CEBM019012

Shop Manual

HD785-7

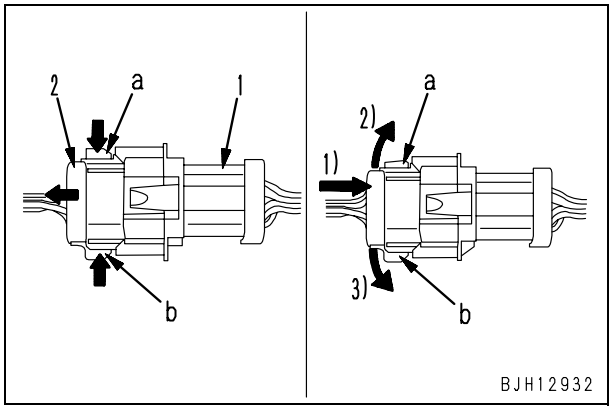
DUMP TRUCK

SERIAL NUMBERS **A10001 & 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.

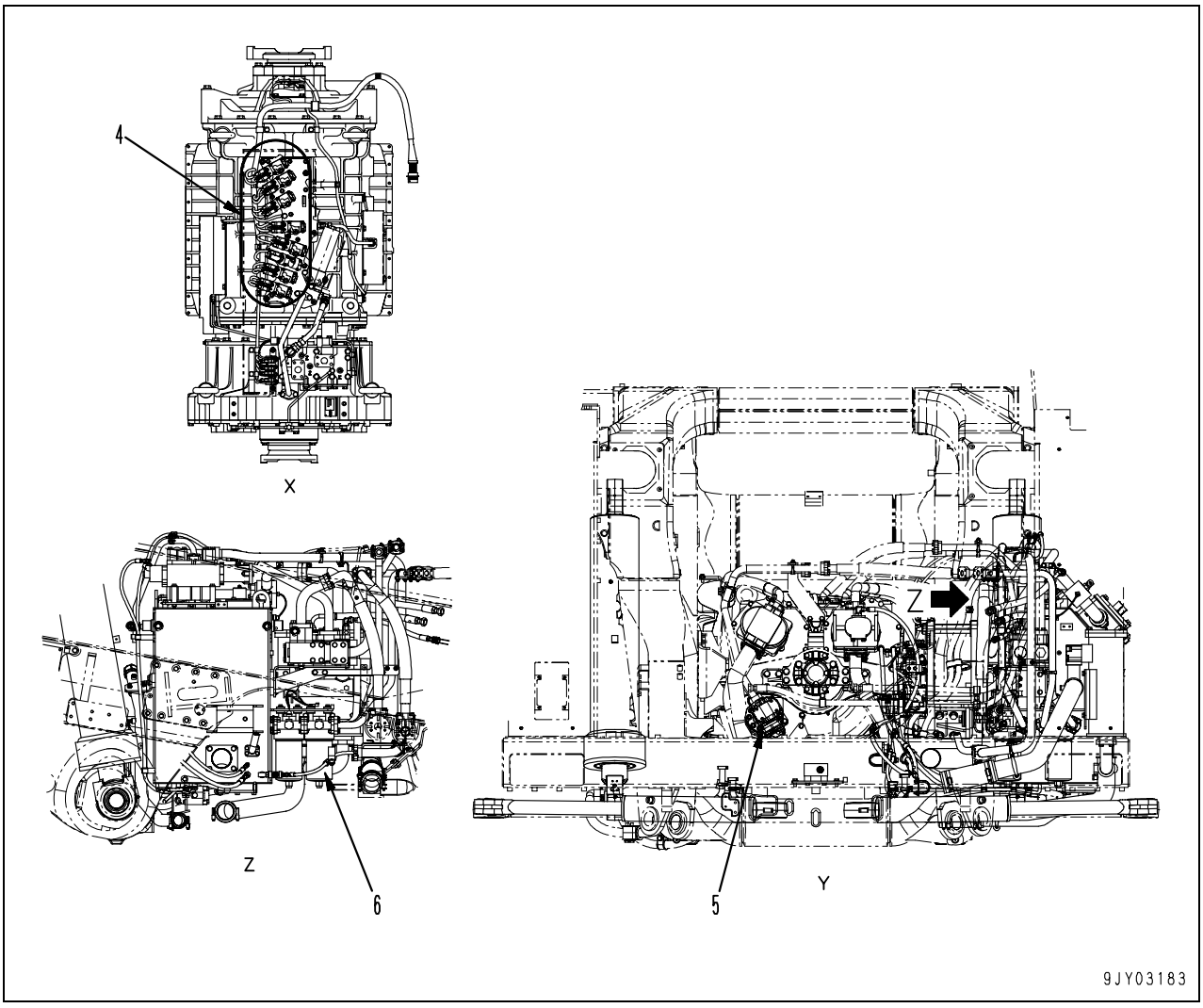
Note 1: SAE0W30EOS and SAE5W40EOS must be fully synthetic and HTHS (High-Temperature High-Shear Viscosity @ 150 °C), specified by ASTM D4741 must be equal to or higher than 3.5mPa-S(3.5cP).
Komatsu EOS0W30 and EOS5W40 are the most suitable oils.

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	A10001 and up

10 Structure, function and maintenance standard

Power train, Part 2

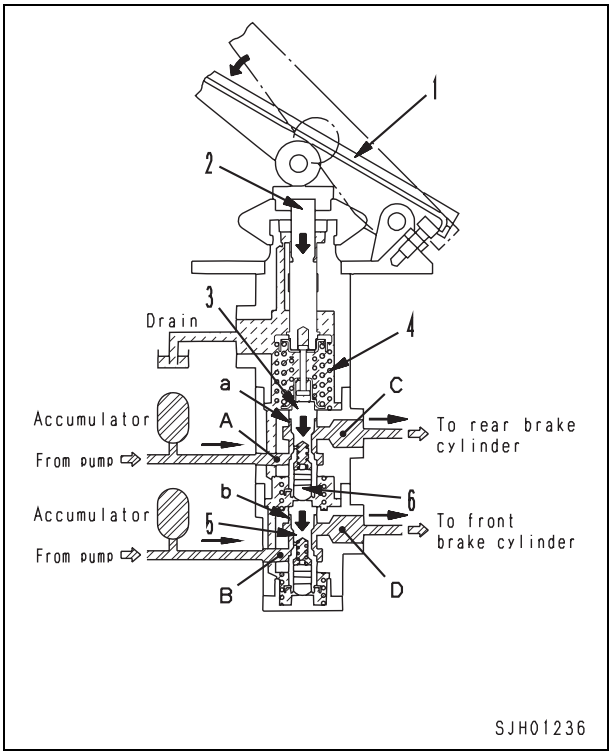
Operation

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.

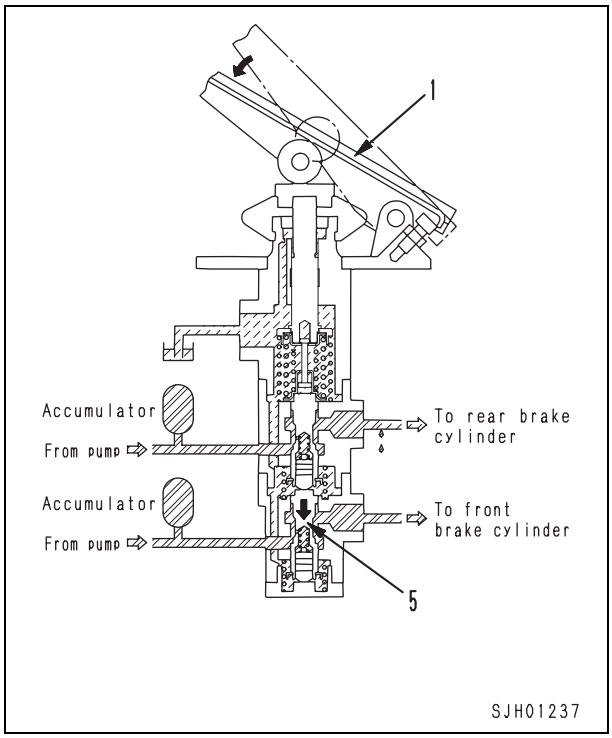


Applying brake when upper valve fails

- 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

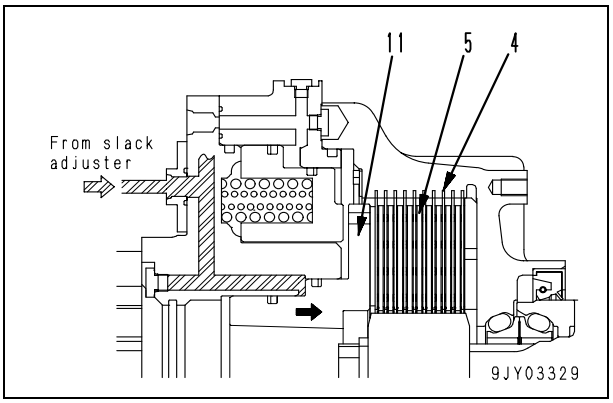
- When oil fills the rear brake cylinders and the pressure between port (A) and port (C) becomes high, the oil entering port (H) from orifice (e) of spool (3) pushes against spring (4). It pushes up spool (3) and shuts off the circuit between port (A) and port (C). When this happens, drain port (a) stays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

Function

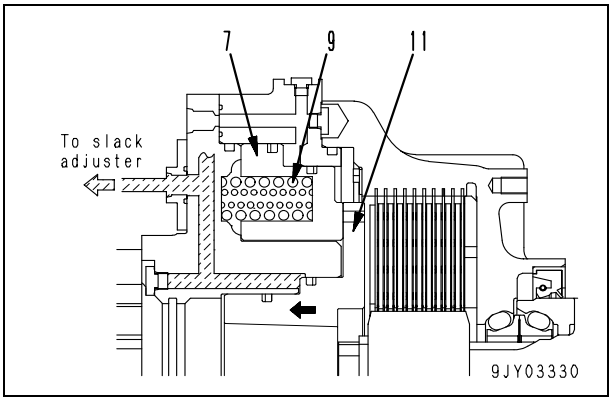
- The rear brake is of an oil cooled multiple disc type, and it operates as a parking brake by use of spring.

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.

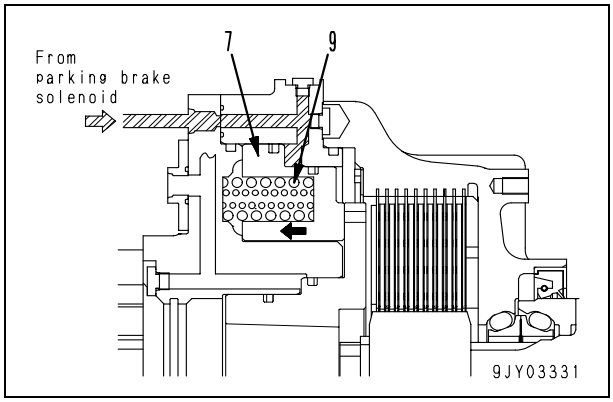


- If the brake pedal is released, the hydraulic pressure on brake piston (11) is released and the piston is moved to the left by the brake cooling oil pressure and consequently the brake is released.

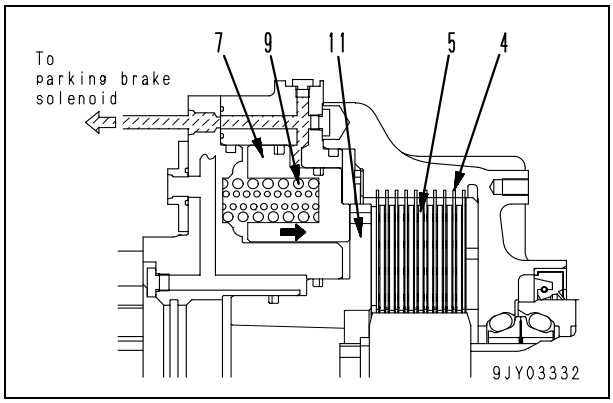


Operation of parking brake

- 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	

1. Spool
2. Check valve
3. Plug
4. Relief valve

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
5	Spool return spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring.
		221.7 x 40	155	1,230 N {125.6 kg}	—	986 N {100.5 kg}	
6	Check valve spring	56 x 21.4	47	3.38 N {0.345 kg}	—	2.71 N {0.276 kg}	

Function

- The steering control valve distributes the hydraulic oil from the steering and hoist pump to the steering circuit and hoist circuit according to pressure signals from the steering valve.
- The steering control valve is a load sensing type valve, which controls spool (1) by operating the steering system.
- While the machine is not being steered (While the steering circuit does not need the pressurized oil), the steering control valve supplies all of the pressurized oil from the pump to the hoist valve.
- If the machine is steered, the steering control valve supplies the necessary hydraulic oil for the steering operation to the steering valve and supplies the rest to the hoist valve.
- The above operation reduces the hydraulic horsepower lost in the steering circuit.

Unit: mm

<table>
<tr><th>No.</th><th>Check item</th><th colspan="6">Criteria</th><th>Remedy</th></tr>
<tr><td rowspan="6">1</td><td rowspan="6">Side clearance</td><td colspan="2">Model</td><td colspan="2">Standard clearance</td><td colspan="2">Clearance limit</td><td rowspan="11">Replace</td></tr>
<tr><td colspan="2">SAR(4)-180</td><td colspan="2" rowspan="2">0.11 – 0.16</td><td colspan="2" rowspan="2">0.20</td></tr>
<tr><td colspan="2">SAR(4)-180</td></tr>
<tr><td colspan="2">SAR(1)-6</td><td colspan="2">0.10 – 0.15</td><td colspan="2">0.19</td></tr>
<tr><td colspan="2" rowspan="3">Clearance between inside diameter of plain bearing and outside of diameter of gear shaft</td><td colspan="2">SAR(4)-180</td><td colspan="2" rowspan="2">0.06 – 0.141</td><td colspan="2" rowspan="2">0.20</td></tr>
<tr><td colspan="2">SAR(4)-180</td></tr>
<tr><td colspan="2">SAR(1)-6</td><td colspan="2">0.06 – 0.119</td><td colspan="2">0.20</td></tr>
<tr><td rowspan="5">3</td><td rowspan="5">Depth to knock in pin</td><td>Model</td><td>Standard size</td><td colspan="2">Tolerance</td><td colspan="2">Repair limit</td></tr>
<tr><td>SAR(4)-180</td><td>21</td><td colspan="2">0
–0.5</td><td colspan="2" rowspan="4">—</td></tr>
<tr><td>SAR(4)-180/
SAR(4)-180</td><td rowspan="2">14</td><td colspan="2" rowspan="2">0
–0.5</td></tr>
<tr><td>SAR(4)-180/
SAR(1)-6</td></tr>
<tr><td>SAR(1)-6</td><td>10</td><td colspan="2">0
–0.5</td></tr>
<tr><td>4</td><td>Rotating torque of spline shaft</td><td colspan="6">21.6 – 34.3 Nm {2.2 – 3.5 kgm}</td><td rowspan="5">—</td></tr>
<tr><td rowspan="4">—</td><td rowspan="4">Discharge amount
Oil: EO10-CD
Oil temperature: 45–55°C</td><td>Model</td><td>Rotating speed (rpm)</td><td>Delivery pressure MPa {kg/cm^2}</td><td>Standard delivery amount (ℓ/min)</td><td colspan="2">Delivery amount limit (ℓ/min)</td></tr>
<tr><td>SAR(4)-180</td><td rowspan="3">2,000</td><td rowspan="2">20.6
{210}</td><td rowspan="2">335.8</td><td colspan="2" rowspan="2">310.2</td></tr>
<tr><td>SAR(4)-180</td></tr>
<tr><td>SAR(1)-6</td><td>24.5
{250}</td><td>10.1</td><td colspan="2">9.4</td></tr>
</table>

DUMP TRUCK

HD785-7

Machine model	Serial number
HD785-7	A10001 and up

10 Structure, function and maintenance standard

Cab and its attachments

Outline

The controllers on the network use the data from the sensors installed to all parts of the machine to observe and control the condition of the vehicle and transmit those data as network data to the machine monitor. The machine monitor, in return, displays these data and inform the operator of the condition of the machine.

- There are two types of display on the machine monitor: the normal mode and the service mode.
- The items that are always displayed for the operator are the normal mode items. Their main content is as follows.

(For details, see "Operation and Maintenance Manual", "Operation".)

1. Normal display items
   - Meters (speedometer, tachometer)
   - Gauges (engine coolant temperature, torque converter oil temperature, retarder oil temperature, fuel level)
   - Pilot display
   - Service meter, odometer (character display)
2. Items displayed when there is abnormality
   Caution, action code display (while an action code is being displayed, press machine monitor mode selector switch (>). A failure code (6-digit) is then displayed.)
3. Maintenance monitor function
   When the filter, oil replacement interval is reached, the item needing replacement is displayed in the character display.
4. Others
   In combination with the character display and the machine monitor mode selector switch, which is used to operate the character display, the following items can be displayed, set, and adjusted.
   1) Dumping counter (if equipped)
   2) Display reverse travel distance measurement value
   3) Reset filter oil replacement interval
   4) Input telephone number
   5) Select language
   6) Reverse R1/R2 selection
   7) Payload meter calibration ID setting (if equipped)

- To make it easier to carry out troubleshooting of the controllers on the network (including the machine monitor itself), a service mode function is provided. Its main content is as follows. For detail, see "Special function of machine monitor" of "Testing and adjusting".

1. Displaying trouble history data for electrical components
   - Displays electrical component failure occurrence data from each controller that is saved in machine monitor.
   - Deletes data from memory
2. Displaying trouble history data for machine
   Displays machine failure occurrence data from each controller that is saved in machine monitor.
3. Real-time monitor
   Takes input, output signal, and calculation values recognized by each controller on network and displays them in real time.
4. Reduced cylinder mode
   This function is used to stop the supply of fuel sprayed from the fuel injector to each of the cylinders. This function is used for the purpose of, for example, determining the cylinder where there is defective combustion.
5. No injection cranking
   This function is used to lubricate an engine without starting the engine to drive a vehicle after a long-term storage.
6. Adjusting function
   This function is used to correct installation errors of sensors, solenoid valves, and compensate production tolerances of parts and components.
7. Maintenance monitor
   This function is used to change filter oil replacement interval and stop the function.
8. Operation information display function
   This function is used to display fuel consumption amount per operation hour.
9. Engine mode fixing function
   This function is used to check the performance.
10. Snapshot function
    For details of this function, see "Testing and adjusting" of "Manual snapshot".
11. Payload meter function (if equipped)
    This function is used to setting and adjusting of payload meter.
    For details of this function, see "Operation and maintenance manual" or "Structure, function and maintenance standard" of "Payload meter (having VHMS)".
12. Option selection function
    This function is used to select controller information and optional equipment to be operated.
13. Model selection function
    Input model information to be mounted.
14. Initialize
    This function is used to set the machine monitor when the machine is shipped from the factory.

Signal and model					Remarks
Signal name	Model name				
	HD325-7 HD405-7	HD465-7E0 HD605-7E0	HD465-7R HD605-7R	HD785-7	
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
CAN SHIELD GND	○	○	○	○	
CAN (–)	○	○	○	○	
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	
–	○	○	○	○	
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	
	○	○	○	○	
	○	○	○	○	(–) : NON CONNECT
CAN (+)	○	○	○	○	(–) : NON CONNECT
–	○	○	○	○	

Input and output signal

CN1

Pin No.	Signal name	Imput/output signal
1	SUS press sensor (RL)	Input
2	Strg potentio	Input
3	Retard oil temp (R)	Input
4	GND (SIG)	–
5	Retard SW (rear)	Input
6	Brake system filter	Input
7	SUS press sensor (RR)	Input
8	Body position sensor	Input
9	Retard oil temp (F)	Input
10	GND (SIG)	–
11	Retard SW (F)	Input
12	Memory clear SW	Input

Pin No.	Signal name	Imput/output signal
13	ARSC set SW	Input
14	Retard lever	Input
15	Alternator R	Input
16	Sens PWR	Output
17	Service brake press SW	Input
18	Validation SW2	Input
19	Hoist lever (main)	Input
20	Hoist lever (SUB)	Input
21	GND (Analog GND)	–
22	Pot PWR	Output
23	Exhaust brake SW	Input
24	Validation SW1	Input

CN2

Pin No.	Signal name	Imput/output signal
1	–	Output
2	Strg hoist filter SW	Input
3	Strg hoist lever SW	Input
4	232C RxD	Input
5	Brake wear SW (RL)	Input
6	–	Input
7	ENG oil level SW	Input
8	–	Output
9	Body float signal	Output
10	Wheel speed (RR)	Input
11	–	Output
12	–	–
13	Eng oil filter	Input
14	–	Output
15	Brake wear SW (FR)	Input
16	–	Input
17	Retard cooling filter	Input
18	Stop lamp relay	Output
19	–	Output
20	Wheel speed (RL)	Input

Pin No.	Signal name	Imput/output signal
21	–	Input/Output
22	CAN0 L	Input/Output
23	–	Input/Output
24	PWR CTR EXT	Input
25	Brake wear SW (FL)	Input
26	Parking brake sol status	Input
27	–	Input
28	TM & Brake oil level SW	Input
29	GND (pulse GND)	–
30	T/M output shaft speed	Input
31	–	–
32	CAN0_H	Input/Output
33	–	Input/Output
34	–	–
35	Key SW C (Engine start)	Input
36	Steering speed	Input
37	–	Input
38	Battery requid level SW	Input
39	GND (pulse GND)	–
40	–	Input

CN3

Pin No.	Signal name	Imput/output signal
1	VB (controller PWR)	Input
2	VIS (solenoid PWR)	Input
3	SOL_COM (solenoid common GND)	Input
4	–	Output
5	Hoist EPC valve	Output
6	–	Output
7	Auto SUS SOL1	Output
8	+24 V for sensor	Output
9	Parking brake press SW	Input
10	ASR press SW (RL)	Input
11	VB (controller PWR)	Input
12	VIS (solenoid PWR)	Input
13	SOL_COM (solenoid common GND)	Input
14	Key SIG	Input
15	ASR shut off valve	Output
16	Retard valve (R)	Output
17	Hoist change valve	Output
18	BCV relay	Output
19	–	Input
20	ASR press SW (RR)	Input

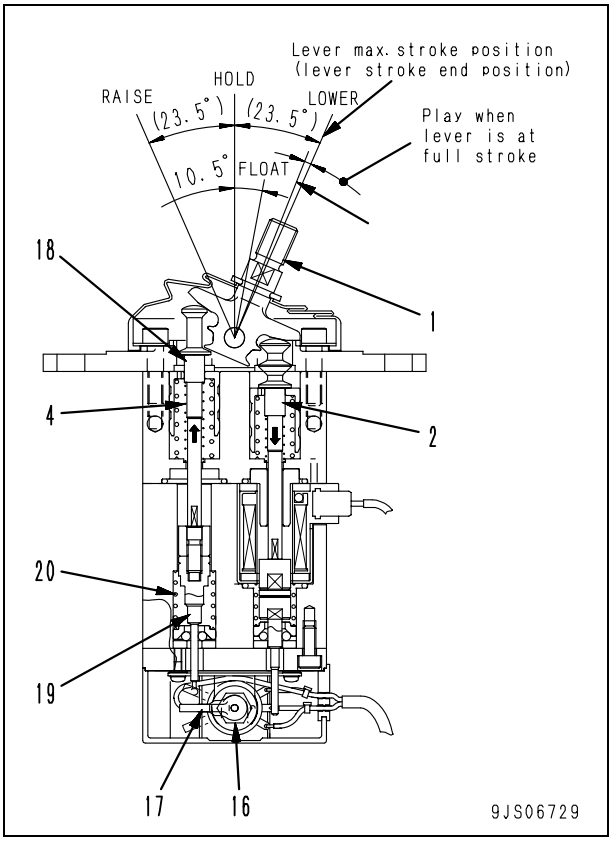
Pin No.	Signal name	Imput/output signal
21	GND (controller GND)	Input
22	VIS (solenoid PWR)	Input
23	SOL_COM (solenoid common GND)	Input
24	Key SIG	Input
25	–	Output
26	ASR valve (RL)	Output
27	Lever kick out sol	Output
28	–	Output
29	–	Input
30	Shut off valve SW	Input
31	GND (controller GND)	Input
32	GND (controller GND)	Input
33	GND (controller GND)	Input
34	Power out 5V1	–
35	–	Output
36	ASR valve (RR)	Output
37	Auto SUS SOL2	Output
38	Exhaust brake valve	Output
39	Secondary brake SW	Input
40	ASR check SW	Input

2. When dump control lever is returned from "FLOAT" position

- To return lever (1) from the "FLOAT" position, push it down with a force larger than the holding force of rod (19), detent spring (20), retainer (13) and ball (14).

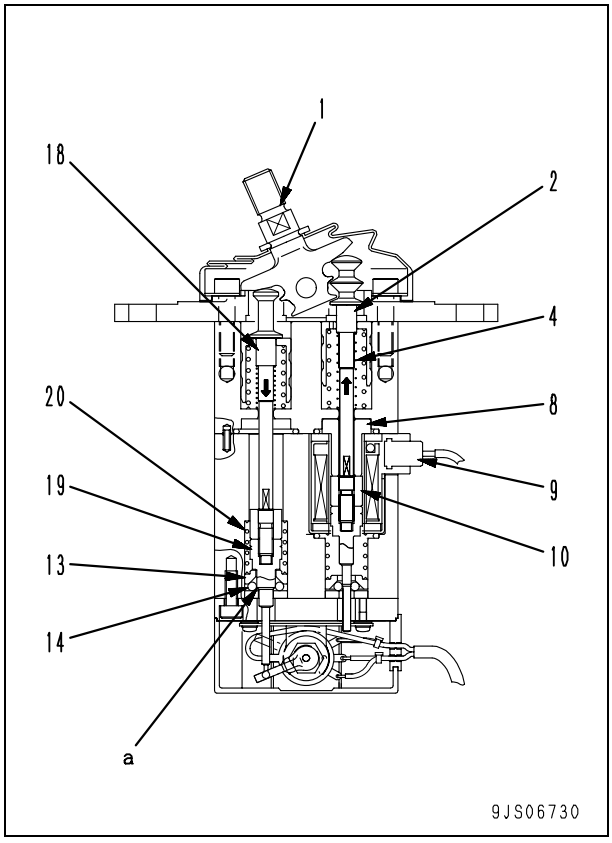
3. When dump control lever is set in "LOWER" position

- If lever (1) is leaned further from the "FLOAT" position, it is set in the "LOWER" position.
- Rod (18) is pushed up by spring (4) according to the operation stroke of lever (1).
- Since lever (17) and rod (19) installed to the turning shaft of potentiometer (16) are connected to each other, potentiometer (16) outputs voltages according to the vertical stroke of the rod.



4. When dump control lever is set in "RAISE" position

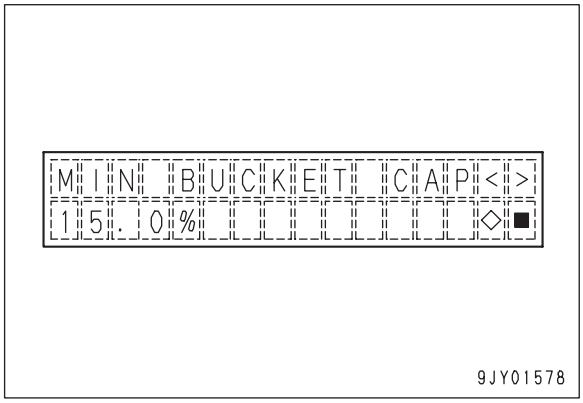
- If rod (18) on the RAISE side is pushed and moved down with lever (1), ball (14) touches projection (a) of rod (19) on the stroke. (Before start of electric detent)
- If rods (18) and (19) are pushed further, ball (14) pushes up retainer (13) held on detent spring (20) and escapes out to go over projection (a) of rod (19).
- At this time, rod (2) on the opposite side is pushed up by spring (4).
- If rod (2) is pushed up while current is flowing in solenoid (9), nut (10) is attracted by bushing (8).
- As a result, rod (2) is kept pushed up. Accordingly, even if the operator releases the lever, the lever is held in the "RAISE" position.



5. When dump control lever is returned from "RAISE" position

- To return lever (1) from the "RAISE" position, push it down with a force larger than the attraction of the solenoid. It is also returned to the "HOLD" position when the solenoid power supply is turned "OFF" and the "RAISE" operation is reset.

5. Setting of payload to recognize start of loading



Input a payload to recognize start of loading by pressing the following switches.

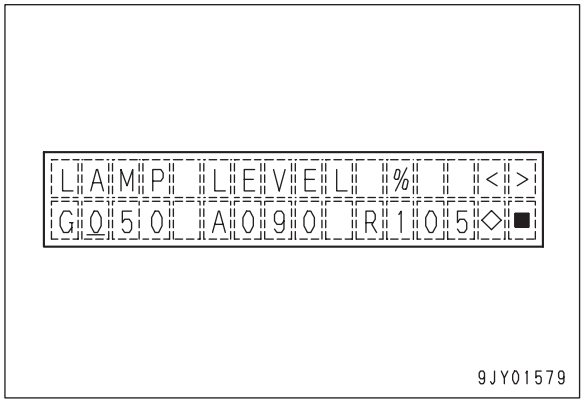
- [>] switch:
  Number at cursor moves forward.
- [<] switch:
  Number at cursor moves backward.
- [◇] switch: Enter number at cursor.
- [■] switch: Stop inputting number.

The setting range is 6 – 25.5%.
(Default: 15%)

★ This function does not assure the operation because of the contrary phenomena shown below.

- If the value is reduced, start of loading may be recognized wrongly.
- If the value is increased and a loader having a small-capacity bucket is used, the forecast function of the outside indicator lamps and the MMS communication may not operate normally.

6. Setting of indication range of outside indicator lamps

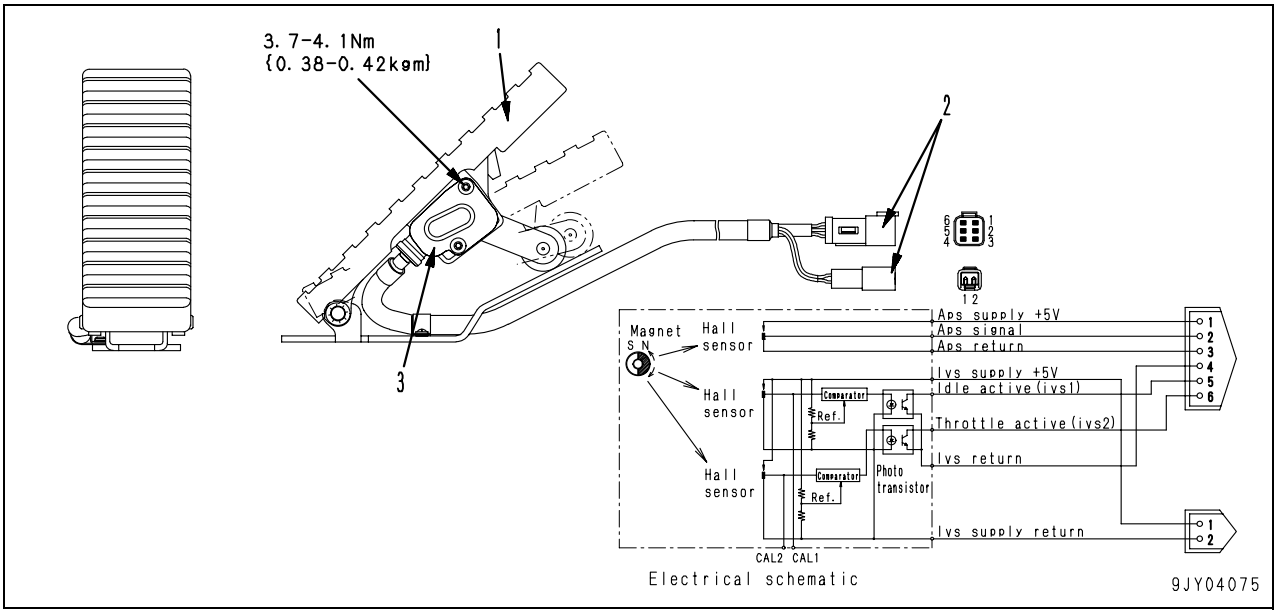


Input an indication range of the outside indicator lamps by pressing the following switches.

- [>] switch:
  Number at cursor moves forward.
- [<] switch:
  Number at cursor moves backward.
- [◇] switch: Enter number at cursor.
- [■] switch: Stop inputting number.

★ The setting range is 0 – 130% of the load capacity.
Set (A) (Yellow lamp) higher than (G) (Green lamp) and set (R) (Red lamp) higher than (A) (Yellow lamp), however.

Serial No. A10001 and up



1. Pedal
2. Connector
3. Sensor

Function

- This sensor is installed on the surface of the floor. It outputs the accelerator signal or idle validation signal depending on the accelerator pressing angle.

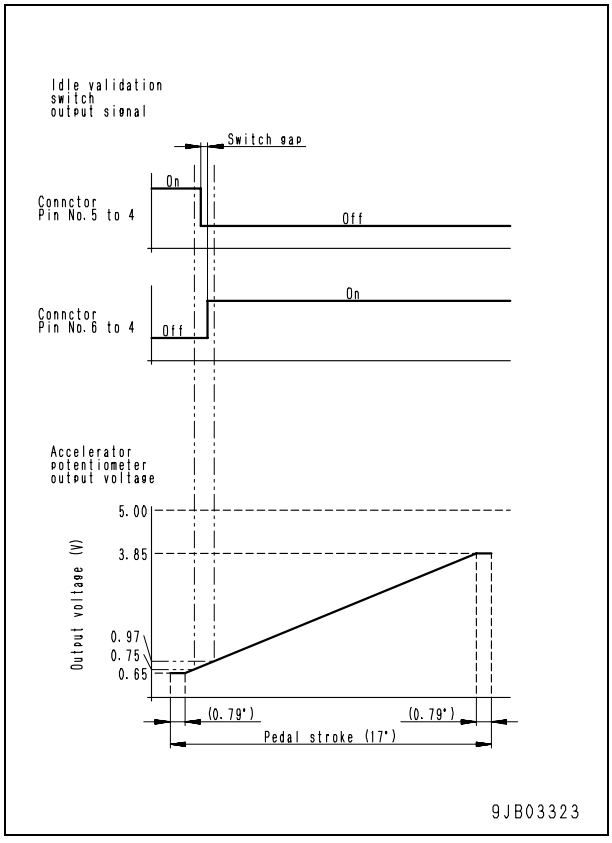
Accelerator signal

- Magnitude of the accelerator pedal displacement being detected by the potentiometer inside the sensor is output in variable voltage from No. 2 pin.

Idle validation signal

- The switch inside the sensor detects the accelerator pedal operation. As the accelerator pedal is released, it outputs the signal being entered to No. 5 pin from No. 4 pin. And as the accelerator pedal is pressed, it outputs the signal being entered to No. 6 pin from No. 4 pin.

Output characteristics



DUMP TRUCK

HD785-7

Machine model	Serial number
HD785-7	A10001 and up

20 Standard value table

Standard service value table

Testing and adjusting tools list

Testing/Adjusting item	Symbol		Part No.	Part name	Q'ty	Remarks
Testing air boost pressure	A		799-201-2202	Boost gauge kit	1	-101 – 200 kPa {-760 – 1,500 mmHg}
			799-401-2220	Hose	1	
Testing exhaust temperature	B		799-101-1502	Digital thermometer	1	-99.9 – 1,299 °C
			6215-11-8171	Sensor	1	Wire length: 490 mm
			799-201-1110	Wiring harness	1	
Testing exhaust color	C	1	799-201-9001	Handy smoke checker	1	Bosch index: Level 0 – 9
		2	795-502-1350	Smoke meter	1	
Adjusting valve clearance	D		Commercially available	Thickness gauge	1	Intake: 0.35 mm Exhaust: 0.57 mm
Testing compression pressure	E	1	795-502-1590	Compression gauge	1	0 – 7 MPa {0 – 70 kg/cm^2}
		2	795-471-1310	Adapter	1	For 140E-3, 5
			6261-71-6150	Gasket	1	
Testing blow-by pressure	F	1	799-201-1590	Gauge	1	0 – 10 kPa {0 – 1,000 mmH_2O}
		2	799-201-1450	Adapter	2	
		3	799-201-1511	Nozzle	2	
		4	799-201-1571	Tube	1	
Testing engine oil pressure	G	1	799-101-5002	Oil pressure gauge KIT (Analog)	1	Pressure gauge: 2.5, 6, 40, 60 MPa {25, 60, 400, 600 kg/cm²}
			790-261-1204	Oil pressure gauge KIT (Digital)	1	Pressure gauge: 60 MPa {600 kg/cm²}
		2	799-401-2320	Gauge	1	Pressure gauge: 1 MPa {10 kg/cm^2}
Testing fuel pressure	H	1	799-101-5002	Oil pressure gauge KIT (Analog)	1	Pressure gauge: 2.5, 6, 40, 60 MPa {25, 60, 400, 600 kg/cm²}
			790-261-1204	Oil pressure gauge KIT (Digital)	1	Pressure gauge: 60 MPa {600 kg/cm²}
		2	795-471-1450	Adapter	1	8 x 1.25 (male) – PT1/8 (female)
		3	799-101-5220	Nipple (10 x 1.25 mm)	1	Size: 10 x 1.25 mm
			07002-11023	O-ring	1	
		4	799-401-2320	Gauge	1	Pressure gauge: 1 MPa {10 kg/cm^2}
Testing leakage through pressure limiter and return rate from injector	J	1	6151-51-8490	Spacer	1	ø 14
		2	6141-71-1710	Joint	1	ø 10
		3	Commercially available	Hose	1	Inside diameter: Approx. 11 mm
		4	Commercially available	Hose	1	Inside diameter: Approx. 17 mm
		5	Commercially available	Measuring cylinder	1	
		6	Commercially available	Stopwatch	1	
		7	07376-70315	Plug	1	Size: 03

Testing engine oil pressure

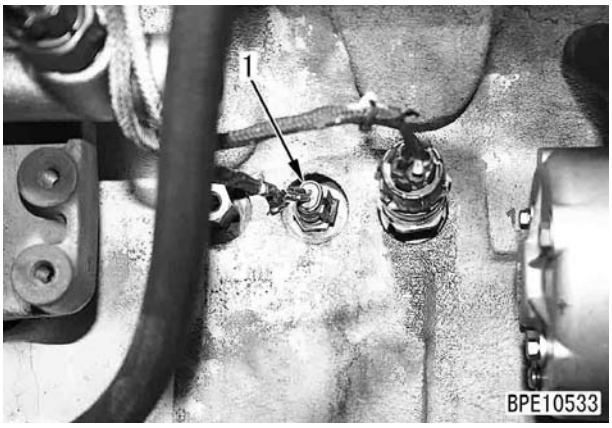
★ **Testing instruments**

Symbol		Part No.	Part name
G	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	799-401-2320	Hydraulic tester

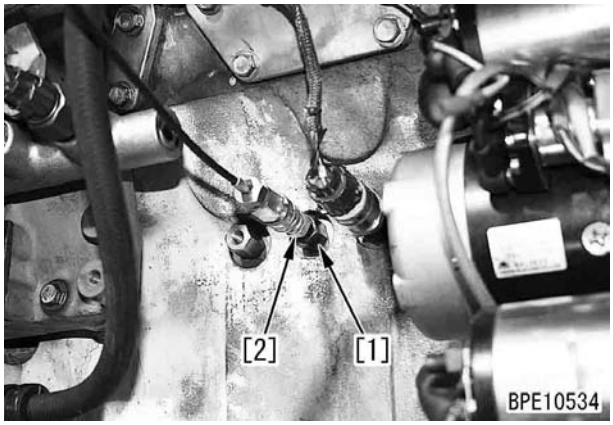
⚠ **Stop the machine on the level ground, turn the parking brake switch PARKING, and set chocks to the tires.**

★ Test the engine oil pressure under the following conditions.
- Engine oil temperature: Min. 80 °C
- Coolant temperature: Within operating range

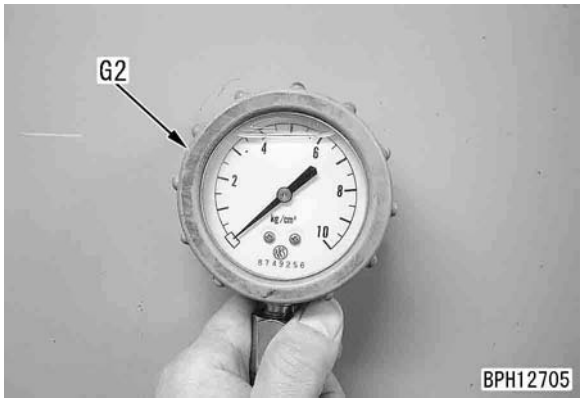
1. Remove oil temperature sensor (1) on the LH side of the cylinder block.
   Keep the removed oil temperature sensor and the wiring harness connector connected.to each other.
   ★ Don't remove the oil pressure sensor right side from the block because the engine controller detects abnormal low pressure error of the oil pressure sensor.



2. Install nipples [1] and [2] of hydraulic tester **G1** and connect them to hydraulic tester **G2**.
   ★ Since the screw size of the sensor mount is 14 x P1.5, nipple (799-101-5230) may be used.



3. Run the engine at the rated output and low idle and test the oil pressure.
   ★ When testing with the engine mounted on the machine, test on the condition described in the shop manual for the machine.

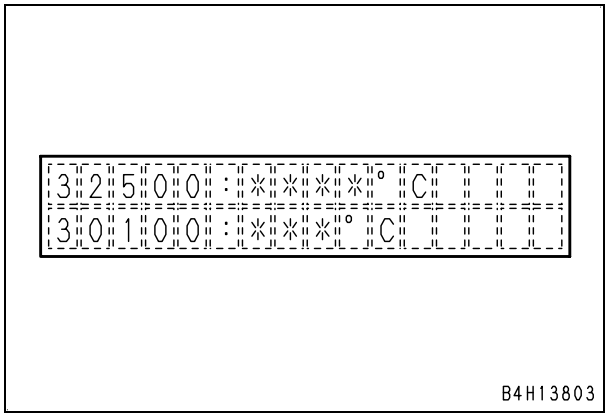


4. After finishing testing, remove the testing tools and return the removed parts.

Testing torque converter stall speed

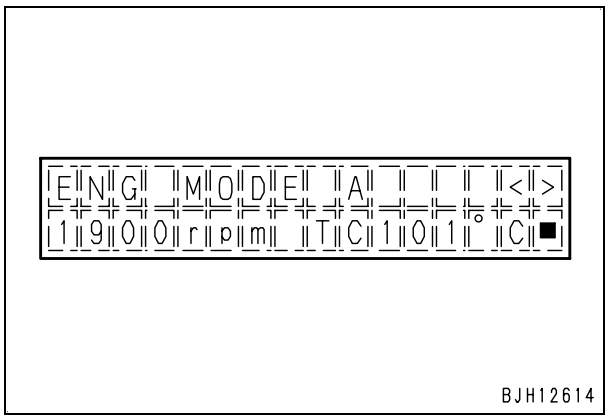
⚠ Stop the machine on the level ground, turn the parking brake switch PARKING, and set chocks to the tires.

1. Turn the starting switch ON and set the monitor panel in the real-time monitoring function (REAL-TIME MONITOR) of the service mode.
   - Monitoring functions: **2 ITEMS**
   - Monitoring code 1: **32500 (T/M OIL TEMP)**
   - Monitoring code 2: **30100 (T/C OIL TEMP)**
   - ★ For the operation method, see "Special functions of machine monitor".



2. Start the engine and raise the temperature of the torque converter oil, transmission oil, hydraulic oil, and coolant.
   - Torque converter oil temperature: 75 – 85 °C
   - Transmission oil temperature: **70 – 85 °C**
   - Hydraulic oil temperature: **45 – 55 °C**
   - Coolant temperature: Within operation range

3. Change the machine monitor to display of the engine mode fixing function (FIX POWER MODE) in the service mode.
   - ★ For the operation method, see "Special functions of machine monitor (EMMS)".



4. Turn the parking brake switch ON, depress the brake pedal, then set the gear shift lever to the D position.
   ⚠ If the gearshift lever is operated to any position other than the D position, the machine may move off even if the brake is being depressed, so always inspect at the D position.
   ⚠ If the torque converter is stalled while the gearshift indicator is indicating "F1", the inside of the transmission may be broken. Accordingly, when stalling the torque converter, seat the body securely and check that the body pilot lamp is turned OFF, and then set the gearshift lever in the D position and check that the gearshift indicator is indicating "F2".

5. Depress the accelerator pedal gradually, run the engine at high idle and stall the torque converter to raise the torque converter oil temperature.
   - ★ 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, perform the test with the body seated.
   ⚠ There is danger of damage to the internal parts of the transmission, so never operate the gear shift lever to any position other than the D position during the stall operation.

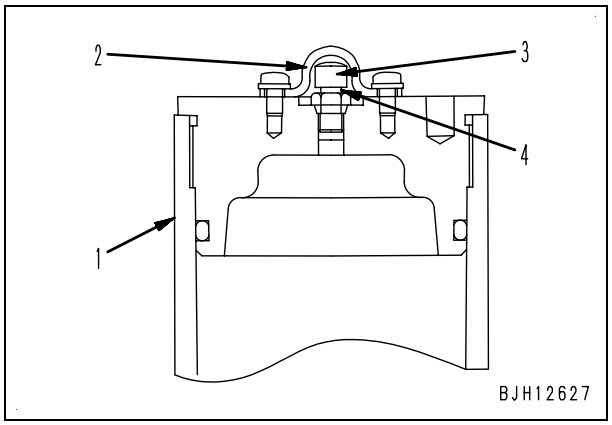
6. When the torque converter oil temperature goes above 90 °C, run the engine immediately at low idle and return the gear shift lever to the N position.
   ⚠ Never operate the gear shift lever with the accelerator pedal depressed. Otherwise it may create a large shock and may also become the cause of shortening the machine's service life.

7. Run the engine at a medium speed, and when the torque converter oil temperature goes down to approx. 80 °C, run at low idle.
   - ★ Keep the gear shift lever at the "N" position.

8. Repeat Steps 4 – 7 and equalize the oil temperature in the torque converter and transmission.

11. Apply soap water to valve (4) of the accumulator to check that nitrogen gas is not leaking.

12. Install cap (3) and valve guard (2) to accumulator (1).
    Cap: **9.8 – 12.7 Nm {1.0 – 1.3 kgm}**



13. In a week after charging the accumulator with nitrogen gas, check that the nitrogen gas pressure has not lowered.
    ★ Check the functions in 5 minutes after stopping the engine. (If the engine is stopped for more than 5 minutes, the brake circuit pressure lowers and the functions cannot be checked accurately.)
    1) Stop the machine on a level place and set the parking brake switch in the "PARK" position.
    2) Start the engine and run it at medium speed for 1 minute and then stop it.
    3) Turn the starting switch to the ON position and press the brake pedal repeatedly. Count the number of presses until the brake oil pressure caution lamp lights up.
       - If number of presses is less than 5: Accumulator gas pressure may have lowered.
       - If number of presses is 5 or more: Accumulator gas pressure is normal.

Testing and adjusting hydraulic pressure in steering, hoist circuit

★ **Testing instrument**

Symbol	Part No.	Part name
K1	799-101-5002	Analog hydraulic meter
	799-261-1204	Digital hydraulic meter

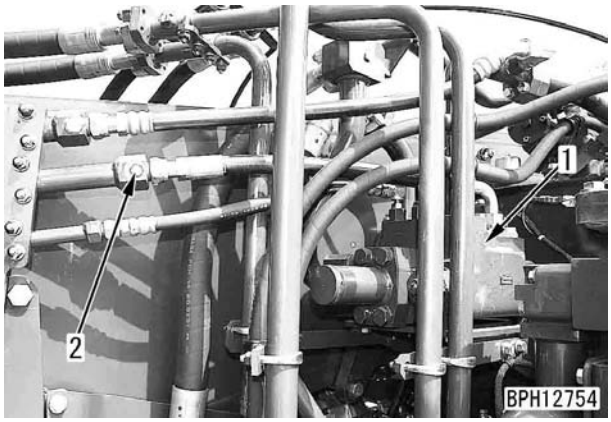
⚠ **Stop the machine on a flat place, turn the parking brake switch to the "PARKING" position and lock the tires with chocks.**

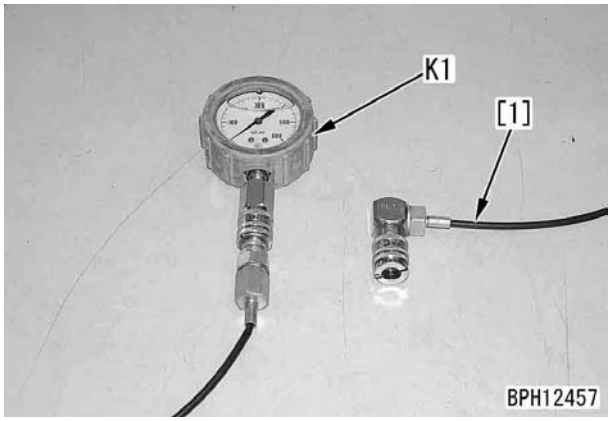
⚠ **When testing and adjusting, lower and seat the body to the frame, stop the engine and remove the hydraulic tank cap to release the residual pressure in the cylinder circuit.**

⚠ **When operating the steering wheel, check that there is nobody around the front tires.**

Steering circuit

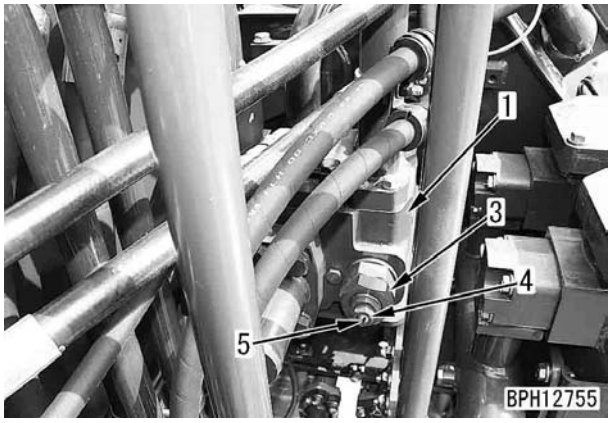
1. **Measuring hydraulic pressure in steering circuit**
   1) Raise the hydraulic oil temperature.
      ★ Oil temperature when measuring : 45 –55°C
   2) Remove plug (2) of the outlet piping of steering demand valve (1) and install tool **K1** (40 MPa {400 kg/cm²}).
   3) Start the engine, turn the steering wheel fully to the right or left to relieve the oil and measure the oil pressure at this time.





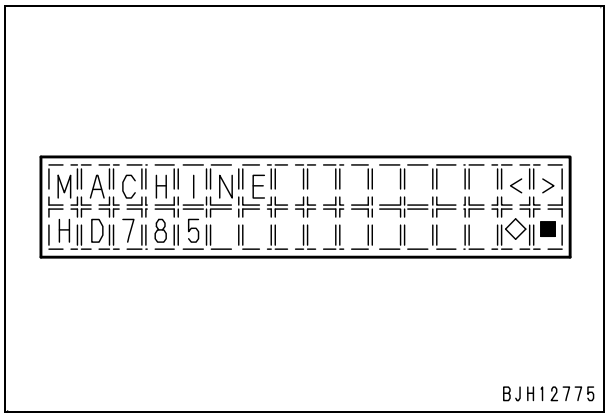
2. **Adjusting hydraulic pressure in steering circuit**
   If the hydraulic pressure is not within the standard value, adjust as follows.
   - Steering pressure (adjust with demand valve)

   1) Loosen locknut (4) of relief valve (5) and turn adjustment screw (5) to adjust.
      ★ To INCREASE pressure, turn CLOCKWISE
      To DECREASE pressure, turn COUNTERCLOCKWISE
      ★ One turn of the adjustment screw adjusts by 12.55 MPa {128 kg/cm²}.



   2) After adjusting, tighten locknut (4), holding adjustment screw (5) with a screwdriver.

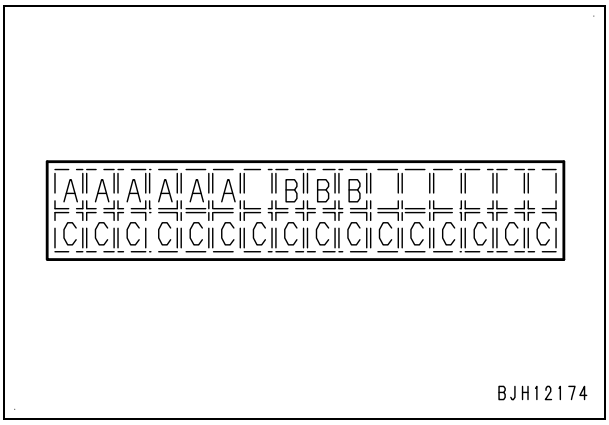
4. Storing data in controller
   1) After determining the model selection setting, check that the display automatically returned to the service menu screen and the selected model is surely displayed.



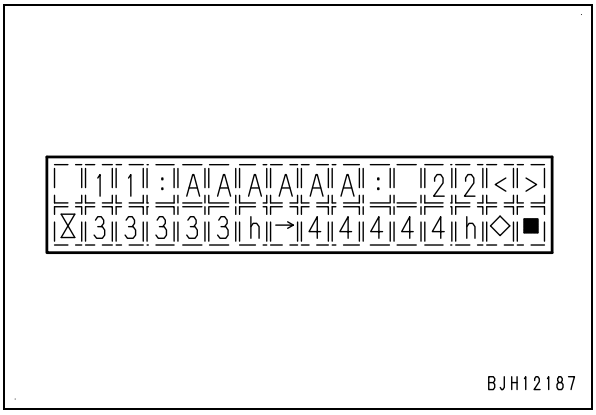
   2) Turn the starting switch OFF and keep that condition for longer than 15 seconds.
      ★ Unless the starting switch is turned off for longer than 15 seconds, the new data is not memorized in the controller.
   3) Turn the starting switch ON again.
      ★ After this operation the model setting becomes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

★ Refer to "Failure code table" for details of displayed failure codes.
★ Be careful of the partial difference in the displayed information for the failure code display function and the failure history display function (service mode).



3. Displayed failure history data
   With the mechanical system failure history display function, the following data can be displayed.
   1: Record number
   A: Failure code (4-digits device code + 2-digits symptom code)
   2: Number of occurrences (number of occurrences of same code in the past)
   3: Elapsed time 1 (time elapsed on service meter since first occurrence)
   4: Elapsed time 2 (time elapsed on service meter since last occurrence)
   ★ Failure codes for problems that are still existing are shown on a flashing display.
   ★ Refer to failure code table of operator mode for details of displayed failure codes.
   ★ Note that with the failure history display function and failure code display function (operator mode) for the mechanical system, the displayed data are partially different.
   ★ If the fault history is not recorded, "-" is displayed on the display section of **1**/**A**/**2**/**3**/**4**.



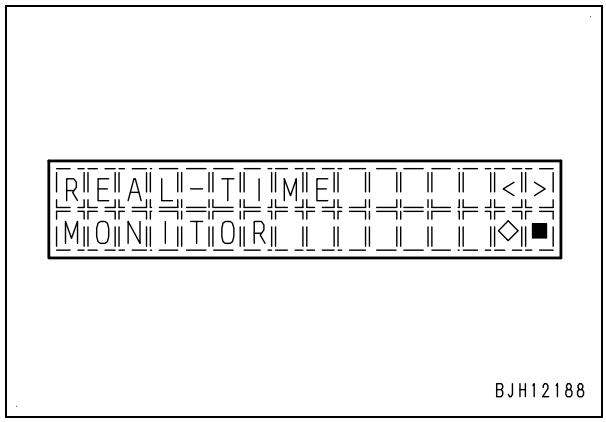
4. Switching failure history display
   If the [>] switch or [<] switch is pressed during the display of failure history, the display switches to another failure history data recorded.
   - [>]: To proceed to data for next record number
   - [<]: Go back to data for previous record number

5. Deleting failure history data (not permitted)
   ★ The failure history data for the mechanical system cannot be deleted.

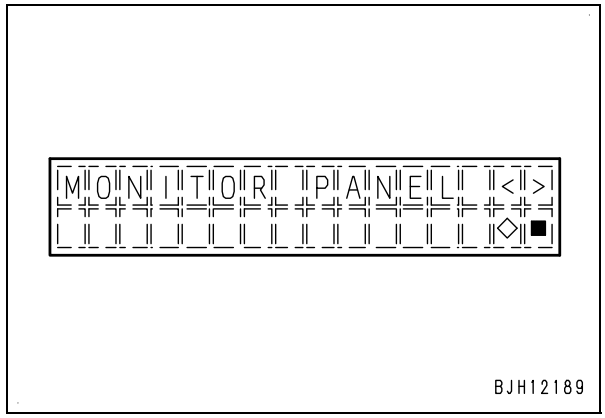
[13] Real time monitoring function (REAL-TIME MONITOR)

The machine monitor can monitor the condition of the machine in real time through the signals from the sensors installed to various parts of the machine.
In the real time monitoring function, the following 2 types of display can be shown.
- 1 item independent display (for each controller)
- 2 items simultaneous display (code input)

1. Selection of the service menu
   Select real time monitoring function (REAL-TIME MONITOR) in the service menu selection screen.



2. Display and selection of monitoring system and function
   1) With the service menu selected, press the [◇] switch to display the monitoring system and function selection screen.
      - [◇]: Conduct the service menu.



   2) If the [>] switch or [<] switch is pressed on the monitoring system and function selection screen, the monitoring system and device is displayed endlessly in the following order, then select the system or function that is used.

Detailed information of 40944 (D-IN--0------7)
[0]: (Unused)
[1]: Connection of ORBCOM (Connected: 1)
[2]: (Unused)
[3]: (Unused)
[4]: (Unused)
[5]: (Unused)
[6]: Download switch under cab (ON: 1)
[7]: Body float state (ON: 1)

Detailed information of 40945 (D-IN--8-----15)
[8]: Protocol selector connector (Automatic transmission: 1)
[9]: Protocol selector connector (MMS communication: 1)
[10]: (Unused)
[11]: (Unused)
[12]: (Unused)
[13]: (Unused)
[14]: (Unused)
[15]: (Unused)

Detailed information of 40946 (D-OUT-0--3)
[0]: External indicator lamp (Lighting of green lamp: 0)
[1]: External indicator lamp (Lighting of orange lamp: 0)
[2]: External indicator lamp (Lighting of red lamp: 0)
[3]: Operation of VHMS (Operating: 1)

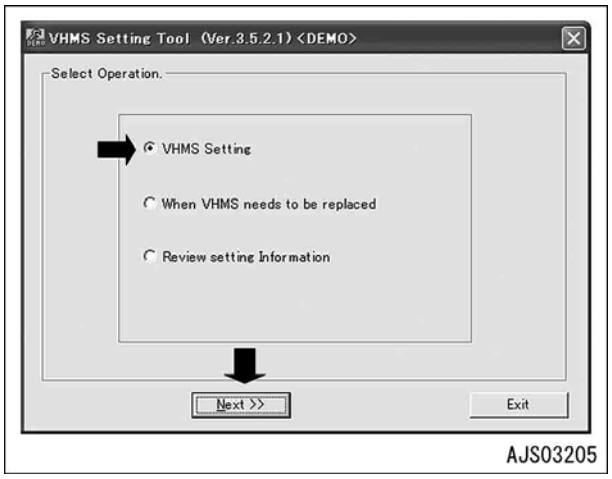
Detailed information of 40947 (D-SEL-0--3)
[0]: SEL-0 (Always: 0)
[1]: SEL-1 (Always: 1)
[2]: SEL-2 (Always: 1)
[3]: SEL-3 (Always: 0)

Detailed information of 42400
[1]: Empty truck is stopped
[2]: Empty truck is traveling
[3]: Truck is being loaded
[4]: Loaded truck is traveling
[5]: Loaded truck is stopped
[6]: Truck is dumping

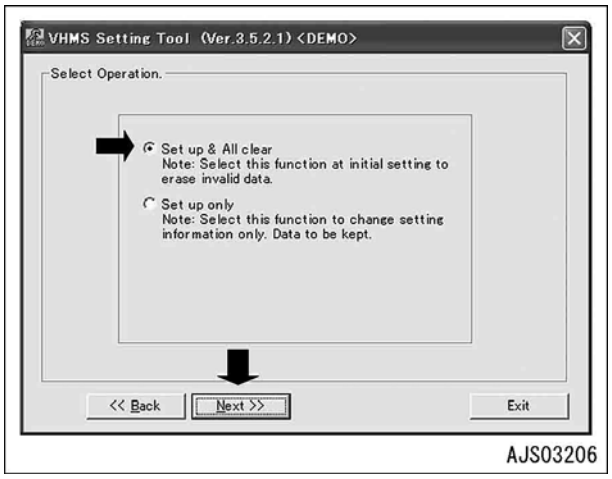
Table of filter and oil replacement time set items

No.	System and function	Code	Display	Replacement frequency (Default value)	Remarks
1	Fuel pre filter	41	FUEL P FILT	0500	
2	Engine oil	01	ENG OIL	0500	
3	Engine oil filter	02	ENG FILT	0500	
4	Transmission oil filter	13	TM FILT	0500	
5	Fuel main filter	03	FUEL FILT	1000	
6	Corrosion resistor	06	CORR RES	1000	
7	Torque converter/Transmission/ Brake oil	24	TC/TM/ BK OIL	1000	
8	Brake oil filter	14	BK OIL FILT	1000	
9	Brake cooling oil filter	16	BK C FILT	1000	
10	Hydraulic oil filter	04	HYD FILT	2000	
11	Differential oil	11	DIFF OIL	2000	
12	Final drive oil	08	FNL OIL	2000	
13	Hydraulic oil	10	HYD OIL	4000	
14	Setting default value for all items	(None)	INITIALIZE	—	All item simultaneous setting function
15	Setting enable or disable for all items	(None)	ALL ITEMS	—	All item simultaneous setting function

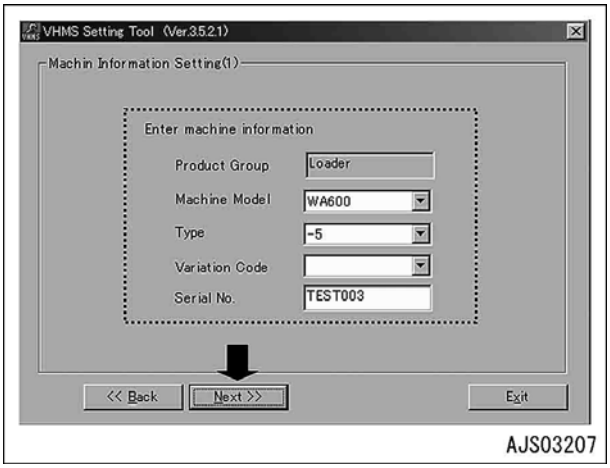
6. **Initial setting of VHMS controller (Ver. 3. 5. 2. 1 or later version)**
   ★ This work is done inside the cab (from PC).
   ★ It is prohibited in the initial setting to modify the data of service meter [SMR].
   1) Select [VHMS Setting] and then press [Next] button.



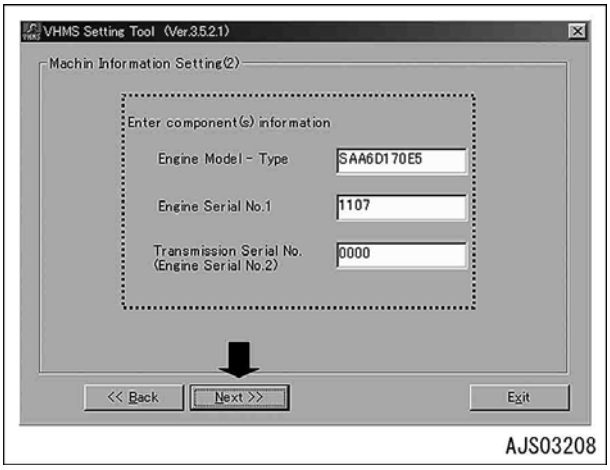
   2) Select [Set up & All clear] and press [Next] button.



   3) Confirm the machine information and, if they are correct, press [Next] button.



   ★ When VHMS has been installed later, it is required to enter the information such as [Serial No.].



Precautions for replacing VHMS controller

★ **Testing instrument**

Symbol		Part No.	Part name
N	1	799-608-3211	Diskette
	2	799-608-3220	Wiring harness
	3	Commercially available	Note type PC (Windows 98/2000/Me/XP/Vista and terminal "RS232C" is with it)

★ When it is required to replace a VHMS controller, setup of the replacing VHMS controller shall be conducted before and after the replacement according to the following procedure.
★ Machine data collected with VHMS controller are stored and managed on WebCARE database. In order to endure smooth data processing on WebCARE, consistency must be provided among the settings done on VHMS controller. Inconsistencies in the settings obstruct loading of data to WebCARE, hampering appropriate use of VHMS data. Setting work after replacement, therefore, is a must.
★ Check each step of the setting work referencing the "VHMS initial setting work check sheet".
★ Information such as models shown in the figures may not be identical with actual ones.

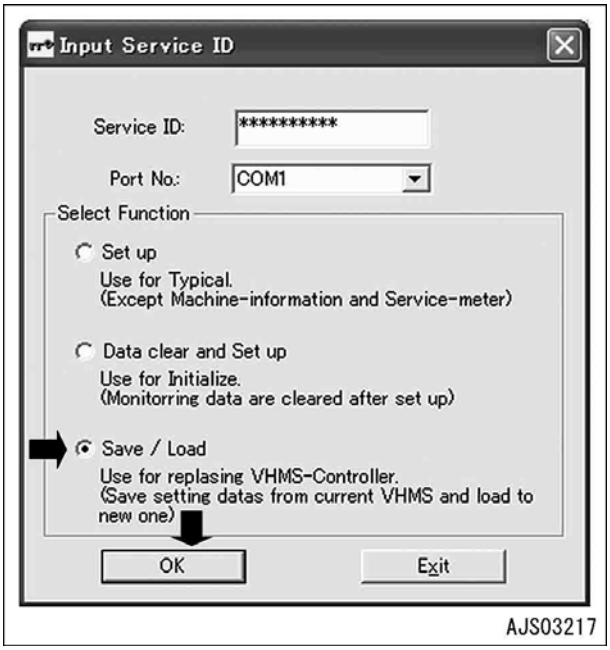
[Operations needed prior to replacement of VHMS controller]

1. **Download of the remaining data**
   ★ This work is done inside the cab (from PC).
   ★ Using [Download] function, download the currently recorded and remained data on VHMS to PC.
   ★ For the operating procedure, refer to "8. Download of setting data" in "VHMS controller initial setting procedure".

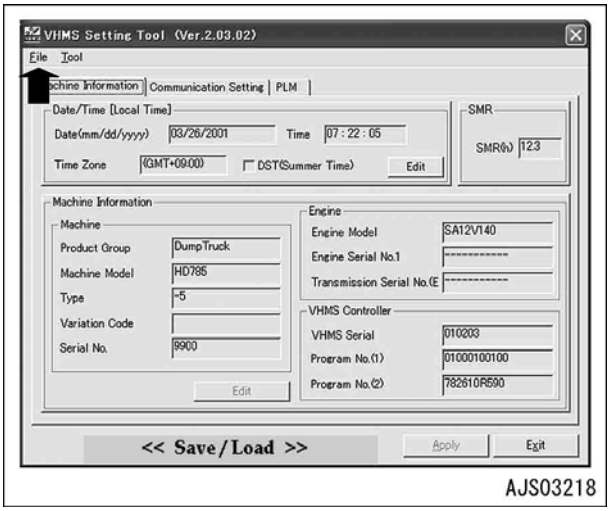
2. **Confirmation, saving and loading of VHMS controller setting information (Ver. 3. 5. 2. 1 or older version)**
   ★ This work is done inside the cab (from PC).
   ★ Setting information is saved from the VHMS controller to be replaced to the PC and the saved information is loaded to the new VHMS controller after the replacement.

2-1. Confirmation of VHMS controller setting information prior to replacement

1) Connect the PC and start the VHMS initial setting tool.
   ★ See the "VHMS controller initial setting procedure" for this operation.
2) Select [Save/Load] and press [OK] button.



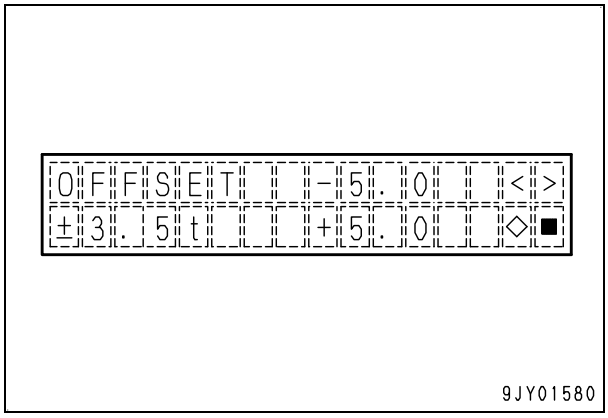
3) Confirm every information before the replacement.
4) Select [Save] from [File] of the menu.



- [<] button: Number at cursor moves backward
- [◇] button: Enter number at cursor
- [■] button: Stop inputting number

★ % The setting range is 0 - 130**%** of the rated load weight.
Set A (Yellow lamp) higher than G (Green lamp) and set R (Red lamp) higher than A (Yellow lamp), however.

8. Setting of OFFSET range



Input an offset range by pressing the following buttons.

- [>] button: Number at cursor moves forward
- [<] button: Number at cursor moves backward
- [◇] button: Enter number at cursor
- [■] button: Stop inputting number

★ The setting range is -5.0 – +5.0 [t].
Check the unit of the input value by the previous menu screen.

★ The unit is indicated in the ( ) on the right side of the input value [t].
(METRIC): metric ton
(SHORT): short ton

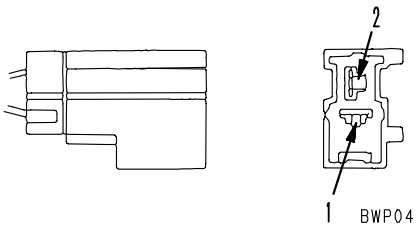
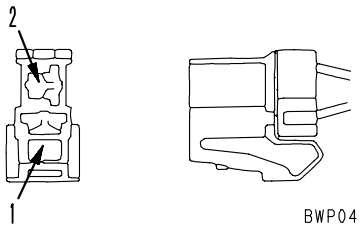
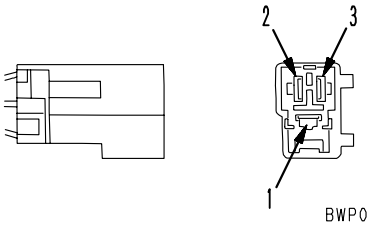
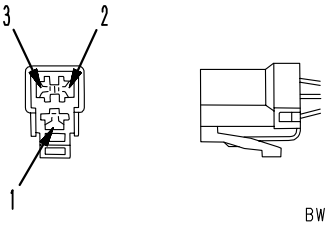
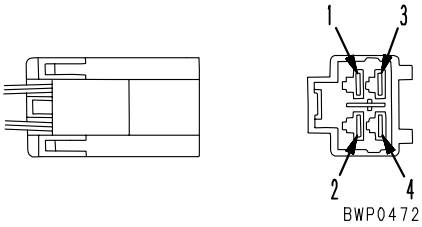
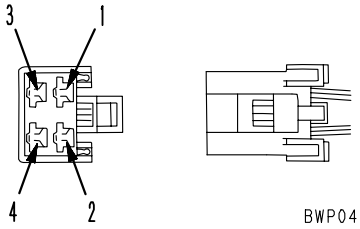
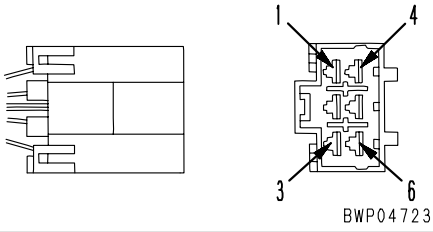
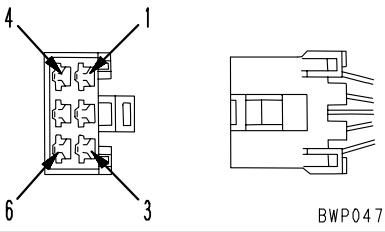
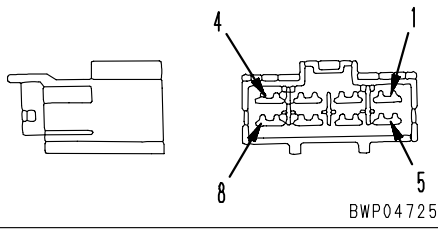
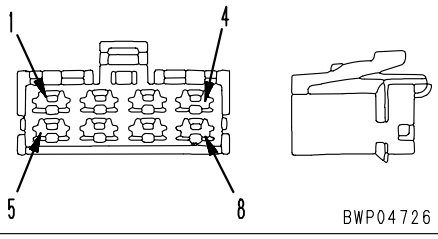
★ Failure codes:
The failure code table is written in alphabetical order and also starting from small number.
The failure code in parentheses is not recorded in the failure history for both electrical system and mechanical system.

★ Applicable equipment:
Applicable equipment indicates in which controller system the failure has occurred.
MON : Machine monitor system
ENG : Engine controller system
TM : Transmission controller system
BK : Retarder controller system
ABS : ABS controller system
VHMS : PLM function system of VHMS controller (Note: Displayed as "PLM" on machine monitor)
PLC : Pre-lubrication controller system

★ Action codes:
Action codes indicate what is displayed in the operator mode when a failure is detected.

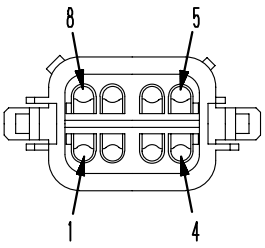
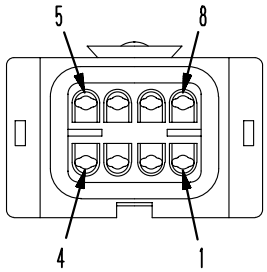
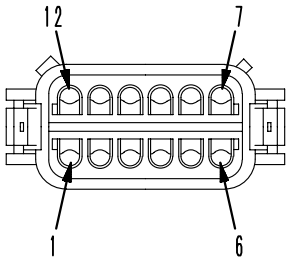
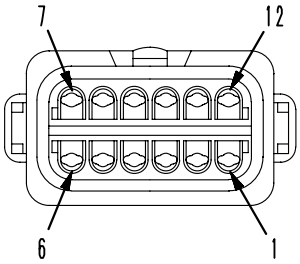
★ History classification:
History classification indicates in which system, either electrical system or mechanical system in the failure history display function, a failure has been recorded.

★ Note : Optional equipment is also included in this table.

No. of pins	M type connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
1	Part No. : 08056-00171	Part No. : 08056-00181	799-601-7080 (T-adapter)
2	 BWP04717	 BWP04718	799-601-7090 (T-adapter)
	Part No. : 08056-00271	Part No. : 08056-00281	
3	 BWP04719	 BWP04720	799-601-7110 (T-adapter)
	Part No. : 08056-00371	Part No. : 08056-00381	
4	 BWP04721	 BWP04722	799-601-7120 (T-adapter)
	Part No. : 08056-00471	Part No. : 08056-00481	
6	 BWP04723	 BWP04724	799-601-7130 (T-adapter)
	Part No. : 08056-00671	Part No. : 08056-00681	
8	 BWP04725	 BWP04726	799-601-7340 (T-adapter)
	Part No. : 08056-00871	Part No. : 08056-00881	

B4D18193

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

No. of pins	DT Series connector		
	Body (plug)	Body (receptacle)	Testing connection use special tool Part No.
8	 BWP05045	 BWP05046	8GR: 799-601-9060 (T-adapter) 8B: 799-601-9070 (T-adapter) 8G: 799-601-9080 (T-adapter) 8BR: 799-601-9090 (T-adapter)
	Part No.: 08192-1820□ (normal type) 08192-2820□ (fine wire type)	Part No.: 08192-1810□ (normal type) 08192-2810□ (fine wire type)	
12	 BWP05047	 BWP05048	12GR: 799-601-9110 (T-adapter) 12B: 799-601-9120 (T-adapter) 12G: 799-601-9130 (T-adapter) 12BR: 799-601-9140 (T-adapter)
	Part No.: 08192-1920□ (normal type) 08192-2920□ (fine wire type)	Part No.: 08192-1910□ (normal type) 08192-2910□ (fine wire type)	

B4D18411

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

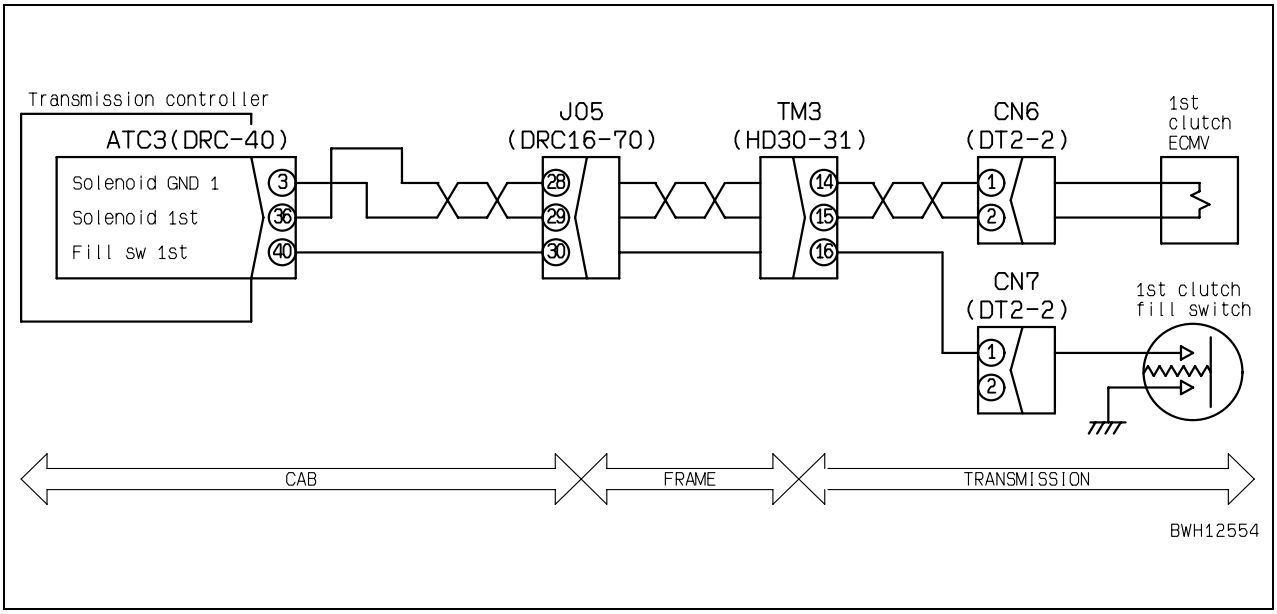


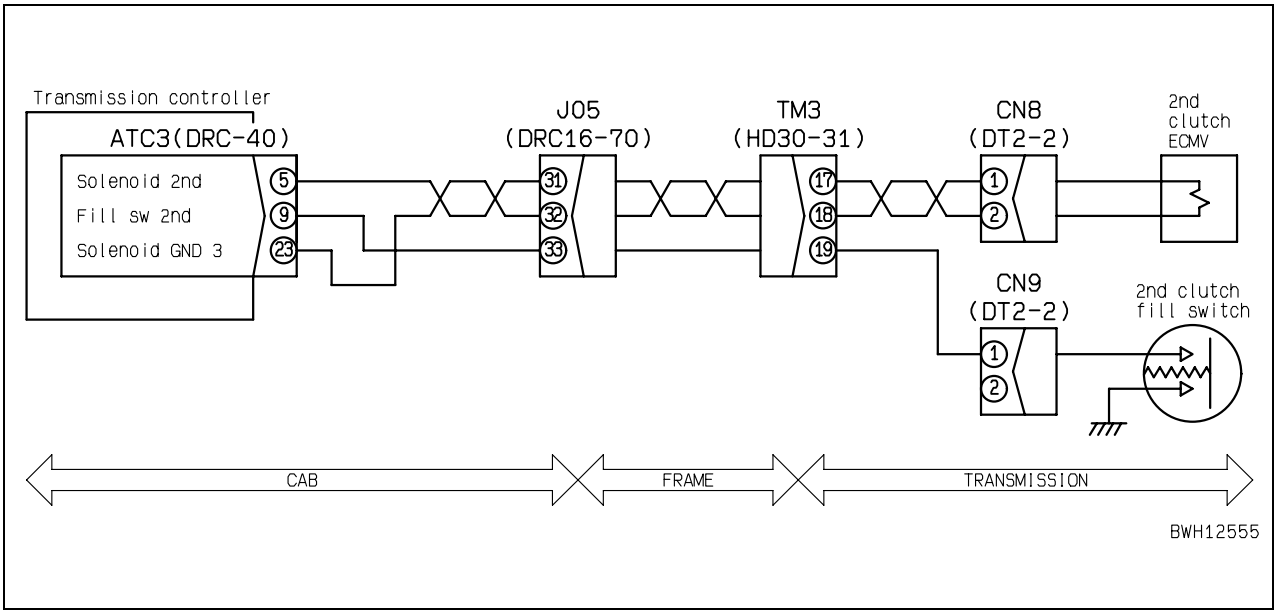
Table 2

Speed when trouble was detected		Failed clutch (Fill switch ON)	Remedy against trouble		
			Action of controller (Selected clutch, gear speed)		ON/OFF state of lockup clutch
F7	4th High	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
F6	4th Low	3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	4H	F7	OFF
F5	3rd High	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	4L	F6	OFF
F4	3rd Low	4th	4L	F6	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	3H	F5	OFF
F3	2nd High	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		Low	3L	F4	OFF
F2	2nd Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		1st	OFF	NEUTRAL	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
F1	1st Low	4th	4L	F6	OFF
		3rd	3L	F4	OFF
		2nd	2L	F2	OFF
		Reverse	OFF	NEUTRAL	OFF
		High	2H	F3	OFF
RH	Reverse High	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		Low	OFF	NEUTRAL	OFF
RL	Reverse Low	4th	OFF	NEUTRAL	OFF
		3rd	OFF	NEUTRAL	OFF
		2nd	OFF	NEUTRAL	OFF
		1st	OFF	NEUTRAL	OFF
		High	RH	RH	OFF
N		ANY	NONE	No reaction	—

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 [989A00] Engine over run prevention command signal: Operating

Action code	Failure code	Trouble	Engine over run prevention command signal: Operating (Machine monitor system)
E02	**989A00**		
Contents of trouble	• When gear speed is set at the position other than neutral, transmission input shaft speed signal exceeds the input shaft speed which is set for each gear speed to prevent over run.		
Action of controller	• Send out command signal to retarder controller and activate brake.		
Problem that appears on machine	• Brake becomes activated and travel speed lowers.		
Related information	• Input shaft speed can be checked in monitoring function (code: **31200 (rpm)**). • Information on operation of engine overrun prevention command is obtained from transmission controller through network.		

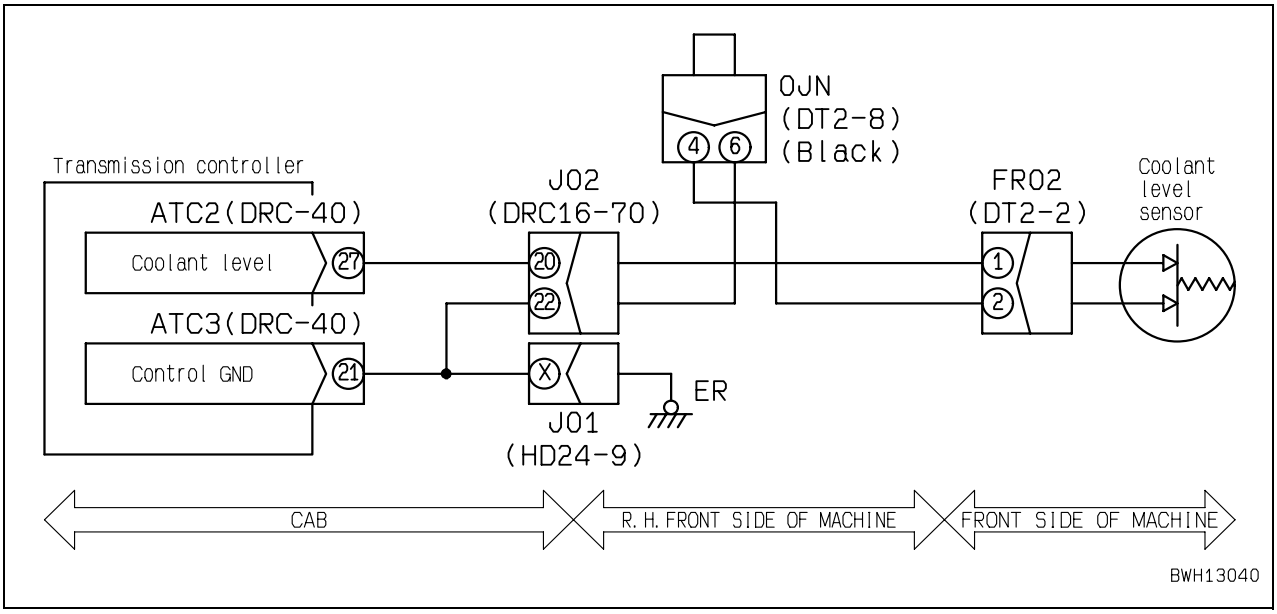
Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Engine over run	★ If machine is so traveling that transmission input shaft speed signal exceeds 2,600 rpm (or 2,400 rpm at R2), engine is overrunning.
	2	Defective transmission controller	• If machine is not so traveling that transmission input shaft speed signal exceeds 2,600 rpm (or 2,400 rpm at R2), transmission controller is defective.

Failure code [989D00] Rear section tipping over alarm: Alarm is activated

Action code	Failure code	Trouble	Rear section tipping over alarm: Alarm is activated (Lift operation when machine is inclined) (Machine monitor system)
—	**989D00**		
Contents of trouble	• Body is lifted when machine is inclined.		
Action of machine monitor	• Turns on inclination caution lamp • Sounds alarm buzzer.		
Problem that appears on machine	• If body is lifted in such condition, machine body may tip over.		
Related information	• Input signal from pitch angle sensor can be checked with monitoring function (code: **32900 (°), 32903 (V)**). • Information on operation of inclination alarm activation is obtained from transmission controller through network.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Mistake in operation	Do not lift body when machine is inclined for more than 15°. (Teach the proper operating method.)

Circuit diagram related

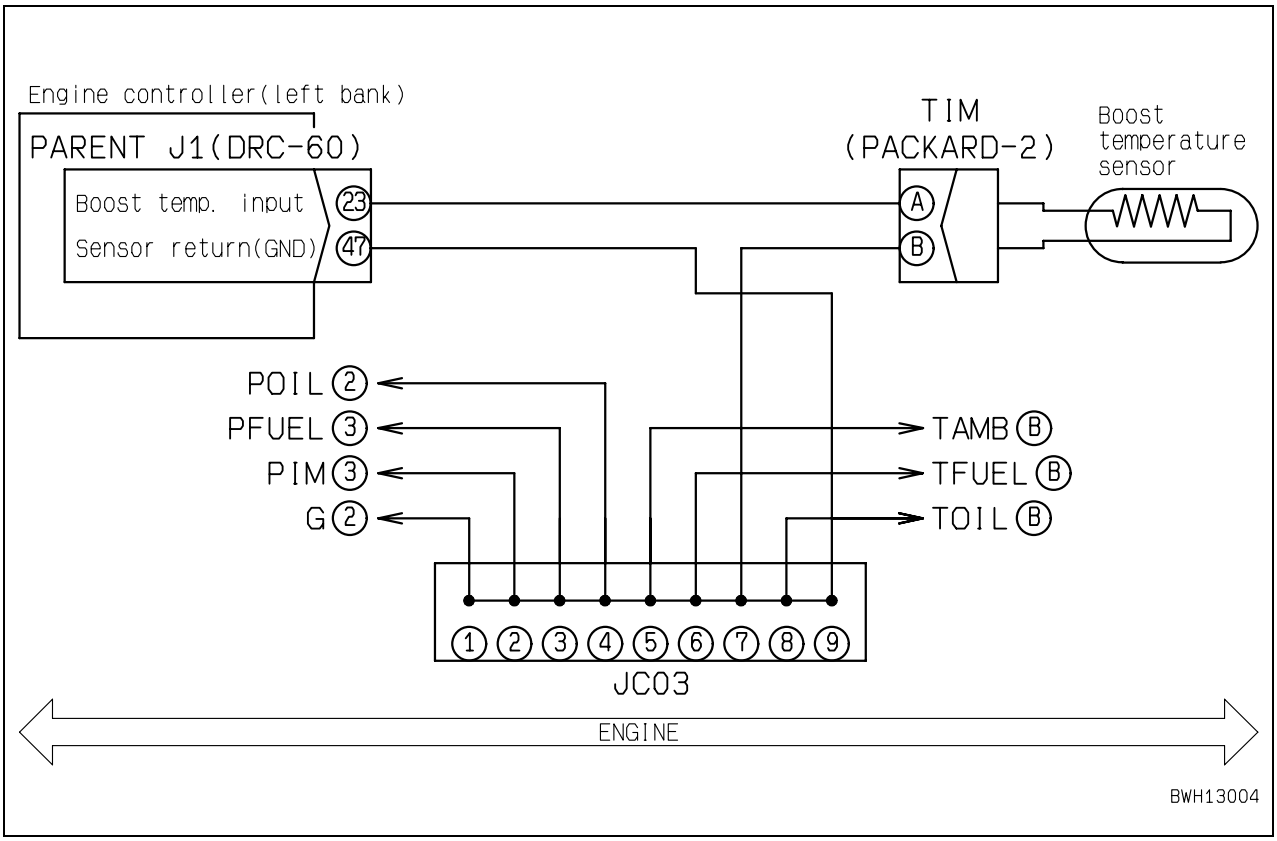


Failure code [CB115] Abnormal engine Ne and Bkup speed sensors (Right bank): Abnormal speed sensor signal

Action code	Failure code	Trouble	Abnormal engine Ne and Bkup speed sensors (Right bank): Abnormal speed sensor signal (Engine controller system)
E03	**CB115**		
Contents of trouble	• Abnormality has occurred at the same time in Ne speed sensor circuit and Bkup speed sensor circuit.		
Action of controller	• Flashes warning lamp and turns on alarm buzzer.		
Problem that appears on machine	• Engine does not start (during engine stop). • Engine stops (during engine running).		
Related information			

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Defective Ne speed sensor circuit	Carry out troubleshooting of [**CB689**].
	2	Defective Bkup speed sensor circuit	Carry out troubleshooting of [**CB778**].
	3	Defective Ne speed sensor mounting section	Since a mounting section of Ne speed sensor can be suspected to be defective, directly check the mounting section. (Defective installation of sensor itself, internal defect of flywheel, etc.)
	4	Bkup speed sensor mounting section	Since a mounting section of Bkup speed sensor can be suspected to be defective, directly check the mounting section. (Defective installation of sensor itself, internal defect of supply pump, etc.)
	5	Defective connection of sensor (wrong connection)	The defective (wrong) connections of Ne speed sensor and Bkup speed sensor can be suspected. Directly check them.
	6	Defective engine controller	Engine controller can be suspected to be defective if no problem is found in causes 1 – 5 (since this is an internal defect, it cannot be diagnosed).

Circuit diagram related



Failure code [CA449] Common rail abnormally high pressure (2) (Left bank): Abnormally high pressure occurrence

Action code	Failure code	Trouble	Common rail abnormally high pressure (2) (Left bank): Abnormally high pressure occurrence (Engine controller system)
E03	**CA449**		
Contents of trouble	• Common rail pressure sensor circuit detected abnormally high pressure (Level 2).		
Action of controller	• Limits output and continues operation (Limits common rail pressure). • Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Output lowers.		
Related information			

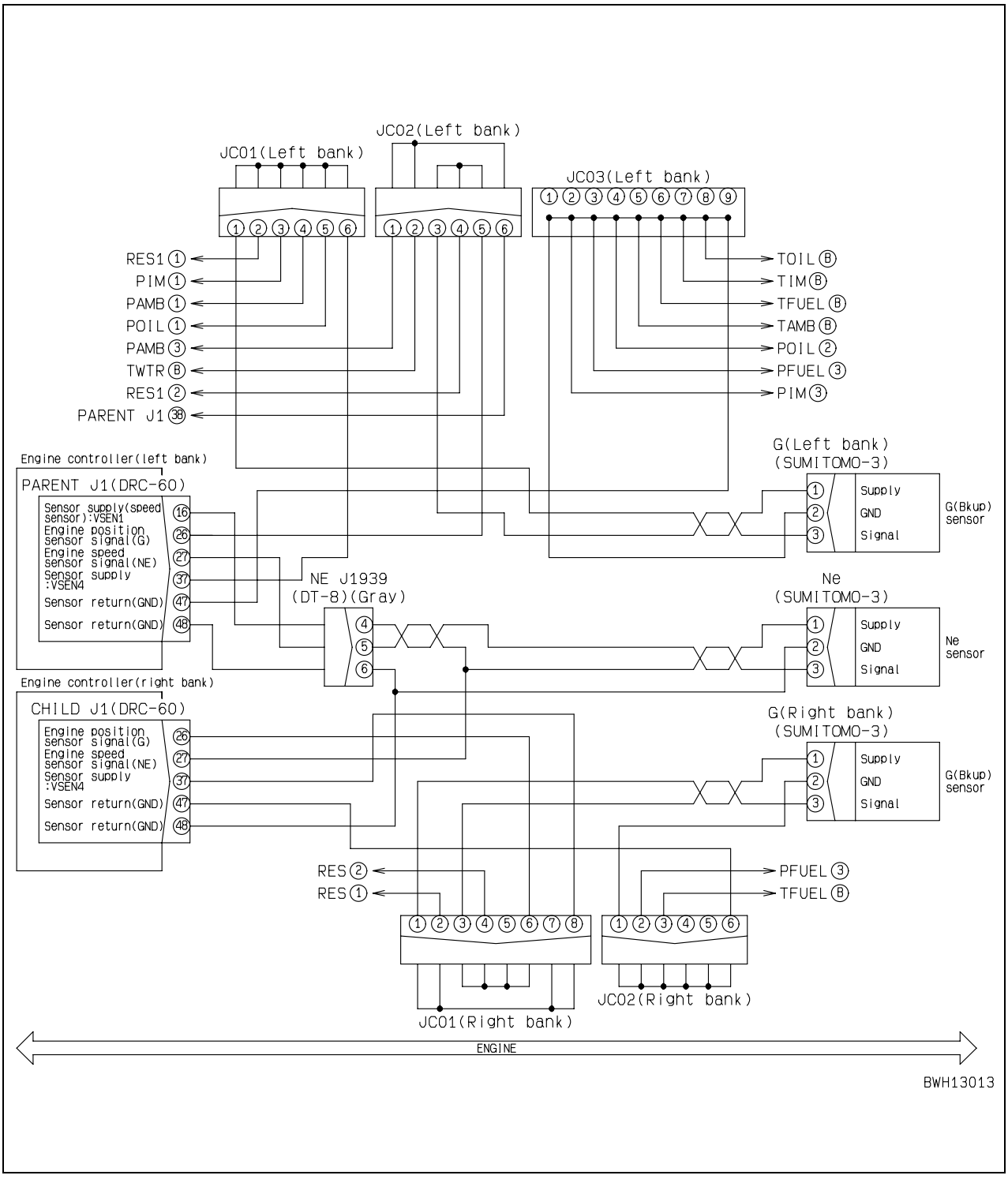
Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [**CA553**].	

Failure code [CB449] Common rail abnormally high pressure (2) (Right bank): Abnormally high pressure occurrence

Action code	Failure code	Trouble	Common rail abnormally high pressure (2) (Right bank): Abnormally high pressure occurrence (Engine controller system)
E03	**CB449**		
Contents of trouble	• Common rail pressure sensor circuit detected abnormally high pressure (Level 2).		
Action of controller	• Limits output and continues operation (Limits common rail pressure). • Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• Output lowers.		
Related information			

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for failure code [**CB553**].	

Circuit diagram related

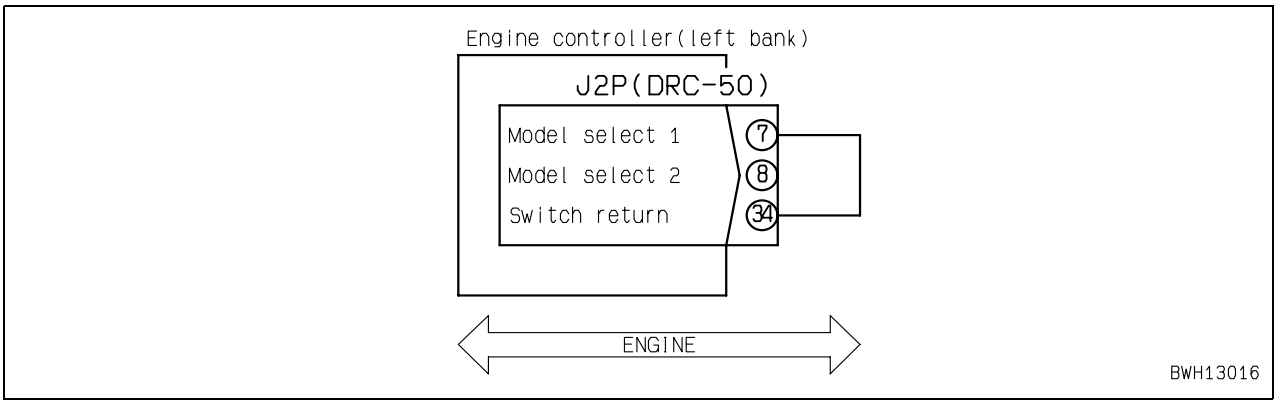


Failure code [CA1257] Multicontroller distinction wiring harness key error (Left bank): Distinction error

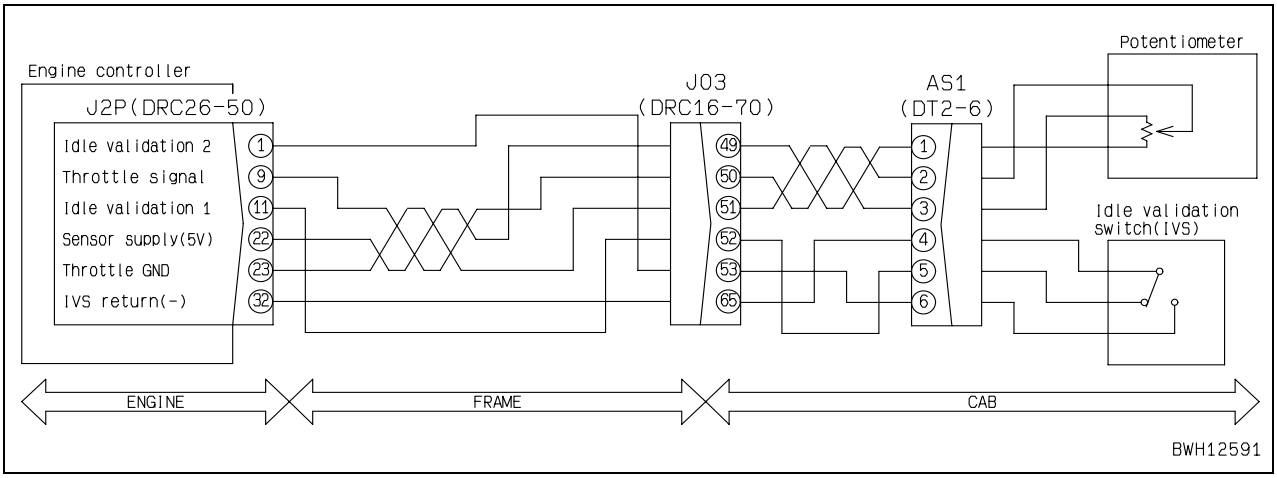
Action code	Failure code	Trouble	Multicontroller distinction wiring harness key error (Left bank): Distinction error (Engine controller system)
E03	**CA1257**		
Contents of trouble	• Controller of each bank disagrees with distinction wiring harness (Left bank).		
Action of controller	• Stops operation. • Blinks warning lamp and sounds alarm buzzer.		
Problem that appears on machine	• When key is ON: Engine cannot be started.		
Related information			

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between J2P (female) (7) – (34)	Resistance	Max. 1 Ω
	2	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between J2P (female) (8) – ground	Resistance	Min. 1 MΩ
	3	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between J2P (female) (7) – ground	Resistance	Max. 1 Ω
			Between J2P (female) (8) – ground	Resistance	Min. 1 MΩ

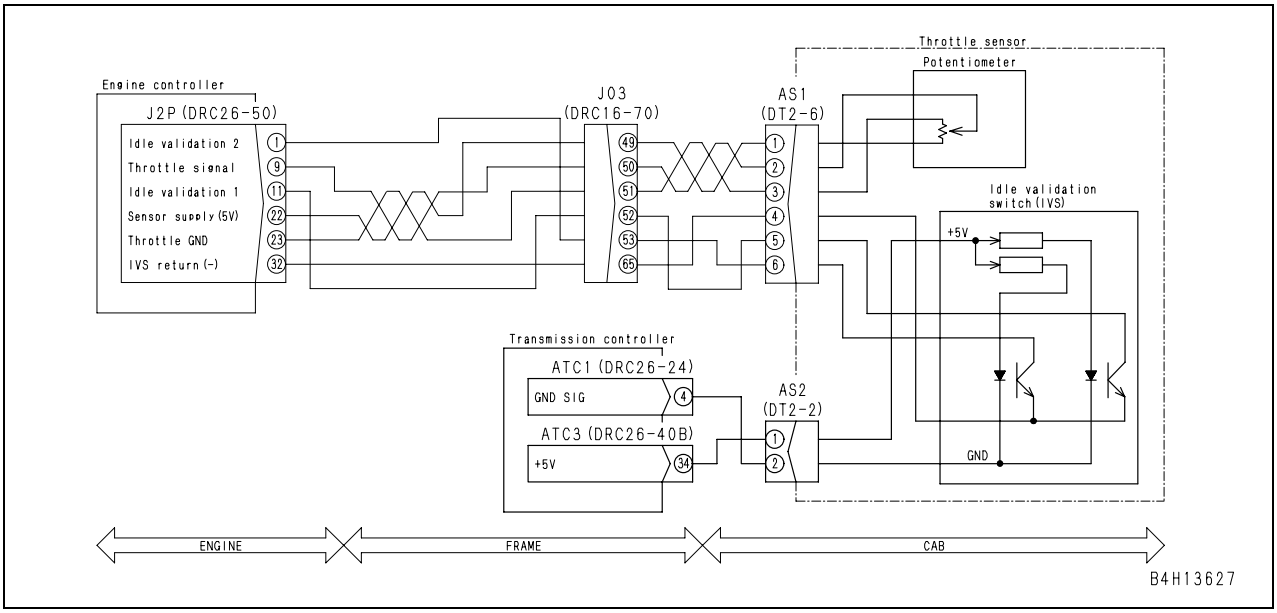
Circuit diagram related



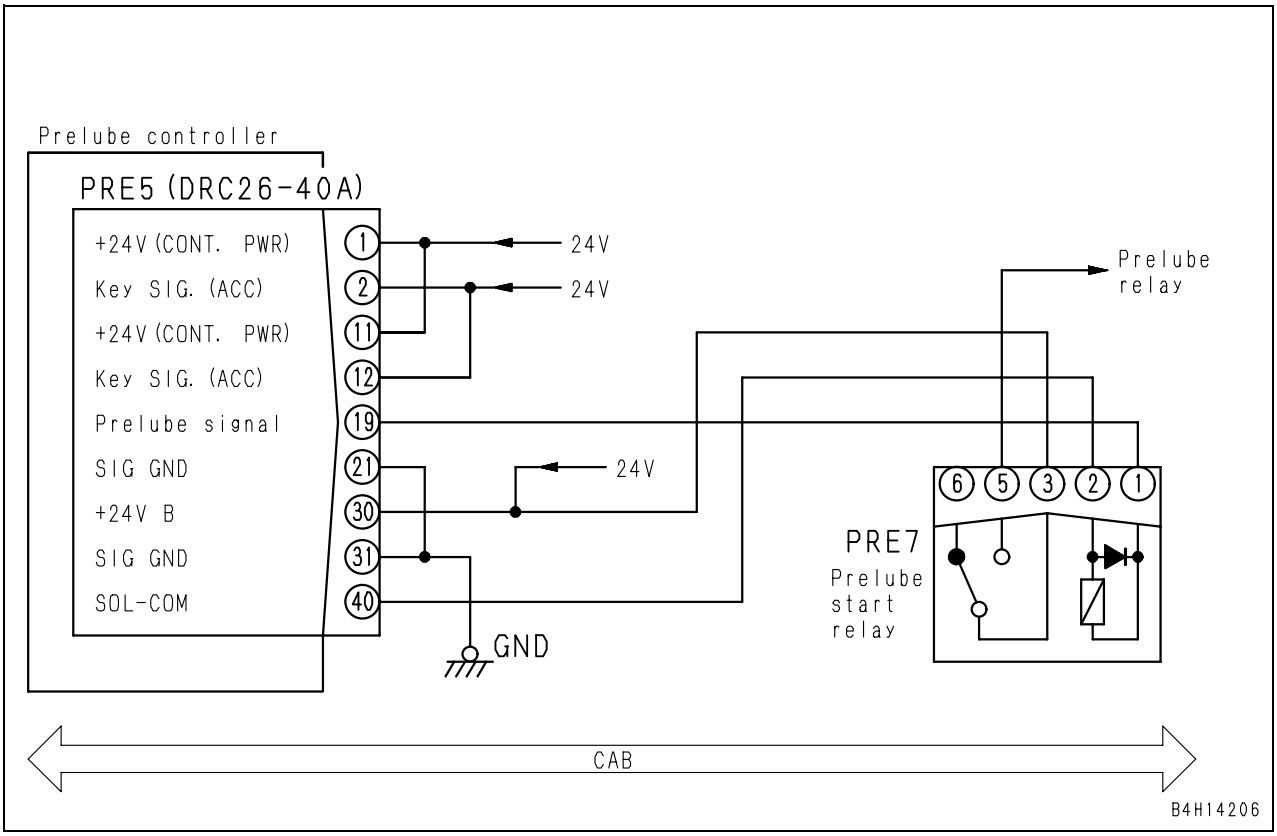
Circuit diagram related
Serial No.: 7001 – 7078



Serial No.: A10001 and up

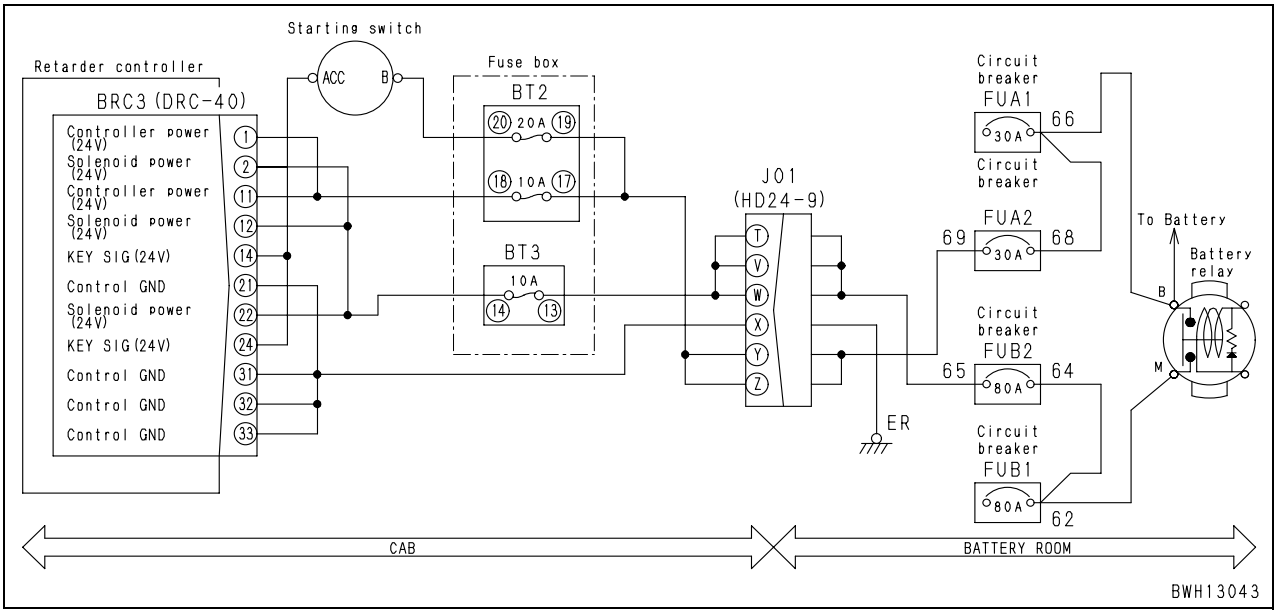


Related electrical circuit diagram

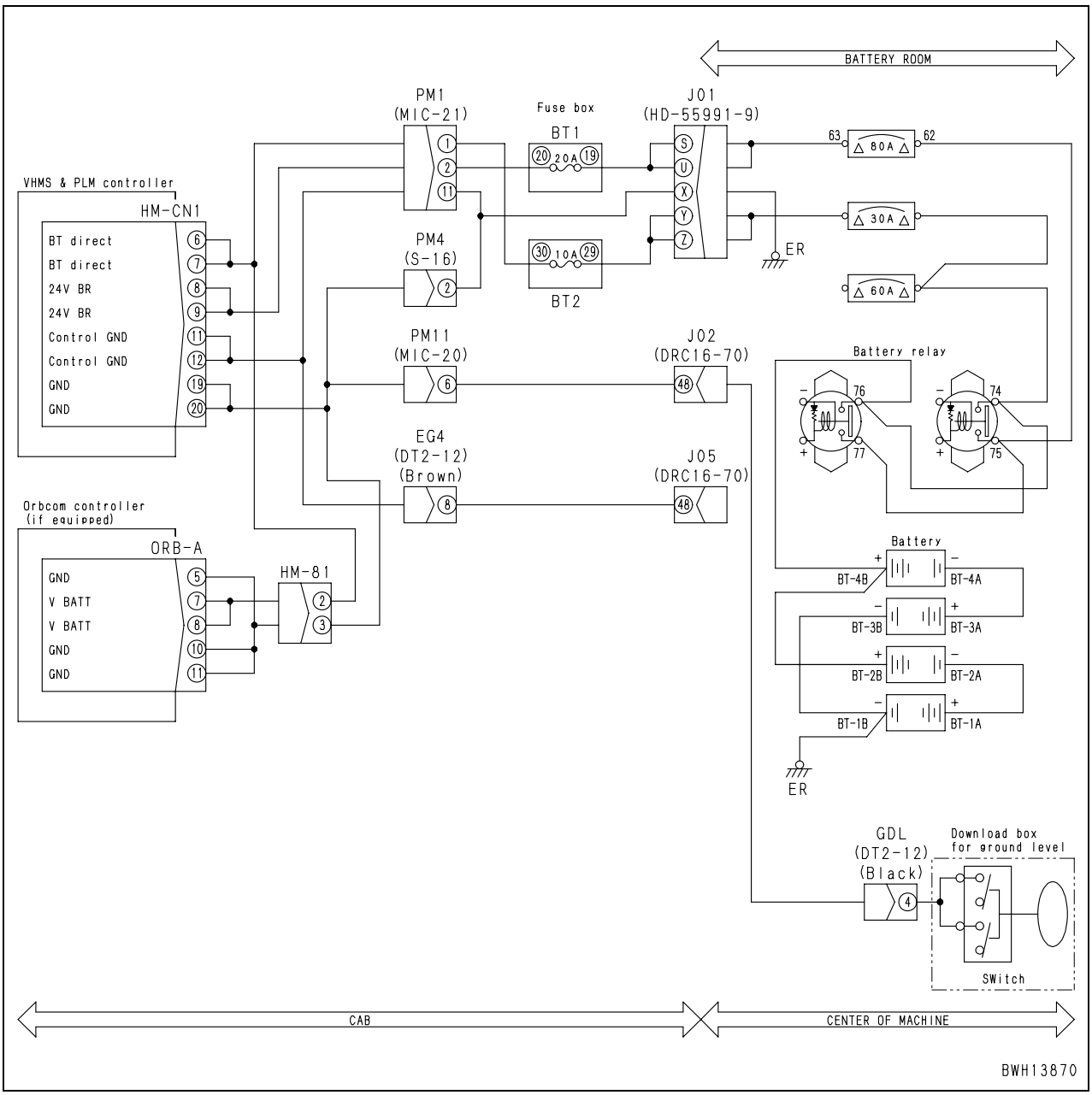


★ Prelube controller is the same as pre-lubrication controller.

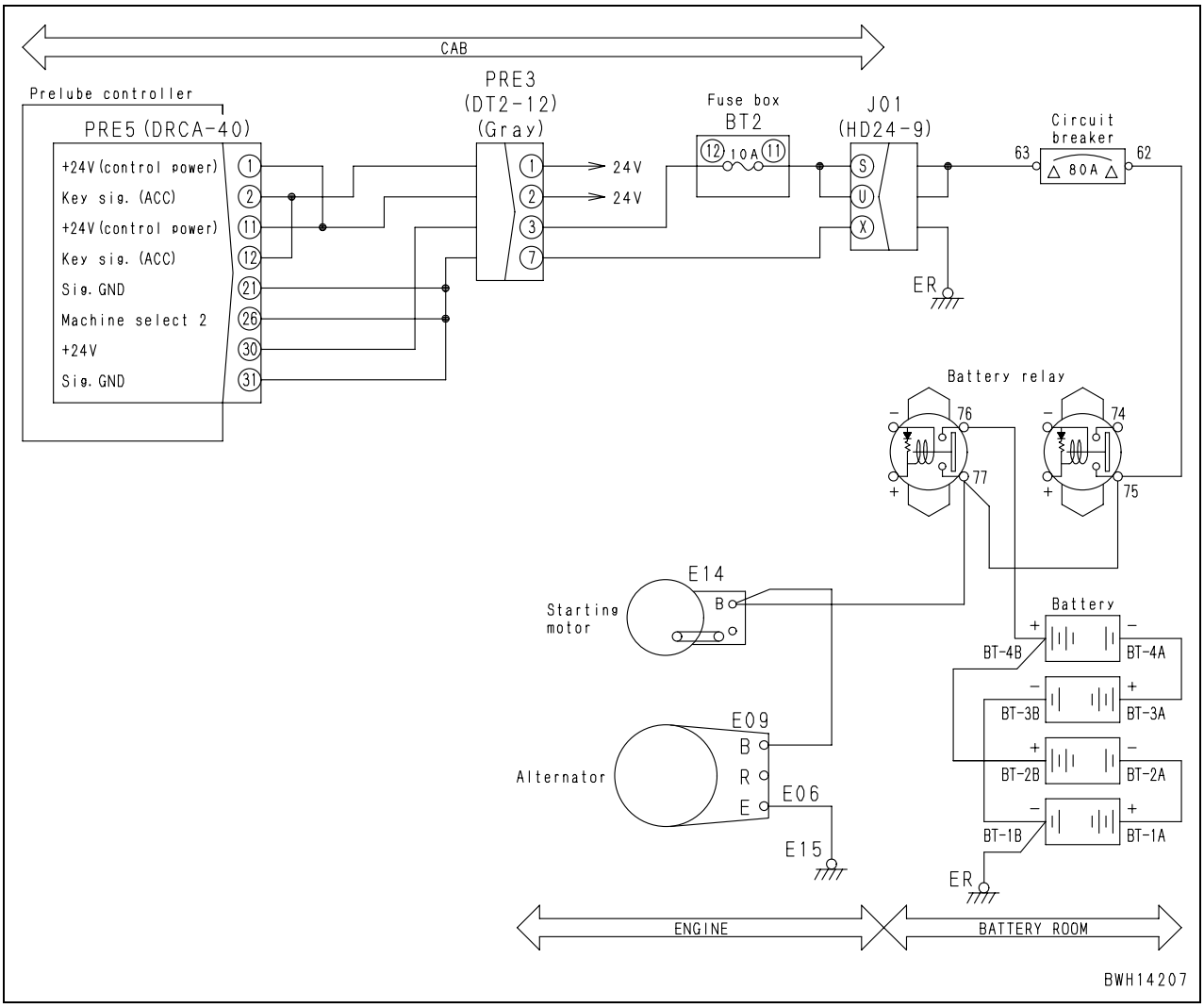
Circuit diagram related



Circuit diagram related

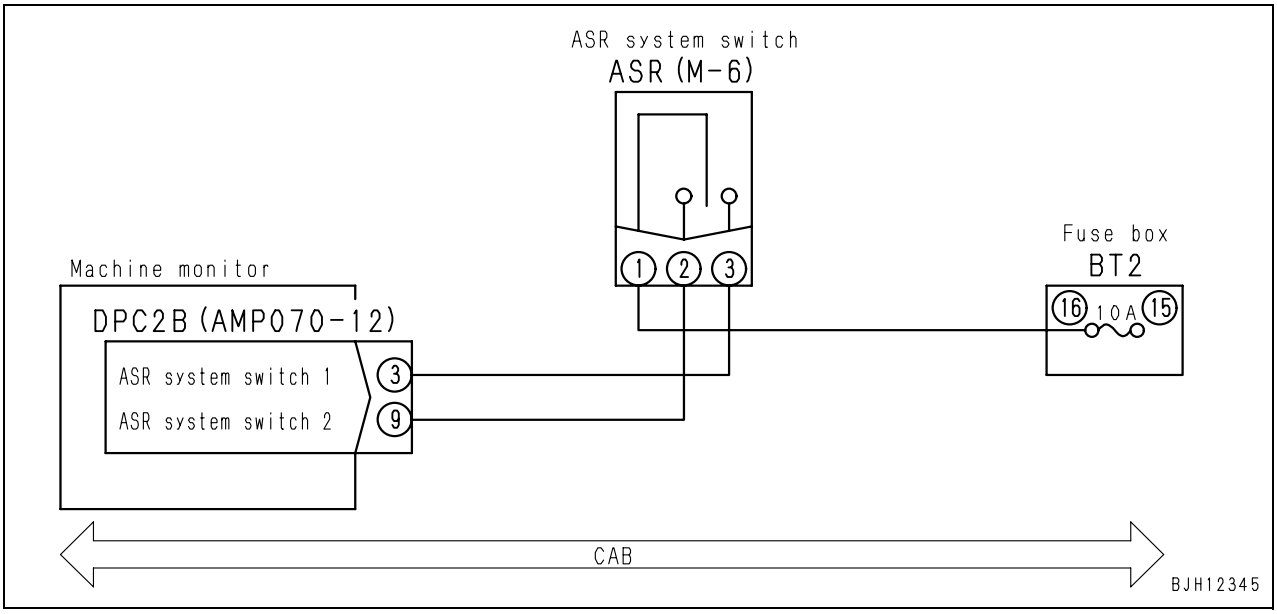


Related electrical circuit diagram

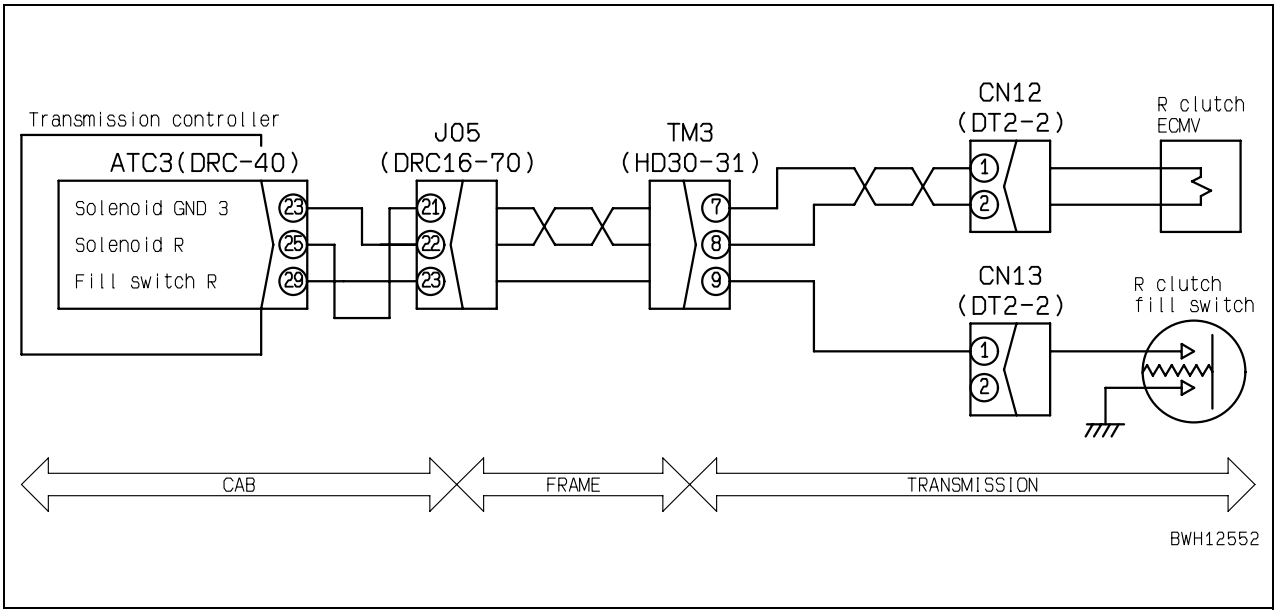


★ Prelube controller is the same as pre-lubrication controller.

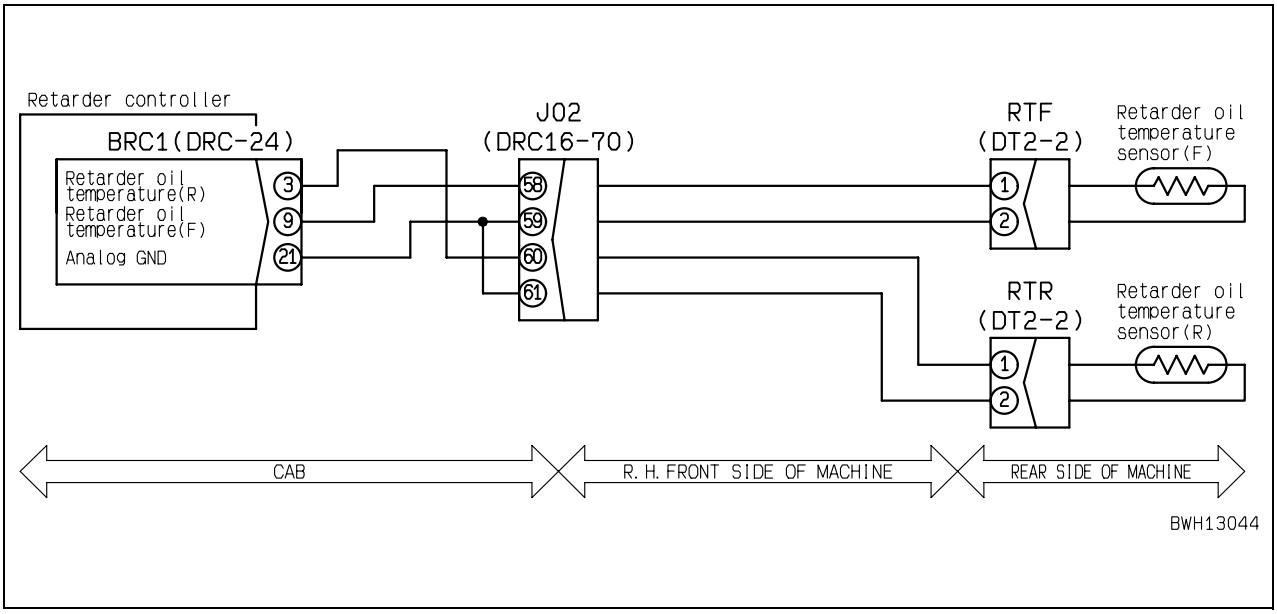
Circuit diagram related



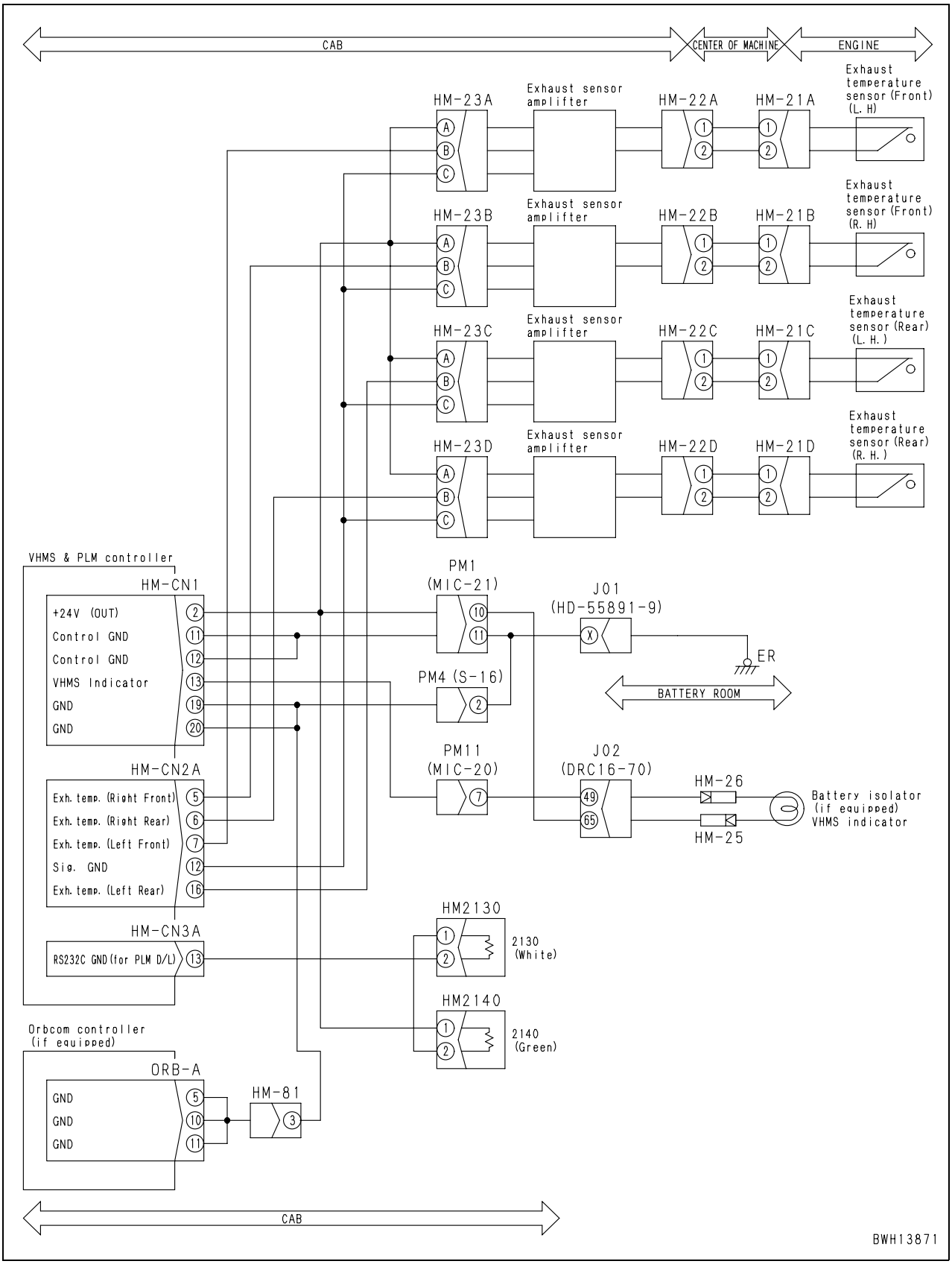
Circuit diagram related



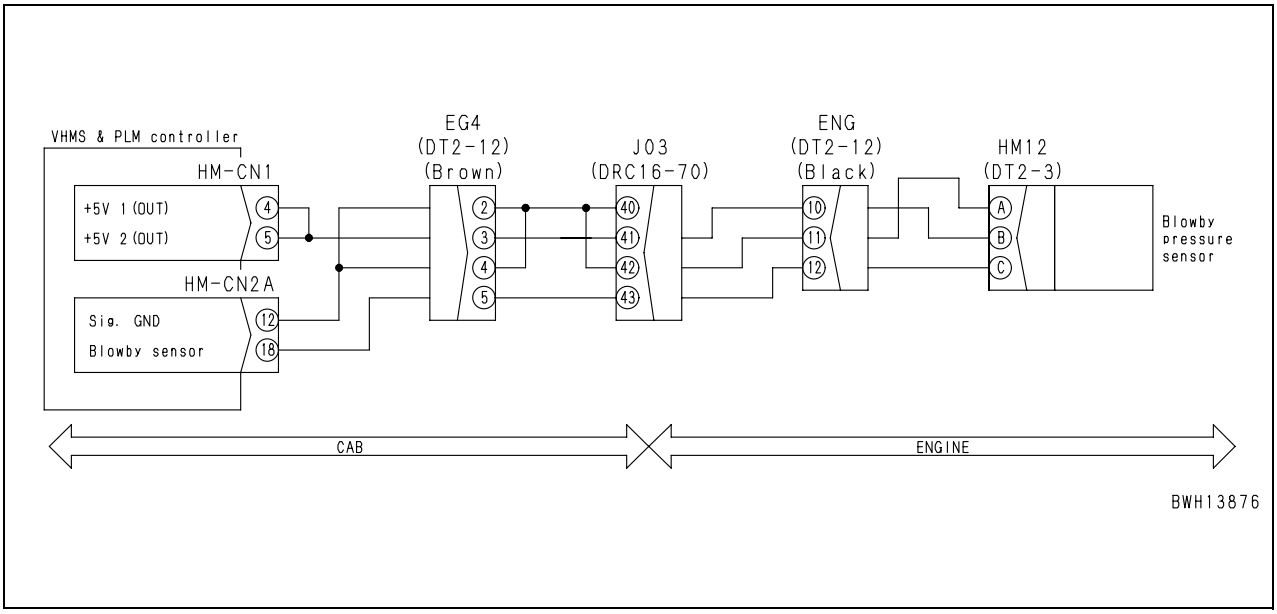
Circuit diagram related



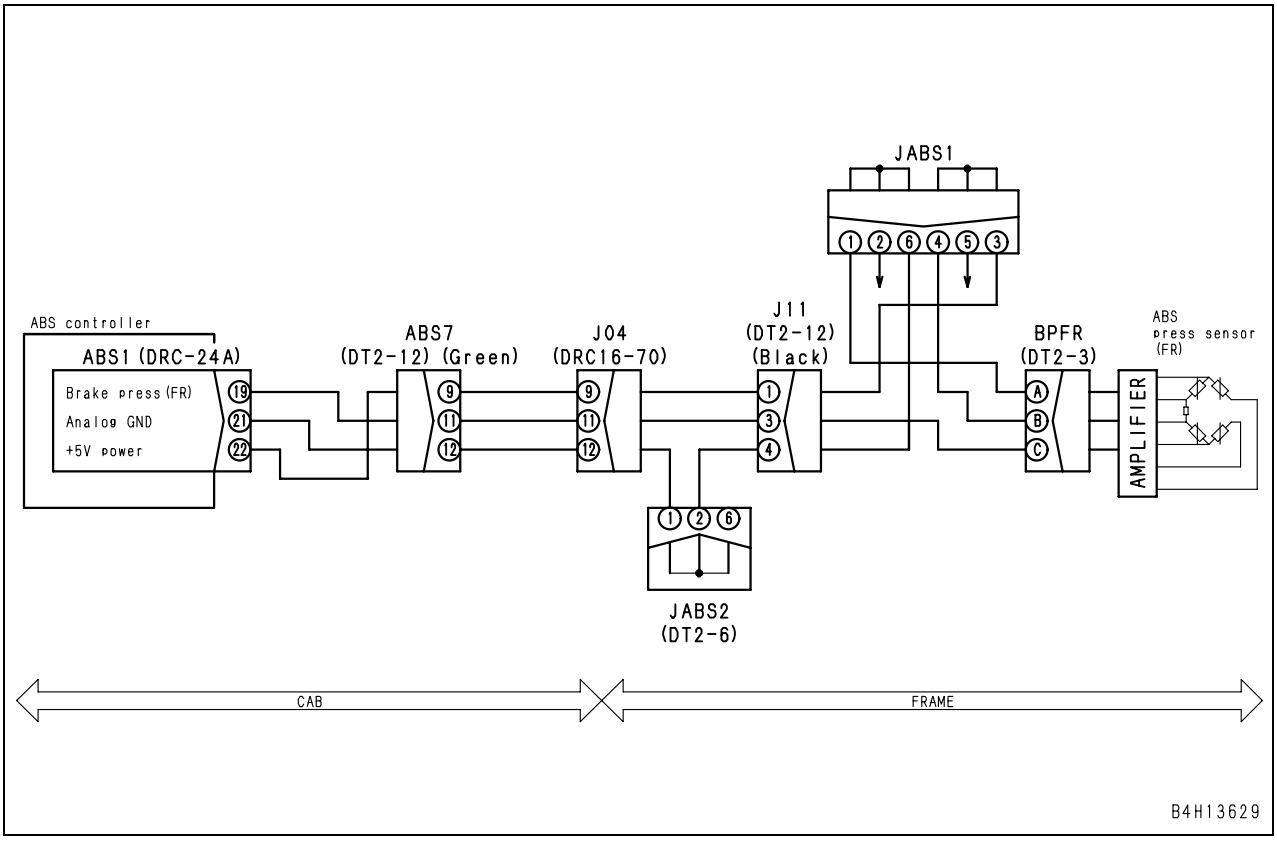
Circuit diagram related



Circuit diagram related

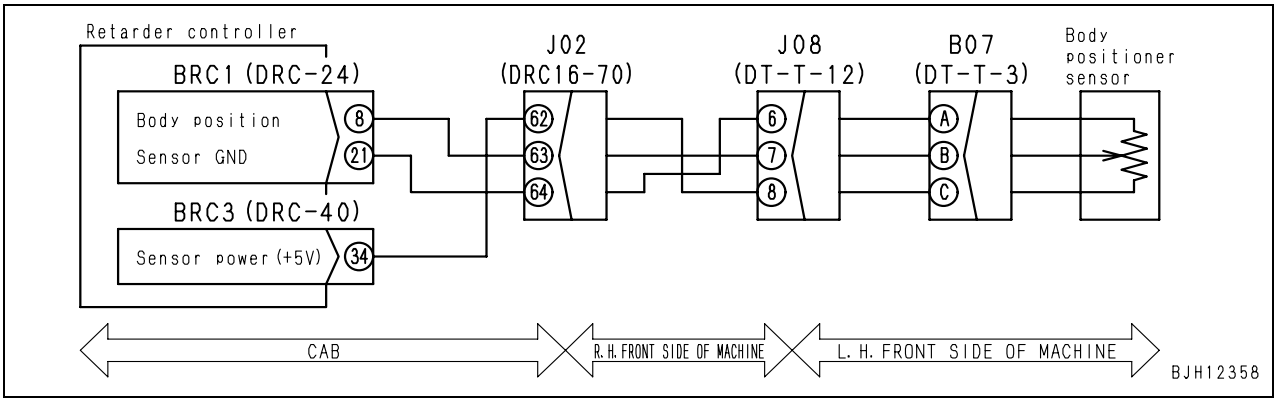


Circuit diagram related

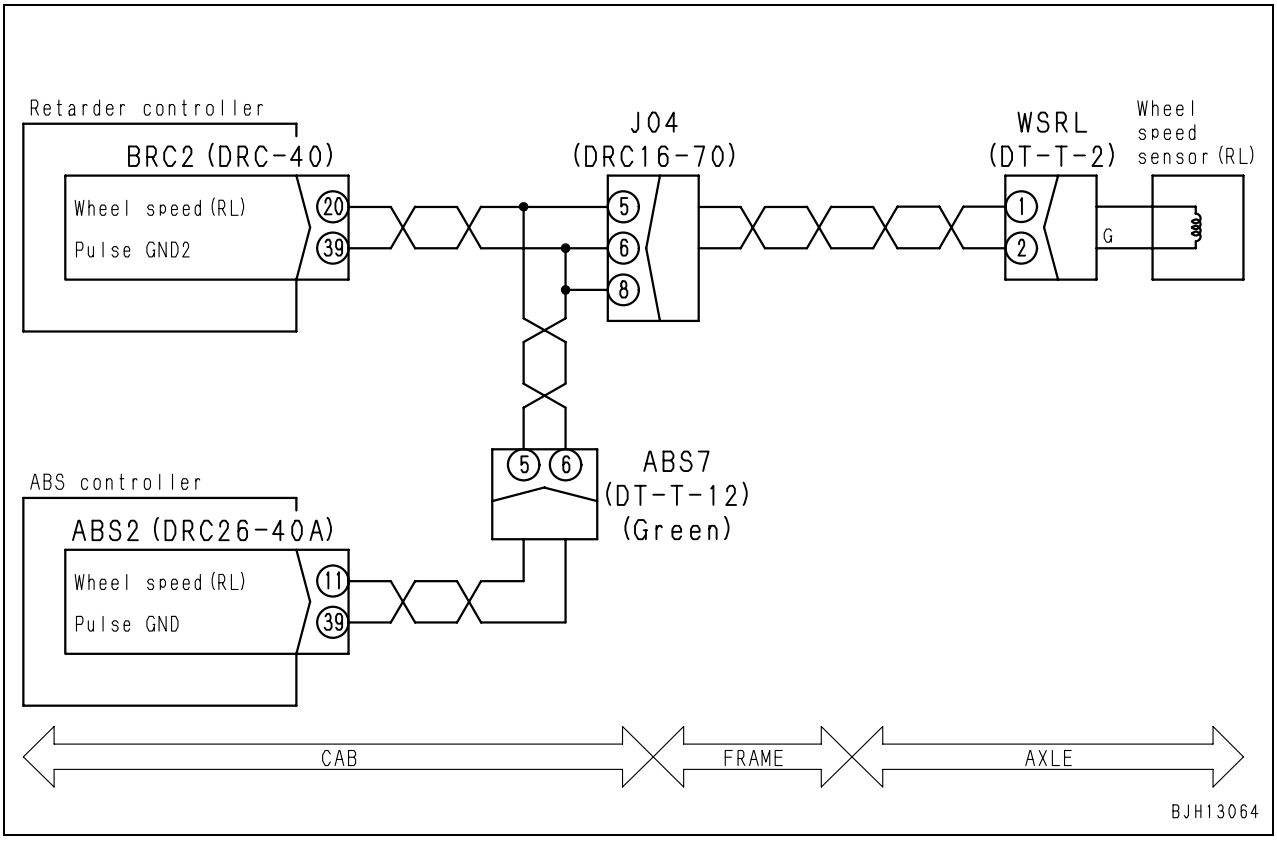


Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	5	Defective retarder controller	1) Turn the starting switch OFF. 2) Disconnect connectors BRC1, BRC3, and B07. 3) Insert T-adapter. 4) Turn the starting switch ON.		
			Between BRC1 (8) – (21)	Voltage	4.1 – 4.8 V
			Between BRC3 (34) – BRC1 (21)	Voltage	0.3 – 4.7 V

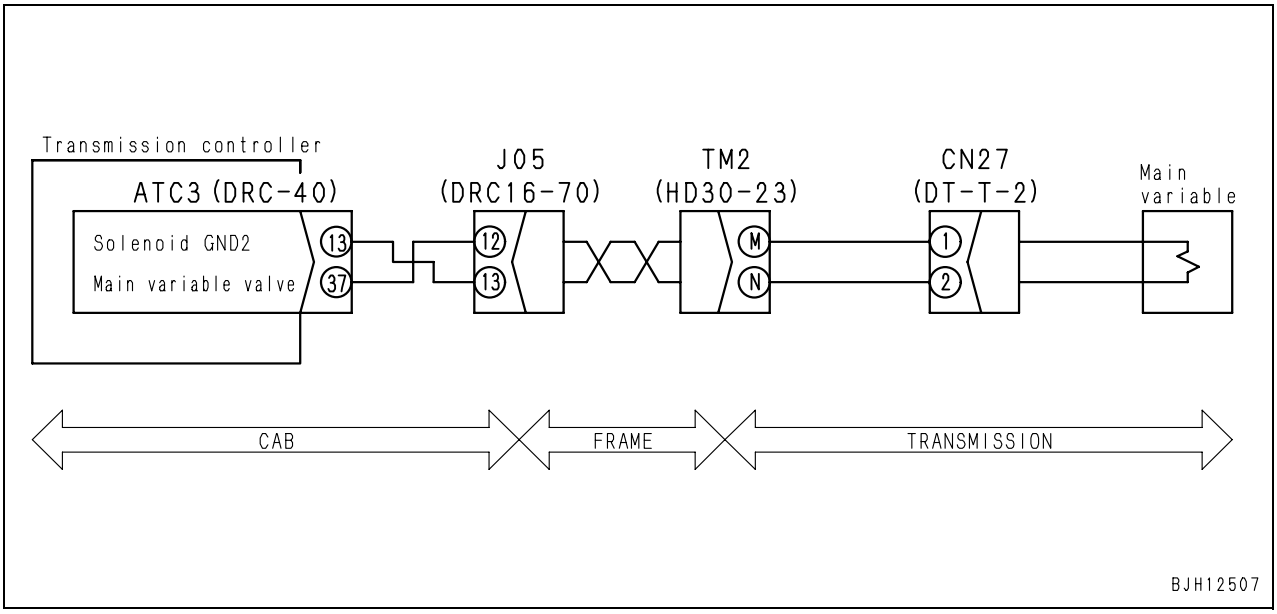
Circuit diagram related



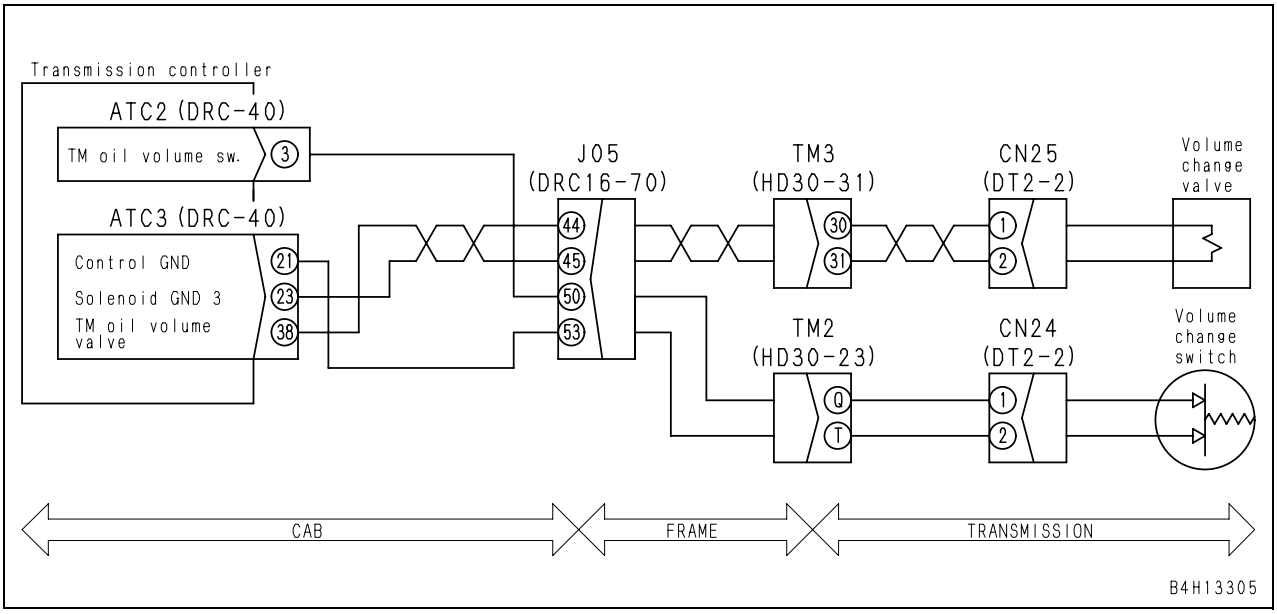
Circuit diagram related



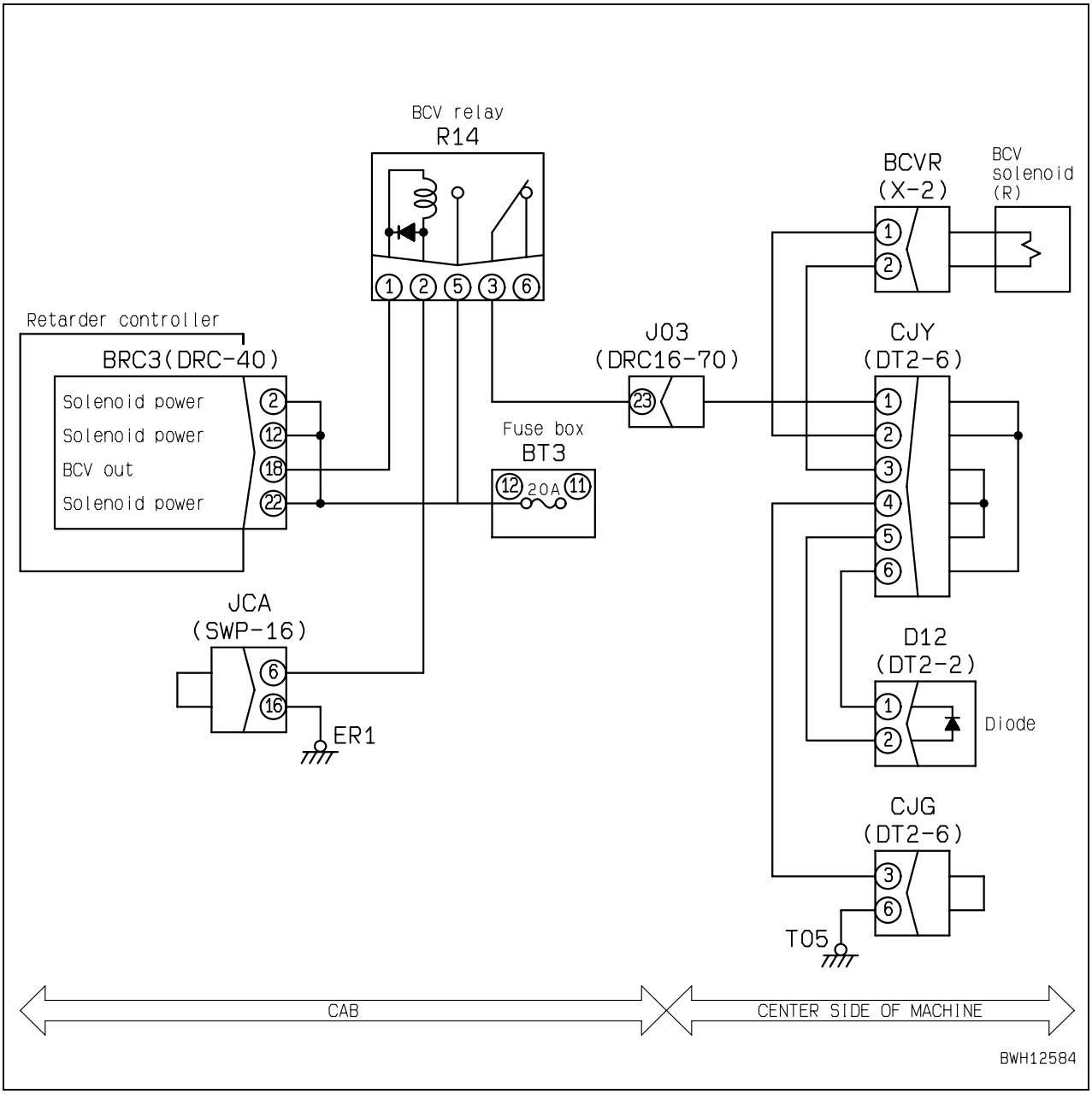
Circuit diagram related



Circuit diagram related



Circuit diagram related



DUMP TRUCK

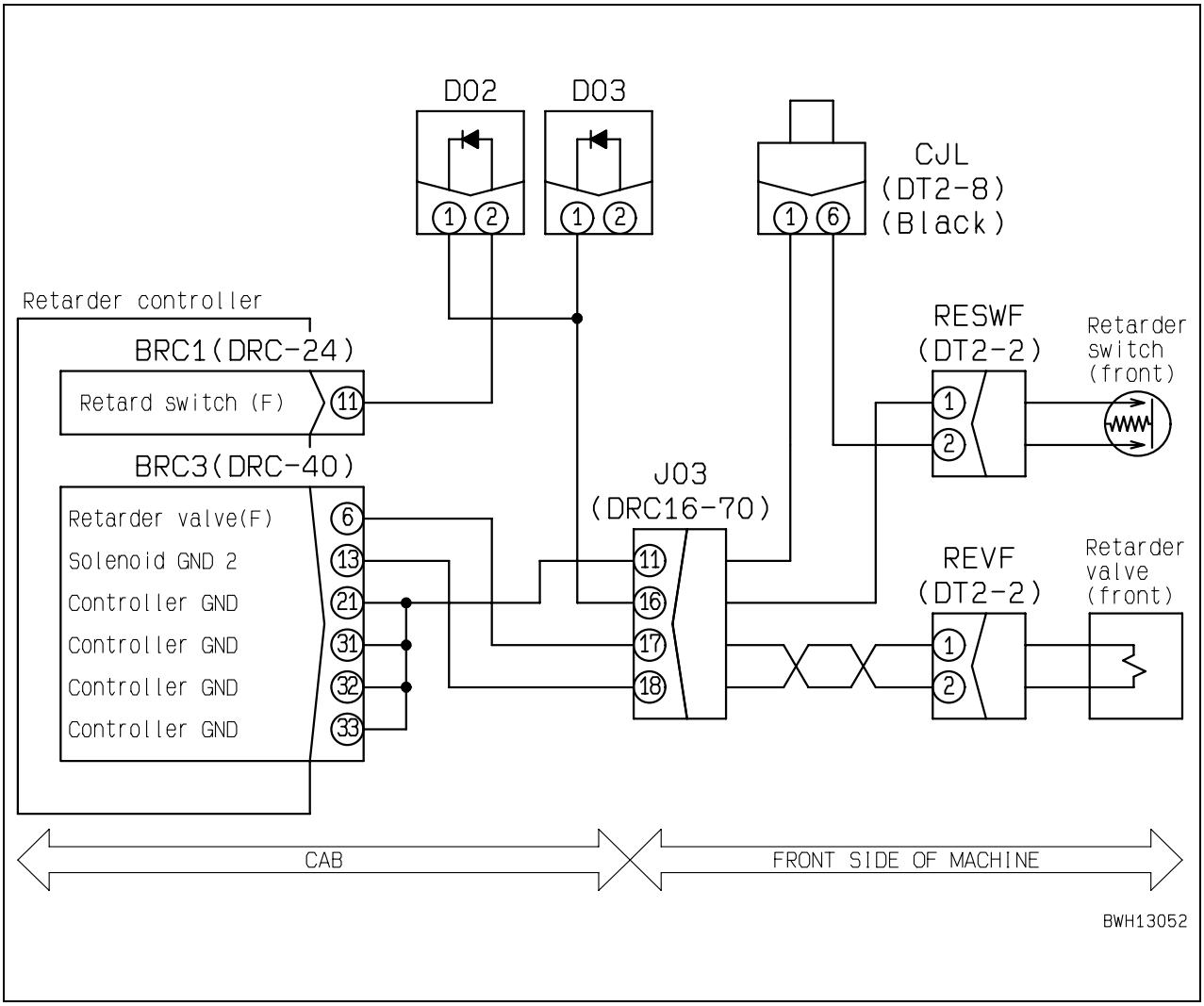
HD785-7

Machine model	Serial number
HD785-7	A10001 and up

40 Troubleshooting

Troubleshooting by failure code, Part 9

Circuit diagram related



Failure code [DX24KY] Hot short in ABS control valve output circuit (Rear left)

Action code	Failure code	Trouble	Hot short in ABS control valve output circuit (Rear left) (Transmission controller system)
E03	**DX24KY**		
Contents of trouble	• Abnormal current flows when no signal is output to ABS control valve solenoid circuit.		
Action of controller	• Stop outputting to ABS control valve (Rear 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 (Rear left) solenoid can be checked with the monitoring function. (Code: **43310**, 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 hot short)	1) Turn the starting switch OFF. 2) Disconnect connector ABSRL. 3) Connect the T-branch to connector ABSRL and carry out troubleshooting with the starting switch OFF.		
			ABSRL (male)	Resistance	
			Between (1) – (2)	10 – 30 Ω	
			Between (1), (2) – ground	Min. 1 MΩ	
	2	Hot short circuit in wiring harness (Contact with 24-V circuit)	1) Turn the starting switch OFF. 2) Disconnect connectors ABS3 and ABSRL. 3) Connect T-branch to connector ABS3. (With connector ABSRL being disconnected) 4) Turn starting switch ON and carry out troubleshooting.		
			Between ABS3 (female) (36) and chassis ground	Voltage	Max. 1 V
	3	Defective ABS controller	1) Turn the starting switch OFF. 2) Disconnect connector ABS3. 3) Connect T-branch.		
			Wiring harness between ABS3 (female) (36) – ABS3 (female) (13) terminal	Resistance	10 – 30 Ω

Circuit diagram related

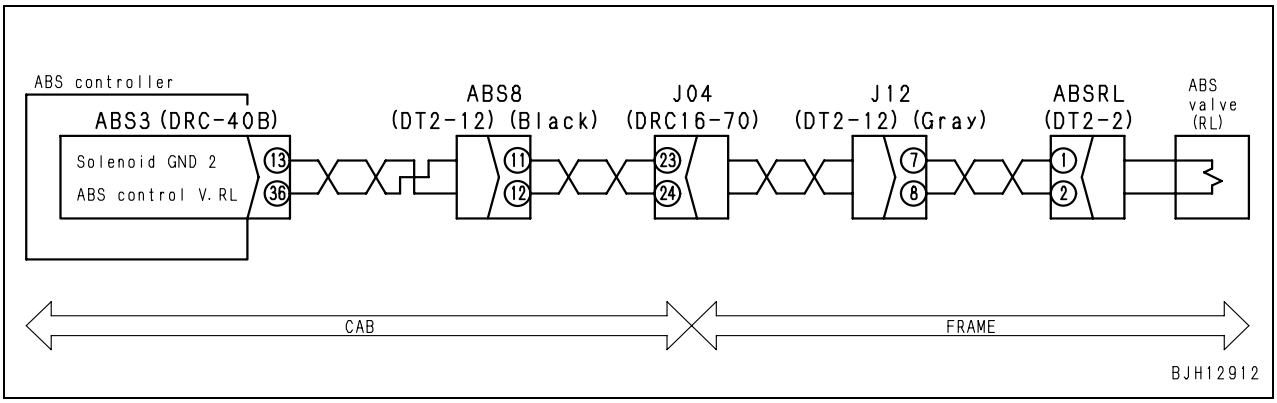


Table 1

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

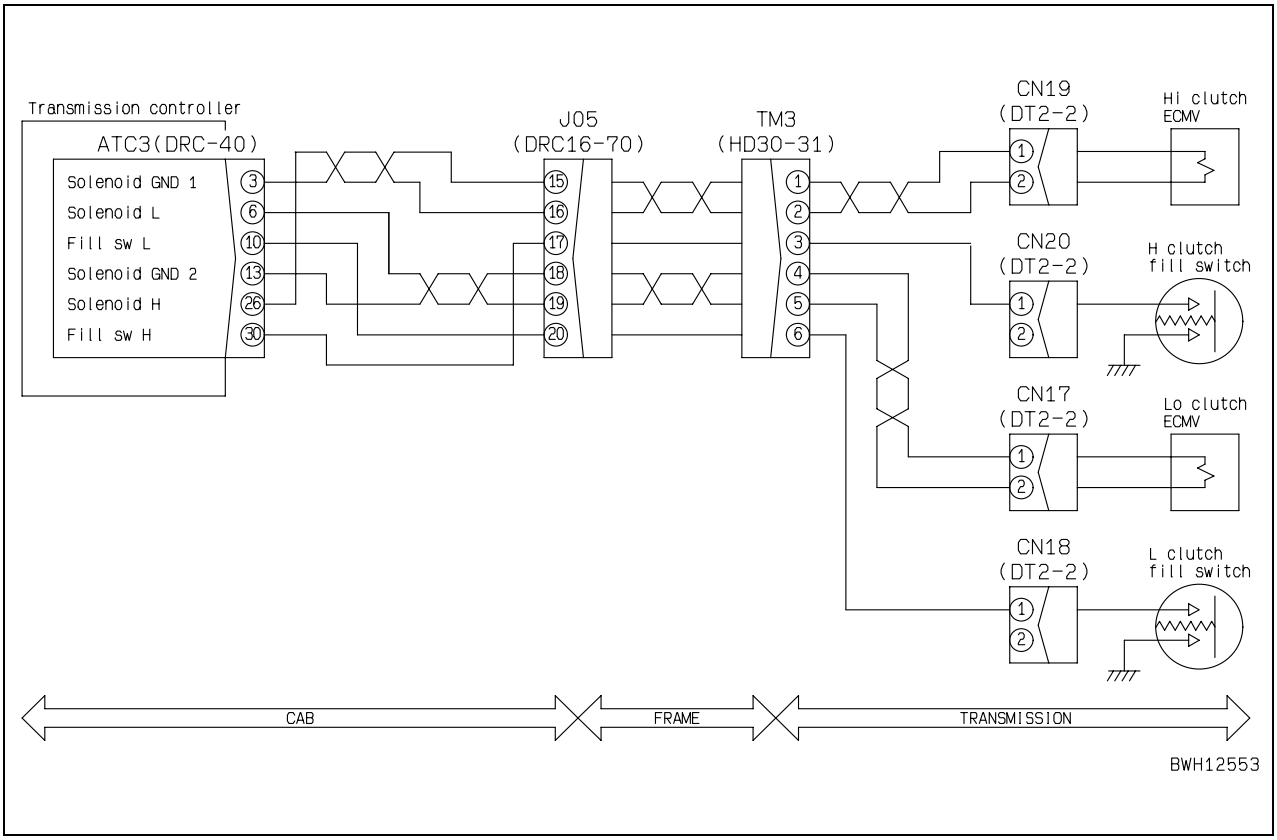
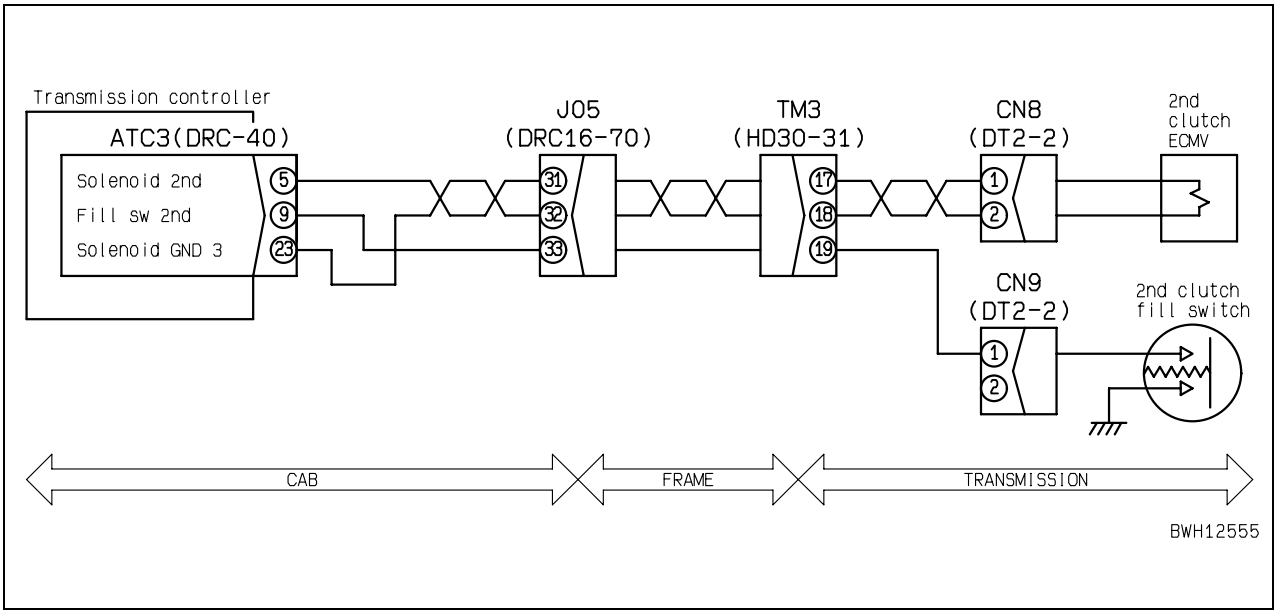


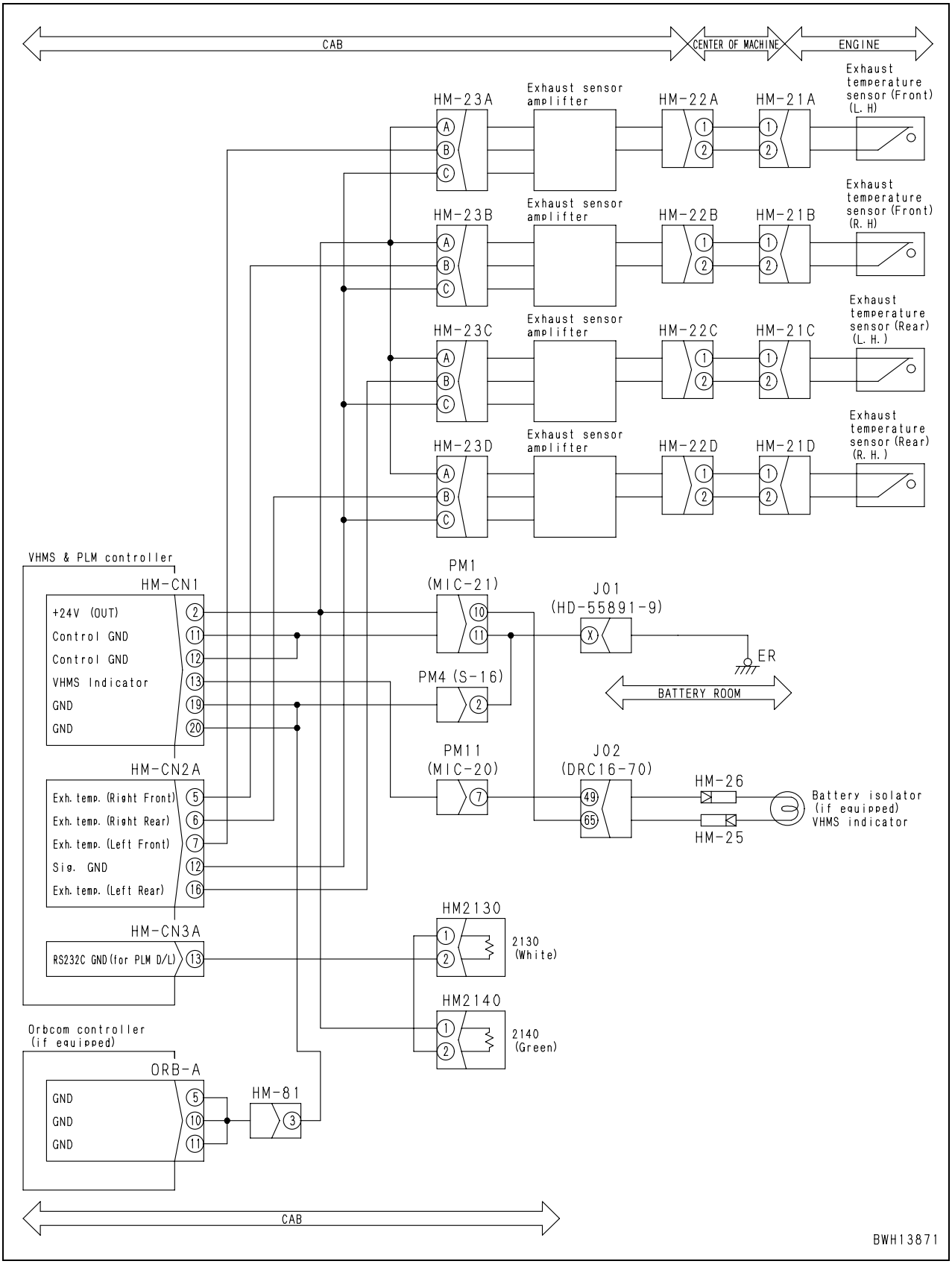
Table 1

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



Circuit diagram related



	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	8	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	1) Turn starting switch OFF. 2) Disconnect terminals of circuit breaker, starting switch, slow-blow fuse, and heater relay.		
			Wiring harness between heater relay terminal (RLY) – air heater inlet terminal	Resistance	Max. 1 Ω
			Wiring harness between heater relay terminal (E12B) – high current fuse outlet terminal	Resistance	Max. 1 Ω
			Wiring harness between slow-blow fuse inlet – battery relay terminal M (75).	Resistance	Max. 1 Ω
			Wiring harness between battery relay terminal M (75) – circuit breaker FUB2 terminal	Resistance	Max. 1 Ω
			Wiring harness between circuit breaker FUB2 terminal – fuse BT4 (3), (4) – R37 (female) (5)	Resistance	Max. 1 Ω
			Wiring harness between battery relay terminal B (74) – circuit breaker FUA2 terminal	Resistance	Max. 1 Ω
			Wiring harness between circuit breaker FUA2 terminal – fuse BT2 (19), (20) – starting switch terminal B	Resistance	Max. 1 Ω
			Wiring harness between starting switch terminal ACC-fuse BT3 (19), (20) – J2P (female) (39)	Resistance	Max. 1 Ω
	9	Short circuit of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect terminals of circuit breaker, slow-blow fuse, heater relay, heater terminal, and starting switch.		
			Between ground and wiring harness between heater relay terminal (RLY) – air heater inlet terminal	Resistance	Min. 1 MΩ
			Between ground and wiring harness between heater relay terminal (E12B) – high current fuse outlet terminal	Resistance	Min. 1 MΩ
			Between ground and wiring harness between slow-blow fuse inlet – battery relay terminal M (75).	Resistance	Min. 1 MΩ
			Between ground and wiring harness between battery relay terminal M (75) – circuit breaker FUB2 terminal (64)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between circuit breaker FUB2 terminal – fuse BT4 (3), (4) – R37 (female) (5)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between battery relay terminal B (74) – circuit breaker FUA2 terminal	Resistance	Min. 1 MΩ
			Between ground and wiring harness between circuit breaker FUA2 terminal – fuse BT2 (19), (20) – starting switch terminal B	Resistance	Min. 1 MΩ
			Between ground and wiring harness between starting switch terminal ACC – fuse BT3 (19), (20) – J2P (female) (39)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between starting switch terminal ACC – fuse BT3 (19), (20) – J2C (female) (39)	Resistance	Min. 1 MΩ

E-12 Turn signal lamp or turning lamp (hazard lamp) do not work properly

Trouble	Turn signal lamp or turning lamp (hazard lamp) do not flash.
Related information	Explanation of circuit 1) If 24 V is input to pin (3), the flasher keeps outputting signals of 24 V and 0 V from pin (4) repeatedly. 2) The input of 24 V to flasher pin (3) is changed by relay (R17). It is supplied through BT1 for turn signal lamp and through BT2 for hazard lamp. 3) The flasher output is supplied constantly (regardless of the position of the switch) through connector (CM) to pin (6) of the turn switch and to pins (1) and (3) of hazard relay (R16). 4) When the turn switch is turned ON, the flashing signal is input to pin (6) of connector (CM) and the turn switch sends that signal to the left side (pin (7)) or right side (pin (8)). 5) If the hazard switch is pressed, pins (1) and (3) of relay (HAZ) are connected and hazard relays 1 (R16) and 2 (R17) are turned ON. Hazard relay 2 (R17) changes the power supply from BT1 to BT2 and hazard relay 1 (R16) connects the flashing signal from the flasher to both of the right side and left side.

<table>
<tr><td rowspan="20">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td>1</td><td>Defective fuse BT1 (4) or BT2 (24)</td><td colspan="4">When the fuse BT1 (4) or BT2 (24) is blown, it is highly possible that a defective grounding has occurred in the circuit (troubleshooting cause 7).</td></tr>
<tr><td>2</td><td>Defective lamp</td><td colspan="4">Since the lamp can be suspected to be defective, visually check it or replace it with known good lamp to make a judgement.</td></tr>
<tr><td rowspan="4">3</td><td rowspan="4">Defective turn signal lamp</td><td colspan="4">1) Turn starting switch OFF.
2) Insert T-adapter in connector FLS.
3) Turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="2">FLS</td><td colspan="2">Voltage</td></tr>
<tr><td colspan="2">Between (3) – ground</td><td colspan="2">20 – 30 V</td></tr>
<tr><td colspan="2">Between (4) – ground</td><td colspan="2">20 – 30 V and 0 V repeatedly</td></tr>
<tr><td rowspan="5">4</td><td rowspan="5">Defective turn switch</td><td colspan="4">1) Turn starting switch OFF.
2) Connect T-adapter to connector FLS (male).
3) Check switch unit.</td></tr>
<tr><td>CM (male)</td><td colspan="2">Turn switch (lever)</td><td>Resistance</td></tr>
<tr><td rowspan="2">Between (6) – (7)</td><td colspan="2">Turned to the left</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Turned to the right</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="2">Between (6) – (8)</td><td colspan="2">Turned to the right</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Turned to the left</td><td>Min. 1 MΩ</td></tr>
<tr><td>5</td><td>Defective relay</td><td colspan="4">When the relay can be suspected to be defective, replace it with another relay to make a judgement.
• As for the relay R16 (6 terminals): Replace with the relay R21, R40 or R05, etc.
• Relay R17 (5-pole): Replace with relay R11, R30, R31, etc.</td></tr>
<tr><td rowspan="7">6</td><td rowspan="7">Disconnection in wiring harness
(Disconnection in wiring or defective contact in connector)</td><td colspan="4">1) Turn starting switch OFF.
2) Disconnect connectors HAZ, R17, R16, FLS, CM, DPC2A, PR03, PL03, CJR, B02, and B03.
3) Connect T-adapter to connector of circuit to be checked.</td></tr>
<tr><td colspan="2">Wiring harness between BT1 (4) – R17 (female) (6)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Wiring harness between BT2 (24) – R17 (female) (5) – HAZ (female) (1)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Wiring harness between HAZ (male) (3) – R17 (female) (1) – R16 (female) (5)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Wiring harness between R17 (female) (3) – FLS (female) (3)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Wiring harness between R16 (female) (4) – CM (female) (7) – DPC2A (female) (7)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Wiring harness between R16 (female) (2) – CM (female) (8) – DPC2A (female) (16)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
</table>

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	6	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	Wiring harness between fuse BT-3 (16) – PSWR (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between PSWR (female) (2) – CJN (female) (4)	Resistance	Max. 1 Ω
			Wiring harness between CJN (female) (3) – H01 (female) (C)	Resistance	Max. 1 Ω
			Wiring harness between H01 (female) (A) – EM (female) (3)	Resistance	Max. 1 Ω
			Wiring harness between EM (female) (5) – relay terminal (54)	Resistance	Max. 1 Ω
	7	Short circuit (ground fault) of harness (Contact with ground circuit)	1) Turn starting switch OFF. 2) Disconnect connectors PSWR, CJN, EM, and BT3 (16). 3) Connect T-adapter to connector of circuit to be measured.		
			Between ground and wiring harness between fuse BT-3 (16) – PSWR (female) (1)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between PSWR (female) (2) – CJN (female) (4)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between CJN (female) (3) – H01 (female) (C)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between H01 (female) (A) – EM (female) (3)	Resistance	Min. 1 MΩ
			Between ground and wiring harness between EM (female) (5) – relay terminal (54)	Resistance	Min. 1 MΩ

★ The 5 factors in causing the trouble that "the emergency steering operates by itself (while the switch is turned OFF)" are as follows. (Factors 4) and 5) can cause this trouble only when they occur simultaneously.)

1) The emergency steering relay is kept turned ON for some vibration. (Replace the emergency steering relay.)
2) The voltage at the (+) terminal of the emergency steering relay is 20 – 30 V. (This terminal should be grounded normally.)
3) The wiring of the emergency steering relay on the M side comes in contact with that on the B side. (Open the battery box and check the wiring.)
4) Parking brake oil pressure switch is stuck. (Replace the parking brake oil pressure switch.)
5) Steering flow switch is stuck. (Replace steering flow switch.)

H-4 Excessive shock when starting or shifting excessive

Trouble	Shock when starting or shifting is excessive.
Related information	• If a failure code related to the machine is displayed, firstly troubleshooting the displayed code.

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Defective gear speed clutch ECMV	* There is some shock, but it is difficult to judge if the shock is excessive or not, so judge that it is excessive in the following cases. • When it is apparent that the shock suddenly became severer than before. • The shock is severer compared with other machines of the same class.
			Since the operation of the gear speed clutch ECMV can be suspected to be defective, check it directly.

H-17 Excessive hydraulic drift of dump body

Trouble	Hydraulic drift of dump body is excessive.
Related information	• If a failure code related to the machine is displayed, firstly troubleshooting the displayed code.

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state			★ Raise the dump body and troubleshooting with the engine stopped.
	1	Defective oil tightness of hoist valve main spool	Raise the dump body and disconnect the hydraulic hose in the dump cylinder head side. If the oil flows out from the cylinder side, the oil tightness of the spool is defective.
	2	Defective dump cylinder	Raise the dump body and disconnect the hydraulic hose in the dump cylinder head side. If the oil does not flow out from the cylinder side, the cylinder piston ring is defective.

S-9 Oil becomes contaminated quickly

General causes why oil becomes contaminated

- Entry of exhaust gas into oil due to internal wear
- Clogging of lubrication passage
- Use of improper fuel
- Use of improper oil
- Operation under excessive load

			Causes									
			Defective seal at turbocharger turbine end	Worn valve and/or valve guide	Worn piston ring and/or cylinder liner	Clogged breather and/or breather hose	Clogged oil cooler	Clogged oil filter	Defective oil filter safety valve	Clogged turbocharger lubrication drain tube	Exhaust smoke is bad
Questions	Confirm recent repair history										
Questions	Degree of machine operation	Operated for long period	△	△	△						
Questions	Non-specified fuel is being used							○			
Questions	Engine oil replenished more frequently				◎						
Questions	Even when engine oil temperature rises, oil filter clogging monitor indicates clogging (if monitor is installed)							◎	○		
Check items	Metal particles are found when oil filter is drained			○	○			◎			
Check items	Inside of exhaust pipe is contaminated with oil			◎							
Check items	Engine oil temperature rises quickly						◎				
Check items	Color of exhaust gas	Blue under light load			◎						
Check items	Color of exhaust gas	Black									◎
Check items	Amount of blow-by gas	Excessive	○	○	◎					○	
Check items	Amount of blow-by gas	None				◎					

Troubleshooting	Excessive play of turbocharger shaft		●								See S-7
Troubleshooting	When compression pressure is measured, it is found to be low			●	●						See S-7
Troubleshooting	Inspect breather and breather hose directly					●					See S-7
Troubleshooting	Inspect oil cooler directly						●				See S-7
Troubleshooting	Inspect oil filter directly							●			See S-7
Troubleshooting	Spring of oil filter safety valve is hitched or broken								●		See S-7
Troubleshooting	Inspect turbocharger lubrication drain tube directly									●	See S-7
		Remedy	Replace	Replace	Replace	Clean	Clean	Replace	Replace	Clean	—

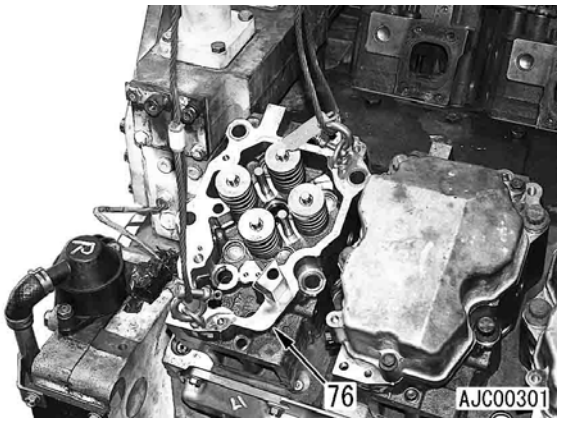
Component	Symbol		Part No.	Part Name	Necessity	Q'ty	New/remodel	Sketch	Nature of work, remarks
Disassembly, assembly of hoist cylinder assembly	U	9	790-502-1003	Repair stand	■	1			
			790-101-1102	Hydraulic pump	■	1			
		10	790-720-1000	Expander	■	1			
		11	796-720-1690	Ring (for cylinder Ⅱ)	■	1			Installation of piston ring
		12	07281-02059	Clamp (for cylinder Ⅱ)	■	1			
		13	792-630-1300	Push tool (for cylinder Ⅰ)	■	1			
			790-101-5421	Grip (for cylinder Ⅰ)	■	1			Press fitting of suspension cylinder coil bushing
			01010-51240	Bolt (for cylinder Ⅰ)	■	1			
			790-445-4210	Push tool (for cylinder Ⅱ)	■	1			
			790-101-5421	• Grip (for cylinder Ⅱ)		1			
			01010-51240	• Bolt (for cylinder Ⅱ)		1			
Disassembly, assembly of hoist cylinder assembly	V	1	792T-674-1010	Body sling pin	■	4	N	○	

Installation
Cylinder head assembly

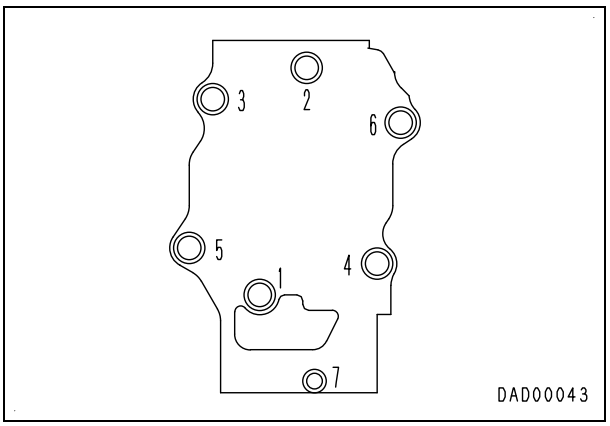
★ Install the cylinder head assembly in the reverse order to removal.

1. Install the cylinder head gasket.

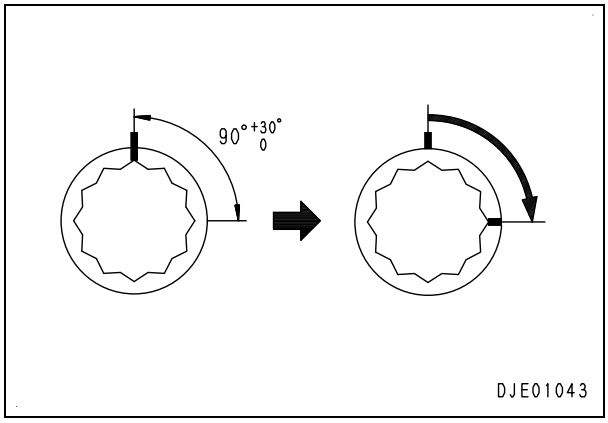
2. Sling and install cylinder head assembly (76).
   Cylinder head assembly: **30 kg**



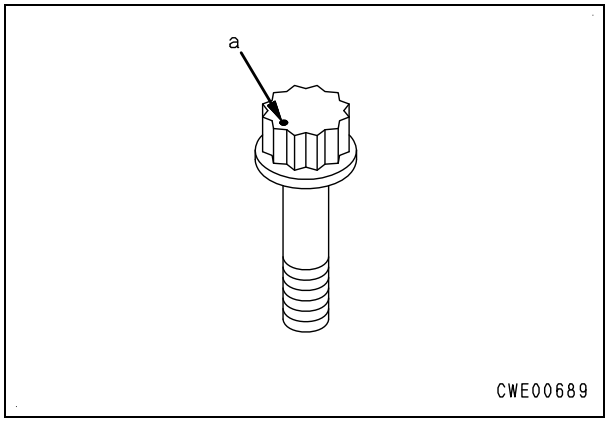
★ If there are 5 punch marks on the head of a bolt, do not reuse that bolt but replace it.
★ Length of mounting bolt
(1), (2), (4): **166 mm**
(3), (5), (6): **201 mm**
★ Tighten the mounting bolts in the numerical order shown in the figure.
Cylinder head assembly mounting bolts (1) – (6):
1st time: 137 – 157 Nm {14 – 16 kgm}
2nd time: 284 – 294 Nm {29 – 30 kgm}
3rd time: Retighten by 90 – 120°.
Cylinder head assembly mounting bolt (7): **66.2 ± 7.4 Nm {6.75 ± 0.75 kgm}**



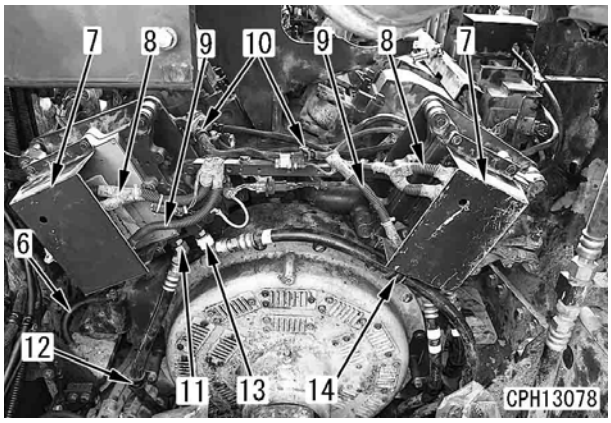
★ Use tool **A4** to retighten the mounting bolts. When not using tool **A4**, make marks on the bolts and cylinder head, and then retighten each bolt by 90 – 120°.



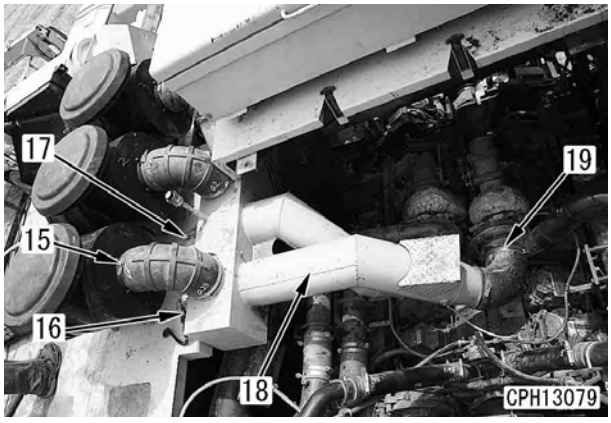
★ After tightening the bolts, make punch mark (a) on the main bolt head (Do not make it when new bolts are used, however).



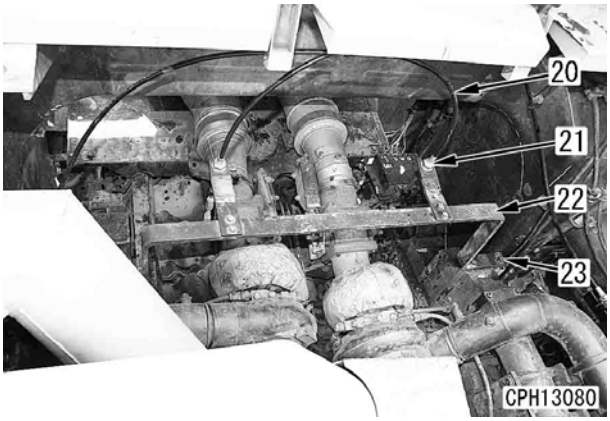
6) Remove engine ground wiring (6).
7) Remove engine controller cover (7).
8) Disconnect the connectors of wirings (8) and (9) on the controller side and remove wiring clamp (10) on the machine side.
9) Disconnect tubes (11) and (13) connected into the engine controller and remove clamps (12) and (14) to remove those tubes.



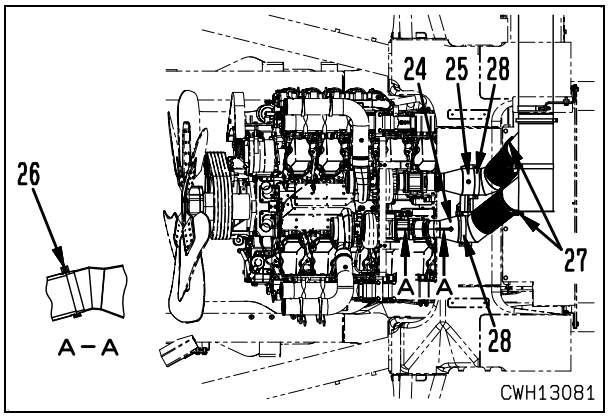
8. **Intake air duct**
1) Disconnect air cleaner clogging sensor switch connector (16).
2) Loosen air cleaner rubber elbow clamp (15). [*1]
3) Sling air duct (18) and remove mounting bolts (17).
4) Remove rubber elbow clamp (19) on the turbocharger side of air duct (18). [*2]
★ While prying the air duct, pull out the rubber elbow.
Air duct: **45 kg**



9. **Exhaust brake control bracket**
1) Loosen mounting nut (21) of exhaust brake cable (20) and remove the yoke pin and cotter pin of the lever. [*3]
2) Disconnect cable (20).
3) Remove mounting bolt (23) and cable bracket (22).

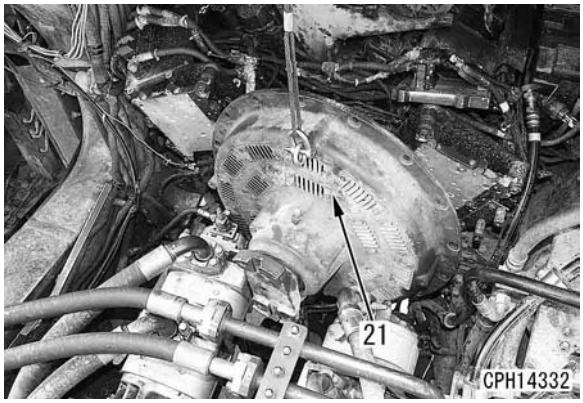


10. **Exhaust connector between turbocharger and muffler**
1) Remove connecting band (26) of exhaust connectors (24) and (25). [*4]
2) Loosen clamp (27) on the rubber tube side of the exhaust connector. [*5]
3) Remove U-bolt (28) which is fixing the exhaust connector.

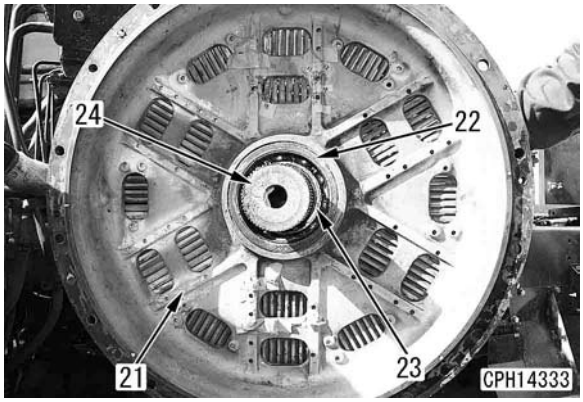


4) Pry out the rubber tube side of the connector.

2) Install an eyebolt to cover assembly (21) and sling it.
3) Remove the mounting bolts and lift off cover (21).
Cover assembly: **80 kg**

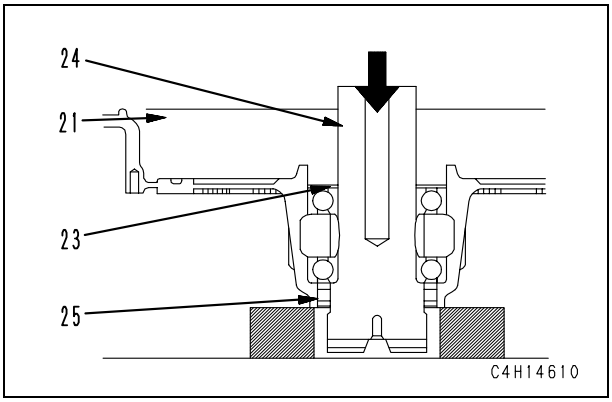


4) Remove oil seal (22) and snap ring (23) on the reverse side of cover assembly (21).

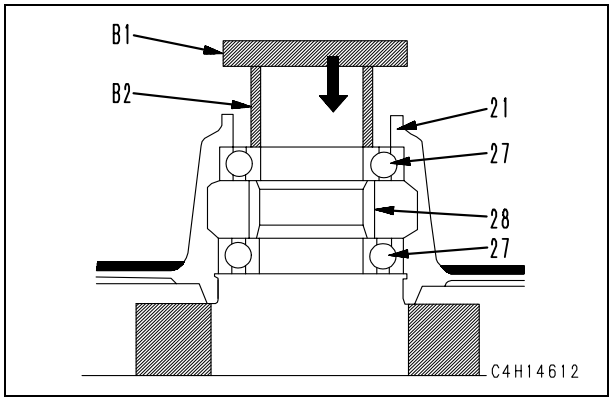


5) Pull out output shaft (24) with a press.

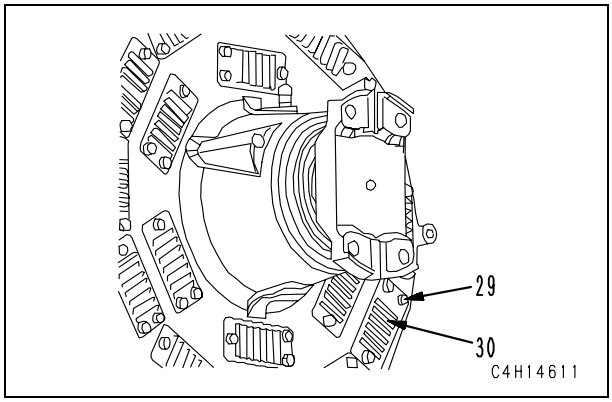
6) Remove oil seal (25).



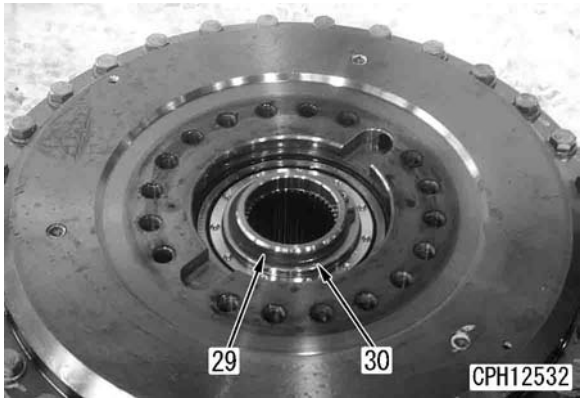
7) Place cover (21) in the reverse direction. Using tools **B1** and **B2**, remove bearing (27), spacer (28) and bearing (27).



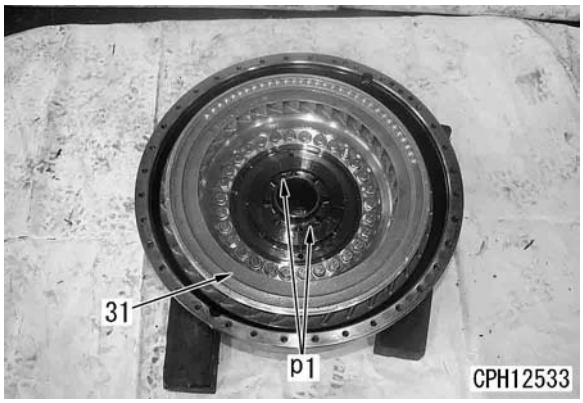
8) Remove bolts (29) and louver (30).

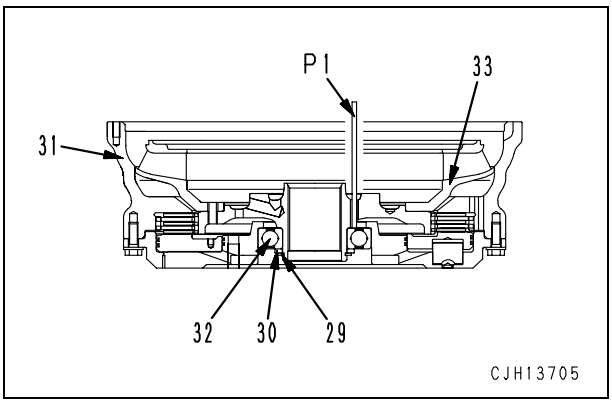


2) Turbine assembly
1] Remove snap ring (29) and spacer (30).

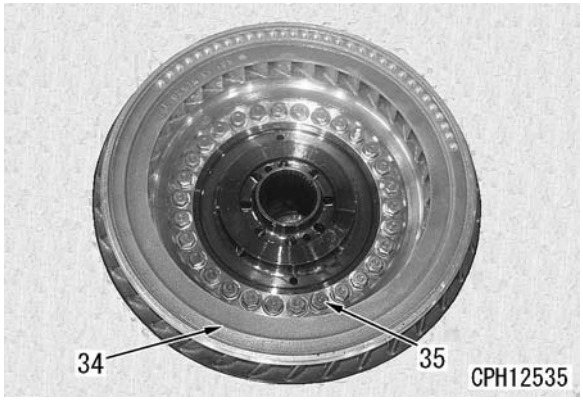


2] Reverse turbine and clutch assembly (31), drive bearing inner race (32) out of hole (p1) on the boss side, and remove turbine assembly (33).
★ Place a block about 50 mm high on the turbine boss.

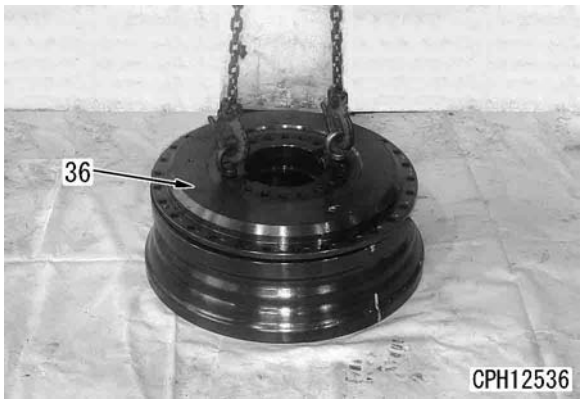




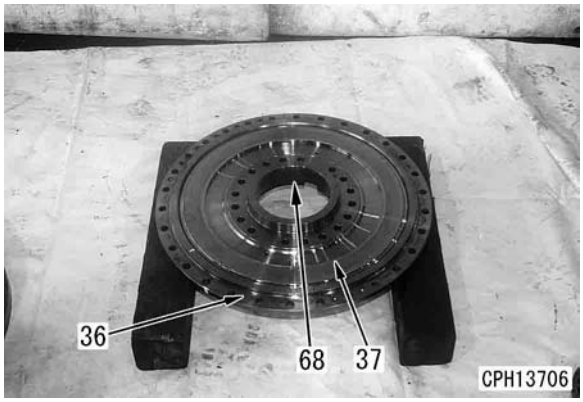
3] Remove inner gear mounting bolts (35) from turbine (34).



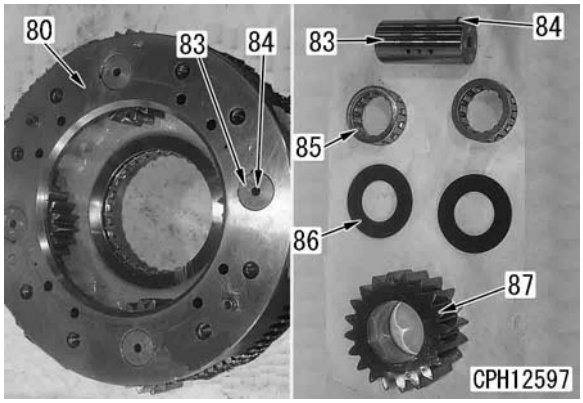
3) Housing
1] Lift off housing assembly (36) with the housing side up.



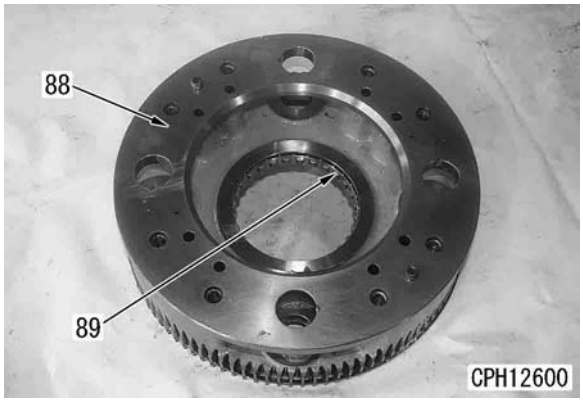
2] Remove piston (37) and bearing (68) from housing (36).



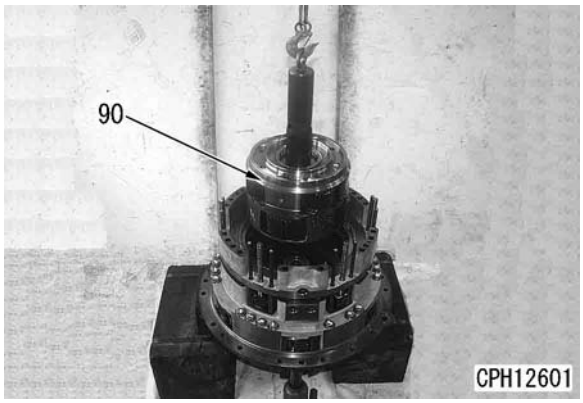
2) No. 4 planetary gear
   1] Pull out shaft (83) toward the ball.
   2] Remove ball (84).
   3] Remove gear (85), bearing (86) and thrust washer (87).



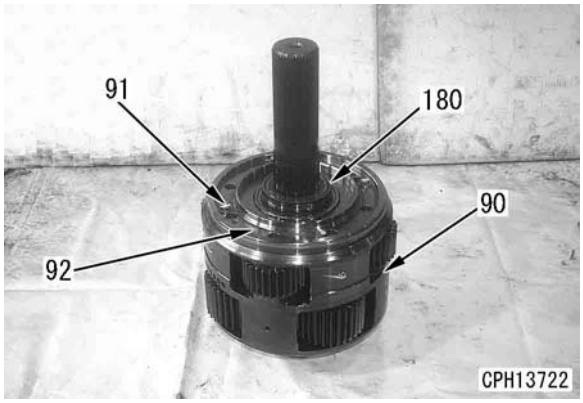
   4] Remove bearing (89) from carrier (88).



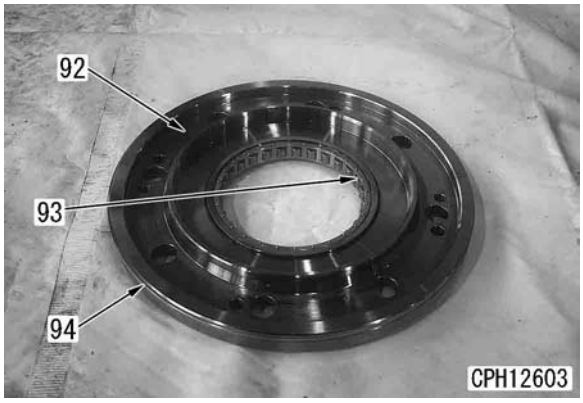
20. No. 5 carrier and No. 6 carrier assembly
Lift off No. 5 carrier and No. 6 carrier assembly (90).



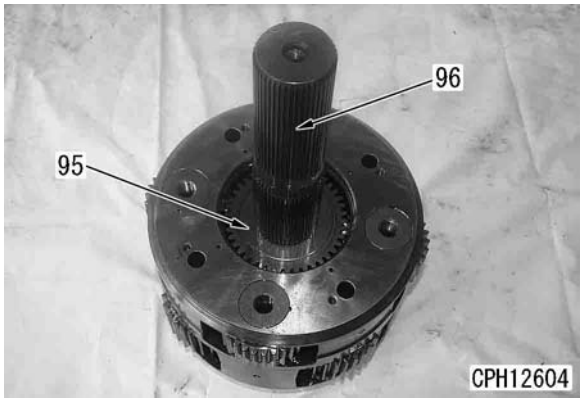
21. Disassembly of No. 5 and No. 6 carrier assembly
1) Remove collar (180) and remove snap ring (181) and inner race (182) from the collar.
   ★ Check the installed direction (vertical) of the collar.
2) Remove bolts (91) from carrier assembly (90) and remove cover (92).



3) Remove bearing (93) and seal ring (94) from cover (92).

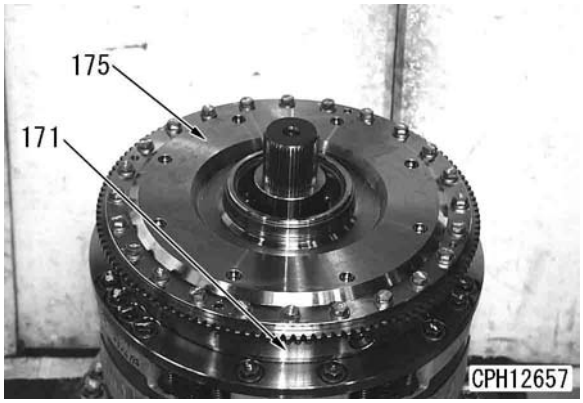


4) Lift off shaft and sun gear assembly.
5) Pull sun gear (95) out of shaft (96).



31. No. 3 clutch housing assembly

1) For assembly of the piston, see "Assembly of No. 2 clutch assembly", (5).
2) While meshing the external teeth of the piston with the internal teeth of drum (171), install housing assembly (175).
   Mounting bolt: **Adhesive (LT-2)**
   Mounting bolt:
   98.1 – 122.6 Nm {10.0 – 12.5 kgm}



32. Check of piston operation

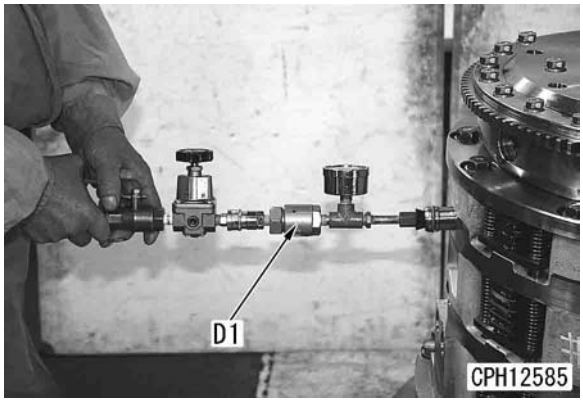
Using tool **D1**, check the operating condition of the No. 4, 5, 6 and 7 clutch pistons.

★ Air pressure:
0.29 – 0.59 MPa {3 – 6 kg/cm²}

Standard piston stroke:

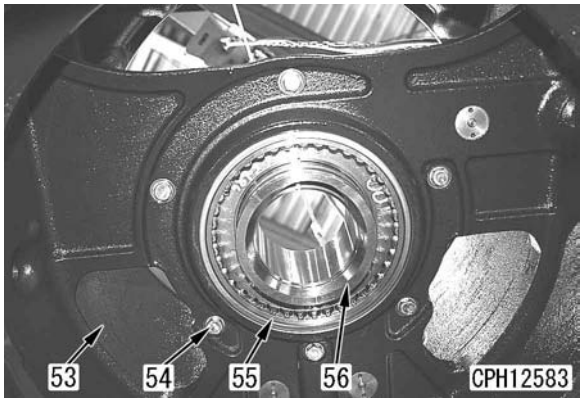
Piston No	Stroke (mm)
No. 4	4.0
No. 5	6.3
No. 6	6.8
No. 7	6.0

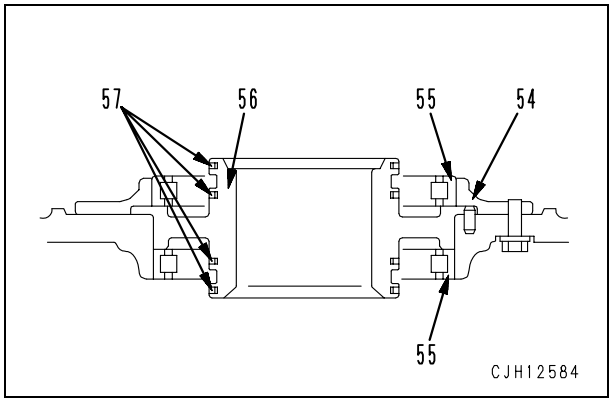
★ If the pistons do not move smoothly, supply power train oil.



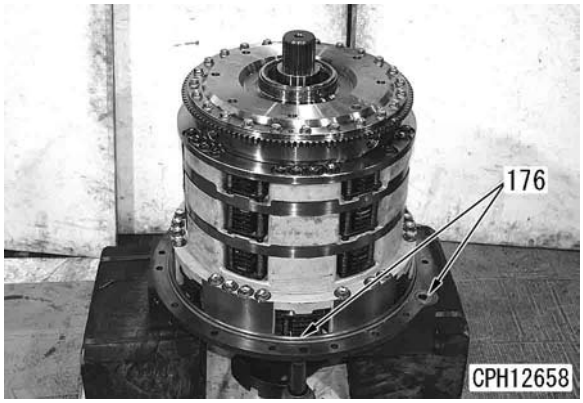
33. Transmission case

1) Install the following parts to the transmission case.
   1] Install seal ring (57) to the outside groove of collar (56) and install them to the transmission case, setting them to the dowel pin.
      Seal ring: **Grease (G2-LI)**
   2] Install cage (54) to case (53).
   3] Install bearings (55) to both sides.
      ★ Press fit the bearing until they reach the collar. (Ensure that there is no clearance between the collar and each bearing.)

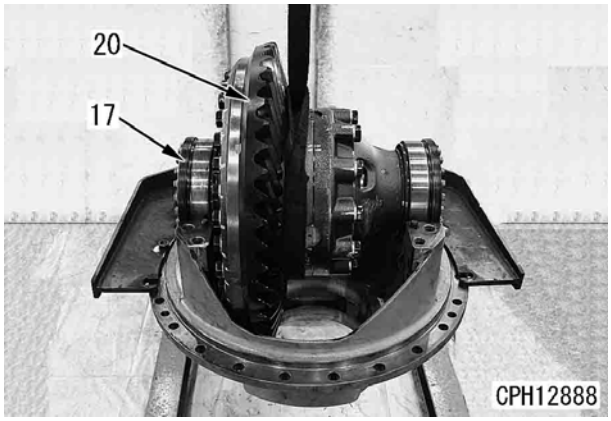




2) Install O-ring (176) to the cover assembly.

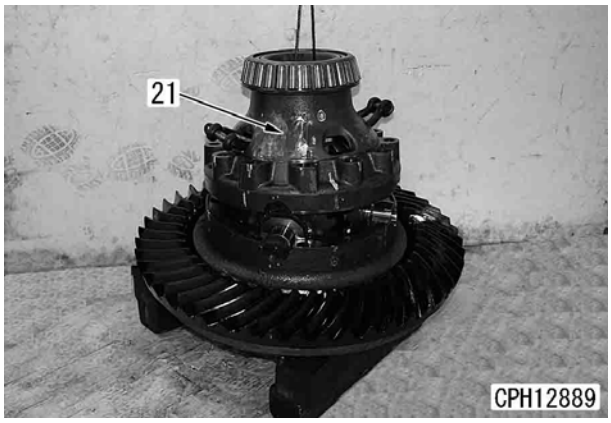


4) Lift off differential gear assembly (20).
5) Remove right and left side bearing adjustment nuts (17).

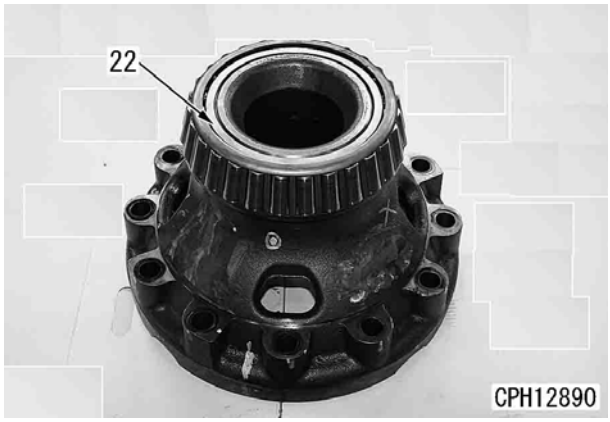


- **Disassembly of differential gear assembly**

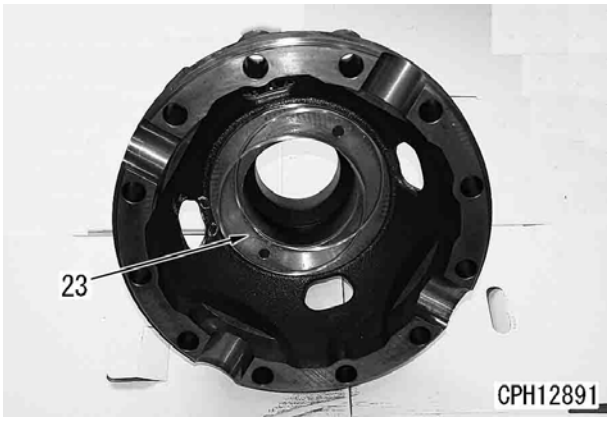
1) Remove the mounting bolts and case (21).
   ★ Make positioning marks on the bevel gear and case in paint.



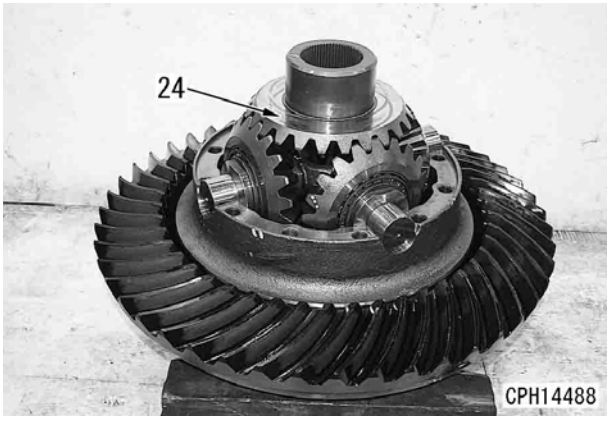
2) Remove bearing (22).



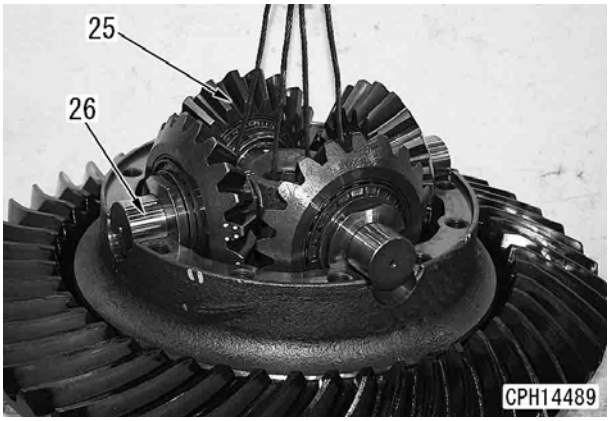
3) Remove thrust washer (23).



4) Remove side gear (24).



5) Remove pinion gear assembly (25) and cross shaft (26) together.
   ★ Take care since the pinion gear assembly comes off the cross shaft easily.



Removal and installation of steering valve assembly

Removal

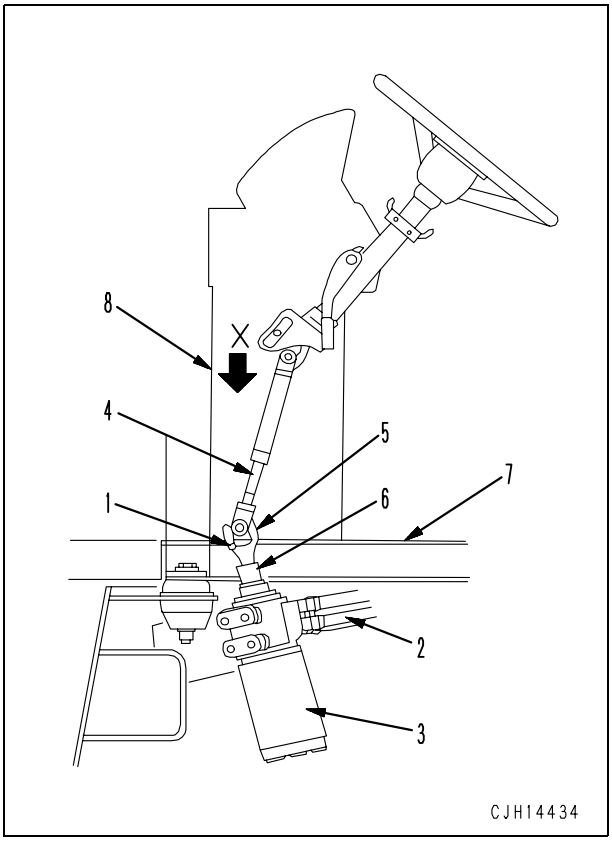
⚠ **loosen the oil filler cap gradually to release the pressure inside the hydraulic tank.**

★ Pass a rope etc. through yoke (5) and sling the yoke so that the yoke will not come off the spline of column shaft (4) .

1. Loosen yoke fixing bolt (1).
   - ★ Since the fixing bolt has fine threads and is a special one, take care not to apply excessive force to it to damage its threads or lose it.
   - ★ Ensure that yoke (5) can be moved up and down lightly along spline (6) of the input shaft and can be pulled out easily.
   - ★ If the input shaft of the steering valve is hitted strongly, it may become eccentric and that can cause a trouble.

2. Disconnect 5 hoses (2).

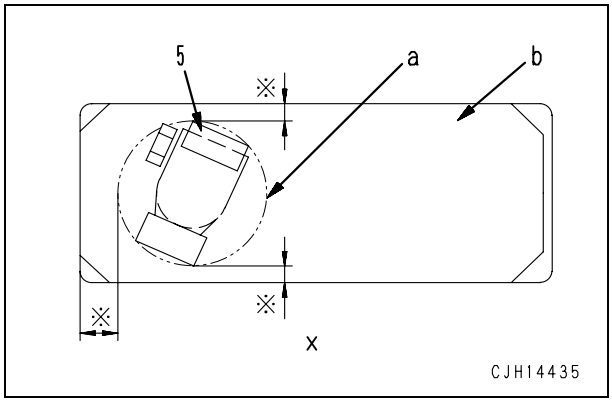
3. Remove steering valve assembly (3).
   - ★ Lift off the steering valve assembly with a rope and take care not to drop it.



Installation

- Carry out installation in the reverse order to removal.

★ When installing, rotate the steering wheel 1 turn to increase the dimensions marked with * between yoke path (a) and floor (7) and between column support (8) and hole (b) to at least 5 mm.



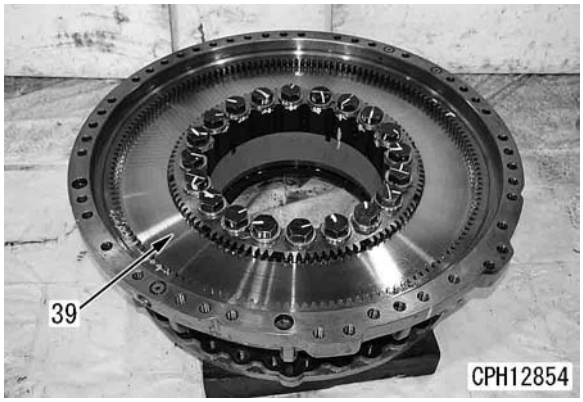
★ After tightening the bolts, rotate the hub and ensure that it is free from abnormality.

- **Refilling with oil**
  Add oil to the specified level. Run the engine to circulate the oil. Then, check the oil level again.

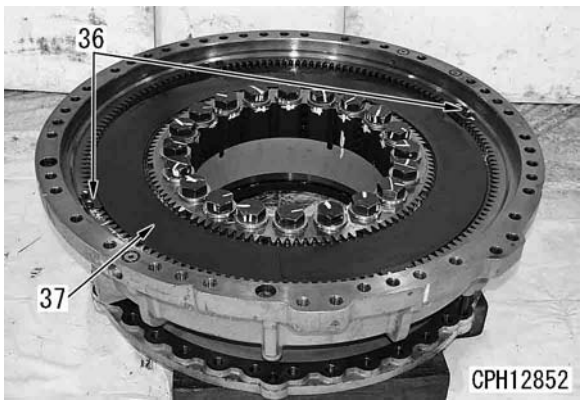
- **Bleeding air**
  Bleed air. For details, see Testing and adjusting, "Bleeding air from brake circuit".

8) Install disc (38).

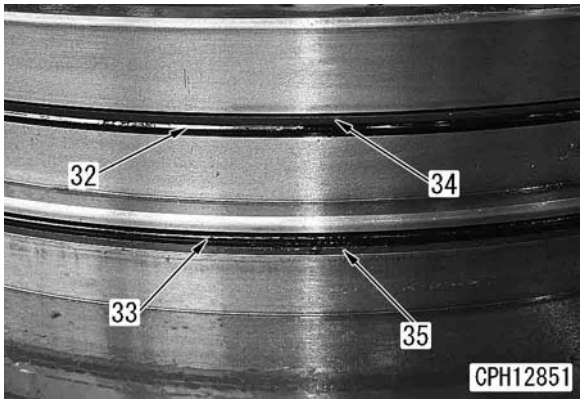
9) Install plate (39).
★ Install the 9 discs and 8 plates alternately.



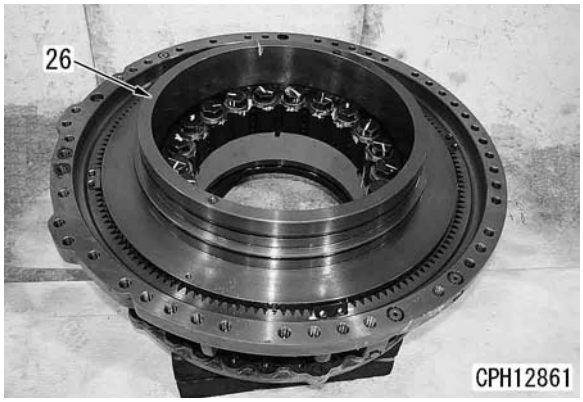
10) Install plate stuck with cork (37).
★ Direct the cork side toward the piston.
11) Install fixing plate (36).



12) Install seal rings (32) and (33) and backup rings (34) and (35) to service brake piston (26).
★ Install the seal rings to the pressure receiving side (inside).

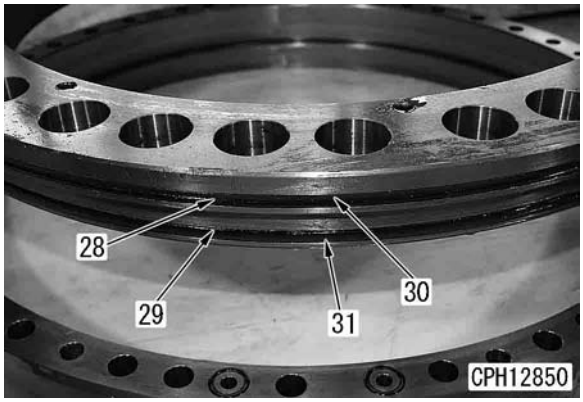


13) Install service brake piston (26).



2. Parking brake

1) Install seal rings (28) and (29) and backup rings (30) and (31) to piston (27).
★ Install the seal rings to the pressure receiving side (inside).

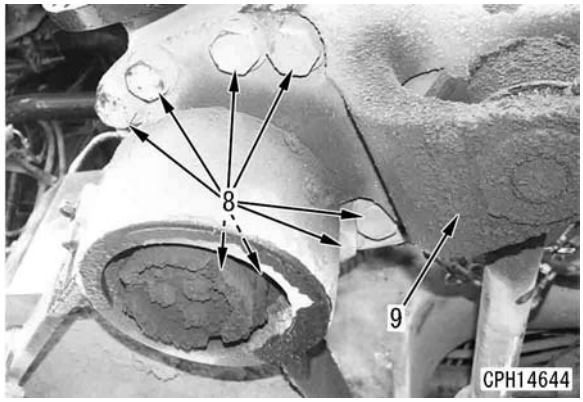


Removal and installation of king pin

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. Loosen bolt (9) of knuckle arm (8). [*1]



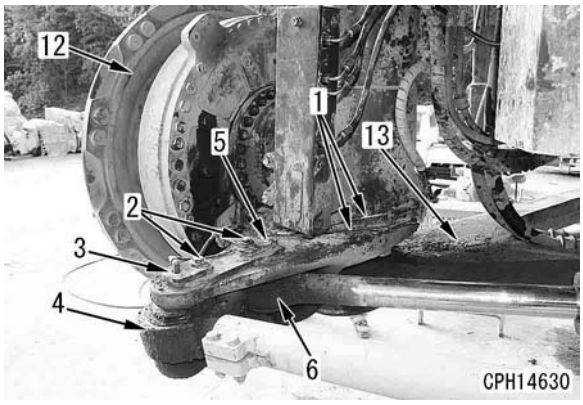
2. Disconnect grease tube (1).

3. Disconnect bolt (2), pull out pin (3), and disconnect tie rod (4).

4. Pull out pin (5) and disconnect steering cylinder (6). [*2]

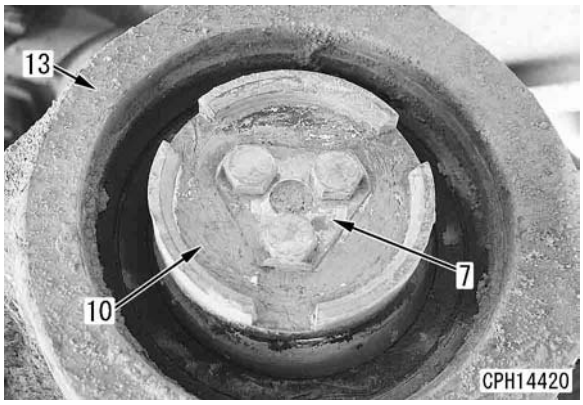
5. Support wheel hub assembly (12) with a forklift.
   ★ Fix wheel hub assembly (12) securely to the fork of the forklift with a chain block etc.

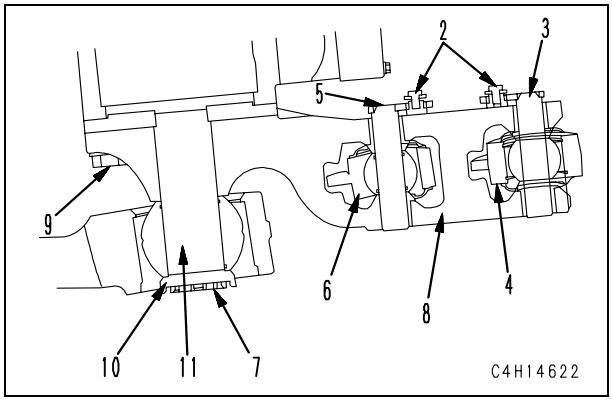
6. Support A-frame (13) with an engine jack etc.



7. While looking at A-frame (13) from below, straighten lock plate (7) of the king pin mounting bolt.

8. Remove the king pin (11) mounting bolt (7) and holder (10). [*3]





9. Lower the jack under the A-frame gradually.

10. Support knuckle arm (8) with an engine jack etc., remove mounting bolt (9) which has been loosened, and lower and remove knuckle arm (8) gradually.
    Knuckle arm: **170 kg**

11. Using a press, remove the king pin (11) from knuckle arm (8).

Installation

- Carry out installation in the reverse order to removal.

[*1]

⚠ **When aligning the pin holes, use a bar. Never insert your fingers in the pin holes.**

Lock plate mounting bolt:

157 – 196 Nm {16 – 20 kgm}

[*2]

★ Adjust the body positioner sensor. For details, see Testing and adjusting, "Adjusting body positioner sensor".

[*3]

⚠ **When aligning the pin holes, use a bar. Never insert your fingers in the pin holes.**

★ Insert the shims as recorded when removed.

Lock plate mounting bolt:

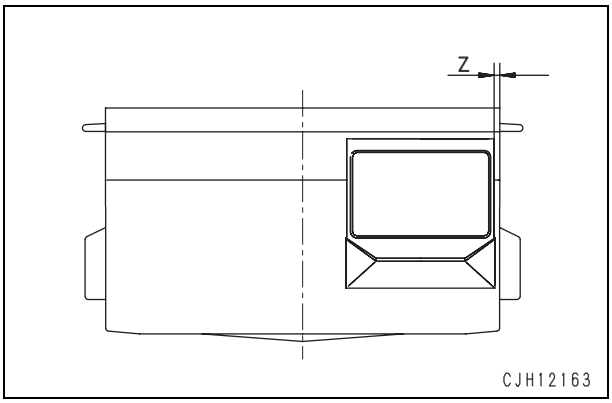
245 – 309 Nm {25 – 31.5 kgm}

[*4]

★ After installing the body, check that difference (Z) between the levels of the body assembly and cab assembly is in the following range.

- Standard value of difference (Z):

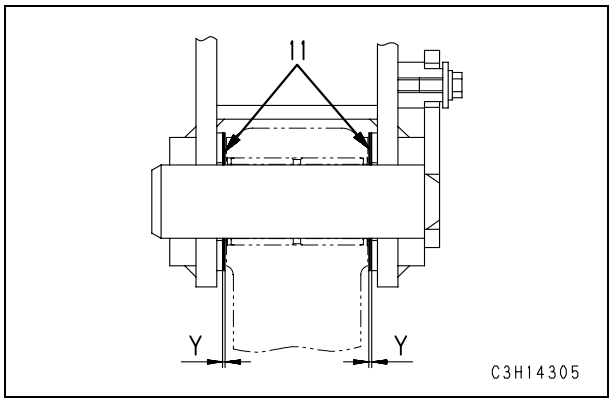
59 ± 30 mm



★ If difference (Z) is out of the standard, adjust it with spacers (11) of the right and left body hinge pins.

- Kinds of spacer thickness: 1 mm, 6 mm

★ Clearance (Y) must be 1 mm or less.



[*5]

★ Set tool **V1** (body sling pin) from outside of the body side.

★ Connect the slings with shackles (for 10 t) inside the body.

★ **Adjustment of body mount shim**

1. Adjust the bottom mount shim.
   1) Insert 43-mm thick spacer [1] in the end of body (10). (1 place each on right and left sides)
   2) Measure clearance (X) between the center of the mounting portion of bottom mount (12) and the top of rear frame (13)
      - Shim thickness = ((X) – 35) mm
      - ★ Measure clearance at each of the 8 places of (A), (B), (C) and (D) on the right and left sides.
   3) Calculate the shim thickness at each of the 8 places of (A), (B), (C) and (D) on the right and left sides.
   4) Set shim (14) calculated in 3) above to bottom mount (12).
      - Standard shim thickness at (A), (B), (C) and (D): 3 mm
      - Kinds of shim thickness: 1 mm, 3.2 mm
   5) Remove spacer [1], lower the body, and check that all of 8 bottom mounts (A), (B), (C) and (D) are in contact with rear frame top (13).

      Mounting bolt (9):

      245 – 309 Nm {25 – 31.5 kgm}

DUMP TRUCK

HD785-7

Machine model	Serial number
HD785-7	A10001 and up

50 Disassembly and assembly

Electrical system