SEBM013917

SHOP MANUAL

KOMATSU

HD785-5
HD985-5

MACHINE MODEL	SERIAL NUMBER
HD785-5	**4001 and up**
HD985-5	**1021 and up**

- This shop manual may contain attachments and optional equipment that are not available in your area. Please consult your local Komatsu distributor for those items you may require.
  Materials and specifications are subject to change without notice.
- HD785-5 and HD985-5 mount the SA12V140-1 engine.
  For details of the engine, see the 12V140-1 Series Engine Shop Manual.

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METHOD OF DISASSEMBLING, CONNECTING PUSH-PULL TYPE COUPLER

⚠ Before carrying out the following work, release the residual pressure from the hydraulic tank. For details, see TESTING AND ADJUSTING, Releasing residual pressure from hydraulic tank.

⚠ Even if the residual pressure is released from the hydraulic tank, some hydraulic oil flows out when the hose is disconnected. Accordingly, prepare an oil receiving container.

Disconnection

1) Release the residual pressure from the hydraulic tank. For details, see TESTING AND ADJUSTING, Releasing residual pressure from hydraulic tank.

2) Hold adapter (1) and push hose joint (2) into mating adapter (3). (See Fig. 1)
   - ★ The adapter can be pushed in about 3.5 mm.
   - ★ Do not hold rubber cap portion (4).

3) After hose joint (2) is pushed into adapter (3), press rubber cap portion (4) against (3) until it clicks. (See Fig. 2)

4) Hold hose adapter (1) or hose (5) and pull it out. (See Fig. 3)
   - ★ Since some hydraulic oil flows out, prepare an oil receiving container.

Connection

1) Hold hose adapter (1) or hose (5) and insert it in mating adapter (3), aligning them with each other. (See Fig. 4)
   - ★ Do not hold rubber cap portion (4).

2) After inserting the hose in the mating adapter perfectly, pull it back to check its connecting condition. (See Fig. 5)
   - ★ When the hose is pulled back, the rubber cap portion moves toward the hose about 3.5 mm. This does not indicate abnormality, however.

Type 1

Fig. 1

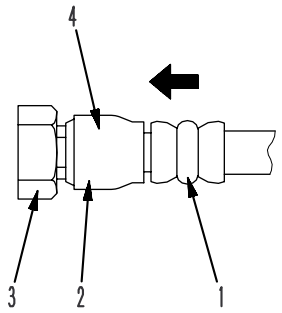


Fig. 2

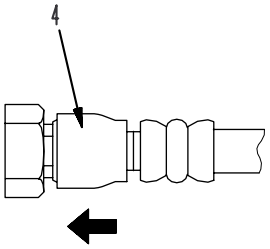


Fig. 3

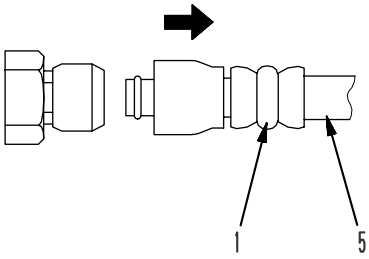


Fig. 4

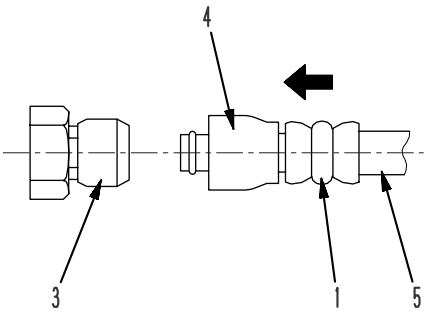
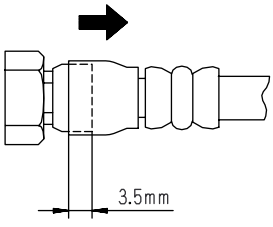


Fig. 5



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Temperature

Fahrenheit-Centigrade Conversion ; a simple way to convert a Fahrenheit temperature reading into a Centigrade temperature reading or vice versa is to enter the accompanying table in the center or boldface column of figures.

These figures refer to the temperature in either Fahrenheit or Centigrade degrees.

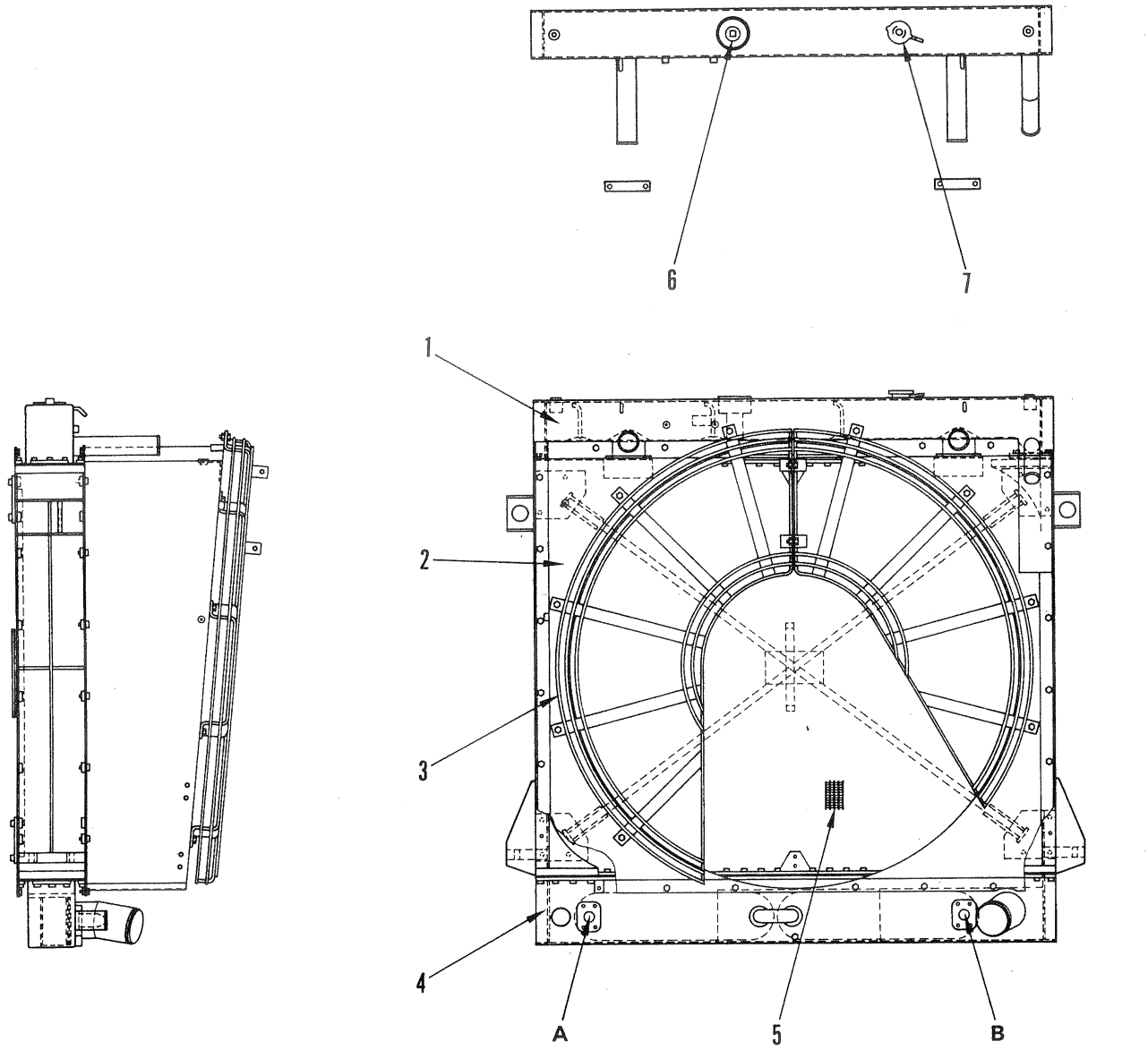
If it is desired to convert from Fahrenheit to Centigrade degrees, consider the center column as a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left.

If it is desired 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.

1°C = 33.8°F

°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	**0**	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

RADIATOR, TORQUE CONVERTER COOLER



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1. Upper tank
2. Shroud
3. Net
4. Lower tank
   (torque converter oil cooler built in)
5. Core
6. Pick-up for radiator coolant level sensor
7. Pressure cap

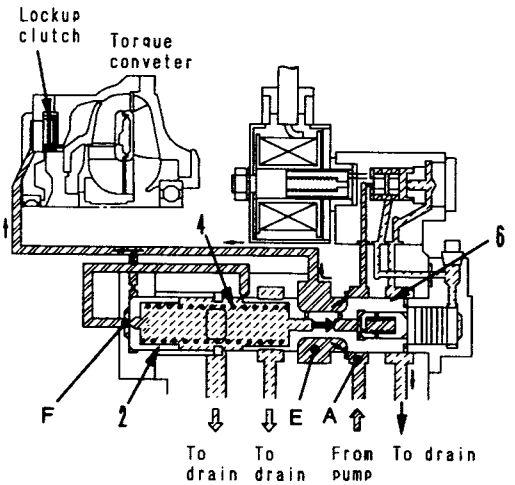
A: Oil outlet
B: Oil inlet

SPECIFICATIONS

Radiator
- Core type: CD-5
- Total radiation surface: 151.82 m^2

Oil cooler
- Element type: Multiple plate
- Radiation surface: 3.12 m^2

4) The oil from port **E** to port **F** applies pressure to load piston (2), and pushes piston (2) to the right in the derection of the arrow to compress spring (4).
Compressed spring (4) pushes lockup valve (6) to the right in the derection of the arrow, and opens port **A** and port **E**. When this happens, the increase in hydraulic pressure to the lockup clutch starts again.



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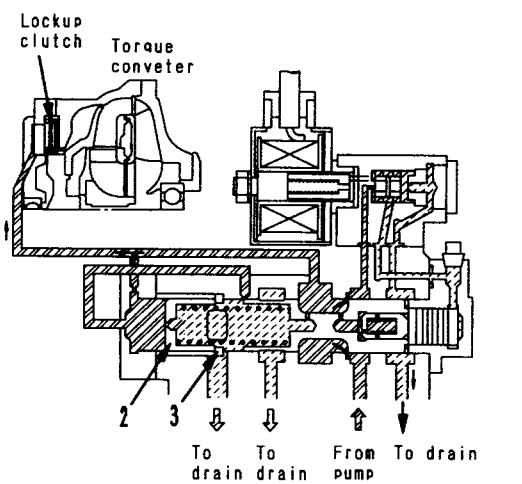
5) By repeating the actions in Steps 3) and 4), the load on spring (4) is increased, and the hydtaulic pressure gradually rises.
Finally, when load piston (2) contacts stopper (3), the rise in hydraulic pressure stops. The pressure at this point is the set pressure of the lockup valve.
- Set pressure: 1.57 MPa {16 kg/cm²}



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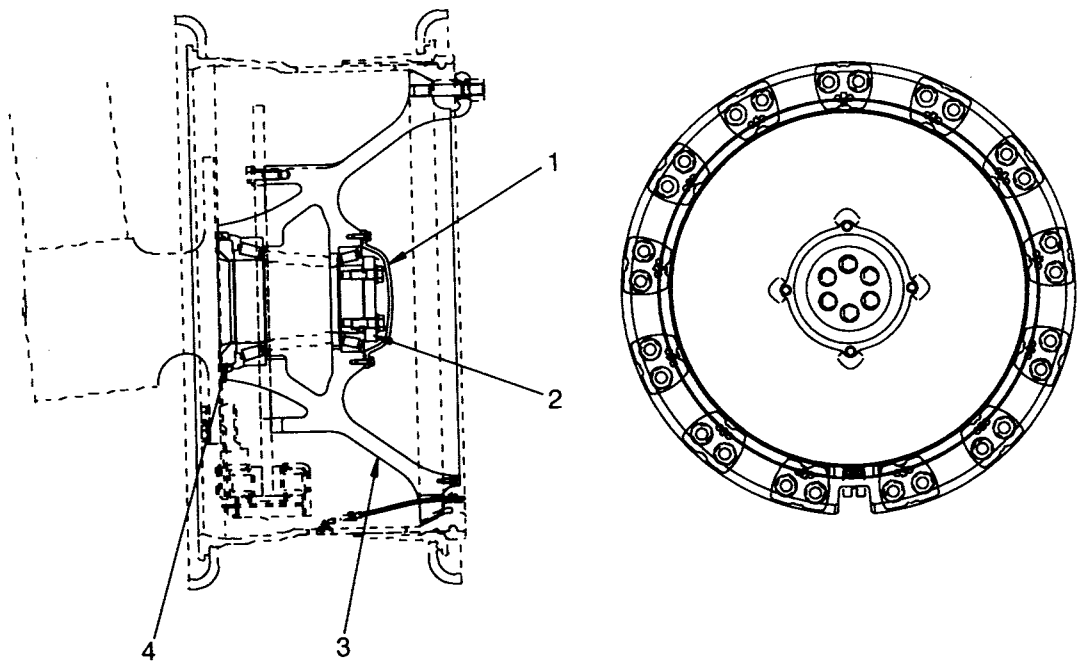
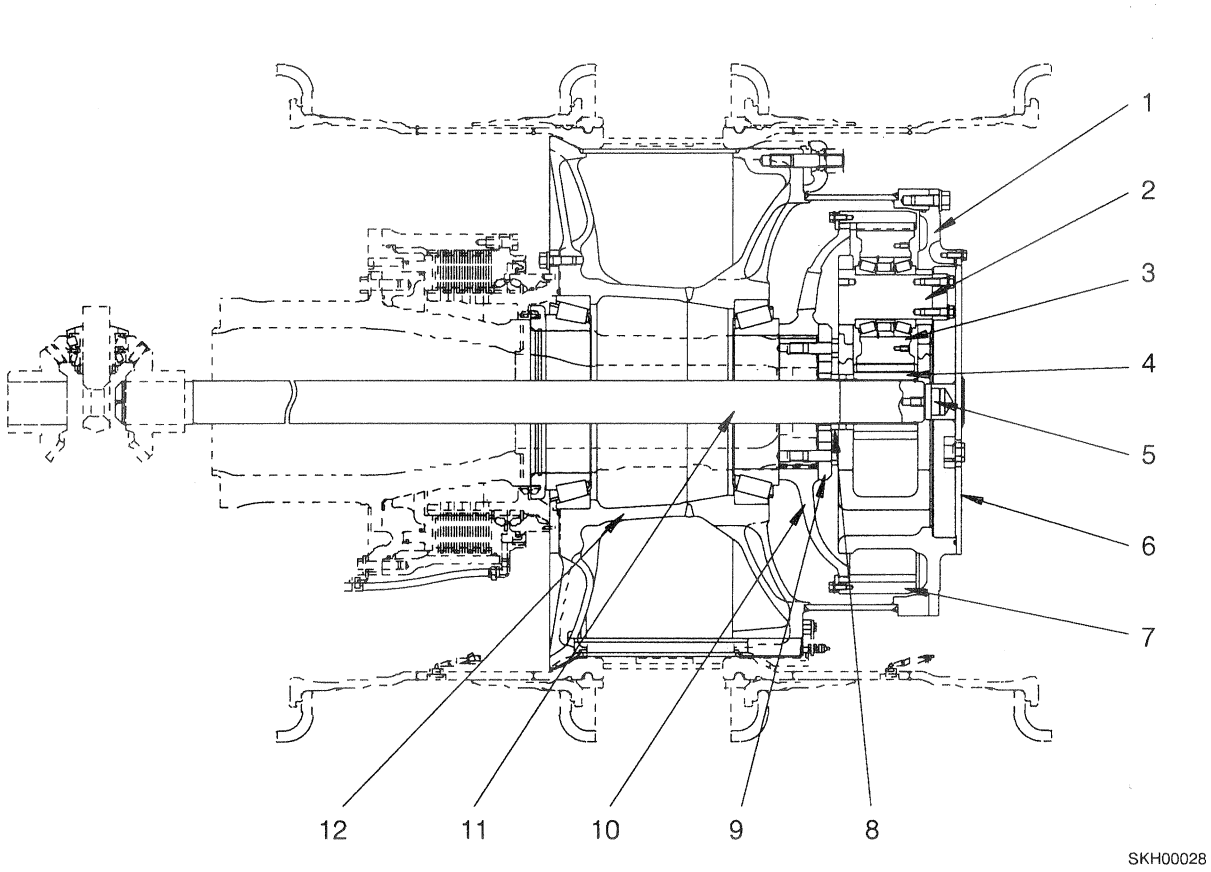
HD985-5



SKH00026

1. Cover
2. Holder
3. Wheel hub
4. Retainer

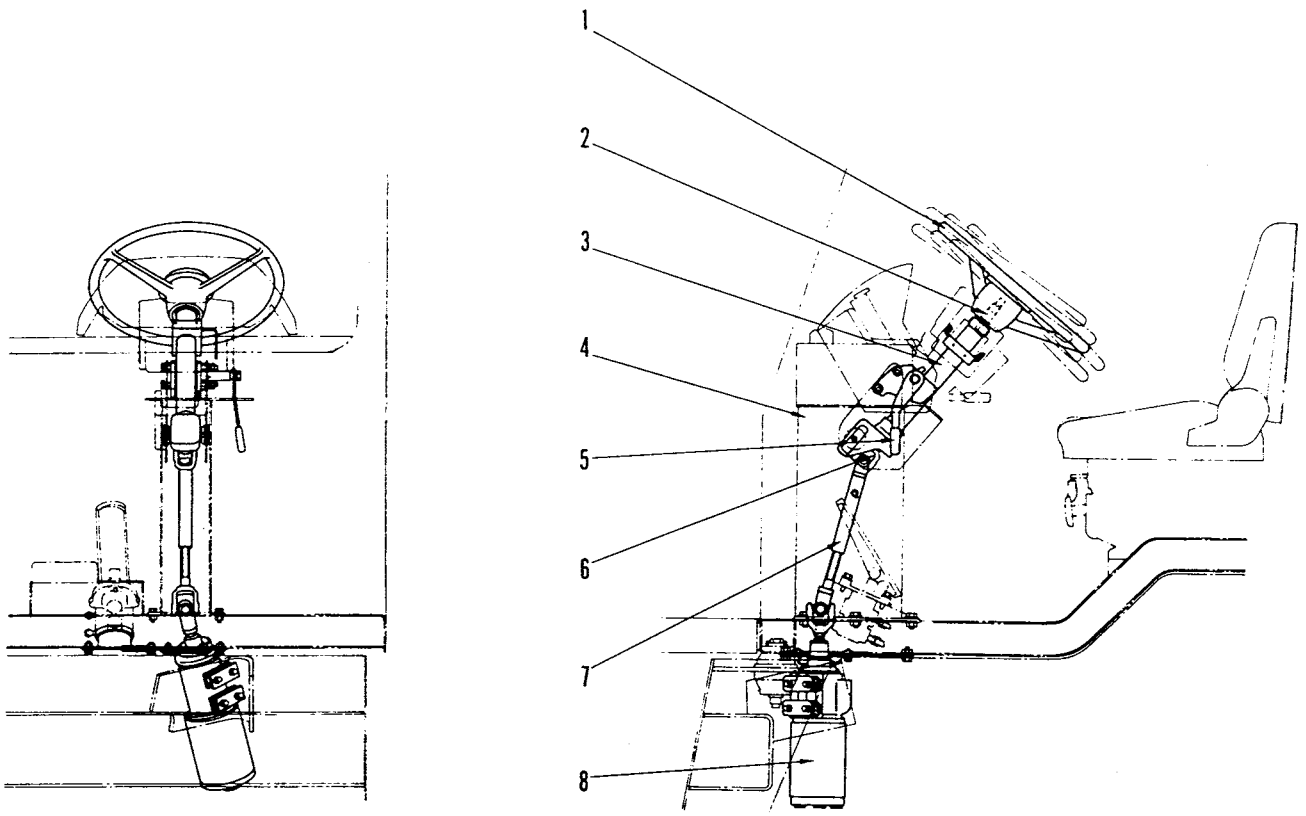
HD985-5



1. Carrier
2. Planetary gear shaft
3. Planetary gear (No. of teeth: 39)
4. Sun gear (No. of teeth: 18)
5. Button
6. Cover
7. Ring gear (No. of teeth: 99)
8. Spacer
9. Holder
10. Inner hub
11. Drive shaft
12. Wheel hub

SPECIFICATIONS
Type: Planetary gear, splash-type lubrication
Reduction tatio: 6.50
Oil: EO30-CD (64 liters each side)

HD985-5

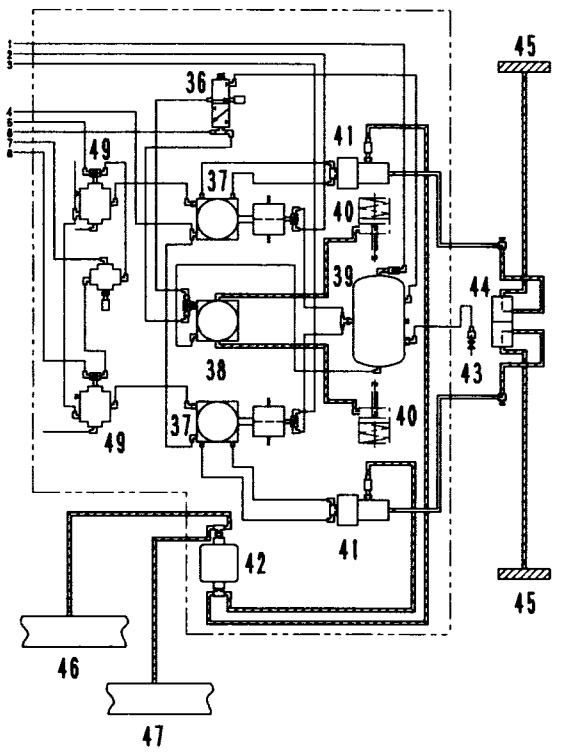


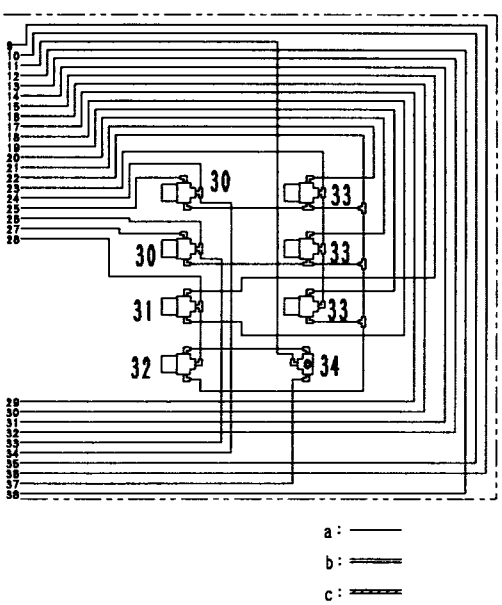
SZH00031

1. Steering wheel
2. Steering shaft
3. Steering column
4. Steering post
5. Lock lever
6. Yoke
7. Joint shaft
8. Steering valve

SPECIFICATIONS

- Tilting range: 94 mm
- Telescoping range: 50 mm





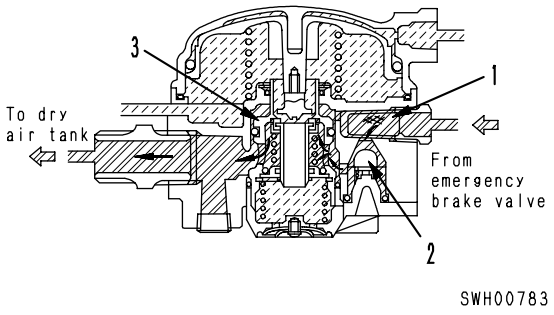
SVH00646

1. Air cylinder (for suspension control)
2. Front brake
3. Exhaust brake cylinder
4. Brake oil tank
5. Front brake chamber
6. Air charge socket
7. Safety valve
8. Air tank (wet)
9. Check valve
10. Air tank (pilot)
11. Air tank (dry)
12. Relay valve (with emergency)
13. Drain valve
14. Air governor
15. Air compressor
16. Horn valve
17. Muffler
18. Muffler
19. Muffler
20. Air pressure sensor
21. Exhaust brake switch
22. Emergency brake switch
23. Brake lamp switch
24. Parking brake switch
25. Retarder lamp switch
26. Brake valve
27. Hand brake valve(retarder)
28. Parking brake valve
29. Emergency brake valve
30. Front brake cut off solenoid valve
31. Exhaust brake solenoid valve
32. Auto retarder solenoid valve
33. Suspension control solenoid valve
34. Double check valve
35. Quick release valve
36. Parking brake pilot valve
37. Relay valve (with emergency)
38. Parking relay valve
39. Air tank (rear)
40. Parking brake chamber
41. Rear brake chamber
42. Brake oil tack
43. Drain valve
44. Slack adjuster
45. Rear brake
46. Brake cooling suction line
47. Brake cooling return line
48. Ratio valve
49. Reducing valve

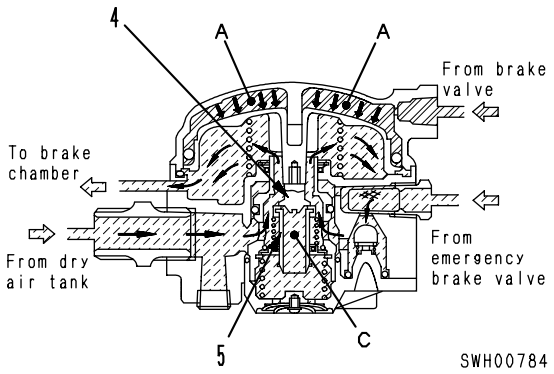
a: NYLON TUBE
b: STEEL TUBE
c: RUBBER TUBE

OPERATION

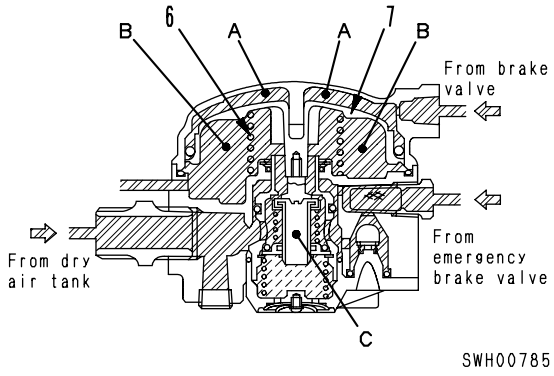
1. **When not operated (compressed air supplied to dry air tank)**
   When the emergency brake valve is at the TRAVELING position and the brake pedal is not being depressed, the compressed air in the wet air tank passes through filter (1), pushes down check valve (2), and is supplied to the dry air tank. The pressure in the dry air tank rises until it is almost the same as the pressure in the wet air tank.
   At the same time, emergency position (3) is pushed down by the compressed air from the emergency brake valve.
   The air is supplied directly from the wet air tank to the dry tank.



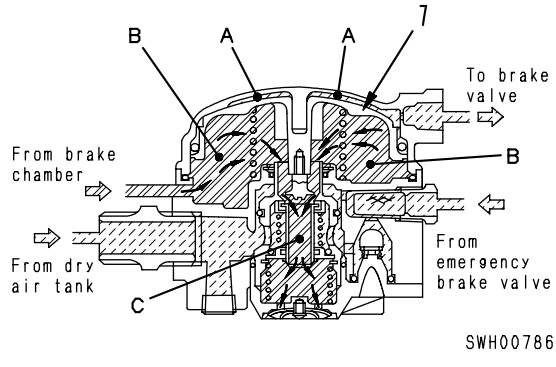
2. **When brake pedal is depressed**
   Compressed air enters top position **A** of the relay piston and pushes the piston down. Exhaust valve seat (4) closes exhaust port **C** and pushes valve (5) open.
   When the valve opens, the compressed air from the dry air tank and emergency brake valve passes through the valve and is supplied to the brake chamber.



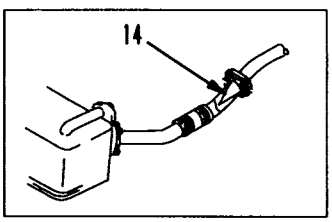
3. **When pedal is kept in same position (balanced condition)**
   The pressure at top position **A** and bottom position **B** of the piston becomes equal, so piston return spring (6) moves and relay piston (7) is pushed up. Moreover, in this position, exhaust port **C** remains closed, so the pressure at bottom portion **B** is maintained at the same pressure.

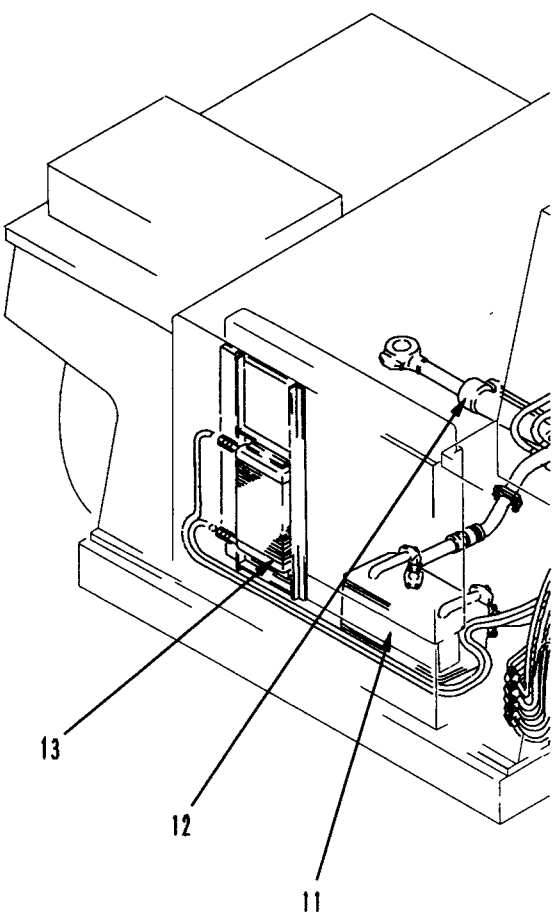


4. **When pedal is released**
   The compressed air at top position **A** of the piston is released from the brake valve. When the pressure at position **A** goes down, relay position (7) is pushed up by the compressed air in bottom position **B**, the exhaust port opens, and the air in position **B** is released.



HYDRAULIC PIPING (Steering and hoist, and brake cooling)





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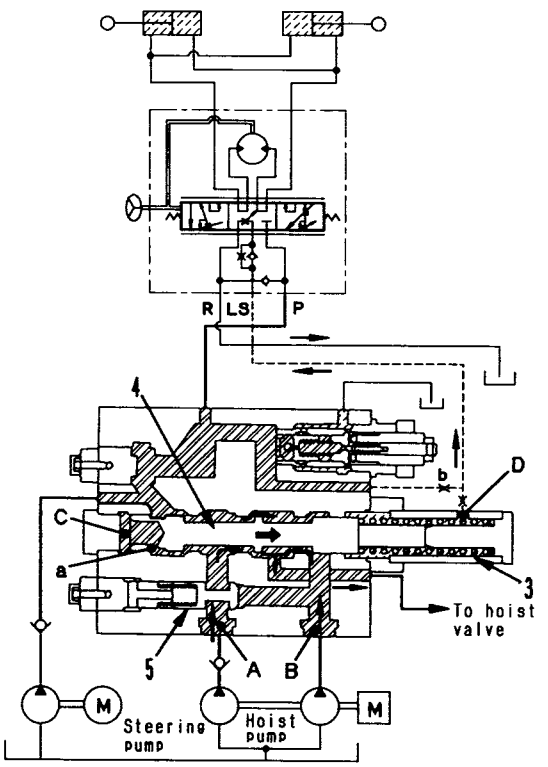
1. Hydraulic pump (SAR4–285+285) (for brake cooling)
2. Hydraulic pump (SAR4–180+180) (for steering and hoist)
3. Brake cooling oil control vavle (BCV)
4. Rear brake (retarder)
5. Hoist cylinder
6. Hoist valve
7. Hydraulic oil and brake cooling oil tank
8. Demand valve
9. Steering valve
10. Crossover relief valve
11. Brake oil cooler
12. Steering cylinder
13. Work equipment oil cooler
14. Strainer (Option) (for brake cooling oil cooler protection)
15. High-pressure filter (for steering, hoist circuit)

OPERATION OF DEMAND VALVE

1. **When steering valve is at neutral.**
   The oil from the steering pump enters port **A**. At the same time, the oil from the hoist pump enters port **B**. When the steering valve is at neutral, port **P** of the steering valve is closed, so the pressure at port **P** rises. The pressure from port **P** passes through orifice "**a**", enters the chamber **C**, and moves spool (4) to the right.
   Port **LS** and chamber **D** are connected to the tank, and the force moving spool (4) to the left is only the force of spool return spring (3). The pressure in chamber **C** rises until it overcomes the set pressure of spool return spring (3). As a result, spool (4) stops in the position shown in the diagram on the right, and all the oil from the steering pump and hoist pump flows to the hoist valve.



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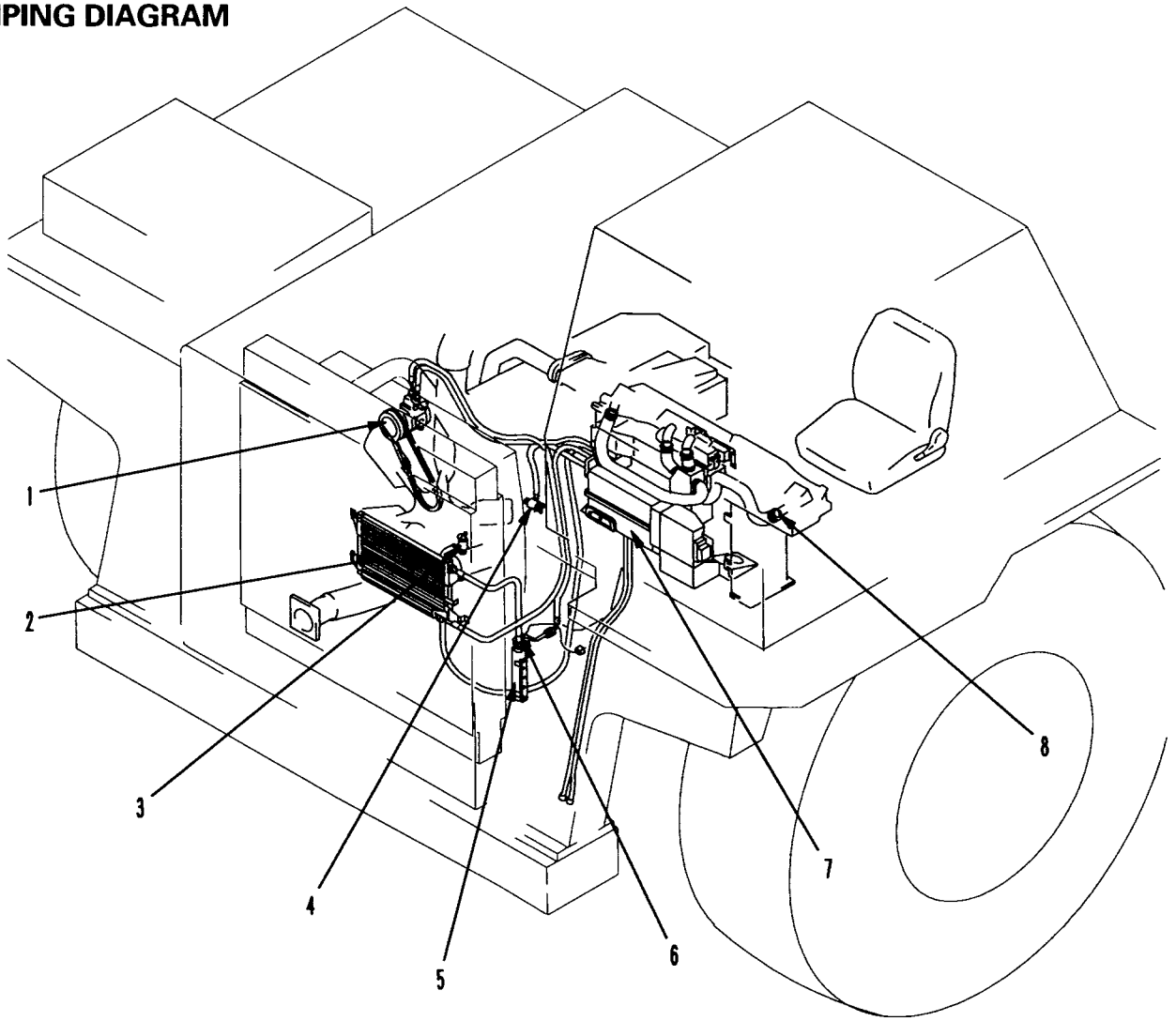
2. **When steering valve is operated.**
   When the steering is operated, port **P** and port **LS** and connected, and the circuit between the tank and port **LS** is shut off. The hydraulic pressure before entering the orifice of the steering valve acts on chamber **C** of spool (4), and the hydraulic pressure coming out from the orifice acts on chamber **D**.
   There is a difference in the area of the opening of the steering valve orifice when the steering is turned quickly and when it is turned slowly. Therefore, the hydraulic pressure on both sides of the orifice also changes and a pressure defference is created. In this way, spool (4) is actuated by the balance of the force of return spring (3) and the differential pressure berween both sides of the orifice. In other words, it moves according to the balance of the oil in chamber **C** pushing to the right, and the force of the oil in chamber **D** pushing to the left + return spring (3). The larger the difference in pressure at the orifice is, the more spool (4) moves to the right.

AIR CONDITIONER

PIPING DIAGRAM



SVH00597

1. Compressor
2. Condenser
3. Hot water return port
4. Hot water take-off port
5. Receiver dryer
6. Pressure switch
7. Air conditioner
8. Vent

FUNCTION

- The air conditioner makes a pleasant operating environment for the oprerator and acts to reduce fatigue.

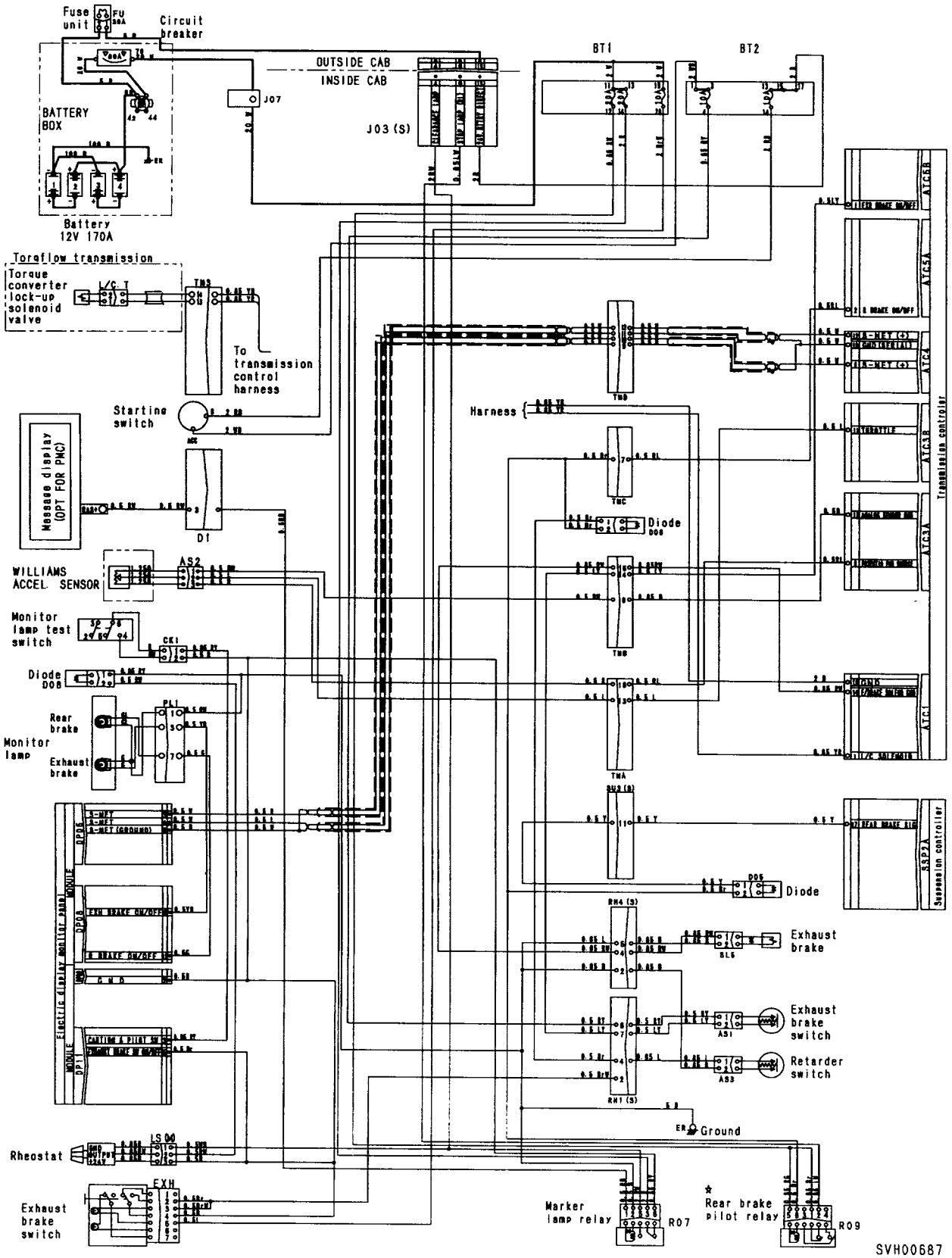
HEATING

- Heating is carried out using the cooling water from the engine.
  High-tempertarure cooling water from the hot water take-off port flows to the air conditioner unit, and hot air is blown out by a fan.
  Whe the tempertature of the cooling water drops, it is returned to the hot water return port and flows as cooling water for the engine.

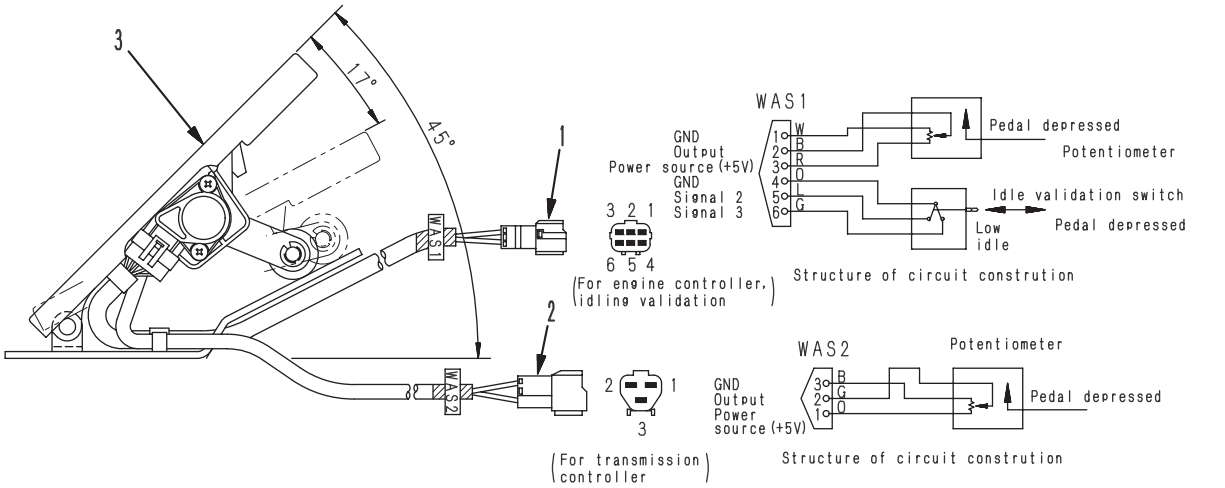
COOLING

- The refrigerant gas compressed and pressurized by the air conditioner compressor enters the air codensor where it is cooled by dissipating the heat. It then enters the air conditioner unit and cold air is blown out by the fan. When the temperature of the refrigerant gas rises, it is retuned to the compressor.

SYSTEM DIAGRAM



ACCELERATOR SENSOR



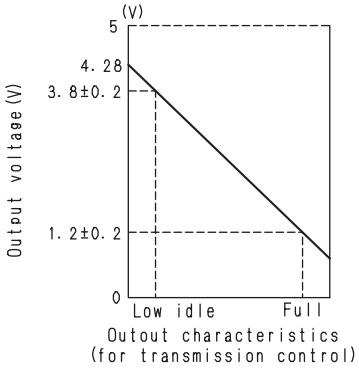
SJH01494

1. Connector
2. Connector
3. Pedal

OUTLINE

Accelerator signal

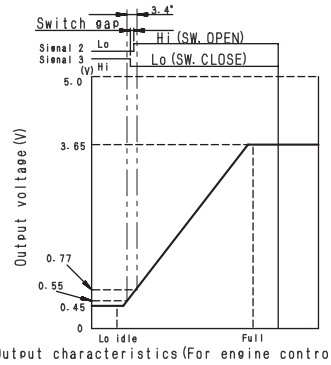
- This is installed under the operator's cab. The accelerator pedal and accelerator sensor are connected by a link. When the accelerator pedal is depressed, the movement is passed through the link and rotates the shaft of the potentiometer inside the accelerator sensor. As a result, the resistance changes. A fixed voltage is impressed between the No. 1 - 3 pins of the potentiometer. A voltage signal corresponding to the angle of the accelerator pedal is sent from the No. 2 pin to the transmission controller.



SJH01495

Idling validation signal (only machines equipped with electronic governor)

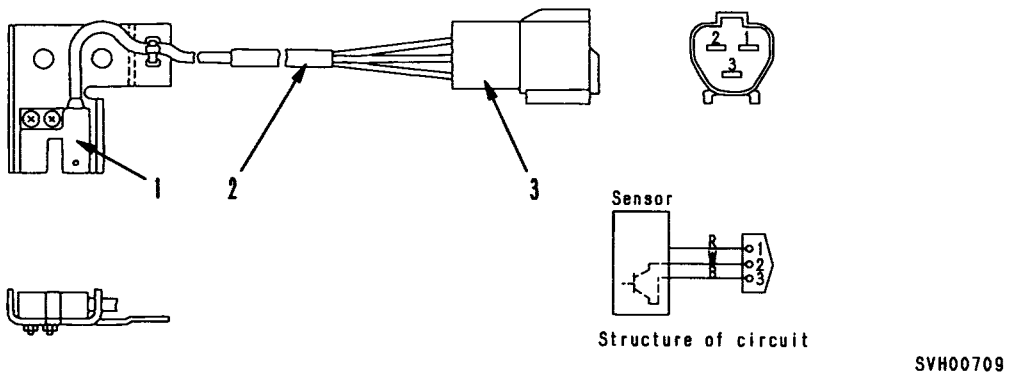
- This is installed under the operator's cab. When the accelerator pedal is released, signal 2 (No. 5 pin) is connected to the ground; when the accelerator pedal is depressed, signal 3 (No. 6 pin) is connected to the ground. The engine controller then detects the condition.



SJH01496

SENSORS, SWITCHES

STEERING ANGLE SENSOR

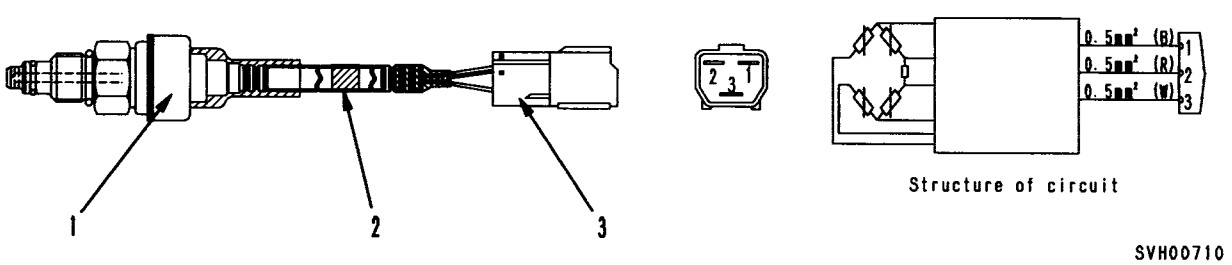


1. Body
2. Tube
3. Connector

FUNCTION

A round disc with teeth like a comb is installed to the steering column, and as this passes through the slit in the sensor, the sensor outputs a pulse signal. The suspension controller can obtain the steering speed from the number of pulses per unit of time.

PRESSURE SENSOR



1. Sensor
2. Tube
3. Connector

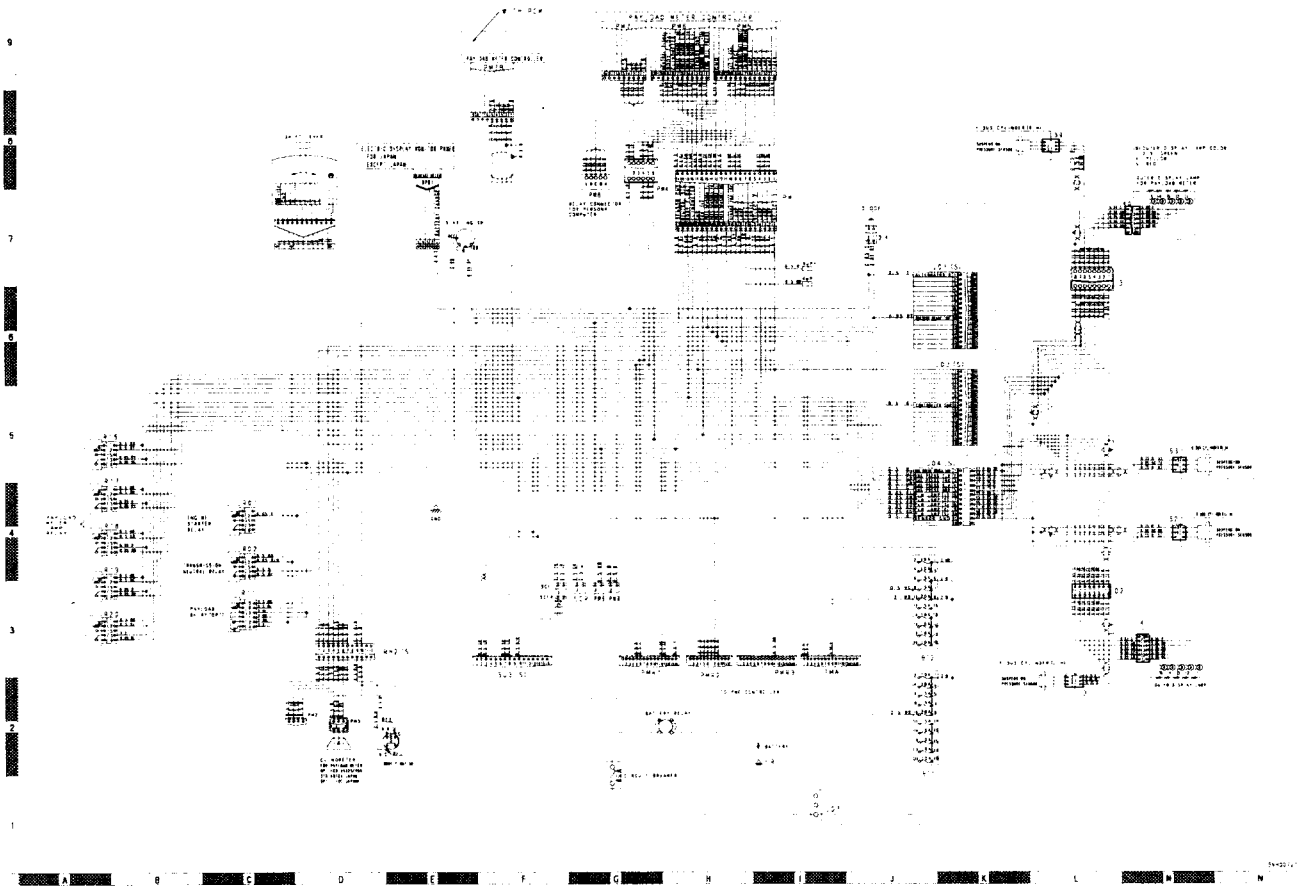
FUNCTION

This sensor is installed to the suspension cylinder, and when the input pressure from the pressure induction portion is impressed on the diaphragm of the pressure detector, the diaphragm bends. A bridge is formed by a strain gauge on the other side of this diaphragm, and when the shape of the diaphragm changes, the resistance value of the strain gauge changes.

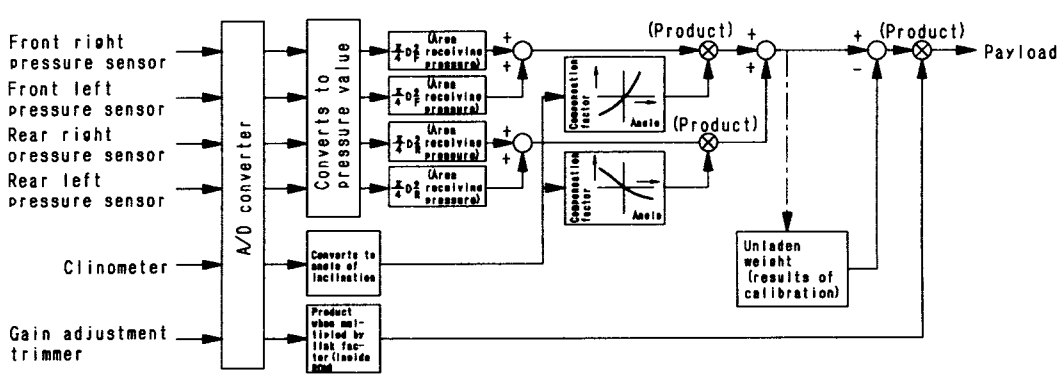
A certain voltage in impressed on the strain gauge, and the change in the resistance value of the strain gauge is sent to the amp as a change in voltage. At the amp, this change in voltage is amplified and output to the controller.

ELECTRICAL CIRCUIT DIAGRAM

★ For details of this page, see section 90.



PAYLOAD METER BLOCK DIAGRAM



SVH00713

x) Service check mode
By operating the switches of payload meter II, it is possible to forcibly carry out display, setting, and correction of the following items.

ⓐ Detailed calibration data display
The display shows the date, suspension pressure, etc. when the latest calibration was carried out.

ⓑ Detailed payload calculation data display (analog data)
The display shows the suspension pressure and machine angle used when calculating the present payload.

ⓒ Memory card dump (service area)
This writes all the data displayed for Items 6-6 and 6-7 to the memory card inserted in the machine.

★ This function is available only when the No. 5 switch on the left side of the controller (memory card use switches) is set for "Use".

ⓓ Data all clear (service area)
This forcibly deletes all the calibration data and analog data, except for the latest calibration data.

★ Before clearing the data, always download the data to a PC or carry out ⓐ Card dump.

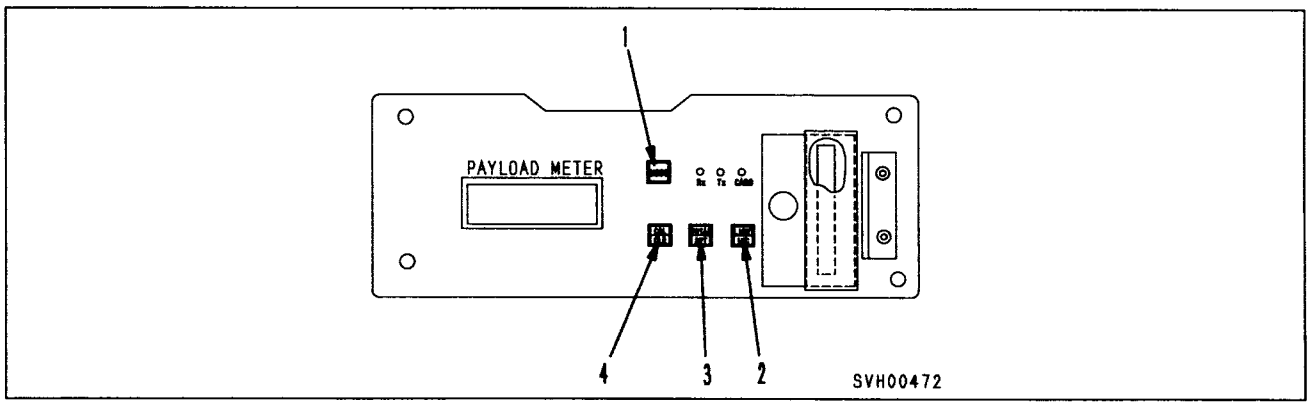
ⓔ Input signal condition display
This displays some of the signal conditions for the sensors input to payload meter II and the present recognition condition of the payload meter.

ⓕ Forced initialization
This forcibly deletes all the data in payload meter II.

★ Before carrying out this operation, check the time and date. Always carry out the operation with the machine unloaded. Do not carry out the operation unless necessary.

ⓖ Extra payload setting when loading
The extra load can be forcibly input or corrected to set the payload when loading.
Available range for setting: –9 – +9 (%)

ⓘ Operation for setting loading completion recognition travel distance



1 Set to PL : XX display, then press CAL/CLR switch ④

Display: O.SEL

2 Press TOTAL/SFT switch ③.

Display: XXX
If it is necessary to correct the setting for the units, press LIGHT/INC switch ② and correct.

3 Press CAL/CLR switch ④.

Display: XXX
If it is necessary to correct the setting for the tens, press LIGHT/INC switch ② and correct.

4 Press CAL/CLR switch ④ again.

Display: XXX
If it is necessary to correct the setting for the hundreds, press LIGHT/INC switch ② and correct.

5 If CAL/CLR switch ④ is pressed again, the display will return to XXX, so it is possible to correct the units again.

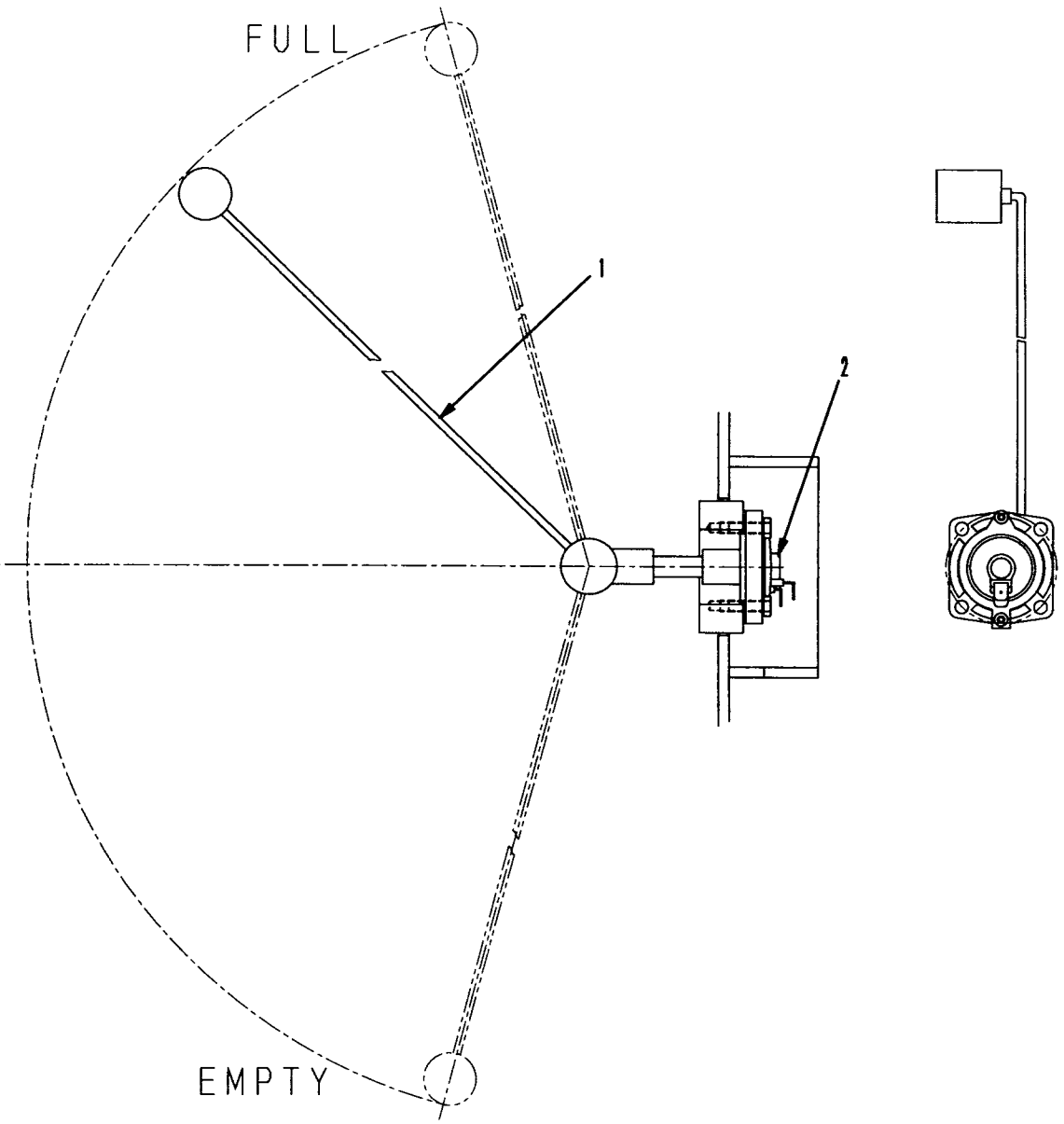
6 When the correction operation from Step 1 is completed, press MODE switch (1) at any time to return to the CHEC display after displaying O.XXX (input value). (End)

If it is impossible to set the input values even when MODE switch ① is pressed, it displays O.XXX (input value) and returns to Step 2.

OUTLINE

- With the machine monitor system, the controllers on the network transmit the data for observation and control of the machine condition performed by sensors installed to various parts of the machine, and transmit this as network data to the monitor panel. The monitor panel then displays these data to inform the operator of the condition of the machine.
- The monitor panel display has a normal mode and a service mode.
- Normally, the normal mode is displayed to the operator. The main contents are as follows.
  (1) Items always displayed:
  Meters (speedometer, tachometer, service meter, odometer)
  Gauges (air pressure, engine water temperature, torque converter oil temperature, retarder oil temperature, fuel level)
  Pilot displays
  (2) Items displayed if there is any abnormality:
  Cautions, user code display
- To make troubleshooting by the controller (including the monitor panel itself) on the network simpler, the system is equipped with a service mode function. The main items are as follows.
  (1) Machine data monitoring mode:
  The input and output values recognized by the controller on the network are displayed in real time.
  (2) Service code, travel data display mode:
  This displays the failure data stored in the controllers on the network.
- The machine monitor system consists of the monitor panel itself, the lamps inside the dashboard, central warning lamp, alarm buzzer, switches used for input to the monitor panel, the network, the controllers on the network, and the sensors related to the controller.

FUEL LEVEL SENSOR



SVH00616

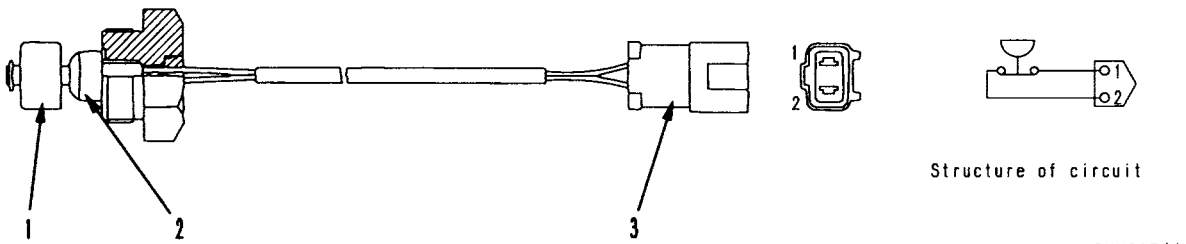
1. Level sensor
2. Transmitter

FUNCTION

- The fuel level sensor is installed to the side face of the fuel tank and a float moves up or down in accordance with the change in the fuel level. The movement of the float is passed through the arm and actuates a variable resistance, and a signal is sent to the shift controller. The signal is sent from the shift controller through the network to the machine monitor system to display the fuel level. When the display on the monitor panel reaches a certain position, the warning lamp flashes.

SENSORS, SWITCHES

ENGINE OIL LEVEL SENSOR

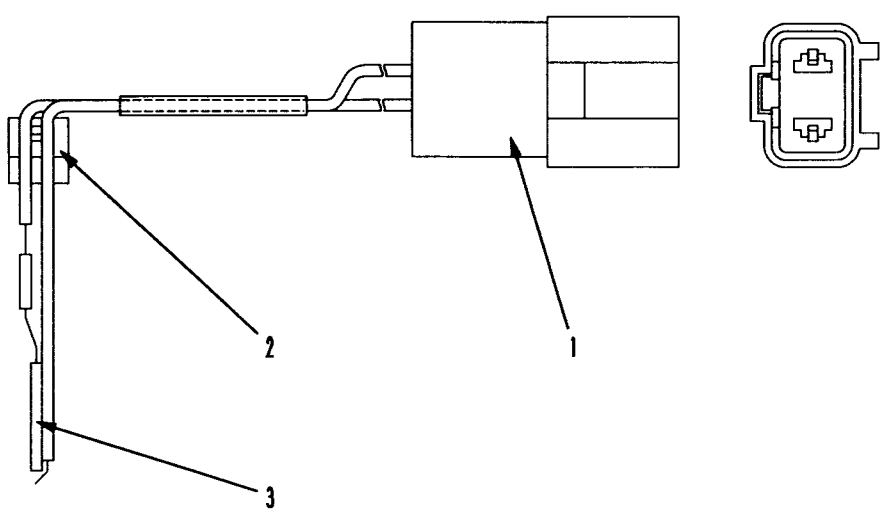


1. Float
2. Sensor
3. Connector

Function

- The engine oil level sensor is installed to the side face of the oil pan. If the oil goes below the specified level, the float goes down and the switch is turned OFF. The abnormality is displayed on the message display to warn the operator.

BRAKE OIL LEVEL SENSOR

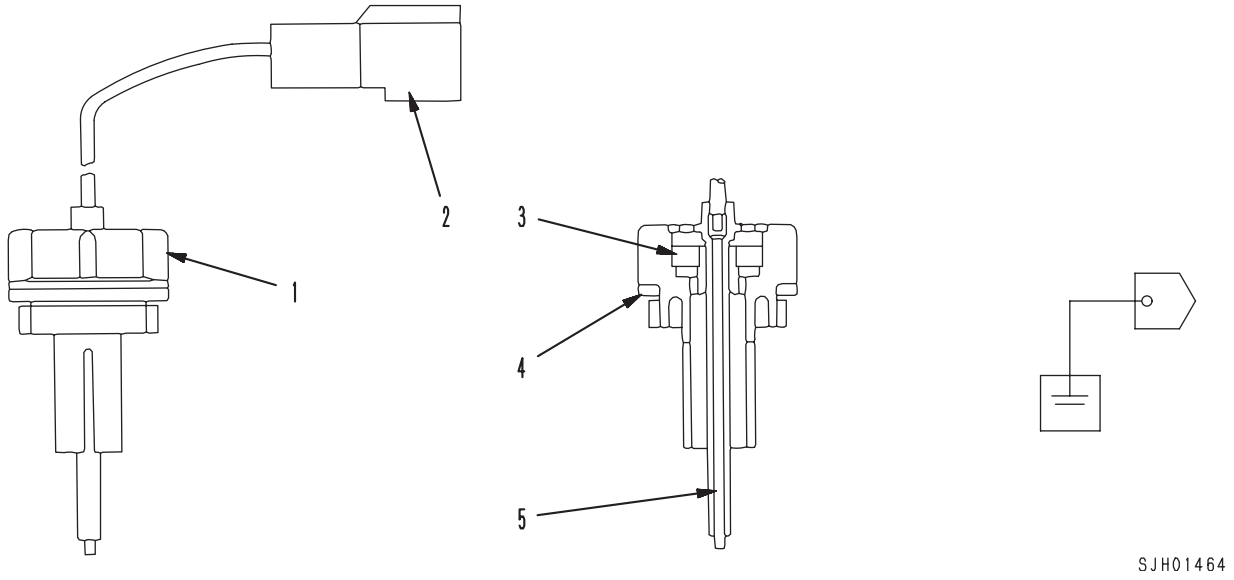


1. Connector
2. Plug
3. Switch

FUNCTION

- The brake oil level sensor is installed to the side face of the brake oil tank. If the oil goes below the specified level, the switch is turned OFF. The abnormality is displayed on the message display to warn the operator.

BATTERY ELECTROLYTE LEVEL SENSOR

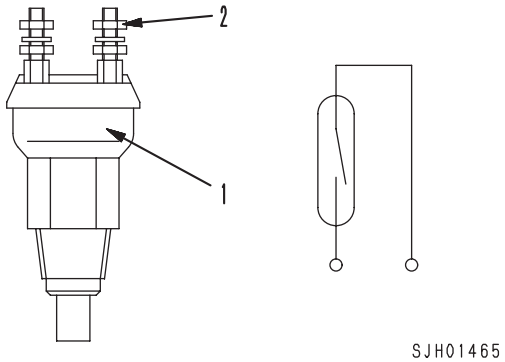


1. Body
2. Connector
3. Filter
4. Packing
5. Pin

Function

- This sensor is installed to the battery, and when the battery electrolyte goes below the specified level, the tip of the sensor comes out of the battery electrolyte into the air, and a signal showing a change in voltage is sent to the maintenance monitor. The maintenance monitor display then flashes to warn of abnormality.

TORQUE CONVERTER OIL TEMPERATURE SWITCH
RETARDER OIL TEMPERATURE SWITCH

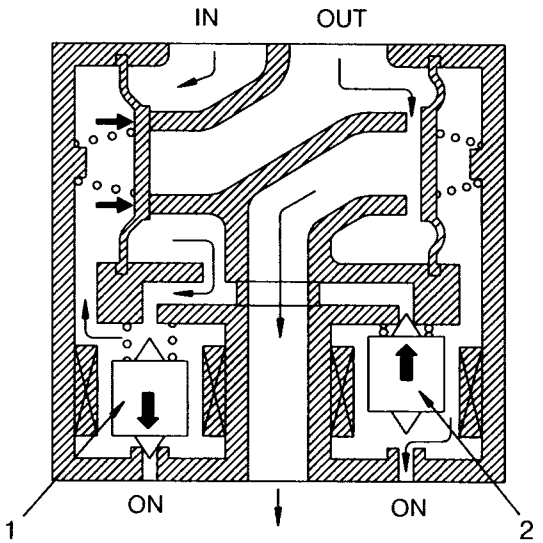


1. Body
2. Terminal

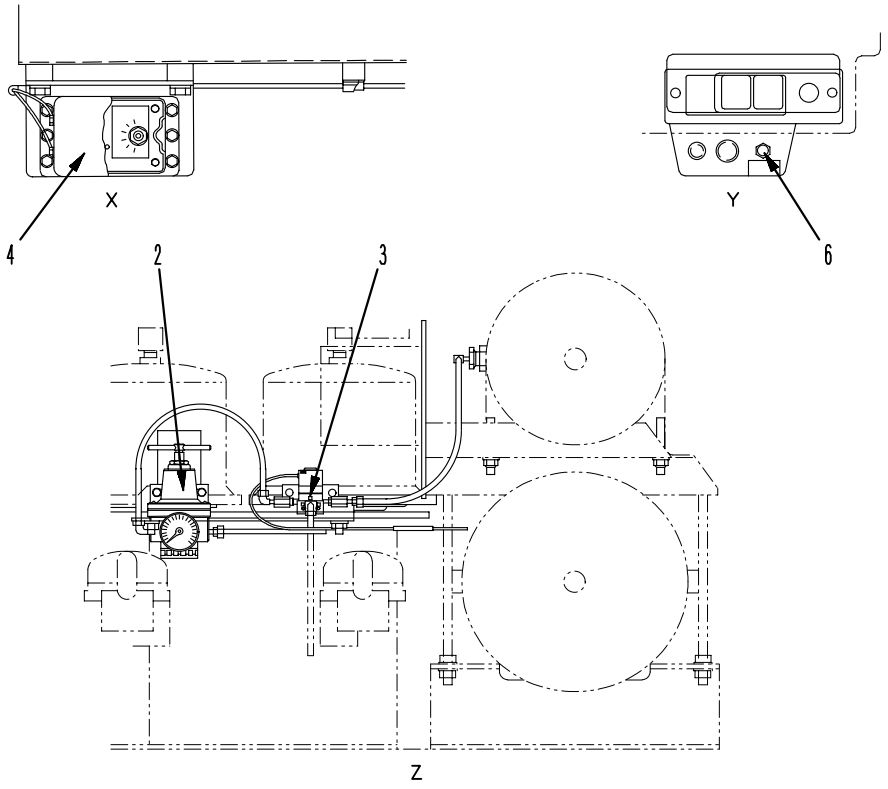
Outline

- These switches are installed in the transmission oil piping and retarder oil piping, and send the inhibit signal to the maintenance monitor. (This signal restricts actuation of the torque converter filter sensor and retarder filter sensor at temperatures below 42°C.)

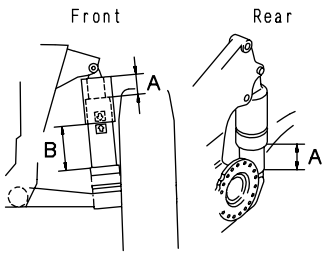
Pressure going down (decrease)
Both hold solenoid (1) and exhaust solenoid valve (2) are ON, the brake circuit pressure is maintained, and the pressure inside the brake chamber is exhausted.



SKH00011



1. Grease pump
2. Regulator
3. Solenoid valve
4. Timer
5. Air reservoir
6. Manual lube switch

Component	Item			Measurement conditions	Unit	Standard value		Permissible value	
Body	Lifting speed			• Oil temperature: 50 – 80°C • Engine: Full throttle • Use FLOAT when lowering	sec.	13±1.5		13±1.5	
	Lowering speed					17±1.5		17±1.5	
	Hydraulic drift			• Oil temperature: 50 – 80°C • Set with No. 2 cylinder extended 200 mm • Hydraulic drift after 5 minutes	mm	Max. 85		170	
Suspension cylinder	Installed length	Front	A	• On flat road surface • When empty 	mm	262±10		262±20	
			B			246±10 (*1)		246±20 (*1)	
		Rear	A			484±10		484±20	
						484±10 (*1)		484±20 (*1)	
						HD785-5	240±10	HD785-5	240±20
							220±10(*1)		220±20(*1)
						HD985-5	250±10	HD985-5	250±20
							230±10(*1)		230±20(*1)
	Pressure	Front			MPa {kg/cm²}	3.874±0.49 {39.5±5} (*2)		3.874±0.49 {39.5±5} (*2)	
		Rear				2.550±0.49 {26.0±5} (*2)		2.550±0.49 {26.0±5} (*2)	
Checking brake performance	Service brake			• F2 • Torque converter stall • Engine coolant temperature: Within operating range • Air pressure: 8.3 ± 0.3 kg/cm² • Transmission oil temperature: 70 – 90°C • Hydraulic oil temperature: 50 – 80°C	rpm	HD785-5 Serial No. 4001 – 4187			
						Min. 2,000		Min. 2,000	
						HD785-5 Serial No. 4188 and up			
						Min. 1,750		Min. 1,750	
						HD985-5			
						Min. 2,000		Min. 2,000	
	Retarder brake					HD785-5 Serial No. 4001 – 4187			
						Min. 1,500		Min. 1,500	
						HD785-5 Serial No. 4188 and up			
						Min. 1,300		Min. 1,300	
						HD985-5			
						Min. 1,500		Min. 1,500	
	Emergency brake					HD785-5 Serial No. 4001 – 4187			
						Min. 2,040		Min. 2,040	
						HD785-5 Serial No. 4188 and up			
						Min. 1,890		Min. 1,890	
						HD985-5			
						Min. 2,070		Min. 2,070	
	Parking brake					HD785-5 Serial No. 4001 – 4187			
						Min. 2,040		Min. 2,040	
						HD785-5 Serial No. 4188 and up			
						Min. 1,890		Min. 1,890	
						HD985-5			
						Min. 2,070		Min. 2,070	

*1. For cylinder with buffer ring.

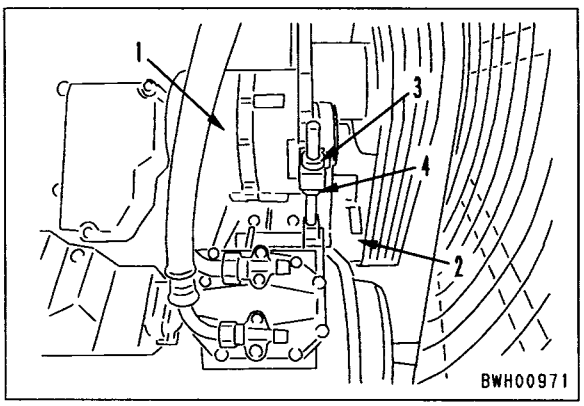
*2. This is a reference value. The actual value depends on the body specification.

System	Name of component	Connector No.	Inpsection method	Judgement table	Measurement conditions
PMC system	Retarder wear sensor	MM19 (male) MM20 (male)	Continuity	If the condition is as shown in the table below, it is normal No retarder wear — Between (1) – (2) — Continuity Retarder wear — Between (1) – (2) — No continuity	1) Start engine. 2) Disconnect MM19 and MM20. 3) Actuate retarder brake.
	Accelerator sensor	WAS1 (male)	Measure voltage	If the condition is as shown in the table below, it is normal Accelerator at FULL position — Between (1) – (2) — Approx. 3.55 – 3.75 V Accelerator at Lo position — Between (1) – (2) — Approx. 0.35 – 0.55 V	1) Turn starting switch ON. 2) Insert T-adapter. 3) Accelerator pedal Lo ↔ FULL.
	Idle validation switch 2	WAS1 (male)	Continuity	If the condition is as shown in the table below, it is normal Accelerator at FULL position — Between (5) – (6) — No continuity Accelerator at Lo position — Between (5) – (6) — Continuity	1) Turn starting switch OFF. 2) Disconnect WAS1.
	Idle validation switch 3	WAS1 (male)	Continuity	If the condition is as shown in the table below, it is normal Accelerator at FULL position — Between (4) – (6) — Continuity Accelerator at Lo position — Between (4) – (6) — No continuity	1) Turn starting switch OFF. 2) Disconnect WAS1.
	Service brake switch	AS5 (male)	Continuity	If the condition is as shown in the table below, it is normal Air pressure 58.8 kPa {0.6 kg/cm^2} or above — Between (1) – (2) — No continuity Air pressure 19.6 kPa {0.2 kg/cm^2} or above — Between (1) – (2) — Continuity	1) Turn starting switch OFF. 2) Disconnect AS5.
	Emergency brake switch	AS4 (male)	Continuity	If the condition is as shown in the table below, it is normal Air pressure 0.481 MPa {4.9 kg/cm^2} or above — Between (1) – (2) — No continuity Air pressure 0.363 MPa {3.7 kg/cm^2} or above — Between (1) – (2) — Continuity	1) Turn starting switch OFF. 2) Disconnect AS4.
	Transmission input shaft speed sensor Transmission output shaft speed sensor	N1 (male) N3 (male)	Measure resistance	If the condition is as shown in the table below, it is normal Between (1) – (2) — 500 – 1,000 Ω	1) Turn starting switch OFF. 2) Disconnect N1 and N3.

ADJUSTING ALTERNATOR BELT TENSION

★ If the deflection of the belt when it is pressed with a finger force of approx. 6 kg. at a point a midway between alternator (1) and the fan pulley (2) is not within the standard value, adjust the belt tension as follows.

1. Loosen the mounting bolts, lock bolts, and locknuts (3) and (4) OF alternator (1).
2. Adjust the belt tension with locknuts (3) and (4).
   ★ After adjusting, tighten the alternator mounting bolts and lock bolts.
3. Check that the belt tension is within the standard value. If it is within the standard value, tighten locknuts (3) and (4).



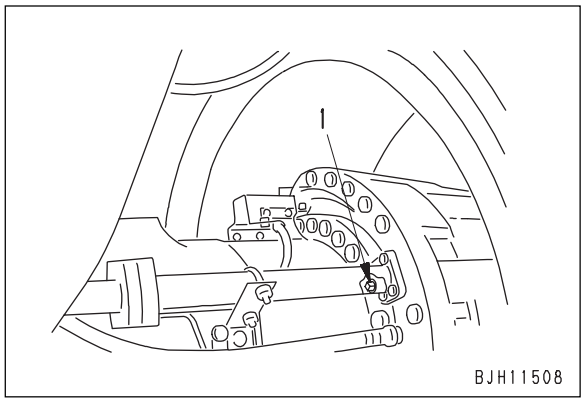
HD785-5 Serial No.: 4254 and up

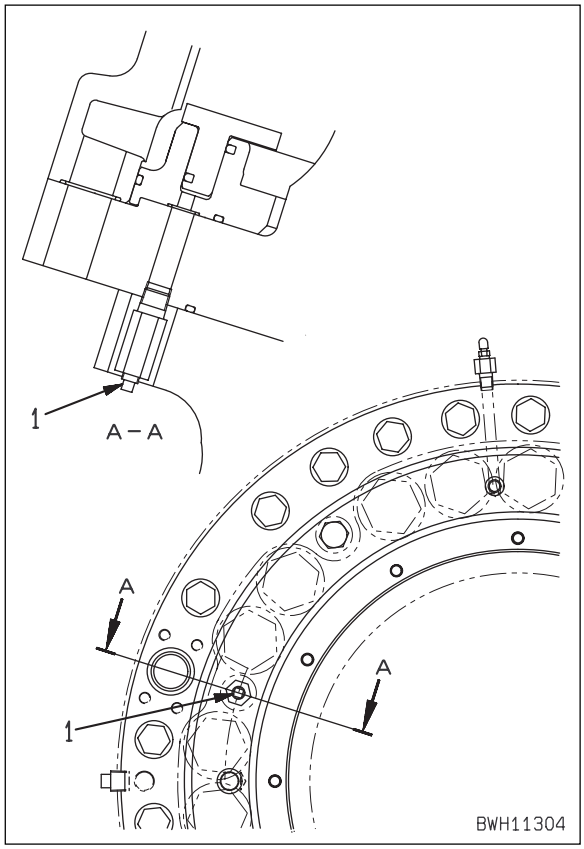
⚠ Stop the machine on level ground, apply the parking brake, and put blocks under the tires.

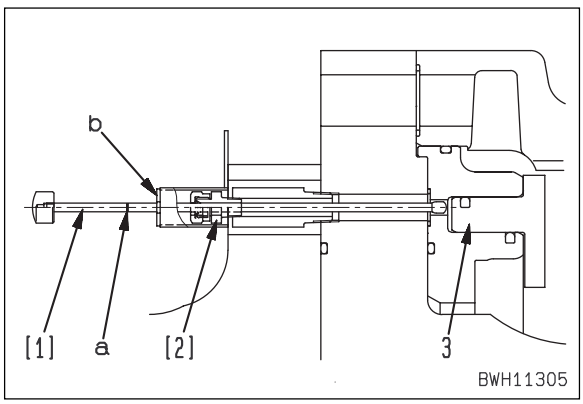
⚠ Install and remove plugs and gauges with the brake cooling oil temperature below 60°C and with the retarder brake control lever at the OFF position.

⚠ If the disc is near the wear limit, check the wear frequently, regardless of the maintenance interval. In addition, check the performance of the retarder carefully.

1. Remove plug (1) of the rear brake, then install disc wear measurement gauge **K**.
   When installing, tighten nipple [2] completely and pull rod [1] of disc wear measurement gauge K fully.
   ★ Pull rod [1] of gauge **K** fully before operating the retarder brake.
2. Turn the starting switch ON, and check that the air pressure gauge is in the green range.
3. If the air pressure is low, start the engine and run it at 2000 rpm until the air pressure gauge enters the green range. When it enters the green range, turn the starting switch OFF.
4. Pull rod [1] of disc wear measurement gauge **K** fully, then operate the retarder brake control lever slowly (take approx. 10 sec.) to apply the brake.
5. In this condition, push in rod [1] of disc wear measurement gauge **K** until it contacts the piston.
6. If mark **a** on disc wear measurement gauge **K** goes in beyond the end face (portion **b**) of the case, the disc has reached the wear limit.
7. After checking the brake wear, pull back rod [1] of wear measurement gauge **K** fully, then release the retarder brake.
   ⚠ After checking the wear, if the retarder brake control lever is pulled suddenly, there is seious danger that the rod of the disc wear measurement gauge may fly out suddenly. for this reason, when the rod is fully pulled, release it, then pull the retarder control lever slowly over a period of approx. 10 seconds. (Release the retarder brake.)
8. After measuring the brake wear, install the plug, and bleed the air.
   For details, see Bleeding air from brake circuit.

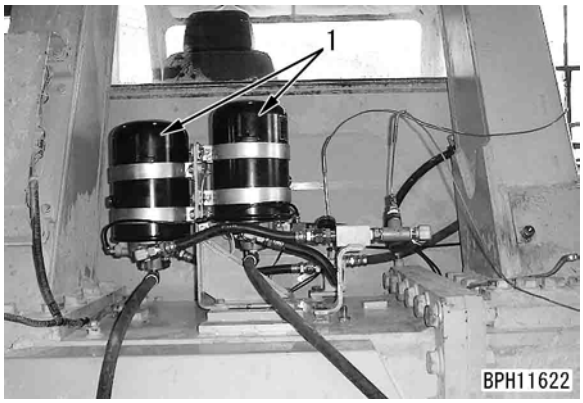






INSPECTION OF AIR DRIER (DESICCANT TYPE)

(IF EQUIPPED)



★ The air drier is installed at the rear of the operator's cab.

1. Daily inspection

During the check before starting or after finishing work, when draining water from the air tank, check the quantity of the drained water and oil.

If the drained water or oil has increased, the capacity of the air drier may have lowered. In this case, disassemble air drier (1) and see if the desiccant is attacked by oil or impurities, referring to DISASSEMBLY AND ASSEMBLY, Removal and installation of air drier (desiccant type) (if equipped), Disassembly and assembly of air drier (desiccant type) (if equipped).

If 1/5 or more of the whole desiccant has been attacked, replace it with new one.

When replacing the desiccant, replace all the oil filters, too. (See *1. Repair kit.)

★ If the desiccant is attacked by oil, etc., its ability to absorb water lowers and that affects the function of the drier largely. Accordingly, be sure to replace the desiccant.

★ Carefully check the drain discharged from the exhaust port of the air drier (1). If abnormally much oil is drained, check the compressor for oil consumption through piston cylinder.

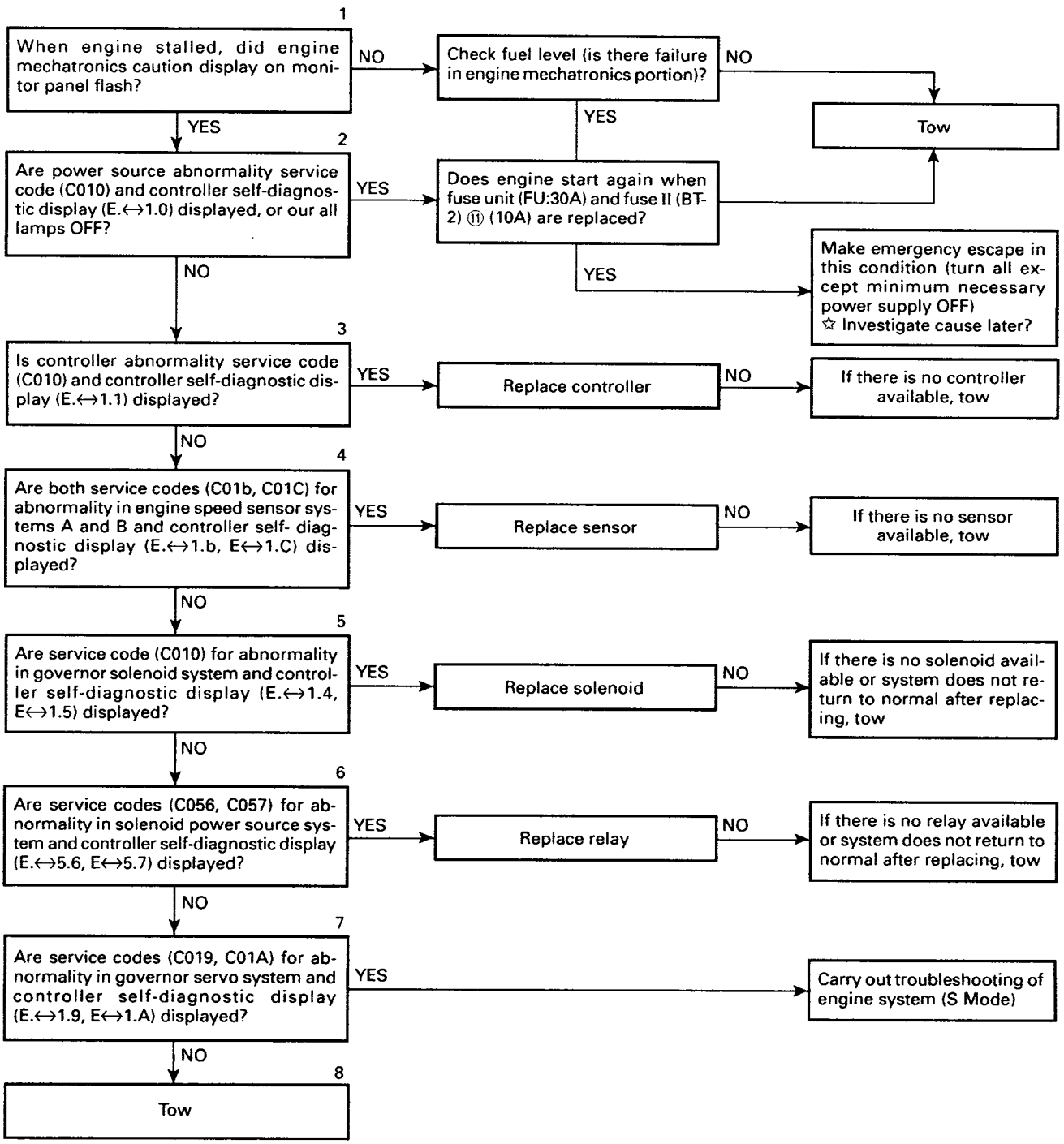
★ Compressed air sent to the air drier (1) contains oil (liquid oil and carbonized oil). This oil is accumulated in the compressor and drier piping, and may burn. Accordingly, clean compressor and drier piping periodically.

2. 6 month or 1,000 operation hour inspection

- Disassemble the air drier (1) and replace the desiccant, oil filter, filter, and all the rubber parts.
  (See *1. Repair kit.)
- Check the metallic parts for rust and repair or replace them, if necessary.
- Check the piping and wiring for abnormality.

METHOD FOR EMERGENCY ESCAPE WHEN THERE IS FAILURE IN ELECTRICAL SYSTEM

1. **Need for emergency escape**
   The following explains the action to take if it becomes impossible to drive the machine.
   If it becomes impossible to drive the machine, and a serious failure has occurred in the engine control or transmission control system, it is necessary to carry out repairs.
   Use the procedure in this section to move the machine to a safe place in order to carry out repairs.
2. **Self-diagnostic display and emergency escape method**
   1) Engine control system
      a) If the engine stops when the machine is traveling and cannot be started again, use the flowchart below to decide the method for emergency escape.



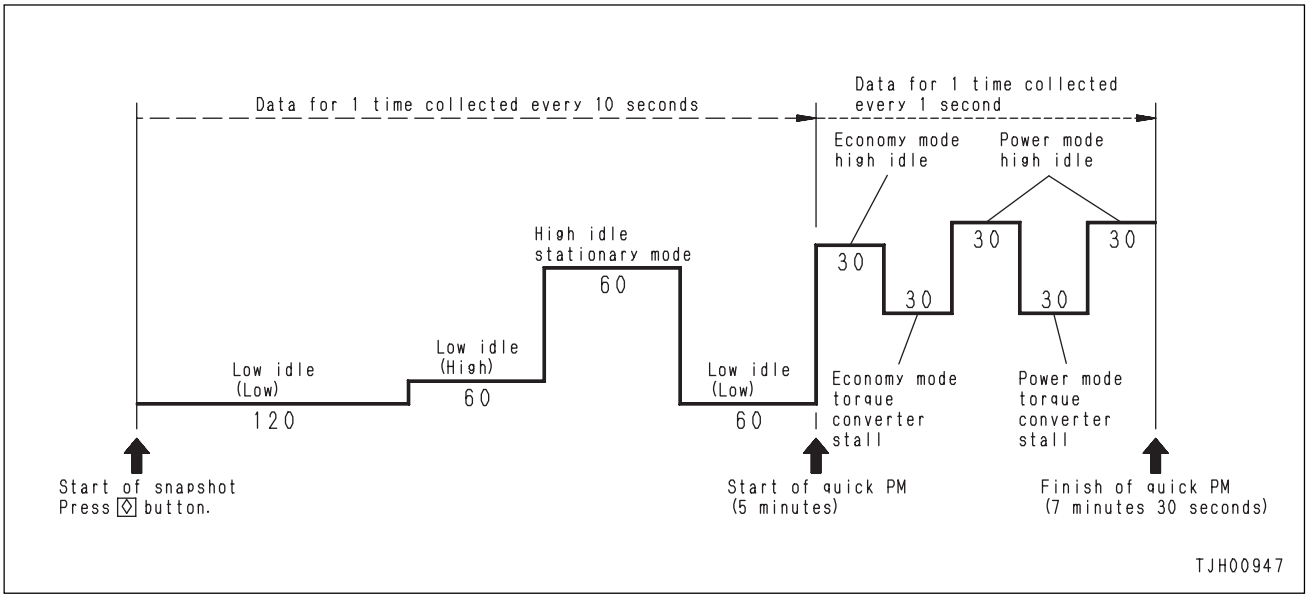
3. Run the engine at low idle for 2 minutes to stabilize it.
   ★ Check that the coolant temperature and torque converter oil temperature gauge are within the green range.

4. After starting, operate the machine as shown in Table 1.

Table 1

	Start	Finish	Time	Engine speed	Measurement conditions						Remarks
					AISS SW	Power mode selection	Gear shift lever	Parking brake	Retarder	Dump lever	
1	0:00	2:00	120 sec.	Low idle(Low)	Auto	Economy	N	ON	ON	Hold	
2	2:00	3:00	120 sec.	Low idle(High)	Auto	Economy	N	OFF	OFF	Hold	Note 1
3	4:00	5:00	60 sec.	Low idle (Economy mode)	Auto	Economy	N	ON	ON	Hold	
4	5:00	5:30	30 sec.	High idle (Economy mode)	Auto	Economy	N	ON	ON	Hold	
5	5:30	6:00	30 sec. (※)	Torque converter stall (Economy mode)	Auto	Economy	D	OFF	ON	Hold	Note 2, 3
6	6:00	6:30	30 sec.	High idle (Power mode)	Auto	Power	N	ON	ON	Hold	
7	6:30	7:00	30 sec. (※)	Torque converter stall (Power mode)	Auto	Power	D	OFF	ON	Hold	Note 2, 3
8	7:00	7:30	30 sec.	High idle (Power mode)	Auto	Power	N	ON	ON	Hold	

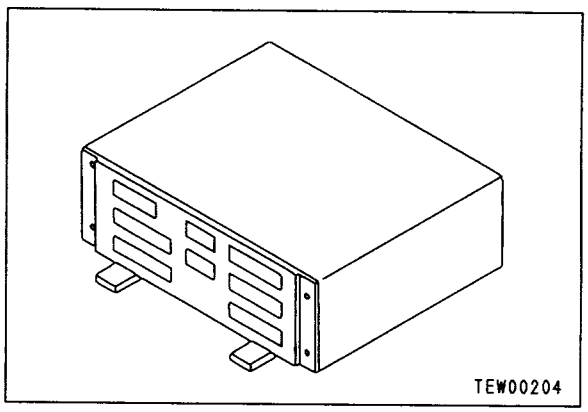
Note 1: Press the foot brake.
Note 2: When performing the torque converter stall {portion (※)}, do not overheat the torque converter. [The 30 seconds for torque converter stall is only a reference value. If the torque converter oil temperature gauge enters the top level of the green range during the torque converter stall operation, return the transmission (gearshift lever) immediately to the **N** position.]
Note 3: Reduce the speed to low idle before shifting to position **D** (to prevent the machine from starting suddenly).



3) Handling control box

① The control box contains a microcomputer and electronic control circuits. These control all of the electronic circuits on the machine, so be extremely careful when handling the control box.

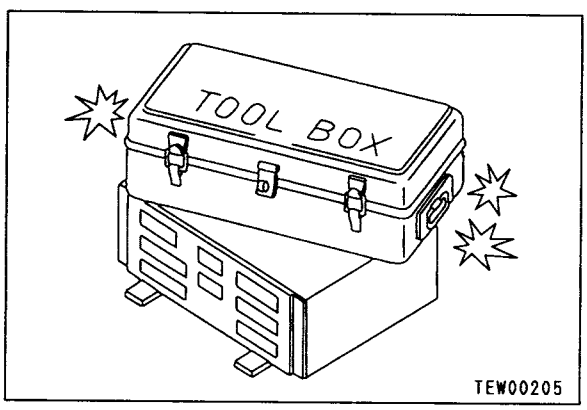
② Do not open the cover of the control box unless necessary.



③ Do not place objects on top of the control box.

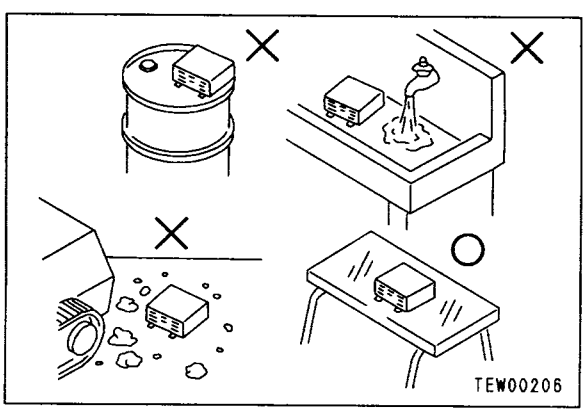
④ Cover the control connectors with tape or a vinyl bag.
Never touch the connector contacts with your hand.

⑤ During rainy weather, do not leave the control box in a place where it is exposed to rain.



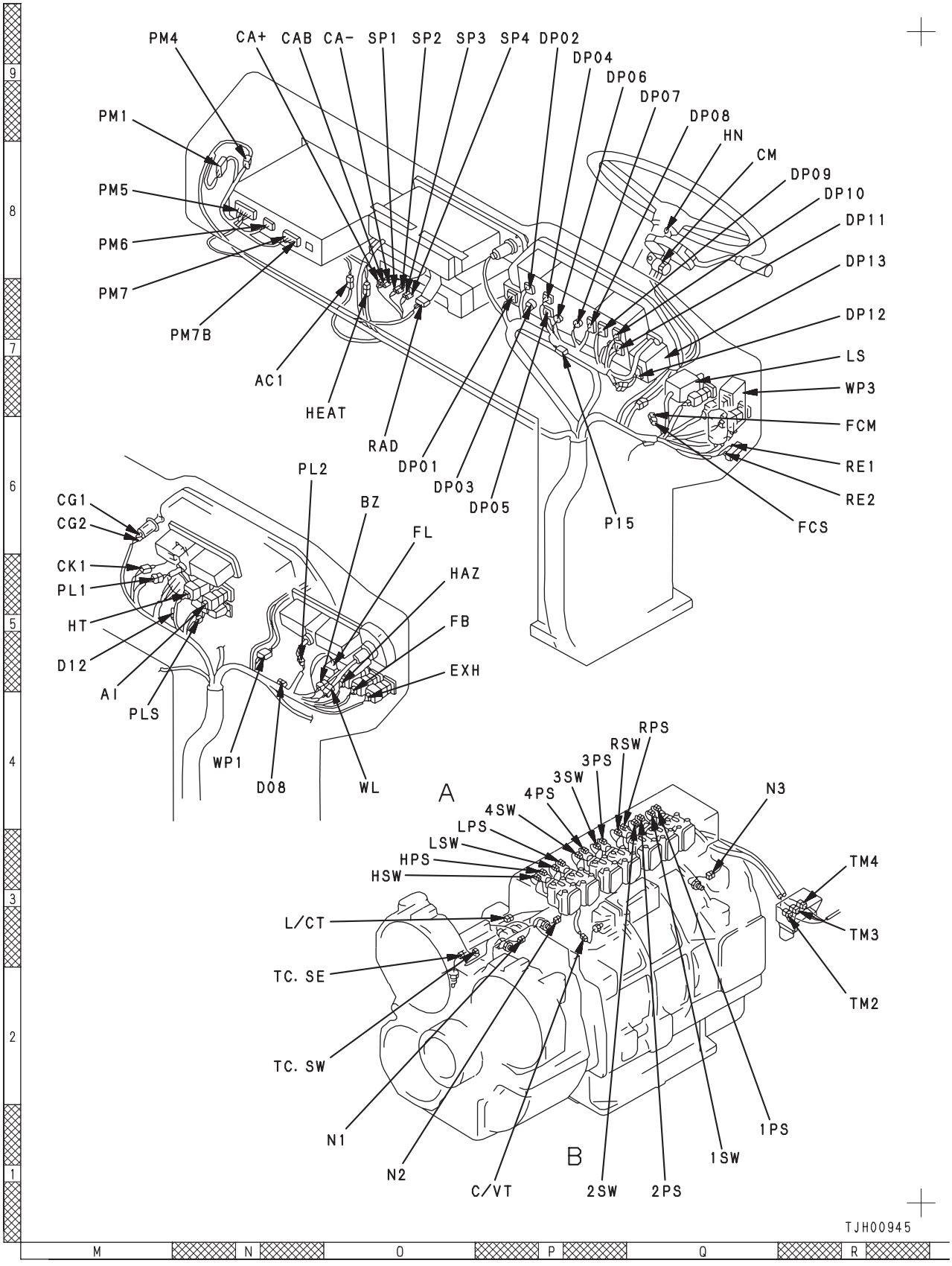
⑥ Do not place the control box on oil, water, or soil, or in any hot place, even for a short time.
(Place it on a suitable dry stand).

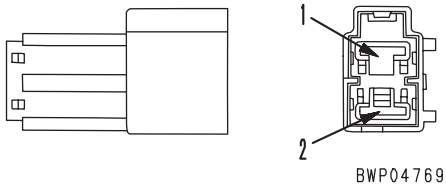
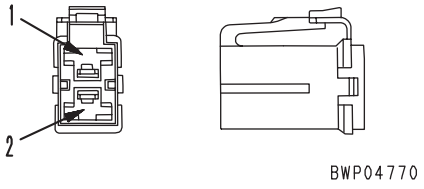
⑦ Precautions when carrying out arc welding
When carrying out arc welding on the body, disconnect all wiring harness connectors connected to the control box. Fit an arc welding ground close to the welding point.

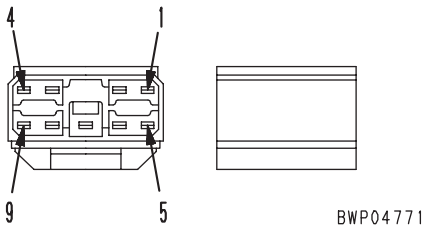
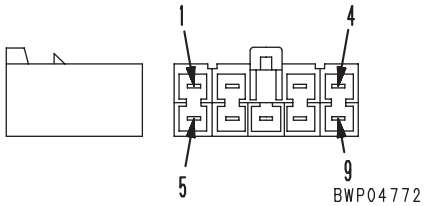


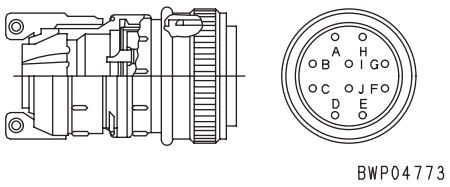
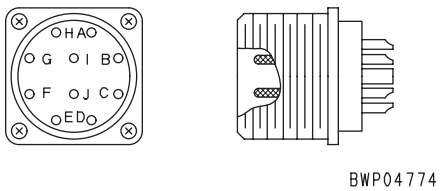
2. Points to remember when troubleshooting electric circuits

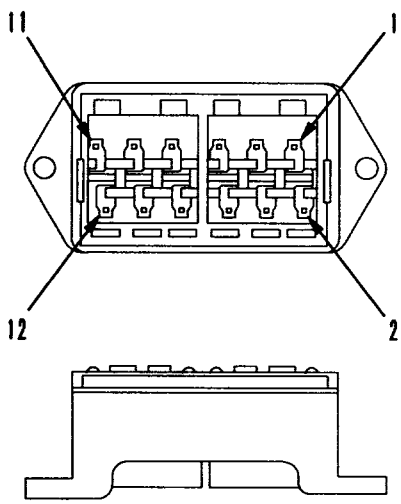
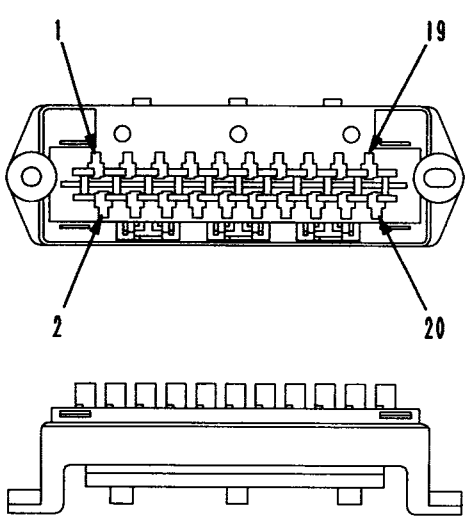
1) Always turn the power OFF before disconnecting or connect connectors.
2) Before carrying out troubleshooting, check that all the related connectors are properly inserted.
   ★ Disconnect and connect the related connectors several times to check.
3) Always connect any disconnected connectors before going on to the next step.
   ★ If the power is turned ON with the connectors still disconnected, unnecessary abnormality 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 defective contact in that circuit.


PM4
CA+
CAB
CA-
SP1
SP2
SP3
SP4
DP02
DP04
DP06
DP07
DP08
HN
CM
DP09
DP10
DP11
DP13
DP12
LS
WP3
FCM
RE1
RE2
FCS
P15
DP05
DP03
DP01
RAD
HEAT
AC1
PM7B
PM7
PM6
PM5
PM1
CG1
CG2
CK1
PL1
HT
D12
AI
PLS
WP1
D08
WL
PL2
BZ
FL
HAZ
FB
EXH
A
RPS
RSW
3PS
3SW
4PS
4SW
LPS
LSW
HPS
HSW
N3
TM4
TM3
TM2
L/CT
TC. SE
TC. SW
N1
N2
C/VT
B
2SW
2PS
1SW
1PS
TJH00945

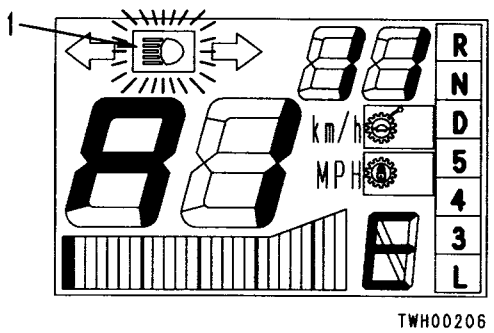
No. of pins	L type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
2			—
	—	—	—

No. of pins	PA type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
9			
	—	—	

No. of pins	Bendix MS connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
10			799-601-3460
	—	—	

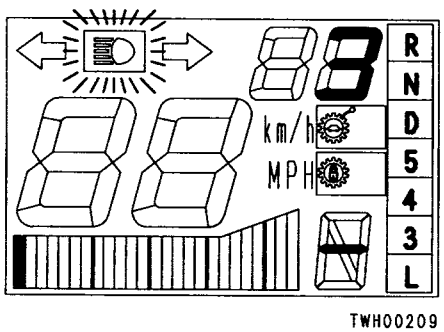
No. of pins	Fuse box	
	Male (female housing)	Female (male housing)
12	 BVH00397	
20	 BVH00398	

③ Example of display (display of existing failure)
High beam pilot lamp (1) lights up: This shows that the trouble data are for a currently existing failure.
High beam pilot lamp (1) is out: This shows that the trouble data are for a failure that has been corrected.



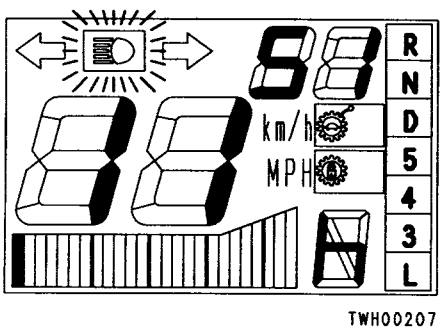
TWH00206

(1) Service code (A111)
This shows that A111 currently exists.



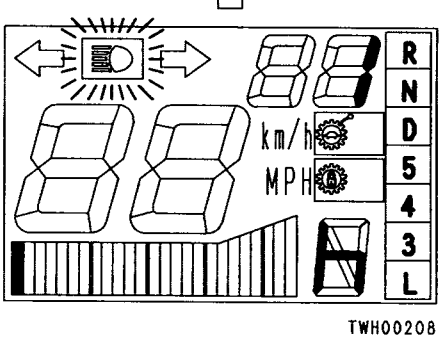
TWH00209

(4) Number of occurrences 3
This shows that within a period of 1151h before and 1 hour before, this failure occurred 3 times.



TWH00207

(2) Elapsed time 1 (1151h)
This shows that the failure first occurred 1151h before.



TWH00208

(3) Elapsed time 2 (1h)
This shows that the failure last occurred 1h before.

★ The above displays 1) – 4) are displayed repeatedly in turn for 2 seconds each. {After displaying Item 4), the display returns to Item 1).}
★ For details of the service code, see TABLE OF SERVICE CODES AND USER CODES (page 20-266).

Warning display table

Abnormal system	Display code	Re-enaction	Actuation of controller
Pilot lamp warning			
Transmission filter clogging	d.1	— (□)	△
Tilt warning	d.5	— (□)	△
Drop in radiator coolant level	d.6	— (□)	△
Battery charge	d.7	— (□)	△
Steering oil level (overheating)	E.5	— (□)	△
Drop in engine oil pressure (Mechanical governor specification machine)	F.5		△
Drop in rear brake oil pressure	F.6	— (□)	△
Actuation warning			
Engine overrun actuated	d.8	—	△
Engine overrun short circuit actuated	d.9	—	△
Overheat warning			
Torque converter oil temperature	d.2	—	△
Retarder oil temperature	F.3	—	△
Engine coolant temperature (Mechanical governor specification machine)	d.3	—	△
Pressure drop warning			
Drop in air pressure	E.9	—	△

Explanation of symbols: □ ← 1 – 8: indicates that there are display patterns from 1 to 8 that appear in the □ portion.
1 : Lock-up clutch related parts
2 : H clutch related parts
3 : L clutch related parts
4 : 1st clutch related parts
5 : 2nd clutch related parts
6 : 3rd clutch related parts
7 : 4th clutch related
8 : R clutch related parts
␣ : Blank (no display)

★ See the next page for explanation of the symbols used in the controller actuation column.

(*1) Warning displays when memory is FULL

1. Cycle data
   1) When more than 2600 cycles are saved (remaining capacity less than 300 cycles), the following cycle is repeated.
      L : FUL flashes 7 times
      : flashes 1 time
   2) When the machine is used more and 2900 cycles are saved in memory (remaining capacity 0), the following cycle is repeated.
      L : FUL lights up (3 seconds)
      : flashes 1 time
   3) If more cycles are added, the 2901st, 2902nd, ... are saved. But each time a new cycle is saved, the data for the oldest cycle are deleted in turn. (The display is kept at the condition in 2) above.)

2. Engine ON/OFF data
   1) When more than 105 times are saved (remaining capacity less than 10 times), the following cycle is repeated 2 times and then the display goes out.
      E : FUL flashes 7 times
      : flashes 1 time
   2) When the machine is used more and 115 times are saved in memory (remaining capacity 0), the following cycle is repeated 2 times and then the display goes out.
      E : FUL lights up (3 seconds)
      : flashes 1 time
   3) If the engine is turned ON/OFF more times, the 116th, 117th, ... are saved. But each time a new time is saved, the data for the earliest time are deleted in turn.

3. Abnormality, warning data
   1) When more than 220 times are saved (remaining capacity less than 10 times), the following cycle is repeated.
      E : FUL flashes 7 times
      : flashes 1 time
   2) When the machine is used more and 230 times are saved in memory (remaining capacity 0), the following cycle is repeated.
      E : FUL lights up (3 seconds)
      : flashes 1 time
   3) If more data are added, the 231st, 232nd, ... are saved. But each time new data are saved, the earliest abnormality and warning data are deleted in turn. (The display is kept at the condition in 2) above.)

4. Aggregate payload, total cycle number data
   1) When the count for the total number of cycles goes above 9994 (remaining capacity less than 5) or the difference between the aggregate payload and 999900 tons (upper limit) goes below 5 rated loads, the following cycle is repeated.
      H : FUL flashes 7 times
      : flashes 1 time
   2) If the operation is continued and the count for the total number of cycles goes above 9997 (remaining capacity less than 2) or the difference between the aggregate payload and 999900 tons (upper limit) goes below 5 rated loads, the following cycle is repeated.
      E : FUL lights up (3 seconds)
      : flashes 1 time
   3) If the operation is continued and the total number of cycles reaches 9999 or the aggregate payload goes above 999900 tons, both the aggregate payload and total cycle number will automatically be cleared and set to 0. After this, the count for both values will start again from 0.
      (The display will return to the normal operation display.)

5. To cancel the data FULL condition in Items 1 – 3, see the Payload Meter II (card type) Operation and Maintenance Manual, "8.3 Operator check mode".
   For Item 4, if data FULL is displayed, it is not canceled until the system is automatically cleared and set to 0. Clear the data and set to 0 forcibly before data FULL is displayed. For details of the method of operation, see the Payload Meter II Operation and Maintenance Manual, "8.2 Forcible display of aggregate payload, total cycle number".

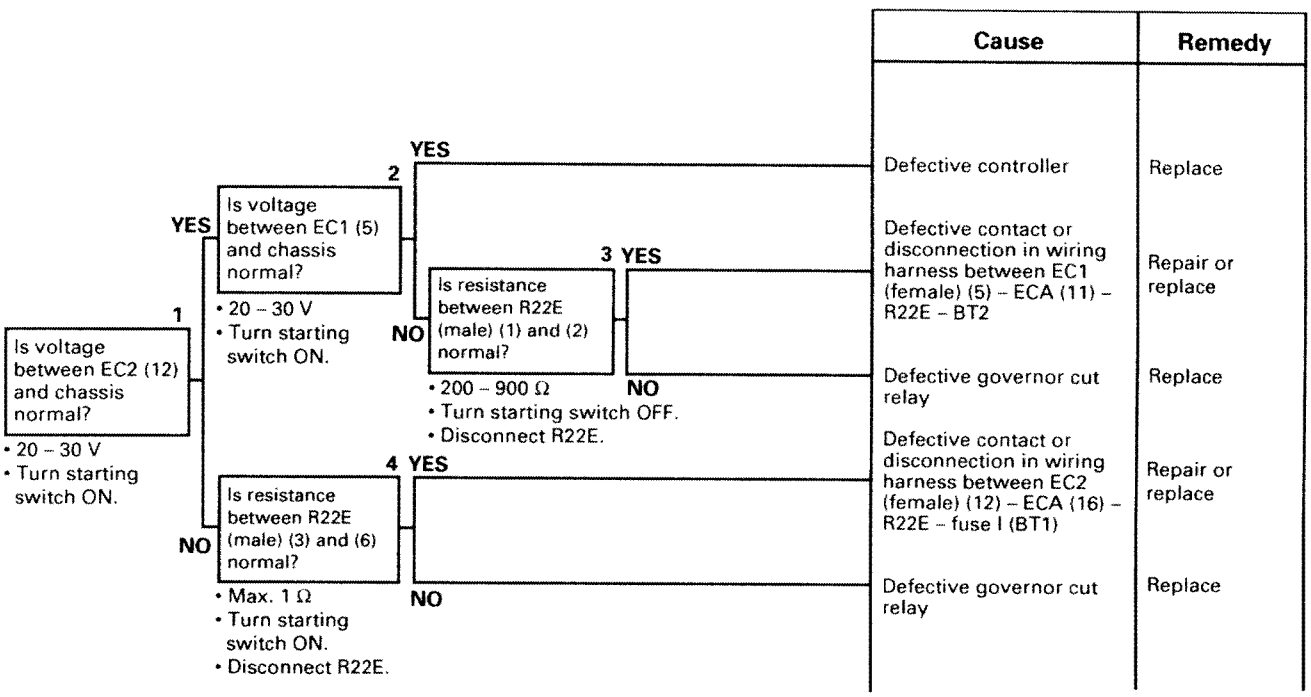
Display code	Abnormal system ★ Judgment conditions	Details of abnormality Check the wiring harnesses and equipment given below : Disconnection, short circuit in wiring harness (+): Positive, (–): Negative
C056 [E.↔5.6]	Disconnection, short circuit in solenoid power source system right bank ★ Voltage between EC2 (1) and chassis less than 5 V	1. Defective governor cut relay 2. Between EC2 (1) – ECA (14) – R22E (6), (3) (governor cut relay) – BT2 fuse (1),(2)
C057 [E.↔5.7]	Disconnection, short circuit in solenoid power source system left bank ★ Voltage between EC2 (12) and chassis less than 5 V	1. Defective governor cut relay 2. Between EC2 (12) – ECA (16) – R23E (6), (3) (governor cut relay) – BT2 fuse (1),(2)
C058 [E.↔5.8]	Backup power source system ★ Voltage between EC1 (7) and (16) becomes less than 17 V	1. Between (+) battery (+) – FU (2),(1) – FUA (1) – J03 (13) – fuse II (BT-2) (16), (18) – ECA (12) – EC1 (7) 2. Between (–) EC1 (16), EC2 (21), EC3A (14) – ECA (13) – J06 – FUA (4) – chassis ground
C059 [E.↔5.9]	Switch power source system ★ Voltage between EC1 (9) – (18), (17) – (16) becomes less than 17 V	1. Between (+) battery (+) – FU (2) 2. Between (+) FU (1) – FUA (1) 3. Between (+) FUA (1) – J03 (13) 4. Between (+) J03 (13) and fuse II (BT2) (11) 5. Between (+) fuse II (BT2) (11) and starting switch terminal B 6. Between (+) starting switch ACC and BT2 (1),(2) 7. Between (+) BT2 (1),(2) – ECA (15) 8. Between (+) ECA (15) – EC1 (9) or (17) 9. Between (–) EC1 (8),(16) – ECA (13) – J06 – FUA (4) – chassis ground
C0C2 [E.↔C.2]	Model selection data ★ C055 [E ↔ 5.5] is displayed Abnormality in rotary switch of transmission controller	Disconnection in network {see display C055 [E ↔ 5.5] or Mistake in selection of model selection data for rotary switch of transmission controller
C0C4 [E.↔C.4]	Disconnection, short circuit in acceleration sensor system ★ Input frequency between EC3A (12) and chassis: 109 Hz or below	1. EC3A (12) – ECA (6) – PMS (7) – PMC3 (6) 2. Defective acceleration sensor 3. Defective model selection data “C0C2 [E.↔C2]” error display given (sometimes given) 4. Disconnection in network wiring “C055 [E.↔55]” error display given (sometimes given)
C0C5 [E.↔C.5]	Disconnection in wiring harness, short circuit in idling validation system ★ When accelerator is at low idling (Voltage between EC5A (3) and EC3A (14): 15 V or below, or voltage between EC5A (4) and EC3A (14): 1 V or below) or when accelerator is at full (Voltage between EC5A (3) and EC3A (14): 1 V or above, or voltage between EC5A (4) and EC3A (14): 15 V or below)	1. EC5A (3) – J09E (8) – WAS1 (4) 2. EC5A (4) – J09E (9) – WAS1 (5) 3. EC3A (14) – ECA (13) – WAS1 (6) 4. Defective model selection data “C0C2 [E.↔C2]” error display given (sometimes given) 5. Disconnection in network wiring “C055 [E.↔55]” error display given (sometimes given)

Monitor panel display: C0 17 | Controller display: E. 17

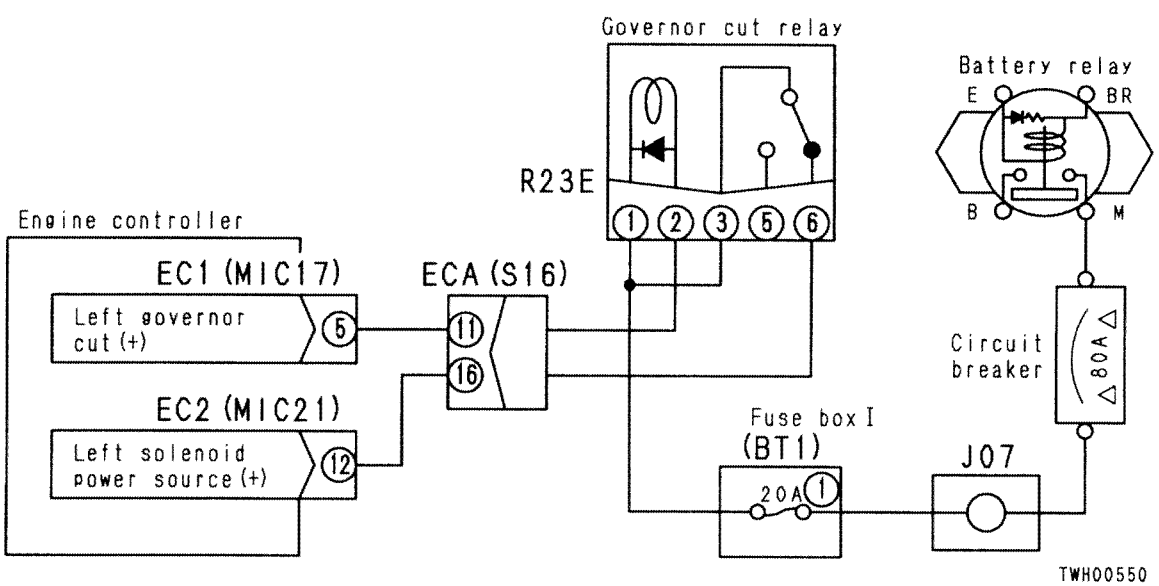
TWH00549

G-8 Abnormality in governor cut relay system left bank

★ When fuse I (BT1) (1) is normal.
★ When the battery is normal.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

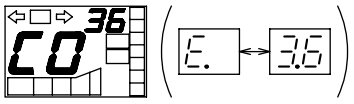


G-8 Related electrical circuit diagram



TWH00550

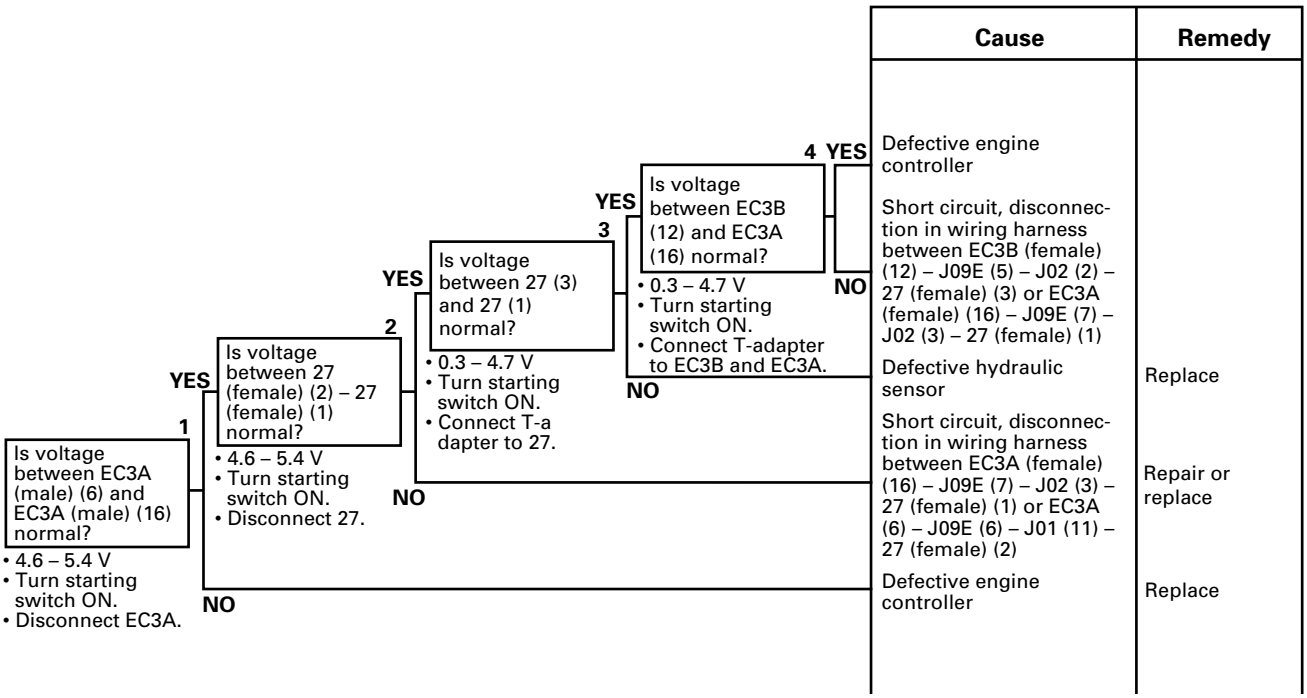
Monitor panel display Controller display



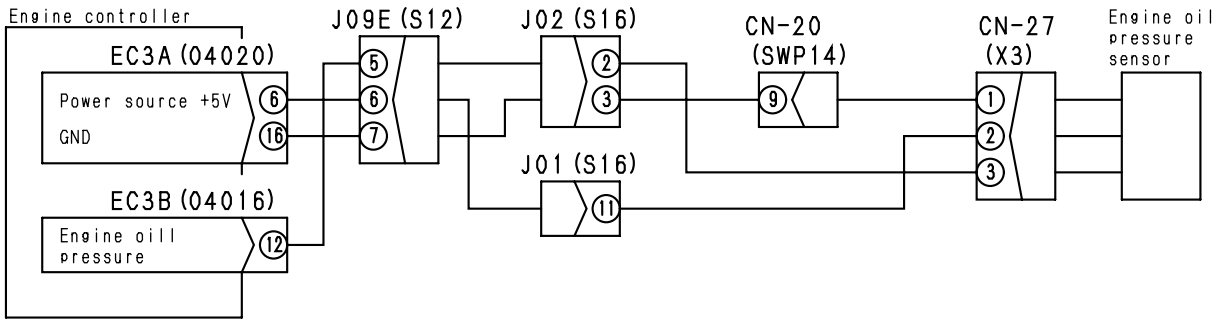
TWH00478

G-22 Abnormality in engine oil pressure sensor

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.



G-22 Related electrical circuit diagram



TWH00559

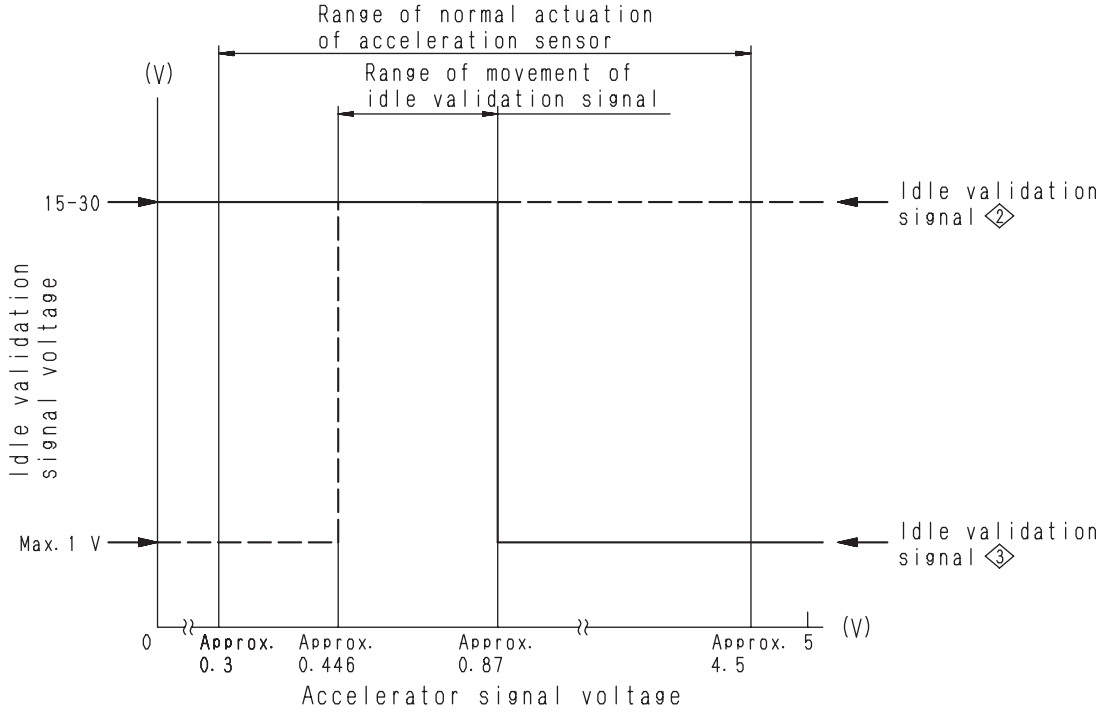
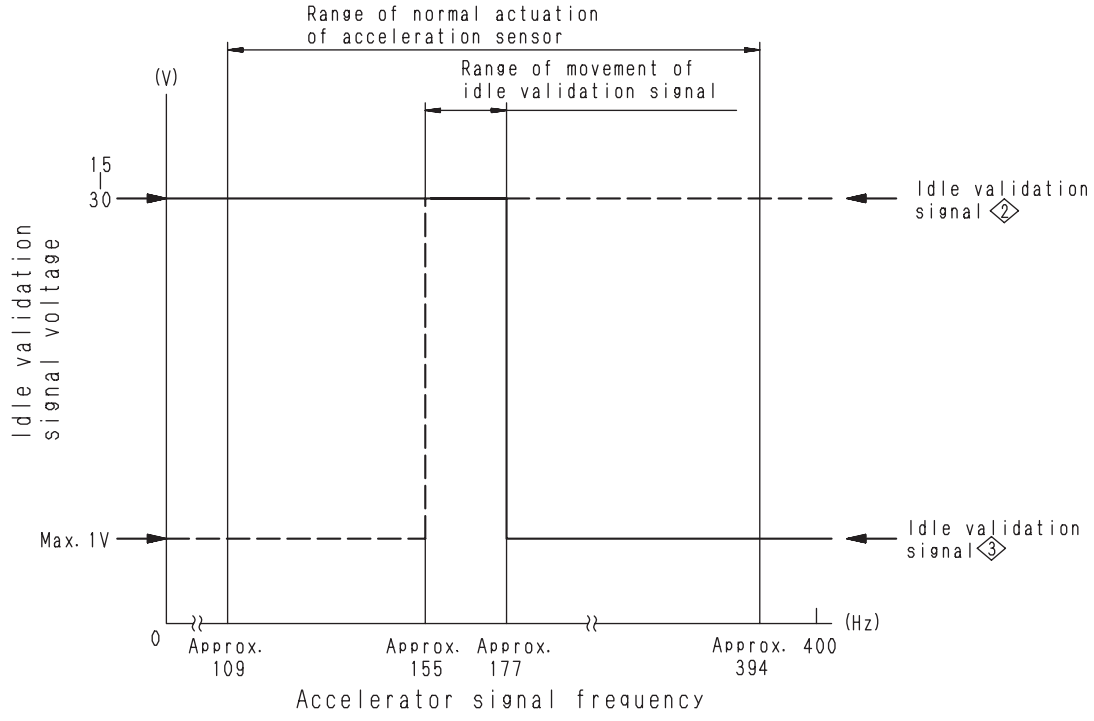


Fig. 1

TJH00955



TJH00956

Fig. 2

S-3 Engine does not pick up smoothly (Follow-up is poor)

★ Check that there is no abnormality display for the governor control system on the monitor panel.

General causes why engine does not pick up smoothly

- Insufficient supply of air
- Insufficient supply of fuel
- Improper condition of fuel injction
- Improper fuel used

Legend
○ : Possible causes (judging from Questions and check items)
◎ : Most probable causes (judging from Questions and check items)
△ : Possible causes due to length of use (used for a long period)
● : Items to confirm the cause.

			Causes: Clogged air cleaner element	Clogged fuel filter, strainer	Clogged feed pump strainer	Clogged injection nozzle, defective spray	Seized injection pump plunger	Worn piston ring, cylinder liner	Seized turbocharger, interference	Improper valve clearance	Clogged air breather hole in fuel tank cap	Clogged, leaking fuel piping	Defective contact of valve and valve seat
Questions	Confirm recent repair history												
	Degree of use of machine	Operated for long period	△	△	△			△					△
	Replacement of filters has not been carried out according to Operation Manual		◎	◎	◎								
	Non-specified fuel is being used			◎	◎	◎	◎						
	Engine oil must be added more frequently							◎					
	Rust and water are found when fuel tank is drained			◎	◎								
	Dust indicator caution is red		◎										
	Noise of interference is heard from around turbocharger								◎				
	Engine pick-up suddenly became poor					○			◎		○	○	
	Color of exhaust gas	Blue under light load						◎					
		Black	◎			◎			◎				○
Check items	Clanging sound is heard from around cylinder head									◎			
	Mud is stuck to fuel tank cap										◎		
	There is leakage from fuel piping											◎	
	High idle speed under no load is normal, but speed suddenly drops when load is applied			◎	◎						○		
	There is hunting from engine (rotation is irregular)			○	◎	○					○		
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low					◎	○						
	Blow-by gas is excessive							◎					

		Causes: Clogged air cleaner element	Clogged fuel filter, strainer	Clogged feed pump strainer	Clogged injection nozzle, defective spray	Seized injection pump plunger	Worn piston ring, cylinder liner	Seized turbocharger, interference	Improper valve clearance	Clogged air breather hole in fuel tank cap	Clogged, leaking fuel piping	Defective contact of valve and valve seat
Troubleshooting	When air cleaner element is inspected directly, it is found to be clogged	●										
	When fuel filter, strainer are inspected directly, they are found to be clogged		●									
	When feed pump strainer is inspected directly, it is found to be clogged			●								
	Speed does not change when operation of certain cylinders is stopped				●							
	When control rack is pushed, it is found to be heavy, or does not return					●						
	When compression pressure is measured, it is found to be low						●					●
	When turbocharger is rotated by hand, it is found to be heavy							●				
	When valve clearance is checked directly, it is found to be outside standard value								●			
	When fuel tank cap is inspected directly, it is found to be clogged									●		
	When feed pump is operated, operation is too light or too heavy										●	
Remedy		Clean	Clean	Clean	Correct	Replace	Replace	Replace	Adjust	Clean	Correct	Replace

S-15 Abnormal noise is made

★ Judge if the noise is an internal noise or an external noise.

General causes why abnormal noise is made

- Abnormality due to defective parts
- Abnormal combustion
- Air sucked in from intake system

Legend
○: Possible causes (judging from Questions and check items)
◎: Most probable causes (judging from Questions and check items)
△: Possible causes due to length of use (used for a long period)
●: Items to confirm the cause.

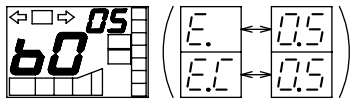
			Causes: Excessive wear of piston ring, cylinder liner	Seized turbocharger, interference	Missing, seized bushing	Clogged, seized injection nozzle	Defective injection pump (rack, plunger seized)	Defective injection pump (excessive injection)	Deformed fan, fan belt interference	Defective adjustment of valve clearance	Broken dynamic valve system (valve, rocker lever, etc.)
Questions	Confirm recent repair history										
	Degree of use of machine	Operated for long period	△								
	Condition of abnormal noise	Gradually occurred	○						○		
		Suddenly occurred		○	○						○
	Non-specified fuel is being used					○	○				
	Engine oil must be added more frequently		◎								
Check items	Color of exhaust gas	Blue under light load	◎								
		Black		◎						○	
	Metal particles are found in oil filter		◎		◎						
	Blow-by gas is excessive		◎								
	Noise of interference is heard from around turbocharger			◎							
	Engine pickup is poor and combustion is abnormal					◎					
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low					◎	○				
	Seal on injection pump has come off							◎			
	Abnormal noise is loud when accelerating engine					○	○	○	○	○	
	Clanging sound is heard from around cylinder head									◎	◎
	Leakage of air between turbocharger and head, loose clamp										
	Vibrating noise is heard from around muffler										
Troubleshooting	When compression pressure is measured, it is found to be low		●								
	When turbocharger is rotated by hand, it is found to be heavy			●							
	Remove gear cover and inspect directly				●						
	Speed does not change when operation of certain cylinders is stopped					●					
	When control rack is pushed, it is found to be heavy, or does not return						●				
	Injection pump test shows that injection amount is incorrect							●			
	Fan is deformed, belt is loose								●		
	When valve clearance is checked, it is found to be outside standard value									●	
	Remove cylinder head cover and inspect directly										●
	When muffler is removed, abnormal noise disappears										
	Inspect air compressor piping for leakage										
	Remove oil pan and inspect										
		Remedy	Replace	Replace	Replace	Replace	Replace	Adjust	Correct	Adjust	Replace

Display code	Abnormal system ★ Judgment conditions	Details of abnormality Check the wiring harnesses and equipment given below : Disconnection, short circuit in wiring harness (+): Positive, (–): Negative
b013 (E. ↔1.3 E.C↔1.3)	Disconnection in transmission output shaft speed sensor ★ If disconnection detection is actuated but there is no sensor signal	1. Output shaft speed sensor system 1) Between N3 (1) – TM2 (5) – ATC3A (3) 2) Between N3 (2) – TM2 (6) – ATC3A (14) 2. Defective output shaft speed sensor
b014 (E. ↔1.4 E.C↔1.4)	Defective model selection signal ★ After the starting switch is turned ON, depending on the wiring harness, the model selection signal does not match	1. Between ATC5B (13) – ATC1 (8) 2. Defective contact of ATC5B, ATC1 connector
b015 (E. ↔1.5 E.C↔1.5)	Short circuit, short circuit with ground in lever signal system ★ When two or more lever signals are generated, and this continues for 3 seconds	1. R Between ATC5B (2) – TMB (2) – SF (3) N Between ATC5B (3) – TMB (3) – SF (4) D Between ATC5B (4) – TMB (4) – SF (5) 5 Between ATC5B (5) – TMB (5) – SF (6) 4 Between ATC5B (6) – TMB (6) – SF (7) 3 Between ATC5B (7) – TMB (7) – SF (8) L Between ATC5B (8) – TMB (8) – SF (9) GND Between ATC5A (16) – TMB (9) – SF (2) 2. Defective shift lever
b016 (E. ↔1.6 E.C↔1.6)	Disconnection in lever signal system ★ When there is no lever signal for 3 seconds	
b017 (E. ↔1.7 E.C↔1.7)	Accelerator signal system Disconnection, defective adjustment of mount, link out of position ★ Voltage between ATC3B (11) and chassis • Min. 4.7 ± 0.1 V • Max. 0.6 ± 0.1 V	1. Between ATC3B (11) – TMA (13) – WAS2 (2) 2. Defective adjustment of clearance of sensor mount 3. Damaged accelerator pedal link 4. Defective acceleration sensor 5. Defective engine controller acceleration sensor power source circuit
b019 (E. ↔1.9 E.C↔1.9)	Short circuit with ground in transmission valve oil temperature system ★ When transmission oil temperature sensor signal is more than 150°C	1. Between (+) ATC3B (9) – TM4 (13) – C/V.T (1) Between (–) ATC3A (16) – TM4 (14) – C/V.T (2) 2. Defective transmission valve oil temperature sensor
b022 | b028 (E. ↔2.2 E.C↔2.2 | E. ↔2.8 E.C↔2.8)	Clutch slipping or defective transmission speed sensor system ★ When the input shaft speed, intermediate shaft speed, output shaft speed are converted and it is found that there is an abnormality with either the HL clutch or speed clutch.	1. Input shaft 1) Between N1 (1) – TM2 (1) – ATC3A (2) Speed sensor 2) Between N1 (2) – TM2 (2) – ATC3A (14) 2. Output shaft 1) Between N3 (1) – TM2 (5) – ATC3A (5) Speed sensor 2) Between N3 (2) – TM2 (6) – ATC3A (14) 3. One of following clutches worn or damaged: H, L, 1st, 2nd, 3rd, 4th, R
b022 (E. ↔2.2 E.C↔2.2)	Defective H clutch or input shaft speed sensor system	See items for display codes b022 – b028 [E. ↔ 2.2, E.C ↔ 2.2, E. ↔ 2.8, E.C ↔ 2.8]
b023 (E. ↔2.3 E.C↔2.3)	Defective L clutch or input shaft speed sensor system	See items for display codes b022 – b028 [E. ↔ 2.2, E.C ↔ 2.2, E. ↔ 2.8, E.C ↔ 2.8]

★ The top code in the Display code column shows the monitor panel display and the bottom code (in [ ]) shows the transmission controller LED display.

Condition when normal : Check with tester Voltage (V), current (A), resistance value Ω	Action of controller when abnormality is detected	Symptoms that appear in machine when there is abnormality Mechatronics abnormality display given, warning actuated
ATC3B,3A (male) / TMD,TMB (male) / J02 / 64 / Ω Between (8) – (16) / Between (5) – (9) / Between (10) – (9) / Between (1) – (2) / 2k Ω – 20k Ω (8) – chassis / (5) – chassis / (10) – chassis / (1) – chassis / (25°C – 120°C)	Only gives self-diagnostic display; does not take any action	No display at all is given on retarder oil temperature gauge display on monitor panel.
ATC3B / TMD / J02 / 27 / (V) (12) – chassis / (15) – chassis / (2) – chassis / (3) – chassis / 0.4 – 4.6 V Between (2) – (3)	Only gives self-diagnostic display; does not take any action	Drop in engine oil pressure cannot be detected.
1. Between ATC5A (1) – ATC1 (16) : 0 Ω 2. ATC5A, ATC1 connectors are securely inserted.	If there is abnormality when starting switch is turned ON, transmission is held at Neutral.	When starting switch is turned ON, machine cannot move off even when shift lever is operated.
ATC1 / TMB / R04 / (V) / Ω (11) – chassis / (13) – chassis / (1) – chassis / 20 – 30 V Between relay (1) and (2) / 100 – 500 Ω	Only gives self-diagnostic display; does not take any action	BCV is not actuated
ATC1 / TMB / R04 / (V) / Ω (11) – chassis / (13) – chassis / (1) – chassis / 20 – 30 V Between relay (1) and (2) / 100 – 500 Ω	Only gives self-diagnostic display; does not take any action	BCV is not actuated
ATC1 / TMB / R04 / (V) / Ω (11) – chassis / (13) – chassis / (1) – chassis / 20 – 30 V Between relay (1) and (2) / 100 – 500 Ω	Only gives self-diagnostic display; does not take any action	BCV is mistakenly actuated
When transmission filter is normal, condition is as shown in table below. ATC5A / TMD / J02 / 52 / (6) – chassis / (6) – chassis / (13) – chassis / (1) – chassis / No continuity Between (1) – (2)	Only gives self-diagnostic display; does not take any action	1. If operations are continued, dirt will circulate in transmission circuit. 2. Mechatronics abnormality display is not given. 3. Buzzer does not sound.
When machine tilt angle is ± 15°, condition is as shown in table below. ATC5A / TMD / SR3 / (5) – chassis / (2) – chassis / (1) – chassis, (1) – (2) / Continuity	Only gives self-diagnostic display; does not take any action	1. If operations are continued, machine may roll over. 2. Mechatronics abnormality display is not given.
When radiator coolant level is normal, condition is as shown in table below. ATC5B / TMD / J02 / 01 / 03 / (15) – chassis / (4) – chassis / (7) – chassis / (8) – chassis / (1) – chassis, (1) – (2) / Continuity	Only gives self-diagnostic display; does not take any action	1. If operations are continued, there will be overheating. 2. Mechatronics abnormality display is not given.

Monitor panel display Controller display



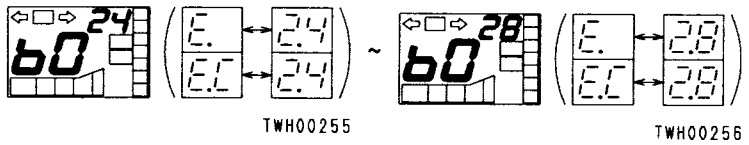
TWH00234

A-3 Double engagement for clutch is displayed

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

	Cause	Remedy
1 Are 2 or more of b032 - b038 [E.↔32, E.C↔32 - E.↔38, E.C↔38 displayed at same time? • Turn starting switch ON.		
YES	See A-14 a)	—
NO	Failure of controller	Replace

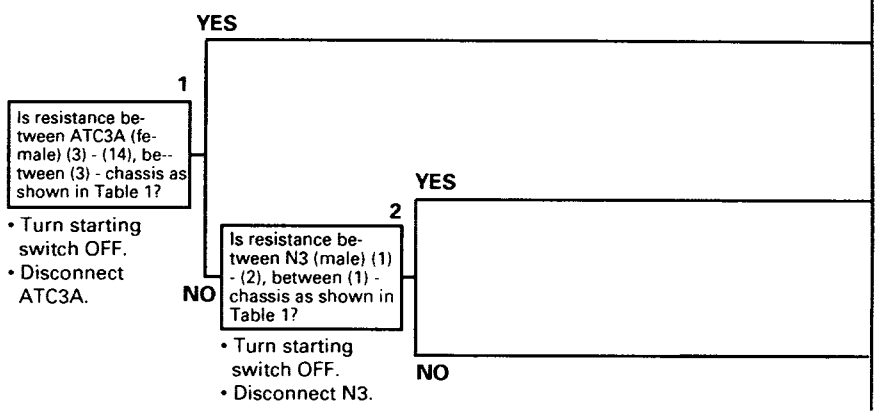
b) Monitor panel display / Controller display ~ Monitor panel display / Controller display



TWH00255 TWH00256

Travel speed sensor system or speed clutch (1, 2, 3, 4, R) system is displayed

★ Check that the mounting bolts of the travel speed sensor are not loose.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

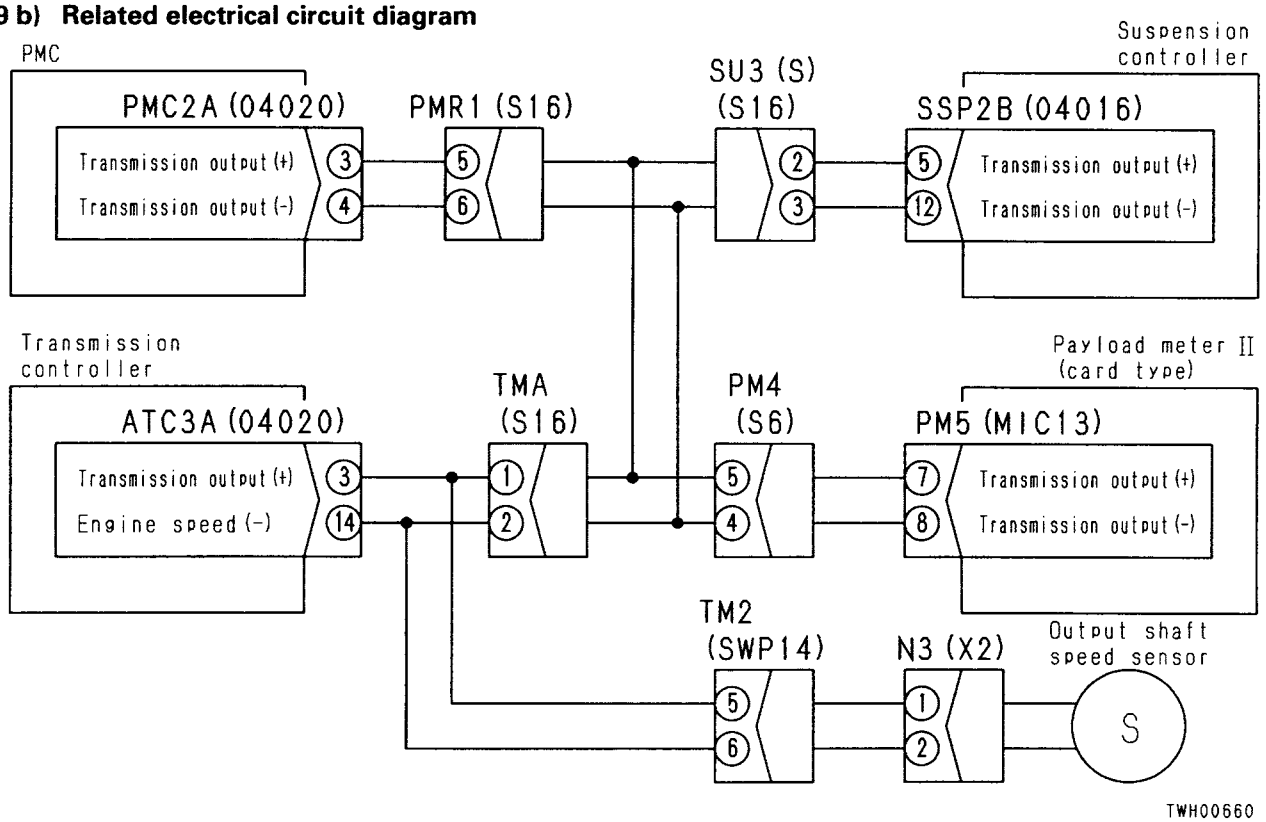


Cause	Remedy
See H-6, c) (Oil pressure of speed clutch 1, 2, 3, 4, R) ★ If the oil pressure is normal, return to Item 1 and start troubleshooting again.	—
Disconnection or short circuit with chassis ground in wiring harness between N3 (female) (1),(2) - TM2 (5),(6) - ATC3A (female) (3),(14), or short circuit with chassis ground in wiring harness between TM2 (female) (5) - TMA (1) - SU3 (2) - SSP2B (female) (2) or between TMA (male) (1) and PMC2A (3) (female)	Repair or replace wiring harness
Defective travel speed sensor	Replace

Table 1

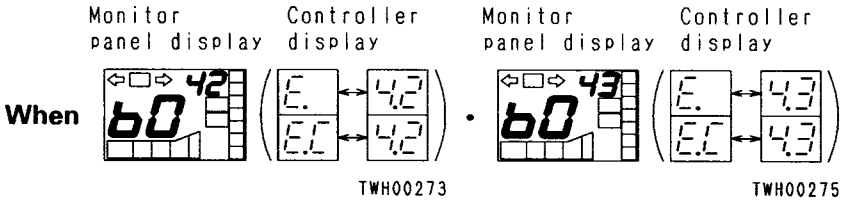
ATC3A (female)	N3 (male)	Resistance
Between (3) – (14) Between (3) – chassis	Between (1) – (2)	500 Ω – 1000 Ω
—	Between (1) – chassis	Min. 1 MΩ

A-9 b) Related electrical circuit diagram



TWH00660

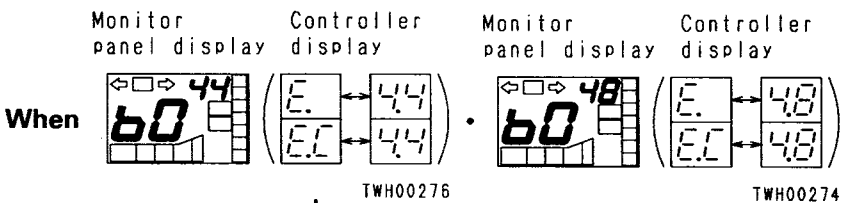
b-2) Inspecting transmission input shaft speed signal system, H, L clutch system (check clutch slip)



★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

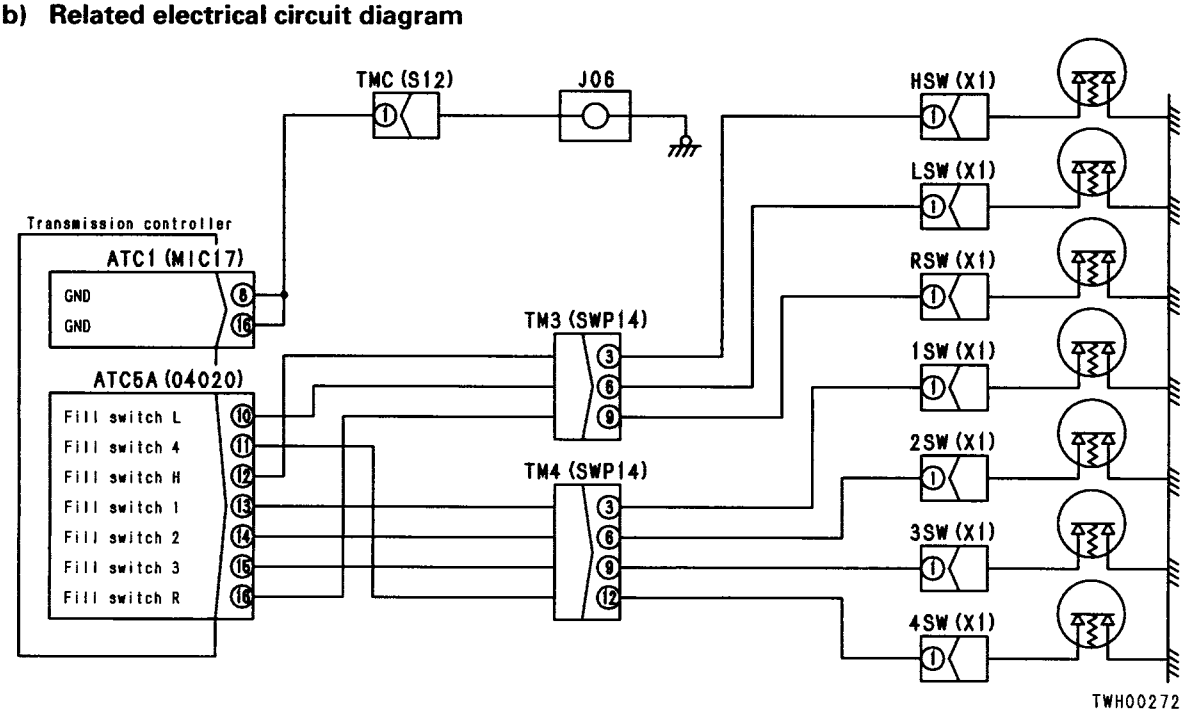
Go to troubleshooting of A-7 b).

b-3) Inspecting transmission output shaft speed signal system, 1-4, R clutch system (check clutch slip)

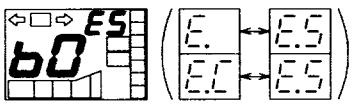


Go to troubleshooting of A-7 a).

A-14 b) Related electrical circuit diagram



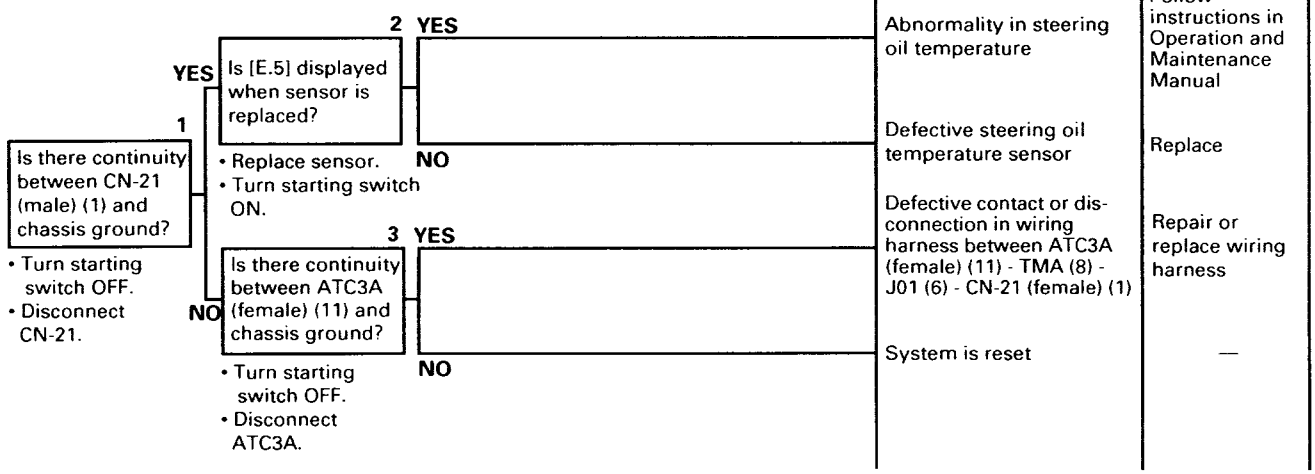
Monitor panel display | Controller display



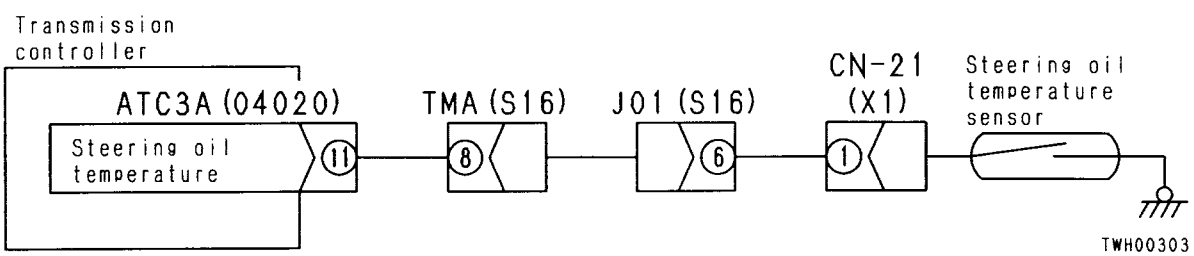
TWH00302

e) Steering oil temperature overheat warning is displayed

★ Before carrying out troubleshooting, check if the steering oil temperature is high.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.



A-18 e) Related electrical circuit diagram

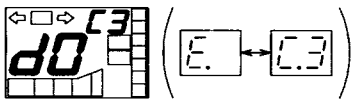


TWH00303

<table>
<tr><th>Condition when normal : Check with tester
Voltage (V), current (A), resistance value Ω</th><th>Action of controller when abnormality is detected</th><th>Symptoms that appear in machine when there is abnormality</th></tr>
<tr><td>
<table>
<tr><th>SL1</th><th>SU3</th><th>Ω</th><th>(V)</th></tr>
<tr><td>Between male (1) – (2)</td><td>Between (female) (16) – SSP1 (21)</td><td>20 – 100 Ω</td><td rowspan="2"></td></tr>
<tr><td>Between female (1) – chassis</td><td>—</td><td>Min. 1 MΩ</td></tr>
<tr><td>Between female (1) – chassis</td><td>—</td><td>—</td><td>20 – 30 V</td></tr>
<tr><td>Between SL1 female (2) – chassis</td><td>—</td><td>0 Ω</td><td>—</td></tr>
</table>
</td><td>Cannot carry out control</td><td>1. All lamps on mode display go out.
2. Machine sometimes rolls excessively.
3. Ride is uncomfortable.
4. Other mechatronics caution lamp on monitor panel flashes.</td></tr>
<tr><td>
<table>
<tr><th>SL2</th><th>SU3</th><th>Ω</th><th>(V)</th></tr>
<tr><td>Between male (1) – (2)</td><td>Between (female) (16) – SSP1 (20)</td><td>20 – 100 Ω</td><td rowspan="2"></td></tr>
<tr><td>Between female (1) – chassis</td><td>—</td><td>Min. 1 MΩ</td></tr>
<tr><td>Between female (1) – chassis</td><td>—</td><td>—</td><td>20 – 30 V</td></tr>
<tr><td>Between SL2 female (2) – chassis</td><td>—</td><td>0 Ω</td><td>—</td></tr>
</table>
</td><td>Cannot carry out control</td><td>1. All lamps on mode display go out.
2. Machine sometimes rolls excessively.
3. Ride is uncomfortable.
4. Other mechatronics caution lamp on monitor panel flashes.</td></tr>
<tr><td>
<table>
<tr><th>SL3</th><th>SU3</th><th>Ω</th><th>(V)</th></tr>
<tr><td>Between male (1) – (2)</td><td>Between (female) (16) – SSP1 (20)</td><td>20 – 100 Ω</td><td rowspan="2"></td></tr>
<tr><td>Between female (1) – chassis</td><td>—</td><td>Min. 1 MΩ</td></tr>
<tr><td>Between female (1) – chassis</td><td>—</td><td>—</td><td>20 – 30 V</td></tr>
<tr><td>Between SL3 female (2) – chassis</td><td>—</td><td>0 Ω</td><td>—</td></tr>
</table>
</td><td>Cannot carry out control</td><td>1. All lamps on mode display go out.
2. Machine sometimes rolls excessively.
3. Ride is uncomfortable.
4. Other mechatronics caution lamp on monitor panel flashes.</td></tr>
<tr><td>1. Between SSP1 (female) (12) – ATC4 (female) (12), DPO5 (female) (4) : 0 Ω
2. Between SSP1 (female) (1) – ATC4 (female) (6), DPO5 (female) (3) : 0 Ω
3. Between SSP2A (female) (9) – ATC4 (female) (10), DPO5 (female) (5) : 0 Ω
4. Model selection setting for transmission must be correct.</td><td>Continues control normally</td><td>1. Suspension mode display stays at condition before abnormality was detected, but all lamps may go out.</td></tr>
<tr><td>1. Between SSP1 (female) (12) – ATC4 (female) (12), DPO5 (female) (4) : 0 Ω
2. Between SSP1 (female) (1) – ATC4 (female) (6), DPO5 (female) (3) : 0 Ω
3. Between SSP2A (female) (9) – ATC4 (female) (10), DPO5 (female) (5) : 0 Ω
4. Model selection setting for transmission must be correct.</td><td>Fixes in medium mode</td><td>1. Suspension mode display stays at condition before abnormality was detected, but all lamps may go out.
2. Machine sometimes rolls excessively.
3. Ride is uncomfortable.
4. Other mechatronics caution lamp on monitor panel flashes.</td></tr>
</table>

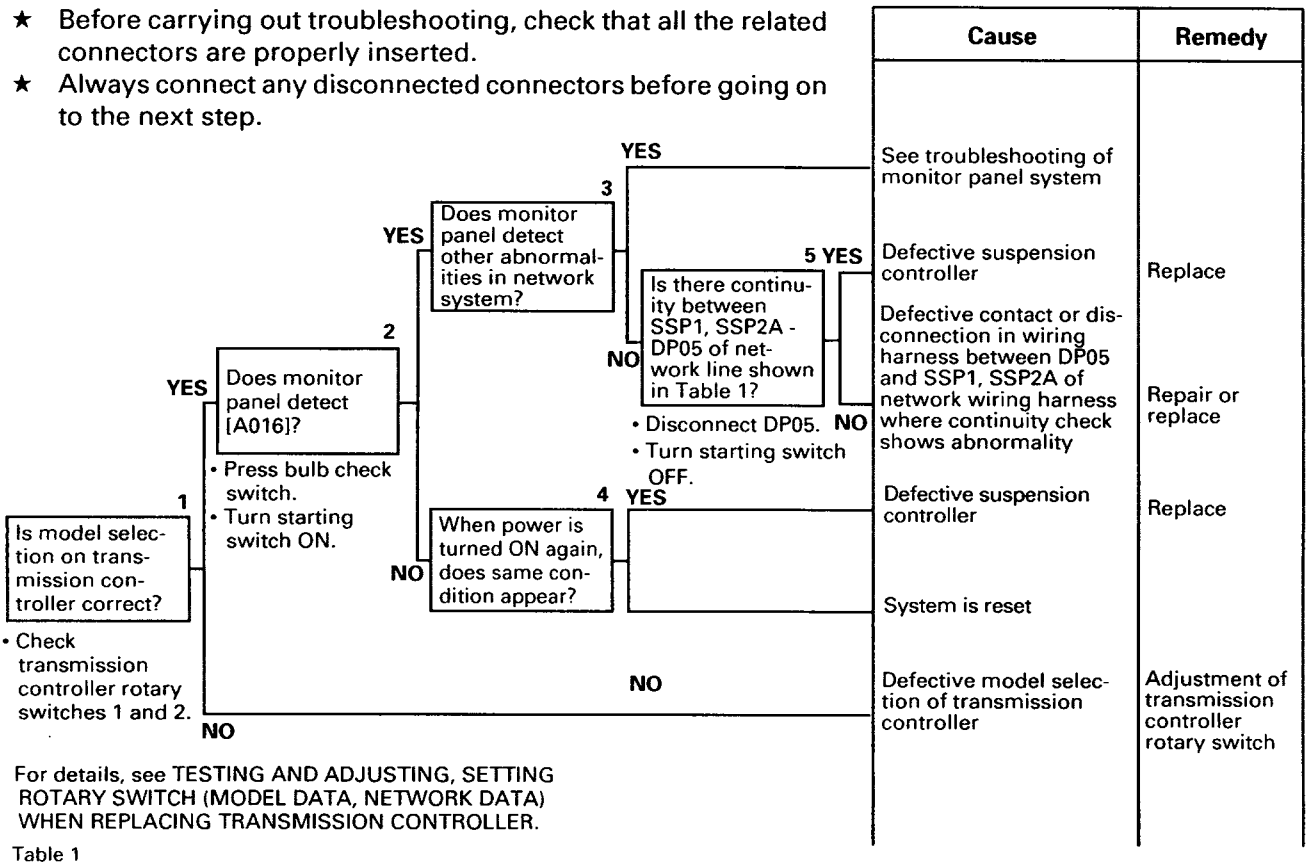
Monitor panel display Controller display

SP-11 Defective travel speed compensation data is displayed



TWH00338

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

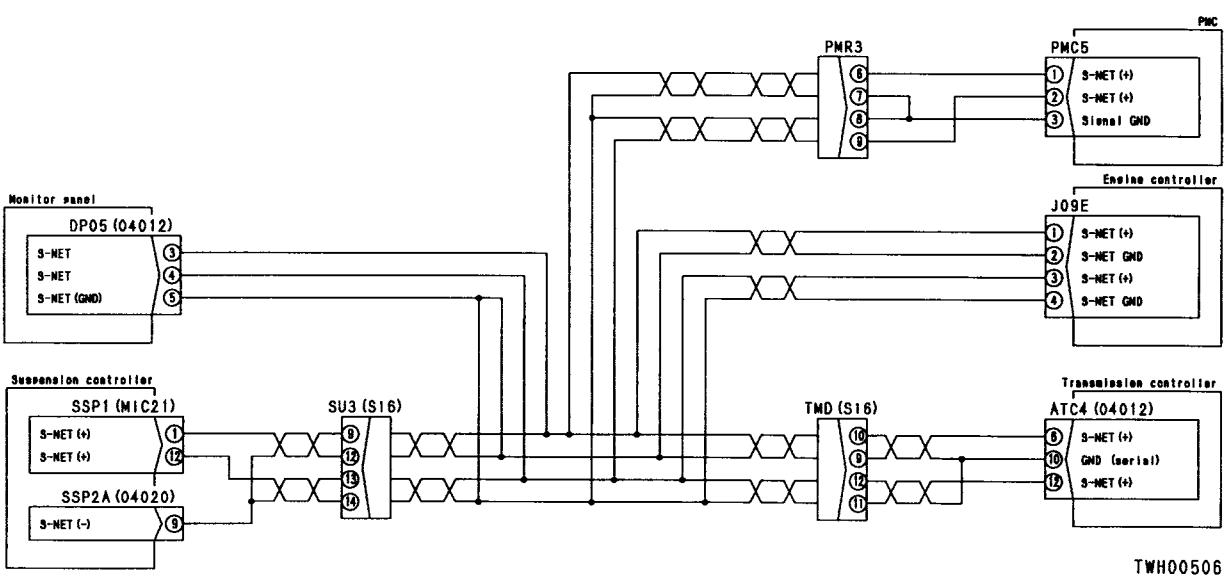


For details, see TESTING AND ADJUSTING, SETTING ROTARY SWITCH (MODEL DATA, NETWORK DATA) WHEN REPLACING TRANSMISSION CONTROLLER.

Table 1

Network wiring harness (1)	SSP1 (12)	SU3 (13)	TMD (12)	ATC4 (12)	DP05 (4)
Network wiring harness (2)	SSP1 (1)	SU3 (9)	TMD (10)	ATC4 (6)	DP05 (3)
Network wiring harness (3)	SSP2A (9)	SU3 (12)	TMD (9)	ATC4 (10)	DP05 (5)
Network wiring harness (4)	SSP2A (9)	SU3 (14)	TMD (11)	ATC4 (10)	DP05 (5)

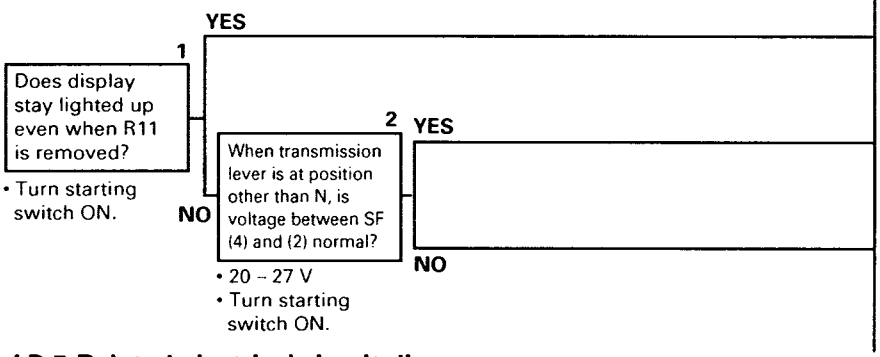
SP-11 Related electrical circuit diagram



TWH00506

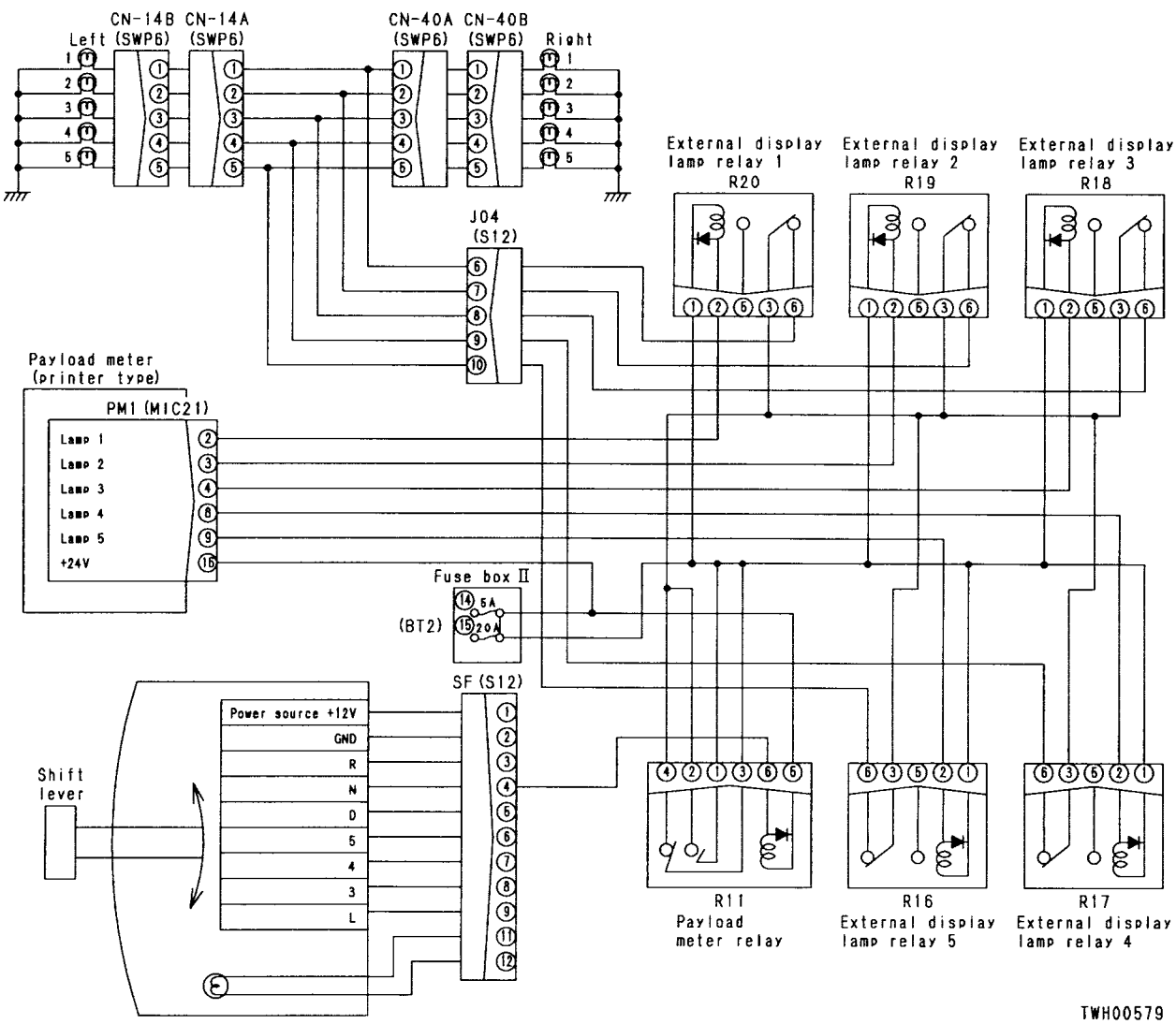
LP-5 Condition does not exist for lamps to light up, but external display lamps light up

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.



Cause	Remedy
Contact of +24V with wiring harness between R11 (2), (4) - each lamp relay (3), or between each lamp relay (6) - display lamp	After inspection, repair
Defective payload relay	Replace
Defective transmission lever	Replace

LP-5 Related electrical circuit diagram



LP-12 E32 is displayed

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

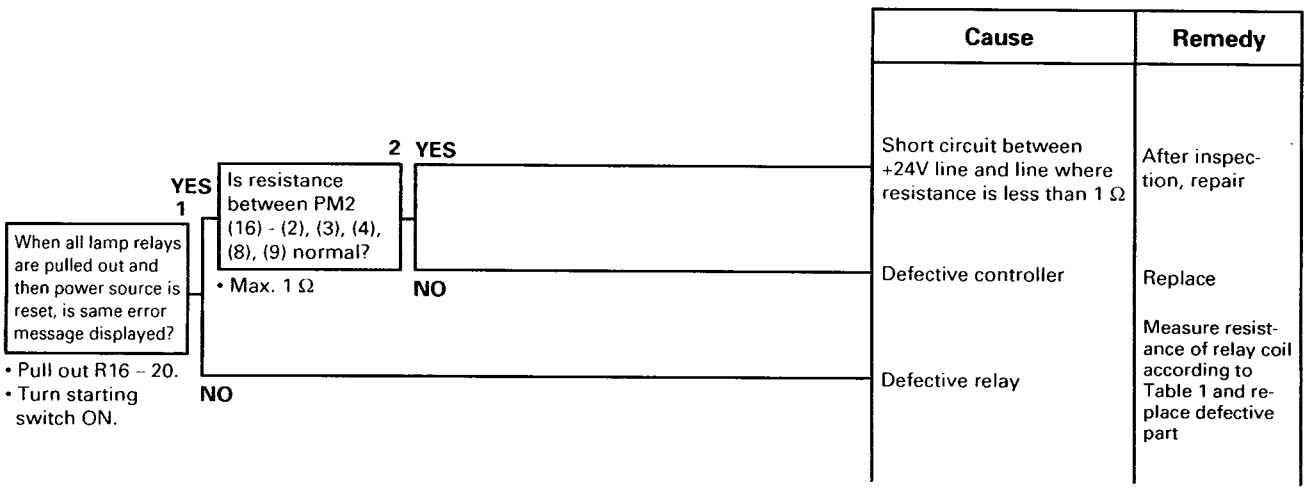
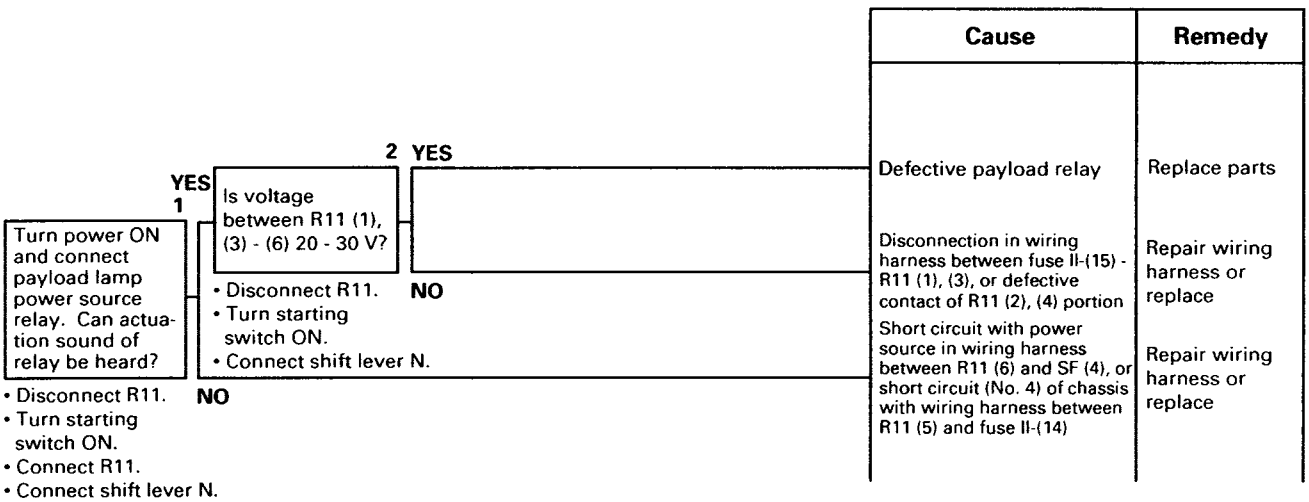


Table 1

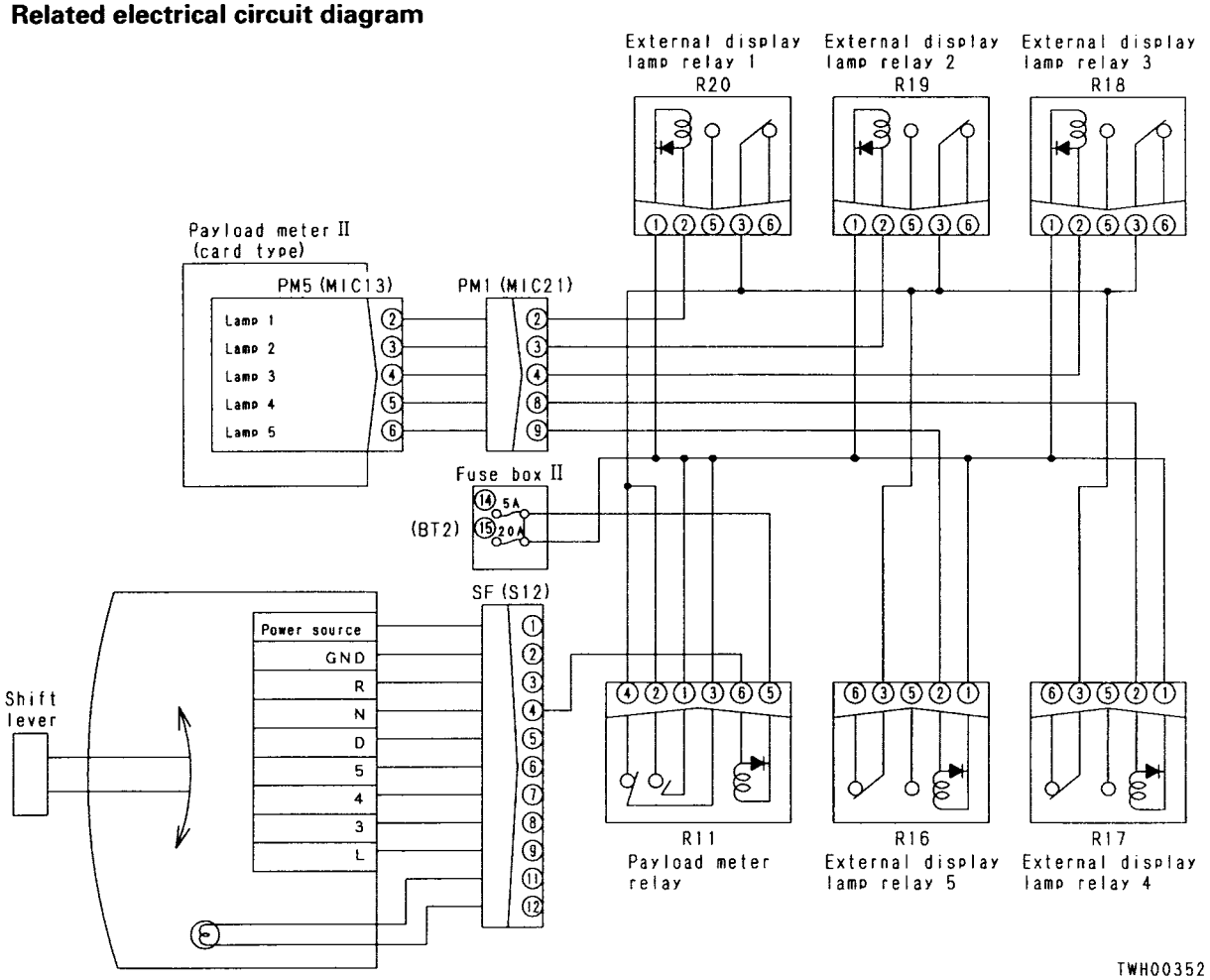
Relay terminal	Resistance	Applicable relay
(1) – (2)	200 – 400 Ω	1
(1) – (2)	200 – 400 Ω	2
(1) – (2)	200 – 400 Ω	3
(1) – (2)	200 – 400 Ω	4
(1) – (2)	200 – 400 Ω	5

LC-2 After starting switch is turned ON, all external display lamps do not light up

★ Set shift lever to N and turn starting switch ON.
★ Check that the 20A external display lamp fuse inside the fuse box is not blown.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Check that the lamp bulb is not blown.
★ Always connect any disconnected connectors before going on to the next step.



LC-2 Related electrical circuit diagram



TWH00352

LC-13 F-25 – F-28 is displayed: Short circuit in suspension pressure sensor system power source

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

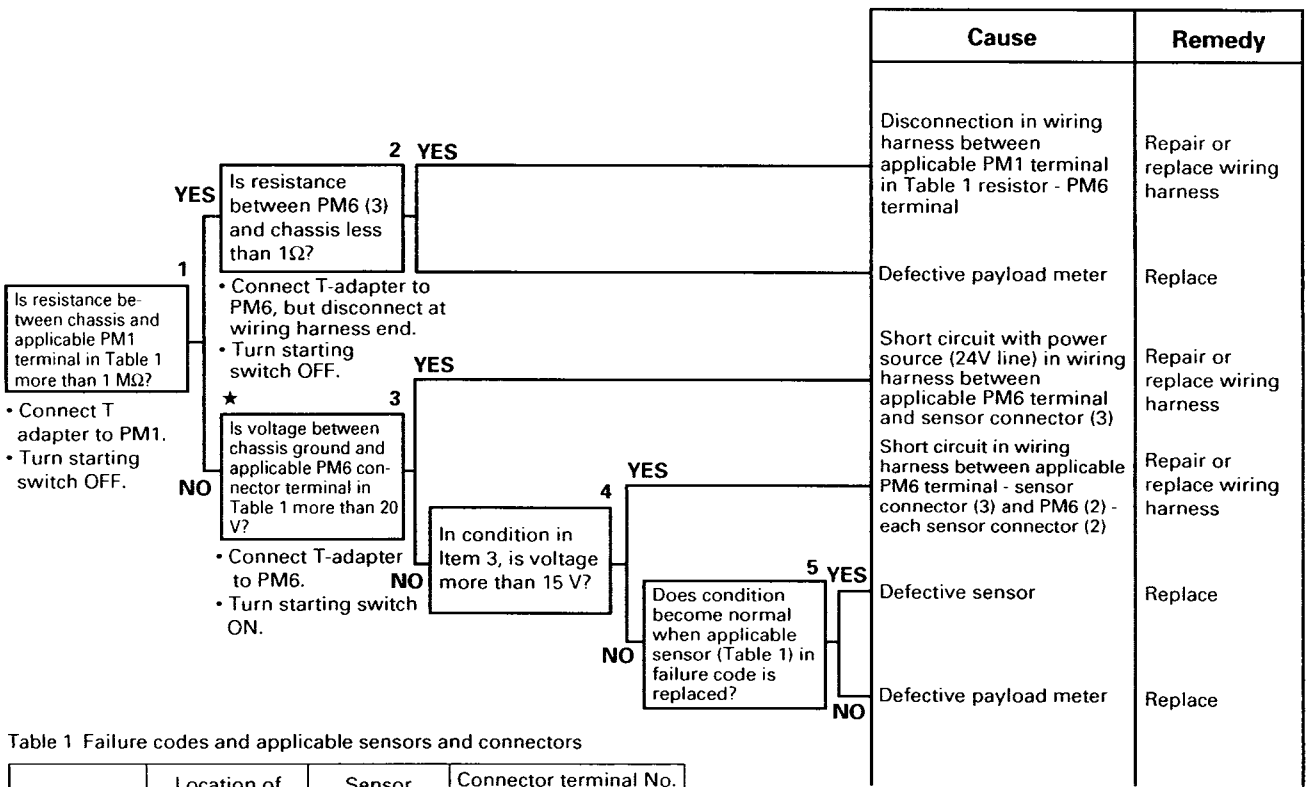


Table 1 Failure codes and applicable sensors and connectors

Failure code	Location of sensor	Sensor connector No.	Connector terminal No.		
			PM6	PM1	J04
F-25	Front left FL	13	(4)	(15)	(2)
F-26	Front right FR	39	(5)	(14)	(3)
F-27	Rear left RL	62	(6)	(13)	(4)
F-28	Rear right RR	63	(7)	(12)	(5)

4. WHEN SYSTEM IS NORMAL

A code is displayed on the controller LED under the assistant's seat.

No.	Code	Conditions
1	0.0	When accelerator pedal is being depressed
2	0.0.	When accelerator pedal is not being depressed

★ If the above code is not displayed when the accelerator pedal is being depressed or not being depressed, it is necessary to adjust the accelerator link. If it is not properly adjusted, the ARSC system will not be able to judge correctly if the accelerator pedal is being depressed or not, so the ARSC may not work normally.

★ Note that this function is not installed to the combination system of ASR and ARSC (the system that uses the ASR-II controller).

5. METHOD OF MODEL SELECTION, TIRE LARGE DIAMETER/SMALL DIAMETER, REFERENCE FOR FAILURE CODE

When the machine starting switch is turned ON, the codes below are automatically displayed in the following order ((1) – (6)) on the controller LED.

① LEDs all light up.

② Model

Code	Model name
32	HD325-6, HD465-6
46	HD465-5, HD605-5
78	HD785-5
98	HD985-5

③ Tire diameter

Code	Tire diameter
B.–	Large diameter
S.–	Small diameter

For the HD325-6 and HD405-6, "– –" is displayed.

For the HD985-5, "– –" is displayed.

④ Initial service code

⑤ Service code that occurred immediately before the service code in ④

⑥ Service code that occurred immediately before the service code in ⑤

6. METHOD OF CLEARING SERVICE CODE

Turn the machine starting switch to ON (the engine is not started) and disconnect connectors CR1 and CR2 under the assistant's seat.

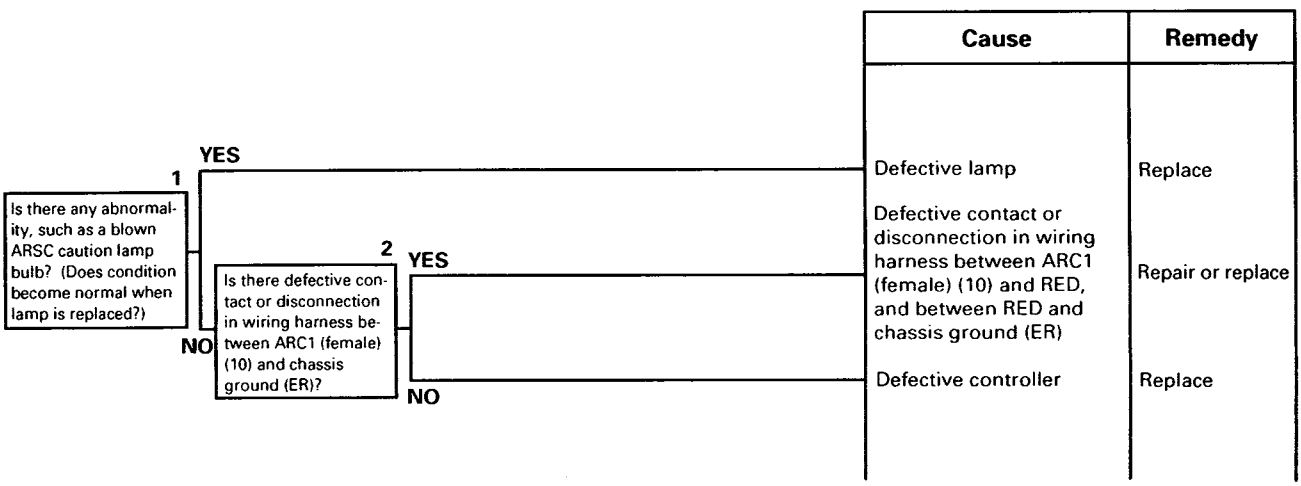
When this is done, "– –" is displayed on the controller LED.

When the "– –" changes from flashing and stays lighted up (3 seconds), the failure code has been cleared.

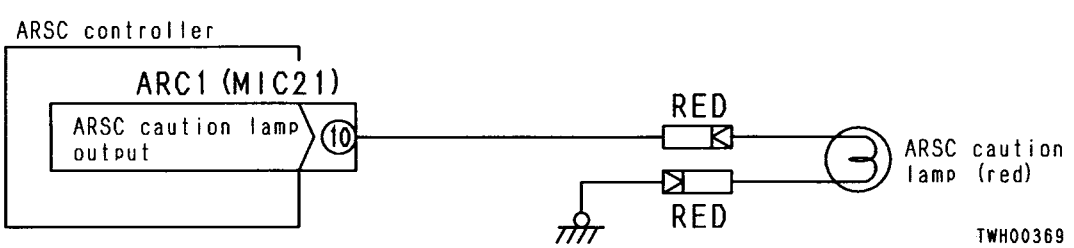
★ When using the ARSC for the first time, always clear the service codes. After clearing the codes, connect connectors CR1 and CR2.

R-9 4.3 (Disconnection in ARSC caution lamp system) is displayed

★ **Troubleshooting is carried out while the abnormality is being generated, so when the connector is disconnected and the T-adapter is inserted, or when the T-adapter is removed and the connector is connected again to its original position, if the error code is not displayed on the monitor, the system has been reset.**
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.
★ The controller observes if there is any disconnection in the output circuit of ARSC caution lamp.
★ Check for defective contact or disconnection in wiring harness between the controller and lamp, in the lamp itself, and lamp - cab ground.

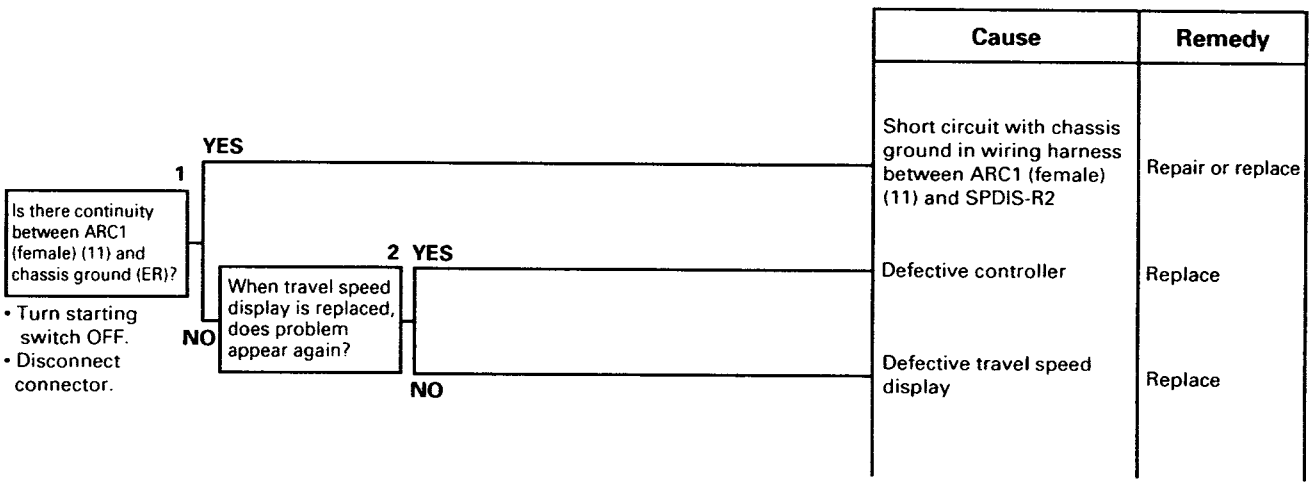


R-9 Related electrical circuit diagram

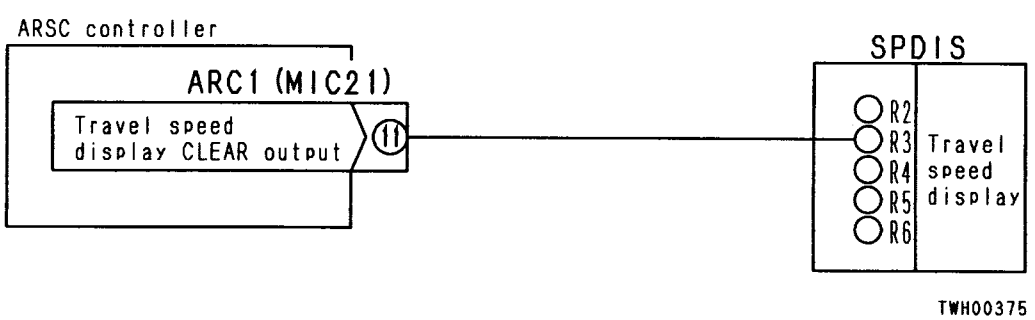


R-22 7.5 (Short circuit with ground in travel speed display CLEAR output system) is displayed

★ **Troubleshooting is carried out while the abnormality is being generated, so when the connector is disconnected and the T-adapter is inserted, or when the T-adapter is removed and the connector is connected again to its original position, if the error code is not displayed on the monitor, the system has been reset.**
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.
★ The controller observes if there is any short circuit with the ground in the CLEAR output to the travel speed display.

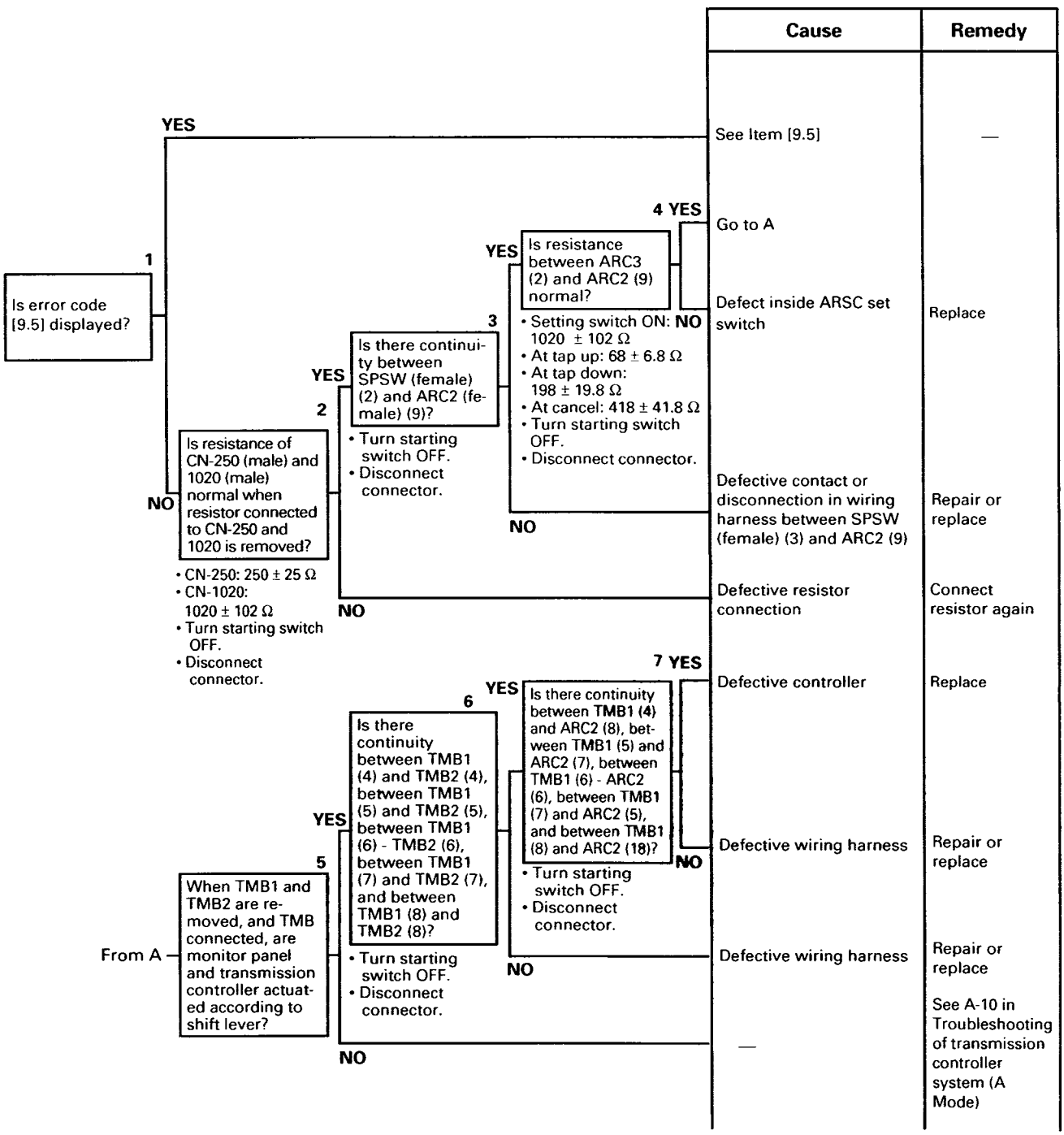


R-22 Related electrical circuit diagram



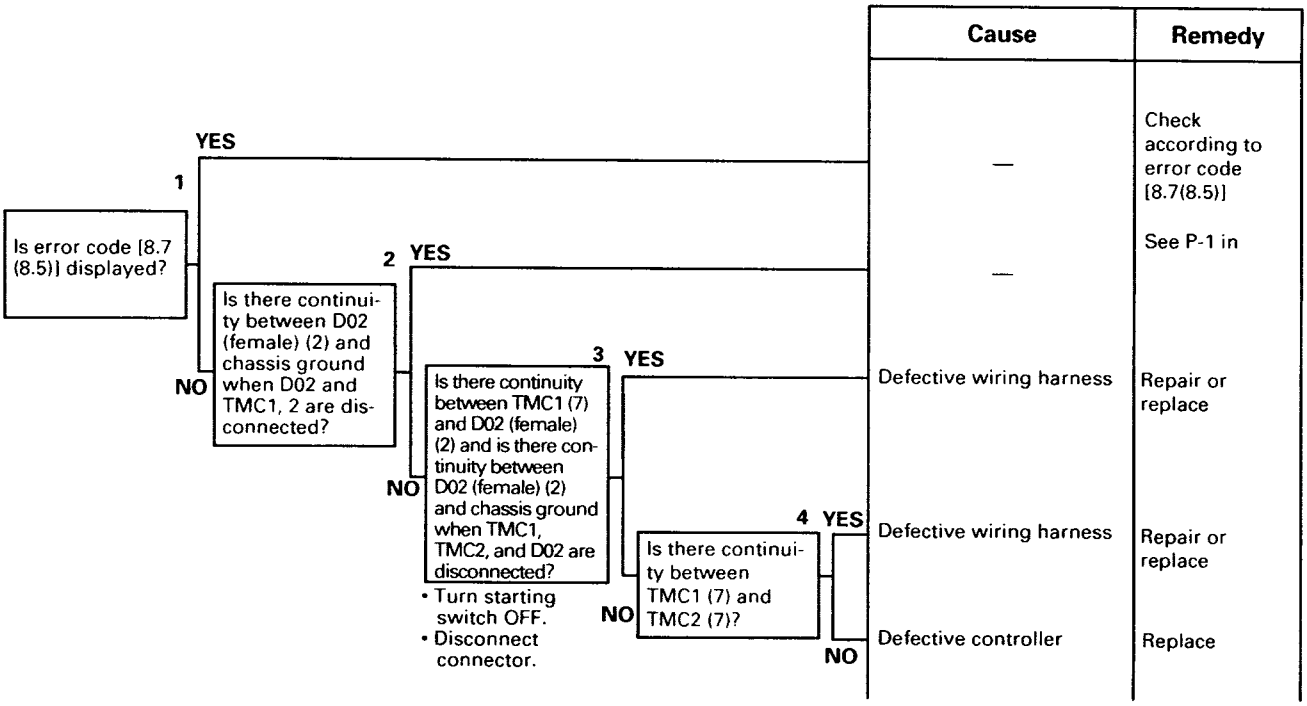
c) Tap up/down, cancel cannot be operated

★ This is a failure in setting switch system circuit or a failure in shift lever system circuit.

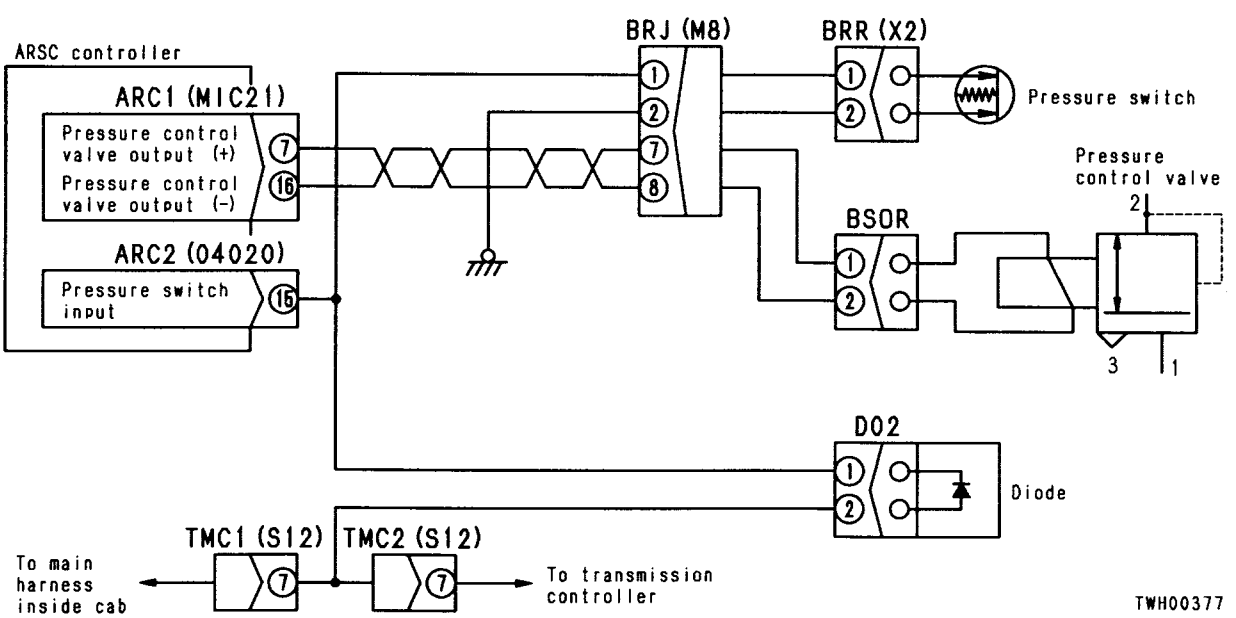


R-110 Retarder lamp does not light up, or stays lighted up

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.



R-110 Related electrical circuit diagram



H-8 Torque converter oil temperature is high

Ask the operator the following questions
- Does oil temperature go up when torque converter is stalled and go down when torque converter is not stalled?
  Yes = Normal (incorrect selection of speed range)

Checks before troubleshooting
- Is oil level in transmission or steering case correct?

Checking for abnormalities
- Use STANDARD VALUE TABLE to judge if torque converter oil temperature is actually high.

★ If oil temperature is normal but oil temperature gauge on machine goes above operating range
→ **defective oil temperature gauge**

The following symbols are used to indicate the action to be taken when a cause of failure is located.
X: Replace △: Repair
A: Adjust C : Clean

No.	Problems \ Remedy	C	△ / ×	×	×	△ / ×	△ / ×
	Causes		*Clogged strainer*	*Air sucked in at suction side of pump*	*Defective pump*	*Clogged filter*	*Defective operation of torque converter relief valve* / *Oil leakage inside torque converter (defective seal ring, loose bolt, crack in pump, turbine)*
			Tank - pump			Torque converter	
			a	b	c	d	e / f
1	Pump makes abnormal noise when oil temperature is low	○					
2	High idle and low idle speeds are low						○
3	Torque converter outlet port oil pressure is low						○
4	Torque converter inlet port oil pressure is low					○	
5	Transmission modulating pressure is low	○	○				
6	Excessive leakage inside torque converter						○

If troubleshooting shows that all other items are normal, this is the cause.

ACTION TAKEN BY SELF-DIAGNOSTIC DEVICE AND PROBLEMS ON MACHINE

• MONITOR PANEL SYSTEM

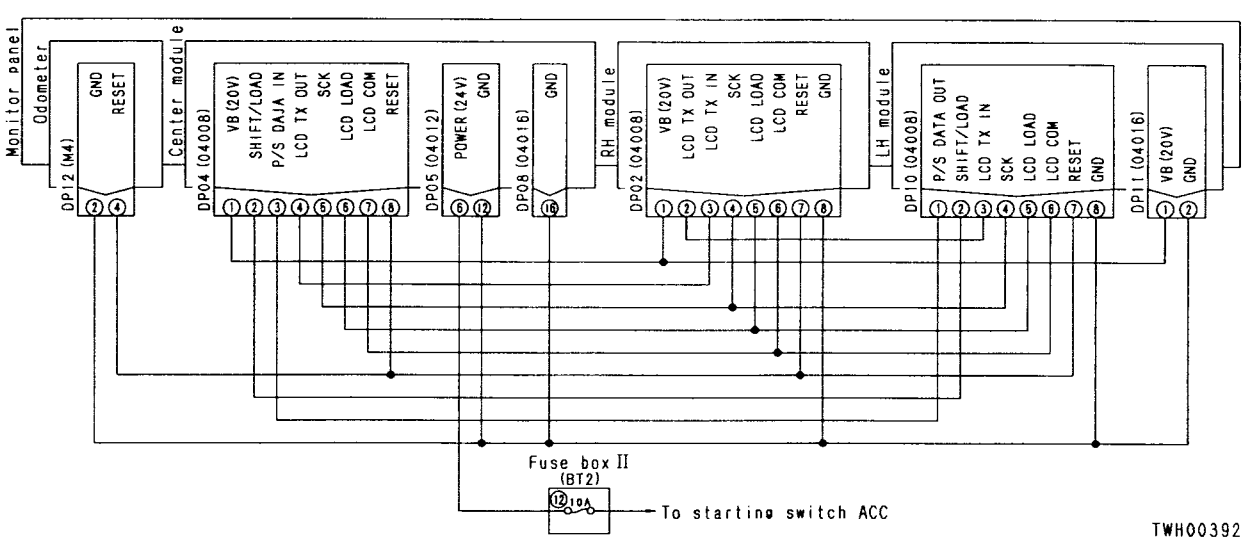
Display code	Abnormal system ★ Judgment conditions	Details of abnormality Check the wiring harnesses and equipment given below : Disconnection, short circuit in wiring harness (+): Positive, (–): Negative
A001	Short circuit in lamp output system inside dashboard ★ Short circuit in output system	1. Between (+) lamp inside dash panel and monitor panel (For details, see troubleshooting P-16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44) 2. Defective lamp
A002	Short circuit in central warning lamp output system ★ Short circuit in output system	1. Between (+) DP08 (2) and WL (2) 2. Defective central warning lamp
A003	Short circuit in alarm buzzer output system ★ Short circuit in output	1. Between (+) DP08 (2) and BZ (2) 2. Defective alarm buzzer
A012	Abnormality in network system ★ Connection data does not match.	1. Defective setting of shift controller model selection
A013	Abnormality in network system ★ Transmission controller system	1. Between (+) DP05 (3) - TMD (10) - ATC4 (6) 2. Between (+) DP05 (4) - TMD (12) - ATC4 (12) 3. Between (–) DP05 (5) - TMD (9) - ATC4 (10) 4. Between (–) DP05 (5) - TMD (11) - ATC4 (10) 5. Defective shift controller
A014	Abnormality in network system ★ PMC system	1. Between (+) DP05 (3) and PMC (1) 2. Between (+) DP05 (4) and PMC (2) 3. Between (–) DP05 (5) and PMC (3) 4. Defective PMC

P-5 RH module does not work

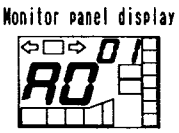
★ Before carrying out troubleshooting, check that all the connectors related to the wiring harnesses between the modules are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.
★ For details of Table a, see P-1.

	Cause	Remedy
1 Is result of check of wiring harnesses between modules normal? (Check A-4, A-5, A-6, and A-7 in Table a) YES	—	See Trouble-shooting P-13
NO	Disconnection in wiring harness between modules where there is improper continuity	After inspec-tion, repair or replace

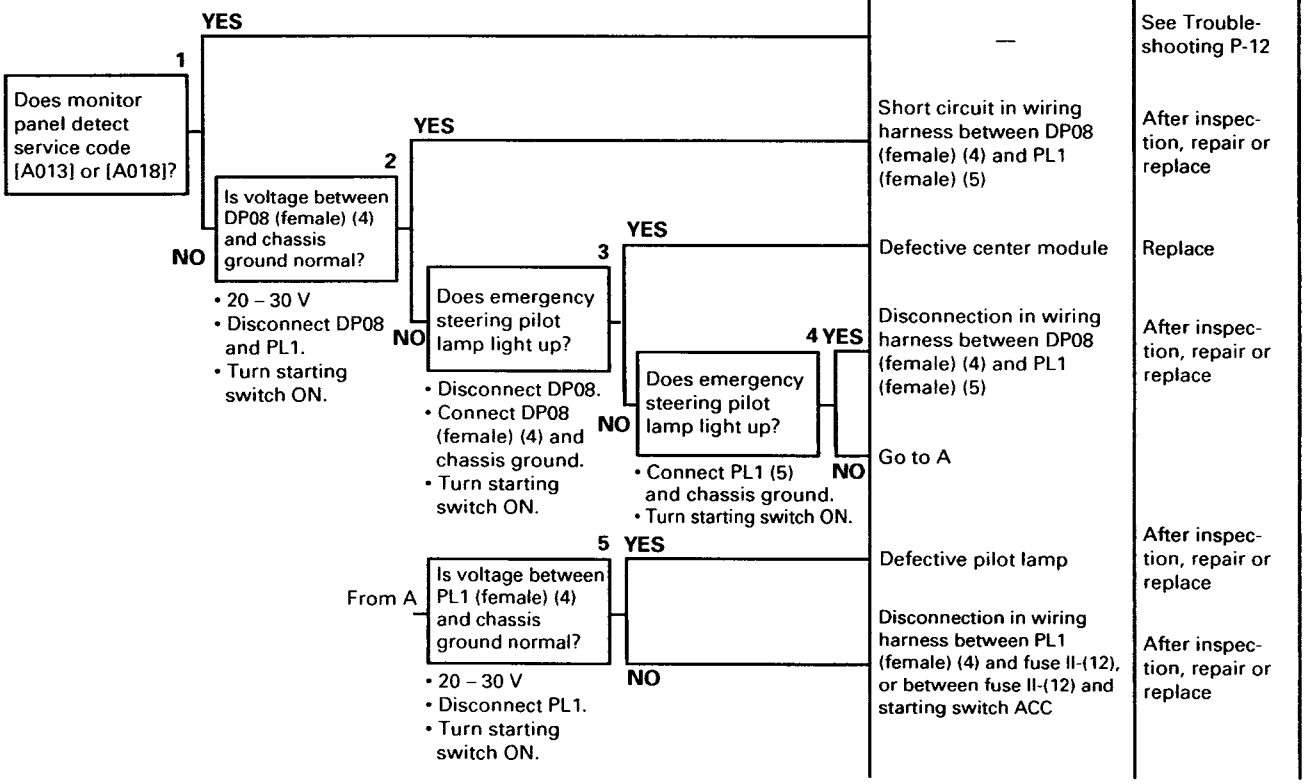
P-5 Related electrical circuit diagram



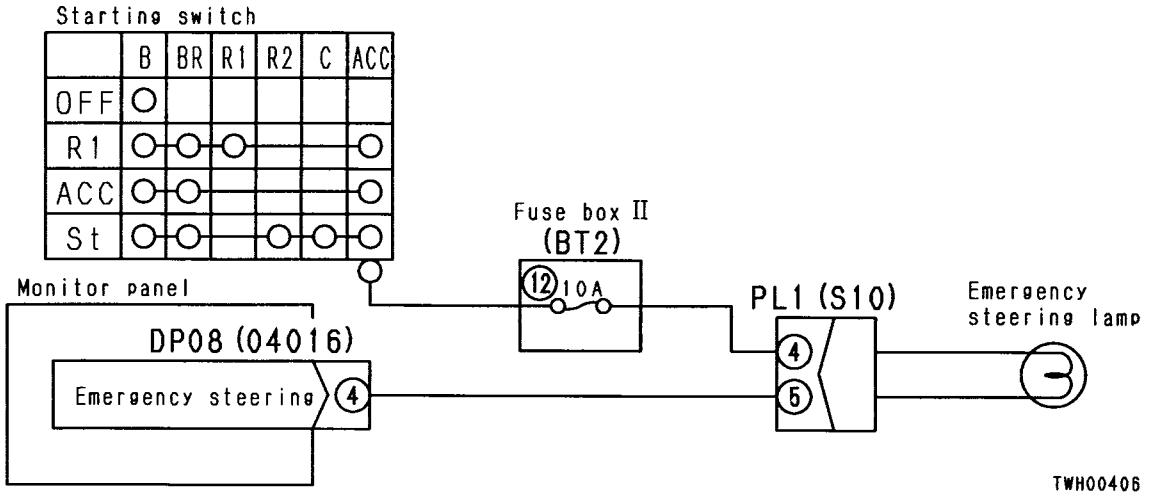
P-18 Emergency steering pilot lamp does not work, or monitor panel detects service code



★ Before carrying out troubleshooting, check that all the connectors related to the wiring harnesses between the modules are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

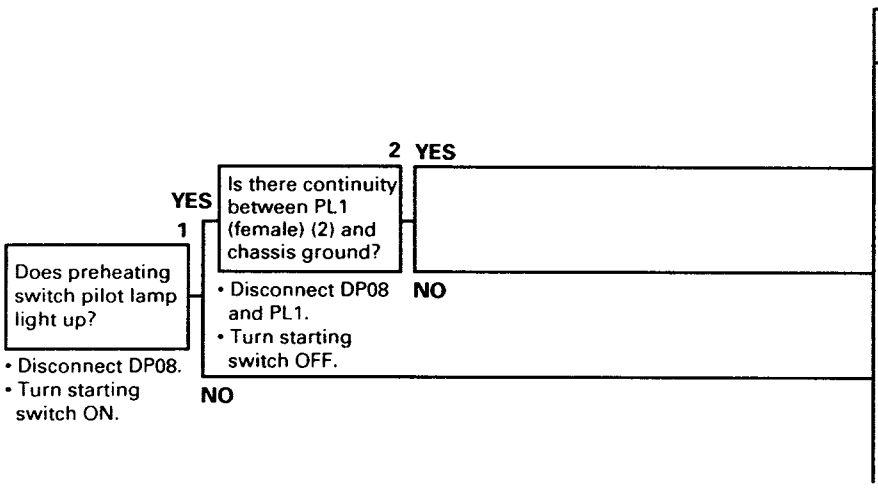


P-18 Related electrical circuit diagram



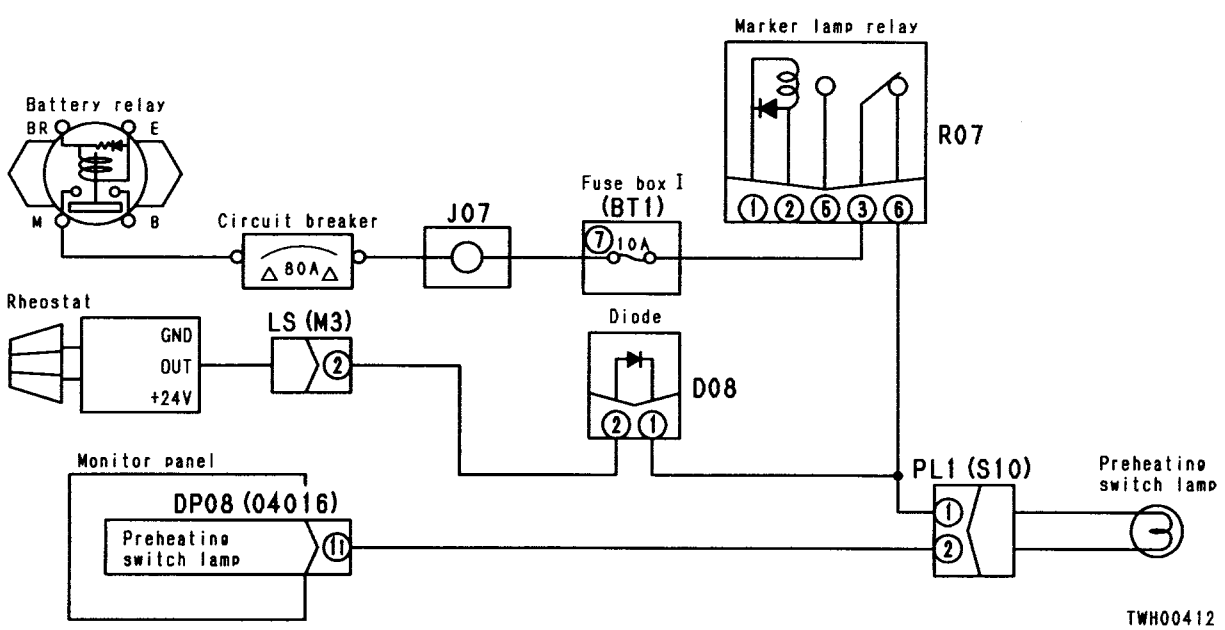
P-31 Preheating switch pilot lamp stays lighted up

★ Before carrying out troubleshooting, check that all the connectors related to the wiring harnesses between the modules are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.



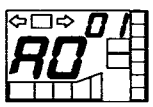
Cause	Remedy
Short circuit with chassis ground in wiring harness between DP08 (female) (11) and PL1 (female) (2)	After inspection, repair or replace
Pilot lamp body in contact with chassis ground, or contact of chassis ground with wiring harness between pilot lamp and PL1 (male) (2)	After inspection, repair or replace
Defective center module	Replace

P-31 Related electrical circuit diagram



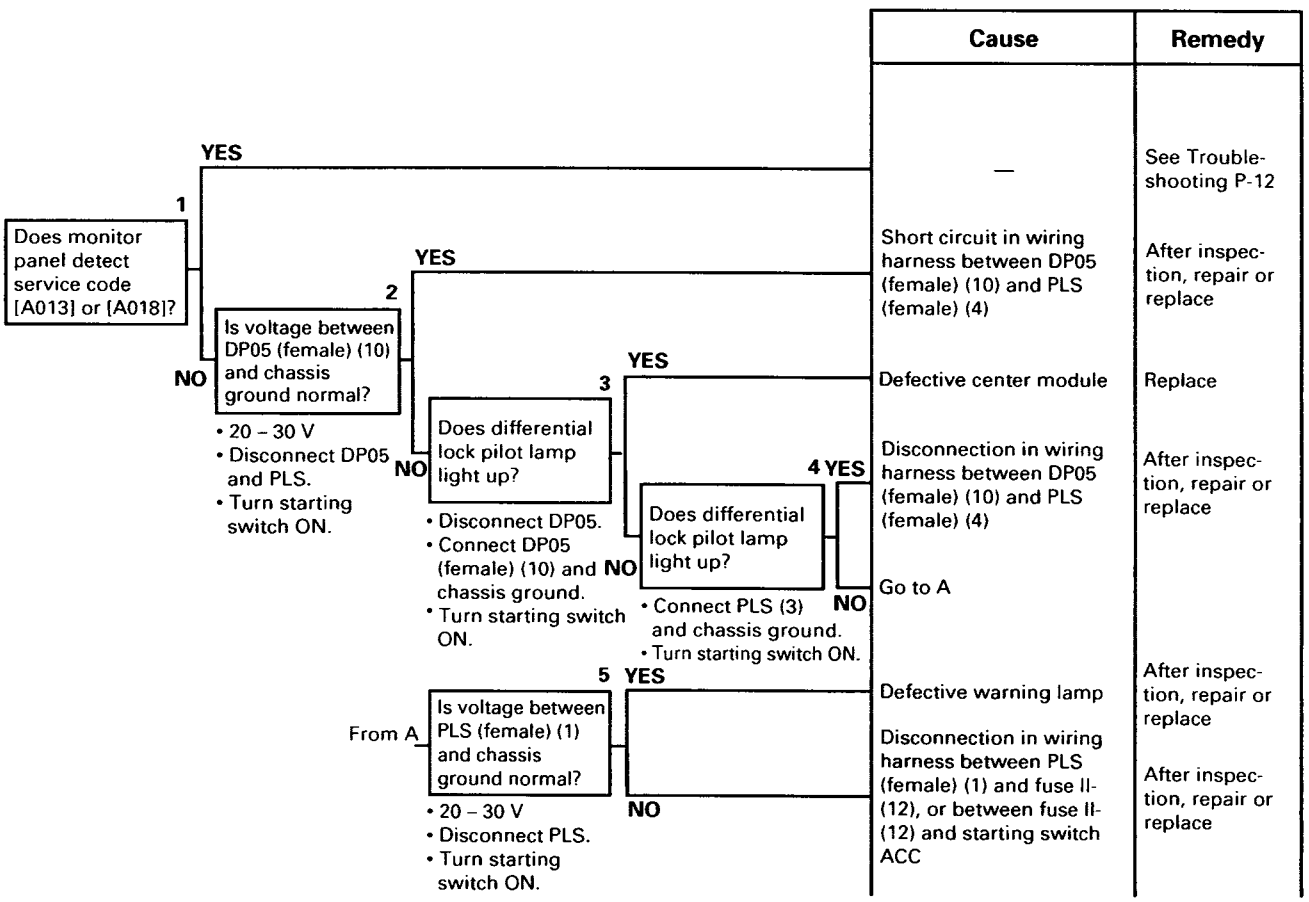
P-44 Differential lock pilot lamp does not work, or monitor panel detects

Monitor panel display

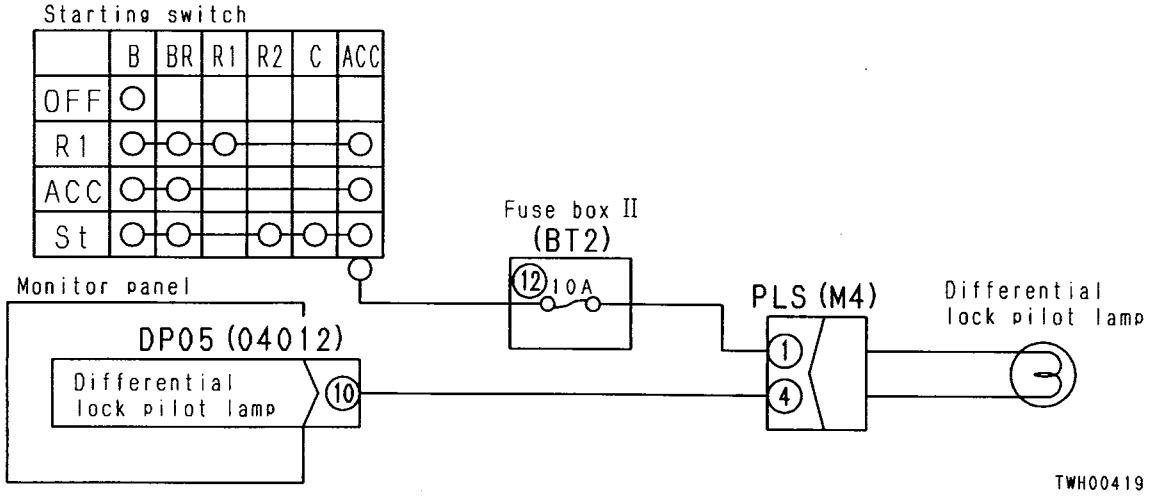
service code 

TWH00404

★ Before carrying out troubleshooting, check that all the connectors related to the wiring harnesses between the modules are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

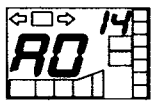


P-44 Related electrical circuit diagram



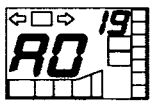
TWH00419

P-56 Monitor panel detects service codes

Monitor panel display 

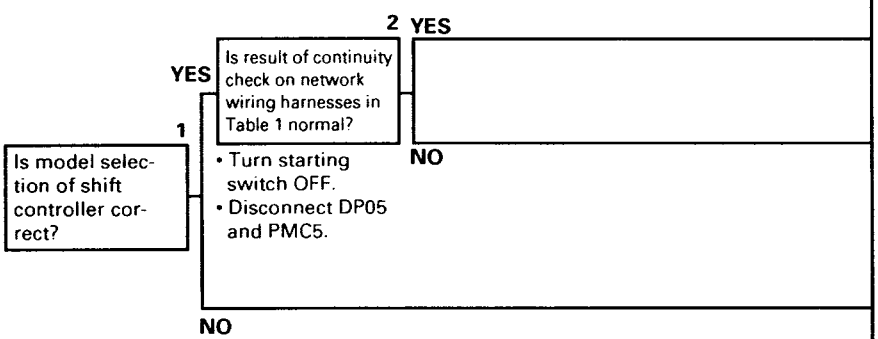
TWH00427

or

Monitor panel display 

TWH00428

★ Before carrying out troubleshooting, check that all the connectors related to the wiring harnesses between the modules are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

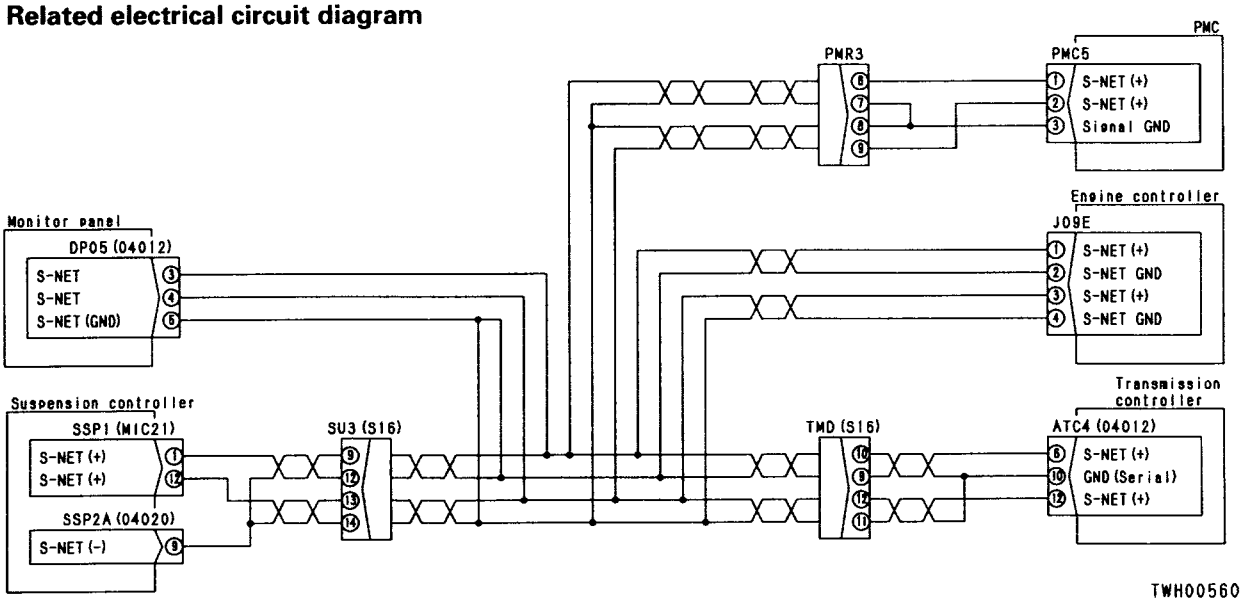


Cause	Remedy
Defective PMC	Replace
Disconnection in wiring harness where there is improper continuity	After inspection, repair or replace
Defective model selection of shift controller	For details of adjusting, see TESTING AND ADJUSTING, SETTING ROTARY SWITCH (MODEL DATA, NETWORK DATA) WHEN REPLACING TRANSMISSION CONTROLLER.

Table 1

No.	Monitor panel end	PMC end	Judgment
1	DP05 (female) (3)	PMC5 (female) (1)	Continuity = Normal
2	DP05 (female) (4)	PMC5 (female) (2)	Continuity = Normal
3	DP05 (female) (5)	PMC5 (female) (3)	Continuity = Normal
4	DP05 (female) (3)	PMC5 (female) (3)	No continuity = Normal
5	DP05 (female) (4)	PMC5 (female) (3)	No continuity = Normal

P-56 Related electrical circuit diagram



TWH00560

Monitor panel display: E0 13 (13 : Flashes)

TWH00602

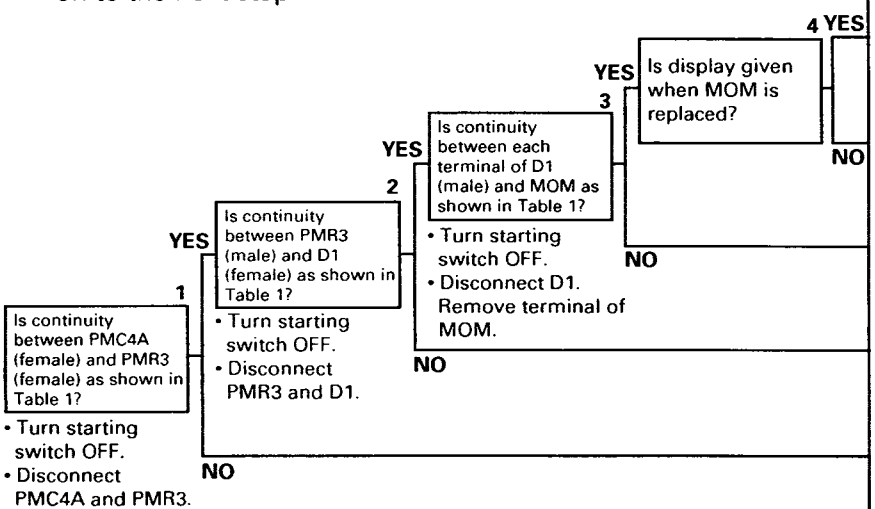
M-6 Disconnection in MOM communications is displayed

Monitor panel display: E0 14 (14 : Flashes)

TWH00603

Abnormality in MOM communications is displayed

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

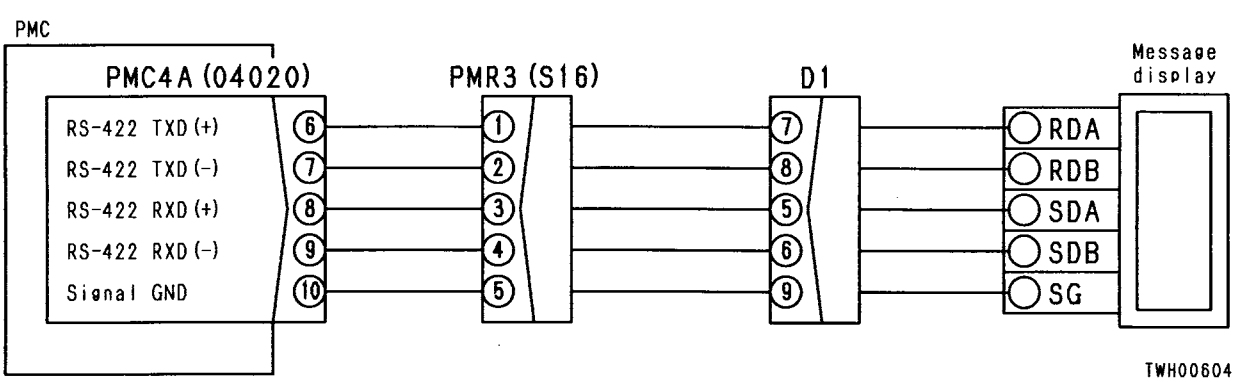


Cause	Remedy
Defective PMC	Replace
System has been reset	—
Defective contact or disconnection in wiring harness between D1 and MOM	Repair or replace wiring harness
Defective contact or disconnection in wiring harness between PMR3 and D1	Repair or replace wiring harness
Defective contact or disconnection in wiring harness between PMC4A and PMR3	Repair or replace wiring harness

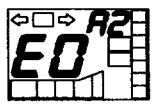
Table 1

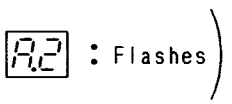
PMC4A	PMR3	D1	MOM	Continuity
(6)	(1)	(7)	RDA	YES
(7)	(2)	(8)	RDB	YES
(8)	(3)	(5)	SDA	YES
(9)	(4)	(6)	SDB	YES
(10)	(5)	(9)	SG	YES

M-6 Related electrical circuit diagram



TWH00604

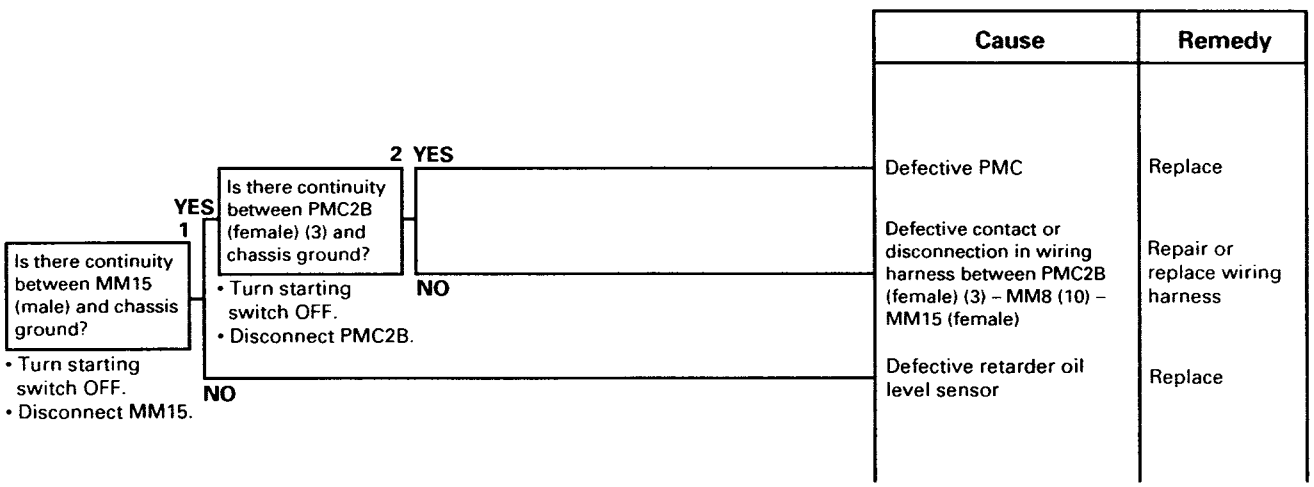
Monitor panel display: 

Controller display: 

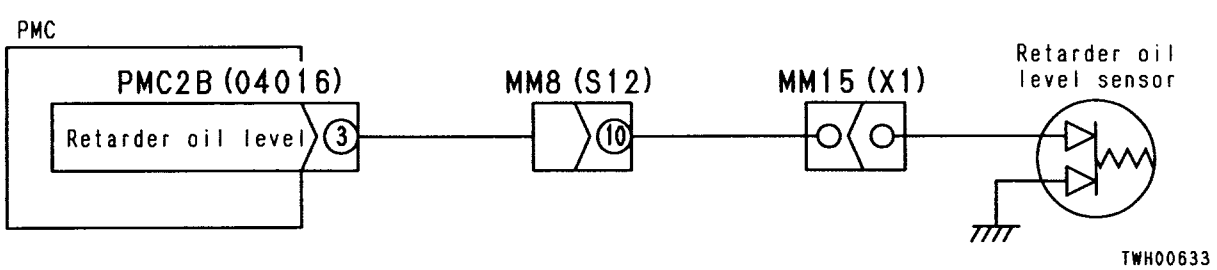
TWH00632

M-18 When engine is not running, drop in retarder oil level is displayed

★ Before starting troubleshooting, check the retarder oil level again.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

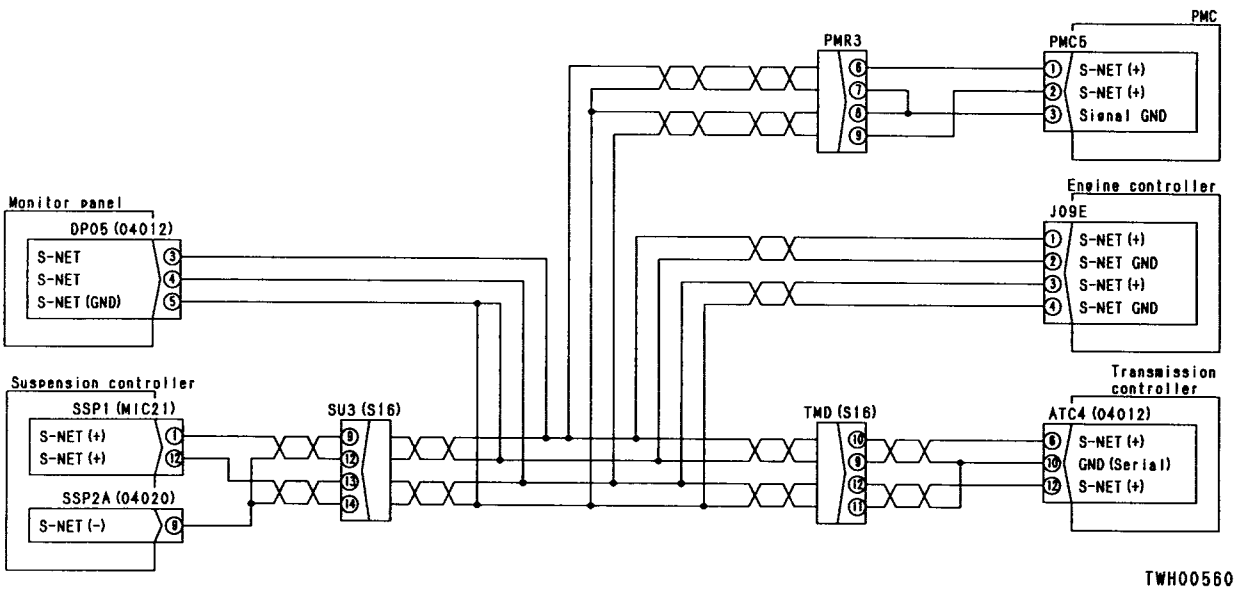


M-18 Related electrical circuit diagram



TWH00633

M-29 Related electrical circuit diagram



INDEX (troubleshooting code)

- **Machines with ABS installed independently**

Number of flashing times			Failure mode	INDEX (Troubleshooting code)
1st block	2nd block	3rd block		
2	1	1		System is normal
2	9	9	Source voltage system	ABS – 18

Number of flashing times			Failure mode	INDEX (Troubleshooting code)
1st block	2nd block	3rd block		
2	2	★	Controller system	ABS – 1
2	10	★	Left front ABS valve system	ABS – 3
2	11	★	Right rear ABS valve system	ABS – 5
2	6	★	Left front wheel speed sensor system	ABS – 7
2	7	★	Right rear wheel speed sensor system	ABS – 9
2	3	★	Left front wheel speed sensor output system	ABS – 11
2	4	★	Right rear wheel speed sensor output system	ABS – 13
2	9	★	Valve relay 1 system	ABS – 15
2	13	★	Valve relay 1 system	ABS – 17

Number of flashing times			Failure mode	INDEX (Troubleshooting code)
1st block	2nd block	3rd block		
2	★	2	Controller system	ABS – 1
2	★	10	Right front ABS valve system	ABS – 2
2	★	11	Left rear ABS valve system	ABS – 4
2	★	6	Right front wheel speed sensor system	ABS – 6
2	★	7	Left rear wheel speed sensor system	ABS – 8
2	★	3	Right front wheel speed sensor output system	ABS – 10
2	★	4	Left rear wheel speed sensor output system	ABS – 12
2	★	9	Valve relay 2 system	ABS – 14
2	★	13	Valve relay 2 system	ABS – 16

In the columns marked with ★, "1" is displayed when normal and "Failure mode in each block" is displayed when abnormal.

(Explanation 1) When only the "left front ABS valve system" has a failure (The right front and left rear systems are normal).

Number of flashing times		
1st block	2nd block	3rd block
2	10	1

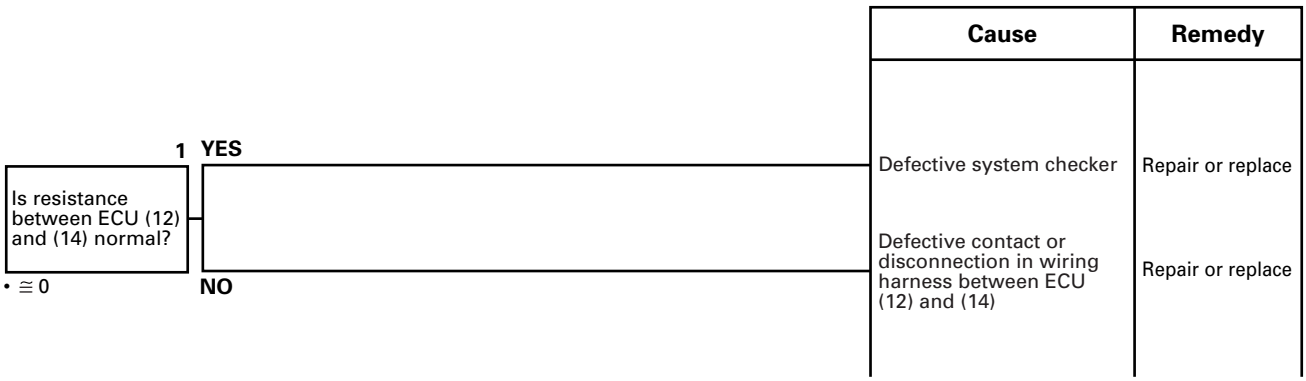
(Explanation 2) When the "left front ABS valve system" and the "right front wheel speed sensor system" have failures simultaneously.

Number of flashing times		
1st block	2nd block	3rd block
2	10	6

(Explanation 3) When only the "source voltage system" has a failure or when the "valve relay 1 system" and "valve relay 2 system" have failures simultaneously.

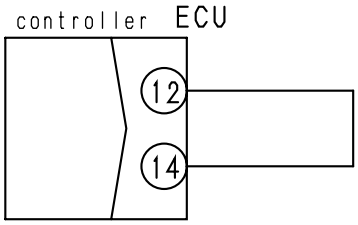
Number of flashing times		
1st block	2nd block	3rd block
2	9	9

ASR-2



Cause	Remedy
Defective system checker	Repair or replace
Defective contact or disconnection in wiring harness between ECU (12) and (14)	Repair or replace

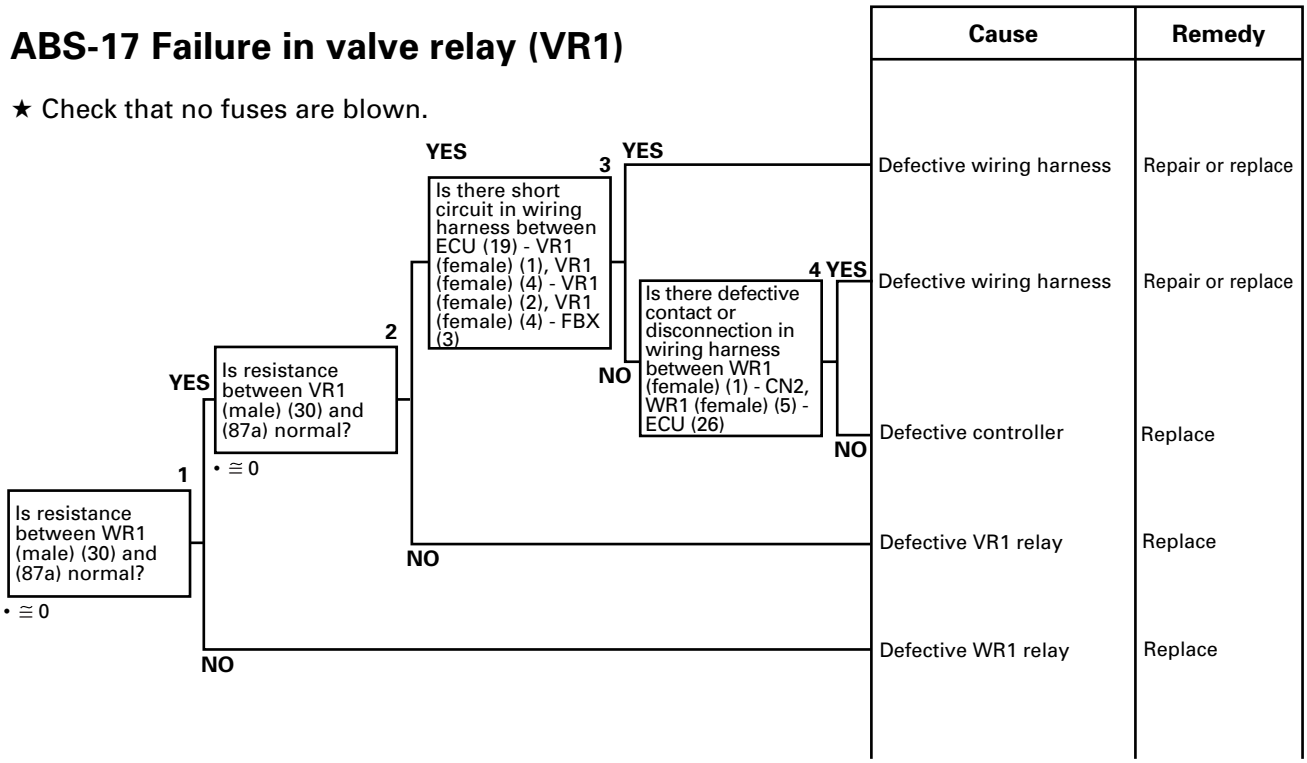
ASR-2 Related electrical circuit diagram



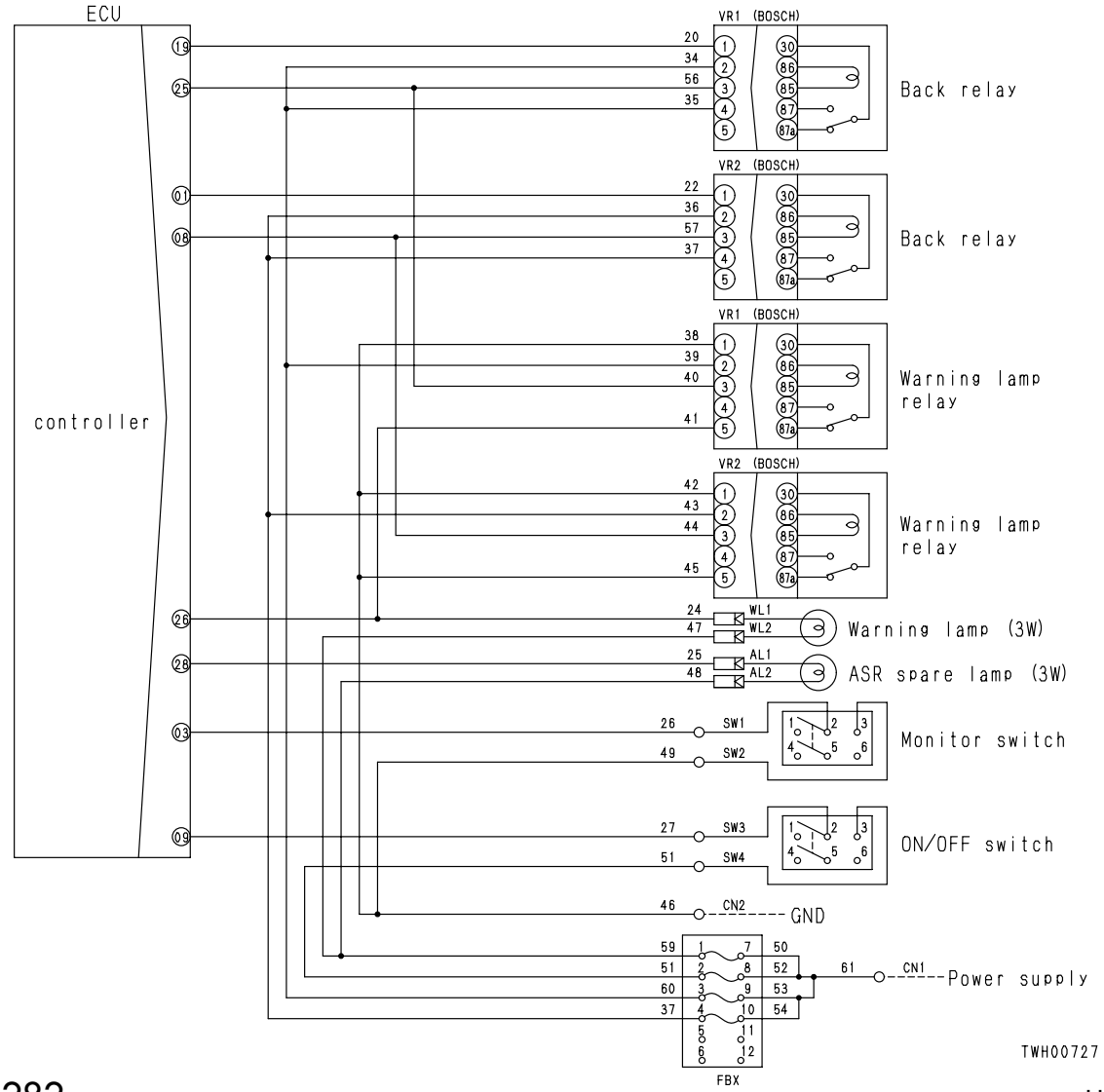
TWH00716

ABS-17 Failure in valve relay (VR1)

★ Check that no fuses are blown.

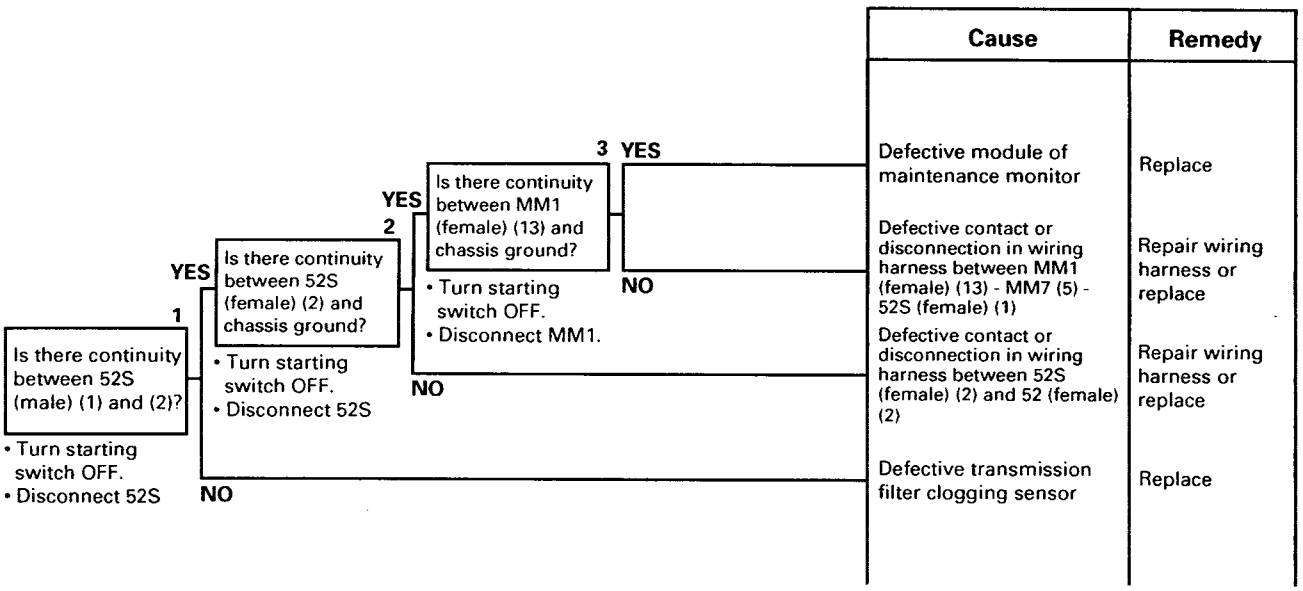


ABS-17 Related electrical circuit diagram

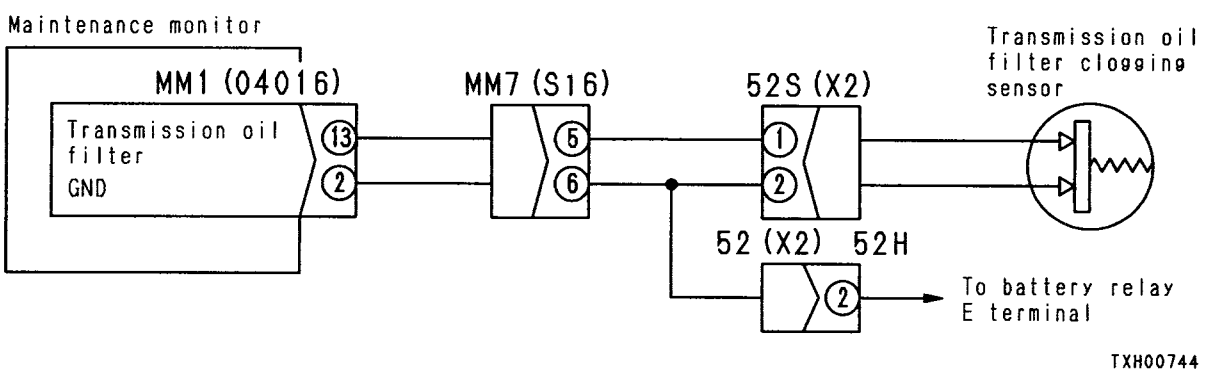


MM-11 When engine is running, transmission filter clogging display flashes

★ Check clogging of transmission filter again before starting troubleshooting.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

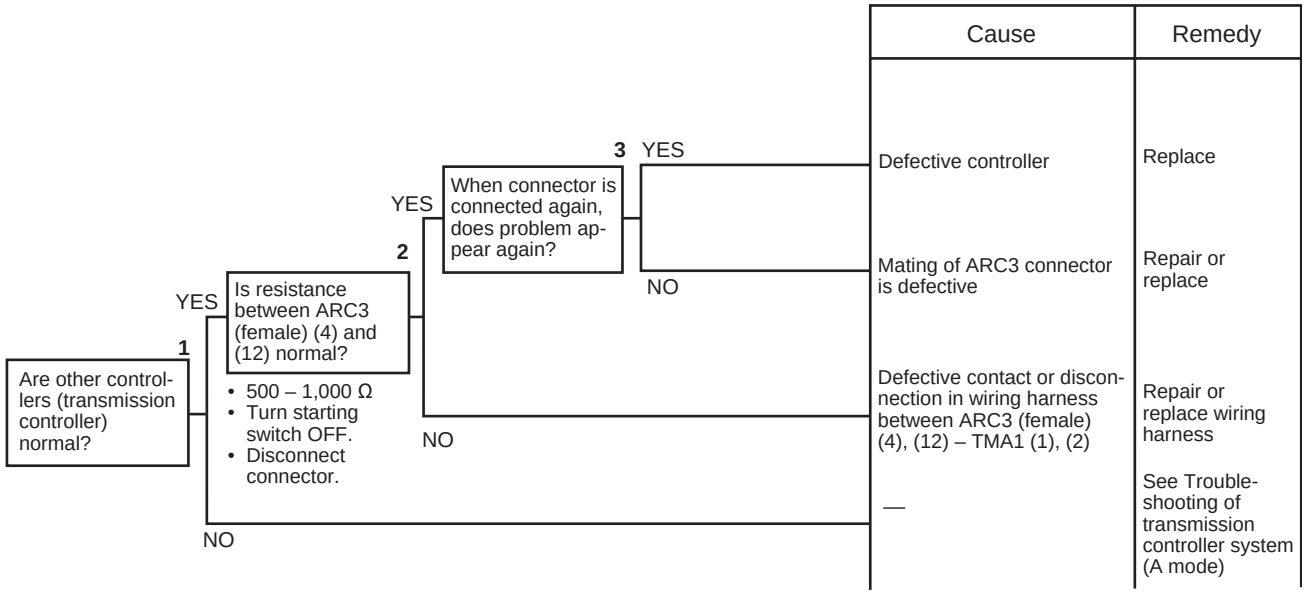


MM-11 Related electrical circuit diagram

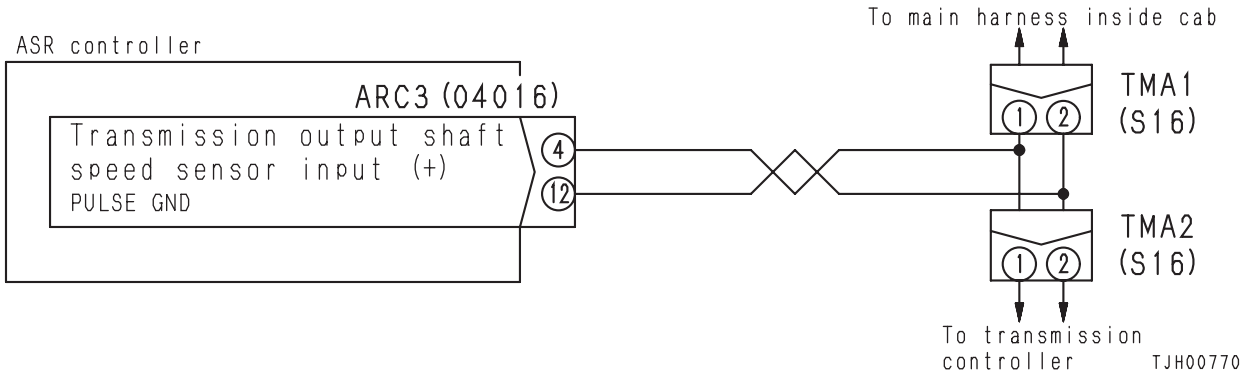


AS-5 Failure Code 1.3 "Disconnection in transmission output shaft speed sensor system" is displayed

★ **Troubleshooting is carried out while the abnormality is being generated, so when the connector is disconnected and the T-adapter is inserted, or when the T-adapter is removed and the connector is connected again to its original position, if the error code is not displayed on the monitor, the system has been reset.**
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.
★ The controller observes if there is any disconnection or other problem in the transmission output shaft speed sensor.
★ The transmission output shaft speed sensor is shared by the transmission controller and electronic display panel.
★ Divide into sensor – junction TMA, and TMA1 – ARC3 (4), (12) when checking. If there is no abnormality, judge that the controller is defective.

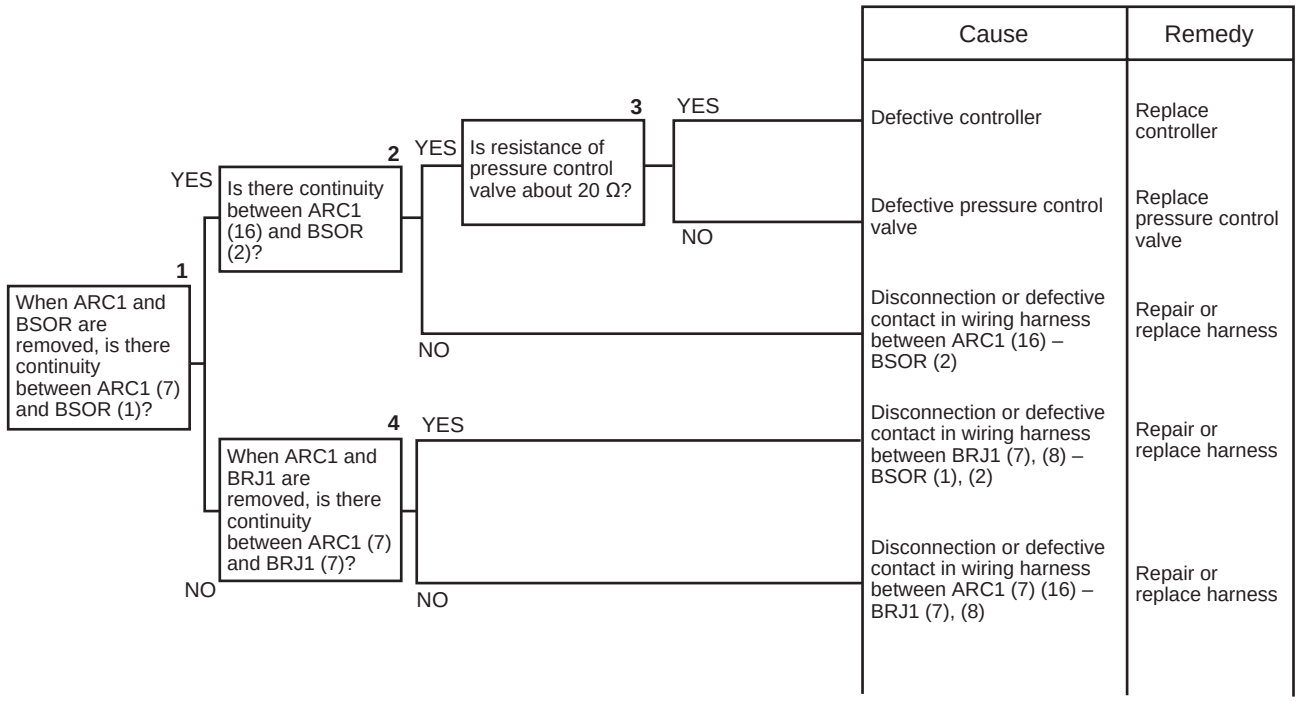


AS-5 Related electrical circuit diagram

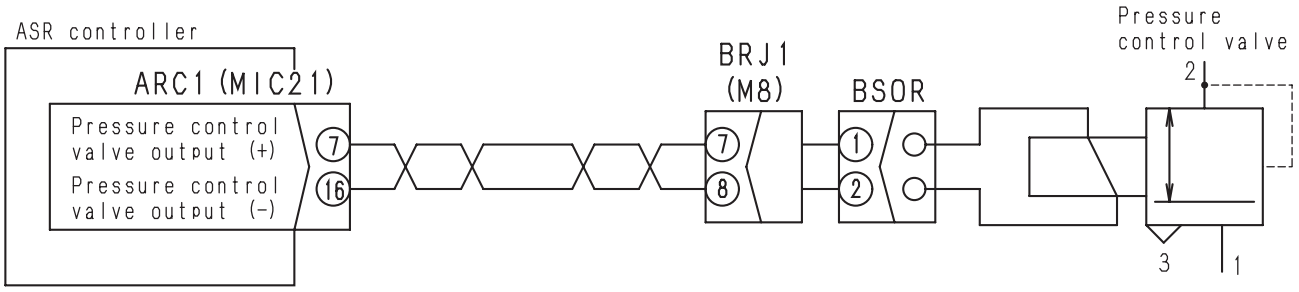


AS-18 Failure Code 8.3 "Disconnection in pressure control valve (R.H.) system" is displayed

★ **Troubleshooting is carried out while the abnormality is being generated, so when the connector is disconnected and the T-adapter is inserted, or when the T-adapter is removed and the connector is connected again to its original position, if the error code is not displayed on the monitor, the system has been reset.**
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.
★ The controller is checking the pressure control valve for disconnection.
★ Divide the system into the sections from ARC1 through junction connector BRJ1, from junction connector BRJ1 through BSOR, and pressure control valve and inspect those sections in order.



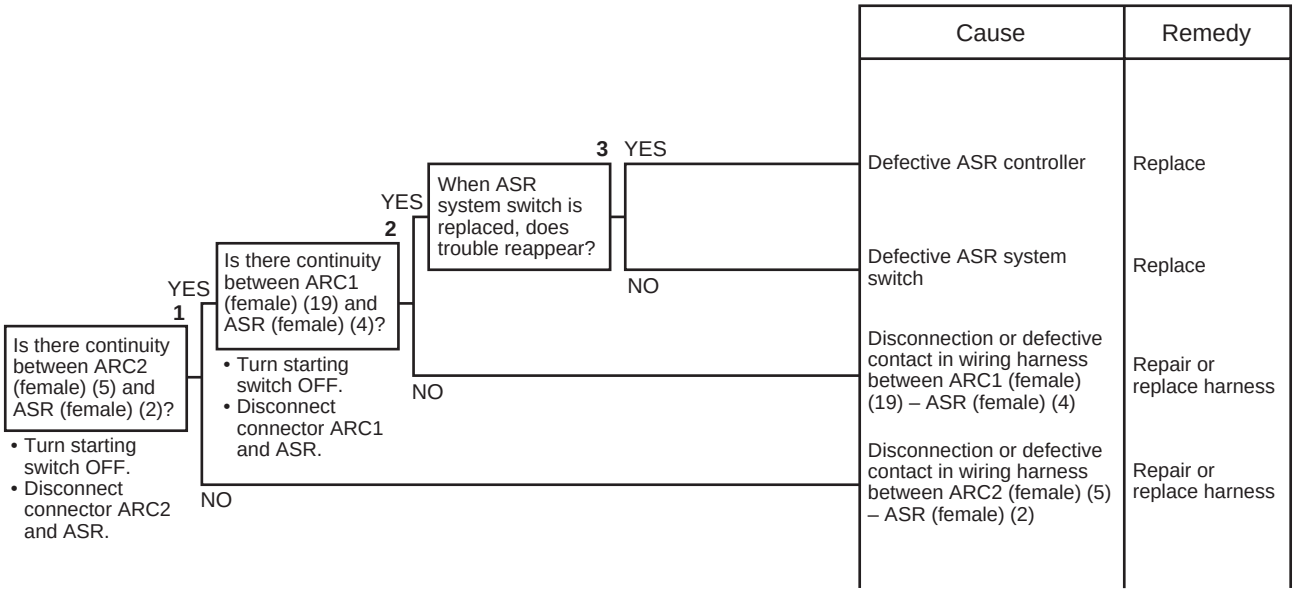
AS-18 Related electrical circuit diagram



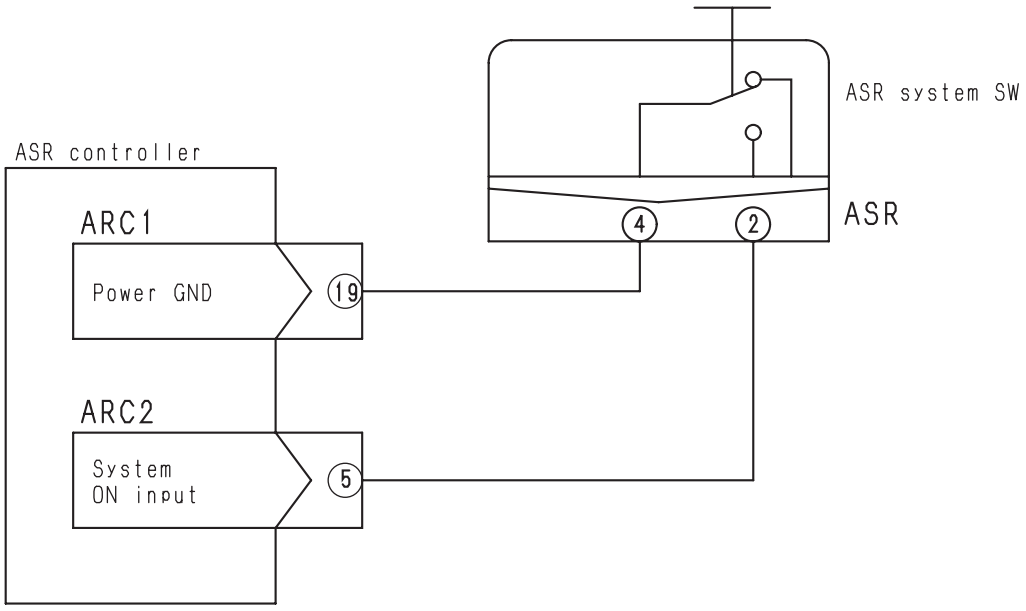
TJH00777

AS-105 Disconnection in switch system of ASR system

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.



AS-105 Related electrical circuit diagram



TJH00783

2-3. INSTALLATION DRAWING

A monitoring controller (VHMS controller) is installed on the machine, and data are collected when the engine, transmission and PLM II are operated.

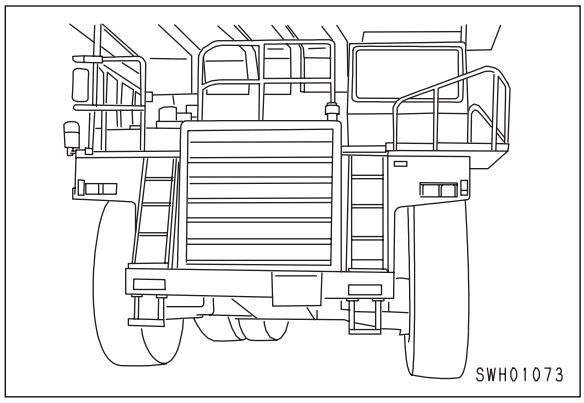
1) Data Collecting Function

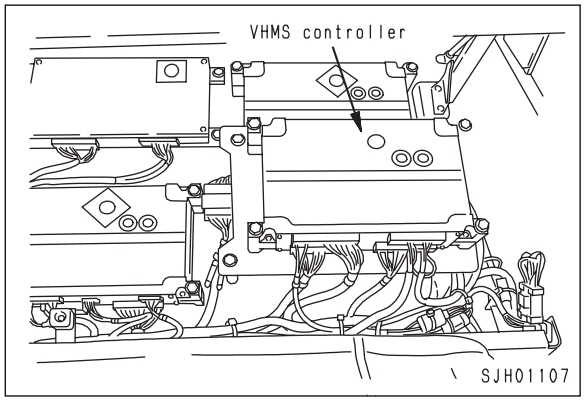
(1) Data from sensors connected
- Blow-by gas pressure
- Engine oil temperature
- Exhaust gas temperature

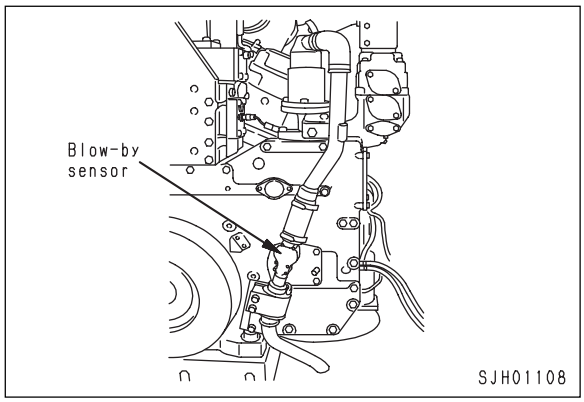
(2) Data from Controller Installed on Machine
- Engine speed
- Rack voltage (fuel injection amount)
- Engine oil pressure
- Data from transmission controller
- Data from PLMII Controller
- SMR

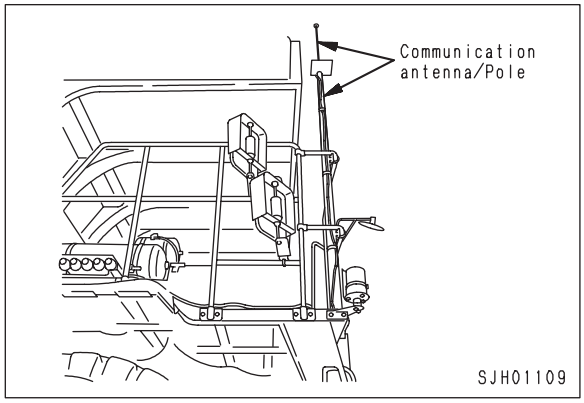
2) Data Storage
- The above data are stored and accumulated.

3) External Communication Function
- A personal computer (PC) is connected to the VHMS controller to download data, and data are transmitted through the Internet.
- Data are automatically transmitted from remote places through the communication satellite.



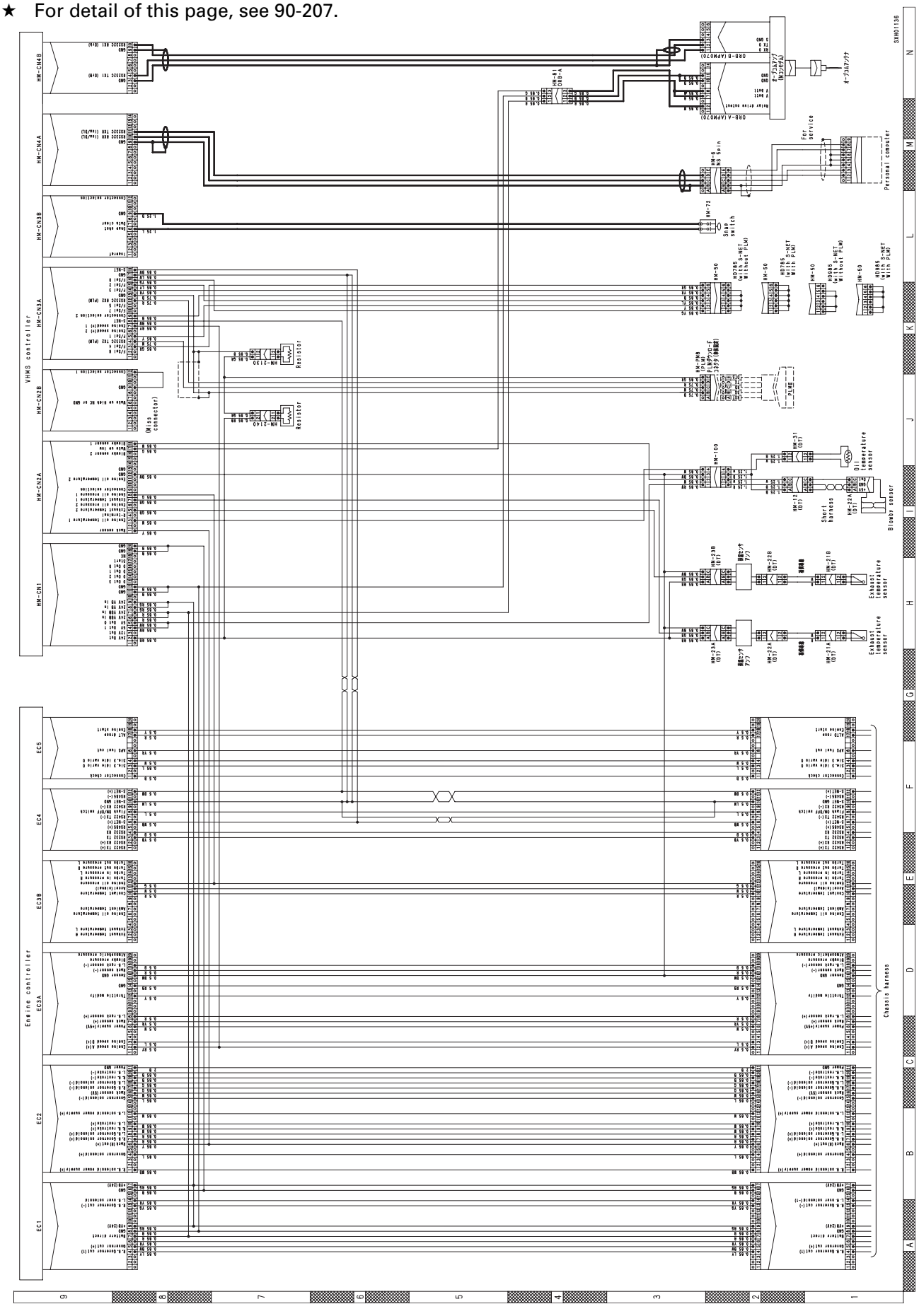




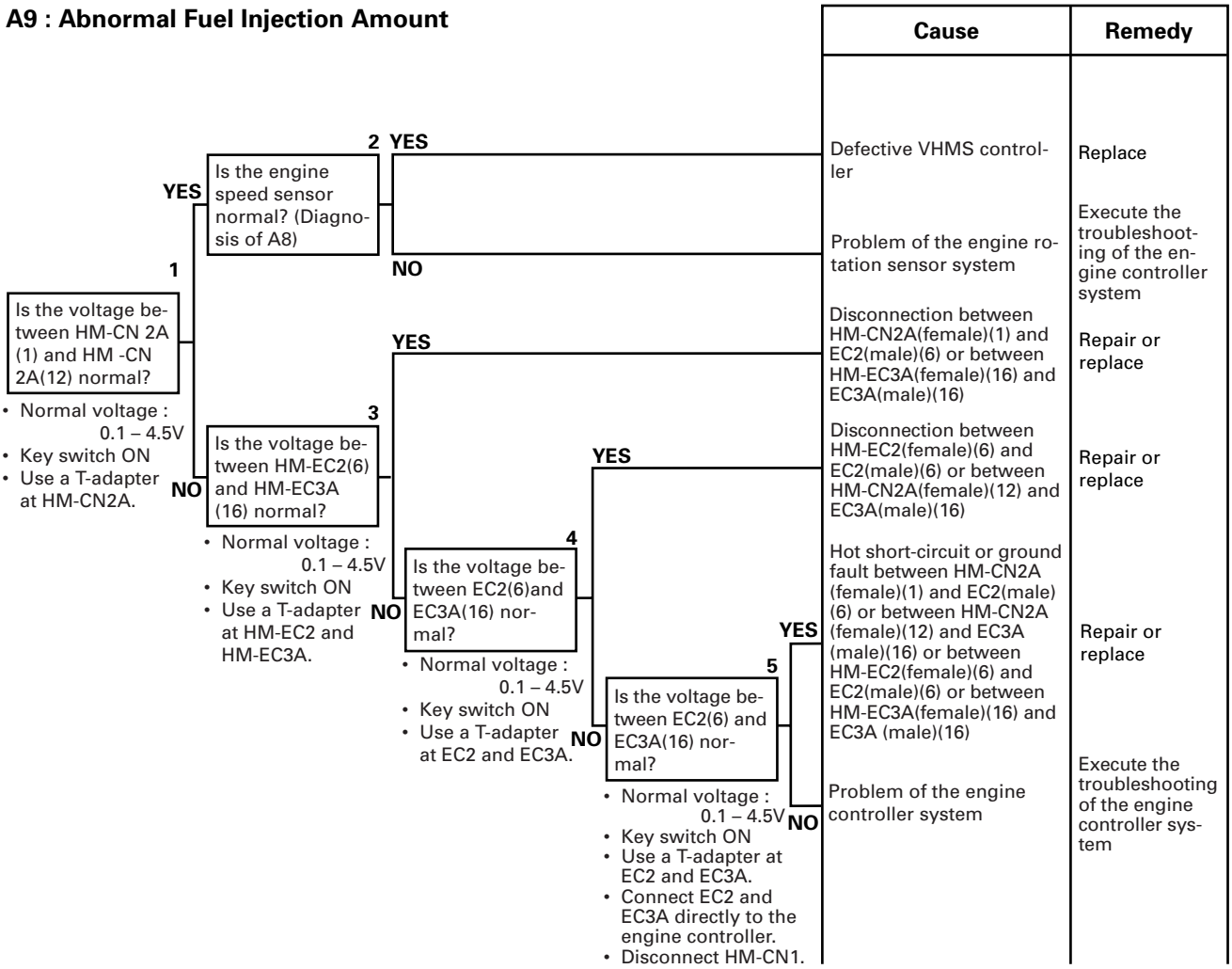


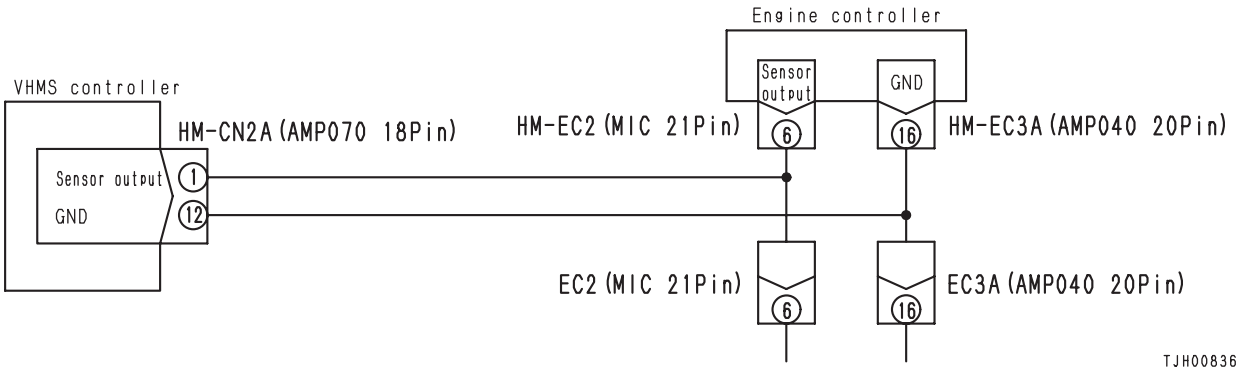
4-4. ELECTRICAL CIRCUIT DIAGRAM

★ For detail of this page, see 90-207.



A9 : Abnormal Fuel Injection Amount





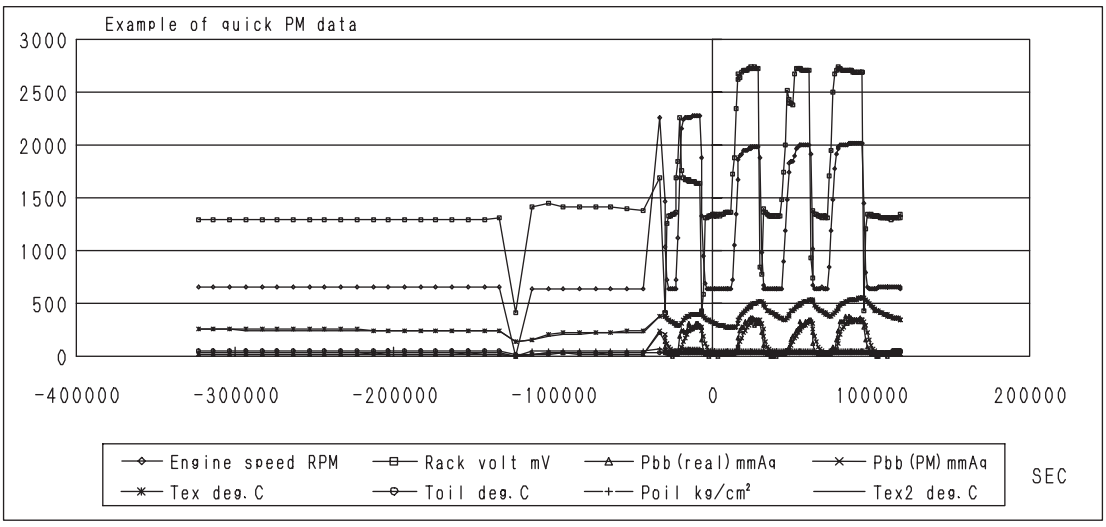
7-1-4. Check of Data

For the checking method of data, refer to the "Operation and Maintenance Manual of Analysis Tool."

- Make sure that each file is saved and does not contain abnormal data.
- Compare the Quick PM data with the PM Clinic data to make sure that they do not contain abnormal values.

<Check of Quick PM Data>

- Engine speed (Hi, torque converter stall)
- Blow-by pressure (Hi, torque converter stall)
- Exhaust gas temperature (Torque converter stall)
- Engine oil pressure (Li, Hi, torque converter stall)
- Engine oil pressure (No PM data ... Reference value)



DJH00279

2. Precautions when carrying out installation work

- Tighten all bolts and nuts (sleeve nuts) to the specified (KES) torque.
- Install the hoses without twisting or interference.
- Replace all gaskets, O-rings, cotter pins, and lock plates with new parts.
- Bend the cotter pins and lock plates securely.
- When coating with adhesive, clean the part and remove all oil and grease, then coat the threaded portion with 2 – 3 drops of adhesive.
- When coating with gasket sealant, clean the surface and remove all oil and grease, check that there is no dirt or damage, then coat uniformly with gasket sealant.
- Clean all parts, and correct any damage, dents, burrs, or rust.
- Coat rotating parts and sliding parts with engine oil.
- When press fitting parts, coat the surface with anti-friction compound (LM-P).
- After fitting snap rings, check that the snap ring is fitted securely in the ring groove.
- When connecting wiring connectors, clean the connector to remove all oil, dirt, or water, then connect securely.
- When using eyebolts, check that there is no deformation or deterioration, screw them in fully, and align the direction of the hook.
- When tightening split flanges, tighten uniformly in turn to prevent excessive tightening on one side.

★ When operating the hydraulic cylinders for the first time after reassembling cylinders, pumps and other hydraulic equipment removed for repair, always bleed the air as follows:

1. Start the engine and run at low idling.
2. Operate the work equipment control lever to operate the hydraulic cylinder 4 – 5 times, stopping the cylinder 100 mm from the end of its stroke.
3. Next, operate the hydraulic cylinder 3 – 4 times to the end of its stroke.
4. After doing this, run the engine at normal speed.

★ When using the machine for the first time after repair or long storage, follow the same procedure.

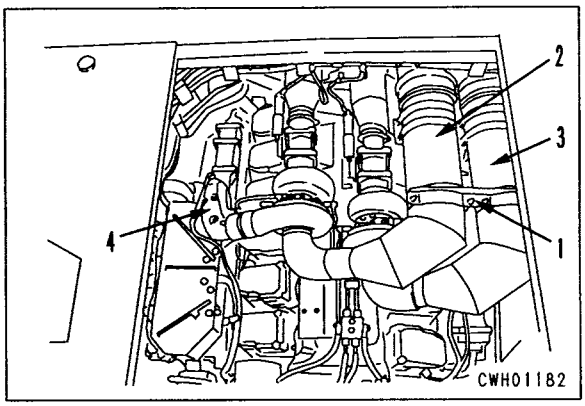
3. Precautions when completing the operation

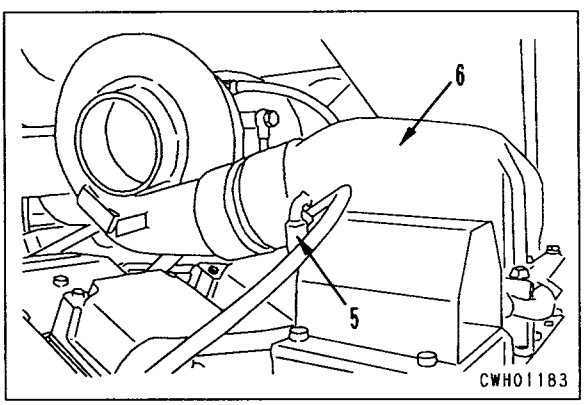
- If the coolant has been drained, tighten the drain valve, and add water to the specified level. Run the engine to circulate the water through the system. Then check the water level again.
- If the hydraulic equipment has been removed and installed again, add engine oil to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.
- If the piping or hydraulic equipment have been removed, always bleed the air from the system after reassembling the parts.
  ★ For details, see TESTING AND ADJUSTING, Bleeding air.
- Add the specified amount of grease (molybdenum disulphide grease) to the work equipment parts.

REMOVAL OF TURBOCHARGER ASSEMBLY

⚠ Disconnect the cable from the negative (–) terminal of the battery.

1. Drain coolant.
   Engine coolant : **230 ℓ**
2. Remove intake pipe clamps (1).
3. Remove intake pipes (2) and (3).
4. Remove right intake connector (4).
5. Disconnect hose (5) and remove left intake connector (6).
6. Disconnect exhaust brake hoses (7) and (8).
7. Disconnect exhaust pipes (9) and (10) from exhaust brake.
8. Disconnect turbocharger lubrication oil inlet hoses (11) and (12).
9. Disconnect turbocharger coolant inlet tubes (13) and (14).
10. Disconnect turbocharger coolant outlet tubes (15) and (16).
11. Disconnect turbocharger lubrication oil outlet tube (17).
    ★ Disconnect on the opposite side also.
12. Remove turbocharger assemblies (18) and (19). ※ 1





INSTALLATION OF TURBOCHARGER ASSEMBLY

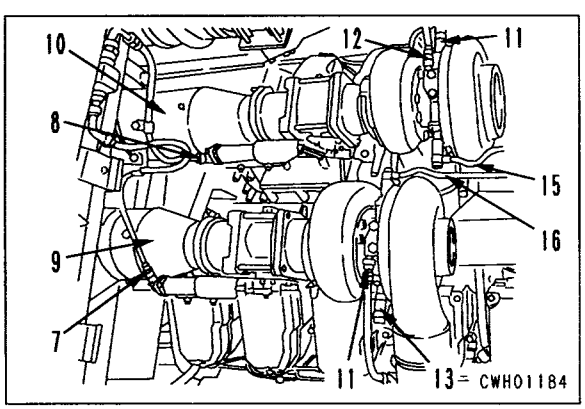
- Carry out installation in the reverse order to removal.

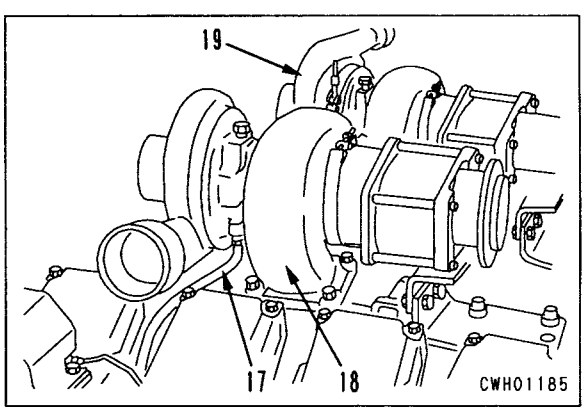
※ 1

kgm Turbocharger mounting bolt :
49.0 ± 4.9 Nm {5.0 ± 0.5 kgm}

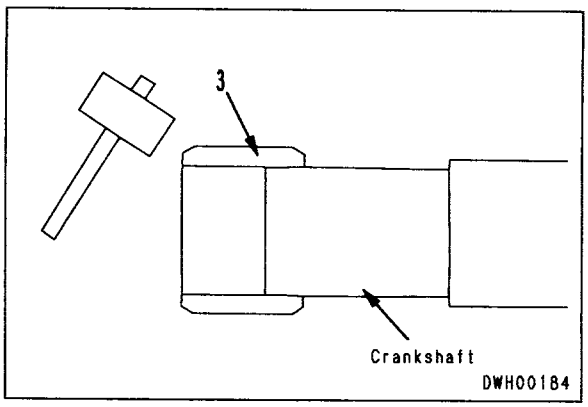
- **Refilling with oil**
  After installing the turbocharger, add oil up to the mount surface through the lubricating oil filler port with a funnel.

- **Refilling with water**
  Add water up to the radiator water filler port. Then run the engine to circulate the water through the system and check the water level in the reserve tank again.

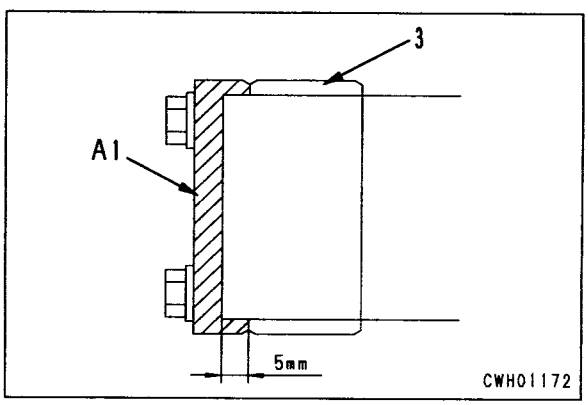




iii) Using plastic hammer, tap end face of sleeve in circumferential direction to install sleeve (3) parallel to crankshaft.
★ The sleeve is symmetrical, so it can be installed in either direction.



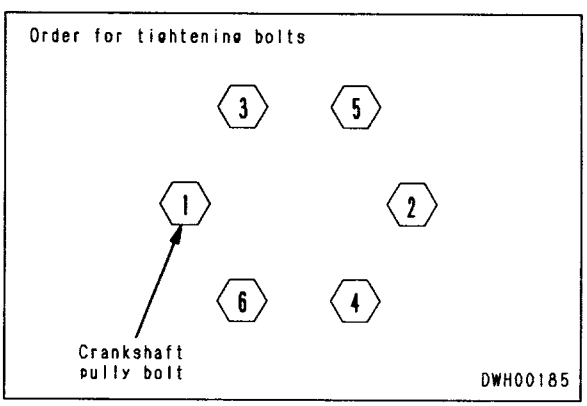
iv) Using tool **A1**, press fit sleeve (3) to specified position.
★ Install the bolts uniformly.
★ After press fitting the sleeve, wipe off all the gasket that is squeezed out (if the gasket that is squeezed out sticks to the lip, it will cause oil leakage).



2. Installing damper, crankshaft pulley
★ Tighten the bolts in the order shown in the diagram on the right in stages as shown below.

kgm Damper, crankshaft pulley mounting bolt

Order	Range
1st step	53.9 – 93.2 Nm {5.5 – 9.5 kgm}
2nd step	225.6 – 264.8 Nm {23.0 – 27.0 kgm}
3rd step	725.7 – 764.9 Nm {74.0 – 78.0 kgm}



REMOVAL OF TORQUE CONVERTER, TRANSMISSION ASSEMBLY

⚠ Stop the machine on level ground, and put blocks under the wheels.

⚠ Raise the dump body and lock with the safety pin.

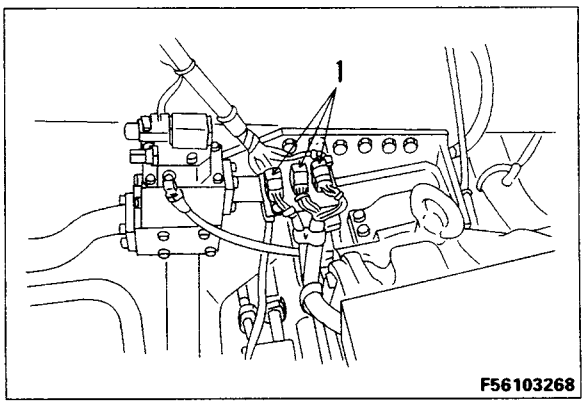
1. **Draining transmission oil**

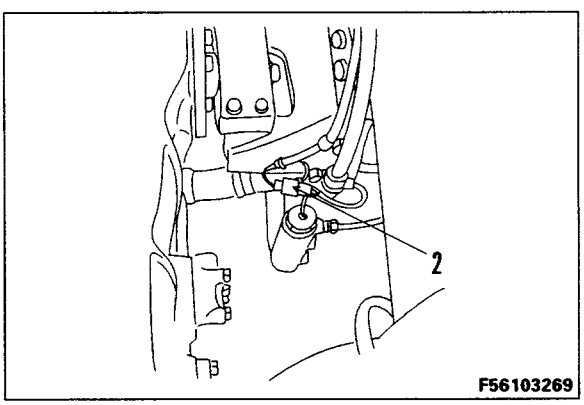
   Transmission oil : **102** ℓ

2. **Draining brake oil**

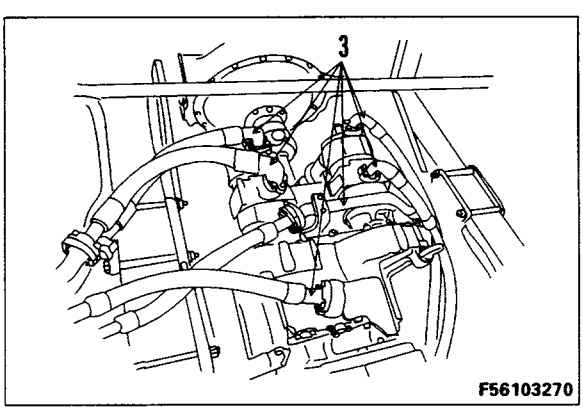
   Brake oil : **143** ℓ

3. **Wiring**
   1) Disconnect transmission controller wiring connector (1).
   2) Disconnect transmission oil level sensor connector (2).

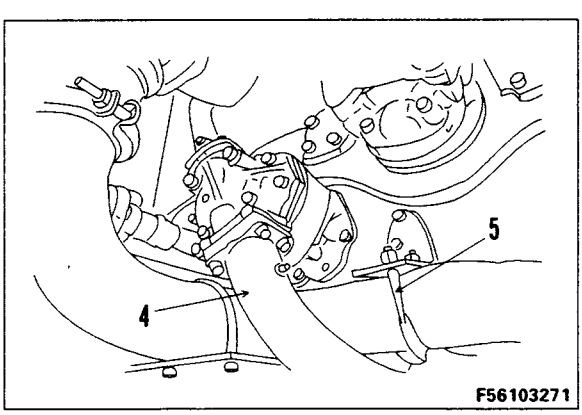




4. Disconnect 6 pump outlet hoses (3).



5. Pump suction tube
   1) Disconnect transmission pump tube (4).
   2) Remove clamp (5).

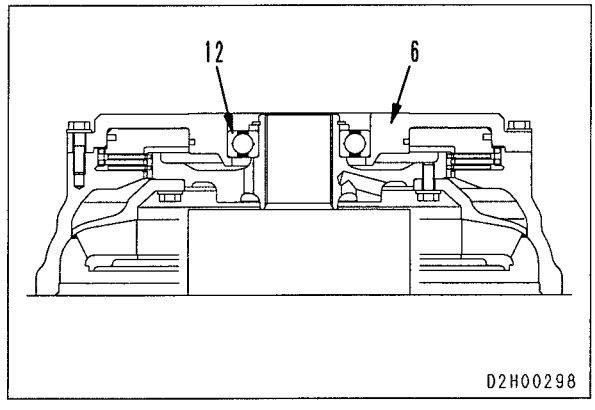


4. Housing

Install housing (6).

Mounting bolt: **Thread tightener (LT-2)**

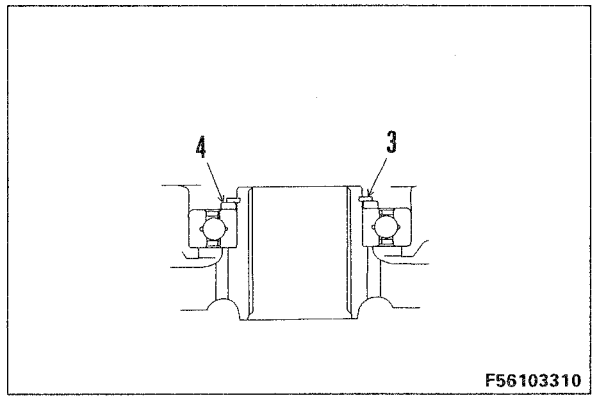
kgm Mounting bolt:
110.32 ± 12.26 kgm {11.25 ± 1.25 kgm}



5. Bearing

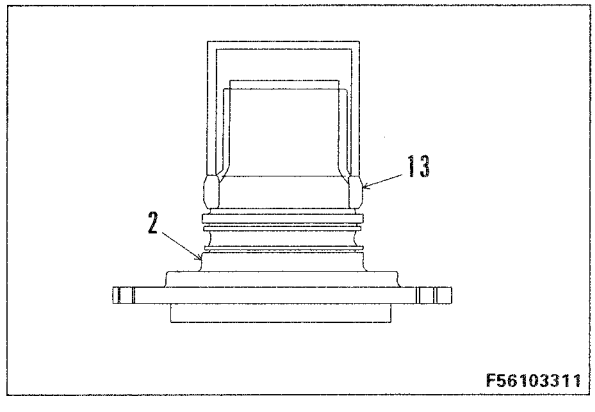
1) Press fit bearing (12).
   ★ Press fit the inner race and the outer race at the same time.

2) Insert spacer (4), and install snap ring (3).



6. Shaft

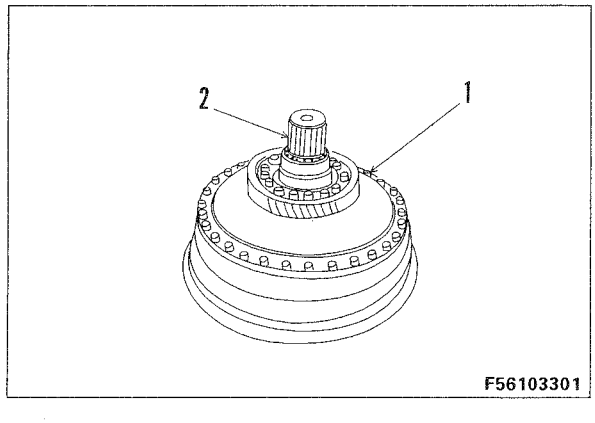
1) Using press fit tool, press fit inner race (13) in shaft (2).



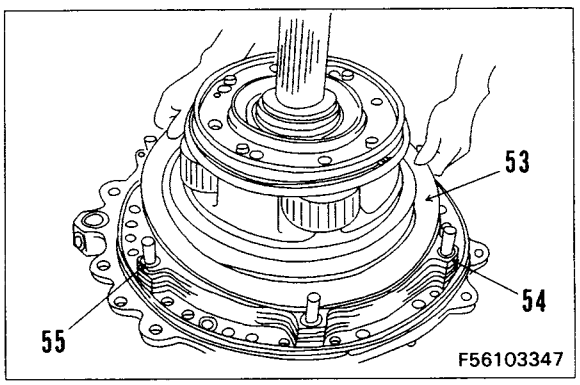
2) Install shaft (2), then fit gear (1) and tighten bolts.
   ★ Tighten the mounting bolts uniformly.

Mounting bolt: **Thread tightener (LT-2)**

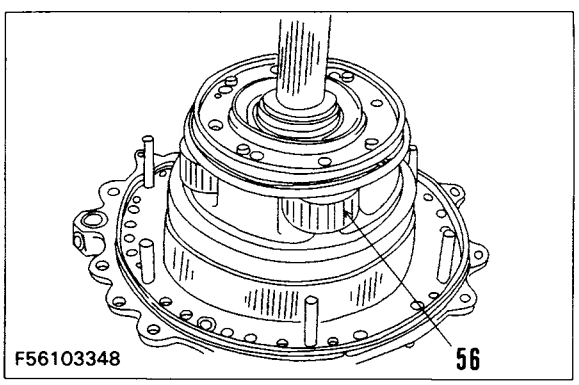
kgm Mounting bolt:
112.8 ± 14.7 kgm {11.5 ± 1.5 kgm}



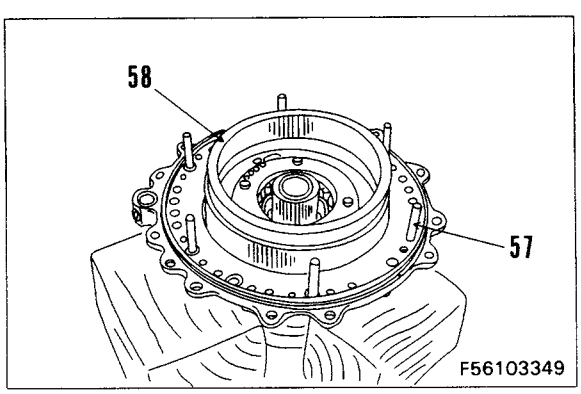
24. No. 7 clutch disc, plate, spring
Remove disc (53), plate (54), and springs (55).



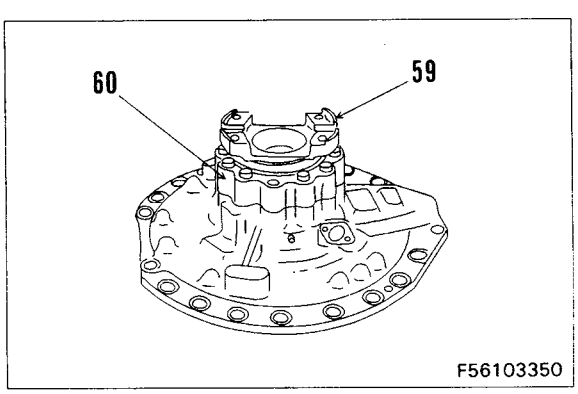
25. No. 6, 7 carrier assembly
Using eyebolts, remove No. 6 and 7 carrier assembly (56).



26. No. 7 guide pin, No. 7 clutch ring gear
1) Remove guide pin (57).
2) Remove No. 7 clutch ring gear (58).



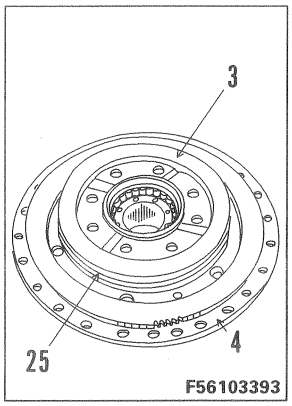
27. Output shaft assembly
1) Remove output shaft assembly (59) from cage (60).
★ This is the last stage of disassembly of the transmission, so it is removed last. However, if the output shaft assembly must be removed for reasons such as oil leakage from the oil seal, it is possible to remove the output shaft assembly simply by removing the speedometer gear first.

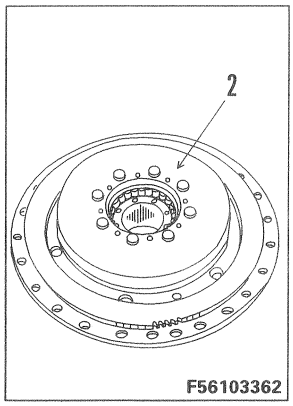


iv) Assemble seal ring (25) to piston.
v) Assemble piston (3) in housing (4), then install cylinder (2).

Mounting bolt:
Thread tightener (LT-2)

Mounting bolt:
58.8 – 73.6 Nm {6.0 – 7.5 kgm}

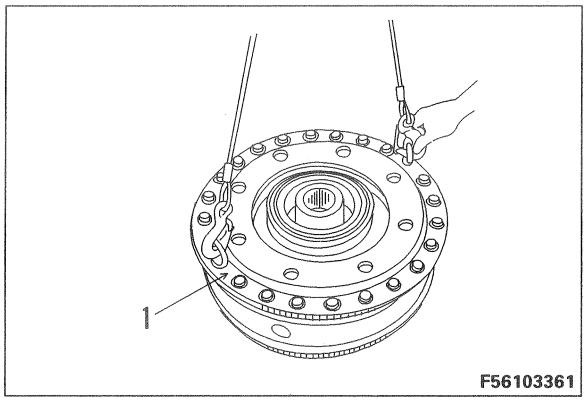




2) Using eyebolts, raise housing assembly (1), align outside teeth of piston with inside teeth of drum, and install housing assembly.

Mounting bolt:
Thread tightener (LT-2)

Mounting bolt:
98.1 – 122.6 Nm {10.0 – 12.5 kgm}



ASSEMBLY OF ECMV ASSEMBLY

★ If the pressure valve has been disassembled or any parts have been replaced, always check the hydraulic pressure.
★ Clean all parts, and check for dirt or damage. Coat the sliding surfaces of all parts with engine oil before installing.

1. Pressure check valve
1) Assemble valve (14) in body (1).
   ★ Push with a finger from both ends of the body to check that the valve moves smoothly.
2) Fit O-ring to solenoid valve (15) and install to body.

   Mounting bolt:
   13.2 ± 1.5 Nm {1.35 ± 0.15 kgm}
3) Assemble piston (13) in valve (14).
   ★ Check that the piston moves smoothly.
4) Assemble shim (12) and spring (11) in valve (14), then fit O-ring and install to body.
   • Standard number of shims: 3
   • Standard shim thickness: 0.6 mm (Thickness of each shim: 0.2 mm)

★ When using all of valve body (1), spring (11), piston (13), valve (14), and solenoid valve (15) again, assemble the same thickness of shim as before disassembly. If any of the above parts have been replaced, assemble the standard number of shims.
★ When replacing solenoid valve (15), remove plate (2), and check that spring (11) is assembled securely.

2. Flow detector valve
1) Assemble valve (5) in body.
   ★ Push with a finger from both ends of the body to check that the valve moves smoothly.
2) Assemble spring (6), then fit O-ring to body and install fill switch (9), and bracket (10).

   Mounting bolt:
   30.9 ± 3.4 Nm {3.15 ± 0.35 kgm}
3) Assemble spring (4), then fit O-ring to plug (3) and install to body.
4) Install plate (2) to body.

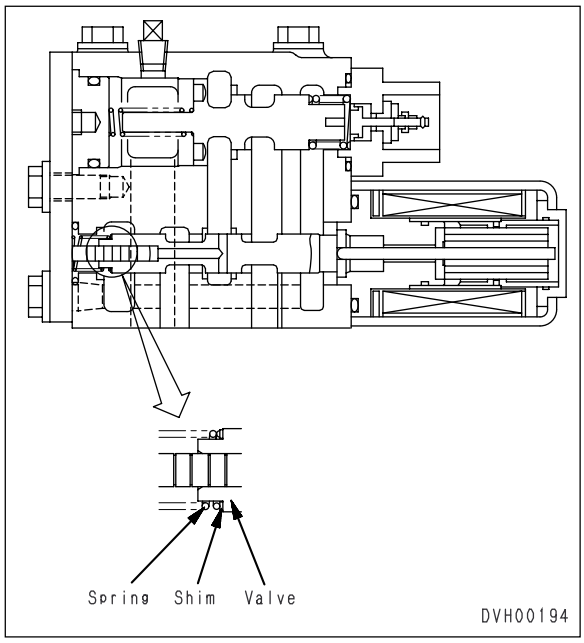
   Mounting bolt:
   30.9 ± 3.4 Nm {3.15 ± 0.35 kgm}
5) Install connectors (7) and (8) to bracket.

3. Checking ECMV pressure
Check ECMV pressure.
For details, see TESTING AND ADJUSTING checking ECMV pressure.

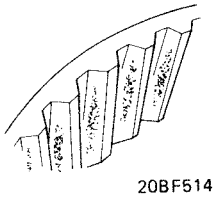
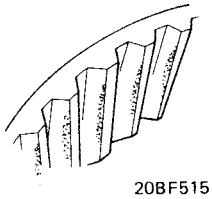
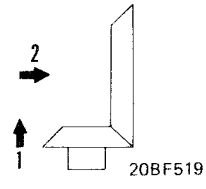
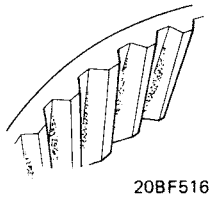
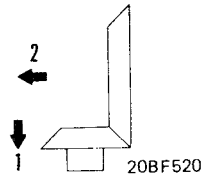
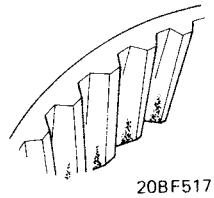
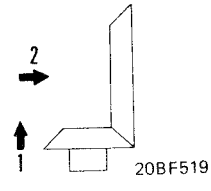
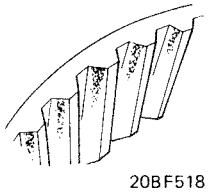
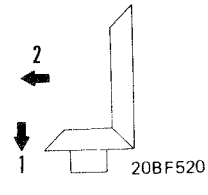
4. Adjusting ECMV pressure
• If the results of the check show that the ECMV pressure is not within the standard pressure, adjust the pressure with shim (12).

Amount of adjustment with 1 shim (thickness: 0.2 mm): Approx. 0.19 kg/cm^2

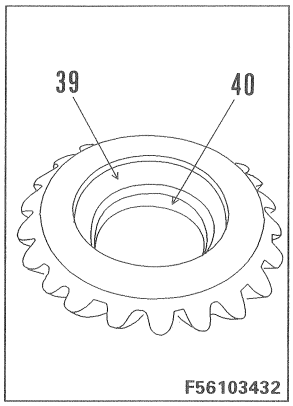
★ To INCREASE pressure, INCREASE shim thickness.
To DECREASE pressure, DECREASE shim thickness.
★ Install the shim securely, and be careful not to drop it inside the valve.
★ After adjusting the shim thickness, check the pressure again.

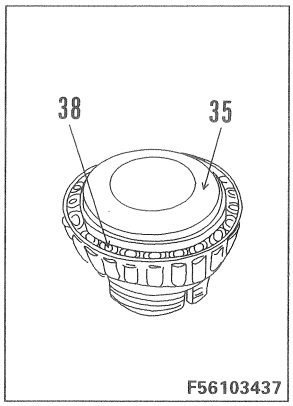


3) Adjusting tooth contact
Mix red lead (minimum) in spindle oil, then coat the face of 7 or 8 teeth of the drive gear. Hold down the driven gear by hand to act as a brake, and rotate the drive pinion gear forward and backward, then inspect the pattern left on the teeth.
Adjust the tooth contacts as follows.

Tooth contact	Cause	Procedure for adjustment
 20BF514	The tooth contact pattern should start from about 5 mm from the toe of the bevel gear and cover about 50% of the tooth. It should be in the center of the tooth height.	Adjust the drive pinion by adjusting the shims at the drive pinion cage. Adjust the driven gear in the same way as when adjusting backlash.
 20BF515	Drive pinion is too far from driven gear.	1. Reduce shims at drive pinion to bring closer to driven gear. 2. Move driven gear further away from drive pinion and adjust backlash correctly.  20BF519
 20BF516	Drive pinion is too close to driven gear.	1. Increase shims at drive pinion to move away from driven gear. 2. Move driven gear closer to drive pinion and adjust backlash correctly.  20BF520
 20BF517	Drive gear is too close to drive pinion.	1. Reduce shims at drive pinion to bring closer to driven gear. 2. Move driven gear further away from drive pinion and adjust backlash correctly.  20BF519
 20BF518	Driven gear is too far from drive pinion.	1. Increase shims at drive pinion to move away from driven gear. 2. Move driven gear closer to drive pinion and adjust backlash correctly.  20BF520

3) Pinion gear
   ★ The bearing is an adjustment-free bearing, so check the matching numbers of the bearing, collar, and outer race.
   i) Using push tool, press fit outer races (40) and (39) in pinion gear.
   ii) Using push tool, press fit bearing (38) to shaft (35).

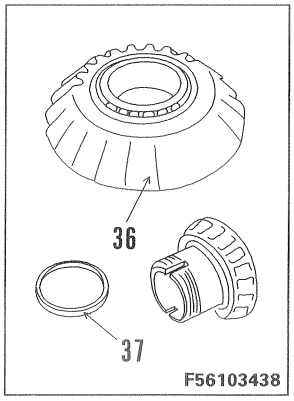


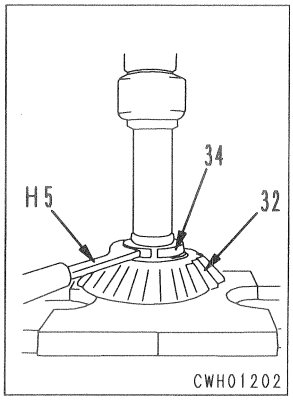


   iii) Set pinion gear to shaft, then assemble collar (37), and using push tool, install collar (37) and bearing (36).
   iv) Hold pinion gear assembly (32) with press, and using tool **H5**, tighten ring nut (34).

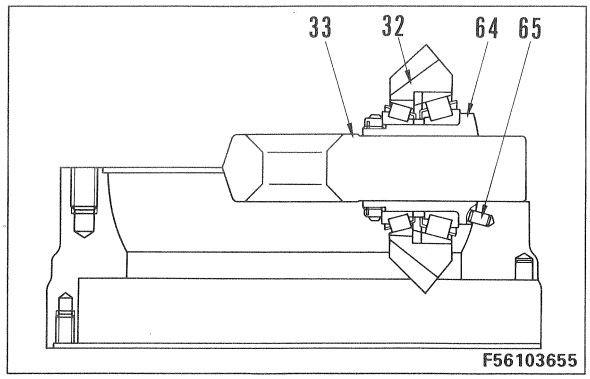
   Ring nut: **Thread tightener (LT-2)**

   Mounting bolt:
   578.6 – 745.3 Nm {59.0 – 76.0 kgm}





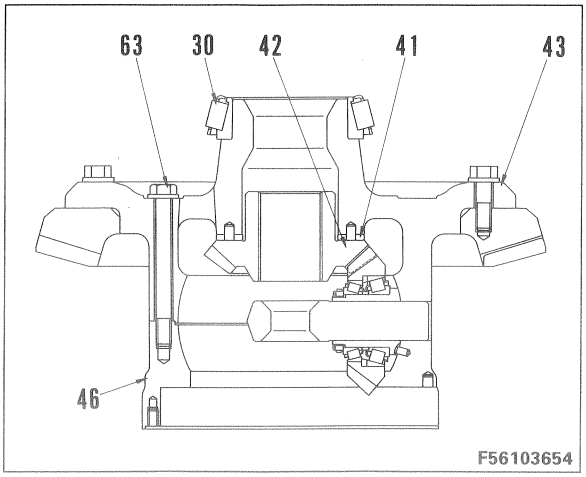
4) Assemble pinion gear assembly (32) together with cross shaft (33).
   • Align groove of washer (64) with dowel pin (65) of case, and install.
     ★ If the groove of the washer is not fitted completely on the dowel pin, the cross shaft will not fit properly, and the pinion gear will not rotate smoothly. Check these two points carefully.



5) Install washer (41) to case (43).
   ★ Check that the head of the dowel pin is $0.5^{+0.2}_{0}$ mm lower than the surface of the washer.
6) Install differential side gear (42).
7) Case
   i) Install case (43).
      ★ Align match mark on mating case (46), and install.
   ii) Tighten with bolts (63).

   Mounting bolt:
   Thread tightener (LT-2)

   Mounting bolt:
   823.8 – 1029.7 Nm {84.0 – 105.0 kgm}

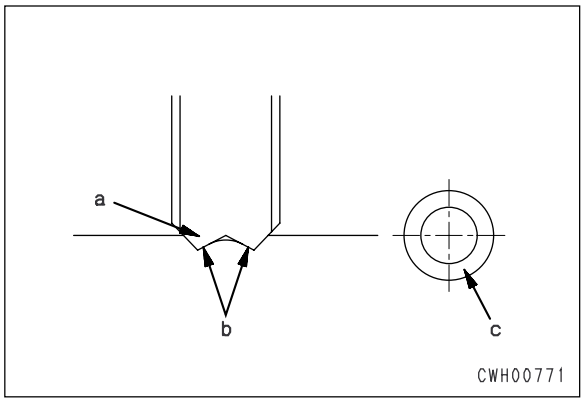


- Lock bolts (1) and (2) are different from the normal bolts: the tip (portion **a**) cuts into the surface of the pin. (Creates plastic deformation.)
  - ★ When tightening, even when resistance is felt, it is necessary to tighten further in order to cut into the surface. For this reason, if the tightening is less than the specified tightening torque, the bolt will not cut in sufficiently and it will not hold in position properly.
    b : Cut-in point
    c : Cut-in mark

★ While tightening the pin fixing bolt, move the torque pin in the axial direction and check that the bolt is fitted in the groove of the torque pin.

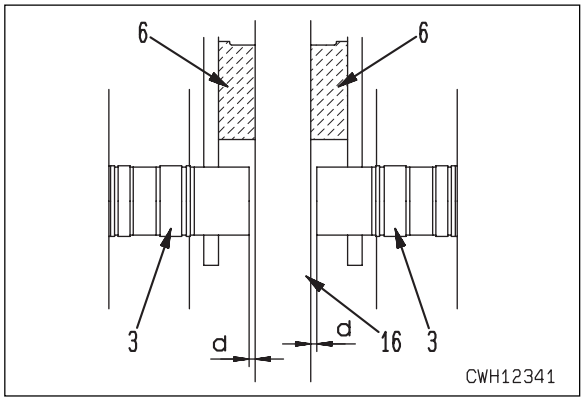
★ Be sure to install short torque pin (5) of torque pins (4) and (5) at the plate end.

★ Assemble the other pistons in the same way.



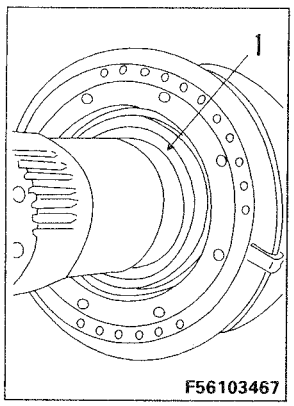
5. Install caliper assembly.
For details, see INSTALLATION OF FRONT CALIPER ASSEMBLY.

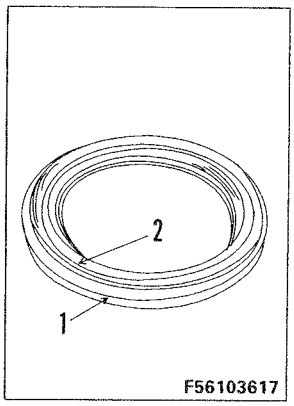
★ Install so that clearance **d** between disc (16) and torque pin (3) is 1.5 – 3.0 mm.

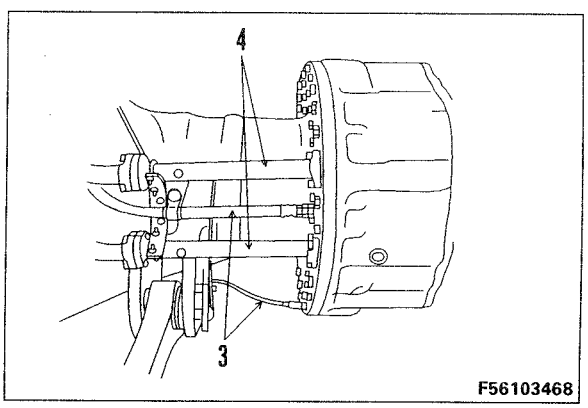


REMOVAL OF REAR BRAKE ASSEMBLY

1. **Final drive assembly**
   Remove final drive assembly.
   For details, see REMOVAL OF FINAL ASSEMBLY.
2. **Drain oil.**
   Brake cooling tank : **143 ℓ**
3. Remove retainer (1).
   ★ Remove floating seal (2) from the retainer.
4. Disconnect hose (3).
5. Disconnect tube (4).
6. Lift off brake assembly (5). ※ 1
   kg Brake assembly : **600 kg**
7. Remove piston (6). ※ 2
   ★ Loosen the air bleed plug and remove piston (6).
8. Remove cylinder assembly (7). ※ 2







INSTALLATION OF REAR BRAKE ASSEMBLY

- Carry out installation in the reverse order to removal.

※ 1

Mounting bolt: **Thread tightener (LT-2)**

kgm Mounting bolt:
926.8 ± 98.1 Nm {94.5 ± 10 kgm}

※ 2

★ Install the piston seal with the grooved side facing the side taking the pressure.

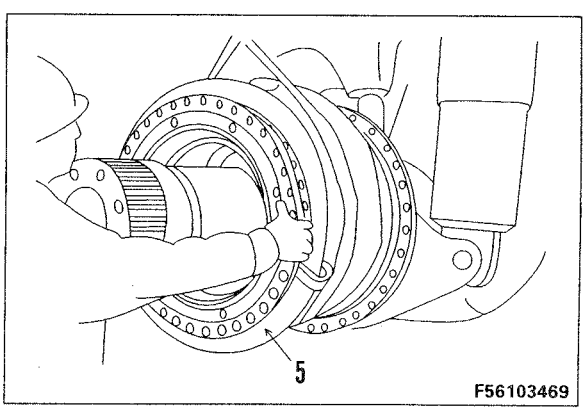
※ 3

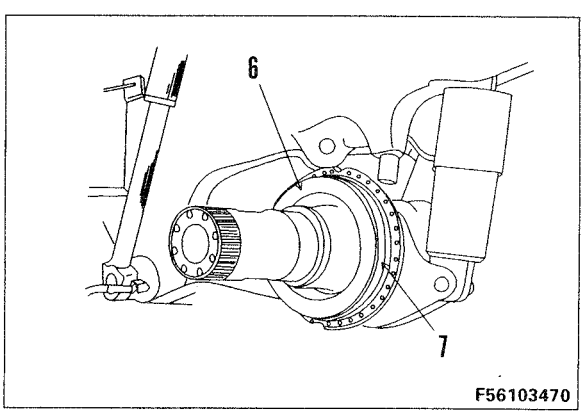
★ Install the cylinder seal with the side with the groove facing the side taking the pressure.

Mounting bolt: **Thread tightener (LT-2)**

kgm Mounting bolt:
549.2 ± 58.8 Nm {56 ± 6 kgm}

- **Refilling with oil**
  Add oil to the specified level, and run the engine to circulate the oil through the system. Then check the oil level again.
  : **143 ℓ**





5) Install flange (8), and spacer (18), retainer (7), and plate (6) to cylinder with bolts (3).

Parts **B** and **C** in figure at right (COH12366)
: **Gasket sealant (LG-6)**

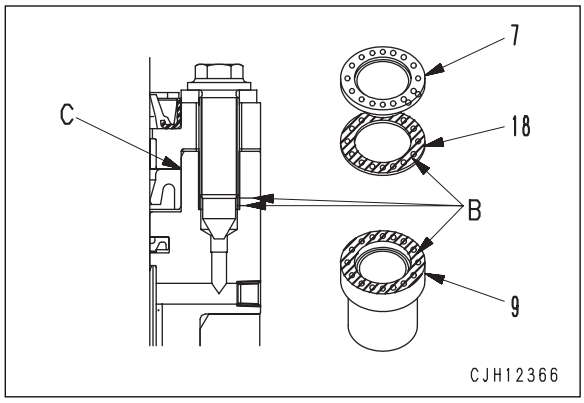
6) Install air bleed valve (4).

Valve: **44.1 ± 4.9 Nm {4.5 ± 0.5 kgm}**

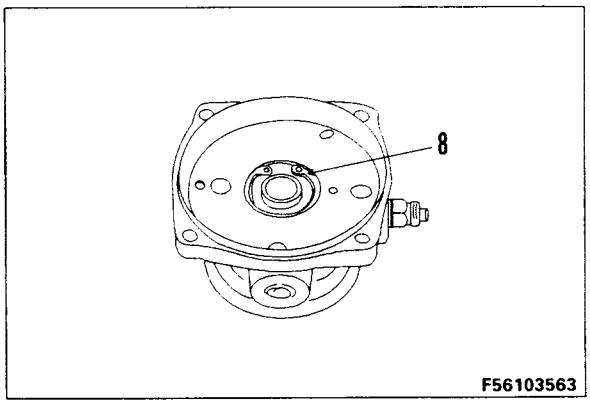
4. Oil level valve, intake valve
Install oil level valve (2) and intake valve (1).

Valve: **44.1 ± 4.9 Nm {4.5 ± 0.5 kgm}**

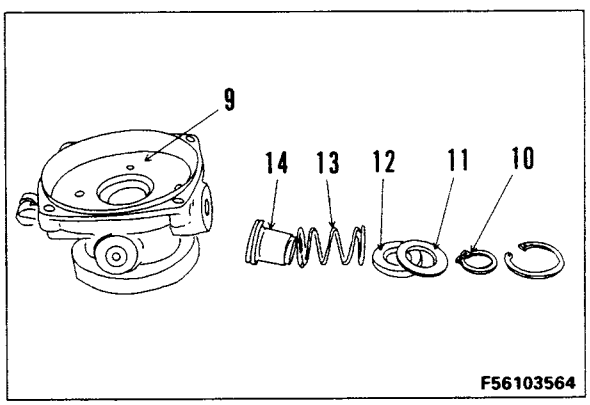
5. Cover
Install cover.



8. **Snap ring**
   Remove snap ring (8).

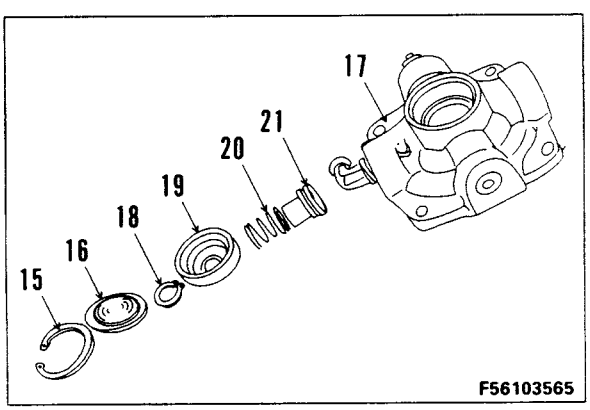


9. **Upper valve**
   Pull out upper valve assembly from body (9), and remove snap ring (10), then disassemble into washer (11), retainer (12), spring (13), and upper valve (14).



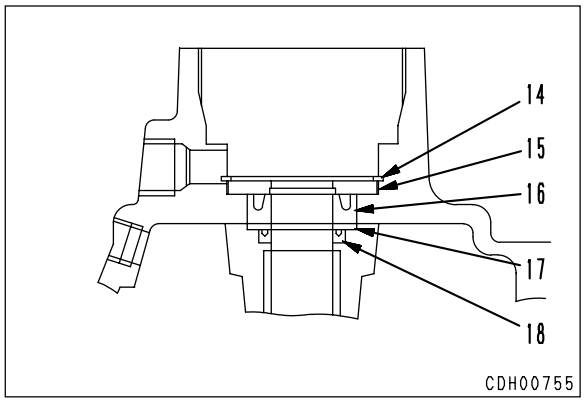
10. **Check valve assembly**
    Remove snap ring (15), then remove check valve assembly (16) from cover (17).

11. **Lower valve**
    Remove snap ring (18), and disassemble into guide (19), spring (20), and lower valve (21).



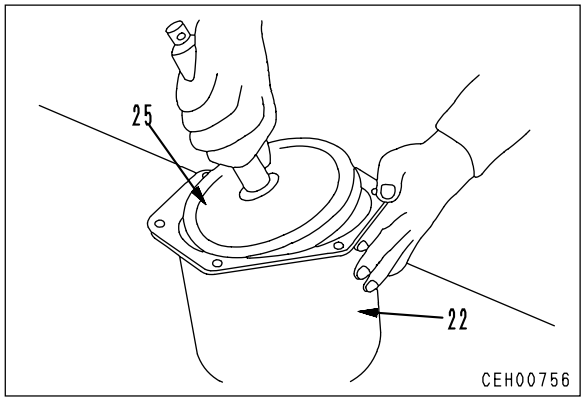
2) Turn over body, assemble packing (18), seat (17), and packing (16) and insert ring (15), then secure with snap ring (14).
   ★ Assemble so that the seal lip is facing the outside.
   ★ Check that the snap ring is fitted securely in the groove.

   Packing : **Engine oil**



3. Piston assembly

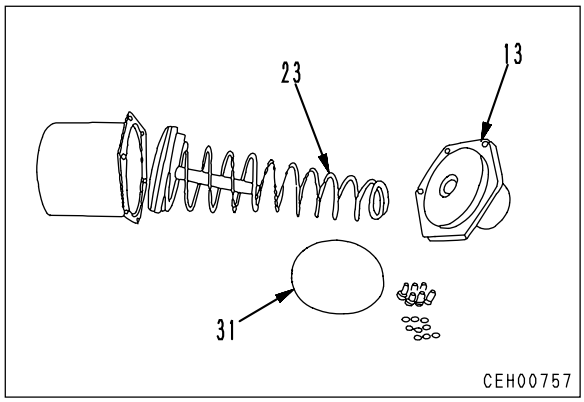
Insert air cylinder (22) in piston assembly (25).
   ★ Coat the inside circumference of the air cylinder well with grease.
   ★ When inserting the piston, insert it at an angle of approx. 30°. When it is inserted about 1/3, set the air cylinder on its side and push in fully.
   ★ Check that the piston assembly moves smoothly.



4. Body assembly

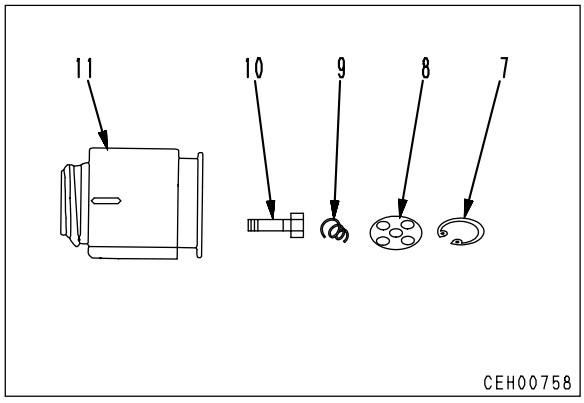
Insert spring (23) in mounting portion of air cylinder, assemble O-ring (31) to body assembly (13), then install to air cylinder.
   ★ Push the body by hand and tighten the mounting bolts on opposite sides in turn to install.

   Mounting bolt :
   43.12 ± 5.88 Nm {4.4 ± 0.6 kgm}

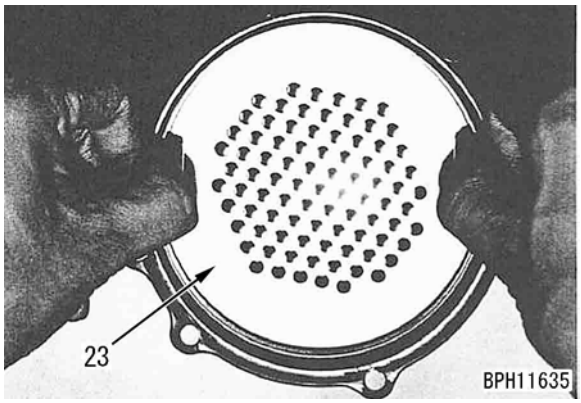


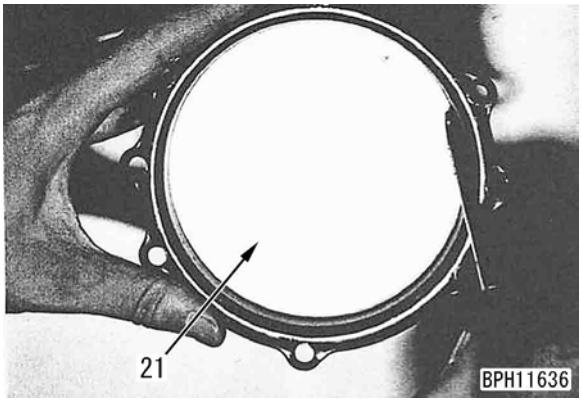
5. Assembly of piston

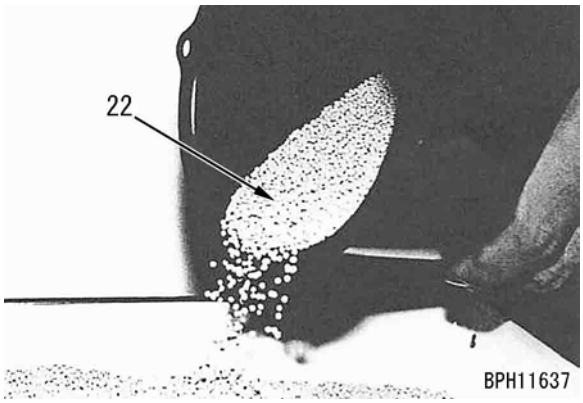
1) Insert valve (10), spring (9), and seat (8) in piston (11), and secure with snap ring (7).
   ★ Be careful to insert the spring facing in the correct direction.
   ★ Check that the snap ring is fitted securely in the groove.

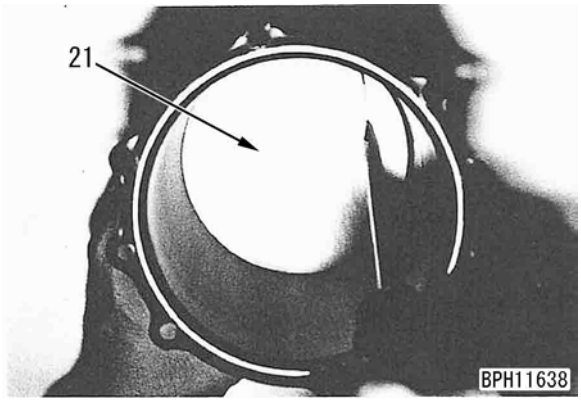


9. Take out filter plate (23), filter (21), desiccant (22), and filter (21) in order from above.









REMOVAL OF BRAKE COOLING PUMP ASSEMBLY

⚠ Raise the dump body and lock with the safety pin.

1. Remove cover (1).

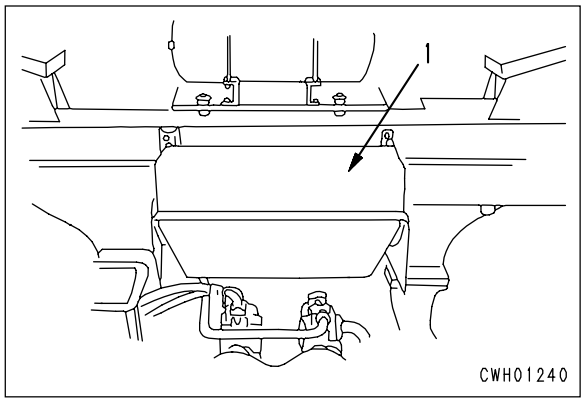
   kg Cover : **90 kg**

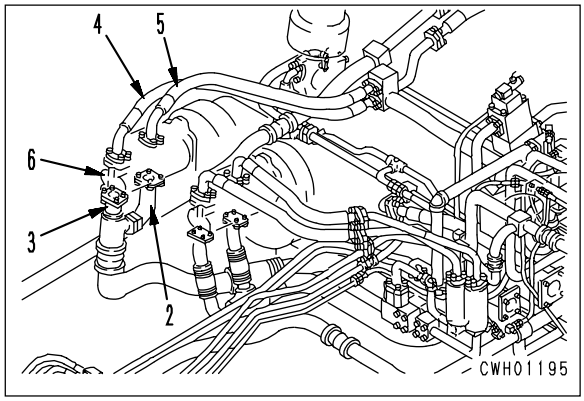
2. Disconnect suction tubes (2) and (3).

3. Disconnect hoses (4) and (5) going to left and right rear brakes.

4. Remove mounting bolts, then remove brake cooling pump assembly (6).

   kg Brake cooling pump assembly : **55 kg**





INSTALLATION OF BRAKE COOLING PUMP ASSEMBLY

- Carry out installation in the reverse order to removal.

- **Refilling with oil**
  ★ Add oil to the specified level, then check the oil level again.