

Shop Manual

PC200LC-7L PC220LC-7L

HYDRAULIC EXCAVATOR

SERIAL NUMBERS **PC200LC-7L** **A86001** and UP
PC220LC-7L

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SAFETY

SAFETY NOTICE

IMPORTANT SAFETY NOTICE

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

To prevent injury to workers, the symbols  and  are 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.

GENERAL PRECAUTIONS

Mistakes in operation are extremely dangerous. Read the OPERATION & MAINTENANCE MANUAL carefully BEFORE operating the machine.

1. Before carrying out any greasing or repairs, read all the precautions given on the decals which are fixed to the machine.
2. 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.
3. If welding repairs are needed, always have a trained, experienced welder carry out the work. When carrying out welding work, always wear welding gloves, apron, glasses, cap and other clothes suited for welding work.
4. When carrying out any operation with two 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 signs on the controls in the operator's compartment.
5. Keep all tools in good condition and learn the correct way to use them.
6. 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 or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.

PREPARATIONS FOR WORK

1. Before adding oil or making repairs, park the machine on hard, level ground, and block the wheels or tracks to prevent the machine from moving.
2. Before starting work, lower blade, ripper, bucket or any other work equipment to the ground. If this is not possible, insert the safety 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. When disassembling or assembling, support the machine with blocks, jacks or stands before starting work.
4. Remove all mud and oil from the steps or other places used to get on and off the machine. Always use the handrails, ladders or steps when getting on or off the machine. Never jump on or off the machine. If it is impossible to use the handrails, ladders or steps, use a stand to provide safe footing.

PRECAUTIONS DURING WORK

1. When removing the oil filler cap, drain plug or hydraulic pressure measuring plugs, loosen them slowly to prevent the oil from spurting out. Before disconnecting or removing components of the oil, water or air circuits, first remove the pressure completely from the circuit.
2. The water and oil in the circuits are hot when the engine is stopped, so be careful not to get burned. Wait for the oil and water to cool before carrying out any work on the oil or water circuits.
3. Before starting work, remove the leads from the battery. ALWAYS remove the lead from the negative (-) terminal first.

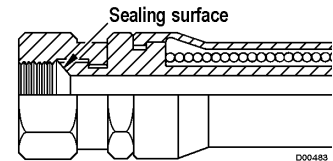
TIGHTENING TORQUE OF SPLIT FLANGE BOLTS

Use these torques for split flange bolts.

| Thread diameter | Width across flat | Tightening torque | |
|-----------------|-------------------|-------------------|-----------------|
| mm | mm | Nm | lbf ft |
| 10 | 14 | 59 - 74 | 43.51 - 54.57 |
| 12 | 17 | 98 - 123 | 72.28 - 90.72 |
| 16 | 22 | 235 - 285 | 173.32 - 210.20 |

TIGHTENING TORQUE FOR FLARED NUTS

Use these torques for flared part of nut.



| Thread diameter | Width across flat | Tightening torque | |
|-----------------|-------------------|-------------------|--------------|
| mm | mm | Nm | lbf ft |
| 14 | 19 | 24.5 ±4.9 | 18.0 ± 3.6 |
| 18 | 24 | 49 ±19.6 | 36.1 ± 14.4 |
| 22 | 27 | 78.5 ±19.6 | 57.8 ± 14.4 |
| 24 | 32 | 137.3 ±29.4 | 101.2 ± 21.6 |
| 30 | 36 | 176.5 ±29.4 | 130.1 ± 21.6 |
| 33 | 41 | 196.1 ±49 | 144.6 ± 36.1 |
| 36 | 46 | 245.2 ±49 | 180.8 ± 36.1 |
| 42 | 55 | 294.2 ±49 | 216.9 ± 36.1 |

TABLE OF TIGHTENING TORQUES FOR O-RING BOSS PIPING JOINTS

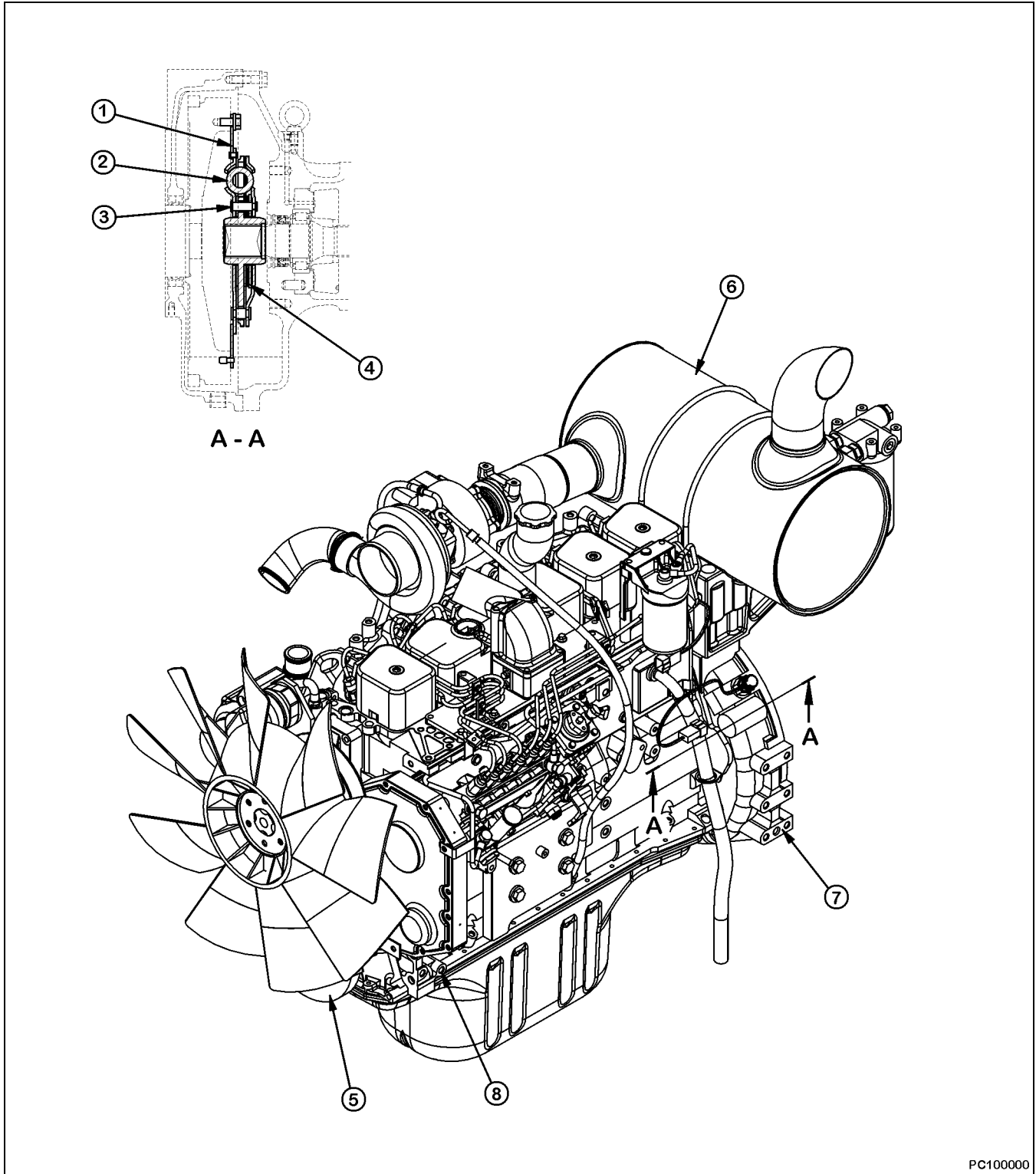
★ Unless there are special instructions, tighten the O-ring boss piping joints to the torque below.

| Nominal No. | Thread diameter | Width across flat | Tightening torque (Nm {lbf ft}) | |
|-------------|-----------------|--|---------------------------------|--------------|
| | mm | mm | Range | Target |
| 02 | 14 | Varies depending on type of connector. | 35 - 63 {25.81 - 46.46} | 44 {32.45} |
| 03, 04 | 20 | | 84 - 132 {61.95 - 97.35} | 103 {75.96} |
| 05, 06 | 24 | | 128 - 186 {94.40 - 137.18} | 157 {115.79} |
| 10, 12 | 33 | | 363 - 480 {267.73 - 354.02} | 422 {311.25} |
| 14 | 42 | | 746 - 1010 {550.22 - 744.93} | 883 {651.26} |

01 GENERAL

| | |
|--|------|
| SPECIFICATION DIMENSION DRAWINGS | 01-2 |
| PC200LC-7L, PC220LC-7L | 01-2 |
| DIMENSIONS | 01-2 |
| WORKING RANGES | 01-3 |
| SPECIFICATIONS | 01-4 |
| WEIGHT TABLE | 01-6 |
| FUEL, COOLANT AND LUBRICANTS | 01-8 |

ENGINE RELATED PARTS



PC100000

- | | |
|-------------------|-----------------------|
| 1. Drive Plate | 5. Damper Assembly |
| 2. Torsion Spring | 6. Muffler |
| 3. Stopper Pin | 7. Rear Engine Mount |
| 4. Friction Plate | 8. Front Engine Mount |

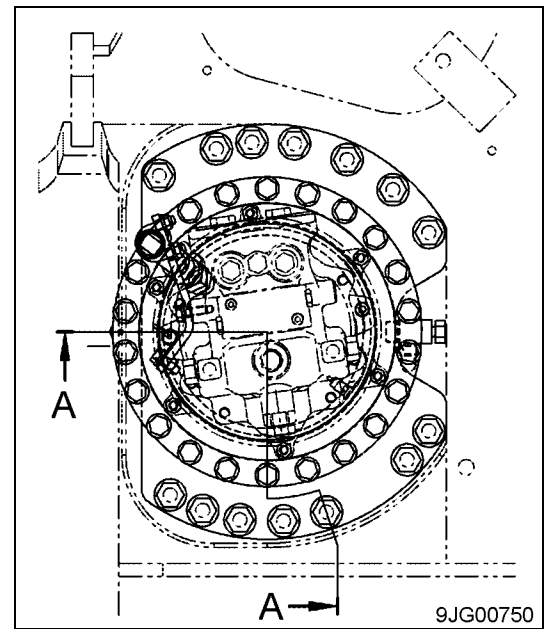
OUTLINE

- The damper assembly is a wet type.
- Oil capacity. 0.75 L

1. Swing Pinion [13 Teeth]
2. Spacer
3. Case
4. #2 Planetary
5. #2 Sun Gear
6. Ring Gear
7. #1 Sun Gear
8. Swing Motor
9. Oil Level Gauge
10. #1 Planetary Gear
11. #1 Planetary Carrier
12. #2 Planetary Gear
13. Drain Plug

SPECIFICATIONS

Reduction ratio $\left(\frac{17 + 58}{17}\right) \times \left(\frac{14 + 58}{14}\right) = 22.689$



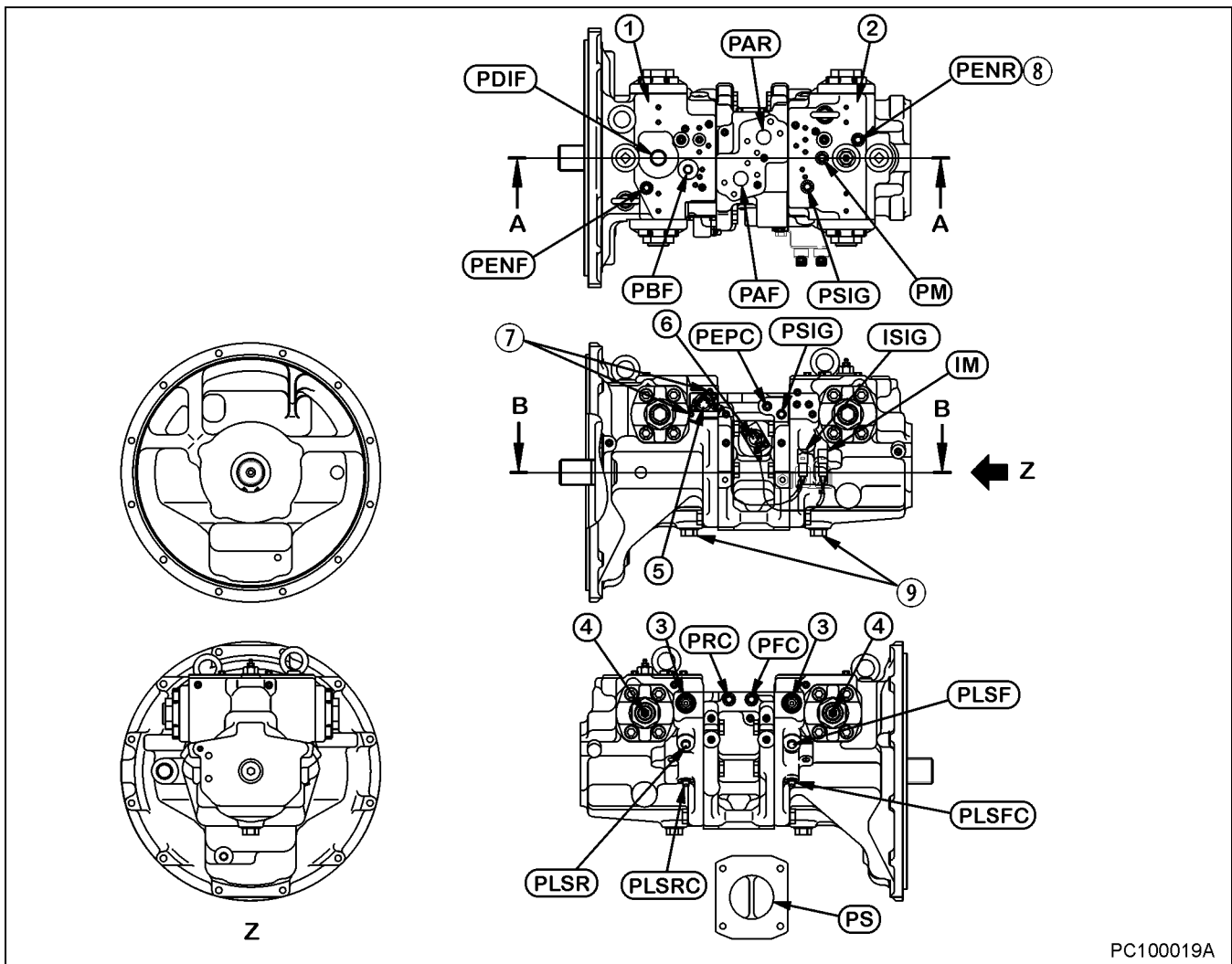
Unit: mm

| No. | Check item | Criteria | | Remedy |
|-----|---|---|-----------------|--|
| | | Std clearance | Clearance limit | |
| 14. | Swing motor shaft and #1 sun gear backlash | 0.18 to 0.28 | --- | Replace |
| 15. | #1 sun gear and #1 planetary gear backlash | 0.16 to 0.59 | 1.00 | |
| 16. | #1 planetary gear and ring gear backlash | 0.18 to 0.50 | 1.10 | |
| 17. | #1 planetary carrier and #2 sun gear backlash | 0.39 to 0.64 | 1.20 | |
| 18. | #2 sun gear and #2 planetary gear backlash | 0.16 to 0.44 | 0.90 | |
| 19. | #2 planetary gear and ring gear backlash | 0.18 to 0.56 | 1.00 | |
| 20. | #2 planetary carrier and swing pinion backlash | 0.08 to 0.23 | --- | |
| 21. | Swing pinion and swing circle backlash | 0.23 to 1.37 | 2.00 | |
| 22. | Clearance between plate and planetary carrier | 0.58 to 0.62 | --- | |
| 23. | Clearance between #2 sun gear and plate | 2.56 to 3.84 | --- | |
| 24. | Wear of swing pinion surface contacting with oil seal | Std size | Repair limit | Apply hard chrome plating, recondition, or replace |
| | | $115 \begin{smallmatrix} 0 \\ -0.100 \end{smallmatrix}$ | --- | |

MEMORANDUM

HYDRAULIC PUMP

HPV95+95



PC100019A

1. Front Main Pump
2. Rear Main Pump
3. LS Valve
4. PC Valve
5. LS-EPC Valve
6. PC-EPC Valve

Torque

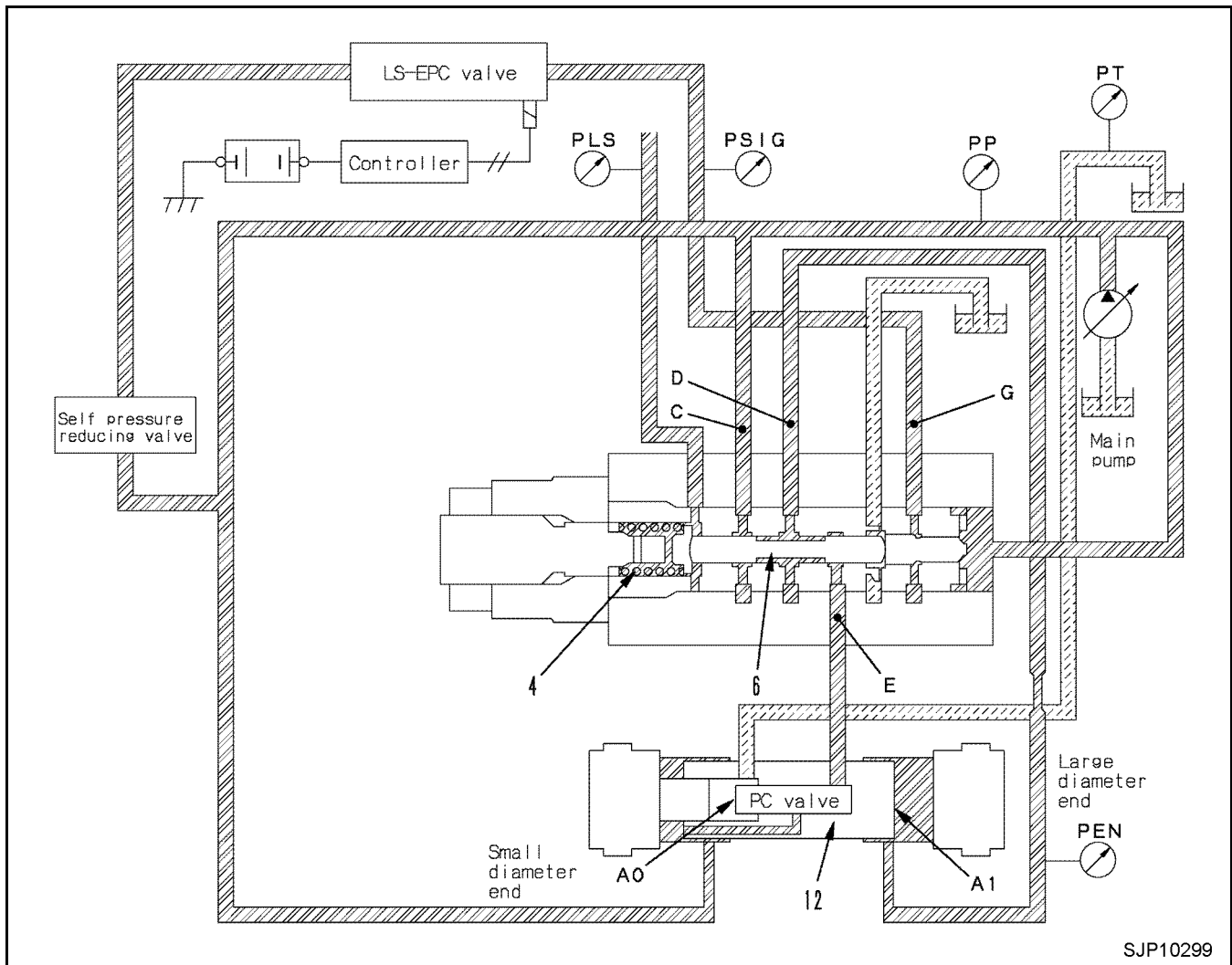
7. 12 - 14 Nm (8.8 - 10.3 lbf ft)
8. 21 - 28 Nm (15.4 - 20.6 lbf ft)
9. 68 - 70 Nm (50.1 - 51.6 lbf ft)

OUTLINE

- This pump consists of 2 variable capacity swash plate piston pumps, PC valve, LS valve, and EPC valve.

- IM** : PC mode selector current
- ISIG** : LS set selector current
- PAF** : Front pump delivery port
- PFC** : Front pump delivery pressure detection port
- PAR** : Rear pump delivery port
- PRC** : Rear pump delivery pressure detection port
- PBF** : Pump pressure input port
- PD1F** : Case drain port
- PENF** : Front pump control pressure detection port

- PENR** : Rear pump control pressure detection port
- PLSF** : Front load pressure input port
- PLSFC** : Front load pressure detection port
- PLSR** : Rear load pressure input port
- PLSRC** : Rear load pressure detection port
- PS** : Pump suction port
- PSIG** : LS set selector pressure detection port
- PM** : PC set selector pressure detection port
- PEPC** : EPC basic pressure input port



SJP10299

D. When servo piston is balanced

Let us take the area receiving the pressure at the large diameter end of the piston as **A1**, the area receiving the pressure at the small diameter end as **A0**, and the pressure flowing into the large diameter end of the piston as **PEN**. If the main pump pressure **PP** of the LS valve and the combined force of force **Z** of spring (4) and LS pressure **PLS** are balanced, and the relationship is $A0 \times PP = A1 \times PEN$, servo piston (12) will stop in that position, and the swash plate will be kept at an intermediate position. (It will stop at a position where the opening of the throttle from port **D** to port **E** and from port **C** to port **D** of spool (6) is approximately the same.)

At this point, the relationship between the area receiving the pressure at both ends of piston (12) is **A0: A1 = 3:5**, so the pressure applied to both ends of the piston when it is balanced becomes **PP: PEN = 5:3**.

The position where spool (6) is balanced and stopped is the standard center, and the force of spring (4) is adjusted so that it is determined when $PP - PLS = 22 \text{ kg/cm}^2$ (312 psi). However, if **PSIG** (the output pressure of $0 \leftrightarrow 30 \text{ kg/cm}^2$ ($0 \leftrightarrow 426 \text{ psi}$) of the EPC valve of the LS valve) is applied to port **G**, the balance stop position will change in proportion to pressure **PSIG** between $PP - PLS = 22.7 \text{ kg/cm}^2$ (312 psi).

MEMORANDUM

MEMORANDUM

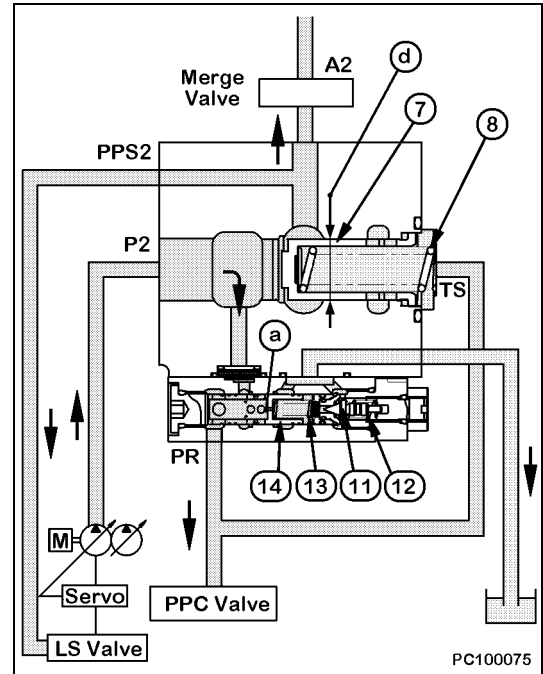
MEMORANDUM

Unit: mm

| No. | Check item | Criteria | | | | | Remedy |
|-----|-----------------------|------------------|-------------|-----------|--------------|-----------|--|
| | | Standard size | | | Repair limit | | |
| | | Free length x | Installed | Installed | Free | Installed | |
| | | Outside diameter | length | load | length | load | |
| 17 | Valve spring | 10.45 x 7 | 4.8 | 3.1 N | - | 2.5 N | If damaged or deformed, replace spring |
| 18 | Unload spring | 31.5 x 10.2 | 26.8 | 70.6 N | - | 56.4 N | |
| 19 | Check valve spring | 11.5 x 4.6 | 8.5 | 1.5 N | - | 1.2 N | |
| 20 | Spool return spring | 46.6 x 21.8 | 3.3 | 156.8 N | - | 125.5 N | |
| 21 | Spool return spring | 64.5 x 32.3 | 63 | 177.5 N | - | 142.0 N | |
| 22 | Sequence valve spring | 70.9 x 18.0 | 59 | 199.8 N | - | 160.0 N | |
| 23 | Spool return spring | 29.9 x 11.0 | 10.7 | 10.4 N | - | 8.3 N | |
| 24 | Relief spring | 34.7 x 10.4 | 32.3 | 430.2 N | - | 344.2 N | |
| | Item | Torque | | | | | |
| | | Nm | lbf ft | | | | |
| 25 | Plug | 75.5 ±9.8 | 55.6 ±7.2 | | | | |
| 26 | Valve | 166.7 ±19.6 | 122.9 ±14.4 | | | | |
| 27 | Plug | 39.2 ±4.9 | 28.9 ±3.6 | | | | |
| 28 | Valve | 53.9 ±4.9 | 39.7 ±3.6 | | | | |
| 29 | Plug | 74.0 ±8.0 | 54.5 ±5.9 | | | | |
| 30 | Plug | 23.5 ±3.9 | 17.3 ±2.8 | | | | |

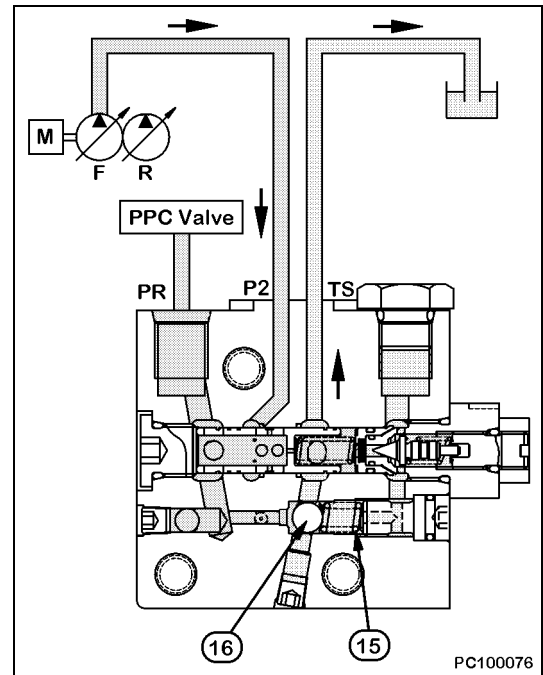
3. When Load Pressure **P2** is High

- If load pressure **A2** rises and the pump discharge increases because of operation of the work equipment, the $\phi d \times P2$ pressure rises higher than the total of the force of spring (8) and the value of $\phi d \times PR$ pressure, and then valve (7) moves to the right stroke end.
- As a result, the area of the pass between ports **P2** and **A2** increases and the pass resistance lowers and the loss of the engine power is reduced.
- If the **PR** pressure rises above the set pressure, poppet (11) opens and the hydraulic oil flows from the **PR** port through orifice **a** in spool (14) and open part of poppet (11) to seal drain port **TS**.
- Accordingly, differential pressure is generated between before and after orifice **a** in spool (14) and then spool (14) moves to close the pass between port **P2** and **PR**. The **P2** pressure is controlled constant (at the set pressure) by the area of the oil pass at this time and supplied as the **PR** pressure.

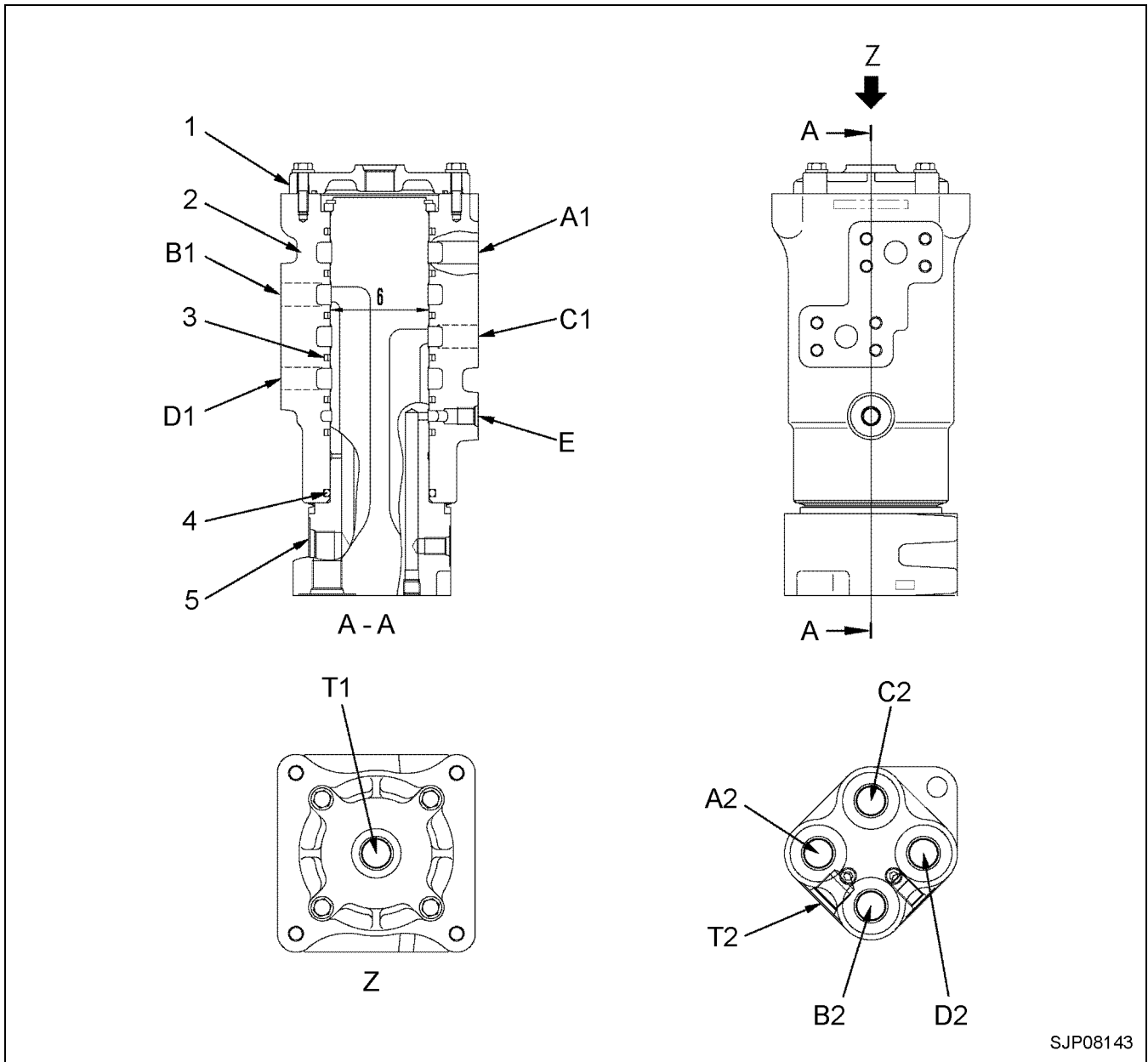


4. When Abnormally High Pressure is Generated

- If **PR** pressure on the self pressure reducing valve rises abnormally high, ball (16) separates from the seat against the force of spring (15) and the hydraulic oil flows from output port **PR** to **TS**. Accordingly, the **PR** pressure lowers. By this operation, the hydraulic devices (PPC valves, solenoid valves, etc.) are protected from abnormal pressure.



CENTER SWIVEL JOINT



- 1. Cover
- 2. Body
- 3. Slipper Seal
- 4. O-ring
- 5. Shaft

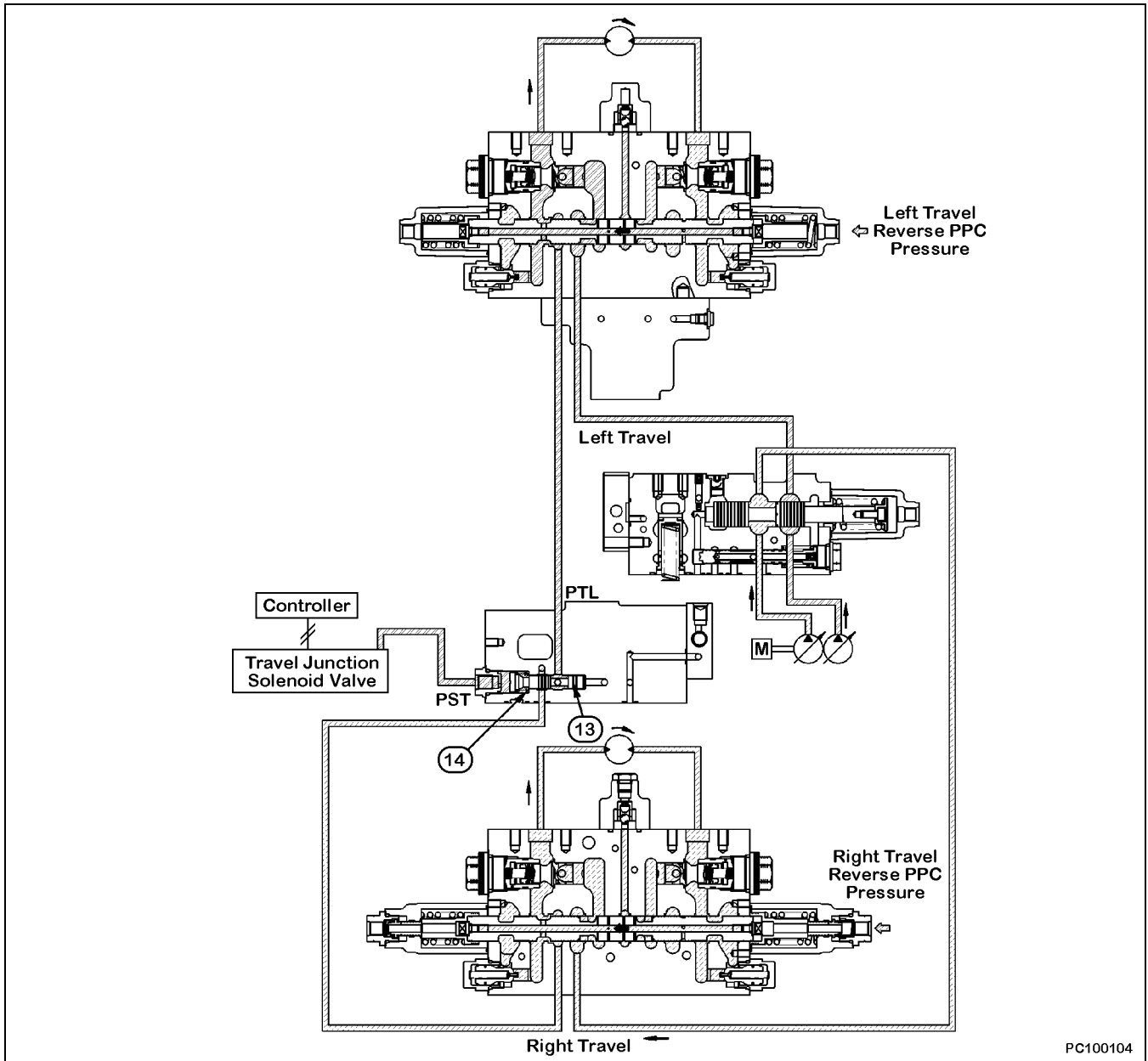
- A1** : To Left Travel Motor Port PB
- A2** : From Control Valve Port A5
- C1** : To Right Travel Motor Port Pa
- B2** : From Control Valve Port B5
- D1** : To Right Travel Motor Port PB
- E** : To Left & Right Travel Motors Port P

- T2** : To Tank
- T1** : From Left & Right Travel Motors Port T
- D2** : From Control Valve Port B2
- B1** : To Left Travel Motor Port PA
- C2** : From Control Valve Port A2

Unit: mm

| No. | Check Item | Criteria | | | Remedy |
|-----|---------------------------|---------------|--------------------|--------------|---------|
| | | Standard Size | Standard clearance | Repair limit | |
| 6. | Rotor and shaft clearance | 80 | --- | --- | Replace |

TRAVEL JUNCTION VALVE



FUNCTION

This valve connects both travel circuits to each other so that the hydraulic oil will be supplied evenly to both travel motors and the machine will travel straight. When the machine is steered, outside pilot pressure **PST** closes the travel junction valve to secure high steering performance.

OPERATION

When Pilot Pressure is Turned On

If the pilot pressure from the travel junction solenoid valve becomes higher than the force of spring (14), travel junction spool (13) moves to the left stroke end and the junction circuit between port **PTL** (left travel circuit) and **PTR** (right travel circuit) is closed.

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

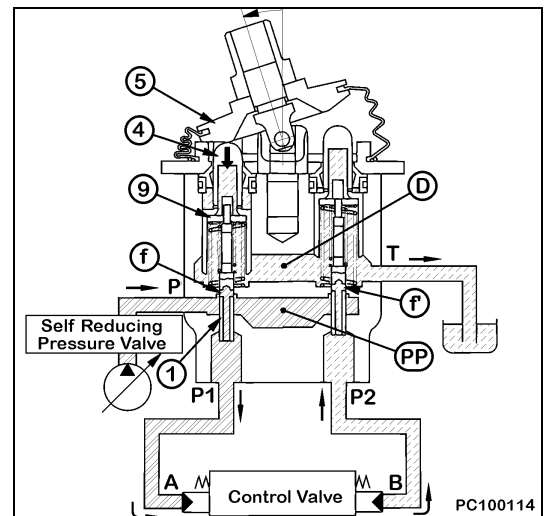
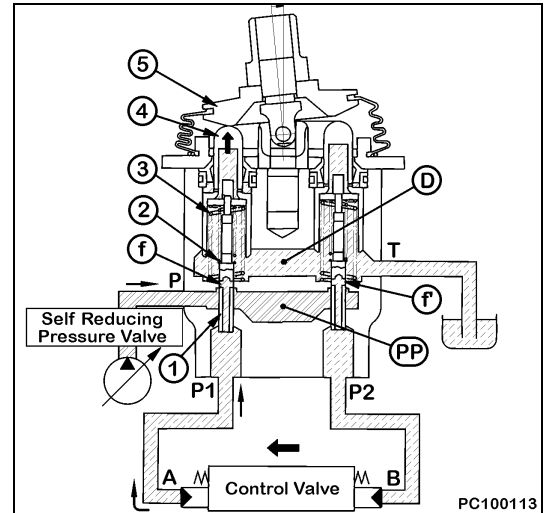
When this happens, fine control hole **f** is connected to drain chamber **D** and the pressure oil at port **P1** is released.

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

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

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

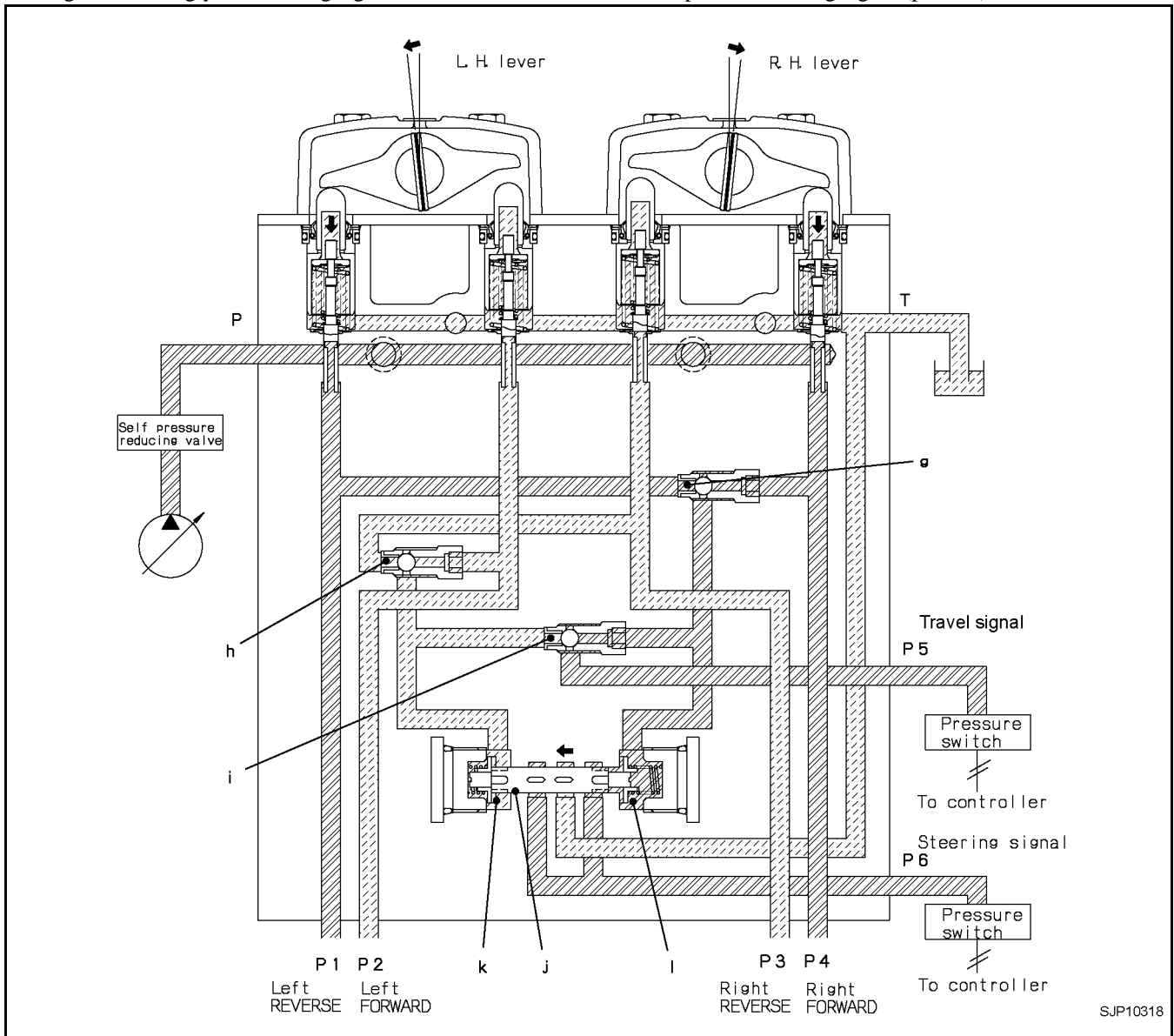
The oil returning from chamber **B** passes from port **P2** through fine control hole **f** and flows to drain chamber **D**.



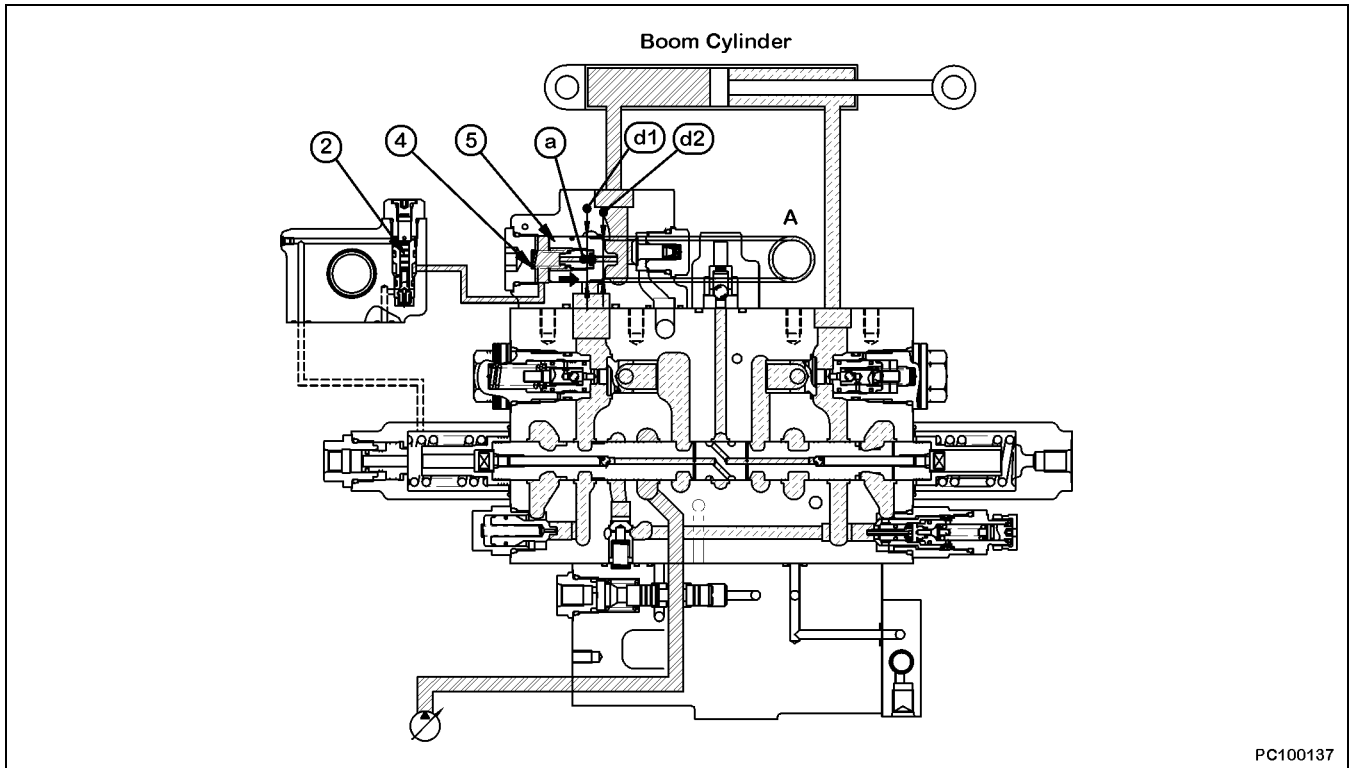
4. When pivot-turned

(The following drawing shows the circuit for left reverse and right forward operation.)

While the left motor is operating for reverse travel (the signal of port **P1** is output) and the right motor is operating for forward travel (the signal of port **P4** is output), only the pressure in right spring chamber **I** of steering signal valve **j** is set high. Accordingly, the steering signal valve moves to the left and outputs the steering signal (port **P6**).



2. When Boom Lever is in Neutral



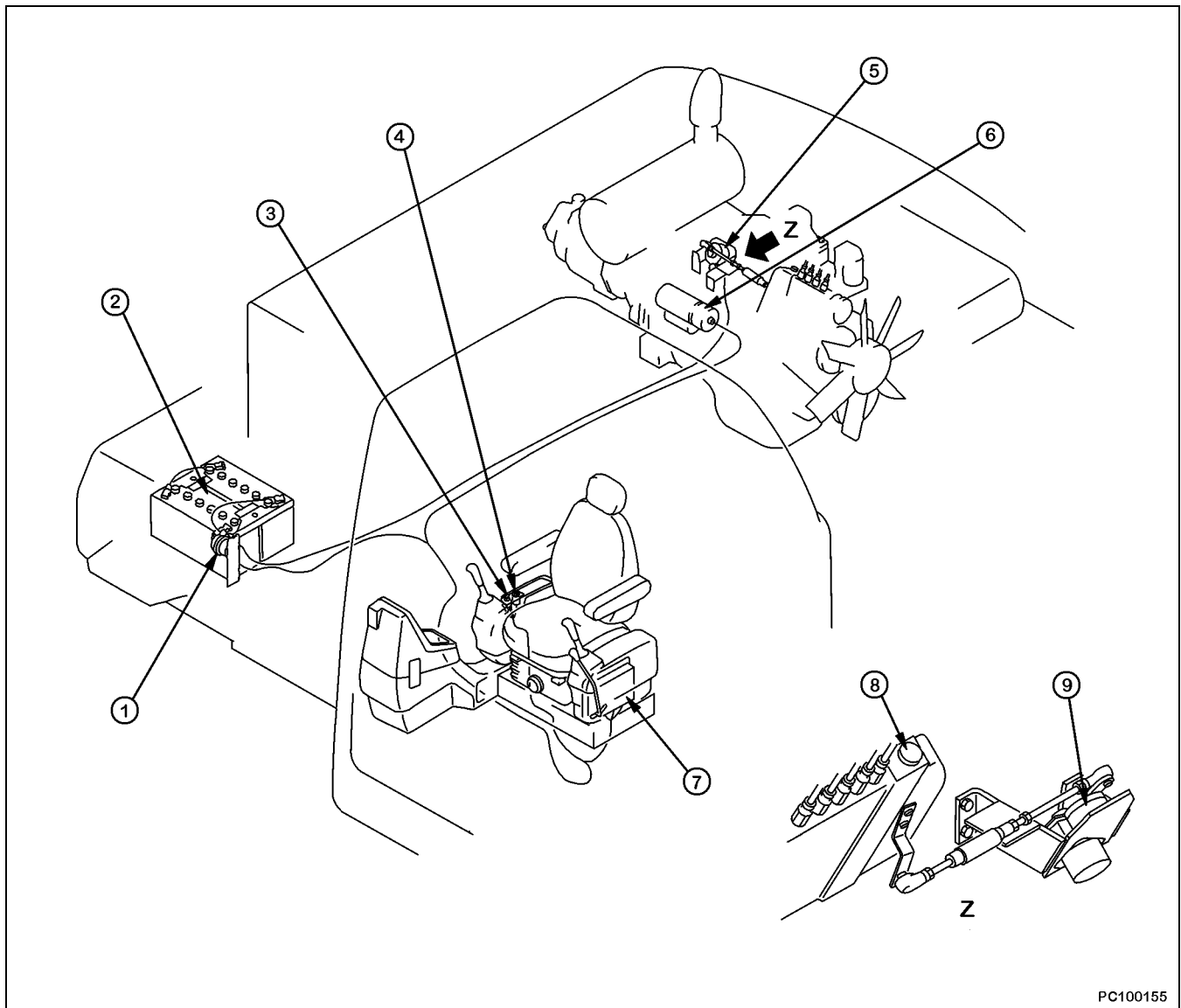
If the control lever is returned to the neutral position while the boom is raised, the oil in poppet (5) which has flowed through orifice **a** is sealed by pilot piston (2). The main hydraulic oil is shut off from the holding pressure on the boom cylinder bottom side.

At this time, the holding pressure on the boom cylinder bottom side is applied toward the right to area **A** of the ring formed by the difference between outside diameter **d1** of poppet (5) and seat diameter **d2** (= Area of $\varnothing d1$ - Area of $\varnothing d2$). The total of this pressure and the force of spring (4) closes poppet (5) to shut off the main hydraulic oil from the holding pressure on the boom cylinder bottom. Accordingly, the boom is held.

Unit: mm

| No. | Check item | Cylinder | Standard size | Tolerance | | Standard clearance | Clearance limit | Remedy |
|-----|---|----------|---------------|------------------|------------------|--------------------|-----------------|------------------------|
| | | | | Shaft | Hole | | | |
| | | | | | | | | |
| 1. | Piston rod and bushing clearance | Boom | 95 | -0.036 -0.090 | +0.222 +0.047 | 0.084 to 0.347 | 0.447 | Replace bushing |
| | | Arm | 100 | -0.036 -0.090 | +0.257 +0.047 | 0.083 to 0.312 | 0.412 | |
| | | Bucket | 90 | -0.036 -0.090 | +0.257 +0.048 | 0.084 to 0.347 | 0.447 | |
| 2. | Piston rod support pin and bushing clearance | Boom | 80 | -0.030 -0.060 | +0.190 +0.070 | 0.100 to 0.250 | 1 | Replace pin or bushing |
| | | Arm | 80 | -0.030 -0.076 | +0.175 +0.075 | 0.105 to 0.251 | 1 | |
| | | Bucket | 80 | -0.030 -0.076 | +0.175 +0.070 | 0.100 to 0.250 | 1 | |
| 3. | Cylinder bottom support pin and bushing clearance | Boom | 80 | -0.030 -0.060 | +0.190 +0.070 | 0.075 to 0.225 | 1 | |
| | | Arm | 80 | -0.030 -0.076 | +0.175 +0.075 | 0.105 to 0.251 | 1 | |
| | | Bucket | 80 | -0.030 -0.076 | +0.175 +0.075 | 0.105 to 0.230 | 1 | |
| | Item | | Torque | | | | | |
| | | | Nm | lbf ft | | | | |
| 4. | Bolt | Boom | 231 - 309 | 170.3 - 227.9 | | | | |
| | | Arm | 319 - 427 | 235.2 - 314.9 | | | | |
| | | Bucket | 231 - 309 | 170.3 - 227.9 | | | | |
| 5. | Bolt | Boom | 265 - 323 | 195.4 - 238.2 | | | | |
| | | Arm | 265 - 323 | 195.4 - 238.2 | | | | |
| | | Bucket | 265 - 323 | 195.4 - 238.2 | | | | |
| 6. | Bolt | Boom | 59 - 73 | 43.5 - 53.8 | | | | |
| | | Arm | 59 - 73 | 43.5 - 53.8 | | | | |
| | | Bucket | 59 - 73 | 43.5 - 53.8 | | | | |

ENGINE CONTROLS



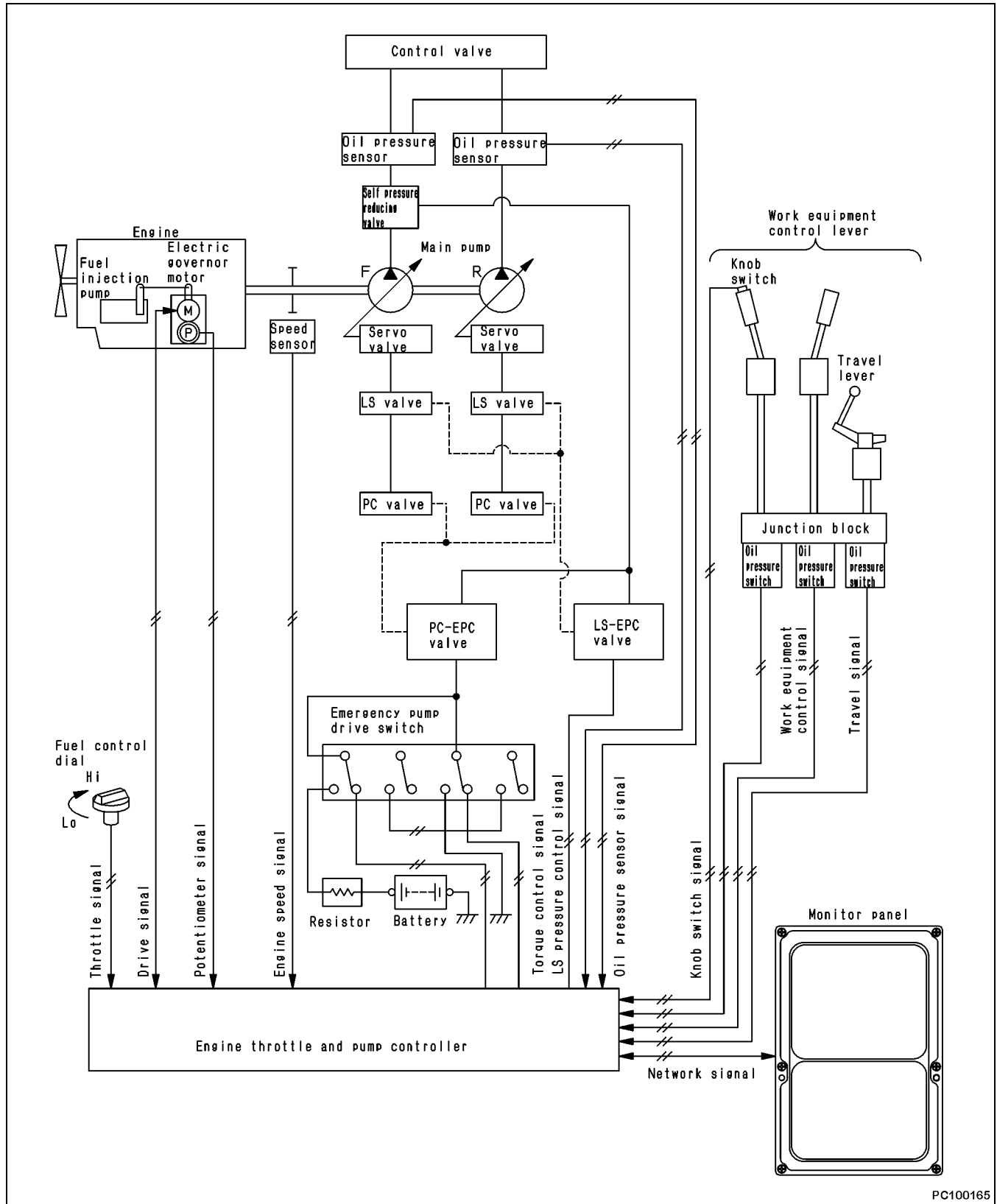
- | | | |
|--------------------|----------------------|------------------------------------|
| 1. Battery Relay | 4. Fuel Control Dial | 7. Engine Throttle Pump Controller |
| 2. Battery | 5. Linkage | 8. Fuel Injection Pump |
| 3. Starting Switch | 6. Starting Motor | 9. Governor Motor |

OUTLINE

The engine can be started and stopped with only starting switch (3).

The engine throttle and pump controller (7) receives the signal of fuel control dial (4) and transmits the drive signal to governor motor (9) to control the governor lever angle of fuel injection pump (8) and control the engine speed.

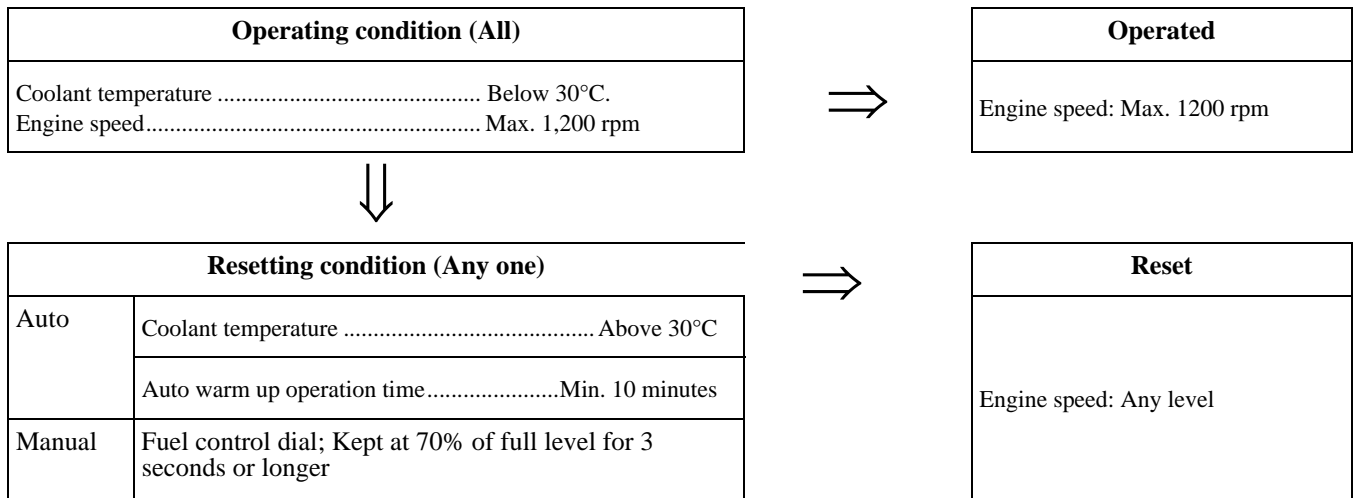
ENGINE AND PUMP CONTROL FUNCTION



STRUCTURE, FUNCTION & MAINTENANCE STANDARDS ELECTRONIC CONTROL SYS-

1. Auto Warm Up Function

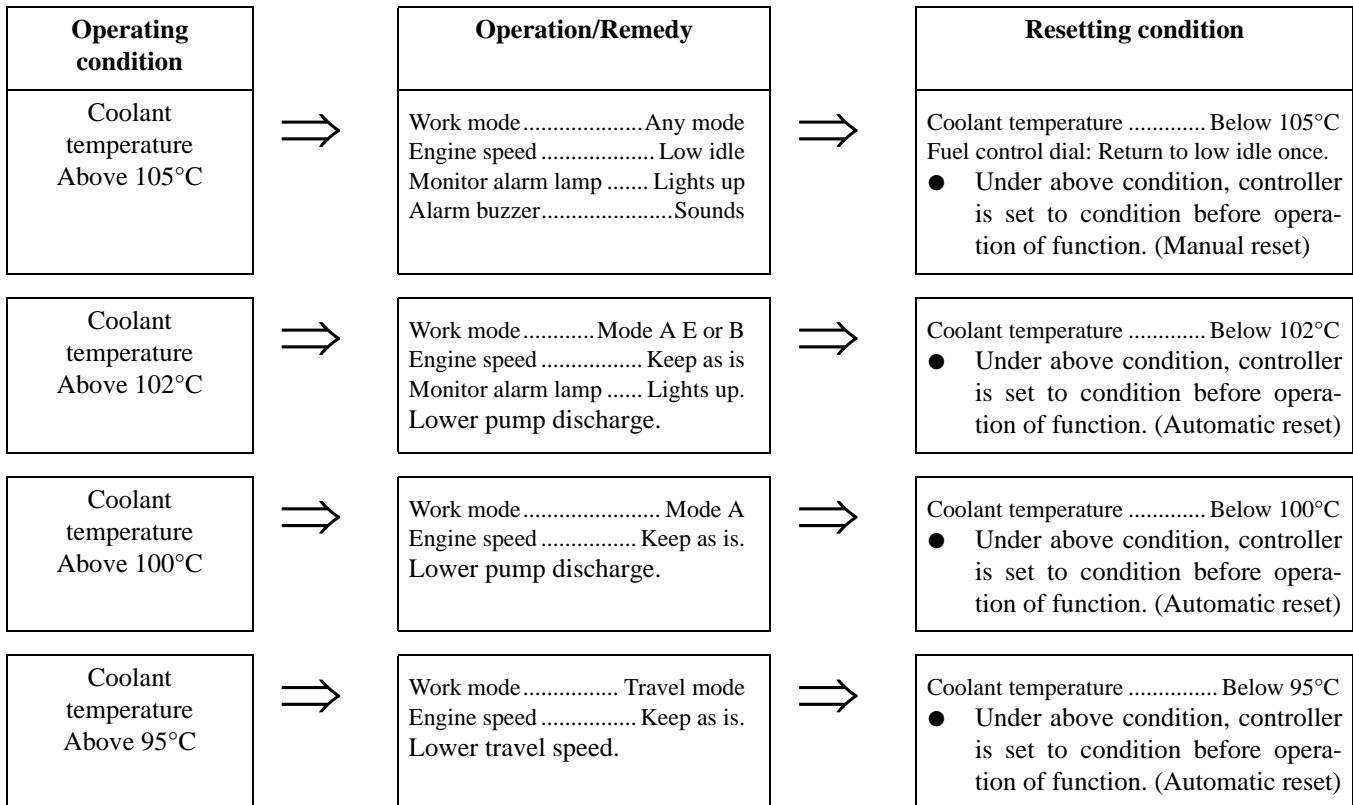
After the engine is started, if the engine coolant temperature is low, the engine speed is raised automatically to warm up the engine.



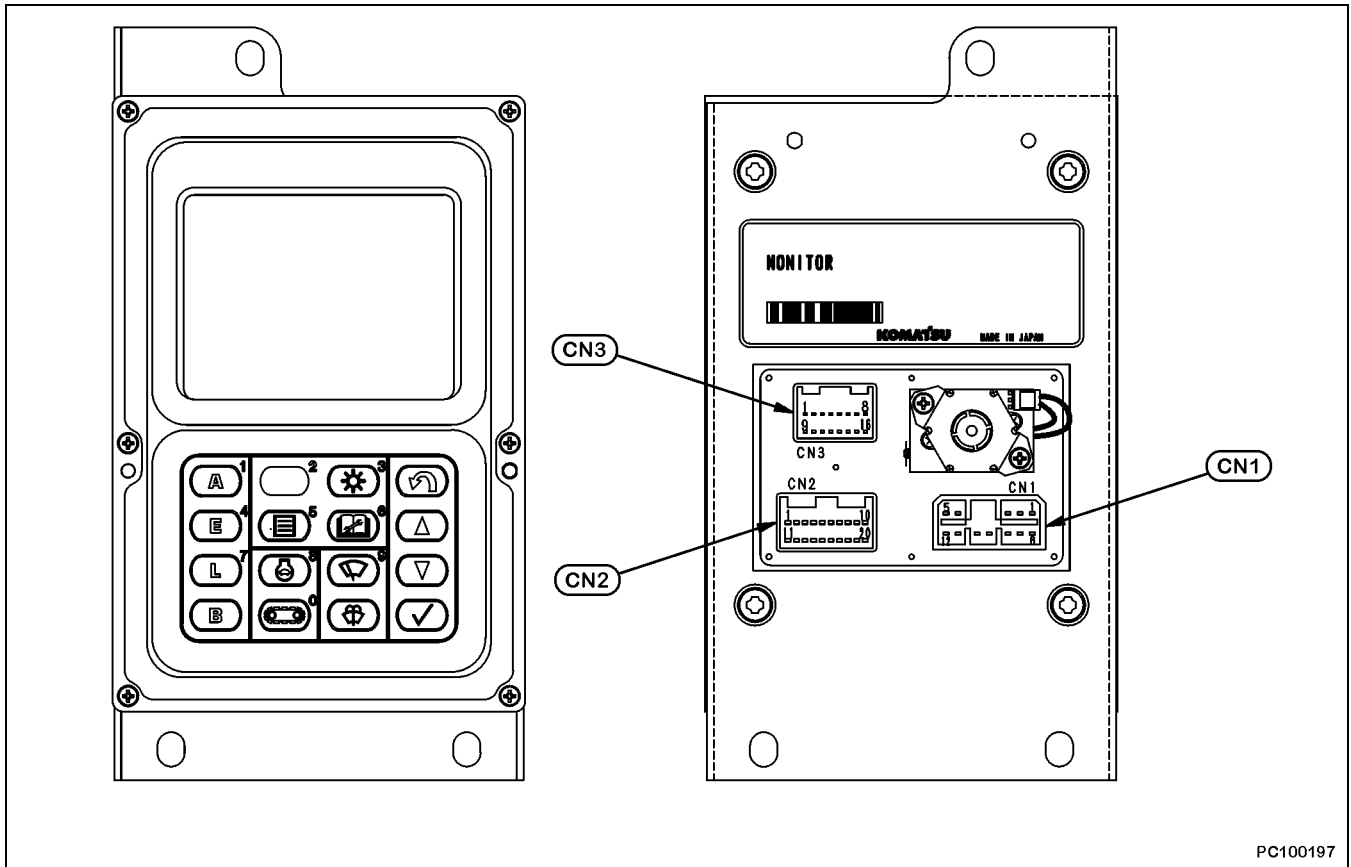
2. Overheat Prevention Function

If the engine coolant temperature rises too high during work, the pump load and engine speed are reduced to prevent overheating.

This function is turned on when the coolant temperature rises above 95°C.



MONITOR PANEL



PC100197

OUTLINE

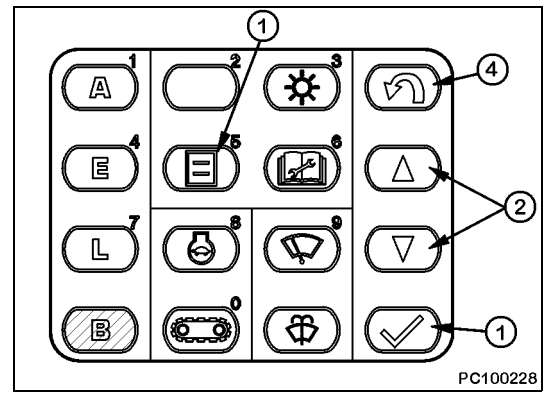
The monitor panel has the functions to display various items and the functions to select modes and electric parts.







The monitor panel has a CPU (Central Processing Unit) in it to process, display, and output the information.

The monitor display unit consists of LCD (Liquid Crystal Display). The switches are flat sheet switches.

2. B mode

- A. Press select switch (1) on the monitor to move to the screen for selecting the 3 stage flow level.
- B. Press control switch (2), or input [01] to [03] with the numeral 10 key pad to choose one on the three flow levels.



| No. | 10 key pad operation |
|-----|---|
| 01 |  →  |
| 02 |  →  |
| 03 |  →  |

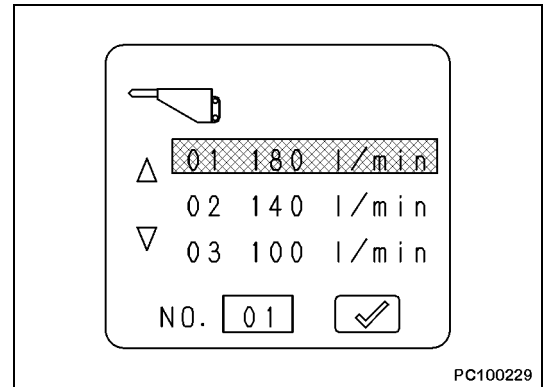
3. After completing the level selection, press input confirmation switch (3).

The selected flow level is selected.



★ Before the input confirmation switch is pressed, the flow level is not confirmed, so press return switch (4) to return to the operator screen. This function can be used to return to the previously set flow.

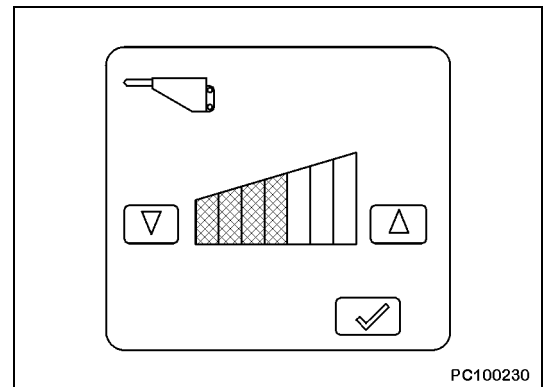
4. After the flow level is confirmed, the screen changes to the screen shown in the diagram on the right. With this screen, it is possible to make fine adjustment to the flow.

5. Press control switch (2) and select the flow level.



| No. | Flow level (L/min.) | Remarks |
|-----|---------------------|---------|
| 01 | 180 | Default |
| 02 | 140 | |
| 03 | 100 | |

| Control switch | Actuation |
|---|---|
|  | Flow level bar graph extends to the right |
|  | Flow level bar graph retracts to the left |



20 TESTING, ADJUSTING AND TROUBLESHOOTING

| | |
|---|--------|
| STANDARD VALUE TABLES | 20-2 |
| ENGINE PARTS | 20-2 |
| CHASSIS PARTS | 20-3 |
| FLOW CONTROL CHARACTERISTIC OF PC VALVE | 20-12 |
| TESTING AND ADJUSTMENT | 20-101 |
| TROUBLESHOOTING | 20-201 |
| TROUBLESHOOTING | 20-301 |
| ELECTRICAL SYSTEM SERVICE CODE AND MECHANICAL SYSTEM FAILURE CODE | 20-302 |
| TROUBLESHOOTING | 20-501 |
| ELECTRICAL SYSTEM - E MODE | 20-502 |
| TROUBLESHOOTING | 20-601 |
| MECHANICAL SYSTEM - H MODE | 20-602 |

Remark

TROUBLESHOOTING of ENGINE - S MODE can be found in the ENGINE SHOP MANUAL.

- ★ The following precautions are necessary when using the standard value tables for testing and adjusting or for troubleshooting.
- 1. The values in the tables are for new machines and are obtained from reference to values when the machine is shipped from the factory. These values should be used only as a target guide for judging the progress of wear or when repairing the machine.
- 2. The standard values for judging failures are based on the results of various tests when shipping the machine from the factory. These values should be used as reference together with the repair condition and operating record of the machine to make judgement on failures.
- 3. These standard values do not form a basis for judging claims.



WARNING! When carrying out testing, adjusting or troubleshooting, position the machine on level ground and use blocks to prevent the machine from moving.



WARNING! When carrying out work together with other workers, use agreed signals and do not allow unauthorized people near the machine.

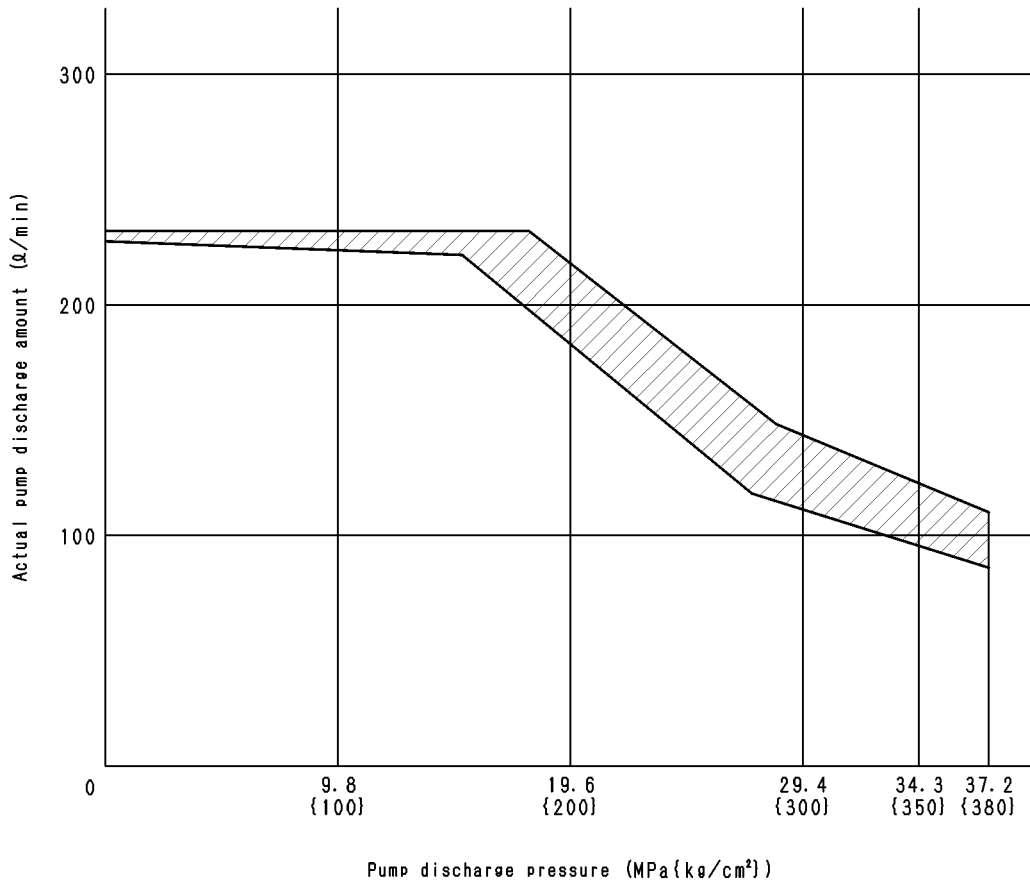


WARNING! Wait for the engine coolant to cool before checking the coolant level. If the radiator cap is removed while the coolant is still hot, the coolant will spurt out and cause burns. Be careful to stay away from the fan, fan belt and other moving parts

| Applicable Model | | | | PC220LC-7L | |
|------------------|------|------------------------|------|----------------|-------------------|
| Category | Item | Measurement conditions | Unit | Standard value | Permissible value |

Performance of hydraulic pump

Discharge amount of hydraulic pump (A mode)



PC200015

Pump speed: At 2050 rpm, PC current 310 mA

| Check point | Test pump discharge pressure kg/cm ² | Discharge pressure of other pump kg/cm ² | Average pressure kg/cm ² | Standard value for discharge amount Q - L/min | Judgement standard lower limit Q L/min |
|-------------|---|---|-------------------------------------|---|--|
| As desired | P1 | P2 | $\frac{P1 + P2}{2}$ | See graph | See graph |

- ★ As far as possible, bring pump discharge pressure P1 and P2 as close as possible to the average pressure when measuring. The error is large near the point where the graph curves, so avoid measuring at this point.
- ★ When measuring with the pump mounted on the machine, if it is impossible to set the engine speed to the specified speed with the fuel control dial, take the pump discharge amount and the engine speed at the point of measurement, and use them as a base for calculating the pump discharge amount at the specified speed.

SWING CIRCLE BEARINGS

★ Follow the steps explained below, when measuring clearance in the swing circle bearing in the actual machine.

WARNING! Be careful not to put a hand or foot under the undercarriage, while taking measurement.

1. Fasten dial gauge **H** to swing circle outer race (1) or inner race (2), and contact the probe with the end surface of inner race (2) or outer race (1) on the opposite side.

★ Set dial gauge at the machine front or rear.

2. Keep the work equipment in the max. reach posture and keep the height of the bucket teeth tip level with the lower height of the revolving frame.

★ The upper structure is lowered at the front and raised at the rear at that time.

3. Set dial gauge at zero point.

4. Hold the arm nearly perpendicular to the ground, and lower the boom until the track shoes will be lifted 150 to 200 mm at the machine front.

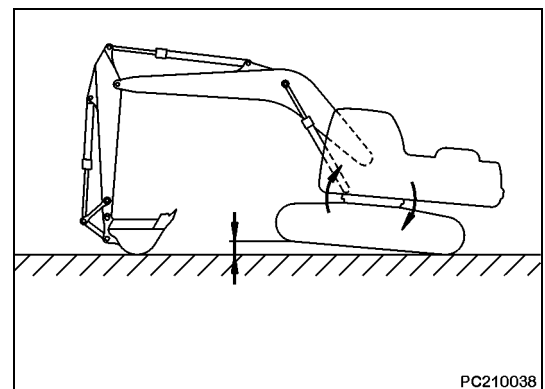
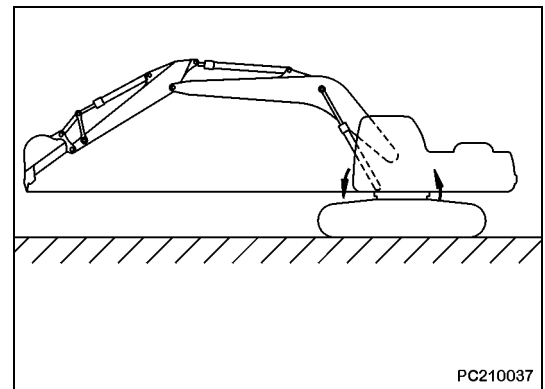
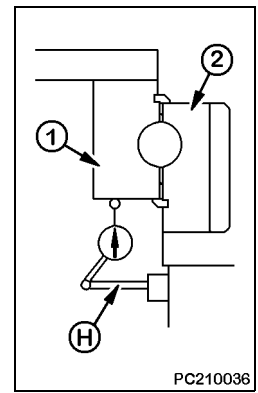
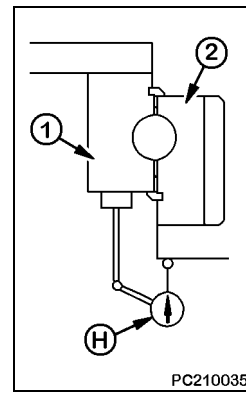
★ The upper structure is raised at the front and lowered at the rear at that time.

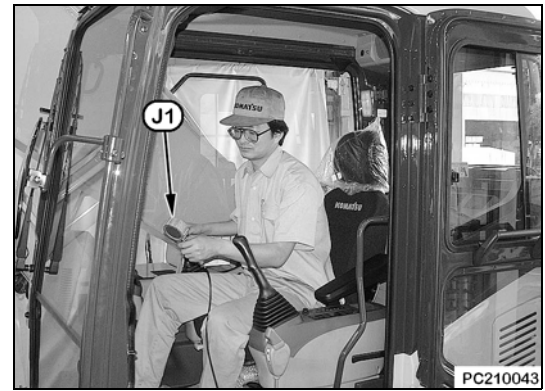
5. Read off the value in dial gauge in this condition.

★ The value indicated in dial gauge expresses clearance in the bearings.

6. Return the machine to the posture in Item 2 above, and confirm reading of dial gauge is zero.

★ If zero value is not indicated, repeat the steps in Items 3 through 5.





ADJUSTMENT

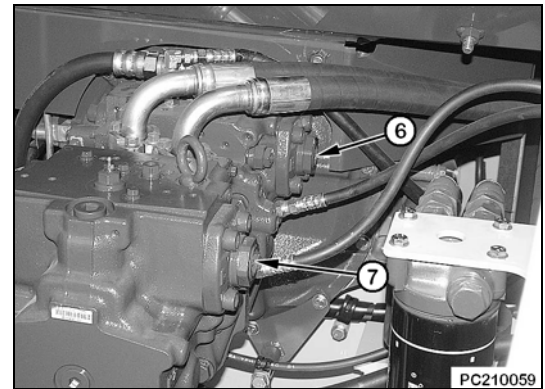
★ If any of the phenomena mentioned below occurs and PC valve malfunctioning is suspected, adjust PC valves (6) and (7) in the following manner.

As workload increases, the engine rpm sharply drops.

While the engine rpm is normal, the work equipment moves slowly.

(6): Front pump PC valve.

(7): Rear pump PC valve.



★ The width across flats of the locknut for the PC valve is 13 mm and that of the adjustment screw (inside width) is 4 mm. Do not turn any other locknut or adjustment screw since it affects the performance of the hydraulic pumps.

1. Loosen lock nut (8) and make adjustment, turning adjusting screw (9).


★ Before loosening the locknut, make match marks at the adjustment screw end so that you can see the position of the locknut before the adjustment (and you can return the locknut to its original position after turning it in reverse).

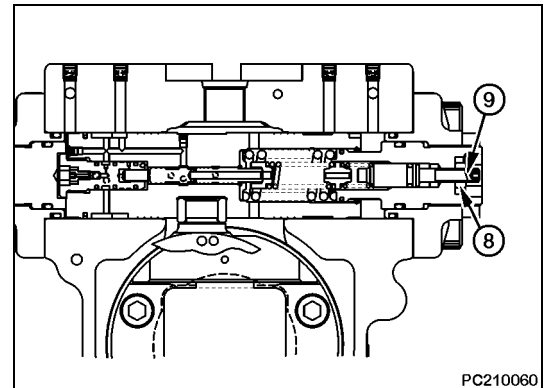
- If the work equipment speed is low, turn the adjustment screw to the right (to increase the pump absorption torque).
- If the engine speed lowers, turn the adjustment screw to the left (to decrease the pump absorption torque).

★ The adjustable range with the adjusting screw is as shown below.

Left turn..... Less than 1 turn

Right turn Less than 1/2 turn (less than 180°)

 Lock nut 27.50 - 34.3 Nm (20.2 - 25.2 lbf ft)



2. Confirm that the PC valve output pressure (servo piston inlet pressure) is normal after the adjustment, following the measurement steps explained earlier.


EQUIPMENT AND SWING PPC VALVE

★ If there is excessive play in the work equipment or swing lever, adjust it in the following manner.

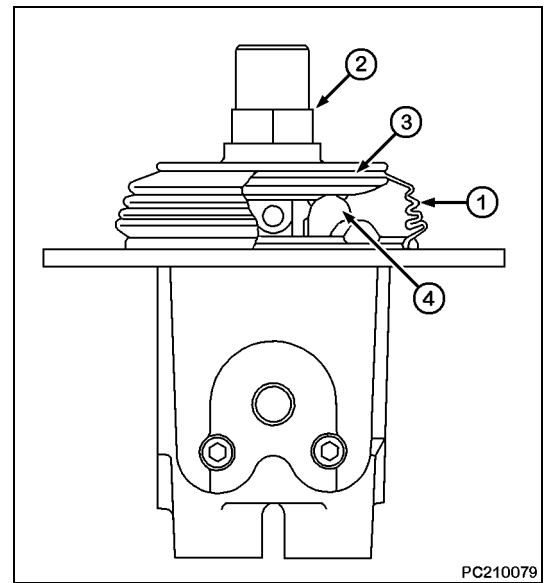
1. Remove equipment and swing PPC valve assy.
2. Take off boot (1).
3. Loosen lock nut (2) and screw in disc (3) until it contacts the heads of four pistons (4).

★ Do not move the piston while doing this work.

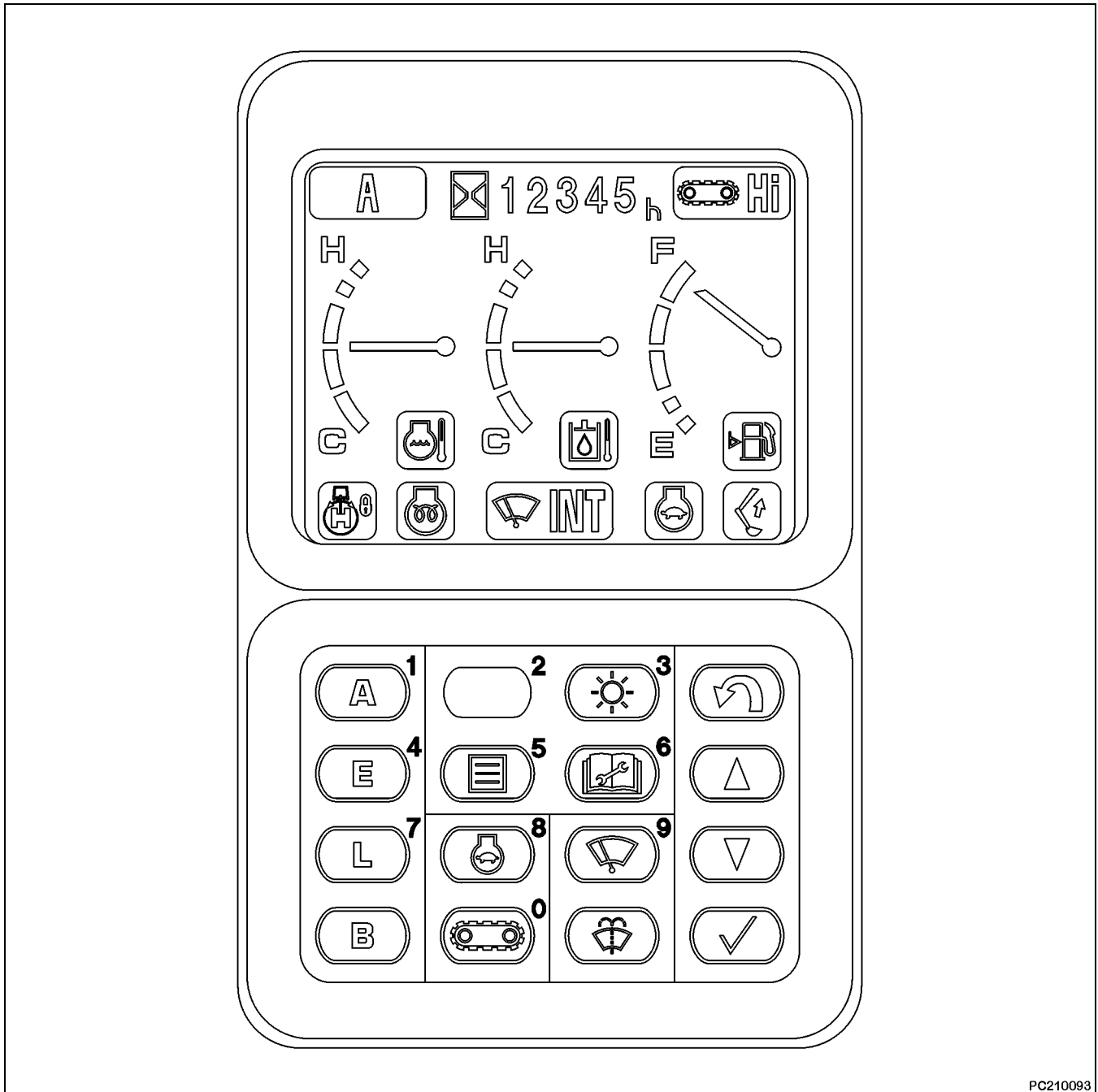
4. Keep disc (3) in place and tighten lock nut (2) to the specified tightening torque.

 Lock nut 98 - 127 Nm (72.2 - 93.6 lbf ft)

5. Install boot (1).
6. Install work equipment and swing PPC valve assembly.



MULTI MONITOR PANEL



PC210093

- [1] Figure input switch 1
- [2] Figure input switch 2
- [3] Figure input switch 3
- [4] Figure input switch 4
- [5] Figure input switch 5

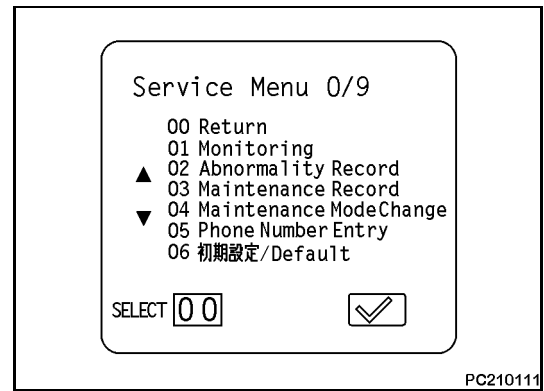
- [6] Figure input switch 6
- [7] Figure input switch 7
- [8] Figure input switch 8
- [9] Figure input switch 9
- [0] Figure input switch 0

- [↶] Return switch
- [△] Upward move switch
- [▽] Downward move switch
- [✓] Input confirmation switch

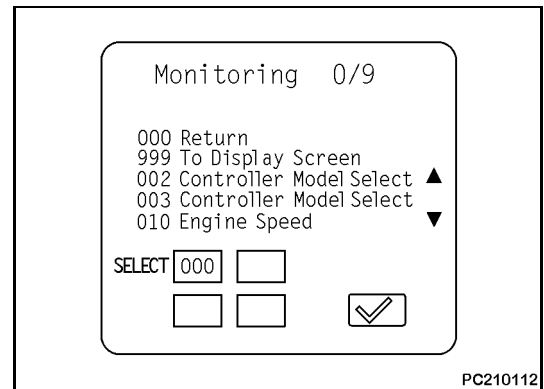
16. FUNCTION OF MONITORING [01]

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

1. Selection of menu
Select "01 Monitoring" in the initial display of Service Menu and depress [✓] switch.
2. Setting of monitoring item
Select or register an item to be monitored through the following switch operation.

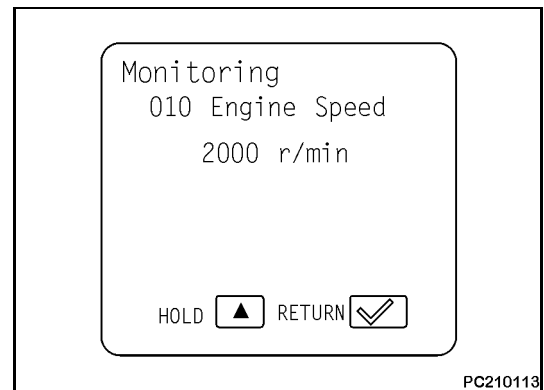


- [△] switch: Selection
- [▽] switch: Selection
- [✓] switch: Registration
- ★ A monitoring item can be set in any number between the min. one to the max. four. Depending upon the selected item, the max. number is less than four.
- ★ In case of monitoring 1 to 3 items, move to the monitored information display through any of the following switch operations, after the registration work has been completed.



- Keep [✓] switch depressed. (For about 3 seconds)
- Select Menu 999 and depress [✓] switch.
- ★ The display automatically moves to the display of monitored information, when all of the registrable items have been duly registered.
- ★ Monitored information are transmitted via communication circuits. Thus the number of selected items can impact the communication speed. If truly real time monitoring is required, reduce the selected items to the minimum.
- ★ For details on the monitoring items, display unit, etc., refer to the Table for Monitoring Items.

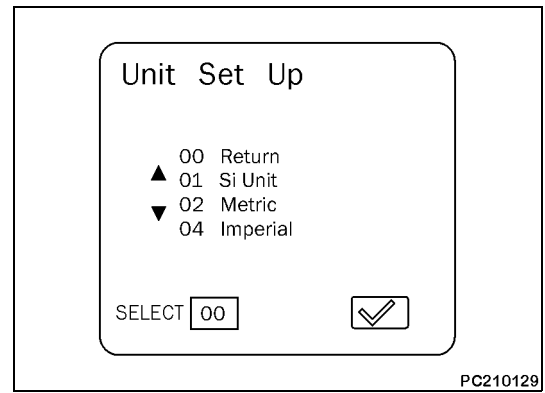
3. Monitoring operation
Call the monitoring information display and confirm the monitored information, while operating the machine.



5. Function for unit selection

As the unit to be used in the monitoring function display of Service Menu, three kinds of unit are provided.

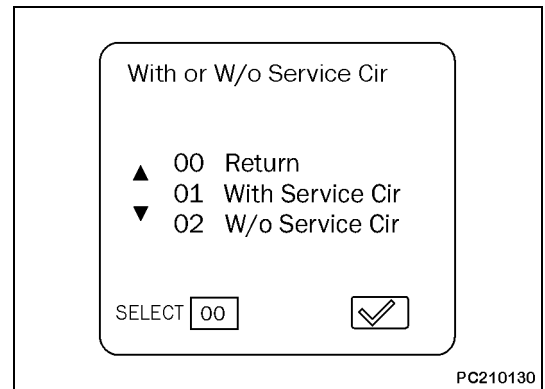
- ★ Unit used for default setting in the monitor panel is SI, i.e. International System of Units.



6. Function for selecting distinction of With/Without Service Circuit

It is possible in this function to set a distinction between with or without attachment.

- With Service Circuit: When an attachment is installed.
- Without Service Circuit: When no attachment is installed.
- ★ If "With Service Circuit" setting is not made in this display, while it is actually installed on a specific machine, SELECT function in Operator's Mode (attachment oil flow rate adjustment) cannot be utilized.

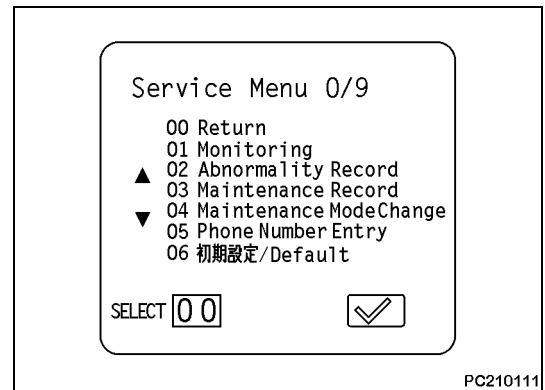


22. FUNCTION FOR ADJUSTMENT [07]

The monitor panel has a function of making various adjustments of the machine.

1. Selection of menu

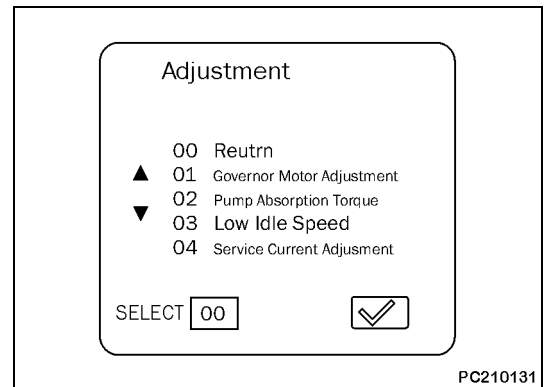
Select 07 adjustment in the initial display of Service Menu, and depress [✓] switch.



2. Selection of submenu

Select an item to change from the submenu and depress [✓] switch

| No. | Adjustment submenu |
|-----|------------------------------------|
| 00 | Return (termination of adjustment) |
| 01 | Governor Motor Adjustment |
| 02 | Pump Absorption Torque |
| 03 | Low Idle Speed |
| 04 | Service Current Adjustment |



MAINTENANCE POINTS TO REMEMBER

To maintain the performance of the machine over a long period, and to prevent failures or other troubles before they occur, correct operation, maintenance and inspection, troubleshooting, and repairs must be carried out. This section deals particularly with correct repair procedures for mechatronics and is aimed at improving the quality of repairs. For this purpose, it gives sections on "Handling electric equipment" and "Handling hydraulic equipment" (particularly gear oil and hydraulic oil).

WHEN HANDLING ELECTRIC EQUIPMENT

1. HANDLING WIRING HARNESSES AND CONNECTORS

Wiring harnesses consist of wiring connecting one component to another component, connectors used for connecting and disconnecting one wire from another wire, and protectors or tubes used for protecting the wiring.

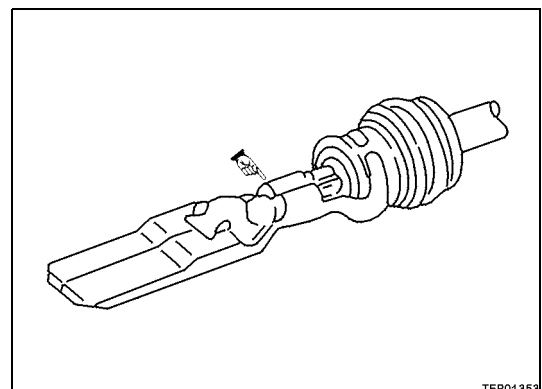
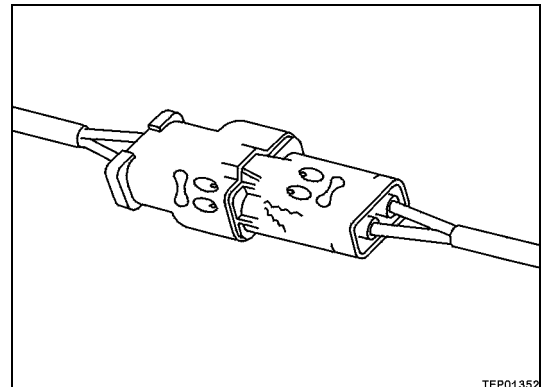
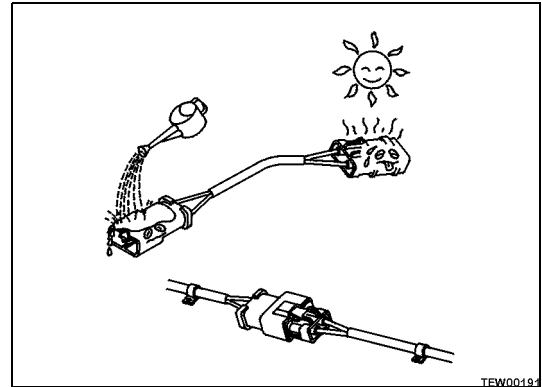
Compared with other electrical components fitted in boxes or cases, wiring harnesses are more likely to be affected by the direct effects of rain, water, heat, or vibration. Furthermore, during inspection and repair operations, they are frequently removed and installed again, so they are likely to suffer deformation or damage. For this reason, it is necessary to be extremely careful when handling wiring harnesses.

1. Main Failures Occurring In Wiring Harness

Defective contact of connectors (defective contact between male and female). Problems with defective contact are likely to occur because the male connector is not properly inserted into the female connector, or because one or both of the connectors is deformed or the position is not correctly aligned, or because there is corrosion or oxidization of the contact surfaces.

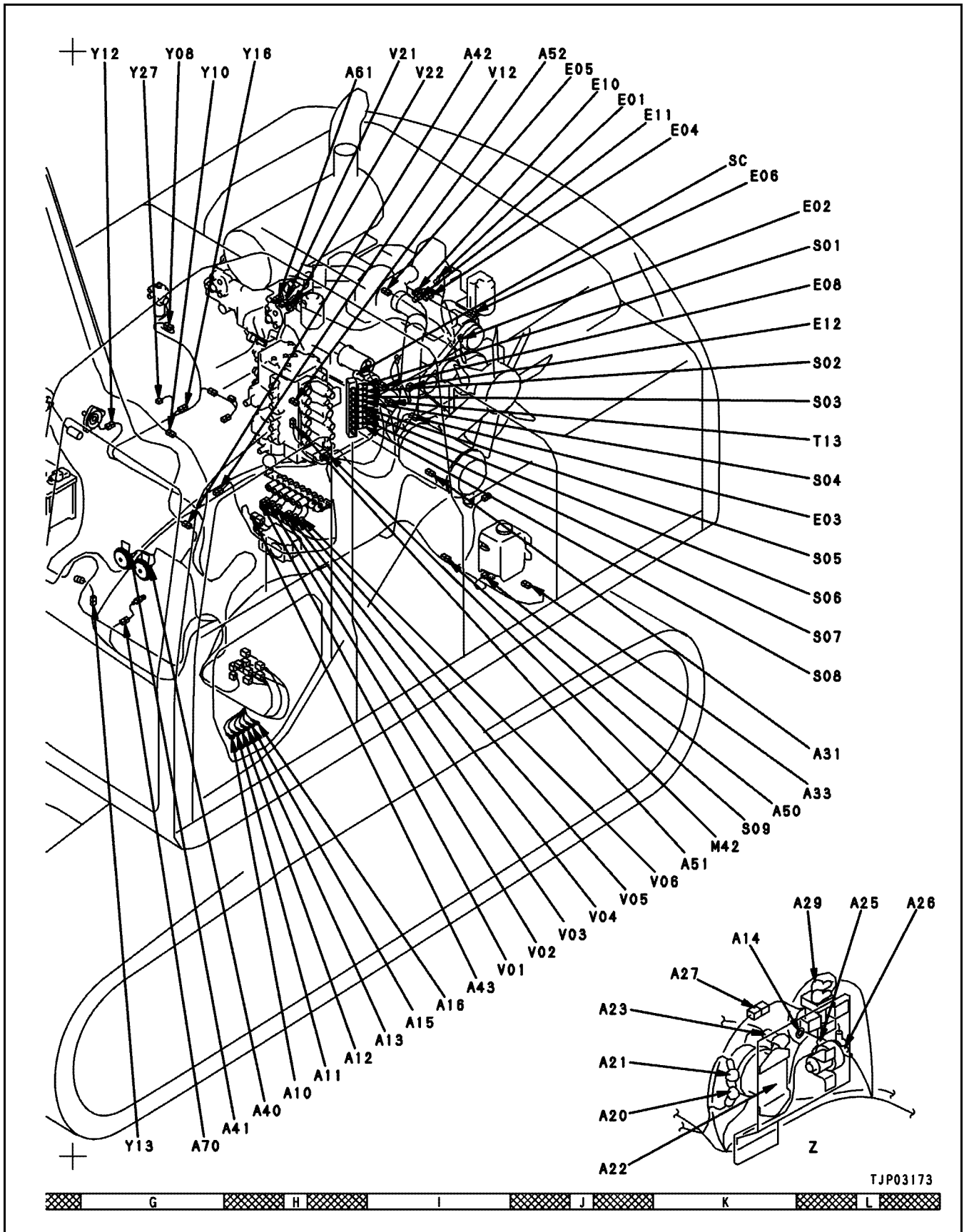
2. Defective Crimping or Soldering of Connectors

The pins of the male and female connectors are in contact at the crimped terminal or soldered portion, but if there is excessive force brought to bear on the wiring, the plating at the joint will peel and cause improper connection or breakage.

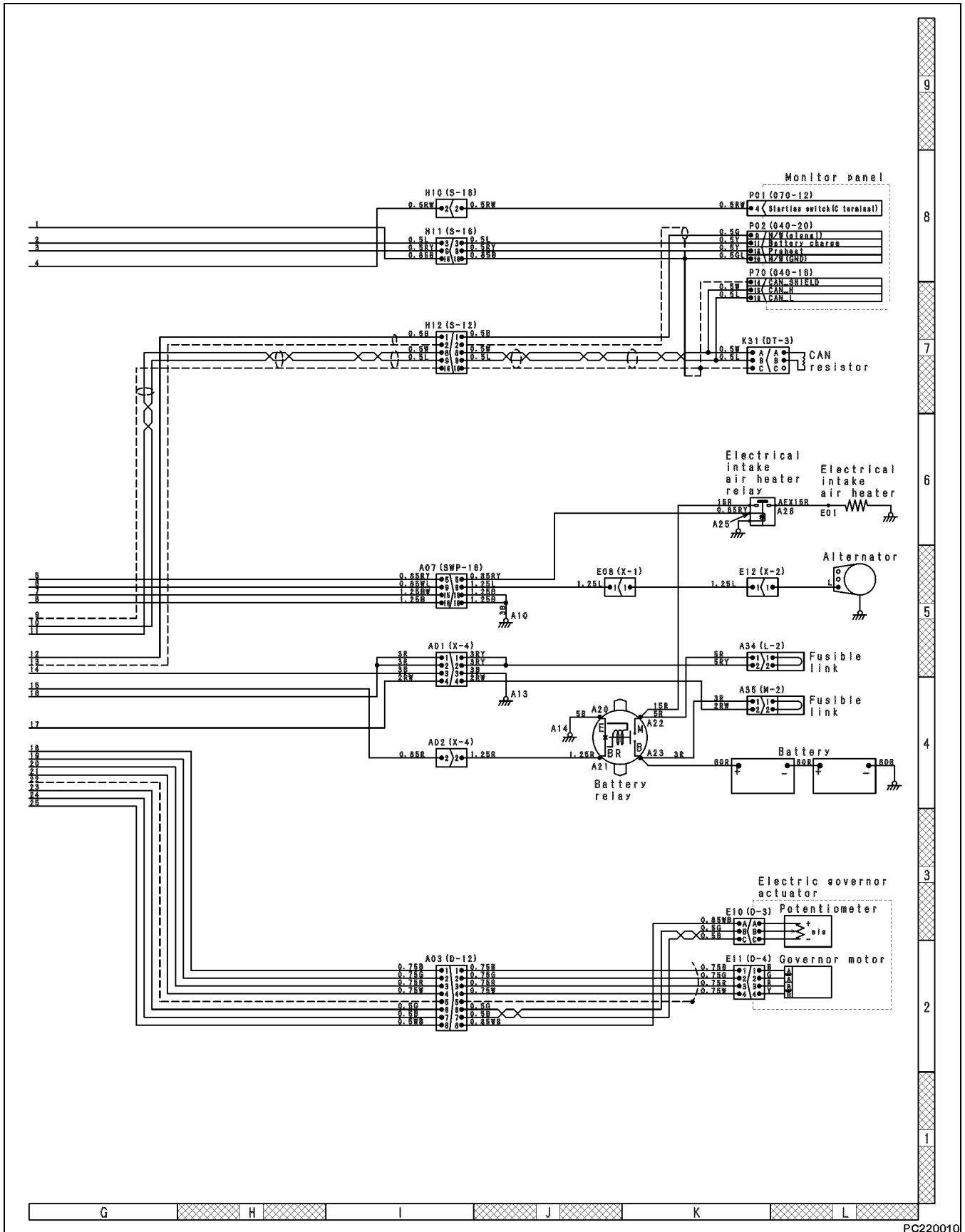


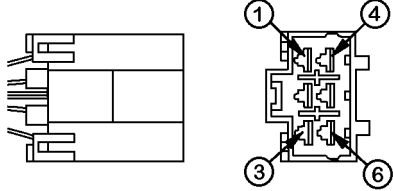
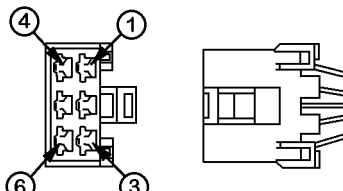
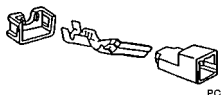

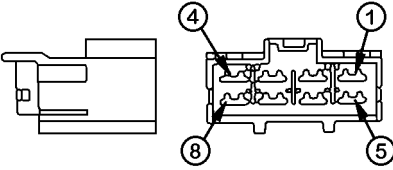
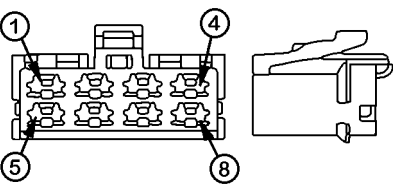
| No. | Failure looking phenomenon | Troubleshooting | | | |
|--|--|---|----------|--------|--------|
| | | Display | E mode | H mode | Engine |
| 31 | Bucket moves slowly or lacks power | | E-25, 26 | H-9 | |
| 32 | Boom, arm or bucket does not move | | | H-10 | |
| 33 | Natural drift of work equipment is too fast | | | H-11 | |
| 34 | Work equipment time lag is too big | | | H-12 | |
| 35 | Other work equipment moves, when specific work equipment is relieved | | | H-13 | |
| 36 | One touch power max. switch does not work | E-9, 21-26 | | H-14 | |
| Compound operation related failure | | | | | |
| 37 | In compound operation, work equipment with larger load moves slowly | | | H-15 | |
| 38 | In swing + boom RAISE operation, boom moves slowly | | | H-16 | |
| 39 | In swing + travel operation, travel speed drops sharply | | | H-17 | |
| Travel related failure | | | | | |
| 40 | Machine tends to swerve while in travel | | | H-18 | |
| 41 | Travel speed is slow | | E-28 | H-19 | |
| 42 | Machine is difficult to steer, or lacks power | | E-28, 29 | H-20 | |
| 43 | Travel speed cannot be shifted or is slow or fast | | E-28 | H-21 | |
| 44 | Track shoe does not move, only on one side | | | H-22 | |
| Swing related failure | | | | | |
| 45 | Machine does not swing | | E-27 | H-23 | |
| 46 | Swing acceleration is poor, or swing speed is slow | | | H-24 | |
| 47 | Upper structure overruns excessively, when stopping swing | | | H-25 | |
| 48 | There is a big shock caused when stopping swing | | | H-26 | |
| 49 | There is abnormal noise generated when stopping swing | | | H-27 | |
| 50 | There is natural drift while in swing | | | H-28 | |
| Monitor panel related failure (Operator's Menu: ordinary display) | | | | | |
| 51 | No display appears in monitor panel at all | | E-10 | | |
| 52 | Part of display is missing in monitor panel | | E-11 | | |
| 53 | Descriptions on monitor panel do not apply to the machine model | | E-12 | | |
| 54 | In startup inspection, radiator water level monitor lamp lights up red | B@BCZK | | | |
| 55 | In startup inspection, engine oil level monitor lamp lights up red | B@BAZK | | | |
| 56 | In startup inspection, maintenance hour monitor lamp lights up red | Refer to Operation and Maintenance Manual | | | |
| 57 | While engine is running, battery charging level monitor lamp lights up red | AB00KE | | | |
| 58 | While engine is running, fuel level monitor lamp lights up red | | E-13 | | |
| 59 | While engine is running, air cleaner clogging monitor lamp lights up red | AA10NX | | | |
| 60 | While engine is running, engine coolant temperature monitor lights up red | B@BCNS | | | |
| 61 | While engine is running, hydraulic oil temperature monitor lights up red | B@HANS | | | |
| 62 | Engine cooling water temperature gauge does not display correctly | | E-14 | | |

| Connector No. | Type | No. of pins | Name of device | Address | | | |
|---------------|----------|-------------|--|---------|-----------|-----------|-----------|
| | | | | Loci | M circuit | G circuit | P circuit |
| M46 | S090 | 4 | RS232C relaying connector | V-9 | | B-9 | |
| M71 | M | 2 | Room lamp | Z-8 | | | |
| M72 | M | 4 | DC/AC converter | W-7 | | | |
| M73 | KES0 | 2 | Speaker (left) | AD-8 | | | |
| M79 | YAZAKI | 2 | 12V electrical equipment socket | W-8 | | | |
| P01 | 070 | 12 | Monitor panel | N-6 | A-7 | K-8 | |
| P02 | 040 | 20 | Monitor panel | N-5 | A-6 | K-8 | A-9 |
| P03 | M | 2 | Buzzer canceling switch | P-9 | D-1 | | |
| P05 | M | 2 | Revolving warning lamp switch | U-2 | | | |
| P15 | Y050 | 2 | Air conditioner sun light sensor | N-6 | | | |
| P17 | S09 | 2 | Air conditioner high/low pressure switch | - | | | |
| P70 | 040 | 16 | Monitor panel | N-4 | A-5 | K-8 | |
| R10 | R | 5 | Lamp relay | O-8 | E-1 | | |
| R11 | R | 5 | Engine starting motor cutting relay (PPC lock) | P-8 | E-1 | | |
| R13 | R | 5 | Engine starting motor cutting relay (personal code) | Q-9 | F-1 | | |
| R20 | R | 5 | Attachment circuit switching relay | U-9 | | | C-9 |
| R21 | --- | --- | --- | W-7 | | | |
| R30 | R | 5 | Air conditioner blower relay | W-4 | | | |
| R31 | R | 4 | Air conditioner compressor relay | W-4 | | | |
| S01 | X | 2 | Bucket digging oil pressure switch | L-8 | | | K-3 |
| S02 | X | 2 | Boom lowering oil pressure switch | L-7 | | | K-3 |
| S03 | X | 2 | Swing oil pressure switch, left | L-7 | | | K-2 |
| S04 | X | 2 | Arm digging oil pressure switch | L-6 | | | K-3 |
| S05 | X | 2 | Bucket dumping oil pressure switch | L-5 | | | K-2 |
| S06 | X | 2 | Boom raise oil pressure switch | L-5 | | | K-3 |
| S07 | X | 2 | Swing oil pressure switch, right | L-5 | | | K-2 |
| S08 | X | 2 | Arm dumping oil pressure switch | L-5 | | | K-3 |
| S09 | X | 2 | Service oil pressure switch (intermediate connector) | K-3 | | | K-2 |
| S10 | X | 2 | Service oil pressure switch, front | - | | | K-2 |
| S11 | X | 2 | Service oil pressure switch, rear | - | | | K-1 |
| S14 | M | 3 | Safety lever lock switch | S-1 | K-9 | | F-8 |
| S21 | Terminal | 6 | Pump emergency driving switch | R-9 | | | E-1 |
| S22 | Terminal | 6 | Swing and parking brake emergency releasing switch | R-9 | | | F-1 |
| S25 | S090 | 16 | Intermediate connector | Q-9 | | | E-3 |
| S30 | X | 2 | Travel hydraulic switch | O-1 | | | A-1 |
| S31 | X | 2 | Travel steering hydraulic switch | P-1 | | | A-1 |

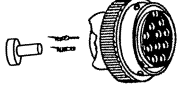

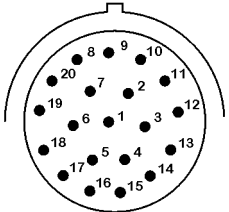
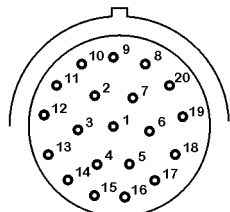
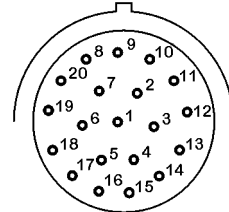
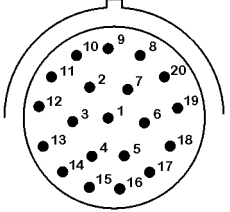
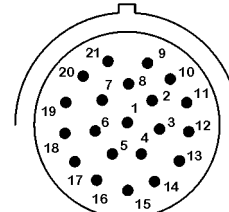
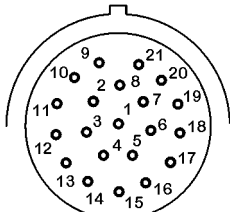
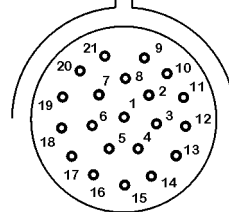
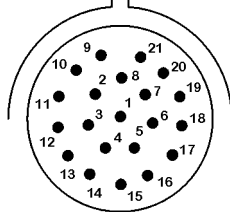


★ This circuit diagram has been compiled by extracting the governor pump controller system (power source, governor control, model selection and communication) from the overall electrical circuit diagram



| | | | |
|--------------------------------|---|--|----------------------------------|
| <p>6</p> |  <p>PC220045 Part No.: 08056-00671</p> |  <p>PC220046 Part No.: 08056-00681</p> | <p>799-601-7130</p> |
| <p>M type connector</p> | | | |
| <p>Pins</p> | <p>Male Pins, Female Housing</p>  <p>PC220035</p> | <p>Female Pins, Male Housing</p>  <p>PC220036</p> | <p>T-adapter Part No.</p> |
| <p>8</p> |  <p>PC220047 Part No.: 08056-00871</p> |  <p>PC220048 Part No.: 08056-00881</p> | <p>799-601-7390</p> |

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

| Type (shell size code) | HD30 Series connector | | T-adapter Part No. |
|------------------------|--|---|--------------------|
| | Plug Body  PC220113 | Receptacle Body  PC220114 | |
| 18-20 (3) | Pin (male terminal)  PC220123 Part No.: 08191-31201, 08191-31202 | Pin (female terminal)  PC220124 Part No.: 08191-34101, 08191-34102 | 799-601-9230 |
| | Pin (female terminal)  PC220125 Part No.: 08191-32201, 08191-32202 | Pin (male terminal)  PC220126 Part No.: 08191-33101, 08191-33102 | |
| 18-21 (4) | Pin (male terminal)  PC220127 Part No.: 08191-41201, 08191-42202 | Pin (female terminal)  PC220128 Part No.: 08191-44101, 08191-44102 | 799-601-9240 |
| | Pin (female terminal)  PC220129 Part No.: 08191-42201, 08191-42202 | Pin (male terminal)  PC220130 Part No.: 08191-43101, 08191-43102 | |

| Part No. | Connector type or part name | No. of pins | 799-601-2500 | 799-601-2700 | 799-601-2800 | 799-601-2900 | 799-601-3000 | 799-601-5500 | 799-601-6000 | 799-601-6500 | 799-601-7000 | 799-601-7100 | 799-601-7400 | 799-601-7500 | 799-601-8000 | 799-601-9000 | 799-601-9100 | 799-601-9200 | 799-601-9300 | ... |
|--------------|-----------------------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-----|
| | | | 799-601-7090 | M | 2P | | | | | | | | | • | • | • | | • | | |
| 799-601-7110 | M | 3P | | | | | | | | | • | • | • | | • | | | | | |
| 799-601-7120 | M | 4P | | | | | | | | | • | • | • | | • | | | | | |
| 799-601-7130 | M | 6P | | | | | | | | | • | • | • | | • | | | | | |
| 799-601-7340 | M | 8P | | | | | | | | | | | | | | | | | | • |

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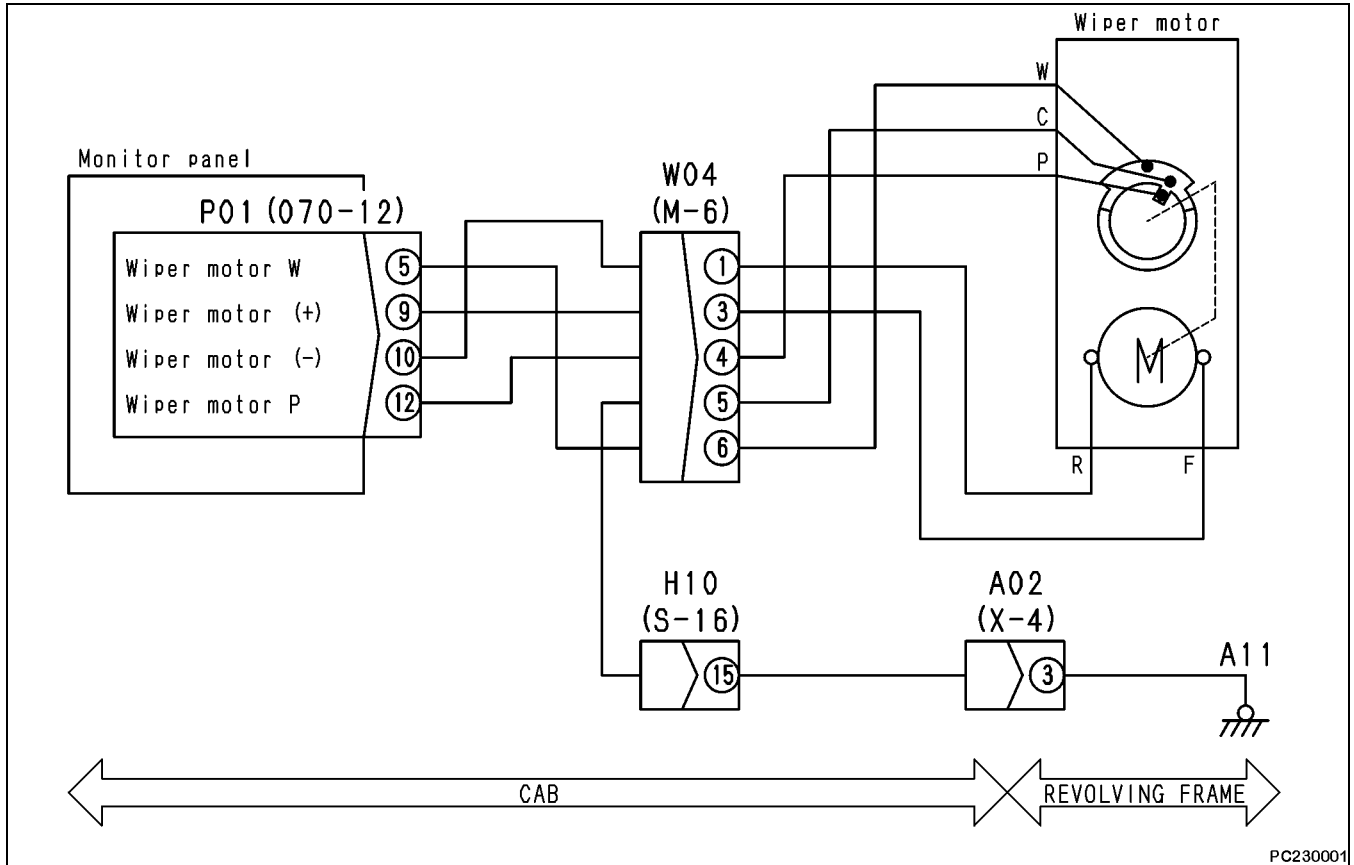
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TROUBLESHOOTING ELECTRICAL SERVICE CODES AND MECHANICAL FAILURE CODES

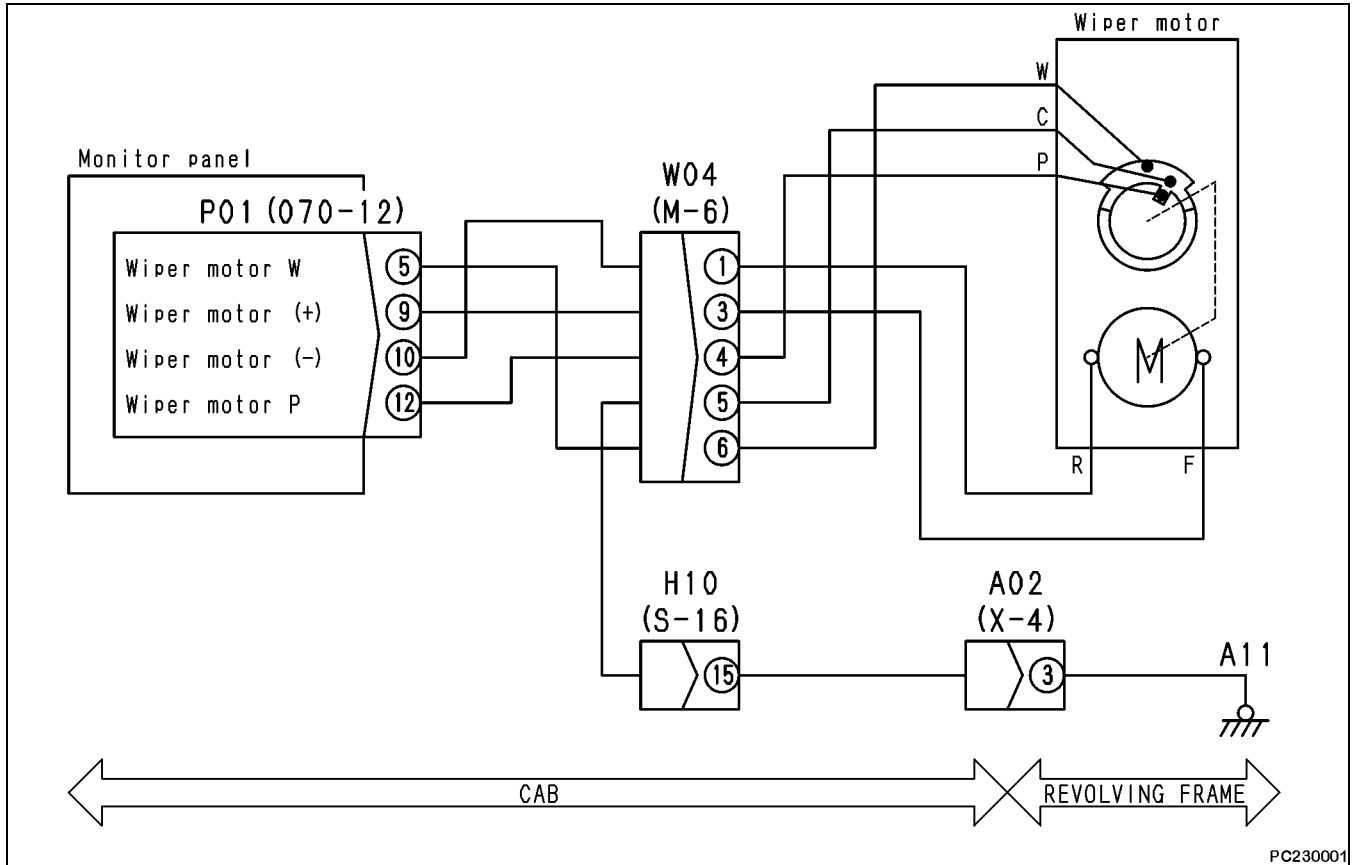
| | |
|---|--------|
| POINTS TO REMEMBER WHEN TROUBLESHOOTING SYSTEM | 20-303 |
| POINTS TO REMEMBER IF ABNORMALITY RETURNS TO NORMAL BY ITSELF | 20-303 |
| USER CODE MEMORY RETENTION FUNCTION | 20-303 |
| INFORMATION CONTAINED IN TESTING PROCEDURES | 20-304 |
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| E112 SHORT OR OPEN IN WIPER MOTOR DRIVE SYSTEM | 20-310 |
| E113 SHORT OR OPEN IN REVERSE ROTATION OF WIPER MOTOR DRIVE | 20-312 |
| E114 SHORT OR OPEN IN WINDOW WASHER SYSTEM | 20-314 |
| E115 ABNORMAL WIPER MOTOR OPERATION | 20-318 |
| E116 ABNORMALITY IN PARKING WIPER ARM | 20-320 |
| E201 SHORT OR OPEN IN TRAVEL INTERLOCKING SOLENOID | 20-322 |
| E203 SHORT IN SWING AND PARKING SOLENOID CONTROLLER SYSTEM | 20-326 |
| E204 SHORT IN MERGE/DIVIDE SOLENOID | 20-330 |
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| E216 OPEN IN TRAVEL SPEED SOLENOID | 20-362 |
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| E317 OPEN IN GOVERNOR MOTOR PHASE "A" AND "B" | 20-406 |
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| E501 MODEL SELECTION FUNCTION NOT PROVIDED | 20-410 |
| E502 MODEL SELECTING SIGNAL FAULT | 20-411 |
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TESTING AND ADJUSTING E112 SHORT OR OPEN IN WIPER MOTOR DRIVE SYSTEM

Circuit Diagram for Monitor Panel Wiper Motor

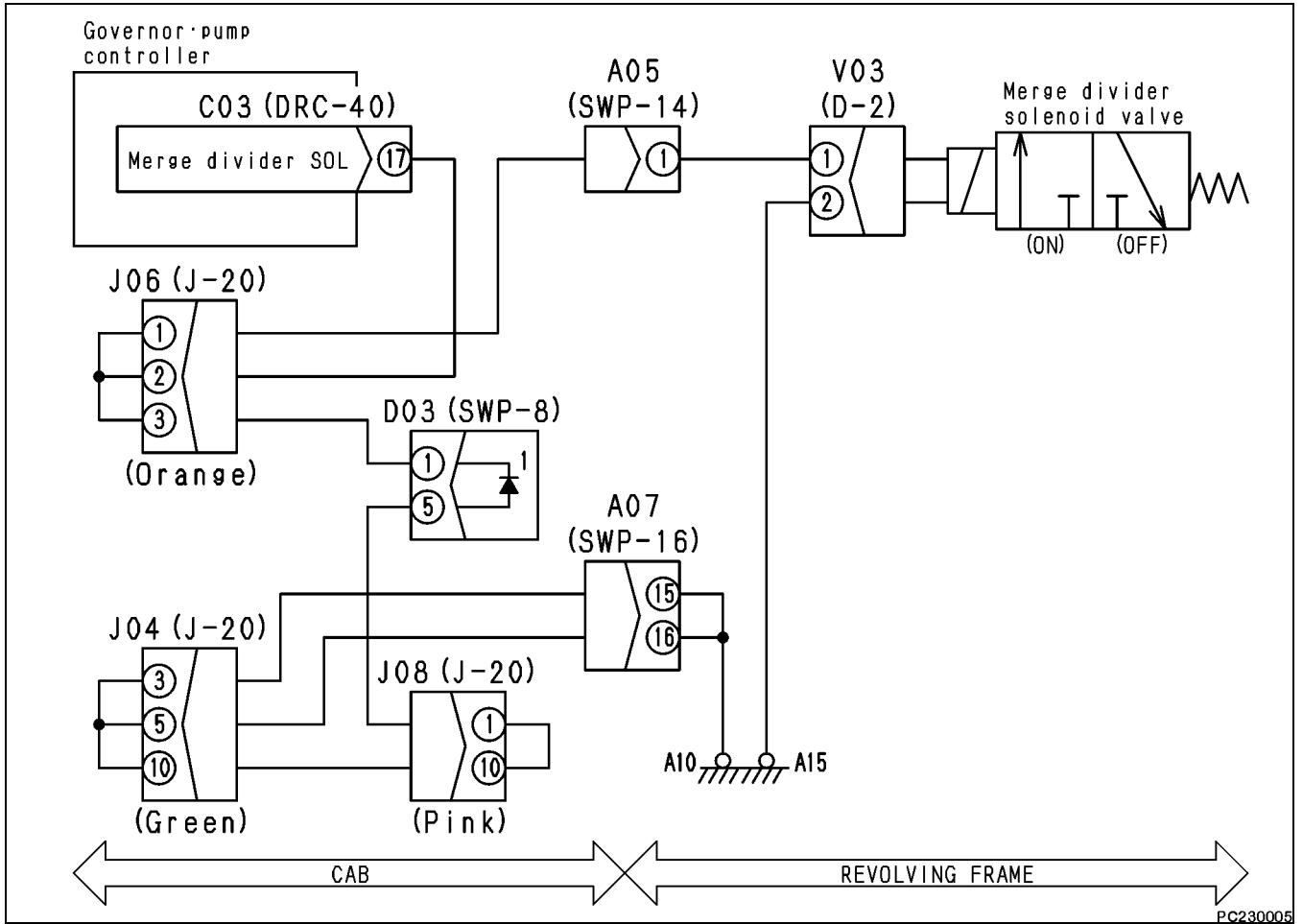


Monitor Panel Wiper Motor Circuit Diagram

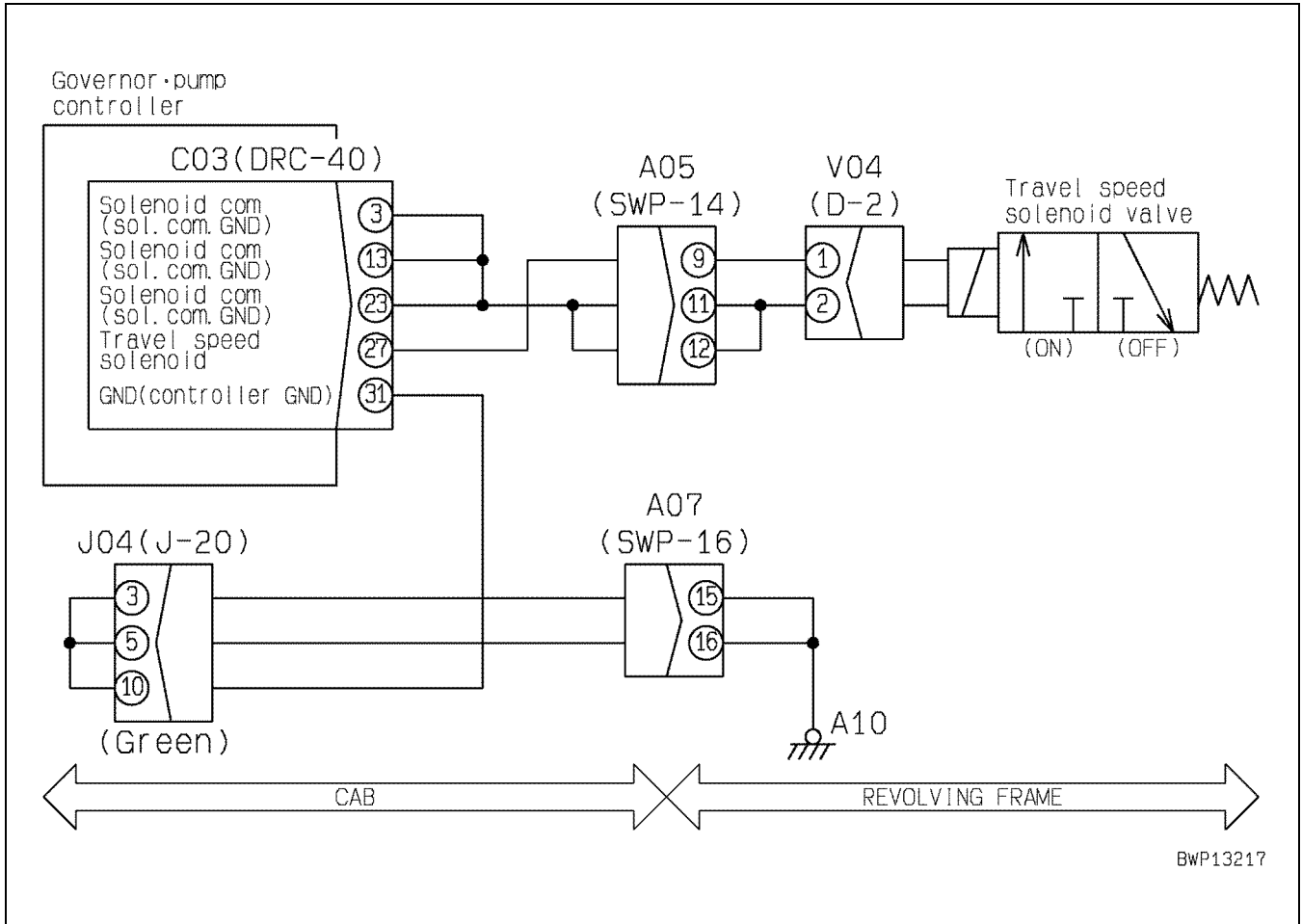


PC230001

Circuit Diagram for Merge/Divide Solenoid in Governor Pump Controller

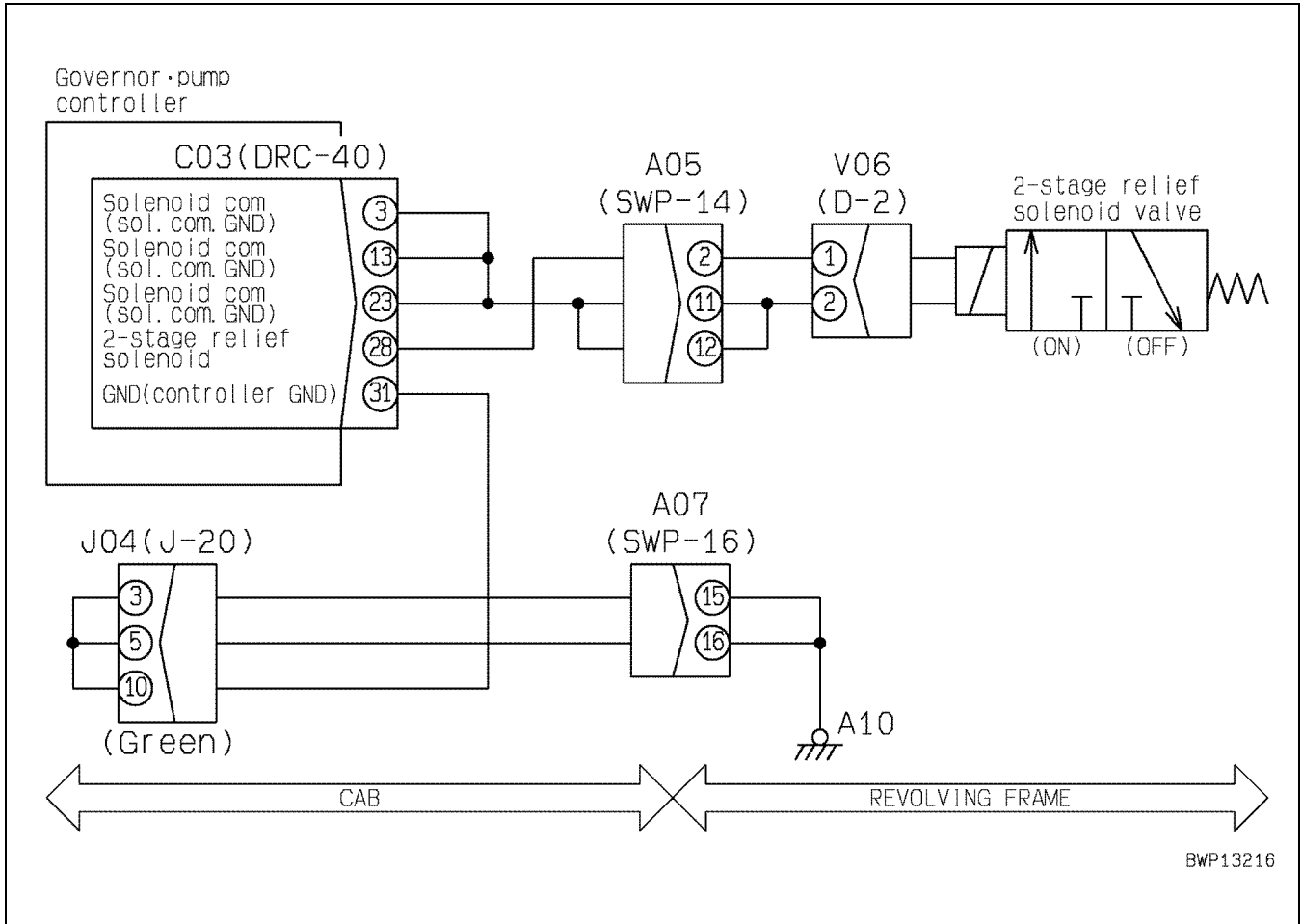


Circuit Diagram for Travel Speed Shifting Solenoid in Governor Pump Controller

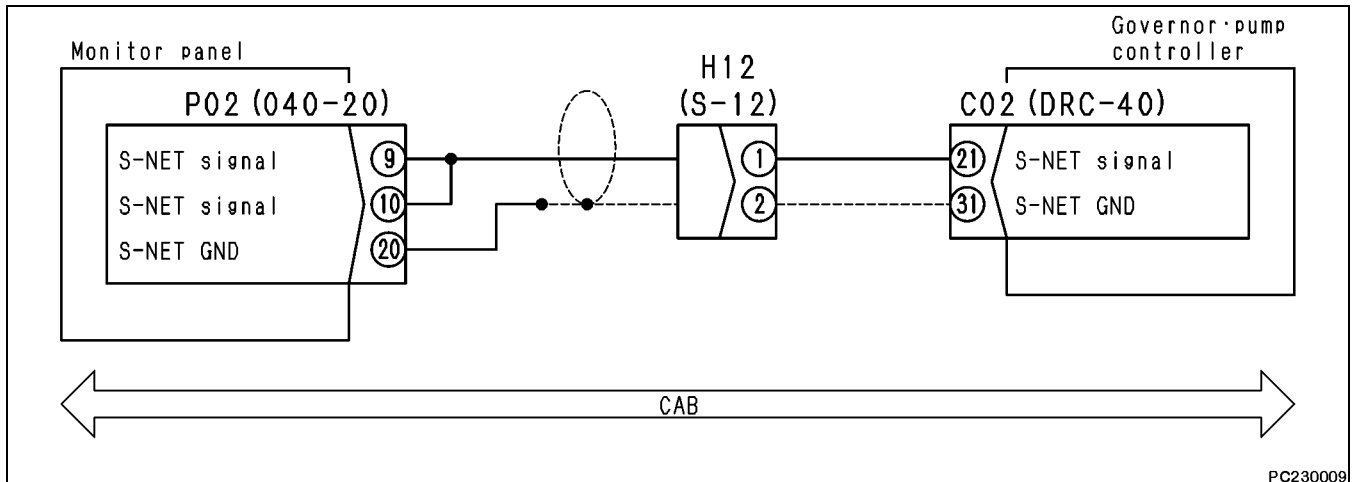


| | | | | | |
|---------------|---------------------|---------------------------------------|-------------------|----|--|
| A. Controller | Resistance Ω | Between C03, (37) and chassis ground. | 20 to 60 Ω | 15 | |
|---------------|---------------------|---------------------------------------|-------------------|----|--|

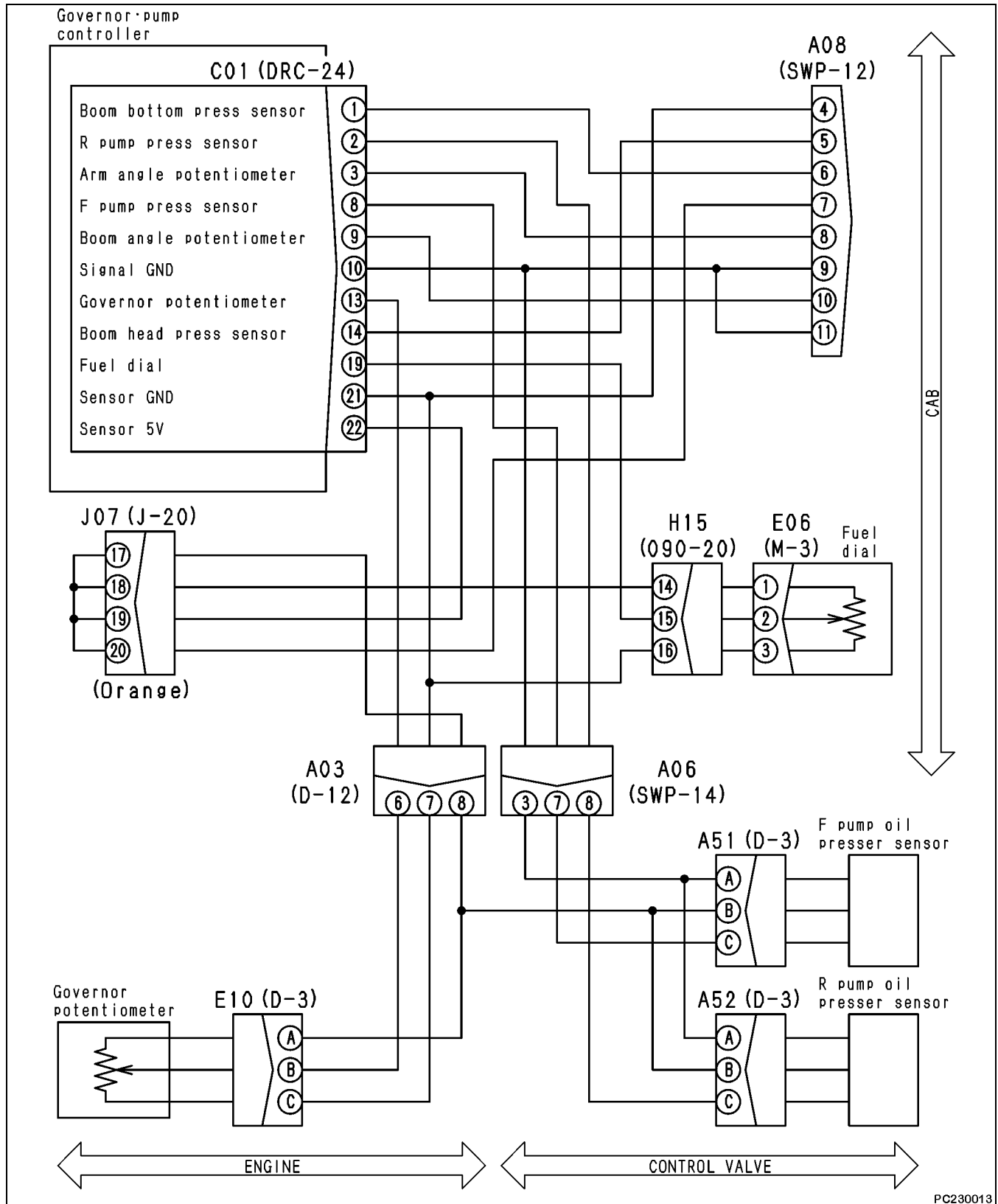
Circuit Diagram for 2 Stage Relief Solenoid in Governor Pump Controller



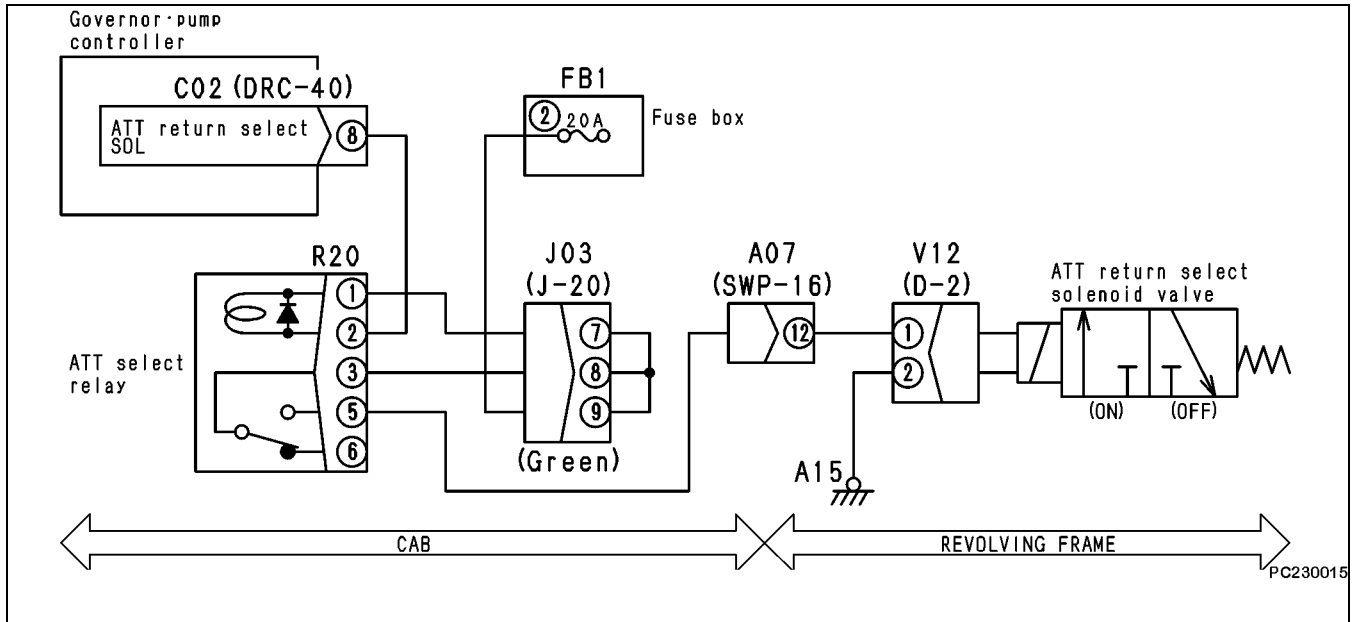
Circuit Diagram for S-NET Communication - Monitor Panel and Governor Pump Controller



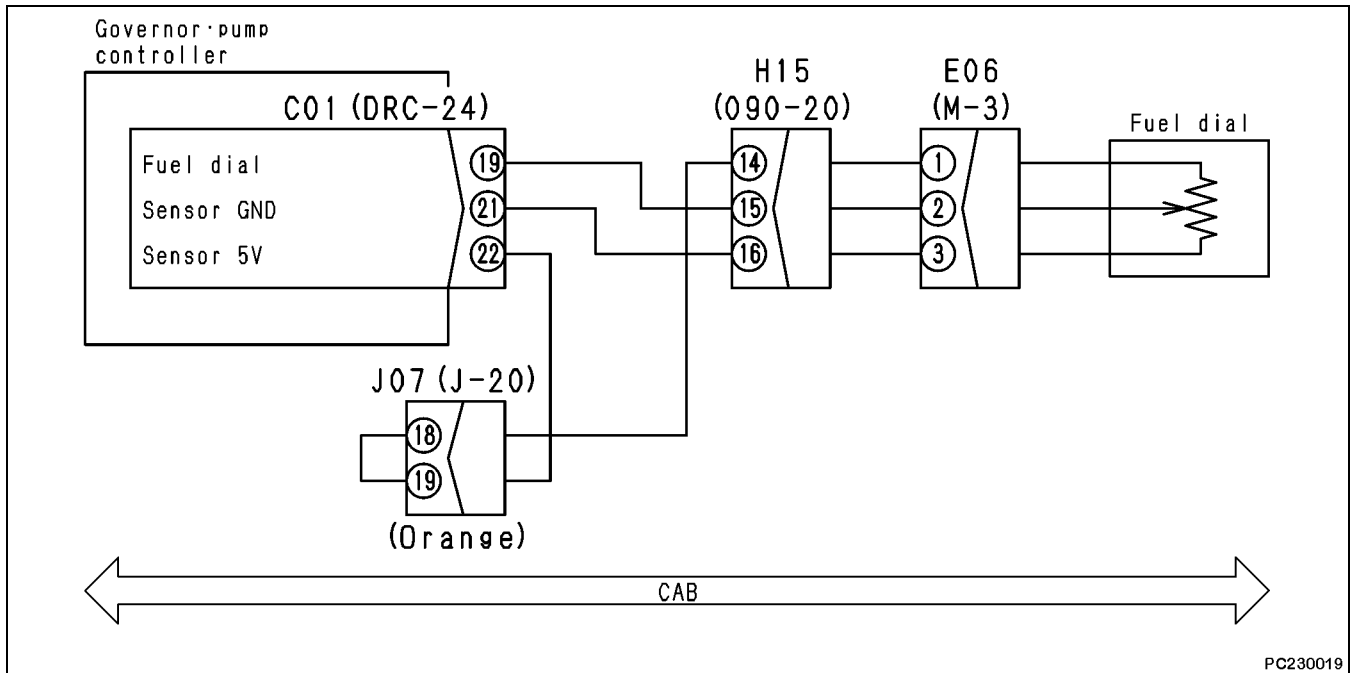
Circuit Diagram for Sensor Power Source in Governor Pump Controller



Circuit Diagram for Attachment Return Switching Relay and Solenoid in Governor Pump Controller



Circuit Diagram for Fuel Dial in Governor Pump Controller

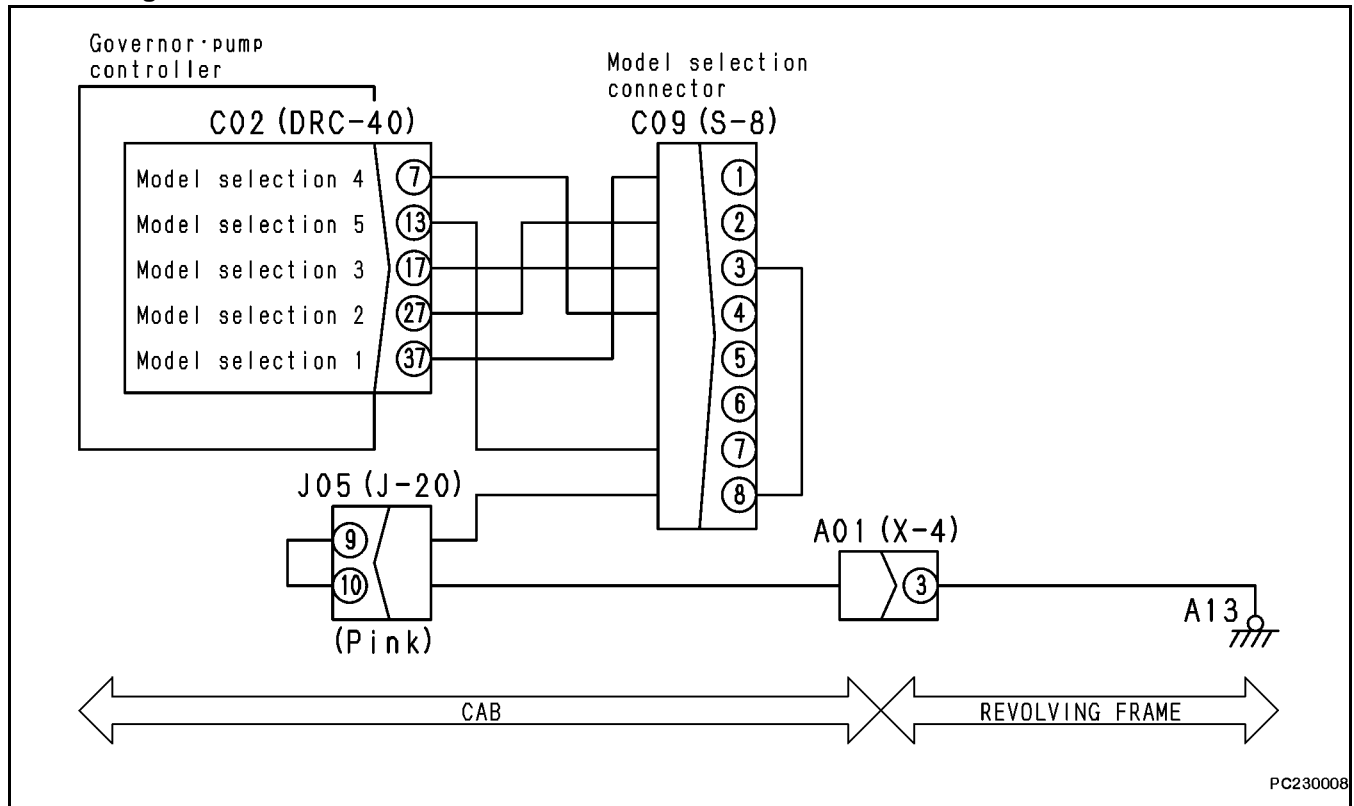


E502 MODEL SELECTING SIGNAL FAULT

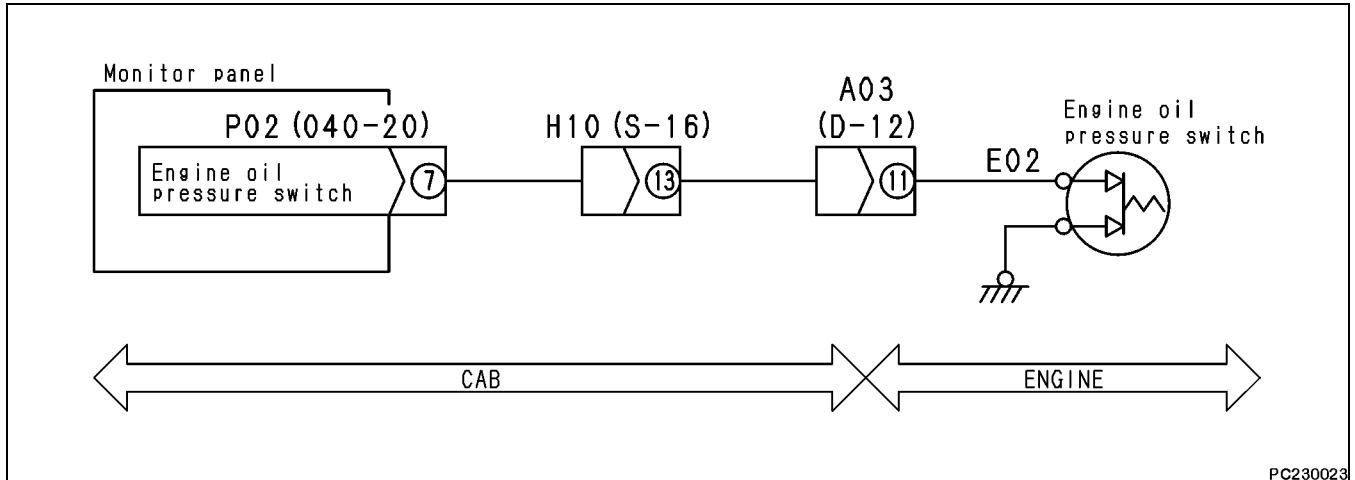
| User Code | Service Code | Failure Code | Failure | Model selecting signal fault (in governor pump controller system) |
|-----------------------------|--|--------------|---------|--|
| — | E502 | DA20KT | | |
| Failure content | Information on the models stored in the controller has been damaged. | | | |
| Response from controller | Model data and rated load cannot be set. Even when the failure cause disappears, the signal does not return to normal, unless the engine starting switch is once turned OFF. | | | |
| Action occurring on machine | The excess load alarm does not work normally. | | | |
| Relative information | Model names that the controller recognizes (figure) can be confirmed in the monitor function. (Code No. 150: Model Code) | | | |

| Cause and standard value | Cause | | Standard value and references for testing |
|--------------------------|-------|--|---|
| | 1 | Setting work not finished yet | Refer to the section Special Function of Monitor Panel in this manual. |
| | 2 | Governor pump controller defective | As this is an internal failure, no testing can be conducted. (If there is no problem with the setting work above, the controller may be judged as defective.) |
| | 3 | Model selection connector (CN-C09) may be loose or defective | Repair or replace |

Circuit Diagram For Model Selection



Circuit Diagram for Engine Oil Pressure Switch in Monitor Panel

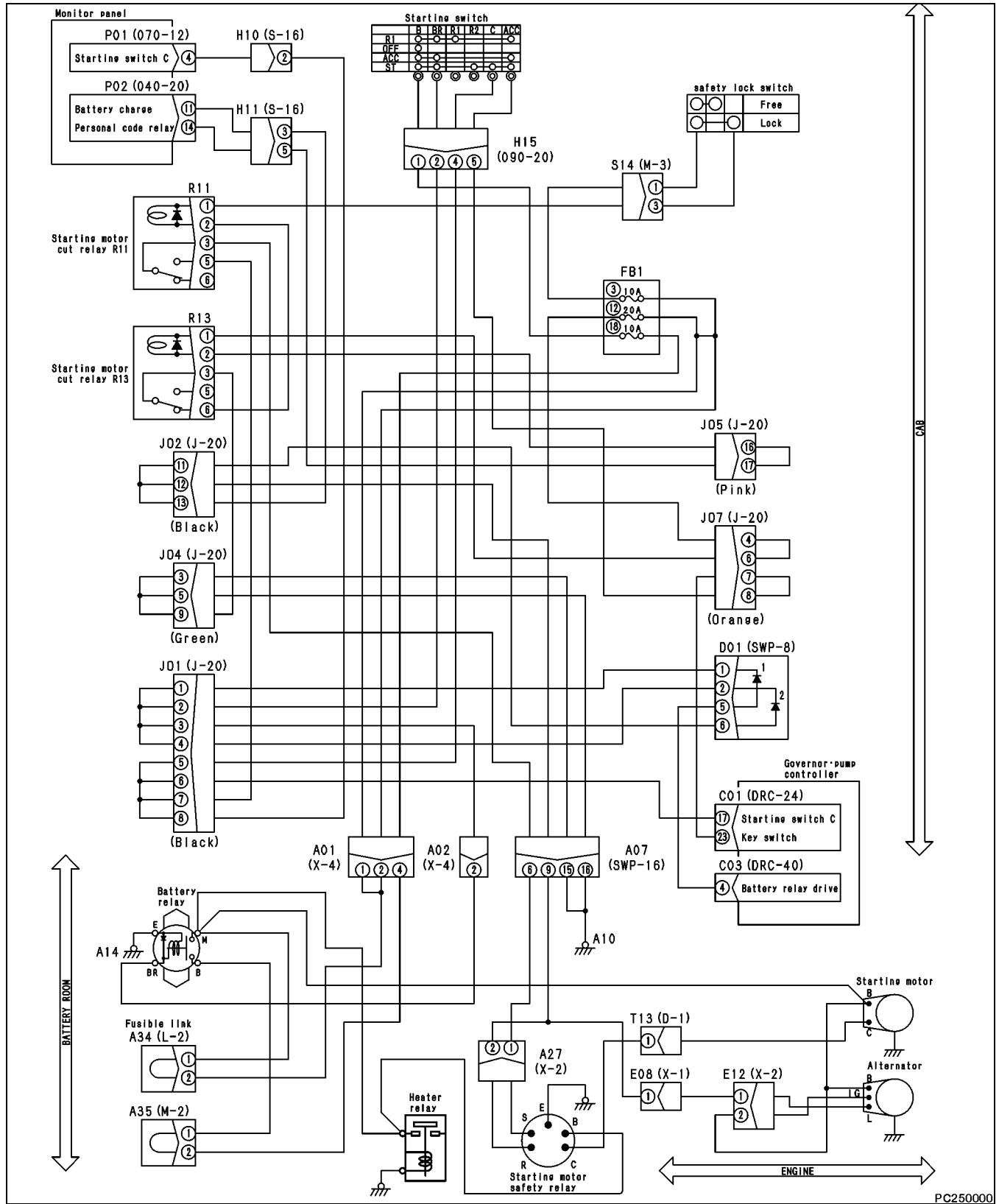


TROUBLESHOOTING ELECTRICAL SYSTEM

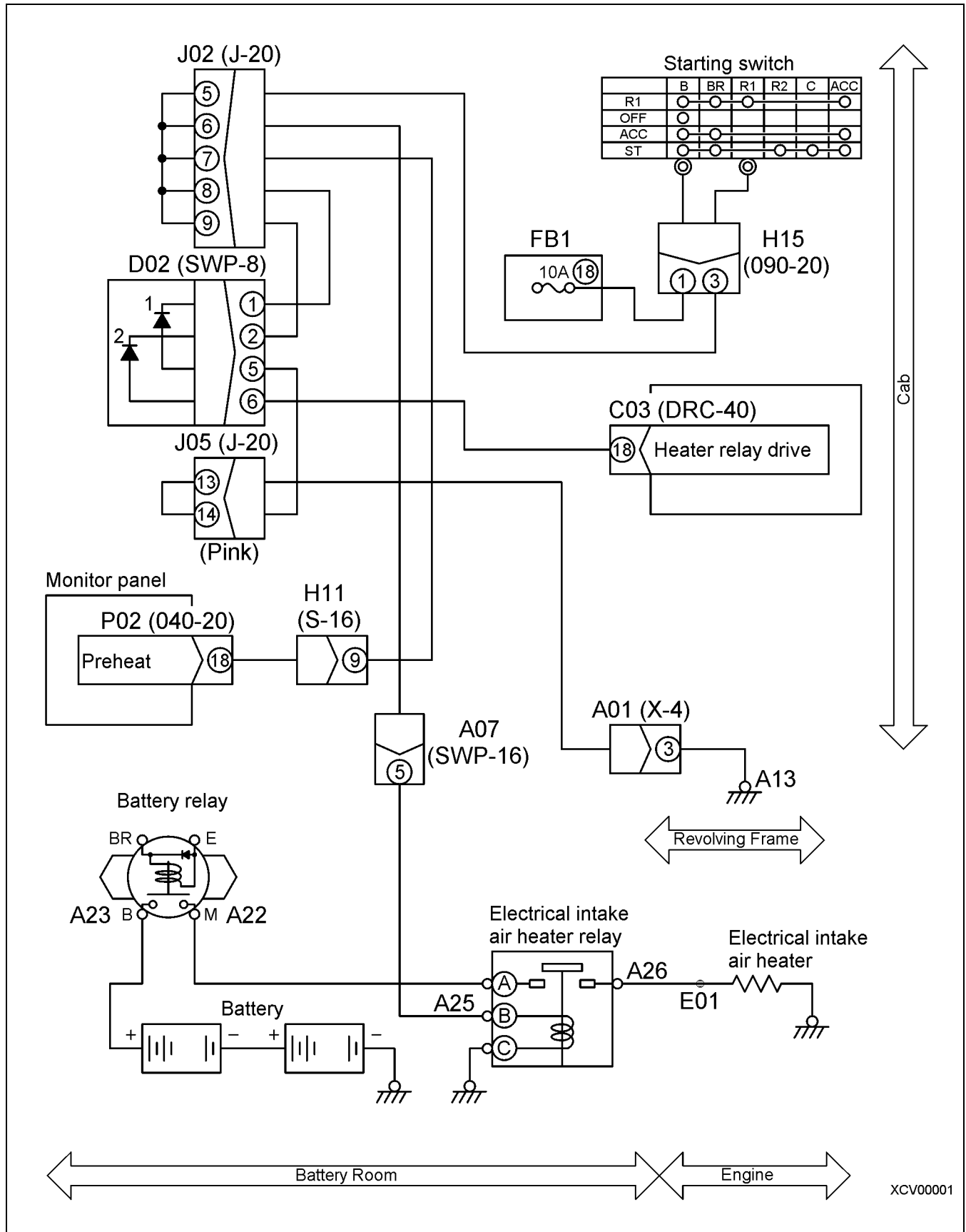
E MODE

| | |
|--|--------|
| POINTS TO REMEMBER WHEN TROUBLESHOOTING SYSTEM | 20-502 |
| POINTS TO REMEMBER IF ABNORMALITY RETURNS TO NORMAL BY ITSELF | 20-502 |
| USER CODE MEMORY RETENTION FUNCTION | 20-502 |
| INFORMATION CONTAINED IN TESTING PROCEDURES | 20-503 |
| E-1 ENGINE WILL NOT CRANK | 20-505 |
| E-2 ENGINE STOPS WHILE IN OPERATION | 20-508 |
| E-3 ENGINE SPEED IRREGULAR, OR HUNTING | 20-510 |
| E-4 ENGINE DOES NOT STOP | 20-514 |
| E-5 AUTO DECELERATOR DOES NOT WORK | 20-517 |
| E-6 AUTO ENGINE WARM UP DEVICE DOES NOT WORK | 20-518 |
| E-7 COLD START PREHEATER DOES NOT WORK | 20-520 |
| E-8 ALL WORK EQUIPMENT, SWING AND TRAVEL DOES NOT OPERATE | 20-522 |
| E-9 ONE TOUCH POWER MAX SWITCH DOES NOT OPERATE | 20-524 |
| E-10 NO DISPLAY ON MONITOR PANEL | 20-526 |
| E-11 PART OF DISPLAY ON MONITOR PANEL IS MISSING | 20-528 |
| E-12 MONITOR PANEL DISPLAY CONTENTS IRRELEVANT TO THE MODEL | 20-529 |
| E-13 FUEL LEVEL INDICATOR LAMP LIGHTS UP WHEN FUEL TANK IS FULL | 20-530 |
| E-14 ENGINE COOLANT TEMPERATURE GAUGE NOT INDICATING CORRECTLY | 20-532 |
| E-15 HYDRAULIC OIL TEMPERATURE GAUGE DOES NOT DISPLAY CORRECTLY | 20-534 |
| E-16 FUEL GAUGE DOES NOT DISPLAY CORRECTLY | 20-536 |
| E-17 SWING LOCK MONITOR DOES NOT DISPLAY CORRECTLY | 20-538 |
| E-18 WHEN THE MONITOR SWITCH IS OPERATED, NO DISPLAY APPEARS | 20-540 |
| E-19 WINDSHIELD WIPER DOES NOT WORK | 20-542 |
| E-20 ALARM BUZZER CANNOT BE CANCELLED | 20-544 |
| E-21 BOOM RAISE NOT CORRECTLY DISPLAYED ON MONITOR | 20-546 |
| E-22 BOOM LOWER NOT CORRECTLY DISPLAYED ON MONITOR | 20-548 |
| E-23 ARM RETRACT NOT CORRECTLY DISPLAYED ON MONITOR | 20-550 |
| E-24 ARM EXTEND NOT CORRECTLY DISPLAYED ON MONITOR | 20-552 |
| E-25 BUCKET CURL NOT CORRECTLY DISPLAYED ON MONITOR | 20-554 |
| E-26 BUCKET DUMP NOT CORRECTLY DISPLAYED ON MONITOR | 20-556 |
| E-27 SWING NOT CORRECTLY DISPLAYED ON MONITOR | 20-558 |
| E-28 TRAVEL NOT CORRECTLY DISPLAYED ON MONITOR | 20-560 |
| E-29 TRAVEL DIFFERENTIAL PRESSURE NOT CORRECTLY DISPLAYED ON MONITOR | 20-562 |
| E-30 SERVICE NOT CORRECTLY DISPLAYED ON MONITOR | 20-564 |
| E-31 AIR CONDITIONER SYSTEM DOES NOT WORK | 20-566 |
| E-31-E11 DISCONNECTION IN RECIRCULATED AIR SENSOR | 20-571 |
| E-31-E12 SHORT CIRCUIT IN RECIRCULATED AIR SPACE | 20-571 |
| E-31-E15 DISCONNECTION IN COOLANT TEMPERATURE SENSOR | 20-572 |
| E-31-E16 SHORT CIRCUIT IN COOLANT TEMPERATURE SENSOR | 20-572 |
| E-31-E18 SHORT IN DAYLIGHT SENSOR | 20-573 |
| E-31-E43 ABNORMALITY IN AIR OUTLET DAMPER | 20-573 |
| E-31-E44 ABNORMALITY IN AIR MIX DAMPER | 20-574 |
| E-31-E45 ABNORMALITY IN RECIRCULATED AND FRESH AIR DAMPER | 20-574 |
| E-31 - TROUBLESHOOTING BY FAILURE PHENOMENON | 20-576 |
| E-32 TRAVEL ALARM DOES NOT SOUND | 20-580 |

Circuit Diagram for Engine Start, Stop and Battery Charging
PC200LC-7L S/N A86001-A87017
PC220LC-7L S/N A86001-A86659

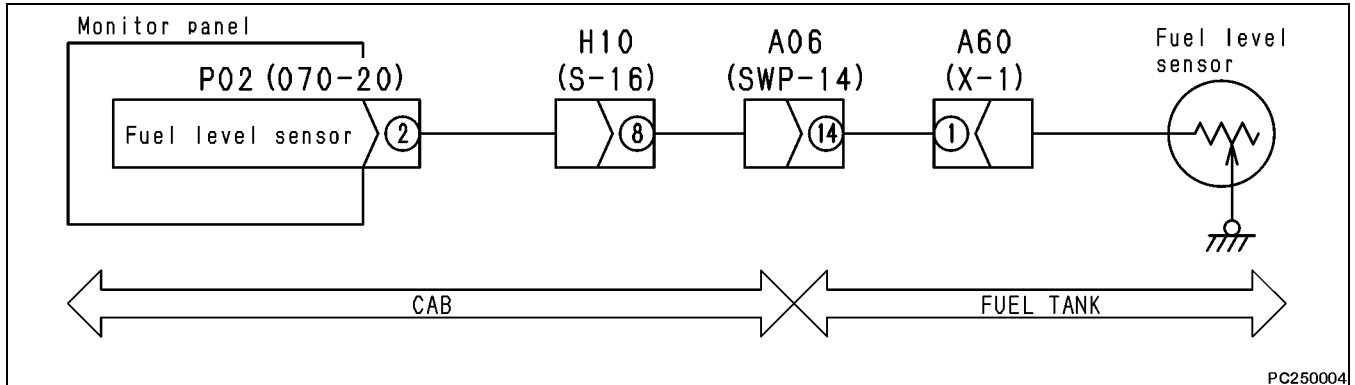


Circuit Diagram for Engine Pre-heater



TROUBLESHOOTING-13 FUEL LEVEL INDICATOR LAMP LIGHTS UP WHEN FUEL TANK

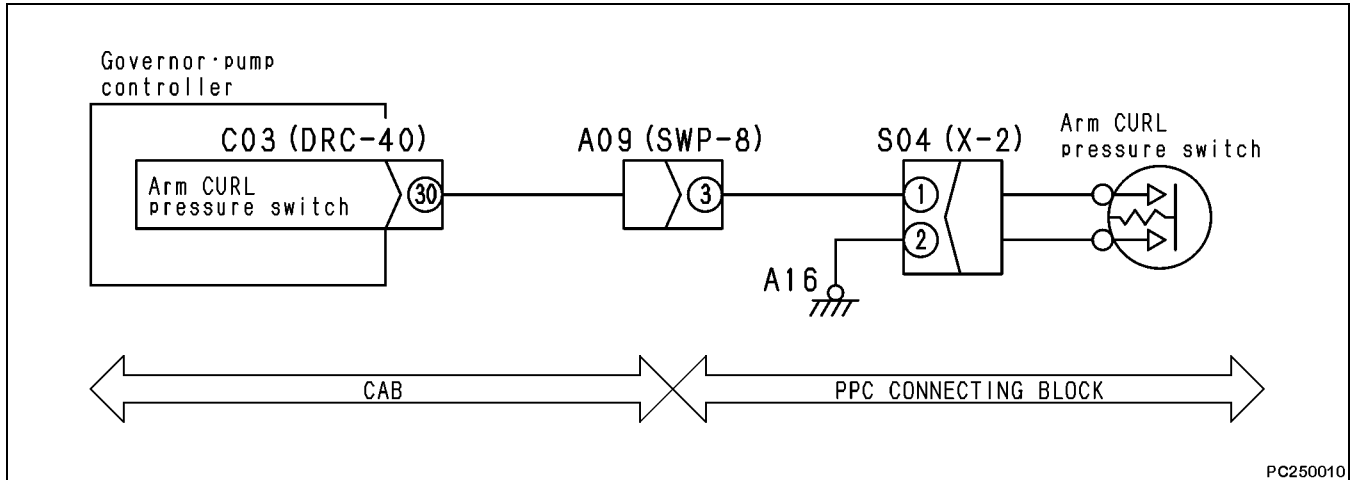
Circuit Diagram for Fuel Level Sensor



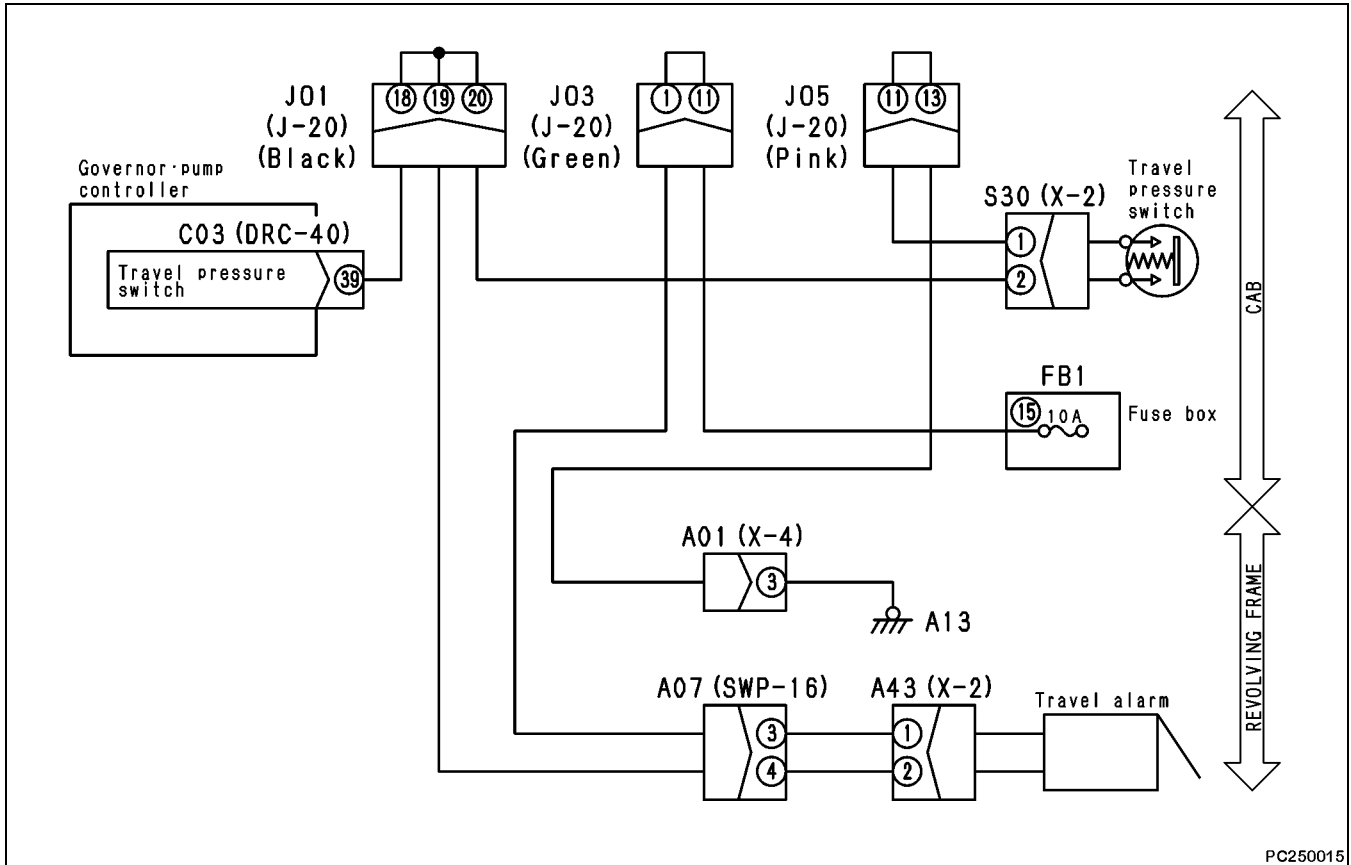
MEMORANDUM

TROUBLESHOOTING E-23 ARM RETRACT NOT CORRECTLY DISPLAYED ON MONITOR

Circuit Diagram for Arm Retract PPC Hydraulic Switch



Circuit Diagram for Travel PPC hydraulic Switch and Travel Alarm



PC250015

E-31-E11 DISCONNECTION IN RECIRCULATED AIR SENSOR

| | | |
|-------------------------|---|--|
| Self-diagnosis notice | Trouble | Disconnection in recirculated air sensor |
| E11 | | |
| Contents of trouble | <ul style="list-style-type: none"> Disconnection in the recirculated air sensor system is detected. | |
| Action of control panel | <ul style="list-style-type: none"> Fixes the recirculated air temperature for control. When the following condition is satisfied, the operation returns to normalcy. <Completion of removal of cause> + <Deletion of self-diagnosis notice> + <Turning starting switch OFF and ON> + <Starting air conditioner> | |
| Related information | --- | |

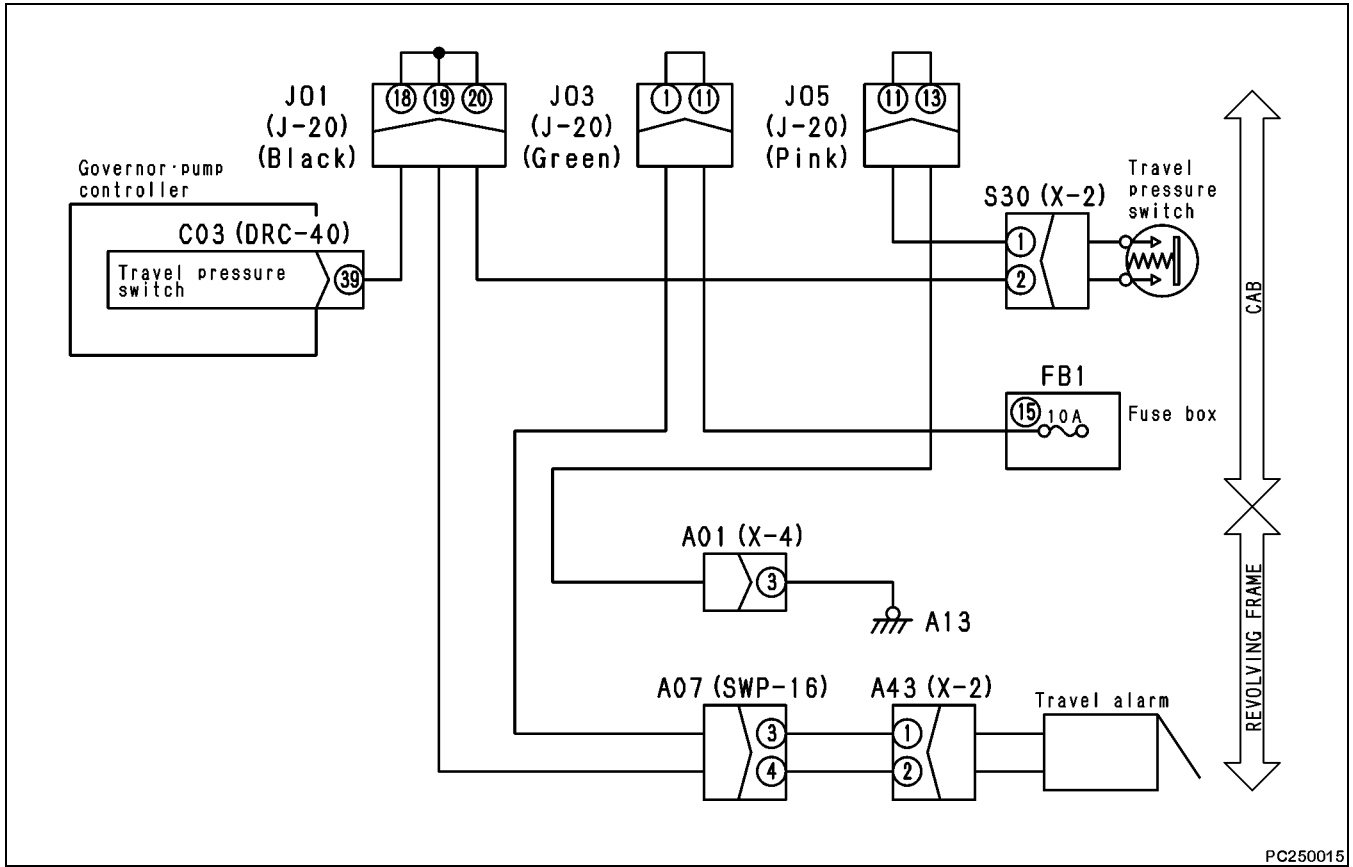
| Steps | Circuit Diagnostic Procedures For Code [---] | | Specifications | No. | Readings |
|---|---|------------------------------|------------------------------|----------|----------|
| 1. Recirculated air sensor | <ul style="list-style-type: none"> Prepare with the ignition switch OFF Disconnect THi connection and install T-adaptor. Keep the ignition switch in the OFF position for troubleshooting. | | | | |
| A. Recirculation air sensor test - Internal disconnection | Resistance Ω | At THi, between (1) and (2) | 300 Ω – 430k Ω | 1 | |
| 2. Wiring harness | <ul style="list-style-type: none"> With ignition switch in the OFF position. Keep ignition switch to the OFF position for this test. | | | | |
| A. Wiring harness test | Resistance Ω | Between M30 (12) and THi (2) | Max. 1 Ω | 2 | |
| Disconnection or contact with connector | | Between M29 (11) and THi (1) | Max. 1 Ω | 3 | |
| 3. Air conditioner system | If neither of Steps 1 and 2 is the cause of the trouble, the air conditioner system may be defective. Refer to CHASSIS COMPONENT, Shop Manual, "Air conditioner". | | | | |

E-31-E12 SHORT CIRCUIT IN RECIRCULATED AIR SPACE

| | | |
|-------------------------|---|--|
| Self-diagnosis | Trouble | Short circuit in recirculated air sensor |
| E12 | | |
| Contents of trouble | <ul style="list-style-type: none"> Short circuit in the recirculated air sensor system is detected. | |
| Action of control panel | <ul style="list-style-type: none"> Fixes the recirculated air temperature for control. When the following condition is satisfied, the operation returns to normalcy. <Completion of removal of cause> + <Deletion of self-diagnosis notice> + <Turning starting switch OFF and ON> + <Starting air conditioner> | |
| Related information | --- | |

| Steps | Circuit Diagnostic Procedures For Code [---] | | Specifications | No. | Readings |
|---|---|------------------------------|------------------------------|----------|----------|
| 1. Recirculated air sensor | <ul style="list-style-type: none"> Prepare with the ignition switch OFF Disconnect THi connection and install T-adaptor. Keep the ignition switch in the OFF position for troubleshooting. | | | | |
| A. Recirculation air sensor test - Internal disconnection | Resistance Ω | At THi, between (1) and (2) | 300 Ω – 430k Ω | 1 | |
| 2. Wiring harness | <ul style="list-style-type: none"> With ignition switch in the OFF position. Keep ignition switch to the OFF position for this test. | | | | |
| A. Wiring harness test | Resistance Ω | Between M30 (12) and THi (2) | Max. 1 Ω | 2 | |
| Disconnection or contact with connector | | Between M29 (11) and THi (1) | Max. 1 Ω | 3 | |
| 3. Air conditioner system | If neither of Steps 1 and 2 is the cause of the trouble, the air conditioner system may be defective. Refer to CHASSIS COMPONENT, Shop Manual, "Air conditioner". | | | | |

Circuit Diagram for Travel PPC Hydraulic Switch and Travel Alarm



PC250015

H-4 ABNORMAL NOISE IS HEARD FROM HYDRAULIC PUMP

| | |
|----------------------|--|
| Failure information | An abnormal noise is heard from around the hydraulic pump. |
| Relative information | --- |

| | | Cause | Standard value and references for testing |
|-----------------------------------|---|-------------------------------------|---|
| Presumed cause and standard value | 1 | Hydraulic oil level is low | Make visual check. |
| | 2 | Quality of hydraulic oil poor | Air may have gotten mixed with the oil. Make a visual check for aeration of oil. |
| | 3 | Hydraulic tank cap breather clogged | Breather cap on hydraulic tank may be clogged, thereby causing negative pressure inside the tank. Make a visual check of breather. |
| | 4 | Hydraulic tank strainer clogged | Strainer in the hydraulic tank may be clogged, thereby causing negative pressure in the suction circuit. Make a visual check of strainer. |
| | 5 | Piston pump defective | The piston pump may be suspected of an internal failure. Check the pump. |

H-14 ONE TOUCH POWER MAX SWITCH DOES NOT OPERATE

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

| Presumed cause and standard value | Cause | | Standard value and references for testing | |
|-----------------------------------|----------------------------------|---|--|--|
| | 1 | Malfunction of 2 stage solenoid valve | ★ Test with engine speed set at high idle. | |
| Swing lock switch | | | Solenoid valve output pressure | |
| OFF | | | 0 | |
| ON | | | 29 to 35 kg/cm ² (412 to 500 psi) | |
| 2 | Malfunction of main relief valve | The main relief valve is presumed to malfunction. Check the valve itself. | | |

TROUBLESHOOTING-H-24 SWING ACCELERATION IS POOR, OR SWING SPEED IS SLOW

H-24 SWING ACCELERATION IS POOR, OR SWING SPEED IS SLOW

| | |
|-------------------------|---|
| Failure information (1) | Swing acceleration is poor, or swing speed is slow. |
| Relative information | Set the working mode at A mode for the testing. |

| | | Cause | Standard value and references for testing | | |
|---|-----------------------|---|--|---------------------|---|
| | | | | | |
| Presumed cause and standard value | 1 | Malfunctioning of LS shuttle valve (all LS shuttles) | The LS shuttle valves for all the control valves are presumed to malfunction. Check them directly. | | |
| | 2 | Malfunctioning of swing motor (parking brake) | The parking brake portion of the swing motor is presumed to malfunction. Check it directly. | | |
| | 3 | Improper adjustment or malfunctioning of swing motor (safety valve) | ★ Test with engine speed set at high idle. | | |
| | | | Swing lock switch | Swing control lever | Swing relief pressure |
| | | | ON | Swing relief | 295 to 335 kg/cm ² (4196 to 4765 psi) |
| If the oil pressure does not return to normal after the adjustment, the safety valve is presumed to malfunction, or suspected of an internal failure. Check the valve itself. | | | | | |
| 4 | Swing motor defective | ★ Test with engine speed set at high idle. | | | |
| | | Swing control lever | Amount of leakage from swing motor | | |
| | | Swing relief | Below 10 L/min (2.6 gal/min) | | |


| | |
|-------------------------|--|
| Failure information (2) | Swing acceleration is poor only on one side, or swing speed is slow. |
| Relative information | Set the working mode at A mode for the testing. |





| | | Cause | Standard value and references for testing | |
|-----------------------------------|---|--|--|---------------------------------------|
| | | | | |
| Presumed cause and standard value | 1 | Malfunctioning of PPC valve | ★ Test with engine speed set at high idle. | |
| | | | Swing control lever | PPC valve output pressure |
| | | | NEUTRAL | 0 |
| | | | Left or right | Above 28 kg/cm ² (398 psi) |
| | 2 | Malfunctioning of swing control valve (spool) | The spool in the swing control valve is presumed to malfunction. Check the valve itself. | |
| 3 | Malfunctioning of swing motor (pressure compensation valve) | The pressure compensation valve in the swing motor is presumed to malfunction. Check the valve itself. | | |
| 4 | Swing motor (suction valve) seal defective | The seal in the suction valve of the swing motor is suspected of defect. Check the seal itself. ★ Whether the seal is defective or not may be determined by swapping the right and left suction valves and watching the result. | | |
| 5 | Swing motor (check valve) seal defective | The seal in the check valve of the swing motor is suspected of defect. Check the seal itself. ★ Whether the seal is defective or not may be determined by swapping the right and left check valves and watching the result. | | |

METHOD OF USING MANUAL

1. When removing or installing unit assemblies

A. When removing or installing a unit assembly, the order of work and techniques used are given for the removal operation; the order of work for the installation operation is not given.

B. Any special techniques applying only to the installation procedure are marked , and the same mark is placed after the relevant step in the removal procedure to indicate which step in the installation procedure it applies to.

| Example | Explanation |
|--|--|
| (COMPONENT) REMOVAL | Title of operation |
|  WARNING! | Safety precautions to observe when performing an operation |
| 1. XXX | Text of or name of procedural step |
| A. | Text of procedural step if 1 was procedural name |
| ★ | Technique or important point |
|  | Reference to a special technique during assembly or installation (note that this symbol is right-aligned). |
| (COMPONENT) INSTALLATION | Title of operation |
| • Installation is the reverse of removal. | Overall directive |
|  | Special technique during assembly or installation (note that this symbol is left-aligned). |
|  (Component/assembly) | Specification |

2. General precautions when carrying out installation or removal (disassembly or assembly) of units are given together as PRECAUTIONS WHEN CARRYING OUT OPERATION, so be sure to follow these precautions when performing out the operation.

3. Listing of special tools

For details of the description, part number, and quantity of any tools (A1, etc.) that appear in the operation procedure, see the SPECIAL TOOL LIST later in this section.

CONNECTOR REPAIR PROCEDURES

These steps outline the proper repair procedures for the HD30 and DT type wire connectors. Failure to follow these procedures may result in a failed contact situation in the electrical circuit or damage to the connector or wiring harness.

CONTACT TERMINAL REMOVAL (HD30 TYPE)

1. Obtain the correct removal tool according to the wire size used in the connector.
2. With the rear insert part of the connector facing you, snap the removal tool over the wire of the contact terminal you will be removing.

Remark

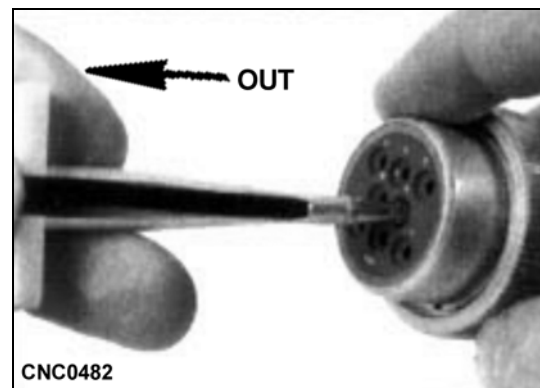
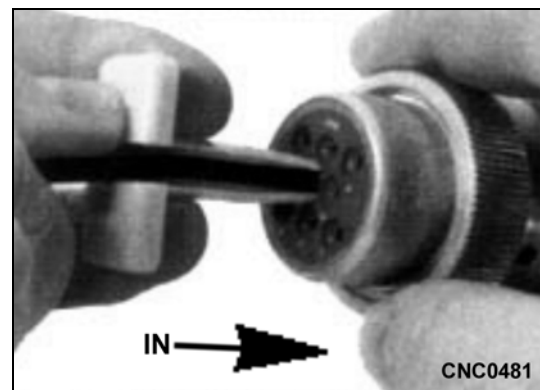
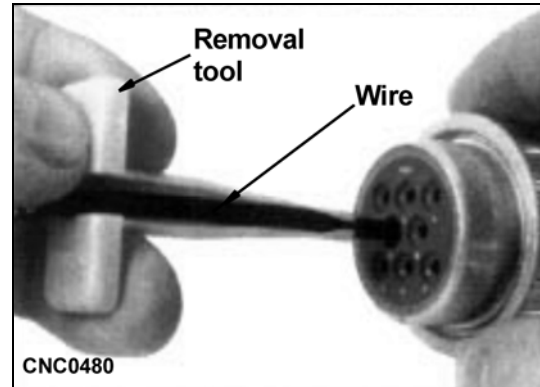
Using a removal tool that is too large or too small will hinder wire removal and may damage the connector or removal tool. Always use the correct removal tool size for the wire gauge you are servicing.

3. In a straight line, carefully slid the removal tool along the wire and into the grommet until a contact resistance is felt.

Remark

Do not pull on the wire or twist the tool when inserting removal tool into the grommet. Damage to the tool or connector may result.

4. Once tool is fully inserted into the connector, carefully pull the removal tool and contact terminal-wire out of the connector.
5. If contact terminal-wire will not come out, remove tool and reinsert removal tool again.



HYDRAULIC OIL COOLER

REMOVAL

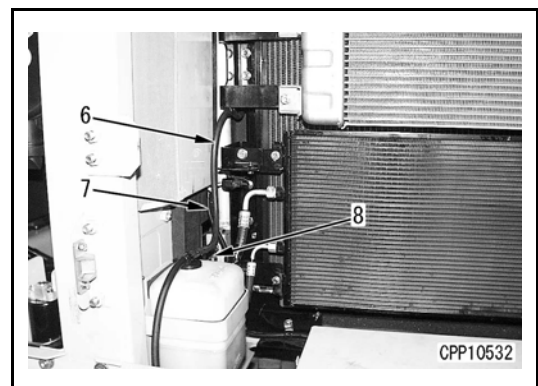
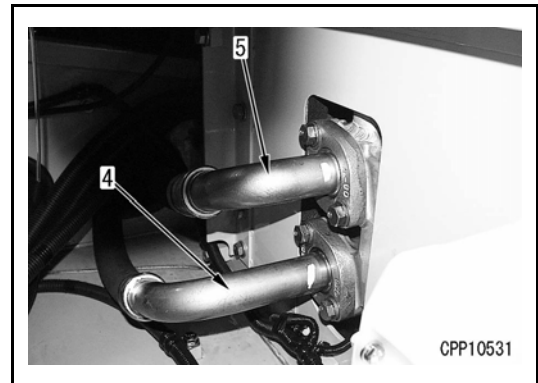
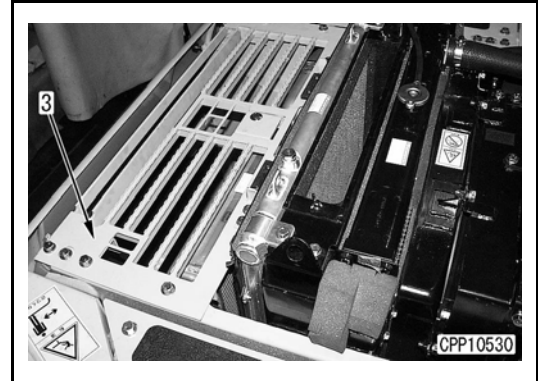
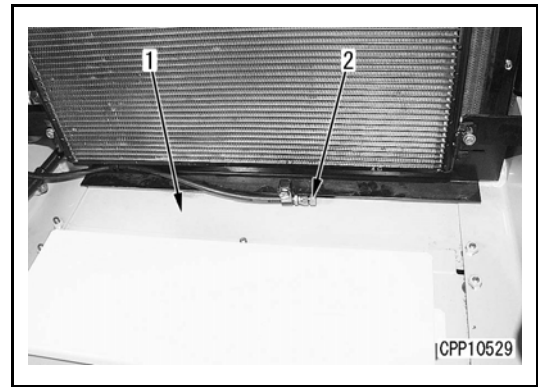
1. Open up the engine hood.
2. Remove cover (1).
3. Remove hydraulic oil cooler drain plug (2) and drain the hydraulic oil.
 - ★ Before draining oil, unscrew the hydraulic tank cap to release the pressure inside the tank, and drain oil through the cooler hose.
 - ★ If a plug on top of the hydraulic oil cooler is loosened, draining oil becomes easier



Hydraulic oil cooler: Approximately 5.0 L (1.3 gal)

4. Remove cover (3).
5. Detach control valve drain hose (4) and tank return hose (5).
 - ★ Plug the hoses to prevent oil from flowing out.

6. Remove the mount clamp and put aside reservoir tank hose (6).
 - ★ When lifting out the hydraulic oil cooler, keep it where it will not interfere with other parts.
7. Remove the mount clamp and disconnect A30 air conditioner ambient temperature sensor (7) from the condenser bracket.
8. Disconnect hydraulic oil cooler drain hose (8).



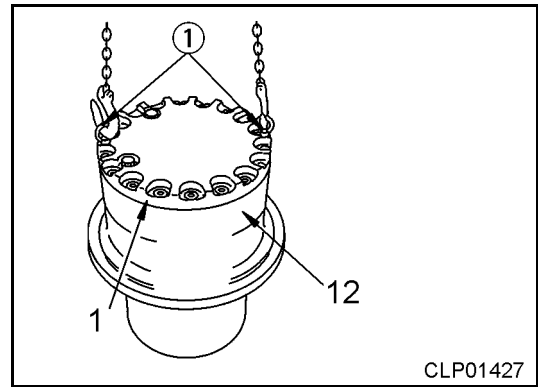
DISASSEMBLY

1. Draining Oil
Remove drain plug and drain oil from final drive case.



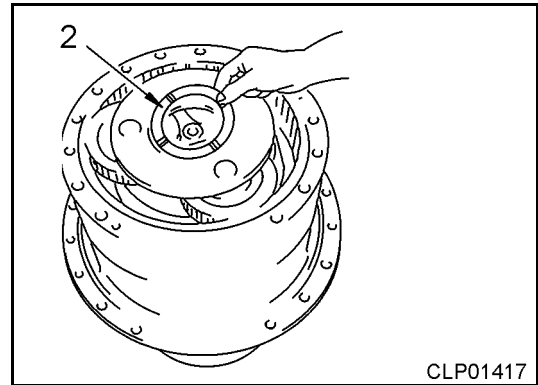
Final drive case: Approximately 4.7 L (1.25 gal)

2. Cover
Remove mount bolts, then remove cover (1) using eyebolts ①.
★ When raising ring gear (12) and cover (1) as one unit, tap the ring gear with a wooden hammer to remove the ring gear.



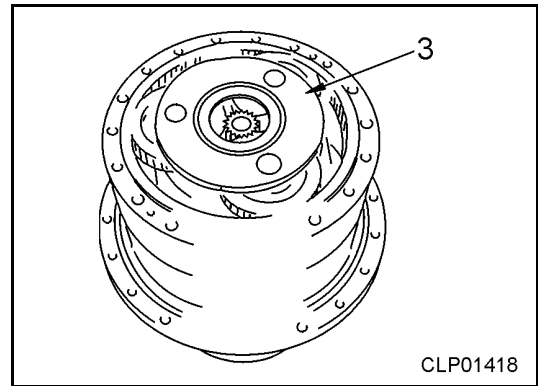
CLP01427

3. Spacer
Remove spacer (2).



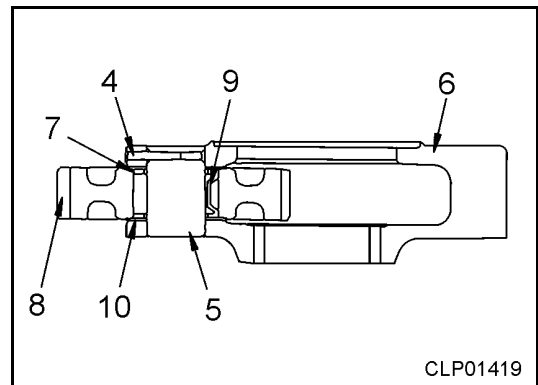
CLP01417

4. No. 1 carrier assembly
A. Remove No. 1 carrier assembly (3).



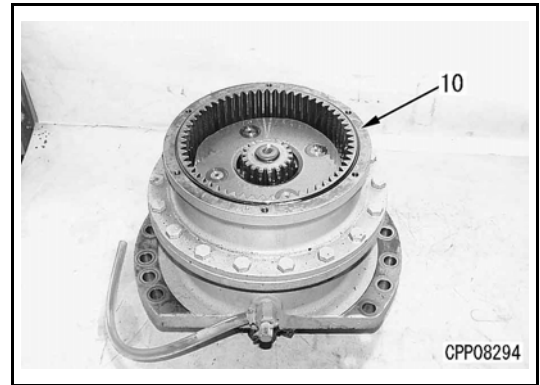
CLP01418

- B. Disassemble No. 1 carrier assembly as follows.
 - i. Push in pin (4) and pull out shaft (5) from carrier (6).
★ After removing the shaft, remove pin (4).
 - ii. Remove thrust washer (7), gear (8), bearing (9), and thrust washer (10).

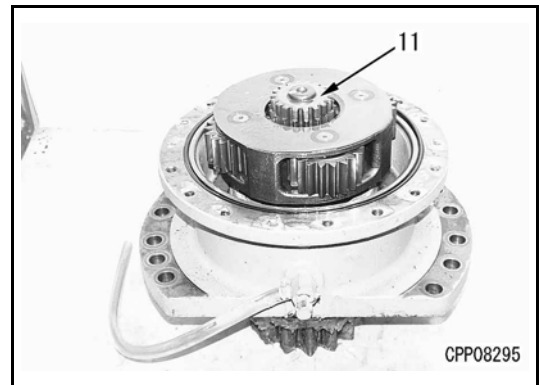


CLP01419

- 5. Ring gear
Remove the mount bolts and remove ring gear (10).



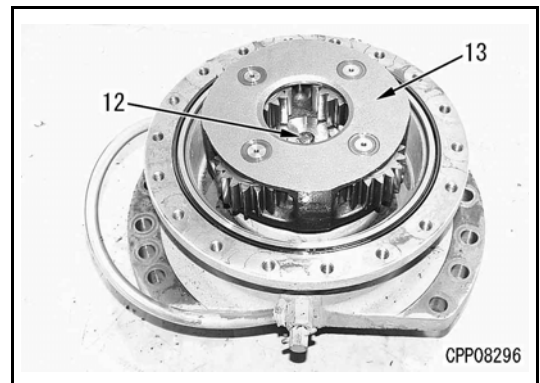
- 6. No. 2 sun gear
Remove No. 2 sun gear (11).



- 7. Bolt
Remove the holder mount bolt (12).

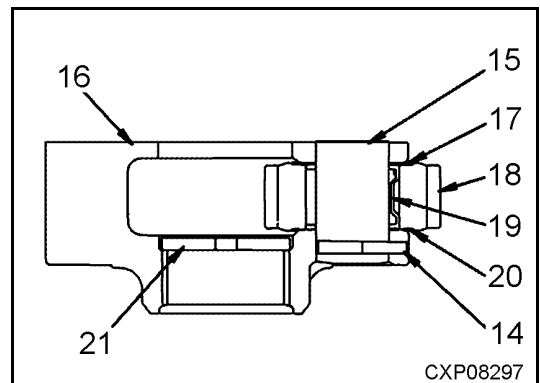
- 8. No. 2 carrier assembly

- A. Remove No. 1 carrier assembly (13).



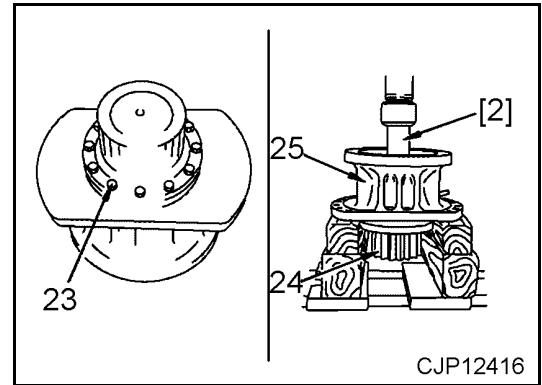
- B. Disassemble the No. 2 carrier assembly by hand in the following manner.

- i. Insert pin (14) and drive shaft (15) out of carrier (16).
★ Pull out pin (14) after removing the shaft.
- ii. Remove thrust washer (17), gear (18), bearing (19) and thrust washer (20).
- iii. Remove plate (21).



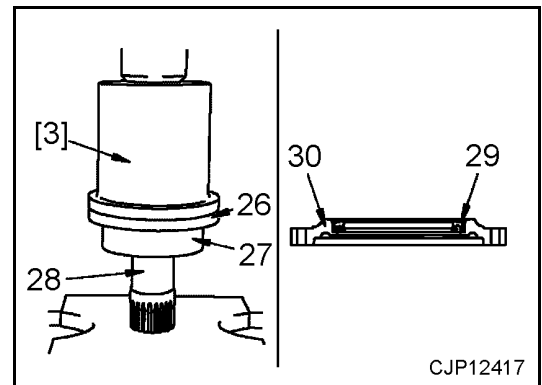
9. Shaft assembly

- A. Remove mounting bolts (23).
- B. Set shaft and case assembly to press, then using push tool [2], remove shaft assembly (24) from case assembly (25).



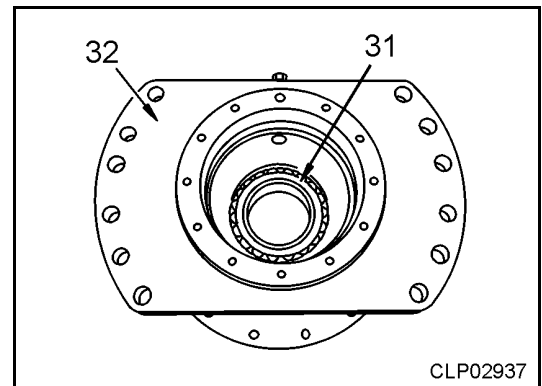
C. Disassemble shaft assembly as follows.

- i. Using push tool [3], remove cover assembly (26) and bearing (27) from shaft (28).
- ii. Remove oil seal (29) from cover (30).



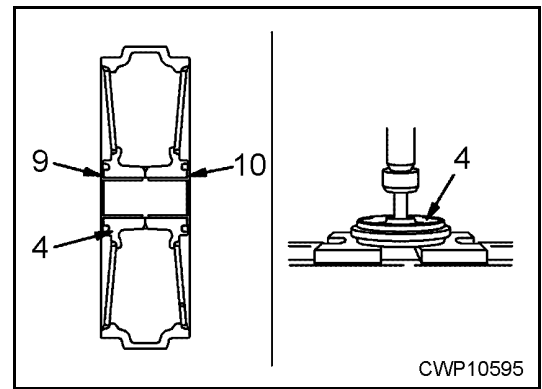
10. Bearing

Using push tool, remove bearing (31) from case (32).



ASSEMBLY

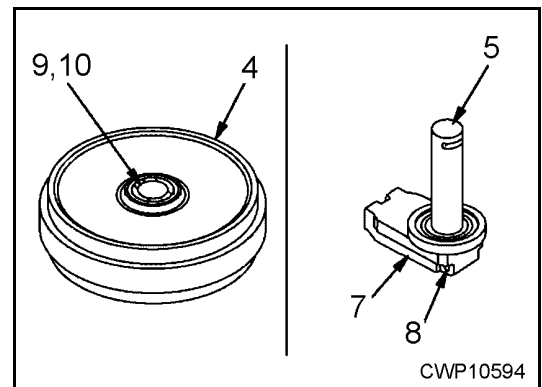
1. Press fit bushing (9) and (10) to idler (4).



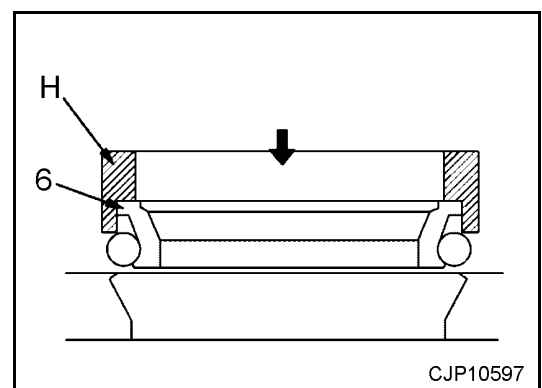
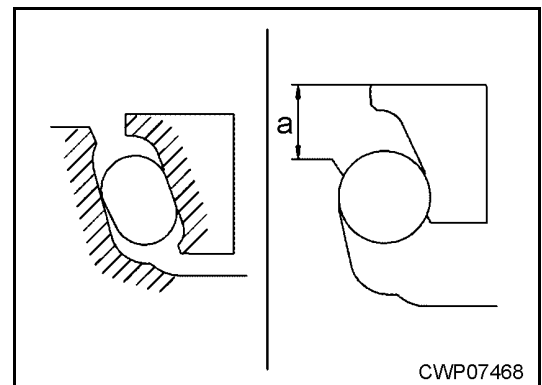
2. Fit O-ring and install support (7) to shaft (5) with dowel pin (8).
3. Using tool **H**, install floating seal (6) to idler (4), shaft (5) and support (7) assembly.

★ Floating seal

Before installing the floating seal, completely degrease both contact surfaces of the O-ring and the floating seal (hatched area in the illustration). Furthermore, take care so that no dust will stick to the contact surface of the floating seal.



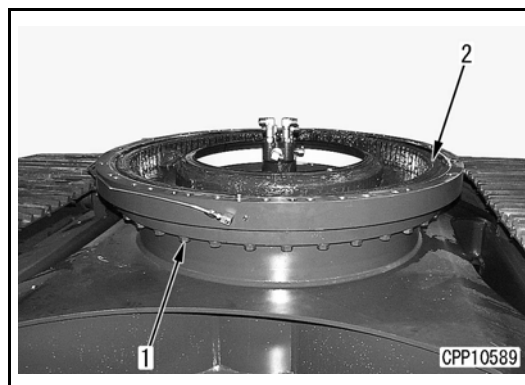
- ★ After inserting the floating seal, check that inclination of the seal is less than 1 mm (0.03937 in) and that protrusion **a** of the seal remains within the range of 5 - 7 mm (0.1968 - 0.2755 in).



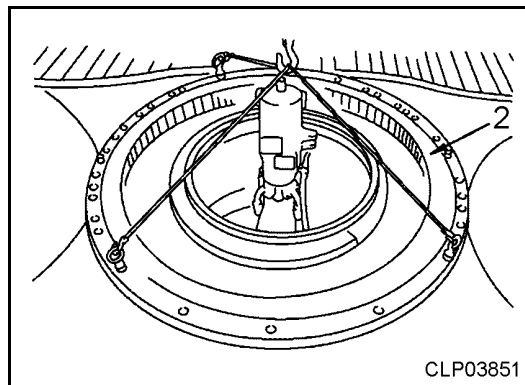
SWING CIRCLE

REMOVAL

1. Remove revolving frame. For details, see REVOLVING FRAME, REMOVAL.
2. Remove 36 mount bolts (1) to remove the swing circle assembly.



3. Lift off swing circle assembly (2).




Swing circle assembly: 270 kg (595.2 lb)

INSTALLATION


- Install in reverse order of removal.

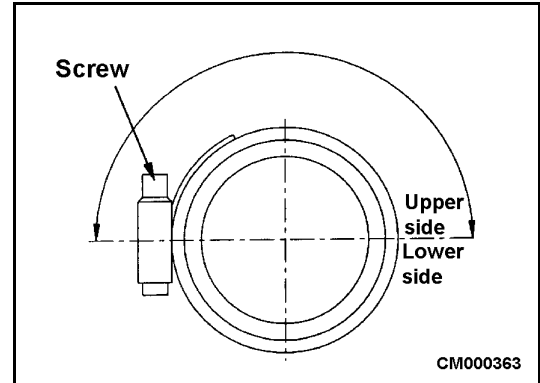
※1

 Hydraulic tank drain plug: 58.8 - 78.5 Nm (43.3 - 57.8 lbf ft)

※2


- ★ After tightening the suction hose clamp screw, check that the screw is located within the range shown in the diagram.

 Hose clamp screw: 8.8 ± 0.5 Nm (6.4 ± 0.36 lbf ft)

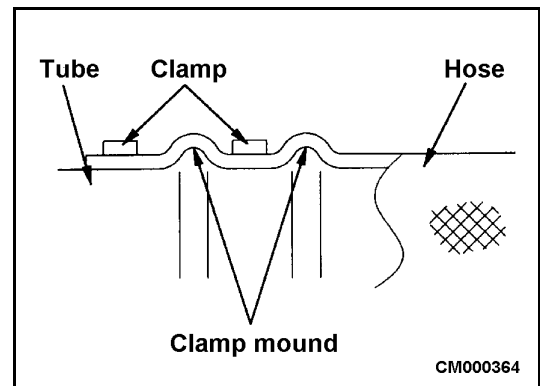



- ★ Install the hose clamp and tighten the clamp screw as shown in the diagram.

※3

 Hose clamp screw: 245.2 - 308.9 Nm (180.8 - 227.8 lbf ft)

- 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.



 Hydraulic tank: Approximately 240 L (63.4 gal)

- Bleeding air
 - ★ Bleed the air.
For details, see TESTING AND ADJUSTING. Air Bleeding of Various Parts.

WORK EQUIPMENT PPC VALVE

ASSEMBLY

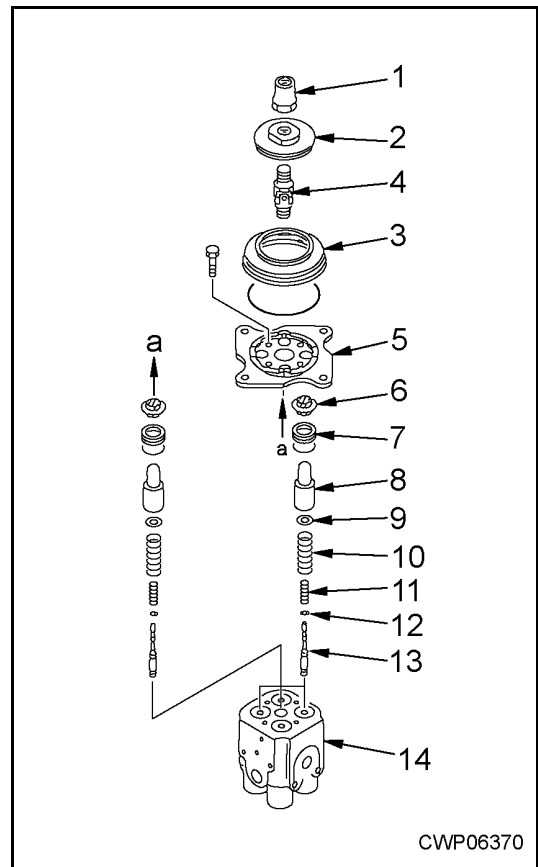
PC200LC-7L S/N A86001-A87017

PC220LC-7L S/N A86001-A86659


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

| Port location | Spring free length |
|---------------|--------------------|
| P1, P2 | 44.4 mm (1.748 in) |
| P3, P4 | 42.4 mm (1.669 in) |

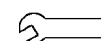
- ★ The location of each port is stamped in the lower part of the valve body.




CWV06370

 Piston (8): Grease (G2-LI)


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

 Plate (5) mount bolt: 11.8 - 14.7 Nm (8.7 - 10.8 lbf ft)


 Joint (4) sliding surface: Grease 2 - 4 cc (0.002 - 0.004 L)
(0.0005283 - 0.0010566 gal) (G2-LI)

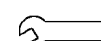
 Body female screw portion: Adhesive compound (LT-2)

- ★ Coat the female screw body with Loctite at two spots as shown in the diagram below. Each spot is to be coated with a drop (approximately 0.02 g [0.00070547 oz]).

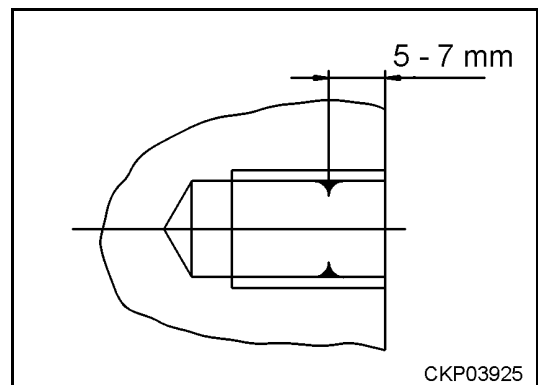
 Joint (4): 39 - 49 Nm (28.7 - 36.1 lbf ft)

- ★ Strictly follow the specified torque for the joint.

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

 Nut (1): 98 - 127 Nm (72.2 - 93.6 lbf ft)

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



CKP03925

WORK EQUIPMENT

REMOVAL



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

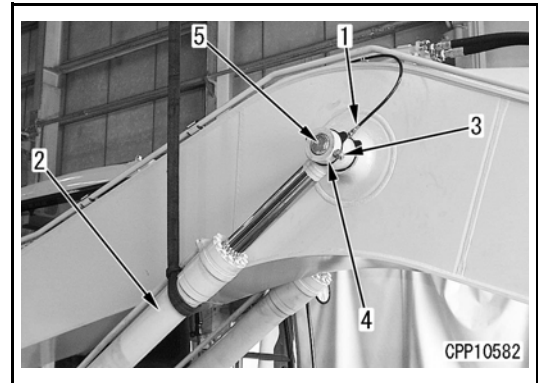


WARNING! Release the residual pressure in the hydraulic circuit. Refer to the Release of Remaining Pressure in the Hydraulic Circuit section in the TESTING AND ADJUSTING chapter of this manual.

1. Disconnect grease hose (1).
2. Sling boom cylinder assembly (2), and remove lock bolt (3).
3. Remove plate (4), then remove head pin (5).



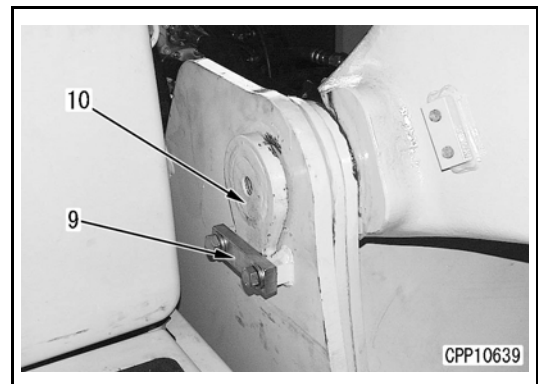
- ★ There are shims installed, so check the number and thickness, and keep them in a safe place.



4. Start the engine and retract the piston rod.
 - ★ Fasten the piston rod with wire so that it will not slip out and lower the cylinder onto a stand, or place a support under the bottom of the cylinder to support it. In the latter case, remove the grease fitting on the bottom side first.
 - ★ Remove the boom cylinder on the other side in the same manner.
5. Disconnect bucket cylinder hoses (6) and arm cylinder hoses (7), two for each.
 - ★ Plug the hoses to prevent oil flow-out, and fasten them on the valve side.



6. Disconnect intermediate connector CN-A42 (8) for a working lamp.
7. Lift off the work equipment and remove plate (9) and then pin (10) at the foot.



COUNTERWEIGHT

REMOVAL

1. Attach eyebolts ① to counterweight assembly (1), and sling.
2. Remove 4 mount bolts (2)
3. Lift off counterweight (1) horizontally with wire or chain block.

※1

※2



- ★ Be careful not to hit the engine, radiator or cooler.

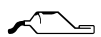


Counterweight assembly: 3750 kg (8267.4 lb)

INSTALLATION

- Install in reverse order of removal.

※1



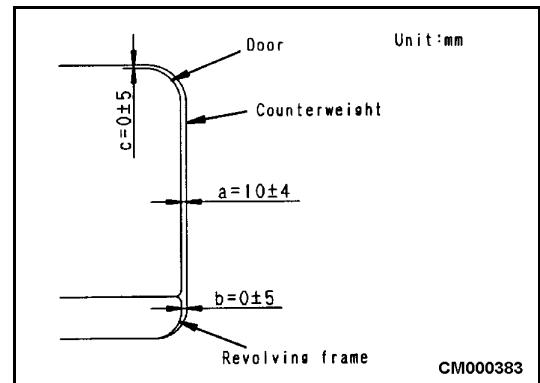
Thread of counterweight mount bolt: Thread tightener (LT-2)



Counterweight mount bolt: 1180 - 1470 Nm (870.3 - 1084.2 lbf ft)

※2

- ★ Installing and adjusting counterweight
- A. Sling counterweight with crane and place in position on the frame.
 - B. Push counterweight, install mount bolts, and adjust to the following dimensions.
 - Clearance from revolving frame: 10 ± 5 mm (0.3937 ± 0.1968 in) (left and right)
 - Clearance from bodywork door: 10 ± 5 mm (0.3937 ± 0.1968 in) (left and right)
 - Stepped difference **b** from revolving frame in left-to right direction: Max. 5 mm (0.1968 in)
 - Stepped difference **a** from bodywork door in left-to right direction: 10 ± 4 mm (0.3937 ± 0.1574 in)
 - Stepped difference **c** from bodywork top cover in up-down right direction: Max. 5 mm (0.1968 in)

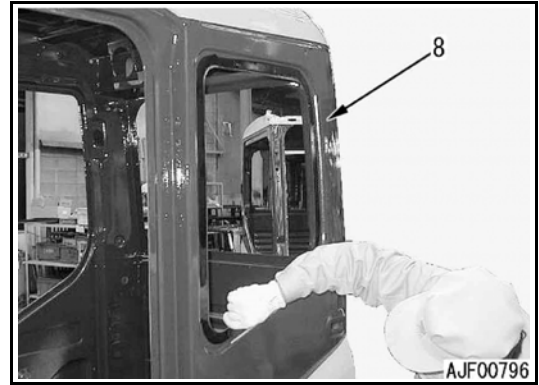


- C. Evenly apply paint primer to the surfaces to stick both-sided adhesive tapes and the surfaces out of those surfaces on operator's cab (8) which will be coated with the adhesive.

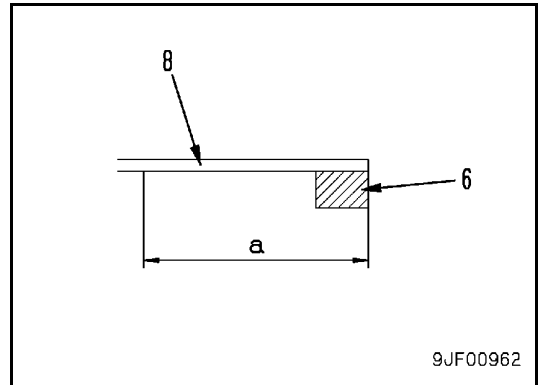
Paint primer: Yokohama M-300 or equivalent



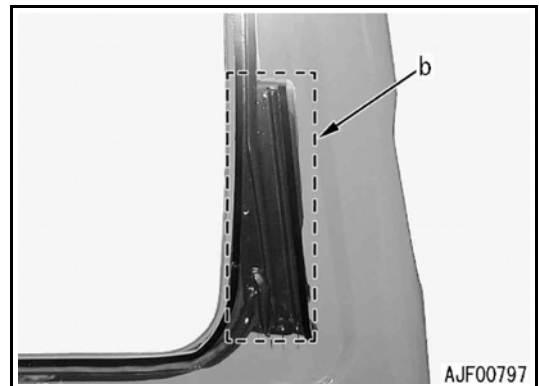
- ★ Do not apply the primer more than 2 times. (If it is applied more than 2 times, its performance will be lowered.)



- ★ Parts to be coated with primer: Apply the primer all over dimension (a).
- Dimension to apply primer (a): 25 mm

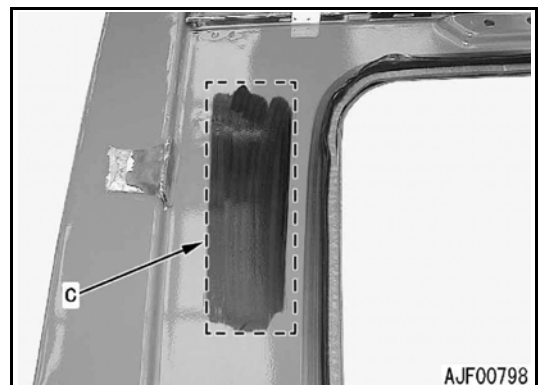


- ★ In addition to the above parts, apply the primer to right side window glass (1) and door lower window glass (3).
- Range to apply primer additionally for right side window glass (1): (b)
- Range to apply primer additionally for door lower window glass (3): (c)
- ★ After applying the primer, leave it for at least 5 minutes (within 8 hours) to dry.

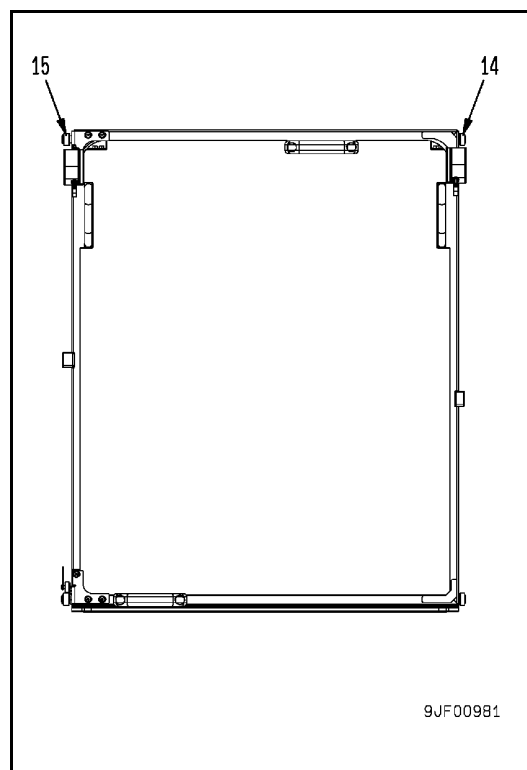
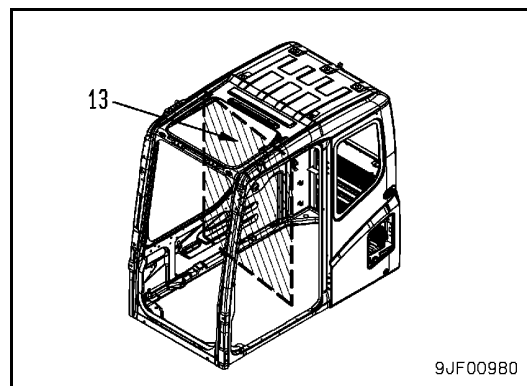


Remark

Never apply wrong primer. If the glass primer is applied by mistake, wipe it off with white gasoline.



11. Twist front window assembly (13) to the right and left to remove both upper rollers (14) and (15) from the rails, and then remove front window assembly (13).



90 OTHERS

| | |
|---|-------|
| ELECTRICAL - PC200LC-7 S/N A86001-A87017, PC220LC-7 S/N A86001-A86659 | 90-3 |
| CIRCUIT DIAGRAM SHEET 1 (PART 1 OF 3) | 90-3 |
| CIRCUIT DIAGRAM SHEET 1 (PART 2 OF 3) | 90-5 |
| CIRCUIT DIAGRAM SHEET 1 (PART 3 OF 3) | 90-7 |
| CIRCUIT DIAGRAM SHEET 2 (PART 1 OF 1) | 90-9 |
| CIRCUIT DIAGRAM SHEET 3 (PART 1 OF 2) | 90-11 |
| CIRCUIT DIAGRAM SHEET 3 (PART 2 OF 2) | 90-13 |
| CIRCUIT DIAGRAM SHEET 4 (PART 1 OF 2) | 90-15 |
| CIRCUIT DIAGRAM SHEET 4 (PART 2 OF 2) | 90-17 |
| | |
| ELECTRICAL - PC200LC-7 S/N A87018-UP, PC220LC-7 S/N A86660-UP | 90-19 |
| CIRCUIT DIAGRAM SHEET 1 OF 9 | 90-19 |
| CIRCUIT DIAGRAM SHEET 2 OF 9 | 90-21 |
| CIRCUIT DIAGRAM SHEET 3 OF 9 | 90-23 |
| CIRCUIT DIAGRAM SHEET 4 OF 9 | 90-25 |
| CIRCUIT DIAGRAM SHEET 5 OF 9 | 90-27 |
| CIRCUIT DIAGRAM SHEET 6 OF 9 | 90-29 |
| CIRCUIT DIAGRAM SHEET 7 OF 9 | 90-31 |
| CIRCUIT DIAGRAM SHEET 8 OF 9 | 90-33 |
| CIRCUIT DIAGRAM SHEET 9 OF 9 | 90-35 |
| | |
| HYDRAULIC | 90-37 |
| HYDRAULIC DIAGRAM (SHEET 1 OF 3) | 90-37 |
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| HYDRAULIC DIAGRAM (SHEET 3 OF 3) | 90-41 |

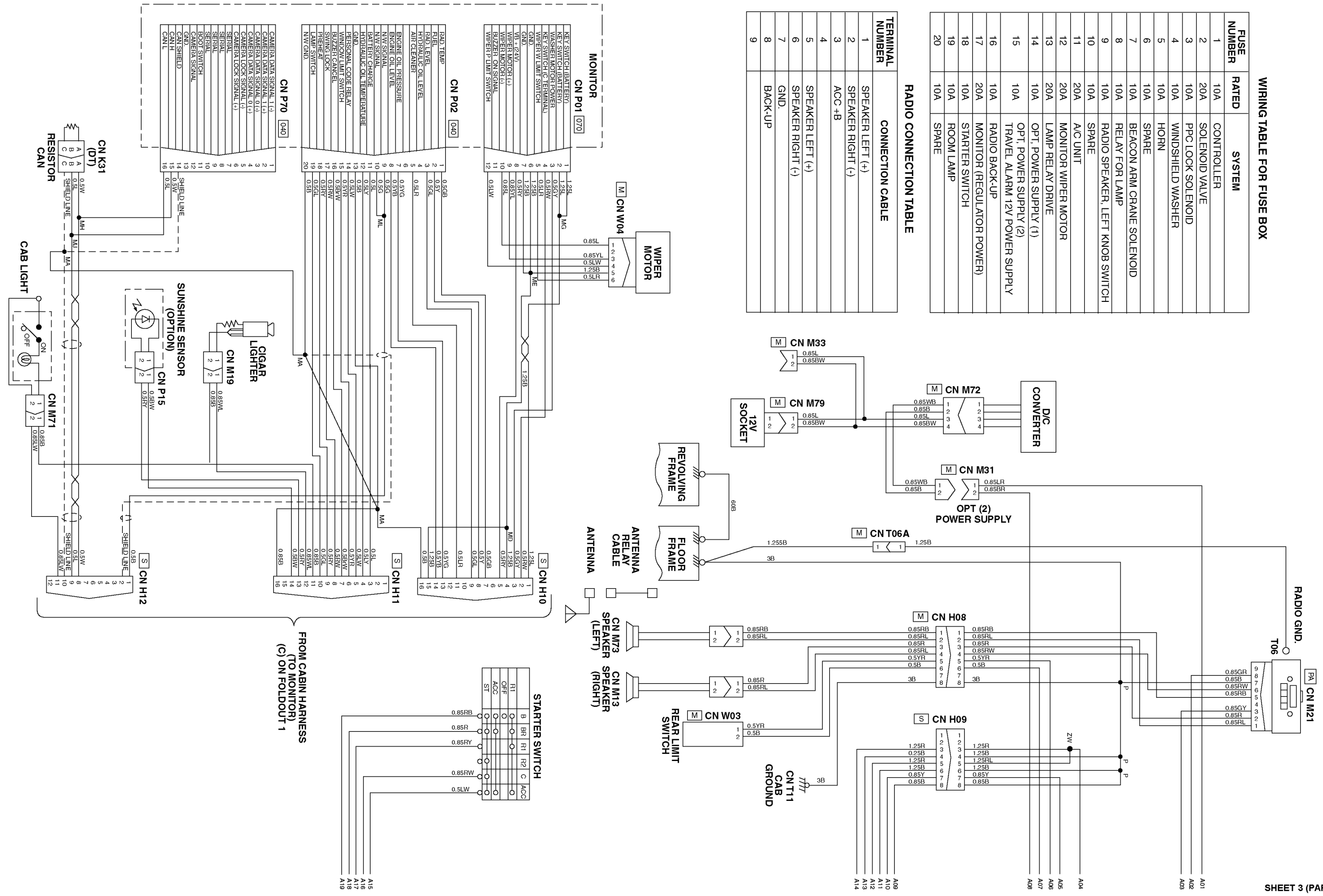
CIRCUIT DIAGRAM SHEET 3 (PART 1 OF 2)

WIRING TABLE FOR FUSE BOX

| FUSE NUMBER | RATED | SYSTEM |
|-------------|-------|---------------------------------|
| 1 | 10A | CONTROLLER |
| 2 | 20A | SOLENOID VALVE |
| 3 | 10A | PPC LOCK SOLENOID |
| 4 | 10A | WINDSHIELD WASHER |
| 5 | 10A | HORN |
| 6 | 10A | SPARE |
| 7 | 10A | BEACON ARM CRANE SOLENOID |
| 8 | 10A | RELAY FOR LAMP |
| 9 | 10A | RADIO SPEAKER, LEFT KNOB SWITCH |
| 10 | 10A | SPARE |
| 11 | 20A | AC UNIT |
| 12 | 20A | MONITOR WIPER MOTOR |
| 13 | 20A | LAMP RELAY DRIVE |
| 14 | 10A | OPT. POWER SUPPLY (1) |
| 15 | 10A | TRAVEL ALARM 12V POWER SUPPLY |
| 16 | 10A | RADIO BACK-UP |
| 17 | 20A | MONITOR (REGULATOR POWER) |
| 18 | 10A | STARTER SWITCH |
| 19 | 10A | ROOM LAMP |
| 20 | 10A | SPARE |

RADIO CONNECTION TABLE

| TERMINAL NUMBER | CONNECTION CABLE |
|-----------------|-------------------|
| 1 | SPEAKER LEFT (+) |
| 2 | SPEAKER RIGHT (-) |
| 3 | ACC +B |
| 4 | |
| 5 | SPEAKER LEFT (+) |
| 6 | SPEAKER RIGHT (-) |
| 7 | GND |
| 8 | BACK-UP |
| 9 | |



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