SHOP MANUAL

KOMATSU

PC120-6 EXCEL

MACHINE MODEL	SERIAL NUMBER
PC120-6 EXCEL	**57499 and up**

- This shop manual may contain attachments and optional equipment that are not available in your area. Please consult your local Komatsu distributor for those items you may require.
  Materials and specifications are subject to change without notice.
- PC120-6 EXCEL mount the S4D102-1 engine.
  For details of the engine, see the 102 Series Engine Shop Manual.

Printed in Japan 03-02(02)

COATING MATERIALS

★ The recommended coating materials such as adhesives, gasket sealants and greases used for disassembly and assembly are listed below.
★ For coating materials not listed below, use the equivalent of products shown in this list.

Category	Komatsu code	Part No.	Q'ty	Container	Main applications, features
Adhesives	LT-1A	790-129-9030	150 g	Tube	• Used to prevent rubber gaskets, rubber cushions, and cock plug from coming out.
	LT-1B	790-129-9050	20 g (2 pes.)	Polyethylene container	• Used in places requiring an immediately effective, strong adhesive. Used for plastics (except polyethylene, polyprophylene, tetrafluoroethlene and vinyl chloride), rubber, metal and non-metal.
	LT-2	09940-00030	50 g	Polyethylene container	• Features: Resistance to heat and chemicals • Used for anti-loosening and sealant purpose for bolts and plugs.
	LT-3	790-129-9060 (Set of adhesive and hardening agent)	Adhesive: 1 kg Hardening agent: 500 g	Can	• Used as adhesive or sealant for metal, glass and plastic.
	LT-4	790-129-9040	250 g	Polyethylene container	• Used as sealant for machined holes.
	Holtz MH 705	790-126-9120	75 g	Tube	• Used as heat-resisting sealant for repairing engine.
	Three bond 1735	790-129-9140	50 g	Polyethylene container	• Quick hardening type adhesive • Cure time: within 5 sec. to 3 min. • Used mainly for adhesion of metals, rubbers, plastics and woods.
	Aron-alpha 201	790-129-9130	2 g	Polyethylene container	• Quick hardening type adhesive • Quick cure type (max. strength after 30 minutes) • Used mainly for adhesion of rubbers, plastics and metals.
	Loctite 648-50	79A-129-9110	50 cc	Polyethylene container	• Features: Resistance to heat, chemicals • Used at joint portions subject to high temperatures.
Gasket sealant	LG-1	790-129-9010	200 g	Tube	• Used as adhesive or sealant for gaskets and packing of power train case, etc.
	LG-3	790-129-9070	1 kg	Can	• Features: Resistance to heat • Used as sealant for flange surfaces and bolts at high temperature locations, used to prevent seizure. • Used as sealant for heat resistance gasket for high temperature locations such as engine precombustion chamber, exhaust pipe, etc.

kg/cm² to lb/in²

1kg/cm² = 14.2233 lb/in²

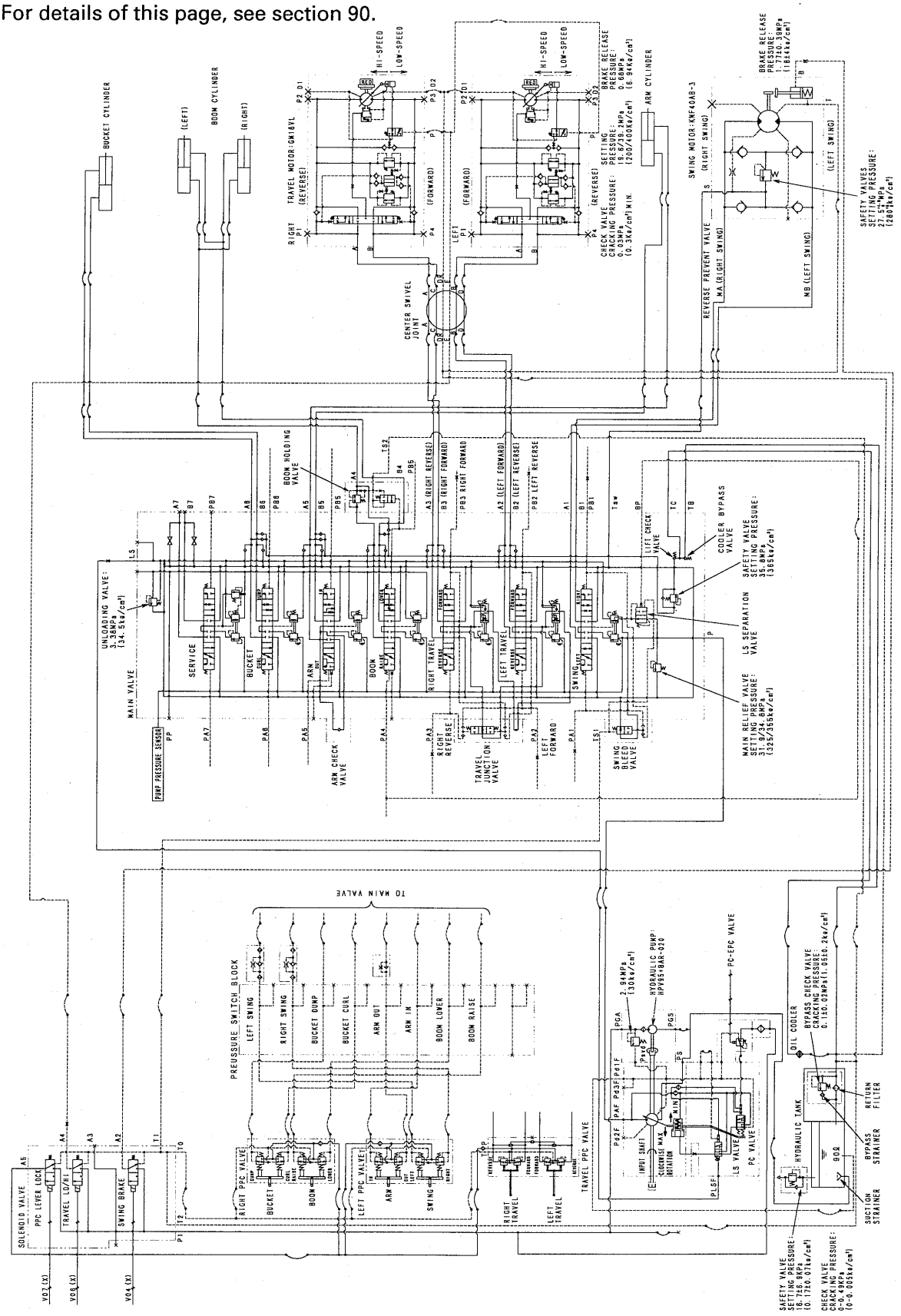
	0	1	2	3	4	5	6	7	8	9
0	0	14.2	28.4	42.7	56.9	71.1	85.3	99.6	113.8	128.0
10	142.2	156.5	170.7	184.9	199.1	213.4	227.6	241.8	256.0	270.2
20	284.5	298.7	312.9	327.1	341.4	355.6	369.8	384.0	398.3	412.5
30	426.7	440.9	455.1	469.4	483.6	497.8	512.0	526.3	540.5	554.7
40	568.9	583.2	597.4	611.6	625.8	640.1	654.3	668.5	682.7	696.9
50	711.2	725.4	739.6	753.8	768.1	782.3	796.5	810.7	825.0	839.2
60	853.4	867.6	881.8	896.1	910.3	924.5	938.7	953.0	967.2	981.4
70	995.6	1010	1024	1038	1053	1067	1081	1095	1109	1124
80	1138	1152	1166	1181	1195	1209	1223	1237	1252	1266
90	1280	1294	1309	1323	1337	1351	1365	1380	1394	1408
100	1422	1437	1451	1465	1479	1493	1508	1522	1536	1550
110	1565	1579	1593	1607	1621	1636	1650	1664	1678	1693
120	1707	1721	1735	1749	1764	1778	1792	1806	1821	1835
130	1849	1863	1877	1892	1906	1920	1934	1949	1963	1977
140	1991	2005	2020	2034	2048	2062	2077	2091	2105	2119
150	2134	2148	2162	2176	2190	2205	2219	2233	2247	2262
160	2276	2290	2304	2318	2333	2347	2361	2375	2389	2404
170	2418	2432	2446	2460	2475	2489	2503	2518	2532	2546
180	2560	2574	2589	2603	2617	2631	2646	2660	2674	2688
190	2702	2717	2731	2745	2759	2773	2788	2802	2816	2830
200	2845	2859	2873	2887	2901	2916	2930	2944	2958	2973
210	2987	3001	3015	3030	3044	3058	3072	3086	3101	3115
220	3129	3143	3158	3172	3186	3200	3214	3229	3243	3257
230	3271	3286	3300	3314	3328	3343	3357	3371	3385	3399
240	3414	3428	3442	3456	3470	3485	3499	3513	3527	3542

10 STRUCTURE AND FUNCTION

E20306

PC120-6 EXCEL Serial No. 60968 and up

★ For details of this page, see section 90.



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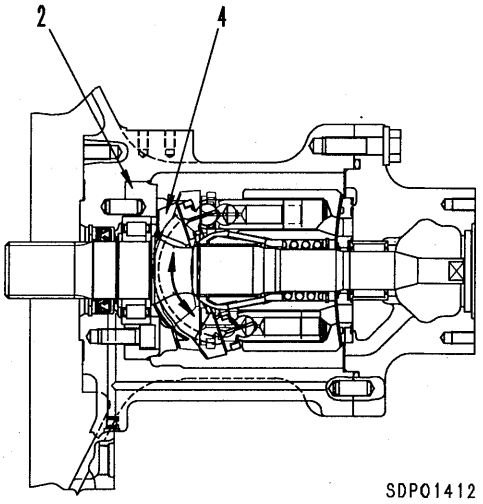
2. Control of discharge amount

- If swash plate angle α becomes larger, the difference in volumes **E** and **F** becomes larger and discharge volume **Q** increases. Swash plate angle α is changed by servo piston (11).
- Servo piston (11) moves in a reciprocal movement (⟷) under the signal pressure of the TVC and LS valves. This straight line movement is transmitted through slider (12) to rocker cam (4), and rocker cam (4), which is supported by the cylindrical surface to cradle (2), slides in a rotating movement in direction (↻).
- With servo piston (11), the area receiving the pressure is different on the left and right, so main pump discharge pressure (self pressure) **PP** is always brought to the pressure chamber on the small diameter piston side (front).
  Output pressure **Pen** of the LS valve is brought to the pressure chamber at the large diameter piston end (rear).The relationship in the size of pressure **PP** at the small diameter piston end and pressure **Pen** at the large diameter piston end, and the ratio between the area receiving the pressure of the small diameter piston and the large diameter piston controls the movement of servo piston (11).



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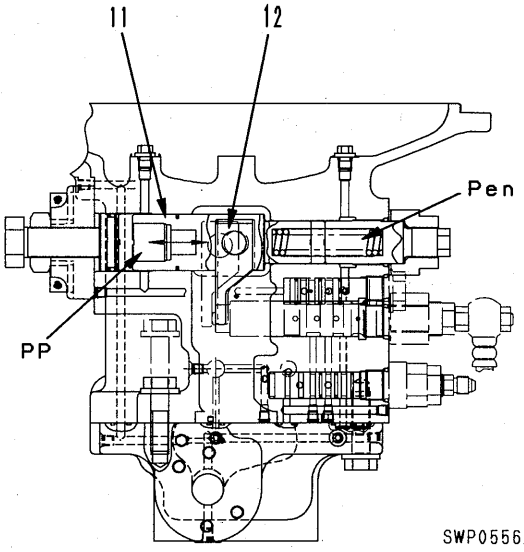

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- When pump pressure **PP** is small, spool (3) is on the left. At this point, port **C** and port **D** are connected, and the pressure entering the LS valve becomes drain pressure **PT**. If port **E** and port **G** of the LS valve are connected (see (1) LS valve), the pressure entering the large diameter end of the piston from port **J** becomes drain pressure **PT**, and servo piston (9) moves to the right. In this way, the pump discharge amount moves in the direction of increase.
- As servo piston (9) moves further, piston (7) is moved to the right by slider (8). Springs (4) and (6) expand and the spring force becomes weaker. When the spring force becomes weaker, spool (3) moves to the right, so the connection between port **C** and port **D** is cut, and the pump discharge pressure ports **B** and **C** are connected. As a result, the pressure at port **C** rises, and the pressure at the large diameter end of the piston also rises, so the movement of piston (9) to the right is stopped.
  In other words, the stop position for piston (9) (= pump discharge amount) is decided at the point where the force of springs (4) and (6) and the pushing force from the PC-EPC valve solenoid and the pushing force created by pressure **PP** acting on spool (3) are in balance.

E20306

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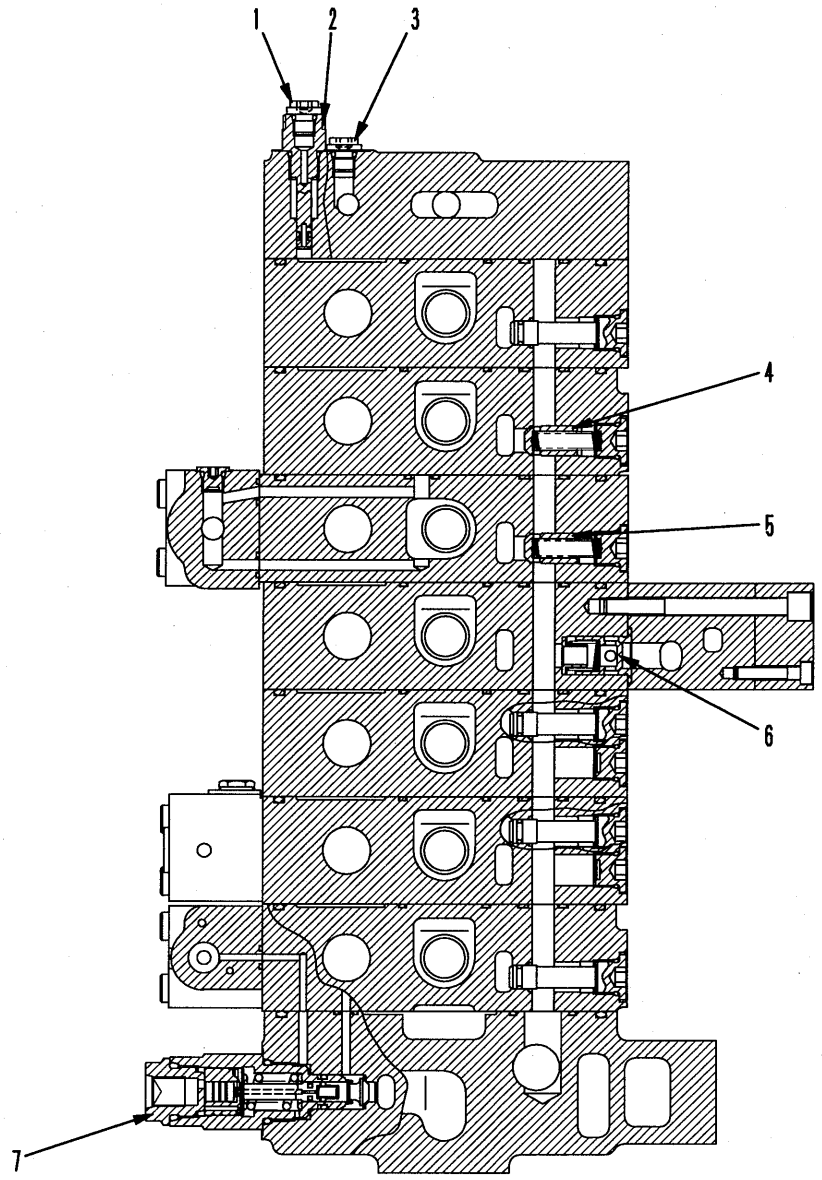

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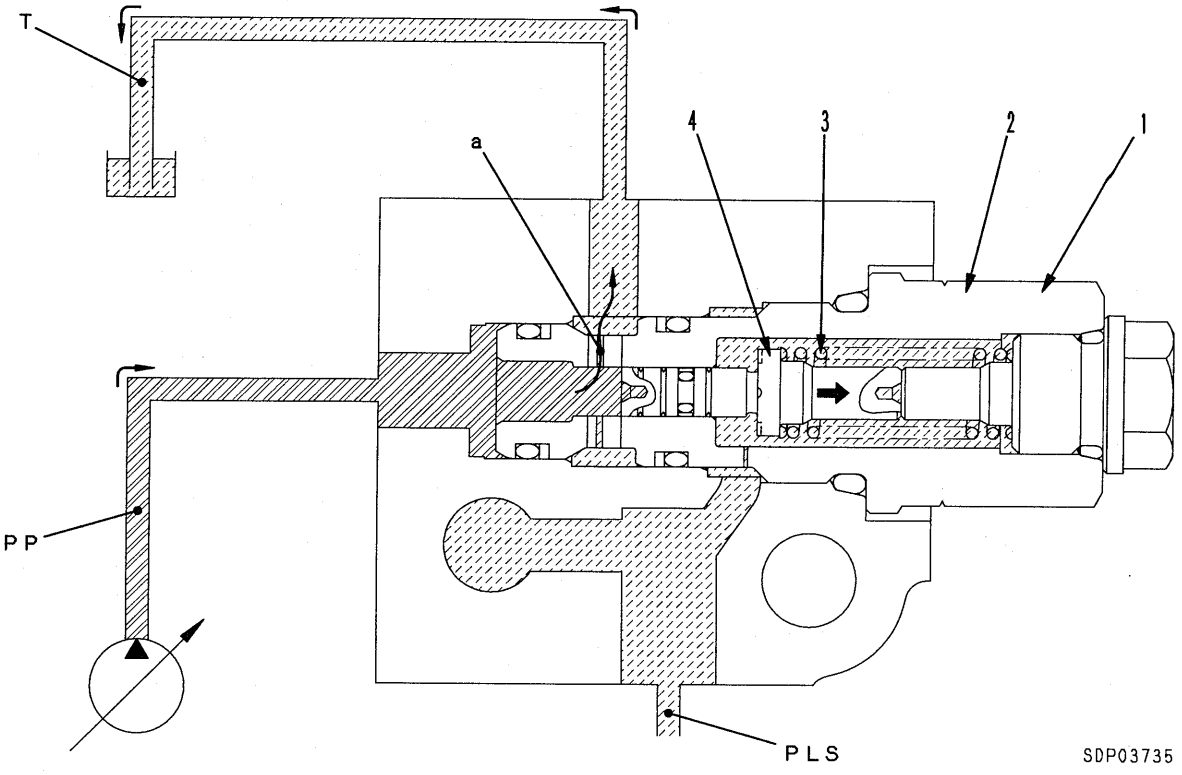
1. LS pressure detection valve
2. LS bypass plug
3. Pump pressure detection plug
4. Check valve (bucket head)
5. Check valve (arm head)
6. Check valve (boom bottom)
7. LS select valve

1. UNLOAD VALVE

Function

1) When the control valve is at neutral, pump discharge amount **Q** discharged by the minimum swash plate angle is released to the tank circuit.
When this happens, pump discharge pressure **PP** is set at 2.5MPa {25 kg/cm²} by spring (3) inside the valve. (LS pressure **PLS**: 0MPa {0 kg/cm²})



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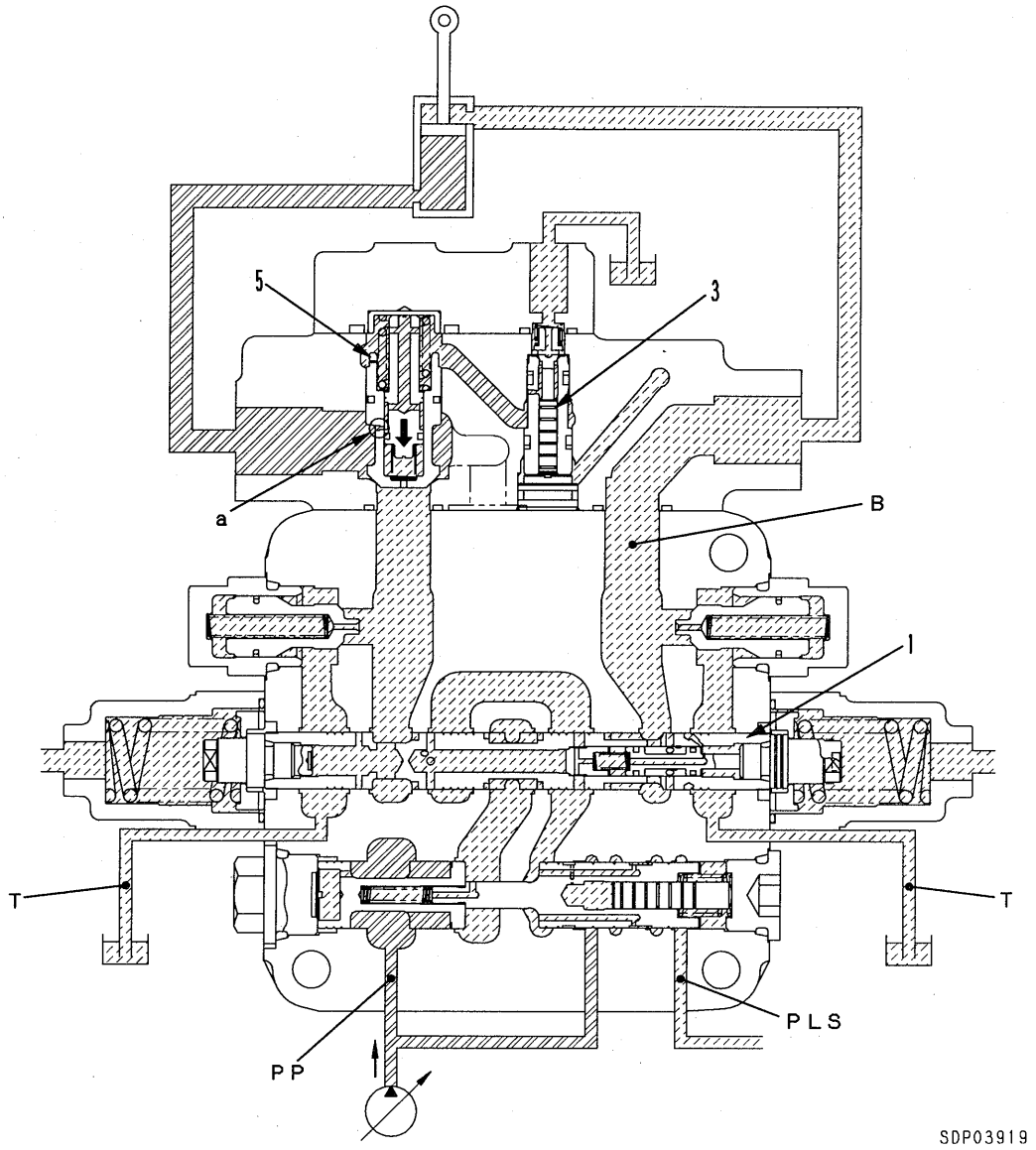
Operation

When control valve is at neutral

- Pump discharge pressure **PP** is acting on the left end of spool (4), and LS pressure **PLS** is acting on the right end.
- When the control valve is at neutral, LS pressure **PLS** is 0, so only pump discharge pressure **PP** has any effect, and **PP** is set only by the load of spring (3).
- As pump discharge pressure **PP** rises and reaches the load of spring (3) (2.5MPa {25 kg/cm²}), spool (4) is moved to the right in the direction of the arrow. Pump discharge pressure **PP** then passes through the drill hole in sleeve (2) and is connected to tank circuit **T**.
- In this way, pump discharge pressure **PP** is set to 2.5MPa {25 kg/cm²}.

1. Unload valve
2. Sleeve
3. Spring
4. Spool

PP: Pump circuit (pressure)
PLS: LS circuit (pressure)
T: Tank circuit (pressure)



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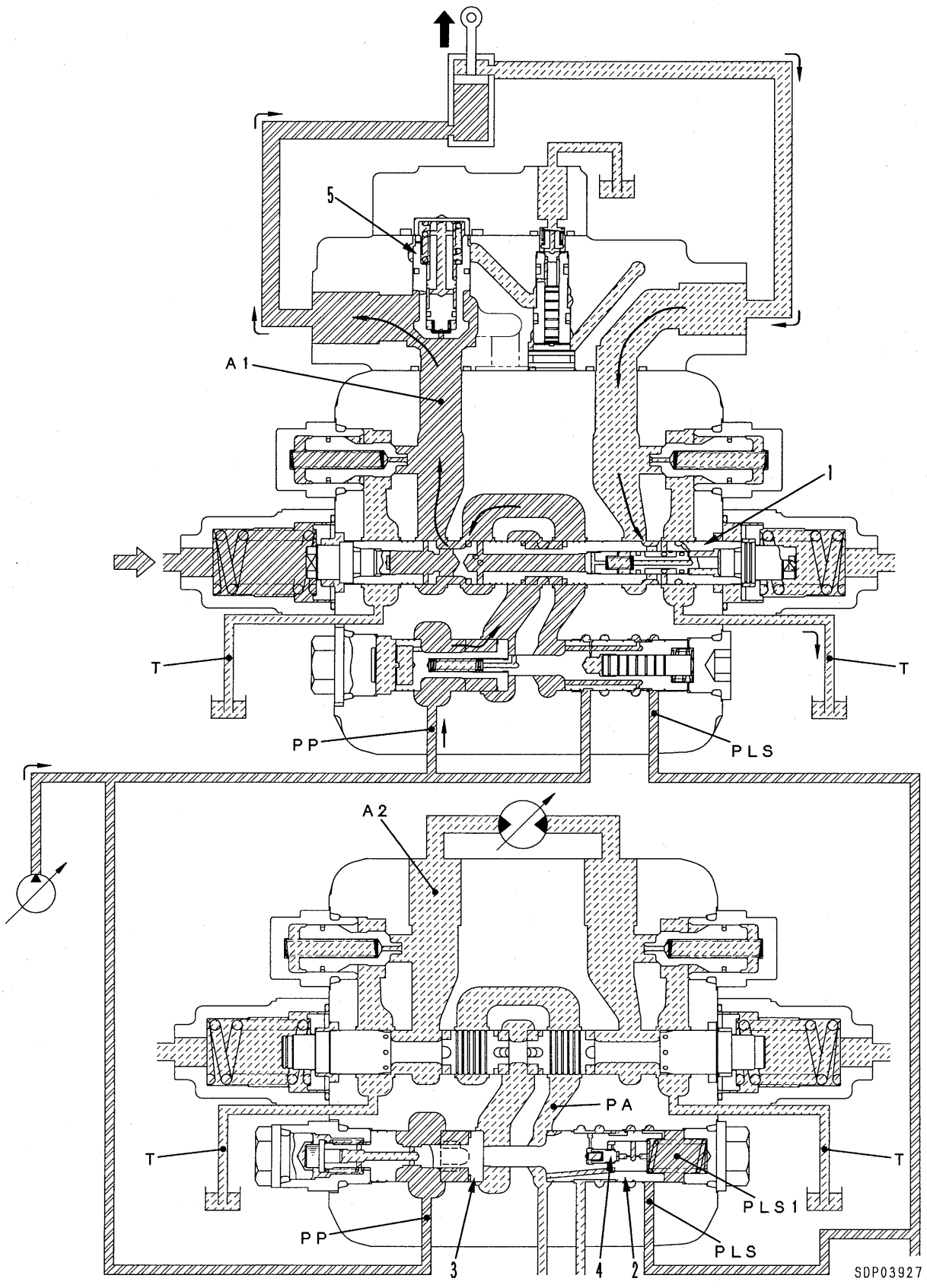
2) At boom HOLD

When the control lever has been operated to boom RAISE and is then returned to the HOLD position, the holding pressure at the boom cylinder bottom end is closed by poppet (5). At the same time, the oil flowing inside poppet (5) from orifice **a** in poppet (5) is closed by pilot spool (3).

In this way, the boom is held in position.

10. TRAVEL LS BYPASS CIRCUIT



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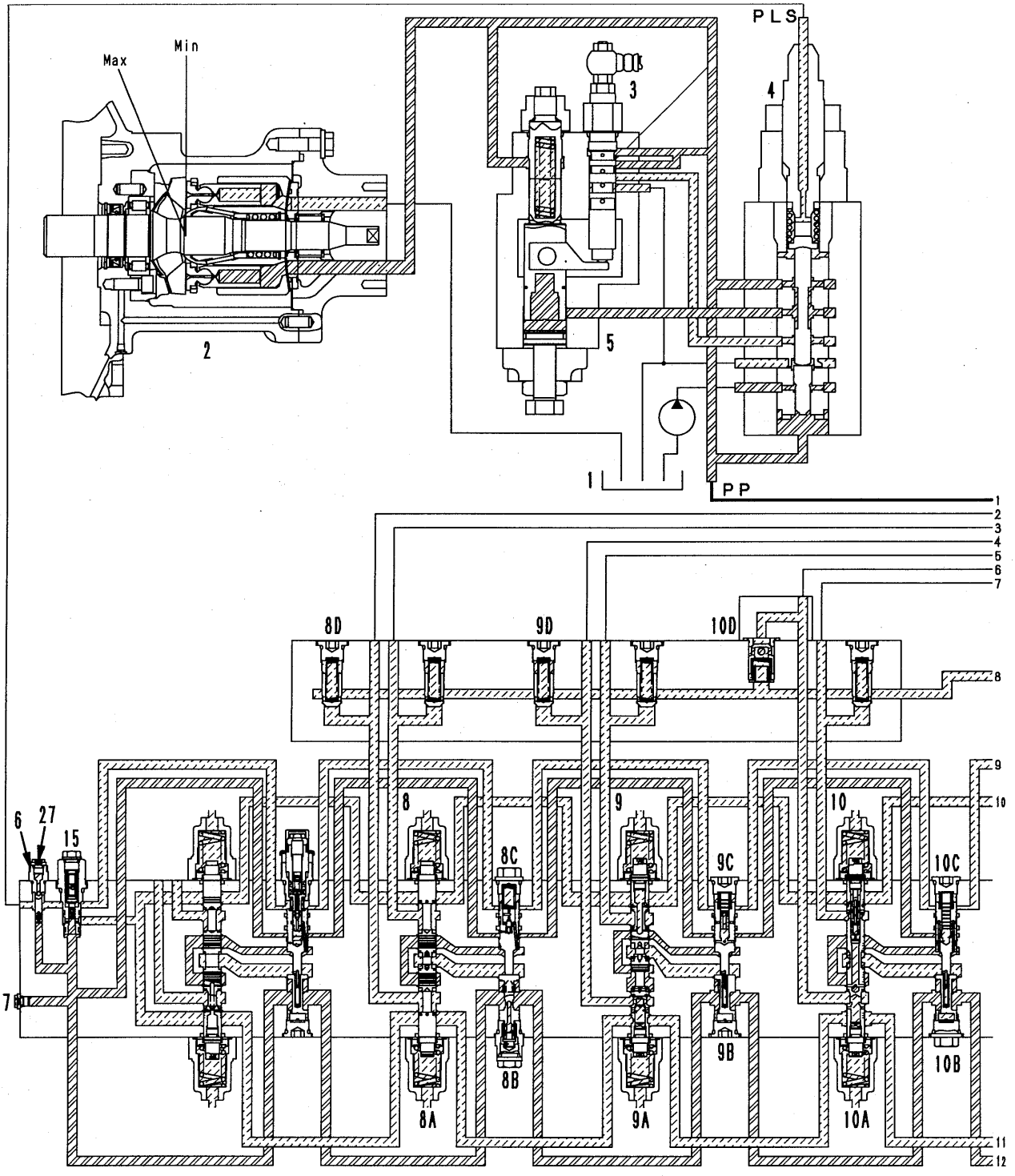
OPERATION OF SYSTEM AS A WHOLE

1) When all control valves are at HOLD



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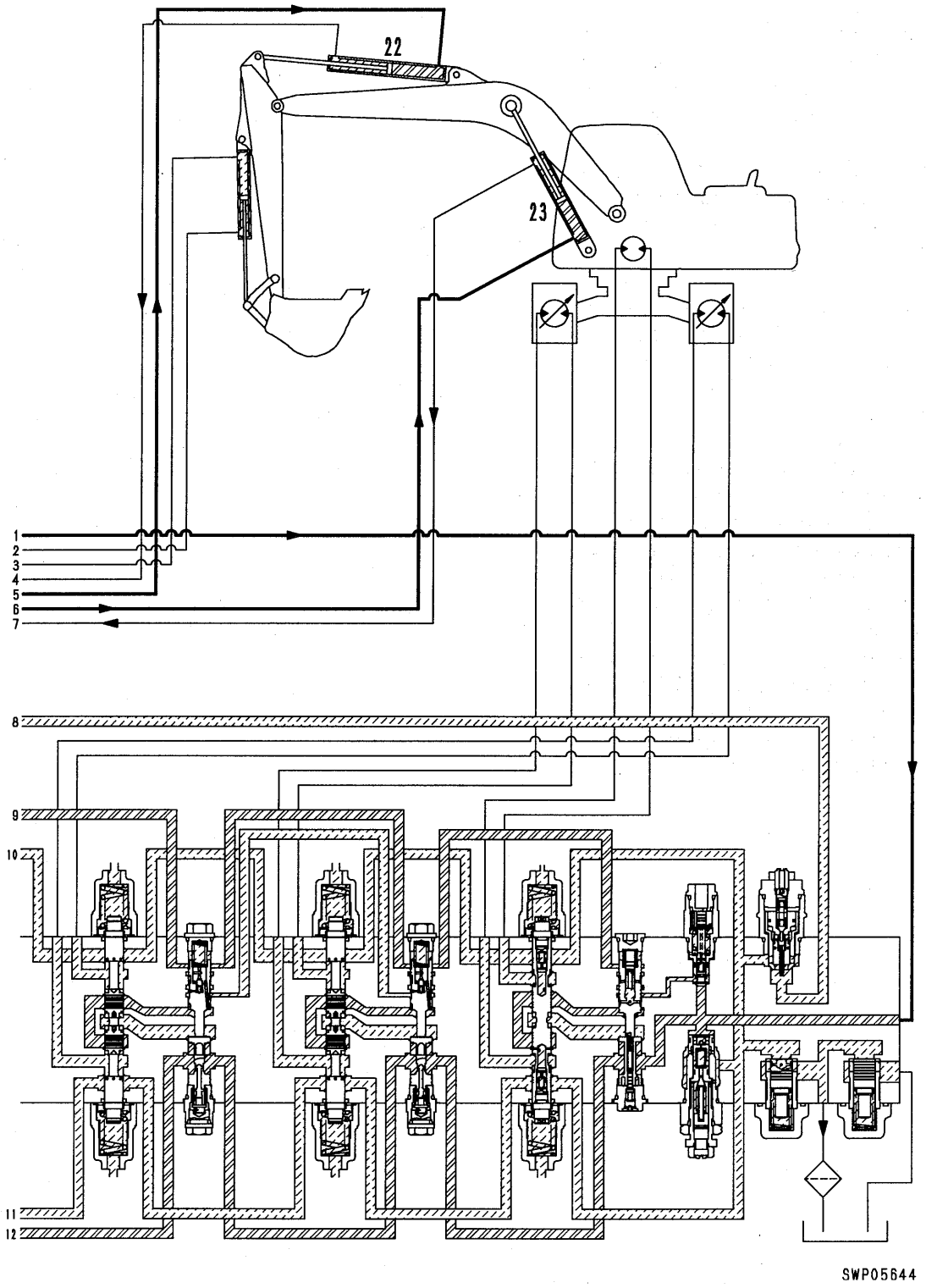
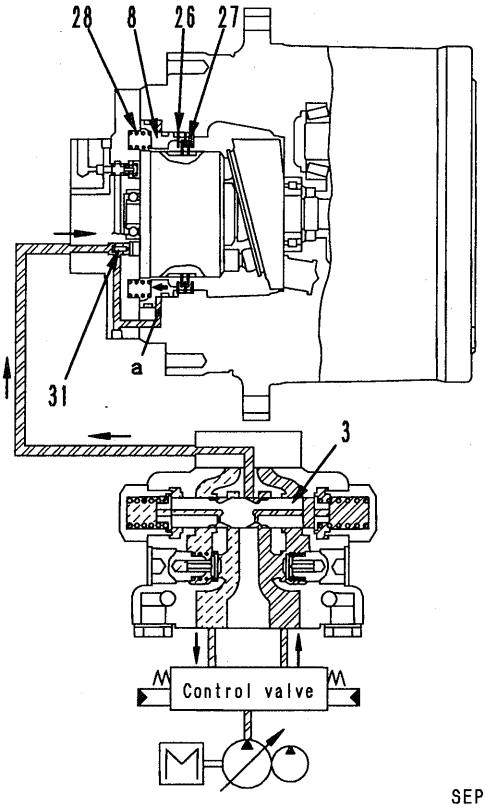


OPERATION OF PARKING BRAKE

1. When starting to travel

- When the travel lever is operated, the pressurized oil from the pump actuates counterbalance valve spool (3), opens the circuit to the parking brake, pushes open check valve (31), and flows into chamber **a** of brake piston (8).
- The pressure in chamber **a** overcomes the force of spring (28), and pushes brake piston (8) to the left.
- When this happens, the force pushing plate (26) and disc (27) together is lost, so plate (26) and disc (27) separate and the brake is released.



SEP04019

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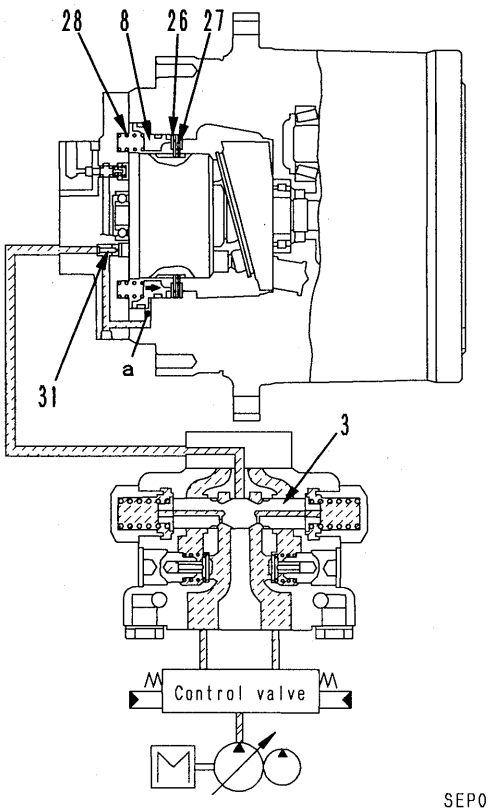
2. When stopping travel

- When the travel lever is placed in neutral, counterbalance valve spool (3) returns to the neutral position and the circuit to the parking brake is closed.
- The pressurized oil in chamber **a** of brake piston (8) is drained to the case from the orifice in check valve (31), and brake piston (8) is pushed fully to the right by spring (28).
- As a result, plate (26) and disc (27) are pushed together, and the brake is applied.



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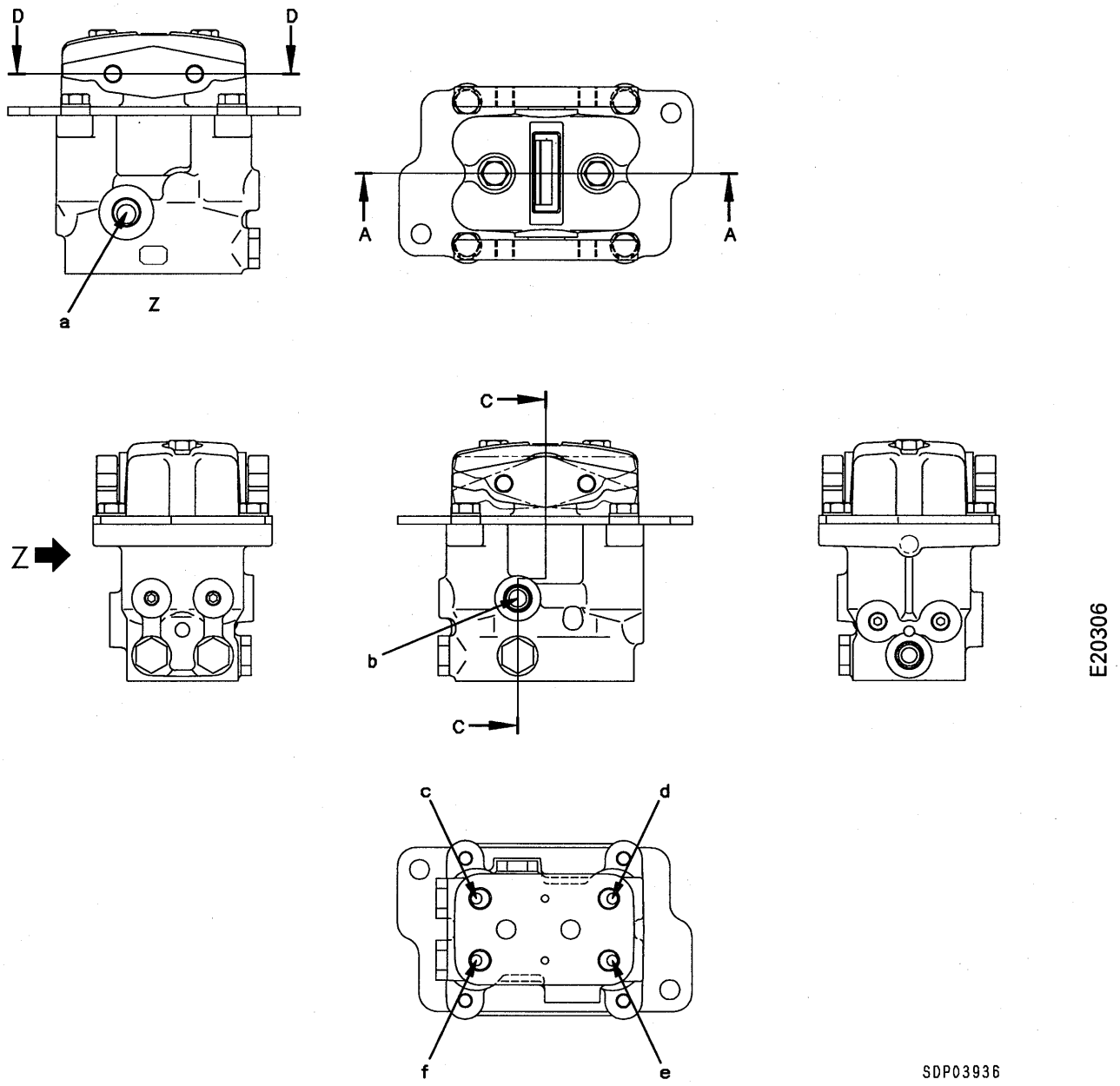
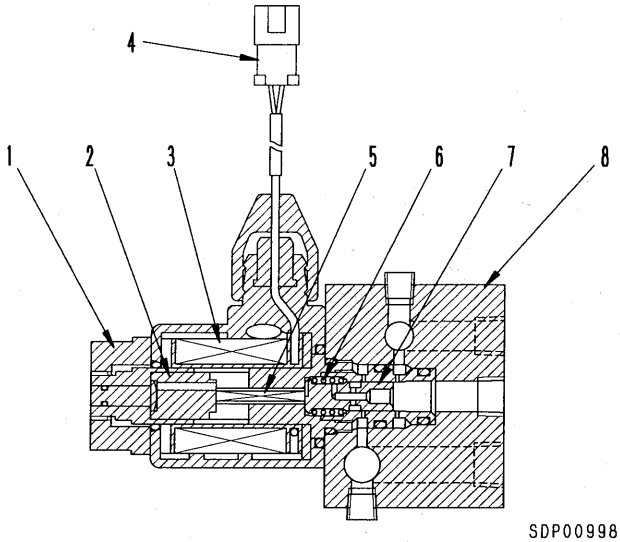
TRAVEL PPC VALVE



a. Port **P** (from control pump)
b. Port **T** (to tank)
c. Port **P1** (L.H. travel REVERSE)
d. Port **P3** (R.H. travel REVERSE)
e. Port **P2** (L.H. travel FORWARD)
f. Port **P4** (R.H. travel FORWARD)
g. Port **P5** (to pressure sensor)

FOR TRAVEL SPEED, SWING BRAKE SOLENOID VALVE



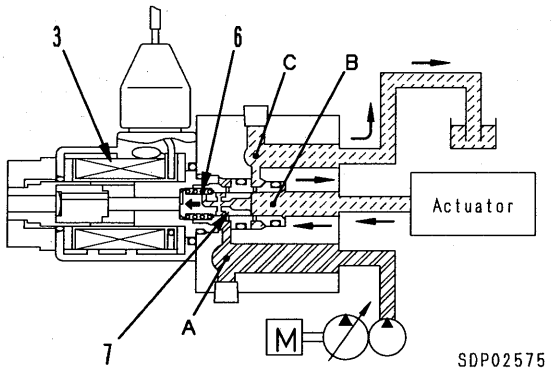
SDP00998

1. Nut
2. Plunger
3. Coil
4. Connector
5. Push pin
6. Spring
7. Spool
8. Block

OPERATION

When solenoid is deactivated

- The signal current does not flow from the controller, so coil (3) is deactivated.
  For this reason, spool (7) is pushed to the left in the direction of the arrow by spring (6).
- As a result, port **A** closes and the pressurized oil from the control pump does not flow to the actuator.
- At the same time, the pressurized oil from the actuator flows from port **B** to port **C**, and is then drained to the tank.



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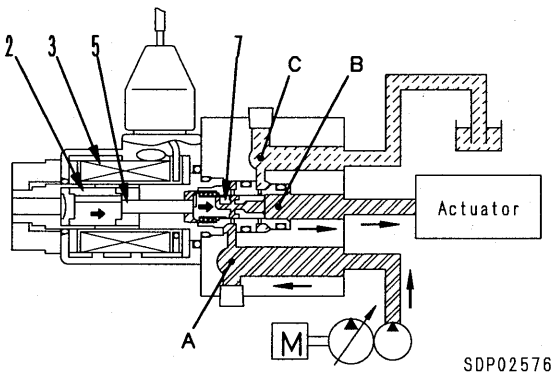
E20306

When solenoid is excited

- When the signal current flows from the controller to coil (3), coil (3) is excited, and a propulsion force is generated in plunger (2) to the right in the direction of the arrow.
- For this reason, spool (7) is pushed to the right in the direction of the arrow by push pin (5).
- As a result, the pressurized oil from the control pump flows from port **A** to port **B**, and then flows to the actuator.
  At the same time, port **C** is closed, and this stops the oil from flowing to the tank.



SDP02576

1. Working light (R.H.)
2. Fuel level sensor
3. Working light (L.H.)
4. Room lamp
5. PC-EPC valve
6. Antenna
7. Starting motor
8. Alternator
9. Fusible link
10. Battery relay
11. Battery
12. Condenser for air conditioner
13. Air conditioner unit
14. Wiper motor
15. Horn
16. Window washer tank
17. Head light
18. Swing brake solenoid valve
19. Travel speed solenoid valve
20. Engine water temperature sensor
21. Engine speed sensor
22. Heater relay
23. Engine oil pressure sensor
24. Engine oil level sensor
25. Caution buzzer
26. Pump controller
27. Horn switch
28. Speaker
29. Monitor panel
30. Starting switch
31. Fuse box
32. Pump prolix switch
33. Window washer switch
34. Additional light switch
35. Radio
36. Wiper switch
37. Swing lock switch
38. Travel speed switch
39. PPC lock switch
40. Heater
41. Travel speed relay
42. PPC lock solenoid valve

E20306

OPERATION

1) Swing lock function

- The swing can be locked at any position desired by using the swing lock switch (manual).
- Operation of swing lock switch.

Lock switch	Pilot lamp	Function	Function
ON	Lights up	Swing lock [ON]	Swing lock is always actuated , and upper structure does not swing even when swing lever is operated
OFF	Goes out	Swing lock [OFF]	Swing lock is canceled, and upper structure swings when swing lever is operated

2) PPC lock function

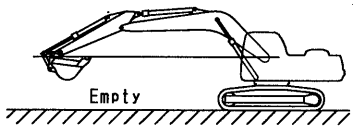
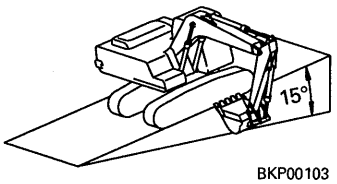
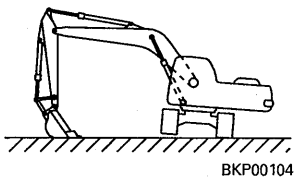
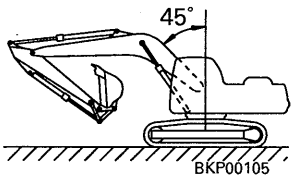
- The PPC lock is interconnected with the safety lock lever. When the safety lock lever is at the LOCK position, the PPC lock switch is turned "OFF".
- when the PPC lock switch is turned "OFF", the electric current going to the work equipment lock solenoid valve is shut off, and the work equipment will not move even if the work equipment control levers are operated.

E20306

3) Travel speed selector function

- When the travel speed selector switch is switched between Hi and Lo, the motor capacity changes to switch the travel speed.

Travel speed switch	Lo (low speed)	Hi (high speed)
Motor capacity (cc/rev)	52.7	33.2
Travel speed (km/h)	3.4	5.0

Applicable model				PC120-6 EXCEL	
Category	Item	Measurement conditions	Unit	Standard value for new machine	Service limit value
Swing	Time taken to swing	Work equipment posture Max. reach  TKP01022 • Engine at full throttle • Hydraulic oil temperature: 45 – 55°C • In heavy-duty operation mode • Swing one turn, then measure time taken to swing next 5 turns	Sec.	26.55±3.45	26.55±4.75
Swing	Hydraulic drift of swing	 BKP00103 • Engine stopped • Hydraulic oil temperature: 45 – 55°C • Set machine on 15° slope, and set upper structure at 90° to the side. • Make counter marks on swing circle outer race and track frame. • Measure distance that counter marks move apart after 15 minutes.	mm	874 (90)	874 (90)
Swing	Leakage from swing motor	• Engine at full throttle • Hydraulic oil temperature: 45 – 55°C • Swing lock switch ON • Relieve swing circuit.	ℓ / mm	3	6
Travel	Travel speed (1)	 BKP00104 • Engine at full throttle • Hydraulic oil temperature: 45 – 55°C • In heavy-duty operation mode • Raise track on one side at a time, rotate one turn, then measure time taken for next 5 turns with no load.	Lo	37 ± 4	37 ± 6
			Hi	23.5 ± 2.4	23.5 ± 3.6
			Sec.		
Travel	Travel speed (2)	 BKP00105 • Engine at full throttle • Hydraulic oil temperature: 45 – 55°C • In heavy-duty operation mode • Run up for at least 10 m, then measure time taken to travel next 20 m on flat ground.	Lo	22 ± 2	22 ± 3
			Hi	14.5 ± 1.5	14.5 ± 2.3
			Sec.		

E20306

MEASURING EXHAUST COLOR

- When measuring in the field when there is no air or power supply, use smoker checker **G1**; when recording official data, use smoke meter **G2**.

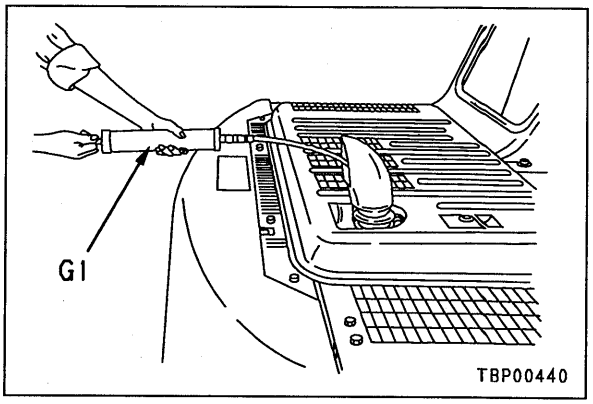
★ Raise the coolant temperature to the operating range before measuring.

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

1. Measuring with handy smoke checker G1

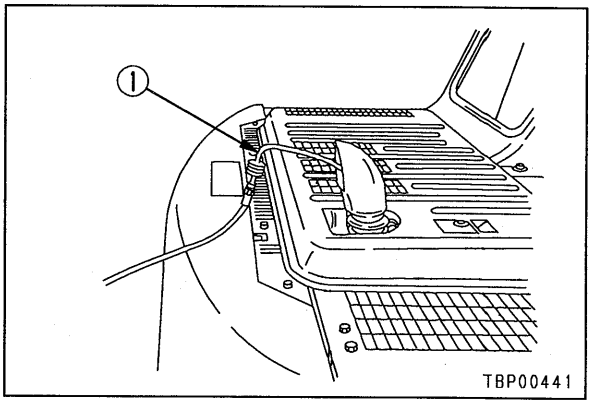
1) Fit filter paper in tool **G1**.
2) Insert the exhaust gas intake port into the exhaust pipe, accelerate the engine suddenly, and at the same time operate the handle of tool **G1** to catch the exhaust gas on the filter paper.
3) Remove the filter paper and compare it with the scale provided to judge the condition.

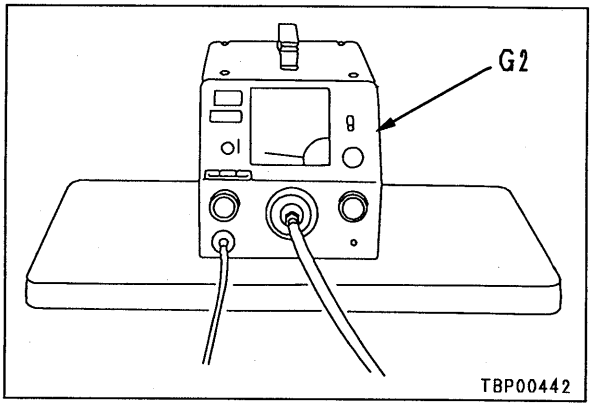
★ Keep the auto-deceleration switch turned OFF.



2. Measuring with smoke meter G2

1) Insert probe ① into the outlet port of exhaust pipe, then tighten the clip to secure it to the exhaust pipe.
2) Connect the probe hose, accelerator switch plug, and air hose to tool **G2**.
   ★ The pressure of the air supply should be less than 1.47 MPa {15 kg/cm^2}.
3) Connect the power cord to the AC outlet.
   ★ When connecting the port, check first that the power switch of tool **G2** is OFF.
4) Loosen the cap nut of the suction pump, then fit the filter paper.
   ★ Fit the filter paper securely so that the exhaust gas does not leak.
5) Turn the power switch of tool **G2** ON.
6) Accelerate the engine suddenly, and at the same time, depress the accelerator pedal of tool **G2** and catch the exhaust gas color on the filter paper.
7) Lay the filter paper used to catch the exhaust gas color on top of unused filter papers (10 sheets or more) inside the filter paper holder, and read the indicated value.





E20306

- **Adjusting**

★ The unload valve cannot be adjusted.

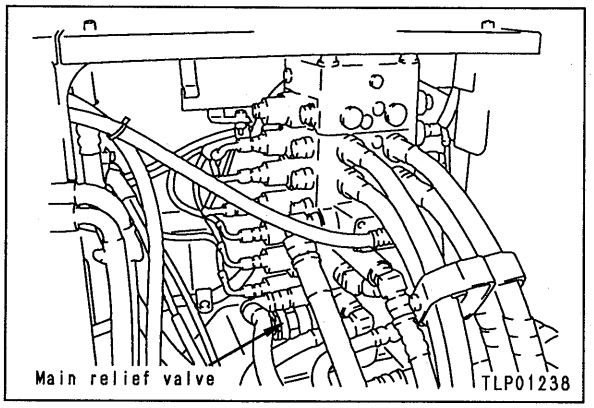
1. Adjusting main relief valve

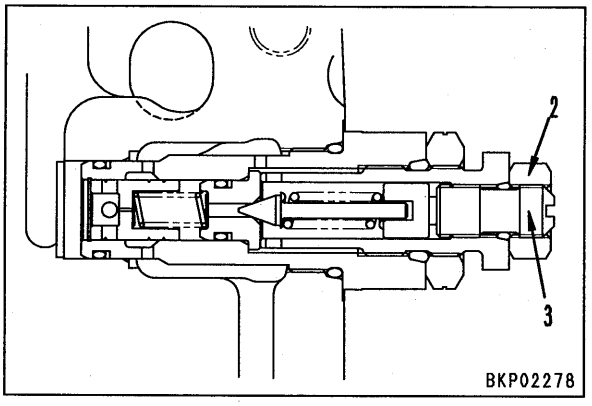
★ If the work equipment or travel relief oil pressure is not correct, adjust the main relief valve as follows.

1) Loosen locknut (2), then turn adjusting screw (3) to adjust.
   ★ Turn the adjusting screw to adjust as follows.
      - To INCREASE pressure, turn CLOCKWISE.
      - To DECREASE pressure, turn COUNTERCLOCKWISE.
   ★ Amount of adjustment for one turn of adjustment screw: Approx. 12.6 MPa {128 kg/cm²}
2) After adjusting, tighten locknut (2).

kgm Locknut: **34.3 ± 4.9 Nm {3.5 ± 0.5 kgm}**

★ After completion of adjustment, repeat the measurement procedure to check again.





2. Adjusting swing motor safety valve

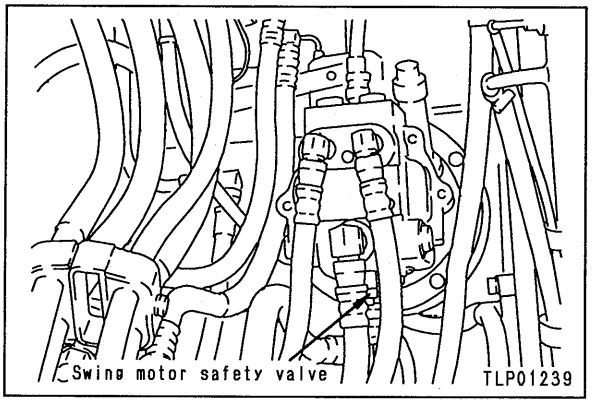
★ If the swing relief oil pressure is not correct, adjust the swing motor safety valve as follows.

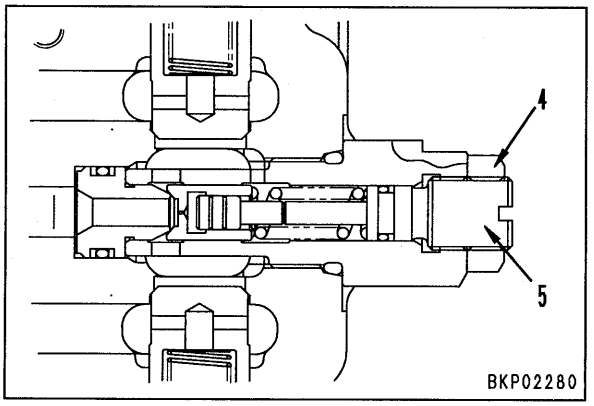
1) Loosen locknut (4), then turn adjustment screw (5) to adjust.
   ★ Turn the adjustment screw to adjust as fol
      - To INCREASE pressure, turn CLOCKWISE.
      - To DECREASE pressure, turn COUNTERCLOCKWISE.
   ★ Amount of adjustment for one turn of adjustment screw: Approx. 14 MPa {143 kg/cm²}
2) After adjusting, tighten locknut (4).

kgm Locknut: **63.7 ± 9.8 Nm {6.5 ± 1 kgm}**

★ After completion of adjustment, repeat the measurement procedure to check again.

★ The safety valve set pressure can be adjusted only for the swing motor. Do not try to adjust the setting for any other component.





E20306

ADJUSTING WORK EQUIPMENT, SWING PPC VALVE

★ If there is excessive play in the work equipment or swing levers, adjust as follows.

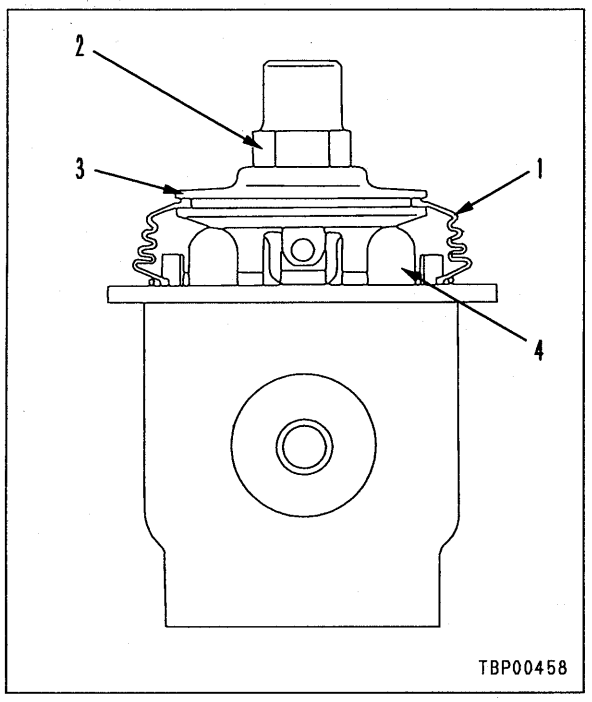
⚠ Lower the work equipment to the ground and stop the engine. Loosen the oil filler cap slowly to release the pressure inside the hydraulic tank. Then set the safety lock lever to the LOCK position.

1. Remove the PPC valve.
2. Remove boot (1).
3. Loosen locknut (2), then screw in disc (3) until it contacts the heads of 4 pistons (4).
   ★ When doing this, do not move the piston.
4. Secure disc (3) in position, then tighten locknut (2) to the specified torque.

   kgm Locknut : **107.9 ± 9.8 Nm {11 ± 1 kgm}**

5. Install boot (1).

★ With the above adjustment, the clearance between disc (3) and piston (4) becomes 0.



E20306

TROUBLESHOOTING

E20306

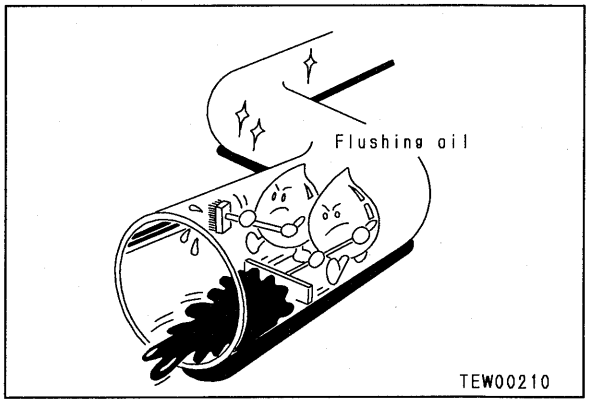
5) Change hydraulic oil when the temperature is high.

When hydraulic oil or other oil is warm, it flows easily. In addition, the sludge can also be drained out easily from the circuit together with the oil, so it is best to change the oil when it is still warm. When changing the oil, as much as possible of the old hydraulic oil must be drained out. Drain the oil from the hydraulic tank; also drain the oil from the filter and from the drain plug in the circuit.) If any old oil is left, the contaminants and sludge in it will mix with the new oil and will shorten the life of the hydraulic oil.

6) Flushing operations

After disassembling and assembling the equipment, or changing the oil, use flushing oil to remove the contaminants, sludge, and old oil from the hydraulic circuit.

Normally, flushing is carried out twice: primary flushing is carried out with flushing oil, and secondary flushing is carried out with the specified hydraulic oil.

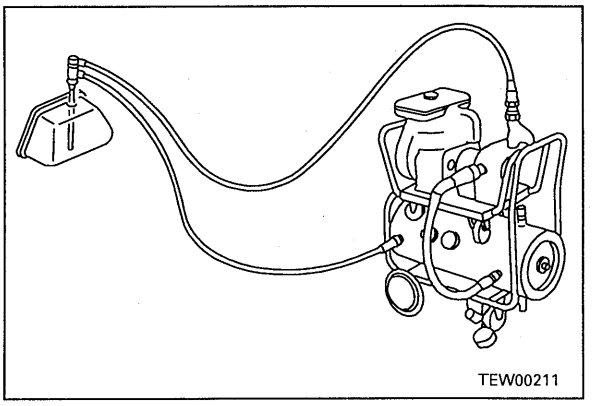


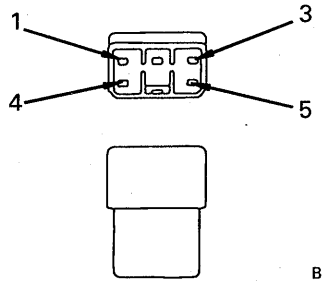
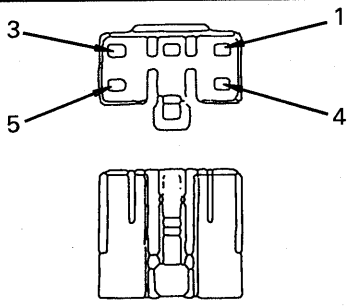
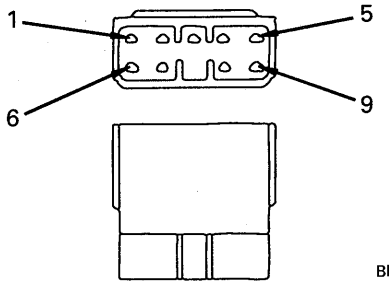
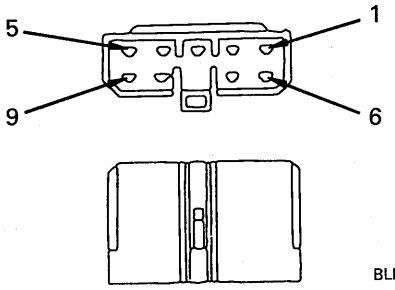
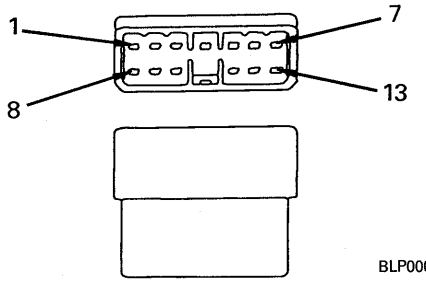
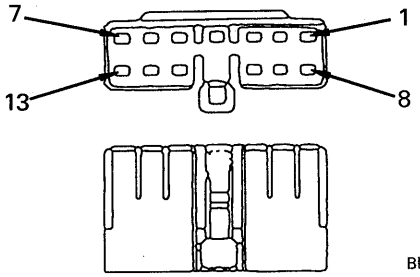
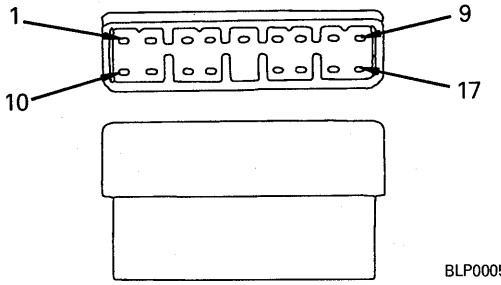
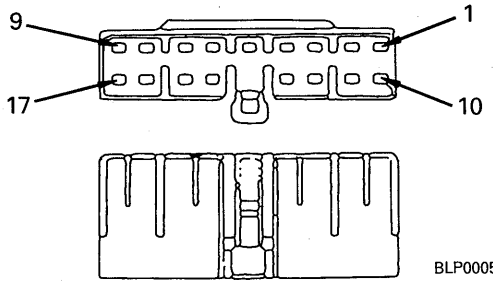
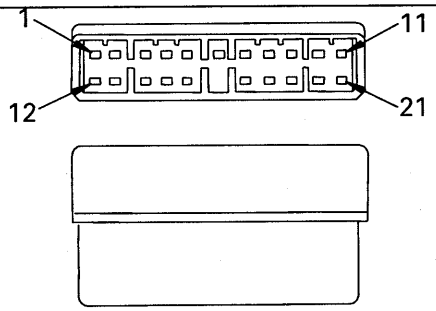
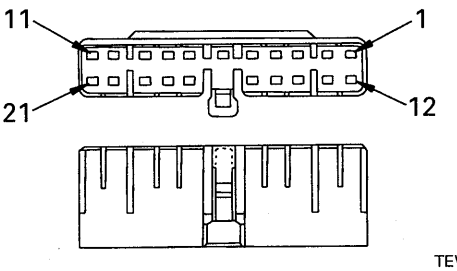
E20306

7) Cleaning operations

After repairing the hydraulic equipment (pump, control valve, etc.) or when running the machine, carry out oil cleaning to remove the sludge or contaminants in the hydraulic oil circuit.

The oil cleaning equipment is used to remove the ultrafine (about 3μ) particles that the filter built into the hydraulic equipment cannot remove, so it is an extremely effective device.



No. of pins	MIC type connector	
	Male (female housing)	Female (male housing)
5	 BLP00045	 BLP00046
9	 BLP00047	 BLP00048
13	 BLP00049	 BLP00050
17	 BLP00051	 BLP00052
21	 TEW00259	 TEW00260

E20306

TROUBLESHOOTING OF ENGINE (S MODE)

E20306

S-4 Engine stops during operations

General causes why engine stops during operations

- Seized parts inside engine
- Insufficient supply of fuel
- Overheating
  - ★ If there is overheating and the engine stops, carry out troubleshooting for overheating.
- Failure in power train

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: Broken, seized piston, connecting rod	Broken, seized crankshaft bearing	Broken dynamic valve system (valve, rocker lever, etc.)	Broken, seized gear train	Broken pump auxiliary equipment	Broken fuel pump auxiliary equipment	Insufficient fuel in tank	Clogged fuel pump drive shaft, key	Clogged fuel filter, strainer	Clogged feed pump strainer	Broken, seized feed pump piston	Clogged, leaking fuel pump piston	Clogged air breather hole in fuel tank	Defective injection pump (rack, plunger stuck)	Failure in power train
Questions	Confirm recent repair history																
	Degree of use of machine	Operated for long period							△	△							
	Condition when engine stopped	Abnormal noise was heard and engine stopped suddenly	◎	◎	◎	◎	◎	◎				○			○	◎	
		Engine overheated and stopped	◎	○			○										
		Engine stopped slowly						◎	○	○							
		There was hunting and engine stopped						◎	○	○				○			
	Fuel level lamp lights up							◎									
	Fuel tank is found to be empty							◎									
	Replacement of filters has not been carried out according to Operation Manual								◎	◎							
	Non-specified fuel is being used								○	○	○				○		
	When feed pump is operated, operation is too light or too heavy								○	○		◎					
	Mud is stuck to fuel tank cap													◎			
Check items	Engine rotates, but stops when power train is operated																◎
	When it is attempted to turn by hand using barring tool	Does not turn at all	◎	◎													
		Turns in opposite direction			◎												
		Moves amount of backlash				◎	◎										
		Shaft does not turn					◎										
	Rust and water are found when fuel tank is drained								◎	◎							
	Metal particles are found when oil is drained		◎	◎					○	○							
Troubleshooting	Remove oil pan and inspect directly		●	●													
	Remove head cover and inspect directly				●												
	When gear train is inspected, it does not turn					●											
	Rotates when pump auxiliary equipment is removed						●										
	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									●							
	Inspect feed pump directly										●						
	When control rack is pushed, it is found to be heavy, or does not return														●		
		Remedy	Replace	Replace	Replace	Replace	Replace	Add	Clean	Clean	Replace	Replace	Correct	Clean	Replace	—	

Troubleshooting of CHASSIS

E20306

S-14 Water temperature becomes too high (Overheating)

General causes why water temperature becomes too high

- Lack of cooling air (deformation, damage of fan)
- Drop in heat dissipation efficiency
- Defective cooling circulation system
- Rise in oil temperature in power train

★ Carry out troubleshooting for chassis.

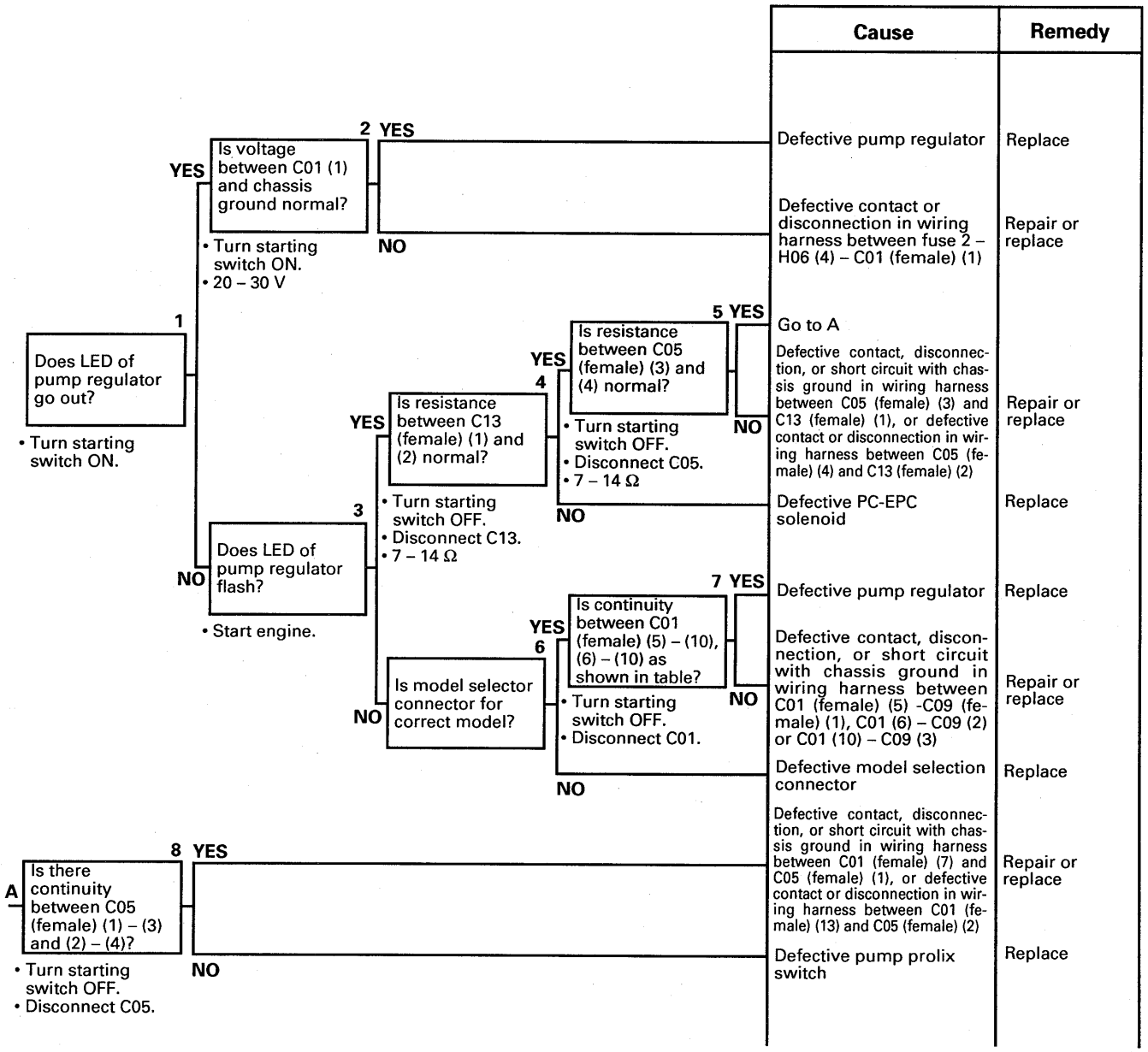
Legend
○ : Possible causes (judging from Questions and check items)
◎ : Most probable causes (judging from Questions and check items)
△ : Possible causes due to length of use (used for a long period)
● : Items to confirm the cause.

			Causes: Broken water pump	Clogged, crushed radiator fins	Clogged radiator core	Defective thermostat (does not open)	Defective water temperature gauge	Lack of cooling water	Fan belt slipping, worn fan pulley	Clogged, broken oil cooler	Defective pressure valve	Broken cylinder head, head gasket	Holes made by pitting	Rise in torque converter oil temperature
Questions	Confirm recent repair history													
	Degree of use of machine	Operated for long period		△	△						△	△		
	Condition of overheating	Suddenly overheated	◎					○	○					
		Always tends to overheat		◎	◎	○			○					
	Water temperature gauge	Rises quickly				◎		○						
		Does not go down from red range					◎							
Check items	Radiator water level sensor lights up							◎						
	Fan belt whines under sudden load								◎					
	Cloudy white oil is floating on cooling water									◎				
	Cooling water flows out from overflow hose										◎			
	Excessive air bubbles inside radiator, water spurts back											◎		
	Engine oil level has risen, oil is cloudy white								○				◎	
	There is play when fan pulley is rotated		◎											
	Radiator shroud, inside of underguard are clogged with dirt or mud			◎					◎					
	When light bulb is held behind radiator, no light passes through			◎										
	Water is leaking because of cracks in hose or loose clamps							◎						
	When belt tension is inspected, it is found to be loose								◎					
	Power train oil temperature enters red range faster than engine water temperature													◎
Troubleshooting	Temperature difference between top and bottom radiator tanks is excessive		●											
	Temperature difference between top and bottom radiator tanks is slight			●										
	When water filler port is inspected, core is found to be clogged				●									
	When function test is carried out on thermostat, it does not open even at cracking temperature					●								
	When water temperature is measured, it is found to be normal						●							
	When oil cooler is inspected directly, it is found to be clogged								●					
	When measurement is made with radiator cap tester, set pressure is found to be low									●				
	When compression pressure is measured, it is found to be low										●			
	Remove oil pan and inspect directly											●		
	Remedy		Replace	Correct	Correct	Replace	Replace	Add	Correct	Replace	Replace	Replace	Replace	—	Carry out troubleshooting for CHASSIS

E20306

b) There is excessive drop in engine speed, or engine stalls

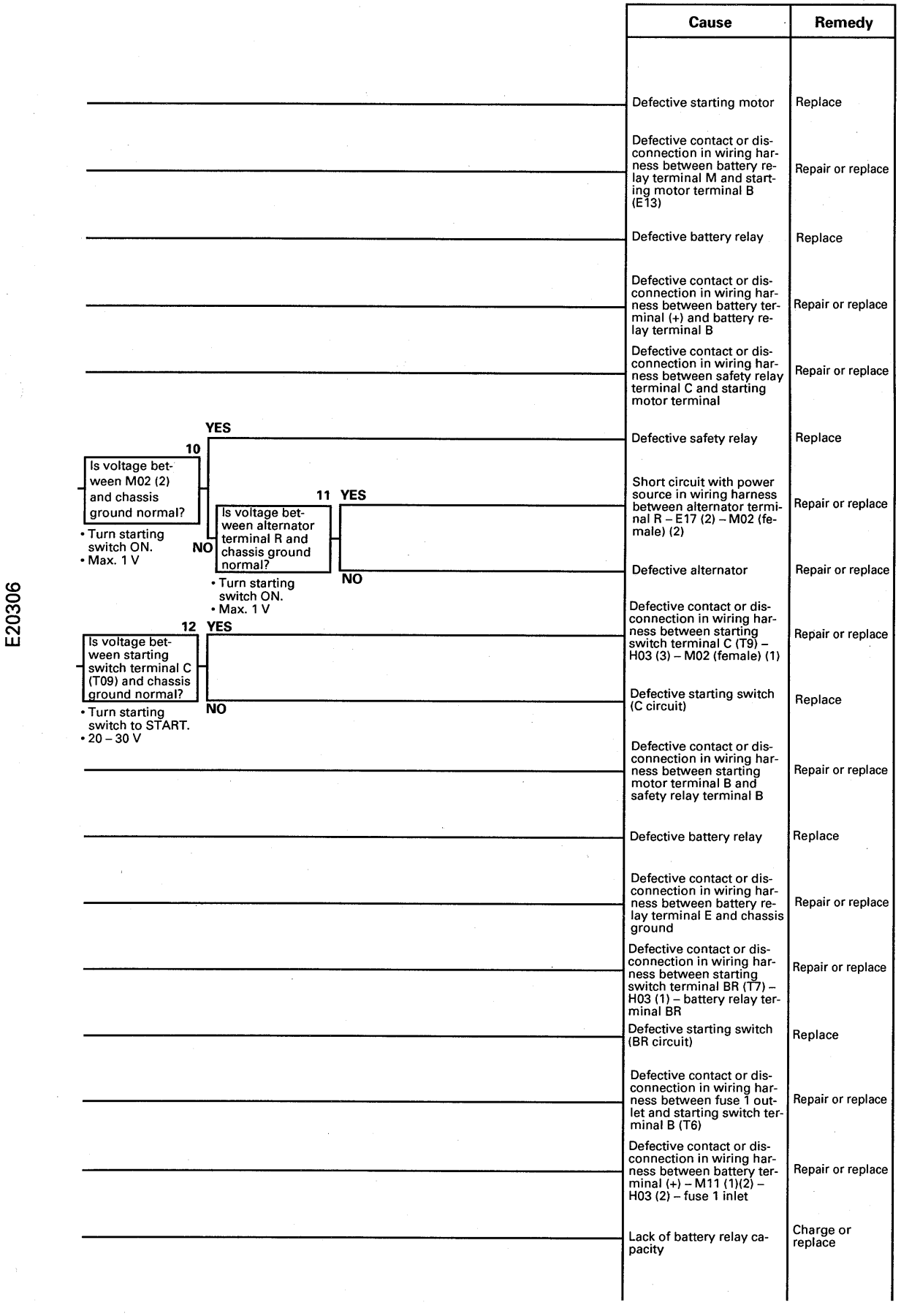
★ Check that fuse 2 is normal (if it is blown, check for a short circuit with the ground in the circuits related to fuse 2).



E20306

Table 3

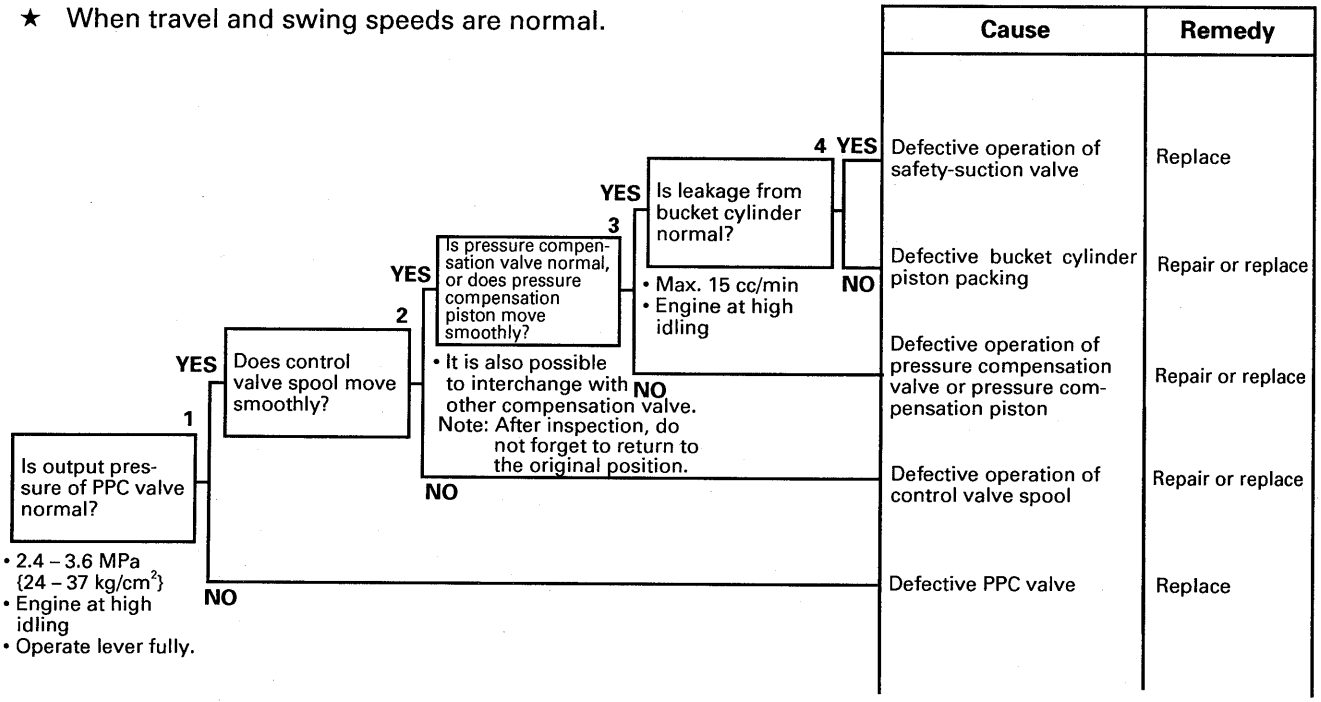
C01 (female)	PC120
Between (5) and (10)	Continuity
Between (6) and (10)	No continuity


Cause
Remedy
Defective starting motor
Replace
Defective contact or disconnection in wiring harness between battery relay terminal M and starting motor terminal B (E13)
Repair or replace
Defective battery relay
Replace
Defective contact or disconnection in wiring harness between battery terminal (+) and battery relay terminal B
Repair or replace
Defective contact or disconnection in wiring harness between safety relay terminal C and starting motor terminal
Repair or replace
YES
10
Is voltage between M02 (2) and chassis ground normal?
• Turn starting switch ON.
• Max. 1 V
NO
Defective safety relay
Replace
11 YES
Is voltage between alternator terminal R and chassis ground normal?
• Turn starting switch ON.
• Max. 1 V
NO
Short circuit with power source in wiring harness between alternator terminal R – E17 (2) – M02 (female) (2)
Repair or replace
Defective alternator
Repair or replace
12 YES
Is voltage between starting switch terminal C (T09) and chassis ground normal?
• Turn starting switch to START.
• 20 – 30 V
NO
Defective contact or disconnection in wiring harness between starting switch terminal C (T9) – H03 (3) – M02 (female) (1)
Repair or replace
Defective starting switch (C circuit)
Replace
Defective contact or disconnection in wiring harness between starting motor terminal B and safety relay terminal B
Repair or replace
Defective battery relay
Replace
Defective contact or disconnection in wiring harness between battery relay terminal E and chassis ground
Repair or replace
Defective contact or disconnection in wiring harness between starting switch terminal BR (T7) – H03 (1) – battery relay terminal BR
Repair or replace
Defective starting switch (BR circuit)
Replace
Defective contact or disconnection in wiring harness between fuse 1 outlet and starting switch terminal B (T6)
Repair or replace
Defective contact or disconnection in wiring harness between battery terminal (+) – M11 (1)(2) – H03 (2) – fuse 1 inlet
Repair or replace
Lack of battery relay capacity
Charge or replace

E20306

H-8 Bucket is slow or lacks power

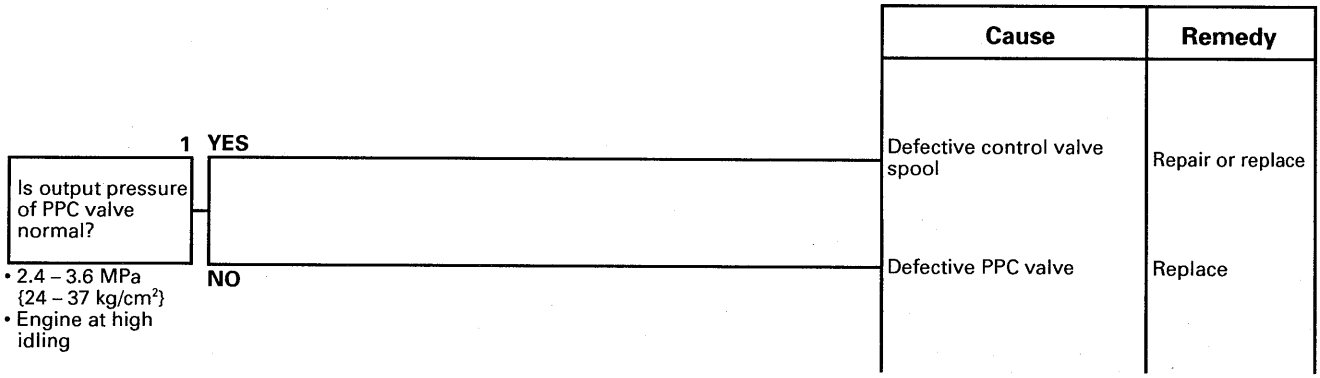
★ When travel and swing speeds are normal.



E20306

H-9 Work equipment (boom, arm, bucket) does not move (but travel and swing are normal)

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

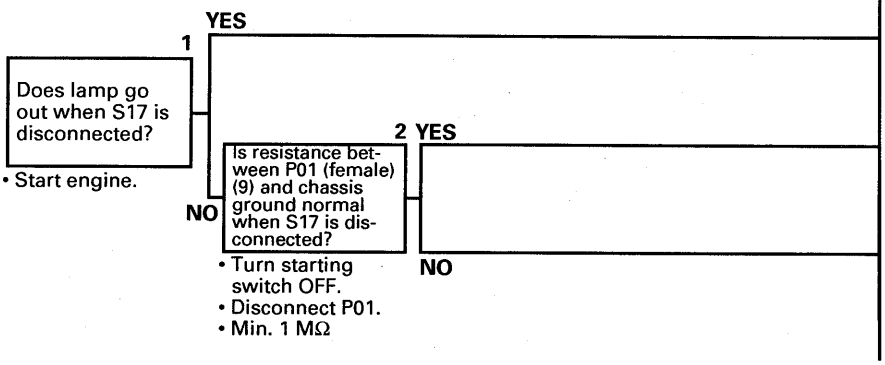


Cause	Remedy
Defective operation of pressure compensation valve or compensation piston	Correct or replace
Defective swing motor safety valve	Replace
Defective swing motor check valve (one side)	Replace
Defective swing motor suction valve	Replace
Defective operation of control valve spool	Correct or replace
Defective PPC valve	Replace

E20306

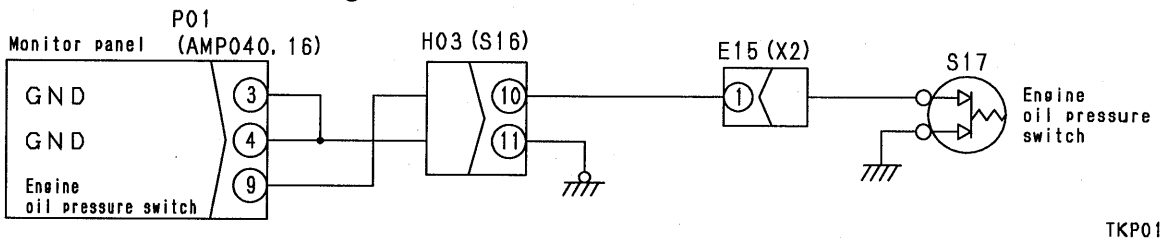
M-8 When engine is running, engine oil pressure caution lamp lights up (engine oil pressure is normal)

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



Cause	Remedy
Defective engine oil pressure switch	Replace
Defective monitor panel	Replace
Short circuit with chassis ground in wiring harness between P01 (female) (9) – H03 (10) - E15 (1) - S17	Repair or replace

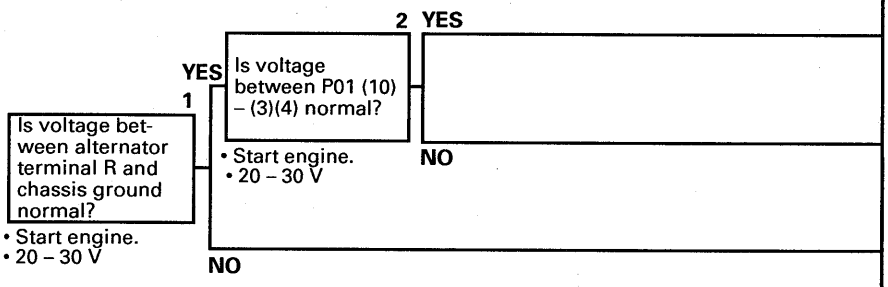
M-8 Related electrical circuit diagram



E20306

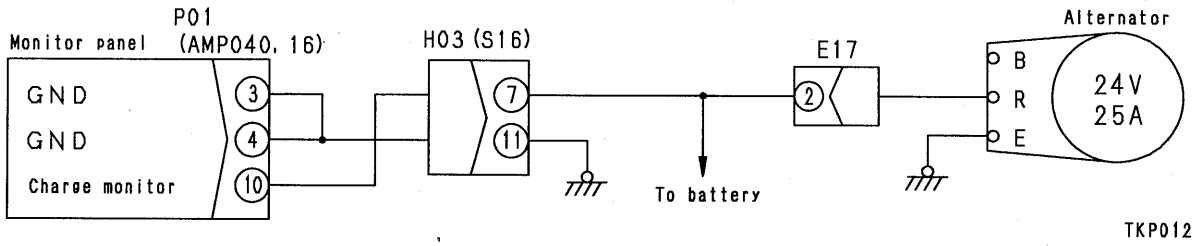
M-9 When engine is running, battery charge caution lamp lights up

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



Cause	Remedy
Defective monitor panel	Replace
Defective contact or disconnection in wiring harness between P01 (female) (10) – H03 (7) - E17 (2) - alternator terminal R	Repair or replace
Defective alternator	Replace

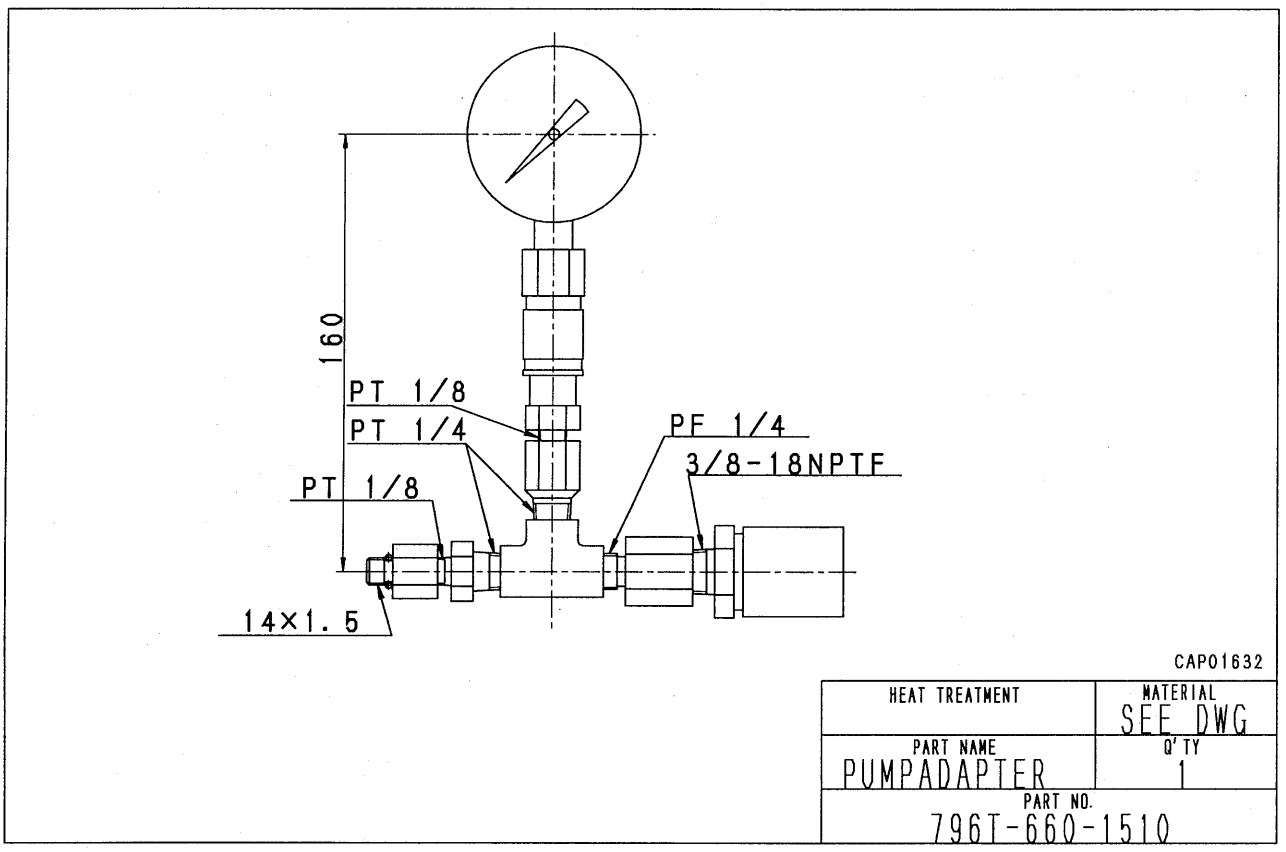
M-9 Related electrical circuit diagram



30 DISASSEMBLY AND ASSEMBLY

E20306

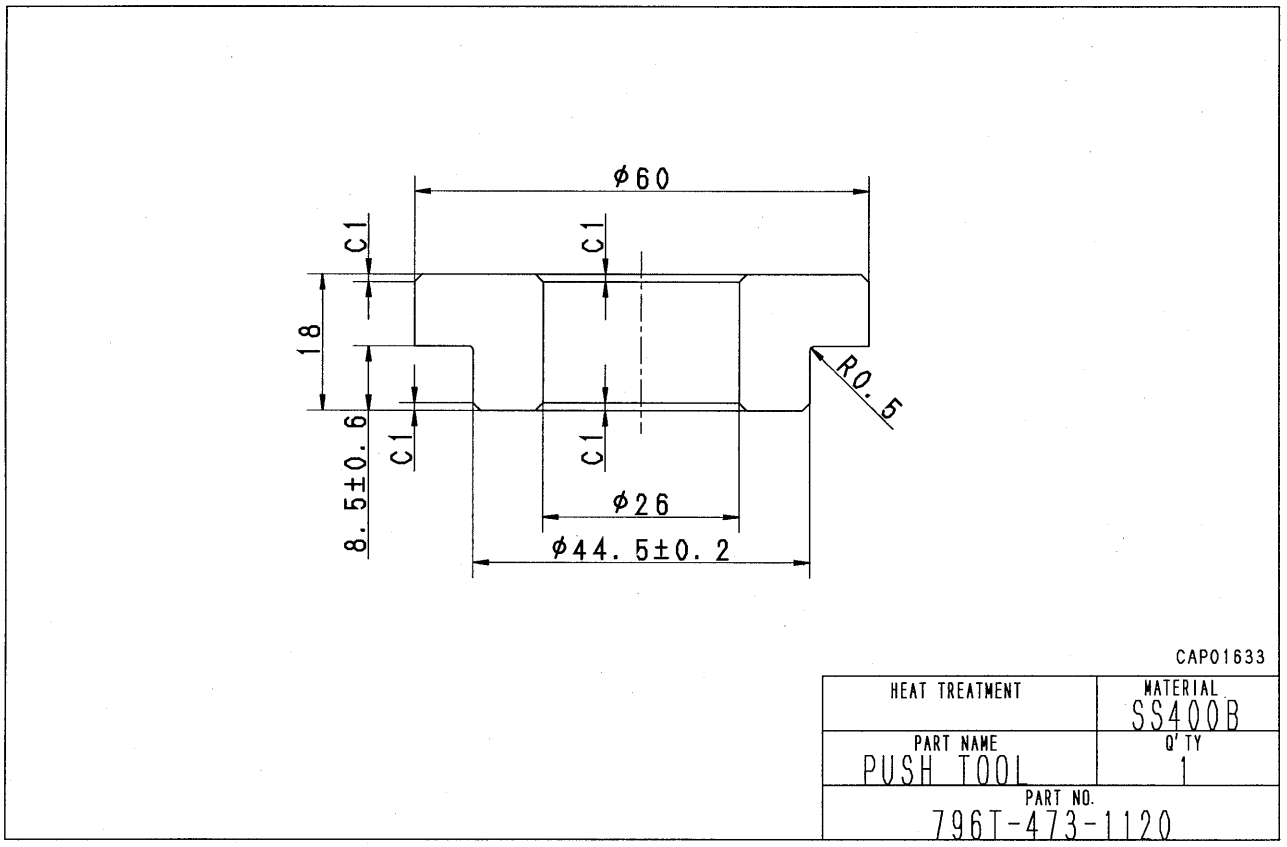
MM. Pump adapter



HEAT TREATMENT	MATERIAL
	SEE DWG
PART NAME	Q'TY
PUMPADAPTER	1
PART NO.	
796T-660-1510	

E20306

NN-1. Push tool

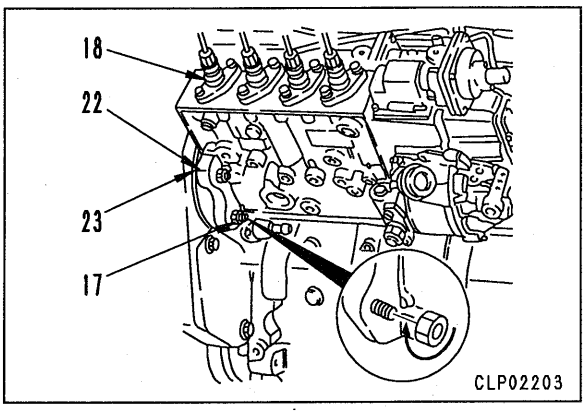


HEAT TREATMENT	MATERIAL
	SS400B
PART NAME	Q'TY
PUSH TOOL	1
PART NO.	
796T-473-1120	

4) Align pump camshaft with pump drive gear and install fuel injection pump assembly (18).
★ Tighten mounting nut (17) temporarily.

5) Align line (22) on fuel injection pump body with line (23) on timing gear case, then tighten nut (17).

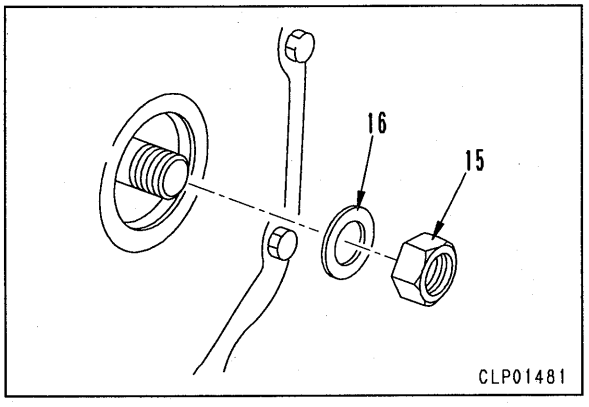
kgm Nut : **42.2 Nm {4.3 kgm}**



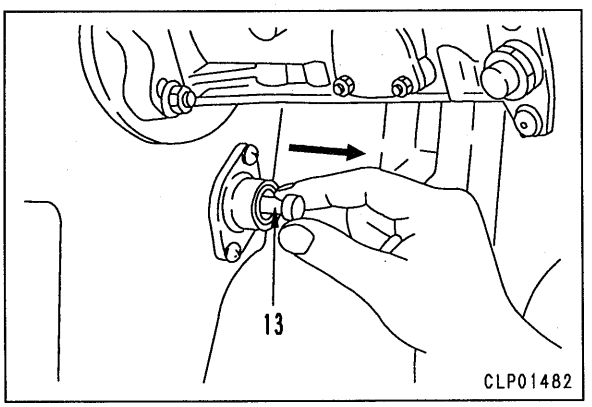
6) Assemble washer (16), and tighten nut (26) temporarily.
★ Be extremely careful not to drop the nut or washer inside the case when installing.

kgm Nut : **12.5 ± 2.5 Nm {1.27 ± 0.25 kgm}**

★ This is not the final torque value.
★ To prevent damage to the timing pin, be careful not to tighten the nut to more than the above tightening torque.



7) Remove meshing of engine timing pin (13).



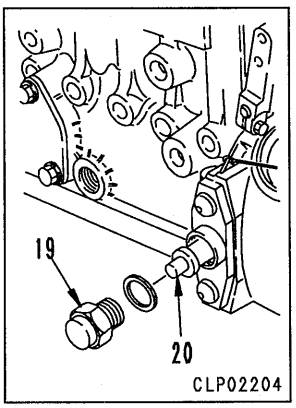
8) Remove plug (19), reverse position of timing pin (20), then assemble and install plug to fuel injection pump.

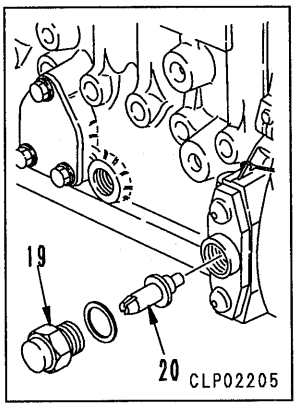
kgm Plug : **14.7 Nm {1.5 kgm}**

9) Tighten drive nut (15) of fuel injection pump fully.

kgm Nut : **164.8 Nm {16.8 kgm}**

10) Carry out the rest of the installation in the reverse order to removal.





E20306

INSTALLATION OF CYLINDER HEAD ASSEMBLY

- Carry out installation in the reverse order to removal.

※ 1

kgm Exhaust outlet pipe clamp :
7.8 Nm {0.8 kgm}

※ 2

kgm Air supply hose clamp : **7.8 Nm {0.8 kgm}**

※ 3

kgm Delivery tube sleeve nut :
32.4 Nm {3.3 kgm}

※ 4

kgm Fan pulley mounting bolt :
43.1 Nm {4.4 kgm}

※ 5

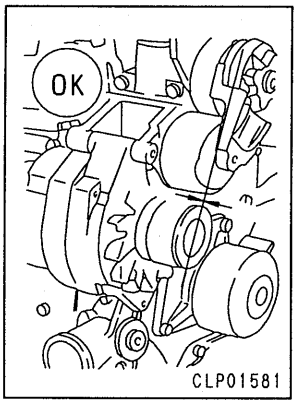
kgm Bracket mounting bolt : **23.5 Nm {2.4 kgm}**

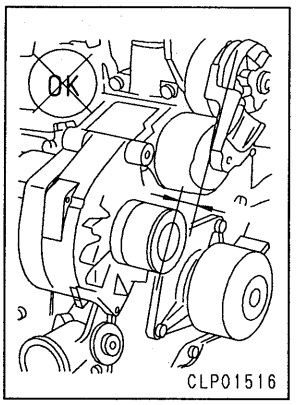
kgm Tensioner mounting bolt :
43.1 Nm {4.4 kgm}

※ 6

kgm Alternator assembly mounting bolt :
80.4 Nm {8.2 kgm}

★ Use a straight edge and check that the alternator pulley is centered with the other pulleys.





※ 7

kgm Bracket mounting bolt : **23.5 Nm {2.4 kgm}**

※ 8

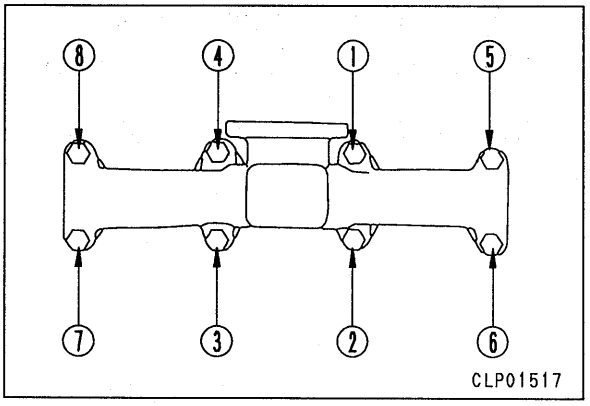
kgm Turbocharger inlet hose sleeve nut :
35.3 Nm {3.6 kgm}

kgm Turbocharger outlet tube mounting bolt :
23.5 Nm {2.4 kgm}

※ 9

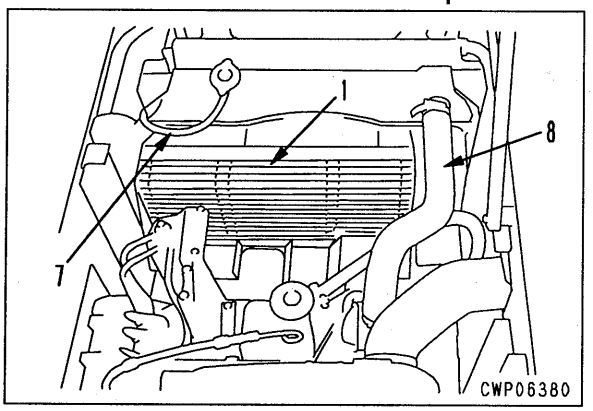
★ Install in the order ① – ⑧ shown in the diagram on the right.

kgm Exhaust manifold mounting bolt :
43.1 Nm {4.4 kgm}



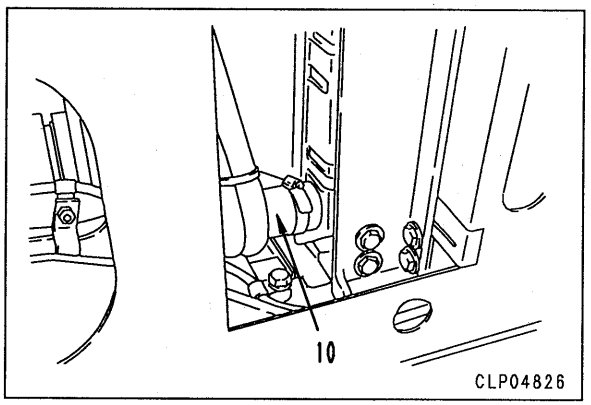
E20306

PC120-6 EXCEL Serial No. 60968 and up



10. Disconnect radiator outlet hose (10).

11. Sling radiator and hydraulic cooler assembly (11), then remove 4 bottom mounting bolts, and lift off slowly. ※ 2
    ★ When removing the radiator and hydraulic cooler assembly, be extremely careful not to damage the core.
    kg Radiator, hydraulic cooler assembly : **75 kg.**



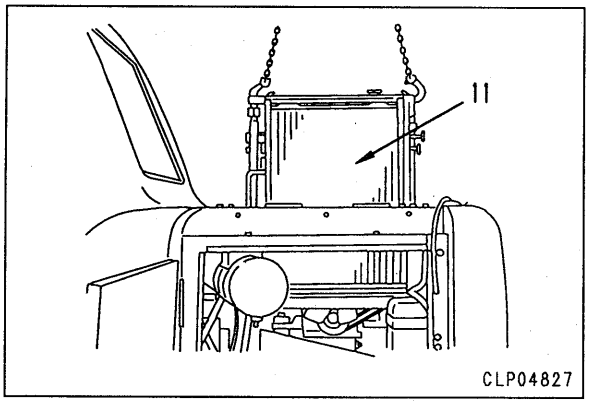
INSTALLATION OF RADIATOR, HYDRAULIC COOLER ASSEMBLY

- Carry out installation in the reverse order to removal.

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

- Fill with refrigerant (R-134a).

※ 2
★ Install the radiator and hydraulic cooler assembly so that there is a clearance of 13 mm or more to the left and right, and top and bottom between the fan and shroud.



- **Refilling with water**
  ★ Add water through the water filler to the specified level. Run the engine to circulate the water through the system. Then check the water level again.

- **Refilling with oil (hydraulic tank)**
  ★ Add oil through the oil filler to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.

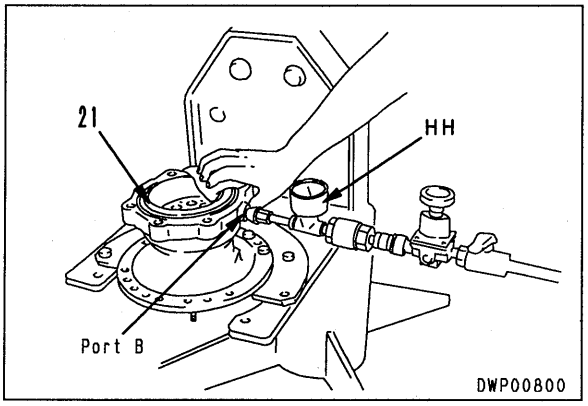
E20306

8. Brake piston

Using tool **HH**, apply pressure to port **B** slowly and remove brake piston (21).

★ Make counter marks on the brake piston and the case.

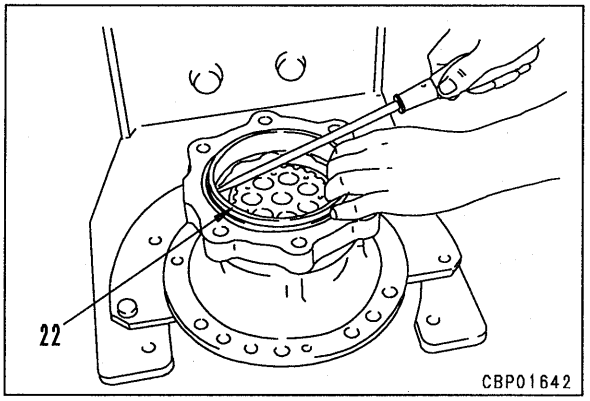
⚠ If the air is at high pressure, the brake piston may fly out, so hold down the brake piston while carrying out the operation.



9. Retainer

Remove retainer (22) using a flat-headed screwdriver.

★ Use a cloth to prevent damage to the retainer or case.

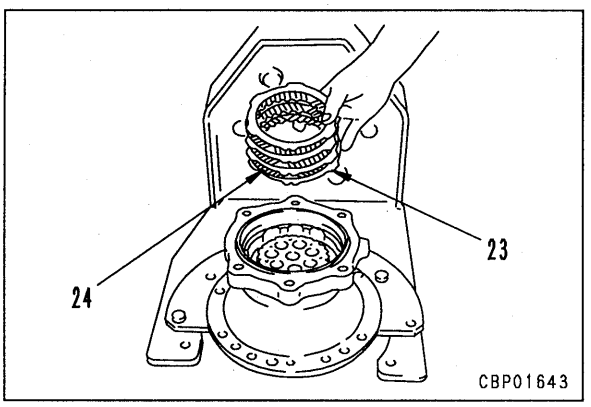


E20306

10. Plates, discs

Remove plates (23) and discs (24).

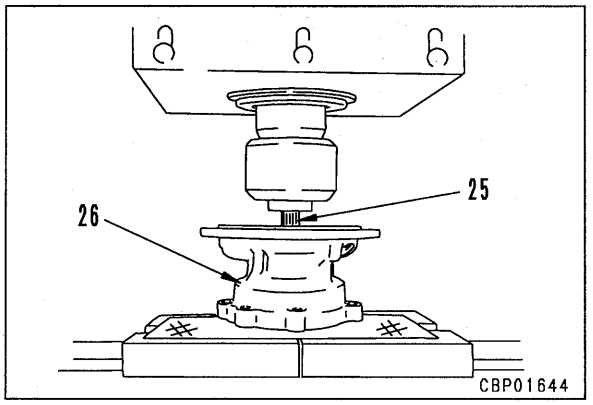
★ Plates : 4, discs : 3



11. Drive shaft assembly

Set case assembly to press and remove drive shaft assembly (25) from case (26).

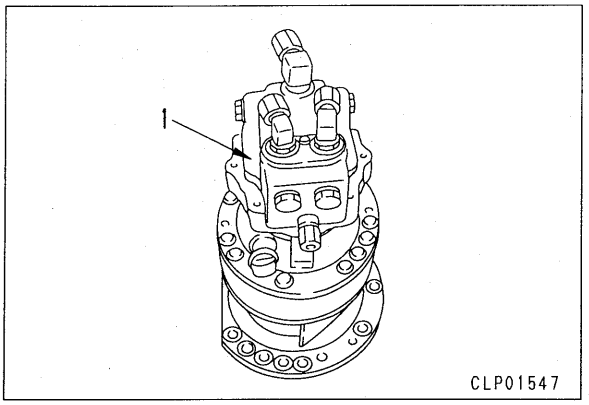
★ Spread a cloth to prevent damage to the piston mounting surface.



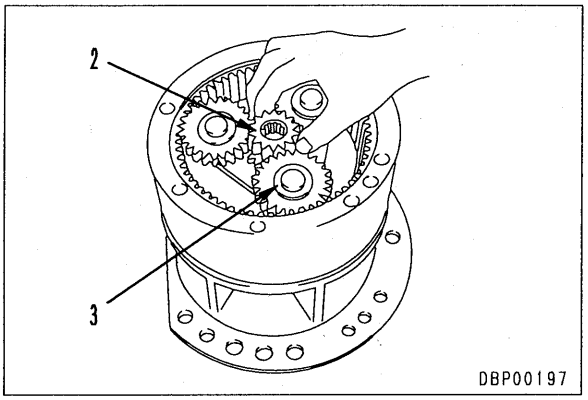
DISASSEMBLY OF SWING MACHINERY ASSEMBLY

1. **Draining oil**
   Remove drain plug and drain oil from swing machinery.
   Swing machinery case : **2.5** ℓ

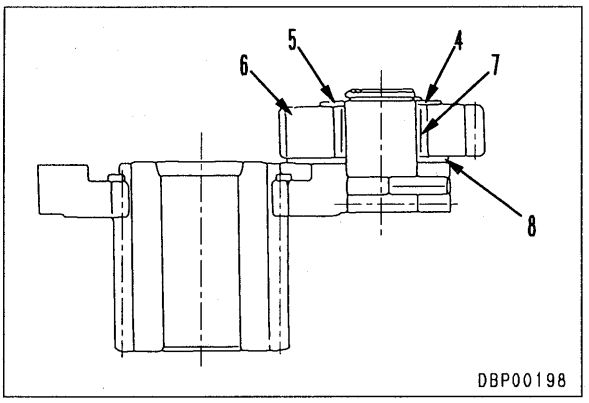
2. **Swing motor assembly**
   Remove swing motor assembly (1).



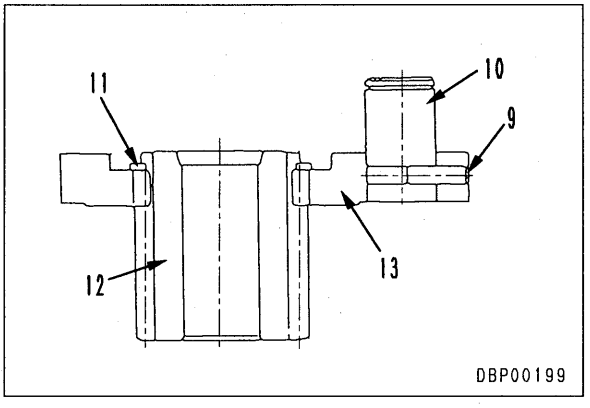
3. **No. 1 carrier, No. 2 sun gear assembly**
   1) Remove No. 1 sun gear (2).
   2) Remove No. 1 carrier and No. 2 sun gear assembly (3).



   3) Disassemble No. 1 carrier and No. 2 sun gear assembly as follows.
      i) Remove snap ring (4), then remove thrust washer (5), gear (6), bearing (7), and thrust washer (8).



      ii) Knock in pin (9), and knock out shaft (10).
         ★ After removing the shaft, remove pin (9).
      iii) Remove snap ring (11), then remove No. 2 sun gear (12) from carrier (13).



E20306

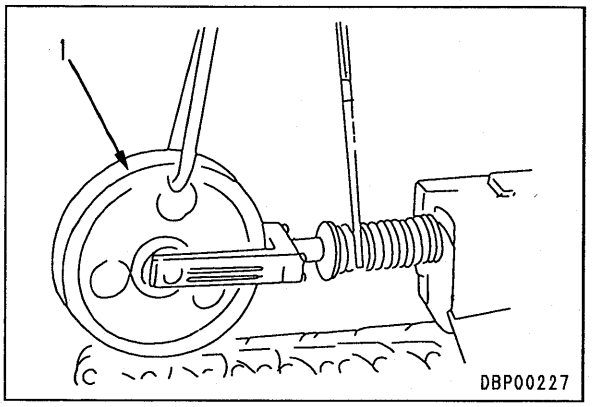
REMOVAL OF IDLER, RECOIL SPRING ASSEMBLY

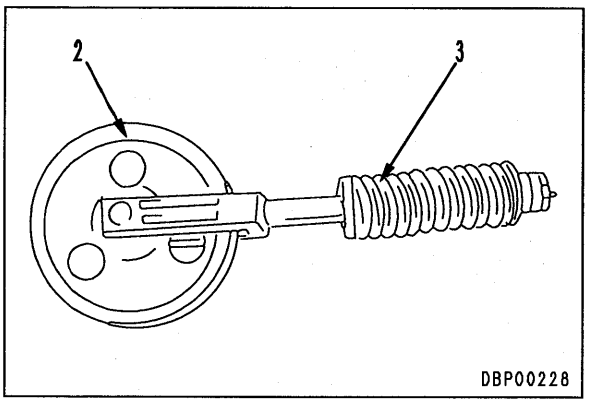
1. Remove track shoe assembly. For details, see REMOVAL OF TRACK SHOE ASSEMBLY.
2. Sling idler and recoil spring assembly (1), and pull out to the front to remove.

   kg Idler, recoil spring assembly : **155 kg**
3. Disconnect recoil spring assembly (3) from idler assembly (2). ※ 1

   kg Idler assembly : **80 kg**

   kg Recoil spring assembly : **75 kg**





INSTALLATION OF IDLER, RECOIL SPRING ASSEMBLY

- Carry out installation in the reverse order to removal.

※ 1

Thread of recoil spring assembly mounting bolt : **Thread tightener (LT-2)**

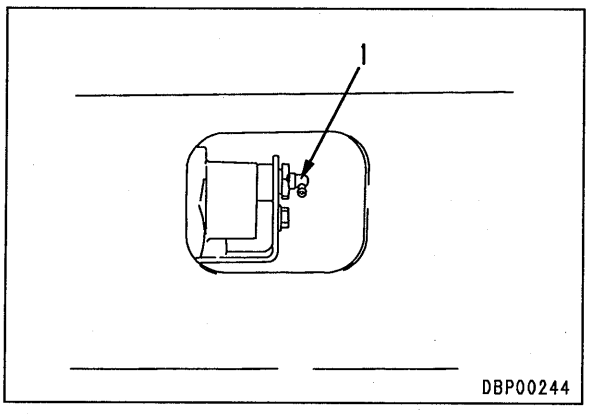
E20306

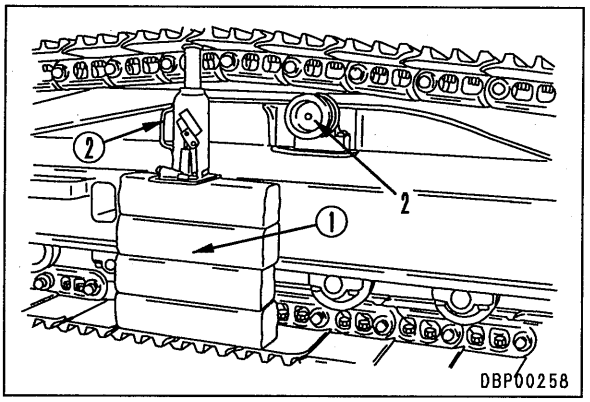
REMOVAL OF CARRIER ROLLER ASSEMBLY

1. Lower work equipment, then loosen lubricator (1), and relieve track tension. ※ 1

   ⚠ The adjustment cylinder is under extremely high pressure. Never loosen the lubricator more than one turn. If the grease does not come out, move the machine backwards and forwards.

2. Using block ① and hydraulic jack ②, push up track to a position where carrier roller assembly can be removed, then remove carrier roller assembly (2). ※ 2





INSTALLATION OF CARRIER ROLLER ASSEMBLY

- Carry out installation in the reverse order to removal.

※ 1

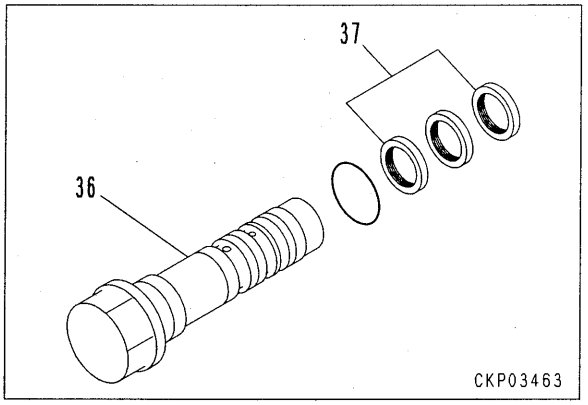
★ Adjust the track tension. For details, see TESTING AND ADJUSTING, Testing and adjusting track tension.

※ 2

Thread of carrier roller assembly mounting bolt : **Thread tightener (LT-2)**

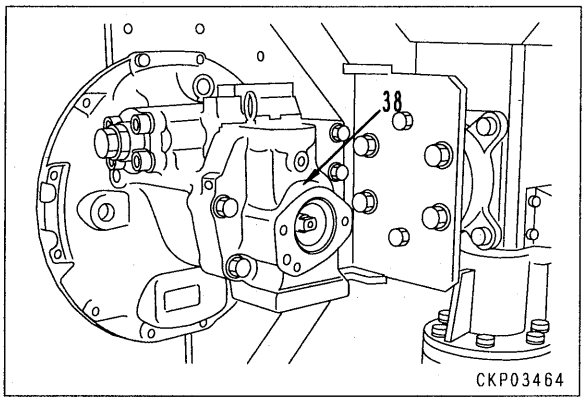
E20306

2) Remove 3 seals (37) from orifice plug (36).

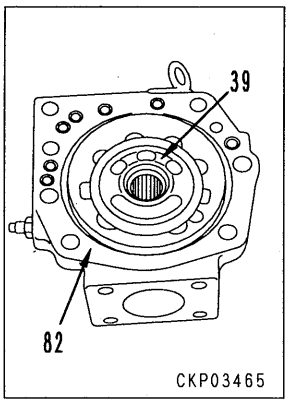


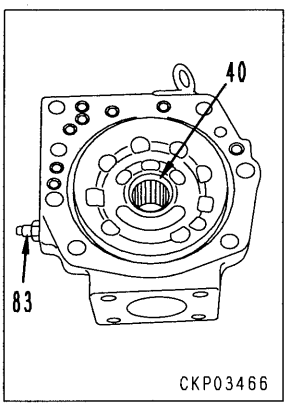
7. End cap assembly

1) Remove end cap assembly (38).



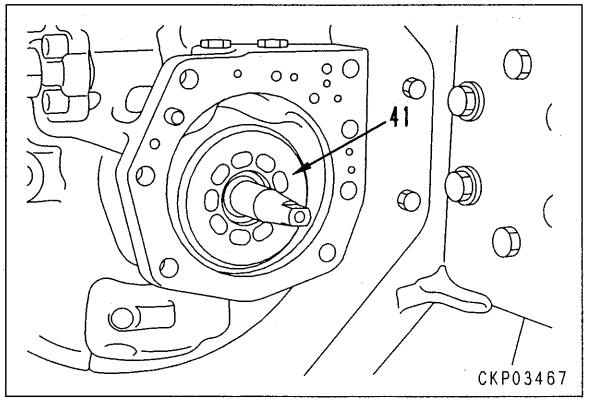
2) Disassemble end cap assembly as follows.
   i) Remove valve plate (39) from end cap (82).
      ★ The valve plate may be stuck to the cylinder block, so be careful when removing.
   ii) Remove needle bearing (40).
   iii) Remove nipple (83).





8. Cylinder block, piston assembly

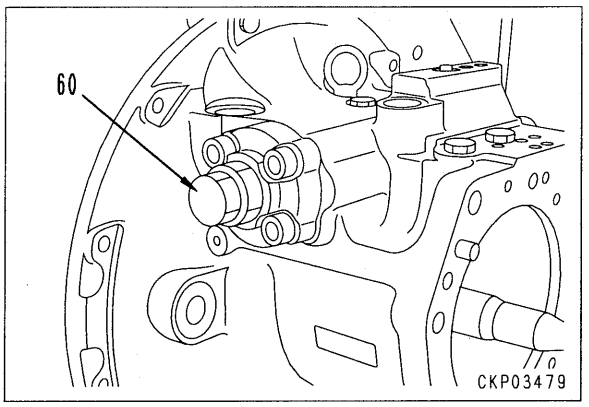
1) Remove cylinder block and piston assembly (41).
   ★ To ensure that the cylinder block and piston assembly come off together as one unit, set the case slightly at an angle when removing.



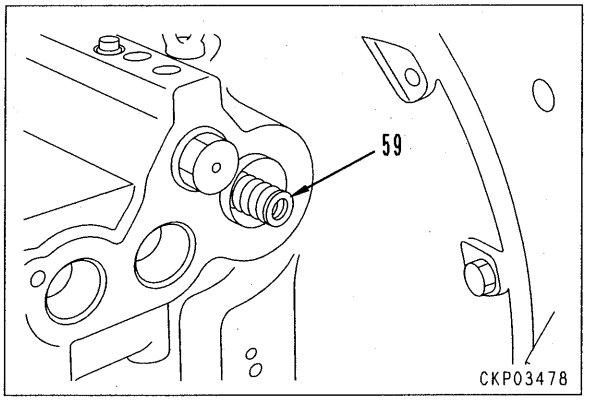
E20306

6) Install MAX stopper assembly (60).

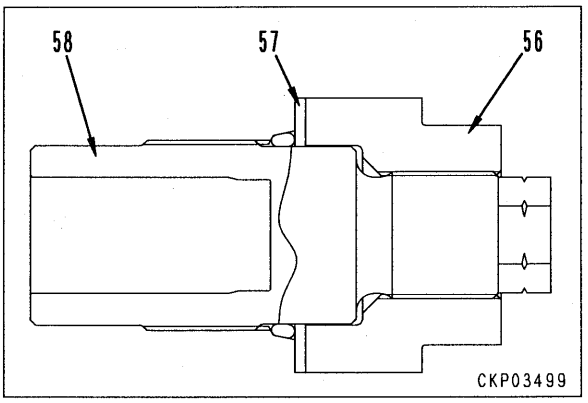
kgm Mounting bolt :
177 ± 20.5 Nm {18 ± 2 kgm}



7) Install spring (59).

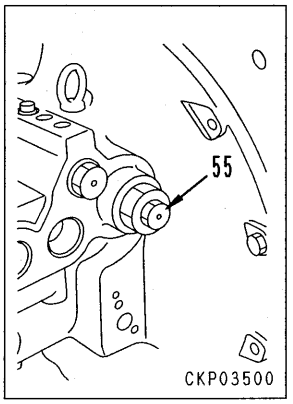


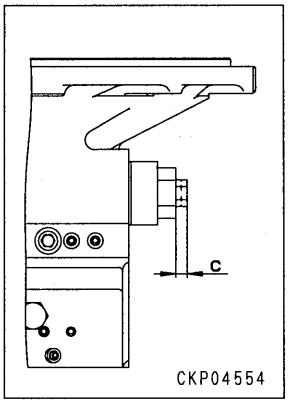
8) Assemble MIN stopper assembly as follows. Fit O-ring and install washer (57) and locknut (56) to screw (58).
★ Install the washer with the surface with the V-notch facing the locknut end.



9) Install MIN stopper assembly (55).
★ Align with adjustment dimension **c** of the minimum swash plate angle (MIN) measured during disassembly.
• Standard adjustment dimension **c** :
9.5 ± 0.1 mm

kgm Locknut : **529 ± 19.6 Nm {54 ± 2 kgm}**



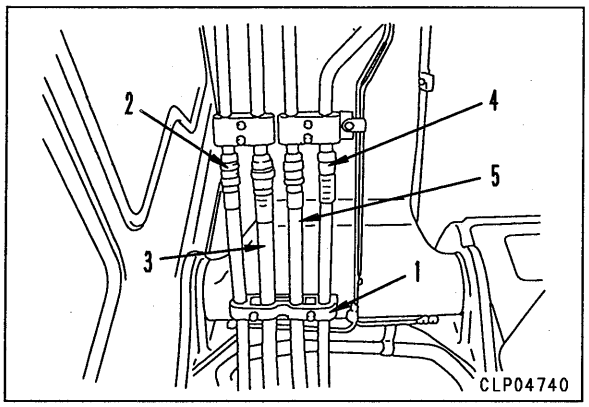


E20306

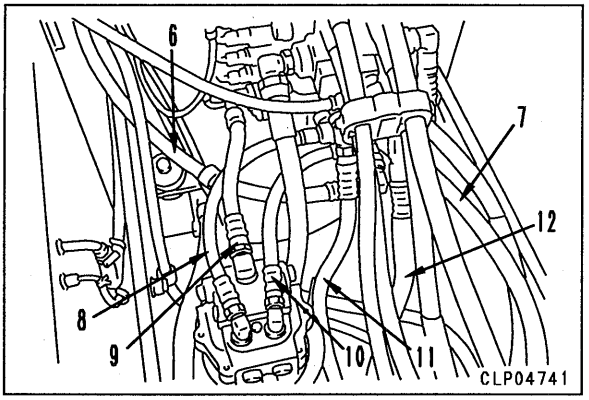
REMOVAL OF CONTROL VALVE ASSEMBLY

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

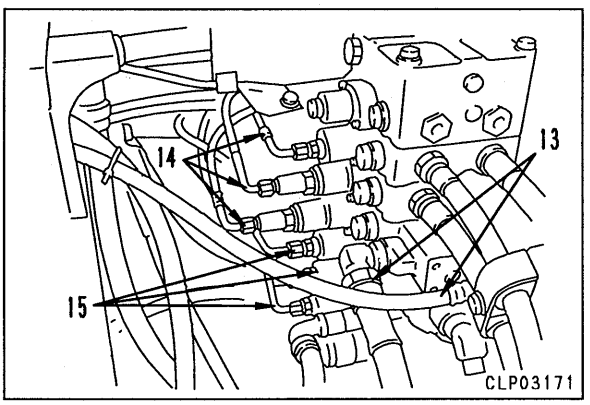
1. Remove engine room divider plate and chassis bodywork cover above control valve assembly.
2. Remove clamp (1), then disconnect hoses (2), (3), (4), and (5).



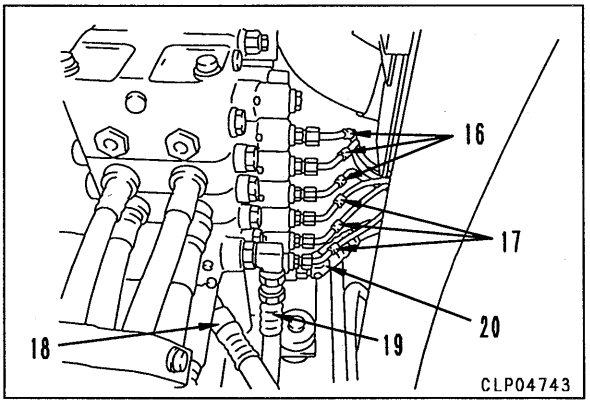
3. Disconnect hoses (6), (7), (8), (9), (10), (11), and (12).



4. Disconnect hoses (13), (14), and (15).



5. Disconnect hoses (16), (17), (18), (19), and (20).



E20306

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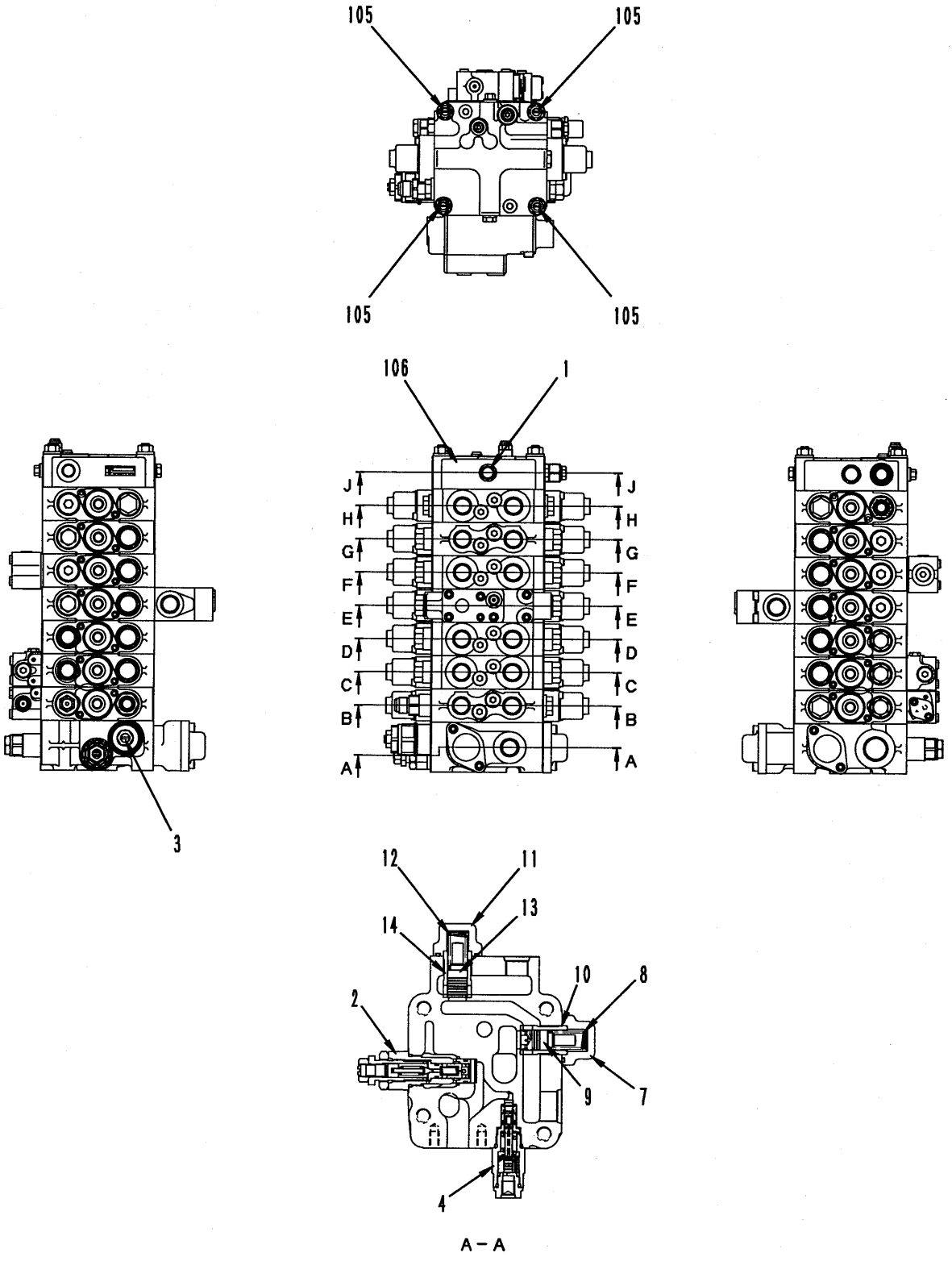
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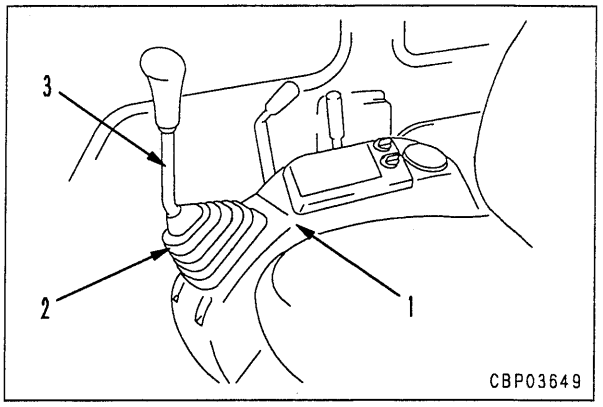
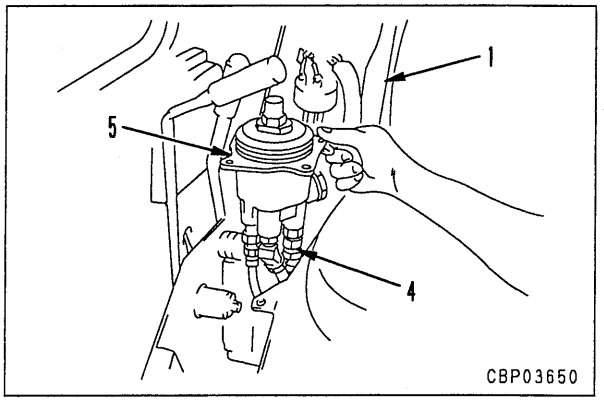
E20306

REMOVAL OF WORK EQUIPMENT RIGHT SIDE PPC VALVE ASSEMBLY (FOR BOOM, BUCKET CONTROL)

⚠ 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.

1. Remove boot (2) from cover (1), raise to top, then disconnect wiring of horn, and remove lever (3).
   ★ Check the direction of the lever.
   ★ Move cover (1) up.
2. Disconnect wiring clamp.
3. Remove mounting bolts of PPC valve assembly (5), then raise PPC valve assembly, and disconnect 6 hoses (4). ※ 1
4. Remove PPC valve assembly (5). ※ 2





INSTALLATION OF WORK EQUIPMENT RIGHT SIDE PPC VALVE ASSEMBLY (FOR BOOM, BUCKET CONTROL)

- Carry out installation in the reverse order to removal.

※ 1

kgm Hose joint bolt :
39.2 ± 4.9 Nm {4.0 ± 0.5 kgm}

※ 2

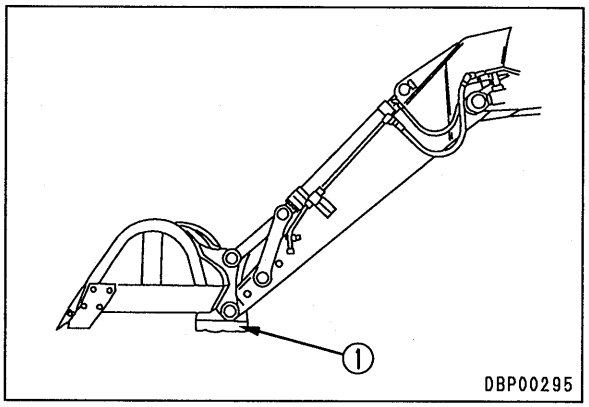
★ If there is excessive play in the control levers, adjust the PPC valve. For details, see TESTING AND ADJUSTING, Adjusting PPC valve.

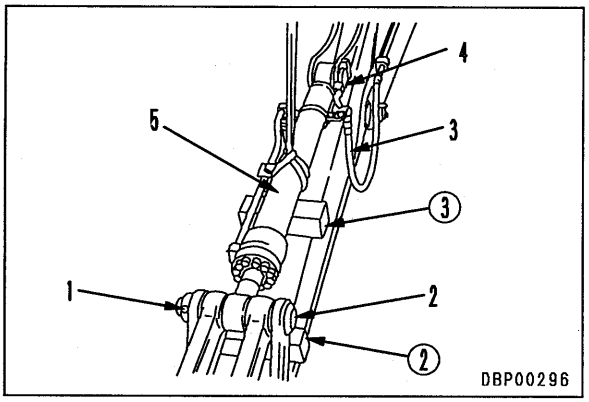
REMOVAL OF BUCKET CYLINDER ASSEMBLY

⚠ Extend the bucket cylinder piston rod approx. 200 mm, lower the work equipment completely to the ground, then set the safety lock lever to the LOCK position.

1. Set block ① under arm top.
2. Set block ② between link and arm, and block ③ between bucket cylinder and arm.
3. Remove lock bolt (1). ※ 1
4. Remove plate, then remove head pin (2). ※ 2
   ★ There are shims installed, so check the number and thickness, and keep in a safe place.
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 2 hoses (3).
7. Raise bucket cylinder assembly, remove plate, remove bottom pin (4), then remove bucket cylinder assembly (5). ※ 3
   ★ There are shims installed, so check the number and thickness, and keep in a safe place.

   kg Bucket cylinder assembly: **100 kg**





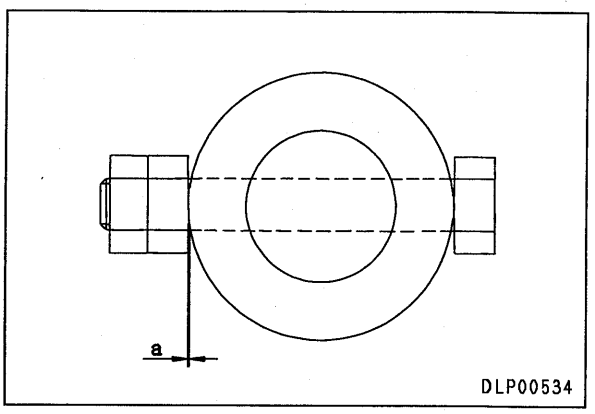
E20306

INSTALLATION OF WORK EQUIPMENT ASSEMBLY

- Carry out installation in the reverse order to removal.

※ 1

★ When tightening the locknut, tighten so that clearance **a** between the plate and nut is 0.5 - 1.5 mm.



※ 2

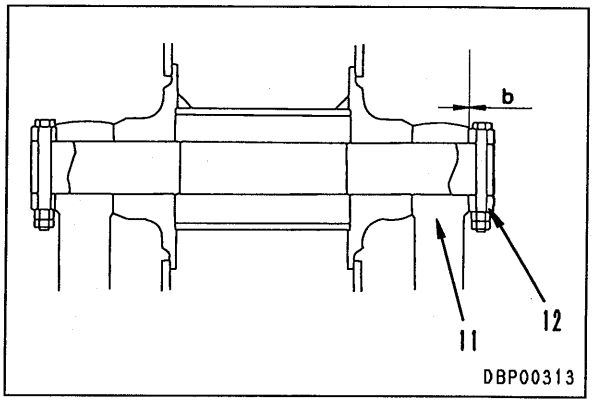
Inside surface of bushing when assembling pin : **Anti-friction compound (LM-P)**

Grease after assembling pin : **Grease (LM-G)**

⚠ When aligning the position of the pin hole, never insert your fingers in the pin hole.

★ Adjust the shim thickness so that clearance **b** between cylinder rod (11) and plate (12) is less than 1 mm.

★ Standard shim thickness : 1.0 mm



※ 3

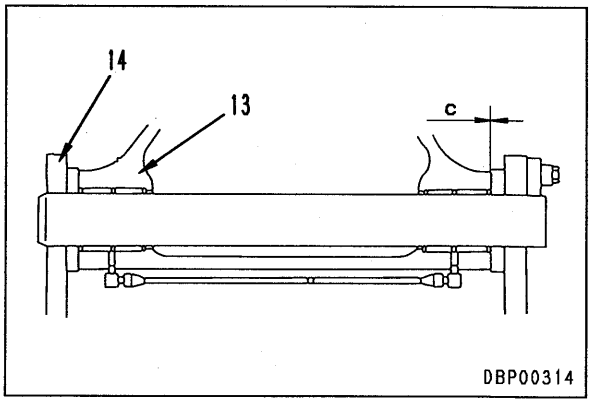
Inside surface of bushing when assembling pin : **Anti-friction compound (LM-P)**

Grease after assembling pin : **Grease (LM-G)**

⚠ When aligning the position of the pin hole, never insert your fingers in the pin hole.

★ Adjust the shim thickness so that clearance **c** between boom (13) and bracket (14) is less than 0.5 mm.

★ Standard shim thickness : 0.5 mm, 1.0 mm, 2.0 mm



- **Bleeding air**

★ Bleed the air. For details, see TESTING AND ADJUSTING, Bleeding air from hydraulic cylinder.

- **Refilling with oil (hydraulic tank)**

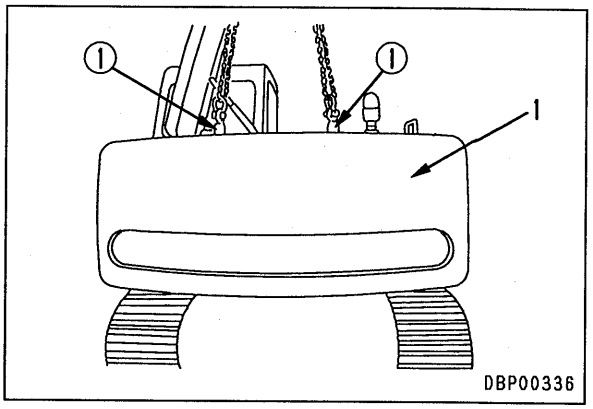
★ Add oil through the oil filler to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.

E20306

REMOVAL OF COUNTERWEIGHT ASSEMBLY

1. Remove counterweight top cover.
2. Set eyebolts (1) to counterweight assembly ①, and sling.
3. Remove 4 mounting bolts (2) and lift off counterweight assembly (1). ※ 1

   kg Counterweight assembly : **2,350 kg**



INSTALLATION OF COUNTERWEIGHT ASSEMBLY

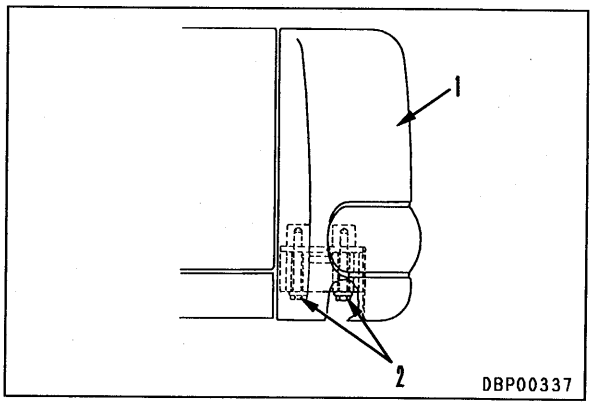
- Carry out installation in the reverse order to removal.

※ 1

Thread of counterweight mounting bolt : **Thread tightener (LT-2)**

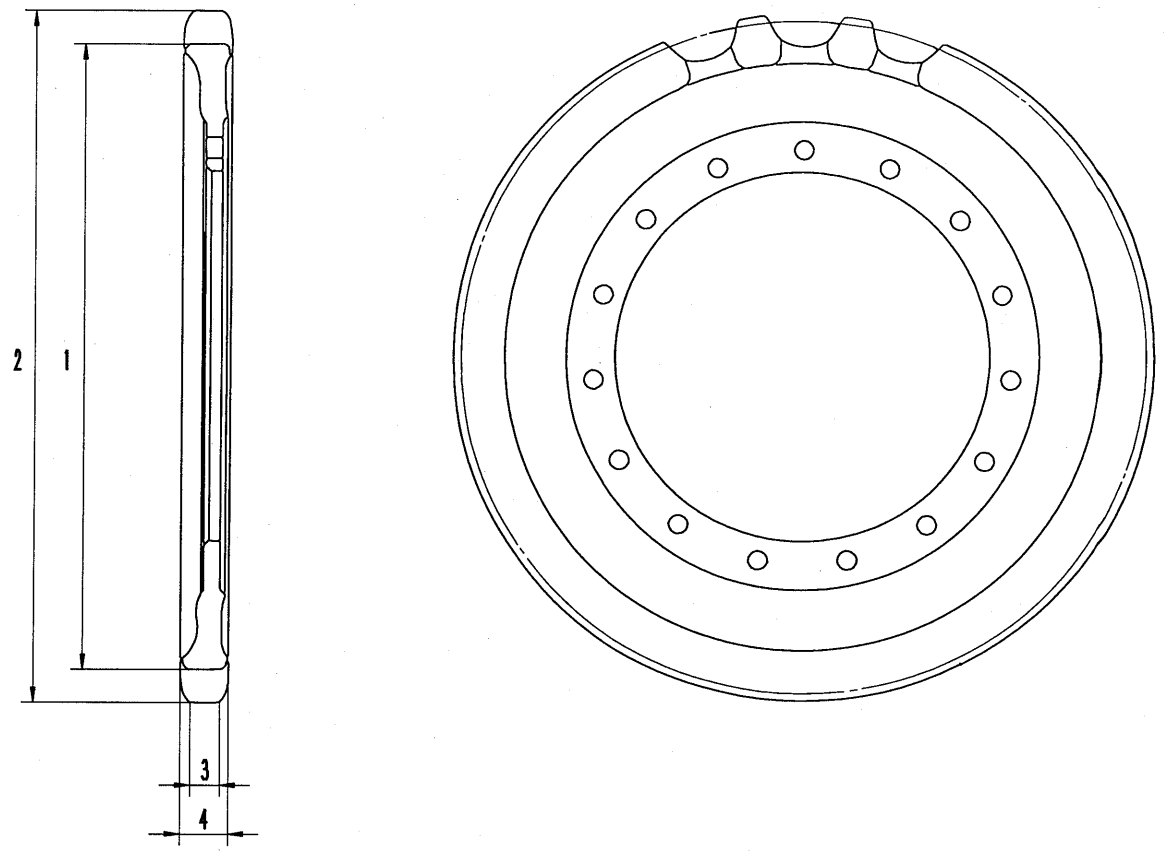
kgm Counterweight mounting bolt : **1,323.9 ± 147.1 Nm {135 ±15 kgm}**

★ When installing the counterweight, adjust so that the stepped difference and the clearance from the bodywork are uniform on the left and right.



E20306

SPROCKET



E20306

SBP02007

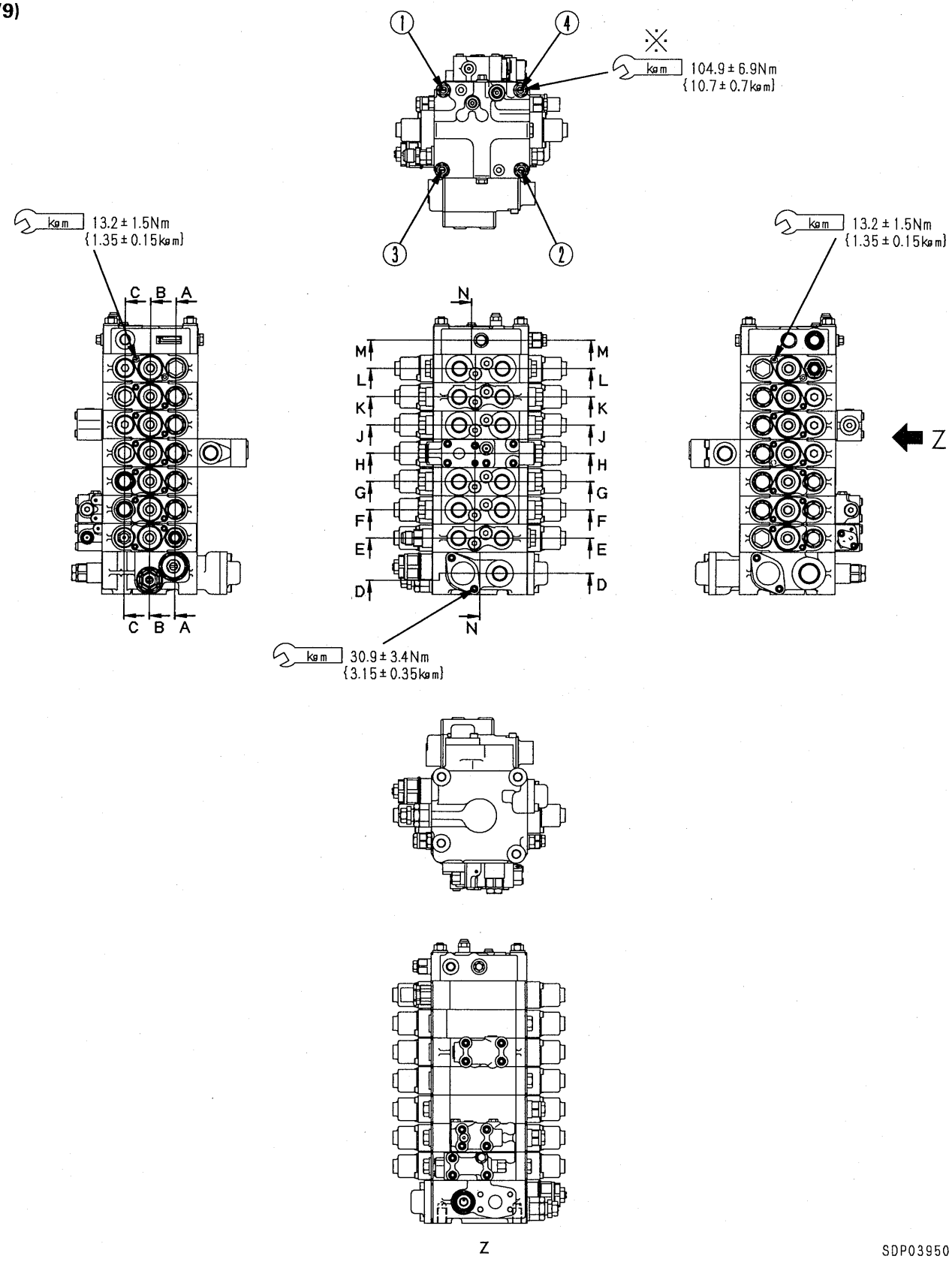
Unit: mm

No.	Check item	Criteria			Remedy
		Standard size	Tolerance	Repair limit	
1	Wear in diameter of sprocket tooth root.	547.4	+1.0 −2.0	535	Rebuild or replace
2	Wear in diameter of sprocket tooth top.	607	—	595	
3	Wear in width of sprocket tooth top.	27	—	22	
4	Wear in width of sprocket tooth root.	42	±1.5	39	

CONTROL VALVE

7-SPOOL CONTROL VALVE (6 + 1 service valve)

(1/9)



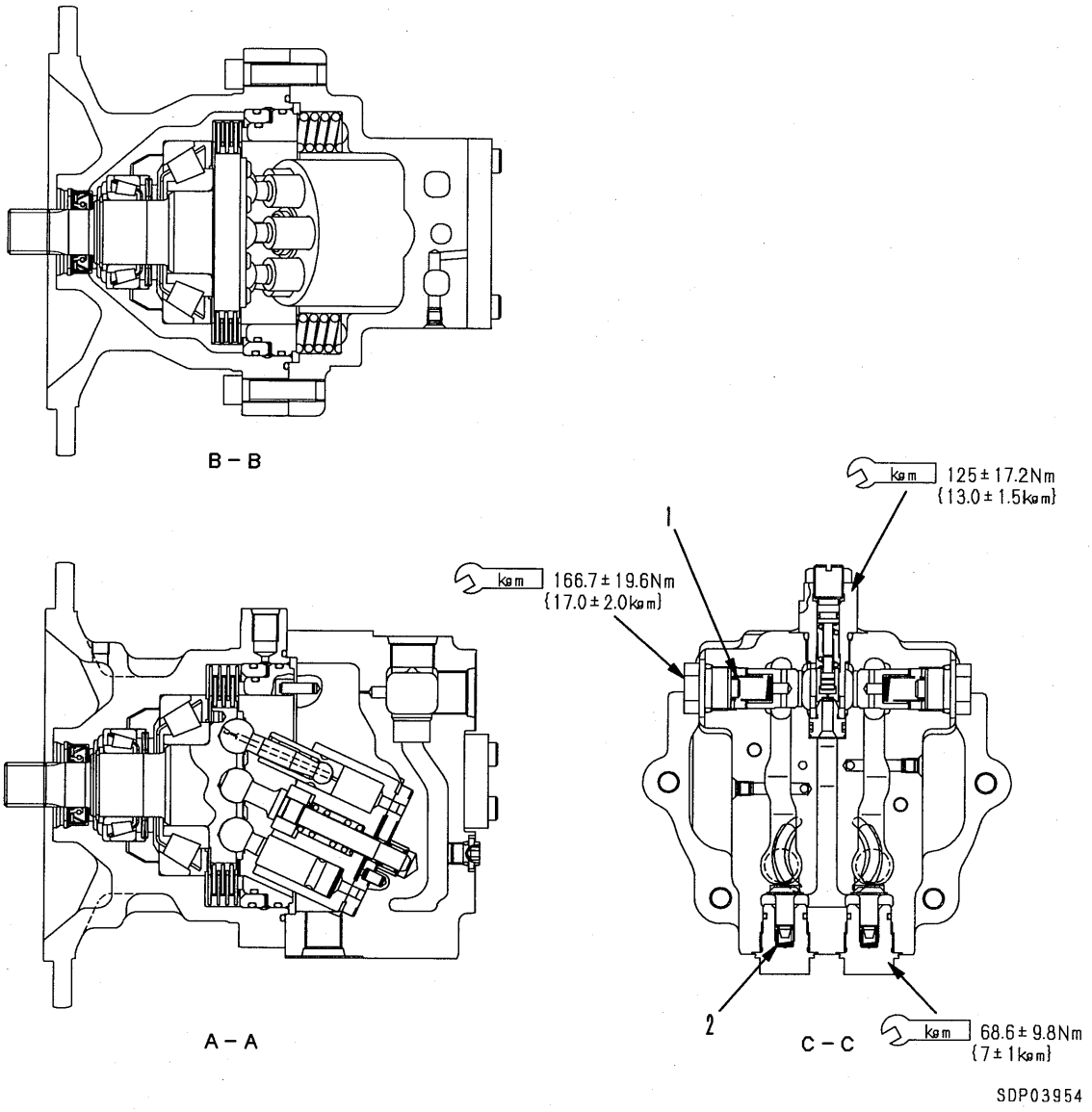
E20306

SDP03950

★ The bolts marked with ※ are tighten in order ① – ④.

SWING MOTOR

KMF40AB-3



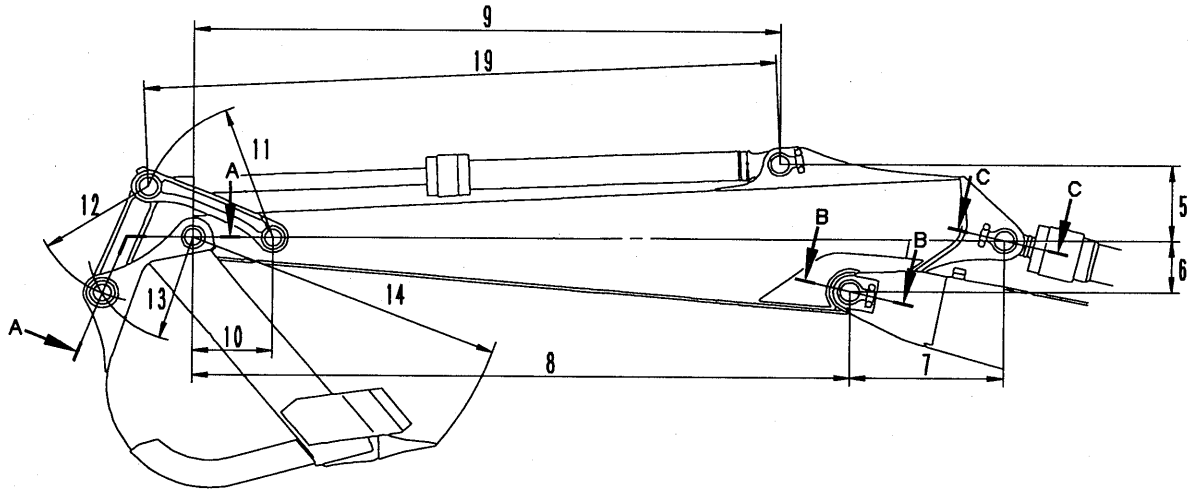
E20306

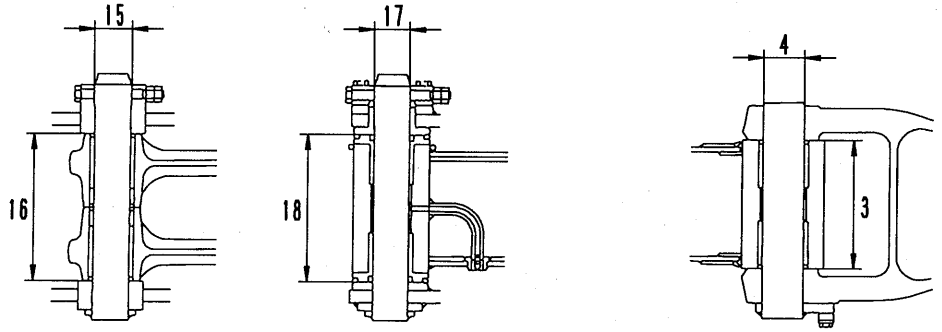
Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
		Free length ×O.D.	Installed length	Installed load	Free length	Installed load	
1	Check valve spring	33.0×13.8	23.0	1.28 N {0.13 kg}	—	0.98 N {0.10 kg}	Replace spring if any damages or deformations are found.
2	Shuttle valve spring	16.4 × 8.9	11.5	13.7 N {1.4 kg}	—	10.8 N {1.1 kg}	

DIMENSION OF WORK EQUIPMENT

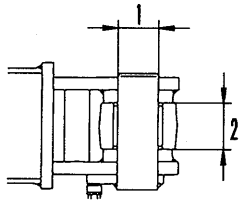
1. ARM





A – A

B – B



C – C

SEP01359

E20306