SHOP MANUAL

KOMATSU

WA1200-3

MACHINE MODEL	SERIAL NO.
WA1200-3	**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.
- WA1200-3 mount the Cummins QSK60 engine.

Printed in Japan 06-23 (01)

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)

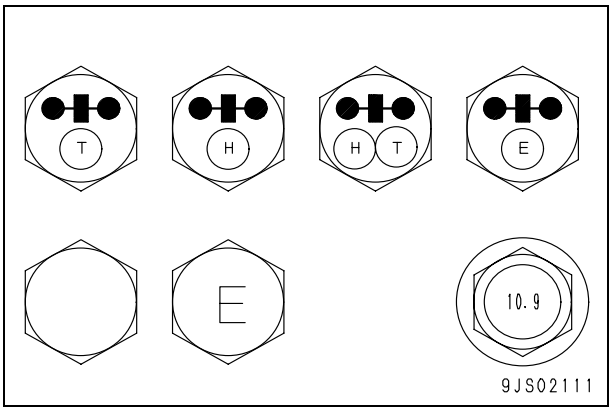
   ★ The following table corresponds to the bolts in Fig. A.

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

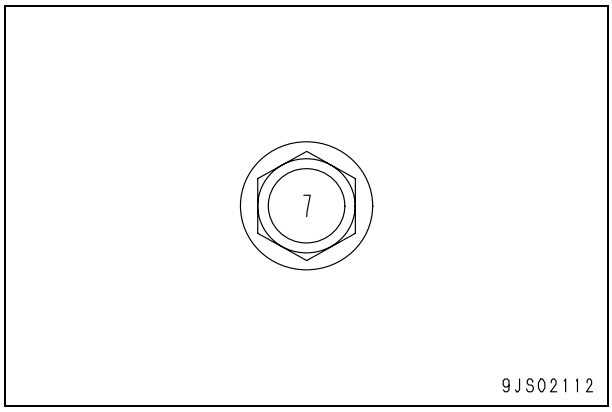
   ★ The following table corresponds to the bolts in Fig. B.

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

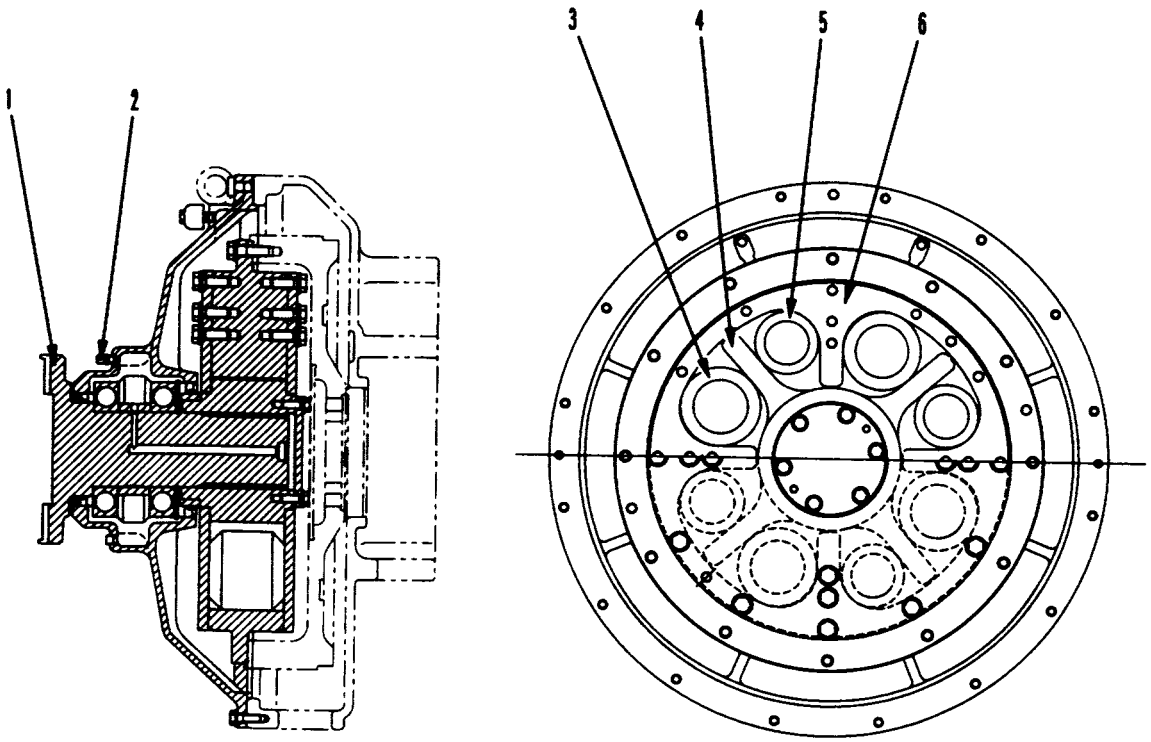
★ Fig. A



★ Fig. B



DAMPER



SJW04724

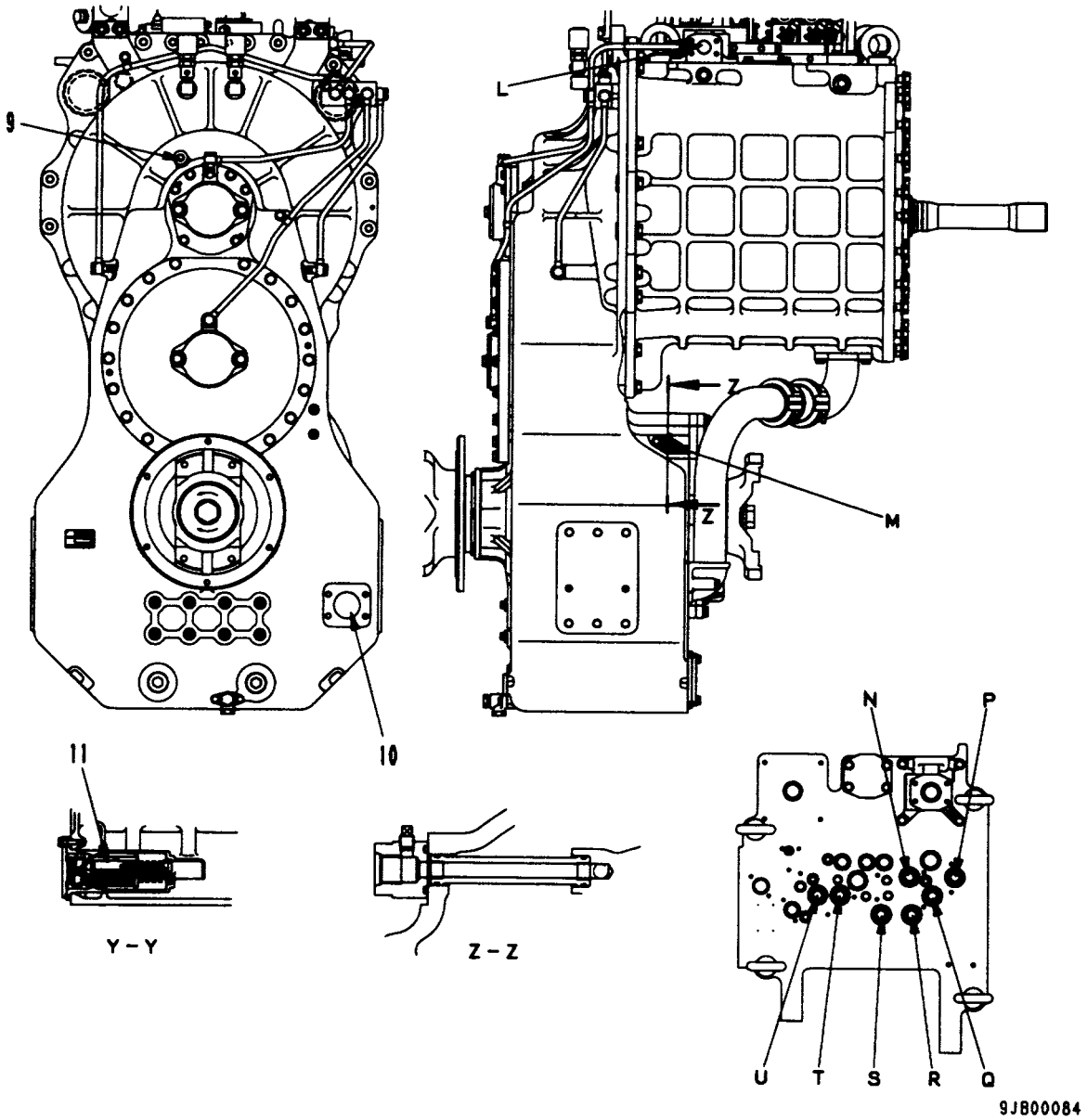
1. Shaft
2. Breather
3. Rubber cushion
4. Inner body
5. Rubber cushion
6. Outer body

FUNCTION

- The damper reduces the torsional vibration caused by changes in the engine torque, and acts to protect the units of the power train beyond the engine from the effects of torsional vibration.

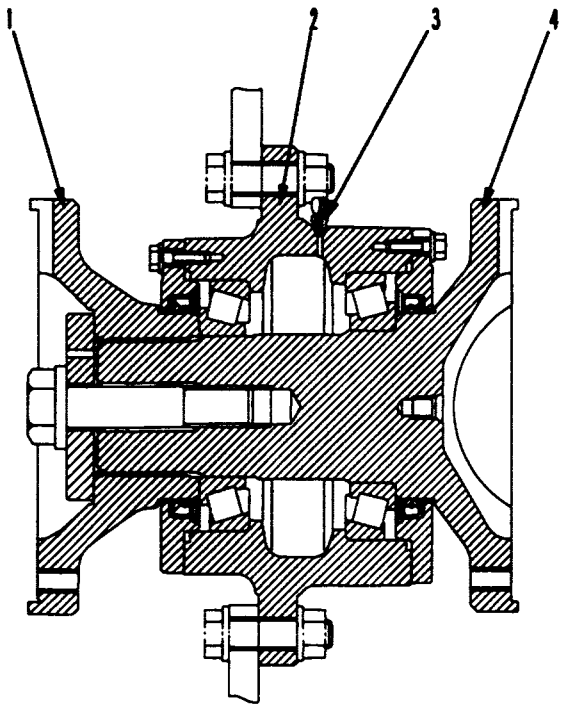
OPERATION

- The power of the engine is transmitted from the flywheel to outer body (6). The torsional vibration of the engine is absorbed by rubber cushions (3) and (5), passes through inner body (4) and shaft (1), and is transmitted to the upper drive shaft between the torque converter.

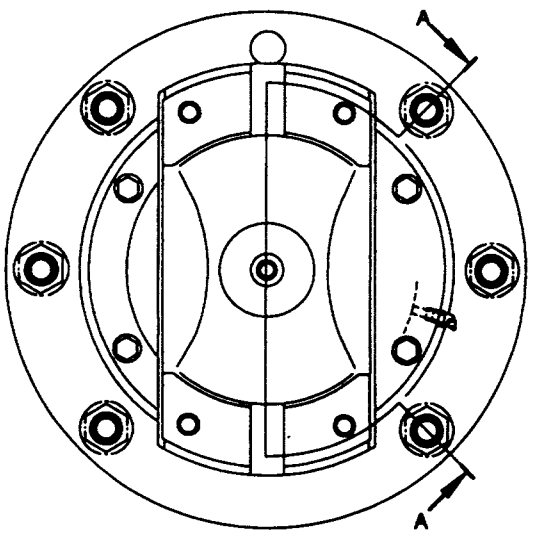


A: From oil filter
B: From oil cooler
C: Lubricating oil pressure pick-up port
D: To parking brake valve
E: To modulated clutch ECMV
F: To main relief valve and torque converter relief valve
G: Drain port
H: From torque converter case
J: To transmission charging pump and torque converter charging pump
K: From torque converter case
L: To modulated clutch (Lubrication) and input transfer (Lubrication)
M: To parking brake piston
N: To transmission lubricating circuit
P: To transmission lubricating circuit
Q: To 1st speed clutch
R: To 2nd speed clutch
S: To 3rd speed clutch
T: To forward clutch
U: To reverse clutch

CENTER SUPPORT



A – A



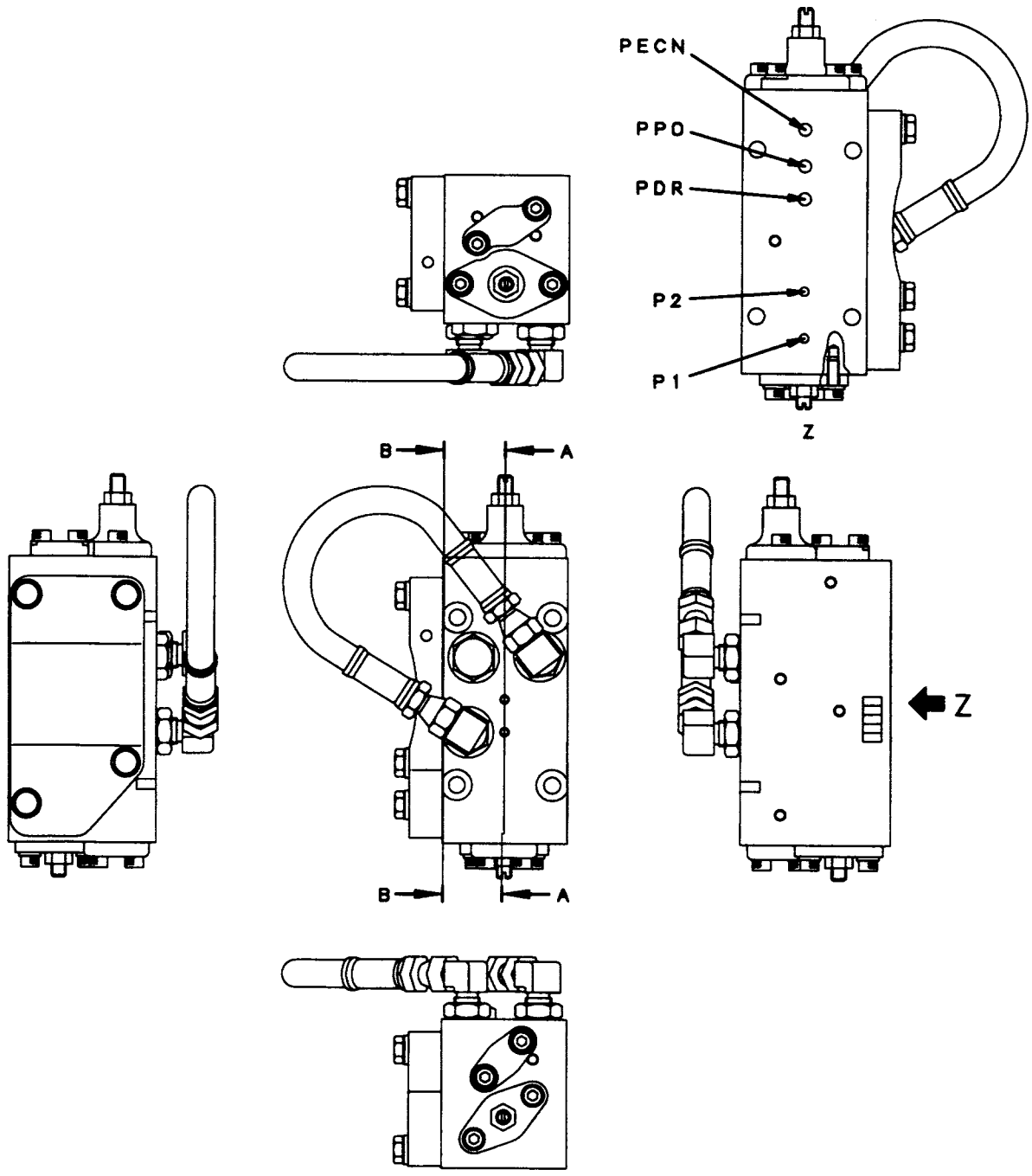
SEW01377

1. Front coupling
2. Case
3. Grease nipple
4. Rear coupling

FUNCTION

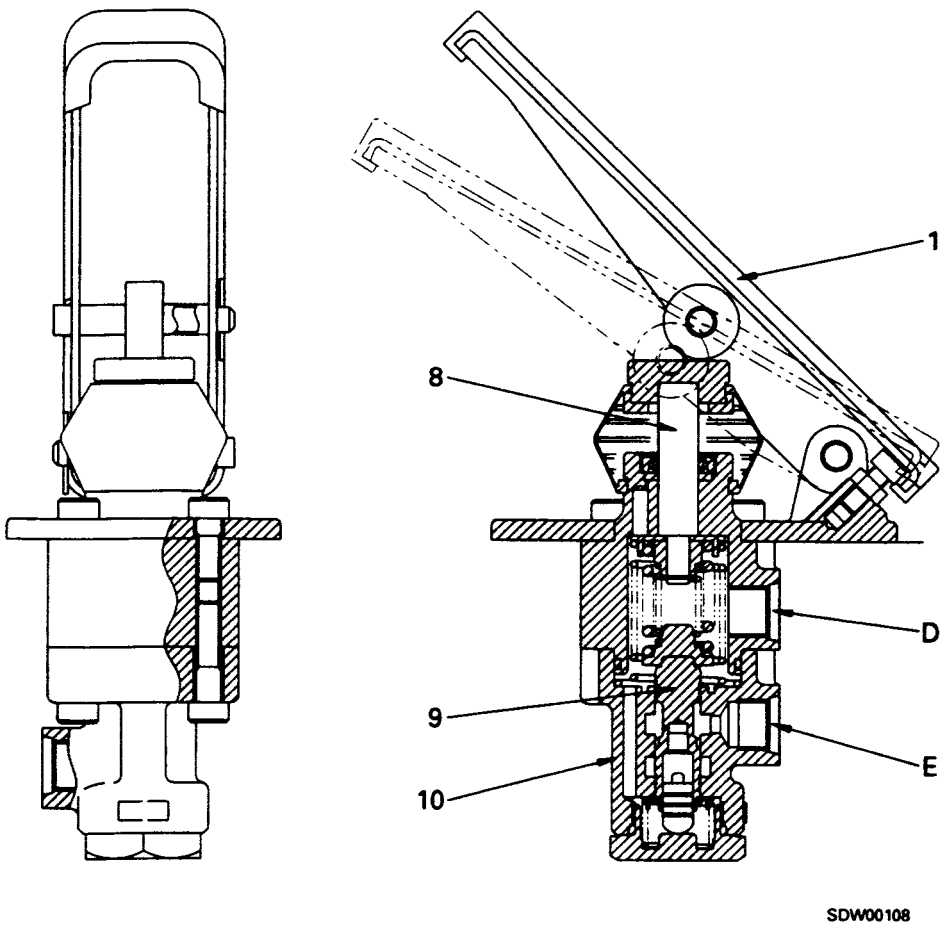
- The center support is installed to the front frame between the center drive shaft and the front drive shaft.
- With the articulating frame, this part is constantly twisting from side to side, so there is liable to be large stress on the drive shaft. Therefore, the center support is used to transmit the power smoothly, to reduce the stress on the drive shafts, and in this way improve the durability of the drive shafts.

CO + NC valves (For front of switch)



P1: Main pump pressure front IN port
P2: Main pump pressure rear IN port
PDR: CO + NC valves drain OUT port
PPO: Servo main pressure IN port
PECN: CO + NC valves output pressure OUT port

BRAKE VALVE (LEFT)

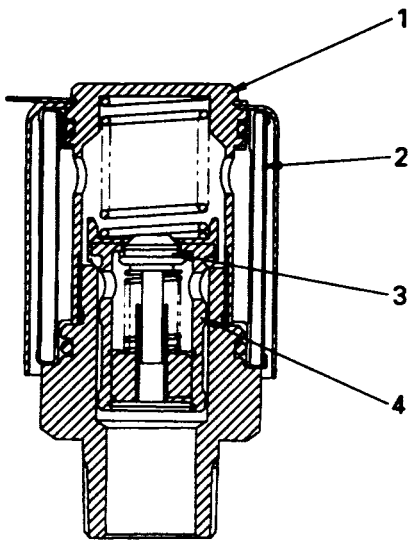


Outline

- There are two brake valves installed in parallel under the front of the operator's cab, and these are actuated by depressing the pedal.
- When the right pedal is depressed, oil is sent to the brake cylinder to apply the brakes.
- When the left pedal is depressed, oil is sent to the right pedal to apply the brakes in the same way as when the right pedal is depressed.

In addition, the left brake pedal operates the transmission cut-off switch to actuate the transmission solenoid valve electrically and set the transmission to neutral.

BREATHER



SEW00141

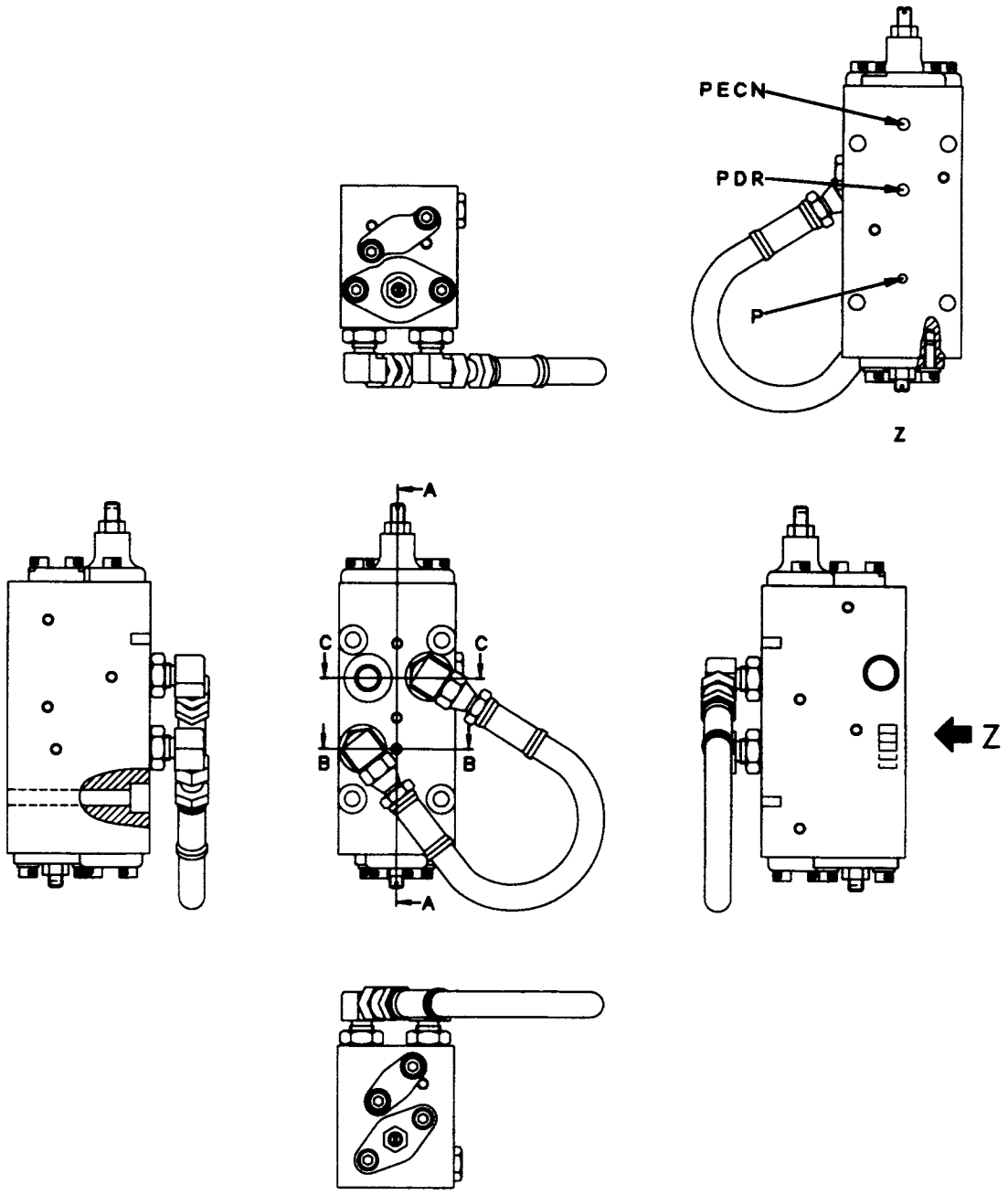
1. Body
2. Filter element
3. Poppet
4. Sleeve

FUNCTION

Preventing negative pressure inside the tank
The tank is pressurized, sealed type, so negative pressure is formed inside the hydraulic tank when the oil level drops during operations.
When this happens, the difference in pressure between the tank and the outside atmospheric pressure opens poppet (3), and air from the outside is let into the tank to prevent negative pressure.

Preventing rise in pressure inside the tank
When the hydraulic cylinder are being used, the oil level in the hydraulic circuit changes and the temperature rises. If the hydraulic pressure rises above the set pressure, sleeve (4) is actuated to release the hydraulic pressure inside the tank.

CO + NC valves (For front No. 2)



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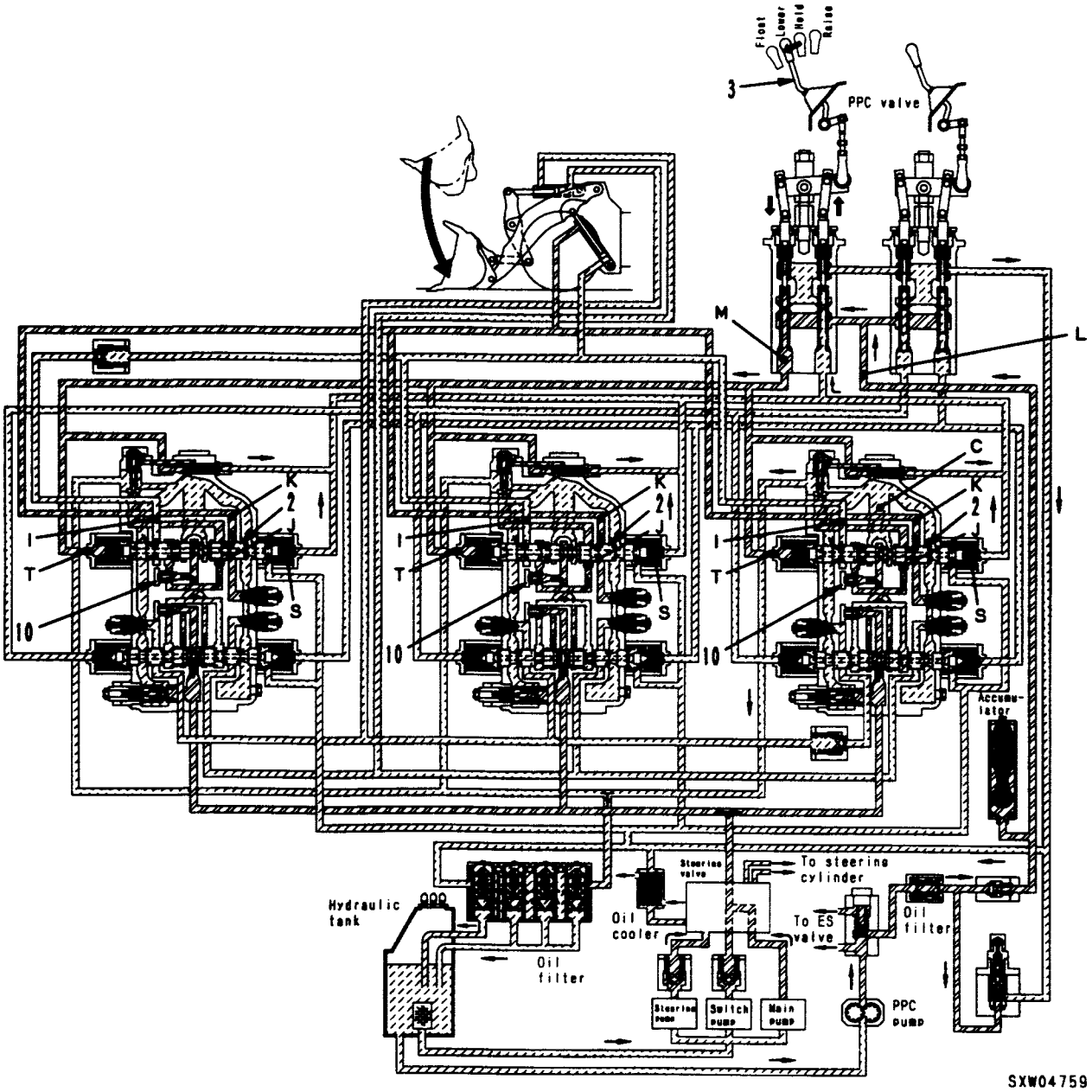
P: Main pump pressure IN port
PDR: CO + NC valve drain OUT port
PECN: CO + NC valve output pressure OUT port

BOOM SPOOL IN "LOWER"



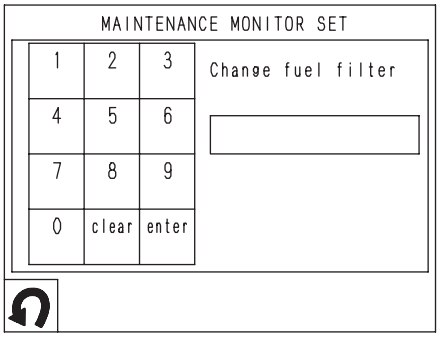
OPERATION

- 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.

Maintenance items list

No.	Interval	Item
1	250H	Change Corrosion Resistor
2	250H	Change Fuel Filter
3	250H	Change Engine Oil Filter
4	250H	Change Engine Oil
5	250H	Change Transmission Oil Filter
6	250H	Change Brake Oil Filter
7	1000H	Change Transmission Oil
8	1000H	Clean Transmission Breather
9	1000H	Clean Transmission Strainer
10	1000H	Change By-pass Engine Oil Filter
11	2000H	Change Brake Oil
12	2000H	Change Brake Oil Tank Breather
13	2000H	Change Hyd. Tank Breather Element
14	2000H	Clean Hyd. Tank Strainer
15	2000H	Change Brake Line Strainer
16	2000H	Clean Pilot Line Strainer
17	2000H	Change Axle Oil
18	2000H	Change Linkage Pin Lube Oil
19	2000H	Change Hyd. Oil Filter
20	2000H	Change Hyd. Oil

- Maintenance period setting button: If this button is pressed, the screen to set the maintenance period appears.
  If a new maintenance period is input and the enter button is pressed, the maintenance period is updated.
  Then, the time before the next periodic maintenance is calculated again on the basis of the new maintenance period.
  For the maintenance items and maintenance period, see the maintenance screen.



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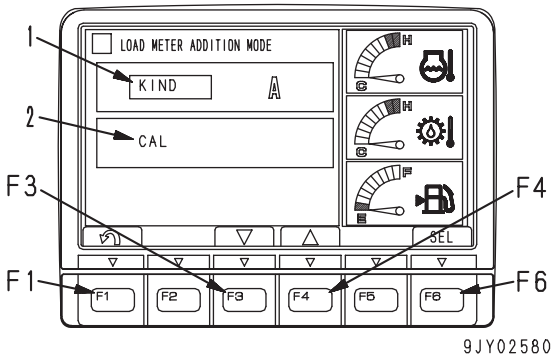
Load meter addition mode setting screen

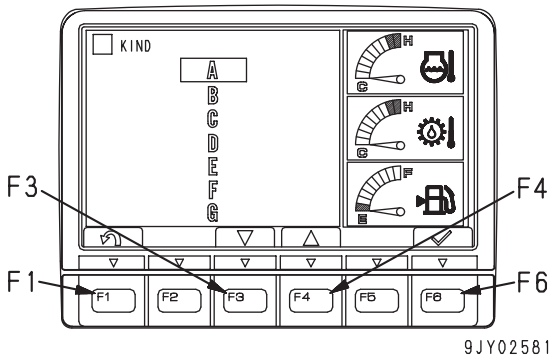


1. Display of load (kind)
2. Display of calibration

F1. RETURN switch
F3, F4. Item selection switch
F6. Selection switch

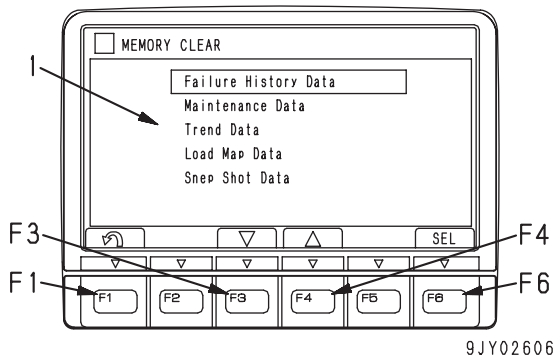
When the [Go to load meter addition mode setting screen] switch is pressed on the load meter screen (accumulation mode), the screen goes to the load meter addition mode setting screen.
It specifies the load kind or selects the calibration mode.

- Display of load (kind): The load (kind) is selected.
  When the item selection switch (F3, F4) is pressed to select the kind and then the selection switch (F6) is pressed, the kind selection screen appears.
  If the yellow cursor is set to "A" to "G" and the decision switch (F6) is pressed, the load kind can be selected.



- Display of calibration: The calibration screen appears.
- RETURN switch (F1): This switch is used to go back to the load meter screen (accumulation mode).

Memory clear screen

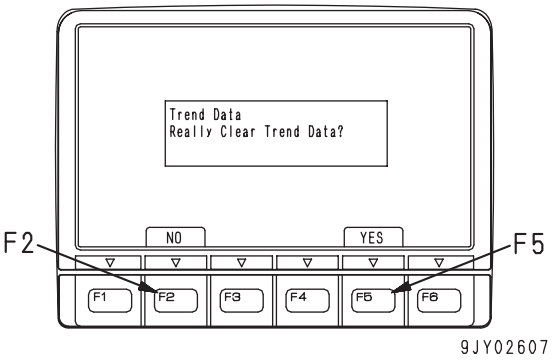


1. Display of memory clear items
F1. RETURN switch
F3, F4. Item selection switch
F6. Selection switch

If the correct ID is input on the memory clear ID inputting screen, this screen appears.
This screen is used to clear various saved data.

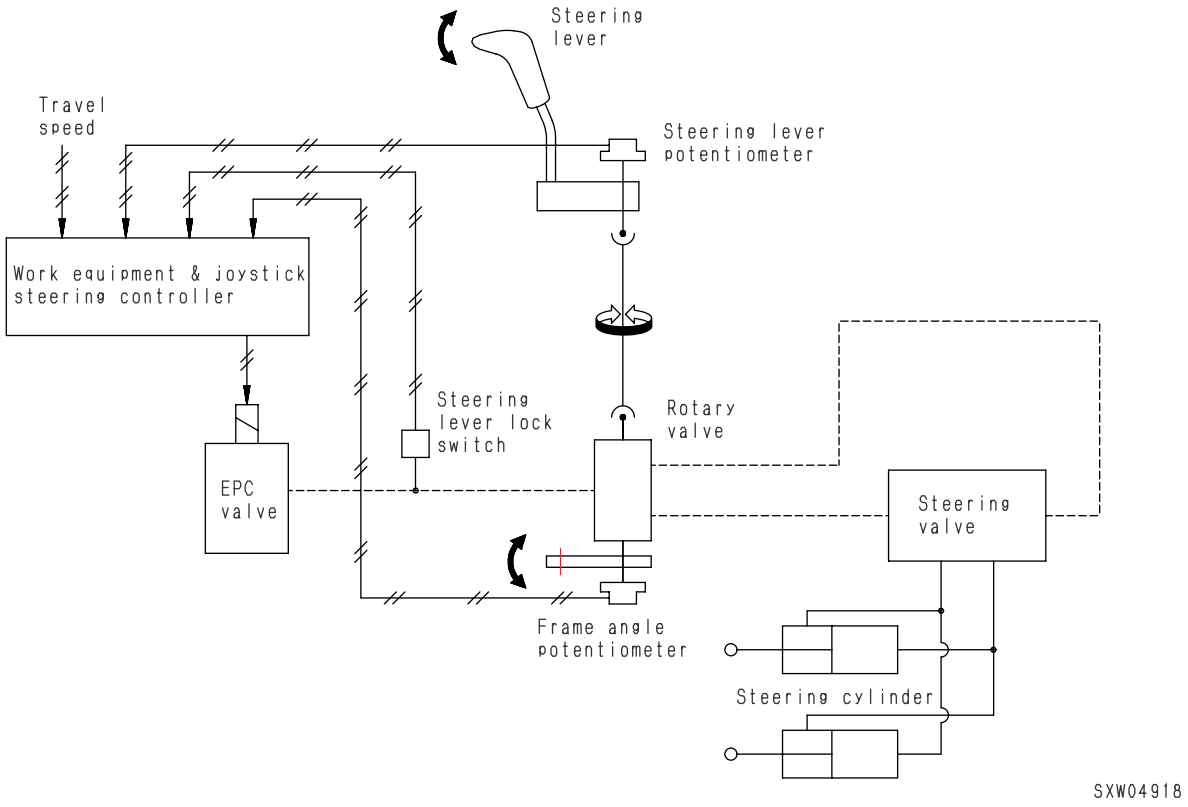
- Use the item selection switch (F3, F4) to select the item to be erased in memory, and then press the selection switch (F6). The confirmation screen appears to check whether or not to erase the selected item in memory.

  [YES] switch (F5):
  This switch is used to erase memory data.
  [NO] switch (F2):
  This switch is used not to erase memory data.



- RETURN switch (F1): This switch is used to go back to the service menu selection screen.

COMPOSITION OF JOYSTICK STEERING CONTROL CIRCUIT



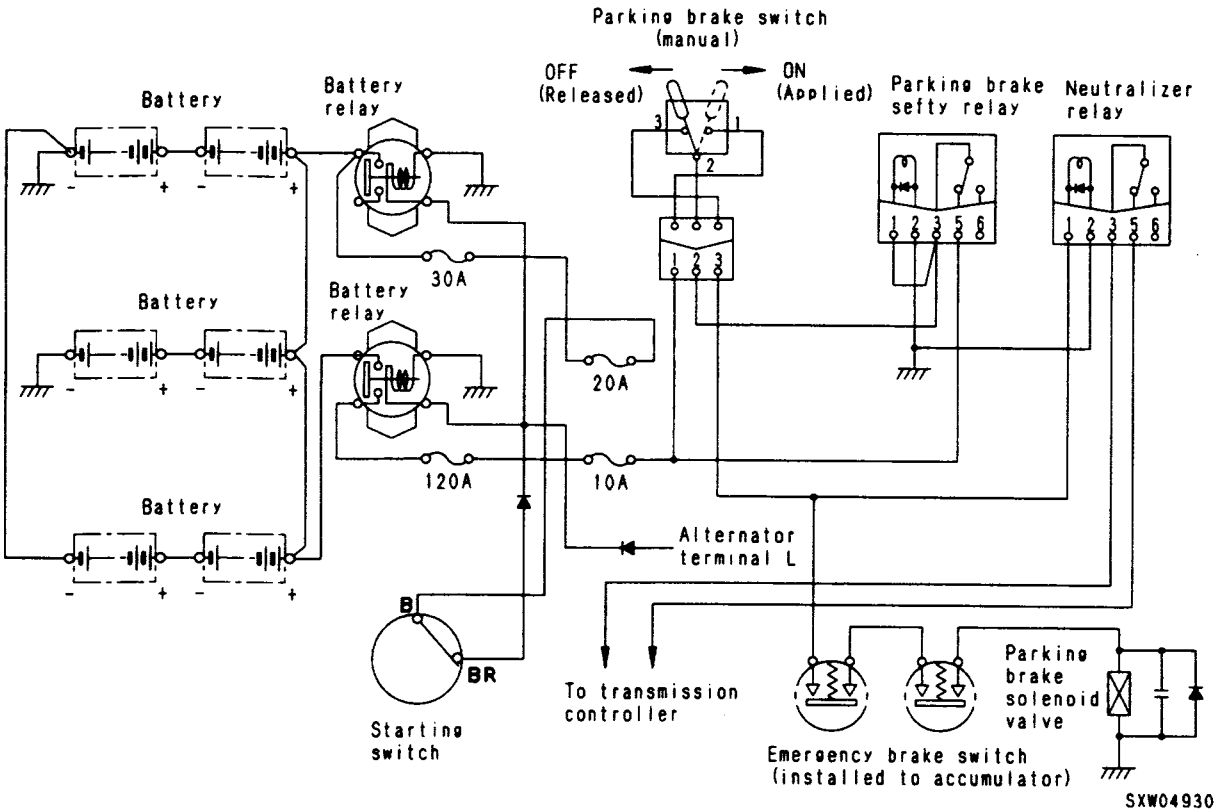
Control function

- Remote positioner control
  - Lift arm “raising” and “lowering” position stop
  - Lift arm “raising” and “lowering” position setting
  - Sensor adjustment function
- Joystick steering control
  - Potentiometer calibrating function
  - Neutral interlock function
- Troubleshooting function

Outline

- With the remote positioner control function, the operator can set the lift arm stopping (lever kick-out) position freely so that the lift arm will stop smoothly. As a result, the operator can operate the machine safely and easily when driving in reverse, digging the earth, or approaching a dump truck.
- With the joystick steering control function, the flow gain in the steering hydraulic system is controlled according to the deviation of the frame angle from the operating angle of the joystick steering lever to improve the narrow steering characteristics and response to high-speed steering for higher maneuverability.

5. When main brake oil pressure lowers (When emergency brake operates)



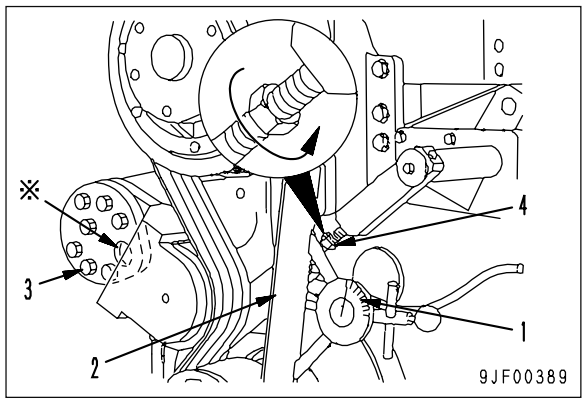
Operation

- If the oil pressure in the main brake line lowers, the emergency brake switch installed to the accumulator is "opened".
  Accordingly, the current does not flow in the parking brake solenoid valve and the pressurized oil in the parking brake cylinder is drained and the parking brake operates. In this case, however, the current is still flowing in the neutralizer coil, unlike the case where the parking brake is turned ON (operated).
- As a result, the signal flows to the transmission controller and the transmission clutch can be engaged. By this operation, the engine can be used as a brake when the emergency brake is operated. Consequently, the braking distance can be shortened. In addition, when the emergency brake operates but the machine needs to be moved (e.g. when the emergency brake operates while the machine is traveling through a railroad crossing), the machine can be moved by operating the transmission switch.

STANDARD VALUE TABLE FOR ELECTRICAL PARTS

System	Name of component	Connector No.	Inspection method	Judgement table	Measurement conditions
Transmission controller — Controller	SW power supply	C1 C2	Measure voltage	Normal ranges are as follows. Between C1(7), (13) – chassis: 20 – 30 V Between C2(1), (12) – chassis: 20 – 30 V Between C1(7), (13) – (6), (12): 20 – 30 V Between C2(1), (12) – (11), (21): 20 – 30 V	1) Turn starting switch OFF. 2) Insert T-adapter. 3) Turn starting switch ON.
	Sensor power supply	C3A	Measure voltage	Normal ranges are as follows. Between (6) – (17): 20 – 30 V Between (6) – chassis: 20 – 30 V	1) Turn starting switch OFF. 2) Insert T-adapter. 3) Turn starting switch ON. 4) Turn parking brake switch OFF.
	S-NET	C3B	Measure voltage	Normal ranges are as follows. Between (4), (12) – chassis: 4 – 8 V	1) Turn starting switch OFF. 2) Insert T-adapter. 3) Turn starting switch ON.
	Manual shift switch	C3B	Measure voltage	Normal ranges are as follows. When auto/manual shift selector switch is "ON": Between (1) – chassis: Max. 1 V When auto/manual shift selector switch is "OFF": Between (1) – chassis: 17 – 30 V	1) Turn starting switch OFF. 2) Insert T-adapter. 3) Turn starting switch ON.
	Transmission cut-off switch	C3A	Measure voltage	Normal ranges are as follows. When in normal state: Between (10) – chassis: Max. 1 V When left brake pedal is pressed: Between (10) – chassis: 17 – 30 V	1) Turn starting switch OFF. 2) Insert T-adapter. 3) Turn starting switch ON.
	Kickdown switch	C3A	Measure voltage	Normal ranges are as follows. When kickdown switch is "ON": Between (20) – chassis: Max. 1 V When kickdown switch "OFF": Between (20) – chassis: 17 – 30 V	1) Turn starting switch OFF. 2) Insert T-adapter. 3) Turn starting switch ON.
	Joystick FNR button switch "F"	C3B	Measure voltage	Normal ranges are as follows. When joystick FNR switch is in "F": Between (14) – chassis: 17 –30 V When joystick FNR switch is not in "F": Between (14) – chassis: Max. 1 V	1) Turn starting switch OFF. 2) Insert T-adapter. 3) Turn starting switch ON.
	Joystick FNR button switch "N"	C3B	Measure voltage	Normal ranges are as follows. When joystick FNR switch is in "N": Between (7) – chassis: 17 –30 V When joystick FNR switch is not in "N": Between (7) – chassis: Max. 1 V	1) Turn starting switch OFF. 2) Insert T-adapter. 3) Turn starting switch ON.

TESTING AND ADJUSTING FAN BELT TENSION



⚠ Referring to "Safety precautions before starting work" (20-102-3 to 5), be sure to perform the related items before starting the work.

Testing

- Using belt tension gauge (1), measure the tension of fan belt (2) at the intermediate point between the pulleys.

★ Standard belt tension: 4,893 N {498.95 kg}

Adjusting

1. Loosen 7 bolts (3) and adjust tension with rod (4).
  ★ Do not loosen the bolt marked with ※.
  ★ If rod (2) is turned in the direction of the arrow, the tension is heightened.

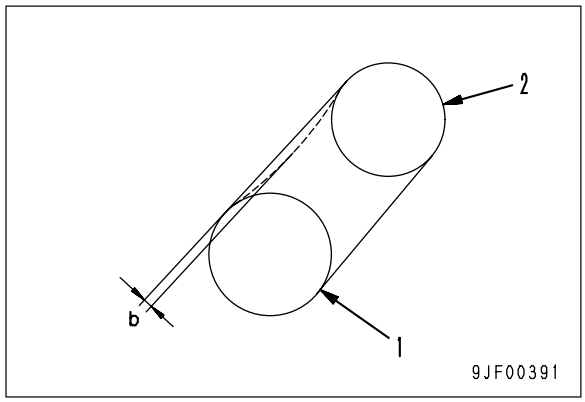
TESTING AND ADJUSTING BELT TENSION OF AIR CONDITIONER COMPRESSOR

⚠ Referring to "Safety precautions before starting work" (20-102-3 to 5), be sure to perform the related items before starting the work.

Testing

- Press the intermediate point of the belt between drive pulley (1) and air conditioner compressor pulley (2) with the force of about 98 N {10 kg}, and measure deflection **b** of the belt.

★ Deflection of belt (Standard value) **b**:
9 – 12.5 mm



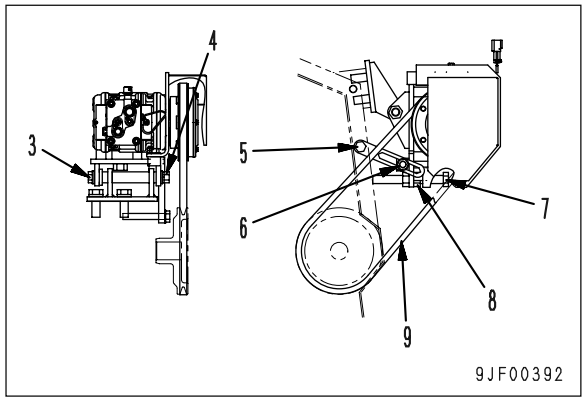
Adjusting

1. Loosen mounting bolts and nuts (3), (4), and (5), and locknut (6).

2. Loosen locknut (8) of adjustment bolt (7), and adjust the tension of air conditioner compressor belt (9) with adjustment bolt (7).

3. After positioning air conditioner compressor, tighten locknut (8) and mounting bolts and nuts (3), (4), (5), and (6).

4. After adjusting the belt tension, check that it is in the standard range according to the above procedure.



TESTING AND ADJUSTING EMERGENCY STEERING OIL PRESSURE

Measuring

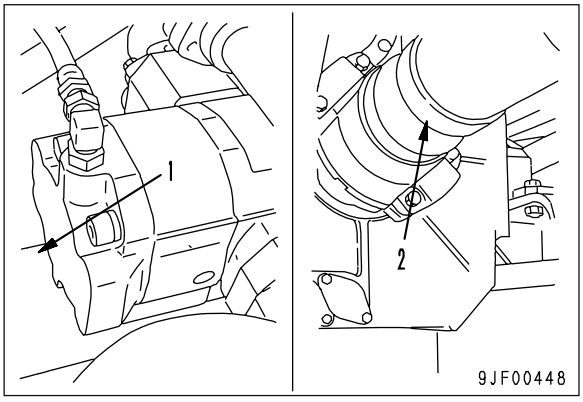
- Hydraulic oil temperature: 45 – 50°C

⚠ **Referring to "Safety precautions before starting work" (20-102-3 to 5), be sure to perform the related items before starting the work.**

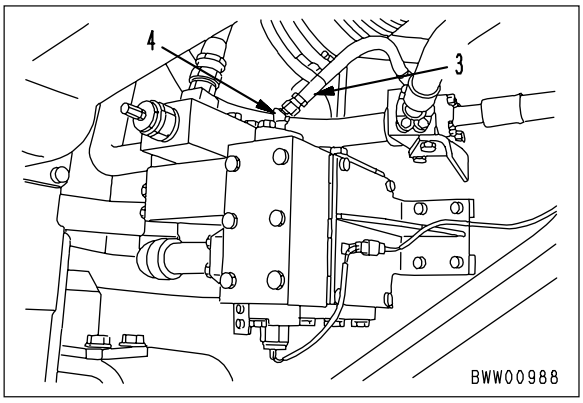
⚠ **Loosen the oil filler cap to release the residual pressure from the hydraulic tank.**

★ Two emergency diverter valves are installed on upside and downside.

1. Disconnect drive shaft (1) between transmission and center support from the transmission.
2. Disconnect drive shaft (2) between transmission and rear axle from the transmission.

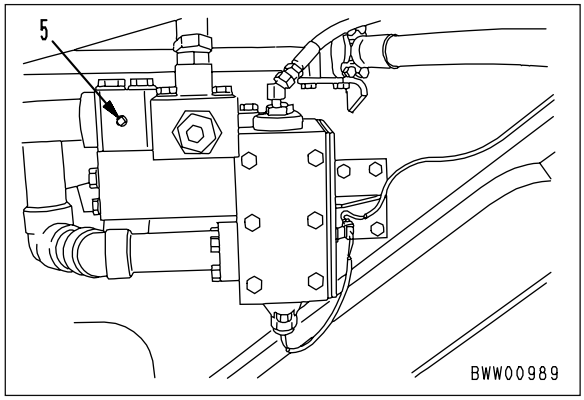


3. Disconnect diverter valve pilot hose (3). Replace elbow (4) with an oil pressure shut-off elbow (See the next page), then install hose (3).
   ★ By this work, the oil pressure applied to the pilot port of the diverter valve is shut off and the emergency steering system can operate.

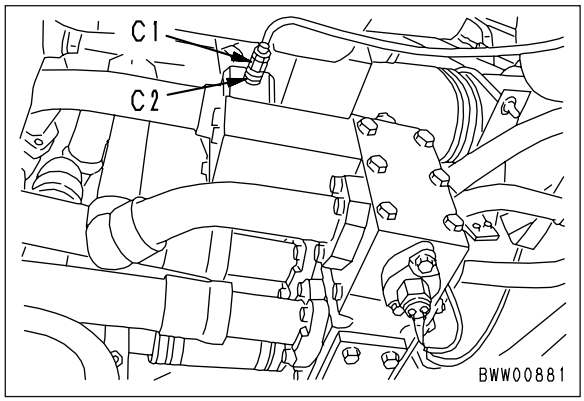


4. Remove oil pressure pickup plug (5) (PT 1/8) between the diverter valve and steering valve, then install nipple **C2** and oil pressure gauge **C1** (40 MPa {400 kg/cm²}).

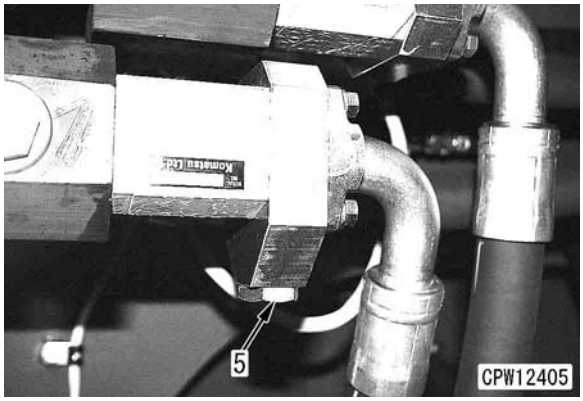
Serial No.: 50001 – 50002



Serial No.: 50001 – 50002



Serial No.: 50003 and up

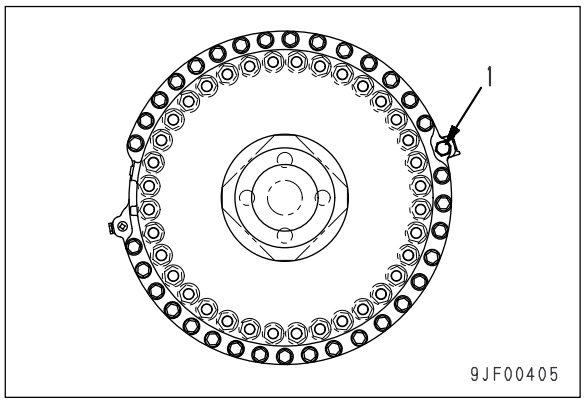


MEASURING WEAR OF WHEEL BRAKE DISC

⚠ Referring to "Safety precautions before starting work" (20-102-3 to 5), be sure to perform the related items before starting the work.

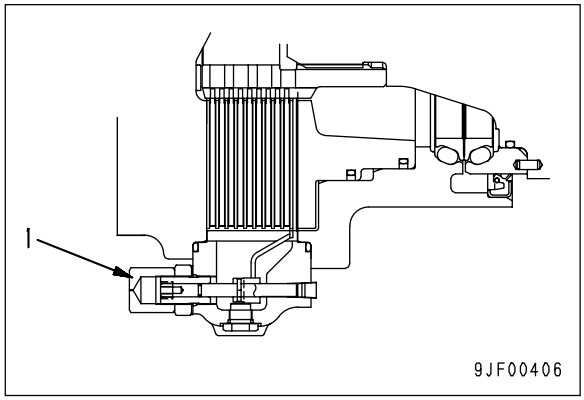
⚠ Stop the machine on a level place, and put blocks under the wheels to prevent the machine from moving.

★ Brake oil pressure:
15.49 ± 1.37 MPa {158 ± 14 kg/cm^2}

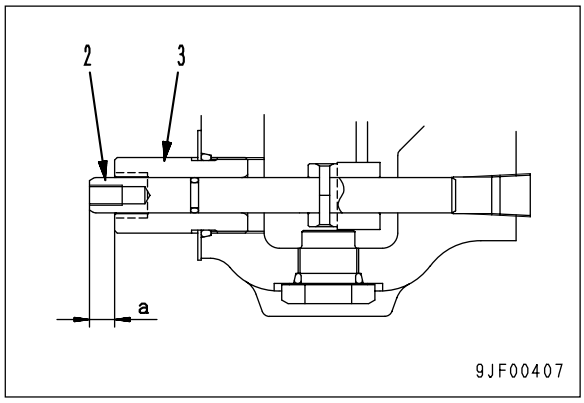


1. Remove cap (1).

2. Press the brake pedal to the stroke end.



3. Using slide calipers **M**, measure depth (**a**) from the end of shaft (2) to guide (3).
- ★ Keep pressing the brake pedal during measurement.
- ★ If protrusion amount (**a**) exceeds 7.0 mm, replace the brake disc.
- ★ After the disc has been worn to near the wear limit, test it frequently, regardless of the maintenance period.



MEASUREMENT PROCEDURE OF WORK EQUIPMENT OIL PRESSURE WITH OIL PRESSURE GAUGE

★ When measuring the relief pressure of each control valve, measure by installing an oil pressure gauge to the oil pressure pickup port of the piping on the pump discharge side.

- Hydraulic oil temperature: 45 – 55°C

⚠ **Referring to "Safety precautions before starting work" (20-102-3 to 5), be sure to perform the related items before starting the work.**

⚠ **Park the machine on a flat place, apply the parking brake, lower the bucket to the ground, and secure a safe place.**

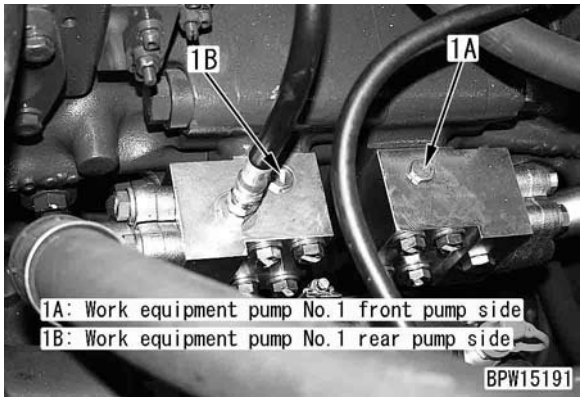
⚠ **Stop the engine and loosen the oil filler cap to release the pressure in the hydraulic tank.**

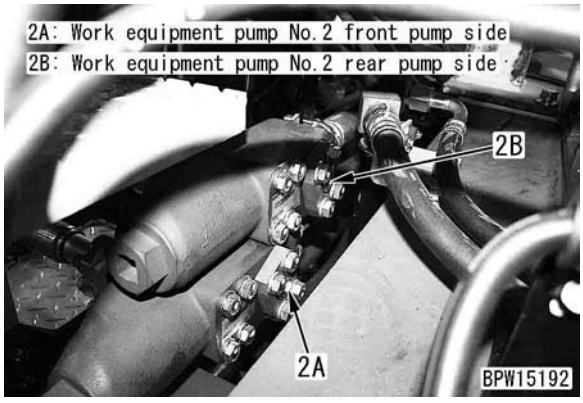
★ **For the location diagram, see pages 20-136-6 to 20-136-7-2.**

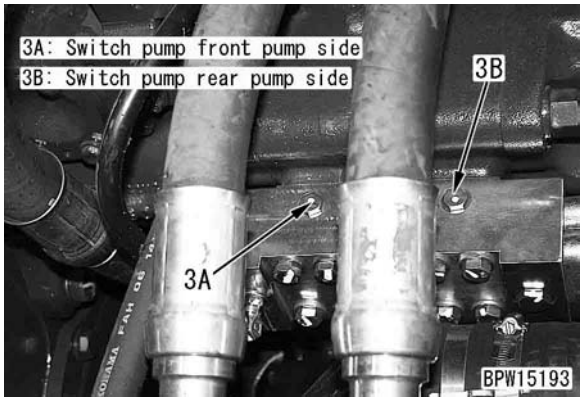
Measurement

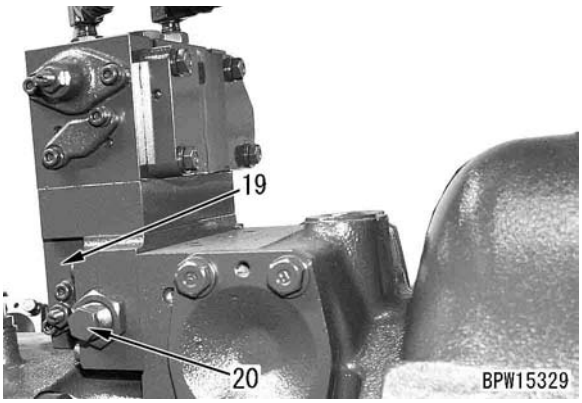
1. Remove plug at the pressure pickup port corresponding to each control valve and install the oil pressure gauge (60 MPa).
   - No. 1 control valve (No. 1 rear pump side of work equipment pump): 1B (Thread size: M10 x 1.25)
   - No. 2 control valve (No. 1 front pump side of work equipment pump): 1A (Thread size: M10 x 1.25)
   - No. 1 control valve (No. 2 rear pump side of work equipment pump): 2B (Thread size: M10 x 1.25)
   - No. 2 control valve (No. 2 front pump side of work equipment pump): 2A (Thread size: M10 x 1.25)
   - No. 3 control valve (Rear pump side of switch pump): 3B (Thread size: M10 x 1.25)
   - No. 3 control valve (Front pump side of switch pump): 3A (Thread size: M10 x 1.25)
2. Start the engine and raise the lift arm, and then operate the bucket with the engine at high idle and measure the oil pressure when the relief valve actuates.

Note) Referring to the troubleshooting for the work equipment oil pressure (pages 20-1001-41 to 58), measure the oil pressure to check if each pump and valve are normal.



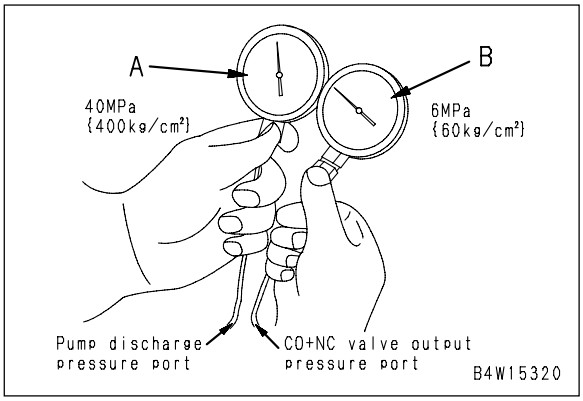






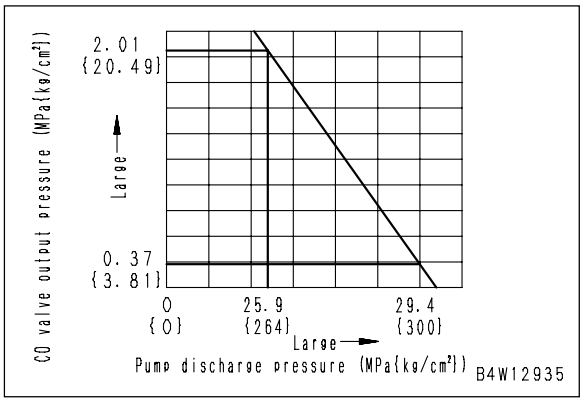
2. Testing CO valve oil pressure

1) While running the engine at low idle (engine speed: 650 rpm), tilt the bucket slowly to the stroke end and read the switching pump discharge pressure and CO valve output pressure indicated by oil pressure gauges (A) and (B).
   A: Oil pressure gauge for measuring pump discharge pressure
   C1 (40 MPa {400 kg/cm²})
   B: Oil pressure gauge for measuring CO valve output pressure
   C1 (6 MPa {60 kg/cm²})



2) Operate the bucket control lever slowly toward the tilt position to increase the switching pump discharge pressure. When oil pressure gauge (A) reads 29.4 MPa {300 kg/cm²}, check with oil pressure gauge (B) that the CO valve output pressure is in the standard range.
   - Standard CO valve output pressure: 0.37 MPa {3.8 kg/cm²}

   ★ If the switching pump discharge pressure does not reach 29.4 MPa {300 kg/cm²}, increase the engine speed.



TESTING OF ACCUMULATOR NITROGEN GAS PRESSURE AND PROCEDURE FOR CHARGING ACCUMULATOR WITH NITROGEN GAS

★ Testing and adjusting tools

Symbol		Part No.	Part name
P	1	792-610-1703	Gas charging tool assembly
	2	07000-11009	O-ring
	3	792-610-2410	Nipple
	4	792-610-1270	Hose
	5	792-610-1400	Regulator
	6	792-610-1310	Nipple (For Russia)
		792-610-1320	Nipple (For USA)
		792-610-1330	Nipple (For USA)
		792-610-1350	Nipple (For Germany)
		792-610-1360	Nipple (For UK)
	7	Commercially available	Nitrogen gas cylinder

⚠ Put on the appropriate protective equipment (goggles, leather gloves, protective clothes) so that the leaked nitrogen gas is not applied to your skin or clothes. Perform the work on the windward side as much as possible.

⚠ When using the nitrogen gas indoors or on an ill-ventilated location, ventilate the room, etc. and observe the Industrial Safety and Health Law, Ordinance on Prevention of Anoxia, etc.

⚠ The accumulator is charged with high-pressure nitrogen gas, and improper operation may cause an explosion which will lead to serious injury or death. When handling, always observe the following.

- Do not bring open flame close to it or do not dispose of it in fire.
- Do not perform drilling, welding or flame-cutting.
- Do not hit or roll it, or subject it to any impact.
- When discarding it, gradually discharge the filled nitrogen gas into the atmosphere outside by using gas charging tool **P1**.

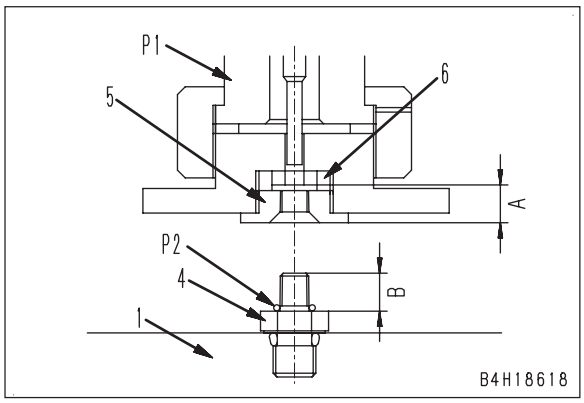
⚠ Be sure to charge the accumulator with nitrogen gas.

Precautions for connecting gas charging tool P1

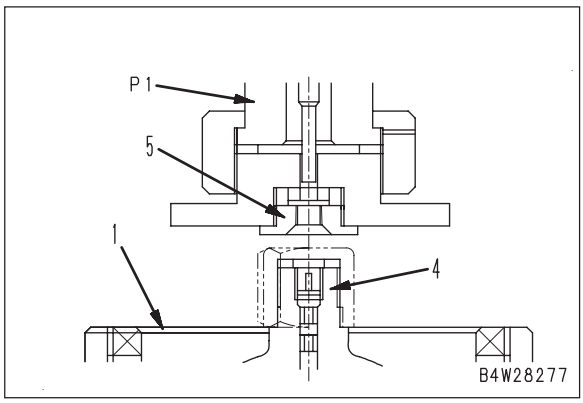
★ The threaded portion of adapter (5) of gas charging tool **P1** is coated with sealant. If the adapter is removed without reason, it can cause gas leakage. Never remove it.

★ 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**.



★ Do not use the adapter (5) when connecting the gas charging tool **P1** to the PPC accumulator.



ADJUSTING MAIN MONITOR (SPEEDOMETER MODULE)

- The speedometer of the main monitor is common to various models, and different models input different travel speed signals. Accordingly, the speedometer needs to be adjusted for each model.

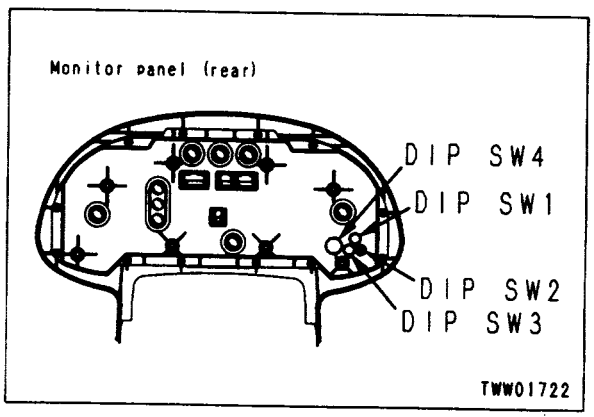
★ The speedometer is normally used as the tachometer.

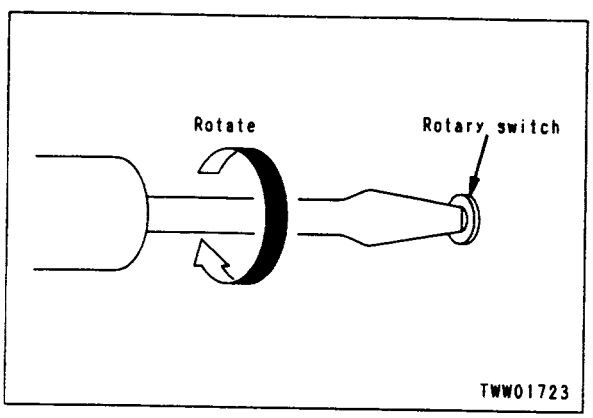
Adjusting procedure

- Turn off the power and remove the main monitor, then adjust the adjustment section of the rear side of the speedometer.

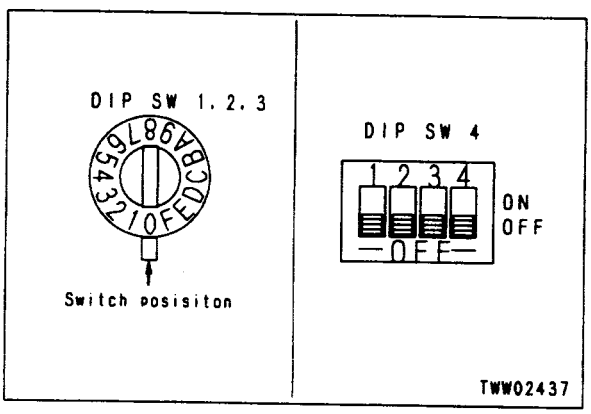
1. Adjusting for each model

1) Remove the rubber caps of DIP switches 1, 2, and 3 (SW1, SW2, and SW3) on the rear side of the main monitor.
2) There are rotary switches under the rubber caps. Adjust these rotary switches with a flat-head screwdriver according to the following table.
   ★ To change the tachometer to the speedometer, set switch 3 to "0".





Tire size	Switch 1 (Model selection)	Switch 2 (Speedometer correction)	Switch 3 (Tachometer selection)
Standard	2	7	5



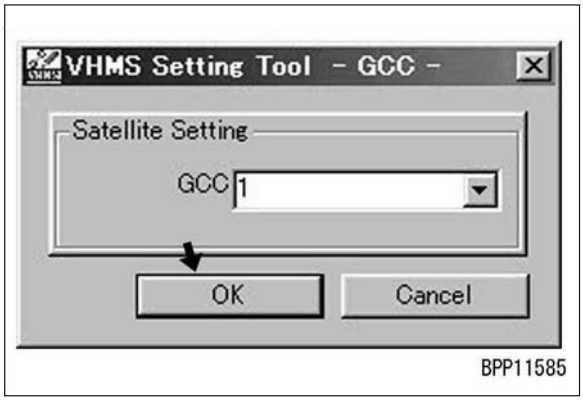
3) Remove the cap of DIP switch 4 (SW4) on the rear side of the main monitor, and set the inside ON-OFF switches according to the table at right.
4) After adjusting, fit the rubber caps securely, then install the main monitor.

Switch No.	DIP SW4
	Without travel damper
1	ON
2	OFF
3	ON
4	ON

(Reference) Correction ratio of switch (2)

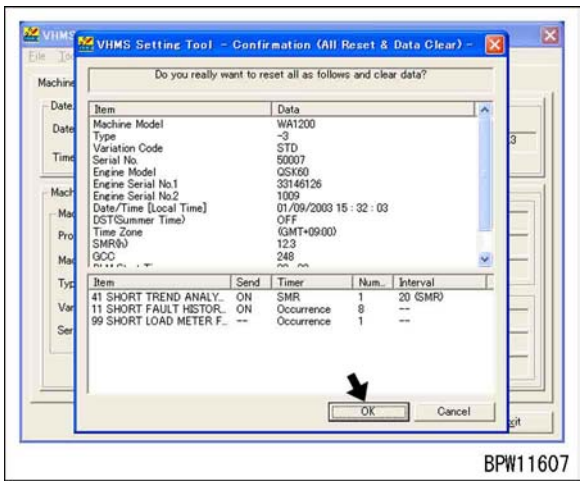
Position of switch	0	1	2	3	4	5	6	7
Correction ratio (%)	+14	+12	+10	+8	+6	+4	+2	0

3) To change the setting of [Satellite Setting], follow the procedure below.
   i) Press the [Edit] button (6) in the [Satellite Setting] block to display the setting screen.
   ii) Bring GCC Code to the applicable area and then press the [OK] button.

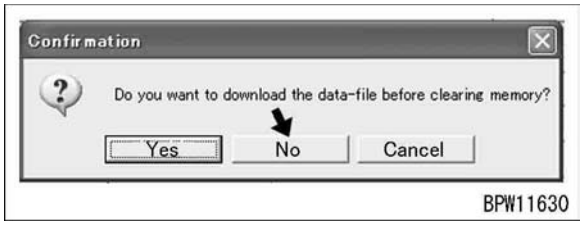


GCC codes and applicable areas	
Code	Applicable area
1	USA
120	Italy
121	Malaysia
122	Korea
123	Brazil
130	Japan

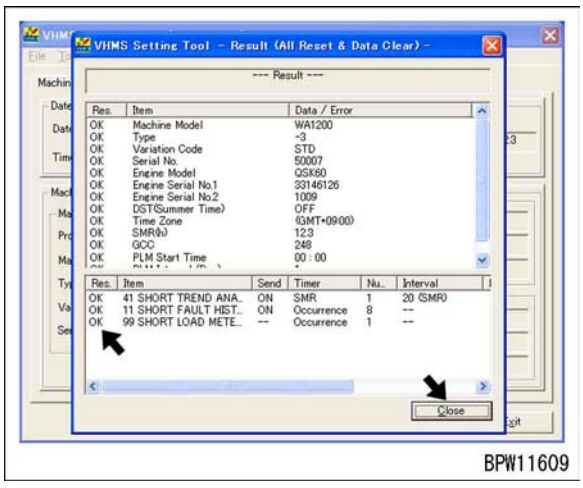
4) After checking and changing all the data in [Communication Setting], press the [Apply] button (7) to settle the setting.
   ★ If the [Apply] button is pressed, the screen for checking the setting appears. Check the setting again and press the [OK] button when the setting is correct.



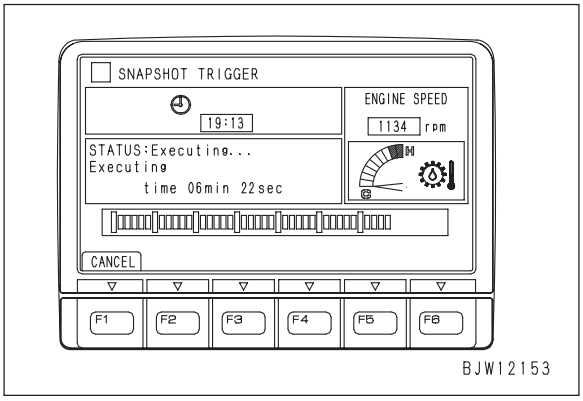
i) When the data are cleared, the system asks you if you will download the current data file. Since the file is not necessary for setting up, press the [No] button.



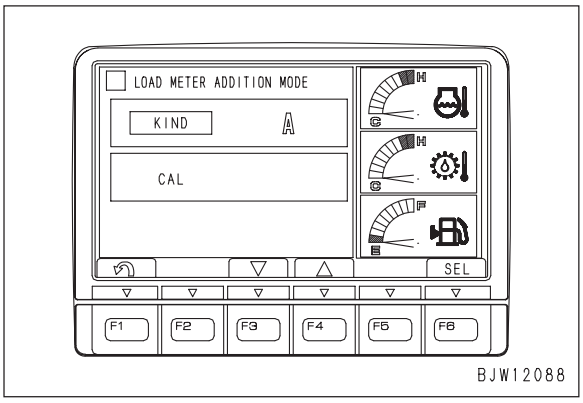
ii) Check that OK is displayed at the left end and confirm that setting is finished normally, and then press the [Close] button.



2) Operate the switches and levers at each execution time according to the "Operating procedure for quick PM clinic" shown on the following parts.
   ★ The execution times are displayed on the Multi monitor.
   ⚠ Since the work equipment and machine are operated actually during the quick PM clinic, take care of the safety around the vehicle extremely during the work.

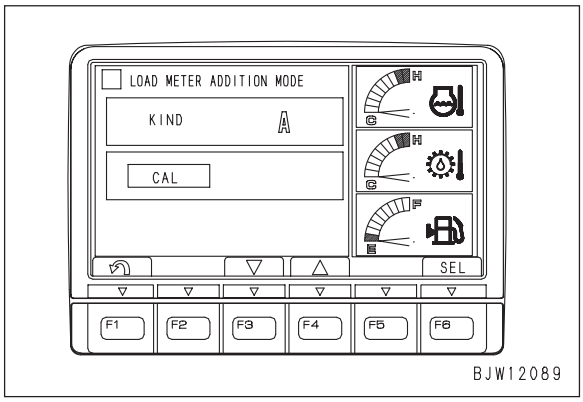


1] Display of item “Kind” in addition mode
To select and set the kind, go to the setting screen from this screen.



- If the [F3] switch is pressed, the screen changes to the “Calibration” screen.
- If the [F1] switch is pressed, the screen returns to the addition mode initial screen.

2] Display of item “Calibration (CAL)” in addition mode
Go to the calibration screen from this screen.

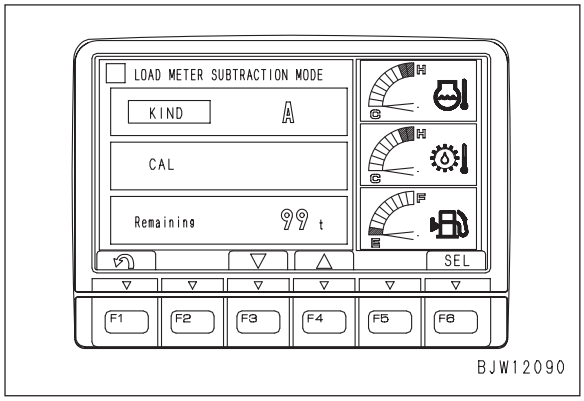


- If the [F4] switch is pressed, the screen changes to the “Kind” screen.
- If the [F1] switch is pressed, the screen returns to the addition mode initial screen.

3) Load meter subtraction mode menu
The load meter subtraction mode menu is classified into the kind items, calibration items and Remaining items. (There are not the Remaining items in the addition mode.)

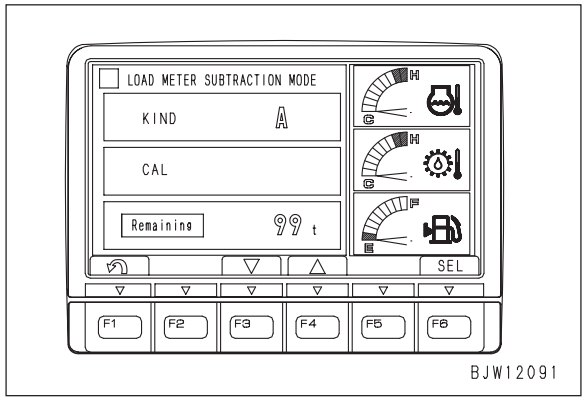
★ While the load meter subtraction mode screen is displayed, if the [F6] switch is pressed, the screen changes to the kind item screen.

1] Display of item “Kind” in subtraction mode



- If the [F3] switch is pressed, the screen changes to the “Calibration” screen.
- If the [F1] switch is pressed, the screen returns to the subtraction mode initial screen.
- If the [F4] switch is pressed, the screen returns to the “Remaining” screen.

2] Display of item “Remaining” in subtraction mode
Go to the subtraction target setting screen from this screen.



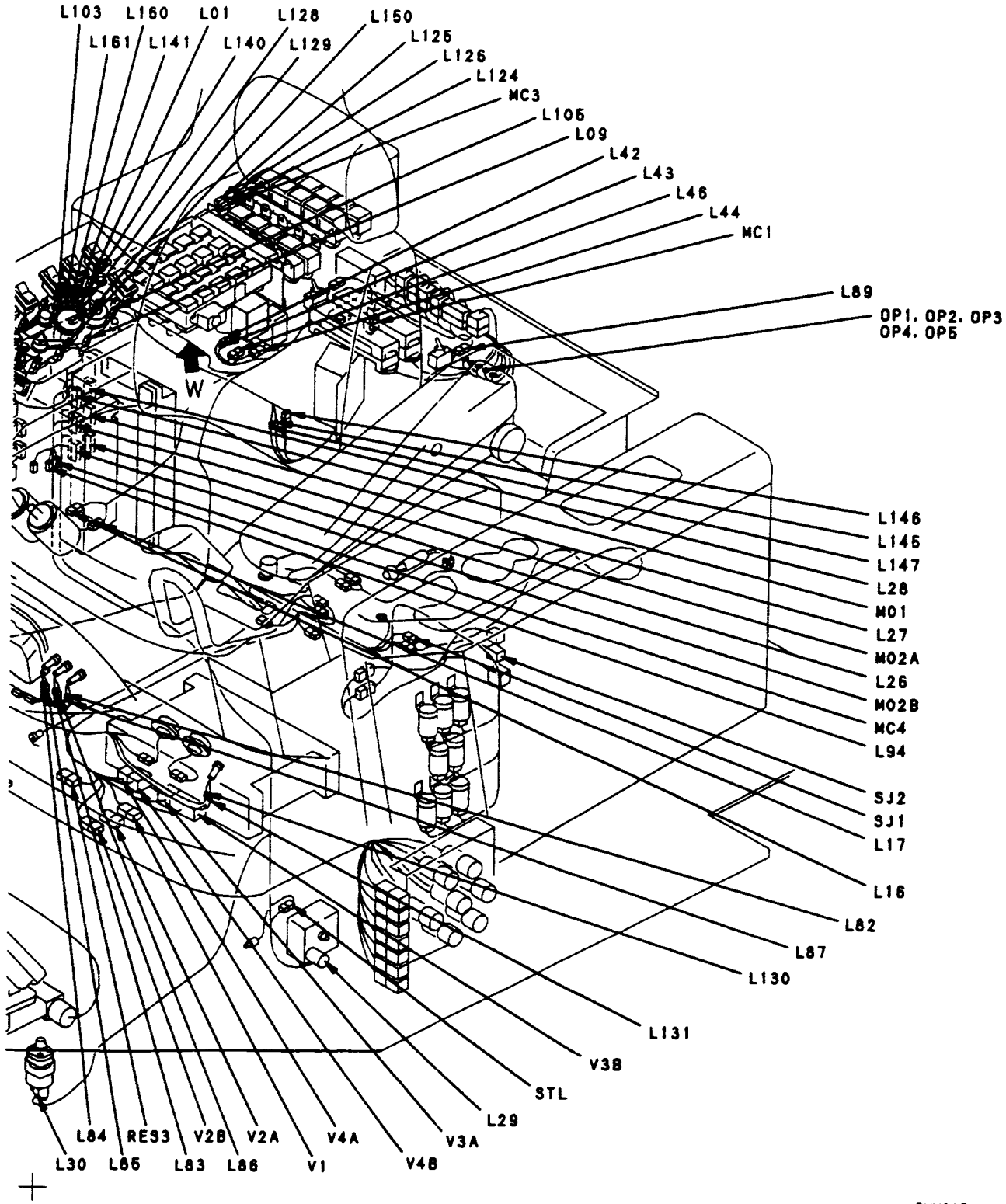
- If the [F4] switch is pressed, the screen changes to the “Calibration” screen.
- If the [F1] switch is pressed, the screen returns to the subtraction mode initial screen.
- If the [F3] switch is pressed, the screen changes to the subtraction mode “Kind” screen.

Failure code	Failed part	Trouble	Controller	Action code	Monitor color
C442	High battery voltage	Abnormally high level	Cummins		–
C451	Abnormality in fuel rail pressure sensor system	Abnormally high level	Cummins		Yellow
C452	Abnormality in fuel rail pressure sensor system	Abnormally low level	Cummins		Yellow
C455	Abnormality in fuel control valve		Cummins		Yellow
C467	Defective timing rail actuator		Cummins		–
C468	Defective fuel rail actuator		Cummins		–
C471	Abnormally low oil level		Cummins		Red
C473	Abnormal remote oil level signal		Cummins		–
C487	Low ether level		Cummins		–
C489	Abnormally low AXG speed		Cummins		–
C514	Abnormality in rail actuator		Cummins		Yellow
C524	Abnormality in alternator droop switch		Cummins		–
C527	Abnormality in A double output system	Disconnection	Cummins		–
C528	Abnormality in alternator torque switch		Cummins		–
C529	Abnormality in B double output system	Disconnection	Cummins		–
C553	Abnormally high fuel rail pressure	Abnormally high level	Cummins		Yellow
C554	Abnormality in fuel rail pressure sensor system		Cummins		–
C555	High blow-by pressure	Abnormally high level	Cummins		Red
C611	Abnormal engine stop		Cummins		–
C612	High oil filter pressure	Abnormally high level	Cummins		Yellow
C616	High left bank rear turbocharger intake air temperature	Abnormally high level	Cummins		–
C621	Low left bank #1 cylinder output	Abnormally low level	Cummins		–
C622	Low left bank #2 cylinder output	Abnormally low level	Cummins		–
C623	Low left bank #3 cylinder output	Abnormally low level	Cummins		–
C624	Low left bank #4 cylinder output	Abnormally low level	Cummins		–
C625	Low left bank #5 cylinder output	Abnormally low level	Cummins		–
C626	Low left bank #6 cylinder output	Abnormally low level	Cummins		–
C627	Low left bank #7 cylinder output	Abnormally low level	Cummins		–
C628	Low left bank #8 cylinder output	Abnormally low level	Cummins		–
C631	Low right bank #1 cylinder output	Abnormally low level	Cummins		–
C632	Low right bank #2 cylinder output	Abnormally low level	Cummins		–
C633	Low right bank #3 cylinder output	Abnormally low level	Cummins		–
C634	Low right bank #4 cylinder output	Abnormally low level	Cummins		–
C635	Low right bank #5 cylinder output	Abnormally low level	Cummins		–
C636	Low right bank #6 cylinder output	Abnormally low level	Cummins		–

TROUBLESHOOTING

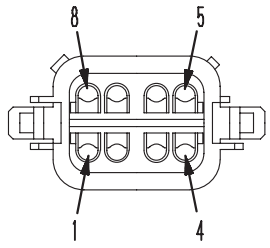
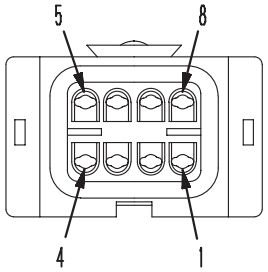
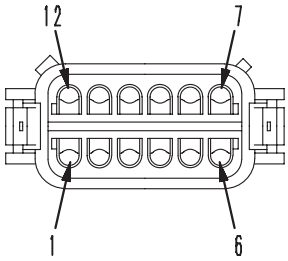
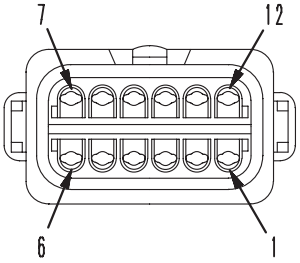
★ Collected data using Snapshot

Item	Unit	Magnification
Time	sec	1000
Engine speed	RPM	1
Fuel injection rate	mm^3/st	1
Fuel rail pressure	kg/cm^2	100
Electronic governor command voltage	V (Volt)	10
Blowby pressure	mmAq	1
Boost pressure	kg/cm^2	10
Engine oil temperature	degC	1
Engine oil pressure	kg/cm^2	10
Engine coolant temperature	degC	1
Engine exhaust gas temperature L1278	degC	1
Engine exhaust gas temperature L3456	degC	1
Engine exhaust gas temperature R1278	degC	1
Engine exhaust gas temperature R3456	degC	1
PPC relief oil pressure	kg/cm^2	10
Hydraulic oil pressure (Lift cylinder bottom pressure)	kg/cm^2	1
Steering pump pressure	kg/cm^2	1
Hydraulic oil temperature	degC	1
Lift arm raise indicator	ON/OFF	1
Lift arm lower indicator	ON/OFF	1
Bucket tilt indicator	ON/OFF	1
Bucket dump indicator	ON/OFF	1
Ambient temperature	degC	1
Travel speed	km/h	1
Torque converter oil temperature	degC	1
Number of gear speeds	Number	1
Modulation clutch slip rate	%	1
Front brake pressure	kg/cm^2	1
Rear brake pressure	kg/cm^2	1


L103
L160
L01
L128
L150
L161
L141
L140
L129
L125
L126
L124
MC3
L105
L09
L42
L43
L46
L44
MC1
L89
OP1. OP2. OP3
OP4. OP5
W
L146
L145
L147
L28
M01
L27
M02A
L26
M02B
MC4
L94
SJ2
SJ1
L17
L16
L82
L87
L130
L131
V3B
STL
L29
V3A
V4B
V4A
V1
V2A
V2B
L83
L86
L85
RE33
L84
L30


BWW01544
q
r
s
t
u
v

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

No. of pins	DT Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
8	 BWP05045	 BWP05046	8GR:799-601-9060 8B: 799-601-9070 8G: 799-601-9080 8BR:799-601-9090
	Part No. :08192-1820□ (normal type) 08192-2820□ (fine wire type)	Part No. :08192-1810□ (normal type) 08192-2810□ (fine wire type)	
12	 BWP05047	 BWP05048	12GR:799-601-9110 12B: 799-601-9120 12G: 799-601-9130 12BR:799-601-9140
	Part No. :08192-1920□ (normal type) 08192-2920□ (fine wire type)	Part No. :08192-1910□ (normal type) 08192-2910□ (fine wire type)	

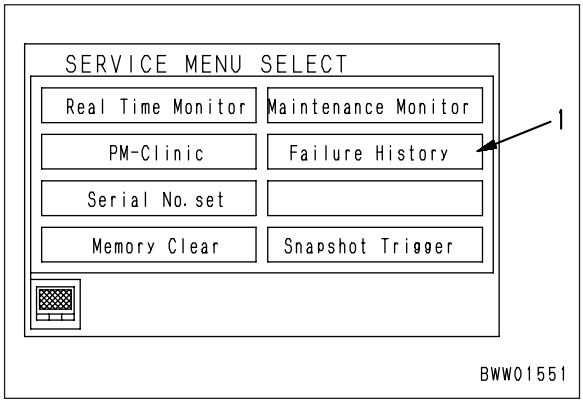
9JS04910

METHOD OF DISPLAYING ACTION CODE AND FAILURE CODE

1. Display on CGC
Serial No.: 50001 – 50056

1) Outline
The VHMS controller transmits information of various types through CAN (network) to the CGC monitor, and the "Failure history information" in that information is displayed on the SERVICE MENU SELECT SCREEN of the CGC monitor.

2) Display of failure history
If failure history button (1) on the service menu is pressed, the "FAILURE HISTORY SCREEN" appears.
The "Code", "Contents", "Starting time of failure detection start time", and "Finishing time of failure detection" of the failures are displayed in the order of time from the oldest one. If the failure still exists, the "finishing time of failure detection" is not displayed.
The number of the all past failures is displayed in section (2), the failure No. in section (3), the failure code and its contents in section (4), and the time when the failure occurred in section 5.

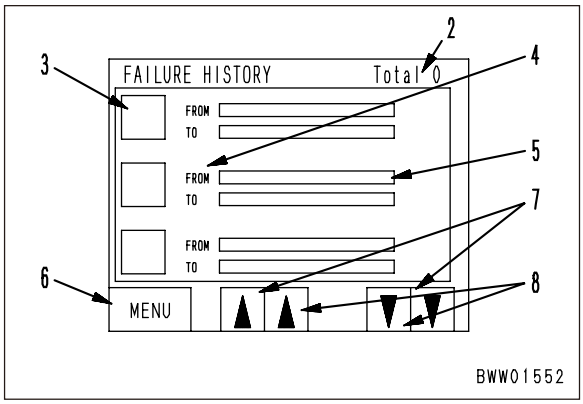


3) Function of each button
i) Service Menu button (6):
- If this button is pressed, the "SERVICE MENU SCREEN" appears.

ii) Page button (7):
- This button is used to turn over the page.

iii) UP/DOWN button (8):
- This button is used to move the displayed part up and down.

iv) Failure history No. button (3):
- If this button is pressed, the history corresponding to it is not displayed.
  - ★ Although the history is not displayed in this case, the data in the controller are saved.



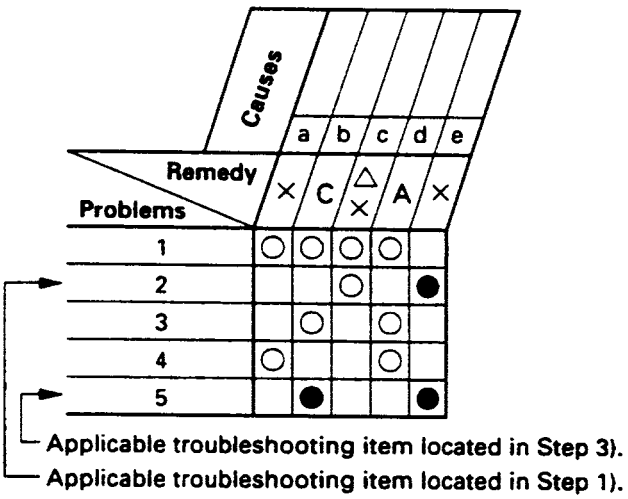
3) Operate the machine and check the troubleshooting items other than those in 1).
Operate the machine and check the items in the same way as in 1), and if the symptom appears, mark that item. (In the chart on the right, the symptom appears again for item 5).

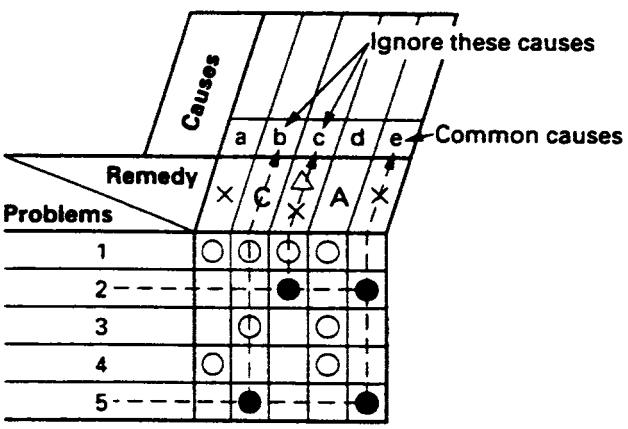
4) Find the appropriate cause from the cause column. In the same way as in Step 2), if the symptom appears, the ○ marks on that line indicate the possible causes. (For item No. 5 in the table on the right, the possible causes are **b** or **e**.)

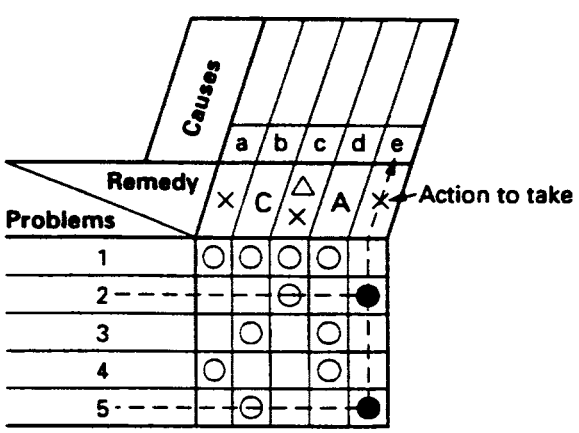
5) Narrow down the possible causes.
There is one common cause among the causes located in Steps 2) and 4). (One cause marked ○ appears on the line for both items.) This cause is common to both the symptoms in troubleshooting Steps 1) and 3).
★ The causes which are not common to both troubleshooting items (items which are not marked ○ for both symptoms) are unlikely causes, so ignore them.
(In the example given on the right, the causes for Troubleshooting Item 2 are **c** or **e**, and the cause for Troubleshooting Item 5 are **b** or **e**, so cause **e** is common to both.)

6) Repeat the operations in Steps 3), 4) and 5) until one cause (one common cause) remains.
★ If the causes cannot be narrowed down to one cause, narrow the causes down as far as possible.

7) Remedy
If the causes are narrowed down to one common cause, take the aciton given in the remedy column.
The symbols given in the remedy column indicate the following:
X: Replace, △: Repair, A; Adjust, C: Clean



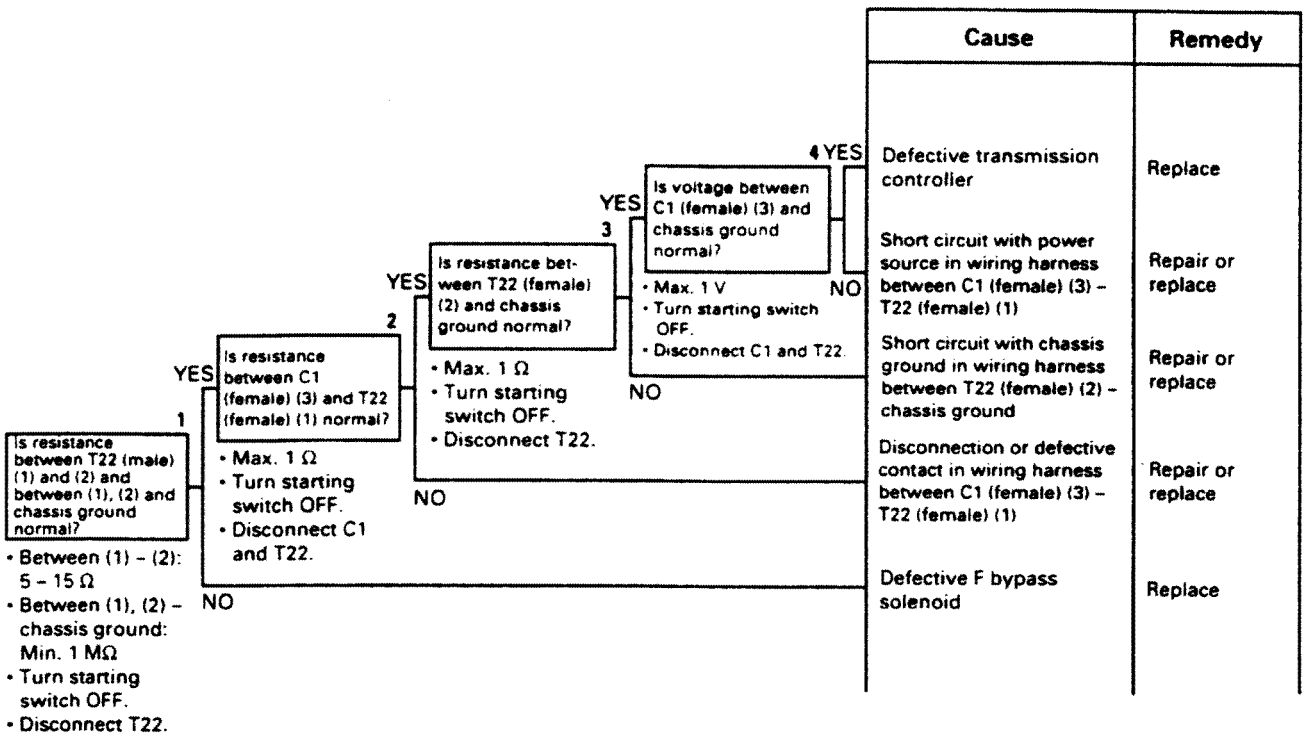




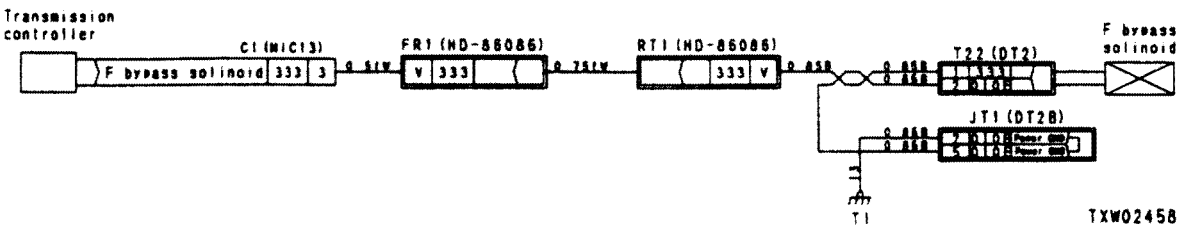
Normal condition (voltage, current, resistance)	Operation of controller against abnormality	Condition of machine caused by abnormality	Diagnosis code
1) Resistance between transmission controller C5 (female) (11) - chassis ground in neutral (F ECMV: OFF): Min. 1 MΩ	Neutral (All ECMV output: OFF)	Machine cannot travel.	T-19
1) Resistance between transmission controller C3B (female) (2) - chassis ground in forward (F ECMV: ON): Below 1 Ω 2) Resistance between transmission controller C3B (female) (10) - chassis ground in reverse (R ECMV: ON): Below 1 Ω	When gear is shifted, data without fill switch signals are used.	Gear shift shock is made.	T-20
1) Resistance between transmission controller C3B (female) (3) - chassis ground during travel in 1st gear (1st ECMV: ON): Below 1 Ω 2) Resistance between transmission controller C3B (female) (11) - chassis ground during travel in 2nd gear (2nd ECMV: ON): Below 1 Ω 3) Resistance between transmission controller C5 (female) (11) - chassis ground during travel in 3rd gear (3rd ECMV: ON): Below 1 Ω	When gear is shifted, data without fill switch signals are used.	Gear shift shock is made.	T-21
1) F bypass solenoid Resistance between T22 (male) (1) - (2): 5 - 15 Ω Resistance between T22 (male) (1), (2) - chassis ground: Min. 1 MΩ	1) When harness is disconnected: Cannot operate at all. (Since this failure cannot be distinguished from short circuit with power source, controller sets in neutral and cannot travel.) 2) When harness has short circuit with power source: Controller sets in neutral and can travel.	1) F clutch makes gear shift shocks and it takes long time to engage (It engages at last). 2) F clutch cannot be disengaged.	T-22
1) F bypass solenoid Resistance between T22 (male) (1) - (2): 5 - 15 Ω Resistance between T22 (male) (1), (2) - chassis ground: Min. 1 MΩ	1) Stops outputting.	1) F clutch makes gear shift shocks and it takes long time to engage (It engages at last).	T-23

T-22 Error code [34] (Disconnection or short circuit with power source in F bypass solenoid 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.
★ Always connect any disconnected connectors before going on to the next step.



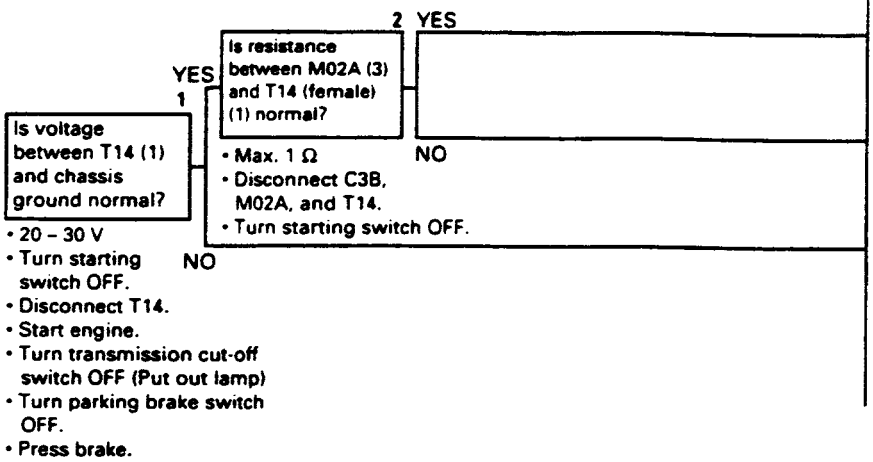
T-22 Related electrical circuit diagram



Normal condition (Voltage, current, resistance)	Operation of controller against abnormality	Condition of machine caused by abnormality	Diagnosis code
1) Voltage between M02A (8) – chassis ground When work equipment control lever is in neutral: Max. 1 V When work equipment control lever is in boom RAISE position: 15 – 30 V 2) Voltage between M02A (7) – chassis ground When work equipment control lever is in neutral: Max. 1 V When work equipment control lever is in boom LOWER position: 15 – 30 V 3) Voltage between M02A (6) – chassis ground When work equipment control lever is in neutral: Max. 1 V When work equipment control lever is in bucket TILT position: 15 – 30 V 4) Voltage between M02A (5) – chassis ground When work equipment control lever is in neutral: Max. 1 V When work equipment control lever is in bucket DUMP position: 15 – 30 V Note: Move each lever a little (to degree that work equipment does not move actually) (for detection of PPC pressure signal).	1) NC solenoid = OFF	1) Machine condition does not change particularly. 2) Hydraulic loss is increased if machine travels at speed of 10 km/h or below in F3 gear.	C-1
1) Voltage between M02A (10) – M02A (9): 4.75 – 5.25 V 2) Voltage between M02A (19) – M02A (9): 0.5 – 4.75 V 3) Voltage between M02A (19) – M02A (9) (at low idling): 0.5 – 1.6 V 4) Voltage between M02A (19) – M02A (9) (at high idling): [Voltage at low idling + 2.1] – 4.75 V Note: Above table shows standard potentiometer voltage by which controller can recognize dial area normally. When adjusting potentiometer again, leave margin to error judgment area. Adjust voltage in range from 1.3 to 1.6 V at low idling. (Error judgment area is as follows; Potentiometer voltage < 0.5 V or Potentiometer voltage > 4.5 V)	1) Controls for low idling.	Engine speed does not rise even if accelerator pedal is pressed.	C-2
1) Resistance between F ECMV fill switch T14 (male) (1) – chassis ground: When forward switch is set to measuring point: Max. 1 Ω When forward switch is set out of measuring point: Min. 1 MΩ 2) Resistance between R ECMV fill switch T12 (male) (1) – chassis ground: When reverse switch is set to measuring point: Max. 1 Ω When reverse switch is set out of measuring point: Min. 1 MΩ ★ Start engine, turn transmission cut-off switch OFF, turn parking brake OFF, and press brake pedal.	1) Engages modulated clutch directly. 2) NC solenoid = OFF	1) Drive force does not change even if drive force control dial is operated. 2) Tire slip control system does not work. 3) Shock time lag is made when travel direction is changed.	C-3
1) Resistance between 1st/2nd/3rd ECMV fill switch T4, T6, T8 (male) (1) – chassis ground: When set to measuring point with shift-up/down switch: Max. 1 Ω When set out of measuring point with shift-up/down switch: Min. 1 MΩ ★ Start engine, set forward/reverse lever in N, and turn manual switch ON. Note: Default when engine is started is 2nd. If shift-down switch is pressed and held, gear is shifted down to 1st. If shift-up switch is pressed and held, gear is shifted up to 3rd.	1) Engages modulated clutch directly. 2) NC solenoid = OFF	1) Drive force does not change even if drive force control dial is operated. 2) Shock time lag is made when travel direction is changed.	C-4
1) Resistance between 1st/2nd/3rd ECMV fill switch T4, T6, T8 (male) (1) – chassis ground: When set to measuring point with shift-up/down switch: Max. 1Ω When set out of measuring point with shift-up/down switch: Min. 1 MΩ ★ Start engine, set forward/reverse lever in N, and turn manual switch ON. Note: Default when engine is started is 2nd. If shift-down switch is pressed and held, gear is shifted down to 1st. If shift-up switch is pressed and held, gear is shifted up to 3rd.	1) Engages modulated clutch directly. 2) NC solenoid = OFF	1) Drive force does not change even if drive force control dial is operated. 2) Shock time lag is made when travel direction is changed.	C-5

MC-16 Disconnection in F ECMV fill switch system

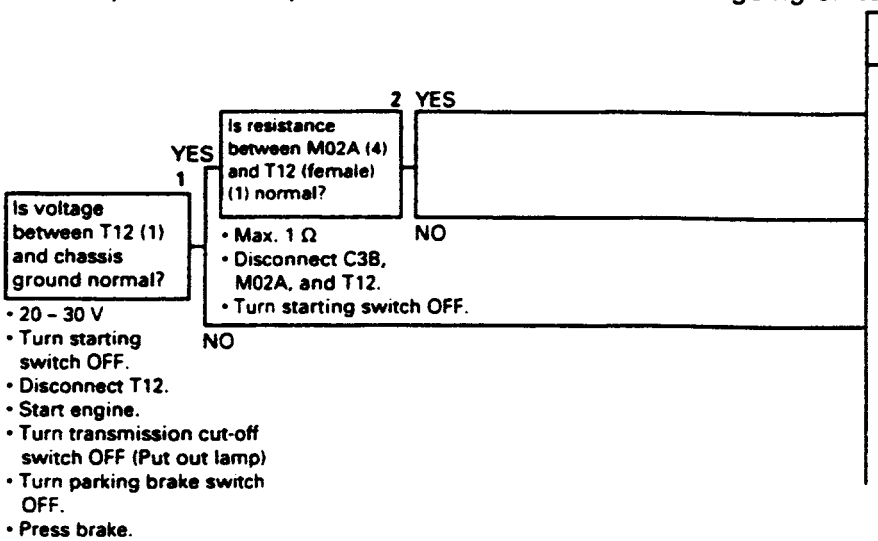
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.



Cause	Remedy
Defective modulated clutch controller	Replace
Disconnection or defective contact in wiring harness between M02A (female) (3) – T14 (female) (1)	Repair or replace
Defective F ECMV fill switch	Replace

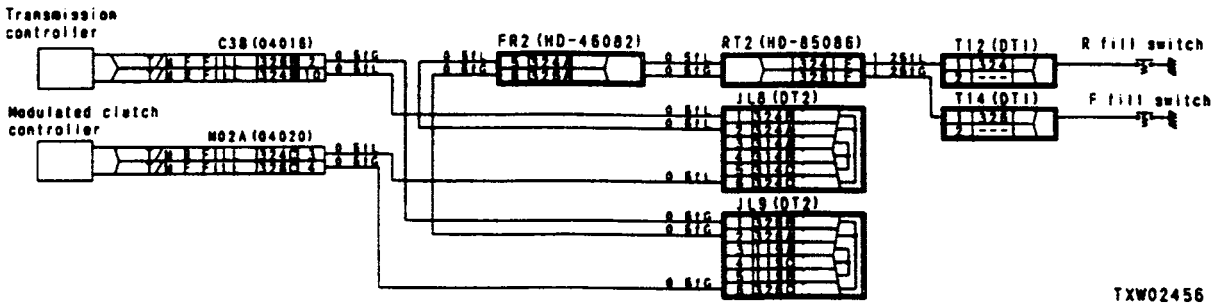
MC-17 Disconnection in R ECMV fill switch system

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



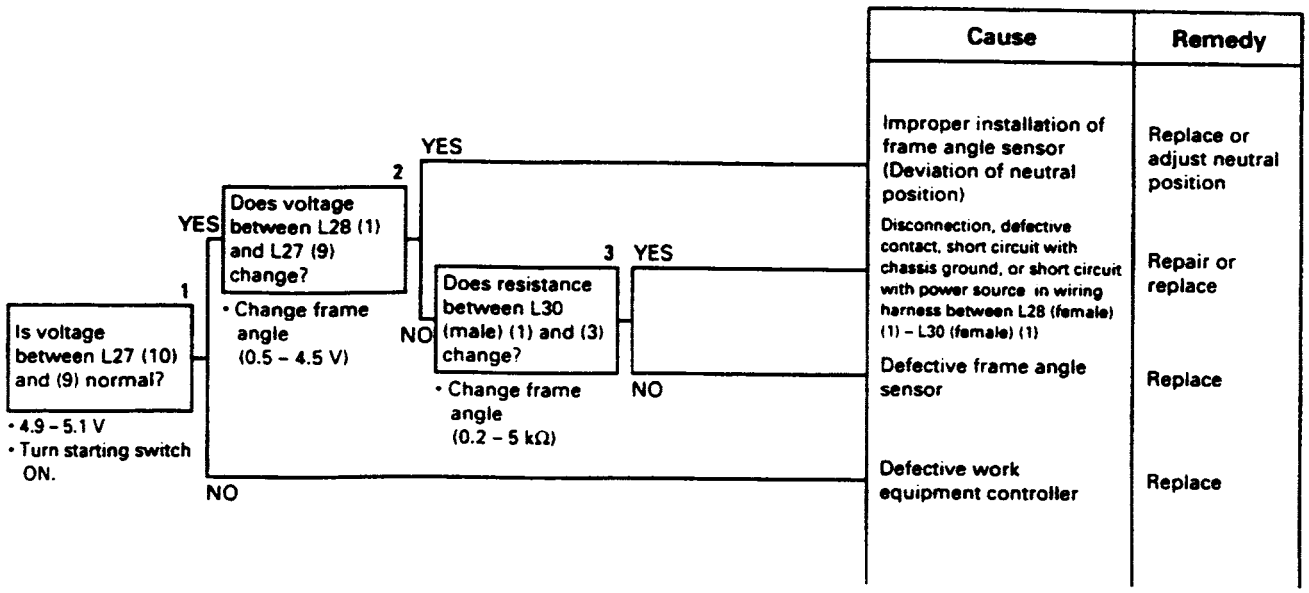
Cause	Remedy
Defective modulated clutch controller	Replace
Disconnection or defective contact in wiring harness between M02A (female) (4) – T14 (female) (1)	Repair or replace
Defective R ECMV fill switch	Replace

MC-16, MC-17 Related electrical circuit diagram

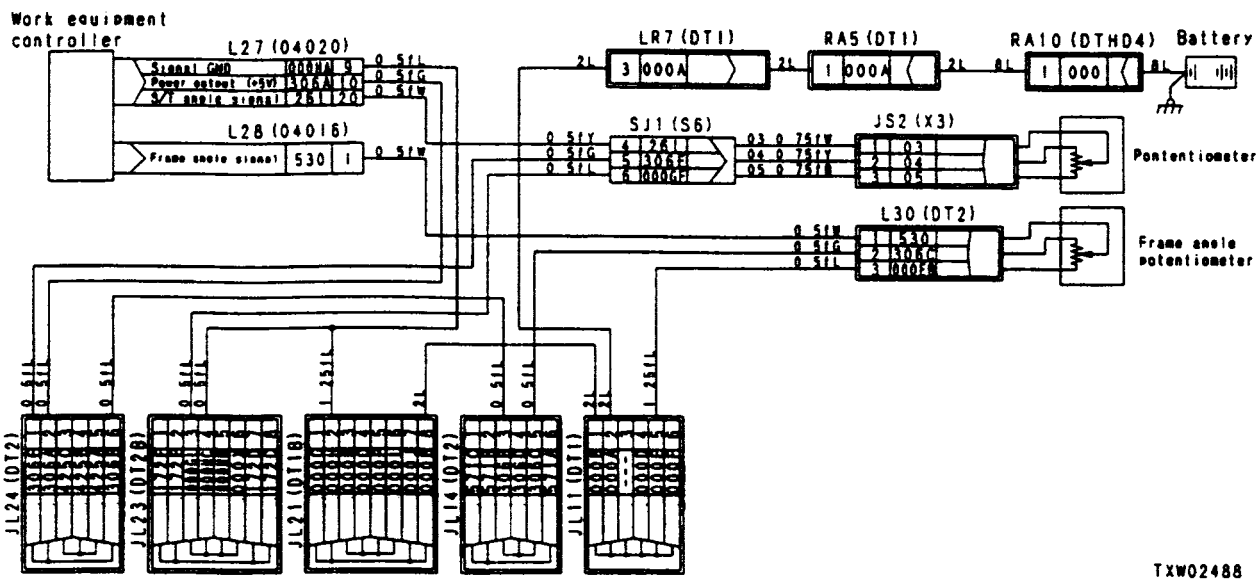


J-5 Error code [59] (Disconnection or short circuit with chassis ground in frame angle sensor system) is displayed

★ **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 and turn the joystick steering selector switch ON.
★ Always connect any disconnected connectors before going on to the next step.

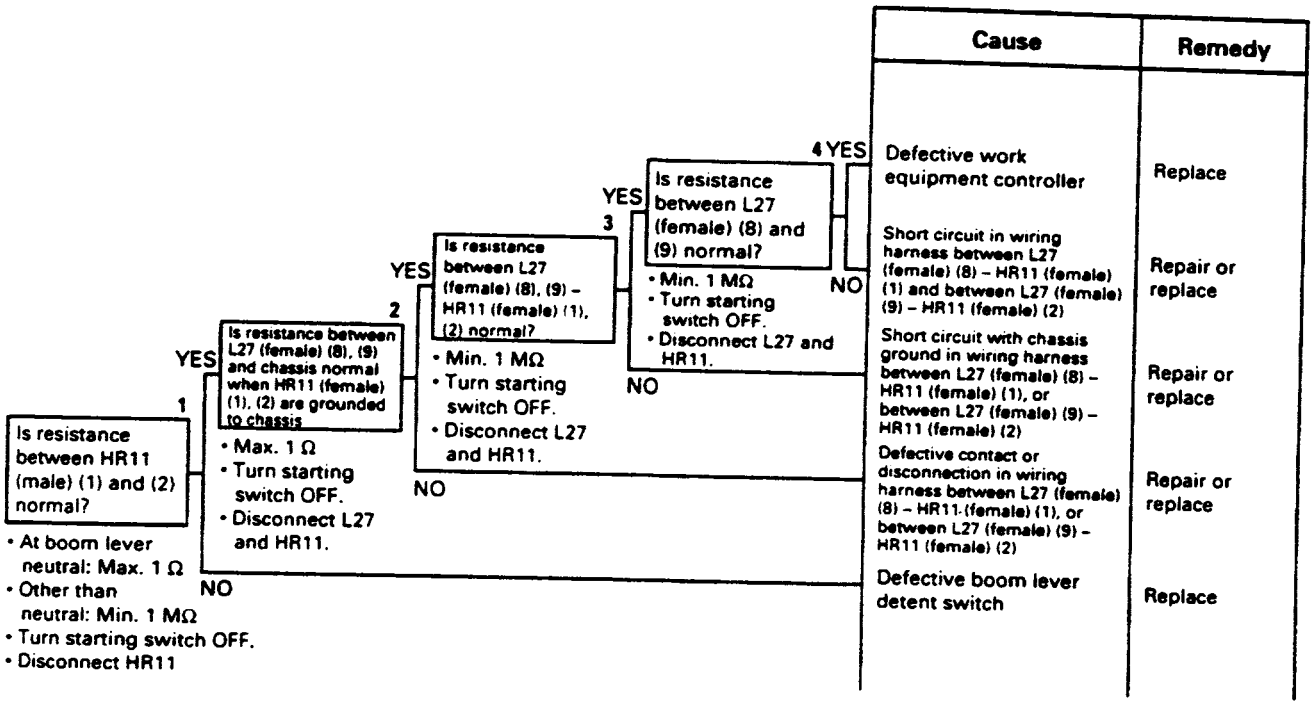


J-5 Related electrical circuit diagram

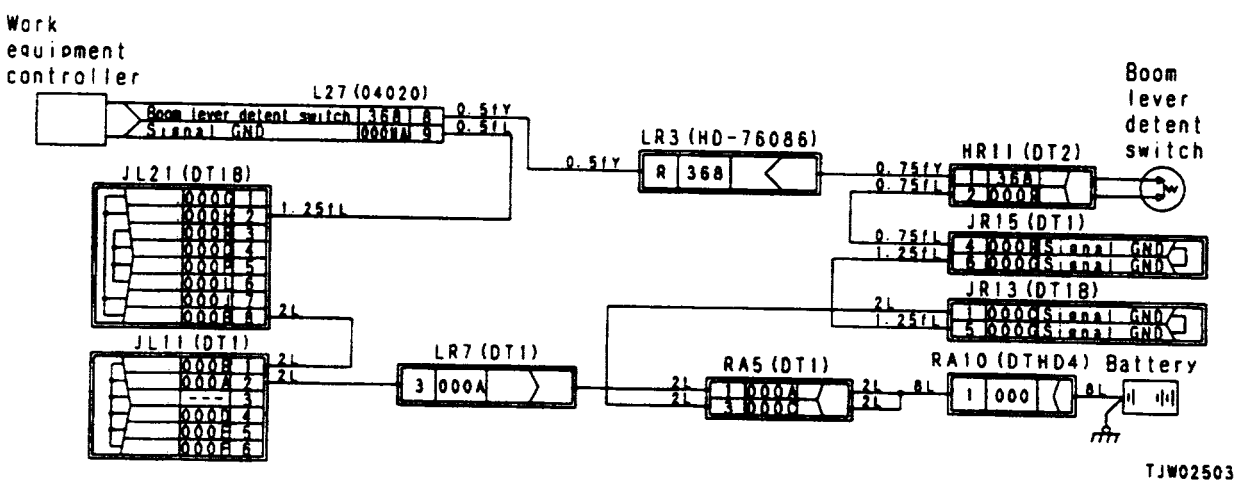


W-13 Shock when stopping boom (abnormality in boom lever detent switch)

★ Check that the failure mode [49] is not displayed.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.
★ When the boom lever is at neutral, [GND] is input to the controller when the boom detent switch is closed.



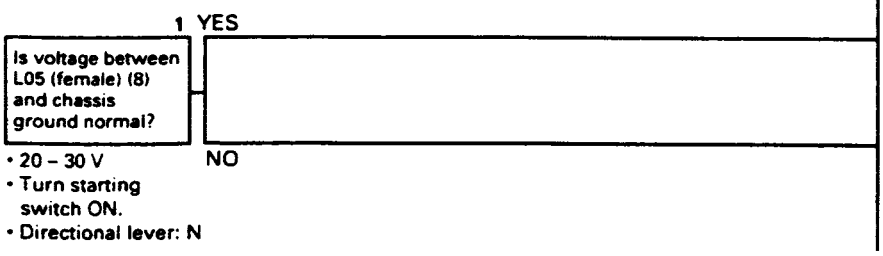
W-13 Related electrical circuit diagram



M-13 Abnormality in parking brake dragging warning

★ 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.

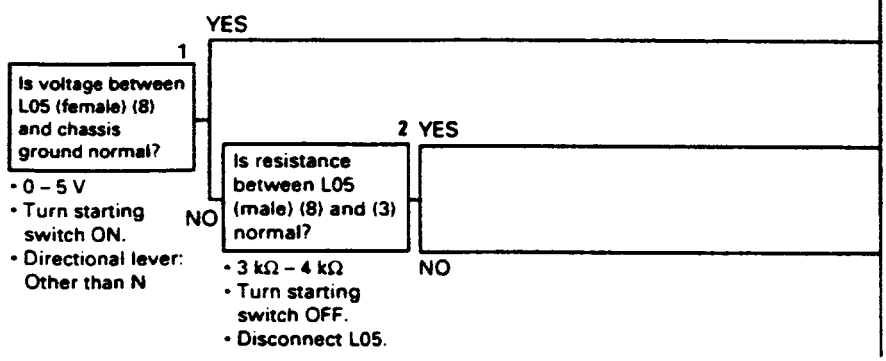
a) When parking brake is applied, buzzer sounds (intermittently) and CAUTION lamp flashes even when directional lever is at N



Cause	Remedy
Defective main monitor	Replace
Defective contact or disconnection in wiring harness between L05 (female) (8) – JS1 (female) (3)	Repair or replace

b) When parking brake is applied, buzzer does not sound and CAUTION lamp does not light up even when directional lever is at position other than N

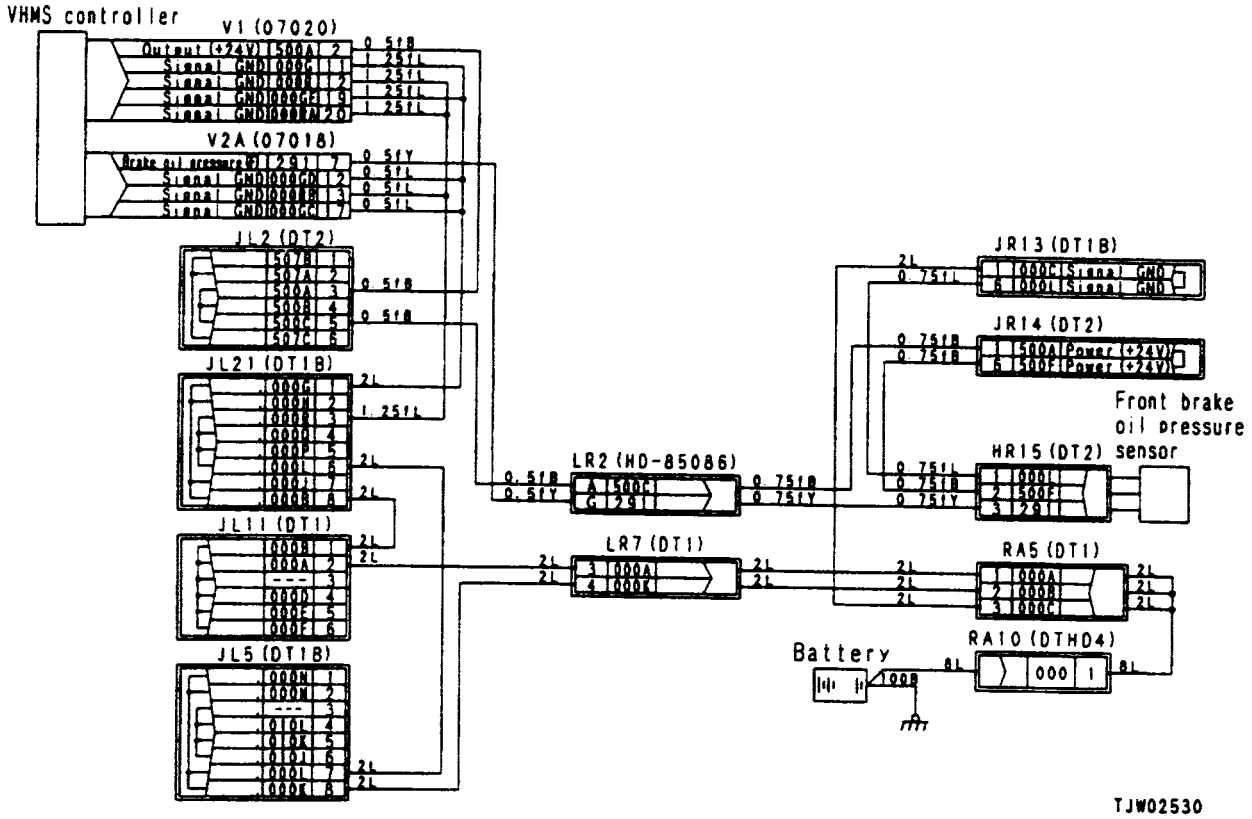
★ Check that the synchronous flash is normal.



Cause	Remedy
Defective main monitor	Replace
Short circuit with power supply in wiring harness between L05 (female) (8) – JS1 (female) (3), or defective directional lever	Repair or replace
Defective main monitor	Replace

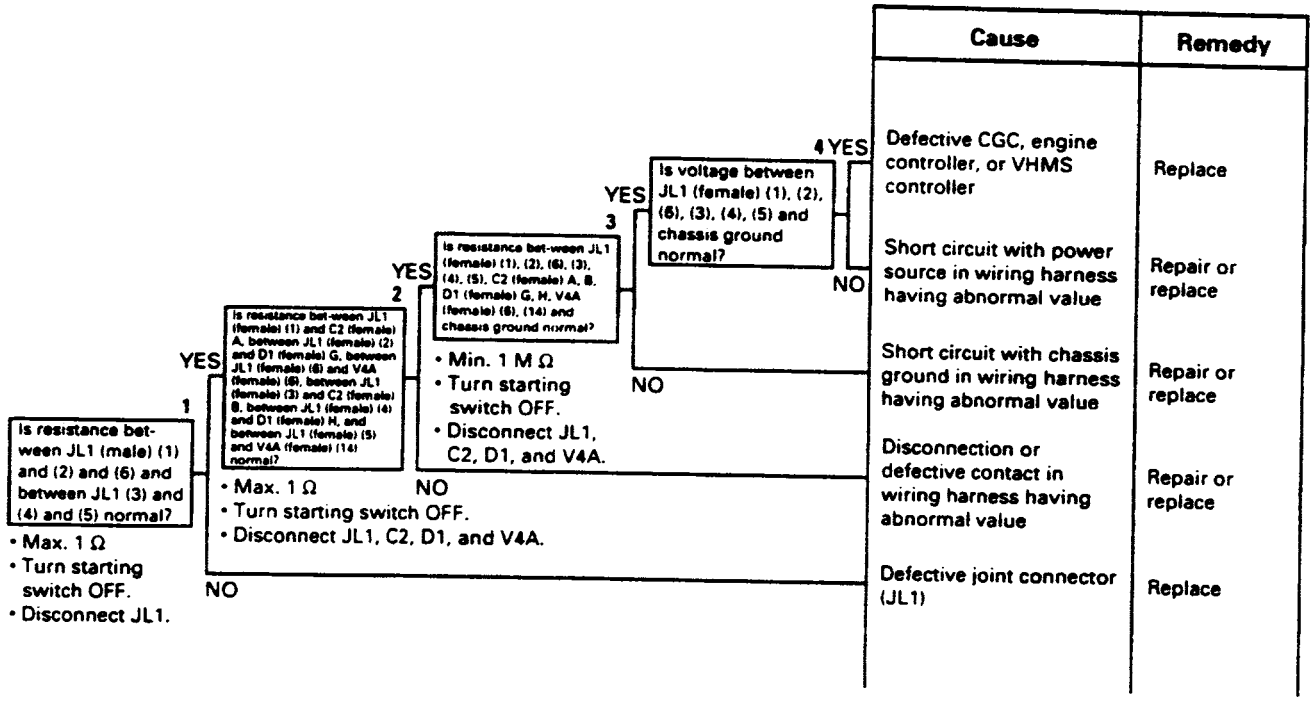
Normal condition	Condition of machine caused by abnormality	Alarm buzzer	Failure history Saved: ○ Other: x	Phenomena under abnormal condition	Resetting method	Diagnosis code
Voltage (between V1 (6), (7) – chassis): 20 – 30 V	– – –	– – –	– – –	Data cannot be saved. (2 wires are set. Failure occurs only when both wires are disconnected.)	When left is not satisfied.	V-101
	– – –	– – –	– – –	Fuse may be broken.	– – –	– – –
	– – –	– – –	– – –	Failure does not occur.	When left is not satisfied.	V-101
Voltage (between V1 (2) – chassis): 22 – 25 V	– – –	– – –	– – –	Abnormal value of power source sensor	– – –	V-201
	Stops outputting.	– – –	○	Abnormal value of power source sensor	Hold until turning starting switch OFF.	V-102
	– – –	– – –	– – –	Abnormal value of power source sensor	– – –	V-201
Voltage (between V1 (3) – chassis): 11 – 13 V	– – –	– – –	– – –	Abnormal value of power source sensor	– – –	V-202
	Stops outputting.	– – –	○	Abnormal value of power source sensor	Hold until turning starting switch OFF.	V-103
	– – –	– – –	– – –	Abnormal value of power source sensor	– – –	V-202
Voltage (between V1 (4), (5) – chassis): 4 – 6 V	– – –	– – –	– – –	Abnormal value of power source sensor	– – –	V-203
	Stops outputting.	– – –	○	Abnormal value of power source sensor	Hold until turning starting switch OFF.	V-104
	– – –	– – –	– – –	Abnormal value of power source sensor	– – –	V-203
Voltage V2A (9): 20 – 30 V V2A (12): 0 – 5 V V3A (9): 0 – 5 V V3B (12): 20 – 30 V	– – –	– – –	– – –	– – –	– – –	
	– – –	– – –	– – –	– – –	– – –	
	– – –	– – –	– – –	– – –	– – –	
	– – –	– – –	○	Connected to connector CN3A wrongly.	When left is not satisfied.	V-105
	– – –	– – –	○	Communication with CGC and engine controller (CENSE) is impossible.	When left is not satisfied.	V-107

V-11 Related electrical circuit diagram

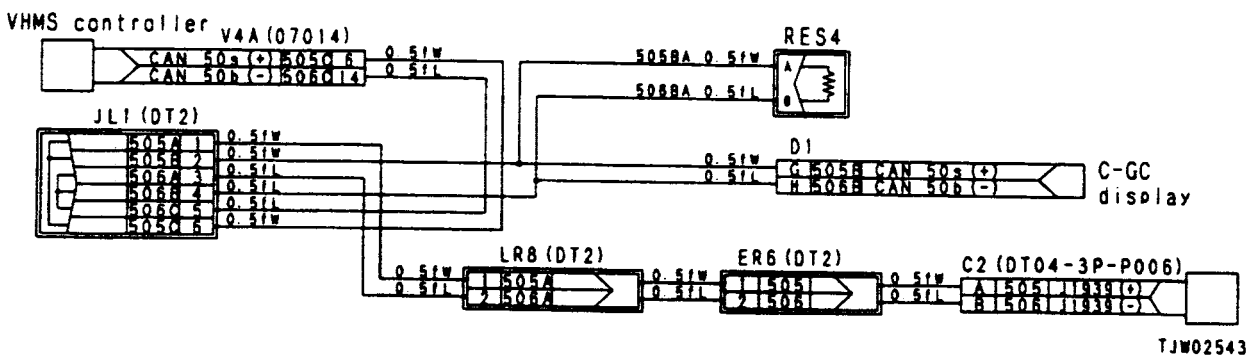


V-107 [E824] (Communication with CGC and engine controller is impossible) is displayed in history

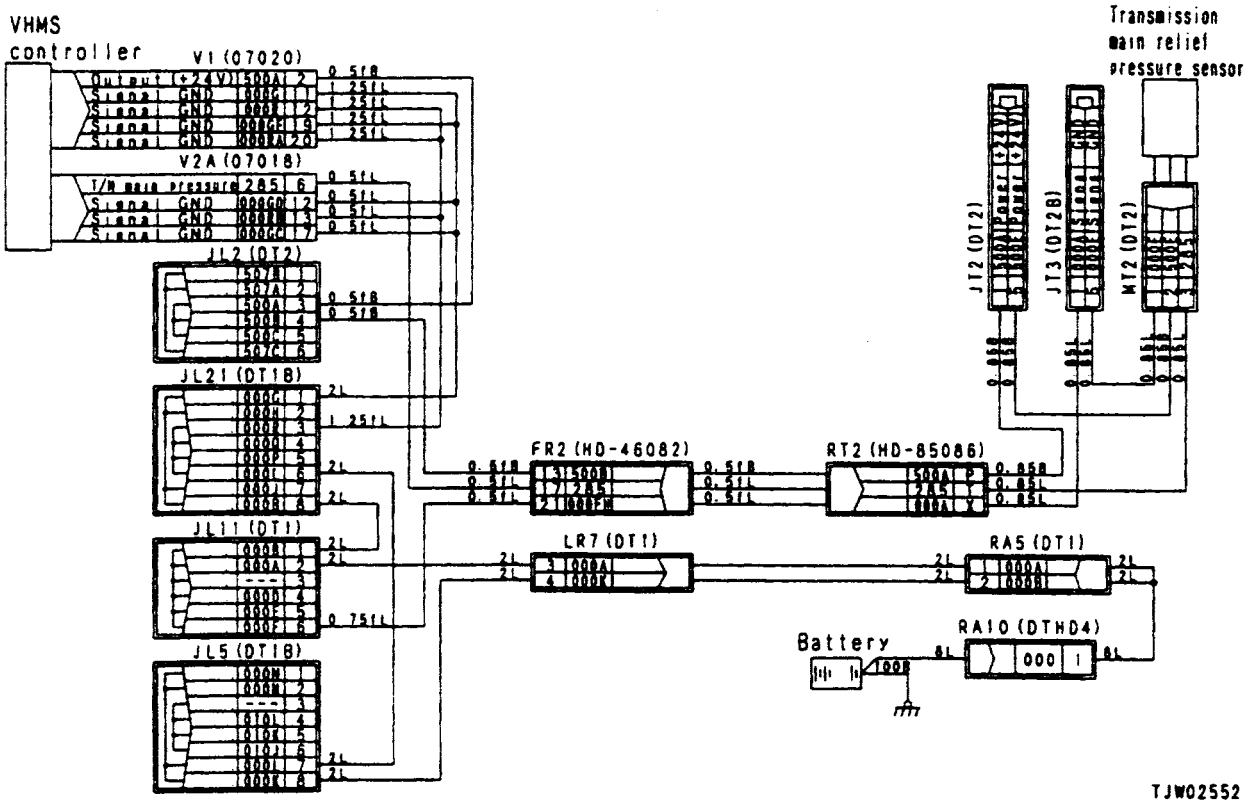
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.



V-107 Related electrical circuit diagram



V-121 Related electrical circuit diagram

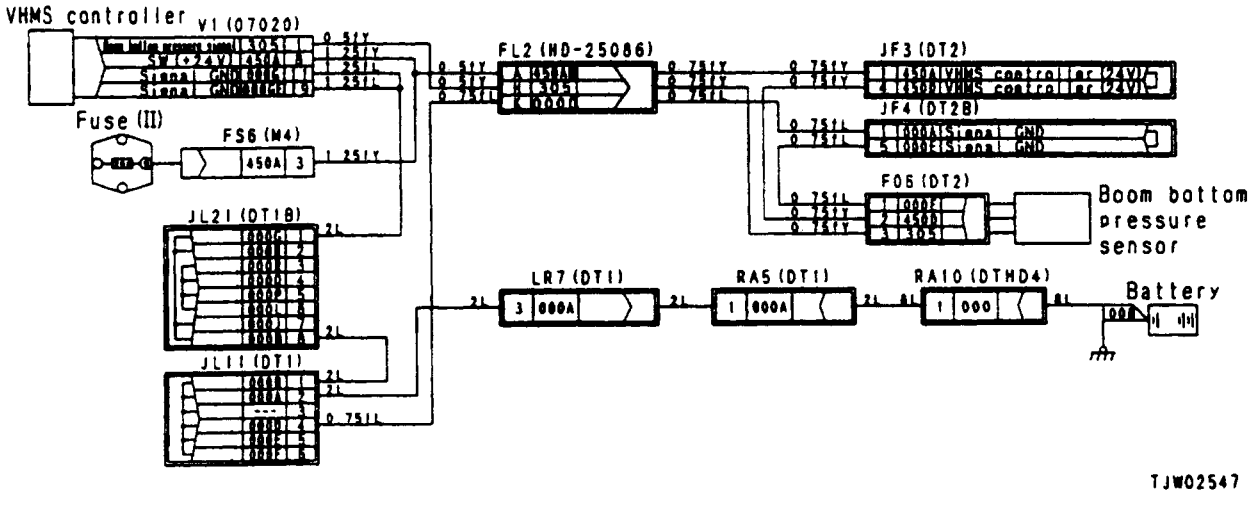


V-207 Short circuit with power source in boom bottom pressure sensor system

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

	Cause	Remedy
1 Is voltage between V1 (female) (1) and chassis ground normal? • Max. 1 V • Turn starting switch OFF. • Disconnect V1 and F06. • Turn starting switch ON.	YES	
	Defective VHMS controller	Replace
	Short circuit with power source in wiring harness between V1 (female) (1) – F06 (female) (3)	Repair or replace
	NO	

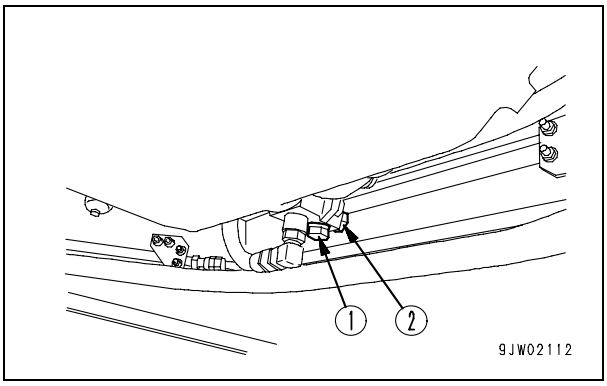
V-207 Related electrical circuit diagram



TROUBLESHOOTING OF HYDRAULIC AND MECHANICAL SYSTEM (H MODE)

Serial No.: 50001 and up

5. If the oil level is above (B) at the bottom of sight gauge (G), remove drain plug (1) and loosen drain valve (2) to discharge excessive oil, and then check the oil level again.
6. If the oil level is proper, tighten the cap.

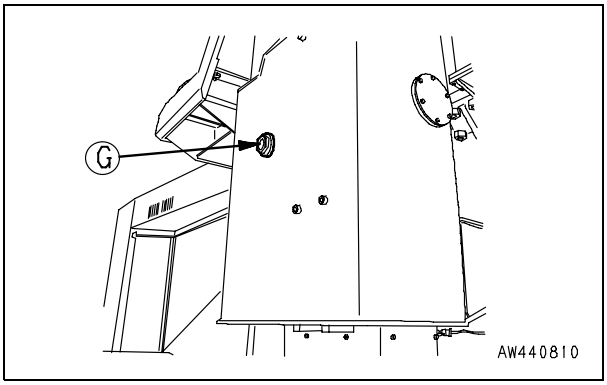


3] Check and supply of oil in hydraulic tank

⚠ **Just after the engine is stopped, its parts and oil are very hot and can burn your hands. Accordingly, wait until they are cooled down and then start the work.**

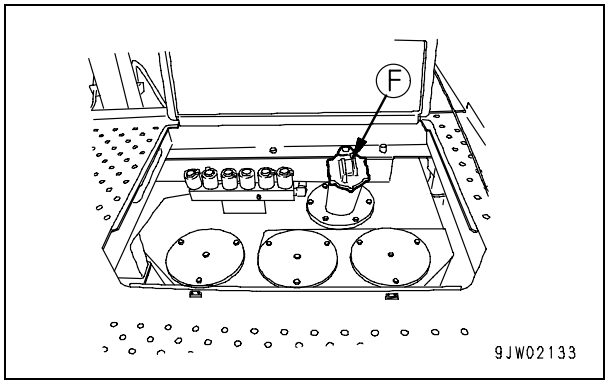
⚠ **If the oil filler cap is removed, the oil may spout out. Accordingly rotate the oil filler cap slowly to release the internal pressure and then remove it.**

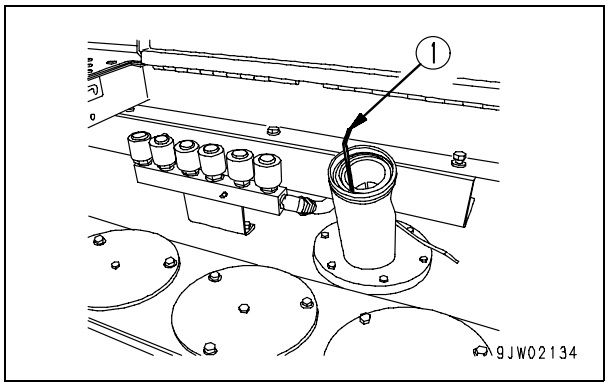
1. Lower the bucket to the ground and stop the engine. After about 5 minutes, if the oil level is near the top of sight gauge (G), it is proper.

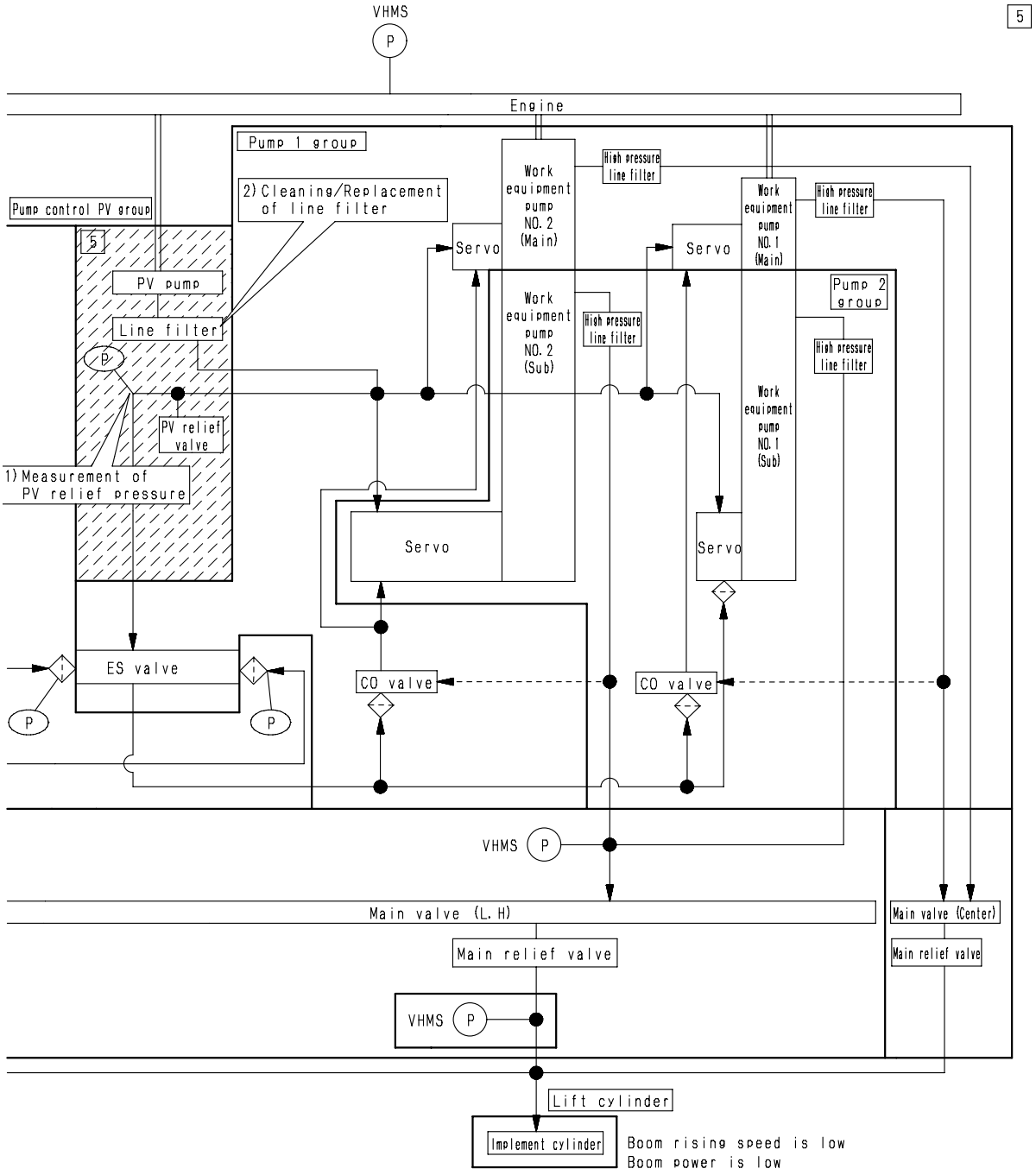


★ **If the oil level is above level H, stop the engine and wait until the hydraulic oil cools down, and then discharge excessive oil through the drain plug. If the oil level is too high, the oil may damage the hydraulic circuit or may spout out.**

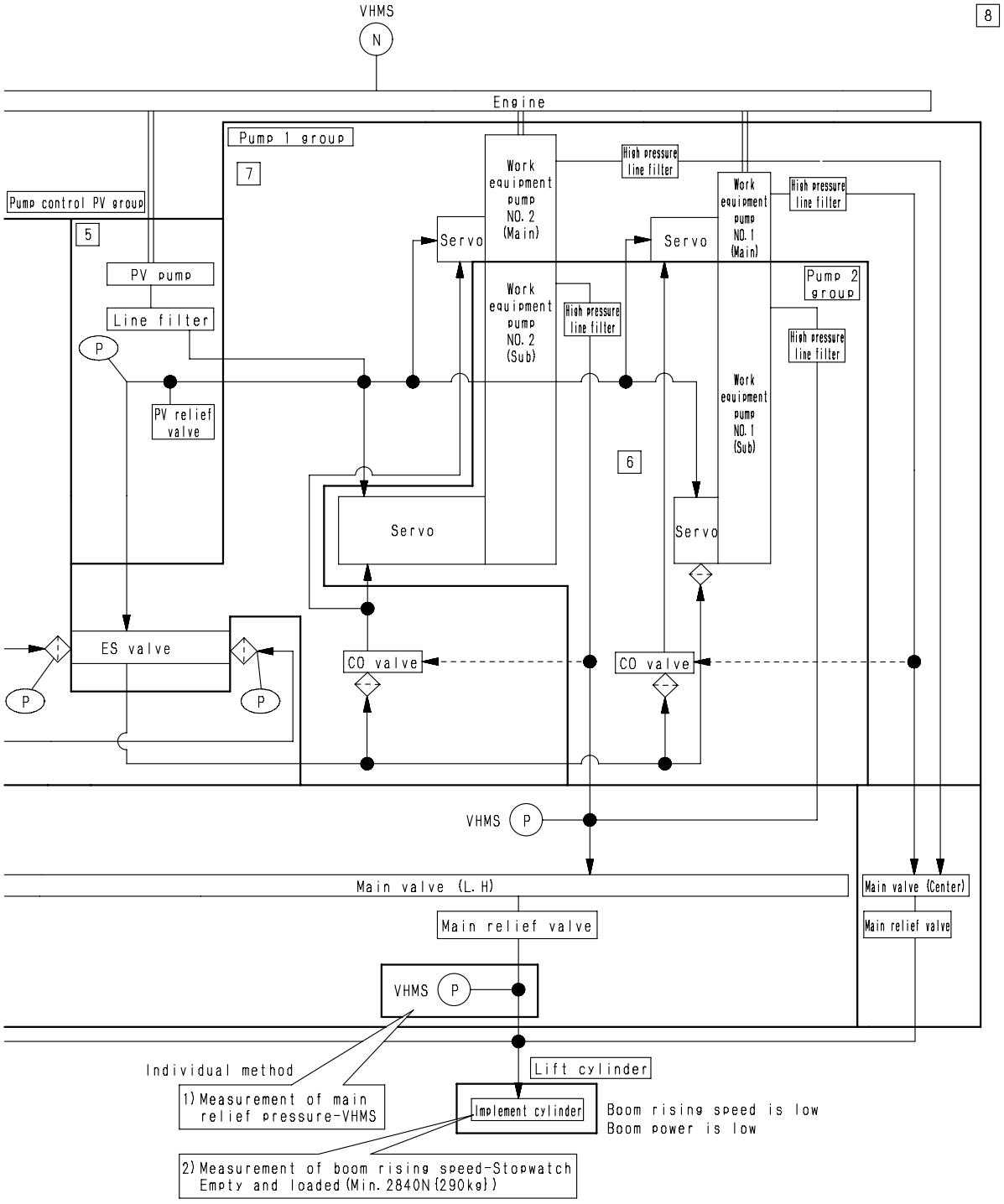
2. If the oil level is not near the top of the sight gauge, open the inspection cover on the step and add oil through oil filler (F). When adding oil, check the oil level by oil level gauge (1). If the oil level is near stamp H of the oil level gauge, it is proper.



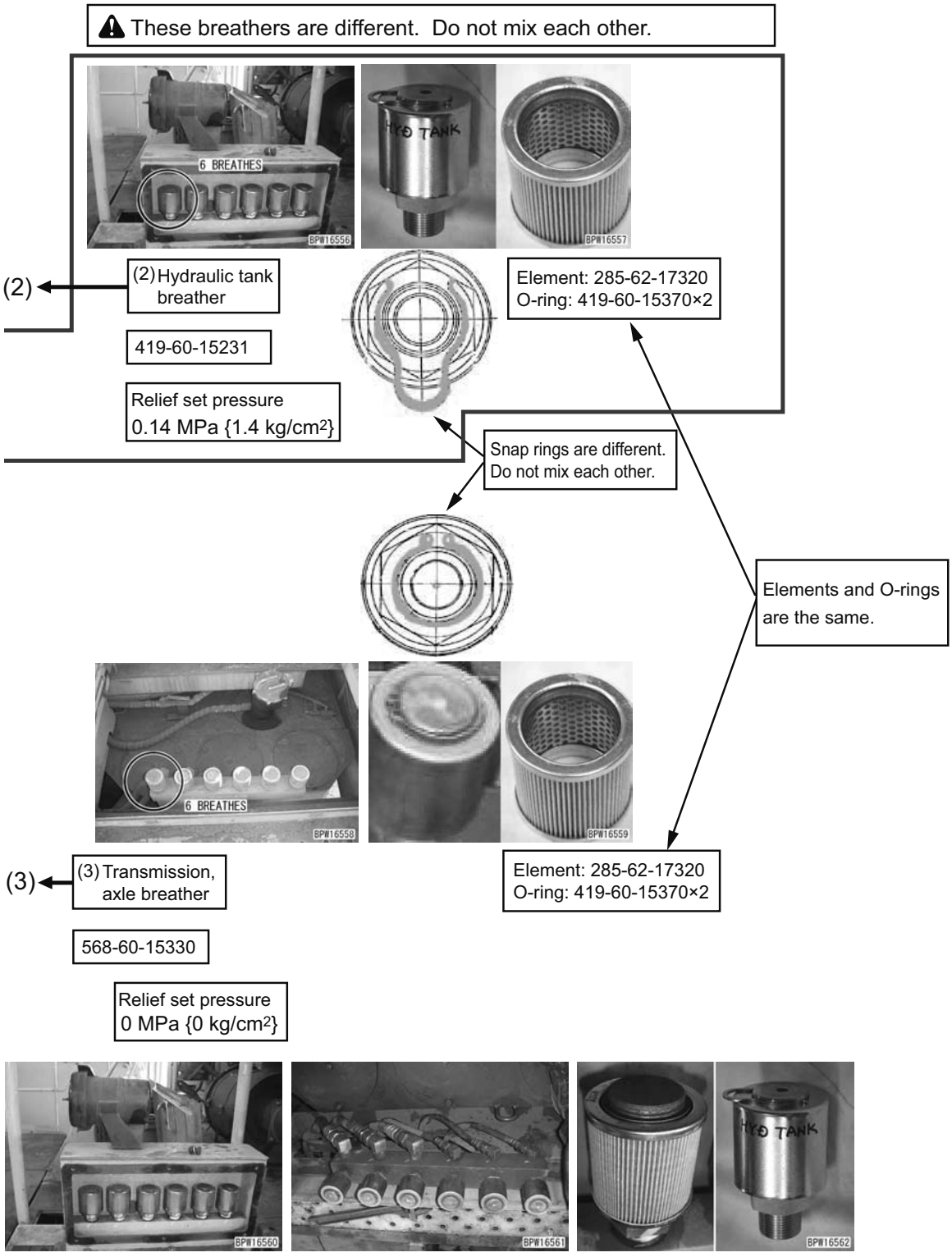



VHMS
P
5
Engine
Pump 1 group
Pump control PV group
2) Cleaning/Replacement of line filter
5
PV pump
Line filter
P
PV relief valve
1) Measurement of PV relief pressure
Work equipment pump NO. 2 (Main)
High pressure line filter
Servo
Work equipment pump NO. 1 (Main)
High pressure line filter
Servo
Pump 2 group
Work equipment pump NO. 2 (Sub)
High pressure line filter
High pressure line filter
Work equipment pump NO. 1 (Sub)
Servo
Servo
ES valve
P
P
CO valve
CO valve
VHMS
P
Main valve (L. H)
Main valve (Center)
Main relief valve
Main relief valve
VHMS
P
Lift cylinder
Implement cylinder
Boom rising speed is low
Boom power is low

B4W17713


VHMS
N
8
Engine
Pump 1 group
7
Pump control PV group
5
PV pump
Line filter
P
PV relief valve
Work equipment pump NO. 2 (Main)
Servo
High pressure line filter
Work equipment pump NO. 1 (Main)
Pump 2 group
Work equipment pump NO. 2 (Sub)
Work equipment pump NO. 1 (Sub)
6
ES valve
CO valve
VHMS P
Main valve (L. H)
Main relief valve
Main valve (Center)
Individual method
1) Measurement of main relief pressure-VHMS
Lift cylinder
Implement cylinder
Boom rising speed is low
Boom power is low
2) Measurement of boom rising speed-Stopwatch
Empty and loaded (Min. 2840N {290kg})

B4W17720


These breathers are different. Do not mix each other.
6 BREATHES
BPW16556
HYD TANK
BPW16557
(2)
(2) Hydraulic tank breather
419-60-15231
Relief set pressure
0.14 MPa {1.4 kg/cm2}
Element: 285-62-17320
O-ring: 419-60-15370×2
Snap rings are different.
Do not mix each other.
Elements and O-rings are the same.
6 BREATHES
BPW16558
BPW16559
(3)
(3) Transmission, axle breather
568-60-15330
Relief set pressure
0 MPa {0 kg/cm2}
Element: 285-62-17320
O-ring: 419-60-15370×2
BPW16560
BPW16561
HYD TANK
BPW16562

3) AJSS Neutral interlock function

1] Engine does not start unless the joystick steering lever is in NEUTRAL position.

AJSS prohibits engine from starting by cutting engine start signal by switching neutral safety relay ON, since the machine may turn immediately after starting engine if joystick steering lever is not in NEUTRAL position (deviation angle between lever steering angle detected by potentiometer and machine frame angle is 6° or more) when engine stops.

2] Steering is activated when steering lever lock is cancelled with joystick steering lever is being shifted to position other than NEUTRAL while engine running.

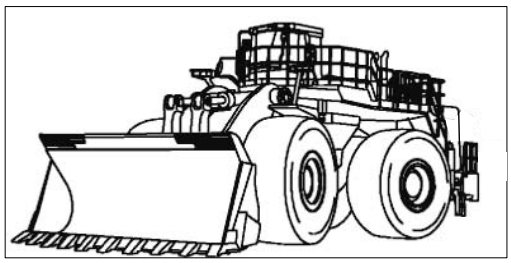
Caution buzzer sounds to attract operator's attention for danger of machine turning soon after canceling the lock, when joystick steering lever is not in NEUTRAL position while steering lever being locked and also engine running.

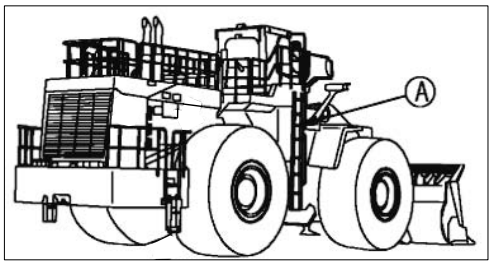
3] Directional selector switch is not activated if steering lock lever is locked, but it is activated if the lock is cancelled while engine running.

Since machine does not turn with steering being locked, activation of directional selection is prohibited by transmission controller. So, when directional selector switch of joystick steering knob is turned to the position other than NEUTRAL with steering being locked, machine may move forward or in reverse right after canceling the lock. Thus, caution buzzer sounds to attract operator's attention.

3) Walk-around check of machine

Check around the machine and internal hydraulic piping for oil leakage.





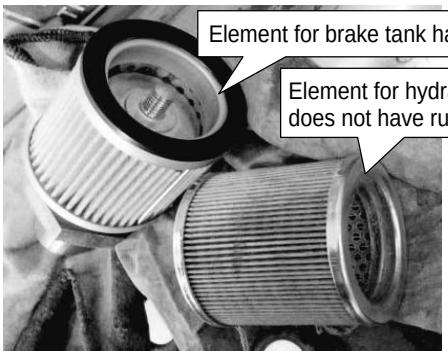
Around suction system, pumps, and valves

Around suction system, pumps, and valves

4) Visual check around brake tank

1] Check of looseness of brake tank cap (Oil stain around oil filler)

2] Check that the element is the genuine one.

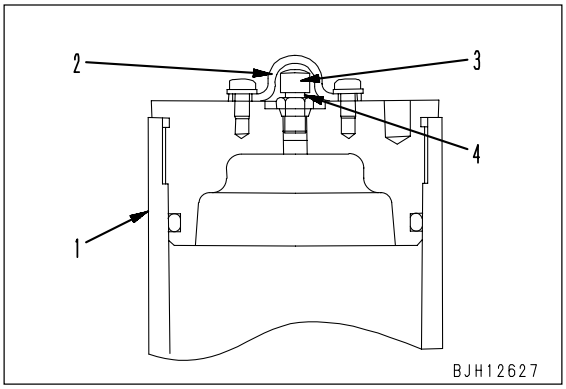


Testing of accumulator nitrogen gas pressure

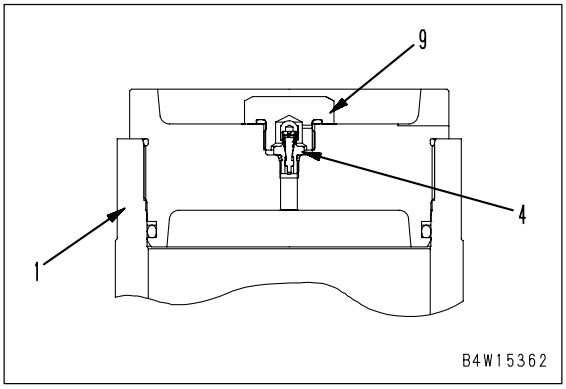
★ The nitrogen gas pressure in the accumulator disconnected from the machine can be measured according to the following procedure, too.

1. Stop the engine and press the brake pedal repeatedly to lower the oil pressure in the brake circuit to zero.
   ★ Generally, if the brake pedal is pressed 30 times, the reaction force to the brake pedal is lost and the oil pressure is lowered to zero.

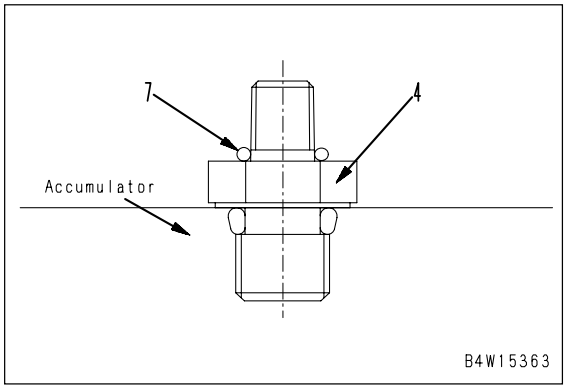
2. Remove valve guard (2) and cap (3) from accumulator (1). (A former accumulator)



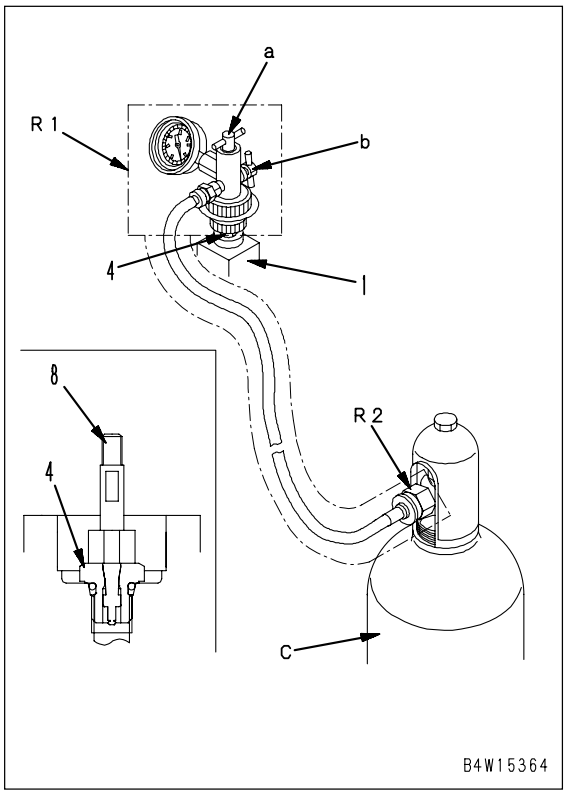
3. Remove plug (9) from accumulator (1). (A new accumulator)



4. Connect gas charge tool **R1** to gas valve (4) of accumulator (1) according to the following procedure.
   1) Turn handle (a) of gas charge tool **R1** to the left until it stops.
      • Nitrogen gas cylinder (c) must be connected even when you measure only the gas pressure.
      • Close the valve of nitrogen gas cylinder (c) and handle (b).
      • For connection of nitrogen gas cylinder (c) and gas charge tool **R1**, see "Procedure for charging accumulator with nitrogen gas".
   2) Install extension (8) (Part number: 792-610-2310), that is attached to tool **R1**, to gas valve (4), referring to "Precautions for connecting gas charge tool **R1**." Or install O-ring (Part number: 07000-11009), that is attached to tool **R1**, to gas valve (4).
      ★ Do not use the O-ring when installing the extension.



   3) Connect gas charge tool **R1** to gas valve (4) of accumulator (1).



<table>
<tr><td rowspan="15">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">7</td><td rowspan="4">Defective work equipment pump cut-off solenoid valve (NC valve)</td><td colspan="4">★ Measure outlet pressure of cut-off solenoid valve.</td></tr>
<tr><td colspan="2"></td><td colspan="2">Port P1 pressure</td></tr>
<tr><td colspan="2">• Port P1 pressure when forward or reverse travel speed exceeds 10 km/h</td><td colspan="2">Max. 0.3 MPa {Max. 3 kg/cm^2}</td></tr>
<tr><td colspan="2">• Port P1 pressure when forward or reverse travel speed is below 10 km/h</td><td colspan="2">Min. 3 MPa {Min. 30 kg/cm^2}</td></tr>
<tr><td rowspan="3">8</td><td rowspan="3">Defective work equipment pump ES valve</td><td colspan="4">★ Measure outlet pressure of ES valve.</td></tr>
<tr><td colspan="2"></td><td colspan="2">ES valve outlet pressure</td></tr>
<tr><td colspan="2">• Tilt bucket slowly with bucket lever with engine at high idle and measure ES valve outlet pressure when differential pressure in 6 above is 0.33 MPa {3.35 kg/cm^2}.</td><td colspan="2">1.8 MPa
{18.34 kg/cm^2}</td></tr>
<tr><td rowspan="5">9</td><td rowspan="5">Defective CO valve</td><td colspan="4">★ Measure CO cut-off pressure and CO output pressure of each pump.</td></tr>
<tr><td rowspan="4">• With engine at low idle, operate the bucket lever slowly to the tilt relief side and measure pressure.</td><td rowspan="2">Check pump</td><td colspan="2">CO valve pressure (MPa {kg/cm^2})</td></tr>
<tr><td>Cut-off pressure</td><td>Output pressure</td></tr>
<tr><td>Loader pump No. 1</td><td>27.5
{280}</td><td>0.37
{3.8}</td></tr>
<tr><td>Loader pump No. 2</td><td>25.2
{260}</td><td>0.74
{7.6}</td></tr>
<tr><td>Switch pump</td><td>29.4
{300}</td><td>0.37
{3.8}</td></tr>
<tr><td rowspan="4">10</td><td rowspan="4">Defective NC valve</td><td colspan="4">★ Measure NC valve output pressure of each pump.</td></tr>
<tr><td rowspan="3">• Engine at low idle
• Work equipment control lever in neutral
• Transmission shift lever in "N"</td><td>Check pump</td><td colspan="2">NC valve pressure (MPa {kg/cm^2})</td></tr>
<tr><td>Loader pump No. 1 (R)</td><td colspan="2">Min. 2.0 {Min. 20.0}</td></tr>
<tr><td>Switch pump (F)</td><td colspan="2">Min. 2.0 {Min. 20.0}</td></tr>
<tr><td rowspan="5">11</td><td rowspan="5">Defective work equipment cylinder</td><td colspan="4">★ Measure hydraulic drift of work equipment</td></tr>
<tr><td rowspan="3">• Hydraulic oil temperature: 45 – 55 ºC
• Stop engine, leave for 5 minutes, then measure for 15 minutes.
• Bucket empty
• Lift arm and bucket in horizontal position</td><td>Measurement points</td><td colspan="2">Drift (mm)</td></tr>
<tr><td>Drift of bucket hinge pin</td><td colspan="2">Max. 250</td></tr>
<tr><td>Drift of bucket cutting edge</td><td colspan="2">Max. 100 (Note)</td></tr>
<tr><td colspan="4">(Note) Exclude drift of bucket hinge pin.</td></tr>
<tr><td>12</td><td>Defective hydraulic pump</td><td colspan="4">Judge which hydraulic pump is defective from data of 4, 9, and 10 above.</td></tr>
</table>

H-24 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.

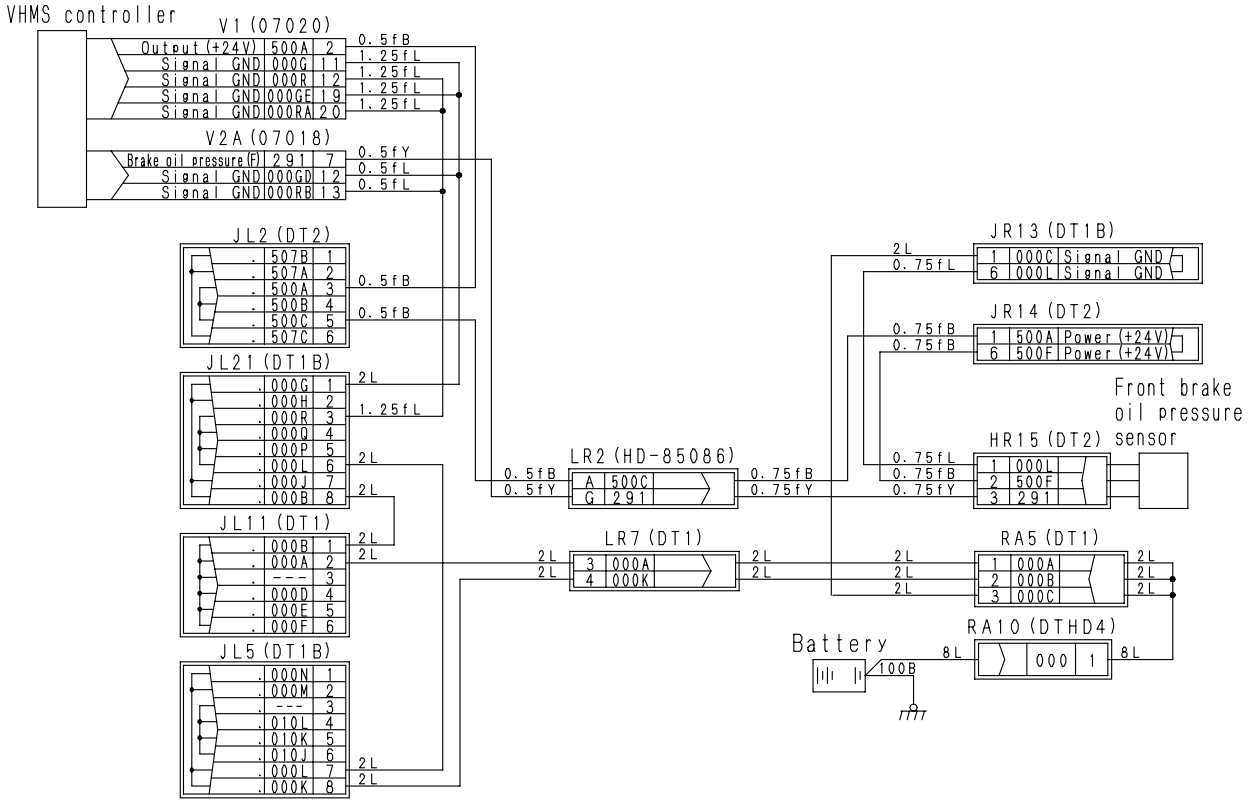
If the above symptoms occur together, refer to the troubleshooting items corresponding to each fault.

H-25 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.

Electric circuit diagram related to front brake oil pressure sensor



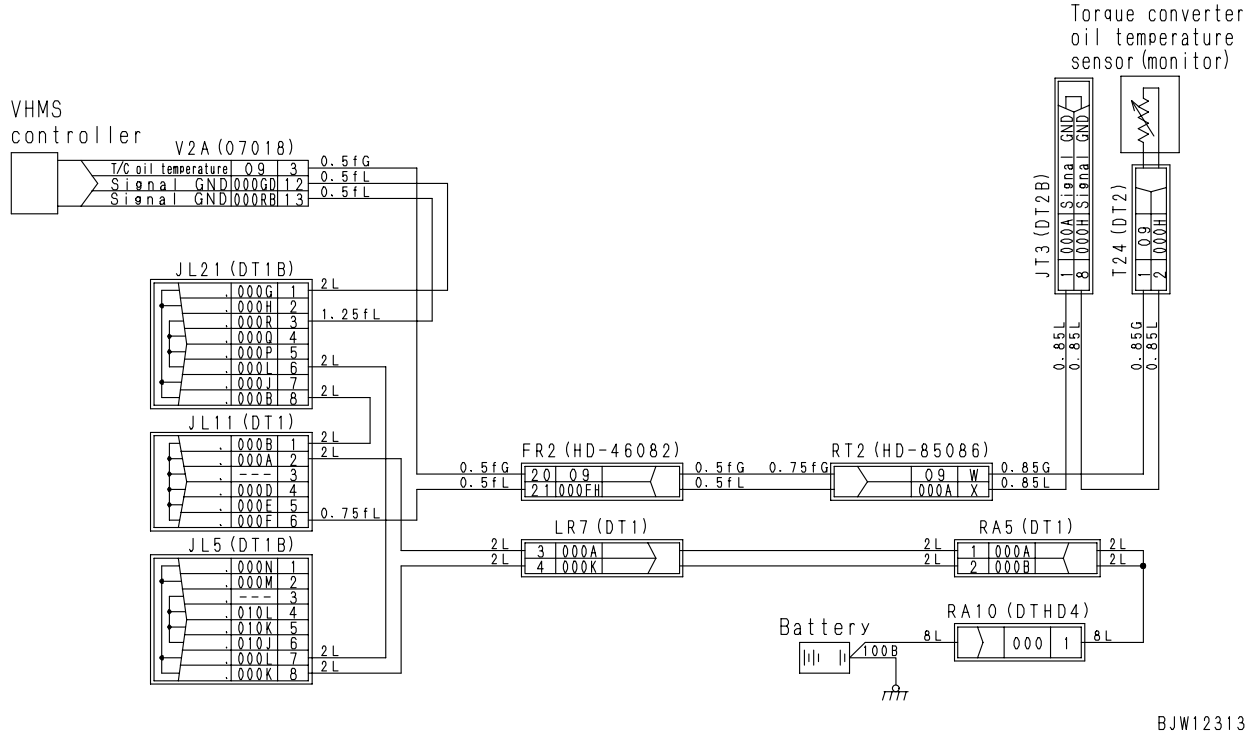
BJW12308

Failure code [b@CENS] Abnormally high torque converter oil temperature (above 130°C)

Action code	Failure code	Trouble	Abnormally high torque converter oil temperature (above 130°C) (VHMS controller system)
–	**b@CENS**		
Contents of trouble	Torque converter oil temperature overheat (above 130°C) is displayed.		
Action of controller			
Problem that appears on machine	• Torque converter oil temperature gauge always indicates "above 130°C". • Alarm screen is displayed wrongly.		
Related information	★ When connector is disconnected and T-adapter is inserted for troubleshooting while abnormality is detected or when T-adapter is removed and connector is connected again, if failure code is not displayed on monitor, system has reset itself.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Torque converter oil temperature above 130°C or defective torque converter oil temperature sensor	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			T24 (male)	Oil temperature	Resistance	
			Between (1) – (2)	Normal temperature (25°C)	Approx. 40 Ω	
				130°C	Approx. 1.7 Ω	
	2	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between V2A (female) (3) – T24 (female) (1) and chassis ground		Resistance	Min. 1 M Ω
	3	Defective VHMS controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			V2A (female)	Resistance		
			Between (3) – chassis	Min. 1 M Ω		

Electric circuit diagram related to torque converter oil temperature sensor

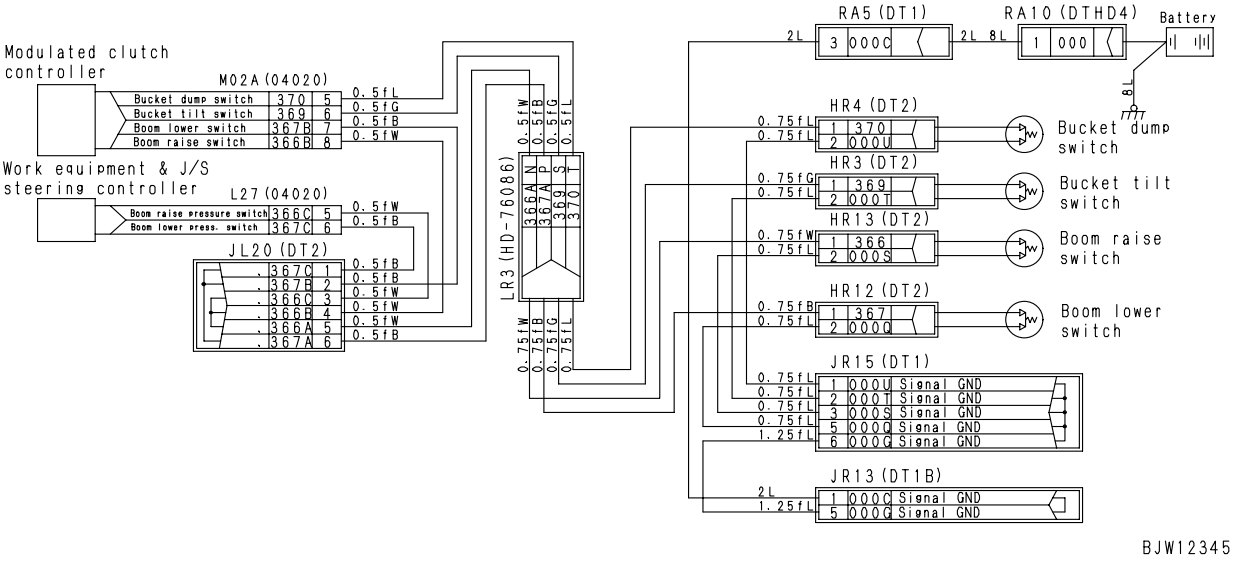


Failure code [DBB6KP] VHMS sensor power supply (24 V) abnormality

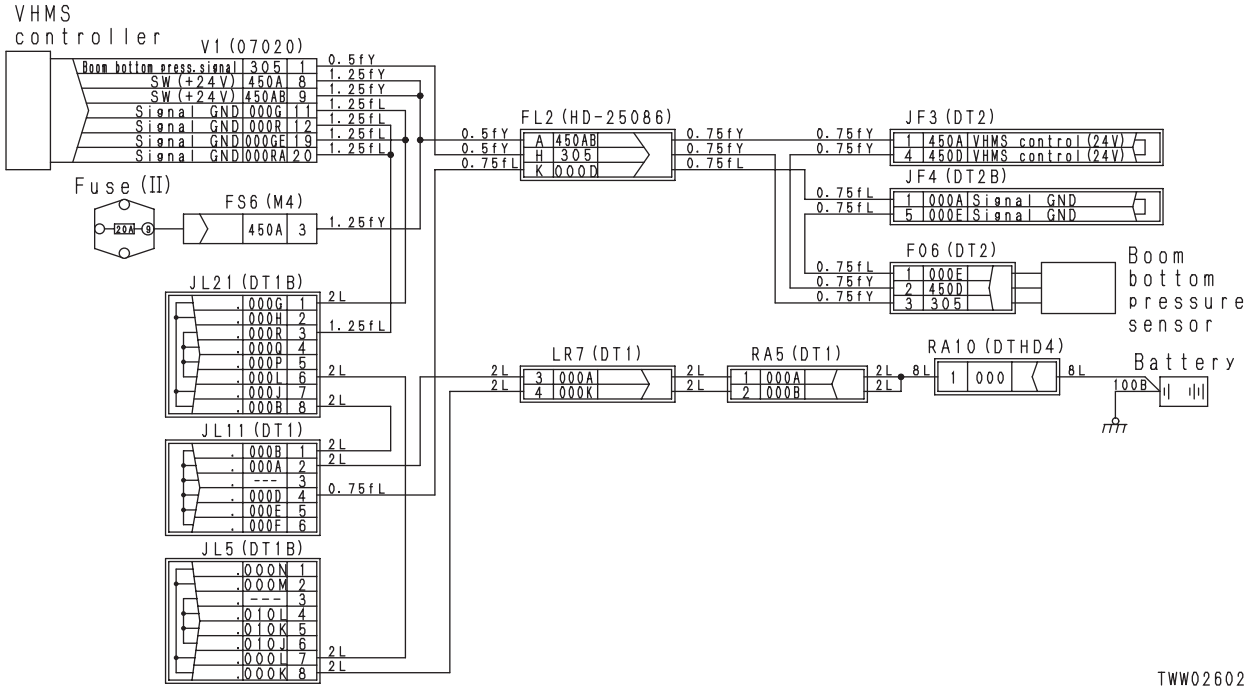
Action code	Failure code	Trouble	VHMS sensor power supply (24 V) abnormality (VHMS controller system)
–	**DBB6KP**		
Contents of trouble	VHMS sensor power supply (24 V) circuit voltage is low.		
Action of controller	Stops outputting signals.		
Problem that appears on machine	Values of sensor which use power supply are abnormal.		
Related information			

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective sensor whose symbol is not displayed	★ Turn starting switch OFF and connect each connector, and then turn starting switch ON each time to disconnect each connector.		
			Disconnect sensors MT2, 3, 4, 5, HR15, 16, HS2, 3 and 4 one by one and see if their symbols go off.		
	2	Defective joint connector (JT2, JR14 or JL2)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between pins JT2 (male), JR14 (male) and JL2 (male)	Resistance	Max. 1 Ω
	3	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between V1 (female) (2) – JL2 (female) (3) and chassis ground	Resistance	Min. 1 M Ω
			Wiring harness between JL2 (female) (4) – JT2 (female) (1) or between JL2 (female) (5) – JR14 (female) (1) and chassis ground	Resistance	Min. 1 M Ω
			Wiring harness between JT2 (female) (2), (3), (4), (5) – MT5 (female) (2), MT4 (female) (2), MT3 (female) (2), MT2 (female) (2) and chassis ground	Resistance	Min. 1 M Ω
			Wiring harness between JR14 (female) (2), (3), (4), (5), (6) – HS4 (female) (2), HS2 (female) (2), HS3 (female) (2), HR16 (female) (2), HR15 (female) (2) and chassis ground	Resistance	Min. 1 M Ω
	4	Defective VHMS controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			V1	Voltage	
			Between (2) – chassis	22 – 25 V	

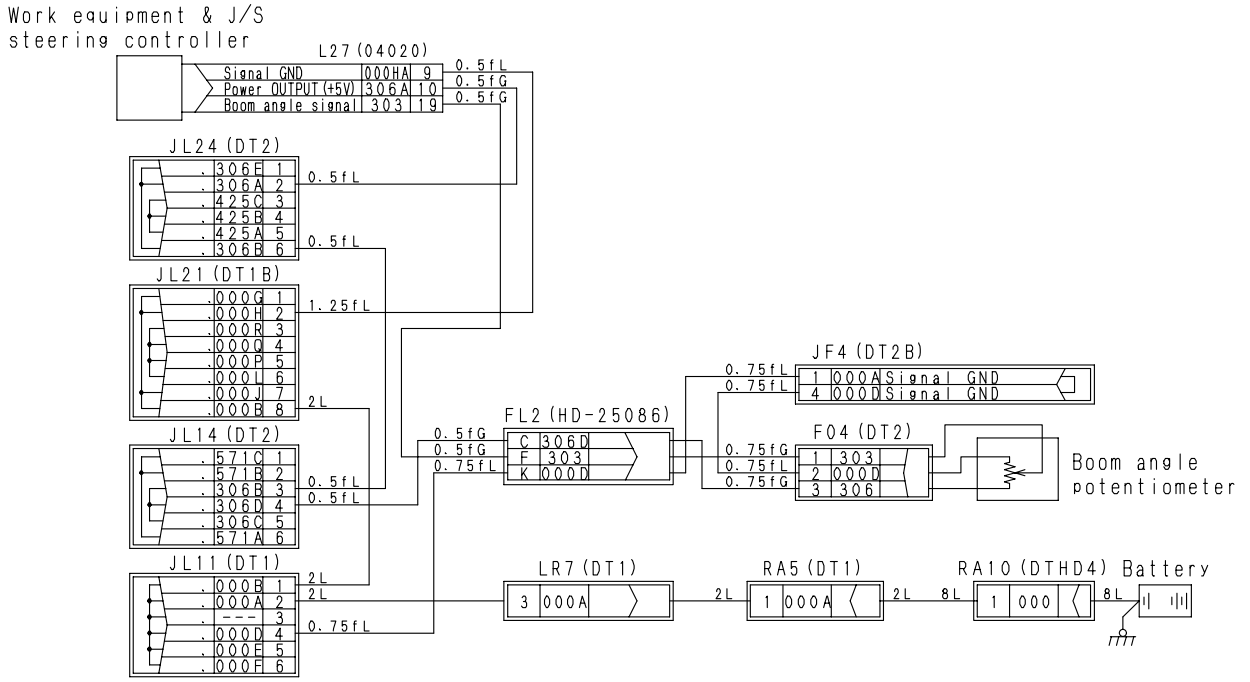
Electric circuit diagram related to work equipment PPC pressure switch



Electric circuit diagram related to boom bottom pressure sensor



Electric circuit diagram related to boom angle sensor



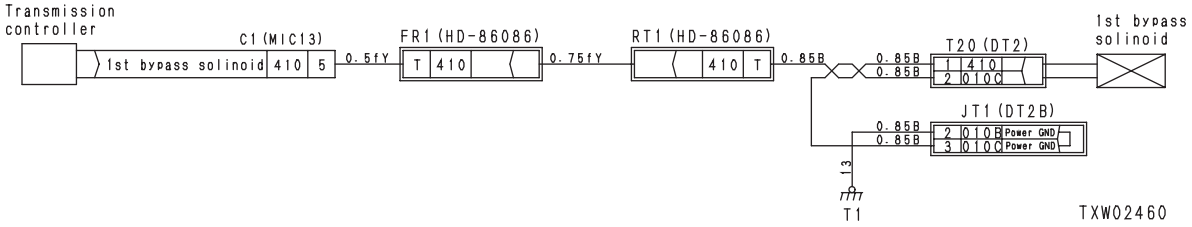
BJW12336

Failure code [DW25KB] 1st bypass valve system abnormality (Hot short)

Action code	Failure code	Trouble	1st bypass valve system abnormality (Hot short) (Transmission controller system)
E01	**DW25KB**		
Contents of trouble	1st bypass valve circuit has hot short.		
Action of controller	Stops outputting signals.		
Problem that appears on machine	1st clutch engagement shocks are made and engaging time increases (Clutch is engaged finally, however).		
Related information	★ When connector is disconnected and T-adapter is inserted for troubleshooting while abnormality is detected or when T-adapter is removed and connector is connected again, if failure code is not displayed on monitor, system has reset itself.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective 1st bypass solenoid	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			T20 (male)	Resistance	
			Between (1) – (2)	5 – 15 Ω	
			Between (1), (2) – chassis	Min. 1 MΩ	
	2	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between C1 (female) (5) – T20 (female) (1) and chassis ground	Resistance	Min. 1 MΩ
	4	Defective transmission controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			C1 (female)	Resistance	
			Between (5) – chassis	Min. 1 MΩ	

Electric circuit diagram related to 1st bypass valve

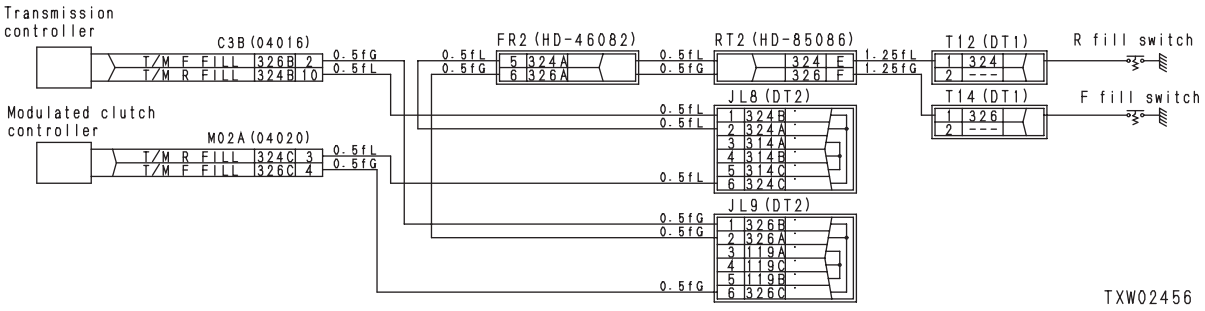


E-16 Disconnection in R ECMV fill switch system

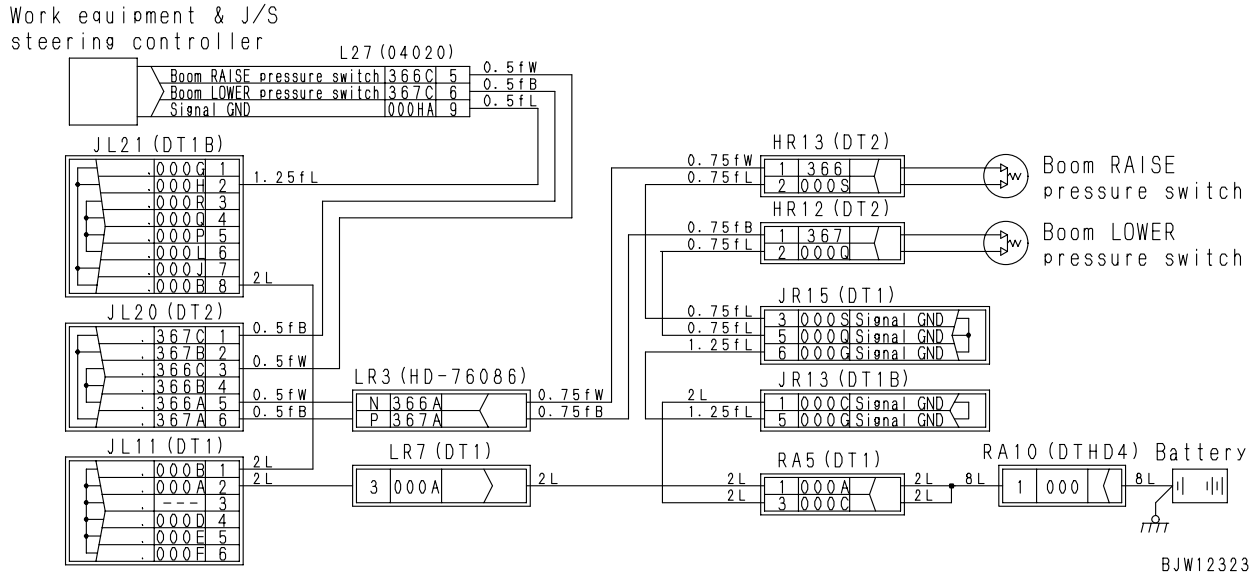
Contents of trouble	Disconnection in R ECMV fill switch system
Related information	

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting			
	1	Defective R ECMV fill switch	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			T12	Voltage		
			Between (1) – chassis	20 – 30 V		
			• Turn transmission cut-off switch OFF (Light off). • Turn parking brake switch OFF. • Press brake.			
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between M02A (female) (3) – T12 (female) (1)	Resistance	Max. 1 Ω	
	3	Defective modulated clutch controller	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between M02A (female) (3) – T12 (female) (1)	Resistance	Max. 1 Ω	

Electric circuit diagram related to R ECMV fill switch



Electric circuit diagram related to boom "Raise"/"Lower" sensor pressure switch

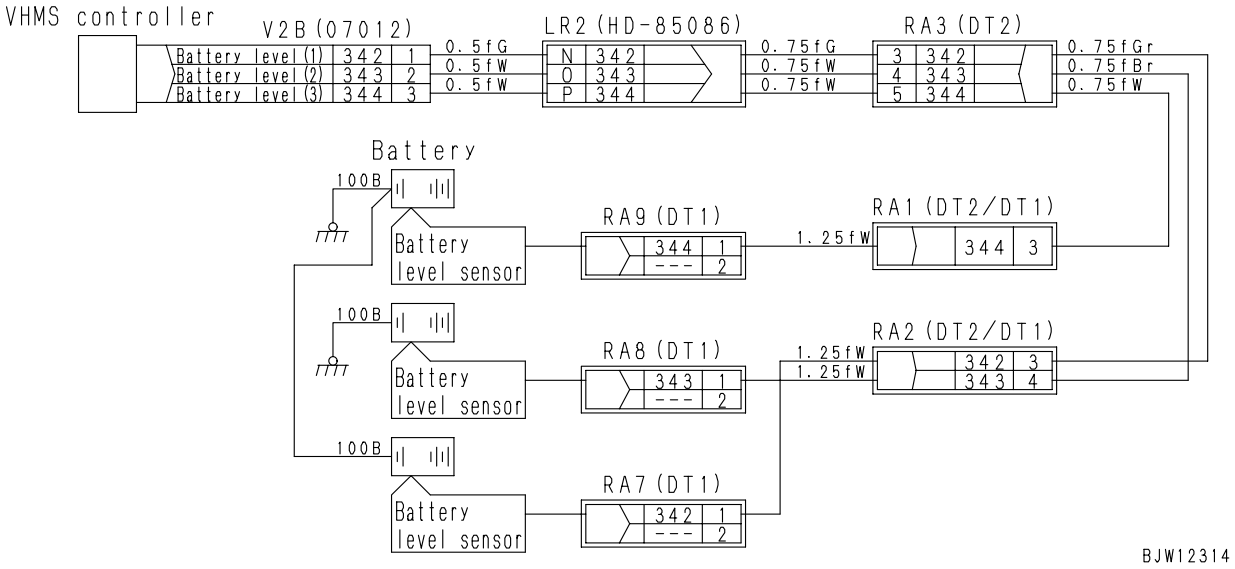


E-62 Hot short in battery electrolyte level sensor [3] system

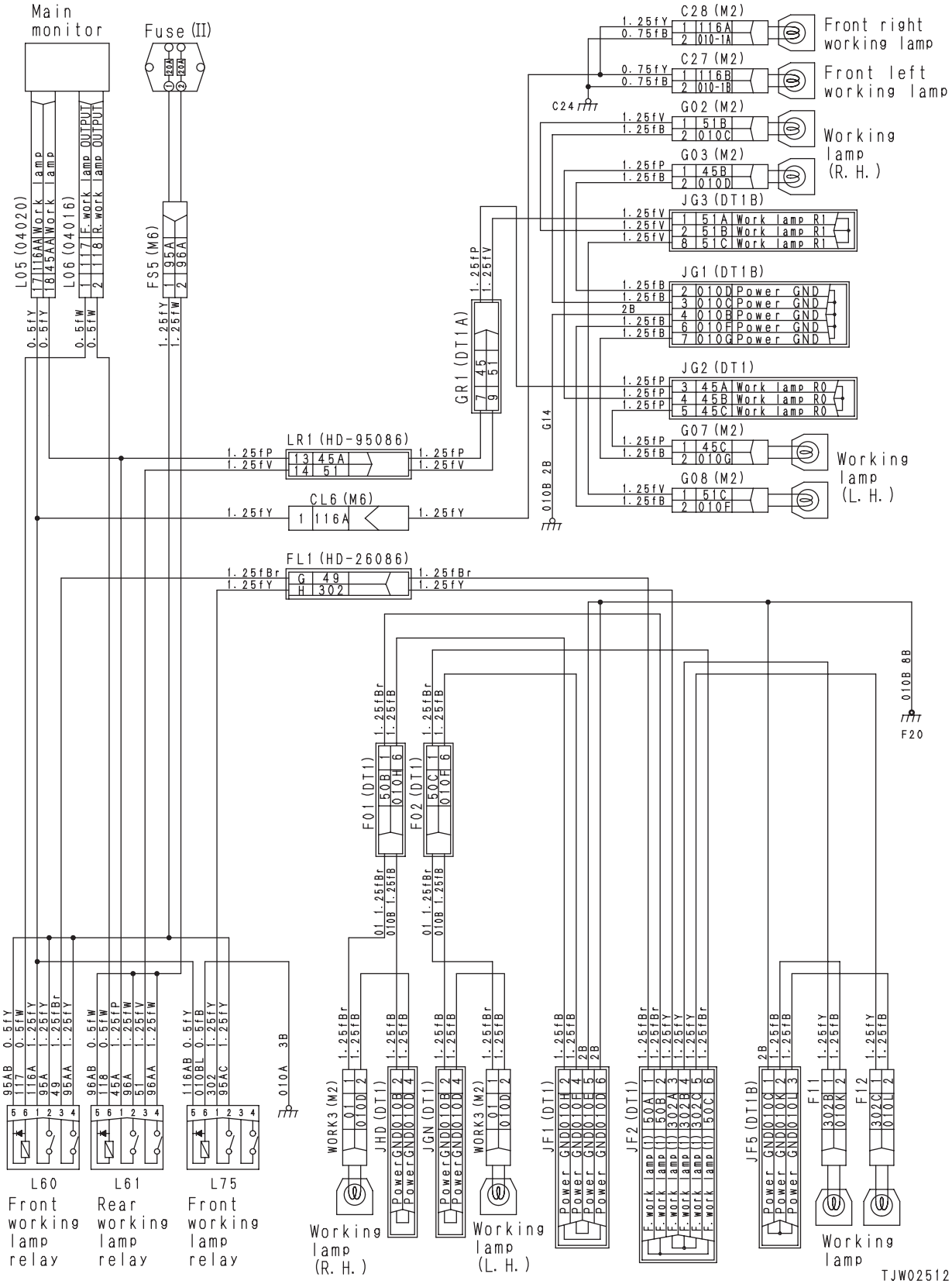
Contents of trouble	Hot short in battery electrolyte level sensor [3] system
Related information	

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Hot short (Contact with 24 V circuit) in wiring harness	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Wiring harness between V2B (female) (3) – RA9 (female) (1) and chassis ground	Voltage	Max. 1 V
	2	Defective VHMS controller	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			V2B (female)	Voltage	
			Between (3) – chassis	Max. 1 V	

Electric circuit diagram related to battery electrolyte level sensor



Electric circuit diagram related to front working lamp



How to read this manual

1. Removal and installation of assemblies

Special tools

- Special tools which are deemed necessary for removal or installation of parts are described as **A1**,•••**X1** etc. and their part names, part numbers and quantities are described in the special tool list.
- Also the following information is described in the special tool list.

1) Necessity
   - ■ : Special tools that cannot be substituted and should always be used (installed).
   - ● : Special tools that will be useful if available and are substitutable with commercially available tools.
2) Distinction of new and existing special tools
   - N : Tools newly developed for this model. They respectively have a new part number.
   - R : Tools with upgraded part numbers. They are remodeled from already available tools for other models.
   - Blank: Tools already available for other models. They can be used without any modification.
3) Circle mark ○ in sketch column:
   - The sketch of the special tool is presented in the section of “Sketches of special tools”.
   - Part No. of special tools starting with 79∗T-∗∗∗-∗∗∗∗: means that they can not be supplied from Komatsu in Japan (i.e. locally made parts).

★ General tools that are necessary for removal or installation are described as [1],[2]•••etc. and their part names, part numbers and quantities are not described.

Removal

- The [Removal] section contains procedures and precautions for implementing the work, know how and the amount of oil or coolant to be drained.
- Various symbols used in the Removal Section are explained and listed below.

⚠ : **This mark indicates safety-related precautions that must be followed when implementing the work.**
★ : Know-how or precautions for work
[*1] : This mark shows that there are instructions or precautions for installing parts.
: This mark shows the amount of oil or coolant to be drained.
: Weight of part or component

Installation

- Except where otherwise instructed, installation of parts is done in the reverse order of removal.
- Instructions and precautions for installing parts are shown with [*1] mark in the Installation Section, identifying which step the instructions are intended for.
- Marks shown in the Installation Section stand for the following.

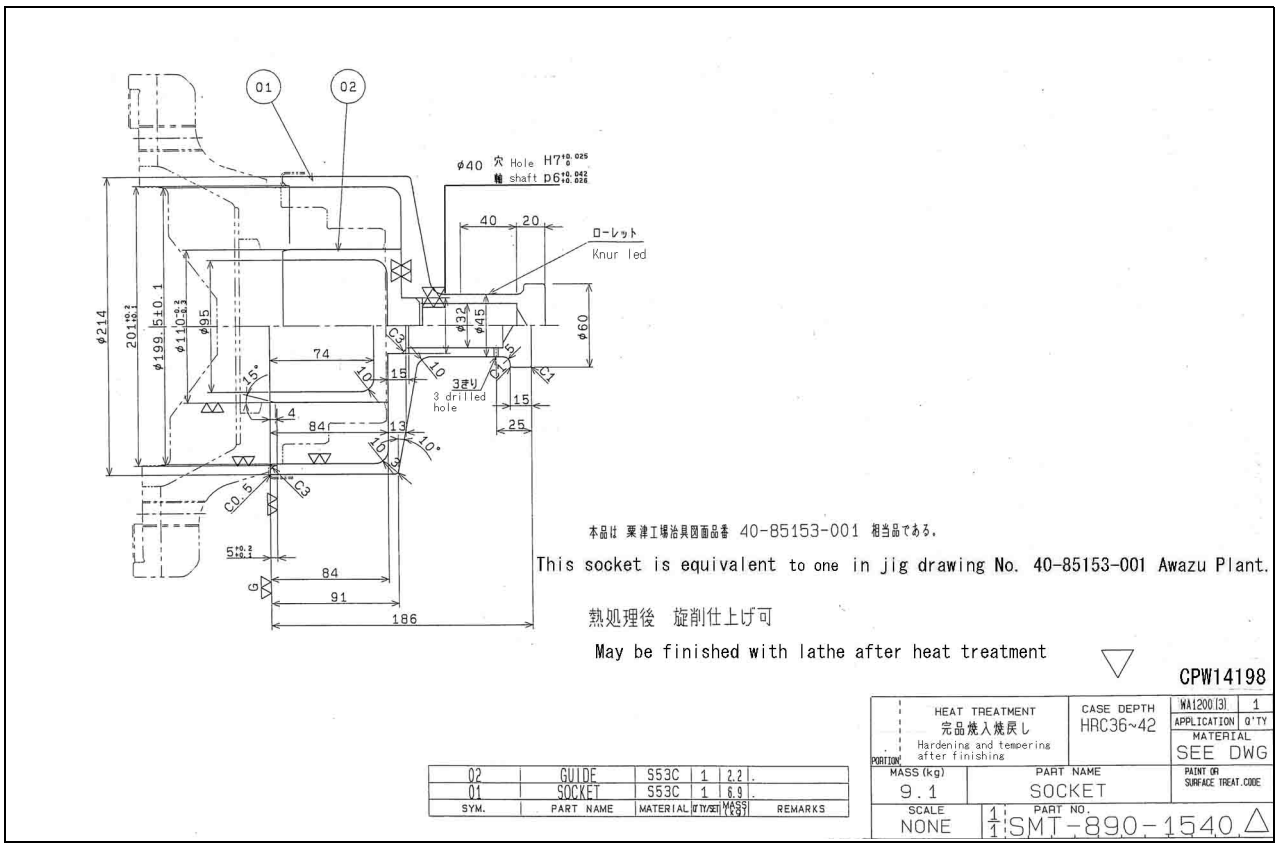
⚠ : **Precautions related to safety in execution of work.**
★ : This mark gives guidance or precautions when doing the procedure.
: Type of coating material
: Tightening torque
: Quantity of oil or coolant to be added

Sketches of special tools

- Various special tools are illustrated for the convenience of local manufacture.

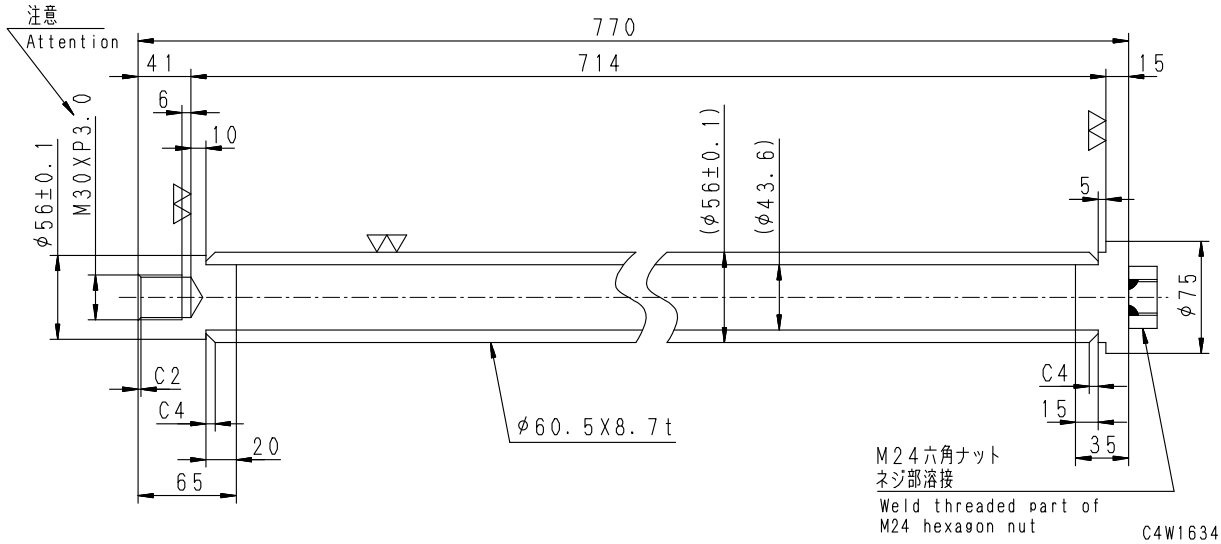
Note: Komatsu cannot accept any responsibility for special tools manufactured according to these sketches.

D4 Socket



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

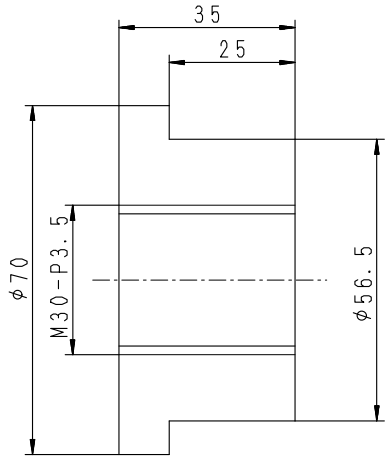
T3 (3/8) Guide bar



1. 本図は 炭酸ガスアーク溶接の開先寸法・隅肉脚長を示す。
   手溶接で行う場合は KES 04.351による。
   THIS DRAWING SHOWN CO -GAS ARC WELDING GROOVE DIMENSIONS AND LEG LENGTH. FOR MANUAL WELDING PER KES 04.351.
2. 溶接部の品質は KES 04.343による。
   WELDING QUALITY TO CONFORM TO KES 04.343.
3. パイプ接合部は、▽にて溶接のこと。
   WELD EACH PIPE JOINT AT THE GRADE OF ▽, UNLESS OTHERWISE SPECIFIED.
4. 指示なき角部は、C0.5にて加工のこと。
   CHAMFER EACH CORNER TO C0.5, UNLESS OTHERWISE SPECIFIED.

		WA1200(3)	2
PORTION	HEAT TREATMENT: ---- / CASE DEPTH: ----	APPLICATION	Q'TY
		MATERIAL: WELD	
MASS (kg): 10.22	PART NAME: GUIDE BAR	PAINT OR SURFACE TREAT. CODE	
SCALE: NONE	PART NO.: SMT-890-5320 △1		

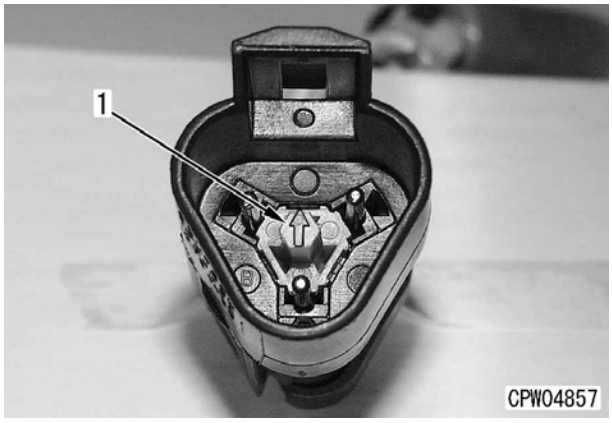
T3 (4/8) Flange nut



★ 指示なき角部は、C1にて加工のこと。
★ Chamfer each corner to C1, unless otherwise specified.

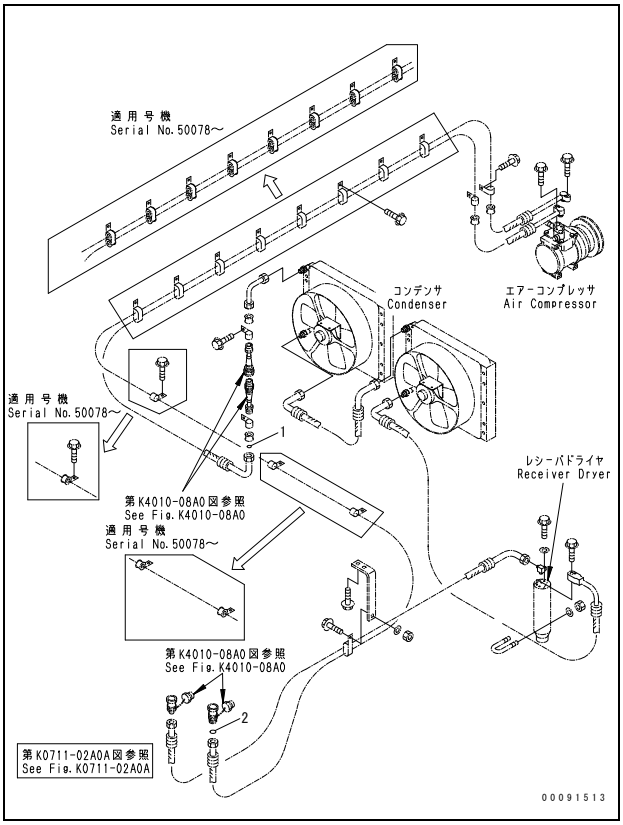
		WA1200(3)	1
PORTION	HEAT TREATMENT: ---- / CASE DEPTH: ----	APPLICATION	Q'TY
		MATERIAL: S45C	
MASS (kg): 0.6	PART NAME: FLANGE NUT	PAINT OR SURFACE TREAT. CODE	
SCALE: NONE	PART NO.: SMT-890-5330 △		

3. After inserting all wires, install wedge (1).
   ★ Install the 3-pin connector (both male and female side) with the arrow of the wedge directed to the fitting part of the connector housing. (Photo shows male side)

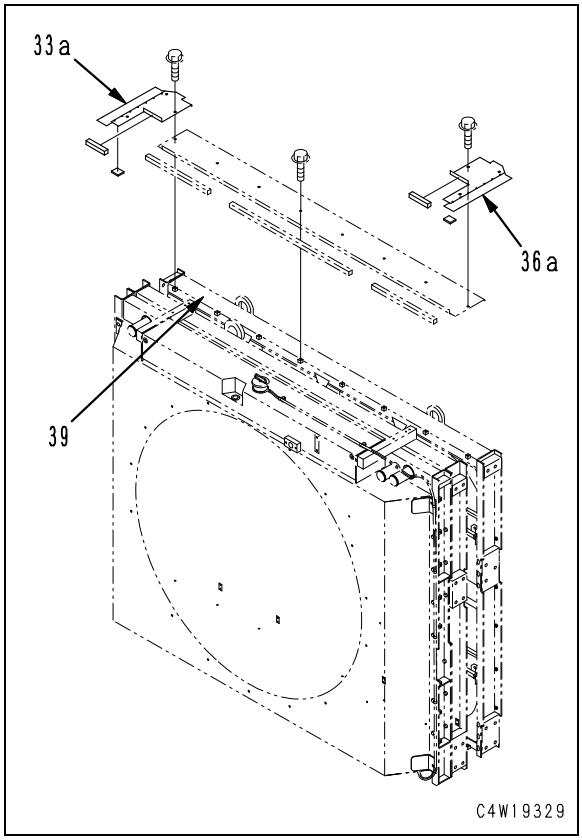


SERVICE KIT PARTS LIST

KIT Part No. : 42C-07-05030 (Service kit for installation of engine)
Fig. No. : Y0000-R0006 (AIR CONDITIONER RELATED PARTS)

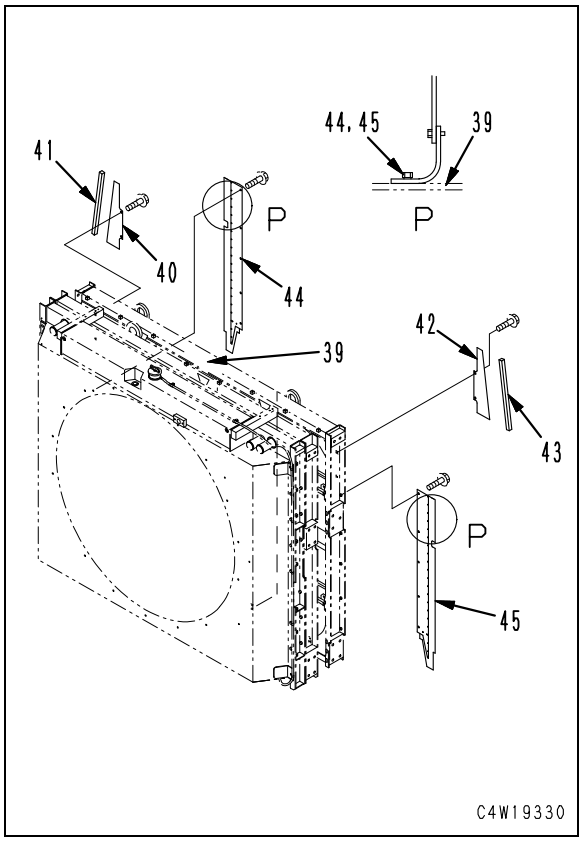


Index	Part No.	Part name	Q'ty
1	20Y-979-3140	O-RING	2
2	20Y-979-3130	O-RING	1

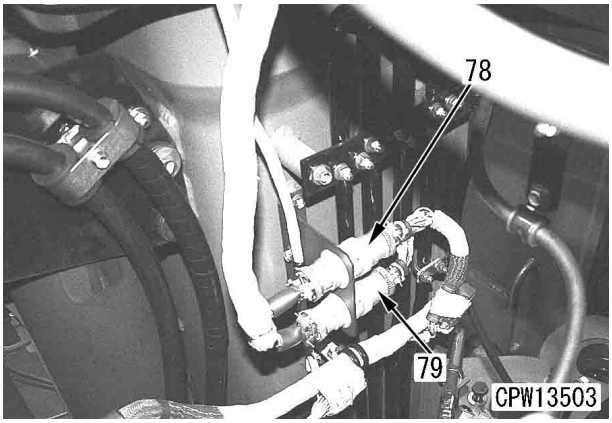


4. Fan guard side face (1)
   1) Paste sheet (41) to baffle (40), and then install the baffle assembly (LH) to the upper part of the left side face of rear oil cooler (39).
   2) Fix the assembly using two mounting bolts.
   3) Paste sheet (43) to baffle (42), and then install the baffle assembly (RH) to the upper part of the right side face of rear oil cooler (39).
   4) Fix the assembly using two mounting bolts.
   5) Install baffle (LH) (44) to the left side face of the rear oil cooler.
   6) Fix the assembly using five mounting bolts.
   7) Install baffle (RH) (45) to the right side face of the rear oil cooler.
      ★ Install the baffle applying its rubber to the radiator guard sheet (see detailed illustration of section P).
   8) Fix it using five mounting bolts.

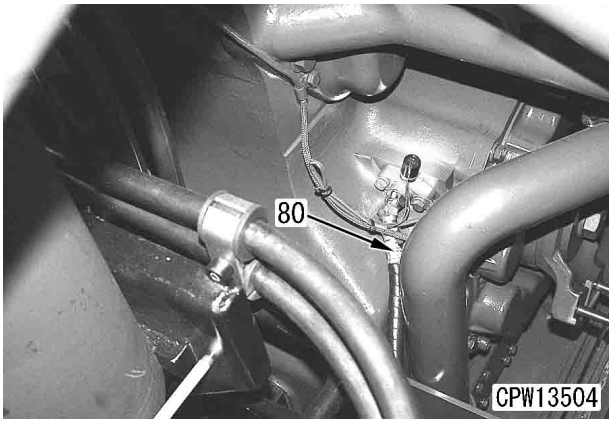
★ Add "R50-36-" to the head of each of the designated numbers shown below to know their part numbers described in the KIT part number list.



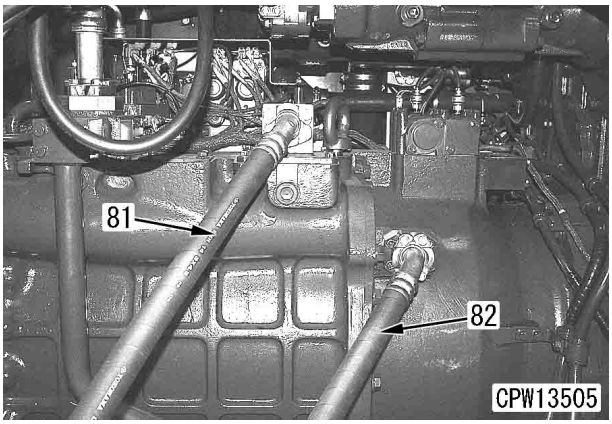
48. Remove wiring harness clamp and disconnect wiring harnesses TM1 (78) and TM2 (79).



49. Disconnect hose (80).



50. Disconnect hoses (81) and (82).



51. Remove two work equipment pump assembly. For details, see "Removal and installation of work equipment pump assembly (Right side)" and "Removal and installation of work equipment pump assembly (Left side) ".

52. Remove steering pump, control pump and PPC pump assembly. For details, see "Removal and installation of steering pump, control pump and PPC pump assembly".

53. Remove switching pump assembly. For details, see "Removal and installation of switching pump assembly".

54. Sling upper drive shaft (83), remove its mounting bolts, and lift it off. [*3]
    ★ When removing the drive shaft, make a match mark on the coupling to indicate the mounting position.

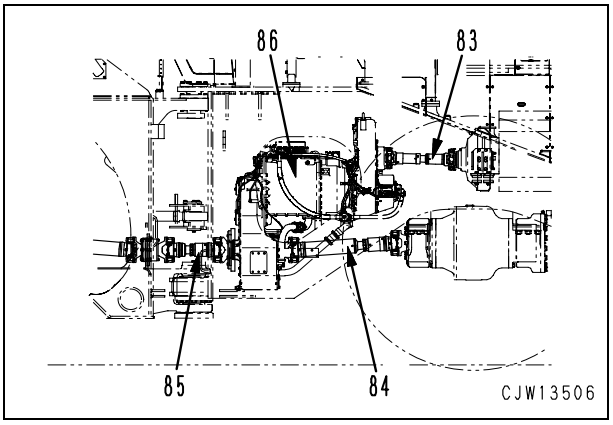
    Upper drive shaft: **115 kg**

55. Sling rear drive shaft (84), remove its mounting bolts, and lift it off. [*4]
    ★ When removing the drive shaft, make a match mark on the coupling to indicate the mounting position.

    Rear drive shaft: **290 kg**

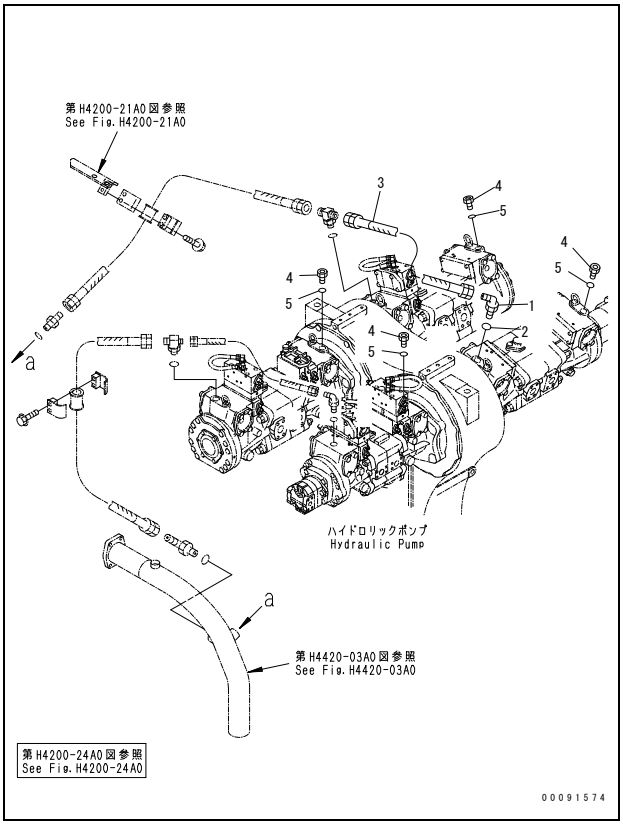
56. Sling center drive shaft (85), remove its mounting bolts, and lift it off. [*5]
    ★ When removing the drive shaft, make a match mark on the coupling to indicate the mounting position.

    Center drive shaft: **190 kg**



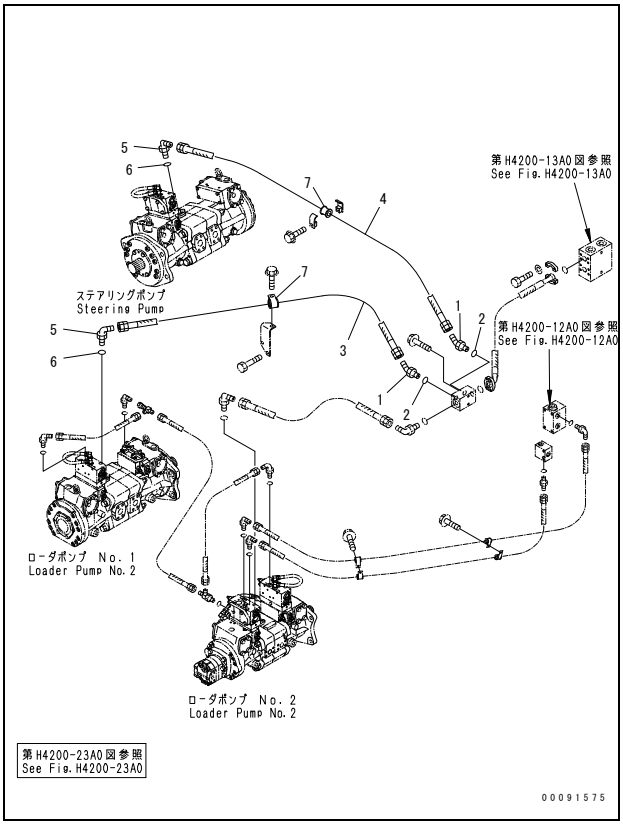
SERVICE KIT PARTS LIST

KIT Part No. : 42C-62-05190 (Service kit for installation of torque converter and transmission)
Fig. No. : Y0000-R0067 (STEERING PUMP) (PUMP DRAIN LINE)



Index	Parts No.	Part name	Q'ty
1	07235-10628	ELBOW	1
2	07002-22434	O-RING	1
3	07102-20606	HOSE	1
4	07040-12412	PLUG	4
5	07002-22434	O-RING	4

KIT Part No. : 42C-62-05190 (Service kit for installation of torque converter and transmission)
Fig. No. : Y0000-R0068 (STEERING PUMP) (PILOT VALVE CONTROL LINE)



Index	Parts No.	Part name	Q'ty
1	07236-10628	ELBOW	2
2	07002-22434	O-RING	2
3	07624-00614	HOSE	1
4	07624-00613	HOSE	1
5	07235-10628	ELBOW	2
6	07002-22434	O-RING	2
7	07095-00526	CUSHION	2

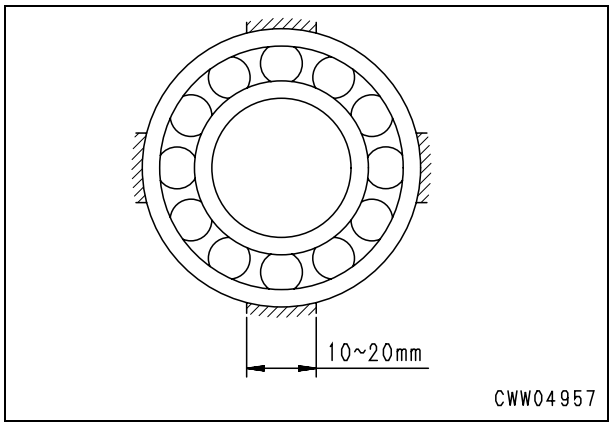
Assembly

1. Shaft

1) Install sleeve (24) to shaft (22).
   ★ Install the sleeve by expansion fit.
2) Press fit the inner race of roller bearing (19) to shaft (22).
   ★ Push the inner race with a press until its end touches the shoulder of the shaft.
3) Install plate (21) to shaft (22) with the 4 bolts.
4) Install seal ring (23) to shaft (22).
   Seal ring: **Grease (G2-LI)**

2. Pump assembly

1) Install drain plug (20) to pump (18).
   Drain plug:
   9.8 – 12.7 Nm {1.0 – 1.3 kgm}
2) Press fit the outer race of roller bearing (19) to guide (17).
   ★ Apply bearing compound to 4 places of the periphery of the bearing. After installing the outer race, wipe off the projected compound so that it will not enter the bearing.



   ★ Push the outer race with a press until its end touches the shoulder of the guide.
3) Install guide (17) and retainer (16) to pump (18) with 16 bolts.
   Threaded parts of mounting bolt:
   Liquid adhesive (LT-2)
   Mounting bolt:
   59 – 74 Nm {6.0 – 7.5 kgm}
4) Install pump assembly (15) to shat (22).
   ★ Since the outer race and inner race of the roller bearing are coupled with each other, lower the pump assembly vertically, taking care not to tilt it.

3. Stator

1) Install spacer (14).
2) Install stator (13) and secure it with snap ring (12).

4. Case and turbine assembly

1) Install ball bearing (10) to case (11).
   ★ Push the ball bearing with a press until its snap ring touches the shoulder of the case.
   ★ After press fitting the bearing, drop about 6 cc of engine oil (EO30-CD or EO10-CD) onto the sliding parts and rotate the bearing 10 turns to spread the oil.
2) Install turbine (9).
   ★ Support the inner race of the ball bearing and push the turbine with a press until the shoulder of the turbine touches the end of the inner race.
3) Install cover (8) and secure it with snap ring (7).
4) Install wire (6) and secure it with snap ring (5).
5) Install case and turbine assembly (4) with the 36 bolts.
   ★ Match the internal oil groove on case to the drain plug of the pump.
   Threaded parts of mounting bolt:
   Liquid adhesive (LT-2)
   Mounting bolt:
   49 – 59 Nm {5 – 6 kgm}

5. Input shaft

1) Install the inner race of tapered roller bearing (3) to shaft (2).
   ★ Push the inner race with a press until its end touches the shoulder of the shaft.
2) Install shaft (2) with the 20 bolts.
   Threaded parts of mounting bolt:
   Liquid adhesive (LT-2)
   Mounting bolt:
   245 – 309 Nm {25.0 – 31.5 kgm}

6. Case

Install the torque converter to case (1) with the 13 bolts.

★ Install a hanging bolt (12 mm) to the input shaft end, then sling and install the torque converter vertically.

Threaded parts of mounting bolt:
Liquid adhesive (LT-2)
Mounting bolt:
245 – 309 Nm {25.0 – 31.5 kgm}

6. PTO gear 1 (gear D)

1) Install the inner races of taper roller bearings (10) and (5) to gear (8).
   ★ Using a press, press fit the inner race until its end face comes in contact with the stepped part of the gear.

2) Install snap ring (9) to gear (8).

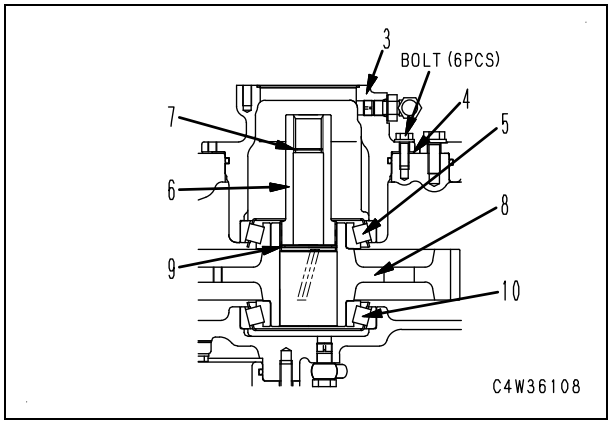
3) Install gear (8).
   ★ Drop transmission oil (TO30 or TO10) about 6 cc to the sliding portion of the bearing and rotate the bearing ten turns to run in the bearing.

4) Install snap ring (7) to coupling (6).

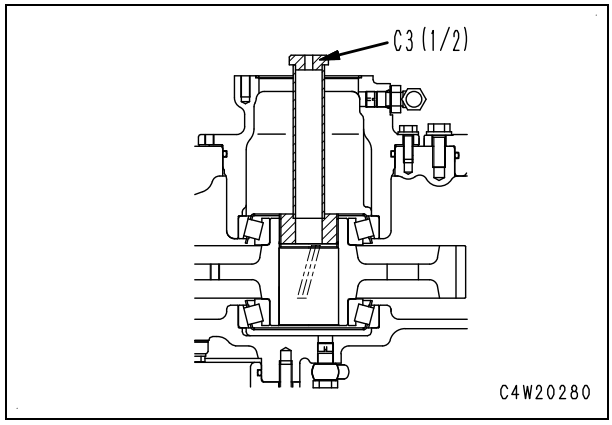
5) Install coupling (6).

6) Install the outer race of taper roller bearing (5) to cage (3).
   ★ Using a press, press fit the outer race until its end face comes in contact with the stepped part of the cage.

7) Install cage (3) with the O-ring and tighten six mounting bolts to 4.9 Nm {0.5 kgm} without fitting shim (4).
   ★ Drop transmission oil (TO30 or TO10) about 6 cc to the sliding portion of the bearing and rotate the bearing ten turns to run in the bearing.

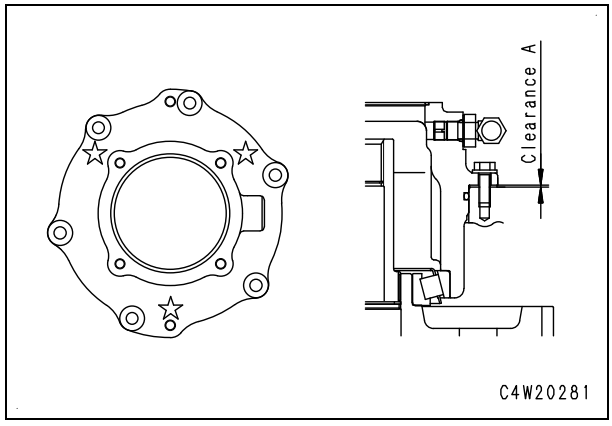


8) Using tool **C3** (1/2), rotate gear (8) 20 turns, and then check the tightening torque of the mounting bolts of cage (3).

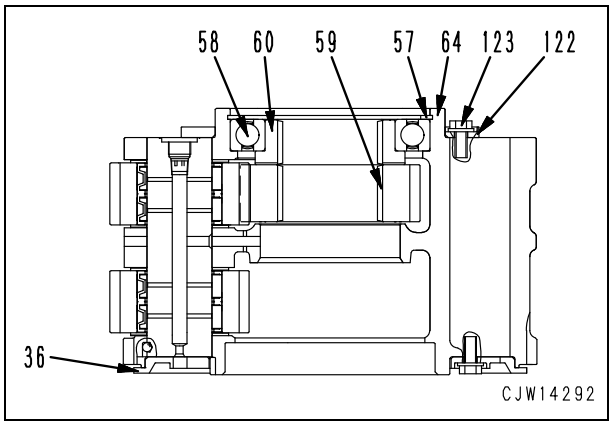


9) If the tightening torque has changed, repeat Steps 7) and 8).

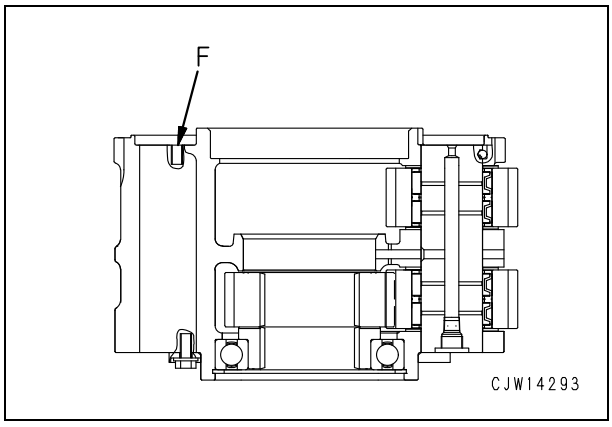
10) If the tightening torque has not changed, loosen the mounting bolts of cage (3) and measure clearance A at three places and obtain the average.
   ★ Measuring point of clearance: Position marked with ☆
   ★ If the dispersion of the values measured at the three places does not fall within 0.15 mm, check whether the bearing is correctly installed, or there is any other cause. Take a corrective action so that the dispersion falls in the normal range.



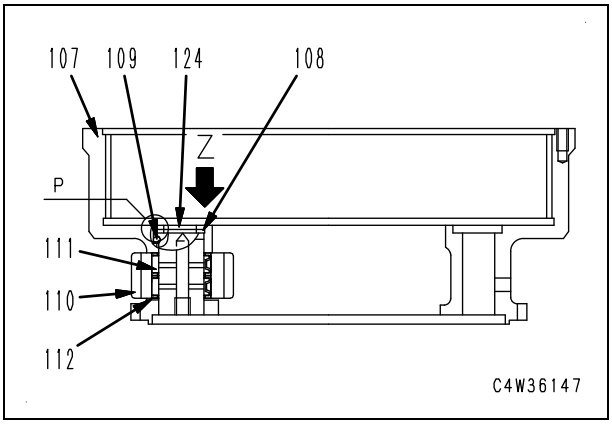
4) Assembly procedure for 3rd gear
   1] Install 3rd sun gear (59) to F-3rd carrier (64).
   2] Using the push tool, press fit bearing (58) to collar (60).
   3] Press fit bearing (58) and collar (60) assembly to F-3rd carrier (64).
   4] Install snap ring (57).
   5] Install plate (122) to F-3rd carrier (64) with bolts (123) and washers.
   Mounting bolt: **Adhesive (LT-2)**
   Mounting bolt:
   98 – 123 Nm {10 – 12.5 kgm}

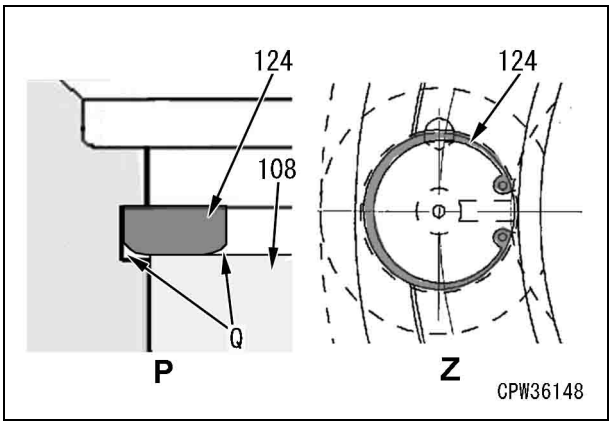


   6] Reverse the F-3rd carrier assembly and remove plate (36) which has been installed temporarily.
   ★ Plate (36) must be removed since tap holes "F" for installing it are used as hanging tap holes for general assembly of the transmission.

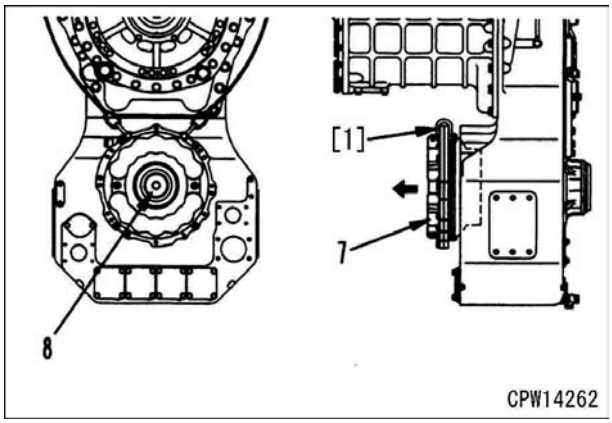


5) Assembly procedure for 2nd carrier
   1] Place 2nd carrier (107) (42C-15-22310) with the output side (ball groove side) up. Install bearing (111) to 2nd line planetary gear (110), fit thrust washers (112) to its both sides, and set them to carrier (107).
   ★ When installing, take care not to bruise the thrust washers (112).
   ★ Set the planetary gear, bearing and thrust washers to the carrier hole so that pinion shaft (108) will not be hitched when inserted.
   ★ Install the 4 sets.
   2] Cool pinion shaft (108) in dry ice and then fit ball (109) and insert the pinion shaft in carrier (107).
   ★ Match the ball to the cut of the carrier and can push the shaft with a press until it is flush with the carrier.
   3] Install four snap rings (124) (04065-05020).
   ★ Install the snap ring (124) with the rounding side (Q) facing the pinion shaft (108) side. Confirm that the snap ring (124) is firmly installed to the snap ring groove.
   ★ Install the 4 sets.



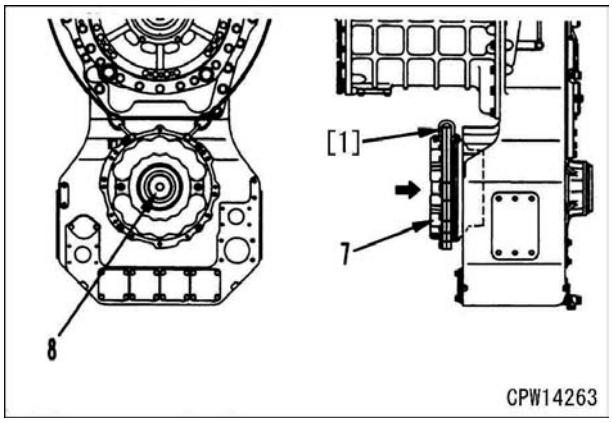


5) Using output shaft (8) as a guide, slide off parking brake assembly (7) to the rear of the vehicle body.

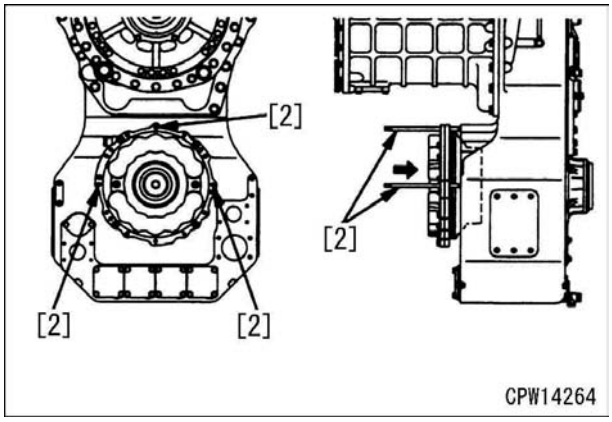


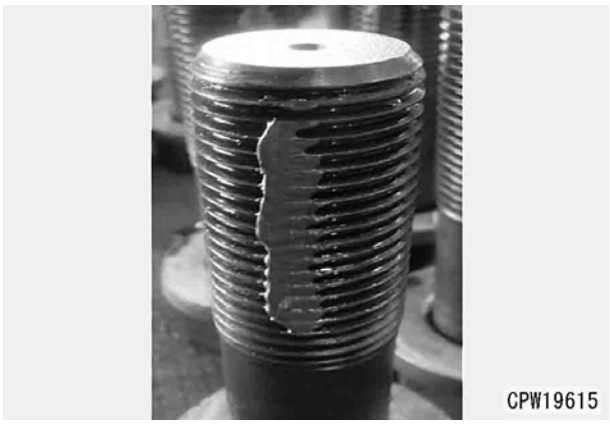
Installation

1. Install parking brake assembly (7) according to the following procedure and tighten the 10 mounting bolts temporarily.
1) Install shackles [1] as shown in the figure.
2) Sling parking brake assembly (7) from both sides of the transmission and slide it toward the transfer until it is placed on output shaft (8) perfectly.

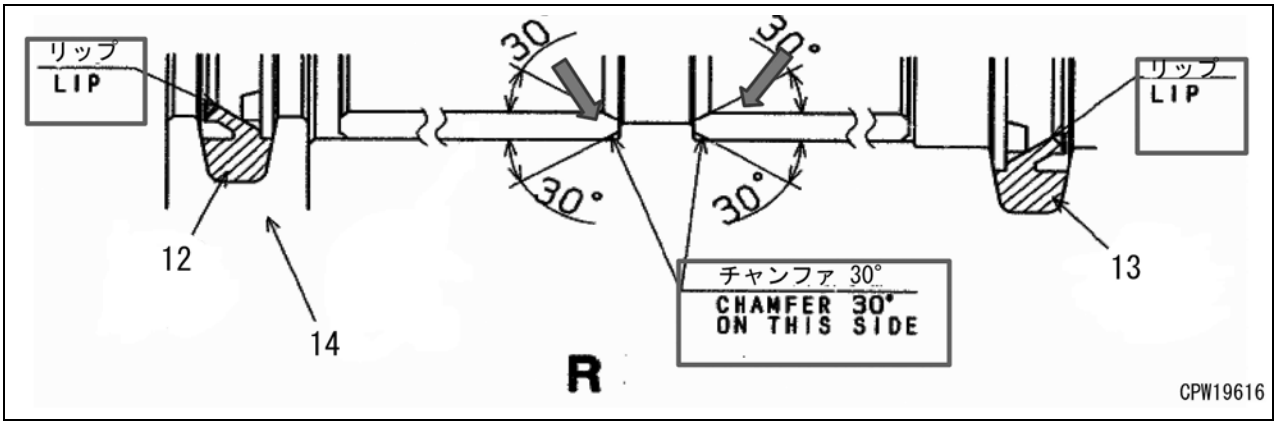


3) Remove shackles [1] and install 3 guide bolts [2] as shown in the figure.
4) Push parking brake assembly (7) toward the transfer to set it to the position for installation.
5) Tighten the 10 mounting bolts temporarily and remove guide bolts [2].

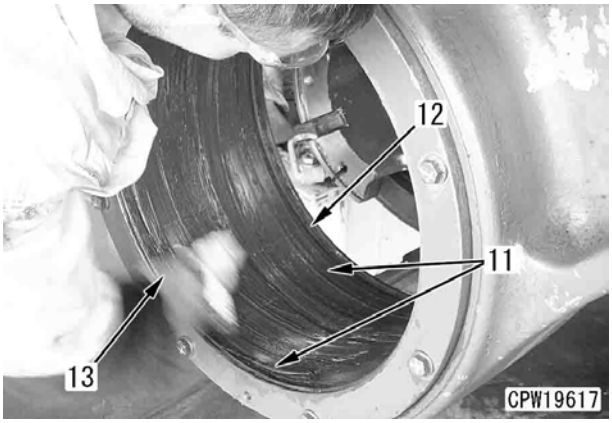




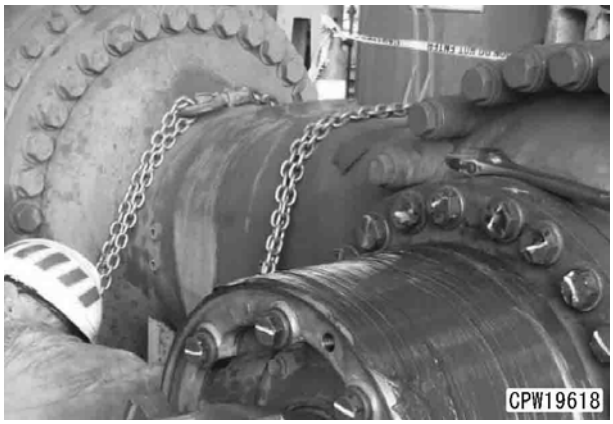
★ Install the dust seal with its lip surface facing outward.



6) Coat the entire inner surfaces of bushing (11) and dust seals (12) and (13) with grease.
   Bushing and dust seal:
   Molybdenu disulphide grease (LM-G)



7) Coat the periphery of the front support mounting surface on the rear axle with grease.
   Periphery of front support mounting surface:
   Molybdenum disulphide grease (LM-G)



Removal and installation of rear final drive assembly

★ If the rear final drive assembly was removed from the machine, prepare the following KIT parts since consumable parts such as O-rings must be replaced with new ones when reinstalling the assembly.
★ See the end of this section for details of the KIT part numbers.
Kit parts No.:
42C-23-05020

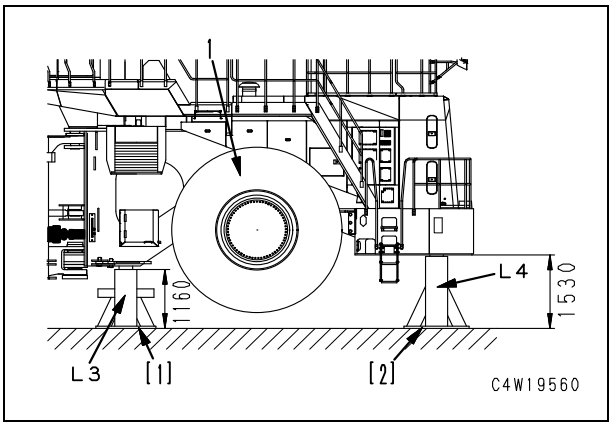
Special tools

Symbol		Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
L	3	793T-870-1420	Stand	■	1	N	○
	4	793T-870-1430	Stand	■	1	N	○

Removal

⚠ **Before starting the removal operation, be sure to carry out the operations described in "2. Preparatory work" of "00-3 Precautions on safety".**

1. If the ground is soft, place the steel plates and stands in the target position according to the following procedure.
   1) Place the steel plates on the ground surfaces where the stands are set.
   2) Park the machine aligning it to the support stand setting positions.
   3) Set support stands **L3** and **L4** and rest the machine gradually on to them.
      Weight of machine's rear section: **90,000 kg**
   ★ Using the liner plates, adjust the height from the steel plate to the frame to the value indicated below.
   A = 887 mm, B = 1,527 mm



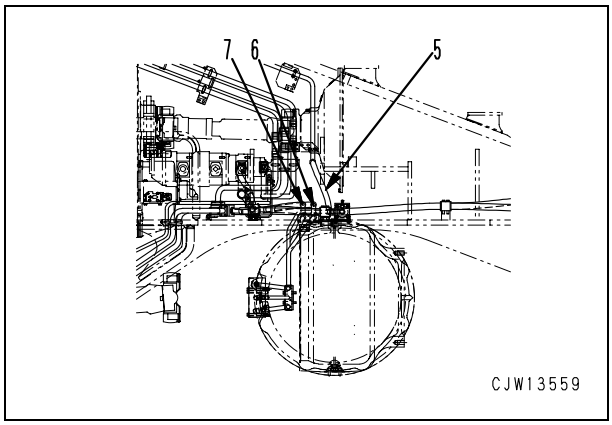
2. Drain the oil in the brake oil tank.
   Hydraulic oil: **45 ℓ**

3. Drain the hydraulic oil.
   Hydraulic oil: **670 ℓ**

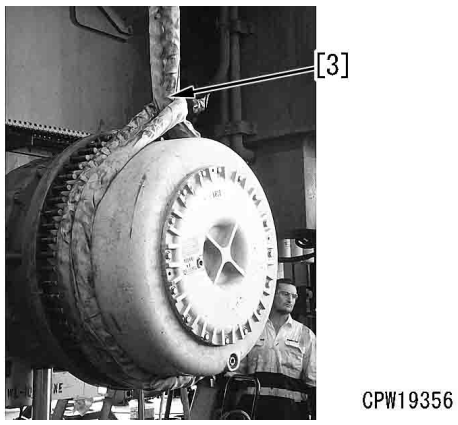
4. Sling tire (1) to be removed.

5. Remove the mounting nuts and remove the left and right tires. [*1]
   Tire (a single tire): **9,150 kg**

6. Disconnect brake hoses (5), (6) and (7).



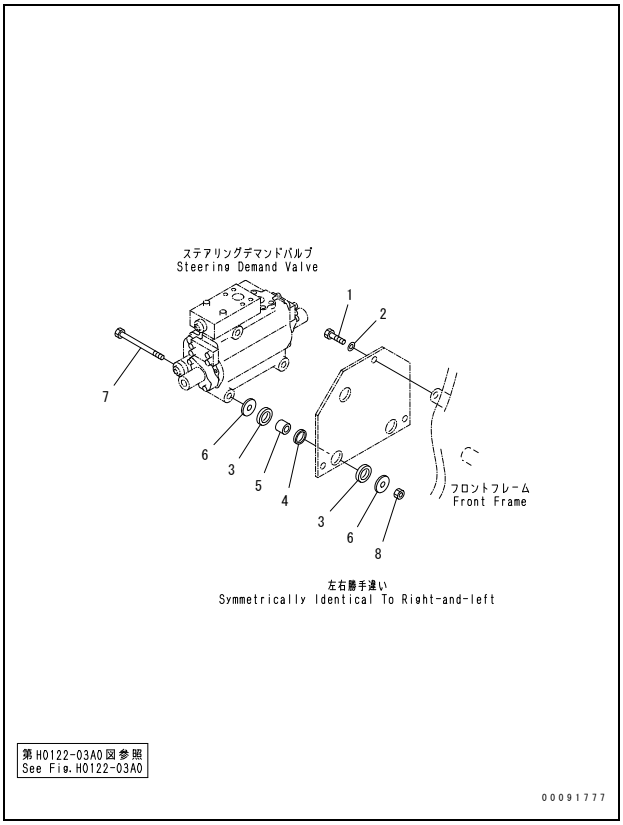
7. Wind the nylon sling [3] around final drive assembly.



8. Remove 36 mounting bolts and lift the final drive assembly to remove. [*2]
   Final drive assembly: **5,500 kg**

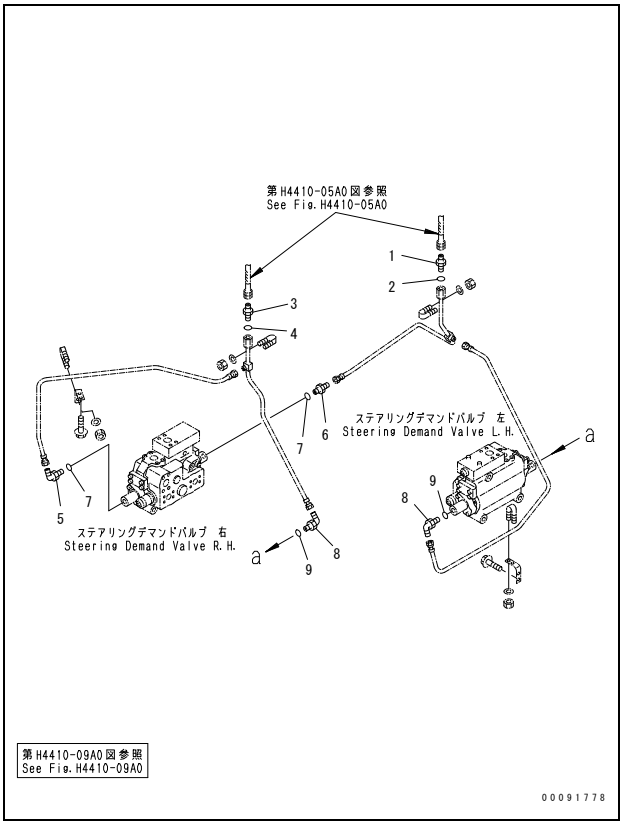
SERVICE KIT PARTS LIST

KIT Part No. : 42C-62-05100 (Service kit for installation of steering demand valve)
Fig. No. : Y0000-F0050 (STEERING VALVE MOUNTING PARTS)



Index	Parts No.	Part name	Q'ty
1	01010-81640	BOLT	3
2	01643-31645	WASHER	3
3	421-64-23120	CUSHION	6
4	421-64-23130	CUSHION	3
5	421-64-23140	SPACER	3
6	421-70-11280	WASHER	6
7	01011-81660	BOLT	3
8	01596-01615	NUT	3

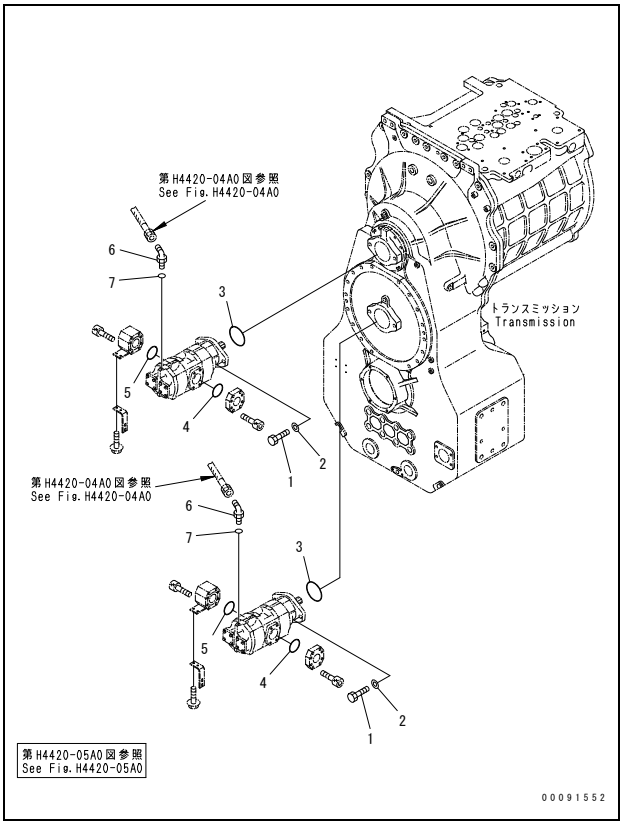
KIT Part No. : 42C-62-05100 (Service kit for installation of steering demand valve)
Fig. No. : Y0000-F0051 (PILOT LINE CONNECTING PARTS)



Index	Parts No.	Part name	Q'ty
1	21J-60-11371	NIPPLE	1
2	07002-22034	O-RING	1
3	21J-60-11371	NIPPLE	1
4	07002-22034	O-RING	1
5	07235-10315	ELBOW	1
6	07230-20315	NIPPLE	1
7	07002-22034	O-RING	2
8	42C-62-11690	ELBOW	2
9	07002-22034	O-RING	2

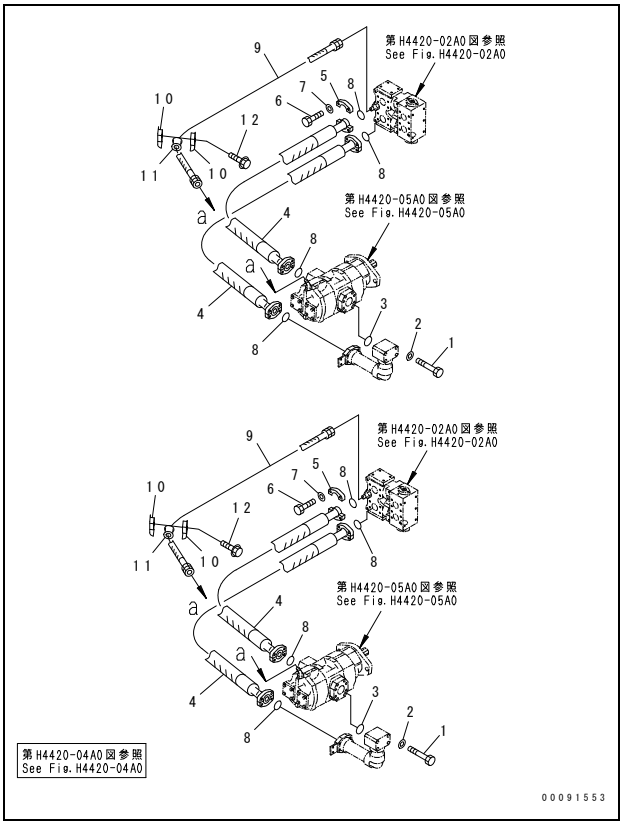
SERVICE KIT PARTS LIST

KIT No.: 42C-87-05030 (Service kit for installation of emergency steering pump)
Fig. No. : Y0000-R0045 (EMERGENCY ST.) (PUMP REPLACE)



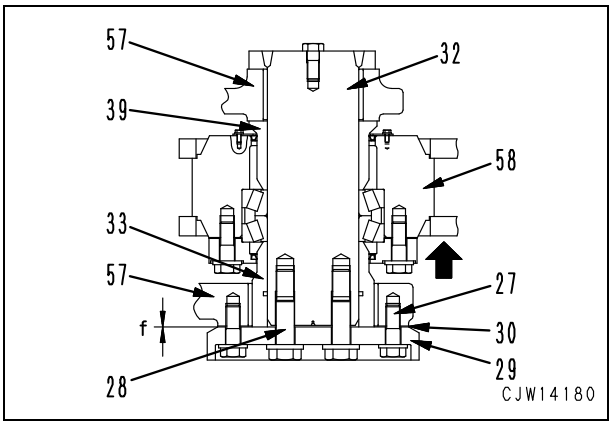
Index	Parts No.	Part name	Q'ty
1	01010-81650	BOLT	4
2	01643-31645	WASHER	4
3	07000-F2135	O-RING	2
4	07000-F2070	O-RING	2
5	07000-F2070	O-RING	2
6	07235-10315	ELBOW	2
7	07002-22034	O-RING	2

KIT No.: 42C-87-05030 (Service kit for installation of emergency steering pump)
Fig. No. : Y0000-R0046 (EMERGENCY ST.) (PUMP REPLACE)



Index	Parts No.	Part name	Q'ty
1	01011-81205	BOLT	8
2	01643-31232	WASHER	8
3	07000-F2060	O-RING	2
4	07122-02014	HOSE	4
5	07371-32076	FLANGE	16
6	07372-21240	BOLT	32
7	01643-51232	WASHER	32
8	07000-F2060	O-RING	8
9	07102-20318	HOSE	2
10	04434-52510	CLIP	2
11	07095-20318	CUSHION	2
12	01435-01220	BOLT	2

3) Tighten 10 mounting bolts (27) and 4 mounting bolts (28) of retainer (29) and then hit the head of lower hinge pin (32) with a copper hammer 3 – 5 times.
   - Mounting bolt (27) (M36): **2,450 – 3,040 Nm {250 – 310 kgm}**
   - Mounting bolt (28) (M45): **4,510 – 5,490 Nm {460 – 560 kgm}**
4) Repeat step 3) 3 times to fit the contacting parts and then retighten retainer mounting bolts (27) and (28) to the tightening torque in step 3).
5) While taking care that rear frame (58) will not move, remove all of 10 bolts (27) and measure clearance "f" between retainer (29) and front frame (57) with clearance gauges at 3 places on the periphery (Interval: 120°) and calculate the average clearance.
   Combine shims (30) so that average clearance "f" will be 0.08 – 0.18 mm.
   ★ The shims must not be thicker than any of the measured clearances.
6) Insert shims (30) selected in step 5) between retainer (29) and front frame (57) and repeat steps 3) and 4).
7) Remove retainer mounting bolts (27) and (28) one by one, apply LOCTITE to them, and tighten them to the specified torque.
   ★ Degrease the threaded parts thoroughly.
   - Mounting bolts (27) and (28): **Adhesive (LOCTITE 262)**
   - Mounting bolt (27) (M36): **2,450 – 3,040 Nm {250 – 310 kgm}**
   - Mounting bolt (28) (M45): **4,510 – 5,490 Nm {460 – 560 kgm}**

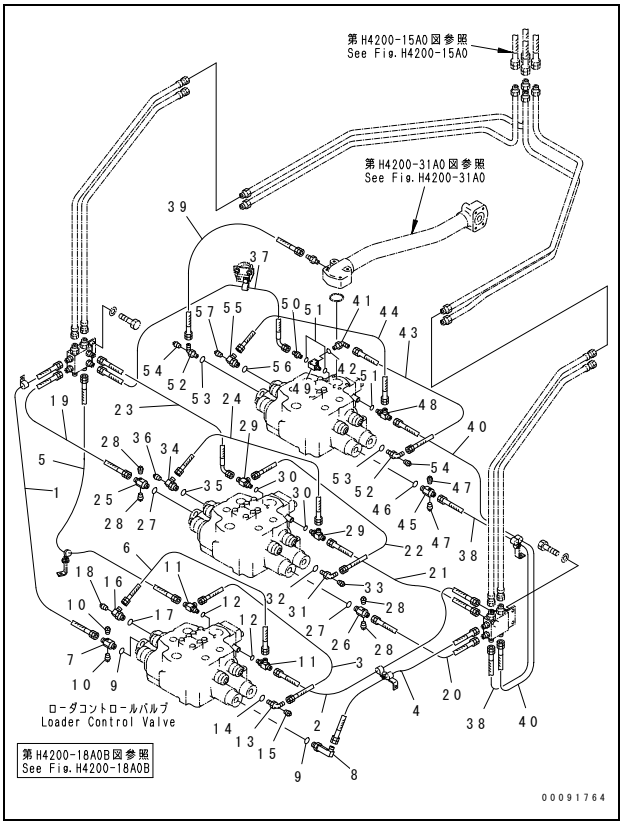


8) Remove the jack set under the lower hinge in step 2).
   ★ After assembling, supply grease to the upper hinge pin, lower hinge pin and steering cylinder shaft until it comes out through the dust seals.

- **Refilling with oil**
  Add hydraulic oil through the oil filler to the specified level.
  - Hydraulic oil: **Approx. 1,125 ℓ**

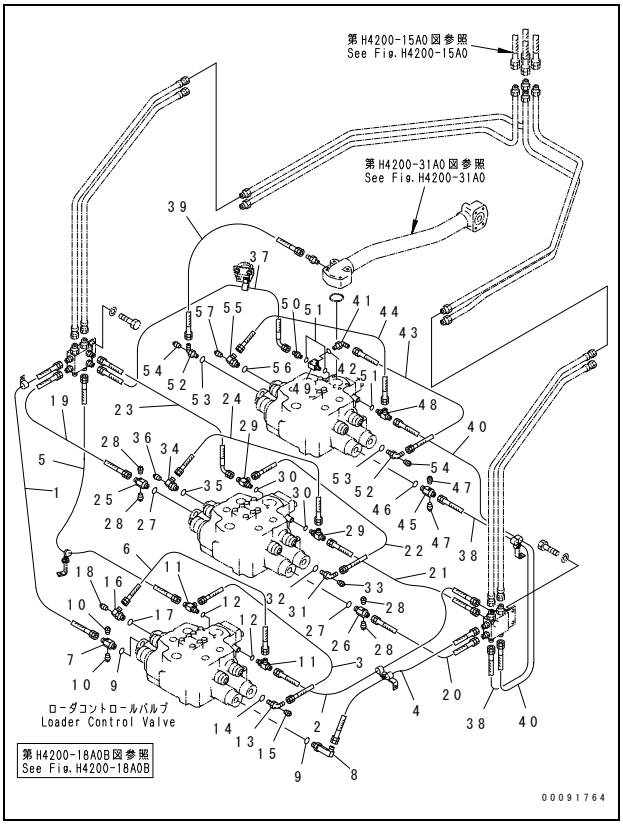
SERVICE KIT PARTS LIST

KIT Part No. : 42C-62-05030 (Service kit for installation of work equipment control valve)
Fig. No. : Y0000-F0038 (PPC VALVE LINE FRONT)



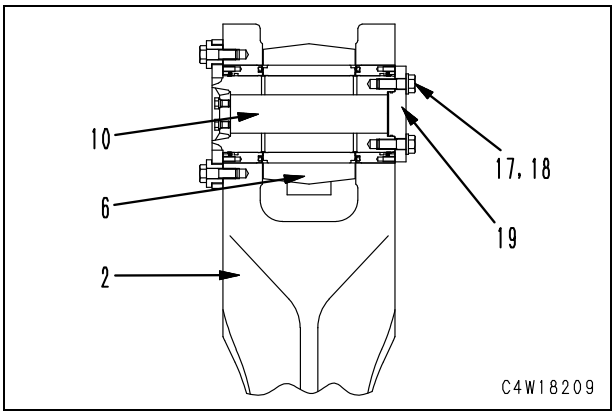
Index	Parts No.	Part name	Q'ty
1	07102-20310	HOSE	1
2	07102-20309	HOSE	1
3	07102-203A6	HOSE	1
4	07102-20307	HOSE	1
5	07102-20311	HOSE	1
6	07102-20307	HOSE	1
7	42C-62-15730	UNION	1
8	20D-62-44160	ELBOW	1
9	07002-22034	O-RING	2
10	07042-20108	PLUG	2
11	709-12-12740	TEE	2
12	07002-21423	O-RING	2
13	07235-50315	ELBOW	1
14	07002-22034	O-RING	1
15	07042-20108	PLUG	1
16	709-12-12750	ELBOW	1
17	07002-22034	O-RING	1
18	07042-20108	PLUG	1

KIT Part No. : 42C-62-05040 (Service kit for installation of work equipment control valve)
Fig. No. : Y0000-F0038 (PPC VALVE LINE FRONT)

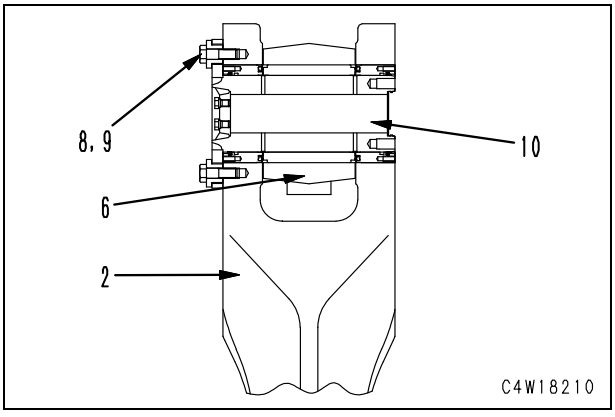


Index	Parts No.	Part name	Q'ty
19	07102-20305	HOSE	1
20	07102-20305	HOSE	1
21	07102-203A4	HOSE	1
22	07102-203A6	HOSE	1
23	07623-00306	HOSE	1
24	07102-20307	HOSE	1
25	42C-62-15730	UNION	1
26	42C-62-15561	UNION	1
27	07002-22034	O-RING	2
28	07042-20108	PLUG	4
29	709-12-12740	TEE	2
30	07002-21423	O-RING	2
31	07235-50315	ELBOW	1
32	07002-22034	O-RING	1
33	07042-20108	PLUG	1
34	709-12-12750	ELBOW	1
35	07002-22034	O-RING	1
36	07042-20108	PLUG	1

2] Remove four cover mounting bolts (17) and washers (18) from the mounting pin (10) of bell crank (2) and bucket cylinder (6) rod. Then, remove the cover (19).
★ If the cover is hard to remove, use the removal tap of the cover to remove it.
★ Prepare an oil receiver in advance to receive oil that flows out from the mounting pin during the cover is removed.



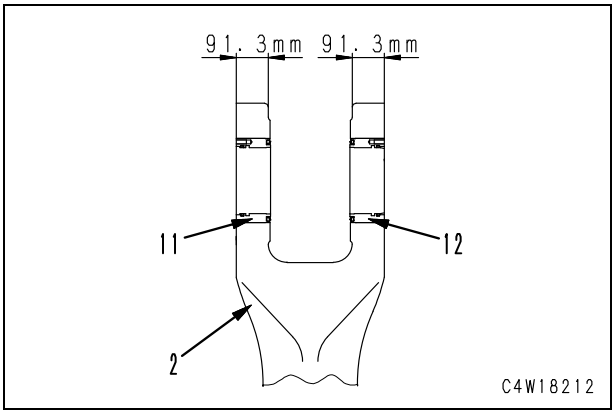
3] Remove four pin flange fixing bolts (8) and spacers (9) from the mounting pin (10) and then pull out the mounting pin (10) using the special tool **T1**, and disconnect the bell crank (2) from the bucket cylinder (6) rod.
Mounting pin: **70 kg**
★ For the mounting pin removal procedure, see “1) How to use work equipment pin puller” of “2. How to use special tools”.



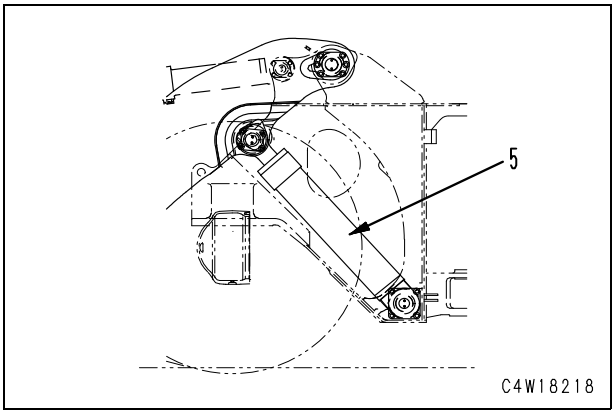
4] Start the engine to draw back the bucket cylinder piston rod.

⚠ **After the piston is withdrawn, stop the engine and loosen the oil filler cap on the hydraulic oil tank to relieve the tank of internal pressure. Then, operate the work equipment control lever a few times to bleed the piping of residual pressure.**

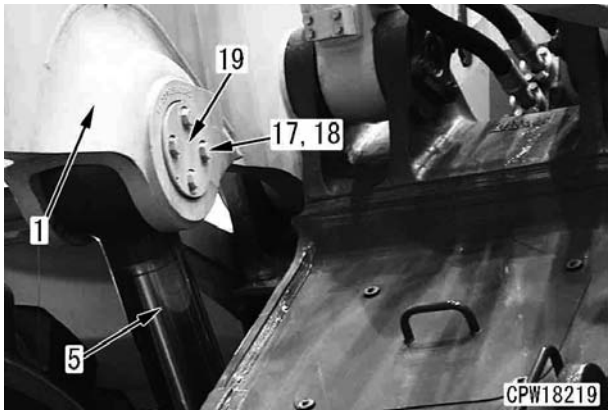
5] Remove collar A (11) and collar B (12) from bell crank (2).
● Length of collar A (11), B (12): 91.3 mm
★ If collars A and B cannot be removed, use the special tool **T4** to remove them.
★ For the procedure to remove collars A and B using the special tool **T4**, see “2) How to use collar puller” of “2. How to use special tools”.

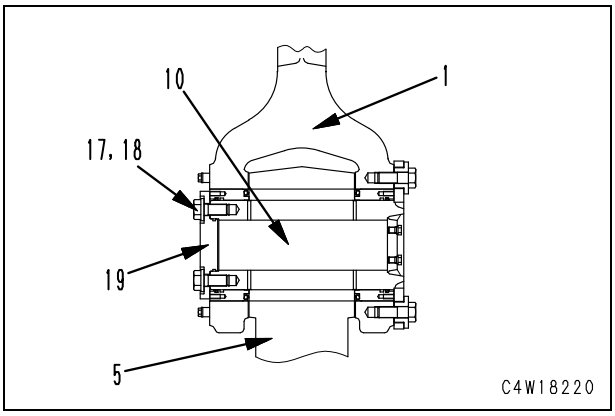


2] Sling lift cylinder assembly (5).
Lift cylinder assembly: **2,950 kg**

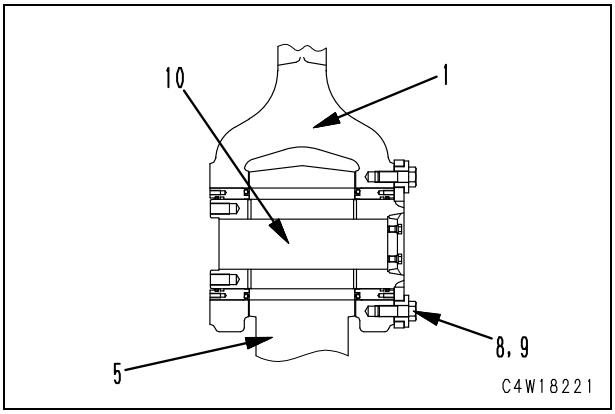


3] Remove the cover mounting bolt (17) and washer (18) from the mounting pin (10) of lift arm (1) and lift cylinder (5) rod. Then, remove the cover (19).
★ If the cover is hard to remove, use the removal tap to remove it.
★ Removal tap : M12 x 1.75 (2pieces)
★ Prepare an oil receiver in advance to receive oil that flows out from the mounting pin during the cover is removed.

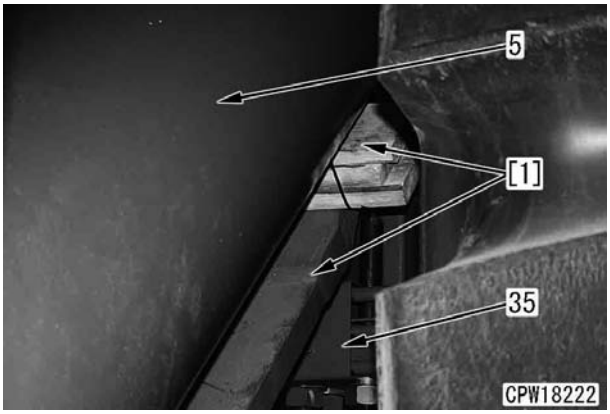




4] Remove four pin flange fixing bolts (8) and spacers (9) from the mounting pin (10) and then pull out the mounting pin (10) using the special tool **T2**.
Mounting pin: **140 kg**
★ For the mounting pin removal procedure, see "1) How to use work equipment pin puller" of "2. How to use special tools".

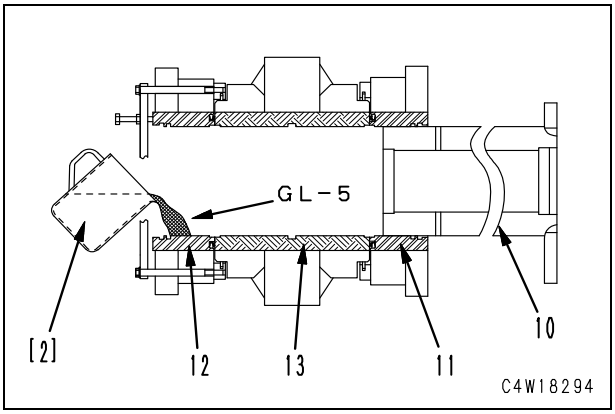


5] After the mounting pin (10) was removed, place a block [1] between lift cylinder (5) and front axle (35) to fix lift cylinder (5) in position.



Purpose:

Gear oil applied to the mounting pin (10) has its oil film thinned by the dust seal and O-ring which are installed to the collar A (11) when the pin is inserted. Therefore, by applying gear oil heavily to the bushing immediately before pin insertion, the initial oil film between the pin and bushing is firmly formed.



A state in which oil gear is heavily applied

10) Final insertion of implement mounting pin

1] Check once again that the center of bushing (13) is in alignment with that of collar A (11) and B (12)

⚠ **When re-alignment is necessary, use a bar etc. Never put fingers in the bushing or collars.**

2] Push the mounting pin (10) at a stretch until it goes beyond the collar O-ring (16) and dust seal (15) on the collar B (12).

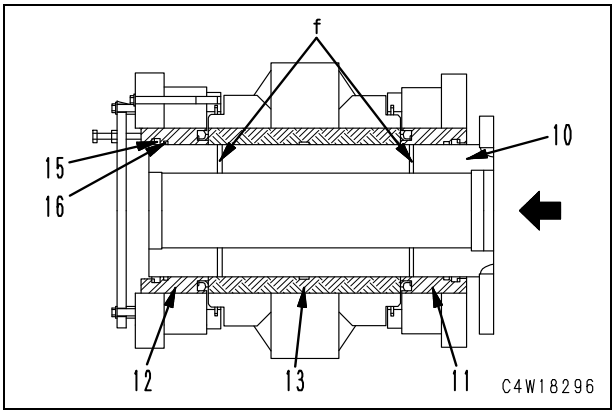
★ The dust seal (15) is installed on machines Serial No. 50077 and up.

★ Make sure that the lubricating hole (f) in the mounting pin (10) faces in the vertical direction.

★ If the mounting pin is large in diameter (240, 280 mm), it needs a large effort to be inserted. In such case, carry it out as a two-person operation from the beginning.

★ If the insertion of the mounting pin (10) is interrupted halfway, it may go out of alignment and need much more effort to be further inserted. To avoid it, insert the pin at one fling as far as at least near the O-ring (16) on the collar B (12).

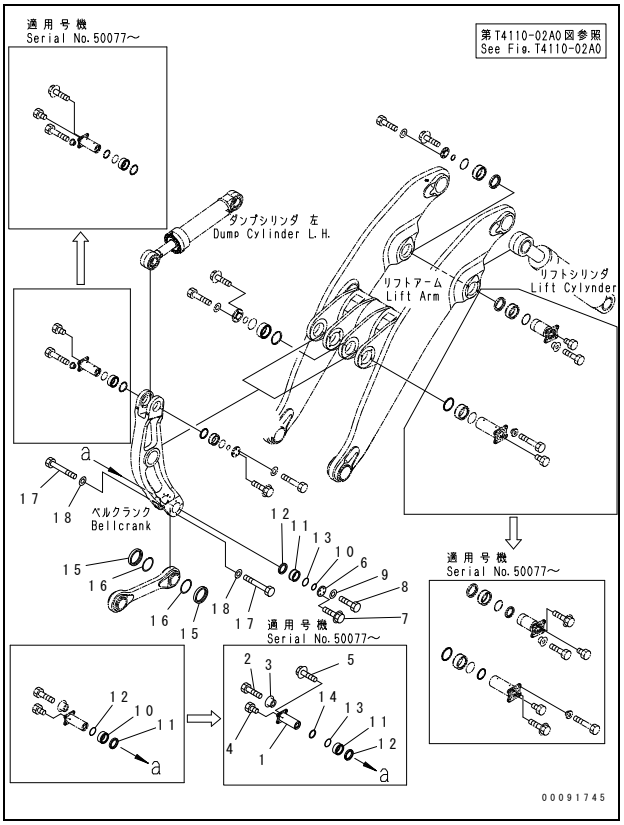
Then, insert the pin slowly through the rest of the way using pin flange fixing bolts and spacers or special tool **T3** (mounting pin insertion tool).



★ To prevent the bushing seal assembly (14) installed to the collar A (11) and B (12) from falling off or forced pin insertion, do not hammer the mounting pin (10) in.

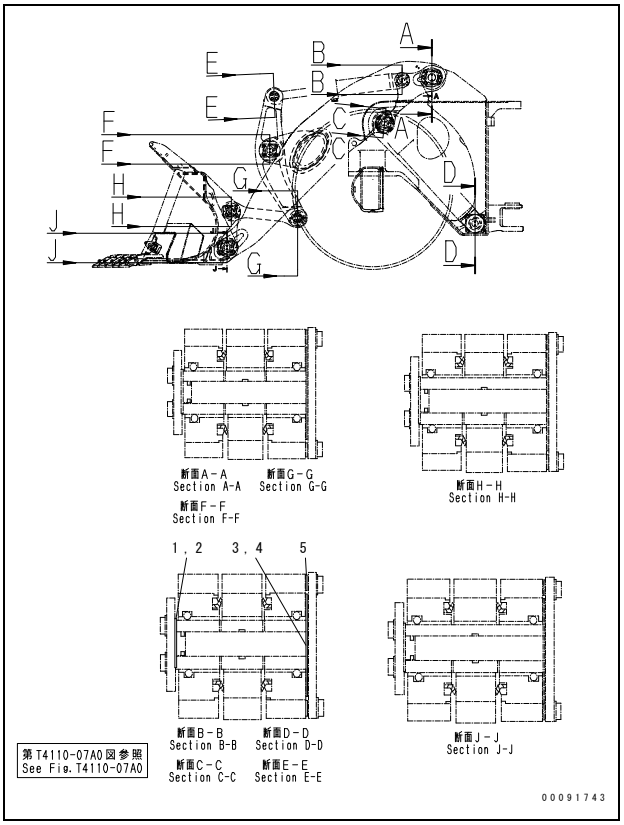
SERVICE KIT PARTS LIST

KIT No.: 42C-70-05120 (Service kit for installation of work equipment)
Fig. No. : Y0000-F0013 (BUCKET LINK MOUNTING PARTS)



Index	Parts No.	Part name	Q'ty
1	42C-70-11264	PIN	1
2	01010-82470	BOLT	4
3	42C-70-11621	SPACER	4
4	07052-31624	PLUG	2
5	01435-01220	BOLT	2
6	42C-70-11440	COVER	1
7	01435-01220	BOLT	2
8	01010-82470	BOLT	4
9	01643-32460	WASHER	4
10	07000-12100	O-RING	1
11	42C-70-11355	COLLAR	2
12	42C-70-11411	SEAL	2
13	07000-A6180	O-RING	2
14	42C-70-11740	SEAL	2
15	42C-70-11650	RING	2
16	42C-70-11670	RING	2
17	01011-81210	BOLT	8
18	01643-31232	WASHER	8

KIT No.: 42C-70-05120 (Service kit for installation of work equipment)
Fig. No. : Y0000-F0014 (BUCKET LINK MOUNTING PARTS)



Index	Parts No.	Part name	Q'ty
1	42C-70-11850	SHIM	2
2	42C-70-11860	SHIM	2
3	42C-70-11770	SHIM	2
4	42C-70-11870	SHIM	2
5	42C-70-12910	SHIM	2

Removal and installation of operator's cab assembly

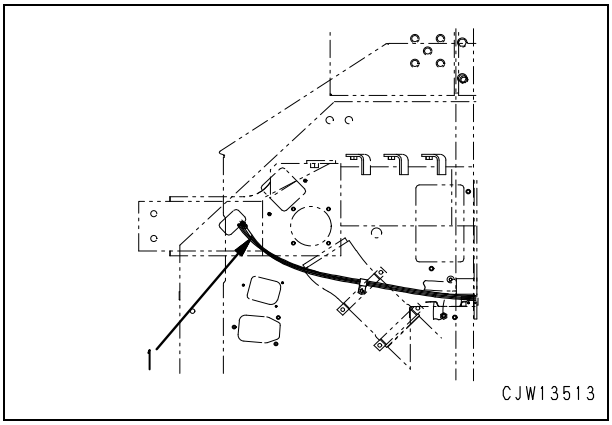
Removal

⚠ **Before starting the removal work, be sure to perform the works described in "2. Preparatory work" and "3. Precautions during work" of "00-3 Safety notice".**

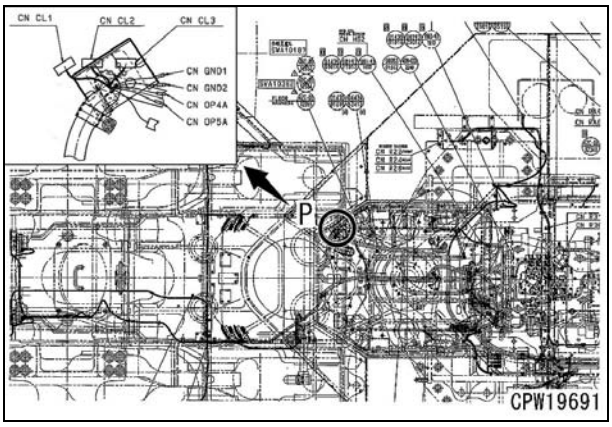
1. Remove the ROPS. For details, see "Removal and installation of operator's cab and floor assembly".

2. Remove the cab bottom side cover.

3. Disconnect 3 washer hoses (1) inside the cab.

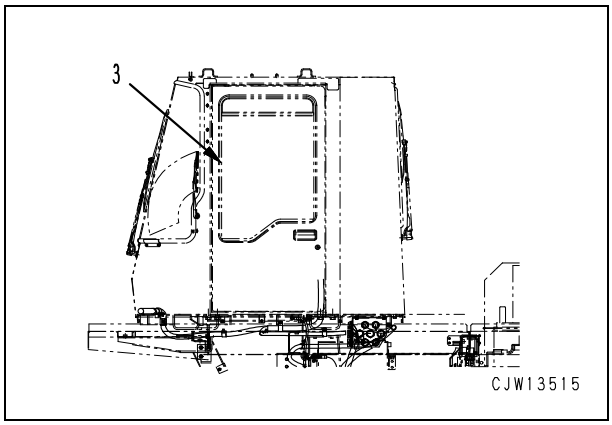


4. Disconnect 7 wiring harness connectors CL1, CL2, CL3, GND1, GND2, OP4A and OP5A (2).



5. Remove the mounting bolts of operator's cab assembly (3) and lift up the operator's cab assembly gradually to remove.
   ★ When removing the operator's cab assembly, check that all the pipings and wiring harnesses are disconnected.

   Operator's cab assembly: **540 kg**



Installation

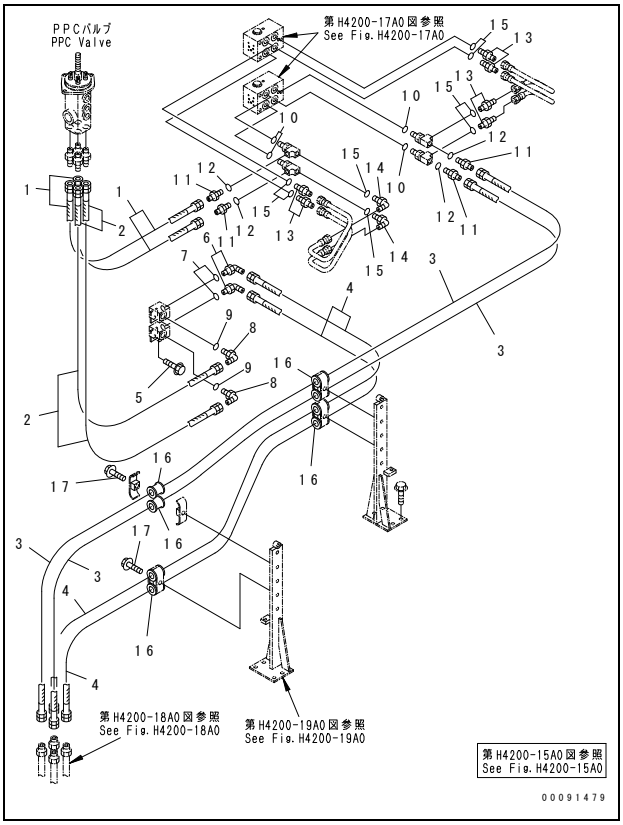
- Carry out installation in the reverse order to removal.

- **Refilling with coolant**
  Supply coolant into the washer tank up to the specified level.

7) Install the 2 air input hoses, compressed-air hose and air input hose with angle to the pneumatic spring (6) by referring to "8. Removal and installation of compressed-air hoses".
8) Install the bellows by referring to "3. Removal and installation of bellows".
9) Install the top cover by referring to "1. Removal and installation of top cover".
10) Install the upper part of the seat by referring to "I. Upper seat".

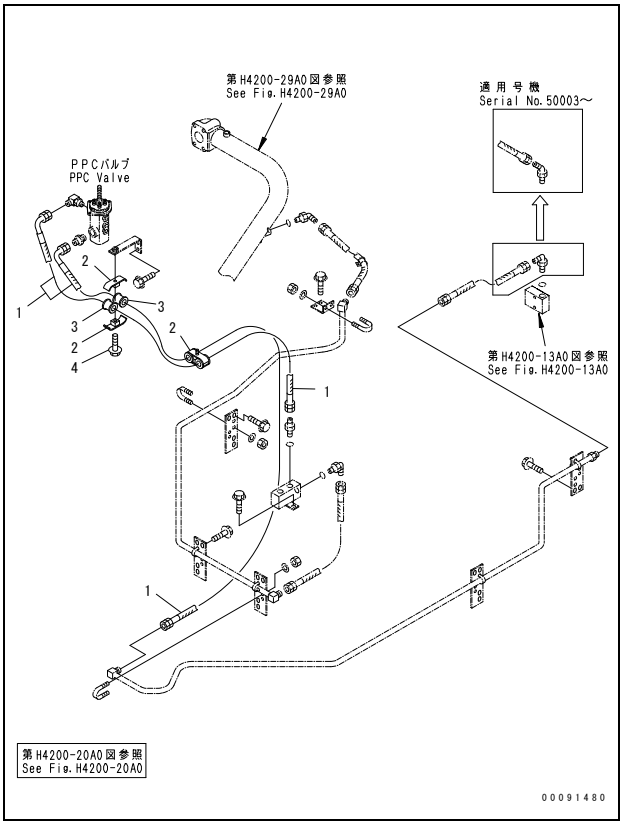
SERVICE KIT PARTS LIST

KIT Part No. : 42C-62-05150 (Replacement of PPC valve hose)
Fig. No. : Y0000-C0003 (PPC VALVE LINE) (UNDER THE CAB)



Index	Parts No.	Part name	Q'ty
1	07102-20406	HOSE	2
2	07102-20408	HOSE	2
3	07102-20418	HOSE	2
4	07102-20417	HOSE	2
5	01435-01020	BOLT	2
6	07235-50422	ELBOW	2
7	07002-22034	O-RING	2
8	07235-10422	ELBOW	2
9	07002-22034	O-RING	2
10	07002-21423	O-RING	4
11	427-62-11750	NIPPLE	4
12	07002-21423	O-RING	4
13	205-62-55270	NIPPLE	6
14	07235-10311	ELBOW	2
15	07002-21423	O-RING	8
16	07095-00420	CUSHION	8
17	01435-01260	BOLT	4

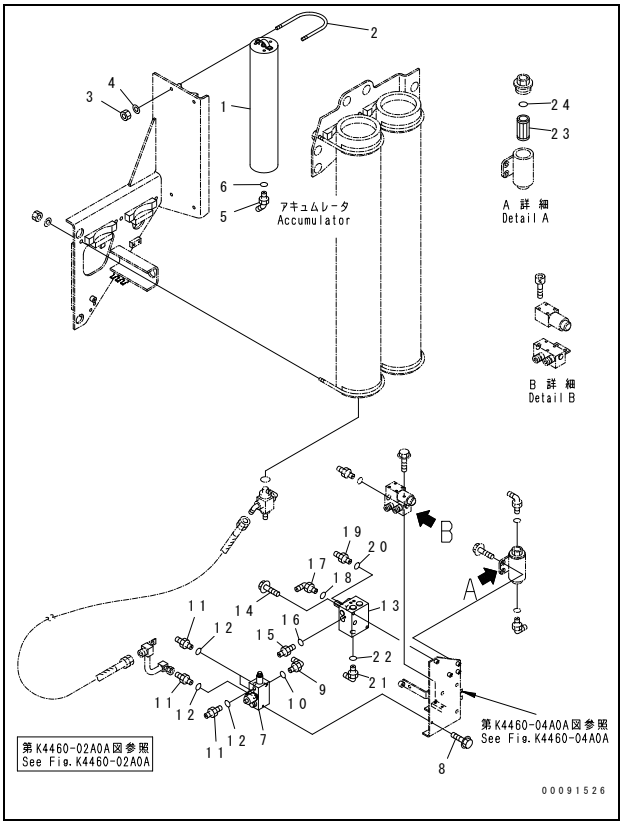
KIT Part No. : 42C-62-05150 (Replacement of PPC valve hose)
Fig. No. : Y0000-C0004 (PPC VALVE LINE) (UNDER THE CAB)



Index	Parts No.	Part name	Q'ty
1	07626-00517	HOSE	2
2	07094-30417	CLAMP	4
3	07095-00423	CUSHION	4
4	01435-01260	BOLT	2

SERVICE KIT PARTS LIST

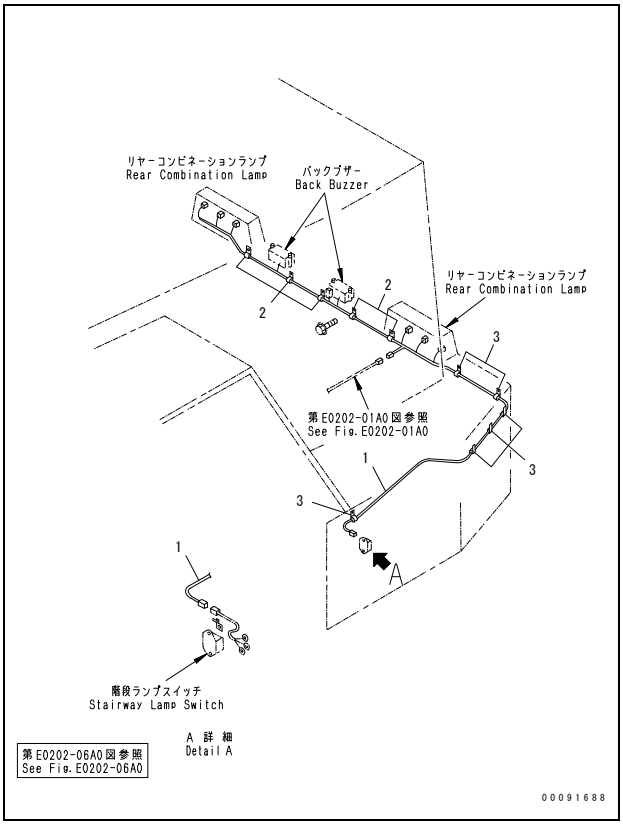
KIT Part No. : 42C-43-05050 (Replacement of emergency parking brake solenoid valve)
Fig. No. : Y0000-R0019 (BRAKE ACCUMULATOR RELATED PARTS)



Index	Parts No.	Part name	Q'ty
7	42C-43-17601	VALVE	1
8	01435-00816	BOLT	2
9	205-62-67270	ELBOW	1
10	07002-21423	O-RING	1
11	562-88-16530	NIPPLE	4
12	07002-21423	O-RING	4

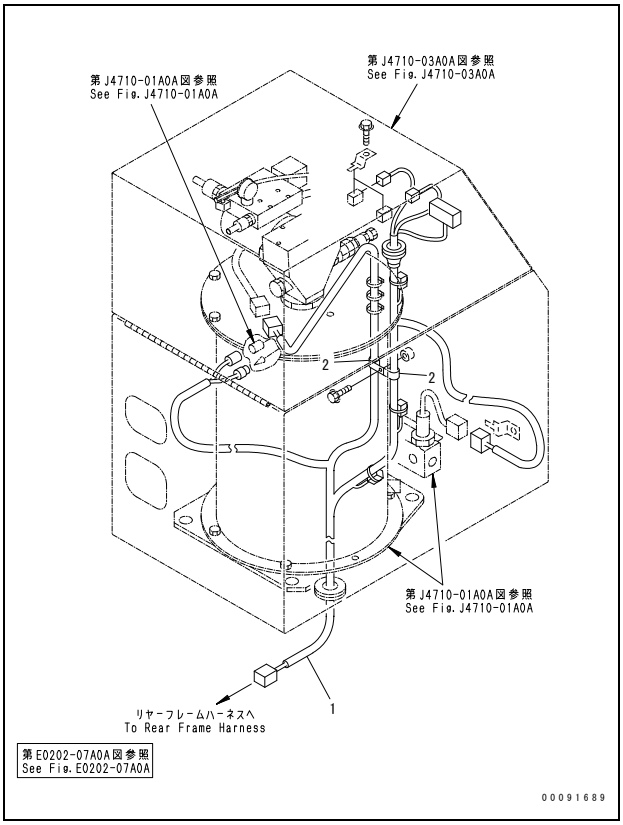
SERVICE KIT PARTS LIST

KIT Part No. : 42C-06-05040 (Replacement of rear harness)
Fig. No. : Y0000-R0181 (BUMPER LINE)



Index	Parts No.	Part name	Q'ty
1	42C-06-12352	WIRING HARNESS	1
2	04434-51510	CLIP	5
3	04434-51010	CLIP	11

KIT Part No. : 42C-06-05040 (Replacement of rear harness)
Fig. No. : Y0000-R0182 (AUTO GREASE LINE)



Index	Parts No.	Part name	Q'ty
1	42C-06-12155	WIRING HARNESS	1
2	04434-51510	CLIP	2

Unit: mm

No.	Check item	Criteria					Remedy
1	Outside diameter of oil seal contact surface of front coupling	Standard size		Tolerance		Repair limit	
		ø140		+0.052 +0.027		139.8	
2	Outside diameter of oil seal contact surface of rear coupling	ø140		+0.052 +0.027		139.8	
3	Backlash between input gear and idler gear	0.20 – 0.44					
4	Backlash between idler gear and output gear	0.20 – 0.44					
5	Interference between input gear and bearing	Standard size	Tolerance		Standard interference	Interference limit	
			Shaft	Hole			
		ø140	+0.078 +0.060	0 –0.025	0.060 – 0.103	0.060 – 0.103	Replace
6	Interference between input gear bearing and transfer case	ø250	0 –0.030	–0.014 –0.060	–0.016 – 0.060	–0.016 – 0.060	
7	Interference between idler gear and bearing	ø140	+0.078 +0.060	0 –0.025	0.060 – 0.103	0.060 – 0.103	
8	Interference between idler bear bearing and transfer case	ø250	0 –0.030	–0.014 –0.060	–0.016 – 0.060	–0.016 – 0.060	
9	Interference between output shaft and bearing	ø120	+0.045 +0.023	0 –0.020	0.023 – 0.065	0.023 – 0.065	
10	Interference between front output bearing and transfer case	ø215	0 –0.030	–0.014 –0.060	–0.016 – 0.060	–0.016 – 0.060	
11	Interference between spacer and bearing	ø140	+0.052 +0.027	0 –0.025	0.027 – 0.077	0.027 – 0.077	
12	Interference between rear output bearing and parking brake cover	ø210	0 –0.030	–0.014 –0.060	–0.016 – 0.060	–0.016 – 0.060	