CEBM3006C2

Shop Manual

PC300LC-6
PC300HD-6

HYDRAULIC EXCAVATOR

SERIAL NUMBERS **PC300LC-6 - A80001** and up
PC300HD-6 - A80001

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

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

June 1996

FOREWARD

GENERAL

This shop manual has been prepared as an aid to improve the quality of repairs by giving the serviceman an accurate understanding of the product and by showing him the correct way to perform repairs and make judgements. Make sure you understand the contents of this manual and use it to full effect at every opportunity.

This shop manual mainly contains the necessary technical information for operations performed in a service workshop. For ease of understanding, the manual is divided into the following sections. These sections are further divided into each main group of components.

GENERAL

This section lists the general machine dimensions, performance specifications, component weights, and fuel, coolant and lubricant specification charts.

STRUCTURE AND FUNCTION

This section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting.

TESTING AND ADJUSTING

This section explains checks to be made before and after performing repairs, as well as adjustments to be made at completion of the checks and repairs. Troubleshooting charts correlating "Problems" to "Causes" are also included in this section.

DISASSEMBLY AND ASSEMBLY

This section explains the order to be followed when removing, installing, disassembling or assembling each component, as well as precautions to be taken for these operations.

MAINTENANCE STANDARD

This section gives the judgement standards when inspecting disassembled parts.

NOTICE

The specifications contained in this shop manual are subject to change at any time and without any advance notice. Contact your distributor for the latest information.

kgm to ft. lb

1 kgm = 7.233 ft. lb

kgm	0	1	2	3	4	5	6	7	8	9
0	0	7.2	14.5	21.7	28.9	36.2	43.4	50.6	57.9	65.1
10	72.3	79.6	86.8	94.0	101.3	108.5	115.7	123.0	130.2	137.4
20	144.7	151.9	159.1	166.4	173.6	180.8	188.1	195.3	202.5	209.8
30	217.0	224.2	231.5	238.7	245.9	253.2	260.4	267.6	274.9	282.1
40	289.3	296.6	303.8	311.0	318.3	325.5	332.7	340.0	347.2	354.4
50	361.7	368.9	376.1	383.4	390.6	397.8	405.1	412.3	419.5	426.8
60	434.0	441.2	448.5	455.7	462.9	470.2	477.4	484.6	491.8	499.1
70	506.3	513.5	520.8	528.0	535.2	542.5	549.7	556.9	564.2	571.4
80	578.6	585.9	593.1	600.3	607.6	614.8	622.0	629.3	636.5	643.7
90	651.0	658.2	665.4	672.7	679.9	687.1	694.4	701.6	708.8	716.1
100	723.3	730.5	737.8	745.0	752.2	759.5	766.7	773.9	781.2	788.4
110	795.6	802.9	810.1	817.3	824.6	831.8	839.0	846.3	853.5	860.7
120	868.0	875.2	882.4	889.7	896.9	904.1	911.4	918.6	925.8	933.1
130	940.3	947.5	954.8	962.0	969.2	976.5	983.7	990.9	998.2	1005.4
140	1012.6	1019.9	1027.1	1034.3	1041.5	1048.8	1056.0	1063.2	1070.5	1077.7
150	1084.9	1092.2	1099.4	1106.6	1113.9	1121.1	1128.3	1135.6	1142.8	1150.0
160	1157.3	1164.5	1171.7	1179.0	1186.2	1193.4	1200.7	1207.9	1215.1	1222.4
170	1129.6	1236.8	1244.1	1251.3	1258.5	1265.8	1273.0	1280.1	1287.5	1294.7
180	1301.9	1309.2	1316.4	1323.6	1330.9	1338.1	1345.3	1352.6	1359.8	1367.0
190	1374.3	1381.5	1388.7	1396.0	1403.2	1410.4	1417.7	1424.9	1432.1	1439.4

WEIGHT TABLE

PC300LC-6, PC300HD-6

Unit: kg

Machine Model	PC300LC-6	PC300HD-6
Serial Number	A80001 and up	A80001 and up
Engine assembly	1,000	1,000
• Engine	675	675
• Damper	14.7	14.7
• Hydraulic pump	200	200
Radiator • oil cooler assembly	165	165
Hydraulic tank • filter assembly (excl. oil)	226	226
Fuel tank assembly (excl. fuel)	218	218
Revolving frame	2,612	2,612
Operator's cab	287	287
Operator's seat	29	29
Counterweight	6,320	6,320
Swing machinery	380	380
Control valve	256	256
Swing motor	81	81
Travel motor	173 x 2	173 x 2
Center swivel joint	37	37
Track frame assembly	8,560	11,884
• Track frame	5,182	7,495
• Swing circle	487	487
• Idler	166 x 2	234 x 2
• Idler cushion	257 x 2	363 x 2
• Carrier roller	31 x 4	31 x 4
• Track roller	52 x 16	72 x 14
• Travel motor • final drive	629 x 2	788 x 2
Track shoe assembly		
• Standard triple grouser shoe (600 mm)	3,840	4,430
• Standard triple grouser shoe (700 mm)	4,220	4,850
• Wide triple grouser shoe (800 mm)	4,560	5,290
• Wide triple grouser shoe (850 mm)	4,790	--
• Std. double grouser shoe (700 mm)	--	5,450
• Std. triple grouser HD shoe (700 mm)	--	5,220

DCA4 Unit Guide

Fleetguard Part No.	DCA4 Units
DCA4 Coolant Filter	
WF-2070	2
WF-2071	4
WF-2072	6
WF-2073	8
WF-2074	12
WF-2075	15
WF-2076	23
WF-2077	0
DCA4 Liquid	
DCA60L	4 (1 Pint)
DCA80L	1760 (55 US gal)
DCA4 Powder	
DCA95	20

DCA4 Precharge and Service Filters

System Capacity		Precharge Filter	Service Filter
Liters	Gallons	(See NOTE 1)	(See NOTE 3)
19-26	5-7	WF-2072	WF-2070
30-38	8-10	WF-2073	WF-2071
42-57	11-15	WF-2074	WF-2071
61-76	16-20	WF-2075	WF-2071
80-114	21-30	WF-2076	WF-2072
118-190	31-50	(See NOTE 2)	WF-2073

NOTE 1 - After draining and replacing coolant, always precharge the cooling system to maintain the DCA4 concentration between 1.0 and 2.0 units per 3.8ℓ (1 US gal).

NOTICE:
When performing service which requires draining the cooling system, discard the coolant. Reusing coolant can introduce contaminates or over concentrated chemicals, resulting in premature failure of cooling system components.

NOTE 2 - To precharge cooling systems larger than 114ℓ (30 gal) do the following:

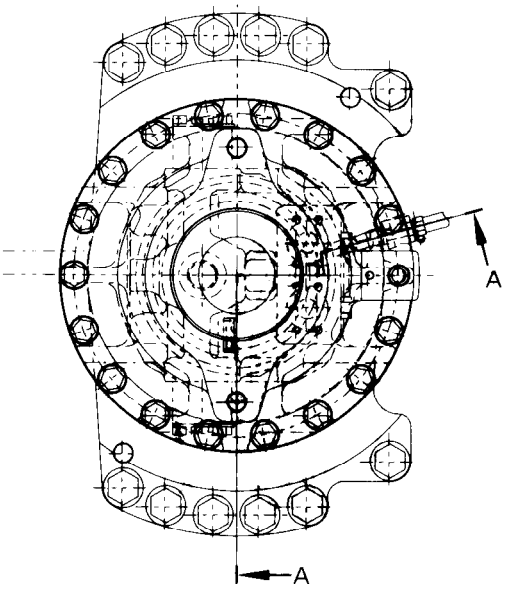
- Install appropriate service filter listed in the above table based on cooling system capacity.

  Example: 95 gal (360ℓ) cooling system capacity
  -15 Units (1) WF-2075 Filter
  80 Units

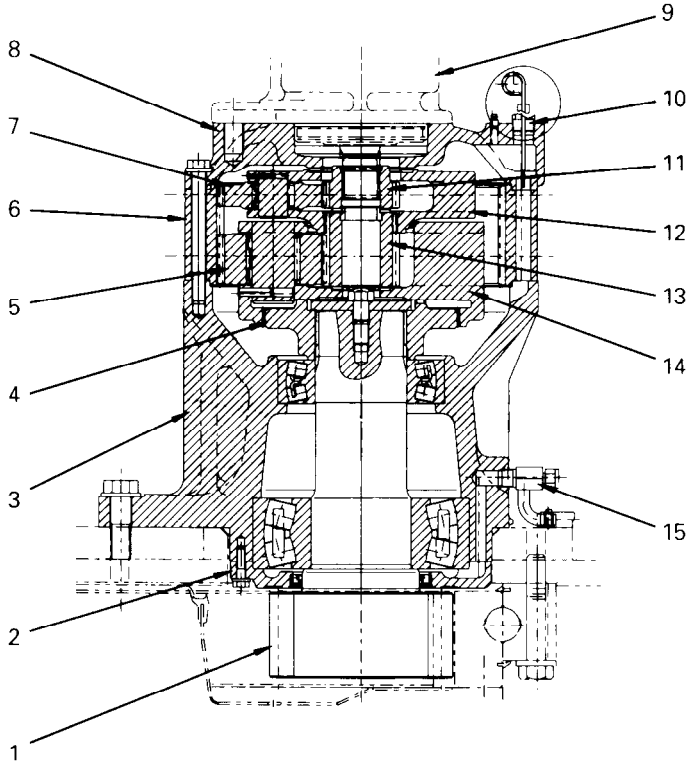
- The answer represents the additional units required to precharge the cooling system. Four bottles of powder, part number DCA95, will provide a sufficient amount of DCA4 units (80) to precharge the example cooling system.

- Install the appropriate service filter at the next and subsequent maintenance intervals.

SWING MACHINERY



1. Swing pinion (No. of teeth: 13)
2. Cover
3. Case
4. Coupling
5. No. 2 planetary gear (No. of teeth: 31)
6. Ring gear (No. of teeth: 84)
7. No. 1 planetary gear (No. of teeth: 31)
8. Cover
9. Swing motor
10. Oil level gauge
11. No. 1 sun gear (No. of teeth: 21)
12. No. 1 planetary carrier
13. No. 2 sun gear (No. of teeth: 21)
14. No. 2 planetary carrier
15. Drain plug



A – A

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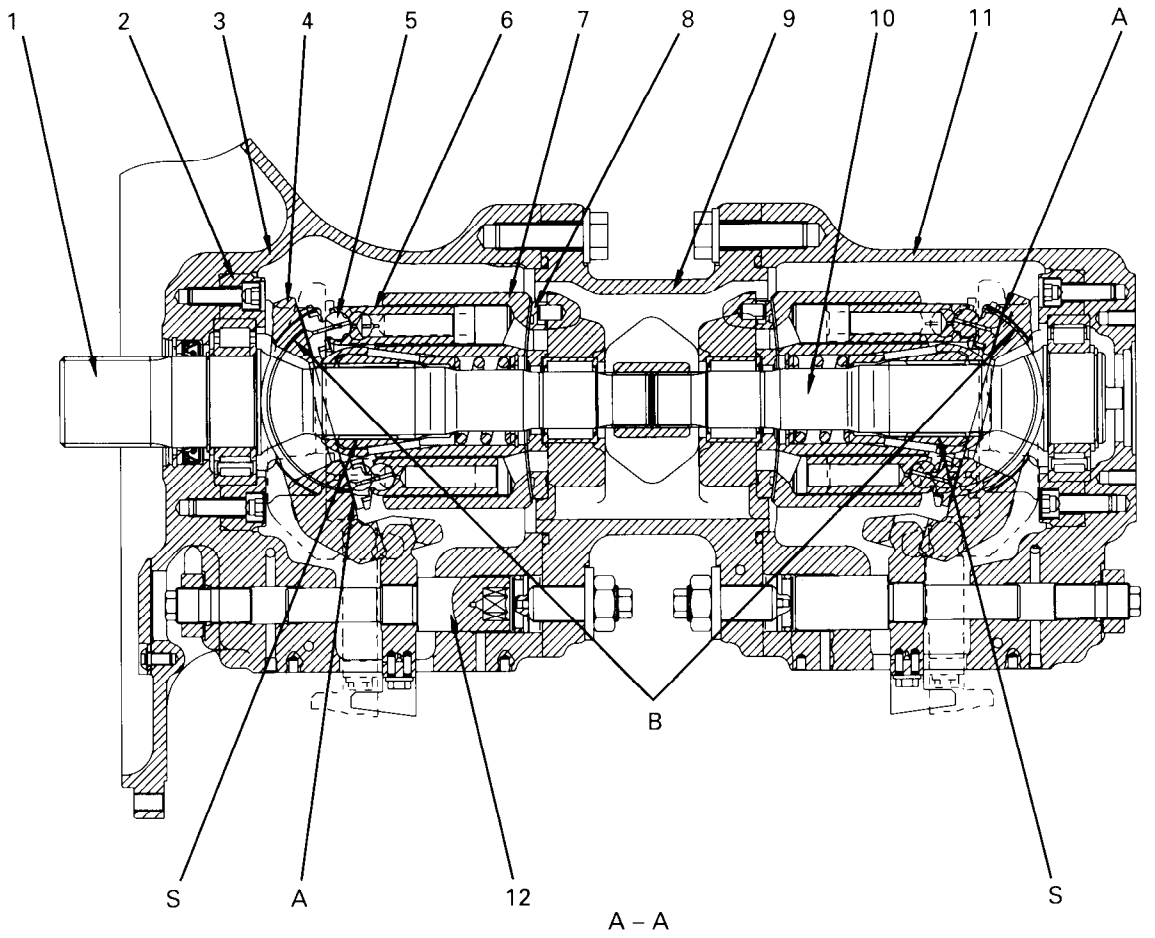
Specifications

Reduction ratio: $\frac{21+84}{21} \times \frac{21+84}{21}$

= 35.000



Function

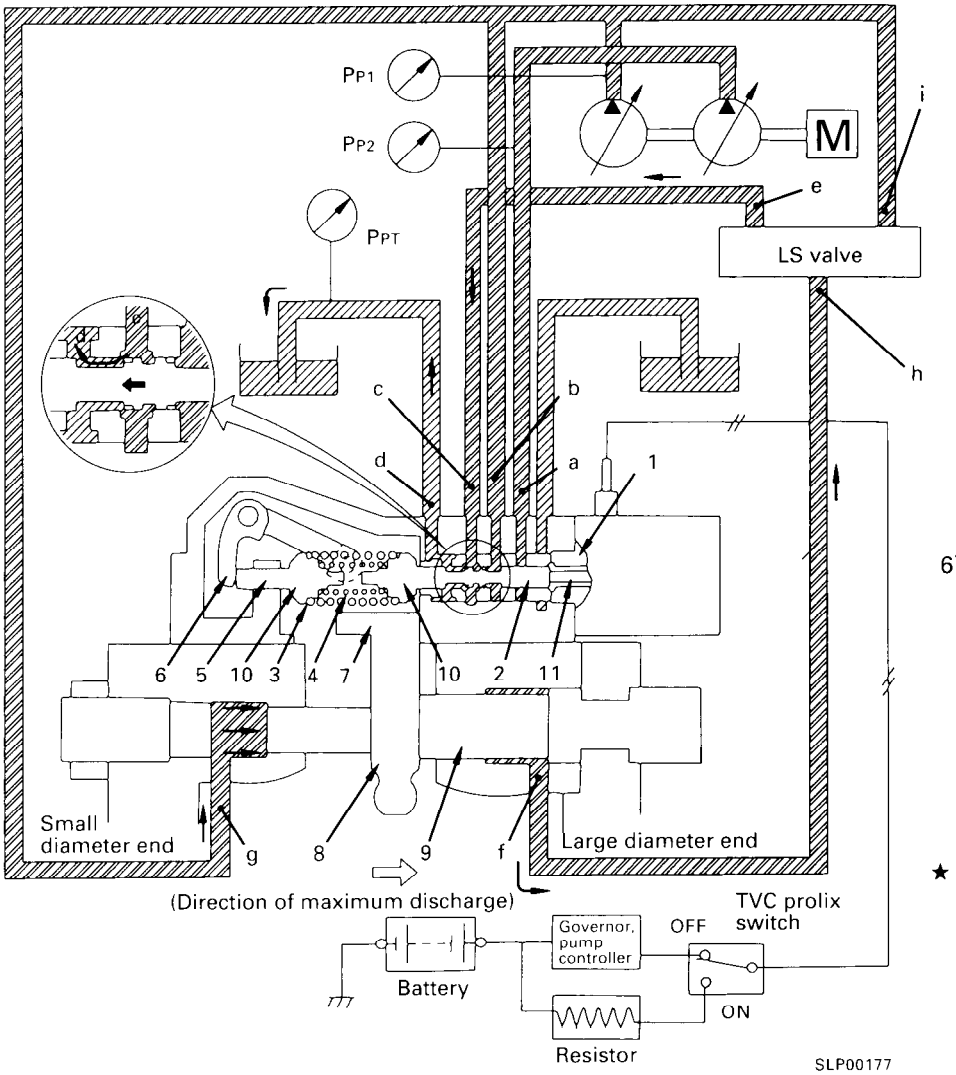
- The engine rotation and torque transmitted to the pump shaft is converted into hydraulic energy, and pressurized oil is discharged according to the load.
- It is possible to change the delivery amount by changing the swash plate angle.

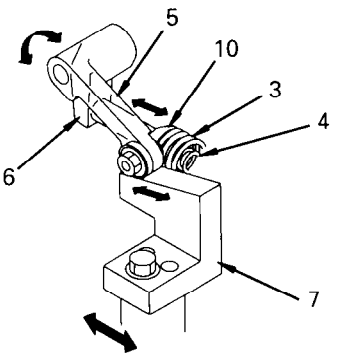
Structure

- Cylinder block (7) is supported to shaft (1) by spline **S**, and shaft (1) is supported by the front and rear bearings.
- The tip of piston (6) is a concave ball, and shoe (5) is caulked to it to form one unit. Piston (6) and shoe (5) form a spherical bearing.
- Rocker cam (4) has flat surface **A**, and shoe (5) is always pressed against this surface while sliding in a circular movement.
  Rocker cam (4) brings high pressure oil at cylindrical surface **B** with cradle (2), which is secured to the case, and forms a static pressure bearing when it slides.
- Piston (6) carries out relative movement in the axial direction inside each cylinder chamber of cylinder block (7).
- The cylinder block seals the pressure oil to valve plate (8) and carries out relative rotation. This surface is designed so that the oil pressure balance is maintained at a suitable level. The oil inside each cylinder chamber of cylinder block (7) is sucked in and discharged through valve plate (8).

2. **TVC valve**

1) **When governor, pump controller are normal**





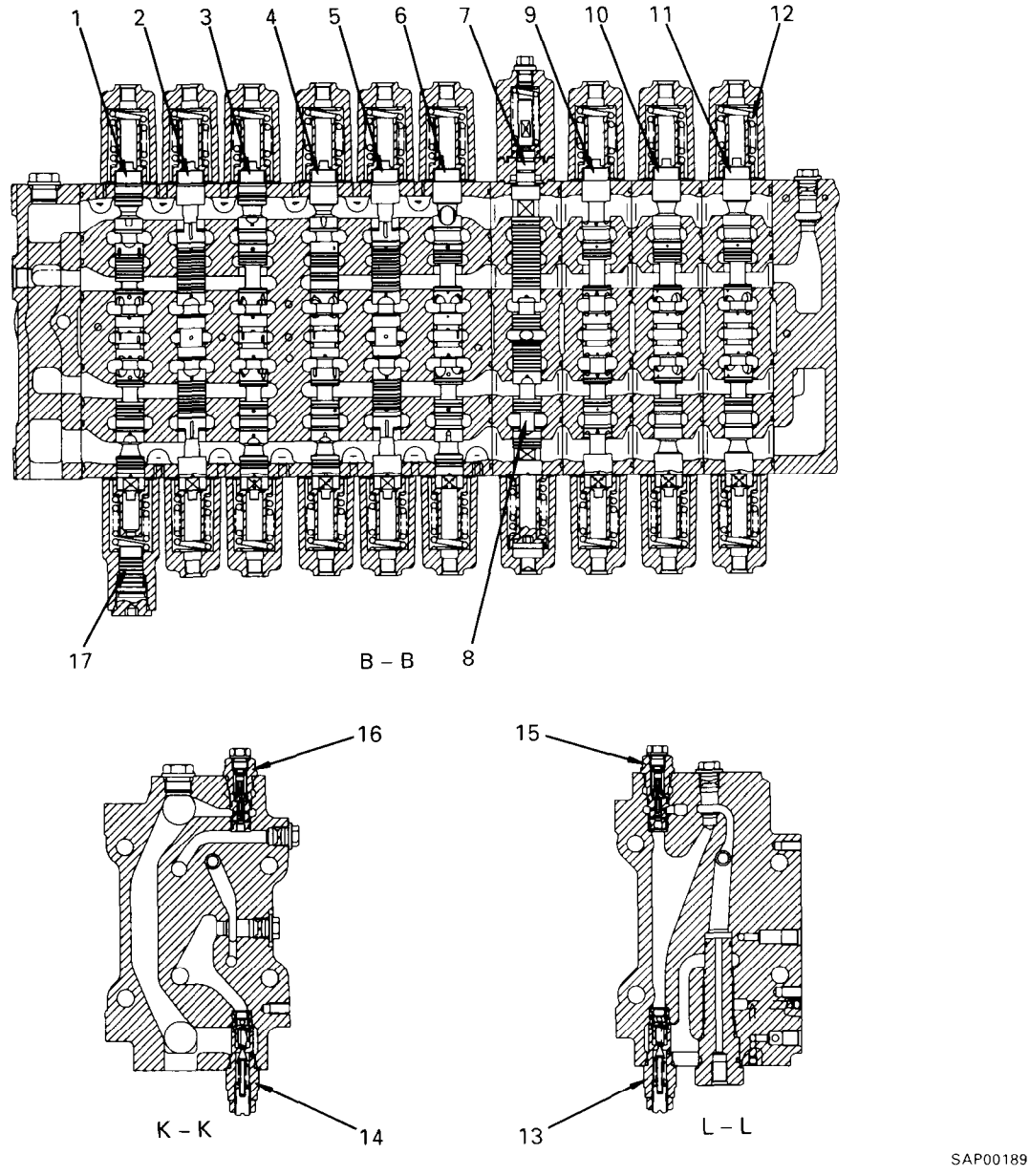
★ Other pump pressure
This is the pressure of the pump at the opposite end.
For the front pump, it is the rear pump pressure
For the rear pump, it is the front pump pressure

a. When the load on the actuator is small and pump pressures P_{P1} and P_{P2} are low

① Action of solenoid (1)

- Command current **x** from the governor, pump controller flows to solenoid (1). This command current changes the internal force pushing solenoid push pin (11).
- On the opposite side to the force pushing this solenoid push pin (11) is the spring set pressure of springs (3) and (4) and pump pressure P_{P1} and other pump pressure P_{P2} (see ★). Piston (2) stops at a position where the combined force pushing piston (2) is balanced, and the pressure (pressure of port **c**) output from the TVC valve changes according to this position.
- The size of command current **x** is determined by the nature of the operation (lever operation), the selection of the working mode, and the set value and actual value for the engine speed.

Main structure of 10-spool valve (1/3)



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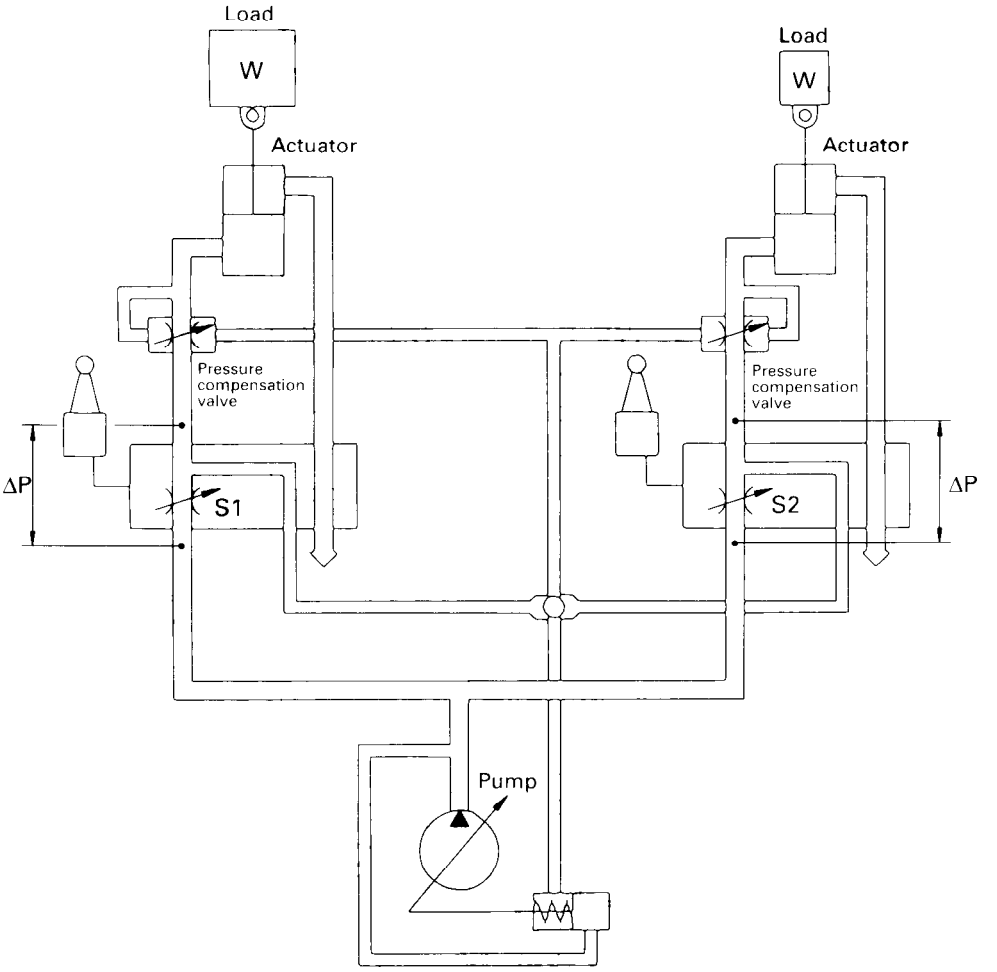
1. Spool (arm Lo)
2. Spool (L.H. travel)
3. Spool (swing)
4. Spool (boom Lo)
5. Spool (R.H. travel)
6. Spool (bucket)
7. Spool (boom Hi)
8. Spool (arm Hi)
9. Spool (service)
10. Spool (service)
11. Spool (service)
12. Spool return spring
13. Main relief valve (bucket)
14. Main relief valve (arm Lo)
15. Unload valve (bucket)
16. Unload valve (arm Lo)
17. Piston (arm Lo stroke control)

2) Pressure compensation

- A pressure compensation valve is installed to the outlet port side of the control valve to balance the load.
  When two actuators are operated together, this valve acts to make pressure difference ΔP between the upstream (inlet port) and downstream (outlet port) of the spool of each valve the same regardless of the size of the load (pressure).
  In this way, the flow of oil from the pump is divided (compensated) in proportion to the area of openings S_1 and S_2 of each valve.



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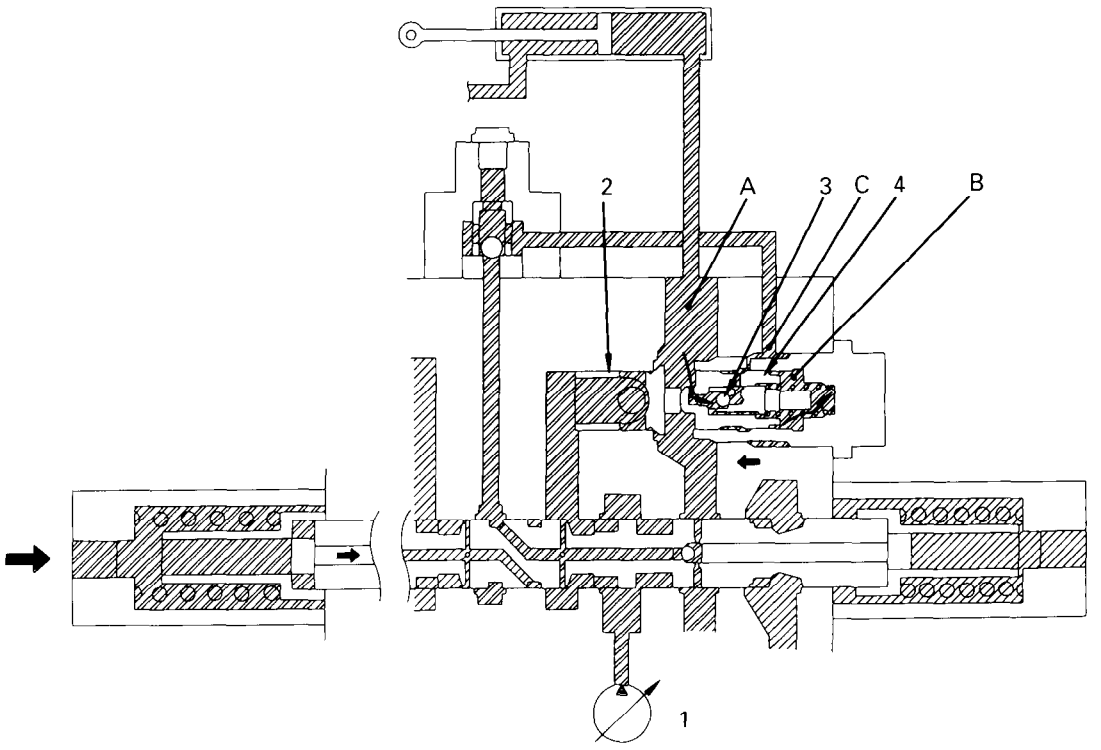
6. Shuttle valve inside pressure compensation valve



SLP00214

1. Main pump
2. Valve
3. Shuttle valve inside pressure compensation valve
4. Piston

Function

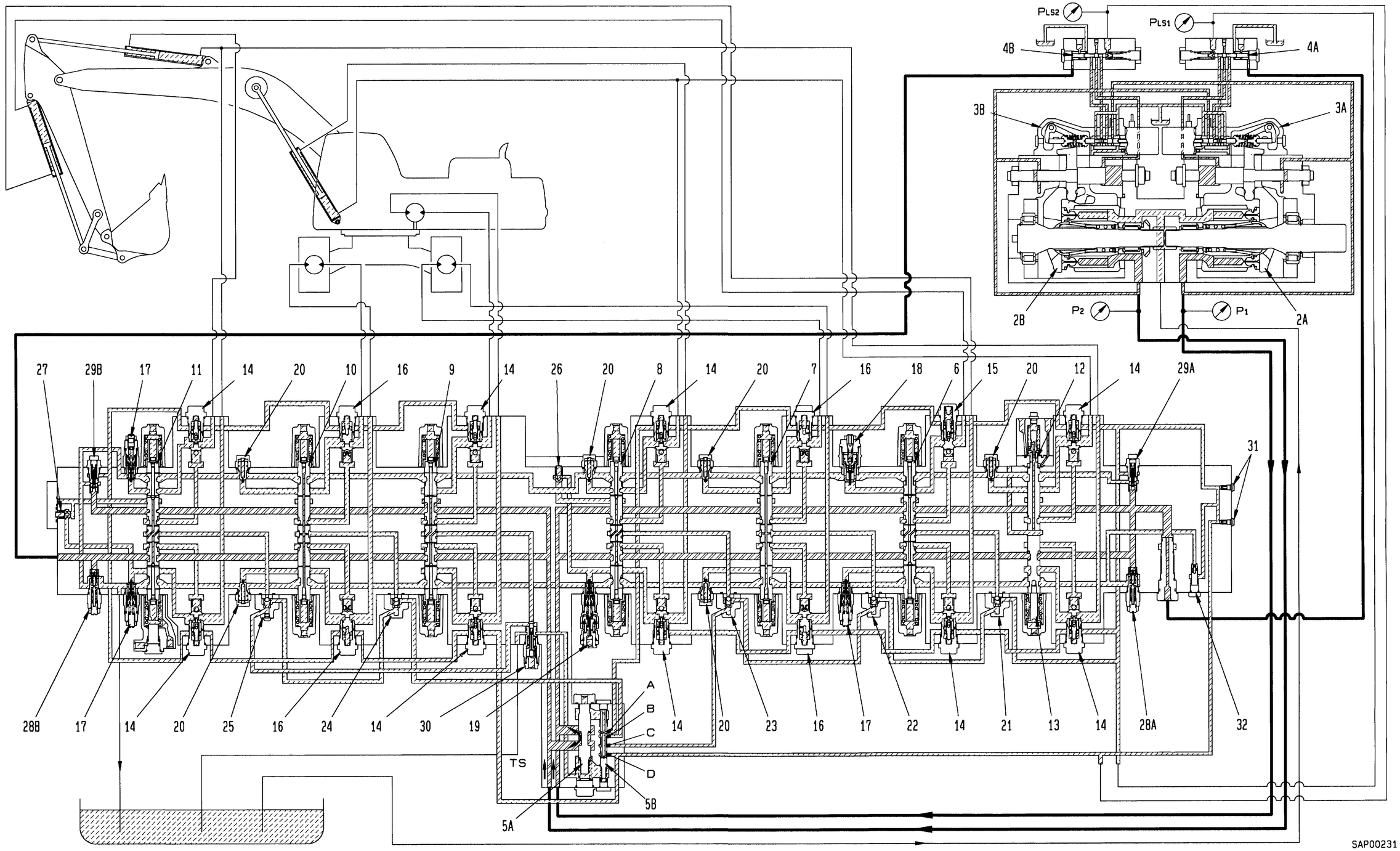
When holding pressure at port A > LS pressure in spring chamber B.

- Shuttle valve (3) is pushed to the right by the pressure of port **A**, and the circuit between ports **A** and **C** is shut off. In this condition, the holding pressure at port **A** is taken to spring chamber **B**, and pushes piston (4) to the left to prevent piston (4) and valve (2) from separating.

OPERATION OF WHOLE CLSS SYSTEM

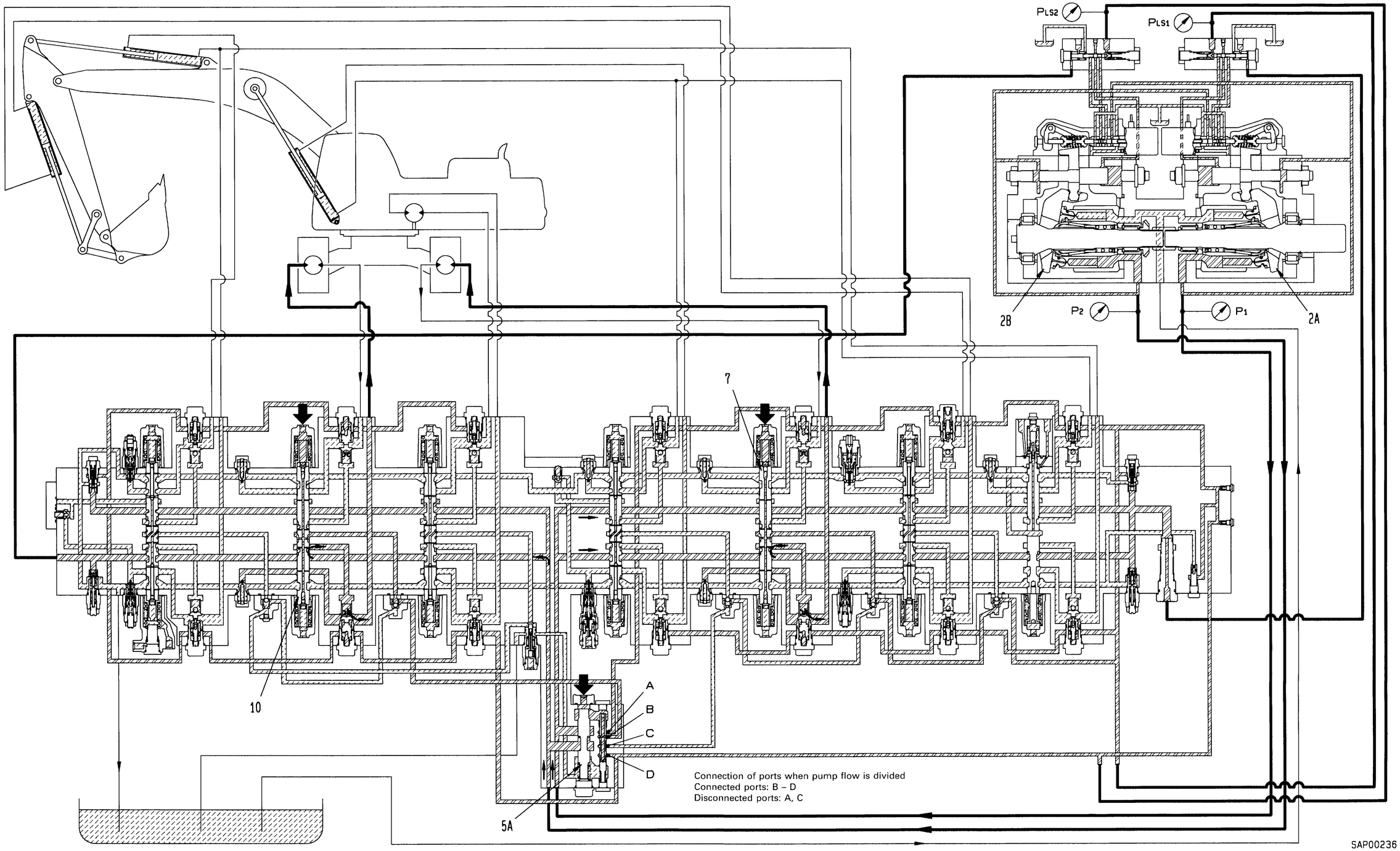
1. When all work equipment is at neutral

★ The diagram shows the situation when all work equipment is at neutral.
★ The valves and circuits that are not connected with the explanation of the operation of the CLSS hydraulic system have been omitted.



020706

6. Pump flow divided, travel operated independently



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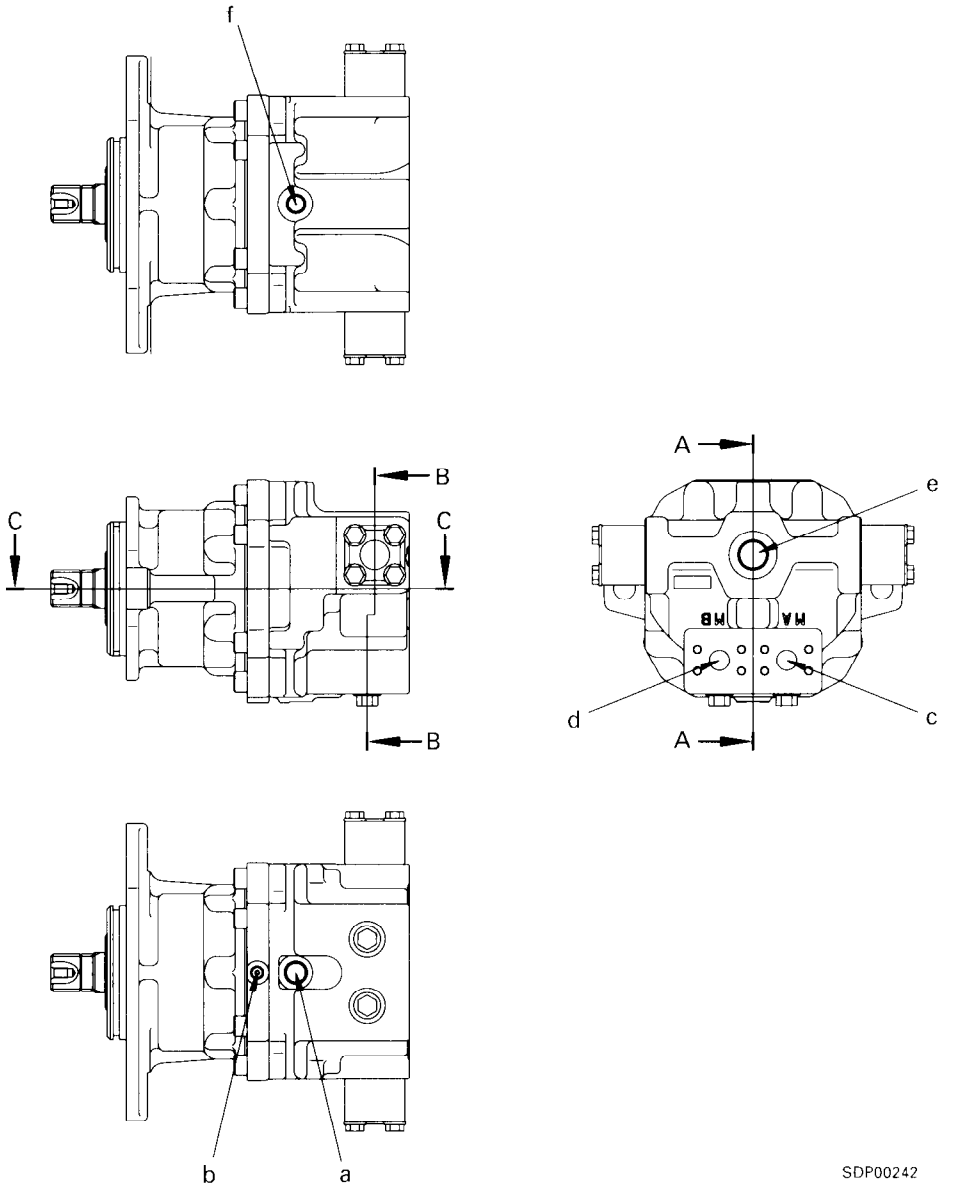
SWING MOTOR

KFM160AB-3



SDP00242

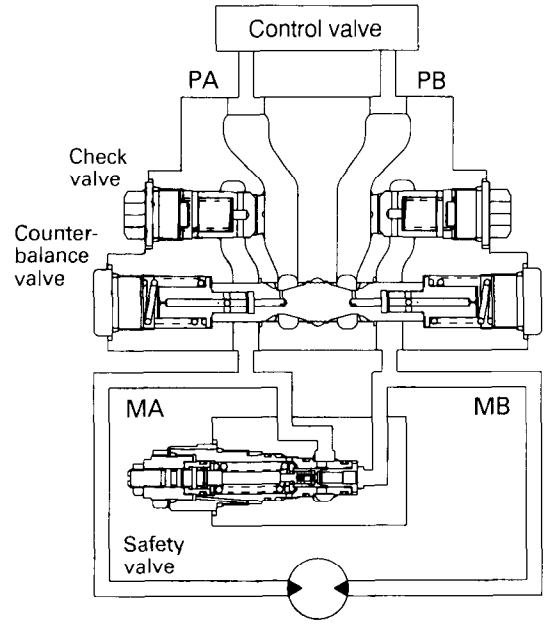
a. Port T_1 (to tank)
b. Port B (from swing brake solenoid valve)
c. Port MA (from control valve)
d. Port MB (from control valve)
e. Port S (from lift check valve)
f. Port T_2 (to port S)

Specifications

Model:	KMF160AB-3
Theoretical delivery:	160.7 cc/rev
Safety valve set pressure:	$28.4^{+0.5}_{0}$ MPa at 244 ℓ/min
	(290^{+5}_{0} kg/cm^2 at 244 ℓ/min)
Rated speed:	1,680 rpm
Brake releasing pressure:	1.8 ± 0.4 MPa
	(18.4 ± 4 kg/cm^2)

Operation of brake valve

- The brake valve consists of a check valve, counterbalance valve, and safety valve in a circuit as shown in the diagram on the right. (Fig. 1)
- The function and operation of each component is as given below.



(Fig. 1)

SAP00262

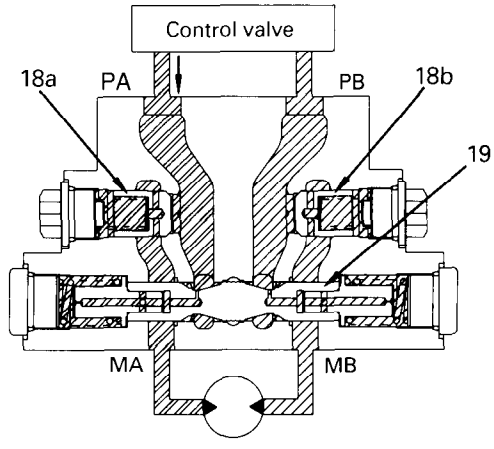
1) Counterbalance valve, check valve

Function

- When traveling downhill, the weight of the machine makes it try to travel faster than the speed of the motor.
  As a result, if the machine travels with the engine at low speed, the motor will rotate without load and the machine will run away, which is extremely dangerous.
  To prevent this, these valves act to make the machine travel according to the engine speed (pump discharge amount).

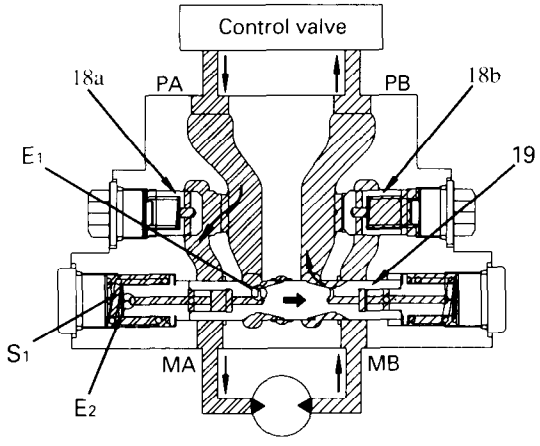
Operation when pressurized oil is supplied

- When the travel lever is operated, the pressurized oil from the control valve is supplied to port **PA**. It pushes open check valve (18a) and flows from motor inlet port **MA** to motor outlet port **MB**.
  However, the motor outlet port is closed by check valve (18b) and spool (19), so the pressure at the supply side rises. (Fig. 2).
- The pressurized oil at the supply side flows from orifice **E1** in spool (19) and orifice **E2** in the piston to chamber **S1**. When the pressure in chamber **S1** goes above the spool switching pressure, spool (19) is pushed to the right. As a result, port **MB** and port **PB** are connected, the outlet port side of the motor is opened, and the motor starts to rotate. (Fig. 3).



(Fig. 2)

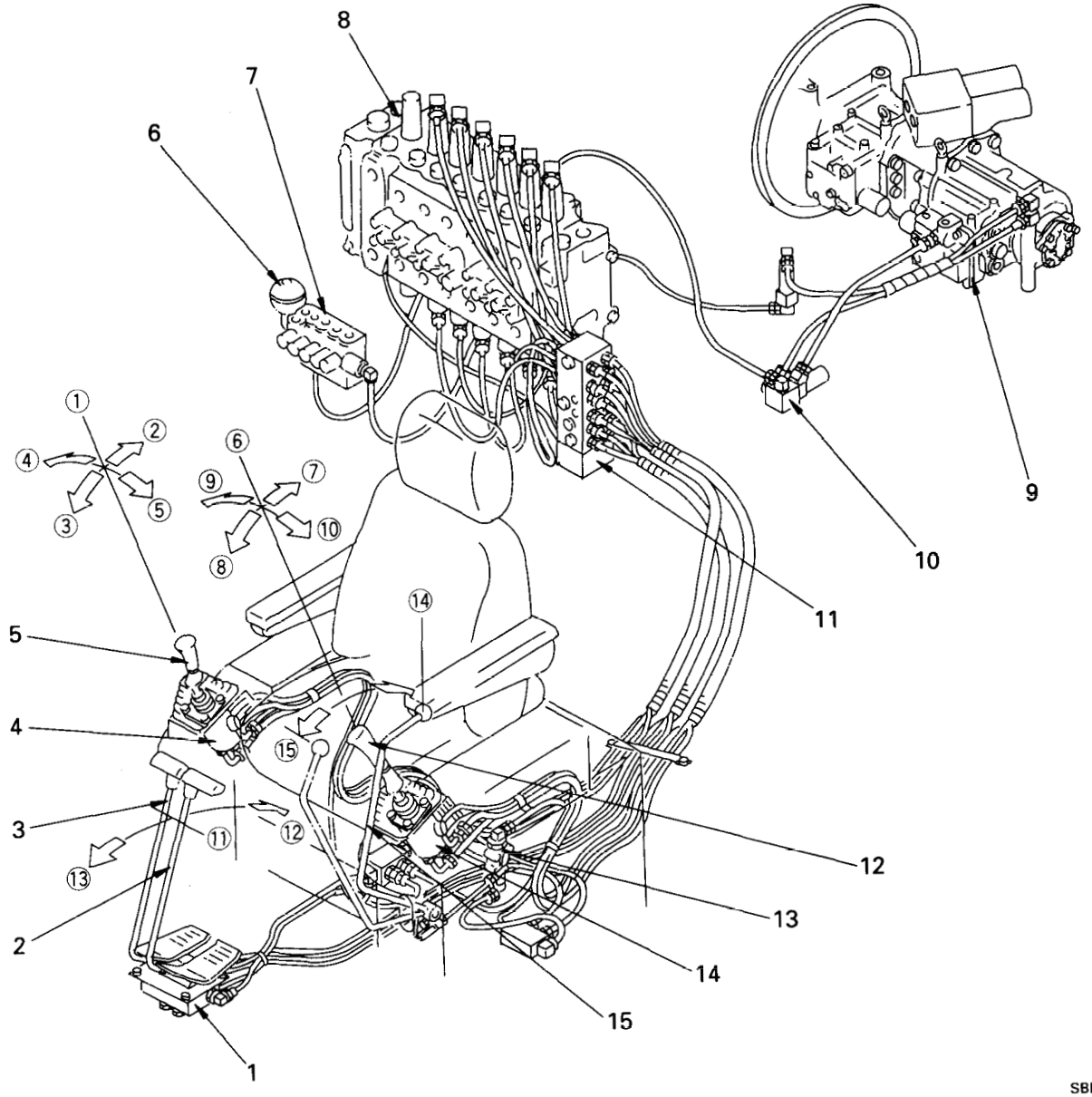
SAP00263



(Fig. 3)

SAP00264

VALVE CONTROL



1. Travel PPC valve
2. L.H. travel lever
3. R.H. travel lever
4. Right PPC valve
5. Right work equipment lever
6. Accumulator
7. Solenoid block
8. Control valve
9. Hydraulic pump
10. LS control EPC valve
11. PPC shuttle valve
12. Left work equipment lever
13. PPC safety lock valve
14. Left PPC valve
15. Safety lock lever

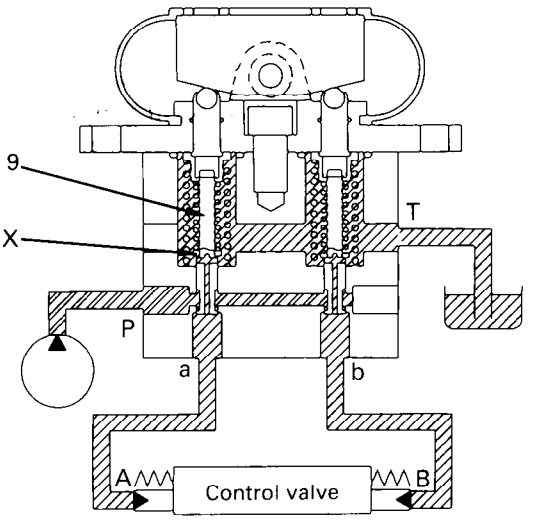
Lever positions

① NEUTRAL
② Boom RAISE
③ Boom LOWER
④ Bucket DUMP
⑤ Bucket CURL
⑥ NEUTRAL
⑦ Arm IN
⑧ Arm OUT
⑨ Swing right
⑩ Swing left
⑪ NEUTRAL
⑫ Travel REVERSE
⑬ Travel FORWARD
⑭ LOCK
⑮ FREE

OPERATION

At neutral

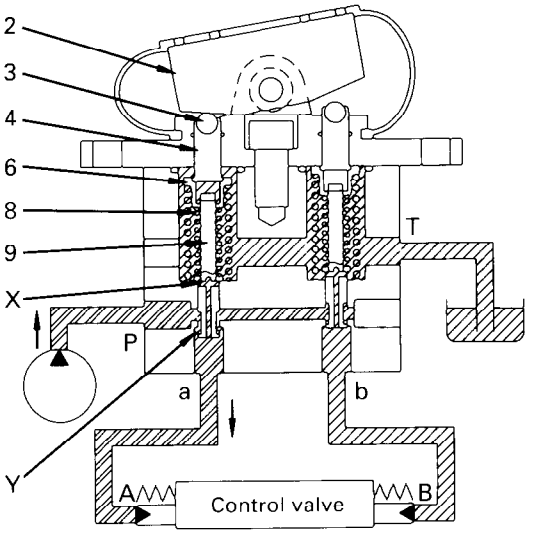
- The pressurized oil from the control pump enters from port **P** and is blocked by spool (9).
- Ports **A** and **B** of the control valve and ports **a** and **b** of the PPC valve are connected to drain port **T** through fine control hole **X** of spool (9).



SBP00286

When operated

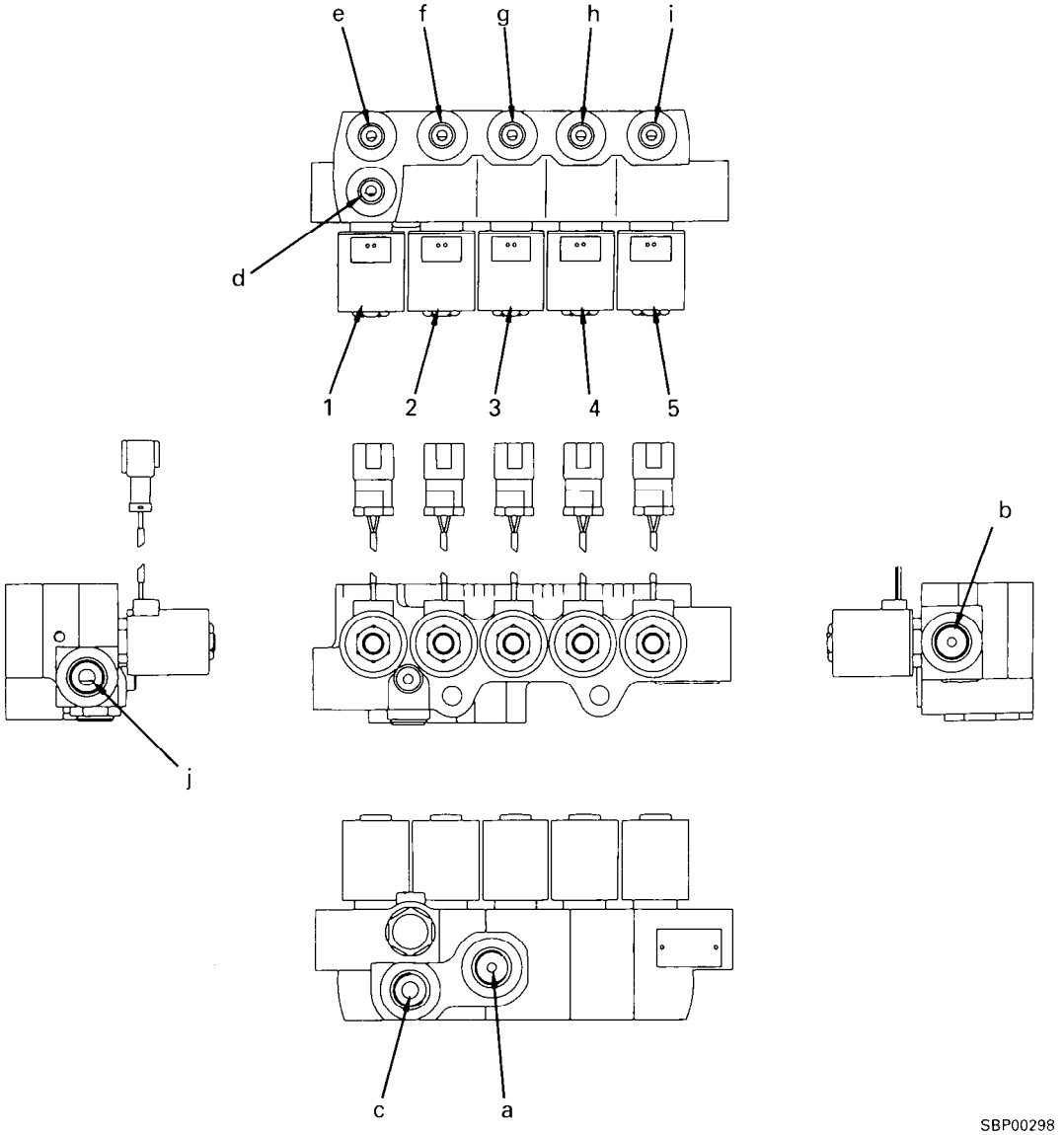
- When cam (2) is moved, metering spring (8) is pushed by ball (3), piston (4), and sleeve (6), and spool (9) is pushed down by this.
- As a result, fine control hole **X** is shut off from the drain circuit. At almost the same time, fine control portion **Y** is connected with port **a**, and the pressurized oil from port **P** flows from port **a** to port **A** of the control valve.



SBP00287

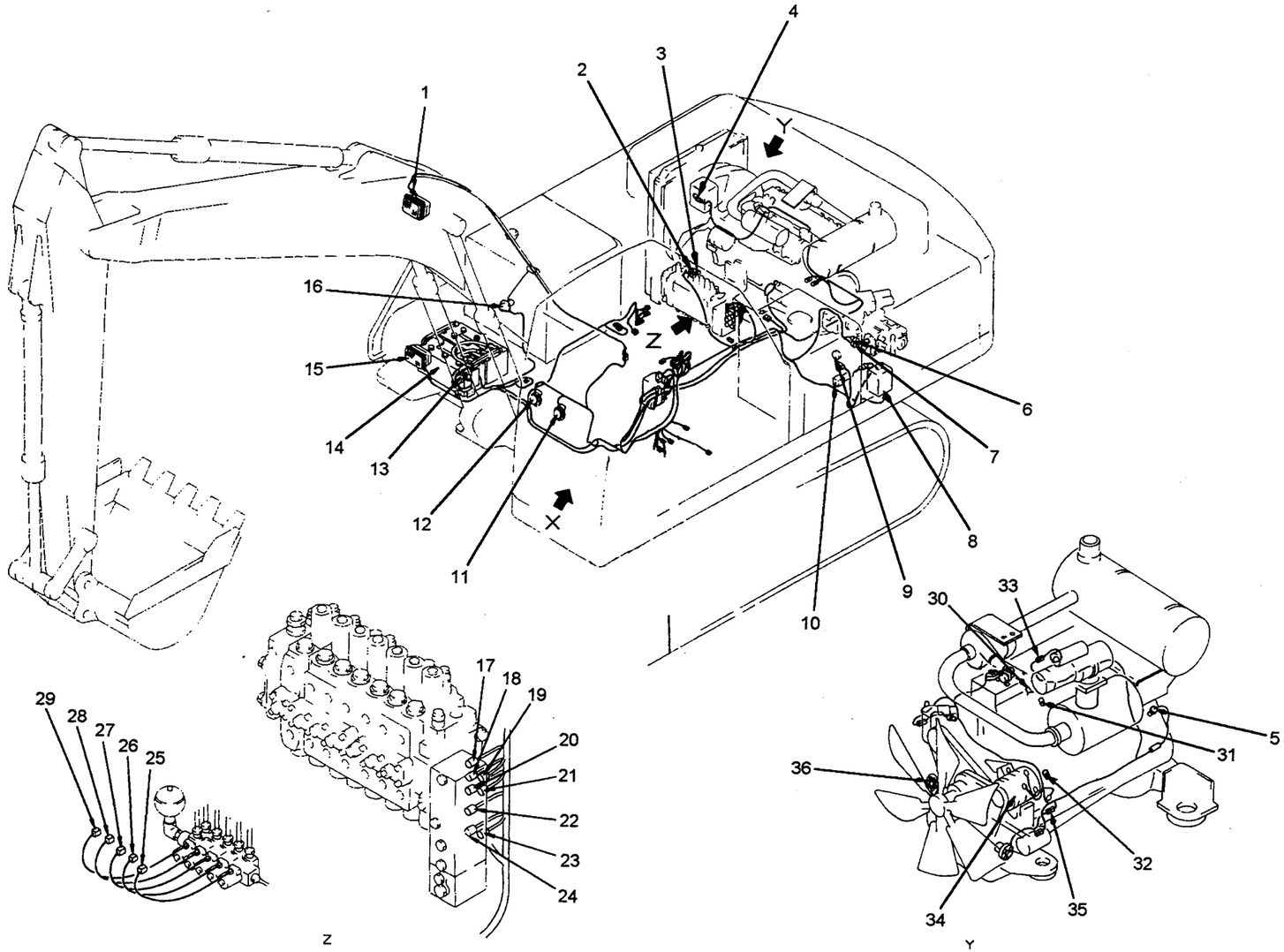
EPC SOLENOID VALVE

For LS select, boom Hi 2-stage safety valve, merge/flow divider, travel speed, swing brake



1. LS select solenoid valve
2. Boom Hi 2-stage safety valve solenoid valve
3. Merge/flow divider solenoid valve
4. Travel speed solenoid valve
5. Swing brake solenoid valve

a. To tank
b. From control pump
c. To PPC valve
d. From shuttle valve
e. To LS select valve
f. To boom control valve
g. To merge/flow divider valve
h. To L.H. and R.H. travel motors
i. To swing motor
j. To accumulator


1
2
3
4
Y
16
Z
15
14
13
12
X
11
6
7
8
9
10
30
33
5
31
36
32
34
35
Y
17
18
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27
26
25
Z

X08CD047

Input and output signals

CN-1

Pin No.	Name of signal	Input/ output
1	Battery relay drive output	Output
2	Pump merge/divider solenoid/NC	Output
3	Swing holding brake solenoid	Output
4	NC	
5	NC	
6	GND	Input
7	Power source (+24V)	Input
8	LS divider solenoid/LS cut-off solenoid	Output
9	Travel selector solenoid	Output
10	2-stage relief solenoid	Output
11	NC	
12	GND	Input
13	Power source (+24V)	Input

CN-2

Pin No.	Name of signal	Input/ output
1	Solenoid power source (+24V)	Input
2	Governor motor phase A (+)	Output
3	Governor motor phase A (–)	Output
4	Governor motor phase B (+)	Output
5	Governor motor phase B (–)	Output
6	NC	
7	LS-EPC solenoid (+)	Output
8	TVC solenoid 1 (+)	Output
9	TVC solenoid 2 (+)	Output
10	NC	
11	PGND	Input
12	Solenoid power source (+24V)	Input
13	NC	
14	NC	
15	NC	
16	NC	
17	LS-EPC solenoid (–)	Output
18	TVC solenoid 1 (–)	Output
19	TVC solenoid 2 (–)	Output
20	NC	
21	PGND	Input

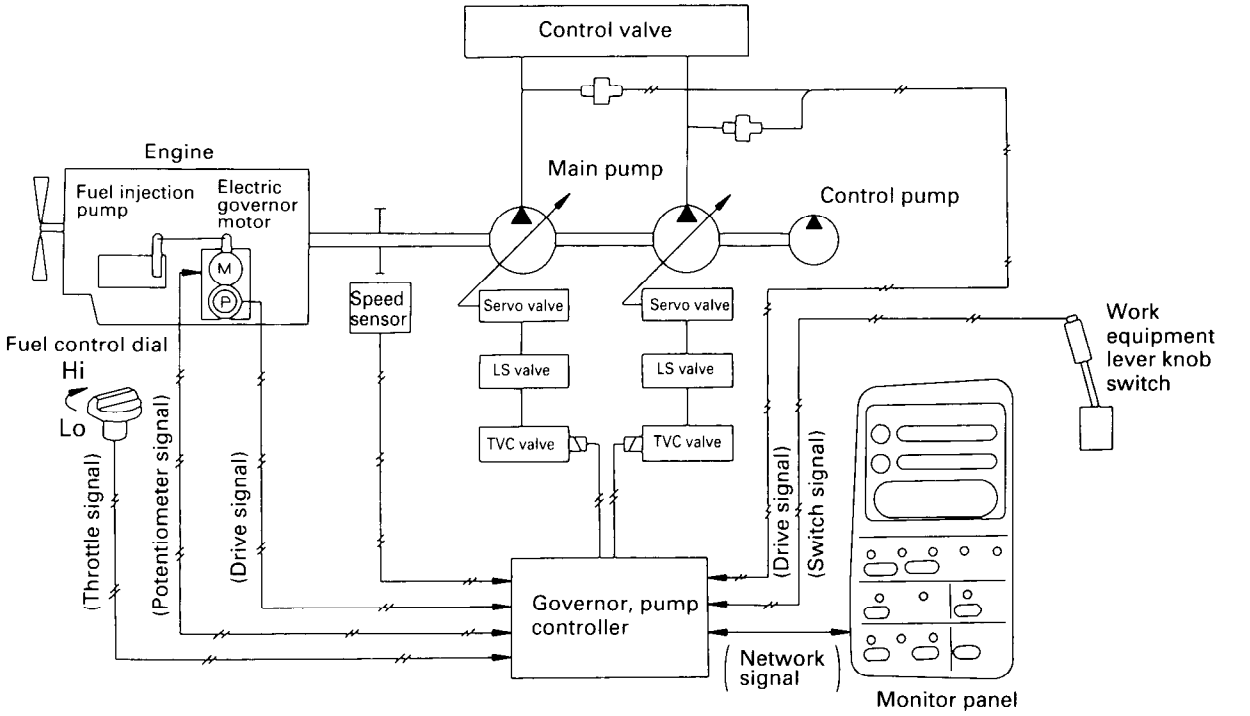
CN-3

Pin No.	Name of signal	Input/ output
1	Engine water temperature sensor	Input
2	Fuel level sensor	Input
3	Pump F pressure input	Input
4	Throttle potentiometer input	Input
5	NC	
6	Pressure sensor power source (+24V)	Output
7	Potentiometer power source (+5V)	Output
8	Starting switch (ACC)	Input
9	Knob switch	Input
10	Hydraulic oil temperature sensor (monitor panel)	Input
11	Hydraulic oil temperature sensor (thermistor type)	Input
12	Battery charge (alternator terminal R)	Input
13	Pump R pressure input	Input
14	Feedback potentiometer input	Input
15	NC	Input
16	Pressure sensor GND	Input
17	Potentiometer GND	Input
18	Starting switch (terminal C)	Input
19	Automatic greasing controller abnormality	Input
20	Hydraulic filter sensor	Input
21	PPC pressure	Input
22	Boom RAISE pressure switch	Input
23	Arm IN pressure switch	Input
24	S-NET(+)	Input, output
25	Model selection 1	Input
26	Model selection 3	Input
27	Model selection 5	Input
28	Swing prolix switch	Input
29	Overload sensor	Input
30	Boom LOWER pressure switch	Input
31	Arm OUT pressure switch	Input
32	S-NET(+)	Input, output
33	Model selection 2	Input
34	Model selection 4	Input
35	Kerosene mode selection	Input
36	Swing lock switch	Input

CN-5

Pin No.	Name of signal	Input/ output
1	Engine speed sensor GND	Input
2	Engine speed sensor	Input
3	GND	Input
4	GND	Input
5	Swing pressure switch	Input
6	Service valve pressure switch	Input
7	Engine oil pressure sensor H	Input
8	Radiator water level sensor	Input
9	Hydraulic oil level sensor	Input
10	Engine speed sensor GND	Input
11	Bucket CURL pressure switch	Input
12	Bucket DUMP pressure switch	Input
13	Travel pressure switch	Input
15	Engine oil pressure sensor L	Input
16	Engine oil level sensor	Input
17	Air cleaner clogging sensor	Input

3. Power max. function, swift slow-down function



SBP00354

Function

- This function provides an increase in the digging power for a certain time or switches the working mode to the fine operation to reduce the speed. It is operated using the L.H. knob switch to momentarily match the operating conditions.

★ The power max. function and swift slow-down function are operated with the same switch. Only one of these functions can be selected at any time; they cannot both be operated together.

1) Pump control function when traveling

- If the travel is operated in any working mode other than the heavy-duty operation mode, this increases the pump absorption torque while keeping the working mode and engine speed as they are.

★ For details, see PUMP & ENGINE MUTUAL CONTROL.

2) Travel speed selection function

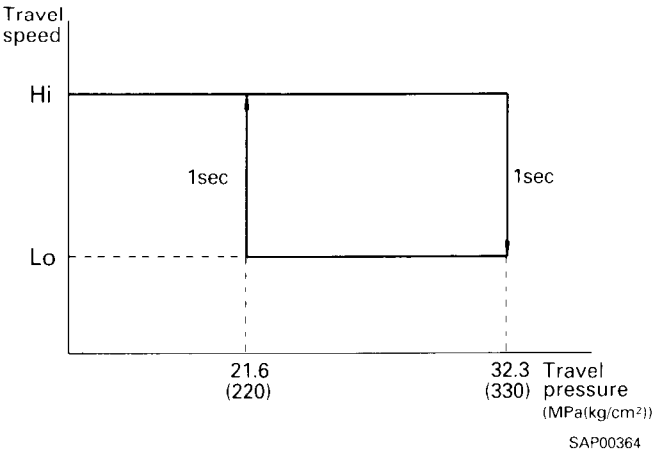
i) Manual selection using travel speed switch
If the travel speed switch is set to Lo, Mi, or Hi, the governor and pump controller controls the pump flow and motor volume at each speed range as shown on the right to switch the travel speed.

ii) Automatic selection according to engine speed
If the engine speed is reduced to below 1,350 rpm by the fuel control dial:

- If the machine is traveling in Lo, it will not shift even if Mi or Hi are selected.
- If the machine is traveling in Mi, it will not shift even if Hi is selected.
- If the machine is traveling in Hi, it will automatically shift to Lo.

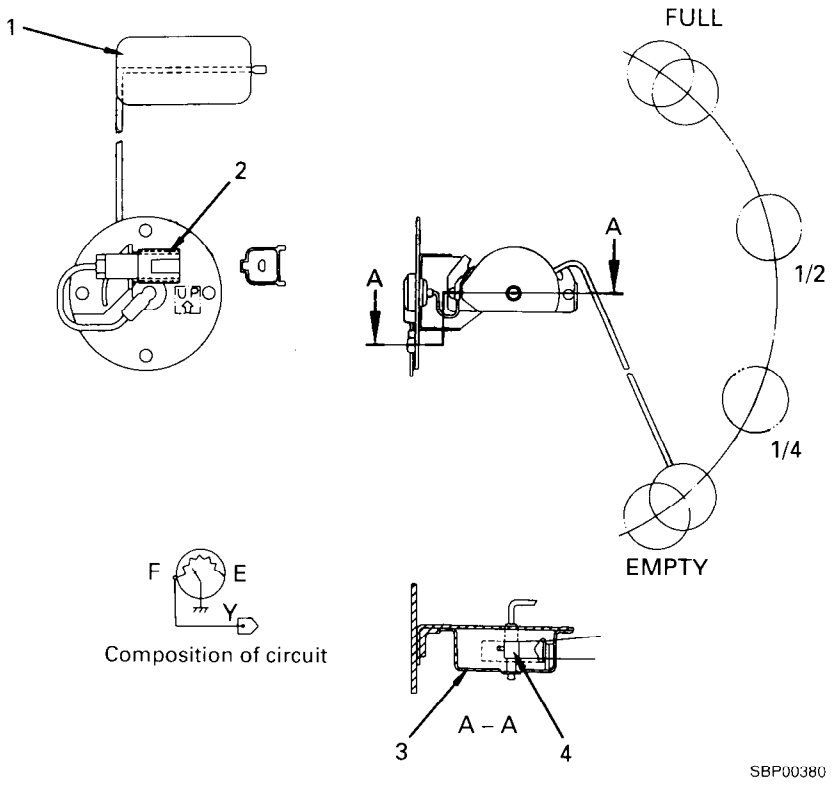
iii) Automatic selection according to pump discharge pressure
If the machine is traveling with the travel speed switch at Hi, and the load increases, such as when traveling up a steep hill, if the travel pressure continues at 32.3 MPa (330 kg/cm^2) for more than 1.0 sec, the pump volume is automatically switched and the travel speed changes to Lo.
(The travel speed switch stays at Hi.)
The machine continues to travel in Lo, and when the load is reduced, such as when the machine travels again on flat ground or goes downhill, and the travel pressure stays at 21.6 MPa (220 kg/cm^2) or less for more than 1.0 sec, the pump volume is automatically switched and the travel speed returns to Hi.

Travel speed switch	LO (Low speed)	Mi (Mid-range speed)	Hi (High speed)
Pump flow (%)	80	60	100
Motor volume	Max.	Min.	Min.
Travel speed (km/h) PC300LC-6	3.7	4.5	5.5
Travel speed (km/h) PC300HD-6	2.5	3.5	4.4

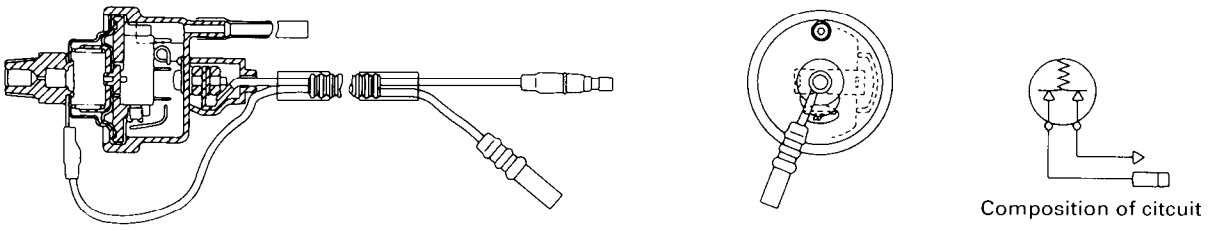


Fuel level sensor

1. Float
2. Connector
3. Cover
4. Variable resistor

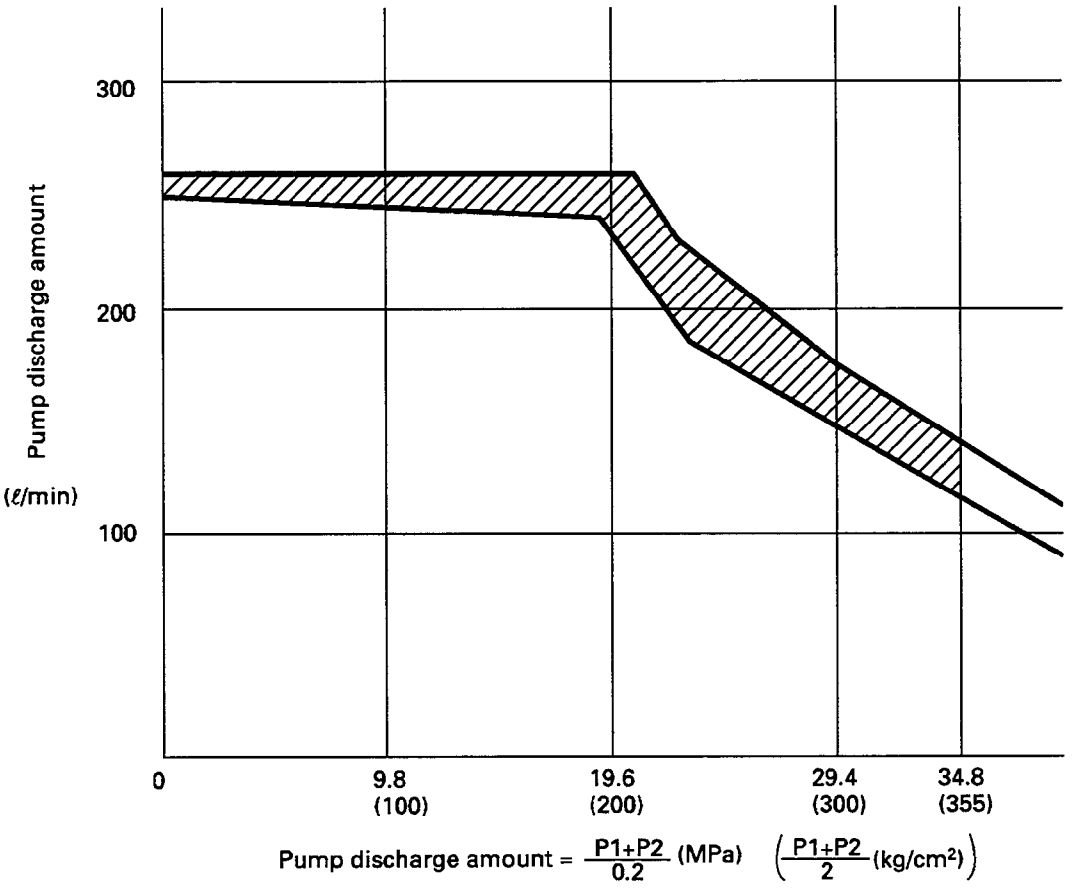


Air cleaner clogging sensor



Category: Performance of hydraulic pump

PC300LC-6 and PC300HD-6: Discharge amount of main piston pump (in H/O mode)



- Pump speed: At 2050 rpm, TVC current 180 mA

Check point	Test pump discharge pressure (MPa (kg/cm²)	Test pump discharge pressure (MPa (kg/cm²)	Average pressure (MPa (kg/cm²)	Standard value for discharge amount Q (ℓ/min)	Judgement standard lower limit Q (ℓ/min)
As desired	P1	P2	$\frac{P1 + P2}{0.2\ (2)}$	See graph	See graph

★ As far as possible, bring pump discharge pressures P1 and P2 as close as possible to the average pressure when measuring. The error is large near the point where the graph curves, so avoid measuring at this point.

★ When measuring with the pump mounted on the machine, if it is impossible to set the engine speed to the specified speed with the fuel control dial, take the pump discharge amount and the engine speed at the point of measurement, and use them as a base for calculating the pump discharge amount at the specified speed.

MEASURING ENGINE SPEED

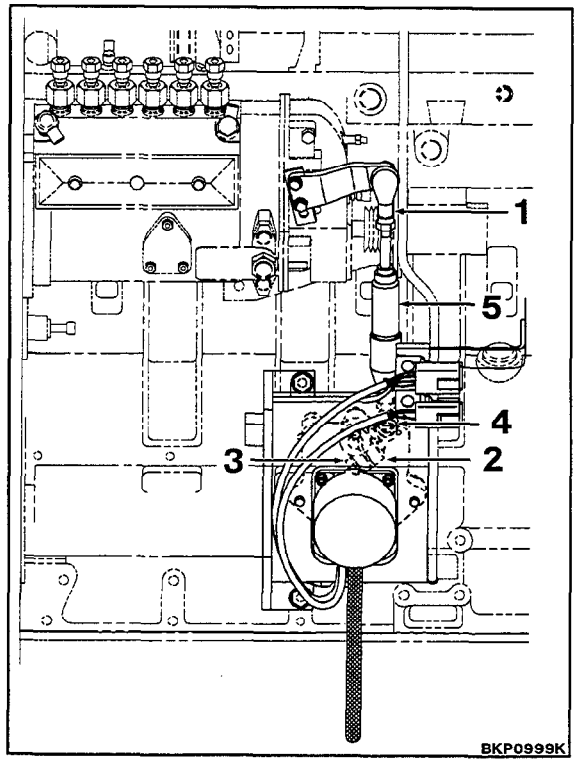
⚠ When removing or installing the measuring equipment, be careful not to touch any high temperature parts.

★ Measure the engine speed under the following conditions.
- Coolant temperature: Within operating range
- Hydraulic oil temperature: 45 to 55°C

1. Install the digital optical tachometer using the instructions supplied with it.

2. Start the engine, and measure the engine speed when it is set to the conditions for measuring.
1) Measuring low idling and high idling speeds.
Measure the engine speed with the fuel control dial set to low idling and high idling.
★ Measure in the heavy-duty mode with the auto-deceleration OFF.
2) Measure the speed at near the rated speed.
I) Set the working mode the H/O mode.
ii) Set the power max./swift slow-down switch to the power max. position.
iii) Run the engine at full throttle, set the knob switch to the ON position, operate the arm lever, and measure the speed when the arm IN circuit is relieved.
★ Even if the L.H. knob switch is kept pressed, the power max. function is automatically turned off after approximately 8 seconds, so measure during the first 8 seconds.
★ Measure speed when travel is operated: Knob switch ON.
3) Measure speed at 2-pump relief:
I) Set the working mode the H/O mode.
ii) Run the engine at full throttle, operate the arm lever, and measure the engine speed when the arm IN circuit is relieved.

TESTING AND ADJUSTING GOVERNOR MOTOR LEVER STROKE



Testing

★ Use the governor motor adjustment mode.

1. Preparatory work
   1) Keep the monitor panel time switch + travel speed (R.H.) switch + working mode (R.H.) switch pressed for 2.5 seconds.
   2) Set the fuel control dial to MAX, and the auto-deceleration switch to OFF.
      ★ Any working mode can be used.
2. In this condition, check the governor lever and spring rod.
3. After checking, repeat the procedure in Step 1 to complete the governor motor adjustment mode.

Adjusting

1. Turn the starting switch OFF, then remove the nut and disconnect joint (1) from governor lever (2).
2. Repeat the procedure in Step 1 above to set to the governor motor adjustment mode.
3. Set governor lever (2) to a position where it contacts full speed stopper (3) of the fuel injection pump, then turn joints (1) and (4) to adjust the length of spring assembly (5) and adjust to the position of the hole of governor lever (2).
4. From the above position, shorten joints (1) and (4) a total of 2 turns (approx. 2.5 mm), and secure in position with the locknut.

Caution

★ When the spring assembly is removed and the starting switch is at the OFF position, if the governor motor lever is moved suddenly, the governor motor will generate electricity, and this may cause a failure in the governor controller.

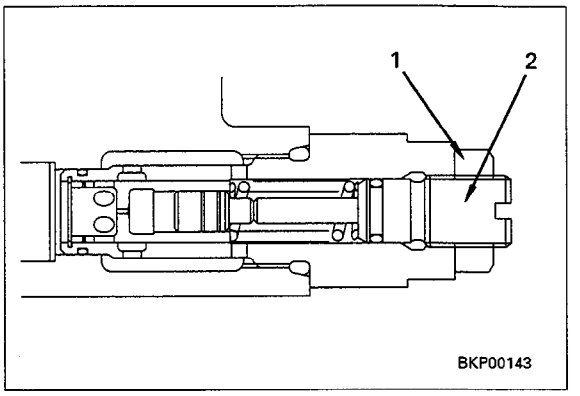
★ When moving the governor motor lever, disconnect connector E05 first.

Adjusting

1. Loosen locknut (1) and turn adjustment screw (2) to adjust.
   - ★ Turn the adjustment screw as follows.
     - To INCREASE pressure, turn CLOCKWISE
     - To DECREASE pressure, turn COUNTER-CLOCKWISE
   - ★ Amount of adjustment for one turn of adjustment screw:

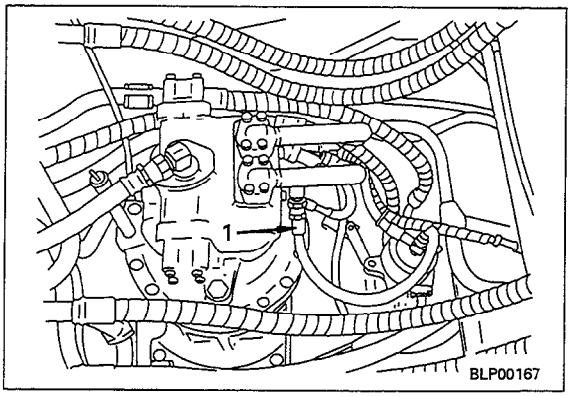
     Approx. 0.56 MPa (5.7 kg/cm^2)

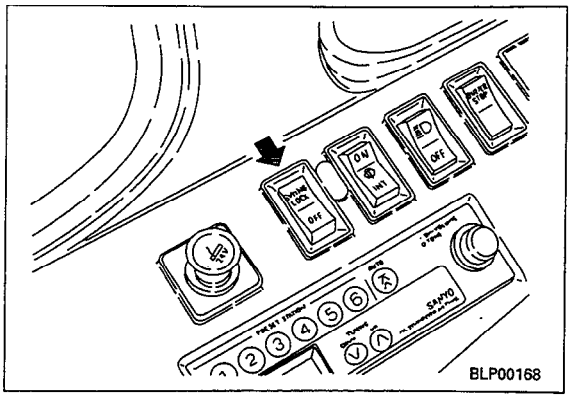
   - kgm Locknut : **63.7 ± 9.8 Nm (6.5 ± 1 kgm)**
   - ★ After completion of adjustment, repeat the procedure in Item 1 to check the set pressure again.



2. Swing motor

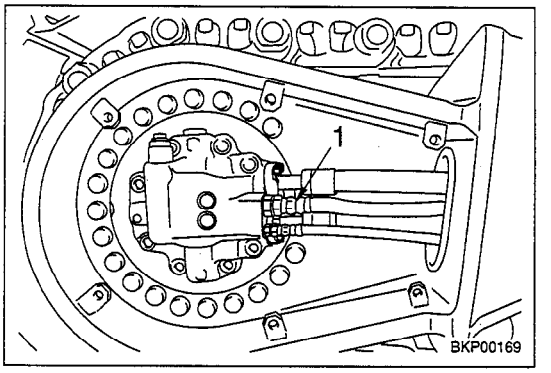
1) Disconnect drain hose (1) from the swing motor, then install a blind plug at the tank end.
2) Turn the swing lock switch ON.
3) Start the engine and operate the swing relief with the engine at full throttle.
4) Continue this condition for 30 seconds, then measure the oil leakage for the next one minute.
   ★ After measuring, swing 180° and measure again.

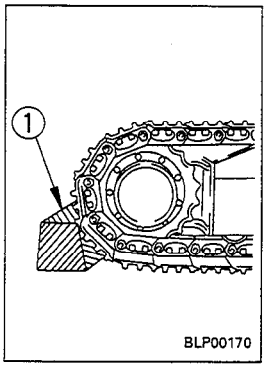


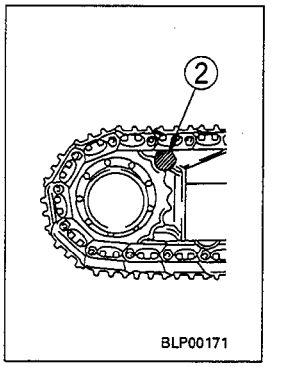


3. Travel motor

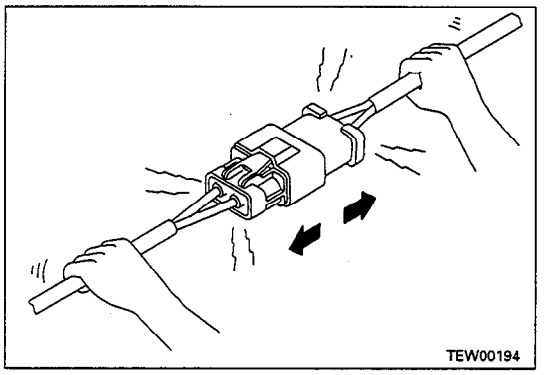
1) Disconnect drain hose (1) from the travel motor, then fit a blind plug at the hose end.
2) Fit block ① under the track shoe grouser, or fit block ② between the sprocket and frame to lock the track.
3) Start the engine and operate the travel relief with the engine at full throttle.
   ⚠ When measuring the oil leakage from the travel motor, mistaken operation of the control lever may lead to a serious accident, so always use signals and check when carrying out this operation.
4) Continue this condition for 30 seconds, then measure the oil leakage for the next one minute.
   ★ When measuring, move the motor slightly (to change the position between the valve plate and cylinder, and piston and cylinder), and measure several times.



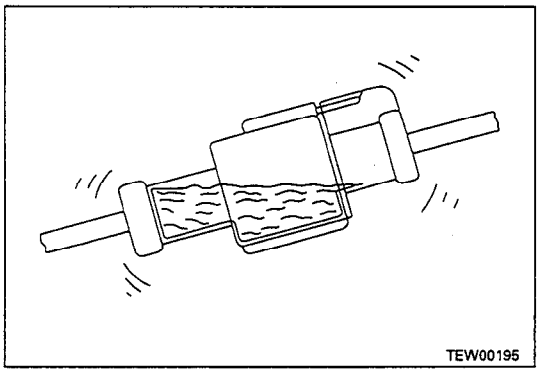




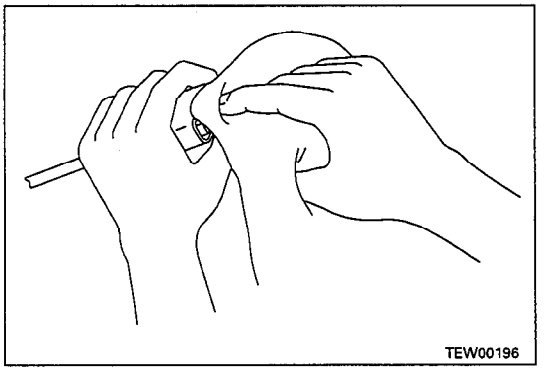
③ Disconnections in wiring
If the wiring is held and the connectors are pulled apart, or components are lifted with a crane with the wiring still connected, or a heavy object hits the wiring, the crimping of the connector may separate, or the soldering may be damaged, or the wiring may be broken.


TEW00194

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

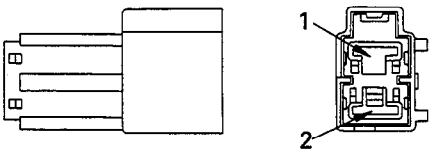
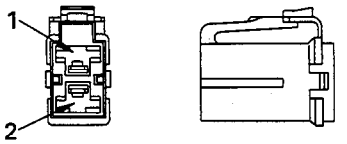

TEW00195

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

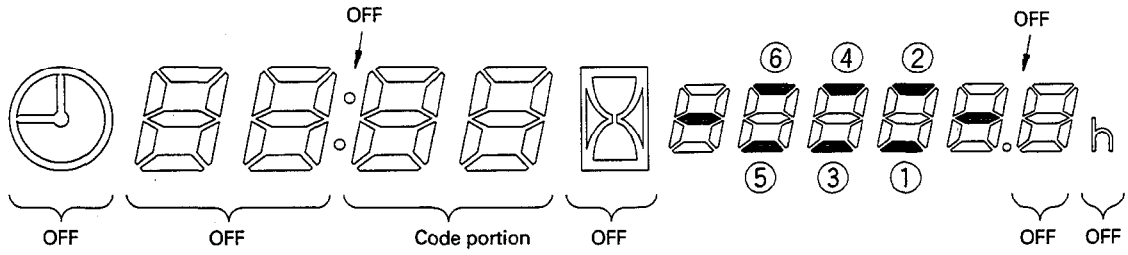

TEW00196

Connector No.	Type	No. of pins	Mounting location	Address
P05	X	4	Engine oil level sensor	H-1
P06	X	1	Fuel level sensor	C-7
P07	X	2	Engine coolant temperature sensor	G-3
P08	X	2	Radiator water level sensor	F-9
P09	X	1	Hydraulic oil level sensor	H-5
P11	---	3	Engine oil pressure switch	---
P12	---	1	Air cleaner clogging sensor	---
R04	Shinagawa	6	Light relay	N-1
R05	Shinagawa	6	Light relay (option)	N-1
S01	X	2	Travel pressure switch	E-1 H-5
S02	X	2	Boom RAISE pressure switch	E-1 H-8
S03	X	2	Arm OUT pressure switch	E-2 F-9
S04	X	2	Boom LOWER pressure switch	E-3 F-9
S05	X	2	Arm IN pressure switch	E-2 G-9
S06	X	2	Bucket CURL pressure switch	E-3 G-9

Connector No.	Type	No. of pins	Mounting location	Address
S07	X	2	Bucket DUMP pressure switch	E-3 F-9
S08	X	2	Swing pressure switch	E-3 G-9
S09	X	2	Service pressure switch (option)	H-5
V02	X	2	LS select solenoid valve	B-3 C-6
V03	X	2	Pump merge/divider solenoid valve	B-3 E-8
V04	X	2	Swing holding brake solenoid valve	C-2 H-8
V05	X	2	Machine push up solenoid valve	B-3 E-8
V06	X	2	Travel speed selector solenoid valve	B-3 E-8
W04	M	6	Wiper motor	K-2 L-6
W08	070	18	Wiper motor controller	O-1
W10	M	4	Intermediate connector	N-1
X01	MIC	21	Intermediate connector	E-4 O-5
X05	M	4	Swing lock switch	M-4
X07	MIC	17	Intermediate connector	P-3

No. of pins	L type type connector	
	Male (female housing)	Female (male housing)
2	 TEW00257	 TEW00258

3) Bit pattern chart
As shown in the diagram below, the time display has bit numbers which light up to show that the signal is being transmitted. (For details, see METHOD OF DISPLAYING MONITORING CODE.)



BKP00085

Code	Content	Bit	Details (condition when lighted up)
08	Connection of S-NET components	(1)	Governor,pump controller connected (ID=2)
		(2)	Governor, pump controller connected (ID=3)
		(3)	
		(4)	
		(5)	
		(6)	
20	Input condition of governor, pump controller PPC switches	(1)	Swing switch ON
		(2)	Travel switch ON
		(3)	Boom LOWER switch ON
		(4)	Boom RAISE switch ON
		(5)	Arm IN switch ON
		(6)	Arm OUT switch ON
21	Input condition of governor, pump controller PPC switches and other switches	(1)	Bucket CURL switch ON
		(2)	Bucket DUMP switch ON
		(3)	Swing lock switch ON
		(4)	Service switch ON
		(5)	Model selection 5
		(6)	Swing prolix switch ON
22	Input condition of governor, pump controller model selection and other switches Drive condition of governor,	(1)	Model selection 1 GND connected
		(2)	Model selection 2 GND connected
		(3)	Model selection 3 GND connected
		(4)	Model selection 4 GND connected
		(5)	Kerosene mode input GND connected
		(6)	Knob switch ON

4) Check kerosene mode input signal
   i) Set to the monitoring mode, and display monitoring code 22.
   ii) Connect the CN-M36 connector and check that bit (5) lights up.
5) Check knob switch input signal .
   i) Set to the monitoring mode, and display monitoring code 22.
   ii) Turn the knob switch ON and check that bit (6) lights up.

2. Check output signals
   1) Check LS-EPC solenoid output current
      i) Set to the monitoring mode, and display monitoring code 15.
      ii) Run the engine at high idling with all the levers at neutral and in the G/O or H/O mode, and measure the current.
         ★ All levers at neutral: 900 ± 80 mA
         Engine at high idling, any lever operated (other than travel): 0 A
   2) No. 2 throttle signal
      i) Set to the monitoring mode, and display monitoring code 16.
      ii) Use the procedure in Item 2 for checking the monitor panel output signal, and measure the engine speed.
   3) Checking ON ↔ OFF solenoid condition
      i) Set to the monitoring mode, and display monitoring code 23.
      ii) Refer to Table 3 and check that the applicable bit lights up.

Table 3 Types of solenoid and conditions for actuation

Name of solenoid	Actuation condition	Bit that lights up
LS select	Swing lock switch OFF, swing + travel lever operated simultaneously	(2)
Swing holding brake	Swing or work equipment lever operated	(3)
Pump merge/divider	Travel operated independently	(4)
Travel speed selector	Travel speed selector switch Hi or Mi	(6)

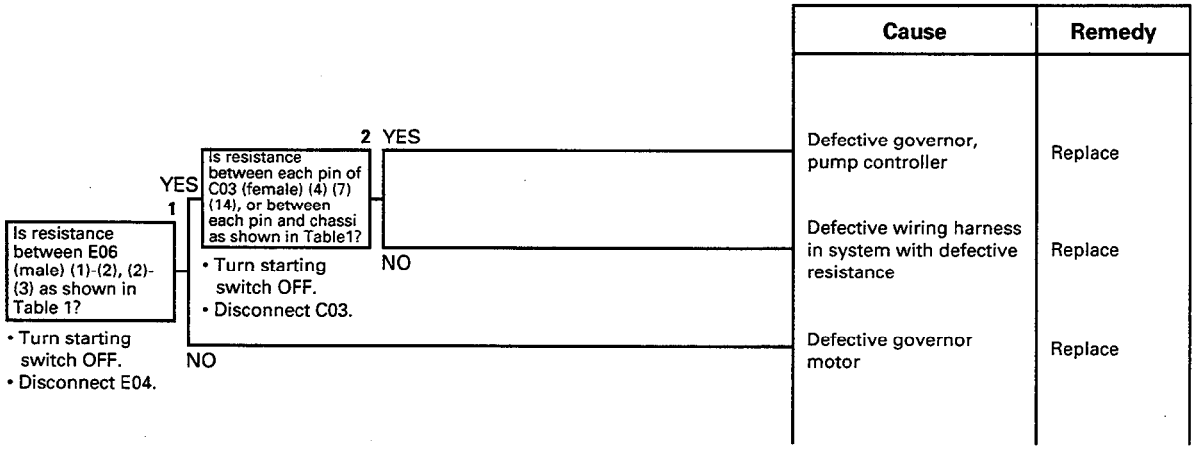
★ Operate the lever slightly not enough to move the machine.

   4) Check TVC solenoid output current
      i) Set to the monitoring mode, and display monitoring codes 13 and 14.
      • Code 13 is for the front pump and code 14 is for the rear pump.
      ii) With the starting switch kept at the ON position (G/O mode), measure the current when the fuel control dial is turned to the MAX position.
      • Current with starting switch ON (G/O mode) and fuel control dial at MAX
      : 520 ± 80 (mA)

User code	Service code	Abnormal system	Nature of abnormality
—	E306	Abnormality in feedback potentiometer system	1. Short circuit in wiring harness between C03 (7) – (14), (7) – (17), (14) – (17) 2. Short circuit in wiring harness between E04 (1) – (2), (1) – (3), (2) – (3) 3. Short circuit in wiring harness between E06 (1) – (2), (1) – (3), (2) – (3) 4. Short circuit in wiring harness between C03 (7) – (4), (4) – (17) 5. Disconnection in wiring harness between C03 (7) – E04 (1) 6. Disconnection in wiring harness between C03 (14) – E04 (2) 7. Disconnection in wiring harness between C03 (17) – E04 (3) 8. Defective governor motor potentiometer 9. Defective contact of C03, E04 connectors
—	E315	Abnormality (short circuit) in battery relay output system	If excess current flows between C03 (1) and battery relay ★ This occurs only when turning starting switch to OFF and stopping engine
—	E316	Abnormality (step-out) in motor	1. Defective adjustment of rod or scuffing of loose spring
			2. Abnormality in governor motor
			3. Abnormality in governor, pump controller

E5 [E306] Abnormality in feedback potentiometer 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 service code E is not displayed, 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 the next step.

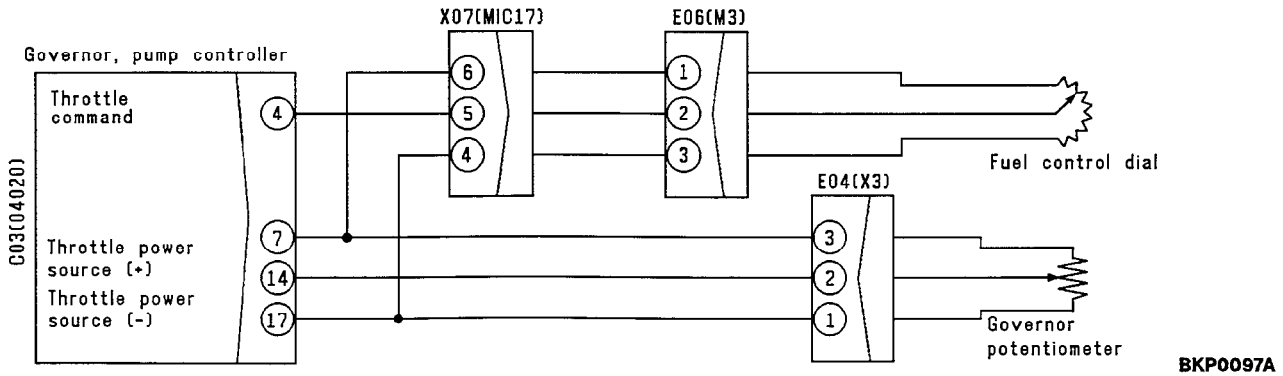


★ If E308 also occurs at the same time, check the wiring harness below.
- Wiring harness between C03 (female) (7) – X07 (6) – E06 (female) (1) short circuiting with ground, or contact with other wiring harness

Table 1

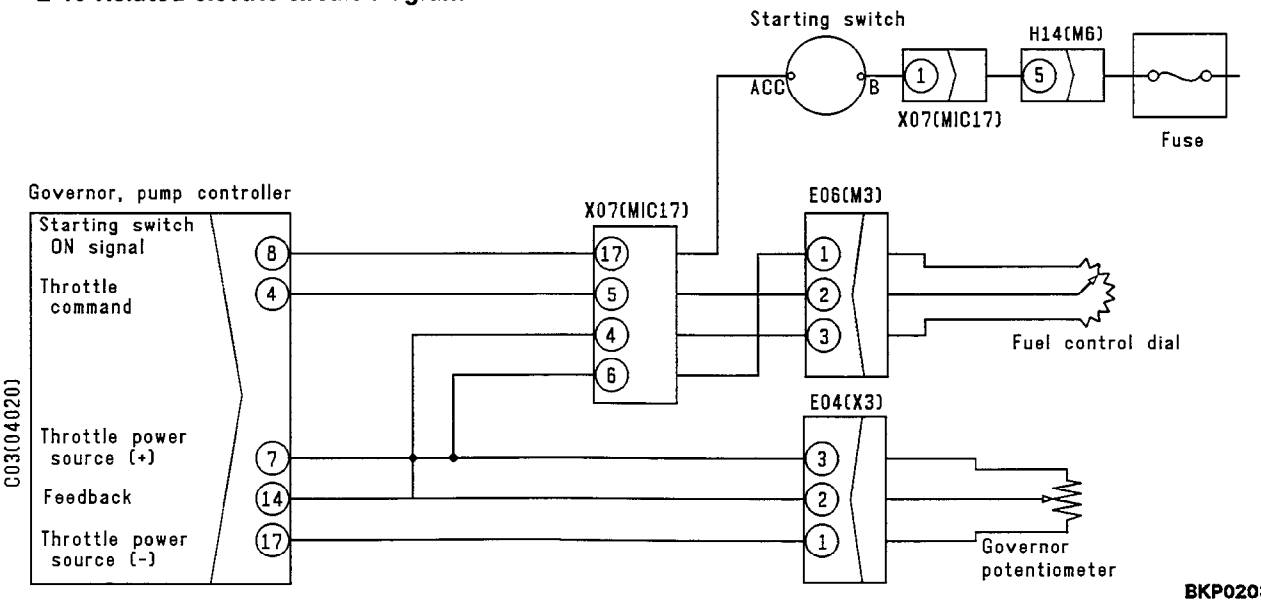
C03 (female)	E04 (male)	Resistance value
(7) – (4)	(1) – (2)	0.25 – 7kΩ
(14) – (17)	(2) – (3)	0.25 – 7kΩ
(7) – (17)	——	2 – 3kΩ
——	(1) – (3)	4 – 6kΩ
Between each pin and chassis	——	Min. 1 MΩ

E-5 Related electric circuit diagram



	Cause	Remedy
	See N mode	—
	Defective injection pump	See S mode
Starting motor signal 7 Is voltage between C03 (8) and chassis normal and stable? • During operation: 20 – 30V — YES	Defective governor motor	Replace
NO	Defective contact of wiring harness between starting switch ACC – X07 (17) – C03 (female) (8), or defective starting switch	Repair or replace
	See E-5	—
	See E-2	—
	Defective adjustment of governor motor linkage	Adjust
	See S mode	—
	See C-14	—

E-10 Related electric circuit diagram



S-1 Starting performance is poor (starting always takes time)

★ Check that the monitor panel does not display any abnormality in the governor control system.
General causes why exhaust smoke comes out but engine takes time to start
- Defective electrical system
- Insufficient supply of fuel
- Insufficient intake of air
- Improper selection of fuel
(At ambient temperature of 10°C or below, use ASTM D975 No. 1)

★ Battery charging rate

Ambient temperature \ Charging rate	100%	90%	80%	75%	70%
20°C	1.28	1.26	1.24	1.23	1.22
0°C	1.29	1.27	1.25	1.24	1.23
−10°C	1.30	1.28	1.26	1.25	1.24

- The specific gravity should exceed the value for the charging rate of 70% in the above table.
- In cold areas the specific gravity must exceed the value for the charging rate of 75% in the above table.

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

			Causes: Worn piston ring, cylinder	Defective contact of valve, valve seat	Clogged air cleaner element	Clogged fuel filter, strainer	Clogged feed pump strainer	Starting aid	Defective regulator	Defective alternator	Defective or deteriorated Electrical intake air heater	Defective injection nozzle	Defective injection timing	Leakage, clogging, pump (rack, plunger stuck)	Clogged air breather hole in fuel tank cap	Leakage, air in fuel piping
Questions	Confirm recent repair history															
	Degree of use of machine	Operated for long period		△	△	△				△						
	Ease of starting	Gradually became worse	◎	◎	○	○										
		Starts when warm					◎			◎						
	Indicator lamp does not light up						◎									
	Engine oil must be added more frequently		◎													
	Replacement of filters has not been carried out according to Operation Manual			◎	◎	◎					○		○			
	Air cleaner clogging caution lamp flashes			◎												
	Non-specified fuel is being used				○	○					○		○			
	Battery charge lamp is ON							◎	◎							
	Starting motor cranks engine slowly								◎							
Check items	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low										◎					
	Engine does not pick up smoothly, and combustion is irregular		○	○							◎					
	Blow-by gas is excessive		◎													
	Match marks on fuel injection pump are out of alignment											◎				
	Mud is stuck to fuel tank cap														○	
	When engine is cranked with starting motor, 1) Little fuel comes out even when injection pump sleeve nut is loosened												◎			
	2) Little fuel comes out even when fuel filter air bleed plug is loosened				◎	◎							◎			
	Leakage from fuel piping												○	◎		◎
	There is hunting from engine (rotation is irregular)				○	○								◎		○
Troubleshooting	When compression pressure is measured, it is found to be low		●	●												
	When air cleaner element is inspected directly, it is found to be clogged				●											
	When fuel filter, strainer are inspected directly, they are found to be clogged					●									●	
	When feed pump strainer is inspected directly, it is found to be clogged						●									
	Heater mount does not become warm							●								
	Is voltage 26 – 30V between alternator terminal R and terminal E with engine at low idling?	Yes※							●							
		No								●						
	Either specific gravity of electrolyte or voltage of battery is low									●						
	Speed does not change when operation of certain cylinders is stopped										●					
	When check is made using delivery method, injection timing is found to be incorrect											●				
	When control rack is pushed, it is found to be heavy or does not return (when blind cover at rear of pump is removed, it can be seen that plunger control sleeve does not move)												●			
	When fuel cap is inspected directly, it is found to be clogged															●
	Remedy		Replace	Correct	Clean	Clean	Clean	Replace	Replace	Replace	Replace	Adjust	Replace	Correct	Clean	

※ It is not permitted to replace only the regulator.

S-9 Oil becomes contaminated quickly

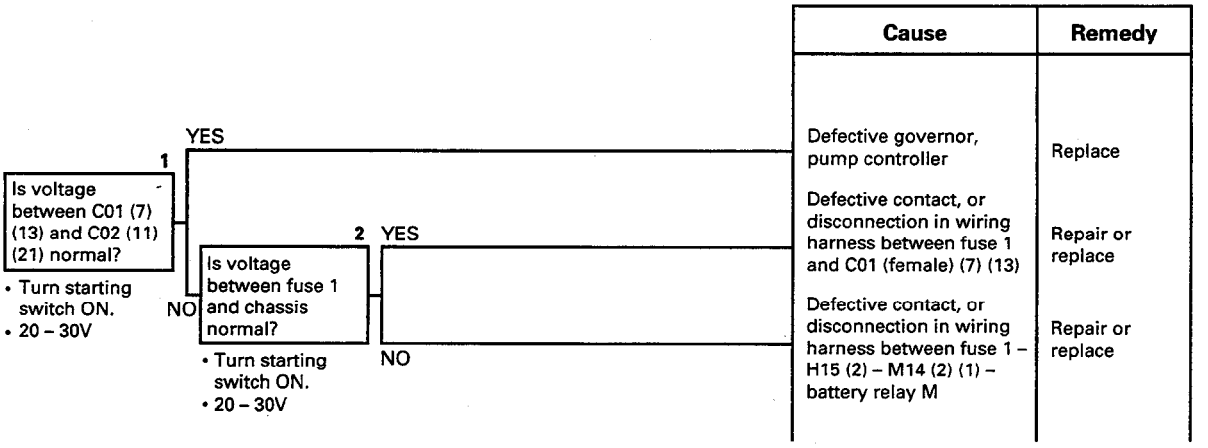
SEE ENGINE SHOP MANUAL

ACTION TAKEN BY CONTROLLER WHEN ABNORMALITY OCCURS AND PROBLEMS ON MACHINE

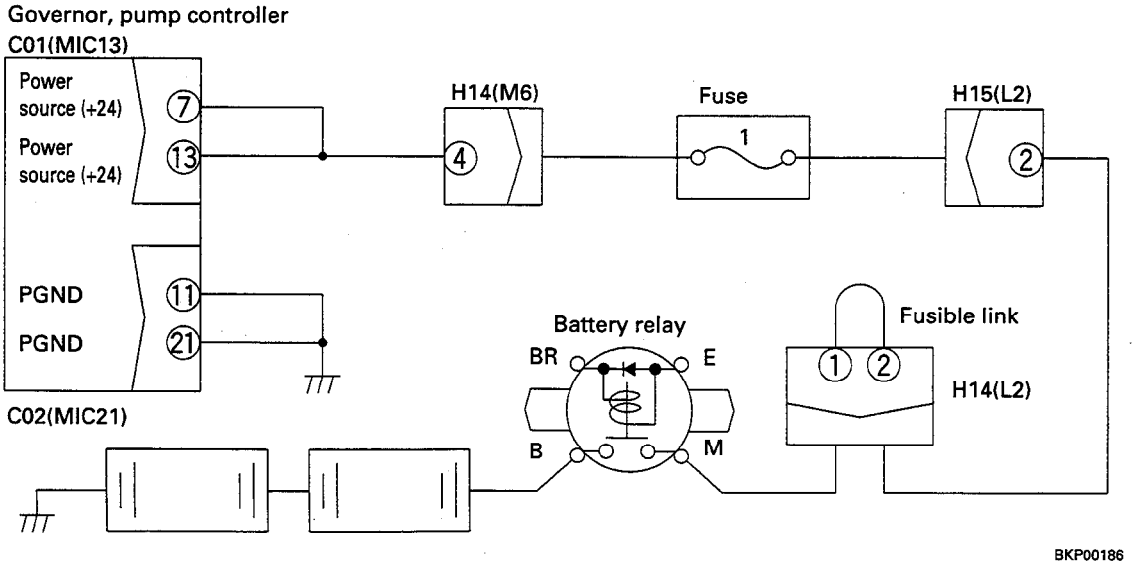
User code	Service code	Abnormal system	Nature of abnormality
E02	E232	Short circuit in front pump TVC solenoid system	1. Short circuit with ground, short circuit inside front pump TVC solenoid 2. Short circuit with power source, short circuit with ground in wiring harness between controller C02 (8) and TVC solenoid C13 (1) ((+) side) 3. Short circuit with power source in wiring harness between controller C02 (18) and TVC solenoid C13 (2) ((-) side) 4. Defective governor, pump controller
	E233	Disconnection in front pump TVC solenoid system	1. Disconnection, defective contact inside front pump TVC solenoid 2. Disconnection, defective contact in wiring harness between controller C02 (8) and TVC solenoid C13 (1) ((+) side) 3. Disconnection, defective contact, short circuit with ground in wiring harness between controller C02 (18) and TVC solenoid C13 (2) ((-) side) 4. Defective governor, pump controller
	E236	Short circuit in rear pump TVC solenoid system	1. Short circuit with ground, short circuit inside rear pump TVC solenoid 2. Short circuit with power source, short circuit with ground in wiring harness between controller C02 (9) and TVC solenoid C04 (1) ((+) side) 3. Short circuit with power source in wiring harness between controller C02 (19) and TVC solenoid C04 (2) ((-) side) 4. Defective governor, pump controller
	E237	Disconnection in rear pump TVC solenoid system	1. Disconnection, defective contact inside rear pump TVC solenoid 2. Disconnection, defective contactin wiring harness between controller C02 (9) and TVC solenoid C04 (1) ((+) side) 3. Disconnection, defective contact, short circuit with ground in wiring harness between controller C02 (19) and TVC solenoid C04 (2) ((-) side) 4. Defective governor, pump controller
E03	E203	Short circuit in swing holding brake solenoid system	1. Short circuit with ground, short circuit inside swing holding brake solenoid 2. Short circuit with ground in wiring harness between controller C01 (3) and solenoid V04 (2) ((+) side) 3. Defective governor, pump controller
	E213	Disconnection in swing holding brake solenoid system	1. Disconnection, defective contact inside swing holding brake solenoid 2. Disconnection, defective contact, short circuit with power source in wiring harness between controller C01 (3) and solenoid V04 (2) ((+) side) 3. Disconnection, defective contact in wiring harness between solenoid V04 (1) and chassis ground ((-) side) 4. Defective governor, pump controller

C-1 Abnormality in controller power source system (controller LED is OFF)

★ **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 an E service code is not displayed, the problem has been removed.**
★ Check that fuse 1 is not blown.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.
★ When the starting motor rotates normally. (If the starting motor also does not rotate, go to E-8.)



C-1 Related electric circuit diagram



C-7 [E212] Disconnection in LS select 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 an E service code is not displayed, the problem has been removed.**
★ If the starting switch is turned OFF after an abnormality occurs, turn the starting switch ON and check if an E service code is displayed. (If it is not displayed, 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 the next step.

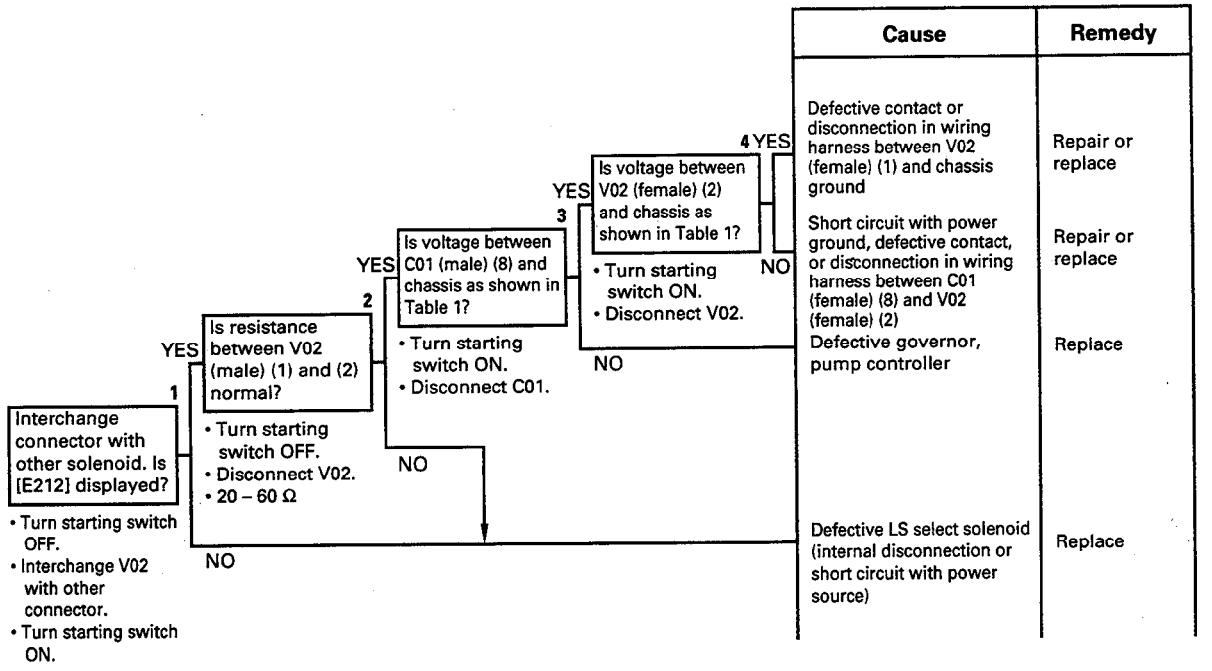
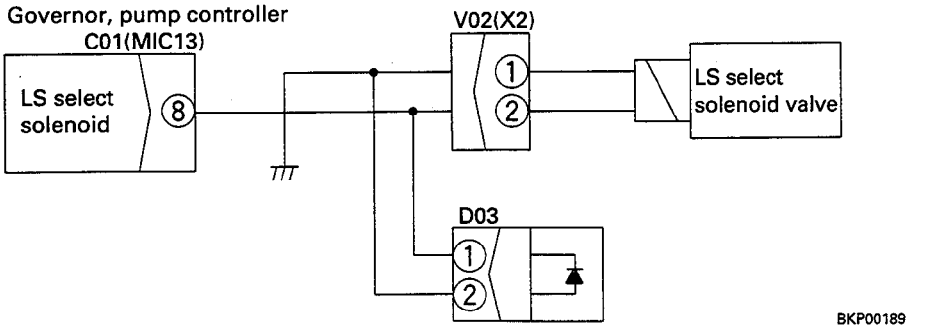


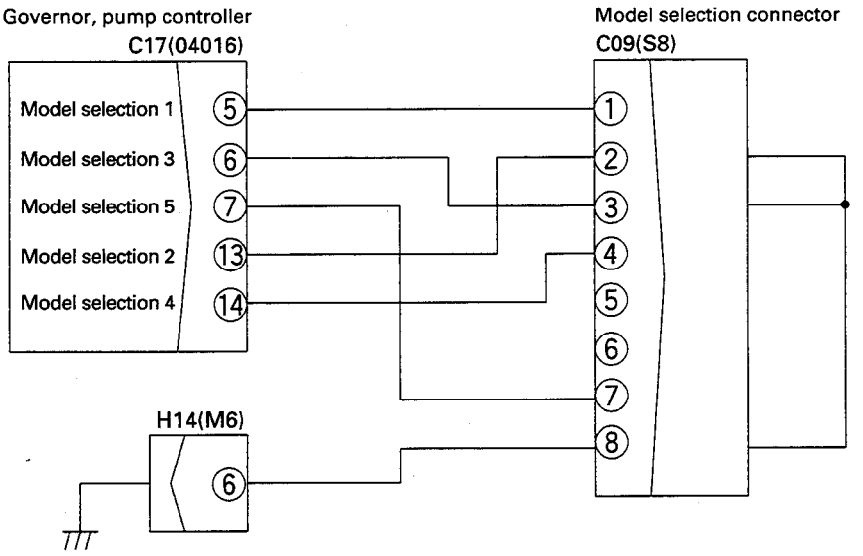
Table 1

Troubleshooting No. 3	Troubleshooting No. 4	Voltage	Measurement condition
Between C01 (male) (8) – chassis	Between V02 (female) (2) – chassis	0 – 3V	When swing lock switch is ON
		20 – 30V	When swing lock switch is OFF
			When swing and travel are operated at same time

C-7 Related electric circuit diagram

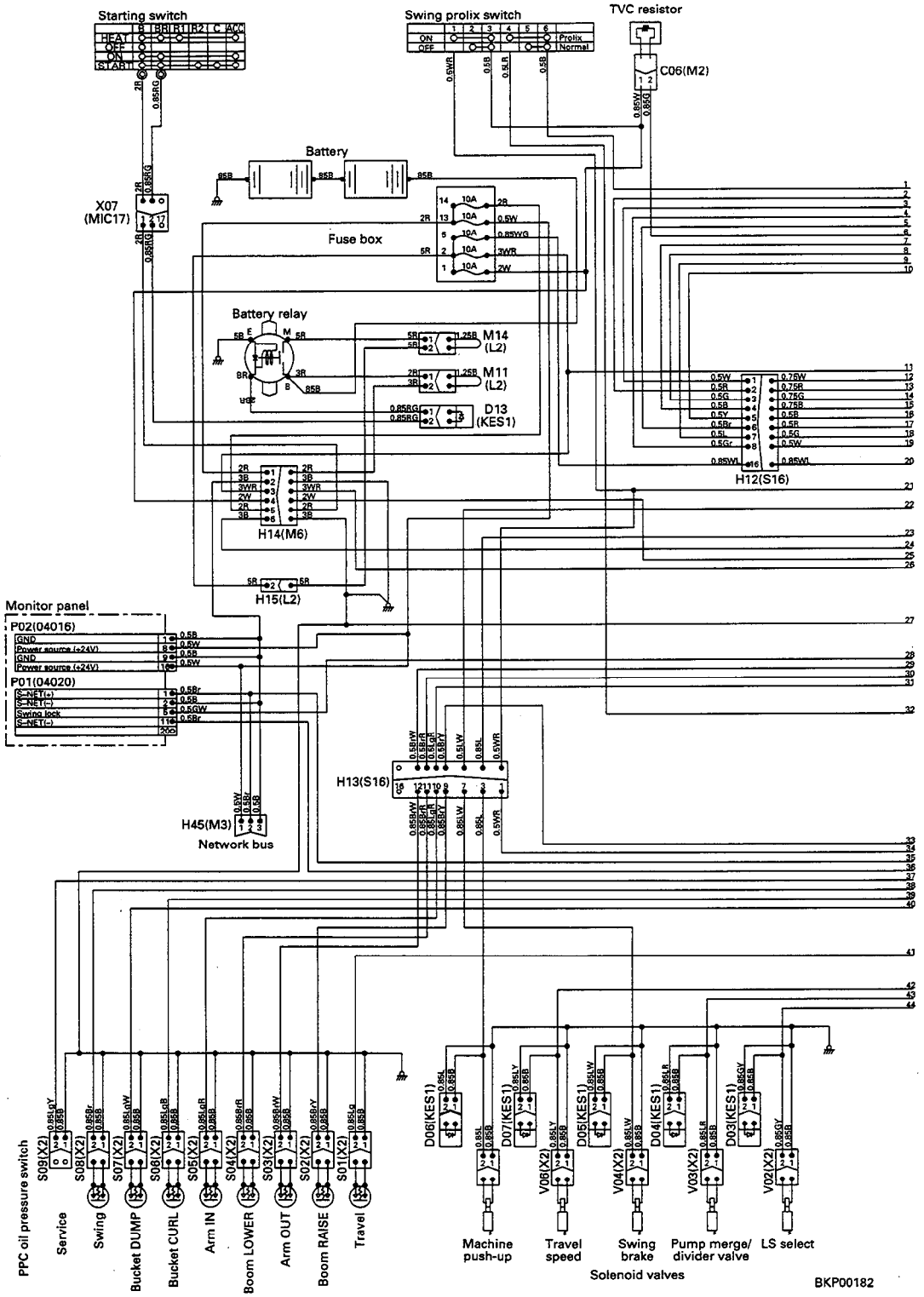


C-14 Related electric circuit diagram



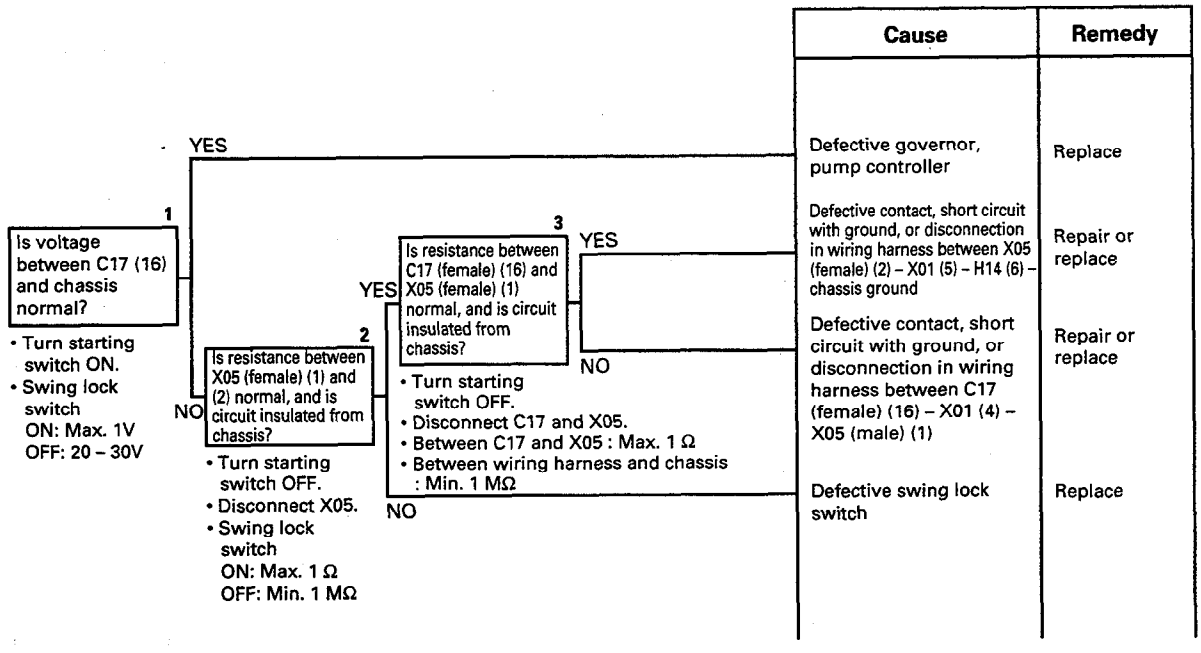
BKP00199

ELECTRICAL CIRCUIT DIAGRAM FOR F MODE

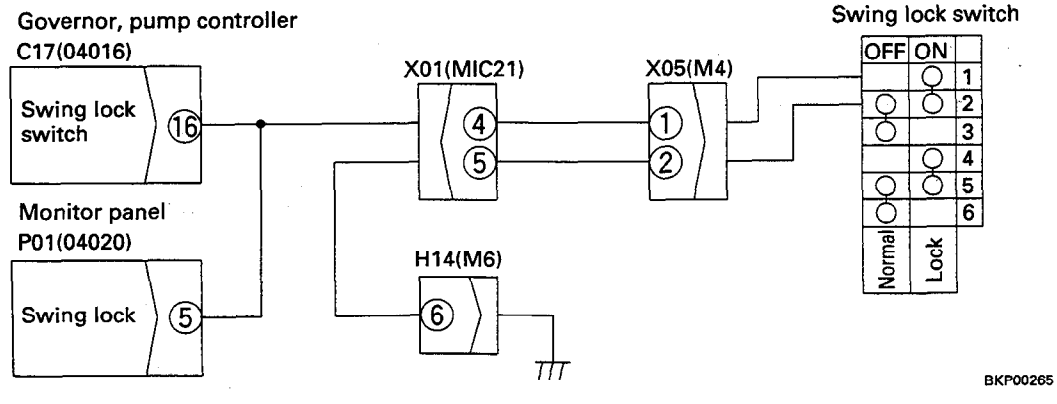


F-9 Bit pattern 21-(3) Swing lock switch does not light up

★ **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 monitor code display returns to normal, the problem has been removed.**
★ If the panel display is normal. (If the swing lock lamp does not light up, go to M-21.)
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.



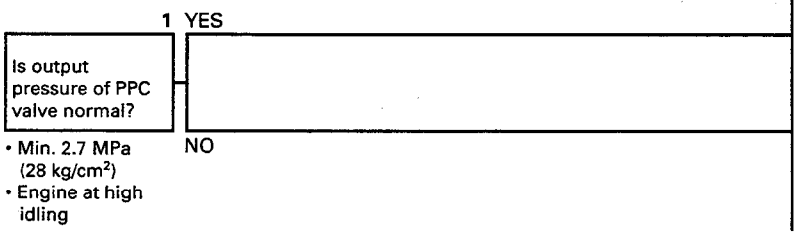
F-9 Related electric circuit diagram



Cause	Remedy
Defective adjustment of TVC valve	Adjust
Defective servo assembly (defective TVC valve)	Repair or replace
Defective piston pump	Repair or replace
Defective servo assembly (defective LS valve)	Repair or replace
Defective piston pump (servo piston)	Repair or replace
Defective operation of LS-EPC solenoid valve	Replace
Defective operation of main relief assembly (valve which becomes normal when adjusted)	Adjust
Defective operation of unload valve (valve which becomes normal when replaced)	Replace
Defective operation of main relief valve	Replace
Defective hydraulic equipment in control pump circuit (See TESTING AND ADJUSTING)	Repair or replace

H-10 Work equipment (boom, arm, bucket) does not move (but travel and swing are normal)

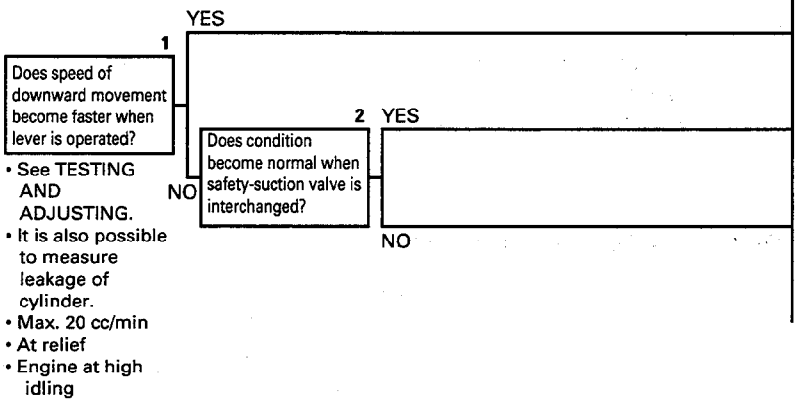
★ When boom, arm, and bucket are each operated independently.



Cause	Remedy
Defective control valve spool	Correct or replace
Defective PPC valve	Replace

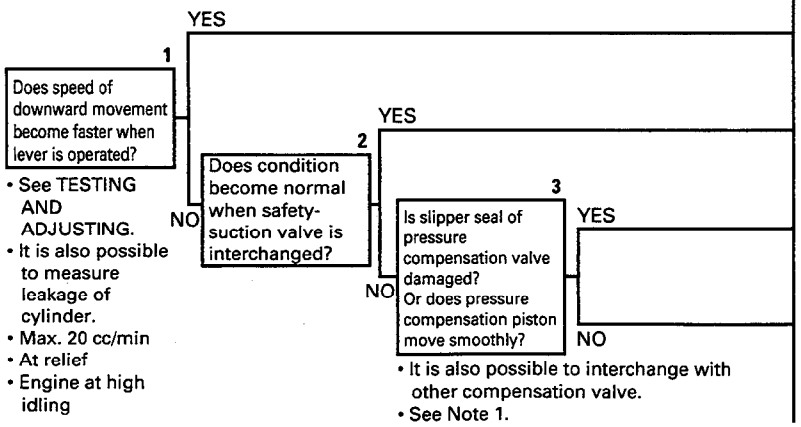
H-11 Excessive hydraulic drift (boom, arm, bucket)

1) Excessive hydraulic drift of boom



Cause	Remedy
Defective hydraulic cylinder piston packing	Replace
Defective operation of safety-suction valve	Replace
Defective operation of boom lock valve	Correct or replace

2) Excessive hydraulic drift of arm or bucket

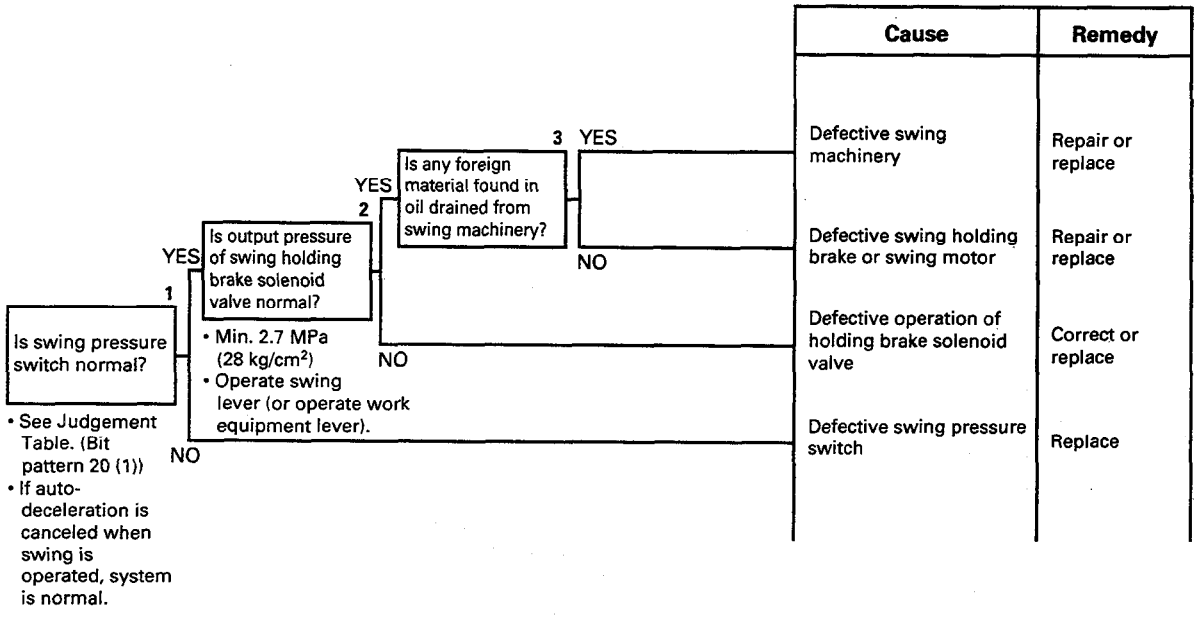


Cause	Remedy
Defective hydraulic cylinder piston packing	Replace
Defective operation of safety-suction valve	Replace
Defective control valve spool	Replace
Damaged slipper seal of pressure compensation valve, or defective operation of pressure compensation piston	Correct or replace

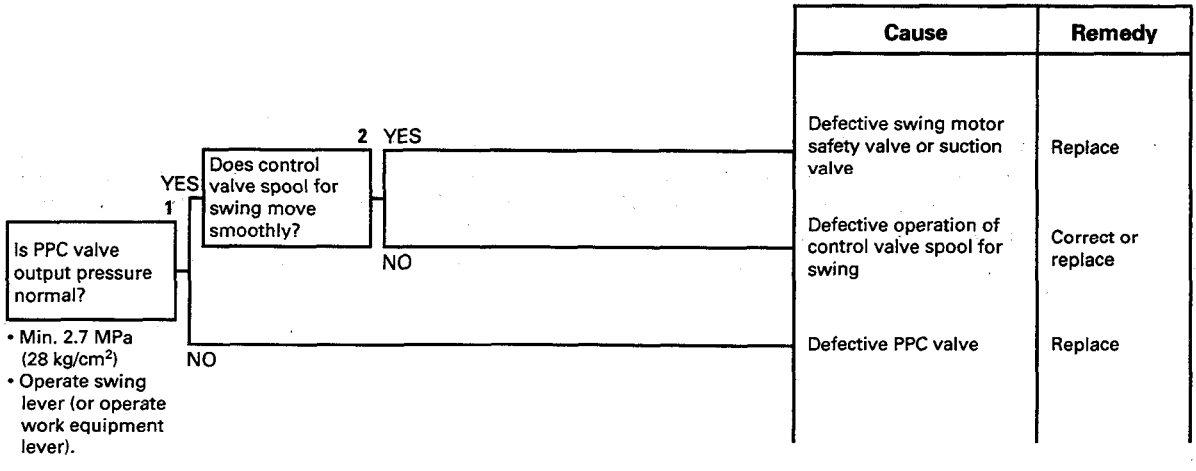
Note 1: After inspection, do not forget to return the interchanged valves to the original position.

H-25 Does not swing

a) Does not swing to either left or right



b) Does not swing in one direction



Condition when normal (voltage, current, resistance)	Action by controller when abnormality is detected	Problem that appears on machine when there is abnormality
• When starting switch is turned ON, keep time switch pressed for 5 seconds to actuate clear function	---	1. Service code cannot be cleared 2. Time becomes 00:00
	---	1. Service code cannot be cleared 2. Time becomes 00:00 3. Clock does not advance
• Voltage between P01 (7) to chassis Buzzer ON: Max. 1V Buzzer OFF: 20 to 30 V ★ When there is a disconnection, E103 is not displayed and the buzzer does not sound	---	1. Buzzer does not sound
• Resistance between P11 (male) and P12 (male): Mi. 1Ω (engine started)	---	1. If abnormality detection continues, air cleaner clogging caution lamp flashes and buzzer sounds
• Resistance between P07 (1) and (2): Min. 3.156Ω (engine started)	---	1. If abnormality detection continues, coolant temperature caution lamp flashes and buzzer sounds 2. If abnormality detection continues, engine speed is reduced to low idling

M-7 When starting switch is turned ON, monitor panel lamps all stay lighted up and do not go out

Cause	Remedy
Defective monitor panel	Replace

M-8 When starting switch is turned ON, items lighted up on monitor panel are different from actual machine (model)

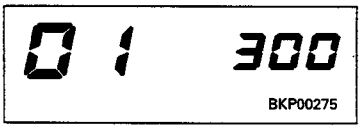
★ Immediately after replacing the monitor panel, turn the starting switch OFF, then turn it ON again and check.

Cause	Remedy
Defective monitor panel	Replace
Go to troubleshooting for C mode (See C-14)	—

1 Is display of monitoring code 01 as shown in table?
- Turn starting switch ON.
- Set to monitoring code 01.

YES
NO

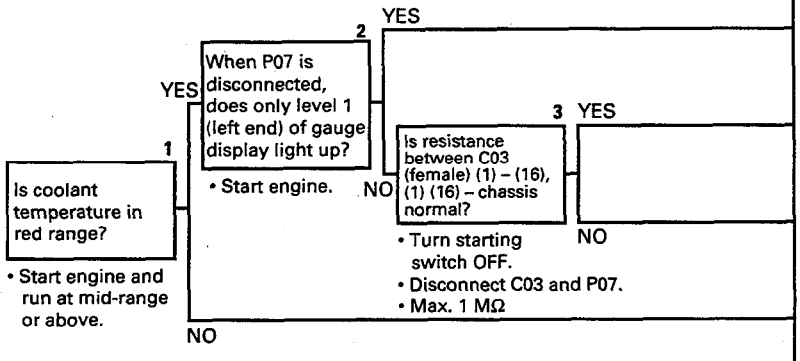
Table



d) (coolant temperature) flashes

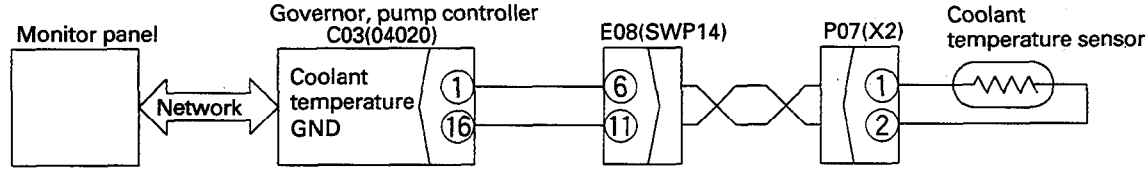
SAP00527

★ Check that the coolant temperature is normal before carrying out troubleshooting.



Cause	Remedy
Defective coolant temperature sensor system (see M-26)	—
Defective governor, pump controller	Replace
Short circuit of wiring harness between C03 (female) (1) – E08 (6) – P07 (female) (1) and wiring harness between C03 (female) (16) – E08 (11) –P07 (female) (2)	Repair or replace
Defective monitor panel	Replace

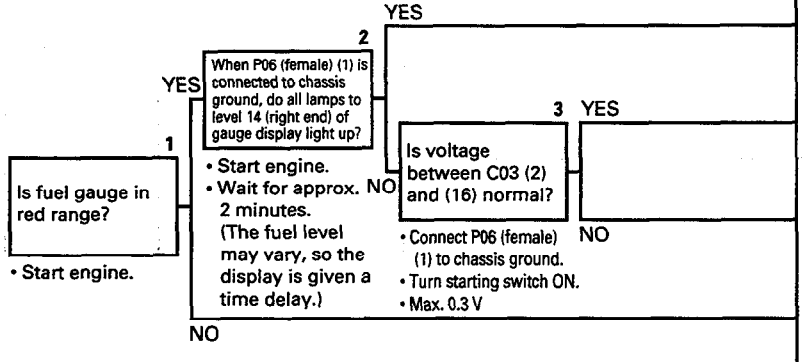
M-13 d) Related electric circuit diagram



e) (fuel level) flashes

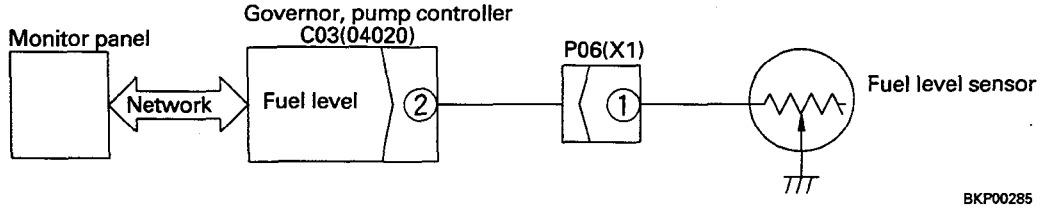
SAP00528

★ Check that there is fuel before carrying out troubleshooting.



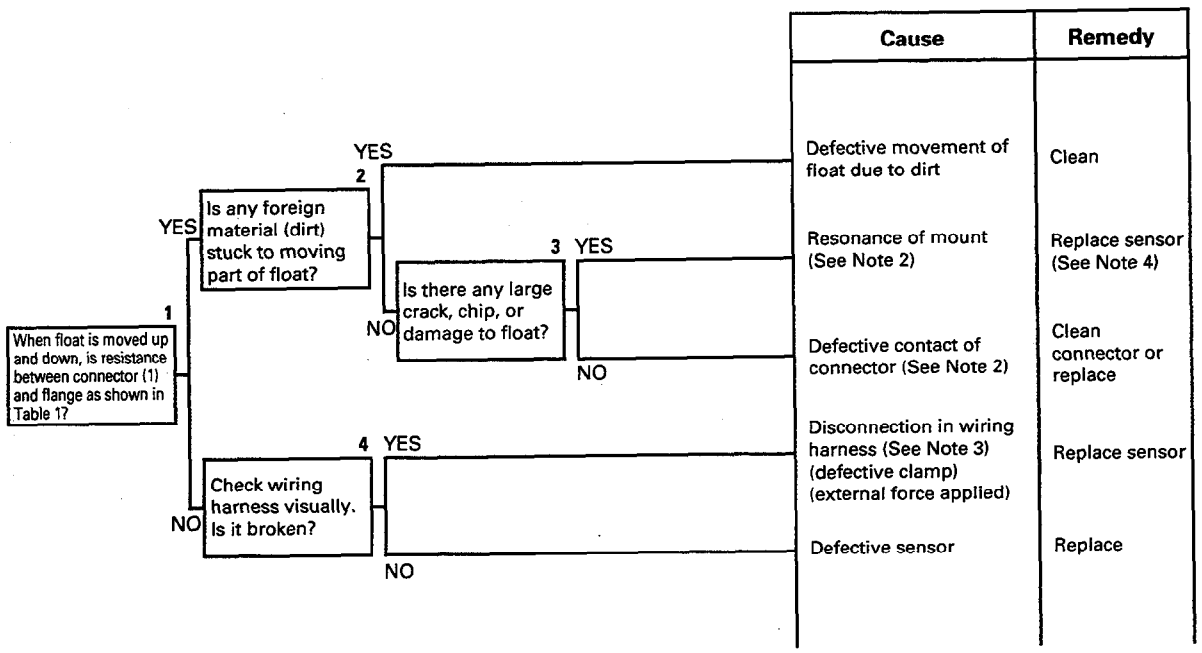
Cause	Remedy
Defective fuel level sensor system (see M-25)	—
Defective governor, pump controller	Replace
Defective contact or disconnection in wiring harness between C03 (female) (2) and P06 (female) (1)	Repair or replace
Defective monitor panel	Replace

M-13 e) Related electric circuit diagram



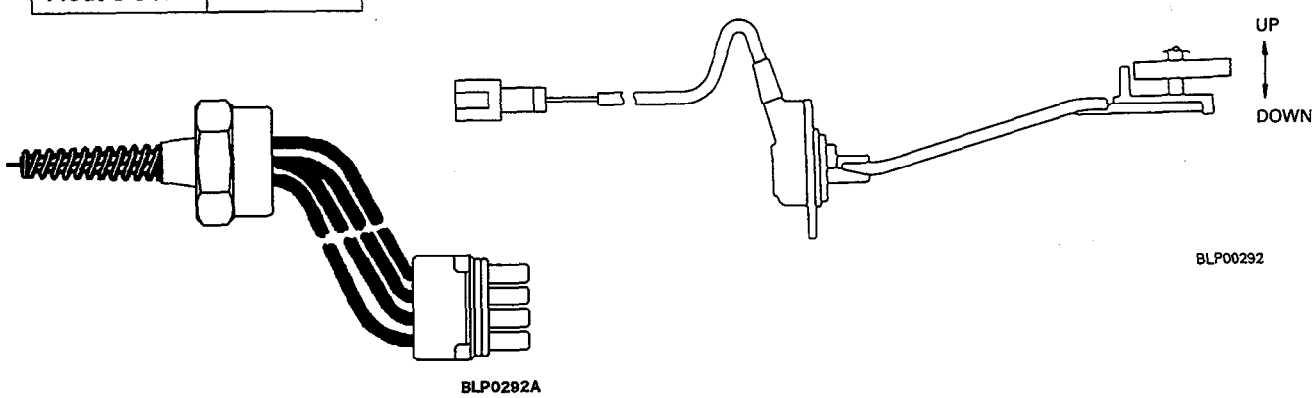
M-27 Defective engine oil level sensor system

★ Remove the engine oil level sensor when carrying out troubleshooting.



Table

Float UP	Max. 1 Ω
Float DOWN	Min. 1 MΩ



Note 1: Variations in oil level
The oil level may change according to the angle of the machine, the engine speed, or the temperature of the oil, so if there is any display, check the oil level again with the machine at a horizontal place.

Note 2: If the problem occurs again, the connector (female) at the chassis end is probably defective, so check the connector and wiring harness at the chassis end.

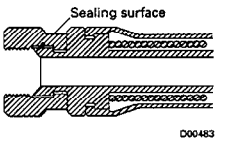
Note 3: Check for vibration at the connector mount. If there is excessive vibration, take the appropriate action.

Note 4: Defective installation is a possible cause, so be careful when installing. If the problem occurs again, check for any vibration of the mount, and if there is excessive vibration, take the appropriate action.

4. General tightening torque table (when using torque wrench)

★ In the case of metric nuts and bolts for which there is no special instructions, tighten to the torque given in the table below.

Thread diameter of bolt	Width across flat	Ⓣ	Ⓗ
mm	mm	kgm	Nm
6	10	1.35 ±0.15	13.2 ±1.4
8	13	3.20 ±0.3	31.4 ±2.9
10	17	6.70 ±0.7	65.7 ±6.8
12	19	11.5 ±1.0	112 ±9.8
14	22	18 ±2.0	177 ±19
16	24	28.5 ±3	279 ±29
18	27	39 ±4	383 ±39
20	30	56 ±6	549 ±58
22	32	76 ±8	745 ±78
24	36	94.5 ±10	927 ±98
27	41	135 ±15	1320 ±140
30	46	175 ±20	1720 ±190
33	50	225 ±25	2210 ±240
36	55	280 ±30	2750 ±290
39	60	335 ±35	3280 ±340



5. Table of tightening torque for flared nuts

★ In the case of flared nuts for which there is no special instructions, tighten to the torque given in the table below.

Thread diameter of bolt	Width across flat	Tightening torque	
mm	mm	kgm	Nm
14	19	2.5 ±0.5	24.5 ±4.9
18	24	5 ±2	49 ±19.6
22	27	8 ±2	78.5 ±19.6
24	32	14 ±3	137.3 ±29.4
30	36	18 ±3	176.5 ±29.4
33	41	20 ±5	196.1 ±49
36	46	25 ±5	245.2 ±49
42	55	30 ±5	294.2 ±49

6. Table of tightening torque of split flange bolts

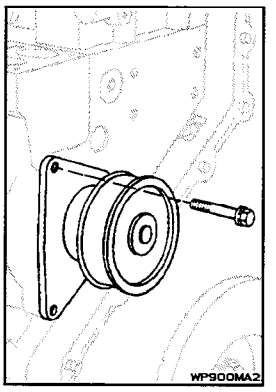
★ In the case of split flange bolts for which there is no special instructions, tighten to the torque given in the table below.

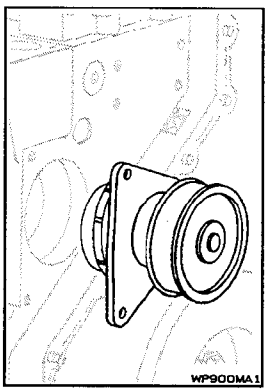
Thread diameter of bolt	Width across flat	Tightening torque	
mm	mm	kgm	Nm
10	14	6.70 ±0.7	65.7 ±6.8
12	17	11.5 ±1.0	112 ±9.8
16	22	28.5 ±3	279 ±29

Component	Symbol	Part No.	Part Name	Qty	New/re-model	Sketch	Nature of work, remarks	
Components related to air conditioner	X	799-703-1200	Service tool kit	1			Removal, installation	Charging with R134a refrigerant
		799-703-1100	Vacuum pump (100V)	1				
		799-703-1110	Vacuum pump (220V)	1				
		799-703-1120	Vacuum pump (240V)	1				
		799-703-1400	Gas leak detector	1				

WATER PUMP

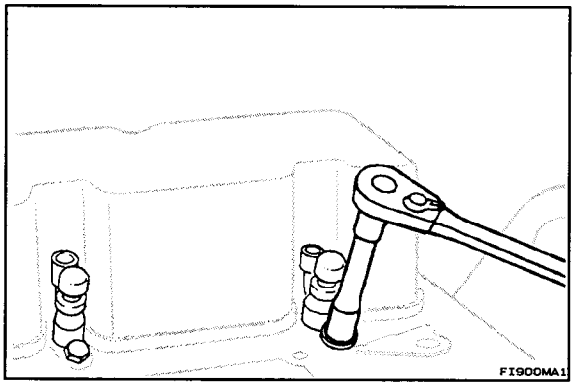
★ Refer to **ENGINE SHOP MANUAL** for proper tools and procedure.





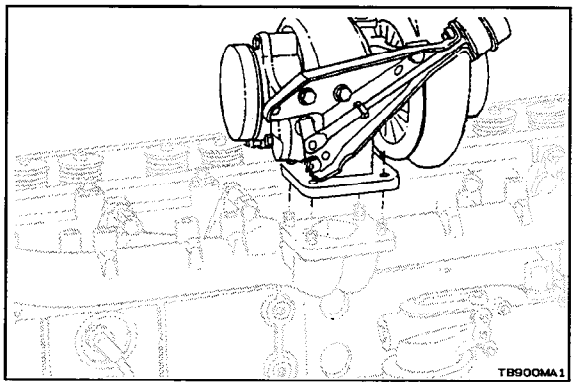
NOZZLE HOLDER

★ Refer to **ENGINE SHOP MANUAL** for proper tools and procedure.



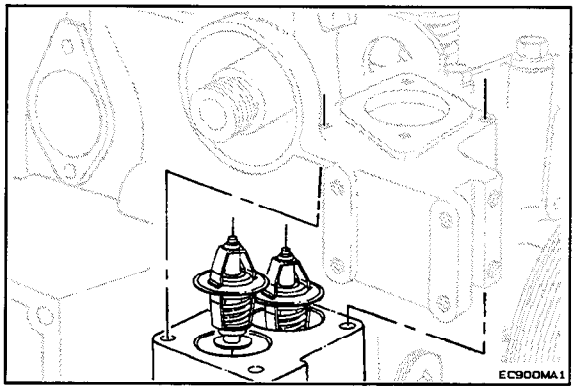
TURBOCHARGER

★ Refer to **ENGINE SHOP MANUAL** for proper tools and procedure.



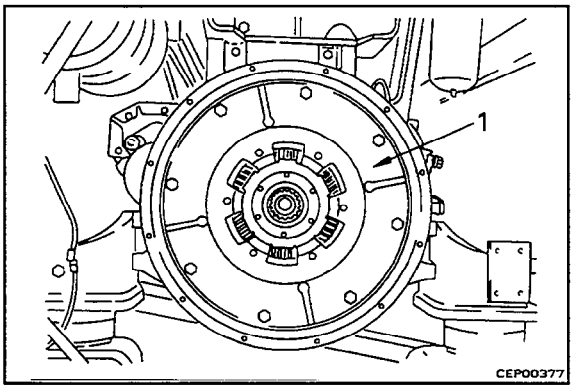
THERMOSTAT

★ Refer to **ENGINE SHOP MANUAL** for proper tools and procedure.



REMOVAL OF DAMPER

1. Remove main pump assembly. For details, see REMOVAL OF MAIN PUMP.
2. Remove damper assembly (1). ※1



INSTALLATION OF DAMPER

- Carry out installation in the reverse order to removal.

※1

Damper mounting bolts: **110.32 ±12.26 Nm (11.25 ±1.25 kgm)**

1. Hub assembly

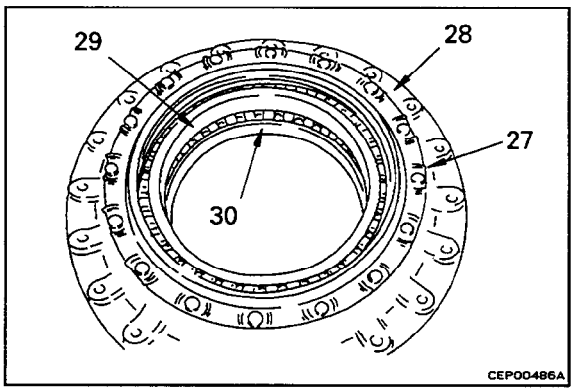
1) Assemble hub assembly as follows.

a) Using push tool **(J2)**, press fit bearings (29 and 30) to hub.

b) Install seal cover (27) to hub.

Mounting surface of cover: **LG-6**

Cover mounting bolt: **59 to 74 Nm (6 to 75. kgm)**

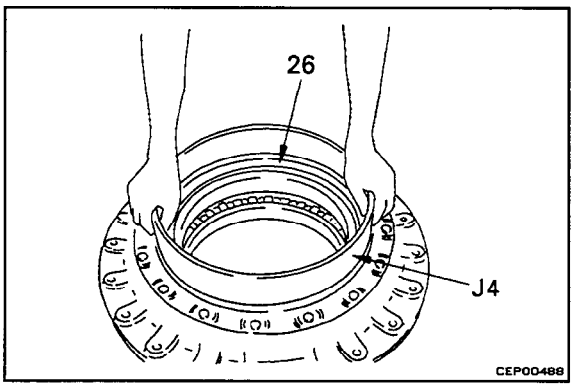


c) Using tool **J4**, install floating seal (26).

★ Remove all oil and grease from the o-ring and o-ring contact surface, and dry the parts before installing.

★ After installing floating seal, check that the angle of the floating seal is within 1 mm.

★ After installing floating seal, coat the sliding surface thinly with engine oil.

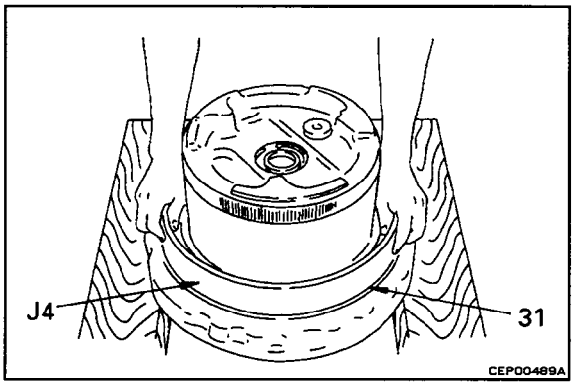


2) Using tool **J4**, install floating seal (31) to travel motor.

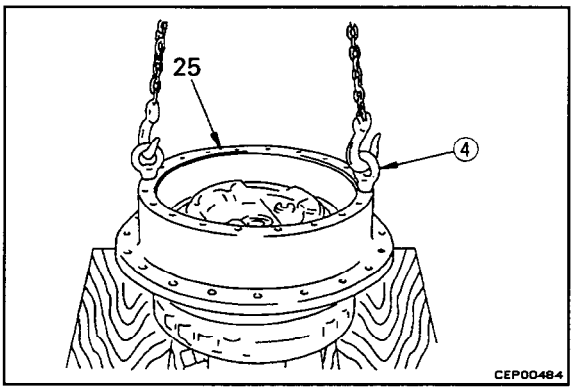
★ Remove all oil and grease from the o-ring and o-ring contact surface, and dry the parts before installing.

★ After installing floating seal, check that the angle of the floating seal is within 1 mm.

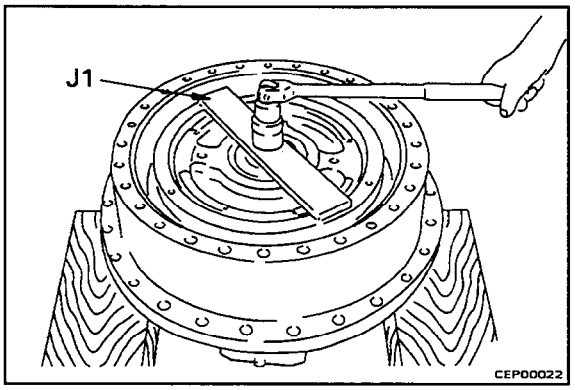
★ After installing floating seal, coat the sliding surface thinly with engine oil.



3) Using eye bolts ④, set hub assembly (25) to travel motor, then using push tool **(J2)**, tap to press fit bearing portion.

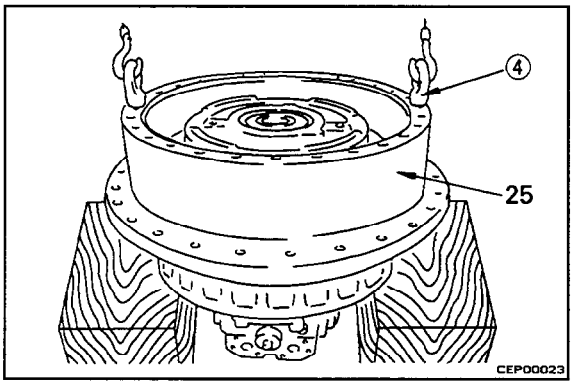


2) Using tool **J1**, remove nut (24).

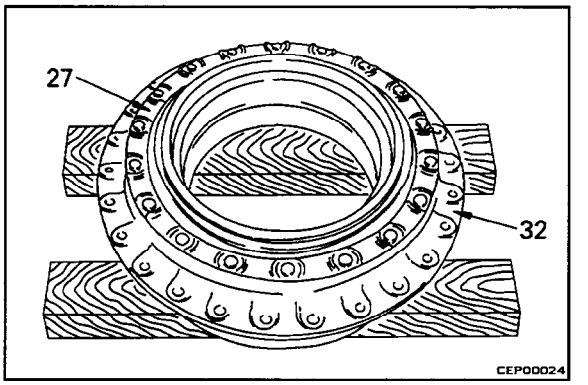


11. Hub assembly

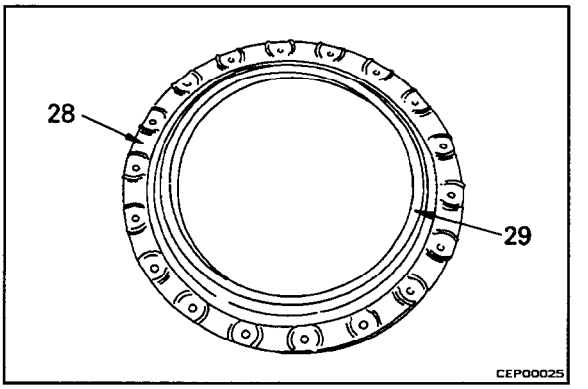
1) Using eye bolts ④, remove hub assembly (25) from travel motor.



2) Disassemble hub assembly as follows.
   a) Remove floating seal and cage assembly (27) from hub (32).



   b) Remove floating seal (29) from cage (28).

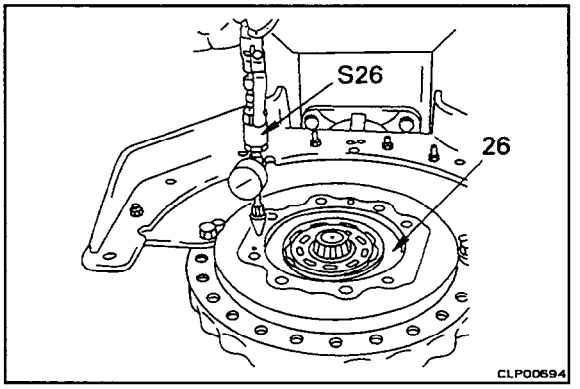


5. Brake piston

Blow in compressed air with tool **S26**, and remove brake piston (26).

★ Air pressure: **0.2 MPa (2 kg/cm²)**

★ Be careful that the air pressure is not too high. The brake piston will fly out.



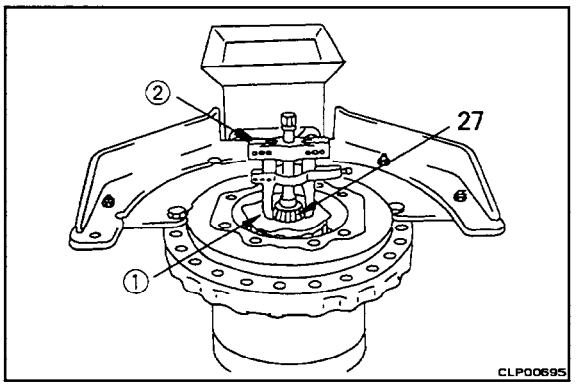
6. Bearing

Using bearing race puller ① and gear puller ②, remove bearing (27).

★ Be careful not to apply any force to the bearing holder.

★ When using the cylinder block again, put gasket paper on the valve plate contact surface to protect the surface.

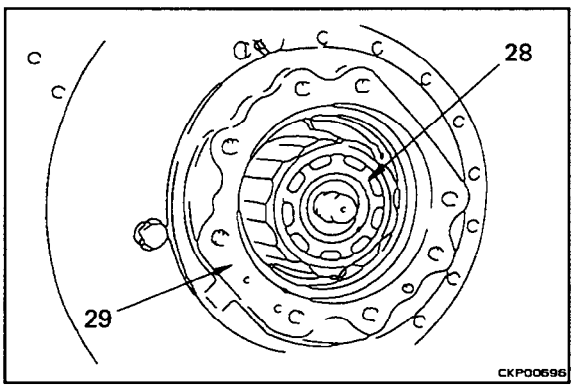
★ Never allow the puller to scratch or damage the cylinder block sliding surface.



7. Cylinder block, piston assembly

Rotate tool **S25** 90°, and remove cylinder block and piston assembly (28) from the motor case (29).

★ The cylinder block and piston assembly may come off separately, so be careful not to drop them.

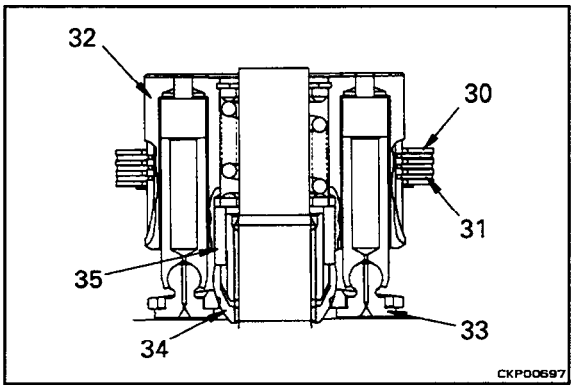


- **Disassembly of cylinder block, piston assembly**

1) Remove plate (30) and disc (31).

2) Pull out piston assembly (33) from cylinder block (32), and remove retainer guide (34) and preload pin (35).

★ When removing the piston assembly from the cylinder block, the preload pin may come out, so be careful not to lose it.



CHECKING CONTACT BETWEEN CYLINDER BLOCK AND VALVE PLATE.

★ This check is unnecessary if both the cylinder block and valve plate are replacement parts (new parts).

★ This check applies if one of the parts is a replacement part or a restored part.

★ If the contact is defective, use a surface plate and correct by lapping.

1) Make a centering tool for the cylinder block and valve plate.
   ★ The tool can be made from plastic, bakelite or any other soft material.

2) Remove all oil and grease from the parts to be checked.
   ★ Do not wipe with a cloth.

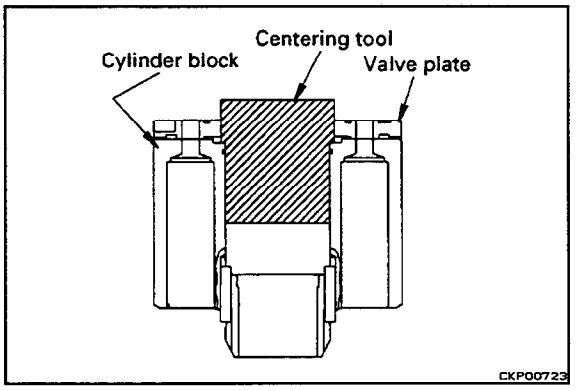
3) Set the tool in position, then paint the cylinder block with inspection paint.
   ★ Coat thinly with paint.

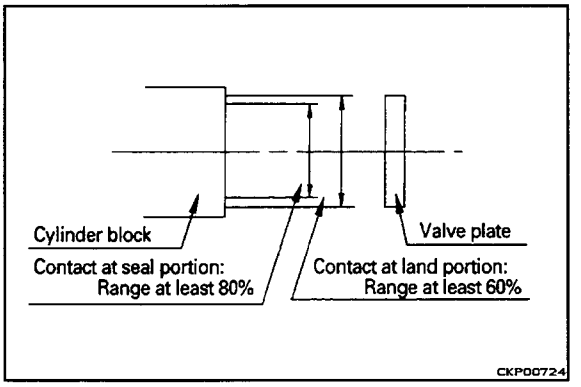
4) Push the valve plate with a force of 39 to 49 N (4 to 5 kg) against the cylinder block, turn the valve plate 90°, then turn it back to its original position. Repeat this process 2 or 3 times.

5) Remove the valve plate, then transfer the contact surface to a tape, and check the contact surface.
   ★ The contact of the plane surface of the valve plate and cylinder block must fulfill the conditions below and must cover the whole circumference without any break.
   a) The contact at the seal portion (range of ϕ84.4 to ϕ116.5 mm from the inside) must be at least 80%.
   b) The contact at the land portion (range of ϕ128 to ϕ142 mm) must be at least 60%.

	Seal portion	Land portion
Valve plate	Min. 80%	Min. 60%
Cylinder block	Min. 80%	Min. 60%

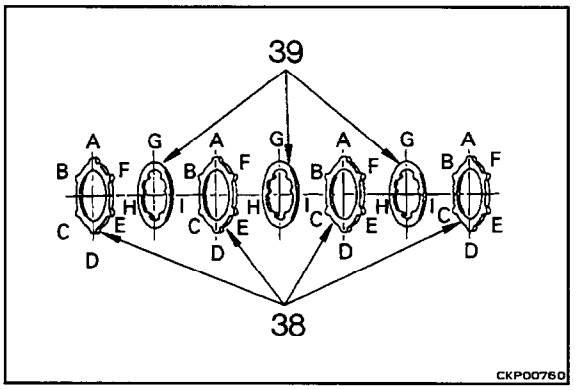
★ For details of the operation, see the Parts Judgement Guide.



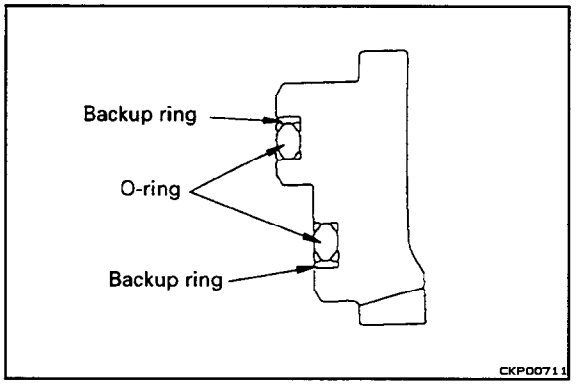


- **Method of placing plates and discs on top of each other**
  a) Align cutout arc teeth areas **G, H** and **I** of the discs (39).

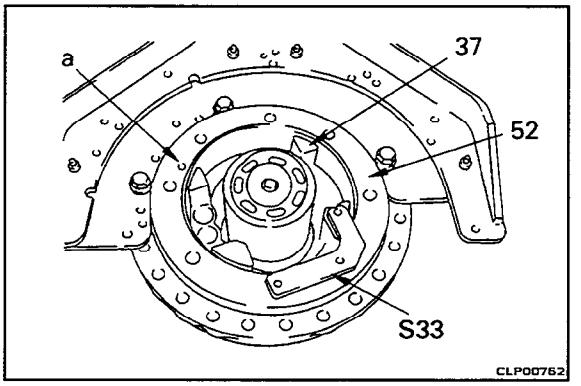
  b) Protrusions **A, B, C, D, E** and **F** on the outside of the plates (38) can be set at any position in relation to positions **G, H** and **I** of discs.



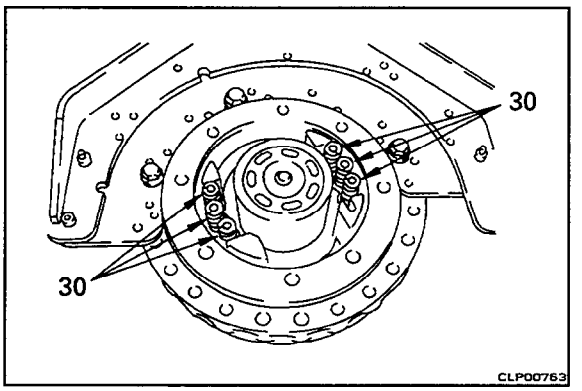
2) Fit o-ring and back up ring, and install brake piston (37).
   ★ Assemble back up ring in the direction shown in the diagram.



3) Install brake piston (37) to motor case (52) and determine position with tool **S33**.
   ★ Install tool **S33** in the position shown in the diagram on the right in relation to port hole "**a**" for the brake piston.

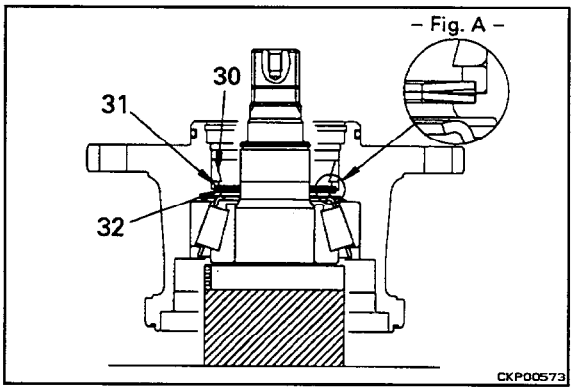


4) Install six brake springs (30).

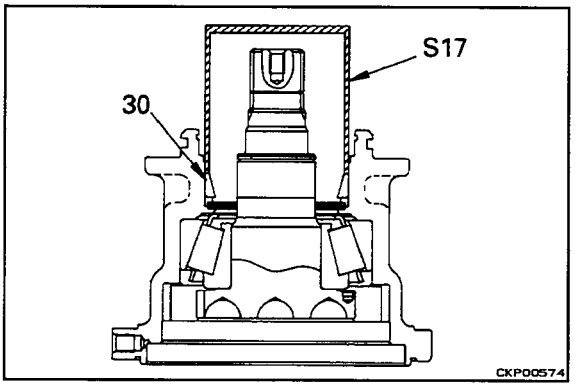


3. Belleville spring, seat and bearing

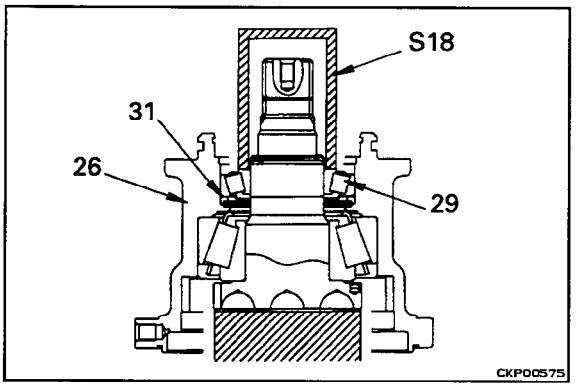
1) Install belleville spring (32) and seat (31).
   ★ Install belleville spring in the direction shown in Fig. A.



2) Using tool **S17**, install outer race (30).



3) Using tool **S18**, press fit bearing (29).
   ★ During the press fitting operation, rotate case (26) and check that the bearing rotates smoothly.
   ★ Press fit until seat (31) is in tight contact with case (26).
   ★ Bearing press fitting load: **3.92 to 20.15 kN (400 to 2055 kg)**

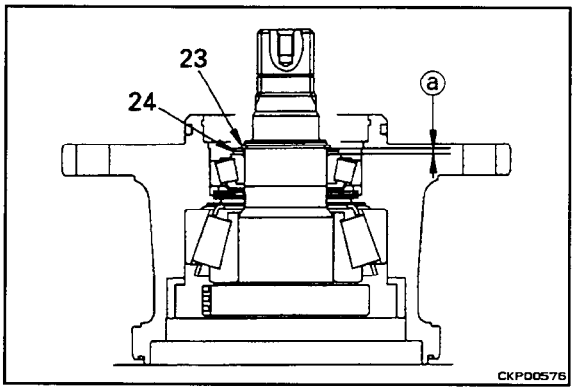


4. Spacer

1) Measure clearance @ between bottom face of snap ring (23) and top face of bearing inner race, then select two spacers (24) equivalent to clearance @ from table below.

	Spacer (24) Part No.	Thickness
①	706-77-42440	2.3 mm
②	706-77-42450	2.5 mm
③	706-77-42460	2.7 mm

★ Standard assembled thickness of spacer: **5.1 mm**

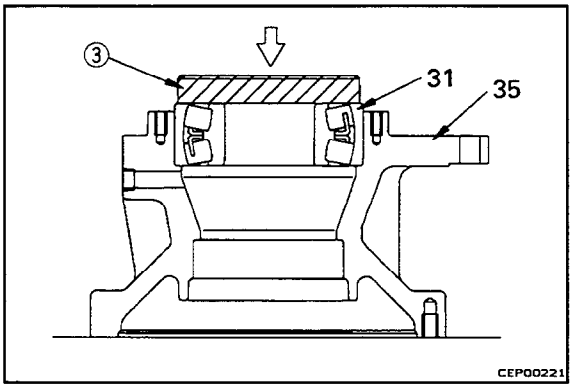


ASSEMBLY OF SWING MACHINERY

★ Clean all parts and check for dirt or damage. Coat sliding surfaces of all parts with engine oil before installing.

1. Bearing

Using push tool ③, press fit bearing (31) to case (35).

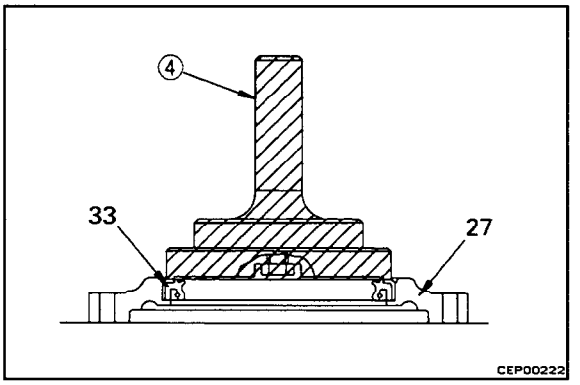


2. Cover assembly

1) Using push tool ④, press fit oil seal to cover (27).

Outside of oil seal: **LG-6**

★ Be careful not to let the gasket sealant (LG-6) get on the oil seal lip when press fitting.

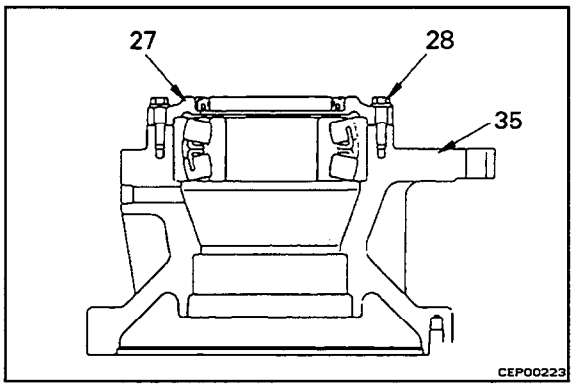


2) Fit the cover assembly (27) to case (35) and tighten mounting bolts (28).

Cover mount face: **LG-6**

Mounting bolt: **66.19 ±7.35 Nm (6.75 ±0.75 kgm)**

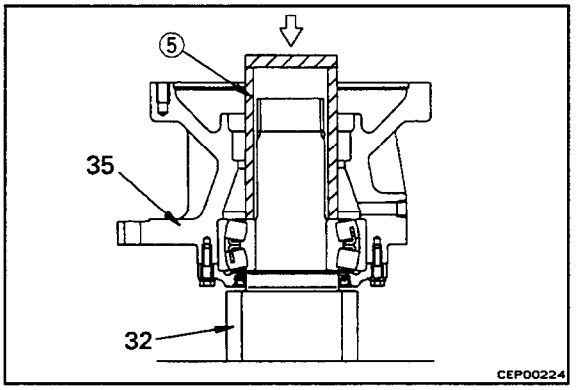
Lip of oil seal: **G2-LI**



3. Case assembly

1) Set case assembly (35) to shaft (32), then using push tool ⑤, press fit bearing inner race portion.

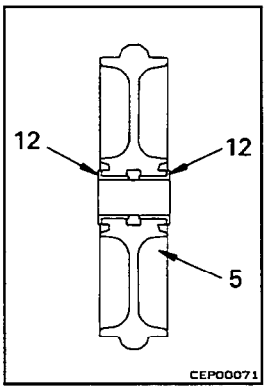
★ When setting the case assembly to the shaft, be extremely careful not to damage the oil seal.

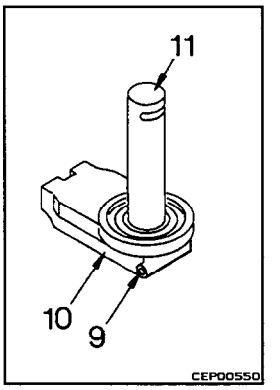


ASSEMBLY OF IDLER

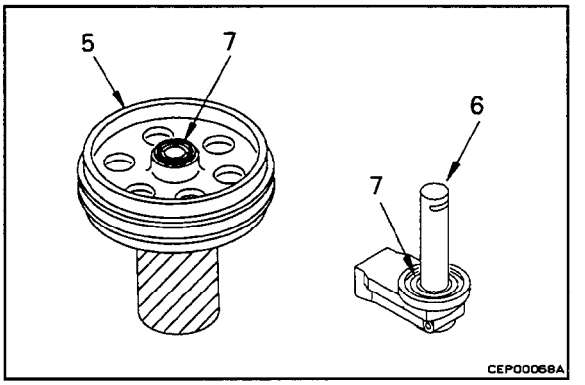
1. Press fit bushing (12) to idler (5).

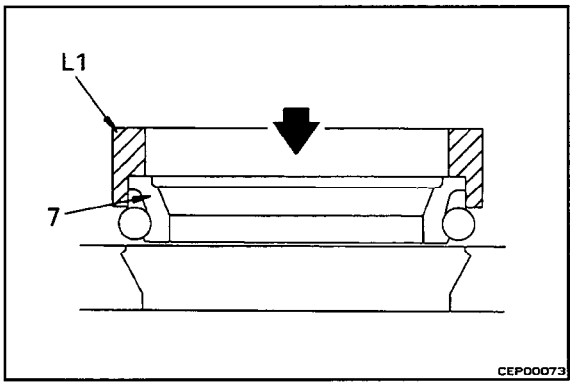
2. Fit o-ring and install support (10) to shaft (11), then install pin (9).
   ★ After inserting the pin, caulk the pin portion of the support.



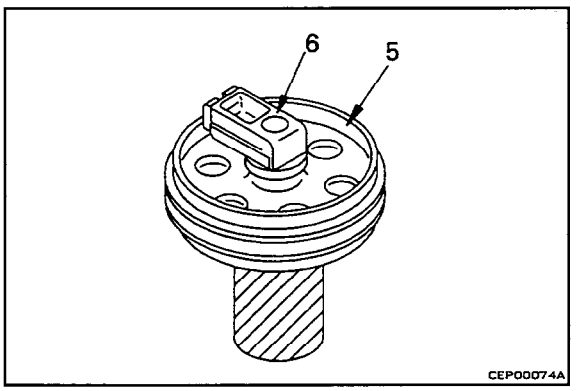


3. Using tool **L1**, install floating seal (7) to idler (5) and shaft and support assembly (6).
   ★ Coat the sliding surface of the floating seal with oil and be careful not to let any dirt or dust get stuck to it.
   ★ Remove all grease and oil from the contact surface of the o-ring and the floating seal.

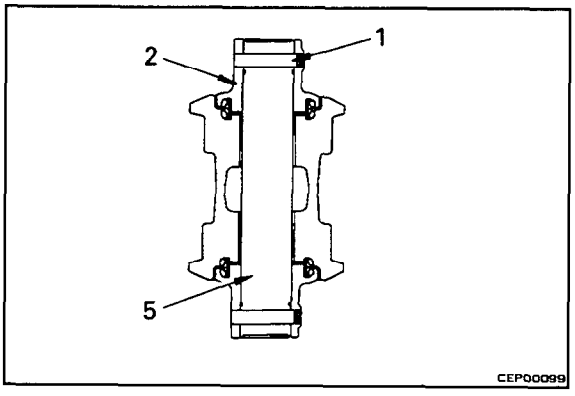




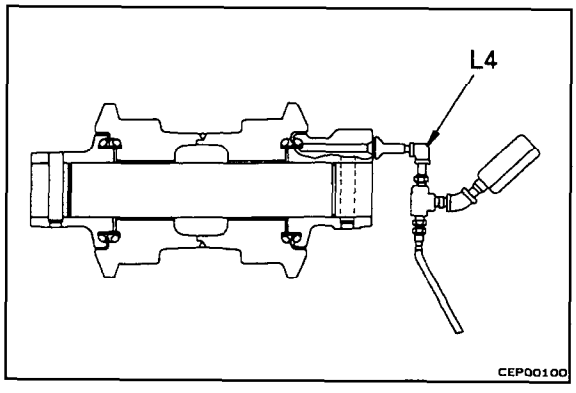
4. Assemble shaft and support assembly (6) to idler (5).



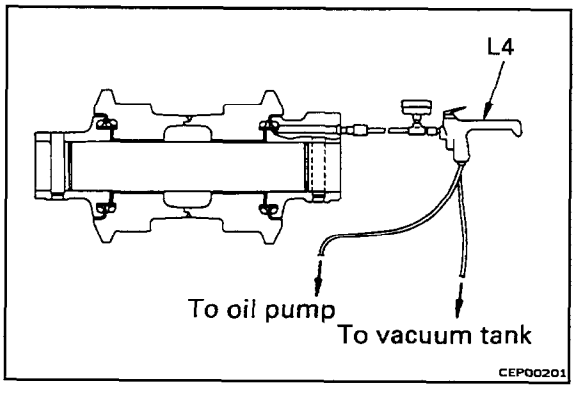
8. Assemble collar (2) to shaft (5) and install pin (1).

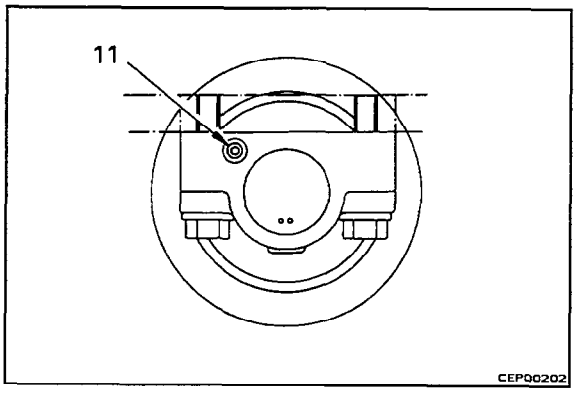


9. Using tool **L4**, apply standard pressure to roller oil filler port and check for leakage of air from seal.
   - ★ Standard pressure: **0.1 MPa (1 kg/cm²)**
   - ★ **Method of checking:** The standard pressure shall be maintained for 10 seconds and the indicator of the gauge shall not go down.



10. Using tool **L4**, fill track roller assembly with oil, then tighten plug (11).
    - Track roller oil: **PC300LC; 250 to 280 cc**
      PC300HD; 280 to 310 cc
    - Plug: **14.7 ±4.9 Nm (1.5 ±0.5 kgm)**





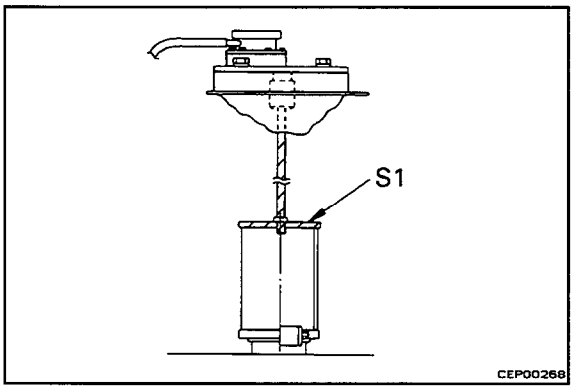
REMOVAL OF MAIN PUMP

⚠ Lower the work equipment completely to the ground and stop the engine. Then loosen the oil filler cap slowly to release the pressure inside the hydraulic tank.

⚠ Disconnect the cable from the negative (-) terminal at the battery.

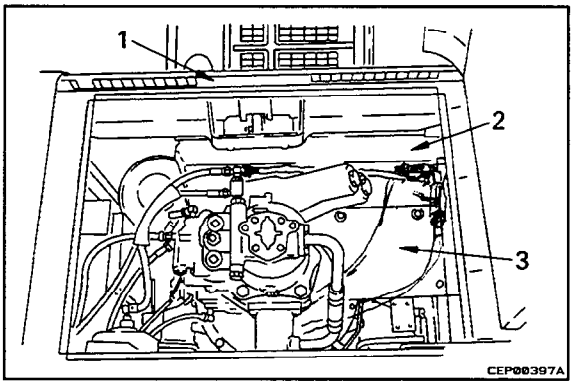
★ Mark all piping with tags to prevent mistakes when installing.

1. Remove hydraulic tank strainer and using tool **S1**, stop oil.
   ★ When not using tool **S1**, remove the drain plug and drain the oil from the hydraulic system.
   Hydraulic tank: **Approx. 200 ℓ**



2. Remove main pump side cover and under cover and open engine hood.

3. Drain oil from damper case.
   Damper case: **Approx. 1.3 ℓ**



4. Remove main pump top cover (1) and partitions (2 and 3).

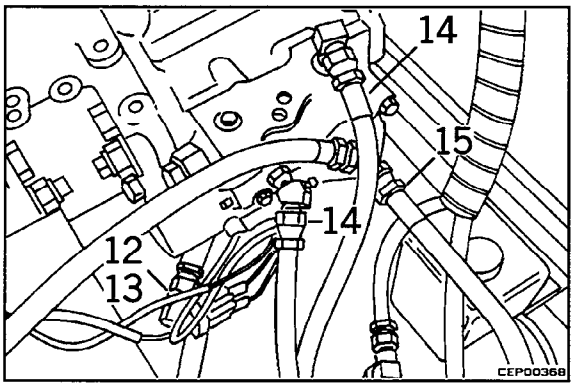
5. Disconnect TVC solenoid connectors (9 and 10), (CN-C04 and CN-C13).

6. Disconnect main pump outlet hoses (11 and 12).

7. Disconnect main pump case drain hose (13).

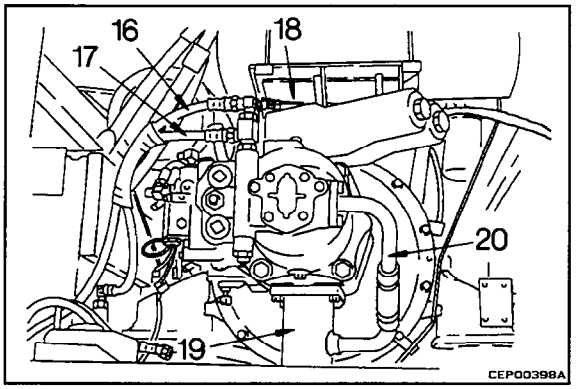
8. Disconnect rear pump servo valve hose (14).

9. Disconnect front pump servo valve hose (15).



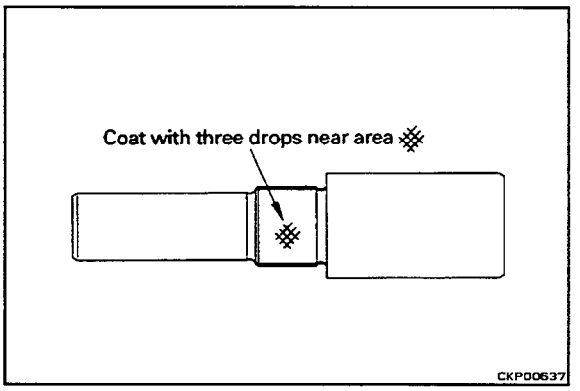
10. Disconnect control pump outlet hoses (16, 17 and 18).

11. Disconnect main pump inlet tube (19) and control pump inlet tube (20).



Three drops of adhesive: **Loctite #648**

Piston: **475.6 ±34.3 Nm (48.5 ±3.5 kgm)**



4. Positioning minimum swash plate angle

1) Remove two dowel pins from servo valve assembly mounting plate.

2) Set tool **S8** in position.

3) Assemble o-ring and tighten screw (76) until it comes in contacts piston (59).

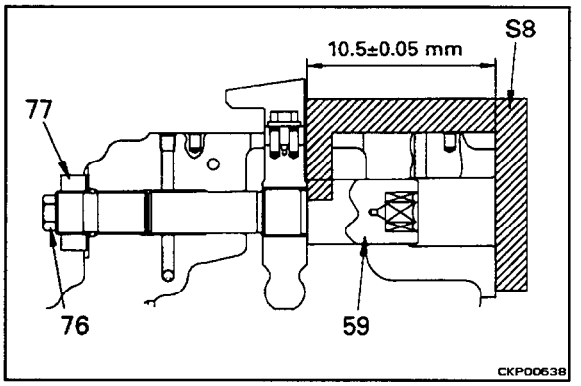
Screw: **12.3 ±2.5 Nm (1.25 ±0.25 kgm)**

4) Tighten locknut (77) to hold screw (76) in position.

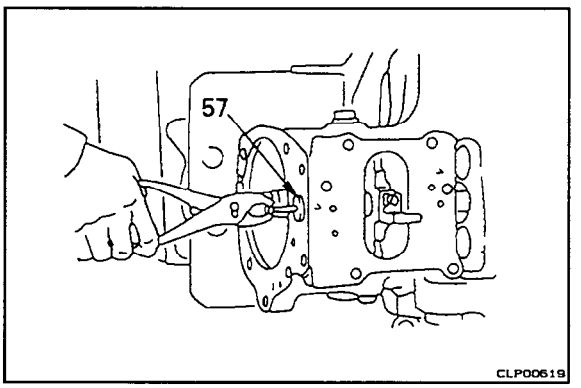
Locknut: **254.9 ±29.4 Nm (26 ±3 kgm)**

★ After completion of assembly, carry out a bench test to check the minimum flow.

★ Assemble the spring after measuring the rotating torque of the pump assembly.



5) Assemble back up ring and o-ring to stopper (57) and install to case.



5. Cylinder block, piston assembly

- **Assembly of cylinder block**

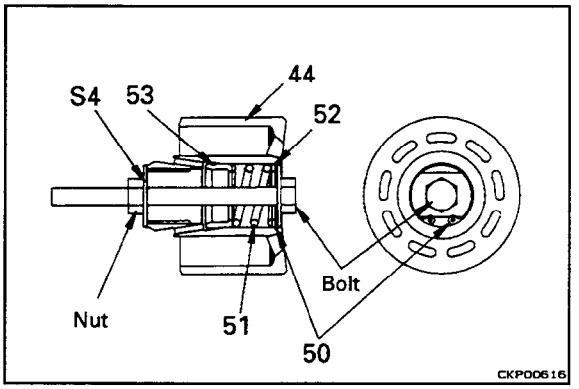
1) Assemble seat (53), spring (51) and seat (52) to cylinder block (44).

★ Assemble with the tapered portion on the inside of seat (53) facing down.

2) Set tool **S4** to cylinder block (44).

3) Hold bolt of tool **S4** with wrench, tighten nut to compress spring (51), then install snap ring (50).

★ Check that snap ring is fitted securely in groove.



REMOVAL OF CONTROL VALVE

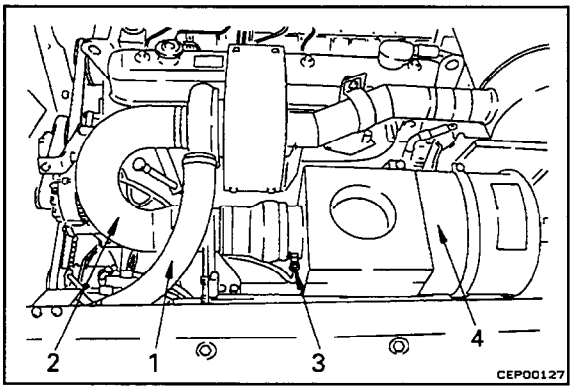
⚠ Lower the work equipment completely to the ground and stop the engine. Then loosen the oil filler cap slowly to release the pressure inside the hydraulic tank.

⚠ Release the remaining pressure in the hydraulic circuit. For details, see TESTING AND ADJUSTMENT, Releasing pressure in hydraulic circuit.

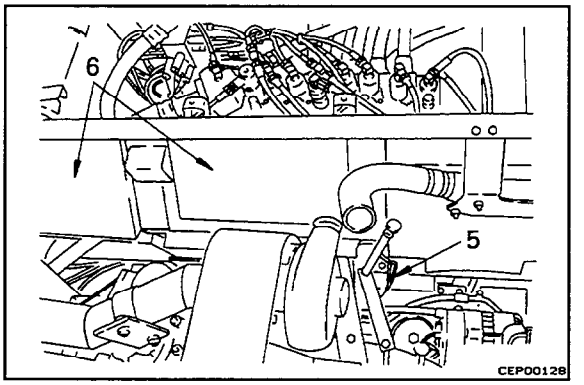
★ Match mark the PPC circuit hoses before disconnecting.

★ Fit blind plugs in the disconnected hoses and tubes.

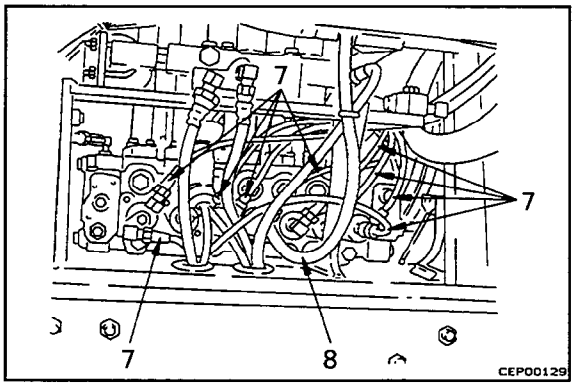
1. Open engine hood. Remove control valve top cover.
2. Disconnect turbocharger outlet port hose (1) and remove inlet port hose (2).



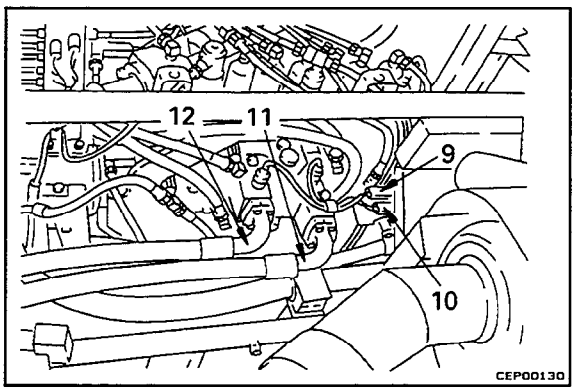
3. Disconnect air cleaner clogging sensor hose (3).
4. Disconnect air cleaner assembly (4) together with bracket.
5. Disconnect wiring harness (5) and remove partition (6).



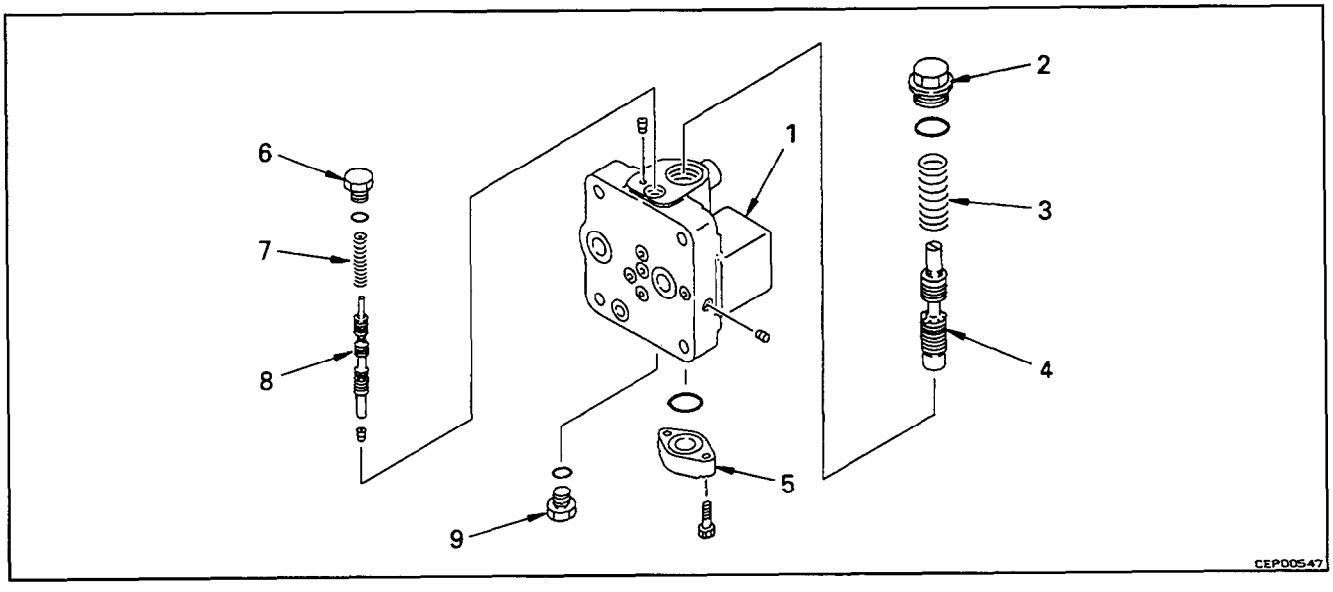
6. Disconnect nine PPC hoses (7).
7. Disconnect pump merge/divider solenoid hose (8).



8. Disconnect pressure sensor connectors (9 and 10) (CN-C08 and CN-C07).
9. Disconnect main pump outlet hoses (11 and 12).



DISASSEMBLY OF PUMP MERGE/DIVIDER VALVE



1. Remove plug (2) from valve body (1), then remove spring (3) and spool (4).
2. Remove plate (5).
3. Remove plug (6), then remove spring (7) and spool (8).
4. Remove plug (9).

★ After disassembling, if there is any abnormality in body (1) or spools (4 or 8), replace the whole valve.

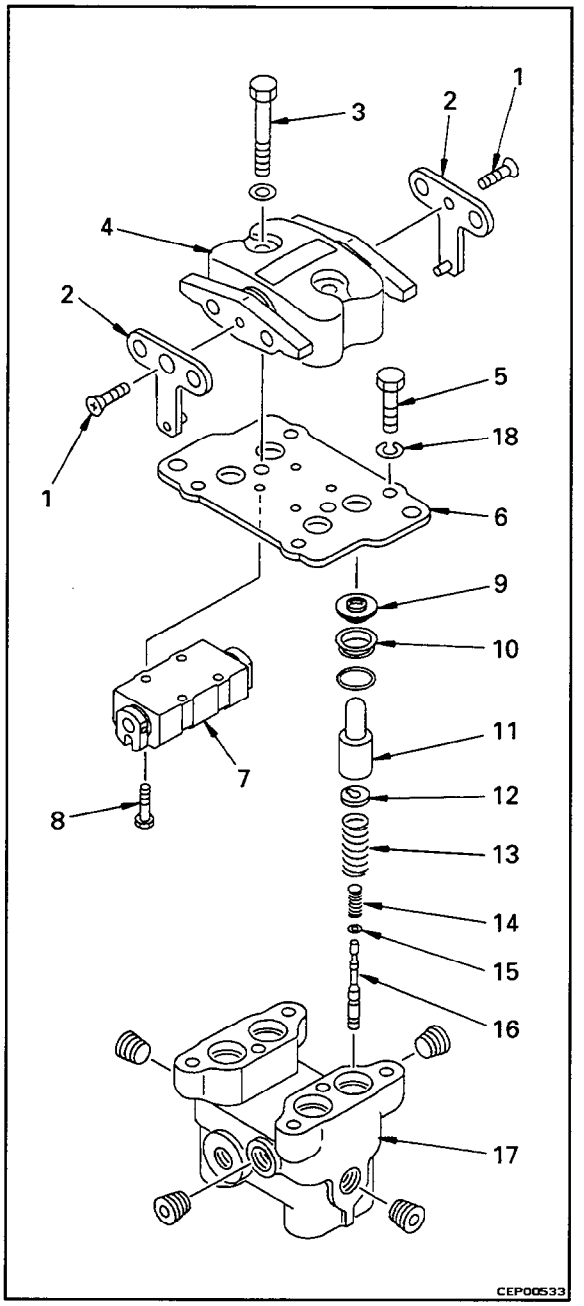
ASSEMBLY OF PUMP MERGE/DIVIDER VALVE

- Before assembling, coat sliding surfaces with engine oil.

1. Fit o-ring to plug (9) and install to valve body (1).
   Plug (9): **39.2 ±5.9 Nm (4.0 ±0.6 kgm)**
2. Assemble spool (8) and spring (7), then fit o-ring to plug (6) and install.
   Plug (6): **39.2 ±5.9 Nm (4.0 ±0.6 kgm)**
3. Fit o-ring to plate (5) and install to valve body.
4. Assemble spool (4) and spring (3), then fit o-ring to plug (2) and install.
   Plug (2): **152.0 ±24.5 Nm (15.5 ±2.5 kgm)**

ASSEMBLY OF TRAVEL PPC VALVE

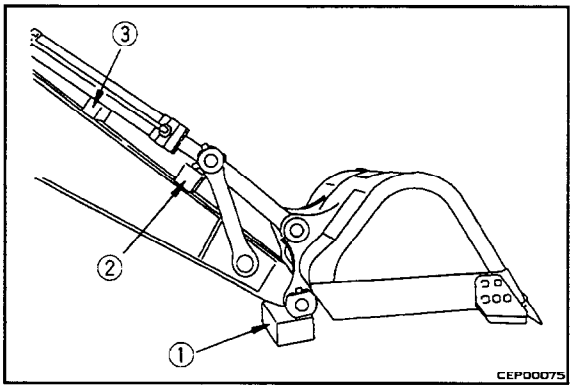
1. Assemble valve (16) in body (17).
2. Assemble shim (15) and spring (14) to valve (16).
   - ★ Assemble the same number and thickness of shim (15) as was removed during disassembly. Standard shim thickness: 0.3 mm
   - ★ Spring (14) is not symmetrical at the top and bottom, so assemble with the small coil diameter (inside diameter) at the shim end.
3. Assemble spring (13), retainer (12), and piston (11).
   - Outside of piston, body hole: **G2- LI**
4. Fit o-ring to collar (10) and assemble in body (17), then install seal (9).
5. Install damper assembly (7) to plate (6), then tighten mounting bolts (8).
   - Mounting bolt: **LT-2**
   - Mounting bolt: **4.41 ±0.49 Nm (0.45 ±0.05 kgm)**
6. Install plate (6) and damper assembly (7) as one unit, then tighten mounting bolts (5).
   - ★ Temporarily assemble standard washer (1.6 mm) for washer (18). After completing the assembly, measure the difference in the angle when the left and right levers are operated fully. If the angle is greater than 0.7°, change the thickness of washer (18) to make the difference less than 0.7°.
     - ★ Washer thickness: **1.0, 1.3, 1.6 mm**
     - ★ If the washer is thinner by 0.3 mm, the angle of the full stroke is 0.39° greater.
   - Mounting bolt: **30.89 3.43± Nm (3.15 ±0.35 kgm)**
7. Install case and shaft assembly (4), then tighten mounting bolts (3).
   - Rocking portion of shaft, contact portion of lever and piston: **G2-LI**
   - Mounting bolt: **27.95 ±3.43 Nm (2.85 ±0.35 kgm)**
8. Install lever (2), then tighten screw (1).
   - Rocking portion of lever pin and plate: **G2-LI**
   - Screw: **8.8 ±0.98 Nm (0.9 ±0.1 kgm)**

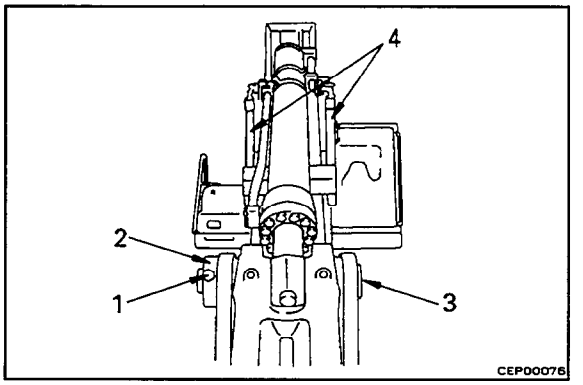


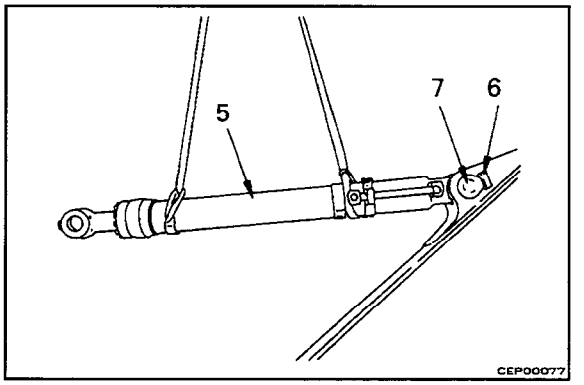
REMOVAL OF BUCKET CYLINDER

⚠ Extend the bucket cylinder piston rod to a point approximately **200 mm** before the end of the DUMP stroke, lower the work equipment completely to the ground, then set the remaining safety lock lever to the LOCK position.

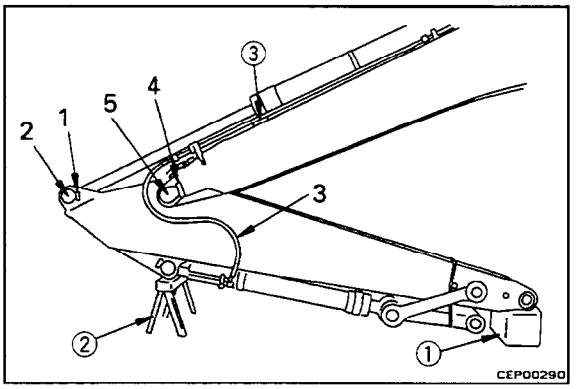
1. Set block ① under arm top, block ② between link and arm and block ③ between bucket cylinder and arm.
2. Remove lock bolt (1). ※1
3. Remove plate (2), then remove head pin (3). ※2
4. Start engine and retract piston rod, then tie piston rod with wire to prevent it from coming out.
   ⚠ Release the remaining pressure in the hydraulic circuit. For details, see TESTING AND ADJUSTMENTS, Releasing remaining pressure in hydraulic circuit.
5. Disconnect hoses (4).
6. Raise bucket cylinder assembly (5), remove plate (6), then remove bottom pin (7) and remove bucket cylinder. ※3
   ★ There are shims installed, so check the number and thickness and keep in a safe place.
   kg Bucket cylinder assembly: **270 kg**

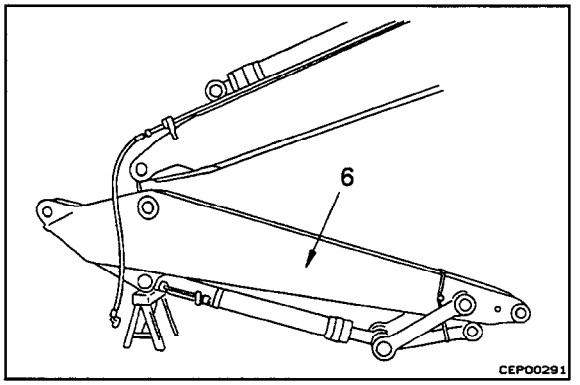






REMOVAL OF ARM





1. Remove bucket assembly. For details, see REMOVAL OF BUCKET ASSEMBLY.

2. Secure link to arm with wire.
   ⚠ Extend the arm cylinder piston rod to a point approx. 200 mm before the end of the IN stroke, then lower the arm on to block ① and stand ② and set the safety lock lever to the LOCK position.

3. Set block ③ between arm cylinder and boom.

4. Remove the plate (1), then remove the arm cylinder head pin (2). ※1

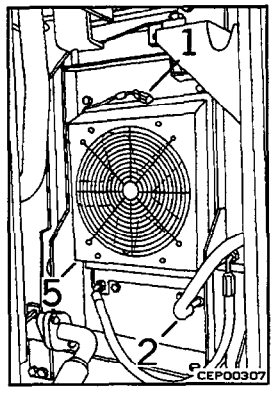
5. Start engine, and retract piston rod, then tie piston rod with wire to prevent it from coming out.
   ⚠ Release the remaining pressure in the hydraulic circuit. For details, see TESTING AND ADJUSTING, Releasing remaining pressure in hydraulic circuit.

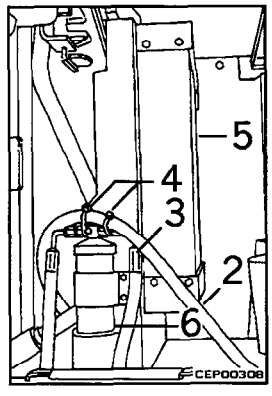
6. Disconnect two bucket cylinder hoses (3).

7. Remove plate (4), then remove connecting pin (5) between arm and boom.
   ★ There are shims installed, so check the number and thickness, and keep in a safe place.

8. Start engine, then raise boom and swing to remove arm assembly (6).
   kg Arm assembly: **1500 kg**

REMOVAL OF CONDENSER





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

⚠ Open the engine hood, then push the valve of the air conditioner compressor hose slowly and release the R134a refrigerant gradually.

1. Open condenser side cover, and remove top cover.
2. Disconnect wiring connector (1) (CN-M35).
   ★ This is at the rear of the condenser.
3. Disconnect hoses (2) and (3), and cut tie strap (4). ※1
   ★ Be careful not to lose the o-ring.
4. Remove condenser assembly (5) together with receiver (6).

INSTALLATION OF CONDENSER

- Carry out installation in the reverse order to removal.

※1
★ Check that the o-ring is not damaged or deteriorated, then connect the hoses.

- **Charging with refrigerant**
  ★ Using tool **X**, charge the air conditioner circuit with R134a refrigerant.

Unit: mm

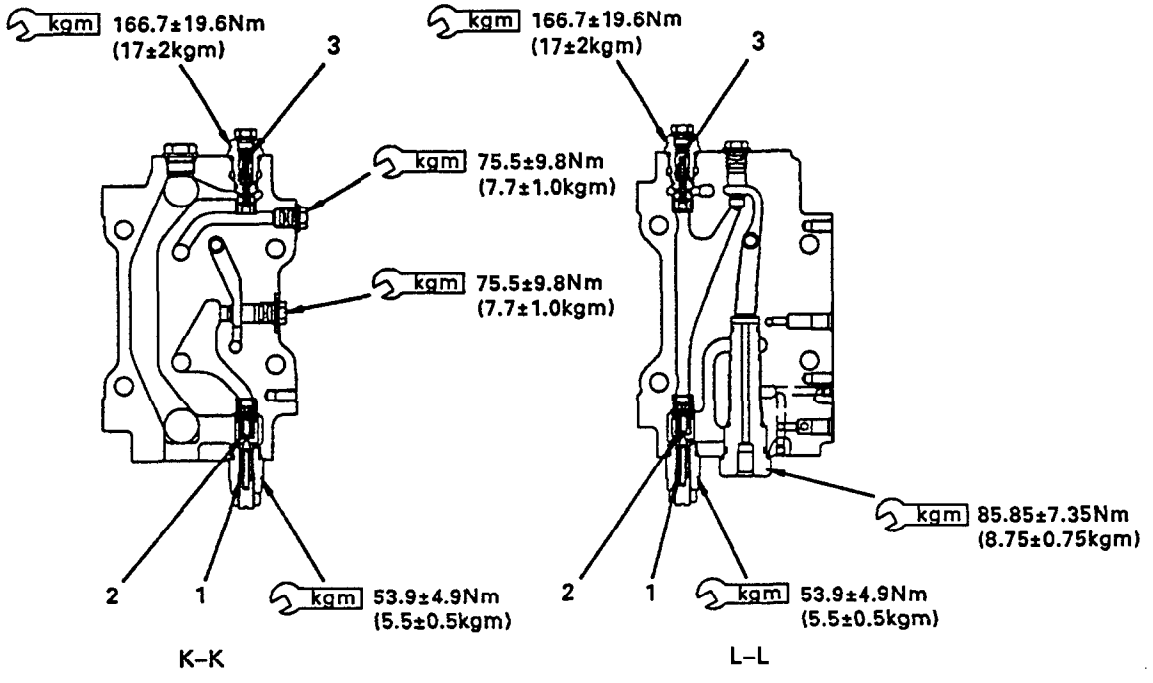
No.	Check item	Criteria		Remedy
		Standard clearance	Clearance limit	
1	Backlash between swing motor and No.1 sun gear	0.19 - 0.29	--	
2	Backlash between No.1 sun gear and No.1 planet gear	0.17 - 0.52	0.90	
3	Backlash between No.1 planet gear and ring gear	0.20 - 0.61	0.90	
4	Backlash between No.2 planet carrier and coupling	0.047 - 0.122	--	
5	Backlash between No.1 planet carrier and No.2 sun gear	0.37 - 0.65	1.10	Replace
6	Backlash between No.2 sun gear and No.2 planet gear	0.17 - 0.52	1.00	
7	Backlash between No.2 planet gear and ring gear	0.20 - 0.61	1.10	
8	Backlash between coupling and swing pinion	0.07 - 0.24	--	
9	Backlash between swing pinion and swing circle	0 - 1.21	2.00	
10	Clearance between plate and coupling	0.06 - 0.82	--	
11	Wear of swing pinion oil seal contact surface	Standard size	Repair limit	Repair hard chrome plating or replace
		$140\ ^{0}_{-0.100}$		

PC300HD-6

Unit: mm

No.	Check item	Criteria					Remedy
1	Outside diameter of protruding portion	Standard size			Repair limit		Rebuild or replace
		704			--		
2	Outside diameter of tread	660			648		
3	Width of protrusion	105			--		
4	Overall width	204			--		
5	Width of tread	49.5			55.5		Replace bushing
6	Clearance between shaft and bushing	Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
		95	-0.120 -0.207	+0.360 -0.220	0.340 - 0.567	1.5	
7	Clearance between shaft and support	95	-0.120 -0.207	+0.035 0	0.120 - 0.242	--	Replace
8	Interference between idler and bushing	Standard size	Tolerance		Standard interference	Interference limit	Replace bushing
			Shaft	Hole			
		87.6	+0.087 +0.037	-0.027 -0.062	0.064 - 0.149	--	
9	Side clearance of idler (both sides	Standard clearance			Clearance limit		
		0.46 - 0.86			1.5		

(3/6)

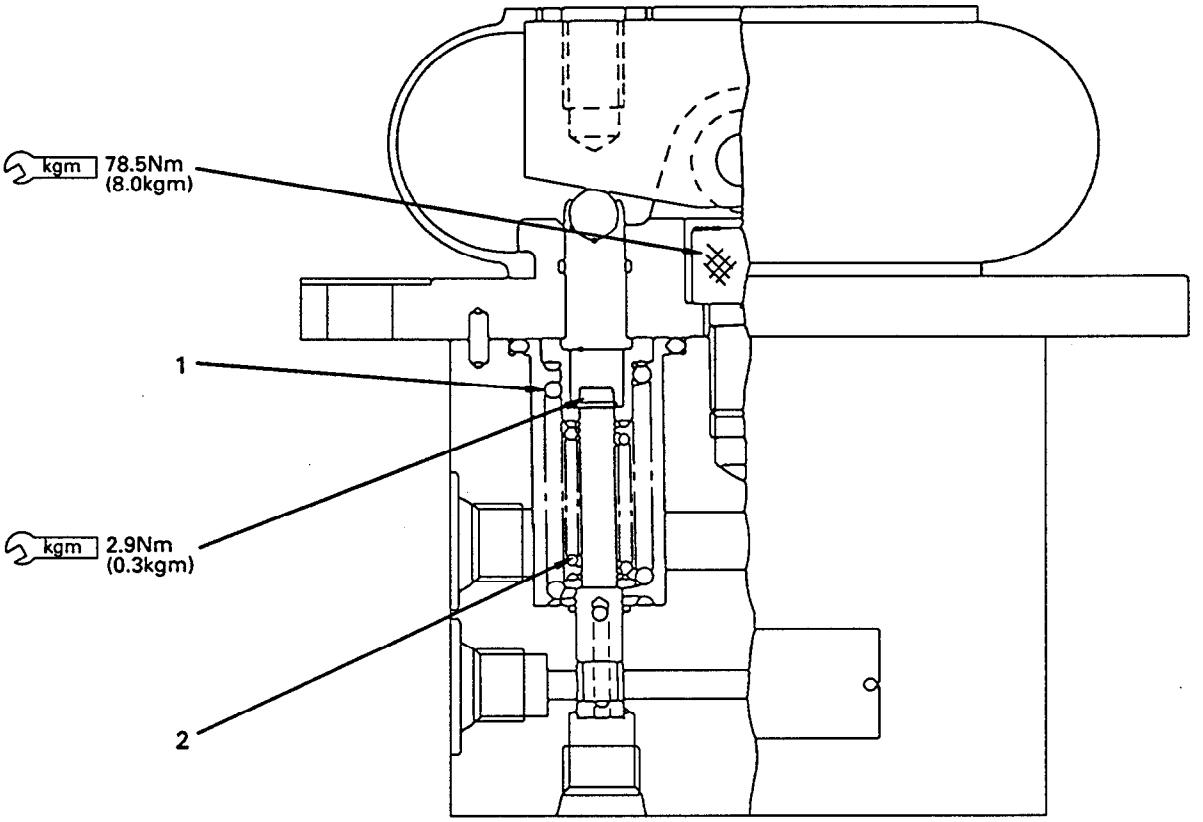


X10BH134

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
		Free length x OD	Installed length	Installed load	Free length	Installed load	
1	Valve spring	23.2 x 7.2	19	41.2 N (4.2 kg)	--	33.3 N (3.4 kg)	Replace spring if there is damage or deformation
2	Relief spring	30.7 x 9.6	26.3	369.7 N (37.7 kg)	--	296.2 N (30.2 kg)	
3	Unload spring	38.5 x 9.8	26	83.4 N (8.5 kg)	--	66.7 N (6.8 kg)	

SERVICE PPC VALVE



X10BH138

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Centering spring	Free length x OD	Installed length	Installed load	Free length	Installed load	Replace spring if there is damage or deformation
		64.8 x 16.6	40.5	46.1 N (4.7 kg)	(62.9)	44.1 N (4.5 kg)	
2	Metering spring	26.0 x 10.5	25.0	25.5 N (2.6 kg)	(25.2)	24.5 N (2.5 kg)	