SHOP MANUAL

KOMATSU

avance LOADER

WA900-3

MACHINE MODEL	SERIAL NO.
WA900-3	**50001 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.
- WA900-3 mount the SA12V140 engine.
  For details of the engine, see the 12V140 Series Engine Shop Manual.

Printed in Japan 01-24(01)

TABLE OF TIGHTENING TORQUES FOR SPLIT FLANGE BOLTS

★ In the case of split flange bolts for which there is no special instruction, tighten to the torque given in the table below.

Thread diameter	Width across flat	Tightening torque	
mm	mm	Nm	kgm
10	14	59 – 74	6 – 7.5
12	17	98 – 123	10 – 12.5
16	22	235 – 285	23.5 – 29.5

TABLE OF TIGHTENING TORQUES FOR O-RING BOSS PIPING JOINTS

★ Unless there are special instructions, tighten the O-ring boss piping joints to the torque below.

Norminal No.	Thread diameter	Width across flat	Tightening torque (Nm {kgm})	
	mm	mm	Range	Target
02	14	Varies depending on type of connector.	35 – 63 {3.5 – 6.5}	44 {4.5}
03, 04	20		84 – 132 {8.5 – 13.5}	103 {10.5}
05, 06	24		128 – 186 {13.0 – 19.0}	157 {16.0}
10, 12	33		363 – 480 {37.0 – 49.0}	422 {43.0}
14	42		746 – 1010 {76.0 – 103}	883 {90.0}

TABLE OF TIGHTENING TORQUES FOR O-RING BOSS PLUGS

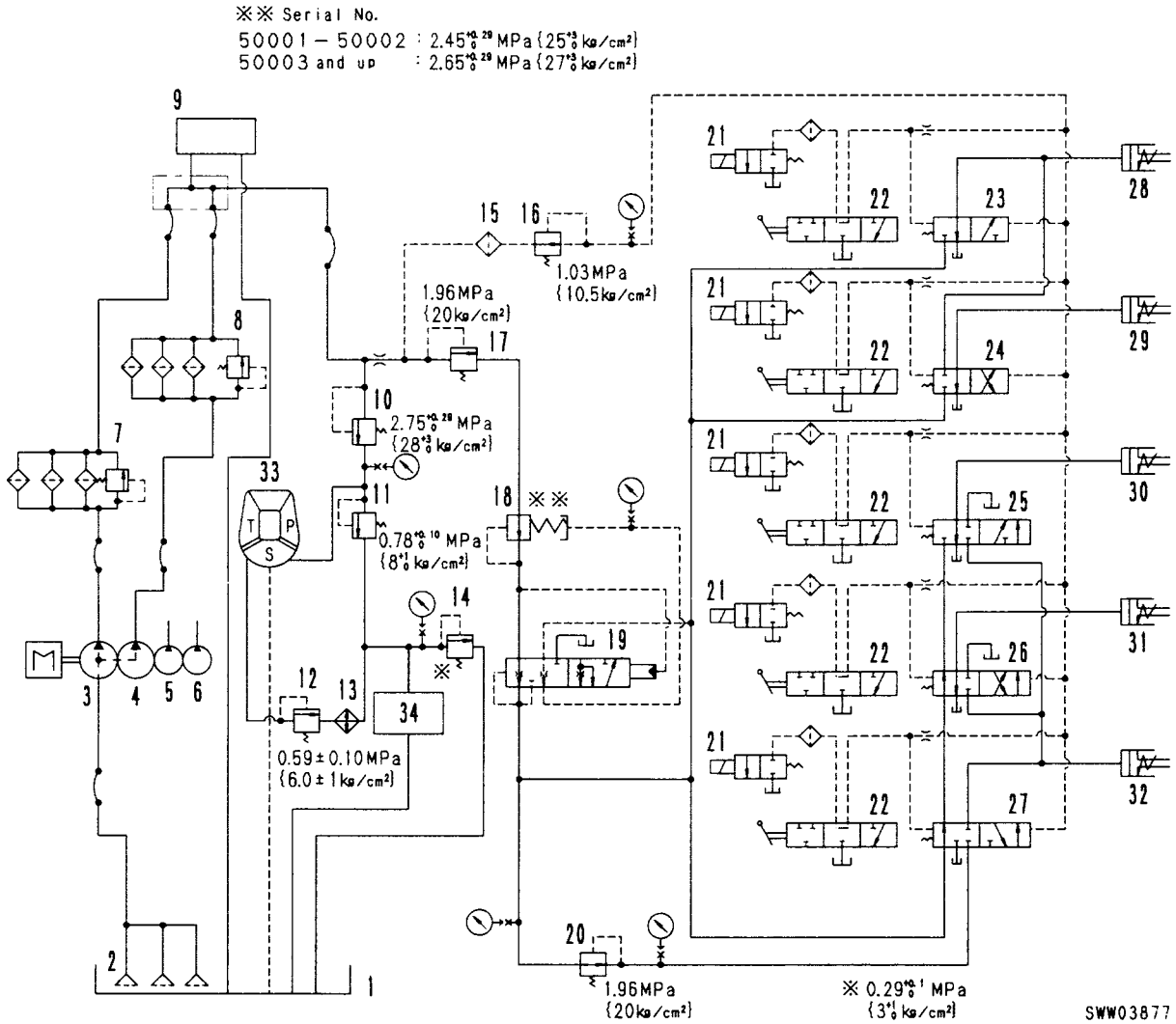
★ Unless there are special instructions, tighten the O-ring boss plugs to the torque below.

Norminal No.	Thread diameter	Width across flat	Tightening torque (Nm {kgm})	
	mm	mm	Range	Target
08	08	14	5.88 – 8.82 {0.6 – 0.9}	7.35 {0.75}
10	10	17	9.8 – 12.74 {1.0 – 1.3}	11.27 {1.15}
12	12	19	14.7 – 19.6 {1.5 – 2.0}	17.64 {1.8}
14	14	22	19.6 – 24.5 {2.0 – 2.5}	22.54 {2.3}
16	16	24	24.5 – 34.3 {2.5 – 3.5}	29.4 {3.0}
18	18	27	34.3 – 44.1 {3.5 – 4.5}	39.2 {4.0}
20	20	30	44.1 – 53.9 {4.5 – 5.5}	49.0 {5.0}
24	24	32	58.8 – 78.4 {6.0 – 8.0}	68.6 {7.0}
30	30	32	93.1 – 122.5 {9.5 – 12.5}	107.8 {11.0}
33	33	—	107.8 – 147.0 {11.0 – 15.0}	124.4 {13.0}
36	36	36	127.4 – 176.4 {13.0 – 18.0}	151.9 {15.5}
42	42	—	181.3 – 240.1 {18.5 – 24.5}	210.7 {21.5}
52	52	—	274.4 – 367.5 {28.0 – 37.5}	323.4 {33.0}

SPECIFICATIONS

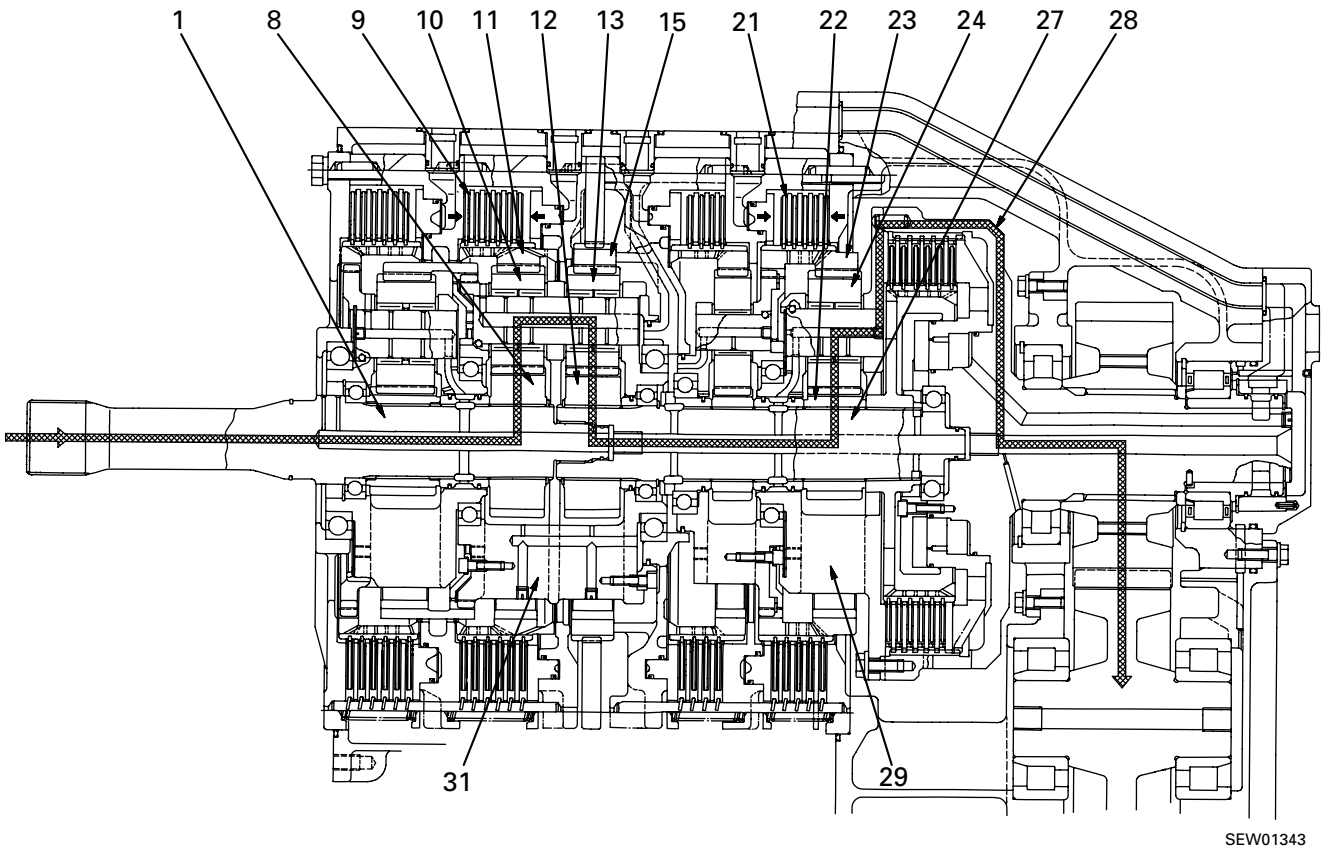
Machine model				WA900-3	
Serial No.				50001 – 50026	50027 and up
Weight	Operating weight		kg	101,550	
	Distribution (front)		kg	55,750	
	Distribution (rear)		kg	45,800	
Performance	Bucket capacity (piled)		m^3	13.0	
	Rated load		kg	23,400	
	Travel speed	FORWARD 1st	km/h	7.0	
		FORWARD 2nd	km/h	12.3	
		FORWARD 3rd	km/h	28.0	
		REVERSE 1st	km/h	7.1	
		REVERSE 2nd	km/h	12.4	
		REVERSE 3rd	km/h	28.3	
	Max. rimpull		kN {kg}	588.4 {60,000}	
	Gradeability		deg	25	
	Min. turning radius	Center of outside wheel	mm	9,200	
		Outside portion of chassis	mm	11,000	
Dimensions	Overall length		mm	14,270 (with tooth)	
	Overall width (chassis)		mm	4,585	
	Bucket width		mm	4,760 (Cutting edge) 5,045 (Tire guard)	
	Overall height	(top of ROPS cab)	mm	5,275	
		(Bucket raised)	mm	9,680	
	Wheelbase		mm	5,450	
	Tread		mm	3,350	
	Min. ground clearance		mm	550	
	Height of bucket hinge pin		mm	6,960	
	Dumping clearance (tip of edge)		mm	5,020	
	Dumping reach (tip of edge)		mm	2,215	
	Bucket dump angle		deg	47 (Max. height)	
	Bucket tilt angle (SAE carrying position)		deg	50	
	Digging depth (10° dump) (tip of edge)		mm	470	

TRANSMISSION HYDRAULIC CIRCUIT DIAGRAM



1. Transfer case
2. Strainer
3. Torque converter charging pump (SAR4-112)
4. Torque converter charging pump (SAR3-100)
5. PPC pump (SAR1-032)
6. Brake pump (SAR1-014)
7. Torque converter oil filter
8. Torque converter oil filter
9. Servo cylinder
10. Main relief valve
11. Torque converter relief valve
12. Torque converter regulator valve
13. Oil cooler
14. Lubrication relief valve
15. Pilot oil filter
16. Pilot reducing valve
17. Priority valve
18. Modulating valve
19. Quick return valve
20. Reducing valve
21. Solenoid valve
22. Emergency manual spool
23. Reverse spool
24. Forward spool
25. 2nd spool
26. 1st spool
27. 3rd spool
28. Reverse clutch
29. Forward clutch
30. 2nd clutch
31. 1st clutch
32. 3rd clutch
33. Torque converter
34. Transmission lubrication

FORWARD 1st



★ The transfer shown in this figure is for serial Nos. 50001 – (T/M No. 101138).

- In the case of FORWARD 1st, FORWARD clutch (9) and 1st clutch (21) are engaged. The power from the torque converter transmitted to input shaft (1) is transmitted to output shaft (28).
- FORWARD clutch (9) is actuated by the hydraulic pressure applied to the clutch piston and holds ring gear (11) in position. 1st clutch (21) is actuated by the hydraulic pressure applied to the clutch piston and holds ring gear (23) in position.
- The power from the torque converter is transmitted to input shaft (1). The rotation of the input shaft is transmitted through sun gear (8) to planet gear (10). Ring gear (11) is being held in position by FORWARD clutch (9), so the rotation of planet gear (10) rotates carrier (31).
- Ring gear (15) is being held in position, so the rotation of carrier (31) is transmitted through planet gear (13) to sun gear (12). It is also transmitted through intermediate shaft (27) to sun gear (22).
- Ring gear (23) is being held in position by 1st clutch (21). For this reason, the rotation of sun gear (22) is transmitted from carrier (29) through planet gear (24) to output shaft (28).

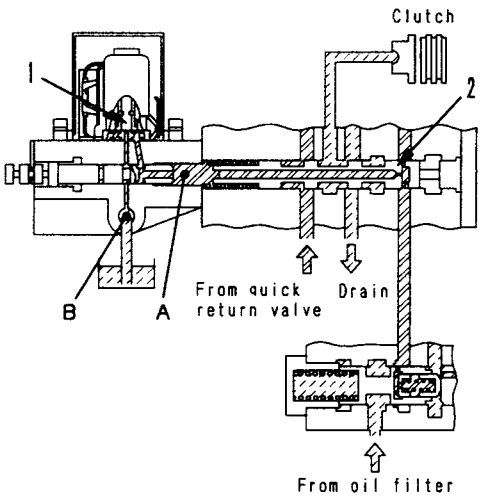
TRANSMISSION SOLENOID VALVE

FUNCTION

- There is one solenoid valve installed for each directional and speed spool in the transmission valve.
  When the directional lever and speed control levers in the operator's compartment are operated, the solenoid valve is actuated, and oil is drained to actuate the directional and speed spools.

OPERATION

1) Solenoid valve **OFF**
   The oil of spool (2) enters port **A**. However, valve (1) shuts off the oil, so directional and speed spool (2) does not move.



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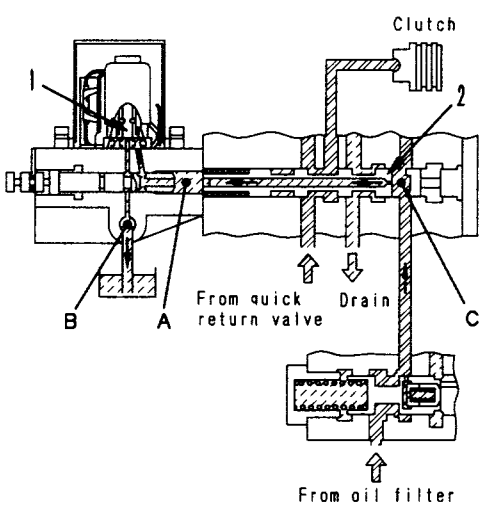
2) Solenoid valve **ON**
   When the directional and gear shift lever are operated, the solenoid valve is pulled up.
   The oil from directional and speed spool (2) enters port **A** and flows from port **B** to the drain circuit. Therefore, port **C** becomes the high pressure circuit and port **A** becomes the low pressure circuit, and directional and speed spool (2) is moved to the left, and the oil from the quick return valve flows to the clutch.



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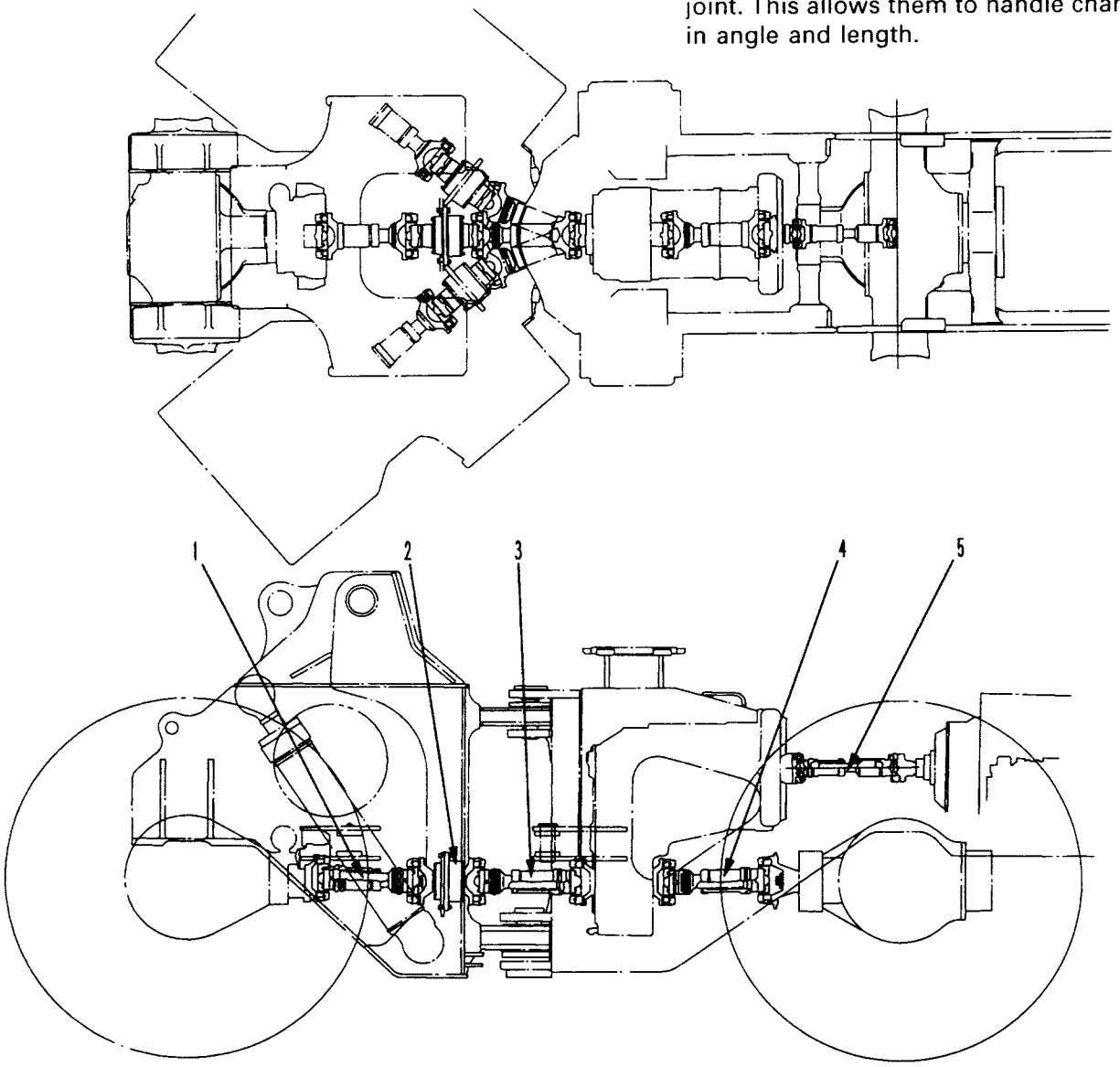
DRIVE SHAFT

OUTLINE

- The motive force from the engine passes through the damper, upper drive shaft (5), torque converter, transmission and transfer. Part of this motive force passes through rear drive shaft (4) and goes to the rear axle; the rest of the motive force passes through center drive shaft (3), center support (2) and front drive shaft (1) and is sent to the front axle. In addition to transmitting the motive force, the drive shafts have the following purposes.
- When the body is articulated, or when there is shock from the road surface during traveling, or when there is shock during operations, the axle in front and behind the engine and transmission change position.
  To allow the motive force to be transmitted without damage to parts of the machine when there is shock or when the components move position, the drive shafts have a universal joint and a sliding joint. This allows them to handle changes in angle and length.



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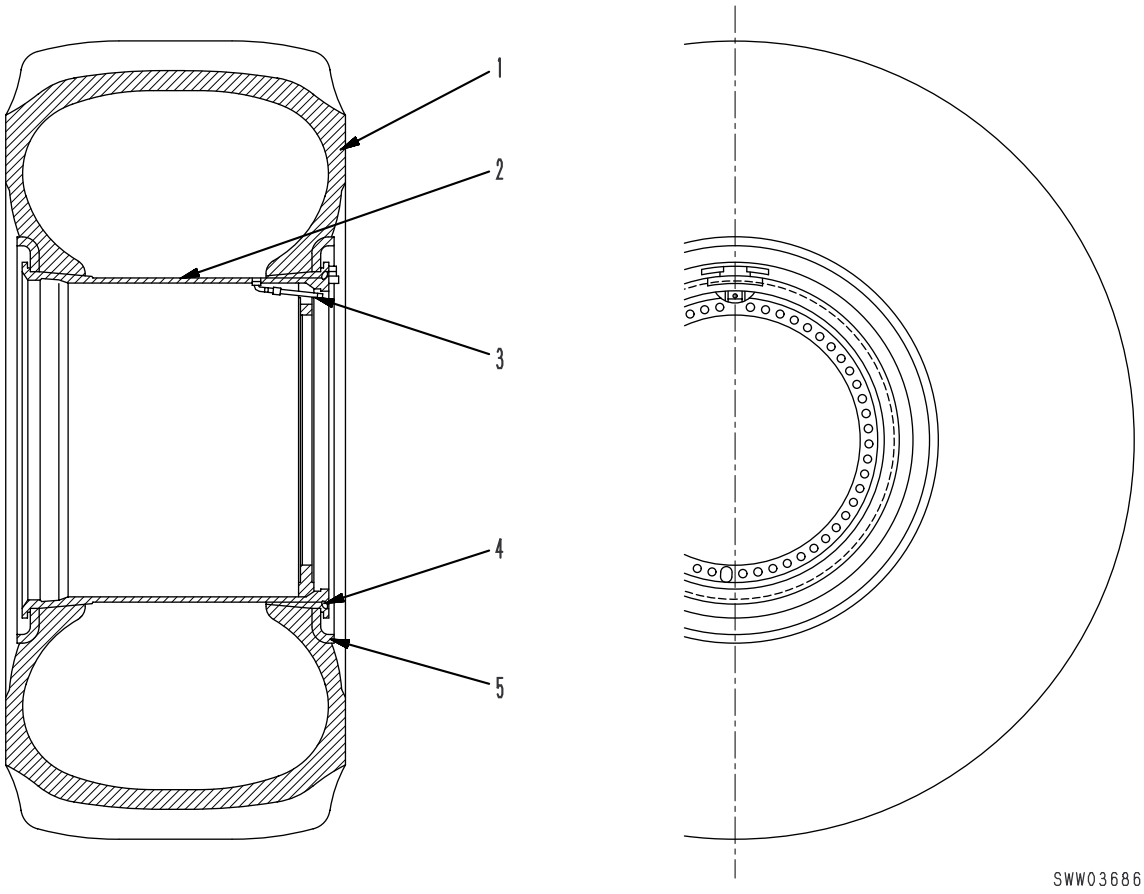
1. Front drive shaft
2. Center support
3. Center drive shaft
4. Rear drive shaft
5. Upper drive shaft

TIRE AND WHEEL



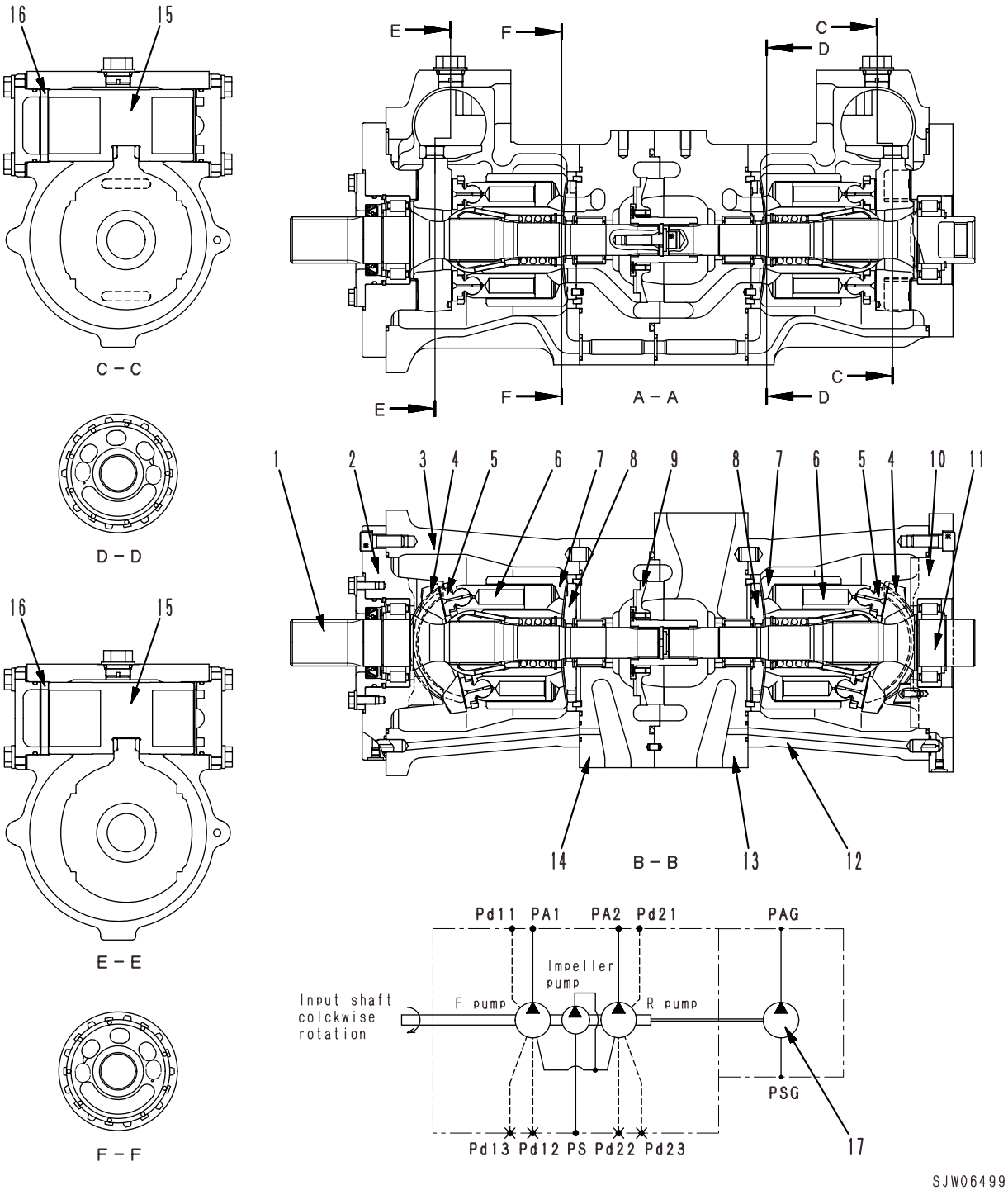
1. Tire
2. Rim
3. Valve
4. Lock ring
5. Side ring

OUTLINE

- The tires act to absorb the shock that the machine receives from the road surface, and at the same time, they provide drive force by rotating in contact with the ground.
- Depending on the purpose of use, there are various types of tire available, so it is important to select the correct tire to match the type of work and bucket capacity.

Specifications

Tire type: 45/65-45-58PR
TRA code: L5
Nominal wheel: 36.00 x 45WTB
Normal inflation pressure: 667 kPa {6.8 kg/cm^2}


16
15
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C
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A – A
D – D
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2
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4
5
6
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8
9
10
11
B – B
14
13
12
E – E
F – F
Pd11
PA1
PA2
Pd21
PAG
Impeller pump
Input shaft colckwise rotation
F pump
R pump
PSG
Pd13
Pd12
PS
Pd22
Pd23
17
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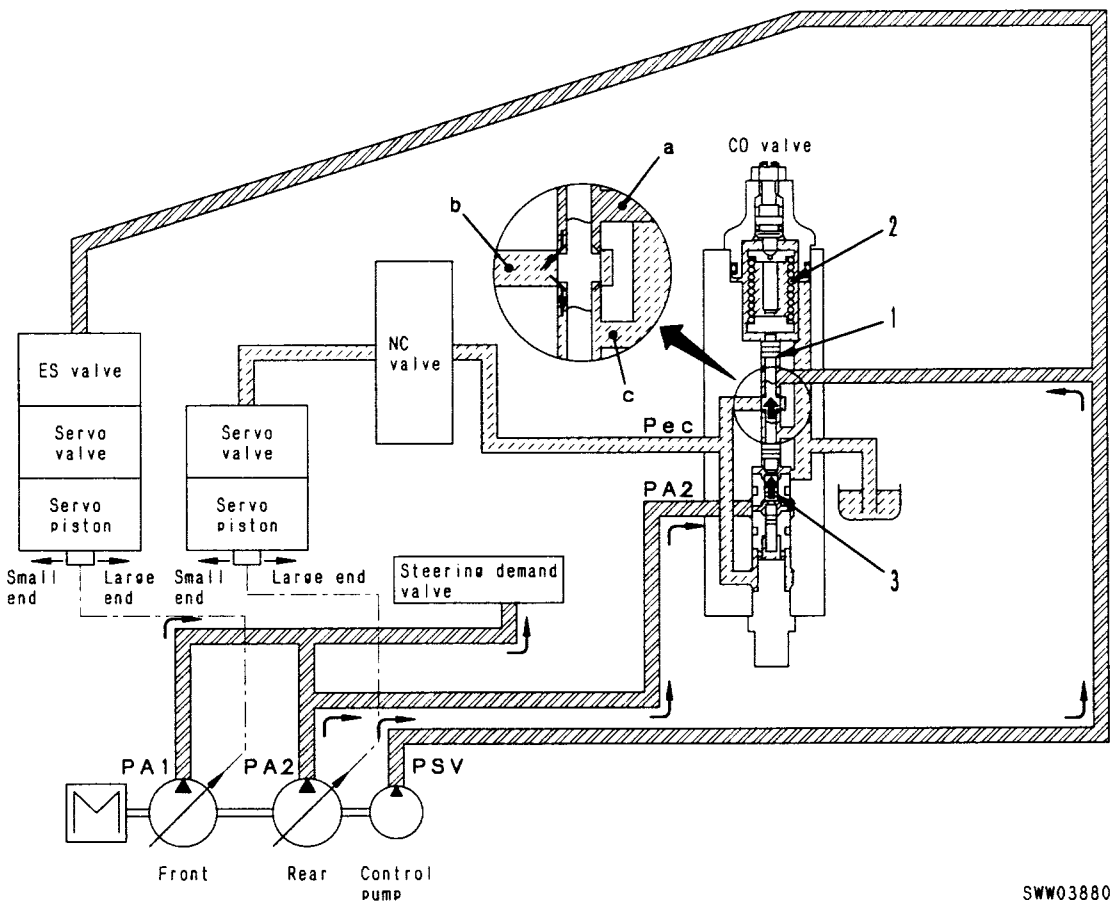
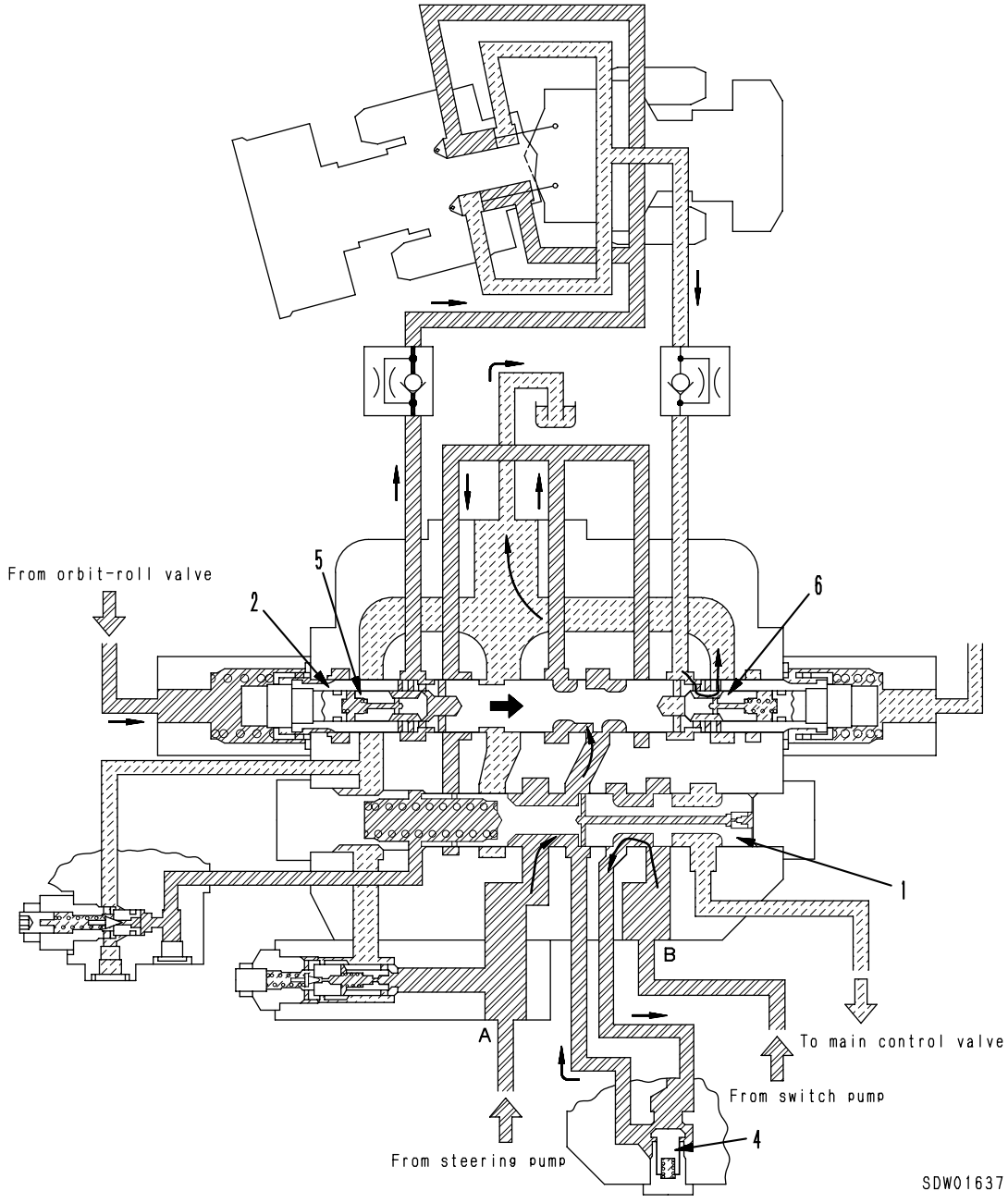
2) When the switch pump discharging pressure approaches to the relief pressure



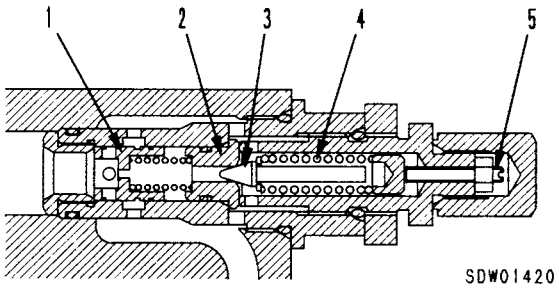
- When the load is increased and switch pump discharging pressure **PA2** approaches to the relief pressure, switch pump discharging pressure **PA2** pushes piston (3). At the same time, CO valve output pressure **Pec** pushes piston (3), and spool (1) moves upward. As a result, because the flow from port **a** to port **b** is throttled, the opening area of port **b** and port **c** (drain port) are increased. This causes CO valve output pressure **Pec** to lower, and the pump delivery is minimized.

Turning left



- When the steering wheel is turned to the left, the Orbit-roll valve is operated and steering spool (2) moves to the right.
  The oil from the steering pump enters port **A**, then flows to steering spool (2) through demand spool (1). The oil pushes open load check valve (5) of the spool, and flows to the rod end of the left cylinder and the bottom end of the right cylinder to turn the machine to the left. The oil from the left and right cylinders passes through load check valve (6) of the steering spool and is drained. The oil from the switch pump enters port **B**, goes through demand spool (1), pushes open check valve (4), and is merged with the oil from the steering pump.

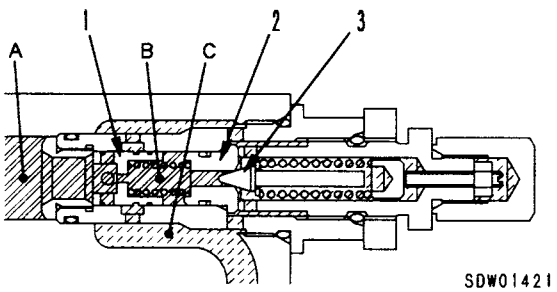
EMERGENCY STEERING RELIEF VALVE



1. Main valve
2. Valve seat
3. Pilot poppet
4. Spring
5. Adjustment screw

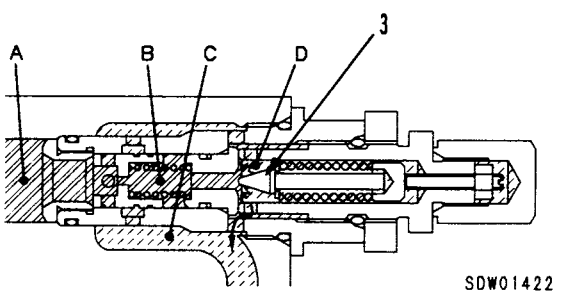
FUNCTION

Compared to the steering valve relief pressure of 31.4 MPa {320 kg/cm²}, the rated pressure of the emergency steering pump and diverter valve are both 20.6 MPa {210 kg/cm²}. Therefore, to protect the emergency steering pump and diverter valve, there is a relief valve in the piping from the diverter valve to the steering valve. When the emergency steering is being operated, and the hydraulic pressure generated by the steering exceeds 20.6 MPa {210 kg/cm²}, the relief valve is actuated.

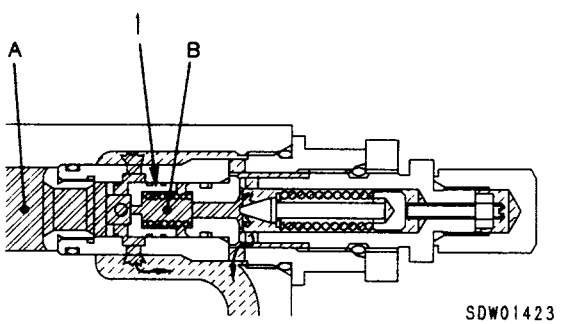


OPERATION

- Port **A** is connected to the pump circuit, and port **C** is connected to the drain circuit. The oil passes through the orifice in main valve (1) and fills port **B**. Pilot poppet (3) is in contact with valve seat (2).



- When the pressure inside port **A** and **B** reaches the pressure set by the poppet spring (set pressure), pilot poppet (3) opens and the hydraulic pressure at port **B** escapes from port **D** to port **C**. This lowers the pressure at port **B**.
- When the pressure at port **B** drops, the orifice of main valve (1) generates a difference in pressure between port **A** and port **B**. Main valve (1) is opened by the pressure at port **A** and the oil at port **A** is relieved.



Actuation of brake when upper valve fails

- Even if there is leakage of oil from the upper piping, when pedal (1) is depressed, spool (5) is moved down mechanically, so the lower portion is actuated normally.
  The upper brake is not actuated.

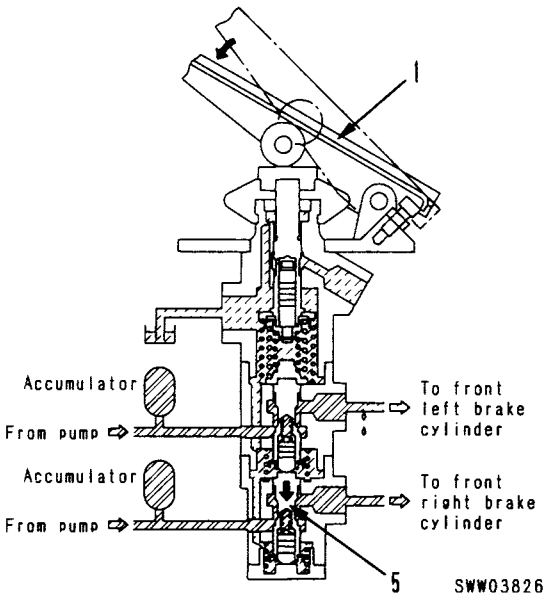
Actuation of brake when lower valve fails

- Even if there is leakage of oil from the lower piping, the upper portion is actuated normally.

When actuation is in balance

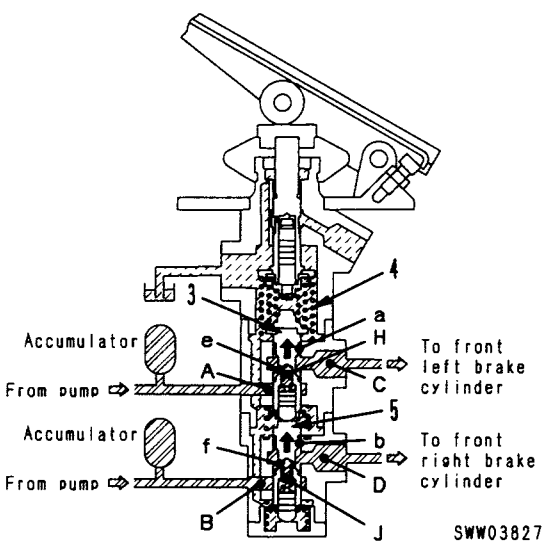
Upper

- When the front left brake cylinder is filled with oil, and the pressure at port **A** and port **C** becomes high, the oil entering port **H** through orifice **e** of spool (3) acts against spring (4). As a result, spool (3) is pushed up and port **A** and port **C** are shut off. When this happens, drain port **a** remains closed, so the oil stays in the brake cylinder and the brake is kept applied.

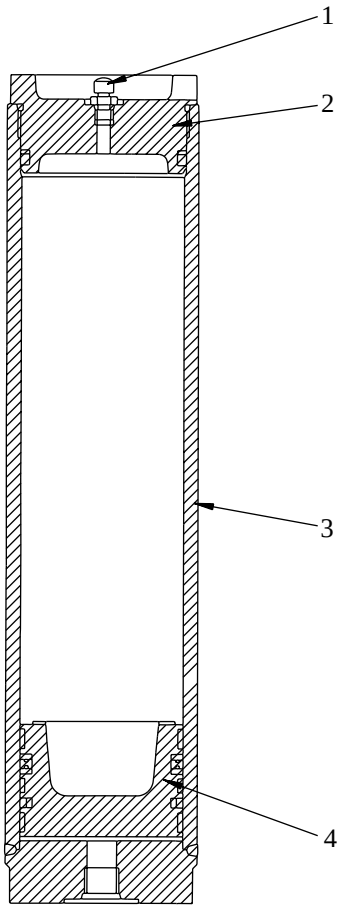


Lower

- Spool (3) of the upper brake moves up. As a result, at the same time that port **A** and port **C** are shut off, the front right brake cylinder is also filled with oil, and the pressure at port **B** and port **D** becomes high. The oil entering port **J** through orifice **f** of spool (5) pushes up spool (5) by the amount of movement of spool (3), so port **B** and port **D** are shut off. Furthermore, drain port **b** is closed, so the oil stays in the brake cylinder and the brake is kept applied.
- The pressure in the space in the upper portion balances the operating effort of the pedal, and the pressure in the space in the lower portion balances the pressure in the space in the upper portion. When spools (3) and (5) move the full stroke, the circuits between ports **A** and **C**, and between ports **B** and **D** are completely opened, so the space in the upper and lower portions and the oil pressure in the left and right brake cylinders is the same as the oil pressure from the pump.
  Therefore, the braking effect can be controlled by the amount the pedal is depressed until the piston moves the full stroke.



ACCUMULATOR (for brake)



SEW00120

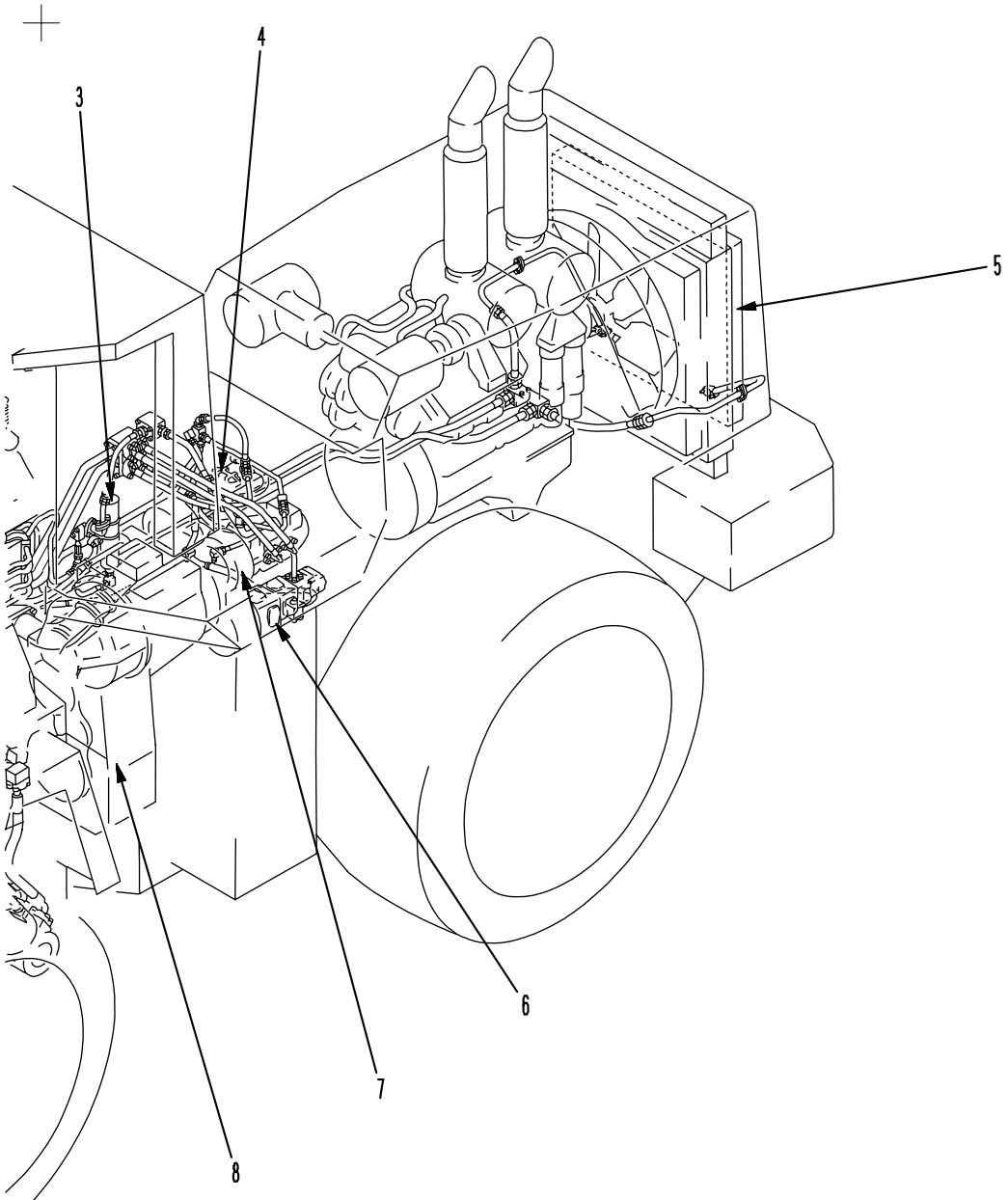
1. Valve
2. Top cover
3. Cylinder
4. Free piston

FUNCTION

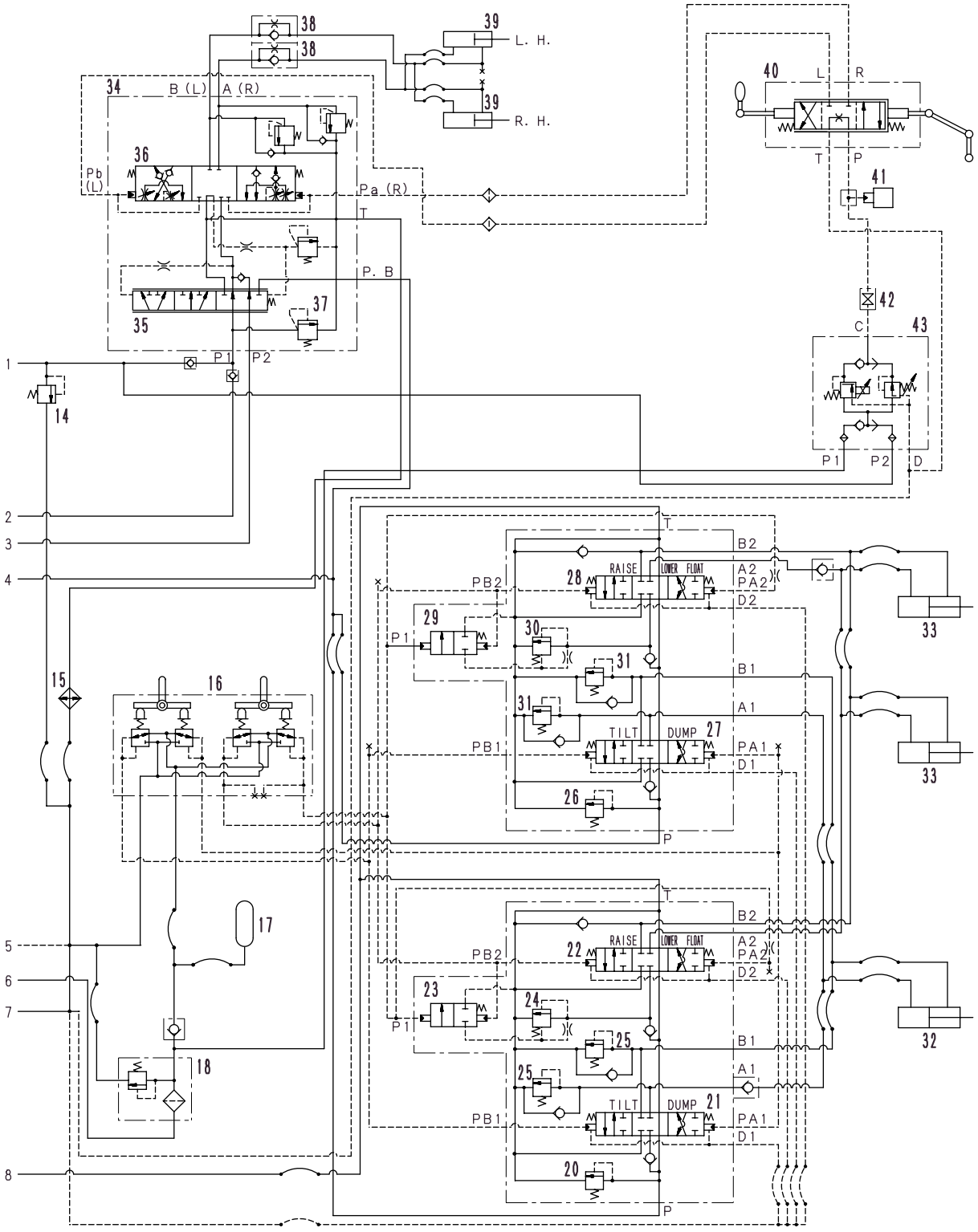
- The accumulator is installed between the charge valve and the brake valve. It is charged with nitrogen gas between cylinder (3) and free piston (4), and uses the compressibility of the gas to absorb the pulse of the hydraulic pump or to maintain the braking force and to make it possible to operate the machine if the engine should stop.

Specifications

Gas used:	Nitrogen gas
Charge amount:	6,000 cc
Charging pressure:	3.43 MPa {35 kg/cm^2} (at 50°C)



1. Bucket cylinder
2. PPC valve
3. Accumulator
4. Main piston pump
5. Hydraulic oil cooler
6. 4th gear pump
   (Torque converter charging (x 2) + PPC + brake)
   (Low-noise specification: Cooling fan motor + Torque converter charging pump (x 2) + Brake)
7. Switch piston pump
8. Transmission
9. Boom cylinder
10. Main control valve (x 2)



On the machines serial No. 50016 and up, the pilot circuits (PA2 and PB2) in which the oil from PPC valve (16) to boom spool (28) are reversed.

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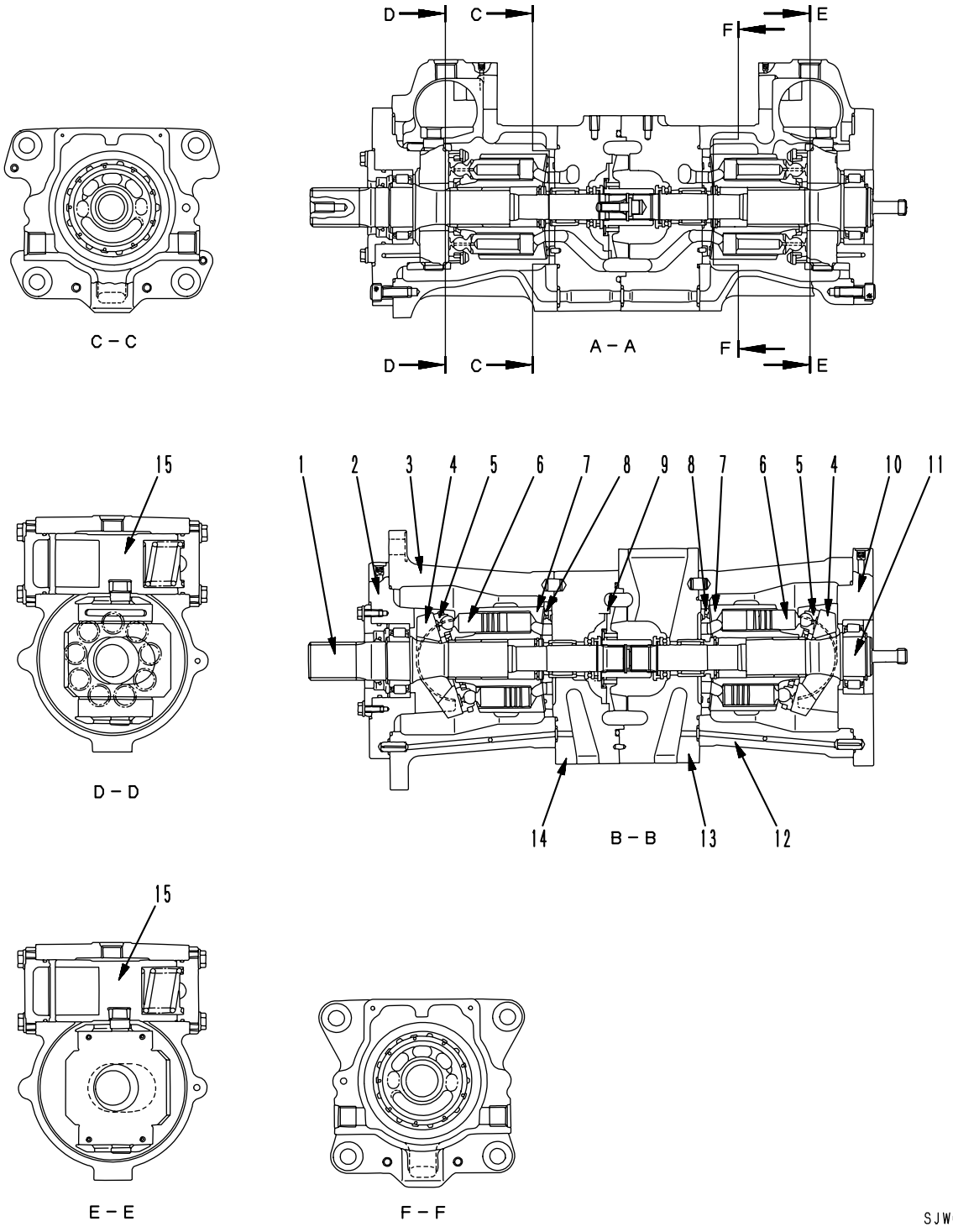
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B – B
13
12
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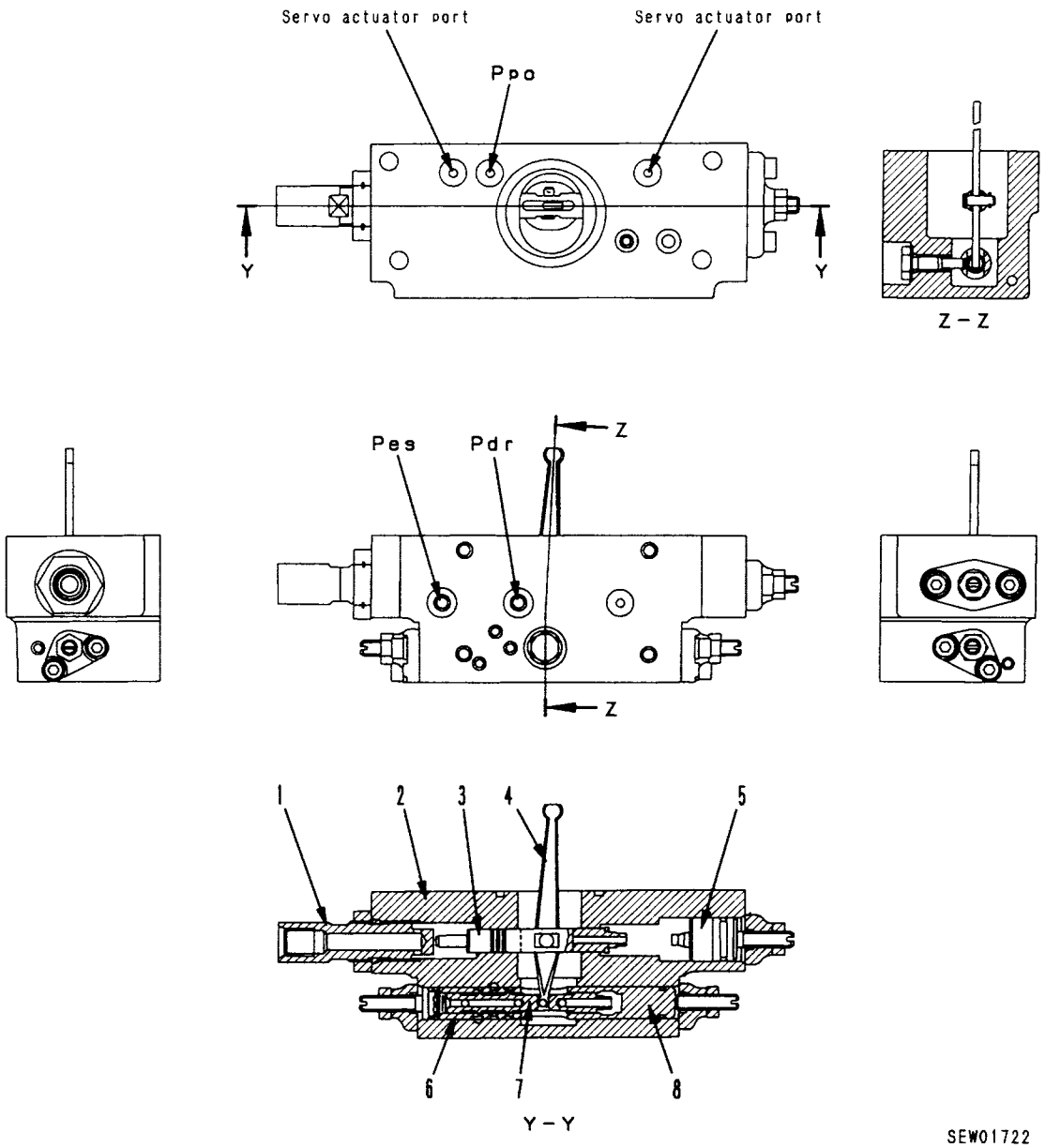
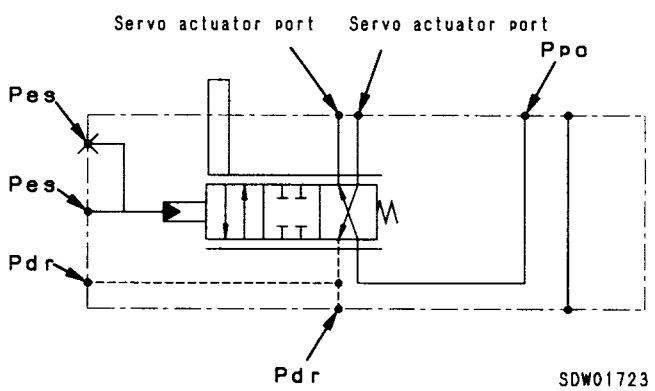
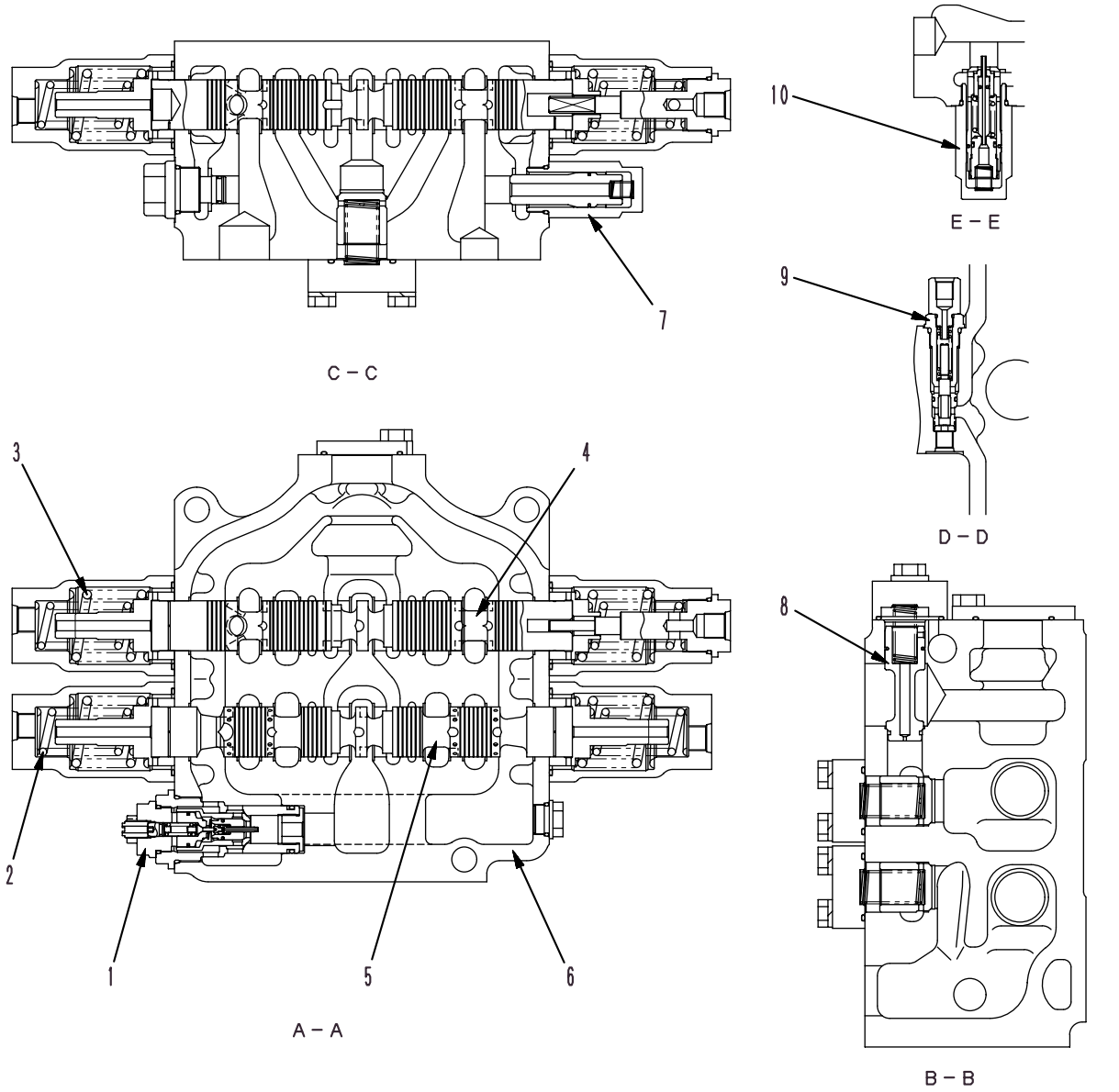
E – E
F – F
SJW06449

SERVO VALVE



1. Sleeve
2. Body
3. Spool
4. Arm
5. Plug
6. Sleeve
7. Spool
8. Plug



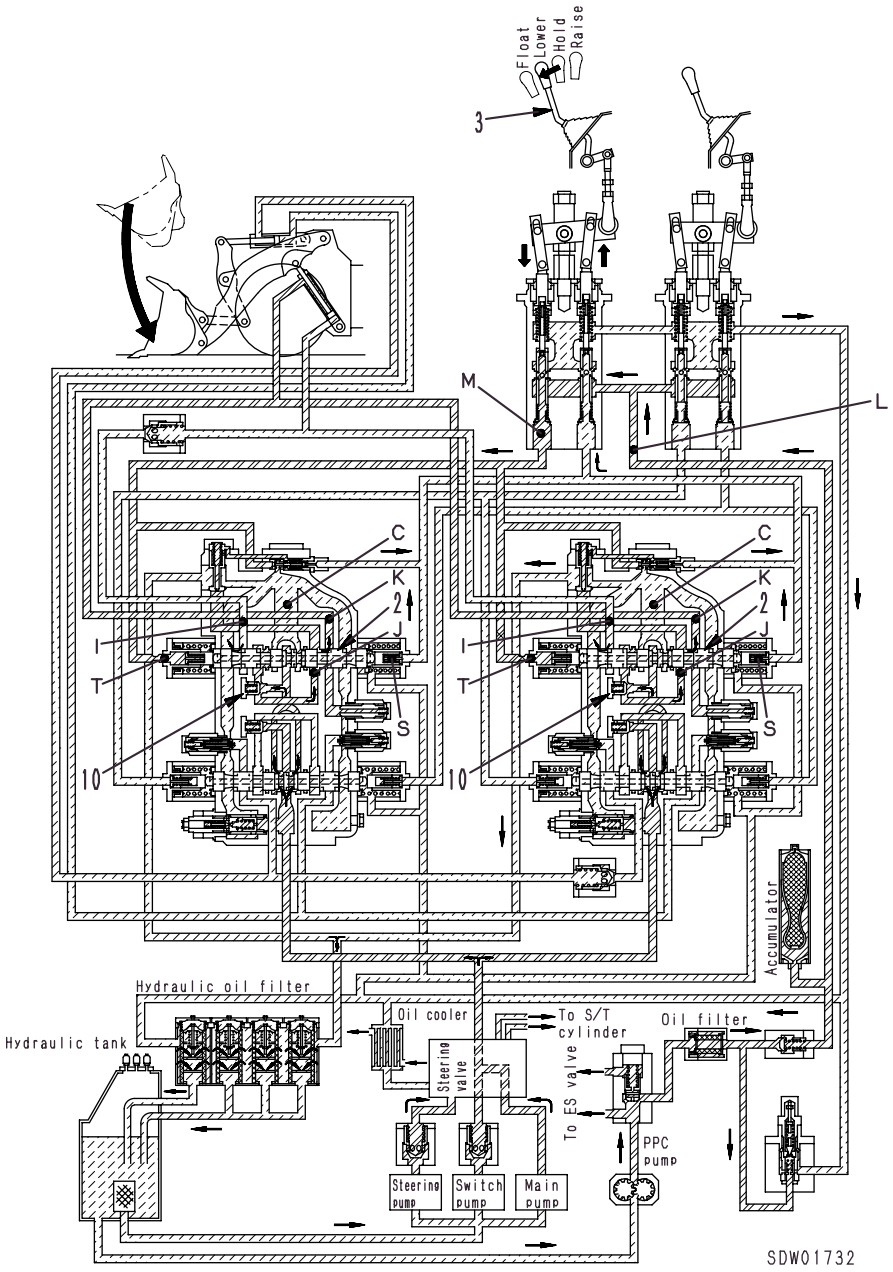


FUNCTION

- The two main control valves control the actuation of the boom and the bucket in the hydraulic system. It has a tandem circuit which gives priority to the bucket circuit.
- The oil from the pump enters port **P**. The maximum pressure is set by main relief valve (1). The oil passes through the bypass circuit of bucket spool (5) and boom spool (4). It then flows from port **T** to the drain circuit, passes through the filter and returns to the tank. If the bucket and boom spools are actuated, the oil flows to the bucket and boom cylinders.
  However, the circuit gives priority to the bucket, so when the bucket spool is being operated, even if the boom spool is operated, the boom will not move.
- There are two safety valves (with suction valves) (10) to protect the circuit if abnormal pressure is generated in the bucket circuit. If one of the two safety valves is acting as a relief valve, the other valve acts as a suction valve to make up any lack of oil.

Serial No.: 50001 – 50015

BOOM SPOOL IN "LOWER"

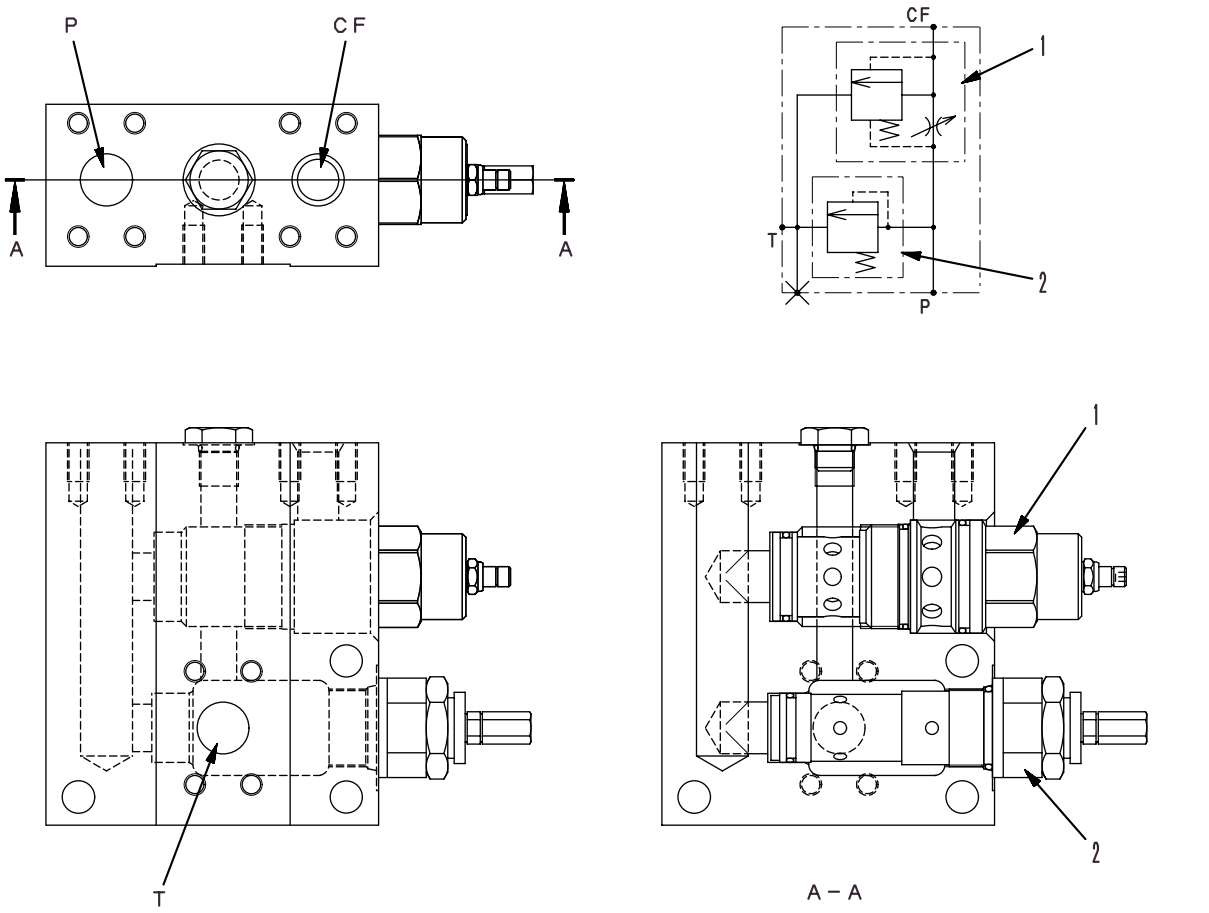


OPERATION

- When boom lever (3) is pushed, the oil flows from port **L** of the PPC valve to port **M** and port **T**. In addition, the oil at port **S** flows to the drain circuit.
  The oil pressure at port **T** pushes boom spool (2) and moves it to the LOWER position.
- The oil from the steering valve passes through the bypass circuit of the bucket spool and flows to the bypass circuit of boom spool (2). The bypass circuit is closed by the spool, so the oil pushes open check valve (10). The oil flows from port **J** to port **K**, and flows to the cylinder rod end.
- At the same time, the oil at the cylinder bottom enters drain port **C** from port **I** and returns to the tank. Therefore, the boom goes down.

PRIORITY VALVE

LOW-NOISE SPECIFICATION



SJW06523

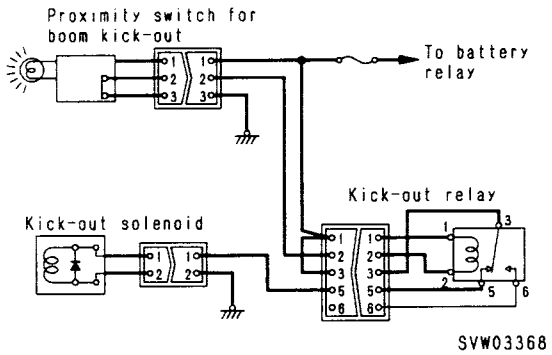
1. Priority valve
2. Relief valve (20.6 MPa {210 kg/cm^2})

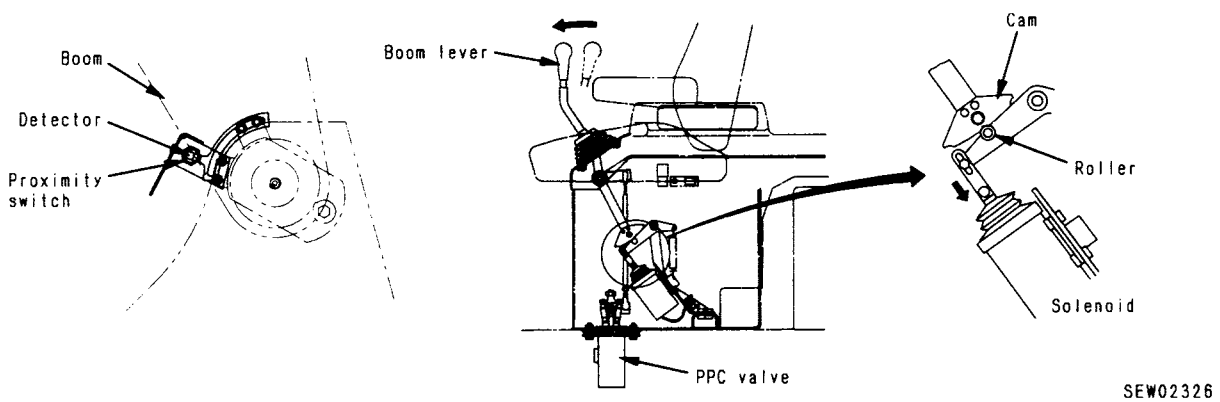
P. From cooling fan motor drive pump
CF. To cooling fan motor
T. To hydraulic tank

FUNCTION

- The priority valve is installed in the circuit between the cooling fan motor drive pump and cooling fan motor and used to keep the oil pressure in the circuit constant and supply hydraulic oil of a fixed quantity to the cooling fan motor regardless of the engine speed.

- When the boom rises and reaches the set position for the kick-out, in other words, the detector (steel plate) is in position on the detection surface of the proximity switch, an electric current is sent to the solenoid by the action of the proximity switch and relay circuit. As a result, the solenoid is actuated, and the cam is pulled away from the cam detent, so the boom spool is returned to the HOLD position by the return spring.





Action of proximity switch

Position	When detector is in position at detection surface of proximity switch	When detector is separated from detection surface of proximity switch
Proximity switch actuation display	Lights up	Goes out
Proximity switch load circuit (relay switch circuit)	Current flows	Current is shut off
Relay switch load circuit (solenoid circuit)	Current flows	Current is shut off

OUTLINE

- The machine monitor system uses the sensors and other devices installed to various parts of the machine to observe the condition of the machine. It processes this information swiftly and displays it on the monitor panel to inform the operator of the condition of the machine.
- The machine monitor system consists of the main monitor, maintenance monitor, sensors, switches, relays, alarm buzzer, and power source.
- The displays can be broadly divided into the following: Cautions displayed on the monitors (abnormalities in the machine where an alarm is given) and normal conditions which are always displayed on the instrument panel (pilot lamps and readings for the gauges, speedometer, and service meter).
- There are also various switches built into the monitor panel which function to operate the machine.

※ The main monitor uses the network wiring to send signals to the controller, and functions to display the following information.
  ① Shift indicator: 1st – 3rd, N, F, R (F, R are optional) (When auto shift, joystick steering are installed)
  ② HOLD (option)
  ③ Failure action code, failure code, time elapsed since failure (failure data display mode)

DISPLAY FUNCTION OF MULTI MONITOR

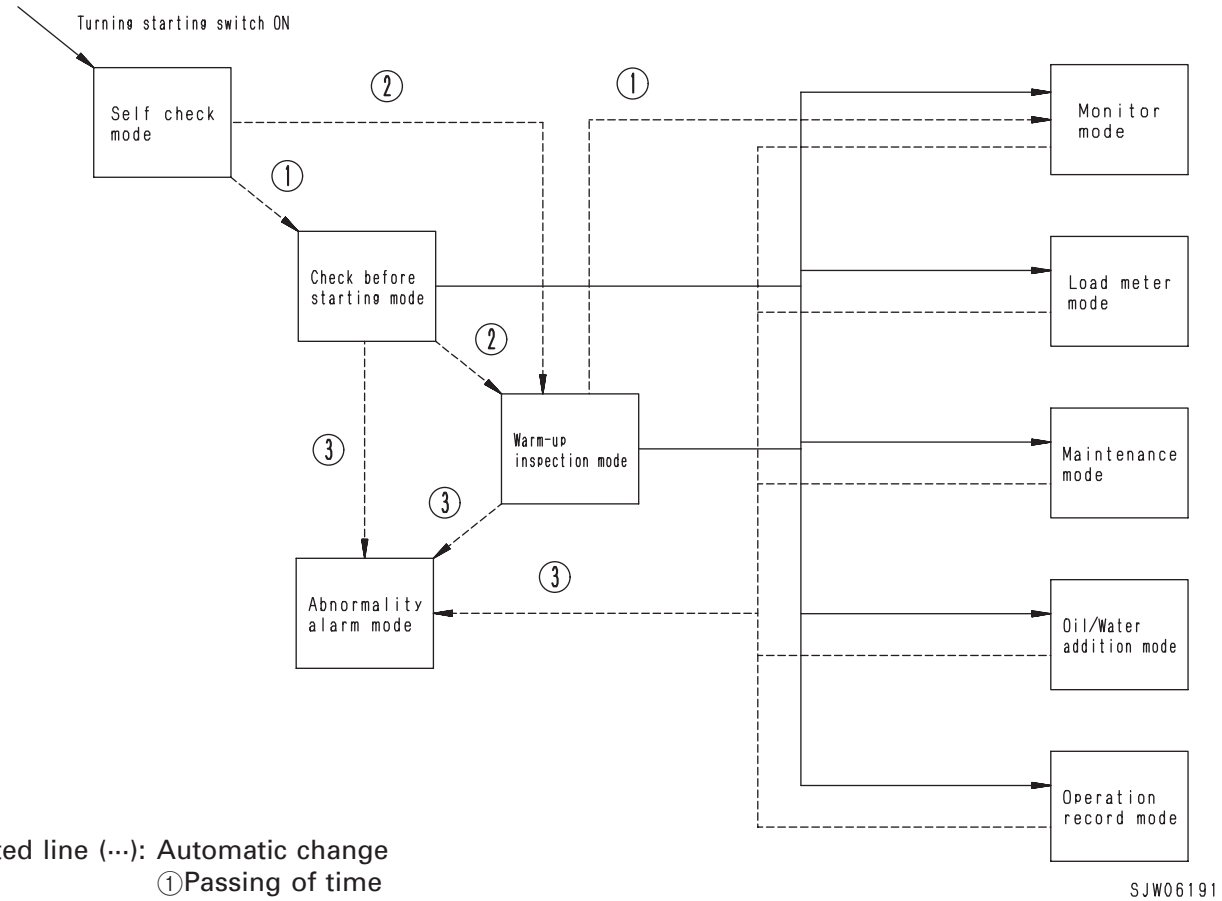
1. Display modes

The display modes of the multi monitor are classified into ones displayed automatically (flow of time and occurrence of abnormality) and the other ones selected and displayed by operation of the switches.

1) Modes displayed automatically
   - Self-check mode
   - Check-before-starting mode
   - Warm-up inspection mode
   - Abnormality alarm mode

2) Modes displayed by operation of switches
   - Monitor mode (Displayed automatically only after warm-up inspection)
   - Load meter mode
   - Maintenance mode
   - Oil/Water addition mode
   - Operation record mode

2. Change of display mode



Dotted line (···): Automatic change
①Passing of time
②Start of engine
③Occurrence of abnormality

Solid line (–): Change by operation of switches

Item		Specified time (h)
Oil	Engine	250
	Transmission	1000
	Hydraulic	2000
	Axle	2000
Filter	Engine	250
	Transmission	500
	Hydraulic	2000
	Fuel	500
Pin 1	Axle pivot	100
	Work equipment	250
	Steering cylinder	250
Pin 2	Center hinge	1000
	Drive shaft	1000
	Center support	1000

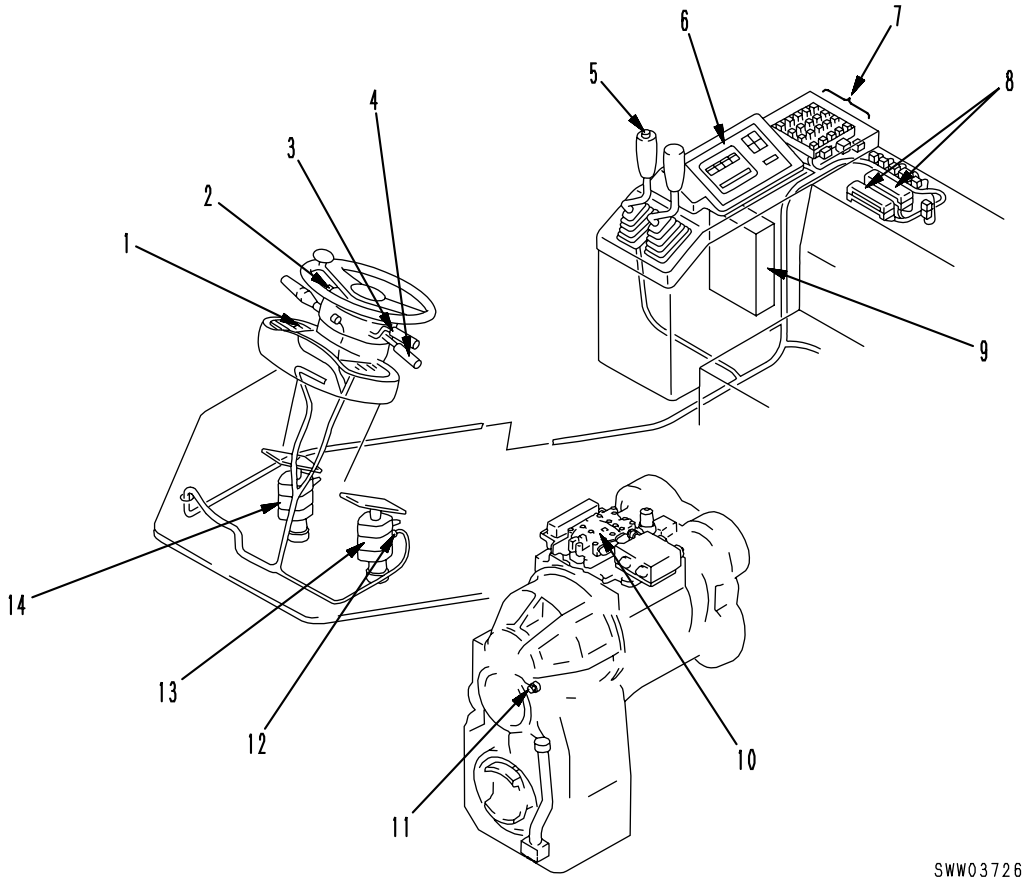
- Selection of screen
  There are 4 screens in the maintenance mode. Those screens appear in the following order each time the maintenance switch is pressed.

  Oil maintenance → Filter maintenance
  ↑ ↓
  Pin 2 maintenance ← Pin 1 maintenance

- Resetting of replacement period
  The time of an item which is replaced or greased can be reset to the specified period by the following method.
  (1) Press the maintenance switch to select the screen of the item to be reset.
  (2) Hold the feed/update switch for 2 seconds, and the replacement period of the top item flashes in yellow.
  (3) Press the feed/update switch to select the item to be reset (Make that item flash).
  (4) Hold the feed/update switch for 2 seconds, and the replacement period is set to the specified value. To return the changed period to the value before changing, hold the feed/update switch for 2 seconds again.
  (5) Hold the feed/update switch for 2 seconds to finish resetting.
  (6) If the numeral/subtotal switch and maintenance switch are held simultaneously for 2 seconds under the condition of step (2), all the data can be reset.

- Prohibition of counting of replacement period
  Counting of the replacement/greasing period of each item can be prohibited by the following method. The replacement period of the prohibited item is displayed in white.
  (1) Press the maintenance switch to select the screen of an item to be prohibited.
  (2) Hold the feed/update switch for 2 seconds, and the replacement period of the top item flashes in yellow.
  (3) Press the feed/update switch to select the item to be prohibited (Make that item flash).
  (4) Hold the numeral/subtotal switch for 10 seconds, and the replacement period becomes white. To reset the prohibition, hold the numeral/subtotal switch for 10 seconds again.
  (5) Hold the feed/update switch for 2 seconds to finish setting prohibition.

ELECTRICAL TRANSMISSION CONTROL

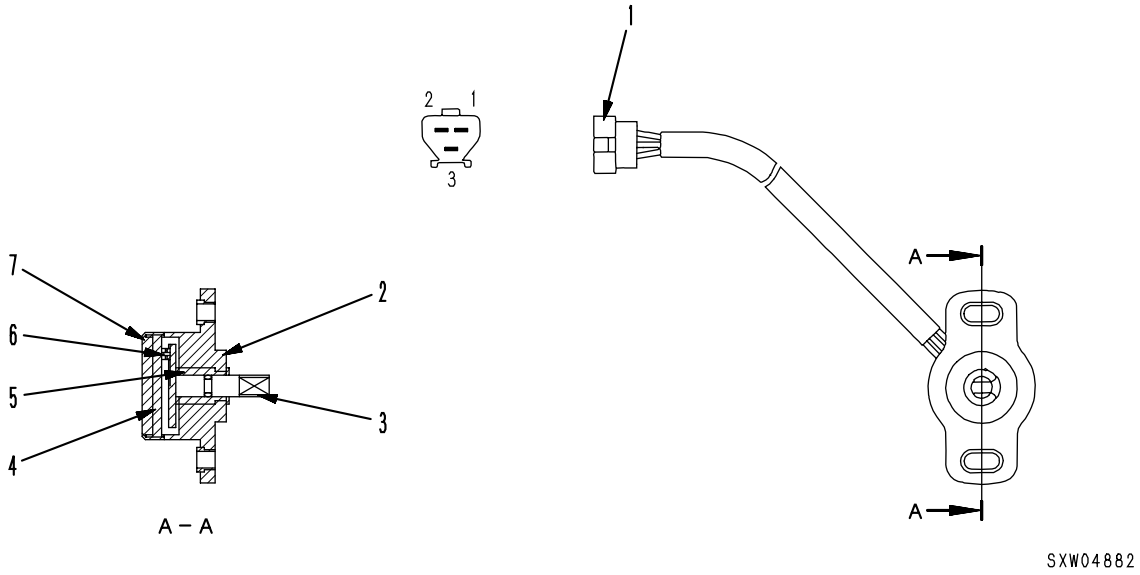


1. Transmission cut-off selector switch
2. Parking brake switch
3. Directional lever
4. Speed lever
5. Kick-down switch
6. Maintenance monitor
7. Relays
8. Fuse boxes
9. Transmission controller
10. Transmission control valve (Model with auto shift system)
11. Speed sensor
12. Transmission cut-off switch
13. Brake valve (left)
14. Brake valve (right)

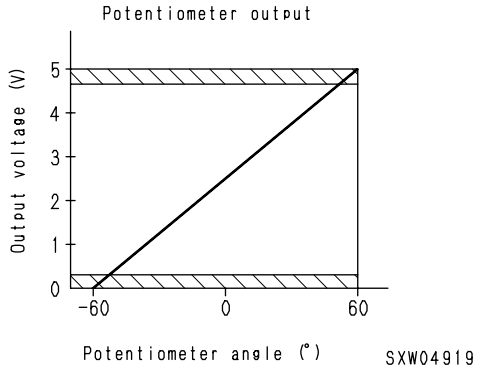
Function

1	Selection of F, R, and N positions	Using directional lever
2	Selection of speed range	Using speed lever
3	Kick-down switch	When traveling in F2, it is possible to shift down to 1st using this switch without using the speed lever. If directional lever is operated to R or N, speed range automatically returned to 2nd.
4	Transmission cut-off function	Transmission is shifted to neutral when brake is operated. (Serial No.: 50001 – 50024: Right and left brake pedals Serial No.: 50025 and up: Left brake pedal)
5	Transmission cut-off selector function	It is possible to select whether to actuate or not actuate the transmission cut-off function. In this way, it is possible to obtain the same or greater ease of operation as on conventional loaders with the left brake when carrying out scooping work or when loading or unloading the machine from a trailer.
6	Neutralizer	To prevent seizure of the parking brake when traveling with the parking brake applied, the transmission is shifted to neutral when the parking brake is applied.
7	Neutral safety function	If the directional lever is not at the N position, the engine will not start when the starting switch is turned. This prevents the machine from starting suddenly. (For details, see STARTING CIRCUIT.)
8	Warning function	When traveling in reverse, the backup lamp lights up and the backup horn sounds to warn people in the area.

POTENTIOMETER



1. Connector
2. Case
3. Shaft
4. Element
5. Bearing
6. Contact
7. Mold

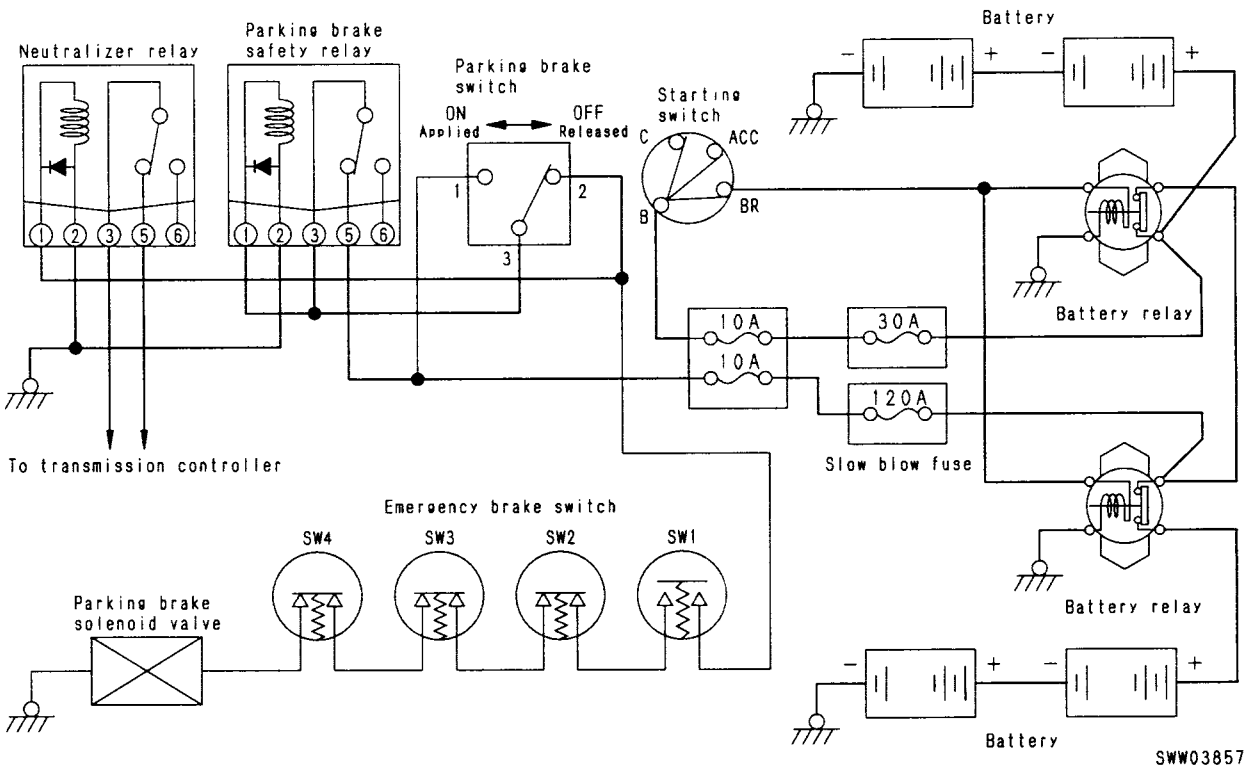


Function

The potentiometer senses the operating angle. In the potentiometer, the source voltage of 5 V is converted with a variable resistor into a signal voltage according to the angle, then sent to the controller.

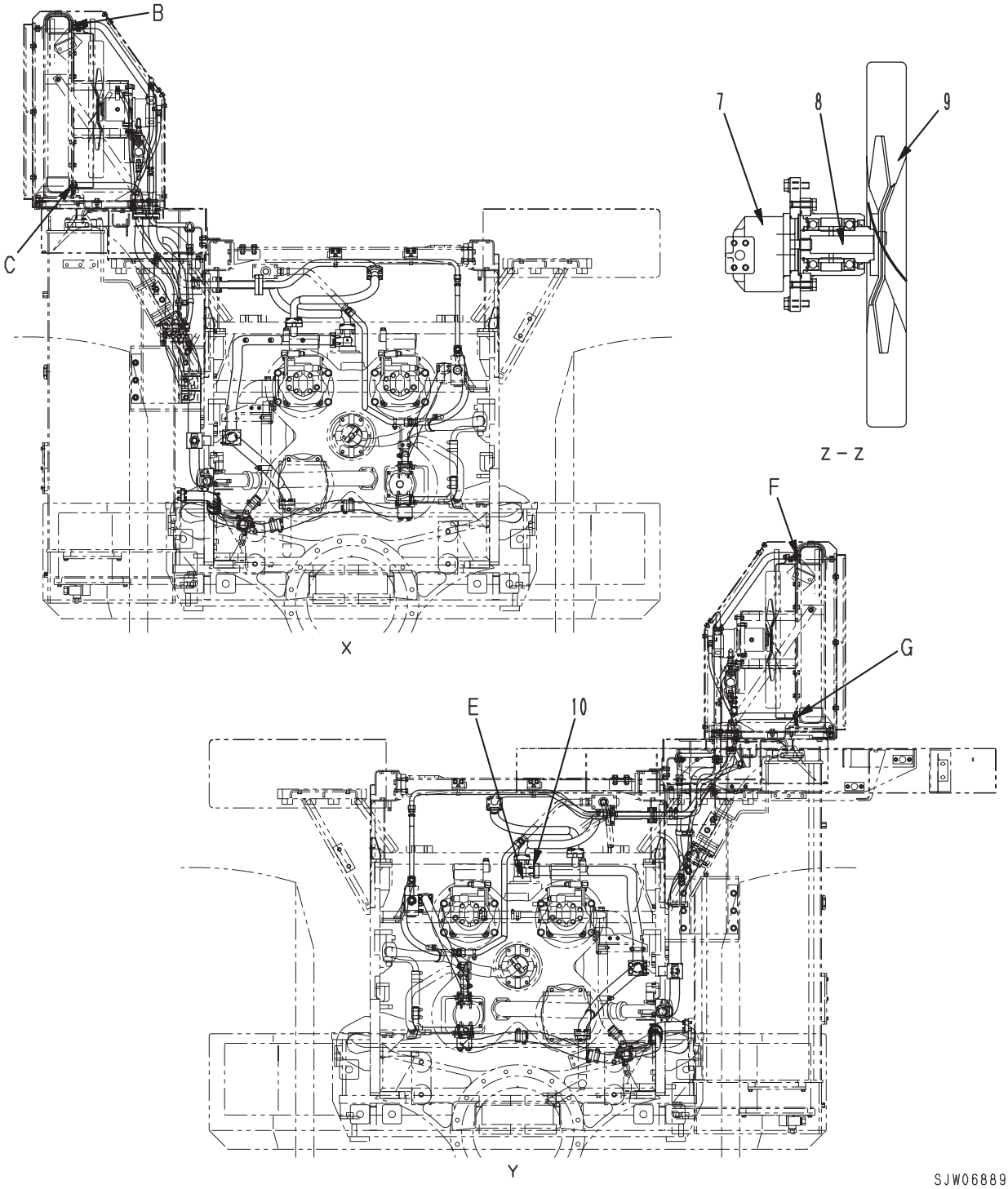
The hatched area in the above figure is the abnormality detection area. If the controller receives the above signal in this area, it judges that the potentiometer system has a trouble such as wire breakage, short circuit, etc. Since the correct position cannot be sensed in this case, the control output is turned off and the failure code is displayed on the main monitor.

5. When main brake oil pressure drops (emergency brake actuated)



OPERATION

- If the accumulator pressure drops, the emergency brake switch installed to the accumulator is opened.
  For this reason, the electric current stops flowing to the parking brake solenoid valve, so the oil pressure inside the spring cylinder is drained and the parking brake is applied.
  However, in this case, the condition is different from the case where the parking brake switch is ON (applied), because there is electric current flowing to the neutralizer relay coil.
- For this reason, a signal is sent to the transmission controller, and it is possible to engage the transmission clutch. In this way, it is possible to use the engine brake when the emergency brake is applied, so the braking distance becomes shorter. At the same time, if the emergency brake has been applied and it is necessary to move the machine (for example, if the emergency brake is applied when the machine is on a railway crossing), it is possible to move the machine by operating the transmission lever.



1. Additional hydraulic oil cooler
2. Additional torque converter oil cooler
3. Flow priority valve
4. Flow divider
5. PPC pump
6. Orifice plate
7. Fan drive motor
8. Shaft
9. Fan
10. Orifice plate

A. To additional hydraulic oil cooler (From main control valve)
B. Hydraulic oil inlet
C. Hydraulic oil outlet
D. To hydraulic tank (From additional hydraulic oil cooler)
E. Torque converter oil outlet (To additional torque converter oil cooler)
F. Torque converter oil inlet
G. Torque converter oil outlet

20 TESTING AND ADJUSTING

★ Note the following when making judgements using the standard value tables for testing, adjusting, or troubleshooting.

1. The standard value for a new machine given in the table is the value used when shipping the machine from the factory and is given for reference. It is used as a guideline for judging the progress of wear after the machine has been operated, and as a reference value when carrying out repairs.
2. The service limit value given in the tables is the estimated value for the shipped machine based on the results of various tests. It is used for reference together with the state of repair and the history of operation to judge if there is a failure.
3. These standard values are not the standards used in dealing with claims.

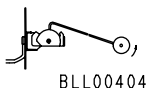
⚠ **When carrying out testing, adjusting, or troubleshooting, park the machine on level ground, insert the safety pins, and use blocks to prevent the machine from moving.**

⚠ **When carrying out work together with other workers, always use signals and do not let unauthorized people near the machine.**

⚠ **When checking the water level, always wait for the water to cool down. If the radiator cap is removed when the water is still hot, the water will spurt out and cause burns.**

⚠ **Be careful not to get caught in the fan, fan belt or other rotating parts.**

System	Name of component		Connector No.	Inspection method	Judgement table	Measurement conditions
Transmission & Joystick steering controller	Controller	Neutralizer relay	C3A	Measure voltage	If the condition is as shown in the table below, it is normal. Parking brake is released: Between (19) – (17): 20 – 30 V Parking brake is applied: Between (19) – (17): Max. 1 V	1) Turn starting switch OFF. 2) Insert T-adapter. 3) Start engine.
	Controller	System network (S-NET) (Between T/M controller and main monitor)	C3B	Measure voltage	If the condition is as shown in the table below, it is normal. Between (4), (12) – chassis: 4 – 8 V	1) Turn starting switch OFF. 2) Insert T-adapter. 3) Turn starting switch ON.
	Kick-down switch & shift-down switch		L15 (male)	Measure resistance	If the condition is as shown in the table below, it is normal. Kick-down switch at ON: Between (1) – (2): Max. 1 Ω Kick-down switch at OFF: Between (1) – (2): Min. 1 MΩ	1) Turn starting switch OFF. 2) Disconnect connectors. 3) Connect T-adapter.
	Shift-up switch			Measure resistance	If the condition is as shown in the table below, it is normal. Shift-up switch at ON: Between (3) – (4): Max. 1 Ω Shift-up switch at OFF: Between (3) – (4): Min. 1 MΩ	1) Turn starting switch OFF. 2) Disconnect connectors. 3) Connect T-adapter.
	Transmission cut-off switch		L12 (male)	Measure resistance	If the condition is as shown in the table below, it is normal. Normal condition: Between (1) – (2): Max. 1 Ω L.H. brake pedal is depressed: Between (1) – (2): Min. 1 MΩ	1) Turn starting switch OFF. 2) Disconnect connectors. 3) Connect T-adapter.
	Controller	Manual switch	C5	Measure voltage	If the condition is as shown in the table below, it is normal. Manual switch at ON: Between (14) – chassis: Max. 1 V Manual switch at OFF: Between (14) – chassis: 20 – 30 V	1) Turn starting switch OFF. 2) Insert T-adapter. 3) Turn starting switch ON.

System	Name of component	Connector No.	Inspection method	Judgement table	Measurement conditions
Maintenance monitor	Power supply	L18	Measure voltage	If the condition is as shown in the table below, it is normal. Between (1), (2) – chassis: 20 – 30 V Between (1), (2) – (3): 20 – 30 V	1) Turn starting switch OFF. 2) Insert T-adapter. 3) Turn starting switch ON.
	Engine water temperature sensor	E04 (male)	Measure resistance	If the condition is as shown in the table below, it is normal. Normal temperature (25°C): Between (1) – (2): Approx. 40 kΩ 130°C: Between (1) – (2): Approx. 1.7 kΩ	1) Turn starting switch OFF. 2) Disconnect connectors. 3) Connect T-adapter.
	Torque converter oil temperature sensor	T02 (male)	Measure resistance	If the condition is as shown in the table below, it is normal. Normal temperature (25°C): Between (1) – (2): Approx. 40 kΩ 130°C: Between (1) – (2): Approx. 1.7 kΩ	1) Turn starting switch OFF. 2) Disconnect connectors. 3) Connect T-adapter.
	Fuel level sensor	R05 (male)	Measure resistance	If the condition is as shown in the table below, it is normal.  BLL00404 Float raised to stopper: Approx. 4 Ω  BLL00405 Float lowered to stopper: Approx. 85 Ω	1) Turn starting switch OFF. 2) Disconnect connectors. 3) Drain fuel. 4) Remove fuel level sensor. 5) Connect T-adapter.
	Radiator water level sensor	G06 (male)	Measure resistance	If the condition is as shown in the table below, it is normal. Water level normal: Between (1) – (2): Max. 1 Ω Water level low: Between (1) – (2): Min. 1 MΩ	1) Turn starting switch OFF. 2) Disconnect connectors. 3) Connect T-adapter.
	Engine oil pressure sensor	E09	Measure resistance	If the condition is as shown in the table below, it is normal. Engine oil pressure when engine running: above 0.07 MPa {0.7 kg/cm²}: Between (1) – (3): Min. 1 MΩ Engine oil pressure when starting switch ON: above 0.03 MPa {0.3 kg/cm²}: Between (1) – (3): Max. 1 Ω	1) Turn starting switch OFF. 2) Disconnect terminal. 3) Start engine.

MEASURING COMPRESSION PRESSURE

★ When carrying out performance test or trouble-shooting, if it is thought that the piston, piston ring, or cylinder liner are worn, measure the compression pressure.

⚠ When measuring the compression pressure, be careful not to touch the exhaust manifold or other hot parts, or to get caught in rotating parts, such as the fan or fan belt.

1. Adjust the valve clearance.
   ★ For details, see ADJUSTING VALVE CLEARANCE.

2. Warm up the engine so that the oil temperature rises to 40 – 60°C.

3. Disconnect wiring connector (1).

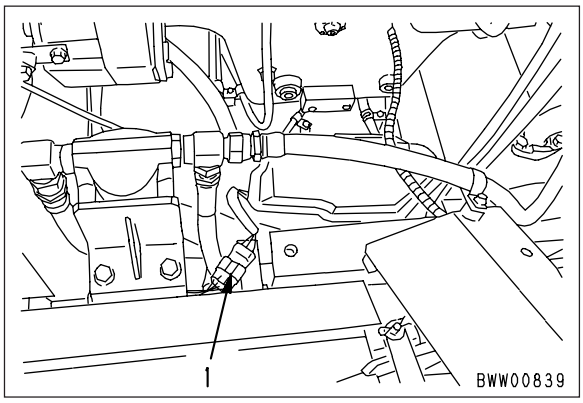
4. Remove nozzle holder of cylinder to be measured.

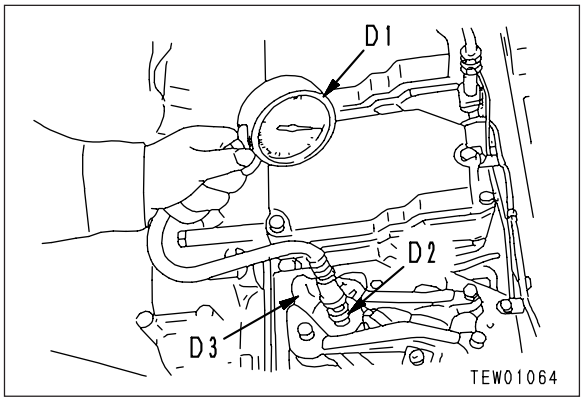
5. Install adapter **D2** and plate **D3** of tool **D** on the mount of the nozzle holder, then connect the pressure gauge **D1**.

6. Set multi-tachometer **A** in position.

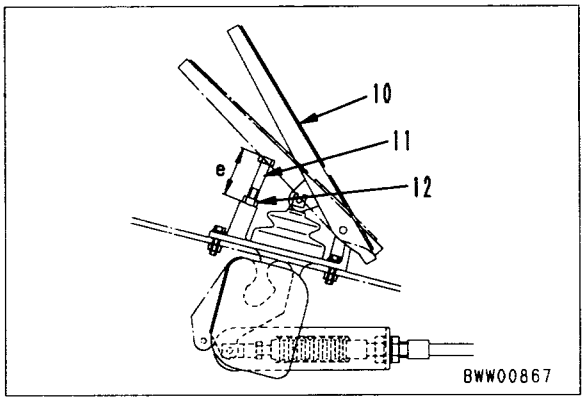
7. Disconnect the wiring of the engine stopping motor, crank the engine with the starting motor and measure the compression pressure.

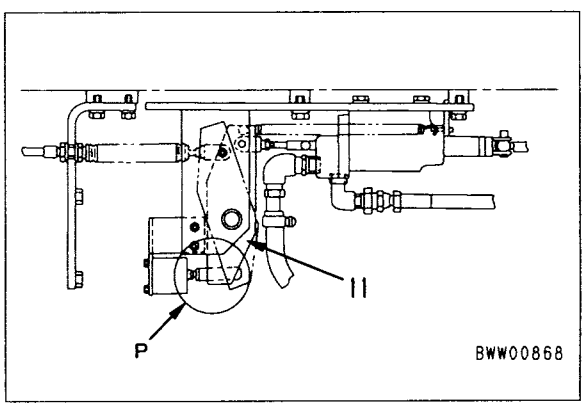
   ★ Measure the compression pressure at the point where the pressure gauge indicator remains steady.
   ★ When measuring the compression pressure, measure the engine speed to confirm that it is within the specified range.

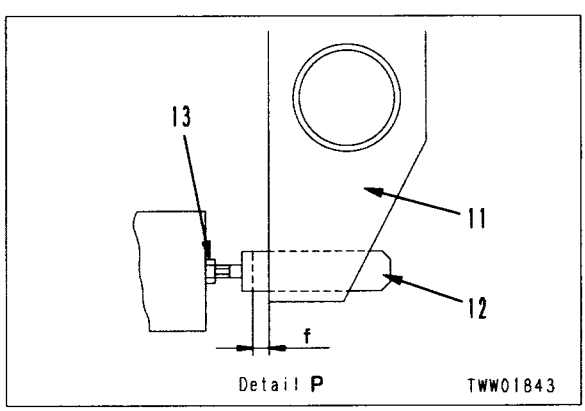




7. Loosen locknut (13) and adjust the secondary low idling by turning yoke (12) so that the clearance **f** between lever (11) at the engine end and air cylinder yoke (12) is as shown below when the engine is topped.
   - Standard value: **f** = 6.3 mm
   - ★ After completing the adjustment, check that the engine speed is 850^{+50}_{0} rpm when the low idling speed is switched to secondary low idling speed.



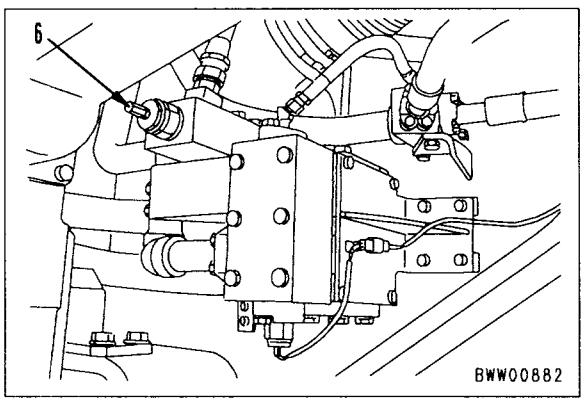




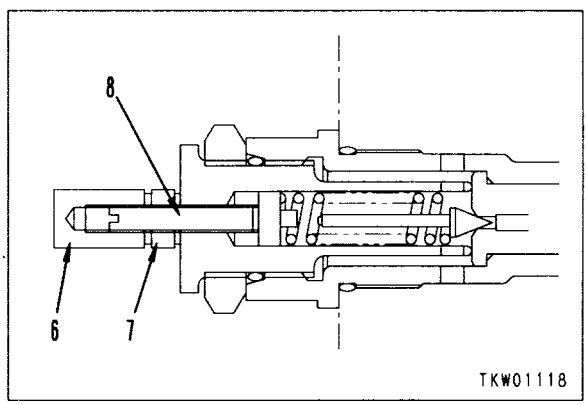
ADJUSTING

⚠ Always stop the engine before adjusting the hydraulic pressure.

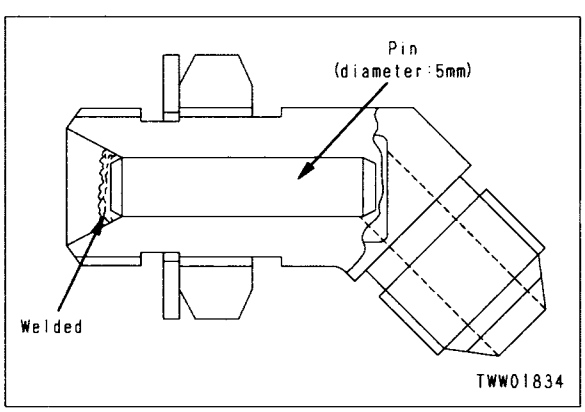
1. Remove capnut (6) of the relief valve.



2. Loosen locknut (7), then turn adjustment screw (8) to adjust.
   - ★ Amount of adjustment for 1 turn of adjustment screw.
     1 turn: Approx. 3.5 MPa {35.7 kg/cm²}
   - ★ Adjust the set pressure as follows.
     To INCREASE pressure, TIGHTEN screw.
     To DECREASE pressure, LOOSEN screw.
   - ★ If it is impossible to measure relief pressure accurately, do not try to adjust the pressure.

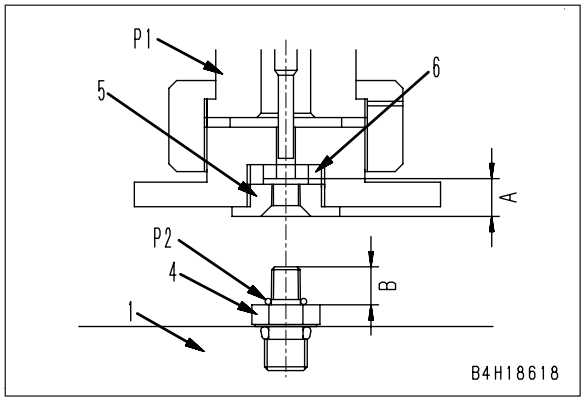


★ **Preparatory of oil passage shut off elbow**
Prepare elbow (07236-10210), insert pin (dia.: 5 mm) in drilled hole, then weld pin and elbow to shut off passage.



Precautions for connecting gas charging tool P1

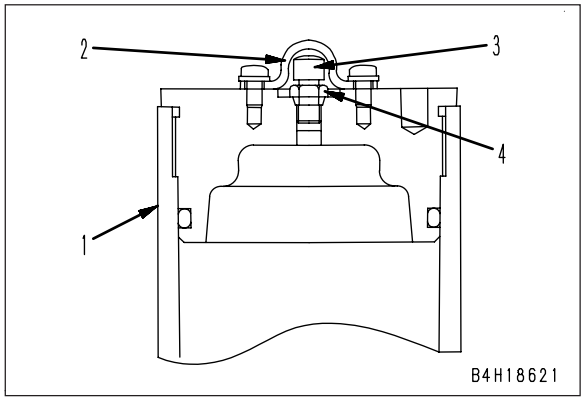
★ The threaded portion of adapter (5) of gas charging tool **P1** is coated with sealant. If the adapter is removed without reason, it can cause gas leakage. Never remove it.
★ When connecting gas charging tool **P1** to accumulator (1), always fit O-ring **P2**, which is an accessory of gas charging tool **P1**, to gas valve (4), and check for leakage.
★ In some cases, threaded portion height (B) of gas valve (4) is short for depth (A) from the end face of adapter (5) of gas charging tool **P1** to packing (6). In this case, nitrogen gas may leak through the threaded portion of gas valve (4). To prevent this, securely install gas charging tool **P1**.



Testing of accumulator nitrogen gas pressure

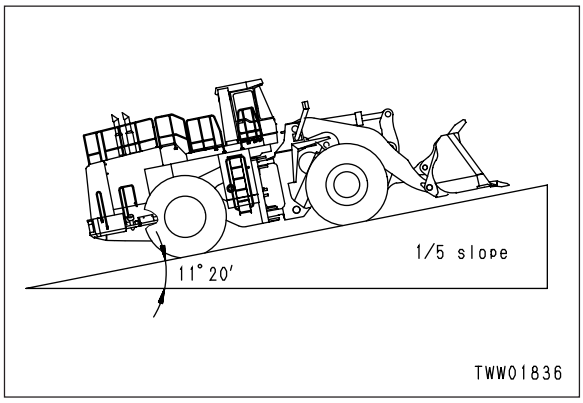
★ The accumulators for the front brake, rear brake, and parking brake have the same shape.
★ The accumulator can be tested similarly in an uninstalled state as well.
★ Both old accumulator and new one are listed. Confirm shape of accumulator and test.

1. Stop the engine, depress the brake pedal repeatedly until its reaction force disappears in order to completely release the oil pressure from the brake circuit.
   ★ As a guide, by depressing the brake pedal approximately 30 times, the reaction force of the brake pedal disappears and the oil pressure is released.
2. Remove valve guard (2) and cap (3) from accumulator (1). (Old type accumulator)



TESTING PARKING BRAKE PERFORMANCE

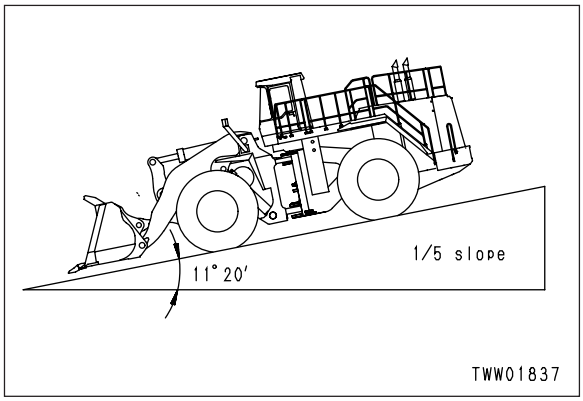
★ Measurement condition
- Tire inflation pressure: Specified pressure
- Road surface: Flat, dry, paved surface with 1/5 (11°20′) gradient.
- Machine: In operating condition



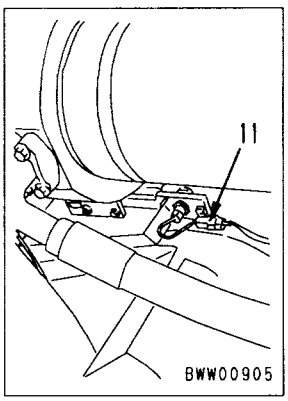
1. Start the engine and drive the machine straight up a 1/5 gradient with the bucket unloaded.

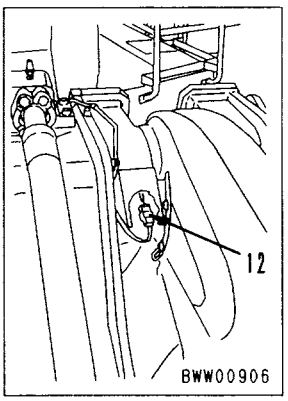
2. Depress the brake, place the directional lever in neutral, then stop the engine.

3. Turn the parking brake switch ON, then slowly release the brake pedal and keep the machine must be kept stopped.
   ★ The measurement must be made with the machine facing either up or down the slope.

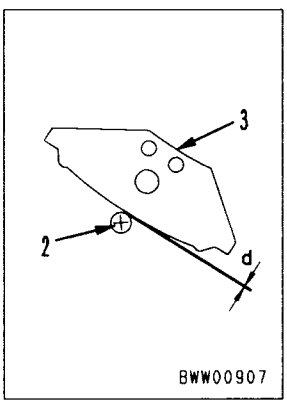


4. Do as follows to set boom kickout solenoid (9) and bucket positioner solenoid (10) at the pulled (electricity flowing) condition.
   1) Disconnect wiring connectors (F05) (11) and (F06) (12).
      ★ F05 (11) : Proximity switch for bucket positioner
      F06 (12) : Proximity switch for boom kickout
   2) Connect T-adapter and short circuit between terminals (1) and (2).
      ★ Check that the solenoid is pulled in full stroke 12 mm.

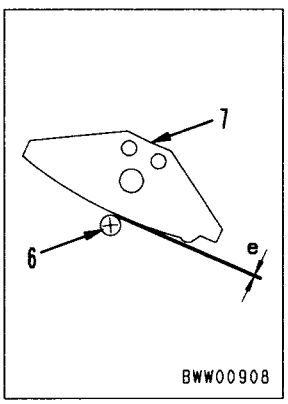




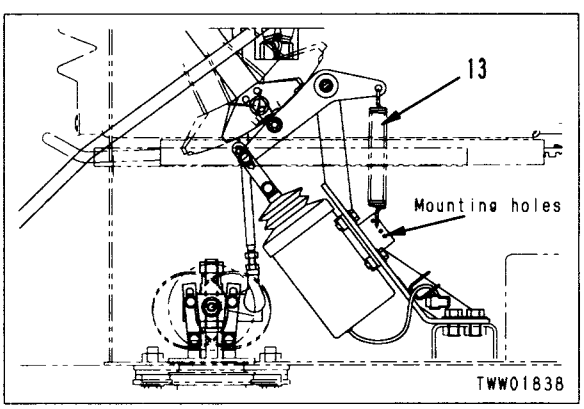
5. Set with boom kickout solenoid (9) pulled, then move to adjust the solenoid so that clearance **d** between boom lever cam (3) and cam follower (2) is 0 – 0.5 mm.
   ★ When adjusting, hold boom lever at HOLD.



6. Set with bucket positioner solenoid (10) pulled, then move to adjust the solenoid so that clearance **e** between bucket lever cam (7) and cam follower (6) is 0 – 0.5 mm.
   ★ When adjusting, hold bucket lever at HOLD.

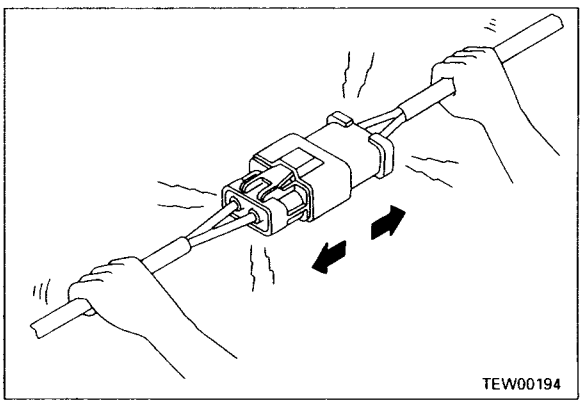


7. If the operating effort for releasing the boom lever is not 19.6 N {2 kg} and the operating effort for releasing the bucket lever is not 9.8 N {1 kg}, change the position of the mounting holes (4 places) of spring (13) to adjust the release effort.
   ★ When the machine is shipped from the factory, the spring is hooked to the 2nd mounting hole from the top.

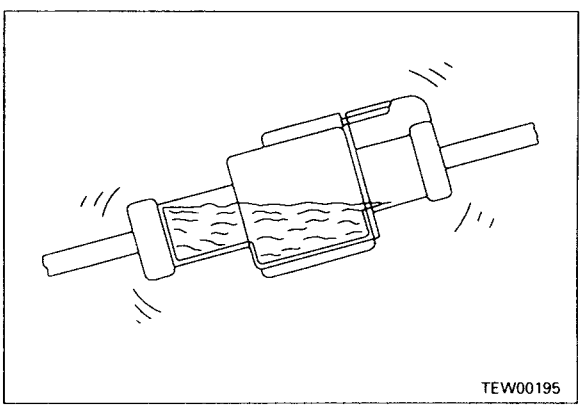


8. After the adjustment, operate the bucket control lever and boom control lever to check that those levers are held at the TILT, DUMP, RAISE and FLOAT positions.

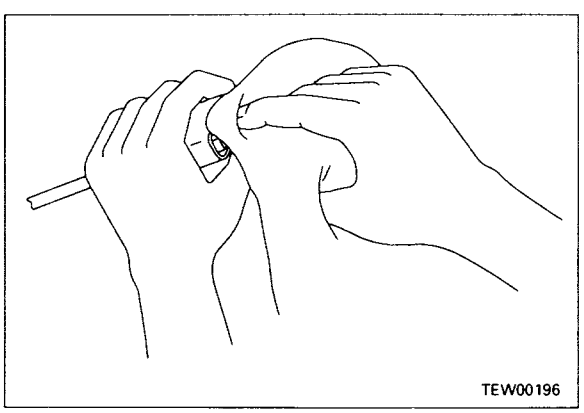
③ Disconnections in wiring
If the wiring is held and the connectors are pulled apart, or components are lifted with a crane with the wiring still connected, or a heavy object hits the wiring, the crimping of the connector may separate, or the soldering may be damaged, or the wiring may be broken.


TEW00194

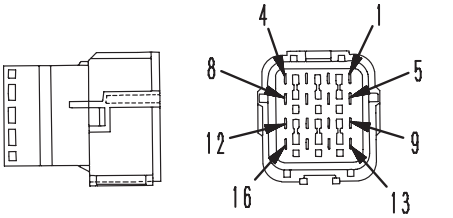
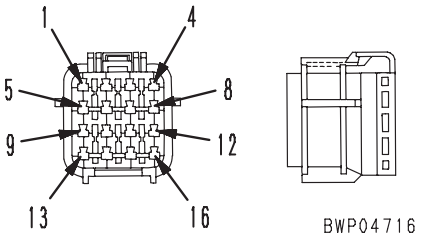
④ High-pressure water entering connector
The connector is designed to make it difficult for water to enter (drip-proof structure), but if high-pressure water is sprayed directly on the connector, water may enter the connector, depending on the direction of the water jet.
As already said, the connector is designed to prevent water from entering, but at the same time, if water does enter, it is difficult for it to be drained. Therefore, if water should get into the connector, the pins will be short-circuited by the water, so if any water gets in, immediately dry the connector or take other appropriate action before passing electricity through it.


TEW00195

⑤ Oil or dirt stuck to connector
If oil or grease are stuck to the connector and an oil film is formed on the mating surface between the male and female pins, the oil will not let the electricity pass, so there will be defective contact.
If there is oil or grease stuck to the connector, wipe it off with a dry cloth or blow it dry with compressed air and spray it with a contact restorer.
★ When wiping the mating portion of the connector, be careful not to use excessive force or deform the pins.
★ If there is oil or water in the compressed air, the contacts will become even dirtier, so remove the oil and water from the compressed air completely before cleaning with compressed air.

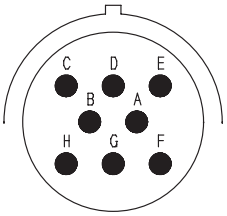

TEW00196

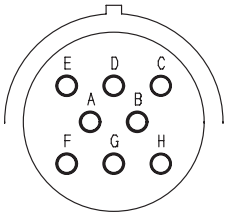
Connector No.	Type	Number of pins	Device name	Address
L05	AMP040	20	Main monitor	N-5
L06	AMP040	16	Main monitor	N-2
L07	AMP040	12	Main monitor	N-4
L08	AMP040	8	Main monitor	O-2
L09	M	4	Starting switch	O-2
L10	S	10	Front & rear wiper switch	P-1
L12	X	2	Transmission cut-off switch	R-1
L15	M	4	Kickdown switch & shift-up switch	P-7
L16	KES1	2	Boom kick-out solenoid	O-6
L17	KES1	2	Bucket positioner solenoid	N-5
L18	AMP040	16	Maintenance monitor	Q-8
L19	AMP040	8	Maintenance monitor	Q-8
L21	KES1	2	Maintenance monitor	R-8
L22	KES1	2	Maintenance monitor	R-9
L26	X	2	Joystick steering left solenoid [Steering wheel and joystick specification]	S-1
L26	DT2	2	Joystick EPC solenoid [AJSS specification]	h-2
L27	X	2	Joystick steering right solenoid [Steering wheel and joystick specification]	S-1
L27	DT2	3	Frame angle potentiometer [AJSS specification]	h-1
L31	One-pin connector	1	Turn signal switch [AJSS specification]	f-8
L32	One-pin connector	1	Turn signal switch [AJSS specification]	f-8
L33	One-pin connector	1	Turn signal switch [AJSS specification]	e-7
L39	KES1	6	Joystick steering ON/OFF solenoid [Steering wheel and joystick specification]	R-8
L39	DT2	2	Steering lock oil pressure switch [AJSS specification]	i-2
L40	YAZAKI	7	Right power window switch	Q-8
L41	YAZAKI	7	Left power window switch	P-8
L42	One-pin connector	1	Caution buzzer	S-9
L43	One-pin connector	1	Caution buzzer	S-9
L44	KES	6	Wiper relay	T-9
L46	KES	4	Flasher unit	T-9
L48	Relay	5	Bucket relay	M-7
L49	Relay	5	Boom relay	N-7
L50	Relay	5	Low idling selector relay	P-8
L51	Relay	6	Side working lamp	N-9
L52	Relay	5	Hazard relay	M-7
L53	Relay	5	Stop lamp relay	M-7
L54	Relay	5	Backup lamp relay	N-9
L55	Relay	5	Horn relay [Steering wheel specification] [Steering wheel and joystick specification]	N-7
L55	Relay	6	Horn relay [AJSS specification]	g-9
L56	Relay	5	Preheater relay	O-9
L57	Relay	5	Neutral relay	M-7
L58	Relay	5	Neutralizer relay	M-8
L59	Relay	5	Parking brake safety relay	M-9
L60	Relay	6	Front working lamp relay	N-9
L61	Relay	6	Rear working lamp relay	N-9
L62	Relay	5	Engine stop relay	M-9
L63	One-pin connector	1	Horn switch	P-1

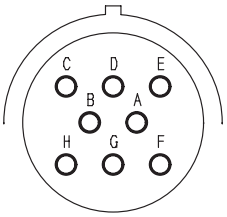
No. of pins	SWP type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
16			799-601-7320
	Part No. : 08055-11681	Part No. : 08055-11691	
—	Terminal part No. : ·Electric wire size: 0.85 ·Grommet: Black ·Q'ty: 20	Terminal part No. : ·Electric wire size: 0.85 ·Grommet: Black ·Q'ty: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

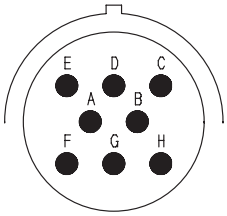
9JS04892

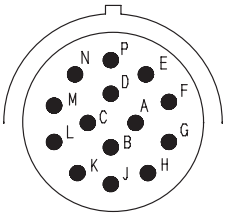
[The pin No. is also marked on the connector (electric wire insertion end)]

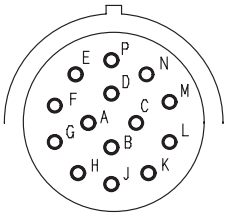
<table>
<tr><td rowspan="2">Type (shell size code)</td><td colspan="2">HD30 Series connector</td><td></td></tr>
<tr><td>Body (plug)</td><td>Body (receptacle)</td><td>T-adapter Part No.</td></tr>
<tr><td rowspan="4">18-8 (1)</td><td>Pin (male terminal)</td><td>Socket (female terminal)</td><td rowspan="3">799-601-9210</td></tr>
<tr><td> 

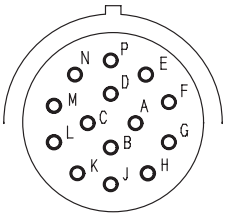
BWP05001</td><td> 

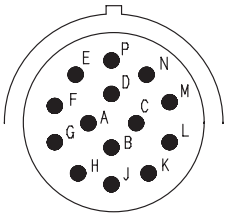
BWP05002</td></tr>
<tr><td>Part No. :08191-11201, 08191-11202,
08191-11205, 08191-11206</td><td>Part No. :08191-14101, 08191-14102,
08191-14105, 08191-14106</td></tr>
<tr><td>Socket (female terminal)</td><td>Pin (male termial)</td><td rowspan="3">799-601-9210</td></tr>
<tr><td> 

BWP05003</td><td> 

BWP05004</td></tr>
<tr><td>Part No. :08191-12201, 08191-12202,
08191-12205, 08191-12206</td><td>Part No. :08191-13101, 08191-13102,
08191-13105, 08191-13106</td></tr>
<tr><td rowspan="4">18-14 (2)</td><td>Pin (male terminal)</td><td>Socket (female terminal)</td><td rowspan="3">799-601-9220</td></tr>
<tr><td> 

BWP05005</td><td> 

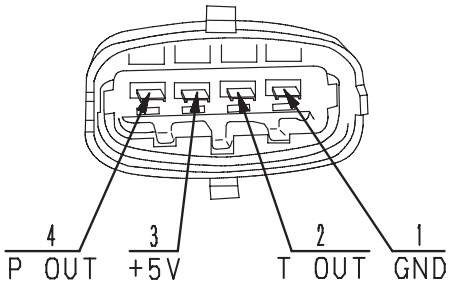
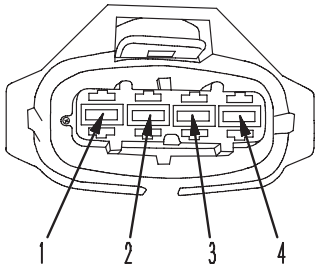
BWP05006</td></tr>
<tr><td>Part No. :08191-21201, 08191-12202,
08191-21205, 08191-12206</td><td>Part No. :08191-24101, 08191-24102,
08191-24105, 08191-24106</td></tr>
<tr><td>Socket (female terminal)</td><td>Pin (male termial)</td><td rowspan="3">799-601-9220</td></tr>
<tr><td> 

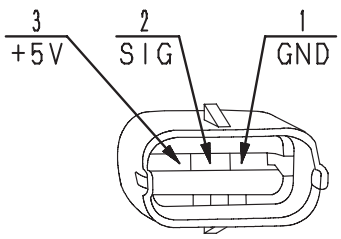
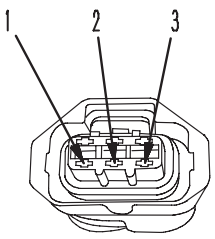
BWP05007</td><td> 

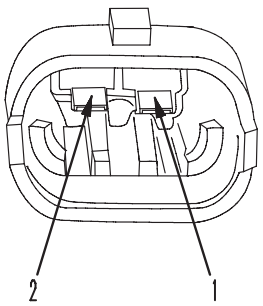
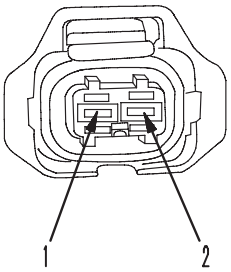
BWP05008</td></tr>
<tr><td>Part No. :08191-22201, 08191-22202,
08191-22205, 08191-22206</td><td>Part No. :08191-23101, 08191-23102,
08191-23105, 08191-23106</td></tr>
</table>

9JS04904

BOSCH connector for engine

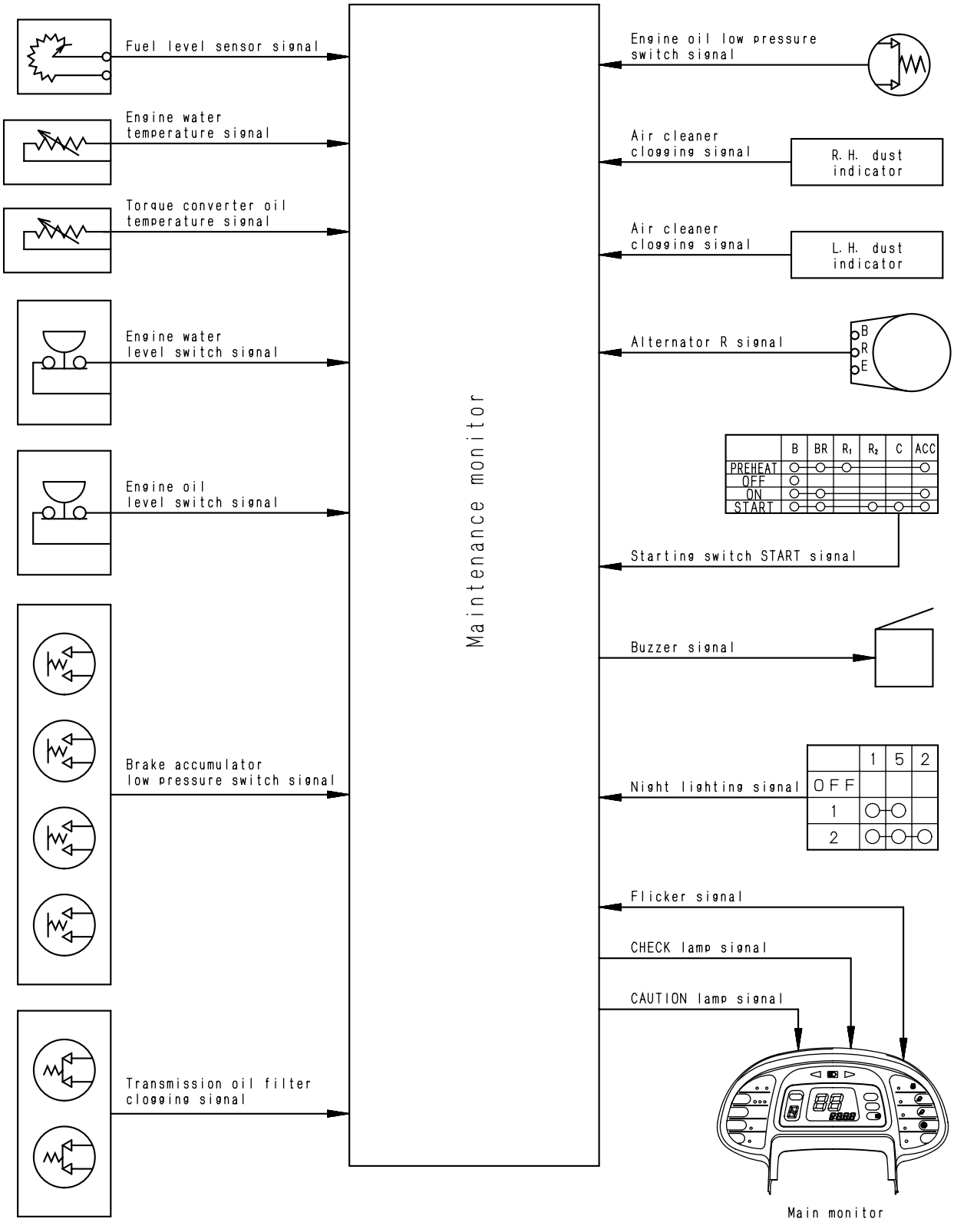
No. of pins	Boost (air intake) pressure and temperature sensor (95 engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
4			799-601-4380
	—	—	

No. of pins	Common rail (fuel) pressure sensor (95, 107, 114 engine)		
	Sensor side (plug)	Harness side (receptacle)	T-adapter Part No.
3			799-601-4190 (Kit:799-601-4100)
	—	—	

No. of pins	Fuel supply pump (95, 107 engine) and fuel injector (95 engine)		
	Valve side (plug)	Harness side (receptacle)	T-adapter Part No.
2			799-601-4340 (Kit:799-601-4100)
	—	—	

BJW12755

MAINTENANCE MONITOR SYSTEM



TWW01735

METHOD OF USING JUDGEMENT TABLE

This judgement table is a tool to determine if the problem with the machine is caused by an abnormality in the electrical system or by an abnormality in the hydraulic or mechanical system. The symptoms are then used to decide which troubleshooting table
(E–○○, H–○○, etc.) matches the symptoms.
The judgement table is designed so that it is easy to determine from the self-diagnostic display which troubleshooting table to go to.

★ The abnormality display given by the monitor panel leads directly to troubleshooting of the monitor system (M–○○, K–○○).
(See troubleshooting of the machine monitor system)

[Method of using judgement table]

- A ○ mark is put at the places where the failure mode and self-diagnostic display match, so check if an error code is displayed on the graphic display portion of the monitor panel.
  - If an error code is displayed:
    Go to the troubleshooting code at the bottom of the judgement table (E–○○, etc.).
  - If there is a problem but no error code is displayed:
    Go to the troubleshooting code on the right of the judgement table (H–○○).
  - For failure modes where no ○ mark is given, go directly to the troubleshooting code on the right of the judgement table.

S-2 Engine does not start

① Engine does not turn

General causes why engine does not turn
- Internal parts of engine seized
  - ★ If internal parts of the engine are seized, carry out troubleshooting for "Engine stops during operations".
- Failure in power train
- Defective electrical 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: Defective wiring of starting circuit	Defective or deteriorated battery	Defective starting motor	Broken ring gear	Defective safety relay or safety switch	Defective battery relay	Defective battery terminal connection	Defective adjustment of engine stop motor wire	Defective engine stop motor	Defective starting switch
Questions	Confirm recent repair history											
	Degree of use	Operated for long period		△		△						
	Condition of horn when starting switch is turned ON	Horn does not sound	◎					○				○
		Horn sound level is low		◎								
	When starting switch is turned to START, pinion moves out, but	Rotating speed is slow		◎								
		Makes grating noise			◎	◎						
		Soon disengages again					◎					
		Makes rattling noise and does not turn		○	○		○					
Check items	When starting switch is turned to START, pinion does not move out		◎	○								○
	When starting switch is turned to ON, there is no clicking sound			○				◎				
	Battery terminal is loose								◎			
	When starting switch is turned to ON, linkage does not move									◎	◎	
	When battery is checked, battery electrolyte is found to be low			◎								
Troubleshooting	Specific gravity of electrolyte, voltage of battery is low			●								
	For the following conditions 1) - 5), turn the starting switch OFF, connect the cord, and carry out troubleshooting at ON											
	1) When terminal B and terminal C of starting switch are connected, engine starts											●
	2) Even when terminal B and terminal C of starting motor are connected, engine does not start				●							
	3) When terminal B and terminal C of safety relay are connected, engine starts					●						
	4) When terminal of safety switch and terminal B of starting motor are connected, engine starts					●						
	5) There is no 24V voltage between battey relay terminal B and terminal E			※			●					
	When ring gear is inspected directly, tooth surface is found to be chipped				●							
	Does not move even when engine stop motor linkage is disconnected									●	●	
		Remedy	Carry out troubleshooting for defective wiring of starting circuit	Replace	Replace	Replace	Replace	Replace	Replace	Adjust	Replace	Replace

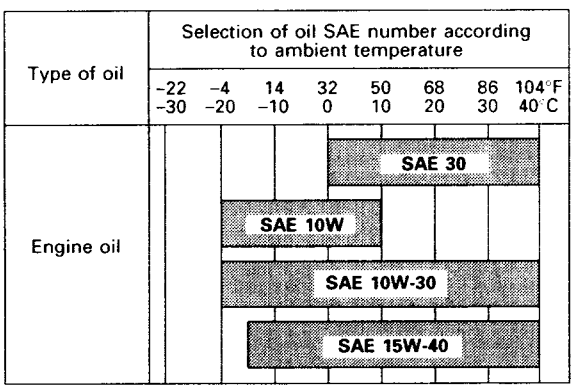
※ Carry out troubleshooting for electrical system E.

S-12 Oil pressure lamp lights up (drop in oil pressure)

General causes why oil pressure lamp lights up

- Leakage, clogging, wear of lubricating system
- Defective oil pressure control
- Improper oil used (improper viscosity)
- Deterioration of oil due to overheating

★ Standards for use of oil



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.

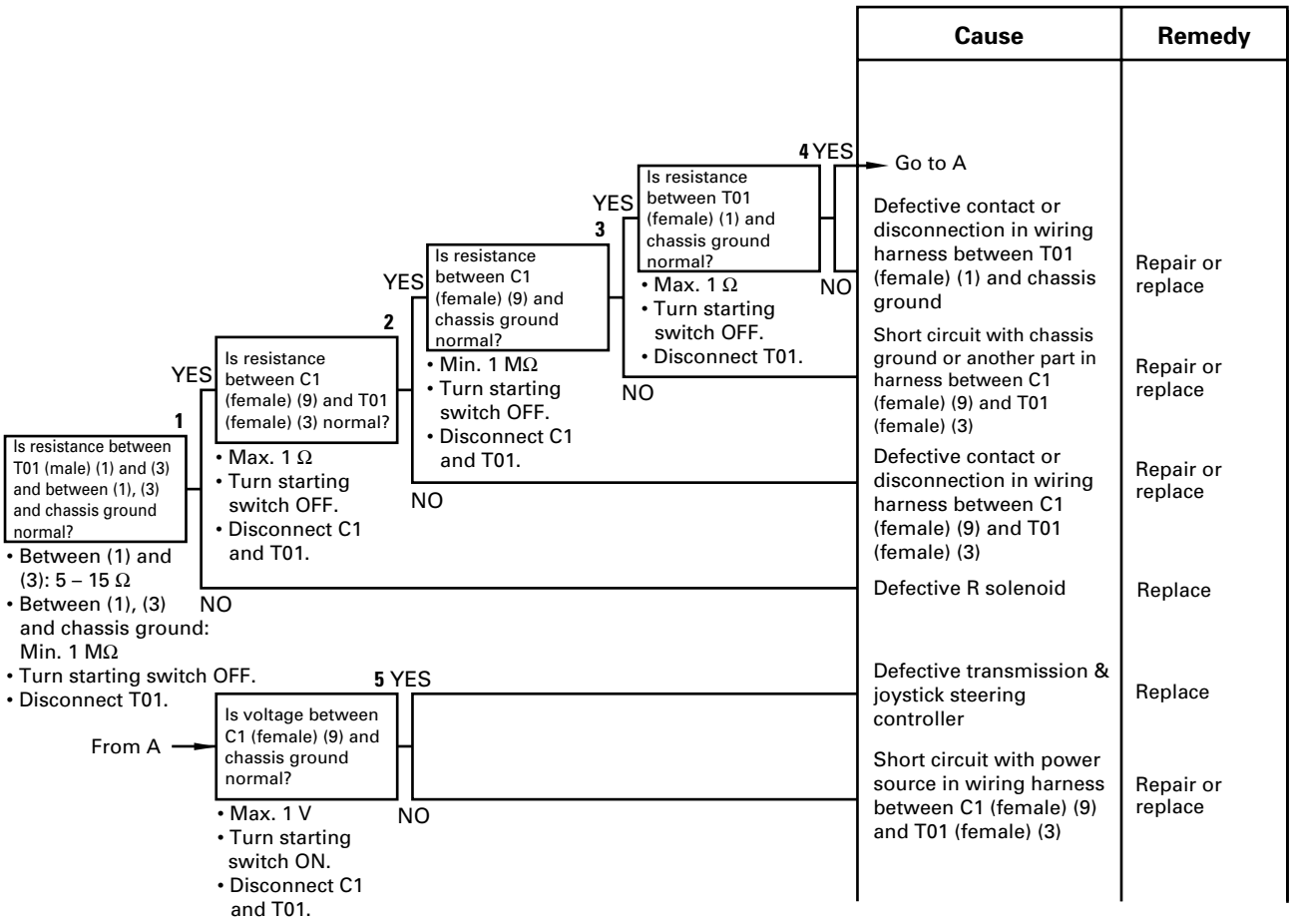
			Causes: Clogged oil filter	Worn bearing journal	Clogged strainer inside oil pan	Clogged, broken oil pipe inside oil pan	Broken suction pipe brazing	Defective oil pump	Insuffcient oil in oil pan	Defective regulator valve	Defective relief valve	Leaking, crushed hydraulic piping	Defective oil level sensor	Defective oil pressure sensor	Water, fuel in oil	Clogged oil cooler
Questions	Confirm recent repair history															
	Dregree of use	Operated for long period	△	△			△									△
	Replacement of filter has not been carried out according to operation manual		◎													
	Caution lamp lights up		◎							○						
	Non-specified fuel has been used		○	○												
	Condition when oil pressure lamp lights up	Lights up at low idling		◎						○						○
		Lights up at low, high idling			◎	◎	◎	◎	○	○	○					○
		Lights up on slopes							◎							
		Sometimes lights up								◎	◎		○	○		
Check items	There is clogging, leakage from hydraulic piping (external)										◎					
	Oil level sensor lamp lights up							◎				◎				
	When oil level in oil pan is checked, it is found to be low							◎								
	Metal particles are found when oil is drained			◎												
	Metal particles are stuck to oil filter element			◎				○								
	Oil is cloudy white or smells of diesel oil													◎		
	Back of head cover is black with carbon from oil															○
Troubleshooting	When oil filter is inspected directly, it is found to be clogged		●	●												
	Remove oil pan and check directly				●	●	●									
	Oil pump rotation is heavy, there is play							●								
	There is catching of relief valve or regulator valve, spring, or valve guide is broken								●	●						
	When oil level sensor is replaced, oil pressure sensor lamp goes out											●				
	When oil pressure is measured, it is found to be within standard value												●			
	When oil cooler is inspected, it is found to be clogged															●
	Remedy		Clean	Clean	Clean	Clean	Repair	Replace	Add	Adjust	Adjust	Repair	Replace	Replace	–	Replace

Carry out troubleshooting for "Oil level rises"

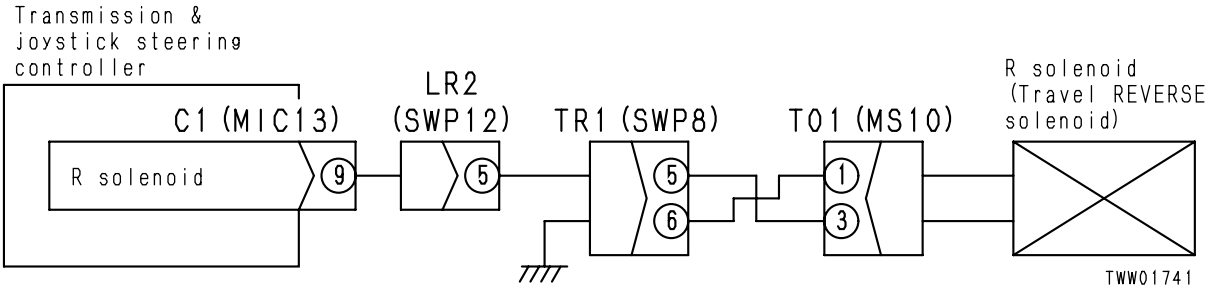
Condition when normal (voltage, current, resistance)	Action by controller when abnormality is detected	Problem that appears on machine when there is abnormality	Trouble-shooting code
1) Resistance between joystick directional lever connector (8) and chassis ground: Less than 1 Ω The following conditions are when the switch is not pressed 2) Resistance between transmission & joystick controller C5 (female) (8) and chassis ground: Less than 1 Ω 3) Resistance between transmission & joystick controller C5 (female) (7) and chassis ground: Less than 1 Ω and resistance between C5 (female) (15) and chassis ground: Min. 1 MΩ 4) Resistance between transmission & joystick controller C5 (female) (9) and chassis ground: Less than 1 Ω and resistance between C5 (female) (17) and chassis ground: Min. 1 MΩ	Neutral (F, R, 1st, 2nd, 3rd solenoid output: off)	Cannot travel in joystick mode (possible in steering wheel mode)	T-8
1) Voltage between combination switch L04 (1) and chassis ground: 20 – 30 V 2) Voltage for only 1 system in accordance with position of directional lever: 20 – 30 V (Others: Less than 1 V) F: Between transmission & joystick controller C3B (5) – chassis ground N: Between transmission & joystick controller C3B (13) – chassis ground R: Between transmission & joystick controller C3B (6) – chassis ground	• Shifts to neutral immediately when short circuit with power supply is detected • When there is no signal (disconnection), holds previous signal condition for 2 seconds	It is impossible to travel	T-9
1) Voltage between combination switch L04 (1) and chassis ground: 20 – 30 V 2) Voltage for only 1 system in accordance with position of range lever: 20 – 30 V (Others: Less than 1 V) 1st: Between transmission & joystick controller C3B (7) – chassis ground 2nd: Between transmission & joystick controller C3B (15) – chassis ground 3rd: Between transmission & joystick controller C3B (8) – chassis ground	• If 2 signals are input, it judges speed range position in order of priority 3←2←1 • When there is no signal (disconnection), holds previous signal condition (speed range position)	1) Auto-shift limit is different from range position selected by operator (OP) 2) Impossible to shift gear in manual mode	T-11
1) Resistance between travel speed sensor C01 (1) and (2): 500 – 1,000 Ω 2) Voltage between transmission & joystick controller C5 (female) (2) and (10): Min. 0.5 V	1) Switches to manual mode (OP) 2) Shifts gear according to operation of range lever	1) Does not carry out auto-shift (OP) 2) Switches to manual shift	T-13
1) Resistance between engine speed sensor E03 (1) and (2): 100 – 500 Ω 2) Voltage between transmission & joystick controller C4 (female) (2) and (9)	1) Switches to manual mode (OP) 2) Shifts gear according to operation of range lever	1) Does not carry out auto-shift (OP) 2) Switches to manual shift	T-14

T-4 Failure code [13] (Short circuit, disconnection, short circuit with power source in R solenoid) is displayed

★ **This troubleshooting is carried out when there is still an abnormality, so when disconnecting the connector and inserting the T-adapter, or when removing the T-adapter and returning the connector to its original position, if the error code is no longer displayed on the monitor display, the problem has been removed.**
★ 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.



T-4 Related electrical circuit diagram



T-12 Failure code [21] (Short circuit or disconnection in joystick shift-up/shift-down switch system) is displayed

AJSS (ADVANCED JOYSTICK STEERING SYSTEM) SPECIFICATION

★ **This troubleshooting is carried out when there is still an abnormality, so when disconnecting the connector and inserting the T-adapter, or when removing the T-adapter and returning the connector to its original position, if the error code is no longer displayed on the monitor display, the problem has been removed.**

★ Check that fuse II (6) 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.

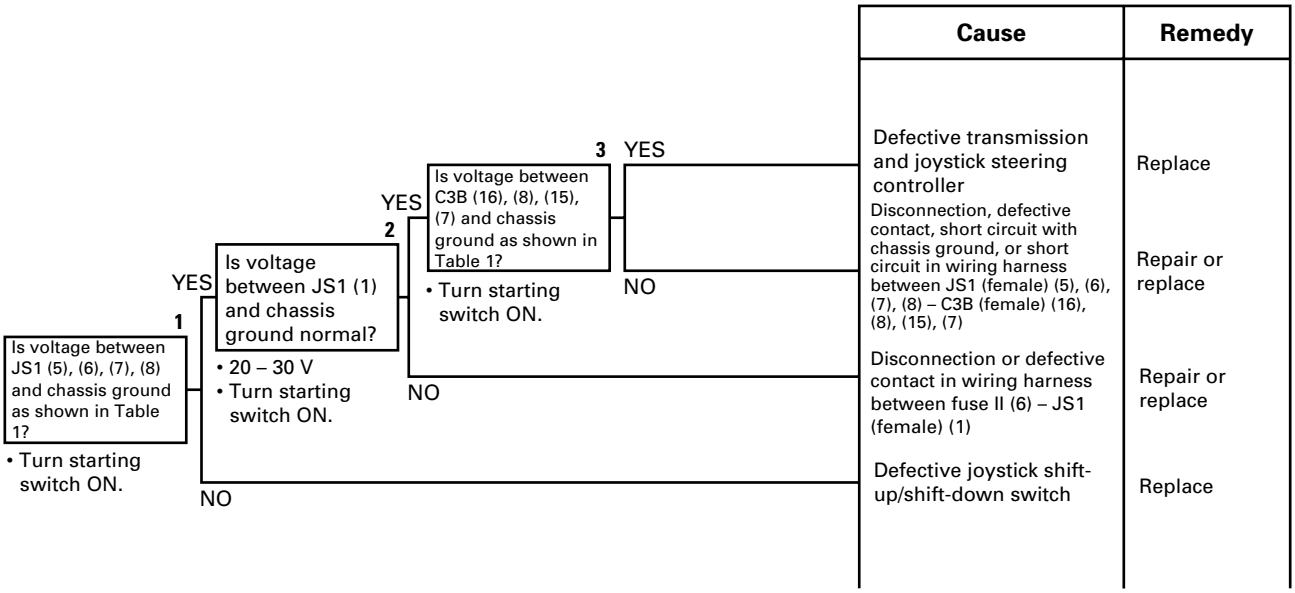
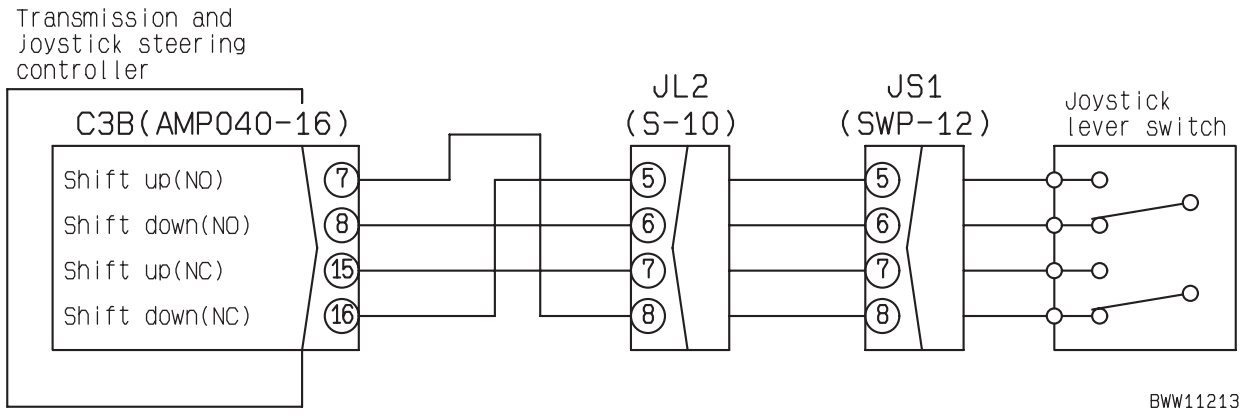


Table 1 Voltage measured with joystick shift-up/shift-down switch at each position

Terminals \ When shift-up/shift-down switch is pressed		Shift-up switch ON	Shift-down switch ON
JS1 (5) – Chassis ground	C5 (16) – Chassis ground	20 – 30 V	Max. 1 V
JS1 (6) – Chassis ground	C5 (8) – Chassis ground	Max. 1 V	20 – 30 V
JS1 (7) – Chassis ground	C5 (15) – Chassis ground	Max. 1 V	20 – 30 V
JS1 (8) – Chassis ground	C5 (7) – Chassis ground	20 – 30 V	Max. 1 V

T-12 Related electrical circuit diagram



TROUBLESHOOTING OF MAIN MONITOR SYSTEM (M MODE)

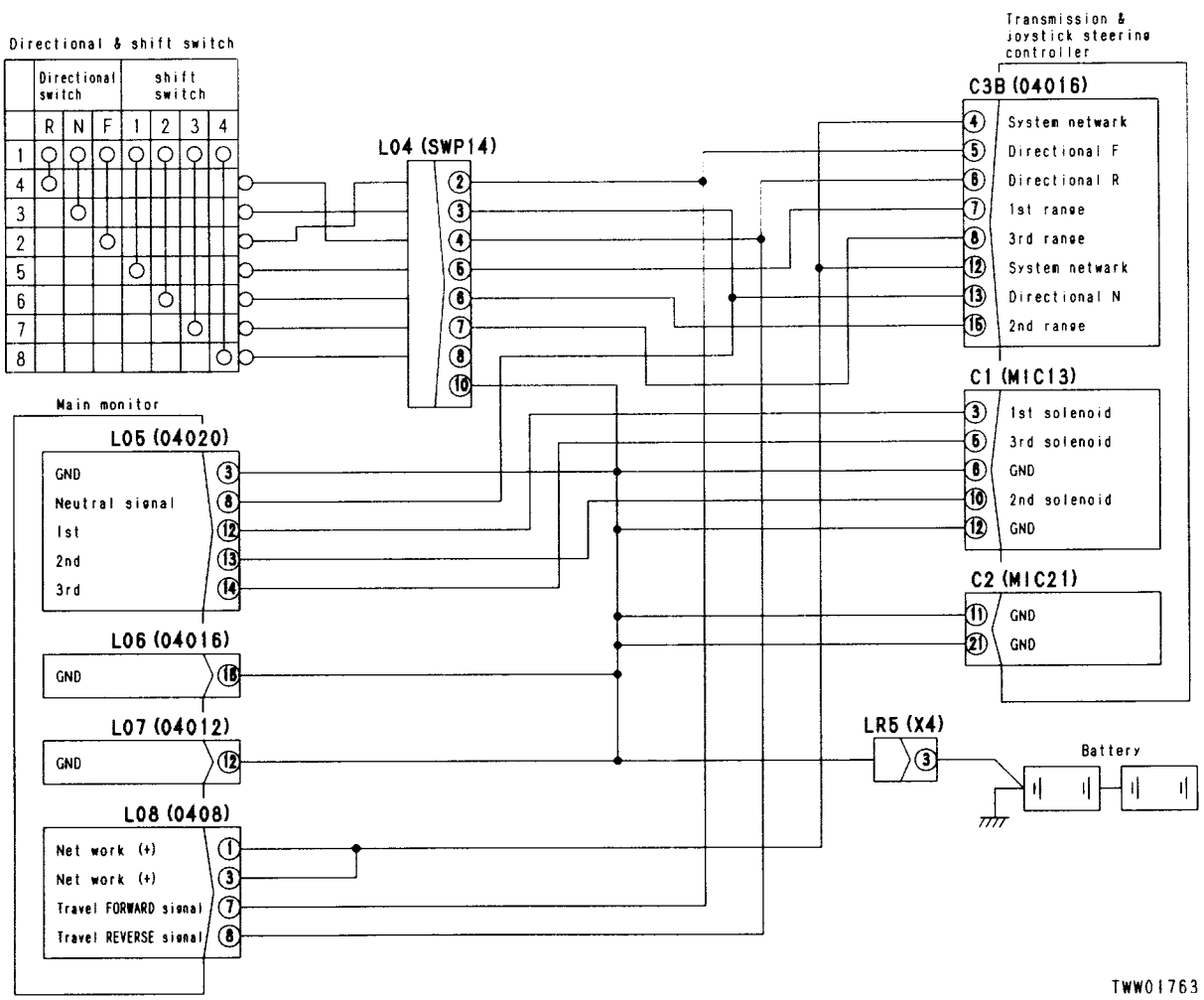
f) Does not display 3rd even when the gear shift lever is at 3 rd position (Directional lever is at F or R position).

Cause	Remedy
Defective main monitor	Replace
Defective contact or disconnection in wiring harness between L05 (female) (14) and C1 (female) (5)	Repair or replace

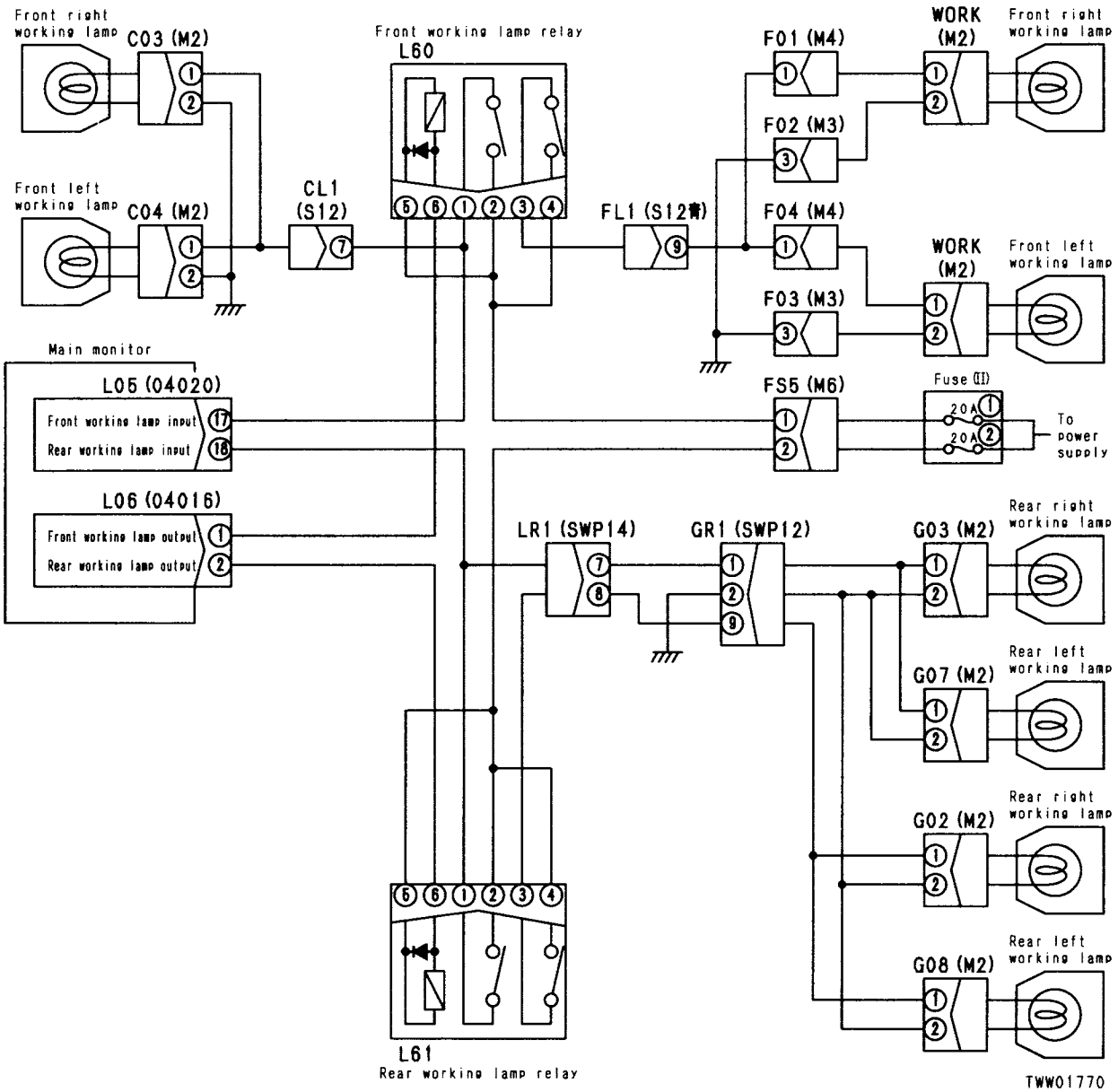
1 Is voltage between L05 (female) (14) and chassis ground normal?
- YES
- NO

- 20 – 30 V
- Turn starting switch ON.
- Set gear shift lever to 3 rd.
- Set directional lever to F or R.

M-4 Related electrical circuit diagram



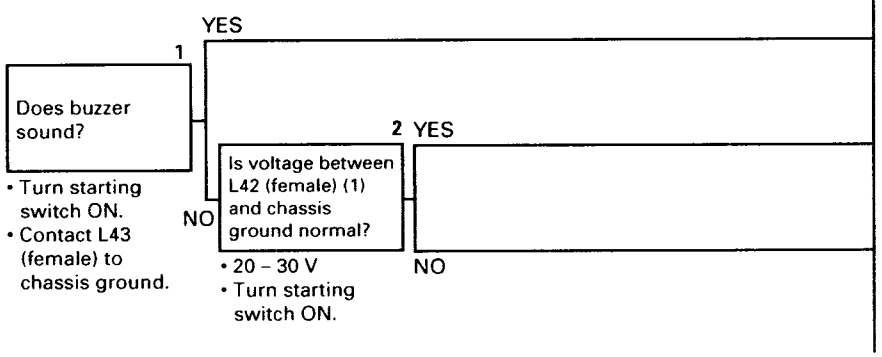
M-11 Related electrical circuit diagram



M-19 Abnormality in buzzer

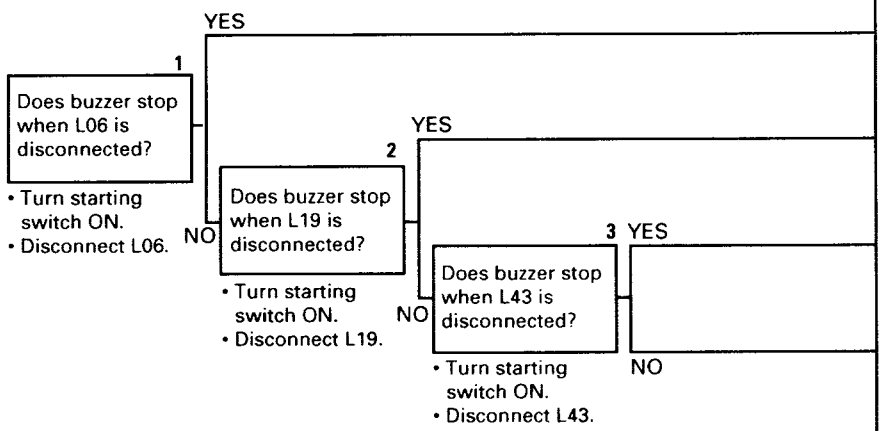
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

a) Buzzer does not sound when starting switch is at ON (for 3 seconds) (during self-check)



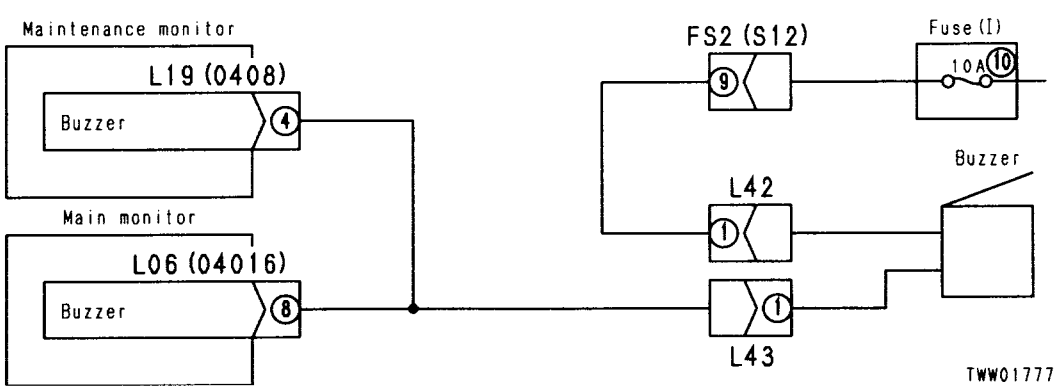
Cause	Remedy
Defective contact or disconnection in wiring harness between L06 (female) (8) and L43 (male) (1)	Repair or replace
Defective buzzer	Replace
Defective contact or disconnection in wiring harness between L42 (female) (1) and FS2 (female) (9)	Repair or replace

b) Buzzer always sounds

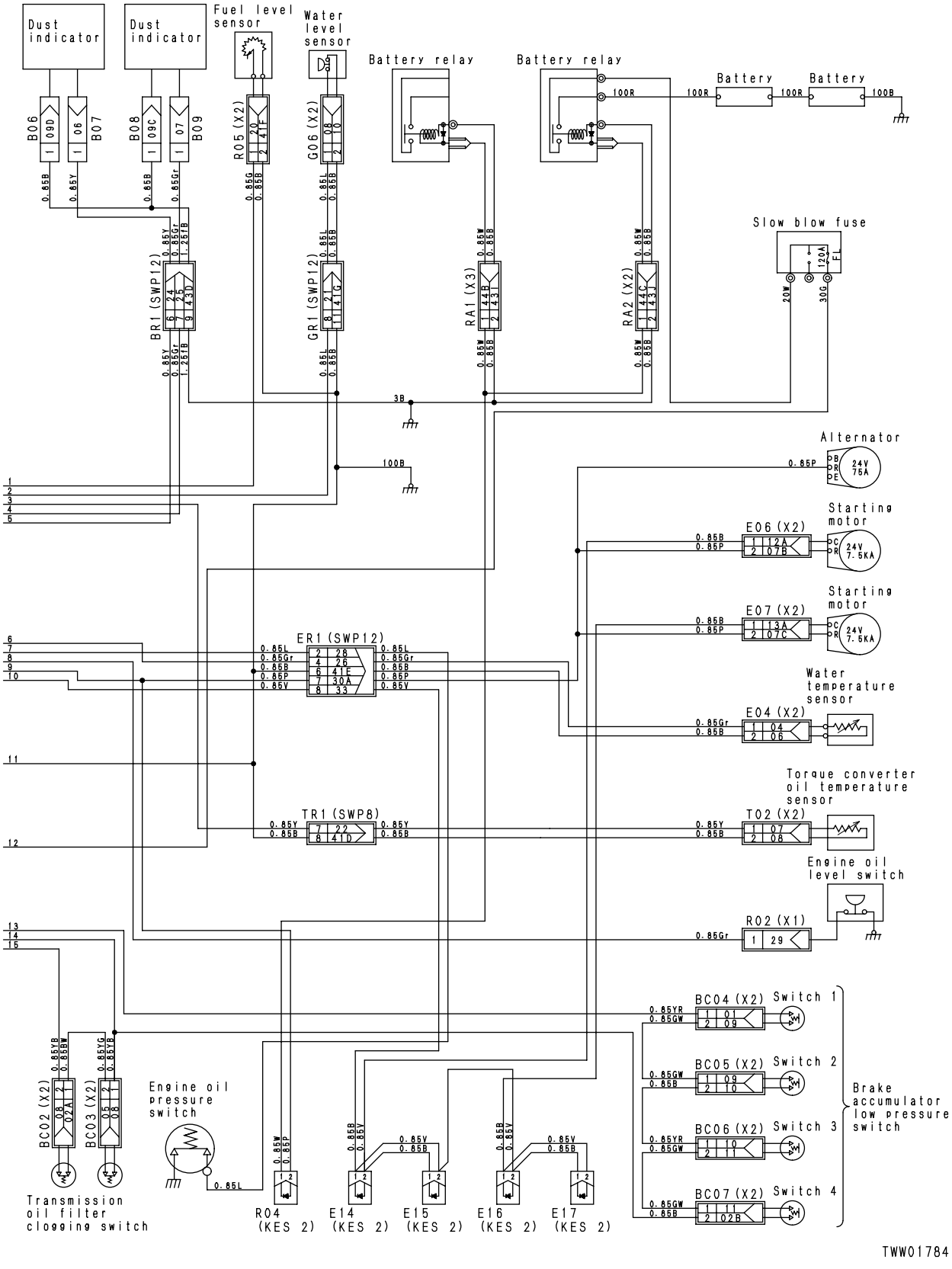


Cause	Remedy
Defective main monitor	Replace
See troubleshooting (K mode) for maintenance monitor	—
Short circuit with chassis ground in harness between L06 (female) (8) and L43 (male) (1)	Repair or replace
Defective buzzer	Replace

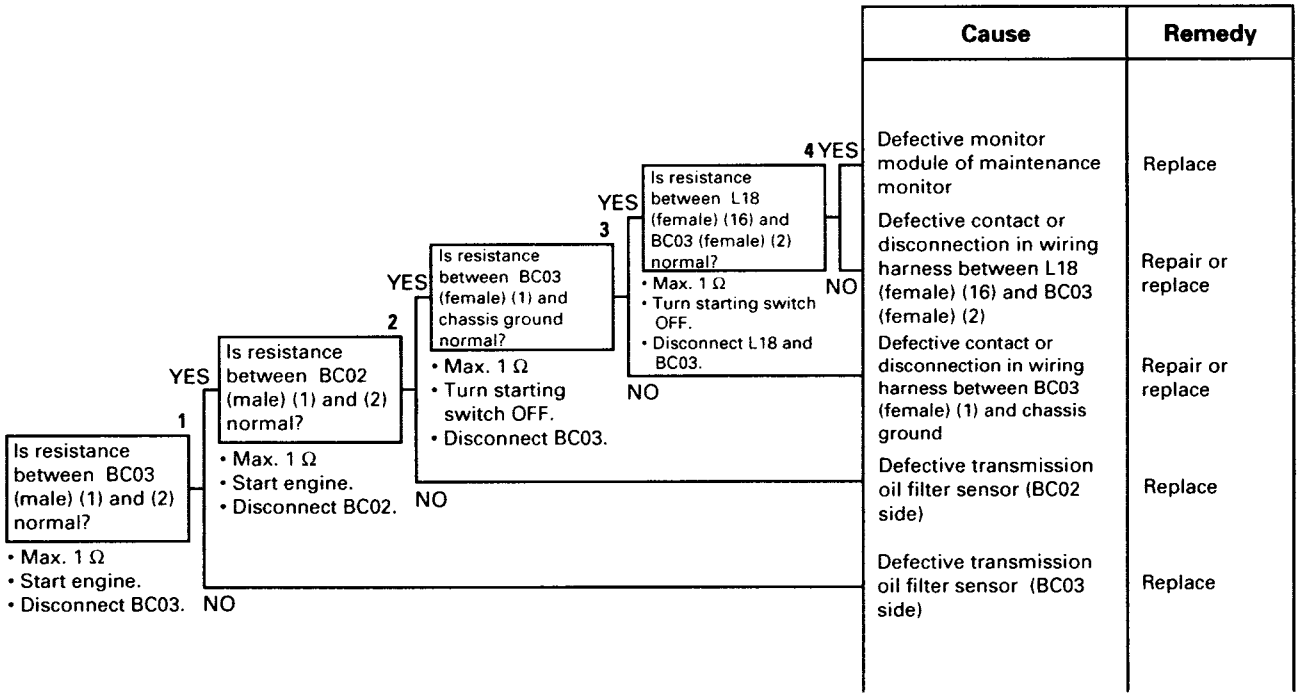
M-19 Related electrical circuit diagram



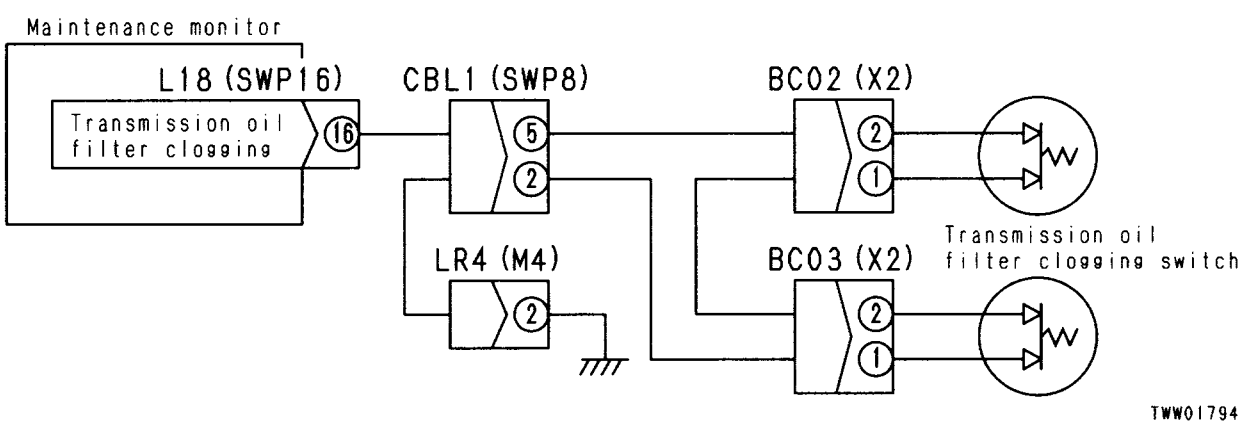
★ This circuit diagram is made by extracting the part of the maintenance monitor system from the general circuit diagram.



f) Transmission oil filter display flashes (The transmission oil filter must not be clogged.)



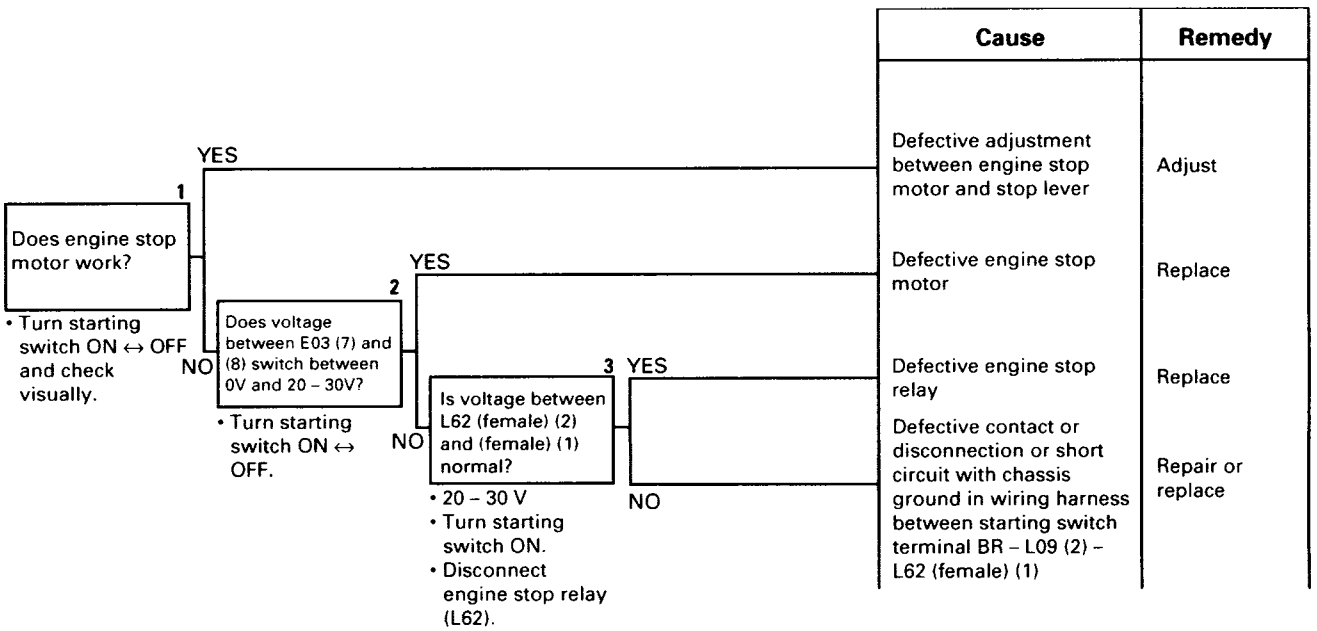
K-5 f) Related electrical circuit diagram



TROUBLESHOOTING OF ELECTRICAL SYSTEM (E MODE)

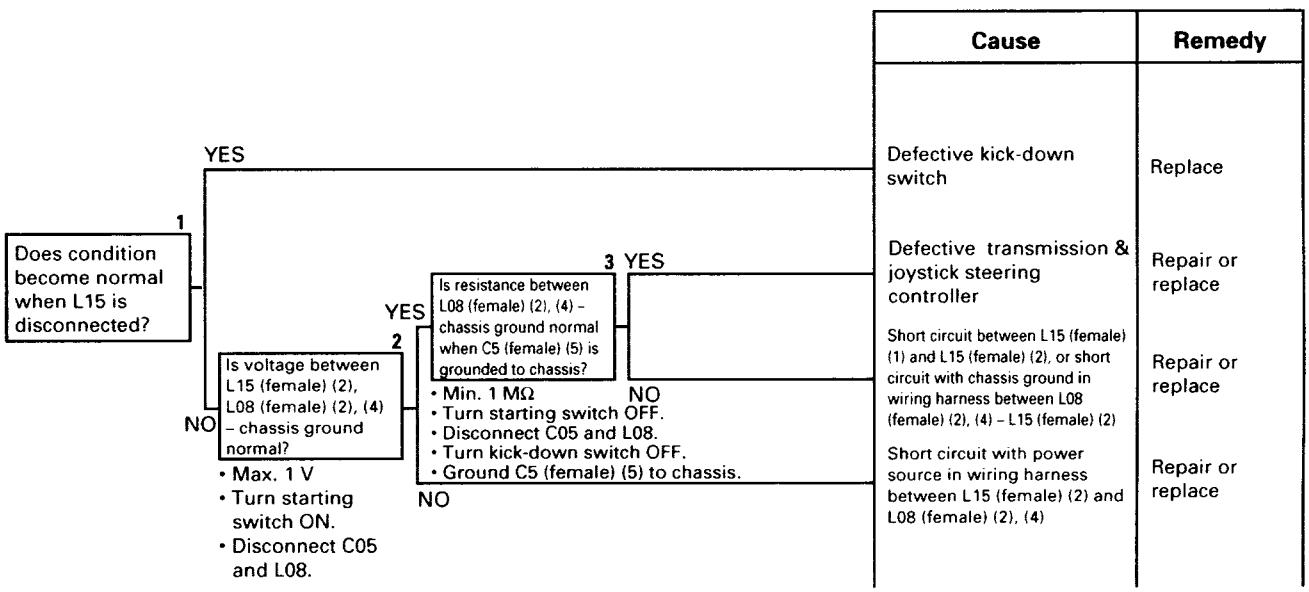
E-3 Engine Stops when machine is traveling (STD spec.)

★ Check if the starting motor turns. If it does not turn, check E-1 a) Starting motor does not turn.

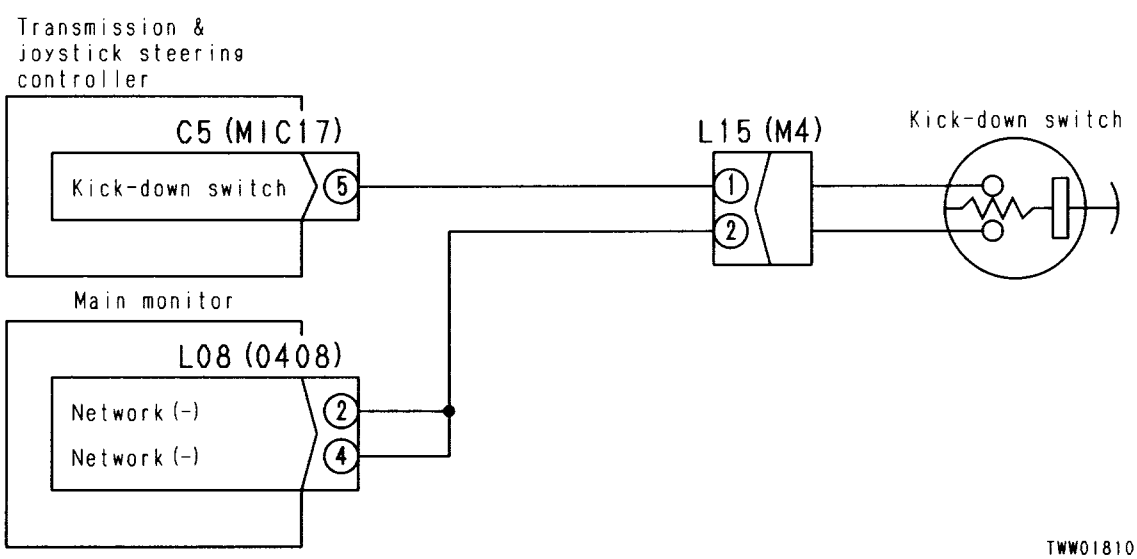


Cause	Remedy
Defective adjustment between engine stop motor and stop lever	Adjust
Defective engine stop motor	Replace
Defective engine stop relay	Replace
Defective contact or disconnection or short circuit with chassis ground in wiring harness between starting switch terminal BR – L09 (2) – L62 (female) (1)	Repair or replace

b) Kick-down cannot be canceled



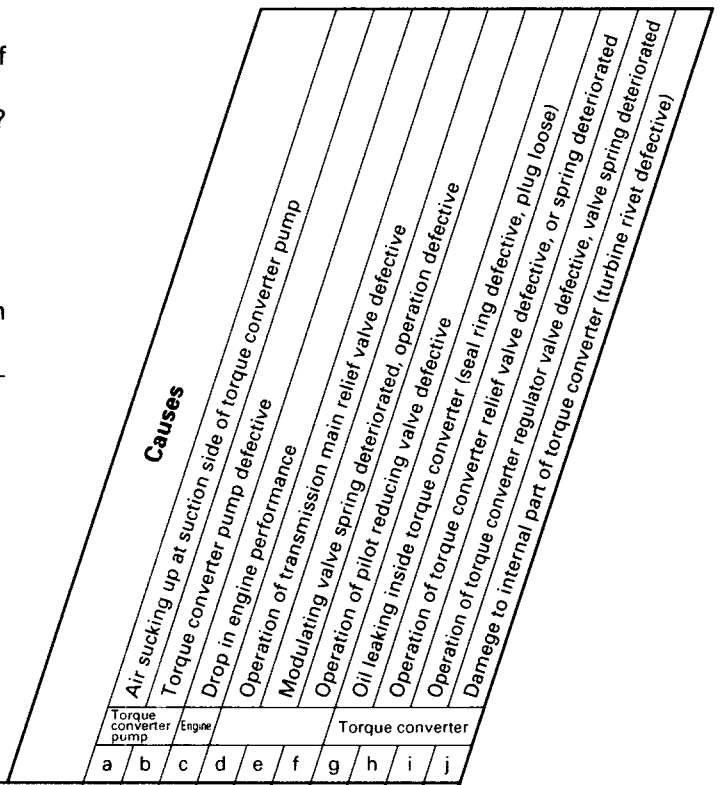
E-9 Related electrical circuit diagram



H-2 Machine lacks power or speed (every speed range)

Checks before troubleshooting
- Is oil level transmission case correct?
- Is there any leakage of oil from joints of piping or valves?
- Is parking brake or wheel brake dragged?

Checking for abnormalities
- Engine high idling speed
- Torque converter stall speed
- Machine travel speed
- Transmission clutch pressure (both high pressure and low pressure)
- Pressure at outlet port of torque converter pump
- Pilot reducing pressure



No.	Problems		a	b	c	d	e	f	g	h	i	j
1	Abnormal noise from between pump and filter.		○	○								
2	Torque converter stall speed too high.			○		○	○			○	○	○
3	Torque converter stall speed too low				○	○				○	○	
4	Transmission main relief valve pressure too low					○						
5	Transmission modulating pressure too low	Low at every speed range (Item 2 abnormal)	○	○								
6		Indicator fluctuates violently.	○									
7	Pilot reducing pressure too low (Items 5 and 6 normal)						○					
8	Relief pressure at torque converter too low (Items 5 and 7 normal)								○			
9	Torque converter regulator valve pressure (outlet port pressure) too low									○		
10	Iron or alumimum particles stuck to strainer of transmission case.										○	
11	Modulating pressure drops when oil temperature rises.			○								

H-15 Steering wheel shakes or jerks

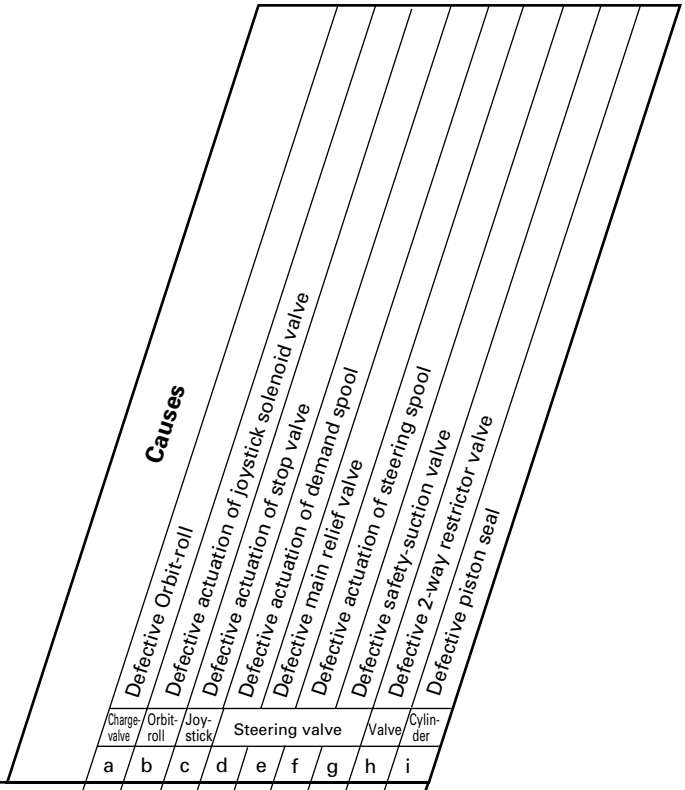
STEERING WHEEL AND JOYSTICK STEERING SPECIFICATION

Checking for abnormalities

- Is the steering difficult to turn?
  Yes = Go to H-9
- Is there any abnormal noise from around the steering equipment?

Checks before troubleshooting

- Is any failure code for the electrical system displayed on the main monitor?
- Is the steering wheel play correct?
- Is there any abnormality in the connection between the steering shaft and the Orbit-roll?
- Is the tire inflation pressure correct?



No.	Problems		Remedy								
			△ ×	×	△ ×	△ ×	△ ×	△ ×	×	△ ×	△ ×
1	When steering mode switch is switched	Abnormality only in steering wheel mode	○								
2		Abnormality only in joystick mode		○							
3		Abnormality in both modes			○	○	○	○	○	○	○
4	Steering wheel shakes or jerks in both directions (left and right)		○	○		○	○	○			○
5	Steering wheel shakes or jerks in one direction (left or right)				○				○	○	
6	During operations or when traveling (when steering is neutral), steering wheel shakes or jerks in both directions (left and right)							○			○
7	During operations or when traveling (when steering is neutral), steering wheel shakes or jerks in one direction (left or right)				○						
8	Steering wheel jerks or there is excessive shock when steering is operated to end of its stroke								○	○	
9	Work equipment also jerks										
10	When steering relief pressure is measured	Oil pressure is unstable in both directions (left and right)	○	○		○	○	○			○
11		Oil pressure is unstable in one direction (left or right)			○				○	○	
12	When Orbit-roll output pressure is measured	Oil pressure is unstable in both directions (left and right)	○								
13		Oil pressure is unstable in one direction (left or right)			○						
14	When joystick solenoid valve output pressure is measured	Oil pressure is unstable in both directions (left and right)		○							
15		Oil pressure is unstable in one direction (left or right)			○						
16	When PPC valve (Orbit-roll) basic pressure is measured, oil pressure is found to be unstable										

H-33 Bucket fluctuates while traveling under load (work equipment valve “HOLD”)

Checks before troubleshooting
- Excessive play in pin and bushing of work equipment linkage. (Was an abnormal noise produced?)

Cause
- Defective piston seal of bucket cylinder.
- Defective safety valve (with suction valve) for the head side of bucket cylinder.

If the above symptoms occur together, refer to the troubleshooting items corresponding to each fault.

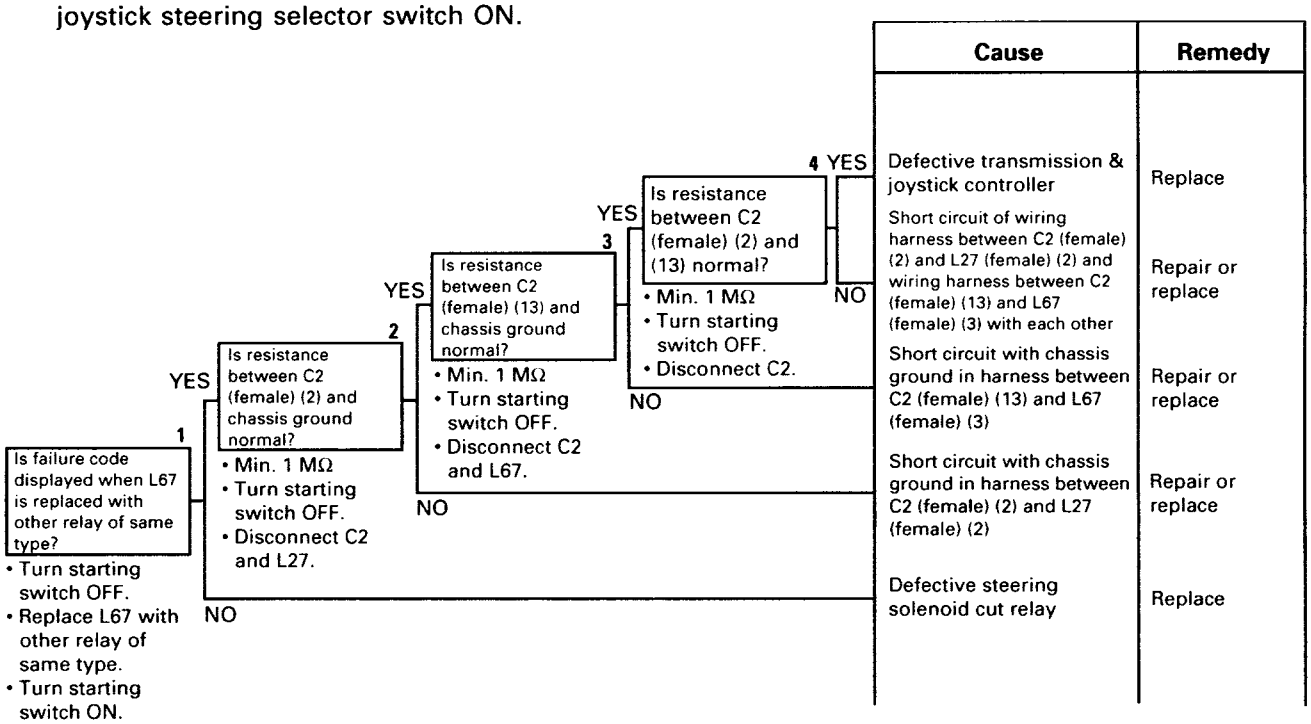
H-34 Bucket dumps momentarily when lever is operated from HOLD to TILT

The bucket dumps momentarily under its own weight when the bucket control lever is gradually shifted from the “HOLD” position to the “TILT” position while the engine is at low idling.
When the control lever is put completely into the “TILT” position, the bucket moves normally.

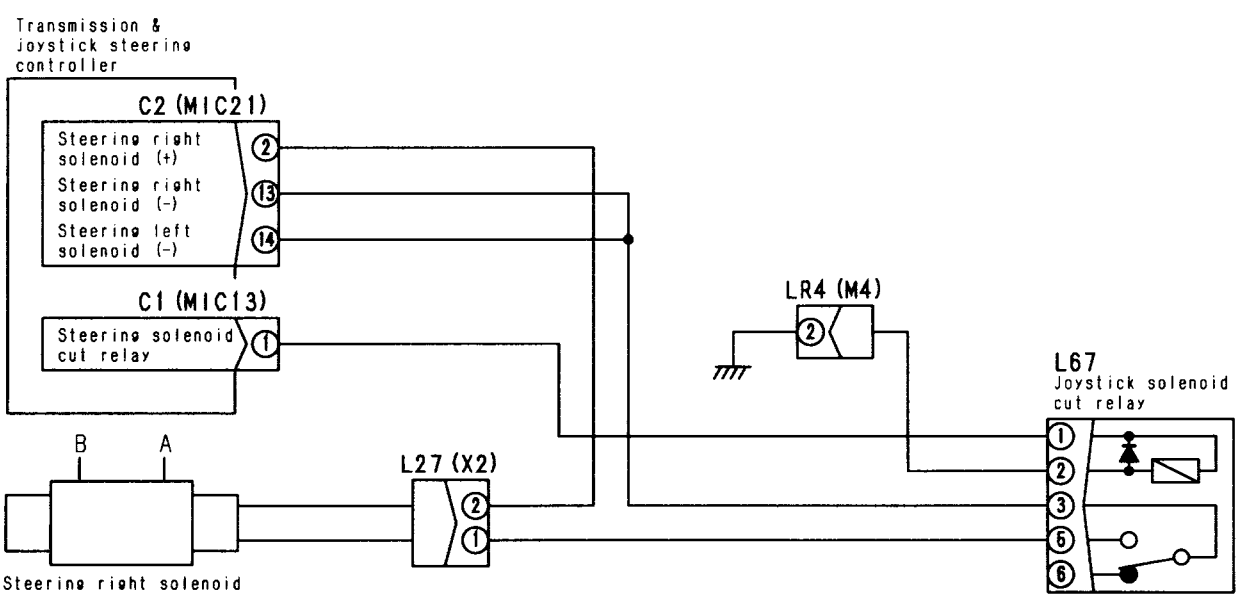
Cause
- Defective seating of bucket spool check valve of work equipment valve.

J-2 Failure code [57] (Short circuit in steering right solenoid (detected when signal is output)) is displayed

★ **This troubleshooting is carried out when there is still an abnormality, so when disconnecting the connector and inserting the T-adapter, or when removing the T-adapter and returning the connector to its original position, if the failure code is no longer displayed on the monitor display, the problem has been removed.**
★ 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.
★ When the joystick steering lever is not being used, leave it at the neutral position and turn the joystick steering selector switch ON.



J-2 Related electrical circuit diagram



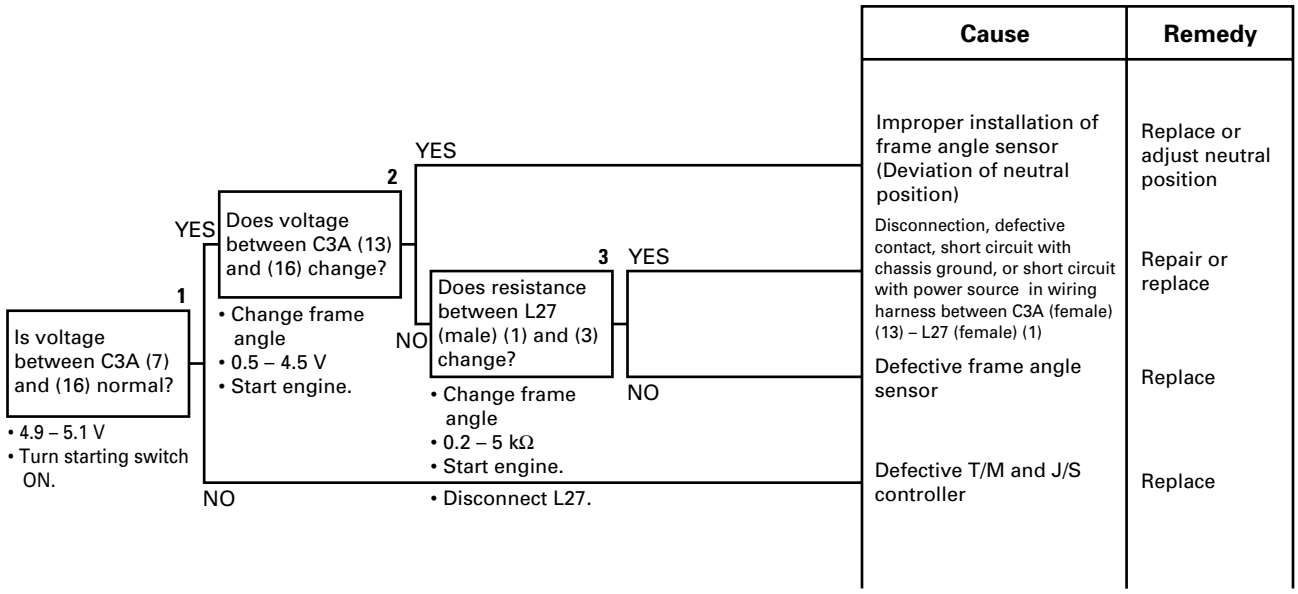
TWW01815

TROUBLESHOOTING OF AJSS (ADVANCED JOYSTICK STEERING SYSTEM) CONTROL SYSTEM (A MODE)

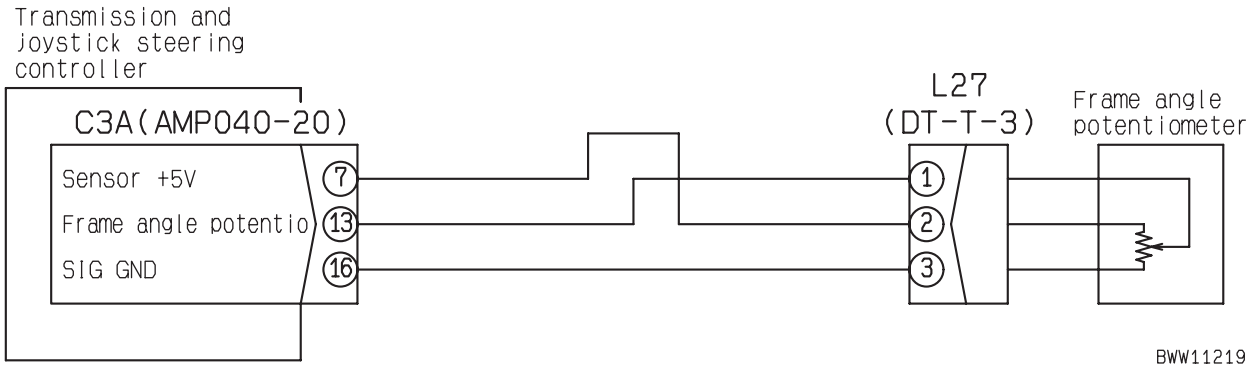
AJSS (ADVANCED JOYSTICK STEERING SYSTEM) SPECIFICATION

A-4 Error code [59] (Disconnection or short circuit with chassis ground in frame angle sensor system) is displayed

★ **This troubleshooting is carried out when there is still an abnormality, so when disconnecting the connector and inserting the T-adapter, or when removing the T-adapter and returning the connector to its original position, if the error code is no longer displayed on the monitor display, the problem has been removed.**
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ When the joystick steering lever is not being used, leave it at the neutral position.
★ Always connect any disconnected connectors before going on to the next step.



A-4 Related electrical circuit diagram



STANDARD TIGHTENING TORQUE TABLE

1. Table of tightening torques for bolts and nuts
   ★ Unless there are special instructions, tighten metric nuts and bolts to the torque below. (When using torque wrench)

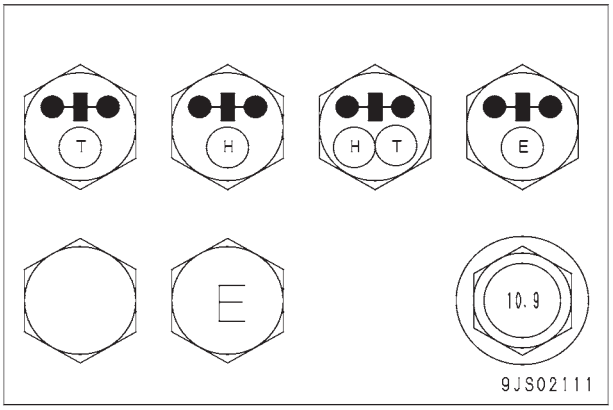
   ★ The following table corresponds to the bolts in Fig. A.

Thread diameter of bolt	Width across flats	Tightening torque	
mm	mm	Nm	kgm
6	10	11.8 – 14.7	1.2 – 1.5
8	13	27 – 34	2.8 – 3.5
10	17	59 – 74	6.0 – 7.5
12	19	98 – 123	10.0 – 12.5
14	22	153 – 190	15.5 – 19.5
16	24	235 – 285	23.5 – 29.5
18	27	320 – 400	33.0 – 41.0
20	30	455 – 565	46.5 – 58.0
22	32	610 – 765	62.5 – 78.0
24	36	785 – 980	80.0 – 100.0
27	41	1,150 – 1,440	118 – 147
30	46	1,520 – 1,910	155 – 195
33	50	1,960 – 2,450	200 – 250
36	55	2,450 – 3,040	250 – 310
39	60	2,890 – 3,630	295 – 370

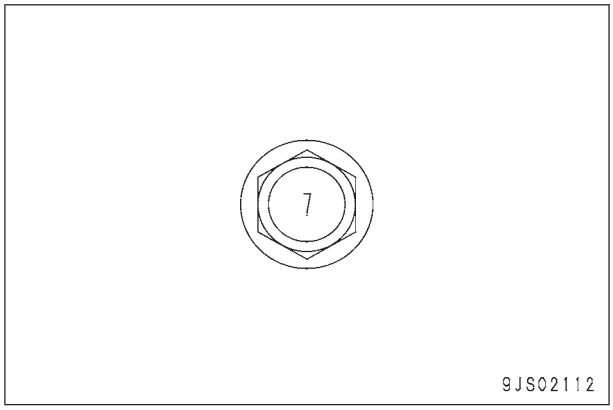
   ★ The following table corresponds to the bolts in Fig. B.

Thread diameter of bolt	Width across flats	Tightening torque	
mm	mm	Nm	kgm
6	10	5.9 – 9.8	0.6 – 1.0
8	13	13.7 – 23.5	1.4 – 2.4
10	14	34.3 – 46.1	3.5 – 4.7
12	27	74.5 – 90.2	7.6 – 9.2

★ **Fig. A**

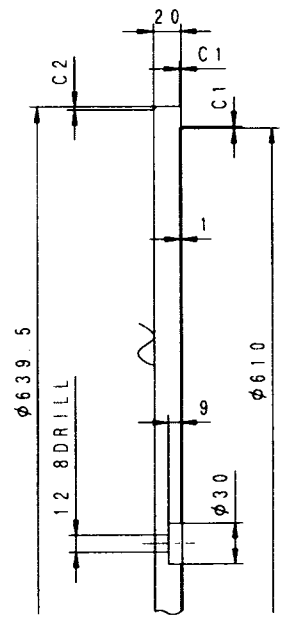


★ **Fig. B**



Category	Komatsu code	Part number	Q'ty	Container	Main features and applications	
Adhesive	SUNSTAR PENGUINE SEAL 580 SUPER "S" or "W"	417-926-3910	320 ml	Polyethylene container	Adhesive for cab glass	• "S" is used for high-temperature season and "W" for low-temperature season as adhesive for glass. (Using limit: 4 months after date of manufacture)
	Sika Japan, Sikaflex 256HV	20Y-54-39850	310 ml	Polyethylene container		• Used as adhesive for glass. (Using limit: 6 months after date of manufacture)
	SUNSTAR PENGUINE SUPER 560	22M-54-27210	320 ml	Ecocart (Special container)		• Used as adhesive for glass. (Using limit: 6 months after date of manufacture)
Caulking material	SUNSTAR PENGUINE SEAL No. 2505	417-926-3920	320 ml	Polyethylene container		• Used to seal joints of glass parts. (Using limit: 4 months after date of manufacture)
	SEKISUI SILICONE SEALANT	20Y-54-55130	333 ml	Polyethylene container		• Used to seal front window. (Using limit: 6 months after date of manufacture)
	GE TOSHIBA SILICONES TOSSEAL 381	22M-54-27220	333 ml	Cartridge		• Used to seal joint of glasses. Translucent white seal. (Using limit: 12 months after date of manufacture)

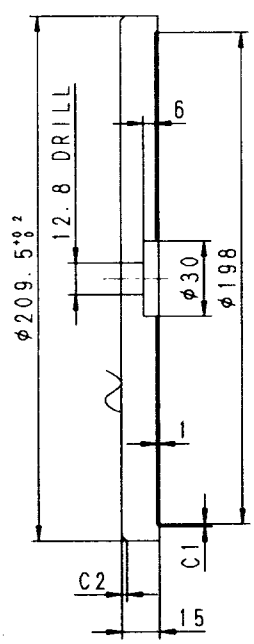
J3 PLATE



CWW03082

HEAT TREATMENT	MATERIAL
----	SS400P
PART NAME	QTY
PLATE	----
793T-833-1110 △	

K4 PLATE



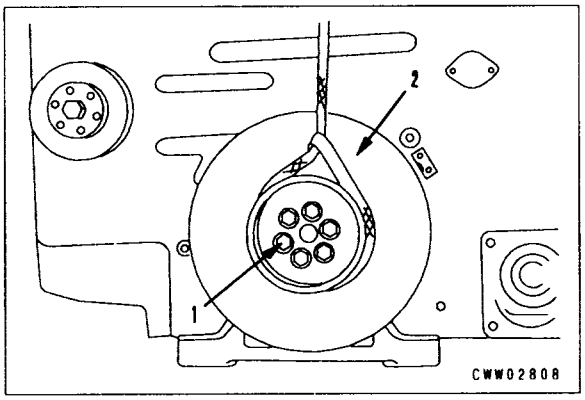
Unless otherwise specified, free from burr.

DWW05231

HEAT TREATMENT	MATERIAL
----	SS400P
PART NAME	QTY
PLATE	----
793T-846-1110 △	

REMOVAL OF ENGINE FRONT SEAL

1. Remove the radiator. For details, see REMOVAL OF RADIATOR.
2. Remove mounting bolts (1), then remove damper and crank pulley (2).
3. Take care not to damage crankshaft (3), remove seal (4) with a screwdriver, etc.

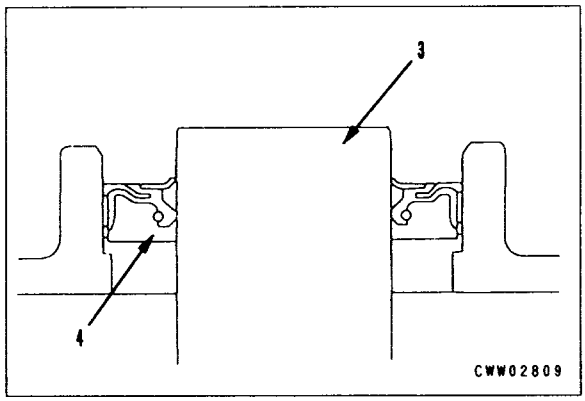


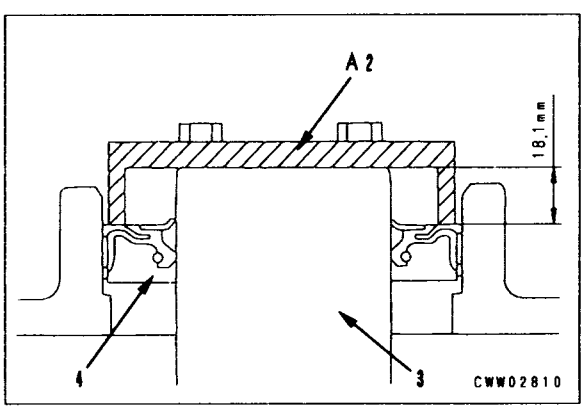
INSTALLATION OF ENGINE FRONT SEAL

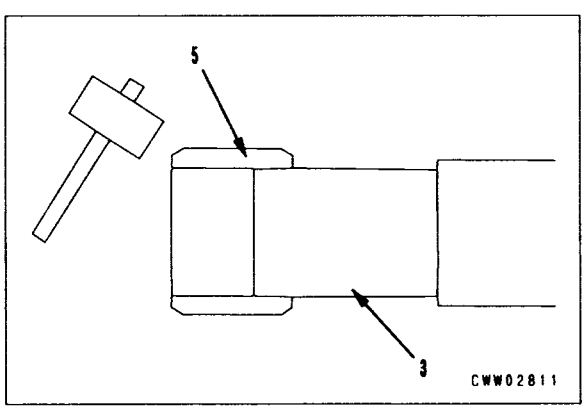
1. **Front oil seal and sleeve**
   1) When the seal contact face of the crankshaft is not worn
      - Press fit the oil seal to the end of the gear case cover by 18.1mm with tool **A2**.
        - ★ Fill the space between lips on the outside with grease (G2-LI) up to 50 – 80%.
        - ★ Tighten the mounting bolts evenly.

   2) When the seal contact face of the crankshaft is worn
      - If the position of the oil seal can be changed, press fit a new oil seal to a place at which its lip does not touch the worn groove.
        - ★ Measure the position of the worn groove, then press fit the new oil seal with tool **A2** to a place where there is not a worn groove.

   3) When the position of the oil seal cannot be changed
      - Press fit sleeve (5) to the crankshaft.
        - ★ Remove rust and mud from sleeve fitting portion of the crankshaft.
        - ★ Thinly apply sealant (LG-7) over the inside of sleeve (5), then install the sleeve to the end of crankshaft (3) in parallel by hitting it lightly with a wooden or plastic hammer.

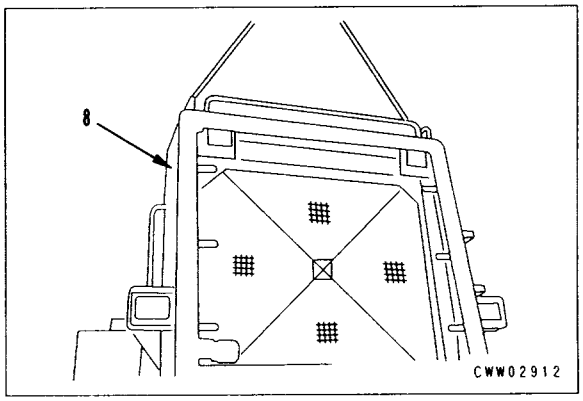




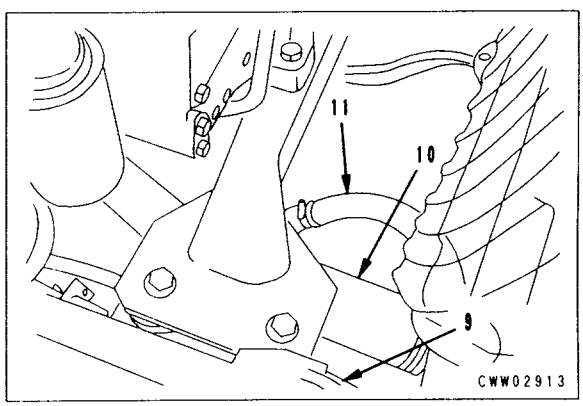


7. Sling radiator guard (8) temporarily, remove mounting bolts, then lift off.

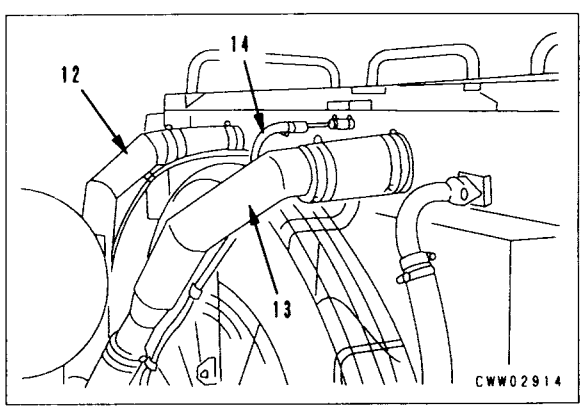
   kg Radiator guard: **Approx. 225 kg**



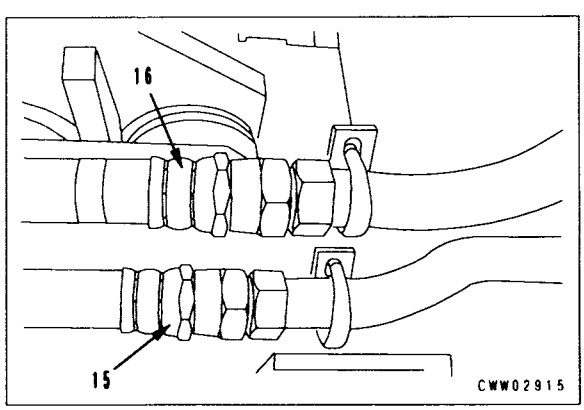
8. Disconnect water drain hose (9) from radiator.
9. Loosen clamp of lower hose (10).
10. Disconnect hose (11).



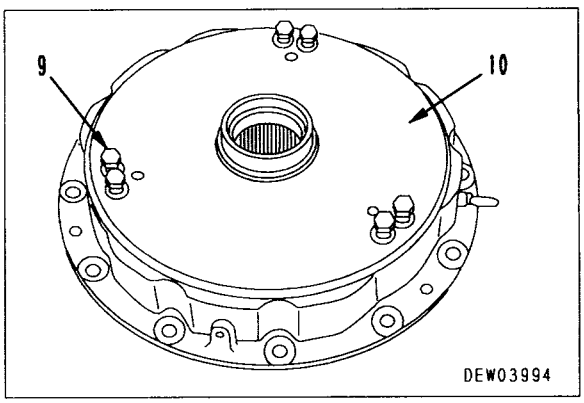
11. Loosen hose clamps of tubes (12) and (13).
    ★ Disconnect hose (14) from the radiator.



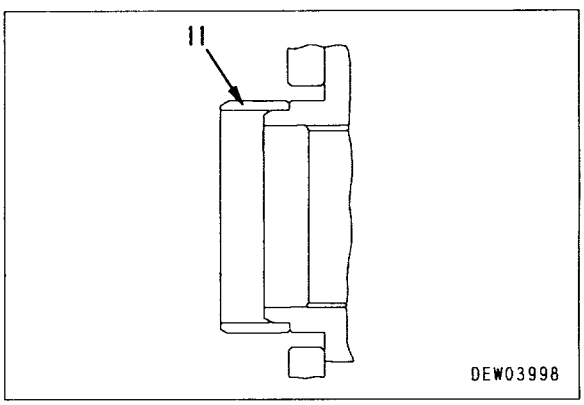
12. Disconnect hydraulic cooler hoses (15), (16).



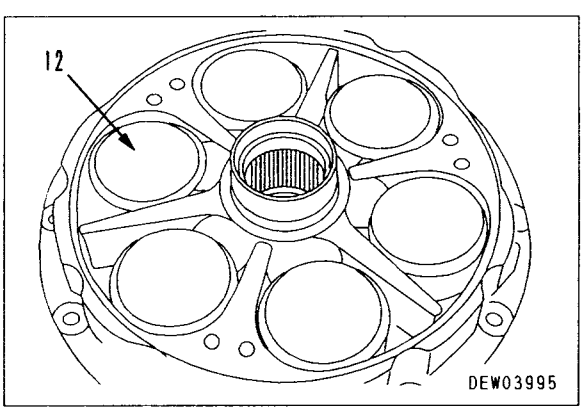
2. **Damper**
   1) Remove mounting bolts (9), and using forcing screws, remove flange (10).
      ★ Tighten the 3 forcing screws evenly.



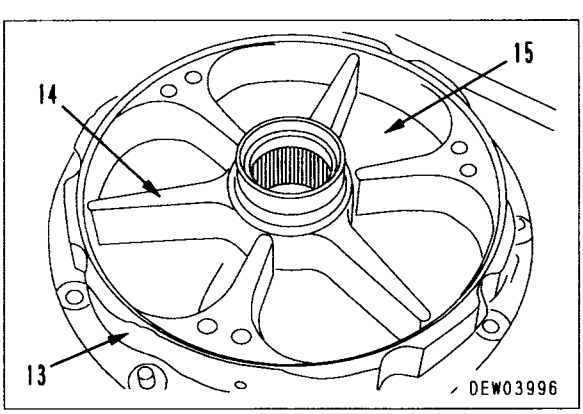
      ★ Do not remove spacer (11) unless necessary.



   2) Remove rubber (12).



   3) Remove inner body (14) and flange (15) from outer body (13).
      ★ Screw in the mounting bolts, tap with a hammer and remove.



INSTALLATION OF TORQUE CONVERTER AND TRANSMISSION ASSEMBLY

- Carry out installation in the reverse order to removal.

※ 1
- ★ Adjust the length of the accelerator cable. For details, see TESTING AND ADJUSTING, Adjusting length of accelerator cable.

※ 2
- ★ When connecting each hose, do not twist it.
- ★ Be careful not to let dirt, dust, water, etc. in each hose.
- ★ Charge the air conditioner circuit with air conditioner gas (R134a) by using refrigerant charger **X1**.

※ 3
Mounting nut:
245 – 309 Nm {25.0 – 31.5 kgm}

※ 4
★ Check that the sliding range of the drive shaft is normal before installing the drive shaft. For details, see TESTING AND ADJUSTING, Testing of upper drive shaft sliding part.
Upper drive shaft:
157 – 196 Nm {16.0 – 20.0 kgm}

※ 5
Center drive shaft:
342 – 427 Nm {35.0 – 43.5 kgm}

※ 6
Rear drive shaft:
342 – 427 Nm {35.0 – 43.5 kgm}

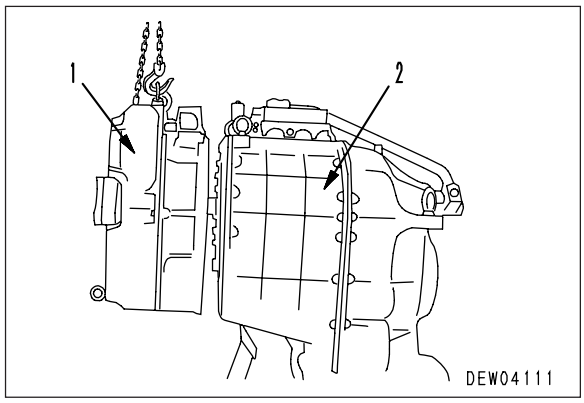
※ 7
Trunnion mounting bolt:
490.4 – 608.0 Nm {50.0 – 62.0 kgm}
- ★ Check the parallelism and adjust the shims. Parallelism: 0.15 mm max.

DISASSEMBLY OF TRANSMISSION

1. Torque converter assembly

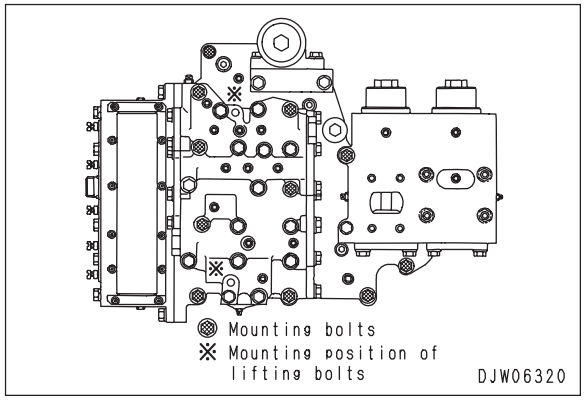
Using eyebolts, remove torque converter assembly (1) from transmission assembly (2).

kg Torque converter assembly: **650 kg**



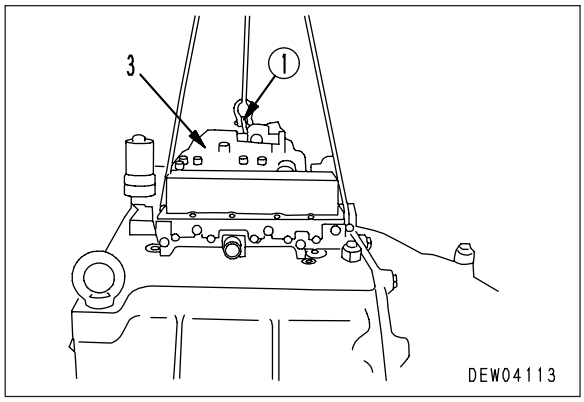
2. Control valve assembly

1) Remove 11 mounting bolts.
   - ★ The length of the bolts is different, so check before removing.
   - ★ Remove only the bolts marked ◎ in the diagram.



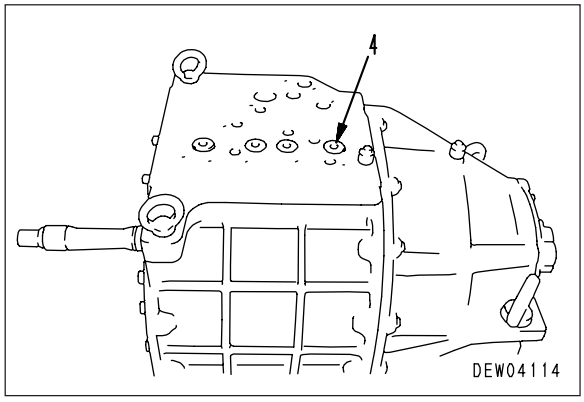
2) Using eyebolts ① (Dia. = 10 mm, Pitch = 1.5 mm), lift off control valve assembly (3).

kg Control valve assembly: **110 kg**



3. Sleeve

Remove sleeve (4).

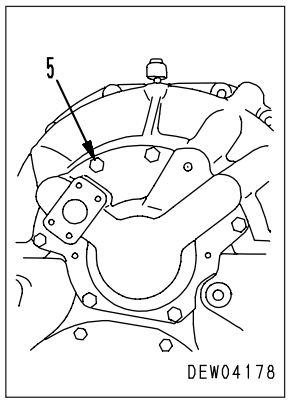


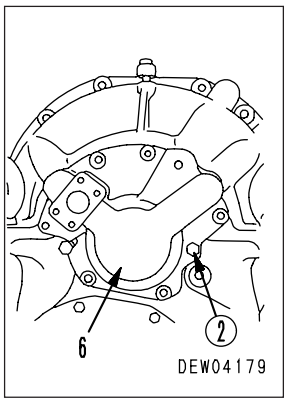
32. Cover assembly

1) Turn over transfer assembly.

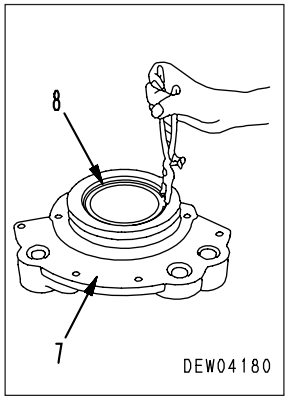
kg Transfer assembly: **1,100 kg**

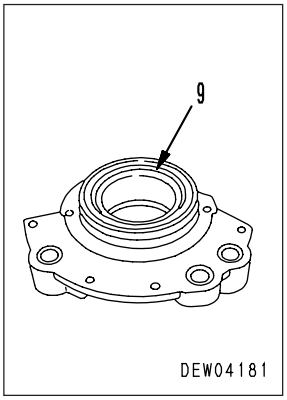
2) Remove mounting bolts (5), then using forcing screws ② (Dia. = 12 mm, Pitch = 1.75 mm), remove cover assembly (6).





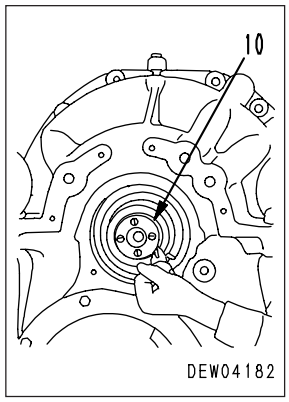
3) Remove snap ring (8) from cover (7), then remove bushing (9).

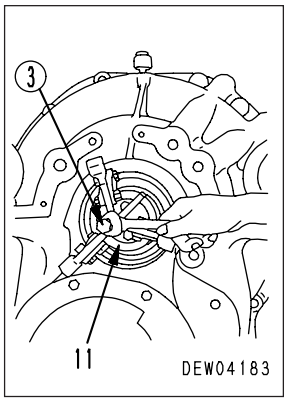




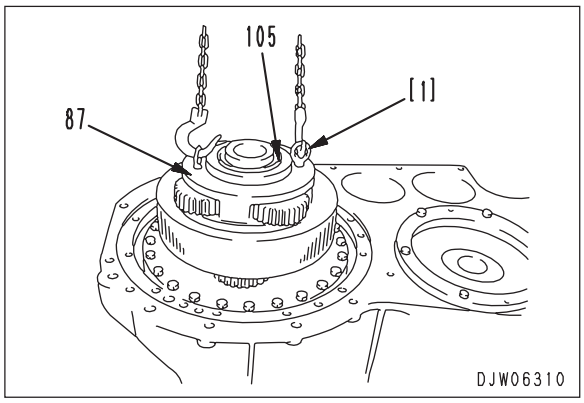
33. Collar assembly

1) Remove snap ring (10).
2) Using puller ③, remove collar assembly (11).
   ★ When using the puller, remove the outside seal ring (1 piece).



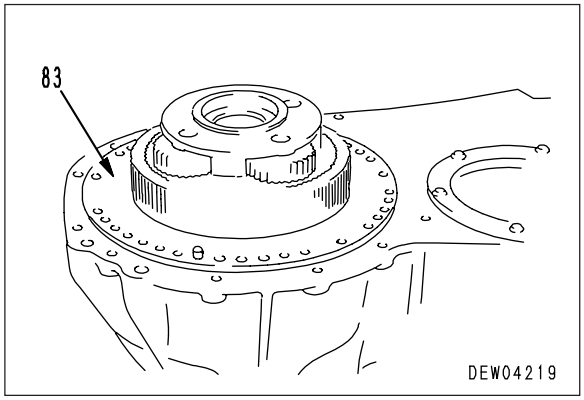


2) Cool only the outer race of bearing (105). Then, using eyebolts [1] (Dia. = 12 mm, Pitch = 1.75 mm), sling and install ring gear and carrier assembly (87) to bearing (105) by expansion fit.



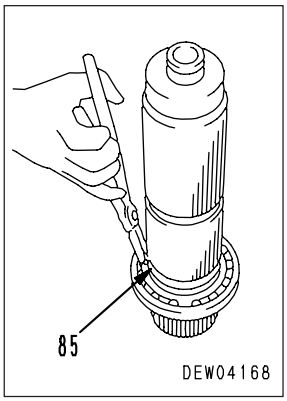
12. Plate

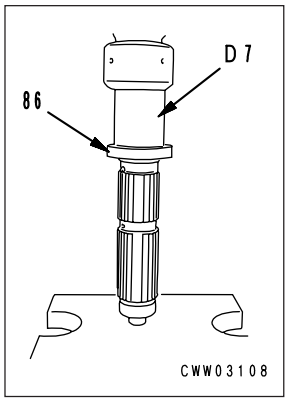
Align with dowel pin, and install plate (83).



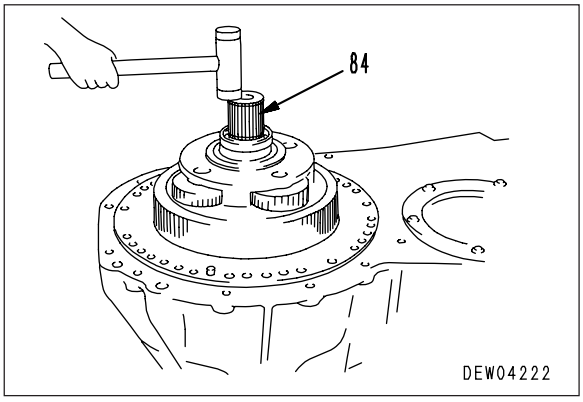
13. Shaft assembly

1) Install snap ring (85).
2) Heat bearing (86) and install it to the shaft by shrink fit.
   ★ Do not heat bearing (86) higher than 120°C.



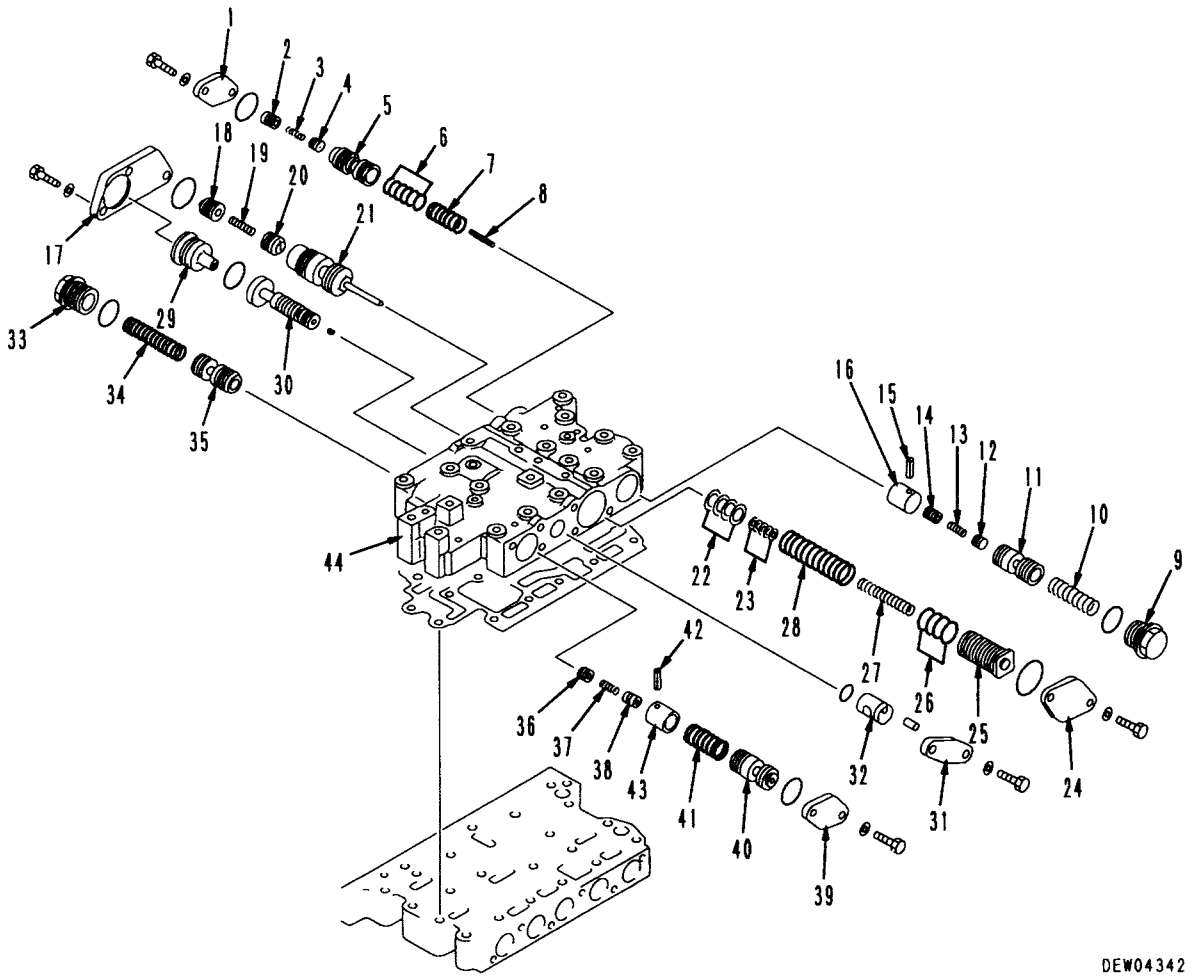


3) Tap shaft assembly (84), and press fit bearing.



DISASSEMBLY AND ASSEMBLY OF TRANSMISSION VALVE

DISASSEMBLY, ASSEMBLY OF UPPER VALVE



DISASSEMBLY OF UPPER VALVE

1. Remove cover (1), then remove valve (2), spring (3), valves (4) and (5), shim (6), and springs (7) and (8).
   ★ Check the number and thickness of the shims, and keep in a safe place.

2. Remove plug (9), then remove spring (10), valves (11) and (12), spring (13), and valve (14).

3. Remove plug, pull out pin (15), then remove stopper (16).

4. Remove cover (17), then remove valve (18), spring (19), valves (20) and (21), and shims (22) and (23).
   ★ Check the number and thickness of the shims, and keep in a safe place.

5. Remove cover (24), then remove piston (25), shim (26), and springs (27) and (28).
   ★ Check the number and thickness of the shims, and keep in a safe place.

6. Using bolts (Dia. = 10 mm, Pitch = 1.5 mm), remove stopper (29), then remove valve (30).

7. Remove cover (31), then remove boss (32).

8. Remove plug (33), then remove spring (34), valves (35) and (36), spring (37), and valve (38).

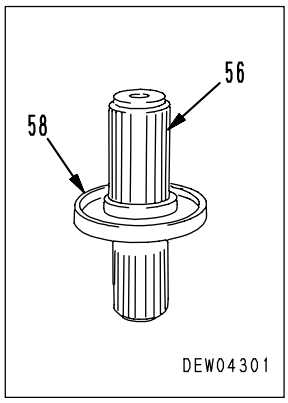
9. Remove cover (39), then remove valve (40) and spring (41).

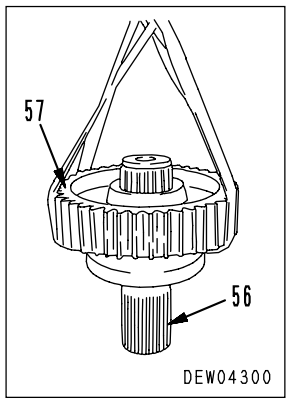
10. Remove plug, pull out pin (42), then remove stopper (43).

ASSEMBLY OF TRANSFER

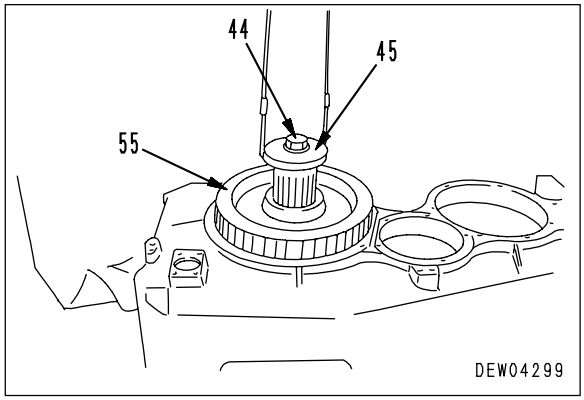
1. No. 4 gear, shaft assembly

1) Install spacer (58) to shaft (56).
2) Raise gear (57) and install to shaft (56).



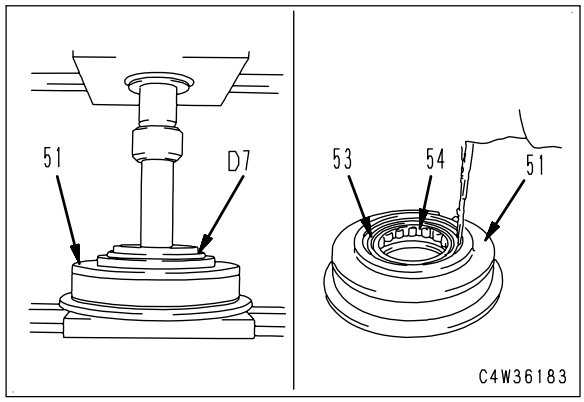


3) Using holder (45) and mounting bolts (44), raise No. 4 gear, shaft assembly (55) and install.
   ★ Support the block under the shaft.

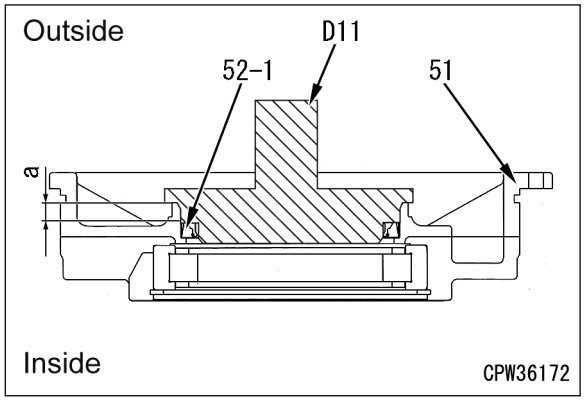


2. Rear side cage

1) Set in press, then using push tool **D7** (outside diameter: 249.5 mm), press fit bearing (54) in cage (51), and install snap ring (53).



2) Horizontally set oil seal (52-1) to cage (51), and press fit it with push tool **D11** gradually and horizontally while preventing it from leaning.
   Oil seal fitting surface:
   Gasket sealant (LG-5)
   ★ Apply the gasket sealant thinly over the inside surface of the cage (51) and wipe off the projected part.
   ★ If the oil seal leans while it is being press fitted, it may be deformed. Press fit it straight while checking not to lean.
   ★ Dimension “a” is 16.7 to 16.8 mm.

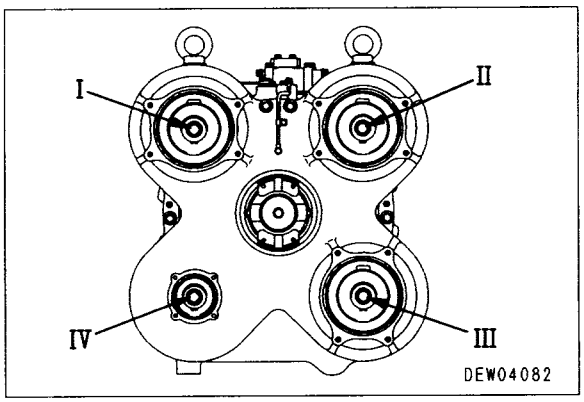


DISASSEMBLY OF PTO

Preparatory work

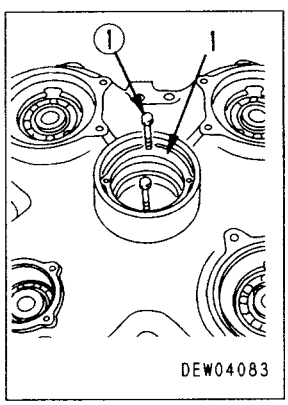
- Remove PTO. For details, see DISASSEMBLY OF TORQUE CONVERTER.

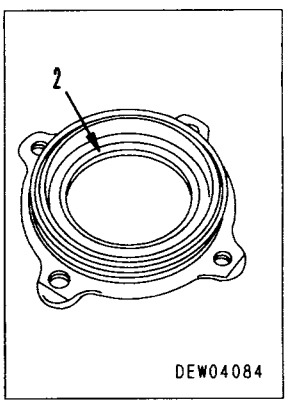
★ The procedure for disassembly and assembly of the gear and shaft assemblies is the same, but for gear and shaft assemblies I, II, III and IV, the shaft and bearing are different.



1. Retainer

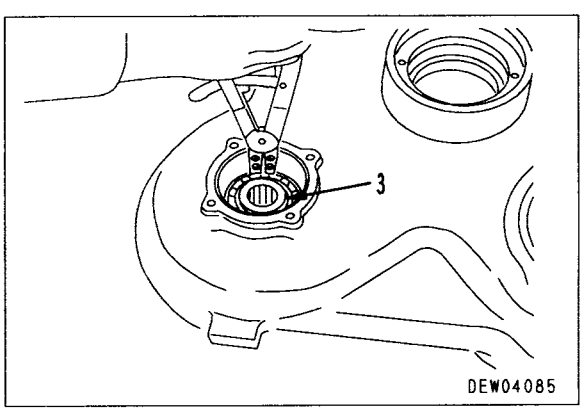
1) Using forcing screws ① (Dia. = 10 mm, Pitch = 1.25 mm), remove retainer (1).
2) Remove oil seal (2).





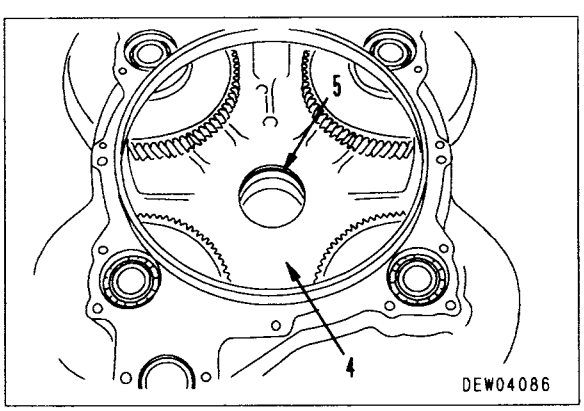
2. Snap ring

Remove snap ring (3).



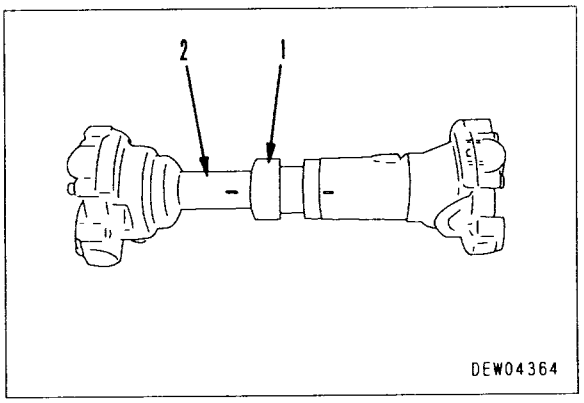
3. Bearing

1) Turn over PTO case assembly (4).
2) Remove bearing (5).

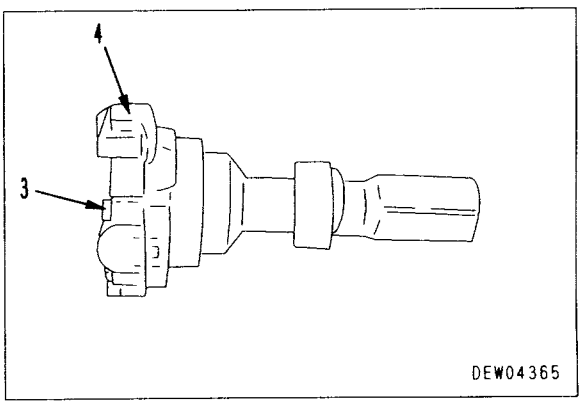


DISASSEMBLY OF DRIVE SHAFT

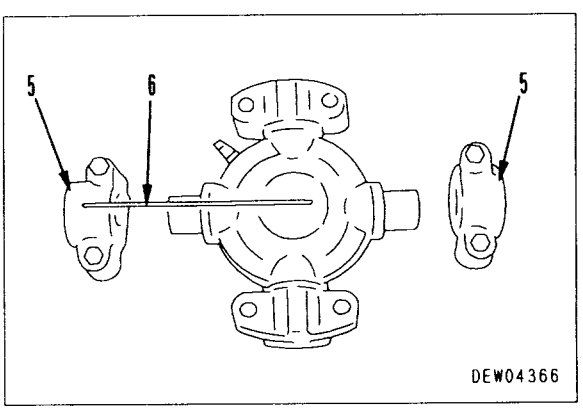
1. **Splined yoke**
   Loosen retainer (1) and remove splined yoke (2).



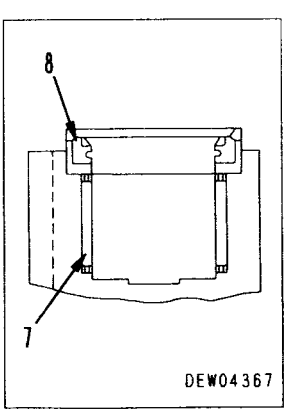
2. **Bearing**
   Remove mounting bolts (3), then remove bearing assembly (4).
   ★ Make match marks on the yoke and bearing.

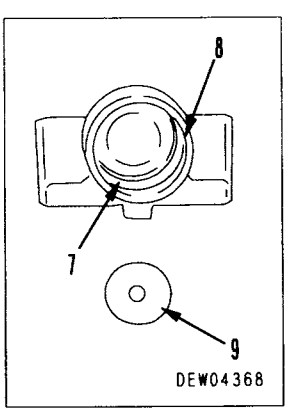


3. **Bearing cap**
   1) Remove bearing cap (5) from bearing assembly.
      ★ Remove strap (6) of cap.



   2) Remove bearing (7), seal (8) and Delrin washer (9) from bearing cap.

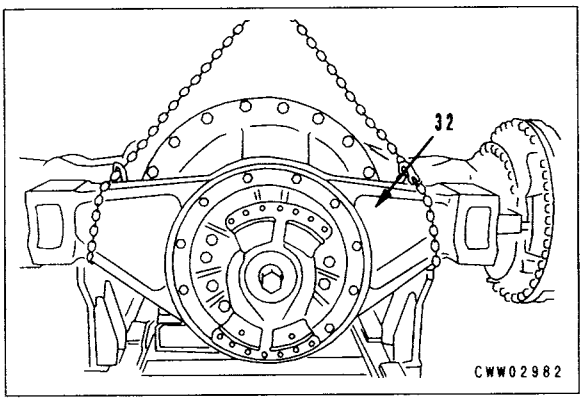




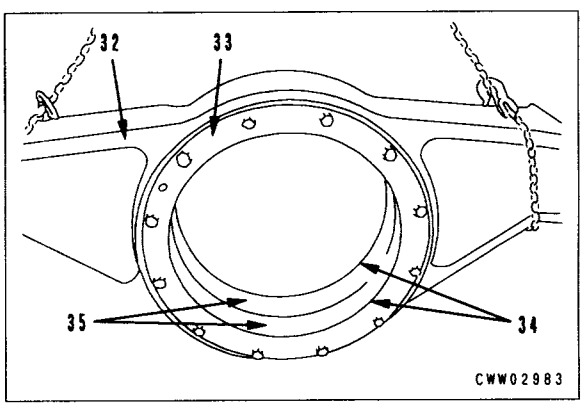
8. Front support

1) Remove front support (32) from rear axle.
   ★ Be careful not to damage the O-ring (or seal).

   kg Front support : **286 kg**

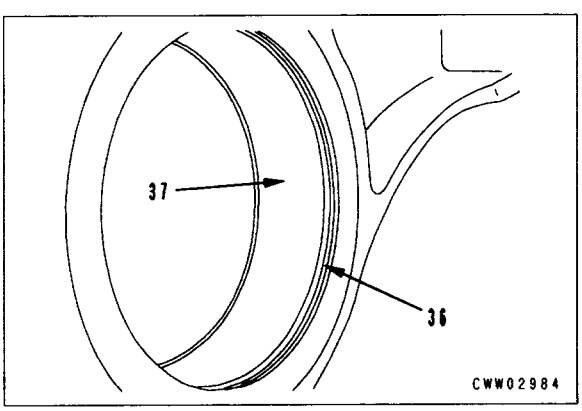


2) Remove retainer (33), O-ring (or seal) (34), and bushing (35) from front support (32).
   ★ For machines where the bushing and support are stuck together, remove bushing (35) in the procedure for Step 10.



9. Rear support

Remove O-ring (or seal) (36) and bushing (37) from rear support.
★ For machines where the bushing and support are stuck together, remove bushing (37) in the procedure for Step 10.



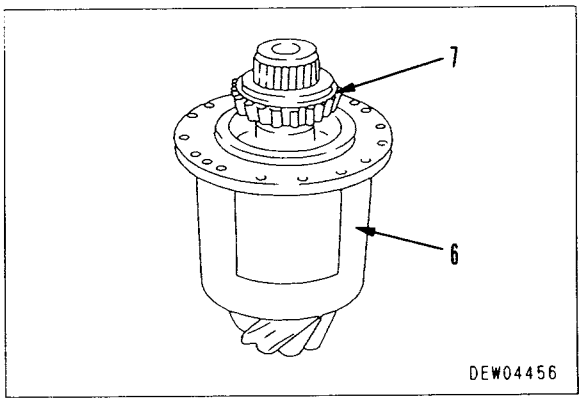
10. Procedure for removing bushing

1) Insert tip of a knife between bushing and support, separate bushing and support around whole circumference, then remove bushing.
   ★ If the adhesive is hard, and it is difficult to separate the bushing and support, heat the bushing to 100°C with boiling water or with a small torch, then try again to separate the bushing and support.

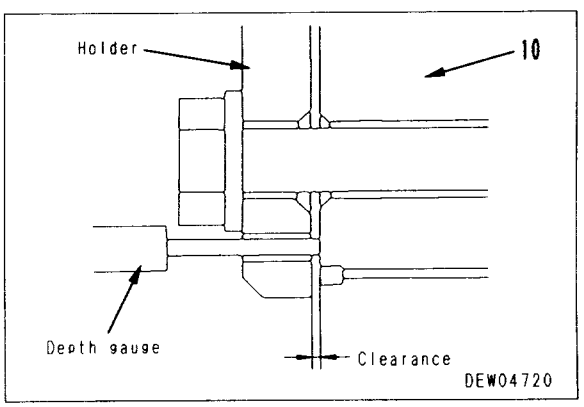
2) Coat adhesion portion (where it is held to the support) with adhesive removing liquid, wait for 2 – 3 minutes, then remove adhesive.

   Portion with hardened adhesive :
   Adhesive removing liquid (part No. 427-46-11890)

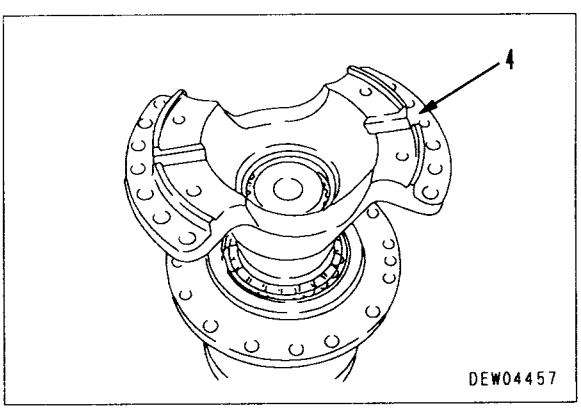
3) Install pinion shaft to cage (6).
4) Install bearing (7).



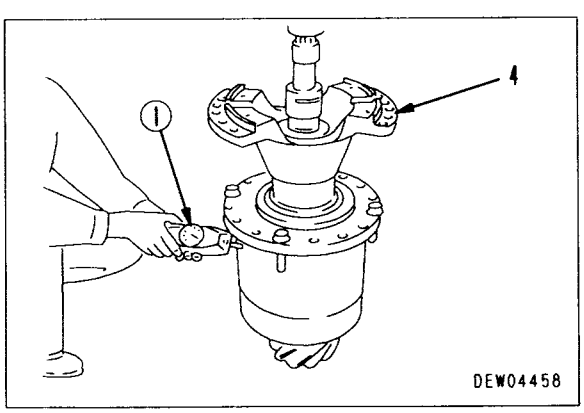
5) Install coupling (4), and tighten holder with mounting bolt to 323.6 ± 19.6 Nm {33 ± 2.0 kgm} temporarily, then measure clearance between holder and pinion.
   ★ Add 0.11 mm to the measured value for the clearance to decide the shim thickness.



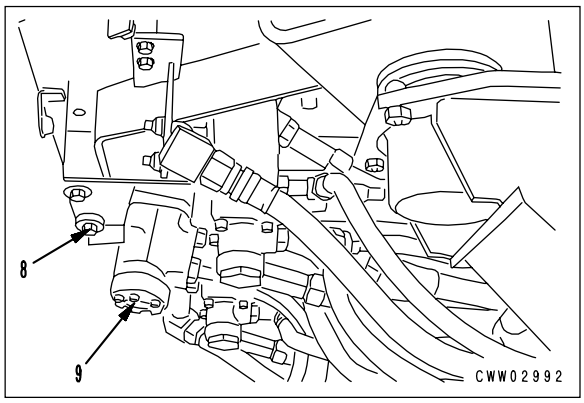
6) Insert shim and rotate cage while tightening holder mounting bolts to specified tightening torque.
   Mounting bolt: **Adhesive (LT-2)**
   kgm Mounting bolt:
   2,750 ± 290 Nm {280 ± 30 kgm}



★ Rotate the cage 20 – 30 times, then using push-pull scale ①, check the starting torque.
   ★ Starting torque: 22.6 ± 6.9 Nm {2.3 ± 0.7 kgm}

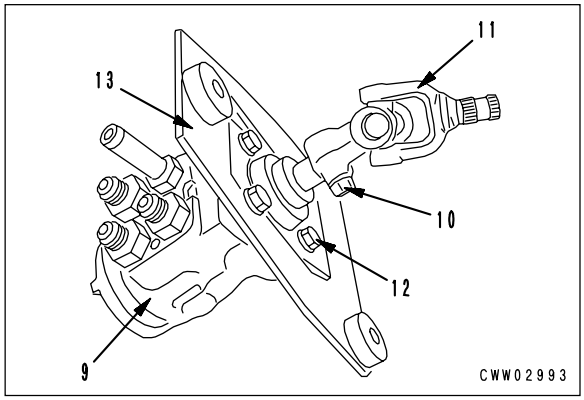


8. Remove mounting bolt (8), then remove orbit-roll (9) and bracket together. ※ 2



9. Loosen lock bolt (10), then remove joint (11).

10. Remove bolt (12), then remove bracket (13) from orbit-roll (9).



INSTALLATION OF ORBIT-ROLL

- Carry out installation in the reverse order to removal.

※ 1
Joint lock bolt:
55.9 ± 7.8 Nm {5.7 ± 0.8 kgm}

※ 2
Bracket mounting bolt:
51.9 ± 7.8 Nm {5.3 ± 0.8 kgm}

- **Bleeding air**
  Bleed air from the steering circuit. For details, see TESTING AND ADJUSTING, “Bleeding air from steering circuit”.

10. Remove bolts (17) and (18), then remove plate (19).

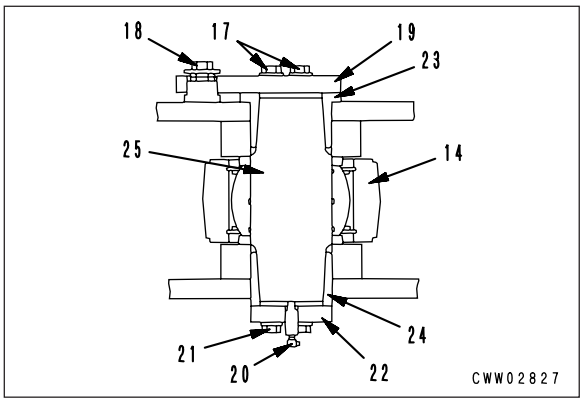
11. Disconnect the remote tube, then remove grease nipple (20).

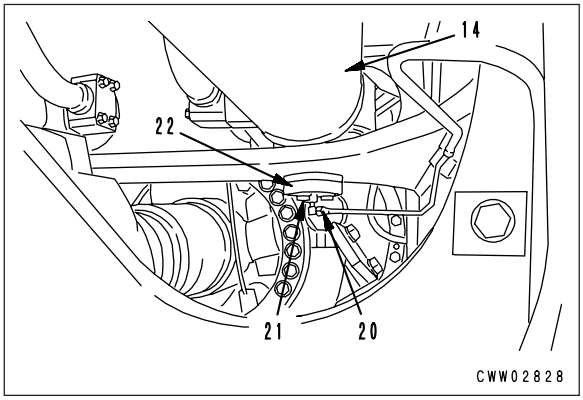
12. Remove bolt (21), then remove plate (22).

13. Remove taper bushings (23) and (24), then pull out pin (25). ※ 2

14. Sling and remove steering cylinder (14).
- ★ When slinging, be careful not to interfere with the remote grease tube, etc.
- ★ Check the number of the shims.

Steering cylinder : **210 kg**





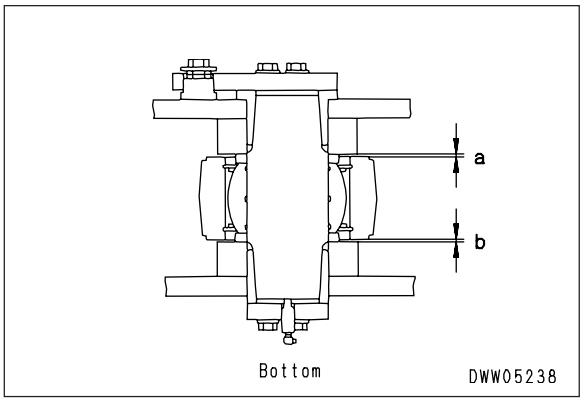
INSTALLATION OF STEERING CYLINDER

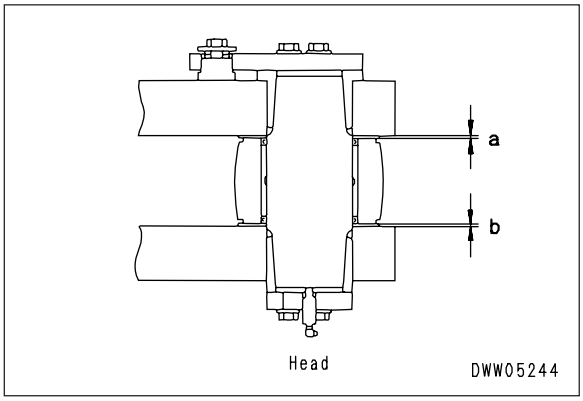
- Carry out installation in the reverse order to removal.

※ 1 ※ 2
1) Do not put grease or other lubricants on the contact faces of the pin and taper bushing.
2) When installing the taper bushing, set its slit in the lateral direction of the machine body.

⚠ When aligning the position of the pin hole, use a bar. Never insert your fingers in the pin hole.

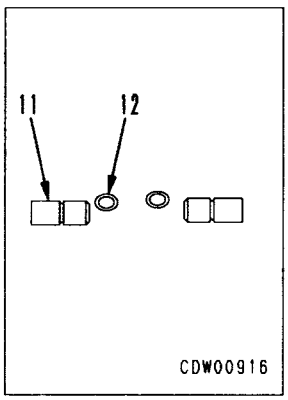
★ Adjust the clearance of the cylinder mounting portions to the following values.
- Bottom side: **a**, **b** = 1 mm max.
- Head side: **a**, **b** = 3 mm max.

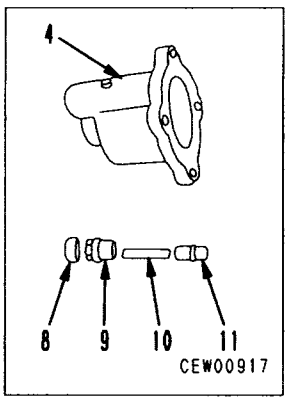




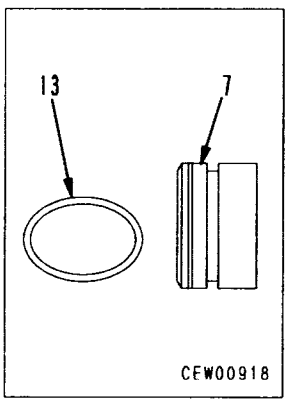
ASSEMBLY OF SLACK ADJUSTER

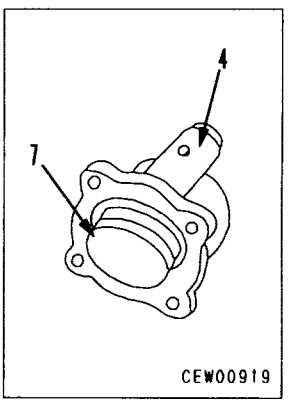
1. **Poppet**
   1) Fit O-ring (12) to poppet (11).
   2) Install poppet (11), spring (10), plug (9) and cover (8), then assemble into the cylinder (4).



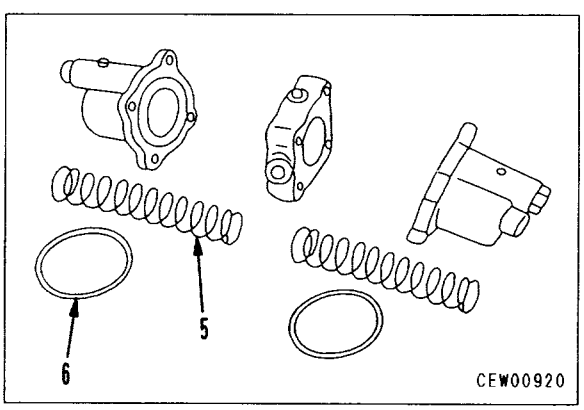


2. **Piston**
   1) Fit O-ring (13) to piston (7).
   2) Insert piston (7) into cylinder (4).
      ★ Confirm that the piston moves smoothly.



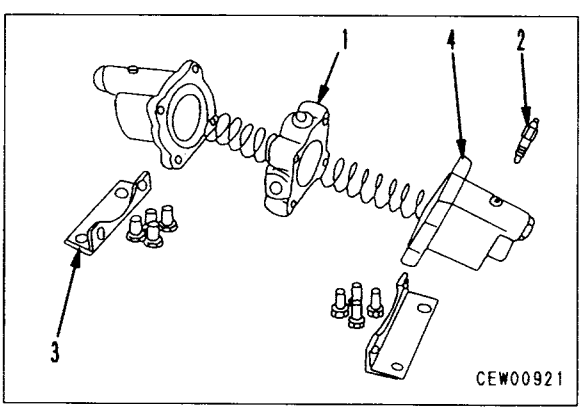


3. **Cylinder**
   1) Install O-ring (6) and spring (5) to cylinder.
      ★ Spring installation load: 43.1N {4.4 kg}



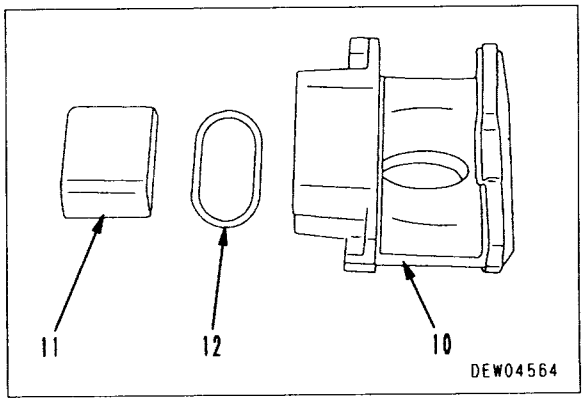
   2) Install cylinders (4) and bracket (3) to body (1).

4. **Bleeder**
   Install bleeder (2).

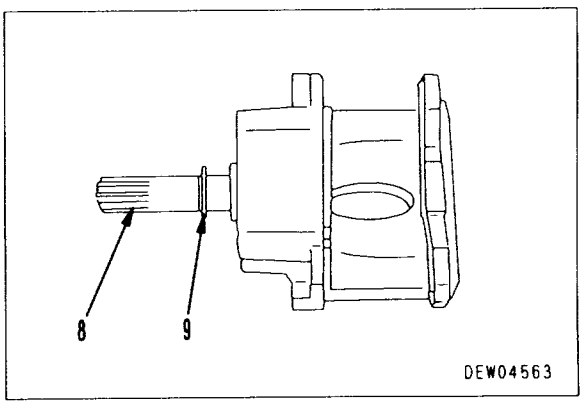


ASSEMBLY OF PARKING BRAKE CALIPERS

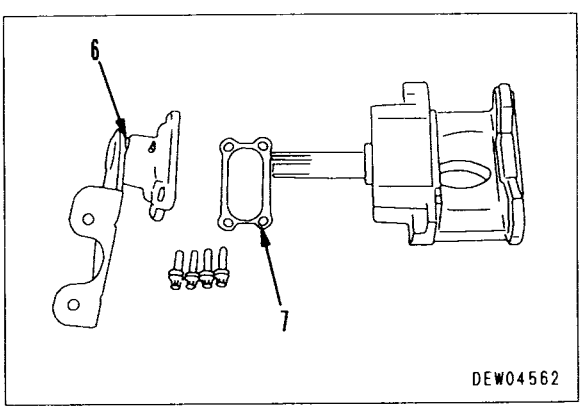
1. Assemble piston seal (12) in calipers (10), and insert piston (11).
   Piston, piston seal: **Grease (G2-LI)**



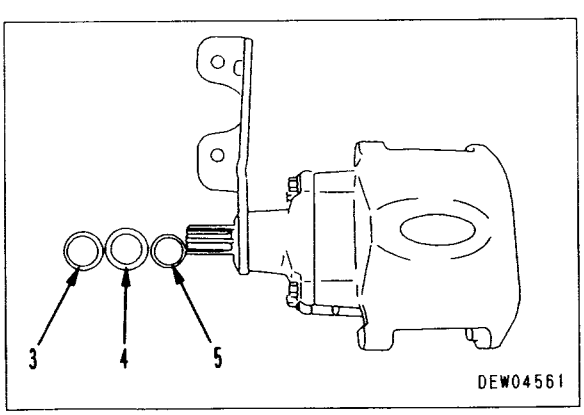
2. Screw piston shaft (8) into piston, and install thrust bearing (9).
   ★ Be careful to install the thrust bearing facing in the correct direction.
   Thrust bearing: **Grease (G2-LI)**



3. Fit gasket (7) and install cap (6).
   kgm Mounting bolt:
   177 ± 20 Nm {18 ± 2 kgm}



4. Install seal (5) and washers (3) and (4).
   ★ Fit the seal securely in the groove.
   Seal: **Grease (G2-LI)**



6. Disconnect tubes (7) and (8) between the hydraulic tank and diverter valve from the hydraulic tank.

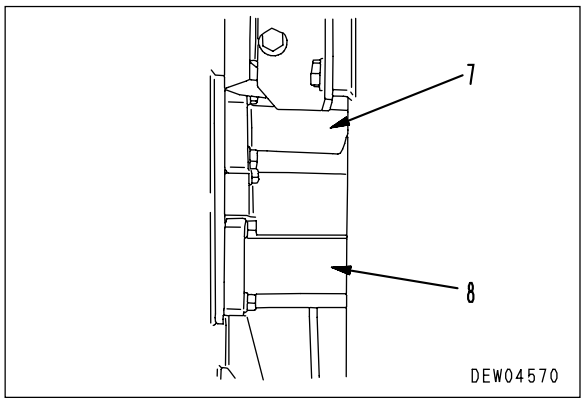
7. Disconnect return tube (9) between the work equipment valve and hydraulic tank from the hydraulic tank.

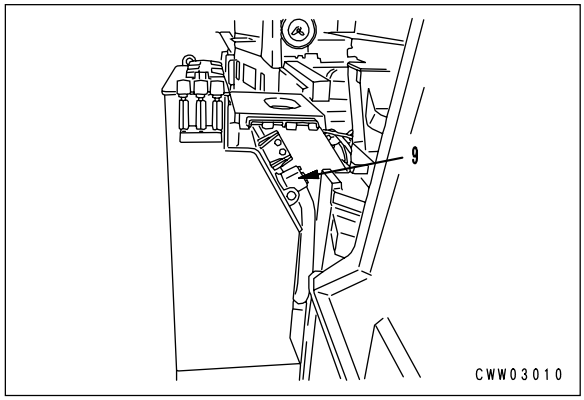
8. Disconnect return tube (10) between the oil cooler and hydraulic tank from the hydraulic tank.

9. Temporarily sling hydraulic tank and filter case assembly (11).

10. Remove mounting bolts (12) and (13), then remove hydraulic tank and filter case assembly (11). ※ 1

Hydraulic tank and filter case assembly: **900kg**





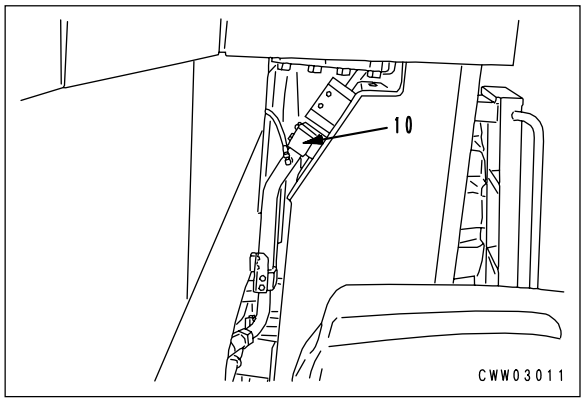
INSTALLATION OF HYDRAULIC TANK AND FILTER CASE

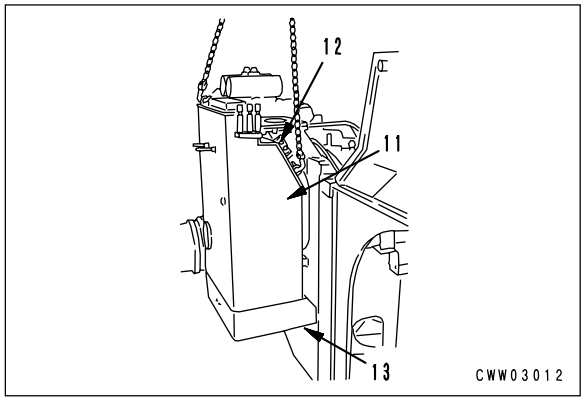
- Carry out installation in the reverse order to removal.

※ 1
Mounting bolt:
820 – 1,030 Nm {84 – 105 kgm}

- **Refilling with oil**
  1) Add hydraulic oil to the specified level.
     Hydraulic oil: **725** ℓ
  2) Before starting the engine, bleed air from the steering pump, switch pump and loader pump. (For details, see TESTING AND ADJUSTING, Bleeding air from piston pump.)
  3) Run the engine to circulate the oil through the system. Then, check the oil level again.

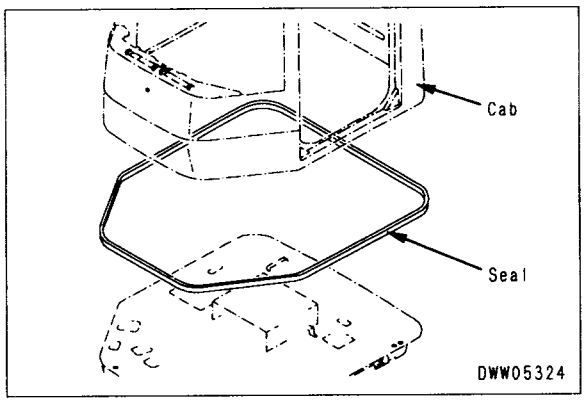
- **Bleeding air**
  Bleed air from each portion. For details, see TESTING AND ADJUSTING, "Bleeding air from work equipment circuit" and "Bleeding air from steering circuit".





INSTALLATION OF CAB

- Carry out installation in the reverse order to removal.

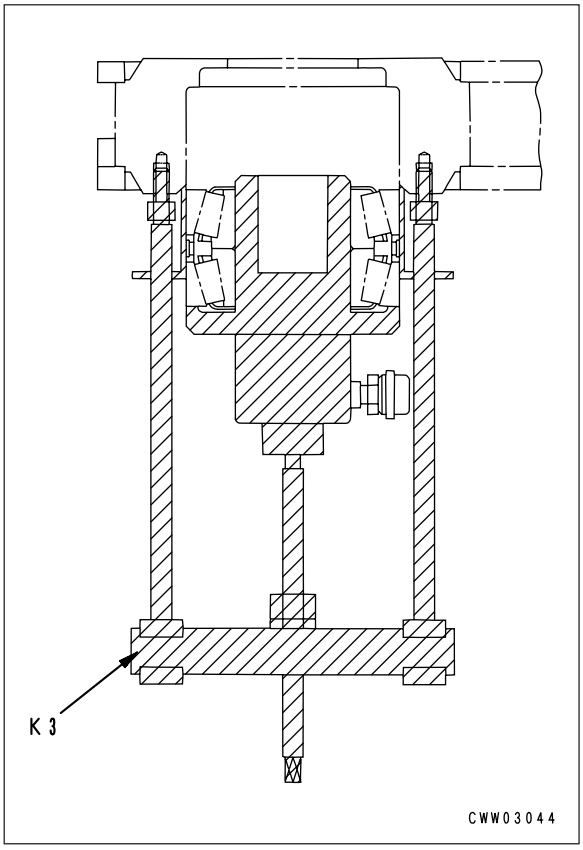


※ 1

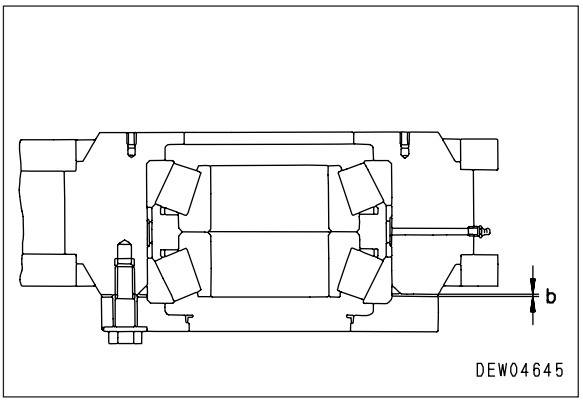
- When installing the cab assembly, do not forget to install the seal.
  ★ Coat the seal uniformly with adhesive.
  Seal: **Adhesive (Cemedyne 366E)**

※ 5

★ Press fit the bearing and spacer to the front frame with tool **K3**.
★ Be careful that the bearing is not at an angle.
★ Fill inside of the bearing with grease sufficiently.
★ When installing the bearing, be sure to remember to install the spacer.
★ The clearance of the bearing is adjusted, so do not change the combination of bearing and the spacer. When replacing, replace as a set.
★ Press fit so that the lip of the dust seal is facing outside.
Dust seal lip face: **Lubricant (G2-LI)**



★ Tighten the 10 mounting bolts of the retainer, and measure clearance **b** between the retainer and hinge at 4 places. Then, select shims so that clearance b will be 0.08 – 0.18mm less than the measured value.
★ The thickness of the shims must not exceed the clearance measured at the four places.
★ After selecting shims, tighten the retainer to the specified torque.
Mounting bolt (For adjusting shims):
245 ± 25 Nm {25.0 ± 2.5 kgm}
Mounting bolt:
927 ± 103 Nm {94.5 ± 10.5 kgm}
★ Press fit so that the lip of the dust seal is facing outside.
Dust seal lip face: **Lubricant (G2-LI)**
★ Install the spacer with the more chamfered side on the bearing side.
Inside of spacer: **Lubricant (G2-LI)**



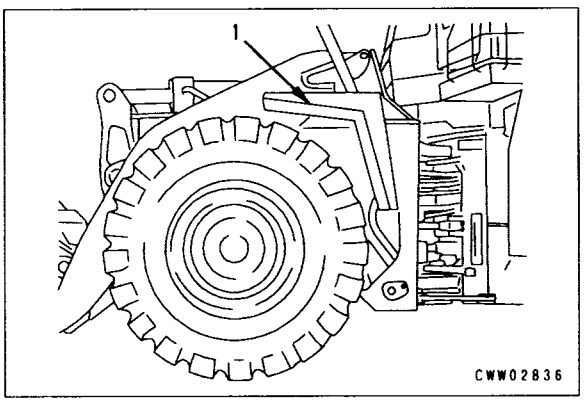
REMOVAL OF LIFT CYLINDER

⚠ Stop the machine on level ground and install the safety bar to the frame, then put blocks under the wheels to prevent the machine from moving.

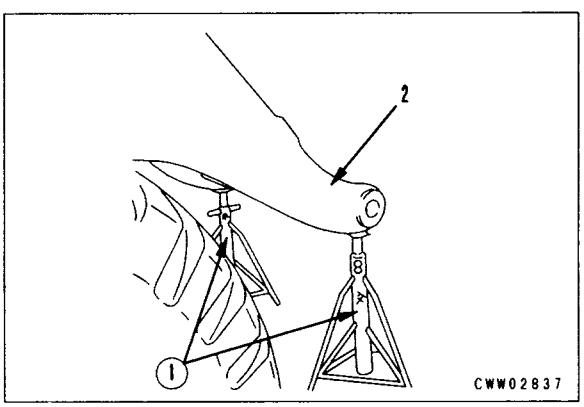
1. Remove the bucket. For details, see REMOVAL OF BUCKET.

2. Remove fender (1).

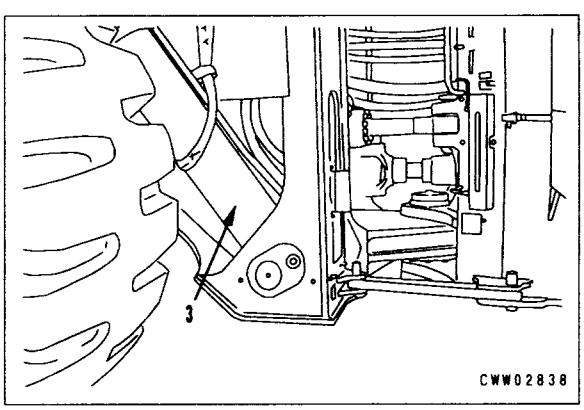
   kg Fender : **200 kg**



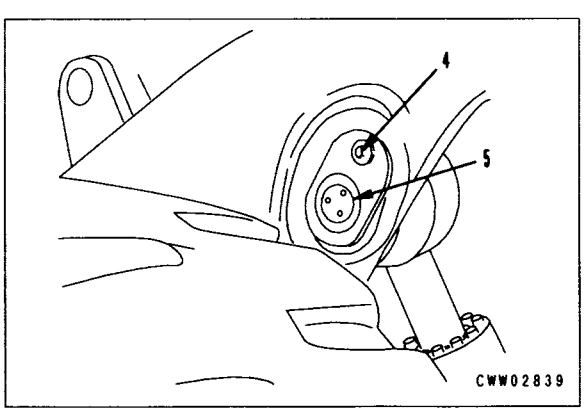
3. Raise the lift arm until the pin on the cylinder head side can be pulled out, then sent stand ①.
   ⚠ After stopping the engine, lower the lift arm slowly to eliminate the load on the lift cylinder.
   Loosen the cap of the hydraulic tank slowly to release the pressure from the hydraulic tank.



4. Temporarily sling lift cylinder (3).
   ★ Be careful not to damage the tubes.



5. Remove lock bolt (4), then pull out pin (5).

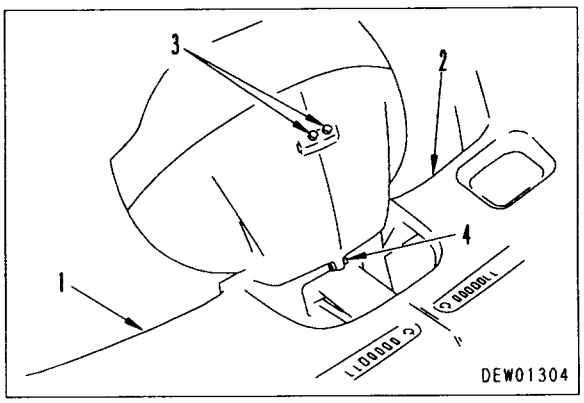


REMOVAL OF MAIN MONITOR

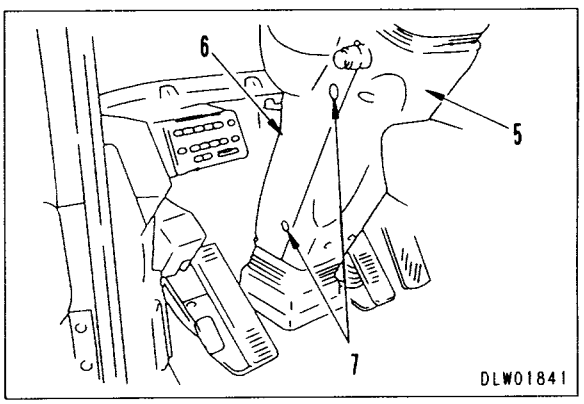
⚠ Stop the machine on level ground and install the safety bar to the frame. Lower the work equipment to the ground and stop the engine and apply the parking brake, then put blocks under the wheels to prevent the machine from moving.

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

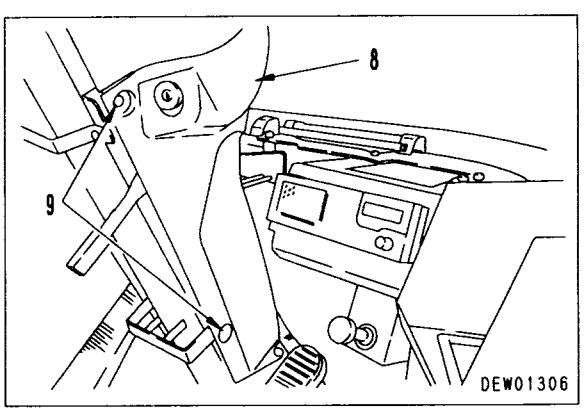
1. **Removal of surrounding steeling column**
   1) Remove dashboards (1) and (2).
   2) Remove steering post covers (3) and (4).



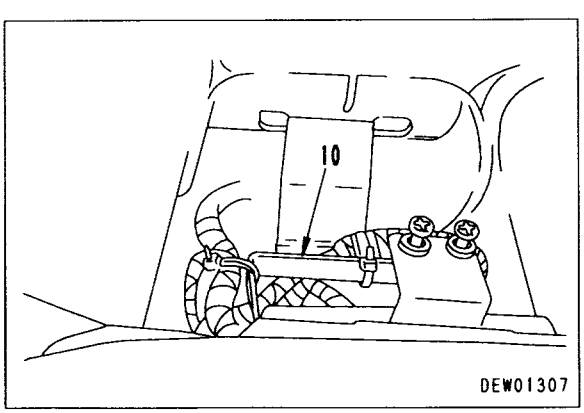
   3) Remove steering post cover (5).
   4) Remove steering post cover (6) and mounting bolt cap (7), then remove the bolt.



   5) Remove steering post cover (8) and mounting bolt cap, then remove mounting bolt (9).
      ★ Turn down the steering post cover forward.



2. Remove bracket (10) on the back side of the main monitor.



Check of operation

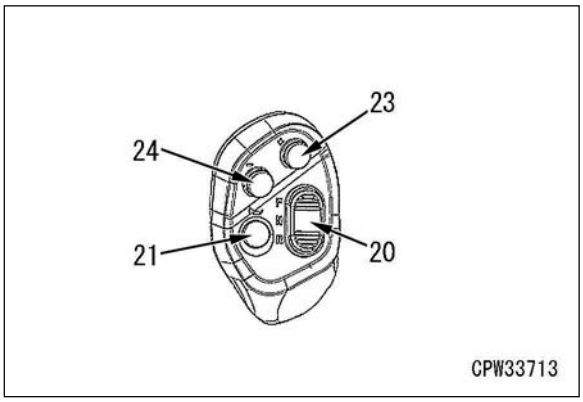
1. Connect the negative (–) terminal of the battery. (If the machine is equipped with the battery disconnect switch, turn it to ON position.)

2. Start the engine, operate AJSS lever and each switch as follows, and check their operations.
   Steering operation
   - Operate AJSS lever to the right and left, and check that the machine turns in the operating direction of AJSS lever.

   Directional operation
   - Set directional selector switch (20) to each position (N, F, R), and check that the travel direction changes according to the operation of directional selector switch.

   Upshift and downshift operations
   - Operate upshift switch (23) and downshift switch (24), and check that gear is shifted according to the switch operation.

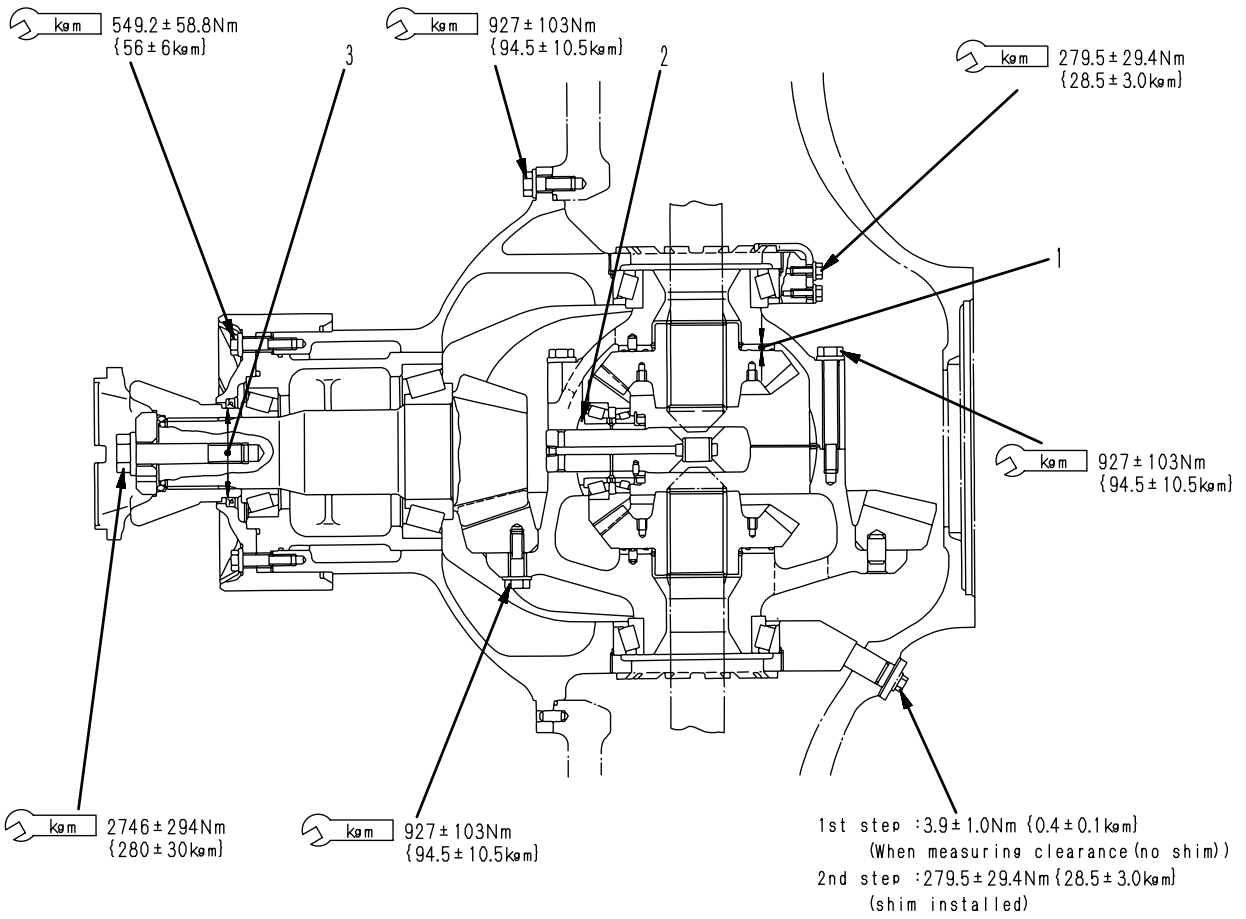
   Horn switch operation
   - Operate horn switch (21), and check that the horn sounds according to the horn switch operation.



Unit: mm

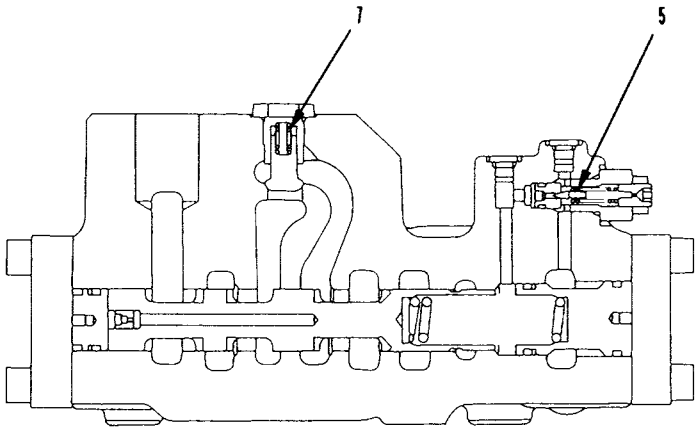
No.	Check item		Criteria					Remedy
1	R clutch springs (12 pieces)		Standard size			Repair limit		Replace
			Free length	Installation length	Installation load	Free length	Installation load	
			91	78	114.7 N {11.7 kg}	85.5	97.1 N {9.9 kg}	
2	F clutch springs (12 pieces)		108.5	92	139.3 N {14.2 kg}	102	108.9 N {11.1 kg}	
3	2nd clutch springs (12 pieces)		91	77	123.6 N {12.6 kg}	85.5	104.9 N {10.7 kg}	
4	1st clutch springs (12 pieces)		91	69	194.2 N {19.8 kg}	85.5	164.8 N {16.8 kg}	
5	Thickness of assembled 6 discs and 5 plates for R clutch		Standard size		Tolerance		Repair limit	
			61.4		–		59.5	
6	Thickness of assembled 6 discs and 5 plates for F clutch		61.4		–		59.0	
7	Thickness of assembled 4 discs and 3 plates for 2nd clutch		39.0		–		37.4	
8	Thickness of assembled 5 discs and 4 plate for 1st clutch		50.8		–		48.8	
9	Thickness of assembled 6 discs and 5 plates for 3rd clutch		61.4		–		59.0	
10	Thickness of 1 disc		5.4		±0.1		5.0	
11	Thickness of 1 plate		5.8		±0.1		5.3	
12	Wear of seal ring for input shaft	Width	3.0		–0.01 –0.03		2.6	
		Thickness	3.5		±0.100		3.35	
13	Wear of seal ring for output shaft	Width	3.0		–0.01 –0.03		2.8	
		Thickness	4.3		±0.120		4.15	
14	Wear of seal ring for 2nd carrier	Width	4.0		–0.01 –0.03		3.5	
		Thickness	5.0		±0.15		4.85	
15	Wear of seal ring for F carrier	Width	4.0		–0.01 –0.04		3.5	
		Thickness	5.0		±0.15		4.85	
16	Wear of seal ring for R carrier	Width	3.0		–0.01 –0.03		2.6	
		Thickness	4.0		±0.12		3.85	
17	Wear of seal ring for idler shaft	Width	3.0		–0.01 –0.03		2.6	
		Thickness	4.0		±0.12		3.85	

DIFFERENTIAL (1/2)

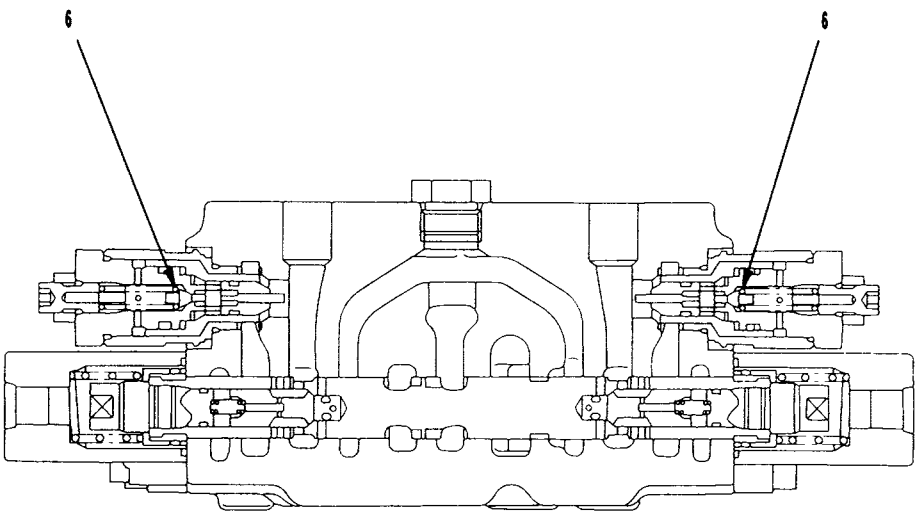


Unit: mm

No.	Check item	Criteria			Remedy
1	Thickness of side gear washer	Standard size	Tolerance	Repair limit	Replace
		9.0	–	8.5	
2	Thickness of pinion gear washer sleeve	10.75	–	10.25	
3	Wear of oil seal surface	150	0 −0.100	–	



B – B



C – C

SVW03601

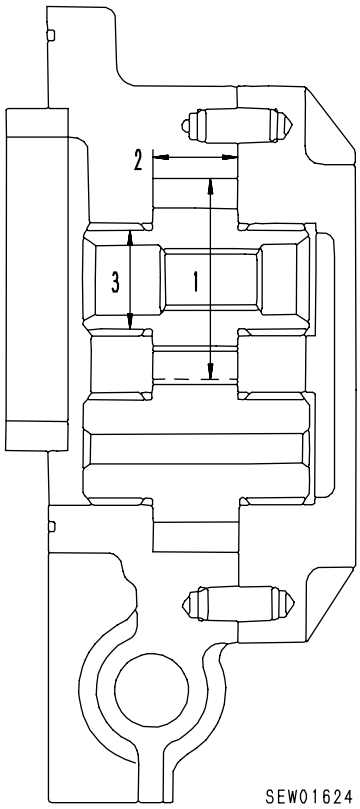
Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Steering spool return spring	Free length	Installation length	Installation load	Free length	Load limit	Replace
		41.8	38.0	74.5 N {7.6 kg}	–	58.8 N {6 kg}	
2	Load check valve spring	20.9	13.2	8.8 N {0.9 kg}	–	7.0 N {0.71 kg}	
3	Demand spool return spring	90.8	83.0	410 N {41.8 kg}	–	328 N {33.4 kg}	
4	Surge cut relief valve spring	24.0	22.19	182.4 N {18.6 kg}	–	145.1 N {14.8 kg}	
5	Main relief valve spring	24.0	22.19	182.4 N {18.6 kg}	–	145.1 N {14.8 kg}	
6	Overload relief valve spring	39.5	35.7	590 N {60.2 kg}	–	471 N {40.8 kg}	
7	Check valve return spring	20.9	13.2	8.8 N {0.9 kg}	–	7.0 N {0.71 kg}	

Unit: mm

No.	Check item	Criteria					Remedy
1	Return spring	Standard size			Repair limit		Replace
		Free length	Installation length	Installation load	Free length	Installation load	
		114.0	98.8	999.3 N {101.9 kg}	112.3	887.5 N {90.5 kg}	
2	Thickness of plate	Standard size			Repair limit		
		2.4			2.15		
3	Thickness of disc	5.1			4.6		
4	Total thickness of plate and disc	107.4			100.4		
5	Wear of contact surface of oil seal	Standard size		Tolerance		Repair limit	
		580		0 −0.175		–	
6	Wear of surface in contact with piston seal	585		+0.110 0		–	
7	Wear of surface in contact with piston seal	630		+0.110 0			
8	Deformation of friction surface of plate and disc	Standard			Repair limit		
		Max. 0.45			0.70		
9	Backlash between outer gear and plate	0.21 – 0.64					
10	Backlash between inner gear and disc	0.21 – 0.64					

CONTROL PUMP (BAR025)

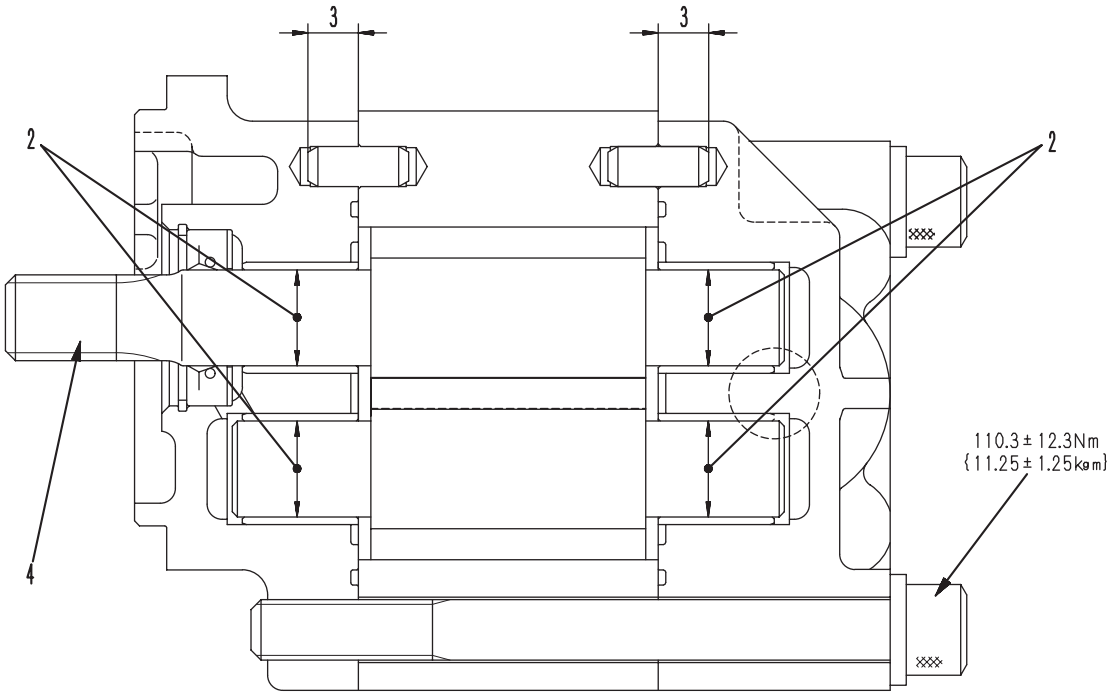


Unit: mm

No.	Check item	Criteria					Remedy
1	Top clearance of gear	Standard size		Repair limit			Replace
		0.090 – 0.130		0.145			
2	Side clearance of gear	0.055 – 0.075		0.105			
3	Clearance between gear shaft and bushing	0.045 – 0.076		0.13			
–	Discharge Oil: EO10-CD Temperature: 45 to 55°C	Pump model	Revolution (rpm)	Pressure	Standard discharge (ℓ/min)	Repair limit discharge (ℓ/min)	–
		BAR25	3,200	2.9 MPa {30 kg/cm^2}	72	68	
–	Tightening torque for housing case mounting bolt	110.3 ± 12.3 Nm {11.25 ±1.25 kgm}					Tighten

BRAKE COOLING PUMP

SBL(1)24
SBR(1)24



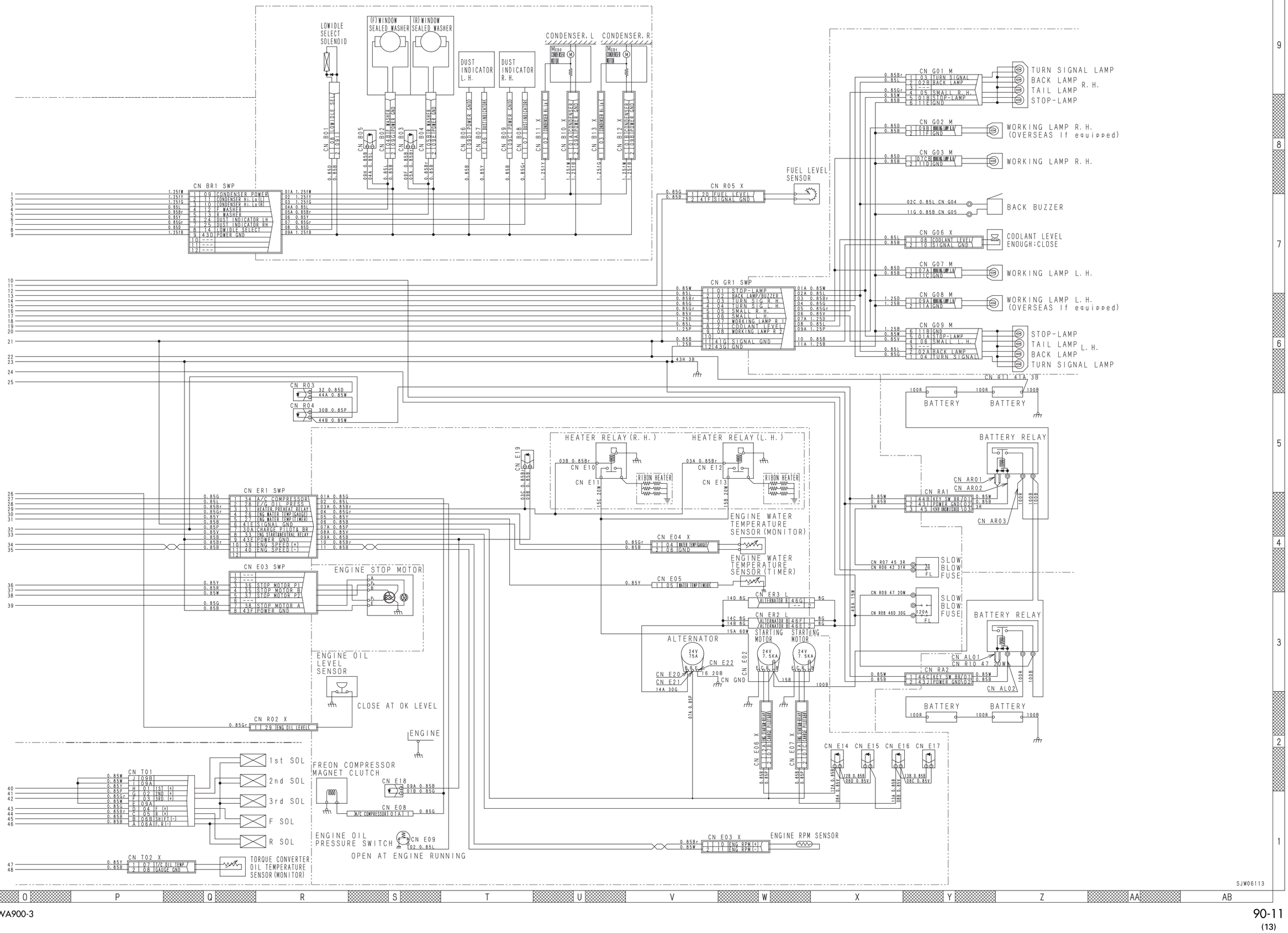
9JY00460

Unit: mm

No.	Check item	Criteria				Remedy
1	Side clearance	Standard clearance		Clearance limit		Replace
		0.10 – 0.15		0.19		
2	Clearance between inside diameter of plain bearing and outside of diameter of gear shaft	0.060 – 0.119		0.20		
3	Depth for knocking in pin	Standard size	Tolerance		Repair limit	
		10	0 –0.5		–	
4	Rotating torque of spline shaft	2.0 – 4.9 Nm {0.2 – 0.5 kgm}				–
–	Discharge amount Oil: EO10-CD Oil temperature: 45 – 55°C	Rotating speed (rpm)	Delivery pressure {MPa (kg/cm²)}	Standard delivery amount (ℓ/min)	Delivery amount limit (ℓ/min)	
		3,000	20.6 {210}	67.8	62.6	

ELECTRIC CIRCUIT DIAGRAM [5/22]

STEERING WHEEL SPECIFICATION, STEERING WHEEL AND JOYSTICK STEERING SPECIFICATION (5/5) [FOR MECHANICAL GOVERNOR ENGINE]



ELECTRIC CIRCUIT DIAGRAM [11/22]

STEERING WHEEL SPECIFICATION, STEERING WHEEL AND JOYSTICK STEERING SPECIFICATION (6/6) [FOR ELECTRONIC GOVERNOR ENGINE]