SEN06593-16

Shop Manual

BULLDOZER

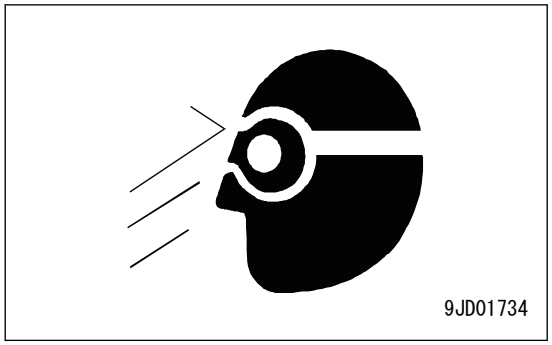
D37EXi -24
D37PXi -24
D39EXi -24
D39PXi -24

SERIAL NUMBERS

D37EXi- 85001
D37PXi- 85001
D39EXi- 95001
D39PXi- 95001

and up

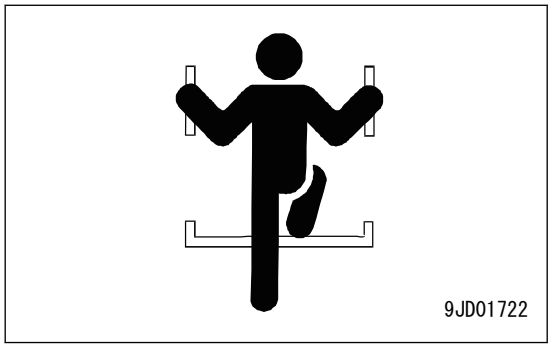
KOMATSU



- Always wear the protective eyeglasses when hitting parts with a hammer.
- Always wear the protective eyeglasses when grinding parts with a grinder, etc.
- When performing any operation with multiple workers, always agree on the operating procedure before starting. Be clear in verbal communication, and observe hand signals. Hang “UNDER REPAIR” warning tag in the operator's compartment Before starting work.
- Only the approved personnel can do the work in a closed environment or in a prohibited area.
- Work and operation which require license or qualification should be performed by qualified workers.
- Welding repairs should be performed by trained and experienced welders. When performing welding work, always wear welding gloves, apron, welding goggles, cap and other clothes suited for welding work.
- Warm up before starting the work with exercise which increases alertness and the range of motion in order to prevent injury.
- Avoid prolonged work, and take a rest at times to keep up a good condition. Take a rest at designated safe area.
- When you work in high places, use a platform.
- Before you start the work, use the personal fall-arrest equipment to prevent falling. There is a danger of personal accident that you fall by slipping.
- Always do the work correctly. If you find the unsafe behavior of co-worker, give him/her a notice and stop it.
- Because there is a danger that you are caught, be very careful when the work is done in dangerous areas such as: when you go in the range where the lifted load possibly falls, or when you stand directly in front of tire, or when you are near the sliding parts.
- When you handle chemical materials (such as nitrogen gas), see the MSDS (safety data sheet) and local guidelines, and get the important information (such as a safe handling method). Also, put on applicable protective equipment (such as protective goggles, gloves, and masks).
- If necessary, cut out all the power sources (electricity, oil pressure, compressed air, etc.) before you start the work. If the machine has a lock mechanism, set it to the LOCK position and install the warning tag in a position where it is easy to see. Do not release the lock until the work is completed.

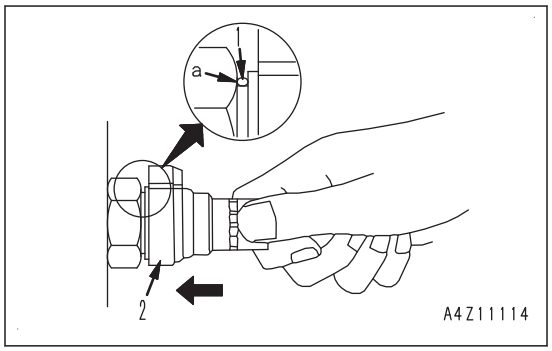
Precautions for Preparatory Work

- Place the machine on a firm and level ground, and apply the parking brake and chock the wheels or tracks to prevent the machine from moving before adding oil or making any repairs.
- Lower the work equipment (blade, ripper, bucket, etc.) to the ground before starting work. If this is not possible, insert the lock pin or use blocks to prevent the work equipment from falling. In addition, be sure to lock all the control levers and hang “UNDER REPAIR” warning tag on them.
- When performing the disassembling or assembling work, support the machine securely with blocks, jacks, or stands before starting the work.
- Remove all mud and oil from the steps or other places for going up and down on the machine. Always use the handrails, ladders or steps when for going up and down on the machine. Never jump on or off the machine. When the scaffold is not provided, use steps or stepladder to secure your footing. Do not use handrails, ladders, or steps if they are damaged or deformed. Repair it or replace it immediately.



Connection

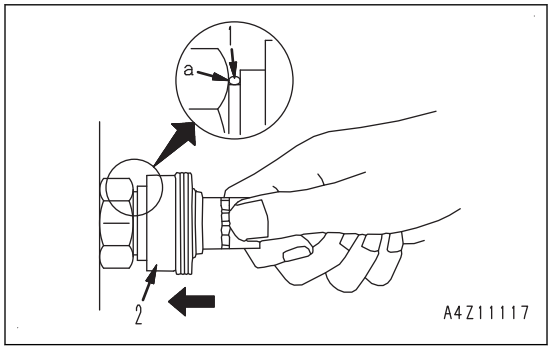
Hold the tightening adapter part, and push body (2) straight until sliding prevention ring (1) contacts contact surface (a) of the hexagonal part at the male end.



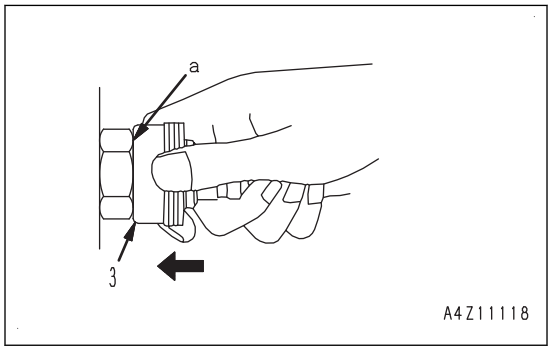
How to Disconnect and Connect Type 3 Push-Pull Type Coupler

Disconnection

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



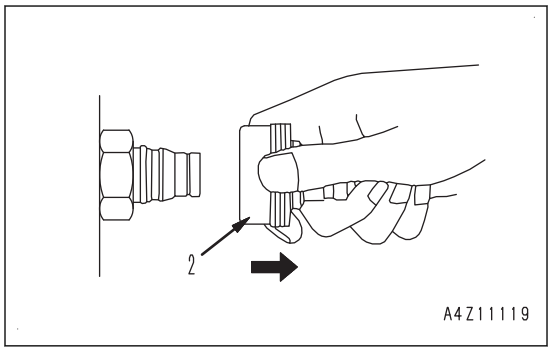
2. While keeping the condition of step 1, push cover (3) straight until it contacts contact surface (a) of the hexagonal portion on the male side.



3. While keeping the conditions of steps 1 and 2, pull out whole body (2) to disconnect it.

   REMARK

   Provide an container to receive a quantity of hydraulic oil which may flow out.



1 °C = 33.8 °F

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

Item	Unit	D39PXI-24
		Serial No. :95001 to 95496
		635 mm
		Single shoe
Length of track on ground	mm	2345
Shoe width (standard track shoe)	mm	635
Minimum ground clearance	mm	390
Engine		
Model	-	SAA4D95LE-7
Type	-	4-cycle, water-cooled, in-line, vertical, and direct injection type with turbocharger and air-cooled after-cooler
No. of cylinders - bore x stroke	mm	4-95 x 115
Total piston displacement	ℓ {cc}	3.26 {3260}
Performance		
Rated horsepower		
• SAE J1995 (gross) (*1)	kW {HP}/ min^{-1} {rpm}	80 {107}/2200 {2200}
• ISO 14396		80 {107}/2200 {2200}
• ISO 9249/ SAE J1349 (net) (*2)		78.4 {105}/2200 {2200}
Maximum torque (net) (*2)	Nm {kgm}/ min^{-1} {rpm}	415 {42.3}/1600 {1600}
Maximum speed with no load	min^{-1} {rpm}	2360 {2360}
Minimum speed with no load	min^{-1} {rpm}	1075 {1075}
Fuel consumption ratio at rated horsepower	g/kWh{g/HPh}	227 {169}
Starting motor	-	24 V, 4.5 kW
Alternator	-	24 V, 85 A
Battery (*3)	-	12 V, 92 Ah x 2 pieces
Radiator core type	-	Corrugated aluminum

*1: Indicates the value of the bare engine (without cooling fan).

*2: Indicates the value at the minimum cooling fan speed.

*3: The battery capacity (Ah) is indicated in the 5-hour rate.

REMARK

- The engine rated horsepower is indicated in the net value and gross value. Gross denotes the rated horsepower measured on the basic engine unit. Net denotes the value of an engine which is measured under the condition almost the same as that of the time when it would be installed on a machine.
  - The rated horsepower (net) at the maximum cooling fan speed is the following value.
    72.9 kW/97.7 HP{2200 min^{-1}/2200 rpm}

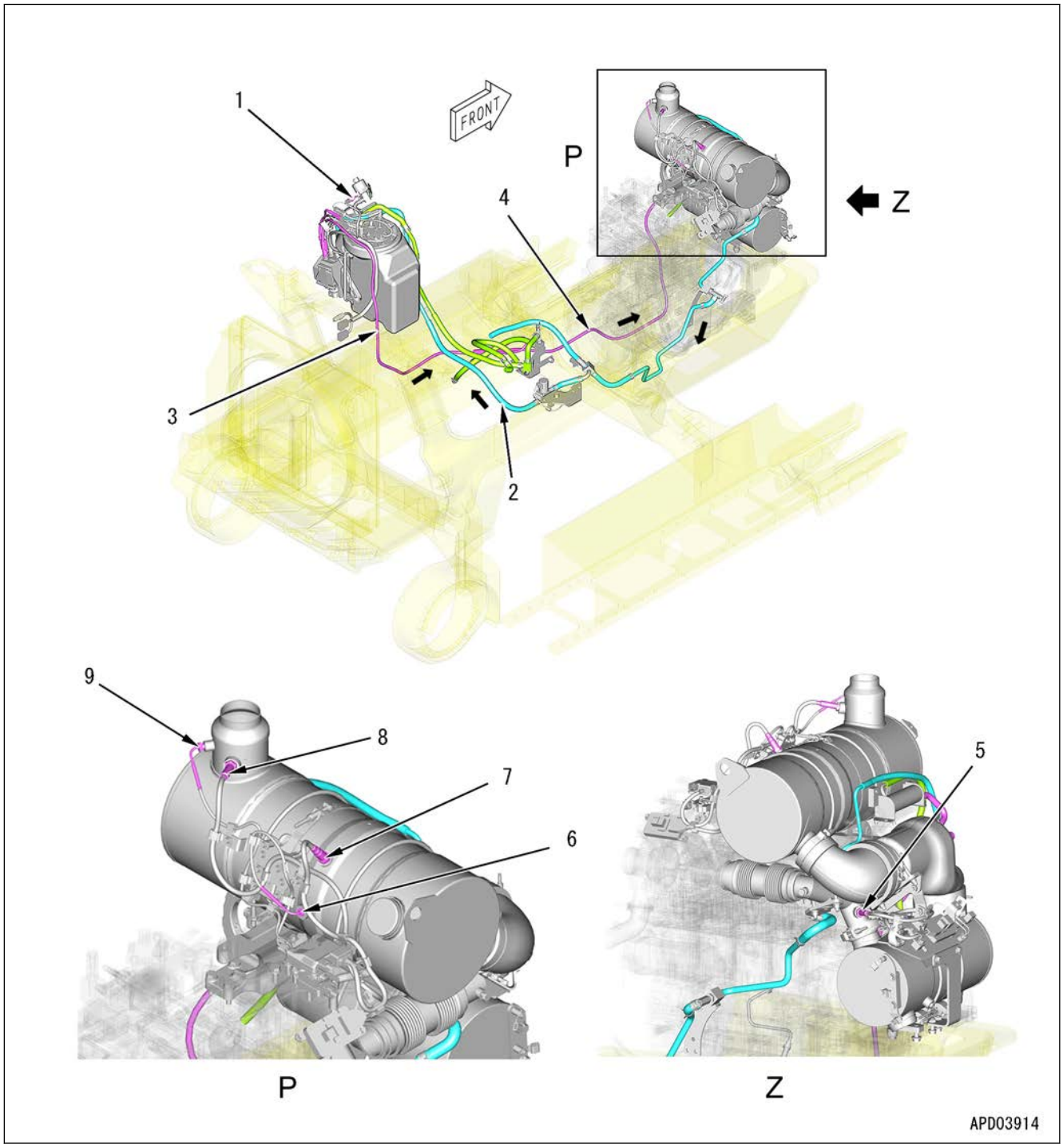
Power train		
HST pump		
Main pump		
Type x quantity	-	Variable displacement swash plate piston type x 2

Urea SCR System

SCR

Abbreviation for Selective Catalytic Reduction

Layout Drawing of Urea SCR System



1: Ambient temperature sensor
2: DEF tank coolant inlet hose
3: DEF pressure hose (low-temperature side)
4: DEF tank pressure hose (high-temperature side)
5: Turbocharger outlet NOx sensor
6: SCR temperature sensor
7: Ammonia sensor
8: SCR outlet NOx sensor
9: SCR outlet temperature sensor

REMARK

- The system operating lamp goes out in a maximum of 6 minutes after the starting switch is turned to “OFF” position.
- The system operating lamp may sometimes lights up while the starting switch is in “OFF” position, because KOMTRAX terminal may maintain its communication under this condition.

On and Off of System Operation Lamp

- Voltage of 24 V is constantly applied to one side of system operating lamp (light emitting diode).
- When any controller is in operation, the controller outputs Low (0 V), and a current flows through the diode and the system operating lamp is lit.
- When no controllers are in operation, the controller outputs High (24 V), and no current flows through the diode and the system operating lamp is not lit.
- KOMTRAX terminal starts and stops repeatedly to perform the communication periodically even when the starting switch is in “OFF” position.
- The start and stop cycle (sleep cycle) of KOMTRAX terminal varies depending on the factors including the communication state and the time when the machine is not in operation, and the lamp may be lit for approximately one hour at the maximum.
- The system operating lamp may look slightly luminous in the dark even when it is not lit. It is due to the minute leakage of current and this is not an abnormal phenomenon.

REMARK

- When you want to cut off the battery circuit for maintenance but the system operating lamp is lit, turn the starting switch to “ON” position once, and then turn it to “OFF” position, and the lamp goes out in a maximum of six minutes.
  After the system operating lamp goes out, turn the battery disconnect switch immediately to “OFF” position.
- After the engine is stopped, DEF in DEF injector or DEF pump is automatically sucked into DEF tank to prevent malfunction caused by freezing of DEF or deposition of urea. Accordingly, the system operation lamp keeps lit for a while after the starting switch is turned to “OFF” position, and this is not an abnormal phenomenon.

Function of System Operating Lamp System (Machine with Gateway Function Controller)

The operation state of each controller is checked by being lit or not being lit of the system operating lamp.

This lamp is lit to inform the operator that any controller is in operation. With this function, an abnormal finishing of the battery power circuit can be prevented from occurring.

⚠ **For shutting off the battery power supply circuit, turn the starting switch to “OFF” position, and check that the system operating lamp is not lit, then turn the battery disconnect switch to “OFF” position.**

⚠ **If the battery disconnect switch is turned to “OFF” position (the battery power supply circuit is shut off) while the system operating lamp is lit, data loss error of controller may occur. Never operate the battery disconnect switch while the system operating lamp is lit.**

REMARK

- The system operating lamp goes out in a maximum of 6 minutes after the starting switch is turned to “OFF” position.
- The system operating lamp may sometimes lights up while the starting switch is in “OFF” position, because Gateway Function Controller may maintain its communication under this condition.

On and Off of System Operation Lamp

- Voltage of 24 V is constantly applied to one side of system operating lamp (light emitting diode).
- When any controller is in operation, the controller outputs Low (0 V), and a current flows through the diode and the system operating lamp is lit.

EGR Cooler

EGR

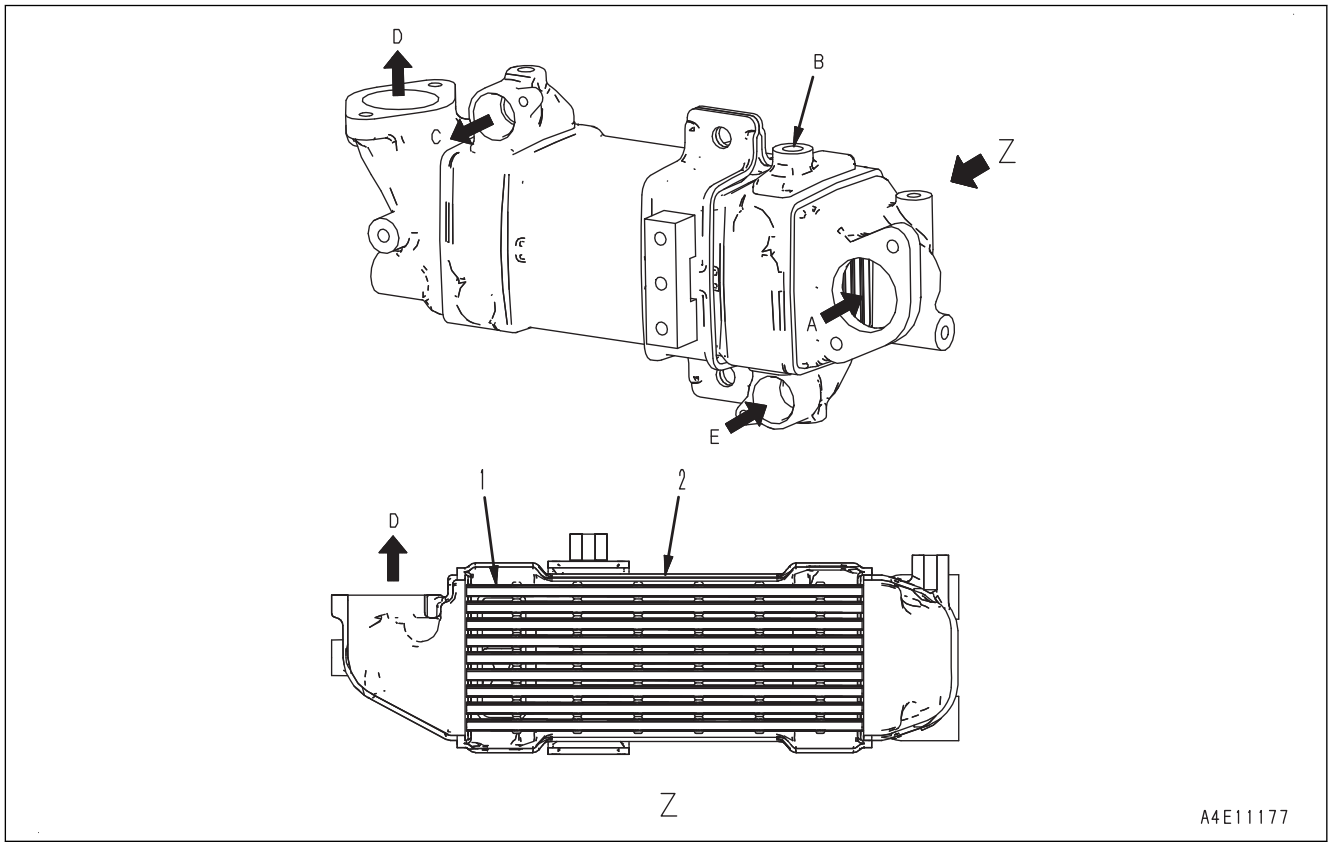
Abbreviation for Exhaust Gas Recirculation

Structure of EGR Cooler

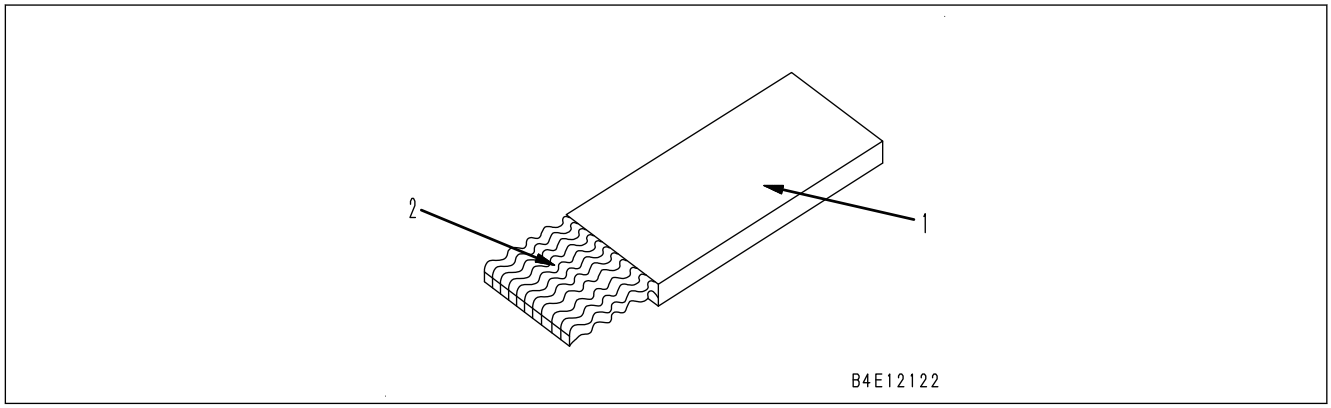
REMARK

The shape is subject to machine models.

General View and Sectional View



A: EGR gas inlet
B: Air vent
C: Coolant outlet
D: EGR gas outlet
E: Coolant inlet
1: Tube
2: Shell



1: Flat tube
2: Inner fin

2: Communication terminal

3: GNSS antenna

4: Communication antenna (Iridium communication version)

Function of KOMTRAX System

- KOMTRAX system transmits various types of information on the machine. KOMTRAX administrator sees the information in the office and supplies various services to the customers.
- KOMTRAX system can transmits the following information.
  - Positional information
  - Working information
  - Alarm and failure information
  - Fuel consumption information
  - Maintenance information
  - Machine working condition information

REMARK

To provide the services, you need to establish radio station for KOMTRAX separately.

Pin No.	Signal name	Input and output signals
19	(*1)	-
20	(*1)	-
21	Datalink4 (+) (sensor controller)	Communication
22	Datalink1(+)(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 2	Input
39	DEF line heater 1	Input
40	(*1)	-
41	(*1)	-
42	(*1)	-
43	Idle validation switch 2:Machine with accelerator pedal	Input
44	Idle validation switch 1:Machine with accelerator pedal	Input
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

Angle valve

4: Pressure compensation valve F (angle) (*1)

5: Suction valve (angle RIGHT)

6: Spool (angle)

7: Suction valve (angle LEFT)

8: Pressure compensation valve R (angle) (*2)

Ripper valve

9: Pressure compensation valve F (ripper) (*1)

10: Suction valve (ripper LOWER)

11: Spool (ripper)

12: Suction valve (ripper RAISE)

13: Pressure compensation valve R (ripper) (*2)

14: Centralized safety valve

15: Pressure relief plug

*1: Flow control valve

*2: Pressure reducing valve

Straight Travel Correction Control Function

- HST controller monitors the operating condition of each lever and each pedal, and constantly controls HST pump swash plate angle, or the discharged volume, so that the output speeds of R.H. and L.H. HST motors are the same.
- When the machine travels forward straight, if R.H. HST motor speed is higher than L.H. HST motor speed, this reduces the control signal of R.H. forward HST pump EPC valve and controls it so that the machine constantly travels straight.

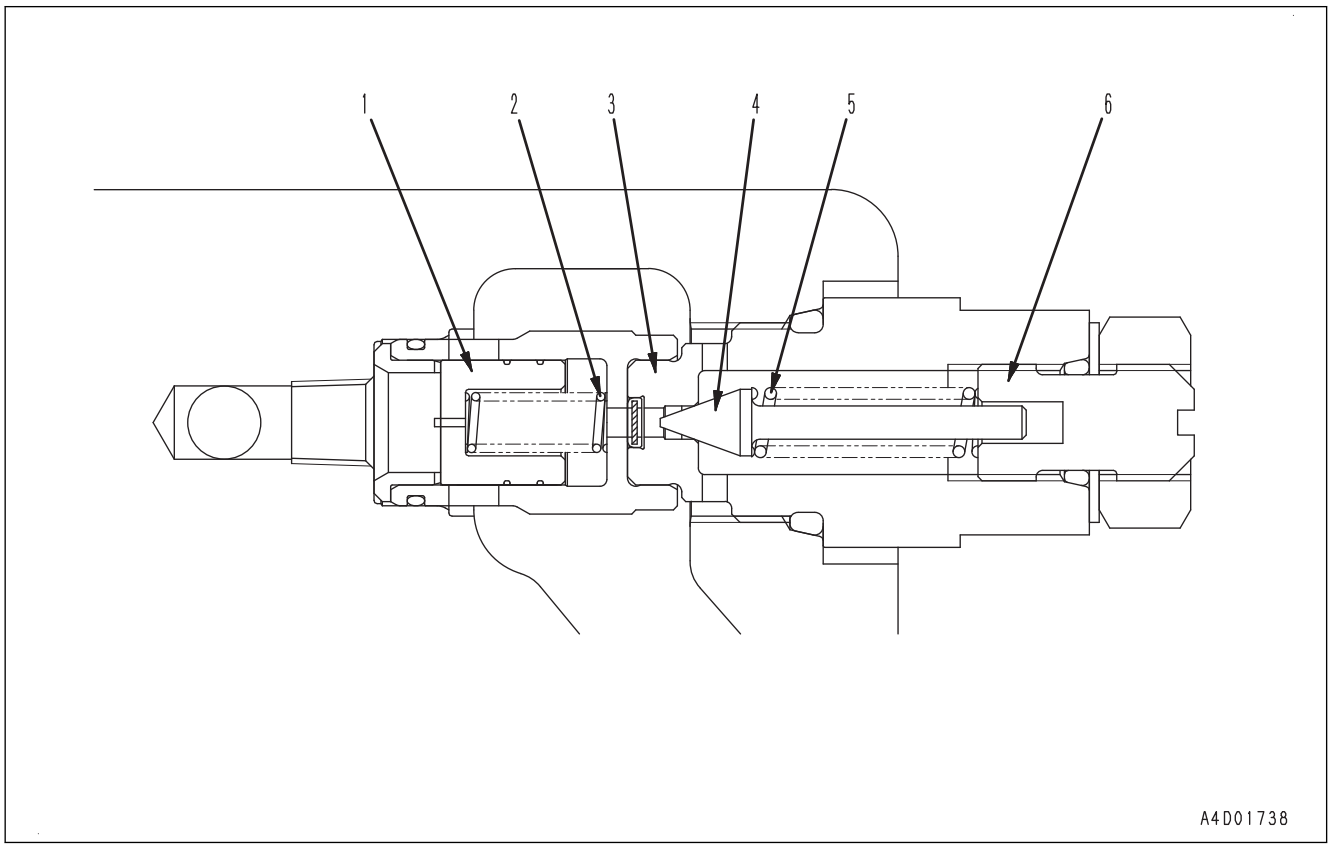
Conditions to Cancel Straight Travel Correction Control

- When the joystick (steering, directional and gear shift lever) is operated to “turn LEFT” or “turn RIGHT”.
- When the travel direction operation of the joystick (steering, directional and gear shift lever) is in “NEUTRAL”.
- When each pedal or the fuel control dial is operated and the speed signal of HST motor speed sensor is 0.15 km/h or less.
- When HST motor speed sensor is judged failed because of an open circuit, etc.

Straight travel is secured in all conditions other than the above.

Structure of Charge Relief Valve of HST Motor

Sectional View



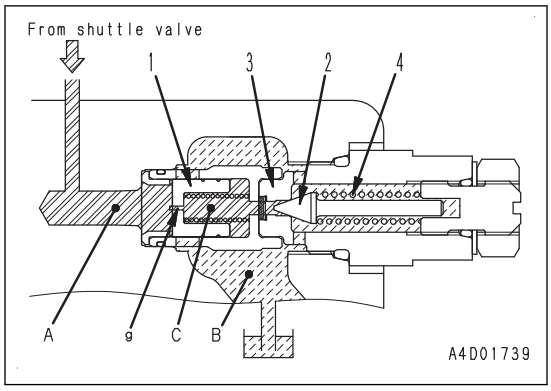
1: Valve
2: Spring
3: Valve seat
4: Poppet
5: Spring
6: Adjustment screw

Function of Charge Relief Valve of HST Motor

- The charge relief valve is installed inside the end cover. By this charge relief valve, the pressure (charge pressure) on the low pressure side of HST main circuit selected by the low-pressure selector spool is prevented from increasing above the set pressure. Also, the oil is relieved into the motor case at the set rate to prevent overheating of the motor.
- In addition, this valve discharges the dirtiest oil in HST main circuit to outside and keep the inside of HST main circuit clean.

Operation of Charge Relief Valve of HST Motor

1. Port (A) is connected to the pressure (charge circuit) on the low pressure side of HST motor's main circuit selected by the low-pressure selector spool.
2. Port (B) is connected to the tank drain circuit through HST motor case.
3. The pressurized oil also fills chamber (C) through orifice (g) of valve(1). Poppet (2) is in close contact with valve seat (3).



Piston Valve

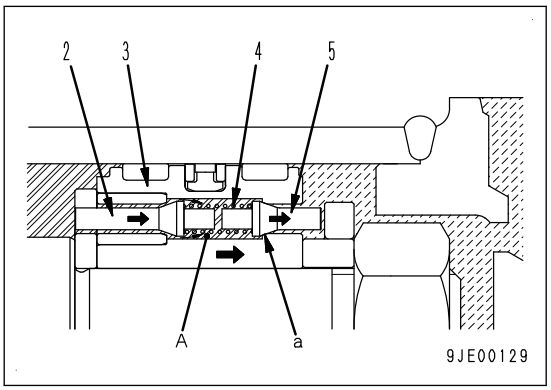
Function of Piston Valve of Blade Angle Cylinder

The piston valve is installed on the piston in the blade angle cylinder. When the piston reaches its stroke end, the valve releases the oil from the hydraulic pump to reduce the oil pressure being exerted on the piston.

Operation of Piston Valve of Blade Angle Cylinder

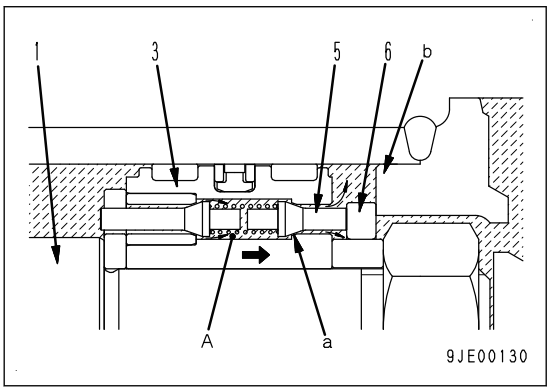
Operation When Piston Valve is Close (During Stroke)

1. The pressurized oil from the work equipment pump pushes piston (2) against spring (4) and open it. Then it flows into chamber (A).
2. Chamber (A) is filled with pressurized oil. Piston valve (5) is pushed to the right, and contacts the tapered area of the piston valve seat (a) to seal in oil.
3. The oil pressure in the cylinder increases and piston (3) is pushed to the right.



Operation When Piston Valve is Open (At Stroke End)

1. Before piston rod (1) reaches its stroke end, slider (6) contacts cylinder bottom (b) and stops movement.
2. Slider (6) touches the end of piston valve (5) and only piston (3) continues moving.
3. Pressurized oil in chamber (A) that has been sealed in by piston valve (5) is released from the piston valve seat (a) to the bottom end and the pressure in the cylinder decreases.



Pin No.	Signal name	Input and output signals
17	(*1)	-
18	(*1)	-
19	(*1)	-
20	(*1)	-
21	GND (power supply)	-
22	Power supply (24 V)	Input
23	(*1)	-
24	Starting switch ACC signal	Input
25	(*1)	-
26	(*1)	-
27	(*1)	-
28	(*1)	-
29	(*1)	-
30	(*1)	-
31	GND (power supply)	-
32	GND (power supply)	-
33	GND (power supply)	-
34	System operating lamp	Output
35	(*1)	-
36	(*1)	-
37	(*1)	-
38	(*1)	-
39	(*1)	-
40	(*1)	-

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

Function of CAB Mount

Sealed and lubricated type damper absorbs vibration of machine in order to reduce the vibration transmitted to an operator.

Machine model			D37EXI-24	
Engine			SAA4D95LE-7	
Item	Measurement condition	Unit	Standard value for new machine	Repair limit
Travel deviation	• Level road surface • HST oil temperature (hydraulic oil temperature)40 to 60 °C • Operating Mode: P (Power mode) • Fuel control dial: MAX (High idle) position • Travel deviation (x): Run 20 m after run up distance of more than 10 m • For measurement posture, see “Machine Posture and Procedures to Measure Performance”, Fig. 1.	mm	Max. 120	Max. 150
Machine drift on slope	• 20 ° slope • Machine posture: Both front up and front down • Joystick (steering, directional, and gear shift lever) (PCCS lever): NEUTRAL position • Control brake: Release mode • Parking brake lock lever: FREE position • Hydraulic drift after the elapse of 1 min. • For measurement posture, see “Machine Posture and Procedures to Measure Performance”, Fig. 2.	m	Max. 3.6	Max. 4.0

Work Equipment Oil Pressure

Machine model			D37EXI-24	
Engine			SAA4D95LE-7	
Item	Measurement condition	Unit	Standard value for new machine	Repair limit
Work equipment pump relief pressure	• HST oil temperature (hydraulic oil temperature)40 to 60 °C • Operating Mode: P (Power mode) • Fuel control dial: MAX (High idle) position • During work equipment relief	MPa {kg/cm^2}	27.44±0.98 {280±10 }	Min. 24.5 {Min. 250}
Control circuit oil pressure	• HST oil temperature (hydraulic oil temperature)40 to 60 °C • Operating Mode: P (Power mode) • Fuel control dial: MAX (High idle) position	MPa {kg/cm^2}	3.23±0.29 {280±3.0 }	3.23±0.29 {280±3.0 }

HST Performance

Machine model				D39EXI-24	
Engine				SAA4D95LE-7	
Item	Measurement condition		Unit	Standard value for new machine	Repair limit
Travel speed	• Level road surface • HST oil temperature (hydraulic oil temperature)40 to 60 °C • Operating Mode: P (Power mode) • Fuel control dial: MAX (High idle) position • Reverse travel speed setting: Default • Gear shift mode: Quick shift mode	F1	km/h	3.4±0.2	3.4±0.4
		F2		5.6±0.3	5.6±0.6
		F3		8.5±0.5	8.5±0.8
		R1		4.1±0.2	4.1±0.4
		R2		6.5±0.3	6.5±0.6
		R3		8.5±0.5	8.5±0.8
	• Level road surface • HST oil temperature (hydraulic oil temperature)40 to 60 °C • Operating Mode: P (Power mode) • Fuel control dial: MAX (High idle) position • Reverse travel speed setting: Default • Gear shift mode: Variable shift mode	Joystick (steering, directional, and gear shift lever) (PCCS lever): FORWARD position	km/h	8.5±0.5	8.5±0.8
		Joystick (steering, directional, and gear shift lever) (PCCS lever): REVERSE position		8.5±0.5	8.5±0.8
	• Level road surface • HST oil temperature (hydraulic oil temperature)40 to 60 °C • Operating Mode: P (Power mode) • Fuel control dial: MIN (Low idle) position • Reverse travel speed setting: Default • Gear shift mode: Variable shift mode	Joystick (steering, directional, and gear shift lever) (PCCS lever): FORWARD position	km/h	0.8±0.2	0.8±0.3
		Joystick (steering, directional, and gear shift lever) (PCCS lever): REVERSE position		0.8±0.2	0.8±0.3

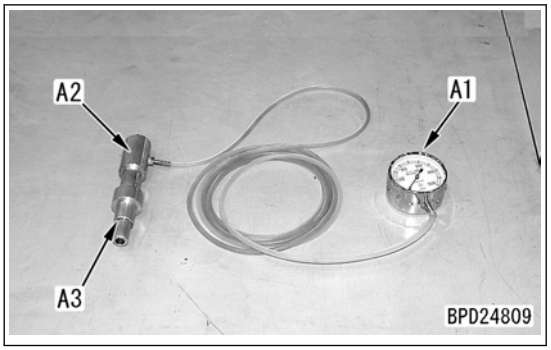
Abbreviation List

- 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

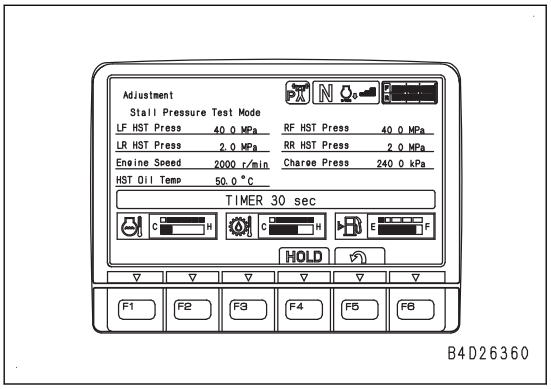
Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*1), or component/system)	Explanation
ABS	Antilock Brake System	Travel and brake (HD, HM)	This is a function that releases the brake when the tires skid (tires are not rotated). This function applies the brake again when the 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).

3. Disconnect the KCCV gas inlet hose (2). Install the cap C to the KCCV hose insertion pipe. Install the tool A2 and the adapter A3 of the blowby checker A to the hose (2), and then connect the gauge A1.
4. Start the engine.
5. Select and display “Pre-defined Monitoring” (01/24). For details, see “Set and Operate Machine Monitor”.
6. Raise the coolant temperature and HST oil temperature to the specified range.



7. Display Adjustment menu, “Stall Pressure Test Mode” screen. See “Set and Operate Machine Monitor”, “VARIOUS SETTINGS OF MACHINE”.
8. Stall the HST and relieve the work equipment circuit simultaneously. Test the blowby pressure at this time.

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

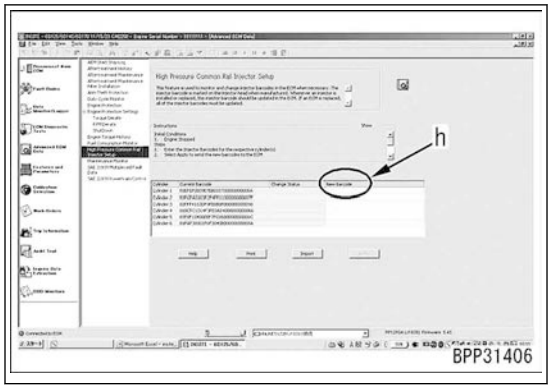


REMARK

- Normally, the blow-by pressure should be measured while the engine is operated at the rated output. In the field, however, an approximate value can be obtained by stalling the HST converter.
- Blowby pressure varies greatly with the condition of the engine. If the value by the test is considered unusual, perform inspection for phenomena such as excessive oil consumption, bad color of exhaust gas, early oil deterioration, early oil contamination, etc., which are related to incorrect blowby pressure.

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

3) Input a new data to the screen (h) “New Barcode”.



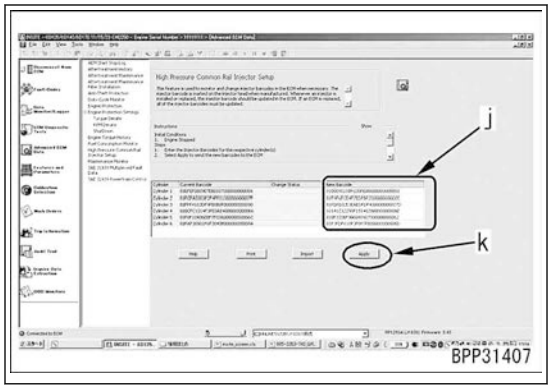
REMARK

- When the injector is replaced, input the injector compensation value of the new injector. When the engine controller is replaced, input the all injector compensation values written on the old engine controller to the new engine controller.
- Input the compensation values referring the maintenance note, etc.

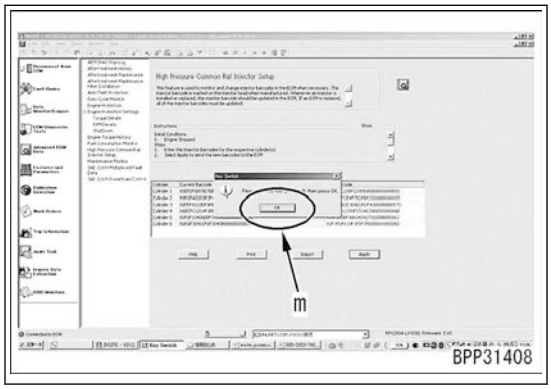
NOTICE

If the compensation values are not correctly written, an engine trouble can result.

10. After inputting the injector compensation values to the screen (j), select the screen (k) “Apply”.



11. Turn the starting switch to OFF position.
12. Select the screen (m) “OK”.



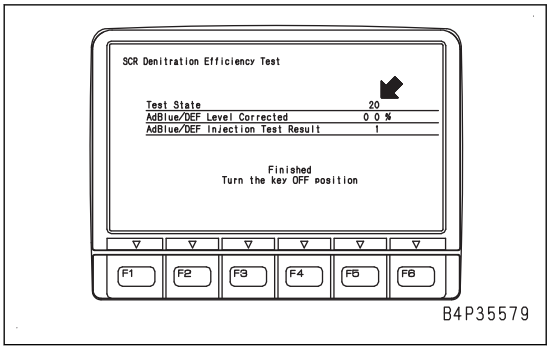
The data processing screen is displayed, and processing is completed in approximately 30 seconds.

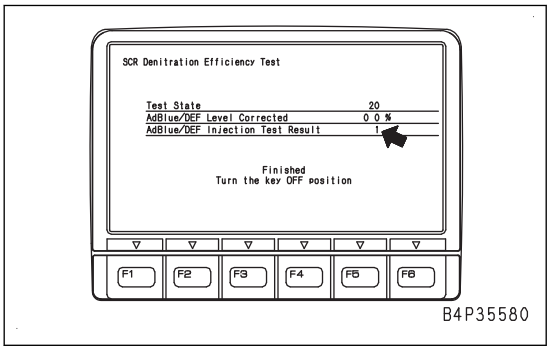
13. After data handling is completed, turn the starting switch to ON position.

7. When “20” of “Test State” flashes, check the state of “DEF Injection Test Result”.

   REMARK

   - “1” indicates a normal state, “0” indicates an abnormal state, and “4” indicates that the test ends halfway due to a failure.
   - If “0” or “4” are displayed, perform procedure 8 and failure code is displayed.





Test	Test result (indication on monitor)			
DEF injection performance	1	0	4	4
Failure code to be displayed	-	[CA3755]	[CA1694]	(*1)

*1: Failure codes other than [CA3755] and [CA1694] may be displayed. Perform troubleshooting for the displayed failure code first.

8. Turn the starting switch to OFF position. Then, turn the starting switch to ON position.

   REMARK

   - If failure codes [CA3755] or [CA1694] is displayed, perform troubleshooting for them.
   - When results of the test is “4” but [CA1694] is not displayed on the monitor, see TROUBLESHOOTING “FAILURE CODES TABLE” and troubleshoot failure codes.

1) Install potentiometer (3) so that “Decelerator/Brake Pedal Potentio” is 3240±100 mV when decelerator/brake pedal (8) is in full stroke position Z.

REMARK

Adjust the voltage by turning the installation position of potentiometer (3).

2) Operate decelerator/brake pedal (8). Check that “Decelerator/Brake Pedal Potentio”is 1830±100 mV when decelerator/brake pedal (8) is in NEUTRAL position X.

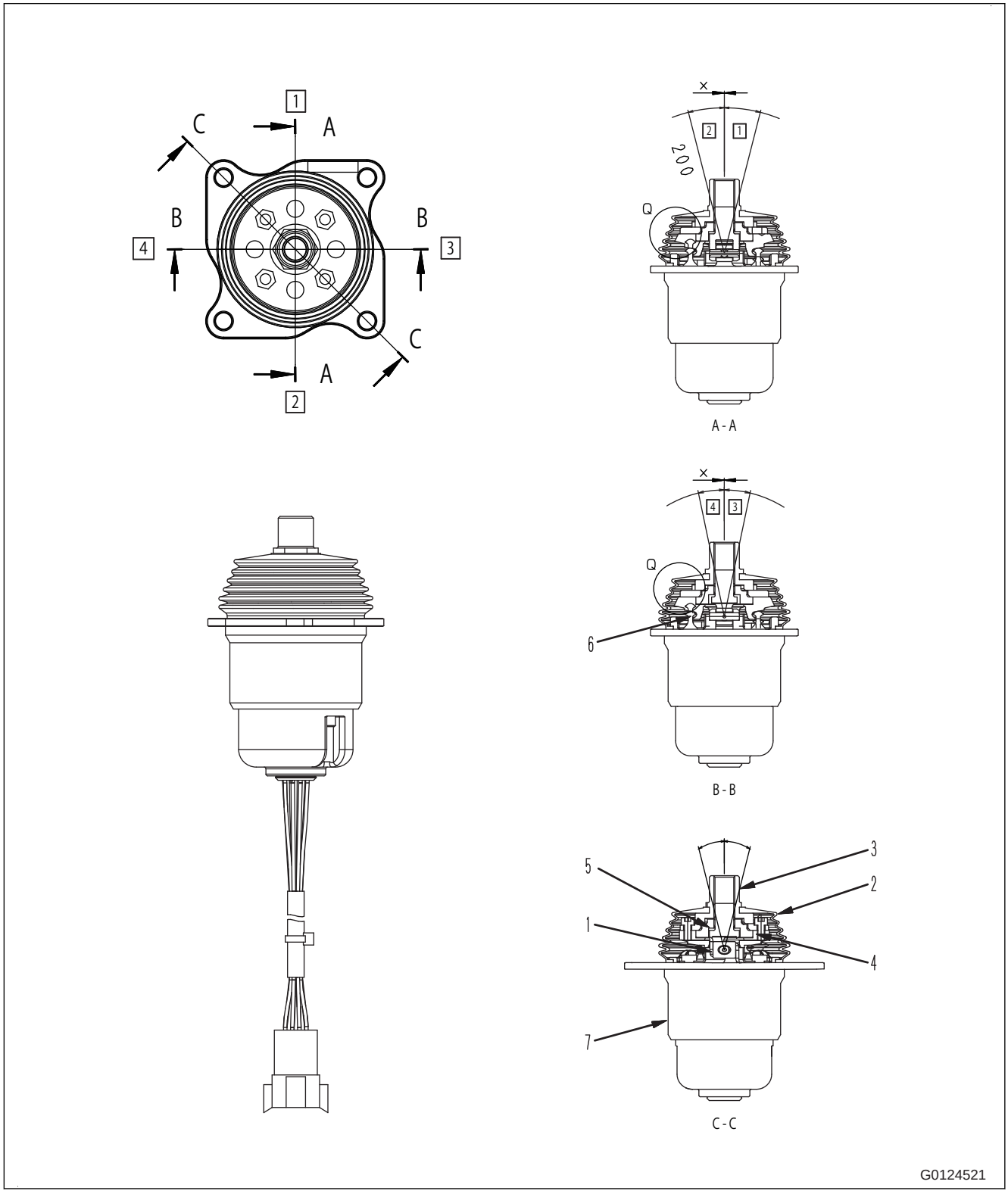
3) Check that “Decelerator/Brake Pedal Potentio”is 3030±180 mV when decelerator/brake pedal (8) is in operating position Y of 2-stage spring.

REMARK

Restart the adjustment from step 1), if the voltage of potentiometer in step 2) and 3) is out of the allowable range.

8. Install limit switch (4).
   1) Set decelerator/brake pedal (8) to operating position Y of the 2-stage spring.
   2) Touch limit switch (4) to face (a) without stroking it, and fix it with the mounting bolts.
   3) Fit notched part of limit switch (5) protection stopper into projection part of limit switch (j).
   4) Set decelerator/brake pedal (8) to full stroke position Z.
   5) Check that limit switch (4) strokes 3 to 3.5 mm.
   6) Check that limit switch protection stopper (5) does not touch surface (a).
   7) Set the parking brake lever to FREE position.
   8) Return the full stroke position Z of decelerator/brake pedal (8) to its NEUTRAL position. Check that the measured value of “Decelerator/Brake Pedal Potentio” in step 7-1) is within -140 to 30 mV whereas the measured value of “Slow Brake SOL Output Curr (F/B)” changes from 0 mA to 600 mA.
   9) Check that the value of “Slow Brake SOL Output Curr (F/B)” changes from 600 mA to 0 mA after stepping on decelerator/brake pedal (8) to full stroke position Z.
9. After installing potentiometer (3) and limit switch (4), restore the condition and perform the following adjustment. For details, see “Set and Operate Machine Monitor”, “VARIOUS SETTINGS OF MACHINE”.
   - Adjustment menu “Brake Pedal Potentio Initial Set”
   - Adjustment menu “Brake Pedal Potentio Detent Set”
   - Adjustment menu “Brake Pedal Potentio Full Set”

The figure is a structural drawing for test and adjustment.



1: Universal joint
2: Boot
3: Nut
4: Disc
5: Nut
6: Rod
7: Valve body

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

Monitoring code	Self-define Monitoring items (screen display)	Unit			Applicable component	Remarks
		SI	Metric	Imperial		
19307	DEF Line Heater 2 State	-	-	-	SCR	1: Being thawed 2: Being kept warm 3: OFF
19309	DEF Pump Heater State	-	-	-	SCR	0: OFF 1: Being thawed 2: Being kept warm 3: OFF
19115	DEF Temperature in Tank	°C	°C	°F	SCR	
19119	Total DEF Injection Qty	L	L	gal	SCR	
19120	DEF Injection Quantity	ml/sec	ml/sec	gal/sec	SCR	
19400	Ambient Temperature	°C	°C	°F	SCR	
19401	Ambient Temperature Sensor Volt	V	V	V	SCR	
19130	DEF Key off Refill Count	-	-	-	SCR	
19133	Engine Room Temperature	°C	°C	°C	SCR	
19134	Engine Room Temp Sensor Voltage	V	V	V	SCR	
19135	DEF Line Heater 2 Command	-	-	-	SCR	0: OFF 1: ON
19136	DEF Pump Temperature	°C	°C	°F	SCR	
19137	Total DEF Heating Time	h	h	h	SCR	
00204	HST Controller Model Code	-	-	-	HST	
20237	HST Controller Ass'y P/N	-	-	-	HST	
20238	HST Controller Program P/N	-	-	-	HST	
20406	HST Controller Serial Number	-	-	-	HST	
04401	HST Oil Temperature	°C	°C	°F	HST	
04402	HST Oil Temperature Sensor Volt	V	V	V	HST	
60000	Theoretical Traction	W	W	W	HST	
40010	Travel Speed	km/h	km/h	mile/h	HST	
40003	Left Travel Speed	km/h	km/h	mile/h	HST	
40002	Right Travel Speed	km/h	km/h	mile/h	HST	
40964	Left Travel Speed Sensor	V	V	V	HST	
40963	Right Travel Speed Sensor	V	V	V	HST	
52503	LF HST Circuit Pressure	MPa	kgf/cm^2	PSI	HST	
52501	RF HST Circuit Pressure	MPa	kgf/cm^2	PSI	HST	
52507	LR HST Circuit Pressure	MPa	kgf/cm^2	PSI	HST	
52505	RR HST Circuit Pressure	MPa	kgf/cm^2	PSI	HST	
52502	LF HST Circuit Pressure Sensor	V	V	V	HST	
52500	RF HST Circuit Pressure Sensor	V	V	V	HST	

Adjustment Menu

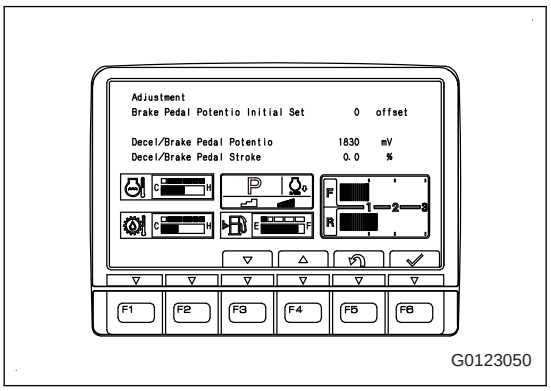
How to do Settings of Machine

Adjustment menu or adjustment ID is used to adjust various settings of the machine.

When performing various adjustments, you can select adjustment items by the following 2 methods.

When You Select Adjustment Items from Adjustment Menu:

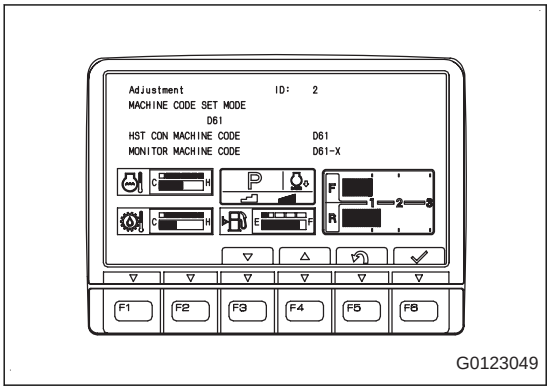
- The functions given to function switches F3 to F6 vary depending on the adjustment item.
- For the method of operating each adjustment item, see the explanation of each adjustment menu.



G0123050

When You Select Adjustment Items from Adjustment ID:

- “000”, “00”, and “0” on the left of the adjustment ID must be filled but they are not displayed on “Adjustment” screen.
- The functions given to function switches F3 to F6 vary depending on the adjustment item.
- For the method of operating each adjustment item, see the explanation of each adjustment ID.



G0123049

Adjustment Item Table

NOTICE

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

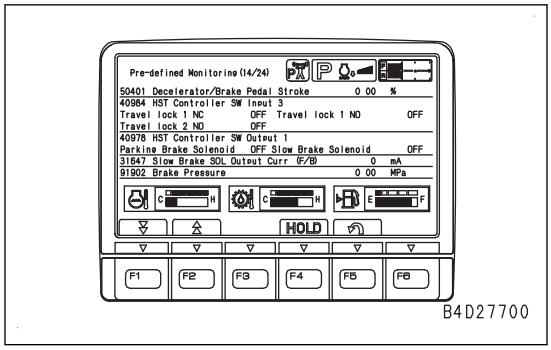
Items to be Selected from “Adjustment Menu”

Code	Adjustment item	Remarks	Reference
02 (*)	Brake Pedal Potentio Initial Set	The control point (zero point) of the decelerator/brake pedal potentiometer is recognized and saved into the HST controller.	METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (BRAKE PEDAL POTENTIO INITIAL SET)
03 (*)	Brake Pedal Potentio Detent Set	The operating effort detent position of the decelerator/brake pedal potentiometer is recognized and saved into the HST controller.	METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (BRAKE PEDAL POTENTIO DETENT SET)
04 (*)	Brake Pedal Potentio Full Set	The full stroke position of the decelerator/brake pedal potentiometer is recognized and saved into the HST controller.	METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (BRAKE PEDAL POTENTIO FULL SET)

6) Display “Pre-defined Monitoring” (14/24). Check that the machine model code of HST controller and machine monitor is normal.

REMARK

- The HST controller and machine monitor may not be compatible between machine models. If a selected machine model is unsupported, settings will not be accepted.
- In this adjustment, the saved setting is effective even when the starting switch is turned to OFF position after the adjustment is completed.



Adjustment ID: 2021 (HST Controller Voltage Check Mode)

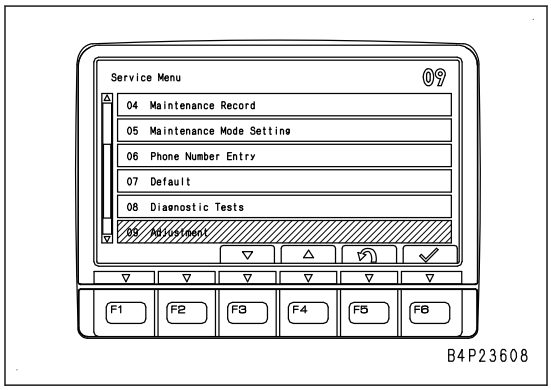
The continuous power supply voltage and switched power supply voltage that are supplied to HST controller can be checked in “HST Controller Voltage Check Mode”.

Perform this testing and adjusting, troubleshooting, etc., as necessary.

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

   REMARK

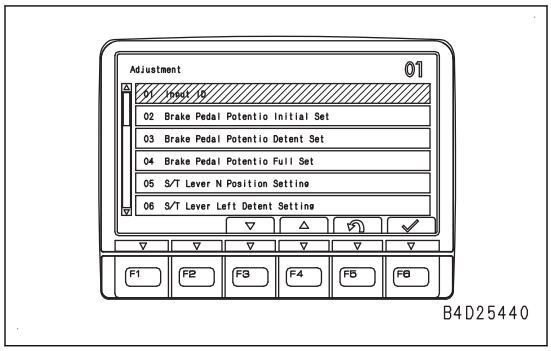
   For selecting method, see “How to Operate Service Mode” in “SERVICE MODE”.



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

   REMARK

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



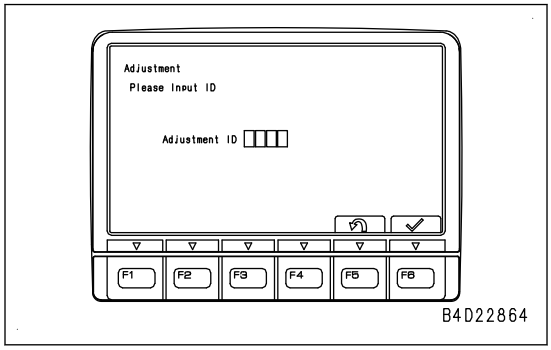
3. On “Input ID” screen, directly input Adjustment ID “2021” by using the numeral input switches.

   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).



REMARK

- If the track specifications are incorrect, press F3 or F4 to select applicable track specifications, and then press F6 to enter the selected item.
- When the specifications are validated, the buzzer makes the short “Beep” sound once.

Machine Monitor Display and Track Specifications (*1)

Machine monitor display	Track specifications
PLUS	PLUS type track shoe + Single shoe

Machine Monitor Display and Track Specifications (*2)

Machine monitor display	Track specifications
PLUS(7 ROLLERS SPEC)	PLUS type track shoe + single shoe + track roller 7 pieces on one side
PLUS(6 ROLLERS SPEC)	PLUS type track shoe + single shoe + track roller 6 pieces on one side

*1: Display and specification of D37EXI-24, D37PXI-24, D39EXI-24, D39PXI-24 machines (applicable to machines 95001 to 95496) are shown.

*2: Display and specification of D39PXI-24 machines (applicable to machines 95497 and up) are shown.

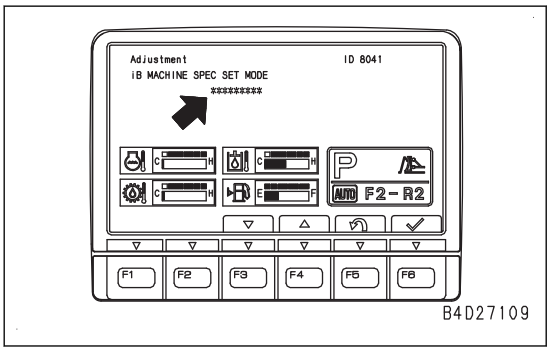
7. After the screen for checking the track width specifications is displayed, check that they are the same as the actual specifications and press F6 to enter the selected item.

   F3: Switches specifications

   F4: Switches specifications

   F5: Cancels the adjustment and returns the screen to the “Input ID” screen.

   F6: Enters the specifications, and moves the screen to the next screen



REMARK

- If the track width specifications are incorrect, press F3 or F4 to select applicable track width specifications, and then press F6 to enter the selected item.
- When the specifications are validated, the buzzer makes the short “Beep” sound once.
- If “UNKNOWN” is displayed, press F3 or F4 to select applicable track width specifications, and then press F6 to enter the selected item.

Machine Monitor Display and Track Width Specifications

Machine monitor display	Machine specifications		Track width specifications
400mm	D37	EXi	D37EXi PLUS type track shoe + Single shoe
460mm			
600mm		PXi	D37PXi PLUS type track shoe + Single shoe
460mm	D39	EXi	D39EXi PLUS type track shoe + Single shoe
510mm			
635mm		PXi	D39PXi PLUS type track shoe + Single shoe
700mm			

Adjust After Replacement of HST Controller

⚠ 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.

⚠ Before replacing HST controller, stop the machine on a safe place and turn the starting switch to OFF position. After the system operating lamp goes OFF, turn the battery disconnect switch to OFF position.

⚠ The system must be adjusted after replacing the HST controller, otherwise the automatic control may not operate and the machine may move unexpectedly.

NOTICE

The system resets adjustment values of the adjustment items to its default values at shipment after replacing HST controller. Check the current adjustment value if necessary.

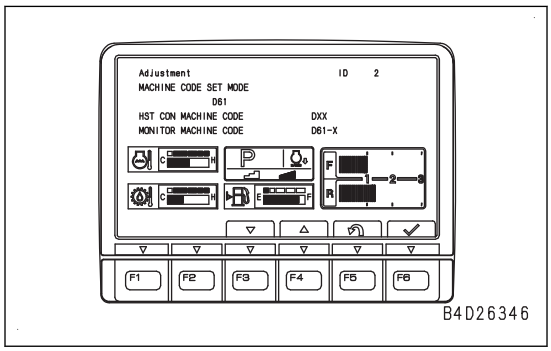
When the machine is assembled or the HST controller is replaced, refer to this section.

How to Adjust After Replacement of HST Controller

1. Turn the starting switch to ON position.
2. Perform the machine model settings. For details, see “Adjustment ID: 0002 (Model Code)”.

   REMARK

   For “METHOD FOR PERFORMING WITH ADJUSTMENT ID: 0002 (MACHINE MODEL MODE)”, see “Set and Operate Machine Monitor”, “VARIOUS SETTINGS OF MACHINE”.
3. Turn the starting switch to OFF position, then turn it to ON position again.

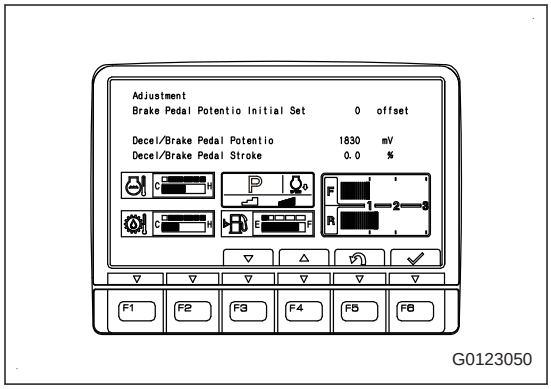


B4D26346

4. Make the HST controller recognize and save the voltage of the decelerator/brake pedal potentiometer in the neutral position. For details, see “Adjustment Menu (Brake Pedal Potentio Initial Set)”.

   REMARK

   For “METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (BRAKE PEDAL POTENTIO INITIAL SET)”, see “Set and Operate Machine Monitor”, “VARIOUS SETTINGS OF MACHINE”.

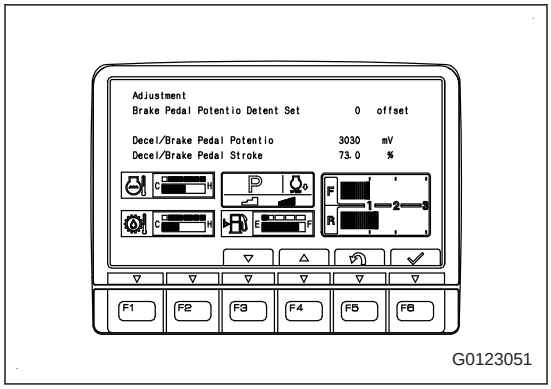


G0123050

5. Make the HST controller recognize and save the voltage of the decelerator/brake pedal potentiometer at operating effort detent position. For details, see “Adjustment Menu (Brake Pedal Potentio Detent Set)”.

   REMARK

   For “METHOD FOR ADJUSTING WITH ADJUSTMENT MENU (BRAKE PEDAL POTENTIO DETENT SET)”, see “Set and Operate Machine Monitor”, “VARIOUS SETTINGS OF MACHINE”.



G0123051

6) Set the position to which total station A is installed (machine position) to total station A.

Coordinates of position to which total station A (Station) was installed: 0, 0, 0

REMARK

For details of the method for setting the station, see the Operation and Maintenance Manual for total station A.

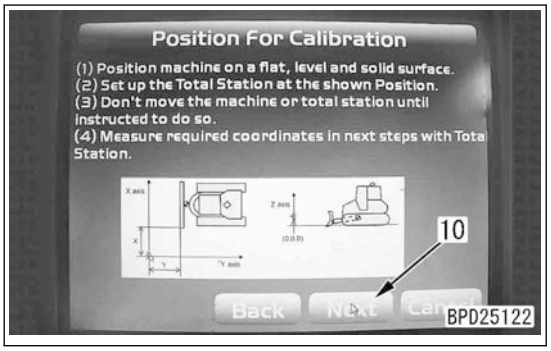
9. After installing the machine and total station A, press “Next” (10).

“Back”: Returns the screen to the previous screen

“Next” (10): Moves the screen to the next screen

“Cancel”: Cancels “Machine Cal Step B”, and returns the screen to the main screen

Pressing “Next” (10) displays the “Blade Position” screen.



10. Measure the coordinates of blade edge position according to the following procedure.

1) Set the prism B at the left edge of the blade.

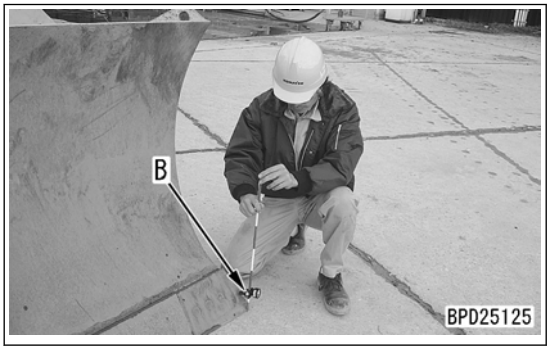
NOTICE

Set the prism B at the top of the cutting edge.

2) Set the total station A to the prism mode.

REMARK

For the method of setting the prism mode, see the Operation Maintenance Manual for total station A.



3) Input the height of prism to total station A.

REMARK

For the method of inputting the prism height, see the Operation and Maintenance Manual for total station A.

4) Measure the coordinates of cutting edge on the left side of the blade, and record them.

NOTICE

- **Measure them accurately because they become a basis to calculate the longitudinal direction of the machine (pitch angle) and the rolling angle of the ground (of the machine).**
- **Measure the coordinates in 1 mm unit.**

REMARK

If the axis of total station A displays “N, E, Z”, read “N” for “X” and “E” for “Y”.

5) Set the prism B at the right edge of the blade.

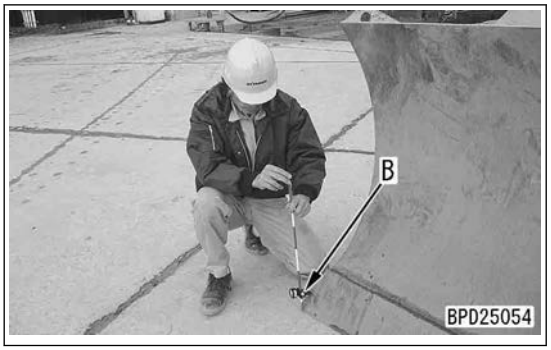
NOTICE

Set the prism B at the top of the cutting edge.

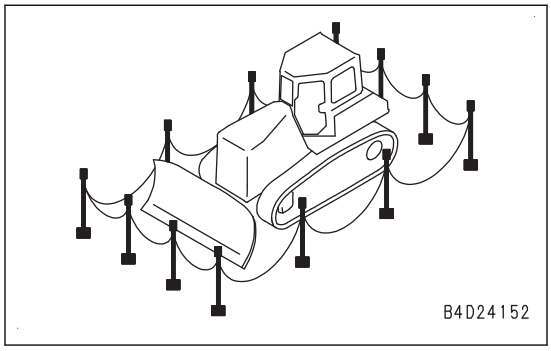
6) Measure the coordinates of cutting edge on the right of the blade, and record them.

NOTICE

- **Measure them accurately because they become a basis to calculate the longitudinal direction of the machine (pitch angle) and the rolling angle of the ground (of the machine).**
- **Measure the coordinates in 1 mm unit.**



Examine Stroke Sensor for Tilt Cylinder



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

⚠ **Since operation of work equipment is required during the test, secure the safety around the machine such as roped-off area before starting the test.**

In “TEST STROKE SENSOR FOR TILT CYLINDER”, test whether the stroke sensor operates.

Make sure to perform this test if any one of these are performed; removal and installation of blade, replacement of stroke sensor, replacement of tilt cylinder.

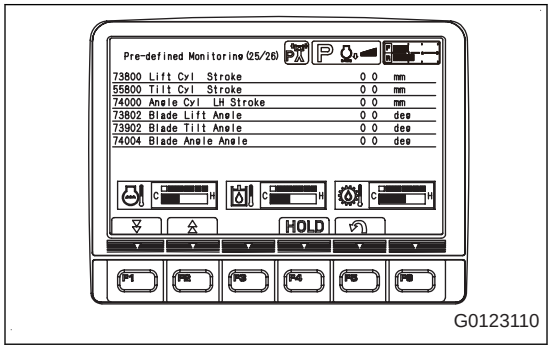
REMARK

Perform this test to clear errors by stroke end reset operation, since the resetting may not be completed due to a large difference between the cylinder length which was saved into ICT sensor controller last time and the actual cylinder length.

How to Examine Stroke Sensor for Tilt Cylinder

1. Start the engine, and stop the machine on a level firm ground.
2. Select and display “Tilt Cyl. Stroke” from “Pre-defined Monitoring” (25/26) or the monitoring selection menu by referring to the section “SET AND OPERATE MACHINE MONITOR”.

   Monitoring Code: 55800 “Tilt Cyl. Stroke”



3. Turn on the power supply of the control box.
4. Reset the stroke end of each cylinder. For details, see “Reset Cylinder Stroke End”.

   REMARK

   Stroke end reset operation is performed to reconfirm cylinder stroke.

5. Measure the stroke on the left tilt side of the blade according to the following procedure.

   REMARK

   Operation of tilting the blade right once is performed to make the ICT sensor controller reset errors of the stroke sensor. This reset operation is performed at the stroke end on the opposite side of measurement (if measuring the left tilt side, this shall be preformed on the right tilt side).

   1) Move the blade to the stroke end by performing right tilt operation and hold it for more than 2 seconds. Confirm that the stroke value on the machine monitor becomes the standard value.

      REMARK

      If the displayed stroke value does not become the standard value, it means that the ICT sensor controller have not cleared all errors of the stroke sensor. Perform stroke end reset on the left TILT side once. Confirm again that the displayed stroke value at the stroke end on the right TILT side becomes the standard value.

Machine model				D39EXI-24			Good	No good
Engine				SAA4D95LE-7				
Item	Measurement condition		Unit	Standard value for new machine	Repair limit	Measured value		
Engine oil pressure	• Engine coolant temperature75 to 94 °C • Joystick (steering, directional, and gear shift lever) (PCCS lever): NEUTRAL position • Engine oil (*2) EO10W30-LA EO15W40-LA EOS5W30-LA EOS5W40-LA	Fuel control dial: MAX (High idle) position	MPa {kg/cm^2}	0.29 to 0.69 {3.0 to 7.0 }	Min. 0.21 {Min. 2.1 }			
		Fuel control dial: MIN (Low idle) position		Min. 0.15 {Min. 1.5 }	Min. 0.13 {Min. 1.3 }			

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

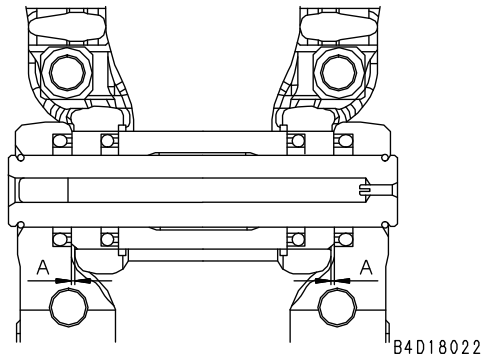
*2: KES diesel engine oil

HST Oil Pressure

Machine model				D39EXI-24			Good	No good
Engine				SAA4D95LE-7				
Item	Measurement condition		Unit	Standard value for new machine	Repair limit	Measured value		
Main circuit oil pressure (LEFT) (*1)	• HST oil temperature (hydraulic oil temperature)40 to 60 °C • Operating Mode: P (Power mode) • Fuel control dial: MAX (High idle) position • Stall pressure test mode	Joystick (steering, directional, and gear shift lever) (PCCS lever): FORWARD position	MPa {kg/cm^2}	40.2 to 44.1 {410 to 450 }	39.2 to 45.1 {400 to 460 }			
		Joystick (steering, directional, and gear shift lever) (PCCS lever): REVERSE position		40.2 to 44.1 {410 to 450 }	39.2 to 45.1 {400 to 460 }			

Track Link

Machine model				D39EXI-24			Good	No good
Engine				SAA4D95LE-7				
Item	Testing conditions		Unit	Allowable clearance	Pin No.	Measurement result		
Opening of track link	Measure opening of track link (A)	Left side of machine	mm	1.2 (one side)				
		Right side of machine		1.2 (one side)				



Related Information to Troubleshooting

General Troubleshooting Points

⚠ If you remove the radiator cap while the engine is still hot, hot coolant may spout out and can scald you. Wait until the engine cools down.

⚠ Take extreme care not to touch a hot portion or not to be wound in a turning portion.

⚠ Before removing a plug or a cap of a portion where oil pressure, hydraulic pressure, or air pressure is applied, release the internal pressure first, then connect the measuring tool securely.

⚠ When disconnecting wiring, remove the key and turn the battery disconnect switch to OFF position.

⚠ Park the machine on a level place and check the frame lock bar, chocks, parking brake, etc.

⚠ When working in a group, make signs and allow only the persons concerned to approach the machine.

- Troubleshooting means to investigate the root cause of a failure, repair immediately, and prevent recurrence of the failure.
- One important thing when you perform troubleshooting is to understand the structure and operation.
- It is important to have an interview with the operator and set up an aim of failure cause for performing a troubleshooting effectively.
- If you disassembly the machine hastily when it has a failure, you may disassemble unrelated portions and may not be able to find the cause. As a result, the costs of the man-hours, parts, oil, or grease may increase, and you may lose the confidence of the users and operators. Accordingly, sufficient advance check and proper procedure are necessary for troubleshooting.

1. Ask users or operators the following questions.
   1) Have any other problems occurred apart from the problem that has been reported?
   2) Is there anything strange about the machine before the failure occurred?
   3) Did the failure occur suddenly, or were there problems with the machine condition before this?
   4) Under what conditions did the failure occur?
   5) Had any repairs been performed before the failure? When were these repairs performed?
   6) Has the same kind of failure occurred before?
2. Perform the following checks before troubleshooting.
   1) Check the machine for a symptom of abnormality.
   2) Perform the Check before starting items.
   3) Check the other check items.
   4) Check other maintenance matters which can be checked externally and are considered to be necessary.
3. Check the degree of the trouble by yourself and judge if it is a real failure or it is a problem of handling or operation.

   When reproducing the trouble phenomenon by operating the machine, do not perform check or measurement that can increase the failure.
4. Use the results of the investigation and inspection to narrow down the probable causes of the failure, then use the troubleshooting flow chart (matrix) to locate the failure exactly.

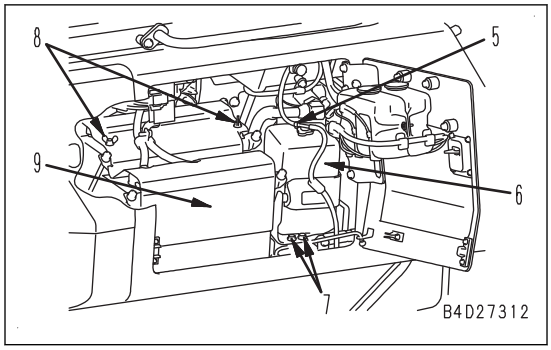
   The basic troubleshooting procedure is as follows.
   - Start from the simple points.
   - Start from the most likely points.
   - Investigate other related parts or information.
5. If the root cause is not corrected, a similar failure may occur again even if the apparent failure has been repaired. Always find out the cause of a failure first and remove the root cause of each failure.

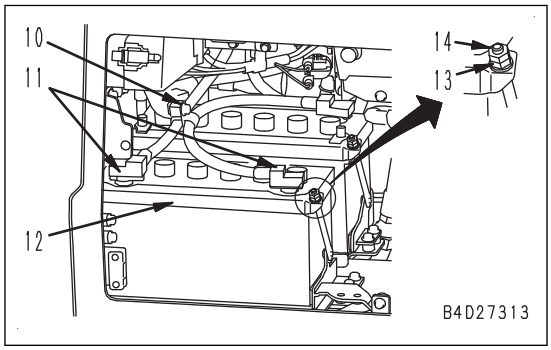
11. Open the hydraulic tank inspection cover on the left side of the machine.
12. Turn the battery disconnect switch to OFF position (O).
13. Remove the clips (5) (2 places) from the hydraulic tank.
14. Remove the bolts (7) (2 pieces), and remove the reservoir tank (6).

    Put the removed reservoir tank on the track.
15. Remove the wing bolts (8) (2 pieces), and remove the vinyl cover (9).
16. Remove the bolt (10) (1 piece), and remove the clip.
17. Loosen the nuts of terminal (11) (2 places), and disconnect the cable from the battery.

    REMARK

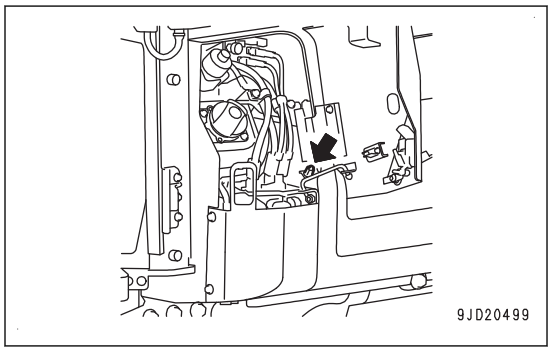
    Remove the ground cable (normally connected to the negative (-) terminal) first.
    If any tool touches the positive (+) terminal of the battery and the chassis, there is a danger that it will cause a spark.



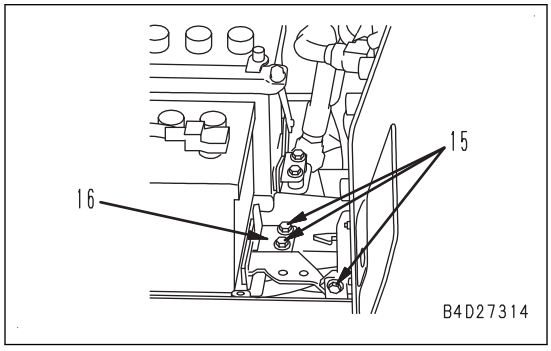


18. Remove the nuts (13) and (14) (2 places each) of the mounting fixture (12) for battery.

    The nut of the battery mounting fixture (1 place) is provided inside the DEF tank filler port cover.

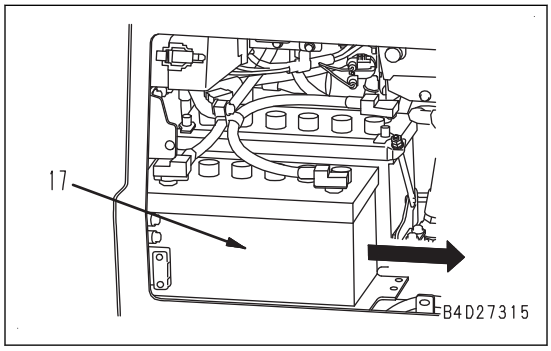


19. Remove the bolts (15) (3 pieces), and remove the bracket (16).



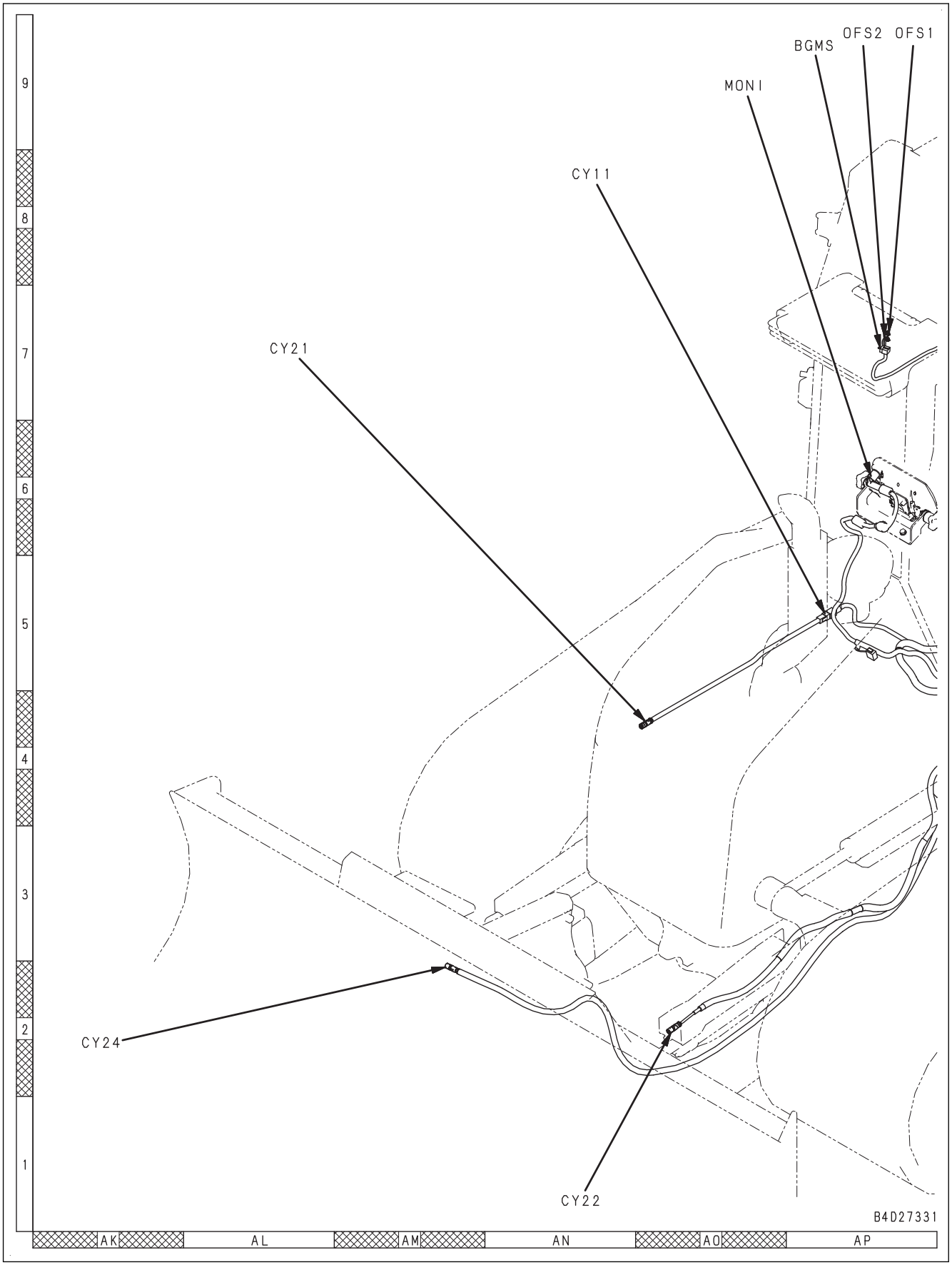
20. Take out the battery (17).

    When taking out the battery, move it toward the rear of the machine.

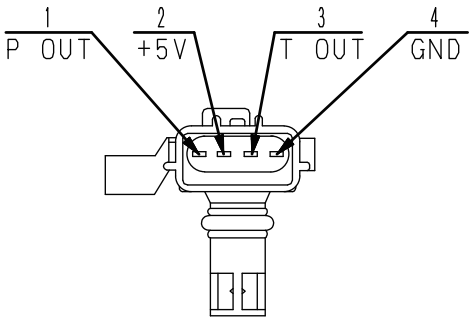
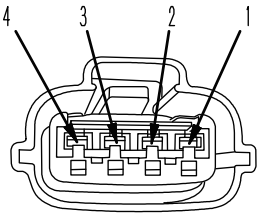


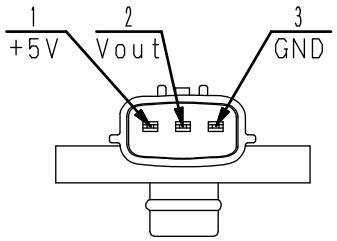
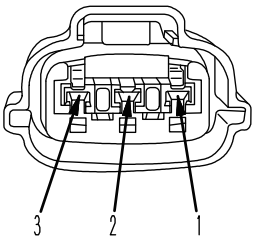
Connector No.	Connector type	Number of pins	Location	Three-dimensional drawing address
AC5	DT	4	Air-conditioning mode selector switch	AD-3
AC6	DT	12	Intermediate connector	AD-7
AC7	DT	2	Diode for foot heater Hi	AB-2
AC8	DT	2	Diode for foot heater Lo	AA-1
AC9	DT	2	Diode for air-conditioning mode	AA-1
ACC1	DT	2	Accessory	AC-2
ACC2	DT	2	Accessory	AD-4
ADB	DT	12	Intermediate connector	L-1
AIS	Relay	5	AIS relay	S-1
AL	DT	2	Blade angle LEFT EPC	K-5
AR	DT	2	Blade angle RIGHT EPC	K-8
ASUS	DT	2	Air suspension seat	M-7
ATS	PACKARD	2	Ambient temperature sensor	L-3
BD2	Terminal	1	Battery disconnect switch	L-3
BGMS	SWP	6	Reverse leveling mode switch (if equipped)	AP-9
BNSW	DT	12	Blade control lever FLOAT switch	P-7
BP1	DT	3	Decelerator/brake potentiometer	O-1
BR1	DTHD (#4)	1	Intermediate connector	V-3
BR2	DTHD (#4)	1	Intermediate connector	V-3
BR3	DT	4	Intermediate connector	V-3
BS	AMP	3	Brake pressure sensor	A-3
BT1	Terminal	1	Battery	J-2
BT4	Terminal	1	Battery	J-3
CAM	-	3	Engine speed sensor (backup)	AE-2
CB01	DT	2	Additional light	AB-9
CB02	DT	2	Rear speaker (L.H.)	AD-7
CB04	DT	2	Rear speaker (R.H.)	AB-9
CB07	YAZAKI	9	Radio	AA-9
CB08	DT	2	Accessory (12 V power supply)	AA-8
CB10	SWP	6	Revolving warning lamp/ additional light switch	Z-8
CB11	SWP	6	Wiper intermittent switch	Z-8
CB12	SWP	6	Rear wiper switch	Z-8
CB13	SWP	6	Right door wiper switch	Z-8
CB14	SWP	6	Front wiper switch	Z-8
CB15	SWP	6	Left door wiper switch	Y-8
CB16	YAZAKI	2	Room lamp	Y-7
CB17/B	DT	4	Right door wiper motor	Y-4

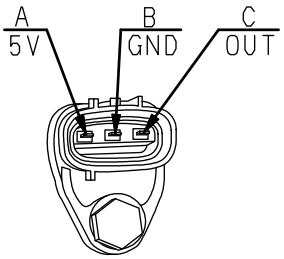
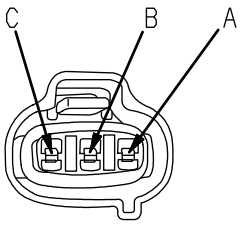
7/8


OFS2
OFS1
BGMS
MONI
CY11
CY21
CY24
CY22
B4D27331
9
8
7
6
5
4
3
2
1
AK
AL
AM
AN
AO
AP

SUMITOMO connector for engine

No. of pins	Boost (air intake) pressure and temeperature sensor (95, 107, 114 engine)		
	Sensor side (plug)	Harness side (receptacle)	Testing connection use special tool Part No.
4			799-601-4230 (Socket) (Kit:799-601-4101) (Kit:799-601-4201)
	-	-	

No. of pins	Boost (air intake) pressure sensor (125, 140 engine)		
	Sensor side (plug)	Harness side (receptacle)	
3			799-601-4250 (Socket) (Kit:799-601-4101) (Kit:799-601-4201)
	-	-	

No. of pins	G sensor (fuel supply pump speed sensor) (125, 140 engine)		
	Sensor side (plug)	Harness side (receptacle)	
3			799-601-4330 (Socket) (Kit:799-601-4101) (Kit:799-601-4201)
	-	-	

B4W21631

Failure code	Failure (Displayed on screen)	Applicable component	Action level	Category of history	Remarks
CA2636	KVGT Communication Error (ECM Detection)	ENG	L03	Electrical system	
CA2637	KDOC Face Plugging	ENG	L01	Electrical system	
CA2765	Injector Trim Data Mismatch	ENG	L01	Electrical system	
CA2771	SCR Outlet NOx Sensor Datalink Timeout Error	ENG	L01	Electrical system	
CA2976	DEF Pump Temperature Sensor Signal Error	ENG	L01	Electrical system	
CA3142	SCR Temperature Sensor High Error	ENG	L01	Electrical system	
CA3143	SCR Temperature Sensor Low Error	ENG	L01	Electrical system	
CA3144	SCR Temperature Sensor In Range Error	ENG	L01	Electrical system	
CA3146	SCR Outlet Temperature Sensor High Error	ENG	L01	Electrical system	
CA3147	SCR Outlet Temperature Sensor Low Error	ENG	L01	Electrical system	
CA3148	SCR Outlet Temperature Sensor In Range Error	ENG	L01	Electrical system	
CA3151	SCR Catalyst Efficiency Low Error 2	ENG	L01	Electrical system	
CA3165	SCR Outlet Temperature High Error	ENG	L03	Electrical system	
CA3229	SCR Temperature High Error	ENG	L03	Electrical system	
CA3231	SCR Temperature High Error - Non Regeneration	ENG	L03	Electrical system	
CA3232	Turbo Outlet NOx Sensor Datalink Timeout Error	ENG	L01	Electrical system	
CA3235	SCR Outlet Temperature High Error - Non Regeneration	ENG	L03	Electrical system	
CA3239	DEF Line Heater 2 Voltage High Error	ENG	L01	Electrical system	
CA3241	DEF Line Heater 2 Voltage Low Error	ENG	L01	Electrical system	
CA3242	DEF Tank Heating Error	ENG	L01	Electrical system	
CA3251	KDOC Inlet Temperature High Error	ENG	L03	Electrical system	
CA3313	KDOC Inlet Temperature Sensor Low Error	ENG	L03	Electrical system	
CA3314	KDOC Inlet Temperature Sensor High Error	ENG	L03	Electrical system	

Failure Code [AQ10MB]

Action level	Failure code	Failure	Manual Stationary Regeneration Request (Automatic Regeneration Uncompleted)2 (Engine controller system)
L03	AQ10MB		
Detail of failure	Manual Stationary Regeneration Request (Automatic Regeneration Uncompleted)2 requires the user to perform “Manual Stationary Regeneration” when a user disables regeneration, the efficiency (catalyst action) of KDOC decreases, or the KDOC outlet temperature during regeneration does not rise because of low load operation being performed.		
Action of controller	Normal operation		
Phenomenon on machine	None		
Related information	**⚠ KDOC is heated to 500 °C and above. Be careful not to get burn injury.** • If the manual stationary regeneration is started when the KDOC inlet temperature is below approximately 250 °C, fuel dosing is disabled, so regeneration does not start. • Temperature in the KDOC inlet temperature sensor can be checked by monitoring function. (Code: 47300) • Temperature in the KDOC outlet temperature sensor can be checked by monitoring function. (Code: 47400) • The KDOC inlet temperature sensor and the KDOC outlet temperature sensor are integrated into one sensor, and controller of integrated sensor communicates with the engine controller through CAN communication. • As to procedure for accessing the KDOC temperature sensor, see Disassembly and Assembly, “Remove and Install KDOC Assembly”. • After turning the starting switch to OFF position, engine controller performs DEF purge (for 6 minutes at maximum) and then stops the engine. To restart the engine, wait until the system operating lamp goes out after turning the starting switch to OFF position, and then turn the starting switch to ON position. • Both of the KDOC inlet temperature and the KDOC outlet temperature during idle (non-regeneration) are approximately 100 to 250 °C. Each temperature difference is approximately 10 °C (KDOC inlet temperature > KDOC outlet temperature). • During the manual stationary regeneration, the KDOC inlet temperature is approximately 250 to 400 °C, and the KDOC outlet temperature is approximately 350 to 600 °C. • Time taken for the manual stationary regeneration responding to Manual Stationary Regeneration Request (Automatic Regeneration Uncompleted)2 is approximately 15 to 60 minutes. How to perform manual stationary regeneration 1. Start the engine. 2. From the manual stationary regeneration start screen of machine monitor, perform “Manual Stationary Regeneration”.		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective KDOC inlet temperature sensor	If there is a significant difference between the KDOC inlet temperature and the KDOC outlet temperature or the SCR temperature while KDOC is completely cooled or the engine is running at idle (non-regeneration), replace the sensor.

<table>
<tr><th>No.</th><th>Cause</th><th colspan="4">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="9">2</td><td rowspan="9">Defective charge temperature sensor</td><td colspan="4">1. Turn the starting switch to OFF position.
2. Disconnect the connector TMAP and connect the socket to male side.
REMARK
Regard the charge temperature sensor as normal if its resistance is 80 Ω to 48 kΩ.</td></tr>
<tr><td rowspan="8">Resistance</td><td rowspan="7">Between TMAP (male) (3) and (4)
Charge thermal characteristics</td><td>-40 °C</td><td>41 to 48 kΩ</td></tr>
<tr><td>-20 °C</td><td>14 to 16 kΩ</td></tr>
<tr><td>0 °C</td><td>5.4 to 6.1 kΩ</td></tr>
<tr><td>30 °C</td><td>1.6 to 1.8 kΩ</td></tr>
<tr><td>60 °C</td><td>500 to 600 Ω</td></tr>
<tr><td>90 °C</td><td>230 to 250 Ω</td></tr>
<tr><td>130 °C</td><td>80 to 90 Ω</td></tr>
<tr><td>Between TMAP (male) (3) and ground</td><td>All range</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Open or short circuit in wiring harness</td><td colspan="4">1. Turn starting switch to OFF position.
2. Disconnect connector ECM J1, and connect T-adapter to female side.</td></tr>
<tr><td>Resistance</td><td colspan="2">REMARK
Use charge temperature sensor resistance characteristics table for check on cause 2 as criteria for resistance
between ECM J1 (female) (62) and (54).</td><td>80 Ω to 48 kΩ</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Hot short circuit in wiring harness</td><td colspan="4">1. Turn the starting switch to OFF position.
2. Disconnect the connector TMAP.
3. Insert the T-adapter into the connector ECM J1.</td></tr>
<tr><td>Voltage</td><td colspan="2">Between ECM J1 (62) and (54)</td><td>Max. 5.25 V</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Short circuit in wiring harness</td><td colspan="4">1. Turn the starting switch to OFF position.
2. Disconnect the connectors ECM J1 and TMAP, and connect the T-adapter to female side of ECM J1.</td></tr>
<tr><td>Continuity</td><td colspan="2">Between ECM J1 (female) (62) and each pin other than pin (62)</td><td>No continuity</td></tr>
<tr><td>6</td><td>Defective engine controller</td><td colspan="4">If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)</td></tr>
</table>

Failure Code [CA332]

Action level	Failure code	Failure	Injector #4 (L#4) Open Circuit Error or Short Circuit Error (Engine controller system)
L03	CA332		
Detail of failure	Injector #4 circuit has open circuit or short circuit.		
Action of controller	None in particular		
Phenomenon on machine	• Engine output lowers. • Engine does not run stably.		
Related information	• After completion of repair, check that the failure code is cleared by the following procedure. Procedure: Start the engine. • While the engine is running normally, approximately 65 V of pulse voltage is supplied to injector (+) side. Because it is pulse voltage, it cannot be measured by using multimeter. • If ground fault or hot short circuit is detected, failure codes [CA322] and [CA332] appear simultaneously.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in “c: Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check it. 2. Start the engine.		
		If this failure code is cleared, wiring harness connector is defective.		
2	Defective injector #4	1. Turn the starting switch to OFF position. 2. Disconnect the connector CN2, and connect the T-adapter to male side.		
		Resistance	Between CN2 (male) (1) and (2)	0.4 to 1.1 Ω
			Between CN2 (male) (2) and ground	Min. 1 MΩ
3	Open circuit or ground fault in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connector ECM J1, and connect the T-adapter to female side.		
		Resistance	Between ECM J1 (female) (27) and (3)	0.4 to 1.1 Ω
			Between ECM J1 (female) (27) and ground	Min. 1 MΩ
4	Open circuit in wiring harness (wire breakage or defective contact of connector)	If no failure is found by check on cause 3, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect the connectors ECM J1 and CN2, and connect the T-adapter to each female side.		
		Resistance	Between ECM J1 (female) (27) and CN2 (female) (2)	Max. 1 Ω
			Between ECM J1 (female) (3) and CN2 (female) (1)	Max. 1 Ω

B. Check with machine monitor (02 Failure record, 01 Monitoring, 09 Cylinder Cutout mode operation)							Good	No good
3	Check of failure code							
4	Check of monitoring information							
	Code	Item to be displayed	Testing conditions	ISO unit	Standard value (reference value)	Measured value	Good	No good
	01002	Engine speed	Minimum speed	r/min	1100±50			
			Max. speed	r/min	2100±50			
			Rated speed	r/min	2050			
	31701	Throttle position	Low idle	%	0			
			High idle	%	100			
	18600	Final inject fueling command (in weight)	Blade relief	mg/st	-		-	-
	36200	Common Rail Pressure Command	Blade relief	MPa	-			
	36400	Common Rail Pressure	Blade relief	MPa	-			
	36300	Final Injection Timing Command	Low idle	CA	-		-	-
			High idle	CA	-		-	-
			Blade relief	CA	-		-	-
	36500	Charge pressure	Blade relief	kPa	-		-	-
	04107	Coolant temperature	Low idle	°C	-		-	-
	14200	Fuel temperature	Low idle	°C	-		-	-
5	Check of Cylinder Cutout Mode Operation (engine speed)							
	Function	Cutout cylinder	Testing conditions	ISO unit	Standard value (reference value)	Measured value	Good	No good
	Set cutout to each cylinder.	No.1 cylinder	Low idle	r/min	-		-	-
		No.2 cylinder	Low idle	r/min	-		-	-
		No.3 cylinder	Low idle	r/min	-		-	-
		No.4 cylinder	Low idle	r/min	-		-	-

C. Check of fuel circuit pressure		Testing conditions	Unit	Standard value (reference value)	Measured value	Good	No good
6	Pressure in fuel low-pressure circuit	High idle or under load equivalent to rated operation (at Blade relief)	MPa {kg/cm^2}	0.15 to 0.3 {1.5 to 3.0}			

Failure Code [CA1684]

Action level	Failure code	Failure	DEF Tank Heating Valve Voltage Low Error (Engine controller system)
L01	CA1684		
Detail of failure	Low voltage error is detected in signal circuit of DEF tank heating valve.		
Action of controller	Advances to Inducement strategy.		
Phenomenon on machine	• Failure to thaw DEF. • Engine power deration according to inducement strategy.		
Related information	• The DEF tank heating valve operates when thawing the DEF and when starting the engine while the temperature of the engine coolant is 45 °C or below. • The DEF tank heating valve also operates when an “DEF Tank Heater Valve Test” is implemented. • This failure code is detected only when the DEF tank heating valve is driven. • After repairing, check if the failure code is cleared by the following procedure. Procedure: Start engine (Engine coolant temperature: 45 °C or below), “Service mode” and “Testing menu (SCR service test) - Operate” of “Setting and operating machine monitor” to perform “DEF tank heater valve test”.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in “Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check it. 2. Start engine (engine coolant temperature: Max. 45 °C) or perform “DEF tank heater valve test”.		
		If this failure code is cleared, wiring harness connector is defective.		
2	Defective DEF tank heating valve	1. Turn starting switch to OFF position. 2. Disconnect connector UHV, and connect T-adapter to male side.		
		Resistance	Between UHV (male) (1) and (2)	15 to 30 Ω
3	Open or short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connector ECM J2, and connect the T-adapter to female side.		
		Resistance	Between ECM J2 (female) (82) and (57) **REMARK** The resistance value is the same as the DEF tank heating valve value.	15 to 30 Ω
4	Ground fault in wiring harness (contact with ground circuit)	1. Turn the starting switch to OFF position. 2. Disconnect the connectors ECM J2 and UHV, and connect the T-adapter to either female side.		
		Resistance	Between ground and ECM J2 (female) (82) or UHV (female) (1)	Min. 1 MΩ

No.	Cause	Procedure, measuring location, criteria and remarks
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. (EU Specification)

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. 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.

No.	Cause	Procedure, measuring location, criteria and remarks
6	Defective exhaust connector or duct to KDOC	Check the exhaust system between the variable flow turbocharger and KDOC for damages in connectors or ducts or loose connections.
7	Defective exhaust gas color	1. Suddenly accelerate the engine from low idle to high idle two times, and then keep the engine running at high idle for 5 seconds. If excessively black smoke is continuously coming out while running the engine at high idle, perform “EXHAUST GAS COLOR IS BLACK” of S mode. **REMARK** Black smoke powder which comes out during acceleration but disappears at high idle is normal.
8	Manual stationary regeneration was performed.	Perform the manual stationary regeneration from Active Regeneration for Service. **NOTICE** **If failure code [CA1691] appears after performing active regeneration for service, KDOC's efficiency is degraded. Perform procedure 8 of [CA1691].**

<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="6">3</td><td rowspan="6">Open circuit in wiring harness (wire breakage or defective contact of connector) (broken power line)</td><td colspan="3">• Power line
1. Turn starting switch to OFF position.
2. Disconnect connector NOX1 and connect T-adapter to female side.
3. Turn starting switch to ON position.</td></tr>
<tr><td>Voltage</td><td>Between NOX1 (female) (1) and (4)</td><td>Min. 22 V</td></tr>
<tr><td colspan="3">If no failure is found by above results, this check is not required.
1. Turn the starting switch to OFF position.
2. Disconnect the connectors SSR and NOX1, and connect the T-adapter to each female side.</td></tr>
<tr><td rowspan="2">Resistance</td><td>Between SSR (female) (6) and NOX1 (female) (1)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between NOX1 (female) (4) and ground</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="8">4</td><td rowspan="8">Open circuit in wiring harness (wire breakage or defective contact of connector) (broken communication line)</td><td colspan="3">• Communication line
If no failure is found by check on cause 2, this check is not required.
1. Turn the starting switch to OFF position.
2. Check that the system operating lamp is not lit, and then turn the battery disconnect switch to OFF position.
3. Disconnect the connectors ECM J2, NOX1, CTE2, and CTE1, and connect the T-adapter to each female side.</td></tr>
<tr><td rowspan="6">Resistance</td><td>Between ECM J2 (female) (21) and NOX1 (female) (3)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between ECM J2 (female) (45) and NOX1 (female) (2)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CTE2 (female) (A) and NOX1 (female) (3)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CTE2 (female) (B) and NOX1 (female) (2)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CTE1 (female) (A) and NOX1 (female) (3)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CTE1 (female) (A) and NOX1 (female) (2)</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Ground fault in wiring harness (contact with ground circuit)</td><td colspan="3">If no failure (no open circuit) is found by check on cause 2, measure resistance at any one place in Hi line and Lo line.
1. Turn the starting switch to OFF position.
2. Check that the system operating lamp is not lit, and then turn the battery disconnect switch to OFF position.
3. Disconnect all related connectors, and connect the T-adapter to the female side of the connector to be measured.</td></tr>
<tr><td rowspan="2">Resistance</td><td>Between ground and any of ECM J2 (female) (21), CTE2 (female) (A), CTE1 (female) (A), NOX1 (female) (3), NH3 (female) (2), TDOC (female) (3), SCRT (female) (3), NOX2 (female) (3), and UREA (female) (2)</td><td>Min. 1 MΩ</td></tr>
<tr><td>Between ground and any of ECM J2 (female) (45), CTE2 (female) (B), CTE1 (female) (B), NOX1 (female) (2), NH3 (female) (3), TDOC (female) (2), SCRT (female) (2), NOX2 (female) (2), and UREA (female) (1)</td><td>Min. 1 MΩ</td></tr>
</table>

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 the HST oil. Immediately after the relieve, return the joystick (steering, directional and gear shift lever) (PPCS lever) to NEUTRAL position before overheating.

5) Return the blade control lever to NEUTRAL position, and wait 5 seconds and perform the step 4 again.

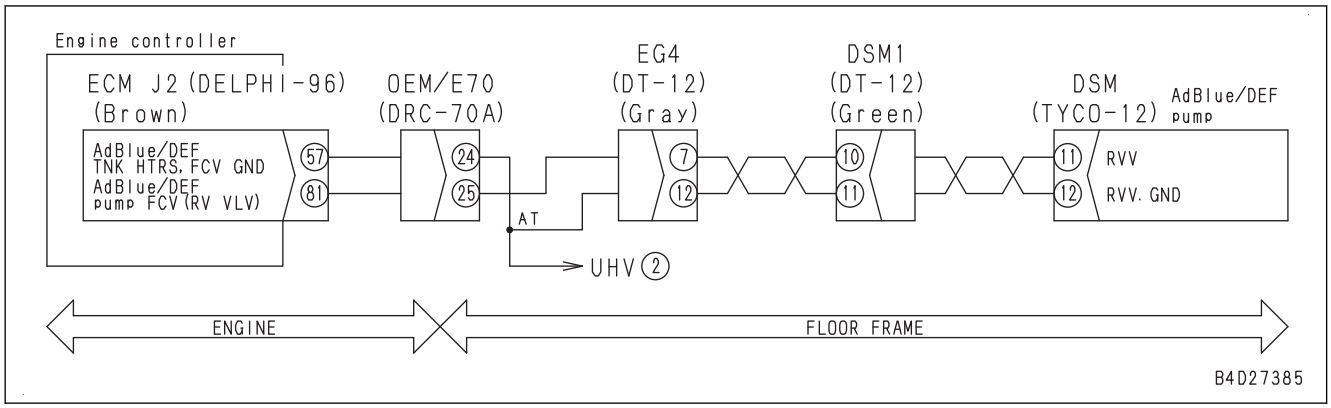
6) Repeat above steps 4 and 5 for 25 minutes.

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

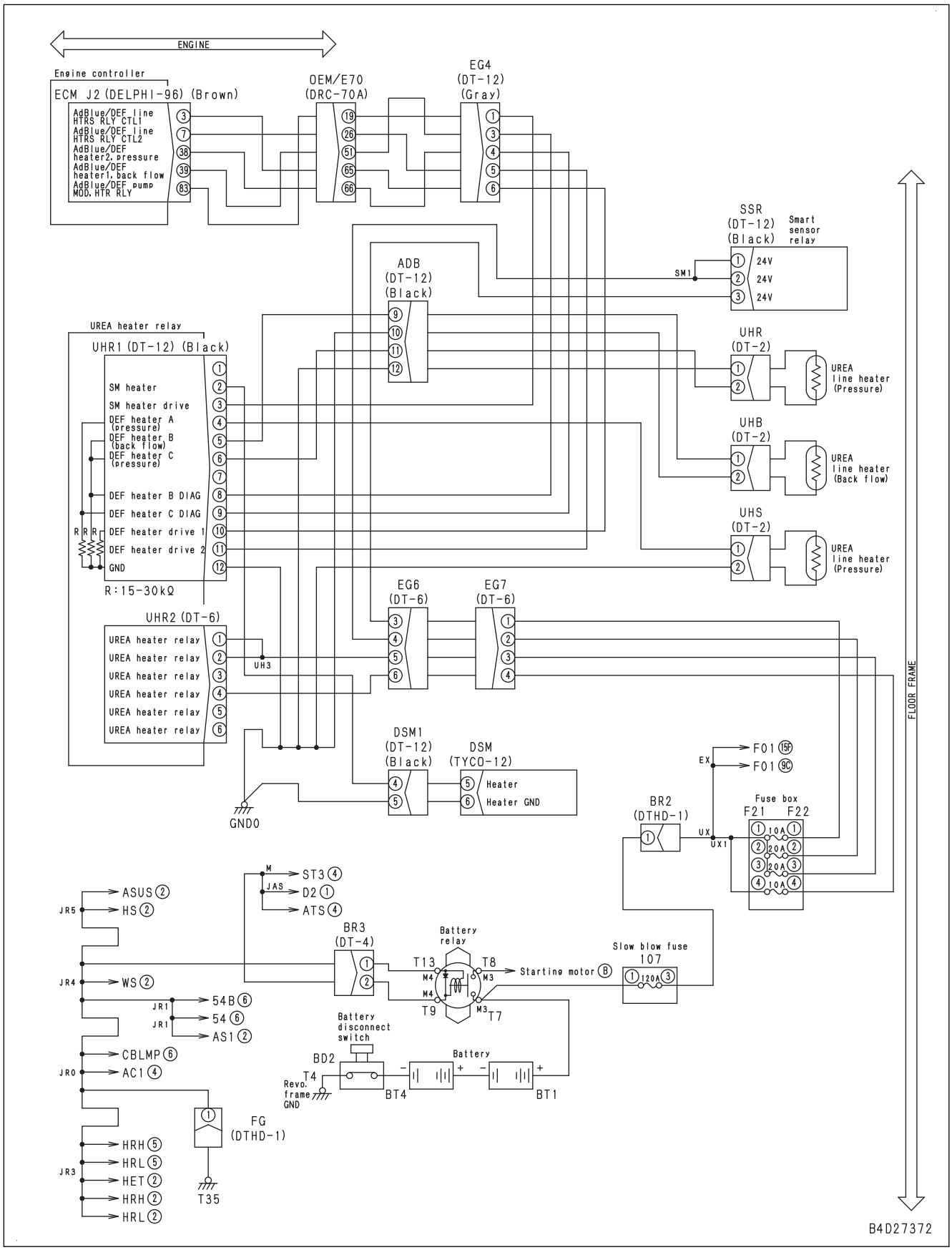
7. (Make sure this failure code and failure code [CA3582] are not displayed.)

No.	Cause	Procedure, measuring location, criteria and remarks		
4	Open circuit in wiring harness (wire breakage or defective contact of connector)	**REMARK** If no failure is found by check on cause 3, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect the connectors ECM J2 and DSM , and connect the T-adapter to each female side.		
		Resistance	Between ECM J2 (female) (81) and DSM (female) (11)	Max. 1 Ω
			Between ECM J2 (female) (57) and DSM (female) (12)	Max. 1 Ω
5	Hot short circuit in wiring harness (contact with 24 V circuit)	1. Turn starting switch to OFF position. 2. Disconnect connector DSM, and connect T-adapter to female side. 3. Turn starting switch to ON position (with the valve disconnected).		
		Voltage	Between DSM (female) (11) and (12)	Max. 4.5 V
6	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J2 and DSM, and connect T-adapter to female side of ECM J2.		
		Continuity	Between ECM J2 (female) (81) and each pin other than (81)	No continuity (no sound)
7	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

Circuit Diagram of DEF FCV



Circuit Diagram of DEF Line Heater

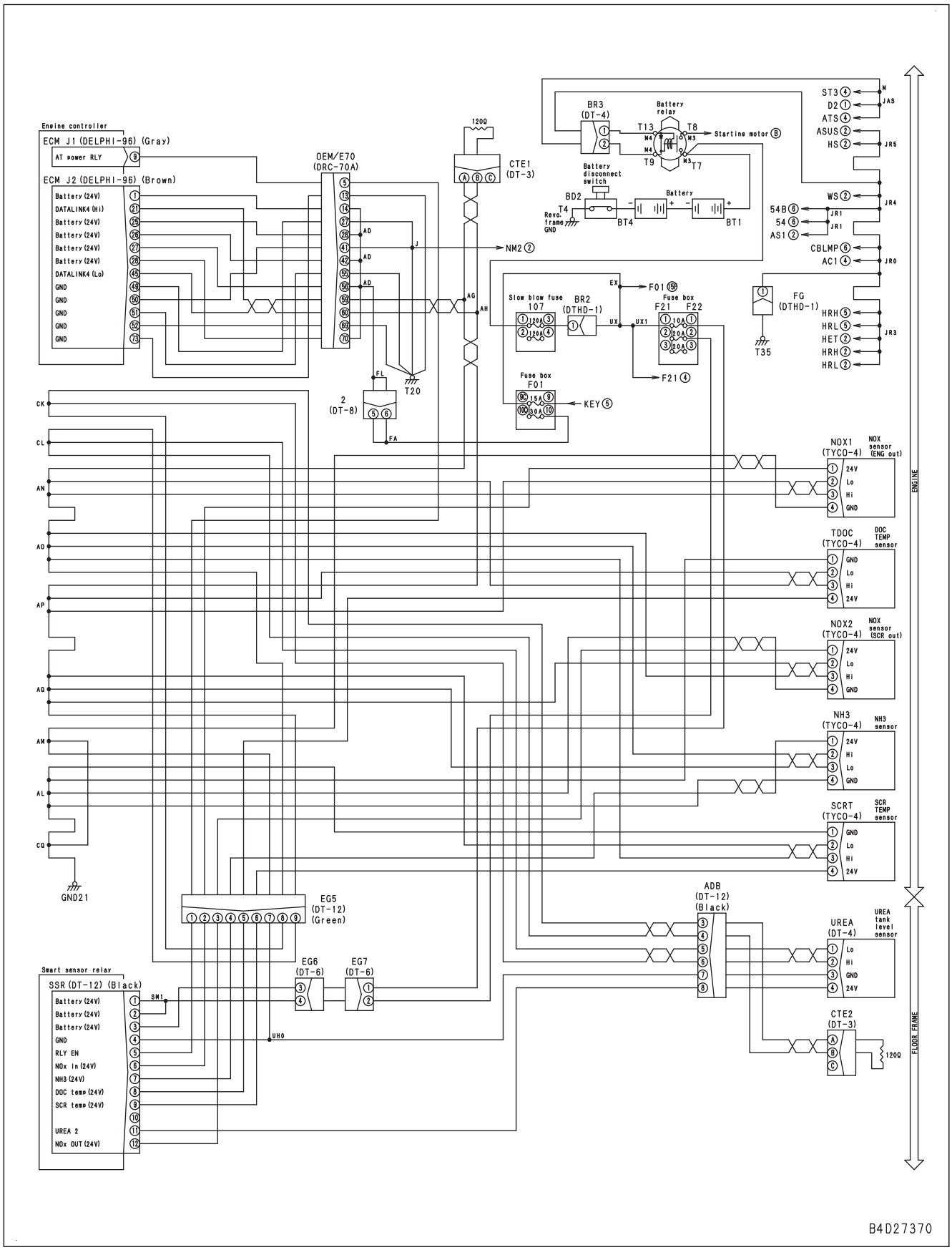


Failure Code [CA3918]

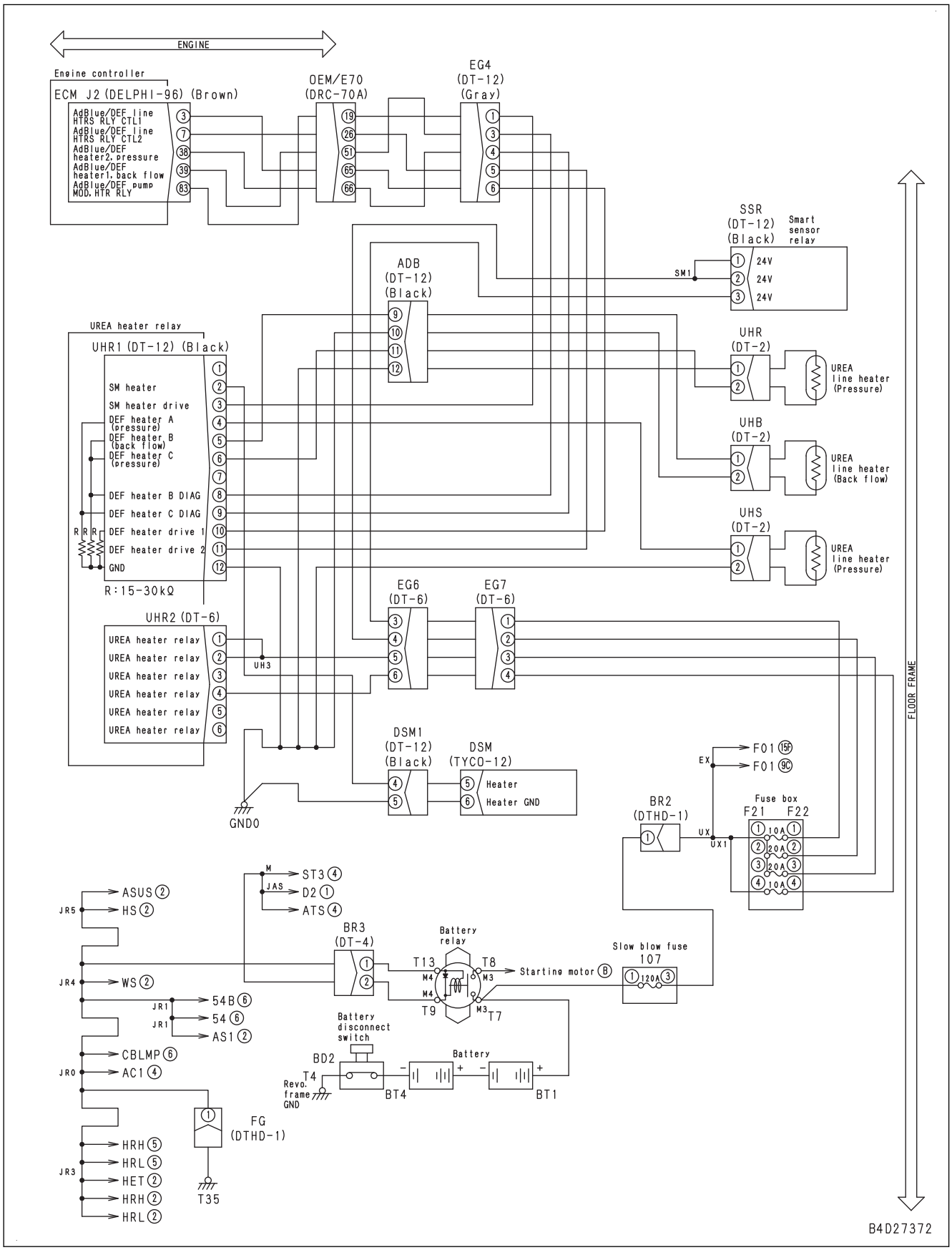
Action level	Failure code	Failure	KVGT Stuck Error (Engine controller system)
L03	CA3918		
Detail of failure	Voltage error is detected in internal data of the variable flow turbocharger drive controller (EDU)		
Action of controller	• Closes EGR valve and fully opens the flow control valve and exhaust throttle valve of the variable flow turbocharger. • Derates engine power for operation.		
Phenomenon on machine	Engine output lowers.		
Related information	• This failure code is detected in the variable flow turbocharger drive controller (EDU). • After completion of repair, check that the failure code is cleared by the following procedure. Procedure: Turn the starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective wiring harness connector	1. See descriptions of wiring harness and connectors in “Electrical equipment” in “CHECKS BEFORE TROUBLESHOOTING” of “RELATED INFORMATION ON TROUBLESHOOTING”, and check them. 2. Start the engine.		
		If this failure code is not displayed, the wiring harness connector is defective.		
2	Defective power supply system of the variable flow turbocharger drive controller	If failure code [CA1938] is displayed, perform troubleshooting for it first. 1. Turn the starting switch to OFF position, and turn the battery disconnect switch to OFF position. 2. Disconnect the connectors EDU, and insert the T-adapter into it. 3. Turn the battery disconnect switch to ON position. 4. Turn the starting switch to ON position. 5. If any abnormality is found, perform failure code [CA1938].		
		Voltage	EDU (13) to (14)	20 to 30 V
3	Defective variable flow turbocharger drive controller (EDU)	1. Turn the starting switch to OFF position, and turn the battery disconnect switch to OFF position. 2. Connect the connector EDU. 3. Turn the battery disconnect switch to ON position. 4. Turn the starting switch to ON position. 5. If the failure code is displayed again, the variable flow turbocharger drive controller (EDU) is defective.		

Electrical Circuit Diagram of SCR Temperature Sensor



Circuit Diagram of DEF Line Heater

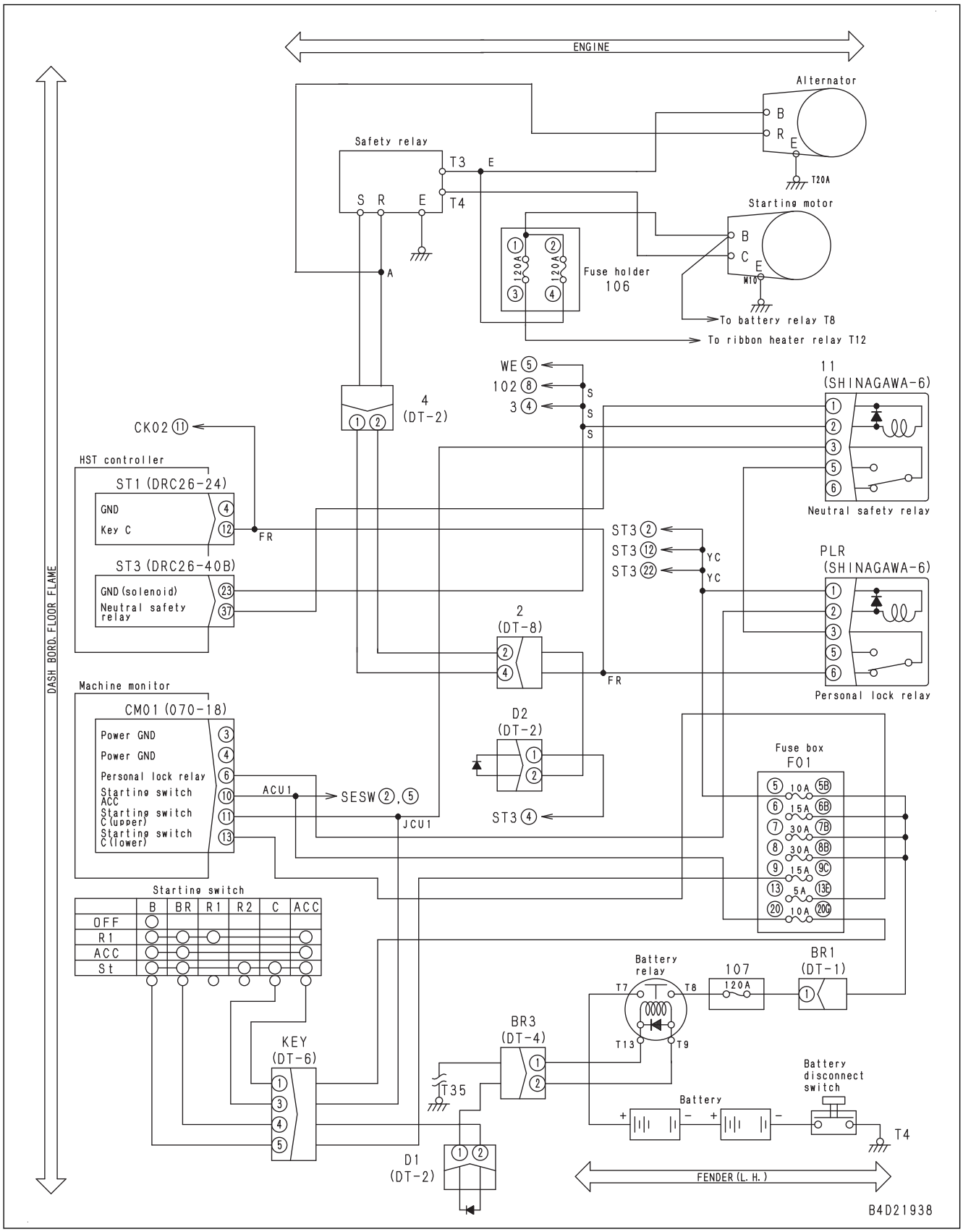


Failure Code [CA5274]

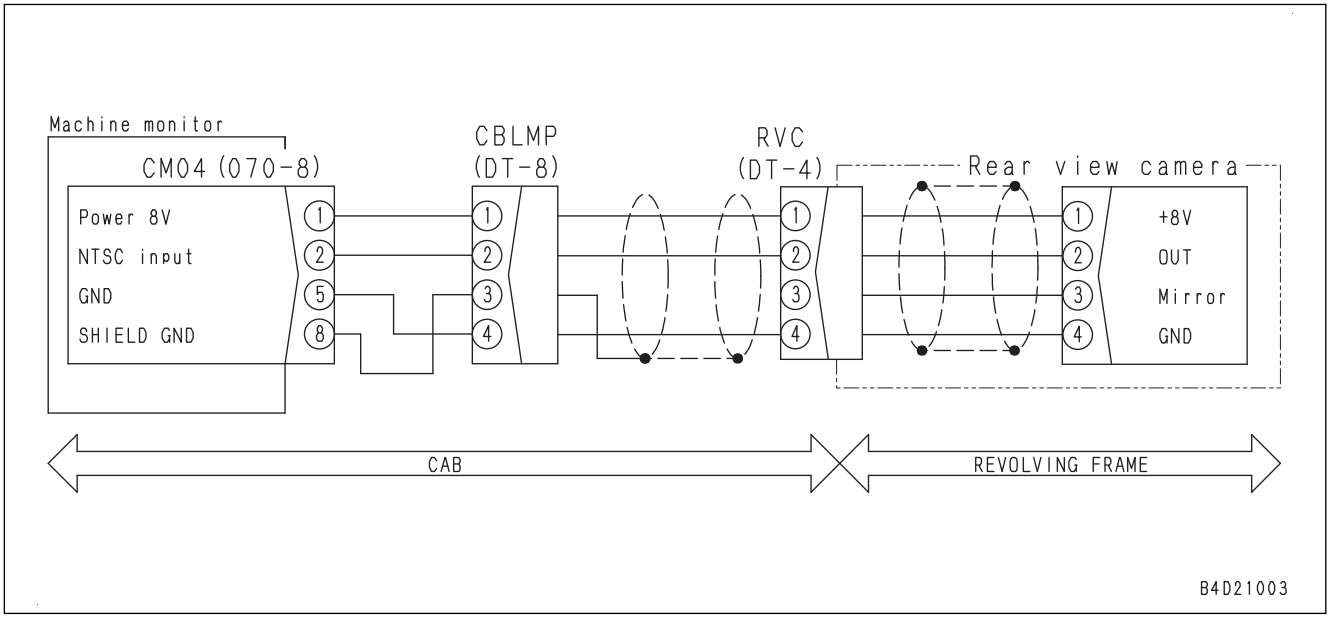
Action level	Failure code	Failure	Exhaust Throttle Valve Position Sensor In Range Error (Engine controller system)
L03	CA5274		
Detail of failure	Error occurs such that the actual position of the exhaust throttle valve largely deviates from the specified position.		
Action of controller	• Closes EGR valve and fully opens the flow control valve and exhaust throttle valve of the variable flow turbocharger. • Derates engine power for operation.		
Phenomenon on machine	Engine output lowers.		
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.		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective exhaust throttle valve internal bearing	First, check the description in failure code [AU10QA]. Even when there is no occurrence of failure code [AU10QA], check the clearance of the exhaust throttle valve.
2	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 them. 2. Turn the starting switch to ON position.
		If this failure code is not displayed, the wiring harness connector is defective.
3	Defective exhaust throttle valve drive motor or position sensor	If failure code [CA5271], [CA5272], [CA5273], [CA5275], [CA5276] is displayed, perform troubleshooting for that code first.
4	Foreign material caught in the exhaust throttle valve	Remove the exhaust throttle valve and check if foreign materials, etc. are caught in the valve.
5	Defective function of the exhaust throttle valve	Remove and check the exhaust throttle valve since it may be mechanically defective. • Check if the valve and the flange contact each other. • Check if the spring is broken.
6	Defective engine controller	If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Circuit Diagram of Neutral Safety Relay



Circuit Diagram of Camera Power Supply



Failure Code [DAJ6KK]

Action level	Failure code	Failure	Hydrostatic Transmission Controller: Sensor Volt 5V (1) Out of Normal Range (HST controller system)
L03	DAJ6KK		
Detail of failure	• Voltage of 5 V power supply circuit (1) for HST controller sensor is 4.5 V and below or 5.5 V and above. • Abnormal current flows in 5 V power supply (1) circuit for HST controller sensors.		
Action of controller	• Stops driving 5 V power supply (1) circuit. • Stops machine travel. • Disables deviation control.		
Phenomenon on machine	• Machine deviates. • After machine stops, engine speed is restricted to 50 %. • After stopping the machine, selectable gear speed is restricted to 2nd.		
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.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective right motor speed sensor or left motor speed sensor	1. Turn the starting switch to OFF position. 2. Disconnect the following connectors one by one in order, and turn starting switch ON each time. 3. Each time troubleshooting is finished, return to step 1. **REMARK** • If this failure code is cleared by disconnecting, the disconnected sensor is defective. Repeat steps 1 to 3 until it is confirmed that there is no sensor causing failure. • Since connector is disconnected, other failure codes are displayed. Ignore all of displayed failure codes other than this one.		
		Connector	Right motor speed sensor	RRS2
			Left motor speed sensor	LRS2
2	Ground fault in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect connector ST2, and connect T-adapter to female side. 3. Disconnect connectors, terminals, and fuses of all the devices which branch out connector ST2 (1).		
		Resistance	Between ST2 (female) (1) and ground	Min. 1 MΩ
3	Hot short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors RRS2 and LRS2, and connect T-adapter to either female side. 3. Turn the starting switch to ON position.		
		Voltage	Between RRS2 (female) (A) and (B) or between LRS2 (female) (A) and (B)	4.5 to 5.5 V
4	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.)		

Failure Code [DB2RKR]

Action level	Failure code	Failure	CAN 1 Defective Communication (Engine Controller) (Machine monitor system)
L03	DB2RKR		
Detail of failure	Machine monitor does not recognize engine controller on CAN1 communication line (KOMNET/r).		
Action of controller	• Does not update communication information of CAN1. • Restricts operations of engine and HST. • If cause of failure disappears, machine becomes normal by itself.		
Phenomenon on machine	• Information to be obtained from engine controller is not displayed and special functions do not work. Or update of received data is stopped. • Engine cannot be controlled. • Engine speed and coolant temperature cannot be detected. • Pointer of engine coolant temperature gauge is not displayed. • Engine speed is restricted to medium (half) speed. • Once machine stops, speed range is restricted to F2.		
Related information	• After completion of repair, check if the failure code is cleared by the following procedure. Procedure: Turn the starting switch to ON position. • Start of CAN communication is recognized by each controller when ACC signal of starting switch is received. • If failure code [DB2QKR] is also displayed, engine controller system is probably defective on cause 1. • Monitor controller uses failure codes [DB2RKR], [DAJRKR], and [DBRRKR] to indicate failure in CAN communication through CAN 1 line. • CAN1 terminating resistor is located in the center of the machine monitor on operator's side. • Since each controller is directly connected to the battery, power supply voltage is continuously provided even while 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 engine controller power supply circuit	1. Turn the starting switch to OFF position. 2. Check that system operating lamp is not lit, and then turn the battery disconnect switch to OFF position. 3. Disconnect the connector ECM J2, and connect T-adapter to female side. 4. Turn the battery disconnect switch to ON position. **REMARK** If there is no failure, troubleshooting for No.2 is not required.		
		Voltage	Between ECM J2 (female) (1) and (49)	20 to 30 V
			Between ECM J2 (female) (25) and (50)	20 to 30 V
			Between ECM J2 (female) (26) and (51)	20 to 30 V
			Between ECM J2 (female) (27) and (52)	20 to 30 V
			Between ECM J2 (female) (28) and (73)	20 to 30 V

Failure Code [DBRRKR]

Action level	Failure code	Failure	CAN1 Disconnection (ICT sensor controller) (Machine monitor system)
L01	DBRRKR		
Detail of failure	Machine monitor does not recognize ICT sensor controller through CAN communication 1 line (KOMNET/r).		
Action of controller	• Does not update communication information of CAN1. • Prohibits automatic control of blade. • If cause of failure disappears, machine becomes normal by itself.		
Phenomenon on machine	• Information to be obtained from ICT sensor controller is not displayed and special functions that need information do not work. Or update of received data is stopped. • Automatic control of blade is turned OFF. • Automatic control of blade does not turn ON even when auto/manual switch is pressed. • Adjustment function is not available.		
Related information	• After completion of repair, check if the failure code is cleared by the following procedure. Procedure: Turn the starting switch to ON position. • Start of CAN communication is recognized by each controller when ACC signal of starting switch is received. • 3 different failure codes, [DB2RKR], [DBERKR], and [DBRRKR], are used for defective CAN communication by CAN1, which are detected by machine monitor. When all of these 3 failure codes are displayed, ground fault, short circuit or hot short in wiring harness (CAN communication circuit) can be suspected. • CAN1 terminating resistor is located in the center of the machine monitor on operator's side. • Since each controller and machine monitor are directly connected to the battery, power supply voltage is continuously provided even while 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 ICT sensor controller power supply circuit	1. Turn the starting switch to OFF position. 2. Check that system operating lamp is not lit, and then turn the battery disconnect switch to OFF position. 3. Disconnect the connector IB3, and connect T-adapter to female side. 4. Turn the battery disconnect switch to ON position. **REMARK** If there is no failure, troubleshooting for No. 2 is not required.		
		Voltage	Between IB3 (female) (1) and (21)	20 to 30 V
			Between IB3 (female) (11) and (31)	20 to 30 V
			Between IB3 (female) (1) and (32)	20 to 30 V
			Between IB3 (female) (1) and (33)	20 to 30 V

Failure Code [DDKQKA]

Action level	Failure code	Failure	Offset Switch UP:Open (ICT Sensor Controller System)
L01	DDKQKA		
Detail of failure	Both 2 line of NO (Normally Open) and NC (Normally Close) of cut/fill offsets switch UP circuit are open (switch is turned off).		
Action of controller	Judges that cut/fill offsets switch is not pressed.		
Phenomenon on machine	When cut/fill offsets switch (RAISE) is pressed, design surface does not rise.		
Related information	• Before performing troubleshooting, check that the cut/fill offsets switch is enabled in the setting of ICT controller. (If option switch specification is “USE” in Adjustment ID: 8041 (specification setting of iB machine).) • Before performing troubleshooting, check that any related-message is not displayed in control box. (If “Komatsu controller not connected!” is displayed in control box, perform troubleshooting for “CONTROL BOX DISPLAYS THE MESSAGE [Komatsu controller not connected!]” in E mode first.) • Before performing troubleshooting, check that no related failure code is displayed. (If failure code [DBRQKR] is displayed on the machine monitor, perform troubleshooting for it first.) • Device name of “offset switch” is displayed on the machine monitor with failure code. It is described as “cut/fill offsets switch” in the table of troubleshooting and other chapter.		

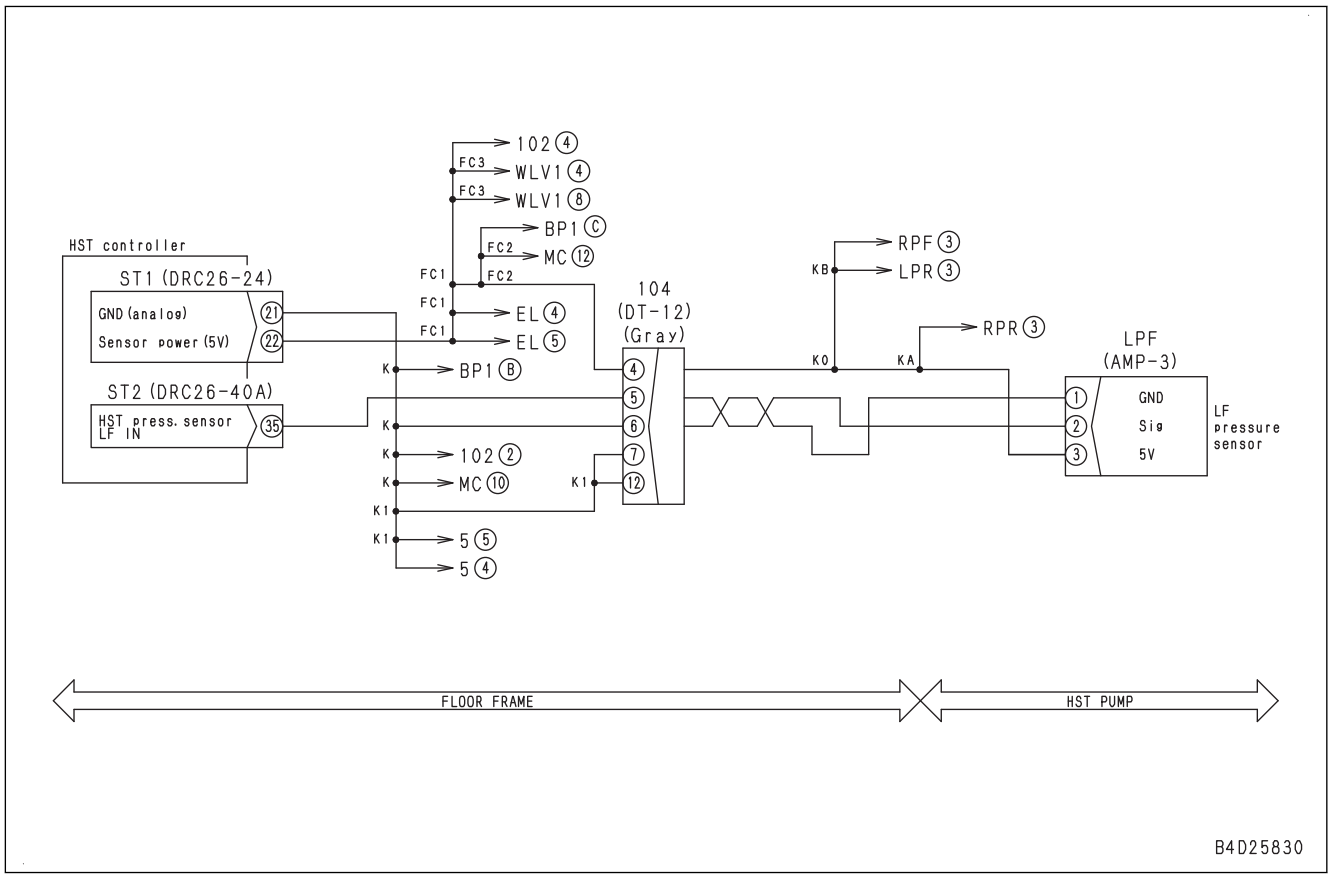
No.	Cause	Procedure, measuring location, criteria and remarks			
1	Defective cut/fill offsets switch (RAISE)	1. Turn the starting switch to OFF position. 2. Disconnect connector OFS1, and connect T-adapter to male side. 3. Turn cut/fill offsets switch (RAISE) ON/OFF to perform troubleshooting. **REMARK** “Switch OFF”: Release, “Switch ON”: Press			
		Resistance	Between OFS1 (male) (3) and (2)	Switch: OFF	Max. 1 Ω
				Switch: ON	Min. 1 MΩ
			Between OFS1 (male) (1) and (2)	Switch: OFF	Min. 1 MΩ
				Switch: ON	Max. 1 Ω
2	Hot short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect connector OFS1, and connect T-adapter to female side. 3. Turn the starting switch to ON position. **REMARK** • If voltage is 0 V, wiring harness has open circuit or ground fault. If it is 24 V, wiring harness has hot short circuit. • Voltage of Approx. 9 V is applied to signal lines of “NO” and “NC” through resistor In ICT sensor controller.			
		Voltage	Between OFS1 (female) (1) and (2)		7 to 11 V
			Between OFS1 (female) (3) and (2)		7 to 11 V

Failure Code [DFA5KA]

Action level	Failure code	Failure	Blade Lift Lever Potentiometer 1 Open Circuit (HST controller system)
L01	DFA5KA		
Detail of failure	Signal voltage of blade lift lever potentiometer system 1 is 0.5 V and below.		
Action of controller	Continues control with signal from blade lift lever potentiometer system 2.		
Phenomenon on machine	None		
Related information	• Signal voltage of blade lift lever potentiometer 1 can be checked with monitoring function. (Code: 73400) • 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 the blade control lever (lift LOWER).		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Open circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connectors ST1, ST2 and WLV1, and connect T-adapter to each female side.		
		Resistance	Between ST1 (female) (22) and WLV1 (female) (4)	Max. 1 Ω
			Between ST1 (female) (4) and WLV1 (female) (1)	Max. 1 Ω
			Between ST2 (female) (36) and WLV1 (female) (3)	Max. 1 Ω
2	Ground fault in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect connectors ST2 and WLV1, and connect T-adapter to either connector female side. 3. Disconnect connectors, terminals, and fuses of all the devices which branch out connector ST2 (36).		
		Resistance	Between ground and either ST2 (female) (36) or WLV1 (female) (3)	Min. 1 MΩ
3	Defective blade lift lever potentiometer 1	1. Turn the starting switch to OFF position. 2. Insert T-adapter into the connectors ST1 and ST2. 3. Turn the starting switch to ON position. 4. Operate the blade lift lever (lift LOWER) to troubleshoot.		
		Voltage	Between ST2 (36) and ST1 (4)	0.96 to 4.04 V
4	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.)		

Circuit Diagram of Lf HST Pressure Sensor



Failure Code [DK55KZ]

Action level	Failure code	Failure	Forward/Reverse Potentiometer 1 and 2 Open Circuit or Hot Short Circuit (HST controller system)
L04	DK55KZ		
Detail of failure	In joystick (steering, directional and gear shift lever) potentiometer 1 (FR 1) and 2 (FR 2), only one side is abnormal when starting switch is in ON position, and then either failure code [DK56KA] or [DK56KB] is displayed with either failure code [DK57KA] or [DK57KB] at the same time.		
Action of controller	Restricts operations of engine.		
Phenomenon on machine	• Once machine stops, engine speed is restricted to medium (half) speed. • Once machine stops, it becomes unable to travel at all.		
Related information	• Signal voltage of joystick (steering, directional and gear shift lever) potentiometer can be checked with monitoring function. (Code: 50202), (Code: 50203) • After completion of repair, check that the failure code is cleared by the following procedure. Procedure: Turn the stsring switch to the ON podion, and operate the joystick (steering, directional and gear shift lever) (F/R direction).		

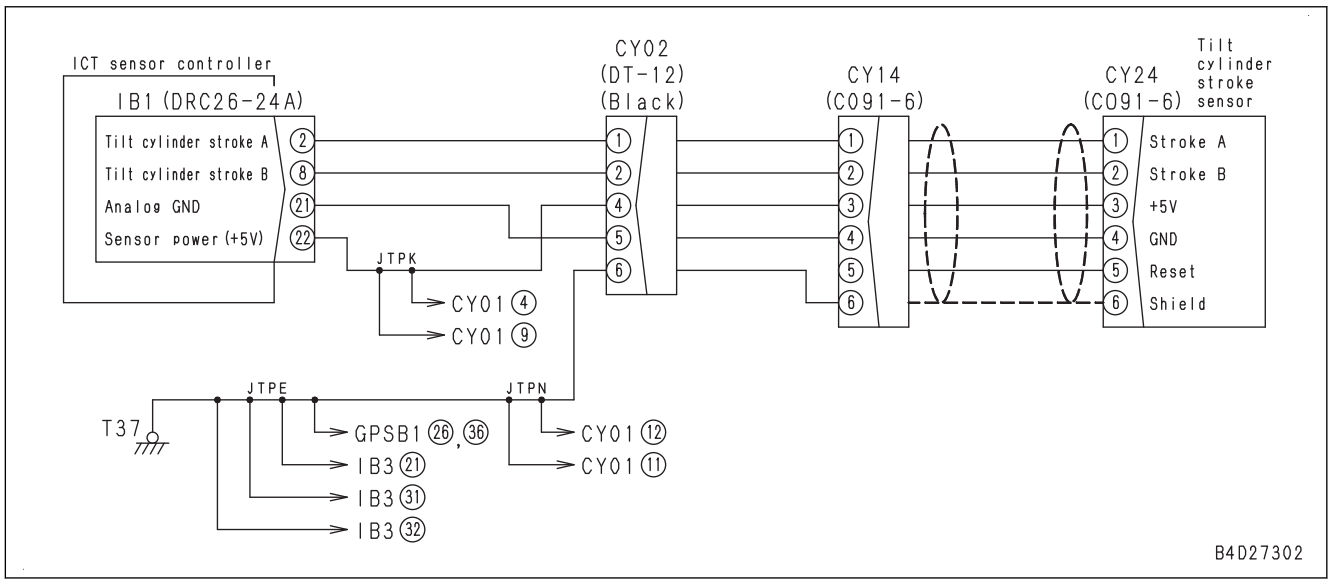
No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective forward and reverse potentiometer system	Perform troubleshooting for failure codes [DK56KA], [DK56KB], [DK57KA], and [DK57KB].

Failure Code [DKS6KB]

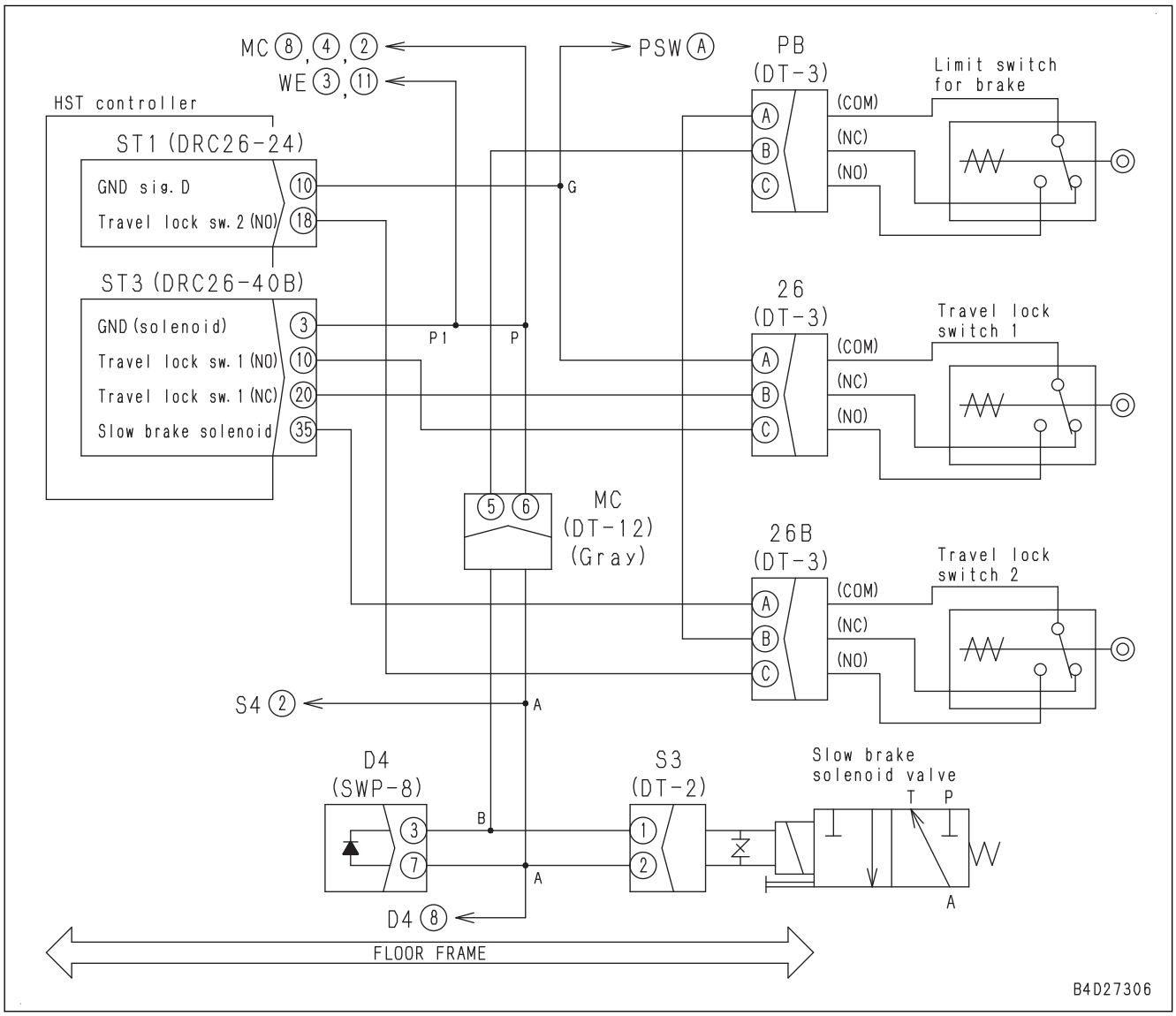
Action level	Failure code	Failure	Blade Tilt Cylinder Stroke Sensor B Phase Hot Short (ICT Sensor Controller System)
L01	DKS6KB		
Detail of failure	Input voltage from stroke sensor B phase for blade tilt cylinder is Min. 4.5 V.		
Action of controller	Prohibits automatic control of blade.		
Phenomenon on machine	• Automatic control of blade is turned OFF. • Automatic control of blade does not turn ON even when auto/manual switch is pressed.		
Related information	• After completion of repair, check if the failure code is cleared by the following procedure. Procedure: Turn the starting switch to ON position. • “Cylinder stroke reading abnormal” is displayed in “Slope control key” of control box • Device name of “Blade tilt cylinder stroke sensor” is displayed on the machine monitor with failure code. It is described as “Stroke sensor for blade tilt cylinder” in the table of trouble-shooting and other chapter.		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Hot short circuit in wiring harness	1. Turn the starting switch to OFF position. 2. Disconnect the connector CY24, and connect T-adapter to female side. 3. Turn the starting switch to ON position.		
		Voltage	Between CY24 (female) (2) and (4)	Max. 1 V
2	Defective ICT sensor controller	If no failure is found by preceding checks, ICT sensor controller is defective. (Since this is an internal defect, troubleshooting cannot be performed).		

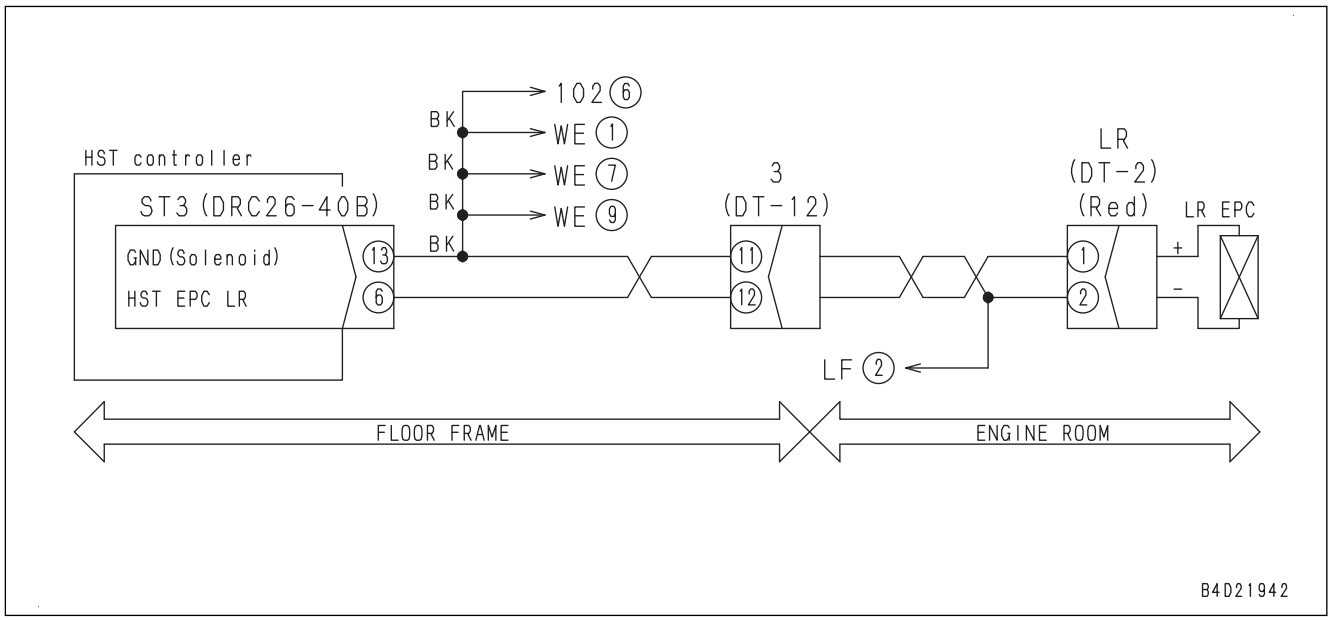
Circuit Diagram of Stroke Sensor for Blade Tilt Cylinder



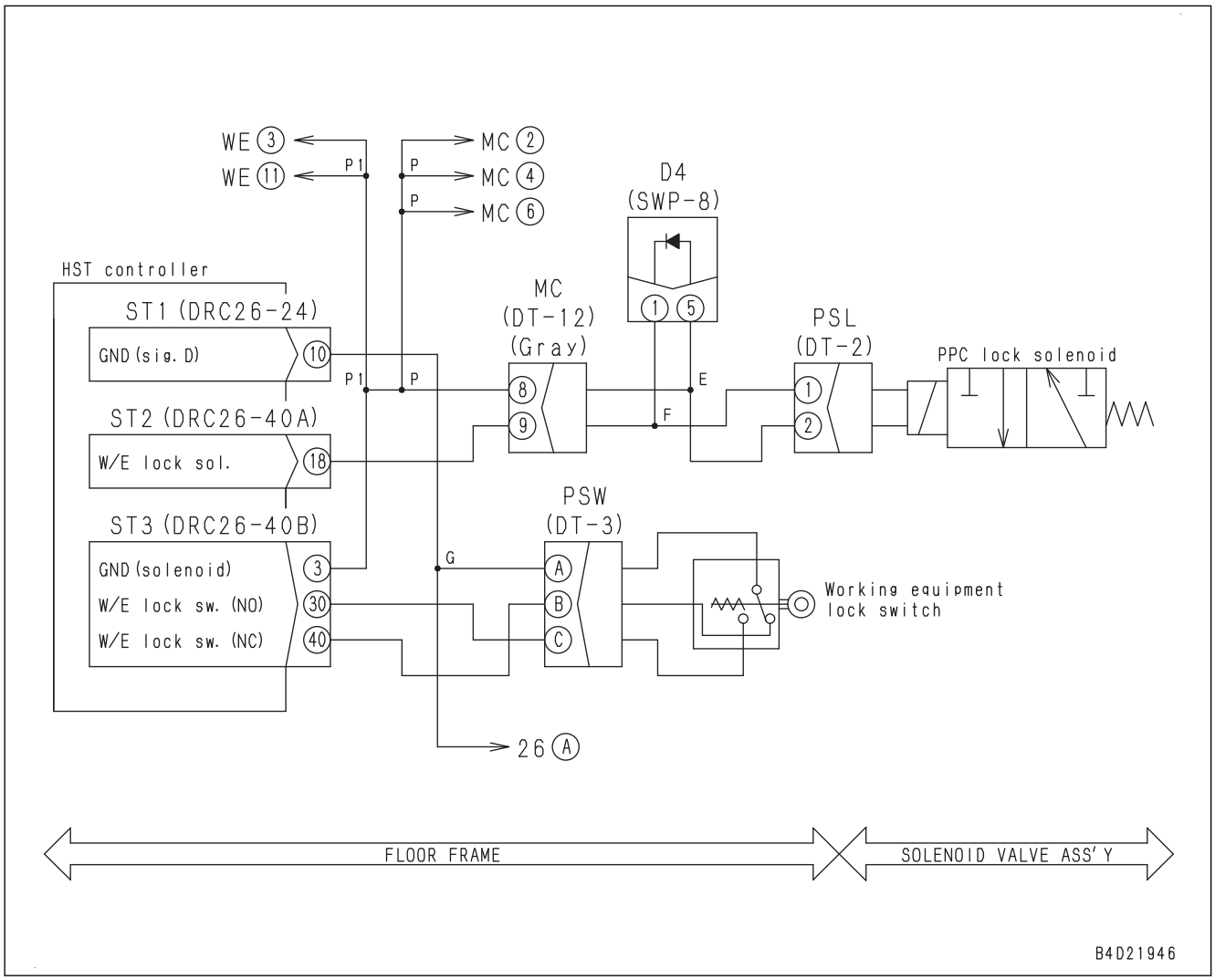
Circuit Diagram Related to Decelerator/Brake Pedal Potentiometer



Circuit Diagram of LR HST Pump EPC



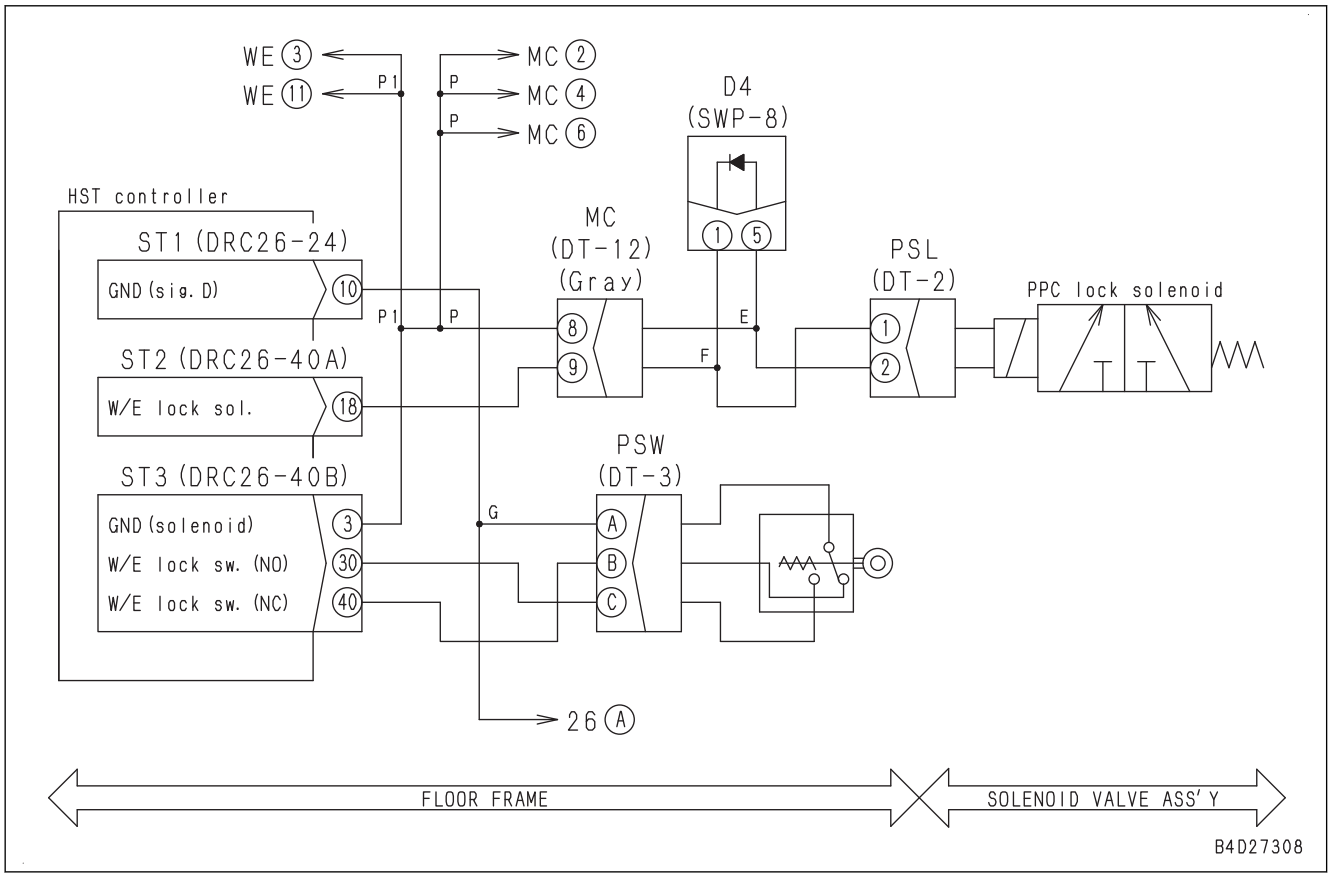
Circuit Diagram of Work Equipment Lock Lever Solenoid



<table>
<tr><th>No.</th><th>Cause</th><th colspan="4">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Defective diode (internal open circuit or short circuit)</td><td colspan="4">If no failure is found in primary side by check on cause 3, this check is not required.
1. Turn the starting switch to OFF position.
2. Disconnect connector D20, and connect T-adapter to diode.
REMARK
Measure it with diode range of multimeter.</td></tr>
<tr><td rowspan="2">Continuity</td><td colspan="2">Between D20 (male) (1) (+) and (2) (-)</td><td>No continuity</td></tr>
<tr><td colspan="2">Between D20 (male) (2) (+) and (1) (-)</td><td>Continuity</td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Defective starting switch</td><td colspan="4">If no failure is found in primary side by check on cause 3, this check is not required.
1. Turn the starting switch to OFF position.
2. Turn the battery disconnect switch to OFF position.
3. Disconnect connector KEY, and connect T-adapter to male side.
4. Turn the starting switch to OFF and HEAT positions to perform troubleshooting.</td></tr>
<tr><td rowspan="2">Resistance</td><td rowspan="2">Between KEY (male) (2) and (5)</td><td>OFF</td><td>Min. 1 MΩ</td></tr>
<tr><td>HEAT</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Defective intake air heater (internal open circuit)</td><td colspan="4">1. Turn the starting switch to OFF position.
2. Disconnect RH terminal.</td></tr>
<tr><td>Continuity</td><td colspan="2">Between RH terminal and ground</td><td>Continuity</td></tr>
<tr><td>7</td><td>Defective heater relay (does not turn on)</td><td colspan="4">If no failure is found by check on cause 3 and heater relay operation sound is not heard, the heater relay is defective (terminal T6).</td></tr>
<tr><td rowspan="4">8</td><td rowspan="4">Ground fault in wiring harness (contact with ground circuit)</td><td colspan="4">If no failure is found by check on cause 2, this check is not required.
1. Turn the starting switch to OFF position.
2. Disconnect connectors KEY, CM01, D20, terminals 15, RH, and starting motor B terminal.</td></tr>
<tr><td rowspan="3">Resistance</td><td colspan="2">Between heater relay T5 terminal (wiring harness side) and ground</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="2">Between heater relay T12 (contact side input terminal) and ground</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="2">Between heater RH terminal (wiring harness side) and ground</td><td>Min. 1 MΩ</td></tr>
</table>

No.	Cause	Procedure, measuring location, criteria and remarks		
6	Open circuit in wiring harness (wire breakage or defective contact of connector)	If no failure is found by check on cause 4, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect connectors PSL, PSW, ST1, ST2, and ST3, and connect T-adapter to each female side.		
		Resistance	Between PSL (female) (1) and ST2 (female) (18)	Max. 1 Ω
			Between PSL (female) (2) and ST3 (female) (3)	Max. 1 Ω
			Between ST1 (female) (10) and PSW (female) (A)	Max. 1 Ω
			Between PSW (female) (C) and ST3 (female) (30)	Max. 1 Ω
			Between PSW (female) (B) and ST3 (female) (40)	Max. 1 Ω
7	Ground fault in wiring harness (contact with ground circuit)	If no failure is found by check on cause 4, this check is not required. 1. Turn the starting switch to OFF position. 2. Disconnect connectors PSL, ST2, ST3, and PSW, and connect T-adapter to female side of PSL and PSW.		
		Resistance	Between PSW (female) (1) and ground	Min. 1 MΩ
			Between PSW (female) (B) and ground	Min. 1 MΩ
			Between PSW (female) (C) and ground	Min. 1 MΩ

Circuit Diagram of Work Equipment Lock Switch



<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="2">11</td><td rowspan="2">Open circuit in ground wiring harness of R.H. wiper switch</td><td colspan="3">1. Turn the starting switch to OFF position.
2. Disconnect connector CB13 and connect T-adapter to female side.</td></tr>
<tr><td>Resistance</td><td>Between CB13 (female) (2) and ground</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="6">12</td><td rowspan="6">Open circuit in wiring harness of wiper motor</td><td colspan="3">1. Turn the starting switch to OFF position.
2. Disconnect connector CB17 and connect T-adapter to female side.
3. Turn the starting switch to ON position.</td></tr>
<tr><td>Voltage</td><td>Between CB17 (4) and (1)</td><td>20 to 30 V</td></tr>
<tr><td colspan="3">1. Turn the starting switch to OFF position.
2. Remove fuse No.6 in fuse box FUSE (in cab).
3. Disconnect connector CB17 and connect T-adapter to female side.</td></tr>
<tr><td rowspan="3">Resistance</td><td>If no failure is found by check on wiper motor power, this check is not required.
Between CB17 (female) (4) and FUSE-6</td><td>Max. 1 Ω</td></tr>
<tr><td>If no failure is found by check on wiper motor power, this check is not required.
Between CB17 (female) (1) and ground</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CB17 (female) (2) and (3)</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="6">13</td><td rowspan="6">Ground fault in wiring harness (contact with ground circuit)</td><td colspan="3">1. Turn the starting switch to OFF position.
2. Disconnect connectors CB11, CB13, CB15, CB17, CB24, and CB27, and connect T-adapter to each female side.</td></tr>
<tr><td rowspan="5">Resistance</td><td>Between CB17 (female) (2) and ground</td><td>Min. 1 MΩ</td></tr>
<tr><td>Between CB17 (female) (3) and ground</td><td>Min. 1 MΩ</td></tr>
<tr><td>Between ground and FUSE-6 or CB17 (female) (4)</td><td>Min. 1 MΩ</td></tr>
<tr><td>Between CB11 (female) (3) and ground</td><td>Min. 1 MΩ</td></tr>
<tr><td>Between CB11 (female) (6) and ground</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="4">14</td><td rowspan="4">Defective right door wiper motor (failure in stop position detection)</td><td colspan="3">If no failure is found by preceding checks, right door wiper motor is defective.
Reference
1. Turn the starting switch to OFF position.
2. Insert T-adapter into connector CB17.
3. Turn the starting switch to ON position.
4. Turn on right door wiper switch.
REMARK
Voltage is applied when operating windshield wiper (GND at wiper stop position and during wiper intermittent).</td></tr>
<tr><td rowspan="2">Voltage</td><td>Between CB17 (2) and (1)</td><td>20 to 30 V</td></tr>
<tr><td>Between CB17 (3) and (1)</td><td>20 to 30 V</td></tr>
</table>

E-53 Control Box Shows Message [Configuring GPS]

Failure	Control box displays “Configuring GPS”.
Related information	• Perform troubleshooting outdoors or at a place open to the sky to acquire a sufficient number of satellites. • Before performing troubleshooting, check that “MACHINE SETTING” is performed correctly as specified in the “Machine Setting” section of the Operation and Maintenance Manual. • Restart control box. If the displayed message is changed, perform troubleshooting for it. **NOTICE** **Message display location** **“Configuring GPS” (red): Elavation Control Key**

No.	Cause	Procedure, measuring location, criteria and remarks
1	System is connecting to GNSS receiver.	Connection will be completed and reset in several minutes.

Failure Mode and Cause Table

Component causing failure / Failure mode		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
HST system	Neither R.H. nor L.H. of tracks can travel forward or reverse. (None of the travel systems operate.)	○		○			○	○				○								
	Either R.H. or L.H. of track cannot travel both forward and reverse. (One of R.H. or L.H. travel systems cannot operate.)											○			○	○				
	Either R.H. or L.H. of track cannot travel one of forward or reverse. (Only one of the travel systems cannot operate in one direction.)											○			○	○	○			
	Travel speed or power is low.	○	○	○			○	○									○			
	Speed range does not change.																			
	Shock is large when machine moves off or stops.										○		○	○						
	Machine deviates largely.											○	○	○		○				
	Machine drift on a slope is large.											○				○	○			
	Engine speed drops largely or engine stops.	○										○			○	○				
	HST oil temperature (hydraulic oil temperature) rises too high.	○						○			○	○					○	○		
	Unusual noise is heard from around HST pump or motor.				○		○	○	○	○	○	○		○						
	All work equipments do not operate.			○			○	○										○		

<table>
<tr><th>No.</th><th>Cause</th><th colspan="4">Procedure, measuring location, criteria and remarks</th></tr>
<tr><td rowspan="3">8</td><td rowspan="3">Defective blade lift cylinder</td><td colspan="4">Be ready with engine stopped, then perform troubleshooting with engine at high idle.</td></tr>
<tr><td>Cylinder leakage</td><td>Blade lift cylinder</td><td>At LOWER relief</td><td>6.6 cc/min</td></tr>
<tr><td colspan="4">If measured relief oil pressure is low, disconnect hydraulic hose at the blade lift cylinder head side. If oil flows out from cylinder when cylinder is stalled at its stroke end, cylinder piston ring may be defective.</td></tr>
</table>

S-16 Water Mixes Into Engine Oil (Milky)

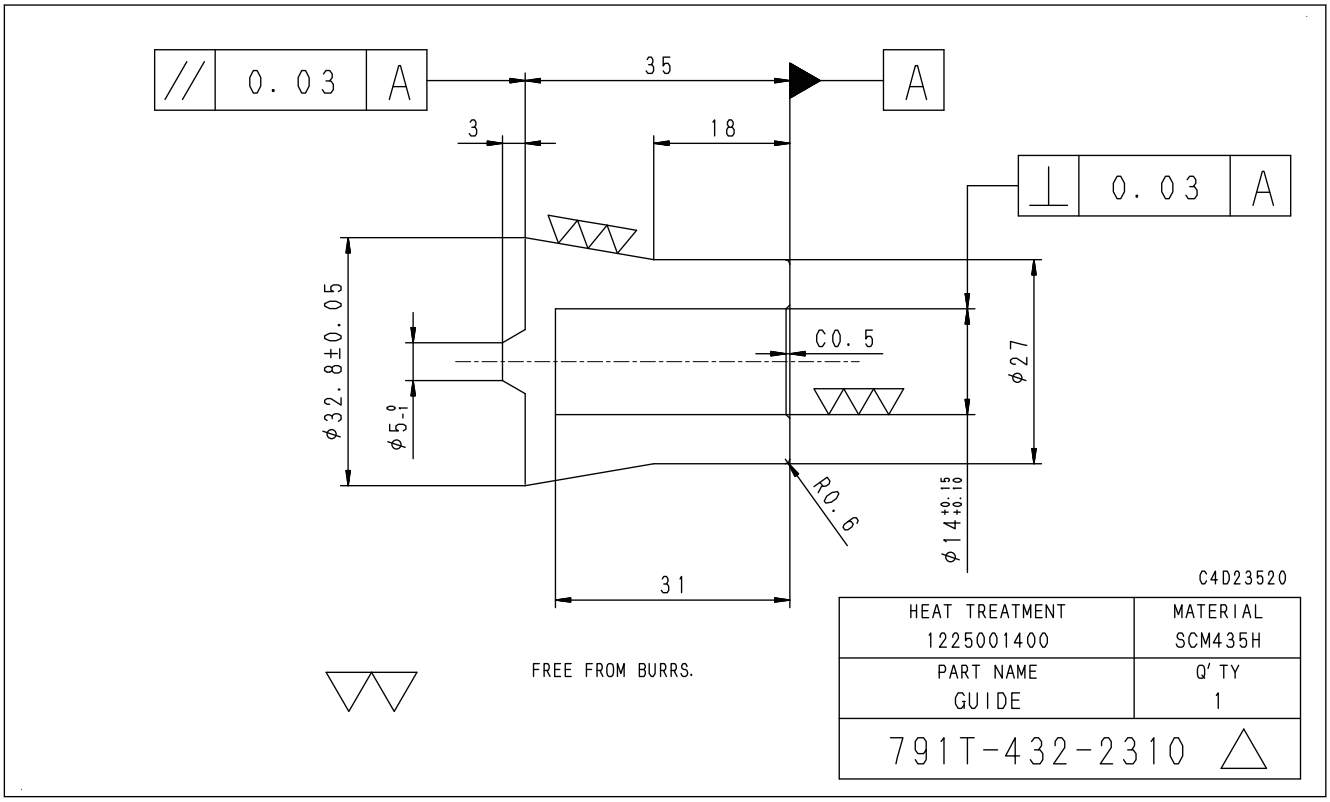
Failure	Water mixes into engine oil (milky)
Related information	• If oil mixes into coolant, perform troubleshooting for “Oil mixes into coolant”. • If any failure code is displayed, perform troubleshooting for that code. • If engine is started and stopped frequently when ambient temperature is low, water vapor in blowby gas may condense and cause milky oil or emulsified matter may stick because of KCCV. This is not abnormal, as long as there is no coolant leakage. If coolant level lowers rapidly and coolant leakage is suspected, perform following troubleshooting.

No.	Cause	Point to check, remarks	Remedy
1	A crack on the EGR cooler	• Water containing coolant is draining after disconnecting the inlet and outlet gas piping of EGR cooler (check if it is antifreeze because it may be condensed water). (Reference: A crack in the EGR cooler, if any, may be caused by lowered coolant level in the coolant system. Check if there is no water leakage from the piping of the coolant system or radiator when the replacing the EGR cooler.)	EGR cooler replacement
2	Breakage of oil cooler element or O-ring	• Check oil cooler element and O-ring • Leakage form oil cooler is detected by pressure test.	Oil cooler element and O-ring replacement
3	Breakage of cylinder head or head gasket	Disassemble engine and check cylinder head and head gasket	Cylinder head and head gasket replacement
4	Cracking or hole caused by pitting in cylinder block	• Engine oil is increasing and milky. • Disassemble engine and check inside of cylinder block for cracking or hole caused by pitting.	Cylinder block replacement

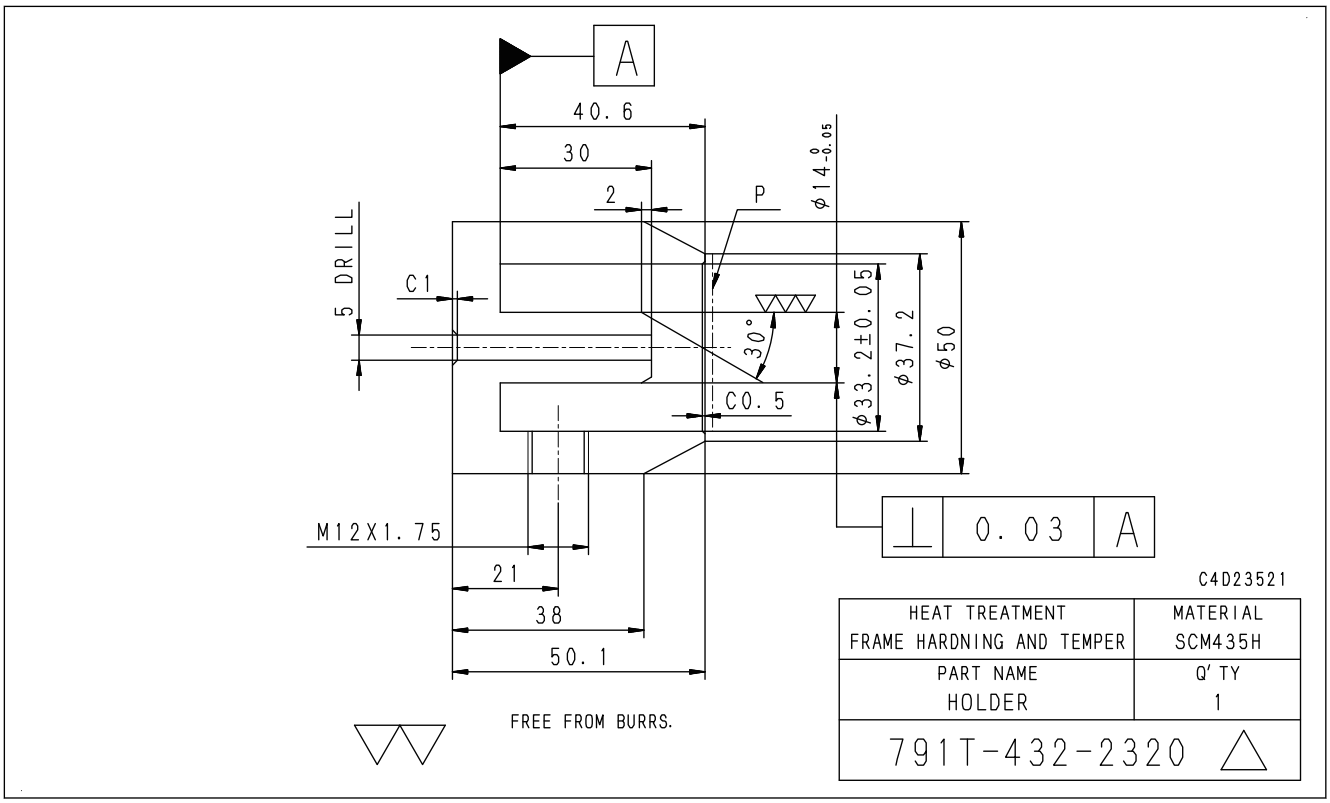
Caulking Material

Komatsu code	Part No.	Volume	Container	Main features and applications	
SUNSTAR Penguin Seal No. 2505	417-926-3920	320 mℓ	Polyethylene container	For adhered window glass	• Use to seal for joint between glasses (Expiration date: 4 months after its production date)
SEKISUI Silicone Sealant	20Y-54-55130	333 mℓ	Polyethylene container		• Use to seal front window (Expiration date: 6 months after its production)
GE TOSHIBA SILICONES TOSSEAL381	22M-54-27220	333 mℓ	Cartridge		• Translucent white seal used for joint between glasses (Expiration date: 12 months after its production date) • Translucent white seal

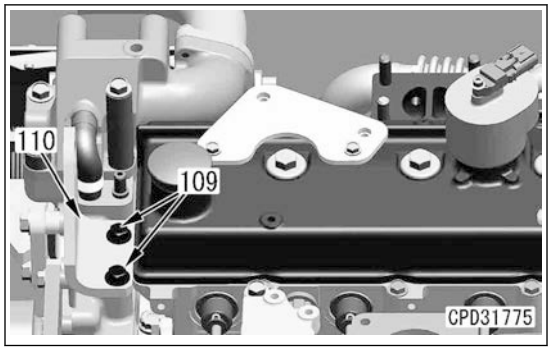
791T-432-2310 : Guide



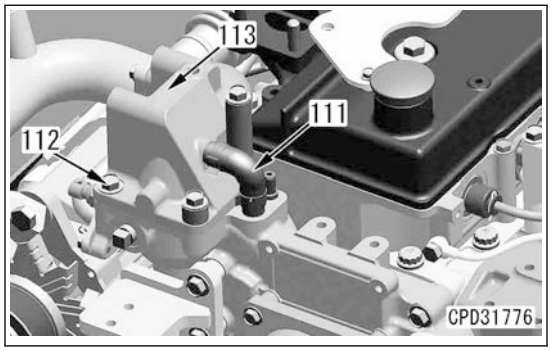
791T-432-2320 : Holder



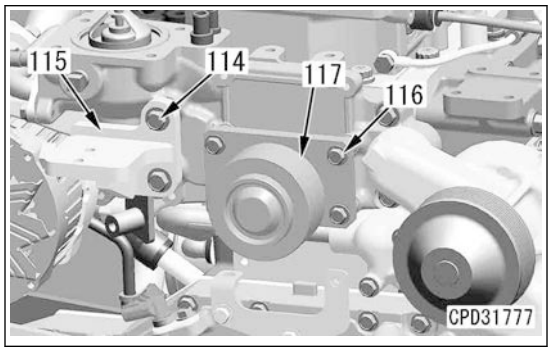
68. Remove the bolts (109) (2 pieces), and remove the bracket (110).



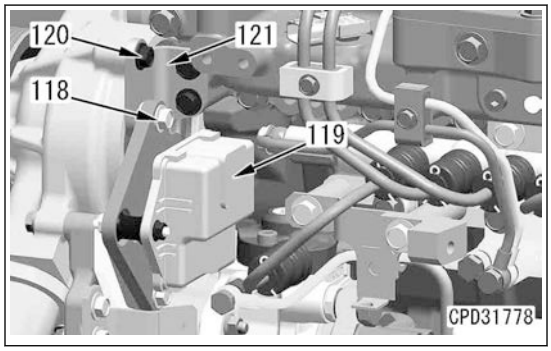
69. Remove the tube (111).
70. Remove the bolts (112) (4 pieces), and remove the coolant outlet connector (113).



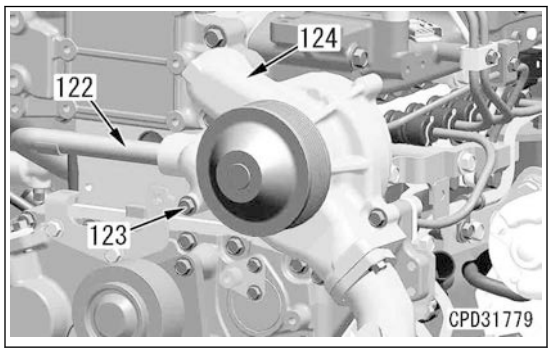
71. Remove the bolts (114) (2 pieces), and remove the bracket (115).
72. Remove the bolts (116) (4 pieces), and remove the idler pulley assembly (117).



73. Remove the bolts (118) (2 pieces), and remove the turbocharger actuator driving control unit (119).
74. Remove the bolts (120) (4 pieces), and remove the bracket (121).



75. Remove the hose (122).
76. Remove the bolts (123) (4 pieces), and remove the water pump assembly (124).



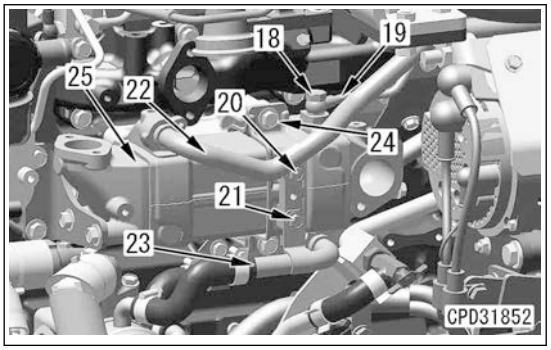
How to Install EGR Cooler Assembly

EGR cooler assembly

1. Install EGR cooler assembly (25) with the bolts (24) (4 pieces).
2. Connect the tubes (22) and (23), and install them with the bolts (20) and (21).
3. Install the tube (19) with the joint bolt (18).

   Joint bolt (18): Width across flats of 17 mm

   Joint bolt (18):
   9.8 to 12.7 Nm {1.0 to 1.3 kgfm}



4. Install the tube (17) with the bolts (16) (4 pieces).

   Tighten the bolt (16) 3 times in the order of [1] to [4] to install it.

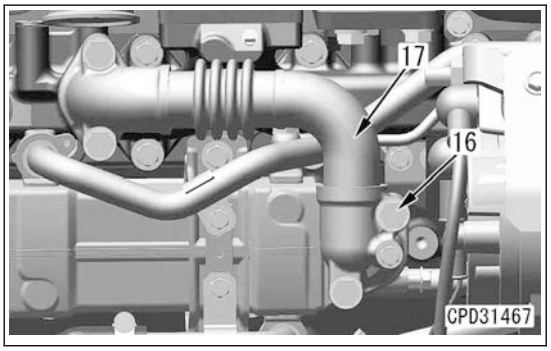
   Bolt (16): Width across flats of 17 mm

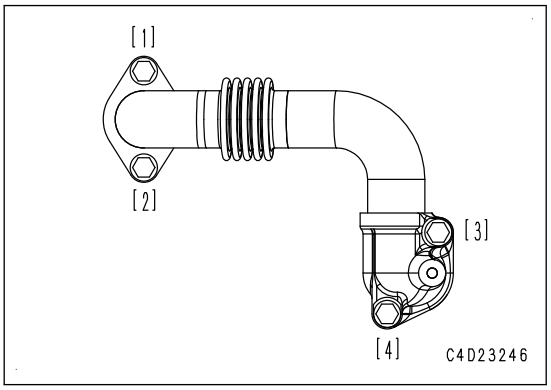
   1st time:
   19.6 to 24.5 Nm {2 to 2.5 kgfm}

   2nd time:
   44.1 to 53.9 Nm {4.5 to 5.5 kgfm}

   3rd time:
   44.1 to 53.9 Nm {4.5 to 5.5 kgfm}

   Threaded portion of the bolt (16):
   Molybdenum dioxide lubricant (LM-P)



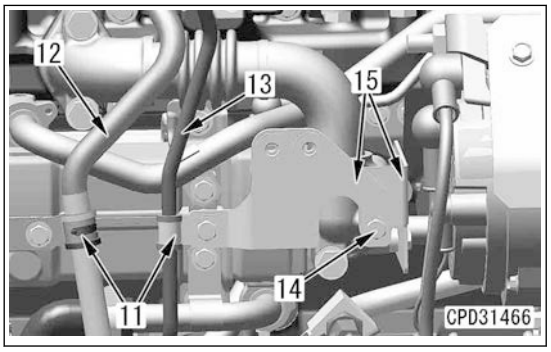


5. Install the bracket (15) with the bolts (14) (2 pieces).
6. Install the tubes (12) and (13).

   Tube (13): Width across flats of 14 mm

   Tube (13):
   9.8 to 12.7 Nm {1.0 to 1.3 kgfm}

7. Install the clamp (11).



Install Cooling Fan Drive Assembly

1. Sling the cooling fan drive assembly (8), hold it, and install it with the bolt (22).

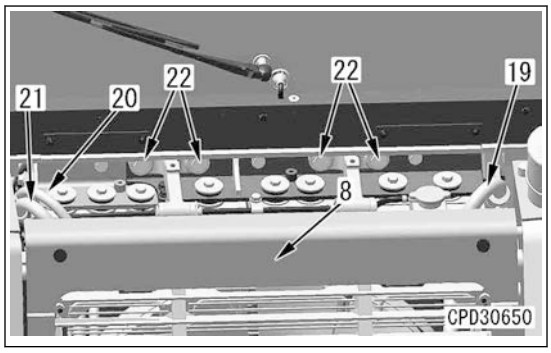
   Bolt (22): Width across flats of 24 mm

   Cooling fan drive assembly (8):

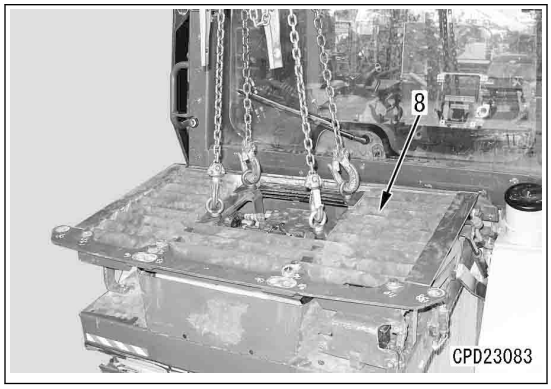
   115 kg

   Bolt (22):

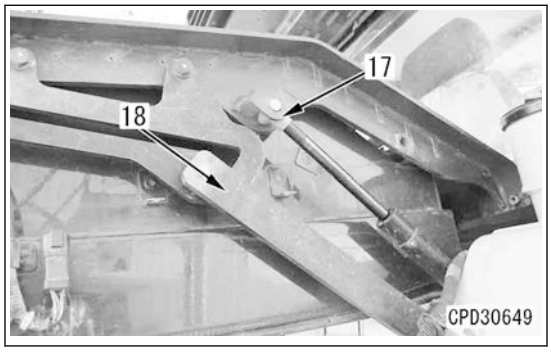
   235 to 285 Nm {23.5 to 29.5 kgfm}



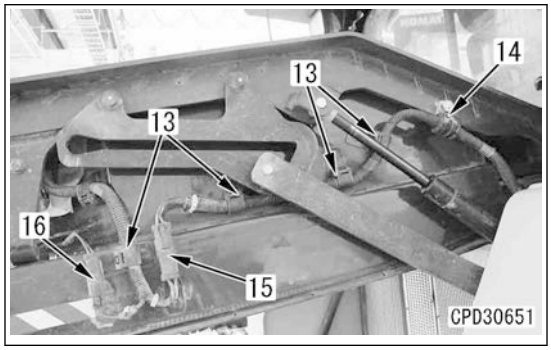
2. Install the hoses (21), (20), and (19) of the cooling fan drive assembly (8).
3. Sling the cooling fan drive assembly (8) while it opens upward, and hold it.



4. Install the lock plate (18).
5. Install the R.H. and L.H. gas springs (17).

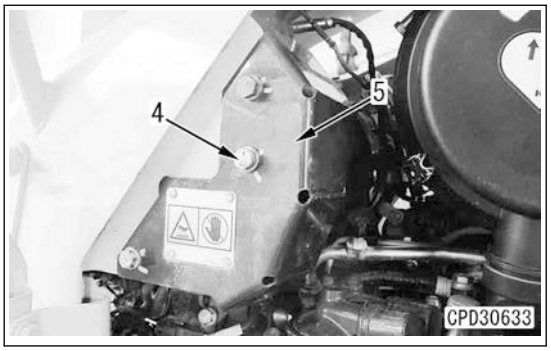


6. Connect the connector CLU (15) and connector 14 (16).
7. Install the clamp (14) and the clamps (13) (4 places).

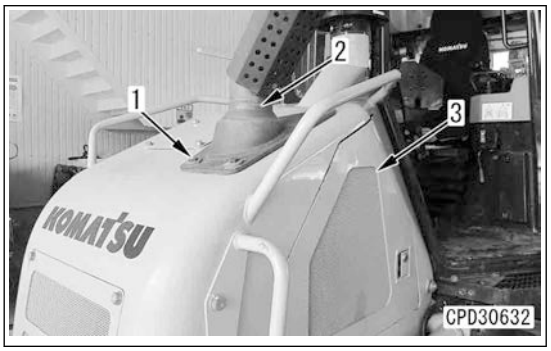


10. Install the cover (7) with the bolts (6) (4 pieces).

11. Install the heat insulation cover (5) with the bolts (4) (3 pieces).



12. Close the cover (3).
13. Install the exhaust pipe (2) with the bolts (1) (4 pieces).



Refilling with coolant

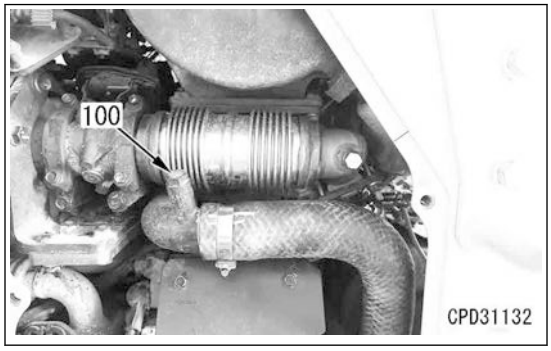
32. Refill the radiator with coolant to the specified level through the coolant filler port. Run the engine to circulate the coolant, and then check the coolant level again.

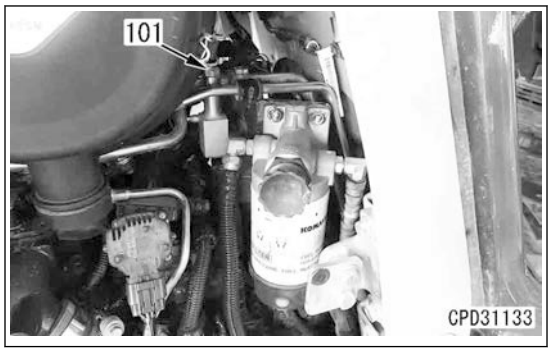
    REMARK

    Leave the air bleeding valves (100) and (101) installed on the front side of the engine open during refilling with coolant, and then close the valves (100) and (101) when air is bled and coolant comes out.

    Radiator:

    36 ℓ





DEF tank assembly

13. Install DEF tank assembly. For details, see “Remove and Install DEF Tank Assembly”.

Remove and Install Exhaust Throttle Valve

Tools for Removal and Installation of the Exhaust Throttle Valve

Symbol	Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A	795T-221-2010	Plate	■	1	N	○	Clearance adjustment of clamp

⚠ 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.

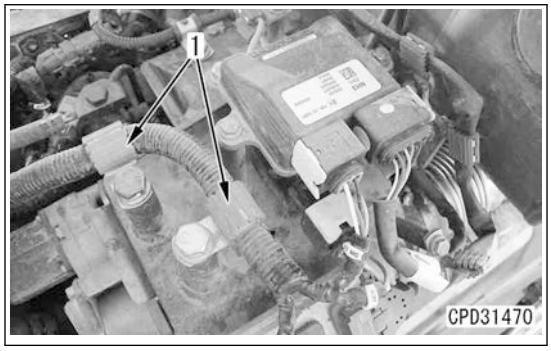
⚠ Turn the starting switch to OFF position to stop the engine.

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

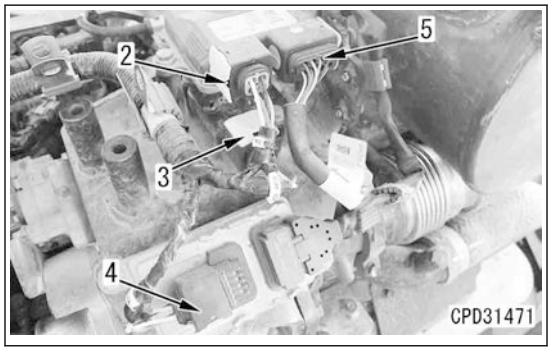
Remove Exhaust Throttle Valve

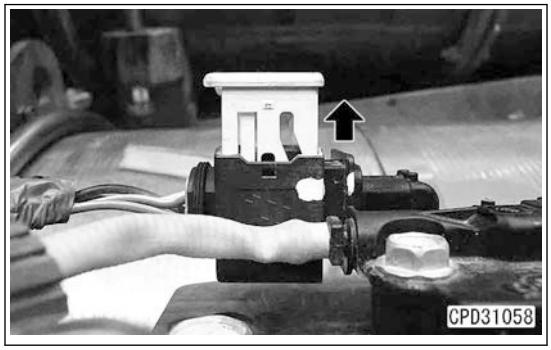
Engine hood assembly

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

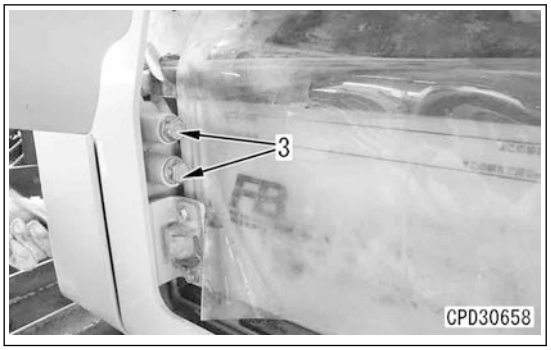


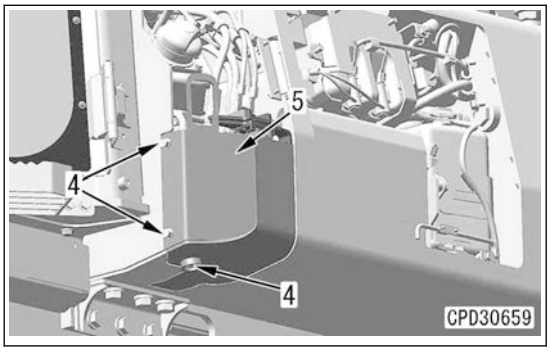
3. Slide the levers (yellow) of the connectors NH3 (2), SCRT (3), NOX2 (4), and connector (5) in the direction of the arrow, release the locks, and then disconnect the connectors. (For details, see the following.)





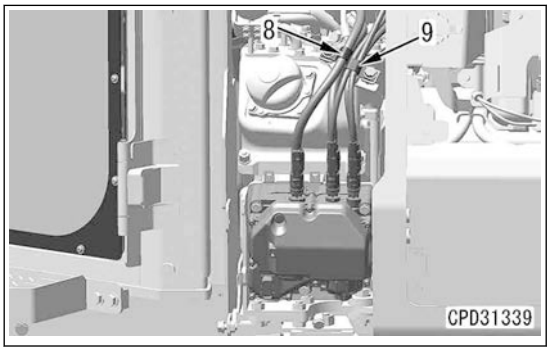
2. Remove the bolts (3) (2 pieces) and bolts (4) (3 pieces), and remove the cover (5).



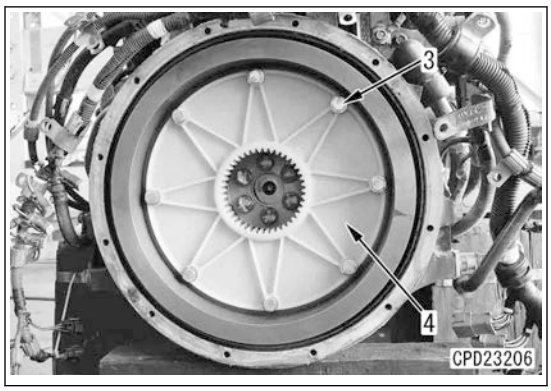


Hose, connector

3. Remove the clamps (8) and (9).



4. Remove the bolts (3) (8 pieces), and remove the damper assembly (4).



How to Install Damper Assembly

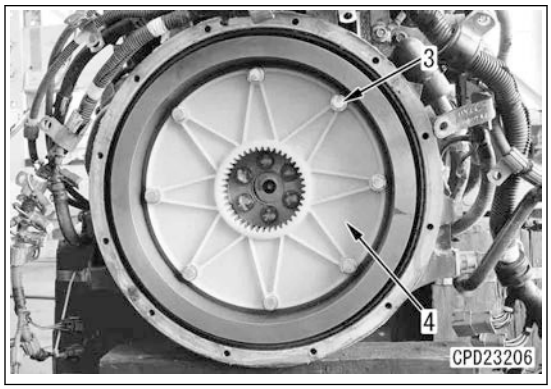
Damper assembly

1. Install the damper assembly (4) with the bolts (3) (8 pieces).

   Bolt (3): Width across flats of 17 mm

   Bolt (3):
   Liquid adhesive (LT-2)

   Bolt (3):
   44.1 to 53.9 Nm {4.5 to 5.5 kgfm}



2. Sling the cover (1), and set it to the installing position.

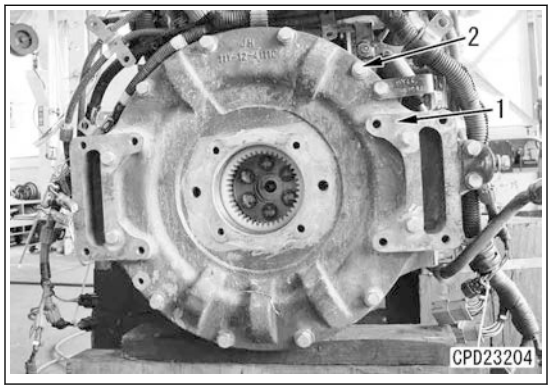
   Cover (1):
   32 kg

   Cover mating face (1):
   Liquid gasket (LG-6)

3. Sling the damper case (1), hold it, and install it with the bolts (2) (12 pieces).

   Bolt (2): Width across flats of 17 mm

   Bolt (2):
   58.8 to 73.5 Nm {6.0 to 7.5 kgfm}



HST pump assembly

4. Install HST pump assembly. For details, see “Remove and Install HST Pump Assembly”.

Engine, HST pump assembly

5. Install the engine and HST pump assembly. For details, see “Remove and Install Engine and HST Pump Assembly”.

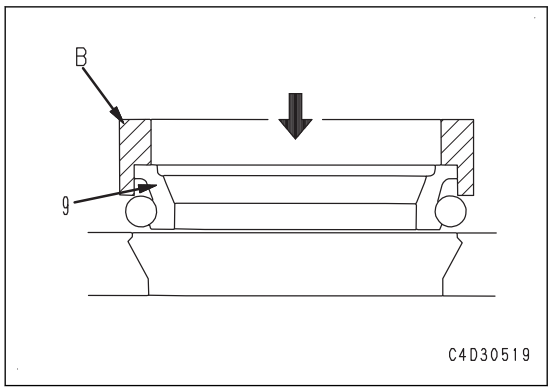
5. Push O-ring, and check that the installer (B) is inserted.

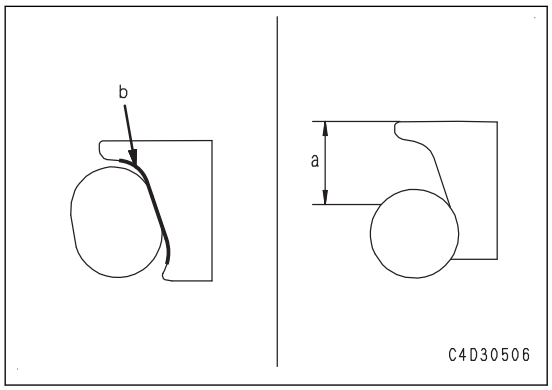
REMARK

- When installing the floating seal, clean the contact surfaces (bold line (b)) of O-ring and floating seal, and completely degrease and dry them. Take care that dirt dose not stick to the contact face of the floating seal.
- After inserting the floating seal, check the following conditions.

  Leaning of floating seal (9): 1 mm or less

  Protrusion dimension (a) of the floating seal (9): 7 to 11 mm





Support

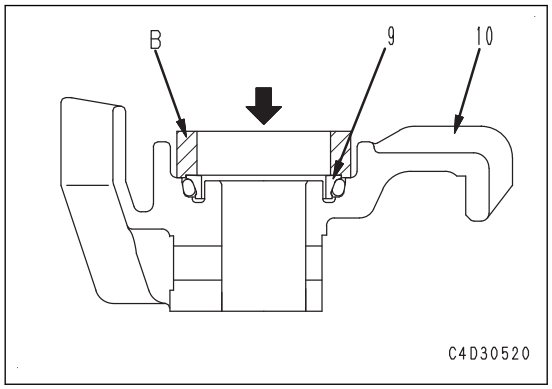
6. Install the floating seal (9) to the support (10) by using the installer (B).

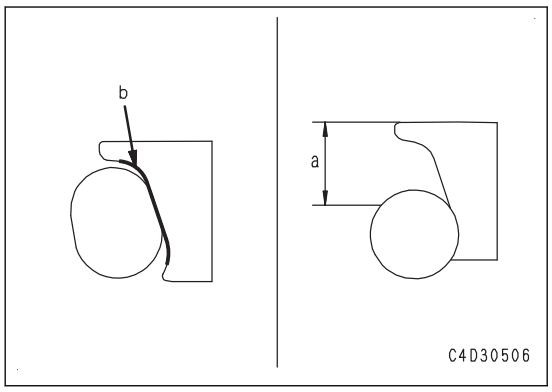
REMARK

- When installing the floating seal, clean the contact surfaces (bold line (b)) of O-ring and floating seal, and completely degrease and dry them. Take care that dirt dose not stick to the contact face of the floating seal.
- After inserting the floating seal, check the following conditions.

  Leaning of floating seal (9): 1 mm or less

  Protrusion dimension (a) of the floating seal (9): 7 to 11 mm



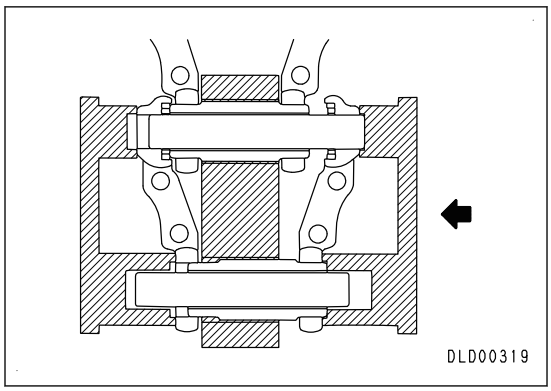


18. Set the R.H. jig on the pressing side and the L.H. jig on the receiving side, and press fit the L.H. link.

REMARK

Press fit the link carefully to avoid removal of the R.H. and L.H. seals and spacers.

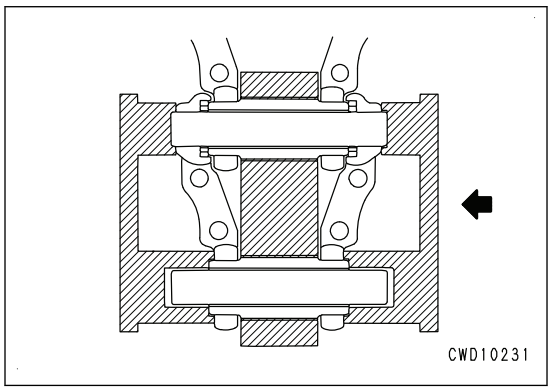
Link press-fitting force: 196 to 294 kN {20 to 30 t}



19. Press fit the link until the link, spacer and bushing closely contact each other.

REMARK

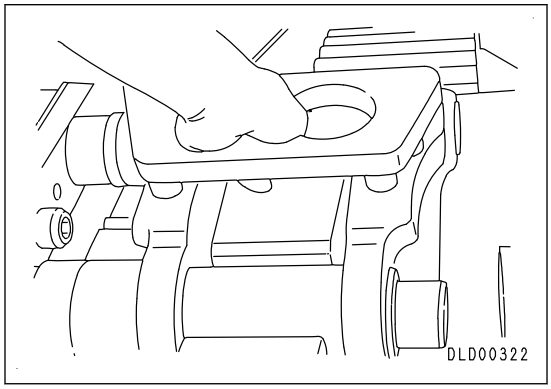
- You cannot visually check whether the parts are closely contacted or not. Therefore, manage it by the oil pressure of the link press. Set the relief pressure to the fixed value, and apply the oil pressure up to the specified pressure.
- For details of setting the relief pressure, see PREPARATORY WORK.
- Check that adjacent links are rotated each other.



20. Check that the distance between the shoe bolt holes is within the standard range by using the shoe bolt pitch gauge.

REMARK

- If the shoe bolt hole distance extremely exceeds the specified value, disassemble it to check for any failure, and then press fit again.
- If the shoe bolt hole distance is extremely shorter than the specified value and the shoe cannot be installed, wear on the spacer, bushing end surface, etc. may exceed the allowable limit. Therefore, disassemble it to replace the parts.

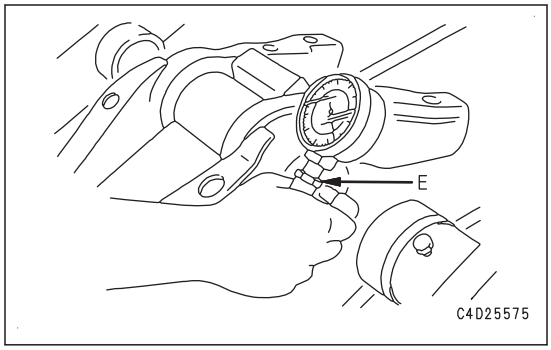


21. Remove the air from inside of the pin for each link assembly by using the seal checker (E), and check the sealing performance.

REMARK

Hold the space inside the pin at 91 to 95 kPa {680 to 710 mmHg} of vacuum for 5 seconds, and check that the pressure does not change.

If the pressure is changed, disassemble the link to check the seal. If no failure is found, reassemble it.

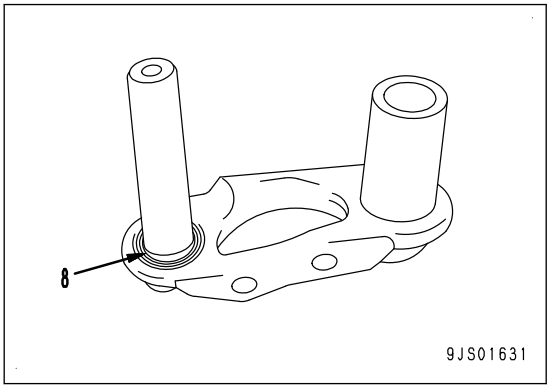


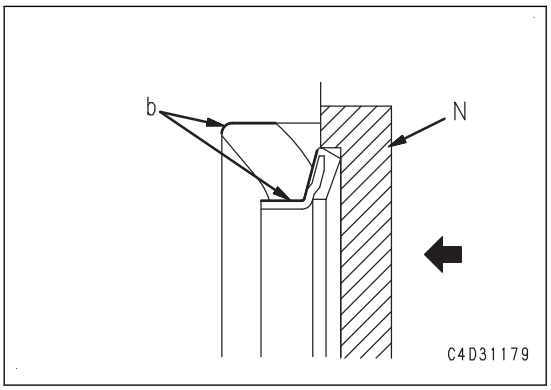
Seal

6. Install the seal (8) by using the installer (N).

   REMARK

   Check that the oil is not attached to the contact faces of the link and seal.



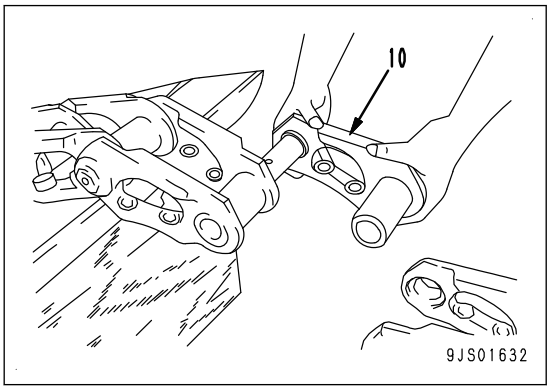


Link sub assembly

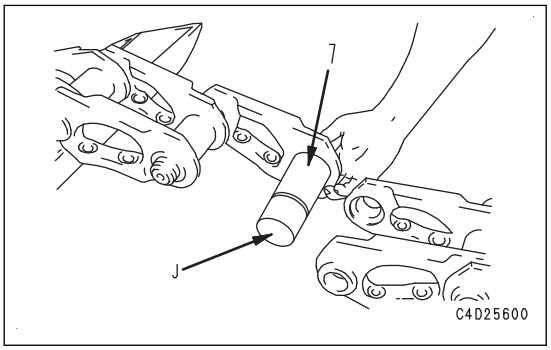
7. Install the link sub assembly (10).

   REMARK

   Check that the seal surfaces and bushing end faces are free from dirt, then apply gear oil (GO90) on them by using a clean cloth or brush.

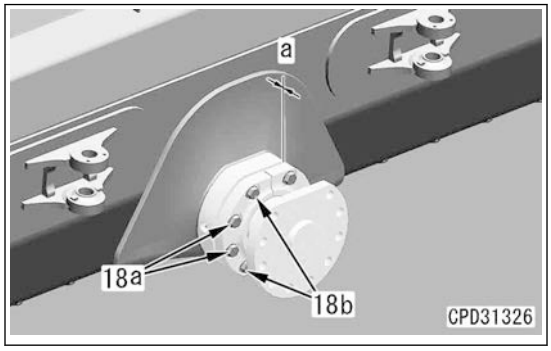


8. Install the guide (J) (guide used when press fitting the link) to the bushing (7).



Adjusting play of center ball

3. Measure the clearance (a) between the cap (18) and bearing (20).
4. Calculate the thickness of shim (23) to be inserted from the measured clearance (a), and determine the shim (23) to be used.
   - Thickness of shim (19) to be inserted: Measured clearance (a) + 0.0 to 1.0 mm
   - Set thickness of the shim (19): 1 mm, 2 mm
   - Thickness of the standard shim (19) (Reference value): 8 mm (1 mm shims (4 pieces) + 2 mm shims (6 pieces))
5. Loosen the bolts (18a), and remove the bolts (18b).
6. Install the determined shims (19).
7. Tighten the bolts (18a) and (18b) lightly.



Blade assembly

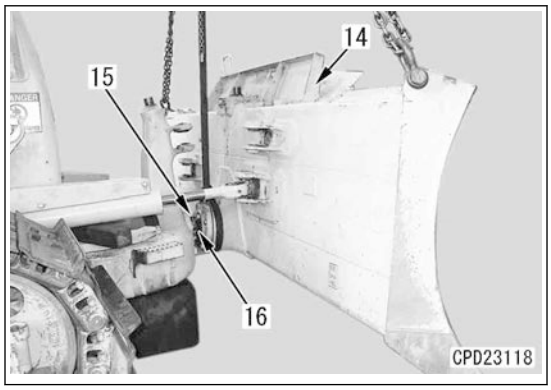
8. Sling the blade assembly (14) at the mounting position, and hold it.

   Blade assembly (D37EX-24): 535 kg

   Blade assembly (D37PX-24): 600 kg

   Blade assembly (D39EX-24): 595 kg

   Blade assembly (D39PX-24): 670 kg



9. Install the trunnion (15) to U-frame with the bolts (16) (10 pieces).

   Bolt (16): 455 to 565 Nm {46.5 to 58.0 kgfm}

   REMARK

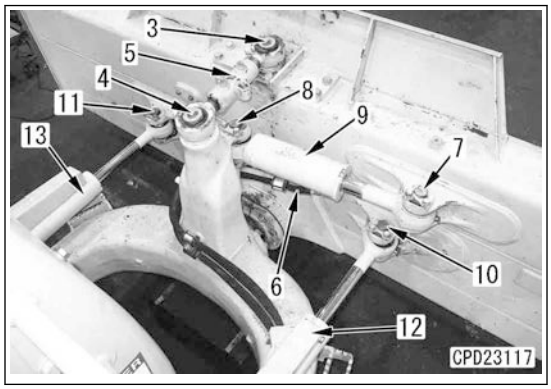
   Fix the trunnion (15) by using the lever block to prevent it from falling off.

Angle cylinder assembly, tilt cylinder assembly

10. To prevent the angle cylinder assemblies (12) and (13) from falling off, set the blocks between the assemblies and U-frame.

    NOTICE

    If the piston rod is rotated without extending and retracting, it may damage the internal parts of the piston rod or the cylinder. If the piston rod is rotated, rotate it while it is being extended and retracted.
11. Install the angle cylinder assemblies (12) and (13) to the blade, and install the mounting pins (10) and (11) on the angle cylinder head side.



Disassemble and Assemble Stroke Sensing Blade Tilt Cylinder Assembly

Tools for Disassembly and Assembly of Stroke Sensing Blade Tilt Cylinder Assembly

Symbol		Part No.	Part name	Necessity	Q'ty	New/Redesign	Sketch	Remarks
A		790-502-1003	Repair stand	■	1			Disassembly and assembly of stroke sensing blade tilt cylinder assembly
B		790-102-3802	Wrench assembly	■	1			Removal and installation of head assembly
C		Commercially available	Rubber hammer	●	1			Removal of stroke sensor assembly
D		Commercially available	Spatula	●	1			Removal of stroke sensor assembly
E		790-302-1270	Socket	■	1			Removal and installation of nut
F		790-201-1500	Push tool kit	■	1			Press-fit of dust seal
		790-201-1620	• Plate		1			
		790-101-5021	• Grip		1			
		01010-50816	• Bolt		1			
G		790-201-1702	Push tool kit	■	1			Press-fit of bushing
		790-201-1811	• Push tool		1			
		790-101-5021	• Grip		1			
		01010-50816	• Bolt		1			
H	1	790-720-1000	Expander	■	1			Assembly of piston assembly
	2	796-720-1670	Ring	■	1			
	3	07281-01279	Clamp	■	1			
J		Commercially available	Digital angle gauge	■	1			For measurement of sensor mounting angle

Disassemble Stroke Sensing Blade Tilt Cylinder Assembly

Preparation

1. Set the cylinder assembly (1) on the cylinder repair stand (A).

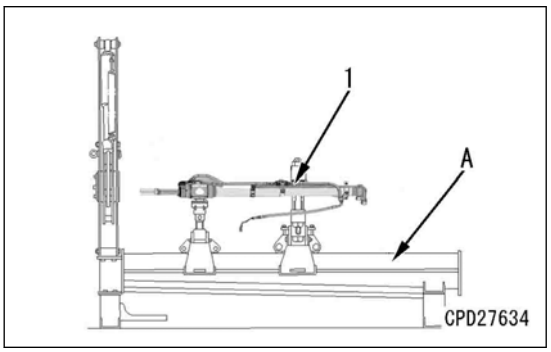
   REMARK

   For details about setting, refer to the figure of the lift cylinder assembly.

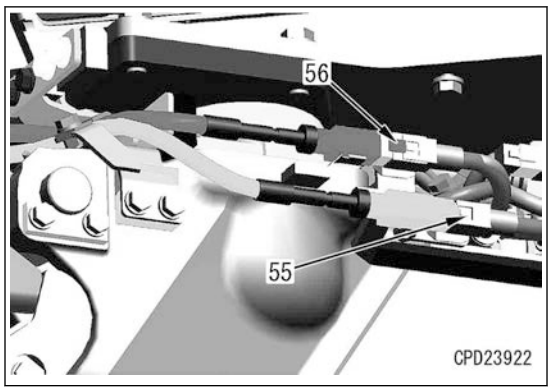
   NOTICE

   Do not rotate the rod while it is at set position when the sensor is installed. (In order not to damage the rod surface with the roller of the stroke sensor)

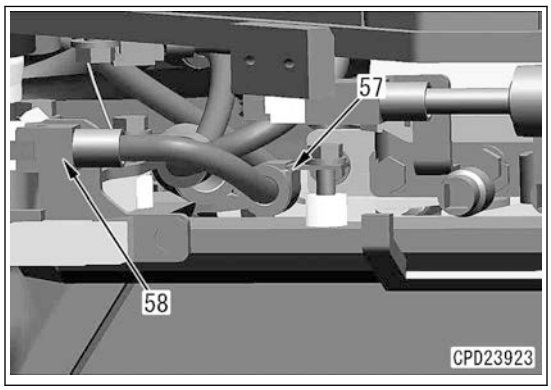
2. Place an oil container under the cylinder assembly (1) to receive oil.



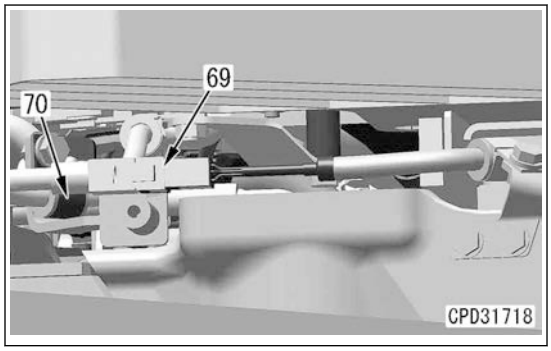
4. Disconnect the connectors CY14 (55) and CY12 (56).



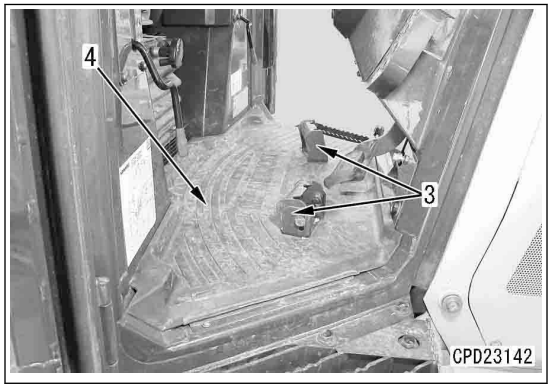
5. Disconnect the connector IMU2 (58), and remove the clamp (57).



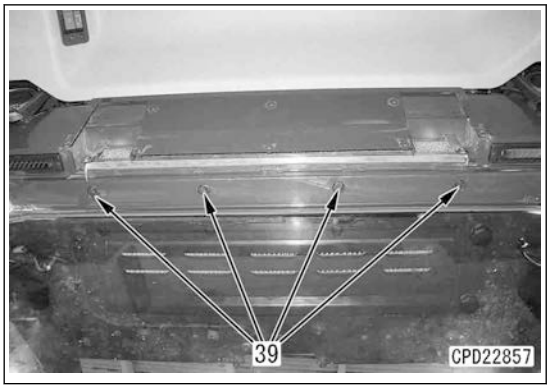
6. Disconnect the connector CY11 (69).
7. Remove the clamp (70).



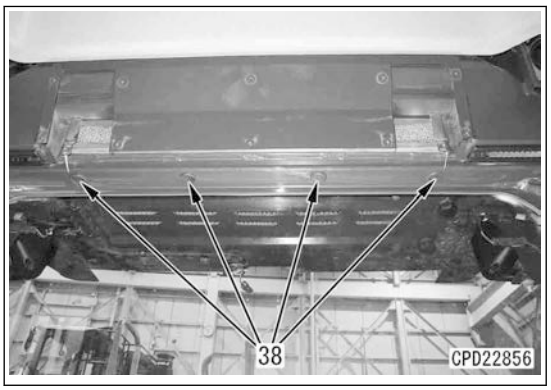
8. Remove the bracket (3).
9. Remove the floor mat (4).



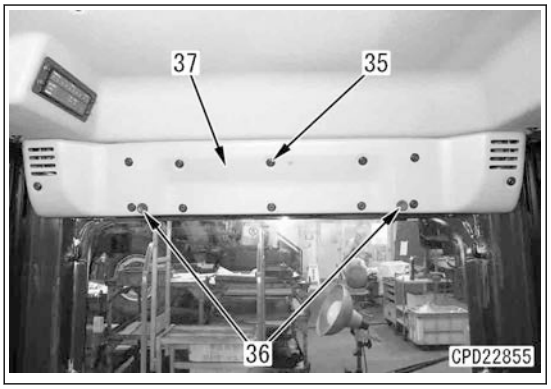
9. Install the bolts (39).



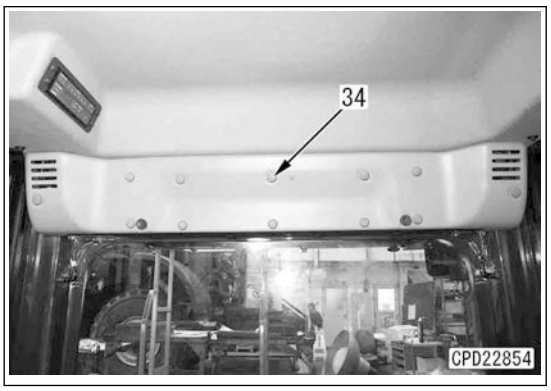
10. Install the plugs (38).



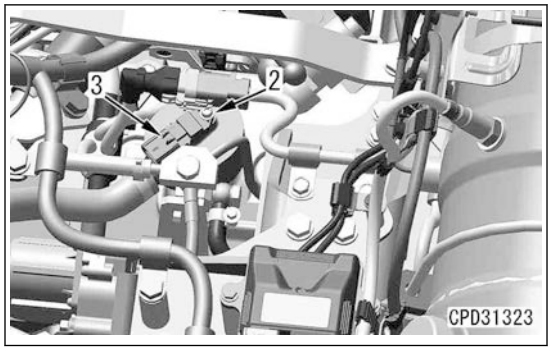
11. Install the trim (37), and tighten the knobs (36).
12. Install the screws (35) (12 pieces).



13. Install the caps (34) (12 pieces).



3. Remove the hexagonal socket head bolt (2), and remove KCCV crankcase pressure sensor (3).



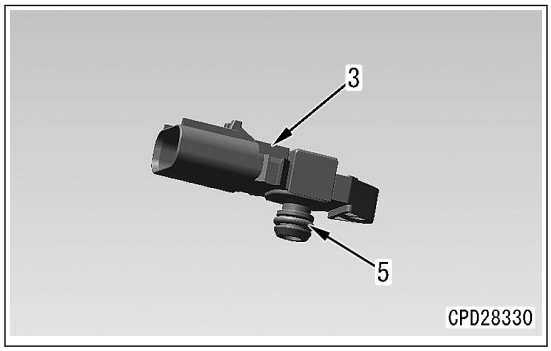
How to Install KCCV Crankcase Pressure Sensor

KCCV crankcase pressure sensor

1. Install O-ring (5) to KCCV crankcase pressure sensor (3).

   REMARK

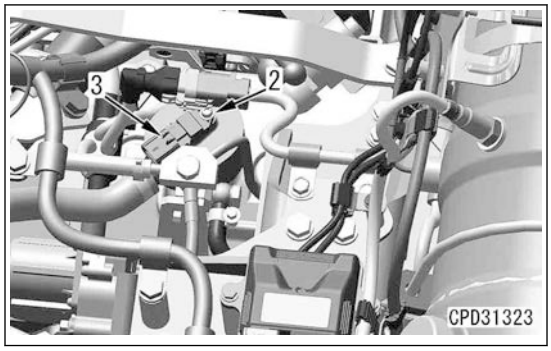
   Use a new O-ring.



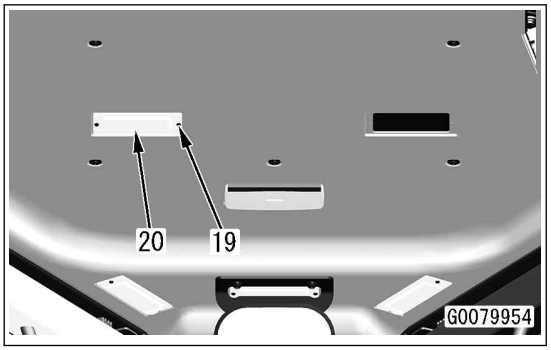
2. Install KCCV crankcase pressure sensor (3) with the hexagonal socket head bolt (2).

   Hexagonal socket head bolt (2): Width across flats of 4 mm

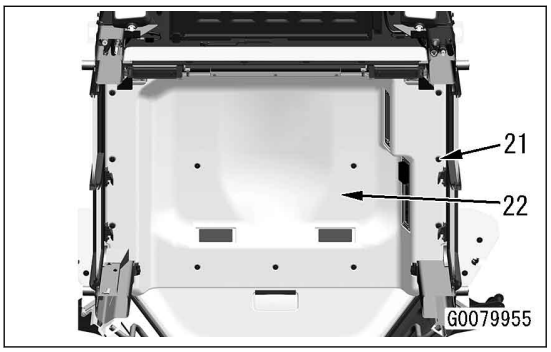
   Hexagonal socket head bolt (2):
   4 to 5 Nm {0.4 to 0.5 kgfm}



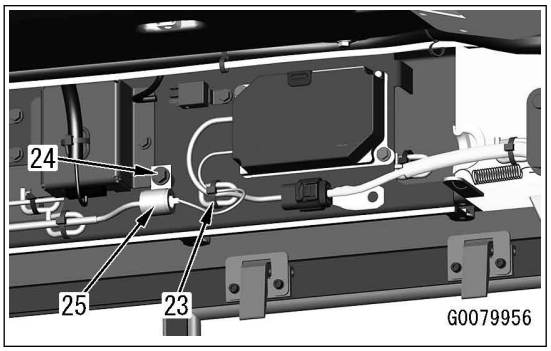
9. Remove the bolts (19) (2 pieces), and remove the vent (20).



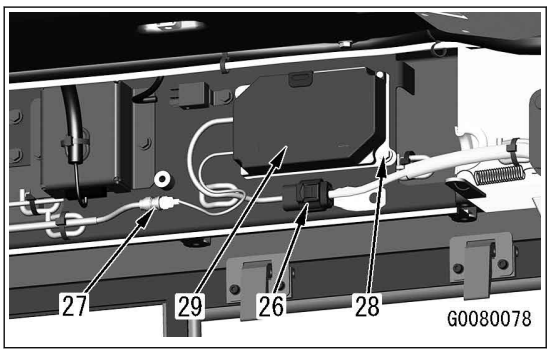
10. Remove the bolts (21) (11 pieces), and remove the cover (22).



11. Remove the banding band (23).
12. Remove the bolt (24), and remove the clamp (25).



13. Disconnect the connectors CK06 (26) and (27).
14. Remove the bolts (28) (2 pieces), and remove the communication terminal (29).

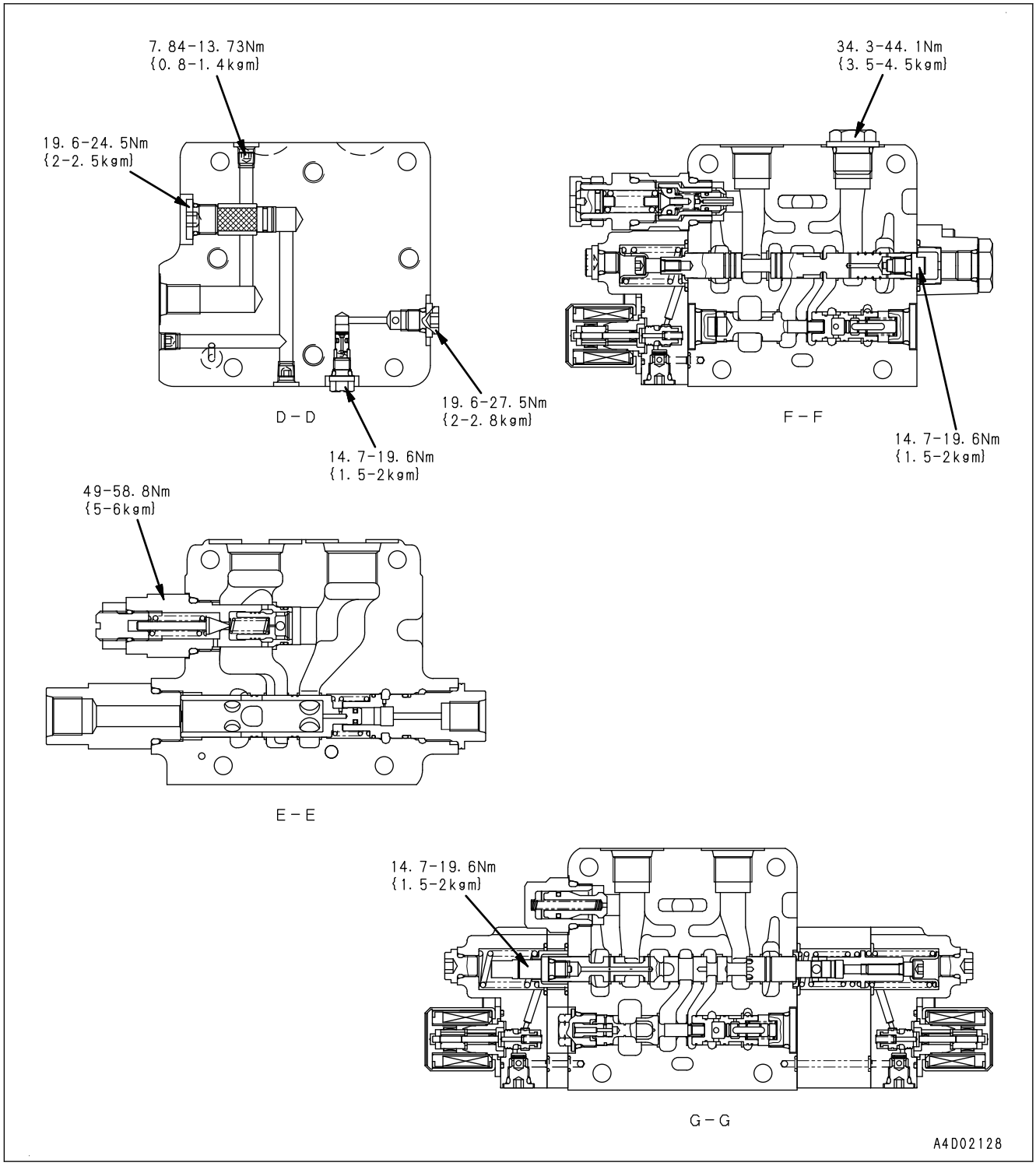


Unit: mm

No.	Item	Judgment criteria			Remedy
1	Wear of tooth bottom diameter	Standard dimensions	Repair limit	Repair limit	Repair by build-up welding or replace
		579.3	+1.0 -2.0	567.3	
2	Wear of tooth tip diameter	652	±2.0	640	
3	Wear of tooth tip width	40.2	-	33.2	
4	Wear of side of teeth (Judge by the groove depth on side)	5.25	±0.4	0	
5	Thickness of tooth bottom	62.15	+1.5 -2.0	56.15	

Unit: mm

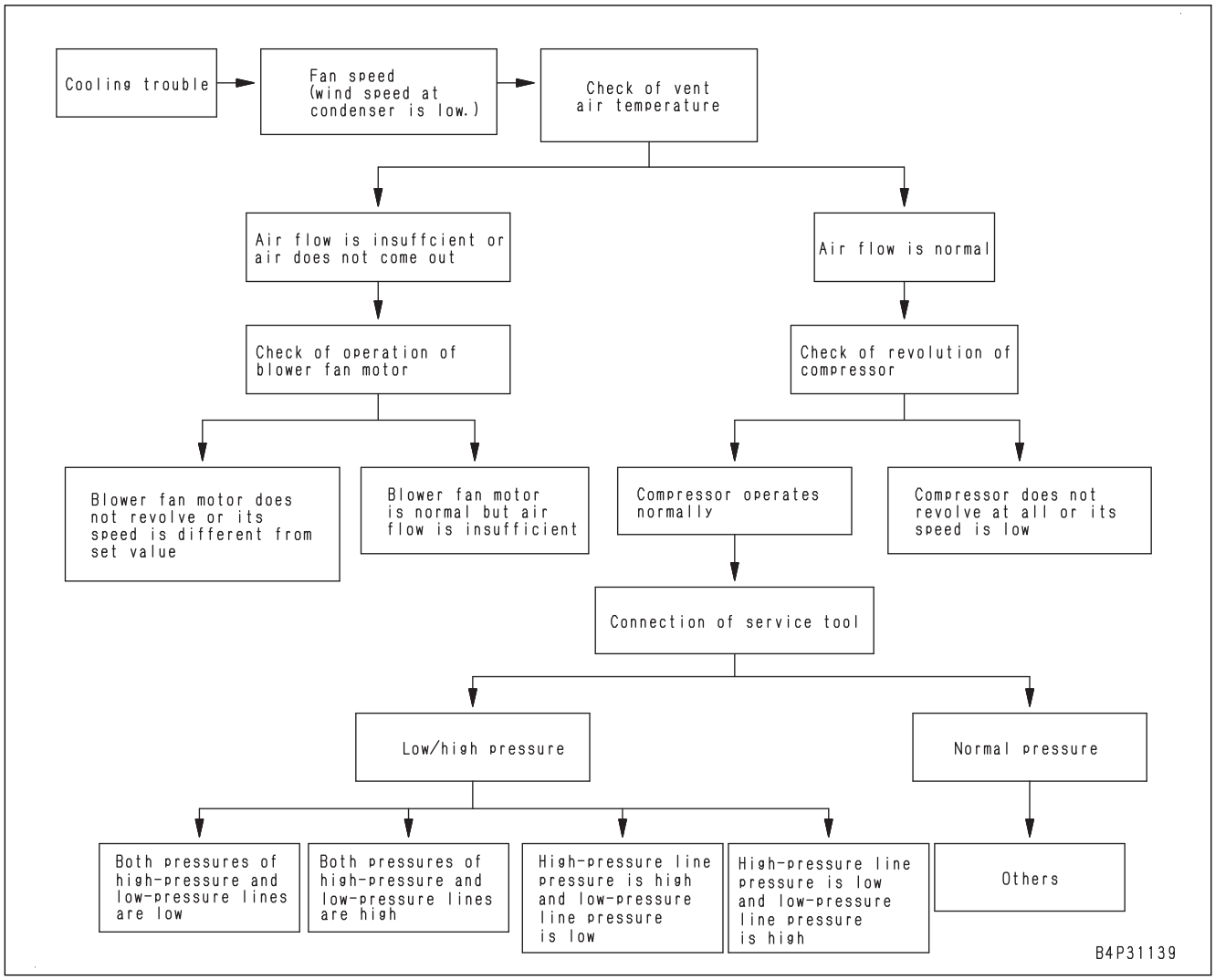
No.	Item	Judgment criteria					Remedy
		Standard dimensions			Repair limit		
1	Unload spring	Free height x outside diameter	Installed length	Load at installed height	Free height	Load at installed height	Replace the spring if damaged or deformed
		28.64 x 18.6	18	91.2 N {9.3 kg}	-	73.0 N {7.44 kg}	



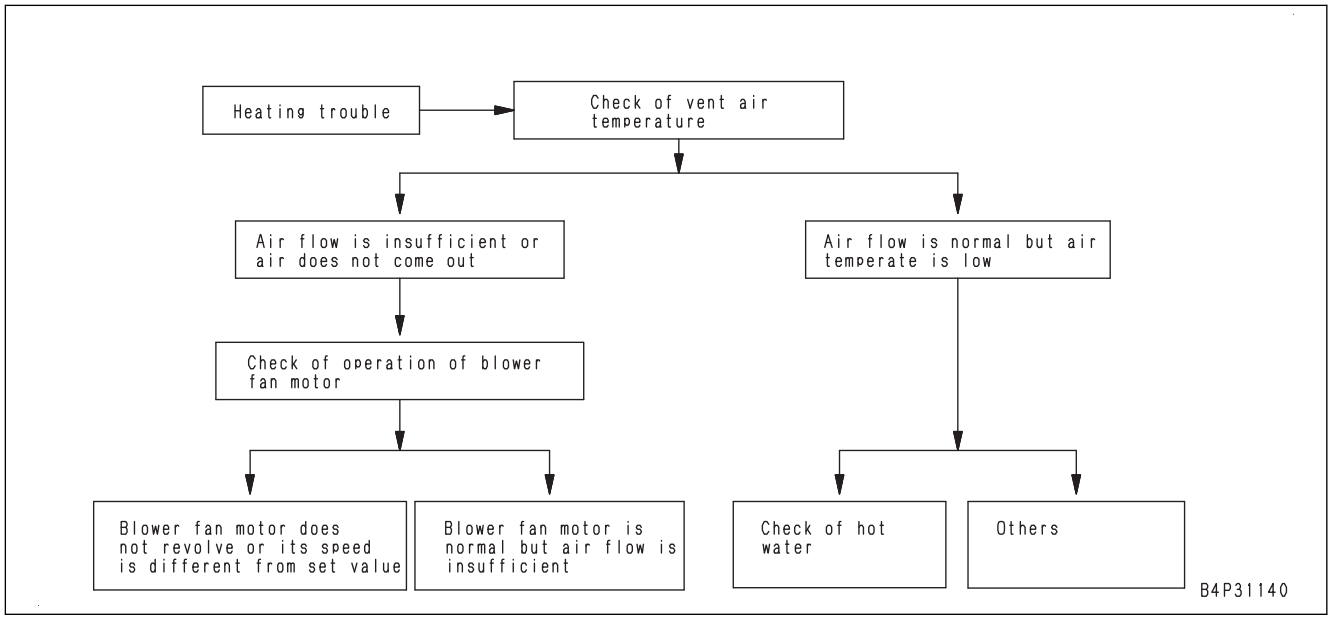
Abbreviation	Actual word spelled out
S/T	Steering
STRG	
SIG	Signal
SOL	Solenoid
STD	Standard
OPT	Option
OP	
PRESS	Pressure
SPEC	Specification
SW	Switch
TEMP	Temperature
T/C	Torque Converter
T/M	Transmission

Air Conditioner Troubleshooting Chart 1

Cooling Trouble



Heat Trouble



Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*1), or component/system)	Explanation
ICT	Information and Communication Technology	Communication and electronic control	A general term for the engineering and its socially applied technology of information processing and communication.
IMA	Inlet Metering Actuator	Engine	This is a valve that adjusts the fuel intake amount at the pump inlet in order to control the supply pump fuel discharged volume. (Same as IMV)
IMU	Inertial Measurement Unit	Engine	This is a device to detect the angle (or angular velocity) and acceleration of the 3 axes that control motions.
IMV	Inlet Metering Valve	Engine	This is a valve that adjusts the fuel intake amount at the pump inlet in order to control the supply pump combustion discharged volume. (Same as IMA)
KCCV	Komatsu Closed Crankcase Ventilation	Engine	This is a mechanism that burns the blowby gas again by separating oil from blowby gas and returning it to the intake side. It primarily consists of filters.
KCSF	Komatsu Catalyzed Soot Filter	Engine	This is a filter that captures soot in exhaust gas. It is built in to KDPF.
KDOC	Komatsu Diesel Oxidation Catalyst	Engine	This is a catalyst that is used for purifying exhaust gas. It is built in to KDPF or assembled with the muffler.
KDPF	Komatsu Diesel Particulate Filter	Engine	This is a component that is used to purify the exhaust gas. KDOC (catalyst) and KCSF (filter to capture soot) are built-in it. It is installed instead of the conventional muffler.
KTCS	Komatsu Traction Control System	Travel and brake (HM)	This is a function that performs braking with the optimum force and recovers the driving force of the wheels by actuating the inter-axle differential lock when the wheels runs idle while the machine travels on the soft ground.
LCD	Liquid Crystal Display	Machine monitor	This is an image display equipment such as a monitor in which the liquid crystal elements are assembled.
LED	Light Emitting Diode	Electronic parts	This is a semiconductor element that emits light when the voltage is applied in forward direction.
LIN	Local Interconnect Network	Communication and electronic control	This is one of communication standards that are used in the network on the machine.
LS	Load Sensing	Hydraulic system	This is a function that detects differential pressure of pump, and controls discharged volume corresponding to load.
LVDS	Low Voltage Differential Signaling	Communication and electronic control	This is one of communication standards that are used in the network on the machine.
MAF	Mass Air Flow	Engine	This indicates engine intake air flow. This is not used independently but is used as combined with sensor. Mass air flow sensor can be called as MAF sensor.