VEBM946101

SHOP MANUAL

WA470-6
WA480-6

MACHINE MODEL	SERIAL NUMBER
WA470-6	**H50051 and up**
WA480-6	**H60051 and up**

- This shop manual may contain attachments and optional equipment that are not available in your area. Please consult your local Komatsu distributor for those items you may require.
  Materials and specifications are subject to change without notice.
- WA470-6 and WA480-6 mounts the SAA6D125E-5 engine.

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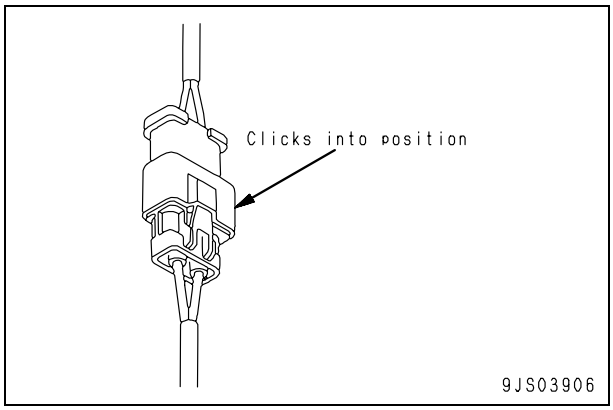
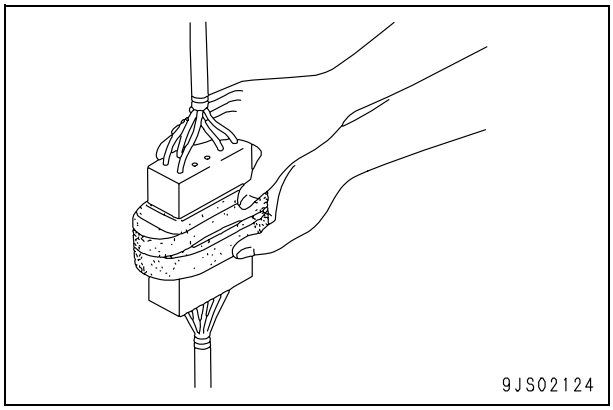
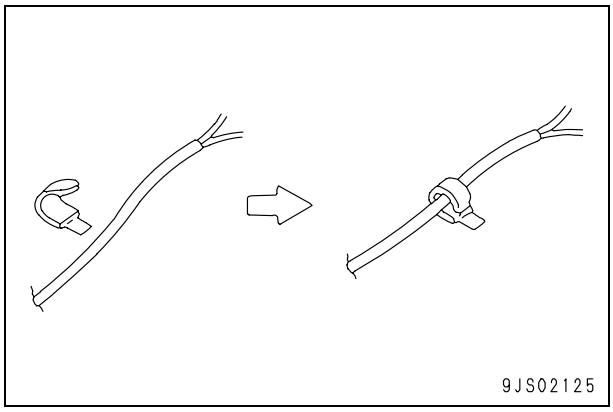
2) Connecting connectors
   1] Check the connector visually.
   Check that there is no oil, dirt, or water stuck to the connector pins (mating portion).
   Check that there is no deformation, defective contact, corrosion, or damage to the connector pins.
   Check that there is no damage or breakage to the outside of the connector.
   ★ If there is any oil, water, or dirt stuck to the connector, wipe it off with a dry cloth. If any water has got inside the connector, warm the inside of the wiring with a dryer, but be careful not to make it too hot as this will cause short circuits.
   ★ If there is any damage or breakage, replace the connector.
   2] Fix the connector securely.
   Align the position of the connector correctly, and then insert it securely. For connectors with lock stopper, push in the connector until the stopper clicks into position.
   3] Correct any protrusion of the boot and any misalignment of the wiring harness.
   For connectors fitted with boots, correct any protrusion of the boot. In addition, if the wiring harness is misaligned, or the clamp is out of position, adjust it to its correct position.
   ★ If the connector cannot be corrected easily, remove the clamp and adjust the position.
   • If the connector clamp has been removed, be sure to return it to its original position. Check also that there are no loose clamps.



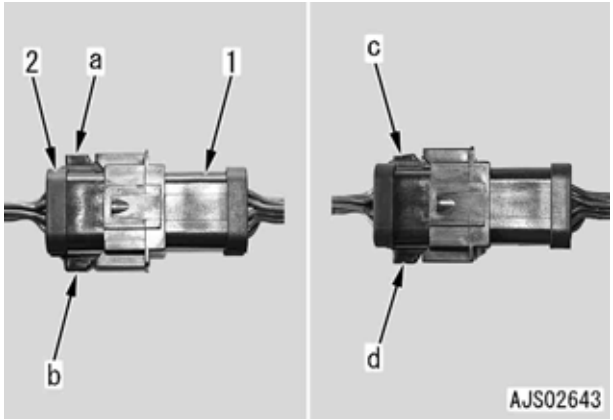




3) Connecting DT connectors
Since the DT 8-pin and 12-pin heavy duty wire connectors have 2 latches respectively, push them in until they click 2 times.

1. Male connector
2. Female connector

• Normal locking state (Horizontal): a, b, d
• Incomplete locking state (Diagonal): c



Conversion table

Method of using the conversion table

The conversion table in this section is provided to enable simple conversion of figures. For details of the method of using the conversion table, see the example given below.

Example: Method of using the conversion table to convert from millimeters to inches

1. Convert 55 mm into inches.

1) Locate the number 50 in the vertical column at the left side, take this as (A), and then draw a horizontal line from (A).
2) Locate the number 5 in the row across the top, take this as (B), then draw a perpendicular line down from (B).
3) Take the point where the two lines cross as (C). This point (C) gives the value when converting from millimeters to inches. Therefore, 55 mm = 2.165 inches.

2. Convert 550 mm into inches.

1) The number 550 does not appear in the table, so divide it by 10 (move the decimal point one place to the left) to convert it to 55 mm.
2) Carry out the same procedure as above to convert 55 mm to 2.165 inches.
3) The original value (550 mm) was divided by 10, so multiply 2.165 inches by 10 (move the decimal point one place to the right) to return to the original value. This gives 550 mm = 21.65 inches.

Millimeters to inches

(B)

1 mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0	0	0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
						(C)				
50	1.969	2.008	2.047	2.087	2.126	2.165	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

(A)

Unit: ℓ

Supply point	WA470-6		WA480-6	
	Specified capacity	Refill capacity	Specified capacity	Refill capacity
Engine oil pan	47	38	47	38
Transmission case	65	54	65	54
Hydraulic system	270	173	275	173
Axle (Front/Rear)	60/56	60/56	59/59	59/59
Fuel tank	413	—	413	—
Coolant system	61	—	61	—

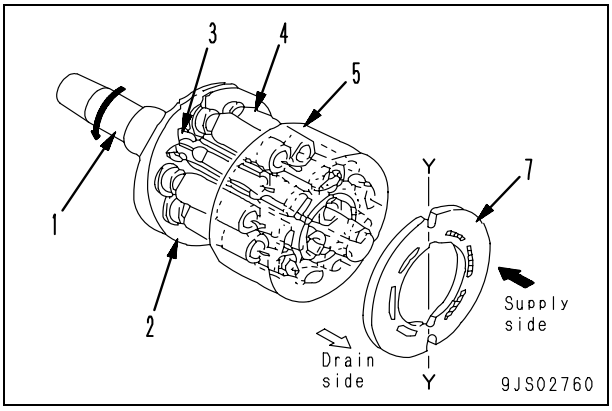
1. Hydraulic motor

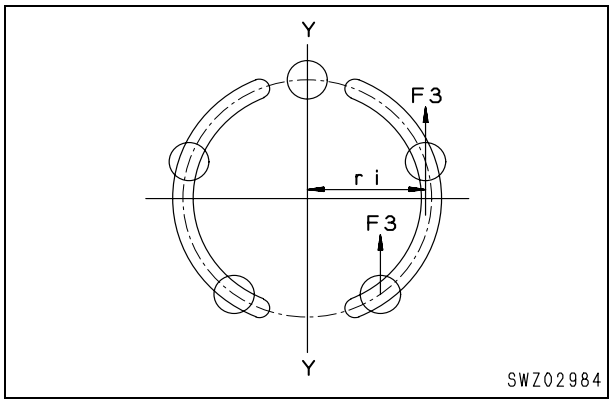
Function

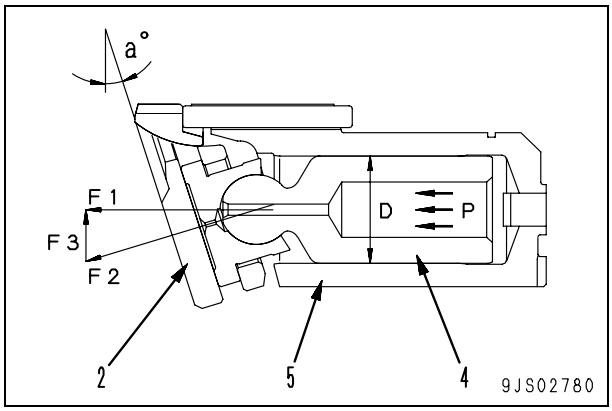
- This hydraulic motor is called a swash plate-type axial piston motor. It converts the energy of the pressurized oil sent from the hydraulic pump into rotary motion.

Principle of operation

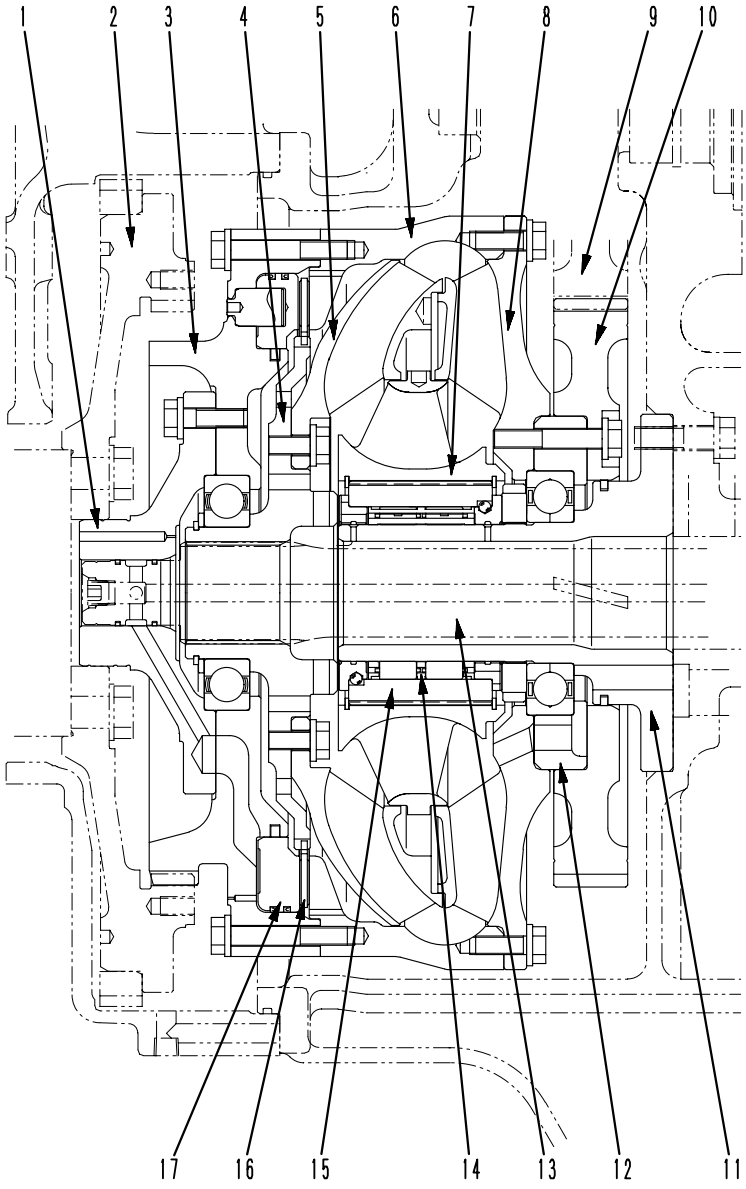
- The oil sent from the hydraulic pump flows through valve plate (7) into cylinder block (5). This oil can flow on only one side of the (Y – Y) line connecting the top dead center and bottom dead center of the stroke of piston (4).
- The oil sent to one side of cylinder block (5) presses piston (4) [2 or 3 pieces], and generates force (F1) [F1 = P × ✕D²/4].
- This force is applied to thrust plate (2). Since thrust plate (2) is fixed to the angle of (a°) degrees to output shaft (1), the force is divided into components (F2) and (F3).
- The radial component (F3) generates torque [T = F3 × ri] against the (Y – Y) line connecting the top dead center and bottom dead center.
- The result of this torque [T = ✕(F3 × ri)] rotates cylinder block (5) through the piston.
- Since this cylinder block (5) is splined to the output shaft, the output shaft revolves to transmit the torque.







With lockup clutch

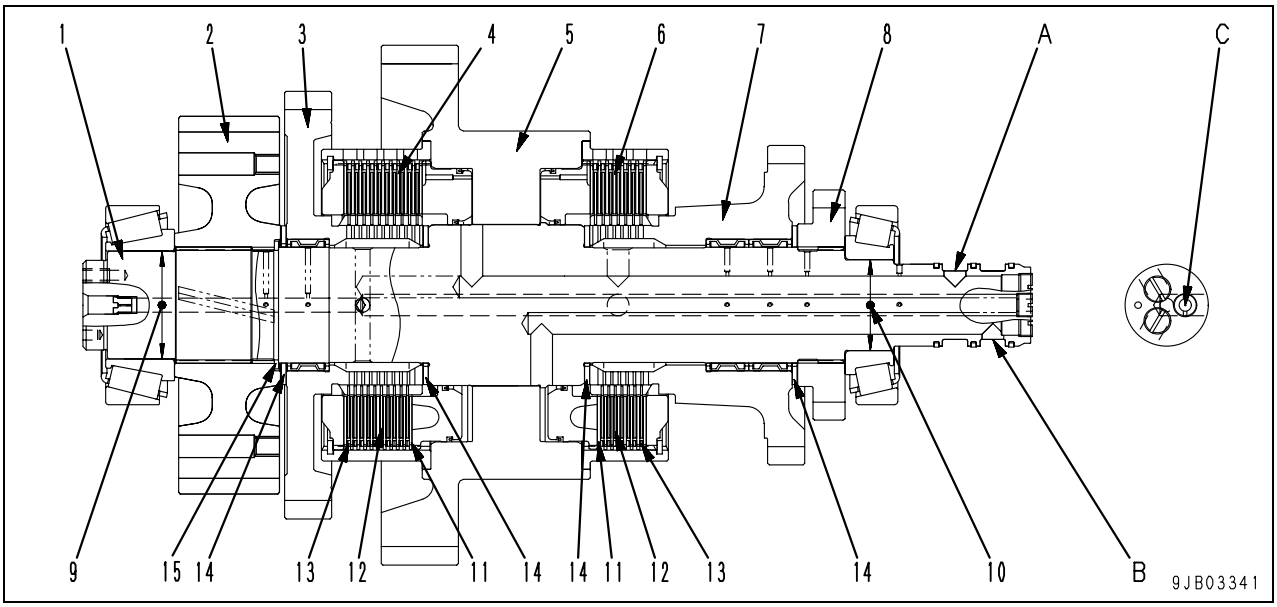


1. Pilot
2. Flywheel
3. Lockup clutch housing
4. Boss
5. Turbine
6. Drive case
7. Stator
8. Pump
9. PTO gear
10. PTO drive gear (Number of teeth: 99)
11. Stator shaft
12. Guide
13. Input shaft
14. Free wheel
15. Race
16. Lockup clutch disc
17. Lockup clutch piston

Specifications

Type	3-element, 1-stage, 2-phase
Stall torque ratio	2.26

2nd and 3rd clutches



A: 2nd clutch oil port
B: 3rd clutch oil port
C: Lubricating oil port

1. Lower shaft
2. Lower gear A (WA470-6 Number of teeth: 53)
   (WA480-6 Number of teeth: 51)
3. 2nd clutch gear (Number of teeth: 54)
4. 2nd clutch
5. 2nd and 3rd cylinders (Number of teeth: 68)
6. 3rd clutch
7. 3rd clutch gear (Number of teeth: 41)
8. Lower gear B (Number of teeth: 29)

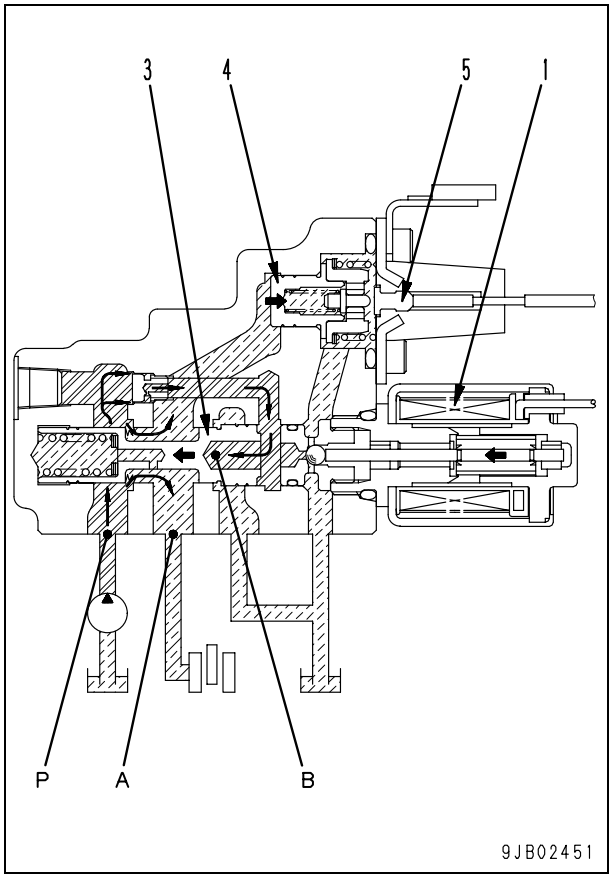
Unit: mm

No.	Check item		Criteria					Remedy
9	Clearance between lower shaft bearing and lower shaft (front)		Standard size	Tolerance		Standard clearance	Clearance limit	Replace
				Shaft	Hole			
			65	+0.055 +0.045	0 –0.015	–0.070 – –0.045	—	
10	Clearance between lower shaft bearing and lower shaft (rear)		55	+0.039 +0.020	0 –0.015	–0.054 – –0.020	—	
11	Clutch plate		Standard size		Tolerance		Repair limit	
		Thickness	1.7		±0.05		1.5	
		Strain	—		+0.1 0		0.15	
12	Clutch disc	Thickness	2.2		±0.08		1.6	
		Strain	—		0.1		0.25	
13	Load of wave spring [Testing height: 2.2 mm]		1,010 N {103 kg}		±101 N {±10.3 kg}		859 N {87.6 kg}	
14	Thickness of thrust washer (2nd and 3rd clutches)		3		±0.1		2.7	
15	Snap ring		Reuse after disassembly not allowed					

When traveling in direct range

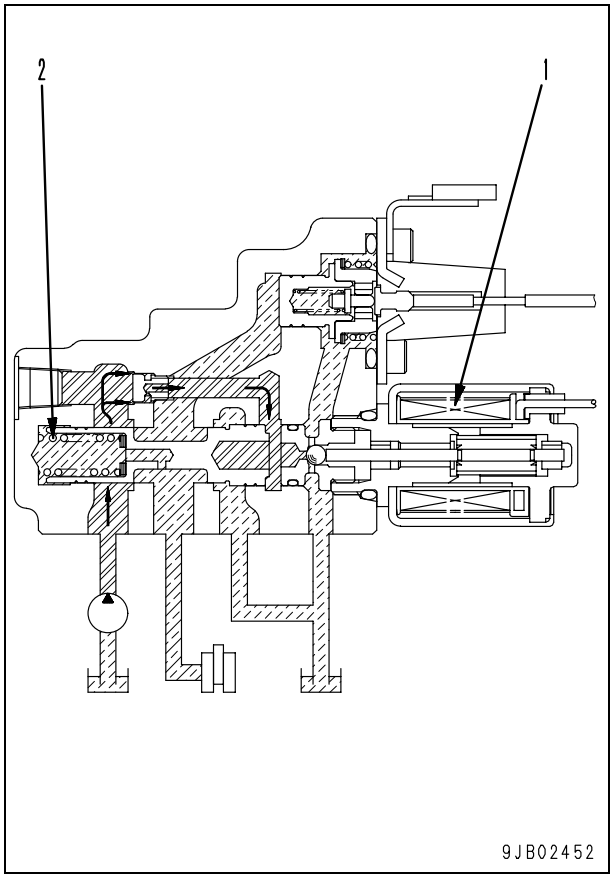
(Torque converter travel ✕ direct travel)

During filling



- When traveling in direct (lockup) range, current is supplied to proportional solenoid (1), the oil pressure force balanced with the solenoid force is applied to chamber (B) and pushes pressure control valve (3) to the left. As a result, pump port (P) and clutch port (A) are opened and oil starts filling the clutch. If the clutch is filled with oil, oil pressure detection valve (4) is operated, and fill switch (5) is turned “ON”.

Pressure adjustment



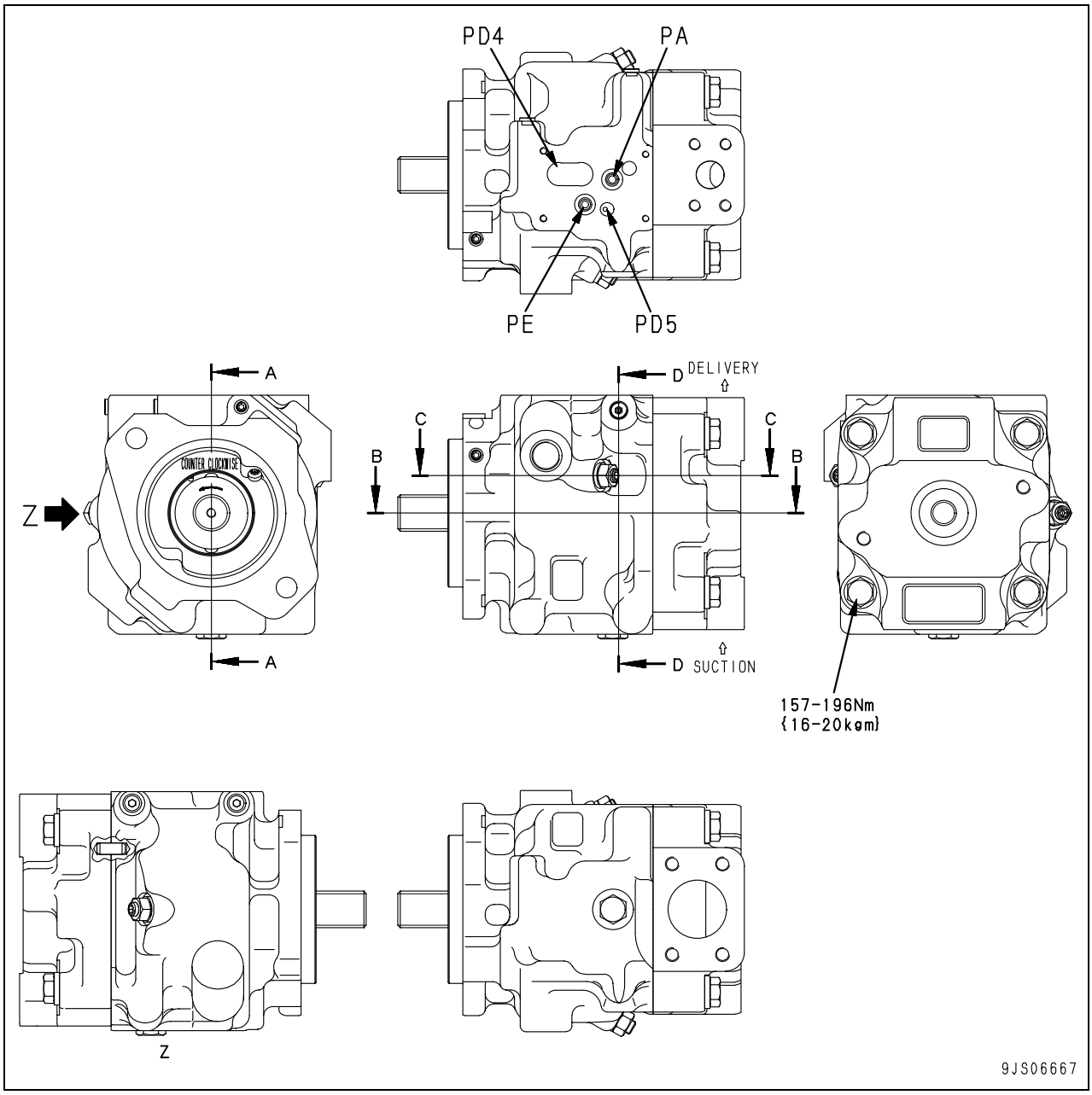
- As current is conducted to proportional solenoid (1), the solenoid generates thrust in proportion to the current. The pressure is settled as the sum of this thrust of the solenoid, thrust generated by the oil pressure in clutch port and the repulsive force of pressure control valve spring (2) is balanced.

WA470-6 Rear

Unit: mm

No.	Check item		Criteria					Remedy
1	Thicknesses of washers		Standard size: 4		Tolerance: ±0.05		Repair limit: 3.8	Replace
			Standard size: 4.1					
2	Thickness of plate		Standard size: 3		Tolerance: ±0.02		Repair limit: 2.9	
			Standard size: 3.1				Repair limit: 3	
3	Thickness of disc		Standard size: 3		Tolerance: +0.04 –0.03		Repair limit: 2.95	
4	Clearance between spider and differential pinion		Standard size: 35	Shaft: –0.11 –0.16	Hole: +0.05 0	Standard clearance: 0.110 – 0.210	Clearance limit: —	
5	Piston assembling section on differential housing (housing and piston)		327	–0.125 –0.214	+0.089 0	0.125 – 0.303	—	
6	Piston assembling section on bearing carrier (piston and carrier)		307	–0.110 –0.191	+0.081 0	0.110 – 0.272	—	
7	Clearance of differential side bearing	Outer race	160	0 –0.025	–0.045 –0.085	–0.085 – –0.020	—	
		Inner race	105	+0.059 +0.037	0 –0.020	–0.079 – –0.037	—	
8	Clearance of bearing on pinion shaft gear side	Outer race	171.45	+0.025 0	–0.025 –0.050	–0.075 – –0.025	—	
		Inner race	76.2	+0.062 +0.043	+0.013 0	–0.062 – –0.030	—	
9	Clearance of bearing on pinion shaft coupling side	Outer race	150	0 –0.020	–0.050 –0.075	–0.075 – –0.030	—	
		Inner race	70	+0.039 +0.020	0 –0.015	–0.054 – –0.020	—	
10	Backlash of case and plate		0 – 0.5					
11	Clearance between disc and plate (Total clearance on both sides)		0.2 – 0.6					
12	Backlash of side gear and disc		0.13 – 0.32					
13	End play of side gear in axial direction (one side)		0.15 – 0.35					

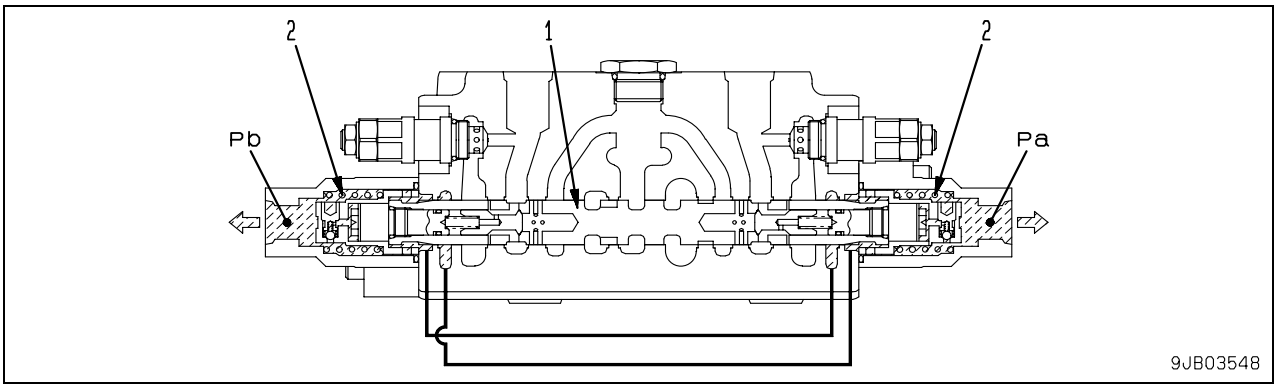
Pump unit



PA : Control basic pressure outlet port
PE : Control pressure input port
PD4 : Drain port
PD5 : Drain port

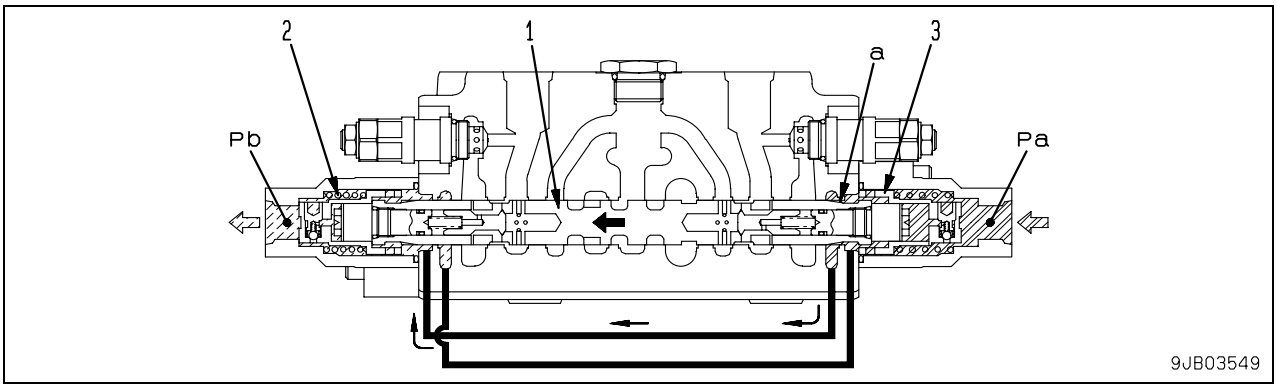
Operation of flow amplifier

When spool is at neutral
(When Orbit-roll valve is not in operation)



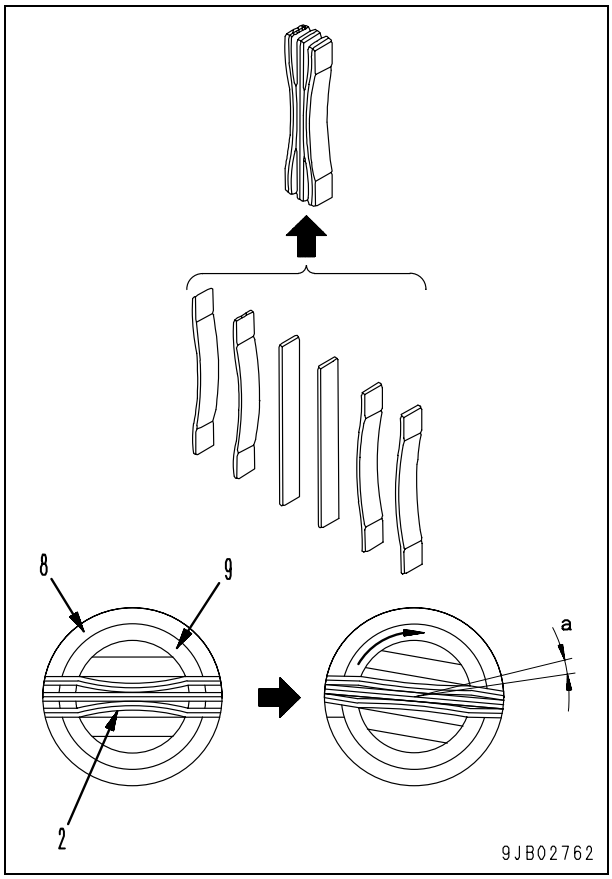
- Since both ports (Pa) and (Pb) are connected through the Orbit-roll valve to the drain circuit, steering spool (1) is kept at neutral position by right and left return springs (2).

When spool is in operation
(When oil flows in port (Pa))



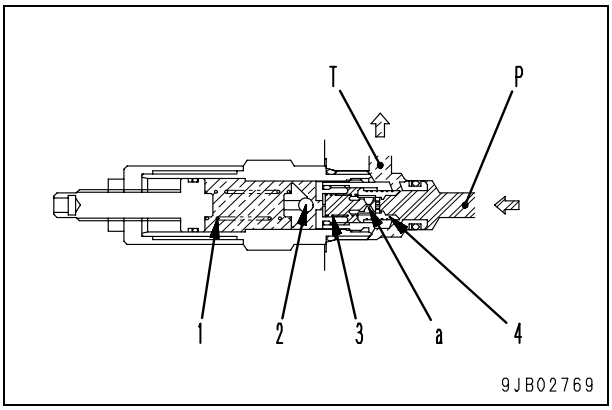
- The pressure in port (Pa) rises and steering spool (1) compresses left return spring (2) and moves to the left.
- The oil in port (Pa) flows through the hole of spring seat (3) and orifice (a) of steering spool (1) to port (Pb).
- Since port (Pb) is connected through the Orbit-roll valve to the drain circuit, the oil in port (Pb) is drained.
- Since the pressure generated in port (Pa) is in proportion to the flow rate of the oil, steering spool (1) moves to a position where the oil pressure reduced by orifice (a) is balanced with the repulsive force of return spring (2).

Role of centering spring



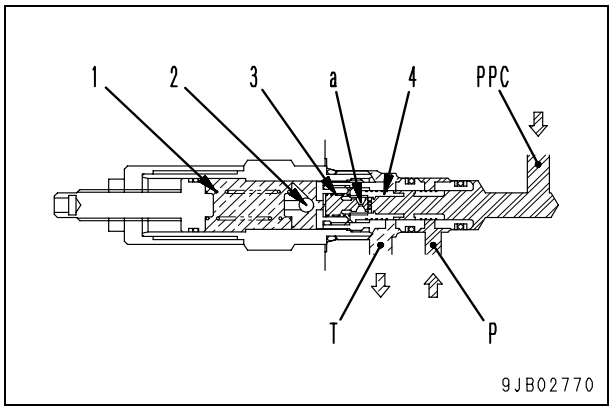
- Centering spring (2) is composed of 4 X-shaped leaf springs and 2 flat leaf springs and installed between spool (9) and sleeve (8) as shown in the figure.
- If the steering wheel is turned, spool (9) compresses centering spring (2) and angular displacement (a) is generated between spool (9) and sleeve (8).
  As a result, the ports of spool (9) and sleeve (8) are connected and the oil is sent to the steering cylinder. When the steering wheel stops turning, the gerotor also stops turning. Then, the oil to the steering cylinder is stopped, increasing the pressure.
  To prevent this, when the steering wheel stopped turning, gerotor is turned by the reaction force of centering spring (2) by angular displacement (a) of spool (9) and sleeve (8) by the reaction force of centering spring (2) to return the steering wheel to the “neutral” position.

Main relief valve (R1)



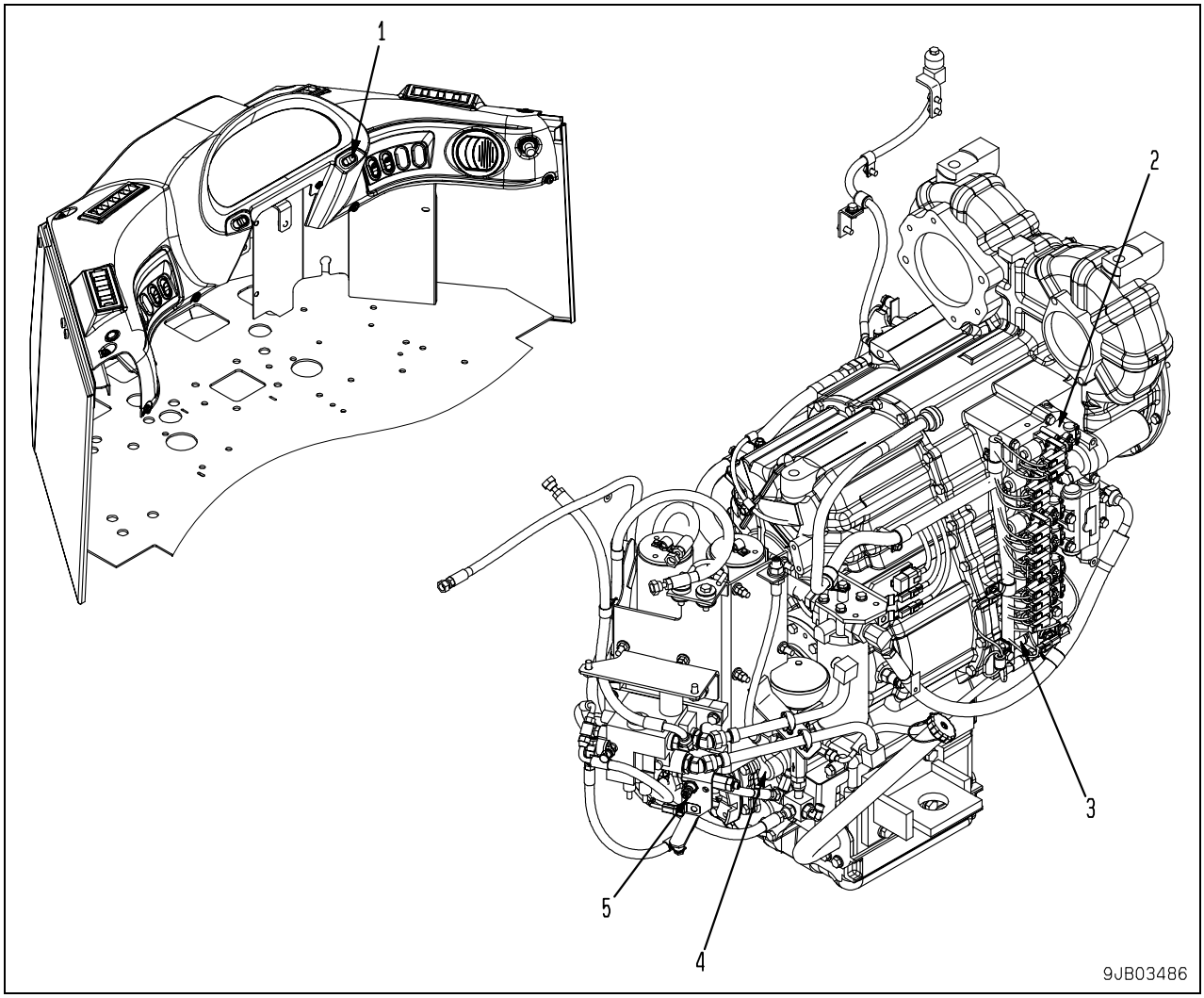
- If the pressure in port (P) (pump pressure) rises above the set pressure, it compresses spring (1) and moves ball (2) to the left.
- The pressure of the oil from the pump is reduced through orifice (a), and the resulting pressure difference compresses spring (3) and moves valve (4) to the left largely.
- Port (P) being connected to port (T) drains the pump pressure and, thereby, regulates the maximum pressure in the charge circuit to protect the circuit.

PPC relief valve (R3)



- If the pressure from port (PPC) (pilot pressure) rises above the set pressure, the oil from the pump compresses spring (1) and moves ball (2) to the left.
- The pressure of the oil from the pump is reduced when the oil flows through orifice (a), and the pressure difference compresses spring (3) and moves valve (4) to the left.
- Since the open area between port (PPC) and port (P) is reduced and the pressure drop results, the pressure in port (P) is at the current level without being not lowered to the set pressure of the relief valve.
- The pressure in port (PPC) is adjusted to a specific desired level according to the open area between port (PPC) and port (P) and supplied as the basic pressure of the pilot circuit.
- If abnormal pressure is generated in port (PPC), port (PPC) is connected to port (T) to release the abnormal pressure and protect the pilot circuit.

Parking brake control



1. Parking brake switch
2. Valve assembly
3. Parking brake solenoid valve
4. Parking brake
5. Emergency parking brake release valve

Outline

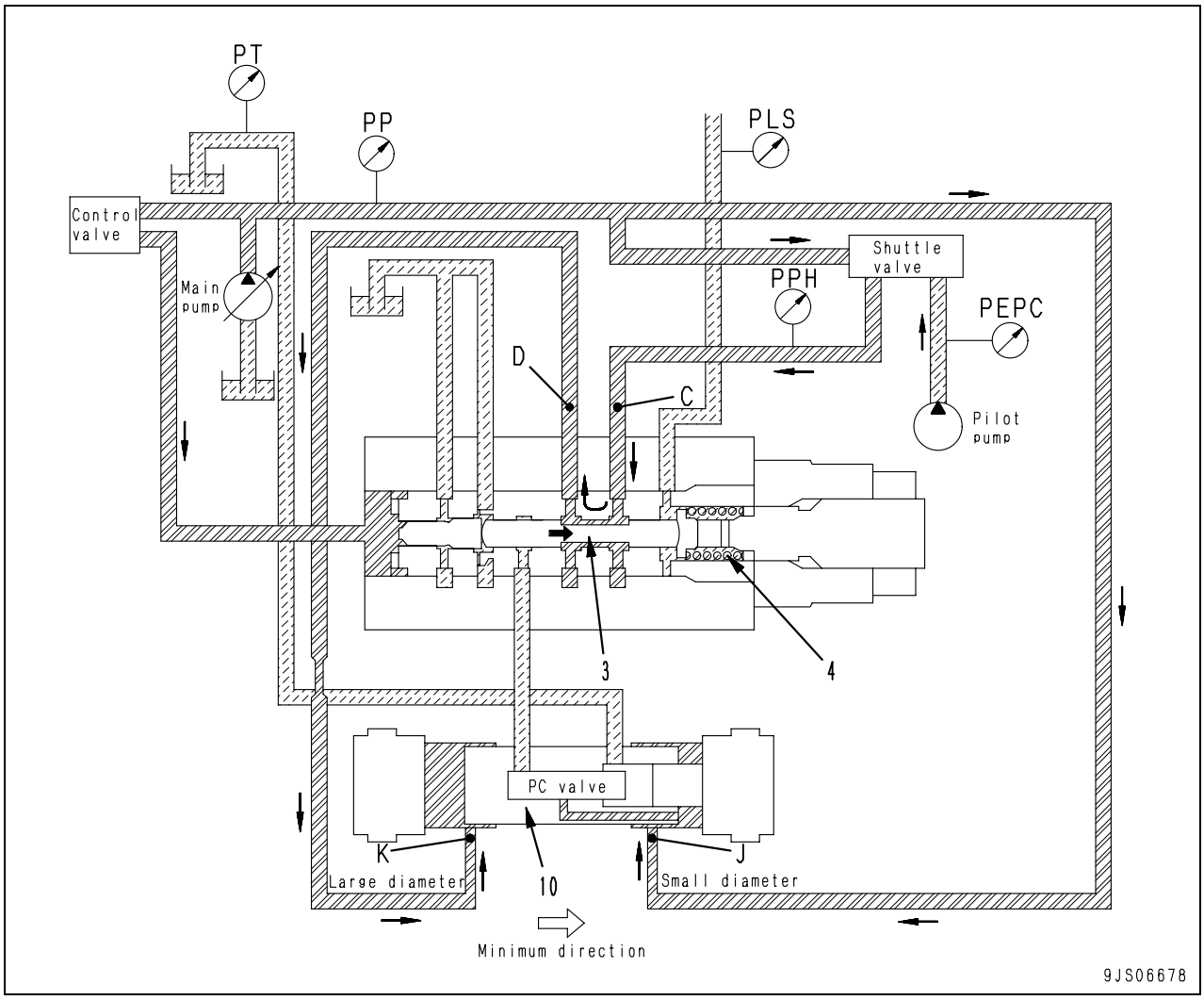
- Parking brake (4) is a wet-type multi-disc brake built in the transmission. It is installed to the output shaft bearing and operated mechanically by the pressing force of the spring and released hydraulically.
- If parking brake switch (1) installed to the operator's seat is turned “ON”, parking brake solenoid valve (3) installed to valve assembly (2) shuts off the oil pressure and the parking brake is applied.
- If parking brake switch (1) is turned “OFF”, the hydraulic force in the cylinder releases the parking brake.
- While the parking brake is applied (While the solenoid valve is turned “OFF”), the signal from the transmission controller to the transmission solenoid valve is stopped by the neutralizer signal to keep the transmission in neutral.
- Emergency parking brake release valve (5) is installed to move the machine when it is stopped (and the parking brake is applied) because of a trouble in the engine or drive system.

1. Work equipment control valve
2. Bucket cylinder
3. Steering valve
4. Cooling fan pump
5. Work equipment PPC valve
6. Work equipment pump
7. Hydraulic tank
8. Oil filler cap and breather
9. Oil cooler
10. Power train oil cooler
11. Steering pump
12. Power train pump
13. PPC accumulator
14. Charge valve
15. ECSS accumulator
16. Steering cylinder
17. Lift cylinder
18. Emergency steering pump
19. Emergency steering motor
20. Cooling fan motor

Outline

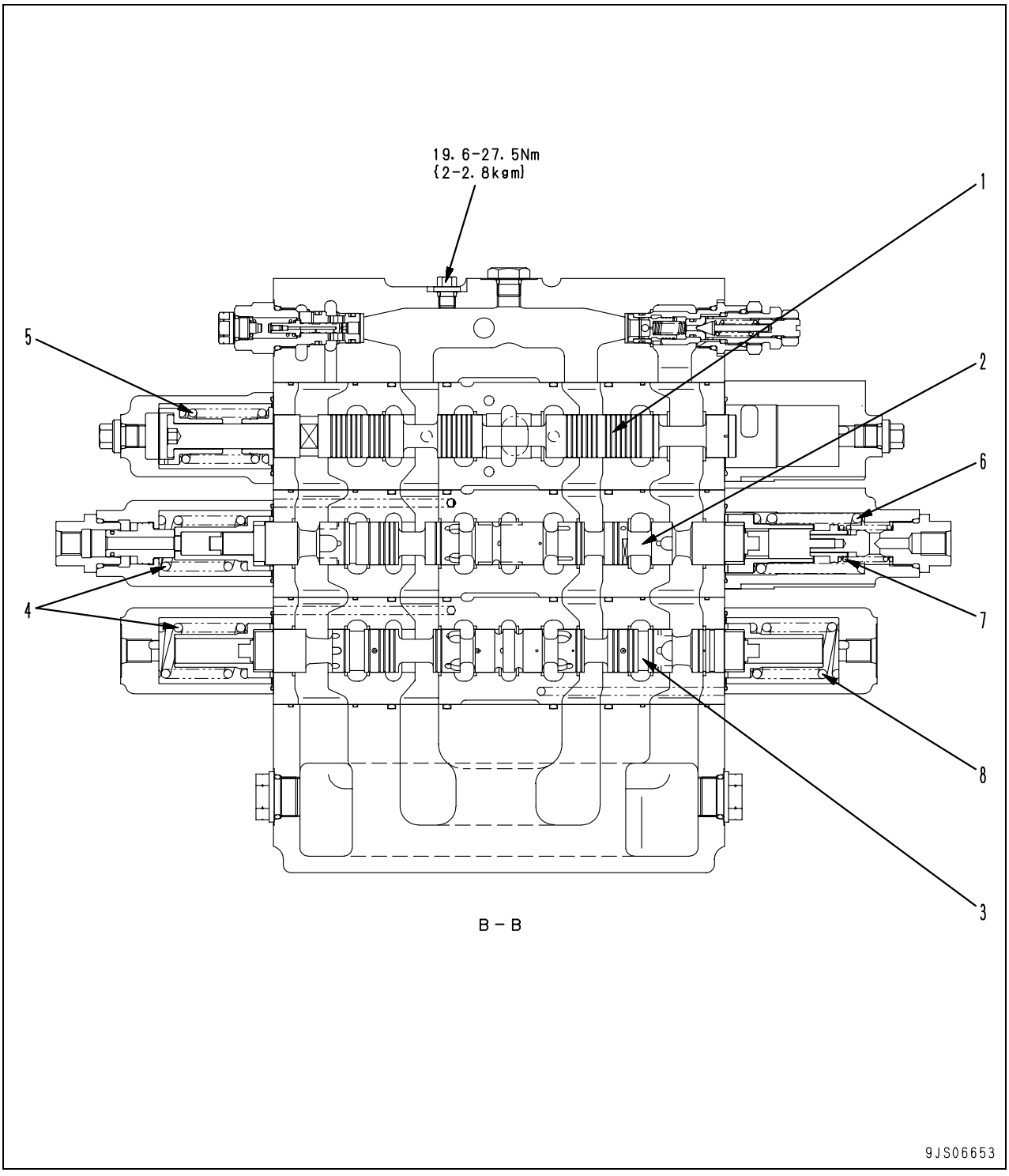
- The hydraulic system consists of the work equipment circuit and steering circuit. The work equipment circuit controls the operation of the bucket and attachments.
- The oil from hydraulic tank (7) is sent by work equipment pump (6) to work equipment control valve (1). If the bucket and lift arm spools of the work equipment control valve are in the HOLD position, the oil is sent through the drain circuit of the work equipment control valve, filtered by the filter in the hydraulic tank, and returned to the tank.
- If the work equipment control lever is operated, the bucket or lift arm spool of work equipment PPC valve (5) moves to operate each spool of the work equipment control valve (1) hydraulically. Then, the oil flows from the work equipment control valve to lift cylinder (17) or bucket cylinder (2) to move the lift arm or bucket.
- The maximum pressure in the hydraulic circuit is controlled with the relief valve in work equipment control valve (1). The bucket cylinder circuit is equipped with the safety-suction valve for protection of the circuit.
- PPC accumulator (13) is installed to the PPC pilot circuit so that the lift arm can be lowered to the ground even while the engine is stopped.
- Hydraulic tank (7) is pressurized, enclosed, and equipped with oil filler cap and breather (8) having the relief valve. It pressurizes the tank and, at the same time, prevents generation of negative pressure in the tank to prevent cavitation on the pump.
- This machine is equipped with the emergency steering system. If the machine cannot be steered normally because of a stall of the engine, a trouble in the steering pump, oil leakage from the piping, etc., emergency steering motor (19) drives emergency steering pump (18) so that the machine can be steered.
- Cooling fan motor (20) installed to the radiator is driven hydraulically and variably with cooling fan pump (4).

3) Action for the direction of minimizing the pump delivery

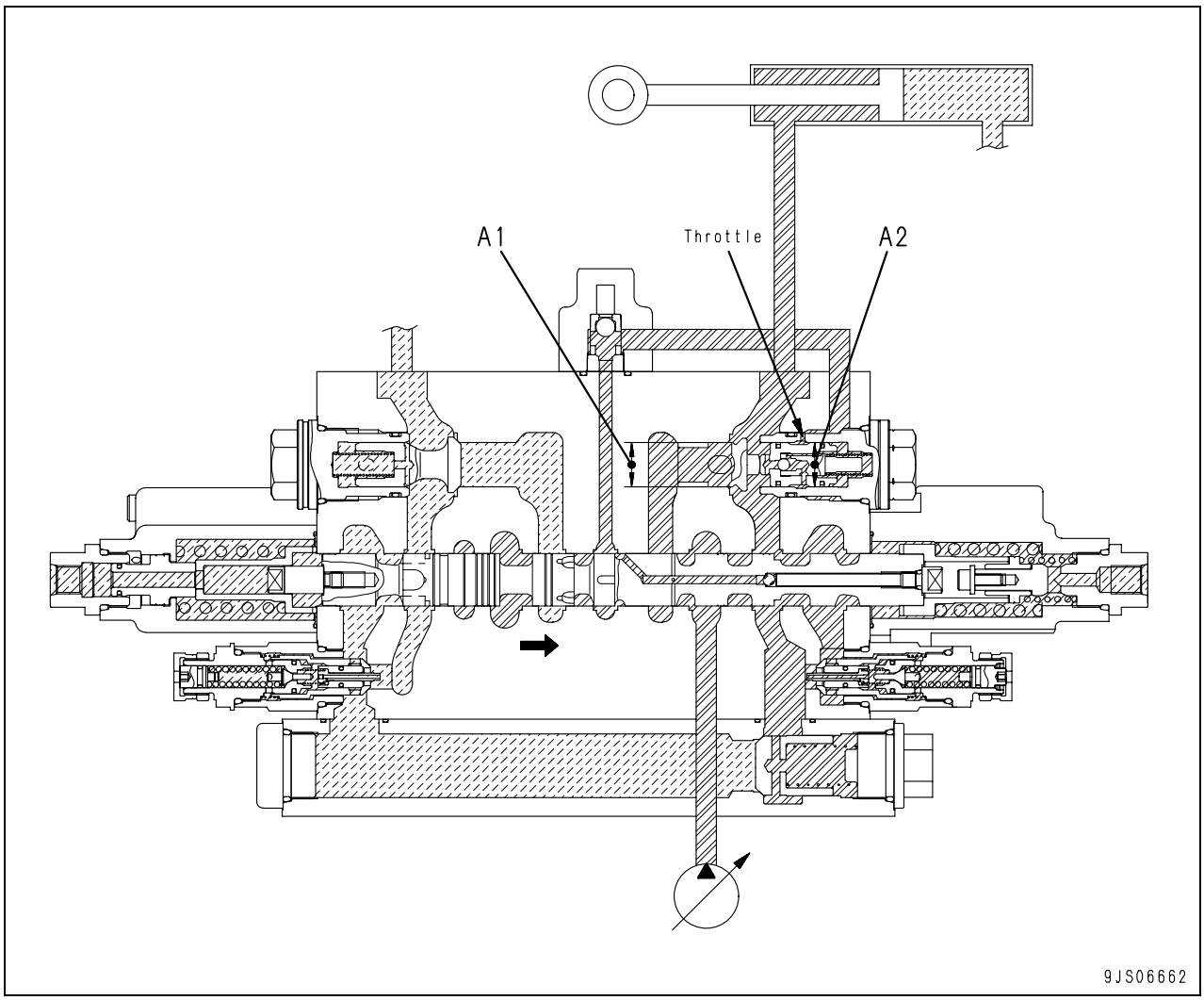


- If LS differential pressure (✕PLS) becomes larger (for example, when the area of control valve opening becomes smaller and the pump pressure (PP) increases), spool (3) is pressed to the right by the force of pump pressure (PP).
- As a result of the movement of spool (3), shuttle valve output pressure (PPH) flows from port (C) to port (D), then from port (K) to the large diameter side of the piston.
- While main pump pressure (PP) is present in port (J) of the smaller diameter side of the piston, servo piston (10) is pressed to the right by its area difference between the larger and the smaller diameter sides. As the result, servo piston (10) moves in the direction to minimize the swash plate angle.

(2/6)



Area ratio of pressure compensation valve



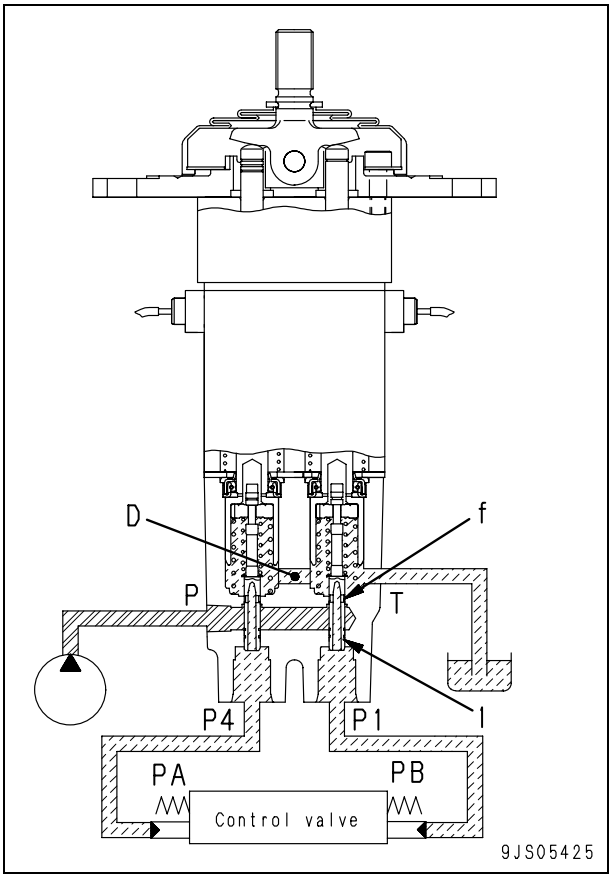
Function

- The state of division changes according to the area ratio of pressure compensation portions (A1) and (A2). Area ratio = (A2)/(A1)
- Since the area ratio is less than 1, spool meter-in downstream pressure < maximum load pressure, and the oil flow is divided greater than by the area ratio of the opening.

Operation

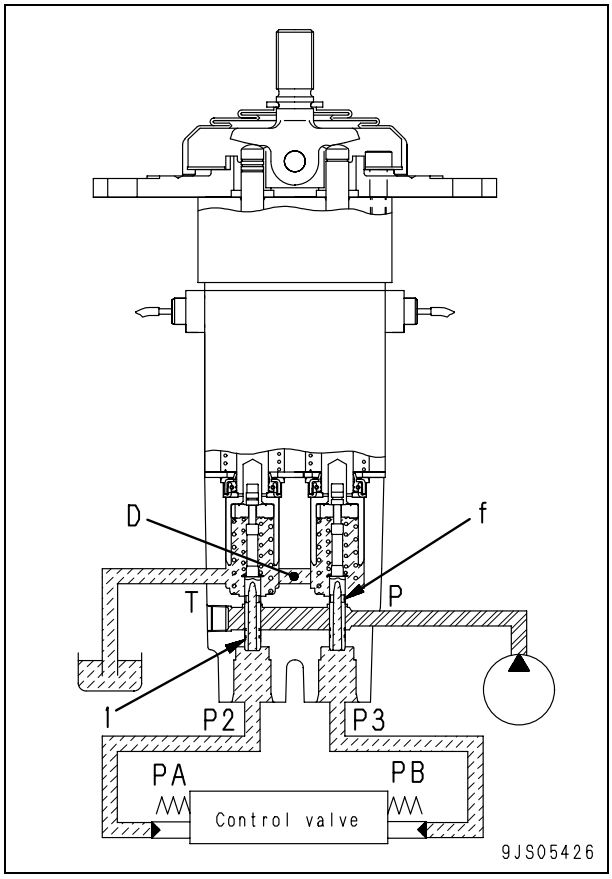
1. When in neutral

1) PPC valve for bucket

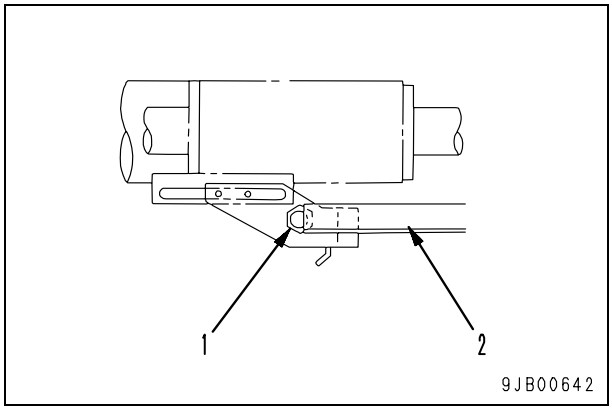


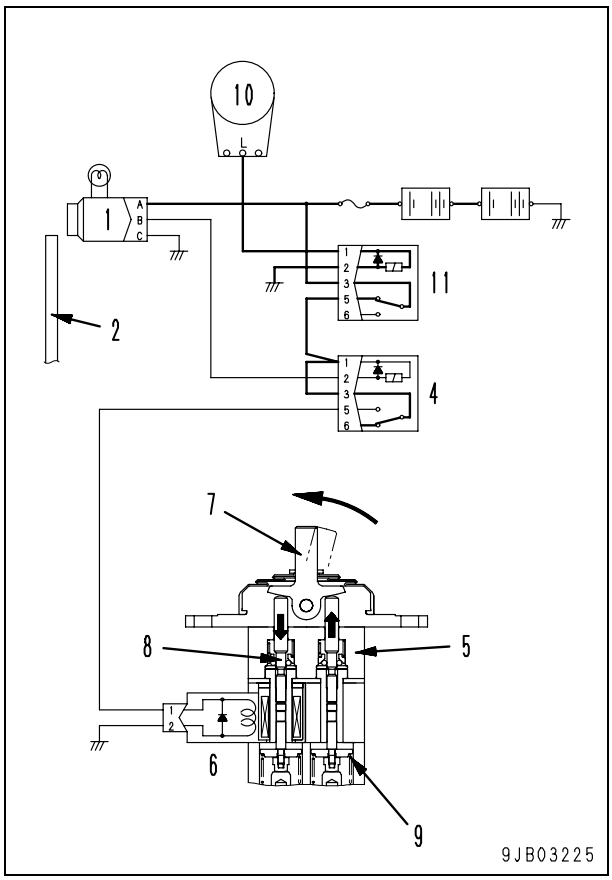
- Ports (PA) and (PB) of the bucket control valve and ports (P1) and (P4) of the PPC valve are connected through fine control hole (f) of spool (1) to drain chamber (D).

2) PPC valve for lift arm



- Ports (PA) and (PB) of the lift arm control valve and ports (P2) and (P3) of the PPC valve are connected through fine control hole (f) of spool (1) to drain chamber (D).





- As the bucket is tilted and moved away from the position set by the positioner – in other words, as angle (2) moves away from the sensing face of proximity switch (1), the lamp of proximity switch (1) goes off and bucket positioner relay (4) is turned off.
  Accordingly, the circuit of detent solenoid (6) of work equipment PPC valve (5) is turned OFF to de-energize the coil. Held lift arm spool (8) receives the reaction force of spring (9) and returns bucket control lever (7) to the neutral position.

★ The power supply for detent solenoid (6) operation is turned “ON” or “OFF” by alternator relay (11).
  Detent solenoid (6) circuit is cut off since L signal from alternator (10) is not sent to alternator relay (11) as long as the engine is stopped.
  As the result, bucket control lever (7) cannot be moved and held in the tilt position as long as angle (2) is positioned in sensing face of proximity switch (1).

Function of proximity switch

When object of sensing is over sensing face of proximity switch

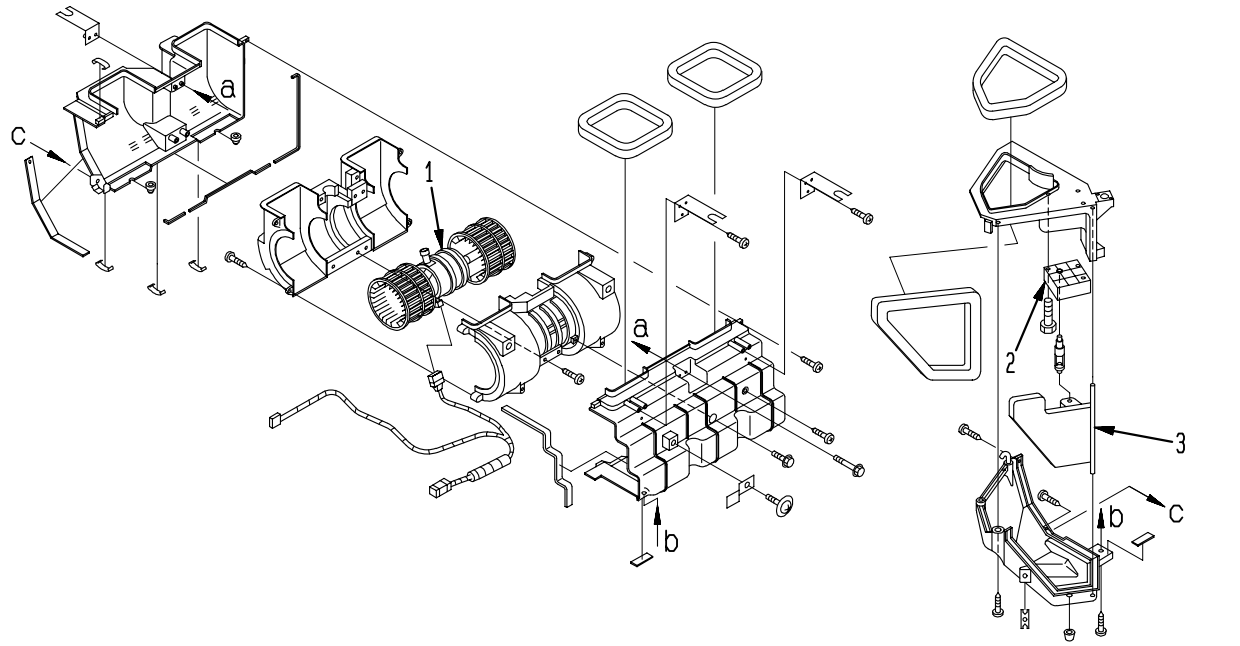
Lamp of proximity switch	ON
Bucket positioner relay	ON
Work equipment PPC valve detent solenoid circuit	ON
Work equipment PPC valve detent solenoid	Energized

When object of sensing is apart from sensing face of proximity switch

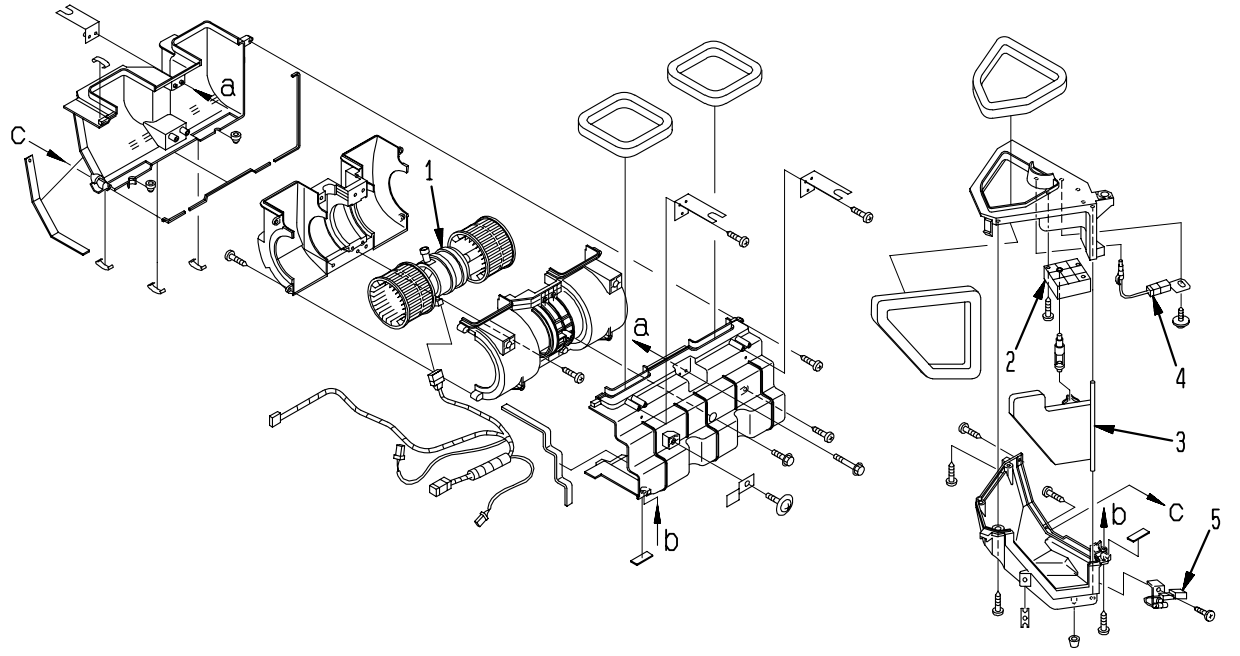
Lamp of proximity switch	OFF
Bucket positioner relay	OFF
Work equipment PPC valve detent solenoid circuit	OFF
Work equipment PPC valve detent solenoid	De-energized

Blower and intake unit

Manual air conditioner

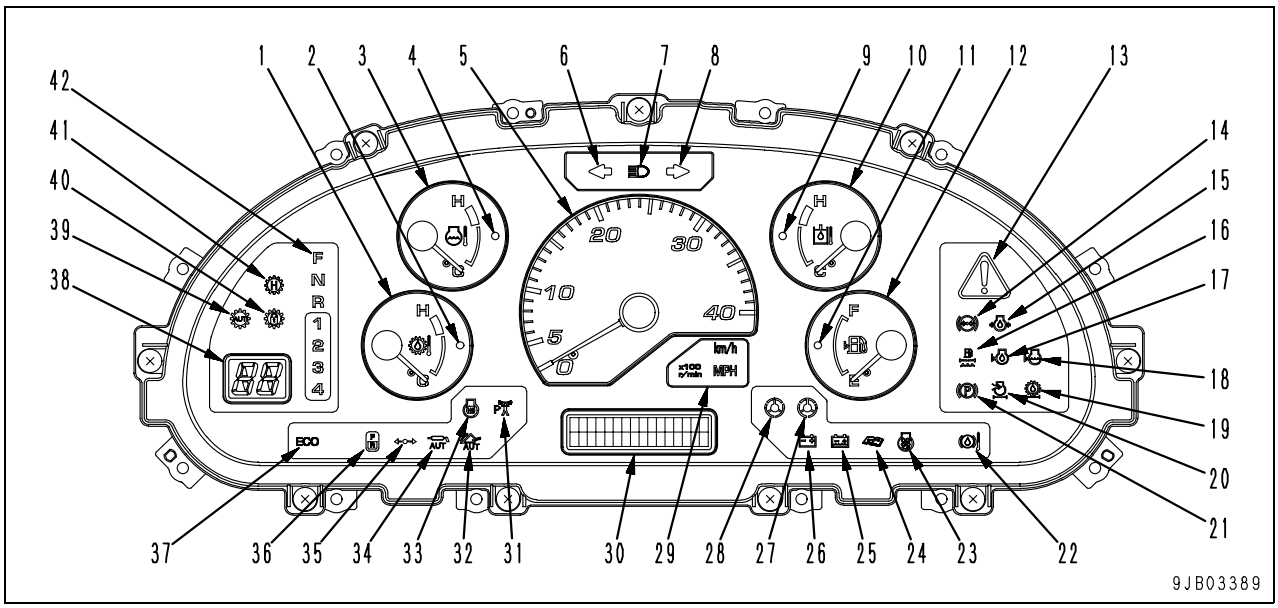


Auto air conditioner



9JB03540

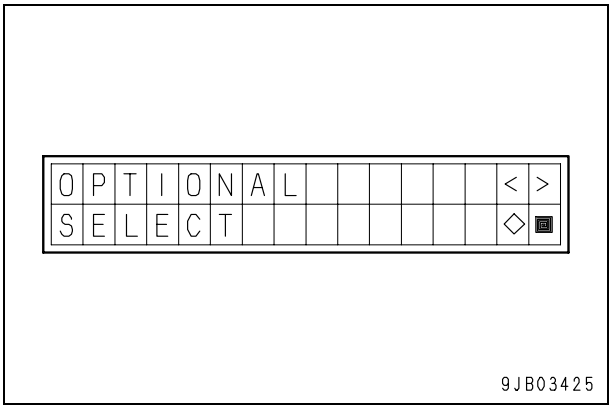
Machine monitor



1. Torque converter oil temperature gauge
2. Torque converter oil temperature caution lamp
3. Engine coolant temperature gauge
4. Engine coolant temperature caution lamp
5. Speedometer or engine tachometer
6. Turn signal pilot lamp (Left)
7. Headlamp high beam pilot lamp
8. Turn signal pilot lamp (Right)
9. Hydraulic oil temperature caution lamp
10. Hydraulic oil temperature gauge
11. Fuel level caution lamp
12. Fuel gauge
13. Centralized warning lamp
14. Brake oil pressure caution lamp
15. Engine oil pressure caution lamp
16. Water separator caution lamp (*1)
17. Engine oil level caution lamp
18. Radiator coolant level caution lamp
19. Transmission oil filter clogging caution lamp (*1)
20. Air cleaner clogging caution lamp (machine equipped with KOMTRAX)
21. Parking brake pilot lamp
22. Brake oil temperature caution lamp
23. Cooling fan reverse rotation pilot lamp
24. Maintenance caution lamp
25. Battery electrolyte level caution lamp (*2)
26. Battery charge circuit caution lamp
27. Steering pump oil pressure caution lamp
28. Emergency steering pilot lamp
29. Meter display pilot lamp
30. Character display
31. Power mode pilot lamp
32. Semi auto digging pilot lamp (*2)
33. Preheater pilot lamp
34. Auto grease pilot lamp (*2)
35. Joystick pilot lamp (*2)
36. Directional selector pilot lamp
37. Economy operation pilot lamp
38. Shift indicator
39. Auto-shift pilot lamp
40. Torque converter lockup pilot lamp (*2)
41. Shift hold pilot lamp
42. Shift lever position pilot lamp

*1: Not used by this model
*2: (if equipped)

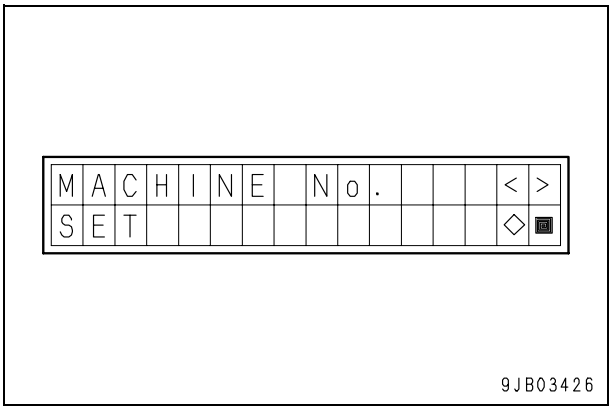
Optional device selecting function (OPTIONAL SELECT)



- This function is used for verifying the installed state of optional devices or when changing their setting.
  This function is also used for installing or removing optional devices.

★ For the operating procedure of this function, see “Special functions of machine monitor (EMMS)” in Testing and adjusting.

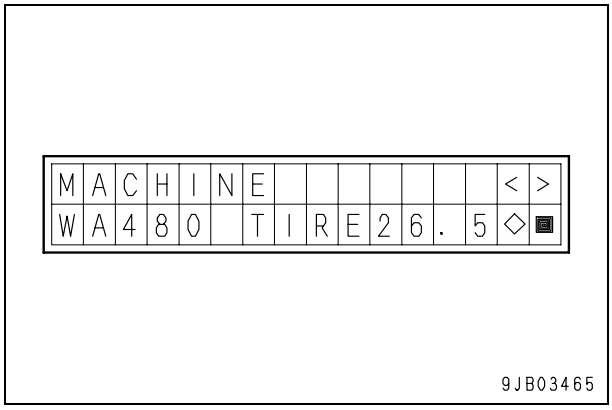
Machine serial number input function (MACHINE No. SET)



- This function is used for displaying or entering the serial number of machine.
  Set machine serial number is used for controlling the machine.

★ For the operating procedure of this function, see “Special functions of machine monitor (EMMS)” in Testing and adjusting.

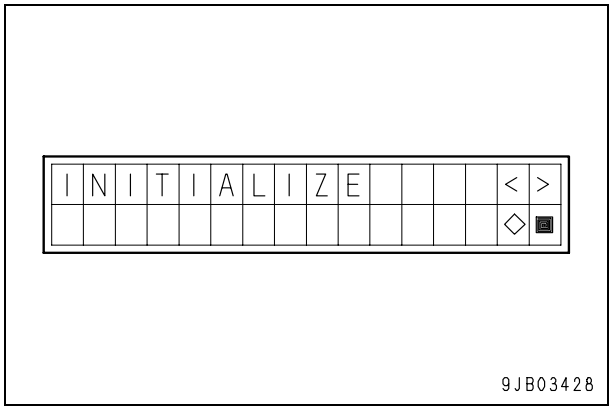
Model selection function (MACHINE WA480 TIRE26.5)



- This function is used for displaying or changing the setting of model information (machine name and tire size).

★ For the operating procedure of this function, see “Special functions of machine monitor (EMMS)” in Testing and adjusting.

Initialize function (INITIALIZE)



- This function is used to set the machine monitor to the state set when delivered.

★ Since this function is specially handled by the factory, no modification is allowed.

Function of shift down protection

- In order to protect the engine and pump, this function rejects the shifting down operation as long as the machine is traveling at a speed higher than the set one.
- The alarm buzzer is sounded as long as the shift down protection function is turned on.
- The buzzer sounds are continued until the gear speed position of the gear shift lever coincides with the actual gear speed. Thus, shifting up operation can stop the alarm buzzer sounds even if the travel speed is not slowed down.
- The shift down protection is enabled also for the kickdown operation in the auto-shift mode. If the kickdown switch is pressed while the machine is traveling at a higher speed than that specified in the protecting conditions, this function rejects the kickdown switch and sounds the alarm buzzer for 3 seconds.
- The operating condition of shift down protection function is as follows.

Targeted gear speed of shift down	Transmission output shaft speed [rpm] (Reference: Travel speed [km/h])	
	Condition for applying protection	Condition for resetting protection
To 3rd gear speed	2,227 (30.2) or above	Below 2,005 (27.2)
To 2nd gear speed	1,470 (19.9) or above	Below 1,322 (17.9)
To 1st gear speed	1,061 (14.3) or above	Below 951 (12.9)

Function of engine overrun prevention

- As the transmission output shaft speed reached a level corresponding to the engine speed of 2,500 rpm or above, this function resets the lockup automatically in order to prevent the engine overrun.
- The alarm buzzer is sounded as long as the engine overrun prevention function is turned on.
- The lockup reset state is maintained for 5 seconds after it has been reset. After 5 seconds from the reset, the transmission output shaft speed reached a level corresponding to the engine speed of below 2,500 rpm, this function applies the lockup again.
- The operating condition of the engine overrun prevention function is as follows.

Actual gear speed	Transmission output shaft speed [rpm] (Reference: Travel speed [km/h])
F3	1,961 (26.6)
F4	3,526 (47.8)
R3	2,113 (28.6)
R4	3,748 (50.8)

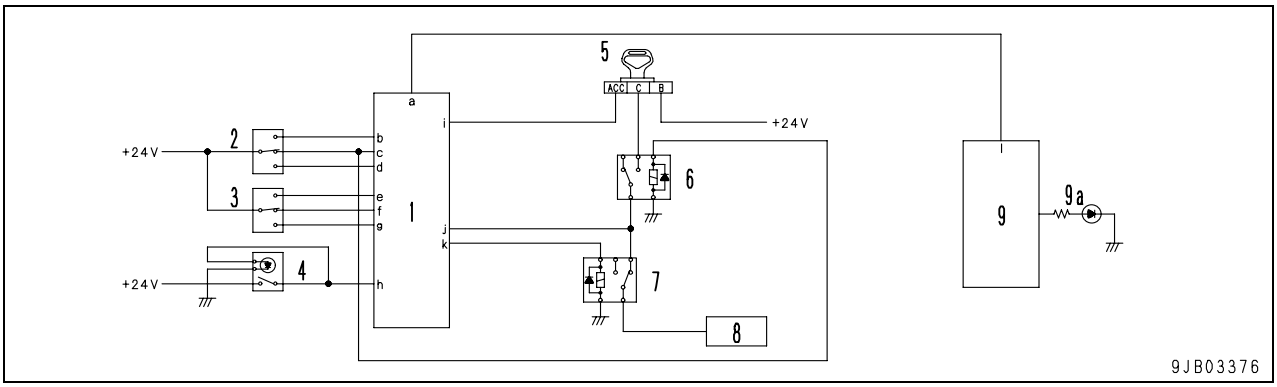
Maximum travel speed derating function

- As the transmission output shaft speed reached a level corresponding to the travel speed of 40 km or above, this function resets the lockup in order for the safety.
- The alarm buzzer is sounded as long as the maximum travel speed derating function is turned on.
- The lockup reset state is maintained for 5 seconds after it has been reset. After 5 seconds from the reset, as the transmission output shaft speed reached a level corresponding to the travel speed of below 38 km, this function stops the alarm buzzer but maintains the lockup in the reset state.
- When the lockup clutch is not installed on the machine, alarm buzzer alone will be sounded.
- The operating condition of the maximum travel speed derating function is as follows.

Threshold value	Transmission output shaft speed [rpm] (Reference: Travel speed [km/h])
Lockup resetting operation	2,953 (40.0)
Completion of lockup resetting operation	2,805 (38.0)
Operation of alarm buzzer	2,953 (40.0)
Resetting of alarm buzzer	2,916 (39.5)

Directional selector switch control function

- Turning “ON” the directional selector switch actuation switch enables the directional selection of the machine from the work equipment directional selector switch in addition to the same operation from the directional lever of the steering column.



1. Transmission controller
2. Directional lever
3. Directional selector switch
4. Directional selector switch actuation switch
5. Starting switch
6. Neutral safety relay
7. Transmission controller neutral safety relay
8. Starting motor
9. Machine monitor

9a. Directional selector pilot lamp

Input and output signals

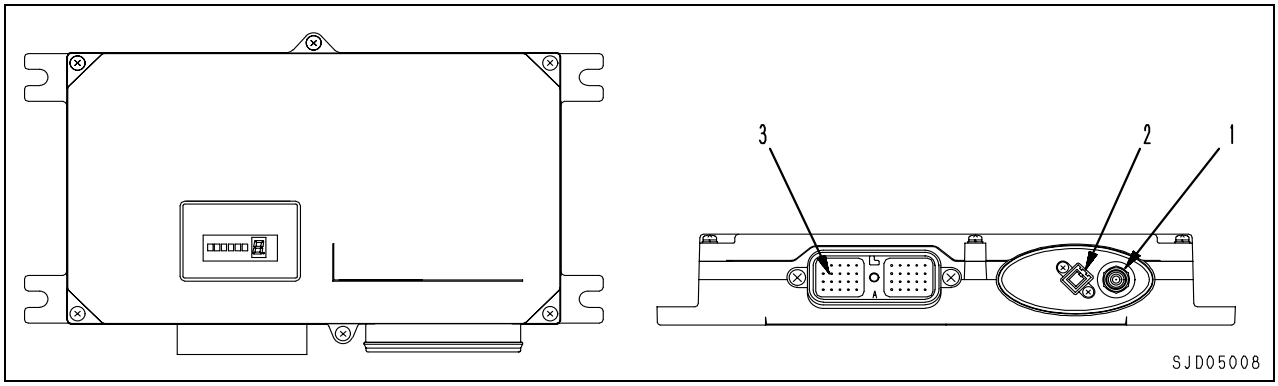
Transmission controller

a. CAN signal
b. Directional lever “F” signal
c. Directional lever “N” signal
d. Directional lever “R” signal
e. Directional selector switch “F” signal
f. Directional selector switch “N” signal
g. Directional selector switch “R” signal
h. Directional selector switch actuation switch “ON” signal
i. Starting switch ACC signal
j. Starting switch C signal
k. Transmission controller neutral signal

Machine monitor

l. CAN signal

KOMTRAX terminal



1. Communication antenna connector
2. GPS antenna connector
3. Machine harness connector (DEUTSCH-40P)

Input and output signals

DEUTSCH-40P [CN-L80]

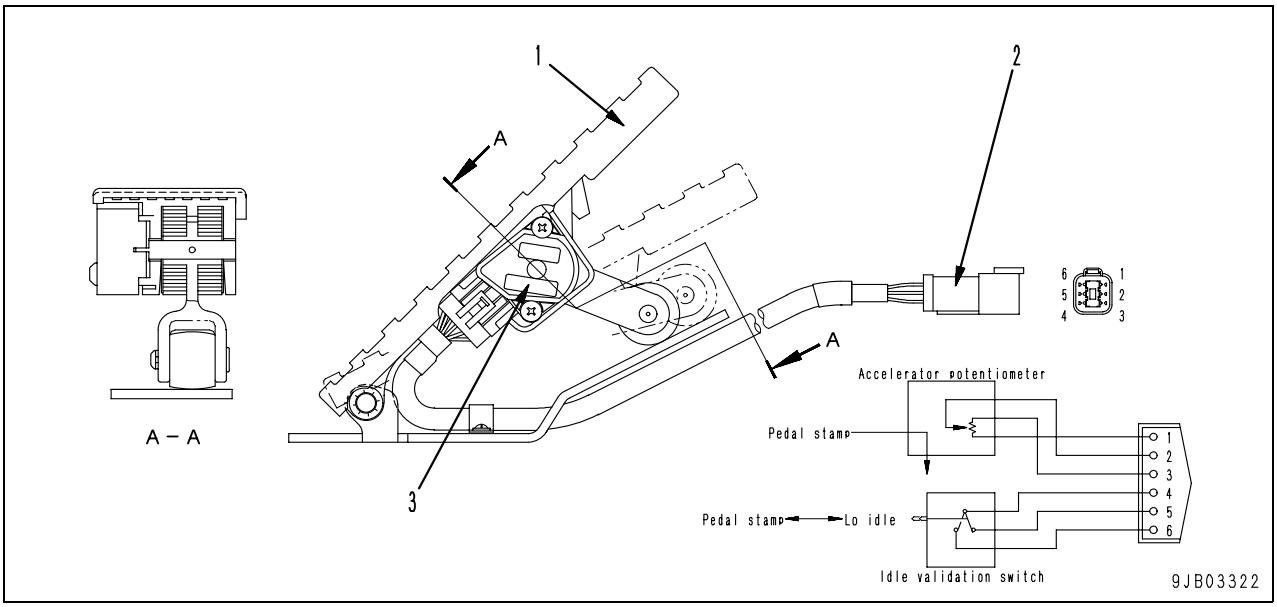
Pin No.	Signal name	Input/Output signal
1	NC	—
2	NC	—
3	NC	—
4	NC	—
5	NC	—
6	NC	—
7	CAN0_L	Input/Output
8	CAN0_H	Input/Output
9	NC	—
10	NC	—
11	NC	—
12	NC	—
13	NC	—
14	NC	—
15	NC	—
16	NC	—
17	NC	—
18	NC	—
19	NC	—
20	Immobilize signal	Output

Pin No.	Signal name	Input/Output signal
21	Operation mode selection 1	Input
22	Operation mode selection 2	Input
23	NC	—
24	NC	—
25	NC	—
26	NC	—
27	Starting switch C signal	Input
28	Alternator R signal	Input
29	NC	—
30	NC	—
31	NC	—
32	NC	—
33	NC	—
34	NC	—
35	NC	—
36	Starting switch ACC signal	Input
37	Power supply GND	—
38	Power supply GND	—
39	Constant power supply (24 V)	Input
40	Constant power supply (24 V)	Input

Outline

- The KOMTRAX controller can send information via wireless communication antenna, acquiring various information of the machine from the network signal in the machine and the input signal. Also, the controller incorporates CPU (Central Processing Unit) and provide the wireless communication function and the GPS function.
- There are the LED lamp and the 7-segment indicator lamp in the display area, and these lamps are used for the testing and the troubleshooting.

Accelerator pedal sensor



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.

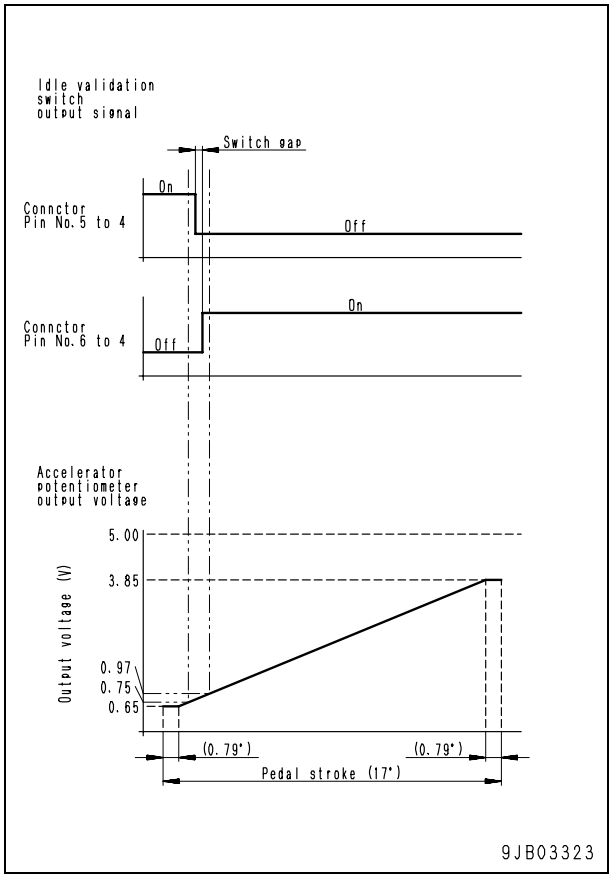
Accelerator signal

- 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



Testing and adjusting, Part 1

Tools for testing, adjusting, and troubleshooting

Testing and adjusting item	Symbol		Part No.	Part Name	Q'ty	Remarks
Measuring exhaust gas color	A	1	799-201-9001	Handy smoke checker	1	Bosch index: Level 0 – 9
		2	Commercially available	Smoke meter	1	
Adjusting valve clearance	B		Commercially available	Clearance gauge	1	
Measuring compression pressure	C	1	795-502-1590	Gauge assembly	1	0 – 6.9 MPa {0 – 70 kg/cm^2}
		2	795-471-1420	Adapter	1	
		3	6217-71-6112	Gasket	1	
Measuring blow-by pressure	D		799-201-1504	Blow-by checker	1	0 – 5 kPa {0 – 500 mmH_2O}
Measuring engine oil pressure	E	1	799-101-5002	Hydraulic tester	1	Pressure gauge:2.5, 5.9, 39.2, 58.8 MPa {25, 60, 400, 600 kg/cm^2}
			790-261-1204	Digital hydraulic tester	1	Pressure gauge: 58.8 MPa {600 kg/cm^2}
		2	799-401-2320	Hydraulic tester	1	Pressure gauge: 0.98 MPa {10 kg/cm^2}
		3	799-101-5230	Nipple	1	14 × 1.5 mm
			6215-81-9720	O-ring	1	
Measuring intake air (boost) pressure	F		799-201-2202	Boost gauge kit	1	–101 – 200 kPa {–760 – 1,500 mmHg}
Measuring fuel compression	G	1	799-101-5002	Hydraulic tester	1	Pressure gauge:2.5, 5.9, 39.2, 58.8 MPa {25, 60, 400, 600 kg/cm^2}
			790-261-1204	Digital hydraulic tester	1	Pressure gauge: 58.8 MPa {600 kg/cm^2}
		2	799-401-2320	Hydraulic tester	1	Pressure gauge: 0.98 MPa {10 kg/cm^2}
		3	6732-81-3170	Adapter	1	10 × 1.0 mm ✕ R1/8
			6215-81-9710	O-ring	1	
Measuring fuel return rate and leakage	H	1	6151-51-8490	Spacer	1	
		2	6206-71-1770	Joint	1	
		3	Commercially available	Hose	1	
		4	Commercially available	Hose	1	
		5	Commercially available	Measuring cylinder	1	
		6	Commercially available	Stopwatch	1	
Measuring directional lever	J		79A-264-0021	Push-pull scale	1	0 – 294 N {0 – 30 kg}
Testing power train oil pressure	K	1	799-101-5002	Hydraulic tester	1	Pressure gauge:2.5, 5.9, 39.2, 58.8 MPa {25, 60, 400, 600 kg/cm^2}
			790-261-1204	Digital hydraulic tester	1	Pressure gauge: 58.8 MPa {600 kg/cm^2}
		2	799-401-2320	Hydraulic tester	1	Pressure gauge: 0.98 MPa {10 kg/cm^2}
		3	799-101-5220	Nipple	1	10 × 1.25 mm
			07002-11023	O-ring	1	Pressure gauge: 0.98 MPa {10 kg/cm^2}
Method of moving machine when transmission valve is broken	L		794-423-1190	Plug	1	20 × 1.5 mm

Measuring intake air (boost) pressure

★ Measuring instruments for intake air (boost) pressure

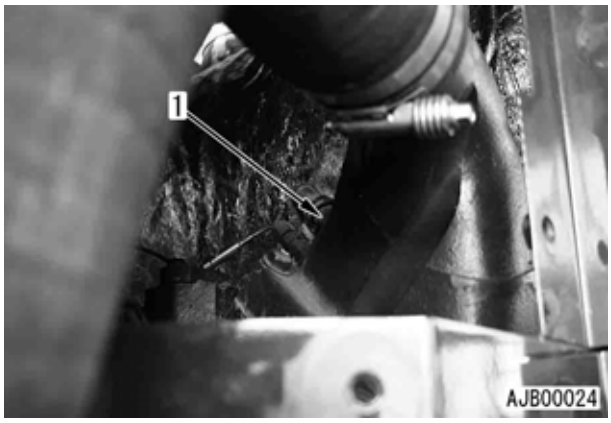
Symbol	Part No.	Part Name
F	799-201-2202	Boost gauge kit

⚠ **When installing and removing the measuring instruments, take care not to touch a hot part of the engine.**

★ Measure the intake air pressure (boost pressure) under the following condition.
- Engine coolant temperature: Within operating range
- Hydraulic oil temperature: Within operating range
- Torque converter oil temperature: Within operating range

1. Open the engine right side cover.

2. Remove air boost pressure pickup plug (1) (R1/8).



3. Install nipple [1] in boost gauge kit **F** and connect pressure gauge [2].

4. Start the engine and increase the coolant temperature to the operating range.

5. Run the engine at medium or higher speed to drain the oil from the hose.
   ★ Insert the connecting parts of the gauge and hose about a half and open the self-seal on the hose side repeatedly, and the oil will be drained.
   ★ If Pm kit (A) is available, you may drain the oil by using the oil draining coupling (790-261-1130) in that kit.
   ★ If the oil is left in the hose, the gauge does not work. Accordingly, be sure to drain the oil.

6. Turn the transmission cut-off selector switch OFF and press the left brake pedal securely.

7. Turn the torque converter lockup switch (if equipped) OFF.

8. Set the transmission auto shift and manual shift selector switch in the MANUAL position.

9. While keeping the directional lever or forward-reverse switch at the N (Neutral) position, set the gear shift lever or gear shift switch to the 4th position.

10. Release the parking brake.

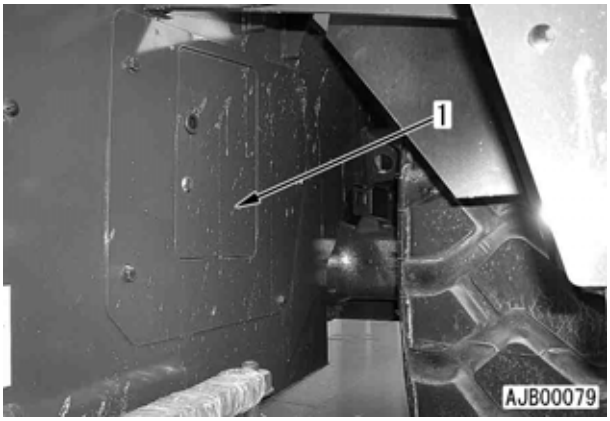
11. While pressing the brake pedal, set the directional lever to the F (forward) or R (reverse) position.
    ⚠ **Keep pressing the brake pedal securely.**

12. Press the accelerator pedal gradually to the high idle. While running the engine at high idle, stall the torque converter and measure the intake air pressure (boost pressure).
    ★ Do not keep stalling the torque converter for more than 20 seconds. Take care that the torque converter oil temperature will not exceed 120°C.

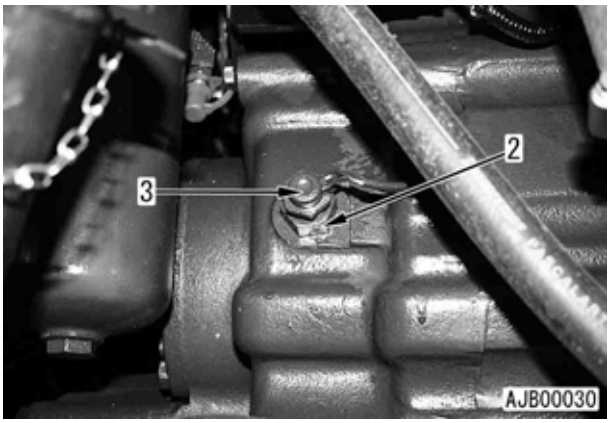
13. Remove the measurement tool after the measurement, and make sure that the machine is back to normal condition.

Adjusting transmission speed sensor

1. Open inspection cover (1) on the left side of the rear frame.

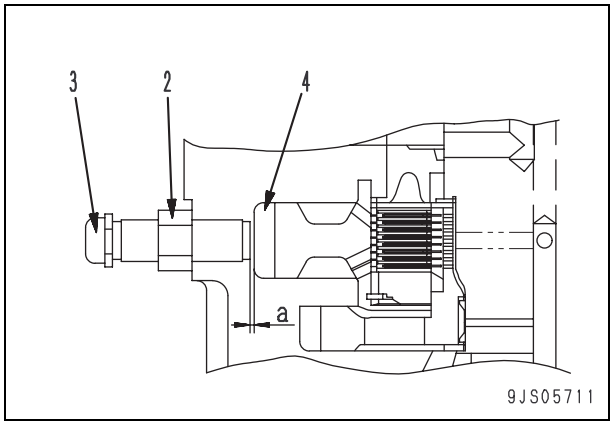


2. Loosen locknut (2) and screw in sensor (3) until its tip comes in contact with a tooth tip of gear (4).
   ★ Before installing the sensor, check that its tip is free from a steel chip, flaw, etc.
   ★ Apply gasket sealant between the case and threaded part of the sensor.
   Threaded part: **Gasket sealant (LG-5)**



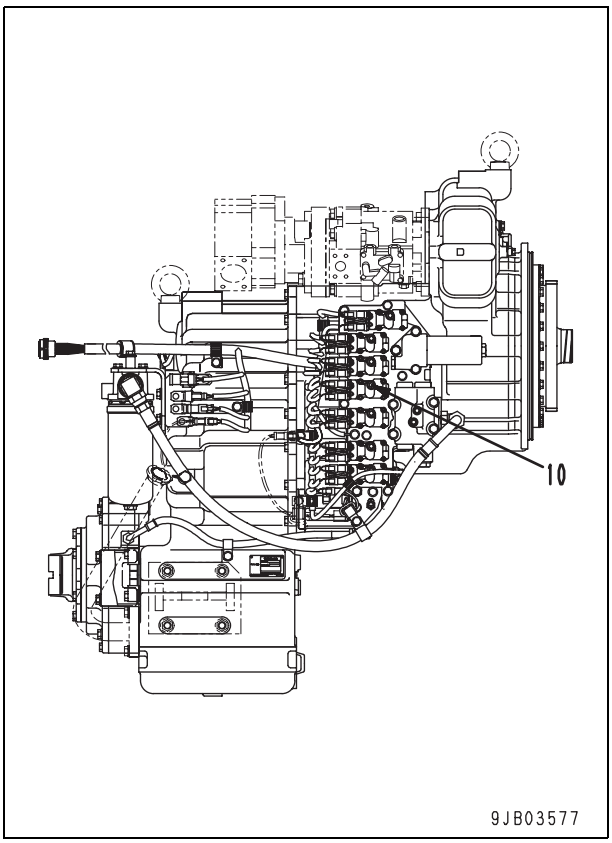
3. Return sensor (3) by 1/2 – 1 turn.
   ★ Adjust clearance (a) between the sensor tip and gear (4) tooth tip to approx. 0.75 – 1.5 mm.

4. Fix sensor (3) with locknut (2).
   Nut: **69 – 74 Nm {7.0 – 7.5 kgm}**

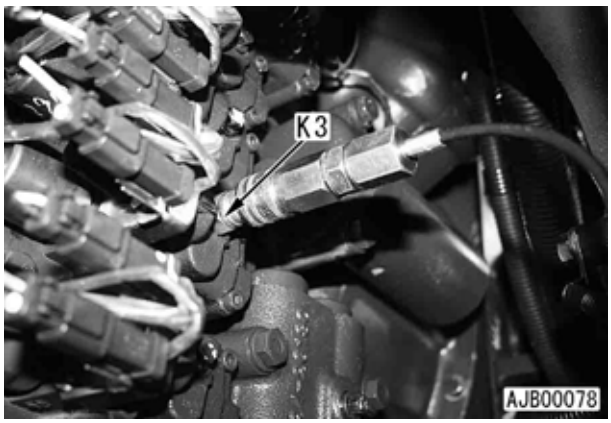


10. Measuring 4th clutch pressure

1) Remove 4th clutch pressure pickup plug (10) (10 × 1.25 mm).



2) Connect nipple **K3** and oil pressure gauge [1] in hydraulic tester **K1**.
   ★ Use the oil pressure gauge of 5.9 MPa {60 kg/cm^2}.



3) Set the transmission auto shift and manual shift selector switch in the MANUAL position.
4) Press the brake pedal.
5) Start the engine and turn the parking brake switch OFF.
6) While keeping the directional lever or switch at N (Neutral) position, set the gearshift lever in the 4th position.
7) While pressing the brake pedal with the engine at low idle, set the directional lever or switch to the F (forward) or R (reverse) position once and then return it to N (Neutral) again.
   ⚠ **Keep pressing the brake pedal securely.**
   ⚠ **The machine will move, so check carefully that the surrounding area is safe.**
   ★ If the directional lever or switch is in N (Neutral), the gear speed is not changed even if the gearshift lever is moved. To avoid this, perform the above operation.
8) While running the engine at 2,000 rpm, measure the 4th clutch oil pressure.

9) Remove the measurement tool after the measurement, and make sure that the machine is back to normal condition.

WHEEL LOADER

WA470-6
WA480-6

Machine model	Serial number
WA470-6	H50051 and up
WA480-6	H60051 and up

30 Testing and adjusting

Testing and adjusting, Part 2

Measuring parking brake oil pressure

★ Measuring instruments for parking brake oil pressure

Symbol		Part No.	Part Name
U	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	799-101-5220	Nipple (10 × 1.25 mm)
		07002-11023	O-ring

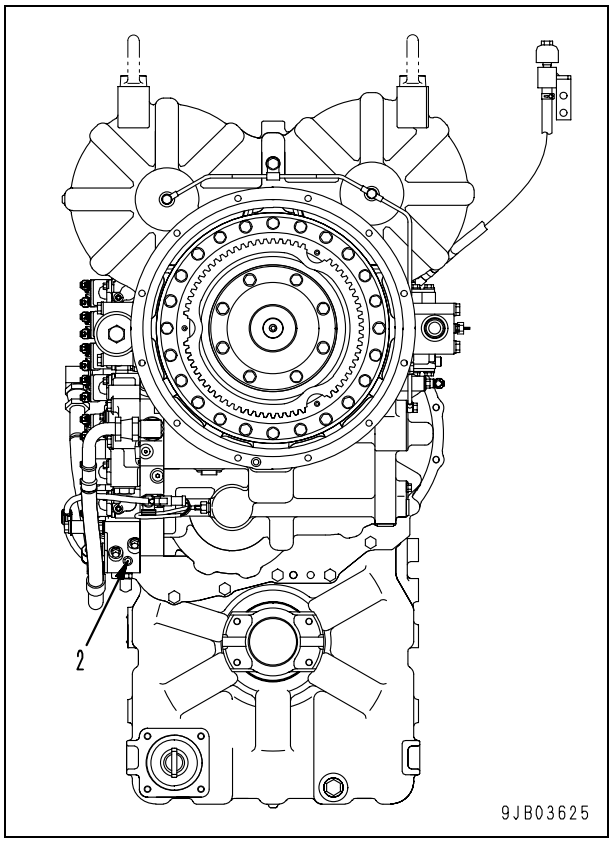
⚠ **Put chocks under the tires.**
⚠ **Install and remove the measuring instruments after the oil temperature lowers fully.**

★ Measure the parking brake oil pressure under the following condition.
- Engine coolant temperature: Within operating range
- Power train oil temperature: Within operating range

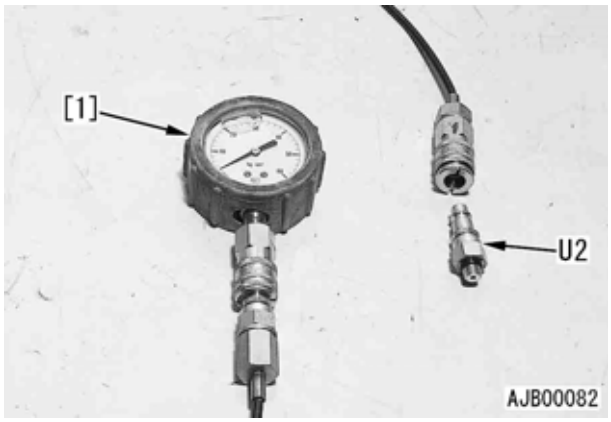
1. Parking brake pressure

1) Remove rear frame left side cover (1).

2) Remove parking brake pressure pickup plug (2).

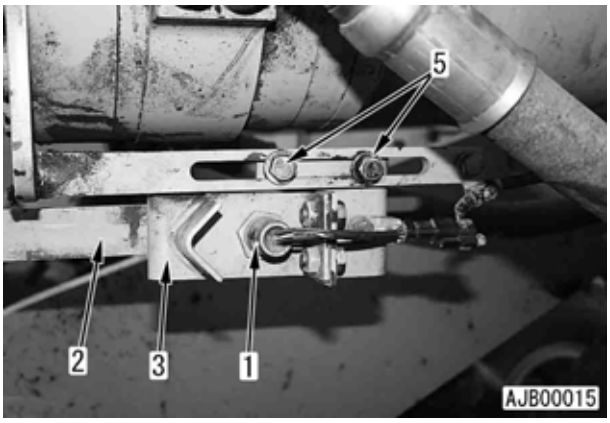


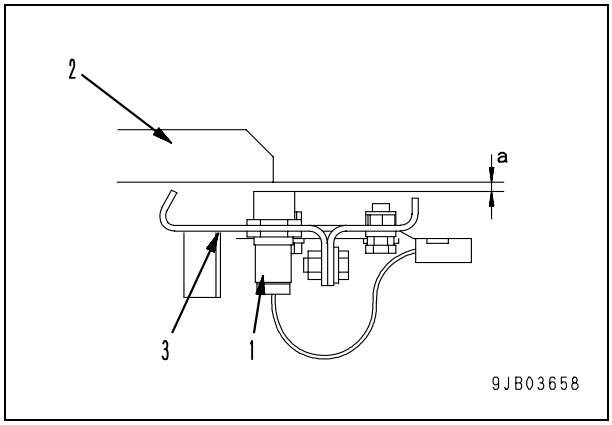
3) Connect nipple **U2** and oil pressure gauge [1] of hydraulic tester **U1**.
★ Use the oil pressure gauge with capacity 5.9 MPa {60 kg/cm^2}.



2. Adjusting mounting position (stopping position)

1) Lower the bucket to the ground and set it to a desired cutting angle, and then return the lever to the holding position and stop the engine.
2) Loose 2 mounting bolts (5) and adjust the position of switch protector (3) so that the rear end of sensor bar (2) will be at the center of the sensitive surface of proximity switch (1), and then tighten 2 mounting bolts (5).
3) Check again that clearance (a) between proximity switch (1) and sensor bar (2) is 3 – 5 mm.
   - You may check by turning the starting switch ON and turning the pilot lamp ON and OFF. (When the pilot lamp is turned OFF, the bucket stops.)





★ After adjusting, start the engine, operate the bucket control lever, and check that the switch operates at the desired position.

Adjusting replaced, reassembled or added sensor, controller, etc. with machine monitor

1. Items to be set when sensor or controller is replaced, reassembled or added

★ If any of the following components and parts is replaced or reassembled, initialize the sensors, solenoids, etc. with the machine monitor.

★ Adjust the items in alphabetical order (A –) with the machine monitor.

Replaced, reassembled, or added component or option	Adjustment item
Machine monitor	D, E, F
Change of tire size	J
Transmission	A, B, C
Transmission controller	A, B, C, D, E
Transmission ECMV solenoid	A, B, C
Work equipment controller	G, H
Taking automobile inspection	E
Addition or removal of option	E

Adjustment item	Contents of adjustment	Description No.
A	Resetting transmission initial learning	7-2 (*1)
B	Transmission initial learning	7-2 (*1)
C	Adjustment of transmission ECMV current	7-1 (*1)
D	Selection of machine model	12 (*1)
E	Selection of option	10 (*1)
F	Inputting of machine serial No.	11 (*1)

*1: Description No. of “Service mode” in “Special functions of machine monitor (EMMS)”

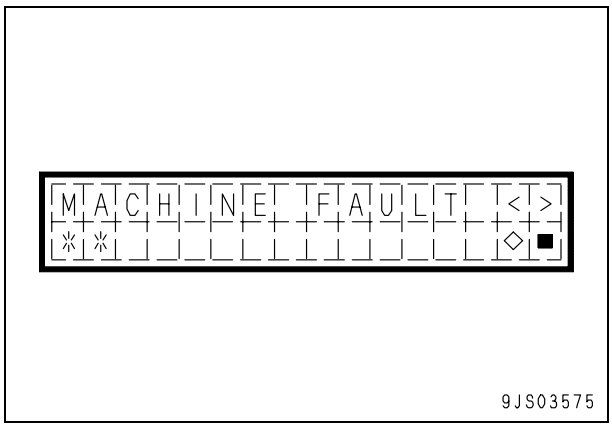
3. Mechanical system fault history display function (MACHINE FAULT)

The machine monitor records the past failures in the mechanical system as the failure codes. The failure codes are displayed from the following operations.

3-1. Selecting the menu

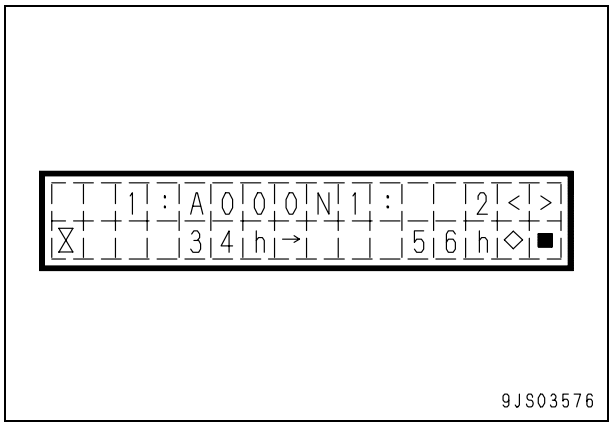
★ Select MACHINE FAULT from the menu screen of Service mode.

★ [**] field displays total number of the fault history currently recorded.



3-2. Displaying fault history

Press [◇] switch while the menu is selected to display the recorded fault history.



3-3. Displayed fault history

The mechanical system fault history display function displays the following information.

A: Record number

B: Failure code (Location code in four digits + Problem code in two digits)

C: Number of occurrences (number of occurrences of same code in past)

D: Elapsed time 1 (Elapsed time on service meter from the first occurrence)

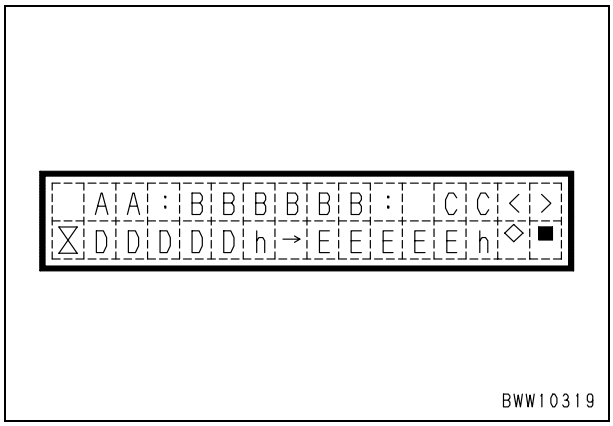
E: Elapsed time 2 (Elapsed time on service meter from the last occurrence)

★ The code of a failure currently occurring is indicated in flashing.

★ For details of a displayed failure code, see "Failure code list" of the failure code display function.

★ Note that part of the information displayed from the mechanical system fault history display function and the failure code display function is not identical.

★ When the requested fault history is not recorded, [–] is indicated in the display space.



3-4. Switching fault history display

Pressing [<] or [>] switch while a set of fault history is on the screen displays another set of recorded fault history.

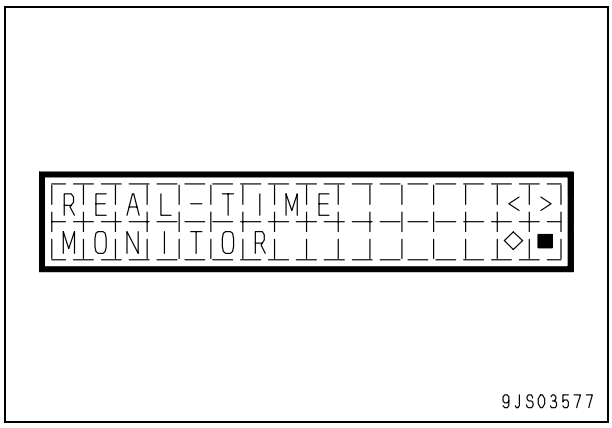
3-5. Deleting fault history (Not available)

The fault history of the mechanical system is not deletable.

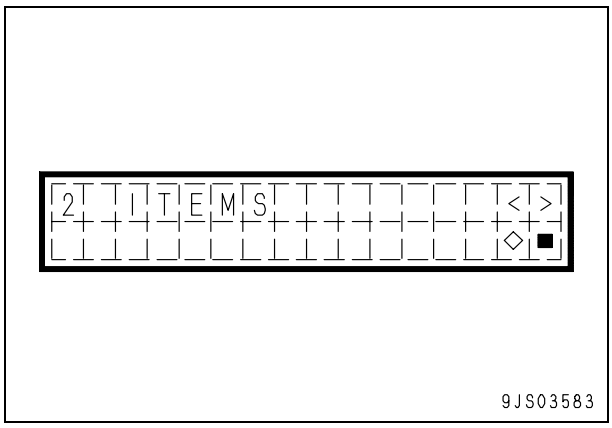
TRANSMISSION [Transmission controller system]				
No.	Monitoring code	Monitoring item (*1)	Indication item (*2)	Data indication range (*3)
42	40949	Output signal D_OUT_0-7	D-OUT-0------7	See separate table
43	40950	Output signal D_OUT_8-15	D-OUT-8-----15	See separate table
44	40951	Output signal D_OUT_16-23	D-OUT-16----23	See separate table
45	94100	Clutch trigger initial learning flag	TRIG FR1234	0/1(ON/OFF)

7-2-2. Preparations for transmission initial learning

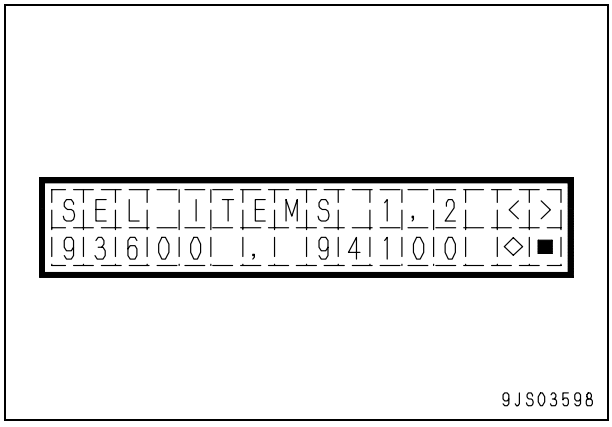
1) Display the REAL-TIME MONITOR from the menu screen of Service mode.



2) Press [◇] switch to display the sub menu, select 2 ITEMS using [<] or [>] switch and then settle the selection using [◇] switch. (SEL ITEMS 1,2 screen)

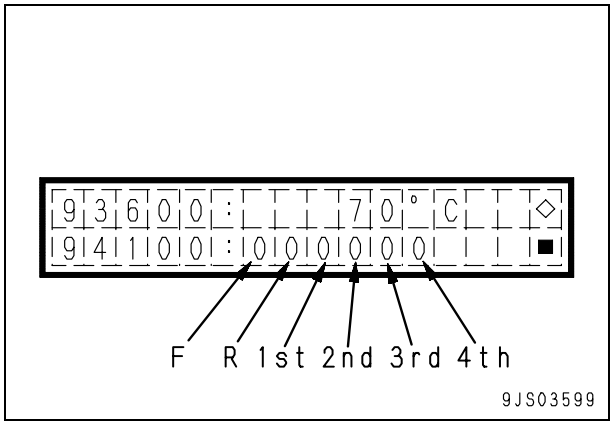


3) From the SEL ITEMS 1,2 screen, enter ID number 93600 of the transmission control oil temperature and ID number 94100 for displaying the trigger learning.
   ★ Referring to “4-5. Setting 2 items simultaneous monitoring”.



4) Using [◇] switch, settle 2 items display of the transmission control oil temperature and the trigger learning display.

★ Content of the trigger learning is displayed for each of F, R, 1st, 2nd, 3rd and 4th clutch in the figure.
- 0: Learning not done yet
- 1: Learning completed



7-2-3. Implementation of transmission initial learning

★ Before starting the transmission initial learning, be sure to implement “7-1 Adjustment of transmission ECMV current” and “7-2-1 Reset of initial learning”. Then start the initial learning according to the following procedure.

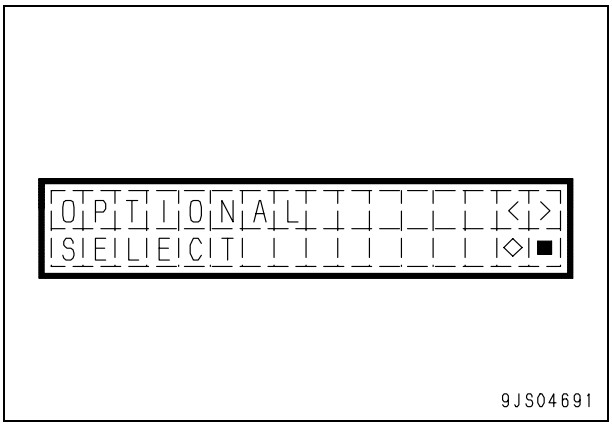
★ Implement the gearshift operation using actual travel, bench travel or while pressing the wheel brake.

⚠ **When actual travel is employed for the operation, be sure to choose a spacious field while paying reasonable care to the environment.**

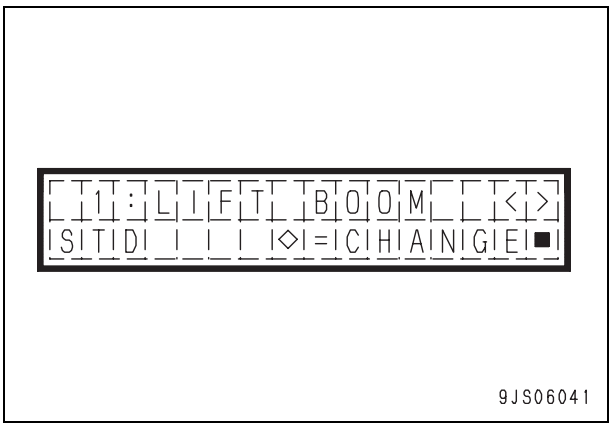
★ When executing the operation, the engine shall be set to low idle, manual switch to ON and lockup switch to OFF.

1) Start the engine, press the brake pedal fully and then release the parking brake.
2) Set the transmission shift mode in MANUAL, set the FNR (directional) lever or joystick steering FNR (directional) switch or right FNR (directional) switch in F (forward), and set the gearshift lever or gearshift switch in the 4th position.
3) Make sure from “7-2-2 Preparations for transmission initial learning” that the transmission control oil temperature is 55 – 70°C. If it is out of the range, stall the torque converter and adjust the temperature to 55 – 70°C. (If the initial learning is performed while the oil temperature is out of the specified range, time lags and gearshift shocks can result).

1) Display the OPTIONAL SELECT screen from the menu screen of Service mode.



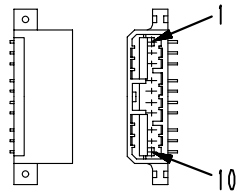
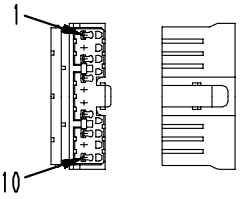
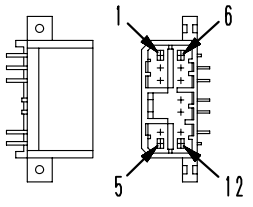
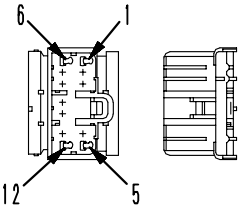
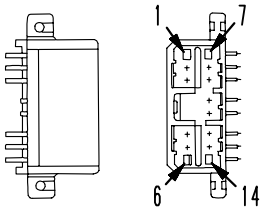
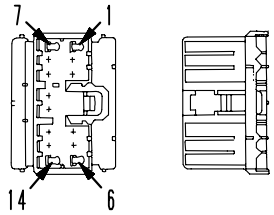
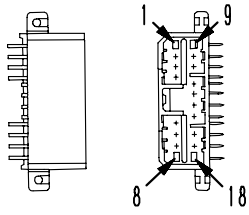
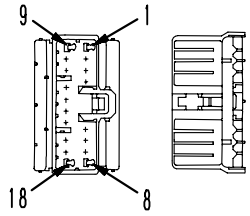
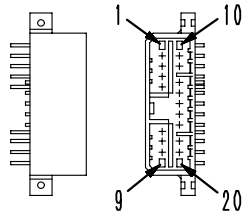
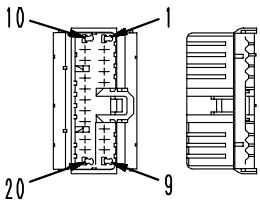
2) Hold down [◇] switch for 5 seconds or longer.
3) The 1: LIFT BOOM screen will appear.
   ★ If the [■] switch is pressed, the screen returns to the OPTIONAL SELECT screen.



Failure code	Troubled part	Trouble	Controller	Action code	Category of record	Reference document No.
CA452	Abnormally low level in common rail pressure sensor	—	ENG	E03	Electrical system	Troubleshooting by failure code, Part 3 SEN01710-00
CA553	Abnormally high common rail pressure 1	—	ENG	E03	Electrical system	
CA559	Supply pump pressure very low error 1	—	ENG	E03	Electrical system	
CA689	Abnormality in engine Ne speed sensor	—	ENG	E03	Electrical system	
CA691	Intake air temperature sensor high error	—	ENG	E01	Electrical system	
CA692	Intake air temperature sensor low error	—	ENG	E01	Electrical system	
CA731	Abnormality in engine Bkup speed sensor phase	—	ENG	E03	Electrical system	
CA757	Loss of all data in engine controller	—	ENG	E03	Electrical system	
CA778	Abnormality in engine Bkup speed sensor	—	ENG	E03	Electrical system	
CA1228	EGR valve servo error 1	—	ENG	E03	Electrical system	
CA1625	EGR valve servo error 2	—	ENG	E03	Electrical system	
CA1633	Abnormality in KOMNET	—	ENG	E03	Electrical system	
CA2185	Throttle sensor power supply voltage high error	—	ENG	E03	Electrical system	
CA2186	Throttle sensor power supply voltage low error	—	ENG	E03	Electrical system	
CA2249	Supply pump pressure very low error 2	—	ENG	E03	Electrical system	Troubleshooting by failure code, Part 4 SEN01711-00
CA2271	EGR valve lift sensor high error	—	ENG	E03	Electrical system	
CA2272	EGR valve lift sensor low error	—	ENG	E03	Electrical system	
CA2351	EGR valve solenoid operation short circuit error	—	ENG	E03	Electrical system	
CA2352	EGR valve solenoid operation disconnection error	—	ENG	E03	Electrical system	
CA2555	Disconnection in intake air heater relay	—	ENG	E01	Electrical system	

Testing before troubleshooting

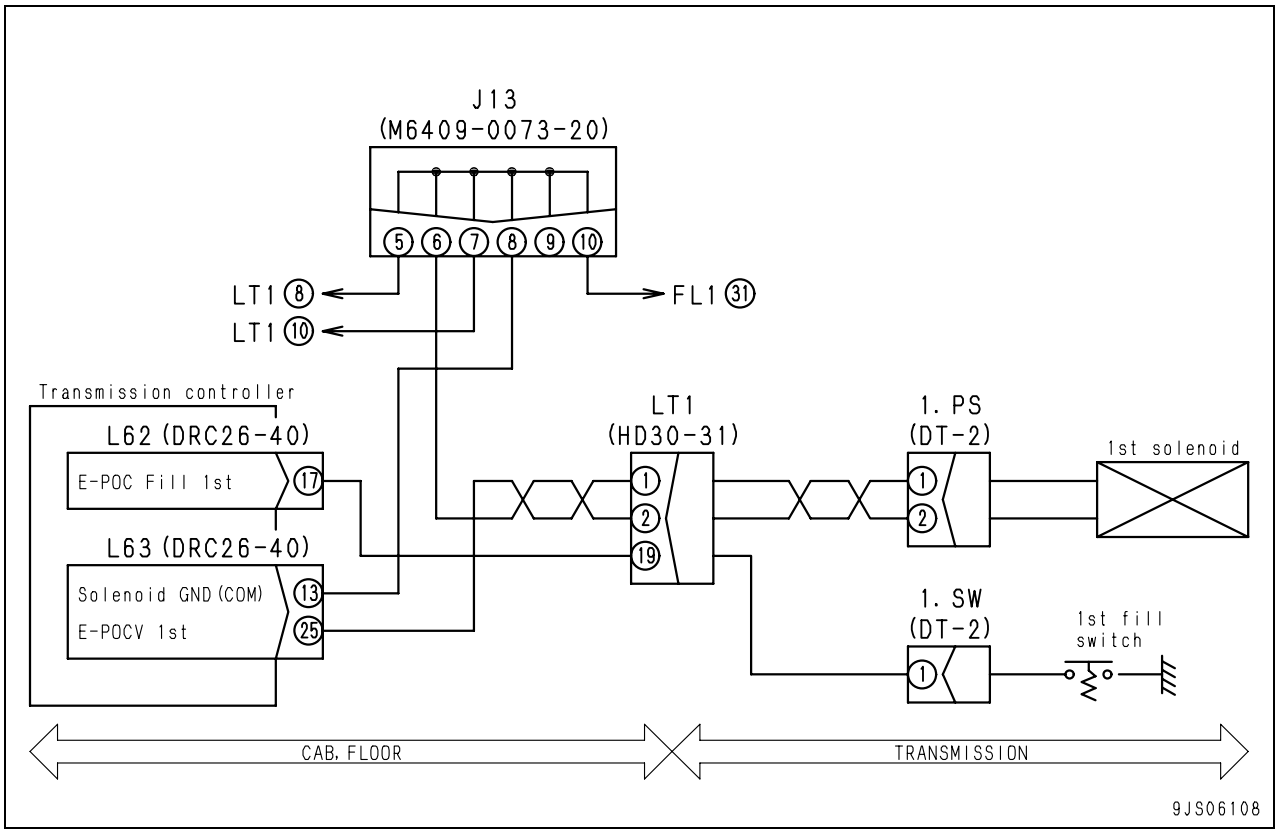
	Item	Criteria	Remedy
Lubricating oil and coolant	1. Check of level and type of fuel	—	Add fuel
	2. Check for foreign matter in fuel Check fuel filter and fuel pre-filter for clogging	—	Clean or drain
	3. Check of level and type of oil in engine oil pan	Between H and L	Add oil
	4. Check of coolant level	Between FULL and LOW	Add coolant
	5. Check of air cleaner for clogging	No red	Clean or replace
	6. Check of level and type of hydraulic oil	Between H and L	Add oil
	7. Check of level and type of transmission oil	Between H and L	Add oil
	8. Check of engine oil filter for clogging	—	Replace
	9. Check of hydraulic oil filter for clogging	—	Replace
	10. Check of transmission oil filter for clogging	—	Replace
Electrical parts	11. Check of battery terminal cables for looseness and corrosion	—	Retighten or replace
	12. Check of alternator terminal cables for looseness and corrosion	—	Retighten or replace
	13. Check of starting motor terminal cables for looseness and corrosion	—	Retighten or replace
	14. Check of operation of instruments	—	Repair or replace
Hydraulic and mechanical equipment	15. Check for abnormal noise and smell	—	Repair
	16. Check for oil leakage	—	Repair
	17. Bleeding air	—	Bleed air
	18. Check of effect of brake	—	Repair or adjust
Electrical equipment	19. Check of battery voltage (with engine stopped)	20 – 30 V	Charge or replace
	20. Check of battery electrolyte level	Between U.L and L.L	Add or replace
	21. Check wires for discoloration, burn, and removal of cover	—	Replace
	22. Check for removed wire clamp and drooping wire	—	Repair
	23. Check wiring for wetting with water (Check connectors and terminals for wetting with water, in particular)	—	Disconnect and dry connectors
	24. Check of slow-blow fuses and fuses for disconnection and corrosion	—	Replace
	25. Check of alternator voltage (with engine at medium speed or higher)	After several-minute operation: 27.5 – 29.5 V	Repair or replace
	26. Check of operating sound of battery relay (Starting switch OFF ✗ ON)	—	Replace

No. of pins	AMP070 type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
10	 BWP04759	 BWP04760	799-601-7510
	—	Part No. : 7821-92-7330	
12	 BWP04761	 BWP04762	799-601-7520
	—	Part No. : 7821-92-7340	
14	 BWP04763	 BWP04764	799-601-7530
	—	Part No. : 7821-92-7350	
18	 BWP04765	 BWP04766	799-601-7540
	—	Part No. : 7821-92-7360	
20	 BWP04767	 BWP04768	799-601-7550
	—	Part No. : 7821-92-7370	

9JS04899

Part No.	Connector type or part name	No. of pins	ID symbol	T-branch adapter kit																Others
				799-601-2500	799-601-2700	799-601-2800	799-601-2900	799-601-3000	799-601-5500	799-601-6000	799-601-6500	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	
799-601-7070	Adapter for SWP	14	SW14P											●		●					
799-601-7320	Adapter for SWP	16	SW16P																		●
799-601-7080	Adapter for M (T-branch)	1												●		●					
799-601-7090	Adapter for M	2	M2P									●	●	●		●					
799-601-7110	Adapter for M	3	M3P									●	●	●		●					
799-601-7120	Adapter for M	4	M4P									●	●	●		●					
799-601-7130	Adapter for M	6	M6P									●	●	●		●					
799-601-7340	Adapter for M	8	M8P																		●
799-601-7140	Adapter for S	8	S8P									●	●	●		●					
799-601-7150	Adapter for S (white)	10	S10P									●	●	●		●					
799-601-7160	Adapter for S (blue)	12	S12P									●	●	●							
799-601-7170	Adapter for S (blue)	16	S16P									●	●	●		●					
799-601-7330	Adapter for S (white)	16	S16PW													●					
799-601-7350	Adapter for S (white)	12	S12PW																		●
799-601-7180	Adapter for AMP040	8	A8P											●							
799-601-7190	Adapter for AMP040	12	A12P											●		●					
799-601-7210	Adapter for AMP040	16	A16P									●	●	●		●					
799-601-7220	Adapter for AMP040	20	A20P									●	●	●		●					
799-601-7230	Short connector for X	2										●	●	●		●					
799-601-7240	Case											●	●								
799-601-7270	Case													●							
799-601-7510	Adapter for 070	10	07-10												●						
799-601-7520	Adapter for 070	12	07-12												●						
799-601-7530	Adapter for 070	14	07-14												●						
799-601-7540	Adapter for 070	18	07-18												●						
799-601-7550	Adapter for 070	20	07-20												●						
799-601-7360	Adapter for relay	5	REL-5P																		●
799-601-7370	Adapter for relay	6	REL-6P																		●
799-601-7380	Adapter for JFC	2																			●
799-601-9010	Adapter for DTM	2	DTM2														●		●		
799-601-9020	Adapter for DT	2	DT2														●		●		
799-601-9030	Adapter for DT	3	DT3														●		●		
799-601-9040	Adapter for DT	4	DT4														●		●		
799-601-9050	Adapter for DT	6	DT6														●		●		
799-601-9060	Adapter for DT (gray)	8	DT8GR														●		●		
799-601-9070	Adapter for DT (black)	8	DT8B														●		●		
799-601-9080	Adapter for DT (green)	8	DT8G														●		●		
799-601-9090	Adapter for DT (brown)	8	DT8BR														●		●		
799-601-9110	Adapter for DT (gray)	12	DT12GR														●		●		
799-601-9120	Adapter for DT (black)	12	DT12B														●		●		
799-601-9130	Adapter for DT (green)	12	DT12G														●		●		
799-601-9140	Adapter for DT	12	DT12BR														●		●		
799-601-9210	Adapter for HD30-18	8	D18-8														●	●			
799-601-9220	Adapter for HD30-18	14	D18-14														●	●			

Circuit diagram related to transmission 1st clutch

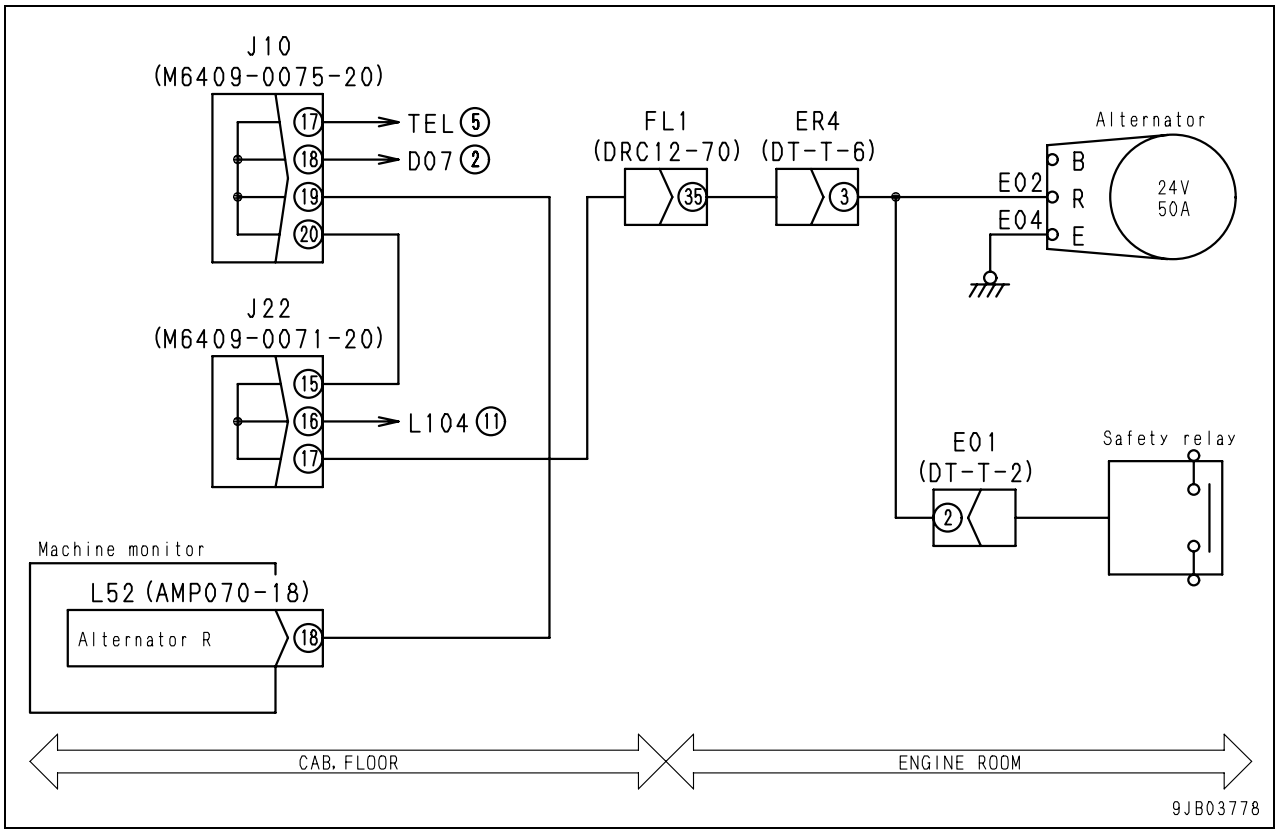


Failure code [2F00MA] (Parking brake: Malfunction)

Action code	Failure code	Trouble	Parking brake: Malfunction (Machine monitor system)
E03	**2F00MA**		
Contents of trouble	• While the F or R clutch is operated, the parking brake operation sensor circuit remains OPEN.		
Action of controller	• Turns the centralized warning lamp and alarm buzzer ON. • If problem is removed, system is returned to normal operating state.		
Problem that appears on machine	• Although the parking brake lamp is turned on, a gear speed other than neutral is actually selected.		
Related information	• This code may also be displayed if engine stalls or the emergency brake is operated while the machine is traveling. • The input state (ON/OFF) from the brake parking indicator switch can be checked with the monitoring function (Code: 40903, D-IN-26). • Method of reproducing failure code: Turn the starting switch ON.		

Possible causes and standard value in normal state	Causes		Standard value in normal state/Remarks on troubleshooting			
	1	Defective parking brake indicator switch (Internal disconnection)	★ Prepare with starting switch OFF, disconnect PB.SW connector and then start the engine to carry out troubleshooting.			
			PB.SW (male)	Parking brake	Resistance	
			Between (1) and (4)	Released	Max. 1 Ω	
				Operating	Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection or defective contact)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between L54 (female) (1) – PB.SW (female) (1)		Resistance	Max. 1 Ω
	3	Defective machine monitor	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			L54	Parking brake oil pressure	Voltage	
			Between (1) and chassis ground	Released	Max. 1 V	
				Operating	20 – 30 V	

Circuit diagram related to alternator



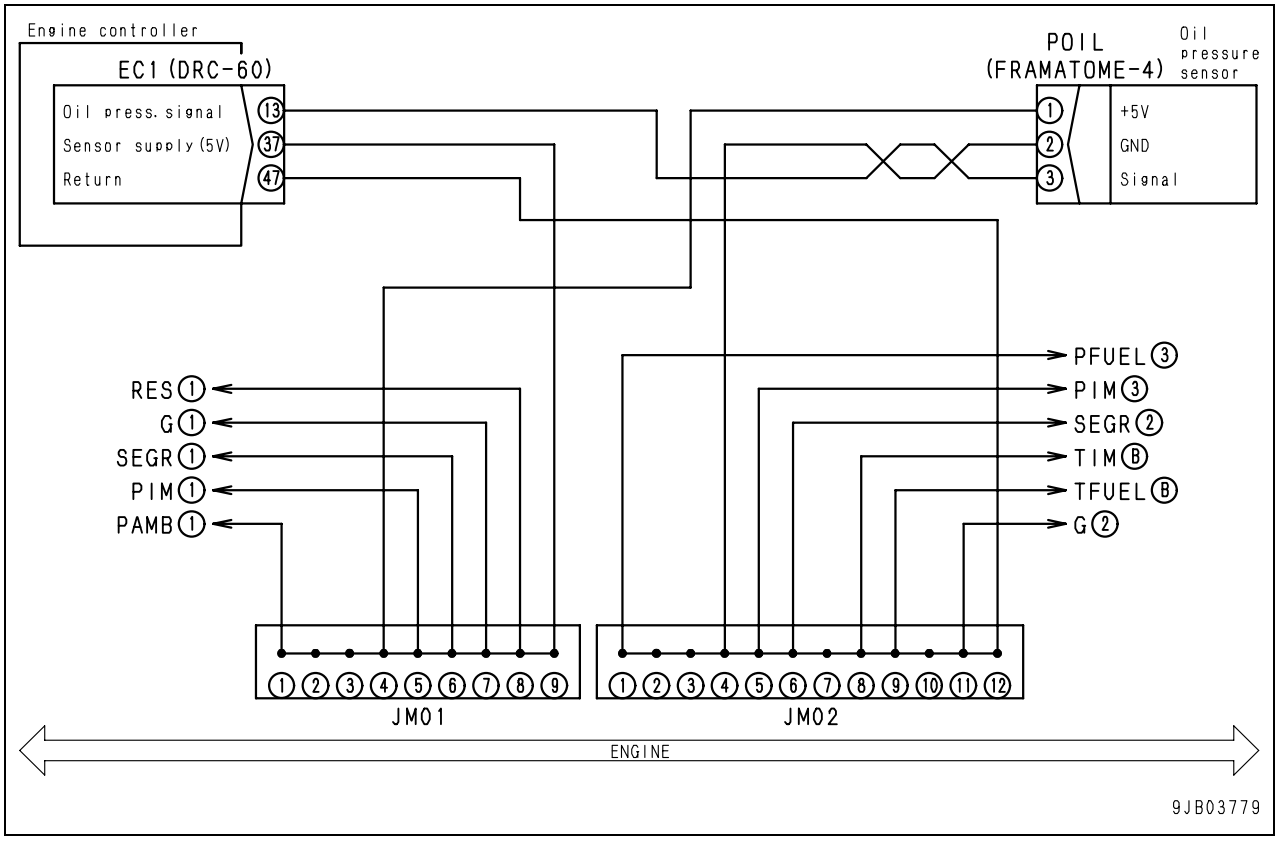
Failure code [B@HANS] (Hydraulic oil: Overheating)

Action code	Failure code	Trouble	Hydraulic oil: Overheating (Machine monitor system)
E02	**B@HANS**		
Contents of trouble	• The hydraulic oil temperature is above 100°C (this level was detected for 10 seconds)		
Action of controller	• Turns the centralized warning lamp and alarm buzzer ON. • If problem is removed, system is returned to normal operating state.		
Problem that appears on machine	• The hydraulic oil overheat warning is turned ON (If the machine is used as it is, the pump and cylinder seals may be broken).		
Related information	• The input state (oil temperature) from the hydraulic oil temperature sensor can be checked with the monitoring function (Code: 04401, HYD TEMP). • The input state (voltage) from the hydraulic oil temperature sensor can be checked with the monitoring function (Code: 04404, HYD TEMP). • Method of reproducing failure code: Turn the starting switch ON.		

	Causes		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Overheating of hydraulic oil	The hydraulic oil may be overheating.		
	2	Defective hydraulic oil temperature sensor (Internal trouble)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			R47 (Male)	Hydraulic oil temperature	Resistance
			Between (1) and (2)	25°C (Normal temperature)	35 – 50 kΩ
				100°C	3.1 – 4.5 kΩ
	3	Defective machine monitor	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			L55 (female)	Hydraulic oil temperature	Voltage
			Wiring harnesses between (7) – chassis ground	25°C (Normal temperature)	4.4 – 4.6 V
				100°C	2.1 – 2.3 V

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	5	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between EC1 (female) (37) – POIL (female) (1) and between EC1 (female) (47) – POIL (female) (2)	Resis-tance	Min. 1 MΩ
			Wiring harness between EC1 (female) (37) – POIL (female) (1) and between EC1 (female) (13) – POIL (female) (3)	Resis-tance	Min. 1 MΩ
			Wiring harness between EC1 (female) (47) – POIL (female) (2) and between EC1 (female) (13) – POIL (female) (3)	Resis-tance	Min. 1 MΩ
	6	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON or start engine and carry out troubleshooting.		
			EC1		Voltage
			Between (37) and (47)	Power supply	4.75 – 5.25 V

Circuit diagram related to engine oil pressure sensor

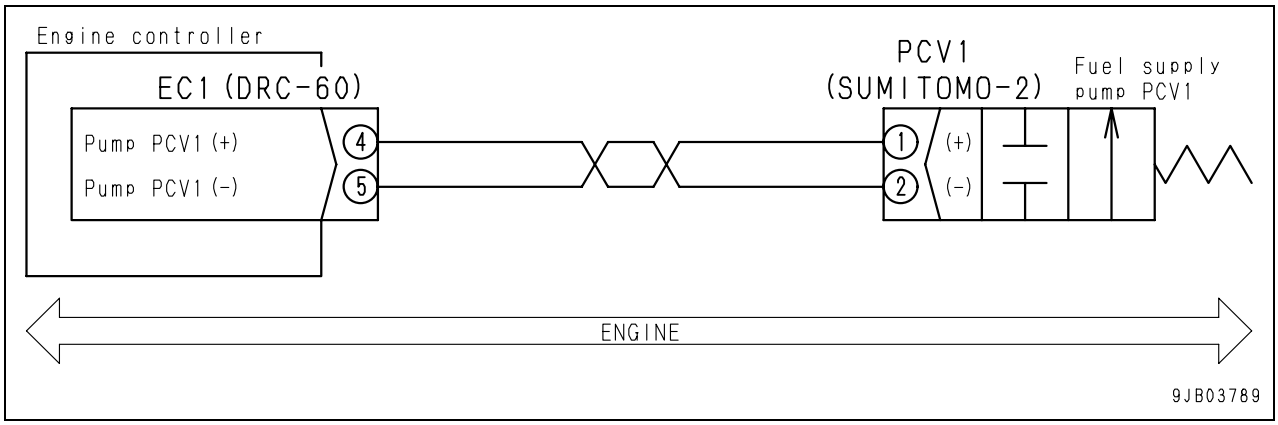


Failure code [CA227] (Sensor power supply 2 high error)

Action code	Failure code	Trouble	Sensor power supply 2 high error (Engine controller system)
E03	**CA227**		
Contents of trouble	• High voltage is detected in sensor power supply 2 (5 V) circuit.		
Action of controller	• Bkup speed sensor operates with signal from Ne speed sensor. • Engine oil pressure sensor sets engine oil pressure to default (250 kPa {2.5 kg/cm^2}), and continues operation. • Atmospheric pressure sensor sets atmospheric pressure to default (52.44 kPa {0.53 kg/cm^2}), and continues operation. • Charge pressure sensor (boost pressure sensor) sets charge pressure to fixed value (400 kPa {4.1 kg/cm^2}), and continues operation. • EGR inlet pressure sensor sets EGR inlet pressure to default (102 kPa {1.04 kg/cm^2}), and limits output to continue operation. • EGR valve lift sensor limits output and closes EGR valve. • Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine	• Engine output lowers.		
Related information	• Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defect in related system	If another code is displayed, carry out troubleshooting for it.			
	2	Defective sensor (Internal defect)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Disconnect device suggested on the right. At this time, if failure code is not indicated, the device is defective.	Bkup speed sensor system	G connector	
				Oil pressure sensor	POIL connector	
				Charge pressure sensor	PIM connector	
				Atmospheric pressure sensor	PAMB connector	
				EGR valve lift sensor	SEGR connector	
	3	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 EC1 (female) (37) – each sensor (female)		Resistance	Max. 1 Ω
			Wiring harness between EC1 (female) (47) – each sensor (female)		Resistance	Max. 1 Ω
	4	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between EC1 (female) (37) – each sensor (female) and chassis ground		Resistance	Min. 1 MΩ
			Wiring harness between EC1 (female) (47) – each sensor (female) and chassis ground		Resistance	Min. 1 MΩ

Circuit diagram related to supply pump PCV1



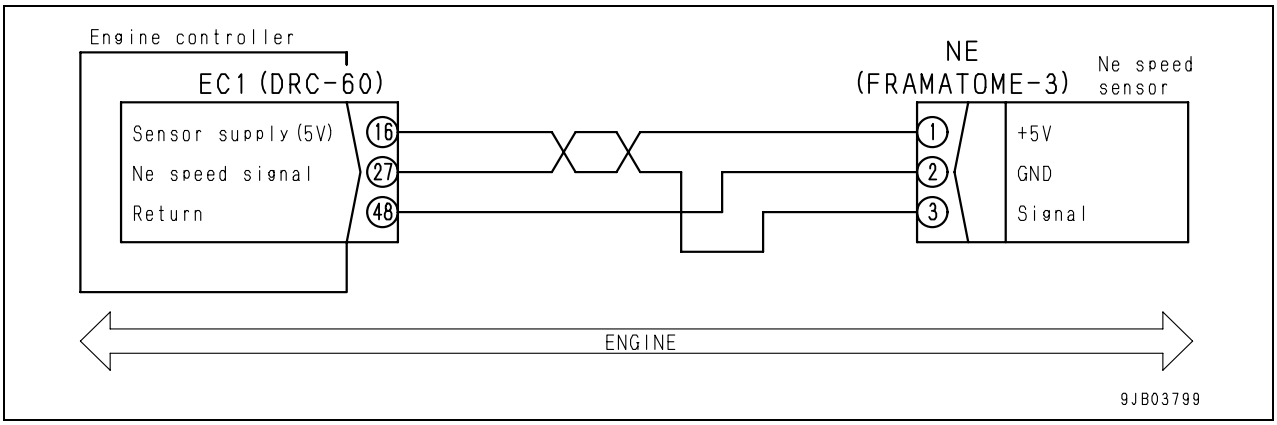
Failure code [CA331] (Injector #2 (L/B #2) open/short error)

Action code	Failure code	Trouble	Injector #2 (L/B #2) open/short error (Engine controller system)
E03	**CA331**		
Contents of trouble	• Disconnection or short circuit was detected in injector #2 circuit.		
Action of controller	• Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine	• Engine output lowers. • Speed does not become stable.		
Related information	• Method of reproducing failure code: Start engine.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective injector #2 (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CN2 (male)	Resistance		
			Between (1) and (2)	0.4 – 1.1 Ω		
			Between (1), (2) and chassis ground	Min. 1 MΩ		
	2	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 EC1 (female) (54) – CN2 (female) (1)	Resis-tance	Max. 1 Ω	
			Wiring harness between EC1 (female) (51) – CN2 (female) (2)	Resis-tance	Max. 1 Ω	
	3	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between EC1 (female) (54) – CN2 (female) (1) and chassis ground	Resis-tance	Min. 1 MΩ	
			Wiring harness between EC1 (female) (51) – CN2 (female) (2) and chassis ground	Resis-tance	Min. 1 MΩ	
	4	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			EC1 (female)	Resistance		
			Between (54) and (51)	0.4 – 1.1 Ω		
			Between (54), (51) and chassis ground	Min. 1 MΩ		

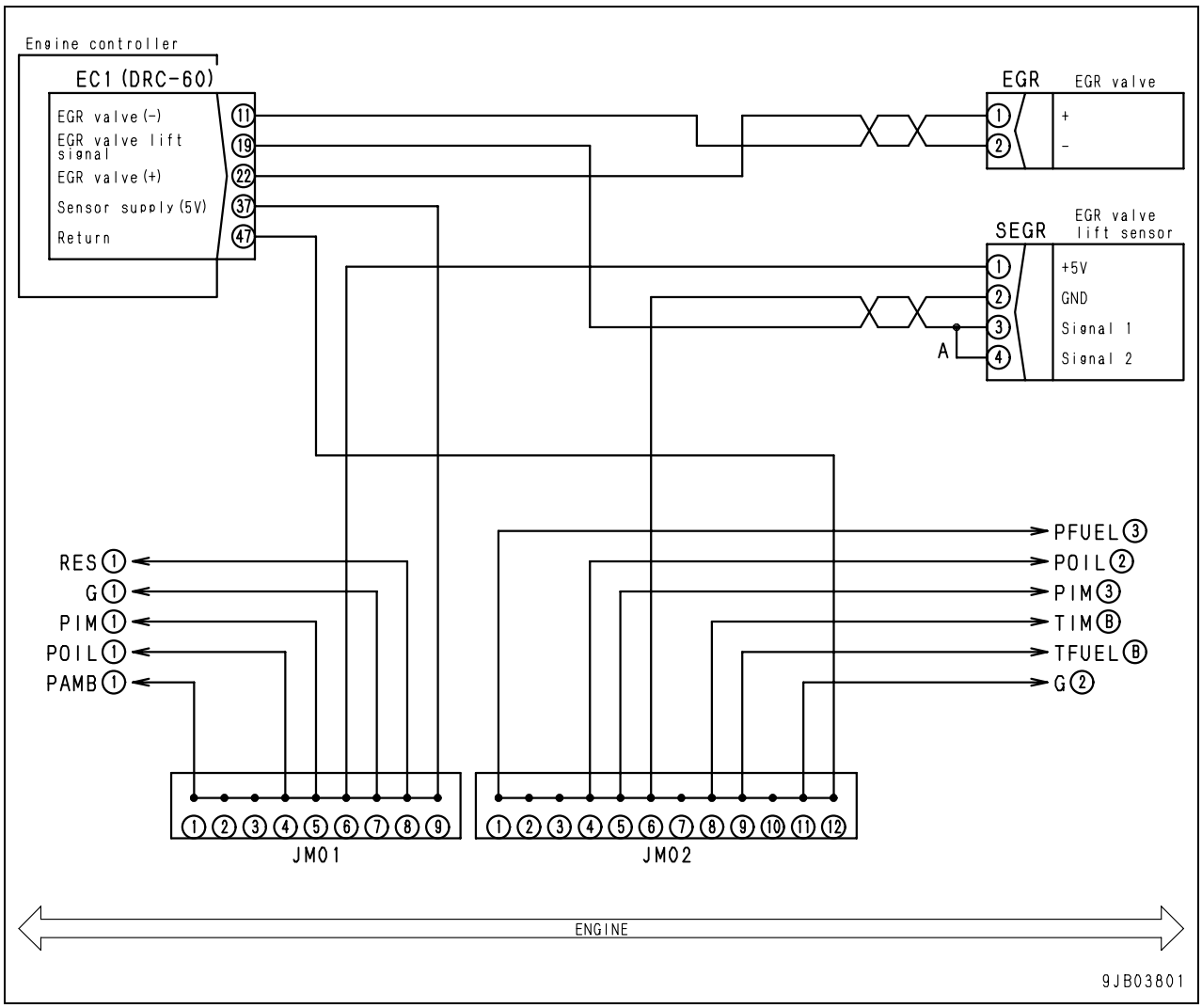
<table>
<tr><td rowspan="12">Possible causes and standard value in normal state</td><td colspan="2">Causes</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">7</td><td rowspan="3">Ground fault in wiring harness (Contact with ground circuit)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">Wiring harness between fuse No. 6 of fuse box B – L171, L172 (female) (3) and chassis ground</td><td>Resis-tance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="2">Wiring harness between L171 (female) (5), L172 (female) (5) – EC (3), (4) and chassis ground</td><td>Resis-tance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="4">8</td><td rowspan="4">Short circuit in wiring harness (with another wiring harness)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">Wiring harness among pins between EC3 (female) (3), (4) – EC3 (female) (1), (2) (With battery terminal disconnected)</td><td>Resis-tance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="2">Wiring harness among all pins between EC3 (female) (3), (4) – EC2 (female) (With battery terminal disconnected)</td><td>Resis-tance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="2">Wiring harness among all pins between EC3 (female) (1), (2) – EC2 (female) (With battery terminal disconnected)</td><td>Resis-tance</td><td>Min. 1 MΩ</td></tr>
<tr><td>9</td><td>Defective wiring harness connector</td><td colspan="4">Connecting parts among fuse No. 6 of fuse box B, engine unit wiring harness, and engine controller are suspected. Inspect them directly.
• Loose connector, broken lock, broken seal
• Corrosive, bent, broken, forced-in, or extended pin
• Humidity in connector, entry of dirt or dust, poor insulation</td></tr>
<tr><td rowspan="3">10</td><td rowspan="3">Defective engine controller</td><td colspan="4">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td>EC3 (female)</td><td>Starting switch</td><td colspan="2">Voltage</td></tr>
<tr><td rowspan="2">Between (3), (4) and (1), (2)</td><td>ON</td><td colspan="2">Min. 24 V</td></tr>
<tr><td>START</td><td colspan="2">Min. 12 V</td></tr>
</table>

Circuit diagram related to engine Ne speed sensor



Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting		
	5	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning staring switch ON.		
			Wiring harness between EC1 (female) (37) – SEGR (female) (1) and EC1 (female) (19) – SEGR (female) (3), (4)	Resis-tance	Min. 1 MΩ
			Wiring harness between EC1 (female) (37) – SEGR (female) (1) and EC1 (female) (19) – SEGR (female) (3), (4)	Resis-tance	Min. 1 MΩ
			Wiring harness between EC1 (female) (47) – SEGR (female) (2) and EC1 (female) (19) – SEGR (female) (3), (4)	Resis-tance	Min. 1 MΩ
	6	Defective engine controller	★ Prepare with starting switch OFF, then turn starting switch ON or start engine and carry out troubleshooting.		
			EC1	Voltage	
			Between (37) and (47)	4.75 – 5.25 V	

Circuit diagram related to EGR valve solenoid & lift sensor



Failure code [D160KA] (Backup lamp relay: Disconnection)

Action code	Failure code	Trouble	Backup lamp relay: Disconnection (Transmission controller)
E01	**D160KA**		
Contents of trouble	• Since the backup lamp relay output system is disconnected, signals are not output to the backup lamp relay. • Since the backup lamp relay output system is shorted with the power source, signal output to the backup lamp lay is continued.		
Action of controller	• Turns the output to the backup lamp relay OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• The backup lamp does not light up (disconnection). • The backup buzzer does not sound (disconnection). • The backup lamp remains turned on (hot short). • The backup buzzer sound does no stop (hot short).		
Related information	• The output state (ON/OFF) to the backup lamp relay can be checked with the monitoring function (Code: 90951, D-OUT-20). • Method of reproducing failure code: Turn the starting switch ON, and set FNR (directional) lever, joystick steering FNR (directional) switch, or right FNR (directional) switch to R (reverse).		

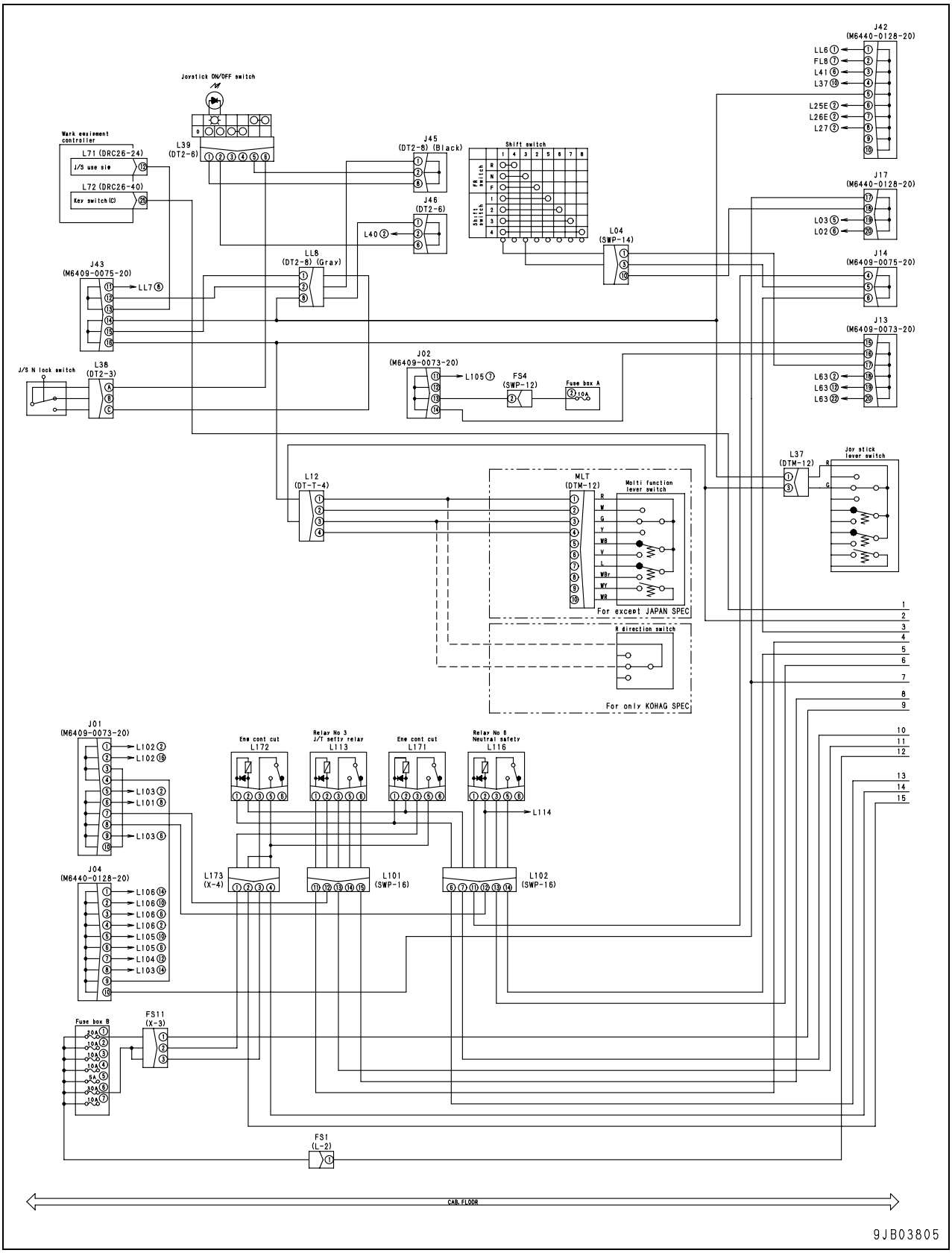
	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective backup lamp relay (L117) (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			When backup lamp relay (L117) is replaced with a relay of the same type, if the condition becomes normal, the backup lamp relay is defective.			
			★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			L117 (male)		Resistance	
			Between (1) and (2)		200 – 400 Ω	
	2	Disconnection in wiring harness (Disconnection or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between L63 (female) (4) – L117 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between L117 (female) (2) – chassis ground		Resistance	Max. 1 Ω
	3	Hot short in wiring harness (Contact with 24V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between L63 (female) (4) – L117 (female) (1) and chassis ground		Voltage	Max. 1 V
	4	Defective transmission controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			L63	FNR (directional) lever, joystick steering FNR (directional) switch or right FNR (directional) switch	Voltage	
			Between (4) and chassis ground	R (Reverse)	20 – 30 V	
				Other than above	Max. 1 V	

Failure code [D193KA] (Joystick steering solenoid cut relay: Disconnection)

Action code	Failure code	Trouble	Joystick steering solenoid cut-out relay: Disconnection (Work equipment controller system)
E03	**D193KA**		
Contents of trouble	• Since the output system of the joystick steering solenoid cut-out relay is disconnected, signals are not output to the joystick steering solenoid cut-out relay.		
Action of controller	• Stops output of signal to the joystick steering right and left solenoids. • Stops output of signal to the joystick steering cut-out relay. • Turns the centralized warning lamp and alarm buzzer ON. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• The operator cannot operate the joystick steering.		
Related information	• The output state (ON/OFF) to the joystick steering solenoid cut-out relay can be checked with the monitoring function (Code: 40953, D-OUT-8). • Only for joystick steering • Method of reproducing failure code: Turn the starting switch ON and operate the joystick steering (with the engine being stopped).		

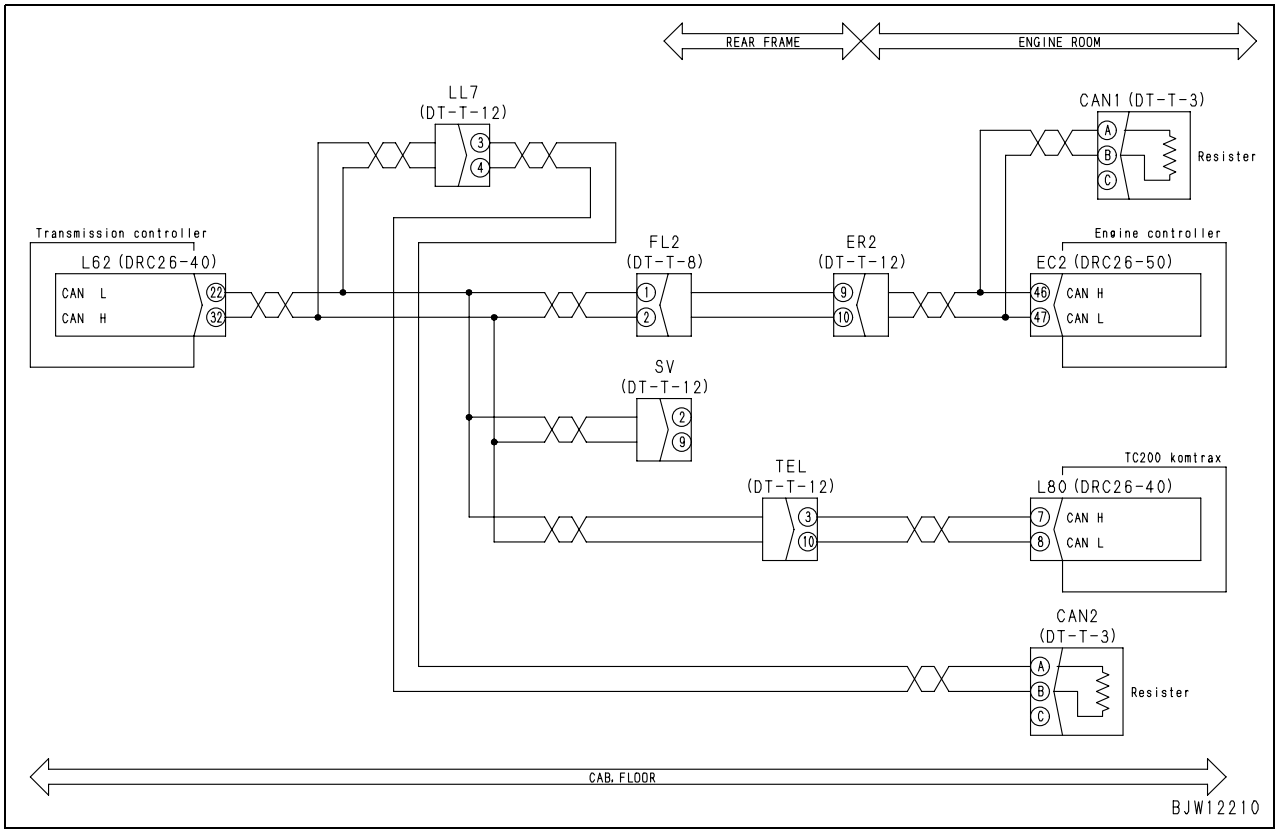
Possible causes and standard value in normal state	Causes		Standard value in normal state/Remarks on troubleshooting		
	1	Defective joystick steering neutral cut-out relay (L41) (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			L41 (male)	Resistance	
			Between (1) and (2)	200 – 400 Ω	
	2	Disconnection in wiring harness (Disconnection or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between L73 (female) (26) – L41 (female) (5)	Resistance	Max. 1 Ω
			Wiring harness between L41 (female) (6) – chassis ground	Resistance	Max. 1 Ω
	3	Defective work equipment controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting. • Operate the joystick steering lever.		
			L73	Voltage	
			Between (26) and chassis ground	20 – 30 V	

Circuit diagram related to engine starting system (C terminal signal)



	Causes		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state			★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
	3	Grounding fault in wiring harness (Contact with ground circuit)	Wiring harness between L62 (female) (22), (32) – L56 (female) (3), (8) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between L62 (female) (22), (32) – L72 (female) (22), (32) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between L62 (female) (22), (32) – EC2 (female) (46), (47) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between L62 (female) (22), (32) – L80 (female) (7), (8) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between L62 (female) (22), (32) – CAN1 (female) (A), (B) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between L62 (female) (22), (32) – CAN2 (female) (A), (B) and chassis ground	Resistance	Min. 1 MΩ
	4	Defective machine monitor, transmission controller, work equipment controller, engine controller or KOMTRAX terminal	★ If above troubleshootings 1 – 3 have not identified the cause of the trouble, failure on the machine monitor, transmission controller, work equipment controller, engine controller or KOMTRAX terminal should be suspected. (Since trouble is in system, troubleshooting cannot be carried out.)		

Circuit diagram related to CAN communication



Failure code [DB90KK] Work equipment controller: Low source voltage (input)

Action code	Failure code	Trouble	Work equipment controller: Low source voltage (input) (Work equipment controller system)
E03	**DB90KK**		
Contents of trouble	• Voltage of work equipment controller UNSW power supply (battery direct power supply) is low. • Voltage of constant power supply (battery direct power supply) is 18 V or less		
Action of controller	• Does not display failure codes other than this code if voltage of constant power supply (battery direct power supply) remains under 18 V for more than 2 seconds. • Even if cause of failure disappears, system does not reset itself until the joystick steering lever and work equipment lever are once set to N (Neutral). • Turns the centralized warning lamp and alarm buzzer ON. • Cannot operate normally since it cannot sense the input signals properly.		
Problem that appears on machine	• The machine cannot operate normally.		
Related information	• Method of reproducing failure code: Turn the starting switch ON.		

	Causes		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective slow-blow fuse	If the slow-blow fuse is shut down, the circuit probably has a grounding fault, etc. (See cause 4.)		
	2	Defective fuse No. 3 of fuse box B	If the fuse is burn, the circuit probably has a grounding fault, etc. (See cause 4.)		
	3	Disconnection in wiring harness (Disconnection or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between emergency steering relay R02 – slow-blow fuse R02	Resistance	Max. 1 Ω
			Wiring harness between slow-blow fuse R03 – fuse No. 3 of fuse box B	Resistance	Max. 1 Ω
			Wiring harness between fuse No. 3 of fuse box B – L73 (female) (1), (11)	Resistance	Max. 1 Ω
	4	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between emergency steering relay R02 – slow-blow fuse R02 and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between slow-blow fuse R03 – fuse No. 3 of fuse box B and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between fuse No. 3 of fuse box B – L73 (female) (1), (11) and chassis ground	Resistance	Min. 1 MΩ
	5	Defective work equipment controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			L73	Voltage	
			Between (1), (11) and (21), (31), (32), (33)	20 – 30 V	

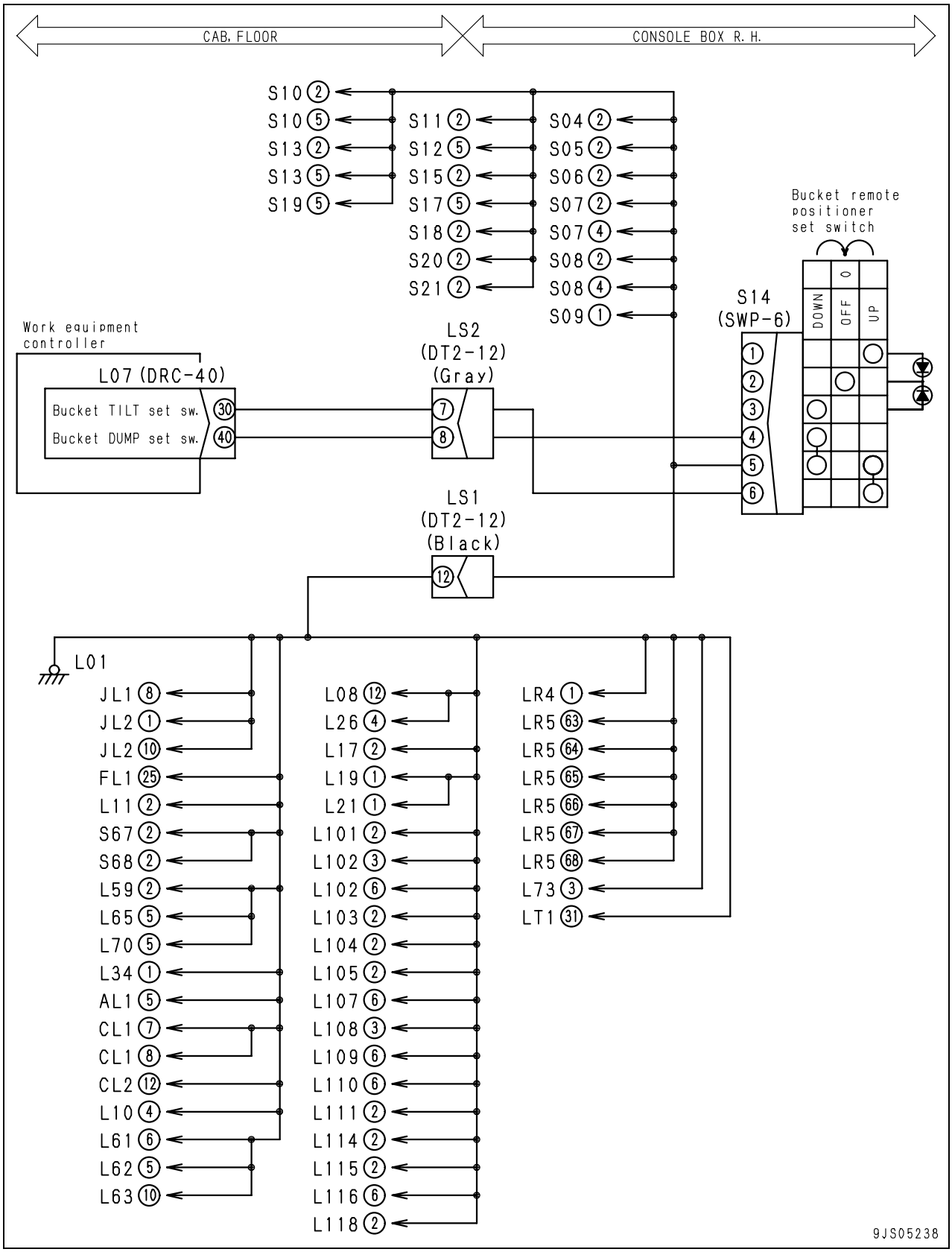
Blank for technical reason

Failure code [DD1FLD] Load meter mode selector switch (A/B): Switch is kept pressed for long time

Action code	Failure code	Trouble	Load meter mode selector switch (A/B): Switch is kept pressed for long time (Machine monitor system)
E01	**DD1FLD**		
Contents of trouble	• The input circuit of the load meter mode selector switch (A/B) is kept CLOSED for more than continuous 1 minute		
Action of controller	• None in particular.		
Problem that appears on machine	• The working object cannot be changed. • Some characters do not appear on the character display.		
Related information	• The input state (ON/OFF) from the load meter mode selector switch (A/B) can be checked with the monitoring function (Code: 40901, D-IN-10). • Only for load meter (if equipped) • Method of reproducing failure code: Turn the starting switch ON.		

Possible causes and standard value in normal state	Causes		Standard value in normal state/Remarks on troubleshooting			
	1	Defective load meter mode selector switch (A/B) (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			S31 (male)	Load meter mode selector switch (A/B)	Resistance	
			Between (5) and (6)	ON	Max. 1 Ω	
				OFF	Min. 1 MΩ	
			Between (5), (6) and chassis ground	Constant	Min. 1 MΩ	
	2	Hot short in wiring harness (Contact with 24V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between L52 (female) (6) – S31 (female) (6) and chassis ground		Voltage	Max. 1 V
	3	Defective machine monitor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			L52 (female)	Load meter mode selector switch (A/B)	Voltage	
			Between (6) and chassis ground	ON	20 – 30 V	
				OFF	Max. 1 V	

Circuit diagram related to remote positioner bucket angle set switch

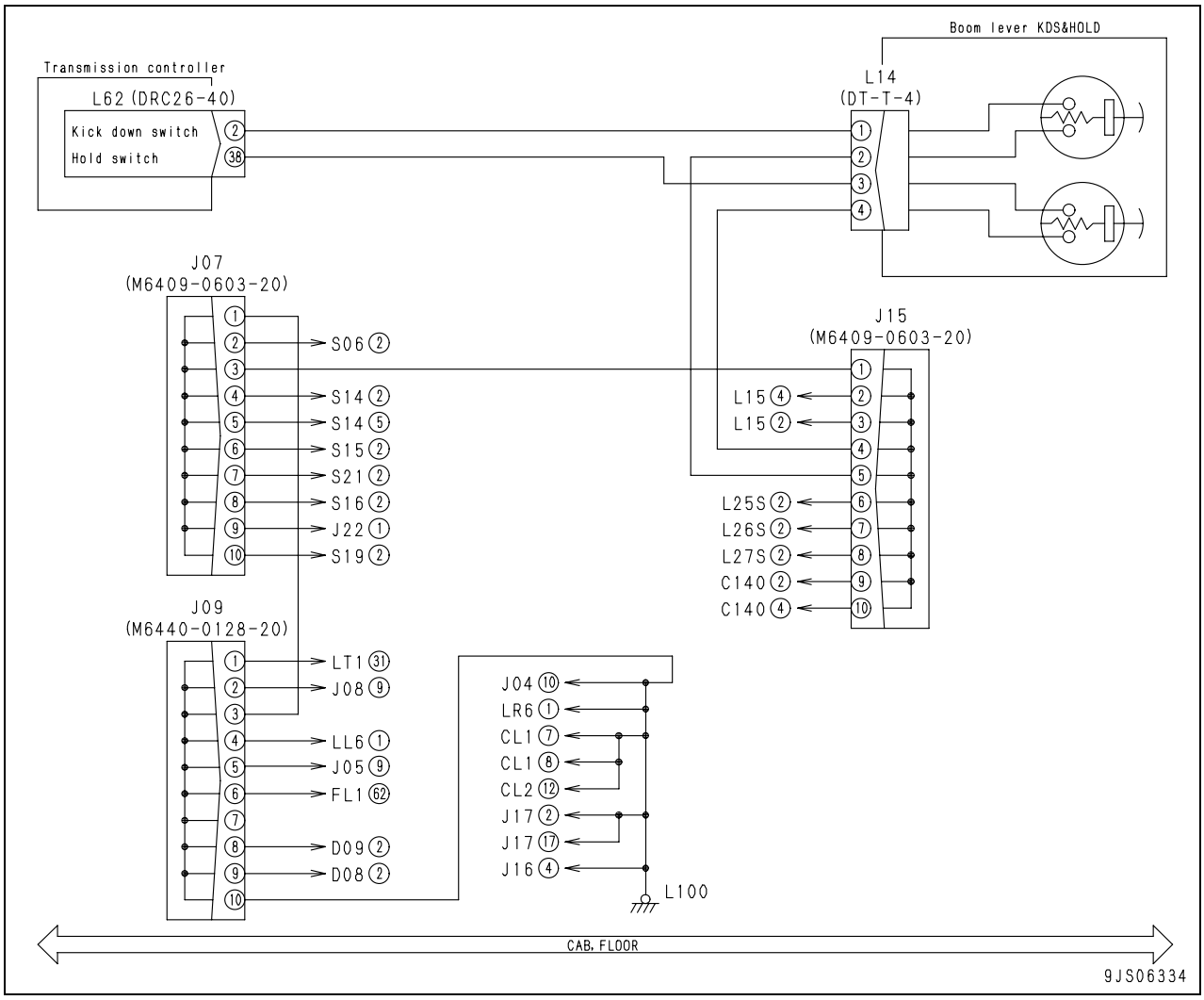


Failure code [DDK6KA] (FNR lever switch: Disconnection)

Action code	Failure code	Trouble	FNR lever switch: Disconnection (Transmission controller system)
E03	**DDK6KA**		
Contents of trouble	• Since the FNR (directional) lever switch signal system is disconnected or shorted, all the lever signals are not input		
Action of controller	• When the joystick steering ON/OFF switch is set to OFF, set it to Neutral. • When the ON-OFF switch of right FNR switch or joystick steering ON/OFF switch is set to ON: 1) The controller operation follows the right FNR (directional) switch or joystick steering FNR (directional) switch. 2) The controller assumes that FNR (directional) lever switch is set to Neutral. • Turns the centralized warning lamp and alarm buzzer ON. • Even if cause of failure disappears, system does not reset itself until FNR (directional) lever is set to N (Neutral).		
Problem that appears on machine	• Machine travel with the FNR (directional) lever switch is unavailable. • Travel is available with right FNR (directional) switch or joystick steering FNR (directional) switch. • Shift lever position pilot lamp goes off.		
Related information	• The input state (ON/OFF) from the FNR (directional) lever switch can be checked with the monitoring function (Code: 40907, D-IN-20, D-IN-21 or D-IN-22). • Method of reproducing failure code: Turn the starting switch ON and operate FNR (directional) lever		

	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective fuse No. 2 of fuse box A	If the fuse is burn, the circuit probably has a grounding fault, etc. (See cause 4.)			
	2	Defective FNR (directional) lever switch (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			L04	FNR (directional) lever	Voltage	
			Between (1) and (10)	Constant	20 – 30 V	
			Between (3) and (10)	N (Neutral)	20 – 30 V	
				Other than above	Max. 1 V	
			Between (2) and (10)	F (Forward)	20 – 30 V	
				Other than above	Max. 1 V	
			Between (4) and (10)	R (Reverse)	20 – 30 V	
				Other than above	Max. 1 V	
	3	Disconnection in wiring harness (Disconnection or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between fuse No. 2 of fuse box A – L04 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between L62 (female) (16) – L04 (female) (4)		Resistance	Max. 1 Ω
			Wiring harness between L62 (female) (26) – L04 (female) (3)		Resistance	Max. 1 Ω
			Wiring harness between L62 (female) (36) – L04 (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between L04 (female) (10) – chassis ground		Resistance	Max. 1 Ω

Circuit diagram related to kick-down switch and hold switch



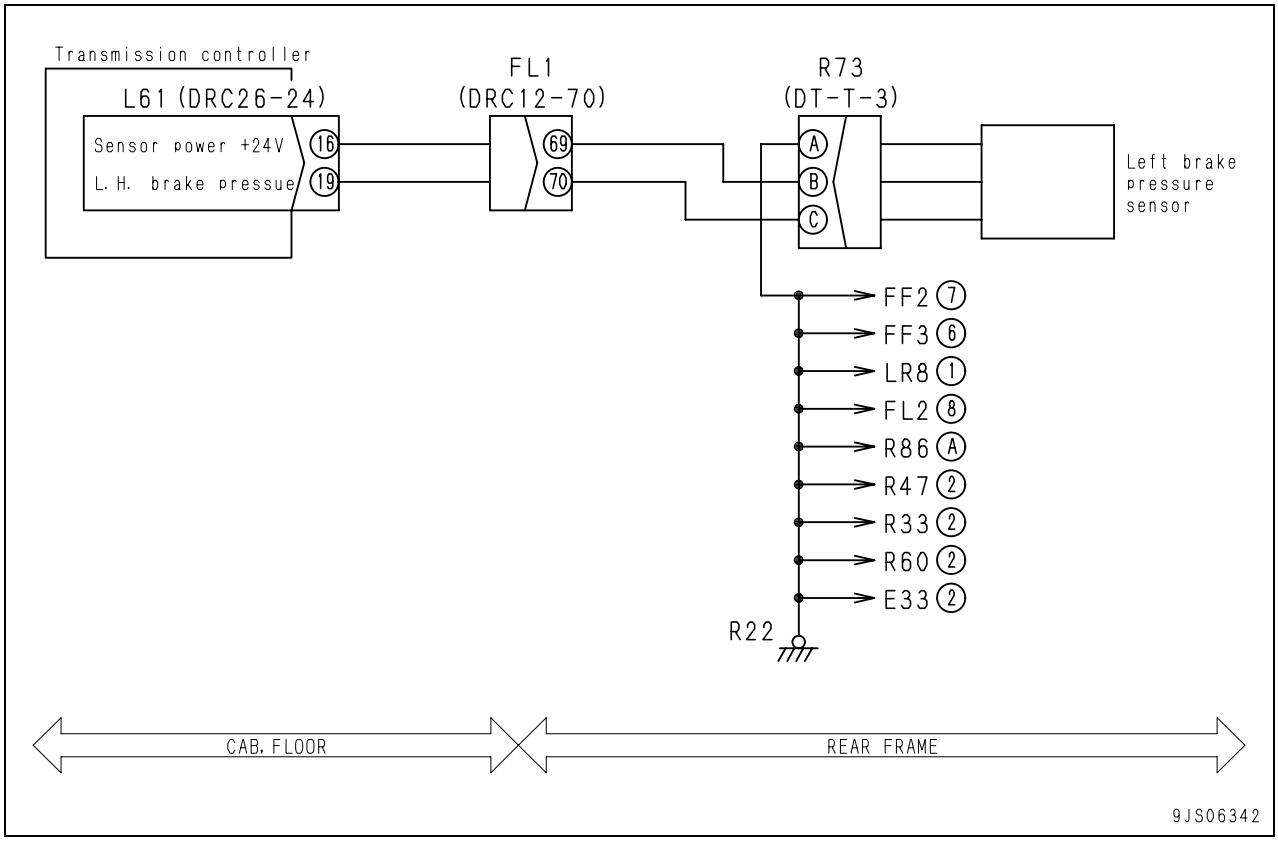
Failure code [DGR2KA] (Rear brake oil temperature sensor: Disconnected)

Action code	Failure code	Trouble	Rear brake oil temperature sensor: Disconnected (Machine monitor system)
E01	**DGR2KA**		
Contents of trouble	• Disconnection in the rear brake oil temperature sensor signal system		
Action of controller	• If problem is removed, system is returned to normal operating state.		
Problem that appears on machine	—		
Related information	• The input state (oil temperature) from the rear brake oil temperature sensor can be checked with the monitoring function (Code: 30202, R BRAKE OIL). • The input state (voltage) from the rear brake oil temperature sensor can be checked with the monitoring function (Code: 30205, R BRAKE OIL). • Method of reproducing failure code: Turn the starting switch ON.		

	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective rear brake oil temperature sensor (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			R60 (male)	Rear brake oil temperature	Resistance	
			Between (1) and (2)	25°C (Normal temperature)	35 – 50 kΩ	
				100°C	3.1 – 4.5 kΩ	
	2	Disconnection in wiring harness (Disconnection or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between L55 (female) (8) – R60 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between R60 (female) (2) – chassis ground		Resistance	Max. 1 Ω
	3	Defective machine monitor	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			L55 (female)	Rear brake oil temperature	Resistance	
			Between (8) and chassis ground	25°C (Normal temperature)	35 – 50 kΩ	
				100°C	3.1 – 4.5 kΩ	

Possible causes and standard value in normal state	Causes		Standard value in normal state/Remarks on troubleshooting		
	4	Disconnection of harness (Disconnection of harness, defective contact or improper mating of connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between L61 (female) (16) and R73 (female) (B)	Resistance	Max. 1 Ω
			Between L61 (female) (19) and R73 (female) (C)	Resistance	Max. 1 Ω
			Between R73 (female) (A) and R22	Resistance	Max. 1 Ω

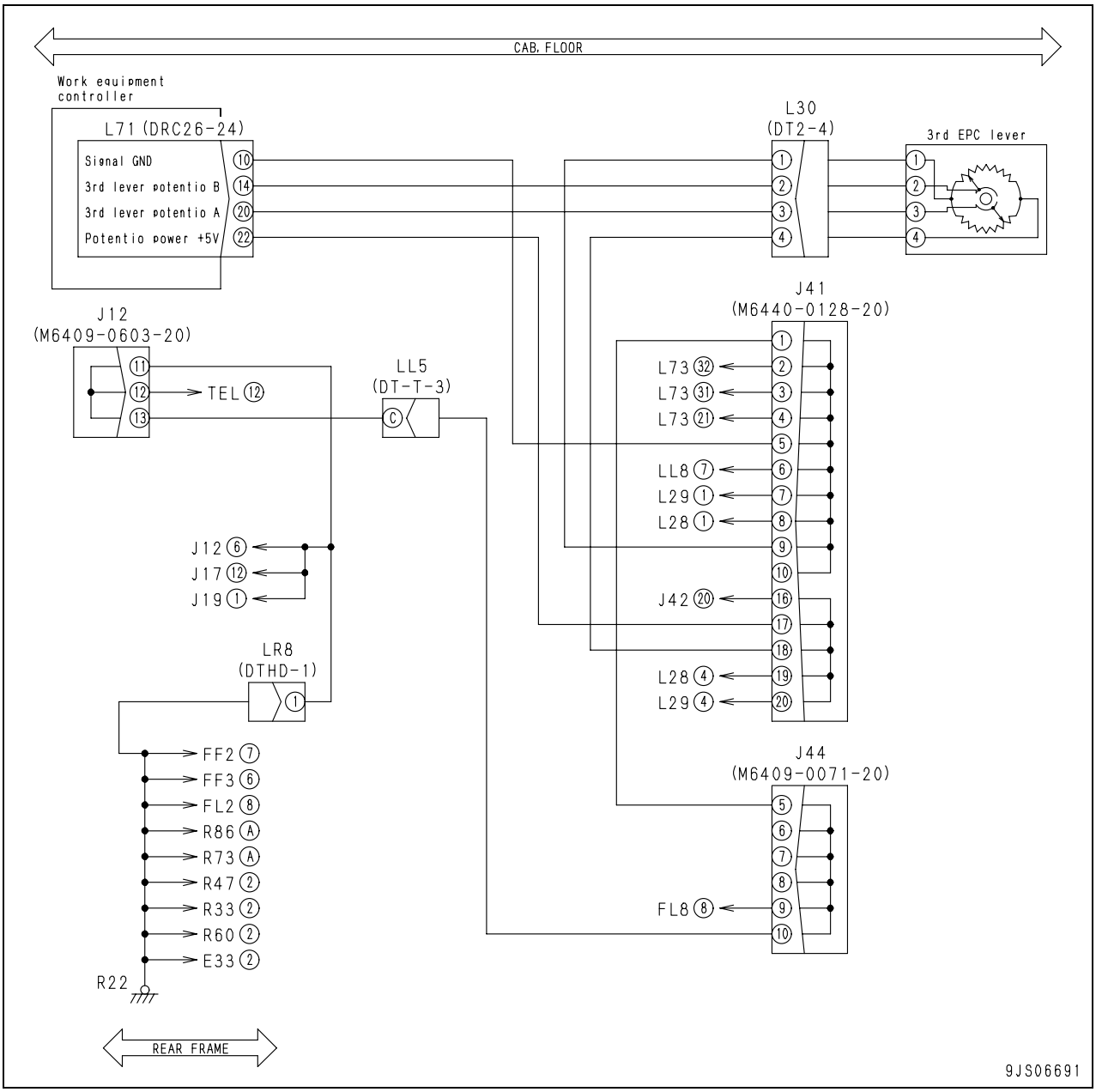
Circuit diagram related to transmission cut-off pressure sensor



<table>
<tr><td rowspan="6">Possible causes and standard value in normal state</td><td colspan="2">Causes</td><td colspan="5">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Grounding fault in wiring harness
(Contact with ground circuit)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Wiring harness between L71 (female) (13) – L28 (female) (2) and chassis ground</td><td>Resis-tance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="3">Wiring harness between L71 (female) (22) – L28 (female) (4), – circuit branch end and chassis ground</td><td>Resis-tance</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Defective work equipment controller</td><td colspan="5">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.
• Work equipment lock lever: Free</td></tr>
<tr><td colspan="3">L71</td><td colspan="2">Lift arm EPC lever</td><td>Voltage</td></tr>
<tr><td colspan="3">Between (22) and (10)</td><td colspan="2">Constant</td><td>4.85 – 5.15 V</td></tr>
<tr><td rowspan="5">Between (13) and (10)</td><td colspan="2">Lever at neutral</td><td>2.40 – 2.60 V</td></tr>
<tr><td colspan="2">Raise operation (Before detent)</td><td>0.91 – 1.31 V</td></tr>
<tr><td colspan="2">Raise operation (Detent position)</td><td>0.69 – 1.09 V</td></tr>
<tr><td colspan="2">Lower operation (Before detent)</td><td>3.69 – 4.09 V</td></tr>
<tr><td colspan="2">Float operation</td><td>3.91 – 4.31 V</td></tr>
</table>

<table>
<tr><td rowspan="7">Possible causes and standard value in normal state</td><td colspan="2">Causes</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="6">4</td><td rowspan="6">Defective work equipment controller</td><td colspan="3">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.
• Work equipment lock lever: Free</td></tr>
<tr><td>L71</td><td>Bucket EPC lever</td><td>Voltage</td></tr>
<tr><td>Between (22) and (10)</td><td>Constant</td><td>4.85 – 5.15 V</td></tr>
<tr><td rowspan="4">Between (1) and (10)</td><td>Lever at neutral</td><td>2.40 – 2.60 V</td></tr>
<tr><td>Tilt operation (Before detent)</td><td>0.91 – 1.31 V</td></tr>
<tr><td>Tilt operation (Detent position)</td><td>0.69 – 1.09 V</td></tr>
<tr><td>Full dump operation</td><td>3.91 – 4.31 V</td></tr>
</table>

Circuit diagram related to 3-spool valve (attachment) EPC lever potentiometer



Failure code [DK5GKY] (Joystick steering EPC lever potentiometer (Sub): Short circuit with power supply line)

Action code	Failure code	Trouble	Joystick steering EPC lever potentiometer (Sub): Short circuit with power supply line (Work equipment controller system)
E03	**DK5GKY**		
Contents of trouble	• Due to hot short circuit in the joystick steering EPC lever potentiometer (Sub) system, the signal voltage is higher than normal range. (Joystick steering EPC lever potentiometer (Sub) signal voltage: Min. 4.7 V)		
Action of controller	• If the joystick steering EPC lever potentiometer (Main) is normal, the Main potentiometer is in control. • Turns the centralized warning lamp and alarm buzzer ON. • Even if cause of failure disappears, system does not reset itself until the joystick steering EPC lever is set to N (Neutral).		
Problem that appears on machine	—		
Related information	• When the joystick steering ON/OFF switch is set to OFF, this failure code is not displayed. • The input state (voltage) from the joystick steering EPC lever potentiometer (Main) can be checked with the monitoring function (Code: 42004, J/S POT1). • The input state (voltage) from the joystick steering EPC lever potentiometer (Sub) can be checked with the monitoring function (Code: 42005, J/S POT2). • Method of reproducing failure code: Turn the starting switch ON and operate joystick steering lever		

	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective joystick steering EPC lever potentiometer (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			L34 (male)		Resistance	
			Between (1) and (4)		3.2 ± 0.64 kΩ	
			Between (1), (2), (3) or (4) and chassis ground		Min. 1 MΩ	
			★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			L34	Joystick steering EPC lever	Voltage	
			Between (4) and (1)	Constant	4.85 – 5.15 V	
			Between (2) and (1)	Lever at neutral	2.40 – 2.60 V	
				Left turning	3.46 – 3.86 V	
				Right turning	1.14 – 1.54 V	
	2	Hot short in wiring harness (Contact with 24V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between L71 (female) (3) – L34 (female) (2) and chassis ground		Voltage	Max. 1 V
			Wiring harness between L71 (female) (22) – L34 (female) (4) and chassis ground		Voltage	Max. 1 V
	3	Defective work equipment controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			L71	Joystick steering EPC lever	Voltage	
			Between (22) and (10)	Constant	4.85 – 5.15 V	
			Between (3) and (10)	Lever at neutral	2.40 – 2.60 V	
				Left turning	3.46 – 3.86 V	
				Right turning	1.14 – 1.54 V	

Failure code [DT20KB] (Transmission cut-off indicator lamp: Short circuit)

Action code	Failure code	Trouble	Transmission cut-off indicator lamp: Short circuit (Transmission controller system)
E01	**DT20KB**		
Contents of trouble	• Since the transmission cut-off indicator lamp system is shorted, output signals are not entered to the indicator lamp.		
Action of controller	• Turns off the transmission cut-off indicator lamp. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Transmission cut-off indicator lamp does not light up.		
Related information	• Method of reproducing failure code: Start engine and turn transmission cut-off switch ON.		

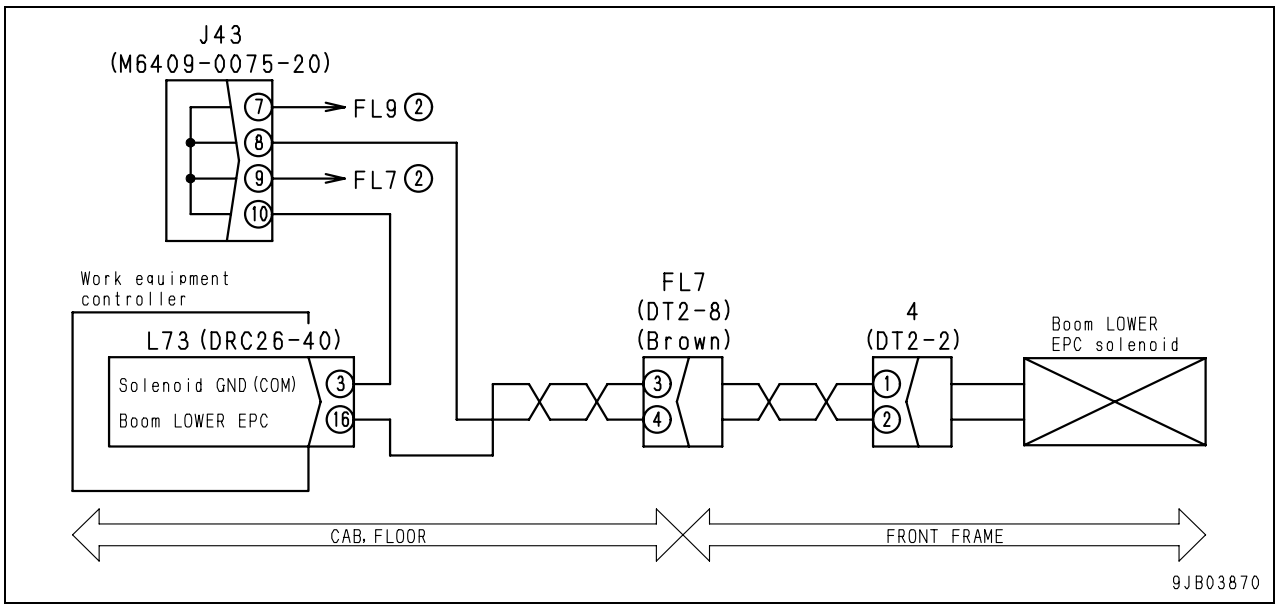
	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective transmission cut-off indicator lamp (LED) (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			S03 (male)		Resistance	
			Between (2) and (1)		Min. 1 MΩ (No continuity)	
			Between (1), (2) and chassis ground		Min. 1 MΩ	
	2	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between L63 (female) (8) – S03 (female) (1) and chassis ground		Resis-tance	Min. 1 MΩ
	3	Defective work equipment controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			L63	Transmission cut-off switch	Voltage	
			Between (8) and chassis ground	ON	Max. 1 V	
				OFF	20 – 30 V	

Failure code [DW4QKB] (Lift arm lower EPC solenoid: Short circuit)

Action code	Failure code	Trouble	Lift arm lower EPC solenoid: Short circuit (Work equipment controller system)
E03	**DW4QKB**		
Contents of trouble	• Since the lift arm lower EPC solenoid signal system is shorted, abnormal current flows when the lift arm lower EPC solenoid output is ON.		
Action of controller	• Stops outputting the signal to the lift arm lower EPC solenoid. • Stops outputting the signal to the lift arm float magnet detent. • Turns the centralized warning lamp and alarm buzzer ON. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Lift arm does not lower.		
Related information	• The output state (current value) to the lift arm lower EPC solenoid can be checked with the monitoring function (Code: 41901, LOWER EPC DIR). • Method of reproducing failure code: Start engine and lower the lift arm.		

Possible causes and standard value in normal state	Causes		Standard value in normal state/Remarks on troubleshooting			
	1	Defective lift arm lower EPC solenoid (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			4 (male)	Resistance		
			Between (1) and (2)	5 – 15 Ω		
			Between (1), (2) and chassis ground	Min. 1 MΩ		
	2	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between L73 (female) (16) – 4 (female) (1) and chassis ground	Resistance	Min. 1 MΩ	
	3	Defective work equipment controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			L73 (female)	Resistance		
			Between (16) and (3)	5 – 15 Ω		
			Between (16), (3) and chassis ground	Min. 1 MΩ		

Circuit diagram related to lift arm lower EPC solenoid

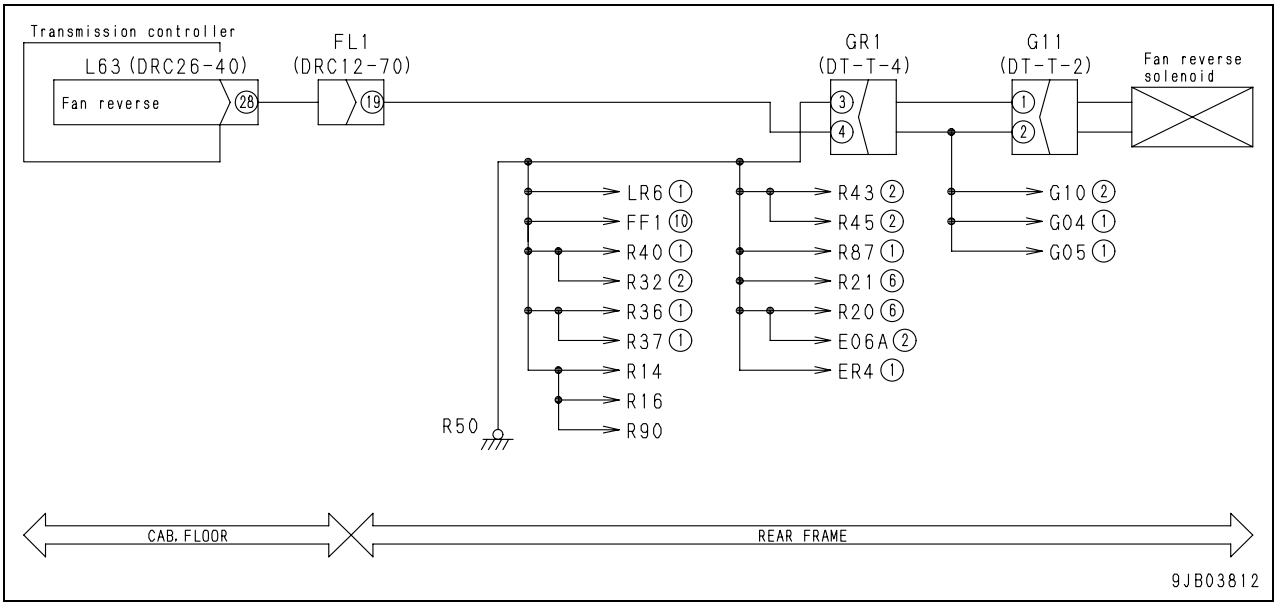


Failure code [DW7BKB] (Fan reverse solenoid: Short circuit)

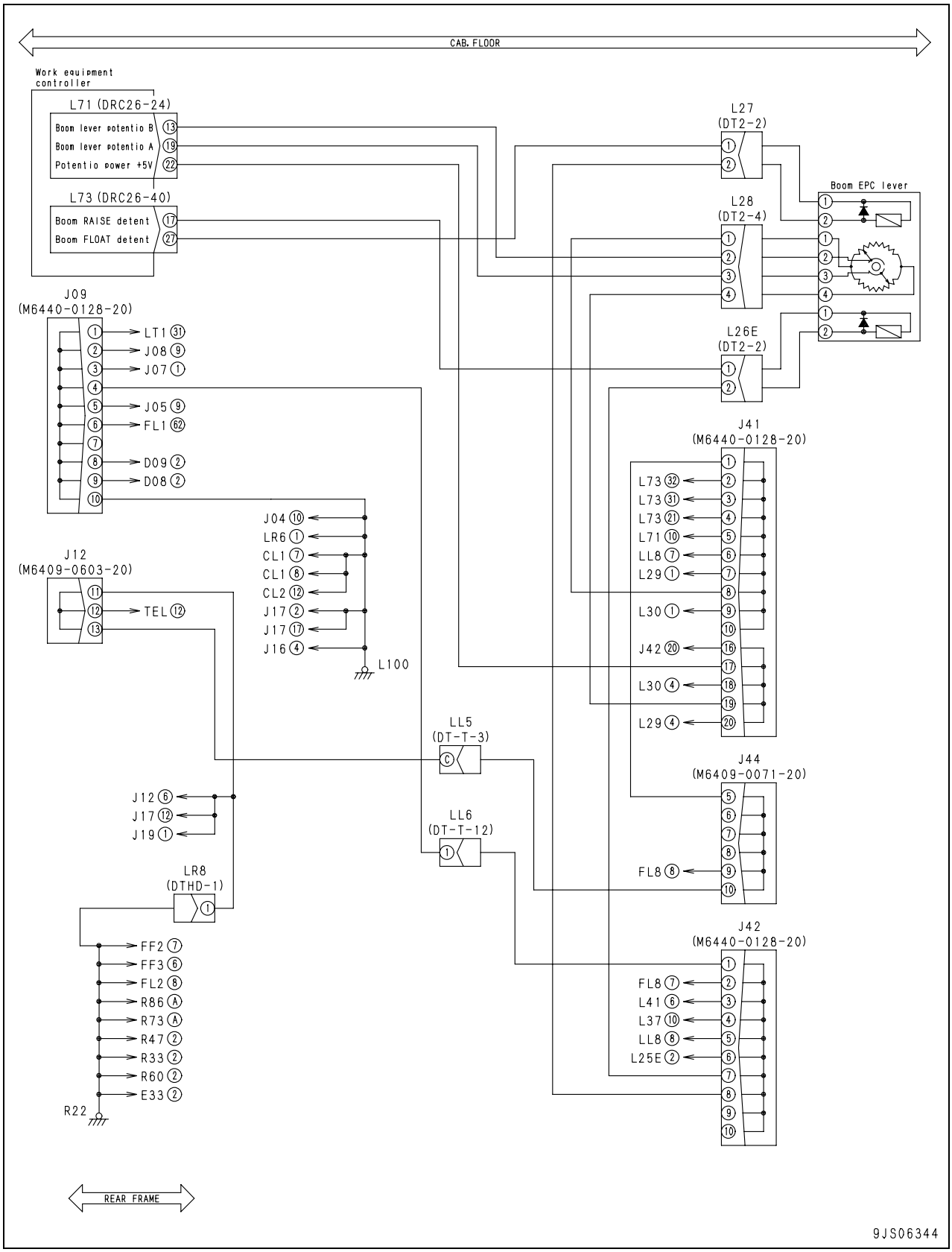
Action code	Failure code	Trouble	Fan reverse solenoid: Short circuit (Transmission controller system)
E01	**DW7BKB**		
Contents of trouble	• Since the fan reverse solenoid system is shorted, abnormal current flows when the fan reverse solenoid output is turned on.		
Action of controller	• Turns the output to the fan reverse solenoid OFF. • Disables the automatic fan reverse function (OPT). • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• The fan cannot turn in reverse by operating the fan reverse switch. • The automatic fan reverse function is disabled in the case of automatic fan reverse function (OPT) specification.		
Related information	• The output state (ON/OFF) to the fan reverse solenoid can be checked with the monitoring function (Code: 40949, D-OUT-4). • Method of reproducing failure code: Turn the starting switch ON.		

	Causes		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fan reverse solenoid (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			G11 (male)	Resistance	
			Between (1) and (2)	35 – 45 Ω	
			Between (1), (2) and chassis ground	Min. 1 MΩ	
	2	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between L63 (female) (28) – G11 (female) (1) and chassis ground	Resistance	Min. 1 MΩ
	3	Defective transmission controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			L63 (female)	Resistance	
			Between (28) and chassis ground	35 – 45 Ω	

Circuit diagram related to fan reverse solenoid



Circuit diagram related to lift arm EPC lever

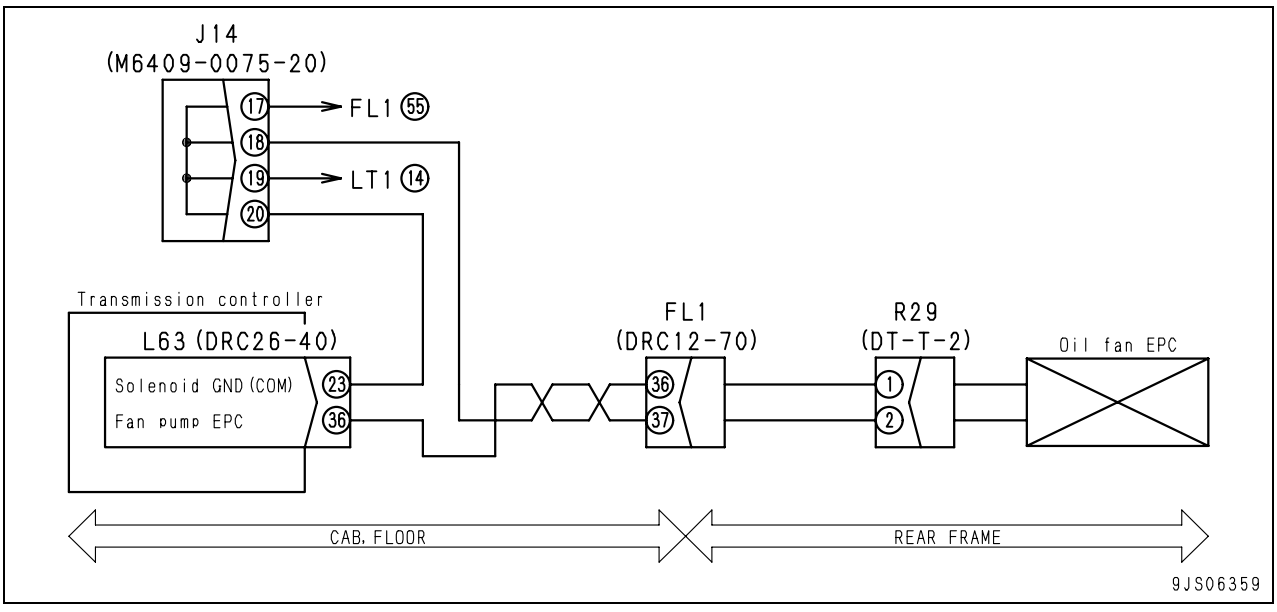


Failure code [DX16KA] (Fan pump EPC solenoid: Disconnection)

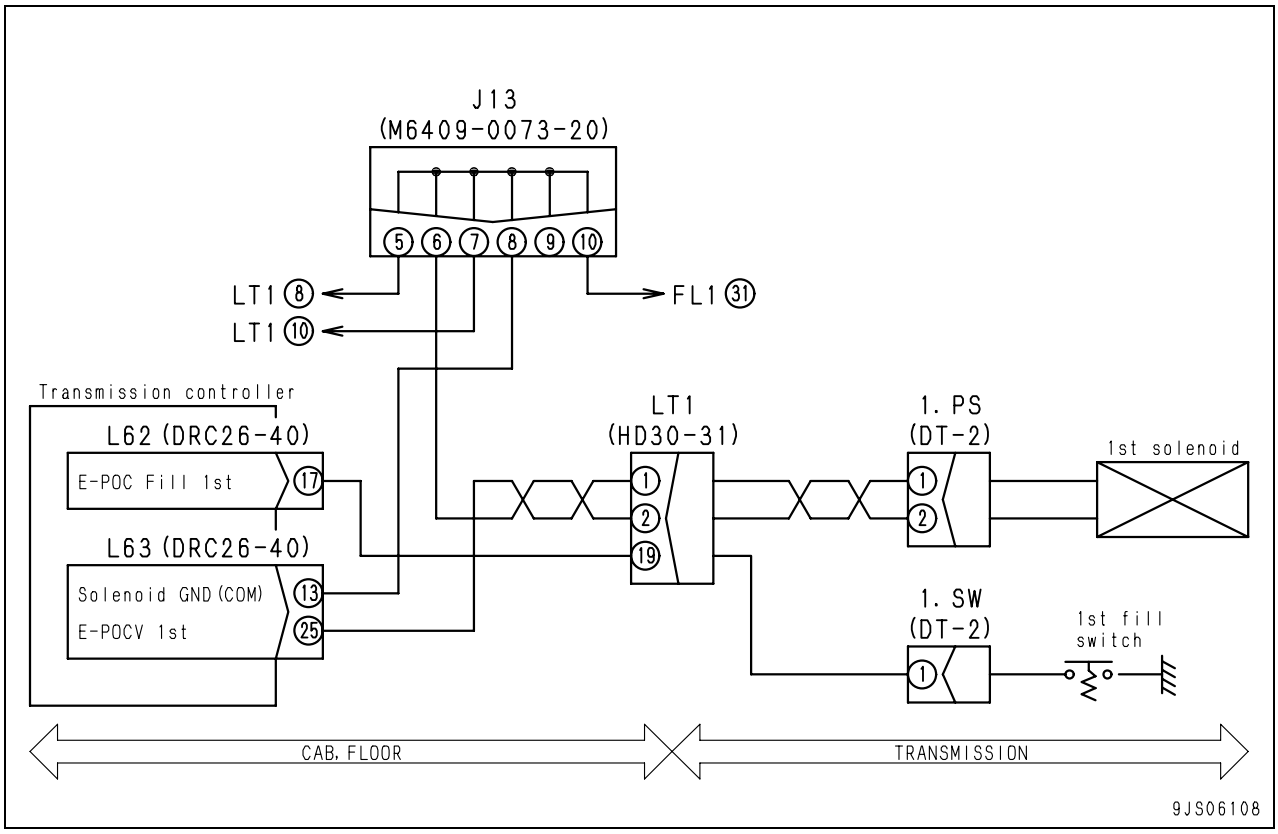
Action code	Failure code	Trouble	Fan pump EPC solenoid: Disconnection (Transmission controller system)
E01	**DX16KA**		
Contents of trouble	• Since the fan pump EPC solenoid system is disconnected, no current flows when the fan pump EPC solenoid output is ON.		
Action of controller	• Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• The fan speed is set to the maximum.		
Related information	• The output state (current) to the fan pump EPC solenoid can be checked with the monitoring function (Code: 41400, FAN EPC DIR). • Method of reproducing failure code: Turn the starting switch ON.		

	Causes		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fan pump EPC solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			R29 (male)	Resistance	
			Between (1) and (2)	5 – 10 Ω	
	2	Disconnection in wiring harness (Disconnection or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between L63 (female) (23) – R29 (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between L63 (female) (36) – R29 (female) (1)	Resistance	Max. 1 Ω
	3	Defective transmission controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			L63 (female)	Resistance	
			Between (36) and (23)	5 – 10 Ω	

Circuit diagram related to fan pump EPC solenoid



Circuit diagram related to 1st clutch ECMV solenoid

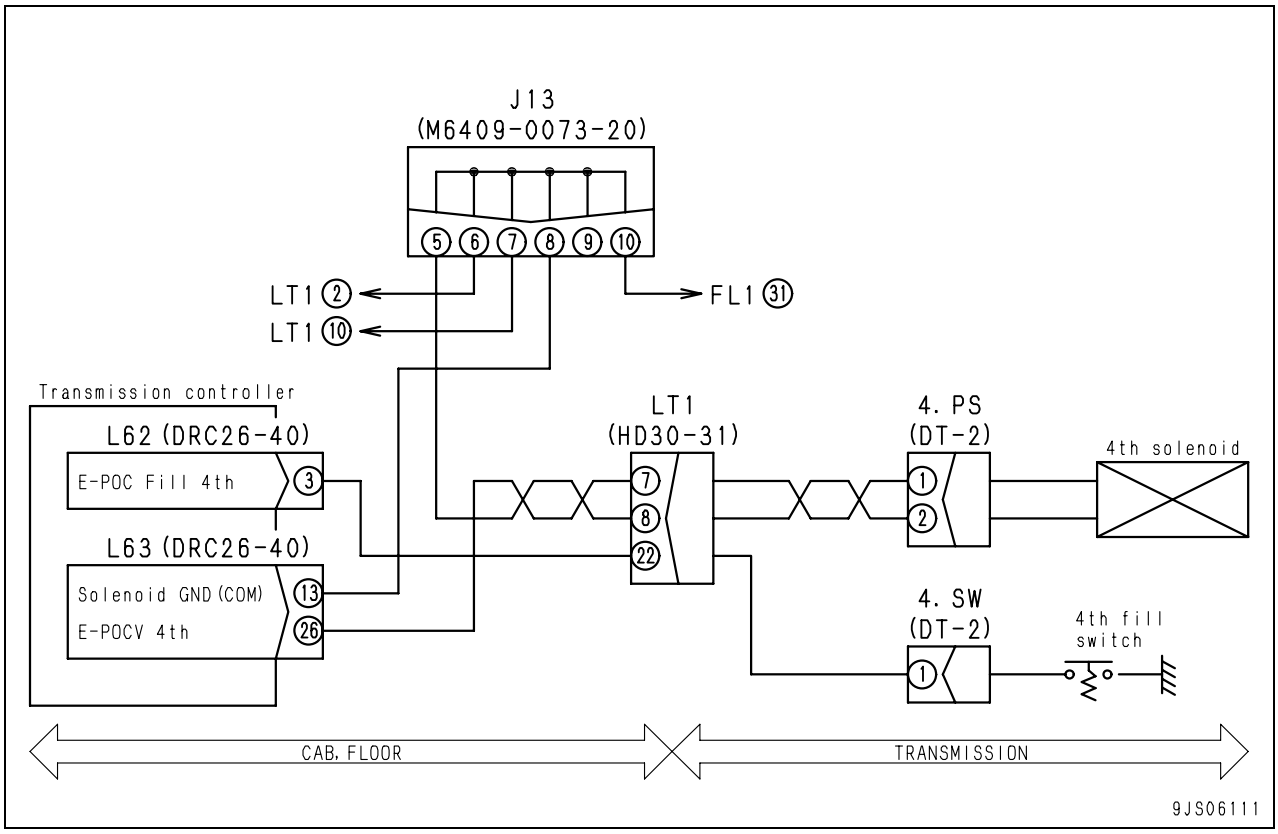


Failure code [DXH6KY] (3rd clutch ECMV solenoid: Short circuit with power supply line)

Action code	Failure code	Trouble	3rd clutch ECMV solenoid: Short circuit with power supply line (Transmission controller system)
E03	**DXH6KY**		
Contents of trouble	• Since the 3rd ECMV solenoid system is shorted with the power source, abnormal voltage is applied when 3rd clutch ECMV solenoid output is OFF.		
Action of controller	• Stops outputting the signal to the 1st, 2nd, and 4th clutch ECMV solenoids. • Also stops outputting the signal to the F (Forward) and R (Reverse) clutch ECMV solenoids when the speed clutch output is OFF (other than 3rd speed). • Turns the centralized warning lamp and alarm buzzer ON. • Even if cause of failure disappears, system does not reset itself until FNR (directional) lever, joystick steering FNR (directional) switch or right FNR (directional) switch is set to N (Neutral).		
Problem that appears on machine	• The transmission does not shift into 1st, 2nd or 4th (the machine can travel at 3rd).		
Related information	• The output state (current value) to the 3rd clutch ECMV solenoid can be checked with the monitoring function (Code: 31604, ECMV 3 DIR). • Method of reproducing failure code: Turn the starting switch ON.		

	Causes		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective 3rd clutch ECMV solenoid (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			3.PS (male)	Resistance	
			Between (1) and (2)	5 – 15 Ω	
			Between (1), (2) and chassis ground	Min. 1 MΩ	
	2	Hot short in wiring harness (Contact with 24V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between L64 (female) (16) – 3.PS (female) (1) and chassis ground	Voltage	Max. 1 V
	3	Defective transmission controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			L64 (female)	Resistance	
			Between (16) and (3)	5 – 15 Ω	
			Between (16), (3) and chassis ground	Min. 1 MΩ	

Circuit diagram related to 4th clutch ECMV solenoid



Failure code [DXHKKY] (3-spool valve retract EPC solenoid: Short circuit with power supply line)

Action code	Failure code	Trouble	3-spool valve retract EPC solenoid: Short circuit with power supply line (Work equipment controller system)
E03	**DXHKKY**		
Contents of trouble	• Since the 3-spool valve (attachment) retract EPC solenoid output signal system is shorted with the power source, abnormal voltage is applied when the 3-spool valve (attachment) retract EPC solenoid output is OFF.		
Action of controller	• Turns the output to the work equipment neutral lock solenoid ON. • Stops outputting the signal to the lift arm raise/lower, bucket dump/tilt, 3-spool valve (attachment) extract/retract EPC solenoids. • Stops outputting the signal to all work equipment detent. • Turns the centralized warning lamp and alarm buzzer ON. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• The 3-spool valve (attachment) cylinder is not retracted. • The 3-spool valve (attachment) retract EPC solenoid may be burnt out.		
Related information	• When the 3-spool valve (attachment) is not installed, this failure code is not displayed. If this failure code is displayed, select “None” in the EPC 3-spool lever setting on the optional setting of the machine monitor. • The output state (current value) to the 3-spool valve (attachment) retract EPC solenoid can be checked with the monitoring function (Code: 41907, 3RD EPC2 DIR). • 3-spool valve (attachment)-equipped model specification only • Method of reproducing failure code: Start engine		

	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective 3-spool valve (attachment) retract EPC solenoid (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			F24 (male)	Resistance		
			Between (1) and (2)	5 – 15 Ω		
	2	Hot short in wiring harness (Contact with 24V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between L73 (female) (25) – F24 (female) (1) and chassis ground	Voltage	Max. 1 V	
	3	Defective work equipment controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			L73 (female)	Resistance		
			Between (25) and (3)	5 – 15 Ω		

WHEEL LOADER

WA470-6
WA480-6

Machine model	Serial number
WA470-6	H50051 and up
WA480-6	H60051 and up

40 Troubleshooting

Troubleshooting of electrical system (E-mode)

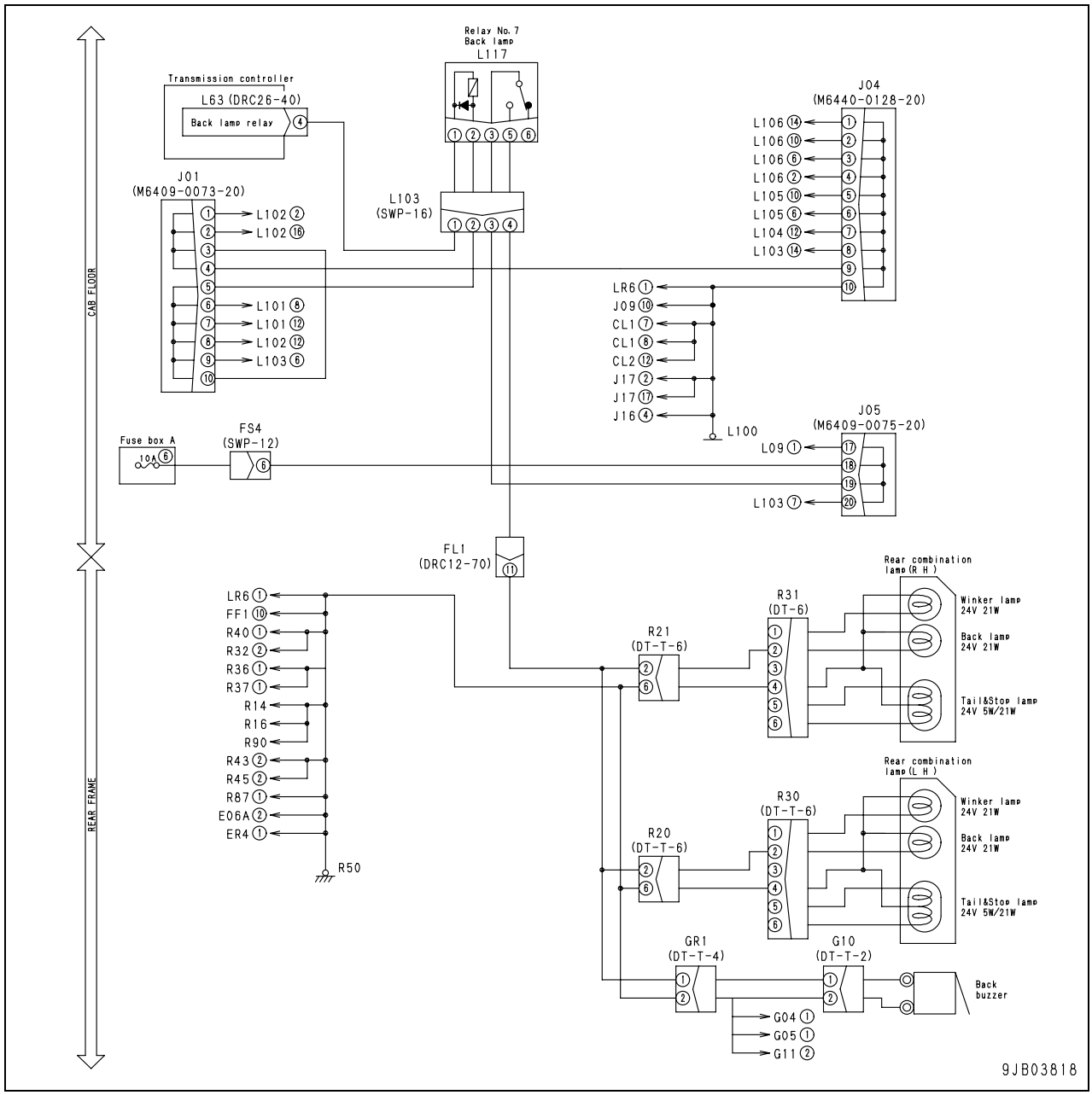
Contents of trouble	(2) Rear wiper does not operate.
Related information	• Since the rear wiper switch or wiring harness is defective, the rear wiper does not operate.

<table>
<tr><td rowspan="20">Possible causes and standard value in normal state</td><td colspan="2">Causes</td><td colspan="5">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Defective rear wiper motor (Internal trouble)</td><td colspan="5">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td>C15</td><td colspan="2">Rear wiper switch</td><td colspan="2">Voltage</td></tr>
<tr><td>Between (1) and chassis ground</td><td colspan="2">Constant</td><td colspan="2">20 – 30 V</td></tr>
<tr><td>Between (2) and chassis ground</td><td colspan="2">ON</td><td colspan="2">20 – 30 V</td></tr>
<tr><td colspan="6">• If wiper switch is turned OFF while wiper is operating, voltage is applied between C15 (1) and chassis ground until wiper motor stops.</td></tr>
<tr><td rowspan="6">2</td><td rowspan="6">Defective rear wiper switch (Internal trouble)</td><td colspan="5">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="3">L21</td><td colspan="2">Voltage</td></tr>
<tr><td colspan="3">Between (7) and chassis ground</td><td colspan="2">20 – 30 V</td></tr>
<tr><td colspan="6">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td>L21</td><td colspan="2">Rear wiper switch</td><td colspan="2">Resistance</td></tr>
<tr><td>Between (7) and (9)</td><td colspan="2">ON</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td>Between (8) and (9)</td><td colspan="2">OFF</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td colspan="3">Other than above</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td rowspan="5">3</td><td rowspan="5">Disconnection in wiring harness (Disconnection or defective contact in connector)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Wiring harness between L21 (female) (7) – C15 (female) (1)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="3">Wiring harness between L21 (female) (8) – C15 (female) (3)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="3">Wiring harness between L21 (female) (9) – C15 (female) (2)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="3">Wiring harness between C15 (female) (4) – chassis ground</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Ground fault in wiring harness (Contact with ground circuit)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Wiring harness between L21 (female) (7) – C15 (female) (1), – circuit branch end and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="3">Wiring harness between L21 (female) (8) – C15 (female) (3) and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="3">Wiring harness between L21 (female) (9) – C15 (female) (2) and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
</table>

	Causes		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	6	Ground fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between fuse No. 8 of fuse box B – S01 (female) (6) and chassis ground	Resis-tance	Min. 1 MΩ
			Wiring harness between S01 (female) (5) – L127 (female) (1) and chassis ground	Resis-tance	Min. 1 MΩ
			Wiring harness between fuse No. 8 of fuse box B – L127 (female) (3) and chassis ground	Resis-tance	Min. 1 MΩ
			Wiring harness between L127 (female) (5) – C04 (female) (1), – C05 (female) (1), – circuit branch end and chassis ground	Resis-tance	Min. 1 MΩ
	7	Hot short in wiring harness (Contact with 24V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting. • Front working lamp switch turned off		
			Wiring harness between fuse No. 8 of fuse box B – S01 (female) (6) and chassis ground	Voltage	Max. 1 V
			Wiring harness between S01 (female) (5) – L127 (female) (1) and chassis ground	Voltage	Max. 1 V
			Wiring harness between fuse No. 8 of fuse box B – L127 (female) (3) and chassis ground	Voltage	Max. 1 V
			Wiring harness between L127 (female) (5) – C04 (female) (1), – C05 (female) (1), – circuit branch end and chassis ground	Voltage	Max. 1 V

Possible causes and standard value in normal state	Causes		Standard value in normal state/Remarks on troubleshooting		
	5	Ground fault in wiring harness (Contact with ground circuit)	Wiring harness between L63 (female) (4) – L117 (female) (1), – circuit branch end and chassis ground • As a failure is detected, failure code [D160KB] or [D160KZ] is indicated	Resis-tance	Min. 1 MΩ
	6	Hot short in wiring harness (Contact with 24V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between L117 (female) (5) – GR10 (female) (1), – circuit branch end and chassis ground	Voltage	Max. 1 V

Circuit diagram related to backup buzzer



Blank for technical reason

H-7 The torque converter oil temperature is high

Ask the operator about the following questions.

- Does the oil temperature rise when the torque converter stalls and does the temperature fall at the time of no load? ✔ **Selection of improper gear speed**
  Did any abnormal noise occur at the time and where?
- Does the oil temperature rise only at the time of lifting? ✔ **Improvement of operating method**

Checking for abnormalities

- Measure the torque converter oil temperature to find if the oil temperature is really high.
  ✔ **The torque converter oil temperature gauge is defective**

Testing before troubleshooting

- Are the coolant level in the radiator and the fan belt tension appropriate?
- Are the oil level in the transmission and the oil type appropriate?
- Haven't the transmission filter and strainer been clogged?

NOTE: When the inspection result was "Engine degradation," proceed to Engine system troubleshooting (S mode).

No.	Diagnosis \ Remedy		Causes: Torque converter charging pump			Torque converter oil cooler		Torque converter		Main relief	Transmission		Others	
			a	b	c	d	e	f	g	h	i	j	k	l
			Clogging of strainer	Clogging or air intake on pump suction side	The charging pump is defective	Clogging of oil cooler and pipe (After torque converter outlet)	Breakage of oil cooler and pipe (After torque converter outlet)	Oil leak inside torque converter	Internal breakage of torque converter	Drop of main relief valve set pressure	Internal breakage of transmission	Clogging of breather	Defective seal of work equipment and steering system hydraulic pump shaft (Mixing of hydraulic oil in transmission case)	Engine degradation
			C x	△ x	x	△ x	x	△ x	△ x	△ x	△ x	C x	△ x	Note
1	When the transmission oil temperature is low, the charging pump or the transmission filter causes any abnormal noise		○	○										
2	Traveling speed, braking force and uphill travelling power do not occur at all gear speeds		○	○	○	○	○	○	○	○	○		○	○
3	Traveling speed, braking force and uphill travelling power do not occur at specific gear speeds										○			
4	The transmission oil level rises or falls					○	○					○		
5	Metal powers (Aluminum, copper, iron, etc.) are adhered to the transmission filter and the strainer				○				○		○			
6	The engine low idle and high idle speeds are measured to be abnormal								○		○			○
7	When the stall speed of the torque converter is measured, the speed is high		○	○	○		○	○	○	○	○	○		
8	When the ECMV output (Clutch) oil pressure is measured	The oil pressure drops as the temperature rises			○									
9		The oil pressure is low at all gear speeds	○	○	○						○	○		
10		The oil pressure is low at specific gear speeds									○			
11		The oil pressure does not become stable as the gauge vibrates	○	○										
12	When the torque converter relief (Inlet) oil pressure is measured, the oil pressure is low. (No. 9 – 11 are normal.)							○	○	○				
13	When the oil pressure at the torque converter outlet is measured, the oil pressure is low. (No. 12 is normal.)						○							

H-25 Bucket does not tilt back

Ask the operator about the following.

- Did the bucket stop suddenly?
  ✔ Seizure or breakage of each component
  Did abnormal sound come out when the lift arm stopped? (From what part)
- Has the speed lowered?
  ✔ Wear of parts and fatigue of springs

Testing before troubleshooting

- Is the oil level in the hydraulic tank proper?
- Is the stroke of the bucket control lever proper?
- Is the engine speed proper?
- Has the machine monitor displayed any failure code?
  ✔ See Troubleshooting by Failure Code (Display of code)

No.	Diagnosis \ Remedy	Causes: Tank – Pump					Accumulator charge valve	PPC valve	Work equipment valve							Cylinder	
		a	b	c	d	e	f	g	h	i	j	k	l	m	n		
		Clogging or air intake on pump suction side	The PTO is defective	Defective work equipment pump servo	Defective work equipment pump	Defective fan pump	Malfunction of relief valve	Malfunction of spool	Malfunction of main relief valve	Malfunction of unload valve	Malfunction of bucket bottom safety valve (suction safety valve)	Malfunction of bucket bottom suction valve (suction safety valve)	Malfunction of bucket pressure compensation valve	Internal breakage of valve body (bucket spool)	Damaged bucket cylinder piston seal		
		C △	△ x	△ x	△ x	△ x	x	△ x	△ x	△ x	△ x	C △ x	△ x	x	x		
1	Lift arm does not move and bucket does not tilt back	○	○	○	○	○	○		○								
2	Bucket can raise chassis but does not tilt back							○						○	○		
3	Lift arm moves but bucket does not tilt back							○					○	○	○		
4	Bucket can tilt back when not loaded but cannot when used for digging or scooping	○			○				○	○	○	○	○				
5	Hydraulic pump is making abnormal sound	○			○	○											
6	Hydraulic drift of bucket cylinder is large										○	○		○	○		
7	When lift arm and bucket are operated simultaneously, bucket does not tilt back												○	○			
8	Fan does not rotate	○	○			○								—			
9	When work equipment pump and servo assembly is replaced, lift arm moves normally			○													

b) Engine turns but no exhaust smoke comes out

General causes why engine turns but no exhaust smoke comes out

- Fuel is not being supplied
- Supply of fuel extremely small
- Improper selection of fuel (particularly in winter)

			Cause														
			Improper fuel used	Insufficient fuel in tank	Clogged air breather hole in fuel tank cap	Leakage, clogging, air in fuel piping	Clogged fuel filter element	Clogged feed pump gauze filter	Seizure or abnormal wear of feed pump	Broken supply pump shaft, key	Stuck or seized supply pump plunger	Defective supply pump PCV	Wrong connection of supply pump PCV	Defective operation of overflow valve (not closing)	Defective operation of flow damper	Defective fuel injector
Questions / Check items	Check recent repair history																
Questions	Degree of machine operation	Machine operated for long period				△	△	△									
Questions	Exhaust smoke suddenly stops coming out (when starting again)								◎	○	◎	◎	◎		△	△	
Questions	Replacement of filters has not been carried out according to Operation & Maintenance Manual						◎	◎			△					○	
Check items	Fuel tank is found to be empty			◎													
Check items	Clogged air breather hole in fuel tank cap			○	◎												
Check items	Rust and water are detected when fuel tank is drained						○	○	○		○	○					
Check items	When fuel filter is removed, no fuel is inside the fuel filter		◎			◎											
Check items	Leakage from fuel piping					◎											
Check items	No response or heavy resistance felt when operating priming pump					◎	○	○									
Check items	When engine is cranked with starting motor,	and the air breathing plug is removed from the fuel filter, fuel fails to discharge		○		○			◎	○							
Check items	When engine is cranked with starting motor,	Spill flow drops, when spill hose is separated from injector				○				◎	◎	◎	◎				○
Troubleshooting	Air is discharged when the air is bled from the fuel system					●											
Troubleshooting	Inspect the fuel filter directly						●										
Troubleshooting	Inspect fuel feed pump gauze filter directly							●									
Troubleshooting	Inspect feed pump directly								●								
Troubleshooting	Carry out troubleshoot by “Rail Press Very Low Error (*1)”									●	●		●				●
Troubleshooting	Carry out troubleshoot by “PCV1 Error (:2) or PCV2 Error (*3)”											●					
Troubleshooting	Inspect overflow valve directly													●			
Troubleshooting	Engine can start when operated in reduced cylinder mode														●	●	
		Remedy	Replace	Add	Correct	Correct	Replace	Clean	Replace	Replace	Replace	Replace	Correct	Replace	Replace	Replace	

*1: Troubleshooting by failure code (Display of code), Code [**CA559**], and Code [**CA2249**]
*2: Troubleshooting by failure code (Display of code), Code [**CA271**], and Code [**CA272**]
*3: Troubleshooting by failure code (Display of code), Code [**CA273**], and Code [**CA274**]

S-14 Coolant temperature rises too high (Overheating)

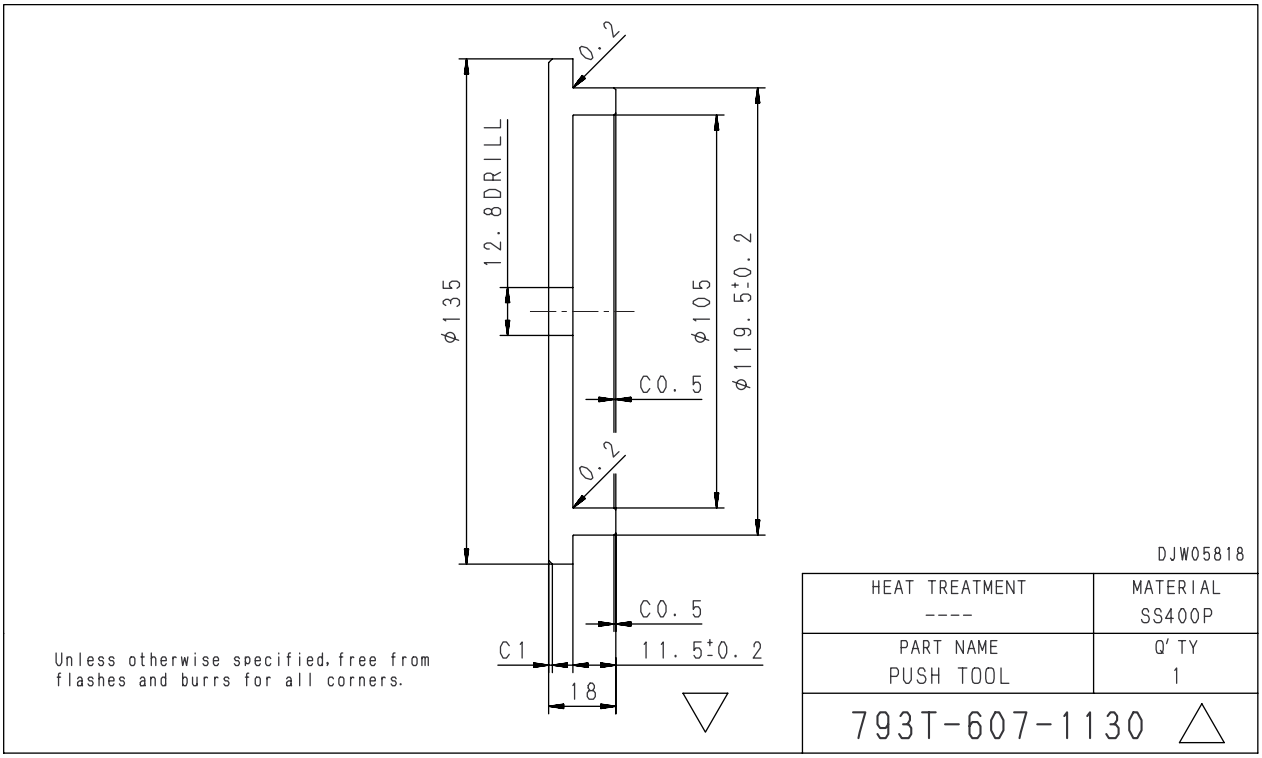
General causes why coolant temperature becomes too high

- Lack of cooling air (deformation, damages of fan)
- Drop in heat dissipation efficiency
- Defect in the coolant circulation system
- Power train oil temperature on applicable machine side is rising:
  ✔ Carry out troubleshoot on applicable machine side

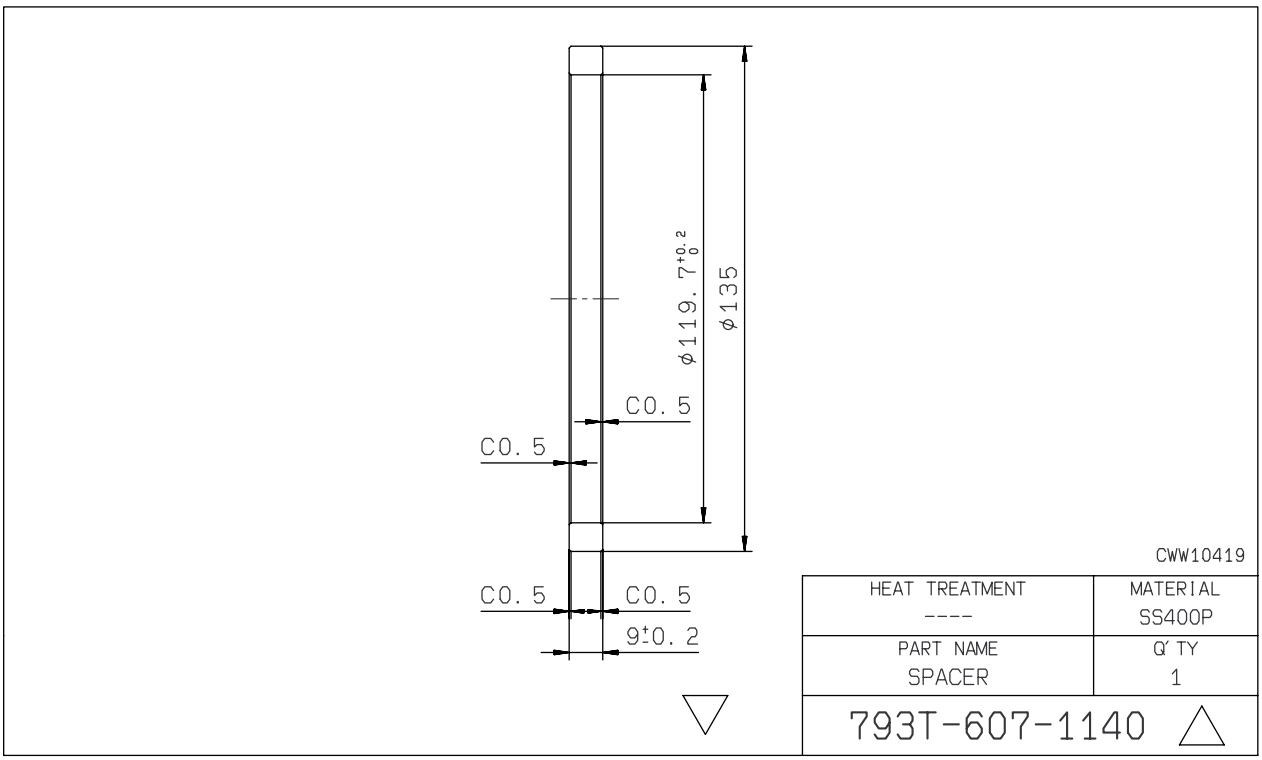
			Cause													
			Water leakage to outside EGR cooler	Broken cylinder head, head gasket	Hole drilled by damages or pitching of cylinder liner O-ring	Clogged, broken oil cooler	Lack of coolant	Broken water pump	Defective operation of thermostat	Clogged, crushed radiator fins	Clogged radiator core	Defective radiator cap (pressure valve)	Slipping of fan belt, wear of fan pulley	Defective coolant temperature gauge	Rise of power train oil temperature
Questions	Check recent repair history														
	Degree of machine operation	Machine operated for long period	△	△	△					△	△				
	Condition of overheating	Suddenly increased	○				○	◎					○		
		Always tends to overheat							○	◎	◎		○		
	Coolant temperature gauge (when installed)	Rises quickly					○		◎						
		Does not go down from red range												◎	
Check items	Radiator coolant level monitor indicates low level (with monitor installed)		○				◎								
	Engine oil level has risen, oil is cloudy white				◎	○									
	Fan belt tension is low												◎		
	Turning the fan pulley causes a looseness.							◎							
	Cloudy white oil is floating on coolant					◎									
	Excessive air bubbles inside radiator, coolant spurts back			◎											
	When light bulb is held behind radiator, no light passes through									◎					
	Radiator shroud and inside of underguard are clogged with dirt or mud									◎			◎		
	Coolant leakage from cracks in the radiator hose or loose clamps						◎								
	Coolant flows out from radiator overflow hose											◎			
	Fan belt whines under sudden load												◎		
	Power train oil temperature gauge enters red range faster than engine coolant temperature gauge (when oil temperature and coolant temperature gauge are installed)														◎
Troubleshooting	Inspect coolant leakage from EGR cooler directly		●												Carry out troubleshooting on applicable machine side
	When compression pressure is measured, the oil pressure is low			●											
	Inspect cylinder liner directly				●										
	Inspect oil cooler directly					●									
	Temperature difference between top and bottom radiator tanks is excessive							●							
	When function test is carried out on thermostat, it does not open even at cracking temperature								●						
	Temperature difference between top and bottom radiator tanks is slight									●					
	Inspect radiator core directly										●				
	When function test is carried out on the radiator cap, cracking pressure is low											●			
	Inspect fan belt, pulley directly												●		
	When coolant temperature is measured, it is found to be normal													●	
		Remedy	Replace	Replace	Replace	Replace	Add	Replace	Replace	Correct	Correct	Replace	Correct	Replace	—

Note: Komatsu cannot accept any responsibility for special tools manufactured according to these sketches.

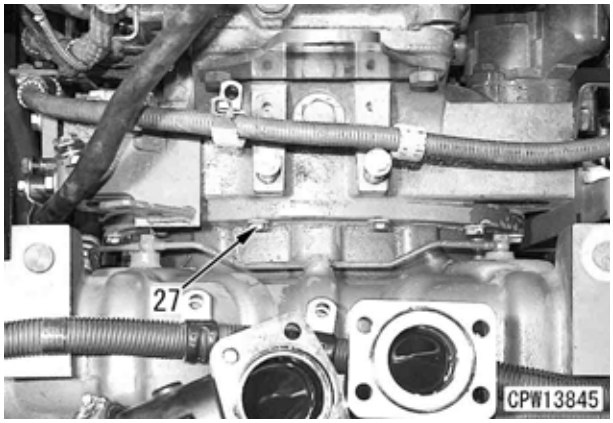
C4, C5 Push tool



C5 Spacer

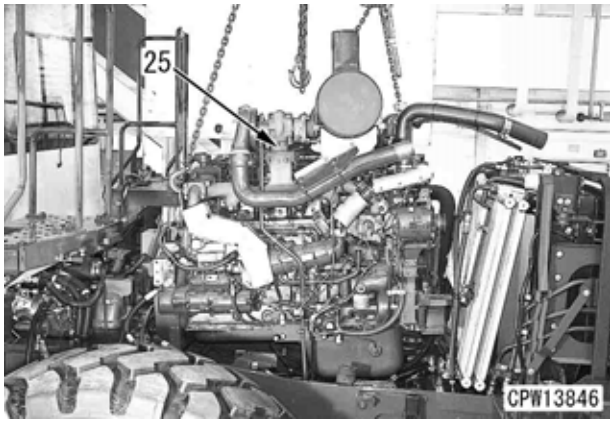


25. Remove 12 torque converter housing mounting bolts (27). [*3]



26. Lift off engine assembly (25).
    ★ Before lifting off the engine, make sure every necessary harness and piping is disconnected.

    Engine assembly: **1340 kg**



Installation

- Carry out installation in reverse order of removal.

[*1]

- Belt tension adjustment
  Adjust the compressor belt tension, referencing to "Testing and adjusting air compressor belt tension" in "Testing and adjusting."

[*2]

Mounting bolt: **490 – 608 Nm {50 – 62 kgm}**

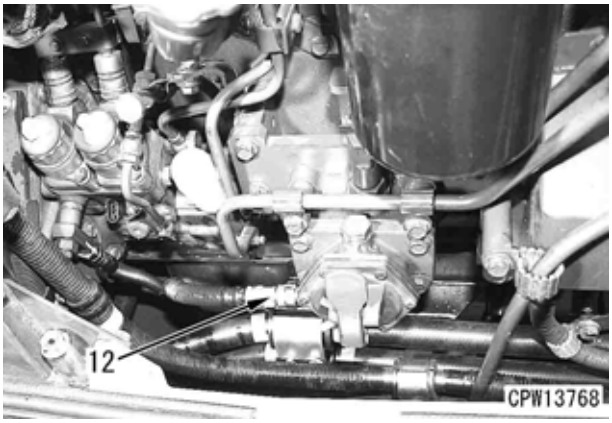
[*3]

★ When connecting the engine to the torque converter, adjust height of the torque converter shaft and ring gear so that they can be smoothly inserted.

- **Refilling with coolant**
  Add coolant up to the specified level. Run the engine to circulate the coolant through the system. Then, check the coolant level again.

- **Refilling with oil (Hydraulic tank)**
  ★ Add hydraulic oil up to the specified level.
  ★ Run the engine to circulate the oil through the system. Then, check the oil level again.

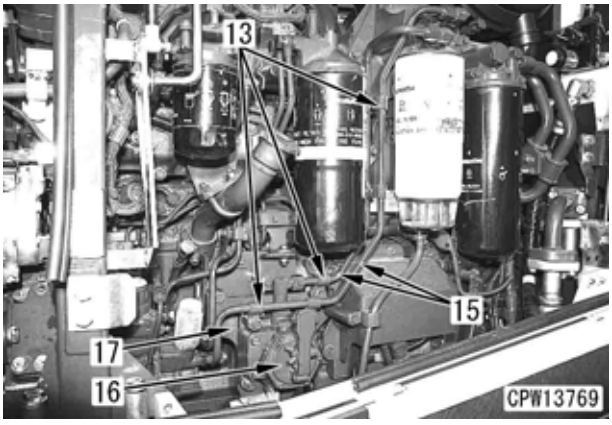
9. Remove fuel inlet hose (12) on the manual pump.



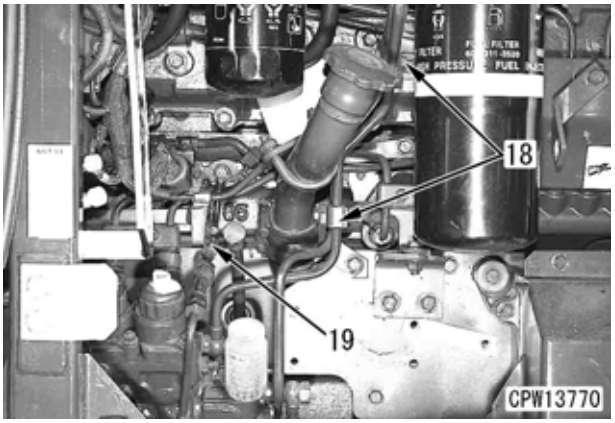
10. Remove 5 clamps (13). [*1]
    ★ Spacers are used for the manual pump side clamps. Take care not to lose them.

11. Remove 2 fuel tubes (15). [*2]

12. Remove manual pump (16) along with bracket (17).
    ★ A spacer is used below the bracket. Take care not to lose the spacer. [*3]

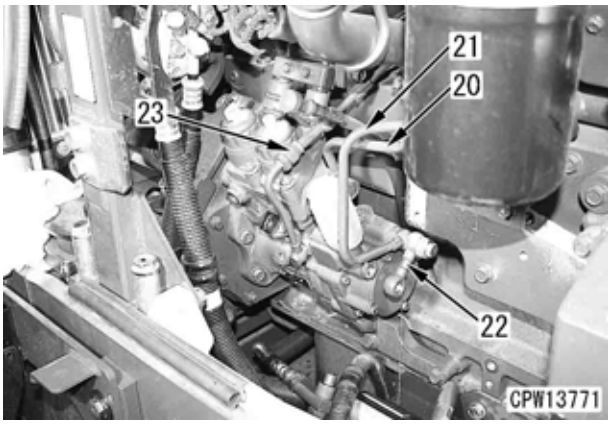


13. Remove 2 clamps (18) and clamp (19). [*4]



14. Remove fuel tubes (20) and (21) plus tube (22) between the supply pump and fuel filter. [*5]

15. Remove lubrication hose (23). [*6]

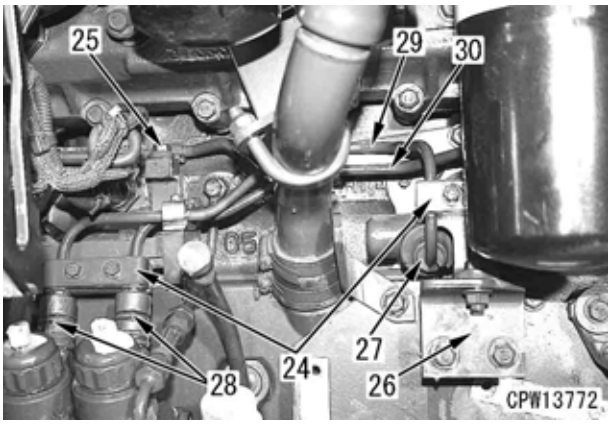


16. Remove 2 clamps (24) and 2 clamps (25). [*7]
    ★ One of clamps (25) is located on the back-side of the oil filler port.

17. Remove clamp mounting bracket (26). [*8]
    ★ A spacer is used for the bracket. Take care not to lose the spacer.

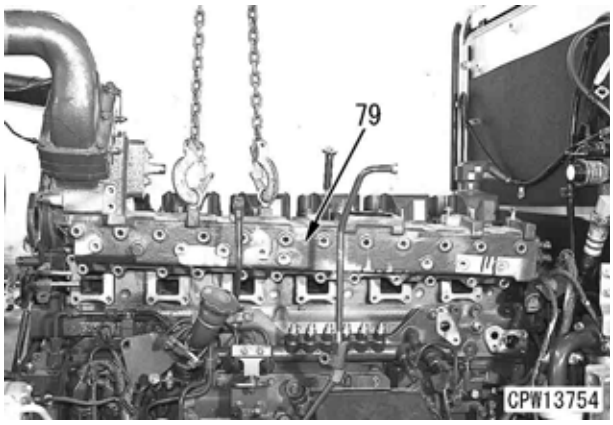
18. Remove common rail side scatter-preventive cover (27) and supply pump side scatter-preventive cover (28). [*9]

19. Remove high-pressure pipes (29) and (30). [*10]

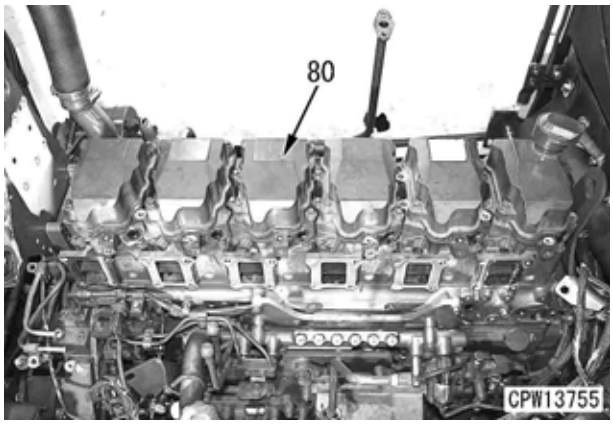


51. Temporarily lift intake manifold (79), remove the manifold mounting bolt and remove intake manifold (79).

    Intake manifold assembly: **53 kg**

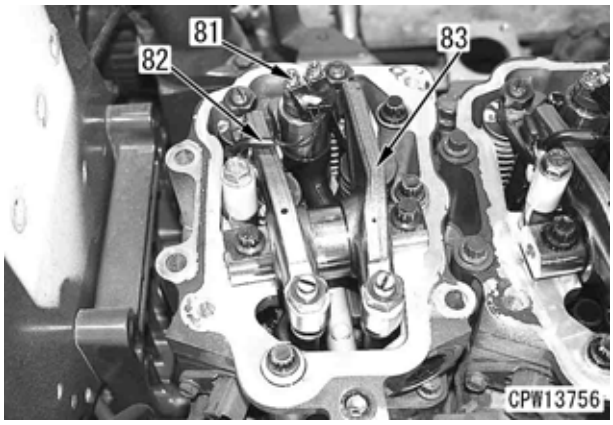


52. Remove cylinder head cover (80). [*27]



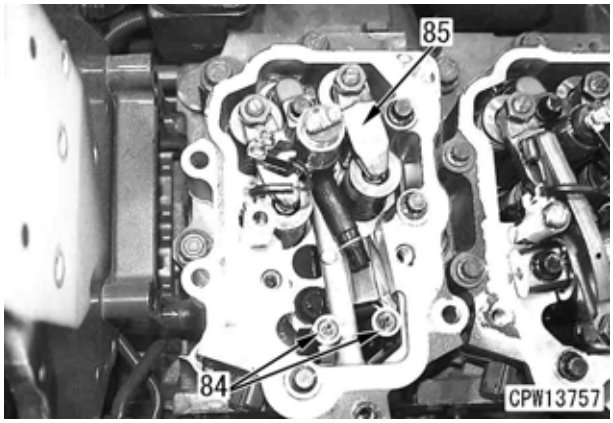
53. Remove 2 nuts (81) on the fuel injector solenoid valve, and then remove harness (82). [*28]
    - ★ Loosen the nuts alternately.

54. Remove rocker arm and shaft assembly (83). [*29]
    - ★ When installing the rocker arm, loosen the locknut to prevent excessive force to the push rod, and then loosen the adjuster screw by 2 to 3 turns.

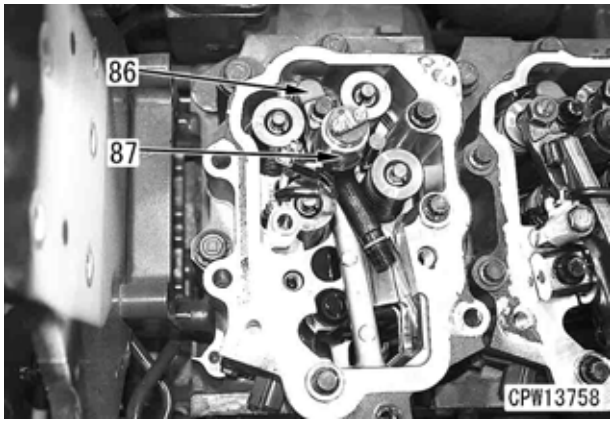


55. Remove push rod (84). [*30]

56. Remove crosshead (85). [*31]



57. Remove the mounting bolt for holder (86), and then remove fuel injector assembly (87) along with the holder. [*32]
    - ★ Insert a small L-shaped bar to the bottom of the fuel injector connector, and then pull out the fuel injector using the leverage.
    - ★ Do not pull out the solenoid valve section at the top of the fuel injector, using a tool such as pliers.



Disassembly and assembly of torque converter assembly (Standard specification)

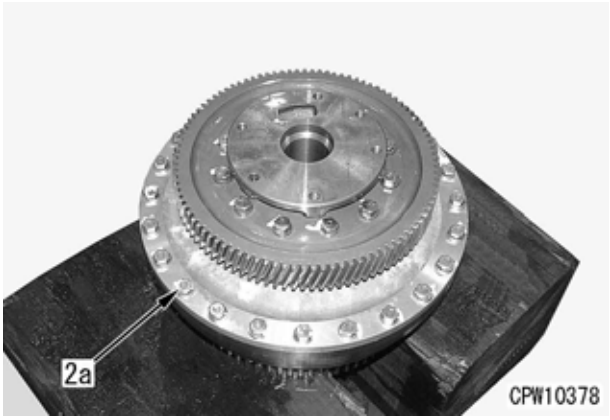
Special tools

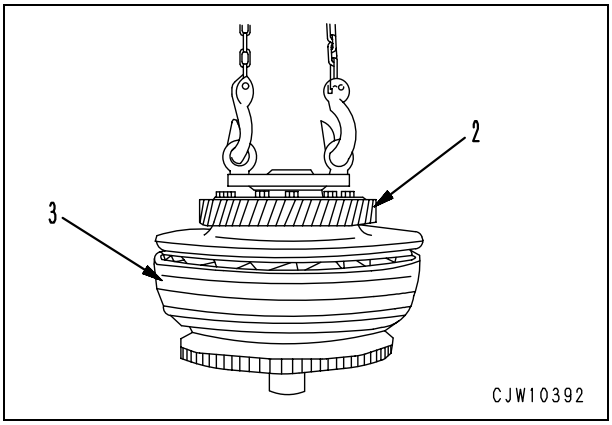
Symbol		Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
B1	1	790-501-5000	Unit repair stand	■	1		
	2	790-901-2110	Bracket	■	1		
	3	790-901-4240	Plate	■	1	R	

Disassembly

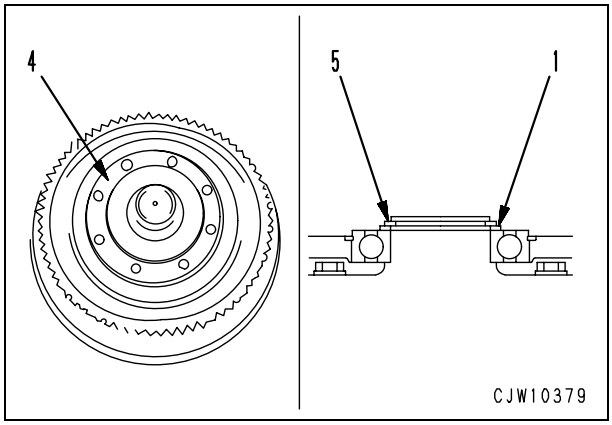
1. Perform steps 1 through 8 described in "Disassembly" and assembly of transmission assembly.
★ Perform the disassembly procedure with the torque converter assembly placed on a block (or with it secured to tool **B1**).

2. Turbine and case assembly
1) Install an eyebolt to the stator shaft and, then remove bolt (2a) to remove stator shaft pump assembly (2) from turbine, case assembly (3).

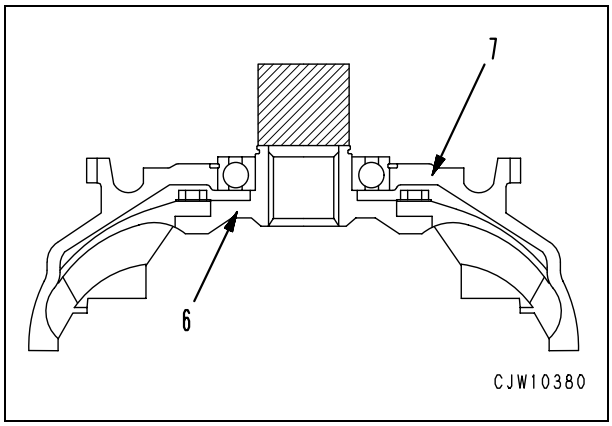




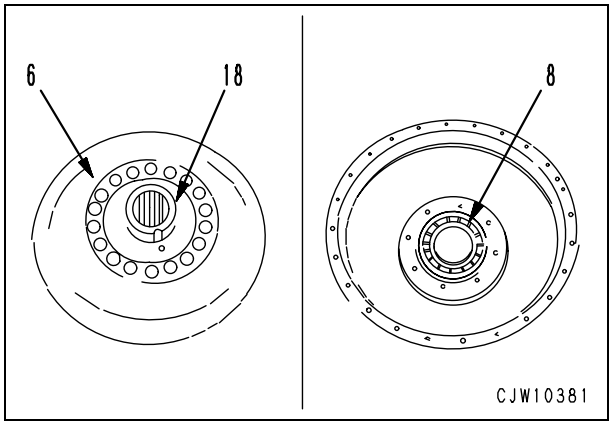
2) Disassemble turbine and case assembly as follows.
1] Remove pilot (4).
2] Remove snap ring (5), then remove plate (1).



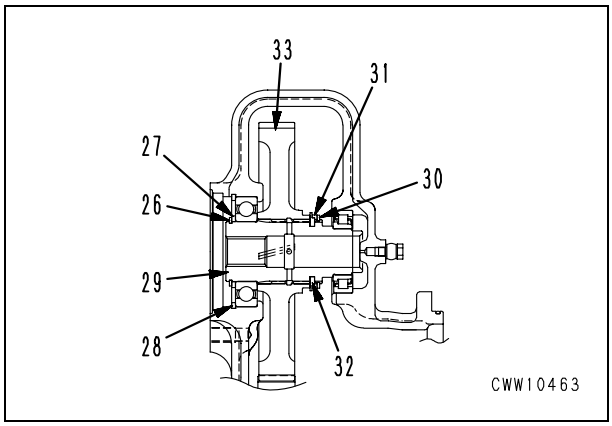
3] Push boss portion of turbine (6) and remove from case (7).



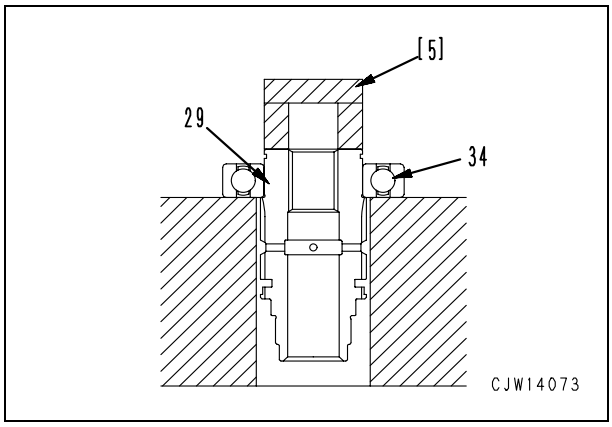
4] Remove mounting bolts and disconnect turbine (6) and boss (18).
5] Remove bearing (8) from case.



5) Jack down with jack [4] to pull shaft (29) out and then remove PTO gear (33).



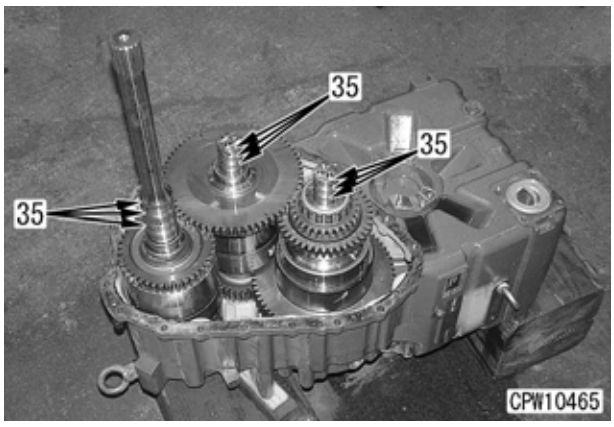
6) Using push tool [5], push shaft (29) to remove bearing (34).



10. Clutch pack assembly

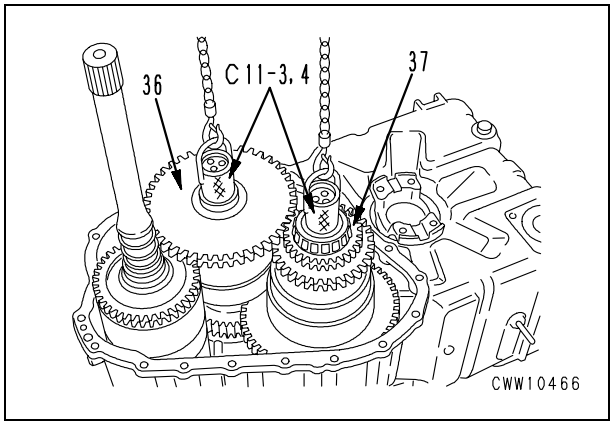
★ To remove all clutch pack assemblies, pull each of them upwards using care not to damage the bearing installed to the clutch pack bottom.

1) Remove seal ring (35) from each of the clutch packs.



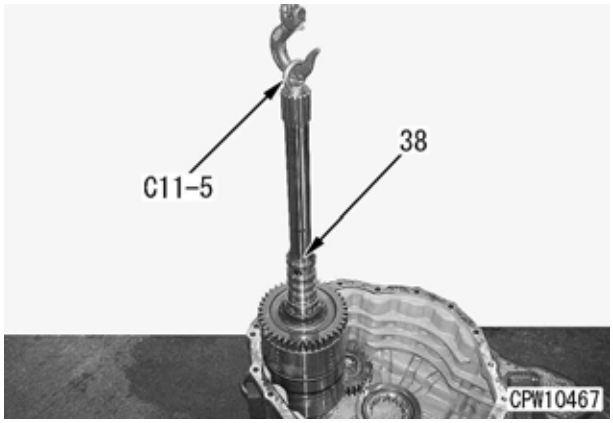
2) Using tools **C11-3** and **-4**, simultaneously lift up 1st-/4th-speed clutch pack assembly (36) and 2nd-/3rd-speed clutch pack assembly (37) to remove them.

Clutch pack assembly: **160 kg**



3) Using tool **C11-5**, lift up forward-reverse clutch pack assembly (38) to remove it.

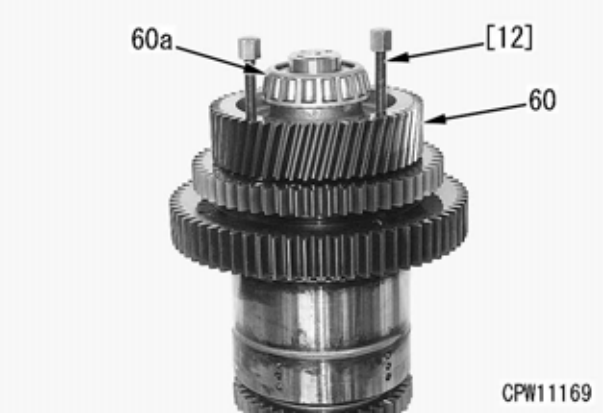
Forward-reverse clutch pack assembly: **65 kg**



[2nd speed clutch]

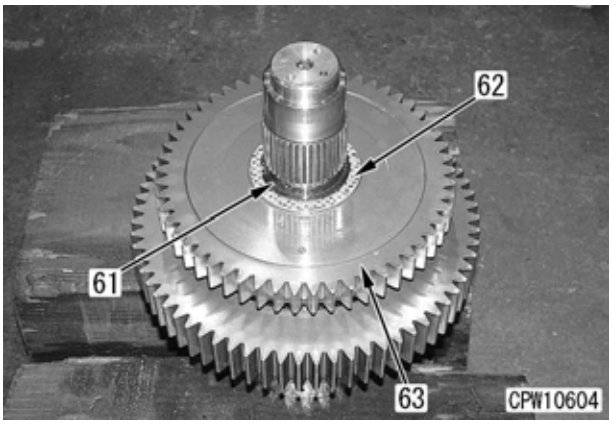
6. Bearing

1) Lift output gear (60) using forcing screw [12] to remove bearing (60a).
2) Remove output gear (60).

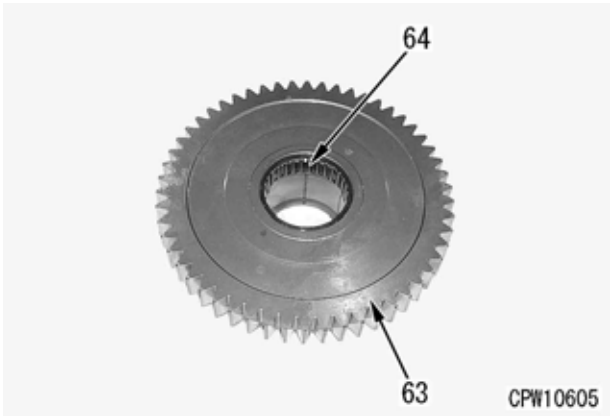


7. 2nd speed gear

1) Remove snap ring (61) to remove thrust washer (62) and 2nd speed gear (63).
   ★ Reuse of snap ring (61) is not allowed. Use a new part for the assembly



2) Remove needle bearing (64) from the 2nd speed gear (63).



8. End plate

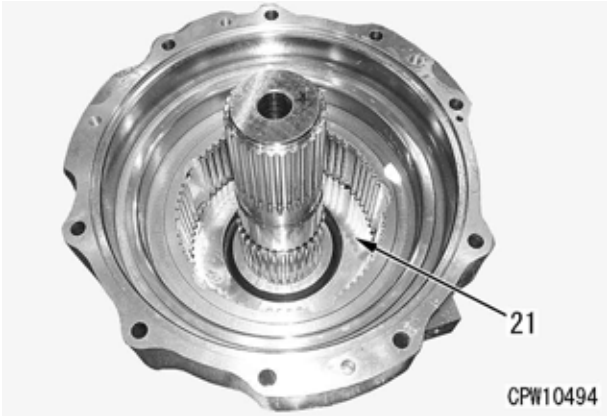
9. Clutch plate

10. Piston

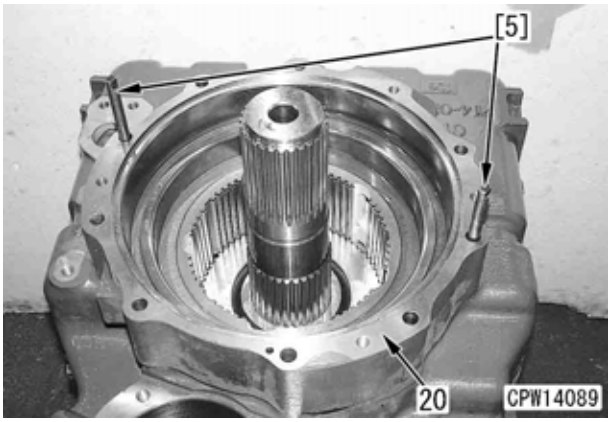
★ For procedures 8 – 10, disassemble the clutch pack in the same way as in procedures 3 – 5 for the 3rd speed clutch.

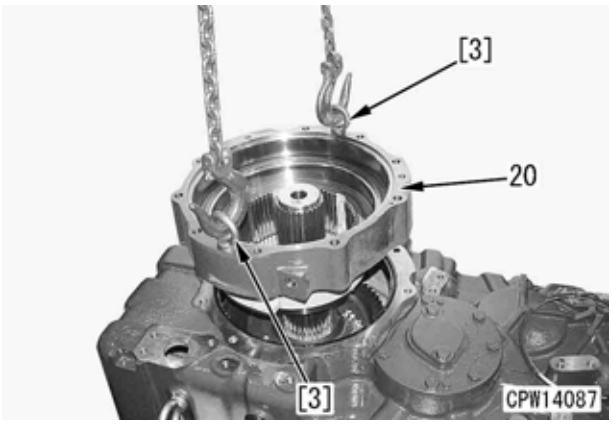
2. Parking brake case

1) Install end plate (21) and install the snap ring on the rear.



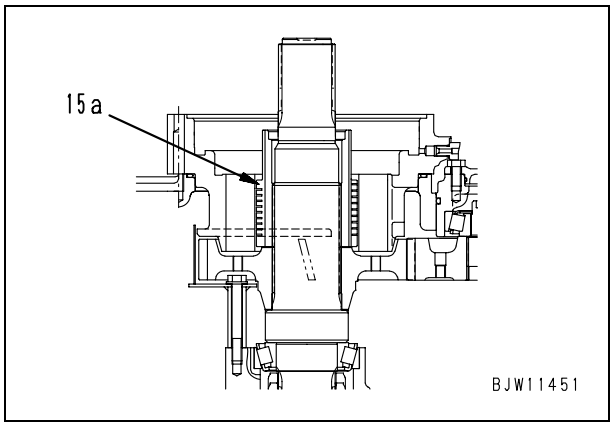
2) Install guide bolt [5] on the front housing and install parking brake case (20).





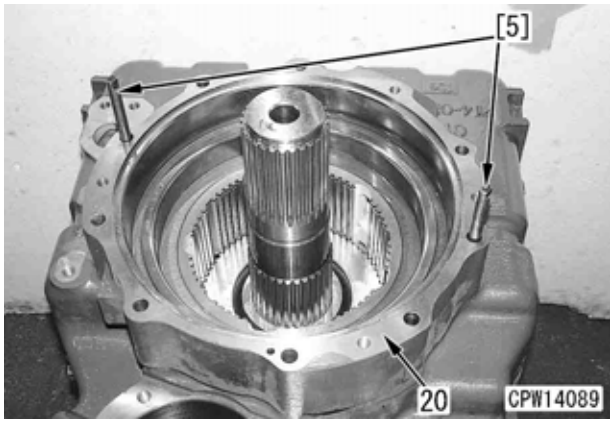
3. Hub

1) Install hub (15a).



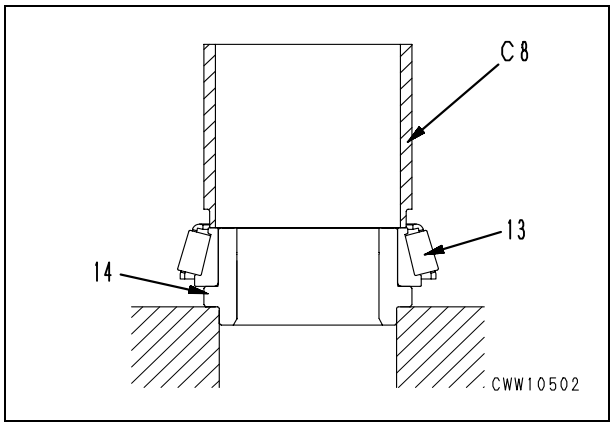
4. Piston

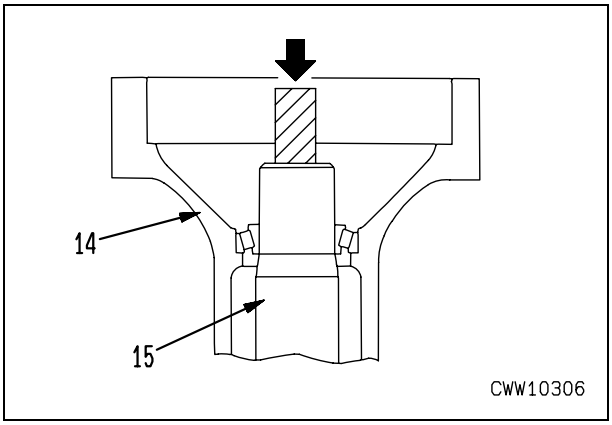
1) Install the O-ring and backup ring on the piston.
   ★ The backup ring shall be assembled on the outside of piston.
   O-ring: **Grease (G0-LI or G2-LI)**
2) Install eyebolt [2], then install piston (15).



5. Spring and bearing assembly

1) Use tool **C8** to press fit bearing (13) onto spacer (14).

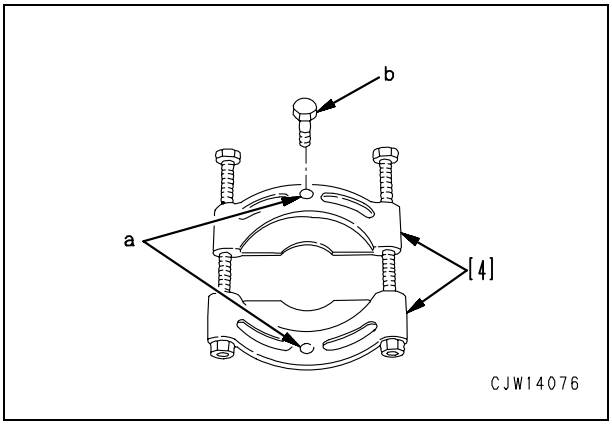




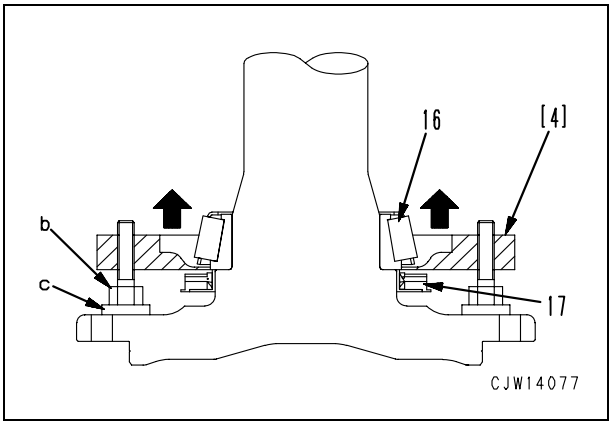
7. Axle shaft bearing

⚠ **Do not pull out the bearing by applying heat or remove by fusing.**

1) Mount bolt (**b**) to the bolt hole (**a**) of the bearing puller [4].

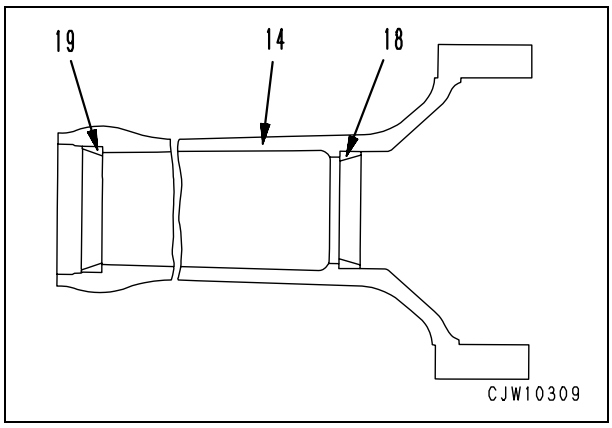


2) Mount the bearing puller [4] to the lower part of the bearing (16) and fix securely.
3) Insert washer (**c**) in between bolt (**b**) and flange face and remove the bearing (16) by turning bolt (**b**) in the slackening direction.
4) Remove the oil seal (17).



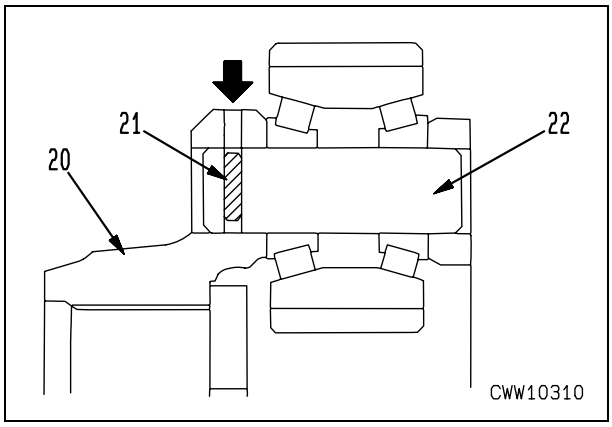
8. Axle housing

Remove the bearing outer races (18) and (19) and oil seal (17) from the axle housing (14).

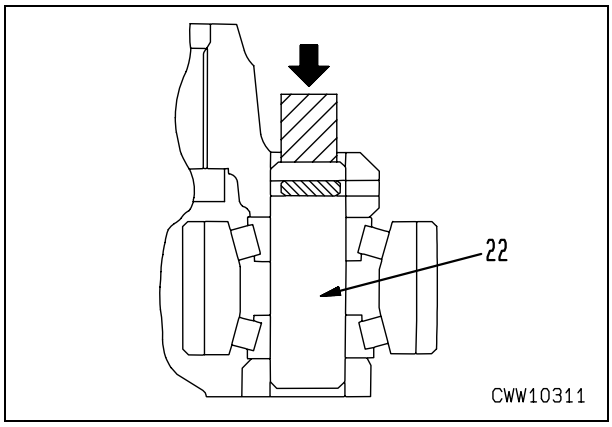


9. Planetary carrier

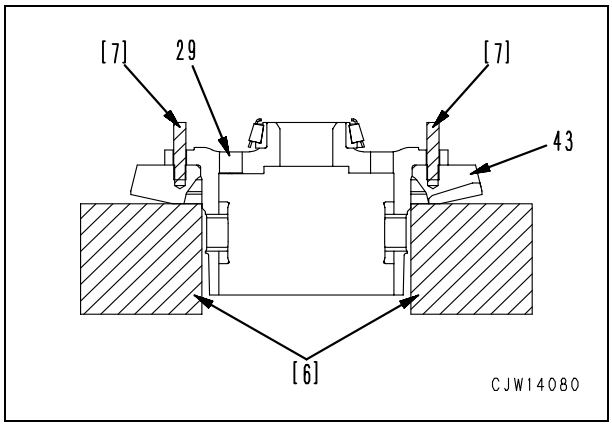
1) Hit in the spring pin (21) of the planetary carrier (20) into the shaft (22).
   ★ Be careful not to hit in the spring pin too much.

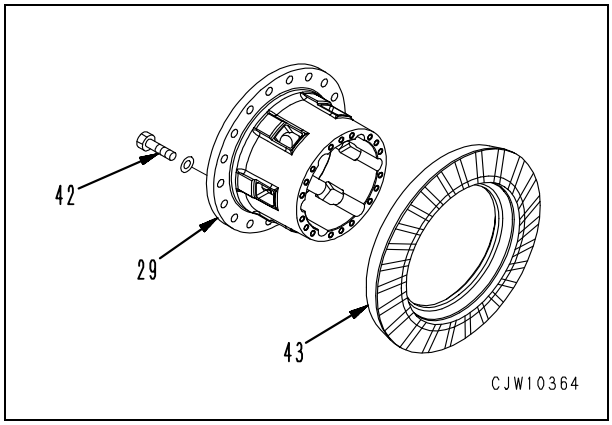


2) Pull out the shaft (22) using the press.



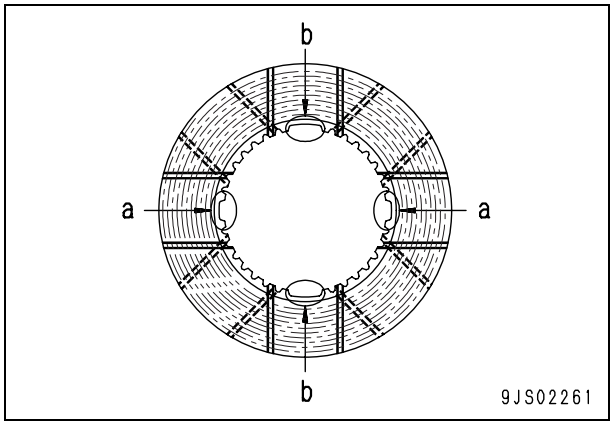
4) Place the bevel gear (43) on the block [6] with the gear side down.
5) Install guide bolt [7] to bevel gear (43).
6) Lower the case (29) and install it in the bevel gear (43) and tighten the bevel gear mounting bolts (42).
   Mounting bolt:
   Adhesive agent (LT-2)
   Mounting bolt:
   245 – 309 Nm {25 – 31.5 kgm}

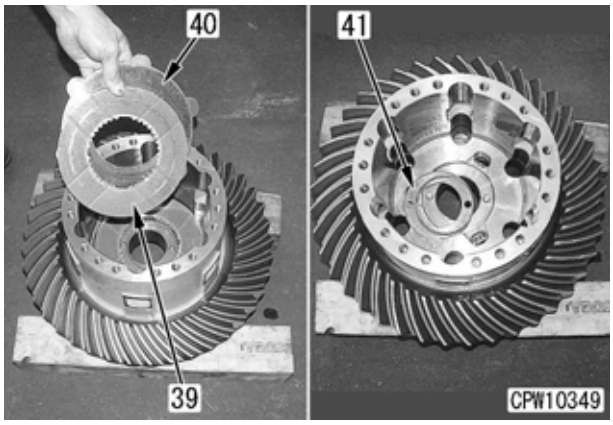




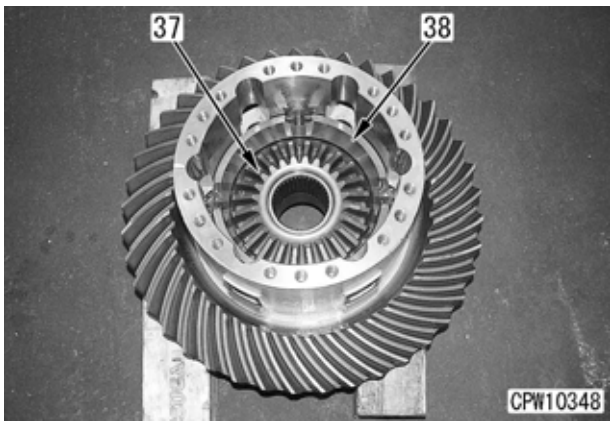
7) Reverse the case (29) and install the washer (41), plate (40), and disc (39) in this order.
   ★ When installing the disc, set cuts (a) and (b) accurately.
   ★ The thickness of the disc depends on the differential. Accordingly, refer to the following when installing the disc.
   - For rear differential of WA470-6: 3.0 mm (Part No. 424-22-27411)
   - For front differential of WA470-6 and front and rear differentials of WA480-6: 3.6 mm (Part No. 421-22-27411)

   Plate and disc: **Axle oil**

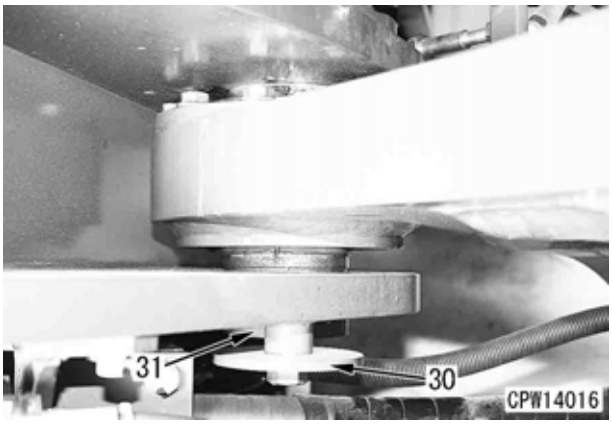




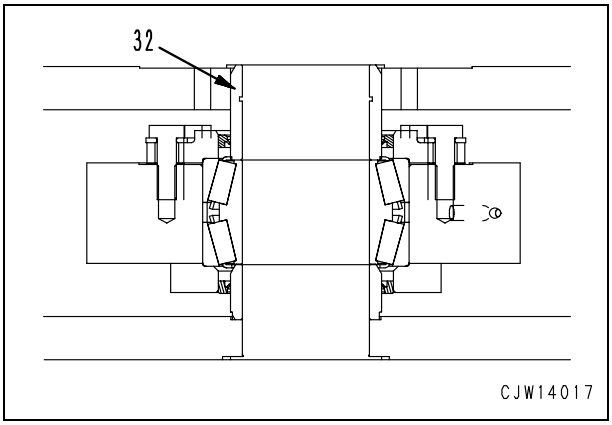
8) Install the pressure ring (38) and side gear (37).



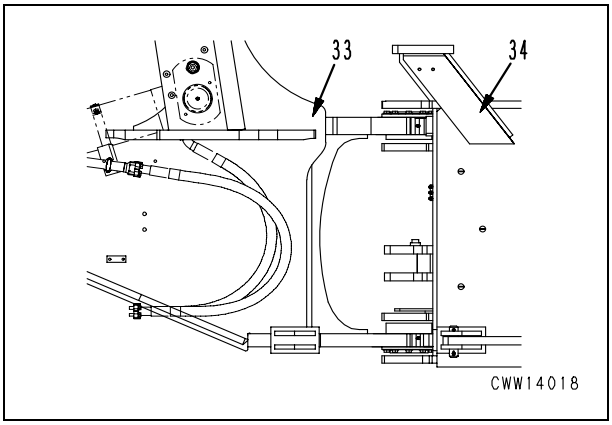
14. Remove plate (30), and then pull out upper hinge pin (31). [*6]
    ★ While adjusting height of the front frame and rear frame from the jack, pull out the pin with your hand.



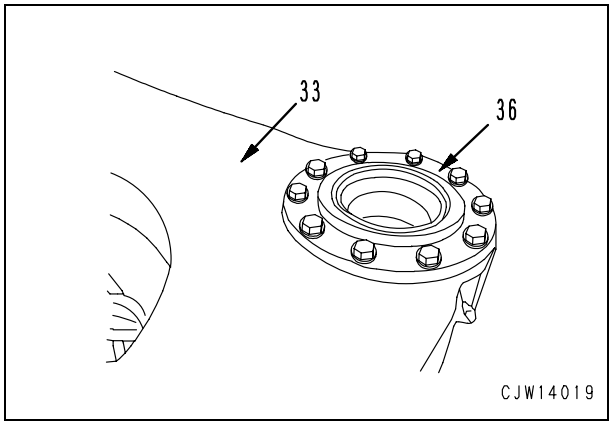
15. Remove spacer (32).



16. Carefully pull out front frame (33) forward and disconnect it from rear frame (34). [*7]
    ★ Take care of the balance at disconnection.
    ★ Confirm whether all the necessary piping and harnesses are disconnected.
    ★ Check that no point was missed when separating.
    ★ Remove the frame lock lever.



17. Remove bolts from the upper hinge of front frame (35), and then remove retainer (36). [*8]
    ★ Check the number and thickness of shims used between the retainer and frame.



18. Remove dust seal (36) from the retainer (35). [*9]