SHOP MANUAL

KOMATSU

PW180-7K

MACHINE MODEL	SERIAL NUMBER
PW180-7K	**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.
- PW180-7K mount the SAA6D102E-2 engine.
- For details of the engine, see the 102 Series Engine Shop Manual.

Printed in Belgium 05-06

GENERAL

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

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

GENERAL

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

STRUCTURE AND FUNCTION

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

TESTING, ADJUSTING AND TROUBLESHOOTING

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

DISASSEMBLY AND ASSEMBLY

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

MAINTENANCE STANDARD

This section gives the judgement standards when inspecting disassembled parts.

NOTICE

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

ELECTRIC WIRE CODE

In the wiring diagrams, various colors and symbols are employed to indicate the thickness of wires. This wire code table will help you understand WIRING DIAGRAMS.

EXAMPLE:05WB indicates a cable having a nominal number 05 and white coating with black stripe.

CLASSIFICATION BY THICKNESS

Nominal number	Copper wire			Cable O.D. (mm)	Current rating (A)	Applicable circuit
	Number of strands	Dia. Of strand (mm)	Cross section (mm)			
0.85	11	0.32	0.88	2.4	12	Starting, lighting, signal etc.
2	26	0.32	2.09	3.1	20	Lighting, signal etc.
5	65	0.32	5.23	4.6	37	Charging and signal
15	84	0.45	13.36	7.0	59	Starting (Glow plug)
40	85	0.80	42.73	11.4	135	Starting
60	127	0.80	63.84	13.6	178	Starting
100	217	0.80	109.1	17.6	230	Starting

CLASSIFICATION BY COLOR AND CODE

Priority	Circuits Classification		Charging	Ground	Starting	Lighting	Instrument	Signal	Other
1	Primary	Code	W	B	B	R	Y	G	L
		Color	White	Black	Black	Red	Yellow	Green	Blue
2	Auxiliary	Code	WR	—	BW	RW	YR	GW	LW
		Color	White & Red	—	Black & White	Red & White	Yellow & Red	Green & White	Blue & White
3		Code	WB	—	BY	RB	YB	GR	LR
		Color	White & Black	—	Black & Yellow	Red & Black	Yellow & Black	Green & Red	Blue & Red
4		Code	WL	—	BR	RY	YG	GY	LY
		Color	White & Blue	—	Black & Red	Red & Yellow	Yellow & Green	Green & Yellow	Blue & Yellow
5		Code	WG	—	—	RG	YL	GB	LB
		Color	White & Green	—	—	Red & Green	Yellow & Blue	Green & Black	Blue & Black
6		Code	—	—	—	RL	YW	GL	—
		Color	—	—	—	Red & Blue	Yellow & White	Green & Blue	—

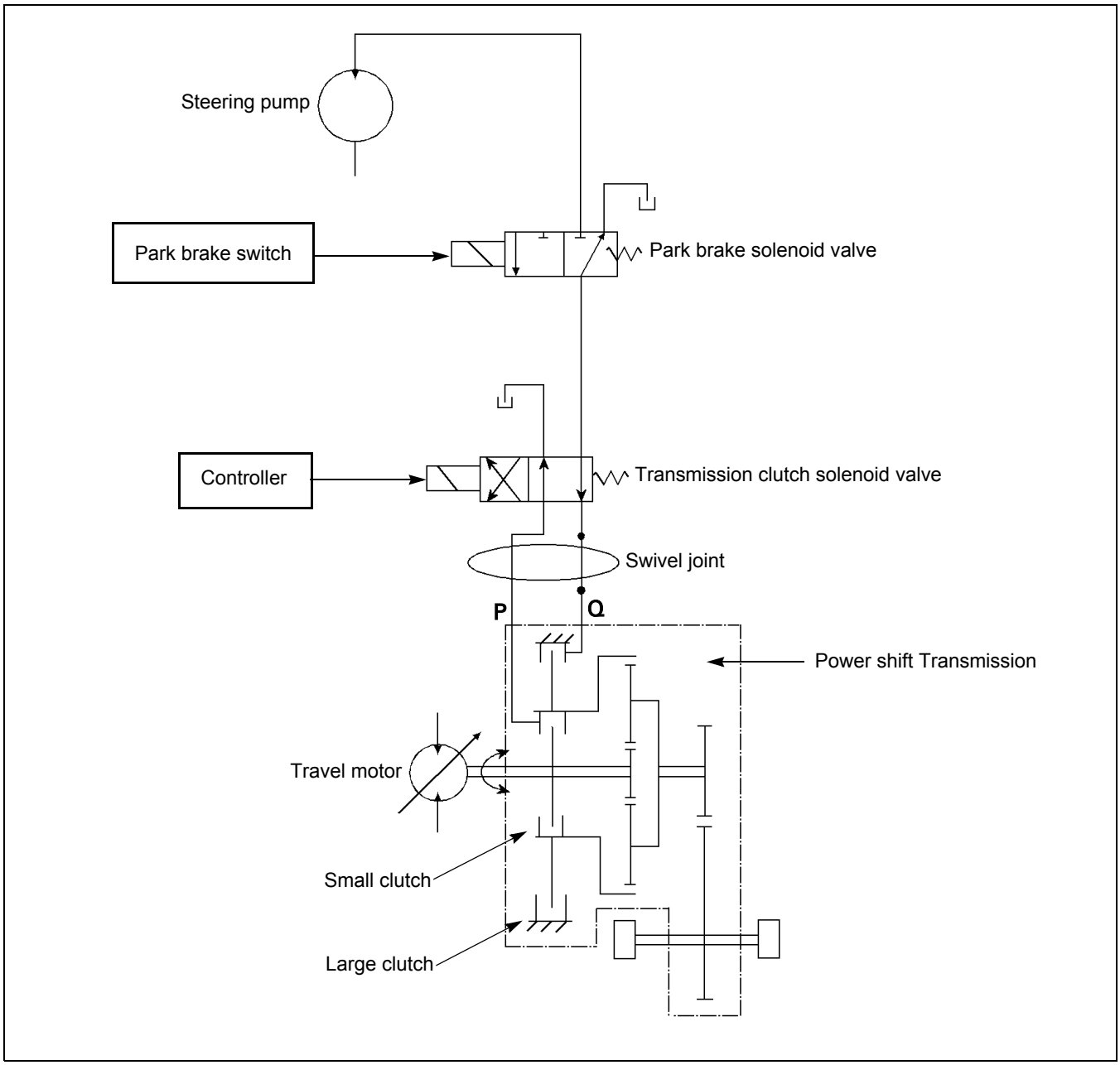
	Description	2.25m	2.6m	2.9m
A	Overall height	3,720		
B	Front overhang	5,100		
C	Wheelbase	2,600		
D	Rear overhang	1,200		
E	Overall length	8,900		
F	Front swing radius	6,400		
G	Work equipment ground clearance	922	800	624
H	Overall width	2.5 m axle	2,550	
		2.75 m axle	2,750	
I	Front axle	2.5 m axle	1,914	
		2.75 m axle	2,124	
J	Rear axle	2.5 m axle	1,914	
		2.75 m axle	2,124	

10 STRUCTURE, FUNCTION AND MAINTENANCE STANDARD

1. Pinion shaft
2. Spacer
3. Sealing
4. Screw
5. Cover
6. Bearing
7. Gearbox housing
8. Plug
9. Output assembly
10. Lubrication kit
11. Cock
12. Seal ring
13. Bearing
14. Nut
15. O-ring
16. Toothed ring
17. Reduction assembly
18. Sun gear
19 Cover
20. Reduction assembly
21. Screw
22. Sun gear
23. Circlip
24. Lubrication kit
25. Lubrication kit
26. Screw
27. Washer
28. O-ring
29. Hydraulic motor

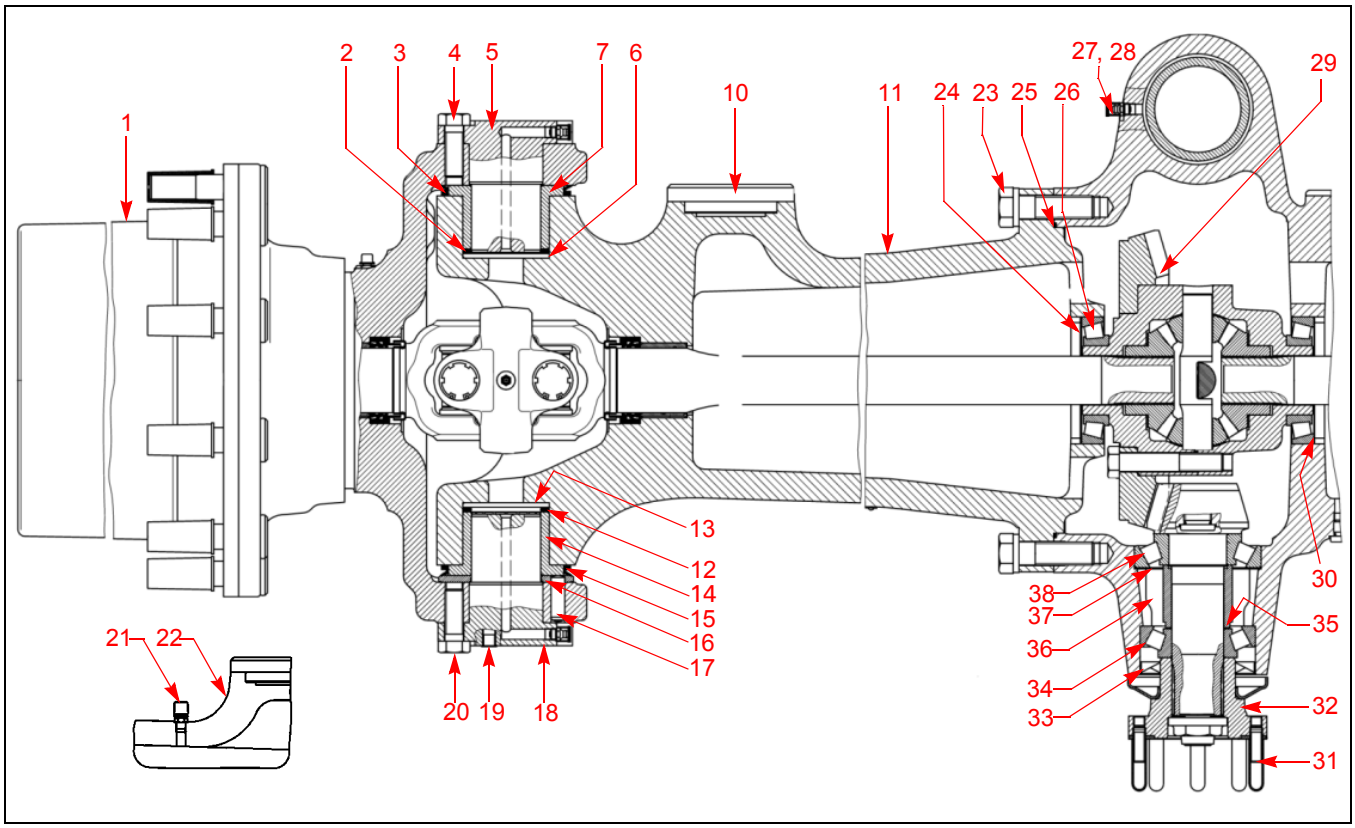
FUNCTION

Pressure applied in port P will disengage the small clutch, low speed will be selected. Pressure applied in port Q will disengage the large clutch, high speed will be selected. No pressure in port P and Q will engage both small and large clutches. When both clutches are engaged this locks the input shaft of the transmission to the housing locking the transmission, this is used for the park brake condition.



Hi = sun + planets locked together, planetary drive = (1.32: 1)

Lo = sun drives planets annulus is held, planet carrier is the output = (4.93: 1)



1.	Planetary holder	20.	Screw
2.	O-ring	21.	Axle body long steering
3.	Seal ring	22.	Air valve
4.	Screw	23.	Screw
5.	Pin	24.	Shim ring
6.	Disk/Washer	25.	O-ring
7.	Bushing	26.	Roller bearing
8.	Lip seal	27.	Protection cap
9.	Bushing	28.	Nipple
10.	Pressure pad	29.	Bevel gear
11.	Axle body short steering	30.	Shim ring
12.	O-ring	31.	Planetary holder
13.	Disk/Washer	32.	Flange
14.	Bushing	33.	Lip seal
15.	Seal ring	34.	Roller bearing
16.	Ring	35.	Shim ring
17.	Parallel pin	36.	Bushing
18.	Pin	37.	Shim ring
19.	Security dowel	38.	Roller bearing

FUNCTION

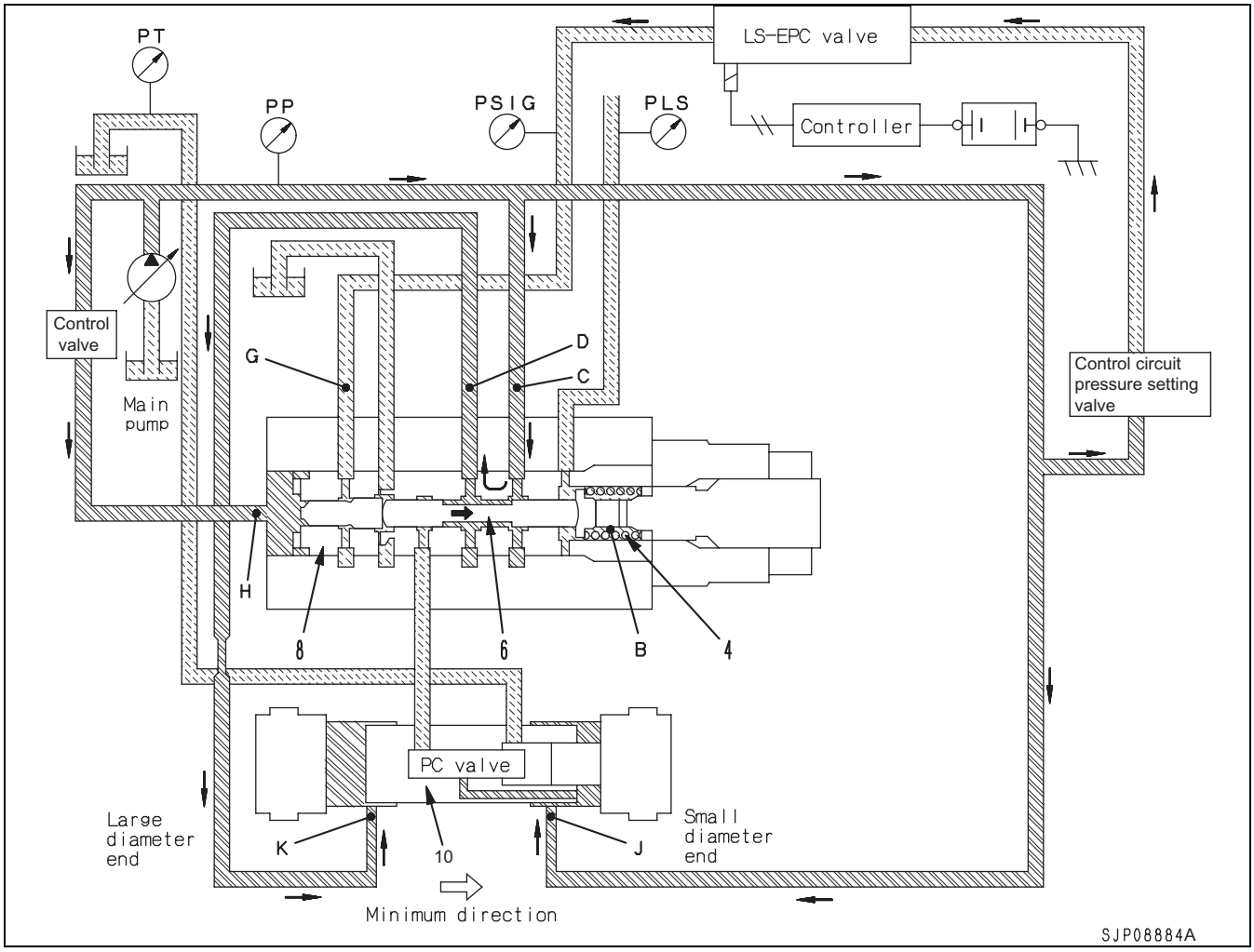
The main function of the power brake valve is to gradually reduce the machines travelling speed when the pedal is slowly depressed. The higher the force applied to depress the pedal, the greater the deceleration of the machine, until the machine is eventually in a stationary position.

An alternative function of the power brake valve is the digging brake application, if the machine is to be used for digging, the power brake valve should be fully depressed until the pedal is locked and the latching hook is secured on its location pin. This will prevent the machine from "Travelling" when it is being used for digging

SPECIFICATIONS

Tank	167 Litres
Amount of oil inside tank	120 Litres
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}

OPERATION

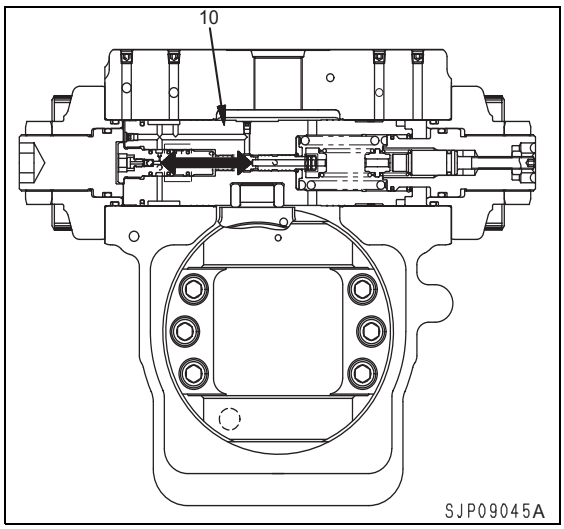


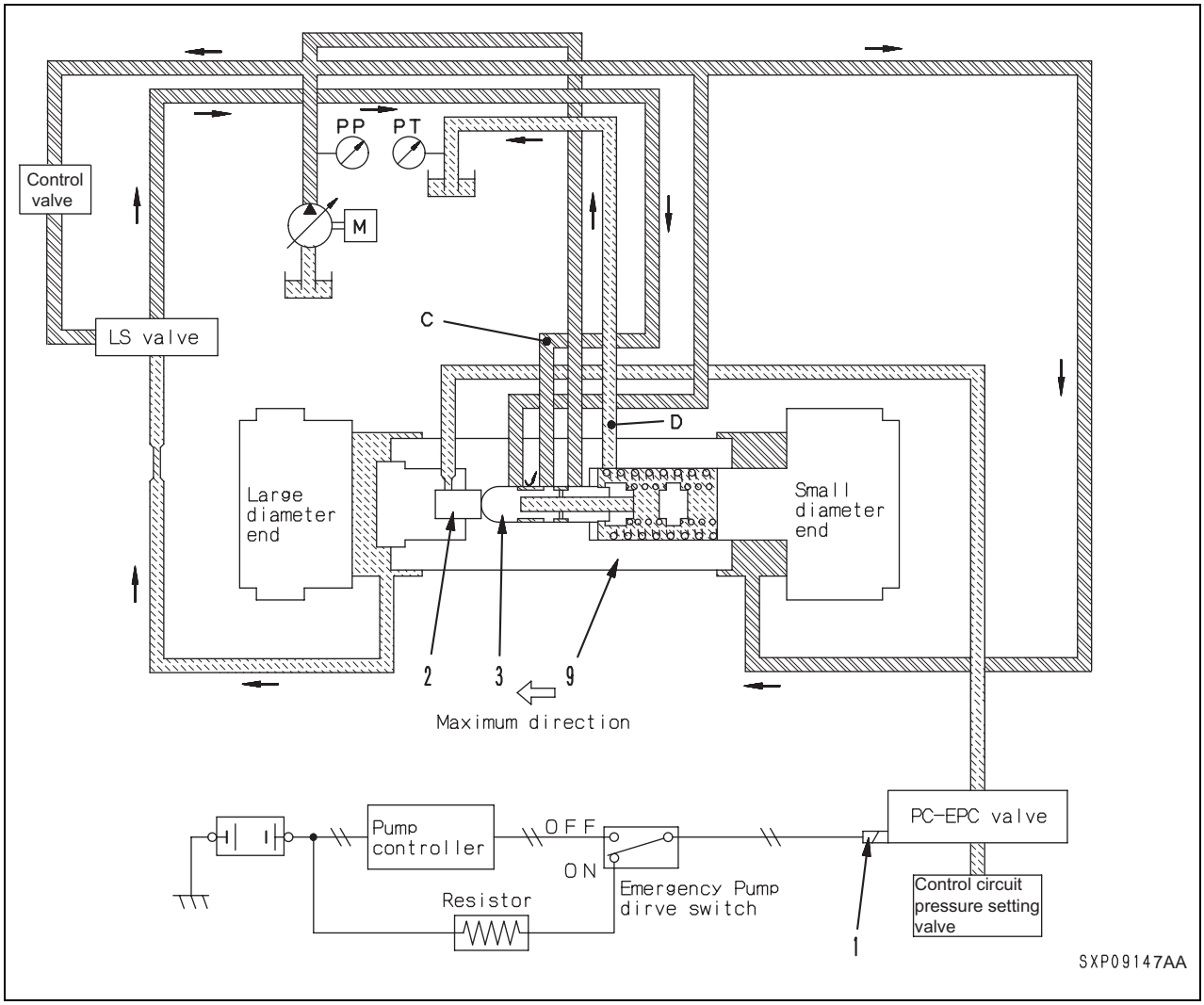
1. LS valve

1.1. When control valve is at neutral position

- The LS valve is a three-way selector valve, with pressure **PLS** (LS pressure) from the inlet port of the control valve brought to spring chamber **B**, and main pump discharge pressure **PP** coming from the control valve output brought to port **H** of sleeve (8). The size of this LS pressure **PLS** + force **Z** of spring (4) and the main pump pressure (self pressure) **PP** determines the position of spool (6). However, the size of the output pressure **PSIG** (the LS selection pressure) of the EPC valve for the LS valve entering port **G** also changes the position of spool (6). (The set pressure of the spring changes).
- Before the engine is started, servo piston (10 is pushed to the left. (See the diagram on the right)
- When the engine is started and the control lever is at the neutral position, LS pressure **PLS** is 0 MPa {0 kg/cm²}. (It is interconnected with the drain circuit through the control valve spool.)

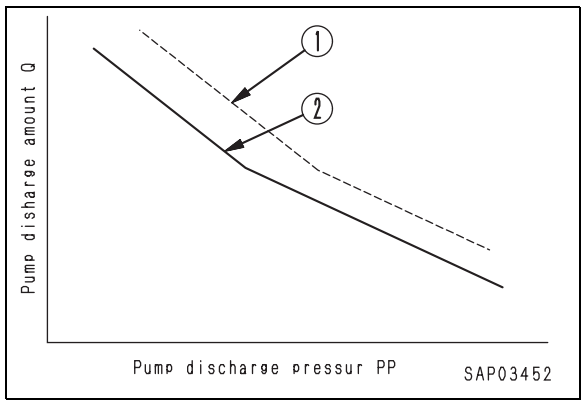
At this point, spool (6) is pushed to the right,and port **C** and port **D** are connected. Pump pressure **PP** enters the large diameter end of the piston from port **K** and the same pump pressure **PP** also enters port **J** at the small diameter end of the piston, so the swash plate is moved to the minimum angle by the difference in the area of the piston (10).





b. When main pump load is heavy

- In the same way as in the previous item, when the emergency pump drive switch is **ON**, the command current sent to PC-EPC valve solenoid (1) becomes constant. For this reason, the force of pin (2) pushing spool (3) is constant.
- If main pump pressures **PP** increase, servo piston (9) moves further to the left than when the main pump load is light, and spool (3) is balanced at the position in the diagram above.
- In this case, the pressure from port **B** flows to port **C**, this makes servo piston (9) move to the right (to make the discharge amount smaller) by the same mechanism as explained in item 2.1.b, and stops at a position to the left of the position when the load on the pump is light. In other words, even when the emergency pump drive switch is **ON**, the curve for the pump pressure **PP** and discharge amount **Q** is determined as shown in the diagram for the valve of the current sent to the PC-EPC valve solenoid through the resistor.
- The curve when the emergency pump drive switch is **ON** is curve ②, which is to the left of curve ① for when the pump controller is normal.

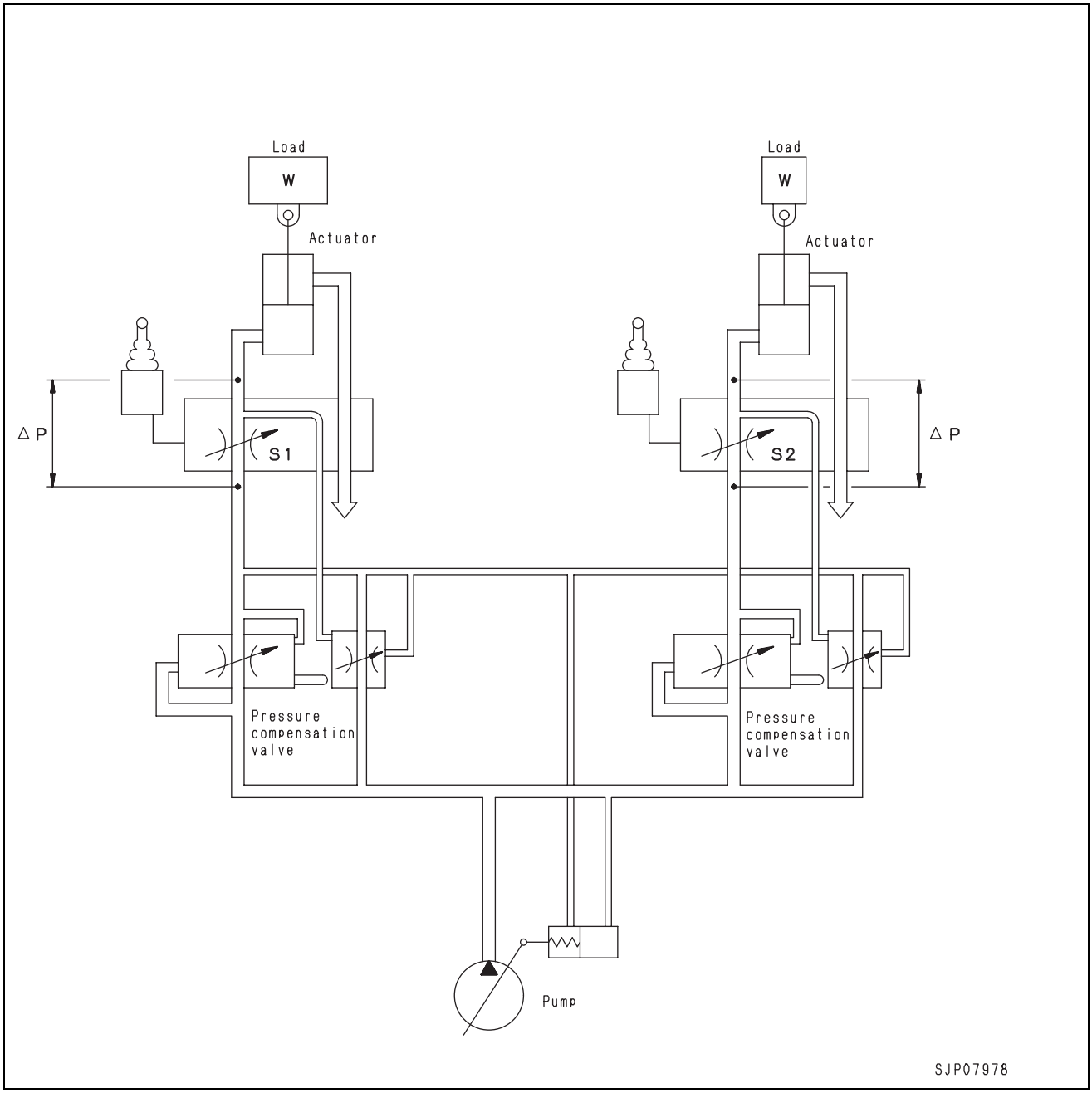


Unit:mm

No	Check Item	Criteria					Remedy
		Standard size			Repair limit		
		Free length x Out-side diameter	Installed length	Installed load	Free length	Installed load	
20.	Control valve spring	32.5 x 14.2	23	17.6Nm (1.8kgm)		13.7Nm (1.4kgm)	If damaged or deformed, replace spring
21.	Control valve spring	7.8 x 14.2	40	66.4Nm (6.8kgm)		53.1Nm (5.4kgm)	
22.	Control valve spring	27.5 x 14.2	18	17.6Nm (1.8kgm)		13.7Nm (1.4kgm)	
23.	Control valve spring	27.5 x 14.2	18	17.6Nm (1.8kgm)		13.7Nm (1.4kgm)	
24.	Control valve spring	36.2 x 5.3	23.5	29.4Nm (3kgm)		23.4Nm (2.3kgm)	
25.	Control valve spring	36.5 x 5.3	23.5	29.4Nm (3kgm)		23.4Nm (2.3kgm)	

2. Pressure compensation control

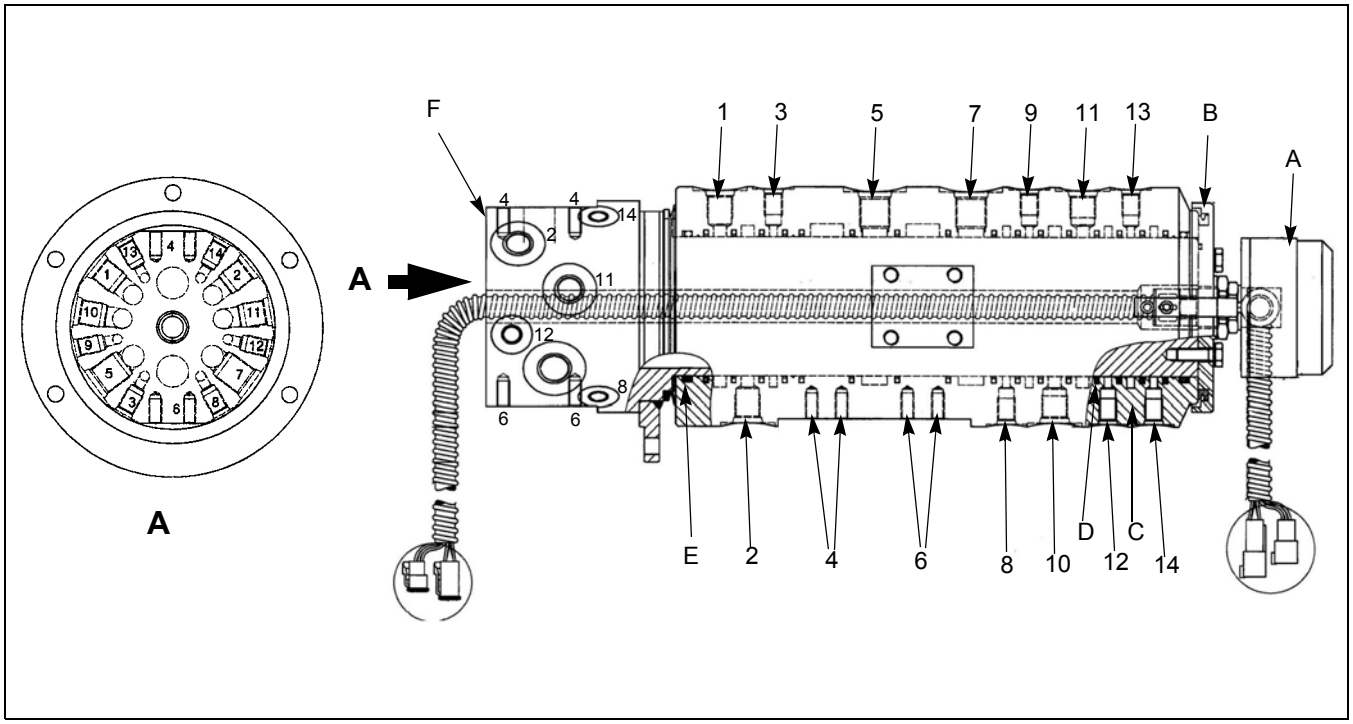
- A pressure compensation valve is installed to the inlet port side of the control valve spool to balance the load.
  When to actuators are operated together, this valve acts to make pressure difference ∆**P** between the upstream (inlet port) and downstream (outlet port) the same, regardless of the size of the load (pressure). In this way, the flow of oil from the pump is divided (compensated) in proportion to the area of openings **S1** and **S2** of each valve when it is operated.



Operation

- When the load pressure of another actuator side (the upper side) rises during a compound operation, the flow in the actuator circuit **Aa** on this side (the lower side) is apt to increase.
- In this case, the LS pressure **PLS** of another actuator is applied to the spring chamber **PLS1** and pushes the pressure reducing valve (1) and the flow control valve (2) to the left side.
- The flow control valve (2) throttles the opening area between the pump circuit **PP** and the spool upstream **PPA** and causes a pressure loss between **PP** and **PPA**.
- The flow control valve (2) and the pressure reducing valve (1) balance each other where the pressure difference between **PA** applied to the both end faces of the pressure reducing valve (1) and **PLS** becomes the same as the pressure loss between **PP** before and after the flow control valve and **PPA**.
- So, the pressure differences between the upstream pressures **PPA** and the downstream pressures **PA** of the both spools under compound operation become the same, and the pump flow is distributed in proportion to the opening area of each spool notch **a**.

CENTRE SWIVEL JOINT



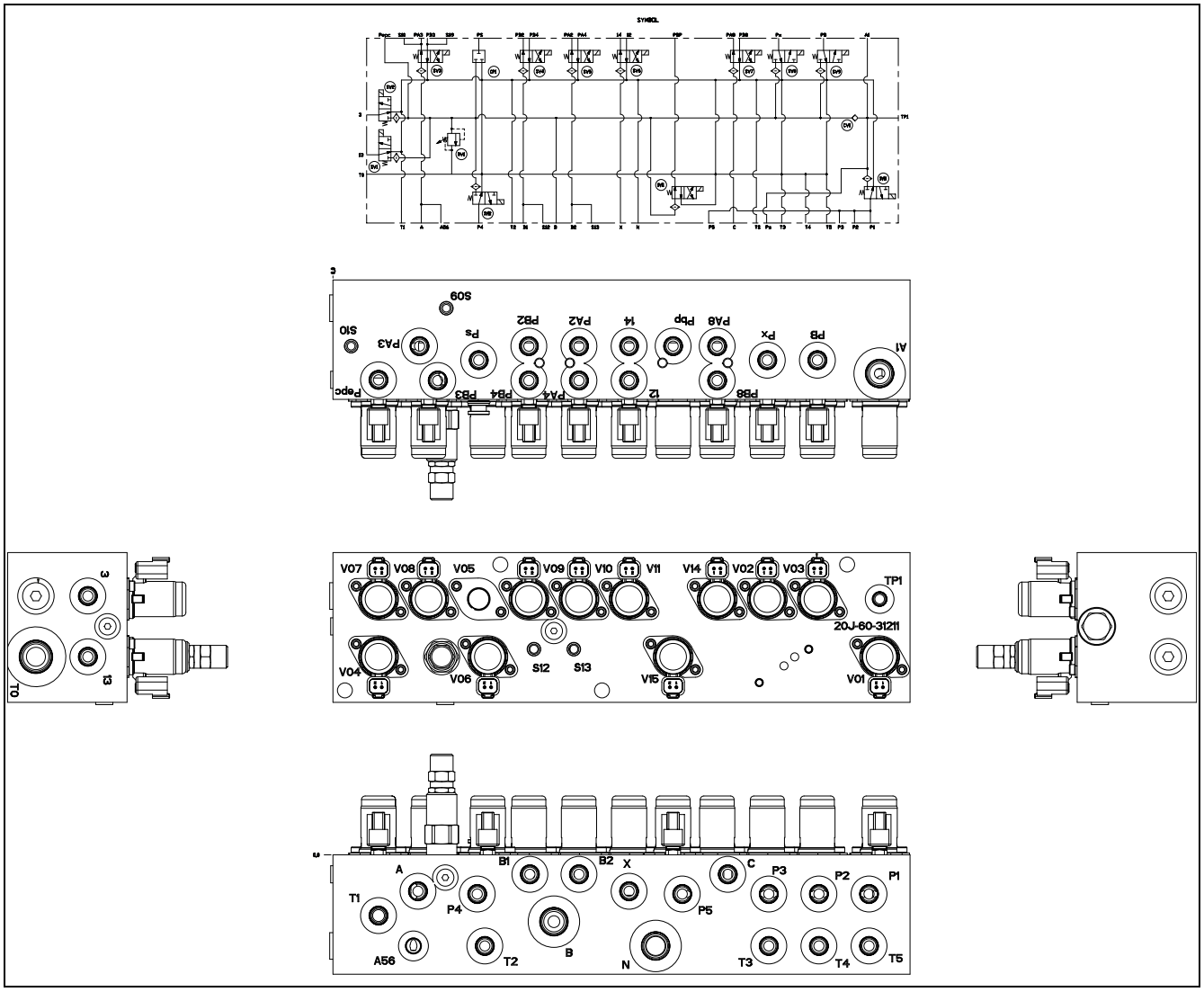
1. Steering left
2. Drain
3. Motor volume pilot
4. Travel motor A
5. Undercarriage attachment cylinder head
6. Travel motor B
7. Undercarriage attachment cylinder bottom
8. Service brake-1
9. Service brake-2
10. Steering right
11. Blanked off
12. Transmission large clutch
13. Suspension lock
14. Transmission small clutch

A. Slip ring assembly
B. Cover
C. Housing
D. Sealing ring
E. O-ring/backup ring seal
F. Rotor

Unit: mm

No.	Check Item	Criteria			Remedy
		Standard Size	Standard clearance	Repair limit	
1	Internal shaft	$110^{-0.02}_{-0.06}$	Max.=0.21 Min.=0.12	>=0.26	Replace
2	External rotor	$110^{0.15}_{0.10}$			

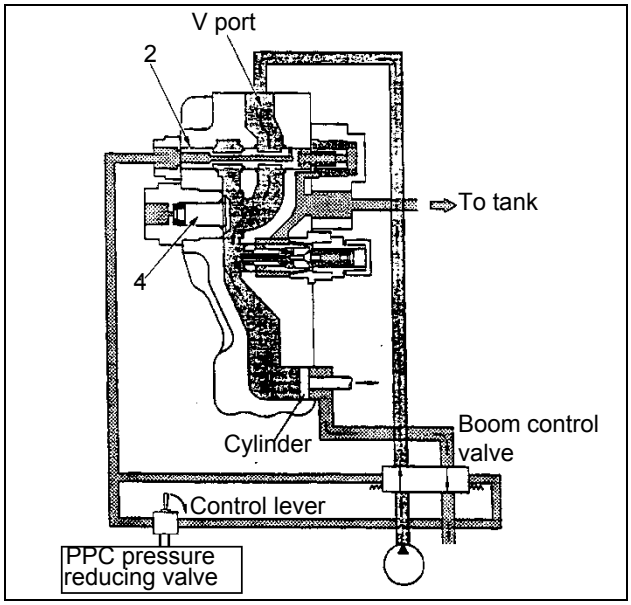
SOLENOID VALVE BLOCK



OPERATION

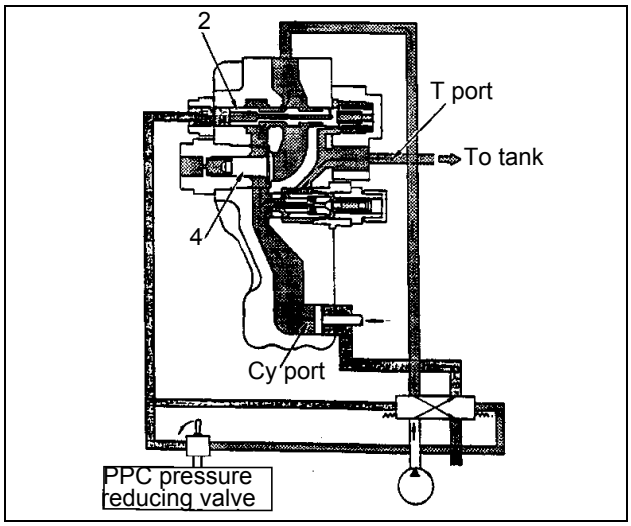
Boom Raise

- 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 boom.



Boom Lower

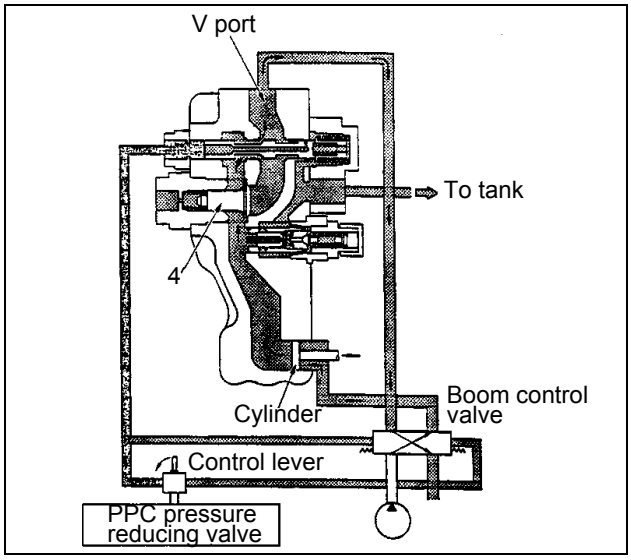
- During boom lowering the pilot signal reverses the flow through the control valve spool. High pressure oil flows to the head side of the cylinder. Oil in the bottom side of the cylinder flows through the port **Cy** of the valve. The pilot signal also opens the spool (2) of the hose burst valve and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



Input and output signals

CN-1

Pin	Signal name	Input/
1	Travel PPC pressure sensor	Input
2	R pump pressure sensor	Input
3	NC	Input
4	Signal GND	
5	Abnormality in auto-greasing controller	Input
6	Service pressure switch	Input
7	Overload sensor (analog)	Input
8	F pump pressure sensor	Input
9	NC	Input
10	Signal GND	
11	Knob SW (power max.)	Input
12	Travel reverse press. switch	Input
13	Throttle actuator feedback signal	Input
14	Angle sensor	Input
15	NC	Input
16	Travel PPC pressure power	Output
17	Start Switch (Terminal C)	Input
18	Clamshell LH	Input
19	Throttle potentiometer	Input
20	NC	Input
21	GND (analog GND)	
22	POT_PWR	Output
23	Start switch (terminal ACC)	Input
24	Clamshell RH	Input

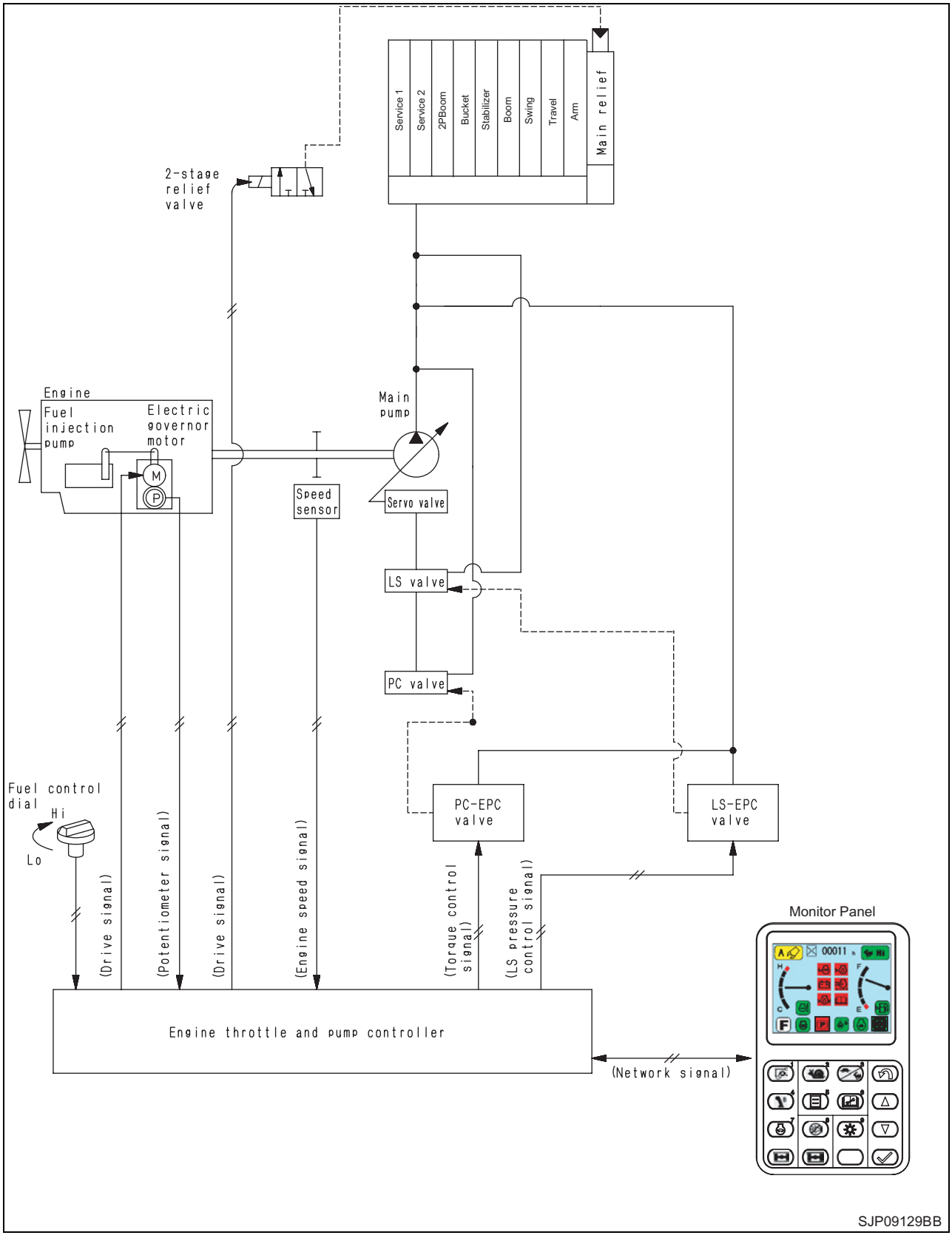
CN-2

Pin	Signal name	Input/
1	NC	Output
2	Swing emergency switch	Input
3	Brake lock proximity switch	Input
4	232C_RxD	Input
5	Arm dump pressure switch	Input
6	Travel forward pressure	Input
7	Model selection 4 switch	Input
8	Brake light cut relay	Output
9	PPC lock (relay)	Output
10	NC	Input
11	NC	Output
12	CAN shield	
13	Model selection 5	Input
14	232C_TxD	Output
15	Arm DIG switch	Input
16	Swing pressure switch	Input
17	Model selection 3	Input
18	Clamshell solenoid relay	Output
19	Suspension lock relay	Output
20	NC	Input
21	S_NET	Input/ output
22	CAN0_L	Input/ output
23	CAN1_L	Input/ output
24	Flash memory write enable signal	Input
25	Boom down pressure switch	Input
26	Bucket dump pressure switch	Input
27	Machine selection 2	Input
28	Swing proximity switch	Input
29	GND (pulse GND)	
30	Speed pickup sensor	Input
31	GND (S_NET GND)	
32	CAN0_H	Input/ output
33	CAN1_H	Input/ output
34	GND (232C GND)	
35	Boom raise pressure switch	Input
36	Bucket DIG pressure switch	Input
37	Model selection switch 1	Input
38	Swing lock switch	Input
39	Pulse GND	
40	Engine speed sensor	Input

CN-3

Pin	Signal name	Input/
1	VB (controller power)	Input
2	VIS (solenoid power)	Input
3	SOL_COM (solenoid com-	
4	Battery relay drive signal	Output
5	Governor motor A (+)	Output
6	LS-EPC solenoid	Output
7	Merge/Flow divider solenoid	Output
8	2 stage relief solenoid	Output
9	Outrigger select switch	Input
10	Travel direction F switch	Input
11	VB (controller power)	Input
12	VIS (solenoid power)	Input
13	SOL_COM (solenoid com-	
14	KEY signal	Input
15	Governor motor A (-)	Output
16	PC-EPC solenoid	Output
17	Creep solenoid	Output
18	Heater relay drive	Output
19	Park brake pressure switch	Input
20	Travel direction N switch	Input
21	GND (controller GND)	
22	VIS (solenoid power)	Input
23	SOL_COM (solenoid common gnd)	
24	KEY signal	Input
25	Governor motor B (+)	Output
26	Service flow control EPC (2)	Output
27	Transmission clutch solenoid	Output
28	Travel FR solenoid	Output
29	PPC lock (IN)	Input
30	Travel direction R switch	Input
31	GND (controller GND)	
32	GND (controller GND)	
33	GND (controller GND)	
34	NC	
35	Governor motor B (-)	Output
36	2 stage back pressure solenoid	Output
37	Swing brake solenoid	Output
38	Travel N solenoid	Output
39	Low brake pressure switch	Input
40	Boom select switch	Input

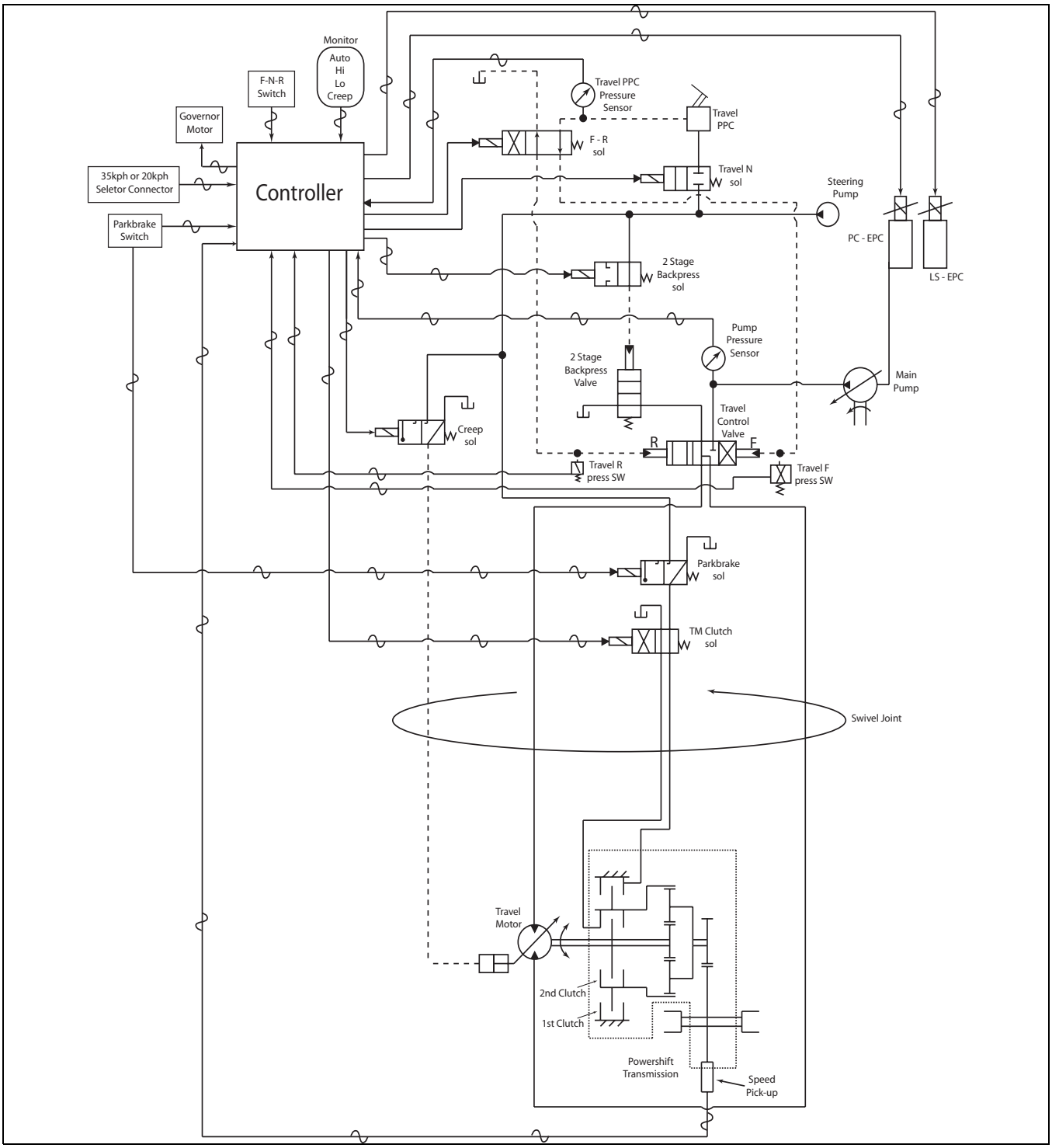
3. Pump/Valve control function



FUNCTION

- The machine is matched to various types of work properly with the 2-stage relief function to increase the digging force, etc.

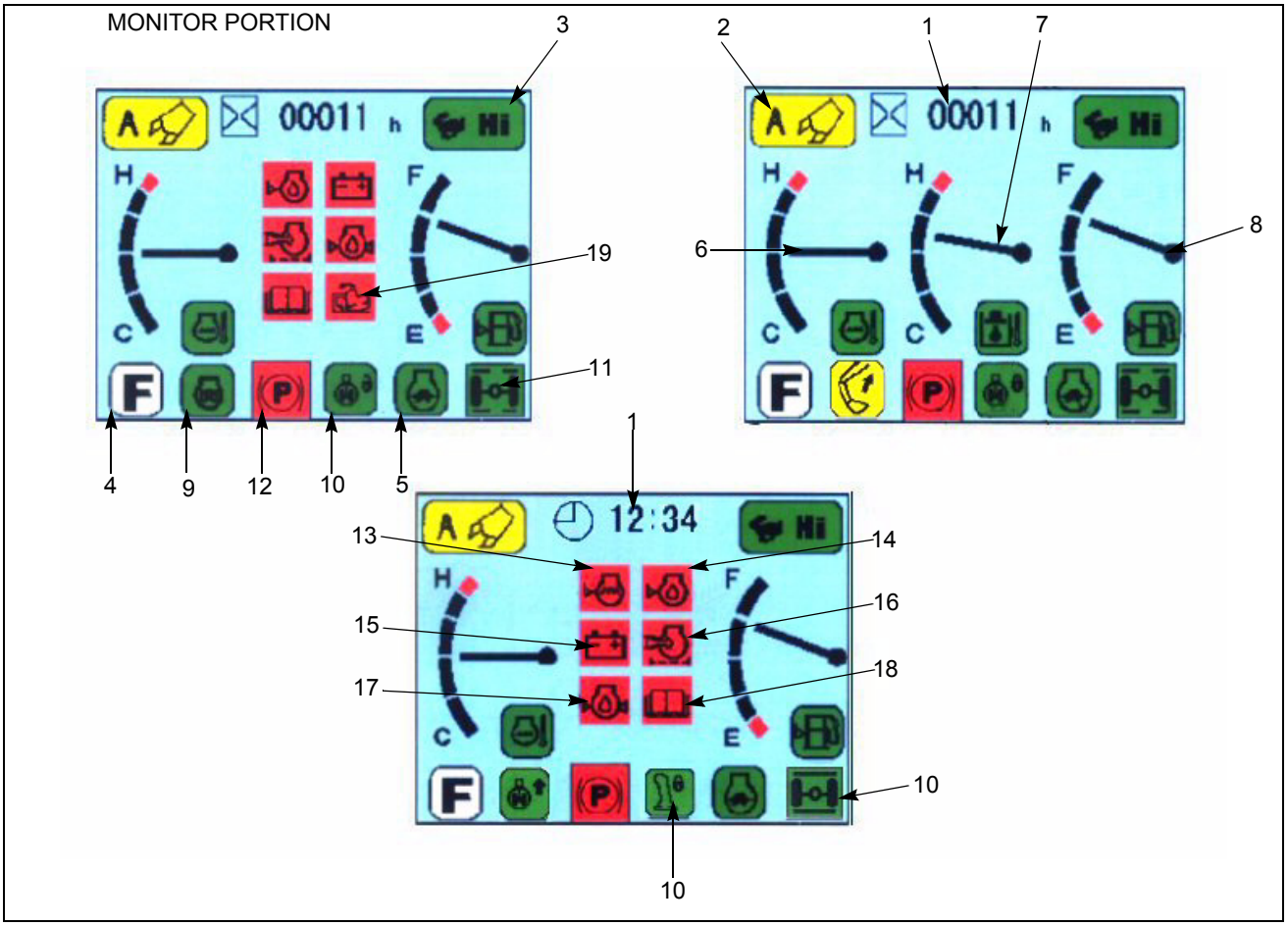
8. Travel control function



FUNCTION

- The pump is controlled and the travel speed is changed manually or automatically, to secure proper travel performance matched to the type of work and jobsite during travel.

MONITOR CONTROL, DISPLAY PORTION

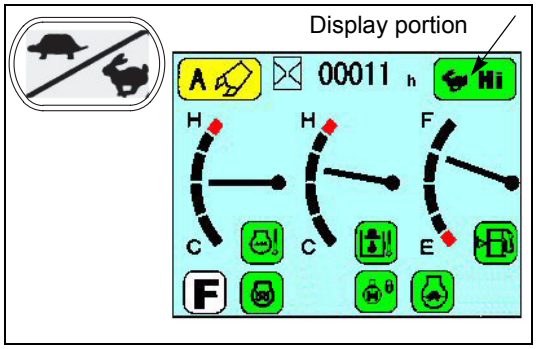


1.	Hour meter / Clock	11.	Suspension lock (Manual) / Suspension lock (Auto)
2.	Working mode	12.	Parking brake
3.	Travel modes	13.	Radiator level caution
4.	Travel direction	14.	Engine oil level caution
5.	Auto-deceleration	15.	Battery charge caution
6.	Engine water temperature guage	16.	Air filter caution
7.	Hydraulic oil temperature guage	17.	Engine oil pressure caution
8.	Fuel guage	18.	Service interval warning
9.	Pre heating / One touch power up (Power max) / Upper structure position	19.	Overload caution
10.	Swing lock / PPC lock		

3. HIGH/LOW SPEED SELECTOR SWITCH

This switch (3) is used to set the travel speed in 3 stages.

Lo lights up:	Low-mode travel
Hi lights up:	Hi-mode travel
AT lights up:	Auto mode travel

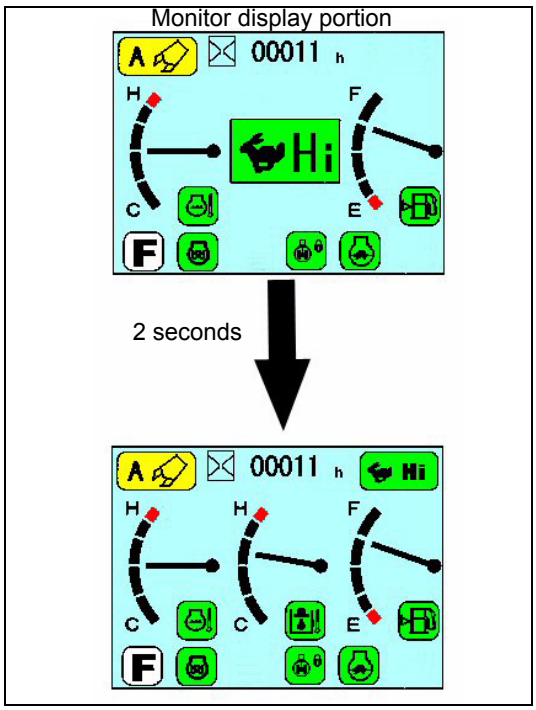


When the engine is started, the speed is automatically set to the last value before engine was stopped.

Each time that the switch is pressed, the display changes Lo→Hi→At→Lo in turn.

When travelling in auto mode (AT), if more travel torque is needed, such as when traveling on soft ground or on slopes, the speed automatically switches to low speed (Lo), so there is no need to operate the switch.

- When loading or unloading from a trailer, always travel at low speed. Never operate the travel speed selector switch during the loading or unloading operation.



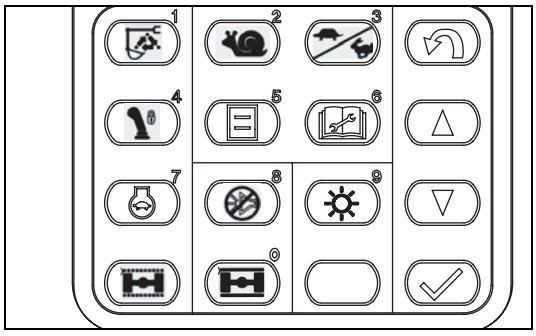
REMARK

Each time that the travel speed selector switch is operated, the mode is displayed in the centre of the monitor display, and the screen returns to the normal screen after 2 seconds.

4. CONTROL LEVER LOCK SWITCH

Depressing control lever lock switch will stop lever functionality. Lever lock switch must be engaged when machine travels on highway to prevent accidental use of work equipment.

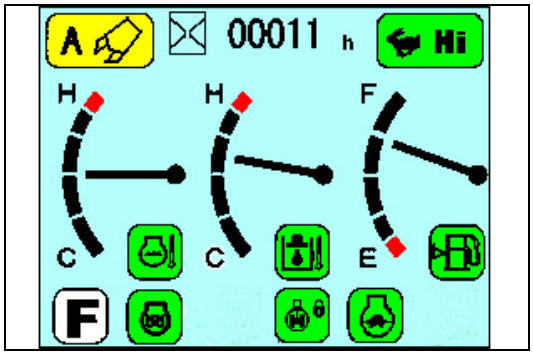
The display will illuminate on the monitor when active.



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.

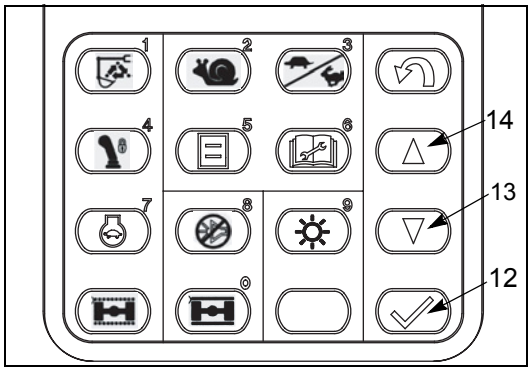
  This becomes possible 10 minutes after the starting switch is turned ON and the monitor screen has changed to the normal screen.

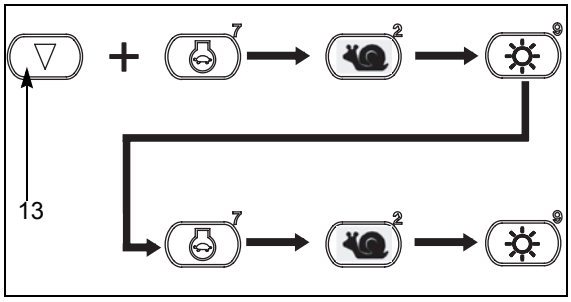


METHOD OF SETTING, CHANGING PASSWORD

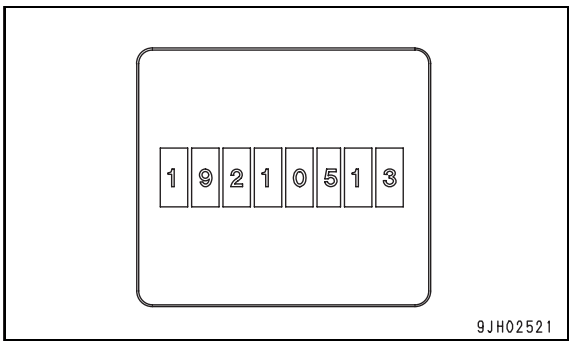
1. Turn Starter key switch to 'on' position (wait 10 minutes). Press and hold down switch (13). Using the 10 digit key pad, input the following number sequence: 7->2->9->7->2->9

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

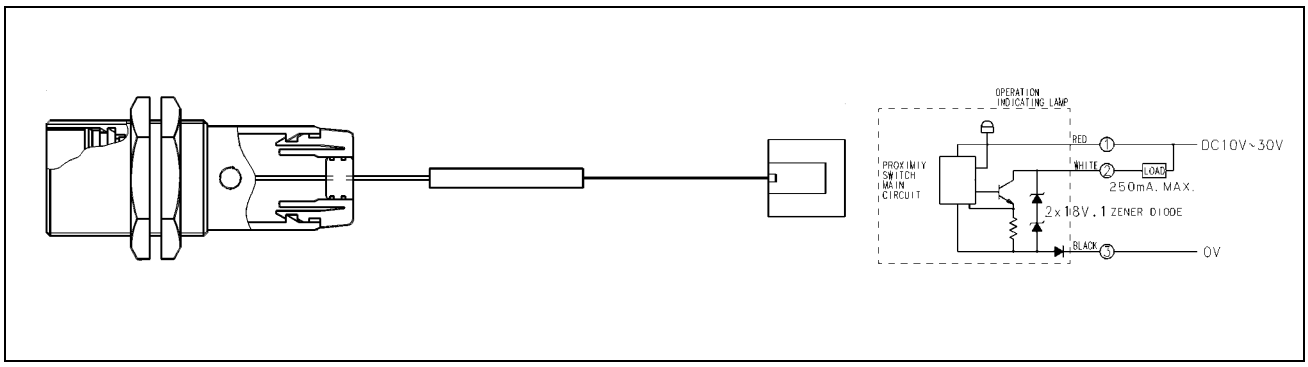




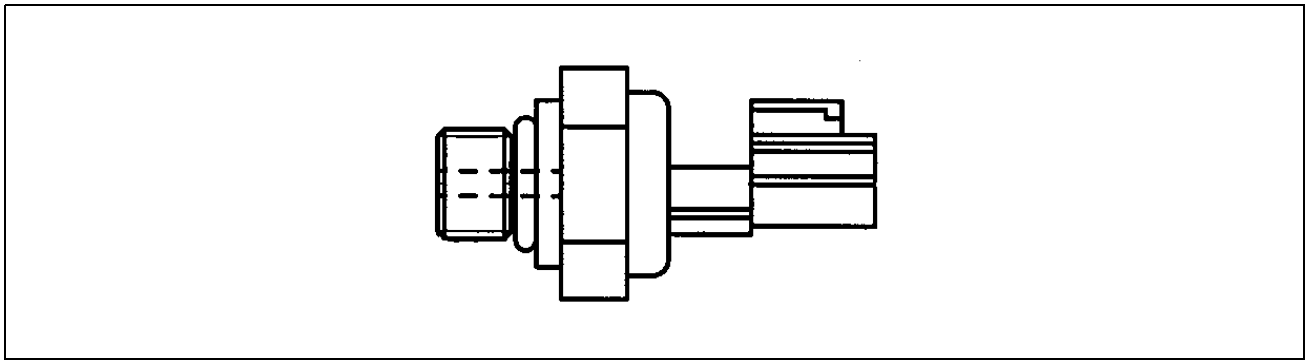
2. On the input screen, use the 10-key pad to input an 8-digit number [19210513]. When the final digit [number 3] is input, the screen will change to the Valid/Invalid screen for the password function.



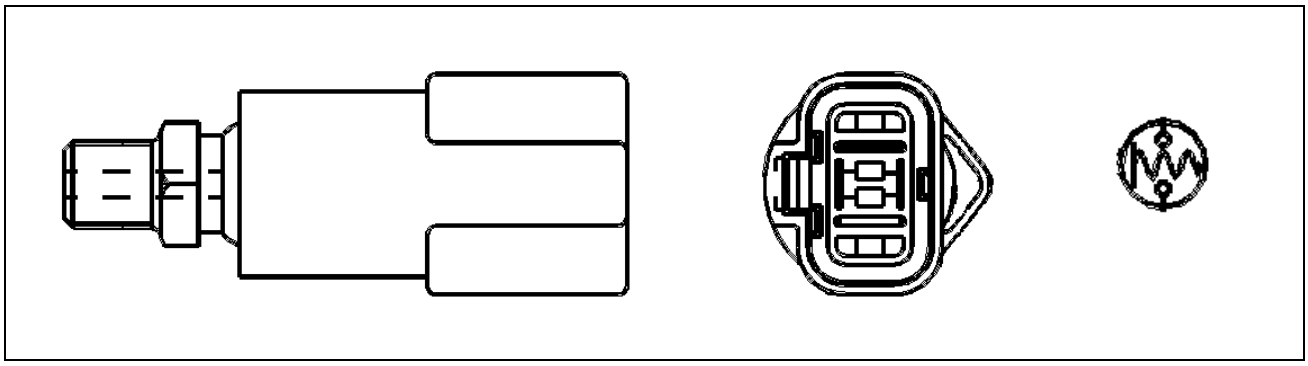
Swing proximity sensor



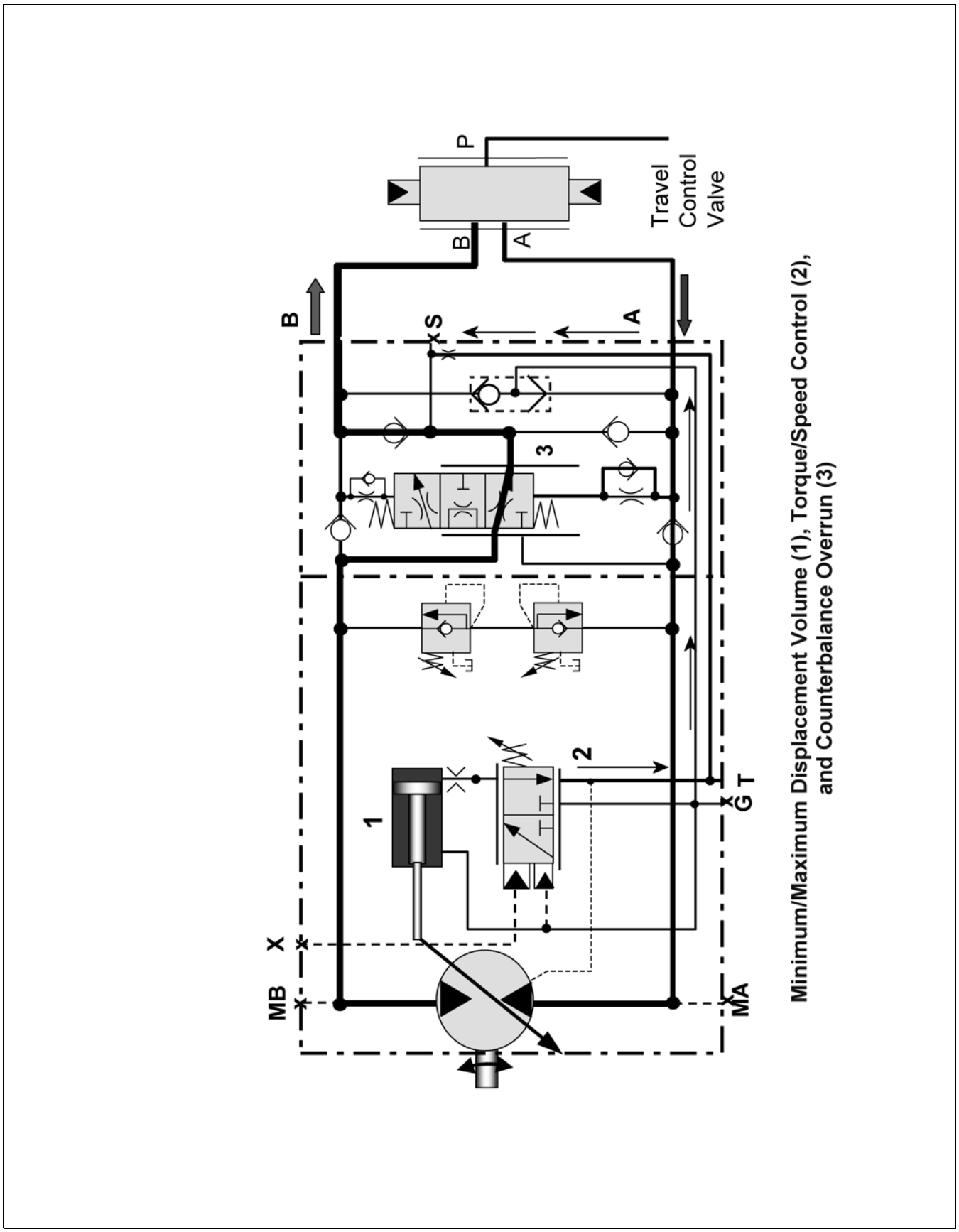
Travel PPC sensor



PPC pressure sensor



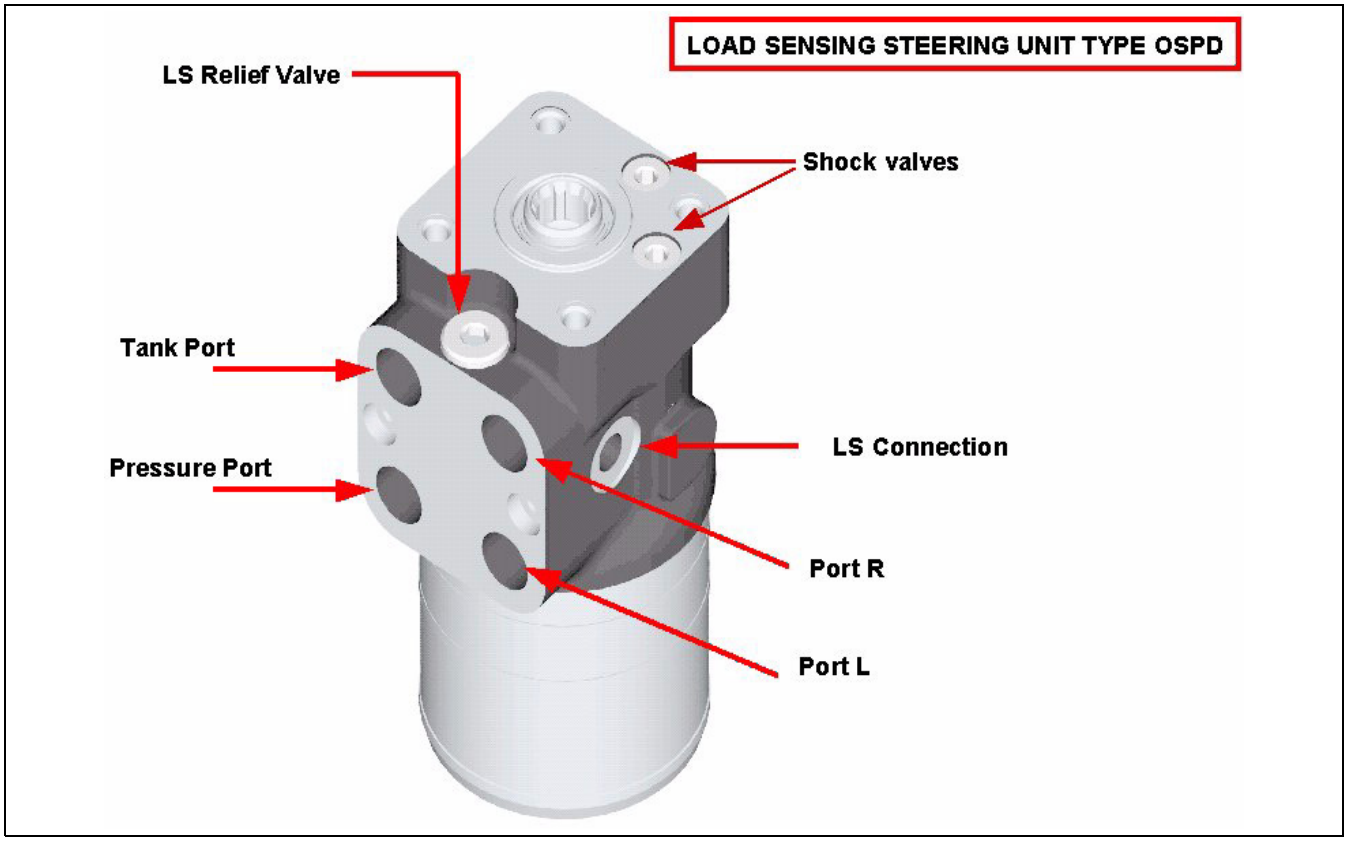
1.5. Motor begins to overrun and pressure falls on supply side: This causes counterbalance valve to begin to close and throttle return flow from motor.



- Operating condition for turning on 2-stage relief function.

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	

8. Load sensing steering unit



Technical data			
Displacement	OSPD 80/240	Small gear set	80 cc/rev.
		Large gear set	160 cc/rev.
		Combined gear set	240 cc/rev.

Valve functions	Pilot pressure relief valve
	Shock valves
	Suction valves
	Check valves in LS-connection
	Check valves in P connection

Pressure	Max. steering pressure	195 bar

20 TESTING AND ADJUSTING

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

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

- When carrying out testing, adjusting, or troubleshooting, park the machine on level ground, insert the safety pins, and use blocks to prevent the machine from moving.
- When carrying out work together with other workers, always use signals and do not let unauthorized people near the machine.
- When checking the water level, always wait for the water to cool down. If the radiator cap is removed when the water is still hot, the water will spurt out and cause burns.

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

Applicable model					PW180-7K	
Category	Item		Measurement Condition	Unit	Standard value	Permissible value
Work equipment	Work equipment speed	Arm	 ● Hydraulic oil temperature: Within operation range ● Engine running at high idling ● Working mode: A mode ● Time required from dumping stroke end to digging stroke end	IN	3.7 ±0.4	Max. 4.5
				OUT	3.1 ±0.3	Max. 3.7
		Bucket	 ● Hydraulic oil temperature: Within operation range ● Engine running at high idling ● Working mode: A mode ● Time required from dumping stroke end to digging stroke end	CURL	2.9 ±0.3	Max. 3.5
				DUMP	2.6 ±0.3	Max. 3.2
	Time lag	Monoboom boom lift	 ● Hydraulic oil temperature: Within operation range ● Engine running at low idling ● Working mode: A mode ● Operate full boom down from stroke end till bucket touches ground. Measure delay from bucket touching ground to bucket starting to push the machine up.	sec	Max. 1.0	Max. 1.2

2.8. Put the polluted filtering paper on non-polluted filtering paper (more than 10 sheets) in the filtering paper holder, and read the indicated value.

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

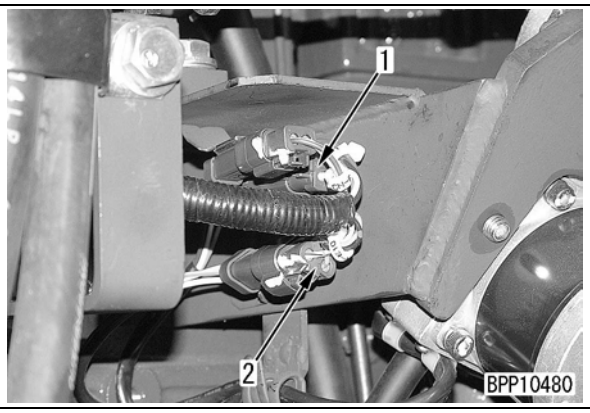
EMERGENCY SETTING IF FAILURE OCCURS IN ENGINE CONTROL SYSTEM

- If a failure occurs on any of the engine control devices such as fuel dial, governor pump controller or governor motor potentiometer, and the engine runs out of control, first fix the engine rpm and take the following steps to avoid immediate danger.
- The suggested steps are provisional ones. Identify the cause for the failure and carry out repairs promptly.

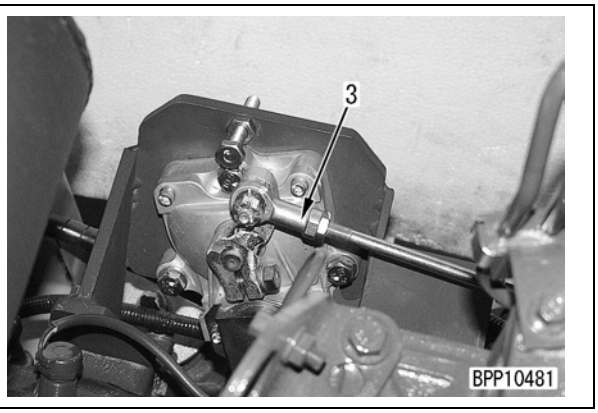
1. Disconnect **E11** connector (1) of the governor motor from **E10** connector (2) of the governor potentiometer.

⚠ CAUTION

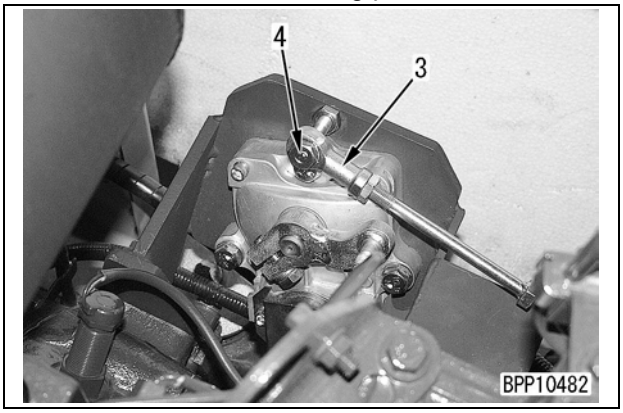
If the governor motor is left connected, the governor motor will be suddenly activated while the engine is running, causing mechanical damage. Be sure to disconnect it.



2. Detach spring linkage (3) on governor motor side, from the governor motor lever (5).



3. Remove bolt (4) and re-fit passing it through spring linkage (3) and fix linkage in original position.
   - Tilt the governor motor lever to the fuel injection pump side, but stop short of the governor spring.
   - The governor lever of the fuel injection pump is fixed at a near-idling position.



4. Start the engine again and travel the machine to a safe place.
5. Disconnect governor spring (3) and stop the engine.
   - Operation of stopping the engine is to be carried out while the engine is running at high speed. Be careful not to touch the rotating parts.
   - If the governor spring is tilted all the way to the fuel injection pump, the pump, stops with no more injection
   - Hold the governor spring until the engine comes to a complete stop. Otherwise the fuel injection pump automatically returns to the low idling position, and the engine does not stop

INSPECTION AND ADJUSTMENT OF PUMP LS VALVE CONTROL OIL PRESSURE

- Pump LS control circuit oil pressure inspection and adjustment tools

Mark		Part No.	Part Name	No. Off
K	1	799-101-5002	Hydraulic Tester	2
		790-261-1203	Digital Type Hydraulic Tester	2
	2	799-101-5220	Grease Fitting (10 x 1.25 mm)	2
		07002-11023	O-ring	2
	3	799-401-1340	Differential Pressure Gauge	2

MEASUREMENT

- Measure pump LS control circuit oil pressure after confirming that the work equipment, swing and travel circuit oil pressure as well as control circuit original pressure are normal.

⚠ CAUTION

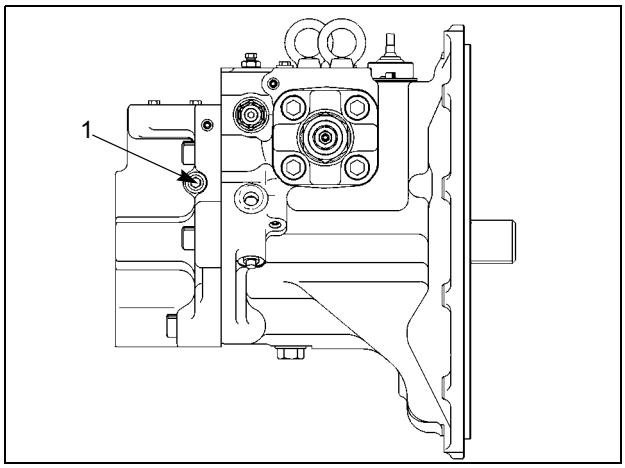
Lower the work equipment to the ground and stop the engine. After the engine is stopped, (but with the ignition switch in the ON position and safety lever still ENGAGED), operated the control levers several times to release the remaining pressure in the hydraulic system. Then loosen the oil filler cap to release any pressure in the hydraulic tank.

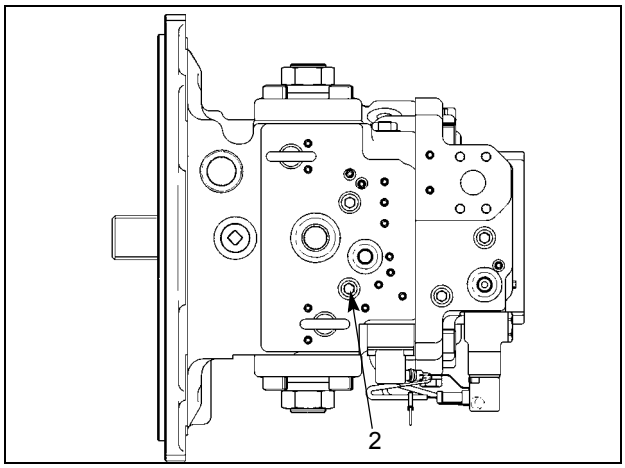
1. Measurement of LS valve output pressure (servo piston inlet pressure)

- Measure LS valve output pressure (servo piston inlet pressure) and pump delivery pressure together, and compare both pressures thereafter.

1.1. Remove oil pressure measurement plugs (1) and (2).

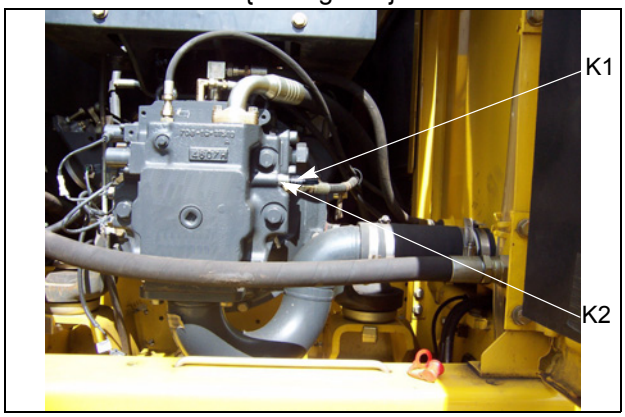
- Plug (1): For measuring the pump delivery pressure
- Plug (2): For measuring the pump LS valve delivery pressure





1.2. Fit tool **K2** to each port (1 and 2), connect each tool to oil pressure gauge of hydraulic tester **K1**.

- Use an oil pressure gauge with the capacity of 58.5 MPa{600 kg/cm^2}.



3. Start the engine and keep it running until the hydraulic oil temperature rises to the operating range.

4. Measure the pressure when the engine is running at high idling and the control lever of the circuit to be measured is in the NEUTRAL position and then at full stroke.

- If PPC valve output pressure is at the level shown below, it is judged normal.

Lever Control	Hydraulic Pressure
In NEUTRAL	0{0}
At full stroke	Nearly equal to control original pressure (see standard value table)

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

MEASUREMENT OF OIL LEAKAGE

- Measuring device for oil leakage

Symbol	Part Number	Part Name
R	Purchased	Measuring Cylinder

- Measure the oil leakage under the following condition.
  - Hydraulic oil temperature: Within operating range.

1. Measuring leakage from boom cylinder

1.1. Run the engine and raise the boom to the stroke end.

⚠ CAUTION

Referring to RELEASE OF RESIDUAL PRESSURE FROM HYDRAULIC CIRCUIT, release the residual pressure from the piping on the boom cylinder head side (Operate the lever only in the RAISE direction, however).

1.2. Disconnect hoses (1) on the cylinder head side block it with a plug.

⚠ CAUTION

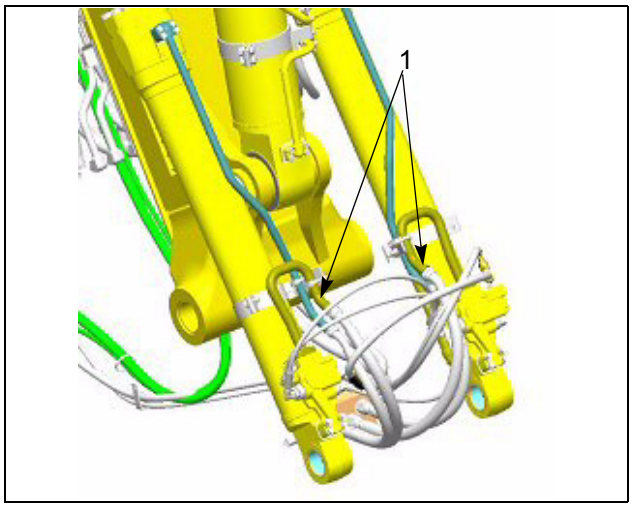
Take care not to disconnect the hose on the cylinder bottom side.

1.3. Run the engine at high idling and relieve the boom cylinder by operating the boom control lever in the **RAISE** direction.

⚠ CAUTION

Take care not to operate the boom control lever in the lower direction.

1.4. Start measuring the oil leakage 30 seconds after the boom cylinder is relieved and measure for 1 minute.



1.5. After finishing the measurement, make sure that the machine is back to normal condition.

2. Measuring leakage from arm cylinder

2.1. Run the engine and move the arm to the digging stroke end.

⚠ CAUTION

Referring to RELEASE OF RESIDUAL PRESSURE FROM HYDRAULIC CIRCUIT, release the residual pressure from the piping on the arm cylinder head side (Operate the lever only in the digging direction however).

2.2. Disconnect hose (2) on the cylinder head end and block the hose end with a plug.

⚠ CAUTION

Be careful not to disconnect the hose at the cylinder bottom end.

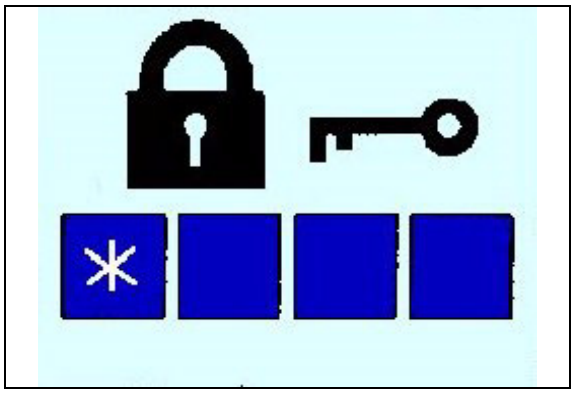
2.3. Run the engine at high idling and relieve the arm cylinder by operating the arm control lever in the **DIGGING** direction.

⚠ CAUTION

Take care not to operate the arm control lever in the DUMP direction.

OPERATION OF OPERATORS 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 section 10 ("STRUCTURE, FUNCTION AND MAINTENANCE STANDARDS") in this shop manual chapter on monitor system.



1. Function for inputting and setting password

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

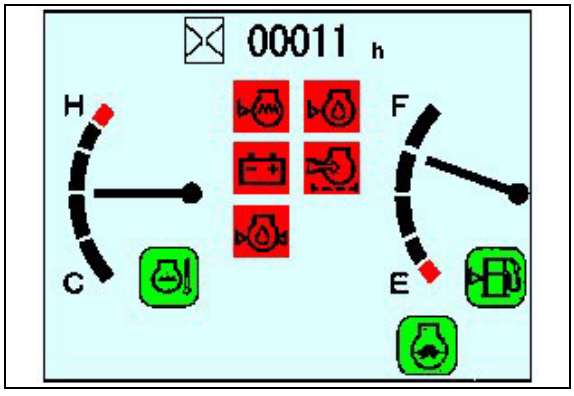
- This display is shown only when a password is registered.

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

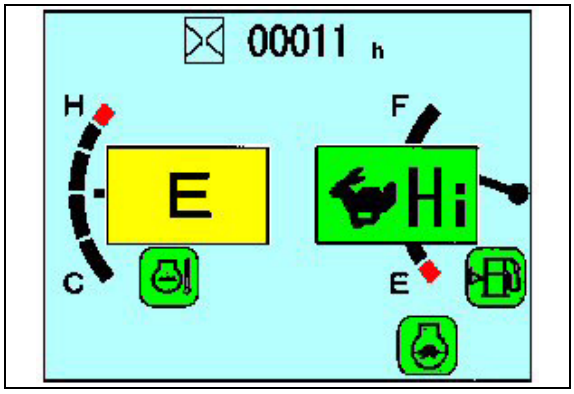
Following the KOMATSU logo, the display of machine inspection before starting day's work is shown for 2 seconds.



4. Function for machine maintenance

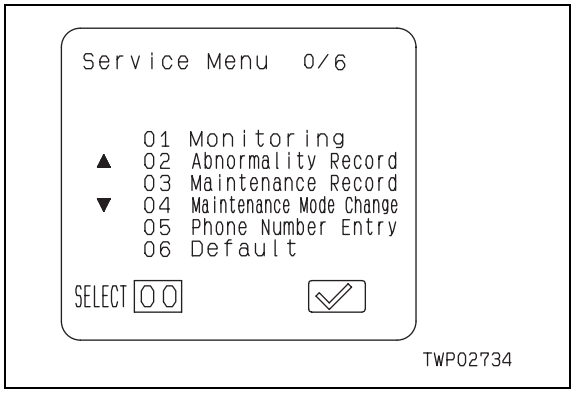
Following the display of machine inspection before starting day's work, the maintenance mark appears for 30 seconds, if there is a service item whose maintenance time is approaching or has just passed.

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



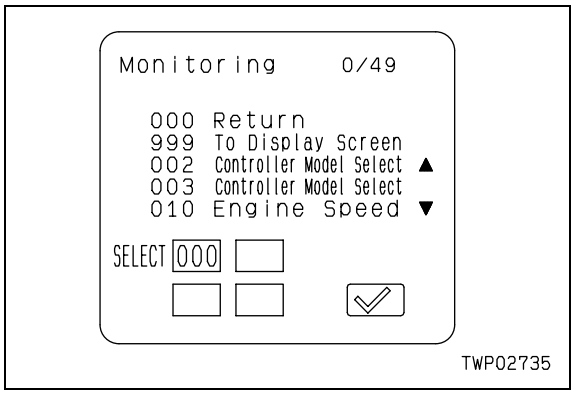
1. Function of monitoring [01]

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.



1.1. Selection of menu

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



1.2. 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 less 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.

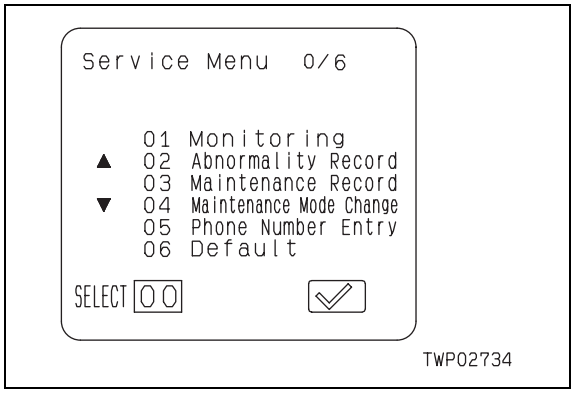
6. Function for Default [06]

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

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

6.1. Selection of menu

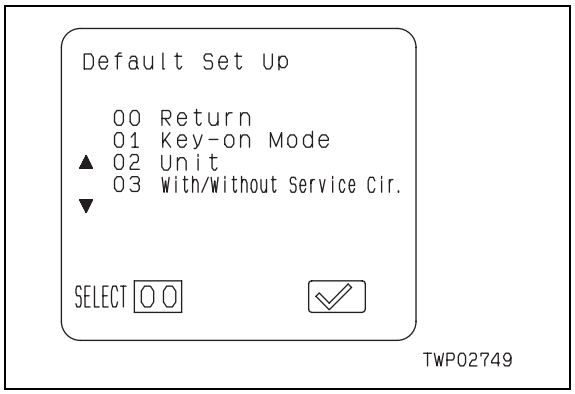
Select 06 "Default menu" in the initial display of Service Menu, and depress [√] switch.



6.2. Selection of submenu

Select an item to change from the submenu, and depress [√] switch.

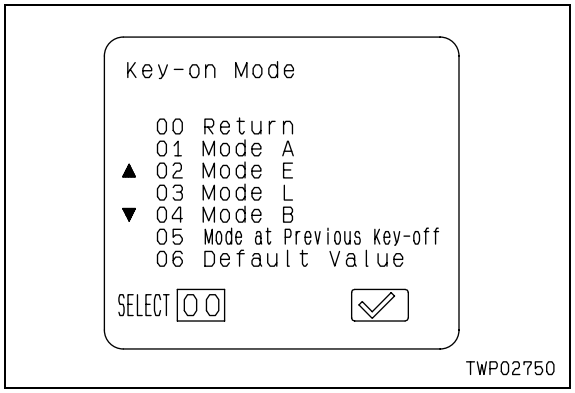
No.	Default submenu
00	Return (Termination of Default)
01	Key-on Mode
02	Unit
03	With/Without Service Circuit



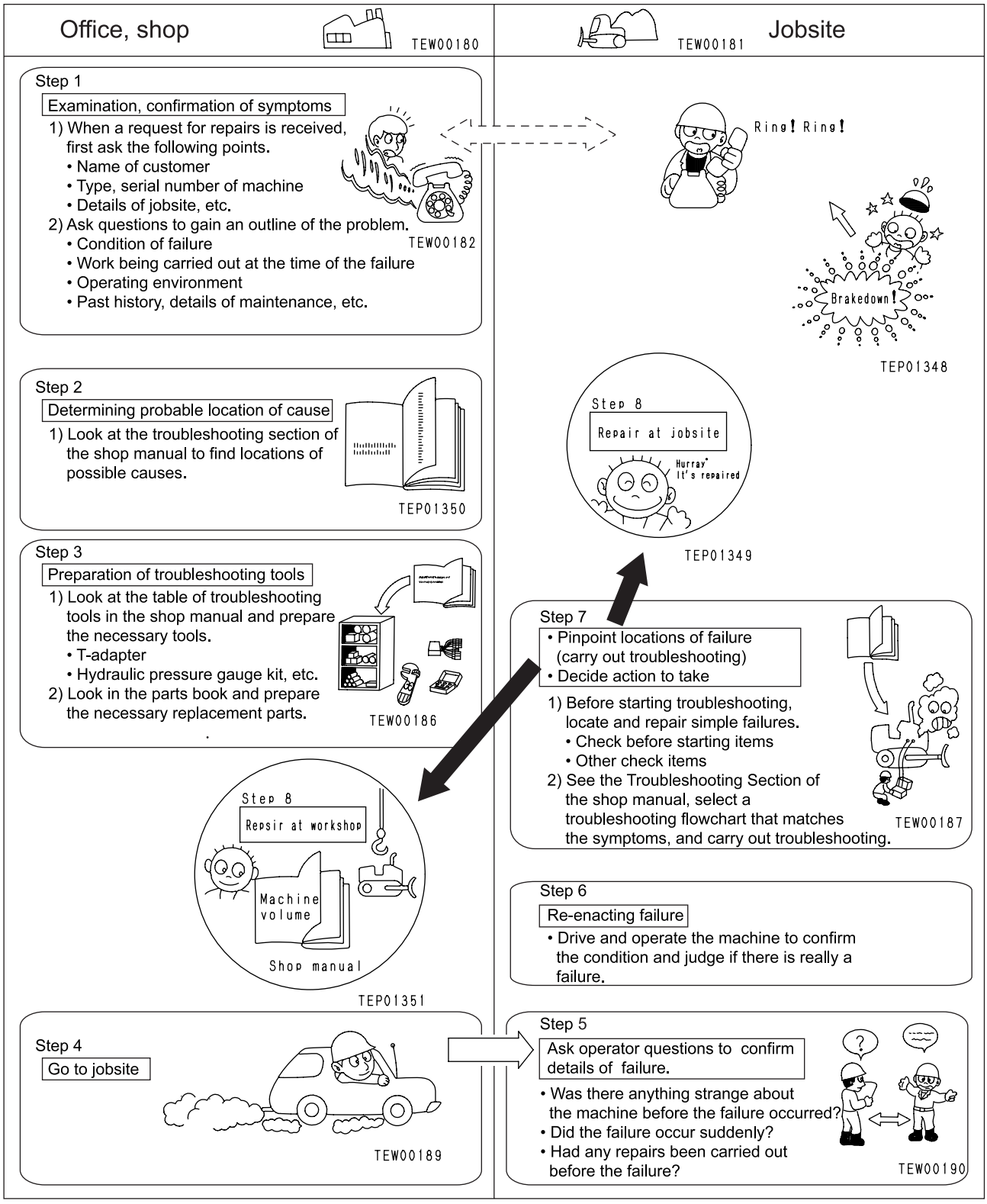
6.3. Function for Key-on Mode

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 same working mode as when the machine was last used.
- Default Value: If this mode is set, the machine starts up with the mode (A mode) set at the original factory setting.
- Irrespective of this setting mode, a machine "With service circuit" always starts 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.



SEQUENCE OF EVENTS IN TROUBLESHOOTING

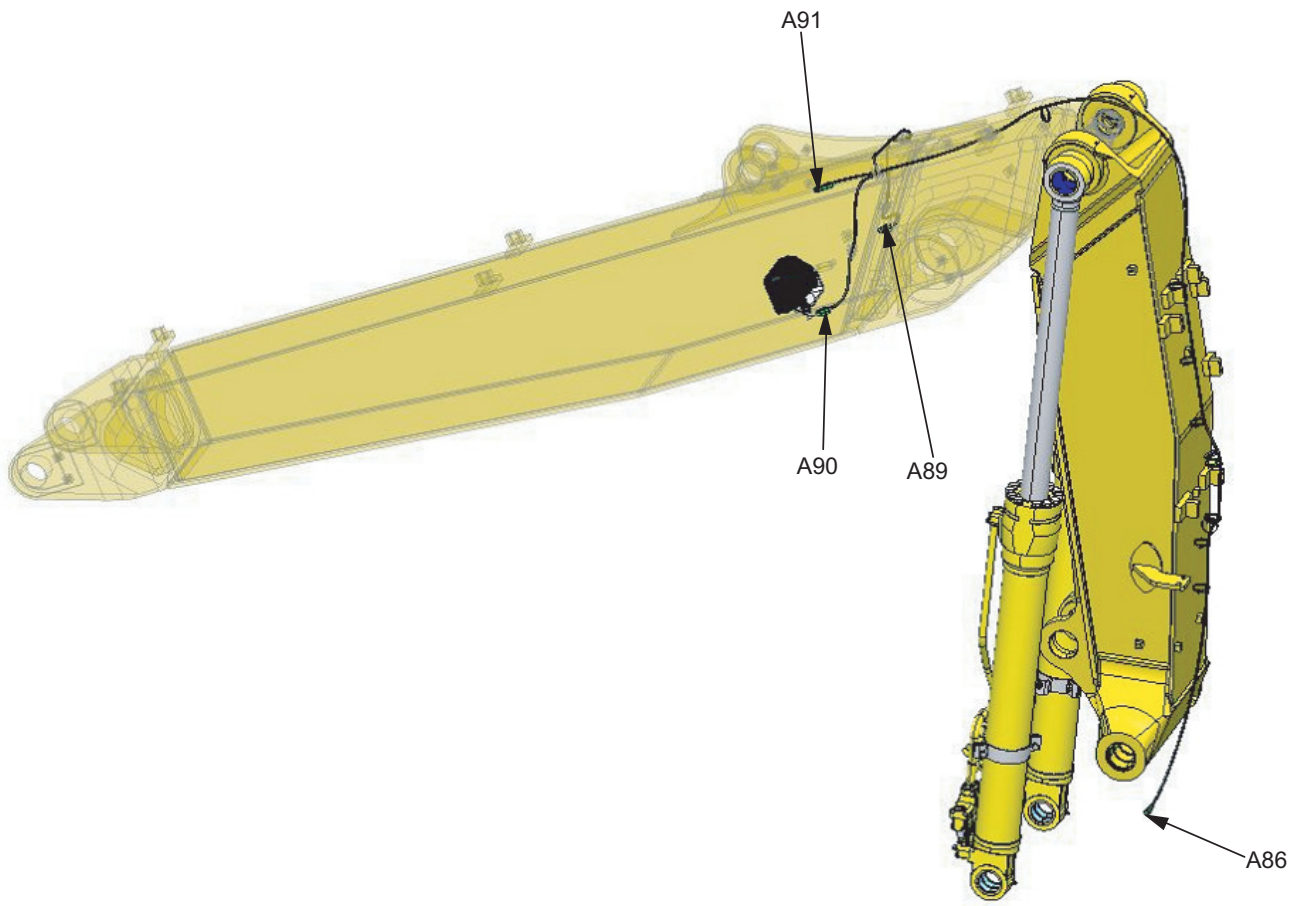


CHECKS BEFORE TROUBLESHOOTING

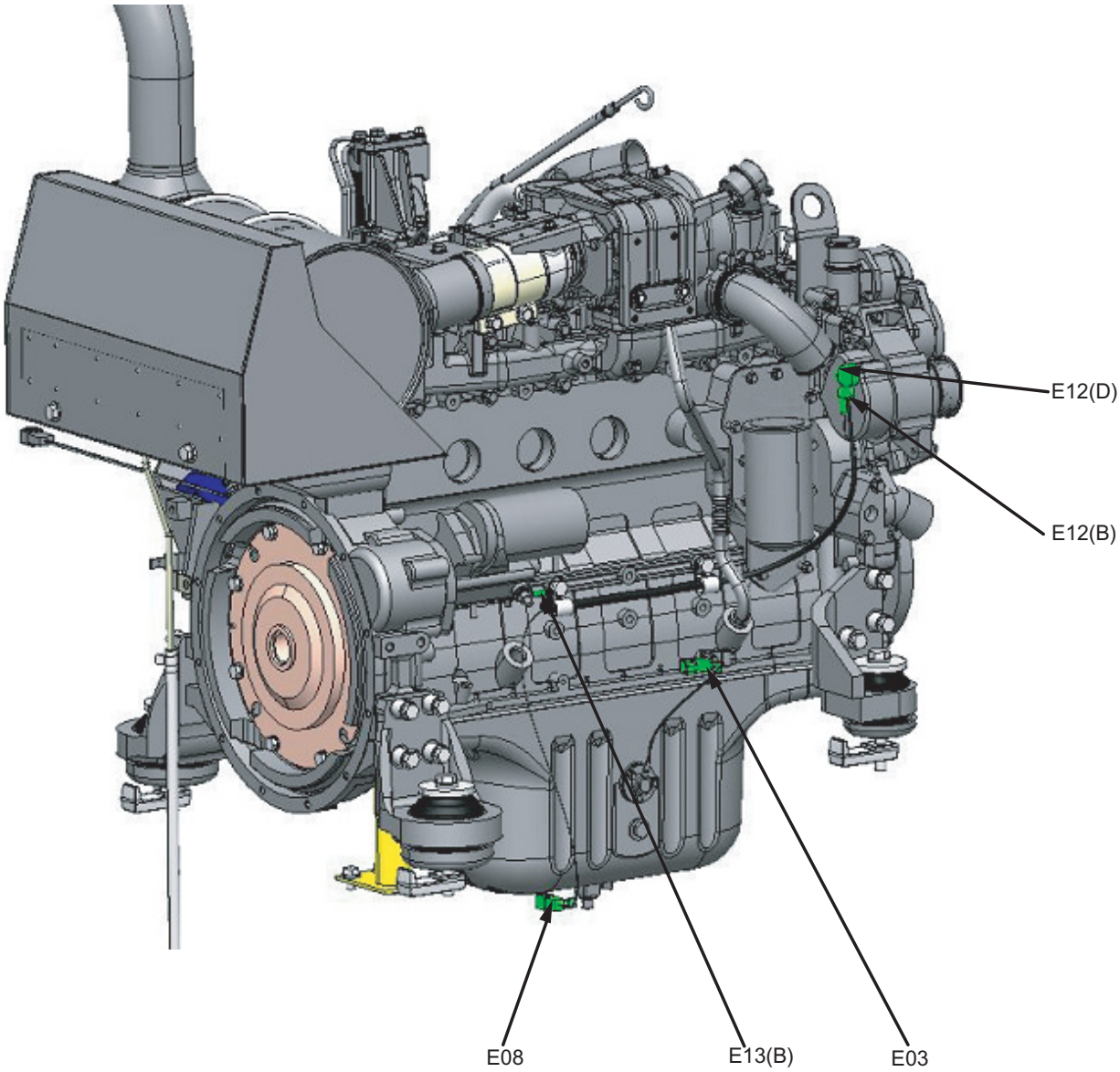
	Item	Judgement value	Action
Lubricating oil, coolant	1. Check fuel level, type of fuel	—	Add fuel
	2. Check for impurities in fuel	—	Clean, drain
	3. Check hydraulic oil level	—	Add oil
	4. Check hydraulic oil strainer	—	Clean, drain
	5. Check swing machinery oil level	—	Add oil
	6. Check engine oil level (oil pan oil level)	—	Add oil
	7. Check coolant level	—	Add water
	8. Check dust indicator for clogging	—	Clean or replace
	9. Check hydraulic filter	—	Replace
	10. Check final drive oil level	—	Add oil
Electrical equipment	1. Check for looseness, corrosion of battery terminal, wiring	—	Tighten or replace
	2. Check for looseness, corrosion of alternator terminal, wiring	—	Tighten or replace
	3. Check for looseness, corrosion of starting motor terminal, wiring	—	Tighten or replace
Hydraulic, mechanical	1. Check for abnormal noise, smell	—	Repair
	2. Check for oil leakage	—	Repair
	3. Carry out air bleeding	—	Bleed air
Electrics, electrical equipment	1. Check battery voltage (engine stopped)	20 – 30V	Replace
	2. Check battery electrolyte level	—	Add or replace
	3. Check for discolored, burnt, exposed wiring	—	Replace
	4. Check for missing wiring clamps, hanging wiring	—	Repair
	5. Check for water leaking on wiring (be particularly careful attention to water leaking on connectors or terminals)	—	Disconnect connector and dry
	6. Check for blown, corroded fuses	—	Replace
	7. Check alternator voltage (engine running at 1/2 throttle or above)	After running for several minutes : 27.5 – 29.5V	Replace
	8. Check operating sound of battery relay (when switch is turned ON/OFF)	—	Replace

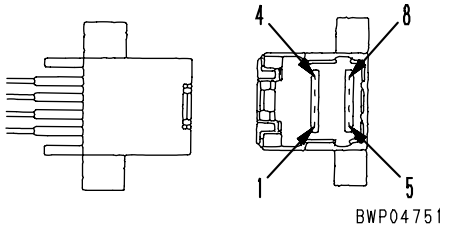
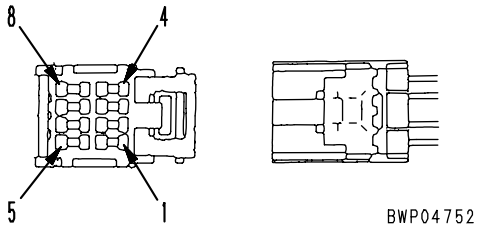
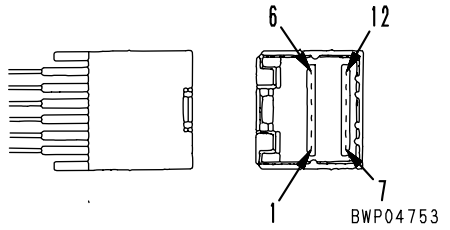
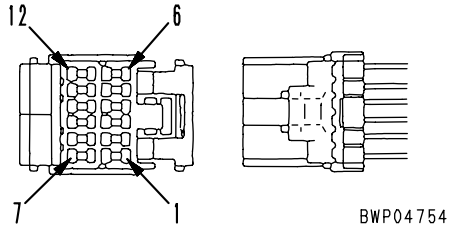
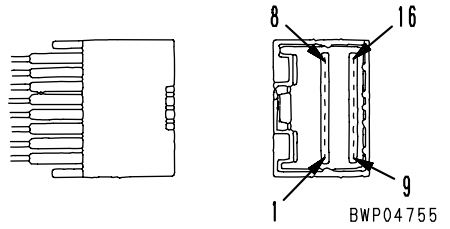
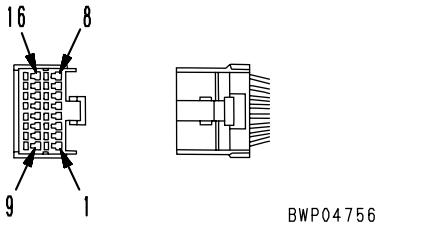
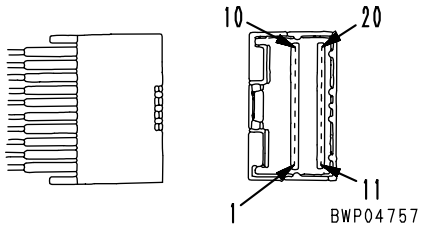
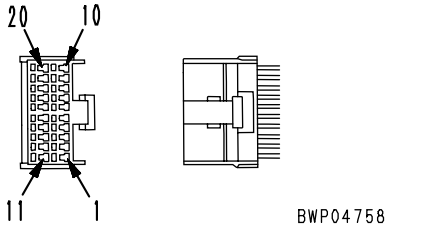
Connector No.	Type	No.of Pin	Name of Device	Address
S08	X	2	2PB retract oil pressure switch	T-5
S09	X	2	Travel reverse oil pressure switch	N-5
S10	X	2	Travel forward oil pressure switch	N-6
S12	X	2	Stabilizer + boom down oil pressure switch	M-5
S13	X	2	Stabilizer + boom up oil pressure switch	L-5
S14	M	3	PPC hydraulic lock switch	BH-4
S17	DT	2	Park brake oil pressure switch	CA-5
S18	DT	2	Low brake oil presssure switch	CA-5
S19	DT	2	Stop lights oil pressure switch	CA-4
S20	X	2	Service oil pressure switch	T-6
S21	X	2	Service oil pressure switch	R-6
S21	OTAX	6	Pump emergency driving switch	BT-5
S22	OTAX	6	Swing and parking brake emergency switch	BT-5
S23	OTAX	6	Emegency travel switch	BT-5
S25	090	16	Intermediate connector (RH console emergency sw.)	BU-5
T05	Terminal	1	Earth to floor frame	CI-3
T11	Terminal	1	Earth	DM-4
V01	DT	2	PPC Pressure Lock Solenoid	L-3
V02	DT	2	2 Stage Relief Solenoid	M-4
V03	DT	2	Swing Brake Sol	M-4
V04	DT	2	Suspension Lock Solenoid	M-6
V06	DT	2	Travel Neutral Solenoid	L-6
V07	DT	2	Creep solenoid	M-6
V08	DT	2	Travel F/R solenoid	M-6
V09	DT	2	Boom / Stabilizer down solenoid	M-5
V10	DT	2	Boom / Stabilizer up solenoid	M-5
V11	DT	2	Transmission clutch solenoid	M-5
V12	DT	2	Park brake solenoid valve	BZ-4
V13	X	2	Service Flow control solenoid	L-3
V14	DT	2	Clamshell CW/ACW solenoid	M-4
V15	DT	2	Transmission back pressure solenoid	L-5
V15	DT	2	Front attatchment solenoid (LHS)	AR-4
V16	DT	2	Front attachment solenoid (RHS)	AR-5
V17	DT	2	Rear attatchment solenoid (LHS)	AQ-5
V18	DT	2	Rear attatchment solenoid (RHS)	AQ-5
V21	DT	2	PC-EPC solenoid valve	AC-5

Work Equipment



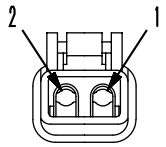
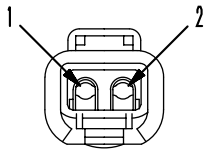
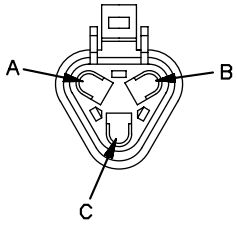
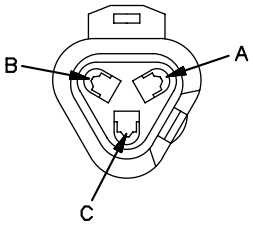
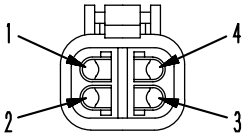
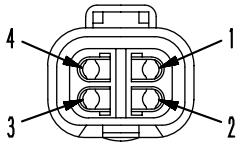
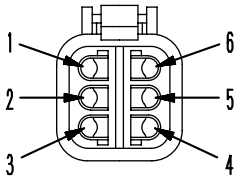
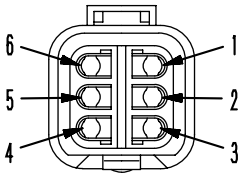
Engine



No.of pins	AMP040 type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
8			799-601-7180
	—	Housing part No.: 79A-222-3430 (Q'ty: 5)	
12			799-601-7190
	—	Housing part No.: 79A-222-3440 (Q'ty: 5)	
16			799-601-7210
	—	Housing part No.: 79A-222-3450 (Q'ty: 5)	
20			799-601-7220
	—	Housing part No.: 79A-222-3460 (Q'ty: 5)	

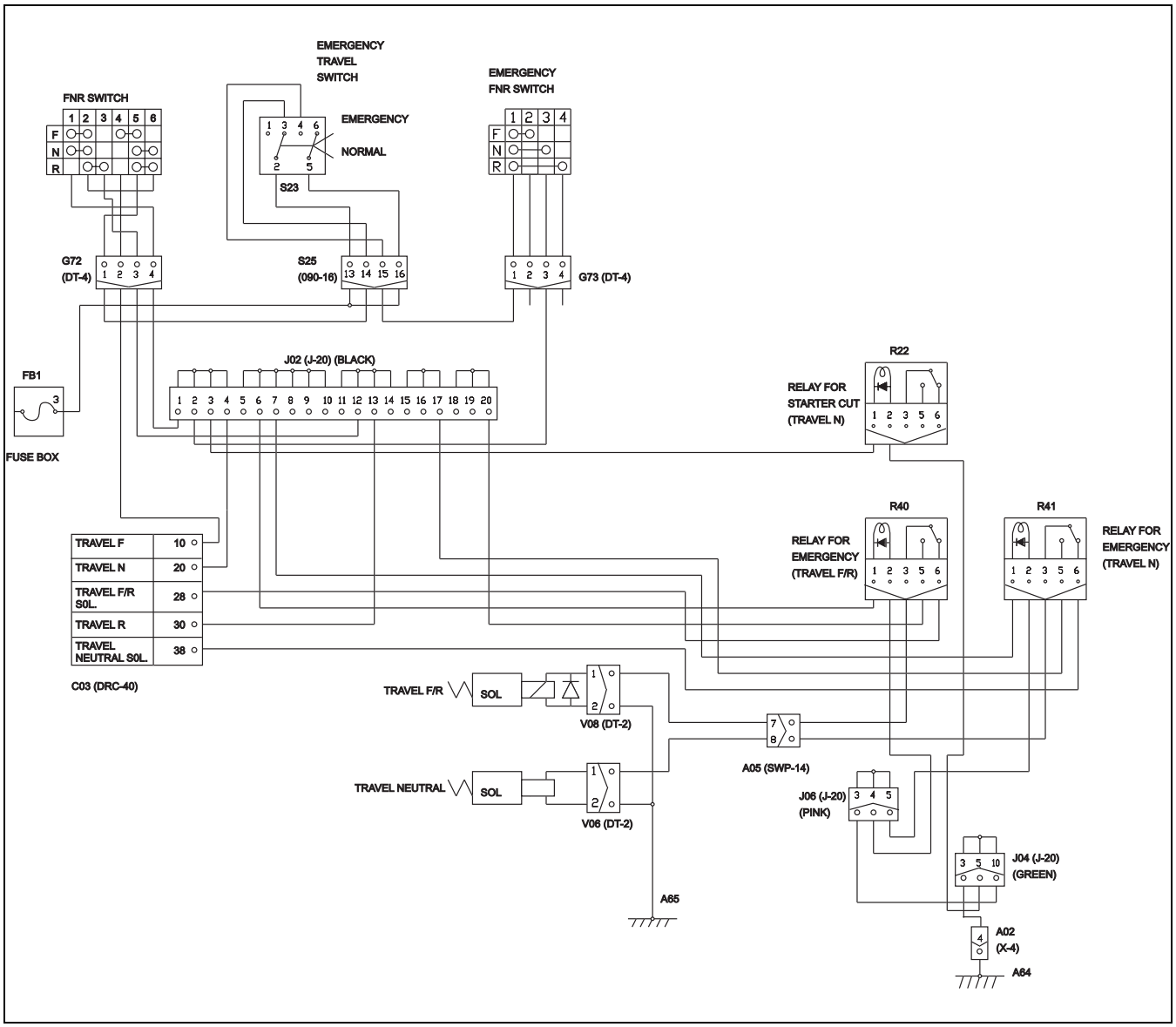
- Terminal part No.: 79A-222-3470 (No relation with number of pins)

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

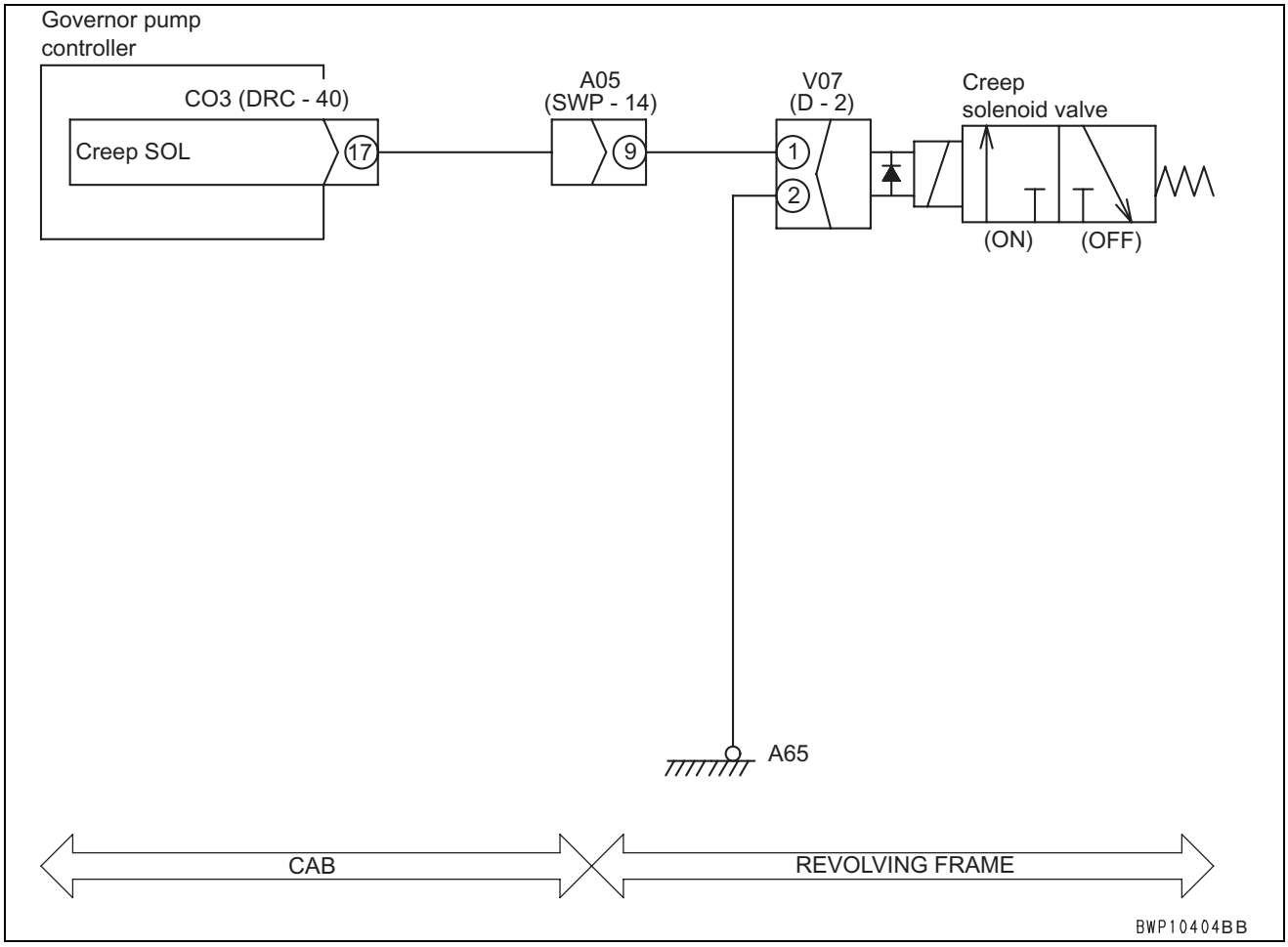
No.of pins	DT Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
2	 BWP05037	 BWP05038	799-601-9020
	Part No.:08192-12200 (normal type) 08192-22200 (fine wire type)	Part No.:08192-12100 (normal type) 08192-22100 (fine wire type)	
3	 BWP05039	 BWP05040	799-601-9030
	Part No.:08192-13200 (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

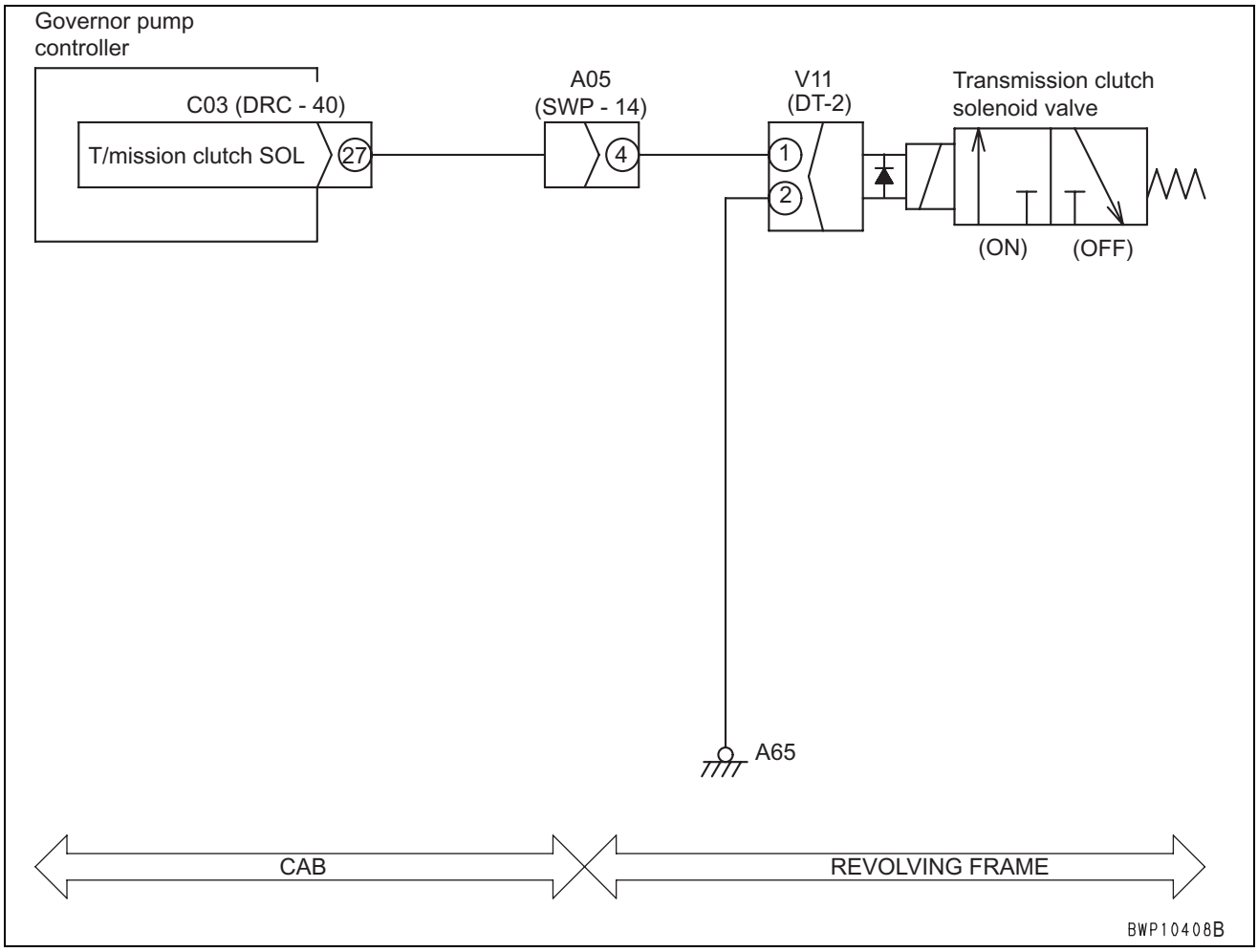
Electrical Circuit for Travel Neutral Solenoid in Governor Pump Controller



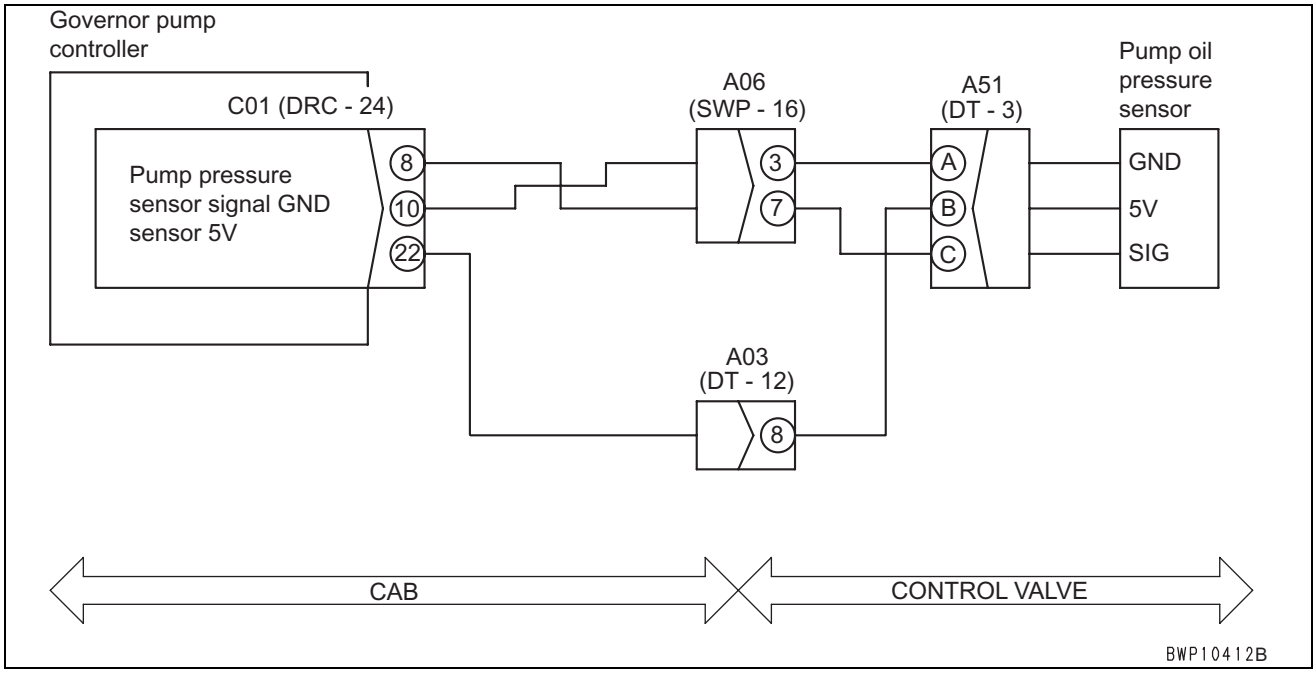
Electrical Circuit Diagram for Creep Solenoid in Governor Pump Controller



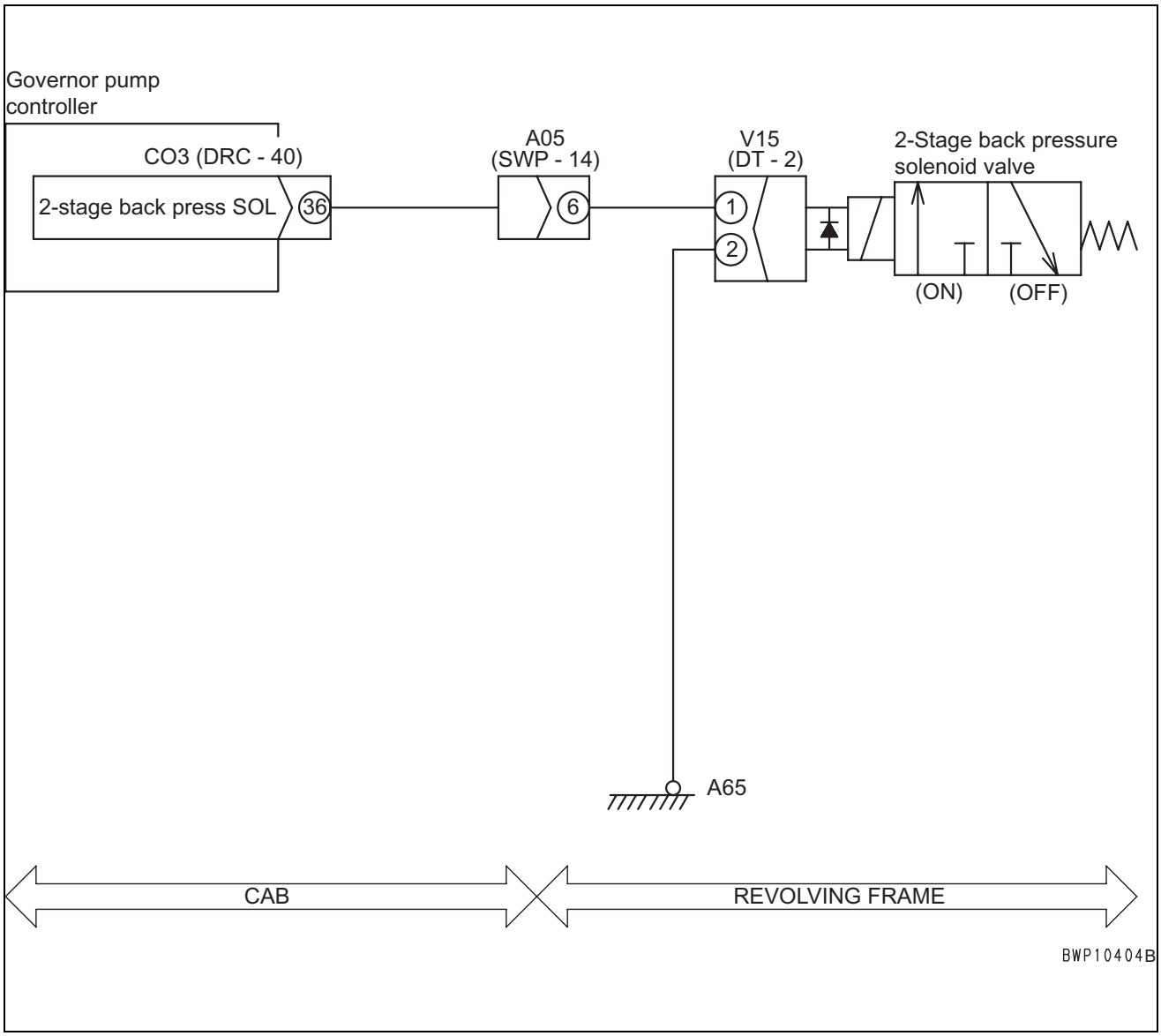
Electrical Circuit Diagram for Transmission Clutch Solenoid in Governor • Pump Controller



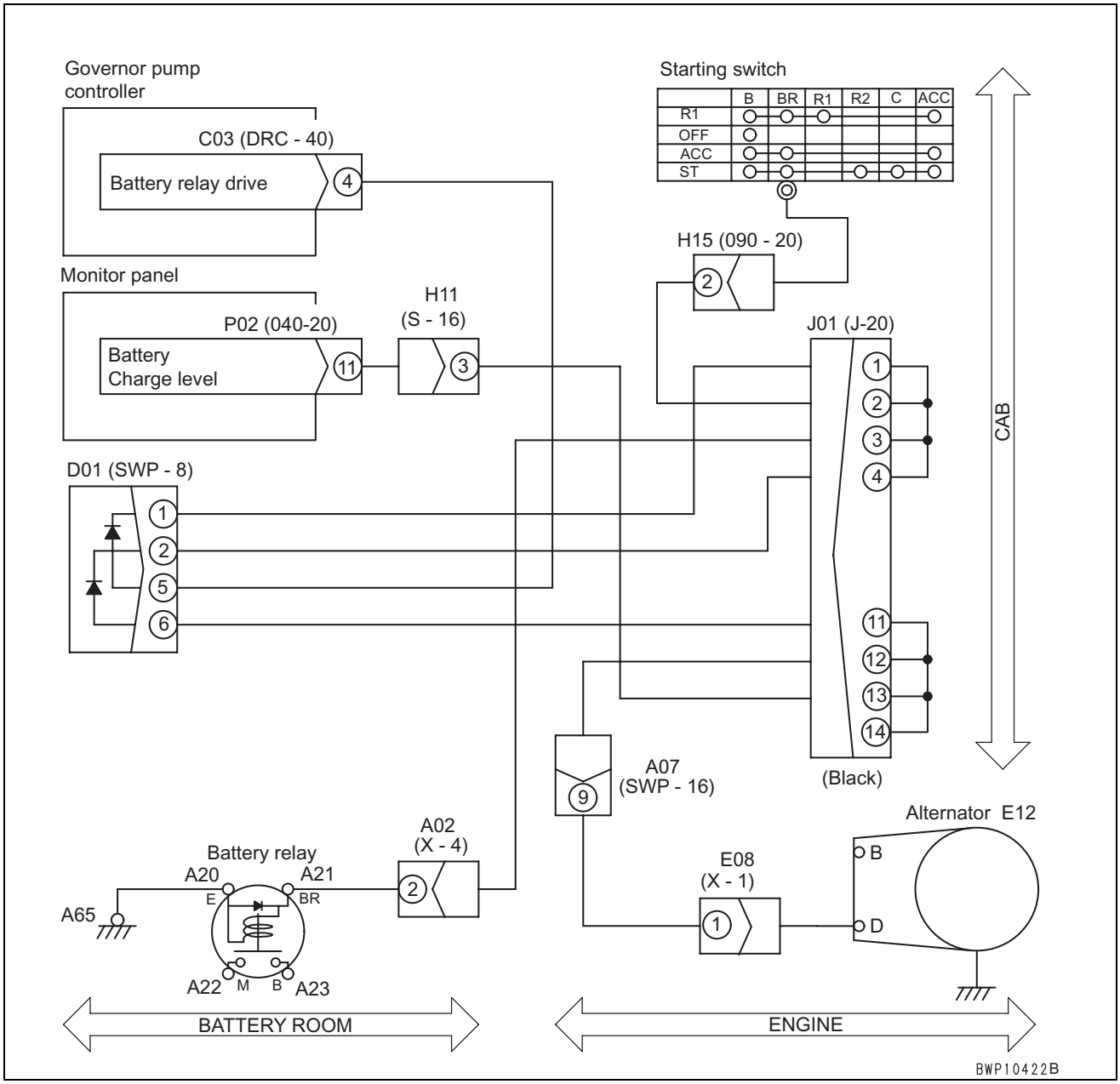
Electrical Circuit Diagram for Pump Pressure Sensor in Governor • Pump Controller



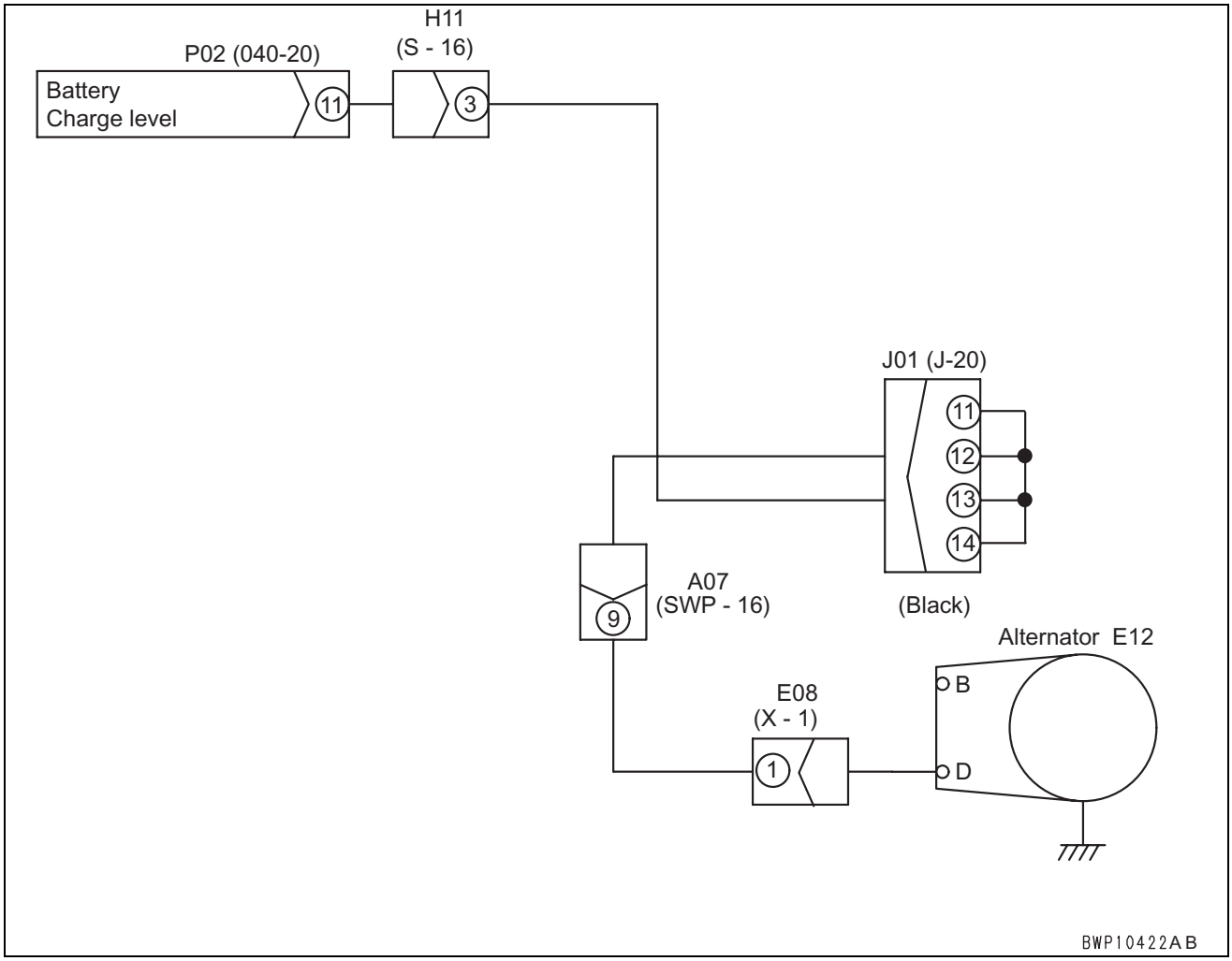
Electrical Circuit Diagram for 2-Stage Back Pressure Solenoid in Governor • Pump Controller



Electrical Circuit Diagram for Battery Relay in Governor • Pump Controller



Electrical Circuit Diagram for Engine Start, Stop and Charging in Monitor Panel



Presumed cause and standard value in normal	Cause		Standard value in normal and references for troubleshooting		
	8	Alternator fault (Internal short-circuit)	• Turn the engine starting switch OFF for the preparations, and hold it in the ON position or running during the troubleshooting.		
			E12 (male)	Voltage	
			Between ① and grounding	Below 1 V	
	9	Disconnection of wiring harness (Disconnection or defective contact with connector)	• Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			Wiring harness between FB1-18 outlet and H15 (female) ①	Resistance value	Below 1 Ω
			Wiring harness from H15 (female) ④ to J01 to R11 (female) ⑤	Resistance value	Below 1 Ω
			Wiring harness between R11 (female) ③ and R22 (female) ③	Resistance value	Below 1 Ω
			Wiring harness between R22 (female) ⑤ to A07 to A27 (female) ①.	Resistance value	Below 1 Ω
			Wiring harness between engine starting motor relay C terminal and engine starting motor C terminal	Resistance value	Below 1 Ω
			Wiring harness between FB1-3 and S14 (male) ①	Resistance value	Below 1 Ω
			Wiring harness between S14 (male) ③ and R11 (female) ①	Resistance value	Below 1 Ω
			Wiring harness between R11 (female) ② and R13 (female) ⑥	Resistance value	Below 1 Ω
			Wiring harness from R13 (female) ③ to J04 to grounding	Resistance value	Below 1 Ω
	10	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 battery relay B terminal (A23) to A35 to A01 to FB1-18 and grounding	Resistance value	Above 1 MΩ
			Wiring harness between FB1-18 outlet and H15 (female) ① and grounding	Resistance value	Above 1 MΩ
			Between wiring harness from H15 (female) ④ to J01 to R11 (female) ⑤ and grounding	Resistance value	Above 1 MΩ
			Wiring harness between R11 (female) ③ and R22 (female) ③ and grounding	Resistance value	Above 1 MΩ
			Wiring harness between R22 (female) ⑤ to A07 to A27 (female) ①.	Resistance value	Above 1 MΩ
			Wiring harness between engine starting motor relay C terminal and engine starting motor C terminal and grounding	Resistance value	Above 1 MΩ
			Wiring harness between FB1-3 and S14 (female) ① and grounding	Resistance value	Above 1 MΩ
			Wiring harness between S14 (female) ③ and R11 (female) ① and grounding	Resistance value	Above 1 MΩ
			Between wiring harness from R13 (female) ② to J06 to H11 to P02 (female) ⑭ and grounding	Resistance value	Above 1 MΩ
	11	Short-circuiting of wiring harness (Contact with 24 V circuit)	• Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
			Wiring harness between A27 (female) ② and E08 (female) ①, or wiring harness from A27 (female) ② to A07 to J01 to D01 (female) ⑥, or between wiring harness between A27 (female) ② to J01 to H11 to P02 (female) ⑪ and grounding.	Voltage	Below 1 V

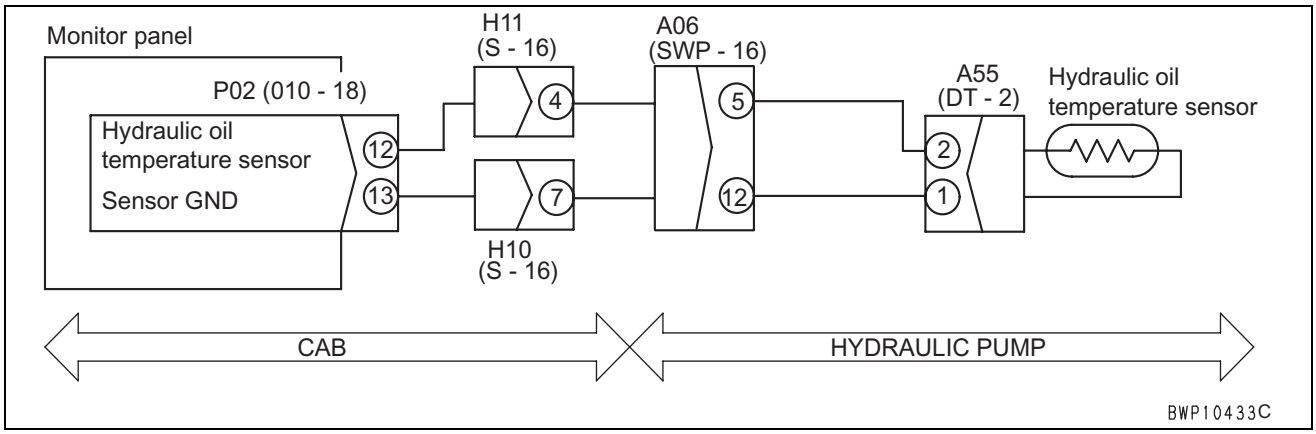
E-15 Hydraulic oil temperature gauge does not display correctly

Failure information	• Hydraulic oil temperature rises normally, but the display does not exceed the white range (C). • Hydraulic oil temperature remains stable, but the display rises up the red range (H).
Relative information	• Input from the hydraulic oil temperature sensor can be confirmed in the monitor function. (Code No. 044: Hydraulic oil temperature)

Presumed cause and standard value in normal

	Cause	Standard value in normal and references for troubleshooting			
1	Hydraulic oil temperature sensor fault (Internal disconnection or short-circuiting)	• Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		A55	Engine cooling water temperature	Resistance value	
		Between ① and ②	10 – 100 °C	90 – 3.5 kΩ	
		Between ② and grounding		Above 1 MΩ	
2	Disconnection of wiring harness (Disconnection or defective contact with connector)	• Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Wiring harness between P02 (female) ⑫ and A55 (female) ②		Resistance value	Below 1 Ω
		Wiring harness between P02 (female) ⑫ and A55 (female) ①		Resistance value	Between 1.9 and 38.2KΩ
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) ⑫ and A55 (female) ② and grounding		Resistance value	Above 1 MΩ
4	Short-circuiting of wiring harness (Contact with 24 V circuit)	• Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
		Between wiring harness between P02 (female) ⑫ and A55 (female) ② and grounding		Voltage	Below 1 V
5	Governor • pump controller defective	• Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		P02	Engine cooling water temperature	Resistance value	
		Between ⑫ and ⑤	10 – 100 °C	90 – 3.5 kΩ	
		Between ⑫ and grounding		Above 1 MΩ	

Electrical Circuit Diagram for Hydraulic Oil Temperature Sensor

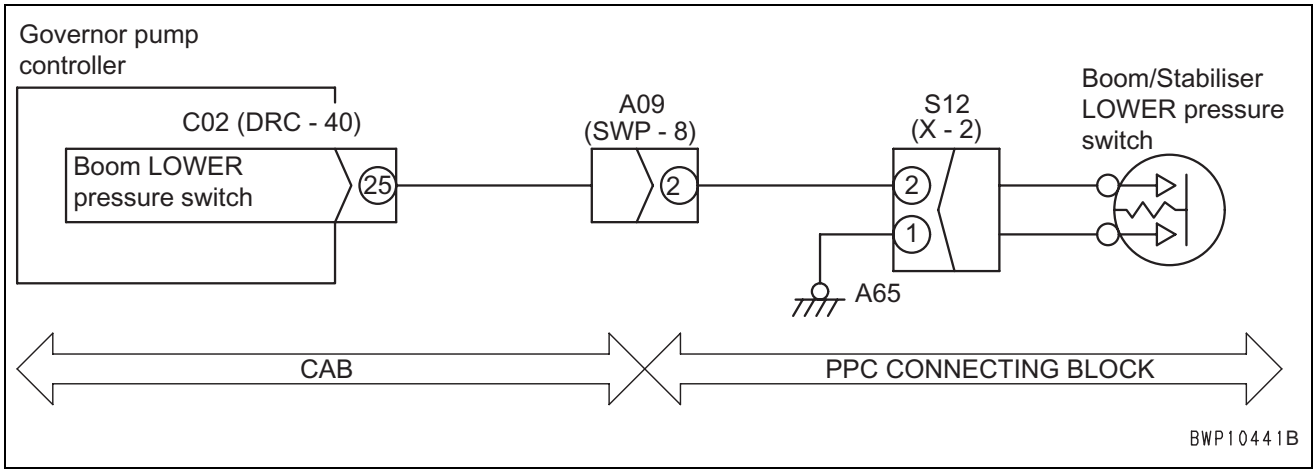


E-22 "Boom/Stabiliser LOWER" is not correctly displayed in monitor function

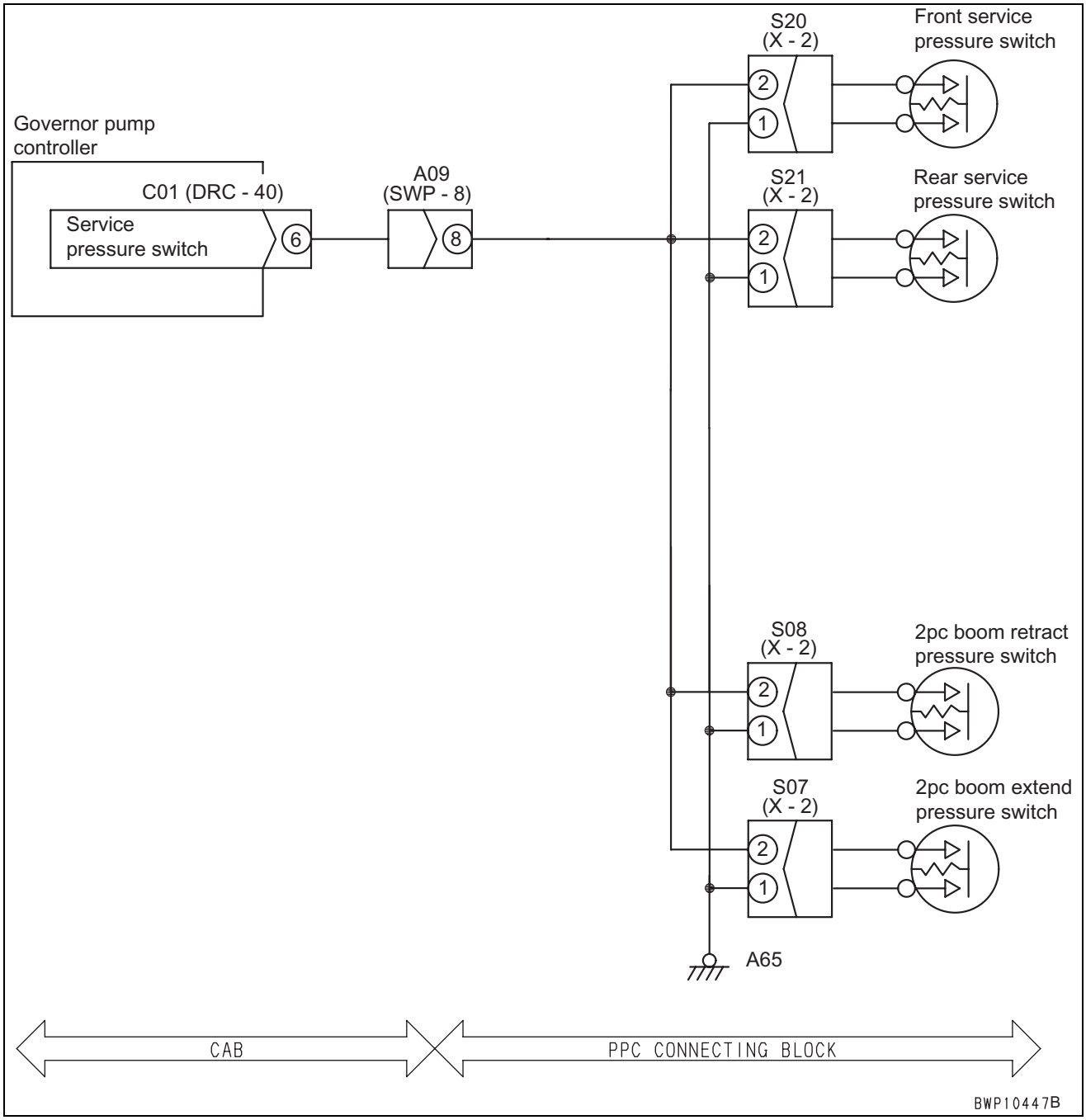
Failure information	• "Boom/Stabiliser LOWER" is not correctly displayed in the monitor function on the monitor panel.
Relative information	—

Presumed cause and standard value in normal		Cause	Standard value in normal and references for troubleshooting			
	1	Boom/Stabiliser LOWER PPC hydraulic switch fault (Internal disconnection or short-circuiting)	• Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
			S12 (male)	Boom control lever	Resistance value	
			Between ① and ②	NEUTRAL	Above 1 MΩ	
				LOWER	Below 1 Ω	
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	• Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between C02 (female) ㉕ and S12 (female) ②		Resistance value	Below 1 Ω
			Wiring harness between S12 (female) ① and grounding		Resistance value	Below 1 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 C02 (female) ㉕ and S12 (female) ② and grounding		Resistance value	Above 1 MΩ
	4	Short-circuiting of wiring harness (Contact with 24 V circuit)	• Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Wiring harness between C02 (female) ㉕ and S12 (female) ② and grounding		Voltage	Below 1 V
	5	Governor • pump controller defective	• Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C02	Boom control lever	Voltage	
			Between ㉕ and grounding	NEUTRAL	20 – 30 V	
				LOWER	Below 1 V	

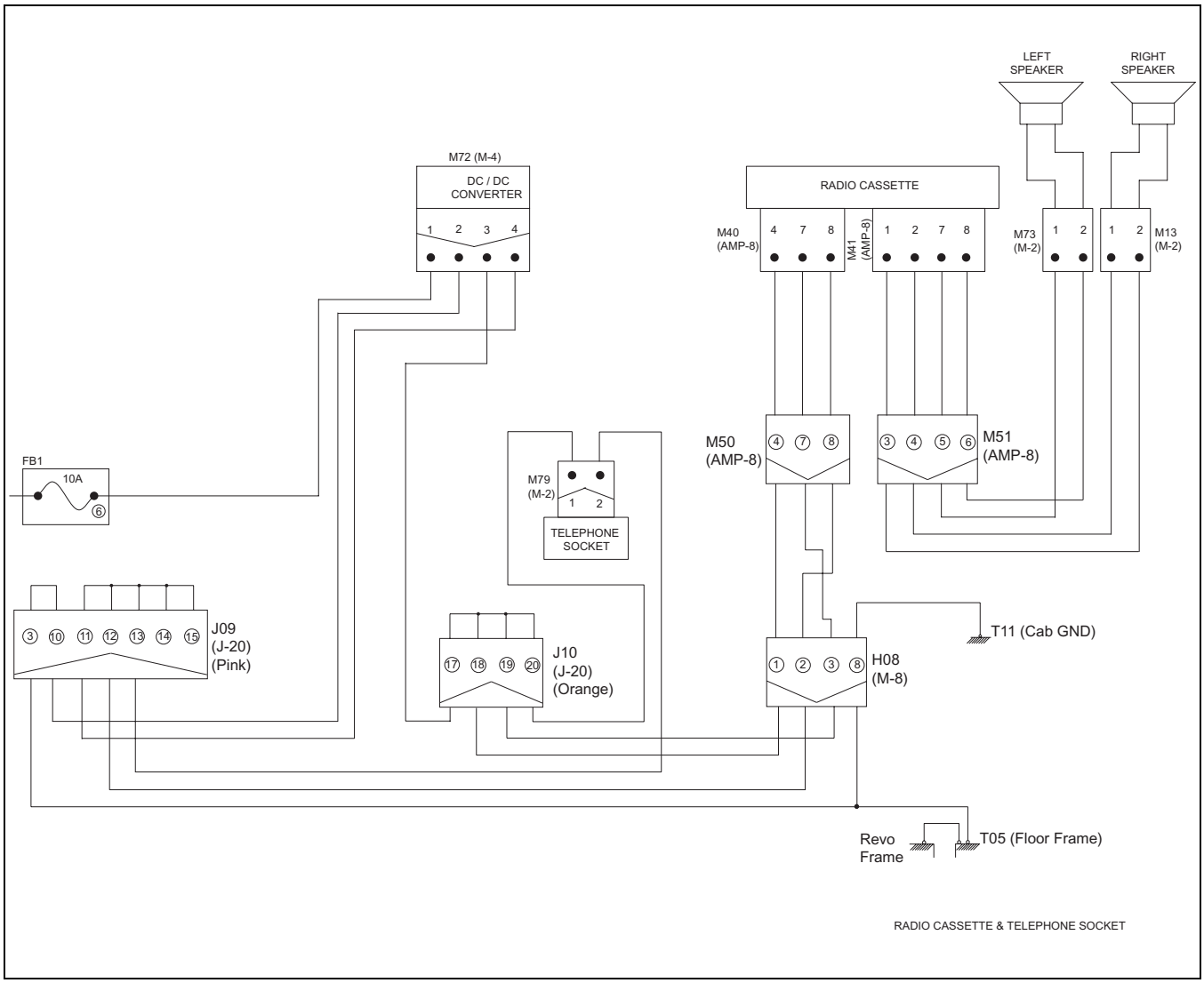
Electrical Circuit Diagram for Boom LOWER PPC Hydraulic Switch



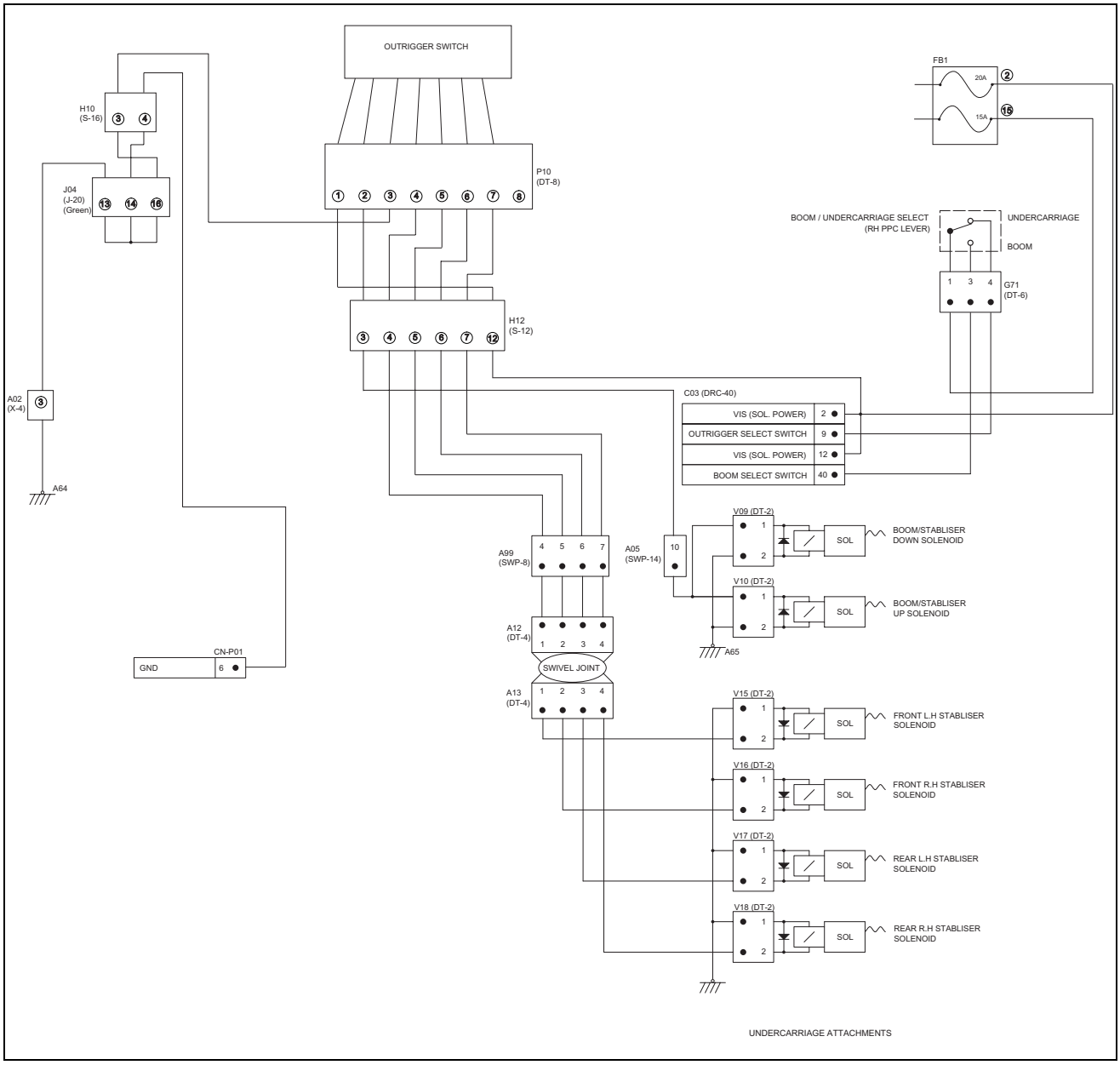
Electrical Circuit Diagram for Service PPC hydraulic Switch



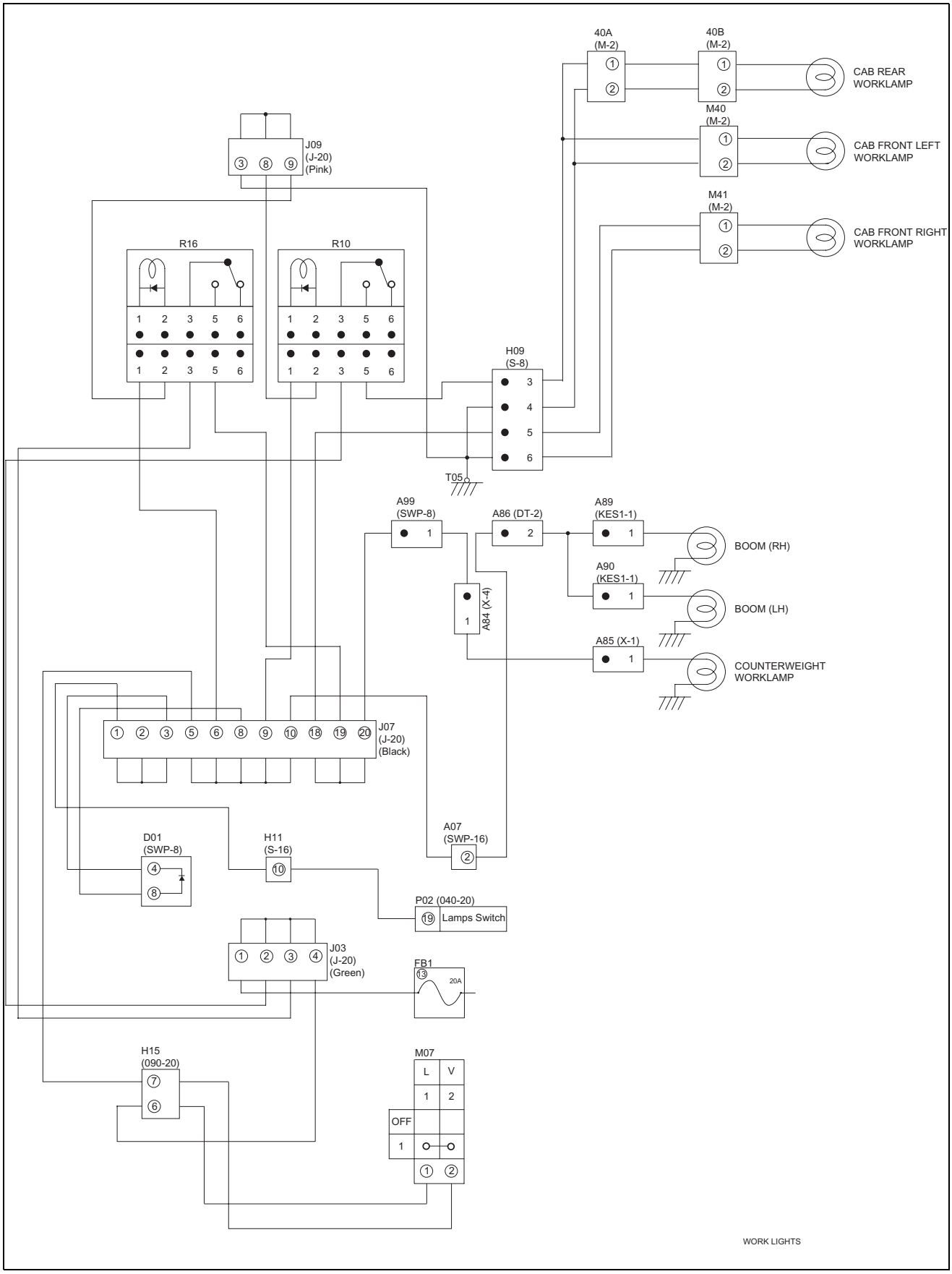
Electrical Circuit Diagram For Radio Cassette & Telephone Socket



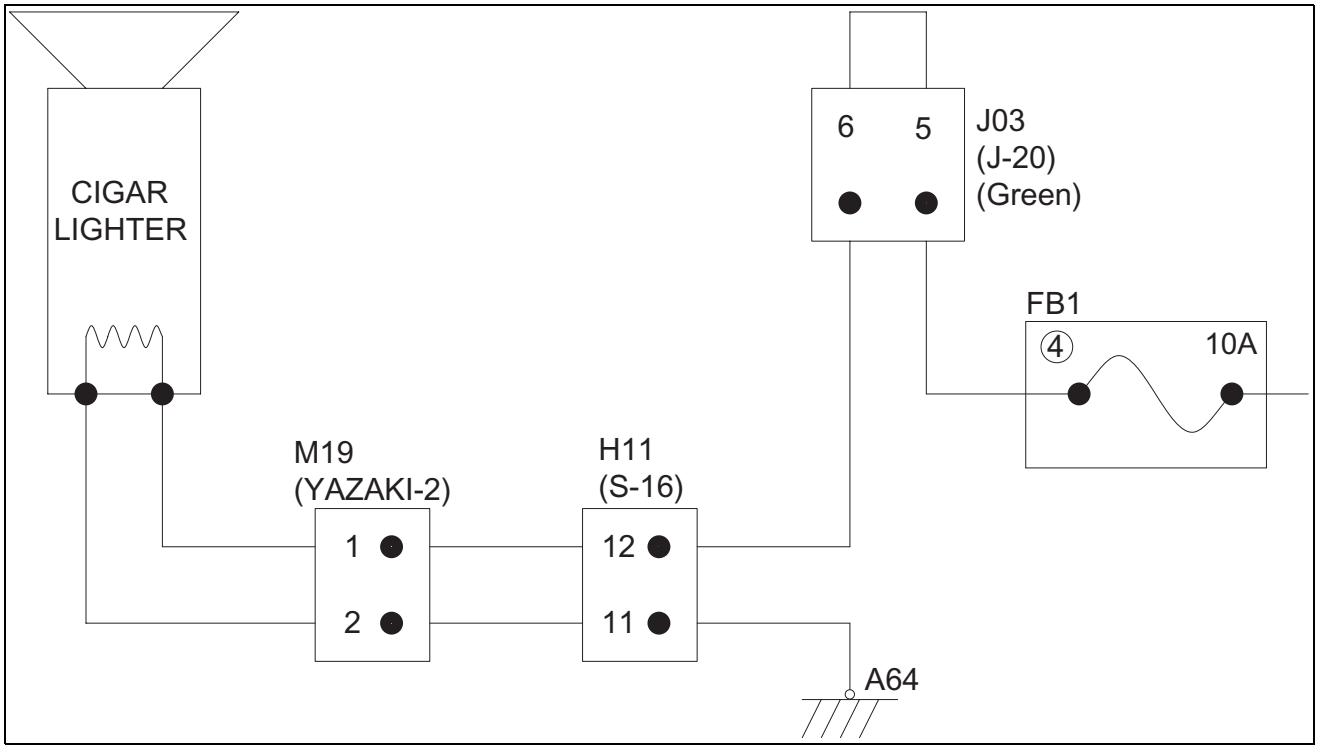
Circuit Diagram for Undercarriage Attachments - Rear left outrigger



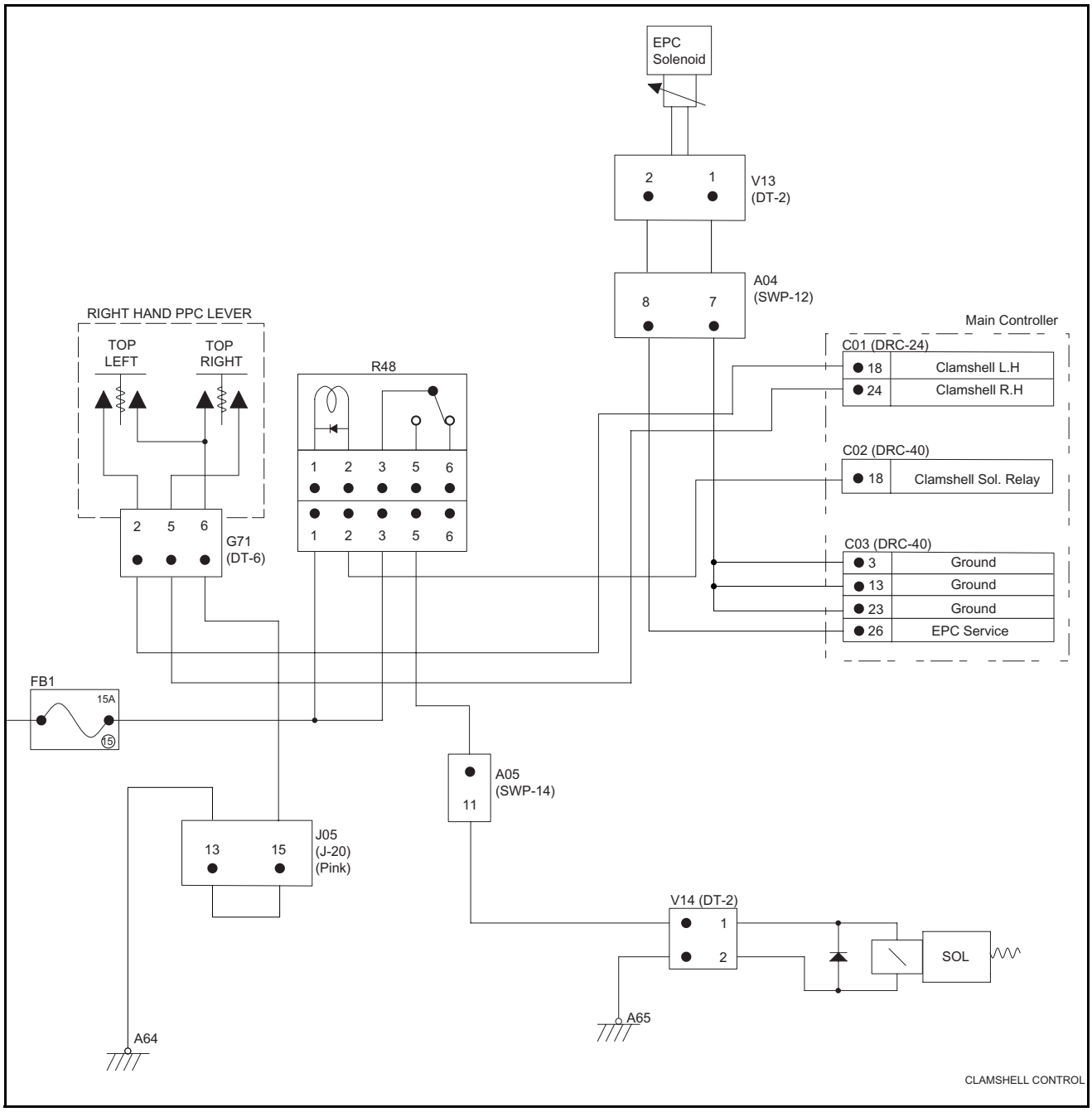
Circuit Diagram for Work Lights (Operator Cab)



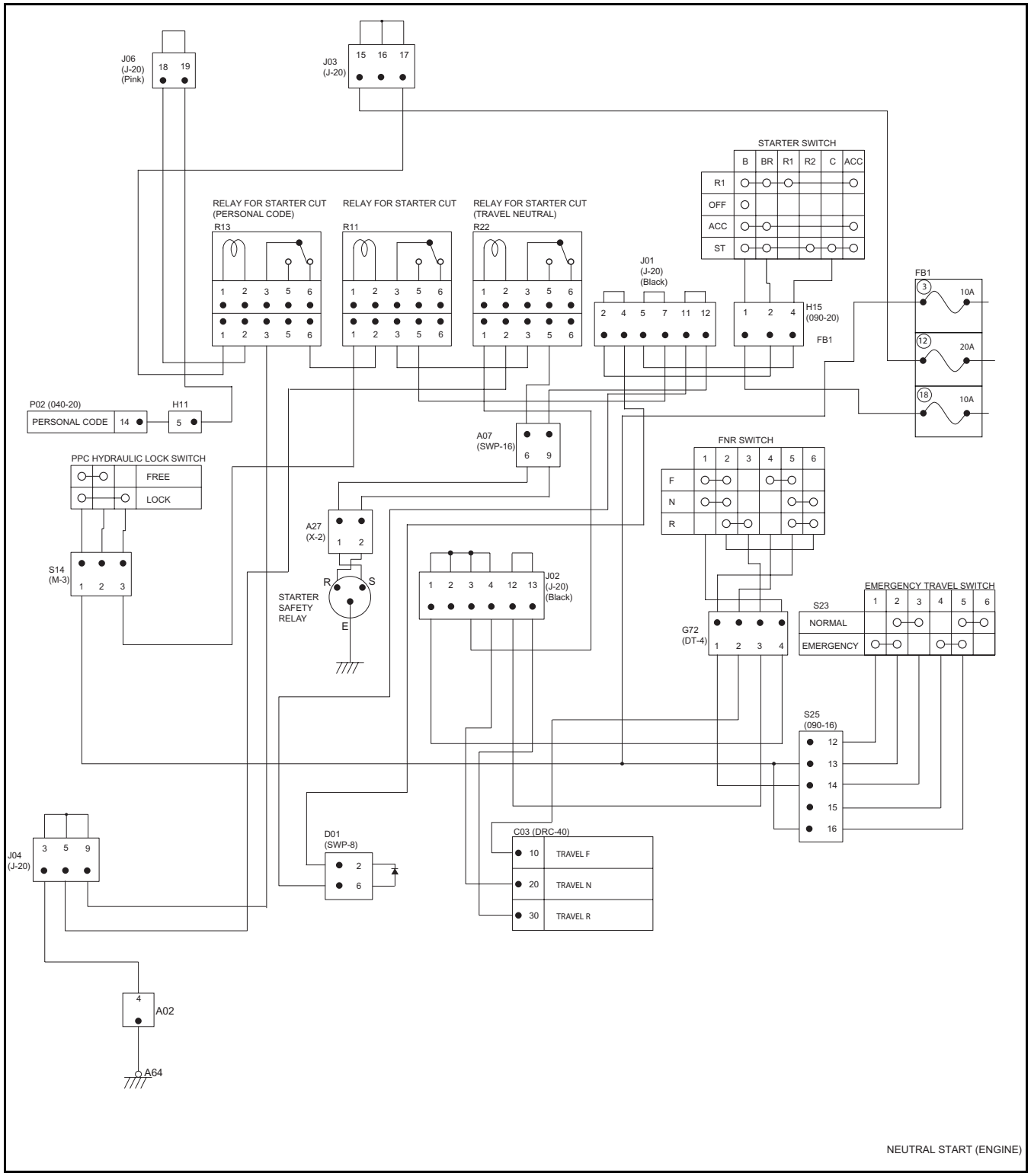
Circuit Diagram for Cigar Lighter



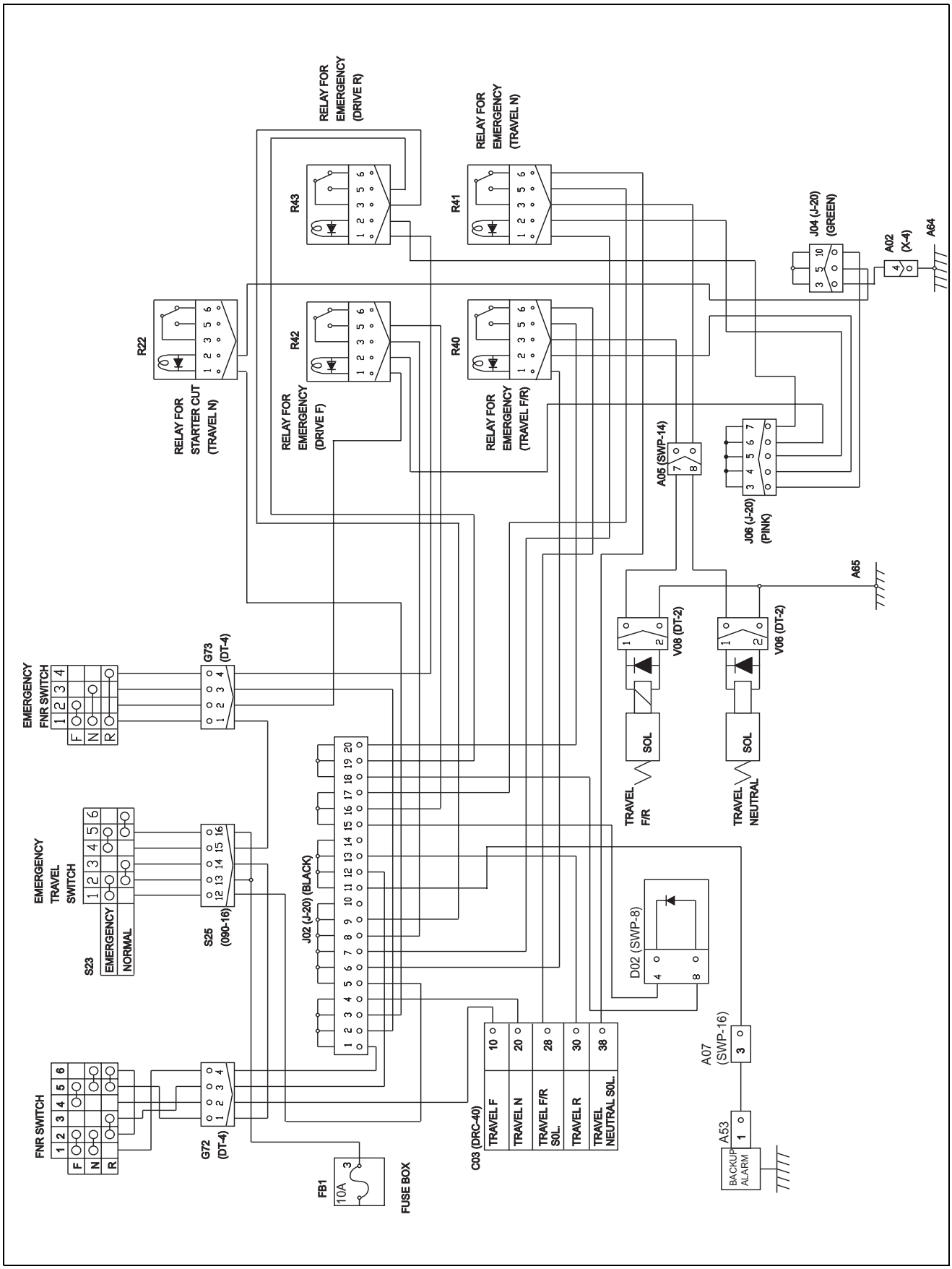
Circuit Diagram for Clamshell Control



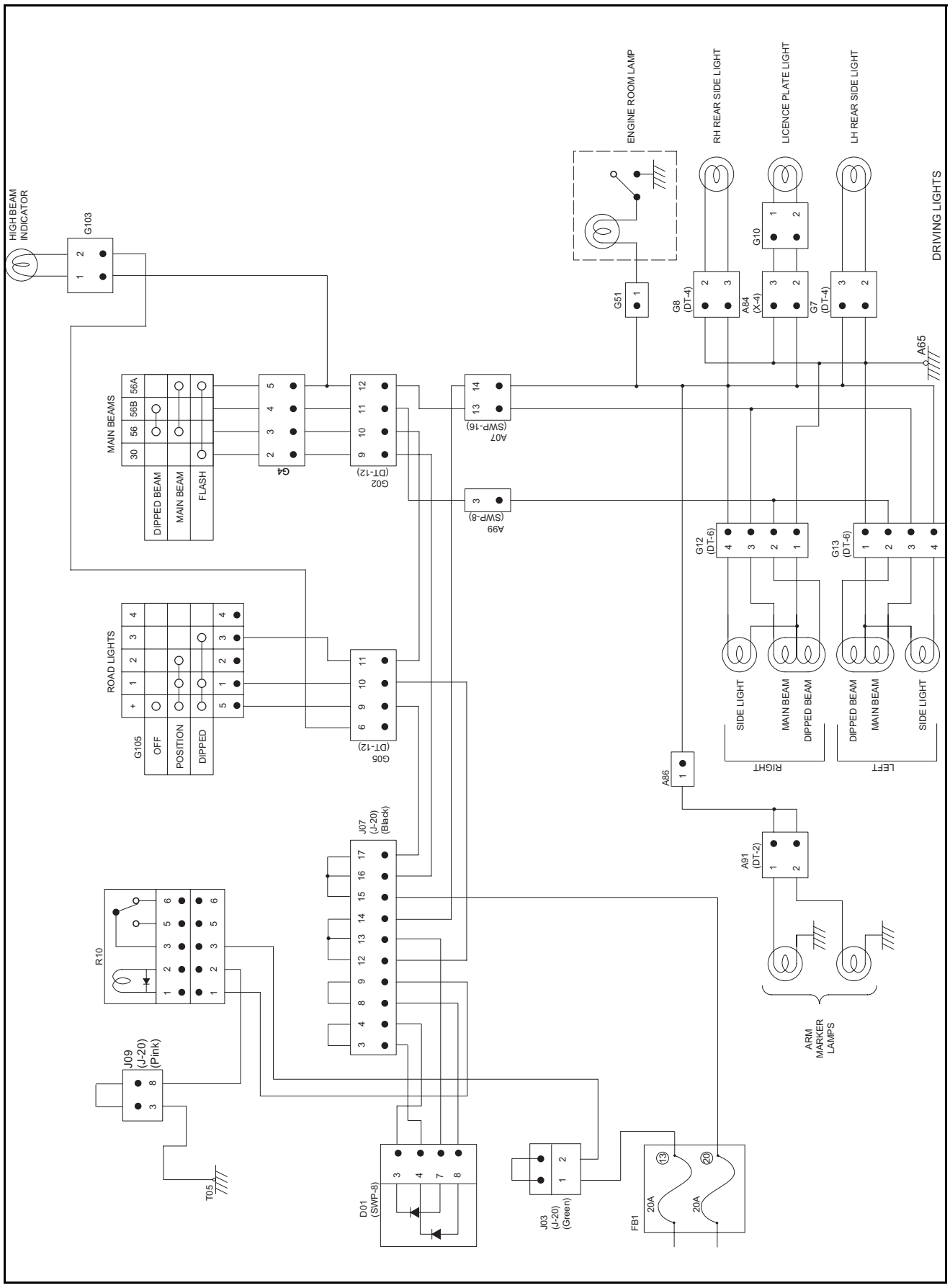
Circuit Diagram for Neutral Start (Engine)



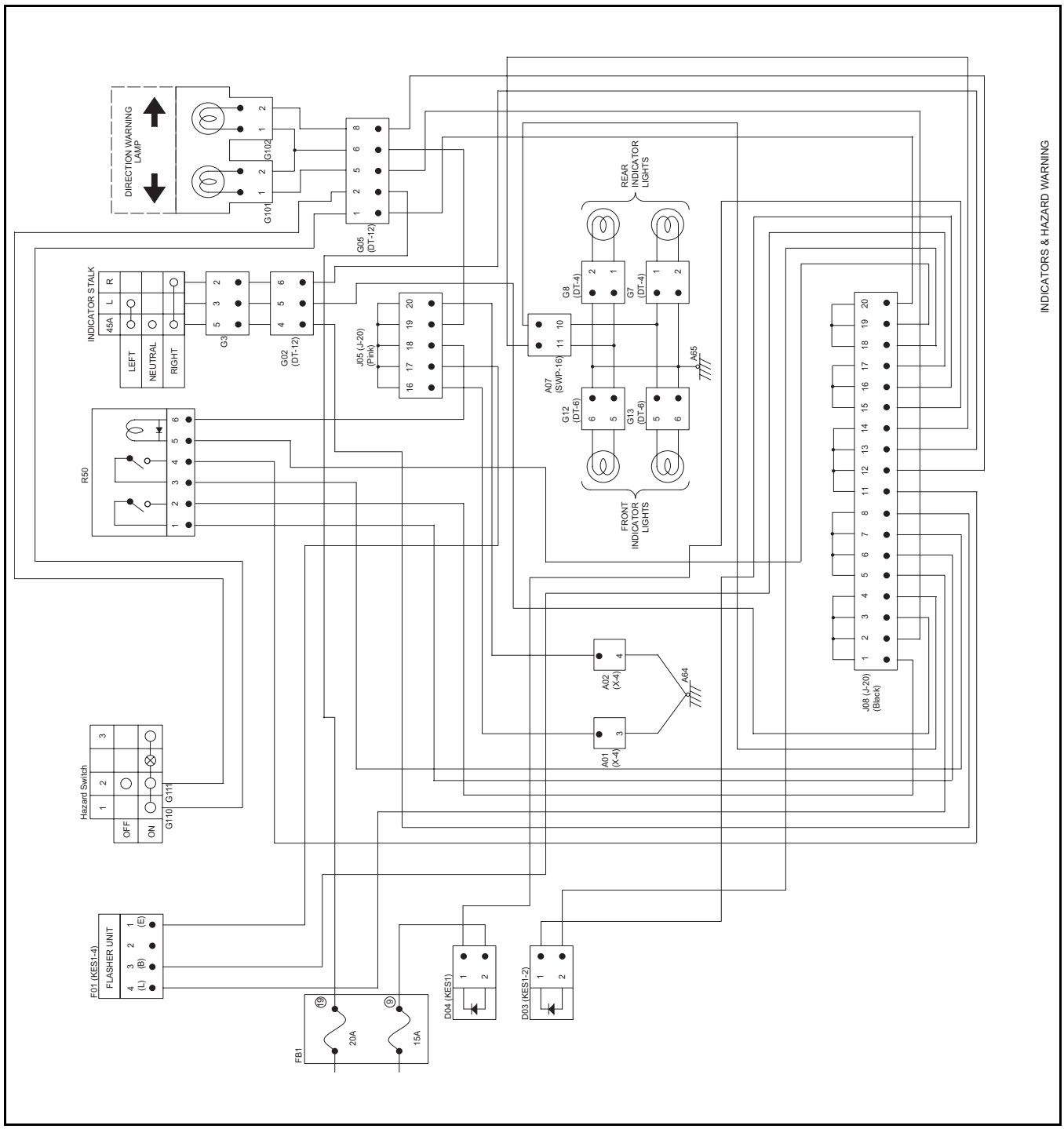
Circuit Diagram for Travel Direction Control

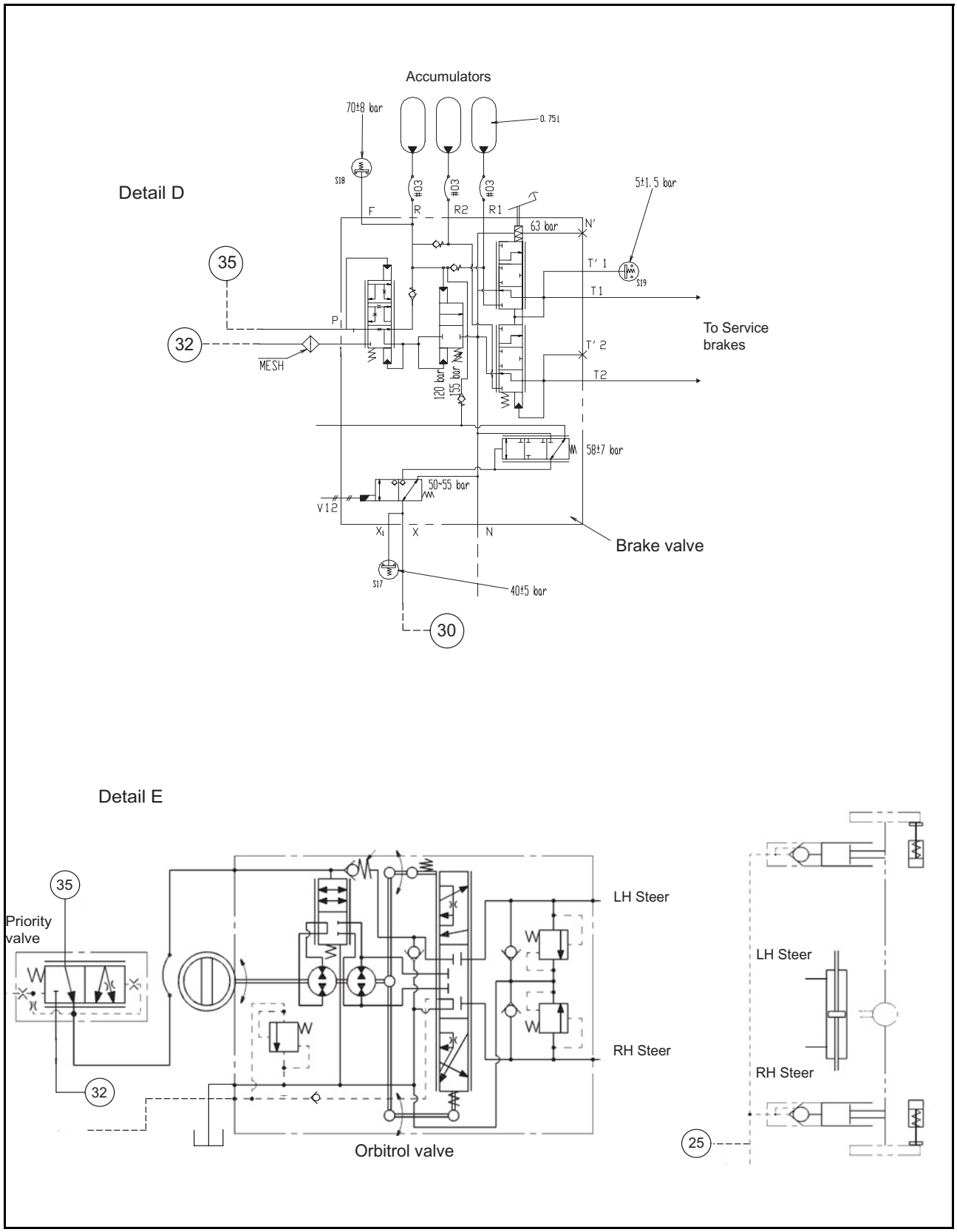


Circuit Diagram for Driving Lights



Circuit Diagram for Indicators & Hazard Warning




Accumulators
70±8 bar
0.75ℓ
S18
#03
#03
#03
F
R
R2
R1
5±1.5 bar
63 bar
N'
T'1
S19
T1
To Service brakes
T'2
T2
35
32
P1
MESH
120 bar
155 bar
58±7 bar
50~55 bar
V12
X1
X
N
Brake valve
S17
40±5 bar
30
Detail D
Detail E
35
Priority valve
32
LH Steer
RH Steer
Orbitrol valve
LH Steer
RH Steer
25

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>3.5 - 3.8 MPa
{35.7 - 38.8 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.

30 DISASSEMBLY AND ASSEMBLY

REMOVAL AND INSTALLATION OF FUEL INJECTION PUMP ASSEMBLY

SPECIAL TOOLS

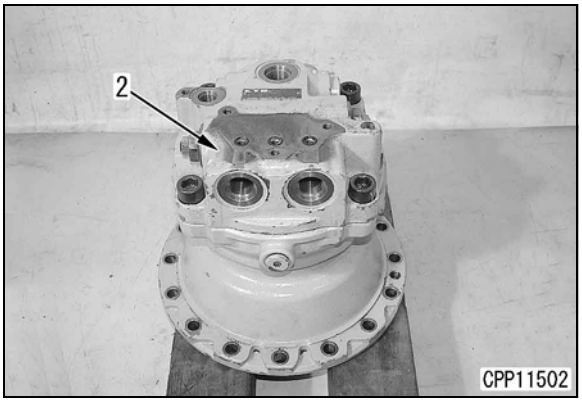
Mark	Part No.	Part Name	Neces-sity	Qty	Distinction*	Sketch
A	795-799-1390	Puller	n	1		

*Distinction between new and existing part.

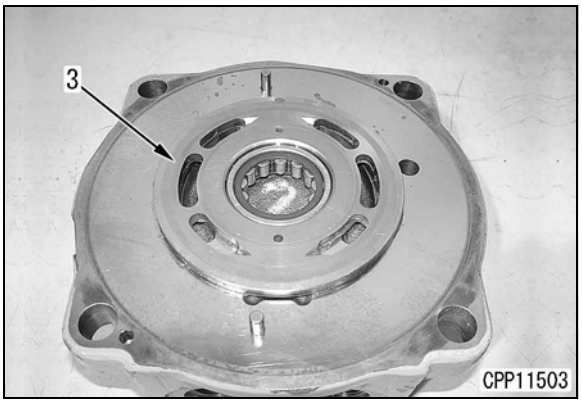
REMOVAL

⚠ Leave the negative (-) terminal of the battery disconnected.

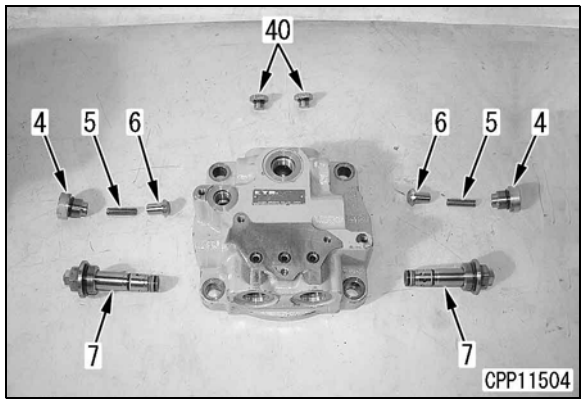
1. Open up the engine hood.
2. Remove plate (1) and cover (2).



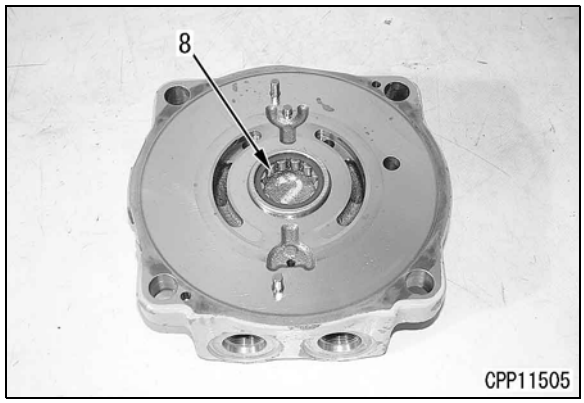
3. Take off radiator fan guard (3).
4. Disconnect air intake hose (4). ※1



5. Disconnect fuel inlet hose (5) and fuel outlet hose (6). ※2
   ★ When disconnecting the hoses, oil will flow out. Stop the flow by inserting a wooden plug into the hoses.



6. Disconnect tubes (7) and (8) between the fuel filter and the fuel injection pump, then remove fuel filter bracket (9). ※3



7. Disconnect lubrication tube (10).
8. Disconnect six delivery tubes (11). ※4
9. Detach E11 governor motor connector and then detach governor spring (12) on the fuel injection pump side. ※5

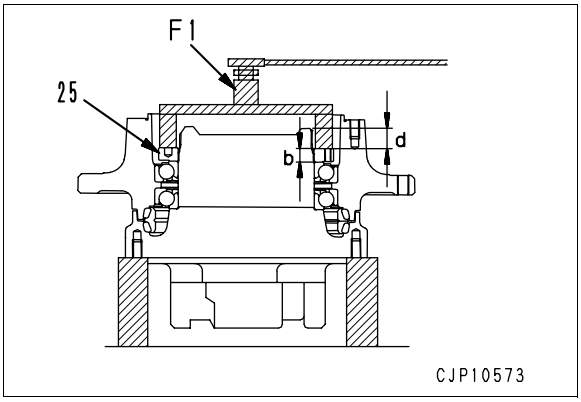
28. Disconnect connector E05 (32) from the engine cooling water temperature sensor, and remove the wiring clamp.

29. Remove the clamps (two places) and disconnect the spill tube (33). 12

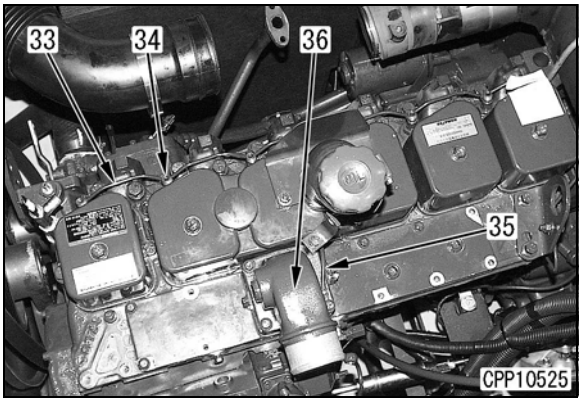
30. Remove six nozzle holders (34). 13

★ If it is difficult to remove the nozzle holder assemblies, use tool **C1**.

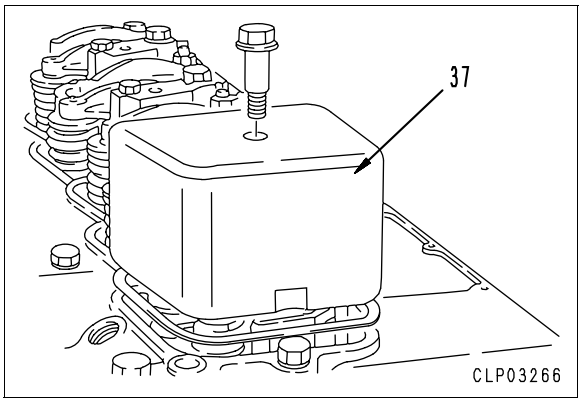
★ Be careful not to allow dust or foreign matter to stick where the nozzle holder assembly is installed.



31. Disconnect ribbon heater wiring (35) and remove air intake connector (36).

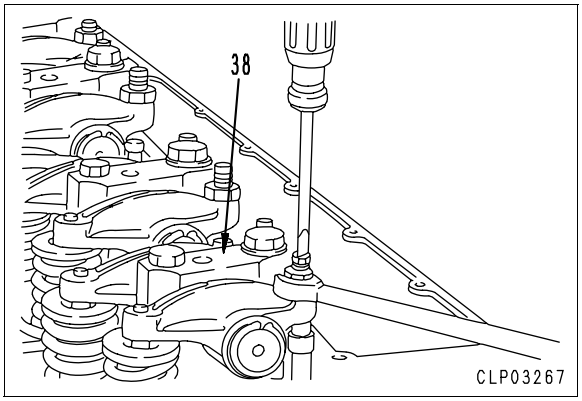


32. Remove head cover (37). 14

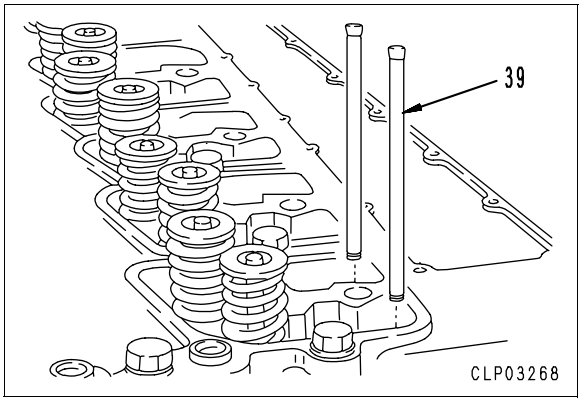


33. Detach rocker arm assembly (38). 15

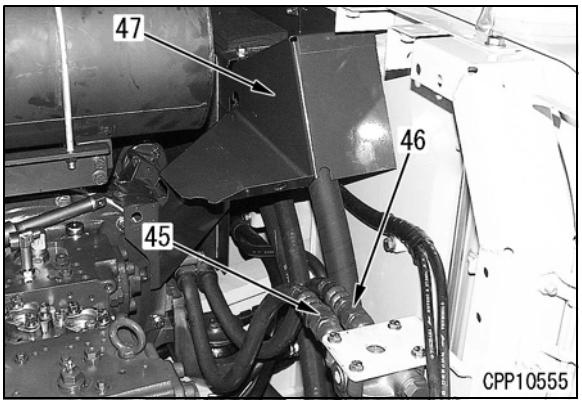
★ Loosen the lock nut, and unscrew the adjusting screw 2 to 3 turns.



34. Remove push rod (39). 16

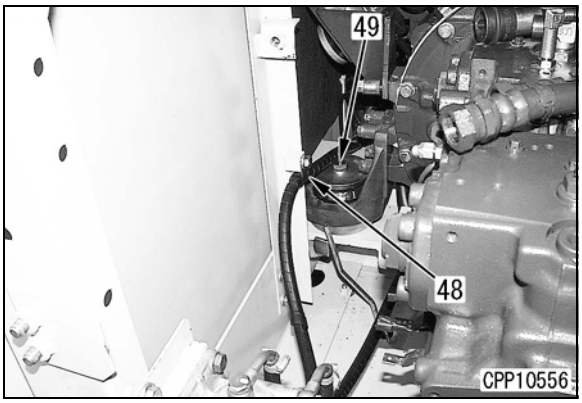


25. Remove cover (47).



26. Remove water separator wiring clamp (48).

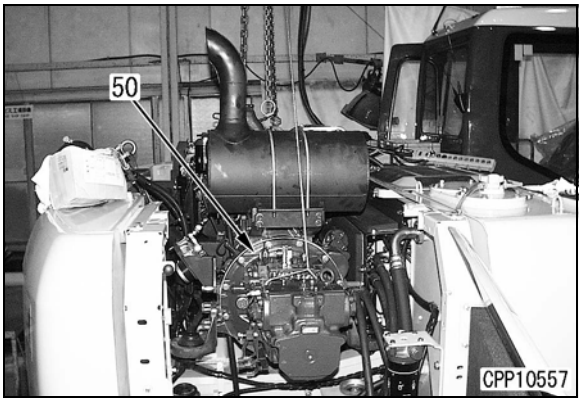
27. Remove four engine mounting bolts (49) at the front and rear. ※6



★ Check that there is no wiring or piping still connected.

28. Lift out engine and hydraulic pump assembly (50).

kg Engine and hydraulic pump assembly: 770 kg



INSTALLATION

- Install in reverse order of removal.

※1

★ Refer to the Inspection and Adjustment of Air Compressor Belt Tension section in the TESTING AND ADJUSTING chapter of this manual.

※2

N·m Air intake hose clamp screw: 5.4 - 6.4 Nm (0.55 - 0.65 kgm)

※3

N·m Fuel inlet hose clamp screw: 29.4 ± 4.9 Nm (3.0 ± 0.5 kgm)

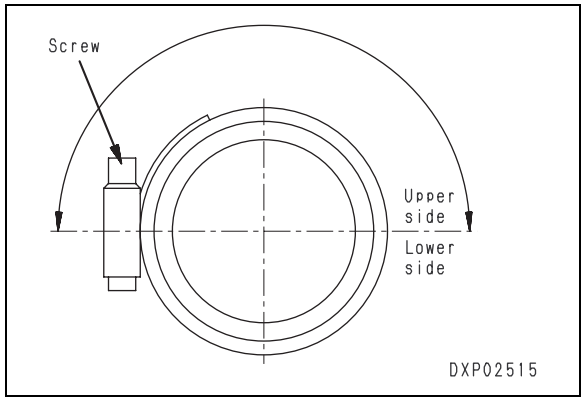
※4

N·m Radiator hose clamp screw: 8.3 - 9.3 Nm (0.85 - 0.95 kgm)

※5

★ After tightening the suction hose clamp screw, check that the screw is in the position as illustrated below.

N·m Suction hose clamp screw: 8.8 ± 0.5 Nm (90 ± 5 kgm)



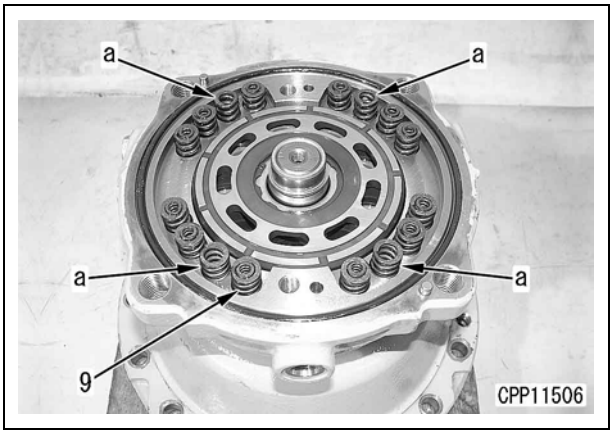
INSTALLATION

- Carry out installation in the reverse order to removal.
- **Refilling with oil**
  - ★ Add oil through the oil filler to the specified level. Run the engine to circulate the oil through the system. Then, check the oil level again.
- **Bleeding air**
  - ★ For details, see TESTING AND ADJUSTING, Bleeding air from each part.

4. Springs

Remove 16 springs (9).

- There are outer springs (large) and inner springs (small). Only the outer springs (large) are installed to 4 places **a**.

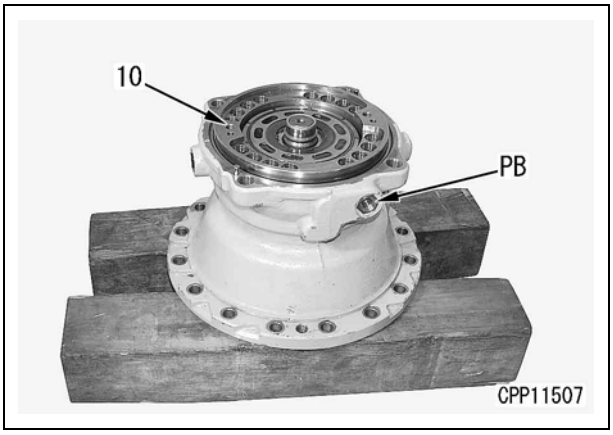


5. Brake piston

Using tool **D1**, supply compressed air to port **PB** of the case to float and remove brake piston (10).

- When installing the cover, make match marks on the brake piston and case so that the dowel pin of the cover will not shift from the dowel pin hole of the brake piston.

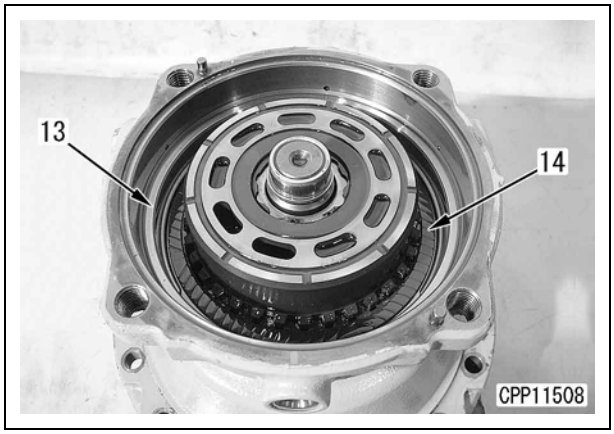
WARNING! If high-pressure air is supplied, the brake piston jumps out. Accordingly, supply very low-pressure air at first and check the movement of the brake piston, and then adjust the air pressure.



6. Collar

Using a puller, etc., remove collar (13).

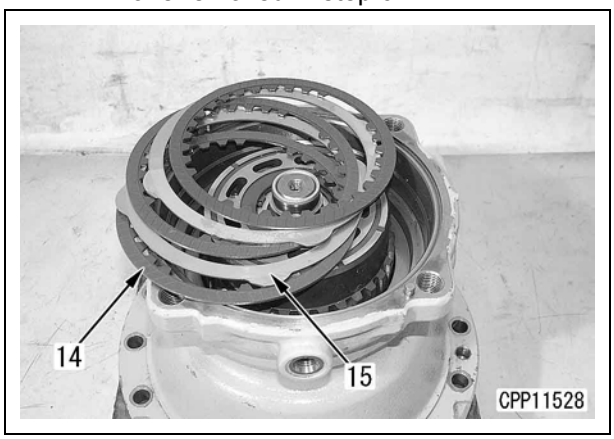
- Remove 1 disc (14) so that you can remove the collar easily.



7. Discs and plates

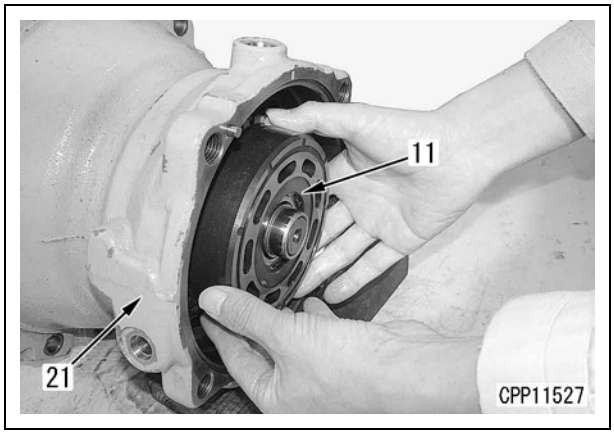
Remove 3 discs (14) and 2 plates (15).

- The number of the discs includes the one removed in step 6.



8. Cylinder block assembly

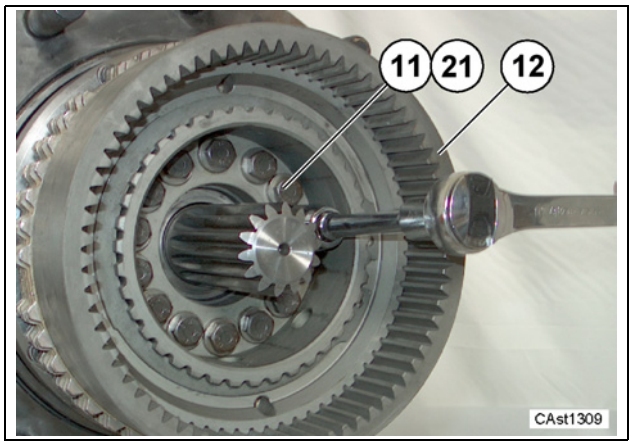
1) Place case (21) on its side.
2) Pull out cylinder block assembly (11).
   - When removing the cylinder block assembly, slant the case down a little so that the internal parts (piston, retainer holder, and pin) will not be left in the case.



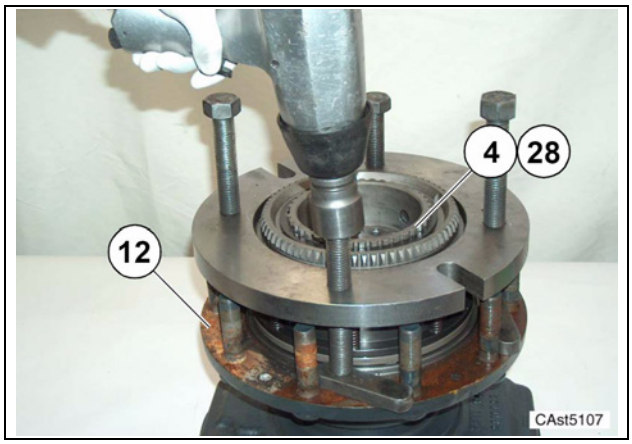
Installation

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

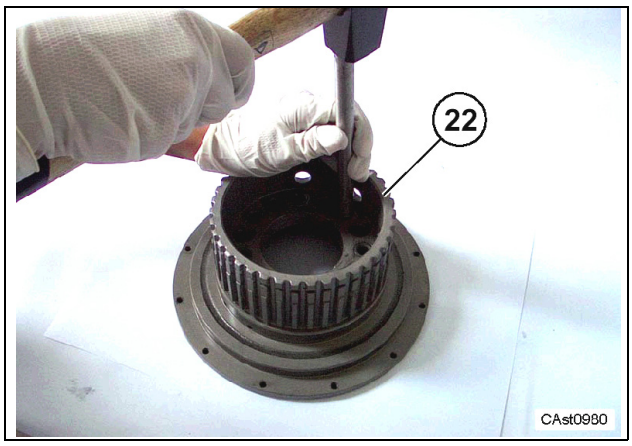
13. Remove screws (11) and washers (21) from brake carrier (12).



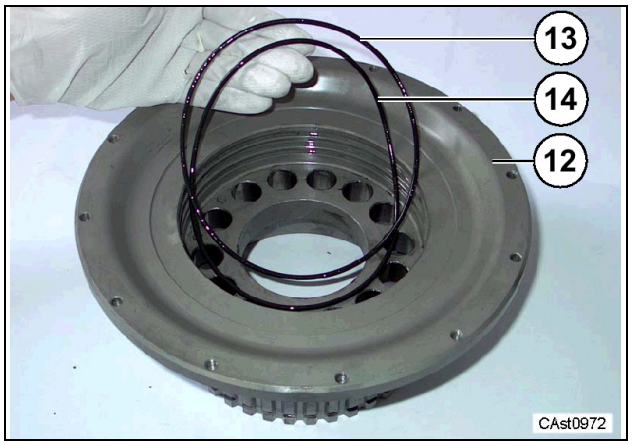
14. Assemble carrier (28) and split ring (4). Remove brake carrier (12).



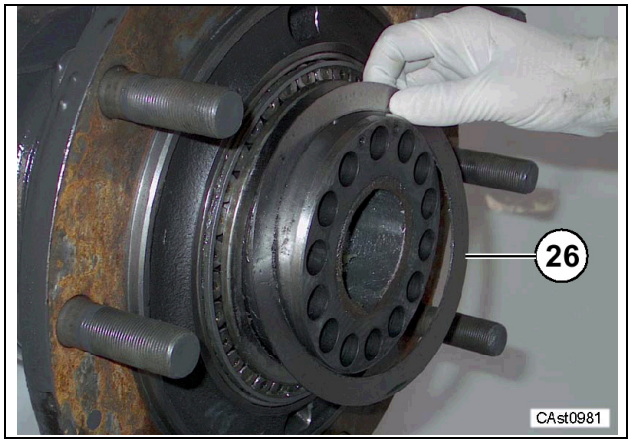
15. Remove bushes (22).



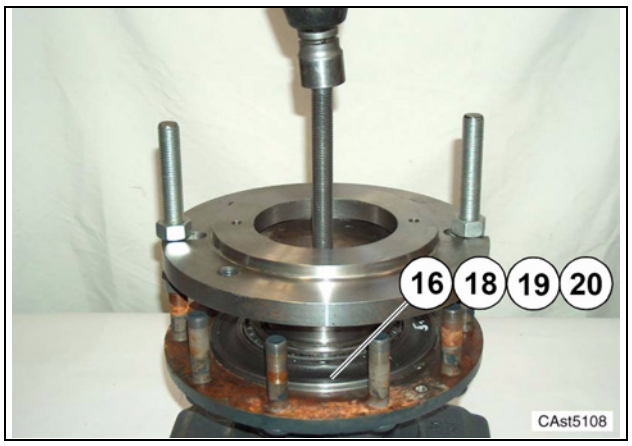
16. Remove seal rings (13) and (14) from brake carrier (12).



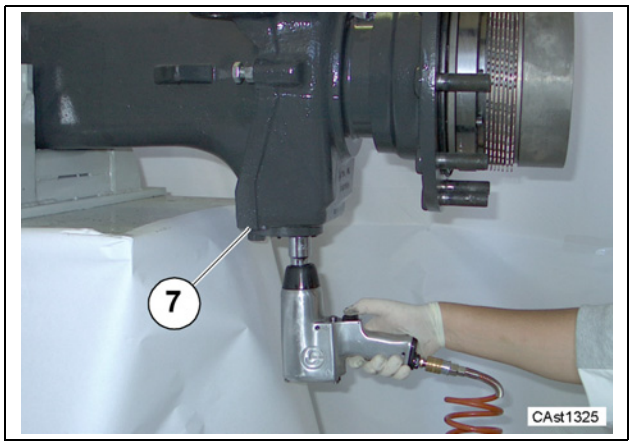
17. Remove shims (26).



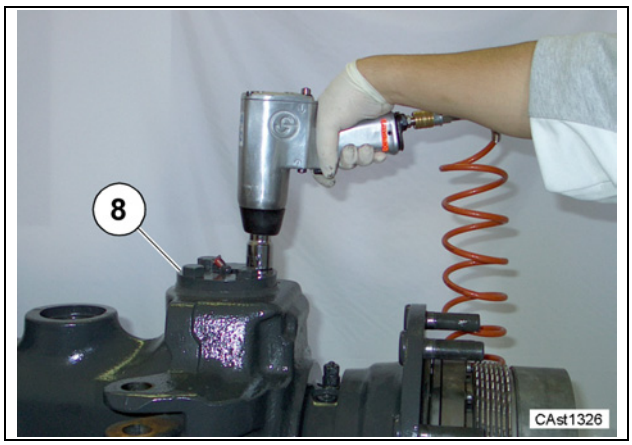
18. Remove wheel hub (16) with bearings (19) and (20) and seal ring (19).



7. Remove the screw (7).

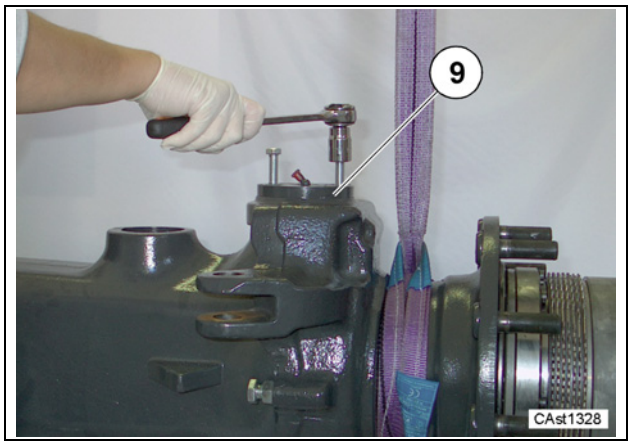


8. Remove the screw (8).

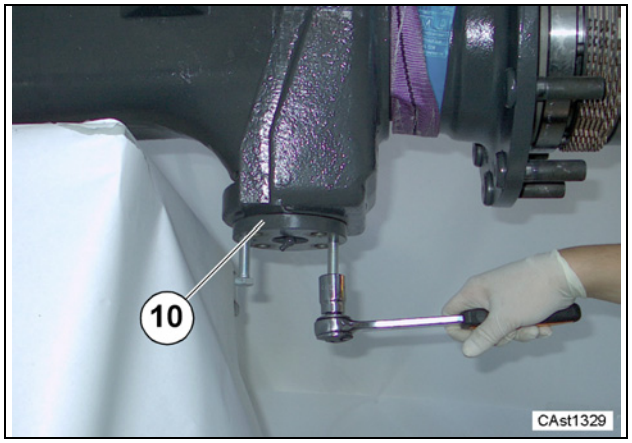


9. Secure the joint box to a hoisting equipment.

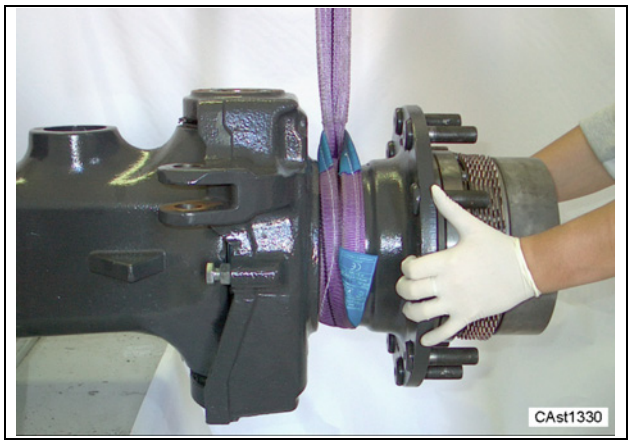
10. Screw two screws M12 x 100 and remove the pivot.



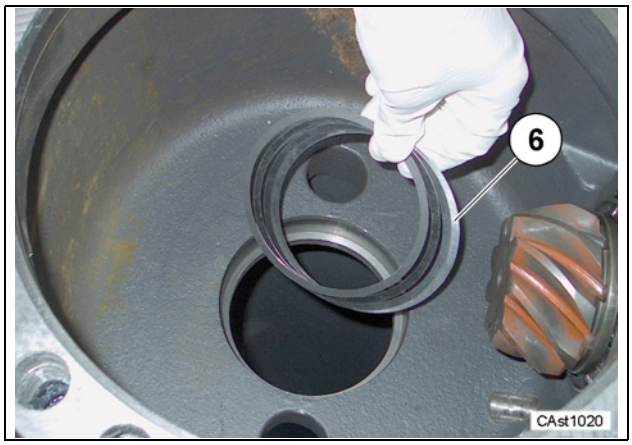
11. Screw screws M12 x 100 and remove the pivot.



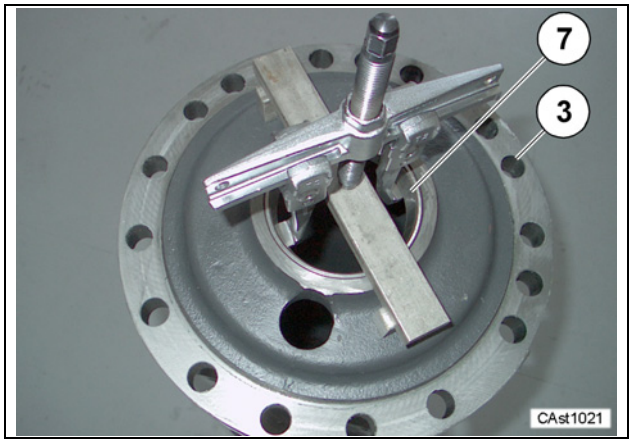
12. Remove the complete joint group.



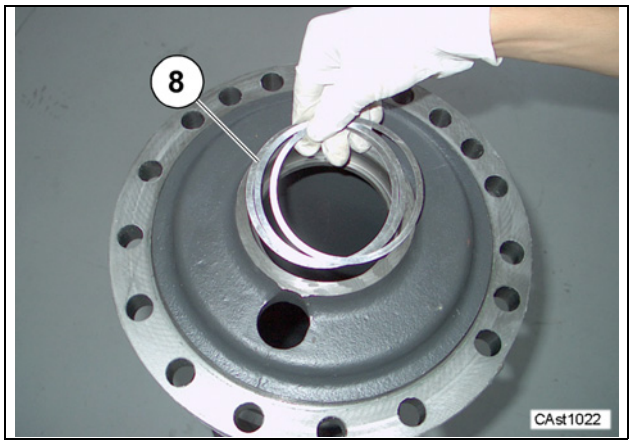
7. Remove shims (6).



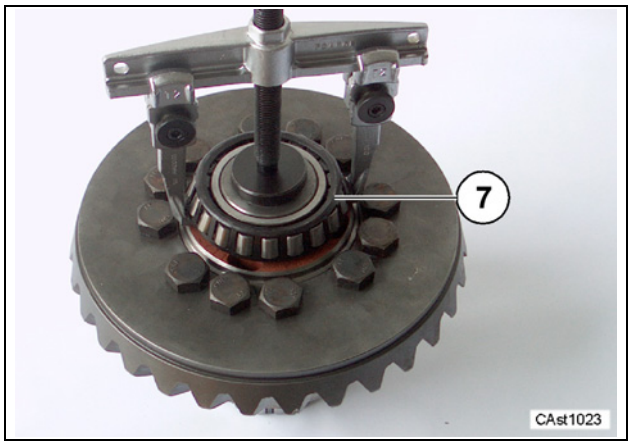
8. Use an extractor and remove from housing (3) the outer cup of bearing (7).



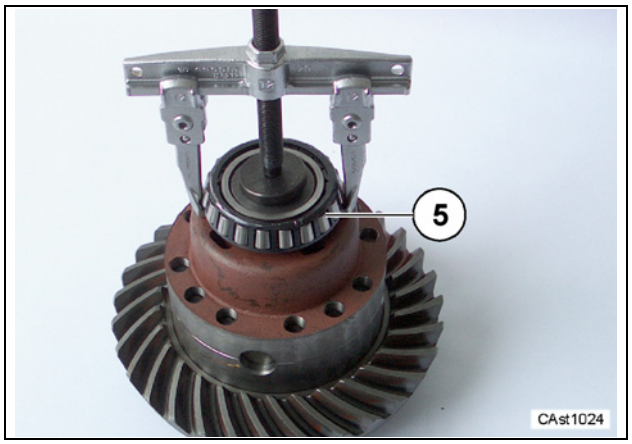
9. Remove shims (8).



10. Use an extractor to remove bearing (7) from differential unit.

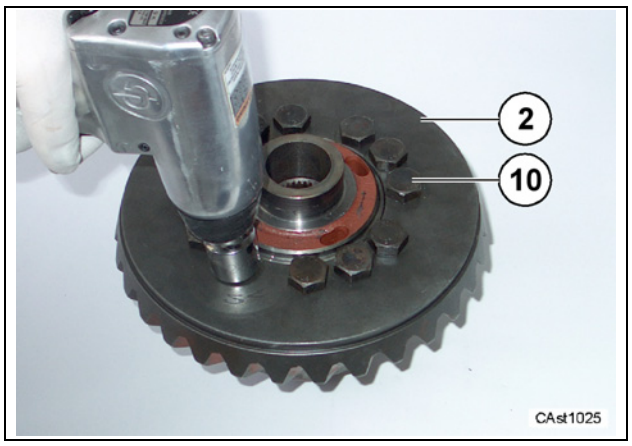


11. Use an extractor to remove bearing (5) from differential unit.

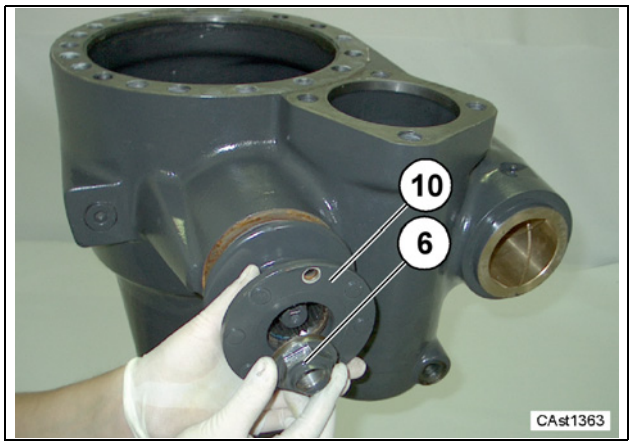


12. Unscrew all fastening screws (10) of bevel gear crown (2).

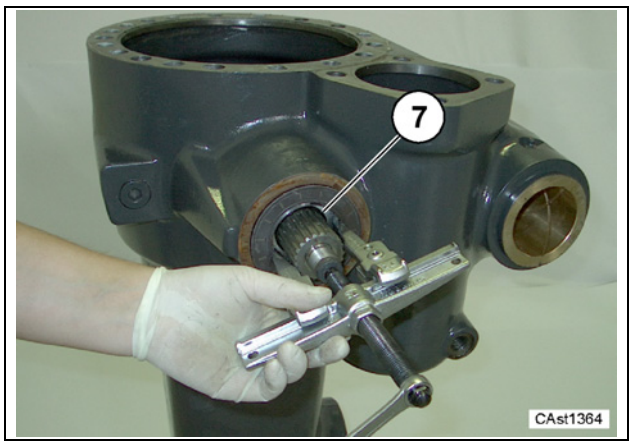
WARNING! This operation makes both differential half boxes free, so take care not to drop the inner components.



7. Remove the nut (6) and the flange (10).

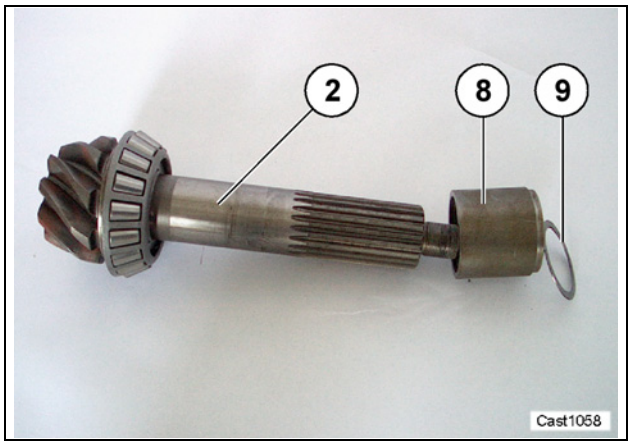


8. Remove the gasket (7).

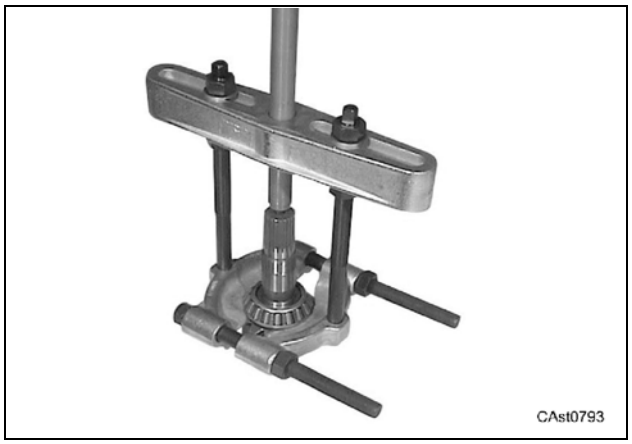


9. Take the bevel pinion out of its housing, by beating with hammer made of soft material on the splined end.

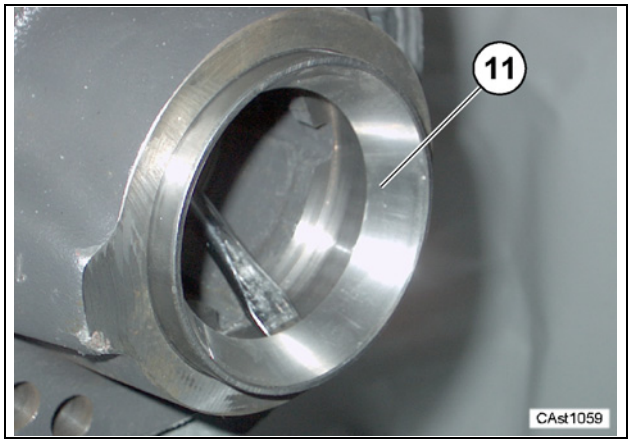
10. Once the bevel pinion (2) has been removed, collect shims (9) and spacer (8).



11. Take the bearing cone (13) out of the bevel pinion end, using a suitable extractor.



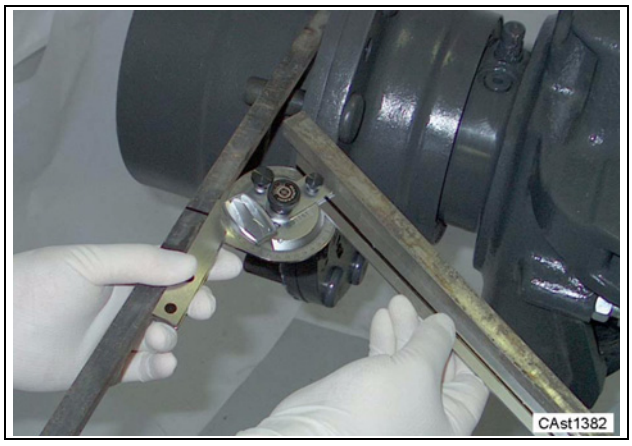
12. Take the cup of the taper roller bearing (11) out of the central body, using a chisel and hammer.



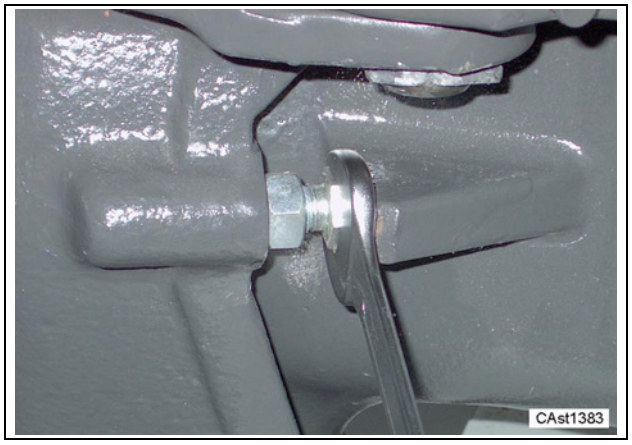
Steering angle adjustment

1. Use the same bars assembled for the toe-in adjustment and a long bar perfectly balanced over the machined part of the central body (pinion side), so that the 2 bars form an acute angle at the maximum steering.

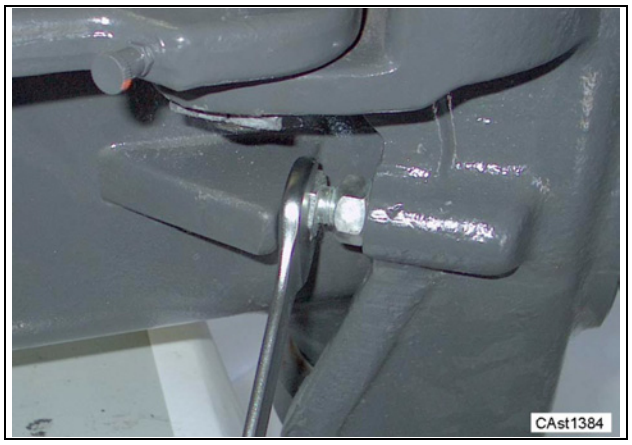
2. Adjust a goniometer to the to the requested angle 32º/26.2º (inner/outer) and position it on the long bar.
   Move a wheel side till it forms with the 2 bars, the angle fixed by the goniometer.



3. Adjust the steering mechanical retainer, screwing in or out the right screw on the bar body, locking it with a locknut. (Tightening torque - 150Nm)

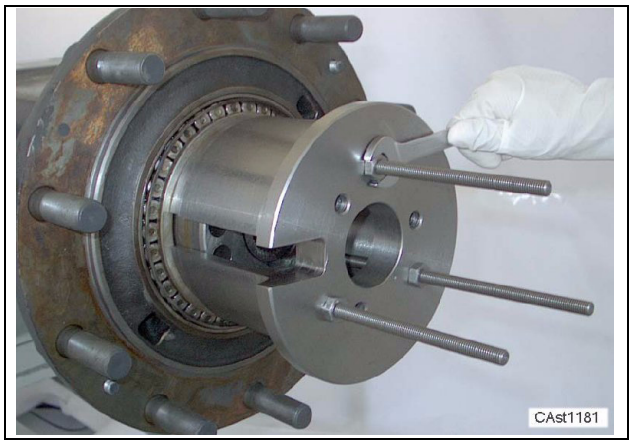


4. Steer completely towards the other side and repeat the previous operations.

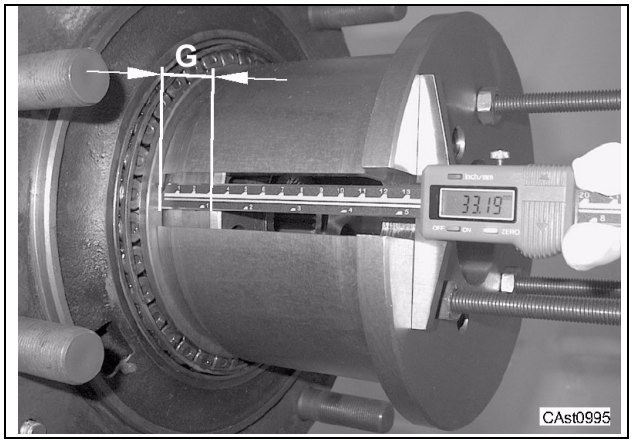


10. Fit bearing (20) inside beam trumpet.
    Warning: Wear gloves to avoid getting burnt.

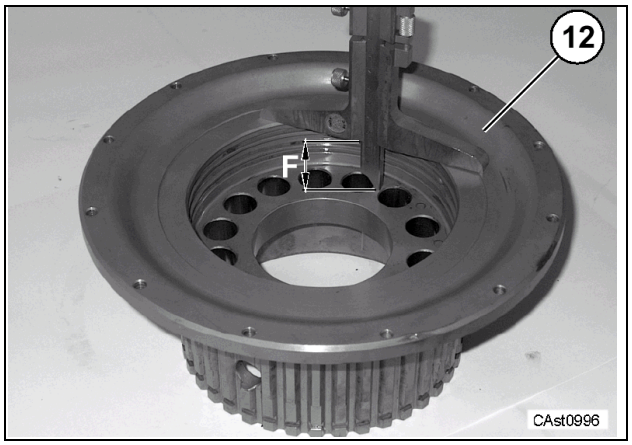
11. Assemble the tool 2897012, 3 draw plates M10 x 285 and 3 nuts M10.



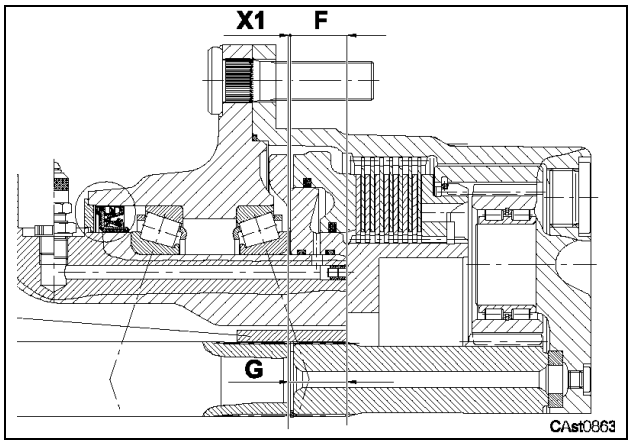
12. Use a depth gauge to measure dimension (g) of wheel hub.



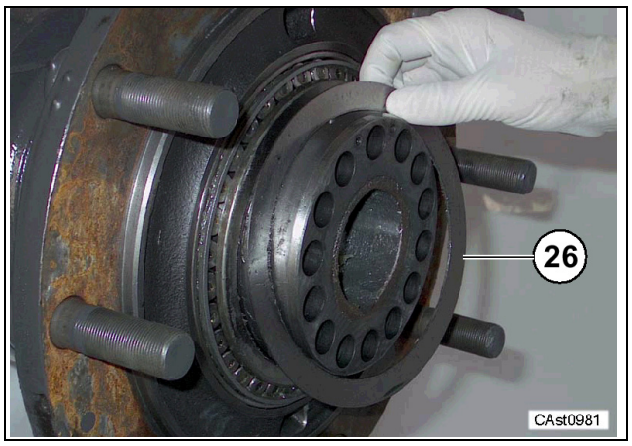
13. Use a depth gauge to measure dimension F of brake carrier (12).



14. Calculate shims X1 of adjustment shims by using the following procedure: X1 (G-F) + 0.05.



15. Assemble previously calculated shims (26) X1.



Installation of Beam Trumpet and Differential Unit

- Install in reverse order to removal.
- When installing screws apply Loctite® 242.
- Apply a thin layer of Molicote G-n plus paste on all planetary gears, crown wheels and half boxes of differential unit.

DISASSEMBLY AND ASSEMBLY OF TRANSMISSION ASSEMBLY

SPECIAL TOOLS

Part Number	Part Name	Quantity
2897005	Seal Assembly	1
2897008	Snap Ring Assembly	1
2897039	Handle	1

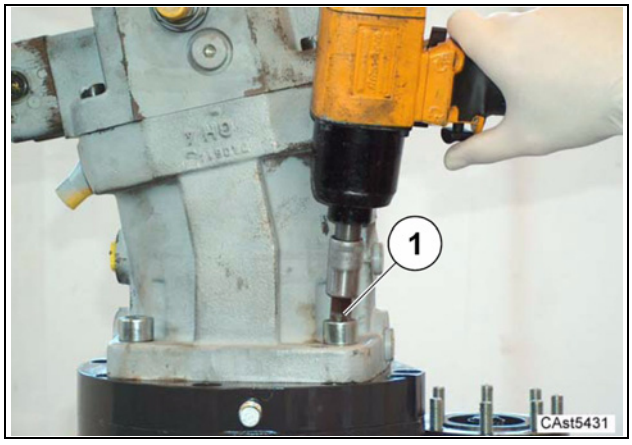
DISASSEMBLY

Removal of Travel Motor and Flange

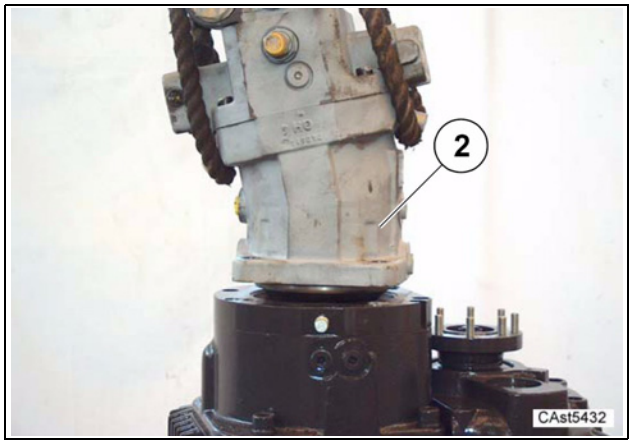
1. Remove drain plug and drain oil from transmission and travel motor.

   Transmission: Approx. 4.85 ℓ

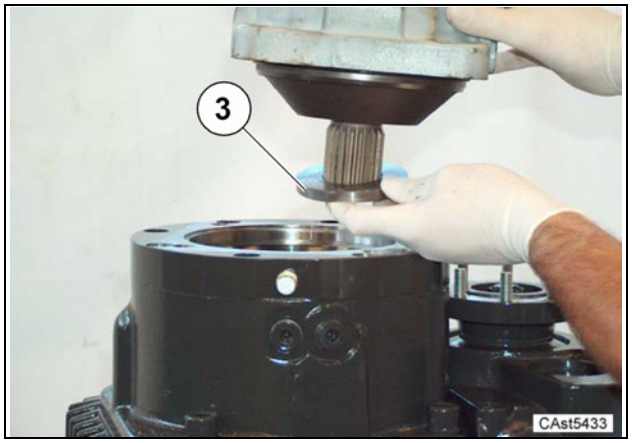
2. Remove screws (1).



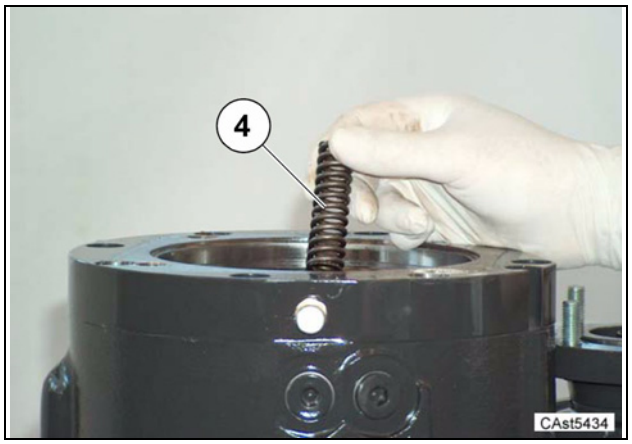
3. Remove the motor (2).



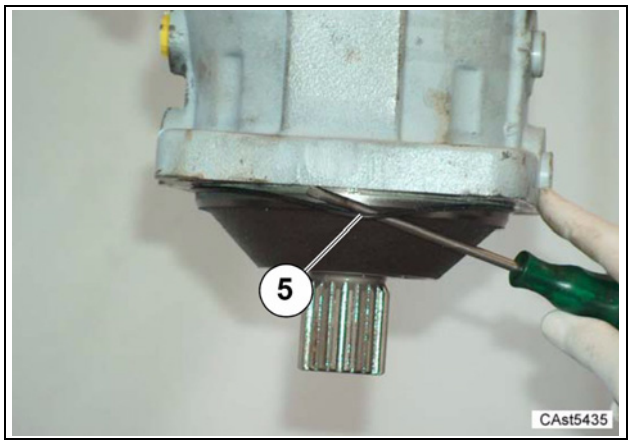
4. Remove disc (3).



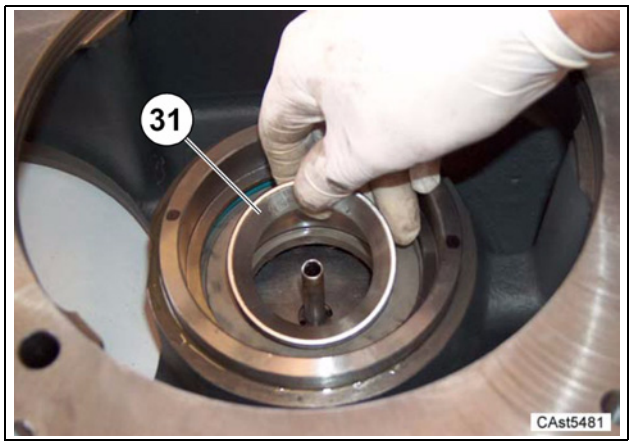
5. Remove spring (4).



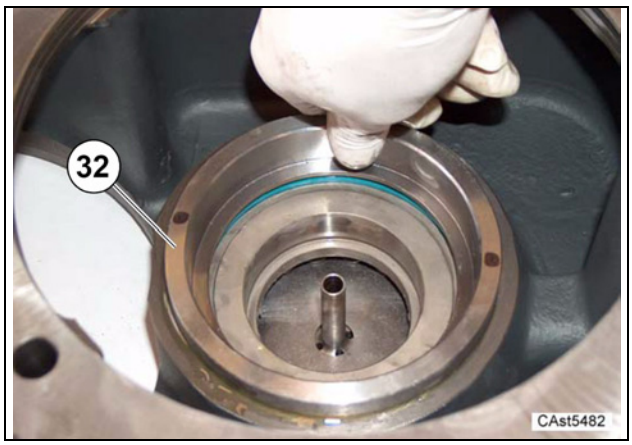
6. Remove O-ring (5).



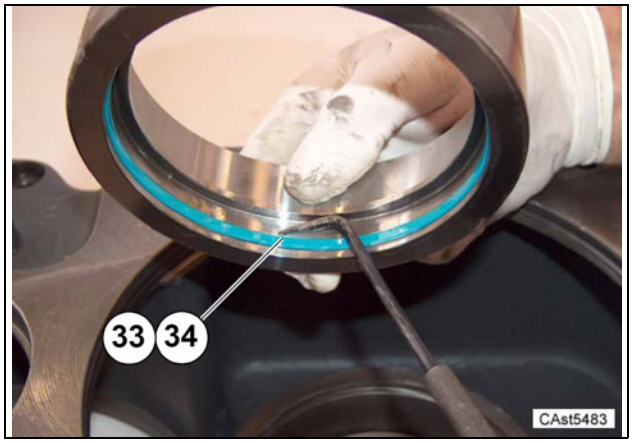
31. Remove bearing outer cup (31).



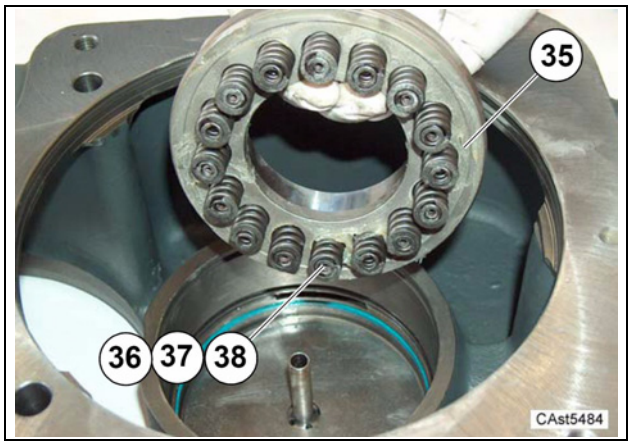
32. Remove piston (32).



33. Remove gasket (33) and O-ring (34).

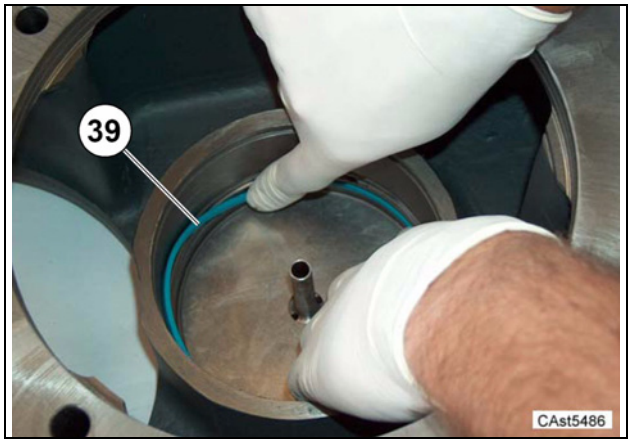


34. Remove piston (35) and springs (36), (37).

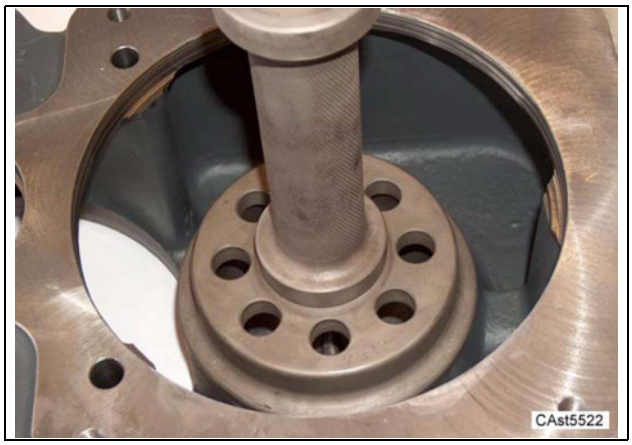


35. Remove bearing cup (38).

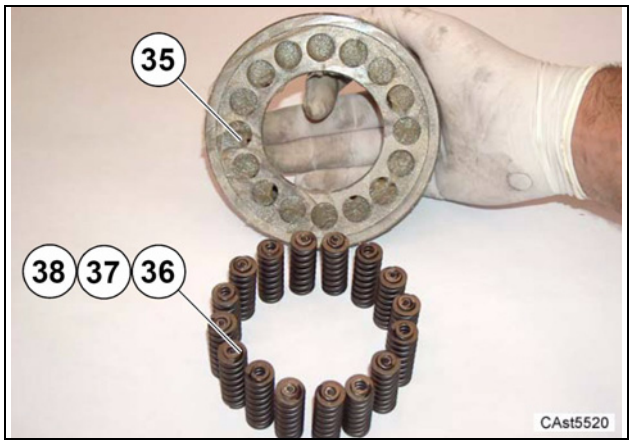
36. Remove gasket (39).



29. Install O-ring (38) and gasket (39).
Use tool 2912484.

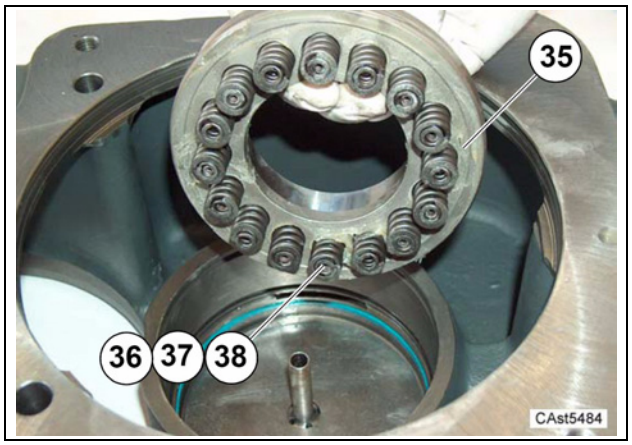


30. Apply grease on piston (35) to prevent springs from falling and insert springs (36), (37) and (38).

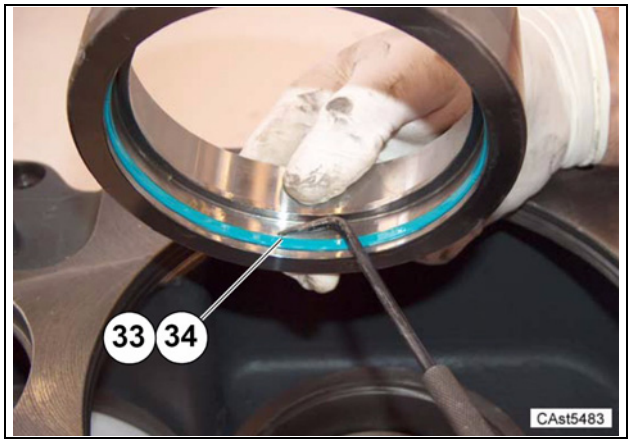


WARNING! Springs are assembled as follows:
N.1 series with 1 spring;
N.1 series with 2 spring;
N.1 series with 1 spring;
N.3 series with 2 spring;
N.1 series with 1 spring;
N.1 series with 2 spring.
Repeat this operation twice.

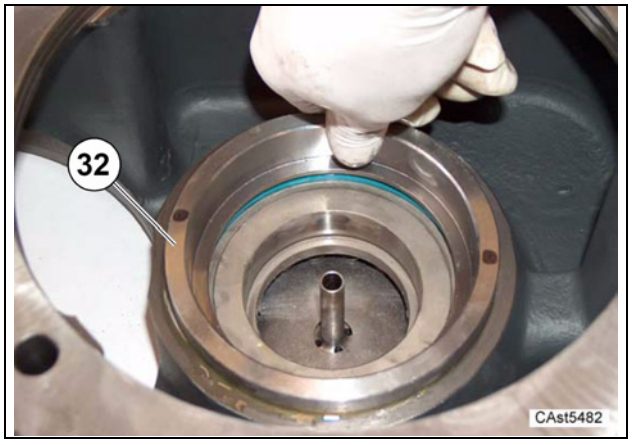
31. Assemble piston assembly



32. Assemble O-ring (34) and gasket (33).



33. Assemble piston (32).

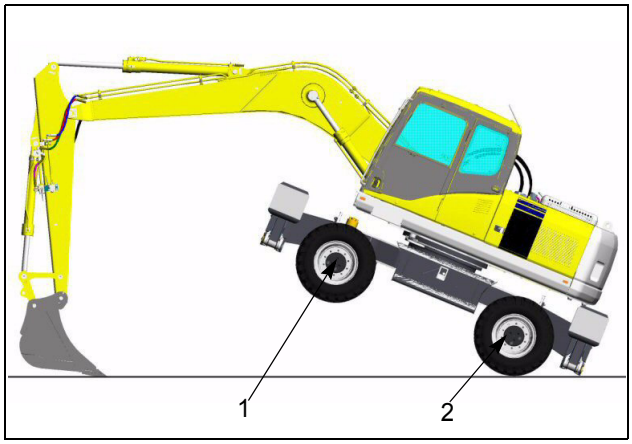


REMOVAL AND INSTALLATION OF WHEEL ASSEMBLY

REMOVAL

1. Stop engine and ensure brake pedal is engaged.

2. Raise the chassis with the boom so that the tyres are raised above the ground. Then, place axle stands below the front (1) and rear (2) axles.



3. Lower onto stands and deflate tyre completely by removing valve (3) with appropriate tool.
   Warning: Always stand to the side while deflating the tyre.

4. Release 8 of the wheel retaining nuts leaving 2 diagonally opposite each other remaining (1+2). Once you have checked there is no pressure on the remaining 2 nuts remove these as well.

INSTALLATION

- Install in reverse order of removal.
- When inflating tyres, inflate to:

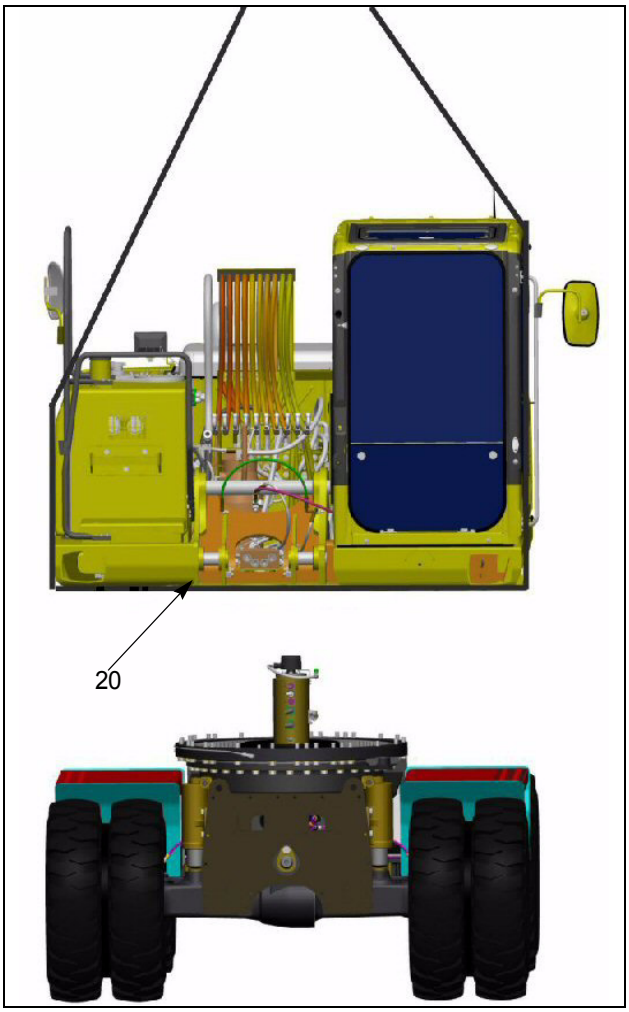
Tyre	Tyre Pressure (bar)
10.00 - 20 16 ply	7.25
11.00 - 20 16 ply	7.00

- Check there is no damage to wheel and rims.

12. Remove the 34 revolving frame mounting bolts and remove revolving frame assembly (20) by lifting it off. ※2

    ★ Attain fore and aft balance and right and left balance of the revolving frame assembly without two mounting bolts at the front and rear being removed and using a lever block. Only when the right balance is obtained, remove the remaining two bolts.

    ⚠ When removing the revolving frame assembly, take care so that it does not hit the swivel joint assembly.



kg Revolving frame assembly

	Assembly	Revolving frame only (Reference value)
PW180-7	8,226 kg	1,516 kg

INSTALLATION

- Install in reverse order of removal.

N·m Air intake hose clamp screw:
5.4 - 6.4 Nm (0.55 - 0.65 kgm)

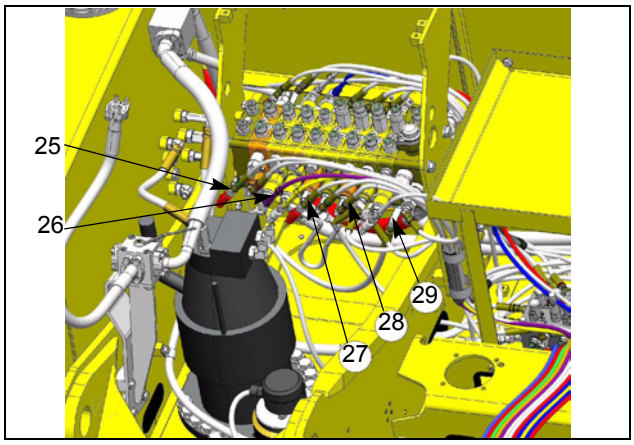
Swivel circle mating surface:
Gasket sealant (LG-1)

Threads of revolving frame mounting bolt: Adhesive compound (LT-2)

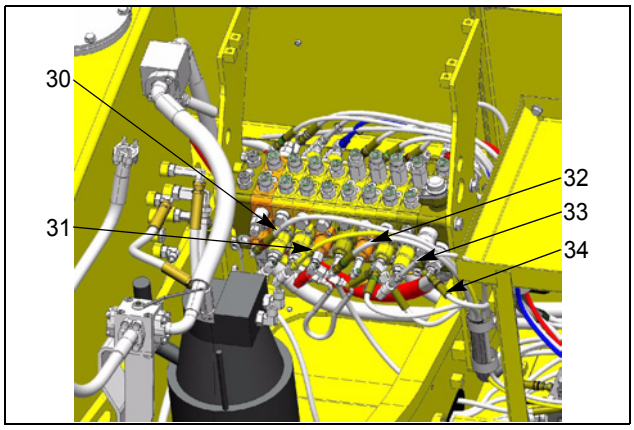
N·m Revolving frame mounting bolt
1st step: 294.2 ± 29.4 Nm (30 ± 3 kgm)
2nd step: Retightening by 60° or
588 - 677 Nm (60 - 69 kgm)

- Refilling hydraulic oil
  Refill hydraulic oil through the oil filler port to the specified level, and let the oil circulate in the hydraulic system by starting the engine. Then check the level again.
- Air bleeding
  Bleed air from the travel motor, refer to the Air Bleeding of Various Parts section in the TESTING AND ADJUSTING chapter of this manual.

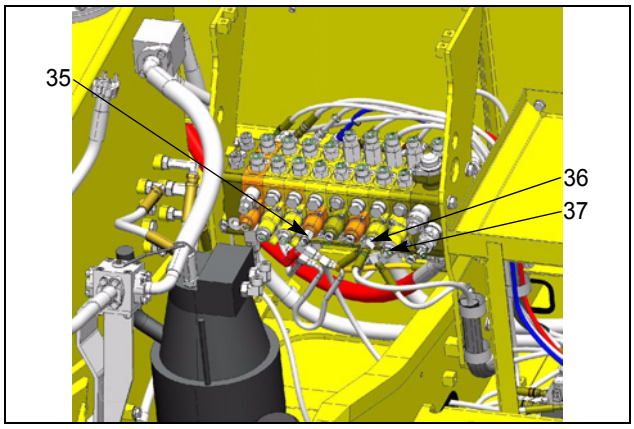
10. Disconnect hoses (25 through 29).



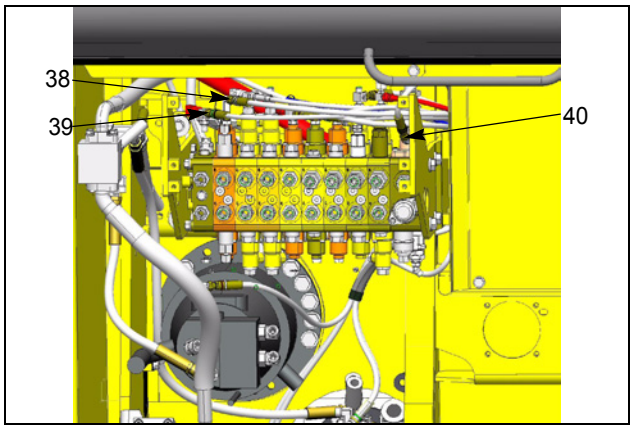
11. Disconnect hoses (30 through 34).



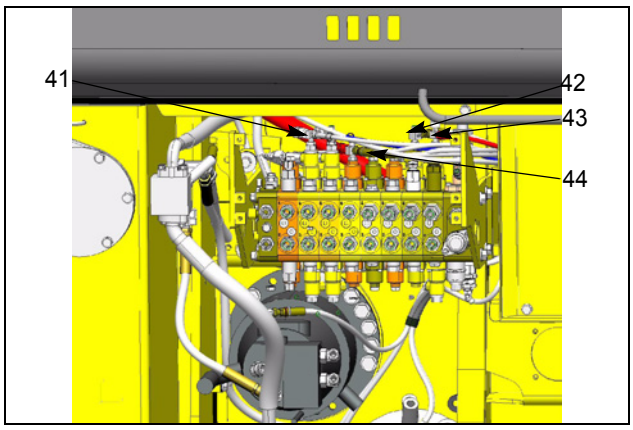
12. Disconnect hoses (35 through 37).



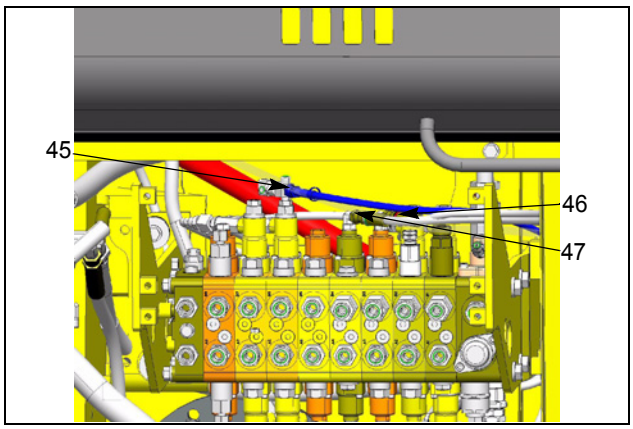
13. Disconnect hoses (38 through 42).



14. Disconnect hoses (41 through 44).

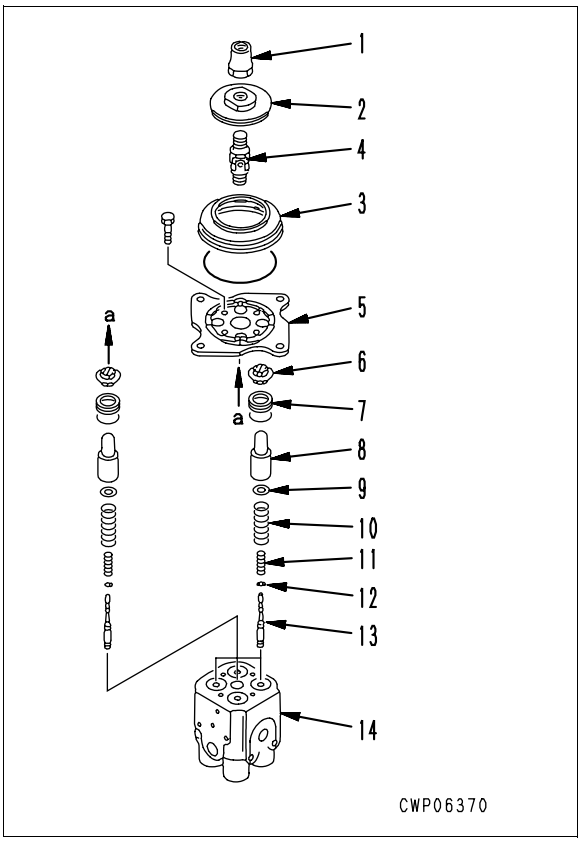


15. Disconnect hoses (45 through 47).



DISASSEMBLY AND ASSEMBLY OF WORK EQUIPMENT PPC VALVE

★ This section deals with only precautions to be followed when reassembling the PPC valve assembly for work equipment.



ASSEMBLY

- Reassembling work equipment PPC valve reassembly
  - ★ Install spring (11) so that the end surface of smaller end coil diameter (inner diameter) will face the shim (12) side.
  - ★ Springs (10) in use differ in the number of turns according to hydraulic ports as classified in the table below. Hence take care when installing one.

Port location	Spring free length
P1, P2	44.4 mm
P3, P4	42.4 mm

  - ★ The location of each port is stamped in the lower part of the valve body.

Piston (8): Grease (G2-LI)

★ When assembling piston (8), coat the piston outer periphery and body hole inner periphery with grease.

N·m Plate (5) mounting bolt:
11.8 - 14.7 Nm (1.2 -1.5 kgm)

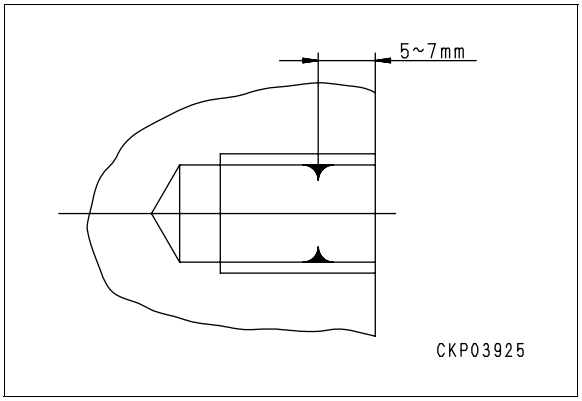
Joint (4) sliding surface:
Grease 2 - 4 cc (G2-LI)

Body female screw portion:
Adhesive compound (LT-2)

★ Coat the female screw body with Loctite® at two spots as shown in the diagram below. Each spot is to be coated with a drop (approx. 0.02 g).

N·m Joint (4): 39 - 49 Nm (4 - 5 kgm)

★ Strictly follow the specified torque for the joint.



Contact surfaces of piston and disc (2):
Grease 0.3 - 0.8 cc (G2-LI)

N·m Nut (1): 98 - 127 Nm (10 - 13 kgm)

★ After assembling the disc, refer to the Adjustment of Work Equipment and Swing PPC Valve section of the TESTING AND ADJUSTING chapter of this manual.

REMOVAL AND INSTALLATION OF 2 PIECE BOOM 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.

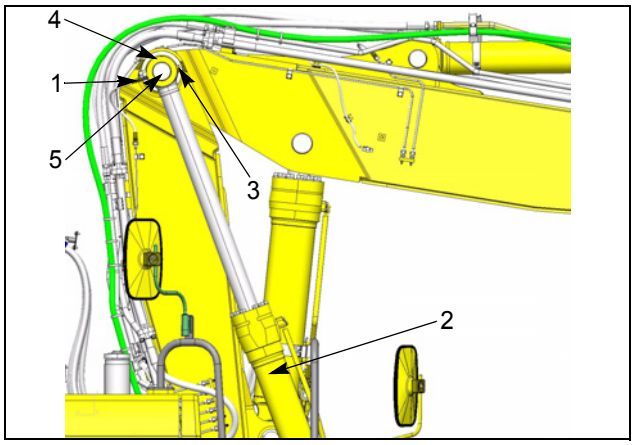
⚠ Release the residual pressure in the hydraulic circuit. Refer to the Release of Remaining Pressure in Hydraulic Circuit section in the TESTING AND ADJUSTING chapter of this manual.

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

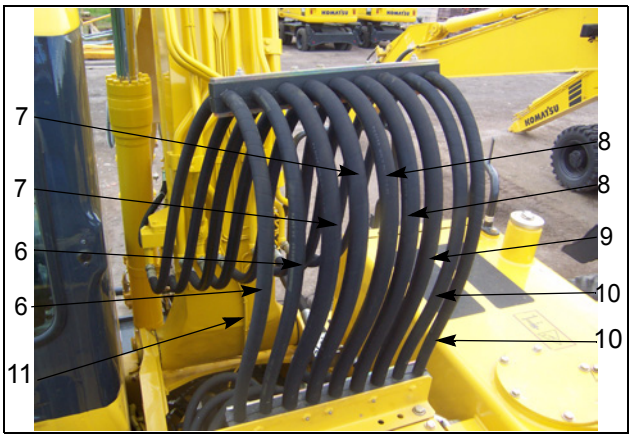
   ★ There are shims installed, so check the number and thickness, and keep them in a safe place.



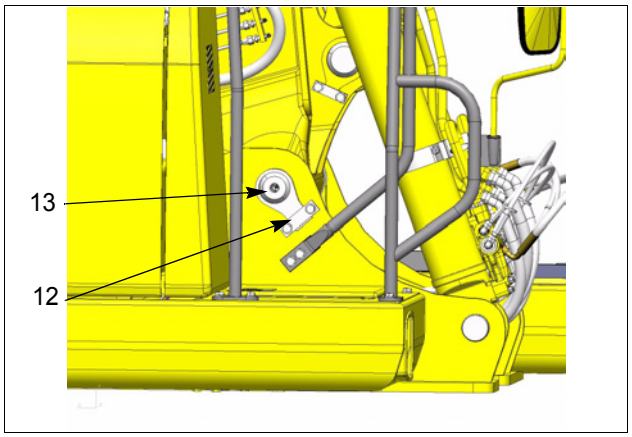
4. Start the engine and retract the piston rod.
   ★ Fasten the piston rod with wire so that it will not slip out and lower the cylinder onto a stand, or place a support under the bottom of the cylinder to support it. In the latter case, remove the grease fitting on the bottom side first.
   ★ Remove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

5. Disconnect 2 piece boom cylinder hoses (6), arm cylinder hoses (7), bucket cylinder hoses (8), service 1 hose (9) and service 2 hose (10).
   ★ Plug the hoses to prevent oil flow-out, and fasten them on the valve side.

6. Disconnect intermediate connector CN-A86 (11) for a working lamp.



7. Lift off the work equipment and remove plate (12) and then pin (13) at the foot. ※2



   • When removing them, first remove plate (12) and then remove pin (13) at the foot, using Tool **R**.
   ★ Shims are installed, so do not forget to check their number and each location of installation.

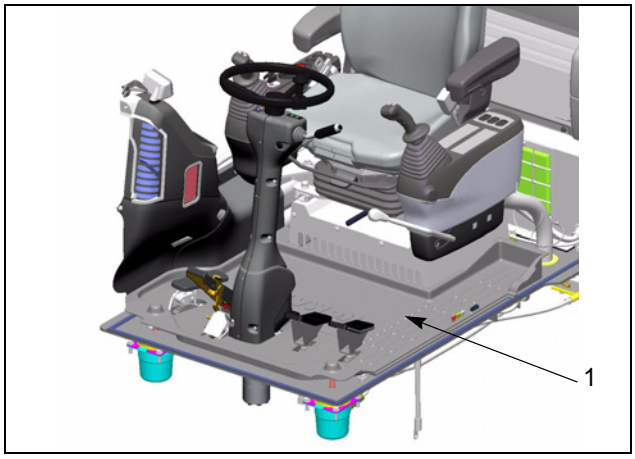
REMOVAL AND INSTALLATION OF OPERATOR CAB ASSEMBLY

REMOVAL

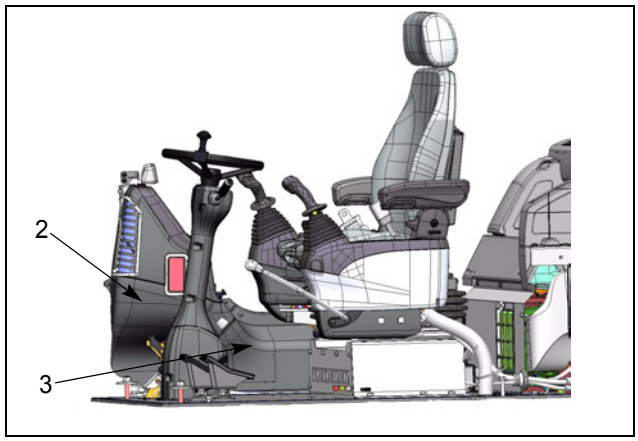
⚠ First, disconnect the cable from the negative terminal (-) of the battery.

⚠ 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. Remove floor mat (1).

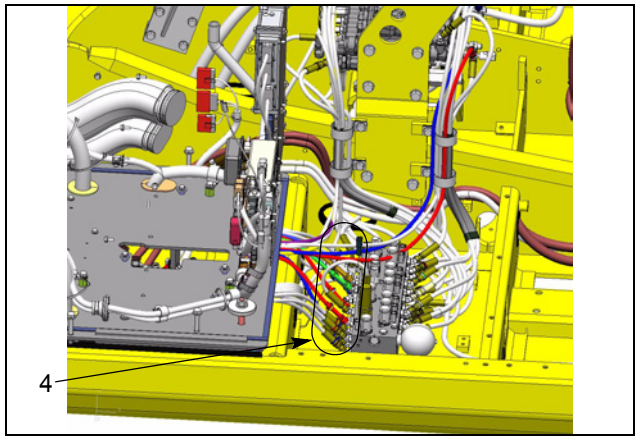


2. Remove covers (2) and (3) under the monitor panel.
   ★ When removing cover (2), first disconnect the M19 wiring for cigarette lighter.

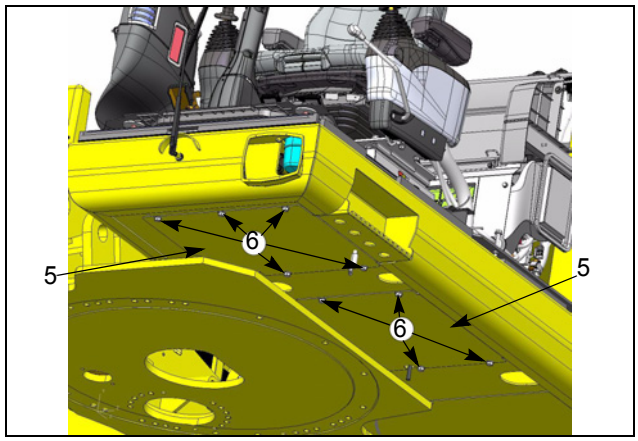


3. Remove air conditioner unit, for details See “AIR CONDITIONER UNIT ASSEMBLY” on page 20-214.

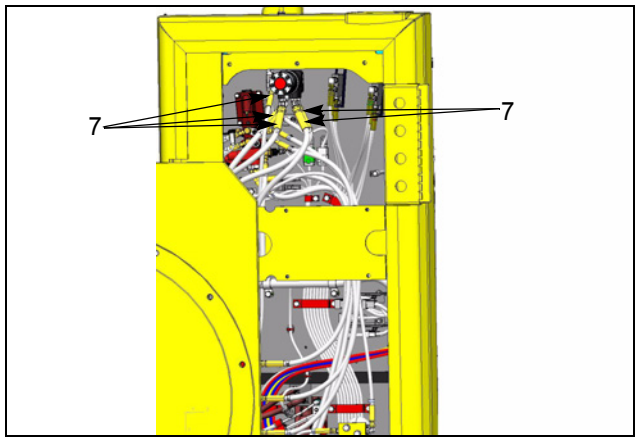
4. Disconnect all hoses at (4).



5. Remove plate (5) by removing bolts (6).



6. Disconnect hoses (7) from orbitrol valve.



HYDRAULIC CIRCUIT DIAGRAM (2/3)