SEN06614-03

Shop Manual

HYDRAULIC
EXCAVATOR

PC500LC-8R

SERIAL NUMBERS 75979 and up

KOMATSU

Foreword and general information

Safety notice

Important safety notice

Proper service and repair are extremely important for safe machine operation. The service and repair techniques recommended by Komatsu and described in this manual are both effective and safe. Some of these techniques require the use of tools specially designed by Komatsu for the specific purpose.

To prevent injury to workers, the symbol ⚠ is used to mark safety precautions in this manual. The cautions accompanying these symbols should always be followed carefully. If any dangerous situation arises or may possibly arise, first consider safety, and take the necessary actions to deal with the situation.

1. General precautions

⚠ **Mistakes in operation are extremely dangerous. Read the Operation and Maintenance Manual carefully before operating the machine.**

1) Before carrying out any greasing or repairs, read all the safety plates stuck to the machine. For the locations of the safety plates and detailed explanation of precautions, see the Operation and Maintenance Manual.
2) Decide a place in the repair workshop to keep tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt, water, or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.
3) When carrying out any operation, always wear safety shoes and helmet. Do not wear loose work clothes, or clothes with buttons missing.
   - Always wear safety glasses when hitting parts with a hammer.
   - Always wear safety glasses when grinding parts with a grinder, etc.
4) When carrying out any operation with 2 or more workers, always agree on the operating procedure before starting. Always inform your fellow workers before starting any step of the operation. Before starting work, hang UNDER REPAIR warning signs in the operator's compartment.
5) Only qualified workers must carry out work and operation which require license or qualification.
6) Keep all tools in good condition, learn the correct way to use them, and use the proper ones of them. Before starting work, thoroughly check the tools, machine, forklift, service car, etc.
7) If welding repairs are needed, always have a trained and experienced welder carry out the work. When carrying out welding work, always wear welding gloves, apron, shielding goggles, cap and other clothes suited for welding work.
8) Before starting work, warm up your body thoroughly to start work under good condition.

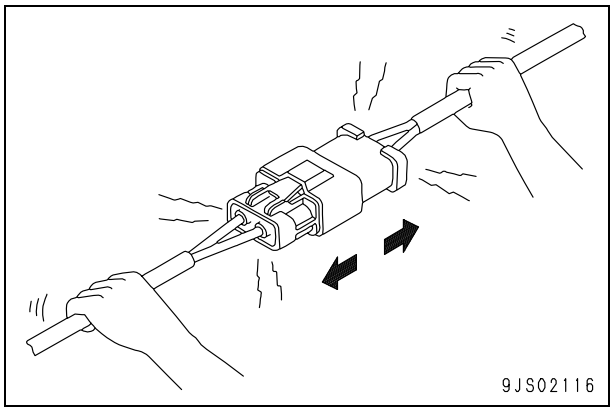
Safety points

1	Good arrangement
2	Correct work clothes
3	Following work standard
4	Making and checking signs
5	Prohibition of operation and handling by unlicensed workers
6	Safety check before starting work
7	Wearing protective goggles (for cleaning or grinding work)
8	Wearing shielding goggles and protectors (for welding work)
9	Good physical condition and preparation
10	Precautions against work which you are not used to or you are used to too much

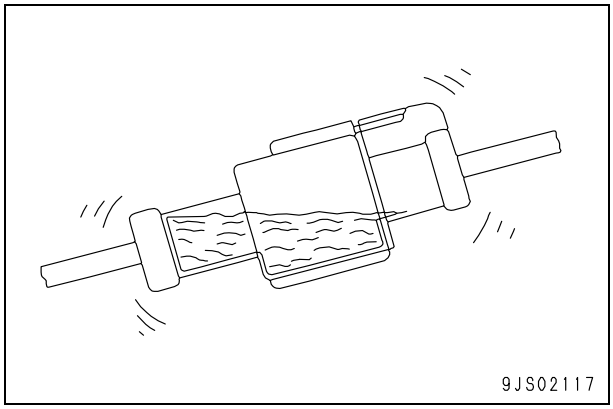
2. Preparations for work

1) Before adding oil or making any repairs, park the machine on hard and level ground, and apply the parking brake and block the wheels or tracks to prevent the machine from moving.
2) Before starting work, lower the work equipment (blade, ripper, bucket, etc.) to the ground. If this is not possible, insert the lock pin or use blocks to prevent the work equipment from falling. In addition, be sure to lock all the control levers and hang warning signs on them.

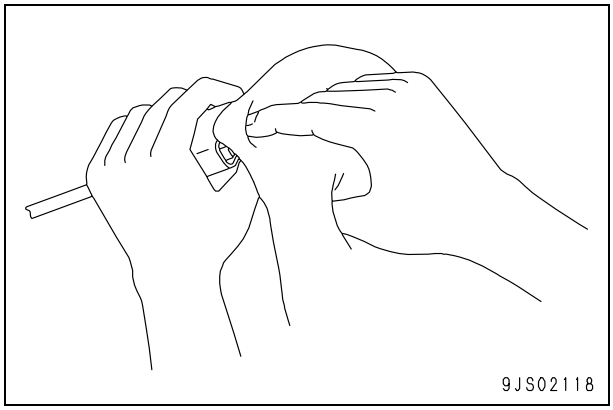
3) Disconnections in wiring
If the wiring is held and the connectors are pulled apart, or components are lifted with a crane with the wiring still connected, or a heavy object hits the wiring, the crimping of the connector may separate, or the soldering may be damaged, or the wiring may be broken.



4) High-pressure water entering connector
The connector is designed to make it difficult for water to enter (drip-proof structure), but if high-pressure water is sprayed directly on the connector, water may enter the connector, depending on the direction of the water jet. Accordingly, take care not to splash water over the connector. The connector is designed to prevent water from entering, but at the same time, if water does enter, it is difficult for it to be drained. Therefore, if water should get into the connector, the pins will be short-circuited by the water, so if any water gets in, immediately dry the connector or take other appropriate action before passing electricity through it.



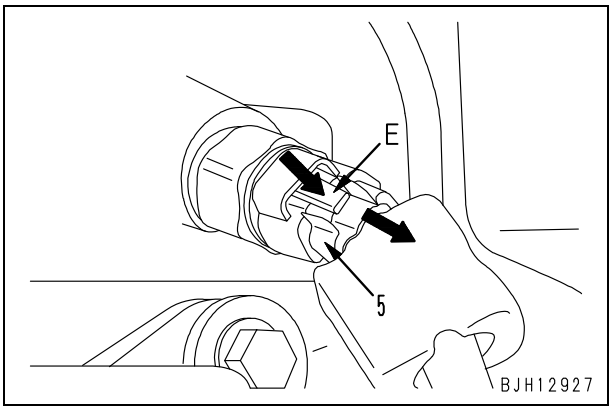
5) Oil or dirt stuck to connector
If oil or grease are stuck to the connector and an oil film is formed on the mating surface between the male and female pins, the oil will not let the electricity pass, so there will be defective contact. If there is oil or grease stuck to the connector, wipe it off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



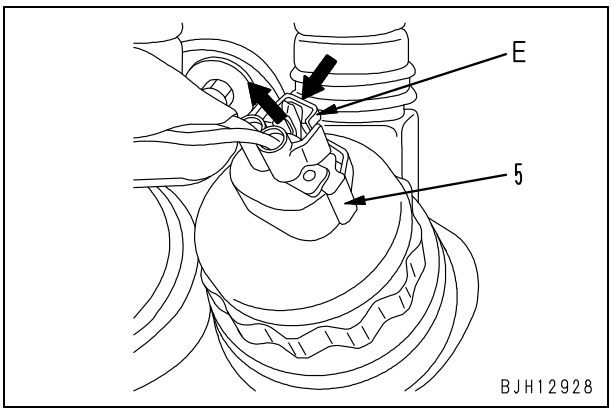
- 125 – 170, 12V140 engine

4) While pressing lock (E) of the connector, pullout connector (5) in the direction of the arrow.

Example)
Fuel pressure in common rail: PFUEL etc. (**AMP-3**)

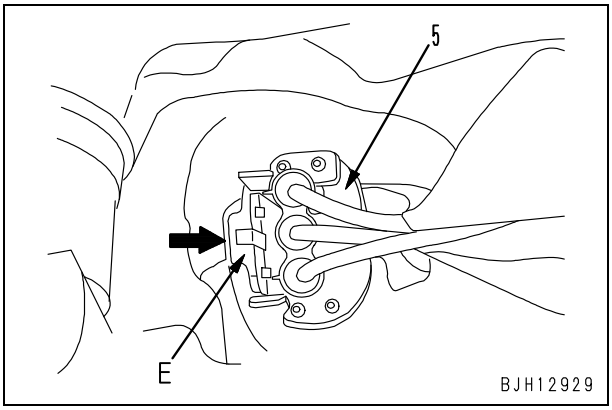


Example)
Injection pressure control valve of fuel supply pump: PCV (**SUMITOMO-2**)



Example)
Speed sensor of fuel supply pump: G (**SUMITOMO-3**)

★ Pull the connector straight up.



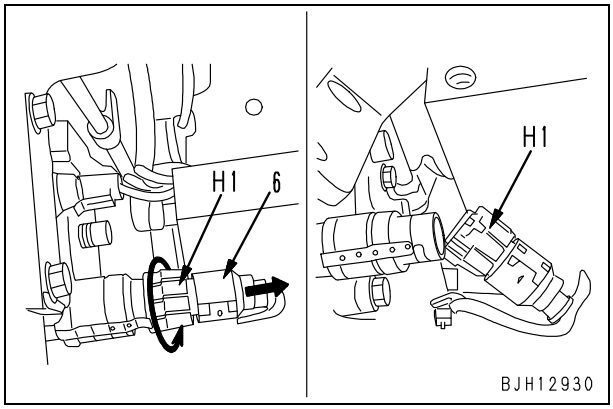
4. Turn-housing type (Round green connector)

- 140 engine

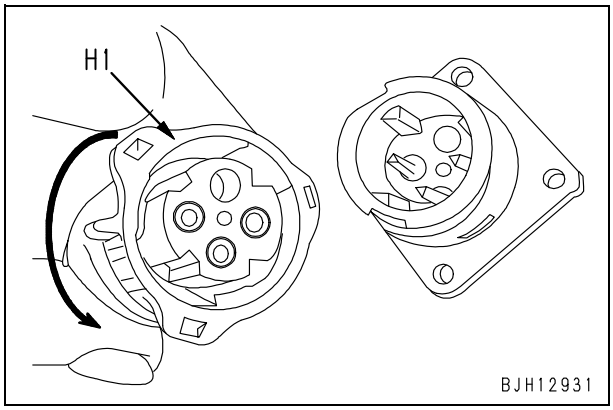
Example)
Intake air pressure sensor in intake manifold (CANNON-04): PIM etc.

1) Disconnect connector (6) according to the following procedure.
   1] Turn housing (H1) in the direction of the arrow.
      ★ When connector is unlocked, housing (H1) becomes heavy to turn.
   2] Pull out housing (H1) in the direction of the arrow.

   ★ Housing (H1) is left on the wiring harness side.



2) Connect the connector according to the following procedure.
   1] Insert the connector to the end, while setting its groove.
   2] Turn housing (H1) in the direction of the arrow until it “clicks”.



Standard tightening torque table

1. Table of tightening torques for bolts and nuts
   ★ Unless there are special instructions, tighten metric nuts and bolts to the torque below. (When using torque wrench)

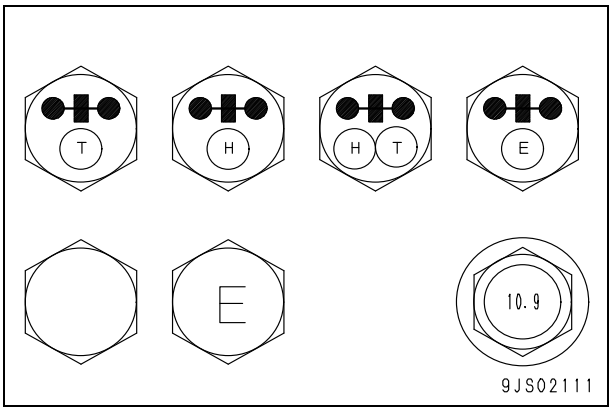
   ★ The following table corresponds to the bolts in Fig. A.

Thread diameter of bolt	Width across flats	Tightening torque	
mm	mm	Nm	kgm
6	10	11.8 – 14.7	1.2 – 1.5
8	13	27 – 34	2.8 – 3.5
10	17	59 – 74	6.0 – 7.5
12	19	98 – 123	10.0 – 12.5
14	22	153 – 190	15.5 – 19.5
16	24	235 – 285	23.5 – 29.5
18	27	320 – 400	33.0 – 41.0
20	30	455 – 565	46.5 – 58.0
22	32	610 – 765	62.5 – 78.0
24	36	785 – 980	80.0 – 100.0
27	41	1,150 – 1,440	118 – 147
30	46	1,520 – 1,910	155 – 195
33	50	1,960 – 2,450	200 – 250
36	55	2,450 – 3,040	250 – 310
39	60	2,890 – 3,630	295 – 370

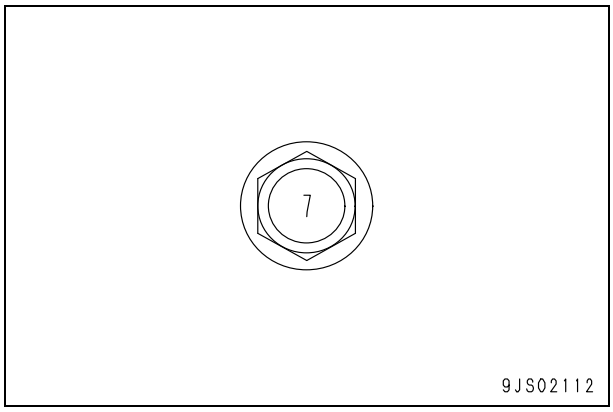
   ★ The following table corresponds to the bolts in Fig. B.

Thread diameter of bolt	Width across flats	Tightening torque	
mm	mm	Nm	kgm
6	10	5.9 – 9.8	0.6 – 1.0
8	13	13.7 – 23.5	1.4 – 2.4
10	14	34.3 – 46.1	3.5 – 4.7
12	27	74.5 – 90.2	7.6 – 9.2

★ Fig. A



★ Fig. B

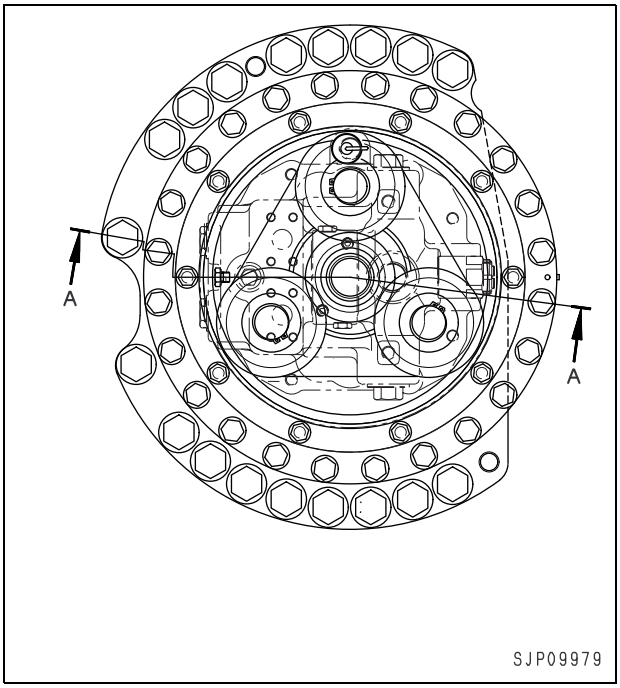


01 Specification

Unit: ℓ

Reservoir	PC500LC-8R	
	Specified	Refill
Engine oil pan	46	37
Swing machinery case	20	20
Final drive case (each side)	11	11
Damper case	1.07	—
Hydraulic system	472	248
Fuel tank	650	—
Cooling system	36	—

★ For the HO46-HM, use the oil recommended by Komatsu.



Specifications

Reduction ratio:

$$\left(\frac{19 + 68}{19}\right) \times \left(\frac{16 + 68}{16}\right) = 24.039$$

Unit: mm

No.	Check item	Criteria		Remedy
14	Backlash between swing motor shaft and No. 1 sun gear	Standard clearance	Clearance limit	Replace
		0.18 – 0.28	—	
15	Backlash between No. 1 sun gear and No. 1 planetary gear	0.15 – 0.51	1.00	
16	Backlash between No. 1 planetary gear and ring gear	0.17 – 0.60	1.10	
17	Backlash between No. 1 planetary carrier and No. 2 sun gear	0.40 – 0.75	1.20	
18	Backlash between No. 2 sun gear and No. 2 planetary gear	0.16 – 0.55	1.00	
19	Backlash between No. 2 planetary gear and ring gear	0.17 – 0.60	1.10	
20	Backlash between coupling and swing pinion	0.08 – 0.25	—	
21	Backlash between swing pinion and swing circle	0.00 – 1.21	2.00	
22	Clearance between plate and coupling	0.57 – 1.09	—	
23	Wear of swing pinion surface contacting with oil seal	Standard size	Repair limit	Apply hard chrome plating, recondition, or replace
		$150^{0}_{-0.100}$	—	

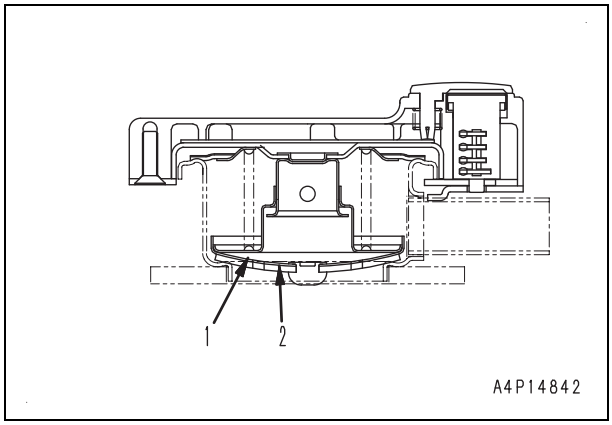
Unit: mm

No.	Check Item		Criteria			Remedy
9	Link	Inside width	106			Repair or replace
10		Overall width	55.2			
11		Tread width	48.4			
12	Protrusion of pin		4.4			Adjust or replace
13	Protrusion of regular bushing		5.25			
14	Overall length of pin		258			
15	Overall length of bushing		167.9			
16	Thickness of spacer		—			
17	Press fitting force	Bushing	127 to 333 kN {13 to 34 ton}			—
18		Regu-larpin	198 to 510 kN {20 to 52 ton}			
19 (*)		Materpin	147 to 412 kN {15 to 42 ton}			
20	Shoe bolt	a. Regular link	Tightening torque (Nm {kgm})		Retightening angle (deg.)	Retighten
			Triple grouser shoe	588 ± 59 {60 ± 6}	120 ± 10	
		b. Master link	Tightening torque (Nm {kgm})	Retightening angle (degree)	Lower limit torque (Nm {kgm})	
			—	—	—	
21	Interference between bushing and link		Standard dimension	Tolerance		Standard interference	Adjust or replace
				Shaft	Hole	
			73.5	+0.494 +0.454	+0.074 0	0.380 to 0.494
22	Interference between regular pin and link		48.8	+0.184 +0.034	+0.330 +0.268	0.302 to 0.514
23	Clearance between regular pin and bushing		Standard dimension	Tolerance		Standard clearance	
				Shaft	Hole	
			48.8	+0.184 +0.034	+0.864 +0.364	0.180 to 0.830
24 (*)	Interference between master pin and link		Standard dimension	Tolerance		Standard interference	
				Shaft	Hole	
			48.75	+0.03 0	–0.218 –0.280	0.218 to 0.310
25 (*)	Clearance between master pin and bushing		Standard dimension	Tolerance		Standard clearance	
				Shaft	Hole	
			48.75	–0.2 –0.4	+0.914 +0.414	0.614 to 1.318

*: Dry type track link

Hydraulic tank oil filler cap

Structure



1: Bottom plate
2: Gasket

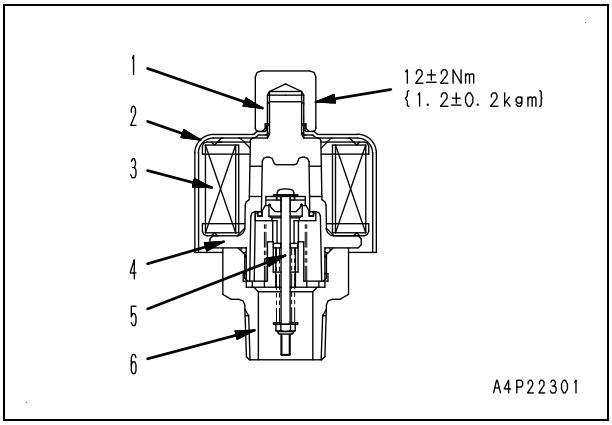
Function

Prevention of pressure rise in hydraulic tank

While the hydraulic circuit is in operation, the pressure in the hydraulic tank increases as the oil level and the temperature in the hydraulic tank rise corresponding to the operation of the hydraulic cylinders. When the pressure in the tank exceeds the set pressure, bottom plate (1) is pushed up to release the pressure in the tank and prevent pressure rise.
(Set pressure of exhaust valve: 16.7 ± 6.86 kPa {0.17 ± 0.07 kg/cm^2})

Hydraulic tank breather

Structure



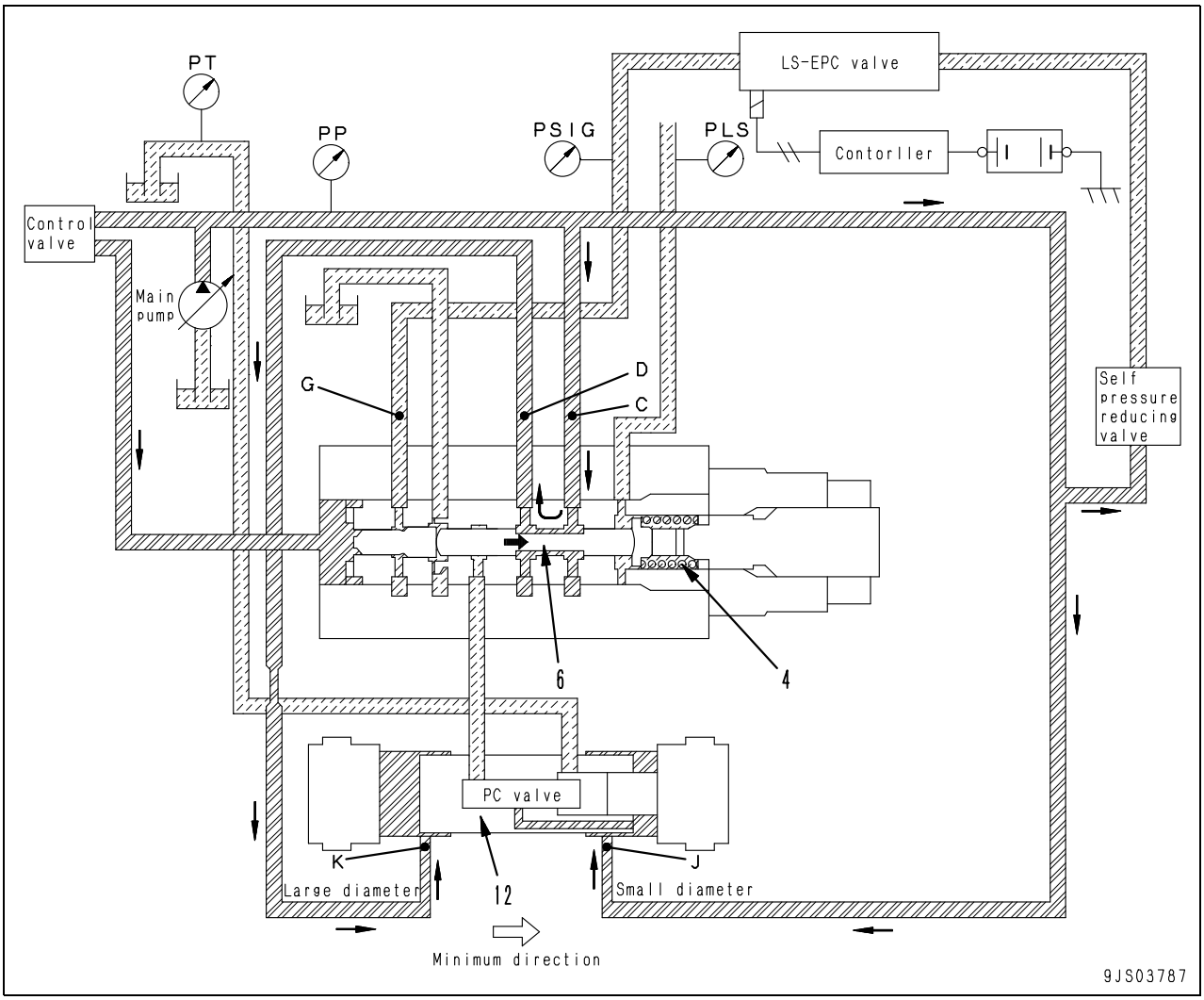
1: Nut
2: Cover
3: Filter element
4: Case
5: Valve assembly
6: Body

Function

Prevention of negative pressure in hydraulic tank

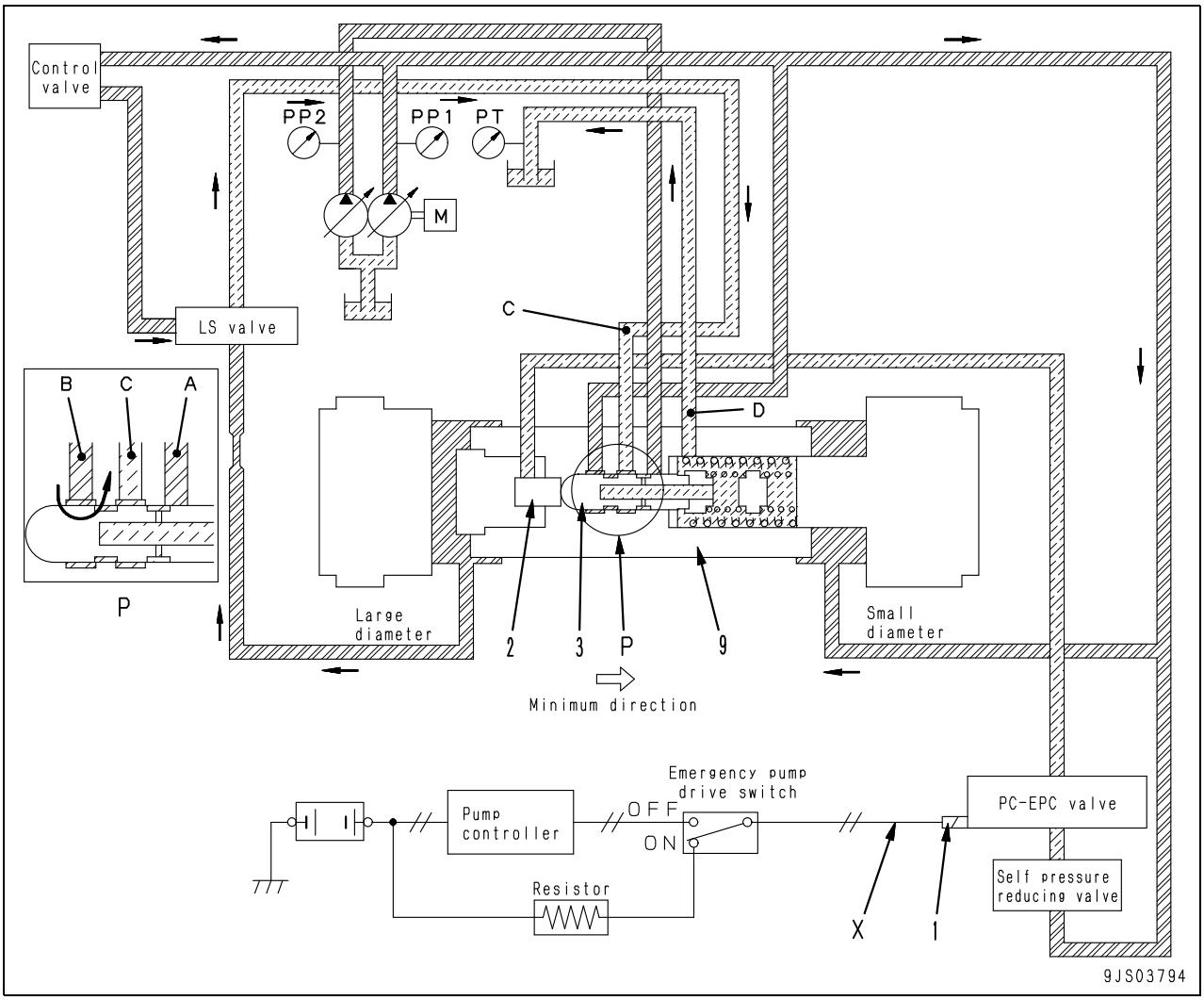
Since the hydraulic tank is pressurized and sealed, if the oil level in it decreases, negative pressure is generated in it. At this time, valve assembly (5) is opened by the differential pressure from the ambient pressure, and ambient pressure is transmitted into the tank to prevent generation of negative pressure in the tank
(Set pressure of intake valve: Max. 0.002 MPa {0.02 kg/cm^2})

3) Action for the direction of minimizing the pump delivery

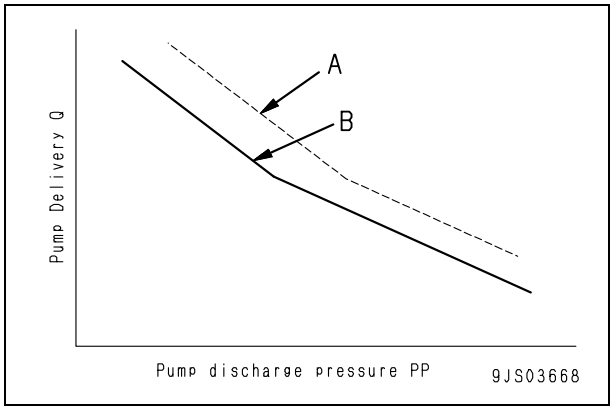


- When LS differential pressure (ΔPLS) becomes larger (for example, when the area of opening of the control valve becomes smaller and pump pressure (PP) rises) because of the rightward move (it reduces pump delivery) of servo piston (12), pump pressure (PP) pushes spool (6) to the right.
- When spool (6) moves, main pump pressure (PP) flows from port (C) to port (D) and from port (K), it enters the large diameter end of the piston.
- Main pump pressure (PP) also enters port (J) of the small diameter end of the piston, but because of the difference in area between the large diameter end and the small diameter end on servo piston (12), it is pushed to the right. As the result, the servo piston (12) moves into the direction of reducing the swash plate angle.
- As LS selector pressure (PSIG) is input to port (G), setting force of spring (4) is reduced.

(2) When the main pump is under heavy load



- If the emergency pump drive switch is turned on In the same way as in above, the command current (X) sent to PC-EPC valve solenoid (1) becomes constant.
- For this reason, the force of piston (2) pushing spool (3) is constant.
- If main pump pressures (PP1) and (PP2) increase, spool (3) moves further to the right than when the main pump load is light, and is balanced at the position in the diagram above.
- In this case, the pressure from port (B) flows to port (C), so servo piston (9) moves to the right (smaller pump delivery) and stops at a position to the further to the right then when the load on the pump is light.
- When the emergency pump drive switch is turned on, too, the pump pressure (PP) and pump delivery (Q) have a relationship as shown with the curve in the diagram corresponding to the current sent to the PC-EPC valve solenoid through the resistor.
- The curve resulting when the emergency pump drive switch is ON is situated further to the left (B) than when the pump controller is normal (A).

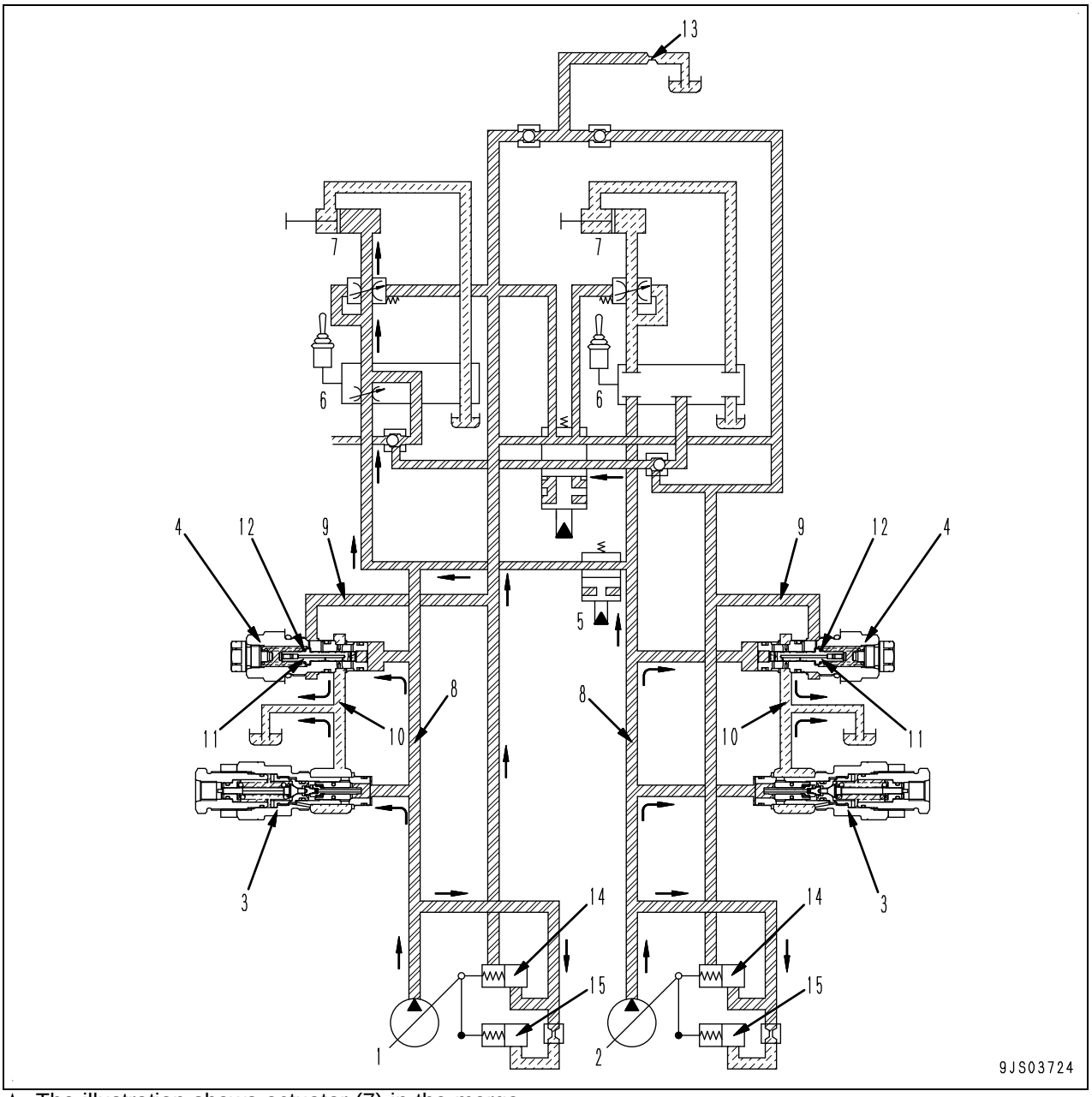


1. Safety-suction valve (Arm out)
2. Suction valve (Right travel reverse)
3. Suction valve (Boom raise)
4. Suction valve (Left travel reverse)
5. Suction valve (Boom Hi raise)
6. Safety-suction valve (Service 1)
7. Safety-suction valve (Service 2)
8. 2-stage safety-suction valve (Service 1)
9. Safety-suction valve (Arm Hi in)
10. Safety-suction valve (Bucket curl)
11. Suction valve (Left travel forward)
12. 2-stage safety-suction valve (Boom lower)
13. Suction valve (Right travel forward)
14. Safety-suction valve (Arm in)
15. LS shuttle valve (Arm)
16. LS shuttle valve (Right travel)
17. LS select valve
18. LS shuttle valve (Boom)
19. LS shuttle valve (Left travel)
20. LS shuttle valve (Bucket)
21. LS shuttle valve (Service 1)
22. LS shuttle valve (Service 2)
23. LS check valve
24. Pressure relief plug

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
25	Suction valve spring	Free length × Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring.
		46.8 × 7.5	40.6	5.5 N {0.56 kg}	—	4.4 N {0.45 kg}	
26	Check valve spring	11.5 × 4.6	8.5	1.5 N {0.15 kg}	—	1.2 N {0.12 kg}	

3. System diagram

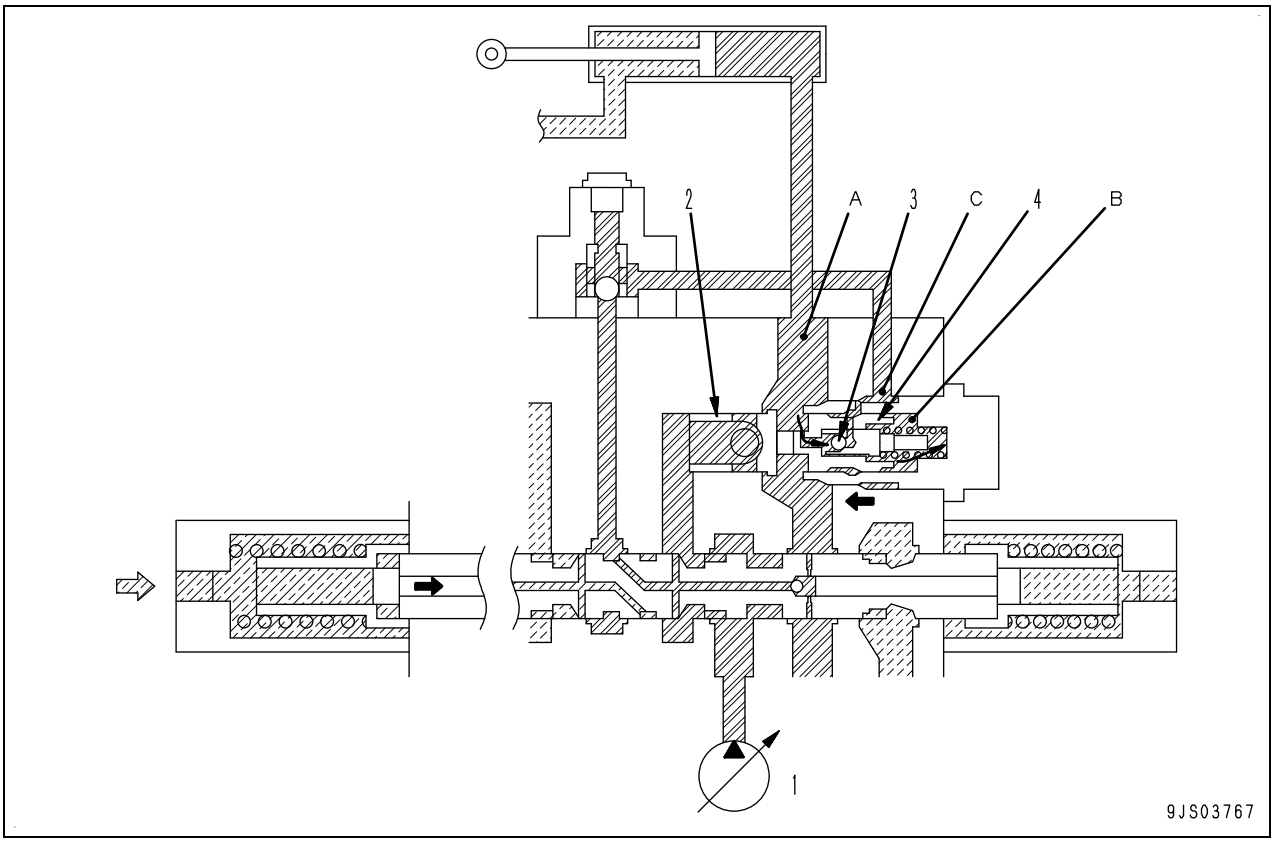


★ The illustration shows actuator (7) in the merge mode with stroke end at the time of relief.

1. Front pump
2. Rear pump
3. Main relief valve
4. Unload valve
5. Merge-divider valve
6. Control valve
7. Actuator
8. Pump circuit
9. LS circuit
10. Tank circuit
11. Valve
12. Spring
13. LS bypass valve
14. LS valve
15. PC valve

Pressure compensation valve inner shuttle valve

1.If holding pressure at port (A) is larger than LS pressure in the springing chamber (B)



1. Hydraulic pump
2. Valve
3. Pressure compensation valve inner shuttle valve
4. Piston

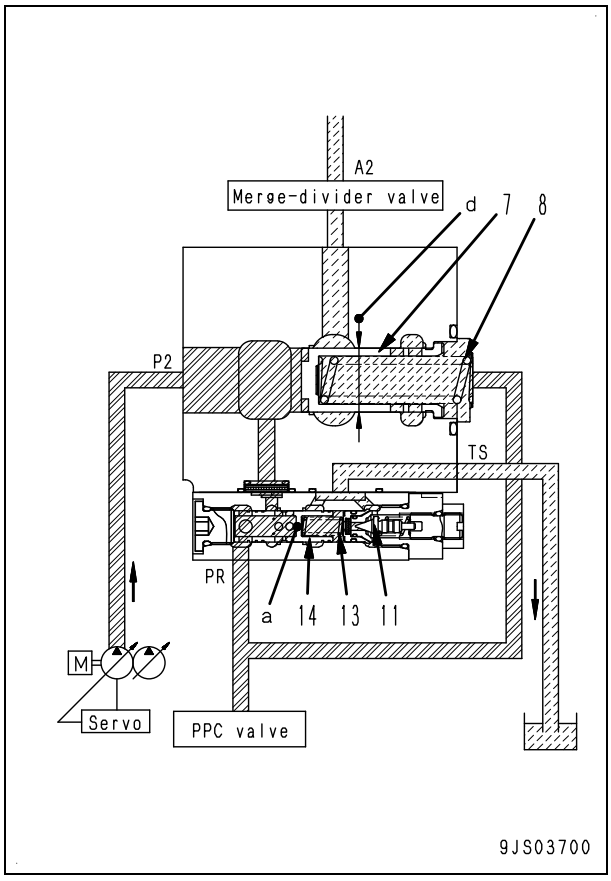
Function

- Shuttle valve (3) is pushed to the right by port (A) pressure and cuts off interconnection between ports (A) and (C).
- Holding pressure at port (A) is led to the spring chamber (B) to push piston (4) to the left so that piston (4) and valve (2) will not be separated.

2. During neutral and when load pressure (P2) is low

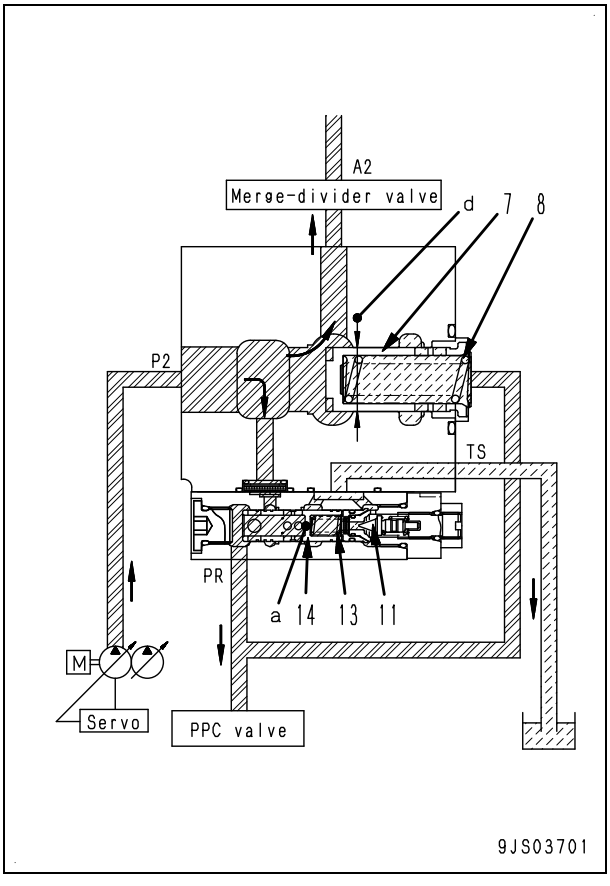
★ When load pressure (A2) is lower than self pressure reducing valve output pressure (PR)

- Valve (7) is pressed to the closing direction of circuit between ports (P2) and (A2) by spring (8) and under pressure (PR) (which is 0 MPa {0 kg/cm^2}).
- When pressurized oil flows in from port (P2), a balance is reached due to [(ϕd area × P2 pressure) = force of spring (8) + (ϕd area × PR pressure)].
- Adjusts valve (7) opening to keep pressure (P2) at a constant level over pressure (PR).
- When pressure (PR) rises above the set pressure, poppet (11) opens.
- Pressurized oil flows from port (PR) to orifice (a) in spool (14), then flows to seal drain port (TS) from poppet (11) opening.
- Differential pressure is generated before and after orifice (a) in spool (14) and then spool (14) moves to close the pass between ports (P2) and (PR).
- Pressure (P2) is reduced by the opening at this time and adjusted to a constant pressure (the set pressure) and supplied as pressure (PR).

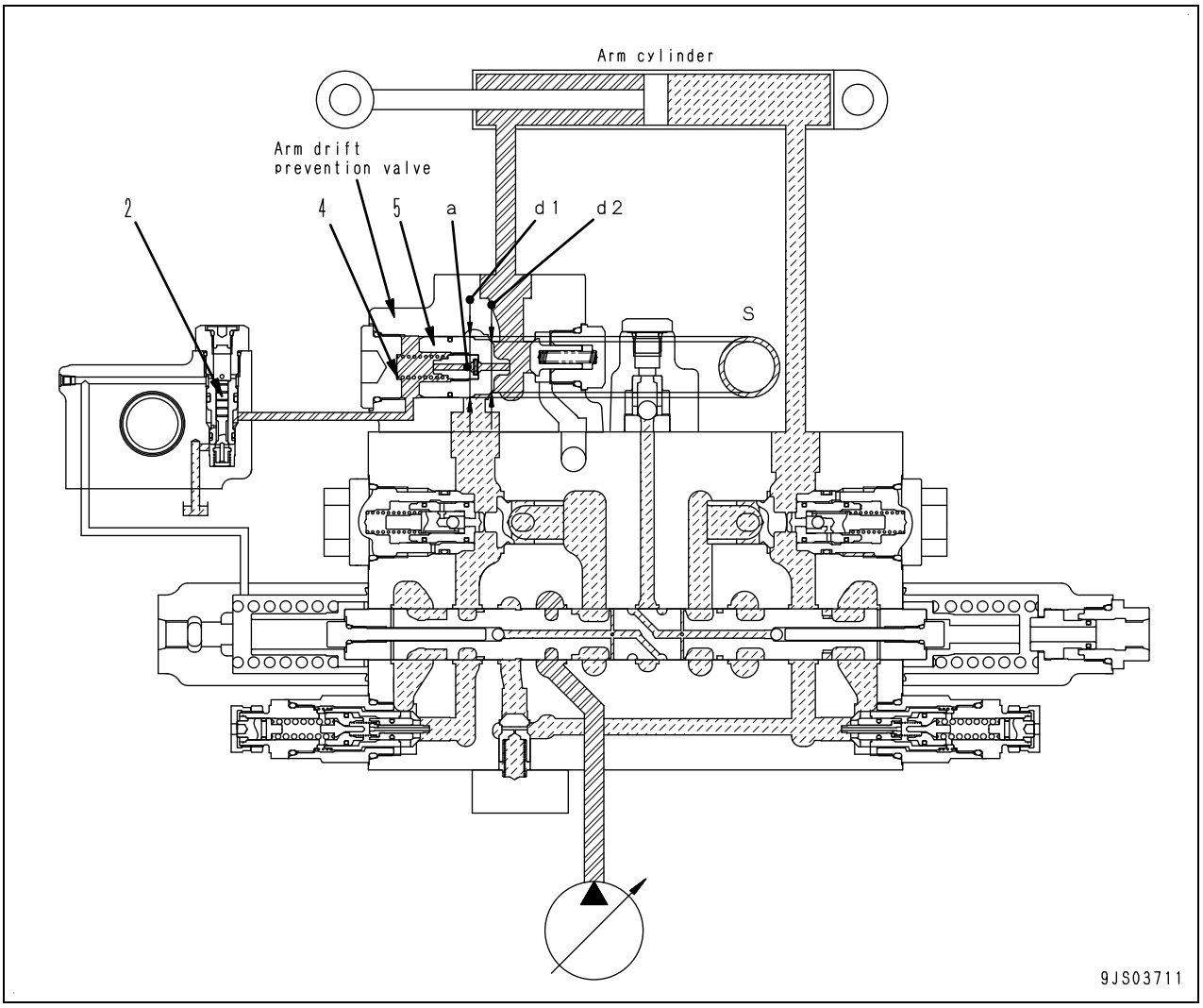


3. When load pressure (P2) is high

- Load pressure (A2) increases with the operation of digging, etc, and the pump discharge increases accordingly.
- Pressure (P2) increases to [(ϕd area × P2 pressure) = force of spring (8) + (ϕd area × PR pressure)], and valve (7) moves to the right to the stroke end.
- As a result, opening between ports (P2) and (A2) increases, and the pass resistance reduces, reducing the engine horsepower loss.
- When pressure (PR) rises above the set pressure, poppet (11) opens.
- Pressurized oil flows from port (PR) to orifice (a) in spool (14), then flows to seal drain port (TS) from poppet (11) opening.
- Differential pressure is generated before and after orifice (a) in spool (14) and then spool (14) moves to close the pass between ports (P2) and (PR).
- Pressure (P2) is reduced by the opening at this time and adjusted to a constant pressure (the set pressure) and supplied as pressure (PR).



2.When the arm is in neutral



Operation

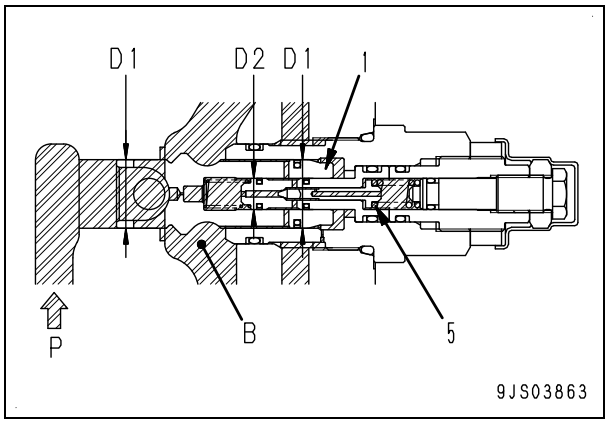
- Moves the lever to neutral with the arm dumped.
- Pressurized oil flown inside poppet (5) from orifice (a) of poppet (5) is closed by pilot piston (2).
- The holding pressure of arm cylinder head works on ring-shaped area (S) caused by the difference between outside diameter (d1) of poppet (5) and seat diameter (d2) to move it to the right.
- The sum of this force and the force of spring (4) closes poppet (5).
- Pressurized oil from the control valve and the holding pressure of the arm cylinder head are shut off.

Operation when jointly operated with a high-load work equipment (such as the boom raising)

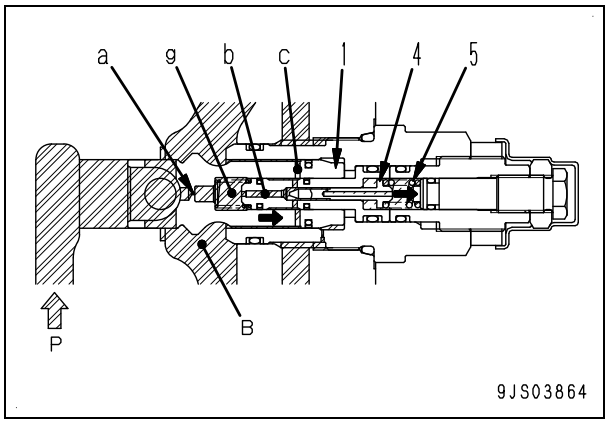
- Both of the pump discharge pressure (P) and LS pressures are determined by other equipment's pressure, while cylinder port pressure causes the attachment to operate.
- If the difference between the pump discharge pressure (P) and cylinder pressure is smaller than the force of spring (5), the balance of forces applying to valve (1) may be expressed with the following equation:

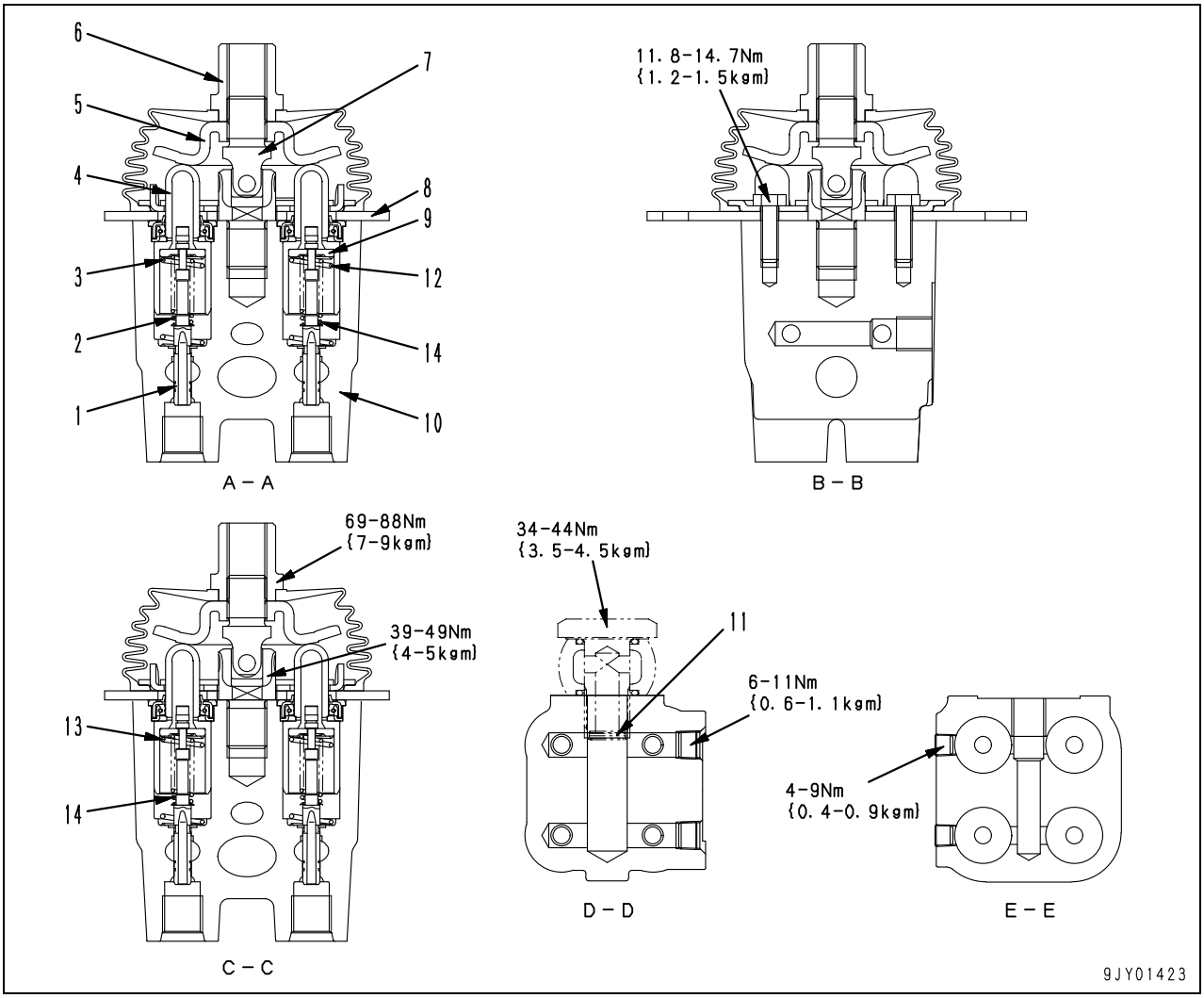
  $P \times A1 = P \times A2 + LS(A2 - 1) + F$

  A1: Area of ϕd1
  A2: Area of ϕd2
  F: Force of spring
  P: Pump discharge oil pressure



- If the difference between the pump discharge pressure (P) and cylinder port pressure (B) is larger than the force of spring (5), poppet (4) is pressed to the right.
- Pump discharge pressure (P) flows to orifice (a) and chamber (g) and is interconnected to cylinder port via passages (b) and (c).
- Differential pressure is generated between the upstream and downstream of orifice (a), which reduces the pressure force in chamber (g).
- Force that presses valve (1) to the left is reduced.
- A state is reached where the area ratio has become smaller.
- Valve (1) moves to the right, and the flow increases from the pump to the cylinder.



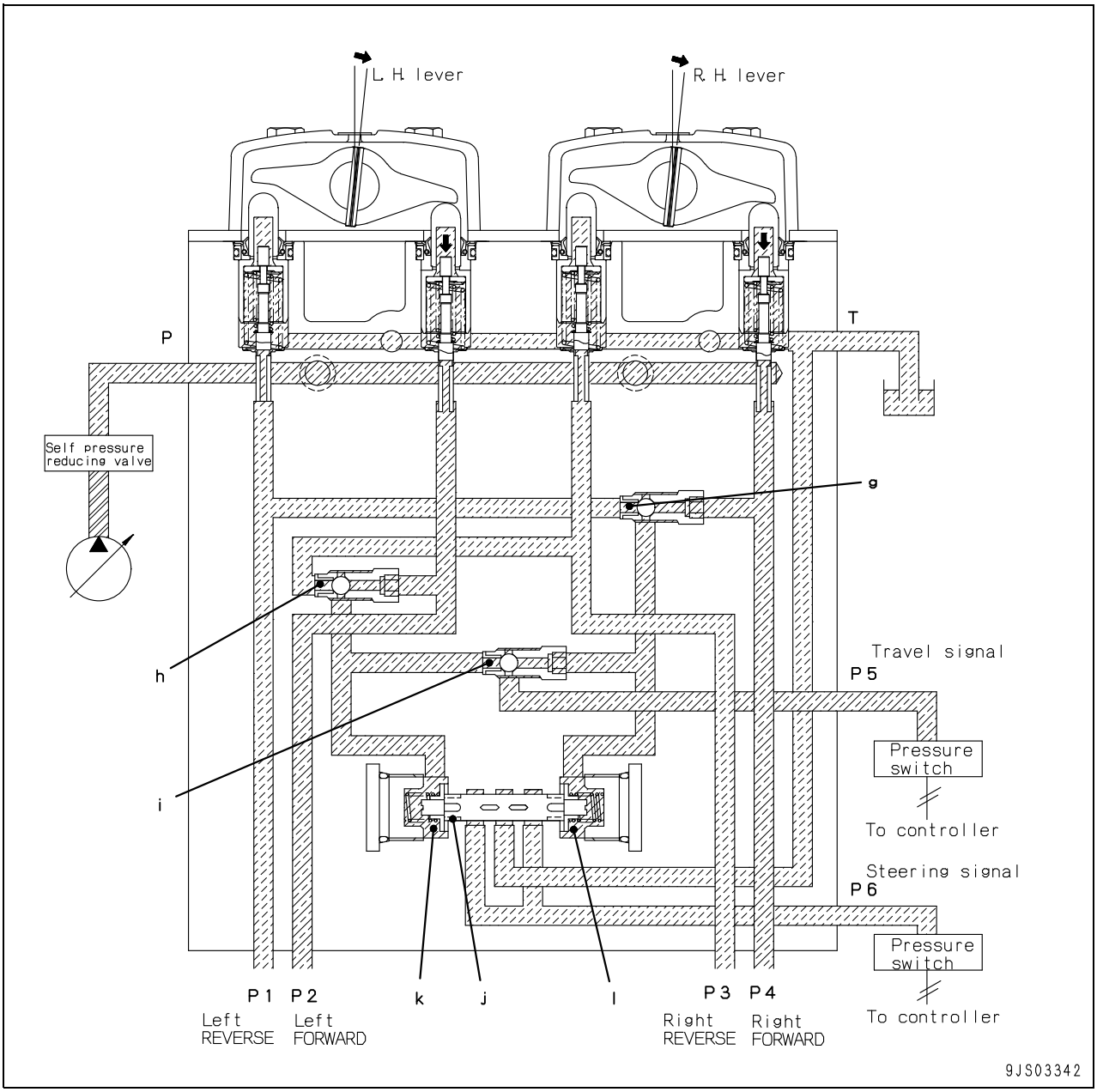


1. Spool
2. Metering spring
3. Centering spring
4. Piston
5. Disc
6. Nut (for lever connection)
7. Joint
8. Plate
9. Retainer
10. Body
11. Filter

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
		Free length × Outside diameter	Installed length	Installed load	Free length	Installed load	
12	Centering spring (for ports P3 and P4)	42.5 × 15.5	34.0	17.7 N {1.80 kg}	—	13.7 N {1.40 kg}	If damaged or deformed, replace spring.
13	Centering spring (for ports P1 and P2)	44.5 × 15.5	34.0	29.4 N {3.0 kg}	—	23.5 N {2.40 kg}	
14	Metering spring	26.5 × 8.15	24.9	16.7 N {1.70 kg}	—	13.7 N {1.40 kg}	

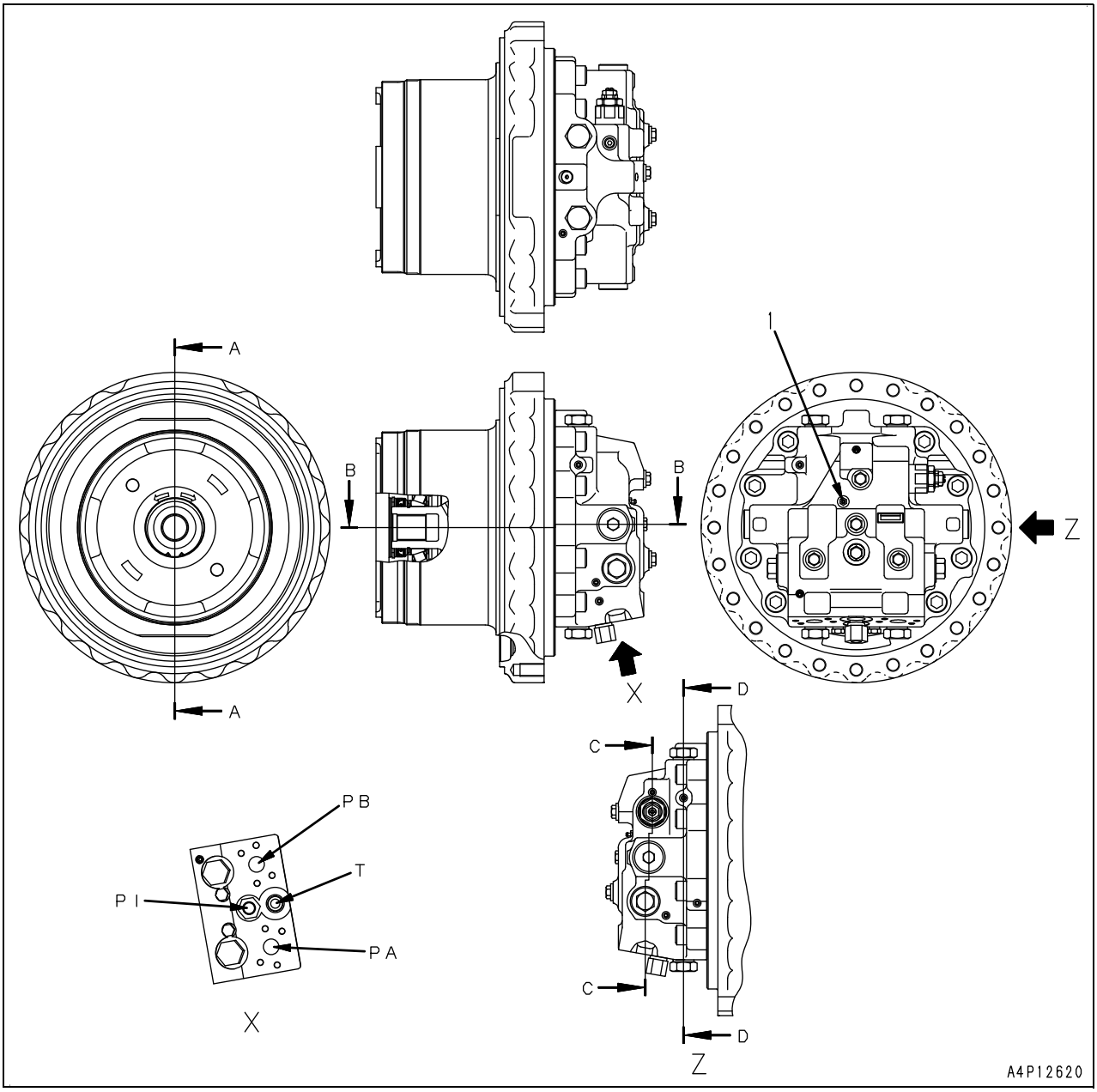
2) During straight travel



★ The Illustration shows the circuit for travelling straight forward.

- When operating L.H. motor forward [port (P2) output] and R.H. motor forward [port (P4) output], pressure of both left spring chamber (k) and right spring chamber (l) rises high.
- Steering signal spool (j) remains at neutral position and does not output a steering signal to port (P6).

Travel motor



1. Bleeder

L.H. travel motor

PA: From control valve (L.H. travel REVERSE port)
PB: From control valve (L.H. travel FORWARD port)

R.H. travel motor

PA: From control valve (R.H. travel FORWARD port)
PB: From control valve (R.H. travel REVERSE port)
PI: From travel speed acceleration valve
T: To hydraulic tank
B: Plug (Brake release pressure port)
MA: Port (PA) pressure pickup port
MB: Port (PB) pressure pickup port

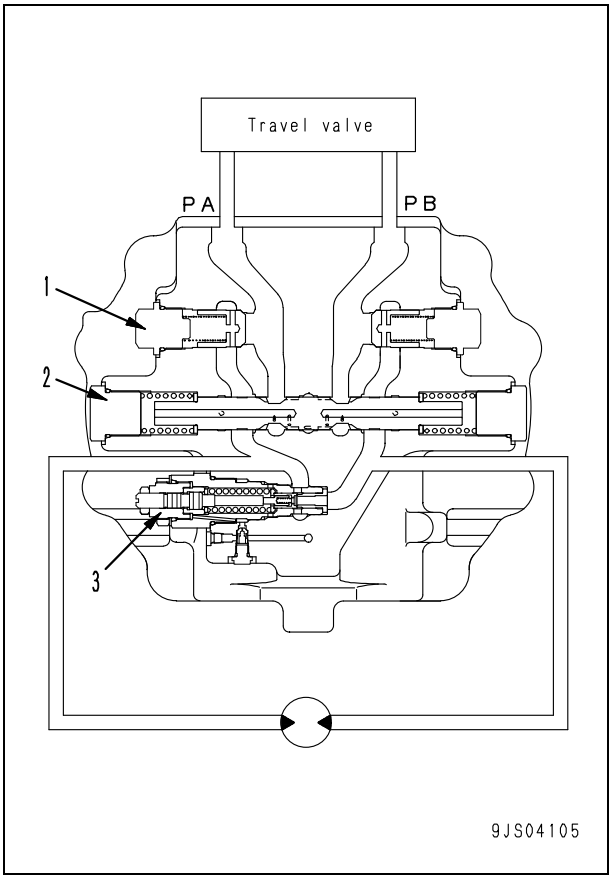
Brake valve

- The brake valve consists of check valves (1), counterbalance valve (2) and safety valve (3).
- Functions and operations of respective components shall conform to the following.

1. Counterbalance valve and check valve

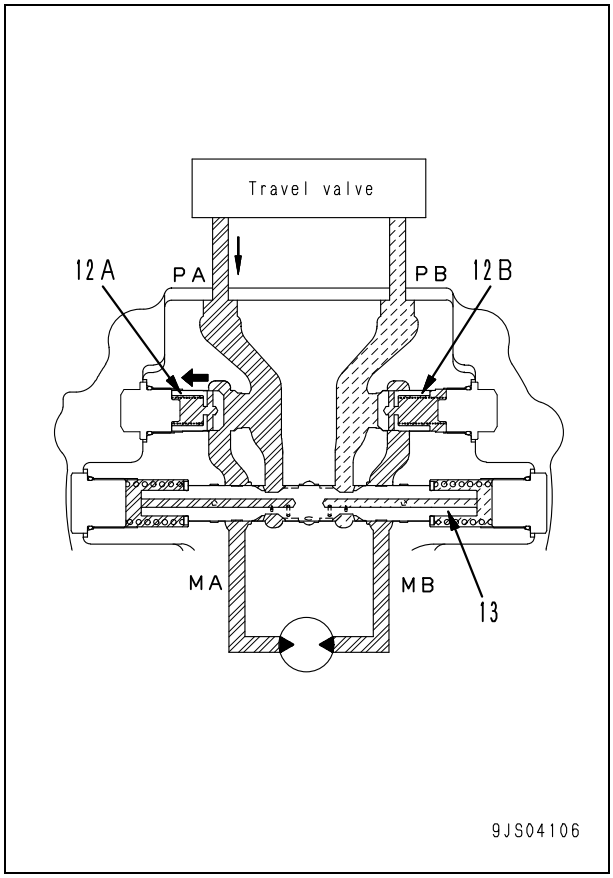
Function

- When the machine travels down a slope, its travel speed tends to get faster than the motor (engine) speed because of the downward force generated from its own weight.
- If the machine travels with the engine at low speed, the motor may run idle, and the machine runs out of control, causing a very dangerous situation.
- These valves serve to prevent the above problem by enabling the machine to travel at a speed that matches the engine speed (pump delivery).



Operation when pressurized oil is supplied

- If the travel lever is operated, the pressurized oil is supplied from the control valve to port (PA).
- The oil opens check valve (12A), and flows from motor inlet port (MA) to motor outlet port (MB).
- Since the motor outlet circuit is blocked by check valve (12B) and spool (13), the pressure of the supply side circuit increases.



Relief valve portion

Outline

- The relief valve portion consists of check valves (2) and (3), shuttle valves (4) and (5), and relief valve (1).

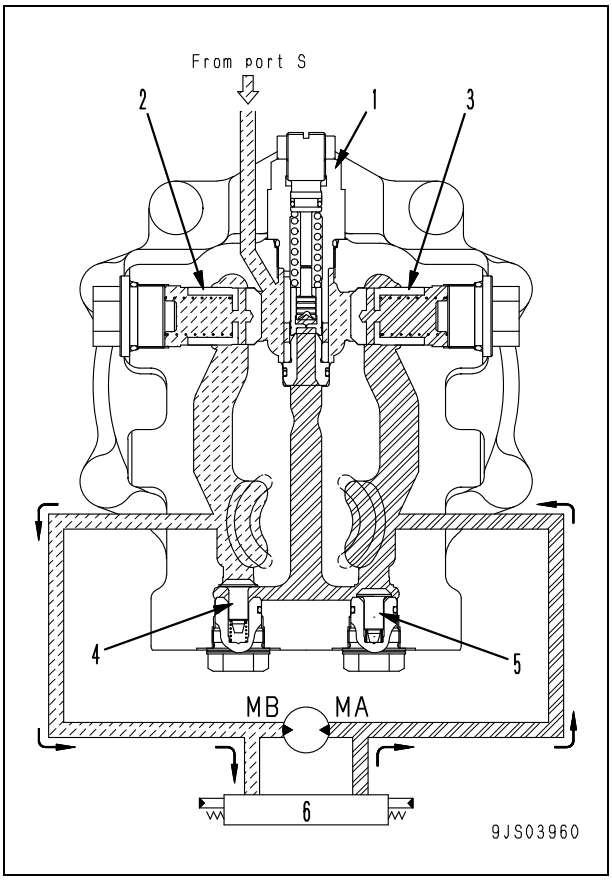
Function

- When the machine is in the swing holding mode, control valve (6) closes the motor outlet circuit, but the motor rotation is continued by inertial force.
- The motor output, therefore, is abnormally increased, resulting in damaging the motor.
- In order to prevent the motor damages, the relief valve relieves the abnormally high pressure to port (S) from the motor outlet side (high-pressure side) of the motor.

Operation

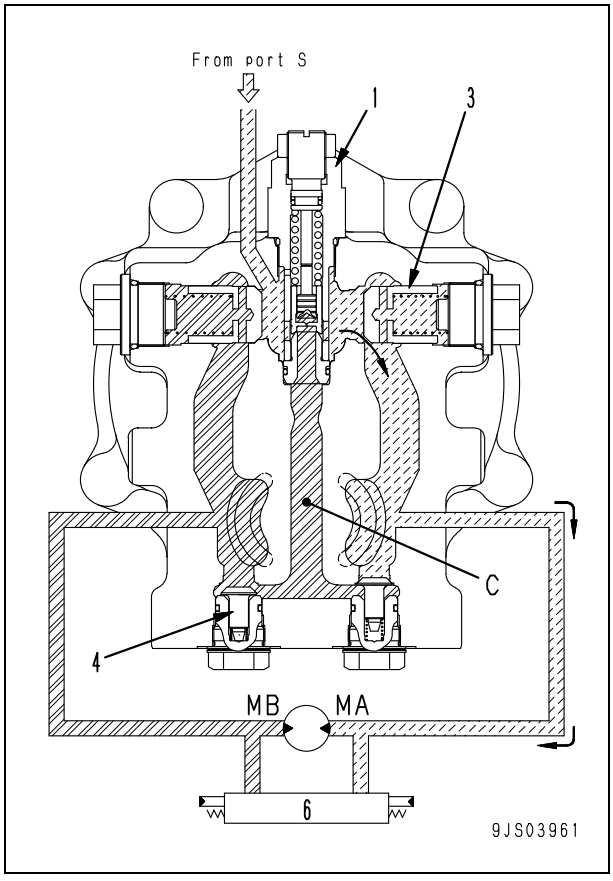
1. When starting swing

- When the swing control lever is operated to the right- swing, the pressurized oil from the pump is supplied to port (MA) through control valve (6).
- The pressure on port (MA) rises, the starting torque is generated in the motor, and the motor starts to rotate.
- The pressurized oil from the outlet port of the motor passes from port (MB) through the control valve (6) and returns to the tank.



2. When swing is stopped

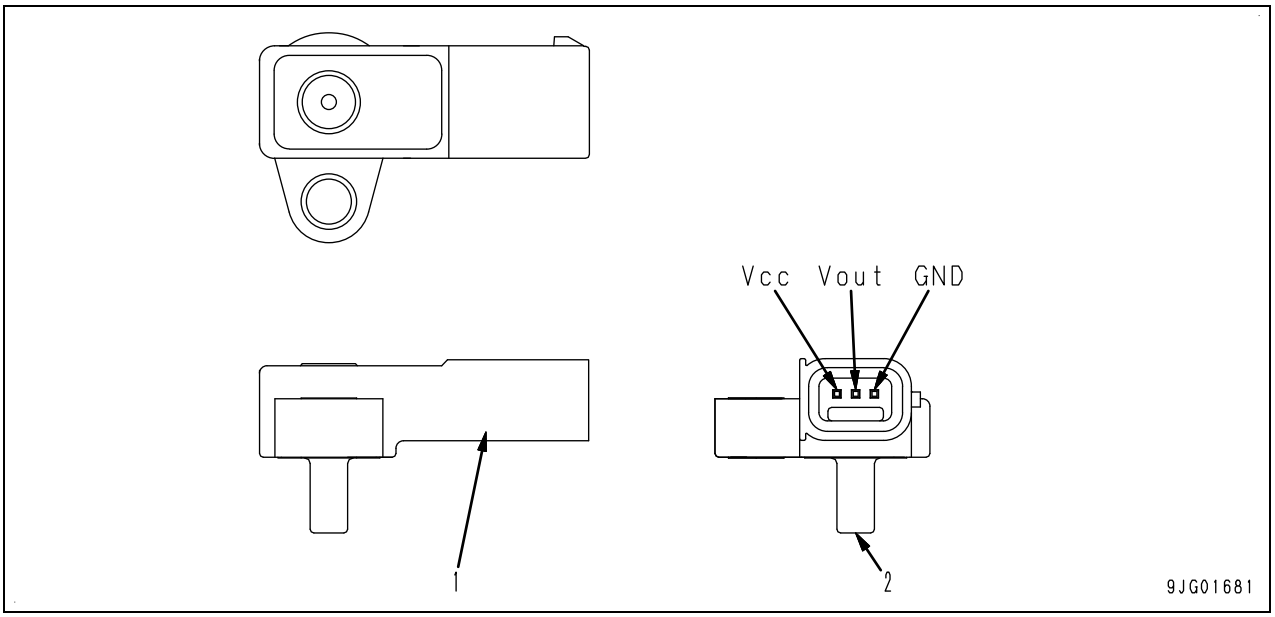
- When the swing control lever is returned to neutral, the supply of pressurized oil from the pump to port (MA) is stopped.
- The pressurized oil from the motor outlet can't return to the tank since the returning circuit to the tank is closed from control valve (6). Thus, pressure on port (MB) increases.
- Rotation resistance is generated on the motor and hence the brake starts working.
- Shuttle valve (4) is pressed as pressure on port (MB) goes above port (MA).
- The pressure on chamber (C) is increased to the set pressure of relief valve (1) and becomes the same as that of port (MB).
- A high braking torque works on the motor, thereby stopping the motor.
- When relief valve (1) is being actuated, the relieved pressurized oil and the pressurized oil from port (S) are fed to port (MA) through check valve (3).
- Above prevents cavitation on port (MA).



Unit: mm

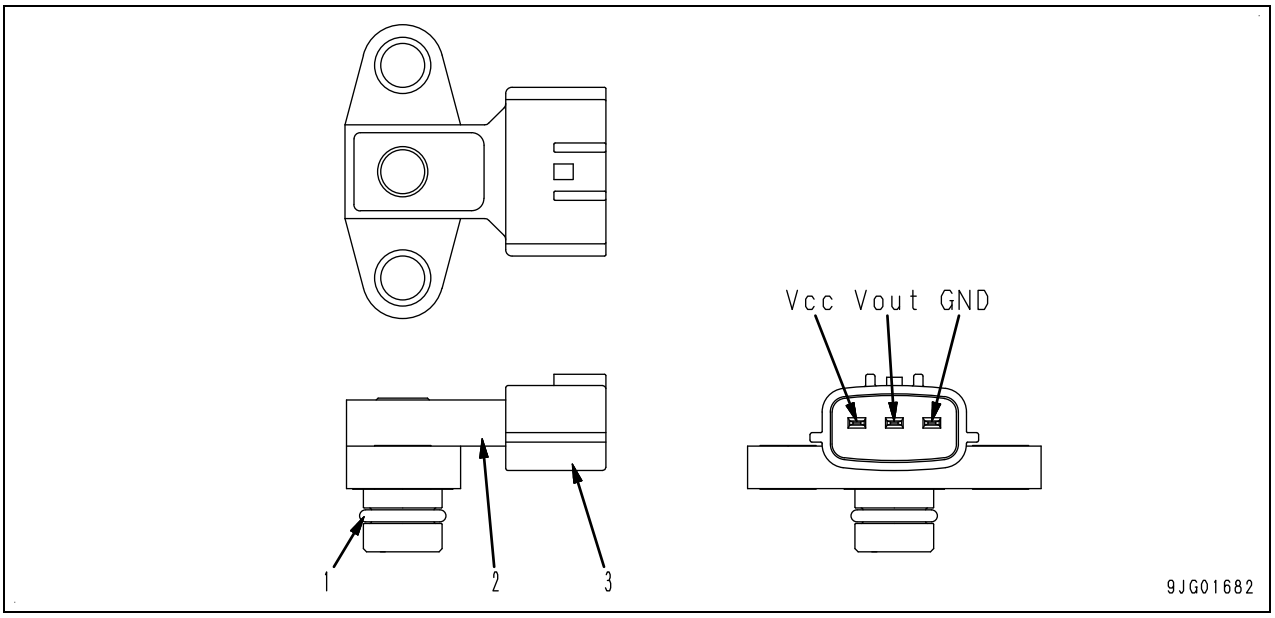
No.	Measuring position	PC500LC-8R, STD work equipment			PC500LC-8R, SE work equipment		
		Standard size	Tolerance		Standard size	Tolerance	
			Shaft	Hole		Shaft	Hole
1	—	ϕ110	–0.036 –0.090	+0.1 0	ϕ110	–0.036 –0.090	+0.1 0
2	Arm side	129.3	+1.5 0		127.3	+1.5 0	
	Cylinder head side	126	±1.2		126	±1.2	
3	Boom side	355	+0.5 0		355	+0.5 0	
	Arm side	351	–0.3 –0.8		351	–0.3 –0.8	
4	—	ϕ120	–0.036 –0.090	+1.0 0	ϕ120	–0.036 –0.090	+0.1 0
5	—	570.6	—		537	—	
6	—	208.2	—		217.5	—	
7	—	1,132.2	—		1,131	—	
8	—	3,375	—		2,390	—	
9	—	2,975.1	—		3,102.5	—	
10	—	506.8	—		497	—	
11	—	720	—		720	—	
12	—	719	—		719	—	
13	—	525	—		537.1	—	
14	—	2,001	—		2,157	—	
15	—	ϕ100	–0.036 –0.090	+0.1 0	ϕ100	–0.036 –0.090	+0.1 0
16	Bucket side	371	+1 0		371	+1 0	
	Link side	370	± 0.5		370	±0.5	
17	—	ϕ100	–0.036 –0.090	+0.1 0	ϕ100	–0.036 –0.090	+0.1 0
18	Arm itself	355	0 –0.5		354	0 –0.5	
	When press fitting bushing	370	—		370	—	
19	Min.	1,870	—		2,075	—	
	Max.	3,140	—		3,235	—	

Ambient pressure sensor



1. Connector
2. Pressure import port

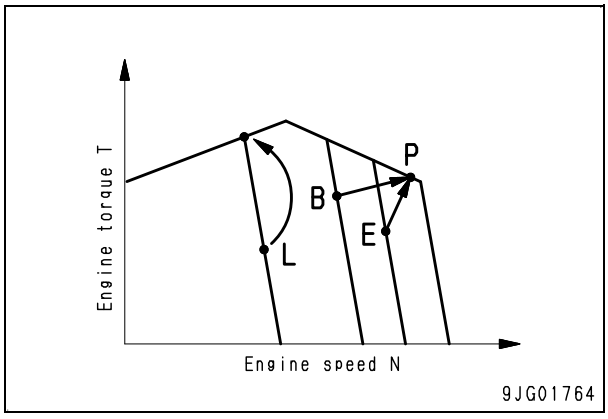
Boost pressure sensor

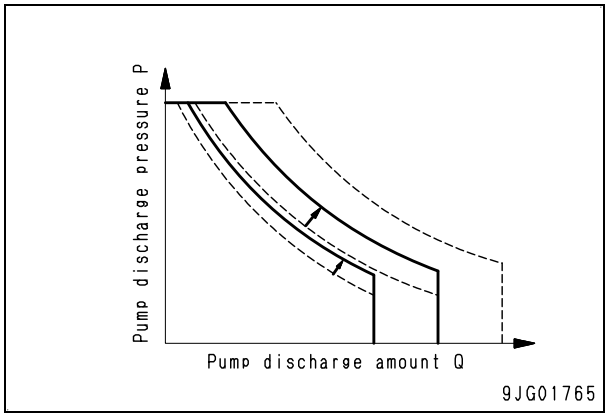


1. O-ring
2. Sensor
3. Connector

2) Function to control pump during travel

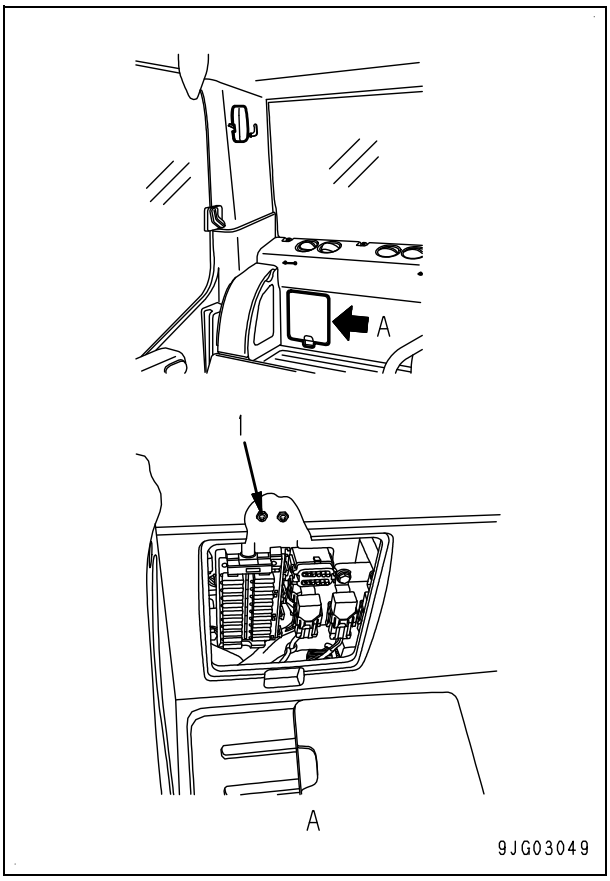
- Traveling the machine in E or B mode leaves the working mode unchanged, but raises the pump absorption torque and engine speed (N) to values same as those in P mode.
- If the machine travels in L mode, the working mode and engine speed (N) do not change, but the pump absorption torque is increased.

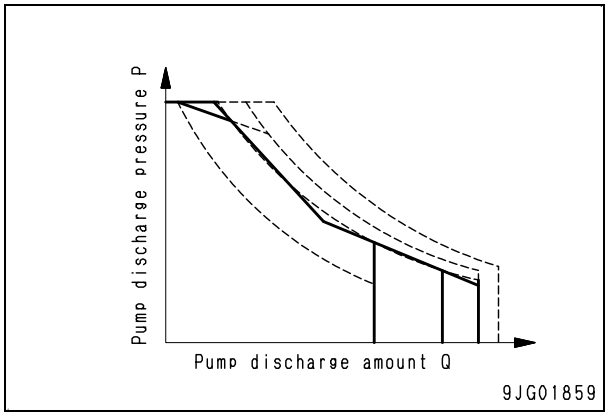




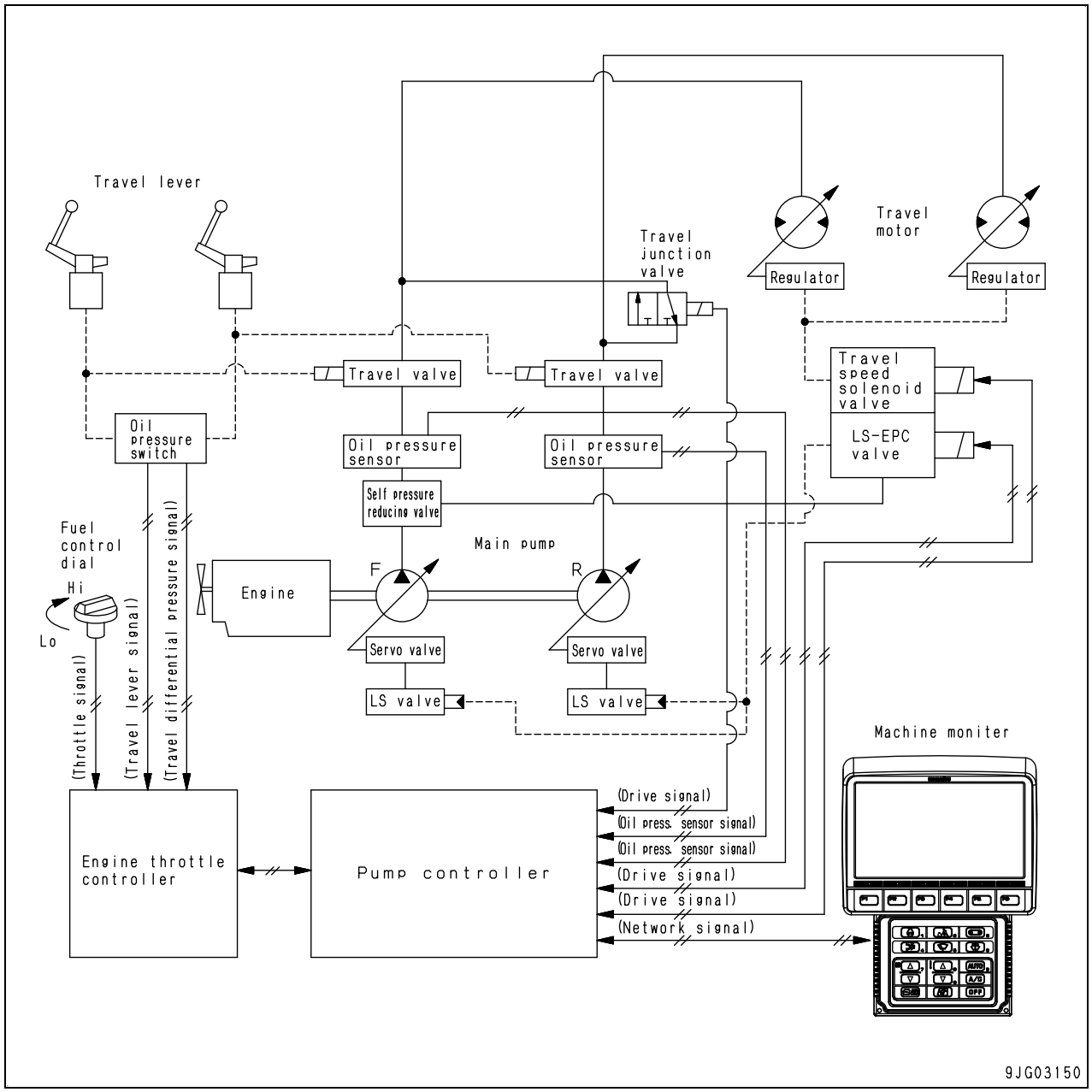
3) Function to control when emergency pump drive switch is turned on

- Even if any abnormality occurs in the controller or sensor, setting emergency pump drive switch (1) to the “ON” position activates the machine with an absorption torque approximately equivalent to that in E mode.
  In this case, a constant current flows from the battery to the EPC valve for PC and therefore, the oil pressure is sensed by only the EPC valve for PC.





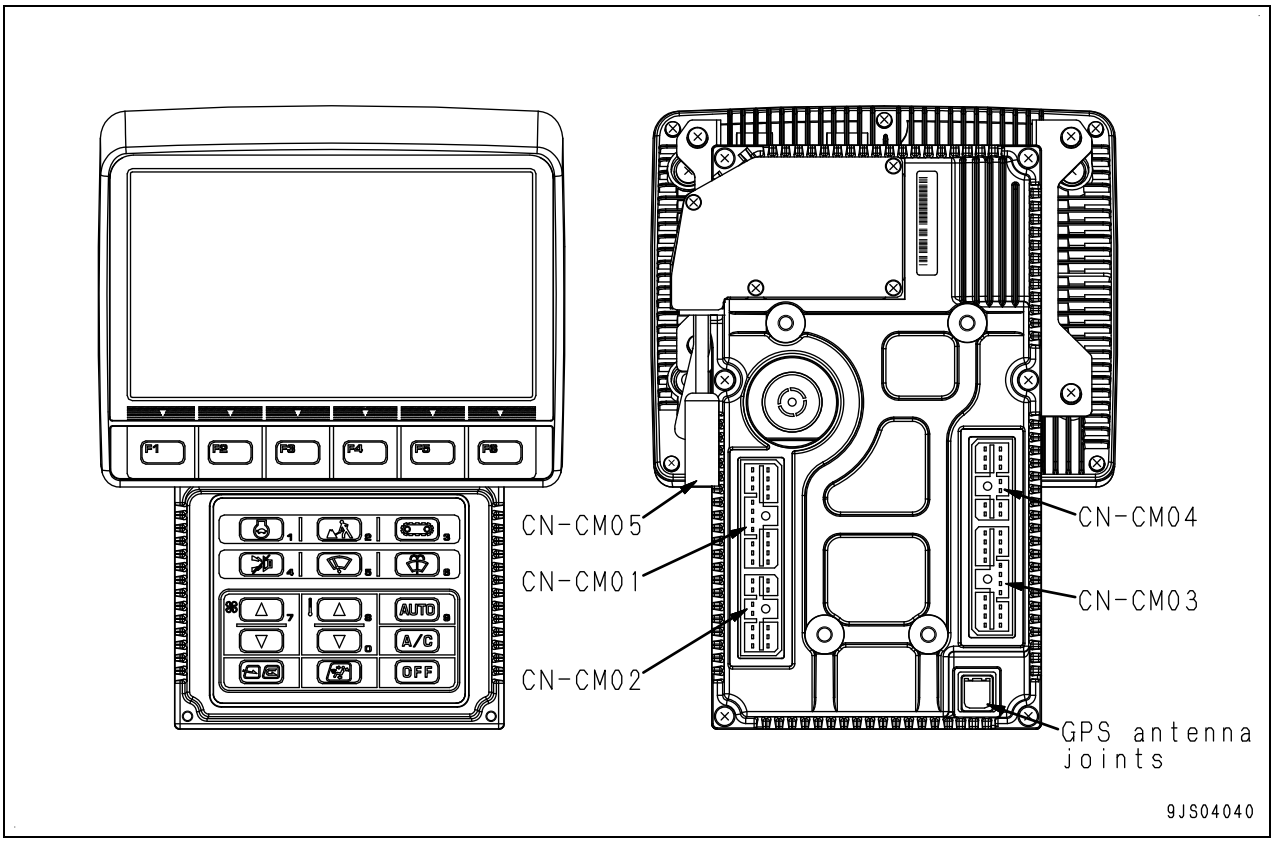
7. Travel control function



Function

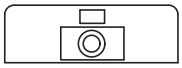
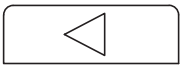
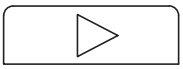
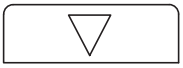
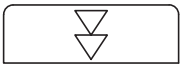
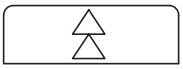
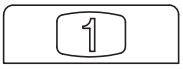
- The machine is provided with a function that ensures travel performance best fit to the type of work and jobsite by controlling pumps during travel or allowing operator to change travel speed automatically or manually.

Machine monitor



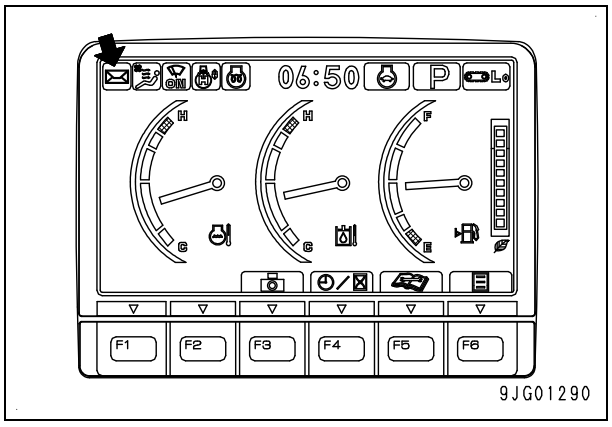
Outline

- The machine monitor has the functions to display various items and the functions to select modes and electric parts.
- The machine monitor has a CPU (Central Processing Unit) in it to process, display, and output the information.
- The monitor display employs an LCD (Liquid Crystal Display). The switches are flat sheet switches.

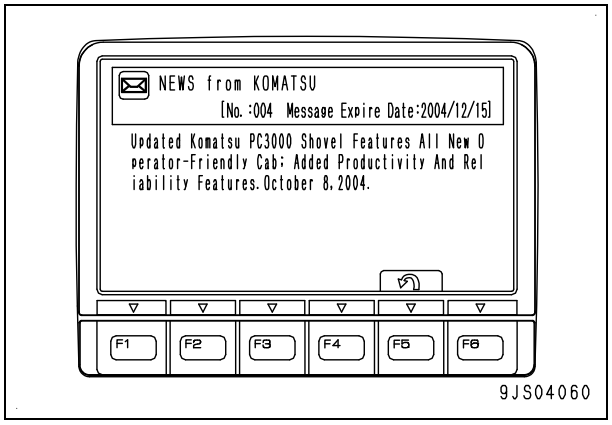
Symbol	Switch	Item	Function
 9JG01246	F6	Enter	Enters selected/set item.
 9JG01247	F5	Return	Returns to previous screen.
 9JG01248	F3	Select camera screen	Selects camera screen.
 9JG01249	F4	Select service meter/clock	Selects service meter and clock alternately.
 9JG01250	F5	Select maintenance screen	Selects maintenance screen.
 9JG01251	F6	Select user mode screen	Selects user mode screen.
 9JG01252	F3	Select item	Selects item on left side (Selects right end item after left end item).
 9JG01253	F4	Select item	Selects item on right side (Selects left end item after right end item).
 9JG01254	F3	Select item	Selects item on lower side (Selects top item after bottom item)/Resets holding of monitoring.
 9JG01255	F4	Select item	Selects item on upper side (Selects bottom item after top item)/Holds monitoring.
 9JG01256	F1	Select item	Selects page on lower side (Selects top page after bottom page).
 9JG01257	F2	Select item	Selects page on upper side (Selects bottom page after top page).
 9JG01258	F1	Display No. 1 camera screen	Selects No. 1 camera screen.
 9JG01259	F2	Display No. 2 camera screen	Selects No. 2 camera screen.
 9JG01260	F3	Display No. 3 camera screen	Selects No. 3 camera screen.
 9JG01261	F4	Display No. 1 and No. 2 camera screens	Displays No. 1 and No. 2 camera screens simultaneously.
 9JG01263	F2	Return to default setting	Returns selected item to default setting. (Used for adjustment of screen.)
 9JG01264	F1	Start	Starts operation. (Used to start measurement of split fuel consumption on fuel consumption display screen.)
 9JG01382	F1	Stop	Stops operation. (Used to stop measurement of split fuel consumption on fuel consumption display screen.)
 9JG01265	F1/F2	Clear	Clears selected/displayed item
 9JG01266	F1	Set	Executes setting.

Message display

- For a KOMTRAX-equipped machine, you can view notification from the sales representative. When there is a message, the message monitor appears on the upper left of the normal screen.
- The lighting green monitor indicates that there are messages to be read.
- The lighting blue monitor appears when you have not sent replies yet after opening messages which accept replies.

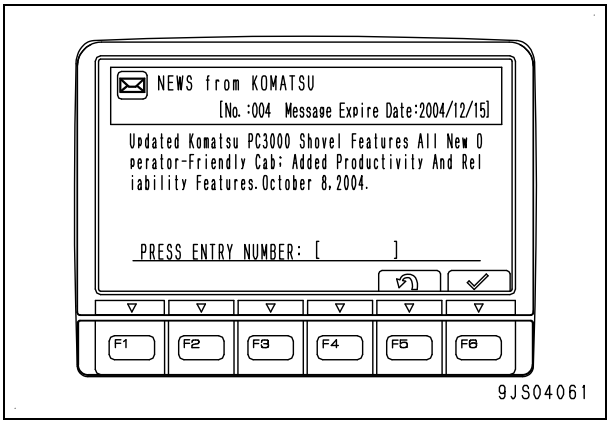


- Press F6 to enter user mode and select “Message display” and you can view (open) the messages.



F6: Returns to the user mode screen.

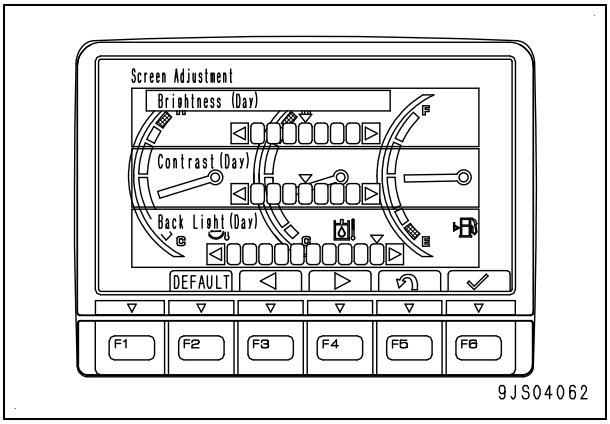
- Under messages that accept replies, “Value to be entered with 10-key: [ ]” appears. If it appears, enter the selected item number provided in the message using the switches of the machine monitor, and press F6.
- “Do you want to transmit the entered value?” appears under the message. Press F6 and the entered value will be sent.



- Messages will be deleted when their validity expire or a new message is received.
- When no message has not been received, “No message” appears at the blue part of the top of the screen.
- Separately from the message display for users above, the service menu is provided with message display for service.

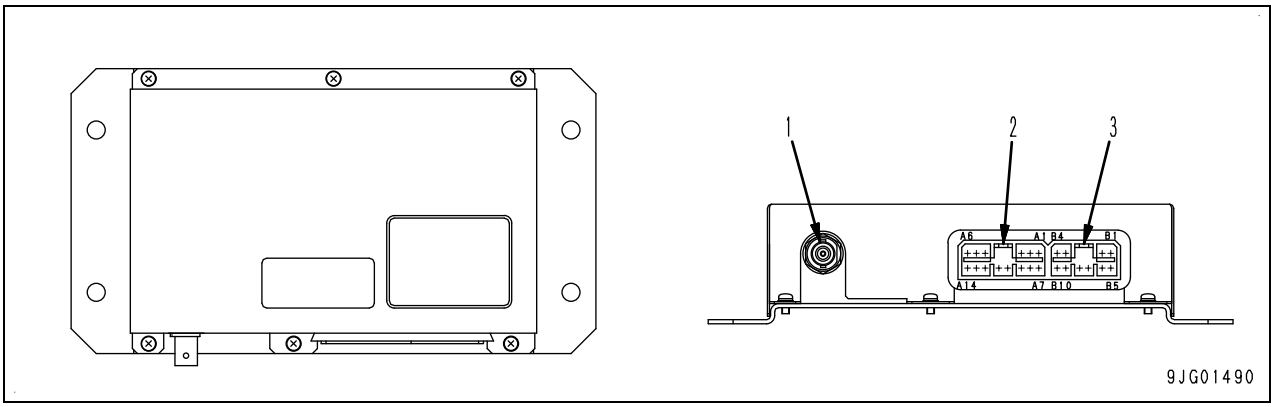
Screen adjustment

- Selecting the Screen adjustment from the user menu and pressing F6 switches to the screen adjustment screen.
- From this menu, you can adjust the brightness, contrast, and luminance of the machine monitor screen.
- When the light switch is in Night mode ON, the night mode screen is adjustable.
- When the light switch is in Daytime mode ON or OFF, the daytime mode screen is adjustable.



F2: Returns all adjusted values to the defaults.
F3: Decreases the value indicated by the indicator one graduation left.
F4: Increases the value indicated by the indicator one graduation right.
F5: Cancels changes you made before confirming them with F6 to return to the menu screen.
F6: Confirms the changes and moves to the next item.

KOMTRAX terminal
TH300



- For japan / For other countries
- Using satellite wave

1. Communication antenna connection
2. Connector A (14 poles)
3. Connector B (10 poles)

Outline

- This terminal sends various machine information based on the network signals and input signals obtained through the machine monitor, as well as GPS position data, via wireless communication. This terminal can send information via communication antenna.
- Corlditions of this terminal can be checked with the "Display of KOMTRAX setting" in the service mode of the machine monitor.
- This terminal cannot be used in the countries or territories where it is not authorized by the law.

★ When starting to use the KOMTRAX system or changing the country where it is used, you are required to notify the country where it will be used in advance.
★ When using the KOMTRAX system in Japan, the terminal special to Japan must be mounted.

Input and output signals

Connector A

Pin No.	Signal name	Input/output
A-1	Electric power supply	Input
A-2	NC(*1)	—
A-3	NC(*1)	—
A-4	Electric power supply switching	Output
A-5	NC(*1)	—
A-6	NC(*1)	—
A-7	(GND)	Input
A-8	(GND)	Input
A-9	NC(*1)	—
A-10	NC(*1)	—
A-11	NC(*1)	—
A-12	NC(*1)	—
A-13	NC(*1)	—
A-14	NC(*1)	—

*1:Never connect to NC or malfunctions or failures will occur.

Connector B

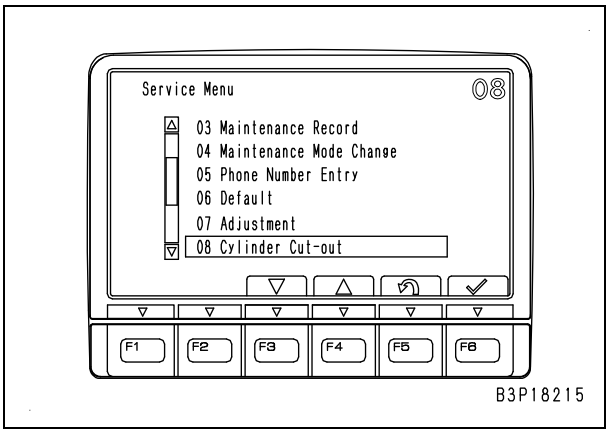
Pin No.	Signal name	Input/output
B-1	Serial signal DCD	Output
B-2	Serial signal RXD	Output
B-3	Serial signal TXD	Input
B-4	Serial signal DTR	Input
B-5	Serial signal SGND	Input
B-6	Serial signal DSR	Output
B-7	NC(*1)	—
B-8	NC(*1)	—
B-9	NC(*1)	—
B-10	NC(*1)	—

*1: Never connect to NC or malfunctions or failures will occur.

Applicable model					PC500LC-8R	
Cate-gory	Item		Measurement conditions	Unit	Standard value	Permissible value
Work equipment	Time lag	Boom	● Hydraulic oil temperature: Within operation range ● Engine at low idle ● Working mode: P mode ● Time required from raise stroke end till bucket touches ground and pushes up machine front ● For measuring posture, see Work equipment 5	sec.	Max. 3.0	Max. 3.6
		Arm	● Hydraulic oil temperature: Within operation range ● Engine at low idle ● Working mode: P mode ● Time required from dumping stroke end till bucket stops momentarily after control lever is tilted to digging and starts to move again ● For measuring posture, see Work equipment 6	sec.	Max. 3.0	Max. 3.6
		Bucket	● Hydraulic oil temperature: Within operation range ● Engine at low idle ● Working mode: P mode ● Time required from dumping stroke end till bucket stops momentarily after control lever is tilted to digging and starts to move again ● For measuring posture, see Work equipment 7		Max. 3.0	Max. 5.0
	Internal leakage	Cylinders	● Hydraulic oil temperature: Within operation range ● Engine at high idle ● Leakage amount for one minute with cylinder or travel to be measured in relief condition	cc/min	4.5	20
		Center swivel joint			10	50
Performance in compound operation	Swerving amount in simultaneous operation of work equipment and travel		● Hydraulic oil temperature: Within operation range ● Engine at high idle ● Working mode: P mode ● Traveling speed: Lo ● Flat and level ground ● Swerving amount (X) when traveling 20 m after initial trial run of 10 m	mm	Max. 400	Max. 440
Performance of hydraulic pump	Hydraulic pump delivery		See next page	ℓ/min	See next page	

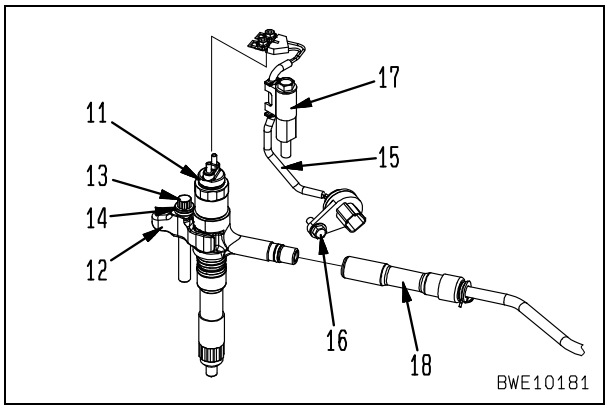
Testing and adjusting item	Symbol	Part No.	Part name	Q'ty	Remarks
Troubleshooting for/engine controller/sensors/actuators	S	799-601-9420	● T-adapter	1	For common rail pressure sensor
		799-601-9430	● T-adapter	1	For supply pump PCV
		799-601-9000 or 799-601-9100 or 799-601-9300	T-adapter assembly	1	
		799-601-9310	● Plate	1	For 24-pole type
		799-601-9320	● T-box	1	
Troubleshooting for chassis/sensors/wiring harnesses	**T**	799-601-2500 or 799-601-2700 or 799-601-2800 or 799-601-2900 or 799-601-7100 or 799-601-7400 or 799-601-8000	T-adapter assembly	1	
		799-601-2600	● T-adapter box	1	
		799-601-2740	● Adapter for MIC	1	
		799-601-4100 or 799-601-4200 or 799-601-9000 or 799-601-9200	T-adapter assembly	1	
		799-601-9020	● Adapter for DT	1	
		799-601-9030	● Adapter for DT	1	
		799-601-7000 or 799-601-7100 or 799-601-7400 or 799-601-8000	T-adapter assembly	1	
		799-601-7010	● Adapter for X	1	
		799-601-7020	● Adapter for X	1	
		799-601-7040	● Adapter for X	1	
		799-601-7050	● Adapter for SWP	1	
		799-601-7060	● Adapter for SWP	1	
		799-601-7070	● Adapter for SWP	1	
		799-601-7080	● Adapter for M	1	
		799-601-7090	● Adapter for M	1	
		799-601-7110	● Adapter for M	1	
		799-601-7120	● Adapter for M	1	
		799-601-7130	● Adapter for M	1	
		799-601-7140	● Adapter for S	1	

7. Referencing “Special functions of machine monitor”, set the cylinder cut-out.
   ⚠ **If the engine is not set in the cylinder cut-out, it will start and will be dangerous. Accordingly, be sure to set the engine in this mode.**



8. Rotate the engine with the starting motor and measure the compression pressure.
   ★ Read the pressure gauge pointer when it is stabilized.
   ★ Check the engine speed with the monitor.

9. After finishing testing, remove the testing tools and return the removed parts.
   ★ Install the injector, injector wiring harness, and fuel high-pressure tube according to the following procedure.
   1) Install the O-ring and gasket to injector (11).
   2) Fit holder (12) to injector (11) to temporarily assemble them as a unit to the cylinder head.
   3) Fit mounting bolt (13) to spherical washer (14) to tighten them to the cylinder head.
      Spherical part of washer:
      Engine oil (SAE30DH))
      Mounting bolt:
      58.8 – 73.5 Nm {6.0 – 7.5 kgm}
   4) Install wiring harness (15) to the rocker arm housing and fix it with mounting bolt (16).
   5) Insert wiring harness (15) into holder (17).
   6) Alternately tighten 2 nuts at wiring harness (15) end to injector (11).
      Nut: **2.0 – 2.4 Nm {0.2 – 0.24 kgm}**
   7) Tighten tube (18) to injector (11).
      Sleeve nut:
      39.2 – 49.0 Nm {4 – 5 kgm}
   8) Tighten the clamping bolt of the fuel piping.
      Clamping bolt:
      11.8 – 14.7 Nm {1.2 – 1.5 kgm}

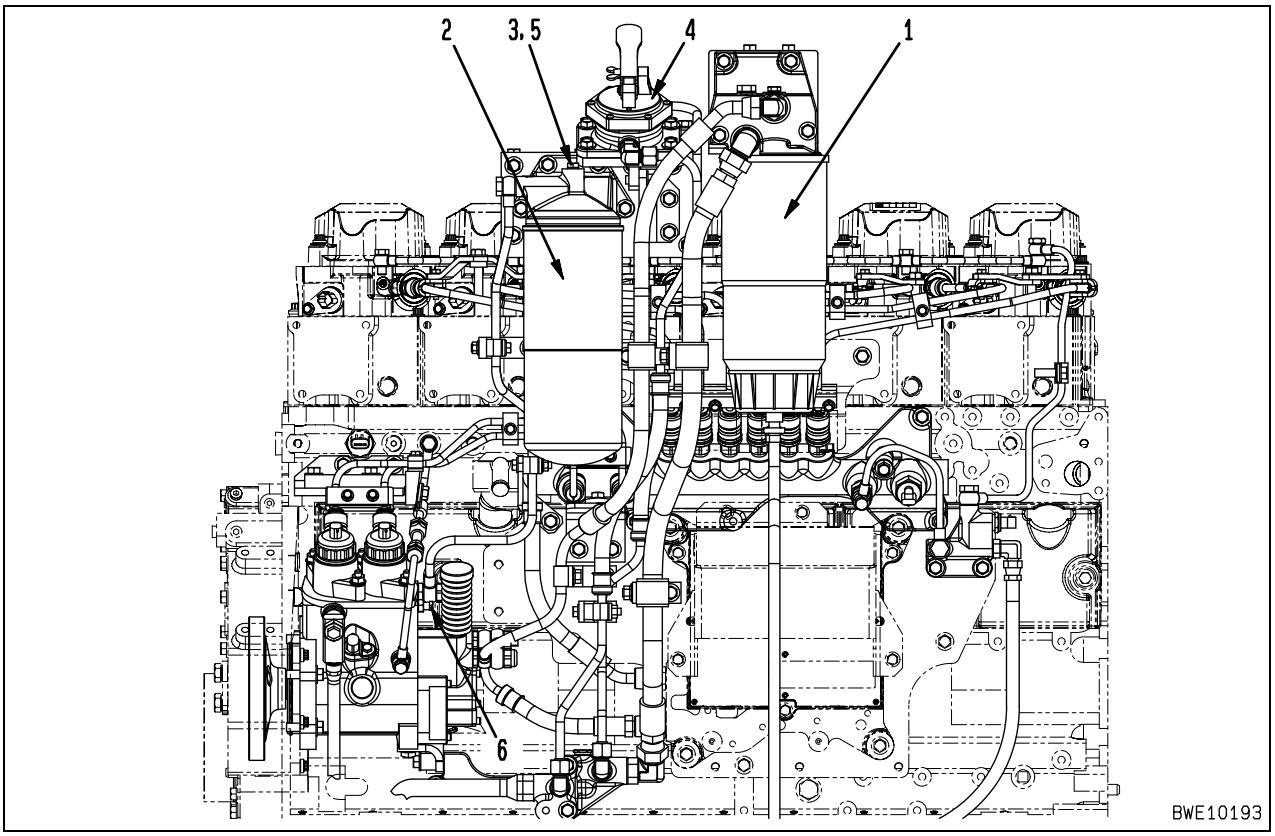


Rocker arm assembly mounting bolt:
58.8 – 73.5 Nm {6.0 – 7.5 kgm}

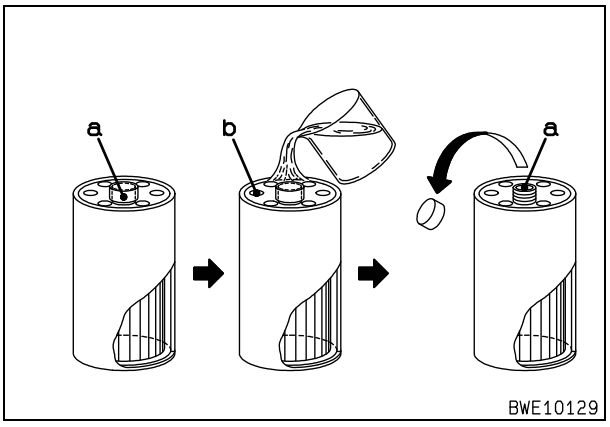
★ Adjust the valve clearance. For details, see “Adjusting valve clearance”.

Cylinder head cover mounting bolt:
9.8 ± 1 Nm {1.0 ± 0.1 kgm}

Reference: The manual priming pump (4) is installed to the engine.



★ If fuel is used up or if a fuel circuit part is removed and installed, bleed air from the fuel circuit according to the following procedure.



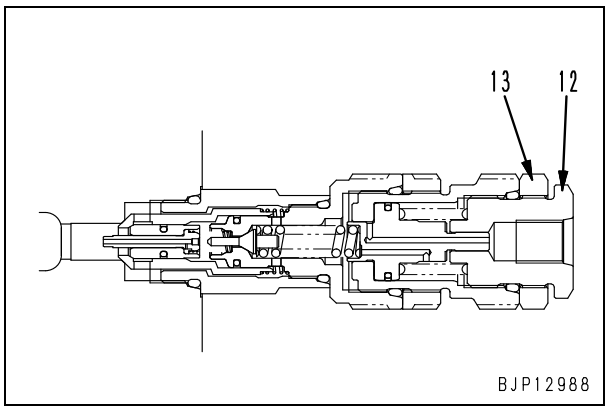
1. Remove fuel pre-fuel filter (1) and fill it with fuel.
   - ★ Fill the fuel filter with clean fuel and take care that dirt will not enter it.
   - ★ Check that the cap is fitted to part (a) (central hole) of the pre-fuel filter, and then add fuel through part (b) (holes around the central hole).
   - ★ After filling the pre-fuel filter with fuel, remove the cap from part (a).
   - ★ If clean fuel is not available, do not remove the pre-fuel filter but fill it with the fuel by operating priming pump (4).
   - ★ Do not add fuel to fuel main filter (2) externally.

5) Connect pilot hose (9).
6) Check the pressure again after the adjustment, following the aforementioned steps for measurement.
   ★ Adjusting the high pressure set side changes setting of the low pressure side. Thus, this side requires adjustment, too.

3. Adjustment of boom LOWER relief pressure (on the side where low pressure is set)

★ When the low relief pressure for boom LOWER is not normal or when the high pressure set side was adjusted, adjust the low pressure side of safety-suction valve (8) for boom LOWER according to the following procedure.
★ The low-pressure relief pressure mode denotes the state in which the machine push-up switch is turned off, disabling to apply the pilot pressure to the switching port.

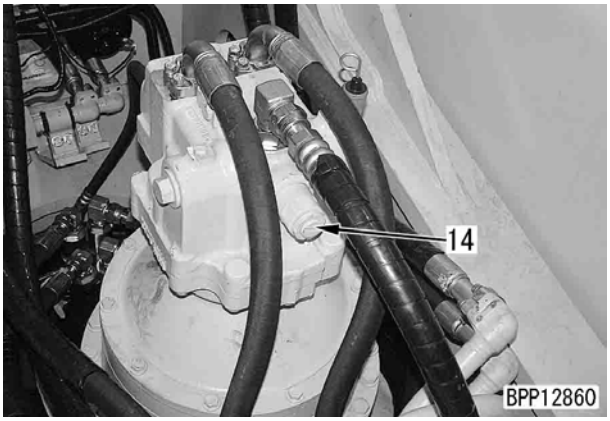
1) Disconnect pilot hose (9).
2) While fixing holder (12), loosen locknut (13).
3) Turn holder (10) to adjust the pressure.
   ★ Turning the holder clockwise increases the pressure. Turning it counterclockwise decreases the pressure.
   ★ Quantity of adjustment per turn of holder:
   Approx. 25.3 MPa {Approx. 258 kg/cm^2}
4) While fixing holder (12), tighten locknut (13).
   Locknut: **78 – 93 Nm {8.0 – 9.5 kgm}**



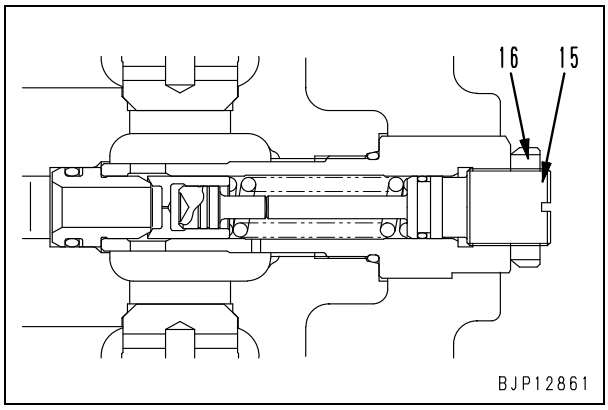
5) Connect pilot hose (9).
6) Check the pressure again after the adjustment, following the aforementioned steps for measurement.

4. Adjustment of swing relief pressure

★ If the swing relief pressure is abnormal, adjust safety valve (14) of the swing motor according to the following procedure.



1) While fixing adjusting screw (15), loosen locknut (16).
2) Turn adjustment screw (15) to adjust the pressure.
   ★ Adjustment screw:
   - Turning it clockwise increases the pressure.
   - Turning it counterclockwise decreases the pressure.
   ★ Quantity of adjustment per turn of adjusting screw:
   4.70 MPa {47.9 kg/cm^2}
3) While fixing adjustment screw (15), tighten locknut (16).
   Locknut: **147 – 196 Nm {15 – 20 kgm}**



4) Check the pressure again after the adjustment, following the aforementioned steps for measurement.

Measuring solenoid valve output pressure

★ Solenoid valve output pressure measurement tools

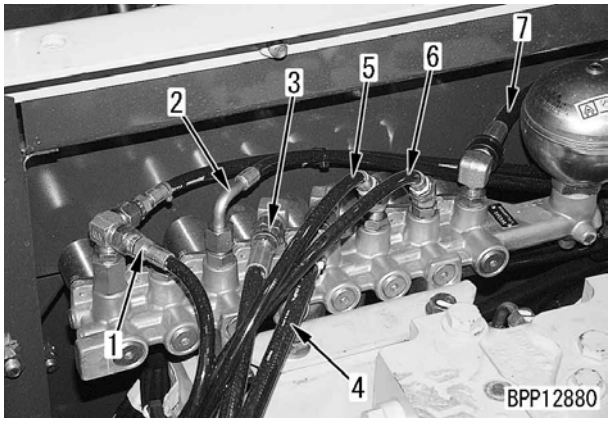
Symbol		Part No.	Part name
P	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	799-401-3100	Adapter (Size 02)
		02896-11008	O-ring
	3	799-401-3200	Adapter (Size 03)
		02896-11009	O-ring

★ Measure the solenoid valve output pressure after confirming that the control circuit source pressure is normal.

⚠ **Lower the work equipment to the ground and, after stopping the engine, release residual pressure in the piping by operating the control lever several times. Then loosen the oil filler cap gradually to release pressure inside the tank.**

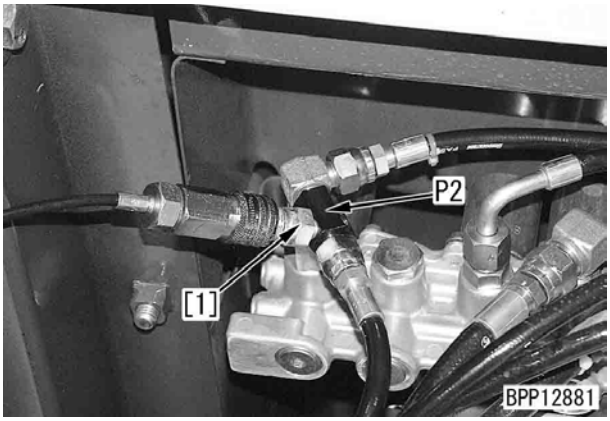
1. Remove the control valve top cover and disconnect outlet hoses (1) to (7) of the target solenoid valve of measurement.
   ★ A quick coupler is attached to the solenoid valve of PPC lock solenoid valve's outlet hose. Thus, measurement shall be conducted on PPC valve side (back side of operator's cab).

No.	Solenoid valve to be measured
1	2-stage relief solenoid valve
2	Machine push-up solenoid valve
3	Swing holding brake solenoid valve
4	Travel speed shifting solenoid valve
5	Merge-divider solenoid valve
6	Travel junction solenoid valve
7	PPC lock solenoid valve

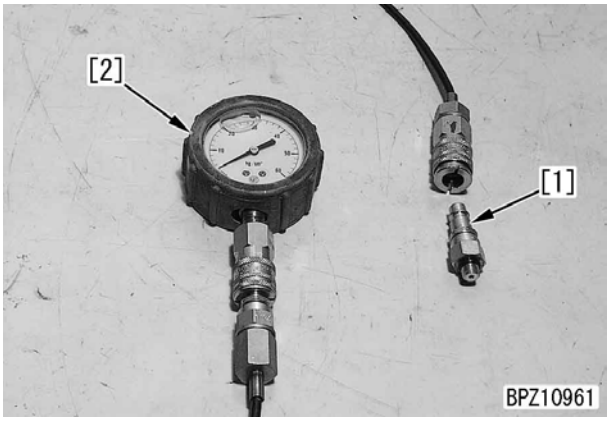


2. Install adapter **P2** or **P3** and connect the currently disconnected hose again.

3. Install nipple [1] of hydraulic tester **P1** and connect it to oil pressure gauge [2].
   ★ Use the oil pressure gauge with capacity 5.9 MPa {60 kg/cm^2}.
   ★ Figure shows the outlet hose of the 2-stage solenoid valve being installed with the measuring tool.



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



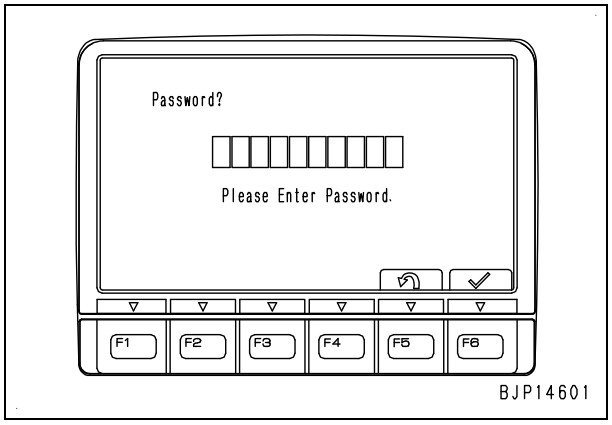
5. Run the engine at high idle and operate the control levers and switches to turn the solenoid valve ON or OFF. Measure the oil pressure when the valve is turned on and also when turned off.
   ★ For conditions for turning each solenoid valve ON or OFF, refer to the ensuing “Table for functioning conditions” for each solenoid valve.
   ★ The operating condition of the solenoid valve can be checked with the monitoring function of the machine monitor (For the operating procedure, see “Special functions of machine monitor”.

4) Run the engine at high idle, relieve the travel circuit, and measure the oil leakage.
   ⚠ **Wrong operation of the lever can cause an accident. Accordingly, make signs and checks securely.**
   ★ Continue this condition for 30 seconds, then measure the oil leakage amount for one minute.
   ★ Measure several times, moving the motor a little (changing the position of the valve plate and cylinder and that of the cylinder and piston) each time.
5) After the measurement, make sure that the machine is back to normal condition.

Display of inputting password

After the KOMATSU logo is displayed, the screen to input the engine start lock password is displayed.

★ This screen is displayed only when the engine start lock function is set effective.
★ If the password is input normally, the screen changes to “Display of check of breaker mode (if B mode is set)” or “Display of check before starting”.
★ The machine monitor has some password functions other than the engine start lock. Those functions are independent from one another.

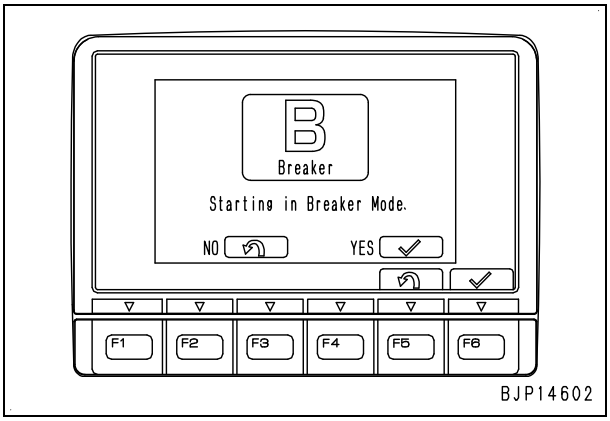


Display of check of breaker mode

When the starting switch is turned ON, if the working mode is set to the breaker mode [B], a message to inform the operator of starting in the breaker mode is displayed on the screen.

⚠ **If an attachment other than the breaker is used while the working mode is set to the breaker mode [B], the machine may move unexpectedly or may not operate normally or the hydraulic components may be damaged.**

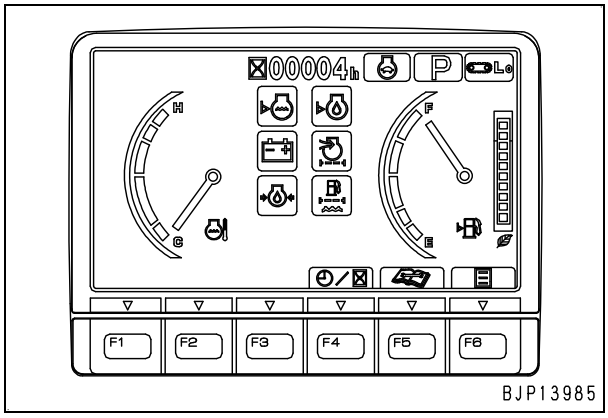
★ After operation to check of the breaker mode is finished, the screen changes to “Display of check before starting”.
If No is selected: Working mode is set to economy mode [E]
If Yes is selected: Working mode is set to breaker mode [B]



Display of check before starting

When the screen changes to the check-before-starting screen, the check before starting is carried out for 2 seconds.

★ If any abnormality is detected by the check before starting, the screen changes to “Display of warning after check before starting” or “Display of ending of maintenance interval”.
★ If no abnormality is detected by the check before starting, the screen changes to “Display of check of working mode and travel speed”.
★ The monitors (6 pieces) displayed on the screen are the items under the check before starting.



Function of checking display of LCD (Liquid Crystal Display)

While the ordinary screen is displayed, if the following numeral input switch and function switch are operated as follows, all the LCD (Liquid Crystal Display) lights up in white.

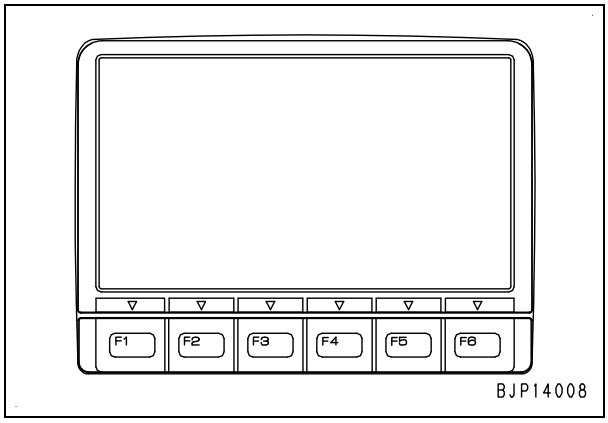
- Operation of switches (simultaneous): [4] + [F2]

★ When finishing the operation of the switches, release [F2] first.

★ If there is a display error in the LCD, only that part is indicated in black.

★ The LCD panel sometimes has black points (points which are not lighted) and bright points (points which do not go off) for the reason of its characteristics. If the number of the bright points and black points does not exceed 10, those points are not a failure or a defect.

★ To return to the former screen, press the function switch.



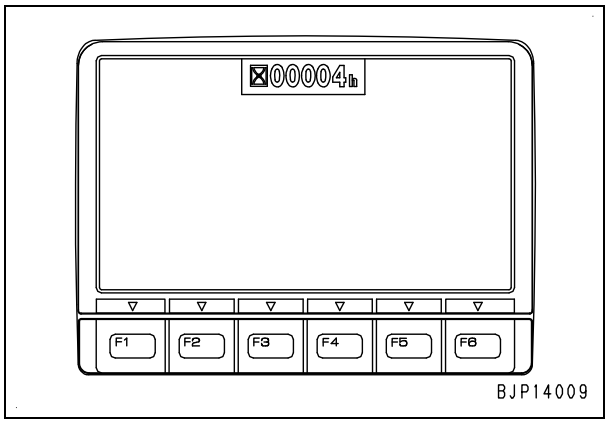
Function of checking service meter

To check the service meter while the starting switch is turned OFF, operate the numeral input switches as follows. At this time, only the service meter section displays.

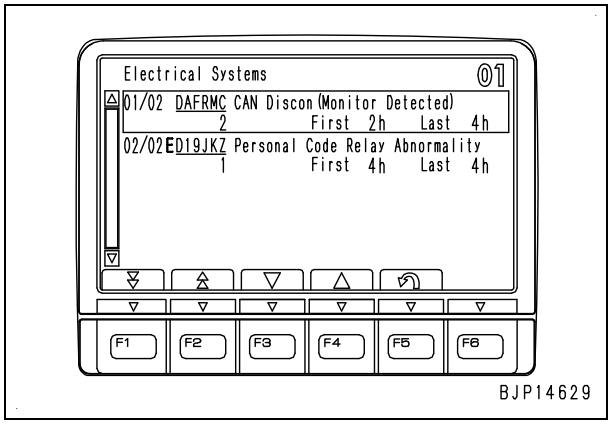
- Operation of switches (simultaneous): [4] + [1]

★ Since there is some time lag in start of the LCD, hold down the switches until the LCD displays normally.

★ After the machine monitor is used continuously, blue points (points which do not go off) may be seen on this screen. This phenomenon does not indicate a failure or a defect.

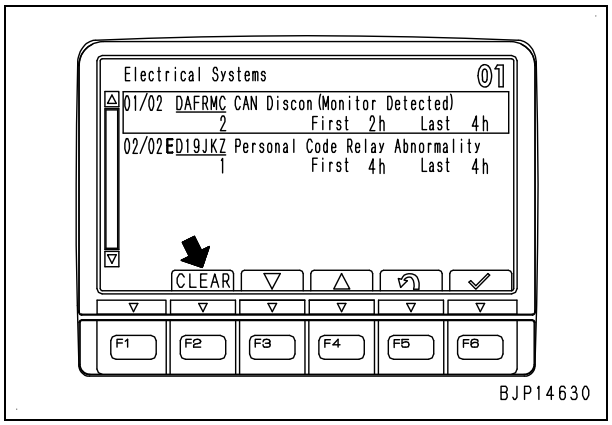


4. Resetting abnormality record
   1) While the “Electrical Systems” screen is displayed, perform the following operation with the numeral input switches.
      - Operation of switches (While pressing [4], perform the operation in order):
        [4] + [1] → [2] → [3]



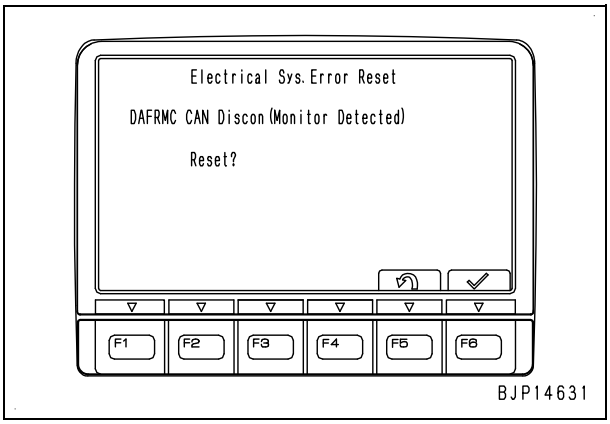
   2) Check that the screen is set in the reset mode, and then reset the items one by one or together with the function switches.
      ★ If the screen is set in the reset mode, [CLEAR] graphic mark is indicated at [F2].
      - [F2]: Reset all items
      - [F3]: Move to lower item
      - [F4]: Move to upper item
      - [F5]: Return to abnormality record screen
      - [F6]: Reset selected item

      ★ To reset items one by one: Select the item to be reset with [F3] or [F4] and press [F6].
      ★ To reset all items together: Press [F2], and all the items are reset, regardless of selection of the items.
      ★ If [**E**] is displayed on the left of a failure code, the resetting operation is accepted but the information is not reset.

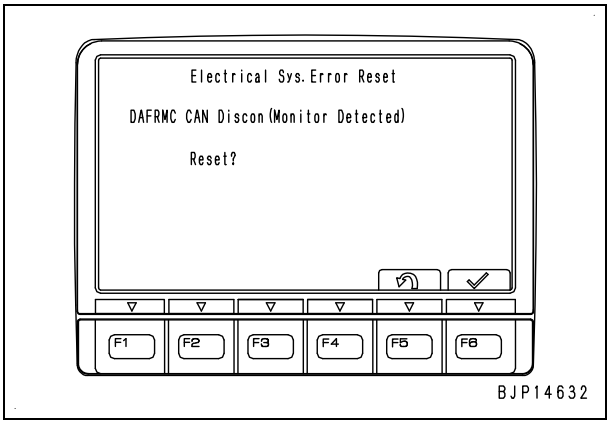


   3) After the “Electrical Sys. Error Reset” screen is displayed, operate the function switches.
      - [F5]: Return to “Electrical systems” screen (Reset mode)
      - [F6]: Execute reset

      ★ The following figure shows the screen displayed when the items are reset one by one (which is a little different from the screen displayed when all the items are reset together).

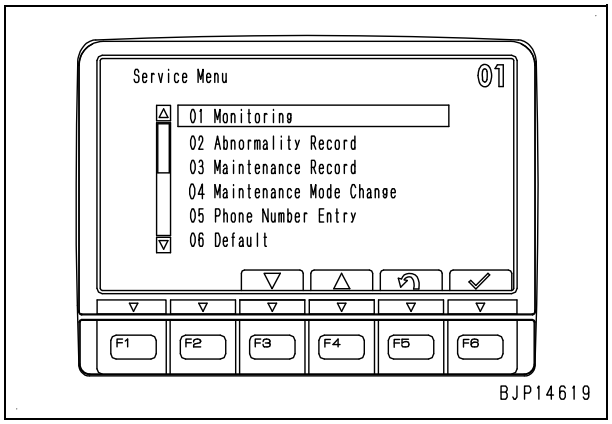


   4) If the screen to notify completion of reset is displayed and then the “Electrical Systems” (reset mode) screen is displayed, the reset of the abnormality record is completed.
      ★ After a while, the screen returns to the “Electrical Systems” screen.

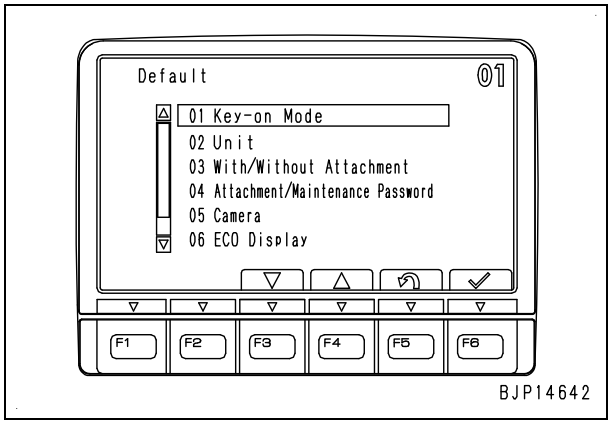


Default (Unit)
Check or change various settings related to the machine monitor and machine by "Default".
The unit selecting function is used to select the unit of the data displayed for monitoring, etc.

1. Selecting menu
   Select “Default” on the “Service Menu” screen.

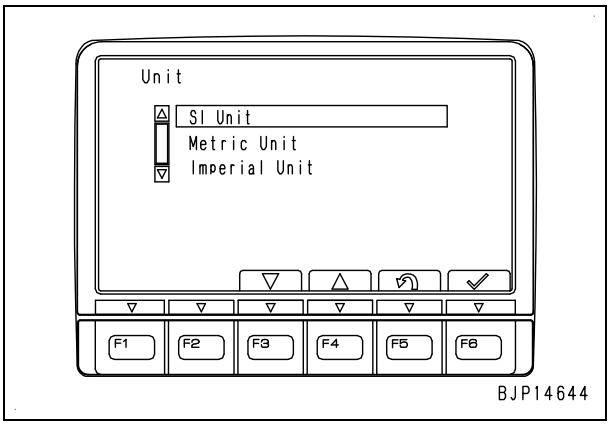


2. Selecting sub menu
   After the “Default” screen is displayed, select “Unit” with the function switches or numeral input switches.
   ★ Select this item similarly to an item on the “Service Menu” screen.



3. Selecting unit
   After the “Unit” screen is displayed, select the unit to be set with the function switches.
   - [F3]: Move to lower unit
   - [F4]: Move to upper unit
   - [F5]: Cancel selection and return to “Default” screen
   - [F6]: Confirm selection and return to “Default” screen

   ★ When the machine is delivered, the SI unit system is set.



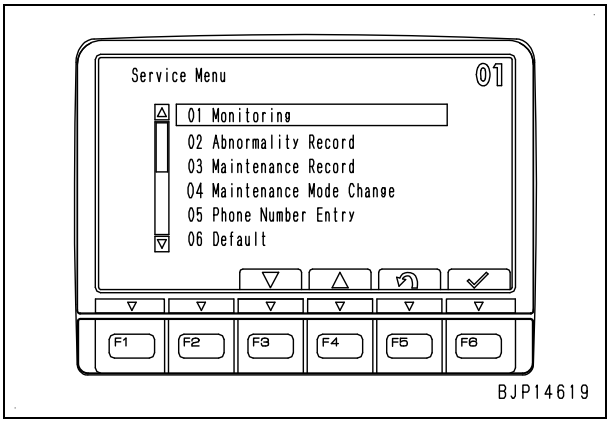
[Reference]

- If a normally operating cylinder is Cut-Out, the following phenomena occur.
  1) Lowering of engine speed
  2) Increase of final injection rate command (quantity)
- If the engine is running near the high idle, however, the engine speed may not lower for the reason of engine control.
- In this case, lower the engine speed with the fuel control dial and judge by increase of the injection rate command.

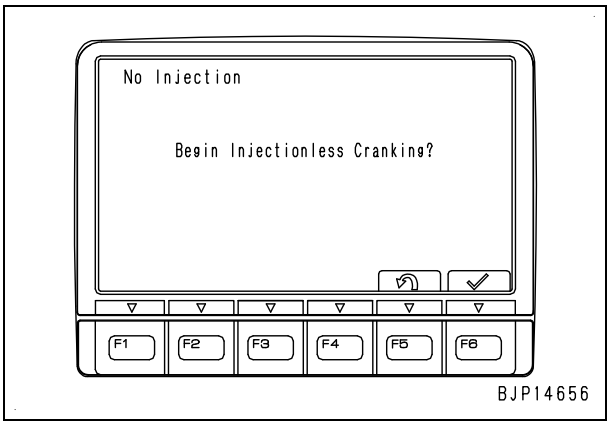
No Injection

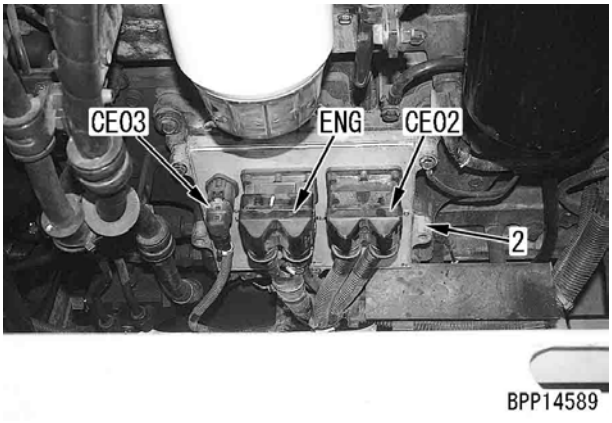
If the engine is operated after long storage of the machine, it may be worn or damaged because of insufficient lubrication with oil. To prevent this, the function to lubricate the engine before starting it by cranking it without injecting fuel is installed.
Set the no-injection cranking while the engine is stopped.

1. Selecting menu
   Select “No Injection” on the “Service Menu” screen.



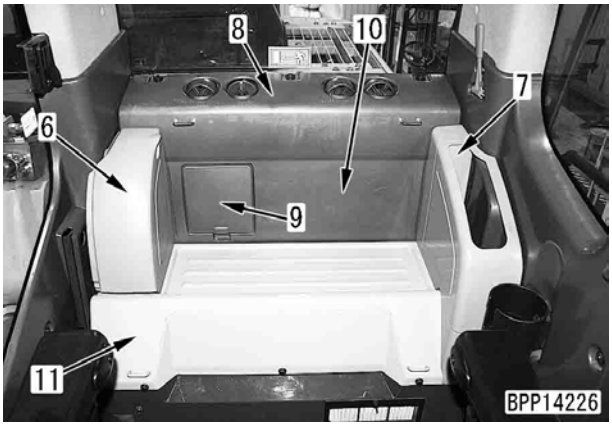
2. Displaying check screen
   If the "No injection" screen is displayed, the machine monitor asks the operator if no injection cranking should be performed. Answer with the function switch.
   - [F5]: Do not perform (Return to Service menu screen)
   - [F6]: Perform
   - ★ While the screen is changing to the following screen, the screen of "Communication between controllers is being checked" is displayed.



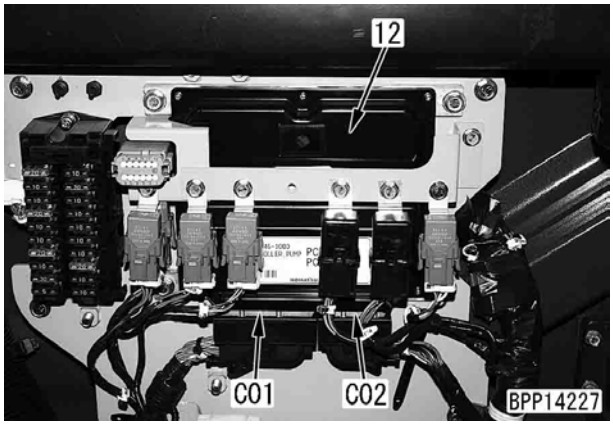


3. Pump controller

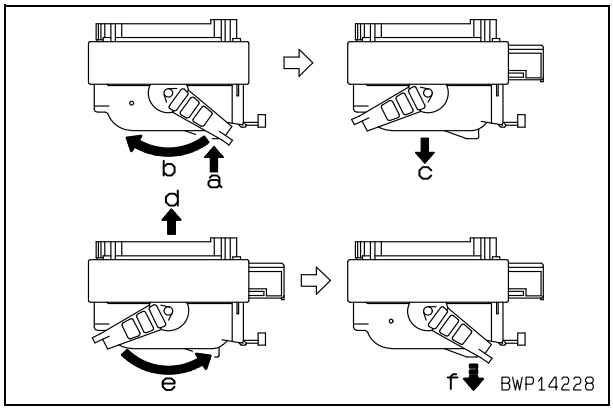
1) Slide the operator's seat and seat stand to the forward end.
2) Remove the 5 mounting bolts and cool & hot box (6).
   ★ While removing the cool & hot box, disconnect the drain hose.
3) Remove the 2 mounting bolts, 1 fastener, and magazine box (7).
4) Remove the 3 mounting bolts and cover (8).
5) Remove fuse box cover (9) and cover (10).
   ★ Since the underside of cover (10) is clamped, pull it up.
6) Remove the 7 mounting bolts and cover (11).



7) Connect the troubleshooting adapters to connectors **C01** and **C02** of pump controller (12).
   ★ Install the adapters to only the wiring harness side.

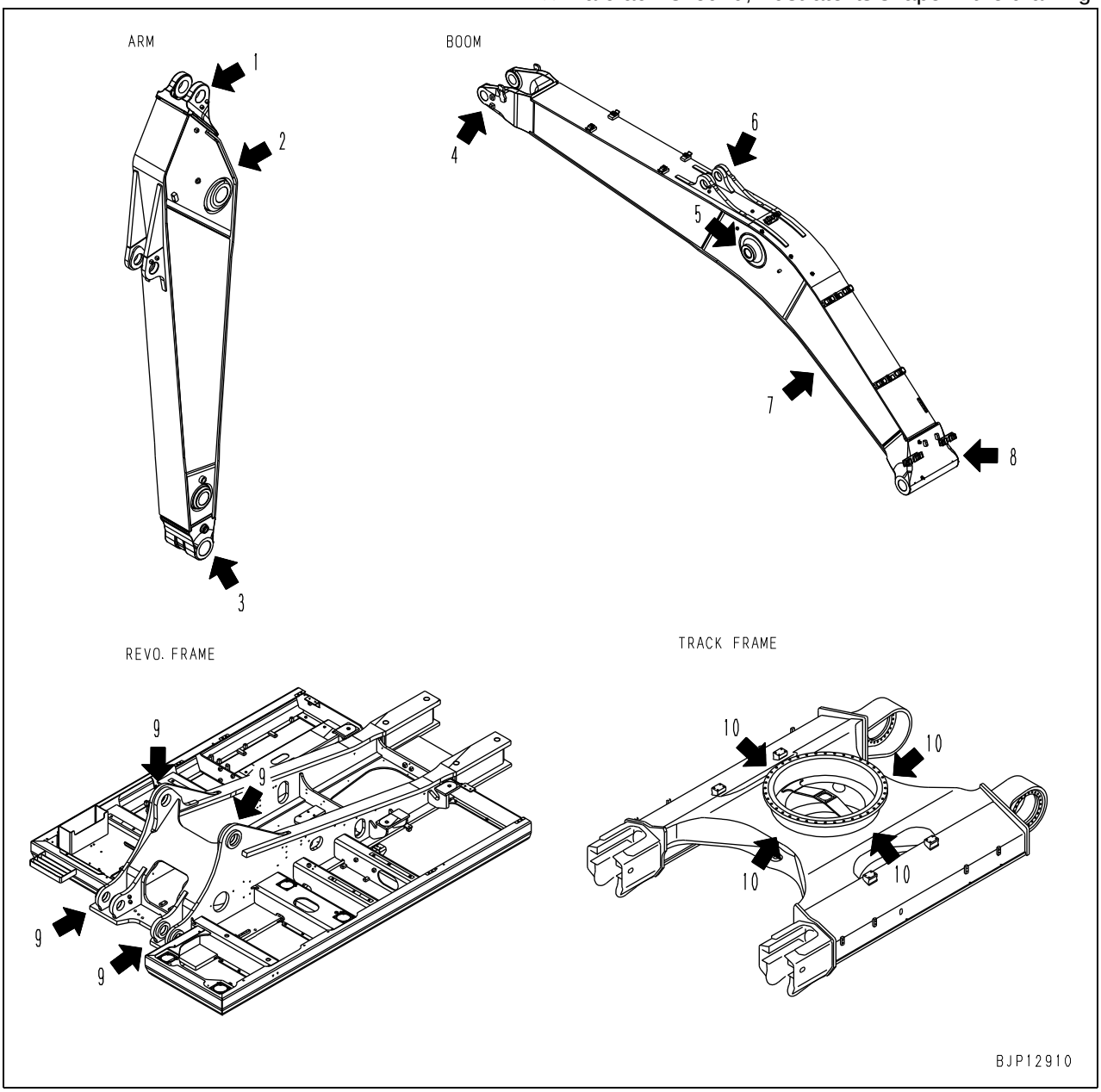


★ The connectors of the pump controller have a special locking mechanism. Disconnect them according to steps (a) – (c) and connect them according to steps (d) – (f) as shown below.
Disconnection: (a) Unlock – (b) Slide lever – (c) Disconnect connector.
Connection: (d) Position connector – (e) Slide lever – (f) Lock.



Visual check of welded structure

★ If a crack is found, illustrate its shape in the drawing.



Arm

1. **Arm cylinder bracket**
   ☐ **Left** ☐ **Right**
2. **Arm foot**
   ☐ **Left** ☐ **Right**
   ☐ **Edge plate**
3. **Arm top boss**
   ☐ **Left** ☐ **Right**

Boom

4. **Arm top bracket**
   ☐ **Left** ☐ **Right**
5. **Boom cylinder bracket**
   ☐ **Left** ☐ **Right**
6. **Arm cylinder bracket**
   ☐ **Left** ☐ **Right**
7. **Boom lower plate**
   ☐ **Left** ☐ **Right**
8. **Boom foot**
   ☐ **Left** ☐ **Right**

Revolving frame

9. **Boom bracket**
   ☐ **Left** ☐ **Right**

Track frame

10. **Circle bracket**
    ☐ **Front** ☐ **Rear**
    ☐ **Left** ☐ **Right**

Classification and troubleshooting steps

Classification for troubleshooting

Mode	Contents
Display of code	Troubleshooting by failure code
E-mode	Troubleshooting of electrical system
H-mode	Troubleshooting of hydraulic and mechanical system
S-mode	Troubleshooting of engine

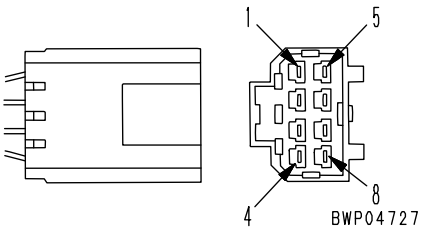
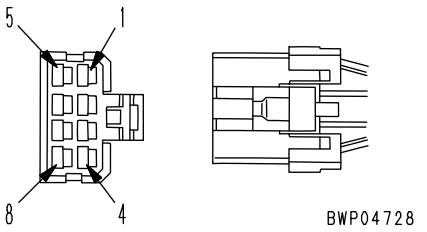
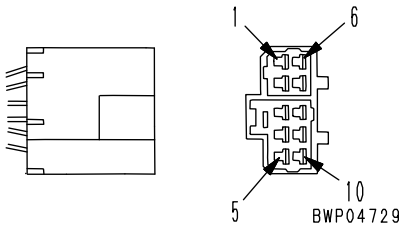
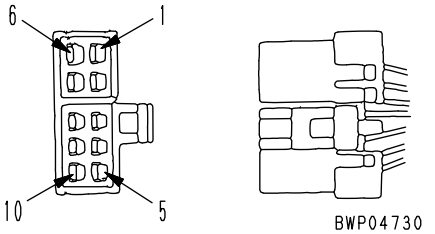
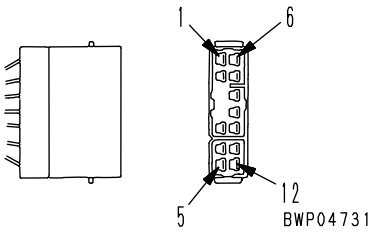
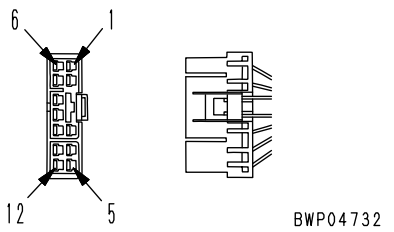
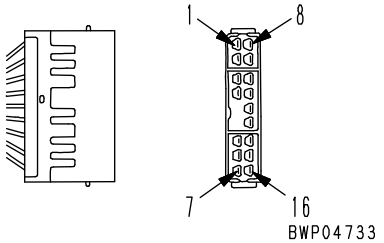
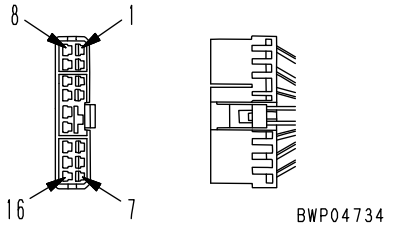
Troubleshooting steps

If a problem that appears to be a failure occurs on the machine, identify the relevant troubleshooting No. by performing the following steps and proceed to the main body of troubleshooting.

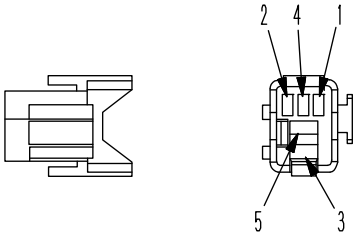
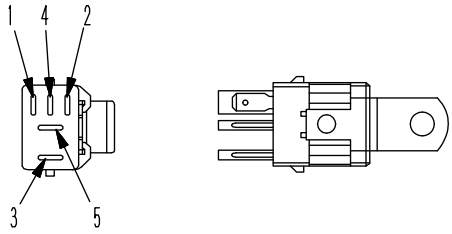
1. **Procedure for troubleshooting to be taken when action code is displayed on machine monitor:**
   When action code is displayed on machine monitor, press [☑] switch at panel switch section to display failure code.
   Carry out the troubleshooting for the corresponding [**Display of code**] according to the displayed failure code.

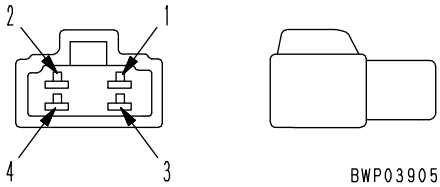
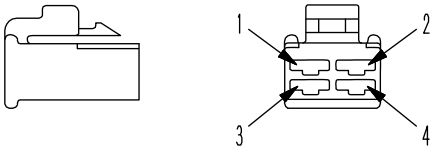
2. **Procedure for troubleshooting to be taken when failure code is recorded in abnormality record:**
   If an action code is not displayed on the machine monitor, check a failure code with the abnormality record function of the machine monitor.
   If a code is recorded, carry out troubleshooting for the corresponding [**Display of code**] according to the recorded code.
   - ★ If an electrical system failure code is recorded, delete all the codes and reproduce them, and then see if the trouble is still detected.
   - ★ An error code of the mechanical system cannot be deleted.

3. **Procedure for troubleshooting to be taken when action code is not displayed and no failure code is recorded in abnormality record:**
   If an action code is not displayed on the machine monitor and no failure code is recorded in the abnormality record, a trouble that the machine cannot find out by itself may have occurred in the electrical system or hydraulic and mechanical system.
   In this case, check the phenomenon looking like a trouble again and select the same phenomenon from the table of “Phenomena looking like troubles and troubleshooting Nos.”, and then carry out trouble-shooting corresponding to that phenomenon in the **“E-mode”**, **“H-mode”**, or **“S-mode”**.

No. of pins	S type connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
8			799-601-7140 (T-adapter)
	Part No. : 08056-10871	Part No. : 08056-10881	
10 (White)			799-601-7150 (T-adapter)
	Part No. : 08056-11071	Part No. : 08056-11081	
12 (White)			799-601-7350 (T-adapter)
	Part No. : 08056-11271	Part No. : 08056-11281	
16 (White)			799-601-7330 (T-adapter)
	Part No. : 08056-11671	Part No. : 08056-11681	

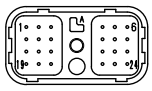
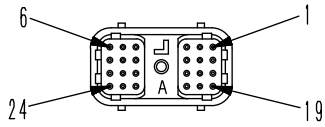
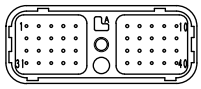
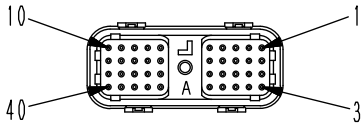
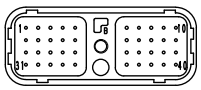
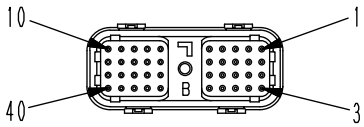
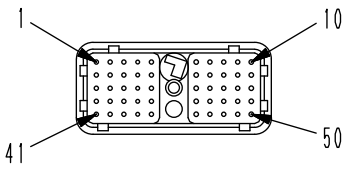
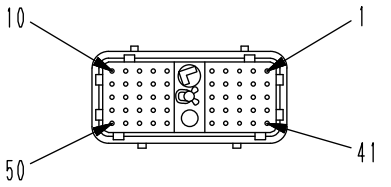
B4D18194

No. of pins	Connector for relay (Socket type)		
	Female (female housing)	Relay (male housing)	Testing connection use special tool Part No.
5			—
	Part No. :7861-74-5300	Part No. :7861-74-5100	

No. of pins	F type connector		
	Male (female housing)	Female (male housing)	
4	 BWP03905	 BWP03906	—
	—	—	

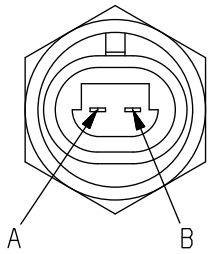
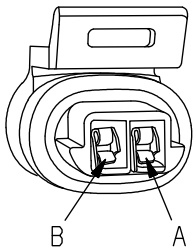
B4D18404

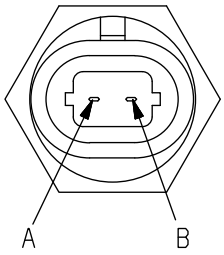
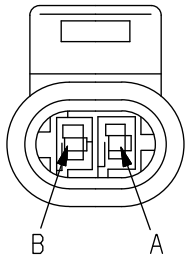
[The pin No. is also marked on the connector (electric wire insertion end)]

No. of pins	DRC26 Series connector		
	Male pin (female housing)	Female pin (male housing)	Testing connection use special tool Part No.
24	 BJD12722	 BJD12723	799-601-9360 (T-adapter) (Kit:799-601-9300)
	–	Part No. :08194-01101	
40 (A)	 BJD12724	 BJD12725	799-601-9350 (T-adapter) (Kit:799-601-9300)
	–	Part No. :08194-02101	
40 (B)	 BJD12726	 BJD12727	799-601-9350 (T-adapter) (Kit:799-601-9300)
	–	Part No. :08194-02102	
50	 9JS02951	 9JS02952	799-601-4211 (T-adapter) (Kit:799-601-4101)
	–	Part No. :08194-03103	

B4D18414

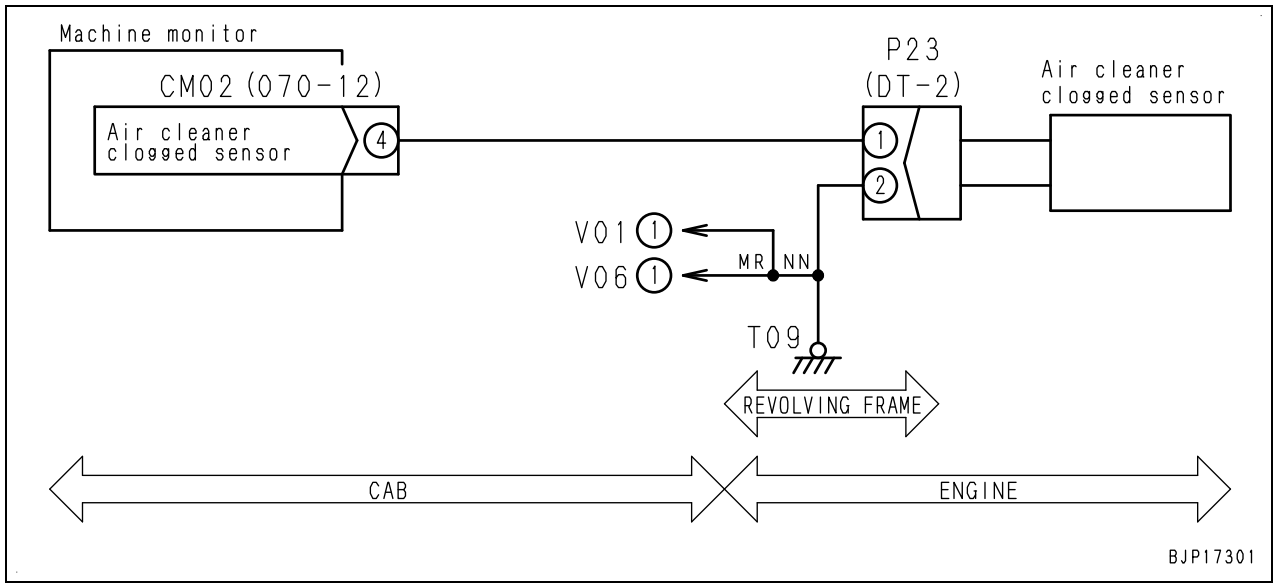
PACKARD conncetor for engine

No. of pins	Temperature sensor of coolant, fuel and lubricating oil (95, 107, 114, 125, 140, 170, 12V140 engine)		
	Sensor side (plug)	Harness side (receptacle)	Testing connection use special tool Part No.
2			795-799-5530 (Socket) (Kit : 799-601-4101) (Kit : 799-601-4201)
	☆ Non-polarity	—	

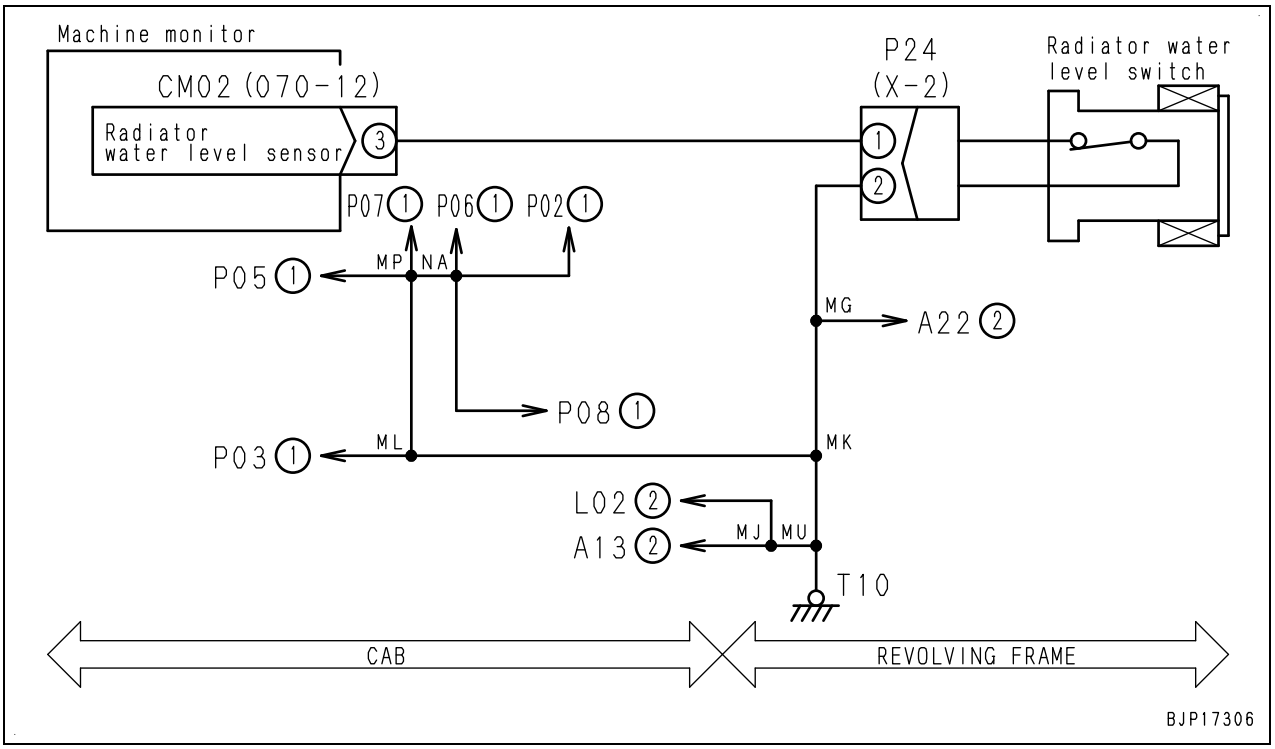
No. of pins	Boost (air intake) temperature sensor (125, 140, 170, 12V140 engine)		
	Sensor side (plug)	Harness side (receptacle)	
2			795-799-5540 (Socket) (Kit : 799-601-4101) (Kit : 799-601-4201)
	☆ Non-polarity	—	

B4D18424

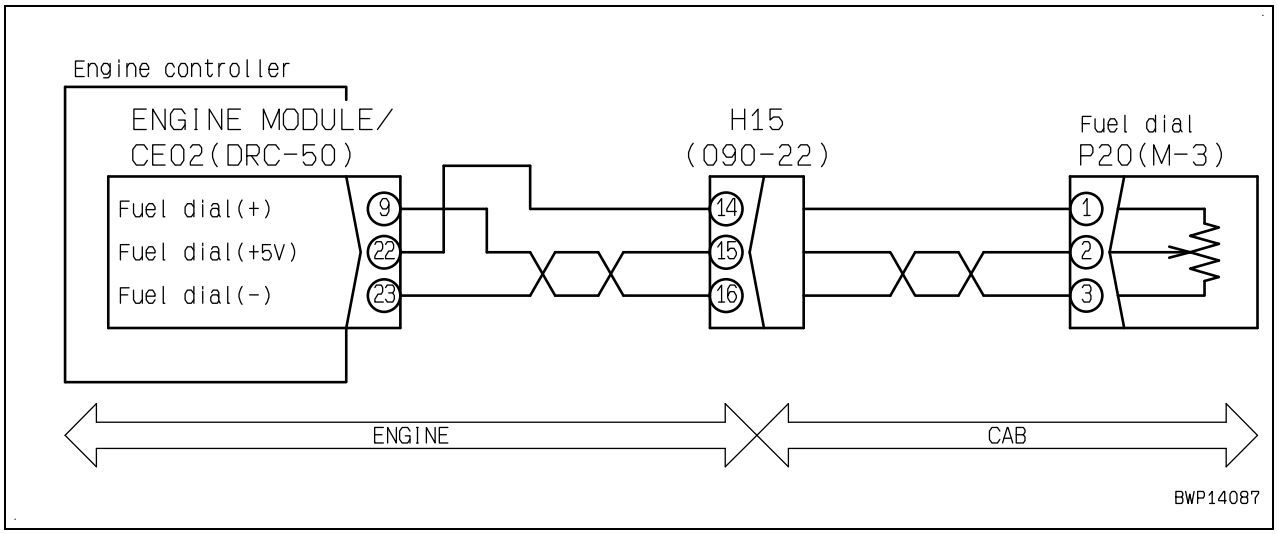
Circuit diagram related to air cleaner clogging switch of machine monitor



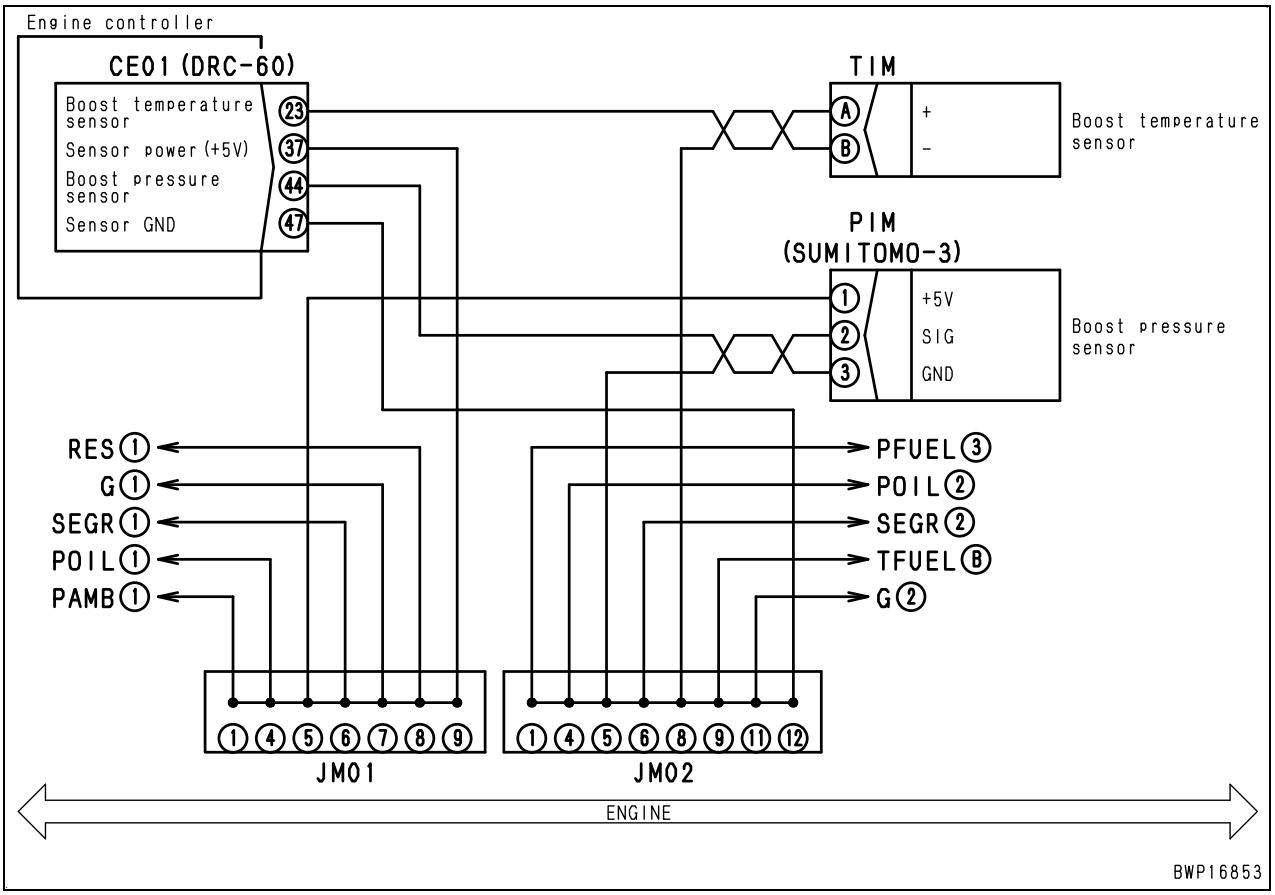
Circuit diagram related to radiator coolant level switch of machine monitor



Circuit diagram related to fuel control dial



Circuit diagram related to boost temperature sensor

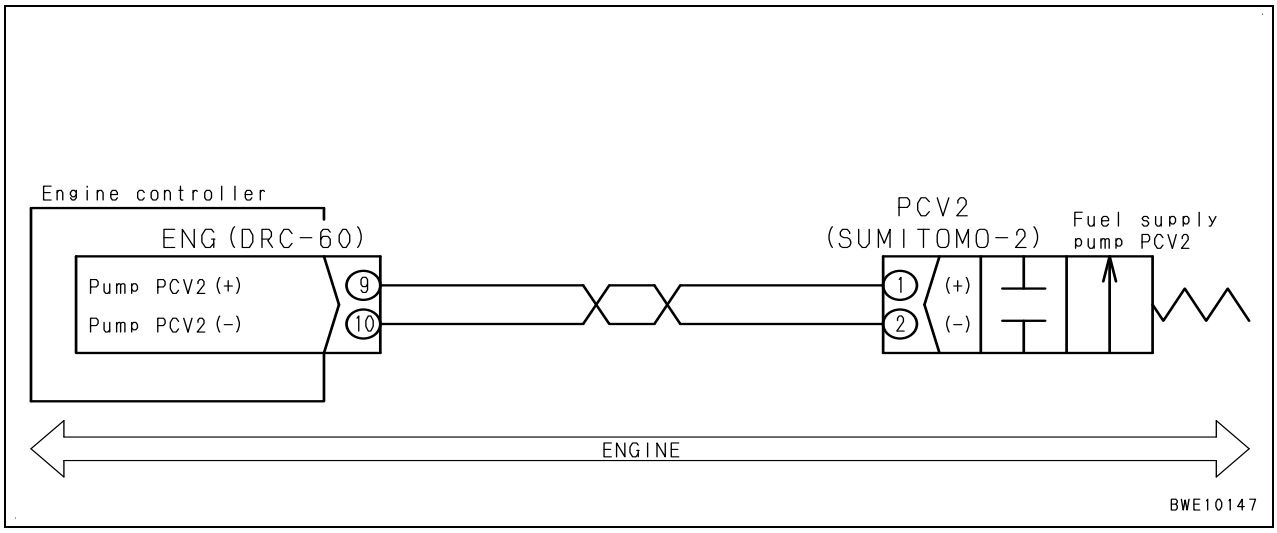


Failure code [CA234] Eng Overspeed

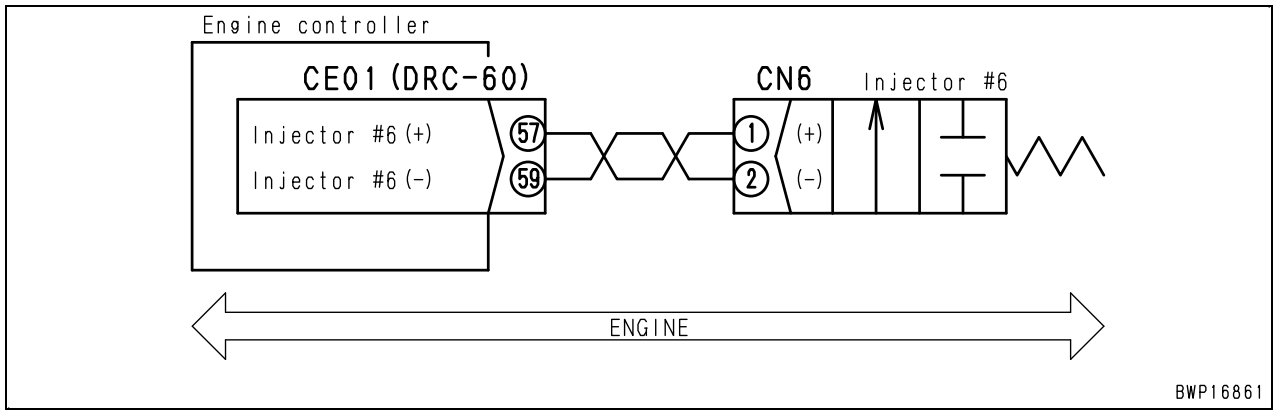
User code	Failure code	Trouble	Engine overspeed (Engine controller system)
—	**CA234**		
Contents of trouble	● Engine speed exceeded control upper speed limit.		
Action of controller	● Stops injection until engine speed lowers to normal level.		
Problem that appears on machine	● Engine speed fluctuates.		
Related information	● Method of reproducing failure code: Run engine at high idle.		

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Use of improper fuel	Fuel used may be improper. Check it directly.
	2	Improper use	Machine may be used improperly. Teach operator proper using method.
	3	Defective engine controller	If cause 1 is not detected, engine controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)

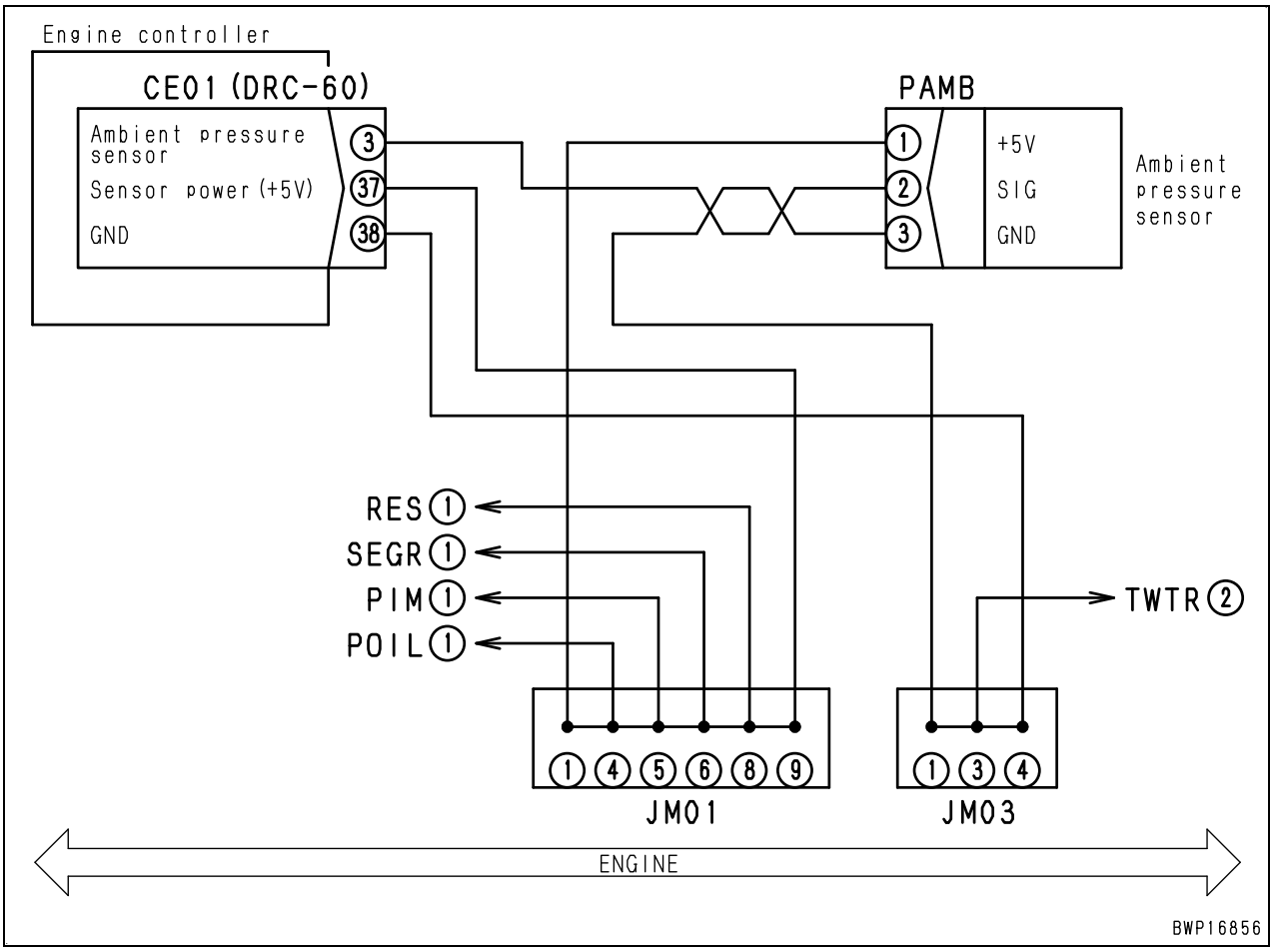
Circuit diagram related to supply pump PCV2



Circuit diagram related to injector No. 6

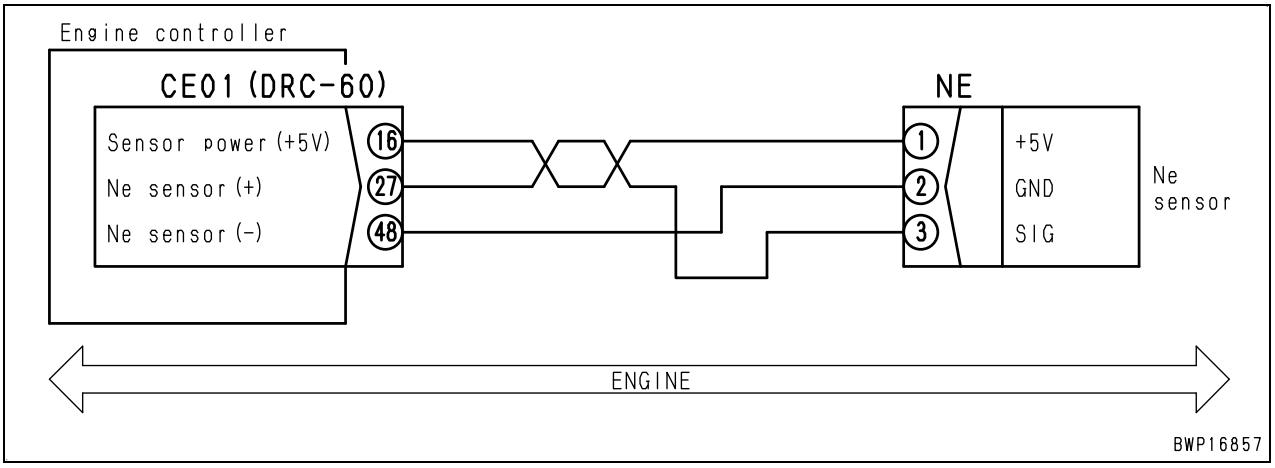


Circuit diagram related to sensor power supply 1



<table>
<tr><td rowspan="6">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">8</td><td rowspan="3">Short circuit in wiring harness
(with another wiring harness)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">Wiring harness between CE01 (female) (27) – NE (female) (3) and between CE01 (female) (16) – NE (female) (1)</td><td>Resistance</td><td>Min. 100 kΩ</td></tr>
<tr><td colspan="2">Wiring harness between CE01 (female) (27) – NE (female) (3) and between CE01 (female) (48) – NE (female) (2)</td><td>Resistance</td><td>Min. 100 kΩ</td></tr>
<tr><td>9</td><td>Defective wiring harness connector</td><td colspan="4">Connecting parts between engine Ne speed sensor – engine wiring harness – engine controller may be defective. Check them directly.
● Looseness of connector, breakage of lock, or breakage of seal
● Corrosion, bend, breakage, push-in, or expansion of pin
● Moisture or dirt in connector or defective insulation</td></tr>
<tr><td rowspan="3">10</td><td rowspan="3">Defective engine controller</td><td colspan="4">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="2">CE01</td><td colspan="2">Voltage</td></tr>
<tr><td colspan="2">Between (16) – (48)</td><td>Power supply</td><td>4.75 – 5.25 V</td></tr>
</table>

Circuit diagram related to engine Ne speed sensor

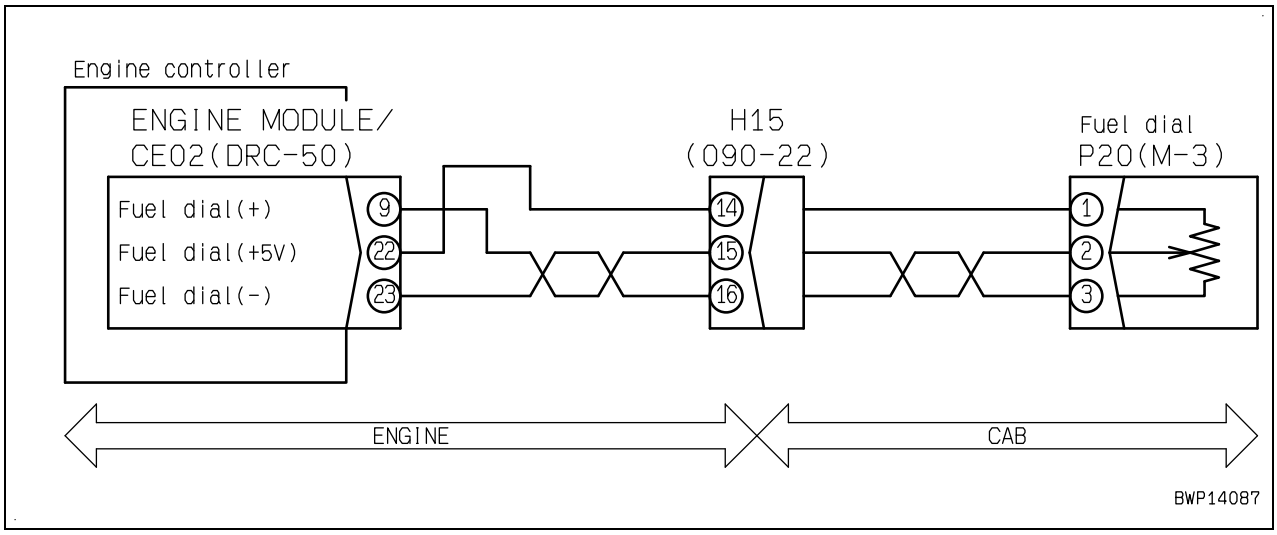


Failure code [CA2186] Throt Sens Sup Volt Low Error

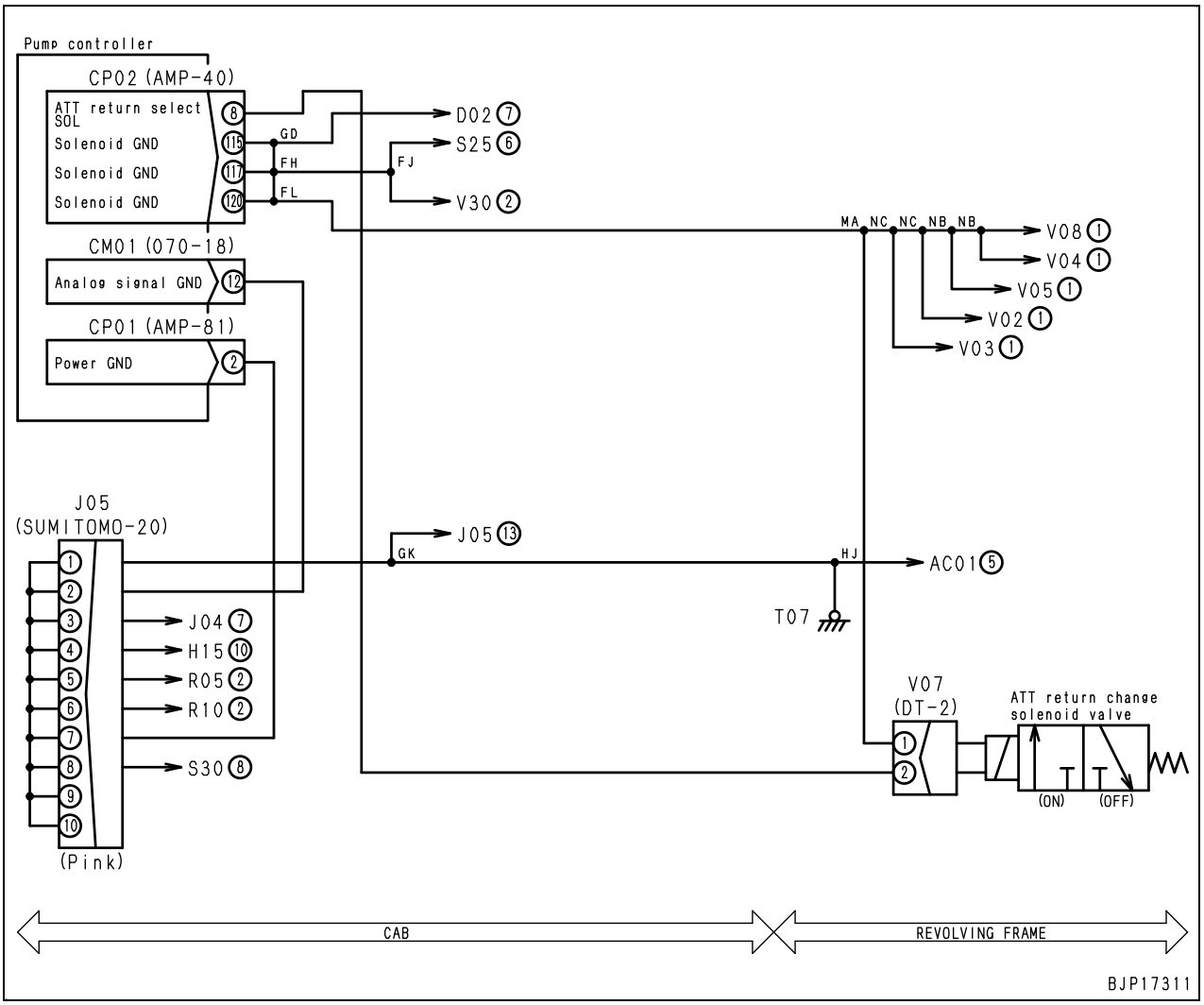
User code	Failure code	Trouble	Throttle sensor supply voltage low error (Engine controller system)
E14	**CA2186**		
Contents of trouble	● Low voltage was detected in throttle sensor power supply circuit.		
Action of controller	● If trouble occurs while starting switch is in ON position, controller fixes voltage value to level just before detection of trouble and continues operation. ● If starting switch is turned ON while voltage is abnormally high, controller continues operation with voltage at 100% value.		
Problem that appears on machine	● Engine speed cannot be controlled with fuel control dial.		
Related information	● Method of reproducing failure code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Ground fault in wiring harness (Short circuit with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between CE02 (female) (22) – P20 (female) (1) and chassis ground	Resistance	Min. 100 kΩ
	2	Short circuit in wiring harness (with another wiring harness)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Between CE02 (female) (9) – each of CE02 (female) pins (With P20 disconnected)	Resistance	Min. 100 kΩ
	3	Defective wiring harness connector	Connecting parts between fuel control dial – machine wiring harness – engine controller may be defective. Check them directly. ● Looseness of connector, breakage of lock, or breakage of seal ● Corrosion, bend, breakage, push-in, or expansion of pin ● Moisture or dirt in connector or defective insulation		
	4	Defective engine controller	If causes 1 and 3 are not detected, engine controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)		

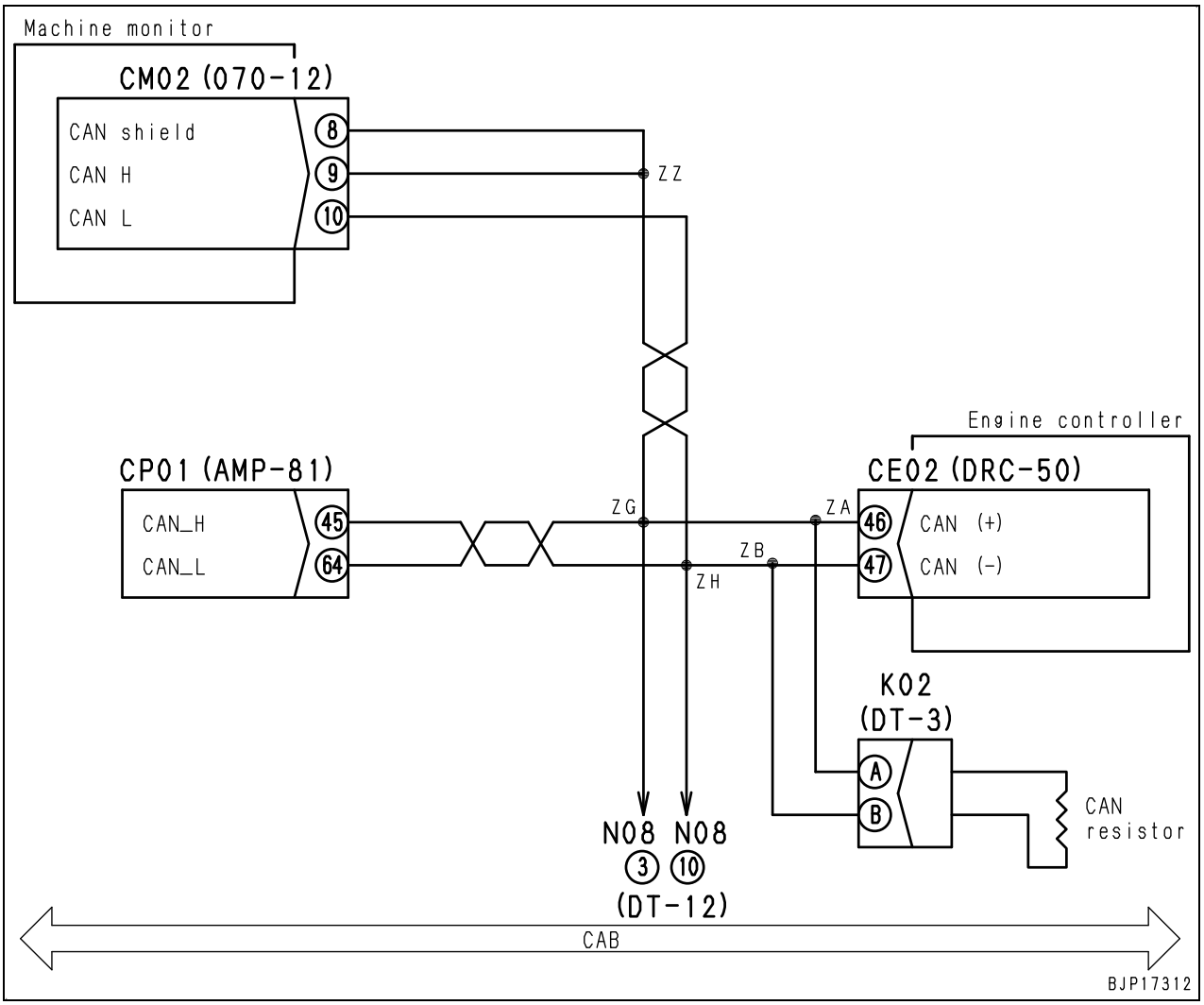
Circuit diagram related to fuel control dial



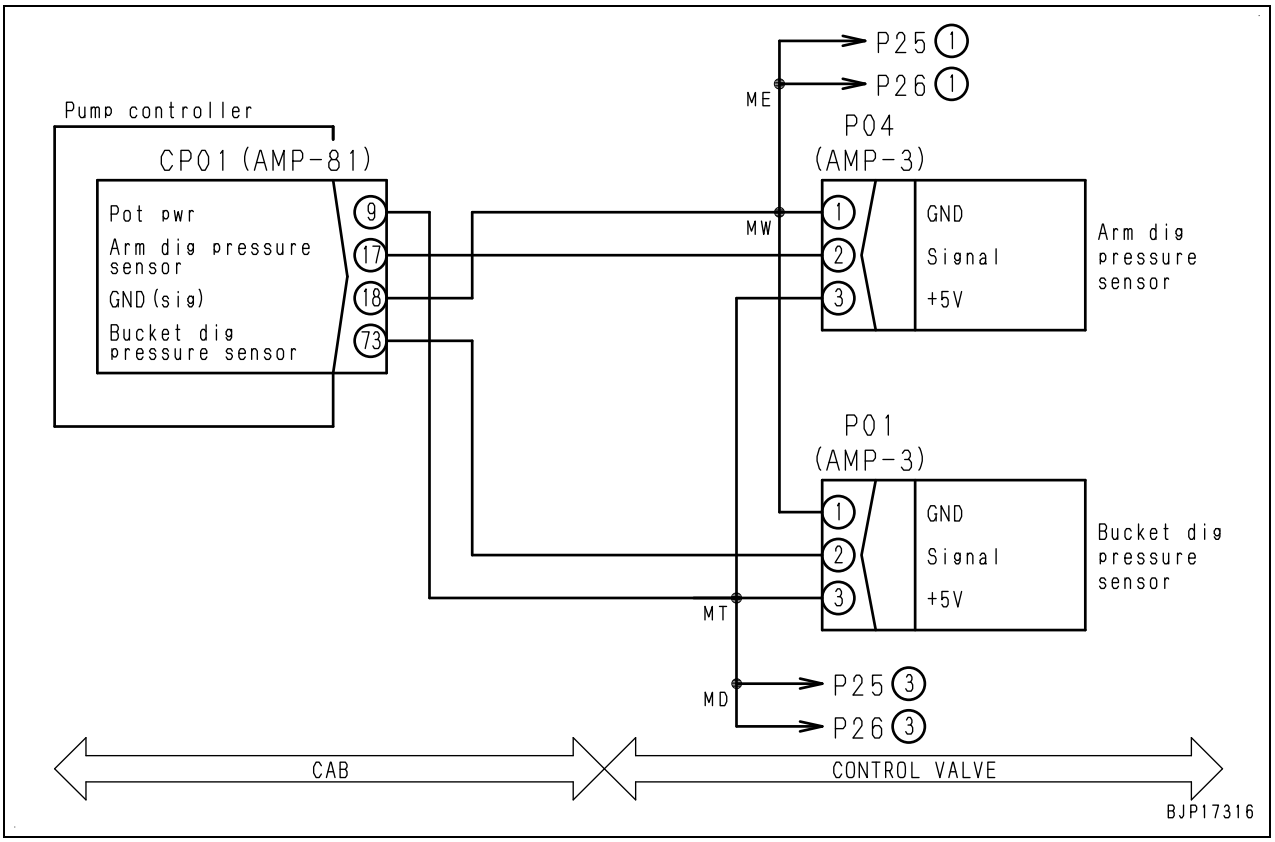
Circuit diagram related to service return relay and solenoid of pump controller



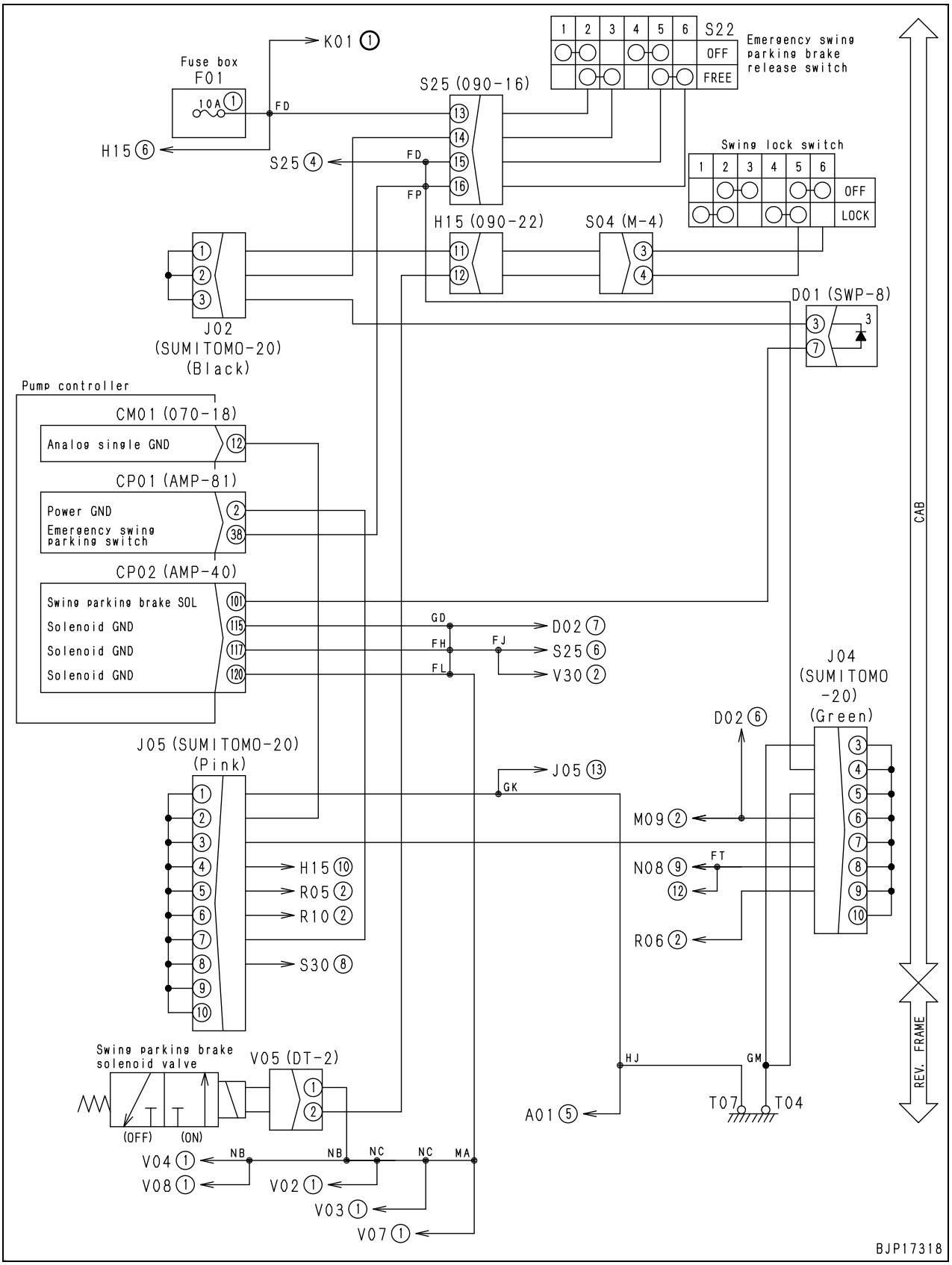
Circuit diagram related to CAN communication of machine monitor



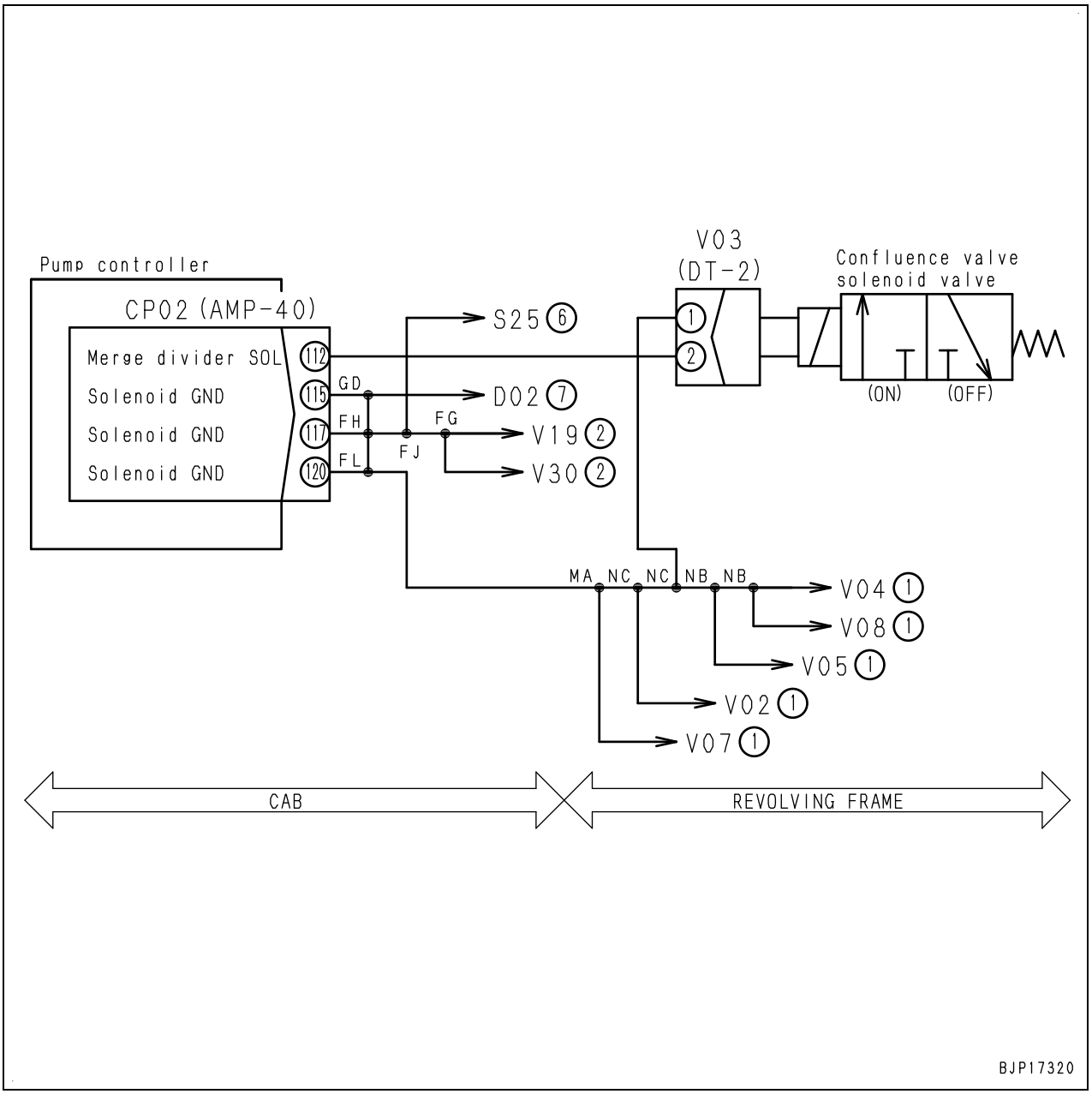
Circuit diagram related to bucket curl PPC pressure sensor of pump controller



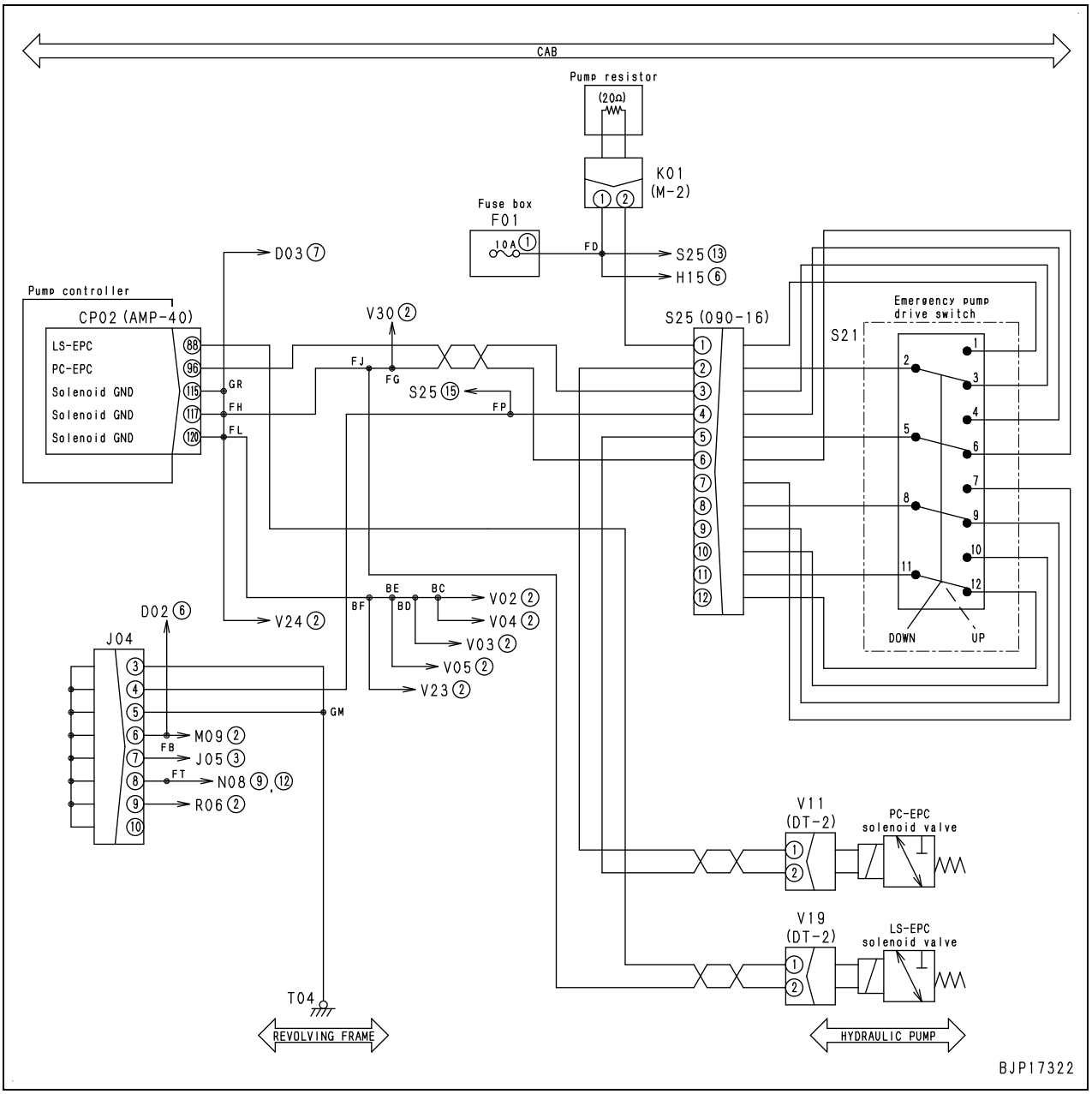
Circuit diagram related to swing holding brake solenoid of pump controller



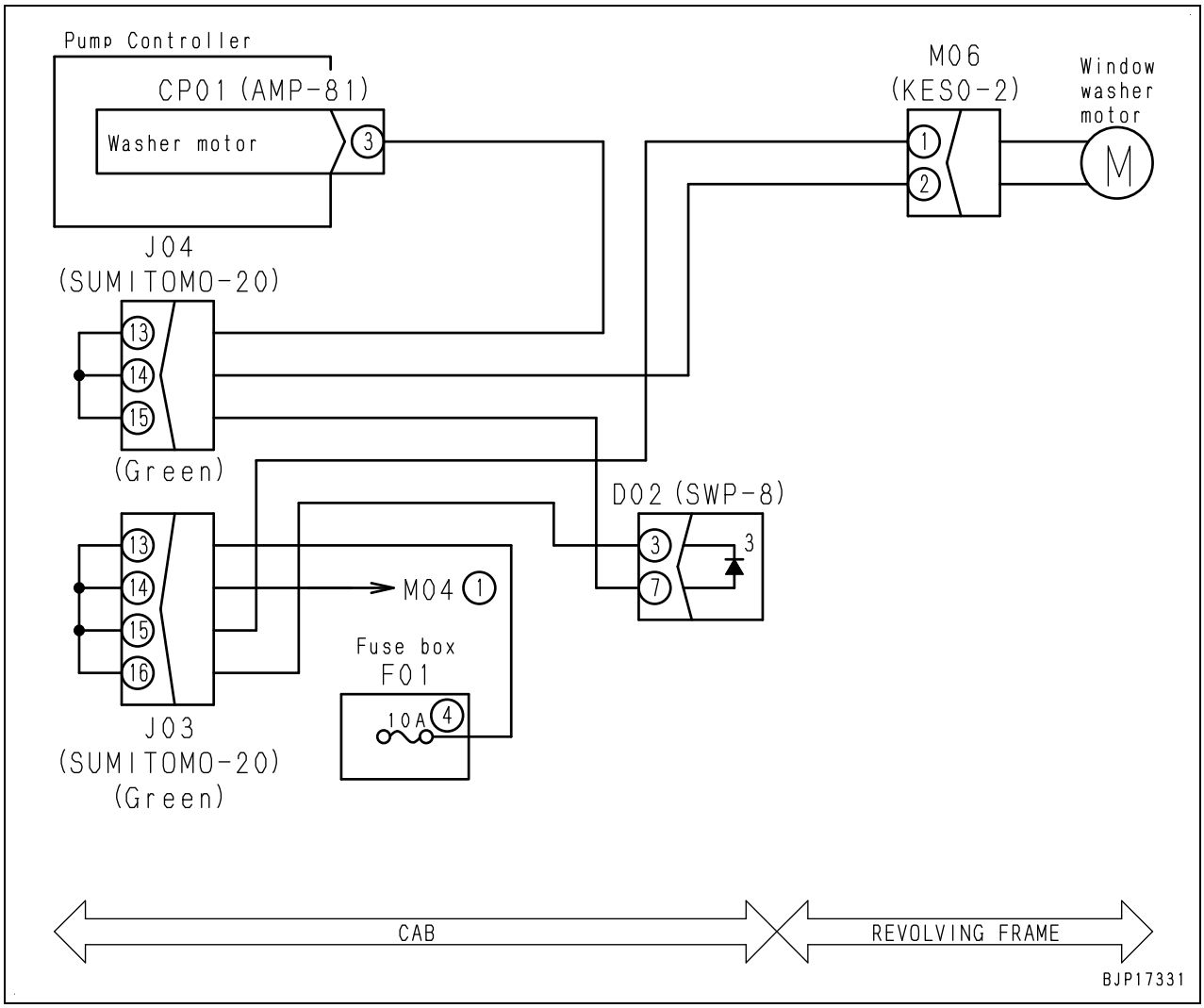
Circuit diagram related to merge-divider solenoid of pump controller



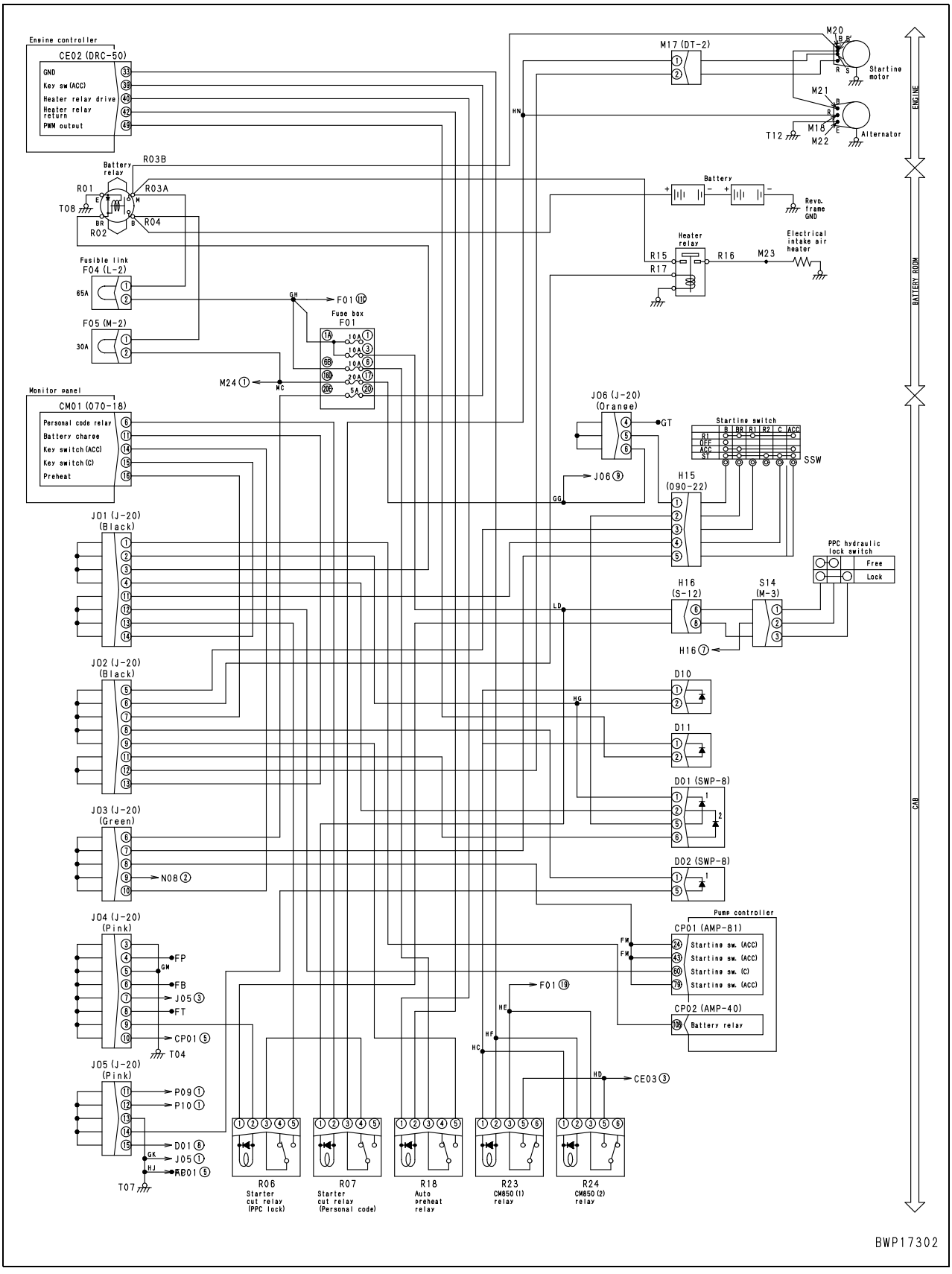
Circuit diagram related to LS-EPC and PC-EPC solenoids of pump controller



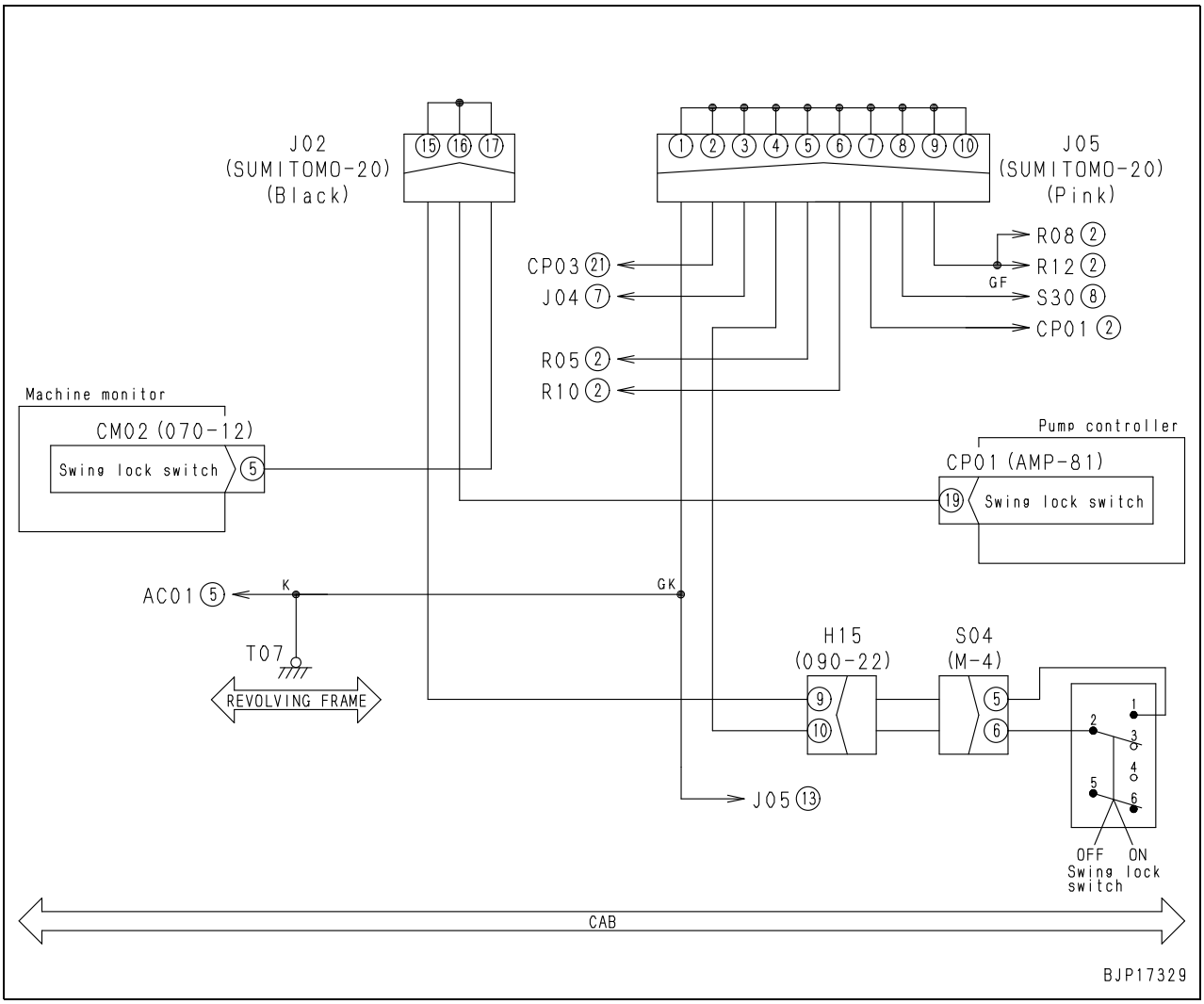
Circuit diagram related to window washer motor of machine monitor



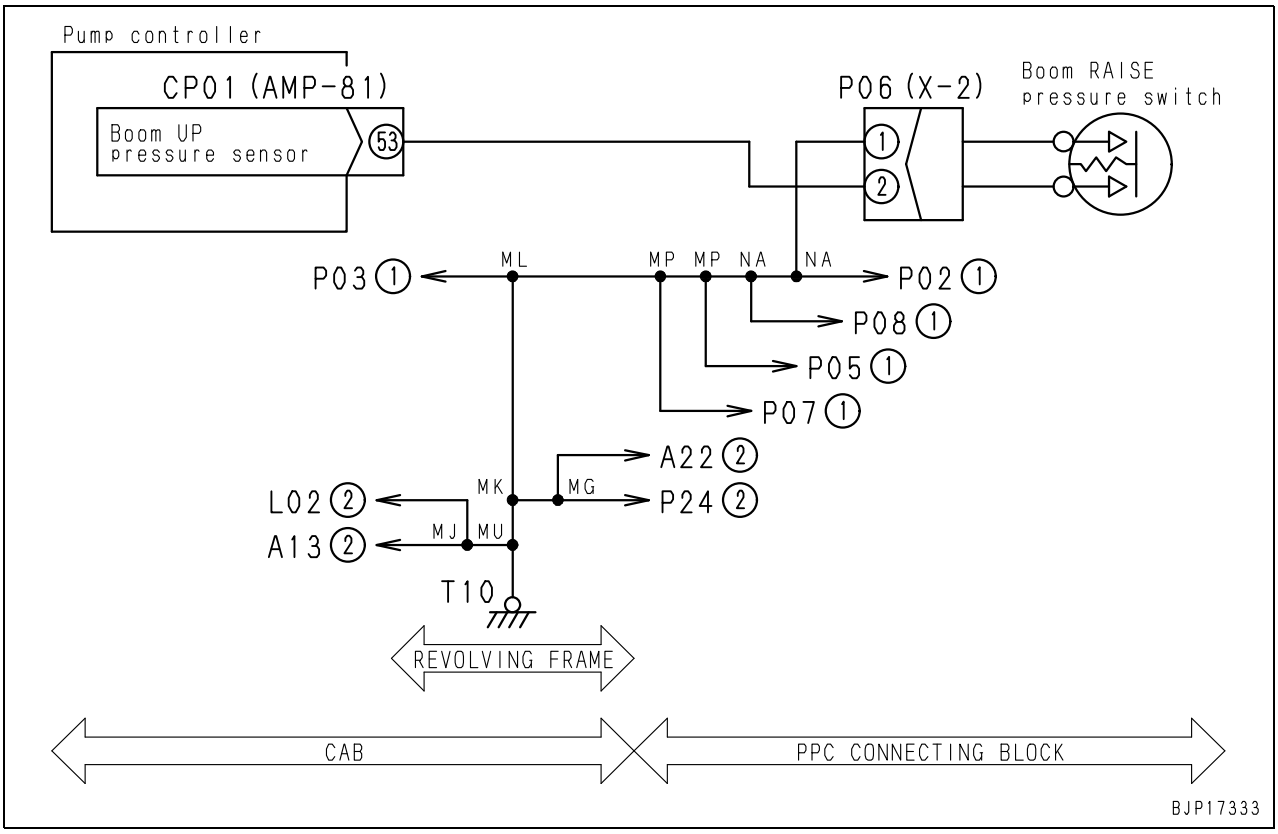
Circuit diagram related to engine start and battery charging



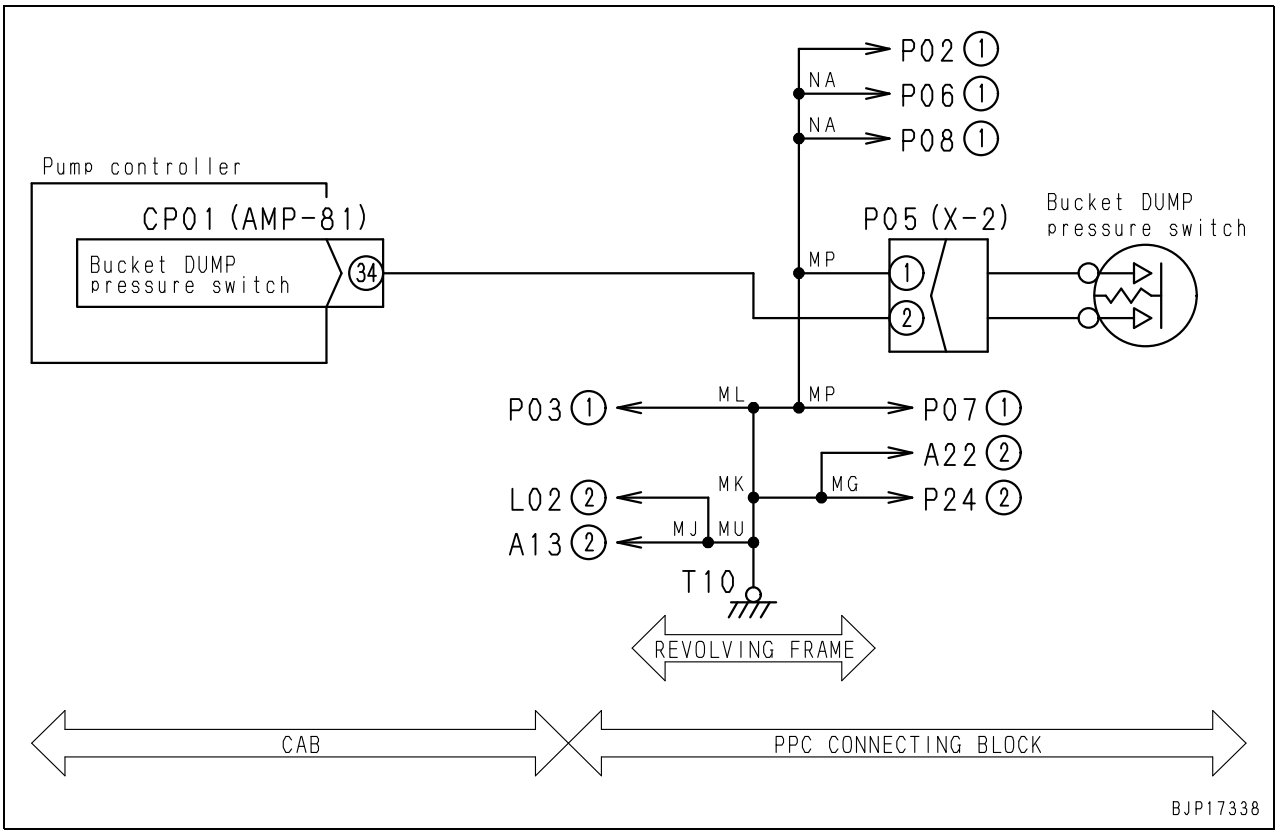
Circuit diagram related to swing lock switch



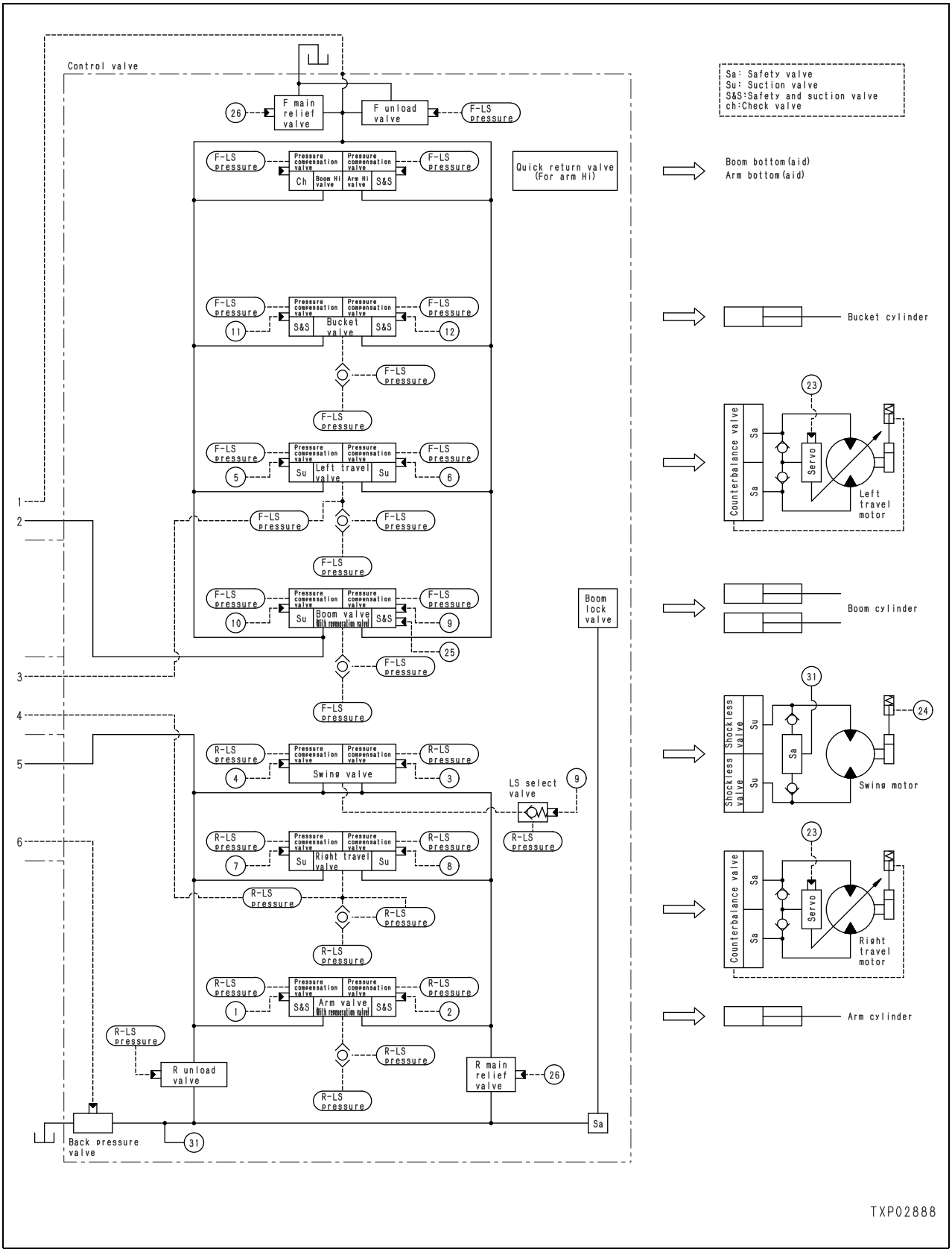
Circuit diagram related to boom RAISE PPC oil pressure switch



Circuit diagram related to bucket DUMP PPC oil pressure switch



★ This is a system chart that has been drawn up by simplifying the whole hydraulic circuit chart. Use it as a reference material when troubleshooting the hydraulic and mechanical system.



H-9 Bucket moves slowly or lacks power

Trouble	• Speed or power of bucket is low
Related information	• Set the working mode in P-mode before start.

<table>
<tr><td rowspan="9">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of right PPC valve (bucket circuit)</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>R.H. work equipment control lever</td><td>PPC valve output pressure</td></tr>
<tr><td>At neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>During bucket CURL operation
During bucket DUMP operation</td><td>Min. 2.7 MPa
{Min. 28 kg/cm^2}</td></tr>
<tr><td>2</td><td>Malfunction of bucket control valve (spool)</td><td colspan="2">Spool of bucket control valve may have malfunction. Check it directly.</td></tr>
<tr><td>3</td><td>Malfunction of bucket control valve (pressure compensation valve)</td><td colspan="2">Pressure compensation valve of bucket control valve may have malfunction. Check it directly.</td></tr>
<tr><td>4</td><td>Malfunction or defective seal of bucket control valve (safety-suction valve)</td><td colspan="2">Safety-suction valve of bucket control valve may have malfunction or defective seal. Check it directly.</td></tr>
<tr><td>5</td><td>Malfunction of LS shuttle valve (service)</td><td colspan="2">LS shuttle valve of service control valve may have malfunction. Check it directly.</td></tr>
<tr><td rowspan="3">6</td><td rowspan="3">Defective bucket cylinder</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Bucket cylinder</td><td>Leakage from cylinder</td></tr>
<tr><td>CURL relief</td><td>20 cc/min</td></tr>
</table>

H-10 Work equipment does not move in its single operation

Trouble	• Work equipment does not move singly	(1) Boom does not move singly. (2) Arm does not move singly. (3) Bucket does not move singly.
Related information	• Set the working mode in P-mode before start.	

<table>
<tr><td rowspan="6">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of PPC valve</td><td colspan="2">★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.</td></tr>
<tr><td>Work equipment control lever</td><td>PPC valve output pressure</td></tr>
<tr><td>At neutral</td><td>0 MPa {0 kg/cm^2}</td></tr>
<tr><td>Operated</td><td>Min. 2.75 MPa
{Min. 28 kg/cm^2}</td></tr>
<tr><td>2</td><td>Malfunction of control valve (spool)</td><td colspan="2">Spool of control valve may have malfunction. Check it directly.</td></tr>
</table>

H-23 Travel system does not move (only one side)

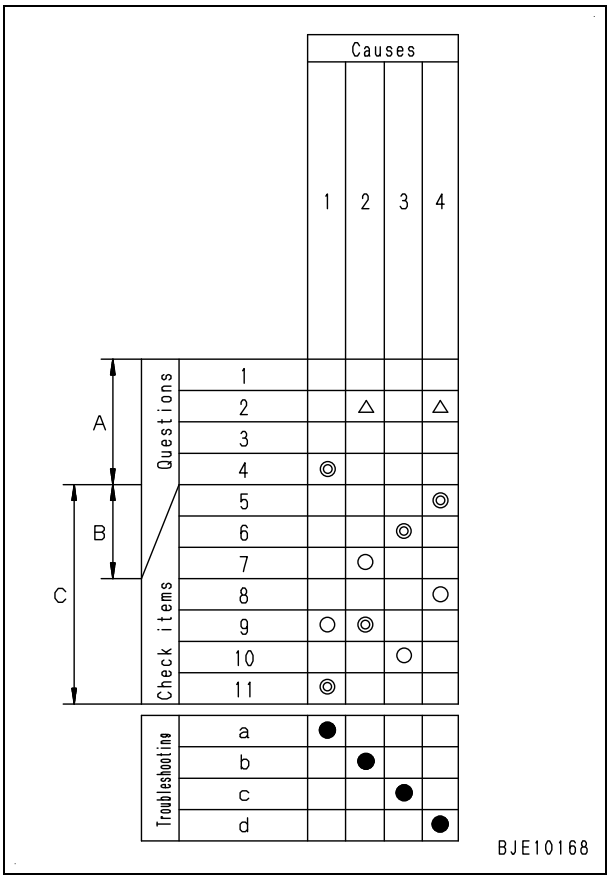
Trouble	• Travel system does not move (only one side).
Related information	• Set the working mode in P-mode before start.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Defective seal of travel control valve (suction valve)	Suction valve of travel control valve may have defective seal. Check it directly.	
	2	Defective seal of travel motor (safety valve)	Safety valve of travel motor may have defective seal. Check it directly.	
	3	Defective seal of travel motor (check valve)	Check valve of travel motor may have defective seal. Check it directly.	
	4	Lowering of travel motor output	★ Prepare with engine stopped, then run engine at high idle and carry out troubleshooting.	
			Travel lever	Leakage from travel motor
			Travel relief	Max. 40 ℓ/min
	5	Defective final drive	Final drive may have internal defect. Check it directly. (It may be checked by abnormal sound, abnormal heating, metal chips in drain oil, etc.)	

Troubleshooting of engine (S-mode)

Method of using troubleshooting chart

The troubleshooting chart consists of the "questions", "check items", "causes", and "troubleshooting" blocks.
The questions and check items are used to pinpoint high probability causes by simple inspection or from phenomena without using troubleshooting tools.
Next, troubleshooting tools or direct inspection are applied to check the narrowed causes in order from the most probable one to make final confirmation according to the troubleshooting procedure.
[Questions]
Items to be drawn from the user or operator. They correspond to **A** and **B** in the chart on the right. The items in **A** are basic ones. The items in **B** can be drawn from the user or operator, depending on their level.
[Check items]
Simple check items used by the serviceman to narrow the causes. They correspond to **C** in the chart on the right.
[Causes]
Items to be narrowed from the questions and check items. The serviceman narrows down the probable causes from **A**, **B**, and **C**.
[Troubleshooting]
Items used to find out the true cause by verifying the narrowed causes finally in order from the most probable one by applying troubleshooting tools or direct inspection.



Items listed in the [Questions] and [Check items] and related to the [Causes] are marked with △, ○, and ◎.
△: Causes to be referred to for questions and check items
○: Causes related to questions and check items
◎: Causes highly probable among ones marked with ○

★ When narrowing the "causes", apply the items marked with ◎ before those marked with ○.
When narrowing the causes, do not apply the items marked with △. (If no items have other marks and the causes cannot be narrowed, however, you may apply them.)

S-6 Engine lacks output (or lacks power)

General causes why engine lacks output

- Insufficient intake of air
- Insufficient supply of fuel
- Defective condition of fuel spray
- Improper selection of fuel
- There is overheating:
  See "S-14 Coolant temperature becomes too high (Overheating)"
- Controller is controlling in derate mode
  (limiting injection rate (output) because of an error in electrical system)

			Cause																
			Clogged air cleaner element	Air leakage from air intake piping	Seized turbocharger, interference of turbocharger	Defective contact of valve and valve seat	Improper valve clearance	Excessive wear of piston ring, cylinder liner	Clogged air breather hole of fuel tank cap	Leaking, clogged fuel piping	Clogged fuel filter, strainer	Clogged feed pump gauze filter	Stuck, seized supply pump plunger	Clogged injector, defective spray (dirt in injector)	Defective drive of injector (signal, solenoid)	Defective installation of charge air pressure sensor (air leakage)	Defective charge air pressure sensor, wiring harness	Defective fuel temperature sensor, wiring harness
Questions	Confirm recent repair history																		
	Degree of use of machine	Operated for long period	△			△		△			△	△							
	Power was lost	Suddenly		○											○	○	○		
		Gradually	○			○		○			○	○		○		○			
	Non-specified fuel is being used										○	○							
	Replacement of filters has not been carried out according to Operation and Maintenance Manual		◎																
	Engine oil must be added more frequently					○	○	○											
Check items	Dust indicator is red (if indicator is installed)		◎																
	Air breather hole of fuel tank cap is clogged								◎										
	Fuel is leaking from fuel piping									◎									
	Output becomes insufficient after short stop of operation																		◎
	Color of exhaust gas	Black	◎	◎															
		Blue under light load			◎														
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low													◎					
	When engine is cranked, interference sound is generated around turbocharger			◎															
	When engine is cranked, abnormal sound is generated around cylinder head						◎												
	High idle speed is too low														○				
	High idle speed under no load is normal, but speed suddenly drops when load is applied										◎	◎	○						
	Engine does not pick up smoothly and combustion is irregular			◎					○	○				◎					
	There is hunting from engine (rotation is irregular)								○	○	○	○							
	Blow-by gas is excessive				◎														
Troubleshooting	Inspect air cleaner directly		●																
	Inspect air intake piping directly			●															
	When boost pressure is measured, it is found to be low		●	●	●														
	When compression pressure is measured, it is found to be low					●		●											
	Inspect valve clearance directly						●												
	Inspect fuel filter, strainer directly										●								
	Inspect gauze filter of feed pump directly											●							
	Carry out troubleshooting for "Rail Press (Very) Low Error. (*1)" See *1 for failure code.												●						
	When a cylinder is cut out for reduced cylinder mode operation, engine speed does not change													●	●				
	Inspect boost pressure sensor mount directly															●			
	Carry out troubleshooting for "Chg Air Press Sensor High (Low) Error. (*2)" See *2 for failure code.																●		
	Carry out troubleshooting for "Fuel Temp Sensor High (Low) Error. (*3)" See *3 for failure code.																		●
		Remedy	Clean	Correct	Replace	Replace	Adjust	Replace	Clean	Correct	Replace	Clean	Replace	Replace	Replace	Replace	Correct	Replace	Replace

*1: Failure codes **[CA559]** and **[CA2249]**
*2: Failure codes **[CA122]** and **[CA123]**
*3: Failure codes **[CA263]** and **[CA265]**

S-16 Vibration is excessive

General causes why vibration is excessive

- Defective parts (abnormal wear, breakage)
- Misalignment between engine and chassis
- Abnormal combustion

★ If abnormal noise is made and vibration is excessive, carry out troubleshooting for "S-15 Abnormal noise is made", too.

			Cause							
			Stuck dynamic valve system (valve, rocker lever)	Worn main bearing, connecting rod bearing	Improper gear train backlash	Worn camshaft bushing	Improper fuel injection timing	Loose engine mounting bolts, broken cushions	Misalignment between engine and devices on machine side	Broken parts inside damper
Questions	Confirm recent repair history									
	Degree of use of machine	Operated for long period		△		△		△		
	Condition of vibration	Suddenly increased	○							○
		Gradually increased		○		○		○		
	Non-specified fuel is being used			○		○				
Check items	Metal particles are found when oil filter is drained			◎		◎				
	★ Metal particles are found when oil pan is drained			◎		◎				
	Oil pressure is low at low idle			○		○				
	Vibration occurs at mid-range speed							○		○
	Vibration follows engine speed				○			○	○	○
	Exhaust smoke is black		◎							
Troubleshooting	Inspect dynamic valve system directly		●							
	Inspect main bearing and connecting rod bearing directly			●						
	Inspect gear train directly				●					
	Inspect camshaft bushing directly					●				
	Check with monitoring function of machine monitor						●			
	Inspect engine mounting bolts and cushions directly							●		
	When alignment is measured, radial runout or facial runout is detected								●	
	Inspect inside of damper directly									●
		Remedy	Replace	Replace	Replace	Replace	Adjust	Replace	Adjust	Correct

Special tools list

★ Tools with part number 79○T-○○○-○○○○ cannot be supplied (they are items to be locally manufactured).

★ Necessity:
- ■ ……. Cannot be substituted, must always be installed (used)
- ● ……. Extremely useful if available or can be substituted with commercially available part

★ New/Redesign:
N : .....Tools with new part numbers, newly developed for this model
R : .....Tools with upgraded part numbers, remodeled from items already available for other models
Blank : .....Tools already available for other models, can be used without any modification

★ Tools marked with ○ in the Sketch column are tools introduced in the sketches of the special tools (See Sketches of special tools).

Component	Symbol		Part number	Part name	Necessity	Q'ty	New/remodel	Sketch	Nature of work, remarks
Fuel supply pump	A	**1**	795-630-5500	Standard puller	■	1			Removal of fuel supply pump
		2	01010-81080	Bolt	■	2			
		3	01643-31032	Washer	■	2			
Rear oil seal		4	795-931-1100	Seal puller assembly	●	1			Removal of rear oil seal
		5	795-931-1210	Sleeve jig tool	■	1			Press fitting of rear oil seal
		6	795-931-1220	Sleeve jig tool	■	1			
		7	01050-31645	Bolt	■	3			
		8	01050-31625	Bolt	■	3			
Angle tightening of bolt		9	790-331-1110	Wrench	●	1			
Engine valve clearance		10	795-125-1360	Clearance gauge	●	1			Adjustment of engine valve clearance
Engine and hydraulic pump assembly	B		796T-601-1110	Stopper	■	1		○	Removal, installation of engine mounting bolt
	C		796-460-1210	Oil stopper	●	1			Stopping of oil
			796-770-1320	Adapter	●	1			
Swing motor and swing machinery assembly	D	**1**	796T-627-1630	Push tool	●	1		○	Removal of shaft
		2	790-201-2350	Push tool	■	1			Removal of bearing
		3	790-201-2510	Push tool	■	1			Press fitting of bearing
		4	790-101-5401	Push tool kit	■	1			Press fitting of oil seal
			790-101-5531	● Plate		1			
			790-101-5421	● Grip		1			
			01010-51240	● Bolt		1			
		5	790-201-2870	Push tool	■	1			Press fitting of bearing inner race
		6	790-201-2770	Push tool	■	1			Press fitting of bearing inner race
		7	796T-626-1110	Push tool	■	1		○	Press fitting of bearing
Final drive assembly	E	**1**	796-627-1210	Wrench assembly	■	1			Removal, installation of round nut
			796-627-1220	● Wrench		1			
			796-427-1140	● Pin		3			
			01314-20612	● Screw		3			
		2	796T-627-1230	Push tool	■	1		○	Pressing of bearing inner race
			790-101-2510	Block	●	1			
			791-122-1130	Plate	●	1			
			790-101-2550	Leg	●	2			
			790-101-2740	Adapter	●	2			
			790-101-2570	Plate	●	4			
			790-101-2560	Nut	●	2			
			790-101-2102	Puller (294 kN {30 t})	■	1			
			790-101-1102	Pump	■	1			
		3	796-627-1020	Installer	■	1			Installation of floating seal
		4	796T-627-1850	Guide	■	1	N	○	Installation of hub assembly

Installation

★ Carry out installation in the reverse order to removal.

[*1]
Tighten clamp (13) with the hand first, and then tighten it permanently.
Clamp mounting bolt:
11.8 – 14.7 Nm {1.2 – 1.5 kgm}

[*2]
Install high-pressure tube (14) by tightening by hand, then tighten it permanently.
Sleeve nut of the high-pressure tube:
Common rail side:
39.2 – 58.8 Nm {4 – 6 kgm}
Pump side: **39.2 – 49 Nm {4 – 5 kgm}**
★ Face the common rail side slit of the splash prevention cover downward and the supply pump side slit toward the cylinder block.

[*3]
Joint bolt of tube (15):
25.5 – 34.3 Nm {2.5 – 3.5 kgm}

[*4]
Gear mounting nut:
127 – 147 Nm {13 – 15 kgm}
★ Match the key and keyway to install.

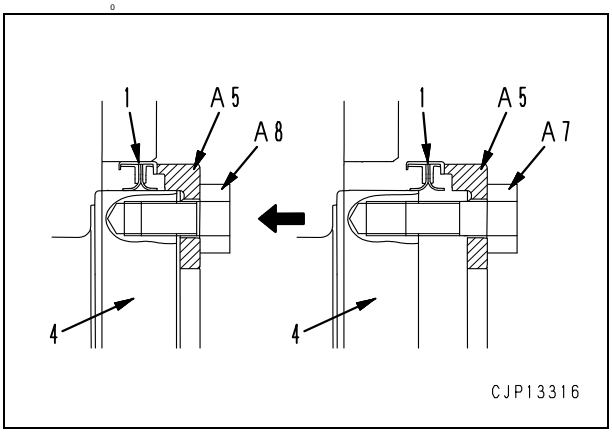
[*5]
Joint bolt of pump side:
24.5 – 34.3 Nm {2.5 – 3.5 kgm}

[*6]
Mounting bolt: **Gasket sealant (LT-2)**

- **Fuel leak check**
  Refer to the paragraph on the "Checking fuel circuit for leakage" in Testing and adjusting, and check the fuel system for any leakage accordingly.

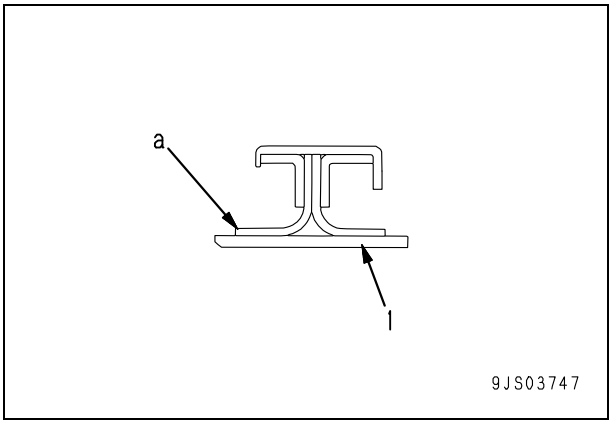
- **Air bleeding**
  Refer to the paragraph on the "Bleeding air from fuel circuit" in Testing and adjusting, and bleed the air accordingly.

★ After press fitting the seal, remove the red sealant layer from its periphery.

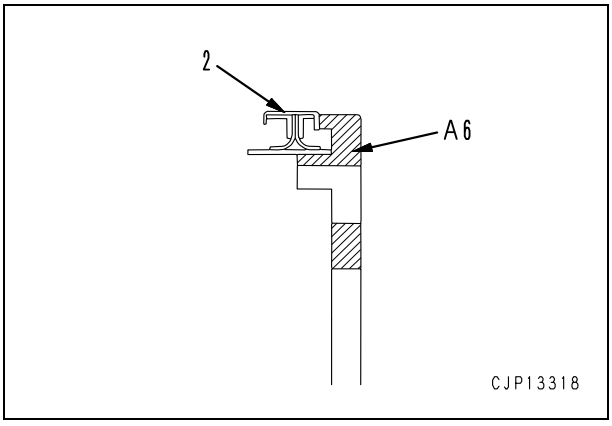


Procedure for installing sleeved seal

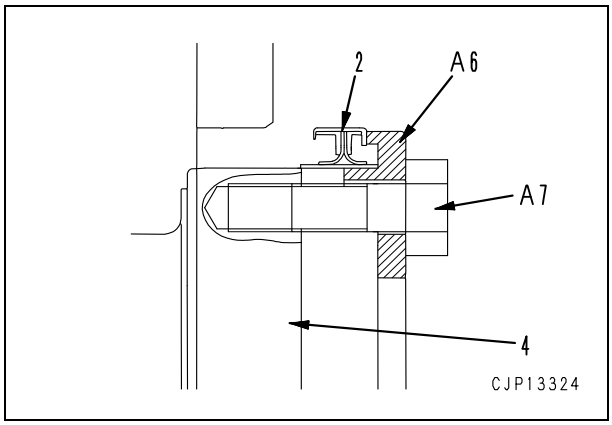
★ Before installing the seal, make sure that the end corners and lip sliding surfaces of crankshaft are free from housing flaws, burrs, sharp edges and rusts, etc.
★ When installing the seal, do not apply oil or grease to between shaft, sleeve (1), and seal lip (a). Wipe off oil from the shaft.
★ Handle the seal and sleeve as an assembly and don't separate them from each other.



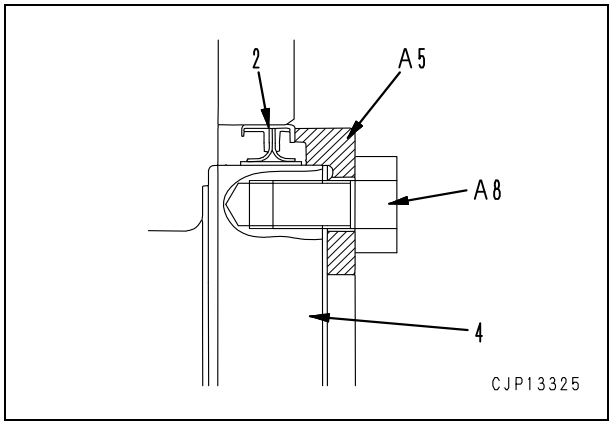
1) Set the sleeve seal assembly (2) to tool **A6**.
   Sleeve inner cylinder surface: **Gasket sealant (LG-7)**



2) Set the sleeve of the seal to the end of the crankshaft, and then tighten the bolt **A7** evenly to press fit sleeve and seal assembly (2) until the end of tool **A6** reaches the end of crankshaft (4).



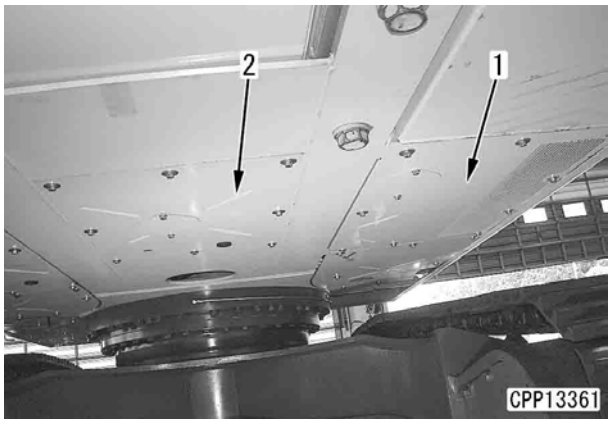
3) Remove tool **A6** and install tool **A5**.
4) Tighten the bolts **A8** evenly to press fit seal assembly (2) until the end of tool **A5** reaches the end of crankshaft (4).
   ★ After press fitting the seal, remove the red sealant layer from its periphery.



Removal and installation of radiator assembly

Removal

1. Remove covers (1) and (2).

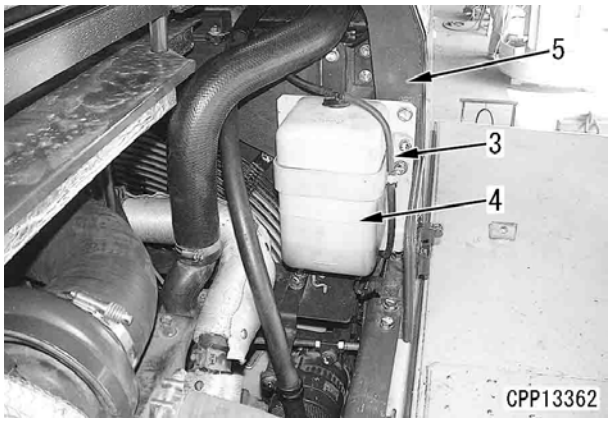


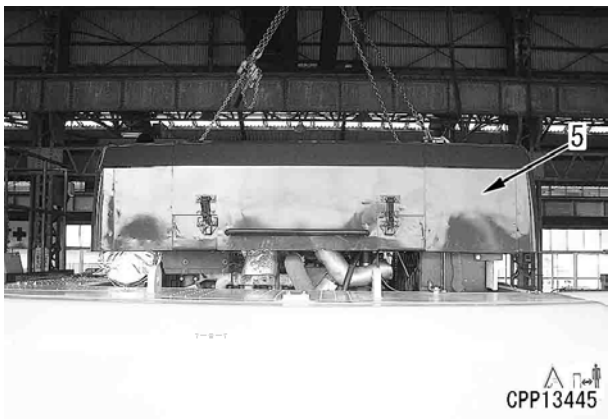
2. Drain coolant.

   Coolant: **Approx. 36 ℓ**

3. Disconnect connector (P24) and overflow tube (3) and remove the sub-tank (4).
4. Remove the mounting bolt and then hoist the engine hood assembly (5) to remove.

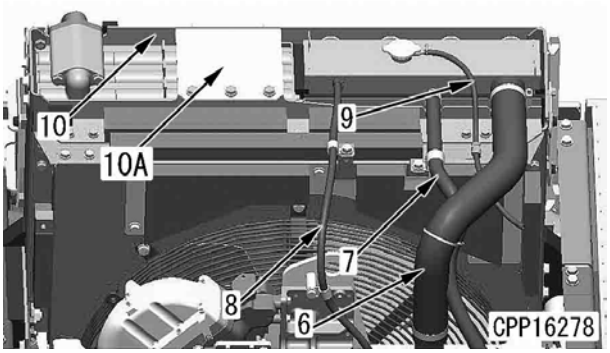
   Engine hood: **200 kg**



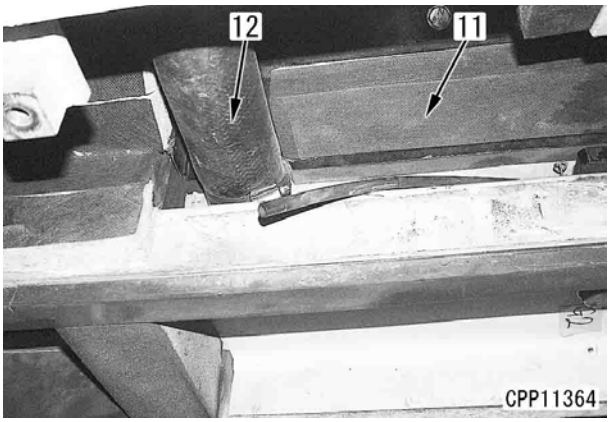


5. Remove the clamp and hoses (6), (7), (8) and (9) between the radiator and the engine. [*1]

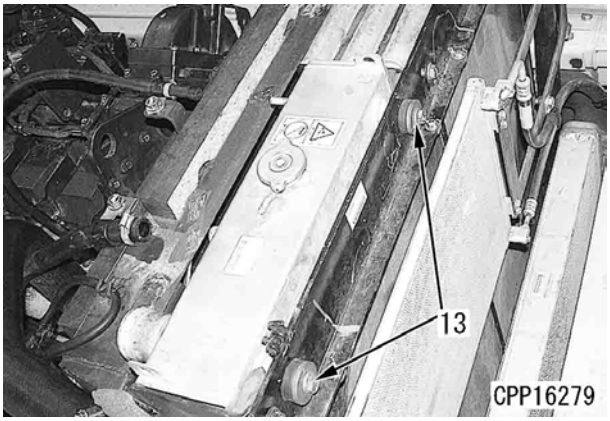
6. Remove radiator front covers (10), (10A).

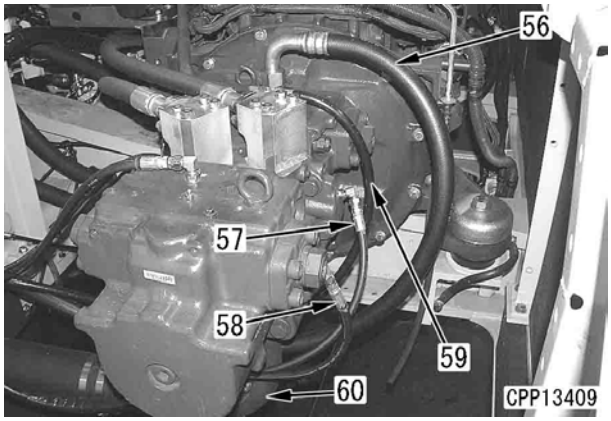


7. Remove undercover.
8. Remove cover (11).
9. Disconnect the lower hose (12).

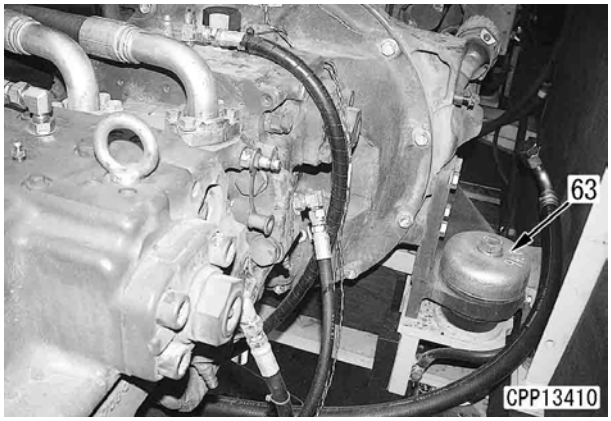


10. Remove 2 upper mounting bolts (13).



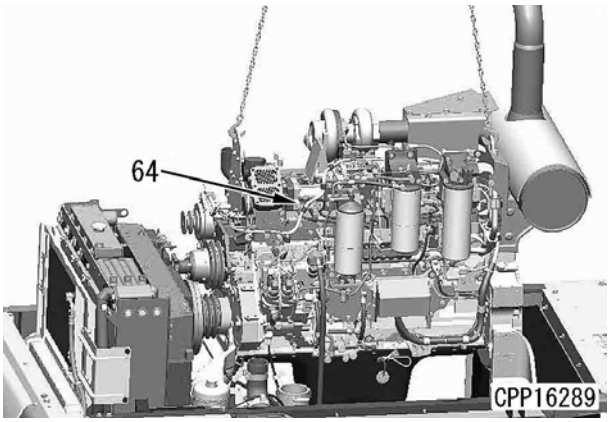


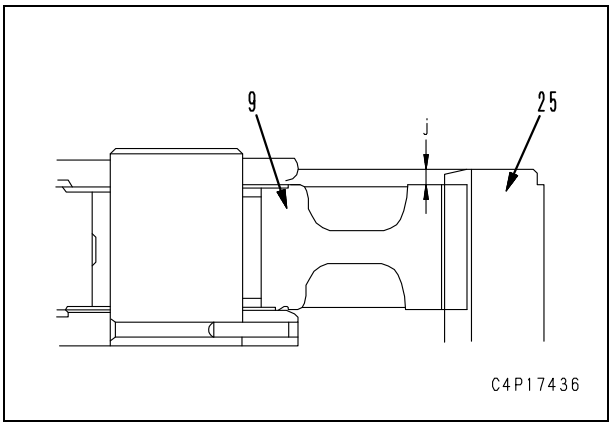
35. Using tool **B**, remove 4 engine mount bolts (63) in front and rear. [*5]
    ★ Easier to remove if nuts are heated by gas.



36. Hoist to remove engine assembly (64).
    ★ Remove after checking that wiring, piping clamps, etc. are disconnected without omission.

    Engine, hydraulic pump assembly: **1,700 kg**



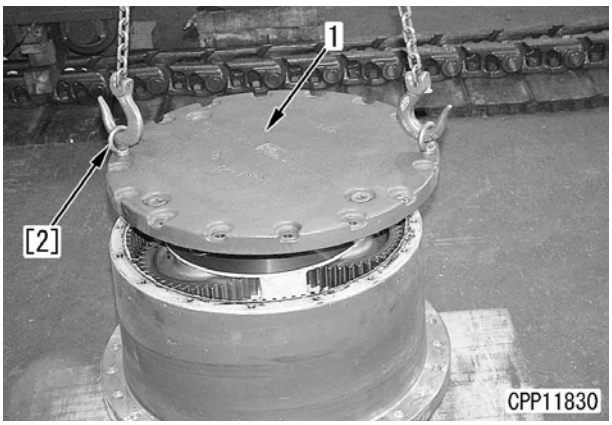


9. Cover

Using eyebolts [2], install cover (1) and tighten the bolts.

Cover mounting face:
Liquid gasket (LG-6)

Mounting bolt:
98 – 123 Nm {10.0 – 12.5 kgm}



- **Refilling (final drive case)**
  - ★ Tighten the drain plug and add oil through the oil filler port.
    - Final drive case (power train oil): **11 ℓ** (specified capacity: **11 ℓ**) (For details, see "Table of fuel, coolant and lubricants")
  - ★ Do a final check of the oil level at the determined position after installing the final drive assembly to the chassis.

Undercarriage and frame

Separation and connection of track shoe assembly

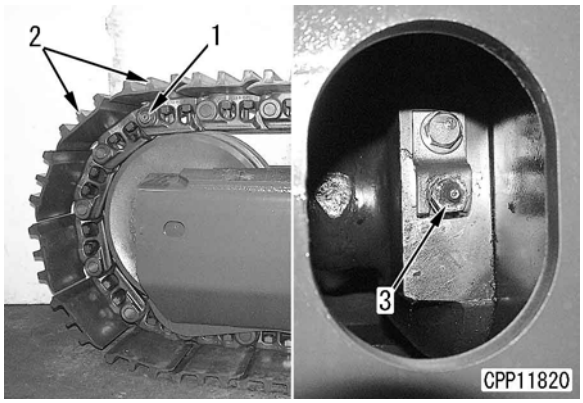
Special tools

Symbol	Part number	Part name	Necessity	Q'ty
K	791-650-3000	Remover and installer	■	1
	790-101-1300	Cylinder (980 kN {100 ton})	■	1
	790-101-1102	Pump	■	1

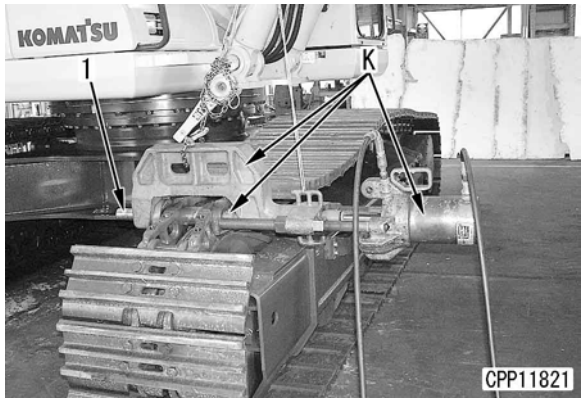
Separating track

1. Start the engine and move the master pin to above the idler.
2. Remove track shoes (2) which are connected by master pin (1). [*1]
3. Lower the work equipment to the ground and loosen lubricator (3) to decrease track tension. [*2]

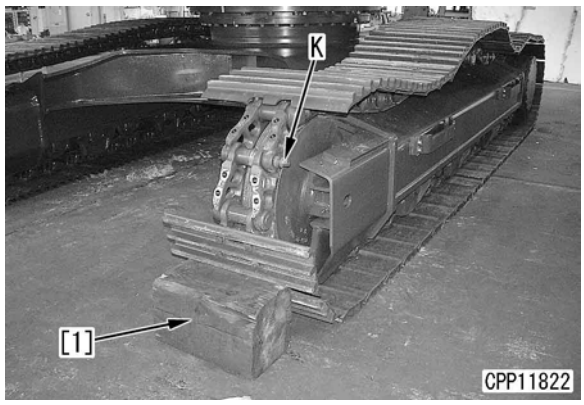
⚠ Since the internal pressure of the adjustment cylinder is very high, do not loosen the lubricator more than one turn. If the grease does not come out sufficiently, move the machine backward and forward.



4. Using tool K, remove master pin (1). [*3]



5. Move the master pin forward and place block [1] under the track in front of the idler.
6. Remove tool **K**.



7. Move the machine back slowly to spread the track. [*4]

Connecting track

- Perform connection in the reverse order to separation.

[*1]

Mounting bolt:
Seizure prevention compound (MARUZEN MOLYMAX No. 2 or equivalent)

Mounting bolt:
Tighten the 4 bolts first to 588 ± 59 Nm {60 ± 6 kgm}. Check that the mating faces are fitted, then retighten each bolt by 120 ° ± 10 ° .

[*2]

★ See Testing and adjusting, “Testing and adjusting track shoe tension”.

Tightening torque for lubricator:
58.8 – 88.3 Nm {6 – 9 kgm}

Disassembly and assembly of carrier roller

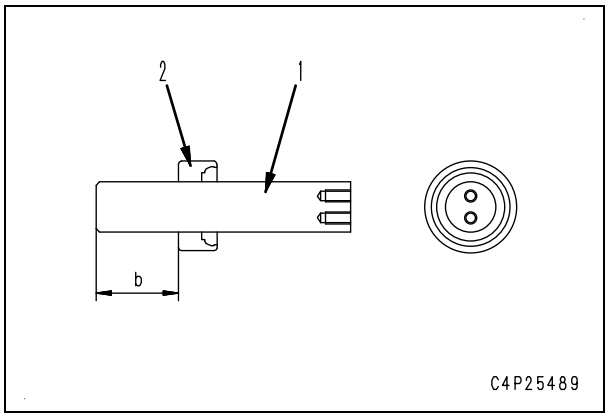
★ This section explains only the precautions forassembling the carrier roller assembly.

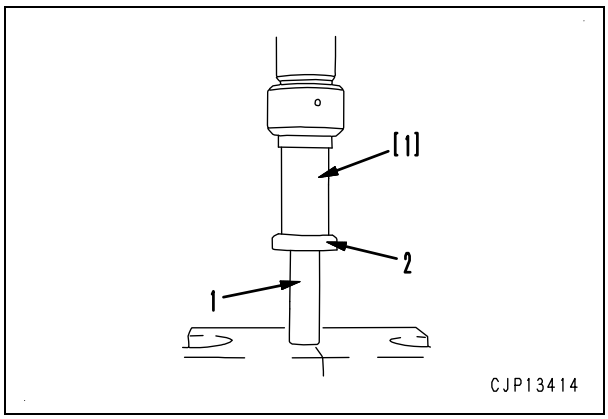
Special tools

Symbol		Part number	Part name	Necessity	Q'ty
F	1	791-430-3230	Installer	■	1
	2	791-601-1000	Oil pump assembly	■	1

Assembly

- Press-fitting of support (2)
  Using push tool [1], press fit support (2) to shaft (1).
  Press-fitting dimension (b) of shaft: 90 mm
  Press-fitting force:
  21.6 – 24.5 kN {2.2 – 2.5 ton}



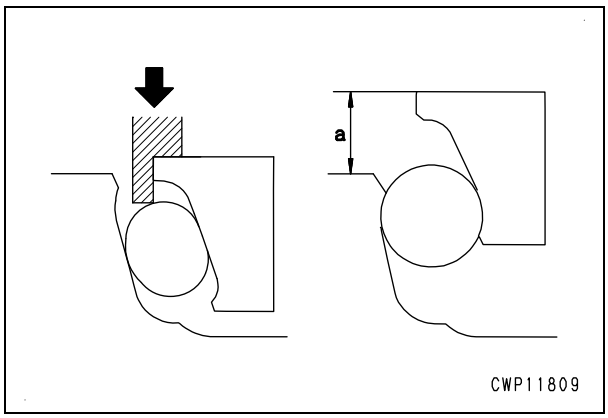


- Floating seal

★ When installing the floating seal, completely clean, degrease, and dry the contact surfaces (hatched area shown in the figure) of the O-ring and floating seal. Also take care not to have any dirt stuck on the contact faces of the floating seal.

★ Be sure to use tool (installer) **F1** to insert the floating seal assembly in the housing.

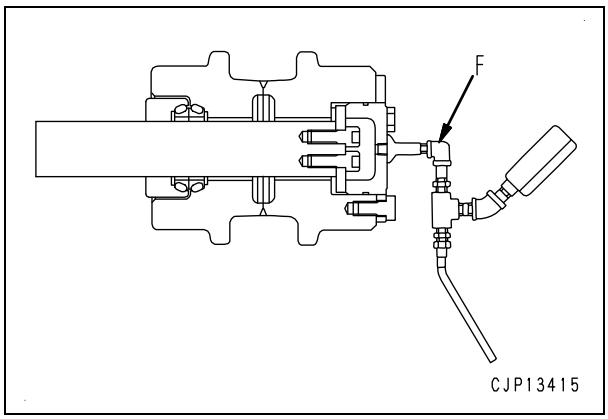
★ After inserting the floating seal, check that the inclination of the seal is less than 1 mm and that the protrusion shown as (a) in the illustration is within the range shown below.
  Protruding amount of the seal (a): **7 – 11 mm**



- Carrier roller

★ Using tool **F1**, apply the standard pressure to the oil filler port to check the oil seal for air leakage.

★ Keep the following standard pressure for 10 seconds and check that the pointer of the gauge does not lower.
  Standard pressure: **0.1 MPa {1 kg/cm^2}**



★ Using tool **F2**, fill the carrier roller assembly with oil and tighten the plug.

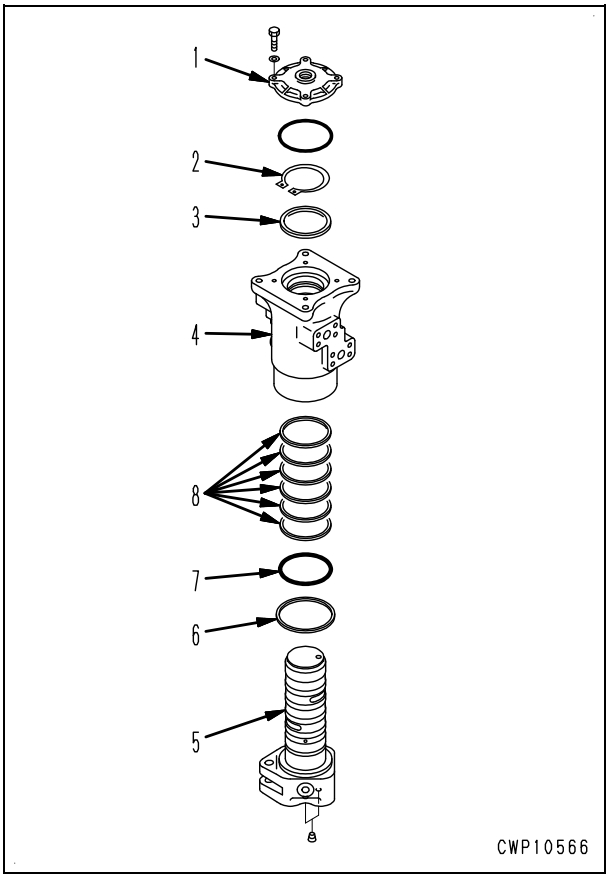
Carrier roller (Engine oil):
190 – 200 cc (EO30-DH)

Disassembly and assembly of center swivel joint assembly

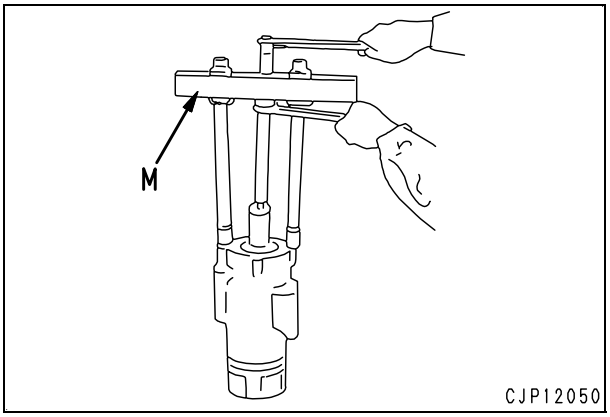
Special tools

Symbol	Part number	Part name	Necessity	Q'ty	N/R	Sketch
M	790-101-2501	Push puller	■	1		
	790-101-2510	● Block		1		
	790-101-2520	● Screw		1		
	791-112-1180	● Nut		1		
	790-101-2540	● Washer		1		
	790-101-2630	● Leg		2		
	790-101-2570	● Plate		4		
	790-101-2560	● Nut		2		
	790-101-2650	● Adapter		2		

Disassembly



1. Remove cover (1).
2. Remove snap ring (2).
3. Using tool **M**, pull out swivel rotor (4) and ring (3) from swivel shaft (5).
4. Remove seal (6) from swivel shaft (5).
5. Remove O-ring (7) and slipper seal (8) from swivel rotor (4).



Assembly

1. Assemble slipper seal (8) and O-ring (7) to swivel rotor (4).
2. Assemble seal (6) in swivel shaft (5).
3. Set swivel shaft (5) to block, then using push tool, tap swivel rotor (4) with a plastic hammer to install.
   Contact surface of rotor, shaft:
   Grease (G0-LI or G2-LI)
   ★ When installing the rotor, be extremely careful not to damage the slipper seal and the O-ring.
4. Install ring (3) and secure with snap ring (2).
5. Install O-ring and cover (1).
   Mounting bolt:
   31.4 ± 2.9 Nm {3.2 ± 0.3 kgm}

Installation

- Carry out installation in the reverse order to removal.

[*1]

Hydraulic pump involute spline:
Anti-friction compound (LM-G)

Mating face of hydraulic pump case:
Gasket sealant (LG-6)

- **Refilling with oil**

  Flywheel housing drain plug:
  42.1 – 70.6 Nm {4.3 – 7.2 kgm}

  Add oil through the oil filler to the specified level.

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

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

  Capacity of hydraulic tank:
  Approx. 335 ℓ

  Quantity of oil in tank (Center of oil level gauge): **248 ℓ**

- **Bleeding air**

  See Testing and adjusting, “Bleeding air from various parts”.

Work equipment

Removal and installation of work equipment assembly

Special tools

Symbol	Part number	Part name	Necessity	Q'ty	N/R	Sketch
P	796-670-1100	Remover	●	1		
	796-670-1110	• Sleeve		1		
	796-670-1120	• Plate		1		
	796-670-1130	• Screw		1		
	796-870-1110	• Adapter		1		
	01643-33080	• Washer		1		
	01803-13034	• Nut		1		
	790-101-4000	Puller (490 kN {50t}, long)	●	1		
	790-101-1102	Pump (294 kN {30t})	●	1		

Removal

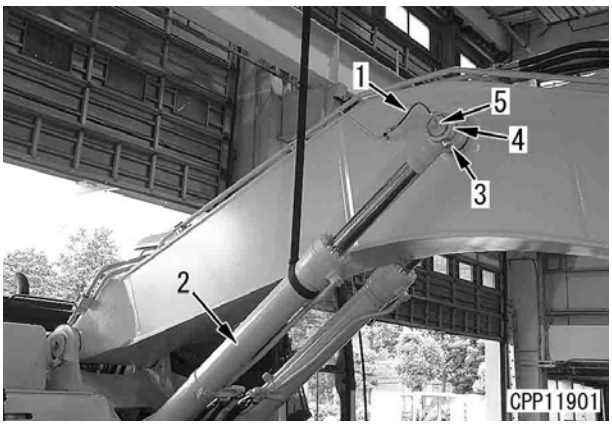
⚠ **Extend the arm and bucket fully, lower the work equipment to the ground, and set the work equipment lock lever to the LOCK position.**

⚠ **See Testing and adjusting, "Releasing residual pressure from hydraulic circuit".**

1. Disconnect grease hose (1).

2. Sling boom cylinder assembly (2) temporarily and remove lock bolt and nut (3). [*1]

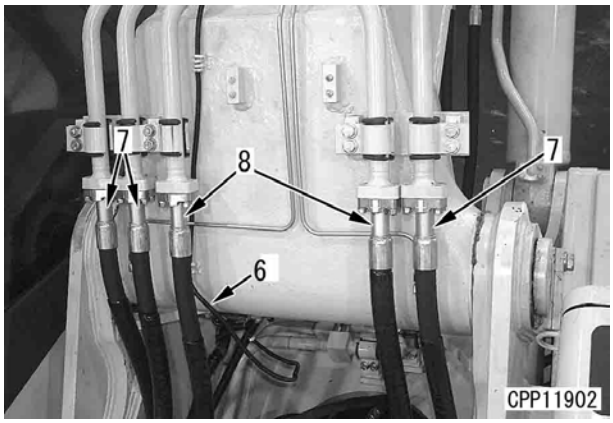
3. Remove plate (4) and head pin (5). [*2]
   ★ Check the quantity and positions of the inserted shims.



4. Start the engine and retract the piston rod.
   ★ Bind the rod with wires, etc. so that it will not be extracted and lower it onto a stand or put a wood block to the bottom side so that the cylinder will not lower. When putting the wood block, remove the grease fitting on the bottom side.
   ★ Disconnect the boom cylinder on the opposite side similarly.
   ★ When slinging the boom cylinder, if the sling interferes with the work equipment lamp, remove the work equipment lamp.

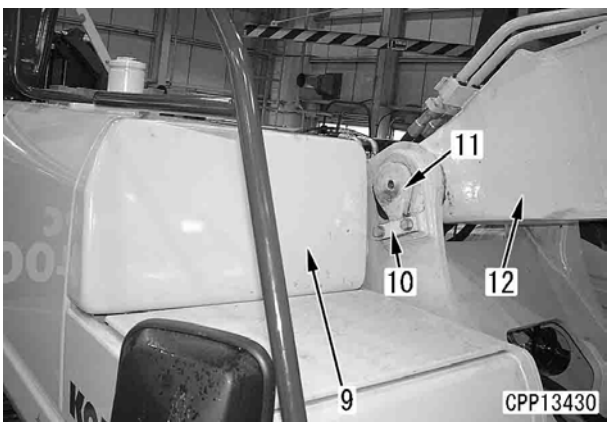
5. Disconnect intermediate connector A42 (6) for the work equipment lamp.

6. Disconnect 3 arm cylinder hoses (7) and 2 bucket cylinder hoses (8).
   ★ Put oil stopper plugs and secure the hoses to the valve side with ropes.

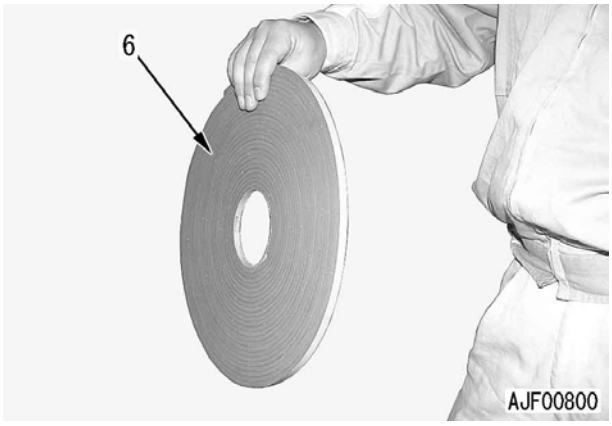


7. Sling work equipment assembly (12) temporarily.

8. Remove cover (9), plate (10), and foot pin (11) to disconnect work equipment assembly (12). [*3]



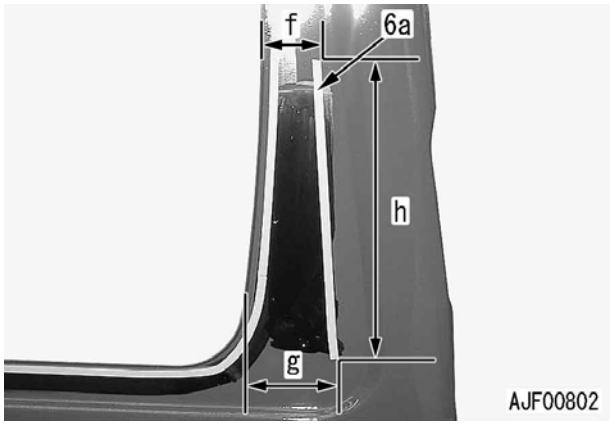
4. Stick dam rubber (both-sided adhesive tape)(6) along the inside edge of the glass sticking section.
   - ★ Do not remove the release tape of dam rubber on the glass sticking side before sticking the glass.
   - ★ When sticking the dam rubber, do not touch the cleaned surface to the utmost.
   - ★ Care should be taken not to float the dam rubber of each sticking corner.



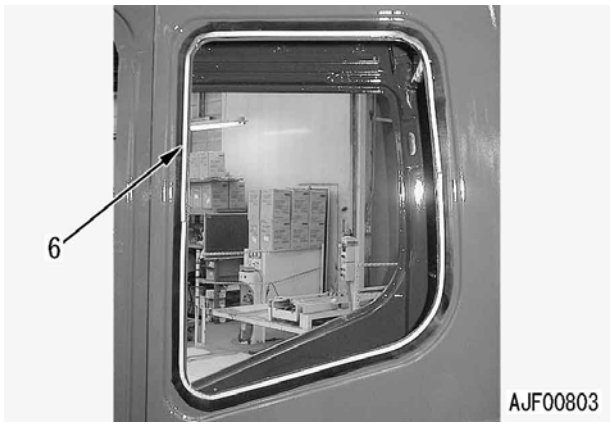
   - ★ When sticking dam rubber (6) around a frame, do not lap its finishing end over the starting end. Or, make clearance of about 5 mm between them (e).

   1) Stick dam rubber (6) for right side window glass (1) to the position as shown in the figure.

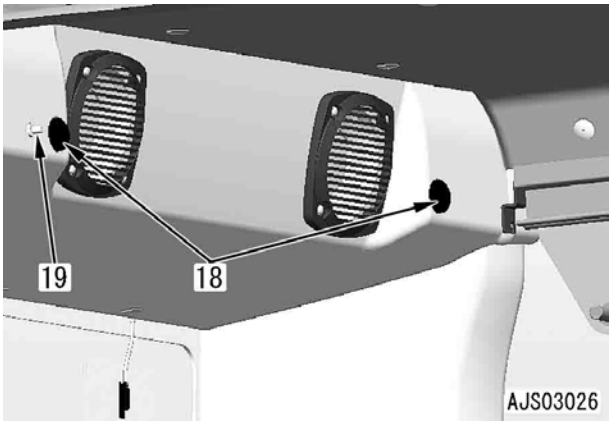
   - ★ Stick dam rubber (6a) additionally to right side window glass (1).
   - ● Positions to stick additional dam rubber to the right side window glass:
     (f): **50 mm**
     (g): **90 mm**
     (h): **250 mm**



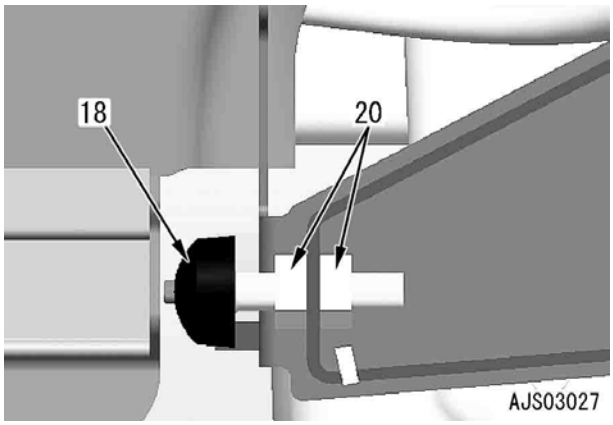
   2) Stick dam rubber (6) for left side window glass (2) to the position as shown in the figure.



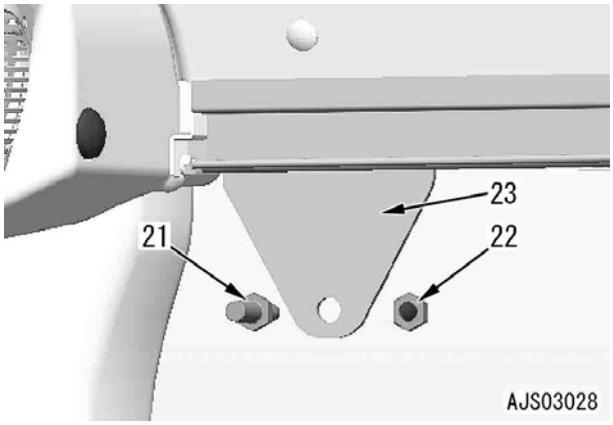
8. Adjust the “Open” position of the front window assembly lock.
   1) After adjusting the “Close” position of the front window assembly lock in steps 6 and 7, raise the front window assembly to the ceiling.
   2) Set the front window assembly locks at the both sides of rear of the operator cab to the “Open” position, and then check the following items.
      - Check the working condition of right and left locks (16) and (17) (as explained above).
      - Front window assembly must be in contact with the right and left rubber stoppers (18) and furthermore, must be pushing them backward for 1.5 – 3.0 mm.
      - The front window assembly must be pushing the limit switch backward for 4 – 7 mm.
      - ★ The position of limit switch (19) cannot be adjusted. Therefore, the “Open” position of the front window assembly is decided within the range where this switch works.
      - ★ Limit switch (19) is used to prevent the windshield wiper from moving when turning the wiper switch on by mistake when the front window assembly is in “Open” position. If the wiper operates when there is no glass in the front, the wiper falls down inside the cab and causes trouble.
        To check whether limit switch (19) is working, turn the key switch on and see that, even if the wiper switch is turned on, the wiper does not operate when the front window assembly is in “Open” position.



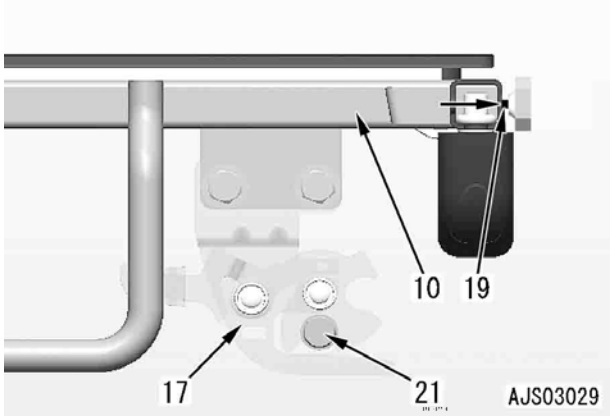
      - After checking the above items, if it becomes necessary to do the adjustment.
   3) Close front window assembly (10).
   4) Loosen locknut (20) of right and left side of rubber stoppers (18), and then pull back both rubber stoppers (18) so that they won't contact with the front window assembly when it is in “Open” position.



   5) Loosen both sides of locknuts (22), and adjust the position of striker bolt (21).
      - ★ Striker bolt (21): M10
        Inner diameter of plate (23): ø 14.5 mm

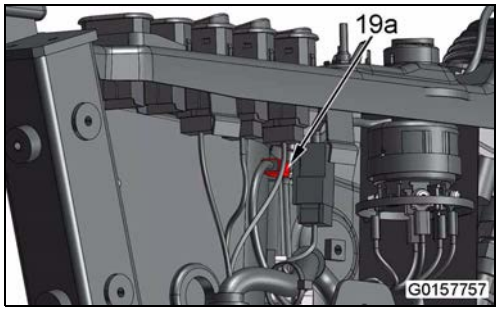


      1] Front window assembly (10) must be pushing the limit switch backward for 4 – 7 mm (at “Open” position).
      2] Working condition of lock (17).

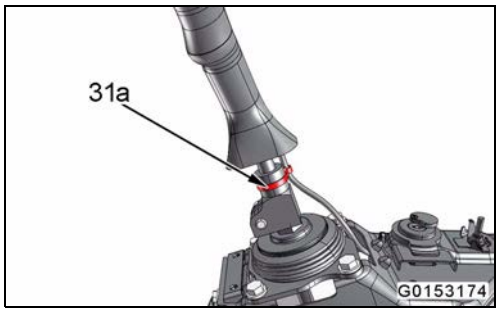


- Split boss type

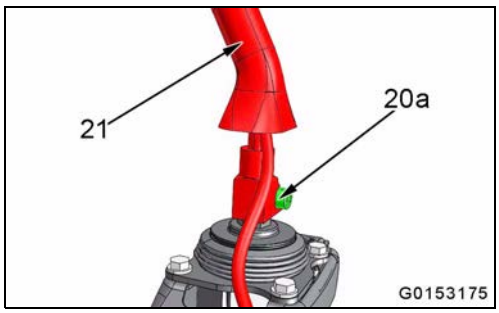
1) Disconnect the connector (19a).



2) Cut the 2 bands (31a).

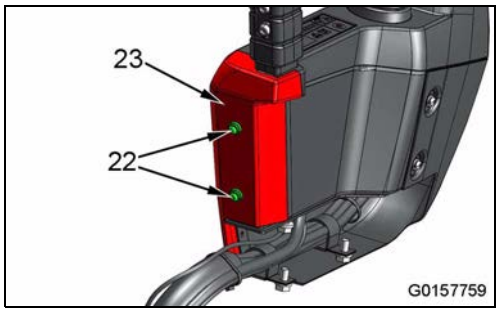


3) Install the work equipment control lever assembly (21) with the bolt (20a).

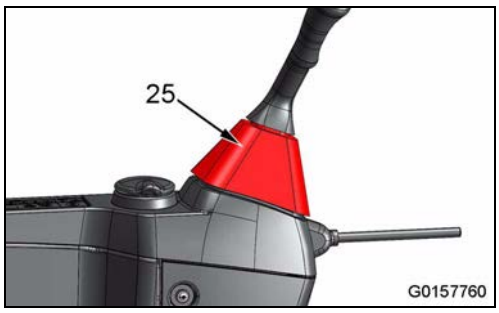


Left hand lever

8. Remove the 2 bolts (22), and remove the cover (23).



9. Remove the boot (25).
   REMARK
   - When you remove the boot from the cover, push the lock of the frame with a flat-head screwdriver or such.
   - If you pull parts other than the lock of the frame by force, it can cause damage to the frame. Be careful.
   - A seat is inserted between the boot and cover. Be careful not to lose it.
   - The seat is not installed on some machines which were made earlier.



Electrical system

Removal and installation of air conditioner unit assembly

Removal

⚠ **Disconnect the negative terminal (–) of the battery before starting the work.**

⚠ **In the case that you do not drain the coolant, if you disconnect the heater hose when the coolant temperature in the radiator is high, you may be scalded. In this case, wait until the coolant temperature lowers and then disconnect the heater hose.**

⚠ **Collect the air conditioner refrigerant (R134a) from air conditioner circuit in advance.**

★ Ask professional traders for collecting and filling operation of refrigerant (R134a).

★ Never release the refrigerant (R134a) to the atmosphere.

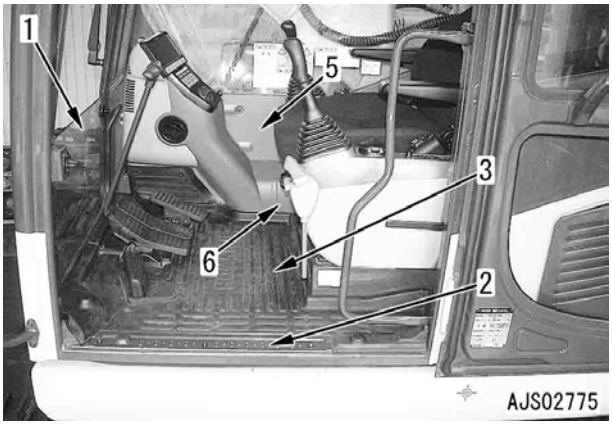
⚠ **If refrigerant gas (R134a) gets in your eyes, you may lose your sight. Accordingly, put on protective goggles while you are collecting the refrigerant (R134a) or filling the air conditioner circuit with the refrigerant (R134a). Collecting and filling work must be conducted by a qualified person.**

1. Turn the upper structure by 90°.

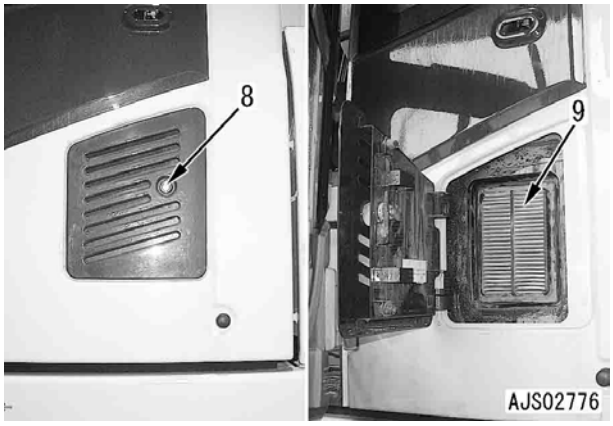
2. Drain the engine coolant.
   Coolant: **Approx. 36 ℓ**

3. Remove front window (1).
4. Remove step plate (2).
5. Remove floor mat (3).

6. Remove covers (5) and (6).

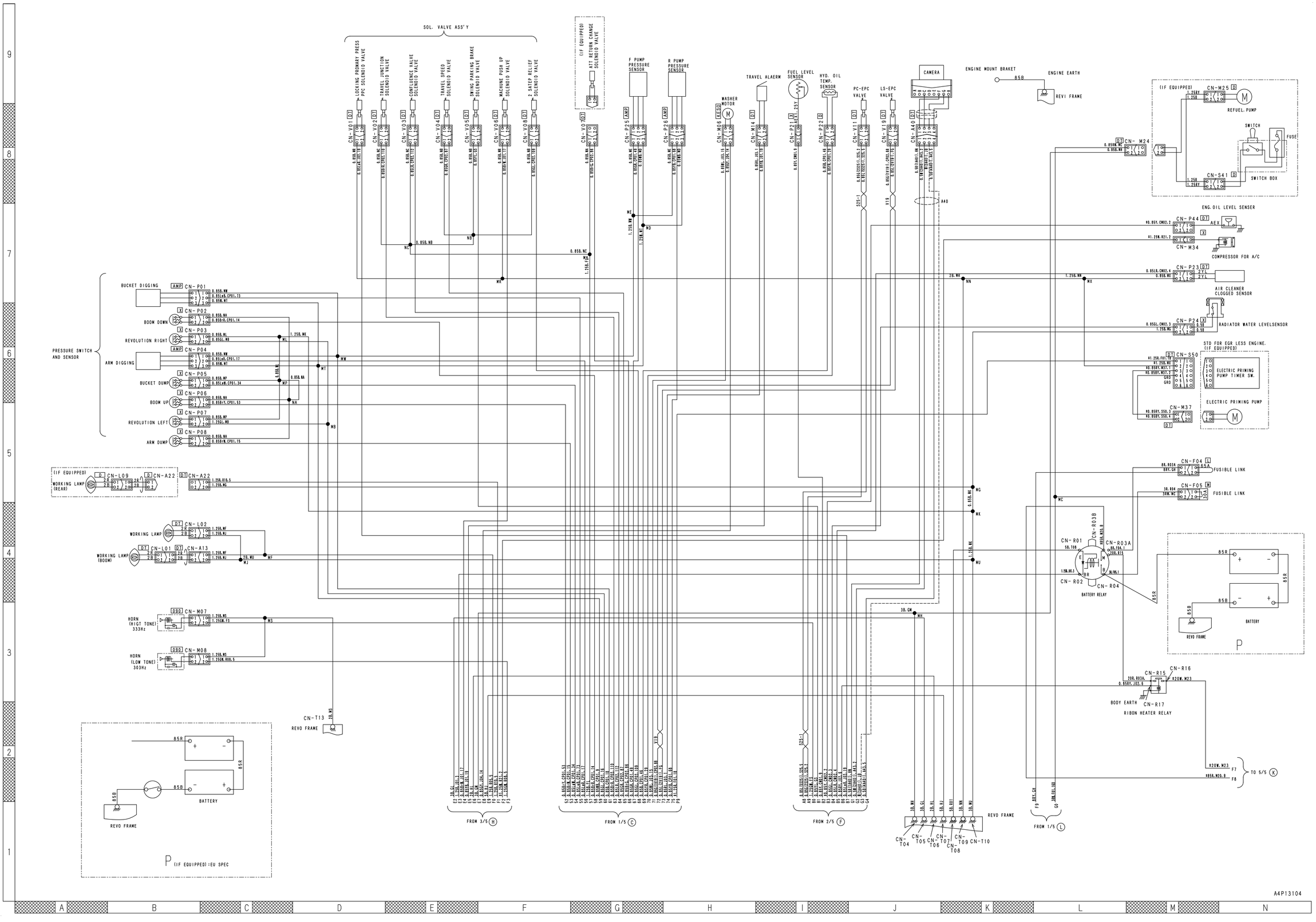


7. Pull down opening and closing lever (8) of the outside air filter cover.
8. Remove outside air filter (9).



9. Remove rear covers (10) to (13).

90 Diagrams and drawings


SOL. VALVE ASS'Y
LOCKING PRIMARY PPC SOLENOID VALVE
TRAVEL JUNCTION SOLENOID VALVE
CONFLUENCE VALVE SOLENOID VALVE
TRAVEL SPEED SOLENOID VALVE
SWING PARKING BRAKE SOLENOID VALVE
MACHINE PUSH UP SOLENOID VALVE
2 SATEP RELIEF SOLENOID VALVE
(IF EQUIPPED) ATT RETURN CHANGE SOLENOID VALVE
F PUMP PRESSURE SENSOR
R PUMP PRESSURE SENSOR
WASHER MOTOR
TRAVEL ALAERM
FUEL LEVEL SENSOR
HYD. OIL TEMP. SENSOR
PC-EPC VALVE
LS-EPC VALVE
CAMERA
ENGINE MOUNT BRAKET
ENGINE EARTH
REVI FRAME
(IF EQUIPPED) REFUEL PUMP
SWITCH
FUSE
SWITCH BOX
ENG. OIL LEVEL SENSER
COMPRESSOR FOR A/C
AIR CLEANER CLOGGED SENSOR
RADIATOR WATER LEVELSENSOR
STD FOR EGR LESS ENGINE. (IF EQUIPPED)
ELECTRIC PRIMING PUMP TIMER SW.
ELECTRIC PRIMING PUMP
PRESSURE SWITCH AND SENSOR
BUCKET DIGGING
BOOM DOWN
REVOLUTION RIGHT
ARM DIGGING
BUCKET DUMP
BOOM UP
REVOLUTION LEFT
ARM DUMP
(IF EQUIPPED) WORKING LAMP (REAR)
WORKING LAMP
WORKING LAMP (BOOM)
HORN (HIGT TONE) 333Hz
HORN (LOW TONE) 303Hz
FUSIBLE LINK
BATTERY RELAY
BATTERY
REVO FRAME
BODY EARTH
RIBON HEATER RELAY
FROM 3/5 (H)
FROM 1/5 (C)
FROM 2/5 (F)
FROM 1/5 (L)
TO 5/5 (K)
P (IF EQUIPPED) :EV SPEC
A4P13104