SEN00783-10

Shop Manual

WHEEL LOADER

WA470-6
WA480-6

SERIAL NUMBERS

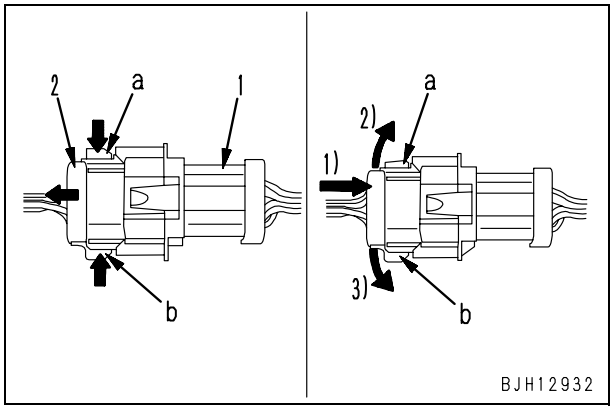
WA470-85001 to 90000
WA480-85001 to 90000

ecot3

KOMATSU

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

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



Standard tightening torque table

1. Table of tightening torques for bolts and nuts

★ Unless there are special instructions, tighten metric nuts and bolts to the torque below.

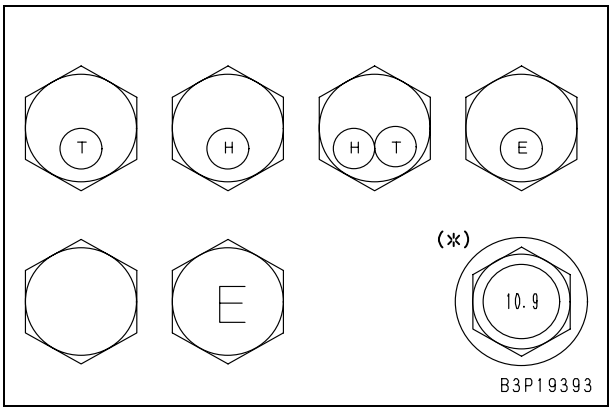
★ The following table applies to the bolts in Fig. A.

Thread diameter of bolt	Width across flats	Tightening torque	
mm	mm	Nm	kgm
6	10	11.8 – 14.7	1.2 – 1.5
8	13	27 – 34	2.8 – 3.5
10	17	59 – 74	6.0 – 7.5
12	19	98 – 123	10.0 – 12.5
14	22	157 – 196	16 – 20
16	24	245 – 309	25 – 31.5
18	27	343 – 427	35 – 43.5
20	30	490 – 608	50 – 62
22	32	662 – 829	67.5 – 84.5
24	36	824 – 1,030	84 – 105
27	41	1,180 – 1,470	120 – 150
30	46	1,520 – 1,910	155 – 195
33	50	1,960 – 2,450	200 – 250
36	55	2,450 – 3,040	250 – 310
39	60	2,890 – 3,630	295 – 370

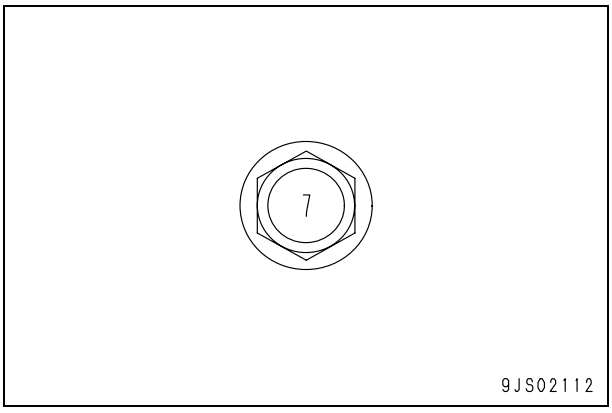
★ The following table applies to the bolts in Fig. B.

Thread diameter of bolt	Width across flats	Tightening torque	
mm	mm	Nm	kgm
6	10	5.9 – 9.8	0.6 – 1.0
8	12	13.7 – 23.5	1.4 – 2.4
10	14	34.3 – 46.1	3.5 – 4.7
12	17	74.5 – 90.2	7.6 – 9.2

★ Fig. A



★ Fig. B



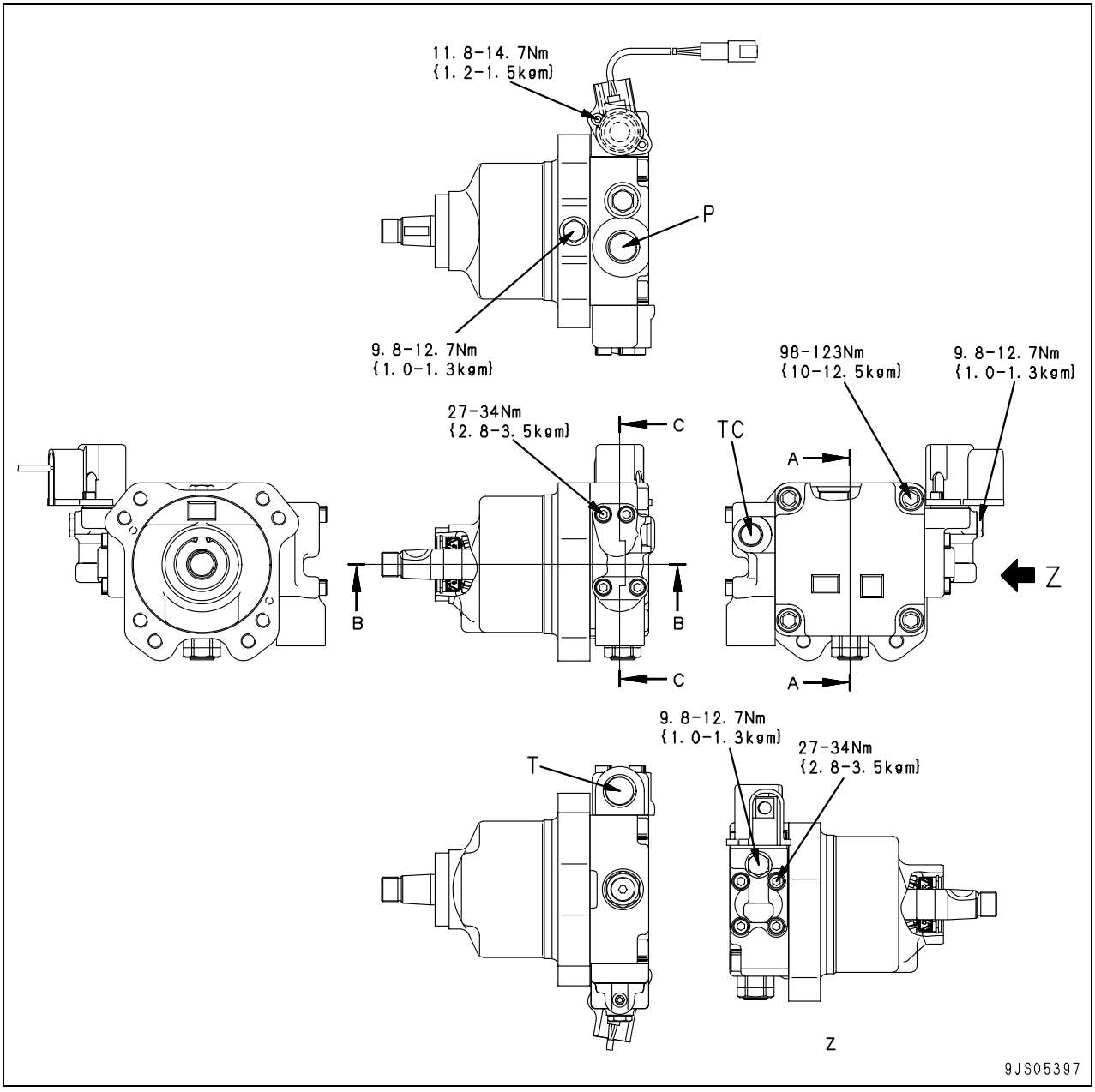
Remarks: The widths across flats against the thread diameters of flanged bolts (marks with "*") in Fig. A are the ones indicated in the table for bolts shown in Fig. B.
(Values of tightening torques shown in the table for Fig. A are applied.)

Machine model name				WA470-6	WA480-6
Serial No.				85001 and up	85001 and up
Hydraulic system	Control valve	Work equipment control valve			
		• Type		2-spool type	2-spool type
		• Set pressure	MPa {kg/cm^2}	34.3 {350}	34.3 {350}
		Steering valve			
		• Type		Spool type	Spool type
		• Set pressure	MPa {kg/cm^2}	24.5 {250}	24.5 {250}
	Motor	Cooling fan motor			
		• Type		Fixed displacement, swash plate, piston type	Fixed displacement, swash plate, piston type
		• Motor capacity	cm^3/rev	28	28
Work equipment	Type of link			Z-bar link	Z-bar link
	Shape of bucket cutting edge			Straight cutting edge with BOC	Straight cutting edge with BOC

★ BOC: Abbreviation for Bolt-On Cutting edge

Cooling fan motor

Type: LMF28



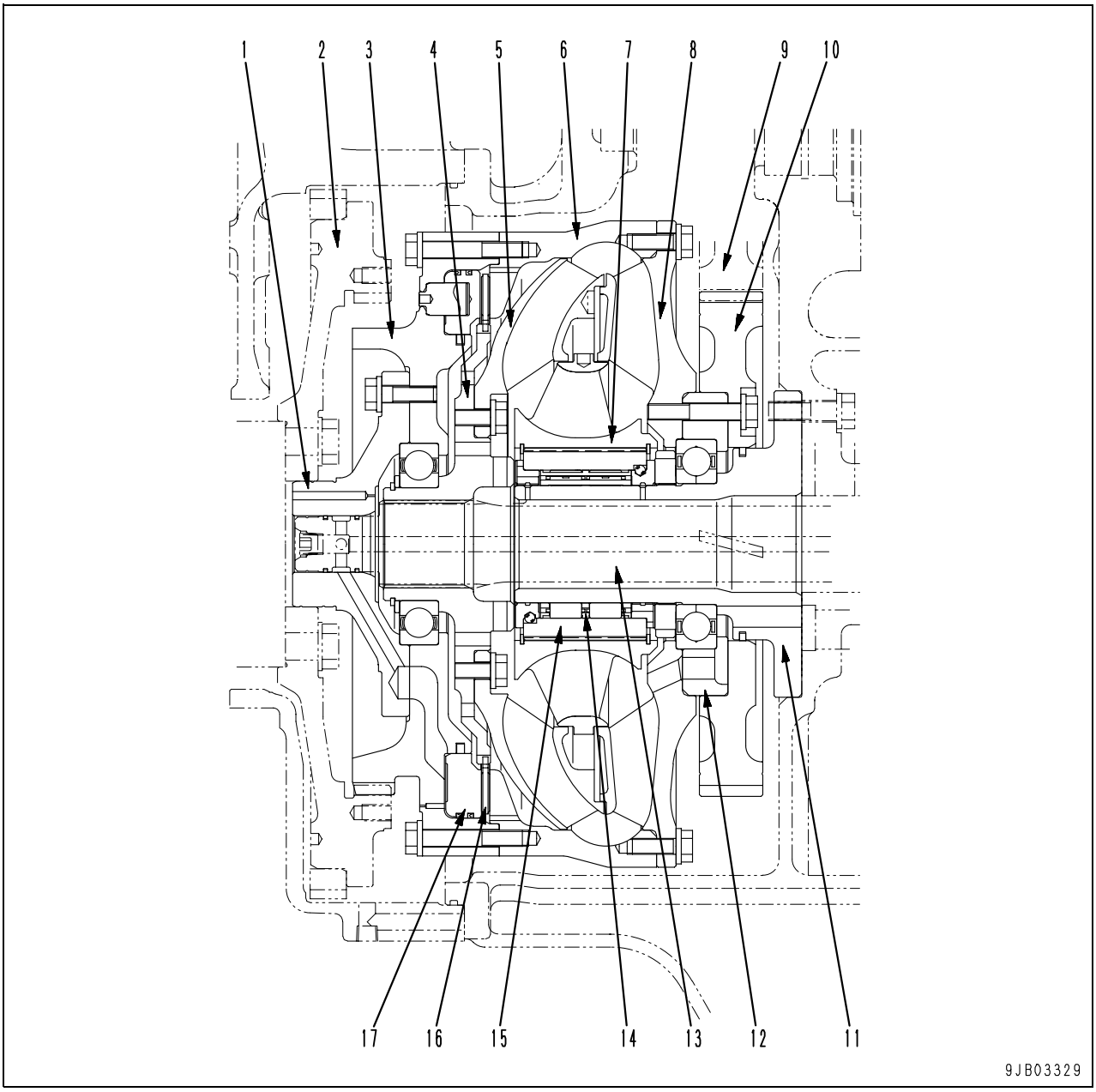
P: From fan pump
T: From cooler to tank
TC: To tank

Specifications

Type:	LMF28
Capacity:	28.0 cc/rev
Rated speed:	1,600 rpm
Rated flow rate:	44.8 ℓ/min

Check valve cracking pressure: 44.1 kPa {0.45 kg/cm^2}

With lockup clutch

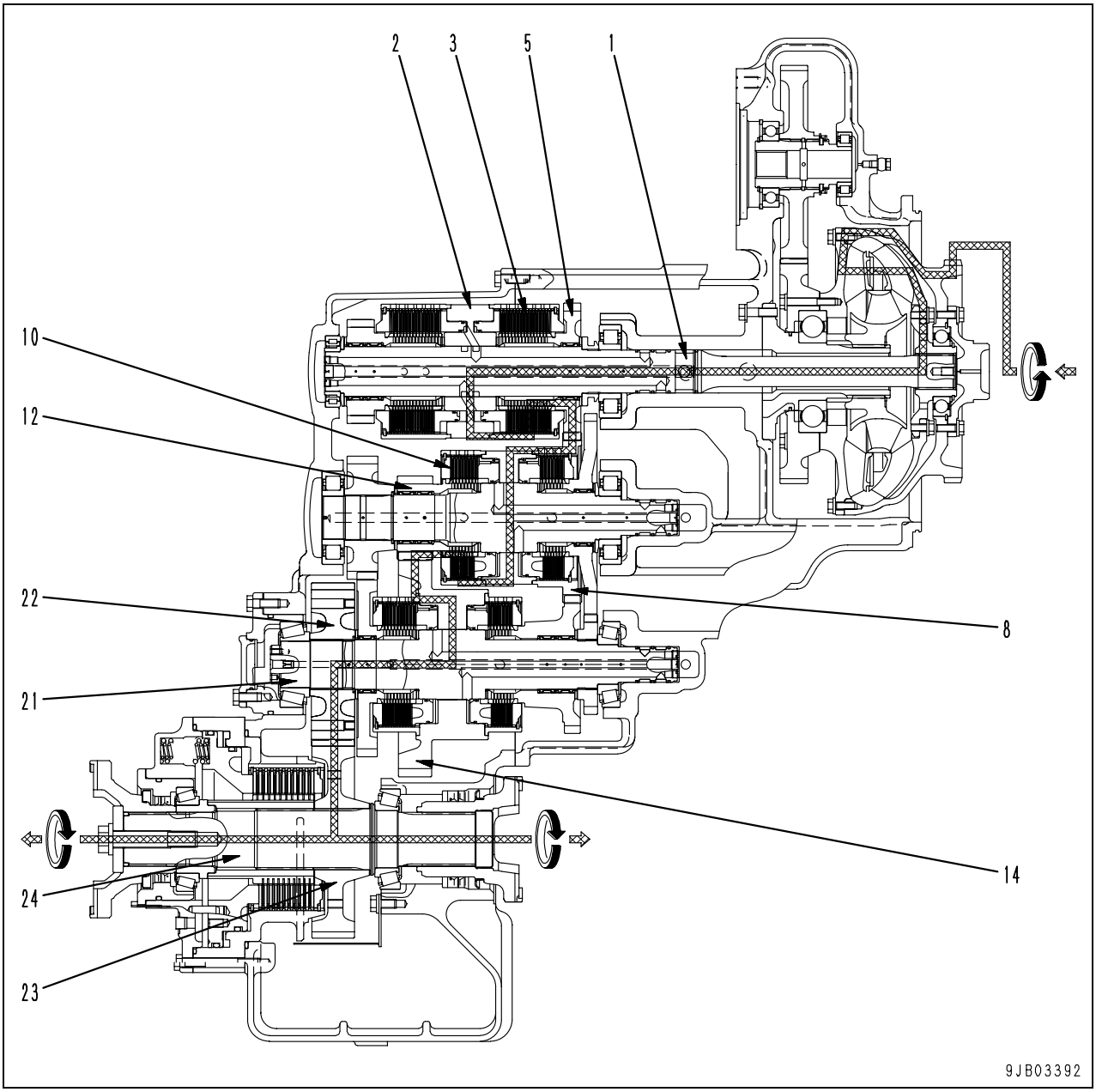


1. Pilot
2. Flywheel
3. Lockup clutch housing
4. Boss
5. Turbine
6. Drive case
7. Stator
8. Pump
9. PTO gear
10. PTO drive gear (Number of teeth: 99)
11. Stator shaft
12. Guide
13. Input shaft
14. Free wheel
15. Race
16. Lockup clutch disc
17. Lockup clutch piston

Specifications

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

Power transmitting route
Forward 1st speed



F clutch (3) and 1st clutch (10) are fixed hydraulically.

The power from the torque converter
↓
Input shaft (1)
↓
F and R cylinders (2)
↓
F clutch (3)
↓
F clutch gear (5)
↓
1st and 4th cylinders (8)
↓
(To center top) →

→ (from left bottom)
↓
1st clutch (10)
↓
1st clutch gear (12)
↓
2nd and 3rd cylinders (14)
↓
Lower shaft (21)
↓
Lower gear A (22)
↓
(To right top) →

→ (from center bottom)
↓
Output gear (23)
↓
Output shaft (24)

Outline

Torque converter relief valve

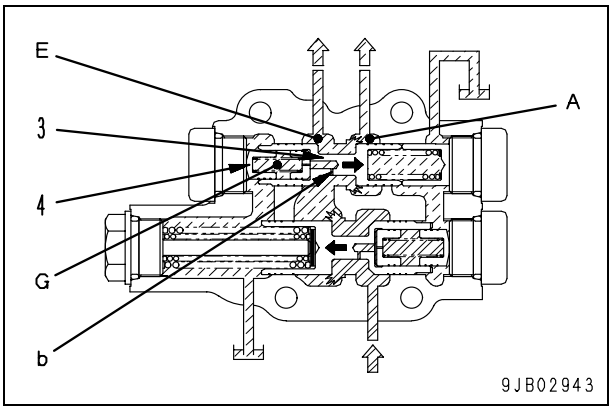
- The torque converter relief valve constantly regulates the torque converter inlet circuit pressure below the set pressure to protect the torque converter from abnormally high pressure.
  Set pressure: 0.91 MPa {9.31 kg/cm^2}
  (Cracking pressure)

Main relief valve

- The main relief valve regulates the pressure in the transmission and parking brake hydraulic circuits to the set pressure.
  Set pressure: 2.87 MPa {29.3 kg/cm^2}
  (At rated engine speed)

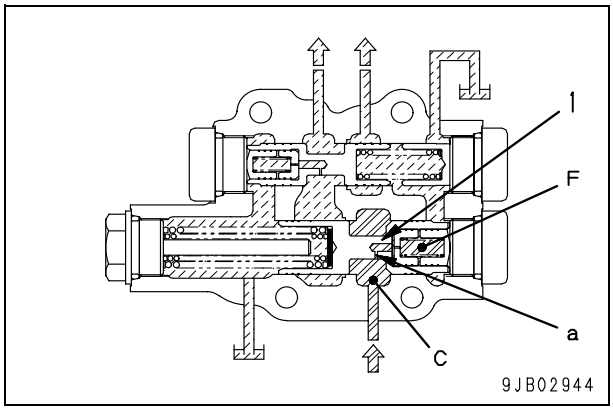
Operation

Operation of torque converter relief valve

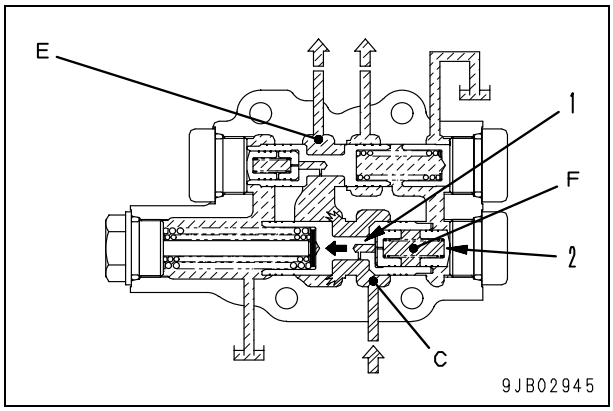


- The oil from the main relief valve is conducted to the torque converter through port (E) and, at the same time, also conducted to chamber (G) through orifice (b) of torque converter relief valve (3).
- As the oil pressure to the torque converter goes beyond the set pressure, the oil conducted to chamber (G) pushes piston (4) and the resulting resisting force pushes torque converter relief valve (3) rightward, opening ports (E) and (A).
  As the result, the oil in port (E) is drained through port (A).

Operation of main relief valve



- The oil from the hydraulic pump flows to chamber (F) through the filter, port (C) of the relief valve and orifice (a) of main relief valve (1).

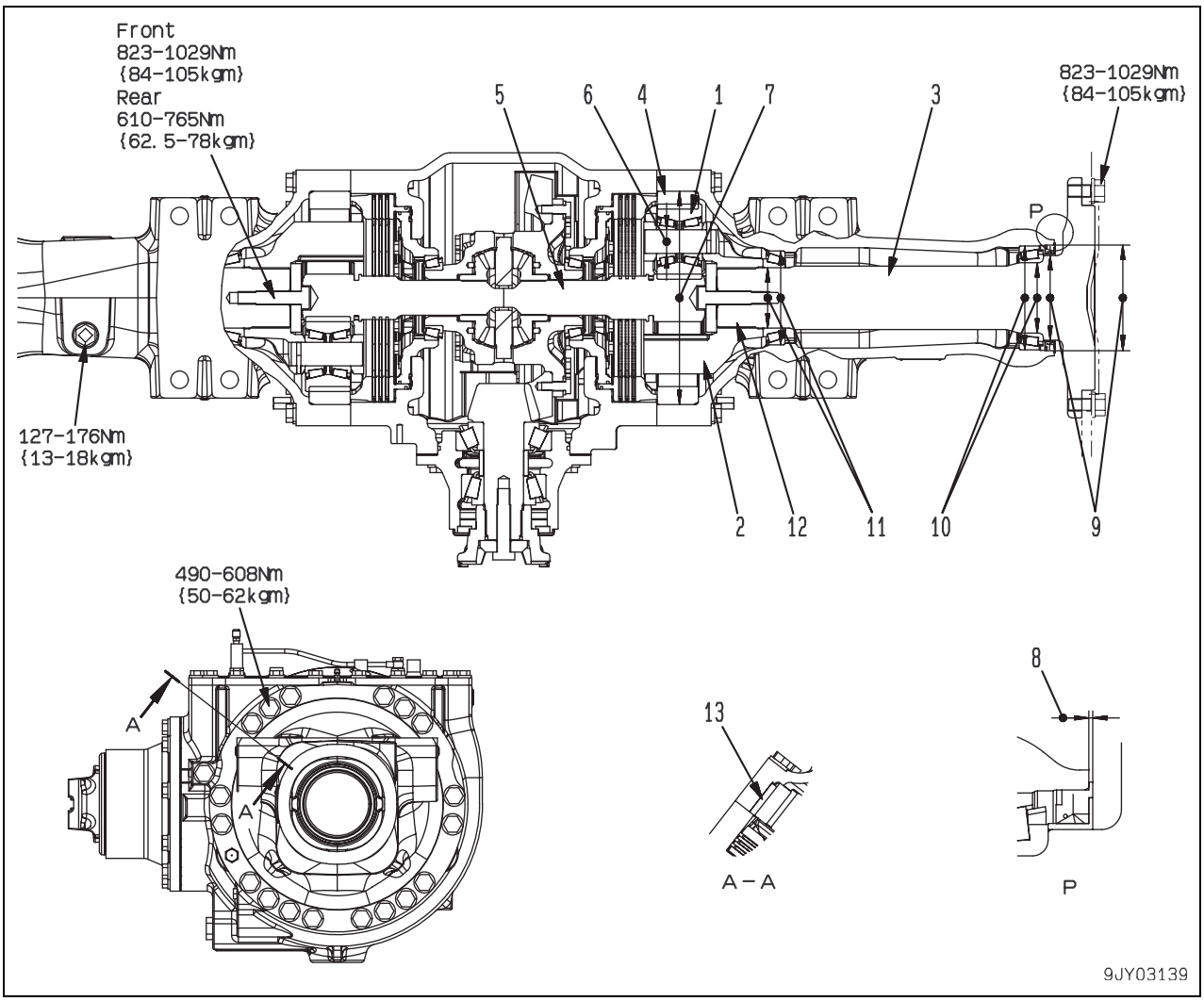


- As the oil pressure in the circuit goes beyond the set pressure, the oil conducted to chamber (F) pushes piston (2) and the resulting resisting force pushes spool (1) leftward, opening ports (C) and (E).
  Above operation conducts the oil from port (E) to the torque converter.

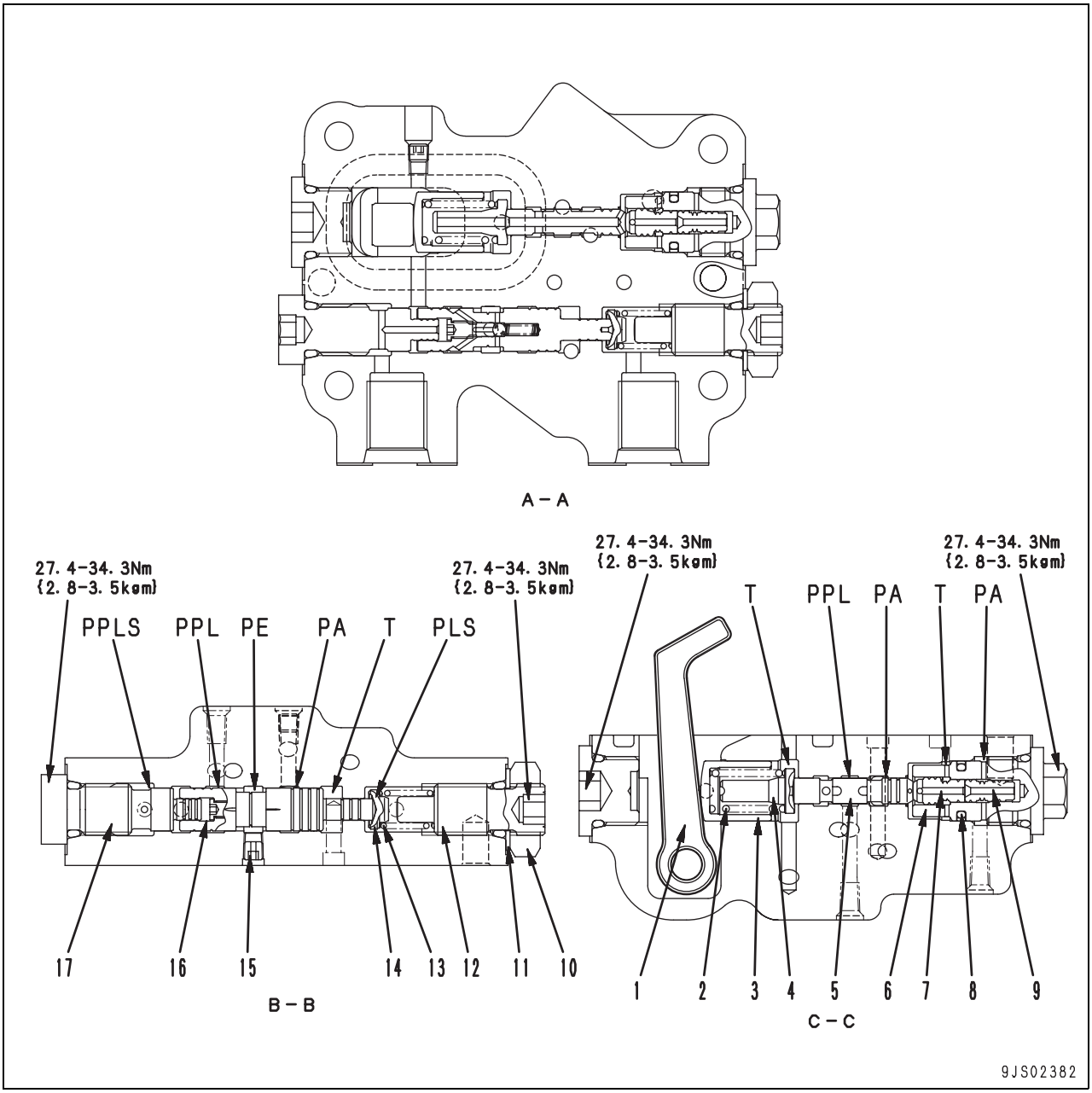
Final drive

WA470-6

★ The figure shows the front axle.



1. Planetary gear (Number of teeth: 26)
2. Planetary carrier
3. Axle shaft
4. Ring gear (Number of teeth: 69)
5. Sun gear shaft (Number of teeth: 15)



PC valve

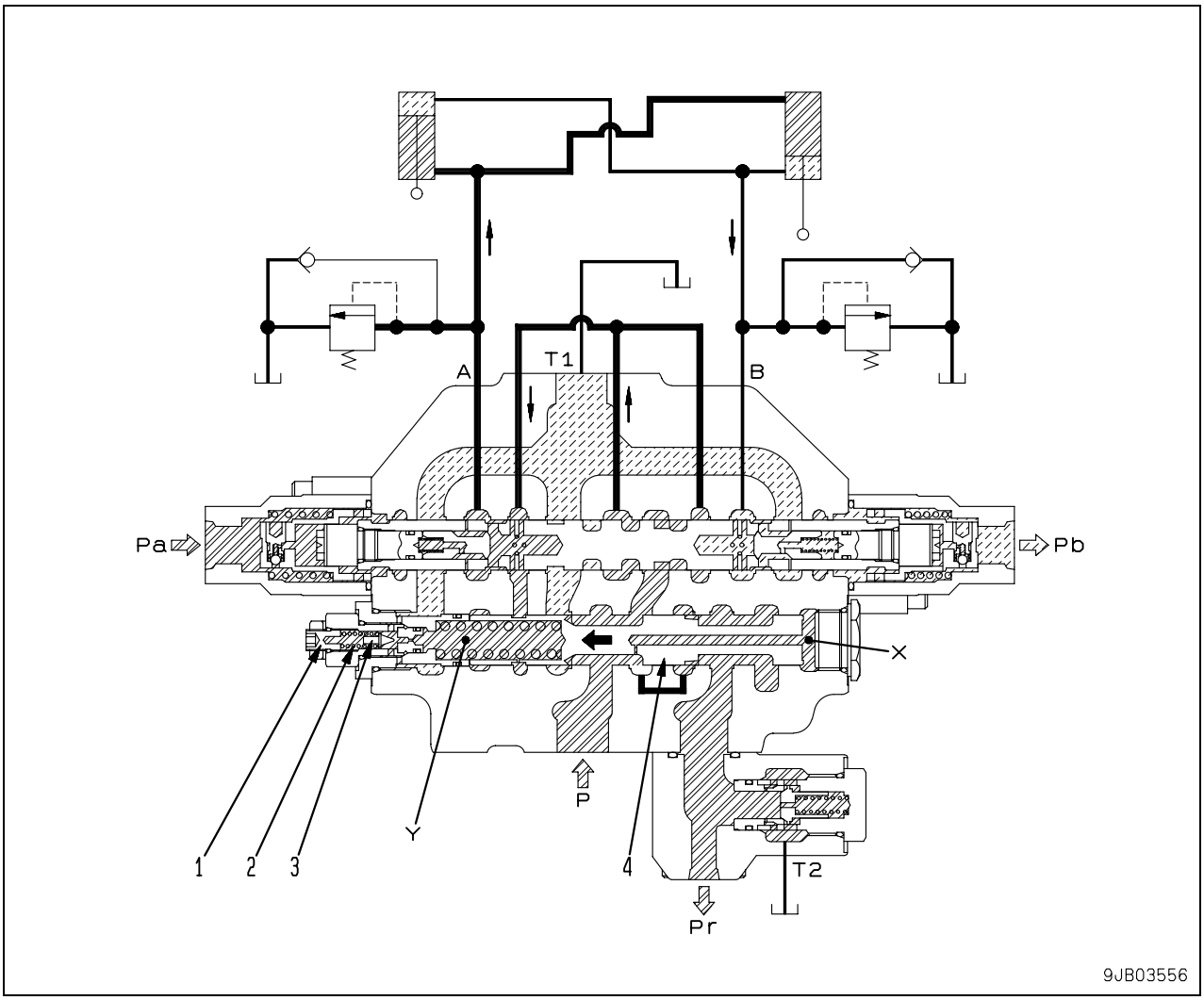
T : Drain
PA : Pump pressure input
PPL: PC valve output pressure

LS valve

PA : Pump pressure input
PE : Control piston pressure
PLS : LS pressure input
PPL : PC valve output pressure
PPLS: LS pump pressure input

1. Lever
2. Spring
3. Retainer
4. Seat
5. Spool
6. Sleeve
7. Piston
8. Seal
9. Piston
10. Nut
11. Plate
12. Plug
13. Spring
14. Seat
15. Plug
16. Spool
17. Plug

Operation of steering relief valve

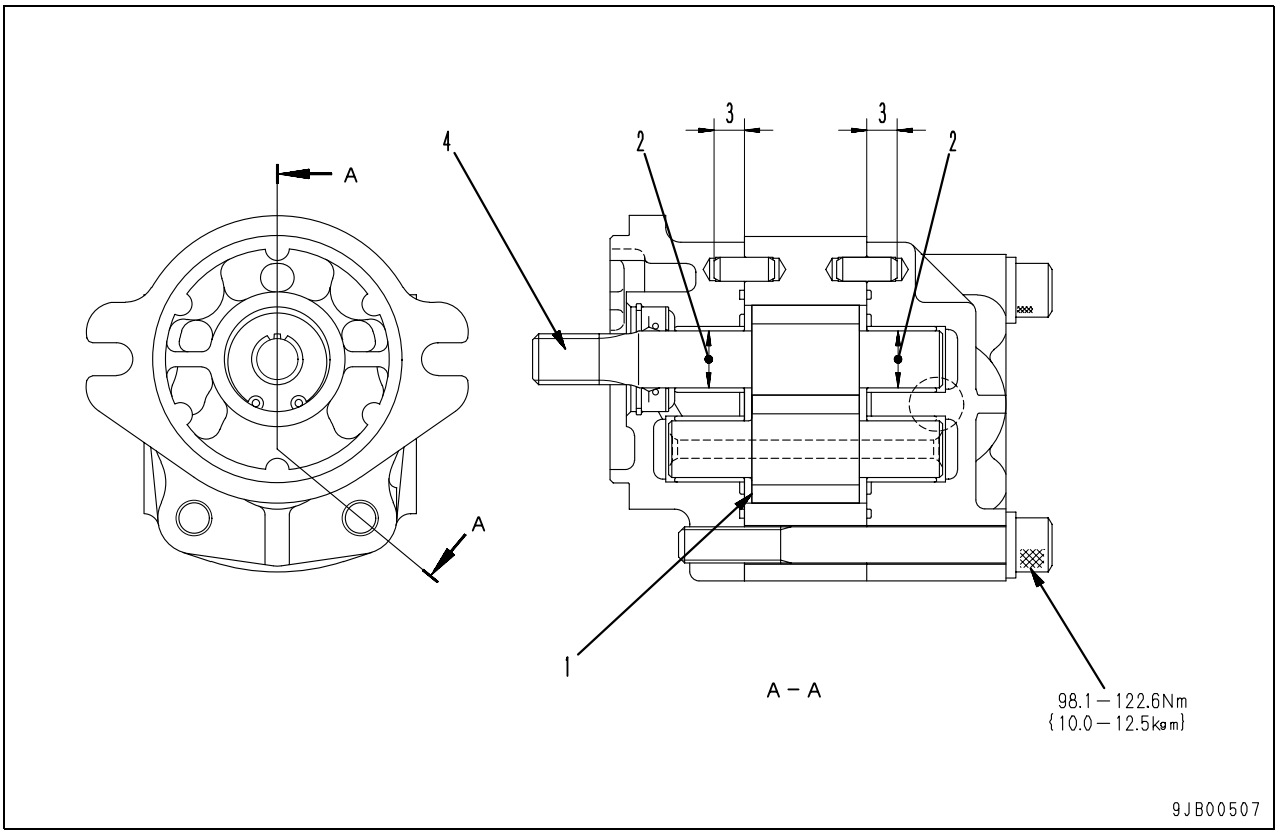


- If the oil pressure in the steering circuit rises to the level being set with adjustment screw (1) and spring (2), pilot poppet (3) opens and the oil is drained through port (T1).
- Pressure balance between receiving chambers (X) and (Y) is lost and flow control spool (4) moves to the left.
- As flow control spool (4) operates, the oil from the steering pump is drained and the pressure in the steering circuit is kept below the set pressure.

Emergency steering pump

(if equipped)

Type: SBL(1)21



Unit: mm

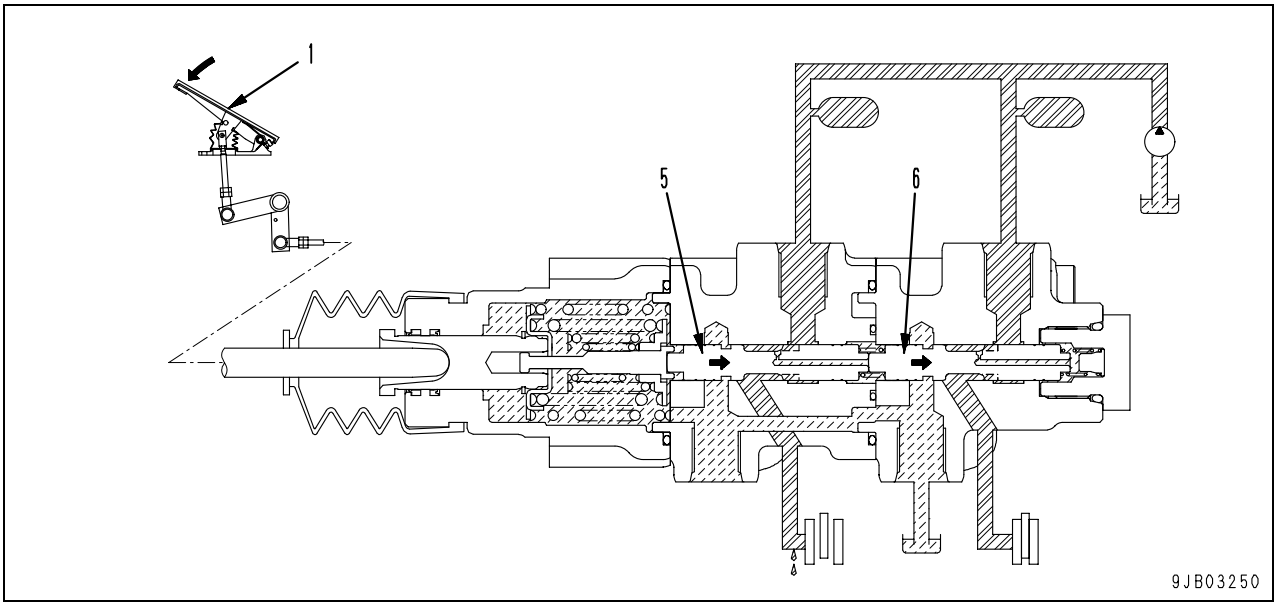
No.	Check item	Criteria				Remedy
1	Side clearance	Standard clearance		Clearance limit		Replace
		0.10 – 0.15		0.19		
2	Clearance between plain bearing inside diameter and gear shaft outside diameter	0.060 – 0.119		0.20		
3	Driven depth of pin	Standard size	Tolerance	Repair limit		
		10	0 –0.5	—		
4	Torque of spline turning shaft	2.0 – 4.9 Nm {0.2 – 0.5 kgm}				—
—	Delivery Discharge oil: SAE10WCD Oil temperature: 45 – 55°C	Speed (rpm)	Discharge pressure (MPa {kg/cm^2})	Standard delivery (ℓ/min)	Allowable delivery (ℓ/min)	
		3,500	20.6 {210}	67.6	62.4	

Function

- The emergency steering pump is installed together with the emergency steering motor to the right side of the transmission. When the engine stops or the oil pressure in the steering circuit lowers below the specified level, the emergency steering pump supplies oil to the steering circuit.

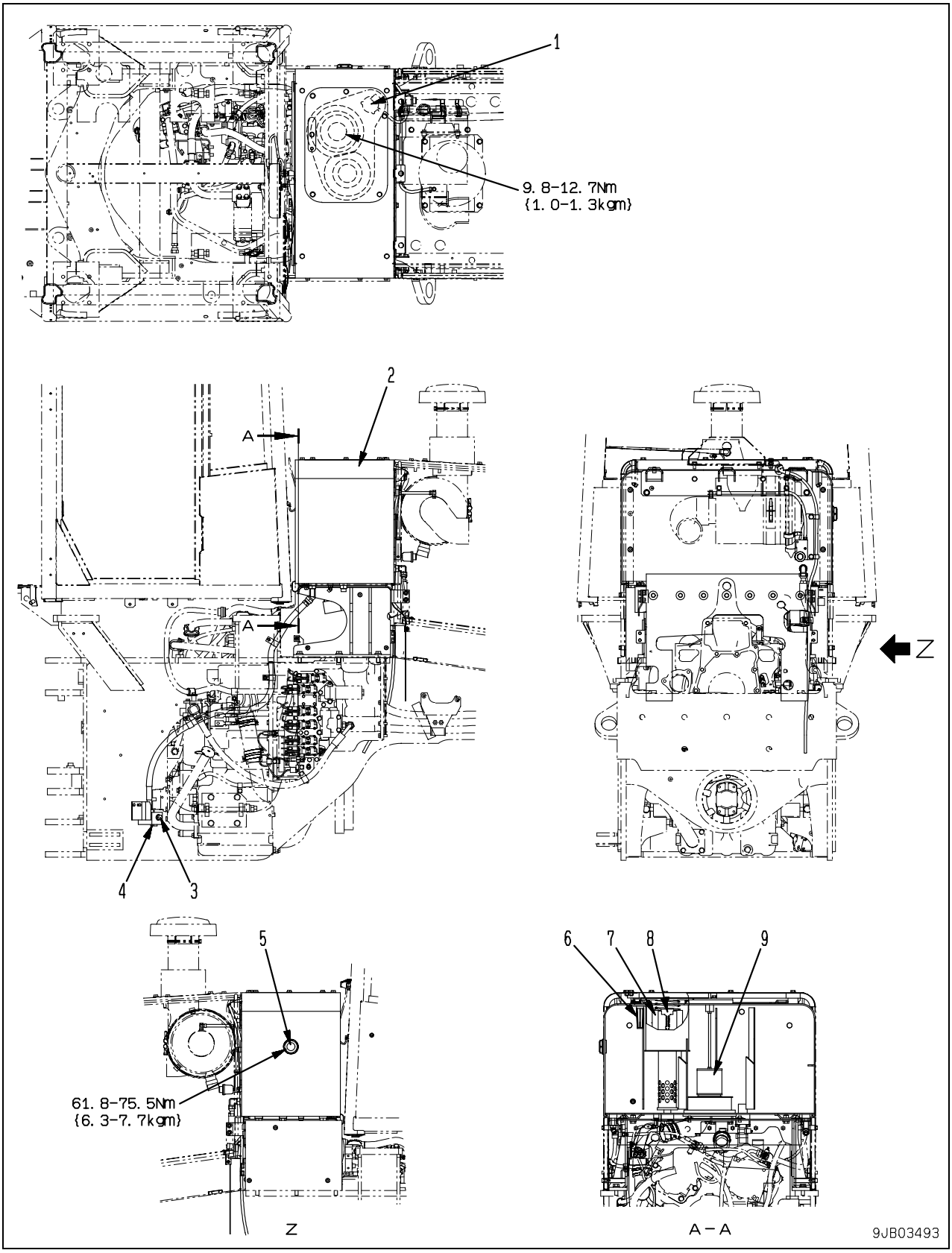
When brake of one side operated

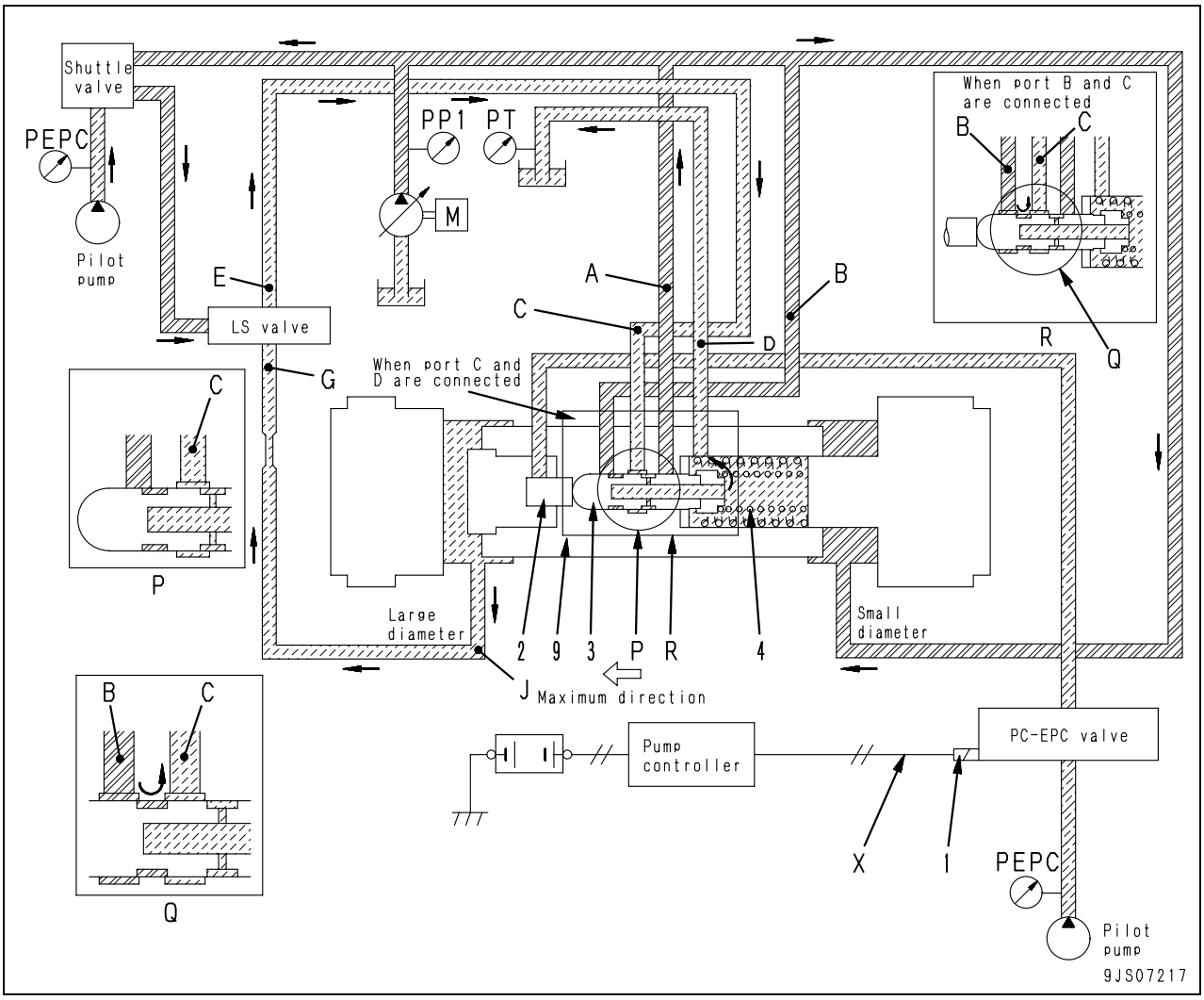
(When the other brake failed)



- When only one of the brakes failed due to leakage of oil in the front or rear brake system, brake pedal (1) pressing effort is capable of mechanically moving spools (5) and (6) to the right.
  Thus, the oil from the pump is normally supplied to the healthy brake piston, enabling it to continue the operation. The brake, therefore, is capable of stopping the machine as needed to ensure the intended safety level.

Hydraulic tank

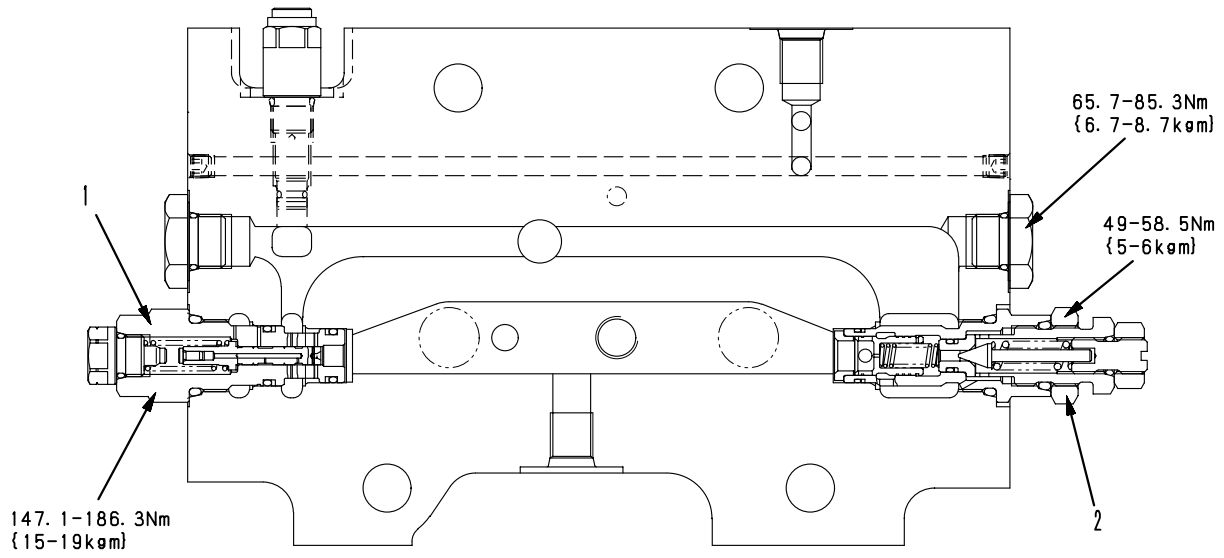




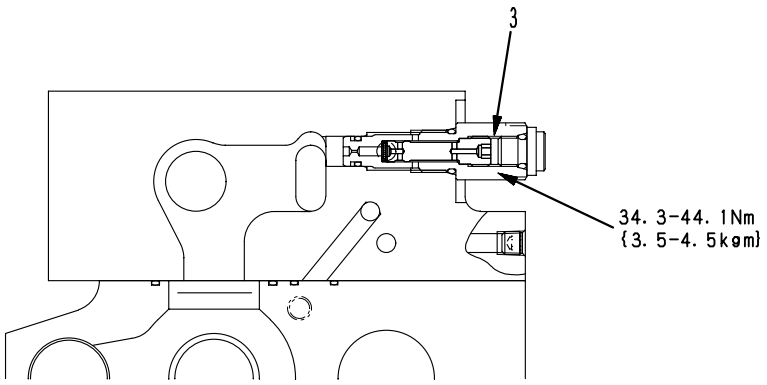
Action of spring

- The load of spring (4) at the PC valve is determined by the position of the swash plate.
- Spring load changes as servo piston (9) makes spring (4) elongate or contract.
- If the command current (X) to PC-EPC valve solenoid (1) changes, so does the force pushing piston (2).
- The load of spring (4) also changes according to the PC-EPC valve solenoid command current (X).
- Port (C) of the PC valve is connected to port (E) of the LS valve.
- Self pressure (PP1) enters port (A), port (B) and the small diameter end of servo piston (9).
- When pump pressure (PP1) is small, spool (3) will be positioned in the left side.
- Ports (C) and (D) are connected, and the pressure entering the LS valve becomes drain pressure (PT).
- If port (E) and port (G) of the LS valve are connected, the pressure entering the large diameter end of the piston from port (J) becomes drain pressure (PT), and servo piston (9) moves to the left side.
- The pump delivery will be set to the increasing trend.
- Spring (4) extends as servo piston (9) moves and weakens the spring force.
- As the spring force is weakened, spool (3) moves to the right, the connection between port (C) and port (D) is shut off and the pump discharge pressure ports (B) and (C) are connected.
- The pressure on port (C) rises and the pressure on the large diameter end of the piston also rises. Thus, the leftward move of servo piston (9) is stopped.
- Stop position of servo piston (9) (= pump delivery) is determined by a position where press force generated by pump pressure (PP1) on spool (3) and other press force by PC-EPC valve solenoid are balanced with the force of spring (4).

(6/6)



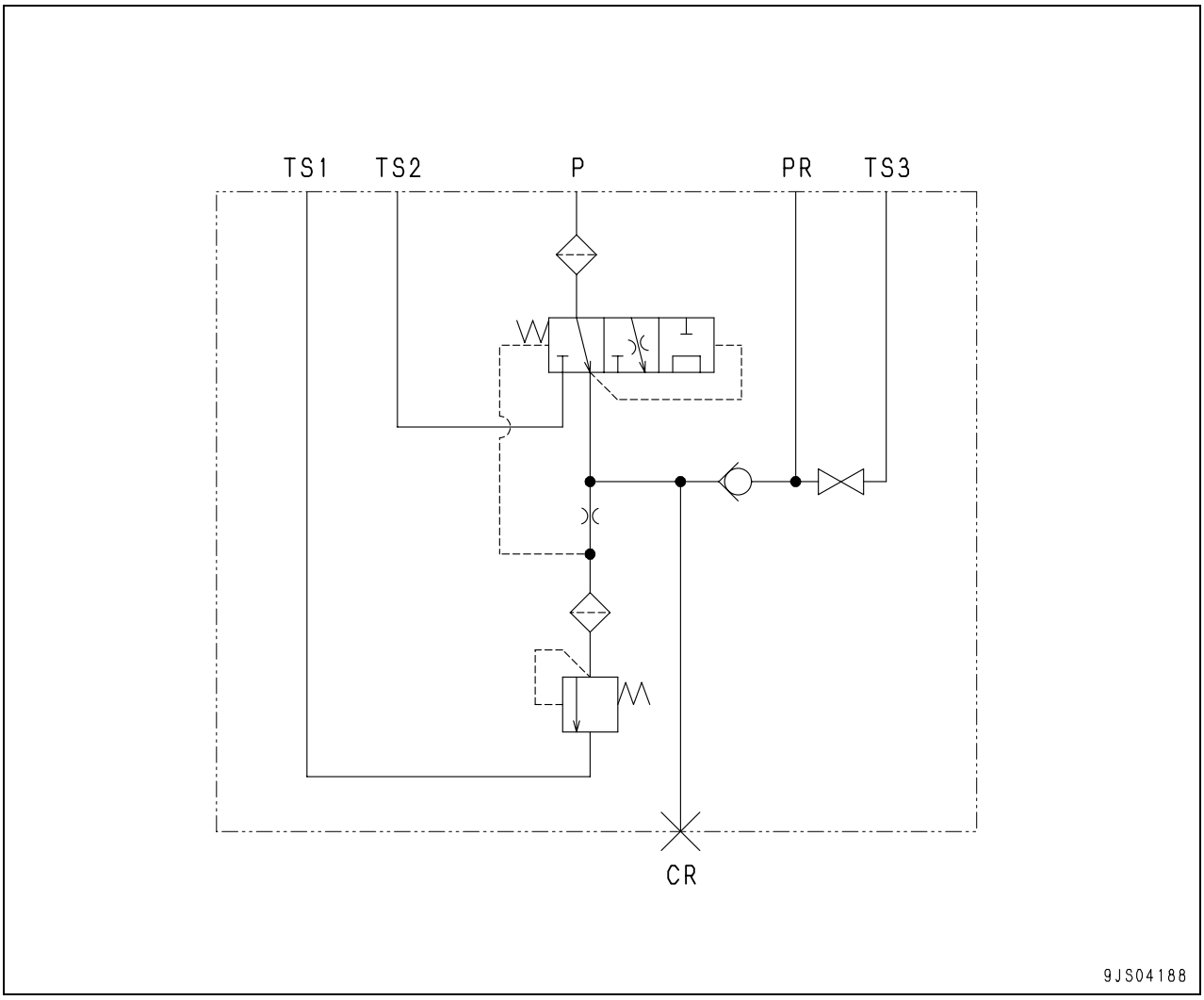
L – L



M – M

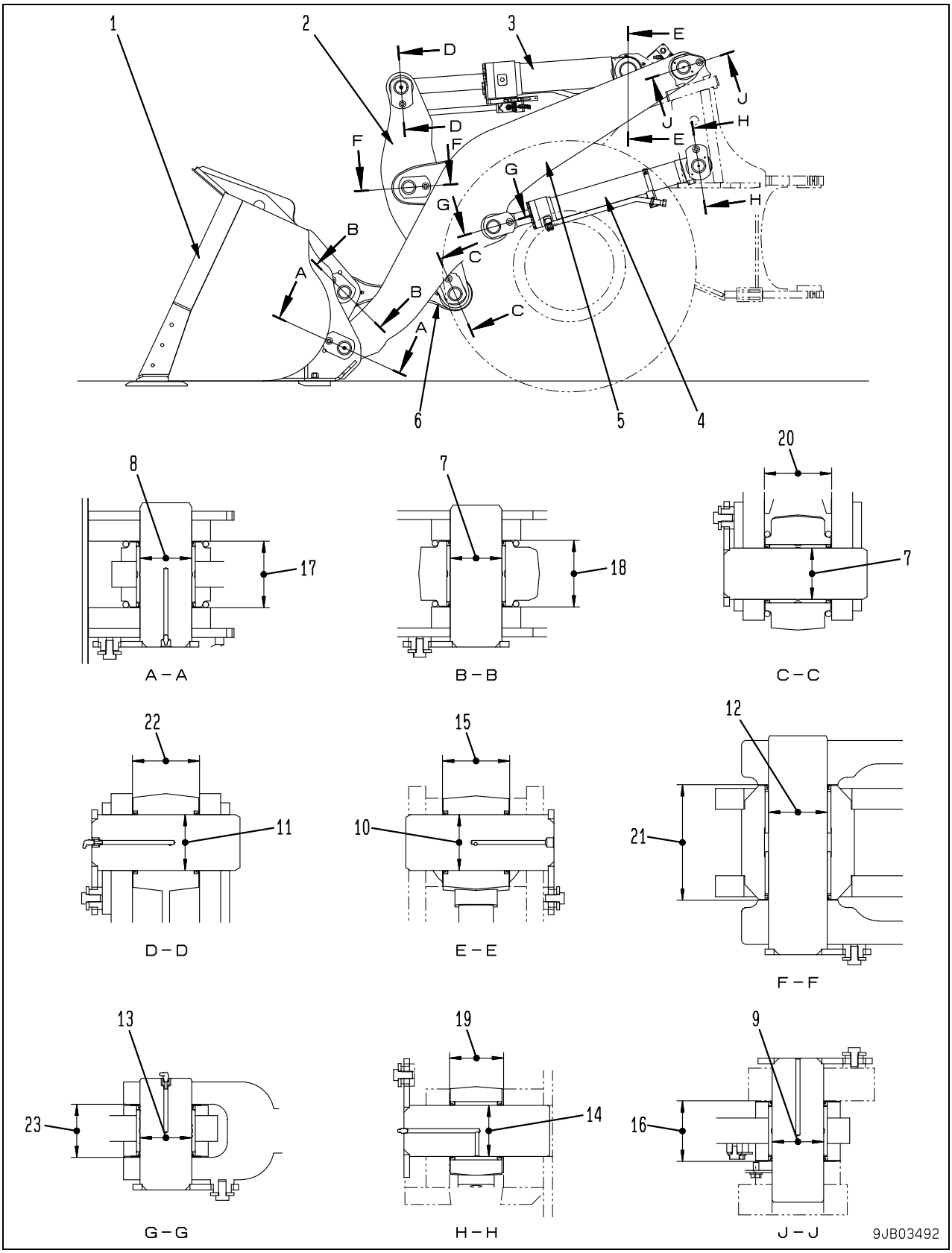
9JS06657

1. Unload valve
2. Main relief valve
3. LS bypass plug


TS1
TS2
P
PR
TS3
CR
9JS04188

Work equipment linkage

★ Figure indicates WA480-6.



1. Bucket
2. Bell crank

1. Hot water supply piping
2. Power train oil cooler
3. Condenser
4. Receiver
5. Hot water return piping
6. Compressor
7. Refrigerant piping
8. External air filter
9. Internal/external air changeover damper
10. Blower unit
11. Air conditioner unit
12. Dual pressure switch
13. Air outlet duct
14. Cool and hot box (if equipped)
15. Internal air filter
16. Solar radiation sensor
    (machines equipped with automatic air conditioner)

Specifications

Refrigerant used	R134a
Refrigerant refilling volume (g)	1,100

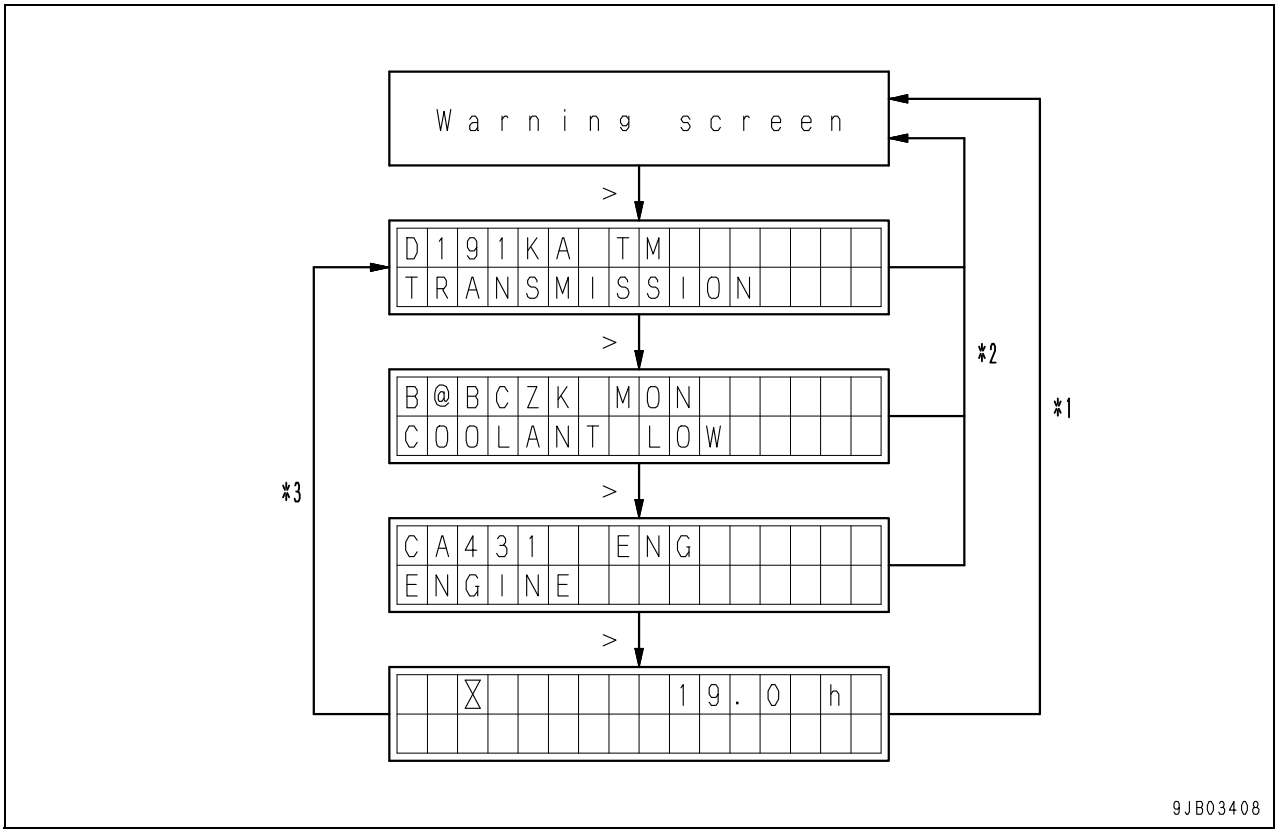
WA470-6, WA480-6 Wheel loader

Form No. SEN01309-02

Failure code screen (1st layer)

- Pressing the “>” switch when the Warning screen is on display changes display to the Failure code screen.
- If multiple failure codes are present, each pressing of the “>” switch displays them from the item of higher priority downward. If items have the same priority, the item that occurred most recently will be displayed first.

Example of a failure code screen (Simultaneously occurring errors: D191KA, B@BCZK, CA431)



*1: The screen automatically returns to the Warning screen if the switch is not pressed more than 10 seconds in the Normal screen display.

*2: The screen returns to the Warning screen if the switch is not pressed more than 30 seconds in the failure code screen or if a new alarm is turned ON.

*3: Pressing the “>” switch in the Normal screen before 10 seconds lapse changes display to the initial failure code screen.

AMP070-18P(1) [CN-L52]

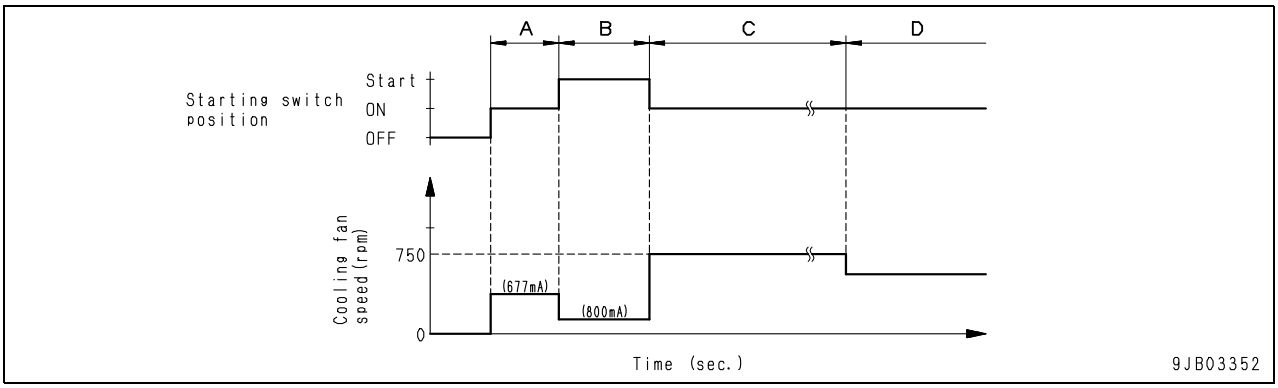
Pin No.	Specification	I/O	Group	Form of use	Signal name	Remarks
1	D_IN_0 (24 V, 5 mA)	I	B	D/I (+24 V)	Head lamp	
2	D_IN_2 (24 V, 5 mA)	I	B	D/I (+24 V)	Starting switch C signal	
3	D_IN_4 (24 V, 5 mA)	I	B	D/I (+24 V)	Auto grease A	If equipped
4	D_IN_6 (24 V, 5 mA)	I	B	D/I (+24 V)	—	
5	D_IN_8 (24 V, 5 mA)	I	B	D/I (+24 V)	—	
6	D_IN_10 (24 V, 5 mA)	I	B	D/I (+24 V)	A/B switch	For load meter
7	D_IN_12 (NSW24 V, 5 mA)	I	C	D/I (+24 V)	Turn signal lamp, right	
8	D_IN_14 (NSW24 V, 5 mA)	I	C	D/I (+24 V)	◇ switch	
9	GND	O	—	GND	Signal GND	
10	D_IN_1 (24 V, 5 mA)	I	B	D/I (+24 V)	—	
11	D_IN_3 (24 V, 5 mA)	I	B	D/I (+24 V)	—	
12	D_IN_5 (24 V, 5 mA)	I	B	D/I (+24 V)	Auto grease B	If equipped
13	D_IN_7 (24 V, 5 mA)	I	B	D/I (+24 V)	—	
14	D_IN_9 (24 V, 5 mA)	I	B	D/I (+24 V)	—	
15	D_IN_11 (24 V, 5 mA)	I	B	D/I (+24 V)	+/– switch	For load meter
16	D_IN_13 (NSW24 V, 5 mA)	I	C	D/I (+24 V)	Turn signal lamp, left	
17	D_IN_15 (NSW24 V, 5 mA)	I	C	D/I (+24 V)	■ switch	
18	A_IN_0 (0 – 30 V)	I	H	A/I	Alternator R signal	

AMP070-12P(1) [CN-L53]

Pin No.	Specification	I/O	Group	Form of use	Signal name	Remarks
1	D_IN_16 (24 V/GND, 5 mA)	I	D	D/I (GND)	Brake oil pressure (Front)	
2	D_IN_18 (24 V/GND, 5 mA)	I	D	D/I (GND)	—	
3	D_IN_20 (24 V/GND, 5 mA)	I	D	D/I (GND)	Clogging of air cleaner	
4	D_IN_22 (24 V/GND, 5 mA)	I	D	D/I (GND)	—	
5	D_IN_24 (24 V/GND, 5 mA)	I	E	D/I (GND)	—	
6	GND	O	—	GND	Sensor GND	
7	D_IN_17 (24 V/GND, 5 mA)	I	D	D/I (GND)	Brake oil pressure (Rear)	
8	D_IN_19 (24 V/GND, 5 mA)	I	D	D/I (GND)	—	
9	D_IN_21 (24 V/GND, 5 mA)	I	D	D/I (GND)	—	
10	D_IN_23 (24 V/GND, 5 mA)	I	D	D/I (GND)	⩓ switch	For load meter
11	D_IN_25 (24 V/GND, 5 mA)	I	E	D/I (GND)	—	
12	A_IN_1 (0 – 30 V)	I	H	A/I	Small lamp switch	

Control at start of engine

- At start of the engine, a fan control approach different from the usual temperature-based one is employed.



Range A: When engine is stopped [When starting switch 1-stage “ON“]

- Engine speed is not recognizable as long as it is stopped. Thus, this function sends the command current of 677 mA to the swash plate angle control EPC valve on the pump.

Range B: While cranking is taking place

- While cranking is taking place to start the engine, this function sends the command current of 800 mA to the swash plate angle control EPC valve on the pump in order to reduce the torque needed for starting the engine.

Range C: For 30 seconds from start of engine.

- This function controls the pump swash plate angle in such that the fan minimum speed may be set to 750 rpm or equivalent. Setting the fan speed at this level allows the cooling fan pump to feed enough refilling oil to the brake accumulator.

★ When the fan speed exceeded 750 rpm because of the temperature condition, precedence is given to the basic control.

Range D: Basic control

- Denotes the ordinary fan control as described in the section of “Fan speed in accordance with temperature”.

Fan reverse rotation function

- As the fan reverse rotation switch is pressed for cleaning of the radiator core, the cooling fan reverse rotation solenoid valve of the cooling fan motor is activated, and the fan starts rotating in reverse.

1. Fan manual reverse rotation function
   The operator can select the fan rotation direction as he chooses by setting the fan reverse rotation switch to “MANUAL”.
   As long as switching of the fan rotation direction is taking place, the pilot lamps of the fan reverse rotation switch and the machine monitor keep blinking to inform the operator that the switching is underway. And when the fan rotation is reversed responding to the high engine speed, high coolant or oil temperature, this lamp also keeps on blinking until the preparation for switching is completed.
   As the fan rotation switching condition is met, this function sends the accelerator opening ratio-restricting signal to the engine controller so that the engine speed may not reach 1,200 rpm or above while the switching is underway.
   As long as the fan reverse rotation is continued, the pilot lamp of the fan reverse rotation switch and the machine monitor remains turned on.

Operation of directional selector switch functions

- If the joystick console is tilted forward and the joystick ON/OFF switch is set in the “ON” position, the command current is sent to the transmission controller to make the directional selection signal of the directional selector switch effective.
- Whenever operating the joystick ON/OFF switch, be sure to set the directional lever and the directional selector switch to “N (Neutral)”. It is an indispensable safety measure. If the joystick ON/OFF switch was operated when any of above lever or switch is not set to “N (Neutral)”, the directional selector pilot lamp of the machine monitor starts flashing, triggering the alarm buzzer.
- When the directional selection from the directional selector switch is available, the machine monitor's directional selector pilot lamp and the pilot lamp contained in the joystick ON/OFF switch come on.
- When the directional selection from the directional selector switch is enabled, setting the directional lever to “F (Forward)” or “R (Reverse)” gives precedence to the directional selection by use of the directional lever. In this case, the system judges an abnormal directional selection is performed, flashing the machine monitor's directional selector pilot lamp and activating the alarm buzzer.
- Flashing of the machine monitor's directional selector pilot lamp and the alarm buzzer sounds can be reset only by setting both the directional lever and the directional selector switch to “N (Neutral)”. Until then, operation from the directional selector switch remains unacceptable.
- The following table shows the directional selection available from the lever and switches under respective operating conditions.

	Operating conditions				Directional selection operation	Function of directional selector switch	Machine monitor output	
	Directional lever	Directional selector switch	Joystick ON/OFF switch	(*1) Joystick console position			Directional selector pilot lamp	Alarm buzzer
Directional lever operation	All range (F/N/R)	N	OFF	Forward/ Reverse	Precedence is given to directional lever	Disabled	OFF	Stopped
Directional selector switch operation	N	All range (F/N/R)	ON	Forward	Precedence is given to directional selector switch	Enabled	ON	Stopped
Precedence is given to directional lever	Other than N (F/R)	All range (F/N/R)	ON	Forward	Precedence is given to directional lever	Disabled	Blinks	Sounded
Directional lever operation error (Operational error)	All range (F/N/R)	Other than N (F/R)	OFF	Forward/ Reverse	Precedence is given to directional lever	Disabled	Blinks	Sounded
Actuation switch operation error (Operational error)	Other than N (F/R)	Other than N (F/R)	Alternate ON/OFF operation	Forward	Precedence is given to directional lever	Disabled	Blinks	Sounded

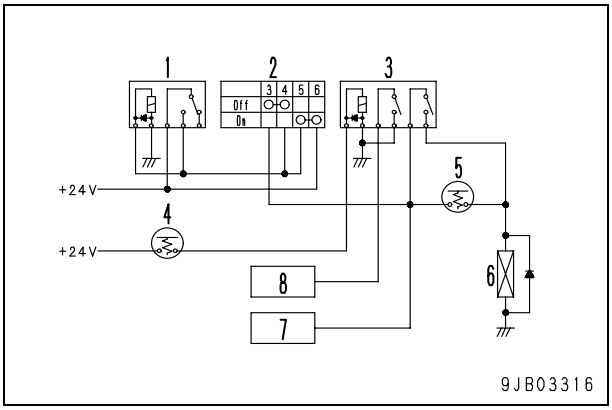
*1: While the joystick console is tilted back, the joystick steering system is ineffective.

Safety function at start of engine

- When the joystick ON/OFF switch is set to “ON” when starting of the engine, be sure to set the directional selector switch to “N (Neutral)”. Otherwise, the signal sent to the transmission controller neutral safety relay will cut off the starting motor circuit, disabling starting of the engine.

Parking brake circuit

Operation



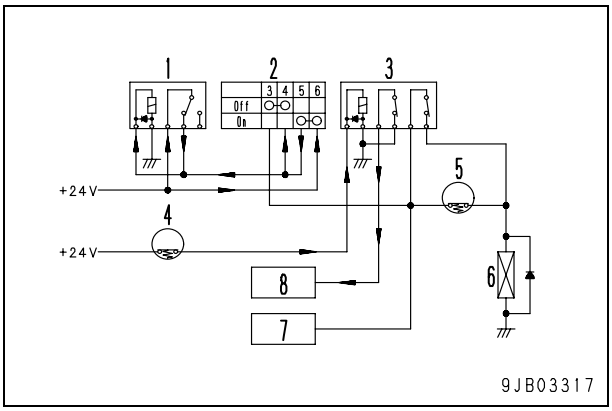
1. Parking brake relay
2. Parking brake switch
3. Brake oil pressure caution relay
4. Rear brake oil pressure switch
5. Emergency brake oil pressure switch
6. Parking brake solenoid valve
7. Transmission controller
8. Machine monitor

When starting switch is turned “OFF”

- Turning the starting switch “OFF” opens contact of parking brake relay (1). Thus, current to the parking brake circuit is stopped and operation of the parking brake is started. Accordingly, when the starting switch is turned “OFF”, current is not conducted to parking brake solenoid valve (6) regardless of the position of parking brake switch (2). And the parking brake remains being applied.

When starting switch is turned “ON”

1. When parking brake switch was turned “ON (applied)” prior to turning “ON” of starting switch



- While parking brake switch (2) is turned “ON (applied)”, current from the battery relay flows through parking brake switch (2) to the coil of parking brake relay (1) and closes the contact.
- As parking brake relay (1) contact is closed, current from the battery relay keeps on flowing to the coil, holding the relay contact, until current from the battery relay is cut off.
- At this time, current does not flow to parking brake solenoid valve (6). Thus, the parking brake remains being applied.
- Recognizing the operation signal from parking brake switch (2), transmission controller (7) sets the transmission to the neutral as long as the parking brake is applied so that its dragging may not result.
- Turning “OFF (released)” the parking brake switch then conducts current from the battery relay through parking brake relay (1), parking brake switch (2), emergency brake oil pressure switch (5) to parking brake solenoid valve (6) to release the parking brake.

Machine model						WA470, 480-6			
Category	Item		Measurement condition		Unit	Standard value for new machine		Service limit value	
						WA470-6	WA480-6	WA470-6	WA480-6
Transmission, torque converter	Main relief pressure		• Engine speed: Low idle	• Torque converter oil temperature: Within operating range (60 – 80°C)	MPa {kg/cm²}	2.78 ± 0.2 {28.3 ± 2}		2.78 ± 0.2 {28.3 ± 2}	
			• Engine speed: 2,000 rpm			2.93 ± 0.2 {29.9 ± 2.0}		2.93 ± 0.2 {29.9 ± 2.0}	
	Torque converter relief (inlet) oil pressure					Max. 0.93 {Max. 9.5}		Max. 0.93 {Max. 9.5}	
	Torque converter outlet port oil pressure					0.59 ± 0.05 {6 ± 0.5}		0.59 ± 0.05 {6 ± 0.5}	
	ECMV output (clutch) oil pressure	1st, 2nd, 3rd, 4th	• Torque converter oil temperature: Within operating range (60 – 80°C) • Engine speed: 2,000 rpm • Manual switch: ON			2.31 ± 0.15 {23.5 ± 1.5}		2.31 ± 0.15 {23.5 ± 1.5}	
		F – R				2.06 ± 0.15 {21.0 ± 1.5}		2.06 ± 0.15 {21.0 ± 1.5}	
		Lockup (if equipped)				2.40 ± 0.15 {24.5 ± 1.5}		2.40 ± 0.15 {24.5 ± 1.5}	
Steering	Steering relief pressure		• Hydraulic oil temperature: Within operating range • Engine speed: High idle		MPa {kg/cm²}	24.5 ± 1.23 {250 ± 12.5}		24.5 (+1.23/–2.45) {250 (+12.5/–25)}	
	Steering control pressure		• Hydraulic oil temperature: Within operating range • Engine speed: Low idle • Steering wheel: Neutral			1.1 – 1.3 {11 – 13}		0.9 – 1.5 {9 – 15}	
Accumulator	Charge cut-in pressure		• Engine speed: Low idle • Hydraulic oil temperature: Within operating range	• Point where brake oil pressure warning lamp goes out	MPa {kg/cm²}	5.9 (+0.5/0) {60 (+5/0)}		5.9 (+0.98/–0.5) {60 (+10/–5)}	
	Charge cut-out pressure			• Point where oil pressure is going up and then starts to go down		9.8 (+0.98/0} {100 (+10/0)}		9.8 (+1.5/–0.5} {100 (+15/–5)}	
Power transmitting system	Travel speed (Bucket empty)	FORWARD	P-mode	1st	km/h	6.3 ± 0.3	6.3 ± 0.3	6.3 ± 0.4	6.3 ± 0.4
				2nd		12.1 ± 0.6	12.2 ± 0.6	12.1 ± 0.8	12.2 ± 0.9
				3rd		21.7 ± 1.1	21.7 ± 1.1	21.7 ± 1.5	21.7 ± 1.5
				4th		34.9 ± 1.7	34.5 ± 1.7	34.9 ± 2.4	34.5 ± 2.4
			E-mode	1st		5.3 ± 0.3	5.7 ± 0.3	5.3 ± 0.4	5.7 ± 0.4
				2nd		10.2 ± 0.5	11.0 ± 0.6	10.2 ± 0.7	11.0 ± 0.8
				3rd		18.1 ± 0.9	19.5 ± 1.0	18.1 ± 1.3	19.5 ± 1.4
				4th		27.3 ± 1.4	30.8 ± 1.5	27.3 ± 1.9	30.8 ± 2.2

Testing exhaust gas color

★ Measuring instruments for exhaust gas color

Symbol		Part No.	Part Name
A	1	799-201-9001	Handy smoke checker
	2	Commercially available	Smoke meter

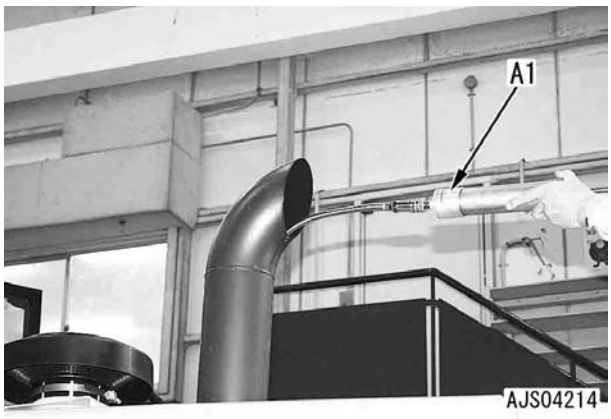
⚠ **When installing and removing the measuring instruments, take care not to touch a hot part.**

★ If an air source and an electric power source are not available in the field, use handy smoke checker **A1**. When recording official data, use smoke meter **A2**.

★ Measure the exhaust gas color under the following condition.
- Engine coolant temperature: Within operating range

1. Measuring with handy smoke checker A1

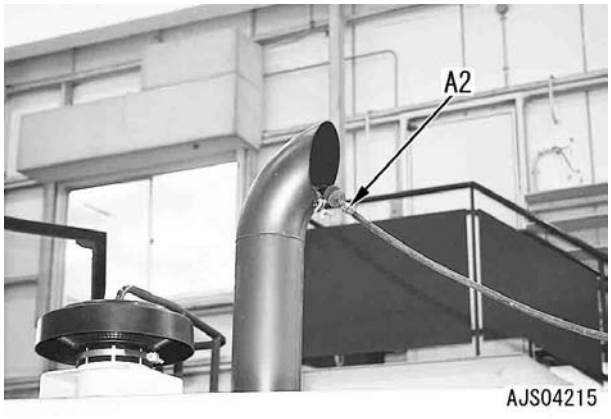
1) Stick a sheet of filter paper to smoke checker **A1**.
2) Insert the exhaust gas intake pipe in the muffler (exhaust pipe).
3) Start the engine and heighten the engine coolant temperature to the operating range.
4) Accelerate the engine suddenly or run it at high idle and operate the handle of smoke checker **A1** so that the filter paper will absorb the exhaust gas.



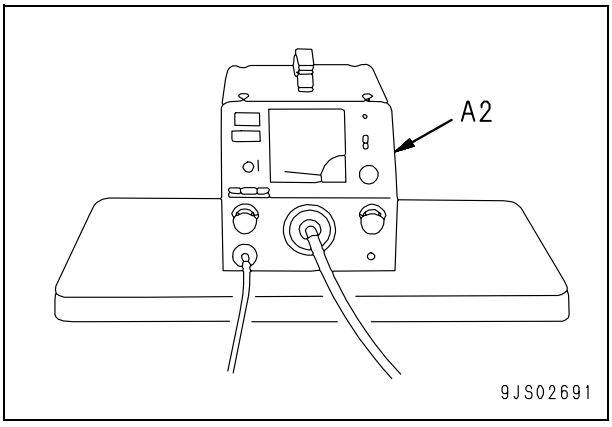
5) Take out the filtering paper and compare it with the attached scale for judgement.
6) Remove the measurement tool after the measurement, and make sure that the machine is back to normal condition.

2. Measuring with smoke meter A2

1) Insert the probe of smoke meter **A2** in the outlet of the muffler (exhaust pipe) and fix it to the exhaust pipe with a clip.



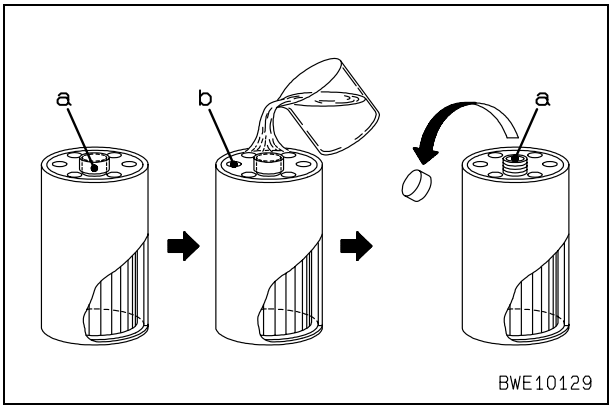
2) Connect the probe hose, receptacle of the accelerator switch, and air hose to smoke meter **A2**.
   ★ Keep the pressure of the supplied compressed air at 1.5 MPa {15 kg/cm^2} or below.
3) Connect the power cable to a 100 V AC receptacle.
   ★ Confirm that the smoke meter power switch is in the OFF position, before connecting the power cable to an outlet.
4) Loosen the cap nut of the suction pump and fit the filter paper.
   ★ Fit the filter paper securely so that the exhaust gas will not leak.
5) Turn on the power switch of smoke meter **A2**.



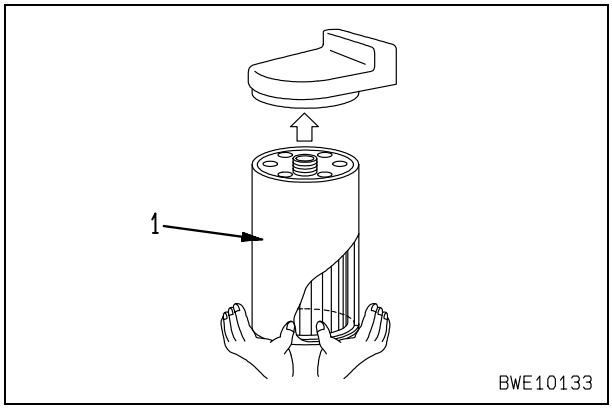
6) Start the engine and keep it running until the engine coolant temperature rises to the operating range.
7) Accelerate the engine suddenly or run it at high idle and press the accelerator pedal of smoke meter **A2** and collect the exhaust gas into the filter paper.
8) Put the polluted filtering paper on non-polluted filtering paper (more than 10 sheets) in the filtering paper holder, and read the indicated value.
9) Remove the measurement tool after the measurement, and make sure that the machine is back to normal condition.

★ Bleed the air as follows if the engine has run out of fuel or the fuel circuit equipment has been removed and installed.

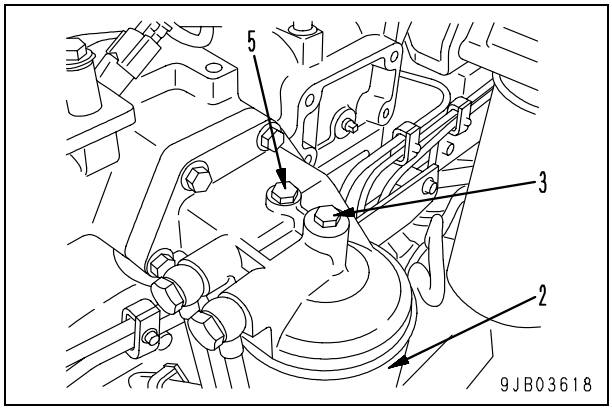
1. Remove fuel pre-fuel filter (1) and fill it with fuel.
   ★ Fill the fuel filter with clean fuel and take care that dirt will not enter it.
   ★ Check that the cap is fitted to part (a) (central hole) of the pre-fuel filter, and then add fuel through part (b) (holes around the central hole).
   ★ After filling the pre-fuel filter with fuel, remove the cap from part (a).
   ★ If clean fuel is not available, do not remove the pre-fuel filter but fill it with the fuel by operating priming pump (4).
   ★ Do not add fuel to fuel main filter (2) externally.



2. Install pre-fuel filter (1) to the filter head.
   ★ Apply engine oil thinly over the packing on the pre-fuel filter side.
   ★ After the packing of the pre-fuel filter touches the sealing face of the filter head, tighten the fuel filter 3/4 turns.

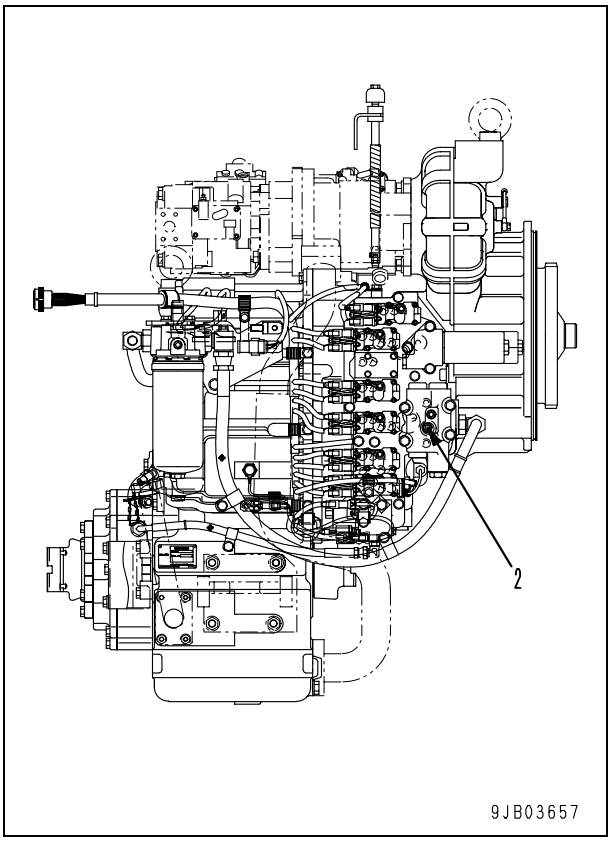


3. Remove air bleeding plug (3) of fuel main filter (2) and operate priming pump (4).
   ★ Operate until fuel flows through plug hole and when fuel is confirmed, install the plug.
   Air bleeding plug:
   7.8 – 9.8 Nm {0.8 – 1.0 kgm}

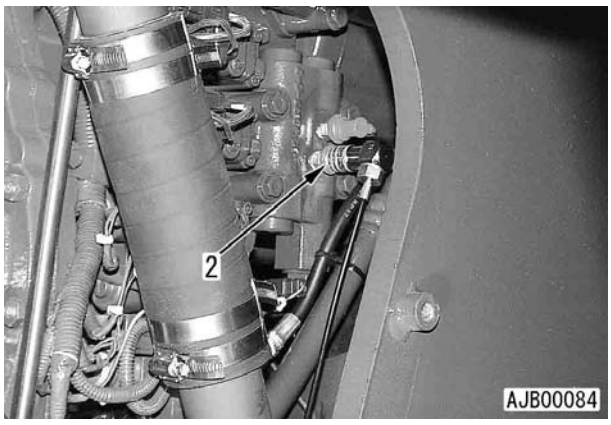


2. Measuring torque converter relief pressure (inlet pressure)

★ Location of torque converter relief pressure (inlet pressure) pickup nipple (2)



1) Connect oil pressure gauge [1] of hydraulic tester **K1** to nipple (2).
   ★ Use the oil pressure gauge of 2.5 MPa {25 kg/cm^2}.



2) Start the engine and keep the directional lever or switch at the N (Neutral) position.
3) While running the engine at 2,000 rpm, measure torque converter relief pressure (inlet pressure).
   ★ Make power mode selector switch “P mode”, and work about WA470-6. (Because engine speed does not reach 2,000 rpm at "E mode".)

4) After finishing measurement, remove the measuring instruments and return the removed parts.

Testing and adjusting steering wheel

★ Testing and adjusting device for steering wheel

Symbol	Part No.	Part name
M	79A-264-0021	Push-pull scale

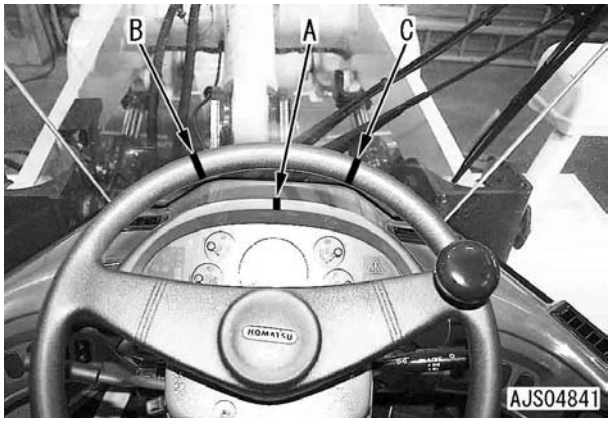
Measuring play of steering wheel

★ Measure the play of the steering wheel under the following condition.
- Engine: Stopped
- Position of machine: Straight travel condition

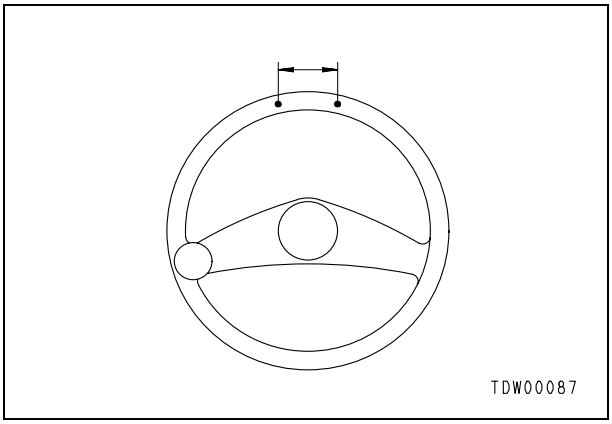
Measuring method

1. Move the steering wheel to the right and left 2 – 3 times and check that the steering wheel is in neutral position, and then make mark (A) on the machine monitor frame.

2. Turn the steering wheel to the right and make mark (B) at a position where the operating effort becomes heavy.



3. Turn the steering wheel to the left and make mark (C) at a position where the operating effort becomes heavy. Then, measure the straight distance between marks (B) and (C).



Measuring operating effort of steering wheel

★ Measure the operating effort of the steering wheel under the following condition.
- Road: Flat, level, paved, and dry road
- Engine coolant temperature: Within operating range
- Hydraulic oil temperature: Within operating range
- Tire inflation pressure: Specified pressure
- Engine: Low idle (No load on bucket)

Measuring method

1. Install push-pull scale **M** to the steering wheel knob.
   ★ Install push-pull scale **M** to the center.

2. Start the engine.
   ★ After starting the engine, raise the bucket about 400 mm and release the frame lock lever.

3. Pull push-pull scale **M** in the tangential direction and read it while the steering wheel is moving smoothly.
   ★ The operating effort is not the value indicated when the steering wheel starts moving.

Testing and adjusting accumulator charge pressure

★ Testing and adjusting instruments for accumulator charge pressure

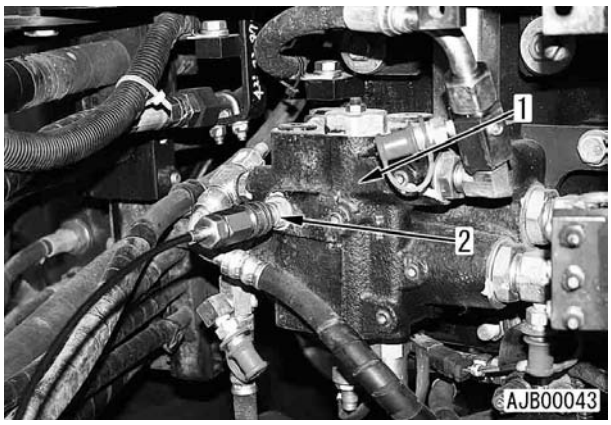
Symbol	Part No.	Part Name
R	799-101-5002	Analog hydraulic tester
	790-261-1204	Digital hydraulic tester

★ Measure the accumulator charge pressure under the following condition.
- Engine coolant temperature: Within operating range
- Hydraulic oil temperature: Within operating range

⚠ **Put chocks under the tires securely.**

Measuring

1. Connect oil pressure gauge [1] of hydraulic tester **R** to accumulator charge pressure pickup plug (2) of accumulator charge valve (1).
   ★ Use the oil pressure gauge of 39.2 MPa {400 kg/cm^2}.



2. Measure the accumulator charge cut-in pressure. While running the engine at low idle, when the brake oil pressure caution lamp on the machine monitor goes off, measure the oil pressure.
   ★ Cut-in pressure: 5.9 (+0.5/0) MPa {60 (+5/0) kg/cm^2}
3. Measure the accumulator charge cut-out pressure. After the accumulator charge cut-in operation, the rising oil pressure gauge lowers suddenly. Measure the oil pressure at this time.
   ★ Cut-out pressure: 9.8 (+0.98/0) MPa {100 (+10/0) kg/cm^2}

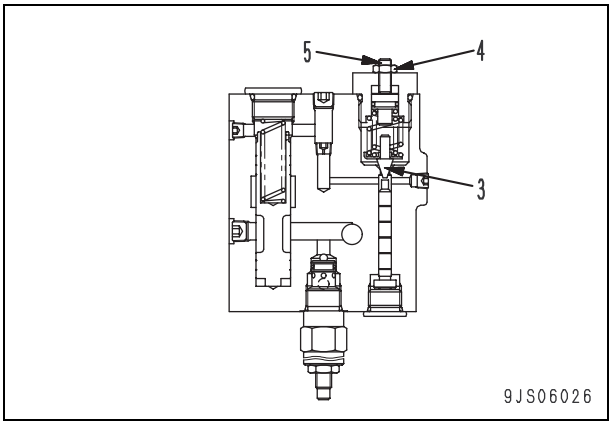
4. After finishing measurement, remove the measuring instruments and return the removed parts.

Adjusting

★ If the accumulator charge cut-out pressure is adjusted, the cut-in pressure changes according to the valve area ratio.

1. Loosen locknut (4) of unload relief valve (accumulator charge cut-out valve) (3) and turn adjustment screw (5) to adjust the pressure.
   ★ If the adjustment screw is
   - Turned to the right, the pressure rises.
   - Turned to the left, the pressure lowers.

   ★ Quantity of adjustment per turn of adjustment screw: 1.45 MPa {14.8 kg/cm^2}
   Locknut: **11.8 – 16.7 Nm {1.2 – 1.7 kgm}**



★ After finishing measurement, check the accumulator charge cut-in and cut-out pressures again according to the above measurement procedure.

5) After finishing measurement, remove the measuring instruments and return the removed parts.

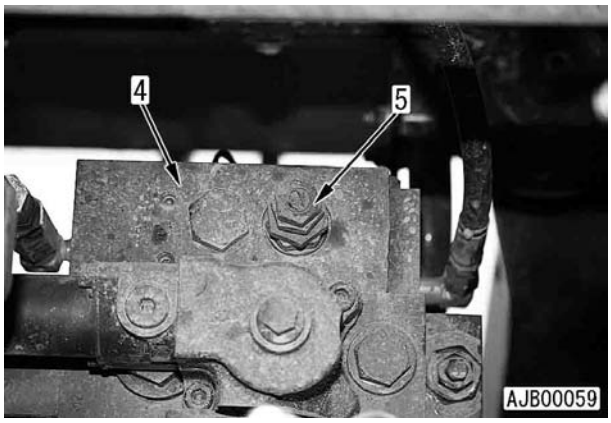
⚠ **After measuring the oil pressure, release the pressure in the circuit according to the procedure for installing the nipple and oil pressure gauge, and then remove the oil pressure gauge and nipple.**

Adjusting

★ The unload valve is not adjustable.

1. Adjusting work equipment relief pressure

1) Adjust main relief valve (5) from work equipment control valve (4).



2) Loosen locknut (6) and turn adjustment screw (7) to adjust the pressure.

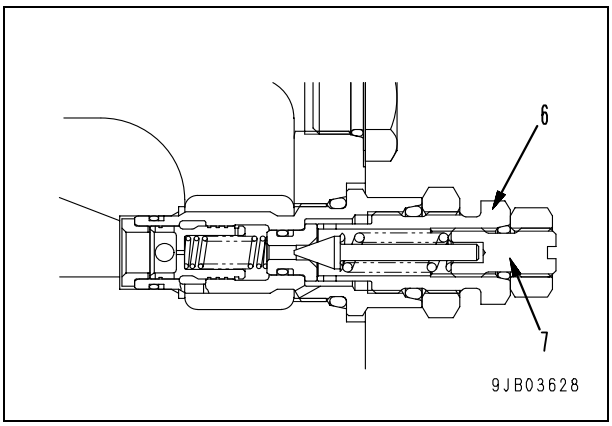
★ If the adjustment screw is
- Turned to the right, the pressure rises.
- Turned to the left, the pressure lowers.

★ Quantity of adjustment per turn of adjustment screw:

12.6 MPa {128 kg/cm^2}

Locknut:

29.4 – 39.2 Nm {3 – 4 kgm}

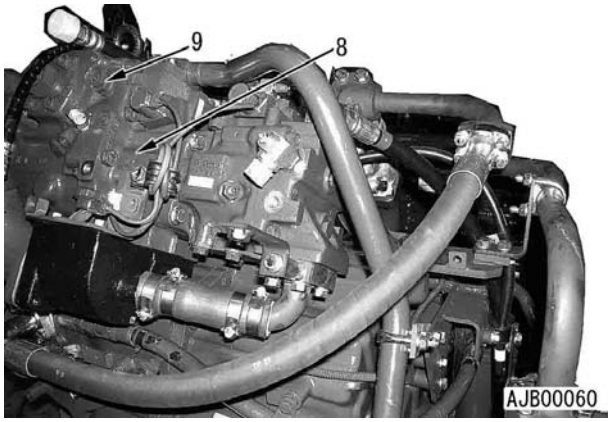


★ After finishing measurement, measure the work equipment relief valve according to the above measurement procedure.

2. Adjusting LS differential pressure

1) Remove the floor frame assembly. For details, see Disassembly and assembly, “Removal and installation of floor frame assembly”.

2) Remove LS valve (9) from work equipment pump assembly (8) and replace it.

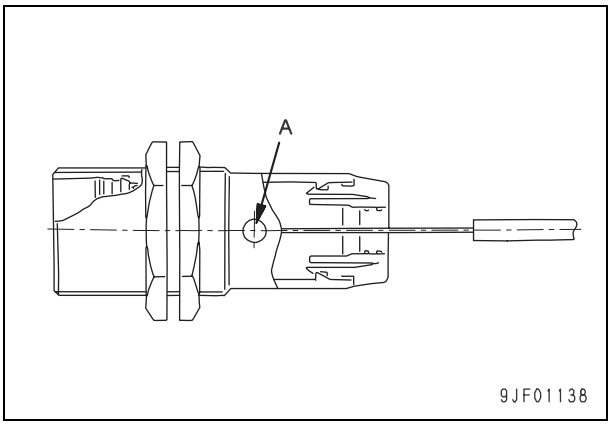


Checking proximity switch operation pilot lamp

Proximity switch operation pilot lamp (Red)

The proximity switch has a pilot lamp to indicate its operating condition. Use this pilot lamp when adjusting the proximity switch.

- A: Operation pilot lamp (Red)



Proximity switch	Positional relationship between sensitive surface of proximity switch and sensing object	Operation pilot lamp	Remarks
Bucket positioner	Near	ON	Operates when center of switch is near
	Far	OFF	
Boom kick-out	Near	ON	Operates when center of switch is far
	Far	OFF	

WHEEL LOADER

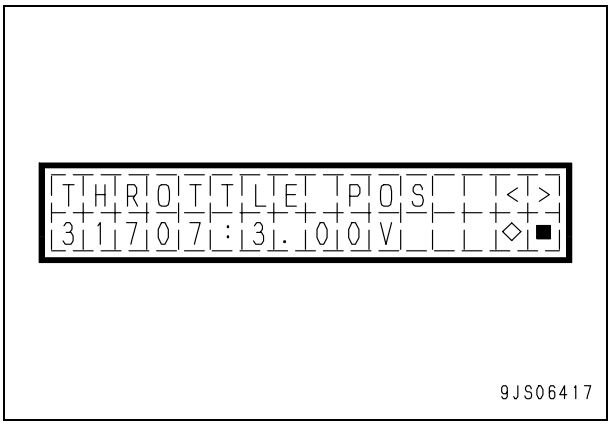
WA470-6
WA480-6

Machine model	Serial number
WA470-6	85001 and up
WA480-6	85001 and up

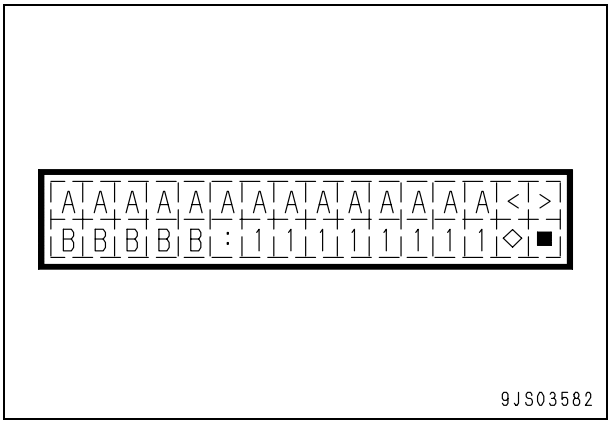
30 Testing and adjusting

Testing and adjusting, Part 3

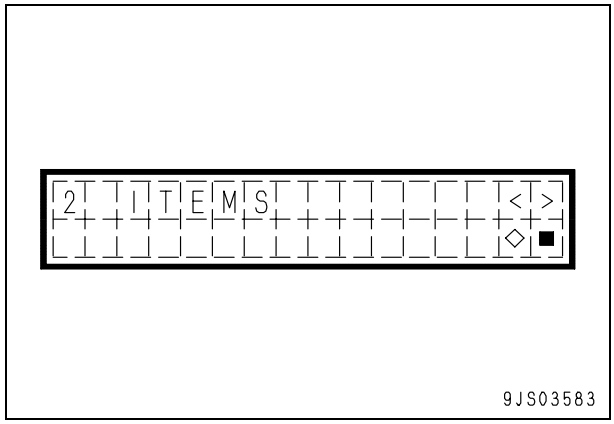
3) Press [<] or [>] switch to select a monitoring item.
★ The monitoring items are scrolled according to the internally set order.
★ Holding down [◇] switch turns on high-speed scrolling.
★ Holding and cancelling the monitoring data: Pressing [◇] switch while the monitoring is in progress holds the monitoring data and [◇] mark starts flashing.Pressing [◇] switch again restores the active state.



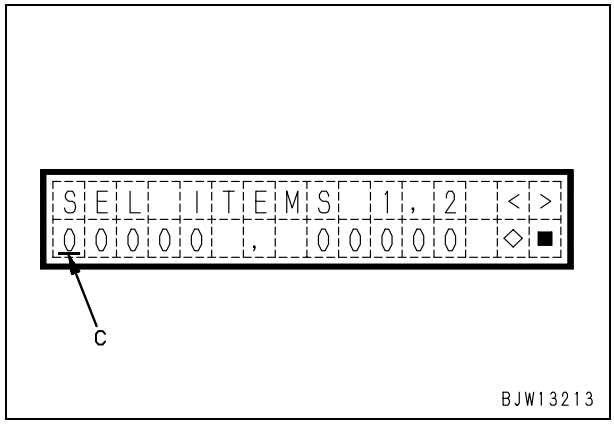
4) Display data for 1 item individual monitoring
The 1 item individual monitoring screen displays the following information.
A: Item display
B: Monitoring codes (5 digits)
1: Monitoring data (including the unit used)
★ See the “Real-time monitoring code list” for details.



4-5. Setting 2 items simultaneous monitoring
1) Select 2 ITEMS from the sub menu screen.
2) Press [◇] switch while the sub menu is selected to display the monitoring code input screen.



1] This cursor (C) is located at the highest-order digit. Pressing [<] or [>] switch changes the value of this digit in the range of 0 – 9.
2] Press [◇] switch when the intended value appeared to specify it as the set value.
★ The cursor moves to the 2nd position.
3] Set the value in the same order and then press [◇] switch.
★When you have entered a wrong value to a position except the highest-order digit (C), the cursor can move to the highest-order digit using [■] switch and repeat the procedure from the first. In this case, values that had been entered remain as they are until modified. When the cursor is at the highest-order digit, it can move to the higher layer using [■] switch.



7-20. Adjustment of interval of fan automatic reverse operation (Automatic reverse fan (if equipped) specification)

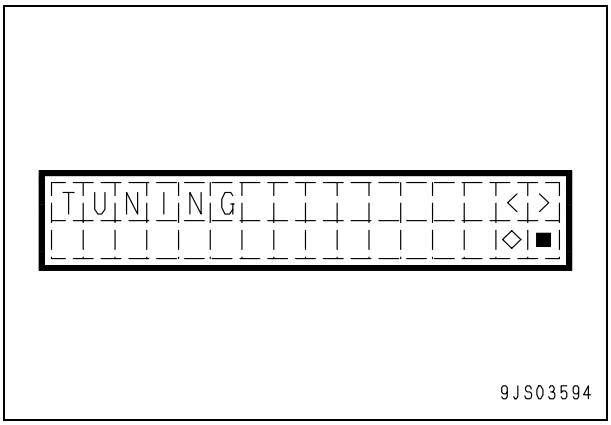
★ This function is used to change the interval of the forward and reverse operations of the fan when the fan automatic reverse operation is selected.

★ The interval of the fan automatic reverse operation is adjustable in the range from 0.1 h (6 minutes) to 200 h. It must be set to at least twice the continuance of the fan automatic reverse operation, however, and cannot be set shorter than twice.

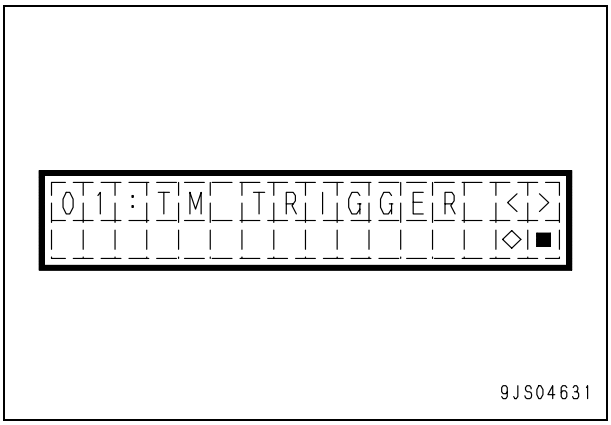
★ When the machine is delivered, the interval of fan automatic reverse operation is set to 2.0 h.

★ When the machine is delivered, the continuance of the fan automatic reverse operation is set to 2 minutes.

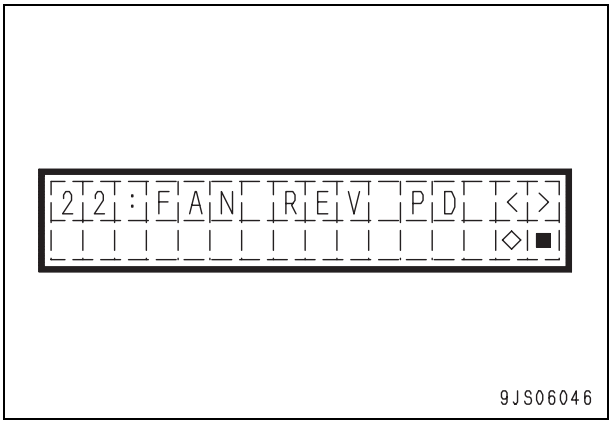
1) On the service mode menu screen, display the TUNING screen.



2) Hold down the [◇] switch for at least 5 seconds to display 01: Transmission trigger adjustment select screen.



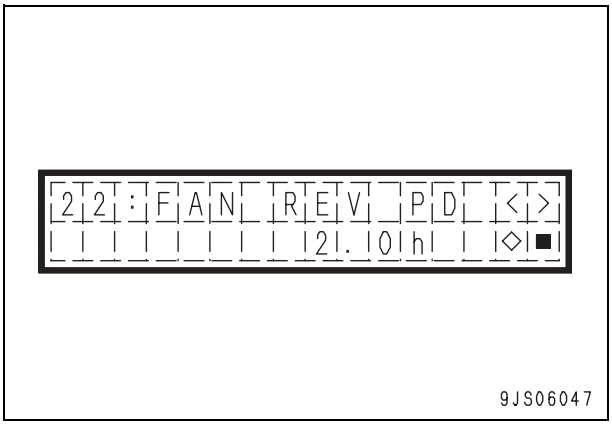
3) With the [<] and [>] switches, select 22: Adjust interval of fan automatic reverse operation.



4) Press the [◇] switch to settle.
   ★ If the [◇] switch is pressed, the screen to adjust the interval of fan automatic reverse operation is displayed.

5) With the [<] and [>] switches, select an interval in the range from “0.1” to “200” (Unit: h).

6) Press the [■] switch to settle the setting.
   ★ The selected interval of fan automatic reverse operation is not changed to a value less than twice the continuance of the fan automatic reverse operation.



Pm-clinic inspection table

WA470-6 Serial No. 85001 and up

	Item	Condition		Unit	Standard value for new machine	Service limit value	Measure-ment result	Good	Bad
Steering	Secure frame with frame lock bar.								
	Steering relief pressure	Engine at high idle		MPa {kg/cm^2}	23.3 – 25.7 {237.5 – 262.5}	22.0 – 25.7 {225 – 262.5}			
Brake	Parking brake inlet pressure	Torque converter oil temperature: Within operating range Engine at low idle As parking brake is released		MPa {kg/cm^2}	Min. 2.27 {Min. 23.1}	Min. 2.27 {Min. 23.1}			
	Parking brake performance	Tire inflation pressure: Specified pressure Test on flat and dry paved slope of 1/5 (11° 20'). Set machine in operating state.		—	Stopped	Stopped			
	Parking brake disc thickness			mm	3.12 – 3.28	2.97			
	Charge cut-in pressure	Hydraulic oil temperature: Within operating range Engine at low idle	Measure when brake oil pressure warning lamp goes off.	MPa {kg/cm^2}	5.9 – 6.4 {60 – 65}	5.4 – 6.88 {55 – 70}			
	Charge cut-out pressure		Measure when brake oil pressure starts lowering after rising.		9.8 – 10.78 {100 – 110}	9.4 – 11.3 {95 – 115}			
	Brake oil pressure	Hydraulic oil temperature: Within operating range Engine at low idle			4.4 – 5.2 {44.8 – 53}	Min. 4.2 {Min. 42.7}			
	Lowering of brake oil pressure	Engine: Stopped Measure lowering of oil pressure from 4.9 MPa {50 kg/cm^2} in 5 minutes.			Max. 0.49 {Max. 5.0}	Max. 0.49 {Max. 5.0}			
	Wheel brake performance	Tire inflation pressure: Specified pressure Test on flat, level, straight, and dry paved road. Braking initial speed: 20 km/h, Delay in pressing pedal: Max 0.1 sec Brake pedal pressing force: Specified force, 293 – 353 Nm {29.9 – 35.9 kg} Measure braking distance.		m	Max. 5	Max. 5			
	Wear of wheel brake disc	Measure with disc wear indicator.		mm	0	Max. 2.4			
Work equipment	Work equipment valve relief pressure	P-mode Hydraulic oil temperature: Within operating range Engine at high idle	Bucket circuit relieved	MPa {kg/cm^2}	32.5 – 36.1 {332 – 368}	29.9 – 36.1 {305 – 368}			
	Work equipment valve LS differential pressure		Work equipment control lever moved halfway		1.17 – 1.57 {12 – 16}	0.98 – 1.76 {10 – 18}			
	Lift arm speed		Rising time	sec	5.3 – 6.3	Max. 7.7			
			Lowering time		3.2 – 4.2	Max. 4.9			
	Bucket tilt back speed		Bucket full stroke time		2.1 – 2.7	Max. 3.2			
			Bucket at level time		1.2 – 1.8	Max. 2.0			
	Hydraulic drift of work equipment	Hydraulic oil temperature: Within operating range Engine: Stopped	Bucket cylinder	mm/ 15 min.	Max. 20	Max. 24			
			Lift cylinder		Max. 30	Max. 36			
Hydraulic drive fan	Max. fan speed	Engine speed: High idle Engine coolant temperature: Min. 95°C Hydraulic oil temperature: Min. 95°C Torque converter oil temperature: Min. 105°C		rpm	1,500 – 1,700	1,400 – 1,800			
	Min. fan speed	Engine speed: Low idle Engine coolant temperature: Max. 75°C Hydraulic oil temperature: Max. 75°C Torque converter oil temperature: Max. 85°C Air conditioner: OFF			550 – 650	500 – 700			
	Fan drive pressure	Engine speed: High idle Engine coolant temperature: Min. 95°C Hydraulic oil temperature: Min. 95°C Torque converter oil temperature: Min. 105°C		MPa {kg/cm^2}	15.6 – 19.0 {158 – 194}	14.7 – 19.9 {150 – 202}			
	Fan reverse solenoid output pressure	Engine speed: High idle Engine coolant temperature: Min. 95°C Hydraulic oil temperature: Min. 95°C Torque converter oil temperature: Min. 105°C			15.6 – 19.0 {158 – 194}	14.7 – 19.9 {150 – 202}			

Fuse locations

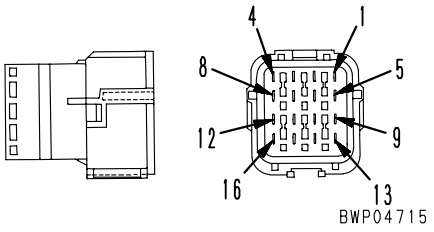
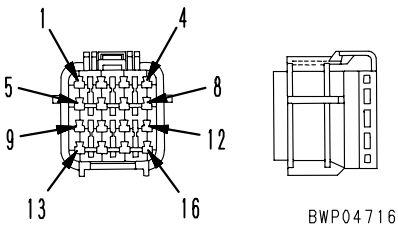
Connection table of fuse box and slow blow fuse

★ This connection table indicates the devices to which the power of the fuse box and slow blow fuse is supplied. (A switch power supply is a device which supplies power while the starting switch is in the ON position and a constant power supply is a device which supplies power while the starting switch is in the OFF and ON positions).

★ When carrying out troubleshooting related to the electrical system, you should check the fuse box and slow blow fuse to see if the power is supplied normally.

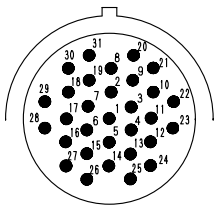
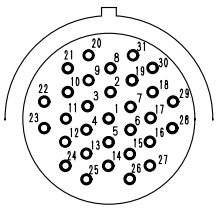
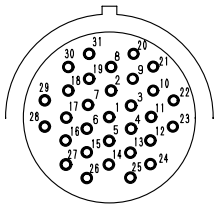
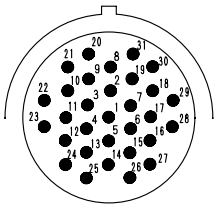
Fuse box 1

Type of power supply	Fuse No.	Capacity of fuse	Destination of power
Constant power supply slow-blow fuse (50 A)	1	20 A	Starting switch terminal B circuit
	2	10 A	Hazard lamp circuit
	3	10 A	Machine monitor (B) circuit KOMTRAX circuit
	4	10 A	Room lamp circuit
	5	5 A	Transmission controller (B) circuit Work equipment controller (B) circuit (if equipped)
	6	30 A	Engine controller (A) circuit
	7	10 A	Spare 1
Switch power supply slow-blow fuse (50 A)	8	10 A	Front working lamp circuit
	9	10 A	Rear working lamp circuit
	10	20 A	Car radio circuit and 12 V converter circuit
	11	10 A	Turn signal lamp circuit
	12	20 A	Yellow rotary lamp circuit (if equipped)
	13	10 A	KOMTRAX (A) circuit (if equipped)
	14	20 A	Rear glass heater circuit
Switch power supply starting switch ACC	15	5 A	Engine controller (B) circuit

No. of pins	SWP type connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
16	 BWP04715	 BWP04716	799-601-7320 (T-adapter)
	Part No. : 08055-11681	Part No. : 08055-11691	
—	Terminal part No. : ·Electric wire size: 0.85 ·Grommet: Black ·Q'ty: 20	Terminal part No. : ·Electric wire size: 0.85 ·Grommet: Black ·Q'ty: 20	—
—	Terminal part No. : ·Electric wire size: 1.25 ·Grommet: Red ·Q'ty: 20	Terminal part No. : ·Electric wire size: 1.25 ·Grommet: Red ·Q'ty: 20	—

B4D18192

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

Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	Testing connection use special tool Part No.
24-31 (9)	Pin (male terminal)	Socket (female terminal)	799-601-9290 (T-adapter)
	 BWP05033	 BWP05034	
	Part No. :08191-91203, 08191-91204, 08191-91205, 08191-91206	Part No. :08191-94103, 08191-94104, 08191-94105, 08191-94106	
	Socket (female terminal)	Pin (male termial)	799-601-9290 (T-adapter)
	 BWP05035	 BWP05036	
	Part No. :08191-92203, 08191-92204, 08191-92205, 08191-92206	Part No. :08191-93103, 08191-93104, 08191-93105, 08191-93106	

B4D18409

T- branch box and T- branch adapter table (Rev. 2009.03)

★ The vertical column indicates a part number of T-branch box or T-branch adapter while the horizontal column indicates a part number of harness checker assembly.

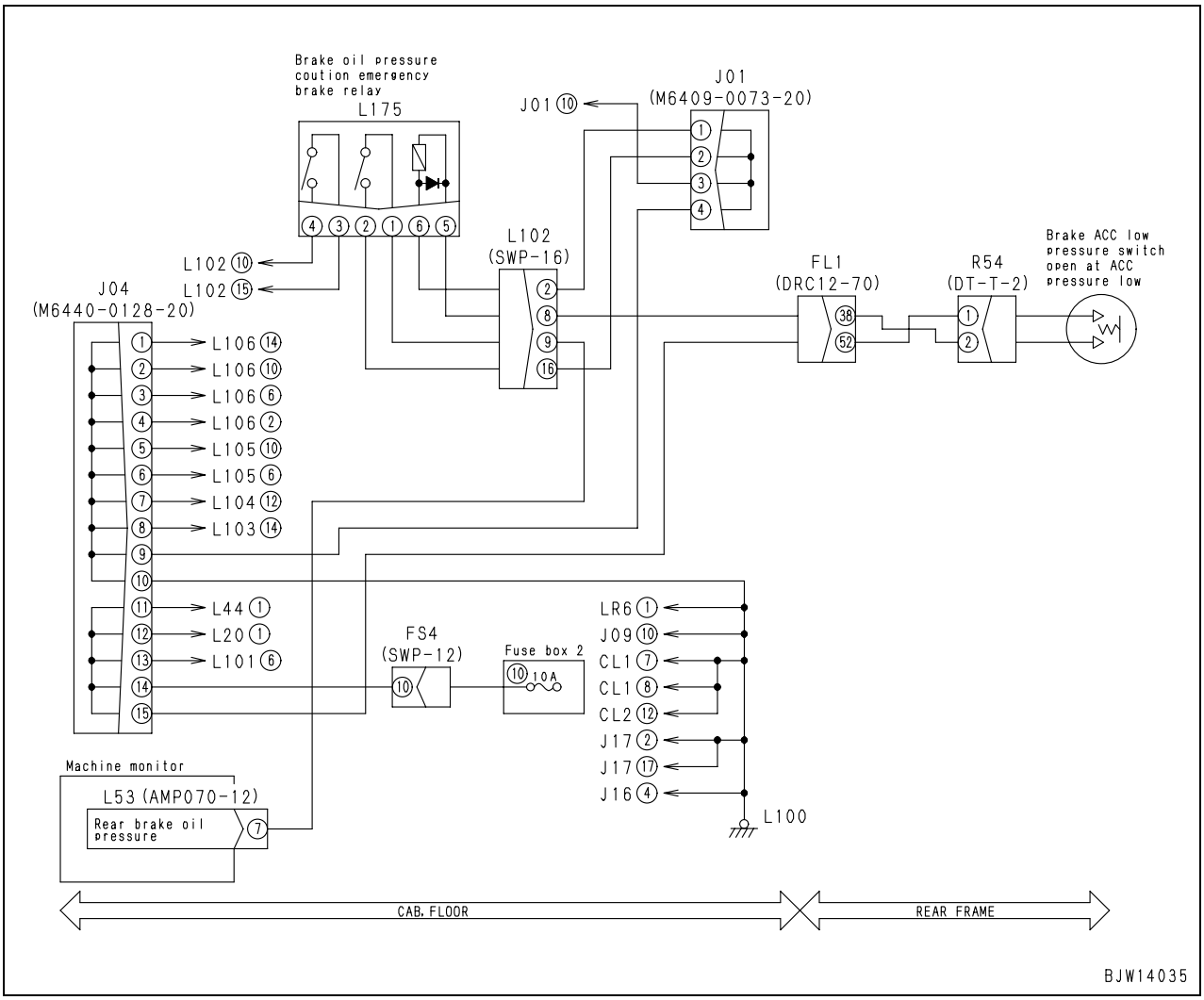
Part No.	Part name	Number of pins	Identification symbol	T-adapter kit														Out of kit
				799-601-2500	799-601-2700	799-601-2800	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	799-601-4101	799-601-4201	
799-601-2600	T-box (for ECONO)	21		●		●		●	●		●							
799-601-3100	T-box (for MS)	37																●
799-601-3200	T-box (for MS)	37																●
799-601-3380	Plate for MS (14-pin)																	●
799-601-3410	Adapter for BENDIX (MS)	24	MS-24P															●
799-601-3420	Adapter for BENDIX (MS)	24	MS-24P															●
799-601-3430	Adapter for BENDIX (MS)	17	MS-17P															●
799-601-3440	Adapter for BENDIX (MS)	17	MS-17P															●
799-601-3450	Adapter for BENDIX (MS)	5	MS-5P															●
799-601-3460	Adapter for BENDIX (MS)	10	MS-10P															●
799-601-3510	Adapter for BENDIX (MS)	5	MS-5P															●
799-601-3520	Adapter for BENDIX (MS)	17	MS-17P															●
799-601-3530	Adapter for BENDIX (MS)	19	MS-19P															●
799-601-2910	Adapter for BENDIX (MS)	14	MS-14P															●
799-601-3470	Case																	●
799-601-2710	Adapter for MIC	5	MIC-5P	●	●				●									
799-601-2720	Adapter for MIC	13	MIC-13P	●	●				●									
799-601-2730	Adapter for MIC	17	MIC-17P	●	●	●		●	●		●							
799-601-2740	Adapter for MIC	21	MIC-21P	●	●	●		●	●		●							
799-601-2950	Adapter for MIC	9	MIC-9P				●	●	●		●							
799-601-2750	Adapter for ECONO	2	ECONO2P	●	●													
799-601-2760	Adapter for ECONO	3	ECONO3P	●	●													
799-601-2770	Adapter for ECONO	4	ECONO4P	●	●													
799-601-2780	Adapter for ECONO	8	ECONO8P	●	●													
799-601-2790	Adapter for ECONO	12	ECONO12P	●	●													
799-601-2810	Adapter for DLI	8	DLI-8P	●	●													
799-601-2820	Adapter for DLI	12	DLI-12P	●	●													
799-601-2830	Adapter for DLI	16	DLI-16P	●	●													
799-601-2840	Extension cable (ECONO type)	12	ECONO12P	●	●				●									
799-601-2850	Case			●														
799-601-4350	T-box (for DRC 60, ECONO)	60														●		
799-601-4360	Case															●		
799-601-7010	Adapter for X (T-adapter)	1							●		●							
799-601-7020	Adapter for X	2	X2P				●	●	●		●							
799-601-7030	Adapter for X	3	X3P				●	●	●		●							
799-601-7040	Adapter for X	4	X4P				●	●	●		●							
799-601-7050	Adapter for SWP	6	SW6P				●	●	●									
799-601-7060	Adapter for SWP	8	SW8P				●	●	●									
799-601-7310	Adapter for SWP	12	SW12P															●
799-601-7070	Adapter for SWP	14	SW14P						●		●							
799-601-7320	Adapter for SWP	16	SW16P															●
799-601-7080	Adapter for M (T-adapter)	1							●		●							
799-601-7090	Adapter for M	2	M2P				●	●	●		●							
799-601-7110	Adapter for M	3	M3P				●	●	●		●							

Failure code [15SELH] (ECMV 1st clutch: When command current is ON, fill signal is OFF)

Action code	Failure code	Trouble	ECMV 1st clutch: When command current is ON, fill signal is OFF (Transmission controller)
E01	**15SELH**		
Contents of trouble	• When 1st ECMV solenoid output is turned ON, 1st ECMV fill switch signal ON is not input.		
Action of controller	• Judges that the 1st ECMV fill switch signal is turned OFF. • If problem is removed, system is returned to normal operating state.		
Problem that appears on machine	• The machine may not travel at 1st speed. • When the 1st gear speed is changed, a shock or a time lag may be made.		
Related information	• This failure code may also be displayed immensely after replacement of the transmission oil. • The output state (current value) to the 1st clutch ECMV solenoid can be checked with the monitoring function (Code: 31602, ECMV 1 DIR). • The input state (ON/OFF) from the 1st fill switch can be checked with the monitoring function (Code: 40908, D-IN-26). • Method of reproducing failure code: Start the engine, set the manual/auto shift selector switch in the MANUAL position, set FNR (directional) lever, joystick steering FNR (directional) switch or right FNR (directional) switch to the F (forward) or R (reverse), then set shift lever to 1st speed position.		

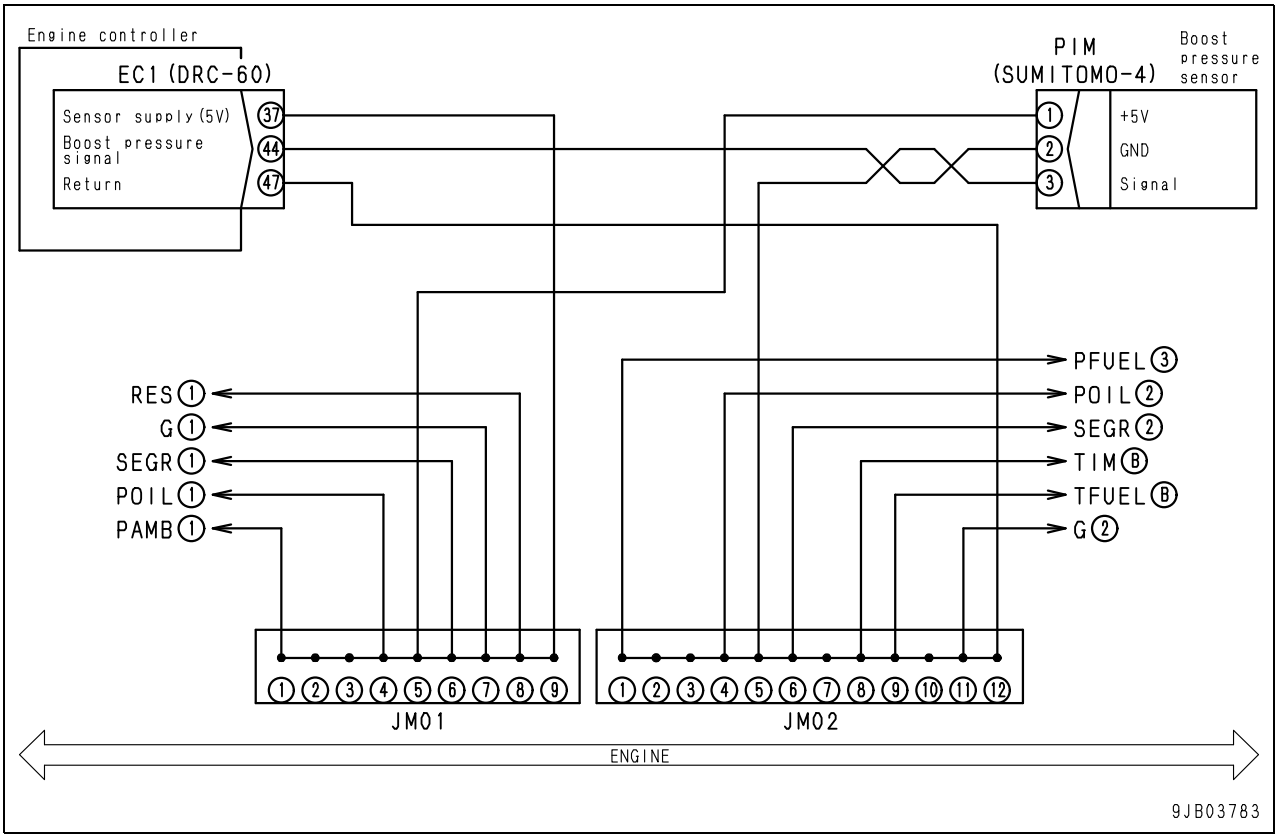
	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	1st clutch oil pressure error	This failure code is displayed if 1st clutch oil pressure were absent when 1st ECMV solenoid output is turned ON. (See Troubleshooting of hydraulic and mechanical system (H-mode)			
	2	Defective 1st ECMV fill switch (Internal disconnection)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting. • Turn transmission cut-off switch OFF. • Turn parking brake switch OFF. • Keep pressing brake pedal to prevent machine from traveling.			
			1.SW (male)	Shift lever	Resistance	
			Between (1) and chassis ground	1st (1st speed)	Max. 1 Ω	
				Other than above	Min. 1 MΩ	
	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 harnesses between L62 (female) (17) – 1.SW (female) (1)		Resistance	Max. 1 Ω
	4	Defective transmission controller	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting. • Turn transmission cut-off switch OFF. • Turn parking brake switch OFF. • Keep pressing brake pedal to prevent machine from traveling. • Set the auto shift and manual shift selector switch in the MANUAL position. • Set FNR (directional) lever, joystick steering FNR (directional) switch or right FNR (directional) switch to the F (forward) or R (reverse) position.			
			L62	Shift lever	Voltage	
			Between (17) and chassis ground	1st (1st speed)	Max. 1 V	
				Other than above	8 – 10 V	

Circuit diagram related to brake accumulator



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 starting switch ON.		
			Wiring harness between EC1 (female) (37) – PIM (female) (1) and between EC1 (female) (47) – PIM (female) (2)	Resis-tance	Min. 1 MΩ
			Wiring harness between EC1 (female) (37) – PIM (female) (1) and between EC1 (female) (44) – PIM (female) (3)	Resis-tance	Min. 1 MΩ
			Wiring harness between EC1 (female) (47) – PIM (female) (2) and between EC1 (female) (44) – PIM (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 charge pressure sensor

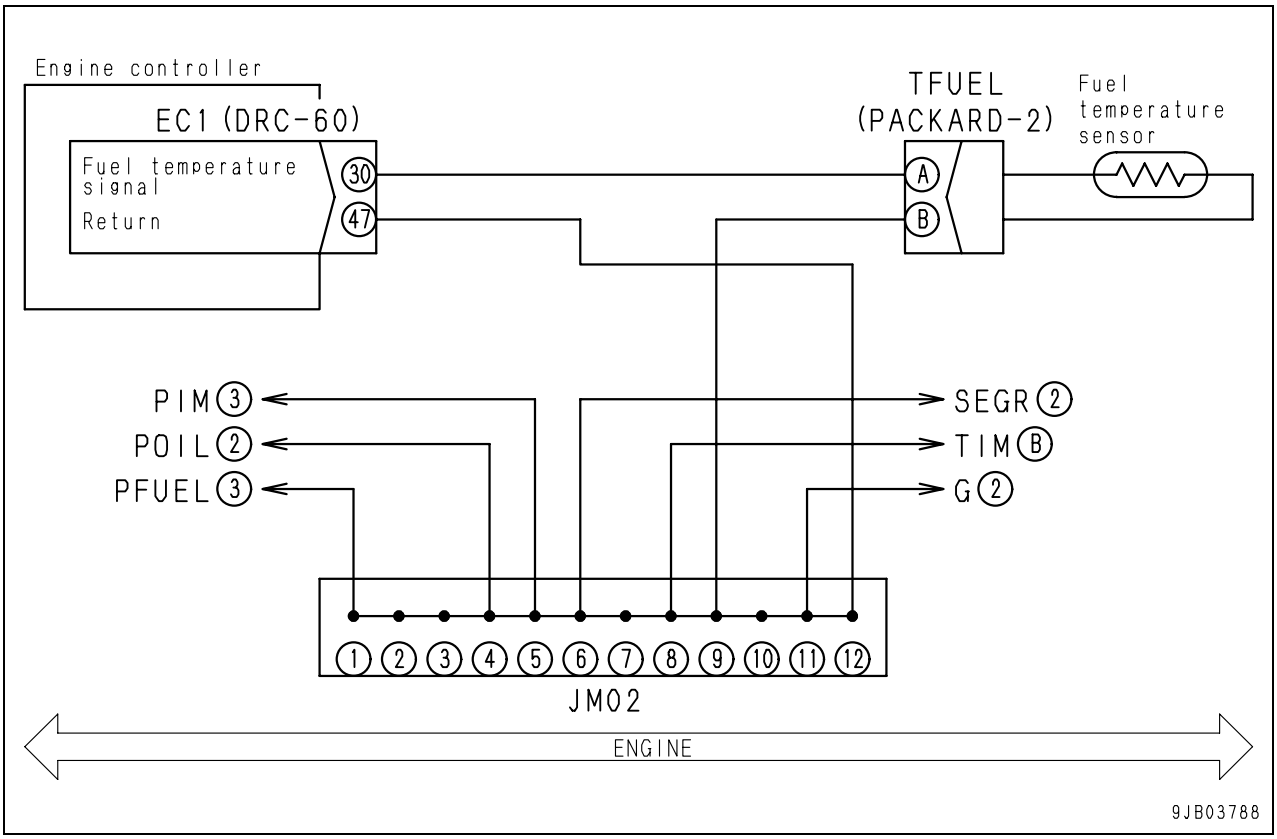


Failure code [CA154] (Charge temperature sensor low error)

Action code	Failure code	Trouble	Charge temperature sensor low error (Engine controller system)
E01	**CA154**		
Contents of trouble	• Low voltage is detected in temperature signal circuit of boost pressure sensor and temperature sensor.		
Action of controller	• Fixes charge temperature (boost temperature) at 70°C and continues operation.		
Problem that appears on machine	• Exhaust smoke becomes white. • Boost temperature-based engine protection function does not function.		
Related information	• The input state (temperature) from the charge temperature sensor (boost temperature sensor) can be checked with the monitoring function (Code: 18500, CHG TEMP). • The input state (voltage) from the charge temperature sensor (boost temperature sensor) can be checked with the monitoring function (Code: 18501, CHG 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	Defective [temperature signal circuit] of boost pressure sensor, temperature sensor (Internal trouble)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			TIM (male)	Temperature	Resistance	
			Between (A) and (B)	0°C	29 – 36 kΩ	
				25°C	9 – 11 kΩ	
				40°C	4.9 – 5.8 kΩ	
				100°C	600 – 700 Ω	
			Between (A) and chassis ground	All range	Min. 1 MΩ	
	2	Ground fault in wiring harness (Short circuit with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between EC1 (female) (23) – TIM (female) (A) and chassis ground		Resistance	Min. 1 MΩ
	3	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 among all pins between EC1 (female) (23) – EC1 (female) (With all connectors of wiring harness disconnected)		Resistance	Min. 1 MΩ
	4	Defective wiring harness connector	Connecting parts among boost pressure sensor/temperature sensor, engine 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			
	5	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			EC1 (female)	Temperature	Resistance	
			Between (23) and (47)	0°C	29 – 36 kΩ	
				25°C	9 – 11 kΩ	
				40°C	4.9 – 5.8 kΩ	
				100°C	600 – 700 Ω	
			Between (23) and chassis ground	All range	Min. 1 MΩ	

Circuit diagram related to fuel temperature sensor



Failure code [CA325] (Injector #6 open/short error)

Action code	Failure code	Trouble	Injector #6 open/short error (Engine controller system)
E03	**CA325**		
Contents of trouble	• Disconnection or short circuit was detected in injector #6 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 #6 (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CN6 (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) (57) – CN6 (female) (1)	Resis-tance	Max. 1 Ω	
			Wiring harness between EC1 (female) (59) – CN6 (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) (57) – CN6 (female) (1) and chassis ground	Resis-tance	Min. 1 MΩ	
			Wiring harness between EC1 (female) (59) – CN6 (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 (57) and (59)	0.4 – 1.1 Ω		
			Between (57), (59) and chassis ground	Min. 1 MΩ		

<table>
<tr><td rowspan="11">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 1 – 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>Min. 1 MΩ</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 1, 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</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>

Failure code [CA778] (Engine Bkup speed sensor error)

Action code	Failure code	Trouble	Engine Bkup speed sensor error (Engine controller system)
E03	**CA778**		
Contents of trouble	• Error was detected in engine Bkup speed sensor circuit.		
Action of controller	• Operates the engine with signal from engine Ne speed sensor. • Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine	• Engine stops during operations. (When engine Ne speed sensor is also defective) • Engine cannot be started during stop. (When engine Ne speed sensor is also defective)		
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 sensor power supply system	If failure code [**CA187**] or [**CA227**] is displayed, carry out troubleshooting for it first.		
	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) (37) – G (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between EC1 (female) (47) – G (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between EC1 (female) (26) – G (female) (3)	Resistance	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) (37) – G (female) (1) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between EC1 (female) (47) – G (female) (2) and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between EC1 (female) (26) – G (female) (3) and chassis ground	Resistance	Min. 1 MΩ
	4	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) – G (female) (1) and between EC1 (female) (47) – G (female) (2)	Resistance	Min. 1 MΩ
			Wiring harness between EC1 (female) (37) – G (female) (1) and between EC1 (female) (26) – G (female) (3)	Resistance	Min. 1 MΩ
			Wiring harness between EC1 (female) (47) – G (female) (2) and between EC1 (female) (26) – G (female) (3)	Resistance	Min. 1 MΩ
	5	Defective engine Bkup speed sensor	If causes 1 – 4 are not the cause of the trouble, engine Bkup speed sensor may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		
	6	Defective engine controller	If causes 1 – 4 are not the cause of the trouble, engine controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

Failure code [CA2352] (EGR valve solenoid operation disconnect)

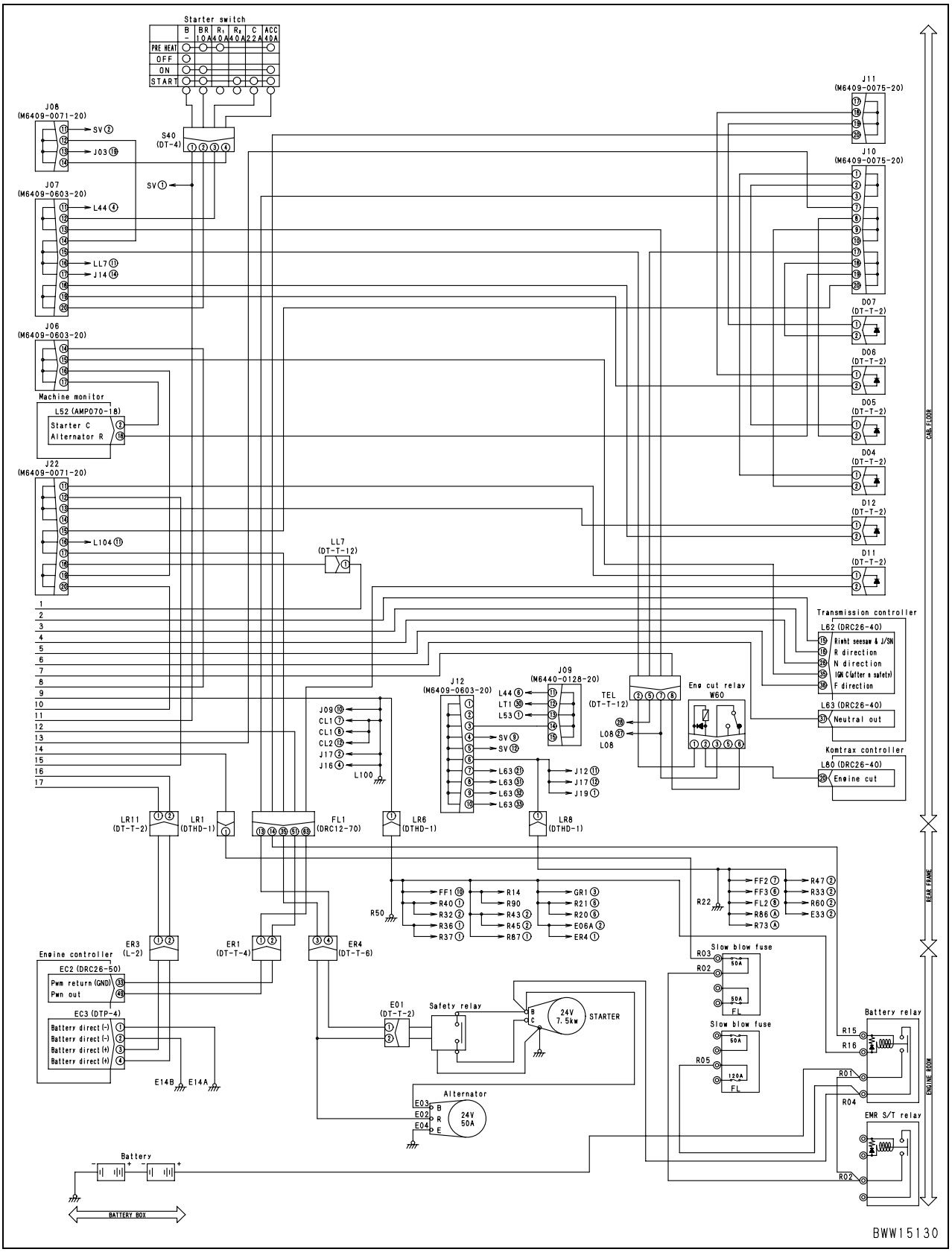
Action code	Failure code	Trouble	EGR valve solenoid operation disconnection error (Engine controller system)
E03	**CA2352**		
Contents of trouble	• Disconnection error was detected in drive circuit of EGR valve solenoid.		
Action of controller	• Limits output and continues operation. • Closes EGR valve. • 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.		

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out trouble shooting for failure code [**CA2351**].	

Failure code [D191KB] (Joystick steering neutral safety relay: Short circuit)

Action code	Failure code	Trouble	Joystick steering neural safety relay: Short circuit (Work equipment controller system)
E01	**D191KB**		
Contents of trouble	• Since the output system of the joystick steering neutral safety relay is shorted, signals are not output to the neutral safety relay.		
Action of controller	• Turns the output to the joystick steering neutral safety relay OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• While operating joystick steering, engine can be started (Steering moves immediately after engine is started). • Starting of the engine is available even when the joystick steering FNR (directional) switch or right FNR (directional) switch is not set to N (neutral).		
Related information	• When the neutral position adjustment (initial setting) is not done for the joystick steering, the neutral safety relay does not work. • As long as the failure code is turned on, the work equipment controller does not output signals to the joystick steering neutral safety relay. • The output state (ON/OFF) to the neutral safety relay can be checked with the monitoring function (Code: 40954, D-OUT-20). • Only for joystick steering • Method of reproducing failure code: Turn the starting switch ON and operate the joystick steering (with the engine being stopped).		

	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective joystick steering neutral safety relay (L113) (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			L113 (male)	Resistance		
			Between (1) and (2)	200 – 400 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) (37) – L113 (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. • Operate the joystick steering lever.			
			L63	Voltage		
			Between (37) and chassis ground	20 – 30 V		

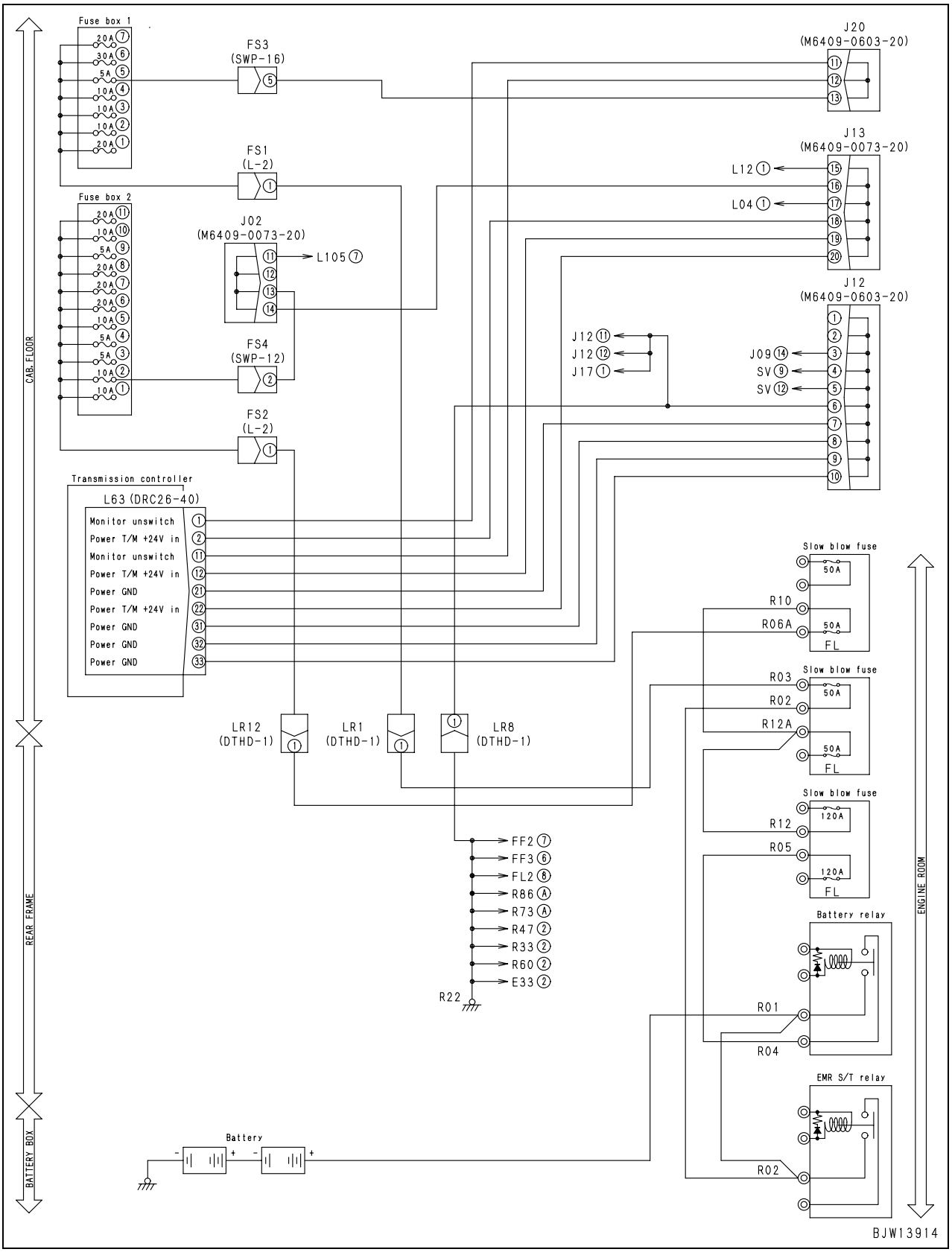

Starter switch
B BR R1 R2 C ACC
PRE HEAT
OFF
ON
START
J08 (M6409-0071-20)
J07 (M6409-0603-20)
J06 (M6409-0603-20)
J22 (M6409-0071-20)
J11 (M6409-0075-20)
J10 (M6409-0075-20)
S40 (DT-4)
SV ①
SV ②
J03 ⑲
L44 ④
LL7 ⑪
J14 ⑭
L104 ⑪
Machine monitor
L52 (AMP070-18)
Starter C
Alternator R
LL7 (DT-T-12)
D07 (DT-T-2)
D06 (DT-T-2)
D05 (DT-T-2)
D04 (DT-T-2)
D12 (DT-T-2)
D11 (DT-T-2)
Transmission controller
L62 (DRC26-40)
Right seensor & J/SW
R direction
N direction
IGN C(after s safety)
F direction
L63 (DRC26-40)
Neutral out
Komtrax controller
L60 (DRC26-40)
Engine cut
J12 (M6409-0603-20)
J09 (M6440-0128-20)
TEL (DT-T-12)
Eng cut relay W60
L08
LR11 (DT-T-2)
LR1 (DTHD-1)
FL1 (DRC12-70)
LR6 (DTHD-1)
LR8 (DTHD-1)
R50
R22
Engine controller
EC2 (DRC26-50)
Pwm return (GND)
Pwn out
EC3 (DTP-4)
Battery direct (-)
Battery direct (-)
Battery direct (+)
Battery direct (+)
ER3 (L-2)
ER1 (DT-T-4)
ER4 (DT-T-6)
E14B
E14A
E01 (DT-T-2)
Safety relay
24V 7.5kw
STARTER
Alternator
24V 50A
Slow blow fuse
50A
120A
FL
Battery relay
EMR S/T relay
Battery
BATTERY BOX
CAB FLOOR
REAR FRAME
ENGINE ROOM
BWW15130

Failure code [DAF5KP] (Machine monitor: Low output voltage)

Action code	Failure code	Trouble	Machine monitor: Low output voltage (Machine monitor system)
E01	**DAF5KP**		
Contents of trouble	• When the voltage of the switch power supply (power supply for operation) is above 17 V, the voltage of the sensor is below 5 V.		
Action of controller	• None in particular. • Even if cause of failure disappears, system does not reset itself until it is restarted.		
Problem that appears on machine	• Machine monitor does not display load.		
Related information	• Only for electric lever (if equipped) • Method of reproducing failure code: Turn the starting switch ON.		

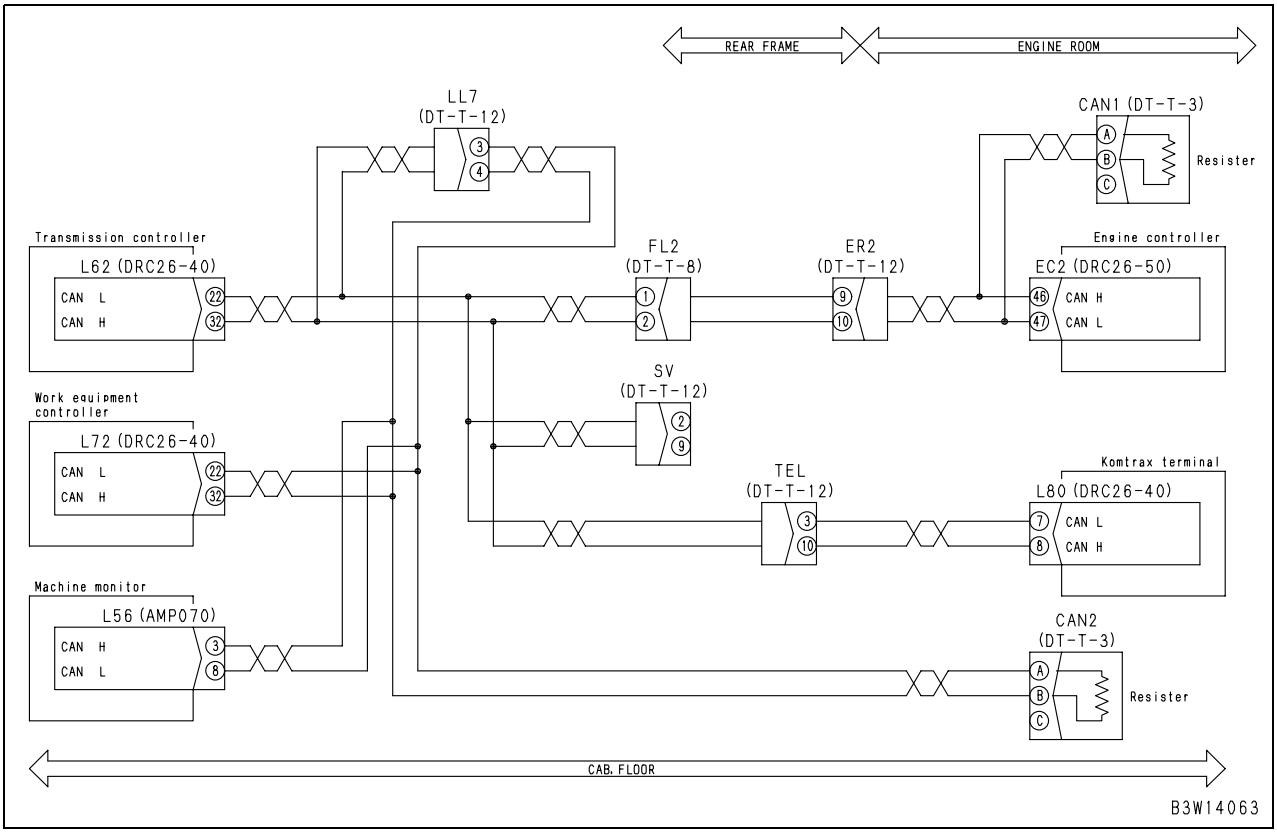
	Causes		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective lift arm angle sensor (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			F15 (male)		Resistance
			Between (C) and (A)		5 kΩ ± 20%
			Between (A), (B), (C) and chassis ground		Min. 1 MΩ
			★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			F15	Lift arm cylinder	Voltage
			Between (C) and (A)	Constant	4.85 – 5.15 V
			Between (B) and (A)	Constant	0.83 – 4.17 V
				At max. length	3.50 – 4.17 V
				At min. length	0.83 – 1.88 V
	2	Defective lift arm bottom pressure sensor (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			F16		Resistance
			Between (A), (B), (C) and chassis ground		Min. 1 MΩ
			★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			F16	Lift arm bottom pressure	Voltage
			Between (C) and (B)	Constant	4.85 – 5.15 V
			Between (C) and (A)	Constant	0.50 – 4.50 V
				When released	0.50 – 0.90 V
				When relieved	3.02 – 3.42 V

Circuit diagram related to transmission controller power supply

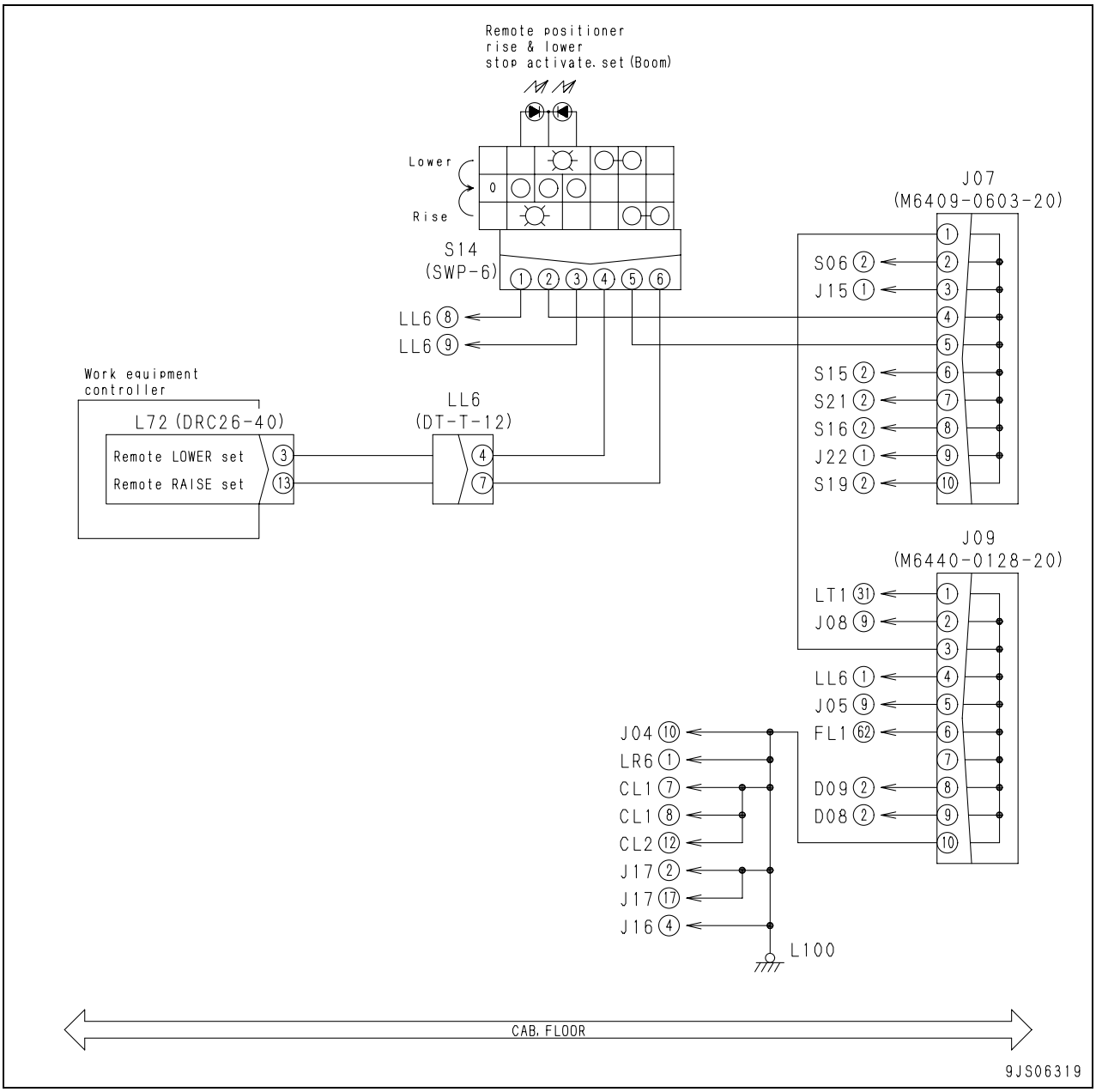


	Causes		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between L62 (female) (22), (32) – EC2 (female) (46), (47) and chassis ground	Resistance	Min. 1 MΩ
			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) – 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 power supply circuit of work equipment controller	★ Power supply circuit or grounding circuit may be defective. Confirm that there is no disconnection of the circuit or defective mating of the connector.		
	5	Defective machine monitor, transmission controller, work equipment controller, engine controller or KOMTRAX terminal	★ If above troubleshootings 1 – 4 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



Circuit diagram related to remote positioner raise/lower set switch



Failure code [DDD1LD] (Remote positioner bucket angle set switch: Switch is kept pressed for long time)

Action code	Failure code	Trouble	Remote positioner bucket angle set switch: Switch is kept pressed for long time (Work equipment controller system).
E01	**DDD1LD**		
Contents of trouble	• Unable to set the bucket to a specified angle due to ground fault in the remote positioner bucket angle set switch system. • Detects continuous operation for 30 seconds and longer.		
Action of controller	• Judges that remote positioner bucket angle set switch is turned ON. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Remote positioner raise set: Setting is changed to upward by 1° (degree) and the monitor displays the changed angle. • Remote lower set: Setting is changed to downward by 1° (degree) and the monitor displays the changed angle. • Change of setting to upward or downward becomes unavailable.		
Related information	• The input state (ON/OFF) from the remote positioner bucket angle set switch can be checked with the monitoring function (Code: 40911, D-IN-10, D-IN-11). • Only for electric lever (if equipped) • Method of reproducing failure code: Turn the starting switch and remote positioner bucket angle set switch ON		

<table>
<tr><td rowspan="20">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="8">1</td><td rowspan="8">Defective remote positioner bucket angle set switch (Internal short circuit)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td>S33 (male)</td><td>Remote positioner bucket angle set switch</td><td colspan="2">Resistance</td></tr>
<tr><td rowspan="2">Between (4) and (5)</td><td>Downward ON</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td>OFF</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td rowspan="2">Between (5) and (6)</td><td>Upward ON</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td>OFF</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td>Between (4), (5), (6) and chassis ground</td><td>Constant</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Grounding 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 L73 (female) (30) – S33 (female) (6) and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="2">Wiring harness between L73 (female) (40) – S33 (female) (4) and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="7">3</td><td rowspan="7">Defective work equipment controller</td><td colspan="4">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td>L73</td><td>Remote positioner bucket angle set switch</td><td colspan="2">Voltage</td></tr>
<tr><td rowspan="2">Between (40) and chassis ground</td><td>Downward ON</td><td colspan="2">Max. 1 V</td></tr>
<tr><td>OFF</td><td colspan="2">7 – 10 V</td></tr>
<tr><td rowspan="2">Between (30) and chassis ground</td><td>Upward ON</td><td colspan="2">Max. 1 V</td></tr>
<tr><td>OFF</td><td colspan="2">7 – 10 V</td></tr>
</table>

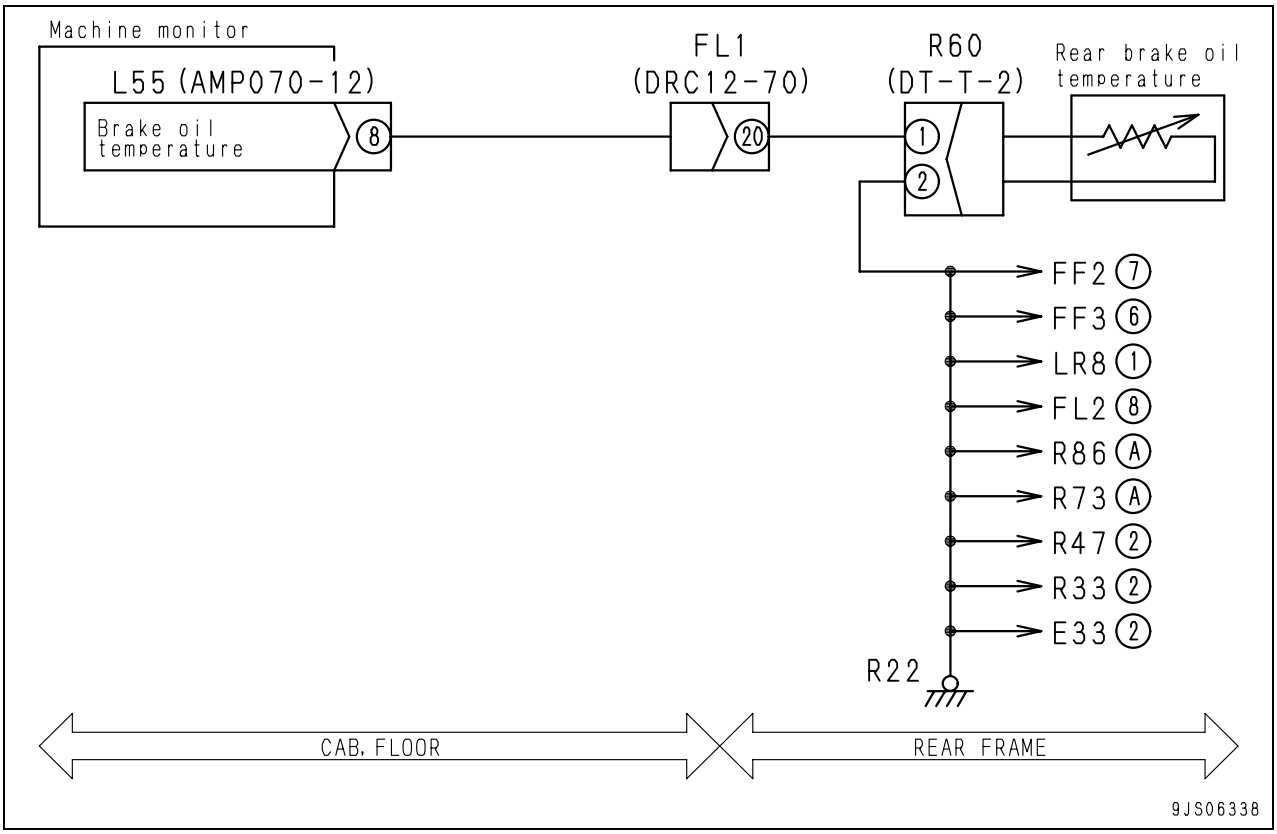
<table>
<tr><td rowspan="11">Possible causes and standard value in normal state</td><td colspan="2">Causes</td><td colspan="5">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Grounding fault in wiring harness
(Contact with ground circuit)</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 fuse No. 2 of fuse box 2 – L04 (female) (1) and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="3">Wiring harness between L62 (female) (16) – L04 (female) (4) and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="3">Wiring harness between L62 (female) (26) – L04 (female) (3) and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="7">5</td><td rowspan="7">Defective transmission controller</td><td colspan="5">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="2">L62</td><td>FNR (directional) lever</td><td colspan="2">Voltage</td></tr>
<tr><td colspan="2" rowspan="2">Between (26) and chassis ground</td><td>N (Neutral)</td><td colspan="2">20 – 30 V</td></tr>
<tr><td>Other than above</td><td colspan="2">Max. 1 V</td></tr>
<tr><td colspan="2" rowspan="2">Between (36) and chassis ground</td><td>F (Forward)</td><td colspan="2">20 – 30 V</td></tr>
<tr><td>Other than above</td><td colspan="2">Max. 1 V</td></tr>
<tr><td colspan="2" rowspan="2">Between (16) and chassis ground</td><td>R (Reverse)</td><td colspan="2">20 – 30 V</td></tr>
<tr><td>Other than above</td><td colspan="2">Max. 1 V</td></tr>
</table>

Failure code [DDWLLD] (Hold switch: Switch is kept pressed for long time)

Action code	Failure code	Trouble	Hold switch: Switch is kept pressed for long time (Transmission controller system)
E01	**DDWLLD**		
Contents of trouble	• Since the hold switch system is shorted, holding of signals becomes unavailable.		
Action of controller	• Holds once when a grounding fault occurs, then does not control holding. • If cause of failure disappears, system resets itself.		
Problem that appears on machine	• When ground fault occurs, turns the hold switch once.		
Related information	• The input state (ON/OFF) from the hold switch can be checked with the monitoring function (Code: 40908, D-IN-31). • 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 hold switch (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			L04 (male)	Hold switch	Resistance	
			Between (3) and (4)	ON	Max. 1 Ω	
				OFF	Min. 1 MΩ	
			Between (3), (4) and chassis ground	Constant	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 L62 (female) (38) – L07 (female) (3) and chassis ground		Resistance	Min. 1 MΩ
	3	Defective transmission controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			L62	Hold switch	Voltage	
			Between (38) and chassis ground	ON	20 – 30 V	
				OFF	Max. 1 V	

Circuit diagram related to rear brake oil temperature sensor

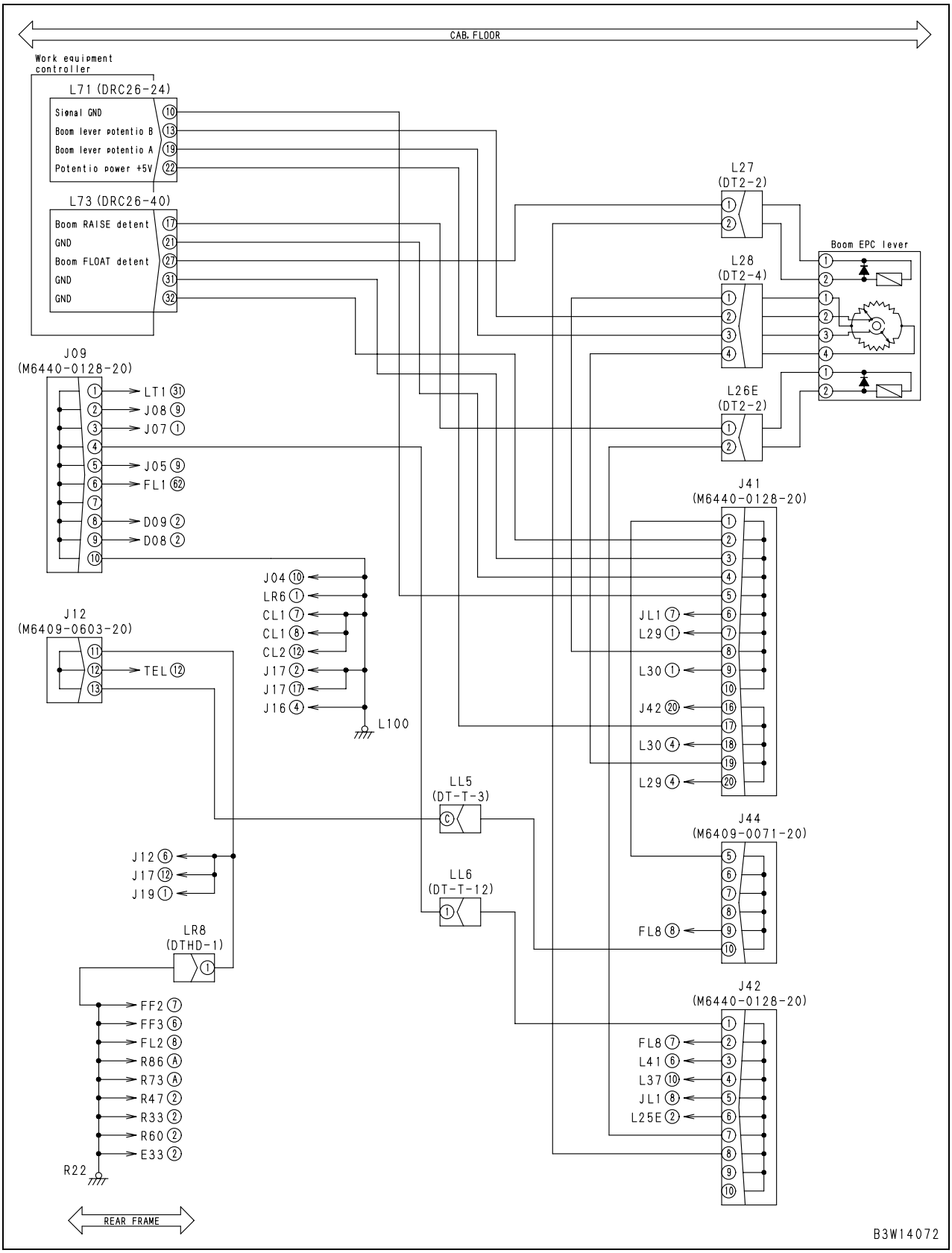


Failure code [DHT1KX] (Transmission cut-off pressure sensor: Out of input signal range)

Action code	Failure code	Trouble	Transmission cut-off pressure sensor: Out of input signal range (Transmission controller system)
E01	**DHT1KX**		
Contents of trouble	• Due to grounding fault in transmission cut-off (left brake) pressure sensor signal system, the signal level is lower than normal range.		
Action of controller	• Turns off the transmission cut-off function • Does not allow changing the transmission cut-off set. • 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). Or the transmission cut-off switch must be turned off.		
Problem that appears on machine	• The transmission cut-off indicator goes off. • The transmission cut-off does not work.		
Related information	• Input voltage of the transmission cut-off pressure sensor is max. 0.3 V • The input state (oil pressure) from the transmission cut-off pressure sensor can be checked with the monitoring function (Code: 41201, T/M CUT OFF P). • The input state (voltage) from the transmission cut-off pressure sensor can be checked with the monitoring function (Code: 41202, T/M CUT OFF P). • Method of reproducing failure code: Turn the starting switch and the transmission cut-off switch ON.		

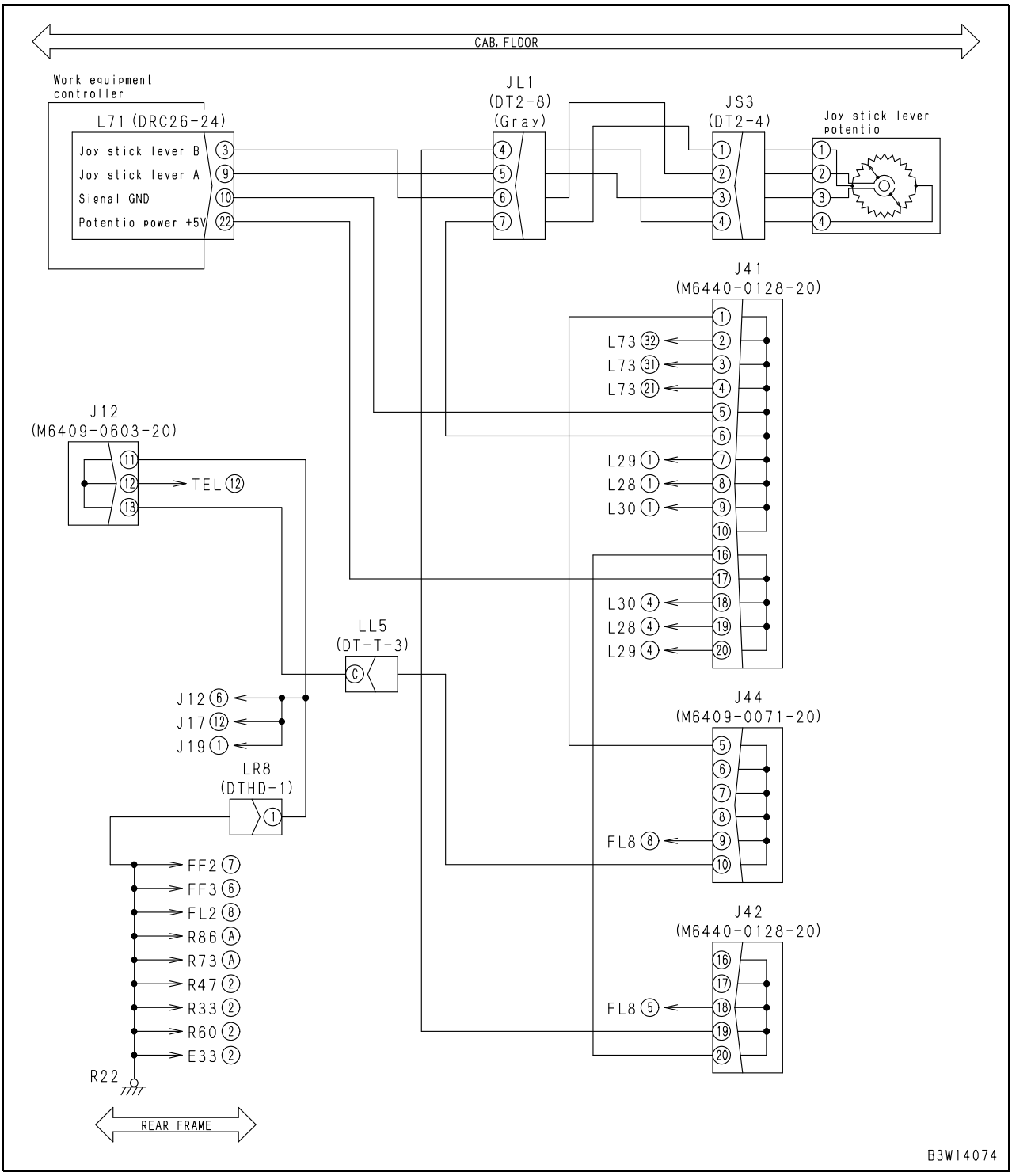
	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective transmission cut-off pressure sensor (Internal short circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting. • Transmission cut-off switch is ON.			
			R73	Brake	Voltage	
			Between (C) and (A)	When brake is released	0.9 – 1.1 V	
				When the left brake pedal is pressed down	1.1 – 5.1 V	
				When the right brake pedal is pressed down	1.1 – 5.1 V	
				Other than above	0.9 – 5.1 V	
	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 L61 (female) (19) – R73 (female) (C) and chassis ground		Resistance	Min. 1 MΩ
	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 L61 (female) (16) – R73 (female) (B)		Resistance	Max. 1 Ω
			Wiring harness between L61 (female) (19) – R73 (female) (C)		Resistance	Max. 1 Ω
			Wiring harness between R73 (female) (A) – R22		Resistance	Max. 1 Ω

Circuit diagram related to lift arm EPC lever potentiometer



<table>
<tr><td rowspan="8">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="7">3</td><td rowspan="7">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 joystick steering EPC lever potentiometer

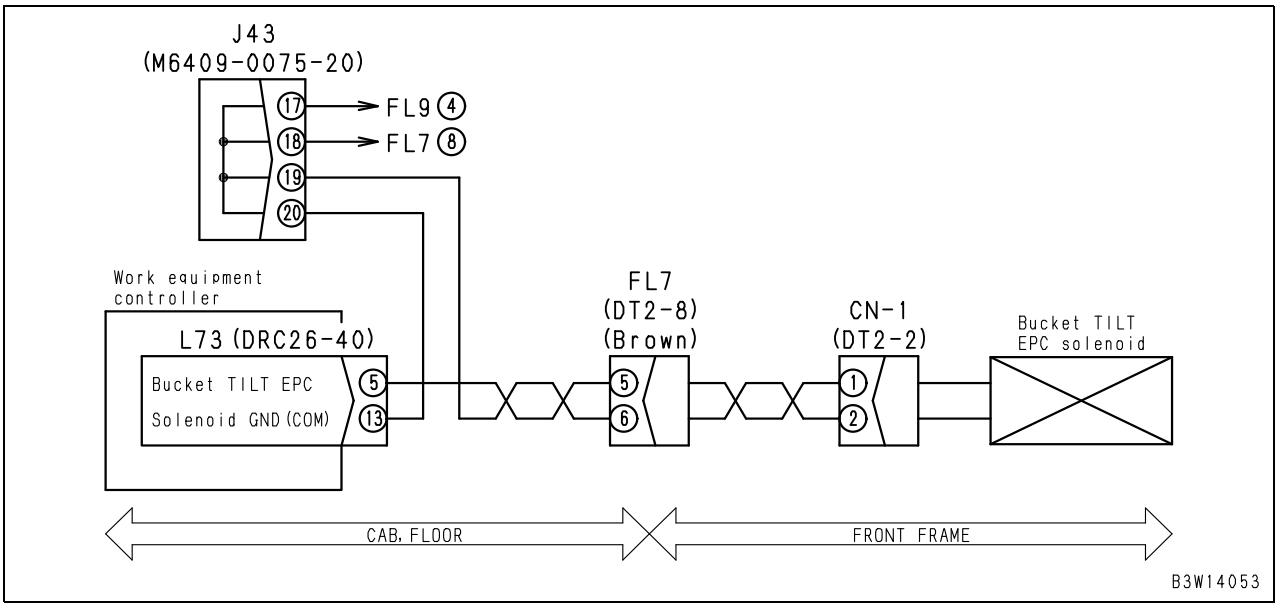


Failure code [DUM2KB] (Remote positioner lower set indicator lamp: Short circuit)

Action code	Failure code	Trouble	Remote positioner lower set indicator lamp: Short circuit (Work equipment controller system)
—	**DUM2KB**		
Contents of trouble	• Since the remote positioner lower set indicator lamp system is shorted, output signals are not entered to the indicator lamp.		
Action of controller	• Turns off the remote positioner lower set indicator output. • If problem is removed, system is returned to normal operating state.		
Problem that appears on machine	• Remote positioner lower set indicator lamp does not light up.		
Related information	• The output state (ON/OFF) to the remote positioner lower set indicator lamp can be checked with the monitoring function (Code: 40954, D-OUT-19). • 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 remote positioner lower set indicator lamp (LED) (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON. • See Testing and adjusting, Diode inspection procedure.			
			S14 (male)		Resistance	
			Between (2) and (3)		Min. 1 MΩ (No continuity)	
			Between (2), (3) 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) (18) – S14 (female) (3) 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.			
			L73	Remote positioner lower	Voltage	
			Between (18) and chassis ground	When used	20 – 30 V	
				When not used.	Max. 1 V	

Circuit diagram related to bucket tilt EPC solenoid

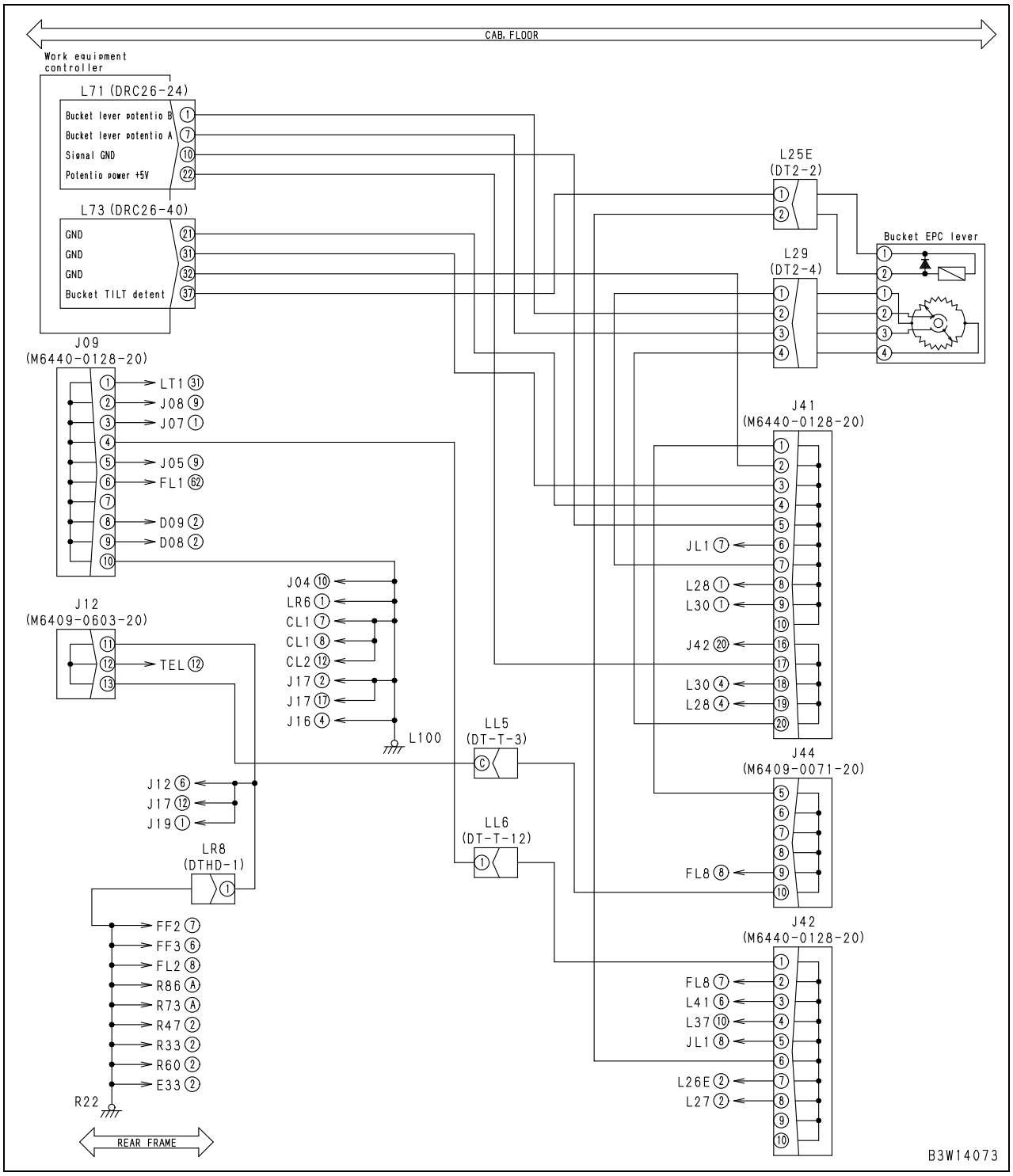


Failure code [DWM1KB] (Work equipment neutral lock solenoid: Short circuit)

Action code	Failure code	Trouble	Work equipment neutral lock solenoid: Short circuit (Work equipment controller system)
E01	**DWM1KB**		
Contents of trouble	• Since the work equipment neutral lock solenoid system is shorted, abnormal current flows when the work equipment neutral lock solenoid output is turned on.		
Action of controller	• Turns off the output to the work equipment neutral lock solenoid. • Stops outputting the signal to the work equipment solenoid according to an input signal from the work equipment lock lever. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Each work equipment solenoid lock normally works according to an input signal from the work equipment lock lever. • The wiring harness or controller may be burnt out.		
Related information	• The output state (ON/OFF) to the work equipment neutral lock solenoid can be checked with the monitoring function (Code: 40952, D-OUT-0). • Method of reproducing failure code: Turn the starting switch ON and move the work equipment lock lever to the LOCK position		

Possible causes and standard value in normal state	Causes		Standard value in normal state/Remarks on troubleshooting			
	1	Defective work equipment neutral lock solenoid (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			F26 (male)		Resistance	
			Between (1) and (2)		35 – 45 Ω	
			Between (1), (2) and chassis ground		Min. 1 MΩ	
	2	Defective diode (F27) (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			F27 (male)	Diode range	Continuity	
			Between (2) and (1)	Measured from (2) side	Continue	
			Between (1) and (2)	Measured from (1) side	Continuity absent	
	3	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) (7) – F26 (female) (1) and chassis ground		Resistance	Min. 1 MΩ
	4	Defective work equipment controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			L73 (female)		Resistance	
			Between (7) and chassis ground		35 – 45 Ω	

Circuit diagram related to bucket EPC lever

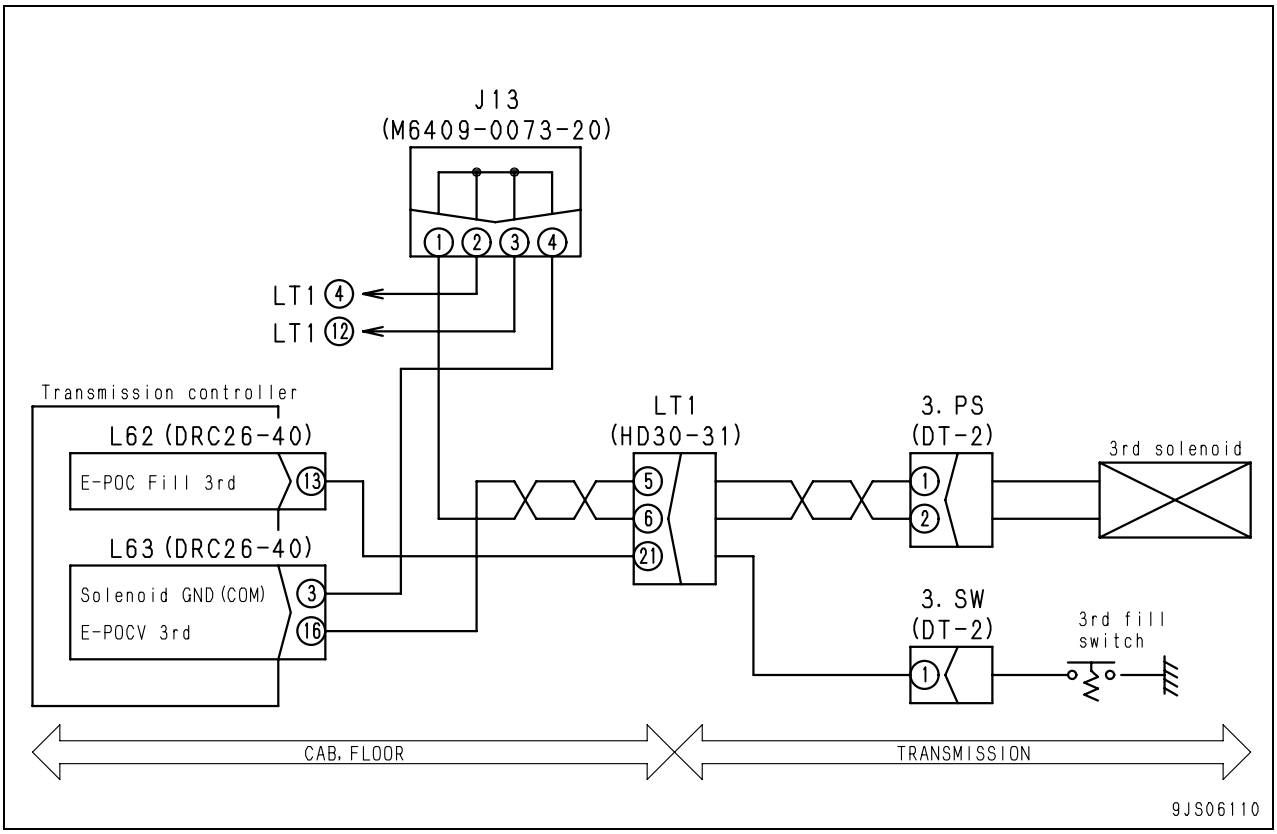


Failure code [DXH4KB] (1st clutch ECMV solenoid: Short circuit)

Action code	Failure code	Trouble	1st clutch ECMV solenoid: Short circuit (Transmission controller system)
E03	**DXH4KB**		
Contents of trouble	• Since the 1st ECMV solenoid system is shorted, abnormal current flows when 1st clutch ECMV solenoid output is ON.		
Action of controller	• Stops outputting the signal to the 1st clutch ECMV solenoid. • 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 transmission does not shift into 1st (The machine can travel in any gear speed other than 1st).		
Related information	• The output state (current value) to the 1st (1st speed) clutch ECMV solenoid can be checked with the monitoring function (Code: 31602, ECMV 1 DIR). • Method of reproducing failure code: Turn on the starting switch, set the transmission auto-shift/manual shift selector switch in the MANUAL position and select 1st using the shift down switch or move the gearshift lever to 1st.		

Possible causes and standard value in normal state	Causes		Standard value in normal state/Remarks on troubleshooting			
	1	Defective 1st clutch ECMV solenoid (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			1.PS (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 L63 (female) (25) – 1.PS (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 (25) and (13)	5 – 15 Ω		
			Between (25), (13) and chassis ground	Min. 1 MΩ		

Circuit diagram related to 3rd clutch ECMV solenoid



Failure code [DXHHKB] (4th clutch ECMV solenoid: Short circuit)

Action code	Failure code	Trouble	4th clutch ECMV solenoid: Short circuit (Transmission controller system)
E03	**DXHHKB**		
Contents of trouble	• Since the 4th clutch ECMV solenoid system is shorted, abnormal current flows when 4th clutch ECMV solenoid output is ON.		
Action of controller	• Stops outputting the signal to the 4th clutch ECMV solenoid. • 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 transmission does not shift into 4th (The machine can travel in any gear speed other than 4th.)		
Related information	• The output state (current value) to the 4th clutch ECMV solenoid can be checked with the monitoring function (Code: 31605, ECMV 4 DIR). • Method of reproducing failure code: Turn the starting switch ON, set the transmission manual/auto shift selector switch in the MANUAL position, and select 4th using the shift down switch or moving the gear shift lever to 4th.		

Possible causes and standard value in normal state	Causes		Standard value in normal state/Remarks on troubleshooting			
	1	Defective 4th clutch ECMV solenoid (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			4.PS (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 L63 (female) (26) – 4.PS (female) (1) and chassis ground	Resis-tance	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 (26) and (13)	5 – 15 Ω		
			Between (26), (13) and chassis ground	Min. 1 MΩ		

	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	5	Defective emergency steering pressure switch	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between R37 (male) (2) and (1)	Emergency steering: Stopped	Resistance	Max. 1 Ω
				At open to atmosphere (for reference)	Resistance	Max. 1 Ω
				Emergency steering: Operating (High pressure) (Operate in manual mode.)	Resistance	Min. 1 MΩ
	6	Defective transmission and fan pump motor controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between L63 (female) (7) and chassis ground		Resistance	200 – 400 Ω

E-1 Engine does not start

Contents of trouble	• The engine does not start.
Related information	• The engine does not start, because the starting motor does not run due to troubles in the starting motor system and starting switch terminal C signal system. • Check that No. 1 fuse of fuse box 1 is normal. (If it is broken, check the related wiring harness for grounding fault.) • The input state (ON/OFF) to the machine monitor from the starting switch terminal C can be checked with the monitoring function (Code: 40900, D-IN-2). • The input state (ON/OFF) to the transmission controller from starting switch terminal C can be checked with the monitoring function (Code: 40907, D-IN-16). • The input state (ON/OFF) to the work equipment controller from the starting switch terminal C can be checked with the monitoring function (Code: 40912, D-IN-17). • If failure codes D5ZHKA, D5ZHKB, D5ZHKZ, D5ZH16, DB2RKR, DDK3KA, DDK4KA, DDK6KA, DDK6KB, and DB2RKR are indicated, curry out troubleshooting for it first.

	Causes		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective battery	Specific gravity		Min. 1.26
			Voltage		Min. 25 V
	2	Defective battery relay (Internal disconnection or short circuit)	The battery relay can be judged normal if operating sounds are audible when the starting switch is operated. • Starting switch operation in the order of OFF → ON → OFF		
	3	Defective fuse No. 1 of fuse box 1	If the fuse is burnt, the circuit probably has a grounding fault, etc. (See cause 15.)		
	4	Defective starting motor (Internal trouble)	★ Prepare with starting switch OFF (with wiring harness connected), then turn starting switch START and carry out troubleshooting.		
			Starting motor		Voltage
			Between terminals B and E	Power supply input	20 – 30 V
			Between terminal R E01 and terminal E	Battery input	Max. 1 V
			Between terminal C E01 and terminal E	Starting input	20 – 30 V
			If the starting motor does not run even if power supply input, battery input and starting input is normal, the starting motor is defective.		
	5	Defective alternator (Internal trouble)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between alternator terminal R (1) – chassis ground	Voltage	Max. 1 V
	6	Defective starting switch (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting with starting switch OFF and START each.		
			S40 (male)	Position of switch	Resistance
			Between (1) and (3)	OFF	Min. 1 MΩ
				START	Max. 1 Ω
	7	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

Contents of trouble	(4) Headlamp (high beam) does not light up or go off.
Related information	• The switch, lamp, or wiring harness of the headlamp (high beam) is disconnected or shorted with the chassis ground. • Carry out the following troubleshooting when the low beam lights up (goes off) normally. • The input state (ON/OFF) to the machine monitor from the lamp switch (head lamp) can be checked with the monitoring function (Code: 40900, D-IN-0). • The input state (ON/OFF) to the machine monitor from the dimmer switch (high beam) can be checked with the monitoring function (Code: 40904, D-IN-34).

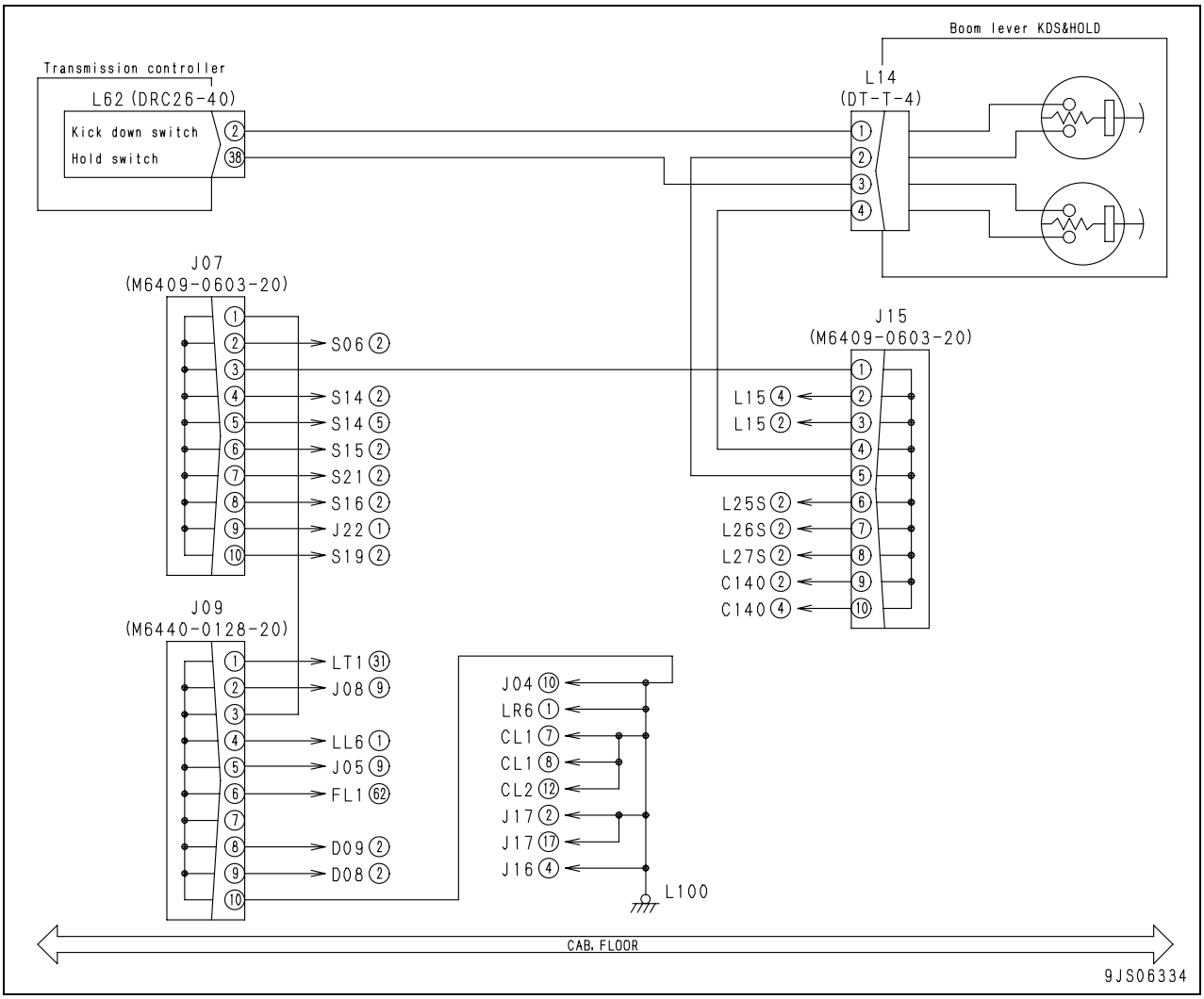
<table>
<tr><td rowspan="13">Possible causes and standard value in normal state</td><td colspan="2">Causes</td><td colspan="5">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td>1</td><td>Broken bulb</td><td colspan="5">If a specific headlamp does not light up, its bulb may be broken or may have a defective contact. Check the bulb directly.</td></tr>
<tr><td rowspan="6">2</td><td rowspan="6">Defective dimmer switch (Internal disconnection or short circuit)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td>L02 (male)</td><td colspan="2">Dimmer switch</td><td colspan="2">Resistance</td></tr>
<tr><td rowspan="2">Between (6) and (3)</td><td colspan="2">Low</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td colspan="2">High</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td rowspan="2">Between (6) and (4)</td><td colspan="2">Low</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td colspan="2">High</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td>Between (3), (4), (6) and chassis ground</td><td colspan="2">Constant</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">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 HEAD (female) (C) – L02 (female) (3)</td><td>Resis-tance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">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 HEAD (female) (C) – L02 (female) (3), – circuit branch end and chassis ground</td><td>Resis-tance</td><td>Min. 1 MΩ</td></tr>
</table>

E-8 Backup lamp does not light or it keeps lighting up

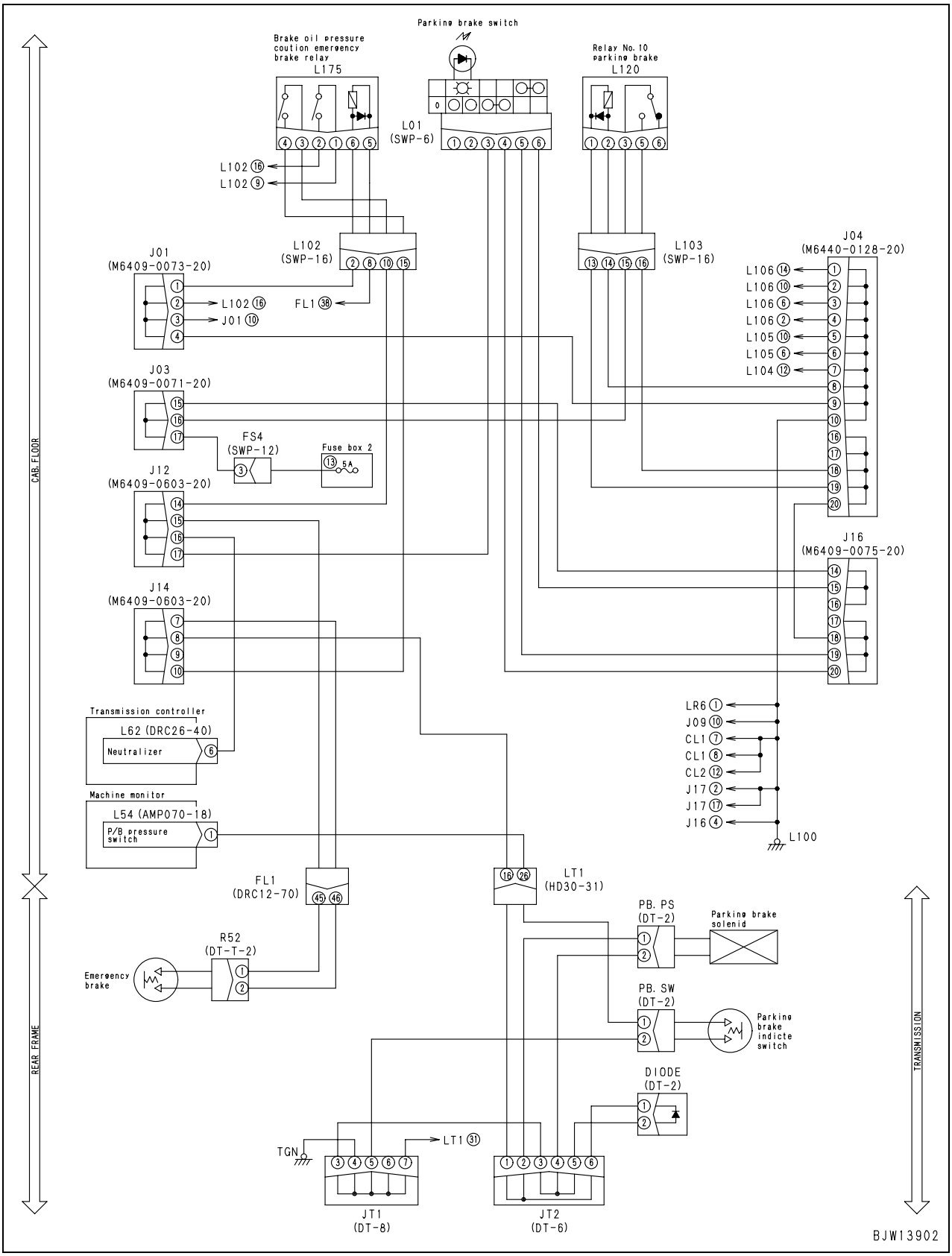
Contents of trouble	Backup lamp does not light or it keeps lighting up.
Related information	• The transmission controller monitors the primary circuit of the backup lamp relay for a trouble. (If disconnection or short circuit occurs in the primary side of the back lamp relay, failure code [D160KA], [D160KB] or [D160KZ] is indicated. Carry out troubleshooting for it first.)

	Causes		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Broken bulb	If a specific backup lamp does not light up, its bulb may be broken or may have a defective contact. Check the bulb directly.		
	2	Defective fuse No. 6 of fuse box 2	If the fuse is burnt, the circuit probably has a grounding fault, etc. (See cause 5.)		
	3	Defective backup lamp relay (L117) (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			L117 (male)	Resistance	
			Between (1) and (2)	200 – 400 Ω	
			★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			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.		
	4	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. 6 of fuse box 2 – L117 (female) (3)	Resistance	Max. 1 Ω
			Wiring harness between L117 (female) (5) – R30 (female) (2), – R31 (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between L63 (female) (4) – L117 (female) (1) • As a failure is detected, failure code [D160KA] is indicated.	Resistance	Max. 1 Ω
			Wiring harness between L117 (female) (2) – chassis ground • As a failure is detected, failure code [D160KA] is indicated	Resistance	Max. 1 Ω
			Wiring harness between R30 (female) (4) – chassis ground	Resistance	Max. 1 Ω
			Wiring harness between R31 (female) (4) – chassis ground	Resistance	Max. 1 Ω
	5	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. 6 of fuse box 2 – L117 (female) (3), – circuit branch end and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between L117 (female) (5) – R30 (female) (2), – R31 (female) (2), – circuit branch end and chassis ground	Resistance	Min. 1 MΩ
			Wiring harness between L63 (female) (4) – L117 (female) (1) and chassis ground • As a failure is detected, failure code [D160KB] or [D160KZ] is displayed	Resistance	Min. 1 MΩ

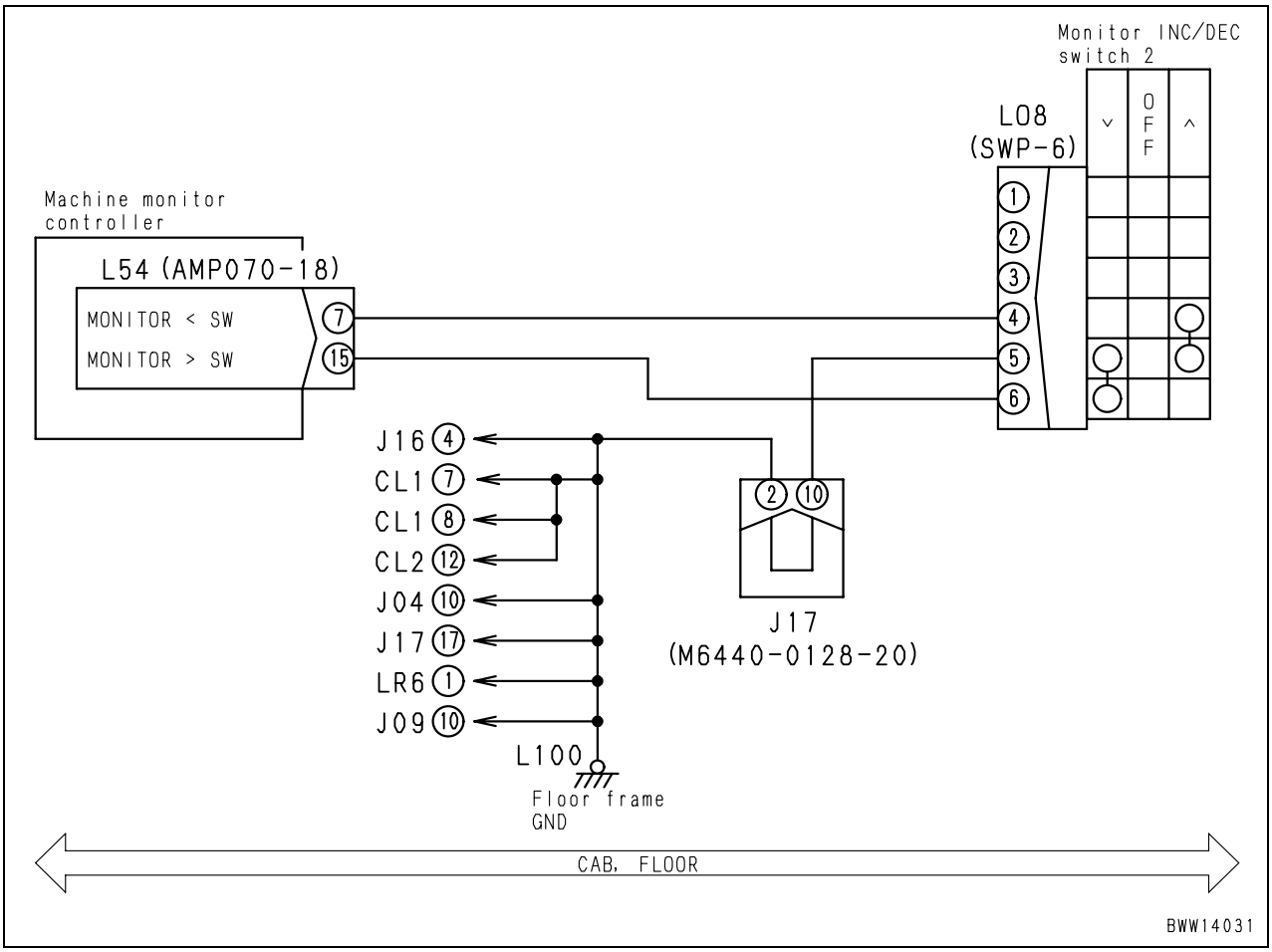
Circuit diagram related to hold switch



Circuit diagram related to parking brake indicator switch



Circuit diagram related to < switch (panel switch 3)



H-4 The travel speed is slow, the thrusting force is weak, the uphill traveling power is weak, and the gear is not shifted

Ask the operator about the following questions.
- Has the abnormality occurred suddenly?
  → Breakage of related equipment
  Did any abnormal noise occur at the time and where?
- Have any abnormal signs come to occur gradually?
  → Wear of related equipment, defective seal

Checking for abnormalities
- Execute digging and measure traveling speeds on a level ground and on a slope to check whether the abnormality actually occurs or is a matter of operator's sense

Testing before troubleshooting
- Is any failure code of the electrical system displayed on the machine monitor?
- Are the transmission oil level and the oil type appropriate?
- Haven't the transmission filter and strainer been clogged?
- Is any external oil leak found on the mating faces of pipes and valves around the torque converter and the transmission?
- Isn't the wheel brake or the parking brake being dragged?
- Are the tire air pressure and the tread shape appropriate?
- Is the operating method correct?

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 valve			ECMV	Transmission				Parking brake	Others	
			a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r
			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	Defective operation of torque converter relief valve	Drop of main relief valve set pressure	Clogging of last chance filter	Defective operation of relevant ECMV	Internal breakage of transmission	The relevant clutch piston seal is defective	Defective seal of relevant clutch shaft	Clogging of breather	The parking brake piston seal is defective	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	x	*	△ x	*	x	C x	x	△ x	Note
1	Any abnormality occurs at all gear speeds		○	○	○	○	○	○	○	○	○	○		○			○	○	○	○
2	Any abnormality occurs at specific gear speeds												○	○	○	○				
3	When the transmission oil temperature is low, the charging pump or the transmission filter causes any abnormal noise		○	○																
4	The torque converter oil temperature rises abnormally high		○	○	○	○	○	○	○	○				○			○		○	
5	The transmission oil level rises or falls					○	○										○		○	○
6	Metal powders (Aluminum, copper, iron, etc.) are adhered to the transmission filter and the strainer				○				○					○						
7	The engine low idle and high idle speeds are measured to be abnormal								○					○						○
8	When the stall speed of the torque converter is measured	The speed is high	○	○	○		○	○	○	○		○		○			○			
9		The speed is low																		○
10	When the ECMV output (Clutch) oil pressure is measured	The oil pressure drops as the temperature rises			○										○	○		○		
11		The oil pressure is low at all gear speeds	○	○	○						○	○		○			○	○		○
12		The oil pressure is low at specific gear speeds											○	○	○	○				
13		The oil pressure does not become stable as the gauge vibrates	○	○																
14	When the torque converter relief (Inlet) oil pressure is measured, the oil pressure is low. (No. 11 – 13 are normal.)							○	○	○										
15	When the oil pressure at the torque converter outlet is measured, the oil pressure is low. (No. 14 is normal.)						○													

*: Proceed to the paragraph of “Defective clutch and ECMV specifying method (Check by failure code).”

H-18 The parking brake is not released or it drags (including emergency release system)

Testing before troubleshooting

- Check if the parking brake emergency release switch is not turned ON.
- Check if the parking brake is automatically applied when the engine stops.

No.	Diagnosis \ Remedy	Causes: Solenoid a	Transmission valve b	Wiring harness c	Parking brake d	Parking brake e
		Defect inside parking brake solenoid valve	Insufficient oil level due to defect of transmission valve	Damages on parking brake switch line wiring harness	Pinching due to peeling of parking brake disc	Defective operation of parking brake piston
		△ x	△ x	△	△ x	△ x
1	When the parking brake switch is off, the parking brake is not released	○	○	○	○	○
2	When the parking brake switch is off, the brake is not applied even if the engine stops					○
3	When the parking brake switch is on, the parking brake does not work well		○		○	

- The parking brake is not released even if the emergency parking brake release valve is opened.
  The following causes are considered:
  a. Malfunction of emergency parking brake release valve
  b. Insufficient gas pressure of accumulator for brake or breakage of piston seal

S-1 Starting performance is poor.

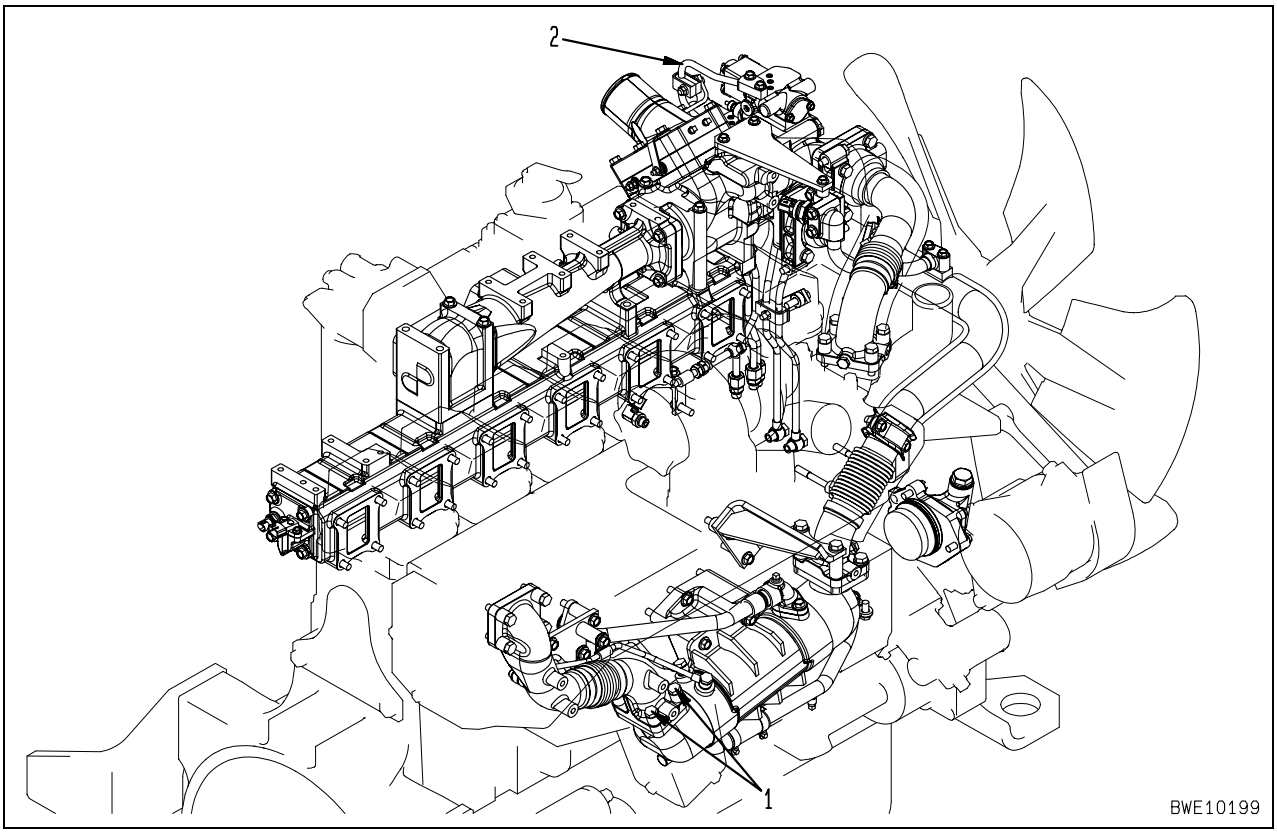
General causes why starting performance is poor

- Defective electrical system
- Insufficient supply of fuel
- Insufficient intake of air
- Improper selection of fuel
- Coolant in exhaust piping

★ The common rail fuel injection system (CRI) recognizes the fuel injection timing electrically. Accordingly, even if the starting operation is carried out, the engine may not start until the crankshaft revolves 2 turns at maximum. This phenomenon does not indicate a trouble, however.

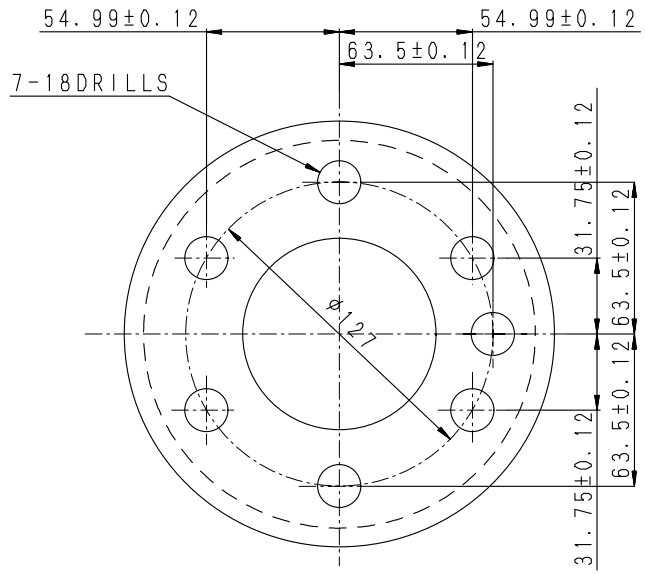
			Cause															
			Clogged air cleaner element	Cracked EGR cooler (Coolant in exhaust piping)	Defective contact of valve and valve seat	Worn piston ring, cylinder	Clogged air breather hole of fuel tank cap	Leaking or clogged fuel piping, entry of air	Clogged fuel filter, element	Clogged feed pump gauze filter	Stuck, seized supply pump plunger	Defective injector	Defective intake air heater system	Defective alternator (regulator section)	Defective alternator (generator section)	Defective or deteriorated battery
Questions	Confirm recent repair history															
	Degree of use of machine	Operated for long period	△	△					△	△						△
	Starting performance	Became worse gradually	○	○	◎	◎			○	○						
		Engine starts easily when warm											◎			◎
	Non-specified fuel is being used								○	○	○	○				
	Replacement of filters has not been carried out according to Operation and Maintenance Manual		◎						◎	◎	○	○				
	Engine oil must be added more frequently					◎										
	When engine is preheated or when temperature is low, preheating monitor does not indicate normally (if monitor is installed)												◎			
	During operation, charge level monitor indicates abnormal charge (if monitor is installed)													◎	◎	
	Dust indicator is red (if indicator is installed)		◎													
Check items	Air breather hole of fuel tank cap is clogged						◎									
	Fuel is leaking from fuel piping							◎			○					
	When priming pump is operated, it makes no reaction or it is heavy							◎	○	○						
	Starting motor cranks engine slowly			○												◎
	While engine is cranked with starting motor	If air bleeding plug of fuel filter is removed, fuel does not flow out							◎	◎						
		If spill hose from injector is disconnected, little fuel spills									◎					
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low											◎				
	Engine does not pick up smoothly and combustion is irregular				○	○						◎				
	There is hunting from engine (rotation is irregular)						○	◎	○	○						
	Blow-by gas is excessive					◎										
Troubleshooting	Inspect air cleaner directly		●													
	When EGR cooler outlet gas pipe is removed, coolant mixed with antifreeze flows out (*1)			●												
	When compression pressure is measured, it is found to be low				●	●										
	When air is bled from fuel system, air comes out							●								
	Inspect fuel filter, strainer directly								●							
	Inspect gauze filter of feed pump directly									●						
	Carry out troubleshooting by failure code “Loss of pressure feed from supply pump (*2)”										●					
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change with some cylinders											●				
	When starting switch is turned to HEAT, intake air heater mount does not become warm												●			
	Is voltage 20 – 30 V between alternator terminal R and terminal E with engine at low idle?	Yes												●		
		No													●	
	When specific gravity of electrolyte and voltage of battery are measured, they are low															●
		Remedy	Clean	Replace	Correct	Replace	Clean	Correct	Clean	Clean	Replace	Replace	Replace	Replace	Replace	Replace

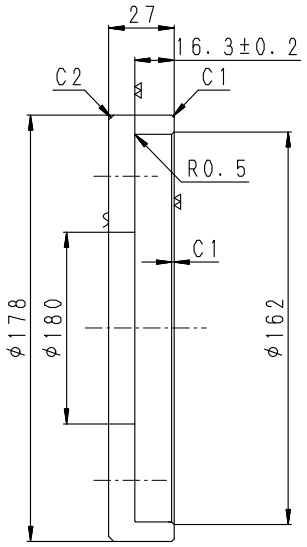
*1: EGR cooler outlet gas piping
Loosen 4 mounting bolts (1) of gas piping to EGR cooler outlet and check the flowout of coolant.
Condensed water from cooled exhaust gas may come out in small quantity but it poses no problem if colorless and transparent.



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

A6 Push tool



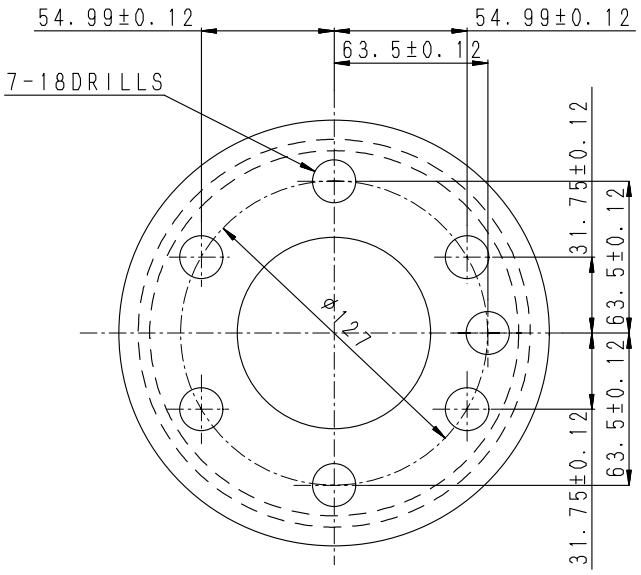


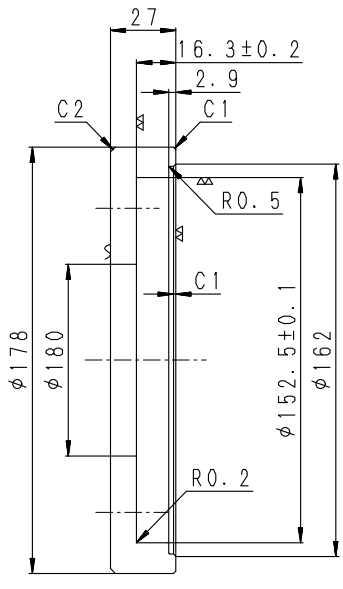
C4P17434

指示なき角部はばり、かえり等なきこと
Unless otherwise specified there shall be no burrs or flushes at the corner.

HEAT TREATMENT	MATERIAL
----	SS400P
PART NAME	Q'TY
PUSH TOOL	1
795T-421-1340 △	

A8 Push tool



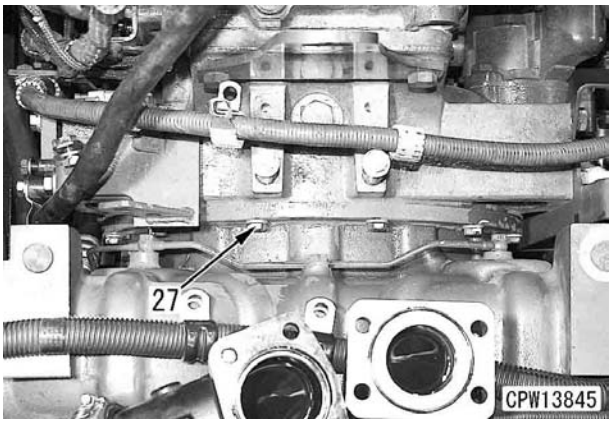


C4P17435

指示なき角部はばり、かえり等なきこと
Unless otherwise specified there shall be no burrs or flushes at the corner.

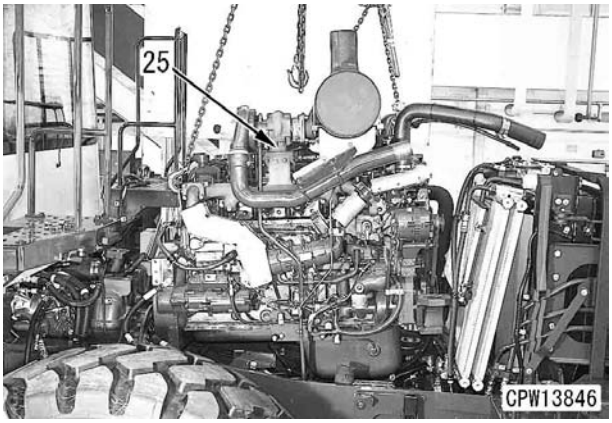
HEAT TREATMENT	MATERIAL
----	SS400P
PART NAME	Q'TY
PUSH TOOL	1
795T-421-1320 △	

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}**

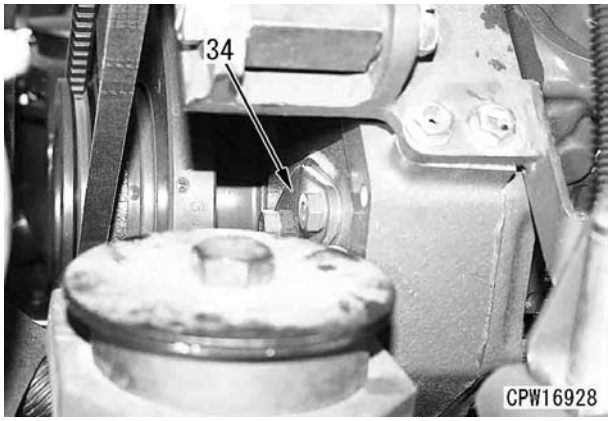
[*3]

★ 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.

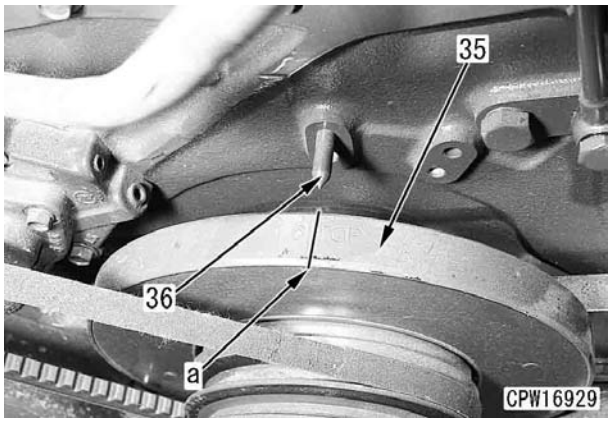
- **Refilling with coolant**
  Add coolant up to the specified level. Run the engine to circulate the coolant through the system. Then, check the coolant level again.

- **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.

20. Remove cover (34). [*7]

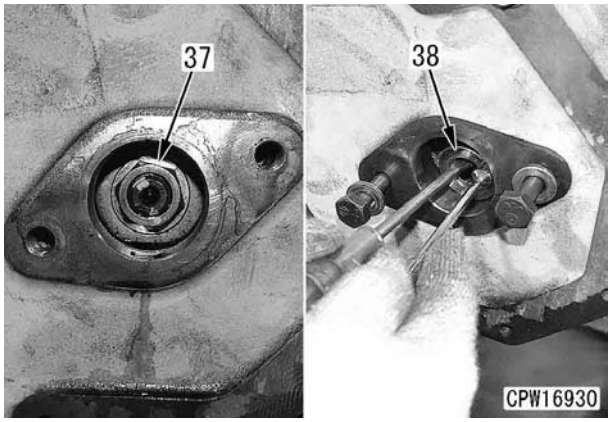


21. Rotate the crankshaft forward, and align mid-position "a" between marking 2/5TOP and 3/4TOP of damper (35) to pointer (36). (Marking 1/6TOP comes almost right below.)
    ★ At this time, check that the forcing tap on the drive gear is aligned to the bolt hole of cover (34).
    (If not, rotate the crankshaft one more turn.)
    ★ This position is equivalent to the pump shaft key position after the key has been rotated 15° clockwise from the top face.



22. Remove nut (37), and then washer (38). [*8]
    ★ When removing the washer (38), use a magnet so that it may not be inadvertently dropped inside the case.

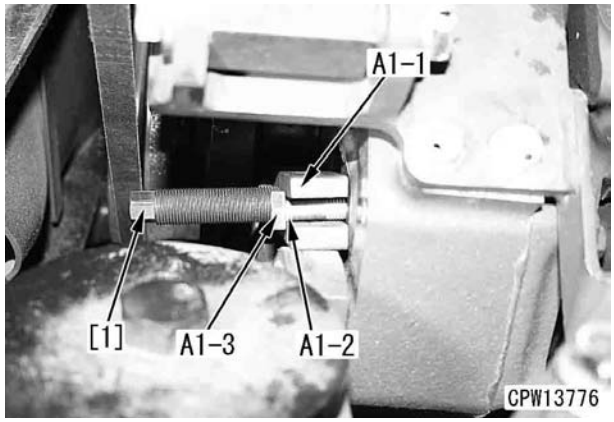
23. Tighten nut (37) by 4 – 5 turns so that the fuel supply pump gear will not collide with the case when it is removed in the next step.



24. Install tools **A1-1**, **A1-2** and **A1-3** and tighten bolt [1] to disconnect the gear from the shaft.

25. Remove tools **A1-1**, **A1-2** and **A1-3** and then remove nut (37).

26. Install tool **A1-2** again for fixing the gear when installing.



[*5]
★ Length of spacer: **12 mm**

[*6]
★ Length of EGR cooler side spacer: **41.6 mm**
★ Length of cylinder block side spacer: **26.2 mm**

[*7]
★ Length of spacer: **18 mm**

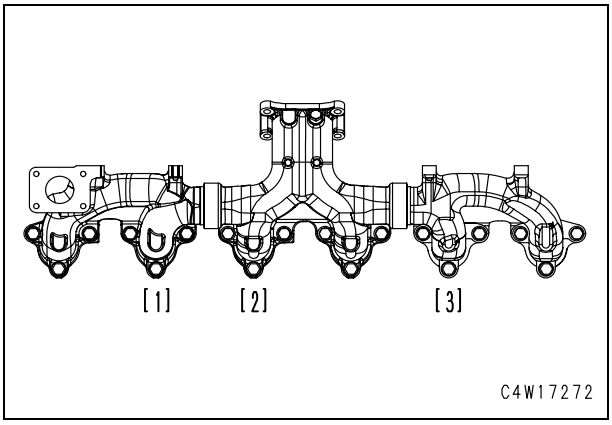
[*8]
★ Length of spacer: **10 mm**
Joint bolt: **24.5 – 34.3 Nm {2.5 – 3.5 kgm}**

[*9]
Union sleeve nut:
40 – 44 Nm {4.1 – 4.5 kgm}

[*10]
EGR valve mounting bolt:
59 – 74 Nm {6.0 – 7.5 kgm}

[*11]
Head cover side mounting bolt:
58.8 – 73.5 Nm {6.0 – 7.5 kgm}

[*12]
★ Exhaust manifold installation procedure
1) Manually screw in all exhaust manifold-mounting bolts by 2 to 3 threads.
2) Tighten mounting bolts [1] to [3] to the specified torque, and then tighten other mounting bolts.
Mounting bolt:
58.8 – 73.5 Nm {6.0 – 7.5 kgm}

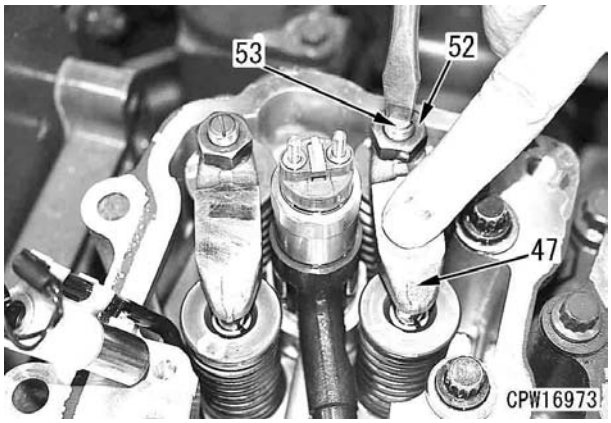


[*13]
Joint bolt: **9.8 – 12.7 Nm {1.0 – 1.3 kgm}**

[*14]
Clip fixation nut:
9.8 – 26.5 Nm {1.0 – 2.7 kgm}

[*15]
★ Check that the push rod is inserted in the cam follower.

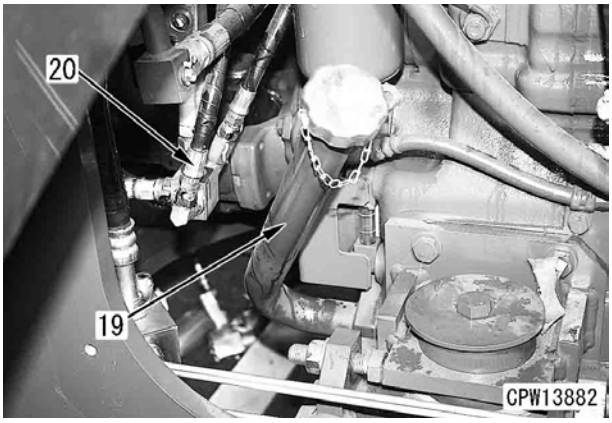
[*16]
★ Adjust the crosshead in the following procedure.
1) Loosen locknut (52) and return adjustment screw (53) to the original position.
2) Hold the top face of crosshead (47) lightly, and then screw in adjustment screw (53).
3) After adjustment screw (53) is in contact with the valve stem, screw it in further by 20°.
4) Tighten locknut (52) in this position.
Crosshead guide and crosshead top face: **Engine oil (EO30)**
Locknut:
58.7 ± 5.9 Nm {6.0 ± 0.6 kgm}



[*17]
Rocker housing mounting bolt:
58.8 – 73.5 Nm {6.0 – 7.5 kgm}

16. Remove transmission oil filler tube (19).

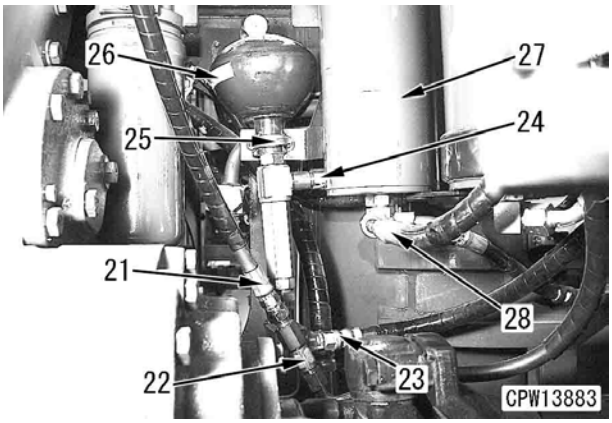
17. Disconnect hose (20) at the bottom of PPC accumulator.



18. Disconnect hoses (21), (22), (23) and (24).

19. Remove clamp (25) and remove PPC accumulator assembly (26).

20. Disconnect hose (28) at the bottom of accumulator (27).



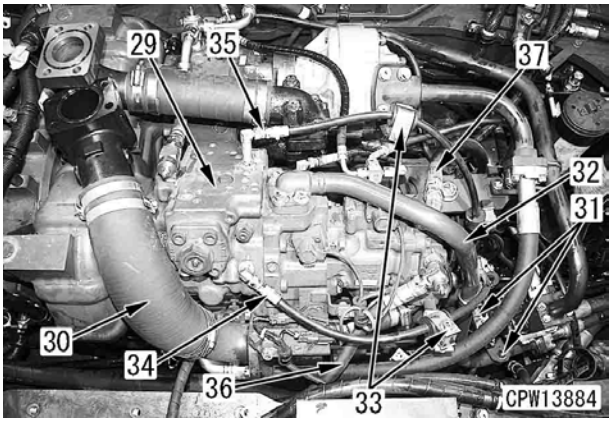
21. Remove suction tube assembly (30) from work equipment pump (29).

22. Remove 2 clamps (31) and disconnect tube (32) from the work equipment pump.

23. Remove clamp (33) and disconnect hoses (34) and (35).

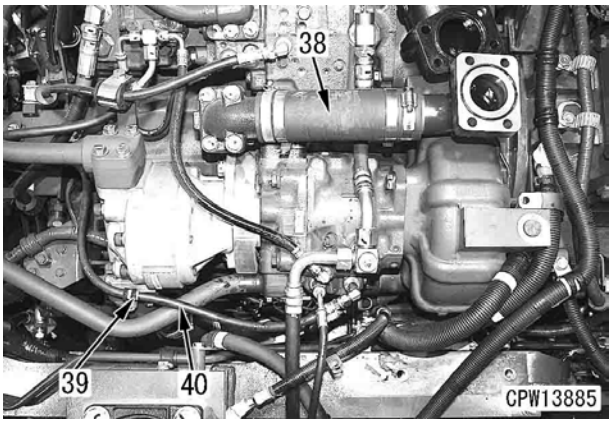
24. Disconnect tube (36).

25. Disconnect discharge tube (37).



26. Remove tube assembly (38).

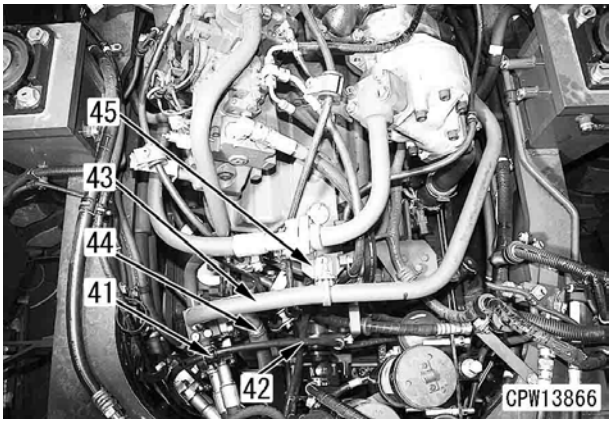
27. Remove clamp (39) and disconnect hose (40).

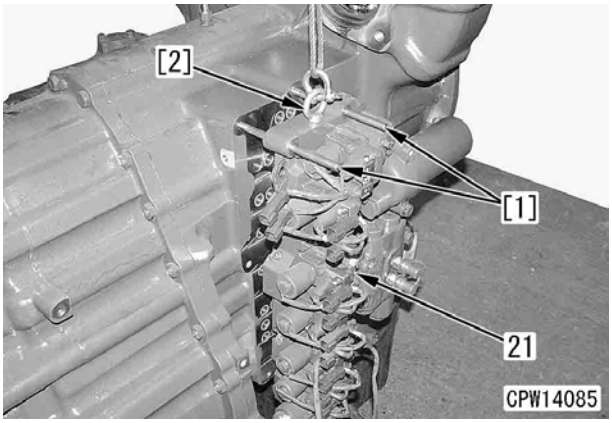


28. Remove 2 clamps (41) and disconnect hose (42).

29. Disconnect hose (44) from the tee side of steering pump tube (43).

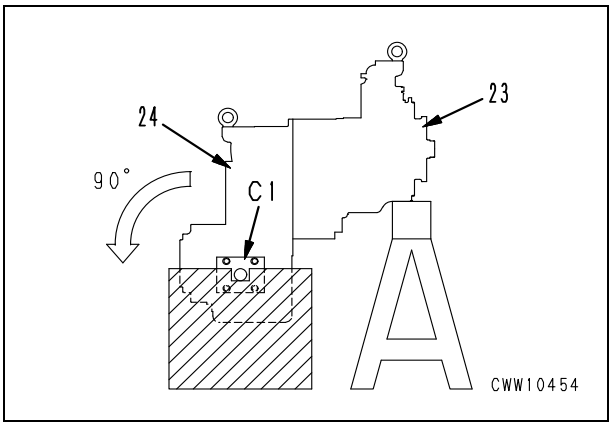
30. Loosen the clip to take out plate (45), and then disconnect tube (43).



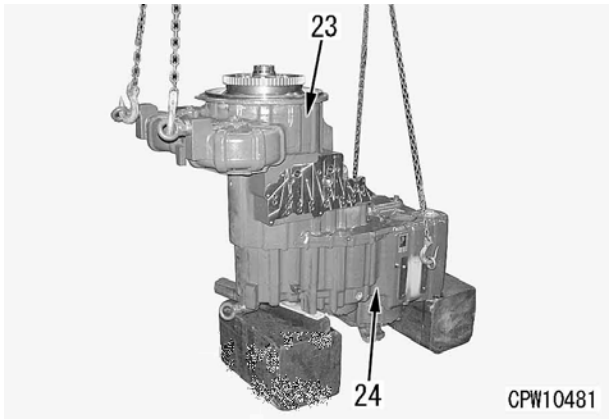


7. Separation of front and rear housings

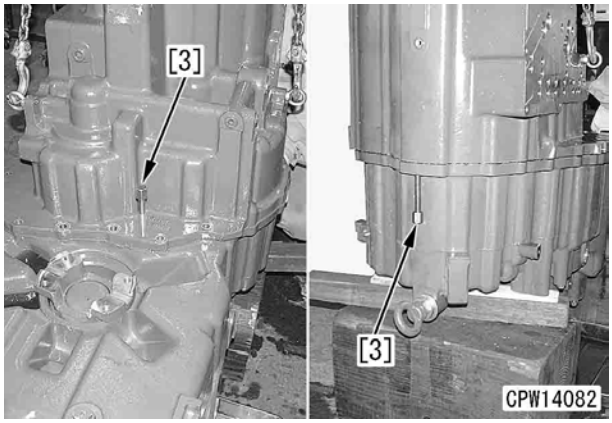
1) Install tool **C1** tool to the position where the left- and right-transmission mount brackets are installed.
2) Lift up the torque converter and transmission assembly. Support two places of tool **C1** shaft with a block. Using a jack, support the bottom of rear housing (23).
3) Turn rear housing (23) 90° around tool **C1** shaft to position the rear housing above the front housing. Then, support the bottom of front housing (24) with blocks.



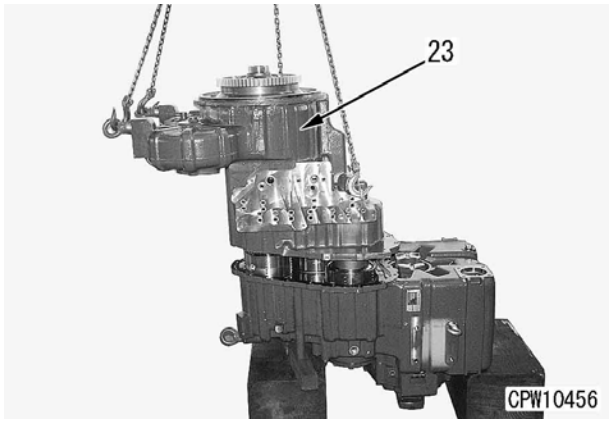
4) Lift up the torque converter and transmission assembly to support the bottom of front housing (24) with blocks.
   ★ Make sure the top of rear housing (23) is level.
5) Remove tool **C1**.



6) Sling the rear housing and then remove the mounting bolts.
7) Tighten all forcing screws [3] with uniform torque and then separate the front and rear housings.



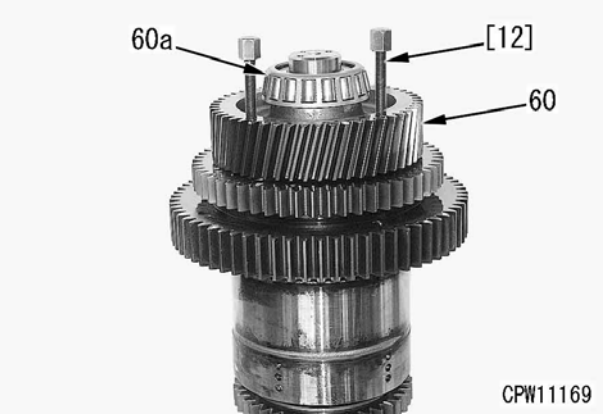
8) Lift up rear housing (23) and then remove it.



[2nd speed clutch]

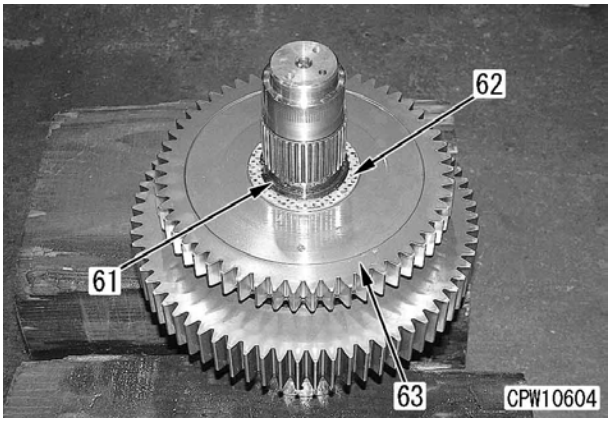
6. Bearing

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

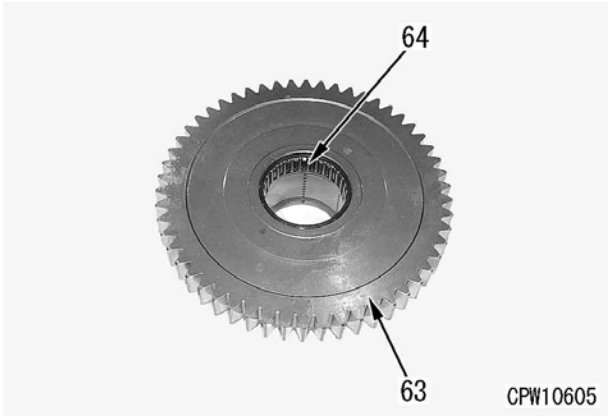


7. 2nd speed gear

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).



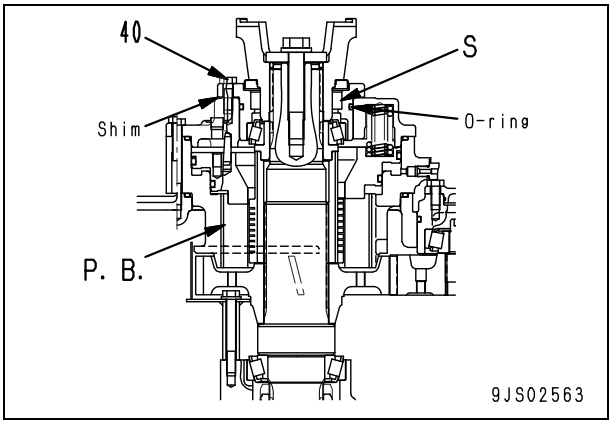
8. End plate

9. Clutch plate

10. Piston

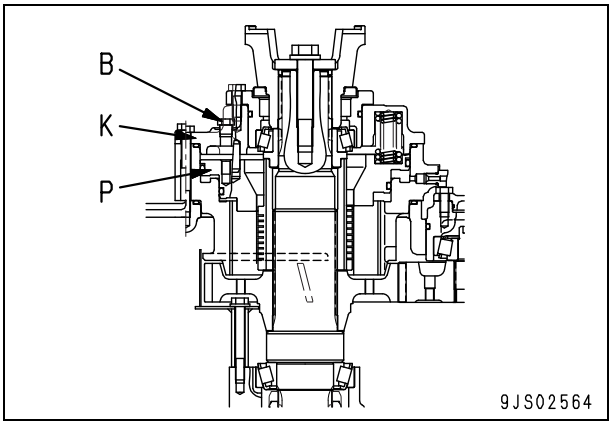
★ For procedures 8 – 10, disassemble the clutch pack in the same way as in procedures 3 – 5 for the 3rd speed clutch.

★ Perform the above adjustment while parking brake P.B. is not installed.
★ Perform the above adjustment while dust seal and oil seal (**S**) are not installed.
★ Replace O-ring **07000-75160**.

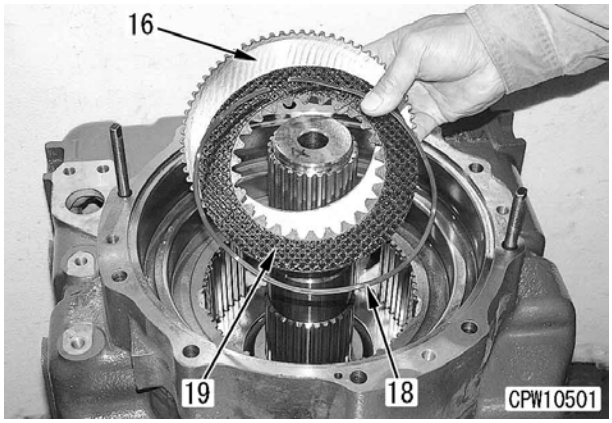


10. Install 2 parking brake reset bolts (**B**) (M12, L = 45 mm).

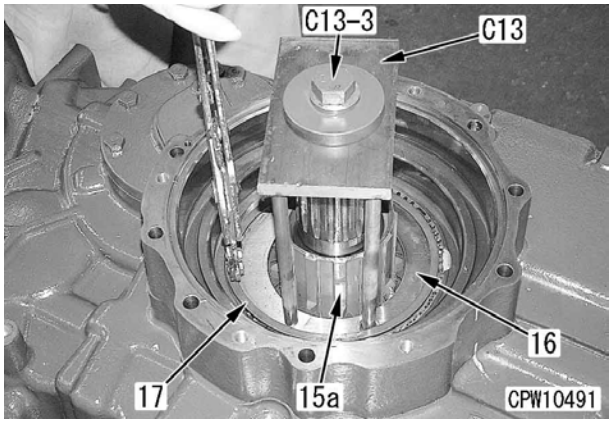
11. Remove cover (**K**) and piston (**P**) as a sub-assembly.
★ Do not remove the cage mounting bolts.



12. Plate and disc
1) Install plate (16), spring (18) and disc (19) in this order.
★ Be careful not to allow the spring and disc to overlap each other.

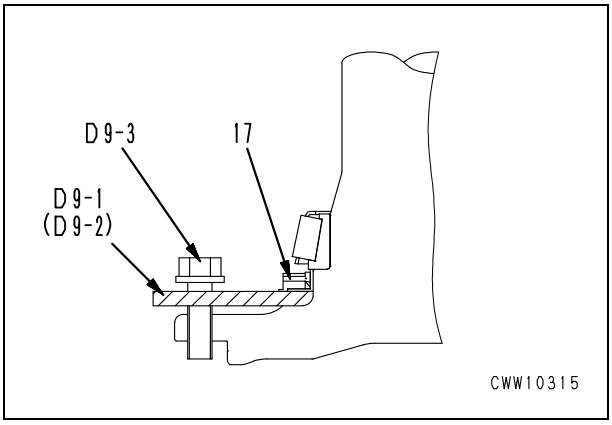


2) Install hub (15a).
3) Install tool **C13** onto the output shaft and tighten coupling mounting bolt (tool **C13-3)**, then press plate (16).
4) Install snap ring (17).

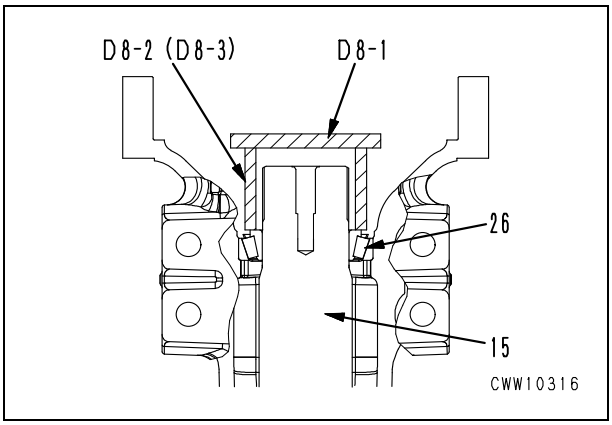


3. Axle housing, shaft

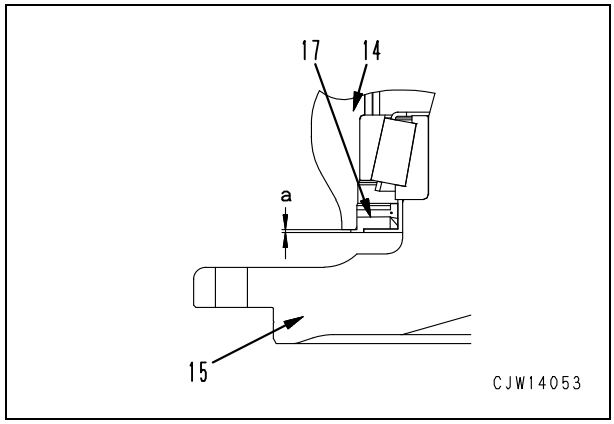
1) Mount tool **D9-1** (**D9-2** for WA480-6) under oil seal (17).
   ★ Adjust with tool **D9-3** so that the upper face of tool **D9-1** (**D9-2**) and the oil seal (17) touches each other lightly and its clearance is even.



2) Suspend the axle housing (14) vertically and slowly lower by aligning its position to the oil seal (17).
   ★ Insert the axle housing using its weight.
   Insertion part of the oil seal, bearing: **Axle oil**
   ★ Keep tool **D9** mounted until step 3). Do not dismount after mounting the housing.
3) Insert the axle shaft (15) to the bearing (26) using tool **D8-1** and **D8-2** (**D8-3** for WA470-6 rear axle).
   Bearing periphery: **Axle oil**



4) Pull out tool **D9** horizontally.
   ★ Check to see if oil seal (17) is not tilting.
   ★ Confirm clearance (a) between the oil seal and housing.
   Clearance (**a**) = Max. 0.2 mm



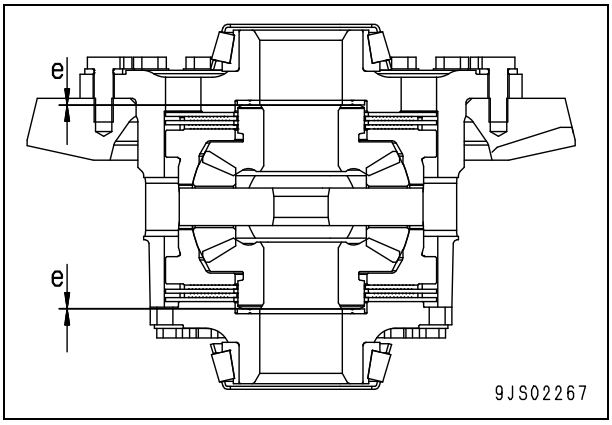
4. Selecting shims

1) Install planetary carrier (20) to the spline of axle shaft (15). Then, install tool **D10** and tighten mounting bolt (9) with your fingers.
   ★ Install planetary carrier (20) without the gear.
   ★ When tightening mounting bolt (9), remove all adhesive from it and its mating bolt hole.
2) While turning axle housing (14), tighten mounting bolt (9).
   Bolt:
   WA470-6 front and WA480-6 front and rear:
   823 – 1,029 Nm {84 – 105 kgm}
   WA470-6 rear:
   610 – 765 Nm {62 – 78 kgm}
3) After fitting bearings (16) and (26) sufficiently, measure the starting torque at hole (**h**) of axle housing (14).
   ● Starting torque
   WA470-6 front:
   21.6 – 57.8 N {2.2 – 5.9 kg}
   WA470-6 rear:
   21.6 – 54.9 N {2.2 – 5.6 kg}
   WA480-6 front and rear:
   63.7 – 122.5 N {6.5 - 12.5 kg}

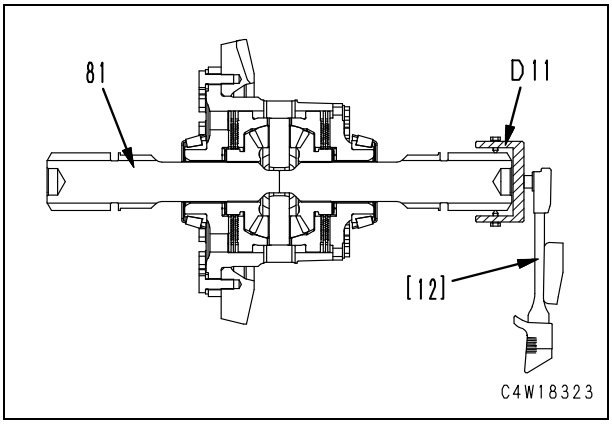
clearance will be in the standard range.

★ When replacing the washer, perform the above procedure from step 7).

● Thicknesses of washers:
4.0 mm, 4.1mm

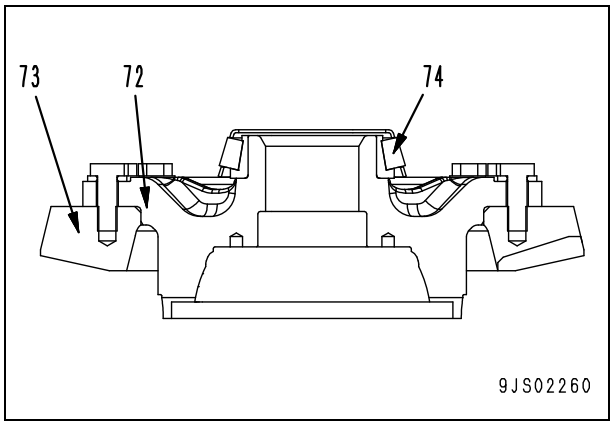


15) Measure the differential torque while no load is applied.
1] Install sun gear shafts (81) to the right and left sides of differential carrier assembly.
2] Fix the sun gear shaft on either one side.
3] Install tool **D7** and torque wrench [12] to the sun gear shaft on the opposite side to measure the rotation torque.
★ When measuring, let the case turn freely.
● Rotation torque:
Rear differential of WA470-6:
Max. 10 Nm {1.0 kgm}
Front differential of WA470-6 and front and rear differentials of WA480-6:
Max. 15 Nm {1.5 kgm}
4] If the rotation torque exceeds the above value, disassemble the differential carrier again and perform steps 12) and 15).

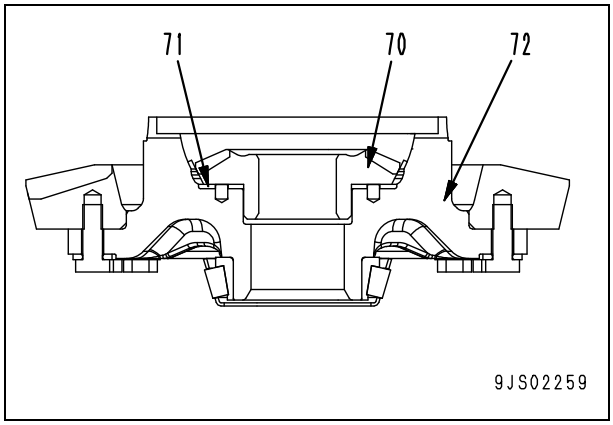


4. Assembly of differential carrier assembly (Standard specification)

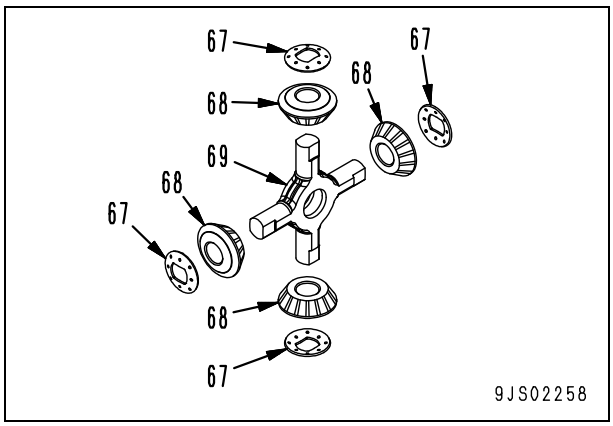
1) Install bearing (74) and bevel gear (73) to case (72).
Bevel gear mounting bolt:
Adhesive (LT-2)
Bevel gear mounting bolt:
245 – 309 Nm {25 – 31.5 kgm}

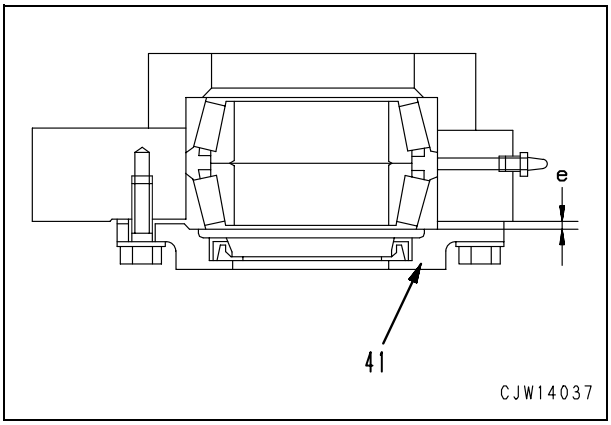


2) Install washer (71) and side gear (70) to case (72).



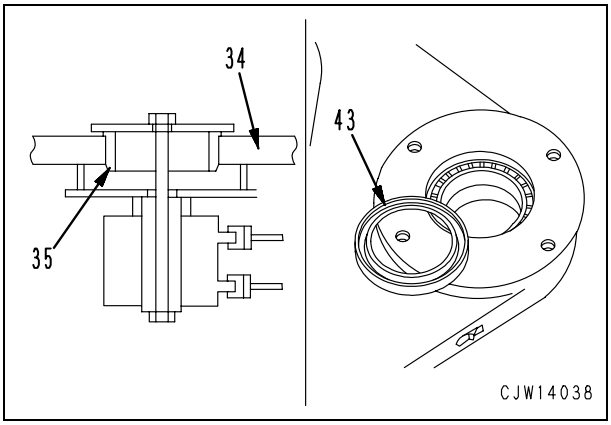
3) Install pinion gear (68) and spherical washer (67) to spider shaft (69).





5) Press dust seal (43) from upper of the front frame.
   ★ At pressing, turn the dust seal lip outside.
   Dust seal lip: **Grease (G2-LI)**
   Periphery of dust seal metallic outer ring: **Adhesive (Loctite 601)**

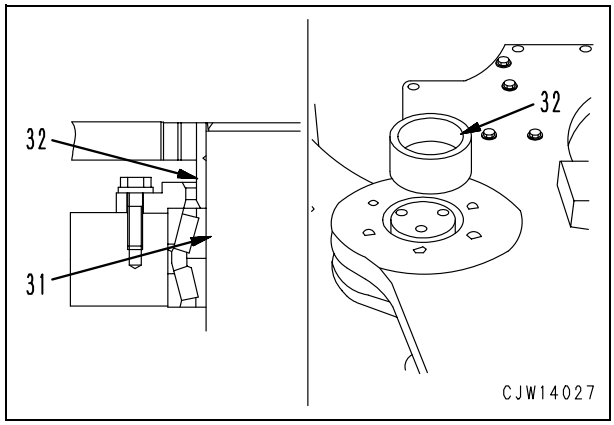
6) Press bushing (35) in the lower hinge of rear frame (34) using the press and the like.



[*3][*4][*5][*6][*7]
- Install the front frame and rear frame in the following procedure.

⚠ **Use a bar to mach the pin holes. Absolutely do not insert fingers.**

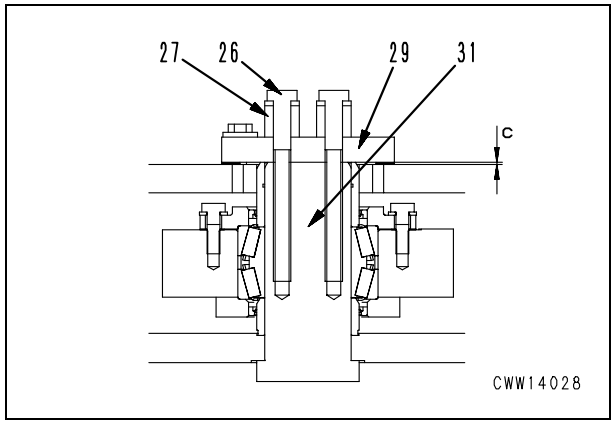
★ Be sure to match the pin holes.
1) Insert upper hinge pin (31), and then assemble spacer (32).
   ★ Install plate (30) to prevent loss of the mounting pin.



2) Assemble retainer (29) to upper hinge pin (31) using spacer (27) and mounting bolt (26).
   Pin mounting bolt (when shim is adjusted):
   19.6 ± 2 Nm {2.0 ± 0.2 kgm}

3) Equally tighten retainer (29) using 3 mounting bolts (26). Then measure clearance (**c**) between the hinge and retainer at two places (compute the mean) and select the shim to be used.
   Clearance (**c**) **= 0.2 mm max.**
   Retainer mounting bolt (when shim is adjusted):
   19.6 ± 2 Nm {2 ± 0.2 kgm}
   ★ After adjusting the shim, temporarily tighten the retainer mounting bolt so that it does not turn.

4) Tighten the mounting bolts for pin (31) and retainer (29) with the specified torque.
   Pin and retainer mounting bolts:
   Adhesive (Loctite 262)
   Pin mounting bolt:
   205.9 ± 2 km {21 ± 0.2 kgm}
   Retainer mounting bolt:
   98 – 123 Nm {10 – 12.5 kgm}



Removal and installation of work equipment and cooling fan pump assembly

Removal

- ⚠ **Park the machine on level ground and lower the bucket to the ground.**
- ⚠ **Install the lock bar on the frame, apply the parking brake and put chocks under the tires.**
- ⚠ **Disconnect the negative (–) terminal from the battery beforehand.**

1. Drain hydraulic oil.

   Hydraulic oil: **Approx. 275 ℓ**

2. Remove the hood, referencing to "Removal and installation of hood."

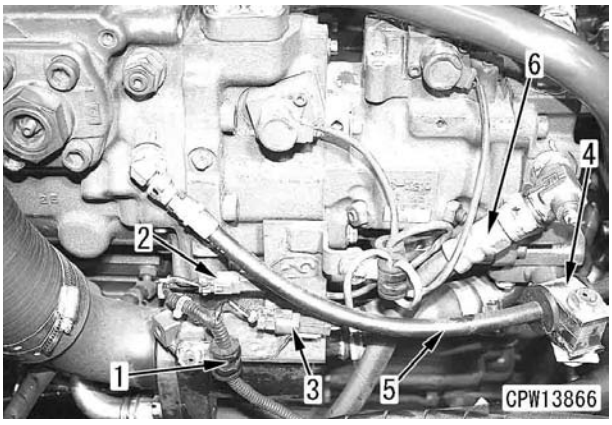
3. Remove the hydraulic tank, referencing to "Removal and installation of hydraulic tank."

4. Remove the operator's cab and floor frame assembly, referencing to "Removal and installation of operator's cab and floor frame assembly."

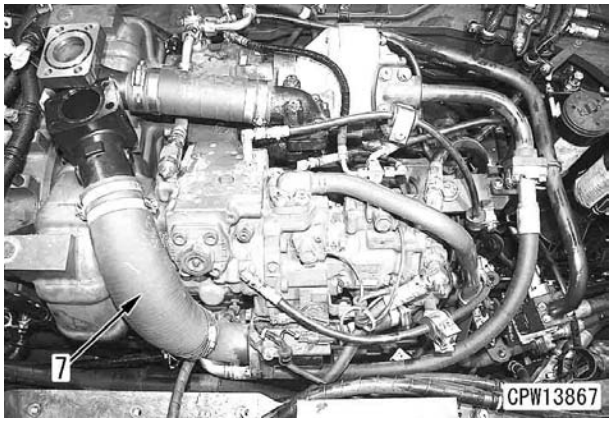
5. Remove clamp (1) and disconnect connectors R71 (2) and R29 (3).

6. Remove clamp (4) and disconnect the pilot hose (5).

7. Disconnect discharge tube (6) on the cooling fan pump.



8. Remove pump suction tube assembly (7).



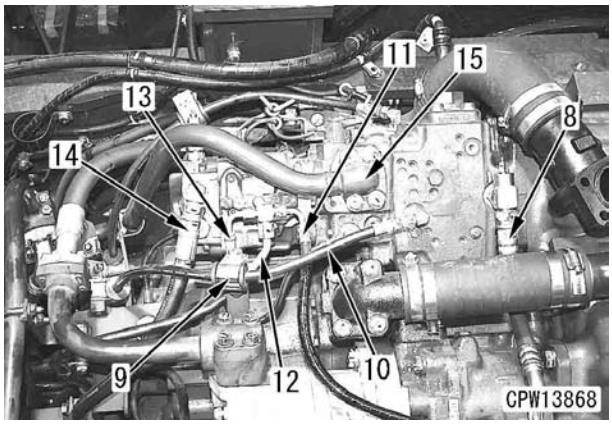
9. Remove drain hose (8).

10. Remove clamp (9) and disconnect pilot hose (10).

11. Disconnect pilot hoses (11), (12) and (13).

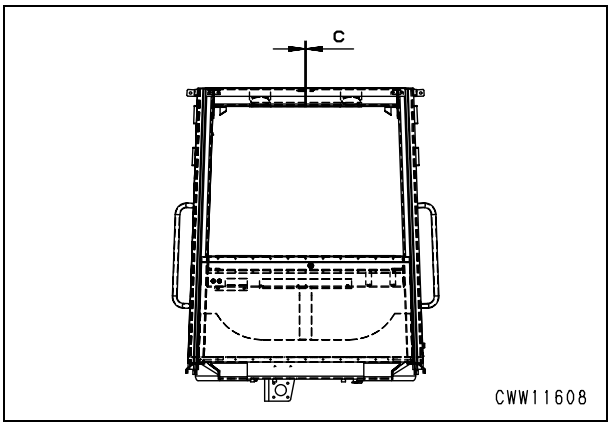
12. Disconnect charge pressure discharge hose (14).

13. Remove 4 mounting bolts for discharge tube (15) on the work equipment pump side.

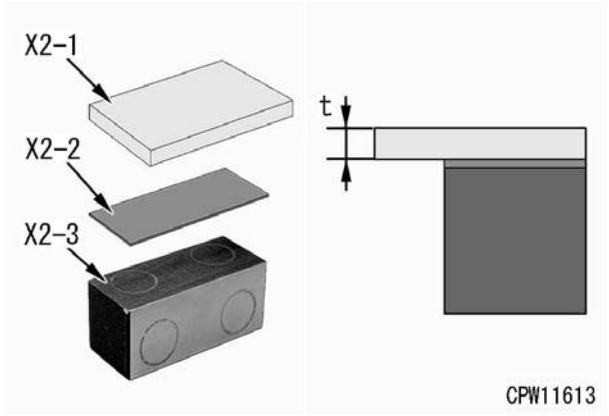


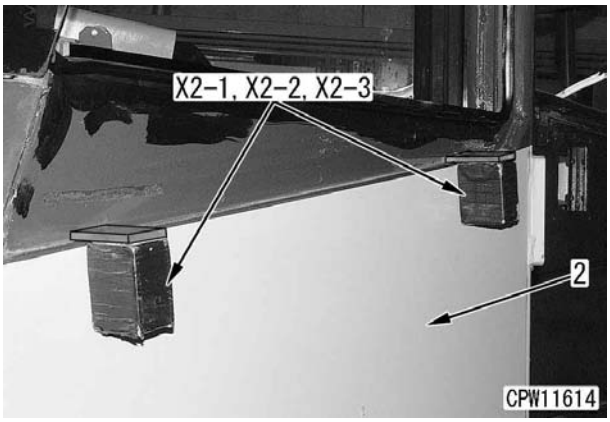
★ Take care that the corner (part (b)) of both-sided adhesive tape (4) will not float.

★ When sticking the both-sided adhesive tape around a side or a rear window glass, start at center of the top and make a clearance of about 5 mm at end joint (c).



5. Position the replacement glass.
   1) Stick **X2-2** (thin steel sheet) to tool **X2-1** (spacer) with adhesive.
      - Spacer thickness (t): **5 mm**
   2) Match tool **X2-3** (magnet) to tools **X2-1** and **X2-2** and set them to the 2 lower places of the window glass sticking part of operator's cab (2).





   3) Using tool **X3** (suction cup), place window glass (3) on tool **X2-1** (5 mm spacer) and match it to the operator's cab.