SEN01274-23

Shop Manual

DUMP TRUCK

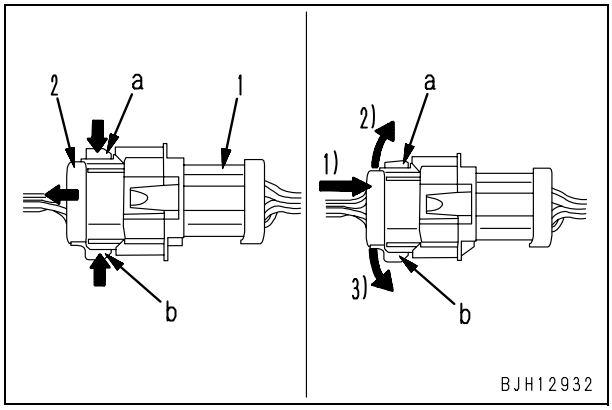
HD785-7

SERIAL NUMBERS 7001 and up

KOMATSU

3) Heavy duty wire connector (DT 8-pole, 12-pole)
Disconnection (Left of figure)
While pressing both sides of locks (a) and (b), pull out female connector (2).
Connection (Right of figure)
1] Push in female connector (2) horizontally until the lock clicks.
Arrow: 1)
2] Since locks (a) and (b) may not be set completely, push in female connector (2) while moving it up and down until the locks are set normally.
Arrow: 1), 2), 3)
★ Right of figure: Lock (a) is pulled down (not set completely) and lock (b) is set completely.
(1): Male connector
(2): Female connector
(a), (b): Locks

- Disconnection
- Connection (Example of incomplete setting of (a))



2. Table of tightening torques for split flange bolts

★ Unless there are special instructions, tighten split flange bolts to the torque below.

Thread diameter of bolt	Width across flats	Tightening torque	
mm	mm	Nm	kgm
10	14	59 – 74	6.0 – 7.5
12	17	98 – 123	10.0 – 12.5
16	22	235 – 285	23.5 – 29.5

3. Table of tightening torques for O-ring boss piping joints

★ Unless there are special instructions, tighten O-ring boss piping joints to the torque below.

Nominal No.	Thread diameter	Width across flats	Tightening torque Nm {kgm}	
	mm	mm	Range	Target
02	14	Varies depending on type of connector.	35 – 63 { 3.5 – 6.5}	44 { 4.5}
03,04	20		84 – 132 { 8.5 – 13.5}	103 {10.5}
05,06	24		128 – 186 {13.0 – 19.0}	157 {16.0}
10,12	33		363 – 480 {37.0 – 49.0}	422 {43.0}
14	42		746 – 1,010 {76.0 – 103}	883 {90.0}

4. Table of tightening torques for O-ring boss plugs

★ Unless there are special instructions, tighten O-ring boss plugs to the torque below.

Nominal No.	Thread diameter	Width across flats	Tightening torque Nm {kgm}	
	mm	mm	Range	Target
08	8	14	5.88 – 8.82 {0.6 – 0.9}	7.35 {0.75}
10	10	17	9.81 – 12.74 {1.0 – 1.3}	11.27 {1.15}
12	12	19	14.7 – 19.6 {1.5 – 2.0}	17.64 {1.8}
14	14	22	19.6 – 24.5 {2.0 – 2.5}	22.54 {2.3}
16	16	24	24.5 – 34.3 {2.5 – 3.5}	29.4 {3.0}
18	18	27	34.3 – 44.1 {3.5 – 4.5}	39.2 {4.0}
20	20	30	44.1 – 53.9 {4.5 – 5.5}	49.0 {5.0}
24	24	32	58.8 – 78.4 {6.0 – 8.0}	68.6 {7.0}
30	30	32	93.1 – 122.5 { 9.5 – 12.5}	107.8 {11.0}
33	33	–	107.8 – 147.0 {11.0 – 15.0}	127.4 {13.0}
36	36	36	127.4 – 176.4 {13.0 – 18.0}	151.9 {15.5}
42	42	–	181.3 – 240.1 {18.5 – 24.5}	210.7 {21.5}
52	52	–	274.4 – 367.5 {28.0 – 37.5}	323.4 {33.0}

	Engine oil pan	Transmission case	Steering, hoist oil tank	Front suspension	Rear suspension
Specified capacity (ℓ)	134	368	270	29.8 each for right and left	16.5 each for right and left
Refill capacity (ℓ)	129	205	175	—	—

	Brake sub tank	Differential case	Final drive case	Fuel tank	Cooling system
Specified capacity (ℓ)	36	137	64 each for right and left	1,308	283
Refill capacity (ℓ)	36	137	64 each for right and left	—	279

Notice

Use only diesel fuel.

The engine mounted on this machine employs electronic control and a high-pressure fuel injection device to obtain good fuel consumption and good exhaust gas characteristics. For this reason, it requires high precision for the parts and good lubrication. If kerosene or other fuel with low lubricating ability is used, there will be a big drop in durability.

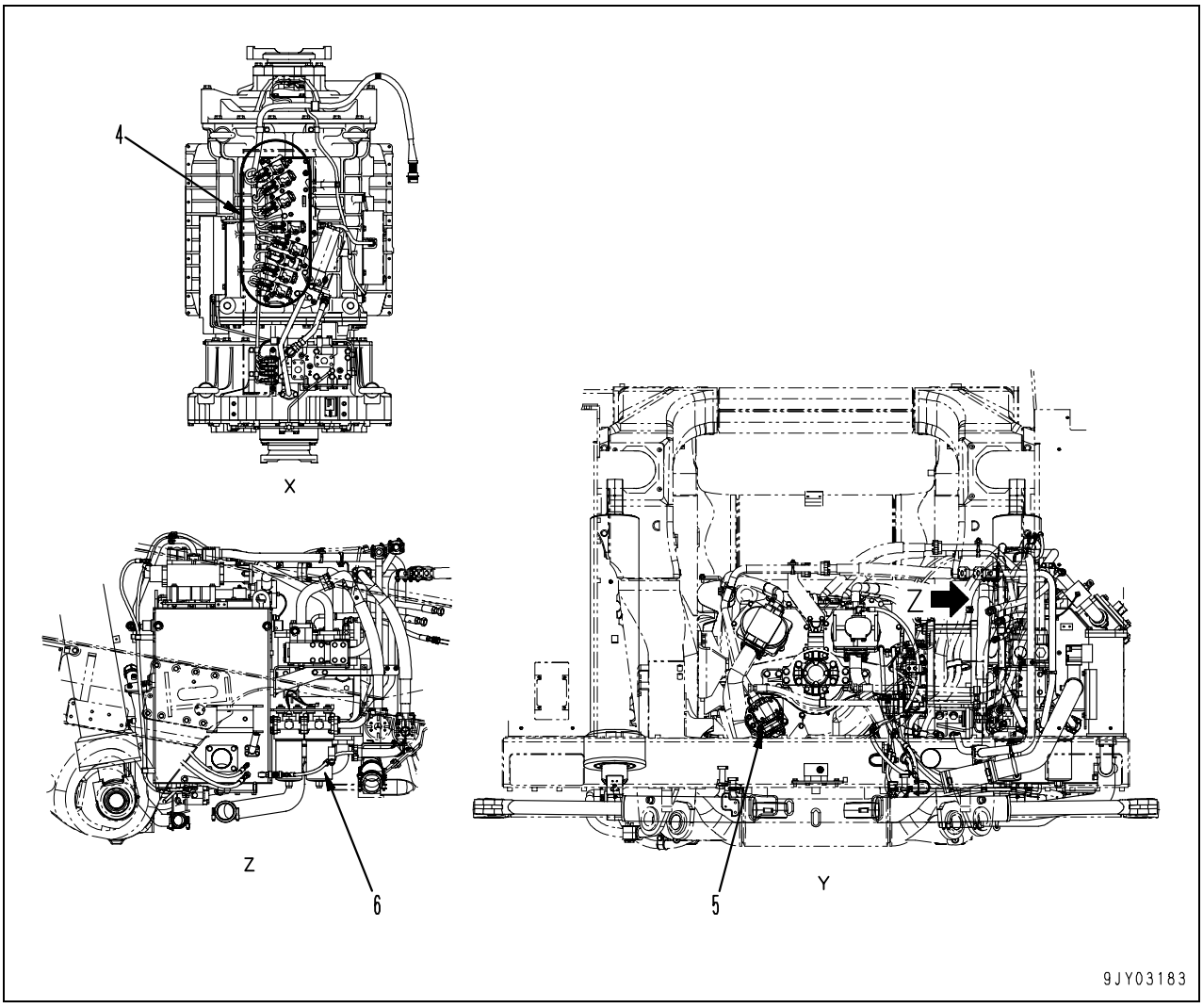
Note 1: SAE0W30EOS and SAE5W40EOS must be fully synthetic and HTHS (High-Temperature High-Shear Viscosity @ 150 °C), specified by ASTM D4741 must be equal to or higher than 3.5mPa-S(3.5cP).
Komatsu EOS0W30 and EOS5W40 are the most suitable oils.

Note 2: Power train oil has different properties from engine oil. Be sure to use the recommended oils.

Note 3: Hyper grease (G2-T, G2-TE) has a high performance.
When it is necessary to improve the lubricating ability of the grease in order to prevent squeaking of pins and bushings, the use of G2-T or G2-TE is recommended.

Note 4: Supercoolant (AF-NAC)

1) The coolant has the important function of preventing corrosion as well as preventing freezing.
Even in the areas where freezing is not an issue, the use of antifreeze coolant is essential.
Komatsu machines are supplied with Komatsu Super coolant (AF-NAC). Komatsu Super coolant (AF-NAC) has excellent anticorrosion, antifreeze and cooling properties and can be used continuously for 2 years or 4,000 hours.
Komatsu Super coolant (AF-NAC) is strongly recommended wherever available.
2) For details of the ratio when diluting super coolant with water, see "Mixing rate of water and super coolant".
When the machine is shipped from the factory, it may be filled with coolant containing 30% or more Super coolant (AF-NAC). In this case, no adjustment is needed for temperatures down to -10°C (14°F). (never dilute with water)
When temperature is below -10°C (14°F), adjust the ratio of Super coolant and water, see "Mixing rate of water and super coolant".
3) To maintain the anticorrosion properties of Super coolant (AF-NAC), always keep the density of Super coolant between 30% and 68%.



1. Torque converter
2. Transmission
3. Oil filler tube
4. Torque converter valve
5. Torque converter, transmission (front brake cooling), brake control pump (SDR(30)100+100+SA(1)25)
6. Transmission oil filter (4 pieces)
7. Brake cooling oil control vale

Unit: mm

No.	Check item		Criteria					Remedy
1	H clutch spring		Standard size			Repair limit		Replace
			Free length	Installed length	Installed load	Free length	Installed load	
			90	53.5	63.3 N {6.5 kg}	84.6	53.9 N {5.5 kg}	
2	3rd clutch spring		48.9	43	125.4 N {12.8 kg}	46	106.8 N {10.9 kg}	
3	2nd clutch spring		85.3	62.3	203.8 N {20.8 kg}	80.2	173.4 N {17.7 kg}	
4	1st clutch spring		85.3	62.8	199.2 N {20.4 kg}	80.2	169.5 N {17.3 kg}	
5	R clutch spring		85	74	247.2 N {25.2 kg}	79.9	209.7 N {21.4 kg}	
6	Total assembled thickness of 5 discs and 4 plates for H clutch		Standard size		Tolerance		Repair limit	
			50.2		±0.30		46.4	
7	Total assembled thickness of 5 discs and 4 plates for L clutch		50.2		±0.30		46.4	
8	Total assembled thickness of 4 discs and 3 plates for 4th clutch		39		±0.26		36.0	
9	Total assembled thickness of 4 discs and 3 plates for 3rd clutch		39		±0.26		36.0	
10	Total assembled thickness of 5 discs and 5 plates for 2nd clutch		56		±0.40		52.0	
11	Total assembled thickness of 5 discs and 5 plates for 1st clutch		56		±0.40		52.0	
12	Total assembled thickness of 5 discs and 5 plates for R clutch		55		±0.32		51.0	
13	Thickness of a single disc	H,L,4th	5.4		±0.1		4.8	
		3rd	5.4		±0.1		4.8	
		2nd,1st	5.4		±0.15		4.8	
		R	5.2		±0.1		4.6	
14	Thickness of a single plate	H	5.8		±0.1		5.6	
		L,4th	5.8		±0.1		5.6	
		3rd	5.8		±0.1		5.6	
		2nd,1st	5.8		±0.1		5.6	
		R	5.8		±0.1		5.6	
15	Wear of transmission input shaft seal ring	Width	3		–0.01 –0.03		2.7	
		Thickness	3.7		±0.12		3.55	
16	Wear of H carrier seal ring	Width	3.95		0 –0.1		3.56	
		Thickness	4.95		±0.1		4.8	

H sun gear (4) of the H clutch and 4th clutch drum (11) of the 4th clutch are fixed hydraulically.

Power from torque converter
↓
Input shaft (1)
↓
H carrier (2)
↓
H planetary pinion (5)
↓
H ring gear (7)
↓
L clutch housing (8)
↓
Intermediate shaft (9) → → → ↓
↓ 2nd sun gear (19)
4th clutch housing (10) ↓
↓ ↓
4th clutch drum (11) ↓
↓ ↓
4th clutch (12) ↓
↓ ↓
4th hub (13) ↓
↓ ↓
3rd carrier (17) ↓
↓ ↓
2nd ring gear (18) ↓
↓ ↓
2nd planetary pinion (20) ← ← ←
↓
1st, 2nd carrier (23)
↓
Output shaft (29)

DUMP TRUCK

HD785-7

Machine model	Serial number
HD785-7	7001 and up

10 Structure, function and maintenance standard

Power train, Part 2

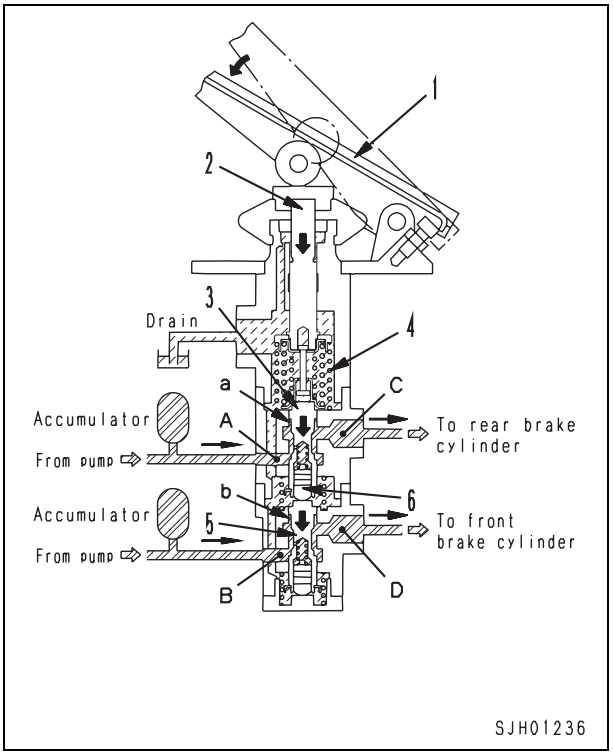
Operation

Upper portion

- When brake pedal (1) is depressed, the operating force is transmitted to spool (3) through rod (2) and spring (4). When spool (3) goes down, drain port (a) is closed, and the oil from the pump and accumulator flows from port (A) to port (C) and actuates the rear brake cylinders.

Lower portion

- When brake pedal (1) is depressed, the operating force is transmitted to spool (3) through rod (2) and spring (4). When spool (3) goes down, spool (5) is also pushed down by plunger (6). When this happens, drain port (b) is closed, and the oil from the pump and accumulator flows from port (B) to port (D) and actuates the front brake cylinders.

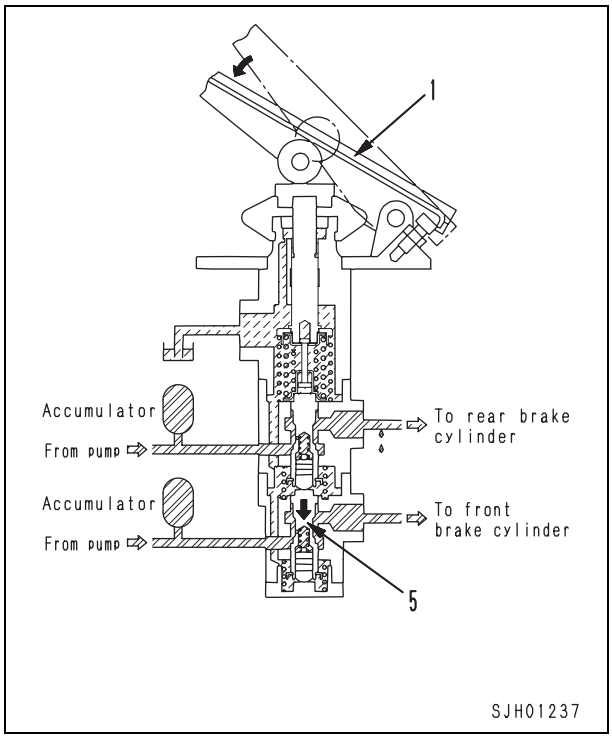


Applying brake when upper valve fails

- Even if there is leakage of oil in the upper piping, spool (5) is moved down mechanically when pedal (1) is depressed, and the lower portion is actuated normally.
  The upper valve is not actuated.

Applying brake when lower valve fails

- Even if there is leakage of oil in the lower piping, the upper portion is actuated normally.



When actuation is balanced

Upper portion

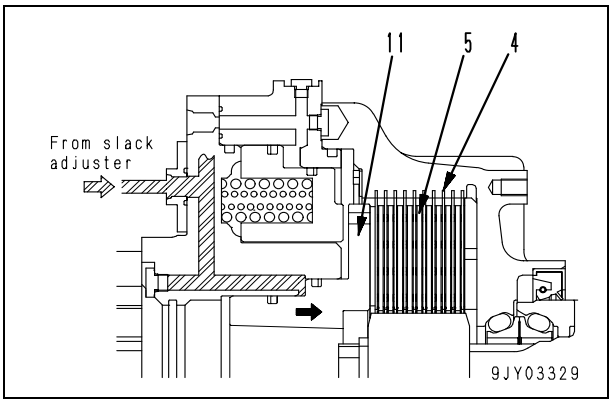
- When oil fills the rear brake cylinders and the pressure between port (A) and port (C) becomes high, the oil entering port (H) from orifice (e) of spool (3) pushes against spring (4). It pushes up spool (3) and shuts off the circuit between port (A) and port (C). When this happens, drain port (a) stays closed, so the oil entering the brake cylinder is held and the brake remains applied.

Function

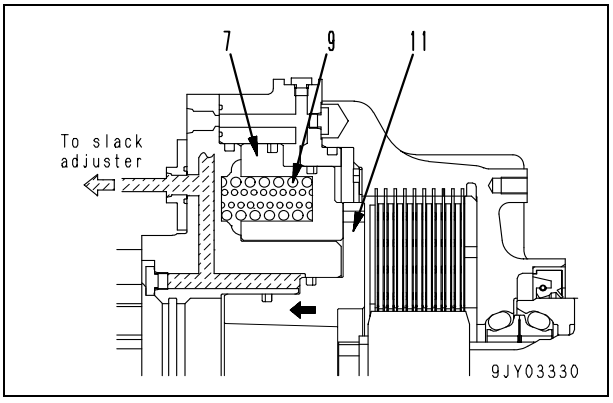
- The rear brake is of an oil cooled multiple disc type, and it operates as a parking brake by use of spring.

Operation of brake

- When the brake pedal is depressed, oil pressure from the brake valve moves brake piston (11) to the right in the direction of the arrow. This presses disc (5) and plate (4) together and generates friction between the disc and plate. The wheel is rotating together with the disc, so this friction reduces the travel speed and stops the machine.

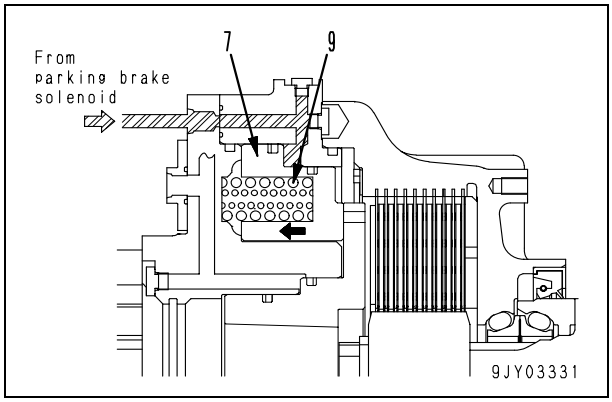


- If the brake pedal is released, the hydraulic pressure on brake piston (11) is released and the piston is moved to the left by the brake cooling oil pressure and consequently the brake is released.

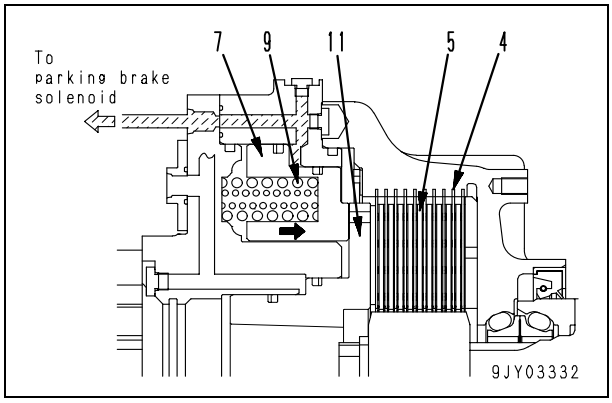


Operation of parking brake

- The parking brake contained in the rear brake is structurally designed to operate mechanically by spring (9) force and to be released by hydraulic pressure.
- The parking releasing hydraulic pressure acts on the parking brake piston (7) from the accumulator through the secondary brake valve and parking brake solenoid.
- With the parking brake switch at the driver's seat in the travel position, the parking releasing hydraulic pressure releases the parking brake by pressing the parking brake piston (7) and retracting the spring (9).



- With the parking brake switch in the parking position, the parking brake solenoid is demagnetized and the parking releasing hydraulic pressure is released. Then, the parking brake is engaged through the parking brake piston (7), brake piston (11), plate (4), and disc (5) pressed by spring (9) force.

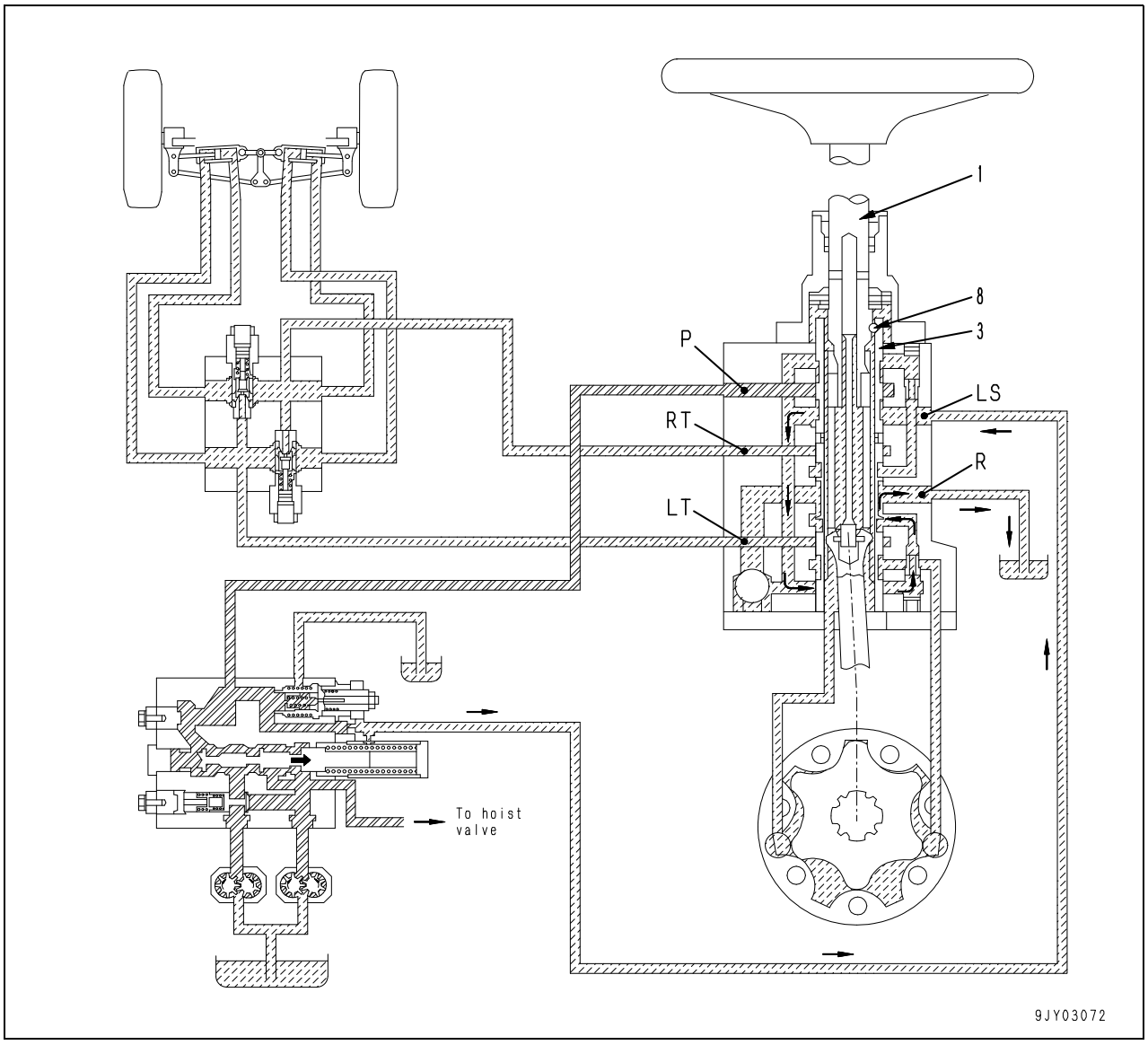


Unit: mm

No.	Check item	Criteria					Remedy
		Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
5	Clearance between rod mounting pin and bushing	90	–0.030 –0.060	+0.091 +0.045	0.075 – 0.970	1.1	Replace
6	Clearance between inner and outer bushing	130	—	—	0.120 – 0.190	0.3	
7	Clearance between suspension cylinder mounting pin and frame or axle	90	–0.030 –0.060	+0.091 +0.045	0.075 – 0.970	1.1	
8	Clearance between inner and outer bushing	130	—	—	0.120 – 0.190	0.3	

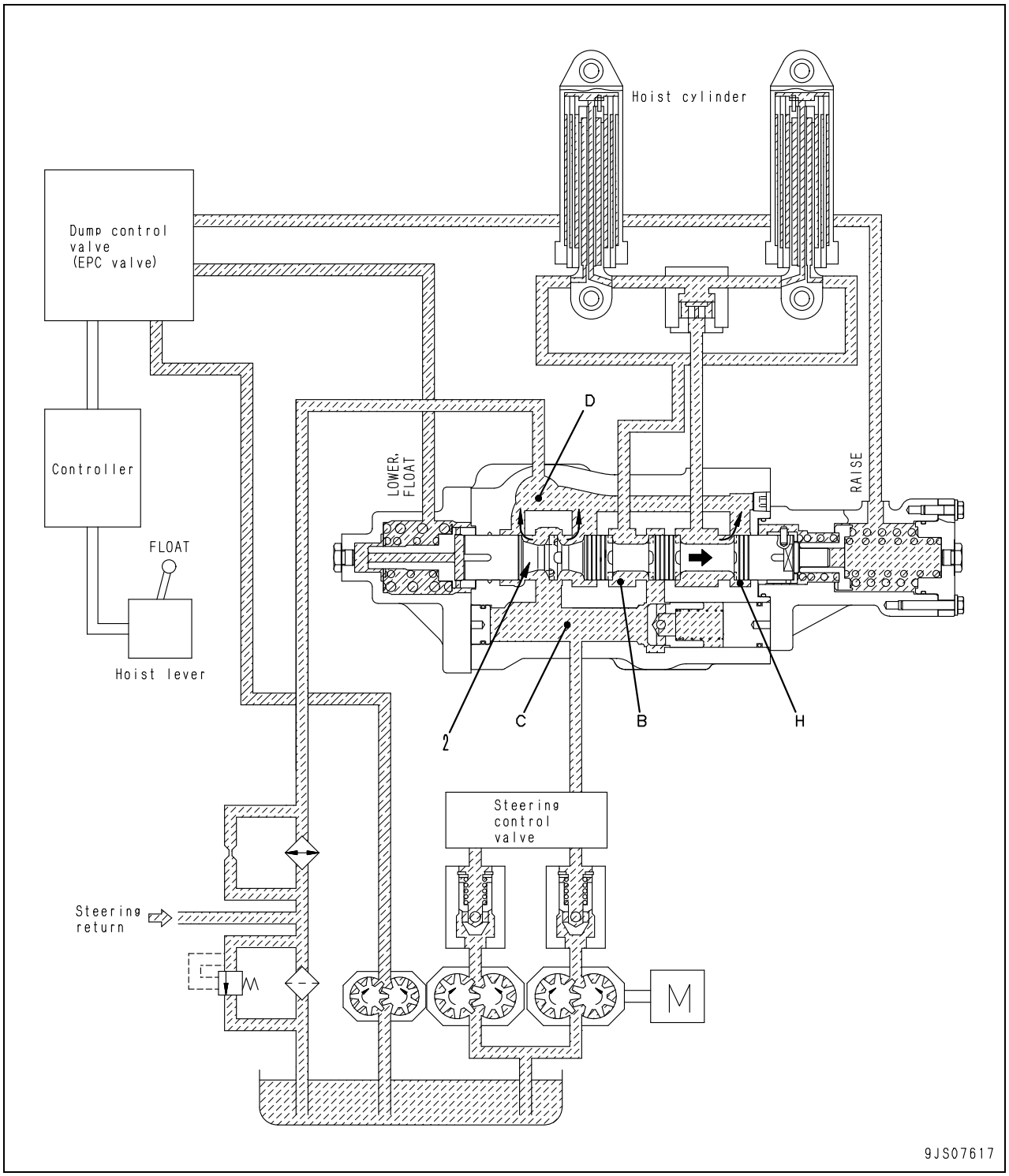
Operation

1. When steering is at neutral



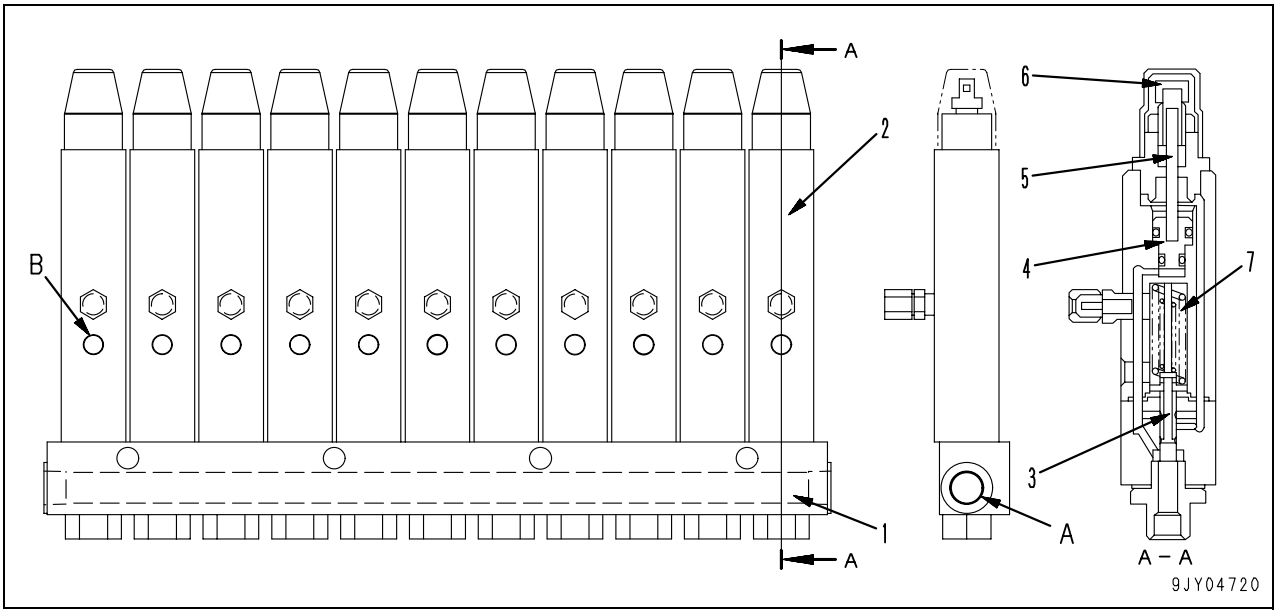
- The oil from the pump passes through the steering control valve and enters port (P) of the steering valve
- Valve spool (3) is at the neutral position, so port (P) and the port (RT and LT) to steering cylinder are closed. No oil flows to the steering cylinder, so the steering cylinder does not move.
- At the same times, port (LS) is connected trough port (R) to the tank. As a result, there is no oil pressure at port (LS), so all the oil from the pump at the steering control valve flows to the hoist valve.

3. When hoist valve is in "FLOAT" position



- If the hoist lever in the cab is set in the "FLOAT" position, the pressurized oil from the EPC valve moves hoist spool (2) to the right. Then, chamber (C) is connected to chamber (D), and chambers (B) and (H) are connected to chamber (D).
- The pressurized oil from the steering control valve flows through chambers (C) and (B) to the hoist cylinder. A part of it flows through chambers (C) and (D) to the steering oil cooler, too.
- Since the bottom side and head side of the hoist cylinder are connected by the hoist valve, the hoist cylinder is free.

Left side of machine



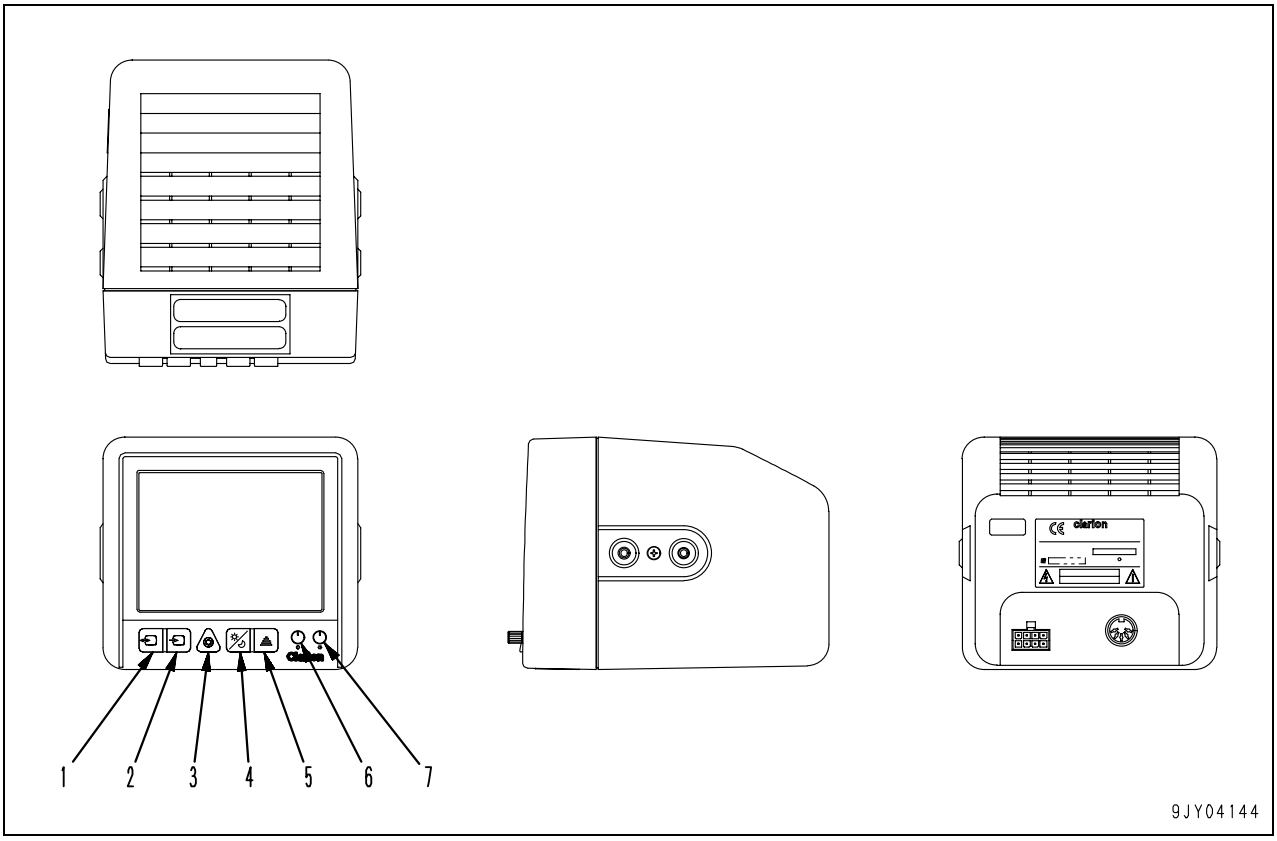
1. Manifold
2. Injector
3. Slide valve
4. Piston
5. Indicator stem
6. Adjusting screw
7. Spring

A: Grease inlet
B: Grease outlet

Specification

Max. using pressure: 41.3 MPa {421 kg/cm^2}
Normal pressure: 21.0 MPa {214 kg/cm^2}
Using temperature range: -40 – 80 °C
Grease delivery range: 0.25 – 1.31 cc

Monitor



1. Auto switch
2. Manual switch
3. Zoom/Iris switch
   (Reverse light compensation switch)
4. Bright/Dim light selector switch
5. Mark switch
6. Contrast adjustment knob
7. Brightness adjustment knob

Specifications

TV signal method:
As per Japanese standard TV method
Scanning method: 2:1 Interlace method
CRT: 4.5 inch, black and white, 90-deg. deflection
Resolution:
Horizontal 400 lines and vertical 300 lines
Power supply voltage: DC 24/12 V

Signal and model					Remarks
Signal name	Model name				
	HD325-7 HD405-7	HD465-7E0 HD605-7E0	HD465-7R HD605-7R	HD785-7	
–	–	–	–	–	(–) : NON CONNECT
–	–	–	–	–	OPEN (RESERVED)
–	–	–	–	–	OPEN (RESERVED)
BAT DIRECT +24 V	○	○	○	○	Directly from battery +24 V
BAT DIRECT +24 V	○	○	○	○	Directly from battery +24 V
POWER SUPPLY +24 V	○	○	○	○	Key switch +24 V (ACC)
POWER SUPPLY +24 V	○	○	○	○	Key switch +24 V (ACC)
–	–	–	–	–	(–) : NON CONNECT
GND (for power supply)	○	○	○	○	+24 V POWER CONNECT
GND (for power supply)	○	○	○	○	+24 V POWER CONNECT
–	–	–	–	–	(–) : NON CONNECT
–	–	–	–	–	(–) : NON CONNECT
BUZZER OUTPUT	○	○	○	○	Warning buzzer (Max. 200 mA sync)
HEAD LIGHT H/L SWITCHING	○	○	○	○	
–	–	–	–	–	(–) : NON CONNECT
–	–	–	–	–	(–) : NON CONNECT
–	–	–	–	–	(–) : NON CONNECT
–	–	–	–	–	(–) : NON CONNECT
–	–	–	–	–	(–) : NON CONNECT
–	–	–	–	–	(–) : NON CONNECT
HI BEAM	○	○	○	○	
AISS SW	○	○	○	○	
EXHAUST SW2	–	–	–	○	Exhaust brake switch lower side
PASSING SW	○	○	○	○	
CONNECTER CHECK	○	○	○	○	Used to detect improper connector, connection
MODE SW2-1 >	○	○	○	○	Mode SW2 upper side
RIGHT TURN	○	○	○	○	
MODE SW1-1 ◇	○	○	○	○	Mode SW1 upper side

Input and output signal

CN1

Pin No.	Signal name	Input/output signal
1	Torque converter oil pressure	Input
2	–	–
3	Transmission oil temperature	Input
4	–	–
5	Emergency escape switch	Input
6	Shift lever position N	Input
7	Accumulator oil pressure sensor (rear)	Input
8	Fuel level sensor	Input
9	Torque converter oil temperature	Input
10	–	–
11	Transmission filter clogging switch 2	Input
12	Emergency steering operation	Input
13	Accumulator oil pressure sensor (front)	Input
14	–	
15	Alternator R terminal	Input
16	Sensor power supply	Output
17	Transmission filter clogging switch 1	Input
18	–	–
19	Machine inclination angle	Input
20	Steering oil temperature	Input
21	GND (for sensor)	–
22	Sensor power supply (5V)	Output
23	–	–
24	Start	Input

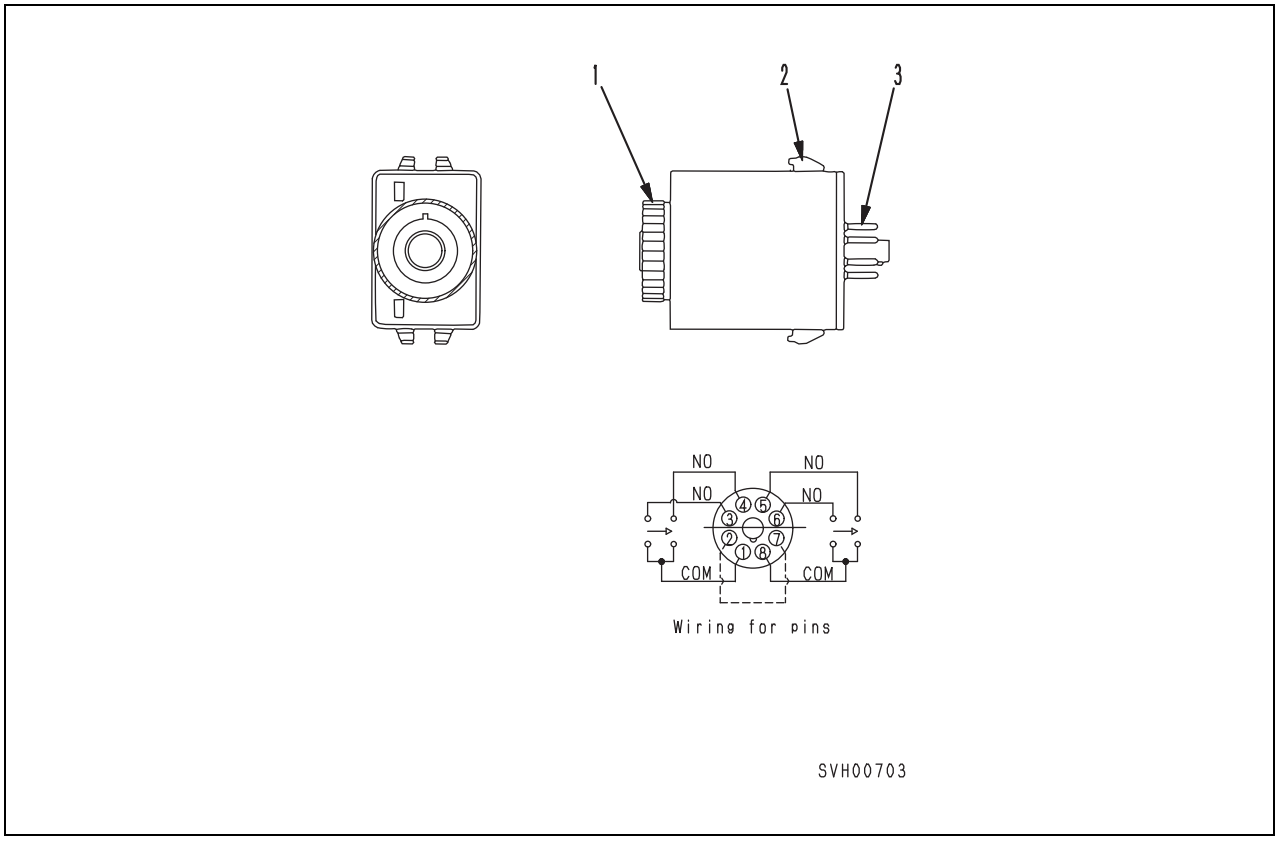
CN2

Pin No.	Signal name	Input/output signal
1	–	–
2	–	–
3	Transmission oil quantity variable valve operation	Input
4	–	–
5	Shift lever position 5	Input
6	Shift lever position L	Input
7	Transmission main variable valve operation	Input
8	–	–
9	–	–
10	–	–
11	–	–
12	–	–
13	Main oil quantity exchange valve operation	Input
14	–	–
15	Shift lever position 6	Input
16	Shift lever position 2	Input
17	Air cleaner clogging switch	Input
18	–	–
19	–	–
20	Transmission intermediate shaft speed	Input
21	–	
22	Network Low	Input/output
23	–	
24	–	
25	Shift lever position D	Input
26	Shift lever position 3	Input
27	Coolant level	Input
28	–	–
29	GND (for input shaft speed, output shaft speed)	
30	Transmission output shaft speed	Output
31	–	
32	Network High	Input/output
33	–	–
34	–	–
35	Shift lever position R	Input
36	Shift lever position 4	Input
37	–	–
38	–	–
39	GND (intermediate shaft speed)	Input
40	Transmission input shaft speed	Input

CN3

Pin No.	Signal name	Input/output signal
1	Power supply 24V	Input
2	Proportional solenoid power supply 24 V	Input
3	ECMV output Hig 1st, 4th, main oil quantity change valve (-)	Output
4	–	–
5	ECMV 2nd (+)	Output
6	ECMV Low (+)	Output
7	–	–
8	Torque converter oil pressure sensor power supply (24V)	Output
9	Fill switch 2nd	Input
10	Fill switch Low	Input
11	Power supply 24V	Input
12	Proportional solenoid power supply 24 V	Input
13	ECMV output Low, 3rd, transmission main pressure variable valve (-)	Output
14	KEY switch ACC	Input
15	ECMV 3rd (+)	Output
16	ECMV 4th (+)	Output
17	–	–
18	–	–
19	Fill switch 3rd	Input
20	Fill switch 4th	Input
21	GND	Input
22	Proportional solenoid power supply 24 V	Input
23	ECMV output Rev. 2nd, lock-up, T/M lubrication oil quantity variable valve (-)	Output
24	KEY switch ACC	Input
25	ECMV Rev (+)	Output
26	ECMV High (+)	Output
27	–	–
28	Main oil quantity exchange valve	Output
29	Fill switch Rev	Input
30	Fill switch High	Input
31	GND	Input
32	GND	Input
33	GND	Input
34	–	–
35	ECMV lock-up (+)	Output
36	ECMV 1st (+)	Output
37	Transmission main pressure variable valve	Output
38	Transmission oil quantity variable valve	Output
39	–	–
40	Fill switch 1st	Input

Relay timer



1. Dial
2. Lock
3. Pin

Set time: 1 seconds

Outline

The relay timer is a delay timer which prevents the emergency steering system from operating when the oil pressure switch malfunctions because of oil pulsation etc.
After power is applied to the timer coil for the set time, the relay contacts are changed.

4. Control when starting switch is turned to ON, OFF, or START

Starting switch at ON:
The output is set to HOLD, regardless of the position of the lever.
If the engine is not started, even if the hoist lever is operated, the condition remains at HOLD.
Starting switch at OFF:
The hoist valve is closed and the dump body is held in position regardless of the position of the lever.
Engine started:
Immediately after the engine is started, the output is set to HOLD, regardless of the position of the lever.
After the lever is moved to the HOLD position, it becomes possible to carry out normal operations.

5. Reverse inhibit function

The retarder controller judges if it is permissible to travel in reverse or not, and transmits the result of the judgment through the network to the transmission controller.
"FLOAT OUTPUT" or "SEATED" and "LEVER NOT RAISED" → Reverse travel permitted
"NOT FLOAT OUTPUT" and "NOT SEATED" or "LEVER RAISED" and "SEATED" → Reverse travel prohibited

6. Calibration function

To absorb any inherent error in the dump body potentiometer, calibration is carried out to recognize the dump body seating and the body cylinder stopper condition.

After adjusting the installation of the body potentiometer or replacing the retarder controller, carry out calibration. For the calibration procedure, see Testing and adjusting.

Outline

- A dump truck is supported by 4 suspension cylinders. By measuring the total of the loads on each cylinder, it is possible to know the mass on the springs of the dump truck.
  The measurement of the load mass is obtained by calculating the difference between the mass when empty and the mass when full.
  Payload meter displays the load mass calculated as above on the monitor screen and displays the load level on the outside indicator lamps.
  It also has an estimation display function: when loading the next load, the new total load mass is estimated and the appropriate lamp flashes. This prevents overloading.

- The operation data, including the load mass of each transportation cycle, can be saved in the internal memory and downloaded with special software (if equipped).
  The hauled load weight is obtained by statistically processing the data sampled during travel from the loading place to the dumping place and then saved.

- The VHMS controller executes the functions of the payload meter and saves the data of each transportation cycle. It displays, sets, and operates various items through the machine monitor and network.
  When the payload meter is installed for the first time or the VHMS controller is replaced, the necessary items of the VHMS controller must be set again.

- The payload meter (having VHMS) cannot be installed to a dump truck which is not equipped with the VHMS controller.

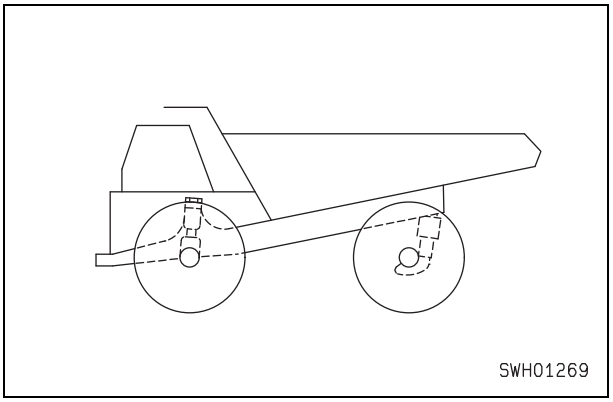
Electric circuit diagram

See Troubleshooting, Troubleshooting of VHMS controller system.

Principle of calculation

1. Outline

A dump truck is supported by 4 suspension cylinders. By measuring the total of the loads on each cylinder, it is possible to know the load mass on the springs of the dump truck.
The measurement of the load mass is obtained by calculating the difference between the mass when empty and the mass when full.
The load on each cylinder can be calculated from the internal pressure and sectional area of the suspension cylinder.



(b) Contents of communication
Format (VHMS controller)

STX (02h)	[1]	[2]	[3]	[4]	[5]	[6]	ETX (03h)	BCC

[1]: M (ASCII) fixed
[2]: 4 (ASCII) fixed
[3]: 02 (h) fixed (Unit classification [HEX])
[4]: Load mass (B) [HEX] (2 BYTES) (Unit: Metric ton, 10-time value, 1 decimal place)
[5]: Estimated load mass (C) [HEX] (2 BYTES) (Unit: Metric ton, 10-time value, 1 decimal place)
[6]: (B) Calculated suspension pressure [HEX] [8 BYTES]
From head

Signal name	Position	Name	HEX
P FL	(Lower position) (Upper position)	Front left suspension pressure (kg/cm^2)	[10-time value] 0 – 6553.5
P FR	(Lower position) (Upper position)	Front right suspension pressure (kg/cm^2)	[10-time value] 0 – 6553.5
P RL	(Lower position) (Upper position)	Rear left suspension pressure (kg/cm^2)	[10-time value] 0 – 6553.5
P RR	(Lower position) (Upper position)	Rear right suspension pressure (kg/cm^2)	[10-time value] 0 – 6553.5

[BCC]: EX-OR of each bit from STX to ETX
Answer (→ VHMS controller)

STX (02h)	ACK (06h)	31H (ASCII 1)	ETX (03h)	BCC

or

STX (02h)	NAK (15h)	31H (ASCII 1)	ETX (03h)	BCC

Action that VHMS controller takes when answer is abnormal
If "NAK" is returned or either of "ACK" and "NAK" is not returned in 3 seconds, the VHMS controller transmits up to 2 more times. If an answer is still not returned, the VHMS controller stops transmission.

Transmission of final load mass
(a) Timing of transmission
When the concerned cycle data are entered (When dumping is finished), the final load mass (= the load mass to be saved as the hauled load mass of the concerned cycle in the memory) is transmitted automatically.
(b) Contents of communication
Format (VHMS controller)

STX (02h)	[1]	[2]	[3]	[4]	ETX (03h)	BCC

[1]: P (ASCII) fixed
[2]: 4 (ASCII) fixed
[3]: 02h fixed for unit identification
[4]: Load mass [HEX] (2 BYTES) (Unit: Metric ton, 10-time value, 1 decimal place)
Order: Lower position→ upper position from the head byte of [4]
[BCC]: EX-OR of each bit from STX to ETX

Answer (→ VHMS controller)

STX (02h)	ACK (06h)	31H (ASCII 1)	ETX (03h)	BCC

or

STX (02h)	NAK (15h)	31H (ASCII 1)	ETX (03h)	BCC

Input and output signal

CN1

Pin No.	Signal name	Input/output signal
1	ABS CONTROL PRESSURE (RL)	Input
2	NC	Input
3	NC	Input
4	GND_SIG_D	–
5	NC	Input
6	NC	Input
7	ABS CONTROL PRESSURE (RR)	Input
8	NC	Input
9	NC	Input
10	GND_SIG_D	–
11	NC	Input
12	NC	Input

Pin No.	Signal name	Input/output signal
13	ABS CONTROL PRESSURE (FL)	Input
14	NC	Input
15	R TERMINAL SIGNAL	Input
16	PWR_OUT_SENS	Output
17	ABS CUT PRESS SW (R)	Input
18	NC	Input
19	ABS CONTROL PRESSURE (FR)	Input
20	NC	Input
21	GND_SIG_A	–
22	POT_PWRO	Output
23	ABS CUT PRESS SW (F)	Input
24	NC	Input

CN2

Pin No.	Signal name	Input/output signal
1	NC	Output
2	NC	Input
3	NC	Input
4	NC	Input
5	NC	Input
6	NC	Input
7	NC	Input
8	NC	Output
9	NC	Output
10	WHEEL SPEED (RL)	Input
11	NC	Output
12	NC	–
13	NC	Input
14	NC	Output
15	NC	Input
16	NC	Input
17	NC	Input
18	NC	Output
19	NC	Output
20	WHEEL SPEED (RR)	Input

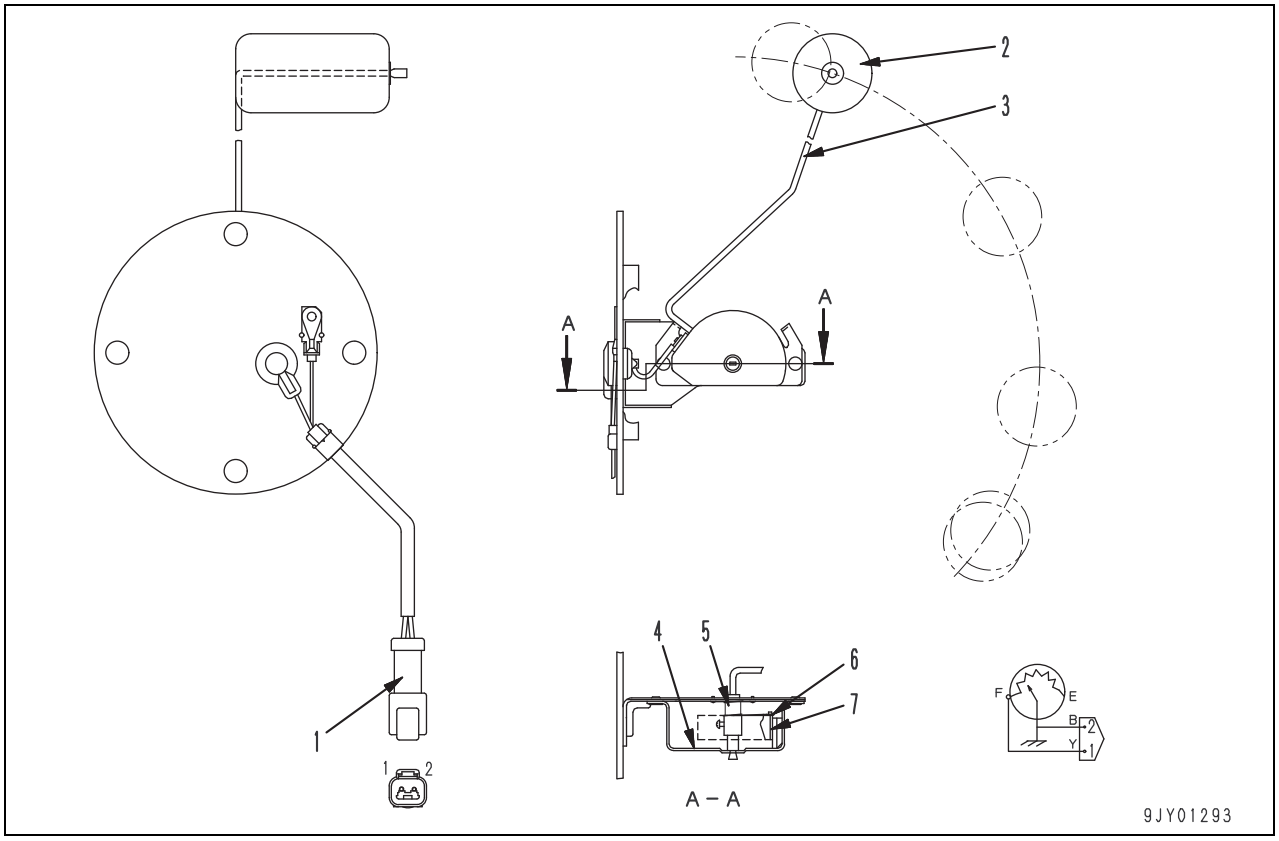
Pin No.	Signal name	Input/output signal
21	NC	Input/output
22	COMM_CAN_L_O	Input/output
23	NC	Input/output
24	PER_CTR_EXT	Input
25	NC	Input
26	NC	Input
27	NC	Input
28	NC	Input
29	GND_SIG_P	–
30	WHEEL SPEED (FL)	Input
31	GND (S_NET_GND)	–
32	COMM_CAN_H_O	Input/output
33	NC	Input/output
34	NC	–
35	KEY SW C (ENGINE START)	Input
36	NC	Input
37	NC	Input
38	NC	Input
39	GND_SIG_P	Input
40	WHEEL SPEED (FR)	Input

CN3

Pin No.	Signal name	Input/output signal
1	PWR_IN_BATT	Input
2	PWR_IN_BRY	Input
3	GND_ACT	Input
4	NC	Output
5	NC	Output
6	ABS CONTROL VALVE (FR)	Output
7	NC	Output
8	ABS CUT VALVE (F)	Output
9	NC	Input
10	NC	Input
11	PWR_IN_BATT	Input
12	PWR_IN_BRY	Input
13	GND_ACT	Input
14	PER_CTR_KEY	Input
15	NC	Output
16	ABS CONTROL VALVE (FL)	Output
17	NC	Output
18	ABS CUT VALVE (F)	Output
19	NC	Input
20	NC	Input

Pin No.	Signal name	Input/output signal
21	GND_PWR	Input
22	PWR_IN_BRY	Input
23	GND_ACT	Input
24	PWR_CTR_KEY	Input
25	NC	Output
26	ABS CONTROL VALVE (RR)	Output
27	NC	Output
28	NC	Output
29	NC	Input
30	NC	Input
31	GND_PWR	Input
32	GND_PWR	Input
33	GND_PWR	Input
34	NC	Output
35	NC	Output
36	ABS CONTROL VALVE (RL)	Output
37	NC	Output
38	NC	Output
39	NC	Input
40	NC	Input

Fuel level secsor



1. Connector
2. Float
3. Arm
4. Body
5. Spring
6. Contact
7. Spacer

Function

- The fuel sensor is installed to the side face of the fuel tank. The float moves up and down according to the fuel level. This movement of the float is transmitted by the arm and actuates a variable resistance. This sends a signal to the monitor panel to indicate the remaining fuel level. When the display of the monitor panel reaches a certain level, a warning lamp flashes.

Machine model								HD785-7	
Check item						Measurement conditions	Unit	Standard value for new machine	Permissible value
Engine speed	Automatic shift control	Power mode (When machine is loaded: *2)	Accelerator full	Shift up	F1 → F2	• Engine coolant temperature: Within operating range • Transmission oil temperature: 60 – 80 °C • Hydraulic oil temperature: 45 – 55 °C • ( ): At high acceleration	rpm	2,080 ± 50 (1,950 ± 50)	2,080 ± 50 (1,950 ± 50)
					F2 → F3 F3 → F4 F4 → F5 F5 → F6 F6 → F7			2,030 ± 50 (1,950 ± 50)	2,030 ± 50 (1,950 ± 50)
				Shift down	F7 → F6 F6 → F5 F5 → F4 F4 → F3 F3 → F2			1,350 ± 50	1,350 ± 50
			Accelerator partial	Shift up	F1 → F2			2,000 ± 50	2,000 ± 50
					F2 → F3			1,800 ± 50	1,800 ± 50
					F3 → F4 F4 → F5 F5 → F6 F6 → F7			1,725 ± 50	1,725 ± 50
				Shift down	F7 → F6 F6 → F5 F5 → F4 F4 → F3			1,200 ± 50	1,200 ± 50
					F3 → F2 F2 → F1			1,250 ± 50	1,330 ± 50
			Accelerator OFF (Coasting run)	Shift up	F1 → F2 F2 → F3 F3 → F4 F4 → F5 F5 → F6 F6 → F7			2,450 ± 50	2,450 ± 50
				Shift down	F7 → F6 F6 → F5 F5 → F4 F4 → F3			1,200 ± 50	1,200 ± 50
					F3 → F2 F2 → F1			1,250 ± 50	1,250 ± 50

*2: The dump truck is recognized loaded when the rear suspension gas pressure is 10.8 MPa {110 kg/cm^2} or higher.

Testing/Adjusting item	Sym-bol	Part No.	Part name	Q'ty	Remarks
Chassis related controller, sensor and harness	Q	799-601-9300	T-adapter Ass'y	1	
		799-601-9350	•For DRC adapter	1	For DRC-40
		799-601-9360	•For DRC adapter	1	For DRC-24
Testing coolant temperature and oil temperature	–	799-101-1502	Digital temperature gauge	1	-99. 9 – 1,299 °C
Testing operation force and pedal force	–	79A-264-0021	Push-pull scale	1	0 – 300 N {0 – 30 kg}
	–	79A-264-0091	Push-pull scale	1	0 – 500 N {0 – 50 kg}
Testing stroke and hydraulic drift	–	Commercially available	Scale	1	
Testing work equipment speed	–	Commercially available	Stopwatch	1	
Testing voltage and resistance	–	Commercially available	Circuit tester	1	

Testing leakage-from pressure limiter and return rate from injector

★ **Testing instruments**

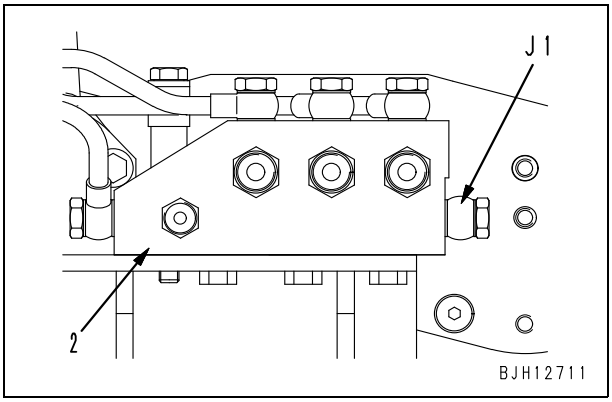
Symbol		Part No.	Part name
J	1	6151-51-8490	Spacer
	2	6141-71-1710	Joint
	3	Commercially available	Inside diameter of the hose: Approx. 11 mm
	4	Commercially available	Inside diameter of the hose: Approx. 17 mm
	5	Commercially available	Measuring cylinder
	6	Commercially available	Stopwatch
	7	07376-70315	Plug

★ If the engine is of a type that returns the fuel spilling from the injector from the return block installed to the front of intake manifold, check the engine according to the following.
★ The above figure and procedure are for the left bank.
★ Prepare an oil pan of about 20 ℓ to receive the fuel flowing out during the test.

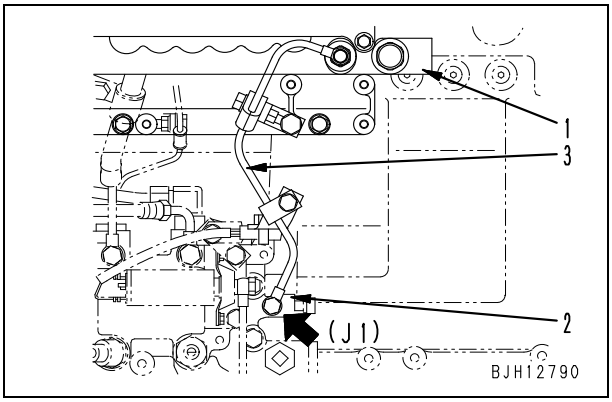
1. Preparation work

1) Remove tube (3) between common rail (1) and fuel block (2). (Standard spec.)

2) Insert spacer **J1** on fuel block (2) side and tighten the removed joint bolt again. (Standard spec.)



★ For the extra low-grade fuel specification, remove tube (3) between common rail (1) and fuel block (2) and install spacer J1 to the arrowed part. (For the procedure, see the standard specification.)

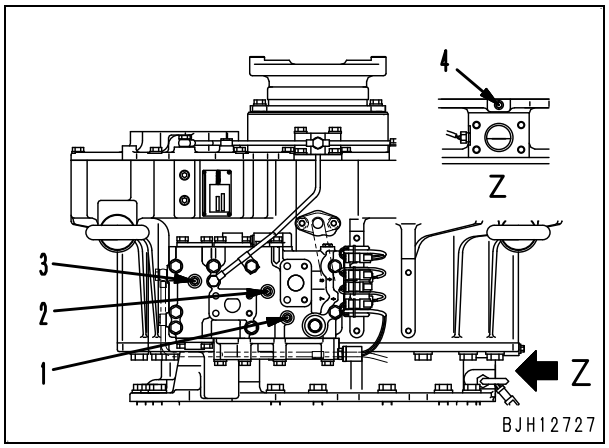


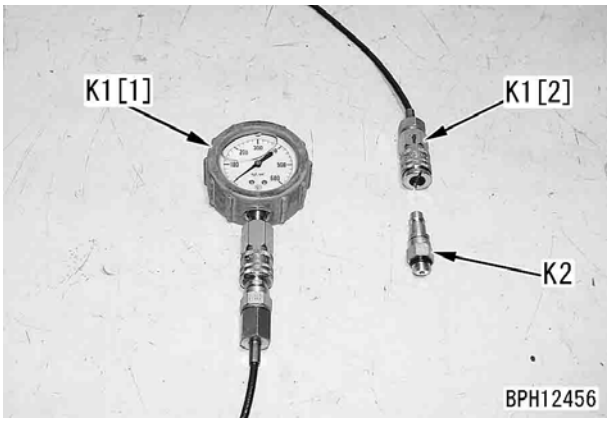
★ Connect the return pipe to the fuel tank again, too.
★ Be sure to provide a gasket to both ends of the spacer.

Items related to torque converter

3. Testing of torque converter inlet pressure

1) Raise the body and fix it with the lock pin.
2) Referring to "Testing of main relief pressure", check that there is no abnormality.
3) Remove plug (3), install nipple **K2** and connect oil pressure gauge [1] (2.5 MPa {25 kg/cm²}) of hydraulic tester **K1** by hose [2].

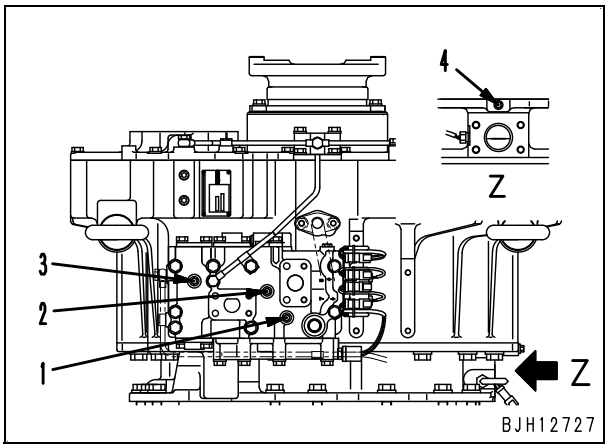


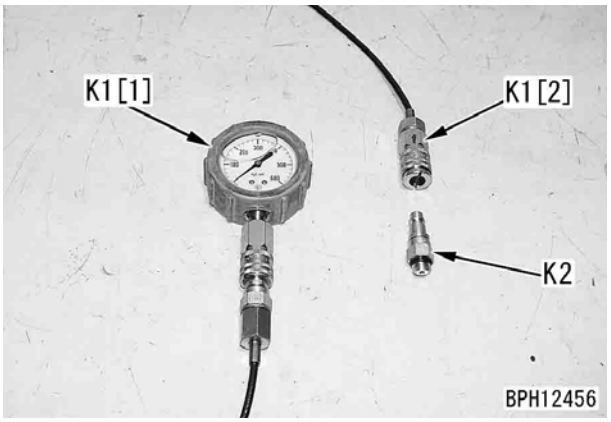


4) Start the engine and test the oil pressure at rated speed (1,900 rpm) and high idle.
   ★ If "TO 2350" is not selected in the high altitude setting selection of the optional setting, the high idle speed is decreased while the body is not seated. Accordingly, measure with the body seated after installing the hydraulic tester.
5) After finishing testing, remove the testing instruments and return the removed parts.

4. Testing of torque converter outlet pressure

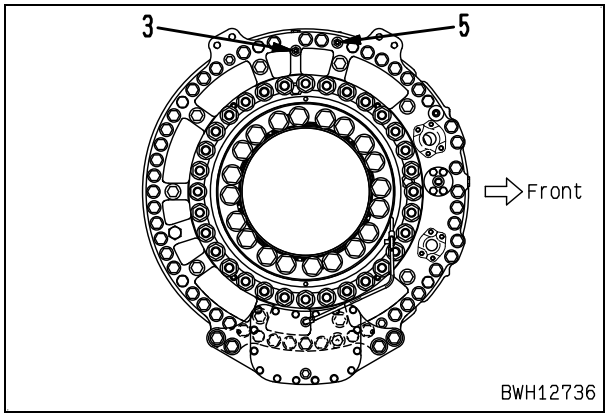
1) Raise the body and fix it with the lock pin.
2) Referring to "Testing of main relief pressure", check that there is no abnormality.
3) Remove plug (4), install nipple **K2** and connect oil pressure gauge [1] (2.5 MPa {25 kg/cm²}) of hydraulic tester **K1** by hose [2].





4) Start the engine and test the oil pressure at rated speed (1,900 rpm) and high idle.
   ★ If "TO 2350" is not selected in the high altitude setting selection of the optional setting, the high idle speed is decreased while the body is not seated. Accordingly, measure with the body seated after installing the hydraulic tester.
5) After finishing testing, remove the testing instruments and return the removed parts.

3) Bleed air through bleeder (5) for the parking brake on the wheel side according to step 1).



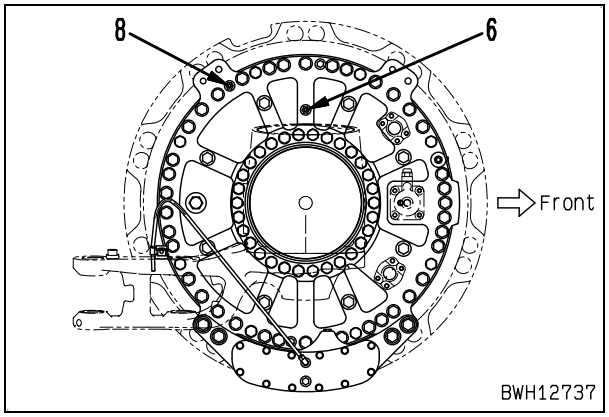
★ After finishing bleeding air, tighten (close) the bleeder and put the cap.

Bleeder:

7– 9 Nm {0.7– 0.9 kgm}

3. **Front brake**

1) Loosen air bleeder (6) by 3/4 turns and bleed air similarly to step 1) for the rear brake.

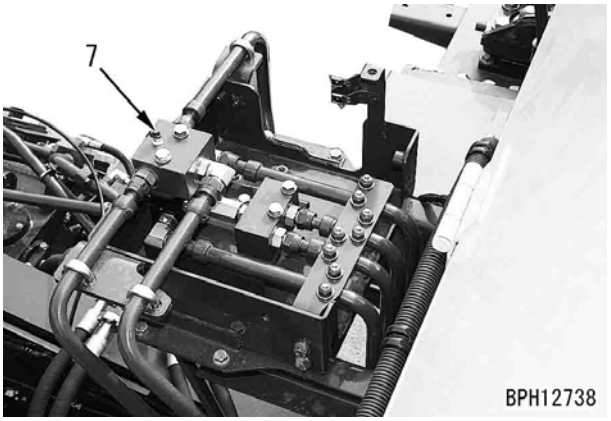


4. **Parking brake on front brake side**

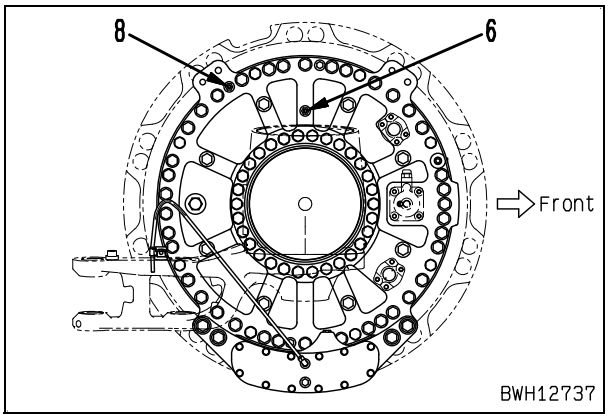
★ Bleed air from the cab rear block side first, then bleed air from the wheel brake side.

1) Using a vinyl tube for bleeding air, turn OFF the parking brake switch (release the parking brake) and loosen air bleeder screw (7) by 3/4 turns.

2) When bubbles do not come out of the bleeder (7) any more, tighten (close) the bleeder and turn PARKING the parking brake switch.



3) Bleed air through bleeder (8) for the parking brake on the wheel side according to step 1).



★ After finishing bleeding air, tighten (close) the bleeder and put the cap.

Bleeder:

7– 9 Nm {0.7– 0.9 kgm}

Air bleeding from steering cylinder

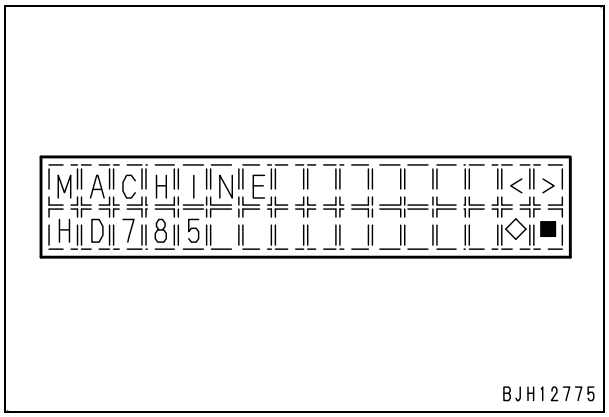
⚠ **Stop the machine on a flat place, turn the parking brake switch to the "PARKING" position and lock the tires with chocks.**

⚠ **Before operating the steering wheel, be sure to check that there is no one around the front tires.**

★ If the hydraulic cylinder was removed and installed or its hydraulic piping was removed, breed air from the hydraulic cylinder according to the following procedure.

1) Start engine, run engine at low idle for 5 minutes.
2) Turn the steering wheel at 30 rpm (2 seconds for one turn) to the left and right to a point approx. 50 mm from the end of the steering cylinder stroke.
   Repeat this action ten times.
   (This action is to prevent damage to the piston seal caused in the steering cylinder.)
3) Turn the steering wheel at a speed of about 30 rpm to the right and left steering cylinder stroke ends repeatedly.
4) Turn the steering wheel as quickly as possible to the left and right to the end of the steering cylinder stroke.
   When reaching the end of the stroke at the left and right, turn the steering wheel immediately in the opposite direction, and carry out this action continuously.
   Repeat this action ten times in both direction.

4. Storing data in controller
   1) After determining the model selection setting, check that the display automatically returned to the service menu screen and the selected model is surely displayed.



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   2) Turn the starting switch OFF and keep that condition for longer than 15 seconds.
      ★ Unless the starting switch is turned off for longer than 15 seconds, the new data is not memorized in the controller.
   3) Turn the starting switch ON again.
      ★ After this operation the model setting becomes effective.

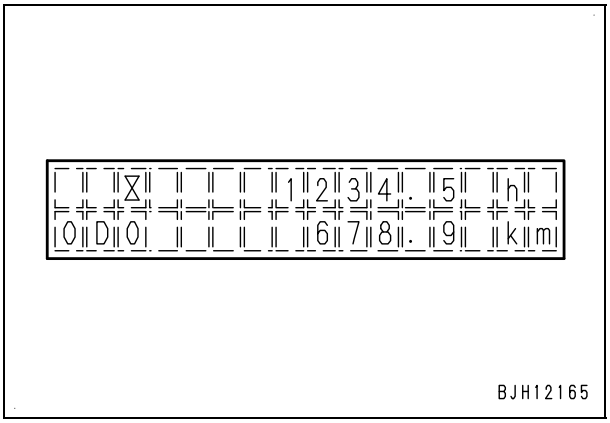
5. Carrying out option setting
   If once carrying out the model selection setting, all setting of option selection is reset, so continue to carry out the setting of option selection.
   ★ Refer to section "1-2. Setting of option selection".

■**Operator mode (Outline)**

[1] Service meter and integrated odometer display function

When turning the starting switch ON, the speed meter and integrated odometer are displayed in the upper and lower row respectively.

★ For details, see operation manual.

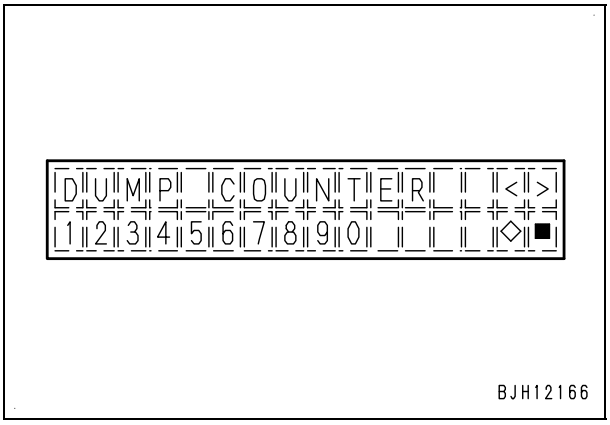


[2] Dump counter display function (When option is selected)

Display the dump counter by operating the machine monitor switch.

★ Dump counter is displayed only when the option selection is set to be effective in the service mode.

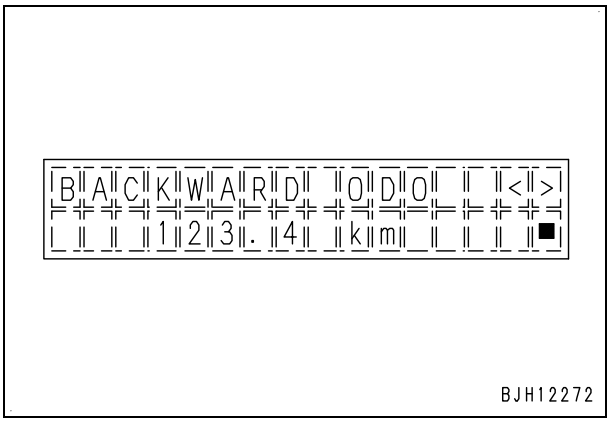
★ For details, see operation manual.



[3] Integrated reverse travel odometer display function

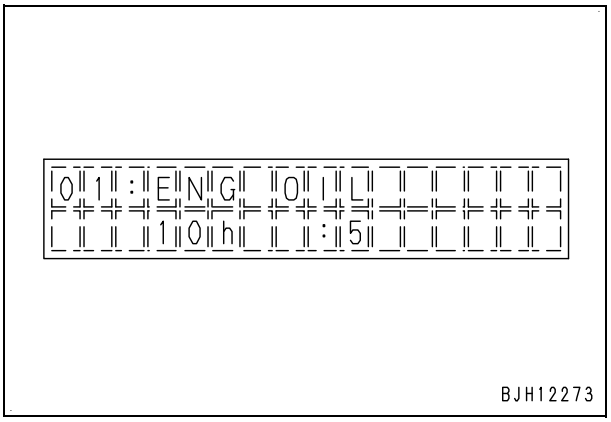
Machine monitor displays the integrated reverse travel odometer by operating the switch.

★ For details, see operation manual.



[4] Filter and oil replacement time display function

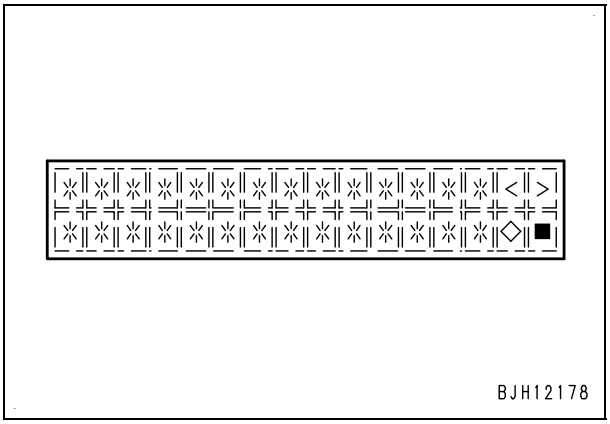
1. Replacement time display of filter and oil (displayed automatically)
   When the replacement interval for the various filters or oils approaches, the machine monitor automatically displays the information to remind an operator of maintenance.



★ Displayed service menu:

No.	Display	Function
1	ELECTRIC FAULT	Electrical system failure history display function
2	MACHINE FAULT	Mechanical system failure history display function
3	REAL-TIME MONITOR	Real-time monitoring function
4	CYLINDER CUT-OUT	Reduced cylinder mode function
5	NO INJECTION	No injection cranking function
6	TUNING	Adjusting function
7	MAINTENANCE MONITOR	Filter and oil replacement time setting function
8	OPERATION INFO	Operation information display function
9	FIX POWER MODE	Engine mode fixing function
10	SNAPSHOT	Manual snap shot function
11	PLM	PLM (Payload meter) setting function
12	OPTIONAL SELECT	Option selection function
13	MACHINE	Model selection function
14	INITIALIZE	Initialize function (exclusive function for factory)

★ The service menu is displayed in the places marked with [*].

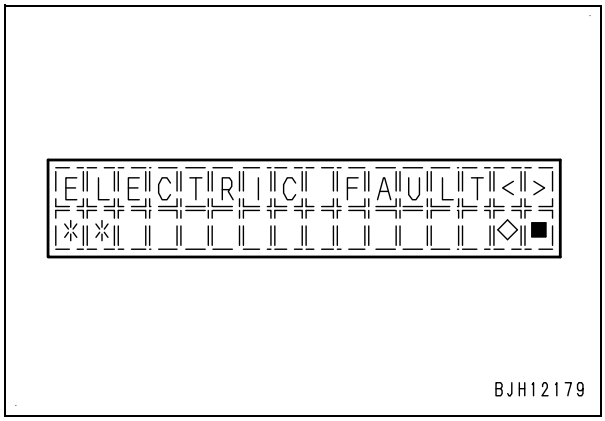


6. Finishing mode and function
   The current mode and function can be finished by either of the following method, regardless of the current function and hierarchy.
   - When continuing operations in another mode or function:
     Press the [■] switch and return to the mode screen to be used or menu screen to be used.
     ★ Note that if the [■] switch is pressed on the YES/NO screen, the function will be executed.
     ★ If you return to the operator mode screen by mistake, repeat the procedure from step 1 above (however there is no need to input the ID again)
   - When completing all operations:
     Turn the starting switch OFF.

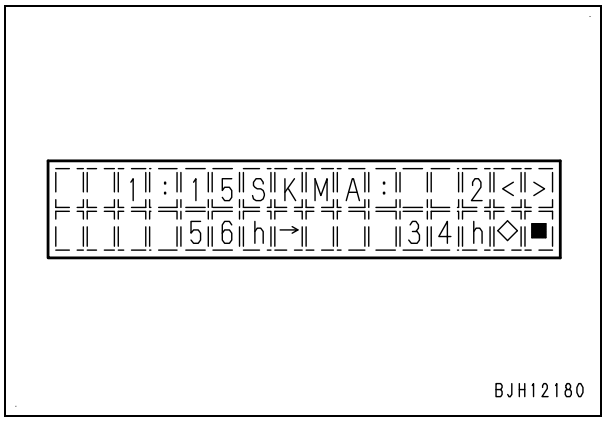
[11] Electrical system failure history display function (ELECTRIC FAULT)

The machine monitor retains the data for problems that occurred in the electrical system in the past as failure history. They can be displayed as follows.

1. Selection of the service menu
   Select electrical system failure history display function (ELECTRIC FAULT) in the service menu selection screen.
   ★ The total number of failure history data items recorded in memory is displayed in the [* *] portion.



2. Failure history data display
   With the service menu selected, press the [◇] switch and display the failure history data recorded in memory.
   - [◇]: Conduct the service menu.



Detailed information of 40932 (D-IN--0------7)
[0]: Exhaust brake switch
[1]: Service brake switch
[2]: Retarder switch (Front)
[3]: Retarder switch (Rear)
[4]: Validation switch 1
[5]: Validation switch 2
[6]: Memory clear switch
[7]: Brake oil filter

Detailed information of 40933 (D-IN--8-----15)
[8]: ASR pressure switch (Rear left)
[9]: ASR pressure switch (Rear right)
[10]: Shut-off valve switch
[11]: ASR check switch
[12]: Parking brake pressure switch
[13]: (Unused)
[14]: (Unused)
[15]: (Unused)

Detailed information of 40934 (D-IN--16----23)
[16]: Starting switch C terminal signal
[17]: (Unused)
[18]: (Unused)
[19]: Brake wear switch (Rear left)
[20]: Brake wear switch (Rear right)
[21]: Parking brake solenoid
[22]: (Unused)
[23]: (Unused)

Detailed information of 40935 (D-IN--24----31)
[24]: Steering wheel speed
[25]: (Unused)
[26]: Retarder cooling filter
[27]: Engine oil level switch
[28]: Engine oil filter
[29]: Steering hoist level switch
[30]: Steering hoist filter switch
[31]: Battery electrolyte level switch

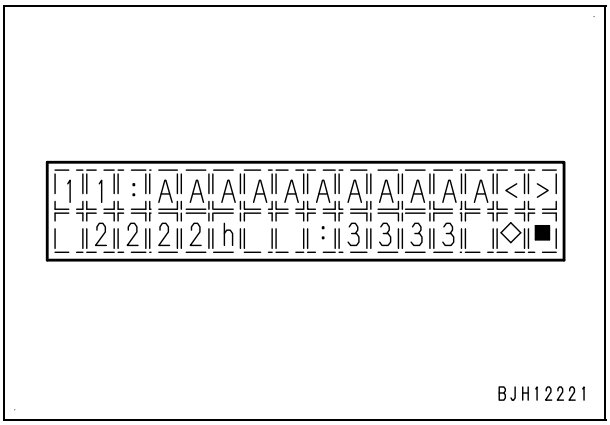
Detailed information of 40943 (D-IN--32----39)
[32]: Transmission/Brake oil level switch

Detailed information of 40955 (D-OUT--0------7)
[0]: Auto-suspension solenoid 1
[1]: Hoist selector valve
[2]: Lever kick-out solenoid
[3]: Auto-suspension solenoid 2
[4]: (Unused)
[5]: Exhaust brake solenoid
[6]: (Unused)
[7]: (Unused)

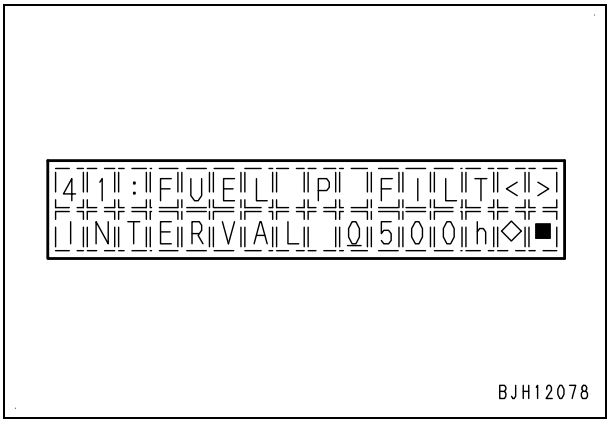
Detailed information of 40956 (D-OUT--8-----15)
[8]: (Unused)
[9]: (Unused)
[10]: (Unused)
[11]: ASR shut-off valve
[12]: (Unused)
[13]: (Unused)
[14]: (Unused)
[15]: Body "Float" signal

Detailed information of 40957 (D-OUT--16-----23)
[16]: Stop lamp relay
[17]: (Unused)
[18]: Sensor power supply (24 V)
[19]: BCV relay
[20]: (Unused)
[21]: (Unused)
[22]: (Unused)
[23]: (Unused)

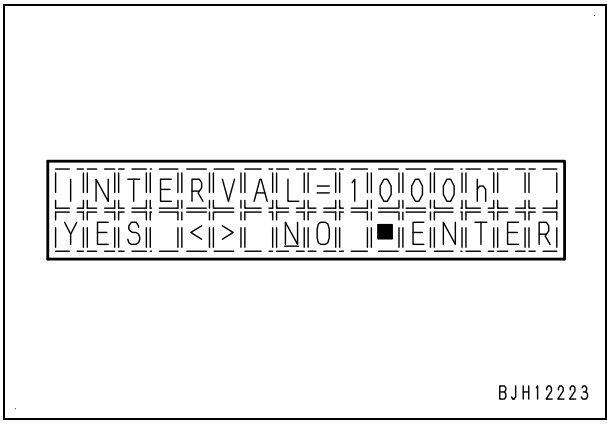
3. Display contents of the maintenance item (Items No.1 – 14)
   If the maintenance item for filter or oil is selected, the following contents are displayed.
   1: Code (2 digits)
   A: Filter and oil replacement time set items
   2: Remaining time to set replacement time
   3: Number of times of replacement up to present



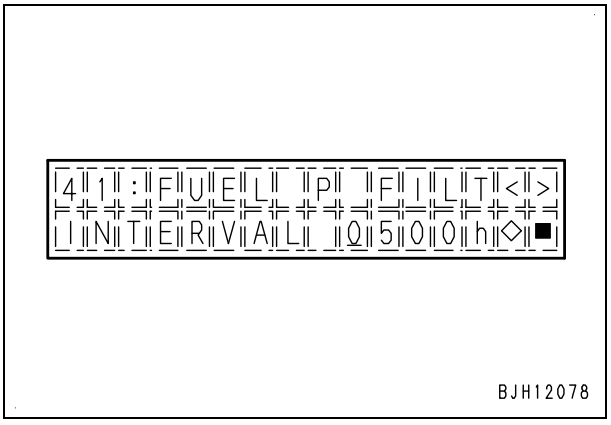
4. Changing the interval time by maintenance item (Items No.1 – 14)
   1) With the item selected on the maintenance item and the function selection screen to change the interval time (ex: P FUEL FILT), press the [◇] switch to display the interval change screen.
      - [◇]: Implement the function to change maintenance item.
      - ★ The currently set interval is displayed on the screen.
      - ★ With this screen displayed, if the [>] switch or the [<] switch is operated, the screen switches to the setting screen for activating or deactivating the maintenance item.
   2) On the interval change screen, operate each of the switches [>], [<], [◇] and [■] to input the interval time.
      - [>]: Number at the cursor increases.
      - [<]: Number at the cursor decreases.
      - [◇]: Number at the cursor is determined.
      - [■]: To return to the service menu selection screen.
      - ★ The time must always be input with 4 digits. For the time with less than 4 digits, input 0s in place of the vacant number.



   3) When the interval time is completely determined, the screen to confirm the changes is displayed. Then, operate each of the switches [<], [>] and [■].
      - [<]: Select YES (move cursor)
      - [>]: Select NO (move cursor)
      - [■]: Execute YES or NO

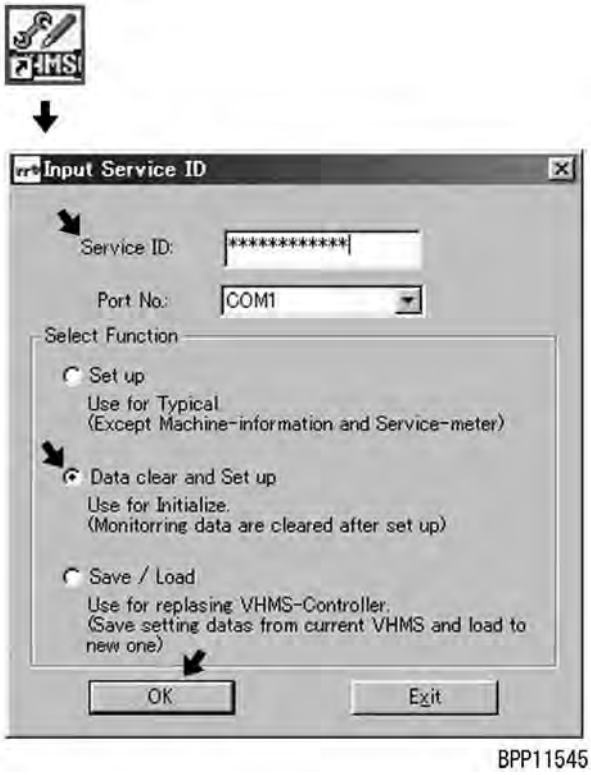


5. Set the function activation or deactivation by maintenance item (items No.1 – 14).
   1) With the item selected on the maintenance item and function selection screen (ex: FUEL P FILT) to change the activation or deactivation of the function, press the [◇]switch to display the interval input screen.
      - [◇]: Implement the function to change maintenance item.



4. **Starting the VHMS initial setting tool**
   ★ This work is done inside the cab (from PC).
   1) Turn on the PC power and start the OS.
   2) Operating [VHMS initial setting tool] icon on the PC, start up the VHMS initial setting tool.

      Important
      ★ Appearance of the setup screen of the VHMS setting tool depends its tool.
      ★ When using Ver.3.5.2.1 or older version (CD-ROM), the setting procedure shall conform to that described in Section 5.
      ★ When using an update version (Ver.3.5.2.1 or after), the procedure in Section 6 shall be used.
      ★ It is recommended to download the latest VHMS version from WebCARE to update the currently used version.
      (Related material: SERVICE MATE SMP-623)
   3) Enter the 10-digit service ID to [Service ID].
      ★ Service ID: **7826138000**
   4) Select [Data clear and Set up] from [Select Function] item.
   5) Click [OK] button to proceed to the setup screen.



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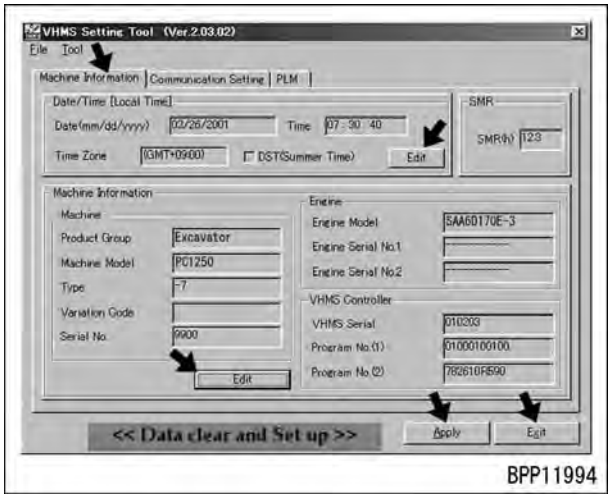
5. **Initial setting of VHMS controller (Ver. 3. 5. 2. 1 or older version)**
   ★ This work is done inside the cab (from PC).
   ★ It is prohibited in the initial setting to modify the data of service meter [SMR].

   [Machine Information]
   1) Open [Machine Information] tab.
      ★ [Data clear and Set up] menu displays [Machine Information] tab first.
   2) Check every data for correctness.
      ★ The figure shows the display of another model as an example.



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   ★ Select a [Variation Code] from the following table.
   3) When [Date/Time] information is not appropriate, correct it in the following manner.
      1] Press [Edit] button in the lower right side of [Date/Time] box to display the correction screen.
      2] After correcting it to the correct information, press [OK] button.

BPP11547

2. Application for starting to use

1) Notify the KOMTRAX operations administrator of the following information of the machine which has completed the sign-up test.

1. Information of machine which has completed sign-up test (Model,Model No., Serial No.)

2. Part No. and serial No. of ORBCOMM terminal

3. Reading of service meter when sign-up test was completed (0.1h unit)

2) Fill in the"VHMS/WebCARE setting notification form" and enter "Use" in the column of "Use of KOMTRAX Service".

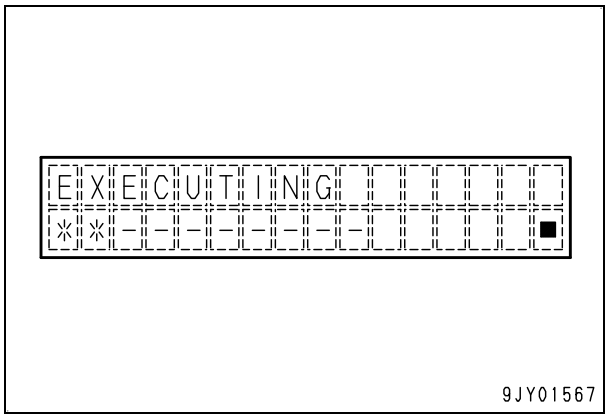
3) Send the "VHMS/WebCARE setting notification form" to VHMS/WebCARE SUPPORT CENTER in KOMATSU HEAD OFFICE.

4) The KOMTRAX operations administrator registers the machine using the KOMTRAX client personal computer.

★ For the procedure, see the following.

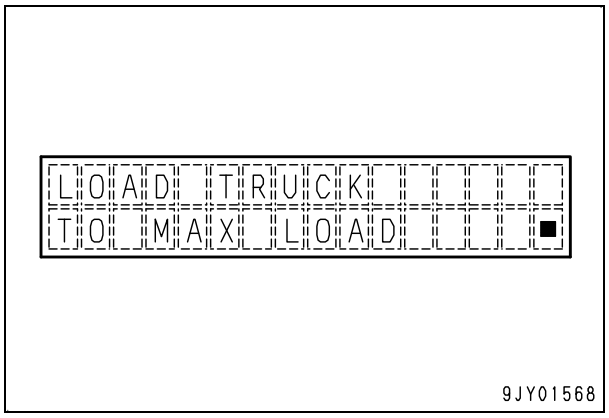
[Global KOMTRAX Web Reference Manual (For Key Person)]

6] Display the progress of measurement.



- [■]button: Stop measurement and return to the previous screen As measurement is executed, the number of "*" increases. When measurement is finished, the next screen appears automatically.

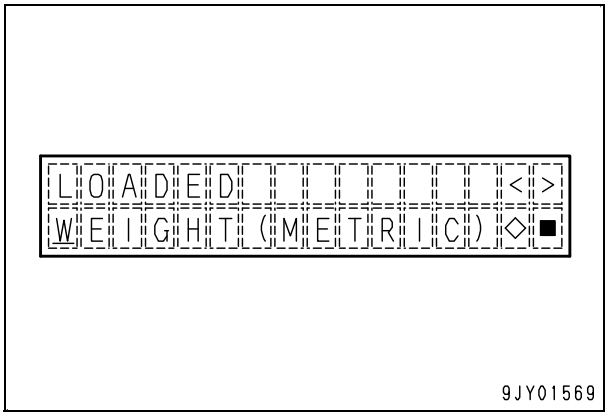
3) Load the machine to measure its fully loaded weight.



- [■ button: Return to the menu screen
  When loading is started, the menu screen appears automatically. When indicating the current load for reference while the machine is being loaded, go out of "Service mode 1" temporarily and return to "Display of load weight/integrated odometer". On this screen, you can check the current load.

4) Measure the weight of the fully loaded machine with the load meter and record it (Write it on a sheet of paper, etc.)

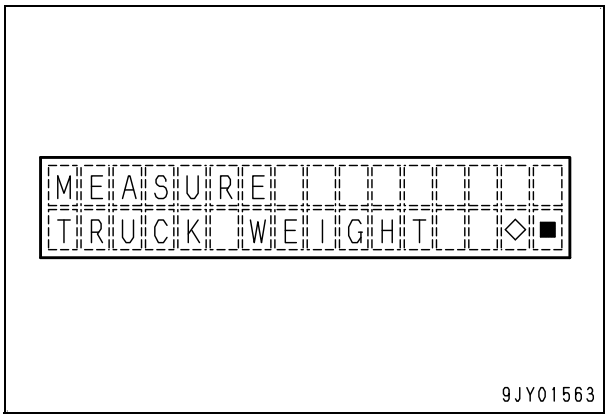
5) Input the measured weight of the fully loaded machine and drive the machine for about 3 minutes.
   1] Select "LOADED WEIGHT".
   For the method of displaying the following screen, see the steps up to the above step.



- [>], [<] buttons: Select "EMPTY WEIGHT" or "LOADED WEIGHT"
- [◇] button: Enter the selection
- [■] button: Return to the previous screen

If the weight of the empty machine has been input and the machine has been driven for about 3 minutes, "LOADED WEIGHT" is displayed when the menu is selected.Check the unit of the input value. The unit is indicated in the ( ) on the right side of WEIGHT.
(METRIC): metric ton
(SHORT): short ton

2] Check that measurement of the weight of the fully loaded machine has been completed.



- [◇] button: Check that measurement has been completed and go to the next step
- [■] button: Return to the previous screen

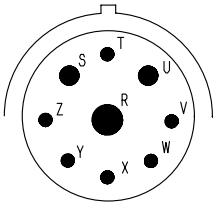
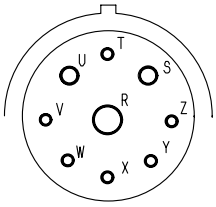
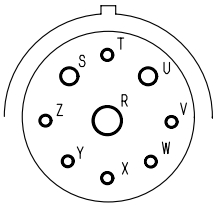
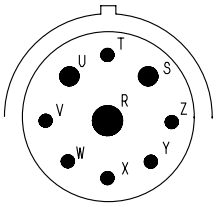
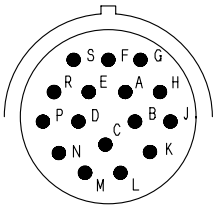
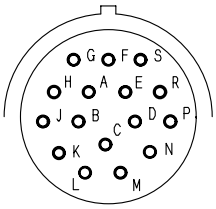
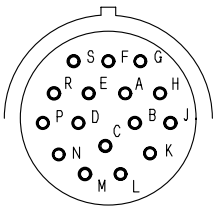
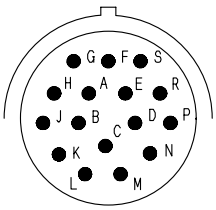
Failure codes	Failure contents	Applicable equipment	Action code	History classification	Reference manual
DLF8LC	Trouble in wheel speed sensor system (rear right)	BK	E01	Electrical system	Troubleshooting by failure code, Part 8 SEN01945-03
DLF8MA	Disconnection in wheel speed sensor (rear right)	ABS	E03	Electrical system	
DLF9KA	Disconnection in wheel speed sensor (rear left)	BK	E01	Electrical system	
DLF9L3	Trouble in wheel speed sensor (rear left)	ABS	E03	Electrical system	
DLF9LC	Trouble in wheel speed sensor system (rear left)	BK	E01	Electrical system	
DLF9MA	Disconnection in wheel speed sensor (rear left)	ABS	E03	Electrical system	
DLT3KA	Disconnection in transmission output shaft speed sensor system	TM	E03	Electrical system	
DLT3LC	Trouble in transmission output shaft sensor	BK	E01	Electrical system	
DLT4KA	Disconnection in transmission output shaft speed sensor	BK	E01	Electrical system	
DLT4MA	Disconnection in transmission output shaft speed sensor	BK	E03	Electrical system	
DUM7KY	Pre-lubrication operation lamp output abnormality: Hot short circuit	PLC	E01	Electrical system	
DUM7KZ	Pre-lubrication operation lamp output abnormality: Disconnection or grounding fault	PLC	E01	Electrical system	
DUM9KZ	Failure of power ladder indicator system	ABS	E01	Electrical system	
DV00KB	Short circuit in buzzer output	MON	E01	Electrical system	
DW2AKA	Disconnection in main pressure variable valve output	TM	E01	Electrical system	
DW2AKB	Ground fault in main pressure variable valve output circuit	TM	E01	Electrical system	
DW2AKY	Hot short in main pressure variable valve output circuit	TM	E01	Electrical system	
DW2AL1	Defective reset of main pressure variable valve	TM	E01	Electrical system	
DW2ALH	Malfunction of main pressure variable valve	TM	E01	Electrical system	
DW2BKA	Main oil level selector valve output disconnection	TM	E01	Electrical system	
DW2BKB	Main oil level selector valve output circuit GND short circuit	TM	E01	Electrical system	
DW2BKY	Main oil level selector valve output circuit GND hot short	TM	E01	Electrical system	
DW2BL1	Main oil level selector valve reset trouble	TM	E01	Electrical system	
DW2BLH	Main oil level selector valve malfunction	TM	E01	Electrical system	
DW2CKA	Transmission lubrication variable valve output disconnection	TM	E01	Electrical system	
DW2CKB	Transmission lubrication variable valve output circuit GND short circuit	TM	E01	Electrical system	
DW2CKY	Transmission lubrication variable valve output circuit hot short	TM	E01	Electrical system	

Circuit diagram related

This drawing is a part of the electric circuit diagram related to trouble-shooting.

- Connector No.: Indicates (Model - Number of pins) and (Color).
- “Connector No. and pin No.“ from each branching/merging point: Shows the ends of branch or source of merging within the parts of the same wiring harness.
- Arrow (⟷): Roughly shows the location on the machine.

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

Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	Testing connection use special tool Part No.
24-9 (5)	Pin (male terminal)	Socket (female terminal)	799-601-9250 (T-adapter)
	 BWP05017	 BWP05018	
	Part No. :08191-51201, 08191-51202	Part No. :08191-54101, 08191-54102	
	Socket (female terminal)	Pin (male termial)	799-601-9250 (T-adapter)
	 BWP05019	 BWP05020	
	Part No. :08191-52201, 08191-52202	Part No. :08191-53101, 08191-53102	
24-16 (6)	Pin (male terminal)	Socket (female terminal)	799-601-9260 (T-adapter)
	 BWP05021	 BWP05022	
	Part No. :08191-61201, 08191-62202, 08191-61205, 08191-62206	Part No. :08191-64101, 08191-64102, 08191-64105, 08191-64106	
	Socket (female terminal)	Pin (male termial)	799-601-9260 (T-adapter)
	 BWP05023	 BWP05024	
	Part No. :08191-62201, 08191-62202, 08191-62205, 08191-62206	Part No. :08191-63101, 08191-63102, 08191-63105, 08191-63106	

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DT series connector for engine

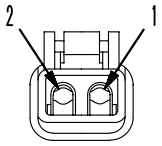
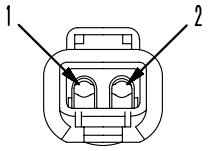
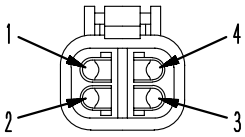
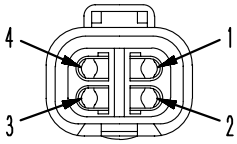
No. of pins	WIF (water in fuel) sensor (107, 114 engine)		
	Body (plug)	Body (receptacle)	Testing connection use special tool Part No.
2	 BWP05037	 BWP05038	799-601-9020 (T-adapter) (kit:799-601-4101) (kit:799-601-4201)
	Part No. :08192-12200 (normal type) 08192-22200 (fine wire type)	Part No. :08192-12100 (normal type) 08192-22100 (fine wire type)	
No. of pins	EGR (by pass) valve stroke sensor (125, 140, 170 engine)		
	Body (plug)	Body (receptacle)	
4	 BWP05041	 BWP05042	799-601-9040 (T-adapter) (kit:799-601-4101) (kit:799-601-4201)
	Part No. :08192-14200 (normal type) 08192-24200 (fine wire type)	Part No. :08192-14100 (normal type) 08192-24100 (fine wire type)	

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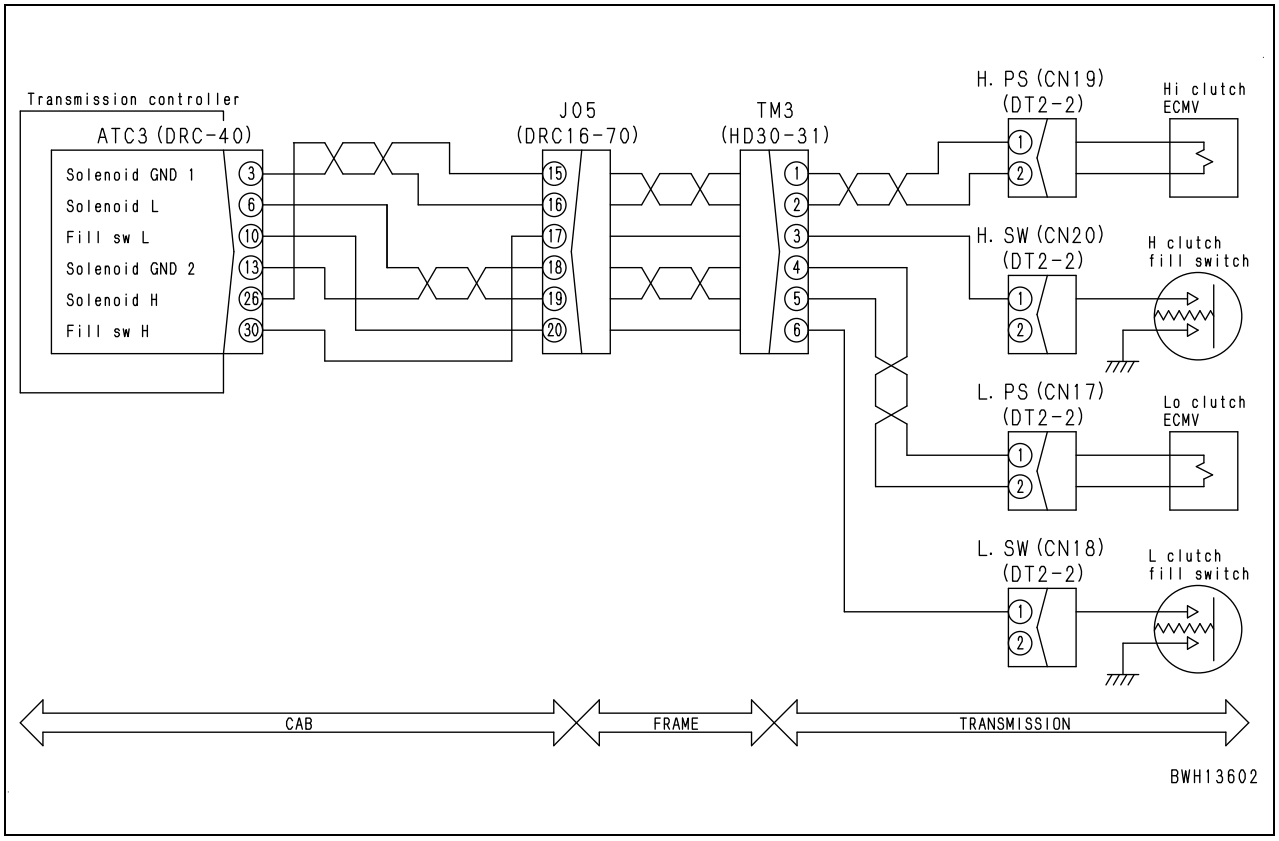
Table 1

Speed when trouble was detected		Failed clutch	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	4th	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
F6	4th Low	4th	OFF	NEUTRAL	OFF
		Low	4H	F7	OFF
F5	3rd High	3rd	4L	F6	OFF
		High	4L	F6	OFF
F4	3rd Low	3rd	4L	F6	OFF
		Low	3H	F5	OFF
F3	2nd High	2nd	3L	F4	OFF
		High	3L	F4	OFF
F2	2nd Low	2nd	3L	F4	OFF
		Low	2H	F3	OFF
F1	1st Low	1st	2L	F2	OFF
		Low	2H	F3	OFF
RH	Reverse High	Reverse	OFF	NEUTRAL	OFF
		High	OFF	NEUTRAL	OFF
RL	Reverse Low	Reverse	OFF	NEUTRAL	OFF
		Low	RH	RH	OFF

Circuit diagram related

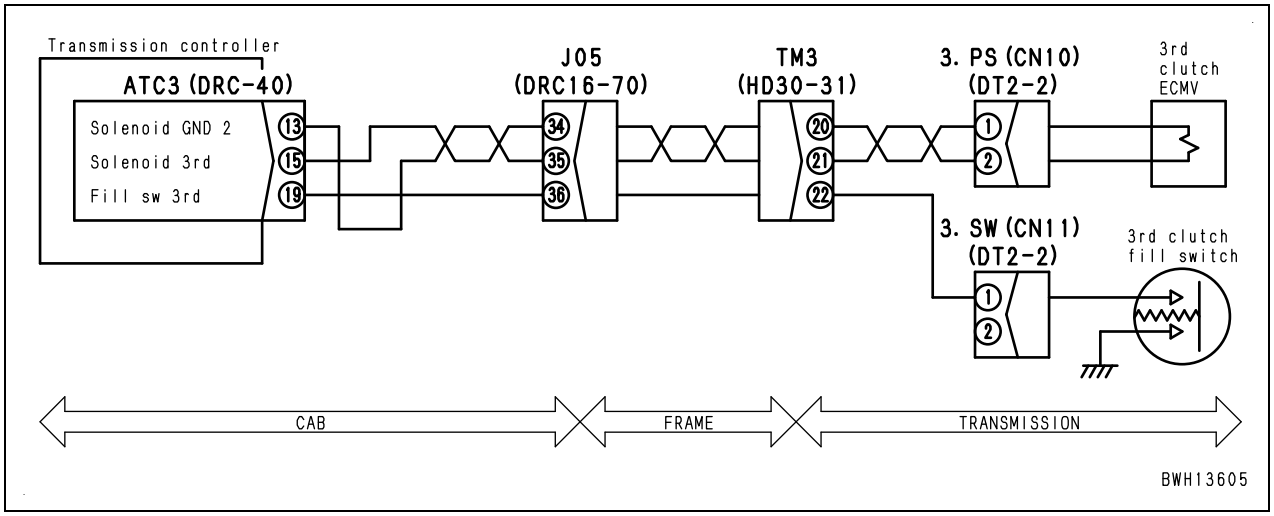


Failure code [15SCMA] Hi clutch solenoid: Malfunction

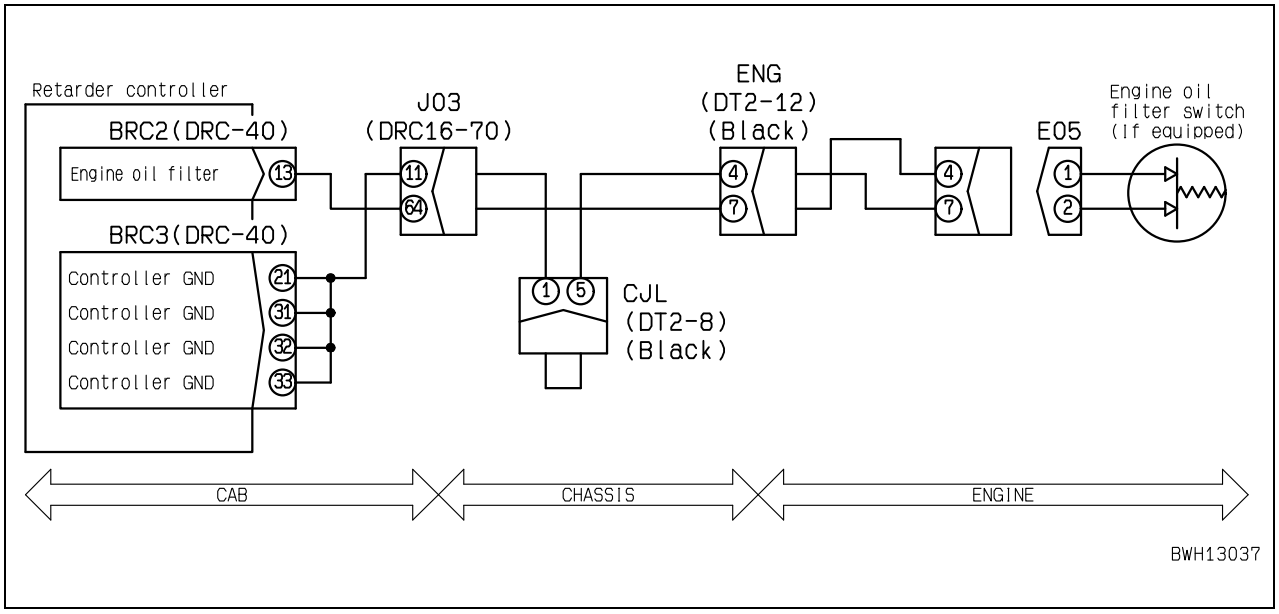
Action code	Failure code		
E03	**15SCMA**	Trouble	Hi clutch solenoid: Malfunction (Hi command holding pressure, Hi clutch fill switch OFF, slipping detected) (Transmission controller system)
Contents of trouble	• The signal from the fill switch stays "OFF" during an output to the Hi clutch ECMV solenoid and an abnormality exists in the value calculated from the signals of transmission input shaft speed sensor, transmission intermediate shaft speed sensor and transmission output shaft speed sensor.		
Action of controller	• Shifts up and holds the gear speed depending on the gear speed before failure as mentioned in **Table 1**. (See failure code [**15H0MW**].) • Turns lock up to OFF.		
Problem that appears on machine	• Machine travels at gear speeds which do not use Hi clutch.		
Related information	• Electric output current to ECMV solenoid can be checked by monitoring function (code: **31600 (mA)**) • At first, check mechanical system for failure such as defective Hi clutch, clogged oil filter of hydraulic pressure control valve, etc. ⚠ **Raise the body at the highest position, and set damp lever to "Hold", and install body lock pin to right and left.**		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Troubleshooting by failure code [**15H0MW**].	

Circuit diagram related



Circuit diagram related

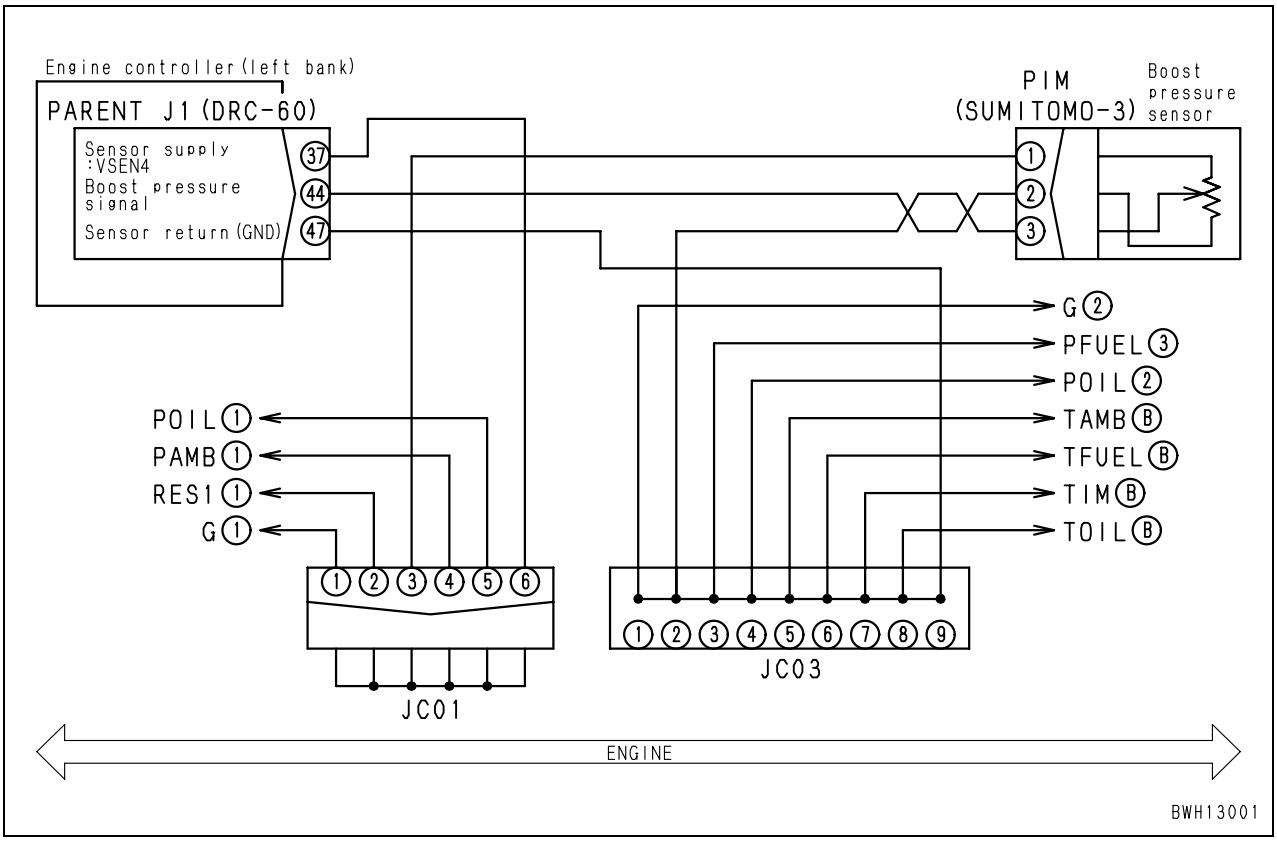


Failure code [B@C6NS] Brake cooling oil: Overheating (Front)

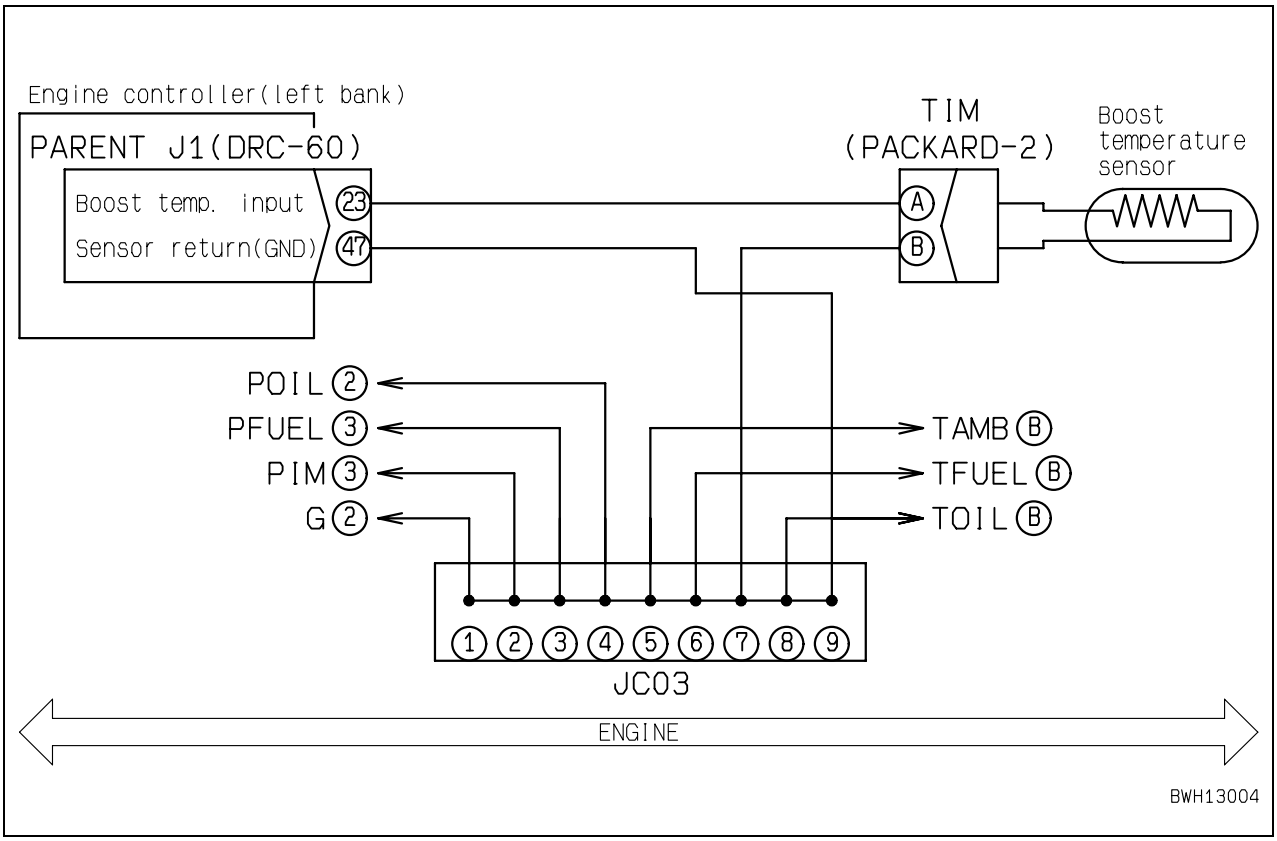
Action code	Failure code	Trouble	Brake cooling oil: Overheating (Front) (Machine monitor system)
E02	**B@C6NS**		
Contents of trouble	• While engine was running, oil overheat was detected by signal from front brake (retarder) oil temperature sensor.		
Action of machine monitor	• Turn on brake oil temperature caution lamp.		
Problem that appears on machine	• Brake (Retarder) (front) comes not to work. • If machine is used as it is, brake (retarder) (front) may be damaged.		
Related information	• Input signal from oil temperature sensor can be checked with monitoring function (Code: **30201 (?)**, **30204 (V)**). • For troubleshooting for brake (retarder) (front) oil temperature sensor, see failure code [**DGR4KZ**].		

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Overheat of front brake cooling oil	Front brake may be overloaded. Check related parts.
	2	Defective brake oil temperature sensor	Carry out troubleshooting for [**DGR4KB**] and [**DGR4KZ**].
	3	Defective retarder controller	If causes 1 and 2 are not detected, retarder controller may be defective.
	4	Defective machine monitor	If causes 1 – 3 are not detected, machine monitor may be defective.

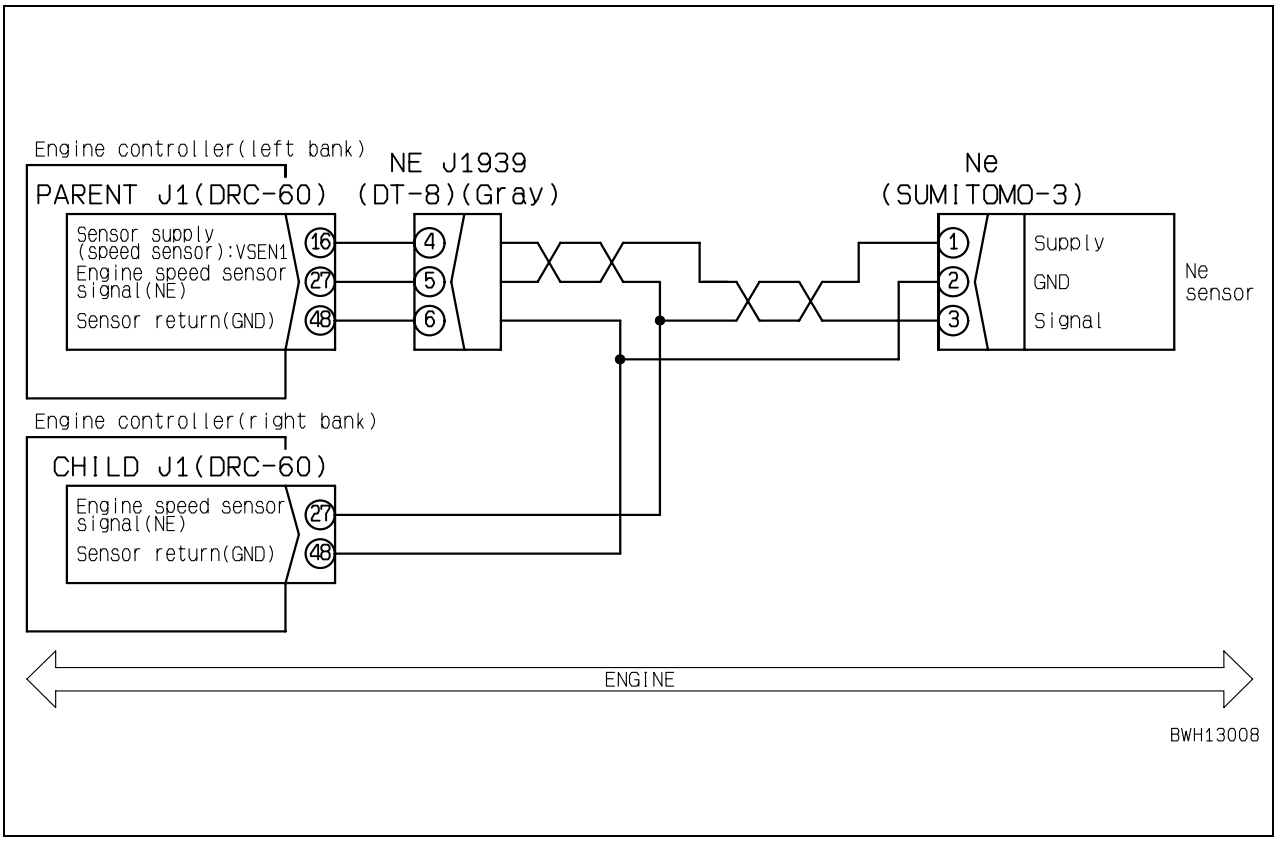
Circuit diagram related



Circuit diagram related



Circuit diagram related



DUMP TRUCK

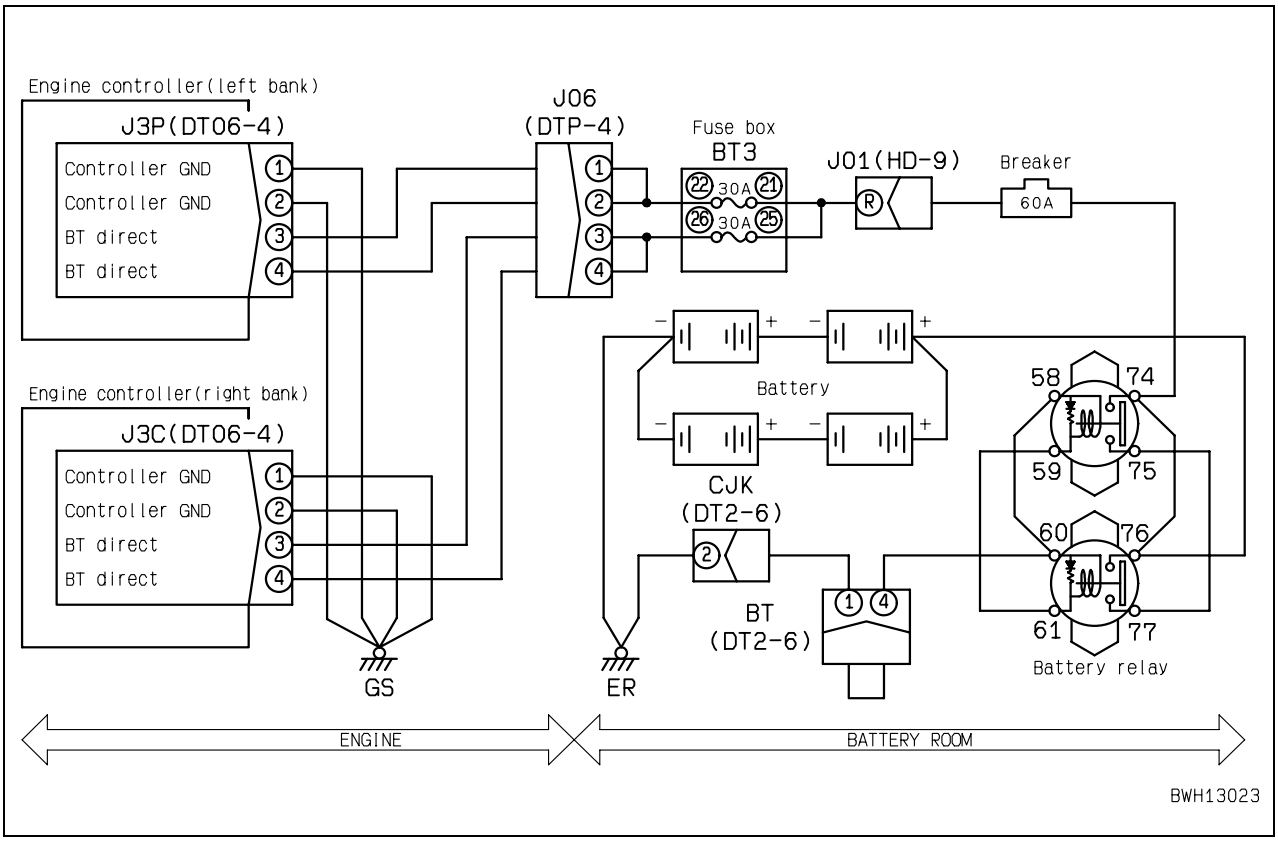
HD785-7

Machine model	Serial number
HD785-7	7001 and up

40 Troubleshooting

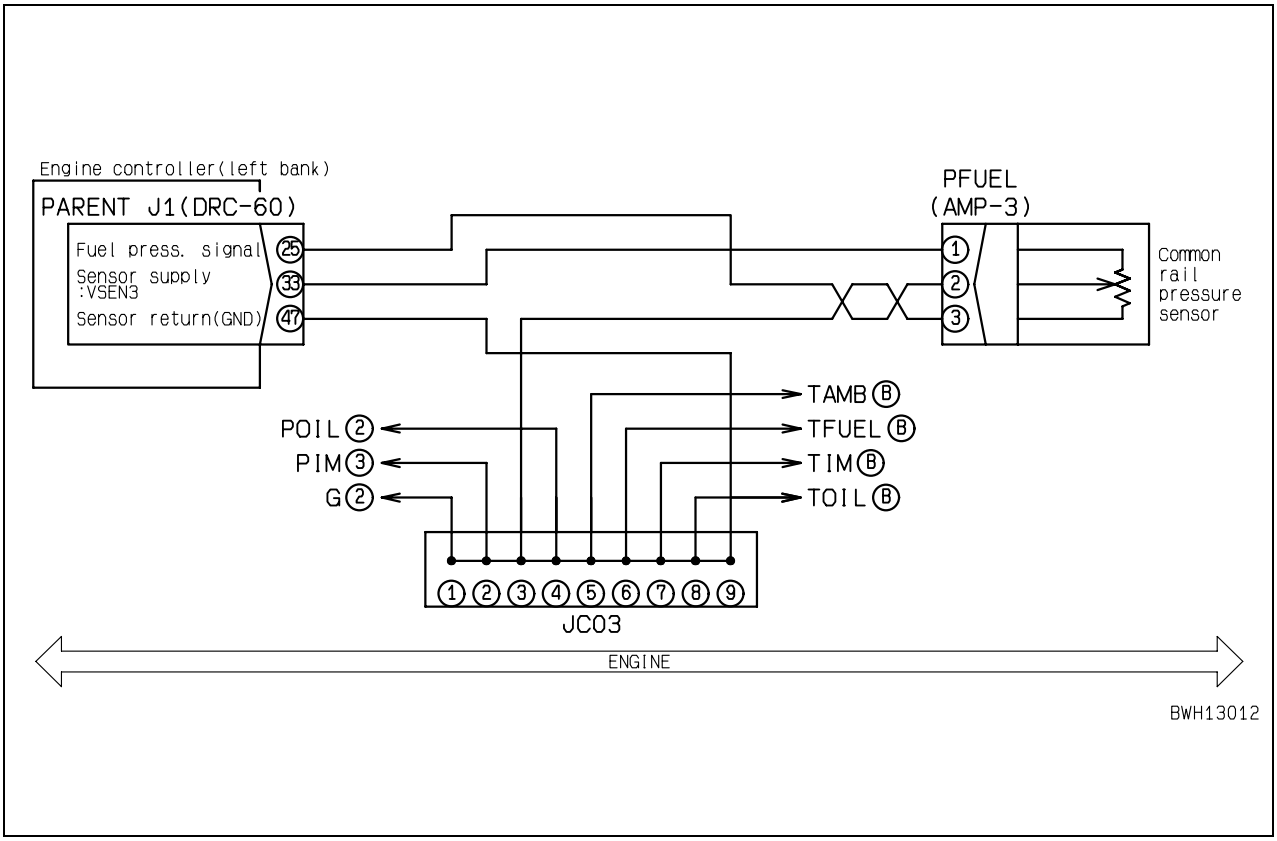
Troubleshooting by failure code, Part 4

Circuit diagram related

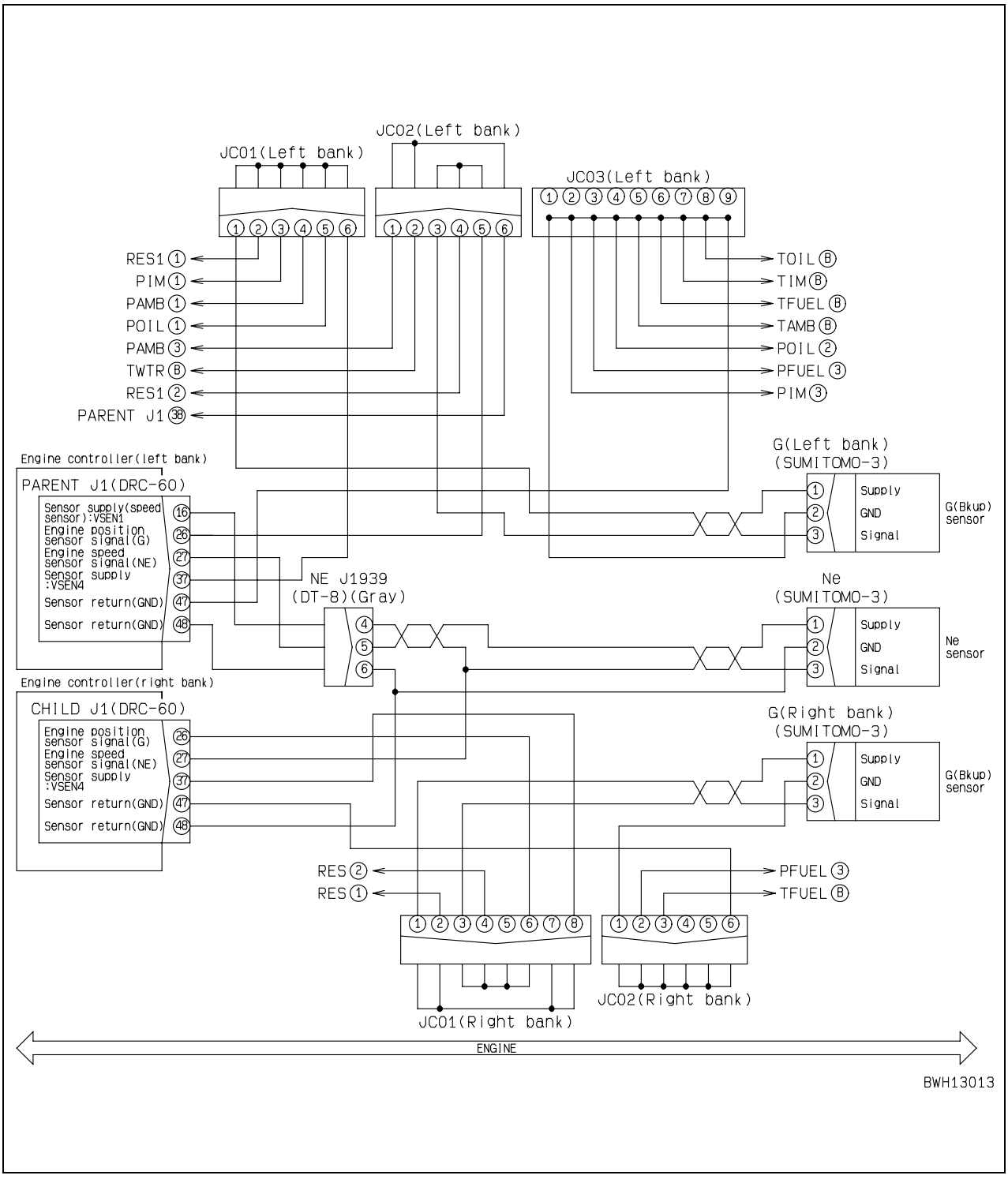


Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	6	Defective engine controller	★ Prepare with starting switch OFF, and diagnose with starting switch ON or with engine started.	
			PARENT J1	Voltage
			Between (33) – (47)	4.75 – 5.25 V
			Between (25) – (47)	0.25 – 4.6 V

Circuit diagram related



Circuit diagram related



Failure code [CA2249] Loss of pressure feed from supply pump (2) (Left bank): Loss of pressure feed detected

Action code	Failure code	Trouble	Loss of pressure feed from supply pump (2) (Left bank): Loss of pressure feed detected (Engine controller system)
E03	**CA2249**		
Contents of trouble	• Loss of pressure feed (level 2) occurred in the common rail circuit.		
Action of controller	• Operates with limited output. • Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Engine is hard to start. • Exhaust gas color becomes black. • Output decreases.		
Related information	• Input state from common rail pressure sensor can be checked with monitoring function. (Code: **36400** Common rail pressure (Left bank), Code: **36402** Common rail pressure sensor voltage (Left bank))		

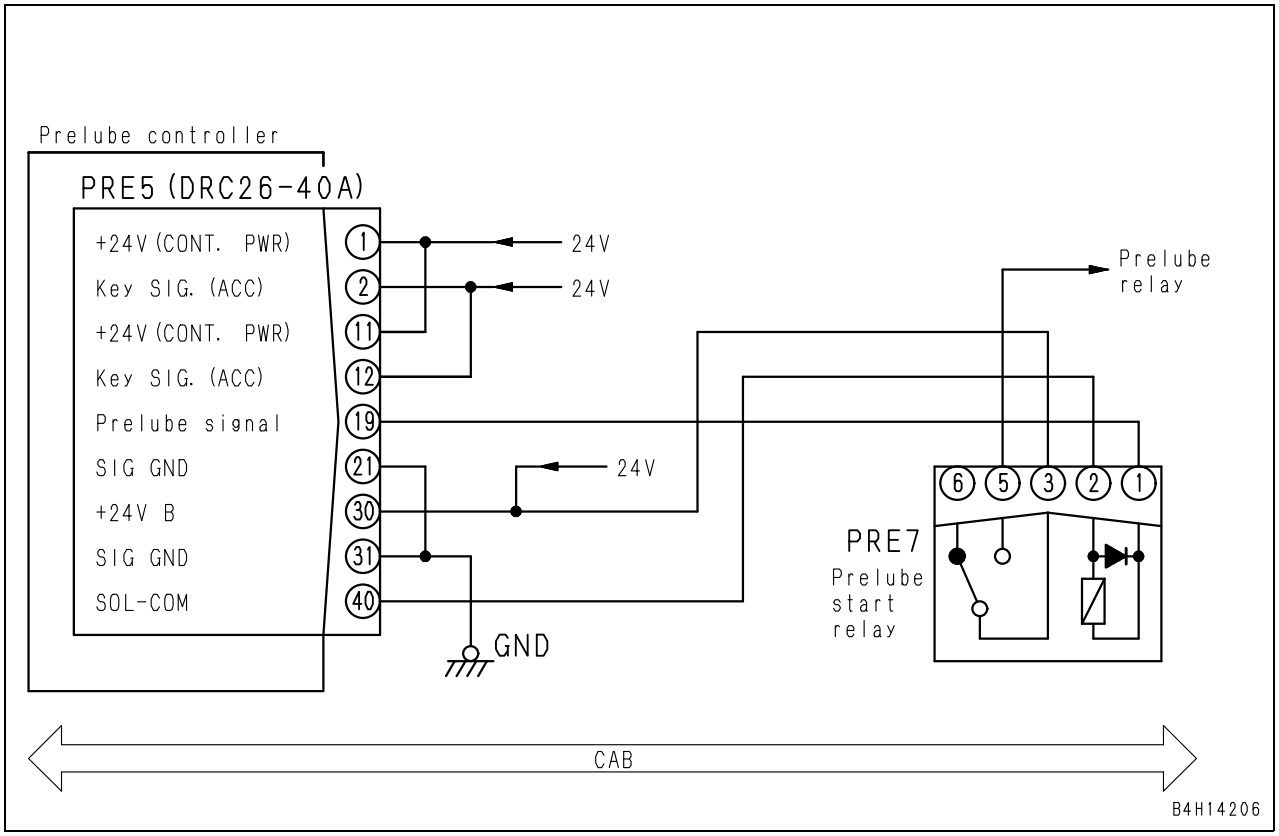
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Carry out troubleshooting of [**CA559**].	

Failure code [CB2249] Loss of pressure feed from supply pump (2) (Right bank): Loss of pressure feed detected

Action code	Failure code	Trouble	Loss of pressure feed from supply pump (2) (Right bank): Loss of pressure feed detected (Engine controller system)
E03	**CB2249**		
Contents of trouble	• Loss of pressure feed (level 2) occurred in the common rail circuit.		
Action of controller	• Operates with limited output. • Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Engine is hard to start. • Exhaust gas color becomes black. • Output decreases.		
Related information	• Input state from common rail pressure sensor can be checked with monitoring function. (Code: **36403** Common rail pressure (Right bank), Code **36404** Common rail pressure sensor voltage (Right bank))		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Carry out troubleshooting of [**CB559**].	

Related electrical circuit diagram



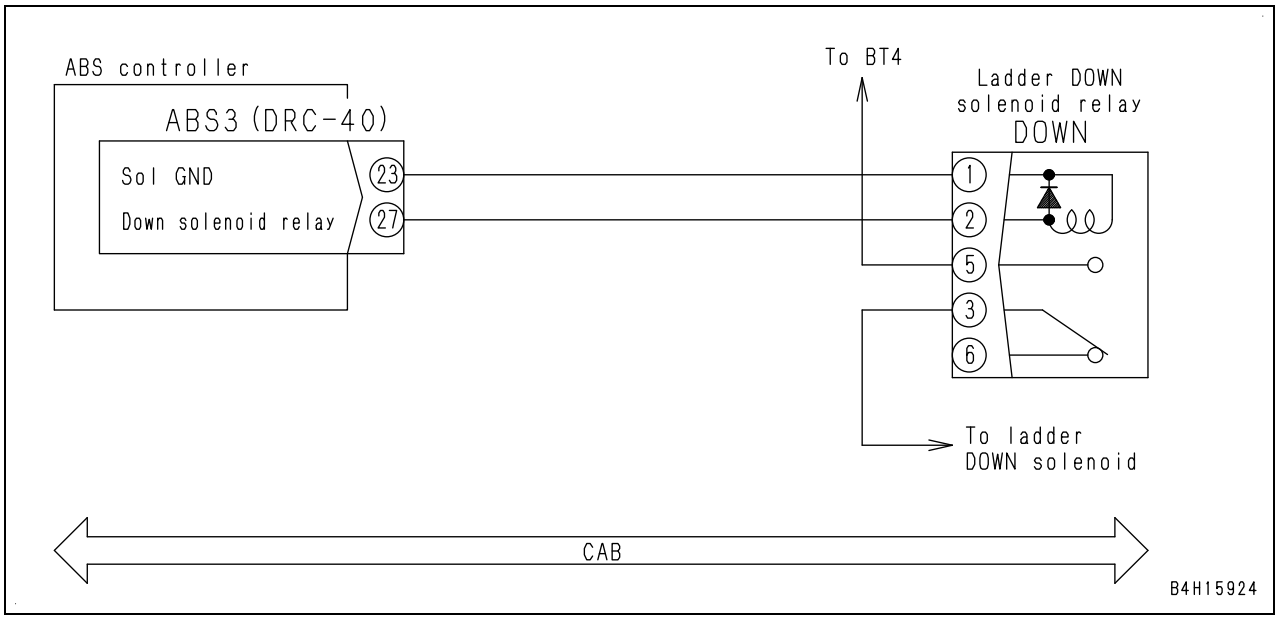
★ Prelube controller is the same as pre-lubrication controller.

Failure code [D1ESKY] Hot Short in Power Ladder Lower Solenoid Relay Output Circuit

Action code	Failure code	Failure	Hot short circuit in power ladder LOWER solenoid relay output circuit (ABS controller system)
E01	**D1ESKY**		
Detail of failure	● When output to power ladder LOWER output circuit is turned OFF, some current flows.		
Action of controller	● Stops output to power ladder and parking brake interlock.		
Problem on machine	● Power ladder continues lowering.		
Related information	● Can be checked with monitoring function (code: 40958) (0: Ladder LOWER output OFF, 1: ON).		

No.	Cause	Procedure, measuring location, criteria and remarks		
1	Defective relay (DOWN)	1. Turn starting switch to OFF position. 2. Disconnect connector DOWN and connect T-adapter to male side.		
		Resistance	Between connector DOWN (male) (1) and (2)	230 ± 30 Ω
2	Hot short circuit in wiring harness (contact with power supply circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors ABS3 and DOWN, and connect T-adapter to female side of ABS3. 3. Turn starting switch to ON position.		
		Voltage	Between ground and wiring harness between ABS3 (female) (27) and DOWN (female) (1)	Max. 1 V
3	Short circuit in wiring harness	1. Turn starting switch to OFF position. 2. Disconnect connectors ABS3 and DOWN, and connect T-adapter to female side of ABS3.		
		Between ABS3 (female) (27) and each pin other than pin (27)		No continuity (No sound is heard)
4	Defective ABS controller	If no failure is found by checks on causes 1 to 3, ABS controller may be defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

Related electrical circuit diagram

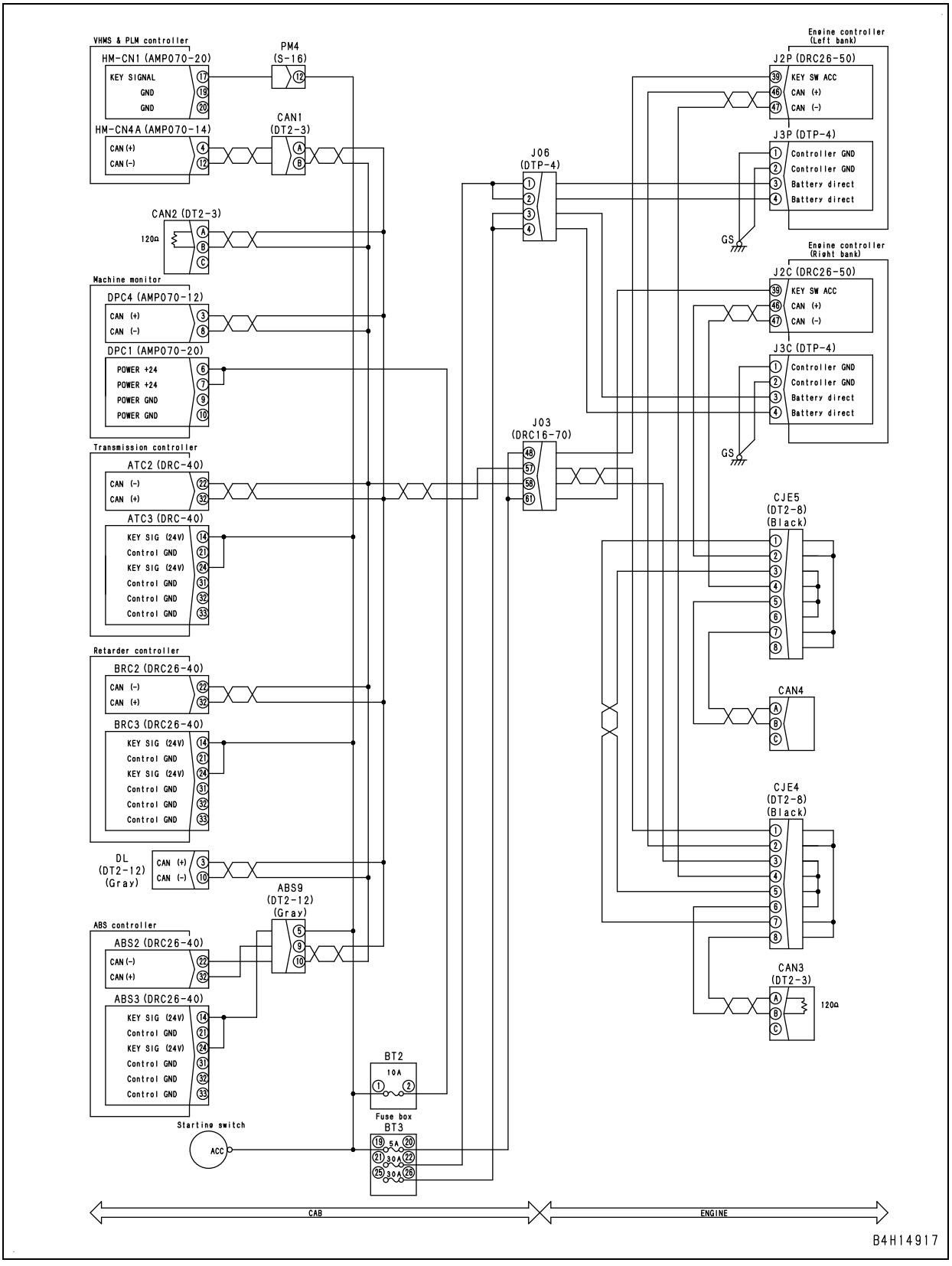


Failure code [DB13KK] Retarder controller battery direct power supply: Power supply voltage too low

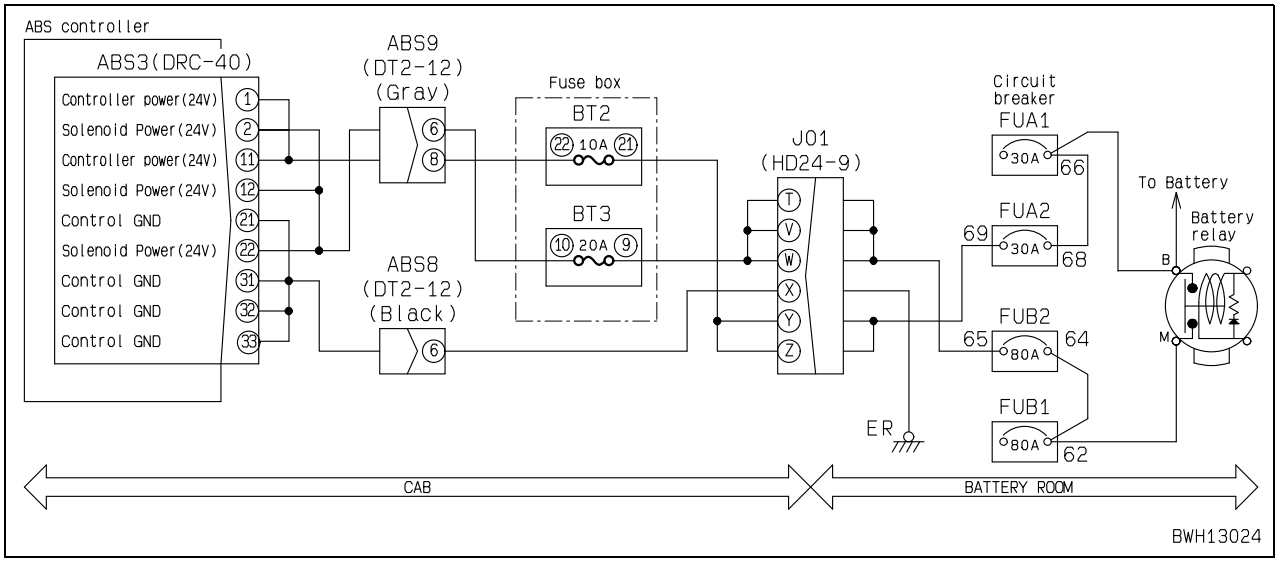
Action code	Failure code	Trouble	Retarder controller battery direct power supply: Power supply voltage too low (Retarder controller system)
E03	**DB13KK**		
Contents of trouble	• Controller power supply voltage is below 18 V.		
Action of controller	• Turns all output OFF.		
Problem that appears on machine	• Retarder does not operate.		
Related information	• When the fuse is blown, check the short circuit of line from fuse – BRC3 (female) (1), (11), (2), (12), (22). • If failure code "**DAQ0KK**" or "**DAQ2KK**" (transmission controller power supply) is displayed, carry out troubleshooting for it first.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective battery	★ Check battery voltage and electrolyte specific gravity.		
			Battery voltage	Voltage	Min. 24 V
			Battery electrolyte specific gravity	Specific gravity	Min. 1.26
	2	Defective circuit breaker FuA2 or defective fuse BT2(21) and (22)	When circuit breaker FuA2 is tripped or fuse BT2 (21) and (22) is blown, a ground fault may have occurred in the circuit.		
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn starting switch OFF. 2) Disconnect battery (–) terminal and connector BRC3 and connect T-adapter to BRC3 (female).		
			Between BRC3 (female) (21), (31), (32), (33) and ground ★ Looseness or rusting on ER1 terminal	Resistance	Max. 1 Ω
			1) Turn starting switch OFF. 2) Disconnect battery (–) terminal and insert T-adapter in BRC3. 3) Connect battery (–) terminal.		
			Between battery relay terminal B and ground	Voltage	20 – 30 V
			Between BRC3 (1), (11) and ground	Voltage	20 – 30 V
			1) Turn starting switch OFF. 2) Disconnect battery (–) terminal and connect T-adapter to BRC3 (female).		
			If there is voltage between battery relay terminal B and ground but not between BRC3 (1), (11) and ground, wiring harness or fuse is broken.		
	4	Defective transmission controller	1) Turn starting switch OFF. 2) Disconnect battery (–) terminal and insert T-adapter in BRC3. 3) Connect battery (–) terminal.		
			Between BRC3 (1), (11) and ground	Voltage	20 – 30 V

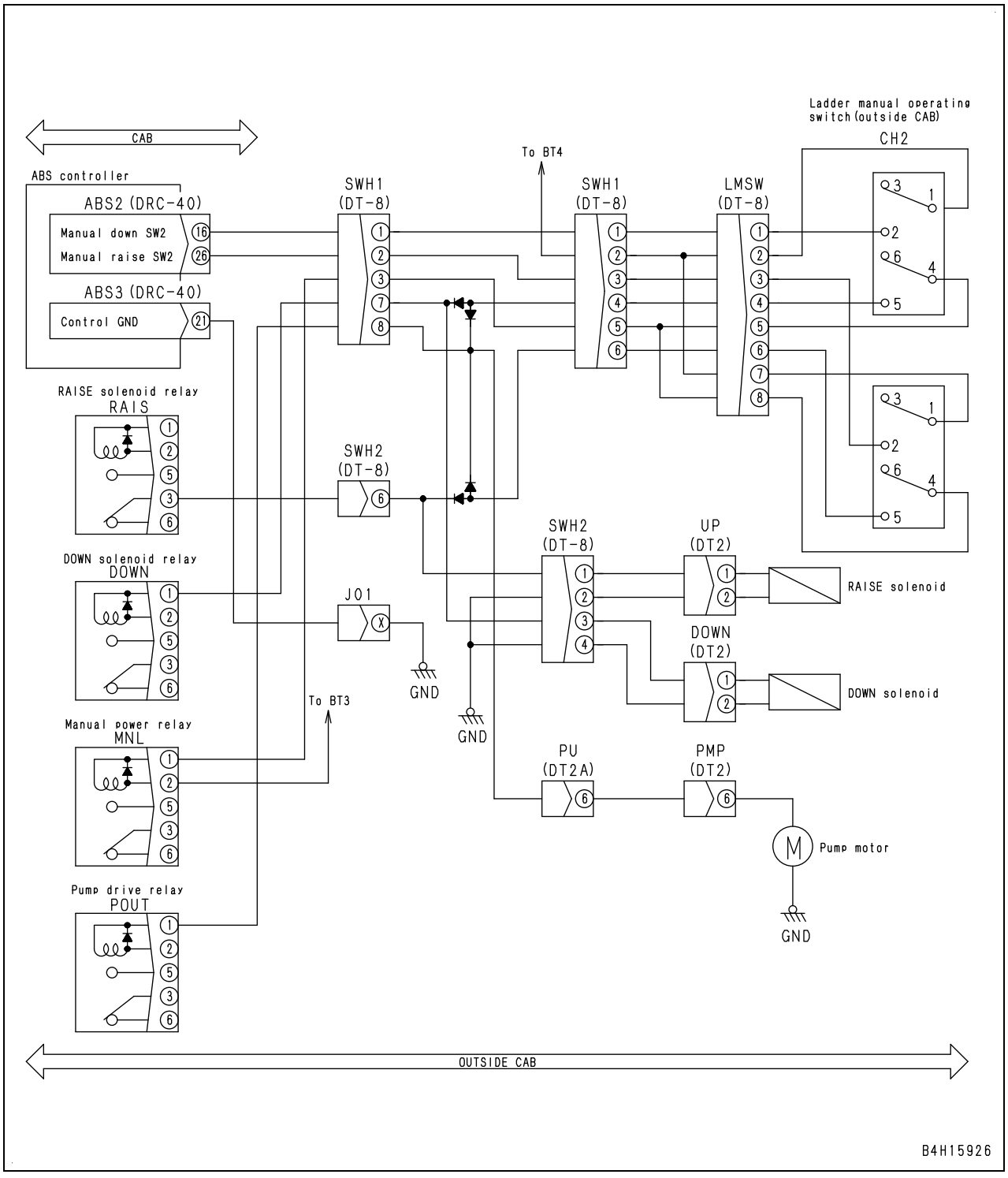
Circuit diagram related



Circuit diagram related

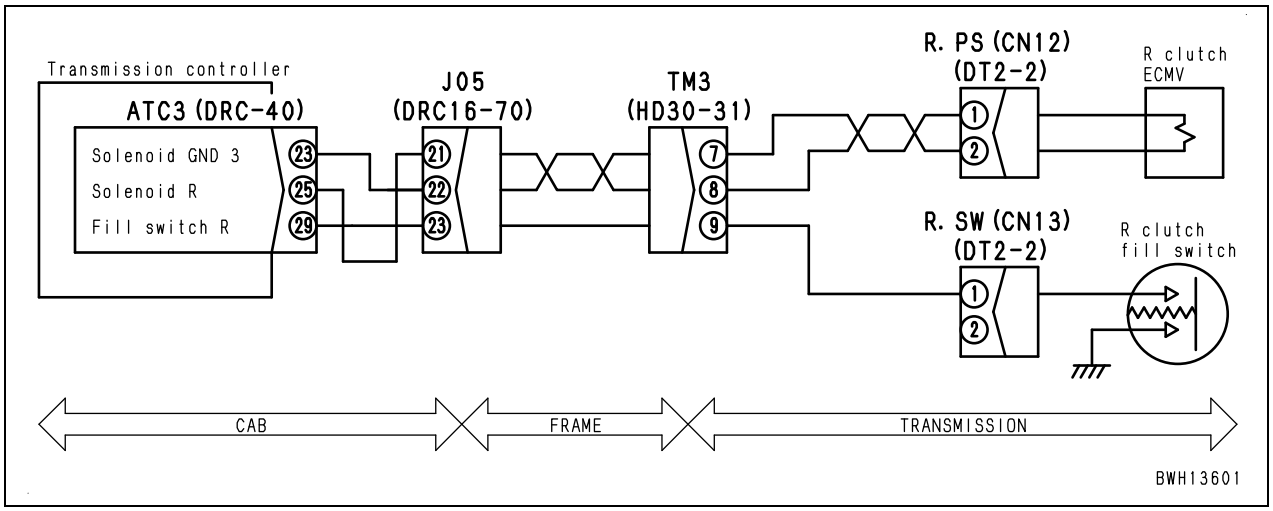


Related electrical circuit diagram



Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	2	Disconnection in wiring harness (Disconnection or defective contact)	1) Turn the starting switch OFF. 2) Disconnect connectors ATC3 and R.SW (CN13). 3) Connect T-adapter.		
			Wiring harness between ATC3 (female) (29) and R.SW (CN13) (female) (1)	Resistance	Max. 1 Ω
	3	Defective transmission controller	If no abnormality is found in the above troubleshooting, the transmission controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

Circuit diagram related

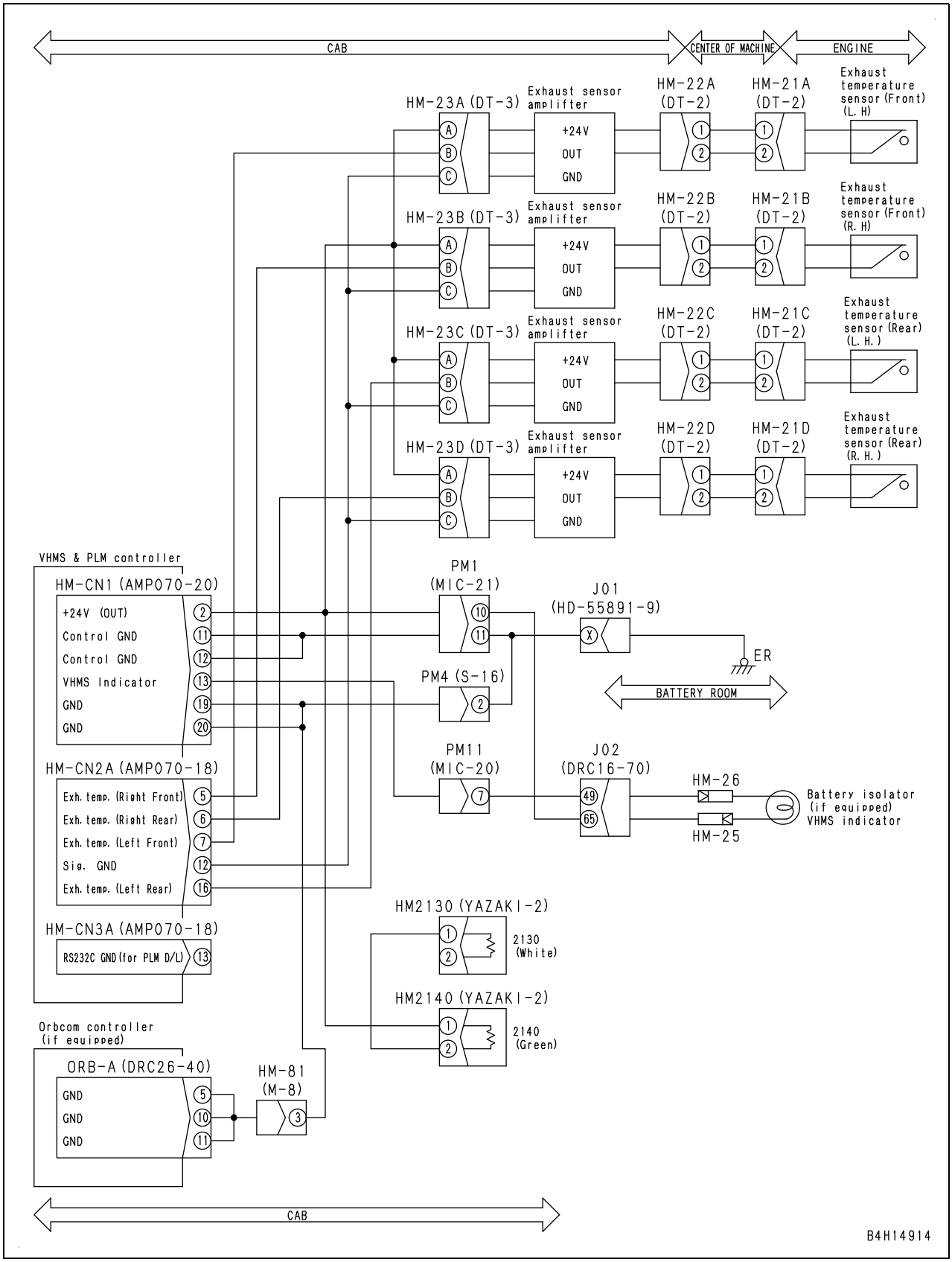


Failure code [DGR4KB] Trouble in retarder oil temperature sensor (front wheel) system (Disconnection and short circuit)

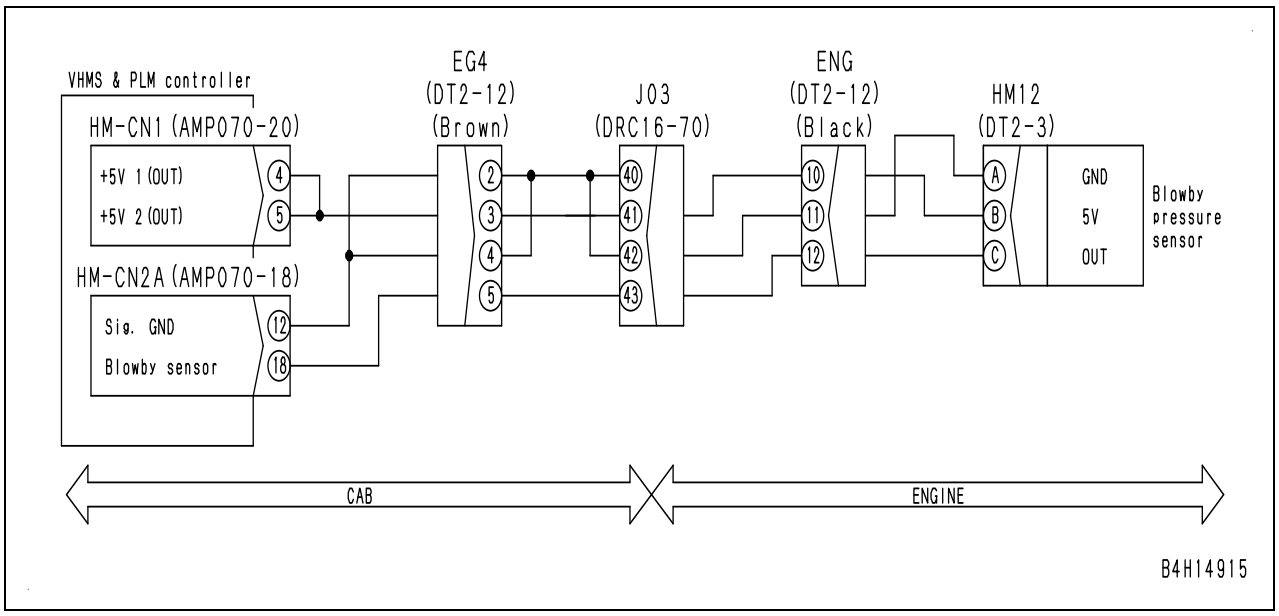
Action code	Failure code	Trouble	Trouble in retarder oil temperature sensor (front wheel) system (Disconnection and short circuit) (Retarder controller system)
E01	**DGR4KB**		
Contents of trouble	• Signal circuit voltage of retarder oil temperature sensor has become below 0.96 V.		
Action of controller	• None in particular.		
Problem that appears on machine	• Oil temperature gauge does not work because of failure mode of sensor.		
Related information	• Input signal from oil temperature sensor can be checked with monitoring function (codes: **30201 (°C)** and **30204 (V)**).		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Perform troubleshooting for failure code [**DGR4KZ**].	

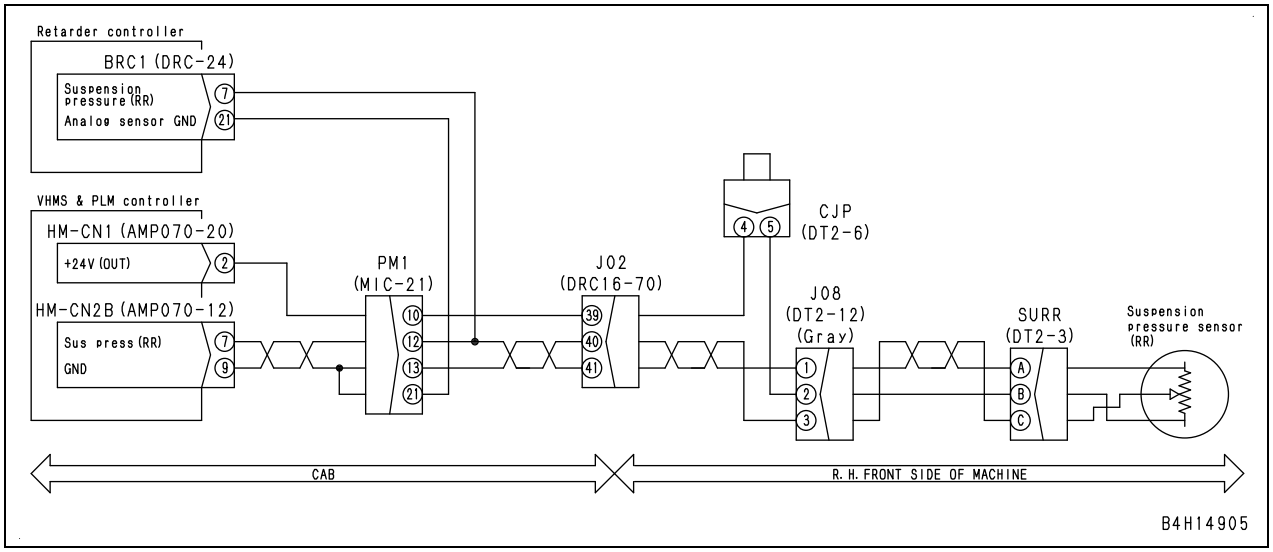
Circuit diagram related



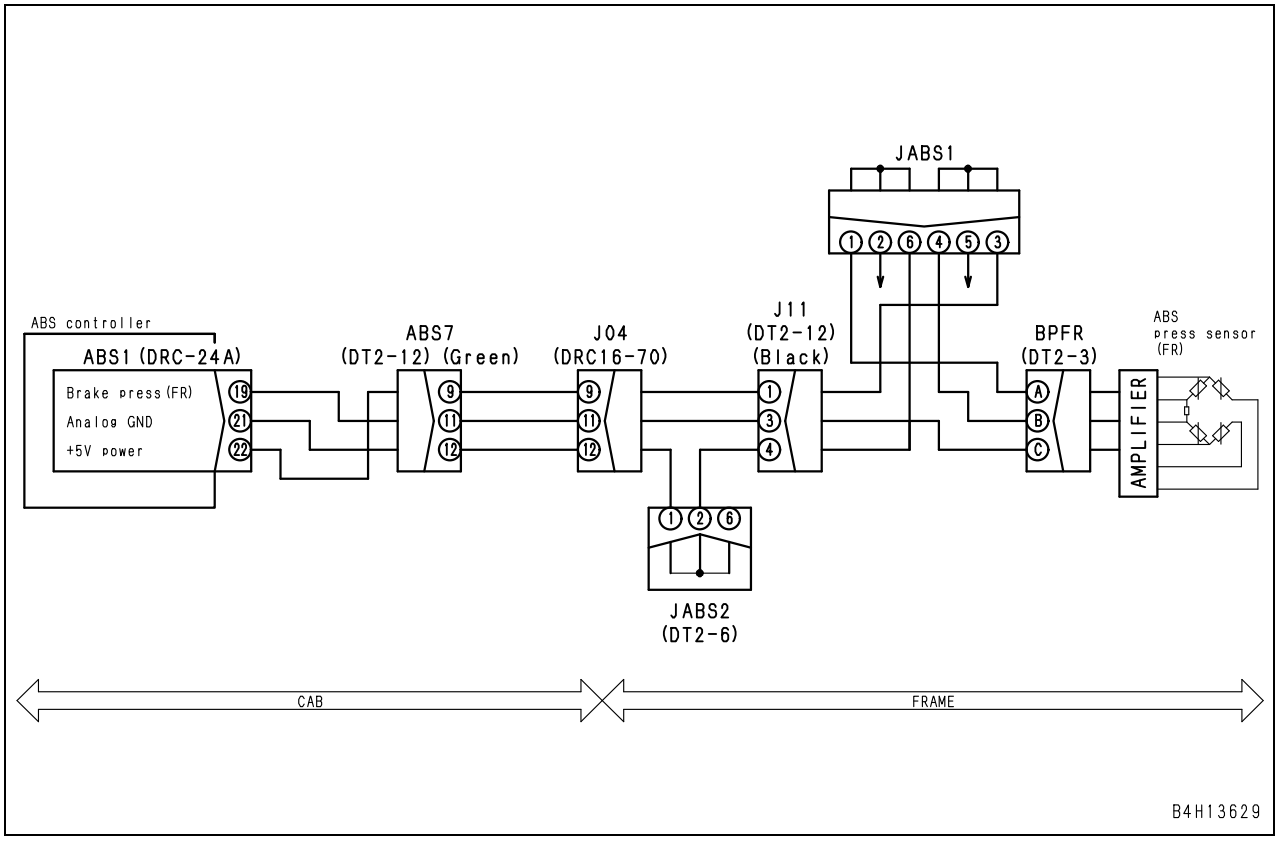
Circuit diagram related



Circuit diagram related

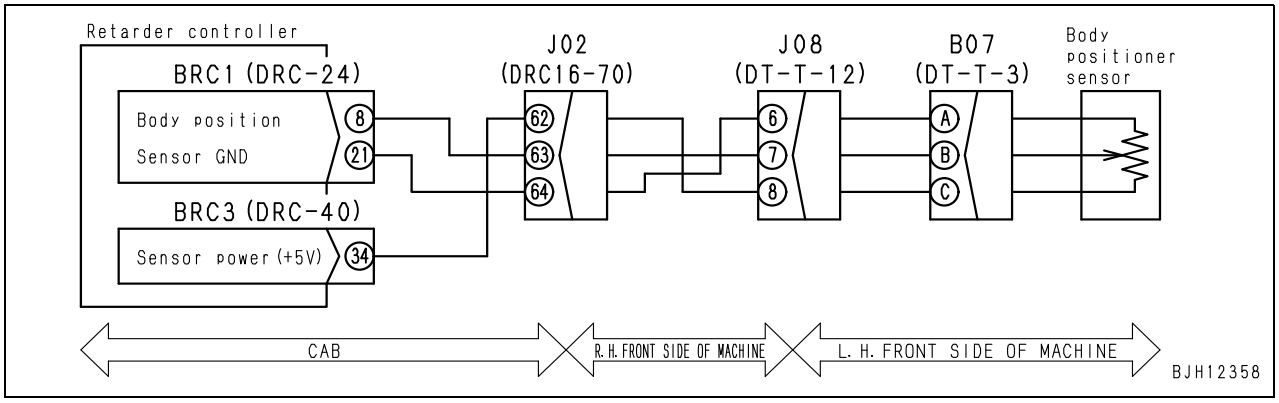


Circuit diagram related

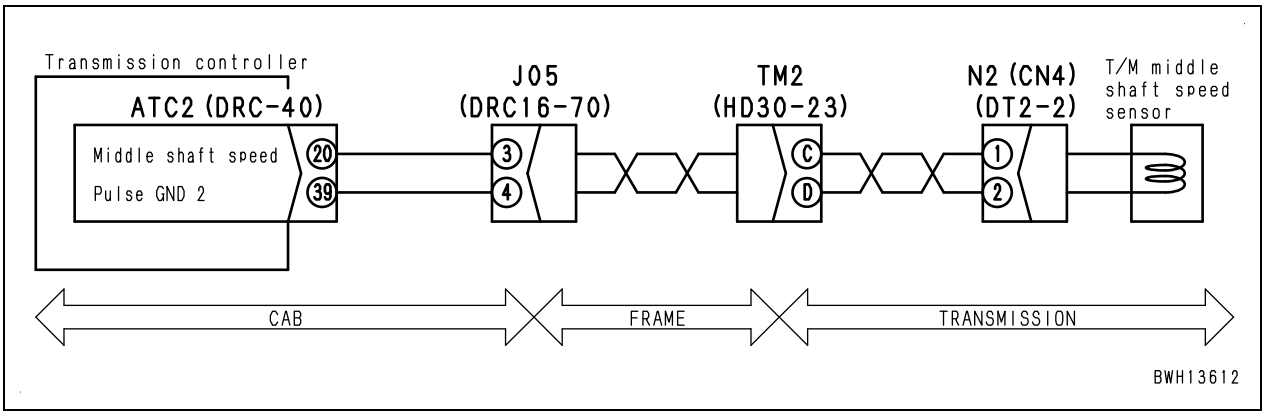


	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	5	Defective retarder controller	If no abnormality is found in the above troubleshooting, the retarder controller may be defective. (Since this is an internal defect, troubleshooting cannot be performed.)		
			★ Reference 1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, BRC3, and B07. 3) Insert T-adapter. 4) Turn the starting switch ON.		
			Between BRC1 (8) – (21)	Voltage	4.1 – 4.8 V
			Between BRC3 (34) – BRC1 (21)	Voltage	0.3 – 4.7 V

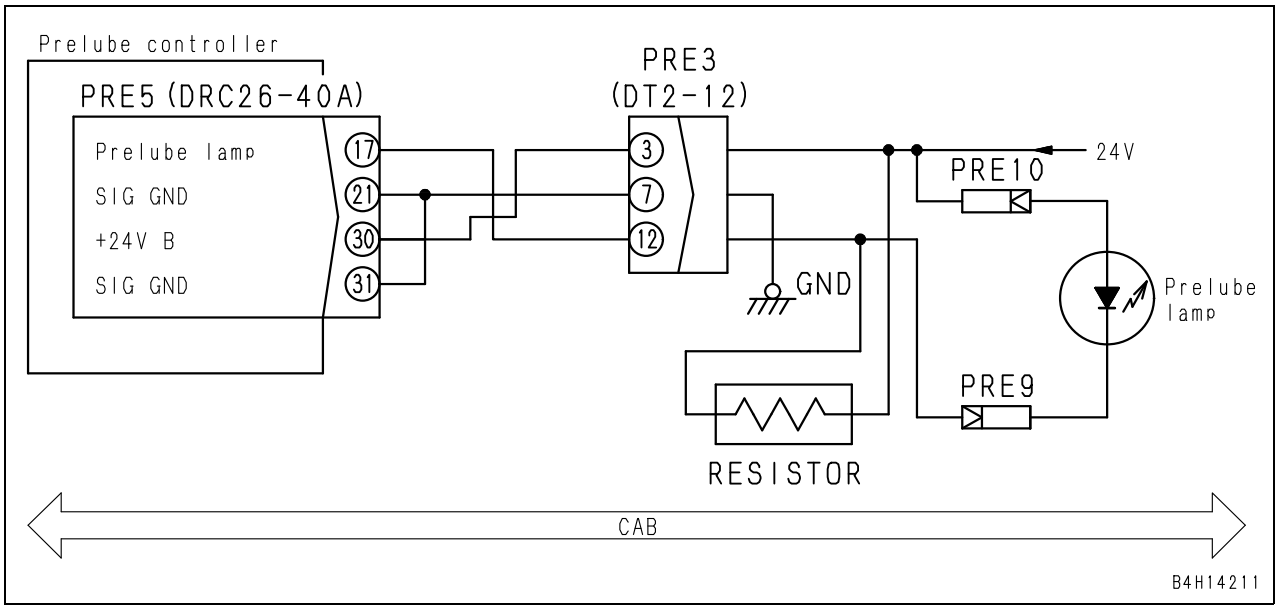
Circuit diagram related



Circuit diagram related

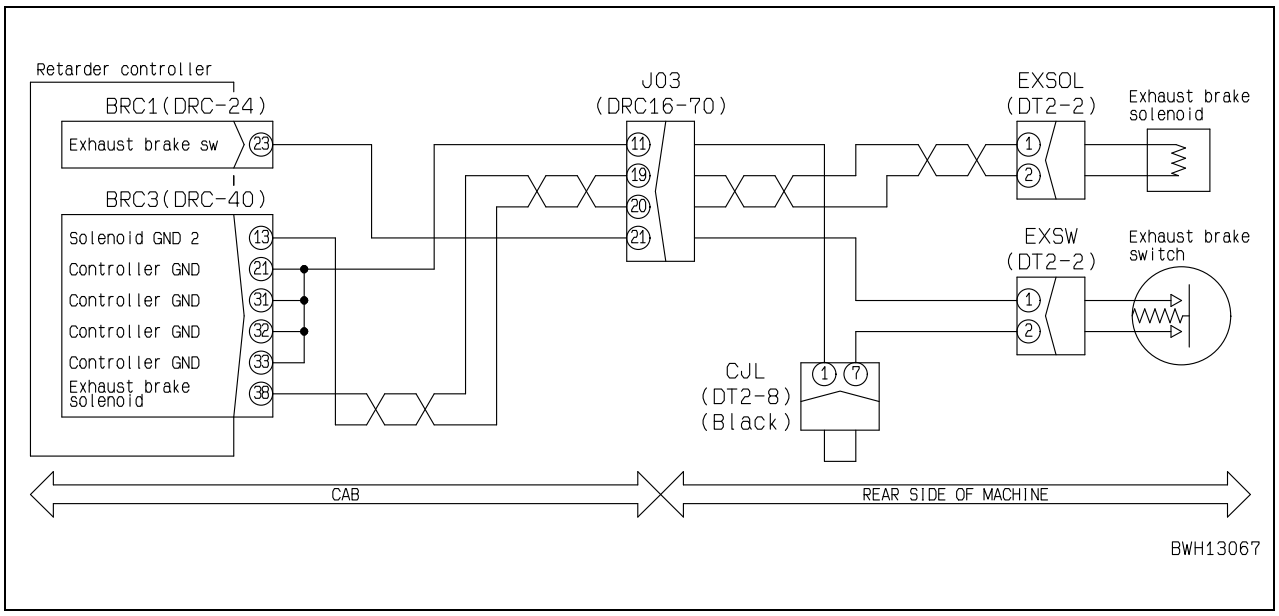


Related electrical circuit diagram



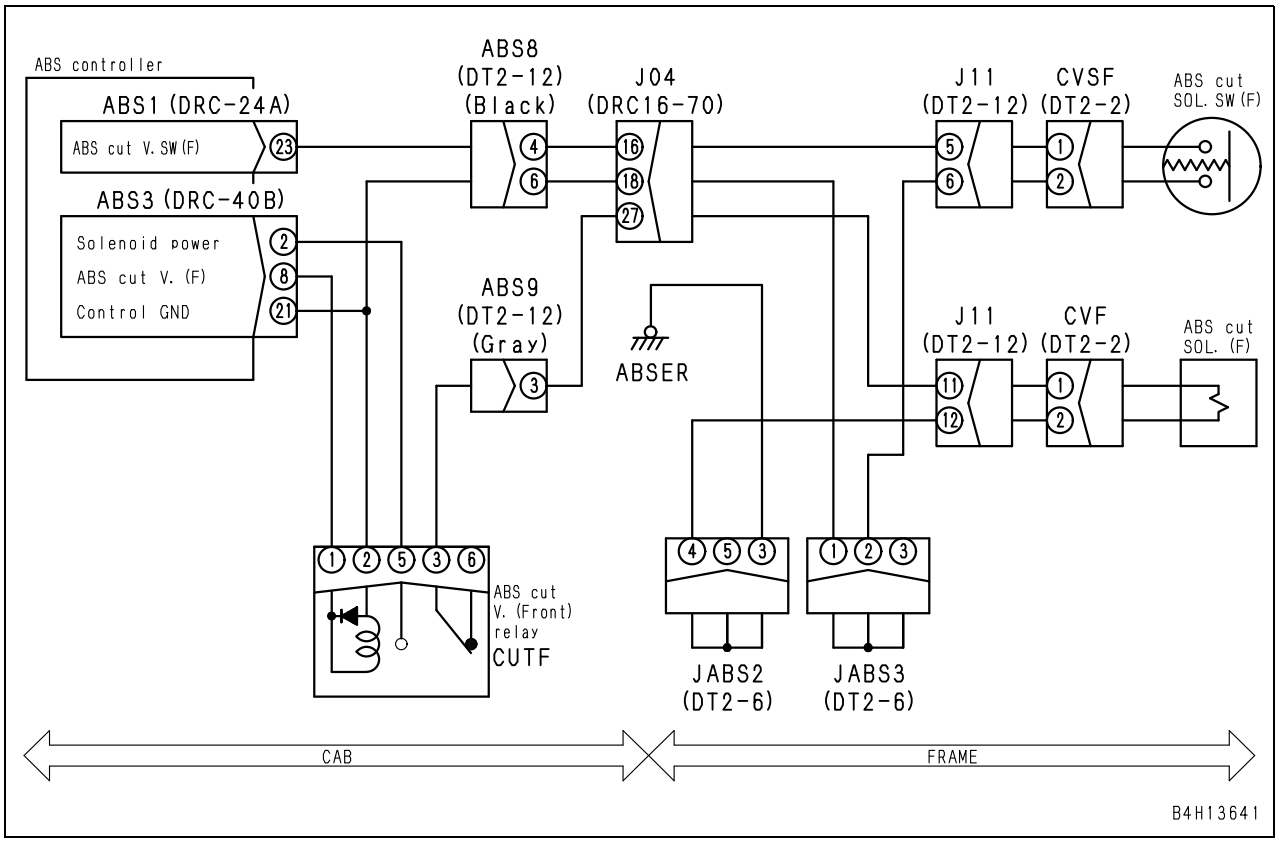
★ Prelube controller is the same as pre-lubrication controller.

Circuit diagram related

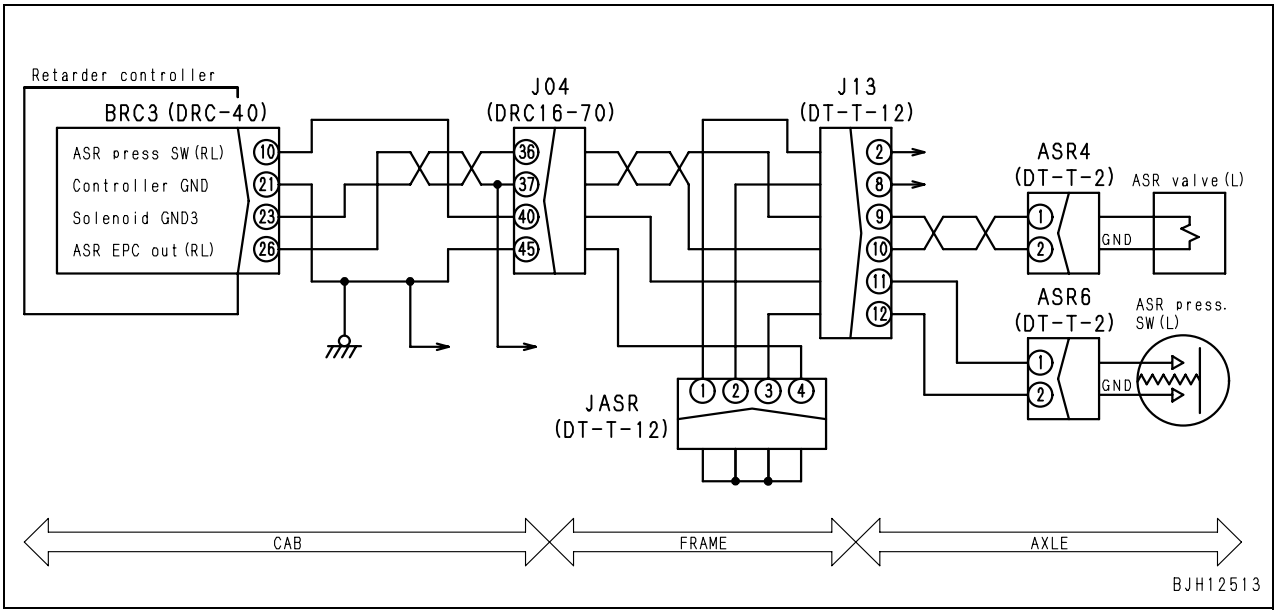


Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	5	Ground fault in wiring harness (Contact with ground circuit)	1) Turn the starting switch OFF. 2) Disconnect CUTF relay, connectors ABS1, ABS3, CVF and CVSF. 3) Connect T-branch to ABS1 (female), ABS3 (female) and CUTF (female), and carry out troubleshooting in this state.		
			Between ABS1 (female) (23) – CVSF (1) and ground	Resis-tance	Max. 1 Ω
			Between CVF (female) (1) – CUTF (3) and ground	Resis-tance	Max. 1 Ω
	6	Defective ABS cut-off valve (F)	Replace ABS cut-off valve (F) to restore normal state.		
	7	Defective ABS controller	1) Turn the starting switch OFF. 2) Disconnect ABS1 and connect T-branch. 3) Connect T-branch to ABS1 (female). 4) Start engine. 5) Turn ABS switch ON and OFF.		
			Between ABS1 (female) (23) – ground	Voltage	8 V/0 V change

Circuit diagram related



Circuit diagram related

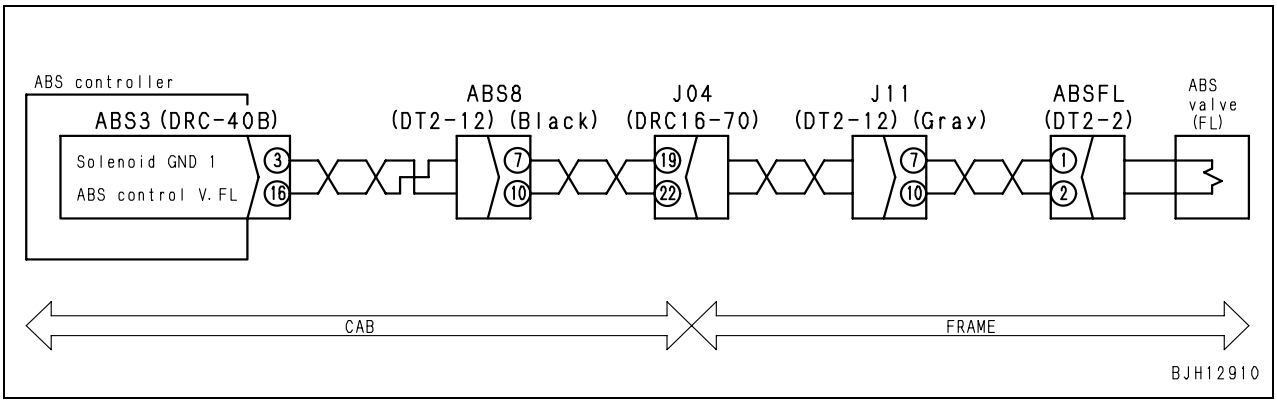


Failure code [DX22KA] Disconnection in ABS control valve output circuit (Front left)

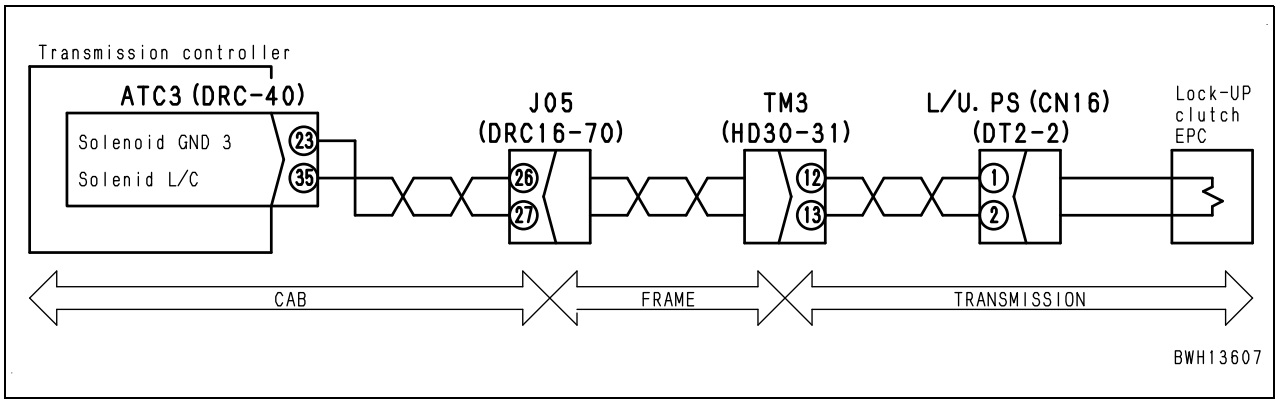
Action code	Failure code	Trouble	Disconnection in ABS control valve output circuit (Front left) (ABS controller system)
E03	**DX22KA**		
Contents of trouble	• No current flows when the signal is output to the ABS control valve (Front left) solenoid circuit.		
Action of controller	• Stop outputting to ABS control valve (Front left) solenoid circuit. (Stop ABS control.)		
Problem that appears on machine	• ABS does not work. • Ordinary brake operation can be carried out.		
Related information	• Output to ABS control valve (Front left) solenoid can be checked with the monitoring function. (Code: **43308**, output current **(0 – 1000 (mA)**) • No signal is output to ABS control valve solenoid until starting switch is turned OFF.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective ABS control valve solenoid (Internal disconnection)	1) Turn the starting switch OFF. 2) Disconnect connector ABSFL. 3) Connect the T-branch to connector ABSFL and carry out troubleshooting with the starting switch OFF.		
			ABSFL (male)	Resistance	
			Between (1) – (2)	10 – 30 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn the starting switch OFF. 2) Disconnect connector ABSFL and ABS3. 3) Connect the T-branch to connectors ABSFL and ABS3, and carry out troubleshooting with the starting switch OFF.		
			Wiring harness between ABS3 (female) (3) – ABSFL (2)	Resistance	Max. 1 Ω
			Wiring harness between ABS3 (female) (16) – ABSFL (1)	Resistance	Max. 1 Ω
	3	Defective ABS controller	1) Turn the starting switch OFF. 2) Disconnect connector ABS3. 3) Connect T-branch.		
			Wiring harness between ABS3 (female) (16) – ABS3 (female) (3)	Resistance	10 – 30 Ω

Circuit diagram related

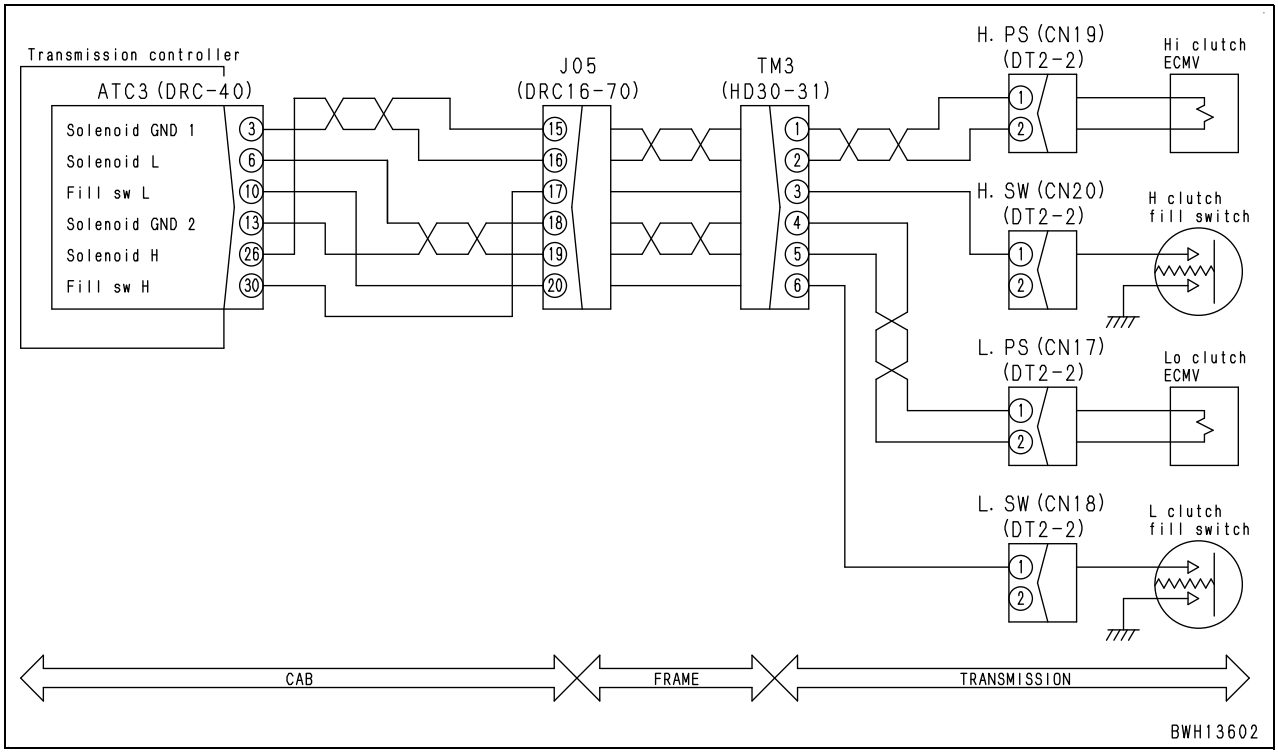


Circuit diagram related

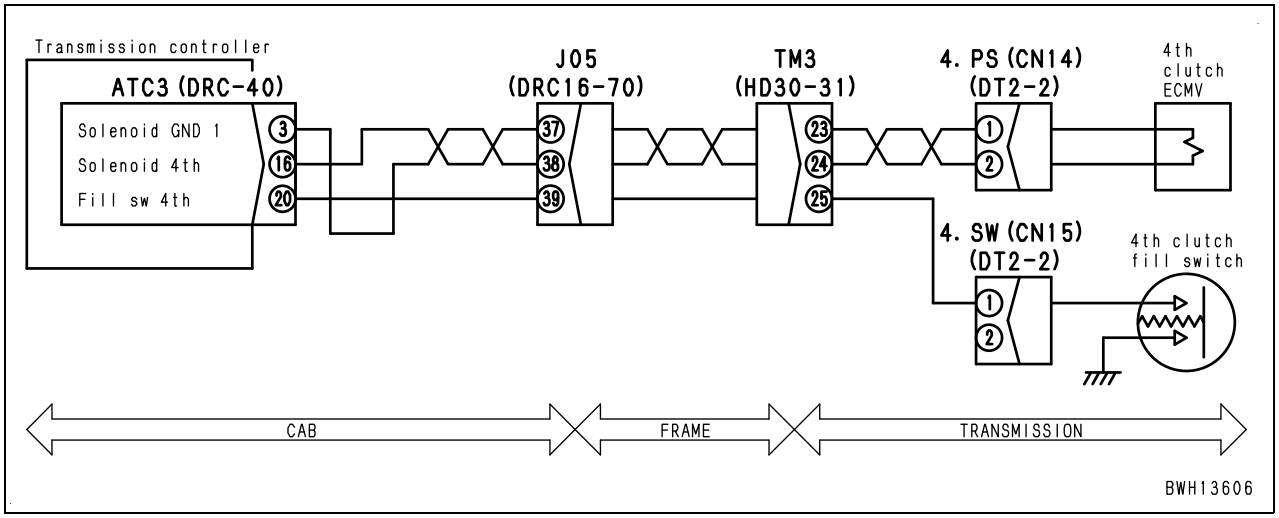


Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	4	Defective transmission controller	If no abnormality was found in the above troubleshooting, the transmission controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

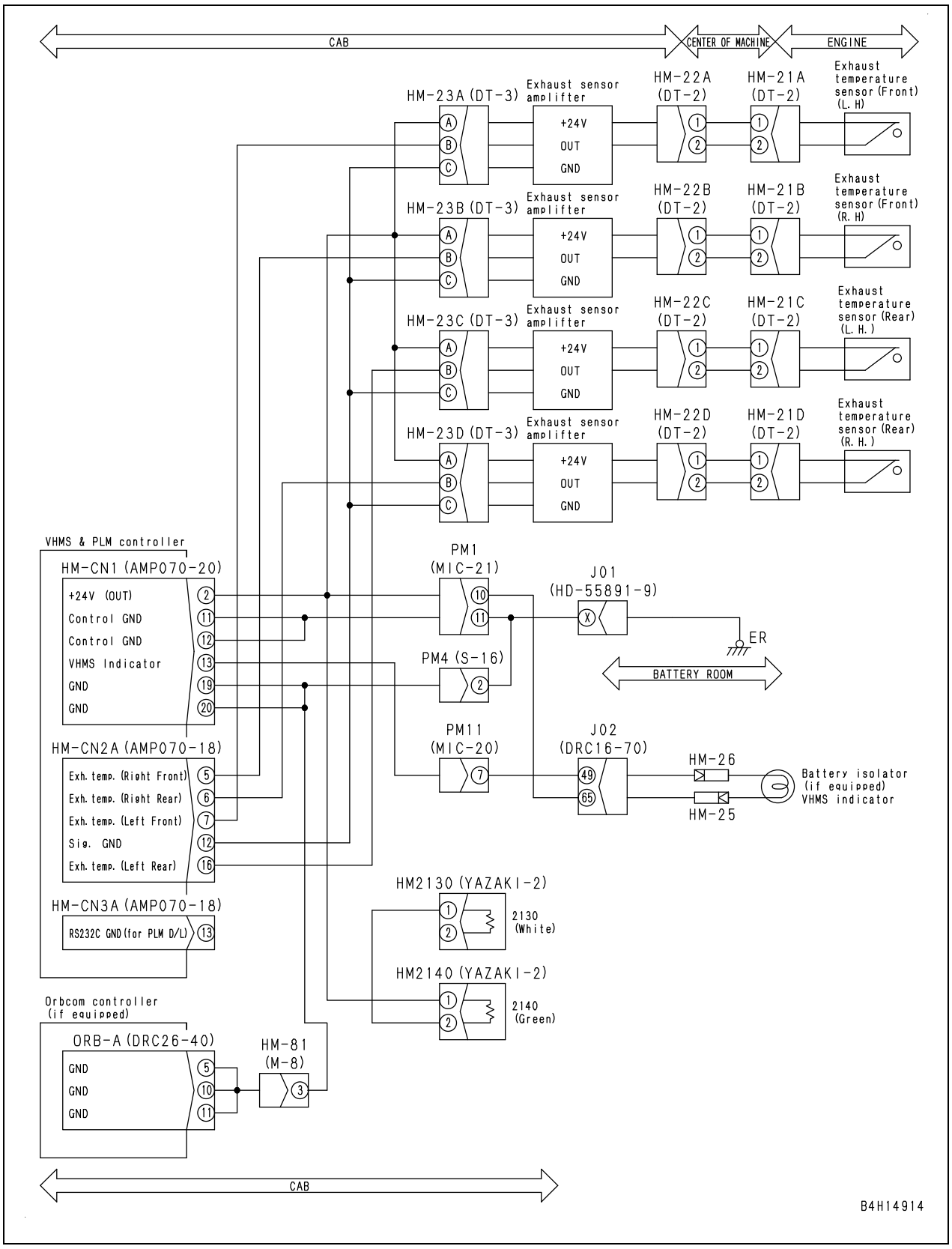
Circuit diagram related



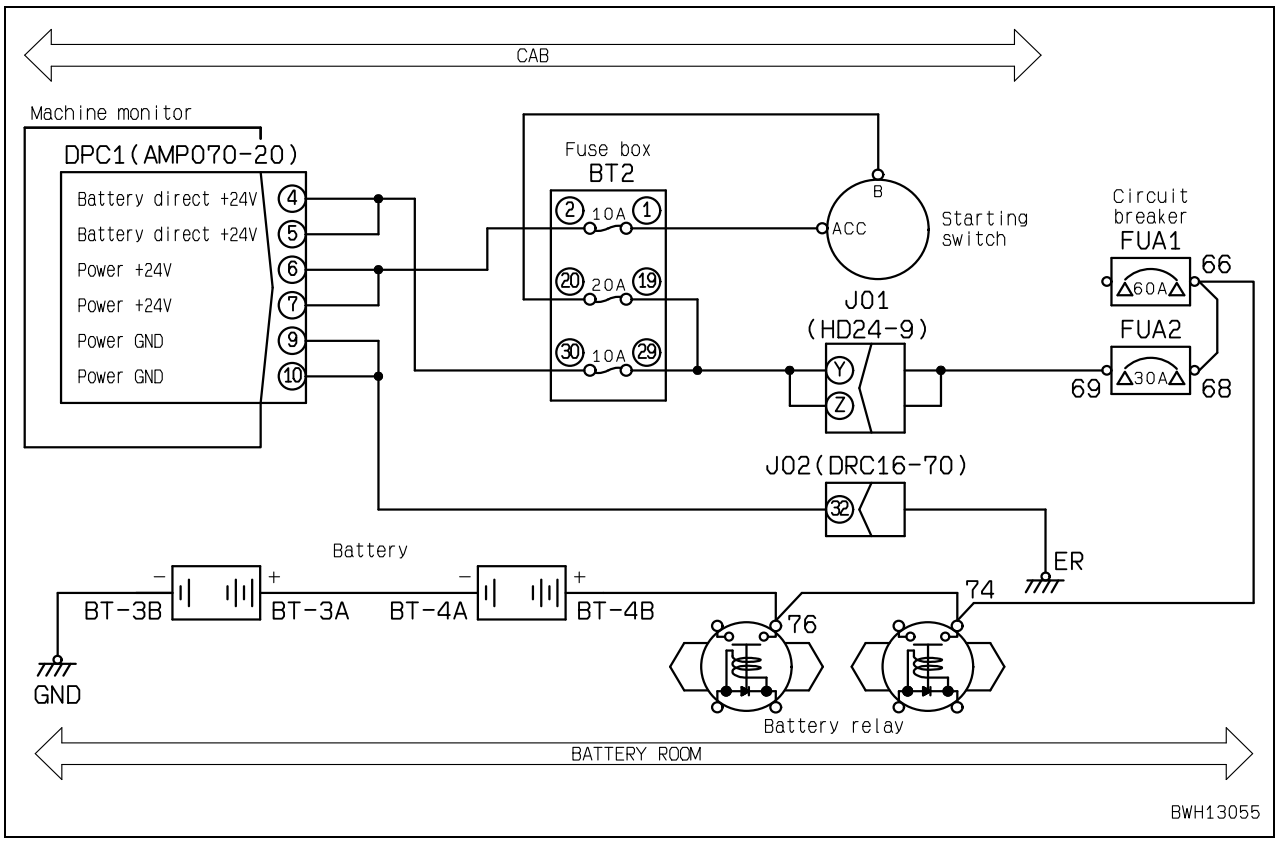
Circuit diagram related



Circuit diagram related



Circuit diagram related



Trouble (4)	Right small lamp (clearance lamp) does not "right" light up.
Related information	• Carry out following troubleshooting when left small lamp and headlamps (right and left) light up. ★ See circuit diagram (1).

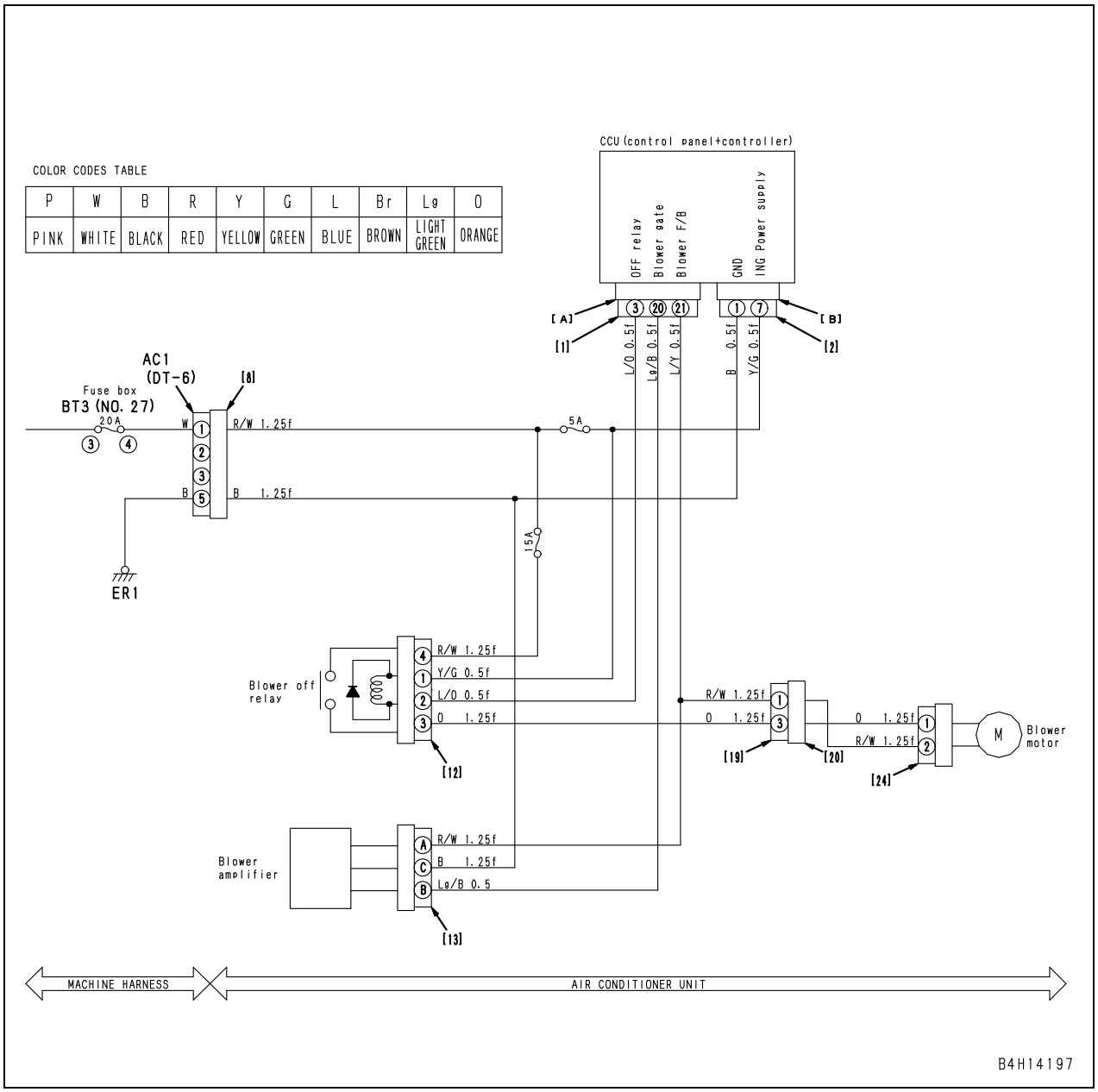
	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective lamp (bulb)	When the lamp (bulb) can be suspected to be defective, judge by visual check or replacing the lamp bulb.		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn starting switch OFF. 2) Disconnect connectors J02, CJB, and PR03.		
			Wiring harness between J02 (male) (3) – CJB (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between CJB (female) (2) – PR03 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between PR03 (female) (2) – ground (PR07)	Resistance	Max. 1 Ω
	3	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors J02, CJB, and PR03. 3) Connect T-adapter to J02 (male).		
			Between ground and wiring harness between J02 (male) (3) – CJB (female) (1)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between CJB (female) (2) – PR03 (female) (1)	Resistance	Min. 1 MΩ

Trouble (5)	Left small lamp (tail lamp) does not "left" light up.
Related information	• Carry out following troubleshooting when right tail lamp and headlamps light up. ★ See circuit diagram (1).

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective lamp (bulb)	When the lamp (bulb) can be suspected to be defective, judge by visual check or replacing the lamp bulb.		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn starting switch OFF. 2) Disconnect connectors J02, CJV, and B02. 3) Connect T-adapter to J02, CJV, and B02.		
			Wiring harness between J02 (branched point) (female) (3) – CJV (female) (4)	Resistance	Max. 1 Ω
			Wiring harness between CJV (female) (5) – B02 (female) (5)	Resistance	Max. 1 Ω
			Wiring harness between B02 (female) (6) – ground (B10)	Resistance	Max. 1 Ω
	3	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors J02, CJV, and B02. 3) Connect T-adapter to J02 (female).		
			Between ground and wiring harness between J02 (male) (branch point) (3) – CJV (female) (4)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between CJV (female) (5) – B02 (female) (5)	Resistance	Min. 1 MΩ

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	5	Ground fault of wiring harness (Contact with ground circuit)	Between connector [8] (1) and (5)	Resistance	Min. 1 MΩ	D
			Between connector [8] (1) and chassis ground	Resistance	Min. 1 MΩ	E
			Between AC1 (1) and (5)	Resistance	Min. 1 MΩ	F
			Between AC1 (1) and chassis ground	Resistance	Min. 1 MΩ	G
	6	Disconnection in wiring harness	★ If fuse is not broken and result A due to cause 4 is abnormal, check circuit diagram.			
	7	Defective control panel	If results due to causes 1 and 2 and result A due to cause 4 are normal, replace control panel.			

Circuit diagram related



	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	7	Defective gear speed clutch	• If oil pressure checked in Cause 6 is low, oil may be leaking through clutch seal ring. • If oil pressure checked in Cause 6 is normal, clutch may be slipping.
	8	Defective power train pump	• If check result of Cause 3 is abnormal, disconnect power train pump outlet hose and crank engine to see if oil flows out. • Check line filter for foreign matter to judge.
	9	Internal defect in transmission	Transmission may have defect in it. Check it directly.

Table 1

		Operated clutches						
		Lo	Hi	1st	2nd	3rd	4th	R
Gear speed	F1	●		●				
	F2	●			●			
	F3		●		●			
	F4	●				●		
	F5		●			●		
	F6	●					●	
	F7		●				●	
	N							
	RH		●					●
	RL	●						●

H-15 Dump body lifting speed is slow

Trouble	When lifting dump body, the speed is slow and the power is insufficient.
Related information	• Check that the oil level in the hydraulic tank is correct. • If a failure code related to the machine is displayed, firstly troubleshooting the displayed code. • Check that the dump lever moves smoothly.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Air sucked in at the suction side of the work equipment and steering pump	Since the air can be suspected to be sucked in from the suction side of the steering and work equipment pump, check it directly.	
	2	Defective work equipment and steering pump strainer	The work equipment and steering pump strainer is potentially clogged, visually check it.	
	3	Defective relief valve of demand valve	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Relief oil pressure (steering cylinder stroke end)	20.6 (+0.98/0) MPa {210 (+10/0) kg/cm²}
	4	Defective dump EPC valve relief valve (dump pilot pressure)	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Operate dump lever to “raise“ or “lower“ position.	3.4 ± 0.49 MPa {35 ± 5 kg/cm²}
				(Reference: low idle) 2.6 ± 0.49 MPa {27 ± 5 kg/cm²}
	5	Defective operation of dump EPC valve	If the oil pressure is low in the item 4, the operation of the dump EPC valve can be suspected to be defective; visually check the valve.	
	6	Defective pilot pump for dump EPC valve	If the oil pressure is low in the item 4, the pilot pump for the dump EPC valve circuit can be suspected to be defective; check it directly.	
	7	Defective hoist valve relief valve	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Relief oil pressure (dump cylinder raise stroke end)	20.6 (+0.98/0) MPa {210 (+10/0) kg/cm²}
	8	Defective operation of the hoist valve main spool	If the oil pressure does not reach the standard value in the item 7, the operation of the hoist valve main spool can be suspected to be defective. (Visually check the spool.)	
	9	Defective dump cylinder	★ Prepare with the engine stopped and troubleshooting with the engine running at high idle.	
			Relief oil pressure (cylinder stroke end)	20.6 (+0.98/0) MPa {210 (+10/0) kg/cm²}
			When the oil pressure is low, disconnect the hydraulic hose in the dump cylinder head side and relieve the pressure at the raise stroke end. If the oil comes out from the cylinder side, the cylinder piston ring is defective.	

S-7 Exhaust smoke is black (incomplete combustion)

General causes why exhaust smoke is black
- Insufficient intake of air
- Excessive injection of fuel
- Defective spray condition of fuel
- Improper selection of fuel
- Overheat
  → See "S-14 Coolant temperature becomes too high (Overheating)"
- Controller is controlling in derate mode (limiting injection rate (output) because of an error in electrical system)

			Causes														
			Clogged air cleaner element	Seized turbocharger or interference of turbocharger	Defective contact of valve and valve seat	Improper valve clearance	Leakage of air between turbocharger and cylinder head	Crushed or clogged muffler	Worn piston ring and/or cylinder liner	Stuck or seized supply pump plunger	Clogged or seized injector	Abnormally worn injector	Clogged fuel spill piping (on cylinder head side)	Improper injection timing	Improper fuel injection pressure	Defective coolant temperature sensor or wiring harness
Questions	Confirm recent repair history																
	Degree of machine operation	Operated for long period	△		△				△		△						
	Color of exhaust gas	Suddenly became black		◎						○	○	○					
		Gradually became black	◎				○				○						
		Blue under light load							◎								
	Non-specified fuel is being used									○	○						
	Oil replenished more frequently								◎								
	Power was lost	Suddenly		◎				○		○	○						
		Gradually	○		○		○		○								
Check items	Dust indicator is red (if indicator is installed)		◎														
	Muffler is crushed							◎									
	Air leaks between turbocharger and cylinder head, and clamp is loosened						◎										
	Engine is operated in low-temperature mode at normal temperature													○	○	○	
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low									○	◎						
	When engine is cranked, interference sound is emitted from around turbocharger			◎													
	When engine is cranked, abnormal sound is generated around cylinder head					◎											
	Torque converter stall speed or pump relief speed is high (Fuel is injected excessively)											○	○				
	Exhaust noise is abnormal			○				◎			○						
	Engine does not pick up smoothly and combustion is irregular			○		○	○	○		○	◎						
	Blow-by gas is excessive								◎								
	If spill hose from injector is disconnected, abnormally much fuel spills											◎					
Troubleshooting	Inspect air cleaner directly		●														
	When turbocharger is rotated by hand, it is fount to be heavy			●													
	When compression pressure is measured, it is found to be low				●				●								
	Inspect valve clearance directly					●											
	When muffler is removed, exhaust sound improves							●									
	Carry out troubleshooting for "Supply pump pressure is low pressure (*1)" indicated by failure code									●		●					
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change on some cylinder										●						
	Inspect fuel spill piping (on cylinder head side) directly												●				●
	Carry out troubleshooting for "Coolant temperature sensor error (*2)" indicated by failure code																
		Remedy	Clean	Replace	Replace	Adjusting	Correct	Replace	Replace	Replace	Replace	Replace	Correct	Adjusting	Adjusting	Replace	

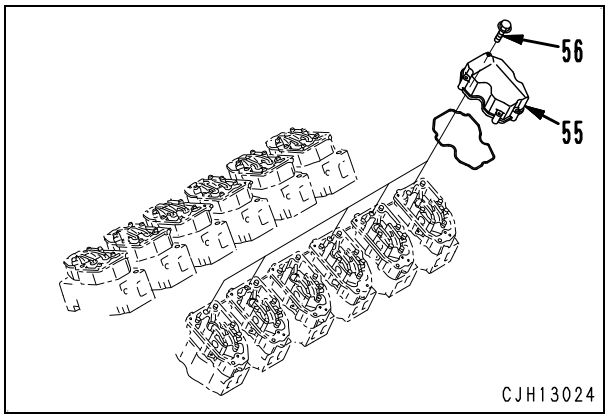
*1: Code [**CA559**], [**CB559**] and code [**CA2249**], [**CB2249**]
*2: Code [**CA144**] and code[**CA145**]

Special tool list

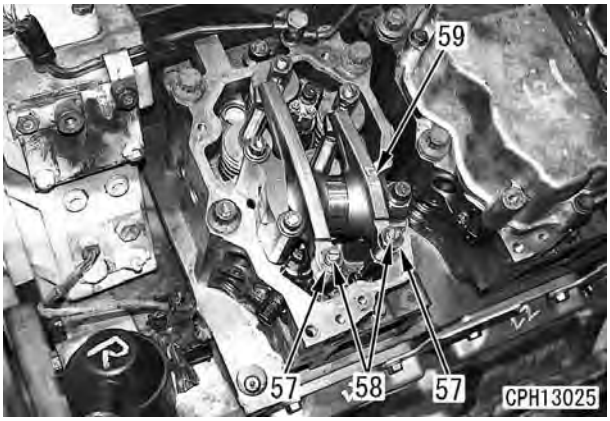
★ Tools with part number 79○T-○○○-○○○○ cannot be supplied (they must be locally manufactured).
★ Necessity : ■. . . . . Cannot be substituted, should always be installed (used)
: ●. . . . . Extremely useful if available, can be substituted with commercially available part
★ New/Remodel: N. . . . . Tools newly developed for this model and given new part Nos.
: R. . . . . Tools remodeled from tools already available for other models and given upgraded part Nos.
: Blank . . Tools already available for other models, usable without any modification
★ Tools marked with ○ in the sketch column are tools introduced in the sketches of the special tools (See Sketches of special tools).

Component	Symbol		Part No.	Part Name	Necessity	Q'ty	New/remodel	Sketch	Nature of work, remarks
Removal and installation of cylinder head assembly	A	3	795-102-2103	Spring pusher	■	1			Disassembly, assembly of cylinder head
		4	790-331-1110	Wrench	●	1			Installation of cylinder head
Removal and installation of engine assembly		5	792T-600-1120	Hanger	■	1	N	○	Removal and installation of engine assembly
		6	792T-600-1110	Engine assembly lifting tool	■	1	N	○	
Disassembly, assembly of engine		7	795-931-1100	Seal puller assembly	■	1			Removal of engine front seal
		8	795T-621-1430	Plate	■	1		○	Installation of engine front seal
			795T-621-1441	Push tool	■	1		○	
			01050-32280	• Bolt	■	3			
			01582-02218	• Nut	■	3			
			01640-22232	• Washer	■	3			
		7	795-931-1110	Seal puller assembly	■	1			Removal of engine rear seal
		9	795T-621-1531	Push tool	■	1	N	○	Installation of engine rear seal
			01050-32060	Bolt	■	5			
			01640-02032	Washer	■	5			
Removal and installation of output shaft assembly	B	1	792T-601-1030	Plate	■	1	N	○	
		2	792T-601-1040	Pipe	■	1	N	○	
		3	792T-601-1010	Push tool	■	1	N	○	
		4	792T-601-1020	Plate	■	1	N	○	
Disassembly, assembly of torque converter, PTO assembly	C	1	792-620-1400	Centering tool	■	1	N		Centering engine and torque converter
		2	790-413-1131	Nut wrench	■	1			Removal and installation of round nut of stator shaft bearing
		3	791-346-1400	Wrench	■	1			Removal and installation of PTO pump shaft
		4	792-413-1131	Installer	■	1	N		Installation of bushing to stator outer race
Disassembly, assembly of transmission	D	1	799-301-1600	Oil leak tester kit (A)	■	1			Operation check of disk and plate
Disassembly, assembly of differential assembly		3	790-425-1670	Adapter	■	1			Bearing preload adjustment
		4	792-525-3000	Micrometer	■	1			

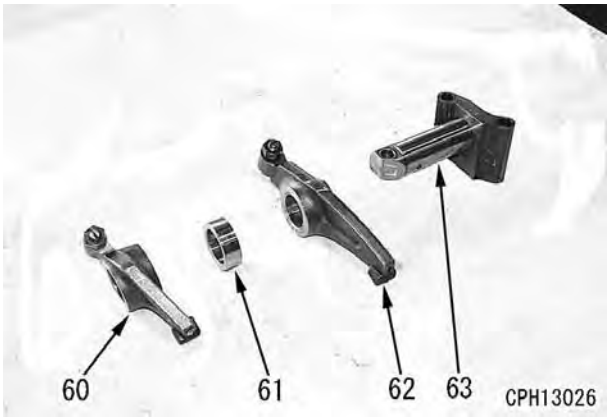
13. Remove mounting bolts (56) of head cover (55).



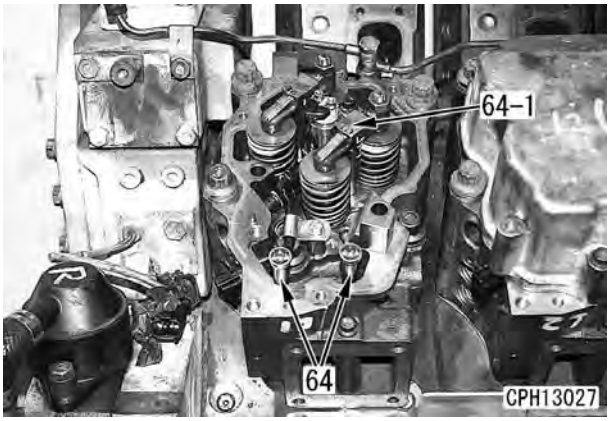
14. **Rocker arm assembly**
    1) Loosen locknut (57) and then loosen adjustment screw (58) fully.
       ★ Check that the rocker arm is not affected by the valve tension and is free.
    2) Remove rocker arm assembly (59).
       ★ Use a tag to record the mounting position of each rocker arm assembly to prevent it from being mistaken.



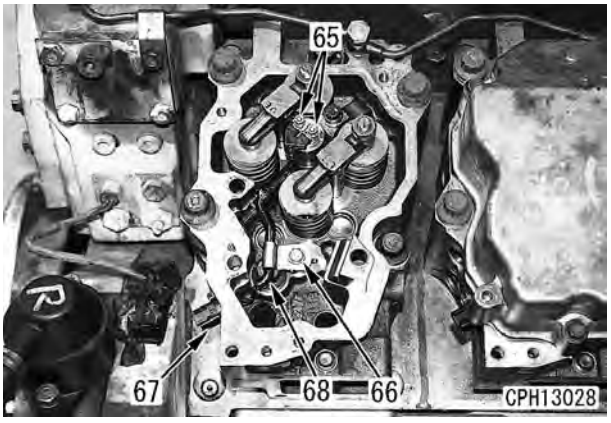
    3) Remove intake rocker arm (60), spacer (61) and exhaust rocker arm (62) from rocker shaft (63).



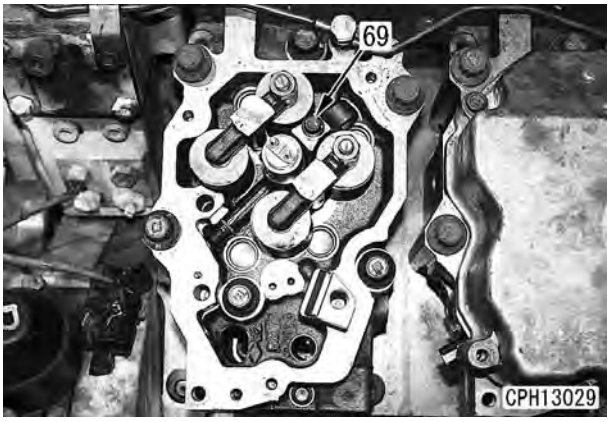
15. Remove push rod (64) and remove crosshead (64-1).



16. **Injector wiring harness**
    1) Remove injector terminal mounting nuts (65) and clamp mounting bolts (66).
    2) Push connector (67) into the cylinder head and remove injector wiring harness (68).

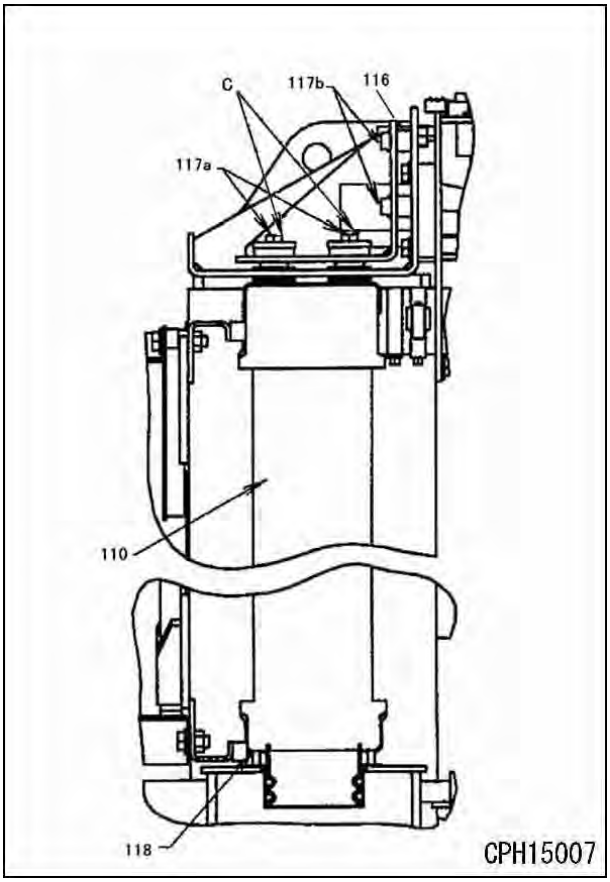


17. **Fuel injector**
    1) Remove holder mounting bolts (69).



★ When the core mounting bolts are tightened permanently, the cushion shrinks and core (110) is raised.
Push the bolt head to press the core again (c) and ensure that there in no clearance between the core anc bottom cushion (118).

10. Tighten mounting bolts (117b) permanently to fix bracket (116).
Mounting bolt: **59 – 74 Nm {6 – 7.5 kgm}**



11. Repeat the procedure from 8 to 10 for each core to install all of the four cores.

Removal and installation of output shaft assembly

Special tools

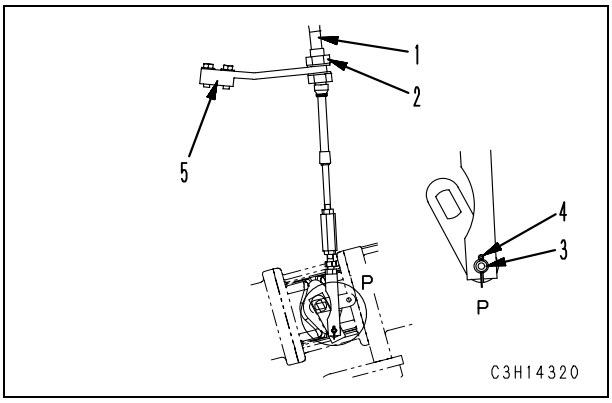
Symbol		Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
B	1	792T-601-1030	Plate	■	1	N	○
	2	792T-601-1040	Pipe	■	1	N	○
	3	792T-601-1010	Push tool	■	1	N	○
	4	792T-601-1020	Plate	■	1	N	○

Removal

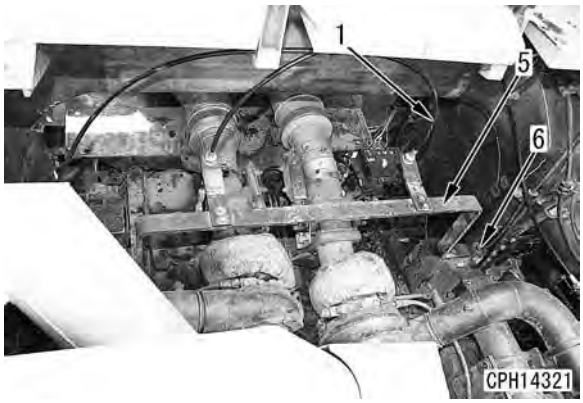
⚠ Stop the machine on a level ground, set the parking brake switch in the "PARK" position, and lock the tires with chocks.
⚠ Raise the body and fix it with the lock pin.
⚠ Disconnect the cable from the negative (–) terminal of the battery.

1. Lift of the engine hood.
For details, see "Removal and installation of engine hood assembly".

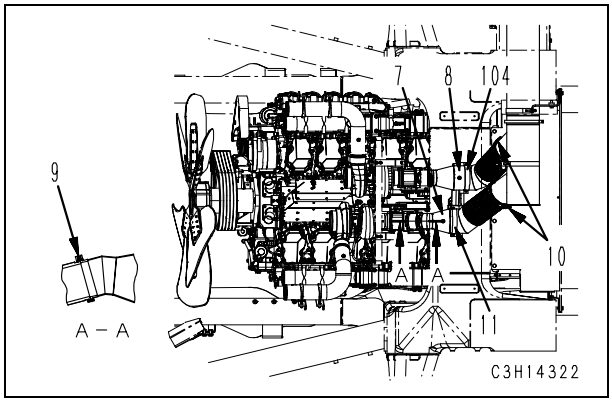
2. Removal of exhaust brake control bracket
1) Loosen mounting nut (2) of exhaust brake cable (1) and remove pin (3) and lock pin (4) of the lever yoke to disconnect cable (1). [*1]



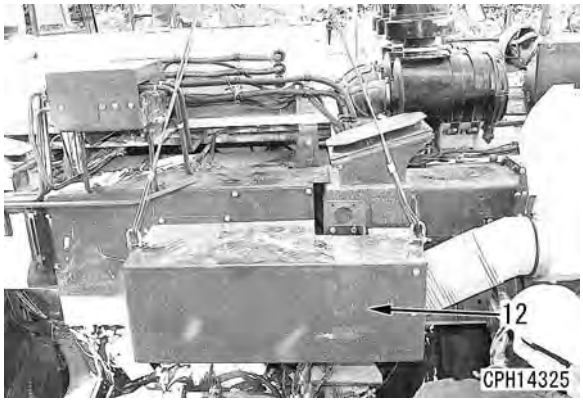
2) Remove mounting bolt (6) and cable mounting bracket (5).



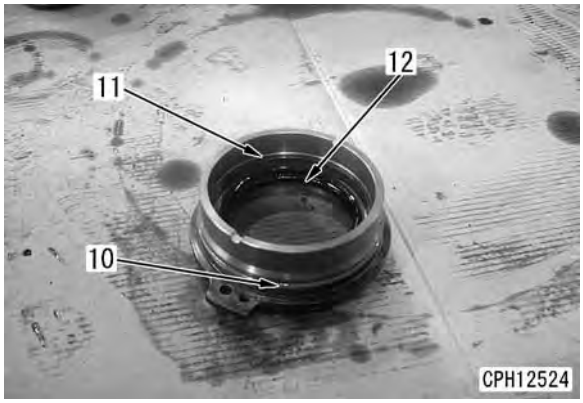
3. Removal of exhaust connector between turbocharger and muffler
1) Remove connecting band (9) of exhaust connectors (7) and (8). [*2]
2) Loosen clamp (10) on the rubber hose side of the exhaust connector. [*3]
3) Remove U-bolt (11) which is fixing the exhaust connector.
4) Pull out exhaust connectors (7) and (8) while prying the rubber tube side.



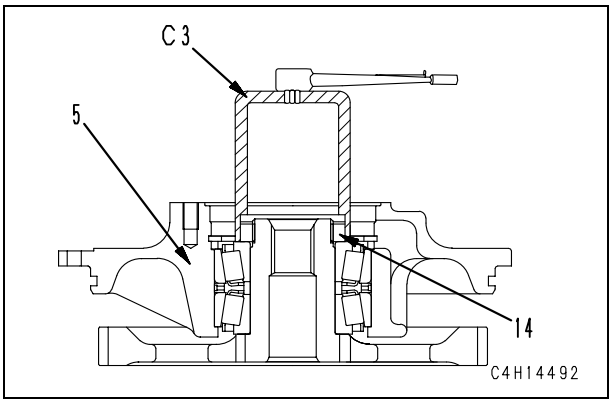
4. Removal of cover and piping
1) Sling cover (12) and loosen the bolts to remove the cover.
Cover: **35 kg**



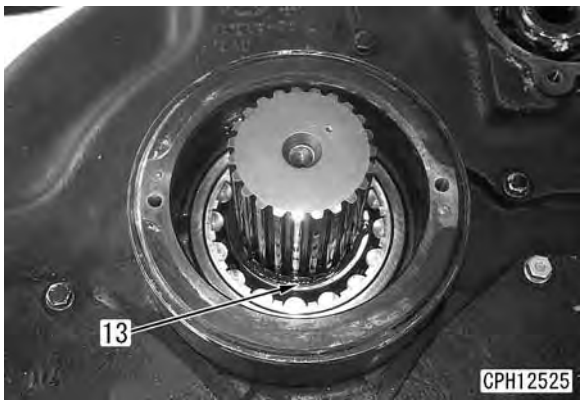
4) Disassembly of cage assembly
   1] Remove O-ring (10).
   2] Remove oil seal (11).
   3] Remove dust seal (12).



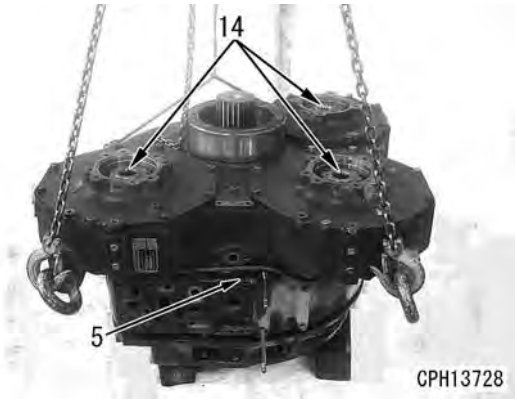
5) Lock the pump drive gear and loosen nut (14) with tool **C3**.
   ★ The nut is difficult to loosen after the pump drive gear assembly is removed. Accordingly, loosen it at this point.



6) Remove snap ring (13).

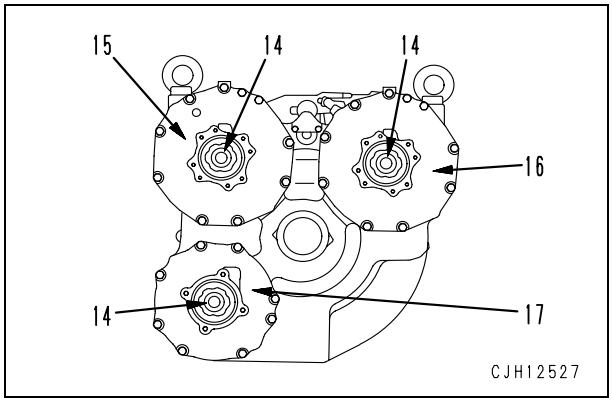


7) Remove 4 remaining PTO assembly mounting bolts (7).
8) Using forcing screws, separate PTO assembly (5) from the housing.
9) Lift off the PTO assembly.



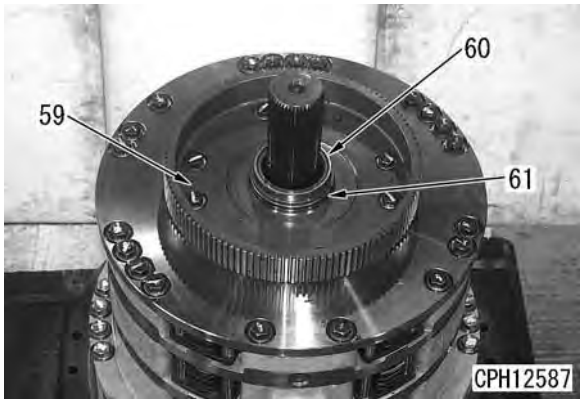
6. Disassembly of PTO assembly

1) Using forcing screws, remove pump drive gear cage assemblies (15), (16) and (17).



11. No. 3 ring gear

1) Remove No. 3 ring gear (59).
2) Remove inner race (60) and seal ring (61) from No. 3 ring gear (59).

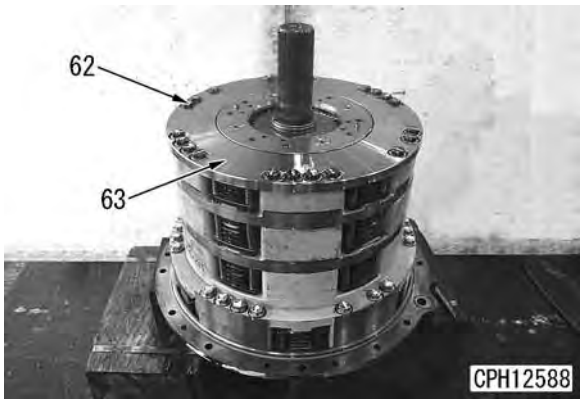


12. Tie bolt

Remove tie bolts (62).

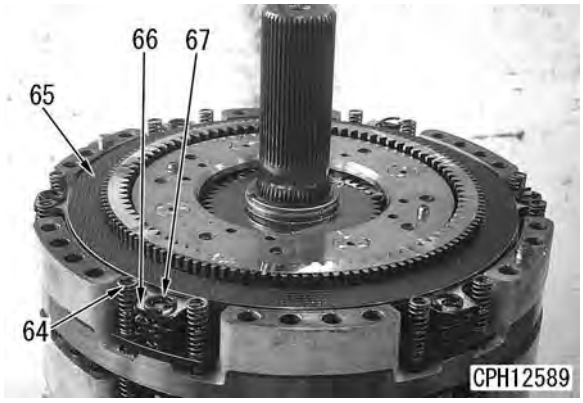
13. No. 4 clutch plate

Using eyebolts, remove plate (63).



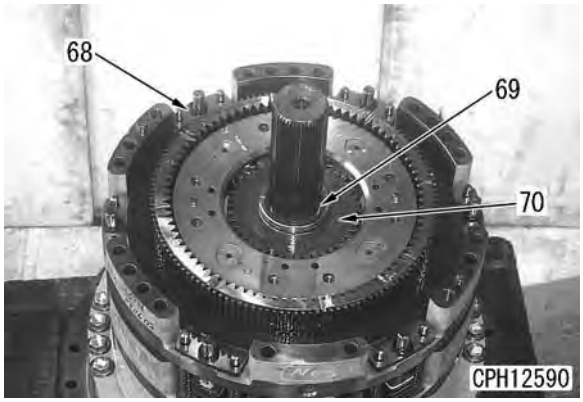
14. Nol. 4 clutch disc, plate and spring

1) Remove springs (64).
2) Remove discs (65), plates (66) and springs (67).



15. No. 4 sun gear and plate

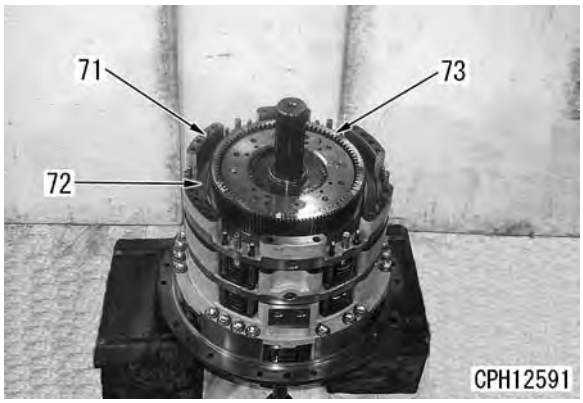
1) Remove plate (68).
2) Remove snap ring (69).
3) Remove sun gear (70).



16. No. 4 housing, piston and ring gear

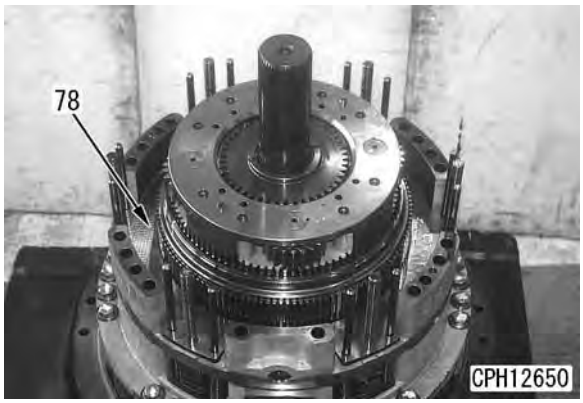
Using eyebolts, remove No. 4 housing (71), piston (72) and ring gear (73) together.

★ If the dowel pin is hard to disconnect and the housing needs to be pried up, take care not to damage the housing.

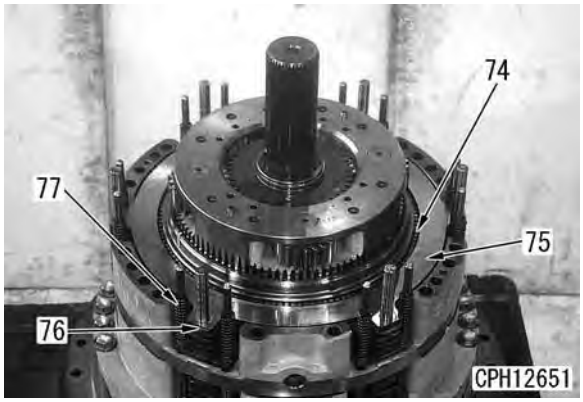


23. No. 5 clutch disc, plate and spring

1) Install piston plate (78).



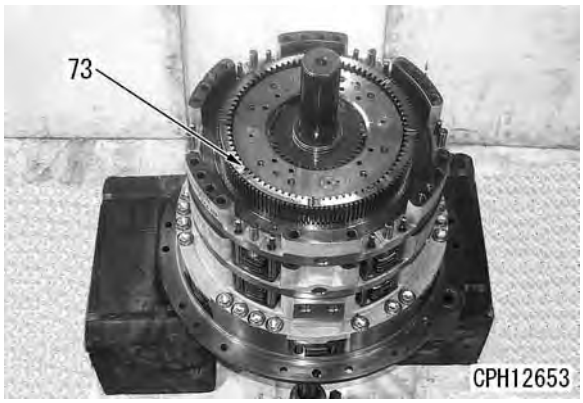
2) Install disc (74), plate (75) and spring (76).
3) Install guide spring (77).



24. No. 4 housing and piston

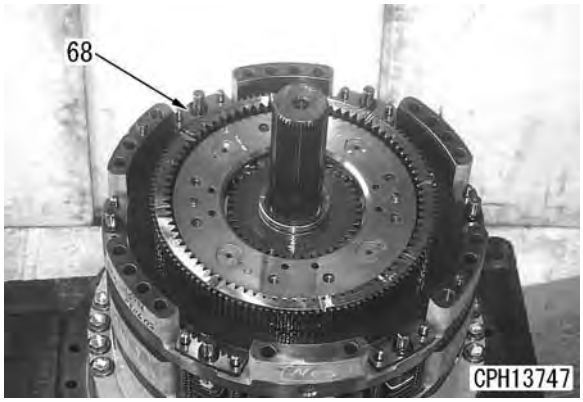
1) Install the seal rings to housing (71) and piston (72), and then install the piston to the housing.
   ★ Direct the grooves of the seal rings toward the pressure receiving side (inside).
2) Using eyebolts, sling and install housing (71) and set it to the springs.
   ★ If the dowel pin is hard to insert, drive it in with a plastic hammer.

3) Set No. 4 clutch ring gear (73).
   ★ Direct the side of the cut inside down.

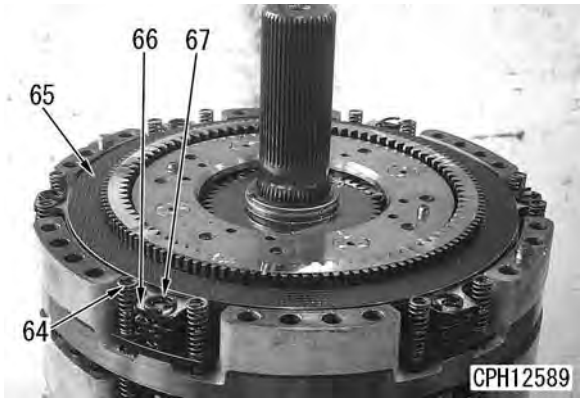


25. No. 4 clutch disc, plate and spring

1) Install piston plate (68).



2) Install discs (65), springs (67) and plates (66) alternately.
3) Install spring (64).



Disassembly and assembly of differential assembly

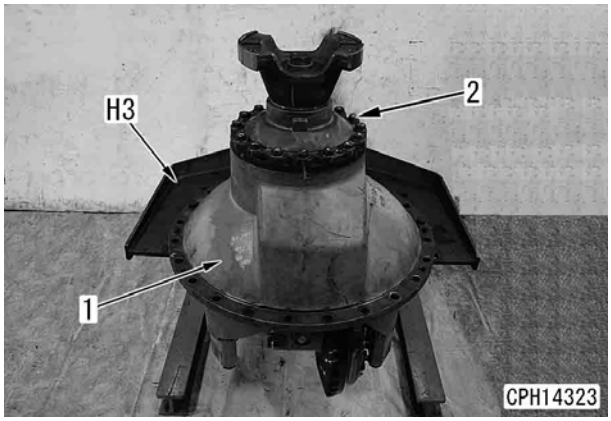
Special tools

Sym-bol		Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
D	3	790-425-1670	Adapter	■	1		
	4	792-525-3000	Micrometer	■	1		
H	3	790-501-2001	Repair stand	■	1		
		792-622-1110	Bracket	■	1		
	4	790-425-1660	Wrench	■	1		
	5	792-201-7010	Wrench	■	1		

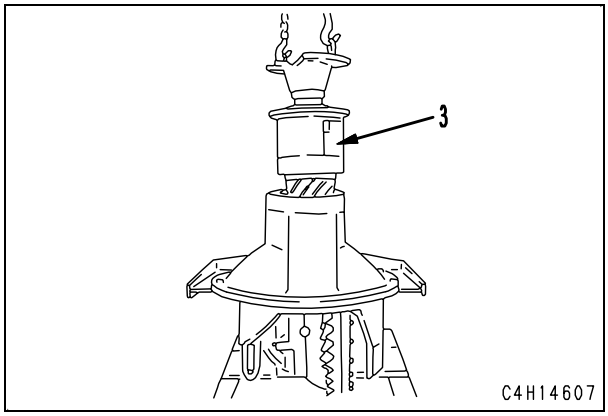
Disassembly

1. Set differential assembly (1) to tool **H3**.

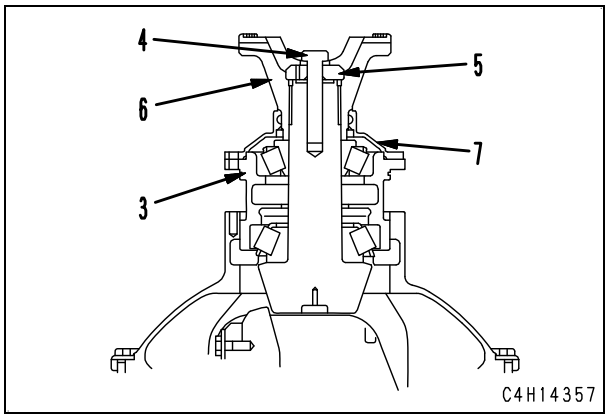
2. Remove mounting bolts (2).



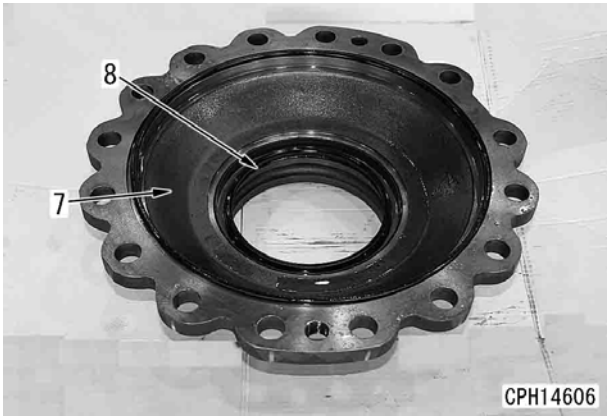
3. **Cage assembly**
   1) Remove cage assembly (3).
      ★ Record the thickness and quantity of the shims.



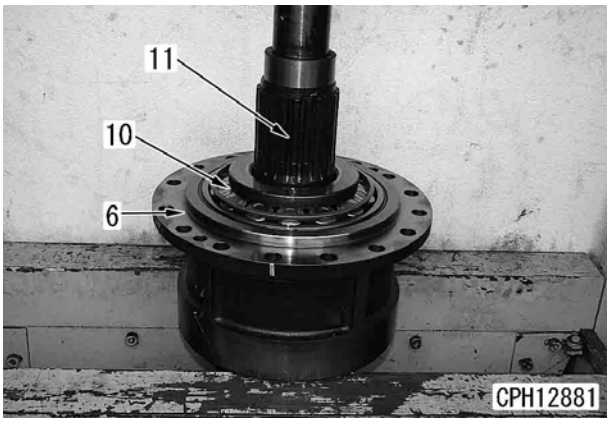
   2) Remove mounting bolt (4) and retainer (5).
   3) Remove the O-ring and coupling (6) together.
   4) Using forcing screws, remove cover (7).



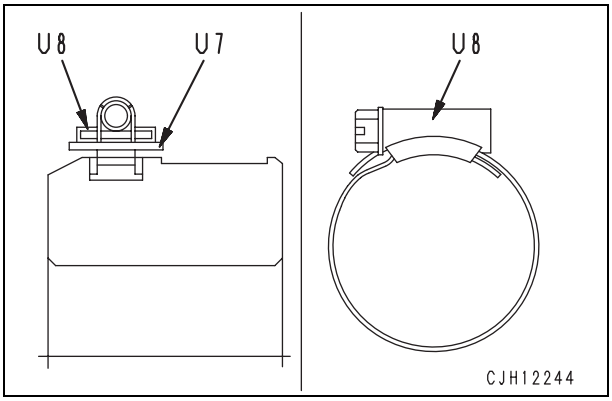
   5) Remove dust seal (8) from cover (7).



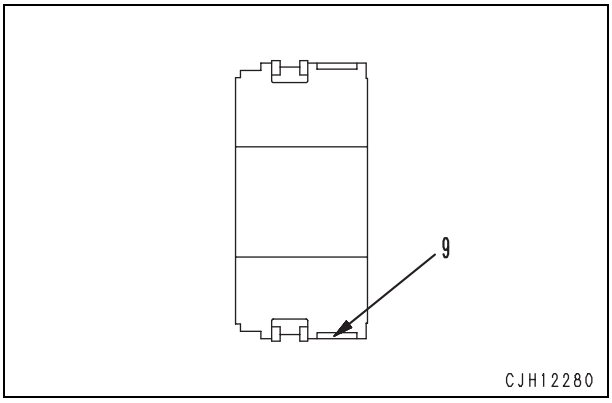
4. **Disassembly of pinion and cage assembly**
   1) Remove cage (6) and inner bearing (10) together from pinion gear (11).



3) Set tool **U7**. Using tool **U8**, shrink the piston ring.

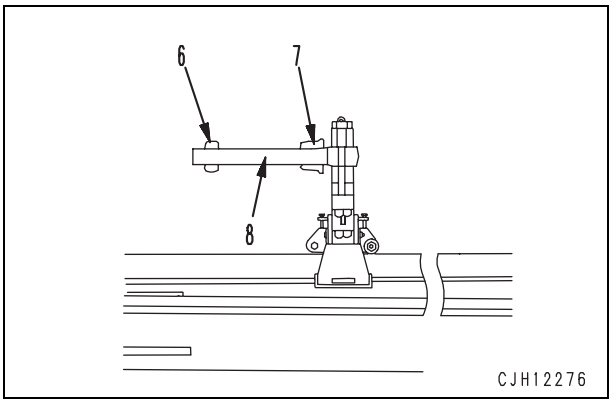


4) Install wear ring (9).

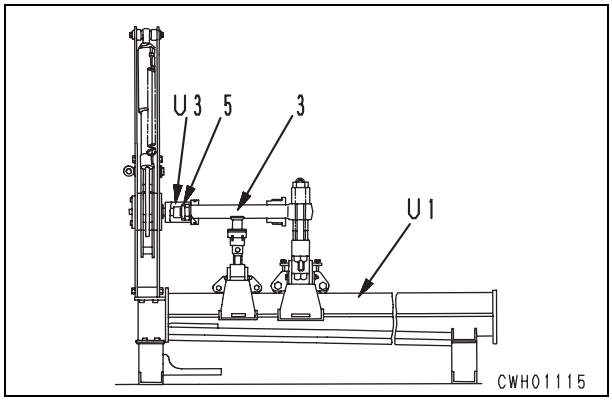


3. Assembly of piston rod assembly

1) Install cylinder head assembly (7) and piston assembly (6) to piston rod (8).

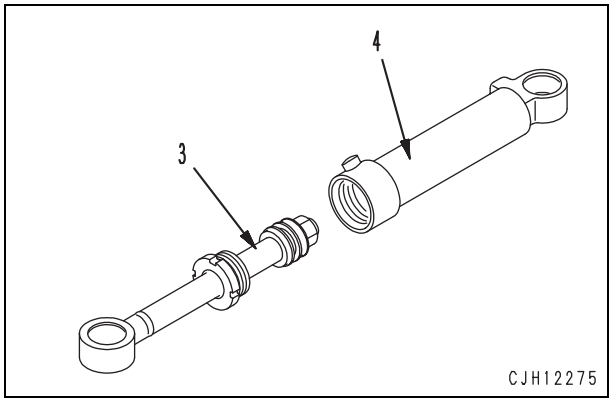


2) Using tool **U3**, tighten nut (5).
   Nut: **Adhesive (LOCTITE No. 262)**
   Nut:
   3.97 ± 0.40 kNm {405 ± 40.5 kgm}
   ★ Width across flats: **80 mm**
3) Remove piston rod assembly (3) from tool **U1**.

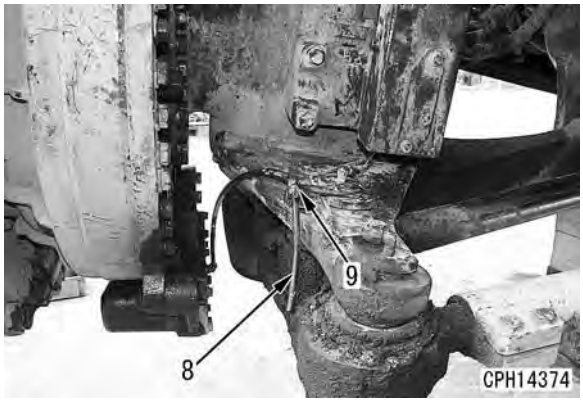


4. Set cylinder (4) to tool **U1**.

5. Install cylinder head and piston rod assembly (3) to cylinder (4).

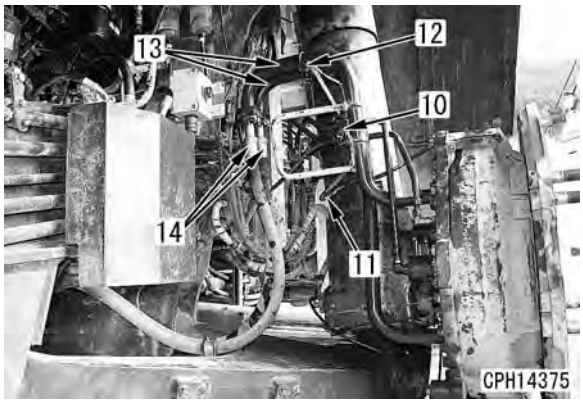


6. Remove clamp (9) of hose (8).



7. Remove clamp (10) and disconnect wiring harness (11).

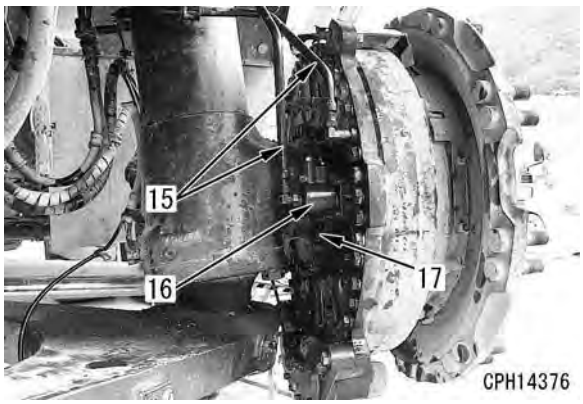
8. Remove U-clamp (12) and tube (13).
   ★ Hang tube (14) on the frame.



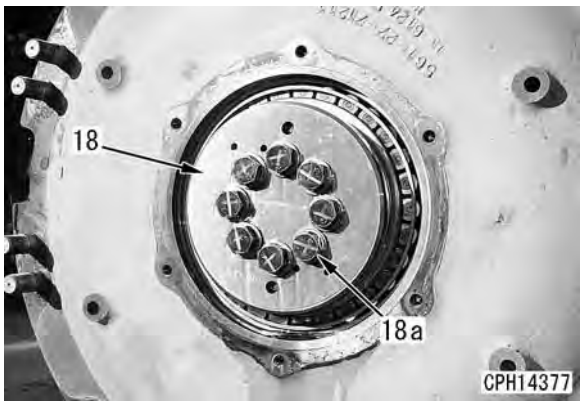
9. Disconnect tube (15) and hang it on the frame.

10. Remove slack adjuster (16).

11. Remove wheel hub assembly mounting bolts (17), leaving some of them. [*3]

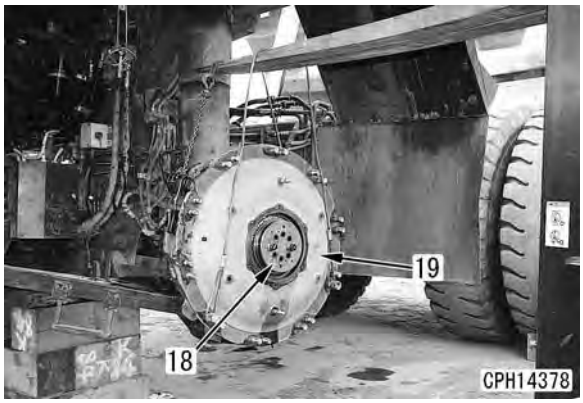


12. Loosen and remove mounting bolts (18a) of hub bearing fixing plate (18), leaving 2 of them at diagonal positions. [*3]



13. Sling wheel hub assembly (19).

14. Insert a bar in the hole of bolt (18a), remove the remaining 2 bolts, and remove hub bearing fixing plate (18) toward this side, taking care not to dropping it.



15. Remove hub bearing assembly (20).