CEBM019402

Shop Manual

WA430-6

WHEEL LOADER

SERIAL NUMBERS **WA430-6** **A41001** and UP

It is our policy to improve our products whenever it is possible and practical to do so. We reserve the right to make changes or add improvements at any time without incurring any obligation to install such changes on products sold previously.

Due to this continuous program of research and development, periodic revisions may be made to this publication. It is recommended that customers contact their distributor for information on the latest revision.

Preparations for Work

1. Before adding oil or making repairs, park the machine on hard, level ground and block the wheels to prevent the machine from moving.

2. Before starting work, lower blade, ripper, bucket, or any other work equipment to the ground. If this is not possible, insert the safety pin or use blocks to prevent the work equipment from falling. In addition, be sure to lock all the control levers and hang warning signs on them.

3. When disassembling or assembling, support the machine with blocks, jacks, or stands before starting work.

4. Remove all mud and oil from the steps or other places used to get on and off the machine. Always use the handrails, ladders, or steps when getting on or off the machine. Never jump on or off the machine. If it is impossible to use the handrails, ladders, or steps, use a stand to provide safe footing.

Precautions During Work

1. When removing the oil filler cap, drain plug, or hydraulic pressure measuring plugs, loosen them slowly to prevent the oil from spurting out. Before disconnecting or removing components of the oil, water, or air circuits, first release the pressure completely from the circuit.

2. The coolant and oil in the circuits are hot when the engine is stopped; be careful not to get burned. Wait for the oil and coolant to cool before carrying out any work on the oil or water circuits.

3. Before starting work, remove the leads from the battery. ALWAYS remove the lead from the negative (-) terminal first.

4. When raising heavy components (in excess of 25 kg (55 lb)), use a hoist or crane. Check that the wire rope, chains, and hooks are free from damage. Always use lifting equipment which has ample capacity. Install the lifting equipment at the correct places. Use a hoist or crane and operate slowly to prevent the component from hitting any other part. Do not work with any part still raised by the hoist or crane.

5. When removing a cover which is under internal pressure or under pressure from a spring, always leave two bolts in position on opposite sides. Loosen the bolts gradually and alternately to release the pressure, and then remove the cover.

6. When removing components, be careful not to break or damage the wiring, Damaged wiring may cause electrical fires.

7. When removing piping, stop the fuel or oil from spilling out. If any fuel or oil drips on the floor, wipe it up immediately. Fuel or oil on the floor can cause you to slip, or can even start fires.

8. Gasoline or other fuels should never be used to clean parts. Clean parts with appropriate solvents.

9. Be sure to assemble all parts again in their original places. Replace any damaged parts or parts that must not be reused.
   - When installing hoses and wires, be sure that they can not be damaged by contact with other parts when the machine is being operated.

10. When installing high pressure hoses, make sure that they are not twisted. Damaged tubes are dangerous. Be extremely careful when installing tubes for high pressure circuits. Check that connecting parts are correctly installed.

11. When assembling or installing parts, always use the specified tightening torques. When installing protective parts such as guards, or parts which vibrate violently or rotate at high speed, be particularly careful to check that they are installed correctly.

12. When aligning two holes, never insert your fingers or hand. Be careful not to get your fingers caught in a hole.

13. When measuring hydraulic pressure, check that the measuring tool is correctly assembled before taking any measurements.

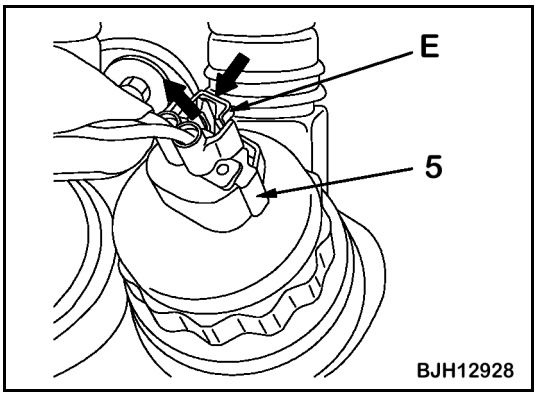
14. Take care when removing or installing the tracks of track-type machines. When removing the track, the track separates suddenly; never let anyone stand at either end of the track.

15. When jump-starting the machine, only use a machine of similar size and voltage. Never use an arc welder or other electrical generating equipment to jump-start the machine. Carefully review the safety procedures for jump-starting the machine.

16. Before starting work, stop the engine. When working on or around a rotating part, stop the engine. When checking the machine without stopping the engine (measuring oil pressure, revolving speed, temperature, etc.), be extremely careful not to get rolled or caught in rotating or moving parts.

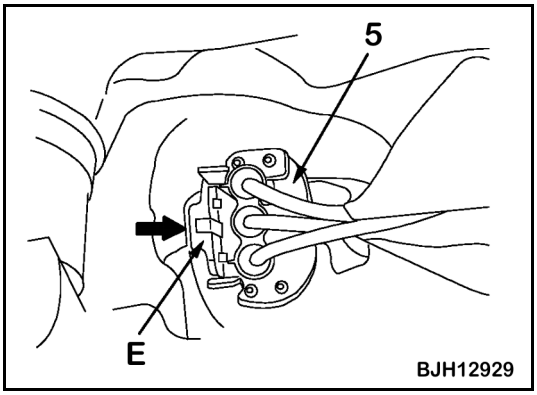
17. If the engine is operated for a long time in a place which is not ventilated well, you may suffer from gas poisoning. Before starting the engine, open the windows and doors so that the area is well ventilated.

★ Injection pressure control valve of fuel supply pump: PCV (SUMITOMO-2)



★ Speed sensor of fuel supply pump: G (SUMITOMO-3)

★ Pull the connector straight up.



Turn-housing Type (Round Green Connector)

★ 140 engine

★ Intake air pressure sensor in intake manifold (CANNON-04): PIM etc.

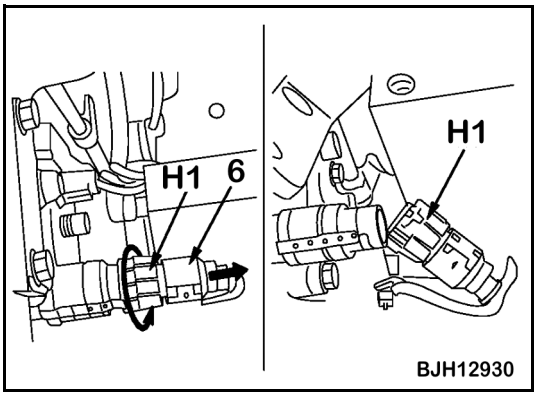
1. Disconnect connector (6) according to the following procedure.

   A. Turn housing (H1) in the direction of the arrow.

   ★ When the connector is unlocked, housing (H1) becomes heavy to turn.

   B. Pull out housing (H1) in the direction of the arrow.

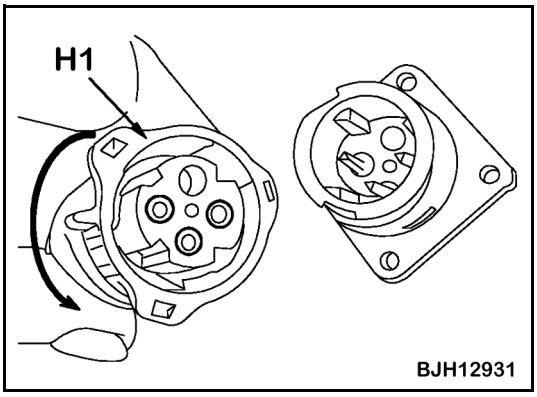
   ★ Housing (H1) is left on the wiring harness side.



2. Connect the connector according to the following procedure.

   A. Insert the connector to the end, while setting its groove.

   B. Turn housing (H1) in the direction of the arrow until it clicks.



Temperature: Fahrenheit Centigrade Conversion

A simple way to convert a Fahrenheit temperature reading into a Centigrade temperature reading or vise versa is to look at the center or boldface column of figures in this table. These figures refer to the temperature in either Fahrenheit or Centigrade degrees. **If you want to convert from Fahrenheit to Centigrade degrees**, consider the center column as a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left. **If you want to convert from Centigrade to Fahrenheit degrees**, consider the center column as a table of Centigrade values, and read the corresponding Fahrenheit temperature on the right.

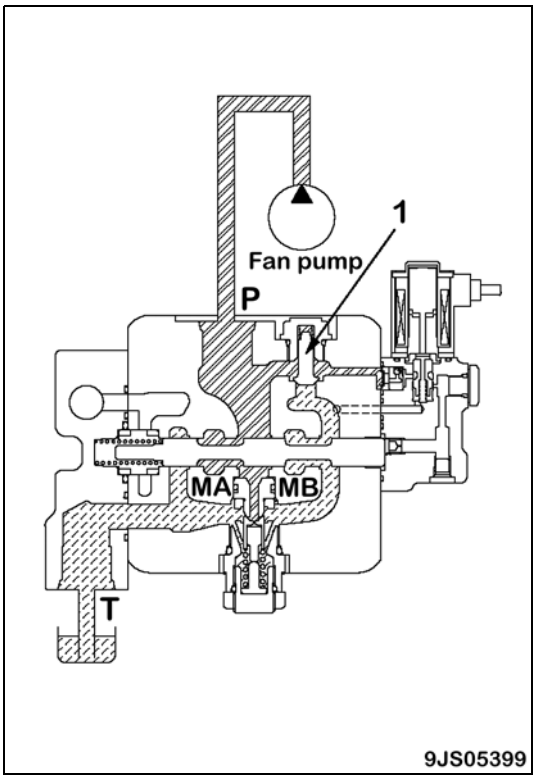
°C		°F	°C		°F	°C		°F	°C		°F
-40.4	**-40**	-40.0	-11.7	**11**	51.8	7.8	**46**	114.8	27.2	**81**	117.8
-37.2	**.35**	-31.0	-11.1	**12**	53.6	8.3	**47**	116.6	27.8	**82**	179.6
-34.4	**-30**	-22.0	-10.6	**13**	55.4	8.9	**48**	118.4	28.3	**83**	181.4
-31.7	**-25**	-13.0	-10.0	**14**	57.2	9.4	**49**	120.2	28.9	**84**	183.2
-28.9	**-20**	-4.0	-9.4	**15**	59.0	10.0	**50**	122.0	29.4	**85**	185.0
-28.3	**-19**	-2.2	-8.9	**16**	60.8	10.6	**51**	123.8	30.0	**86**	186.8
-27.8	**-18**	-0.4	-8.3	**17**	62.6	11.1	**52**	125.6	30.6	**87**	188.6
-27.2	**-17**	1.4	-7.8	**18**	64.4	11.7	**53**	127.4	31.1	**88**	190.4
-26.7	**-16**	3.2	-7.2	**19**	66.2	12.2	**54**	129.2	31.7	**89**	192.2
-26.1	**-15**	5.0	-6.7	**20**	68.0	12.8	**55**	131.0	32.2	**90**	194.0
-25.6	**-14**	6.8	-6.1	**21**	69.8	13.3	**56**	132.8	32.8	**91**	195.8
-25.0	**-13**	8.6	-5.6	**22**	71.6	13.9	**57**	134.6	33.3	**92**	197.6
-24.4	**-12**	10.4	-5.0	**23**	73.4	14.4	**58**	136.4	33.9	**93**	199.4
-23.9	**-11**	12.2	-4.4	**24**	75.2	15.0	**59**	138.2	34.4	**94**	201.2
-23.3	**-10**	14.0	-3.9	**25**	77.0	15.6	**60**	140.0	35.0	**95**	203.0
-22.8	**-9**	15.8	-3.3	**26**	78.8	16.1	**61**	141.8	35.6	**96**	204.8
-22.2	**-8**	17.6	-2.8	**27**	80.6	16.7	**62**	143.6	36.1	**97**	206.6
-21.7	**-7**	19.4	-2.2	**28**	82.4	17.2	**63**	145.4	36.7	**98**	208.4
-21.1	**-6**	21.2	-1.7	**29**	84.2	17.8	**64**	147.2	37.2	**99**	210.2
-20.6	**-5**	23.0	-1.1	**30**	86.0	18.3	**65**	149.0	37.8	**100**	212.0
-20.0	**-4**	24.8	-0.6	**31**	87.8	18.9	**66**	150.8	40.6	**105**	221.0
-19.4	**-3**	26.6	0	**32**	89.6	19.4	**67**	152.6	43.3	**110**	230.0
-18.9	**-2**	28.4	0.6	**33**	91.4	20.0	**68**	154.4	46.1	**115**	239.0
-18.3	**-1**	30.2	1.1	**34**	93.2	20.6	**69**	156.2	48.9	**120**	248.0
-17.8	**0**	32.0	1.7	**35**	95.0	21.1	**70**	158.0	51.7	**125**	257.0
-17.2	**1**	33.8	2.2	**36**	96.8	21.7	**71**	159.8	54.4	**130**	266.0
-16.7	**2**	35.6	2.8	**37**	98.6	22.2	**72**	161.6	57.2	**135**	275.0
-16.1	**3**	37.4	3.3	**38**	100.4	22.8	**73**	163.4	60.0	**140**	284.0
-15.6	**4**	39.2	3.9	**39**	102.2	23.3	**74**	165.2	62.7	**145**	293.0
-15.0	**5**	41.0	4.4	**40**	104.0	23.9	**75**	167.0	65.6	**150**	302.0
-14.4	**6**	42.8	5.0	**41**	105.8	24.4	**76**	168.8	68.3	**155**	311.0
-13.9	**7**	44.6	5.6	**42**	107.6	25.0	**77**	170.6	71.1	**160**	320.0
-13.3	**8**	46.4	6.1	**43**	109.4	25.6	**78**	172.4	73.9	**165**	329.0
-12.8	**9**	48.2	6.7	**44**	111.2	26.1	**79**	174.2	76.7	**170**	338.0
-12.2	**10**	50.0	7.2	**45**	113.0	26.7	**80**	176.0	79.4	**175**	347.0

ELECTRICAL SYSTEM 10-317
Machine Monitor System 10-317
System Circuit Diagram 10-319
Monitor Display Functions 10-322
Speedometer Specification 10-322
List of Items Displayed on Monitor 10-324
Machine Monitor Operation Switches 10-333
Setting the Machine Monitor 10-334
Troubleshooting Function 10-335
Character Display Function 10-335
Operator Mode Functions 10-336
Service Mode Functions 10-339
Input And Output Signals 10-344
Transmission Controller System 10-352
Transmission Controller Gearshifting Control Function 10-352
Cooling Fan Control Function 10-376
ECSS Function 10-386
Electric Emergency Steering Function (if equipped) 10-388
Power Train Pump Bypass Control Function (if equipped) 10-391
Directional Selector Switch Control Function (if equipped) 10-392
Multi-Function Mono Lever Function (if equipped) 10-395
Joystick Steering Function (if equipped) 10-398
Transmission Controller 10-405
Work Equipment Controller System 10-409
Work Equipment Controller 10-415
ELECTRONIC TRANSMISSION CONTROL 10-418
Combination Switch 10-420
Kickdown and Hold Switch 10-422
Multi-Function Knob (if equipped) 10-423
Joystick Steering Knob (if equipped) 10-424
KOMTRAX Terminal System 10-425
Engine Starting Circuit 10-428
Engine Stopping Circuit 10-430
Preheating Circuit 10-431
Engine Power Mode Selector Circuit 10-432
Engine Output Derating Function 10-433
Automatic Warm-up Function 10-433
Parking Brake Circuit 10-434
Sensors 10-436
Speed Sensor 10-436
Torque Converter Oil Temperature Sensor 10-437
Hydraulic Oil Temperature Sensor 10-437
Transmission Oil Temperature Sensor 10-437
Brake Oil Temperature Sensor 10-437
Work Equipment Pump Oil Pressure Sensor 10-438
Steering Pump Oil Pressure Sensor 10-438
Transmission Cutoff Oil Pressure Sensor 10-439
Coolant Level Sensor 10-440
Fuel Level Sensor 10-441

Suction Valve

Function

- If the fan pump stops, the pressurized oil does not flow into the motor. Since the motor continues to revolve because of the force of inertia, the pressure on the outlet side of the motor rises.
- When the oil stops flowing in from inlet port (P), suction valve (1) sucks in the oil on the outlet side and supplies it to port (MA) where there is not sufficient oil to prevent cavitation.



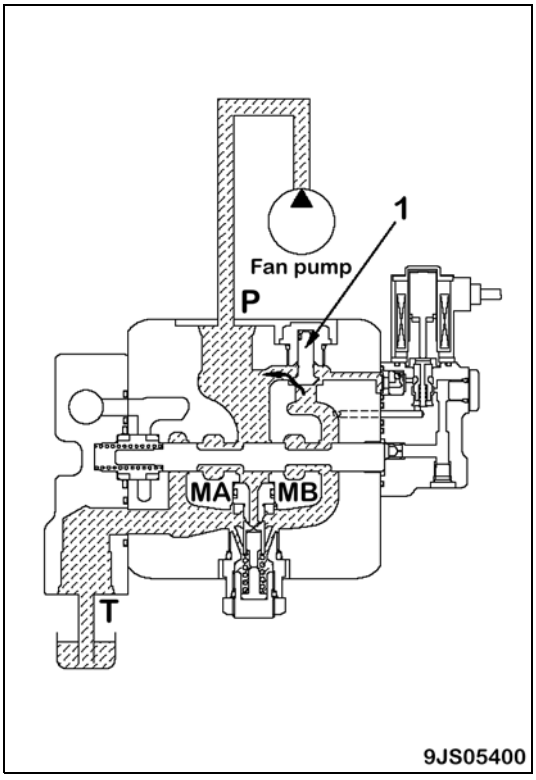
Operation

When the pump is started

- If the pressurized oil from the pump is supplied to port (P) and the pressure on motor inlet (MA) side rises and starting torque is generated in the motor, the motor starts to revolve.
- The pressurized oil on the motor outlet (MB) side of the motor returns through port (T) to the tank.

When the pump is stopped

- If the engine is stopped and the input revolution of the fan pump lowers to 0 rpm, the pressurized oil from the pump is no longer supplied to port (P). As the pressurized oil is not supplied to (MA) side of the motor, the motor speed lowers gradually to stop.
- If the motor shaft is revolved by the force of inertia while the oil flow in (P) is reducing, the oil in port (T) on the outlet side is sent by suction valve (1) to (MA) side to prevent cavitation.



A. To power train oil cooler
B. To power train pump
C. Oil pressure pickup port at torque converter outlet
D. From power train pump
E. Transmission lubricating oil pressure pickup port
F. From power train oil cooler

1. Steering pump and cooling fan pump mounting port
2. Power train pump and work equipment pump mounting port
3. Oil level gauge
4. Speed sensor
5. Breather
6. Transmission case (rear)
7. Transmission control valve
8. Transmission case (front)
9. Oil filler pipe mounting port
10. Transmission oil filter
11. Transmission oil temperature sensor
12. Drain plug
13. Torque converter oil temperature sensor
14. Flow control valve

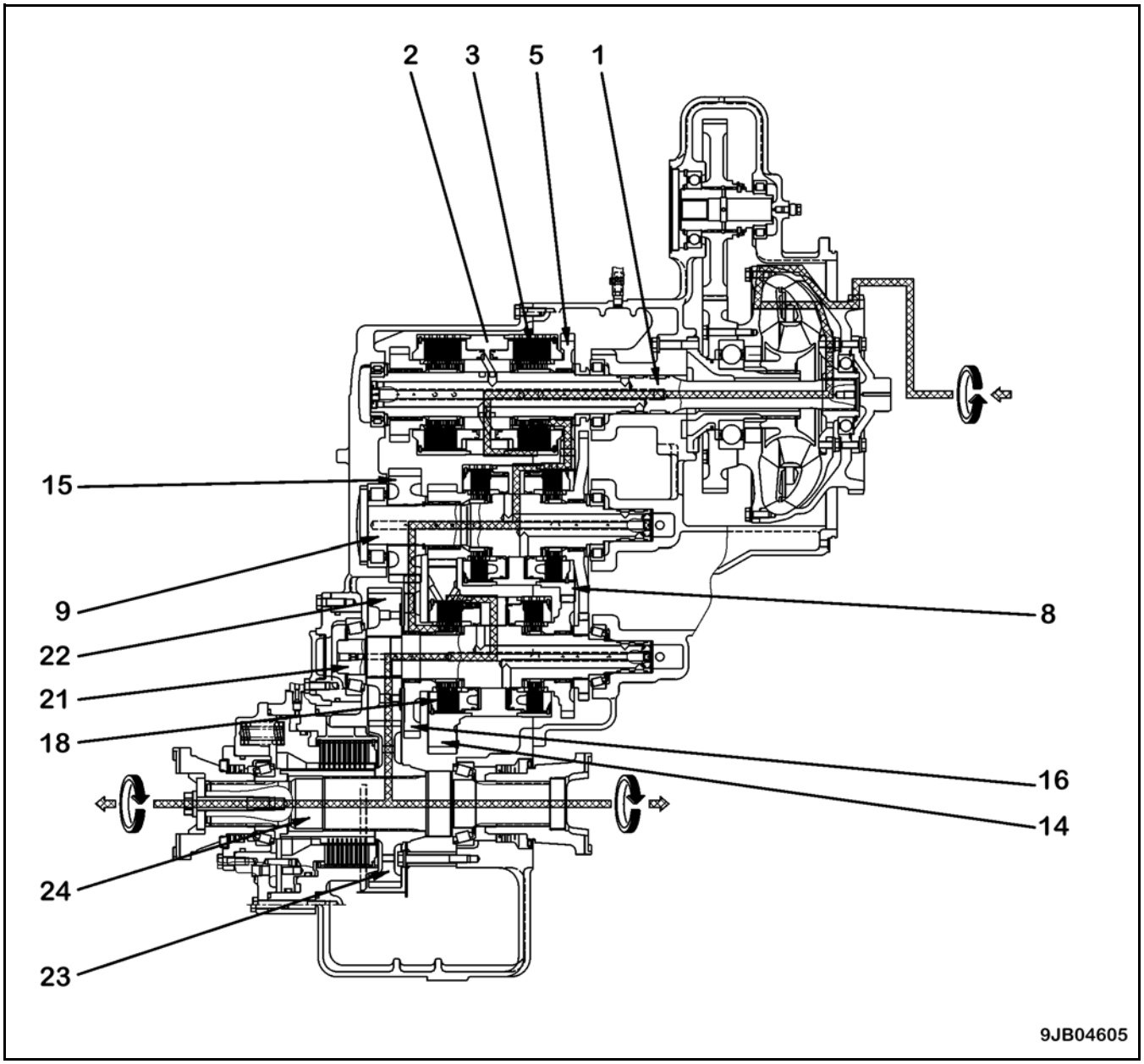
Torque Values

Item	N•m	lbf ft	lbf in
G	98 – 123	72.28 – 90.72	–
H	98 – 123	72.28 – 90.72	–
J	12.7 – 13.7	–	112.40 – 121.26
K	34.3 – 63.7	25.30 – 46.98	–
L	265 – 363	195.45 – 267.73	–
M	49.0 – 68.6	36.14 – 50.60	–
N	44.1 – 53.9	32.53 – 39.75	–
P	34.3 – 63.7	25.30 – 46.98	–
Q	29.4 – 39.2	21.68 – 28.91	–
R	29.4 – 49.0	21.68 – 36.14	–
S	9.8 – 12.7	–	86.74 – 112.40
T	9.8 – 12.7	–	86.74 – 112.40
U	29.4 – 49.0	21.68 – 36.14	–
V	34.3 – 63.7	25.30 – 46.98	–
W	58.8 – 78.5	43.37 – 57.90	–

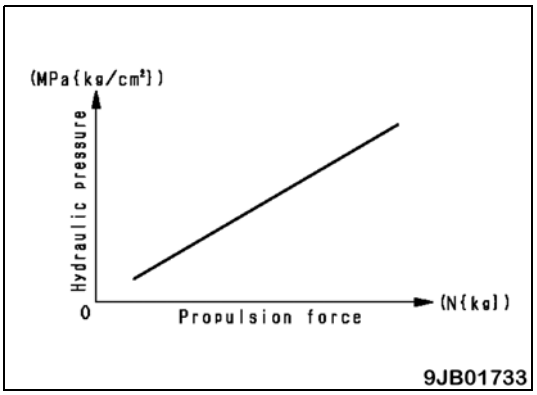
Outline

- The transmission employed consists of the counter-shaft constant gear mesh mechanism and disc clutch that provides four forward gear speeds and four reverse gear speeds.

Forward 2nd Speed



★ **Propulsion force:** Hydraulic pressure characteristics of proportional solenoid



ECMV and Fill Switch

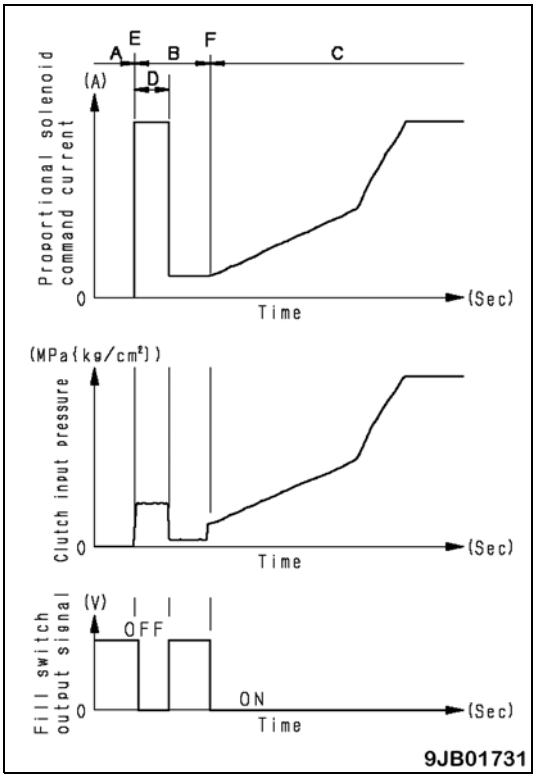
★ For each ECMV, one fill switch is installed.

- If the clutch is filled with oil, the fill switch is turned **ON** by the pressure of the clutch. The oil pressure is built up according to this signal.

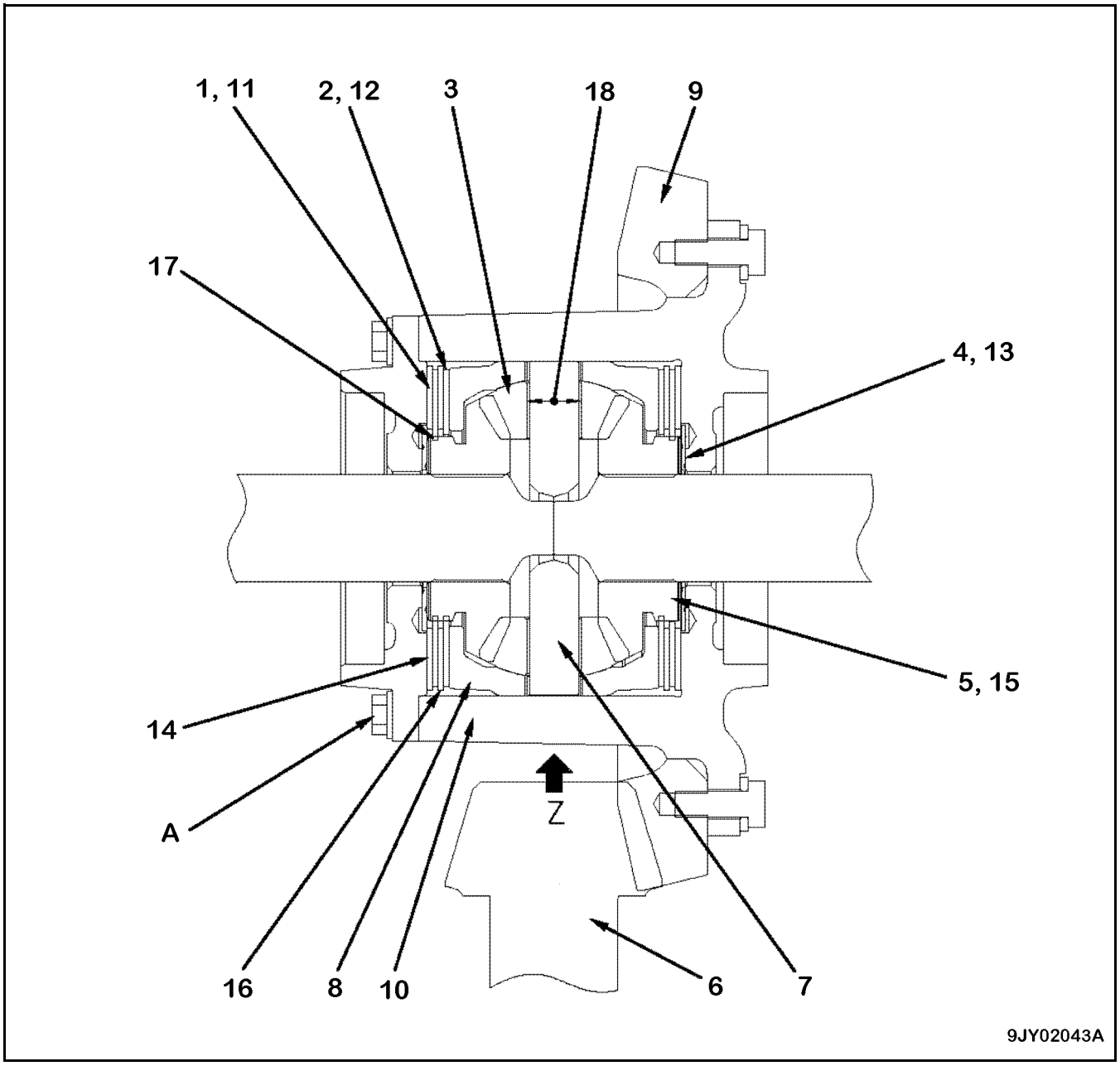
Operation of ECMV

- ECMV is controlled with the command current sent from the controller to the proportional solenoid and the fill switch output signal.
- The relationship between the proportional solenoid command current of ECMV, clutch input pressure, and fill switch output signal is shown in the graph to the right.
  - Range A: Before shifting gear (when draining)
  - Range B: During filling
  - Range C: Pressure regulation
  - Range D: During filling (during triggering)
  - Point E: Start of filling
  - Point F: Finish of filling

★ The logic is that the controller does not recognize completion of filling even if the fill switch is turned **ON** during triggering (Range D).

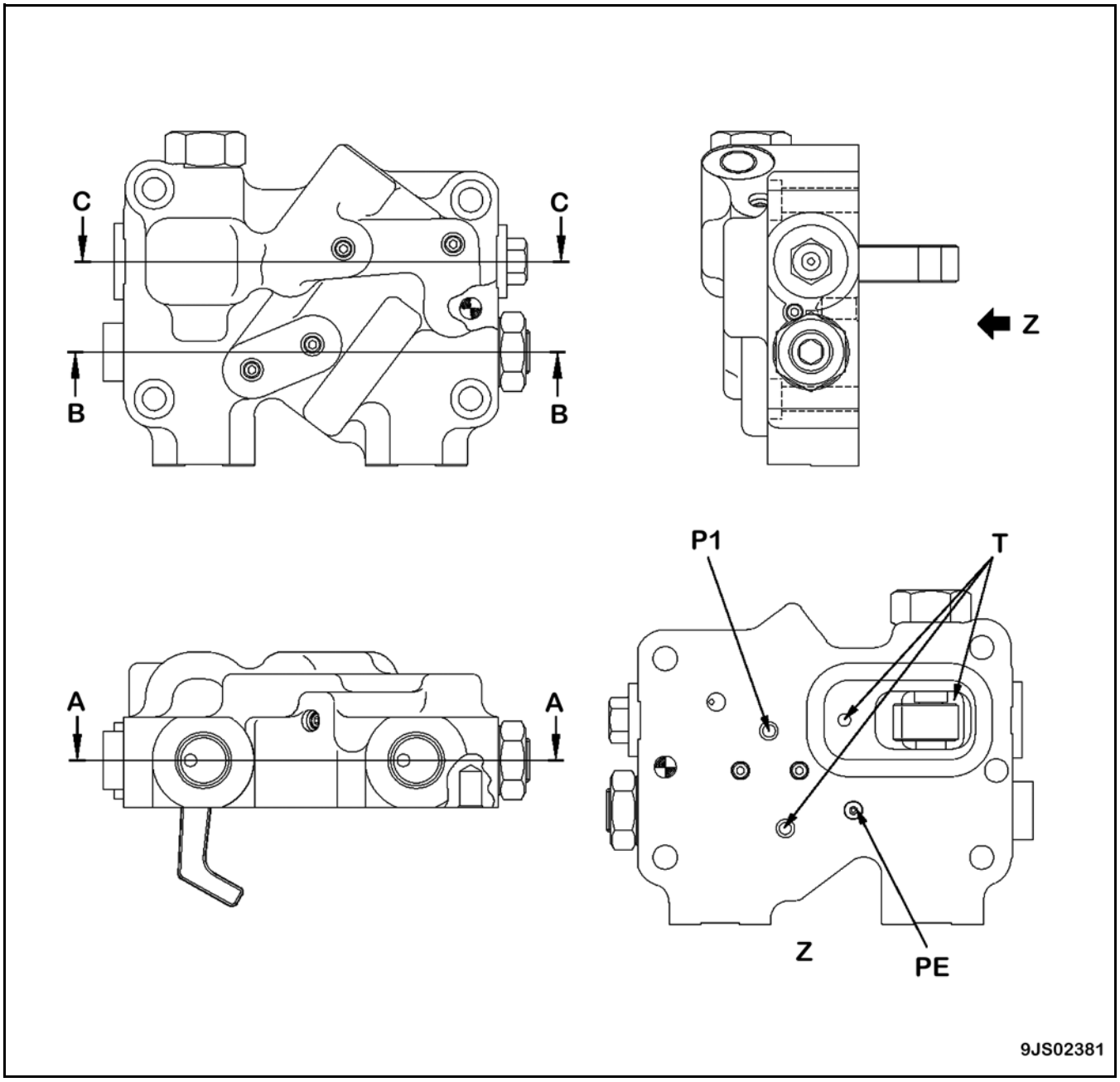


Rear Axle



1. Plate
2. Disc
3. Pinion (Teeth: 12)
4. Washer
5. Side gear (Teeth: 24)
6. Bevel pinion
7. Shaft
8. Pressure ring
9. Bevel gear (Teeth: 41)
10. Case

Servo Valve

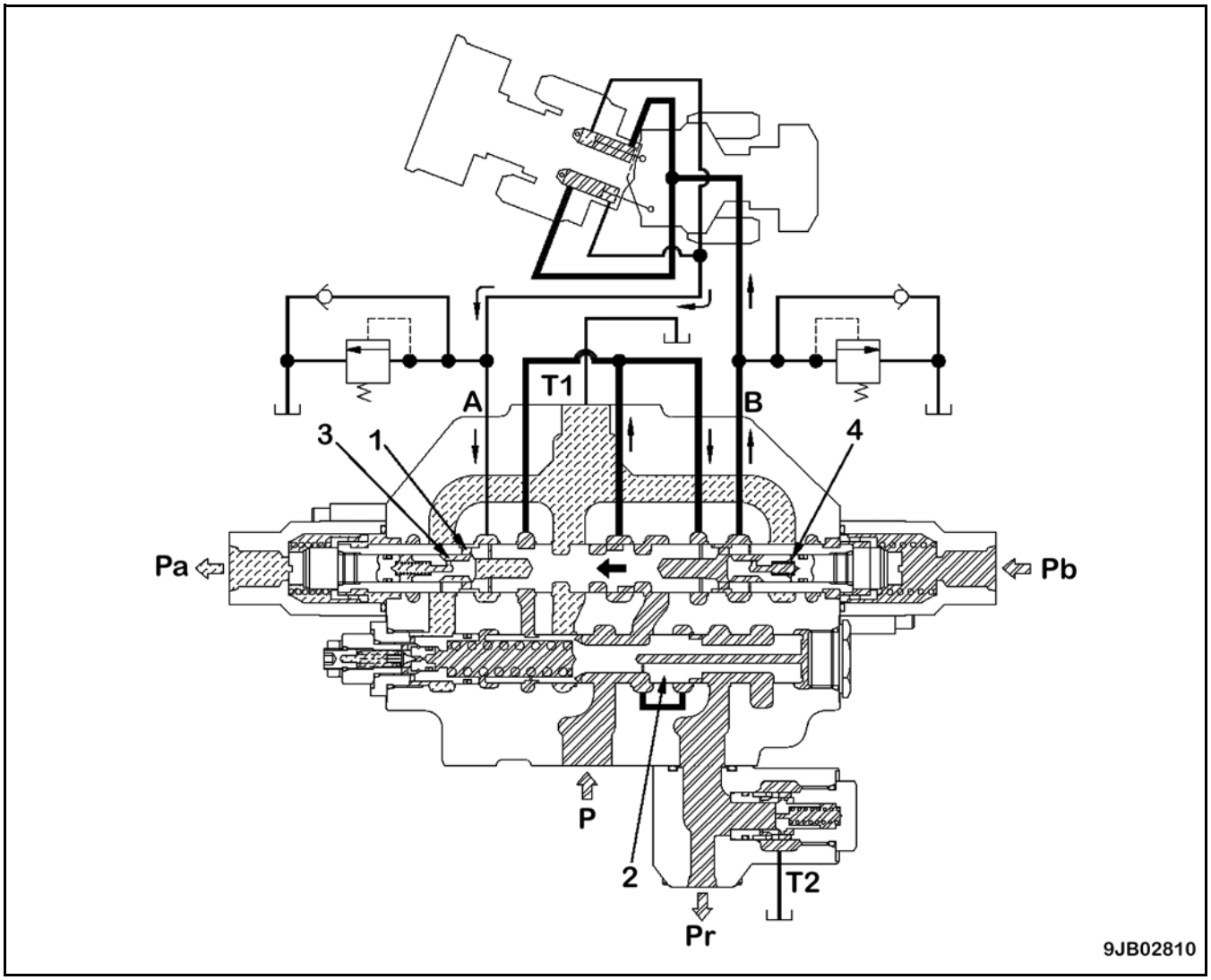


P1: Pump discharge pressure port

PE: Control pressure output port

T: Drain port

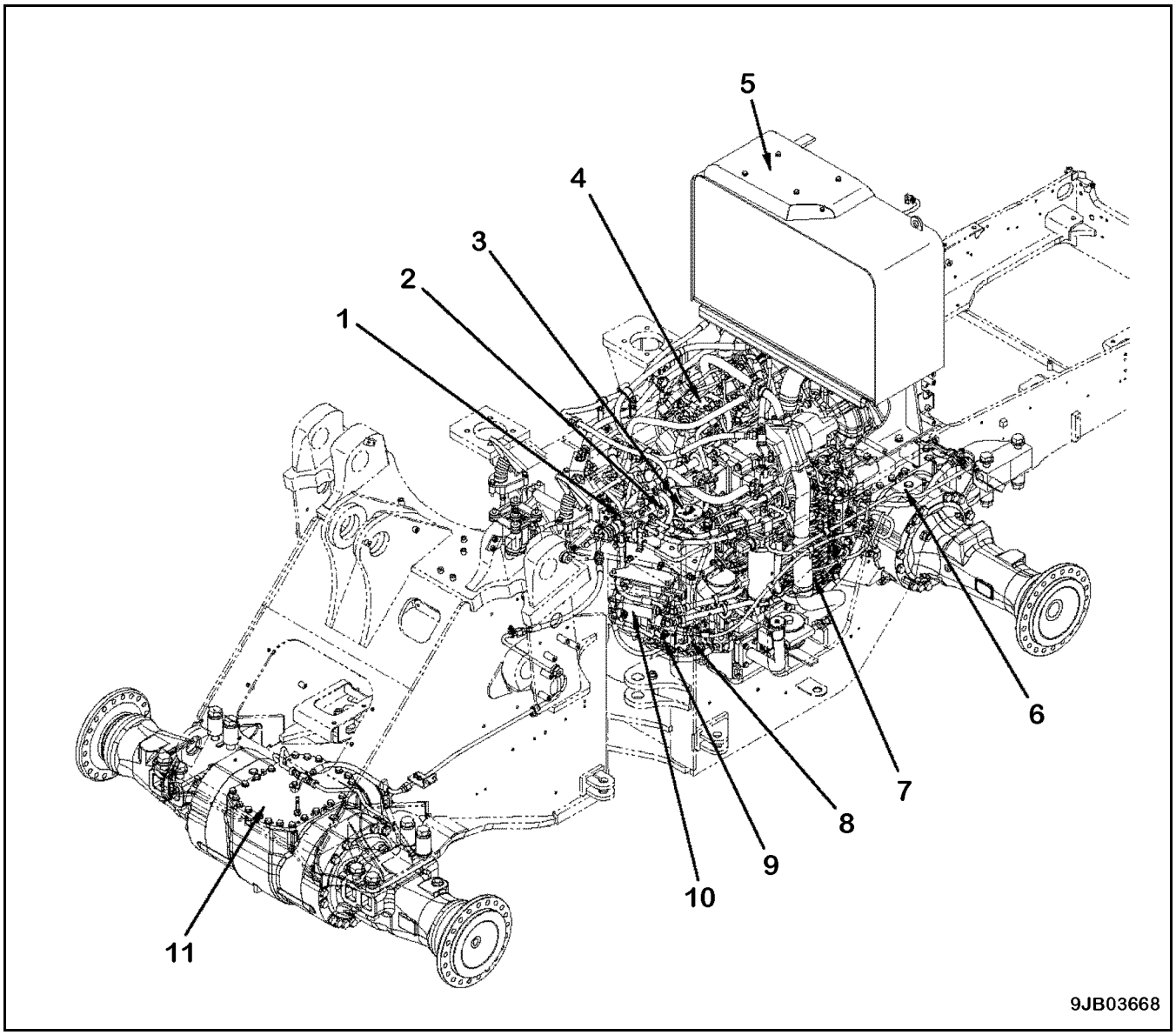
Turning Right



- If the steering wheel is turned to the right, the output pressure from the Orbitrol valve enters port (Pb) and steering spool (1) is pushed to the left.
- The oil from the steering pump flows in port (P), and then flows through flow control spool (2) to steering spool (1).
- Load check valve (4) is pushed to the right and opened, conducting the oil flow to the head side of the right steering cylinder and to the bottom side of the left steering cylinder to turn the machine to the right.
- The oil returning from the right and left steering cylinders is drained through load check valve (3) and port (T1).

SERVICE BRAKING SYSTEM

Brake Piping Diagram

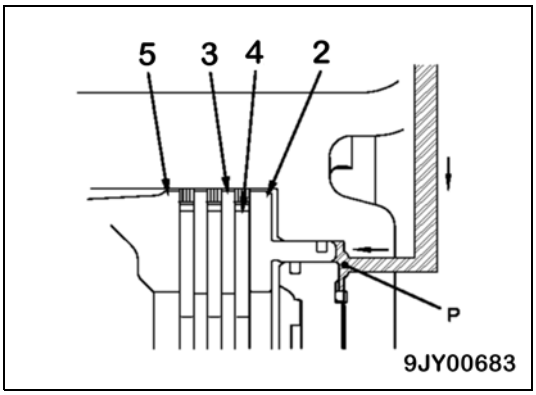


1. Brake valve
2. Accumulator (for rear)
3. Accumulator (for front)
4. Cooling fan pump
5. Hydraulic tank
6. Rear brake
7. Parking brake solenoid valve
8. Parking brake
9. Emergency parking brake release valve
10. Charge valve
11. Front brake

Operation

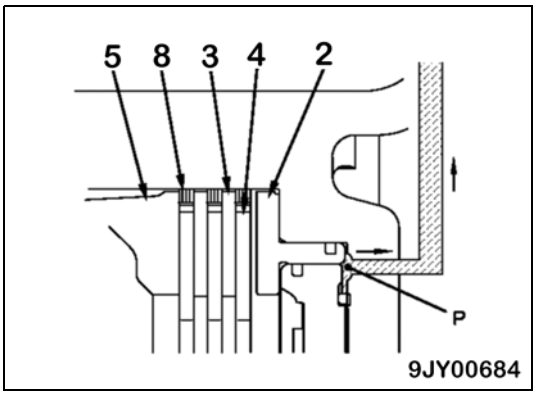
When brake is operated

- When the brake pedal is pressed, oil pressure (P) supplied through the hydraulic tank, pump, and brake charge valve to the oil passage in the brake cylinder, presses piston (2) to the left.
- Accordingly, rotation of discs (4), installed between piston (2), inner rings (3), and outer ring (5), is stopped and the machine is braked.



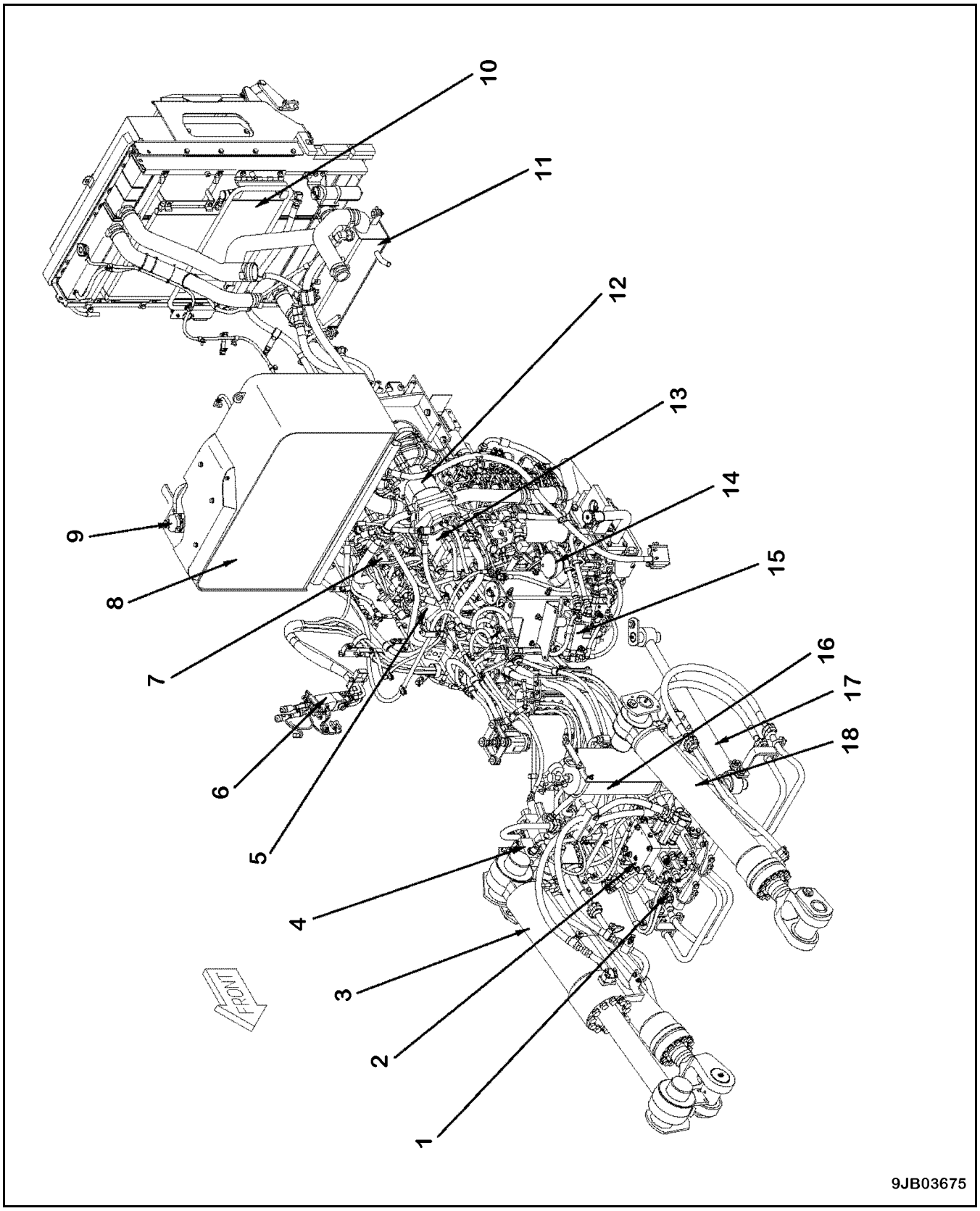
When brake is released

- If the oil pressure is released, piston (2) is returned to the original position by the reactive force of springs (8) and clearance is made between inner rings (3) and discs (4), and discs (4) become free.
- The linings bonded to discs (4) have crosshatch grooves in them. While discs (4) are rotating, oil flows in these grooves to cool the linings.



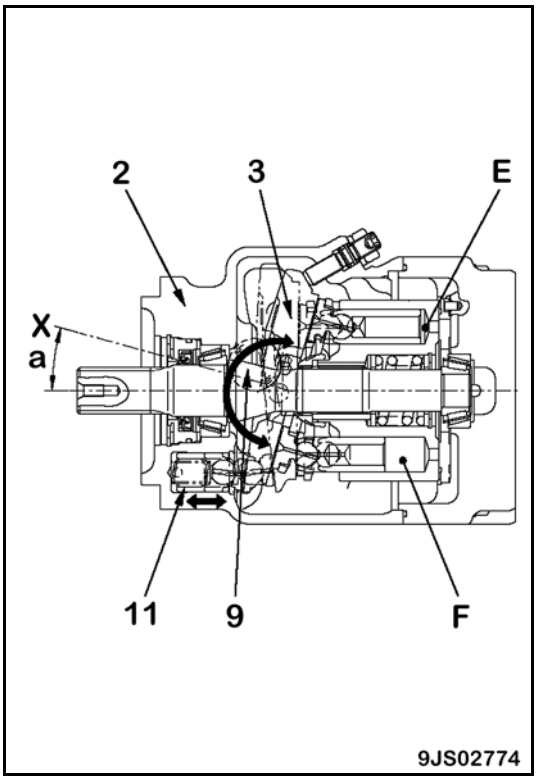
HYDRAULIC SYSTEM

Hydraulic Piping Diagram



Control of Delivery

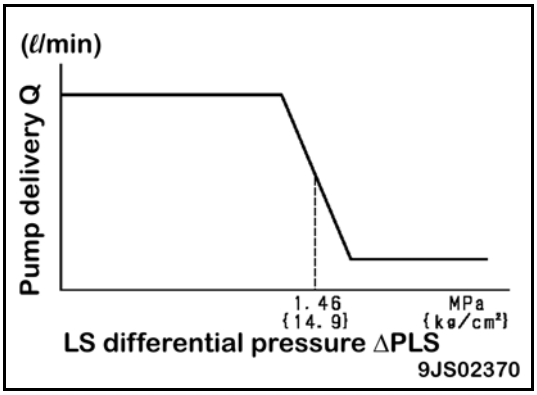
- If swash plate angle (a) is increased, the difference between volumes (E) and (F) is increased and pump delivery (Q) increases.
- Servo piston (11) is used to change swash plate angle (a).
- Servo piston (11) reciprocates straight according to the signal pressure of the PC and LS valves.
- This straight-line motion is transmitted to rocker cam (3).
- Rocket cam (3), supported on case (2) through ball (9), is tilted toward the axial direction.



LS Valve

Function

- The LS valve controls the pump delivery according to the stroke of the control lever, or the demand flow for the actuator.
- The LS valve detects the demand flow for the actuator from differential pressure (ΔPLS) between control valve inlet pressure (PPLS) and control valve outlet pressure (PLS) and controls main pump delivery (Q). PPLS is called the LS pump pressure; PLS the LS pressure; and ΔPLS is the LS differential pressure.
- The pressure loss caused by flow of oil through the opening of the control valve spool (= LS differential pressure ΔPLS) is detected, and then pump delivery (Q) is controlled to keep that pressure loss constant and supply the pump delivery according to the demand flow for the actuator.
- Main pump discharge pressure (PP), LS pump pressure (PPLS), and LS pressure (PLS) are led to the LS valve. The relationship between LS differential pressure (ΔPLS) and pump delivery (Q) changes as shown in this chart.



1. Suction valve
2. Safety suction valve
3. Spool (lift arm)
4. Pressure compensation valve R
5. Pressure-compensation valve F
6. Safety suction valve
7. Safety suction valve
8. Spool (bucket)
9. Shuttle valve
10. Pressure compensation valve R
11. Pressure compensation valve F

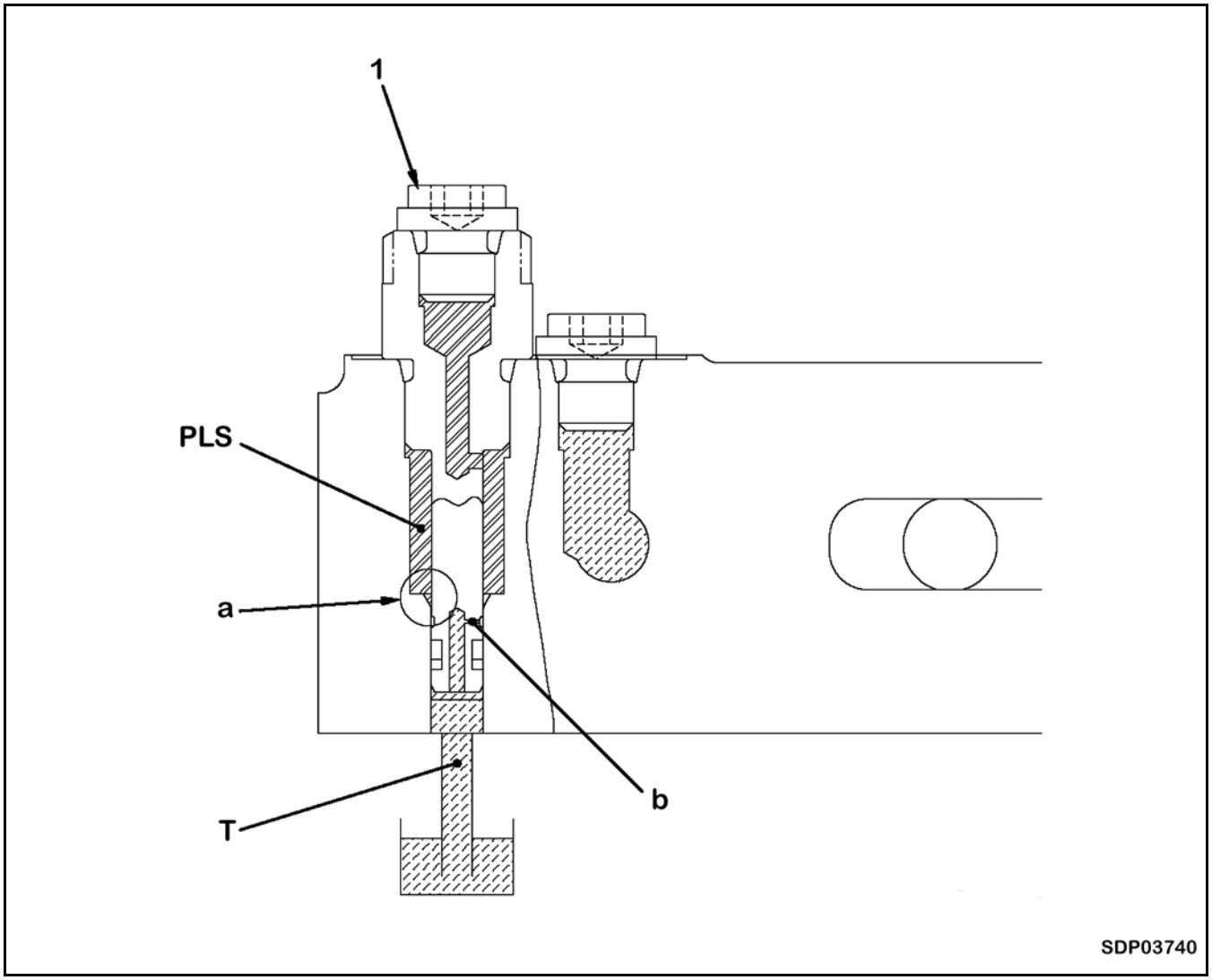
F: Flow control valve

R: Pressure-reducing valve

Torque Values

Item	N•m	lbf ft	lbf in
AA	19.6 – 24.5	14.46 – 18.07	–
BB	9.8 – 14.7	–	86.74 – 130.11

LS Bypass Plug



1. LS bypass plug

T: Tank circuit (pressure)

PLS: LS circuit

Function

- LS bypass plug releases residual LS pressure (PLS).
- The LS bypass plug lowers the rising speed of LS pressure (PLS) and creates pressure loss in the spool and shuttle valve with the discarded throttle flow to lower the effective LS differential pressure, and increases the stability.

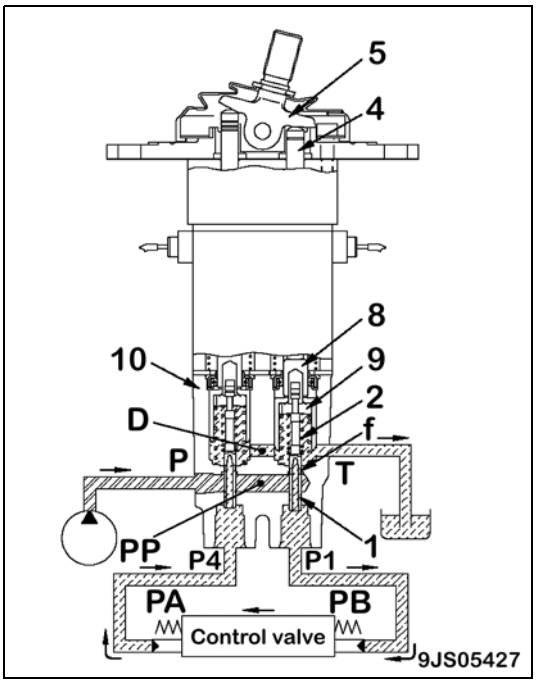
Operation

The pressurized oil in LS circuit (PLS) flows through clearance filter (a) formed by the clearance between LS bypass plug (1) and valve body, and then flows through orifice (b) to tank circuit (T).

★ During fine control

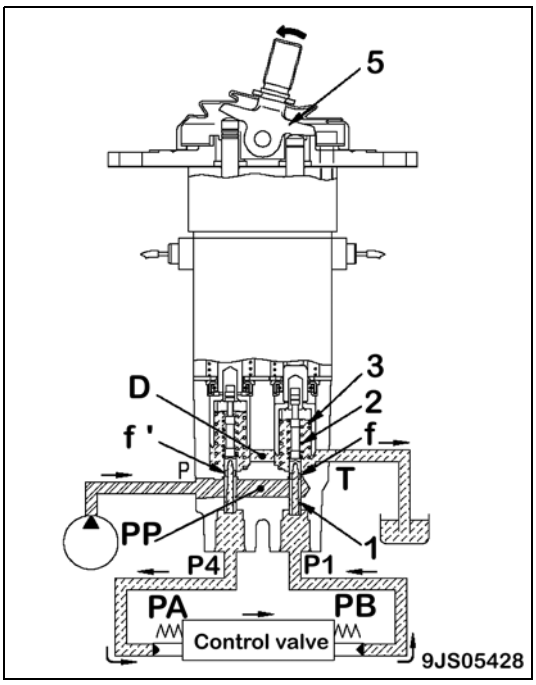
Neutral → Fine Control

- If rod (4) and piston (8) are pushed by lever (5), retainer (9) is pushed and spool (1) is also pushed downward through metering spring (2).
- As fine control hole (f) is disconnected from drain chamber (D), it is connected to pump pressure chamber (PP) almost simultaneously, and then the pilot oil of the main pump flows from port (P1) to port (PB).
- If the pressure in port (P1) rises, spool (1) is pushed back and fine control hole (f) is disconnected from pump pressure chamber (PP) and connected to drain chamber (D) almost simultaneously to release the pressure in port (P1).
- As a result, spool (1) moves up and down to balance the force of metering spring (2) with the pressure in port (P1). The positional relationship between spool (1) and body (10) (where fine control hole (f) is between drain chamber (D) and pump pressure chamber (PP)) does not change until retainer (9) comes in contact with spool (1).
- Since metering spring (2) is compressed in proportion to the stroke of the control lever, the pressure in port (P1) also rises in proportion to the stroke of the control lever.
- The control valve spool moves to a position where the pressure in chamber (PB) (equal to the pressure in port (P1)) is balanced with the force of the control valve spool return spring.

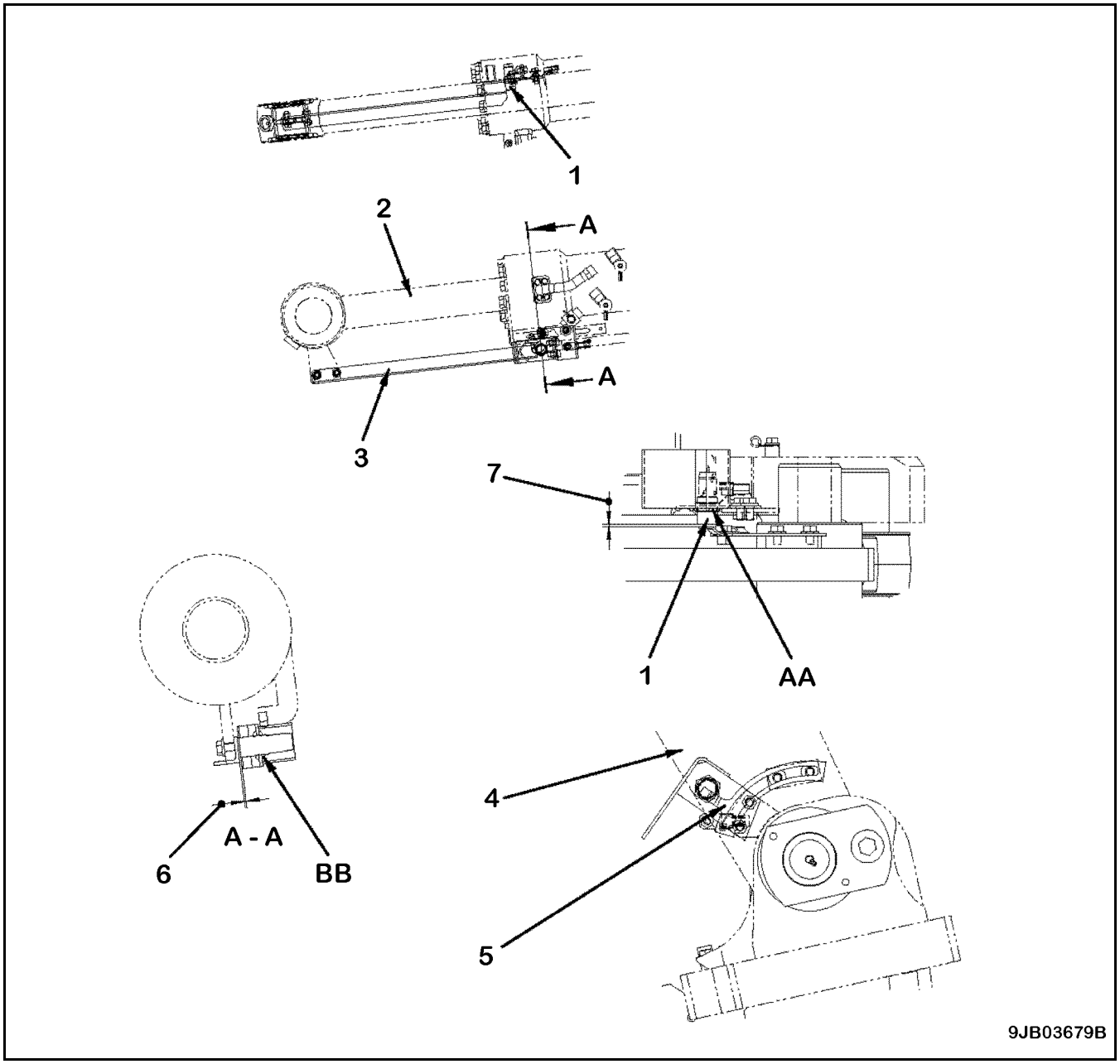


When Control Lever Is Returned

- If lever (5) begins to return, the force of centering spring (3) and the pressure in port (P1) push up spool (1).
- Because of this, fine control hole (f) is connected to drain chamber (D), and the pressurized oil at port (P1) is released.
- If the pressure at port (P1) goes down too far, spool (1) is pushed down by metering spring (2). Fine control hole (f) is shut off from drain chamber (D) and, almost simultaneously, it is connected to pump pressure chamber (PP). Pump pressure is supplied until the pressure at port (P1) recovers to a pressure equivalent to the position of the lever.
- When the control valve spool returns, the oil in drain chamber (D) flows in through fine control hole (f') of the valve which is not in operation and then flows through port (P4) into chamber (PA).

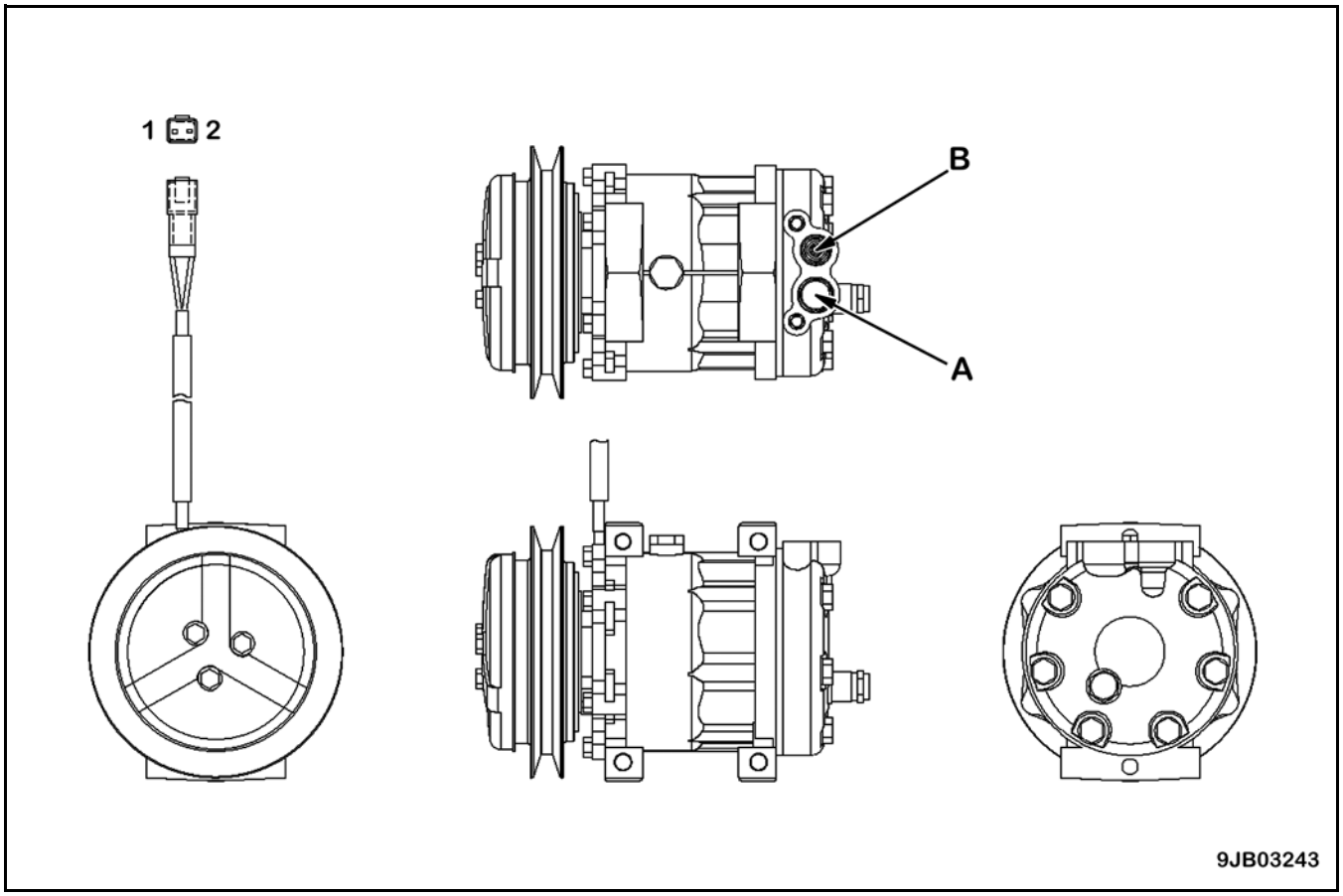


Bucket Positioner and Boom Kickout



1. Proximity switch
2. Bucket cylinder
3. Angle
4. Lift arm
5. Plate

Compressor



A: From air conditioner unit

B: To condenser

Function

- Other than circulating the refrigerant, the compressor compresses the refrigerant gas from the evaporator to high-pressure, high-temperature misty refrigerant so that it may be easily regenerated (liquefied) at normal temperature.
- Its built-in magnet clutch turns on or off depending on the evaporator temperature and refrigerant pressure.

Specifications

Number of cylinders – Bore x Stroke (mm)	7 – 29.3 x 27.4
Piston capacity (cc/rev)	129.2
Allowable maximum speed (rpm)	4,000
Refrigerant oil used	Sanden: SP-10
Refrigerant oil refilling volume (cc)	135

Category	No.	Check Item	Device	Operating Condition	Detecting time (sec)		Operating Condition								Display Color	Remarks
							Engine Stopped				Engine is Running					
					Detection	Reset	Alarm Buzzer	Individual Display	Central Warning	Display of Message	Alarm Buzzer	Individual Display	Central Warning Lamp	Display of Message		
Other symbols	14	Brake oil pressure	LED	Normal oil pressure (CLOSED)			—	—	—		—	—	—		Red	
				Below set pressure (front) (OPEN) (Detect time continues) and 30 seconds after starting engine (No detection time)	5	1	—	❍	—		✔	❍	❍	2G42ZG		
				Below set pressure (rear) (OPEN) (Detect time continues) and 30 seconds after starting engine (No detection time)	5	1	—	❍	—		✔	❍	❍	2G43ZG		
	14	Brake oil pressure	LED	Below set pressure (front) (OPEN) (Detect time continues) and 30 seconds after starting engine (No detection time)	1	1	—	❍	—		✔	❍	❍		Red	
				Below set pressure (rear) (OPEN) (Detect time continues) and 30 seconds after starting engine (No detection time)	1	1	—	❍	—		✔	❍	❍			
	15	Engine oil pressure	LED	Normal oil pressure (CLOSED)			—	—	—		—	—	—		Red	
				Low oil pressure (OPEN)			✔	❍	❍	B@BAZG	✔	❍	❍	B@BAZG		
	16	Water separator	LED	Normal			—	—	—		—	—	—		Red	
				Water mixing with fuel			—	❍	—	CA418	—	❍	—	CA418		

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	

Lockup Operating Points Table

★ Forward

		Accelerator Pedal Opening Ratio [%]	Shifting Up			Shifting Down		
			Transmission Output Shaft Speed [rpm] Reference: Travel Speed [km/h] (mph		No-shift Time [sec.]	Transmission Output Shaft Speed [rpm] Reference: Travel Speed [km/h] (mph)		No-shift Time [sec.]
			Ordinary	Hunting Prevention		Ordinary	Hunting Prevention	
Power mode "P-mode"	From 3rd T/C to 3rd L/U (H-mode)	0	1,162 [14.5] (9.0)	1,524 [19.0] (11.8)	0	1,082 [13.5] (8.4)		0
		50	1,162 [14.5] (9.0)	1,524 [19.0] (11.8)		1,082 [13.5] (8.4)		
		90	1,362 [17.0] (10.6)	1,524 [19.0] (11.8)		1,282 [16.0] (9.9)		
		100	1,362 [17.0] (10.6)	1,524 [19.0] (11.8)		1,282 [16.0] (9.9)		
	From 3rd T/C to 3rd L/U (L-mode)	0	986 [12.3] (7.6)	1,524 [19.0] (11.8)		906 [11.3] (7.0)	–	
		50	986 [12.3] (7.6)	1,524 [19.0] (11.8)		906 [11.3] (7.0)		
		90	1,106 [13.8] (8.6)	1,524 [19.0] (11.8)		1,026 [12.8] (8.0)		
		100	1,106 [13.8] (8.6)	1,524 [19.0] (11.8)		1,026 [12.8] (8.0)		
	From 4th T/C to 4th L/U (H-mode)	0	1,843 [23.0] (14.3)	–	0	1,763 [22.0] (13.7)	–	0
		50	1,843 [23.0] (14.3)			1,763 [22.0] (13.7)		
		90	2,084 [26.0] (16.2)			2,003 [25.0] (15.5)		
		100	2,084 [26.0] (16.2)			2,003 [25.0] (15.5)		
	From 4th T/C to 4th L/U (L-mode)	0	1,683 [21.0] (13.0)	–		1,603 [20.0] (12.4)	–	
		50	1,683 [21.0] (13.0)			1,603 [20.0] (12.4)		
		90	1,843 [23.0] (14.3)			1,763 [22.0] (13.7)		
		100	1,843 [23.0] (14.3)			1,763 [22.0] (13.7)		

2. Outputting conditions

Outputting Conditions	Pilot Lamp Contained in Transmission Cutoff Switch	Buzzer Command (Communication output)	Cutoff Point
When transmission cutoff switch is ON.	ON	Not issued	Controlled with the last saved value.
When transmission cutoff switch is ON and transmission cutoff set switch is ON. For 2.5 seconds or until reset (sensor normal) Up to setting methods 2) – 5)	Blinks (For 2 seconds or until reset)	As the set switch is pressed, set completion buzzer sounds (blip-blip).	Brake pilot oil pressure is saved as the set switch is pressed.
When transmission cutoff switch is ON and transmission cutoff pressure sensor is abnormal.	Remains turned off	Not issued (Error buzzer is sounded.)	No control is turned on. Saved value is not modified.
When transmission cutoff switch is ON and transmission cutoff set switch is abnormal.	ON	Not issued (Machine monitor displays an error indication.)	Controlled with last saved value. Saved value is not modified.
When transmission cutoff switch is ON and transmission cutoff set switch is ON. Reset is done within 2.5 seconds.	ON	As the set switch is pressed, setting cancel buzzer sounds (beep).	Default value of brake pilot oil pressure is saved.
When transmission cutoff switch is OFF.	OFF	Not issued	Not controlled.

- Shift indicator of machine monitor displays “N” as long as cutoff is continued (directional output signal “N”).
- As long as cutoff is continued, gear speed change from the gearshift lever is unavailable.
  (Gear speed change when transmission is at neutral is prohibited.)
- After the cutoff is reset, connecting F or R clutch enables the gear speed change.
- When the cutoff is turned on after selecting 1st speed with the kickdown switch, 1st speed is selected after the reset regardless of the shift mode selected.
- When the lockup is turned on, the cutoff is activated only after the lockup is reset.

3. Settable range of transmission cutoff point

Settable range: . . . . . 0.49 – 4.41 MPa (71.07 – 639.62 psi)

Note 1: When the specified cutoff point is below 0.49 MPa (71 psi), it is assumed to be 0.49 MPa (71.07 psi).

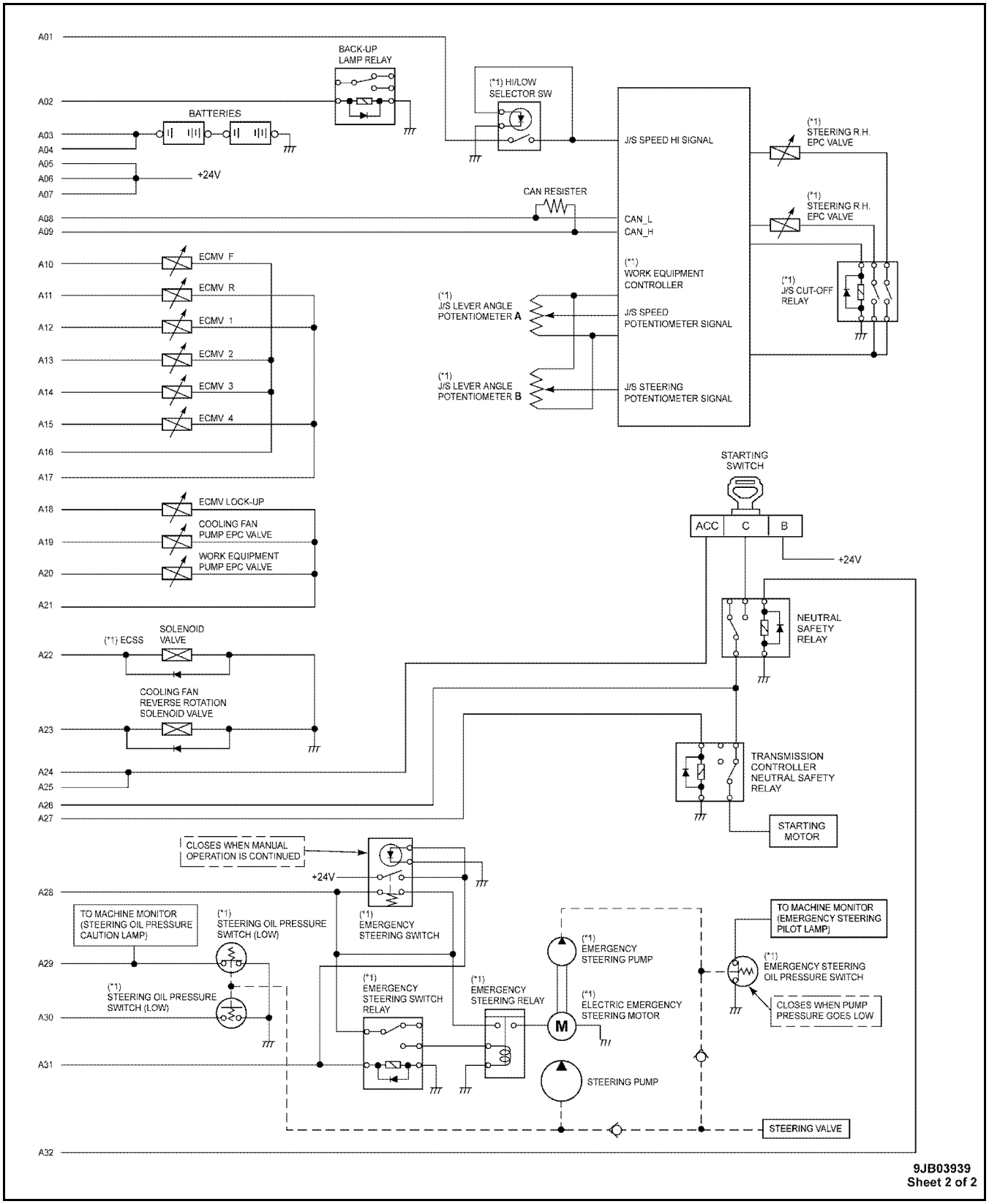
Note 2: When specified cutoff point is 4.41 MPa (640 psi) or above, it is assumed to be 4.41 MPa (639.62 psi).

★ The default value is 1.47 MPa (213.21 psi)

★ Hysteresis of 0.20 MPa (29 psi) is set for the cutoff IN (for neutral) pressure and OUT (reset) pressure.

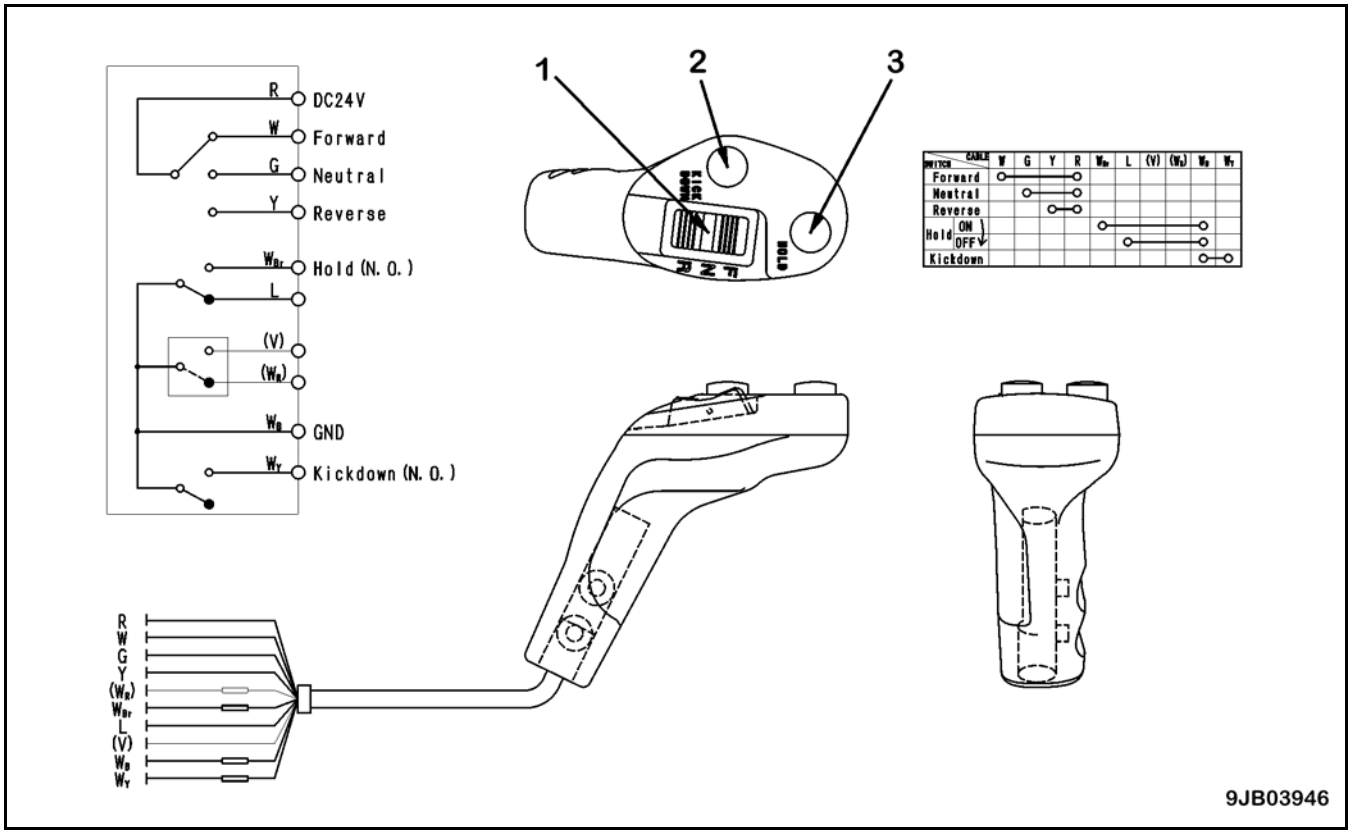
Example: When the pressure sensor is set at a position where the pressure is 0.98 MPa (142.14 psi):

Cutoff IN pressure. . . . . 0.98 MPa (142.14 psi)
Cutoff OUT pressure. . . . . 0.78 MPa (113.13 psi)



9JB03939
Sheet 2 of 2

Multi-Function Knob (if equipped)

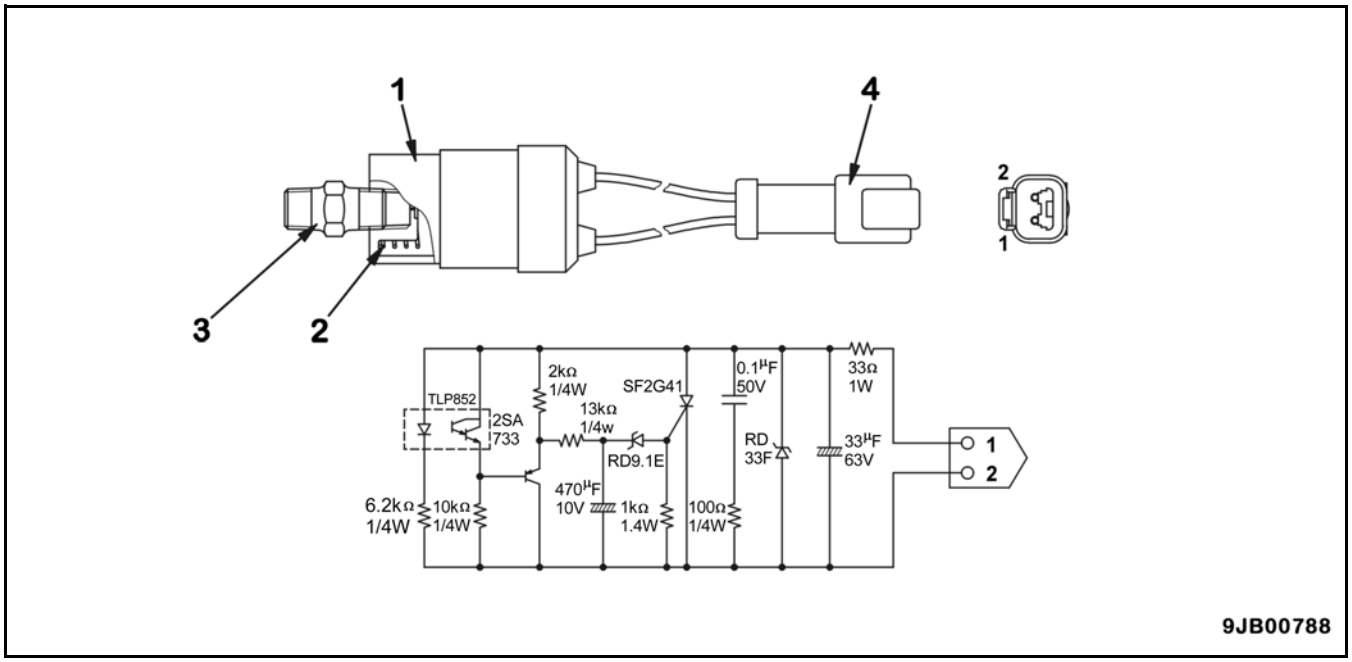


1. FNR switch
2. Kickdown switch
3. Hold switch

Function

- FNR switch (1) is an alternate switch. Its control signal is sent to the transmission controller to change the travel direction.
- Kickdown switch (2) and hold switch (3) are momentary switches. Their control signals are sent to the transmission controller to shift or hold the gear.

Air Cleaner Clogging Sensor



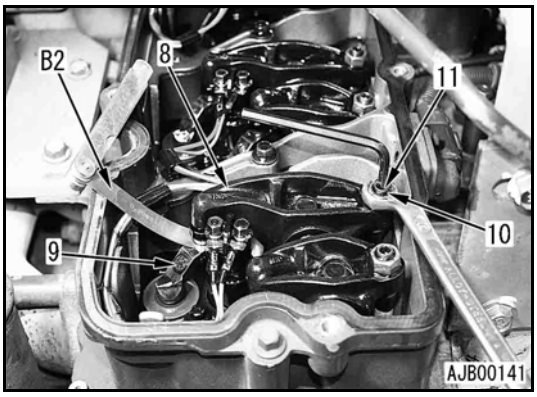
1. Indicator
2. Spring
3. Adapter
4. Connector

Function

- The air cleaner clogging sensor is installed in the air cleaner outlet.
- The sensor outputs the signal when the air cleaner is clogged and the pressure is decreased to the specified level (negative pressure).

WHEEL BRAKE SYSTEM 30-85
Brake Pedal 30-85
Measuring Pressing Angle of Pedal 30-85
Brake Pedal Linkage 30-86
Testing 30-86
Adjusting 30-86
Measuring Brake Performance 30-87
Accumulator Charge Pressure 30-88
Measuring 30-88
Adjusting 30-89
Measuring Brake Oil Pressure 30-90
Testing Wear of Wheel Brake Disc 30-93
Bleeding Air from Brake Circuit 30-94
Releasing Residual Pressure in Brake Accumulator Circuit 30-95
PARKING BRAKE SYSTEM 30-96
Testing Parking Brake Performance 30-96
Measuring Parking Brake Oil Pressure 30-97
Checking Wear of Parking Brake Disc 30-99
Releasing Parking Brake Manually 30-100
WORK EQUIPMENT 30-101
Work Equipment Control Levers 30-101
Operating Effort of Work Equipment Control Lever 30-101
Stroke of Work Equipment Control Lever 30-101
PPC Oil Pressure 30-102
Measuring PPC Pump Basic Pressure 30-102
Measuring PPC Valve Output Pressure 30-104
Adjusting PPC Relief Valve 30-105
Work Equipment Oil Pressure 30-106
Preparation Work 30-106
Measuring Work Equipment Relief Pressure 30-107
Measuring Unload Pressure 30-108
Measuring Work Equipment LS Differential Pressure 30-109
Adjusting Work Equipment Relief Pressure 30-110
Adjusting Unload Pressure 30-110
Adjusting LS Differential Pressure 30-110
Bleeding Air from Work Equipment Circuit 30-111
From Work Equipment Pump (Piston Pump) 30-111
From Hydraulic Cylinder 30-111
Releasing Residual Pressure in Work Equipment Circuit 30-112
From the Circuit between Hydraulic Cylinders and Control Valve 30-112
From ECSS (Travel Damper) Circuit 30-112
Work Equipment Positioners 30-114
Testing and Adjusting Bucket Positioner 30-114
Testing and Adjusting Boom Kickout 30-115
Proximity Switch Operation Pilot Lamp 30-116
ELECTRICAL SYSTEM 30-117
Troubleshooting 30-117
Procedure for Testing Diodes 30-117
Preparation for Troubleshooting Electric System 30-119

6. Adjust the valve clearance according to the following procedure.



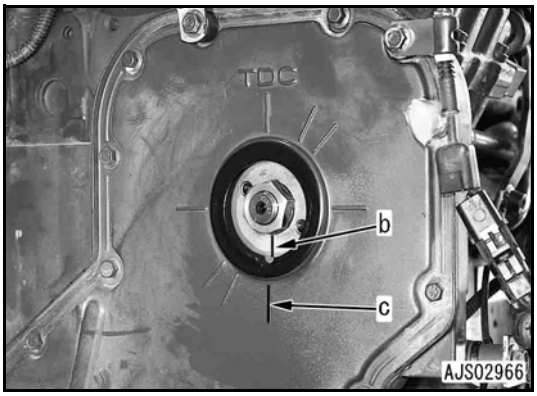
A. Insert clearance gauge **B2** into the clearance between rocker lever (8) and crosshead (9).

B. Loosen locknut (10) and adjust the valve clearance using adjustment screw (11).
   ★ With the clearance gauge inserted, turn the adjustment screw to a degree that you can move the clearance gauge **B2** lightly.

C. Fix adjustment screw (11) and tighten locknut (10).

Locknut 24 ±4 N•m (17.7 ±2.95 lbf ft)

   ★ After tightening the locknut, check the valve clearance again.



D. Rotate the crankshaft forward 360°, precisely make alignment with the countermark placed in Step 4, and adjust the valve clearance indicated by ❍.
   ★ At this moment, the stamp line (b) of the fuel injection pump gear is aligned with the stamp line (c) right in the graphic to the right.

E. Adjust the valves indicated by ❍.
   • Firing order: 1–5–3–6–2–4
   • The adjustment method is the same as one indicated by ●.

F. After finishing the adjustment, remove the measurement tools and return the parts you removed.
   ★ Make sure to remove gear **B1**.

Cylinder head cover mounting bolt: 11.8 ±1.96 N•m (104.44 ±17.35 lbf in)

Bleeding Air from Fuel Circuit

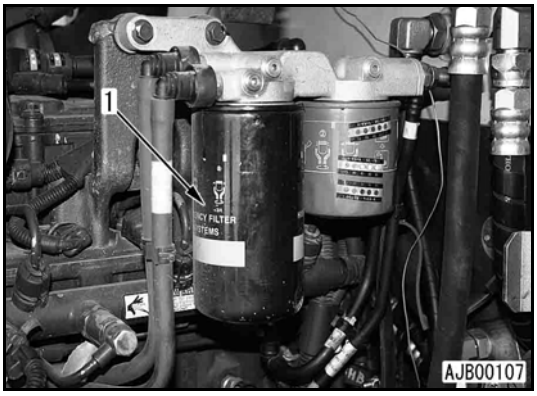
WARNING! Park the machine on level ground and lower the work equipment to the ground.

WARNING! Put chocks under the tires.

★ Bleed the air from the fuel circuit by electric lift pump if the fuel tank is empty or if a fuel circuit part has been removed then installed.

1. Stop the engine.

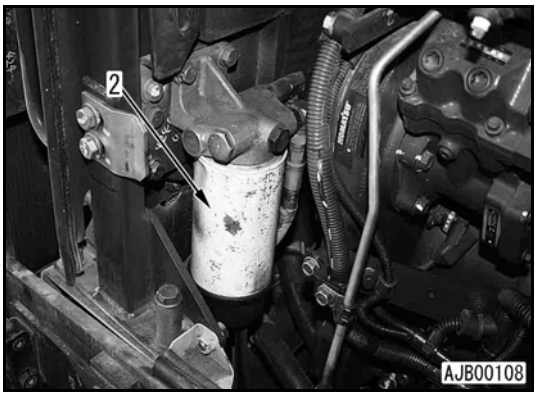
2. The installation procedures for fuel main filter (1) and fuel prefilter (2) after their removal, installation, or replacement are as follows.



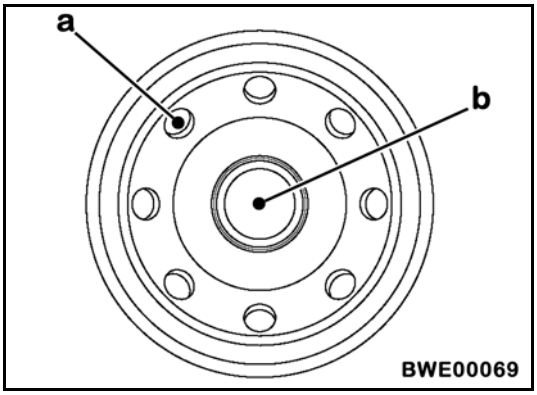
   A. Do not add fuel to fuel main filter (1).

   B. Add fuel to fuel prefilter (2).

      ★ When filling, use clean fuel and be careful not to let dirt get in.



      ★ Add fuel through inlet port (a) areas (eight places) of the filter.
      ★ Area (b) is the outlet port (clean side) after the fuel has been filtered; never add fuel to this area.



   C. Apply a thin coat of oil on the packing surface of the filter and install it to the filter head until it touches the sealing surface, then tighten 3/4 rotation.
      ★ For the procedure to replace the fuel filter cartridge, see the *Operation & Maintenance Manual*.

3. Fill up the fuel tank with fuel.

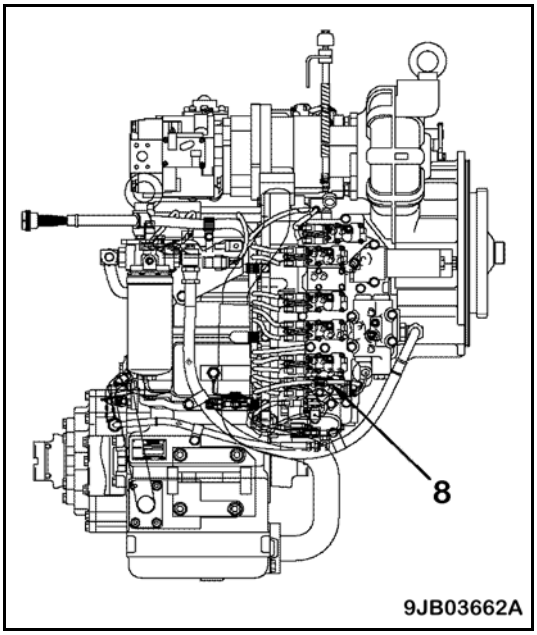
4. Turn the starting switch ON.

   The lift pump is operated for 30 seconds automatically.

WARNING! Do not turn the starting switch to the start position.

2nd Clutch Pressure

1. Remove 2nd clutch pressure pickup plug (8) (10 x 1.25 mm) (0.40 x 0.05 in).



2. Connect nipple **K3** and oil pressure gauge [1] in hydraulic tester **K1**.

   ★ Use oil pressure gauge with capacity of 6.0 MPa (870.23 psi).

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

4. Press the brake pedal.

5. Start the engine and turn the parking brake switch OFF.

6. While keeping the directional lever or switch at the N (Neutral) position, set the gearshift lever in the 2nd position.

7. While pressing the brake pedal with the engine at low idle, set the directional lever or switch to the F (Forward) or R (Reverse) position once and then return it to N (Neutral) again.

WARNING! Keep pressing the brake pedal securely. The machine will move. Make sure that **nobody** is standing within the operating area of the machine.

   ★ If the directional lever or switch is in N (Neutral), the gear speed is not changed even if the gearshift lever is moved. To avoid this, perform the above operation.

8. While running the engine at 2,000 rpm, measure the 2nd clutch oil pressure.

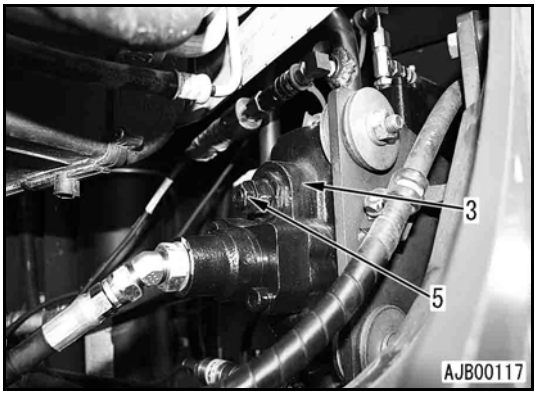
9. After completing the measurement, remove the measurement tool and make sure that the machine is back to normal condition.

Adjusting Steering Relief Pressure

WARNING! When adjusting the oil pressure, be sure to stop the engine.

1. Stop the engine.

2. If the steering relief pressure is abnormal, adjust steering relief valve (5) of steering valve assembly (3) according to the following procedure.

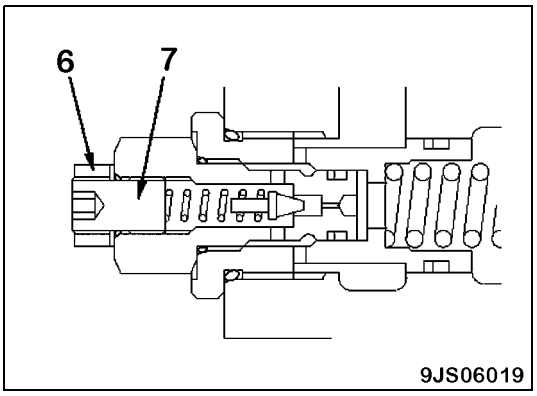


3. Loosen locknut (6) and turn adjustment screw (7) to adjust the pressure.

   ★ Adjustment screw:
   - Turned to the right, the pressure rises.
   - Turned to the left, the pressure lowers.

   ★ Quantity of adjustment per turn of adjustment screw:
   - Per turn: 17.8 MPa (2,581.67 psi)

Locknut: 27 – 31 N•m (19.91 – 22.86 lbf ft)

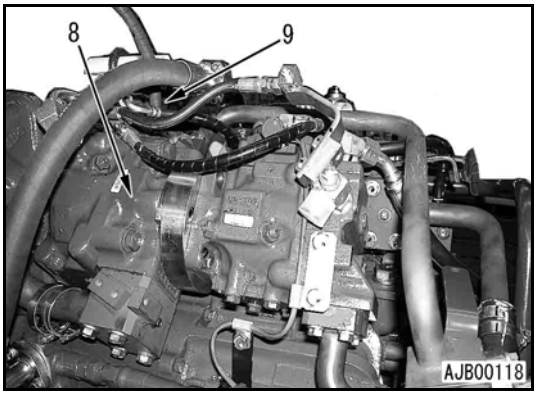


Adjusting Steering Control Circuit Pressure

1. Remove the front frame assembly.

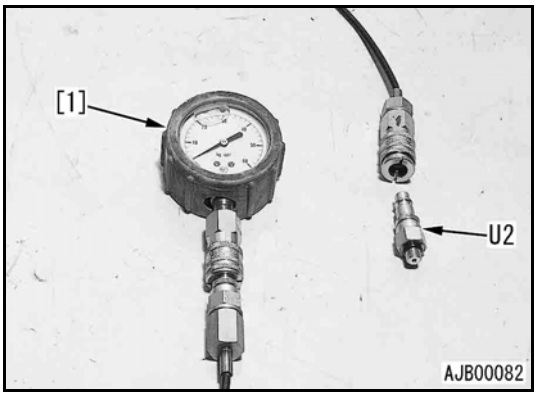
   ★ For details, see *CAB AND ATTACHMENTS: Cab and Floor Frame* in the *Disassembly and Assembly* section.

2. Remove servo assembly (9) from steering pump assembly (8) and install a new one.



3. Connect nipple **U2** and oil pressure gauge [1] of hydraulic tester **U1**.

   ★ Use the oil pressure gauge with capacity of 6.0 MPa (870.23 psi).



4. Run the engine at low idle and measure the parking brake pressure.

   ★ Measure the oil pressure when turning OFF the parking brake.

WARNING! Keep pressing the brake pedal for safety.

5. After completing the measurement, remove the measurement tool and make sure that the machine is back to normal condition.

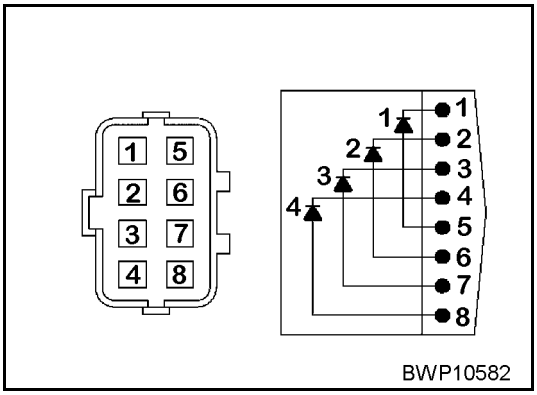
ELECTRICAL SYSTEM

Troubleshooting

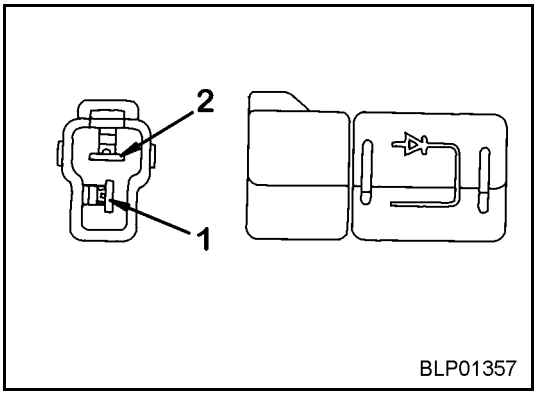
Procedure for Testing Diodes

Check an assembled-type diode (8 pins) and independent diode (2 pins) in the following manner.

★ The conductive directions of the **assembled-type diode** are indicated on the surface of the diode as shown in the figure to the right.



★ The conductive directions of the **single diode** is indicated on the surface of the diode as shown in the figure to the right.



When Using Digital Type Circuit Tester

1. Switch the testing mode to the diode range and confirm the indicated value.

   ★ Voltage of the battery inside is displayed with conventional circuit testers.

2. Put the red probe (+) of the test lead to the anode (P) of the diode and the black probe (-) to the cathode (N) of the diode.

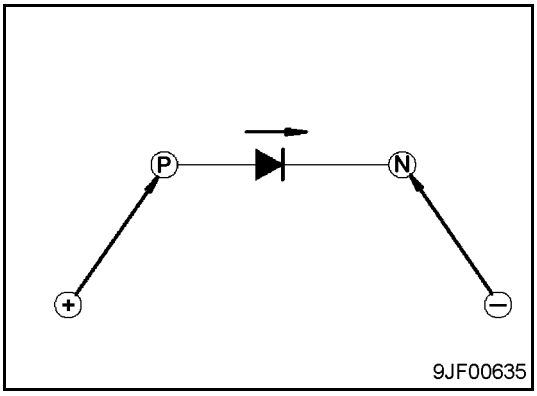
   ★ Confirm the indicated value.

3. Determine acceptability of the diode from the indicated value.

   Indicated value remains unchanged: . . . . . Conduction is absent (Failure)

   Indicated value changes: . . . . . Diode has conductivity (Normal)

   ★ A value between 460 to 600 is indicated for silicon diodes.



Special Functions of Machine Monitor (EMMS)

Normal Functions and Special Functions of Machine Monitor

The machine monitor is equipped with normal functions and special functions. Data items are displayed on the character display in the middle of the machine monitor.

Depending on the internal setting of the machine monitor, the display items are divided into automatic display items and items displayed when the machine monitor switches are operated.

★ Normal functions: Operator mode
Functions for which the content is normally displayed or which can be displayed and executed by the operator using the switches. See the *Operation & Maintenance Manual* for details about the Operator mode.

★ Special functions: Service mode
Functions which the serviceman can display and execute with the special switches to carry out inspection, maintenance, and troubleshooting.

Operator Mode	
1	Service meter/clock display function (*1)
2	Load meter function (if equipped) (*1)
3	Odometer display function
4	Maintenance monitoring function
5	Telephone number input function
6	Language selection function
7	Monitor brightness adjustment function
8	Time adjustment function (*1)
9	Travel speed/engine speed display selecting function
10	Travel speed/engine speed display/non-display selecting function (*2)
11	Action code display function
12	Failure code display function

⇔

Service Mode	
1	Switching to Service mode and screen display
2	Electrical system fault history display function
3	Mechanical system fault history display function
4	Real-time monitoring function
5	Engine reduced-cylinder function
6	No-injection cranking function
7	Adjustment function
8	Maintenance monitoring function
9	Operating information display function
10	Optional device selecting function
11	Machine serial number input function
12	Model selection function
13	Initialize function

★ The number in the Section No. column correlates with an item number in the *Operator Mode* or the *Service Mode* function descriptions in this section.

(*1): This display is not available when the load meter function is turned off through OPT selection of Service mode.

(*2): This display is not available when the travel speed/engine speed display on character display is turned off through OPT selection of Service mode.

	MONITOR PANEL [Machine Monitor System]		
No.	**Contents of Display in Normal State**	**Unit (*4)**	**Remarks (*5)**
1	As per part No. of software	Indication of condition	
2	As per version No. of application software	Indication of condition	
3	As per version No. of data	Indication of condition	
4	Low idle: 850 ±25 rpm High idle: 2220 ±50 rpm (P-mode) 1900 ±50 rpm (E-mode)	rpm	
5	F1/R1: 7.0/7.6 (4.4/4.7) ±5% (P-mode) F2/R2: 12.3/12.9 (7.6/8.0) ±5% (P-mode) F3/R3: 21.6/23.0 (13.4/14.3) ±5% (P-mode) F4/R4: 37.2/37.2 (23.1/23.1) ±5% (P-mode)	km/h (mph)	
6	0 – 100%	%	
7	Gauge FULL (100%, 10 Ω): 0.31 V Gauge 1/2 (50%, 28.5 Ω) Gauge 1/4 (25%, 44.3 Ω) Caution (80 Ω): 1.74 V Gauge EMPTY (0%, 85 Ω): 1.81 V	V	• When sensor is disconnected or has hot short: Gauge EMPTY • When sensor has ground fault: Gauge FULL
8	Depends on condition of machine (°C)	°C (°F)	• Engine coolant temperature: Max. 100°C (212°F) • Data are received from engine controller
9	Depends on condition of machine (°C)	°C (°F)	• Overheating: 120°C (248°F)
10	Gauge enters red range (120°C) (248°F): 1.62 V (80°C) (176°F): 2.91 V	V	• When sensor is disconnected or has hot short: Gauge MIN • When sensor has ground fault: Gauge MAX
11	Depends on condition of machine (°C)	°C (°F)	• Hydraulic tank oil temperature: Max. 100°C (212°F)
12	Gauge enters red range (120°C) (248°F): 1.62 V (80°C) (176°F): 2.91 V	V	• When sensor is disconnected or has hot short: Gauge MIN • When sensor has ground fault: Gauge MAX
13	Depends on condition of machine (°C)	°C (°F)	
14	(120°C) (248°F): 1.62 V (80°C) (176°F): 2.91 V	V	
15	Depends on condition of machine (0.0 – 30 V)	V	
16	Depends on condition of machine (0.0 – 30 V)	V	
17	Min. 2 V	V	Only when option is set
18	—	V	Unused

WRK [Work Equipment Controller System]				
No.	**Monitoring Codes**	**Monitoring Items (*1)**	**Display Item (*2)**	**Data Display Range (*3)**
14	42101	Bucket lever operation frequency	BUCKET LVR	0 – 256000 (In a thousand times)
15	42002	Lever potentiometer voltage bucket 1	BOOM POT1	0.00 – 5.00
16	42003	Lever potentiometer voltage bucket 2	BUCKET POT2	0.00 – 5.00
17	41900	Lift arm raise EPC current (Command)	RAISE EPC DIR	0 – 1000
18	41901	Lift arm lower EPC current (Command)	LOWER EPC DIR	0 – 1000
19	41902	Bucket tilt EPC current (Command)	TILT EPC DIR	0 – 1000
20	41903	Bucket dump EPC current (Command)	DUMP EPC DIR	0 – 1000
21	41908	AJSS EPC current (Command)	AJSS EPC DIR	—
22	41904	AJSS right EPC current (Command)	J/S EPC DIR RH	0 – 1000
23	41905	AJSS left EPC current (Command)	J/S EPC DIR LH	0 – 1000
24	42004	Lever potentiometer voltage AJSS 1	J/S POT1	0.00 – 5.00
25	42005	Lever potentiometer voltage AJSS 2	J/S POT2	0.00 – 5.00
26	41906	3-spool valve 1, ECMV and current value (Command)	3RD EPC1 DIR	0 – 1000
27	41907	3-spool valve 2, ECMV and current value (Command)	3RD EPC2 DIR	0 – 1000
28	42102	3-spool valve lever operation frequency	3RD LVR	0 – 256000 (In a thousand times)
29	42006	Lever potentiometer voltage 3-spool valve 1	3RD POT1	0.00 – 5.00
30	42007	Lever potentiometer voltage 3-spool valve 2	3RD POT2	0.00 – 5.00

C. Make sure from the Step 2 in *Setting of Transmission Initial Learning (7-2)* procedure that the transmission control oil temperature is 55 – 70°C (131 – 158°F). If it is out of this range, stall the torque converter and adjust the temperature to 55 – 70°C (131 – 158°F). (If the initial learning is performed while the oil temperature is out of the specified range, time lags and gearshift shocks can result.)

D. Operate the FNR (directional) lever or joystick steering FNR (directional) switch or right FNR (directional) switch and gearshift lever or gearshift switch as shown in the following table to perform the initial learning.

Operating order	1	2	3	4
Gear speed	N2	F2	F1	F2
Holding time	Min. 6 sec.	Min. 6 sec.	Min. 6 sec.	Min. 4 sec.
Operating order	5	6	7	8
Gear speed	F3	F4	F3	F2
Holding time	Min. 4 sec.	Min. 4 sec.	Min. 4 sec.	Min. 4 sec.
Operating order	9	10	11	
Gear speed	N2	R2	N2	
Holding time	Min. 4 sec.	Min. 4 sec.	Min. 4 sec.	

★ Hold the gearshift lever in each gear speed for more than the specified time.
★ If the gearshift lever is operated before the specified time is reached, the initial learning is not completed (TUNED is not displayed).

4. Confirmation of completion of transmission initial learning

A. Refer to Step 2 in *Setting of Transmission Initial Learning (7-2)* to make sure 111111 is marked on ID number 94100, indicating that the initial learning is completed.

B. Press the [■] switch to end confirmation of the initial learning.

Adjustment of Transmission L Mode Gearshift Point (7-3)

★ This function is used for modifying the shift point when the shift mode switch is at the L position, by adding a correction amount.

★ The factory default setting of the correction amount must be 0.

★ The shift point depends on the engine mode. When this function is used, however, the same correction value is applied independent of the engine mode.

★ Some of the shift points adjusted with the shift point adjustment function may not include the following shift patterns.

- The shift point that is used when the hunting prevention function is turned on.
- The shift down point that is used when the accelerator is set to idle.

★ After a shift point adjustment is done, confirmation on the machine must be done.

Optional Device Selecting Function (OPTIONAL SELECT) (10)

Procedure for Setting an Option

★ Set the option and turn the starting switch OFF.

★ After the power for each controller is turned OFF (about 15 seconds), turn the starting switch ON again. The option is now effective.

★ Before setting an option, check that the machine model has been selected.

★ Select the machine model before setting the option.

Optional Component Setting table

Item	Display in English	Item No.	Setting at Delivery	Contents of Selection
Boom specification	LIFT BOOM	1	STD	Set following items according to boom specification. • If standard boom is used, select STD. • If high lift boom (optional) is used, select HI LIFT.
Auto grease	AUTO GREASE	2	NO ADD	If there is option, select ADD.
Electrolyte level sensor	BAT LIQUID	3	NO ADD	If there is option, select ADD.
Transmission filter clogging sensor	TRANSM CLOG	4	NO ADD	If there is option, select ADD.
Printer	PRINTER	5	NO ADD	If there is option, select ADD”
Tire size	TIRE SIZE	6	0	Set to “0” normally and do not change.
Selection of short ton	SHORT TON	7	NO ADD	Since setting is made at the factory, it cannot be changed.
Unit of travel speed	SPEED (UNIT)	8	MPH	Since setting is made at the factory, it cannot be changed.
Machine which requires an automobile inspection	RPM OPT	9	NO ADD	Select NO ADD and do not change it.
Indication of engine speed/travel speed on normal screen of character display	RPM/SPEED	10	ADD	Normally select ADD and do not change it.
Load meter	LOAD METER	11	NO ADD	Select NO ADD and do not change it.
Emergency steering	EMERG S/T	13	ADD	If option is not installed, select NO ADD.
Joystick steering and/or right FNR (directional) switch are/is not installed	J/S-FNR SW	14	NON	When joystick steering or right FNR (directional) switch is installed, set necessary items. • When only steering wheel is used, set NON. • When joystick steering is set, set J/S. • When right FNR (directional) switch is set, set FNR SW.
Joystick steering 4th and lockup clutch function	J/S 4TH L/U	15	ADD	Normally select ADD and do not change it. NO ADD is selected; 4th and lockup clutch do not operate in joystick steering mode.
Low-temperature bypass solenoid function	BYPASS SOL	16	NO ADD	Select NO ADD and do not change it.
Loader pump high altitude mode	HIGHLAND MD	17	NO ADD	Select NO ADD and do not change it.

CAN Communication with Transmission Controller: Defective Communication 40-350
DAQRMA 40-354
Transmission Controller Option Setting: Malfunction 40-354
DB2RKR 40-356
CAN Communication with Engine Controller: Defective Communication 40-356
DB90KK 40-360
Work Equipment Controller: Low Source Voltage (input) 40-360
DB90KT 40-362
Work Equipment Controller: Abnormality in Controller 40-362
DB92KK 40-364
Work Equipment Controller Load Power Supply Line: Low Source Voltage (input) 40-364
DB95KX 40-366
Work Equipment Controller Power Supply Output: Out-of-Input Signal Range 40-366
DB99KQ 40-370
Work Equipment Controller: Disagreement in Model Selection Signals 40-370
DB9RKR 40-372
CAN Communication with Work Equipment Controller: Defective Communication 40-372
DB9RMA 40-376
Work Equipment Controller Option Setting: Malfunction 40-376
DB9RMC 40-378
CAN Communication: Defective Operation 40-378
DD15LD 40-382
Switch (Panel Switch 1 ■): Switch is Pressed for Long Time 40-382
DD16LD 40-384
Switch (Panel Switch 2 ◊): Switch is Pressed for Long Time 40-384
DD17LD 40-386
Switch (Panel Switch 3 <): Switch is Pressed for Long Time 40-386
DD18LD 40-388
Switch (Panel Switch 4 >): Switch is Pressed for Long Time 40-388
DD1ALD 40-390
Remote Positioner Raise/Lower Set Switch (raise): Switch is Pressed for Long Time 40-390
DD1BLD 40-392
Remote Positioner Raise/Lower Set Switch (lower): Switch is Pressed for Long Time 40-392
DD1CLD 40-394
Load Meter Subtotal Switch: Switch is Pressed for Long Time 40-394
DD1FLD 40-396
Load Meter Mode Selector Switch (A/B): Switch is Pressed for Long Time 40-396
DD1GLD 40-398
Load Meter Mode Selector Switch (+/-): Switch is Pressed for Long Time 40-398
DD1HLD 40-400
Load Meter Display Selector Switch: Switch is Pressed for Long Time 40-400
DD1NLD 40-402
Fan Reverse Switch: Switch is Pressed for Long Time 40-402
DD1NL4 40-404
Fan Automatic Reverse Switch: Switch is Pressed for Long Time 40-404
DDB6L4 40-406
Parking Brake Switch (Neutralizer): ON/OFF Signals Disagree 40-406
DDD1LD 40-410
Remote Positioner Bucket Angle Set Switch: Switch is Pressed for Long Time 40-410

Points to Remember when Troubleshooting Electrical Circuits

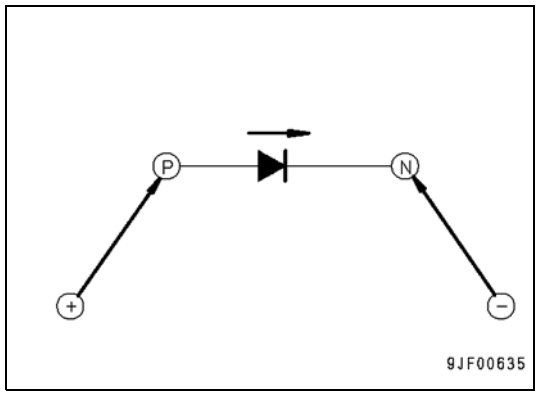
1. Always turn the power **OFF** before plugging or unplugging connectors.

2. Before carrying out troubleshooting, check that all the related connectors are properly inserted.
   - Plug and unplug the related connectors several times to check.
   - Check each individual wire on the connector suspected of the problem by performing a pull test on the wire insert.

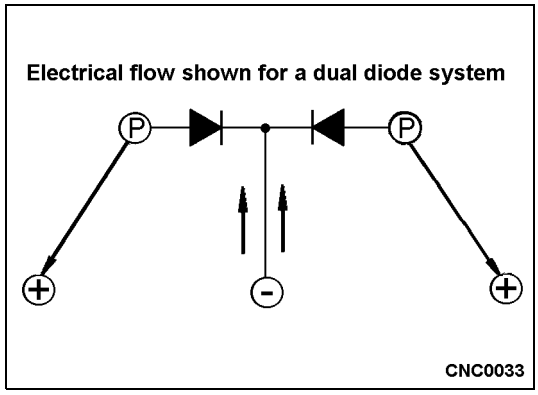
3. Always plug any unplugged connectors before going on to the next step.
   ★ If power is turned ON with the connectors still unplugged, unnecessary abnormal displays will be generated.

4. When carrying out troubleshooting of circuits (measuring the voltage, resistance, continuity, or current), move the related wiring and connectors several times and check that there is no change in the reading of the tester.
   ★ If there is any change, there is probably a defective contact in that circuit.

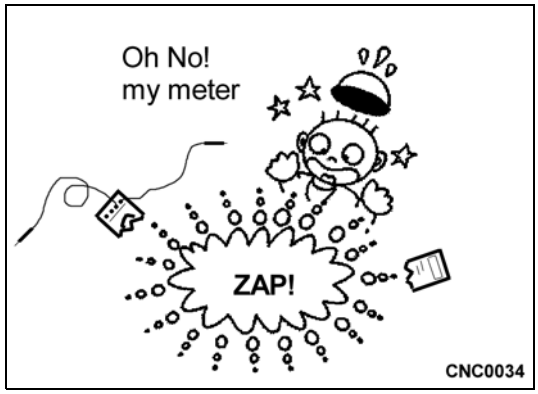
5. When checking a single diode circuit:
   - Isolate the diode from the circuit.
   - Using a digital volt ohm meter, in the Ohms mode, check the polarity of the diode as shown in the illustration. Reversing the meter leads, you should have a reading in one direction only.
   ★ Electrical flow should be negative (-) to positive (+) only, red lead positive and black lead negative.

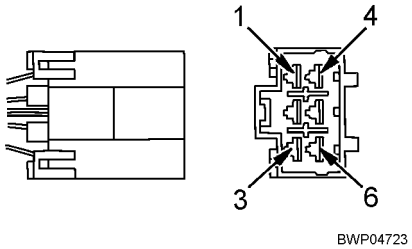
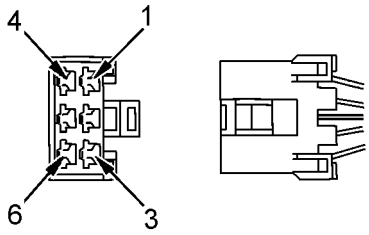
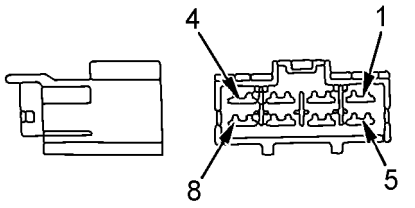
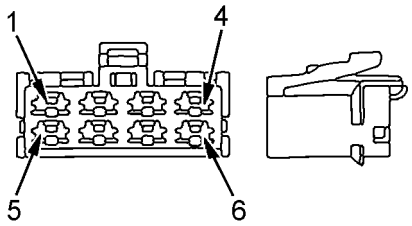


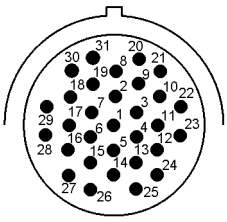
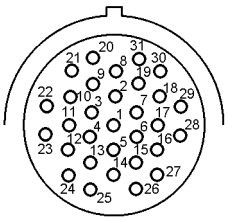
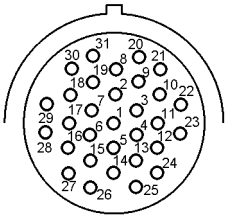
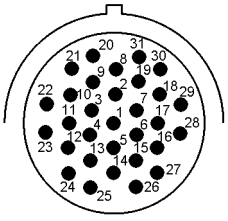
6. When checking a dual diode circuit:
   - Isolate the diode from the circuit.
   - Using a digital volt ohm meter, in the Ohms mode, check the polarity of the diode as shown in the illustration. Reversing the meter leads, you should have a reading in one direction only.
   ★ Electrical flow should be negative (-) to positive (+) only, red lead positive and black lead negative.



7. Always be aware of what you are measuring: Voltage, Ohms, or Amps. Always use caution when measuring a circuit.
   - When measuring voltage, be sure the meter is set in the voltage range, AC or DC, and above the voltage value you are measuring.
   - When measuring ohms, be sure the circuit is dead (has no voltage in it) before you take any readings. Be sure the meter is set in the proper ohms range.
   - When measuring amps, be sure your meter is rated for the amount of amps you will be measuring. Failure to follow these procedures may damage your equipment or possibly cause injury. Always study the operator's manual for the meter you are using.



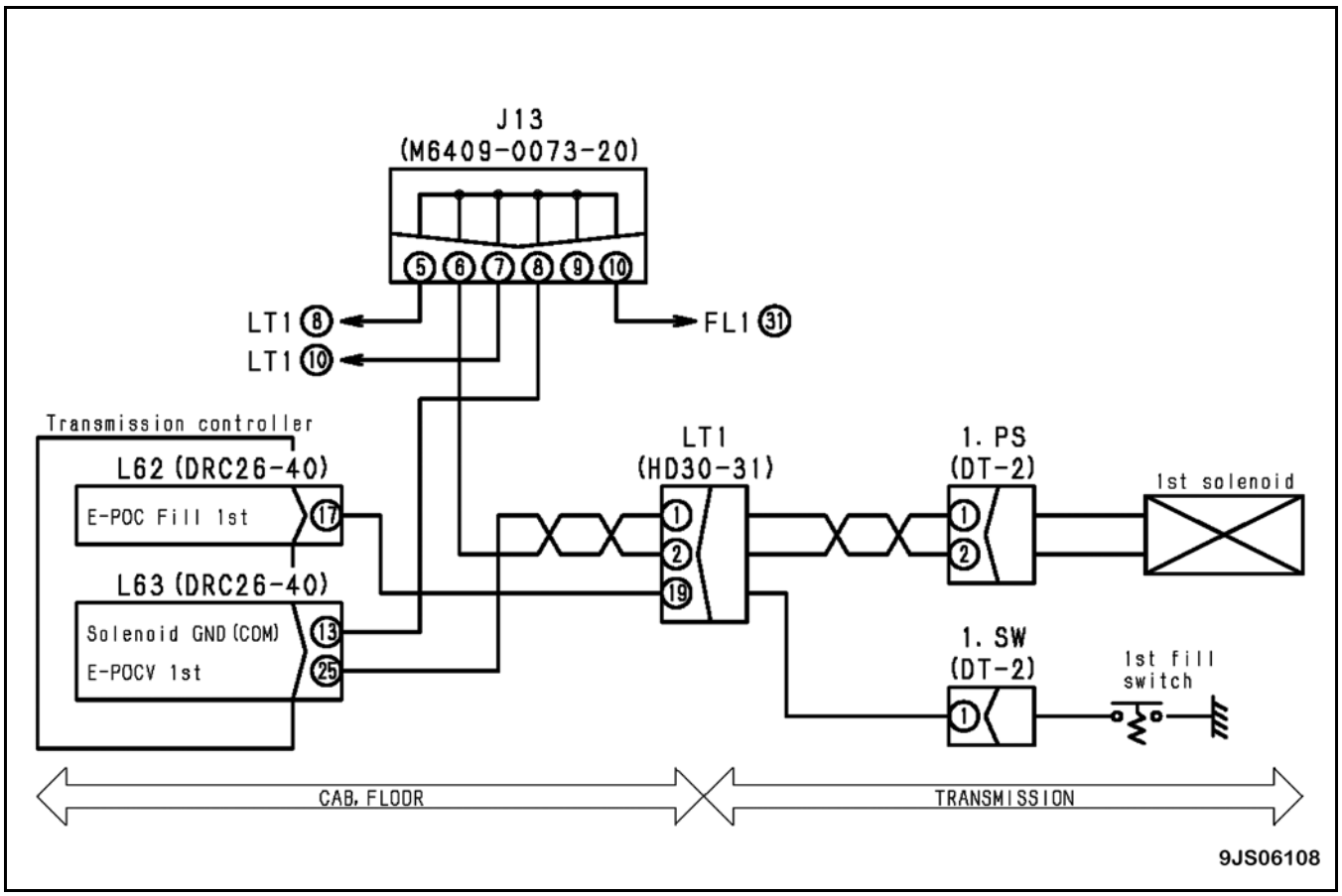
M-Type Connectors			
Number of Pins	**Male (Female housing)**	**Female (Male housing)**	**T-adapter Part Number**
6	 BWP04723	 BWP04724	799-601-7130
	Part number: 08056-00671	Part number: 08056-00681	
8	 BWP04725	 BWP04726	799-601-7340
	Part number: 08056-00871	Part number: 08056-00881	

HD30 Series Connectors			
Type (shell size code)	**Body (Plug)**	**Body (Receptacle)**	**T-adapter Part Number**
24-31 (9)	Pin (Male terminal)	Socket (Female terminal)	799-601-9290
	 BWP05033	 BWP05034	
	Part number: 08191-91203, 08191-91204 08191-91205, 08191-91206	Part number: 08191-94103, 08191-94104 08191-94105, 08191-94106	
	Socket (Female terminal)	Pin (Male terminal)	799-601-9290
	 BWP05035	 BWP05036	
	Part number: 08191-92203, 08191-92204 08191-92205, 08191-92206	Part number: 08191-93103, 08191-93104 08191-93105, 08191-93106	

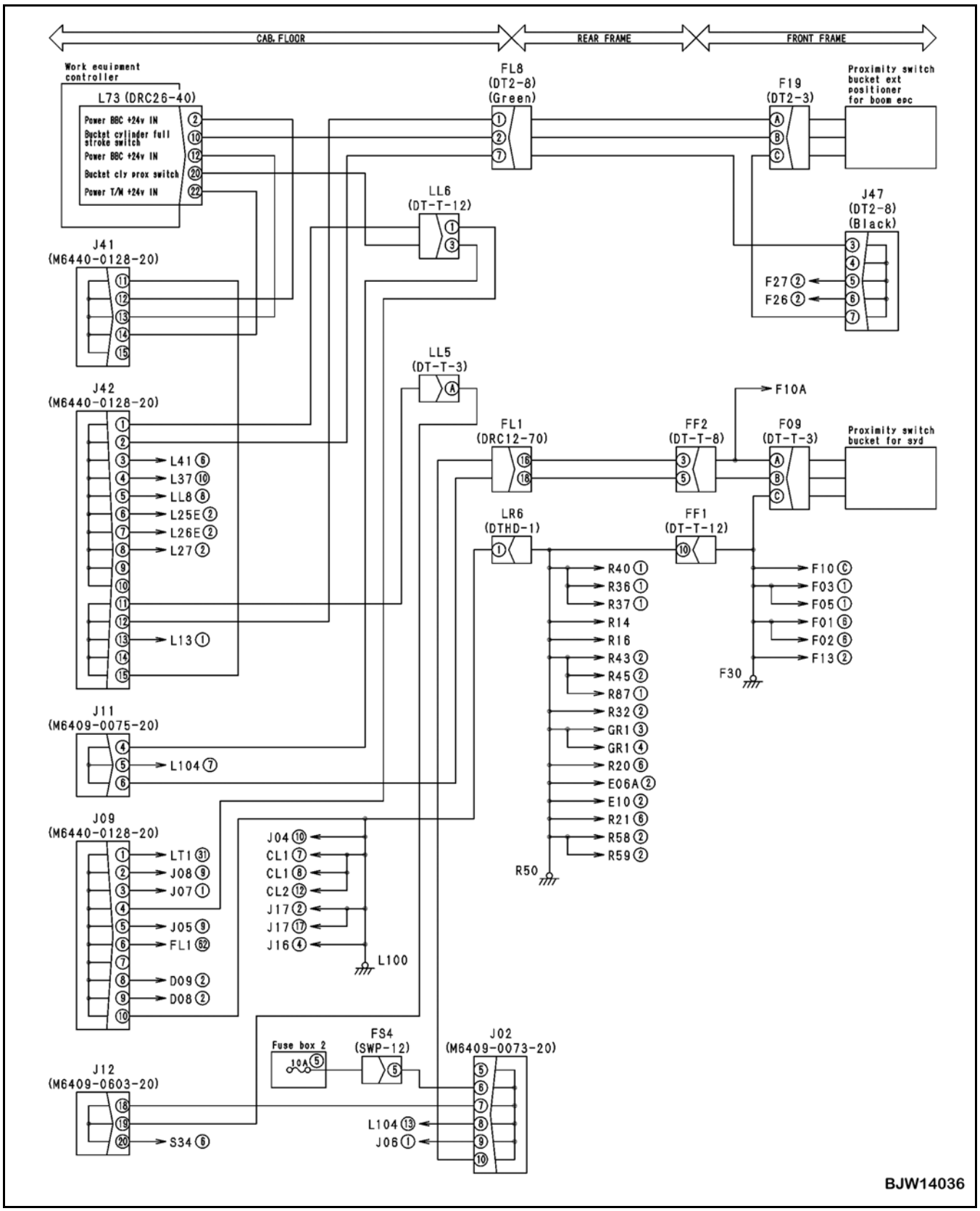
Part No.	Part Name	Number of Pins	Identification Symbol	T-adapter Kit														Out of Kit
				799-601-2500	799-601-2700	799-601-2800	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	799-601-4101	799-601-4201	
799-601-7270	Case								●									
799-601-7510	Adapter for 070	10	07-10							●								
799-601-7520	Adapter for 070	12	07-12							●								
799-601-7530	Adapter for 070	14	07-14							●								
799-601-7540	Adapter for 070	18	07-18							●								
799-601-7550	Adapter for 070	20	07-20							●								
799-601-7360	Adapter for relay	5	REL-5P															●
799-601-7370	Adapter for relay	6	REL-6P															●
799-601-7380	Adapter for JFC	2	—															●
799-601-9010	Adapter for DTM	2	DTM2									●		●				
799-601-9020	Adapter for DT	2	DT2									●		●		●	●	
799-601-9030	Adapter for DT	3	DT3									●		●				
799-601-9040	Adapter for DT	4	DT4									●		●		●	●	
799-601-9050	Adapter for DT	6	DT6									●		●				
799-601-9060	Adapter for DT (Gray)	8	DT8GR									●		●				
799-601-9070	Adapter for DT (Black)	8	DT8B									●		●				
799-601-9080	Adapter for DT (Green)	8	DT8G									●		●				
799-601-9090	Adapter for DT (Brown)	8	DT8BR									●		●				
799-601-9110	Adapter for DT (Gray)	12	DT12GR									●		●				
799-601-9120	Adapter for DT (Black)	12	DT12B									●		●				
799-601-9130	Adapter for DT (Green)	12	DT12G									●		●				
799-601-9140	Adapter for DT	12	DT12BR									●		●				
799-601-9210	Adapter for HD30-18	8	D18-8									●	●					
799-601-9220	Adapter for HD30-18	14	D18-14									●	●					
799-601-9230	Adapter for HD30-18	20	D18-20									●	●					
799-601-9240	Adapter for HD30-18	21	D18-21									●	●					
799-601-9250	Adapter for HD30-24	9	D24-9									●	●					
799-601-9260	Adapter for HD30-24	16	D24-16									●	●					
799-601-9270	Adapter for HD30-24	21	D24-21									●	●					
799-601-9280	Adapter for HD30-24	23	D24-23									●	●					
799-601-9290	Adapter for HD30-24	31	D24-31									●	●					
799-601-9310	Plate for HD30 (24-pin)											●	●		●			

Failure Code	Troubled Part	Trouble	Controller	Action Code	Category of Record
DXH8KB	F clutch ECMV solenoid	Short circuit	TM	E03	Electrical system
DXH8KY	F clutch ECMV solenoid	Power supply line short	TM	E03	Electrical system
DXHHKA	4th clutch ECMV solenoid	Disconnection	TM	E03	Electrical system
DXHHKB	4th clutch ECMV solenoid	Short circuit	TM	E03	Electrical system
DXHHKY	4th clutch ECMV solenoid	Power supply line short	TM	E03	Electrical system
DXHLKA	Joystick steering right EPC solenoid	Disconnection	WRK	E03	Electrical system
DXHLKB	Joystick steering right EPC solenoid	Short circuit	WRK	E03	Electrical system
DXHLKY	Joystick steering right EPC solenoid	Power supply line short	WRK	E03	Electrical system
DXHMKA	Joystick steering left EPC solenoid	Disconnection	WRK	E03	Electrical system
DXHMKB	Joystick steering left EPC solenoid	Short circuit	WRK	E03	Electrical system
DXHMKY	Joystick steering left EPC solenoid	Power supply line short	WRK	E03	Electrical system
DY30MA	Electrical emergency steering pump	Malfunction	TM	E01	Electrical system
DY30MC	Electrical emergency steering pump	Defective operation	TM	E03	Electrical system

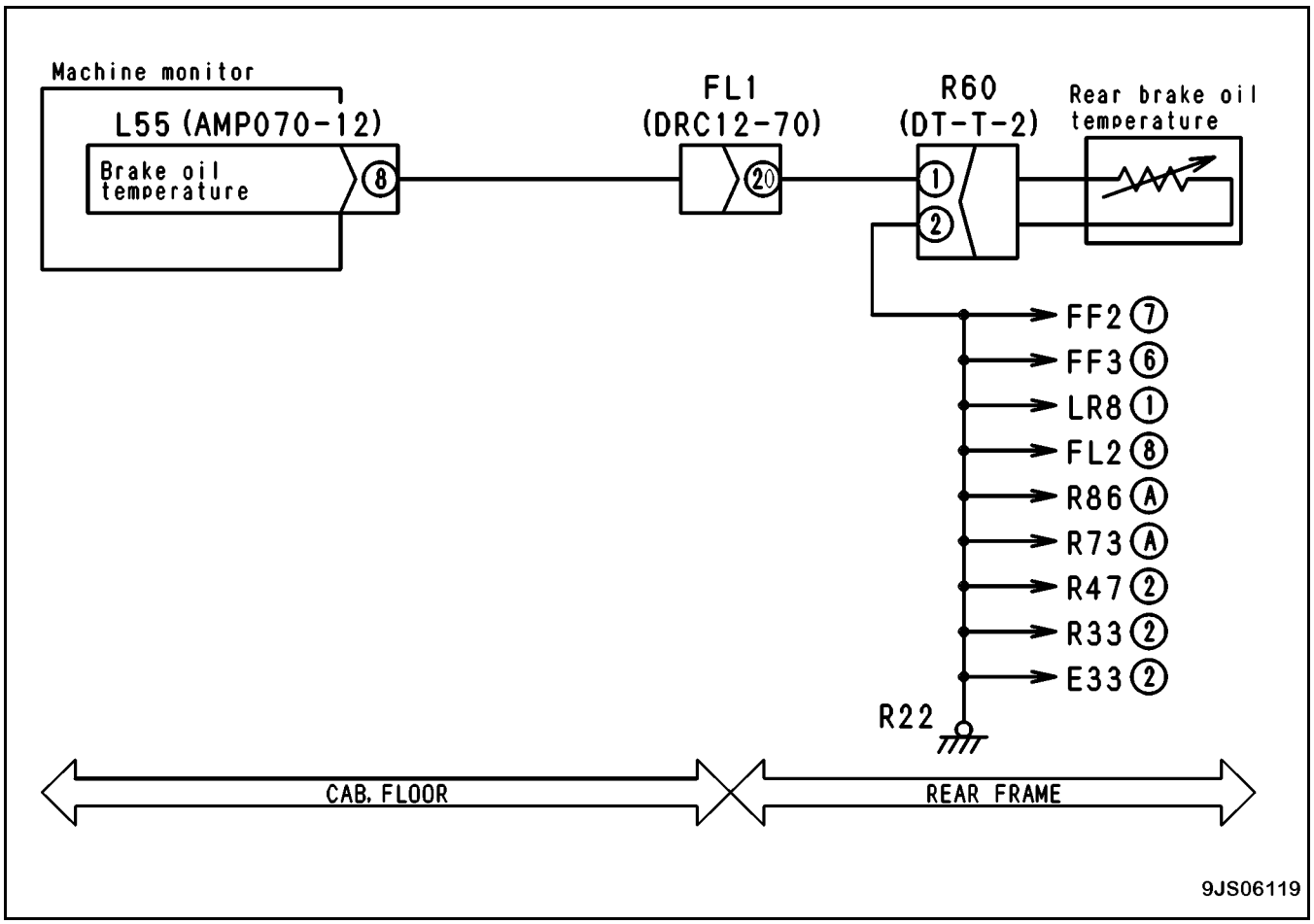
Related Circuit Diagram



Related Circuit Diagram



Related Circuit Diagram



CA144

Coolant Sensor High Error

Action Code	Failure Code	Trouble	Coolant sensor high error (Engine controller system)
E01	**CA144**		
Contents of trouble	• High voltage is detected in coolant temperature sensor signal circuit.		
Action of controller	• Fixes engine coolant temperature and continues operation.		
Problem that appears on machine	• Exhaust smoke becomes white. • Overheat prevention function does not function. • Engine starting performance falls during low temperature.		
Related information	• The input state (temperature) from the engine coolant temperature sensor can be checked with the monitoring function (Code: 04104 COOLANT TEMP). • The input state (voltage) from the coolant temperature sensor can be checked with the monitoring function (Code: 04105 COOLANT TEMP). • Method of reproducing failure code: Turn starting switch ON.		

	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective coolant temperature sensor (Internal trouble)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			COOLANT TEMP (male)	Temperature	Resistance	
			Between (A) and (B)	0°C (32°F)	30 – 37 kΩ	
				25°C (77°F)	9.3 – 10.7 kΩ	
				50°C (122°F)	3.2 – 3.8 kΩ	
				80°C (176°F)	1.0 – 1.3 kΩ	
				95°C (203°F)	700 – 800 Ω	
	2	Disconnection in wiring harness (Disconnection or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between EC1 (female) (15) – COOLANT TEMP (female) (B)		Resistance	Max. 10Ω
			Wiring harness between EC1 (female) (38) – COOLANT TEMP (female) (A)		Resistance	Max. 10Ω
	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) (15) – EC1 (female) (With all connectors of wiring harness disconnected)		Resistance	Min. 100 kΩ
	4	Defective wiring harness connector	Connecting parts among coolant temperature sensor, engine wiring harness, and engine controller are suspected. Inspect them directly. • Loose connector, broken lock, broken seal • Corroded, bent, broken, forced-in, or extended pin • Humidity in connector, entry of dirt or dust, poor insulation			

Related Circuit Diagram

★ There is no related circuit diagram.

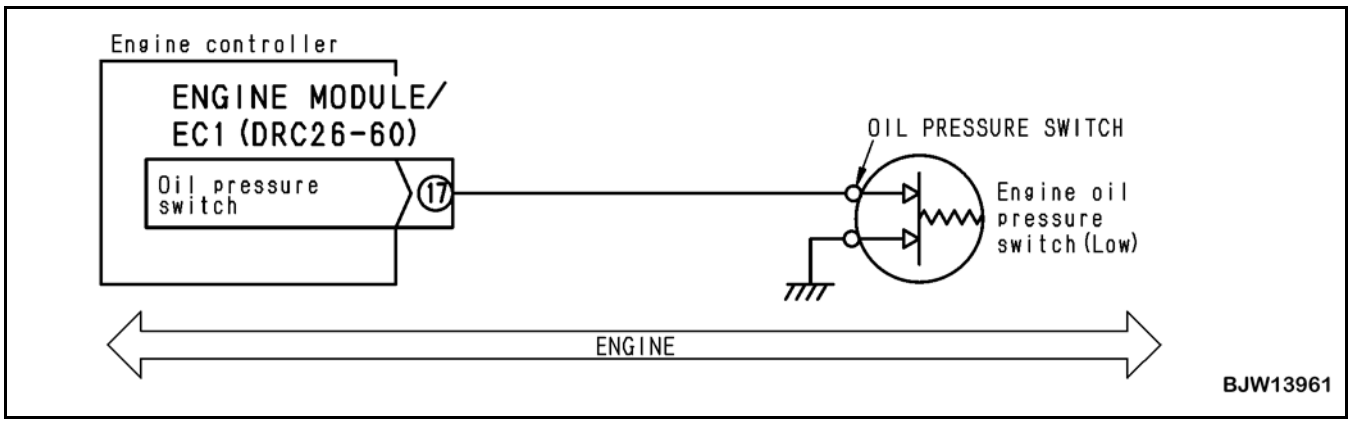
CA332

Injector #4 Open/Short Error

Action Code	Failure Code	Trouble	Injector #4 open/short error (Engine controller system)
E03	**CA332**		
Contents of trouble	• Disconnection or short circuit in drive circuit of injector #4.		
Action of controller	• Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine	• Engine output drops. • There is irregular combustion or hunting.		
Related information	• 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 injector No. 4	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			C10 (male)	Resistance	
			Between (1) and (2)	Max. 2 Ω	
			Between (2) and chassis ground	Min. 100 kΩ	
	2	Disconnection in wiring harness (Disconnection or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between EC1 (female) (56) – C10 (female) (2)	Resistance	Max. 2 Ω
			Wiring harness between EC1 (female) (58) – C10 (female) (1)	Resistance	Max. 2 Ω
	3	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 EC1 (female) (56) – C10 (female) (2) and chassis ground	Resistance	Max. 2 Ω
	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 among all pins between EC1 (female) (56) – EC1 (female) (With all connectors of wiring harness disconnected)	Resistance	Min. 100 kΩ
			Wiring harness among all pins between EC1 (female) (58) – EC1 (female) (With all connectors of wiring harness disconnected)	Resistance	Min. 100 kΩ
	5	Defective wiring harness connector	Connecting parts among injector No. 4, engine wiring harness, and engine controller are suspected. Inspect them directly. • Loose connector, broken lock, broken seal • Corroded, bent, broken, forced-in, or extended pin • Humidity in connector, entry of dirt or dust, poor insulation		
	6	Defective other cylinder injector or harness	If other failure codes are indicated simultaneously, carry out troubleshooting for them.		

Related Circuit Diagram



CA559

Supply Pump Pressure Very Low Error

Action Code	Failure Code	Trouble	Supply pump pressure very low error (Engine controller system)
E03	**CA559**		
Contents of trouble	• No-pressure feed (1) occurred in common rail circuit.		
Action of controller	• Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine	• Engine does not start or starting performance is poor. • Exhaust smoke is black. • Engine output drops.		
Related information	• The input state (common rail pressure) from the common rail pressure sensor can be checked with the monitoring function (Code: 36400 RAIL PRESS). • The input state (voltage) from the common rail pressure sensor can be checked with the monitoring function (Code: 36402, RAIL PRESS). • 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	Fuel leakage to outside	Inspect for fuel leakage directly (visual inspection at engine low idle).		
	2	Defective low-pressure circuit device	★ For check of pressure in fuel low-pressure circuit, see *FUEL SYSTEM: Measuring Fuel Pressure* in the *Testing and Adjusting* section. • Measure pressure at the fuel filter inlet side. • Cranking speed: Min. 150 rpm		
			Pressure in fuel low-pressure circuit	Cranking	Min. 0.14 MPa (20.31 psi)
			★ For check of pressure in fuel low-pressure circuit, see *FUEL SYSTEM: Measuring Fuel Pressure* in the *Testing and Adjusting* section. • Measure at fuel filter outlet side.		
			Pressure in fuel low-pressure circuit	At high idle	Min. 0.48 MPa (69.62 psi)
			★ For check of pressure in fuel low-pressure circuit, see *FUEL SYSTEM: Measuring Fuel Pressure* in the *Testing and Adjusting* section. • Measure at fuel filter inlet and outlet sides. • Drop of fuel low-pressure circuit pressure = Fuel filter inlet pressure – Fuel filter outlet pressure		
			Drop of fuel low-pressure circuit pressure	At high idle	Max. 0.14 MPa (20.31 psi)
			★ For check of fuel suction pressure, see *FUEL SYSTEM: Measuring Fuel Pressure* in the *Testing and Adjusting* section. • Measure at gear pump fuel inlet side of supply pump.		
			Fuel suction circuit pressure (Gear pump side)	At high idle	Max. 33.9 kPa (4.92 psi)
			★ For check of fuel suction pressure, see *FUEL SYSTEM: Measuring Fuel Pressure* in the *Testing and Adjusting* section. • Measure at fuel connector side.		
			Fuel suction circuit pressure (Fuel connector side)	At high idle	Max. 27.1 kPa (3.93 psi)

Related Circuit Diagram

★ See graphic related to failure code noted in table on previous page.

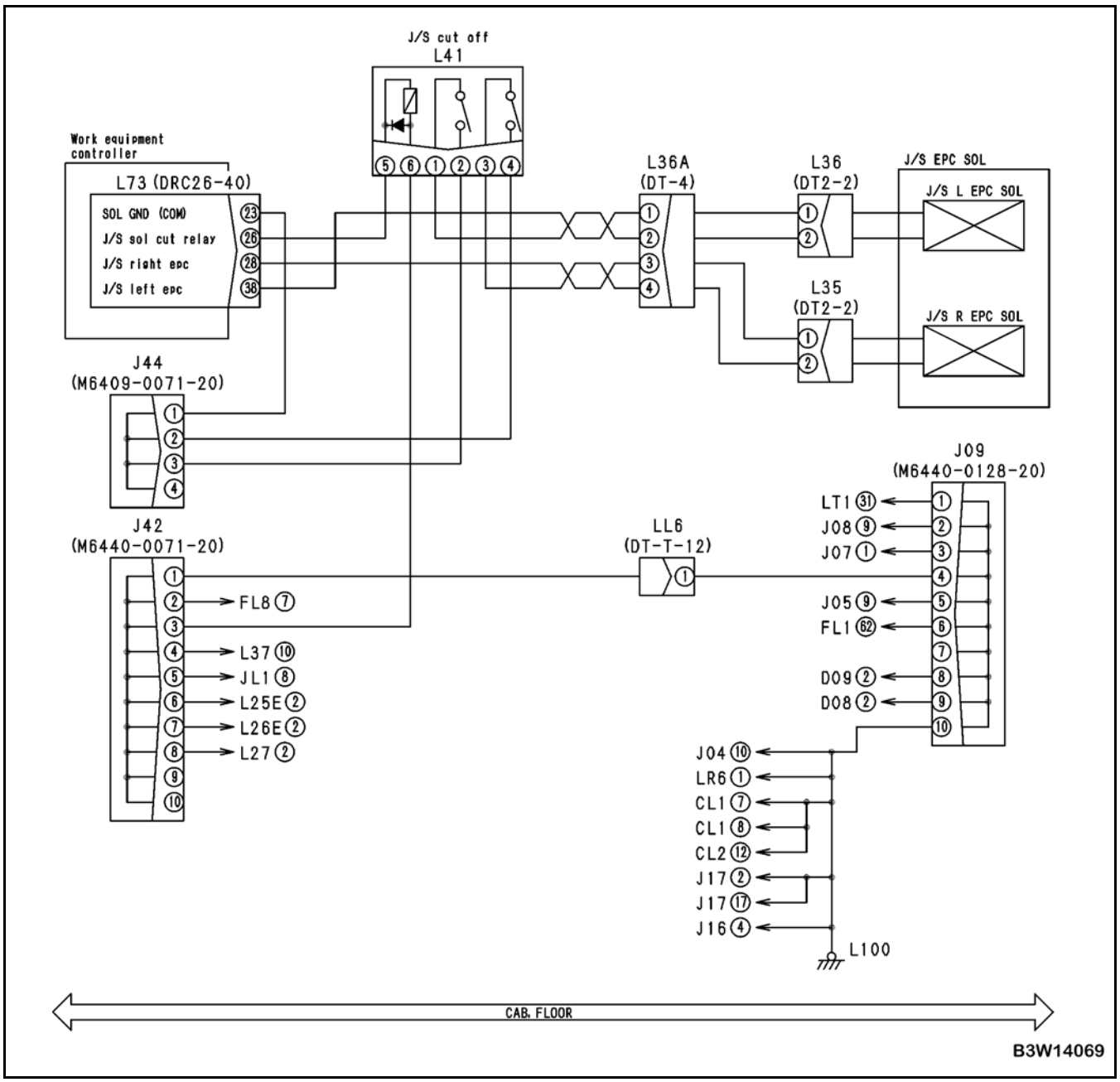
D160KB

Backup Lamp Relay: Short Circuit

Action Code	Failure Code	Trouble	Backup lamp relay: Short circuit (Transmission controller)
E01	**D160KB**		
Contents of trouble	• Since the backup lamp relay output system is shorted, signals are not output to the backup lamp relay.		
Action of controller	• Turns the output to the backup lamp relay OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• The backup lamp does not light up. • The backup buzzer does not sound.		
Related information	• The output state (ON/OFF) to the backup lamp relay can be checked with the monitoring function (Code: 90951, D-OUT-20). • Method of reproducing failure code: Turn the starting switch ON and set FNR (directional) lever, joystick steering FNR (directional) switch, or right FNR (directional) switch to R (reverse).		

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

Related Circuit Diagram



DA80L4

Auto-Grease Controller: ON/OFF Signals Disagree

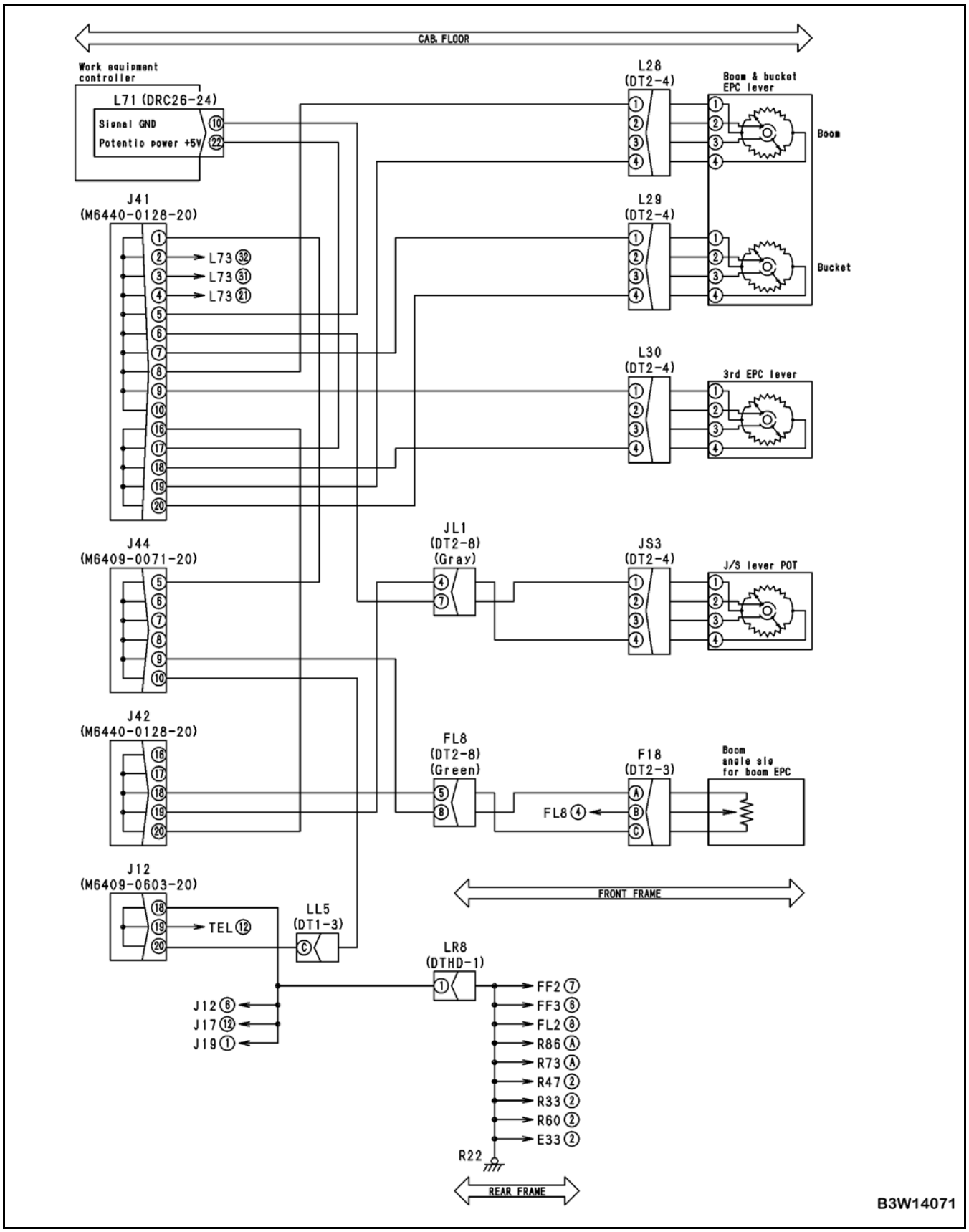
Action Code	Failure Code	Trouble	Auto-grease controller: ON/OFF signals disagree (Machine monitor system)
—	**DA80L4**		
Contents of trouble	• 24 V signal has been input to the auto-grease sensor A/B circuits at the same time.		
Action of controller	• None in particular. • If problem is removed, system is returned to normal operating state.		
Problem that appears on machine	• Auto-grease does not work. • Auto-grease lamp goes off.		
Related information	• The input state (ON/OFF) from the auto-grease controller can be checked with the monitoring function (Code: 40900, D-IN-4 and D-IN-5). • Applicable only to machines equipped with auto-grease function. • Method of reproducing failure code: Turn the starting switch and auto-grease start button ON.		

	Causes		**Standard value in normal state/Remarks on troubleshooting**			
Possible causes and standard value in normal state	1	Hot short in wiring harness (Contact with 24 V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between L52 (female) (3) – R38 (female) (2)		Voltage	Max. 1 V
	2	Defective auto-grease controller	★ Refer to and carry out troubleshooting for auto-grease system.			
	3	Defective machine monitor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			L52	Auto-grease	Voltage	Auto-grease lamp
			Between (3) and chassis ground	In operation	Max. 1 V	ON
				With empty tank	20 – 30 V	Flashing (1 Hz)
				When abnormal	Max. 1 V	Flashing (2 Hz)
					20 – 30 V	OFF
			Between (12) and chassis ground	In operation	20 – 30 V	ON
				With empty tank	Max. 1 V	Flashing (1 Hz)
				When abnormal	Max. 1 V	Flashing (2 Hz)
					20 – 30 V	OFF

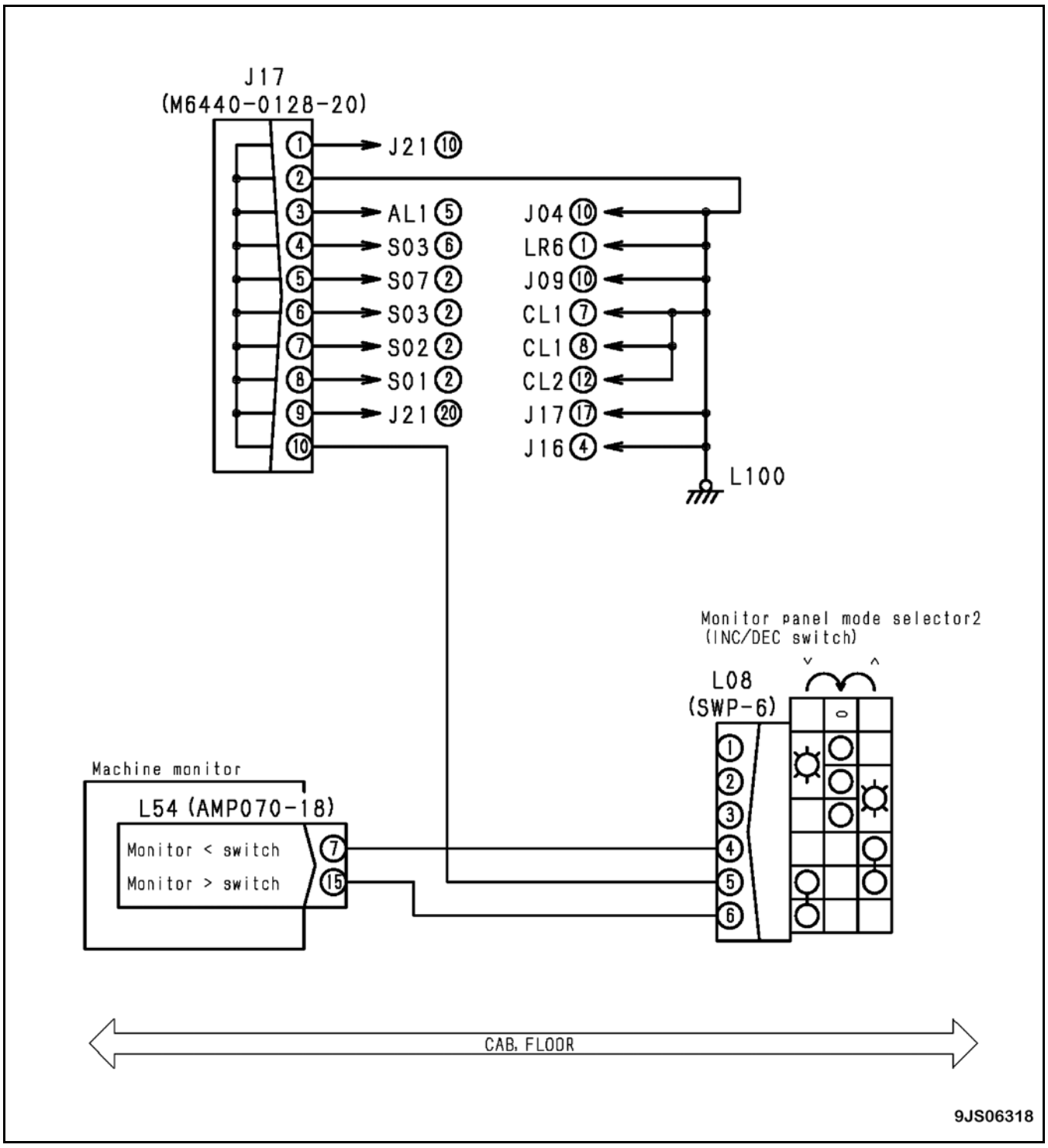
Related Circuit Diagram

★ There is no related circuit diagram.

Related Circuit Diagram



Related Circuit Diagram



DDB6L4

Parking Brake Switch (Neutralizer): ON/OFF Signals Disagree

Action Code	Failure Code	Trouble	Parking brake switch (Neutralizer): ON/OFF signals disagree (Transmission controller system)
E03	**DDB6L4**		
Contents of trouble	• Controller outputs a failure signal when the following conditions are all met: 1) Parking brake switch signal ON (neutralizer signal OPEN) 2) Parking brake released (by CAN communication from the machine monitor) 3) Hydraulic oil temperature above 25°C (77°F)		
Action of controller	• Turns the centralized warning lamp and alarm buzzer ON. • If problem is removed, system is returned to normal operating state.		
Problem that appears on machine	• Forward and reverse travel of the machine become unavailable or the parking brake indicator remains unlit.		
Related information	• The input state (ON/OFF) from the parking indicator switch to the machine monitor can be checked with the monitoring function (Code: 40903, D-IN-26). • The input state (ON/OFF) from the parking brake switch can be checked with the monitoring function (Code: 40907, D-IN-23). • If failure code [DGH2KX] (Hydraulic oil temperature sensor: Out of input signal range) is indicated; carry out troubleshooting for it first. • If failure code [DAFRKR] (CAN communication with machine monitor: Defective communication (Abnormality in target component system)) is indicated, carry out troubleshooting for it first. • Above error is sometimes detected if the emergency parking brake switch is set to ON (release side) when the parking brake switch is turned ON (parking side). • Method of reproducing failure code: Turn the starting switch ON and turn the parking brake switch ON.		

	Causes		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective parking brake indicator switch (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			PB.SW (male)	Parking brake oil pressure	Resistance
			Between (1) and (2)	When parking brake is released: Min. 0.61 MPa (88.5 psi)	Max. 1 Ω
				When parking brake applied: Max. 0.34 MPa (Max. 49.3 psi)	Min. 1 MΩ
	2	Defective parking brake switch (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			L01 (male)	Parking brake switch	Resistance
			Between (3) and (4)	ON	Min. 1 MΩ
				OFF	Max. 1Ω
			Between (5) and (6)	ON	Max. 1 Ω
				OFF	Min. 1 MΩ
			Between (3) and (6)	Constant	Min. 1 MΩ

<table>
<tr><th></th><th colspan="2">Causes</th><th colspan="4">Standard value in normal state/Remarks on troubleshooting</th></tr>
<tr><td rowspan="10">Possible causes and standard value in normal state</td><td rowspan="4">4</td><td rowspan="4">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 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="2">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="2">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="6">5</td><td rowspan="6">Defective transmission controller</td><td colspan="4">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td>L62</td><td>FNR (directional) lever</td><td colspan="2">Voltage</td></tr>
<tr><td 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 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 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>

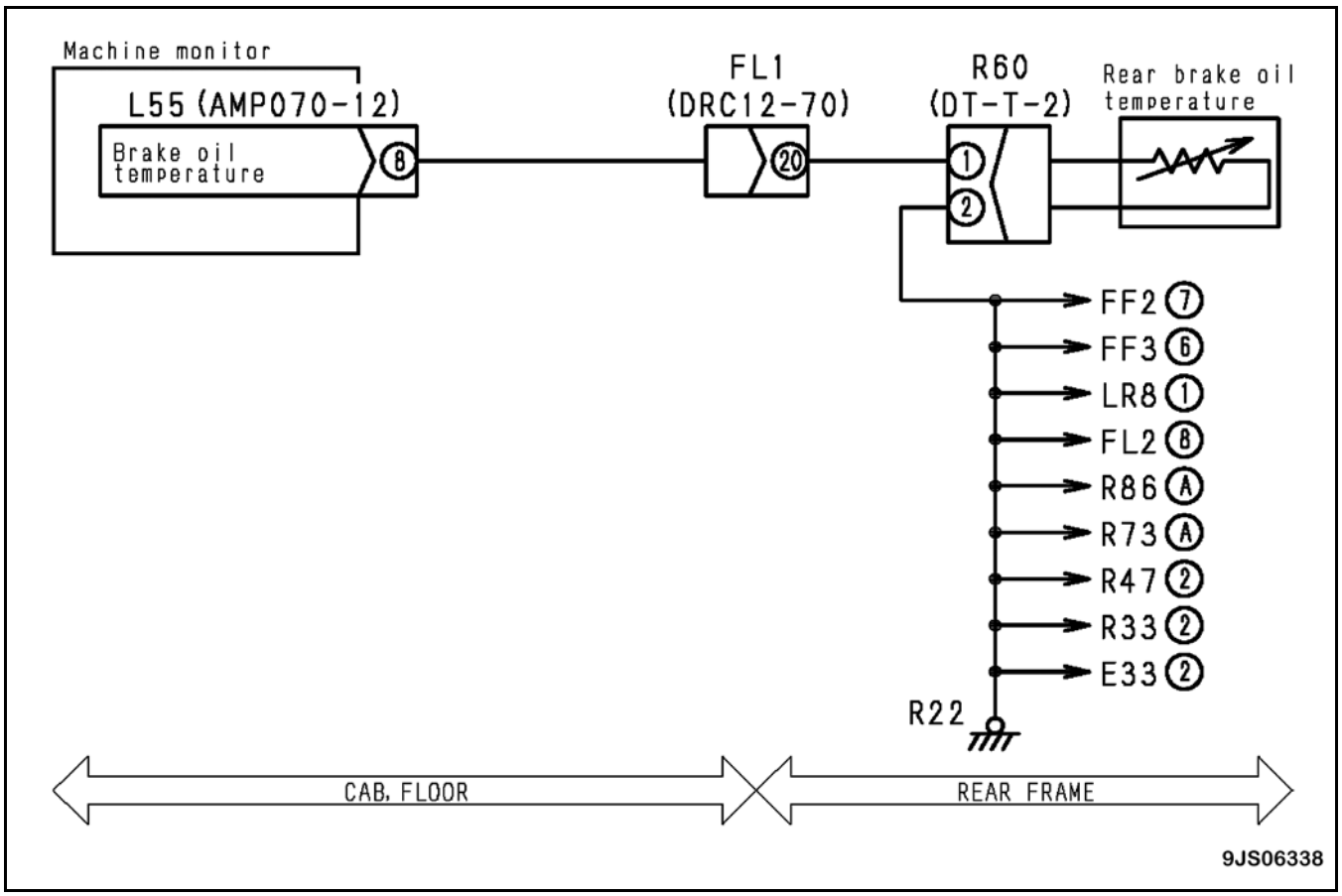
DDY0LD

Load Meter Cancel Switch: Switch is Pressed for Long Time

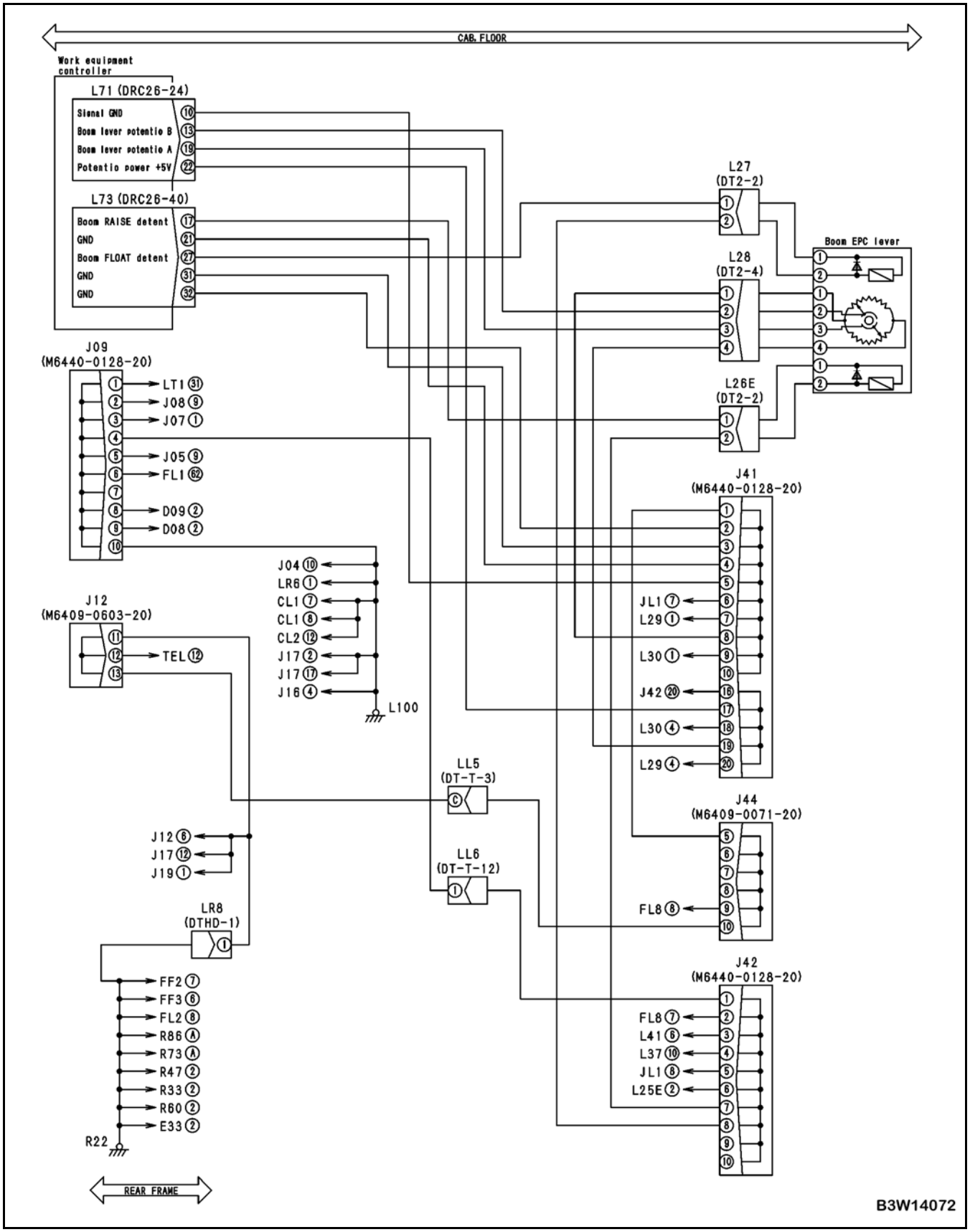
Action Code	Failure Code	Trouble	Load meter cancel switch: Switch is kept pressed for long time (Machine monitor system)
E01	**DDY0LD**		
Contents of trouble	• The load meter cancel switch is shorted and load meter cancel switch does not function.		
Action of controller	• None in particular		
Problem that appears on machine	• Unable to cancel calculated load.		
Related information	• The input state (ON/OFF) from the load meter cancel switch can be checked with the monitoring function (Code: 40904 D-IN-33). • Only for load meter (if equipped) • Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective load meter cancel switch (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			L15 (male)	Load meter cancel switch	Resistance	
			Between (1) and (2)	ON	Max. 1 Ω	
				OFF	Min. 1 MΩ	
			Between (1), (2) 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 L54 (female) (13) – L15 (female) (1) and chassis ground		Resistance	Min. 1 MΩ
	3	Defective machine monitor	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			L54 (male)	Load meter cancel switch	Voltage	
			Between (13) and chassis ground	ON	Max. 1 V	
				OFF	20 – 30 V	

Related Circuit Diagram



Related Circuit Diagram



<table>
<tr><th></th><th colspan="2">Cause</th><th colspan="3">Standard value in normal state/Remarks on troubleshooting</th></tr>
<tr><td rowspan="7">Possible causes and standard value in normal state</td><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 (7) and (10)</td><td>Lever in neutral</td><td>2.40 – 2.60 V</td></tr>
<tr><td>Tilt operation (Before detent)</td><td>3.69 – 4.09 V</td></tr>
<tr><td>Tilt operation (Detent position)</td><td>3.91 – 4.31 V</td></tr>
<tr><td>Full dump operation</td><td>0.69 – 1.09 V</td></tr>
</table>

DK5FKY

Joystick Steering EPC Lever Potentiometer (Main): Power Supply Line Short

Action Code	Failure Code	Trouble	Joystick steering EPC lever potentiometer (Main): Short circuit with the power supply line (Work equipment controller system)
E03	**DK5FKY**		
Contents of trouble	• Due to hot short circuit in the joystick steering EPC lever potentiometer (Main) system, the signal voltage is higher than normal range. (Joystick steering EPC lever potentiometer (Main) signal voltage: Max. 4.7 V)		
Action of controller	• If the joystick steering EPC lever potentiometer (Sub) is normal, the Sub potentiometer is in control. • Turns the centralized warning lamp and alarm buzzer ON. • Even if cause of failure disappears, system does not reset itself until joystick steering EPC lever is set to N (Neutral).		
Problem that appears on machine	• If disconnection occurs, machine turns to right but returns to normal operation in 0.5 seconds.		
Related information	• When the joystick steering ON/OFF switch is set to OFF, this failure code is not displayed. • The input state (voltage) from the joystick steering EPC lever potentiometer (Main) can be checked with the monitoring function (Code: 42004, J/S POT1). • The input state (voltage) from the joystick steering EPC lever potentiometer (Sub) can be checked with the monitoring function (Code: 42005, J/S POT2). • Method of reproducing failure code: Turn the starting switch ON and operate joystick steering lever.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective joystick steering EPC lever potentiometer (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			JS3 (male)	Resistance		
			Between (1) and (4)	3.2 ±0.64 kΩ		
			Between (1), (2), (3), (4), and chassis ground	Min. 1 MΩ		
			★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			JS3	Joystick steering EPC lever	Voltage	
			Between (4) and (1)	Constant	4.85 – 5.15 V	
			Between (3) and (1)	Lever in neutral	2.40 – 2.60 V	
				Left turning	1.14 – 1.54 V	
				Right turning	3.46 – 3.86 V	
	2	Hot short in wiring harness (Contact with 24 V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between L71 (female) (9) – JS3 (female) (3) and chassis ground		Voltage	Max. 1 V
			Wiring harness between L71 (female) (22) – JS3 (female) (4) and chassis ground		Voltage	Max. 1 V

MEMORANDUM

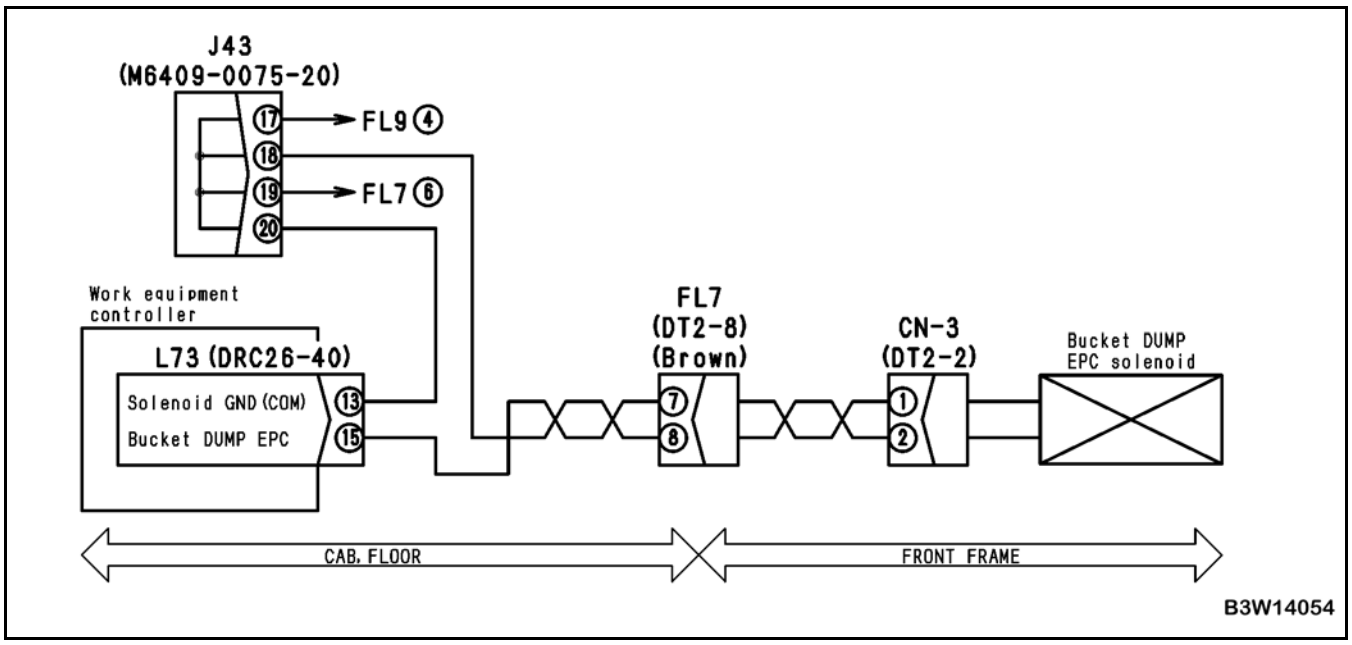
DW4PKB

Lift Arm Raise EPC Solenoid: Short Circuit

Action Code	Failure Code	Trouble	Lift arm raise EPC solenoid: Short circuit (Work equipment controller system)
E03	**DW4PKB**		
Contents of trouble	• Since the lift arm raise EPC solenoid signal system is shorted, abnormal current flows when the lift arm raise EPC solenoid output is turned ON.		
Action of controller	• Stops outputting the signal to the lift arm raise EPC solenoid. • Stops outputting the signal to the lift arm raise detent. • Turns the centralized warning lamp and alarm buzzer ON. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Lift arm does not rise.		
Related information	• The output state (current value) to the lift arm raise EPC solenoid can be checked with the monitoring function (Code: 41900 RAISE EPC DIR). • Method of reproducing failure code: Engine started + lift arm raise		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective lift arm raise EPC solenoid (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			CN-4 (male)	Resistance		
			Between (1) and (2)	5 – 15 Ω		
			Between (1), (2), and chassis ground	Min. 1 MΩ		
	2	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between L73 (female) (6) – CN-4 (female) (1) and chassis ground	Resistance	Min. 1 MΩ	
	3	Defective work equipment controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			L73 (female)	Resistance		
			Between (6) and (3)	5 – 15 Ω		
			Between (6), (3), and chassis ground	Min. 1 MΩ		

Related Circuit Diagram



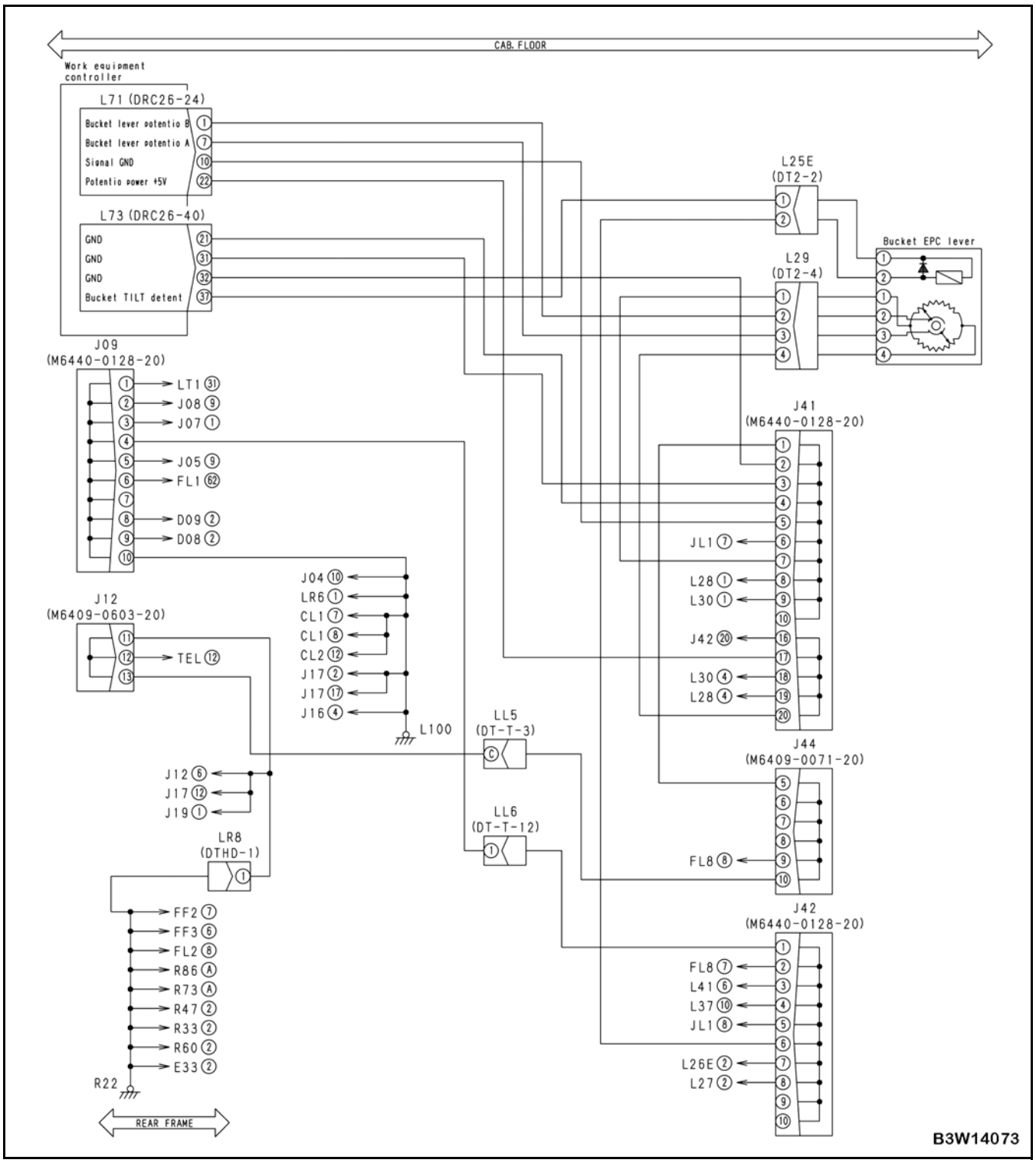
DWM1KY

Work Equipment Neutral Lock Solenoid: Short Circuit with Power Supply Line

Action Code	Failure Code	Trouble	Work equipment neutral lock solenoid: Short circuit with power supply line (Work equipment controller system)
E01	**DWM1KY**		
Contents of trouble	• Since the work equipment neutral lock solenoid system is shorted with the power source, abnormal voltage is applied when the work equipment neutral lock solenoid output is OFF.		
Action of controller	• Turns OFF the output to the work equipment neutral lock solenoid. • Stops outputting the signal to each 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	• All work equipment does not move.		
Related information	• The work equipment can be operated by removing (disconnecting) the connector of the work equipment neutral lock solenoid. • 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 starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	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 side (2).	Continue	
			Between (1) and (2)	Measured from side (1).	No continuity	
	3	Hot short in wiring harness (Contact with 24 V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Wiring harness between L73 (female) (7) – F26 (female) (1) and chassis ground		Voltage	Max. 1 V
	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	

Related Circuit Diagram



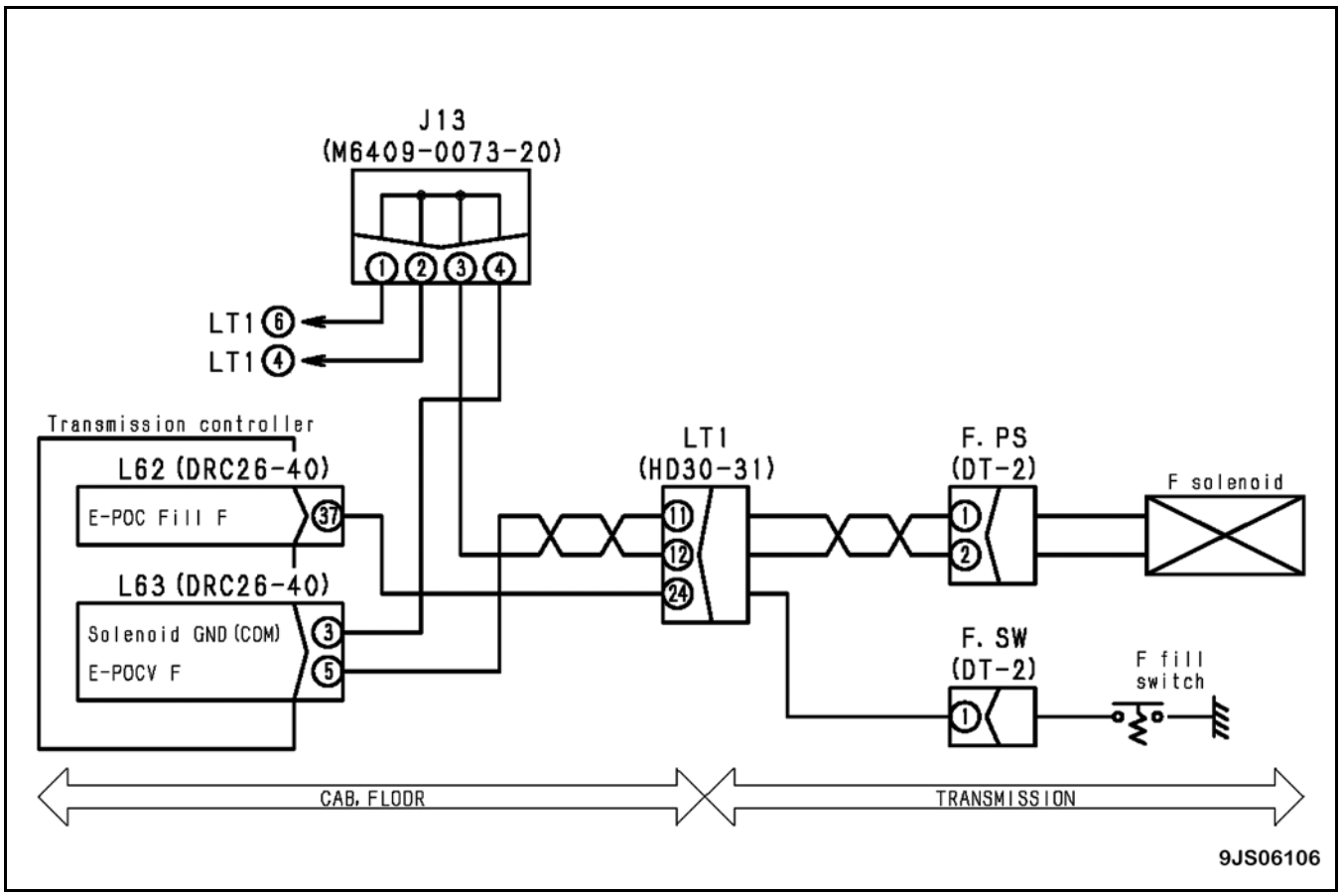
DXH5KA

2nd Clutch ECMV Solenoid: Disconnection

Action Code	Failure Code	Trouble	2nd clutch ECMV solenoid: Disconnection (Transmission controller system)
E03	**DXH5KA**		
Contents of trouble	• When the 2nd clutch ECMV solenoid system is disconnected, no current flows when 2nd clutch ECMV solenoid output is ON.		
Action of controller	• Stops outputting the signal to the 2nd 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 2nd (the machine can travel in any gear speed other than 2nd).		
Related information	• The output state (current value) to the 2nd (2nd speed) clutch ECMV solenoid can be checked with the monitoring function (Code: 31603 ECMV 2 DIR). • Method of reproducing failure code: Turn ON the starting switch; set the transmission manual/auto-shift selector switch in the MANUAL position; and select 2nd using the shift down switch or move the gearshift lever to 2nd.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective 2nd clutch ECMV solenoid (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			2.PS (male)	Resistance	
			Between (1) and (2)	5 – 15 Ω	
	2	Disconnection in wiring harness (Disconnection or defective contact of connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between L63 (female) (6) – 2.PS (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between L63 (female) (3) – 2.PS (female) (2)	Resistance	Max. 1 Ω
	3	Defective transmission controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			L63 (female)	Resistance	
			Between (6) and (3)	5 – 15 Ω	

Related Circuit Diagram



DXHMKB

Joystick Steering Left EPC Solenoid: Short Circuit

Action Code	Failure Code	Trouble	Joystick steering left EPC solenoid: Short circuit (Work equipment controller system)
E03	**DXHMKB**		
Contents of trouble	• Since the joystick steering left EPC solenoid system is shorted, abnormal current flows when the joystick steering left EPC solenoid output is ON.		
Action of controller	• Stops the output signal to the joystick steering right and left EPC solenoids. • Stops the output signal to the joystick steering solenoid cutoff relay. • Turns the centralized warning lamp and alarm buzzer ON. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• Joystick steering is inoperable (steering control from the handle mode is available). • Wiring harness or controller may burn.		
Related information	• The output state (current) to the joystick steering left EPC solenoid can be checked with the monitoring function (Code: 41905 J/S EPC DIR LH). • Method of reproducing failure code: Start engine and steer to the left using the joystick steering.		

	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective joystick steering left EPC solenoid (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			L36 (male)	Resistance		
			Between (1) and (2)	5 – 15 Ω		
			Between (1), (2) and chassis ground	Min. 1 MΩ		
	2	Defective joystick steering cutoff relay (L41) (Internal disconnection)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			L41 (male)	Resistance		
			Between (5) and (6)	200 – 400 Ω		
			★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			When joystick steering cutoff relay (L41) is replaced with a relay of the same type, if the condition becomes normal, the joystick steering cutoff relay is defective.			
	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) (38) – L36 (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 (38) and (23)	5 – 15 Ω		
			Between (23), (38) and chassis ground	Min. 1 MΩ		

<table>
<tr><th></th><th colspan="2">Causes</th><th colspan="3">Standard value in normal state/Remarks on troubleshooting</th></tr>
<tr><td rowspan="15">Possible causes and standard value in normal state</td><td rowspan="4">7</td><td rowspan="4">Defective FNR (directional) lever switch (Internal disconnection or short circuit)</td><td colspan="3">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td>L04</td><td>FNR (directional) lever</td><td>Voltage</td></tr>
<tr><td>Between (1) and (10)</td><td>Constant</td><td>20 – 30 V</td></tr>
<tr><td rowspan="2">Between (3) and (10)</td><td>N (Neutral)</td><td>20 – 30 V</td></tr>
<tr><td>Other than above</td><td>Max. 1 V</td></tr>
<tr><td rowspan="4">8</td><td rowspan="4">Defective joystick steering FNR (directional) switch (Internal disconnection or short circuit)</td><td colspan="3">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td>L37 (male)</td><td>Joystick steering FNR (directional) switch</td><td>Resistance</td></tr>
<tr><td rowspan="2">Between (1) and (3)</td><td>N (Neutral)</td><td>Max. 1 Ω</td></tr>
<tr><td>Other than above</td><td>Min. 1 MΩ</td></tr>
<tr><td>Between (1), (3) and chassis ground</td><td>Constant</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="4">9</td><td rowspan="4">Defective right FNR (directional) switch (Internal disconnection or short circuit)</td><td>L12 (male)</td><td>Right FNR (directional) switch</td><td>Resistance</td></tr>
<tr><td rowspan="2">Between (1) and (3)</td><td>N (Neutral)</td><td>Max. 1 Ω</td></tr>
<tr><td>Other than above</td><td>Min. 1 MΩ</td></tr>
<tr><td>Between (1), (3) and chassis ground</td><td>Constant</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="5">10</td><td rowspan="5">Defective diodes (D04, D05) (Internal disconnection)</td><td colspan="3">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td>D04 (male)</td><td>Diode range</td><td>Continuity</td></tr>
<tr><td>Between (2) and (1)</td><td>Measure at (2) in diode range.</td><td>Continue</td></tr>
<tr><td colspan="3">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td>D05 (male)</td><td>Diode range</td><td>Continuity</td></tr>
<tr><td>Between (2) and (1)</td><td>Measure at (2) in diode range.</td><td>Continue</td></tr>
<tr><td rowspan="4">11</td><td rowspan="4">Defective joystick safety relay (L113) (Internal problem)</td><td colspan="3">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">L113 (male)</td><td>Resistance</td></tr>
<tr><td colspan="2">Between (1) and (2)</td><td>200 – 400 Ω</td></tr>
<tr><td colspan="3">★ Prepare with starting switch OFF, then turn starting switch to START and carry out troubleshooting.</td></tr>
<tr><td colspan="4">When joystick safety relay (L113) is replaced with a relay of the same type, if the condition becomes normal, the joystick safety relay is defective.</td></tr>
<tr><td rowspan="4">12</td><td rowspan="4">Defective neutral safety relay (L116) (Internal problem)</td><td colspan="3">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">L116 (male)</td><td>Resistance</td></tr>
<tr><td colspan="2">Between (1) and (2)</td><td>200 – 400 Ω</td></tr>
<tr><td colspan="3">★ Prepare with starting switch OFF, then turn starting switch to START and carry out troubleshooting.</td></tr>
<tr><td colspan="4">When neutral safety relay (L116) is replaced with a relay of the same type, if the condition becomes normal, the neutral safety relay is defective.</td></tr>
</table>

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	6	Hot short in wiring harness (Contact with 24 V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting. ★ Headlamp switch is OFF.		
			Wiring harness between L02 (female) (5) – fuses No. 13, No. 12 of fuse box 2, – circuit branch end and chassis ground	Voltage	Max. 1 V
			Wiring harness between fuse No. 12 of fuse box 2 – right COMBI (female) (A), – R31 (female) (4), – circuit branch end and chassis ground	Voltage	Max. 1 V
			Wiring harness between fuse No. 13 of fuse box 2 – left COMBI (female) (A), – circuit branch end and chassis ground	Voltage	Max. 1 V

MEMORANDUM

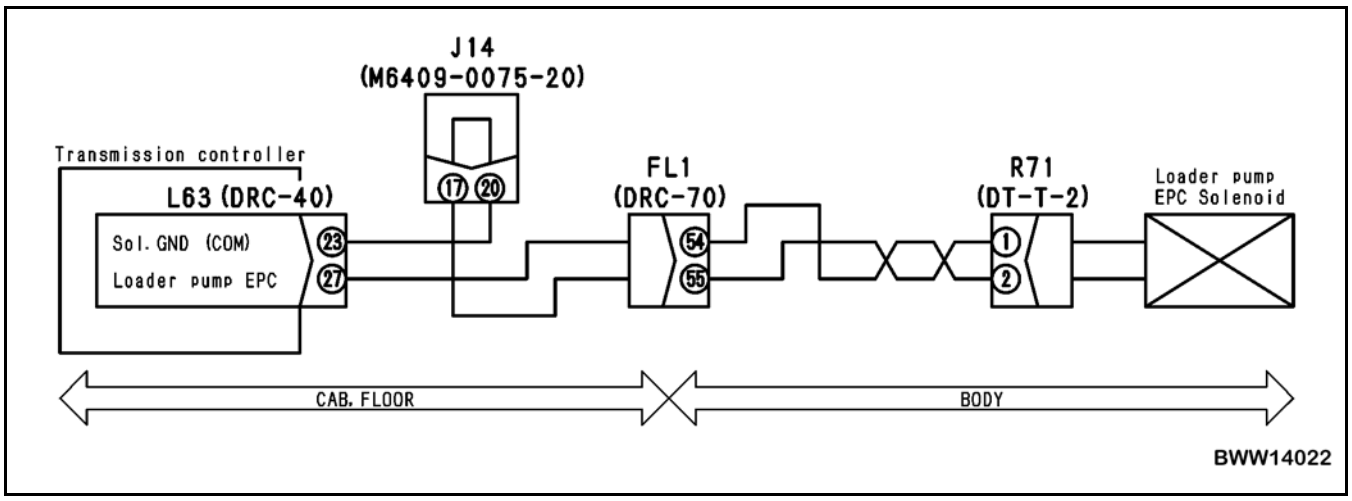
E-13

KOMTRAX System Does Not Work Properly

Trouble	KOMTRAX system does not work properly.
Related information	• If the KOMTRAX system administrator asks you to check whether any defect occurs in the machine system, carry out the following troubleshooting. ★ A defect in the KOMTRAX system, if any, does not appear as a defective phenomenon.

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective power supply	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			L80	Signal	Voltage
			Between (39), (40) – (37) and (38)	Constant power supply	20 – 30V
	2	Defective starting switch ACC signal and alternator R signal	★ Turn the starting switch ON, then start engine and carry out troubleshooting.		
			LED(1)	Normal state	
			LED-C1	ON	
			★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.		
			L80	Signal	Voltage
			Between (36) and (37), (38)	Starting switch ACC	20 – 30V
			Between (28) – (37), (38)	Alternator R	20 – 30V
	3	Defective starting switch C signal	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			L80	Signal	Voltage
			Between (27) and (37), (38)	Starting switch C	Max. 1 V
	4	Defective CAN connection state	★ Turn the starting switch ON, and carry out troubleshooting.		
			LED(4)	Normal state	
			LED-C4	ON	
			★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			L80 (female)	Signal	Resistance
			Between (7) and (8)	CAN	40 – 80 Ω
	5	Number of unsent mails	★ Turn the starting switch ON, and carry out troubleshooting.		
			LED(7)	Normal state	
			7 segments	0 – 9	
	6	Defective GPS positioning status	Turn the starting switch ON, and carry out troubleshooting.		
			LED (8)	Normal state	
			Dot	ON	
			One or more minutes may pass before GPS positioning is completed after the starting switch has been turned ON even in an outdoor service area.		

Related Circuit Diagram



E-30

Abnormality in Switch (■) (Panel Switch 1) Input

Contents of trouble	Abnormality in ■ switch (panel switch 1) input
Related information	• The ■ switch (panel switch 1) circuit is disconnected or shorted with the chassis ground. • While the ■ switch (panel switch 1) is turned ON, the input circuit is kept OPEN (the switch is kept OFF). • The operator cannot operate the monitor (cannot enter the service mode and monitoring function). • The input state (ON/OFF) from the ■ switch (panel switch 1) can be checked with the monitoring function (Code: 40901. D-IN-15).

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective fuse (3) of fuse box 1	If the fuse is burnt out, the circuit probably has a grounding fault, short circuit, etc. (See cause 4.)			
	2	Defective ■ switch (panel switch 1) (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			L07 (female)	■ switch (Panel switch 1)	Resistance	
			Between (4) and (5)	ON	Max. 1 Ω	
				Other than above	Min. 1 MΩ	
			Between (4) or (5) and chassis ground	Constant	Min. 1 MΩ	
	3	Disconnection in wiring harness (Disconnection or defective contact of connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between L52 (female) (17) – L07 (female) (4)		Resistance	Max. 1 Ω
			Wiring harness between L51 (female) (4) or (5) – L07 (female) (5)		Resistance	Max. 1 Ω
	4	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between L52 (female) (17) – L07 (female) (4) wiring harness and chassis ground		Resistance	Min. 1 MΩ
			Wiring harness between L51 (female) (4) or (5) – L07 (female) (5)		Resistance	Min. 1 MΩ
	5	Defective monitor panel	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			L52	■ switch (Panel switch 1)	Voltage	
			Between (17) and chassis ground	ON	20 – 30 V	
				Other than above	Max. 1 V	

H-3

Torque Converter Lockup is Not Switched ON

★ Machine with lockup clutch (if equipped)

Ask the operator the following questions:

- Has the lockup suddenly started not to turn on?
  → **Seizure or breakage inside torque converter**
- Did any abnormal noise occur at the time?
  → **Breakage of parts**

Checks before troubleshooting

- Is the oil level in the transmission case correct?
- Is there any external oil leakage?

Check for abnormality

- Main relief oil pressure
- Lockup oil pressure
- Travel speed

No.	Diagnosis	Remedy Transmission controller self-diagnosis code	Cause a: Drop of transmission main relief valve set pressure (Δ x)	b: Defective operation of lockup clutch ECMV (x)	c: Defective seal of lockup clutch piston (x)	d: Wear or seizure of lockup clutch disc (x)	e: Crack on lockup clutch case (x)	f: Clogging of last chance filter (C)	g: Defective seal of lockup clutch shaft (x)
1	Main relief oil pressure is low.		❍						
2	Main relief oil pressure is normal but lockup oil pressure is low or 0.			❍	❍		❍	❍	❍
3	Main relief oil pressure and oil pressure are normal but lockup oil pressure is low or 0.					❍			
4	Time to lockup actuation takes long.	15SJLH		❍					

H-13

When Machine Turns, It Shakes or Jerks

Check for abnormality

- Is the steering difficult to turn?
  → **See H-8.**
- Is there any abnormal noise from around the steering equipment?

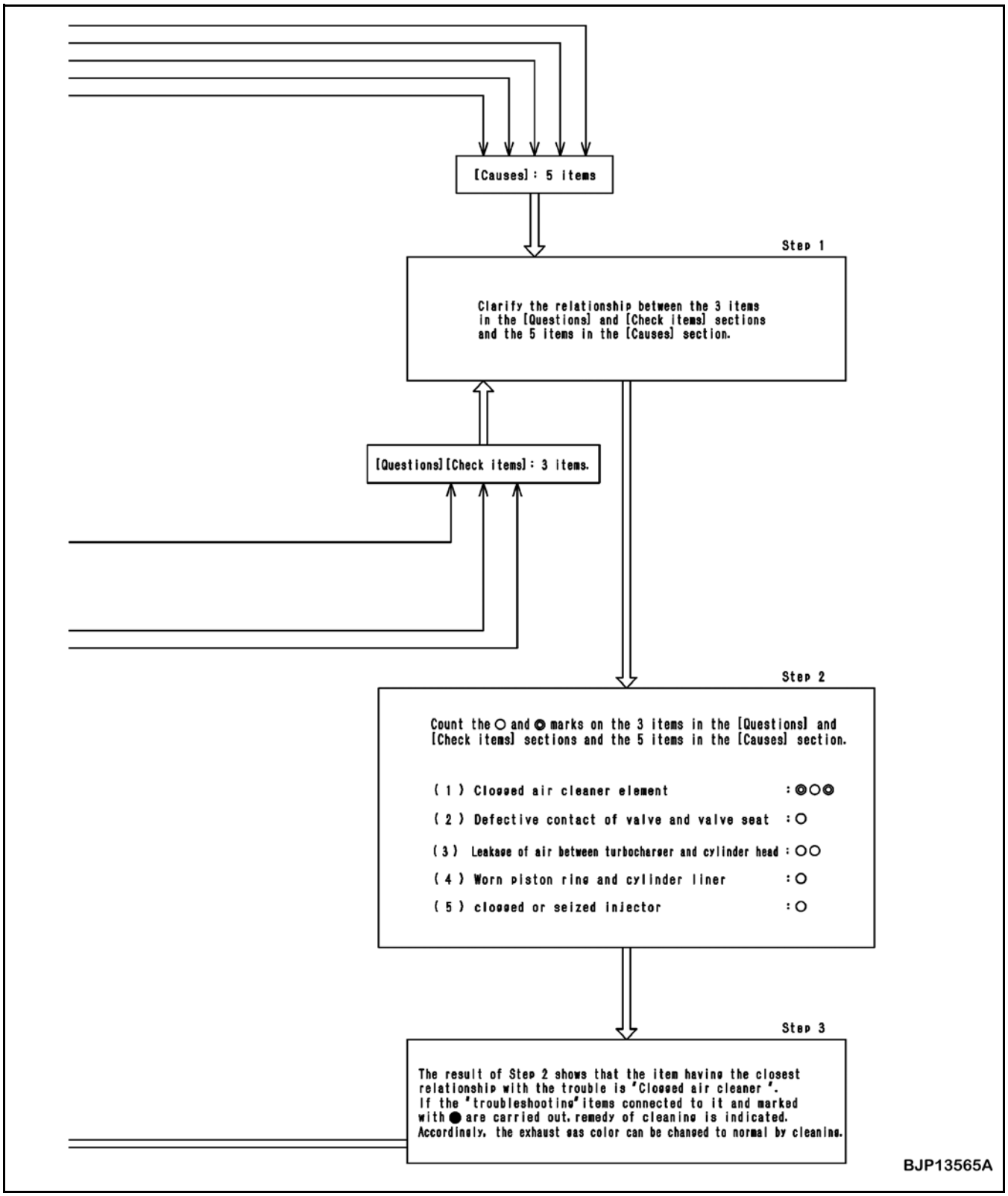
Checks before troubleshooting

- Is the steering wheel play correct?
- Is there any abnormality in the connection between the steering shaft and the Orbitrol?
- Is the tire inflation pressure correct?

No.	Diagnosis	Remedy	Cause: Hydraulic pump a: Defective fan pump	Charge valve b: Defective accumulator charge valve	Orbitrol c: Defective Orbitrol	Stop valve d: Defective stop valve	Steering valve e: Malfunction of flow control spool	Steering valve f: Defective main relief valve	Steering valve g: Defective actuation of steering spool	Steering valve h: Defective overload relief valve	Cylinder i: Defect in steering cylinder (defective piston seal)
			Δ x	Δ x	Δ x	Δ x	Δ x	Δ x	E	Δ x	Δ x
1	When machine turns, it shakes or jerks in both directions (left and right).		❍	❍	❍		❍	❍	❍		❍
2	When machine turns, it shakes or jerks in one direction (left or right).					❍				❍	
3	During operations or when traveling (steering is neutral), the machine shakes or jerks.								❍	❍	❍
4	Steering wheel jerks or there is excessive shock when steering is operated to end of its stroke.					❍					
5	Work equipment also jerks.		❍	❍							
6	When steering relief pressure is measured:	Oil pressure is unstable in both directions (left and right).	❍	❍	❍		❍	❍	❍		❍
7		Oil pressure is unstable in one direction (left or right).				❍				❍	
8	When Orbitrol discharge pressure(steering pilot pressure) is measured:	Oil pressure is unstable in both directions (left and right).	❍	❍	❍						
9		Oil pressure is unstable in one direction (left or right).				❍					
10	When Orbitrol basic pressure is measured, oil pressure is unstable.		❍	❍							

The five items of [causes] and the three items of [questions] and [check items] have a cause-and-effect relationship.

Steps 1 to 3, in the following figure, explain how to narrow down the [causes] from the cause-and-effect relationship and lead to [troubleshooting].



S-10

Fuel Consumption is Excessive

General causes why fuel consumption is excessive:

- Leakage of fuel
- Fuel injection condition (fuel pressure and injection timing) not normal
- Excessive injection of fuel

			Causes									
			Fuel leakage inside head cover	Fuel leakage from fuel filter, piping, etc.	Defective feed pump oil seal	Defective supply pump plunger	Defective common rail pressure	Defective spray by injector	Defective operation of injector	Improper fuel injection timing	Defective coolant temperature sensor , wiring harness
Questions	Check recent repair history.										
	Degree of machine operation	Machine operated for long period			Δ	Δ		Δ			
	Condition of fuel consumption:	More than for other machines of same model					❍		❍	❍	❍
		Gradually increased				❍		❍			
		Suddenly increased	❍	❍							
Check items	Fuel leakage to outside			✪							
	Combustion is irregular.							✪			
	Engine oil level rises and oil smells of diesel fuel.		✪		✪						
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low.							✪			
	Low idling speed is too high.								❍		
	Pump relief speed is high.								❍		
	Color of exhaust smoke:	Black					❍	❍		❍	❍
		White	❍								
Troubleshooting	Remove head cover and check directly.		●								
	Inspect feed pump oil seal directly.				●						
	Carry out troubleshooting according to the displayed code, “No-pressure feed by supply pump (*1).”					●					
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change.							●			
	If spill hose from injector is disconnected, much fuel spills.								●		
	Carry out troubleshooting according to the displayed code, “Abnormality in coolant temperature sensor (*2).”										●
	Check by the monitoring function.						●			●	
		Remedy	Correct	Correct	Replace	Replace	Correct	Replace	Replace	Replace	Replace

★ *1: Failure codes CA559 and CA2249 in the display code

★ *2: Failure codes CA144 and CA145 in the display code

Category	Komatsu Code	Part Number	Qty	Container	Main Features and Applications	
Primer	SUNSTAR PAINT PRIMER 580 SUPER	417-926-3910	20 ml	Glass container	Adhesive for cab glass	• Used as primer for cab side. (Using limit: 4 months after date of manufacture)
	SUNSTAR GLASS PRIMER 580 SUPER		20 ml	Glass container		• Used as primer for glass side. (Using limit: 4 months after date of manufacture)
	SUNSTAR PAINT PRIMER 435-95	22M-54-27230	20 ml	Glass container		• Used as primer for painted surface on cab side. (Using limit: 4 months after date of manufacture)
	SUNSTAR GLASS PRIMER 435-41	22M-54-27240	150 ml	Can		• Used as primer for black ceramic-coated surface on glass side and for hard polycarbonate-coated surface. (Using limit: 4 months after date of manufacture)
	SUNSTAR SASH PRIMER GP-402	22M-54-27250	20 ml	Glass container		• Used as primer for sash (Almite). (Using limit: 4 months after date of manufacture)
Adhesive	SUNSTAR PENGUINE SEAL 580 SUPER “S” or “W”	417-926-3910	320 ml	Polyethylene container	Adhesive for cab glass	• “S” is used for high-temperature season and “W” for low-temperature season as adhesive for glass. (Using limit: 4 months after date of manufacture)
	Sika Japan, Sikaflex 256HV	20Y-54-39850	310 ml	Polyethylene container		• Used as adhesive for glass. (Using limit: 6 months after date of manufacture)
	SUNSTAR PENGUINE SUPER 560	22M-54-27210	320 ml	Ecocart (Special container)		• Used as adhesive for glass. (Using limit: 6 months after date of manufacture)
Caulking material	SUNSTAR PENGUINE SEAL No. 2505	417-926-3920	320 ml	Polyethylene container		• Used to seal joints of glass parts. (Using limit: 4 months after date of manufacture)
	SEKISUI SILICONE SEALANT	20Y-54-55130	333 ml	Polyethylene container		• Used to seal front window. (Using limit: 6 months after date of manufacture)
	GE TOSHIBA SILICONES TOSSEAL 381	22M-54-27220	333 ml	Cartridge		• Used to seal joint of glasses. Translucent white seal. (Using limit: 12 months after date of manufacture)

CONNECTOR REPAIR PROCEDURES

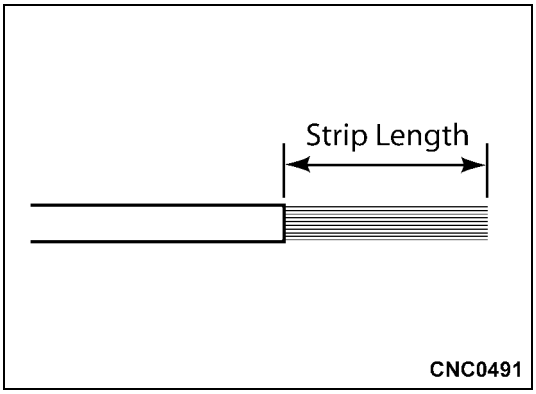
These steps outline the proper repair procedures for the HD30 and DT type wire connectors. Failure to follow these procedures may result in a failed contact situation in the electrical circuit or damage to the connector or wiring harness.

Stripping Insulation

After obtaining the proper terminal size for the wire gauge you will be using in the connector repair, remove all damaged or corroded sections of the wire being repaired referring to the table below.

Deutsch Terminal Part Number	Wire Gauge Range	Strip Length: mm (in)
0460 - 202 - 20141 0462 - 201 - 20141	20 AWG 20 AWG	3.96 - 5.53 (0.156 - 0.218) 3.96 - 5.53 (0.156 - 0.218)
0460 - 202 - 16141 0462 - 201 - 16141	16, 18 and 20 AWG 16, 18 and 20 AWG	6.35 - 7.92 (0.250 - 0.312) 6.35 - 7.92 (0.250 - 0.312)
0460 - 215 - 16141 0462 - 209 - 16141	14 AWG 14 AWG	6.35 - 7.92 (0.250 - 0.312) 6.35 - 7.92 (0.250 - 0.312)
0460 - 204 - 12141 0462 - 203 - 12141	12 and 14 AWG 12 and 14 AWG	5.64 - 7.21 (0.222 - 0.284) 5.64 - 7.21 (0.222 - 0.284)
0460 - 204 - 08141 0462 - 203 - 08141	8 and 10 AWG 8 and 10 AWG	10.92 - 12.47 (0.430 - 0.492) 10.92 - 12.47 (0.430 - 0.492)
0460 - 204 - 0490 0462 - 203 - 04141	6 AWG 6 AWG	10.92 - 12.47 (0.430 - 0.492) 10.92 - 12.47 (0.430 - 0.492)

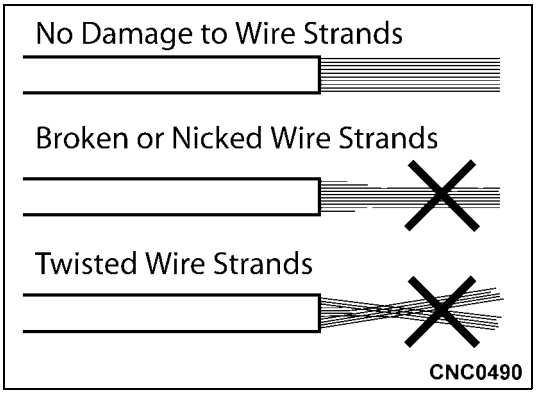
Using wire insulation strippers, remove only the measured amount of insulation from the wire according to the size contact terminal listed in the "Strip Length" above.



Wire Inspection

After stripping insulation from wire, inspect wire strands for:

- Corrosion, straightness and uniformity
- Broken or nicked wire strands are unexcitable and may cause high resistance in the circuit.
- Do not twist or wrap the wire strands as this may cause wire strand breakage during the crimping process.



4. Connect the engine harness. At this time, pay attention to the polarity of the connector.

5. Start the engine and check that fuel does not leak.
   ★ For details, see *FUEL SYSTEM: Testing Leakage in Fuel Syste*m in the *Testing and Adjusting* section.

Relief Valve

★ Do not reuse a relief valve whose leakage rate has exceeded the specified value.

1. Check that the high-pressure seal surfaces of the relief valve and rail are not damaged.

2. Install the relief valve.
   ★ Apply clean gear oil #90 to the threads.

Tightening torque: 100 ±4 N•m (73.76 ±2.95 lbf ft)

3. Start the engine and check that fuel does not leak.
   ★ For details, see *FUEL SYSTEM: Testing Leakage in Fuel Syste*m in the *Testing and Adjusting* section.

[*10]

Blow-by duct mounting bolt: 10 ±2 N•m (88.51 ±17.70 lbf in)

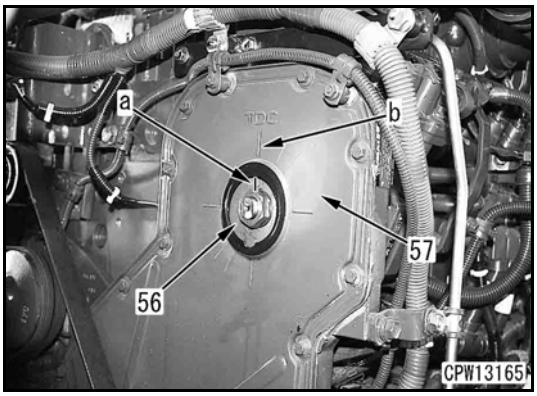
[*11]

Cylinder head cover mounting bolt: 24 ±4 N•m (17.70 ±2.95 lbf ft)

[*12]

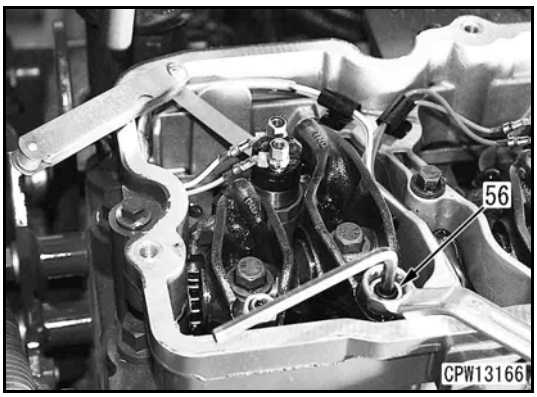
Adjusting Valve Clearance

1. Check that No. 1 cylinder is at the top dead center.
   - Align mark [a] on supply pump drive gear (56) with the TDC mark [b] on gear cover (57).
   - If No. 1 cylinder is not at the top dead center, follow Step 14 in the removal procedure to move it to the top dead center position.

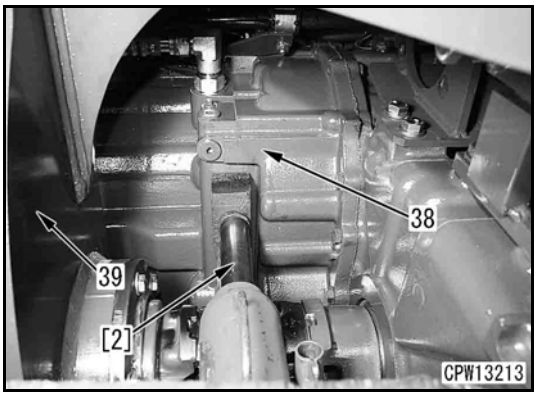


2. Adjust the valve clearance.
   ★ Refer to *Adjusting Valve Clearance* in the *Testing and Adjusting* section.

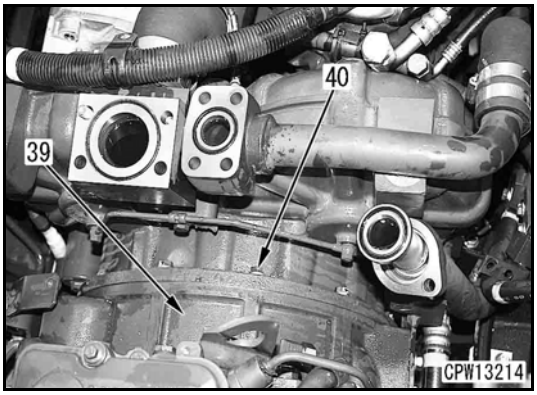
Locknut (56): 24 ±4 N•m (17.70 ±2.95 lbf ft)



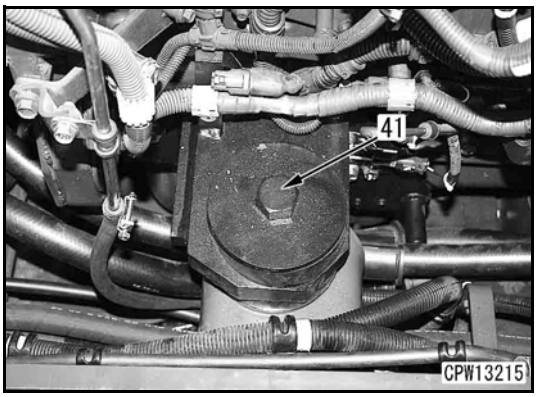
22. Support the bottom of transmission case (38) with jack [2] and keep it level.
    ★ This is to prevent engine assembly (39) from toppling backward when it is removed. The torque converter and transmission assembly are secured at two places at the transmission side.



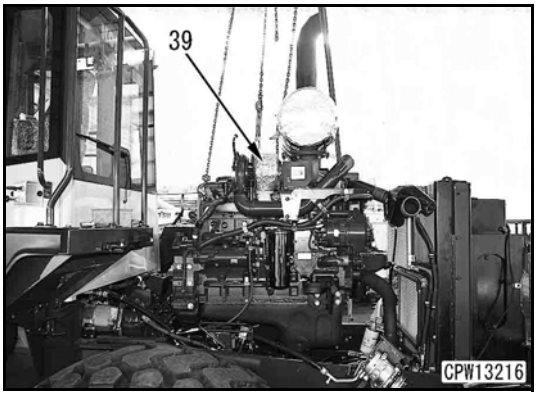
23. Temporarily lift engine assembly (39), and remove 12 mounting bolts (40) from the torque converter assembly. **[*5]**



24. Remove two mounting bolts (41) on both sides. **[*6]**

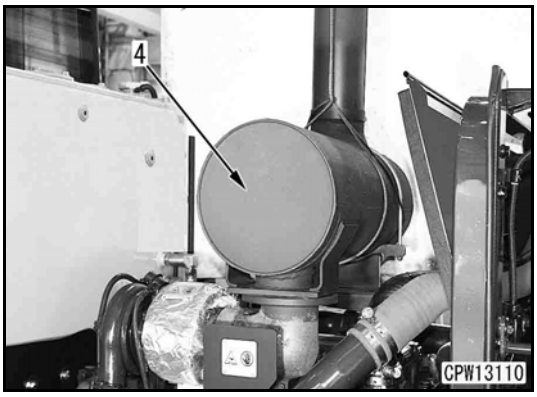


25. Lift off engine assembly (39).



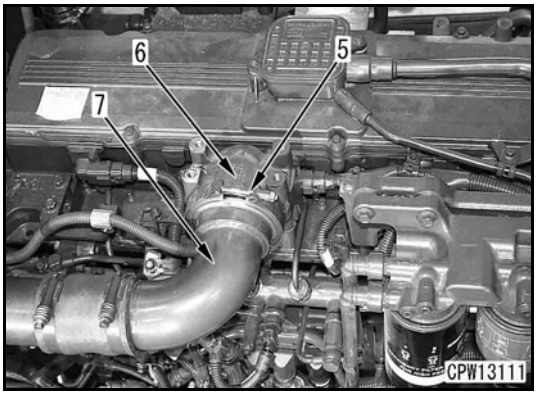
5. Remove the mounting bolts and lift off muffler (4).

Muffler (including exhaust pipe): 40 kg (88.19 lb)

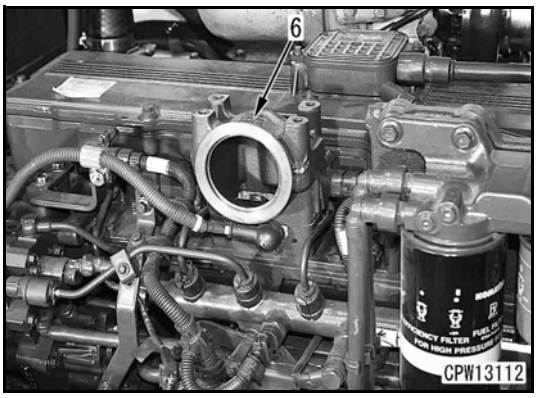


6. When removing Nos. 2 and 3 injectors:

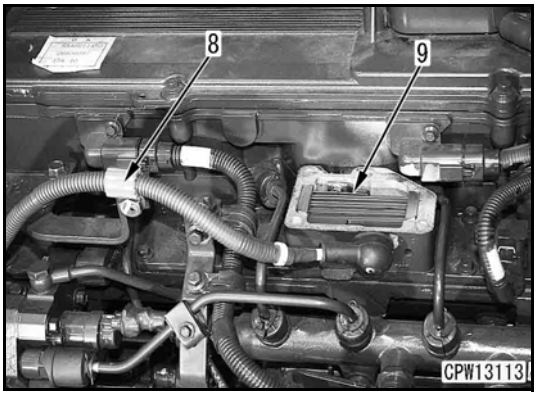
   A. Loosen clamp (5) and disconnect tube (7) from air intake connector (6). **[*1]**



   B. Remove four bolts and remove air intake connector (6). **[*2]**



   C. Remove clamp (8) for electrical intake air heater wiring E07A and move the electrical intake air heater (9) to the left side.



Torque Converter (Standard Specification)

Special Tools

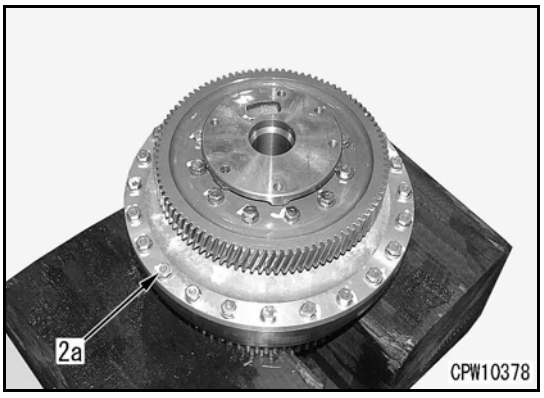
Symbol		Part Number	Part Name	Necessity	Qty	N/R	Sketch
C	1	790-501-5000	Unit repair stand	■	1		
		790-501-5200	Unit repair stand	■	1		
		790-901-2110	Bracket	■	1		
		790-901-2150	Plate	■	1		

Disassembly

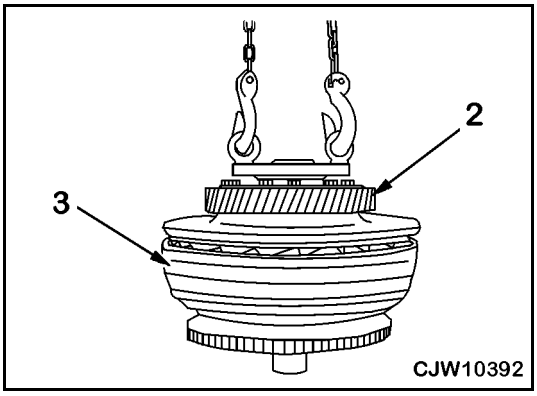
1. Do Steps 1 – 8 of the *POWER TRAIN: Transmission: Disassembly* procedure in this section.
   ★ Once the torque assembly is on the block (or mounted on tool **C1**), continue with Step 2.

2. Turbine and case assembly.

   A. Install the eyebolt on the stator shaft and remove bolt (2a).



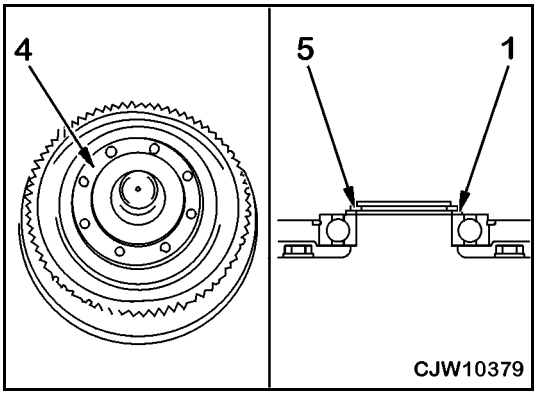
   B. Remove stator shaft and pump assembly (2) from turbine case assembly (3).



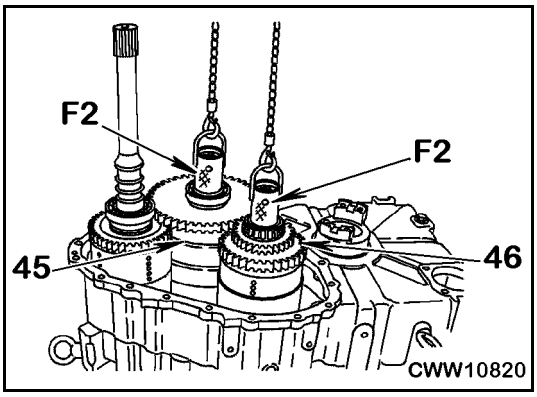
   C. Disassemble the turbine and case assembly.

      i. Remove pilot (4).

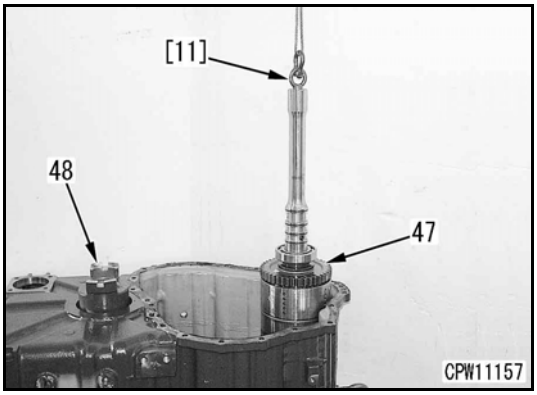
      ii. Remove snap ring (5) and remove plate (1).



B. Use tool **F2** to lift the 1st speed and 4th speed clutch assembly (45), together with the 2nd speed and 3rd speed clutch assembly (46), and remove it.



C. Use eyebolt [11] to lift the forward and reverse clutch assembly (47) and remove it.

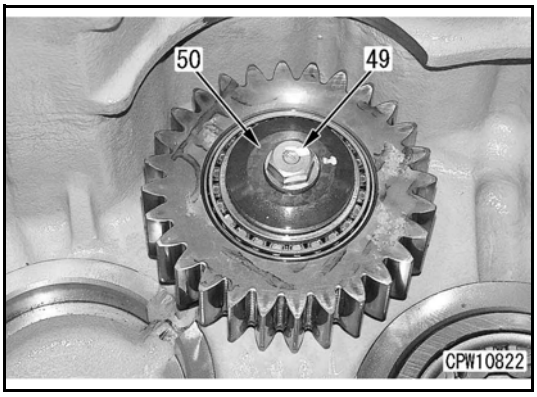


12. Yoke

Remove the yoke (48).

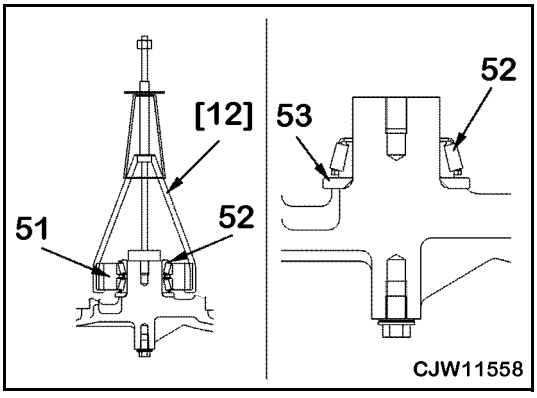
13. Reverse idler gear.

A. Remove bolt (49) and plate (50).



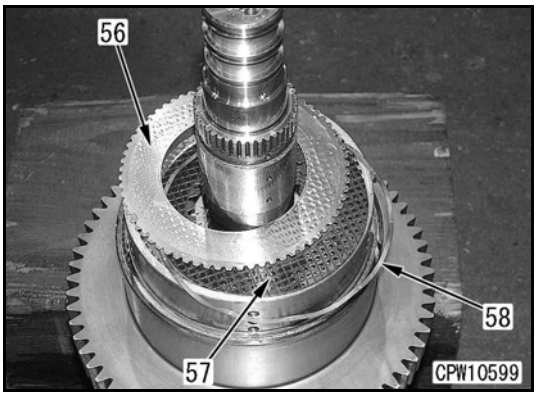
B. Use puller [12] to remove gear (51) and bearing (52).

C. Remove bearing (52) and plate (53).

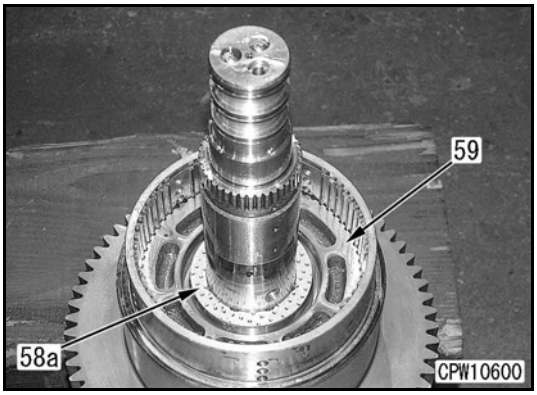


4. Clutch plate

A. Remove plate (56), disc (57), and spring (58) from the housing.



B. Remove thrust washer (58a).

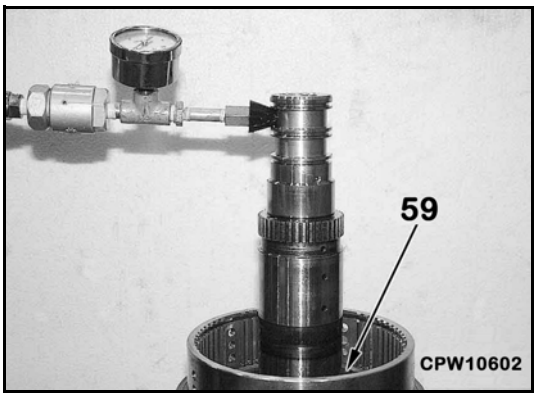


5. Piston

Blow air into the 3rd clutch side oil hole of the shaft and remove piston (59).

★ If the piston is tilted and you cannot remove it, push the piston again.

★ If the piston is removed by force, the inside surface of the cylinder may be damaged.

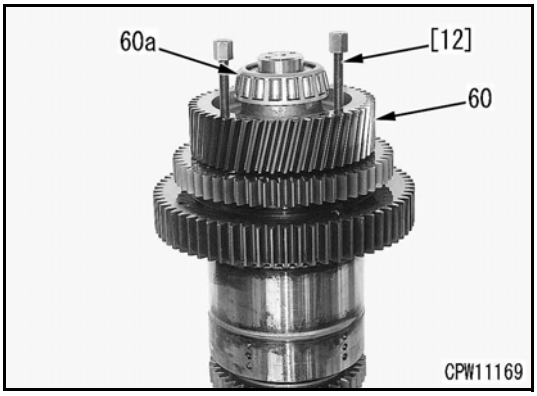


[2nd Clutch Side]

1. Bearing

A. Use forcing screw [12] to pull out output gear (60) and remove bearing (60a).

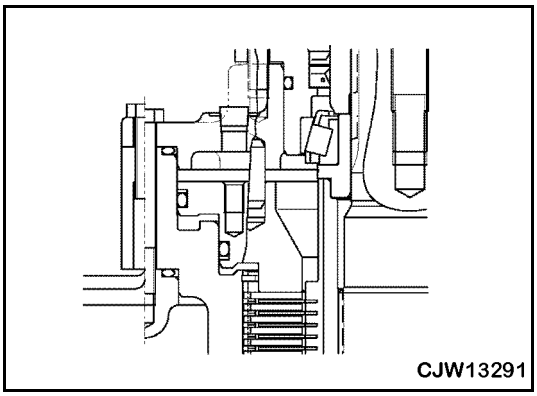
B. Remove output gear (60).



6. Piston

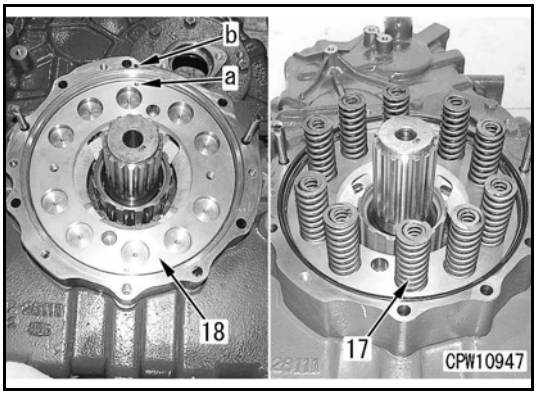
A. Assemble the O-ring and backup ring in the piston.
★ Assemble the backup ring on the outside; see the figure to the right.

O-ring: Grease (G0-LI or G2-LI)



B. Use the eyebolt to install piston (18).
★ Mount the piston, aligning the counter mark (a) of the piston with the counter mark (b) of the housing.

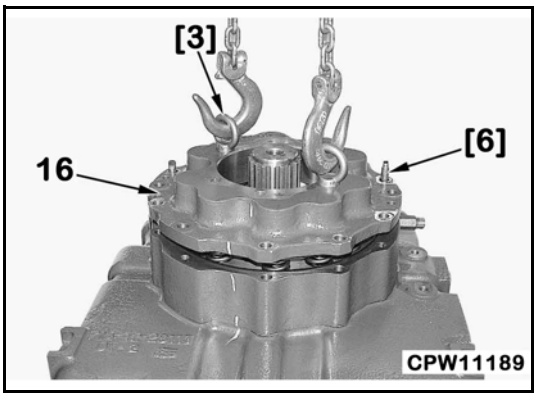
C. Install spring (17).



7. Spring cover

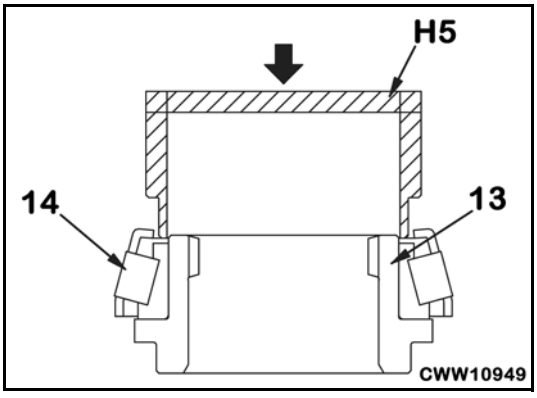
Use eyebolt [3] to install spring cover (16, aligning it to eyebolt [6].

★ Check that the spring is correctly contained in the cover.



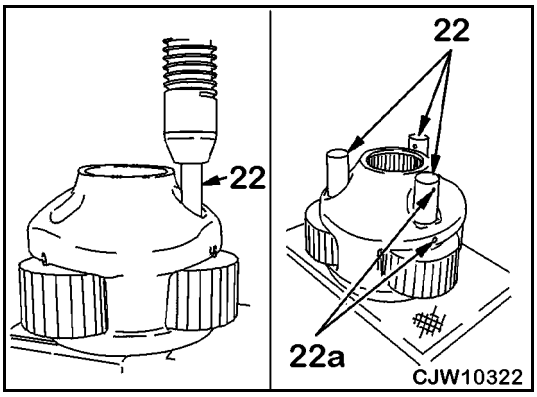
8. Bearing assembly

A. Use tool **H5** to install bearing (14) on boss (13).

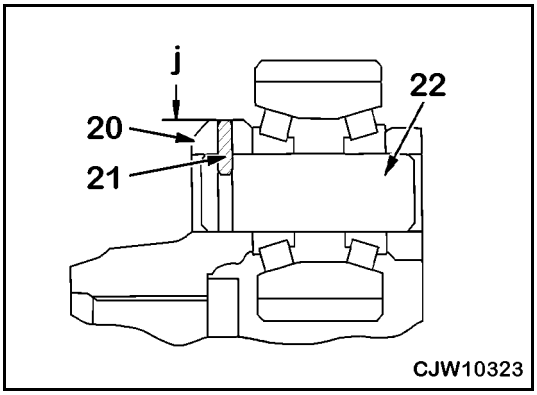


C. While matching shafts (22) to spring pin holes (22a), press-fit them.

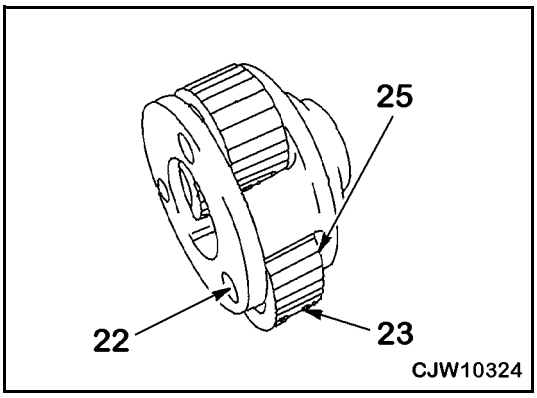
Shaft: Oil (Axle oil)



★ Match the hole of shaft (22) to the hole of spring pin (21) and drive spring pin (21) so that it is flush with planetary carrier (20) (part j).

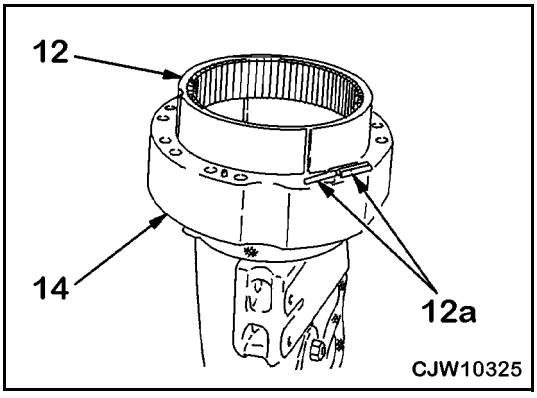


D. Hit the end of shaft (22) and the differential side of gear (23) lightly to push back bearing (25) then check that the gear rotates smoothly.

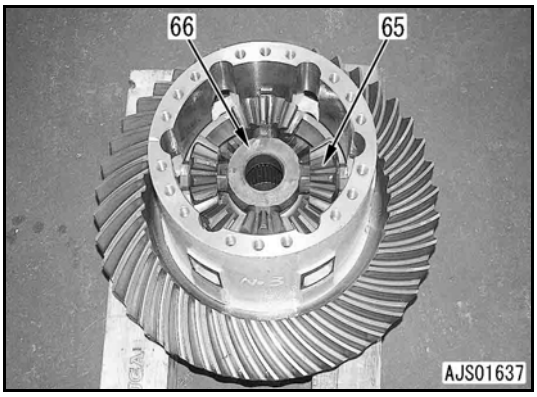


5. Ring gear

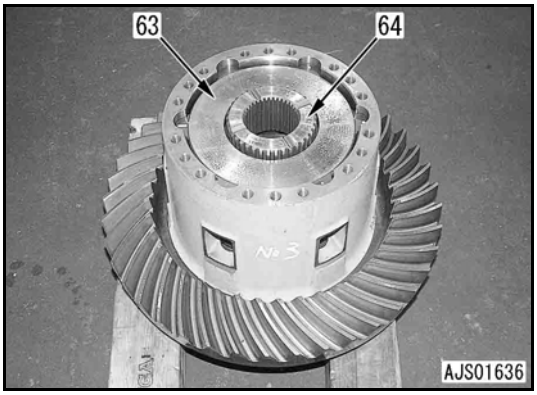
A. Press-fit ring gear (12) to axle housing (14) and insert pins (12a).
   - ★ Match the pin holes of the housing and ring gear.
   - ★ Press-fit the ring gear horizontally. Do not tilt it.



J. Install pinion gear (65) and spider shaft (66).

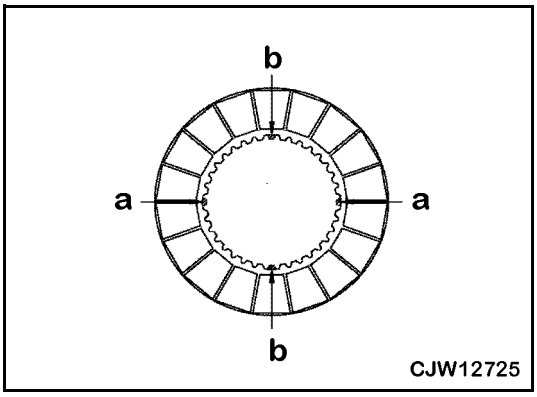


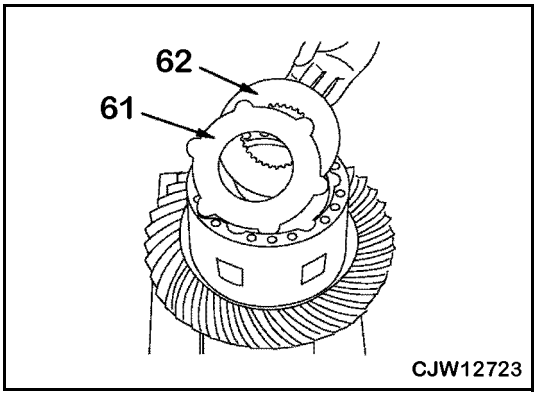
K. Install side gear (64) and pressure ring (63).



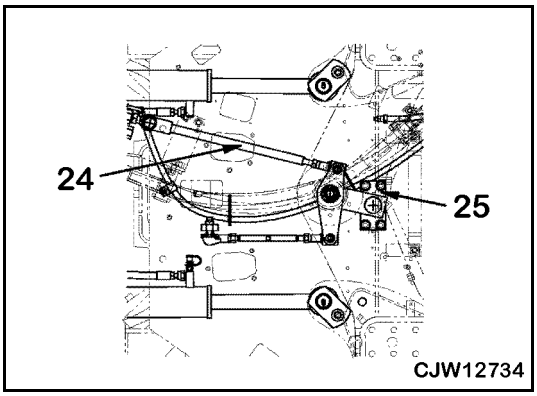
L. Install disc (62) and plate (61) in this order.
- ★ When installing the disc, set cuts (a) and (b) accurately.
- ★ Disc part number:
  - Front: Part No. 56D-22-27410
  - Rear: Part No. 56D-22-27410

Plate and disc: Axle oil

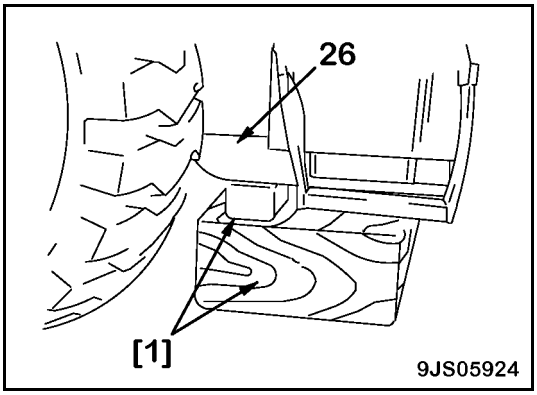




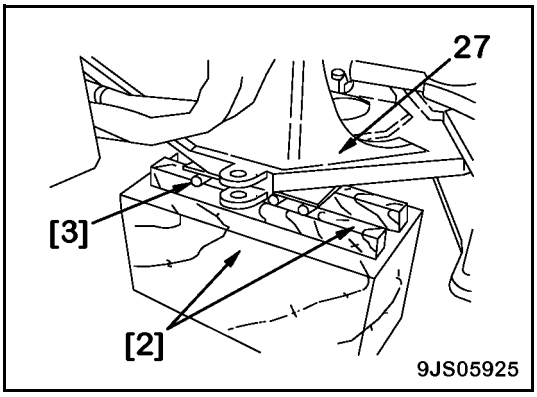
9. Disconnect steering rod (24) and remove bracket (25).



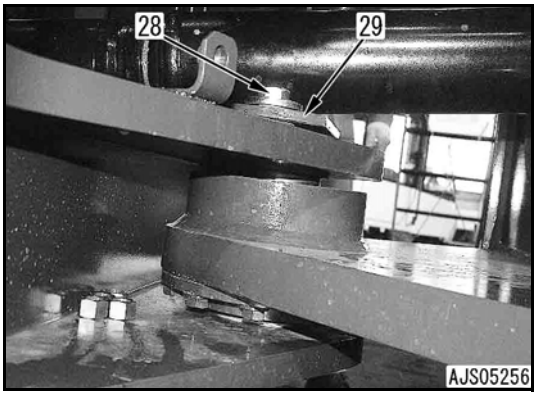
10. Jack up rear frame (26) and put blocks [1] under its right and left portions, while adjusting its height.



11. Jack up front frame (27) and put blocks [2] under its right and left portions, while adjusting its height.
    ★ Place rollers [3] between blocks [2] and the front frame so that the front frame can be pulled out.



12. Remove lock bolt (28) and lower hinge pin (29).



Installation

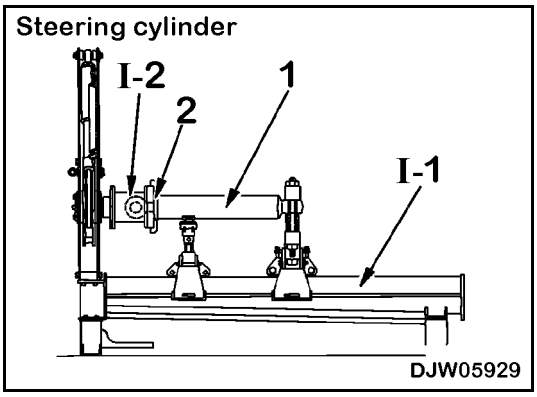
★ Carry out installation in the reverse order of removal.

- Bleed air.
  ★ Refer to *WORK EQUIPMENT: Bleeding Air from Work Equipment Circuit* in the *Testing and Adjusting* section.

iii. Using tool **I2**, install cylinder head assembly (2) to the cylinder.

Cylinder head: 569 ±57 N•m (419.7 ±42.0 lbf ft)

iv. Remove cylinder assembly (1) from tool **I1**.



B. Lift/Bucket cylinder assembly

i. Set cylinder (4) to tool **I1**.

ii. Sling cylinder head and piston rod assembly (3) and install it to cylinder (4).

iii. Install cylinder head assembly (2) to the cylinder.

★ Tighten the bolts of the leveler plate of the bucket cylinder to obtain the dimensions shown in drawing to the right.

★ Mounting bolt torque:

Cylinder	N•m (lbf ft)
Lift cylinder	270 ±39 (199.14 ±28.76)
Bucket cylinder	529.7 ±78.5 (390.69 ±57.90)

iv. Remove cylinder assembly (1) from tool **I1**.