SHOP MANUAL

KOMATSU

PW160-7K

MACHINE MODEL	SERIAL NUMBER
PW160-7K	**K40001 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.
- PW160-7K mount the SAA4D102E-2 engine.
  For details of the engine, see the 102 Series Engine Shop Manual.

Printed in Belgium

Category	Code	Part No.	Quantity	Container	Main applications, features
Gasket sealant	LG-4	790-129-9020	200 g	Tube	• Features: Resistance to water, oil • Used as sealant for flange surface, thread. • Also possible to use as sealant for flanges with large clearance. • Used as sealant for mating surfaces of final drive case, transmission case.
	LG-5	790-129-9080	1 kg	Polyethylene container	• Used as sealant for various threads, pipe joints, flanges. • Used as sealant for tapered plugs, elbows, nipples of hydraulic piping.
	LG-6	09940-00011	250 g	Tube	• Features: Silicon based, resistant to heat, cold. • Used as sealant for flange surface, thread. • Used as sealant for oil pan, final drive case, etc.
	LG-7	09920-00150	150 g	Tube	• Features: Silicon based, quick hardening type. • Used as sealant for flywheel housing, intake manifold, oil pan, thermostat housing, etc.
	Three bond 1211	790-129-9090	100 g	Tube	• Used as heat-resisting sealant for repairing engines.
Molybdenum disulphide lubricant	LM-G	09940-00051	60 g	Can	• Used as lubricant for sliding parts (to prevent squeaking).
	LM-P	09940-00040	200 g	Tube	• Used to prevent seizure or scuffing of the thread when press fitting or shrink fitting. • Used as lubricant for linkage, bearings, etc.
Grease	G2-LI	SYG2-400LI SYG2-350LI SYG2-400LI-A SYG2-160LI SYGA160CNLI	Various	Various	• General purpose type
	G2-CA	SYG2-400CA SYG2-350CA SYG2-400CA-A SYG2-160CA SYG2-160CNCA	Various	Various	• Used for normal temperature, light load bearing at places in contact with water or steam.
	Molybdenum disulphide lubricant	SYG2-400M	400 g (10 per case)	Belows type	• Used for places with heavy load.

Temperature

Fahrenheit Centigrade Conversion; a simple way to convert a Fahrenheit temperature reading into a Centigrade temperature reading or vise versa is to enter the accompanying table in the center or boldface column of figures. These figures refer to the temperature in either Fahrenheit or Centigrade degrees. If it is desired to convert from Fahrenheit to Centigrade degrees, consider the center column as a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left. If it is desired to convert from Centigrade to Fahrenheit degrees, consider the center column as a table of Centigrade values, and read the corresponding Fahrenheit temperature on the right.

°C		°F	°C		°F	°C		°F	°C		°F
-40.4	-40	-40.0	-11.7	11	51.8	7.8	46	114.8	27.2	81	117.8
-37.2	.35	-31.0	-11.1	12	53.6	8.3	47	116.6	27.8	82	179.6
-34.4	-30	-22.0	-10.6	13	55.4	8.9	48	118.4	28.3	83	181.4
-31.7	-25	-13.0	-10.0	14	57.2	9.4	49	120.2	28.9	84	183.2
-28.9	-20	-4.0	-9.4	15	59.0	10.0	50	122.0	29.4	85	185.0
-28.3	-19	-2.2	-8.9	16	60.8	10.6	51	123.8	30.0	86	186.8
-27.8	-18	-0.4	-8.3	17	62.6	11.1	52	125.6	30.6	87	188.6
-27.2	-17	1.4	-7.8	18	64.4	11.7	53	127.4	31.1	88	190.4
-26.7	-16	3.2	-7.2	19	66.2	12.2	54	129.2	31.7	89	192.2
-26.1	-15	5.0	-6.7	20	68.0	12.8	55	131.0	32.2	90	194.0
-25.6	-14	6.8	-6.1	21	69.8	13.3	56	132.8	32.8	91	195.8
-25.0	-13	8.6	-5.6	22	71.6	13.9	57	134.6	33.3	92	197.6
-24.4	-12	10.4	-5.0	23	73.4	14.4	58	136.4	33.9	93	199.4
-23.9	-11	12.2	-4.4	24	75.2	15.0	59	138.2	34.4	94	201.2
-23.3	-10	14.0	-3.9	25	77.0	15.6	60	140.0	35.0	95	203.0
-22.8	-9	15.8	-3.3	26	78.8	16.1	61	141.8	35.6	96	204.8
-22.2	-8	17.6	-2.8	27	80.6	16.7	62	143.6	36.1	97	206.6
-21.7	-7	19.4	-2.2	28	82.4	17.2	63	145.4	36.7	98	208.4
-21.1	-6	21.2	-1.7	29	84.2	17.8	64	147.2	37.2	99	210.2
-20.6	-5	23.0	-1.1	30	86.0	18.3	65	149.0	37.8	100	212.0
-20.0	-4	24.8	-0.6	31	87.8	18.9	66	150.8	40.6	105	221.0
-19.4	-3	26.6	0	32	89.6	19.4	67	152.6	43.3	110	230.0
-18.9	-2	28.4	0.6	33	91.4	20.0	68	154.4	46.1	115	239.0
-18.3	-1	30.2	1.1	34	93.2	20.6	69	156.2	48.9	120	248.0
-17.8	0	32.0	1.7	35	95.0	21.1	70	158.0	51.7	125	257.0
-17.2	1	33.8	2.2	36	96.8	21.7	71	159.8	54.4	130	266.0
-16.7	2	35.6	2.8	37	98.6	22.2	72	161.6	57.2	135	275.0
-16.1	3	37.4	3.3	38	100.4	22.8	73	163.4	60.0	140	284.0
-15.6	4	39.2	3.9	39	102.2	23.3	74	165.2	62.7	145	293.0
-15.0	5	41.0	4.4	40	104.0	23.9	75	167.0	65.6	150	302.0
-14.4	6	42.8	5.0	41	105.8	24.4	76	168.8	68.3	155	311.0
-13.9	7	44.6	5.6	42	107.6	25.0	77	170.6	71.1	160	320.0
-13.3	8	46.4	6.1	43	109.4	25.6	78	172.4	73.9	165	329.0
-12.8	9	48.2	6.7	44	111.2	26.1	79	174.2	76.7	170	338.0
-12.2	10	50.0	7.2	45	113.0	26.7	80	176.0	79.4	175	347.0

1 PIECE BOOM

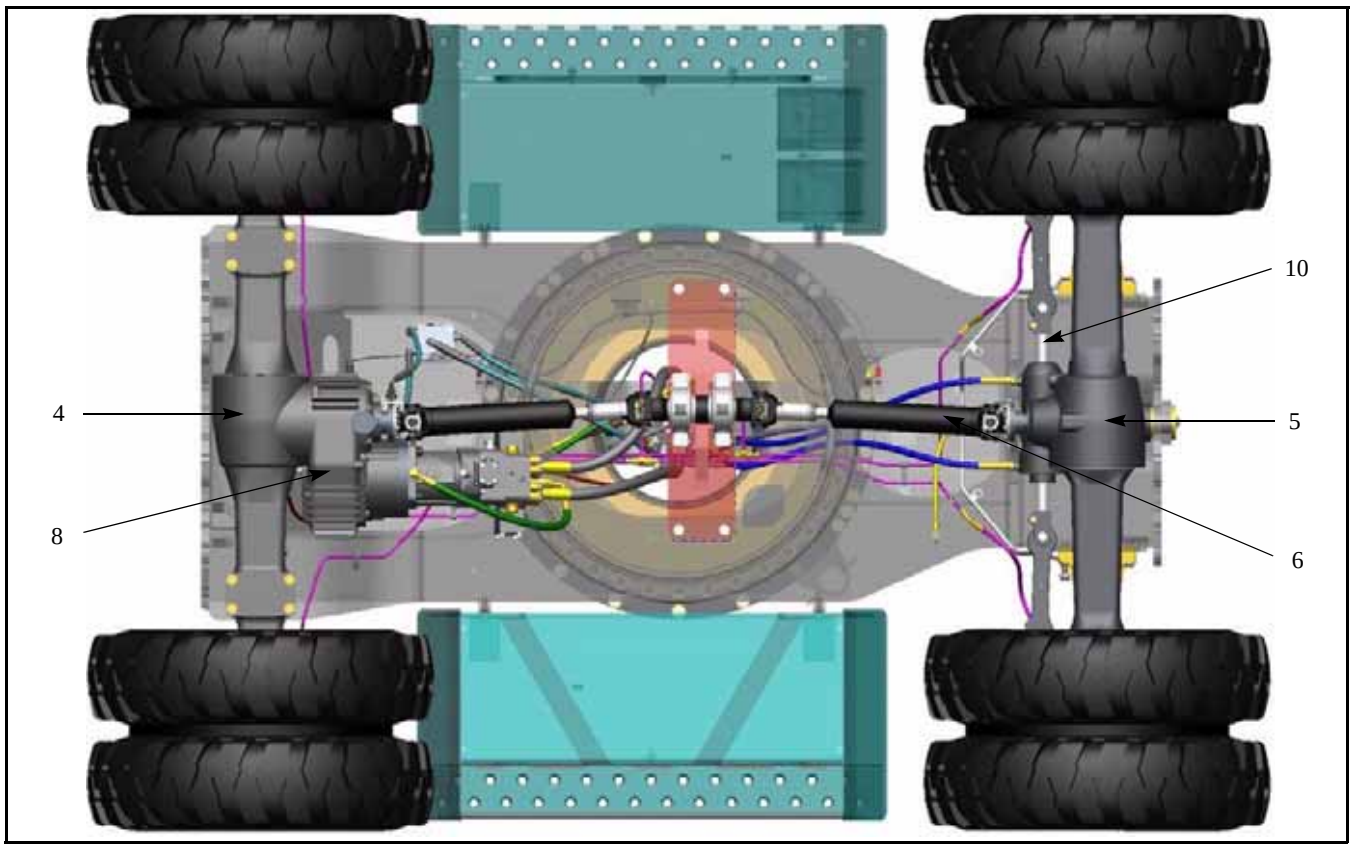
Unit: kg

Machine model		PW160-7K
Serial Number		K40001 and up
Boom assembly		980
Arm assembly	2.1m	291
	2.5m	328
	3.0m	442
Bucket assembly		460
Lift cylinder	Left Hand	135
	Right Hand	135
Arm cylinder assembly		140
Bucket cylinder assembly	2.1m	90
	2.5m	
	3.0m	
Link / pins assembly		112.8
Boom pin		20+12
Arm pin		12

2 PIECE BOOM

Unit: kg

Machine model		PW160-7K
Serial Number		K40001 and up
Boom assembly	1st Boom	470
	2nd Boom	684
Arm assembly	2.1m	291
	2.5m	328
	3.0m	442
Bucket assembly		460
Lift cylinder	Left Hand	128
	Right Hand	128
Adjust cylinder		195
Arm cylinder assembly		215.4
Bucket cylinder assembly	2.1m	90
	2.5m	
	3.0m	
Link / pins assembly		112.8
Boom pin	1st Boom	26.5
	2nd Boom	26
Arm pin		12



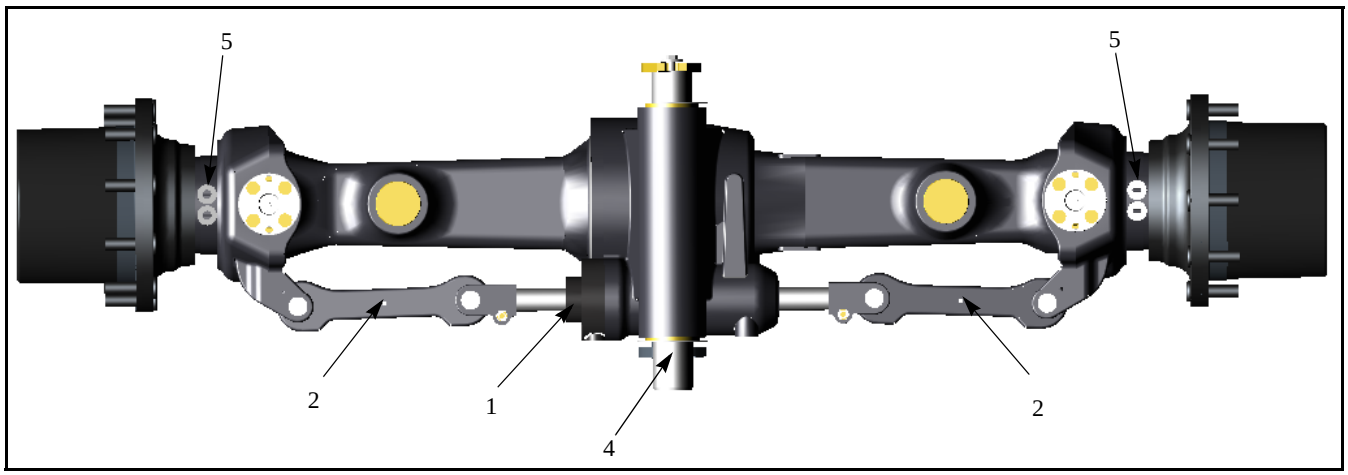
1.	Undercarriage	8.	Transmission
2.	Step	9.	Double Wheel Assy
3.	Wheel Chock	10.	Steering Cylinder
4.	Front Oscillating Steering Axle	11.	Suspension
5.	Rear Axle	12.	Swivel Joint
6.	Propshaft	13.	Slew Ring
7.	Travel motor	14	Axle Oscillation pin

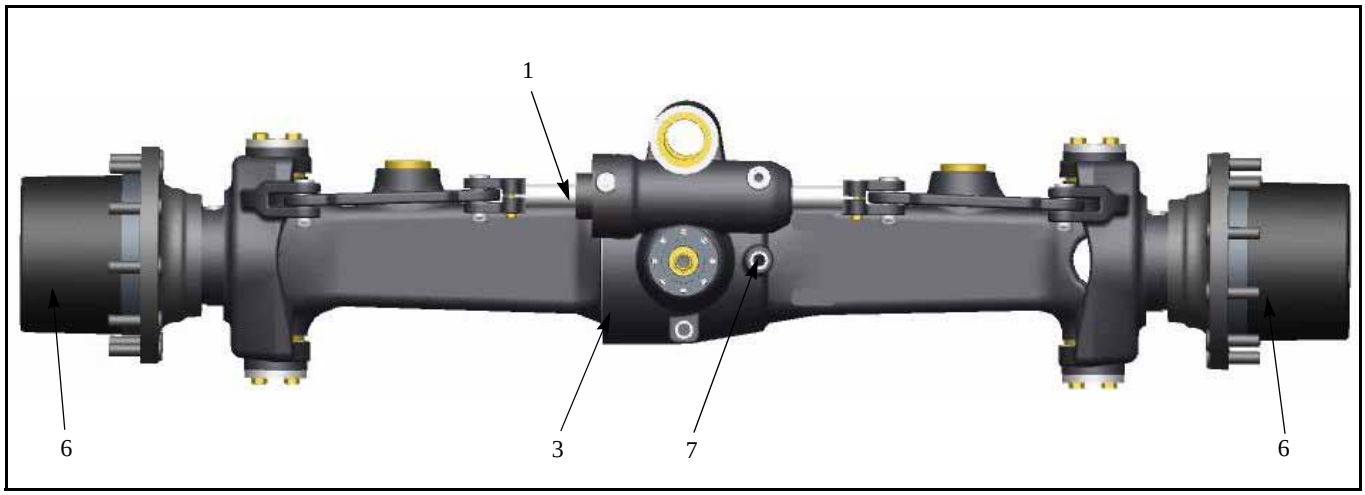
AXLE

OUTLINE

- Each axle consists of an axle housing supporting the chassis weight, a differential set in the axle housing, a final drive, and a brake provided at each end.
- A trunnion-type axle shaft with a king pin at the final drive end is used to enable the direction of the machine to be changed.

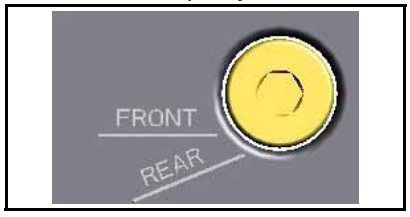
FRONT AXLE





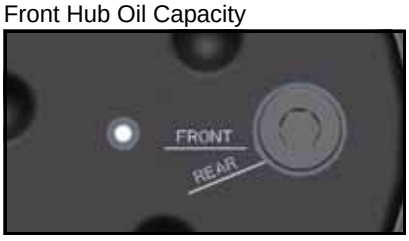
1. Steer cylinder
2. Track control arms
3. Axle housing
4. Drive shaft input
5. Brake line input
6. Wheel hub
7. Oil level plug

Front Axle Oil Capacity



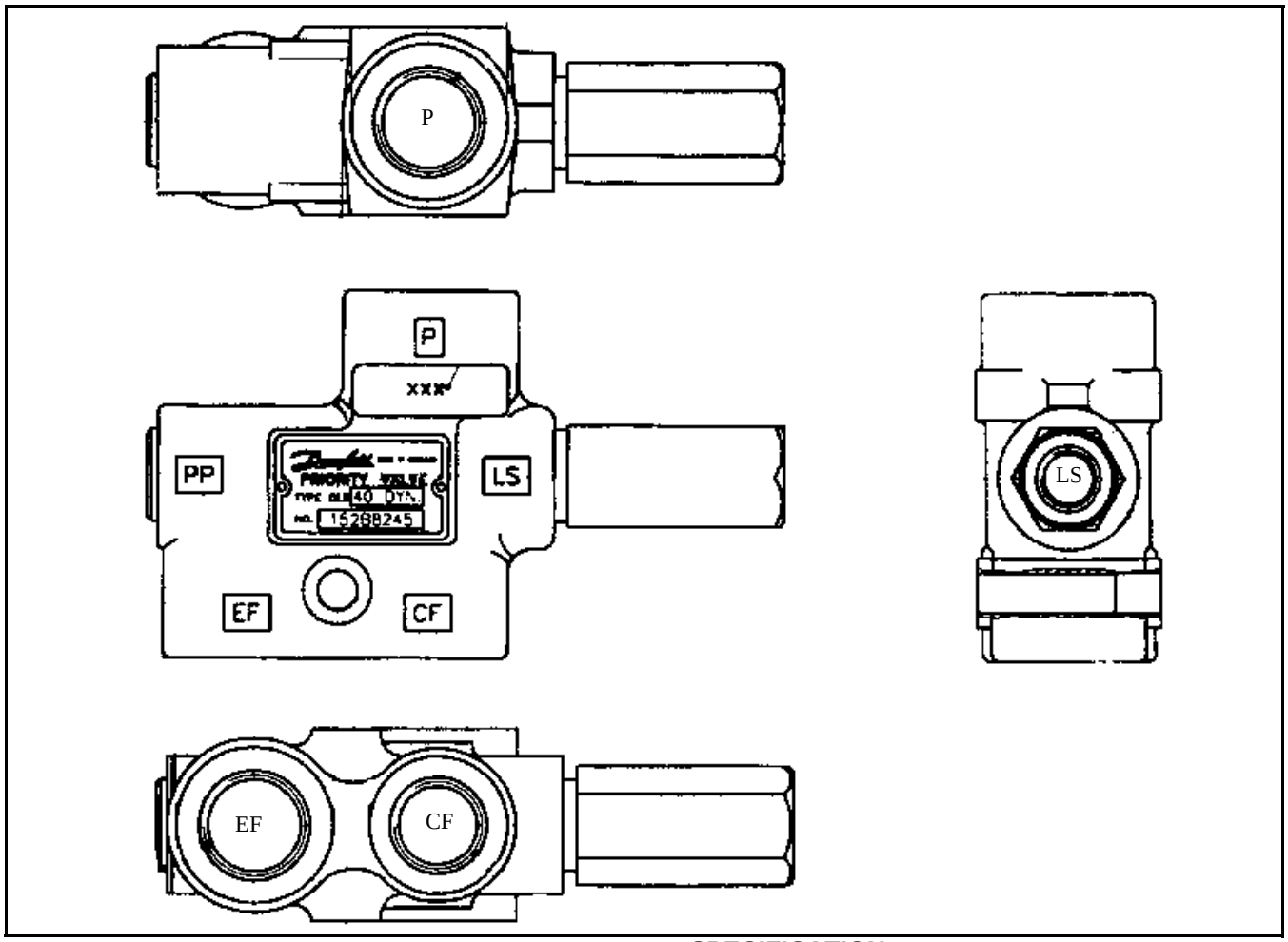
PW160	11.5 Litres

Front Hub Oil Capacity



PW160	2.5 Litres

PRIORITY VALVE



P	Pressure port (from pump)
EF	Output port to brake system
CF	Output port to steering system
LS	Load sensing port from steering valve

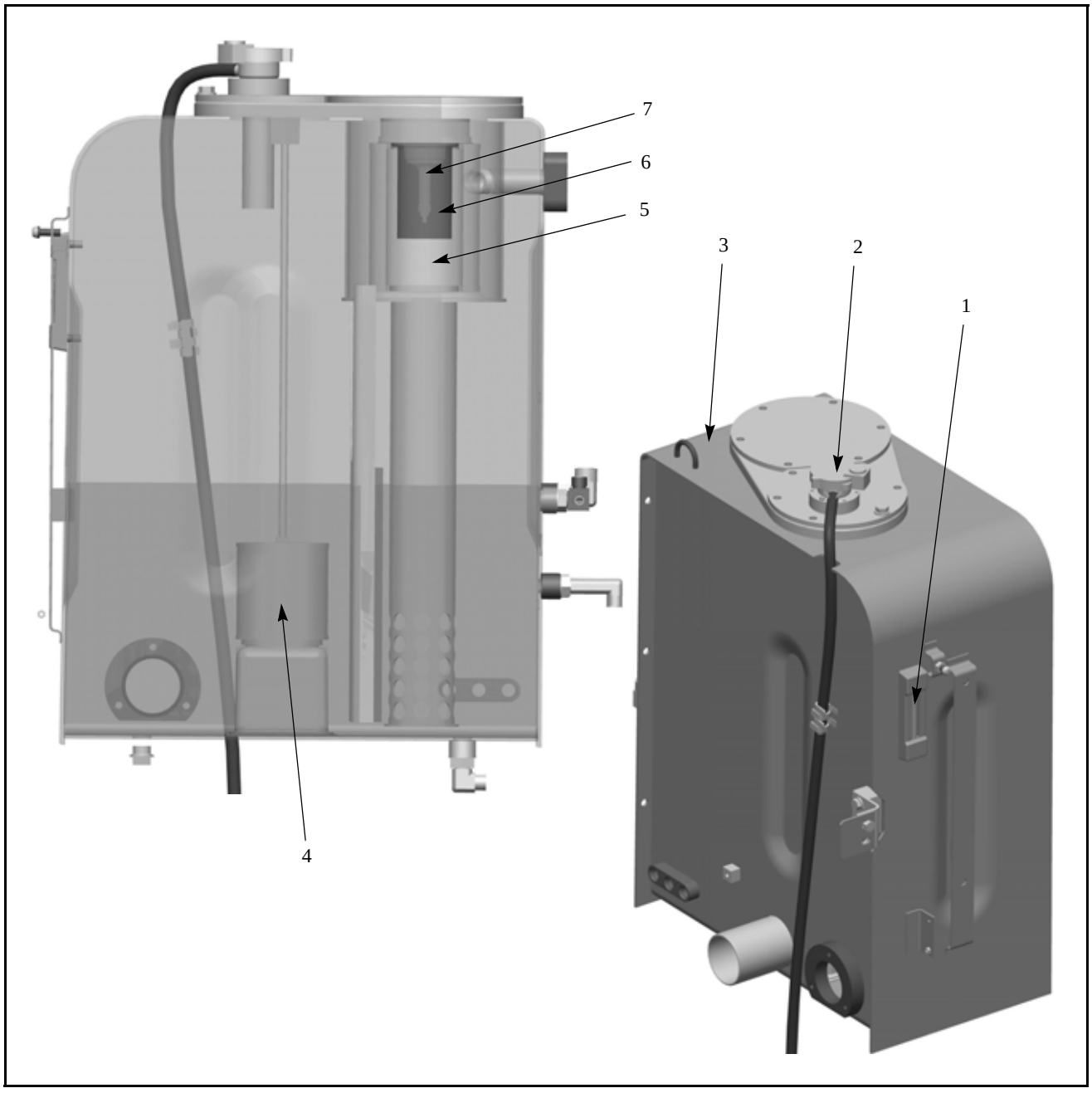
SPECIFICATION

Priority valve control spring pressure	7 bar

FUNCTION

When the steering wheel is turned, the oil flow is distributed in such a way that the oil flow necessary for steering is led to the steering unit through the CF connection.
The remaining oil flow is available for the working hydraulics through the EF connection.
The distribution is controlled by the LS signal from the steering unit; so that the oil flow to the steering unit is always determined by the actual steering rate.
Steering takes priority

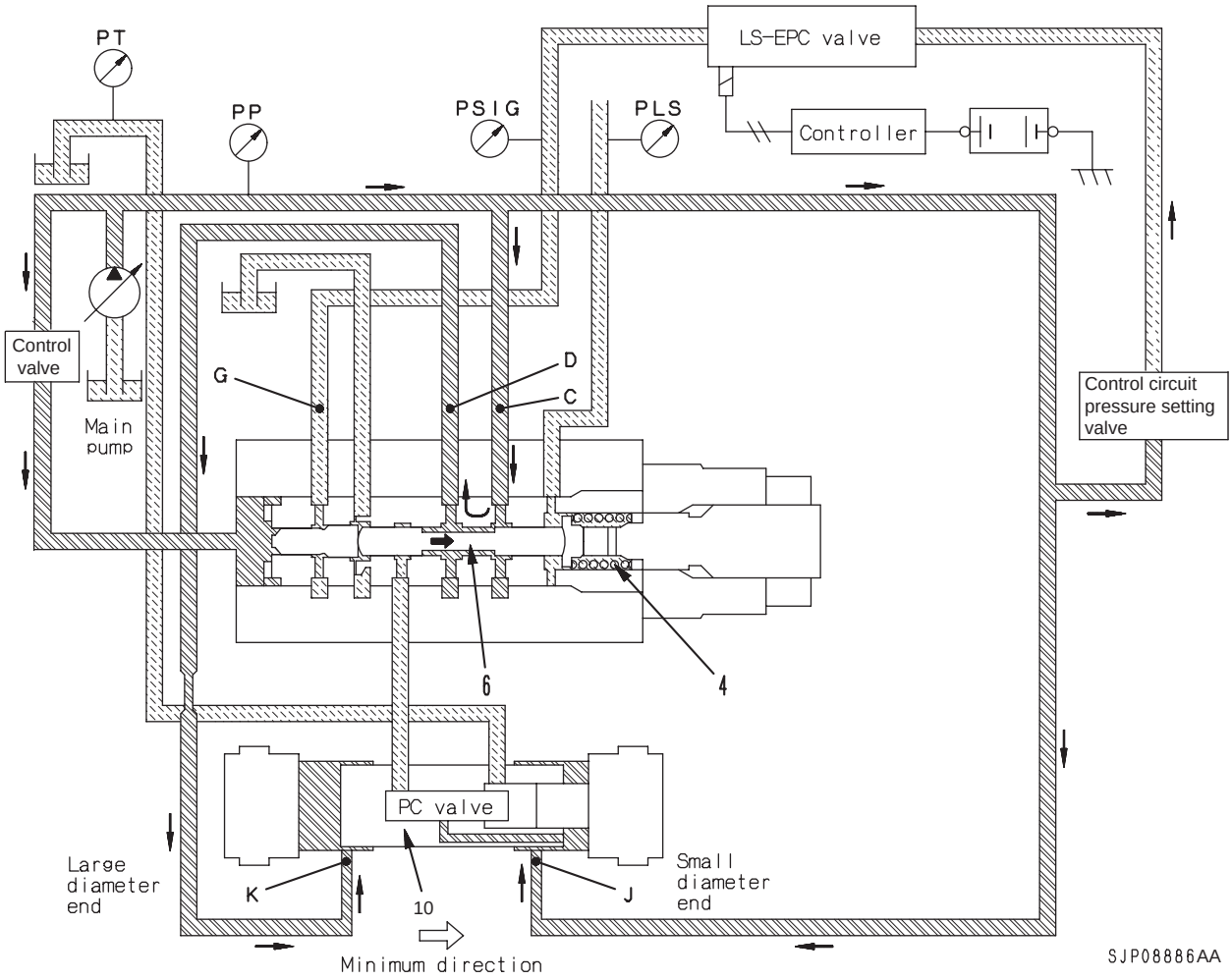
HYDRAULIC TANK



1. Sight gauge
2. Oil filler cap
3. Hydraulic tank
4. Suction strainer
5. Filter element
6. Strainer
7. Bypass valve

SPECIFICATIONS

Tank	166 l
Amount of oil inside tank	120 l
Pressure valve	
Relief cracking pressure	16.7 $^{+}/_{-}$6.9 kPa
	{0.17 $^{+}/_{-}$0.07 kg/cm^2}
Suction cracking pressure	0 - 0.49 kPa
	{0 - 0.005 kg/cm^2}
Bypass valve set pressure	150 $^{+}/_{-}$ 30 kPa
	{1.5 $^{+}/_{-}$ 0.3 kg/cm^2}

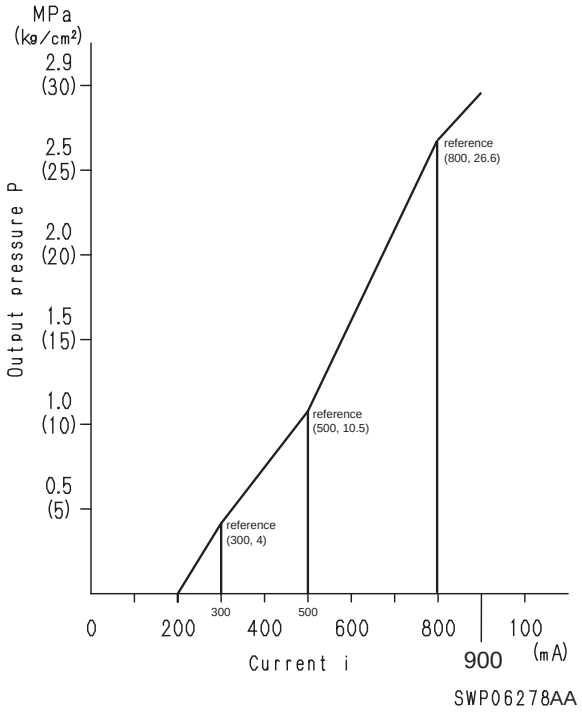


3) Operation in decrease direction for pump discharge amount

- The following explains the situation if the servo piston (10) moves to the right (the discharge amount becomes smaller). When LS differential pressure ∆**PLS** becomes larger (for example, when the area of opening of the control valve becomes smaller and pump pressure **PP** rises), pump pressure **PP** pushes spool (6) to the right.
- When spool (6) moves, main port pressure **PP** flows from port **C** and port **D** and from port **K**, it enters the large diameter end of the piston.
- Main pump pressure **PP** also enters port **J** at the small diameter end of the piston, but because of the difference in area between the large diameter end and the small diameter end of servo piston (10), servo piston (10) is pushed to the right.
- As a result, the swash plate moves in the direction to make angle smaller.
- If LS selection pressure **PSIG** enters port **G**, it acts to make the set pressure of spring (4) weaker.

Function

- The EPC valve consists of the proportional solenoid portion and the hydraulic valve portion.
- When it receives signal current **i** from the pump controller, it generates the EPC output pressure in proportion to the size of the signal, and outputs it to the LS (PC) valve.

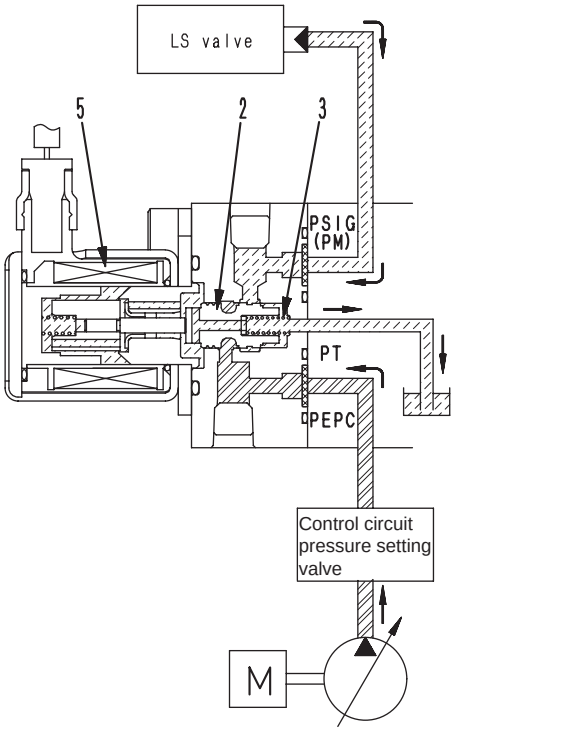


SWP06278AA

Operation

1. When signal current is 0 (coil de-energized)

- When there is no signal current flowing from the controller to coil (5), coil (5) is de-energized.
- For this reason, spool (2) is pushed to the left in the direction of the arrow by spring (3).
- As a result, port **PEPC** closes and the pressurized oil from the main pump does not flow to the LS (PC) valve.
- At the same time, the pressurized oil from the LS (PC) valve passes from port **PSIG(PM)** through port **PT** and is drained to the tank.



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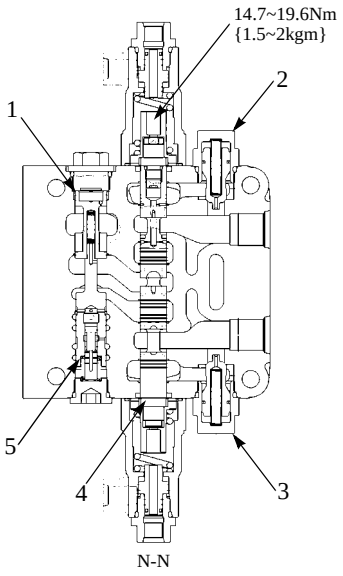
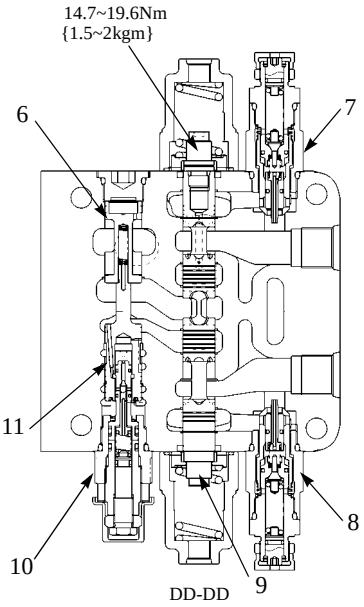


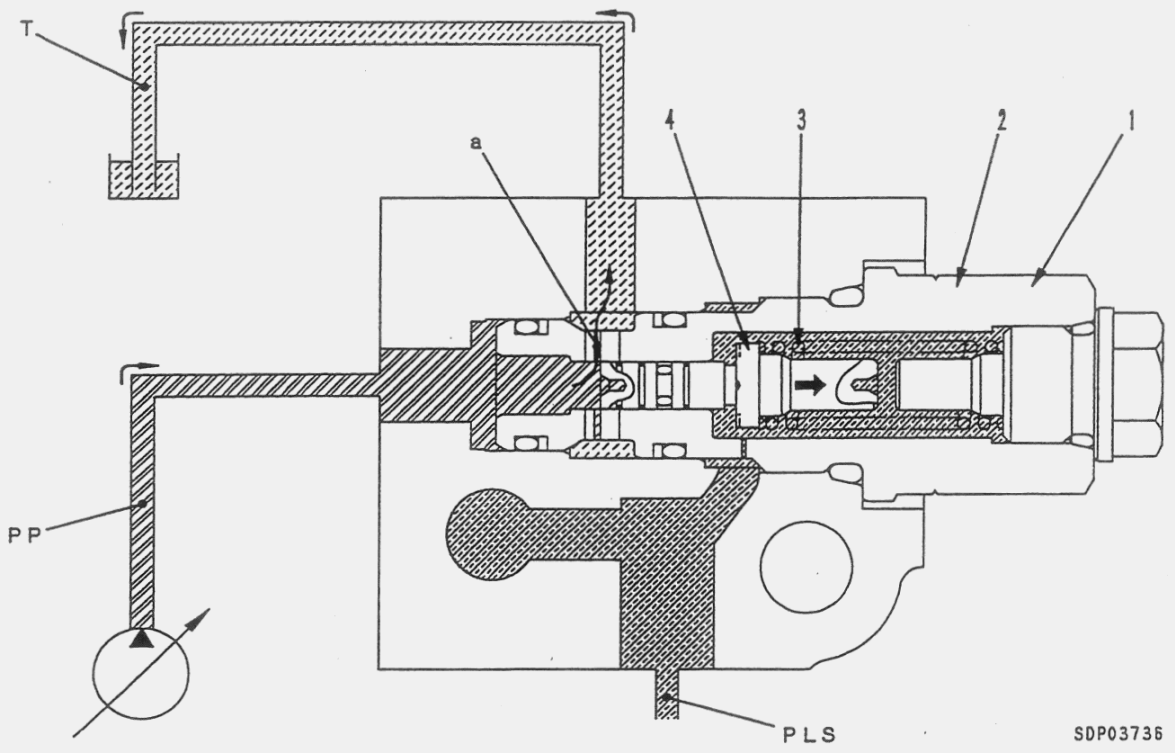
Bucket control valve



Service control valve

1. Pressure compensation valve F
2. Safety suction valve
3. Safety suction valve
4. Spool (Bucket)
5. Pressure compensation valve R
6. Pressure compensation valve F
7. Safety suction valve mount
8. Safety suction valve mount
9. Spool (service)
10. Variable pressure compensation valve
11. Pressure compensation valve R

2. During fine control of the valve, when the demand flow for the actuator is within the amount discharged by the minimum swash plate angle of the pump, pump discharge pressure **PP** is set to LS pressure **PLS** + 2.45MPa {25kg/cm^2}.
   When the differential pressure between the pump discharge pressure **PP** and LS pressure **PLS** reaches the load of spring (3) (2.45MPa {25kg/cm^2}),the unload valve opens, so LS differential pressure **PLS** becomes 2.45MPa {25kg/cm^2}.



Operation

Fine control of control valve

- When fine control is carried out on the control valve, LS pressure **PLS is** generated and acts on the right end of the spool (4).
  When this happens, the area of the opening of the control valve spool is small, so there is a big difference between LS pressure **PLS** and pump discharge pressure **PP**.
- When the differential pressure between pump discharge pressure **PP** and LS pressure **PLS** reaches the load of the spring (3) (2.45MPa {25kg/cm^2}), spool (4) is moved to the right in the direction of the arrow, and pump circuit **PP** and tank circuit **T** are connected.
- In other words, pump discharge pressure PP is set to a pressure equal to the spring force (2.45MPa {25kg/cm^2}) + LS pressure PLS, and LS differential pressure PLS becomes 2.45MPa {25kg/cm^2}.

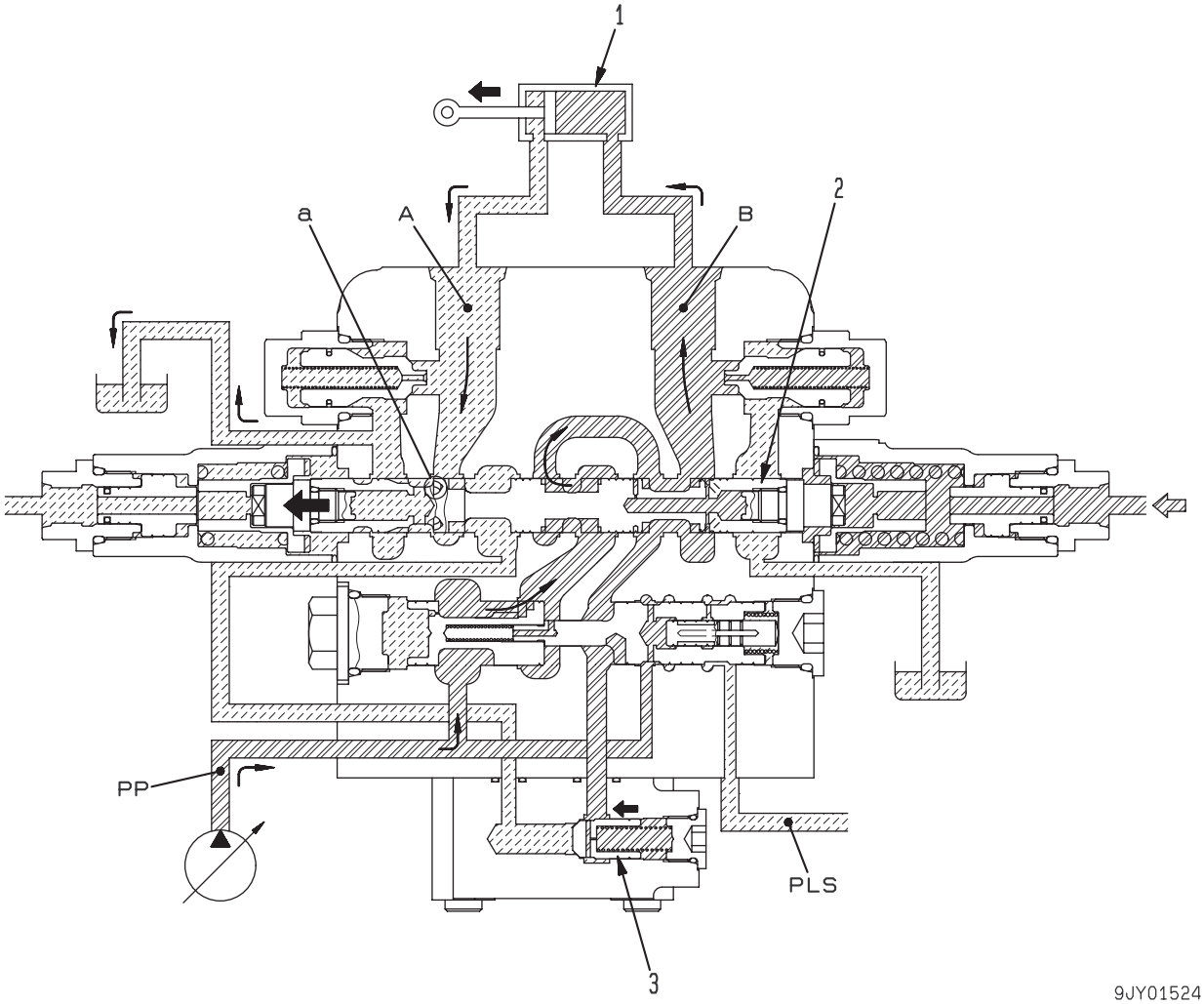
1. Unload valve
2. Sleeve
3. Spring
4. Spool

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

2. At arm in process

Function

- When the bottom pressure B of the cylinder (1) rises above the head pressure **A** and the arm enters the digging process, the check valve (3) will be closed and the circuits on the head side and the bottom side will be interrupted.



Operation

- When the arm is in the digging process, the bottom side pressure B of the arm cylinder (1) will rise, close the check valve (3) and interrupt the circuits on the head side and the bottom side.

1. Arm cylinder
2. Arm spool
3. Check valve

A : Head circuit (pressure)
B : Bottom circuit (pressure)
PP : Pump circuit (pressure)

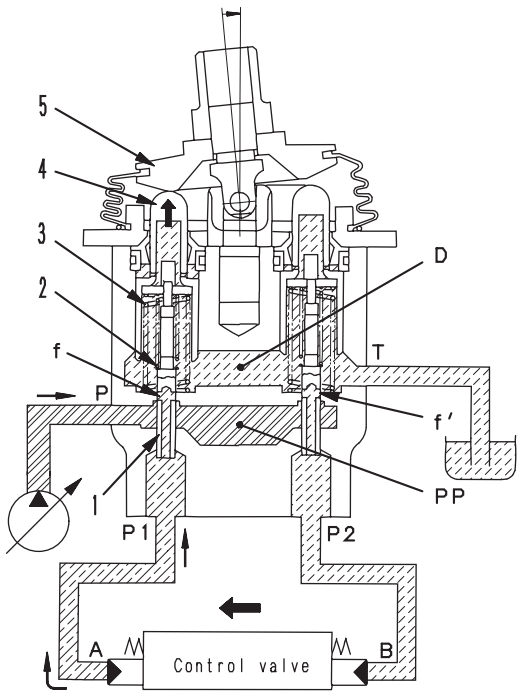
3) During fine control (when control lever is returned)

- When disc (5) starts to be returned, spool (1) is pushed up by the force of centering spring (3) and the pressure at port **P1**.

  When this happens, fine control hole **f** is connected to drain chamber **D** and the pressure oil at port **P1** is released.

  If the pressure at port **P1** drops too far, spool (1) is pushed down by metering spring (2), and fine control hole **f** is shut off from drain chamber **D**. At almost the same time, it is connected to pump pressure chamber **PP**, and the pump pressure is supplied until the pressure at port **P1** recovers to a pressure that corresponds to the lever position.

  When the spool of the control valve returns, oil in drain chamber **D** flows in from fine control hole **f** in the valve on the side that is not working. The oil passes through port **P2** and enters chamber **B** to fill the chamber with oil. (Fig. 3)



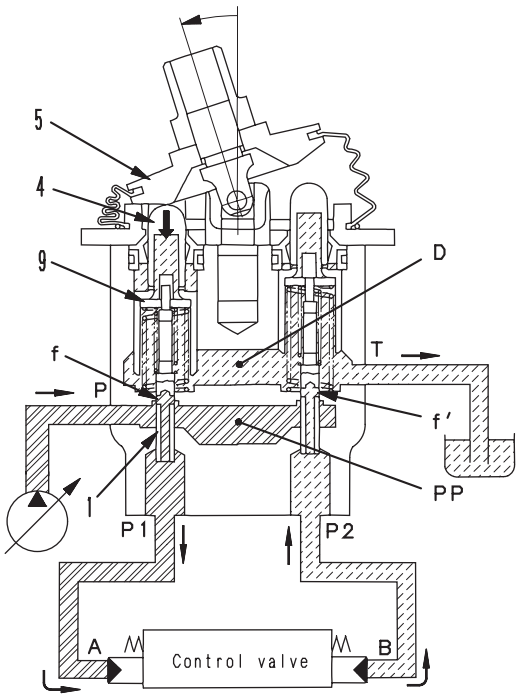
(Fig. 3)

SBP03495A

4) At full stroke

When disc (5) pushes down piston (4), and retainer (9) pushes down spool (1), fine control hole **f** is shut off from drain chamber **D**, and is connected with pump pressure chamber **PP**. Therefore, the pilot pressure oil from the control circuit passes through fine control hole **f** and flows to chamber **A** from port **P1**, and pushes the control valve spool.

The oil returning from chamber **B** passes from port **P2** through fine control hole **f** and flows to drain chamber **D**. (Fig. 4)

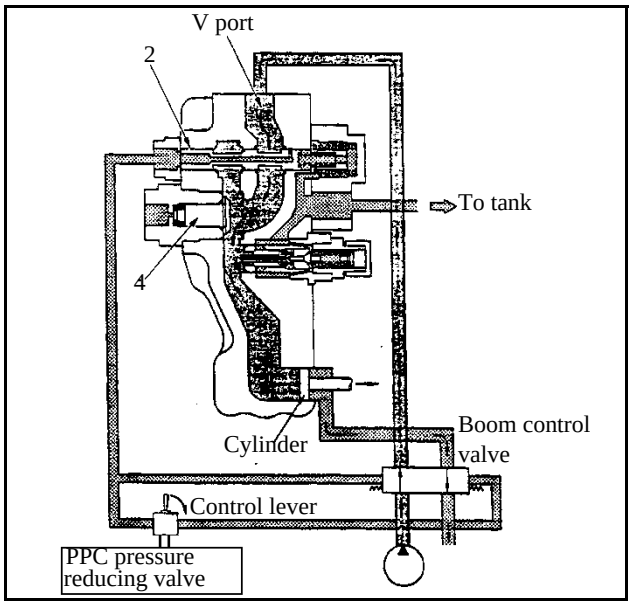


(Fig. 4)

SBP03496A

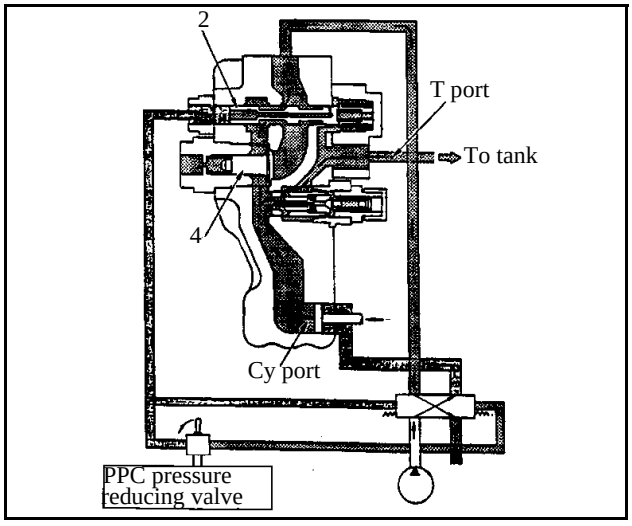
Operation
Boom Raise

- During boom raising the pilot signal from wrist control operates control valve spool to direct high pressure oil to port **V** of hose burst valve.
- This pressure lifts check valve (4) from seat and high pressure oil flows in the bottom of the cylinder raising the room.



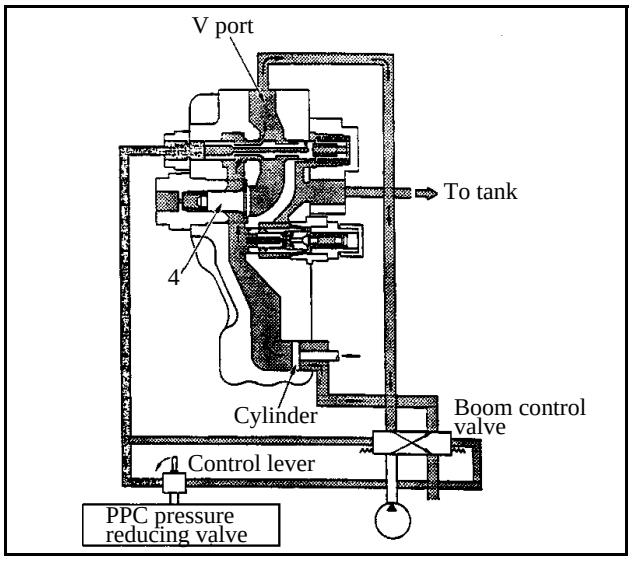
Boom Lower

- During boom lowering the pilot signal reverses the flow through the control valve spool. High pressure oil flows to the head side of the cylinder. Oil in the bottom side of the cylinder flows through the port **Cy** of the valve. The pilot signal also opens the spool (2) of the hose burst valve and allows oil to flow back to tank.

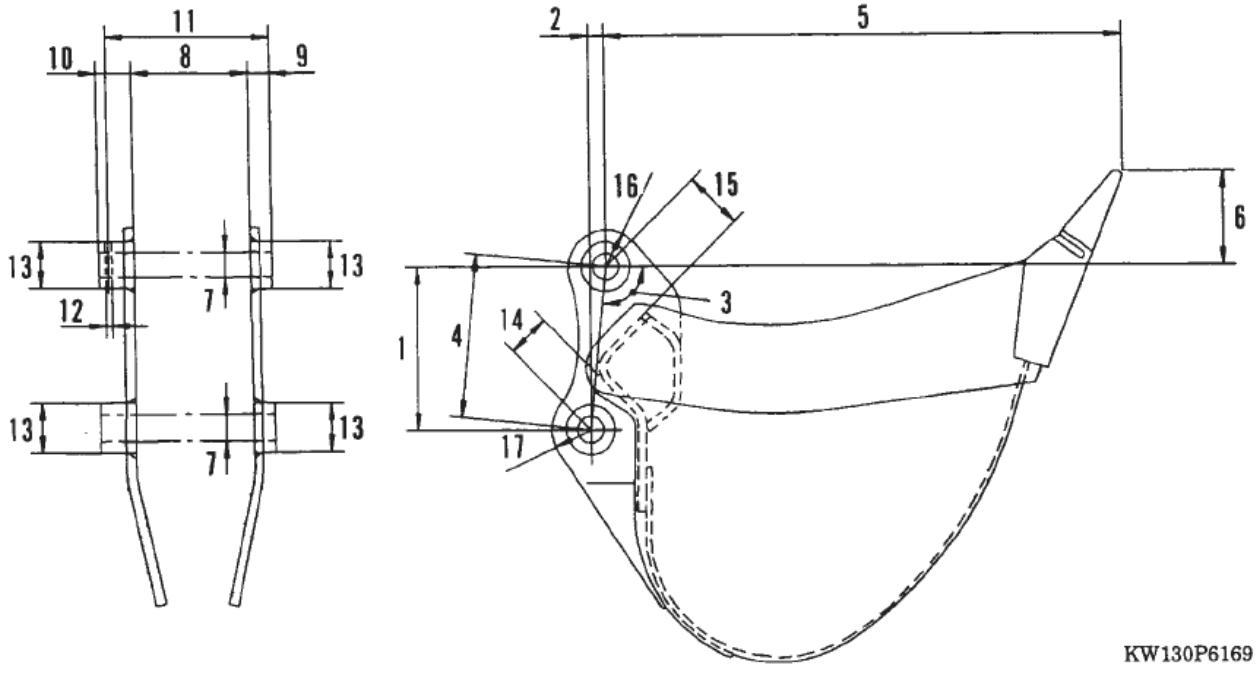


When hose burst occurs
(operation to lower safety)

- The sudden loss of pressure at port **V** will cause check valve (4) to re-seat and so the valve is locked.

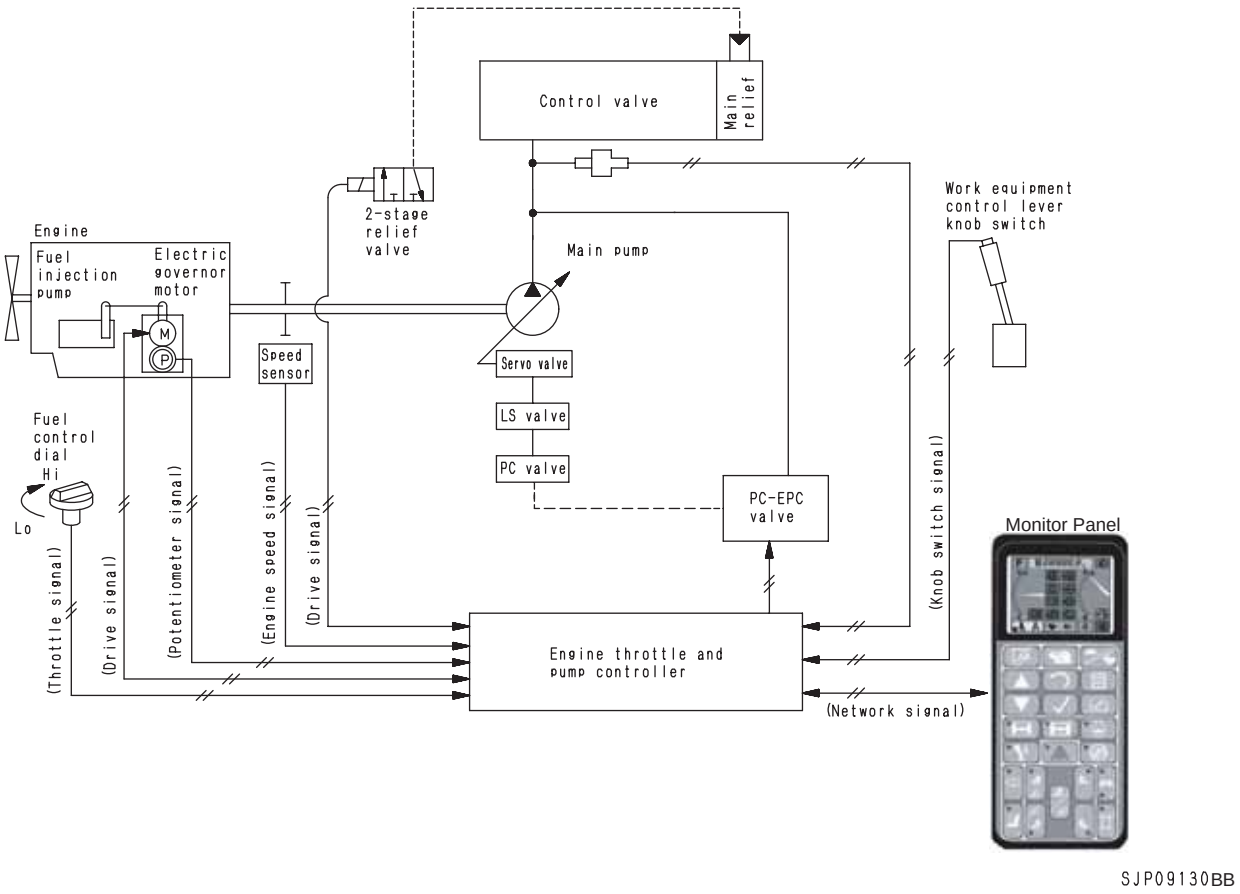


2.DIMENSION OF BUCKET



Model No.	Size (mm)	Model No.	Size (mm)
1.	373	10.	85
2.	38	11.	380
3.	95.80	12.	∅ 16
4.	374.9	13.	∅ 110
5.	1,197	14.	101.5
6.	222	15.	138
7.	∅ 60	16.	85
8.	260	17.	85
9.	50		

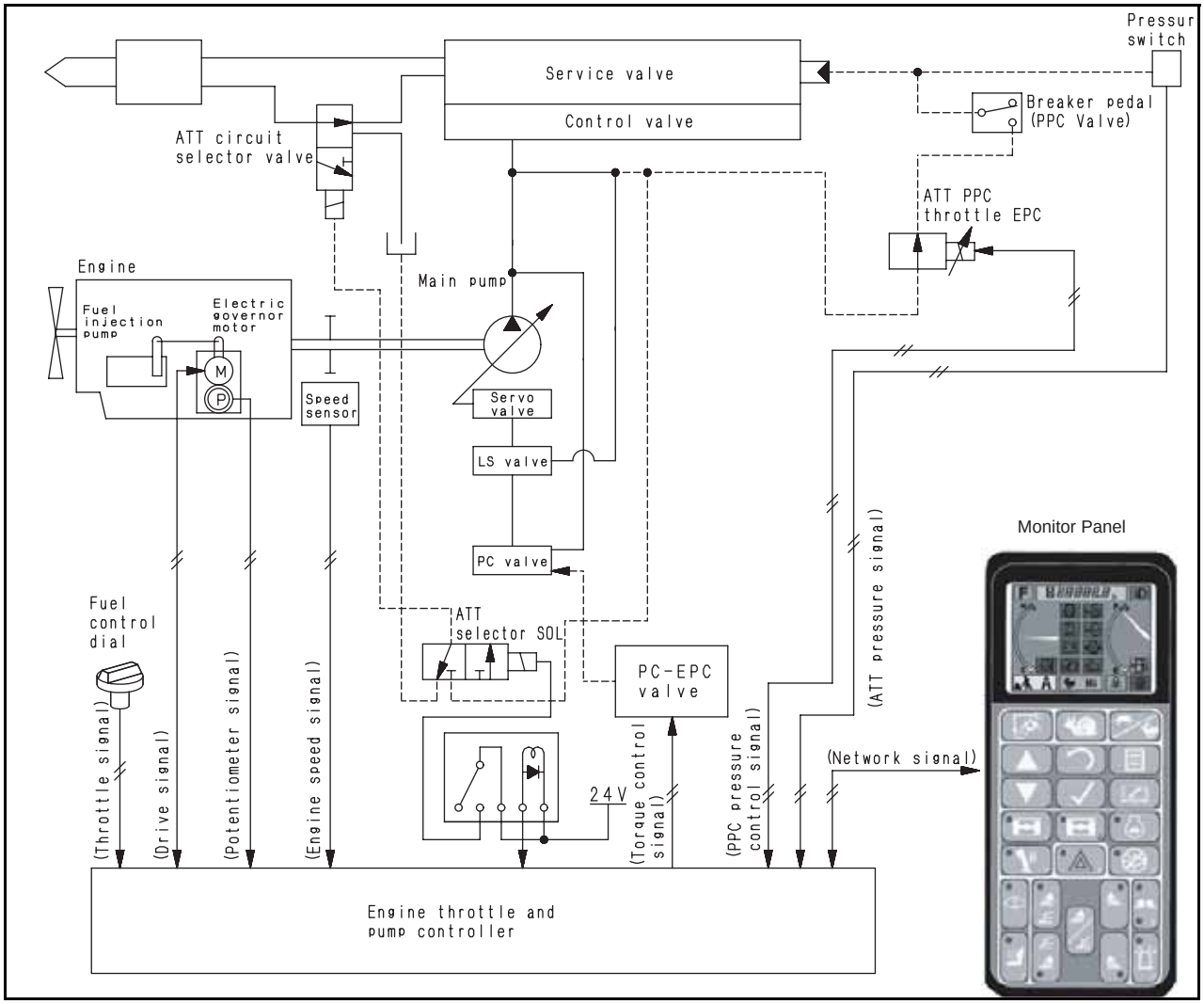
3. One-touch power maximizing function

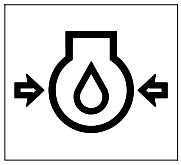
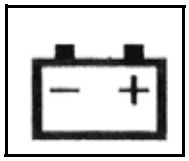
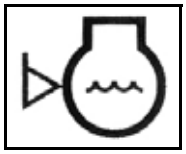
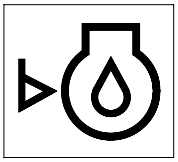
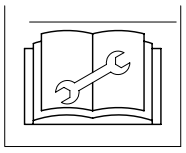


FUNCTION

- Power can be increased for approximately 8 seconds by depressing the power max switch on LH work equipment lever.
- The power max function is available in "A" and "E" working modes only.

8 . ATT flow control, circuit selector function (option)



Symbol	Display item	Check before starting item	When engine is stopped	When engine is running
	Engine oil pressure	Yes	--	When abnormal, lights up and buzzer sounds
	Battery charge	Yes	--	Lights up when abnormal
	Radiator water level	Yes	Lights up when abnormal	When abnormal, lights up and buzzer sounds
	Engine oil level	Yes	Lights up when abnormal	--
	Air cleaner clogging	Yes	--	Lights up when abnormal
	Maintenance	No	Lights up when maintenance is due. Lights up for only 30 sec. after key is turned ON, then goes out.	

The problems that have occurred are displayed in order from the left.

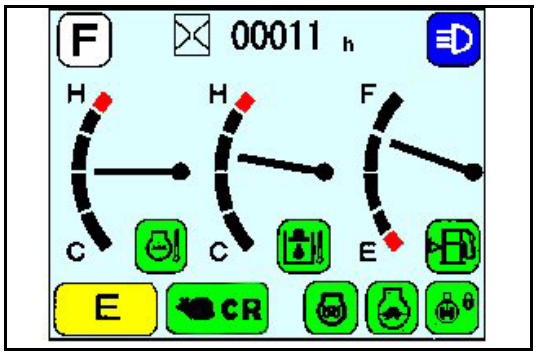
When the above cautions are displayed, if the hydraulic oil temperature is high or low, only the symbol is displayed.

Condition of hydraulic oil	Colour of symbol
Low temperature (below B6 or equivalent)	Black on white background
Normal (B6 - B2)	No display
High temperature (below B2)	White on red letters

PASSWORD FUNCTION

- If the password function is active, the engine will not start unless the password is input correctly when starting.
- When setting this function or when changing the password, it is necessary to go from the normal screen to the setup screen and input the pass word.

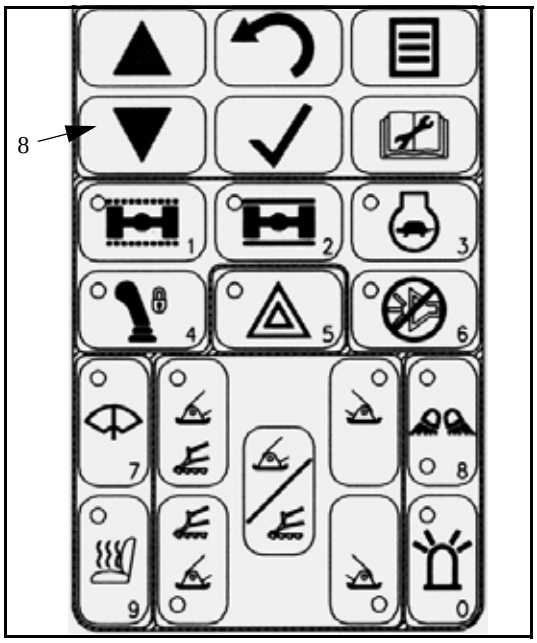
  This becomes possible 10 minutes after the starting switch is turned ON and the monitor screen has changed to the normal screen.

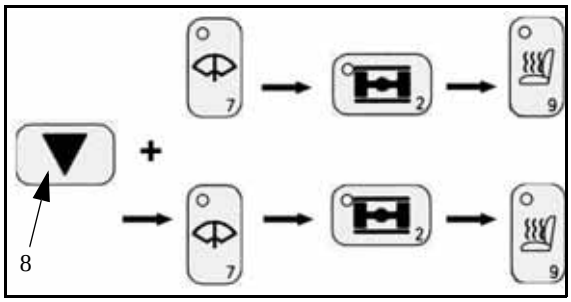


METHOD OF SETTING, CHANGING PASSWORD

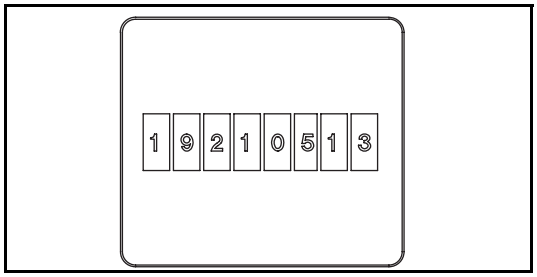
1. Turn Starter key switch to 'on' position (wait 10 minutes). Press and hold down switch (8). Using the 10 digit key pad, input the following number sequence: 7->2->9->7->2->9

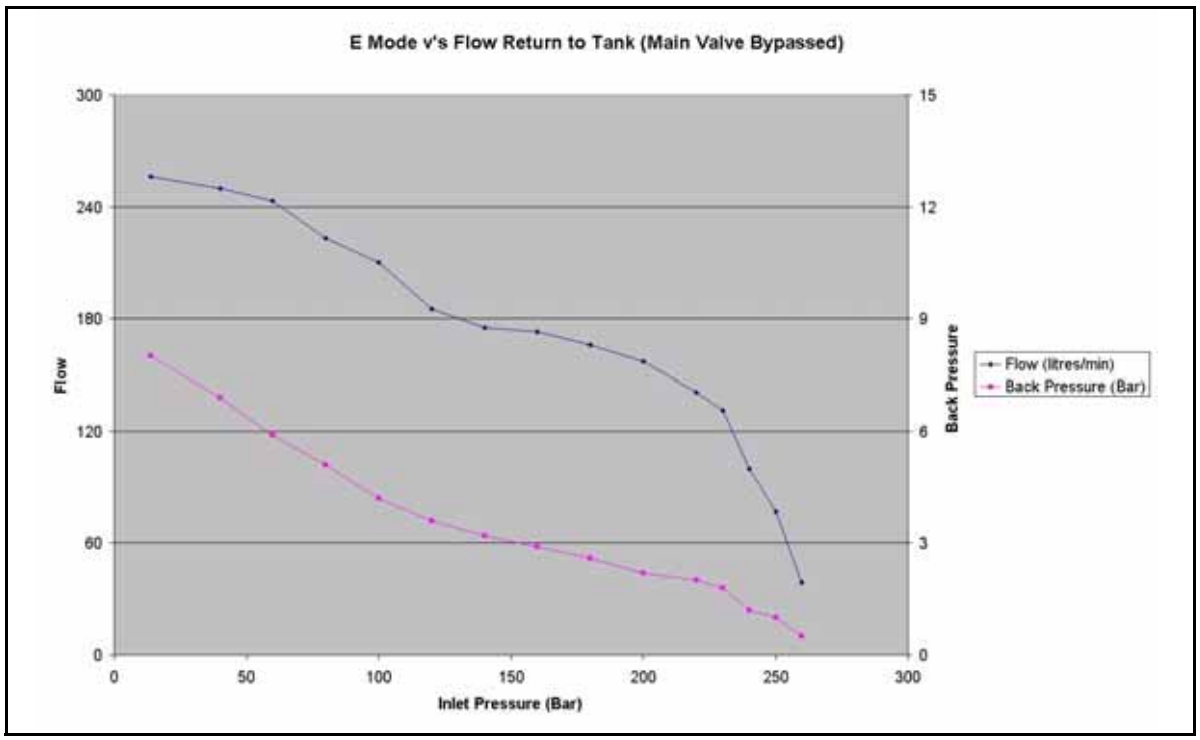
   If input correctly, the display screen will change to an 8 digit numerical input screen.

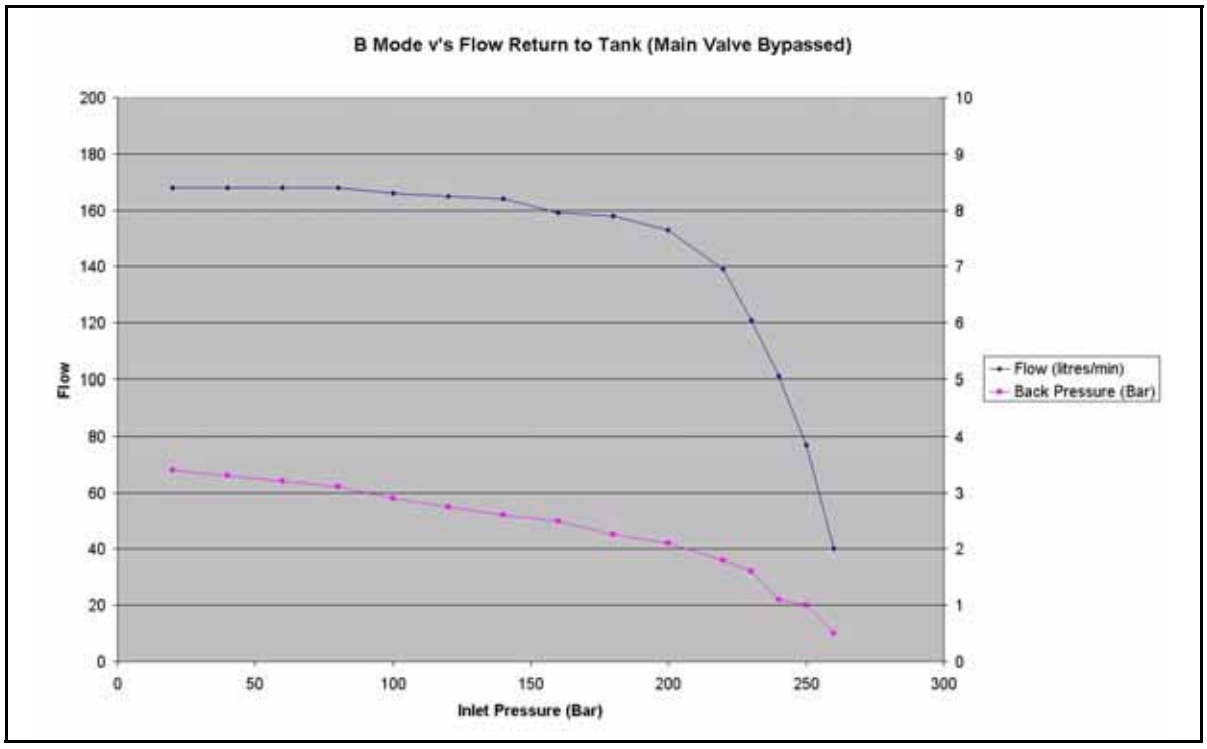




2. On the input screen, use the 10-key pad to input an 8-digit number [19210513]. When the final digit [number 3] is input, the screen will change to the Valid/Invalid screen for the password function.



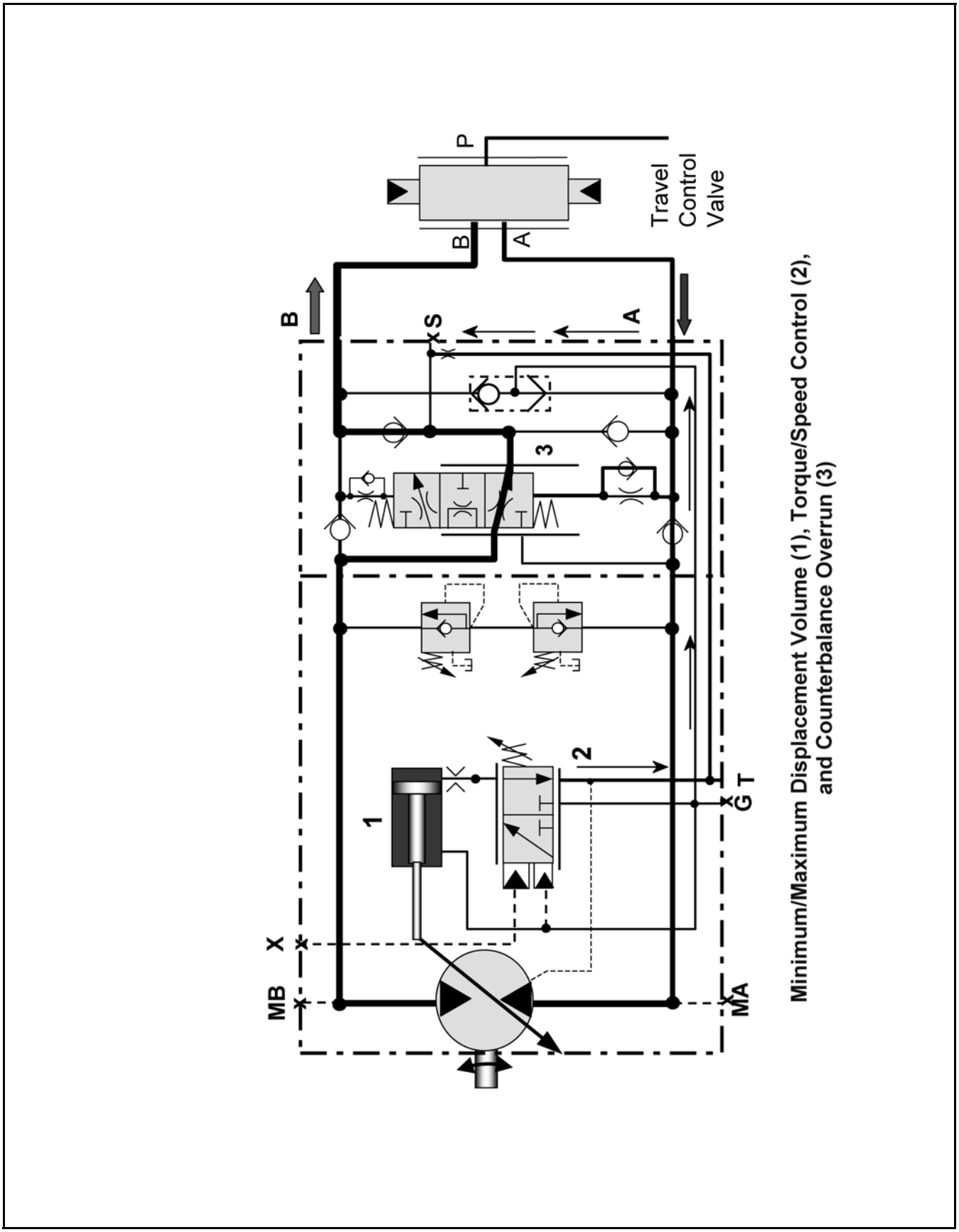




NOTE: The data given here is intended as a guide only. This is because the data is typical for an excavator of this type therefore there will be variation from one machine to another.

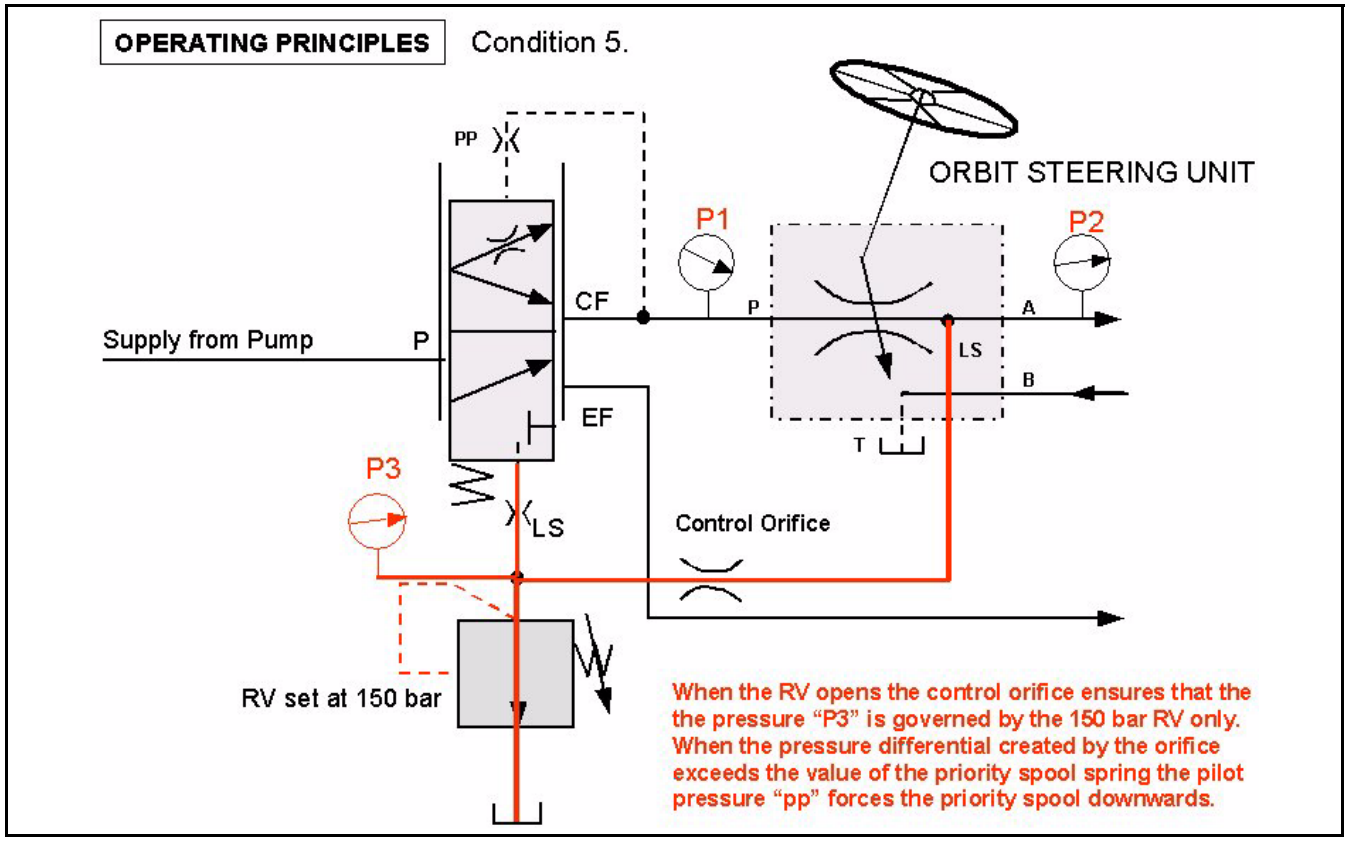
1. Travel Motor.

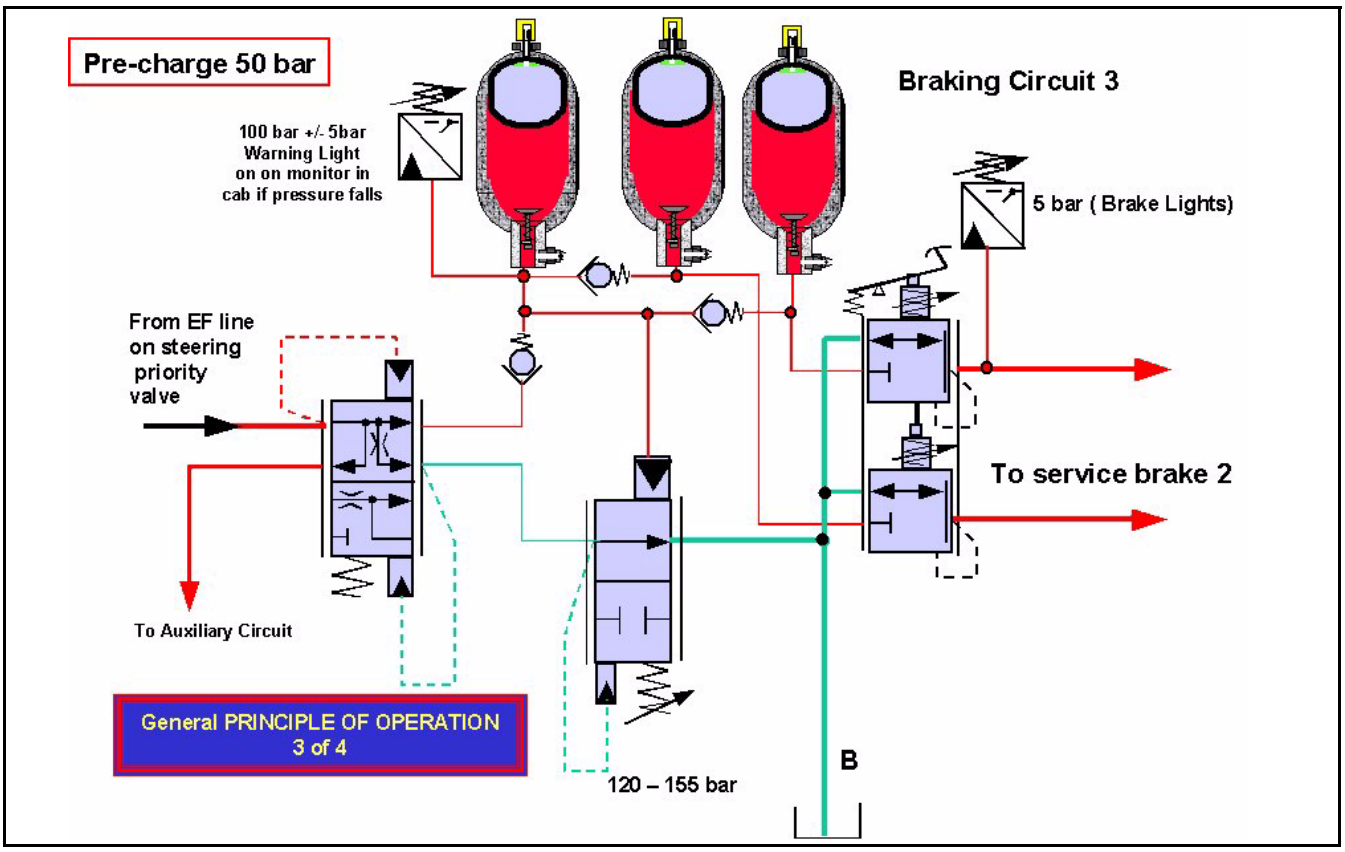
1.5 Motor begins to overrun and pressure falls on supply side: This causes counterbalance valve to begin to close and throttle return flow from motor.

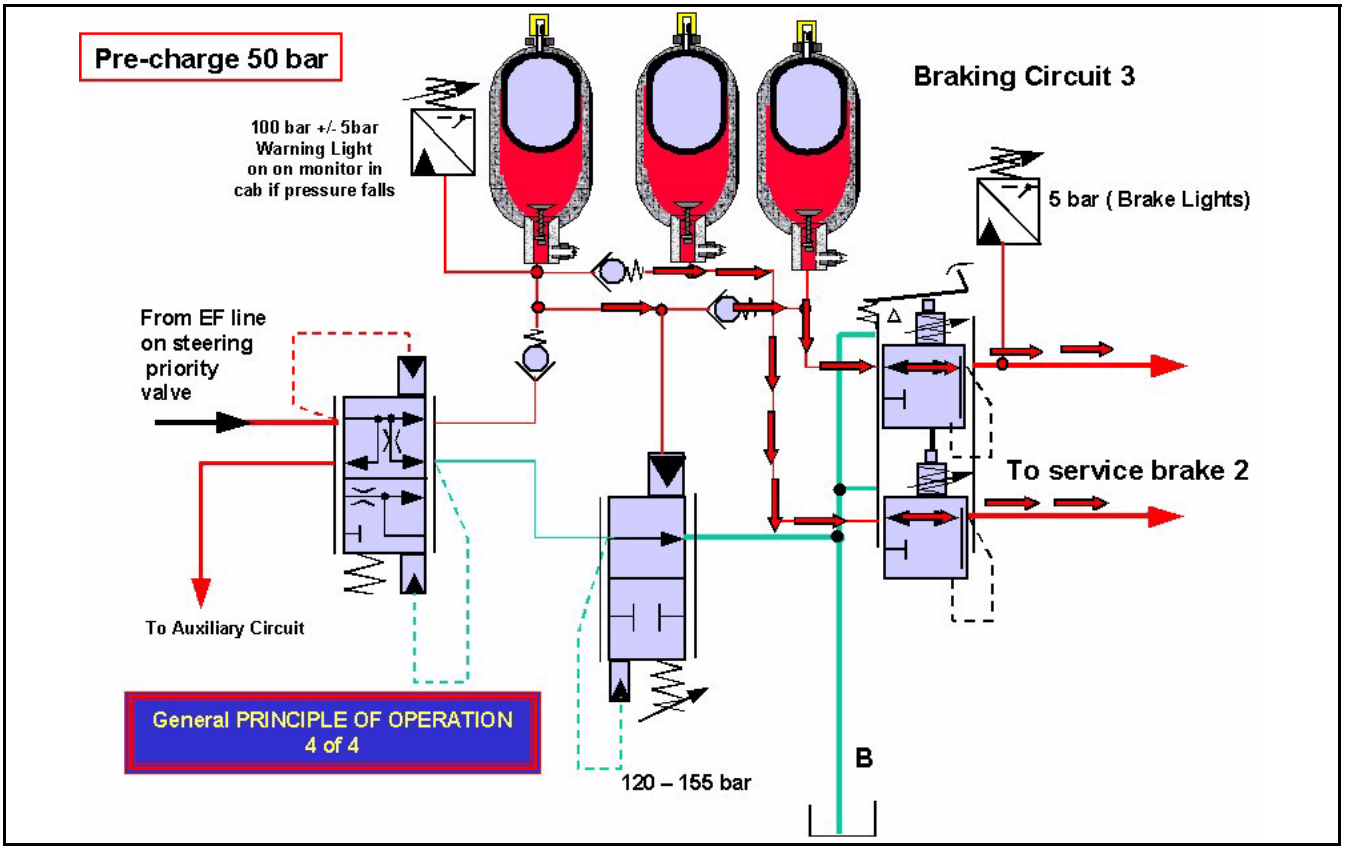


Condition	Relief pressure
During travel	34.8 Mpa ($355\ kg/cm^2$) ↓ ↓ 37.2 Mpa ($380\ kg/cm^2$)
When swing lock switch is turned on	
When boom is lowered	
When one-touch power maximizing function is turned on.	
When L mode is operated	

5. Condition 5.




Pre-charge 50 bar
100 bar +/- 5bar
Warning Light
on on monitor in
cab if pressure falls
Braking Circuit 3
5 bar (Brake Lights)
From EF line
on steering
priority
valve
To service brake 2
To Auxiliary Circuit
General PRINCIPLE OF OPERATION
3 of 4
120 – 155 bar
B


Pre-charge 50 bar
100 bar +/- 5bar
Warning Light
on on monitor in
cab if pressure falls
Braking Circuit 3
5 bar (Brake Lights)
From EF line
on steering
priority
valve
To service brake 2
To Auxiliary Circuit
General PRINCIPLE OF OPERATION
4 of 4
120 – 155 bar
B

Applicable model					PW160-7K	
Category	Item		Measurement Condition	Unit	Standard value	Permissible value
Leakage of travel motor	Leakage of travel motor		• Engine running at high idle • Hydraulic oil temperature 45~55°C. Within operation range. • Apply service brake and relieve travel circuit. • Disconnect transmission drain line.	l/min	5 ±1	Max. 10
Work equipment	Hydraulic drift of work equipment	Whole work equipment (tooth tip fall amount)	 (including bucket mass) • Hydraulic oil temperature: Within operation range • Flat and level ground • Work equipment in measurement posture as illustrated above • Engine stopped • Work equipment control lever in NEUTRAL position • Fall amount for 15 minutes as measured every 5 minutes starting immediately after initial setting	mm	Max. 600	Max. 900
		Boom cylinder (cylinder retraction amount)			Max. 18	Max. 27
		Arm cylinder (cylinder extension amount)			Max. 160	Max. 240
		Bucket cylinder (cylinder retraction amount)			Max. 40	Max. 58
		Second Boom adjust cylinder (Cyl retraction amount)			Max. 20	Max. 30

★ The one-touch power max. function is automatically released in 8.5 seconds, even if the knob switch is kept depressed. Take measurement during the period.

3.RPM when auto-decelerator is set

a. Turn the auto-decelerator ON.
b. Set the fuel dial at high idling (MAX).
c. Move all the control levers of work equipment, swing and travel to the NEUTRAL position.

★ Approx. 5 seconds after all the control levers are moved to the NEUTRAL position, the rpm falls automatically. That is when the rpm with the auto-decelerator in motion should be measured.

5. Detach all the measurement tools after the inspection, and make sure that the machine is back to normal condition.

WARNING! Stop engine before detaching measurment tools.

ADJUSTMENT

1. Adjustment of RPM at low idling

★ If the rpm at low idling deviates from the standard value, make adjustment using the adjustment function provided in the monitor panel.

★ For the adjustment procedures, refer to the section, See “Function for Low Idle Speed adjustment” on page 176."

2. Adjustment of Governor Spring

★ If the rpm at high idling deviates from the standard value, or it is unsteady (hunting), adjust the governor spring securing dimensions, using the adjustment function in the monitor panel.

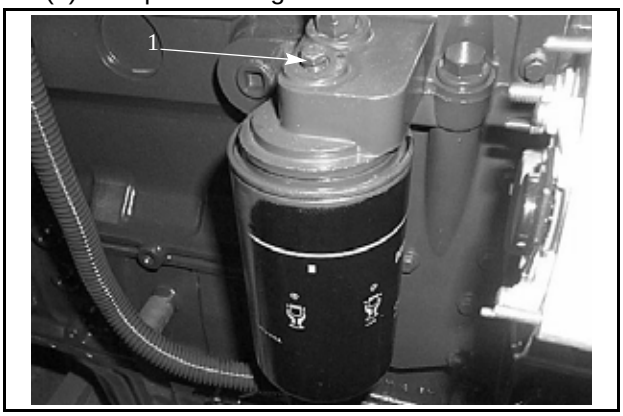
★ For the adjustment procedures, refer to the section, See “Function for Governor Motor Adjustment” on page 175.

MEASUREMENT OF ENGINE OIL PRESSURE

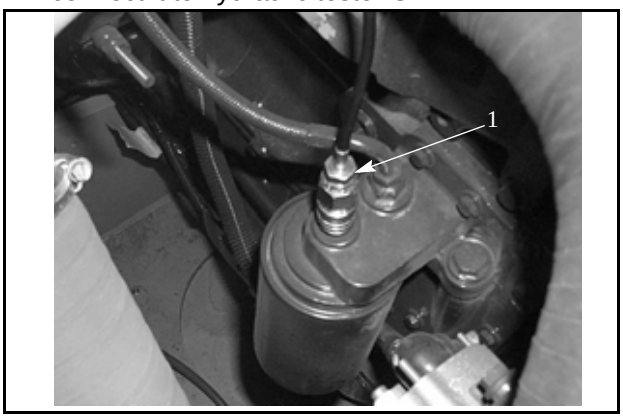
★ Engine oil pressure measurement tools

Mark		Part No.	Part Name
G	1	799-101-5002	Hydraulic Tester
		790-261-1203	Digital type hydraulic tester
	2	799-401-2320	Hydraulic Tester (1.0MPa{10 kg/cm^2})

1. Take off engine oil pressure measurement plug (1) on top of the engine filter.



2. Install fitting (2) of the hydraulic tester **G1**, and connect it to hydraulic tester **G2**.



3. Start the engine and keep it running until the engine cooling water temperature rises to the operating range.

4. Measure engine oil pressure at low idling as well as at high idling.

5. Detach the measurement tools after the measurement, and make sure that the machine is back to normal condition.

INSPECTION AND ADJUSTMENT OF PUMP PC (VALVE INLET) CONTROL OIL PRESSURE

★ Pump PC control circuit oil pressure inspection and adjustment tools

Mark		Part No.	Part Name
J	1	799-101-5002	Hydraulic Tester
		790-261-1203	Digital Type Hydraulic Tester
	2	799-101-5220	Grease Fitting (10 x 1.25 mm)
		07002-11023	O-ring

MEASUREMENT

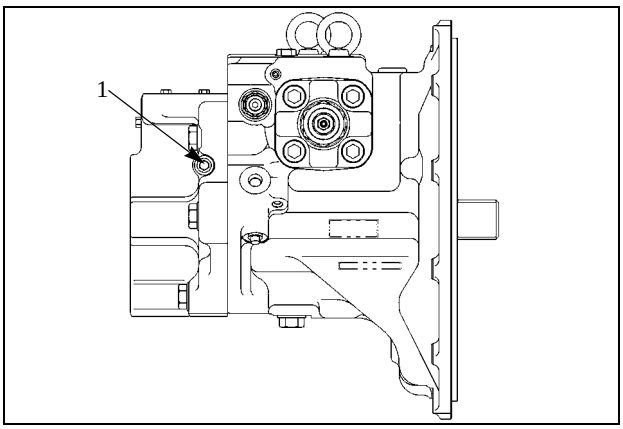
★ Implement measuring the pump PC control circuit oil pressure after confirming that the work equipment, swing and travel circuit oil pressure as well as the control circuit original oil pressure are normal.

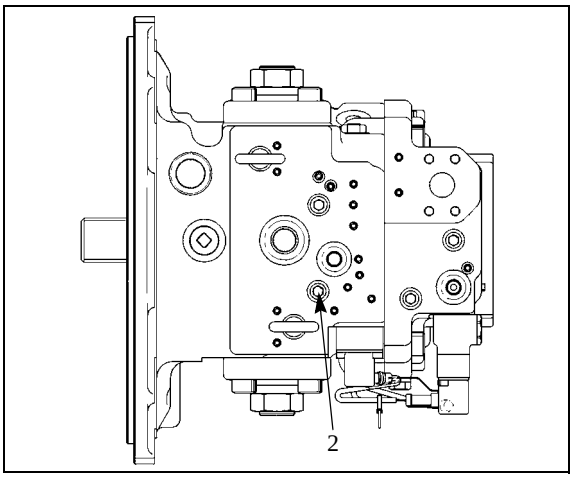
CAUTION!Lower the work equipment to the ground and stop the engine. After the engine stops, operate the control lever several times to release the remaining pressure in the piping. Then loosen the oil filler cap to release the pressure inside the hydraulic tank. Ignition switch must be in the 'ON' position.

1. Measurement of PC valve output pressure (servo piston inlet pressure)

★ Measure PC valve output pressure (servo piston inlet pressure) and pump delivery pressure together, and compare the two pressures.

1) Remove oil pressure measurement plugs (1) and (2).
- Plug (1): For measuring the pump delivery pressure
- Plug (2): For measuring the pump PC valve delivery pressure





2) Fit fitting **J2** and connect to oil pressure gauge ① of hydraulic tester **J1**.

★ Use an oil pressure gauge with the capacity of 58.8 MPa{600 kg/cm^2}

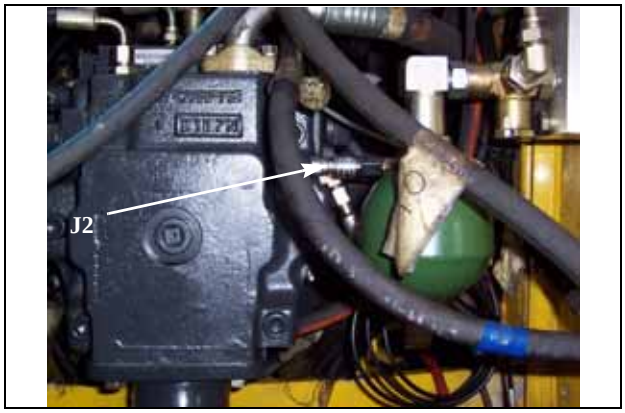
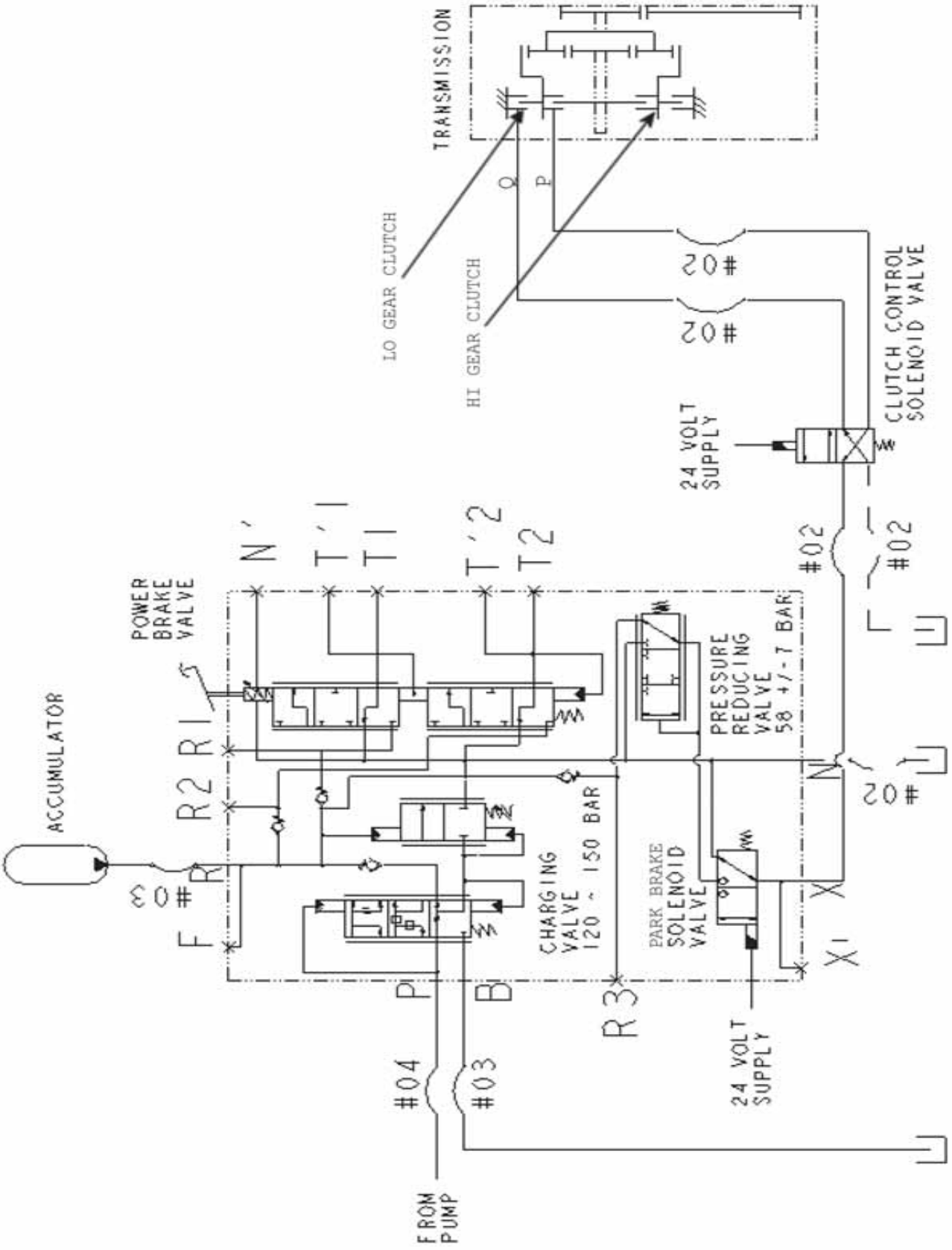


Table for Functioning Conditions - Travel neutral solenoid valve.

Functioning Condition		Functioning
Travel Neutral	When travel forward selected	On
	When travel reverse selected	
	When travel neutral selected	Off
	Lock lever raised	

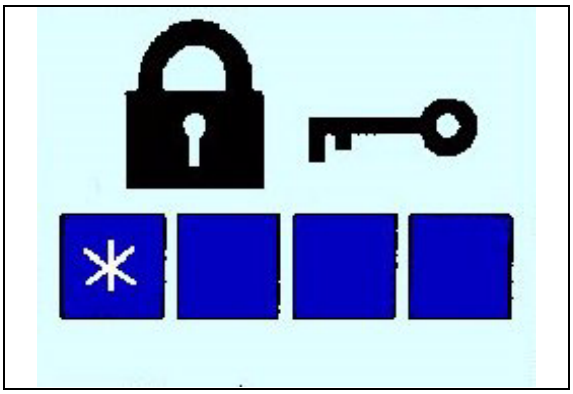
Table for Functioning Conditions - Travel creep solenoid valve.

Functioning Condition		Functioning
Travel Creep	Creep selected	On
	Creep not selected	Off
	Stationary	On


TRANSMISSION
Q
P
LO GEAR CLUTCH
HI GEAR CLUTCH
20#
20#
CLUTCH CONTROL SOLENOID VALVE
24 VOLT SUPPLY
N'
T'1
T1
T'2
T2
#02
#02
POWER BRAKE VALVE
PRESSURE REDUCING VALVE 58 +/- 7 BAR
ACCUMULATOR
R2
R1
F
R
20#
CHARGING VALVE 120 - 150 BAR
PARK BRAKE SOLENOID VALVE
N
20#
X1
P1
B1
R3
#04
#03
24 VOLT SUPPLY
FROM PUMP

OPERATION OF OPERATOR'S MENU AND DISPLAY (OUTLINE)

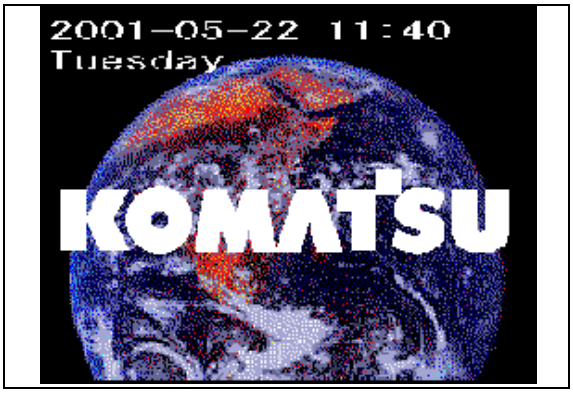
★ This section introduces only the outline of the operator's menu. For details on the contents and operation steps of each menu, refer to the operation and maintenance manual or the chapter of "STRUCTURE AND FUNCTION" in this shop manual.



1. Function for inputting and setting password

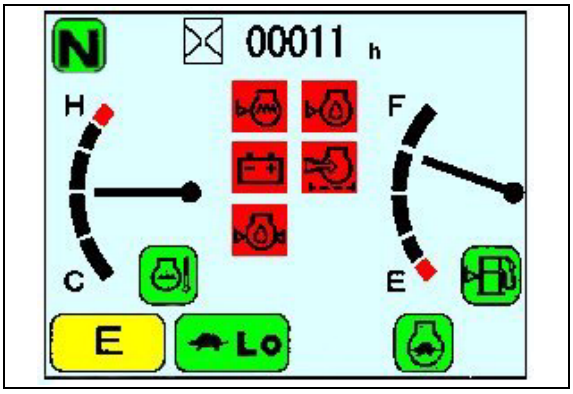
When the engine starting switch is turned ON, the password inputting display is shown.

★ This display is shown only when a password is registered.



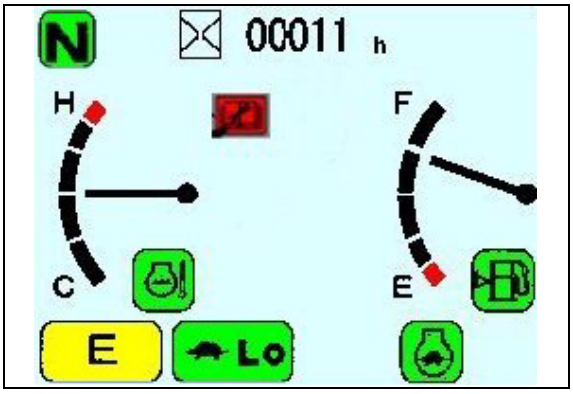
2. Function for showing KOMATSU logo

When a password is input, or when the engine starting switch is turned ON, KOMATSU logo is shown for two seconds.



3. Function for machine inspection before starting day's work

Following the KOMATSU logo, the display of machine inspection before starting day's work is shown for 2 seconds.



4. Function for machine maintenance

Following the display of machine inspection before starting day's work, the maintenance mark appears for 30 seconds, if there is a service item whose maintenance time is approaching or has just passed.

★ This display appears only when the maintenance function is set.

1. Function of monitoring [01]

The monitor panel monitors signals from an assortment of switches, sensors and actuators installed in various parts of the machine. Monitored information can be put in display or confirmed on a real time basis through the following operations.

1) Selection of menu
Select "01 Monitoring" in the initial display of Service Menu and depress [√] switch.

2) Setting of monitoring item
Select or register an item to be monitored through the following switch operation.

- [▲] switch: Selection
- [▼] switch: Selection
- [√] switch: Registration

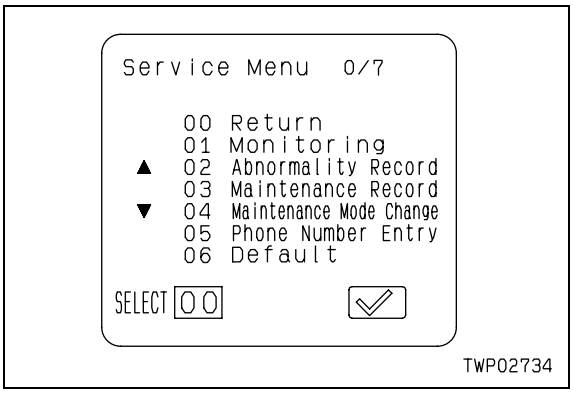
★ A monitoring item can be set in any number between the min. one to the max. four. (Depending upon the selected item, the max. number maybe than four)

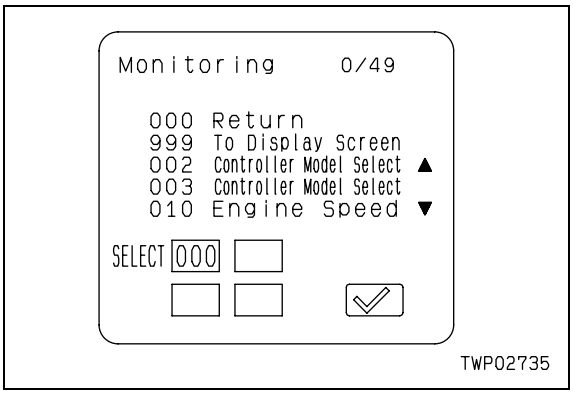
★ In case of monitoring 1 to 3 items, move to the monitored information display through any of the following switch operations, after the registration work has been completed.
  - Keep [√] switch depressed. (For about 3 seconds)
  - Select Menu 999 and depress [√] switch.

★ The display automatically moves to the display of monitored information, when all of the registrable items have been duly registered.

★ Monitored information are transmitted via communication circuits. Thus the number of selected items can impact the communication speed. If truly real time monitoring is required, reduce the selected items to the minimum.

★ For details on the monitoring items, display unit, etc., refer to the Table for Monitoring Items.



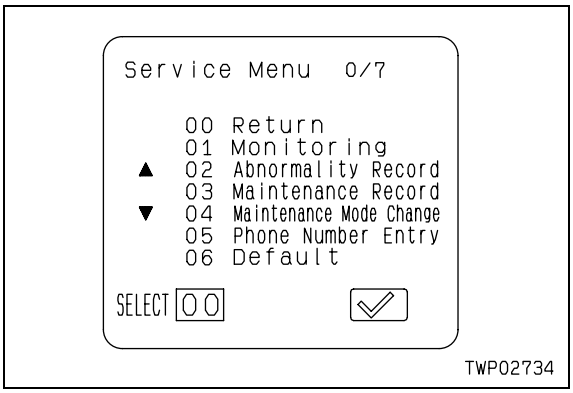


1. Function for Default [06]

It is possible to change the following settings for the monitor panel as well as the machine. Make a change as is required.

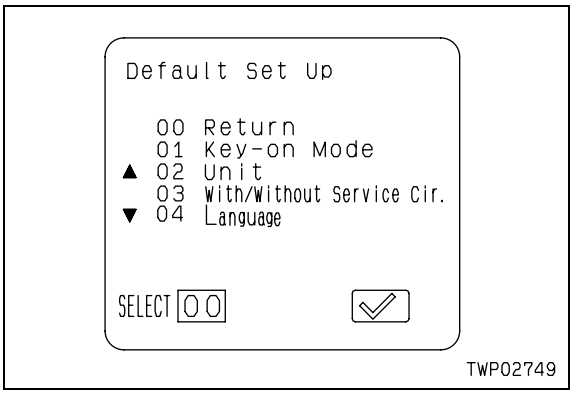
- Working mode when the engine starting switch is in the ON position.
- Display unit in the monitoring function
- With/Without Service Circuit.

1) Selection of menu
Select 06 "Default menu" in the initial display of Service Menu, and depress [✓] switch.

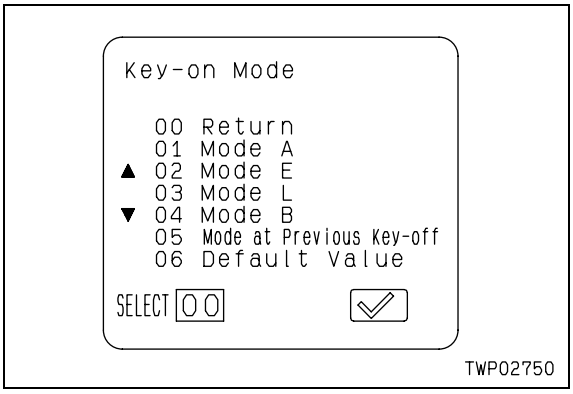


2) Selection of submenu
Select an item to change from the submenu, and depress [✓] switch.

No.	Default submenu
00	Return (Termination of Default)
01	Key-on Mode
02	Unit
03	With/Without Service Cir.



3) Function for Key-on Mode
When the engine starting switch is turned ON, a working mode can be set that is shown in the monitor panel.
   - A, E, L and B Modes: If any of them is set, the machine always starts up with that working mode, when turning the engine starting switch ON.
   - Mode at Previous Key-off: If this mode is set, the machine starts up with the working mode that was last used in the previous machine operation.
   - Default Value: If this mode is set, the machine starts up with the default mode (A mode) that was originally set at the time of delivery from the factory.
   - Irrespective of this setting mode, a machine "With attachment" always ramps up with B mode, when the engine starting switch is turned ON at the subsequent operation, if that was the working mode used in the last machine work.



TROUBLESHOOTING

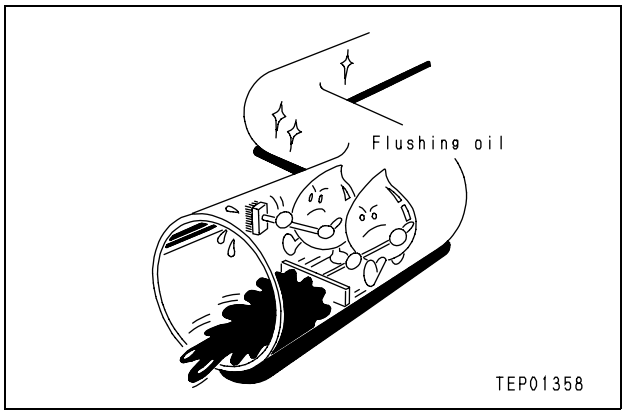
5) Change hydraulic oil when the temperature is high.

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.

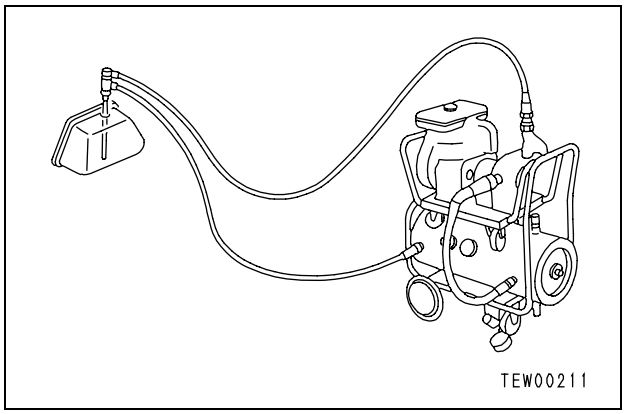
Normally, flushing is carried out twice: primary flushing is carried out with flushing oil, and secondary flushing is carried out with the specified hydraulic oil.



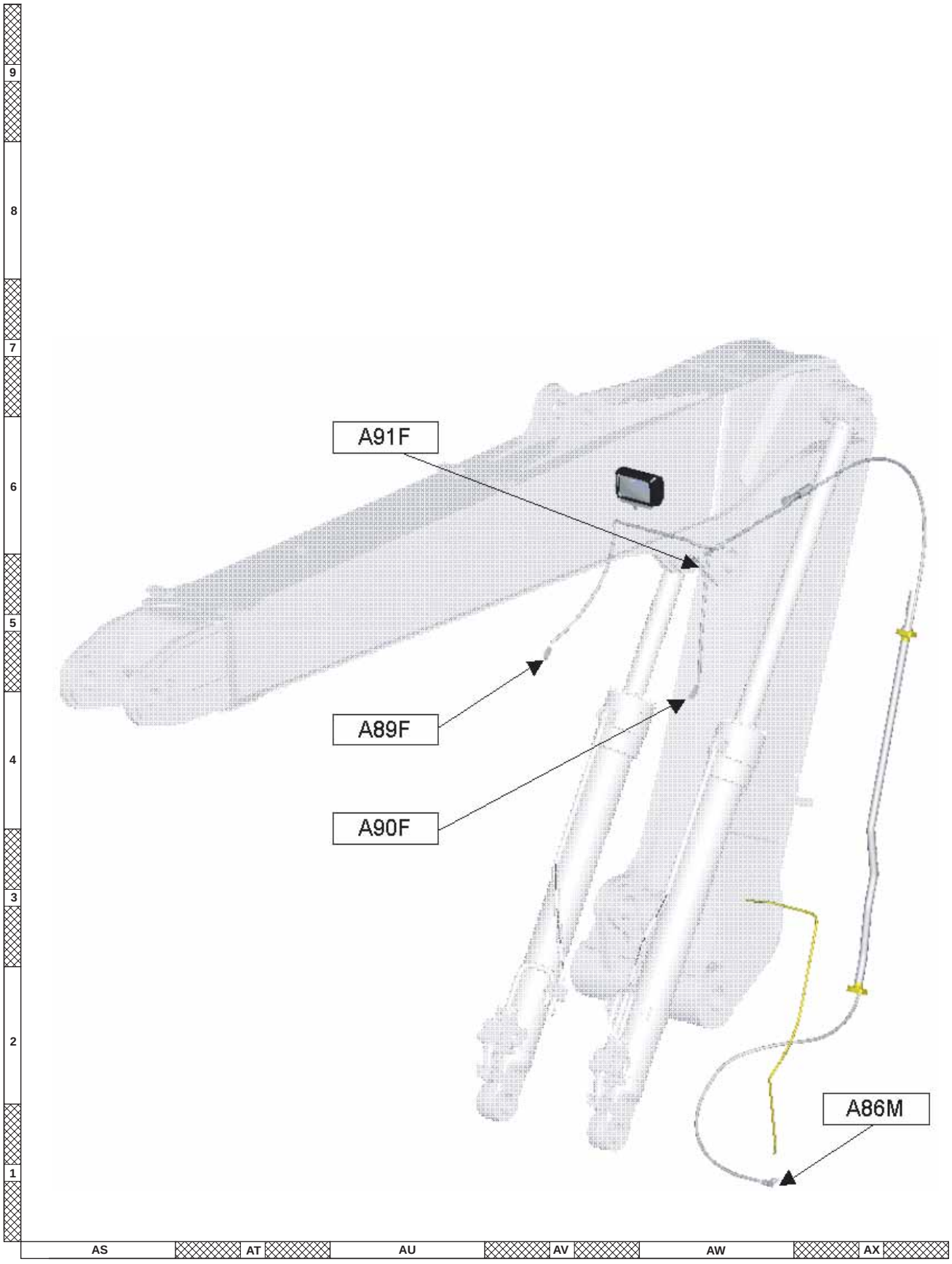
7) Cleaning operations

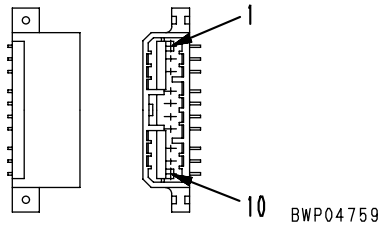
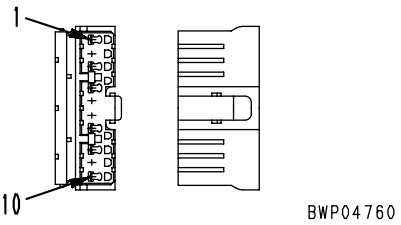
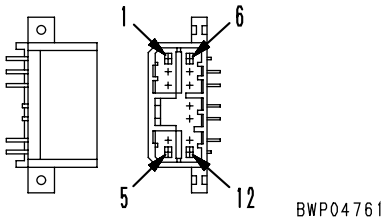
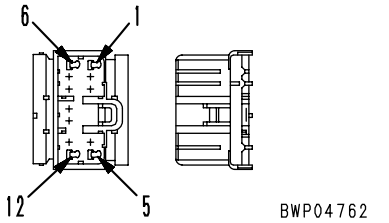
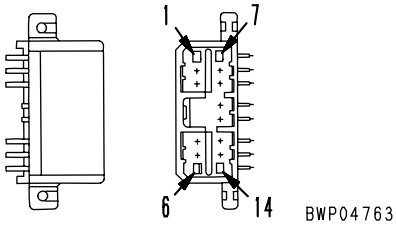
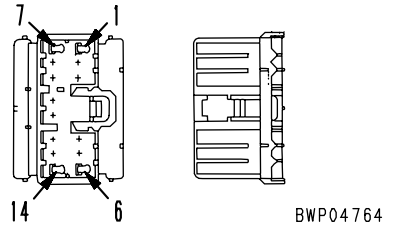
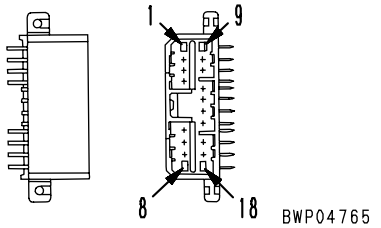
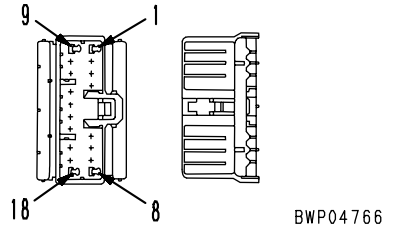
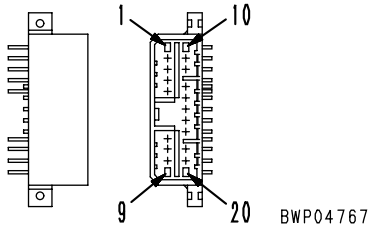
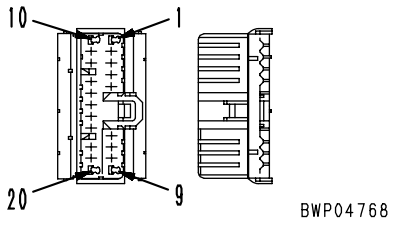
After repairing the hydraulic equipment (pump, control valve, etc.) or when running the machine, carry out oil cleaning to remove the sludge or contaminants in the hydraulic oil circuit.

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.

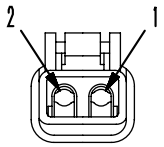
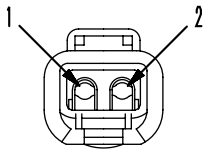
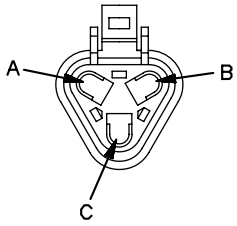
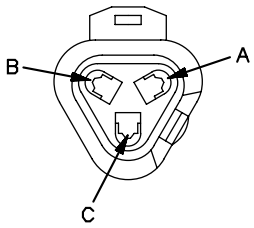
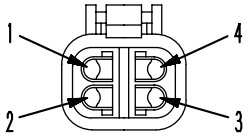
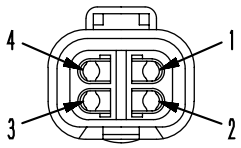
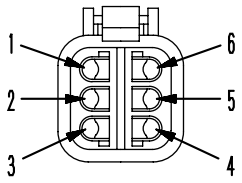
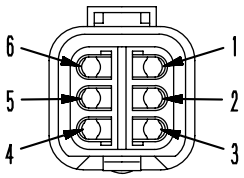


Conn No.	Type	No.of Pin	Name of Device	Address			
				stereo	sht 1	sht 2	sht 3
R14	Grote	9	PPC lock relay	AJ-3			
R15	Grote	9	Starter cut (personal code) relay	AJ-3			
R16	Grote	9	Starter cut (work equip.) relay	AJ-3			
R17	Grote	9	Starter cut (Travel N) relay	AJ-2			
R18	Grote	9	Emergency (travel N) relay	AJ-2			
R19	Grote	9	Emergency (travel FR) relay	AJ-2			
R21	Grote	9	Hazzard warning on/off relay	AK-2			
R22	Grote	9	Hazzard warning right lamp relay	AK-2			
R23	Grote	9	Hazzard warning relay	AK-2			
R24	Grote	9	Brake light interlock relay	AK-1			
R25	Grote	9	Indicator power cut relay	AK-2			
R26	Grote	9	Clamshell left relay	AK-2			
R27	Grote	9	Clamshell right relay				
S01	X	2	Swing RH oil pressure switch	M-2			
S02	X	2	Swing LH oil pressure switch	M-2			
S03	X	2	Bucket dumping oil pressure switch	L-2			
S04	X	2	Bucket digging oil pressure switch	L-2			
S05	X	2	Arm dump oil pressure switch	M-2			
S06	X	2	Arm digging oil pressure switch	M-2			
S07	X	2	2PB extend oil pressure switch	L-2			
S08	X	2	2PB retract oil pressure switch	L-2			
S09	X	2	Travel reverse oil pressure switch	L-3			
S10	X	2	Travel forward oil pressure switch	L-3			
S12	X	2	Stabilizer + boom down oil pressure switch	L-2			
S13	X	2	Stabilizer + boom up oil pressure switch	L-3			
S17	DT	2	Park brake oil pressure switch	C-3			
S18	DT	2	Low brake oil presssure switch	C-3			
S19	DT	2	Stop lights oil pressure switch	C-3			
S20	X	2	Service oil pressure switch	L-2			
S21	X	2	Service oil pressure switch	M-2			
S21	Terminal	6	Pump emergency driving switch	AF-8			
S22	Terminal	6	Swing and parking brake emergency switch	AF-8			
S25	M	3	Fuel dial	AE-8			
S28	DT	12	Intermediate	AB-8			
S29	DT	6	Intermediate	AB-8			
S95	Terminal	6	Emergency travel switch	AF-8			
S96	Terminal	6	Emergency F-N-R switch	AF-8			
T11	Terminal	1	Earth	Z-3			
V01	DT	2	PPC Pressure Lock Solenoid	I-4			
V02	DT	2	2 Stage Relief Solenoid	I-4			
V03	DT	2	Swing Brake Sol	I-5			
V04	DT	2	Suspension Lock Solenoid	I-5			
V06	DT	2	Travel Neutral Solenoid	I-5			
V07	DT	2	Creep solenoid	I-7			
V08	DT	2	Travel F/R solenoid				
V09	DT	2	Boom down / Stabilizer solenoid	L-3			
V10	DT	2	Boom up / Stabilizer solenoid	L-3			


9
8
7
6
5
4
3
2
1
A91F
A89F
A90F
A86M
AS
AT
AU
AV
AW
AX

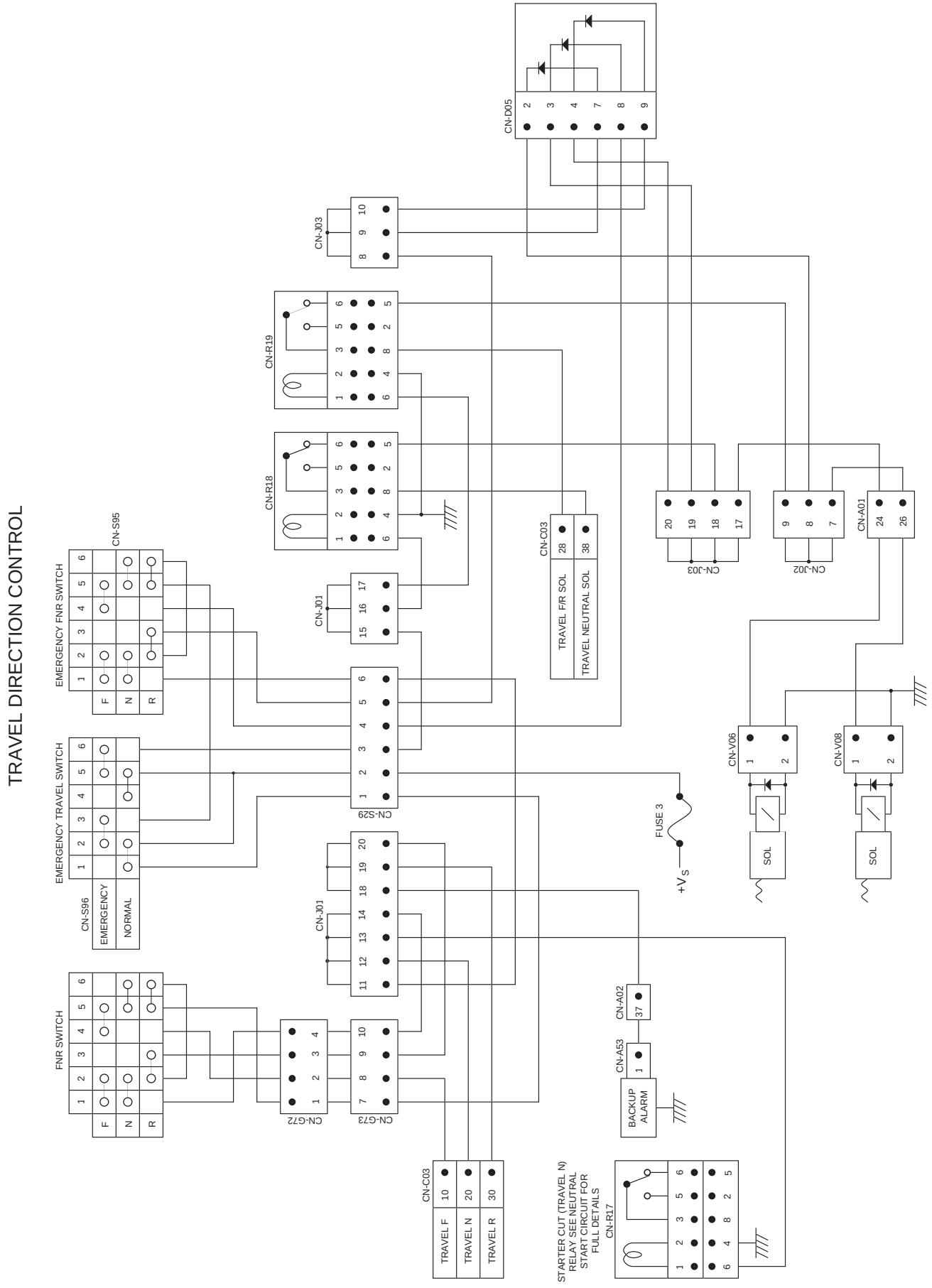
No.of pins	AMP070 type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
10			799-601-7510
	—	Part No.: 08195-10210	
12			799-601-7520
	—	Part No.: 08195-12210	
14			799-601-7530
	—	Part No.: 08195-14210	
18			799-601-7540
	—	Part No.: 08195-18210	
20			799-601-7550
	—	Part No.: 08195-20210	

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

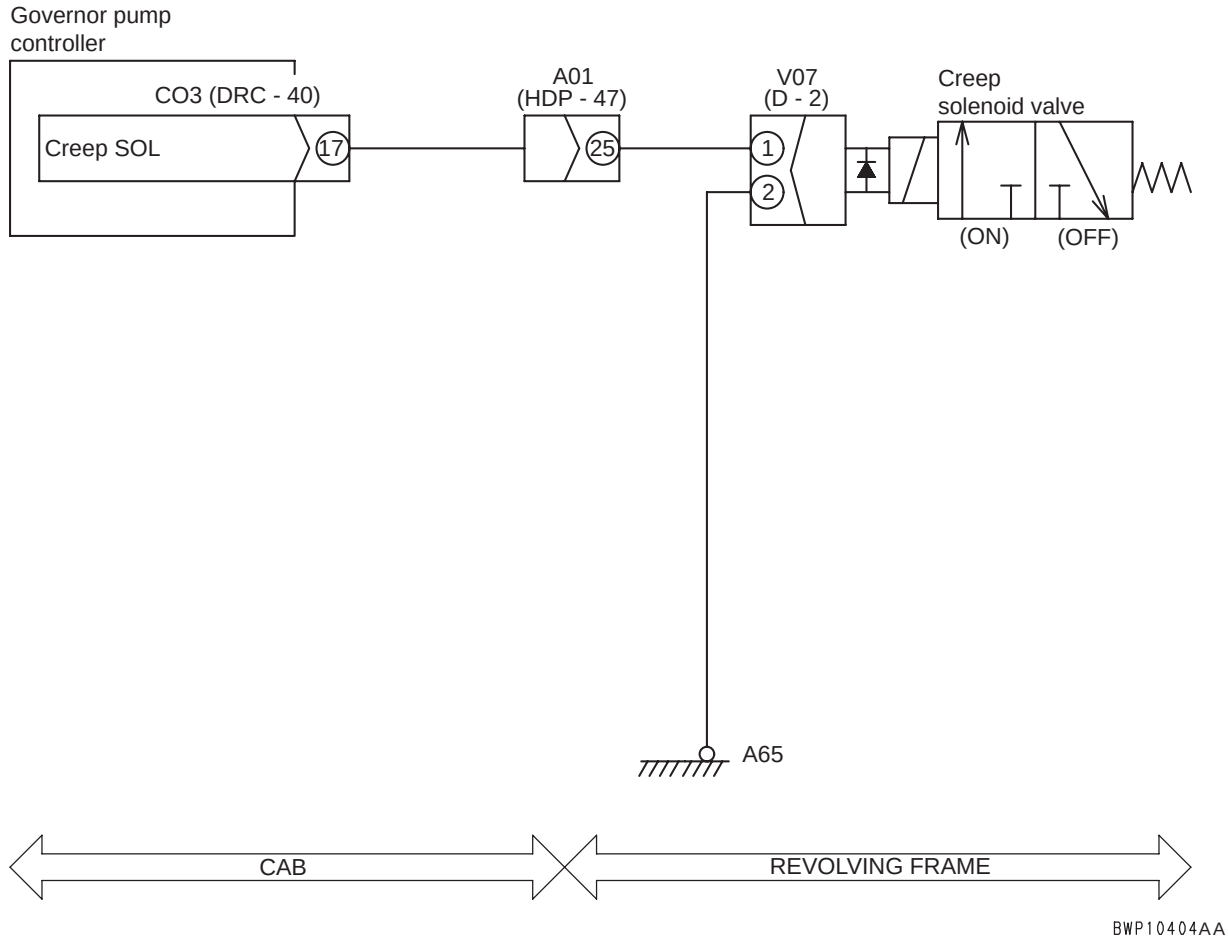
No.of pins	DT Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
2	 BWP05037	 BWP05038	799-601-9020
	Part No.: 08192-12200 (normal type) 08192-22200 (fine wire type)	Part No.: 08192-12100 (normal type) 08192-22100 (fine wire type)	
3	 BWP05039	 BWP05040	799-601-9030
	Part No.: 08192-13200 (normal type) 08192-23200 (fine wire type)	Part No.: 08192-13100 (normal type) 08192-23100 (fine wire type)	
4	 BWP05041	 BWP05042	799-601-9040
	Part No.: 08192-14200 (normal type) 08192-24200 (fine wire type)	Part No.: 08192-14100 (normal type) 08192-24100 (fine wire type)	
6	 BWP05043	 BWP05044	799-601-9050
	Part No.: 08192-16200 (normal type) 08192-26200 (fine wire type)	Part No.: 08192-16100 (normal type) 08192-26100 (fine wire type)	

TROUBLESHOOTING WHEN SERVICE CODE "ELECTRICAL SYSTEM" AND FAILURE CODE "MECHANICAL SYSTEM" ARE INDICATED

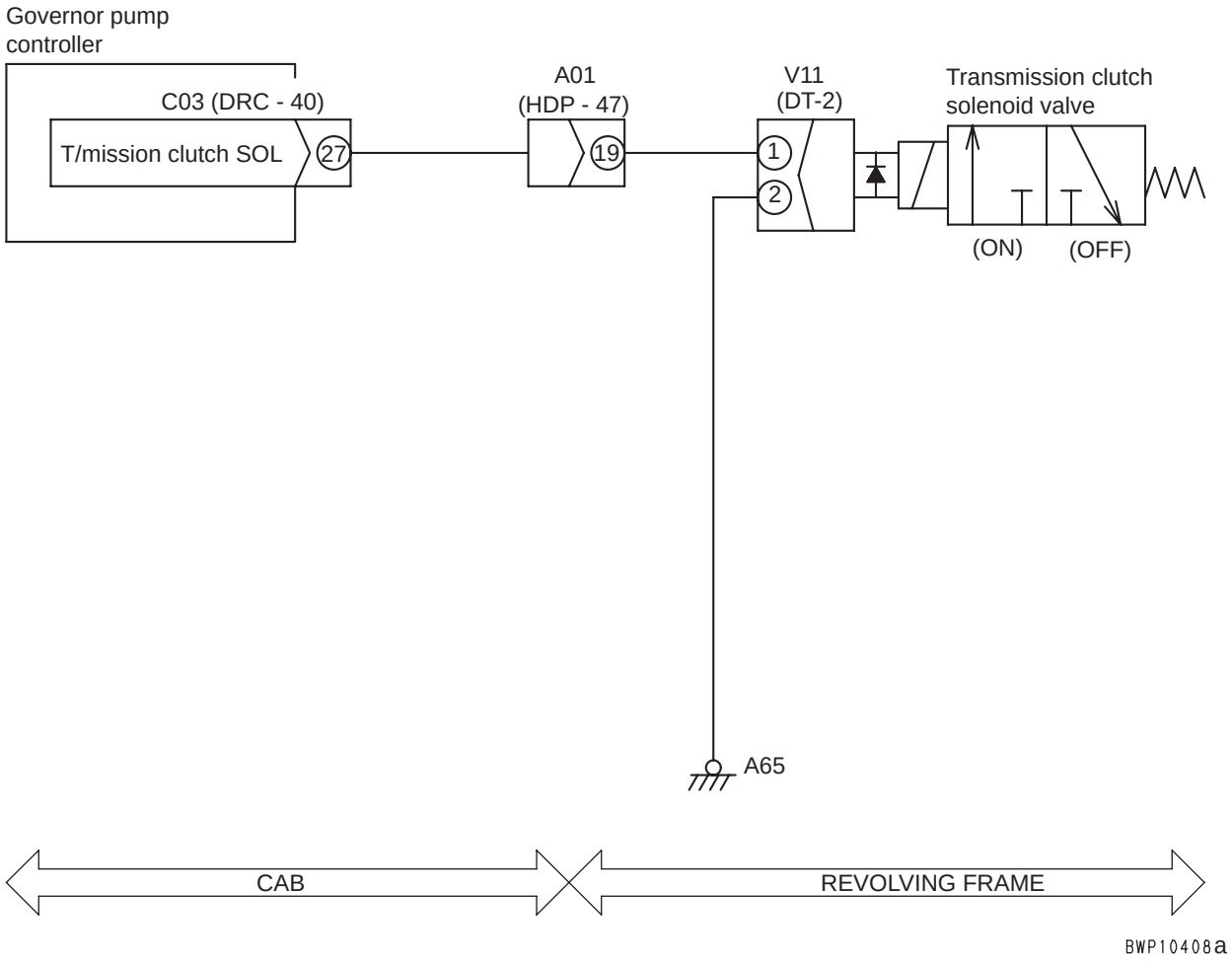
Electrical Circuit for Travel Neutral Solenoid in Governor Pump Controller



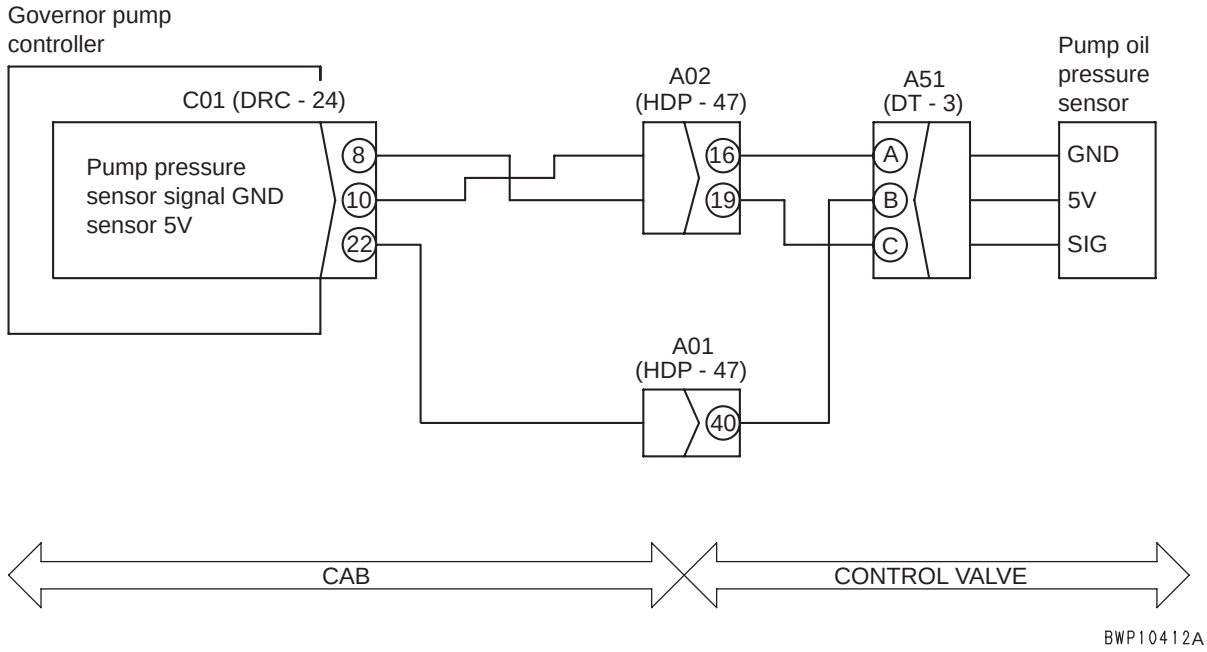
Electrical Circuit Diagram for Creep Solenoid in Governor Pump Controller



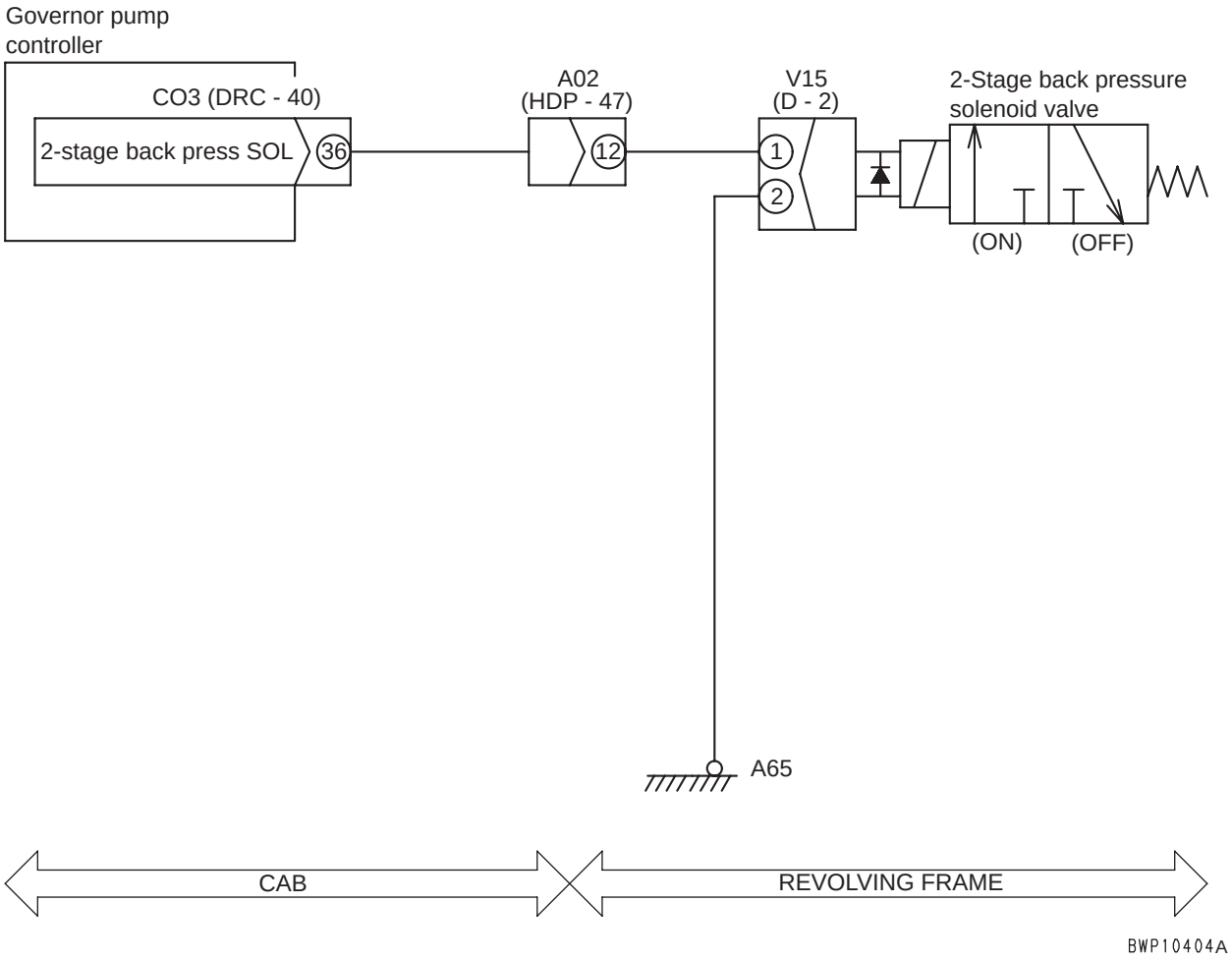
Electrical Circuit Diagram for Transmission Clutch Solenoid in Governor • Pump Controller



Electrical Circuit Diagram for Pump Pressure Sensor in Governor • Pump Controller



Electrical Circuit Diagram for 2-Stage Back Pressure Solenoid in Governor • Pump Controller



Service Code in Electrical System E315 (Short-circuiting in battery relay)

User Code	Service Code	Failure Code	Failure phenomenon	Short-circuiting in battery relay (in governor • pump controller)
—	**E315**	**D110KB**		
Failure content	• Abnormal current flew to the battery relay drive circuit, when power was supplied to the circuit.			
Response from controller	• The controller turns OFF power to the battery drive circuit. • Even when the failure cause disappears, the relay does not return to normal, unless the engine starting switch is once turned OFF.			
Phenomenon occurring on machine	• The engine does not stop.			
Relative information	• It can be confirmed in the monitor function how the battery relay works (ON or OFF). (Code No. 037: Controller output)			

Presumed cause and standard value in normal	Cause		Standard value in normal and references for troubleshooting			
	1	Battery relay defective (Internal failure)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Battery relay	Continuity & Resistance value		
			Between A21 (BR terminal) and A20 (E terminal)	Continued		
			Between A21 (BR terminal) and grounding	Above 1 MΩ		
	2	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness from C03 (female) ④ to D01 to J01 to A21 (BR terminal) and grounding	Resistance value	Above 1 MΩ	
	3	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C03 (female)	Engine starting switch OFF	Voltage	
			Between ④ and grounding	ON → OFF	20 – 30 V (for 4 to 7 seconds)	

Failure Code in Mechanical System A000N1 (Out-of-rate engine rotation at high idling)

User Code	Service Code	Failure Code	Failure phenomenon	Engine rotation at high idling out of rate (in mechanical system)
—	—	**A000N1**		
Failure content	• Engine rotation above 2,450 rpm was detected for more than 10 seconds, while the engine was running.			
Response from controller	• None in particular • If the failure cause disappears of itself, the engine rotation returns to normal.			
Phenomenon occurring on machine	• There is a possibility that the engine is damaged, if is used continuously without adjustment.			
Relative information	• Input from the engine rotation sensor (rpm) can be confirmed in the monitor function. (Code No. 010: Engine rotation)			

		Cause	Standard value in normal and references for troubleshooting
Presumed cause and standard value in normal	1	Failure in engine mechanical system	Check if there has been an internal or external factor that would cause the engine to overrun at high idling, and troubleshoot the mechanical system of the engine.
	2	Governor • pump controller defective	As this is an internal failure, troubleshooting cannot be conducted. (Unless there is any visible trouble found in the machine, use of the controller may be continued as it is)

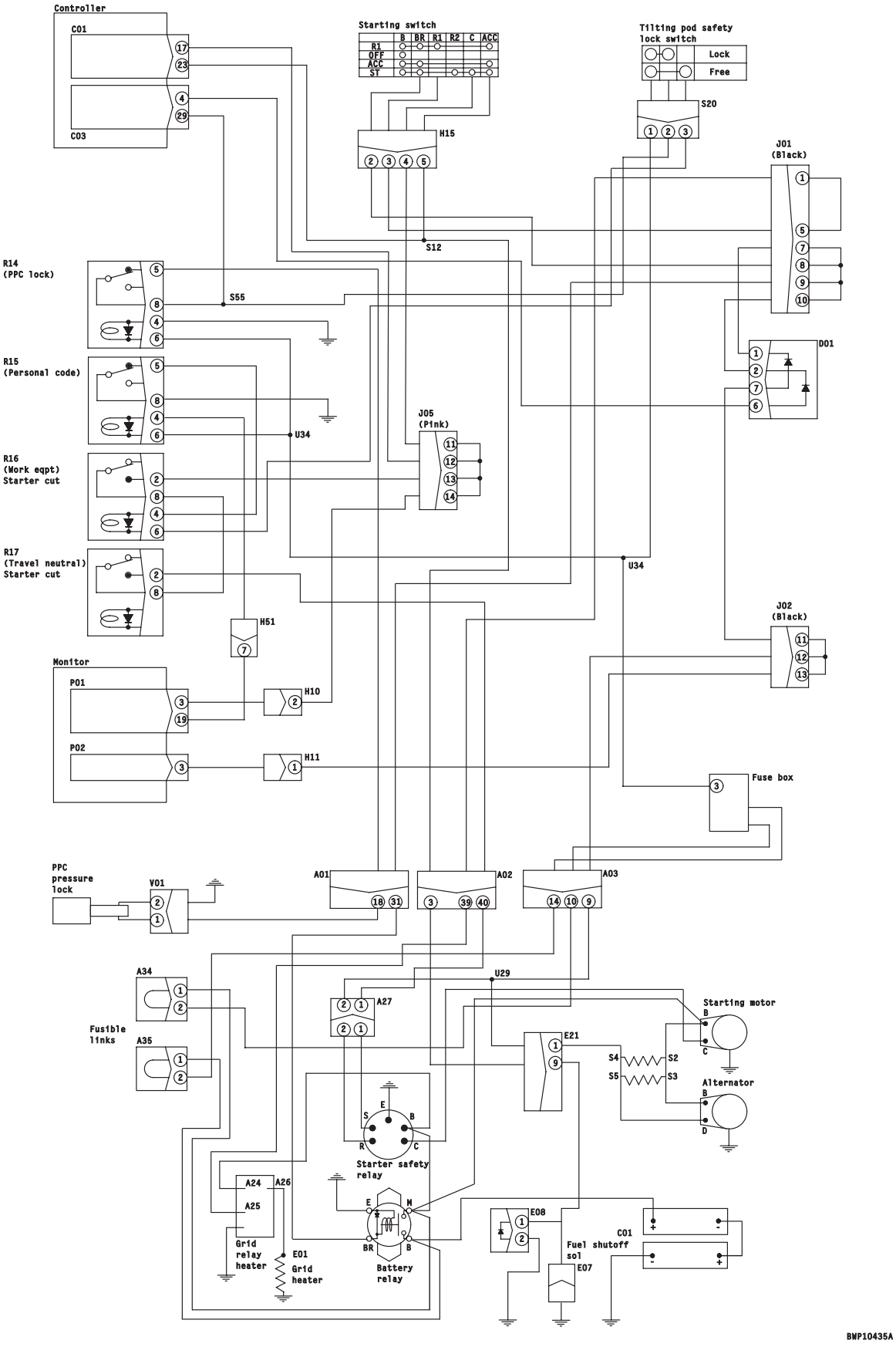
Failure Code in Mechanical System A000N2 (Out-of-rate engine rotation at low idling)

User Code	Service Code	Failure Code	Failure phenomenon	Out-of-rate engine rotation at low idling (in mechanical system)
—	—	**A000N2**		
Failure content	• Engine rotation below 500 rpm was detected for more than 10 seconds, while the engine was running.			
Response from controller	• None in particular • If the failure cause disappears of itself, the rotation returns to normal.			
Phenomenon occurring on machine	• There is a possibility that the engine is damaged, if it is used continuously without adjustment.			
Relative information	• Input from the engine rotation sensor (rpm) can be confirmed in the monitor function. (Code No. 010: Engine rotation)			

		Cause	Standard value in normal and references for troubleshooting
Presumed cause and standard value in normal	1	Failure in engine mechanical system	Check if there has been an internal or external factor that would cause the engine to overrun at high idling, and troubleshoot the mechanical system of the engine.
	2	Governor • pump controller defective	As this is an internal failure, troubleshooting cannot be conducted. (Unless there is any visible trouble found in the machine, use of the controller may be continued as it is)

TROUBLESHOOTING OF ELECTRICAL SYSTEM (E-MODE)

Electrical Circuit Diagram for Engine Start and Stop and Battery Charging

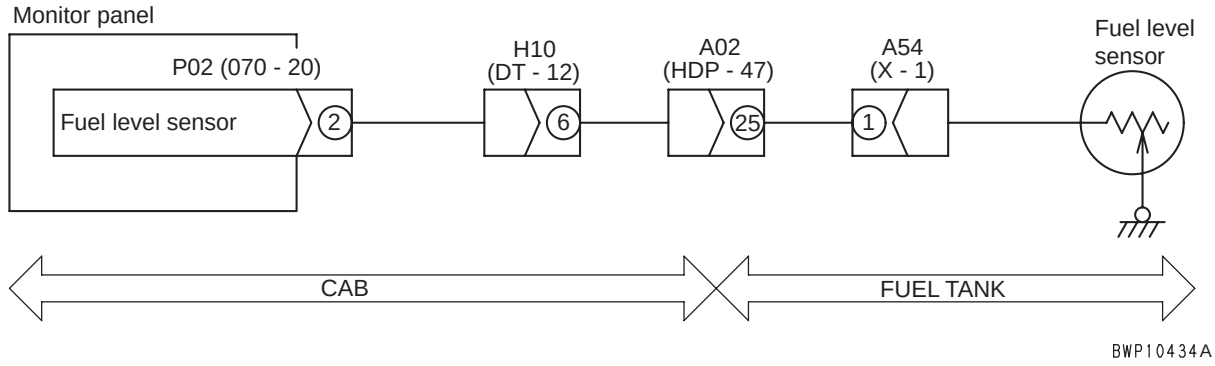


E-13 Fuel level monitor red lamp lights up while engine is running

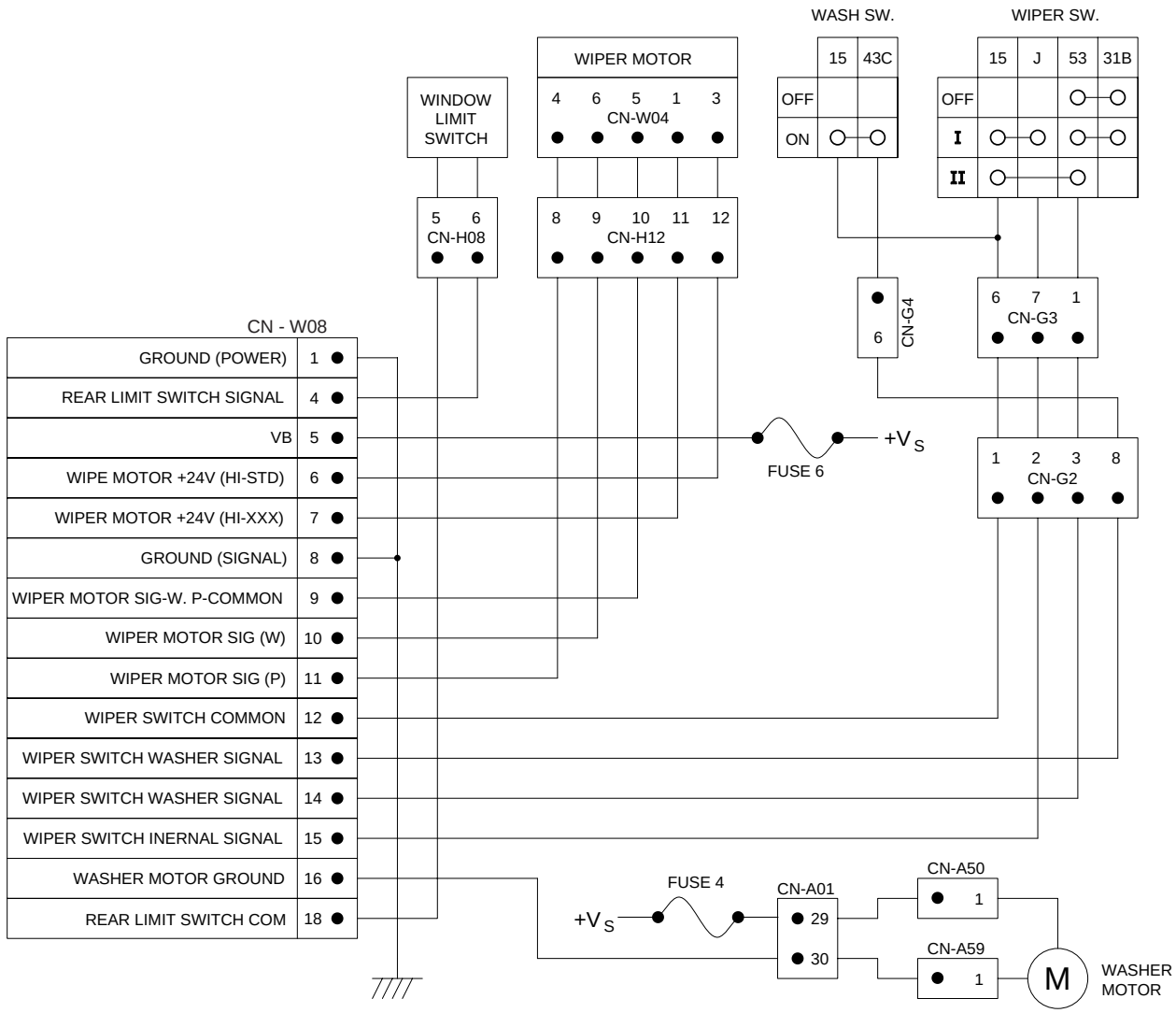
Failure information	• The fuel level monitor red lamp lighted up while the engine was running.
Relative information	• If the fuel gauge shows in a red range on the monitor panel, the fuel level monitor lamp lights up red. • (5) Input signal from the fuel level sensor (voltage) can be confirmed in the monitor function. (Code No. 042: Fuel level sensor)

Presumed cause and standard value in normal	Cause		Standard value in normal and references for troubleshooting			
	1	Fuel level lowered (system in normal condition)	★Refill fuel.			
	2	Fuel level sensor fault (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			A54 (male)	Fuel level	Resistance value	
			Between ① and grounding	FULL (Upper limit)	Approx. 12 Ω	
				EMPTY (Lower limit)	85 – 110 Ω	
	3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between P02 (female) ② and A54 (female) ①		Resistance value	Below 1 Ω
	4	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			P02 (female)	Fuel level	Resistance value	
			Between ② and grounding	FULL (Upper limit)	Approx. 12 Ω	
				EMPTY (Lower limit)	85 – 110 Ω	

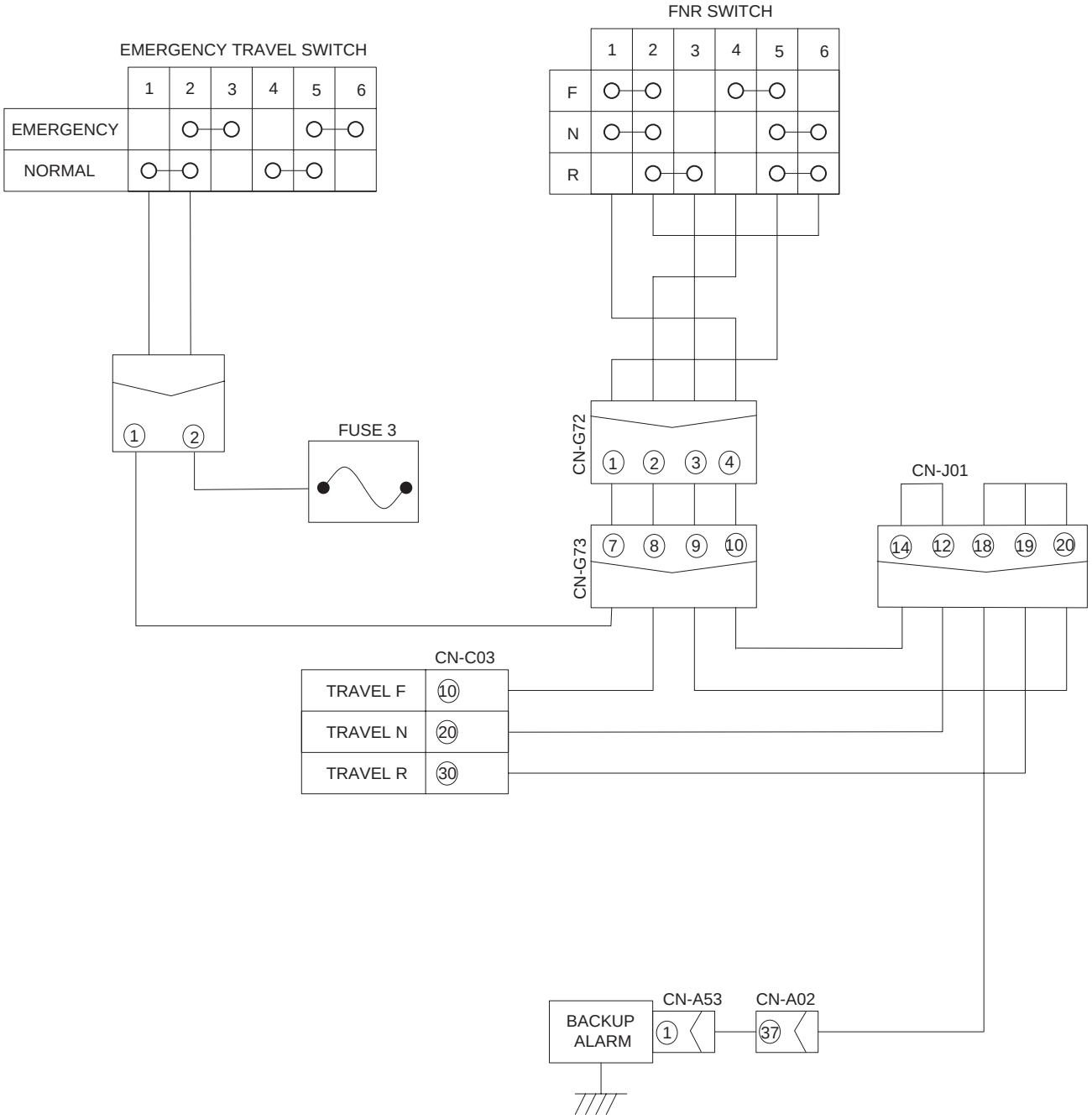
Electrical Circuit Diagram for Fuel Level Sensor



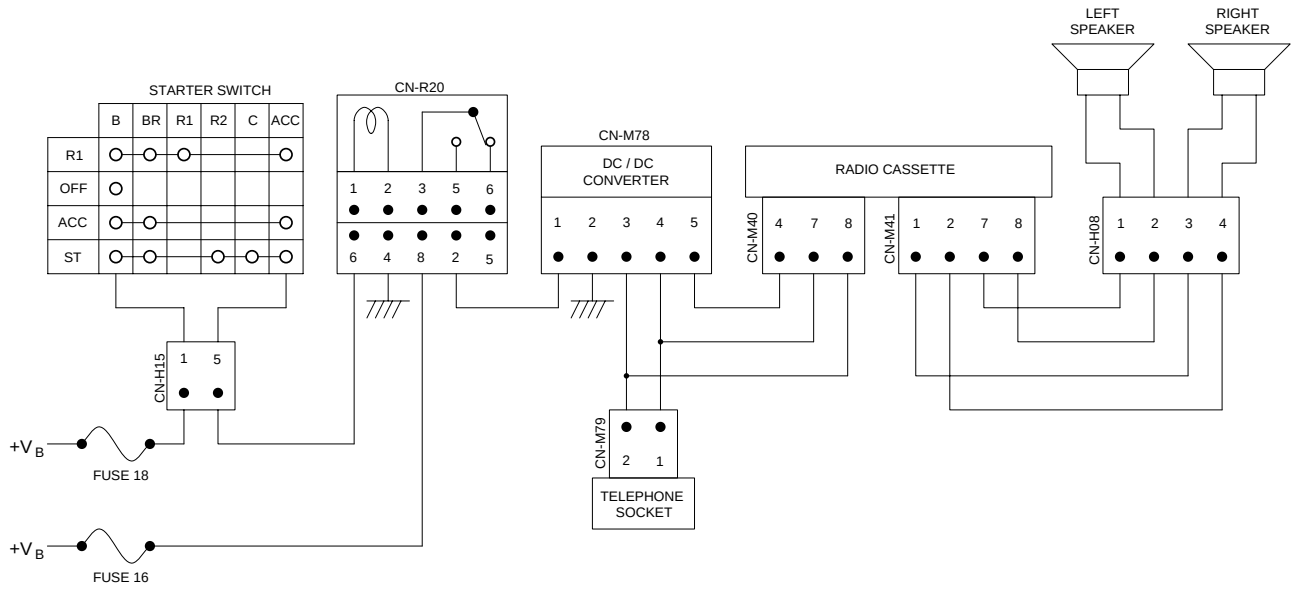
Electrical Circuit Diagram for Windshield Wiper Motor



Electrical Circuit Diagram for Travel PPC hydraulic Switch and Travel Alarm

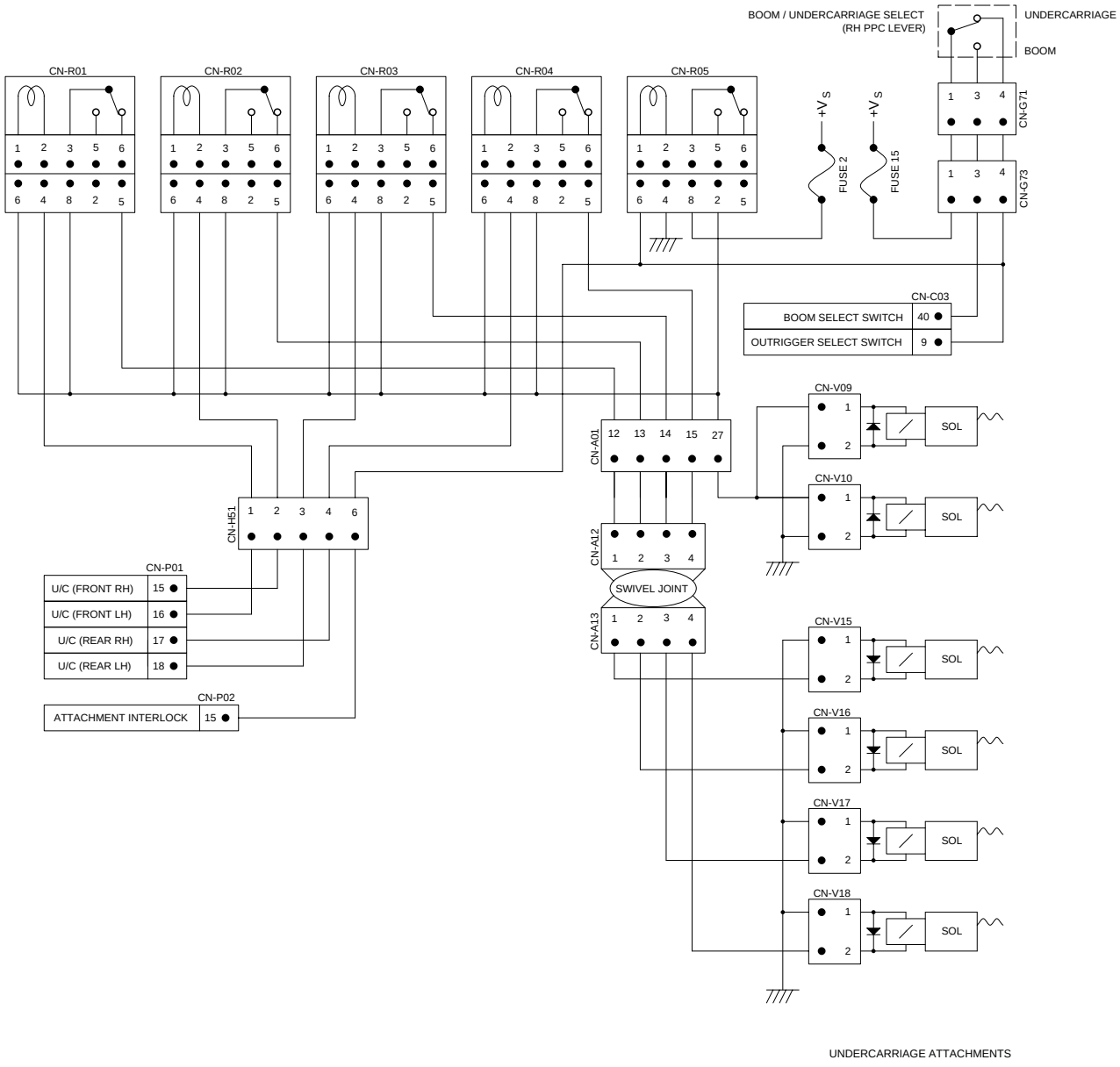


Electrical Circuit Diagram For Radio Cassette & Telephone Socket

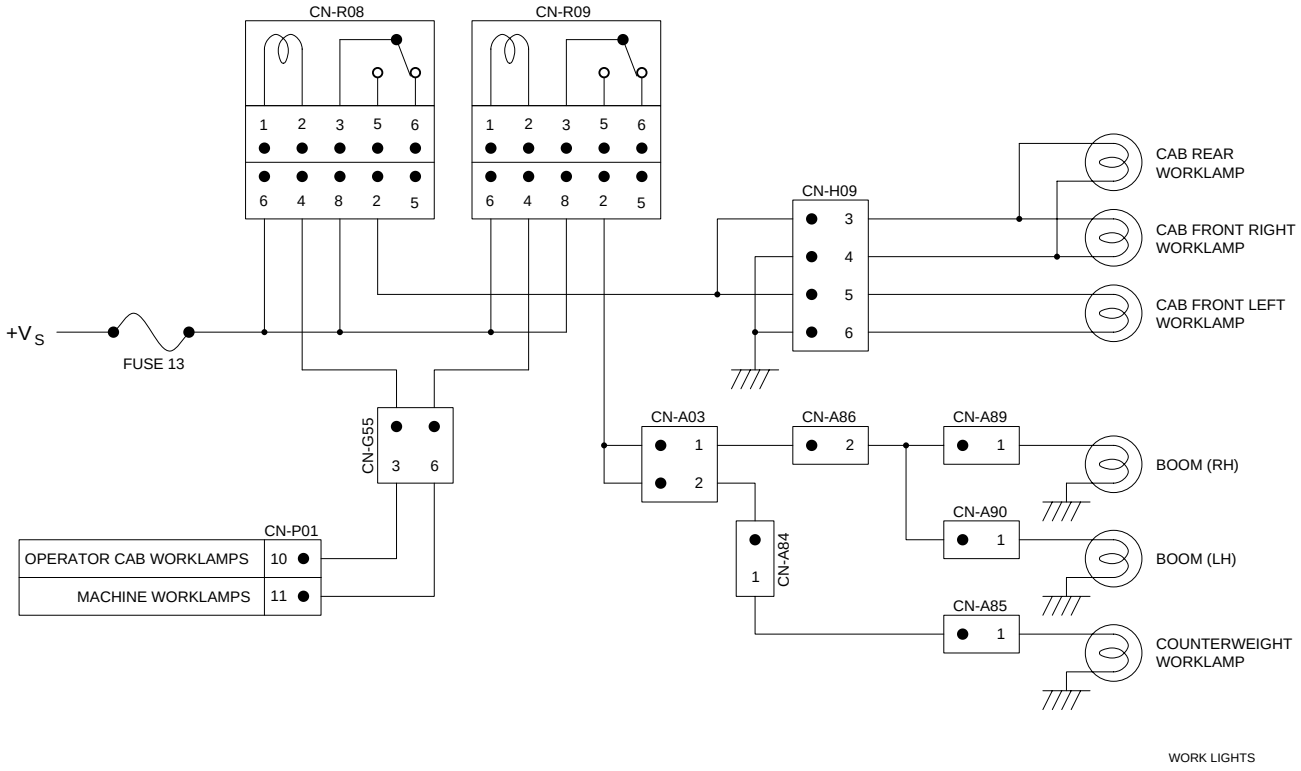


RADIO CASSETTE & TELEPHONE SOCKET

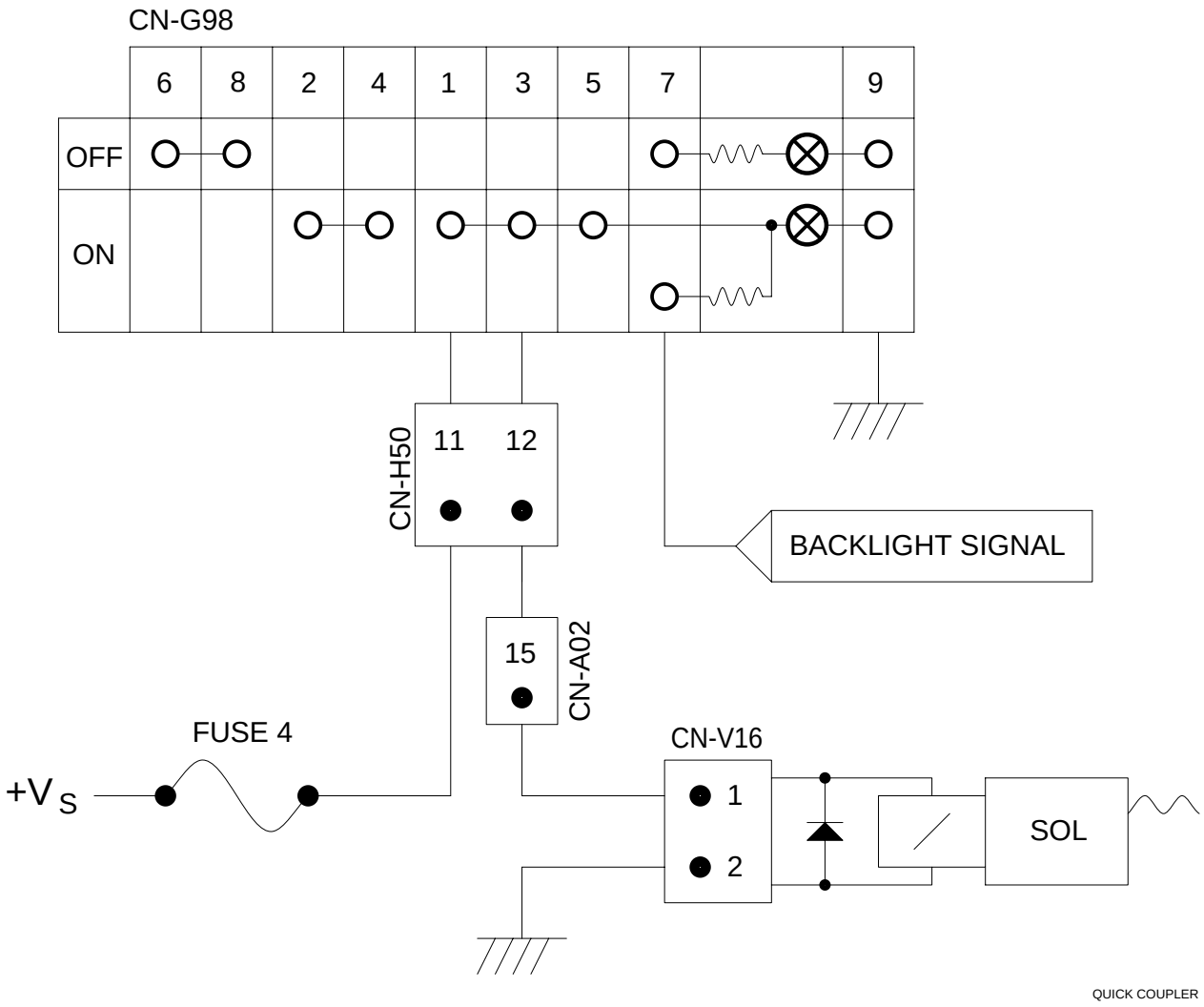
Circuit Diagram for Undercarriage Attachments - Rear left outrigger



Circuit Diagram for Work Lights (Operator Cab)

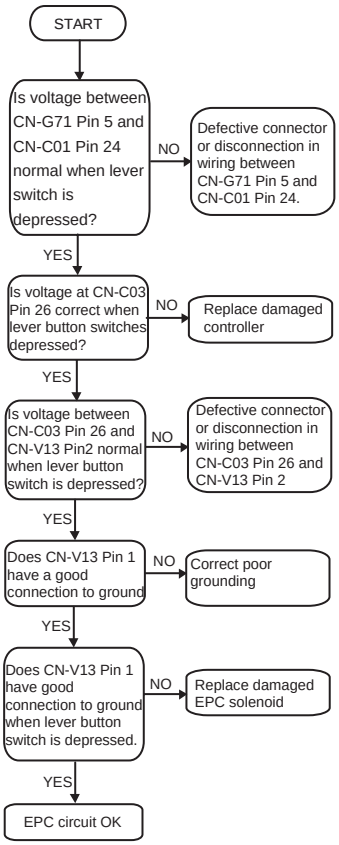


Circuit Diagram for Quick Coupler

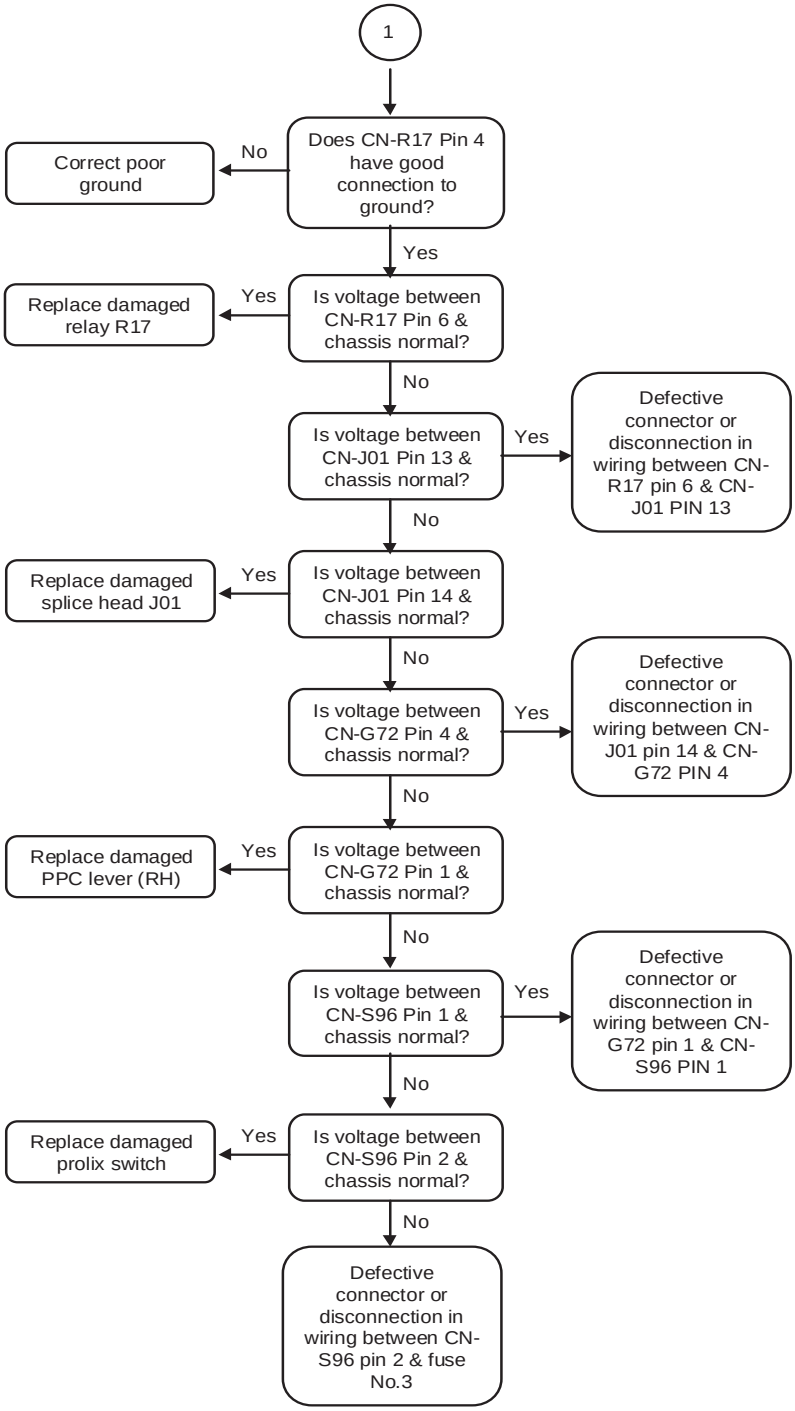


Clamshell Control - Rotate Left - Check EPC Circuit

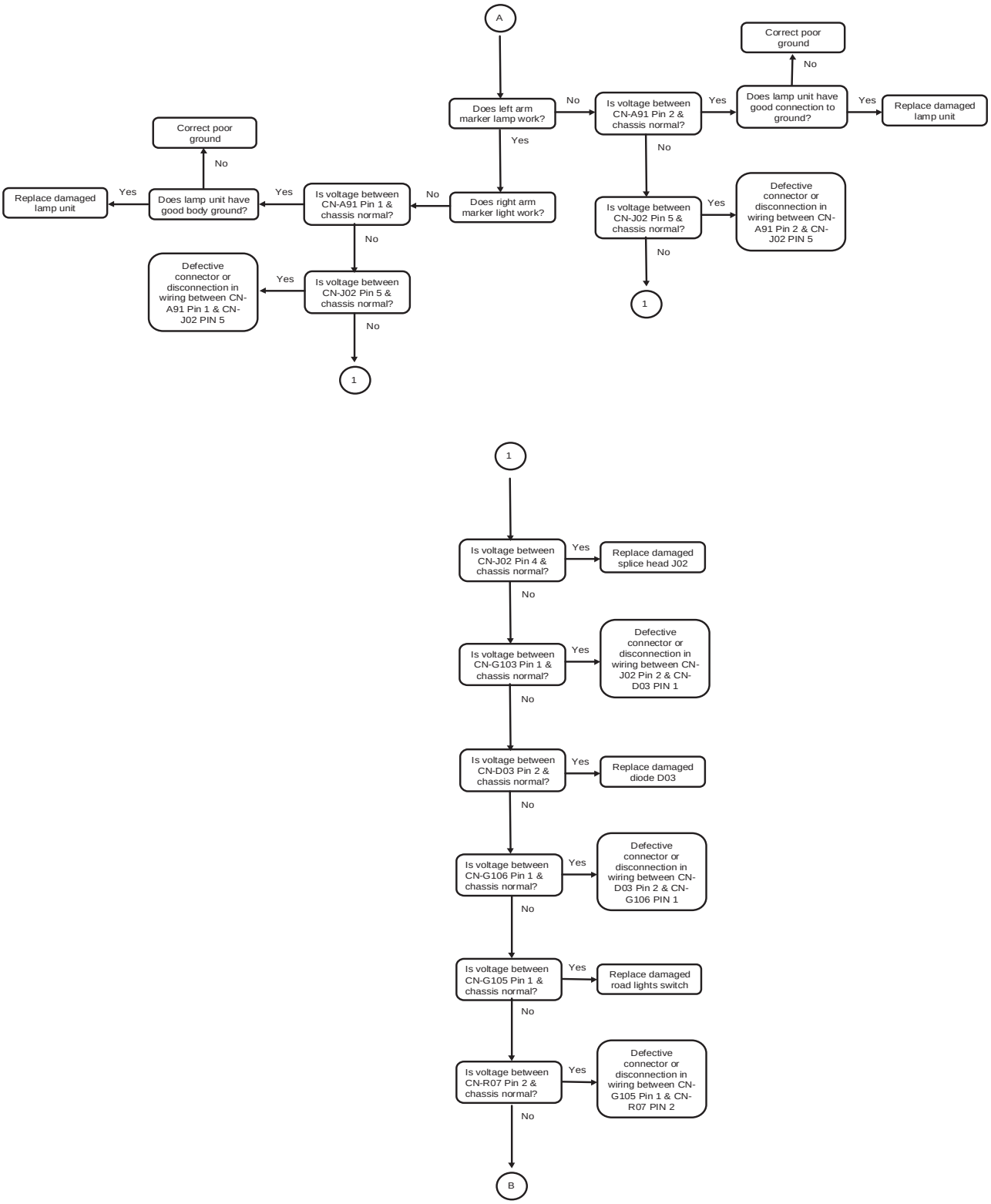
*When Fuse No.15 is not blown



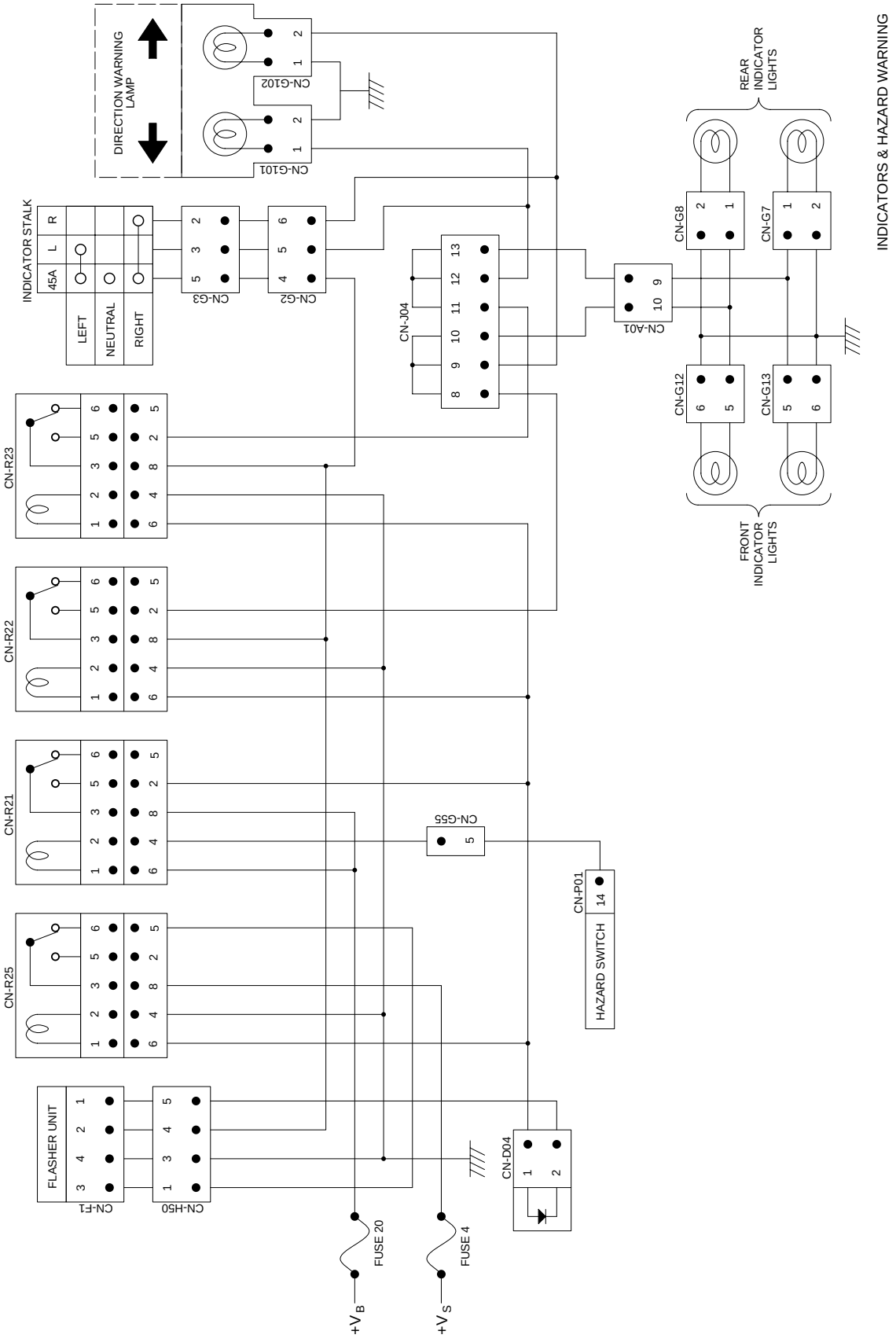
Neutral Start (Engine) cont'd (1)



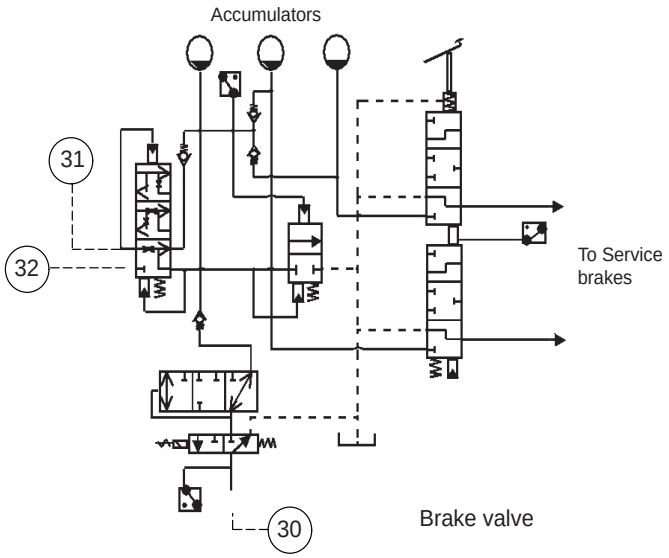
Driving Lights - Position Lights cont'd (1)



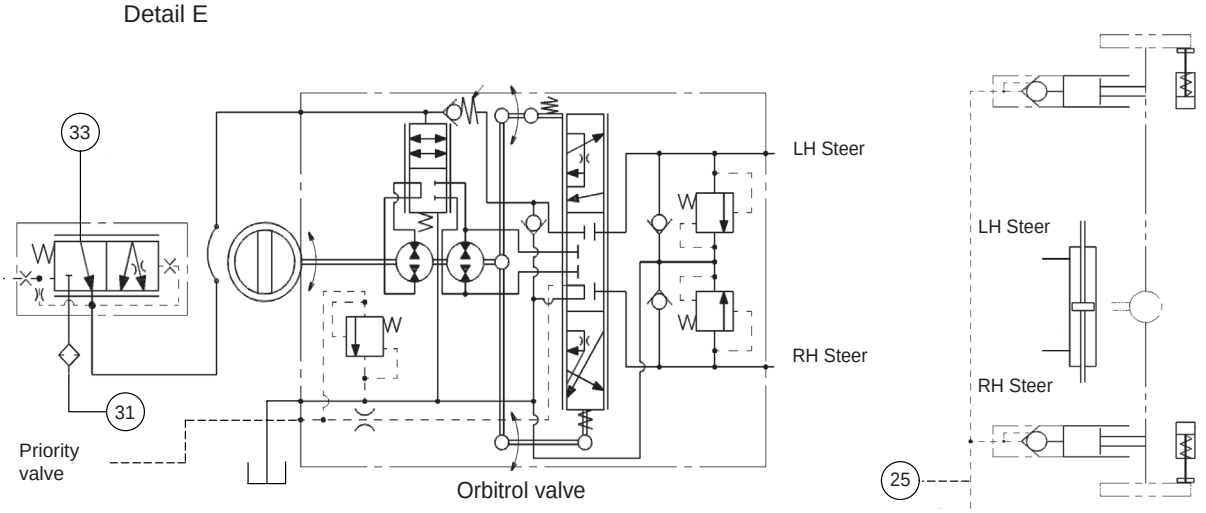
Circuit Diagram for Indicators & Hazard Warning



Detail D



Detail E



H-12 Work equipment has big time lag

Failure information	• The work equipment has a big time lag.
Relative information	• Set the working mode at A mode for the troubleshooting.

<table>
<tr><td rowspan="6">Presumed cause and standard value in normal condition</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal condition and references for troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunctioning of LS-EPC valve</td><td colspan="3">★Stop engine for preparations. Start troubleshooting at engine high idling.</td></tr>
<tr><td>Travel speed</td><td>Travel mode</td><td>LS-EPC valve output pressure</td></tr>
<tr><td>Lo</td><td>NEUTRAL</td><td>Approx. 2.9 MPa {approx. 30 kg/cm^2}</td></tr>
<tr><td>Hi</td><td>Operation</td><td>0{0}</td></tr>
<tr><td>2</td><td>Malfunctioning of control valve (regeneration valve) - with boom and arm only</td><td colspan="3">The regeneration valve in the control valve is presumed to malfunction. Check the valve itself.</td></tr>
<tr><td>3</td><td>Malfunctioning of control valves (safety & suction valve)</td><td colspan="3">The safety and suction valves of the control valve are presumed to malfunction. Check those valves themselves directly.
★For the arm and boom, whether they are defective or not may well be determined by changing them for other safety and suction valves. (Do not attempt to change them for the safety and suction valves for the boom LOWER and the lock valve, because each set pressure differs)</td></tr>
<tr><td>4</td><td>Malfunctioning of control valve (pressure compensation valve)</td><td colspan="3">The pressure compensation valve of the control valve is presumed to malfunction. Check the valve itself directly.</td></tr>
</table>

H-13 Other work equipment moves when relieving single circuit

Failure information	• Other work equipment moves when relieving the single circuit of specific work equipment.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normal condition	Cause		Standard value in normal condition and references for troubleshooting
	1	Control valve (pressure compensation valve) seal defective	The seal for pressure compression valve in the control valve is suspected to be defective. Check the seal itself.

H-14 One-touch power max. switch does not operate

Failure information	• The one-touch power max. switch does not operate.
Relative information	• Set the working mode at A mode for the troubleshooting.

<table>
<tr><td rowspan="5">Presumed cause and standard value in normal condition</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal condition and references for troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Malfunctioning of 2-stage solenoid valve</td><td colspan="2">★Stop engine for preparations. Start troubleshooting at engine high idling.</td></tr>
<tr><td>Swing lock switch</td><td>Solenoid valve output pressure</td></tr>
<tr><td>OFF</td><td>0{0}</td></tr>
<tr><td>ON</td><td>2.84 – 3.43 MPa {29 – 35kg/cm^2}</td></tr>
<tr><td>2</td><td>Malfunctioning of main relief valve</td><td colspan="2">The main relief valve is presumed to malfunction. Check the valve itself.</td></tr>
</table>

30 DISASSEMBLY AND ASSEMBLY

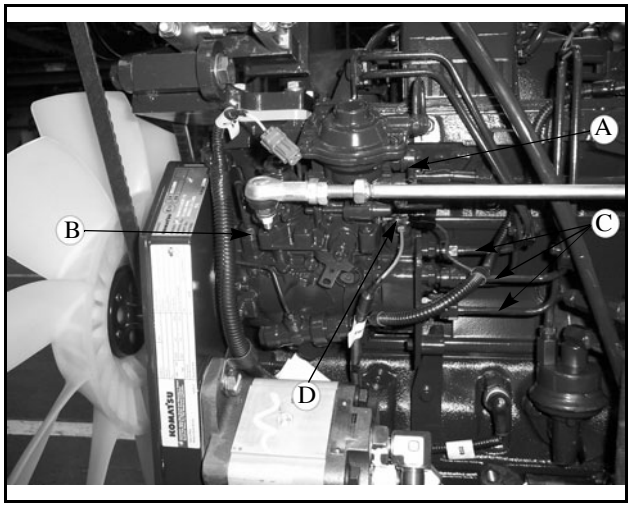
REMOVAL AND INSTALLATION OF ASSEMBLY FUEL INJECTION PUMP

SPECIAL TOOLS

Mark	Part No.	Part Name	Neces-sity	Qty	Distinc-tion*	Sketch
A	795-799-1390	Puller	n	1		

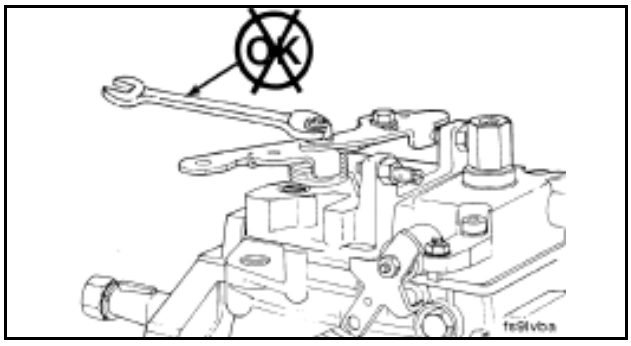
*Distinction between new and existing part.

★ Disconnect the fuel drain manifold. (A)
★ Remove the injection pump supply. (B)
★ Remove the high-pressure lines. (C)
★ Disconnect the electrical wire to the fuel shutoff valve. (D)



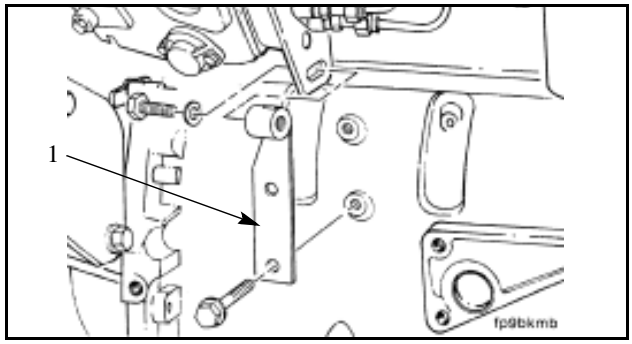
REMOVAL

WARNING! Do not remove the control lever. The fuel control lever on the fuel injection pump is indexed to the shaft during pump calibration. If the lever has been removed and reinstalled incorrectly, engine speed and power will be affected.

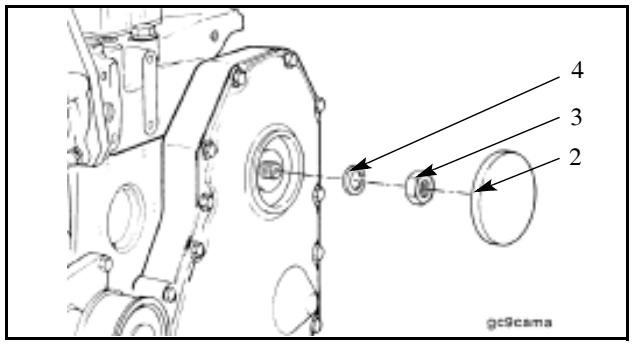


1. Disconnect all control linkage. Refer to OEM service manual.

2. Remove the pump support bracket (1).

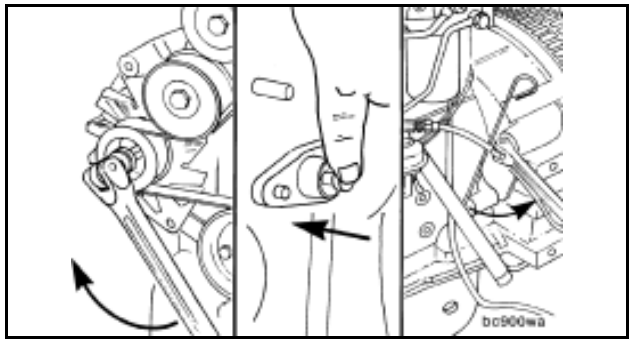


3. Remove the access cap (2), gear retaining nut (3) and washer (4).



4. Locate top dead centre (TDC) for cylinder No.1 by barring engine slowly while pushing in on TDC pin.
   See “INSPECTION AND ADJUSTMENT OF FUEL INJECTION TIMING<$paranumonly>-20 - 110

   Note: Be sure to disengage the pin after locating TDC.



REMOVAL AND INSTALLATION OF CYLINDER HEAD ASSEMBLY

SPECIAL TOOLS

Symbol		Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
A	2	795-799-1171	Puller	t	1		
	3	790-331-1110	Wrench	t	1		

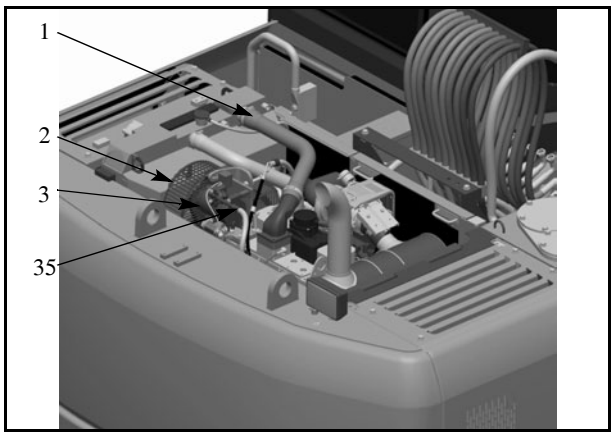
REMOVAL

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

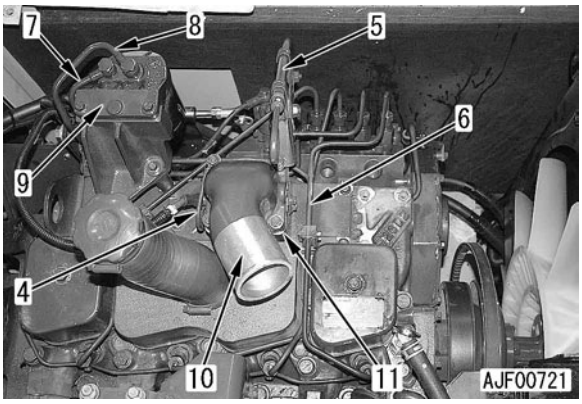
1. Drain the coolant.

Engine cooling water: Approx. 16.2 l

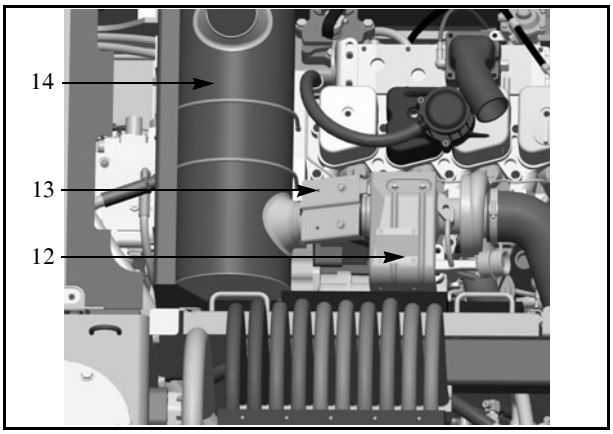
2. Close the fuel stop valve.
3. Open the engine hood.
4. Disconnect hose (1) from the engine. [*1]
5. Remove fan guard (2).
6. Remove the air conditioner compressor belt.[*2]
7. Disconnect connector E06 (35), and then remove air conditioner compressor (3) and bracket and move them toward the counter-weight.
   ★ Do not separate the air conditioner piping.



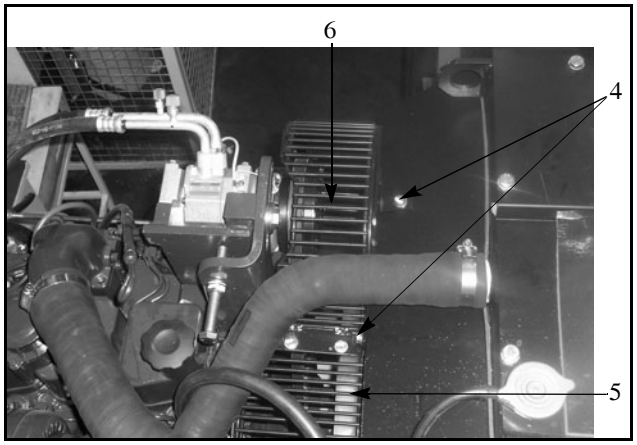
8. Disconnect terminal E01 (4) - Grid heater.
9. Remove the bracket mounting bolts of engine oil level gauge guide (5) and move the level gauge guide.
10. Remove 4 delivery tubes (6).
11. Remove tubes (7) and (8) between fuel filter and fuel injection pump.
12. Remove bracket (9) and fuel filter as a unit. [*3]
13. Remove air intake connector (10) and ribbon heater (11). [*4]
    ★ Cover the openings with adhesive tapes, etc. to prevent foreign matter from entering the engine.



14. Remove heat insulation covers (12) and (13).
15. Remove muffler (14). [*5]



5. Remove radiator fan guards (5) and (6) by removing bolts (4).



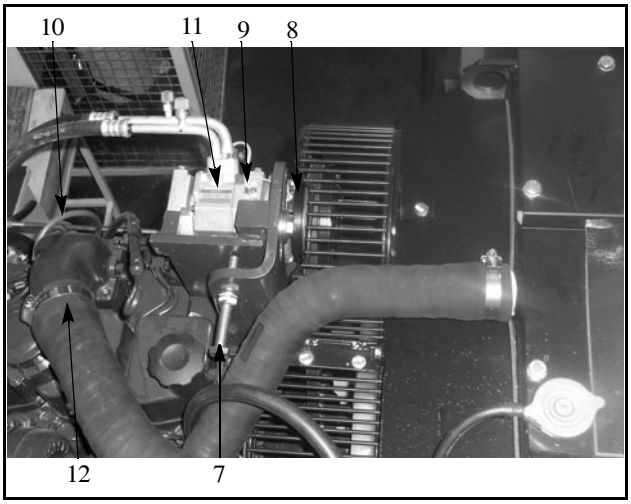
6. Loosen air compressor belt tension adjusting bolt (7) and remove belt (8).

7. Disconnect E06 air conditioner wiring connector (9) and E01 ribbon heater wiring connector (10).

8. Displace air compressor assembly (11). ※1

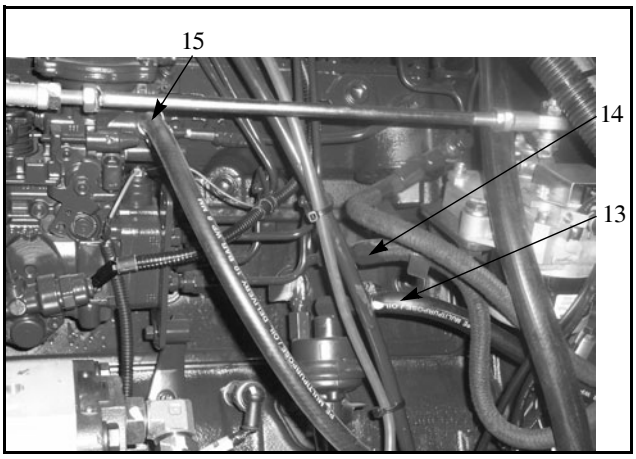
   ★ Remove air compressor assembly (11) in one piece with the bracket, and set them aside near the counter weight.

9. Disconnect air intake hose (12). ※2

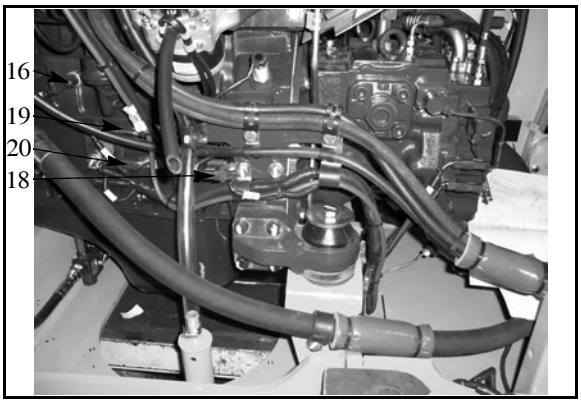


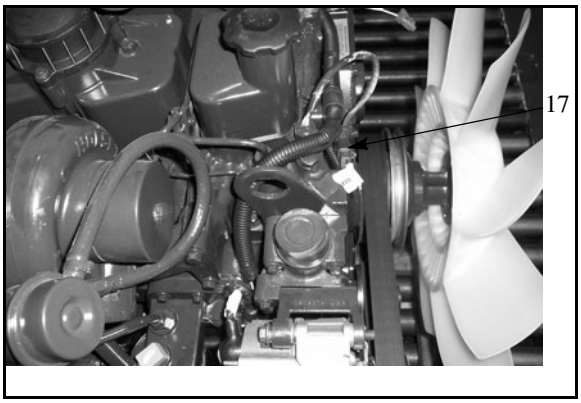
10. Disconnect fuel inlet hose (13) and fuel outlet hose (14). ※3

11. Disconnect fuel return hose (15).

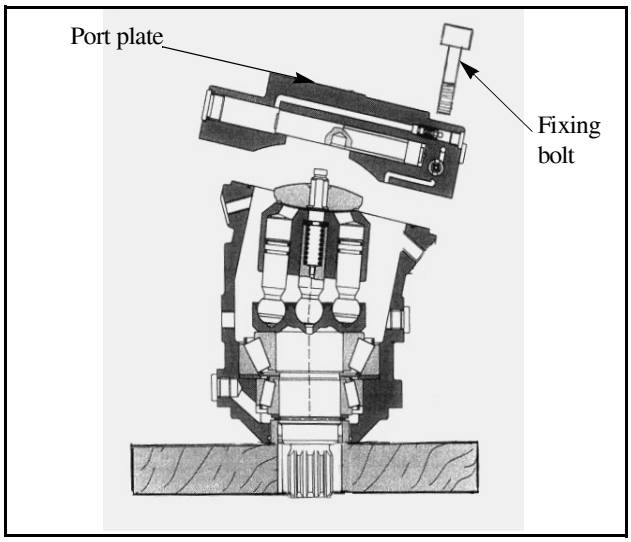


12. Disconnect engine wiring connectors at the following five points.
    - (16): E02 (Engine oil pressure switch)
    - (17): E05 (Engine cooling water temperature sensor).
    - (18): E04 (Engine revolution sensor).
    - (19): E10 (Governor and potentiometer).
    - (20): E11 (Governor and motor).

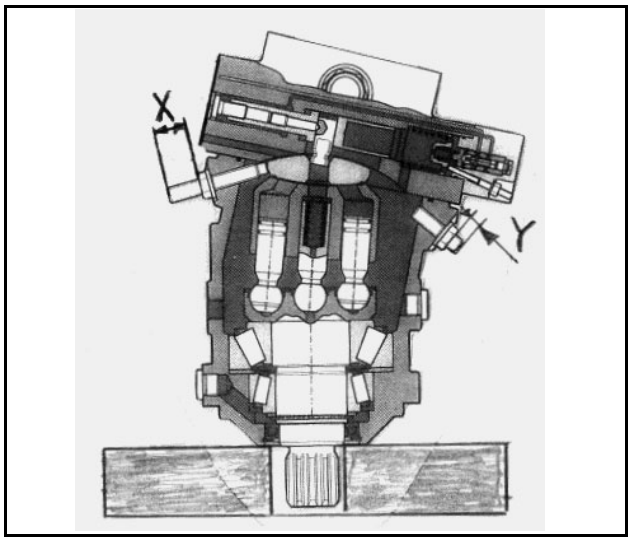




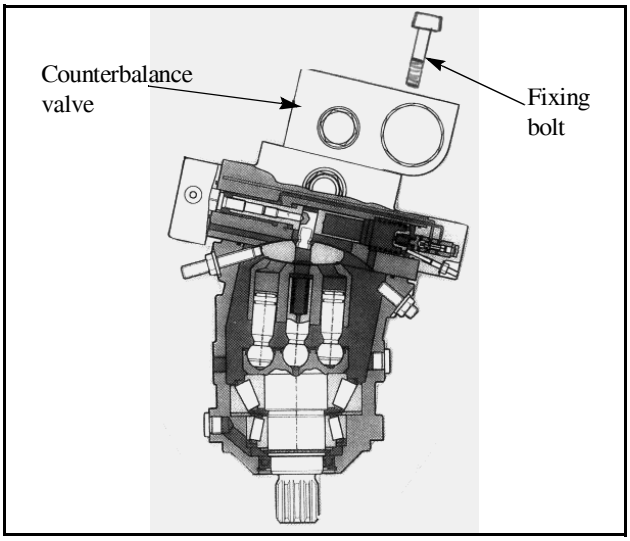
3. Assemble the port plate by locating the lens plate onto the rotary group.
   Secure the port plate by tightening the eight fixing bolts.
   Tightening torque - 310 Nm



4. Insert the Qmin and Qmax adjustment screws and set at dimensions **X** and **Y** which were recorded during the disassembly procedure.



5. Assemble the counterbalance valve assembly using the six fixing bolts.
   Tightening torque - 205 Nm.



DISASSEMBLY AND ASSEMBLY OF SWING MOTOR ASSEMBLY

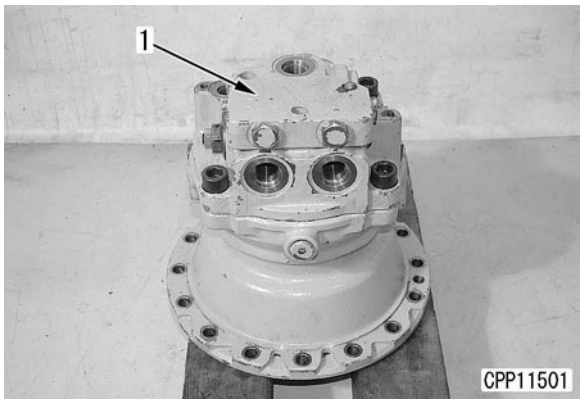
SPECIAL TOOLS

Symbol	Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
D1	799-301-1600	Oil leak tester kit	t	1		

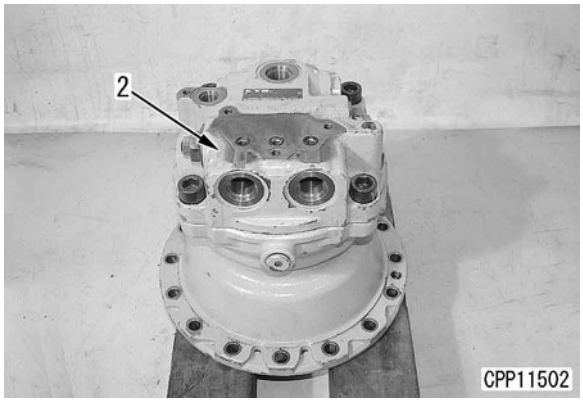
Disassembly

1. **Set the swing motor and swing machinery assembly on blocks.**

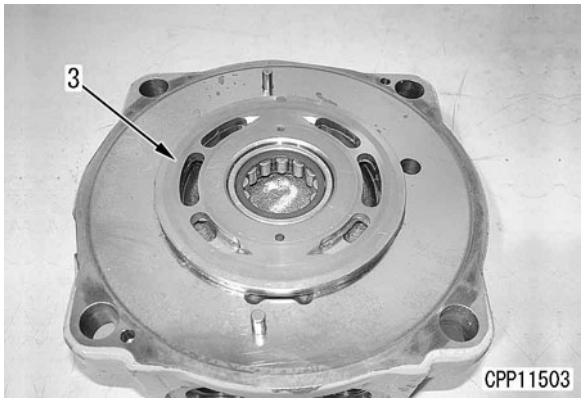
2. **Reverse prevention valve assembly**
   Remove reverse prevention valve assembly (1).



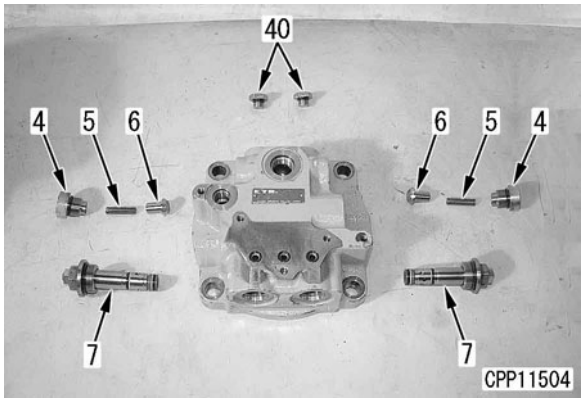
3. **Cover assembly**
   1) Remove cover assembly (2).
      - Note that the valve plate may fall from the cover assembly.



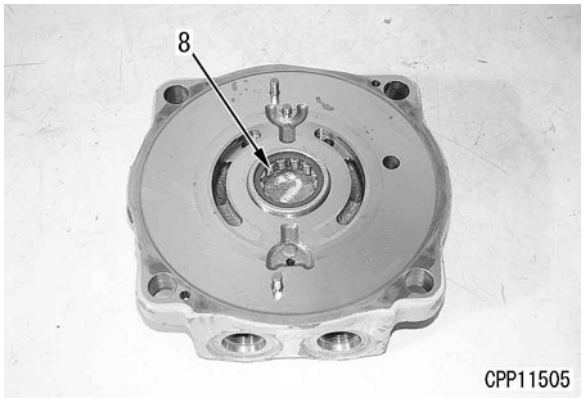
   2) Remove valve plate (3) from the cover assembly.



   3) Remove 2 plugs (4), 2 springs (5), and 2 poppets (6).
   4) Remove relief valve assembly (7).
      - Do not disassemble the relief valve assembly.
      - Note that the poppet seat at the relief valve end may be left in the cover.
   5) Remove 2 plugs (40).



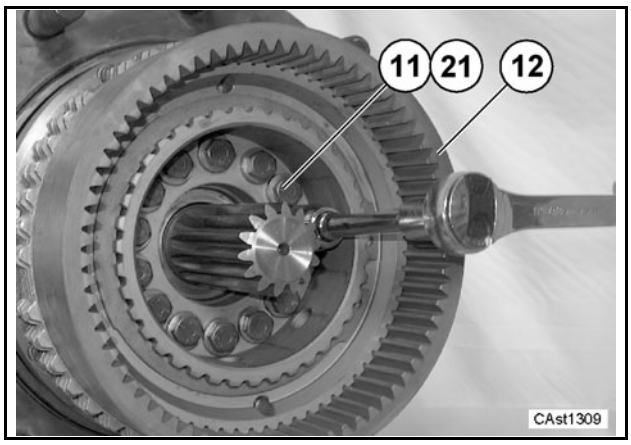
   6) Remove bearing outer race (8).



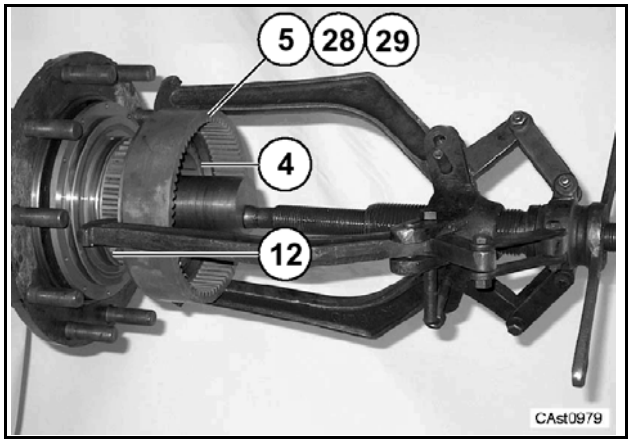
Installation

- Install in reverse order of removal.
- Grease all cylinders before installation
- Tightening torque for propshaft nuts (3): 58.8 - 73.5 Nm.

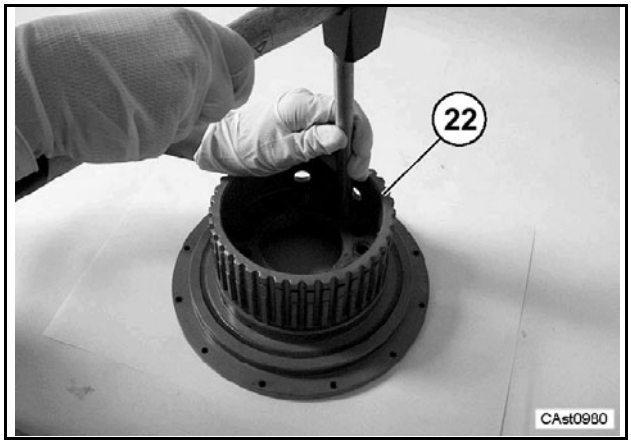
13. Remove screws (11) and washers (21) from brake carrier (12).



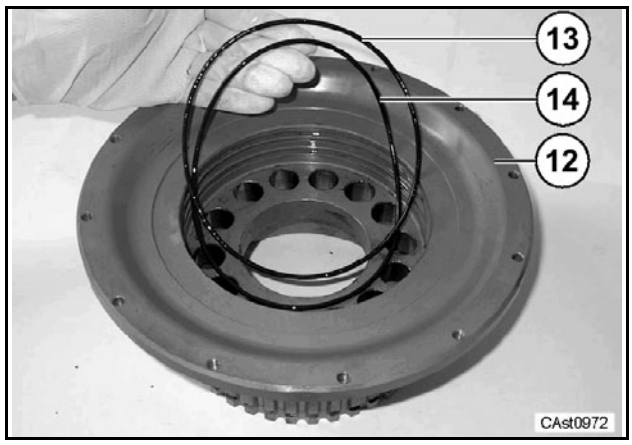
14. Fit ring bevel gear (5) complete with carrier (28) and with split ring (29). Fit split ring (4) and remove brake carrier (12) with three-position extractor.



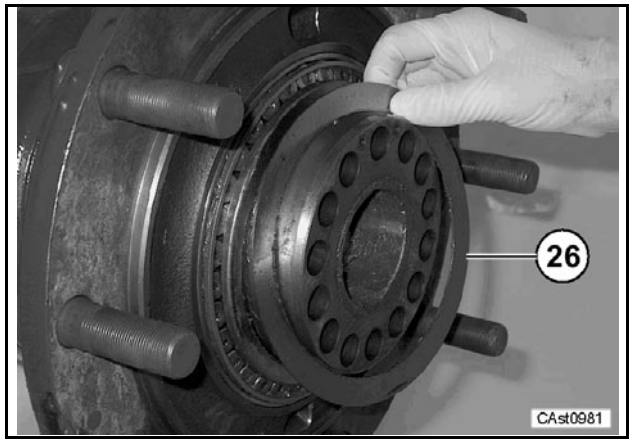
15. Remove bushes (22).



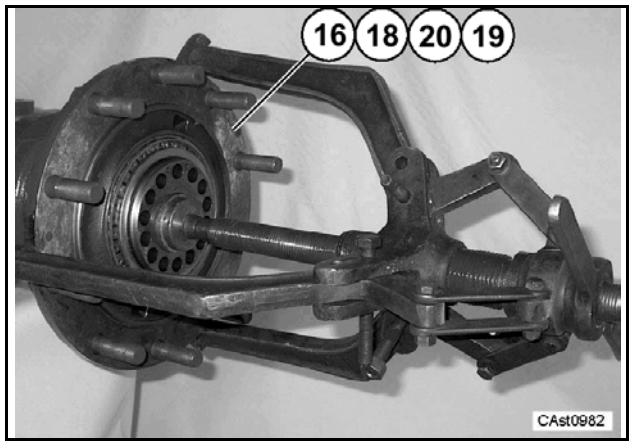
16. Remove seal rings (13) and (14) from brake carrier (12).



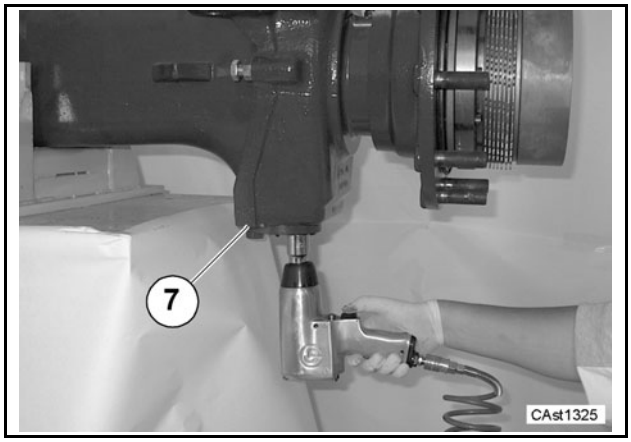
17. Remove shims (26).



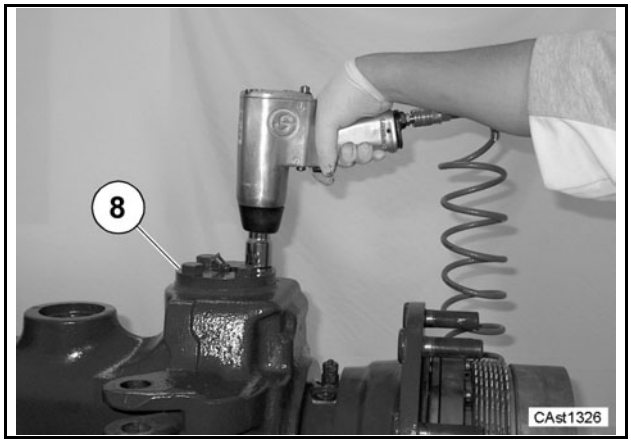
18. Remove wheel hub (16) with bearings (19) and (20) and seal ring (19).



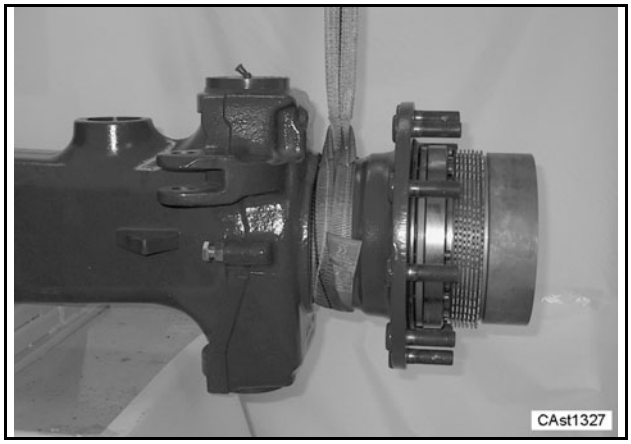
7. Remove the screw (7).



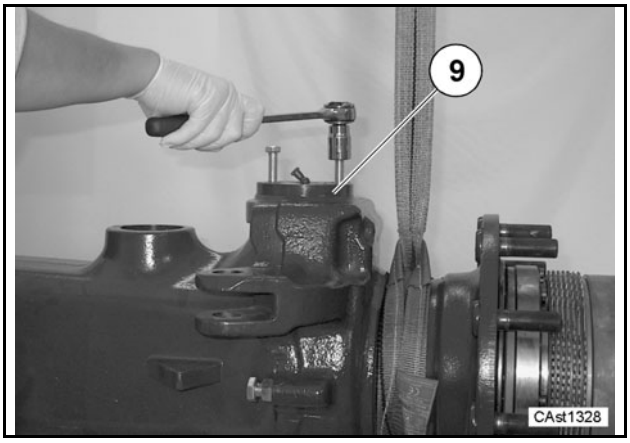
8. Remove the screw (8).



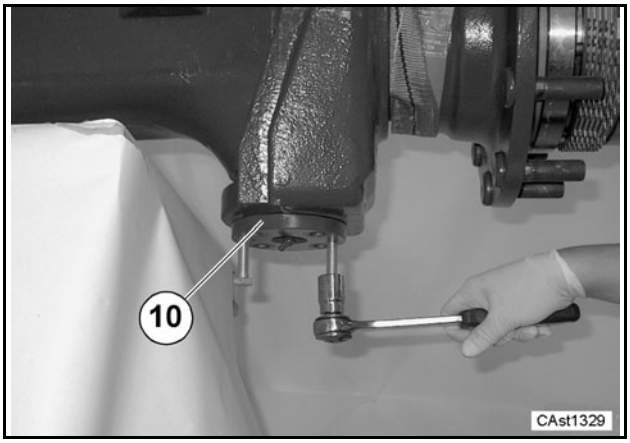
9. Secure the joint box to a hoisting equipment.



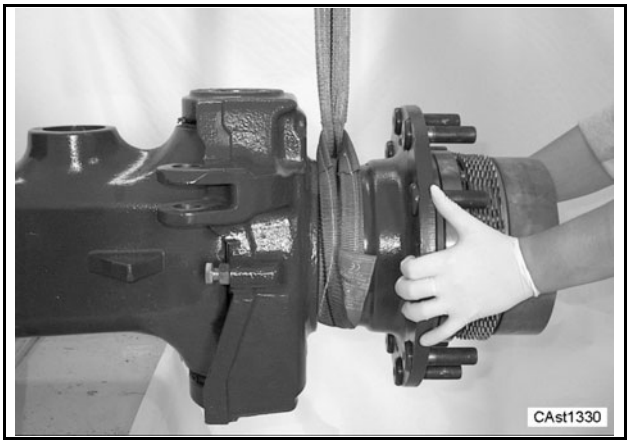
10. Screw two screws M12 x 100 and remove the pivot.



11. Screw screws M12 x 100 and remove the pivot.

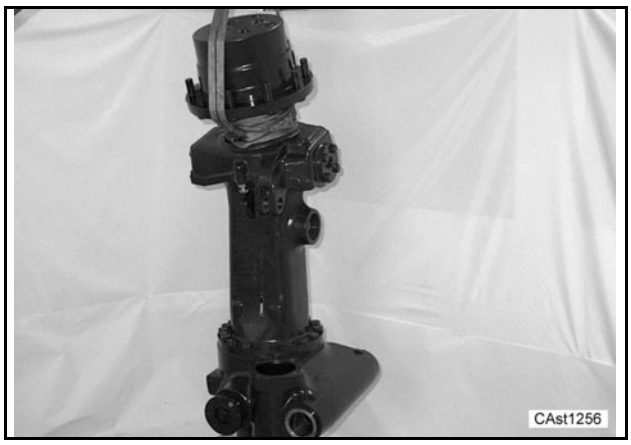


12. Remove the complete joint group.

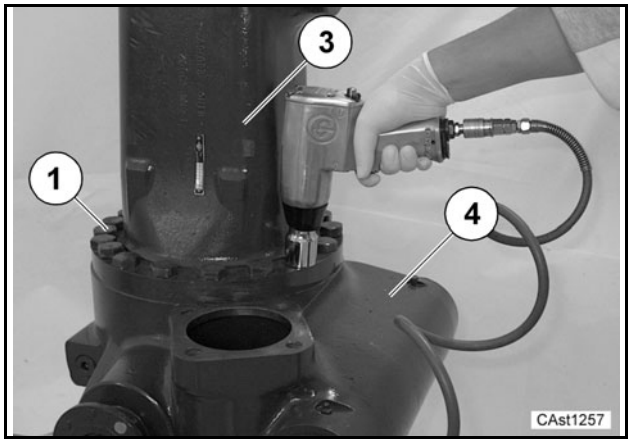


Disassembly of beam trumpet and differential unit

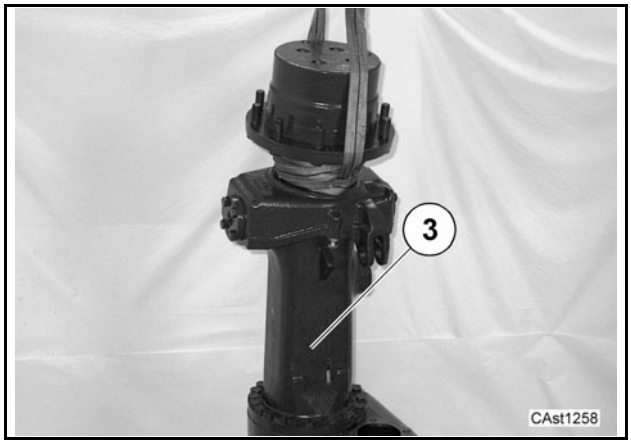
1. Remove the axle unit. Sling and slightly tension the rope. Turn and then fix it in vertical position.



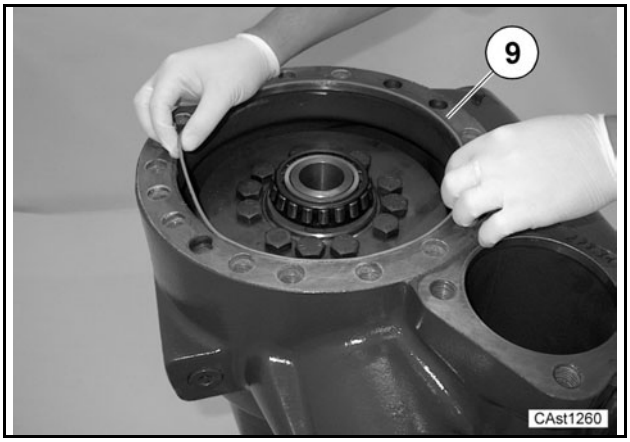
2. Loosen and remove screws (1) fixating beam trumpet (3) to the body (4).



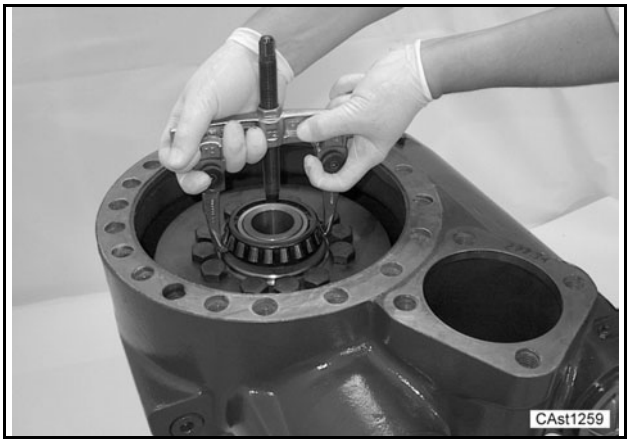
3. Sling the beam trumpet (3) and slightly lift it.



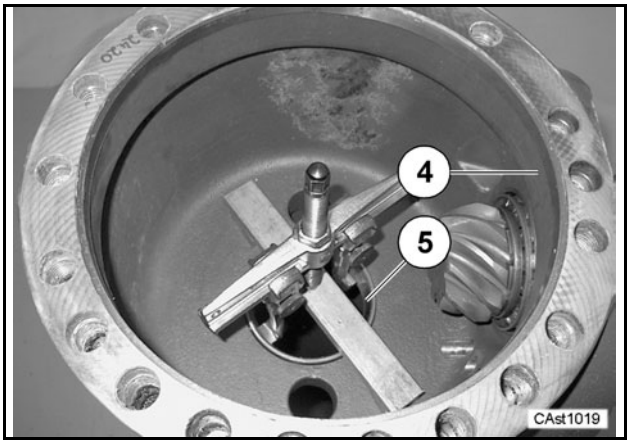
4. Remove O-ring (9).



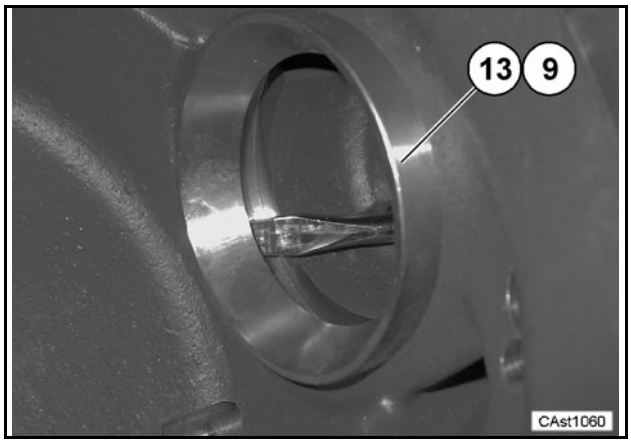
5. Lift the whole differential unit.



6. Use an extractor and remove from housing (4) the outer cup of bearing (5).



13. Remove the outer cup of the taper roller bearing (13) and shims (9) from the central body. Use a chisel and a hammer.



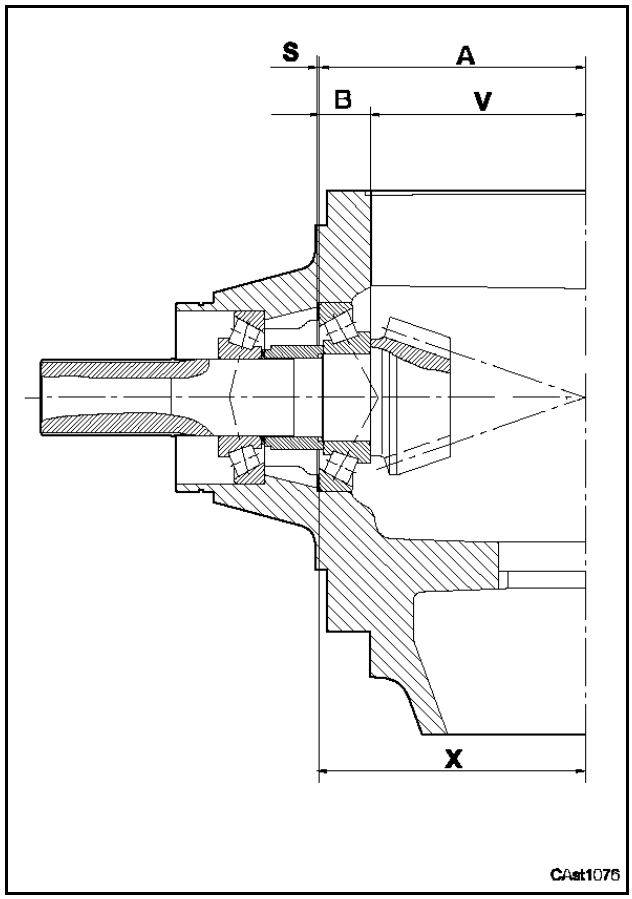
Assembly of pinion group

1. Bevel pinion adjustment for 20K-23-31000.

X	155.50	155.50	155.70
B	29.25	29.45	29.45
V	125.00	125.20	124.80
A	154.25	154.65	154.05
S	1.25	0.85	1.65

Bevel pinion adjustment for 20K-23-32000.

X	163.50	163.50	163.70
B	29.25	29.45	29.25
V	133.00	133.20	132.80
A	162.25	162.65	162.05
S	1.25	0.85	1.65



DISASSEMBLY AND ASSEMBLY OF REAR AXLE

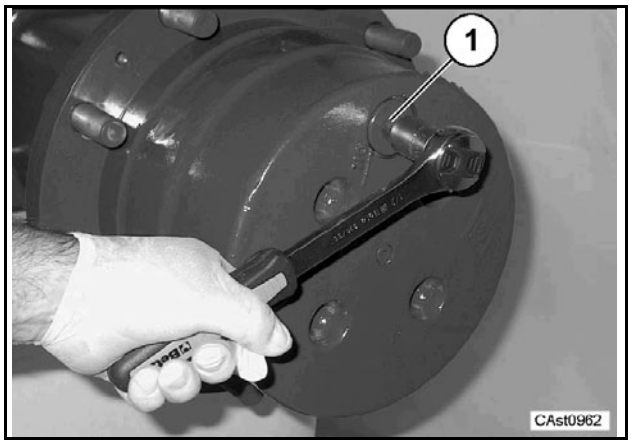
SPECIAL TOOLS

Part Number	Part Name	Quantity
2897002	Toque control device	1
2897003	Chuck for bushings	1
2897004	Chuck for bushings	1
2897007	Assemle pin	1
2897009	Pin	1
2897012	Assemble device	1
2897014	Brake centring	1
2897015	Assemble pin	1
2897039	Assemble pin	1

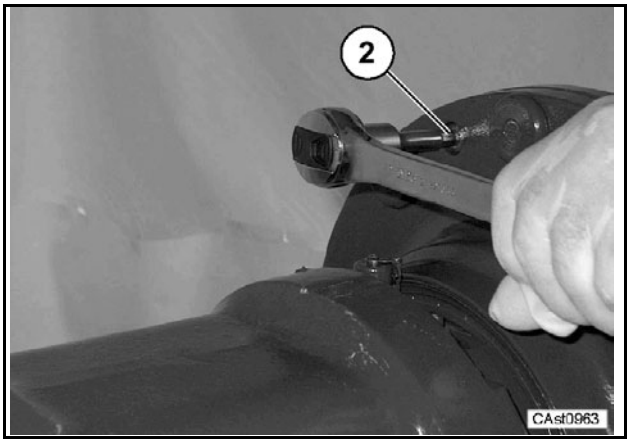
DISASSEMBLY

Removal of Epicyclic Reduction Gear and Brake

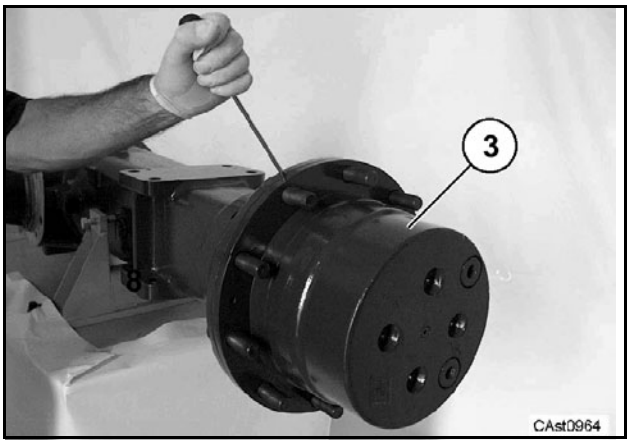
1. Before draining the oil, position the wheel hub (1) with the plug on the upper part and loosen it off some turns in order to eliminate any possible inner pressure, then remove it completely. Turn the wheel hub upside down till the hole is in the lowest point.
   Drain the oil completely.



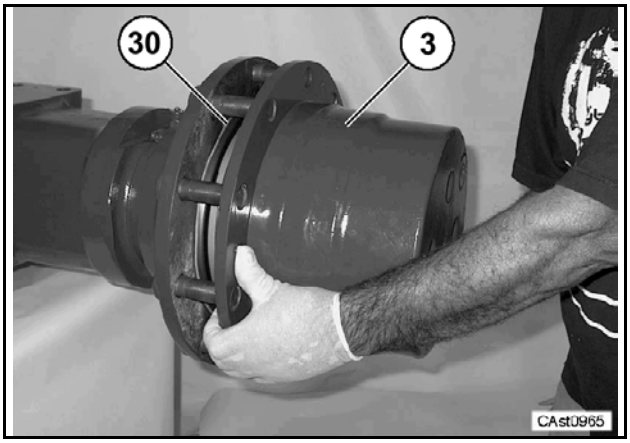
2. Remove fastening screws (2) from the cover of the planetary gears carrier.



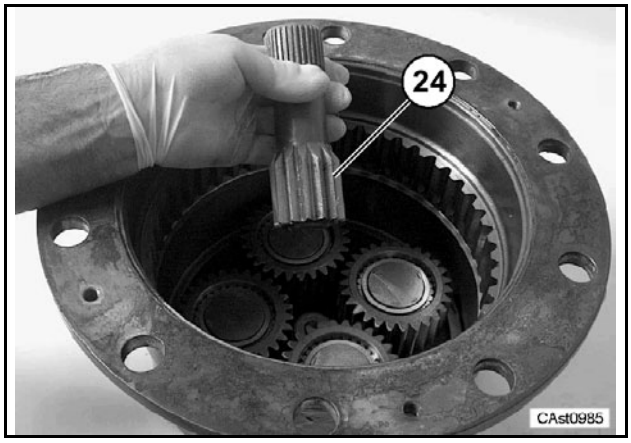
3. Use the levers inside the preset slots to detach the planetary gear carrier cover.



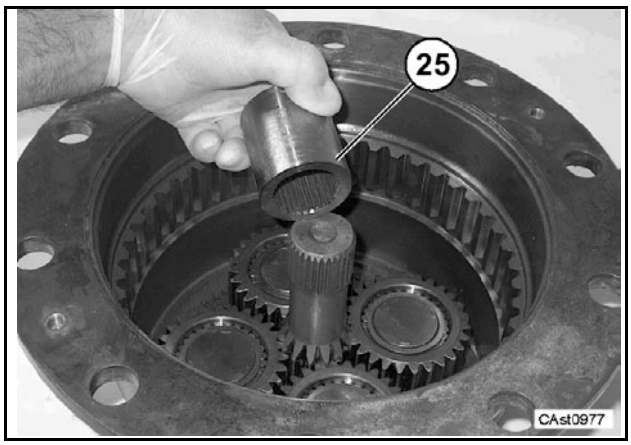
4. Remove the planetary gear carrier cover (3) and O-ring (30).



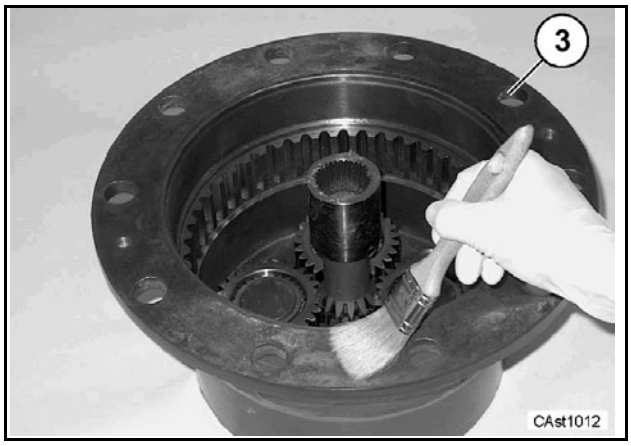
34. Fit pinion shaft (24).



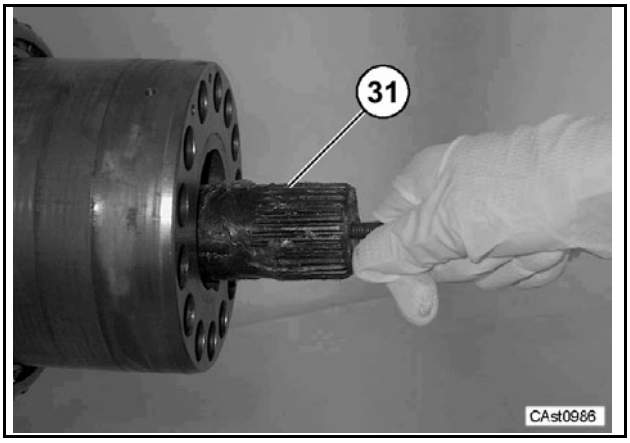
35. Fit sleeve (25).



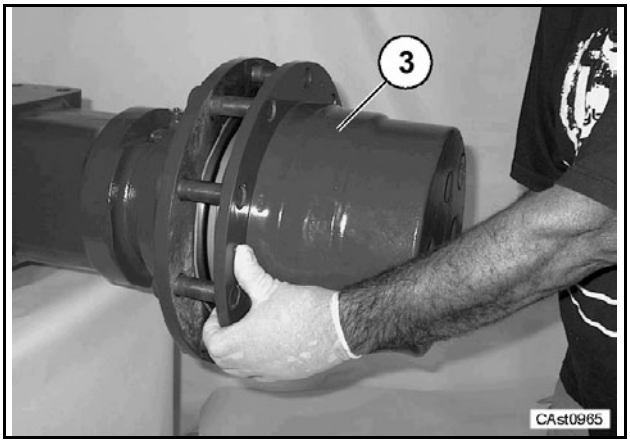
36. Lubricate with grease the contact surface of planetary gear cover (3). Apply loctite 510 in the holes.



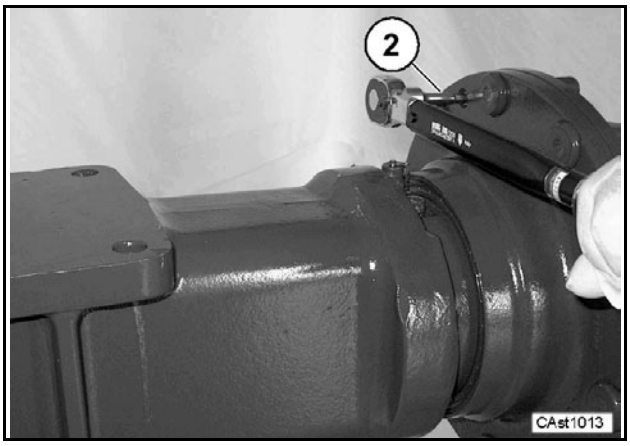
37. Assemble axle shaft (31).



38. Fit the planetary gear cover (3) and discharge pressure from the hydraulic pump.

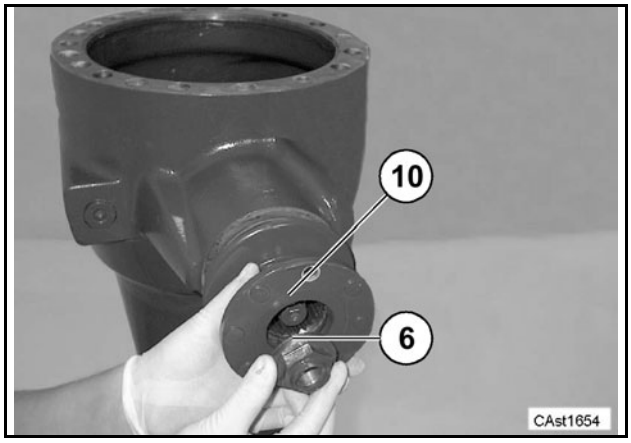


39. Fit screws (2) according to the proper tightening torque (48Nm).

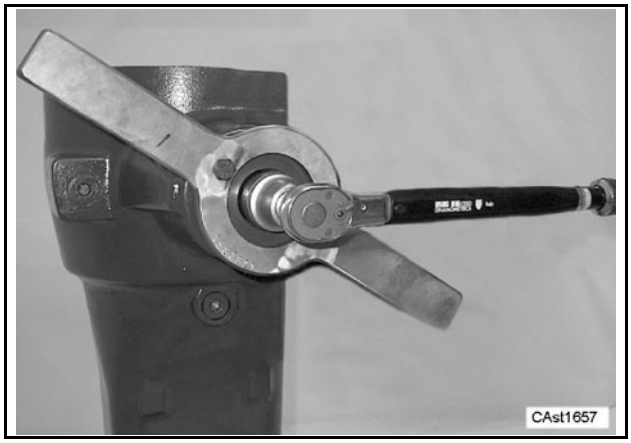


4

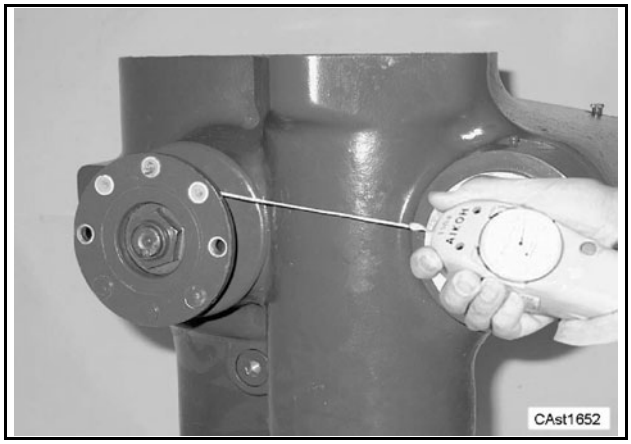
20. Assemble the flange (10) and the nut (6).



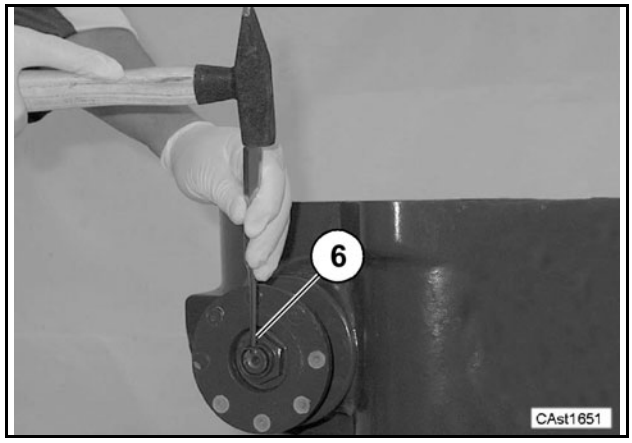
21. Apply tool 2897001.
Torque: 400Nm



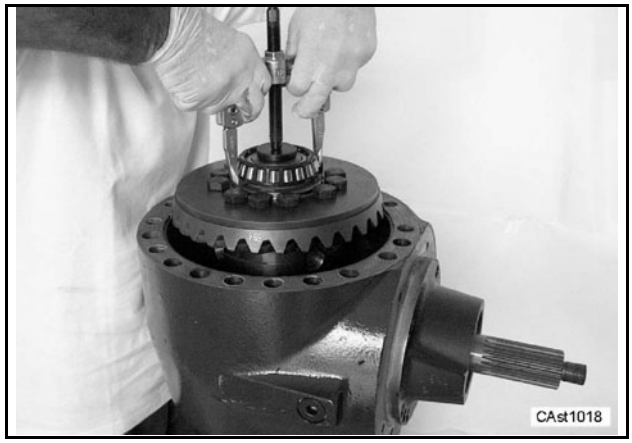
22. Carry out the preloading measurement (P) of pinion taper roller using a dynamometer whose cord is wound on the flange diameter. The adjustment is performed by gradually increasing shims mounted under bearing.
Warning: All preloadings should be measured without the seal ring.
P = 2 / 3 Nm



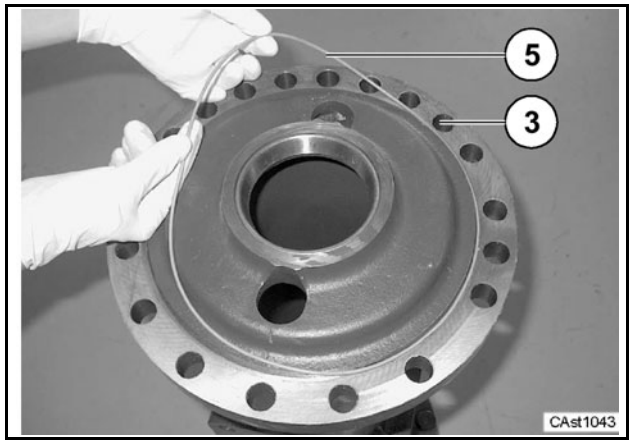
23. Offset the nut (6) by means of a heading tool.



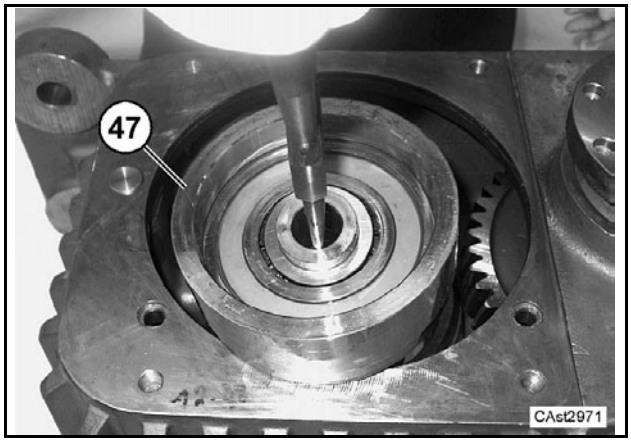
24. Assemble whole differential unit.



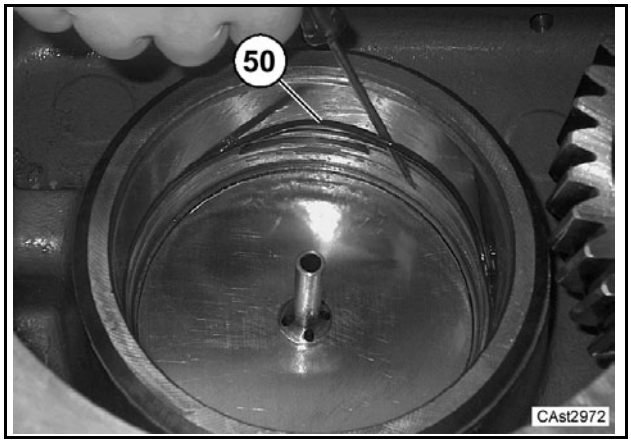
25. Assemble the O-ring (5) on beam trumpet (3). Grease the O-ring (5).



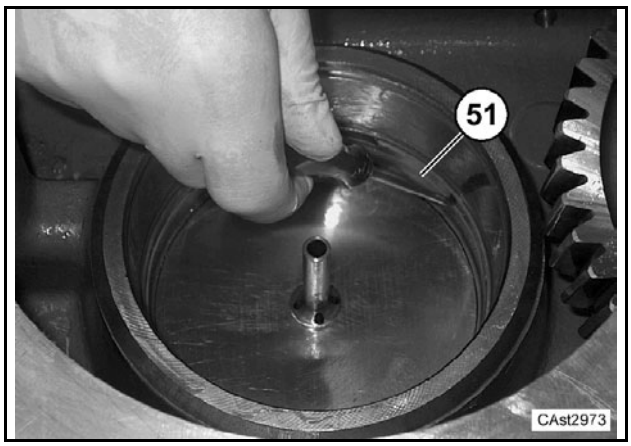
37. Remove piston (47) assembly.



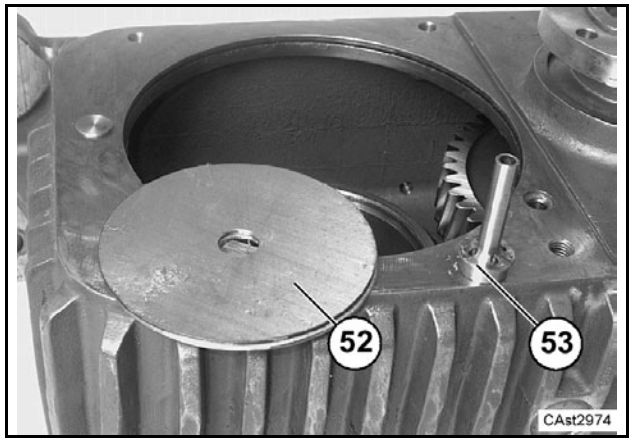
38. Remove O-ring (50).



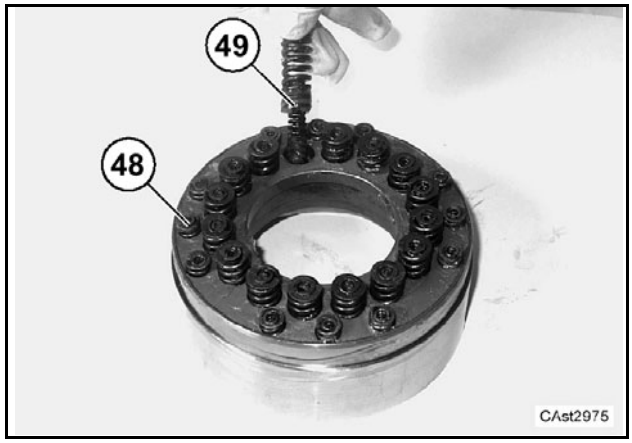
39. Remove the gasket (51).



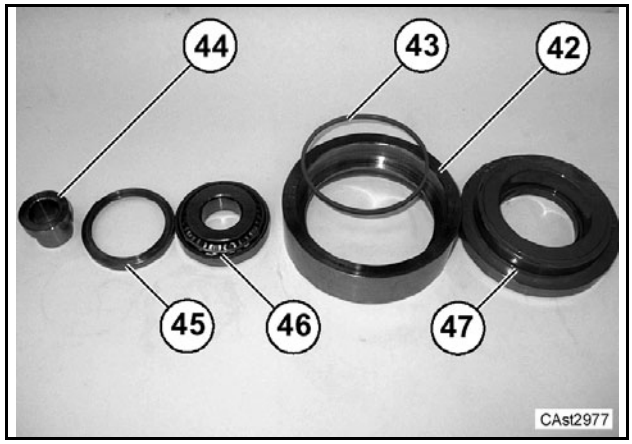
40. Remove pin (53) and disc (52).



41. Remove spring sets (48) and (49).



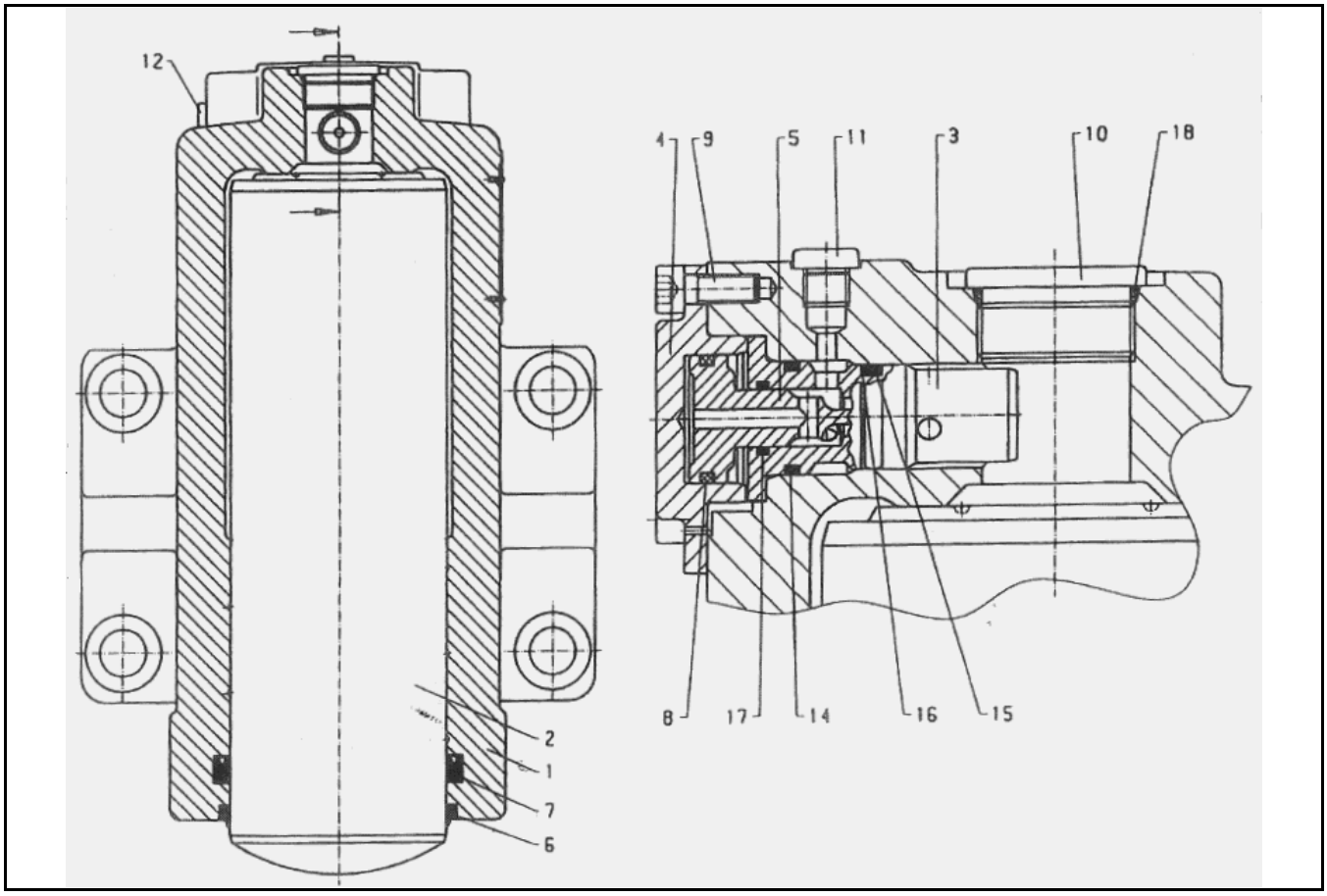
42. Disassemble piston (47), gasket (43), ring (42), bearing (46), spacer (45) and bushing (44).



Installation of Transmission Input Shaft

- Install in reverse order of removal.
- When installing planetary gears apply loctite 638, flange apply loctite 510, screws apply loctite 242.
- When installing sintered discs pay attention to discs alignment.

DISASSEMBLY AND ASSEMBLY OF SUSPENSION LOCK CYLINDERS



Change Rod Seal

1. Remove screw plug position 10.
2. Press rod position 2 downwards.

WARNING! Do not damage rod surface!

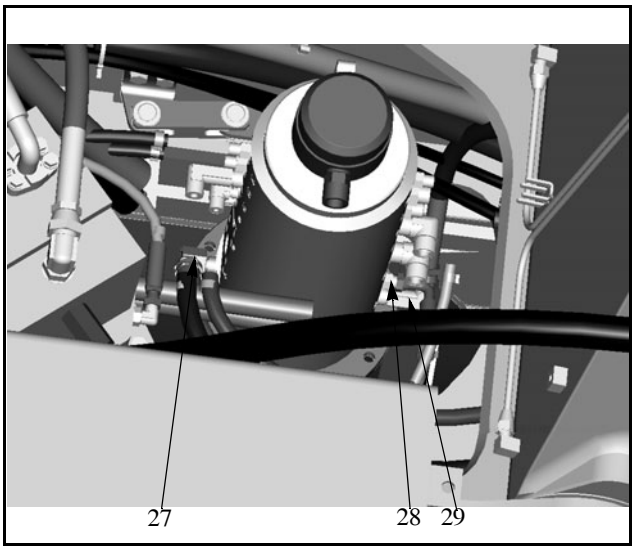
3. Take out U - ring position 7 using aa tool without sharp edges.

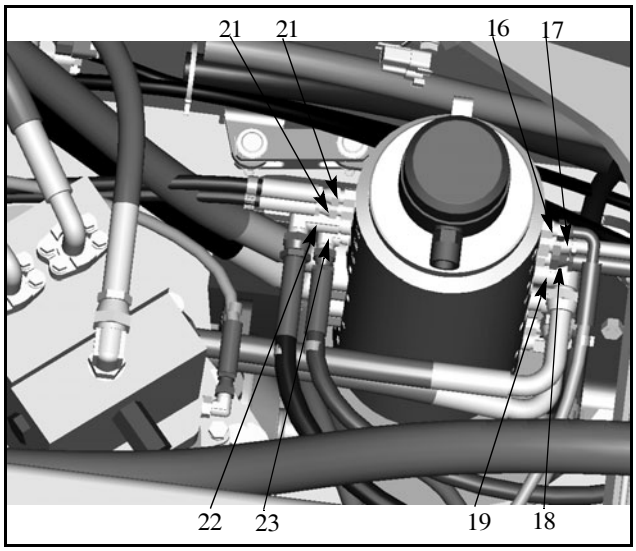
WARNING! Do not damage groove!

4. Insert new U -ring in a reniform squeezed state and press it into the groove ensuring that there are no kinks.
5. Investigate wiper ring position 6 with respect to damages, if necessary replace it.
6. Grease the seals.
7. Mount the rod.

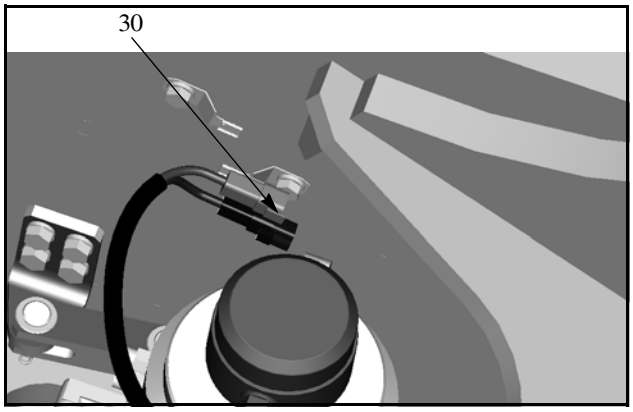
WARNING! With all repairs pay attention to extreme cleanliness!

4. Disconnect 14 hoses (16) through (29).
- (16): Suspension lock
- (17): Speed sensor
- (18): Brake 2
- (19): Attachment bottom
- (20): 2nd clutch
- (21): 1st clutch
- (22): Steer right
- (23): Brake 1
- (24): Travel B
- (25): Travel A
- (26): Attachment Head
- (27): Drain
- (28): Motor volume pilot
- (29): Steer left

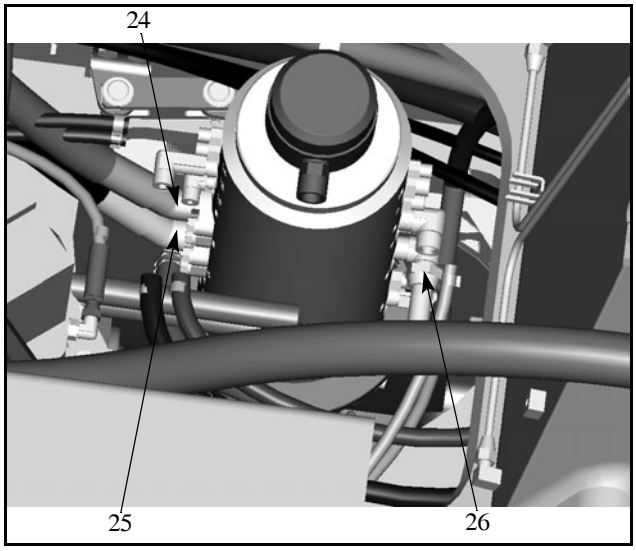


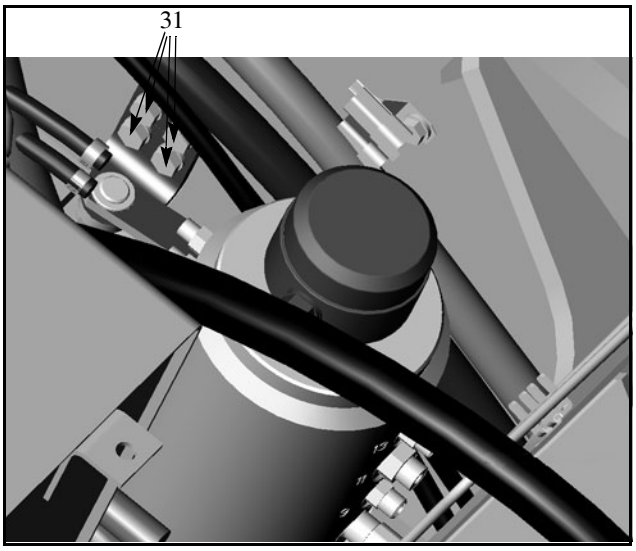


5. Disconnect connector (30).



6. Remove 4 bolts attached to revolving frame (31).





REMOVAL AND INSTALLATION OF CONTROL VALVE

REMOVAL

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

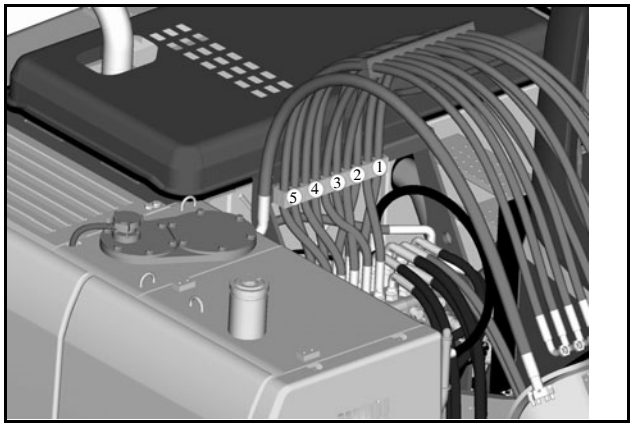
★ Remove pressure from all circuits.

1. Drain oil from the hydraulic tank and then drain oil out of the system.

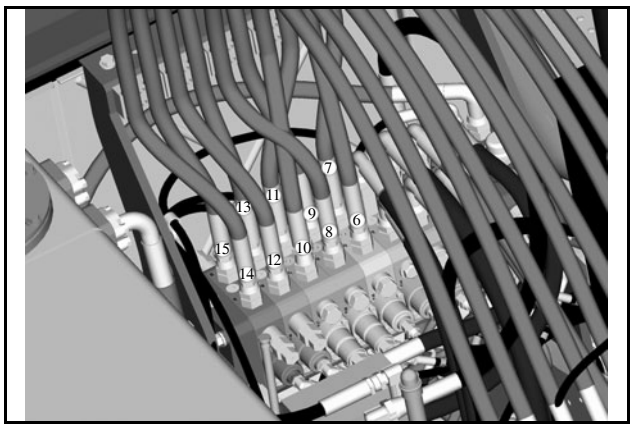
2. Attach an identification tag to pipe/hose to avoid incorrect connection during re-assembly.

3. Repeat for electrical connections.

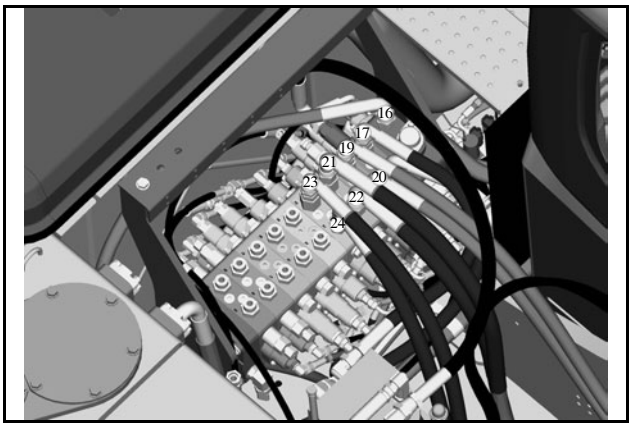
4. Remove pipe clamps, including back block (1, 2, 3, 4 and 5 if fitted).

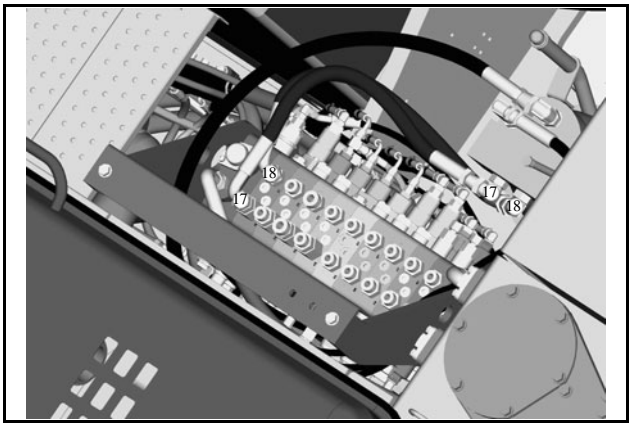


5. Disconnect hoses (6 through 11, also 12 through 15 if fitted).

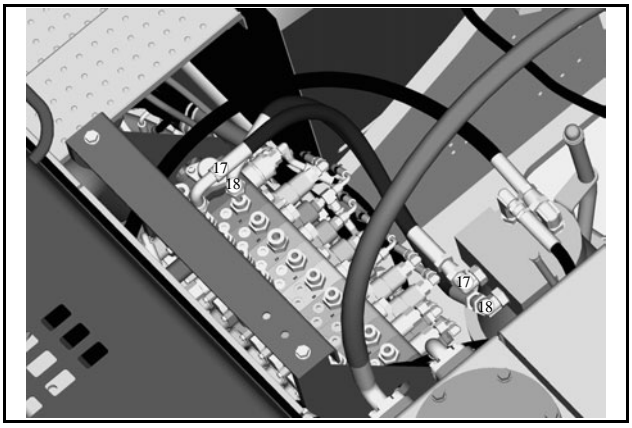


6. Disconnect hoses (16 through 24) from top of control valve.





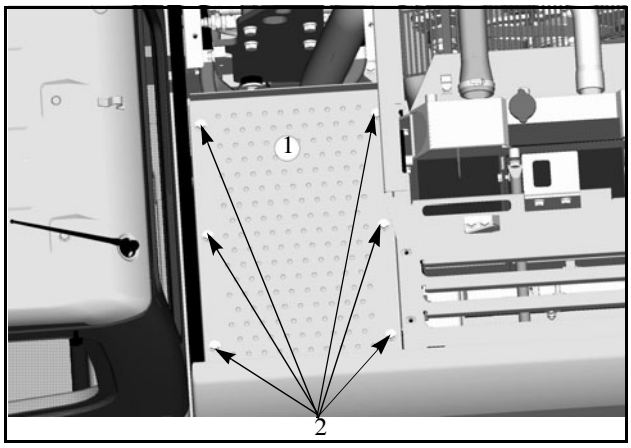
7. Also disconnect hoses 17 and 18 from swing machinery to aid removal of control valve and improve accessibility.



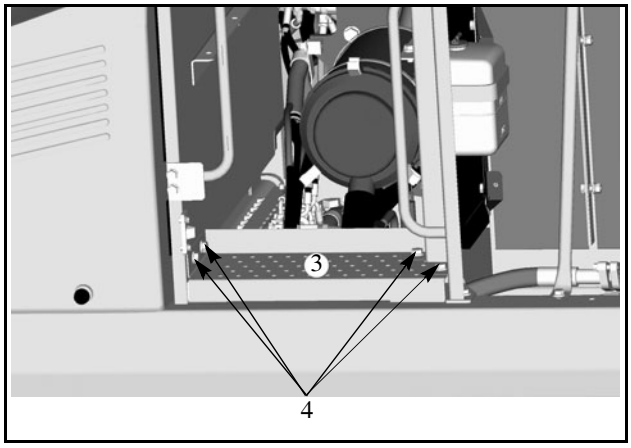
REMOVAL AND INSTALLATION OF MANIFOLD BLOCK ASSEMBLY

REMOVAL

1. Remove middle step (1), by removing 6 bolts (2) and lifting step out.



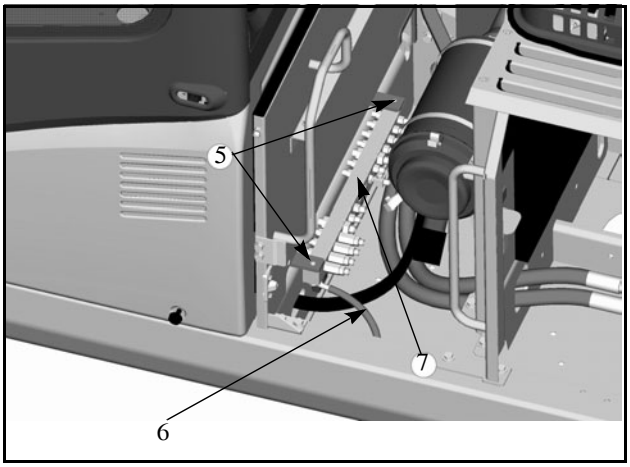
Remove bottom step (3), by removing 4 bolts (4) lifting step out.



2. Attach an identification tag to hoses and electrical connections to avoid incorrect connection during re-assembly.

3. Remove all hoses and electrical connections from manifold block.

4. Remove 2 bolts (5), disconnect earth strap (6) and remove manifold block (7).



INSTALLATION

- Install in reverse order of removal.

REMOVAL AND INSTALLATION OF MONOBOOM WORK EQUIPMENT

SPECIAL TOOLS

Mark	Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
R	796-900-1200	Remover	■	1		
	790-101-4000	Puller (490 kN 50-T-long)	■	1		
	790-101-1102	Pump (294 kN 30 T)	■	1		

*Distinction between new and existing part.

REMOVAL

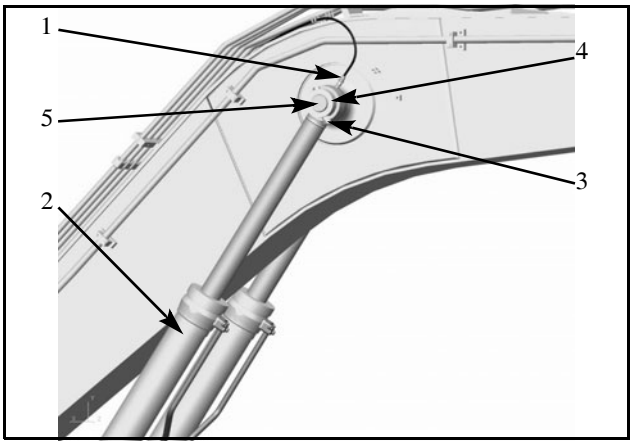
⚠ Extend the arm and bucket fully. Lower the work equipment to the ground and set the safety lock lever to the lock position.

⚠ Release the residual pressure in the hydraulic circuit. Refer to the Release of Remaining Pressure in Hydraulic Circuit section in the TESTING AND ADJUSTING chapter of this manual.

1. Disconnect grease hose (1).

2. Sling boom cylinder assembly (2), and remove lock bolt (3).

3. Remove plate (4), then remove head pin (5). ※1
   - ★ There are shims installed, so check the number and thickness, and keep them in a safe place.

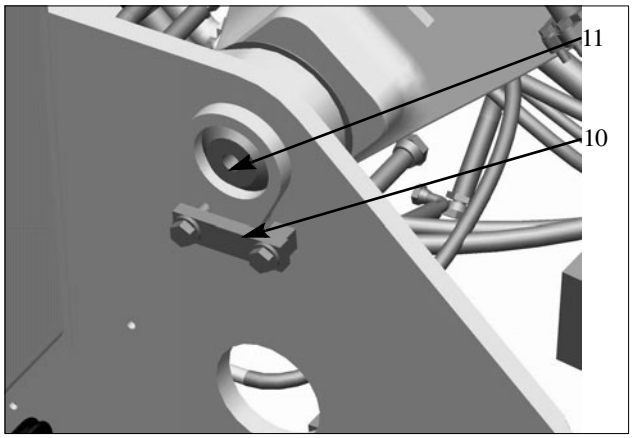


4. Start the engine and retract the piston rod.
   - ★ Fasten the piston rod with wire so that it will not slip out and lower the cylinder onto a stand, or place a support under the bottom of the cylinder to support it. In the latter case, remove the grease fitting on the bottom side first.
   - ★ Remove the boom cylinder on the other side in the same manner.

5. Disconnect stabilizer hoses (6), arm cylinder hoses (7), boom cylinder hoses (8) two for each.
   - ★ Plug the hoses to prevent oil flow-out, and fasten them on the valve side.

6. Disconnect intermediate connector CN-A86 (9) for a working lamp.

7. Lift off the work equipment and remove plate (10) and then pin (11) at the foot. ※2



- ● When removing them, first remove plate (10) and then remove pin (10) at the foot, using Tool **R**.
- ★ Shims are installed, so do not forget to check their number and each location of installation.

INSTALLATION

- Install in reverse order of removal.

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

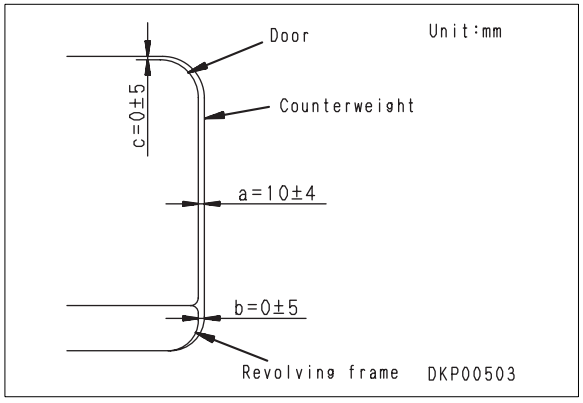
Counterweight mounting bolt:
1,180 - 1,470 Nm {120 - 150 kgm}

※2

★ Installing and adjusting counterweight.

Sling counterweight with crane and place in position on the frame.
Push counterweight, install mounting bolts, and adjust to the following dimensions.

- Clearance from revolving frame:
  10 ± 5 mm (left and right)
- Clearance from bodywork door:
  10 ± 5 mm (left and right)
- Stepped difference **b** from revolving frame in left- to right direction: Max. 5 mm
- Stepped difference **a** from bodywork door in left- to right direction: 10 ± 4
- Stepped difference **c** from bodywork top cover in up-down right direction: Max. 5 mm



HYDRAULIC CIRCUIT DIAGRAM (1/2)

PW160-7K