SEN06062-04

# Shop Manual

HYDRAULIC
EXCAVATOR

## PC138USLC-10

SERIAL NUMBERS 40001 and up

KOMATSU

# Foreword, safety and general information *(ALL-0370-001-A-00-A)*

## Important safety notice *(ALL-1120-012-A-01-A)*

(Rev. 2014/08)

- Appropriate servicing and repair are extremely important to ensure safe operation of the machine. The shop manual describes the effective and safe servicing and repair methods recommended by Komatsu. Some of these methods require the use of the special tools designed by Komatsu for the specific purpose.
- The symbol mark ⚠ is used for such matters that require special cautions during the work. The work indicated by the caution mark should be performed according to the instructions with special attention to the cautions. Should hazardous situation occur or be anticipated during such work, be sure to keep safe first and take every necessary measure.

**Safety points**

- Good arrangement
- Correct work clothes
- Observance of work standard
- Practice of making and checking signals
- Prohibition of operation and handling by unlicensed workers
- Safety check before starting work
- Wearing protective goggles (for cleaning or grinding work)
- Wearing shielding goggles and protectors (for welding work)
- Good physical condition and preparation
- Precautions against work which you are not used to or you are used to too much

**General precautions**

⚠ **Inappropriate handling causes an extreme danger. Read and understand what is described in the operation and maintenance manual before operating the machine. Read and understand what is described in this manual before starting the work.**

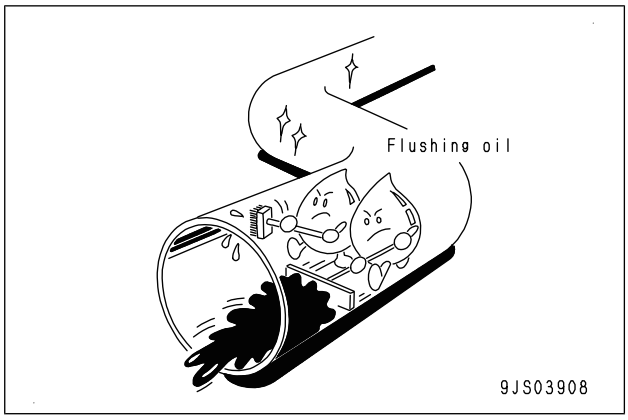
- Before performing any greasing or repairs, read all the safety labels stuck to the machine. For the locations of the safety labels and detailed explanation of precautions, see the operation and maintenance manual.
- Locate a place in the repair workshop to keep the tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt, water or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.
- When performing any work, always wear the safety shoes and helmet. Do not wear loose work cloths, or clothes with buttons missing.
  1. Always wear the protective eyeglasses when hitting parts with a hammer.
  2. Always wear the protective eyeglasses when grinding parts with a grinder, etc.
- When performing any work with 2 or more workers, always agree on the working procedure before starting. While working, always keep conversations of the work between your fellow workers and your self on any step of the work. During the work, hang the warning tag of "UNDER WORKING" in the operator's compartment.
- Only qualified workers must perform the work and operation which require license or qualification.
- Keep the tools in good condition. And learn the correct way to use the tools, and use the proper ones among them. Before starting the work, thoroughly check the tools, lift truck, service vehicle, etc.
- If welding repairs is required, always have a trained and experienced welder with good knowledge of welding perform the work. When performing welding work, always wear welding gloves, apron, shielding goggles, cap, etc.
- Before starting work, warm up your body thoroughly to start work under good condition.
- Avoid continuing work for long hours and take rests with proper intervals to keep your body in good condition. Take a rest in a specified safe place.

**Preparation**

- Before adding oil or making any repairs, place the machine on a firm and level ground, and apply the parking brake and chock the wheels or tracks to prevent the machine from moving.
- Before starting work, lower the work equipment (blade, ripper, bucket, etc.) to the ground. If it is not possible to lower the equipment to the ground, insert the lock pin or use blocks to prevent the work equipment from falling. And be sure to lock all the work equipment control levers and hang a warning tag on them.
- When performing the disassembling or assembling work, support the machine securely with blocks, jacks, or stands before starting the work.
- Remove all of mud and oil from the steps or other places used to get on and off the machine completely. Always use the handrails, ladders of steps when getting on or off the machine. Never

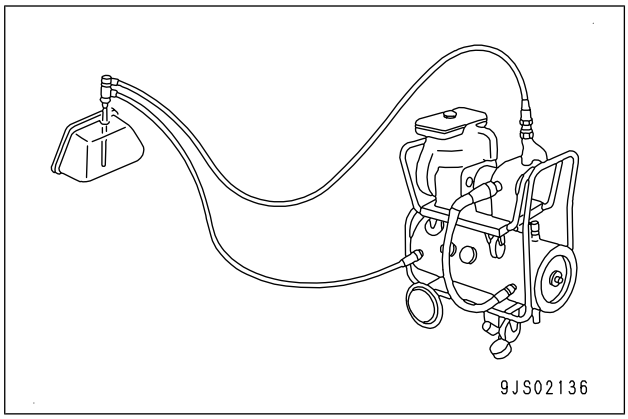
**Flushing operations**

- After disassembling the equipment or when changing the hydraulic oil with new one, flush the system to remove the contaminant and sludge left in the hydraulic circuit as well as the oil which includes them. Normally, flushing is performed twice. Primary flushing is performed by use of the flushing oil and the secondary flushing is performed by use of the specified hydraulic oil.




**Cleaning operations**

- After repairing the hydraulic equipment (pump, control valve, etc.) or when the machine is in operation, perform oil cleaning to remove the sludge or contaminant in the hydraulic oil circuit. The oil cleaning equipment can remove the ultra fine (approximately 3 μm) particles that the filter built in the hydraulic equipment can not remove. So, it is an extremely effective device.



**Color codes table**
(Table 3)

| Color Code | Color of wire | Color Code | Color of wire |
|---|---|---|---|
| B | Black | LgW | Light green & White |
| Br | Brown | LgY | Light green & Yellow |
| BrB | Brown & Black | LR | Blue & Red |
| BrR | Brown & Red | LW | Blue & White |
| BrW | Brown & White | LY | Blue & Yellow |
| BrY | Brown & Yellow | O | Orange |
| Ch | Charcoal | P | Pink |
| Dg | Dark green | R | Red |
| G | Green | RB | Red & Black |
| GB | Green & Black | RG | Red & Green |
| GL | Green & Blue | RL | Red & Blue |
| Gr | Gray | RW | Red & White |
| GR | Green & Red | RY | Red & Yellow |
| GW | Green & White | Sb | Sky Blue |
| GY | Green & Yellow | Y | Yellow |
| L | Blue | YB | Yellow & Black |
| LB | Blue & Black | YG | Yellow & Green |
| Lg | Light green | YL | Yellow & Blue |
| LgB | Light green & Black | YR | Yellow & Red |
| LgR | Light green & Red | YW | Yellow & White |

★ Remarks: In a color code consisting of 2 colors, the first color is the color of the background and the second color is the color of the marking.

Examples)

GW means that the background is "Green" and marking is "White".

**Types of circuits and color codes**

| Type of wire | | AVS, AV, CAVS | | | | | | AEX | |
|---|---|---|---|---|---|---|---|---|---|
| Type of circuit | Charge | R | WG | — | — | — | — | R | — |
| | Ground | B | — | — | — | — | — | B | — |
| | Start | R | — | — | — | — | — | R | — |
| | Light | RW | RB | RY | RG | RL | — | D | — |
| | Instrument | Y | YR | YB | YG | YL | YW | Y | Gr |
| | Signal | G | GW | GR | GY | GB | GL | G | Br |
| | Others | L | LW | LR | LY | LB | — | L | — |
| | | Br | BrW | BrR | BrY | BrB | — | — | — |
| | | Lg | LgR | LgY | LgB | LgW | — | — | — |
| | | O | — | — | — | — | — | — | — |
| | | Gr | — | — | — | — | — | — | — |
| | | P | — | — | — | — | — | — | — |
| | | Sb | — | — | — | — | — | — | — |
| | | Dg | — | — | — | — | — | — | — |
| | | Ch | — | — | — | — | — | — | — |

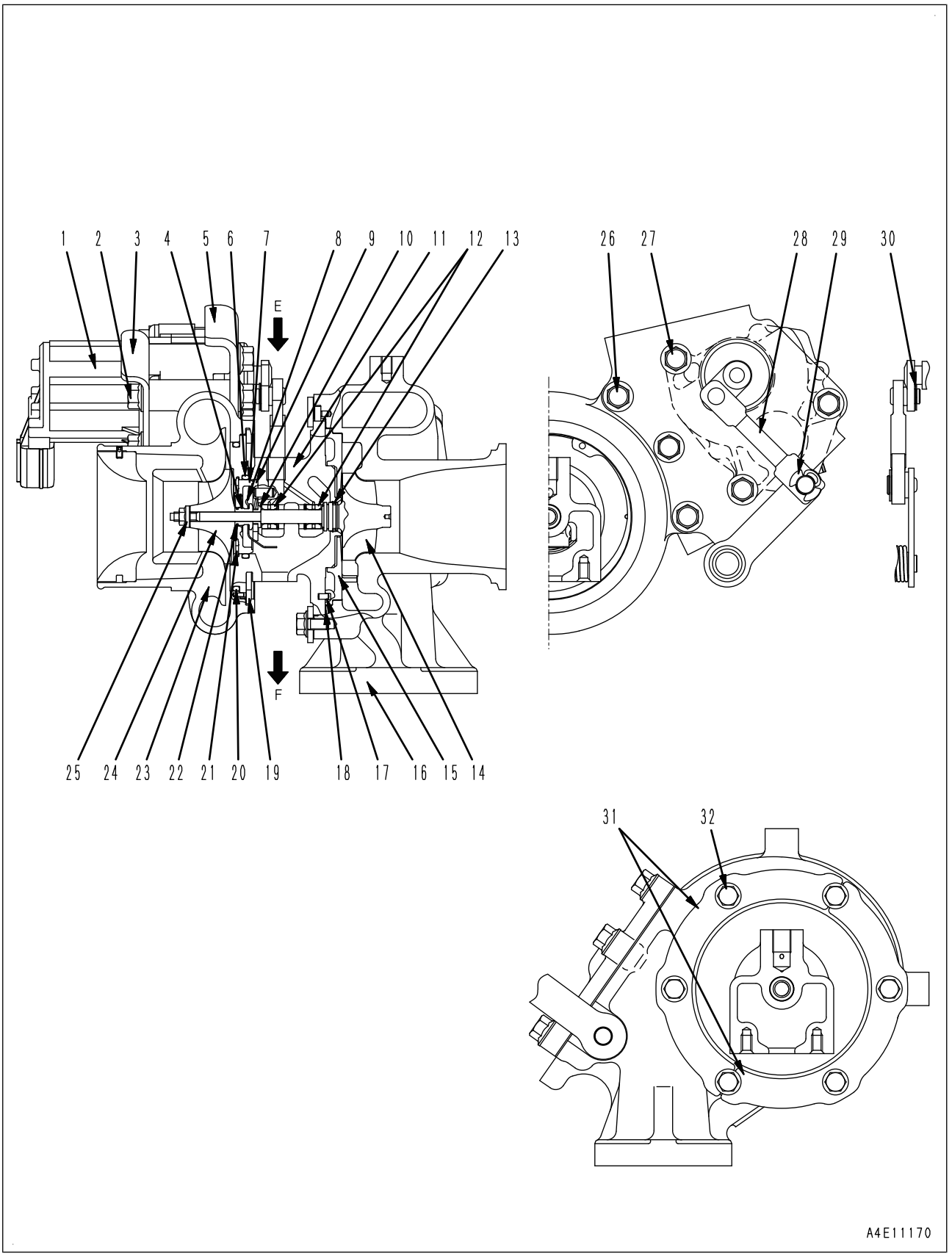
| Abbreviation | Actual word spelled out | Purpose of use (major applicable machine (*), or equipment/device) | Explanation |
|---|---|---|---|
| ECMV | Electronic Control Modulation Valve | Transmission (D, HD, WA, etc.) | Proportional electromagnetic valve that gradually increases oil pressure to engage clutch and reduces transmission shock. |
| ECSS | Electronically Controlled Suspension System | Travel (WA) | This system ensures smooth high-speed travel by absorbing vibration of machine during travel with hydraulic spring effect of accumulator. |
| ECU | Electronic Control Unit | Electronic control system | Electronic control device uses the signals from the sensors on the machine. This signal indicates the optimum actuation to the actuators. (Same as E.C.M.) |
| EGR | Exhaust Gas Recirculation | Engine | This function recirculates part of exhaust gas to combustion chamber in order to reduce combustion temperature, controls emission of NOx. |
| EMMS | Equipment Management Monitoring System | Machine monitor | This system allows data (filter, oil replacement interval, malfunctions on machine, failure code, and failure history) from each sensor on the machine to be checked on the monitor. |
| EPC | Electromagnetic Proportional Control | Hydraulic system | This mechanism allows actuators to be operated in proportion to the current supplied. |
| FOPS | Falling Object Protective Structure | Cab and canopy | This structure protects the operator's head from falling objects. (Falling Object Protective Structure)<br>This performance is standardized as ISO 3449. |
| F-N-R | Forward-Neutral-Reverse | Operation | Forward-Neutral-Reverse |
| GNSS | Global Navigation Satellite System | Communication | A general term for positioning system using satellites such as GPS, GALILEO, etc. |
| GPS | Global Positioning System | Communication (KOMTRAX, KOMTRAX Plus) | This system uses satellites to determine the current location on the earth. |
| HSS | Hydrostatic Steering System | Steering (D) | This function uses a combination of hydraulic motor and bevel shaft to control difference in travel speed of right and left tracks. Accordingly machine can turn without using steering clutch. |
| HST | Hydro Static Transmission | Transmission (D, WA) | This function uses a combination of hydraulic pump and hydraulic motor to shift the speed range steplessly without using gears. |
| ICT | Information and Communication Technology | Intelligent Machine Control | A general term for the engineering and its socially applied technology of information processing and communication. |
| IMA | Inlet Metering Actuator | Engine | This valve is installed at inlet port of pump, and it adjusts fuel intake amount in order to control fuel discharge of supply pump. Same as I.M.V. |
| IMU | Inertial Measurement Unit | Intelligent Machine Control | This is a device to detect the angular velocity and acceleration of the 3 axes that control motions. |
| IMV | Inlet Metering Valve | Engine | This valve is installed at inlet port of pump, and it adjusts fuel intake amount in order to control fuel discharge of supply pump. Same as I.M.V. (I.M.A.) |
| KCCV | Komatsu Closed Crankcase Ventilation | Engine | This mechanism separates oil in blowby gas and returns it to the intake side to afterburn it there. It primarily consists of filters. |

# Specifications *(ALL-2111-001-A-01-A)*

## PC138USLC-10 *(PC138_10-2111-931-A-00-A)*

| Machine model | Unit | PC138USLC-10 | |
|---|---|---|---|
| | | Blade mountable specification | Reinforced blade specification |
| Serial No. | | 40001 and up | |
| Bucket capacity | $m^3$ | 0.50 | 0.50 |
| Machine weight | kg | 14,600 | 15,450 |
| **Performance** | | | |
| Working ranges | | | |
| Max. digging depth | mm | 5,480 | 5,480 |
| Max. vertical wall digging depth | mm | 4,900 | 4,900 |
| Max. digging reach | mm | 8,300 | 8,300 |
| Max. digging reach at ground level | mm | 8,180 | 8,180 |
| Max. digging height | mm | 9,340 | 9,340 |
| Max. dumping height | mm | 6,840 | 6,840 |
| Max. blade lift above ground | mm | — | 470 |
| Max. blade drop below ground | mm | — | 490 |
| Max. digging force (bucket) | kN {kg} | 93.2 {9,500} | 93.2 {9,500} |
| Continuous swing speed | $min^{-1}$ {rpm} | 11.0 {11.0} | 11.0 {11.0} |
| Swing operation max. slope angle | deg. | 20 | 20 |
| Travel speed (Lo/Hi) | km/h | 2.9/5.1 | 2.9/5.1 |
| Gradeability | deg. | 35 | 35 |
| Ground pressure (standard shoe) | kPa {$kg/cm^2$} | 35.3 {0.36} | 37.3 {0.38} |
| **Dimensions** | | | |
| Overall length (for transport) | mm | 7,390 | 8,040 |
| Overall width | mm | 2,590 | 2,590 |
| Overall height (for transport) | mm | 2,850 | 2,850 |
| Overall height (for operation) | mm | 2,830 | 2,830 |
| Ground clearance of upper structure (*1) | mm | 900 | 900 |
| Min. ground clearance | mm | 395 | 395 |
| Tail swing radius | mm | 1,545 | 1,545 |
| Min. swing radius of work equipment | mm | 1,980 | 1,980 |
| Max. height of work equipment in min. swing radius posture | mm | 6,770 | 6,770 |
| Overall width of track | mm | 2,590 | 2,590 |
| Overall length of track | mm | 3,870 | 3,870 |
| Distance between tumbler centers | mm | 3,140 | 3,140 |
| Track gauge | mm | 1,990 | 1,990 |
| Machine cab height | mm | 2,140 | 2,140 |
| Blade width x height | mm | — | 2,590 x 590 |

*1: The values are for machines with triple grouser shoes.

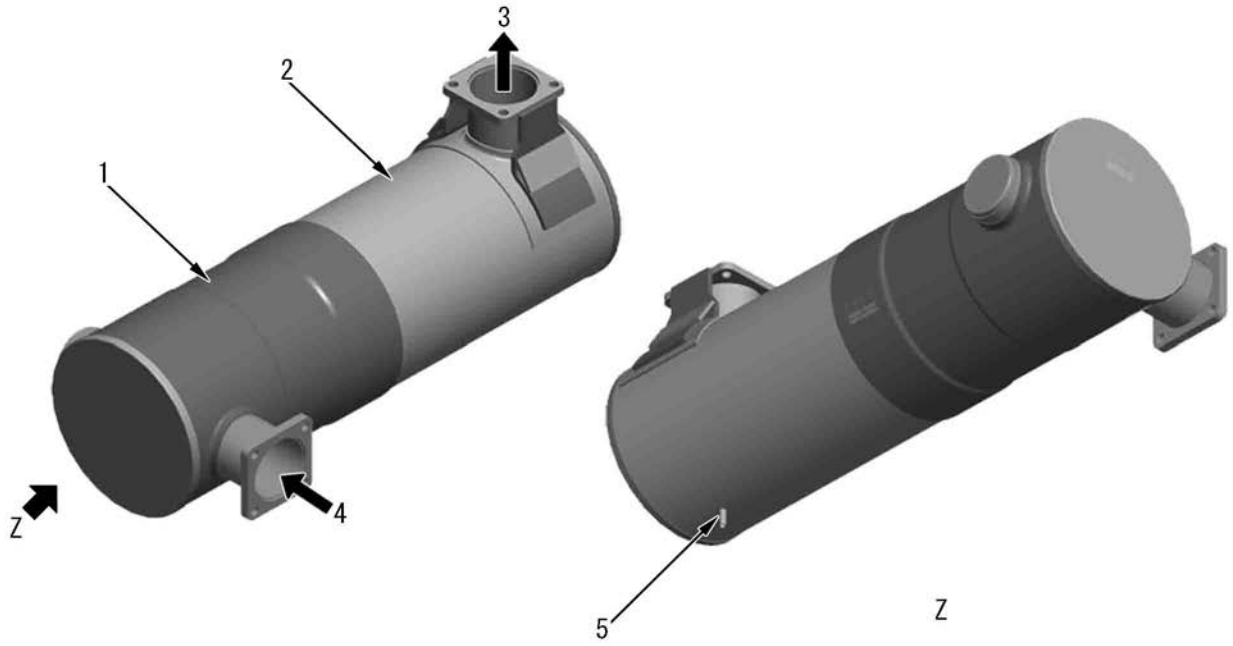



1. Variable flow turbocharger motor
2. Flange bolt
3. Bracket
4. Thrust sleeve

## KDOC muffler *(ENG95-A9H2-041-K-00-A)*

★ KDOC: Abbreviation for Komatsu Diesel Oxidation Catalyst

★ The shape is subject to machine models.



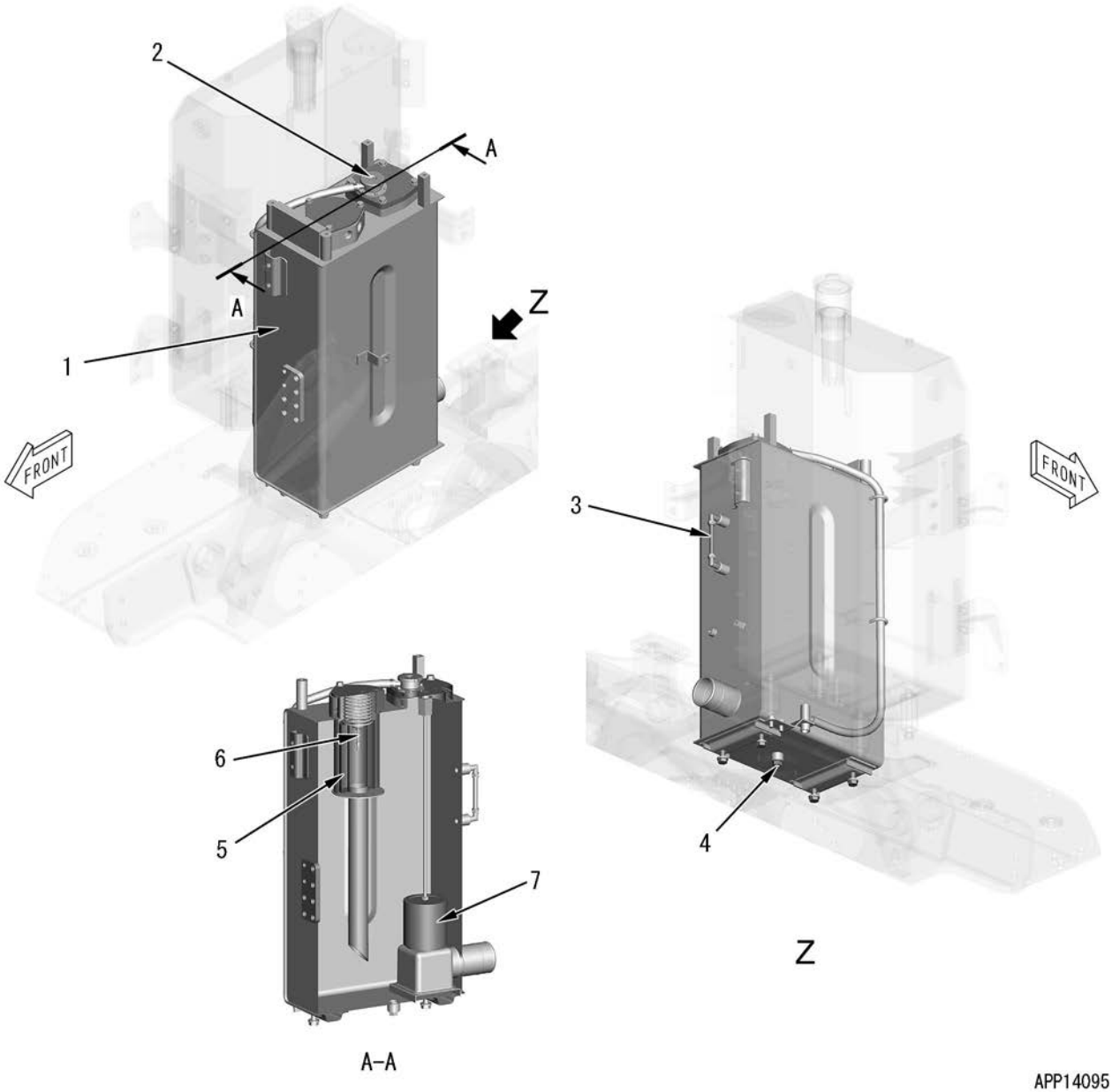

APE11180

1. DOC unit
2. Silencer unit
3. Exhaust gas outlet piping
4. Exhaust gas inlet piping
5. Drain piping

**Structure**

- The KDOC muffler consists of inlet piping (4) to lead in the exhaust gas from the engine, DOC unit (1) to store the oxidation catalyst, silencer unit (2) having silencing function and containing a "dam" to prevent rain water from flowing into the DOC unit from exhaust gas outlet piping, outlet piping (3) to discharge the exhaust gas, and drain piping (5) to drain water from the silencer unit. Those components are welded together into one unit.
- DOC unit (1) consists of ceramic honeycomb with oxidation catalyst.
- The ceramic honeycomb is protected with a mat made of special fibers to prevent breakage of the ceramic under the vibrations from the engine and chassis.

## Hydraulic tank *(PC138-PM30-041-K-00-A)*



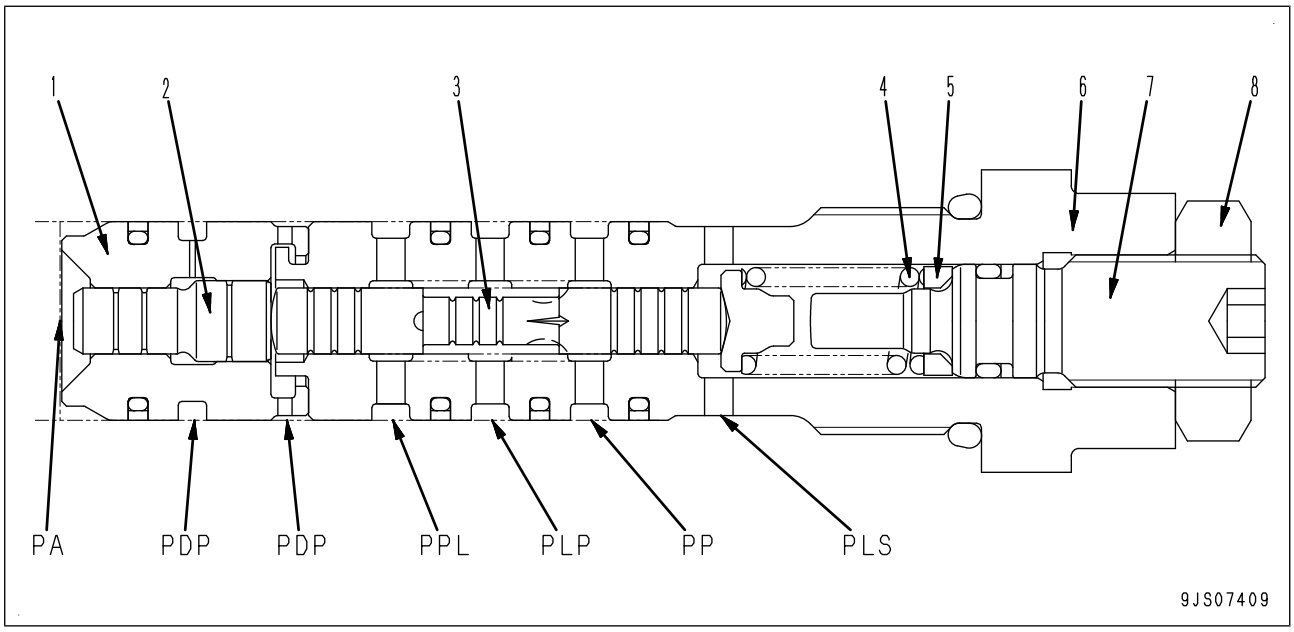

1. Hydraulic tank
2. Oil filler cap with breather
3. Sight gauge
4. Drain plug
5. Filter element
6. Bypass valve
7. Suction strainer

## Specifications *(PC138-PM30-030-K-00-A)*

| | |
|---|---|
| Hydraulic tank capacity (ℓ) | 99 |
| Hydraulic oil in tank (ℓ) | 69 |
| Bypass valve set pressure (MPa {kg/cm²}) | 0.15 ± 0.03 {1.53 ± 0.3} |

## LS valve *(PC138-C2J0-041-K-00-A)*

★ LS: Abbreviation for Load Sensing




PA: Pump port

PDP: Drain port

PLP: LS control pressure output port

PLS: LS pressure input port

PP: Pump port

PPL: Control pressure input port

1. Sleeve
2. Piston
3. Spool
4. Spring
5. Seat
6. Sleeve
7. Plug
8. Lock nut

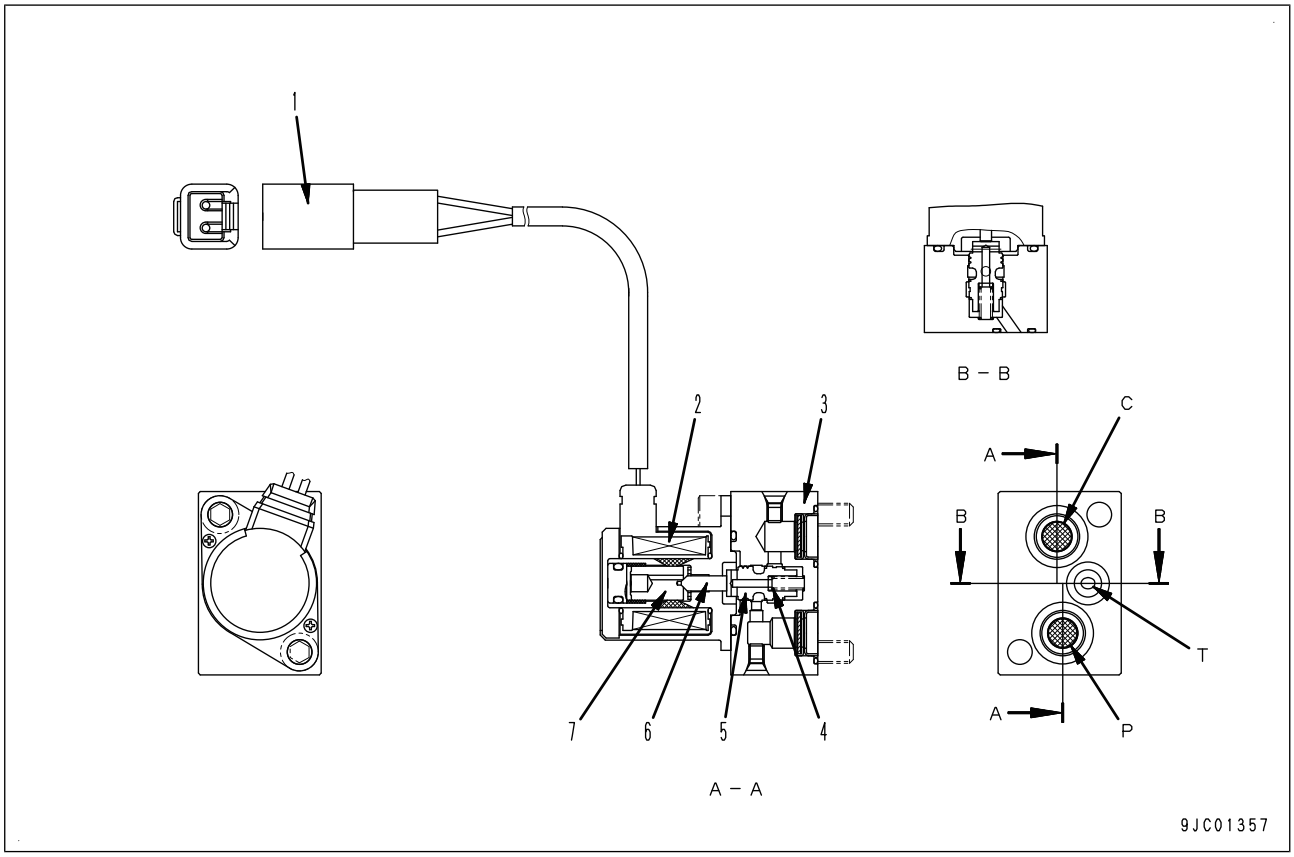
### Function *(PC138-C2J0-042-K-00-A)*

- The LS valve detects the load and controls the pump discharge.
- This valve controls pump discharge (Q) according to differential pressure (ΔPLS) [ = (PP) — (PLS)] (called LS differential pressure) between pump discharge pressure (PP) and control valve outlet port pressure (PLS).
- This valve receives main pump pressure (PP) and pressure (PLS) (called the LS pressure) coming from the control valve output.

## PC-EPC valve *(D65-C2E5-041-P-00-A)*

★ PC: Abbreviation for Pressure Compensation

★ EPC: Abbreviation for Electromagnetic Proportional Control




C: To PC valve

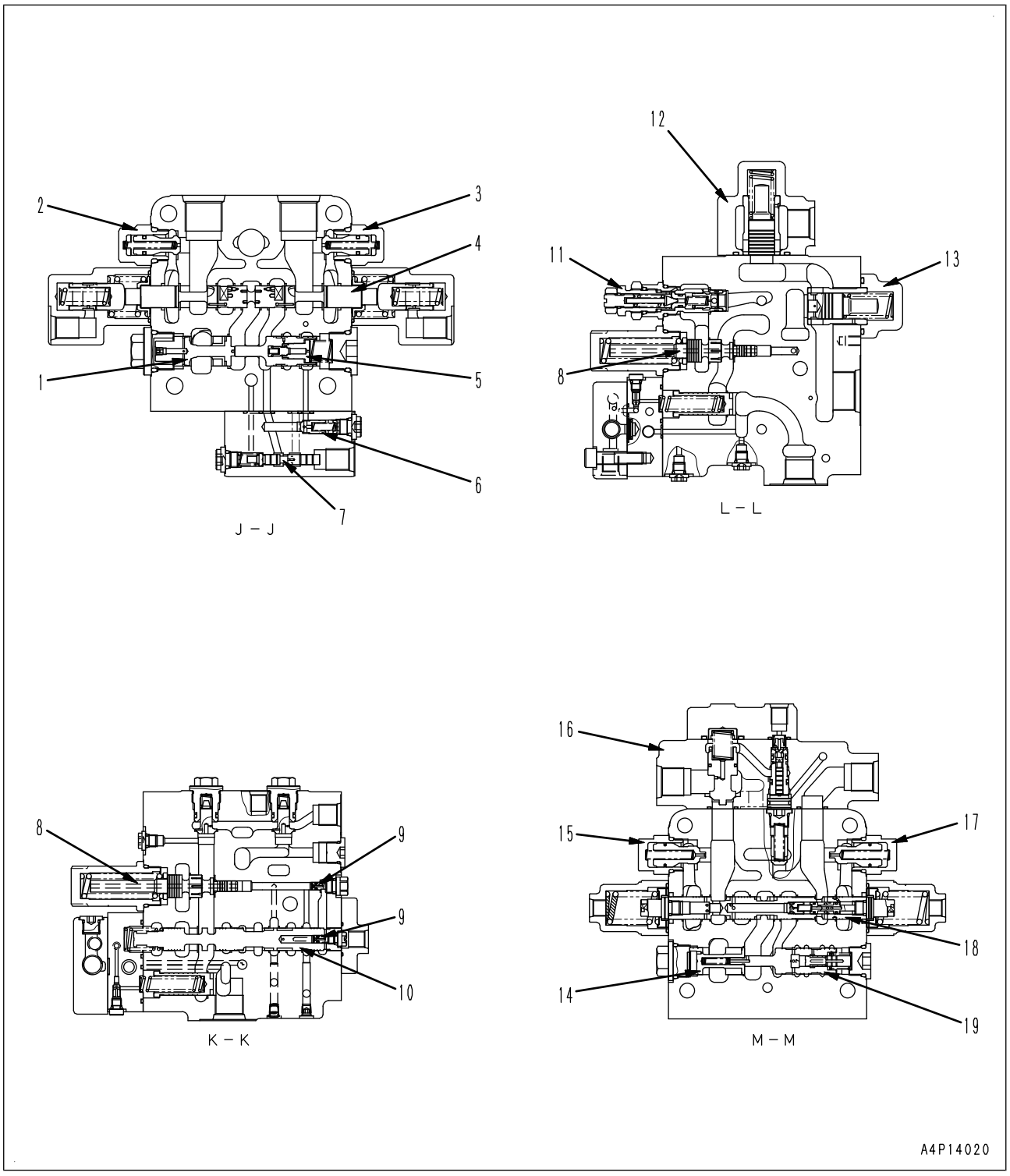
P: From pump

T: To tank

1. Connector
2. Coil
3. Body
4. Spring
5. Spool
6. Rod
7. Plunger

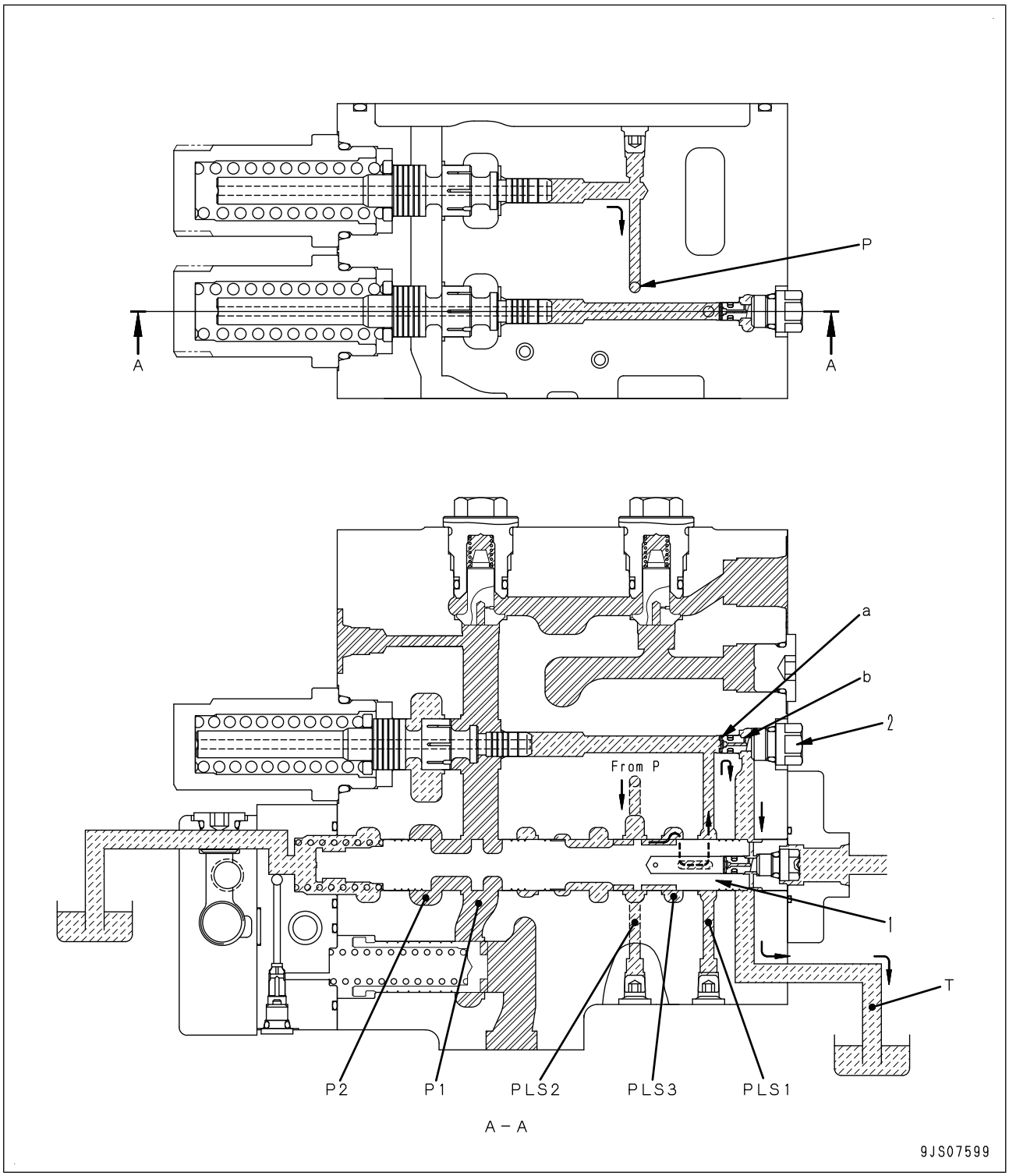
### Function *(D65-C2E5-042-P-00-A)*

- The EPC valve consists of the proportional solenoid and the hydraulic valve.
- When signal current (i) from the controller is received, an EPC output pressure proportional to the amperage of current is generated and output to the PC valve.


2
3
4
1
5
6
7
J – J
12
11
13
8
L – L
8
9
9
10
K – K
16
15
17
18
14
19
M – M
A4P14020

**Operation**

**When work equipment valve is operated**
(including simultaneous operation of work equipment and travel)




- Since merge-divider spool (1) is located at the merge position, the pressurized oil in LS circuits (PLS1), (PLS2), and (PLS3) flows from filter (a) at the end of LS bypass plug (2) through orifice (b) into tank circuit (T).

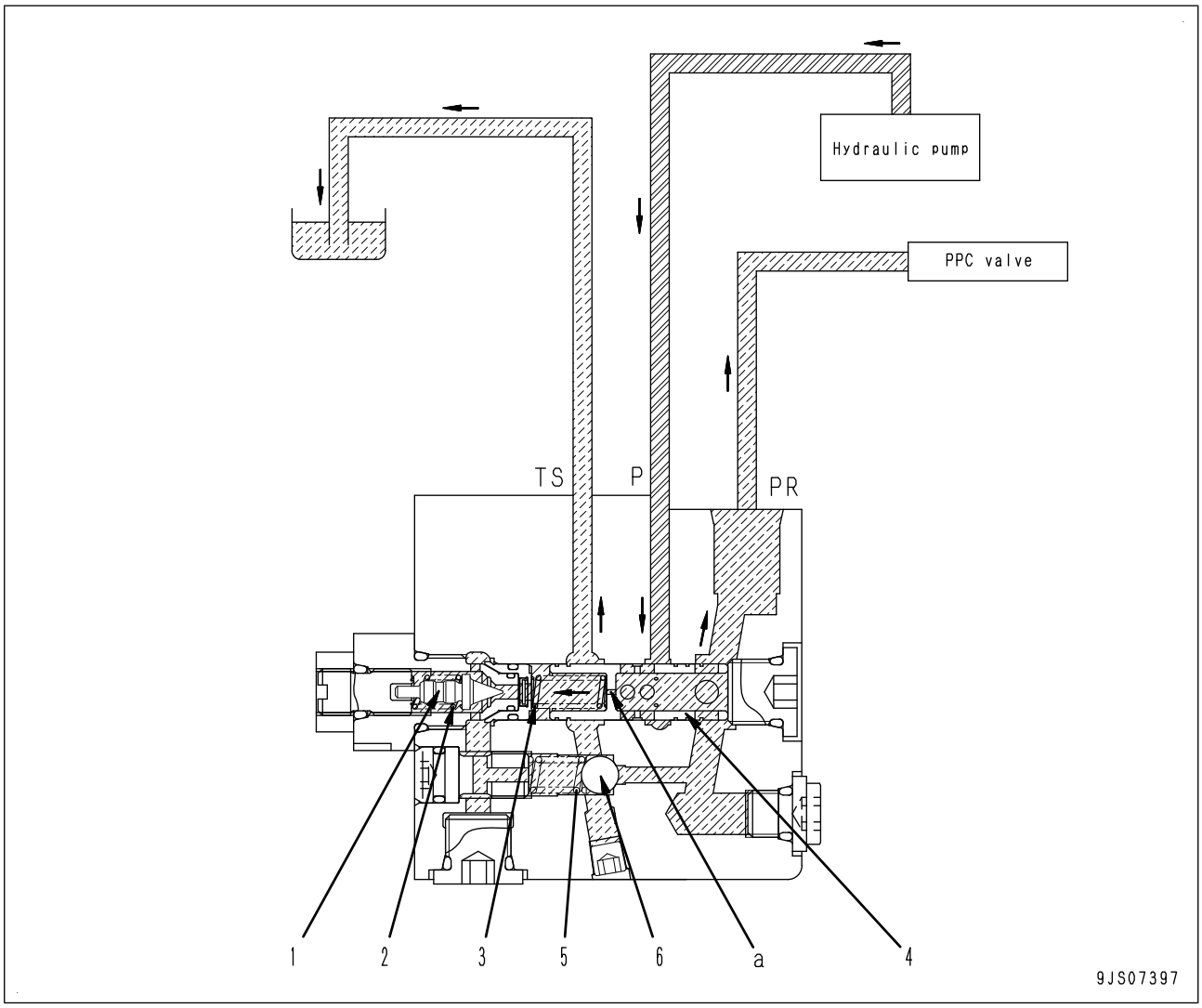
## Self-pressure reducing valve *(PC138-PL30-042-K-00-A)*

**Function**

- It reduces the main pump discharge pressure and provides it as control pressure to the solenoid valves, EPC valves, etc.

**Operation**

**If normal**

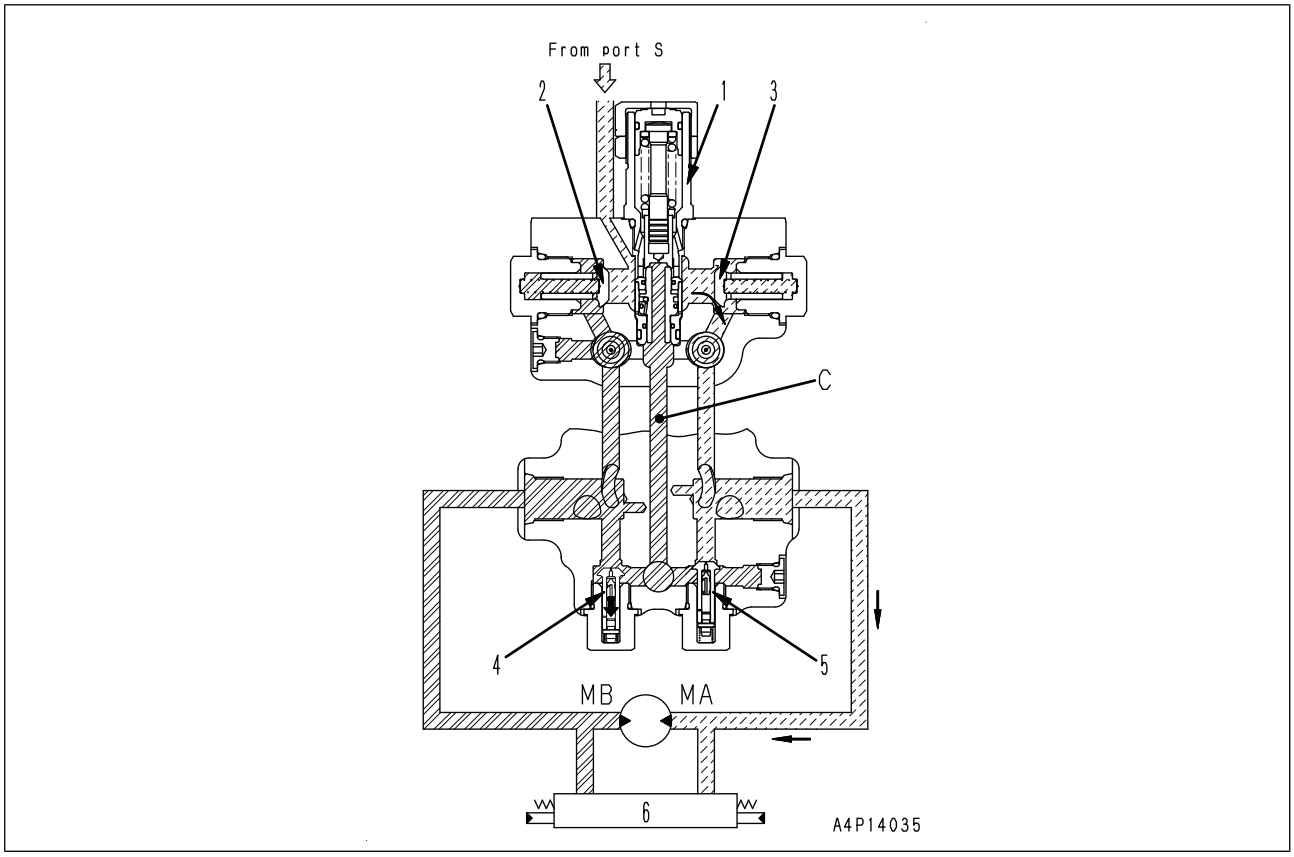



- When pressure (PR) exceeds the set pressure, poppet (1) opens.
- The pressurized oil flows from port (PR) to orifice (a) in spool (4), and then flows through the opening of poppet (1) to seal drain port (TS).
- Differential pressure is generated over orifice (a) in spool (4) and spool (4) moves to close the opening between ports (P) and (PR).
- Pressure (P) is reduced and adjusted to constant pressure (set pressure) by the opening area at this time and supplied as pressure (PR).

**When abnormal high pressure occurs**

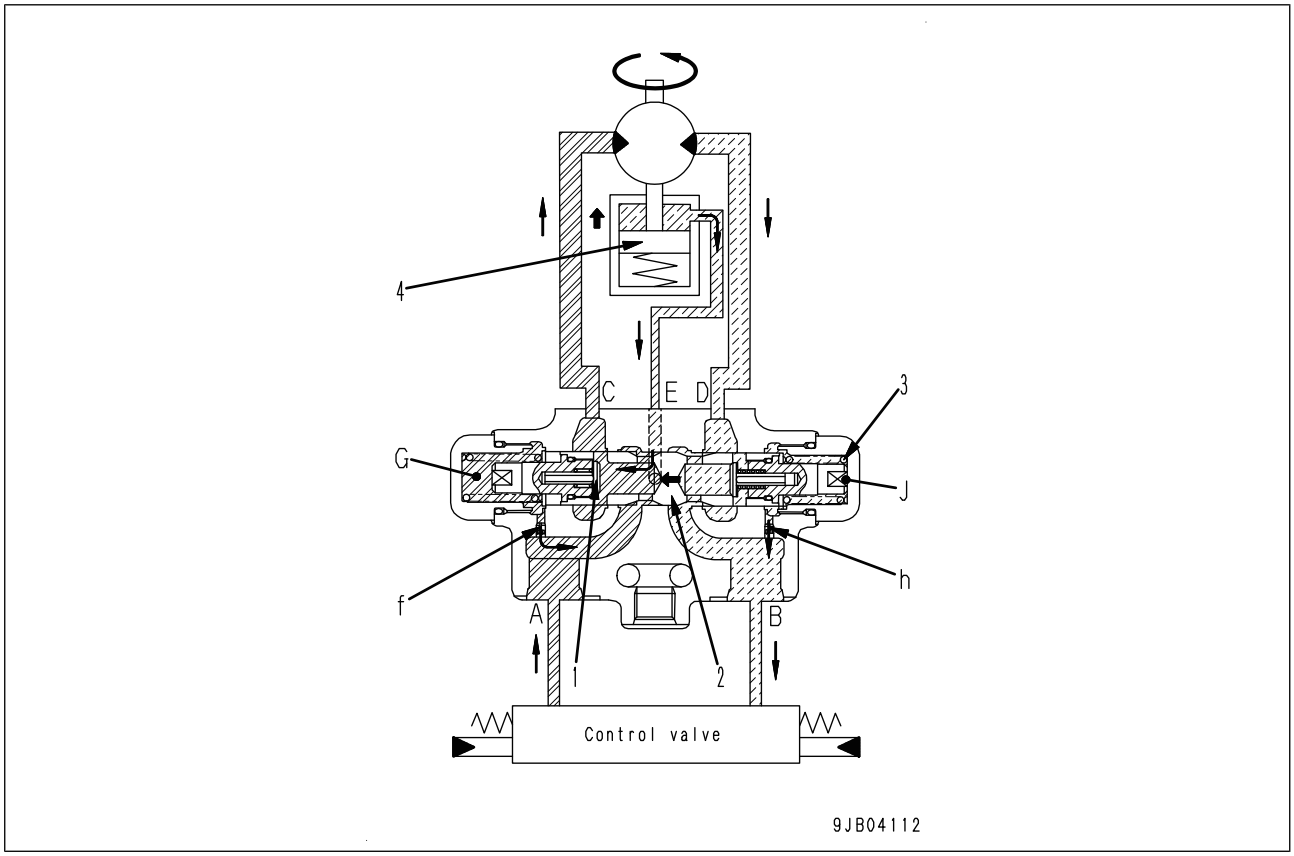
- If pressure (PR) of the self-pressure reducing valve becomes abnormal, ball (6) compresses spring (5) and separates from the seat.
- The pressurized oil flows through port (PR) to (TS) to reduce pressure (PR).
- Thus, the hydraulic components such as the PPC valves and solenoid valves are protected from abnormal pressure.

**When stopping swing**




- When the control lever is returned from "Swing RIGHT" to "NEUTRAL", the pressurized oil from the pump is not supplied to port (MA).
- Since the return circuit to the tank for the pressurized oil from the motor outlet is closed by control valve (6), the pressure in port (MB) increases.
- Rotation resistance is generated in the motor and the brake starts to work.
- When the pressure in port (MB) exceeds that in port (MA), it pushes shuttle valve (4).
- The pressure in chamber (C) becomes the same with port (MB) and increases to the set pressure of relief valve (1).
- High braking torque is applied to the motor to stop.
- While relief valve (1) is in operation, the relieved pressurized oil and the pressurized oil from port (S) are supplied to port (MA) through check valve (3).
- Cavitation in port (MA) is prevented.

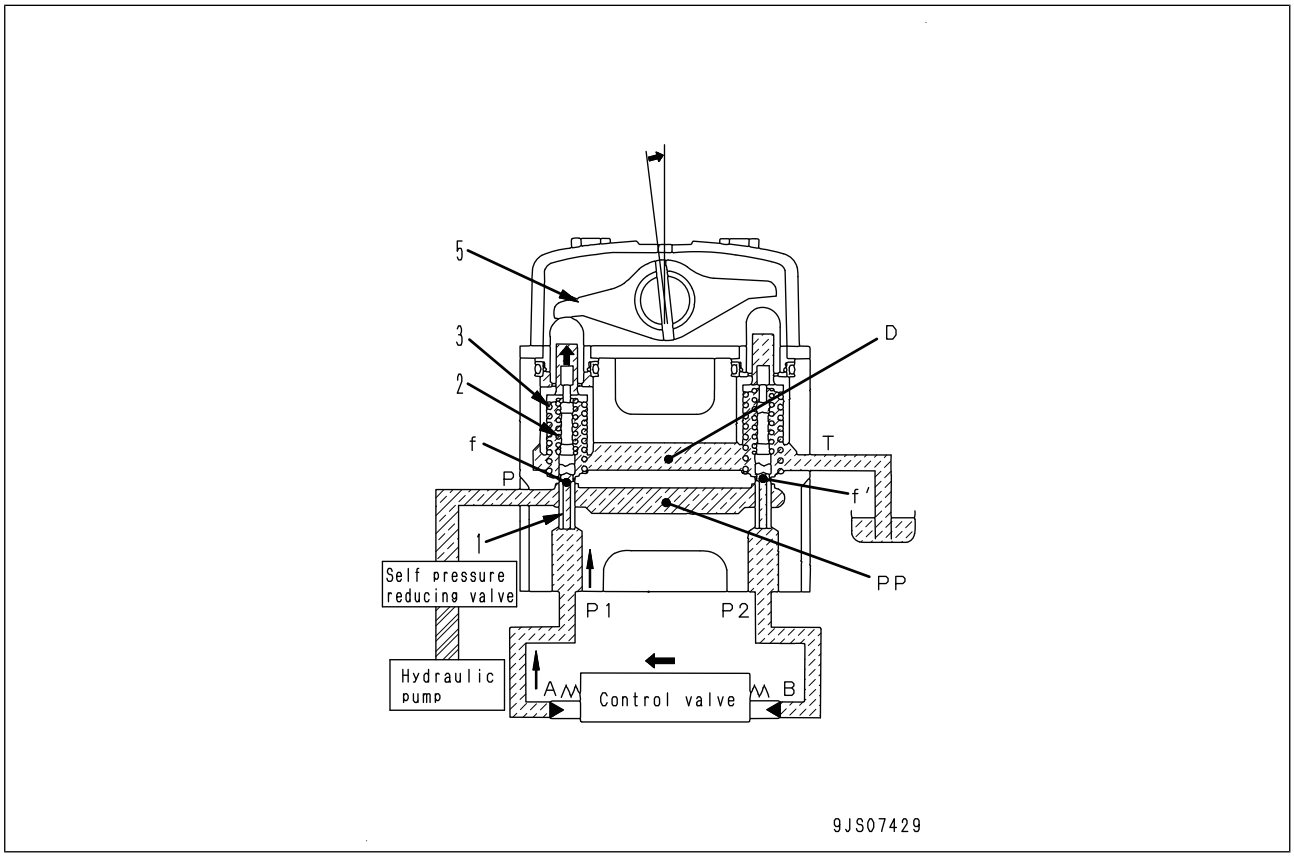
**When traveling downhill**




- If the machine runs away during downhill travel, the hydraulic motor rotates idle and the oil pressure in port (C) drops, and the oil pressure in port (G) also drops through orifice (f).
- When the oil pressure in chamber (G) decreases below the set pressure of spring (3), counterbalance valve (2) moves to the left.
- When the oil in chamber (J) flows through orifice (h) to port (B), the throttle effect of orifice (h) generates back pressure, which controls the speed of counterbalance valve (2) moving to the right.
- When ports (D) and (B) are throttled and the oil pressure in port (D) increases, resistance is applied to the rotation of the hydraulic motor to prevent running away of the machine.
- Counterbalance valve (2) moves to a position where the pressure generated by the machine weight and the pressure in port (A) are balanced with the pressure in port (B). As a result, the outlet circuit is throttled to control the rotation speed according to the pump discharge.

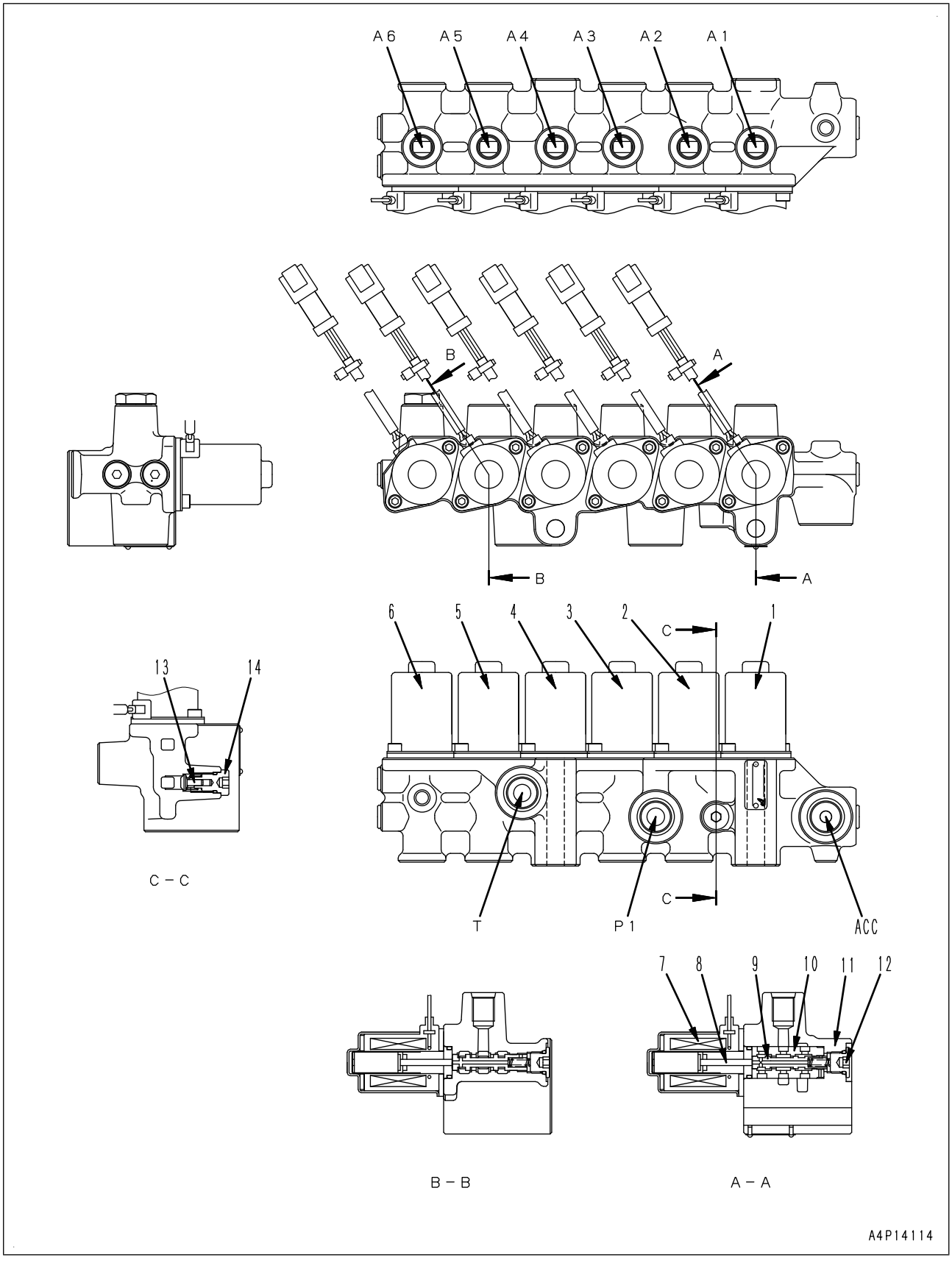
**When valve is in fine control range**

**(when control lever is returned)**




- When lever (5) begins to return, spool (1) is pushed up by the force of centering spring (3) and the pressure in port (P1).
- Fine control hole (f) is connected to drain chamber (D), and the pressurized oil in port (P1) is released.
- When the pressure in port (P1) decreases too much, spool (1) is pushed down by metering spring (2).
- Fine control hole (f) is disconnected from drain chamber (D) and connected to pump pressure chamber (PP) almost at the same time.
- The pump pressure is supplied until the pressure in port (P1) recovers to the pressure corresponding to the lever position.
- When the spool of control valve returns, the pressurized oil in drain chamber (D) flows in through fine control hole (f') in the valve on the side that is not operated. The oil passes through port (P2) and flows into chamber (B) to replenish the port with pressurized oil.

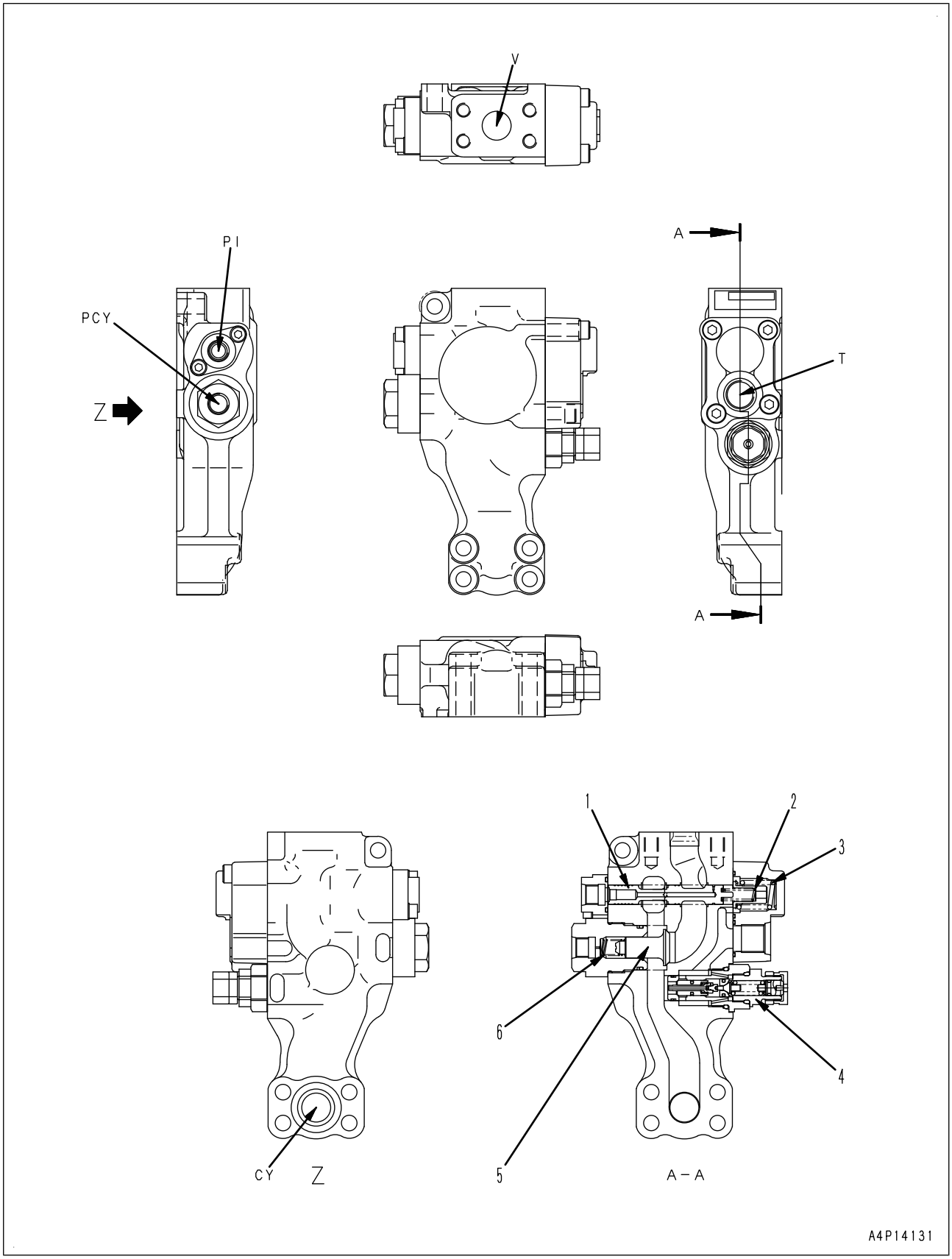
**For machine(s) ready for installation of attachment**



## Anti-drop valve for arm *(PC138-LA1B-041-K-01-A)*

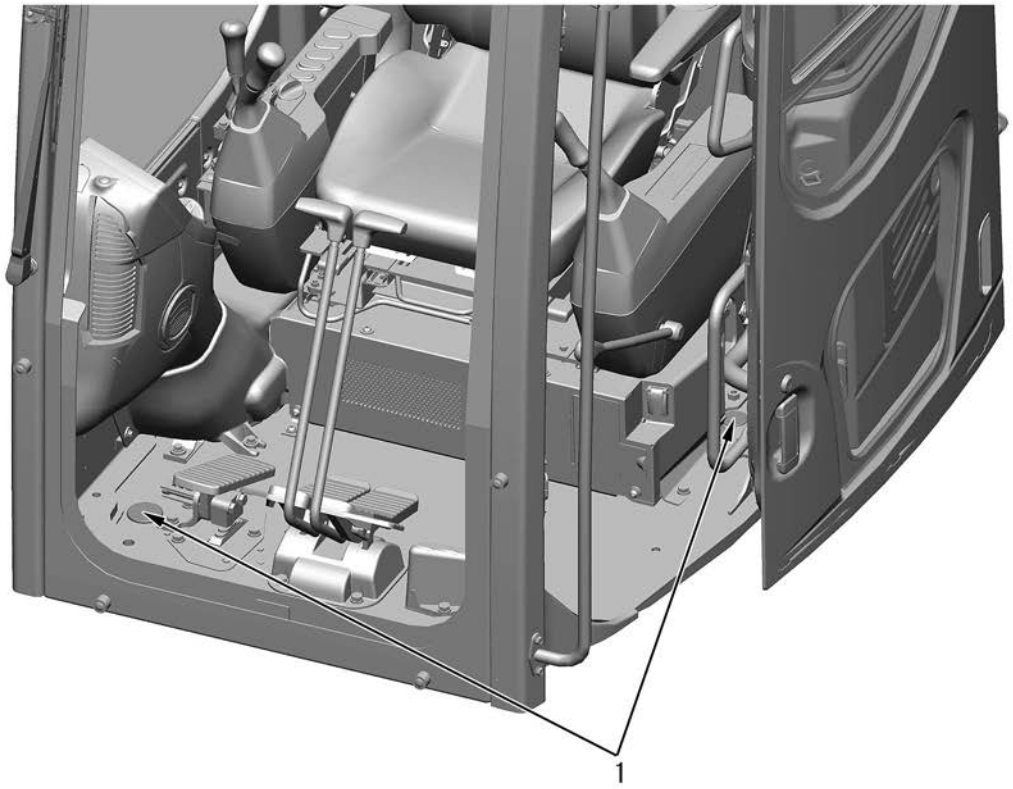
(Machine with anti-drop valve for arm)

★ General view




CY: To work equipment cylinder

## Take wiring harness out of cab *(PC138-K16F-520-K-00-A)*



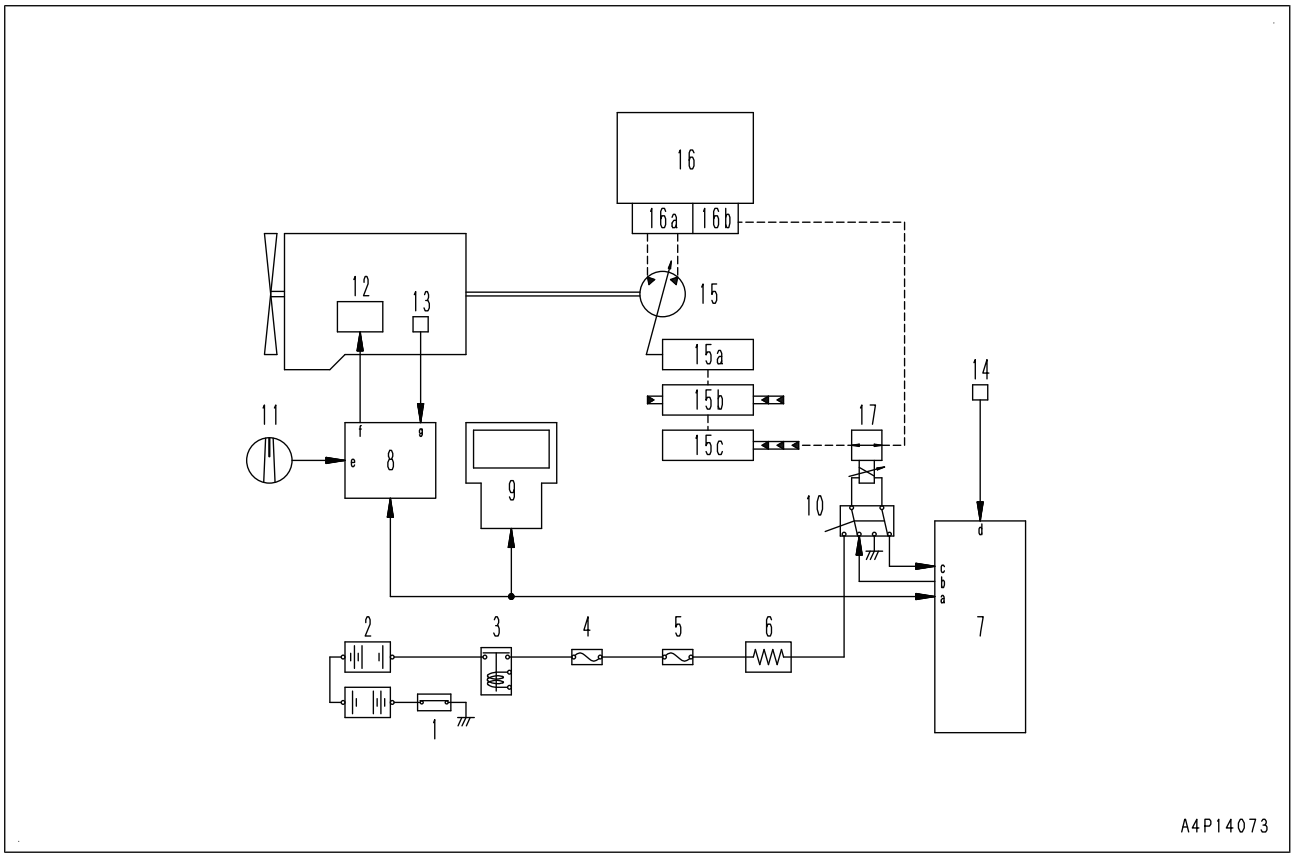

APP14092

1. Grommet

**Structure**

- 2 grommets (1) are installed to take the wiring out of the cab.

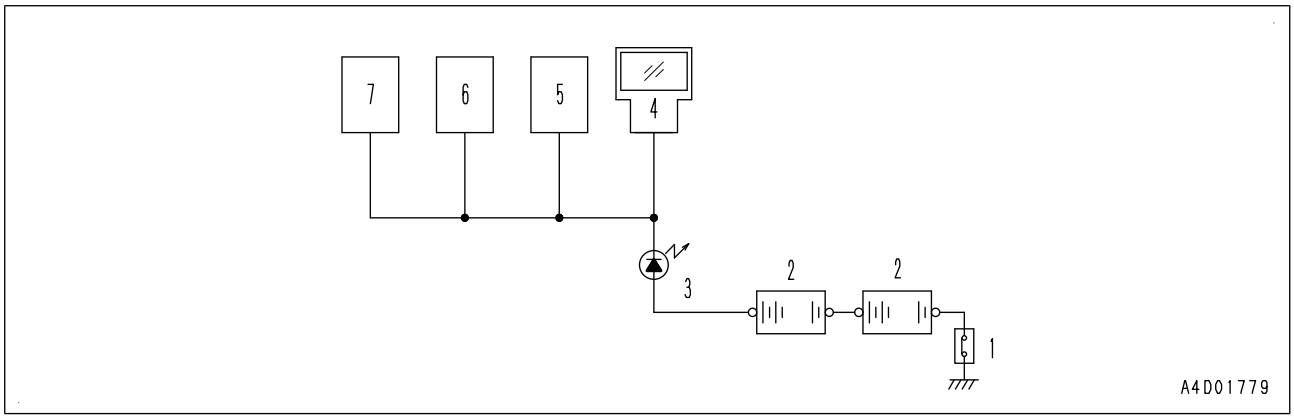
## Engine automatic warm-up function *(PC138-AP13-042-K-00-A)*




1. Battery disconnect switch
2. Battery
3. Battery relay
4. Fusible link
5. Fuse box
6. Resister for PC-EPC valve
7. Pump controller
8. Engine controller
9. Machine monitor
10. Emergency pump drive switch
11. Fuel control dial
12. Fuel supply pump
13. Various sensors
14. Hydraulic oil temperature sensor
15. Main pump
15a. Servo
15b. LS valve
15c. PC valve
16. Control valve
16a. Merge-divider valve
16b. Self-pressure reducing valve
17. PC-EPC valve

**Input/output signal**
a. CAN signal

## System operating lamp function *(PC138-AW1Q-042-K-00-A)*




1. Battery disconnect switch
2. Battery
3. System operating lamp
4. Machine monitor
5. Engine controller
6. Pump controller
7. KOMTRAX terminal

**Function**

- You can prevent an abnormal end due to cut-off of the battery power supply circuit while the controllers are in operation by checking the operating status of machine monitor (4), controllers (5), (6), and (7) with system operating lamp (3).

★ Before cutting off the battery power supply circuit, turn the starting switch to "OFF" position, and check that system operating lamp (3) goes off, then turn battery disconnect switch (1) to "OFF" position.

★ If you turn battery disconnect switch (1) to "OFF" position (battery power supply circuit is cut off) while system operating lamp (3) is ON, data lost error of machine monitor (4), controllers (5), (6), and (7) can occur. Do not operate battery disconnect switch (1) while system operating lamp (3) is ON.

★ System operating lamp (3) goes off in 2 minutes after the starting switch is turned to "OFF" position.

★ System operating lamp (3) may sometimes light up while the starting switch is turned to "OFF" position because KOMTRAX terminal (7) may maintain its communication under this condition.

**ON/OFF of system operating lamp**

- Voltage of 24 V is always applied to one end of the system operating lamp (LED) (3).
- When any of machine monitor (4), controllers (5), (6), and (7) is in operation, the controller outputs low voltage (0 V), and a current flows in the diode to turn ON system operating lamp (3).
- When all of machine monitor (4), controllers (5), (6), and (7) are stopped, the controller outputs high voltage (24 V), and no current flows in the diode, thus system operating lamp (3) goes off.

★ System operating lamp (3) may look slightly luminous in the dark after it is turned off. It is due to the minute leakage of current and not an abnormal phenomenon.

- KOMTRAX terminal (7) performs communication periodically even if the starting switch is kept in "OFF" position, thus it starts and stops repeatedly.
- The start and stop cycle (sleep cycle) of KOMTRAX terminal (7) varies the conditions including the communication status and machine stop time, and the lamp may keep lighting for up to approximately one hour

★ When you want to cut off the battery circuit for maintenance but system operating lamp (3) keeps on lighting up, turn the starting switch to ON position, and then turn it to OFF position, and the lamp goes off in 2 minutes.

After system operating lamp (3) goes off, turn battery disconnect switch (1) immediately to "OFF" position.

| Symbol | Item displayed | Description | | | Remarks |
|---|---|---|---|---|---|
| | | Range | Monitor display (Background color) | Action level monitor | |
|  9JC01168 | Maintenance due time warning | When maintenance due time is over | Lights up (Red) | — | • The display changes depending on how long it has been since the maintenance due time was over<br>• After starting switch is turned to "ON" position, monitor lights up if condition for lighting it up is satisfied, and then goes out in 30 seconds. |
| | | (*2)<br>When maintenance notice time is over | Lights up (Yellow) | — | |
|  9JC01169 | State of system | When action level "L04" or "L03" is detected | Lights up (Red) | L04 and L03 | • Monitor lights up when abnormality is detected in machine system.<br>• When the background color is red, the alarm buzzer sounds. |
| | | When action level "L01" is detected | Lights up (Yellow) | (*3)<br>L01 | |
|  9JC01170 | State of engine system | When action level "L04" or "L03" is detected | Lights up (Red) | L04 and L03 | • Monitor lights up when abnormality is detected in engine system.<br>• When the background color is red, the alarm buzzer sounds. |
| | | When action level "L01" is detected | Lights up (Yellow) | (*3)<br>L01 | |
|  9JC01171 | State of hydraulic system | When action level "L04" or "L03" is detected | Lights up (Red) | L04 and L03 | • Monitor lights up when abnormality is detected in hydraulic system.<br>• When the background color is red, the alarm buzzer sounds. |
| | | When action level "L01" is detected | Lights up (Yellow) | (*3)<br>L01 | |
|   9JC01174 | Engine overspeed | When engine overspeed is detected | Lights up (Red) | L02 | • Monitor lights up and alarm buzzer sounds when engine overspeed is detected. |
|  9JC01175 | State of air conditioner | When air conditioner is abnormal | Lights up (Yellow) | (*3)<br>L01 | • Monitor lights up when abnormality is detected in air conditioner system. |

| Pin No. | Signal name | Input/Output signal |
|---|---|---|
| 9 | (*1) | - |
| 10 | (*1) | - |
| 11 | Starting switch (C) | Input |
| 12 | (*1) | - |

*1: Never connect these pins. Malfunctions or failures may occur.

### Function *(PC-Q220-042-K-00-A)*

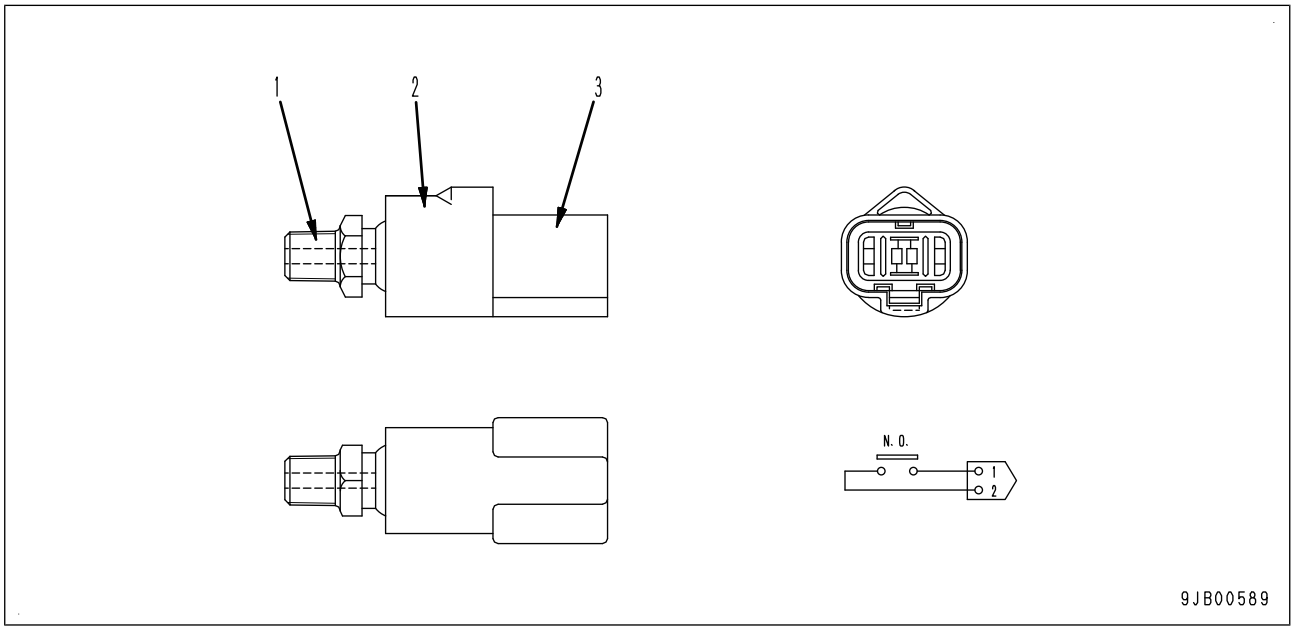
- This terminal utilizes satellite communications technology.
- The terminal is an equipment which transmits various machine information obtained through network signals and input signals, as well as GPS positioning data. The terminal can transmit data via the communication antenna.
- The status of the terminal can be checked by using the menu of "KOMTRAX setting" in the service mode of the machine monitor .
- Use of KOMTRAX terminal must be limited for the countries in which such communication is allowed.
- This terminal has LED lamps and 7-segment lamp indicator used for testing and troubleshooting on its display section.

★ When commencing operation of the KOMTRAX system or changing the country in which the system is used, you must give notice about the name of the country to Komatsu Ltd.

★ When operating the system in Japan, install a terminal dedicated for use in Japan.

### PPC oil pressure switch *(PC-E610-041-P-00-A)*

★ PPC: Abbreviation for Proportional Pressure Control




1. Plug
2. Switch
3. Connector

### Specifications *(PC220-E610-030-P-00-A)*

Contact type: Normally open

Operating (ON) pressure: 490 ± 98.1 kPa {5.0 ± 1.0 kg/cm$^2$}

Resetting (OFF) pressure: 294 ± 49.0 kPa {3.0 ± 0.5 kg/cm$^2$}

### Function *(PC138-E610-042-P-00-A)*

- This sensor is installed to 8 places of the junction block, senses the PPC oil pressure while each actuator is operated, and turns the switch "ON" when the PPC oil pressure exceeds the specified pressure.

SHOP MANUAL

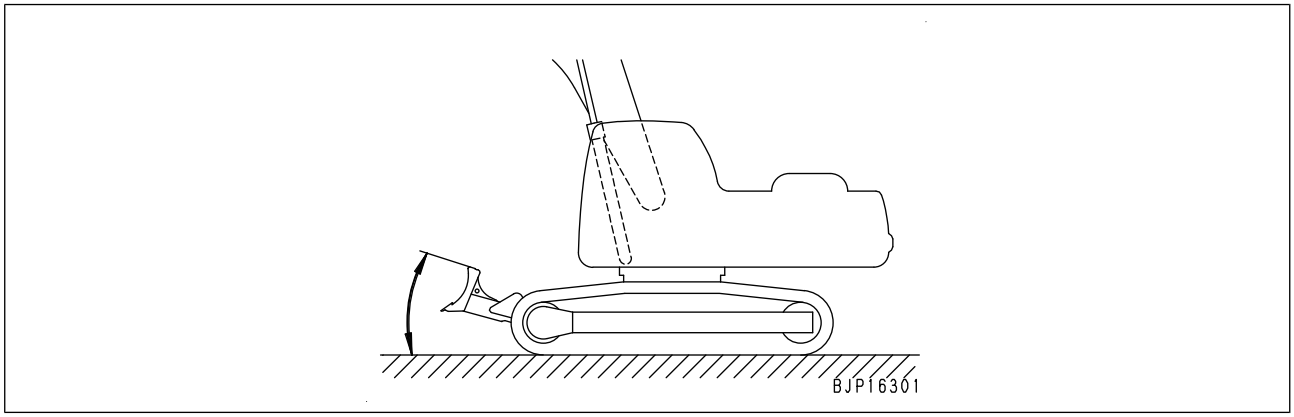
# HYDRAULIC EXCAVATOR

## PC138USLC-10

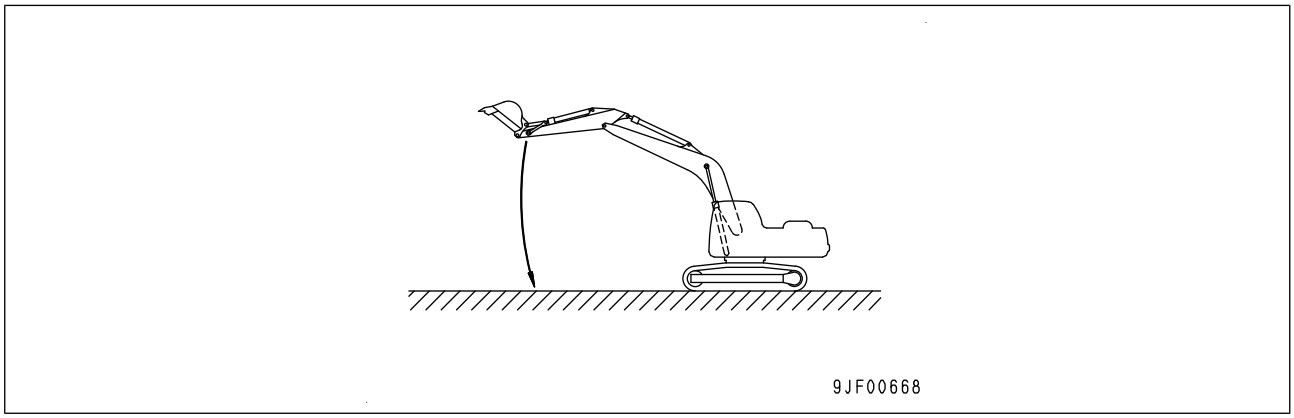
| Model | Serial Number |
| --- | --- |
| PC138USLC-10 | 40001 and up |

# 20 Standard value tables

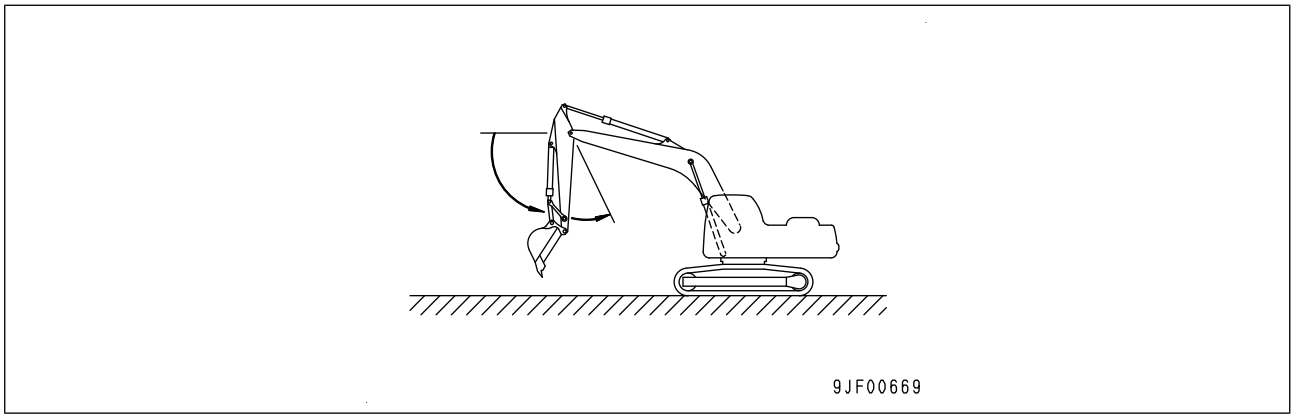
**Work equipment 5:** Blade speed



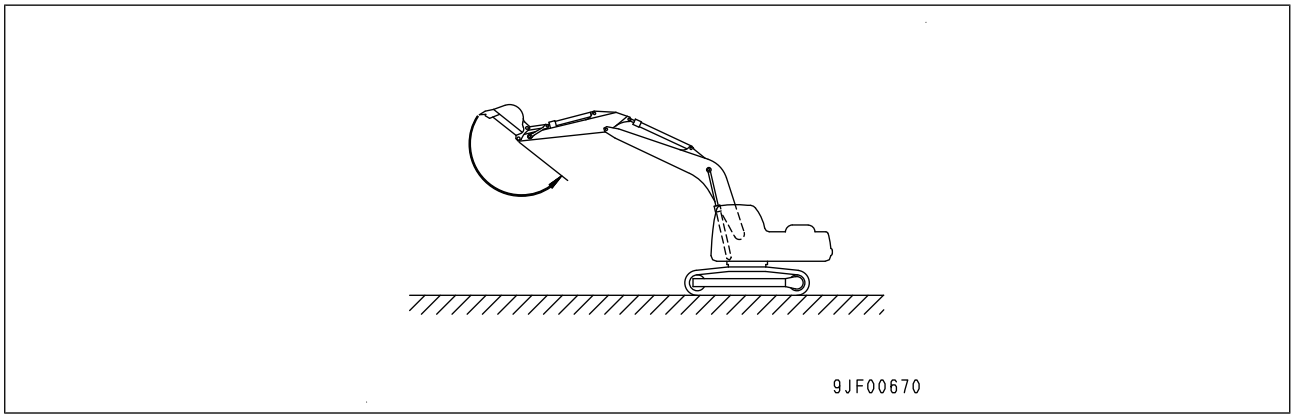

**Work equipment 6:** Boom time lag




**Work equipment 7:** Arm time lag

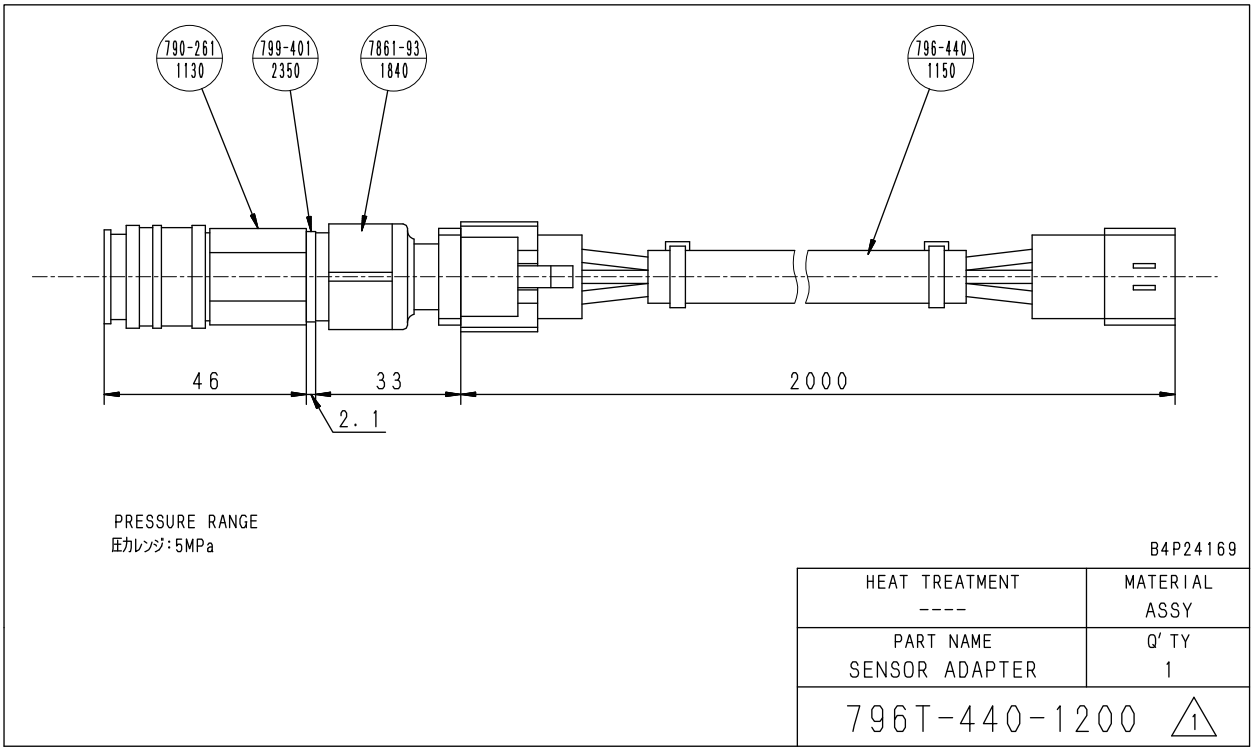



**Work equipment 8:** Bucket time lag

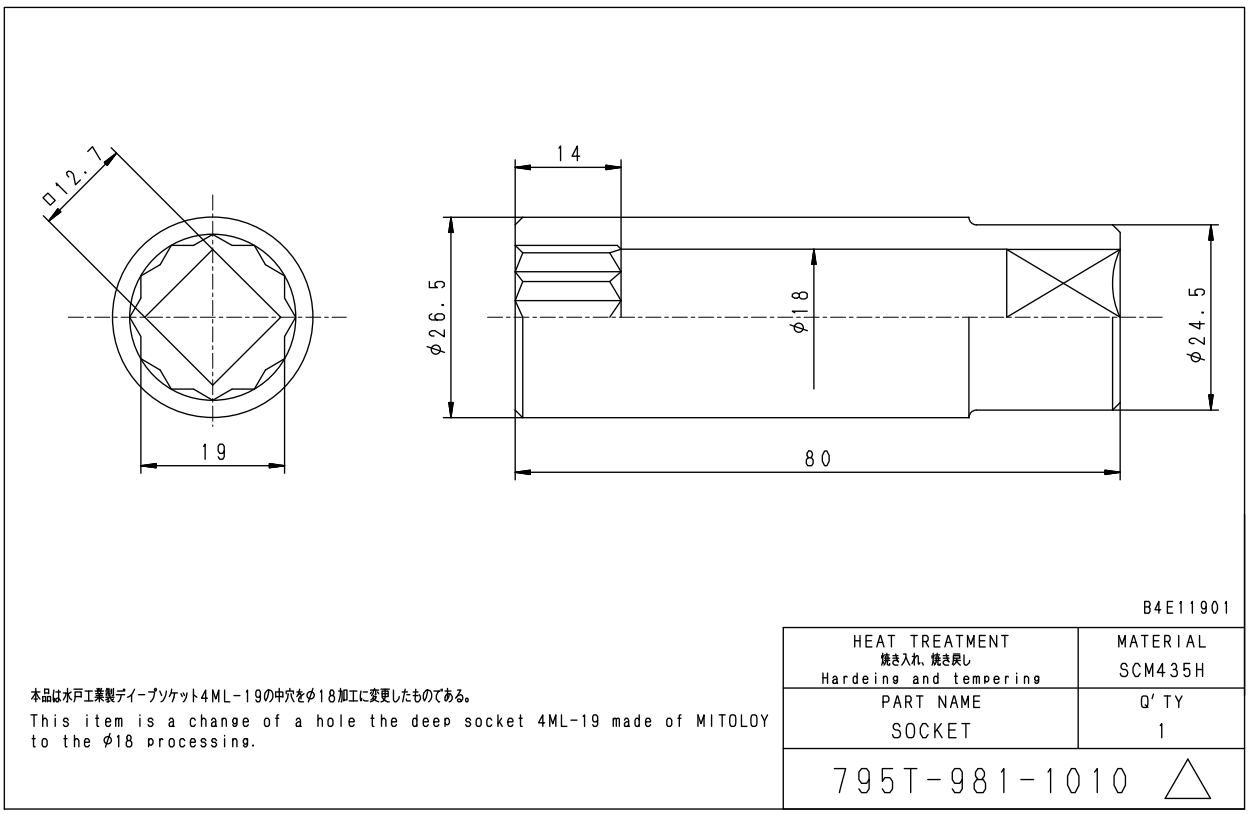


Note: Komatsu does not take any responsibility for special tools manufactured according to these sketches.

**M5: Sensor adapter**




**-: Socket**



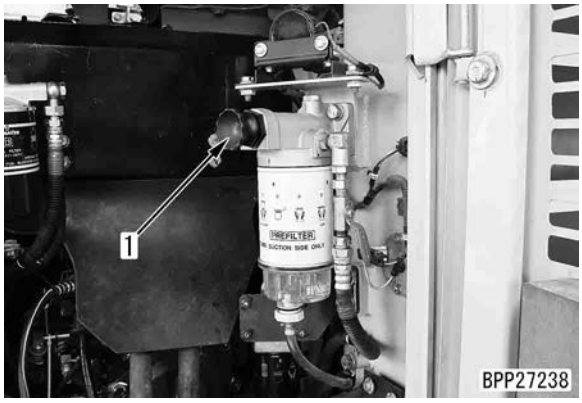
## Bleeding air from fuel system *(ALL-AD00-001-K-00-A)*

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

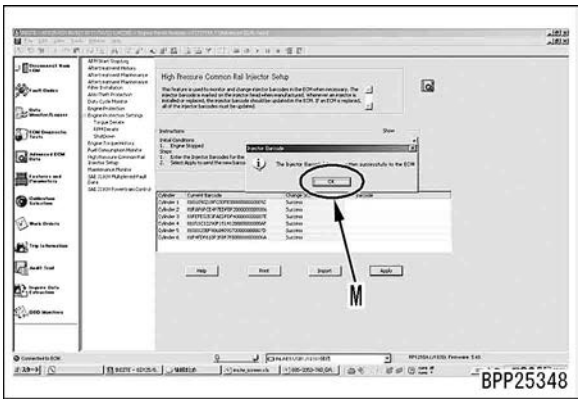
⚠ **Place the machine on a level ground and lower the work equipment to the ground.**

### Bleeding air *(PC138-AD00-231-K-00-A)*

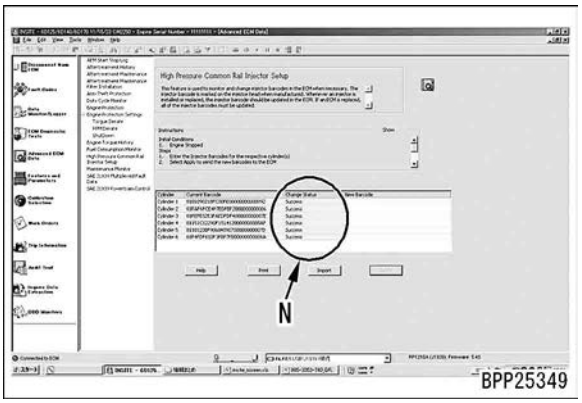
1. Fill the fuel tank with fuel.
   ★ Supply fuel until the float of sight gauge reaches to the highest position.
2. Open the side cover of the pump room.
3. Loosen knob (1) of the feed pump and pull it out, and move it back and forth.
   ★ Move the knob until its movement becomes heavy.
   ★ You may not remove the plug on the top surface of the main fuel filter.



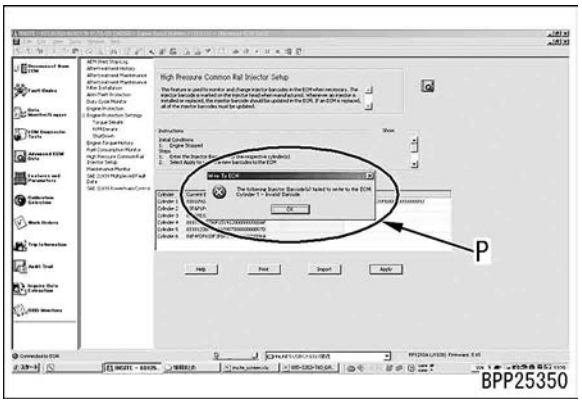

4. After bleeding air, push knob (1) in and tighten it.



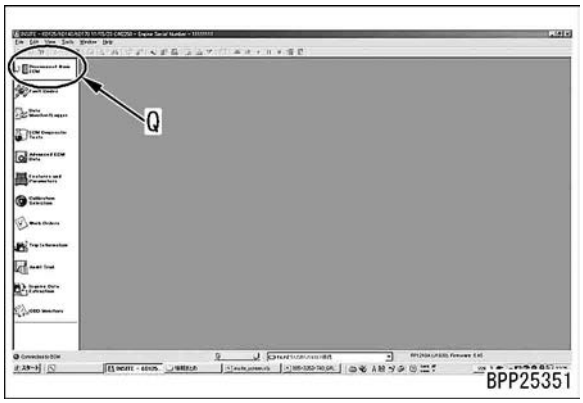

8) Screen that appears when data writing ends successfully. "Success" is displayed on the screen.
   - Section N: Make sure that "success" is indicated.




★ Screen that appears for faulty data writing
   - Section P: Indicates that writing is faulty.
   - If the following appears instead of the screen of item 8) after the operation of item 7), it is suspected that the entered new data is inappropriate. (Check the data again and repeat its entry.)




6. Disconnect and end the communication with the engine controller.
   - Section Q: Select "Disconnect from ECM."




7. Turn the starting switch to OFF position, then boot the PC again (turn the starting switch to ON position) to make sure that an error is not present on the monitor.

   ★ Related error code:

   CA2765: Inj Trim Data Error

8. When replacing the injector, clear the values on the compensation values sheet on the back of the engine controller.

   ★ Clear the former data characters of the replaced injector on the compensation values sheet that is provided on the back of the controller. (Draw strike through)

   ★ Record the former data of the replaced injector in the maintenance register.

9. When the engine controller is replaced, inconsistency may result between the data recorded on the sheet on the back of the controller and that recorded in the register when replacement of an injector or engine controller was done before. In such case, you must use the compensation character strings contained in the maintenance record information or import the compensation value information described on the top face of every injector installed on the cylinders, in the same way as you did in the above when you replaced the injector.

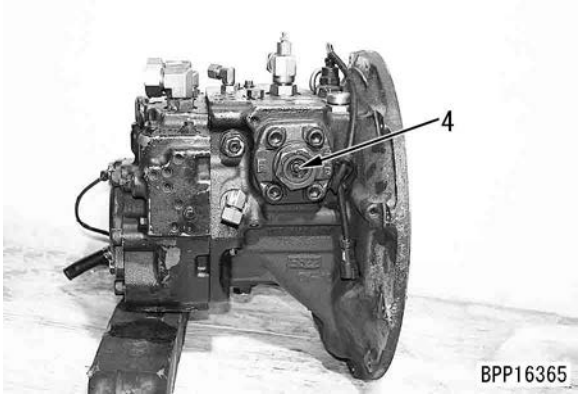
## Adjusting *(PC138-C2A3-270-K-00-A)*

### Adjustment of pump PC valve

★ When the phenomena shown below occur and PC valve (4) seems to be defective, adjust it according to the following procedure.
- When the working load increases, the engine speed drops largely.
- The engine speed is normal but the work equipment speed is low.

★ The width across flats of the lock nut for the PC valve is 13 mm and that (inside width) of the adjustment screw is 4 mm.

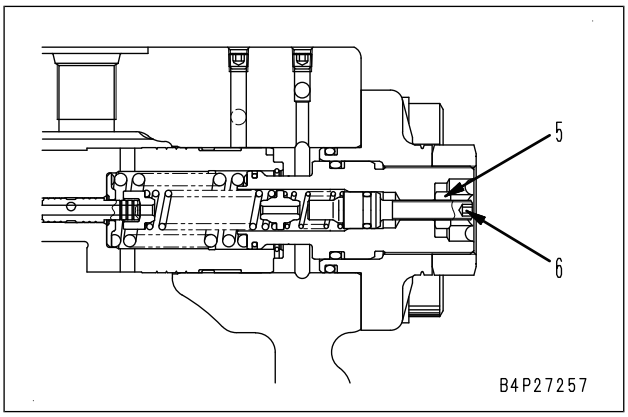
Do not rotate any other lock nut or adjustment screw than the above, since it affects the hydraulic pump performance.




1. Loosen lock nut (5).
   ★ Before loosening the lock nut, make a matchmark on its end surface so that you can see the position before the adjustment (you can return to the original position by rotating in reverse).
2. Adjust by rotating adjustment screw (6) clockwise or counterclockwise.
   ★ Rotate the adjustment screw
   - clockwise when the work equipment speed is low (to increase the pump absorption torque), or
   - counterclockwise when the engine speed is low (to decrease the pump absorption torque).
3. Tighten lock nut (5).

   **Lock nut:**

   **27 to 34 Nm {2.8 to 3.5 kgm}**




4. After finishing the adjustment, check the PC valve output pressure (servo piston inlet pressure) again according to the above procedure.

## Testing oil leakage *(PC200_10-C000-360-P-00-A)*

★ Testing tools

| Sym-bol | Part No. | Part name |
|---|---|---|
| T | Commercially available | Measuring cylinder |

★ Measure the oil leakage under the following condition.
- Hydraulic oil temperature: 45 to 55°C

### Testing *(PC138-C000-364-K-00-A)*

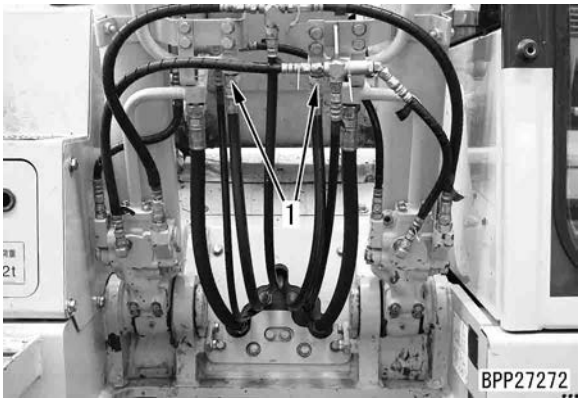
1. Testing oil leakage of boom cylinder
   1) Set the boom cylinder at RAISE stroke end, and stop the engine.

      **⚠ Release the remaining pressure in the piping on the boom cylinder head side (however, operate the lever only in the boom RAISE direction). For details, see "Releasing remaining pressure in hydraulic circuit".**

   2) Disconnect hose (1) on the cylinder head side and block the hose side by using a plug.

      **⚠ Be careful not to disconnect the hose on the cylinder bottom side.**

      ★ Use the following parts to block the hose.
      07376-70422 (Plug #04)




   3) Start the engine, run it at high idle, and relieve the circuit by raising the boom.

      **⚠ Be careful not to operate the lever to "Boom LOWER" side.**

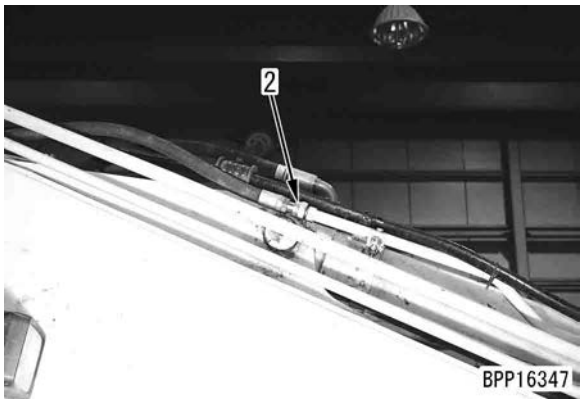
   4) 30 seconds after starting relief, measure the amount of leakage for 1 minute.
   5) After finishing the test, restore the machine.
2. Testing oil leakage of arm cylinder
   1) Set the arm cylinder at its extension stroke end, and stop the engine.

      **⚠ Release the remaining pressure in the piping on the arm cylinder head side (however, operate the lever only in the arm IN direction). For details, see "Releasing remaining pressure in hydraulic circuit".**

   2) Disconnect hose (2) on the cylinder head side and block the hose side by using a plug.

      **⚠ Be careful not to disconnect the hose on the cylinder bottom side.**

      ★ Use the following parts to block the hose.
      07376-70628 (Plug #06)




   3) Start and run the engine at high idle, and relieve the circuit by moving the arm IN.

      **⚠ Be careful not to operate the lever to "Arm OUT" side.**

   4) 30 seconds after starting relief, measure the amount of leakage for 1 minute.
   5) After finishing the test, restore the machine.
3. Testing oil leakage of bucket cylinder
   1) Set the bucket cylinder at its extension stroke end and stop the engine.

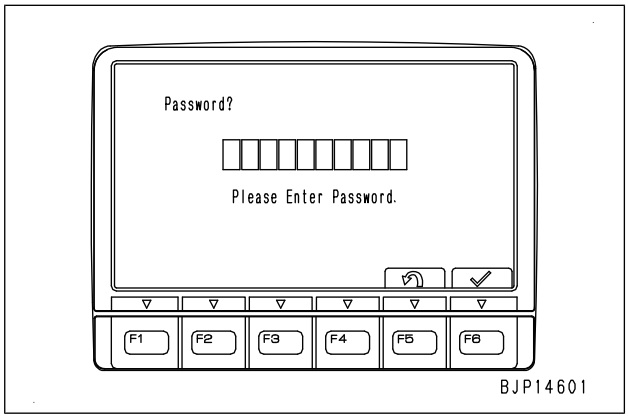
      **⚠ Release the remaining pressure in the piping on the bucket cylinder head side (however, operate the lever only in the bucket CURL direction). For details, see "Releasing remaining pressure in hydraulic circuit".**

   2) Disconnect hose (3) on the cylinder head side and block the hose side by using a plug.

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

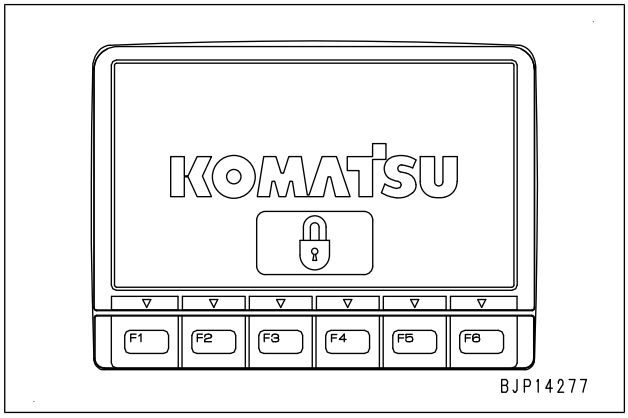
      ★ Use the following parts to block the hose.
      07376-70522 (Plug #05)

★ The machine monitor has some password functions other than the engine start lock. Those functions are independent from one another.




★ The following screen may sometimes be displayed instead of the above "Password input" screen.

★ If this screen is displayed, call the person responsible for the operation of KOMTRAX in your Komatsu distributor and ask for remedy.




**Display of check of breaker mode** *(PC220-Q180-044-K-03-A)*

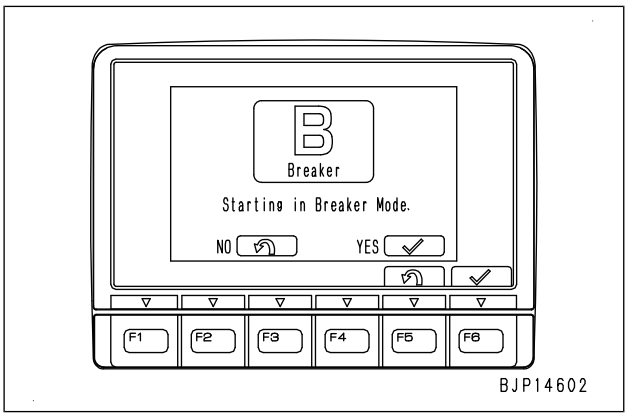
When the starting switch is turned ON, if the working mode is set to the breaker mode [B], a message to inform the operator of starting in the breaker mode is displayed on the screen.

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

★ After operation to check of the breaker mode is finished, the screen changes to "Display of check before starting".

If [No] is selected: Working mode is set to economy mode [E]

If [Yes] is selected: Working mode is set to breaker mode [B]



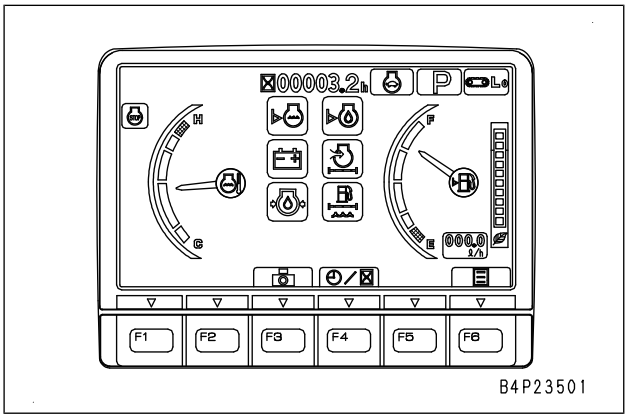

**Display of check before starting** *(PC220-Q180-044-K-04-A)*

When the screen changes to the check before starting screen, the check before starting is performed for 2 seconds.

★ If any abnormalities are detected in the check before starting, the screen changes to "Warning after the check before starting" screen or "Overdue Maintenance" screen.

★ If no abnormalities were detected in the check before starting, display changes to "Working Mode and Travel Speed Check" screen.

★ The monitors (6 monitors) on the screen shows the items currently subjected to the check before starting.




**Display of warning after Check before starting** *(PC138-Q180-044-K-01-A)*

If any abnormalities are detected in "Check before starting", the alarm monitor is displayed on the screen.

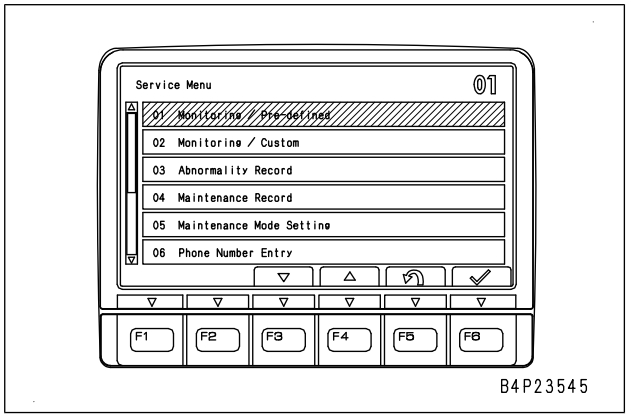
★ The following figure shows that engine oil level monitor (a) is warning of low engine oil level.

### Monitoring/ Pre-defined *(PC138-Q1S1-100-K-00-A)*

The machine monitor can monitor the condition of the machine in real time by receiving signals from various switches, sensors, and actuators installed to various parts of the machine and the information from the controllers which is controlling switches, etc.

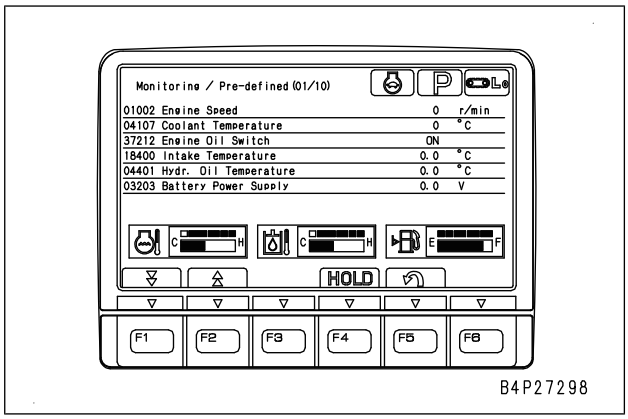
In "Monitoring/ Pre-defined", frequently used monitoring items in daily work are selected beforehand.

1. Selecting menu
   Select "Monitoring/Pre-defined" on "Service Menu" screen.

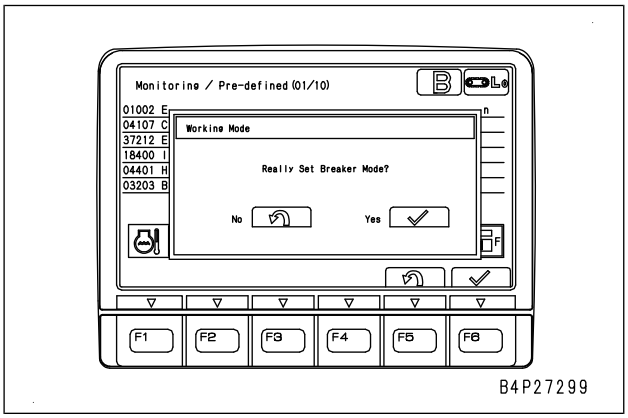


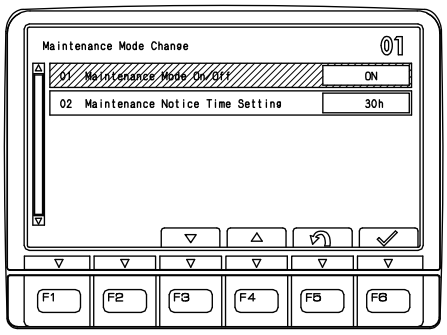

2. Checking Monitoring/Pre-defined information
   After "Monitoring/Pre-defined" screen is displayed, you can check the items displayed in monitoring/pre-defined by using the function switches.
   - [F1]: Moves to next page (screen)
   - [F2]: Moves to previous page (screen)
   - [F4]: Selects hold or releasing hold
     (If the Hold is selected, a diagonal line is drawn on the HOLD part.)
   - [F5]: Returns the display to service menu screen

   ★ For the items not displayed in "Monitoring/ Pre-defind", you can freely select and check from the "Monitoring / Custom" items.

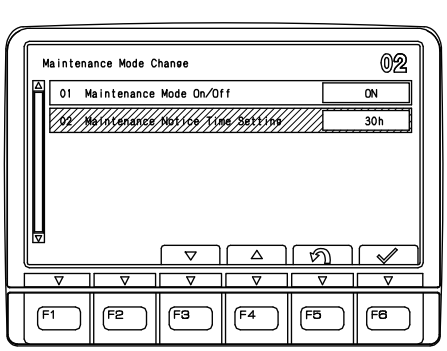



★ When the working mode is changed to breaker mode [B], the screen to confirm the change of the setting is displayed as in changing the working mode on the standard screen.

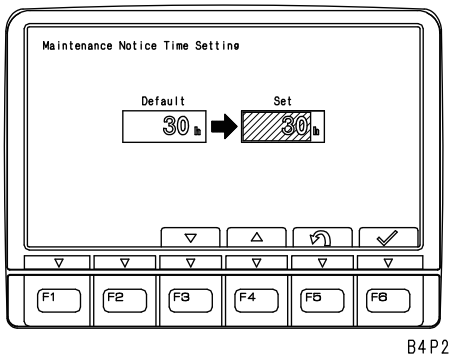




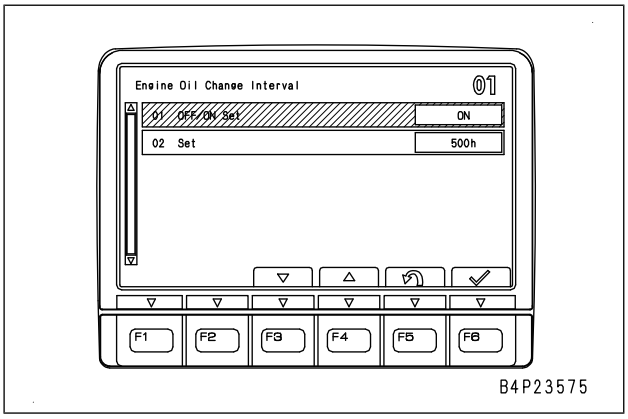

4. Setting of Maintenance Notice Time Setting
   After selecting "Maintenance Notice Time Setting", if the screen is displayed, set with the function switches.



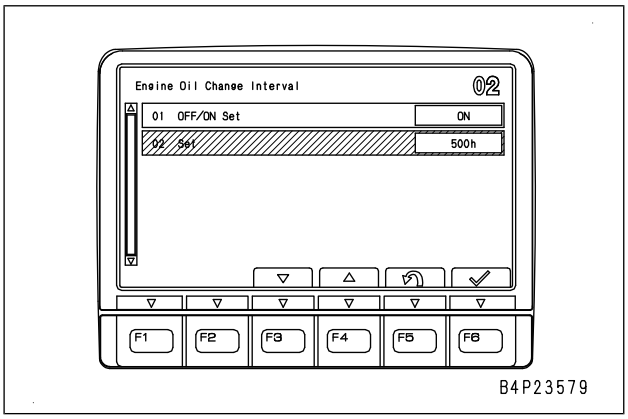

- Default value: Maintenance notice time set on the machine monitor (Recommended by the manufacturer and not changeable).
- Set value: Maintenance interval that can be freely set. Maintenance reminder function works according to this set time in operator mode (the time increases or decreases in multiples of 10 hours).
- [F3]: Decreases set value
- [F4]: Increases set value
- [F5] Cancels contents of setting before entry and returns to the "Maintenance Mode Change" screen
- [F6]: Enters setting and returns to Maintenance mode setting screen




5. Setting of each maintenance item
   Select each maintenance item. After the screen is displayed, set the item by using the function switches.
   - ON: Function of the selected individual maintenance item becomes effective in operator mode.
   - OFF: Function of the selected individual maintenance item becomes ineffective in operator mode.
   - [F3]: Moves selection downward
   - [F4]: Moves selection upward
   - [F5]: Cancels selection and returns to the "Maintenance Mode Change" screen
   - [F6]: Enters selection and returns to "Maintenance Mode Change" screen

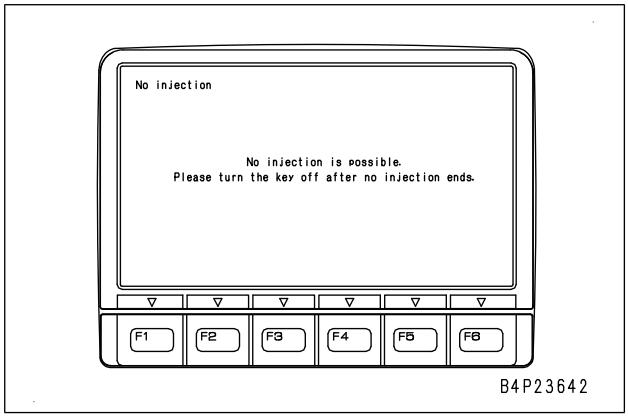



6. Setting of set value of each maintenance item
   Select the set value of each maintenance item. After the screen is displayed, set the value by using the function switches.




- Default value: Maintenance notice time set on the machine monitor (Recommended by the manufacturer and not changeable).
- Set value: Maintenance interval that can be freely set. Maintenance reminder function works according to this set time in operator mode (the time increases or decreases in multiples of 25 hours).
- [F3]: Decreases set value
- [F4]: Increases set value

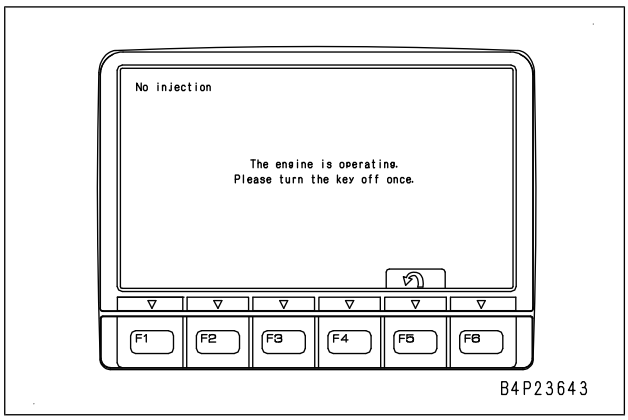
★ Do not crank the engine for 20 seconds or longer to protect the starting motor.




4. Finishing no-injection cranking
   After the cranking is over, turn the starting switch to OFF position.

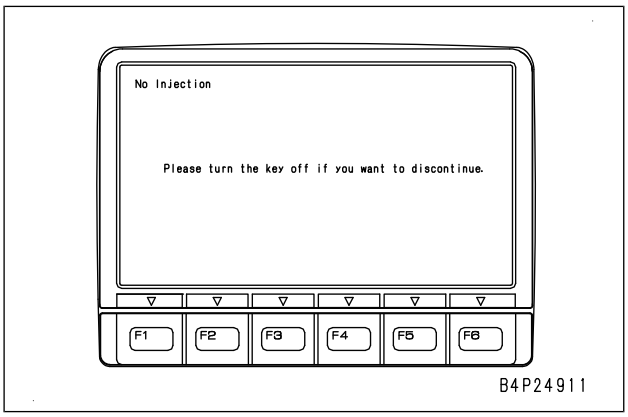
   ★ You cannot change the screen described above to another screen.
5. Prohibiting no-injection cranking
   Even if the operator tries to perform the no-injection cranking while the engine is running, the message "The engine is operating" is displayed and the no-injection cranking does not become effective.

   ★ This function can be selected even when the engine is running. However, if you execute no-injection cranking, a message "The engine is operating. Please turn the key off once." is displayed on the screen.




Also, if no-injection cranking is operated when "Check" screen is displayed, the function does not become effective in the following case.

- The communication between the monitor and engine controller is not normal.
- Perform an engine start operation before the message "No injection is possible" is displayed.

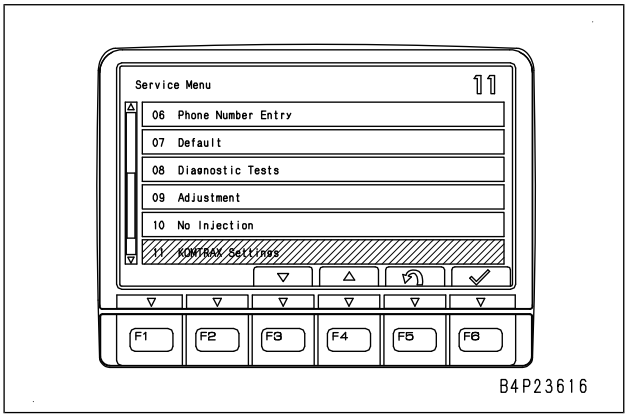



**KOMTRAX Settings (Terminal Status)** *(PC220-Q210-110-K-00-A)*

The setting and operating conditions of KOMTRAX can be checked on the display of KOMTRAX Settings.

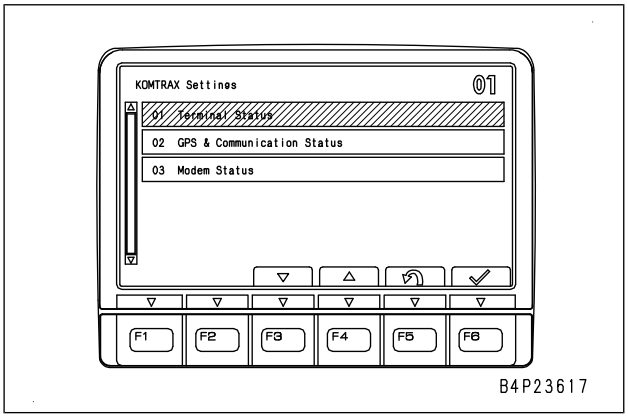
Terminal setting status is used for checking the setting condition of the KOMTRAX terminal.

1. Selecting a menu
   Select "KOMTRAX Settings" on "Service Menu" screen.




2. Selecting a sub menu
   After the "KOMTRAX Settings" screen is displayed, select "Terminal Status" by using the function switch or numeral input switches.

   ★ Selecting method is the same as ot on the "Service Menu" screen.




3. Contents displayed on Terminal Status screen

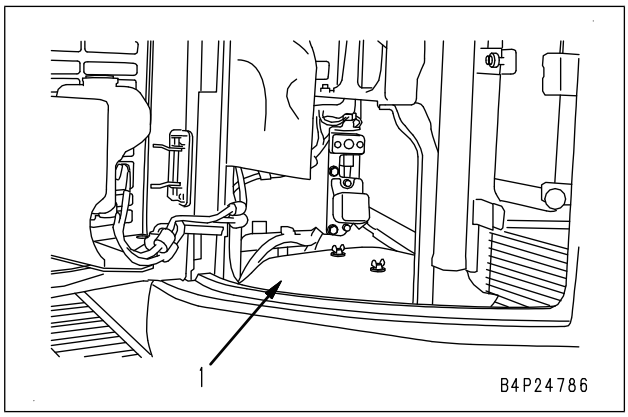
4. Hydraulic circuit

| No. | Testing tools | Testing conditions | | | [1] | [2] | [3] | [4] | [5] | Good | No good |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 60 MPa | 60 MPa | 60 MPa | 60 MPa | 6 MPa | | |
| | | Fuel control dial | Working mode | Operation of work equipment | Main pump A1 | Main pump A2 | Pump LS pressure | Servo inlet pressure | Control circuit source pressure | | |
| 1 | Self-pressure reducing valve | MAX | P | All control levers in NEUTRAL | – | – | – | – | A | | |
| 2 | Main relief valve | | | Arm OUT relief | B | B | – | – | – | | |
| 3 | Unload valve | | | All control levers in NEUTRAL | C1 | C1 | C2 | C2 | – | | |
| 4 | LS valve | | | Running R.H. track idle off ground Lever operated halfway | D1 | – | D2 | – | – | | |
| | | | | Running L.H. track idle off ground Lever operated halfway | – | D1 | – | D2 | – | | |
| 5 | Swing motor safety valve | | | Swing locked Right SWING relieved | E | E | – | – | – | | |
| | | | | Swing locked Left SWING relieved | E | E | – | – | – | | |
| 6 | Main relief valve, travel motor safety valve, and travel junction valve | | | R.H. Travel locked R.H. FORWARD relieved | F | – | – | – | – | | |
| | | | | R.H. Travel locked R.H. REVERSE relieved | F | – | – | – | – | | |
| | | | | L.H. Travel locked L.H. FORWARD relieved | – | F | – | – | – | | |
| | | | | L.H. Travel locked L.H. REVERSE relieved | – | F | – | – | – | | |

| Standard value | Oil pressure to be measured | Unit | Standard value for new machine | Repair limit |
|---|---|---|---|---|
| | A (Control circuit source pressure) | MPa {kg/cm$^2$} | 3.0 to 3.4 {31 to 35} | 2.7 to 3.7 {28 to 35} |
| | B (Work equipment relief pressure) | | 33.8 to 35.8 {345 to 365} | 33.3 to 36.8 {340 to 375} |
| | C (Unload pressure) | | 1.8 to 3.8 {18 to 38} | 1.8 to 3.8 {18 to 38} |
| | D (LS differential pressure when lever in NEUTRAL) | | 2.1 to 2.3 {21.5 to 23.5} | 2.1 to 2.3 {21.5 to 23.5} |
| | E (Swing relief pressure) | | 26.7 to 29.7 {263 to 303} | 25.7 to 29.7 {263 to 303} |
| | F (Travel relief pressure) | | 33.8 to 35.8 {345 to 365} | 33.3 to 36.8 {340 to 375} |

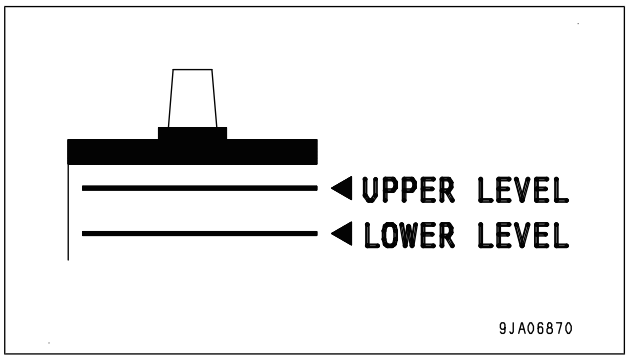
* Gauge selection work: Exchagne hoses of gauges [3] and [4].

| | No. | Role | Judge-ment value | Remedy |
|---|---|---|---|---|
| c: Electrical parts | 1 | Check of battery terminal for looseness and corrosion | - | Retighten or replace |
| | 2 | Check of alternator terminal for looseness and corrosion | - | Retighten or replace |
| | 3 | Check of starting motor terminal for looseness and corrosion | - | Retighten or replace |
| | 4 | Check of battery voltage (with engine stopped) | 20 to 30 V | Charge or replace |
| | 5 | Check of battery electrolyte level | Between H and L | Add or replace |
| | 6 | Check of wiring harness for discoloration, burnt areas and cover peeling | - | Repair or replace |
| | 7 | Check for coming off of wiring harness clamp and sagging of wiring harness | - | Correct |
| | 8 | Check of grounding | - | Correct |
| | 9 | Check for loose connector and damaged lock | - | Repair or replace |
| | 10 | Check of connector pin for corrosion, bends and deformation | - | Repair or replace |
| | 11 | Check for water and foreign material in connector | - | Dry, clean or replace |
| | 12 | Check of wiring harness for open circuit and short circuit | - | Repair or replace |
| | 13 | Check of fuse for blowout and corrosion | — | Replace |
| | 14 | Check of alternator voltage (when engine speed is medium or higher) | After few minutes of operation: 27.5 to 29.5 V | Replace |
| | 15 | Check of battery relay operation sound (When the starting switch is turned to ON or OFF position) | - | Replace |
| | 16 | Check and cleaning of rear view camera | - | Clean or repair |
| d: Exterior parts | 1 | Check of undercarriage | - | Correct |
| | 2 | Check of handrails and steps | - | Correct |
| | 3 | Check of rear view mirrors | - | Clean or repair |
| e: Interior parts | 1 | Check of gauges and monitors | - | Clean or replace |
| | 2 | Check of seat belt | - | Replace |

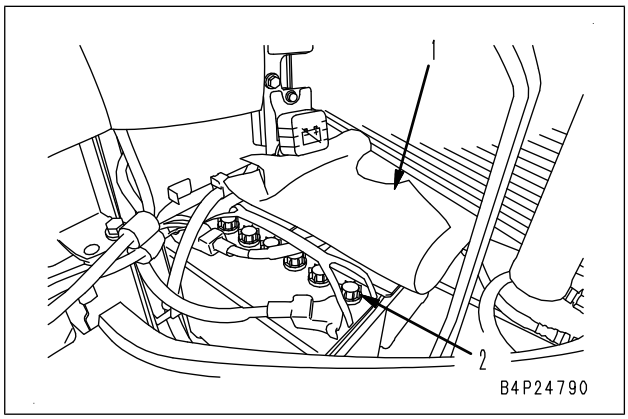



2. Wipe and clean the battery surface, especially around the battery level lines with a wet cloth, and check to see that the battery fluid is between the UPPER LEVEL and LOWER LEVEL lines.

   ★ Do not clean the battery with a dry cloth since static electricity may cause an explosion.



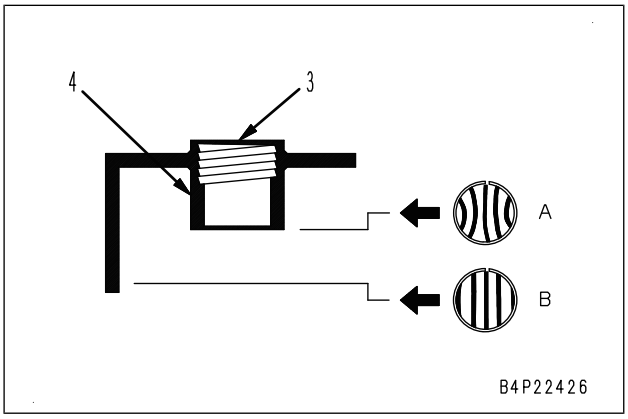

3. If the electrolyte level is below the center between the U.L. and L.L. lines, remove cap (2) and add purified water (example: commercially available battery fluid) to the U.L. line immediately.
4. After adding the purified water, tighten cap (2) securely.




   ★ If the fluid exceeds the UPPER LEVEL, remove the fluid using a dropping pipette or others until the fluid drops to the UPPER LEVEL. When you have removed the fluid from the battery, neutralize it with the baking soda (sodium bicarbonate) and wash it away with a large quantity of water.

- When electrolyte level cannot be checked through the side face of the battery

1. Remove caps (2) from the top of battery. (As mentioned before)
2. Observe fluid level port (3), and check the fluid level. If the fluid level is below sleeve (4), always add the fluid (such as a commercial battery fluid) until it reaches the bottom of sleeve (the UPPER LEVEL).
   - (A) Correct level: Since the electrolyte level reaches to the sleeve bottom, the shape of the electrode plates will appear distorted due to the surface tension.
   - (B) Low level: Electrolyte level does not reach the bottom of sleeve, so pole plates appear straight and not bent.
3. After adding fluid, tighten cap (2).




   ★ If the fluid exceeds the UPPER LEVEL, remove the fluid using a dropping pipette or others until the fluid drops to the UPPER LEVEL. When you have removed the fluid from the battery, neutralize it with the baking soda (sodium bicarbonate) and wash it away with a large quantity of water.

**c6. Check of wiring harness for discoloration, burn and cover peeling**

- Check the wiring harness and cables for discoloration and burn.

★ If discolored or burnt, the circuit may be shorted or grounded.

- Check the wiring harnesses and cables for damage and peeling of the covers.
- If any abnormality is found, repair or replace the wiring harness or cables.

**c7. Check for coming off of wiring harness clamp and sagging of wiring harness**

## Information in troubleshooting table *(ALL-5170-421-A-01-A)*

(Rev. 2011/12)

★ The following information is summarized in the troubleshooting table. Before performing troubleshooting, understand that information fully.

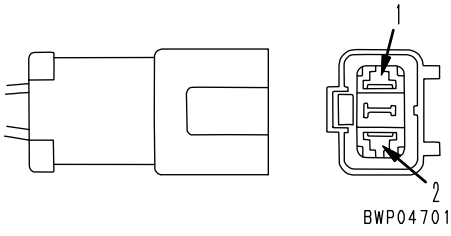
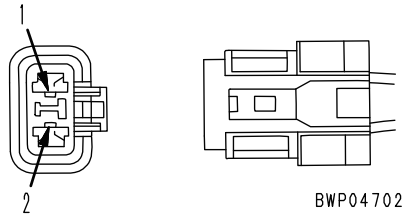
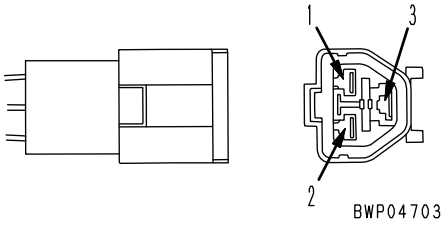
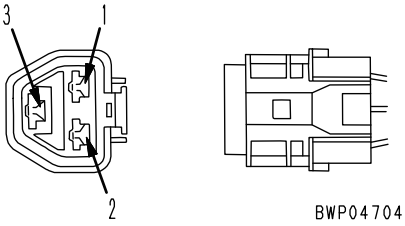
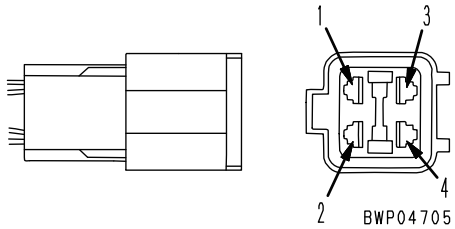
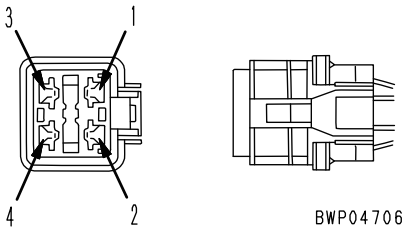
| | | | |
|---|---|---|---|
| Action level | Failure code | Failure | Failure name displayed on the Abnormality Record screen of the machine monitor |
| Display on machine monitor | Display on machine monitor | | |
| Detail of failure | Description of the failure detected by the machine monitor or controller | | |
| Action of controller | An action that is performed to protect the system and devices when a failure is detected by the machine monitor or controller | | |
| Problem on machine | A problem that appears as a failure on the machine as a result of an action (above) that is performed by the machine monitor or controller. | | |
| Related information | Information on occurred failure or troubleshooting | | |

| No. | Cause | Procedure, measuring location, criteria and remarks |
|---|---|---|
| 1 | Defective — | <Contents of description><br>• Procedure<br>• Measuring location<br>★ "Between A and B" denotes measuring values such as voltage and resistance between A and B.<br>★ "Between A and ground" means the measurement of voltage, resistance or others between terminal A and the place which has a continuity with chassis frame such as unpainted hexagonal head bolt or bolt hole which has no rust, etc.<br>• Criteria to judge probable causes (standard value), remarks<br><How to use troubleshooting sheet><br>• Perform troubleshooting procedures in numerical order.<br>• If the check result does not meet the criteria, the probable cause described on the left column is the actual cause of the failure.<br>• If the check result meet the criteria and there is no specific instruction, proceed to the next step (cause).<br>• If a defect is found and repaired, check that the defect has been corrected.<br><Failures in wiring harness><br>• Open circuit<br>Connection of connector is defective or wiring harness is broken.<br>• Ground fault<br>A harness not to be connected to the ground (earth) circuit comes into contact with the ground (earth) circuit or chassis accidentally.<br>• Hot short circuit<br>A harness not to be connected to the power circuit comes into contact with the power circuit accidentally.<br>• Short circuit<br>An independent wire in the harness erroneously comes into contact with another independent wire.<br>(poor insulation at connector and others) |
| 2 | Open or short circuit in wiring harness | |
| 3 | Open circuit in wiring harness (wire breakage or defective contact of connector) | |
| 4 | Ground fault in wiring harness (contact with ground circuit) | |
| 5 | Hot short circuit | |
| 6 | Short circuit in wiring harness | |

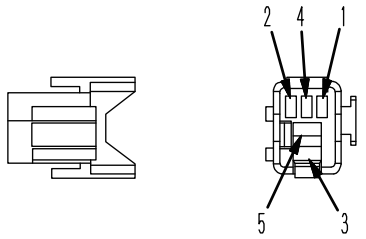
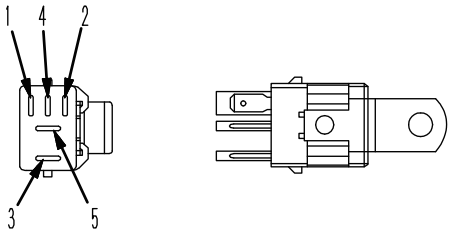
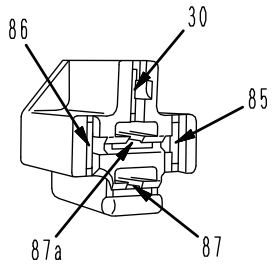
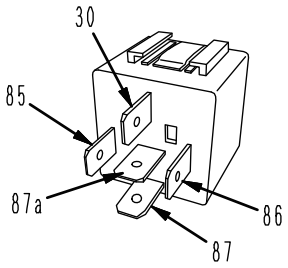
# Connector contact identification *(ALL-5310-030-A-00-A)*

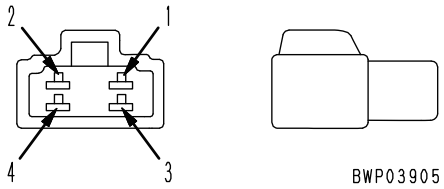
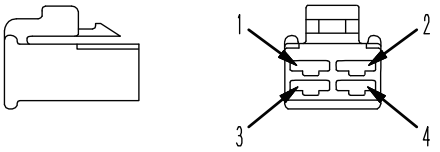
(Rev. 2014. 08)

★ The terms of male and female refer to the pins, while the terms of male housing and female housing refer to the mating portion of the housing.

| No. of pins | X type connector | | |
|---|---|---|---|
| | Male (female housing) | Female (male housing) | Testing connection use special tool Part No. |
| 1 | Part No. : 08055-00181 | Part No. : 08055-00191 | 99-601-7010 (T-adapter) |
| 2 |  BWP04701 |  BWP04702 | 799-601-7020 (T-adapter) |
| | Part No. : 08055-00282 | Part No. : 08055-00292 | |
| 3 |  BWP04703 |  BWP04704 | 799-601-7030 (T-adapter) |
| | Part No. : 08055-00381 | Part No. : 08055-00391 | |
| 4 |  BWP04705 |  BWP04706 | 799-601-7040 (T-adapter) |
| | Part No. : 08055-00481 | Part No. : 08055-00491 | |
| — | Terminal part No. : 79A-222-3370<br>·Electric wire size: 0.85<br>·Grommet: Black<br>·Q'ty: 20 | Terminal part No. : 79A-222-3390<br>·Electric wire size: 0.85<br>·Grommet: Black<br>·Q'ty: 20 | — |
| — | Terminal part No. : 79A-222-3380<br>·Electric wire size: 2.0<br>·Grommet: Red<br>·Q'ty: 20 | Terminal part No. : 79A-222-3410<br>·Electric wire size: 2.0<br>·Grommet: Red<br>·Q'ty: 20 | — |

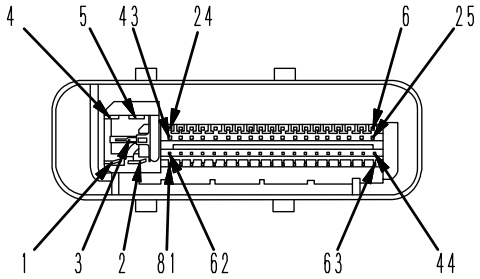
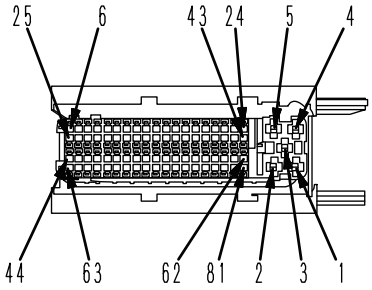
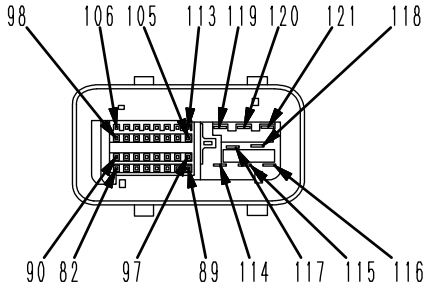
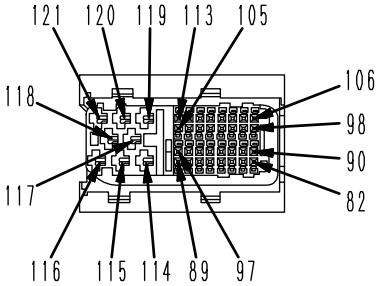
B4D18190

| No. of pins | Connector for relay (Socket type) | | |
|---|---|---|---|
| | Female (female housing) | Relay (male housing) | Testing connection use special tool Part No. |
| 5 |  |  | — |
| | Part No. :7861-74-5300 | Part No. :7861-74-5100 | |
| |  |  | — |
| | — | Part No. :RD-5-4417-OP | |

| No. of pins | F type connector | | |
|---|---|---|---|
| | Male (female housing) | Female (male housing) | |
| 4 |  <br>BWP03905 |  <br>BWP03906 | — |
| | — | — | |

B4W21621

AMP connector for pump controller (CH700) and monitor controller

| No. of pins | PC series, HM series, WA series | Testing connection use special tool Part No. |
|---|---|---|
| | Controller side (plug) | |
| |  | |
| | — | |
| 81 | Harness side (receptacle) | |
| |  | |
| | Part No. : 7880-70-9040 | 799-601-4280 (Socket) |
| | Controller side (plug) | |
| |  | |
| | — | |
| 40 | Harness side (receptacle) | |
| |  | |
| | Part No. : 7880-70-9010 | |

B4W21622

| Part No. | Part name | Number of pins | Identification Symbol | T-adapter kit | | | | | | | | | | | | | Not included in kit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 799-601-2500 | 799-601-2700 | 799-601-2800 | 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 | 799-601-4101 | 799-601-4201 | |
| | Oil pressure switch | | | | | | | | | | | | | | | | | |
| 799-601-4180 | Adapter PEVA for engine (CRI-T3) | 3 | 4180 | | | | | | | | | | | | | ● | ● | |
| 799-601-4190* | Socket for engine (CRI-T3) Common rail pressure | 3 | 1, 2, 3 L | | | | | | | | | | | | | ● | ● | |
| 799-601-4230* | Socket for engine (CRI-T3) Intake pressure/ temperature | 4 | 1, 2, 3, 4 C | | | | | | | | | | | | | ● | ● | |
| 799-601-4240* | Socket PAMB for engine (CRI-T3) | 3 | 1, 2, 3A | | | | | | | | | | | | | ● | ● | |
| 799-601-4250* | Socket PIM for engine (CRI-T3) | 3 | 1, 2, 3B | | | | | | | | | | | | | ● | ● | |
| 799-601-4330* | Socket G for engine (CRI-T3) | 3 | 1, 2, 3, G | | | | | | | | | | | | | ● | ● | |
| 799-601-4340* | Socket for engine (CRI-T3) Pump actuator | 2 | 2, PA | | | | | | | | | | | | | ● | ● | |
| 799-601-4380* | Socket for engine (CRI-T3) (95) Intake pressure/ temperature | 4 | 1, 2, 3, 4T | | | | | | | | | | | | | | | ● |
| 799-601-4260 | Adapter for controller (ENG) | 4 | DTP4 | | | | | | | | | | | | | ● | ● | |
| 799-601-4211 | Adapter for controller (ENG) | 50 | DRC50 | | | | | | | | | | | | | ● | | |
| 799-601-4220 | Adapter for controller (ENG) | 60 | DRC60 | | | | | | | | | | | | | ● | | |
| 799-601-4390* | Socket for controller (95ENG) | 60 | | | | | | | | | | | | | | | | ● |
| 799-601-4280* | Box for controller (PUMP) | 12-1 | | | | | | | | | | | | | | | | ● |
| 799-601-9720 | Adapter for controller (HST) | 16 | HST16A | | | | | | | | | | | | | | | ● |
| 799-601-9710 | Adapter for controller (HST) | 16 | HST16B | | | | | | | | | | | | | | | ● |
| 799-601-9730 | Adapter for controller (HST) | 26 | HST26A | | | | | | | | | | | | | | | ● |
| 799-601-9890 | Multi-adapter for DT 2 to 4, DTM 2 pins | 2, 3, 4 | | | | | | | | | | | | | | | | ● |
| 799-902-9600 | T-adapter for ICT control box | 26 | | | | | | | | | | | | | | | | ● |
| 799-902-9700 | T-box | 26 | | | | | | | | | | | | | | | | ● |

*: These are not T-adapters but sockets.

## Failure code [879CKA] Ventilating Sensor Open Circuit *(PC400-879CKA-441-A-Z0-A)*

See chapter 80 Appendix "Failure code [879CKA] Ventilating Sensor Open Circuit"

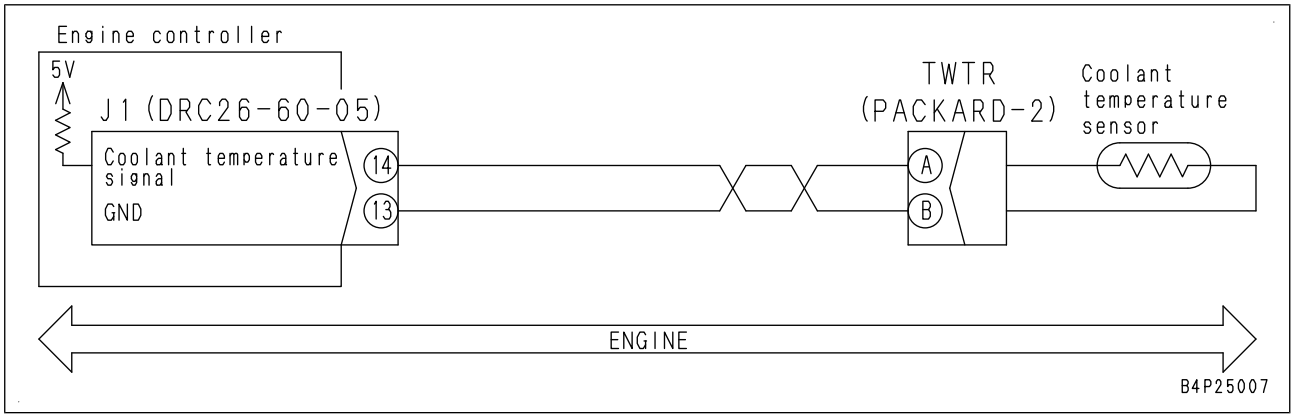
★ Since the ventilating sensor (evaporator temperature sensor) cannot be disconnected with the sensor installed on the machine, the air conditioner controller or air conditioner unit must be replaced.

## Failure code [B@HANS] Hyd Oil Overheat *(PC138-BaHANS-400-A-Z0-A)*

| Action level | Failure code | Failure | Hydraulic Oil Overheat |
|---|---|---|---|
| L02 | B@HANS | | (Pump controller system) |
| Detail of failure | • Pump controller detects overheating of hydraulic oil temperature (approximately 102 °C or above) by signal voltage of hydraulic oil temperature sensor while engine is running. | | |
| Action of controller | • Displays hydraulic oil temperature monitor on machine monitor in red.<br>• If cause of failure disappears, machine becomes normal by itself. | | |
| Problem on machine | • If machine is used as it is, hydraulic component may be damaged. | | |
| Related information | • Signal from hydraulic oil temperature sensor is input to pump controller and then data is transmitted to machine monitor through CAN communication system.<br>• Hydraulic oil temperature can be checked with monitoring function. (Code: 04401 "Hydraulic Oil Temperature")<br>• Refer to following troubleshooting described in E mode troubleshooting section.<br>  • E-17 Hydraulic oil temperature gauge indicates either Min. or Max. and does not move<br>  • E-18 Hydraulic oil temperature gauge indicates incorrect temperature (indicates neither Min nor Max)<br>• Method of reproducing failure code: Start engine.<br>⚠ **Loosen the oil filler cap of the hydraulic tank to release the pressure in the hydraulic tank. For details, see Testing and adjusting "Releasing remaining pressure in hydraulic circuit" when checking and replacing hydraulic oil temperature sensor. With monitoring function (Code: 04401), check that hydraulic oil temperature is 40 °C or lower and cool enough not to burn.** | | |

| No. | Cause | Procedure, measuring location, criteria, and remarks | | | |
|---|---|---|---|---|---|
| 1 | Hydraulic Oil Overheat | Hydraulic oil may overheat. Remove the cause of failure if hydraulic oil overheats. | | | |
| 2 | Defective hydraulic oil temperature sensor (Internal open or short circuit) | 1. Turn starting switch to OFF position.<br>2. Disconnect connector P22 and connect T-adapter to male side. | | | |
| | | Resistance | Between P22 (male) (1) and (2)<br>★ Temperature-resistance characteristics of oil temperature sensor | 10 °C | Approx. 90 kΩ |
| | | | | 30 °C | Approx. 35 kΩ |
| | | | | 80 °C | Approx. 6.5 kΩ |
| | | | | 100 °C | Approx. 3.5 kΩ |
| | | | Between P22 (male) (2) and ground | | Min. 1 MΩ |
| 3 | Ground fault in wiring harness | 1. Turn starting switch to OFF position.<br>2. Disconnect connectors CP01 and P22, and connect T-adapter to either female side. | | | |
| | | Resistance | Between ground and CP01 (female) (28) or P22 (female) (2) | | Min. 1 MΩ |
| 4 | Pump controller is defective. | If cause is not found by above checks, pump controller is defective.<br>(Since this is an internal defect, troubleshooting cannot be performed.) | | | |

**Circuit diagram related to coolant temperature sensor**

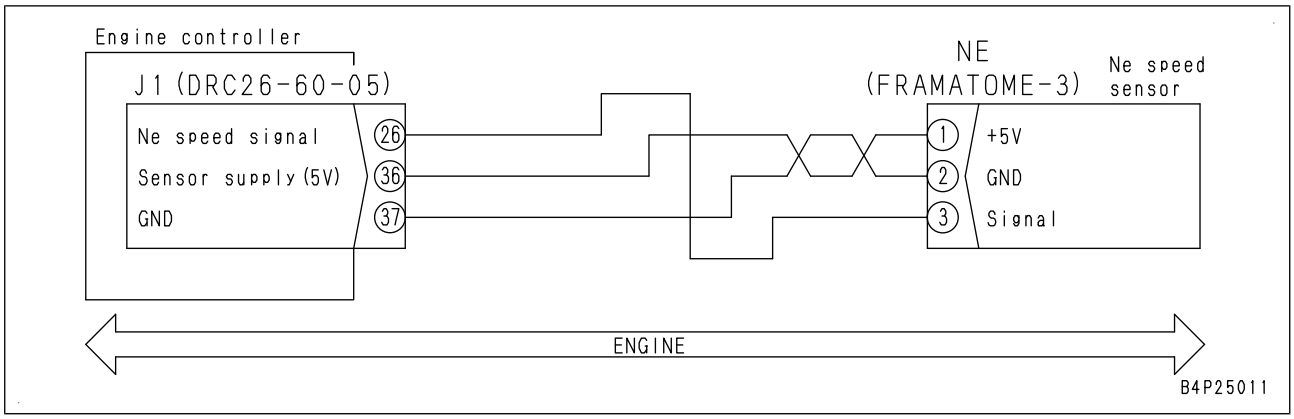


# Failure code [CA239] Ne Speed Sens Supply Volt High Error *(PC400-CA239-400-A-Z0-A)*

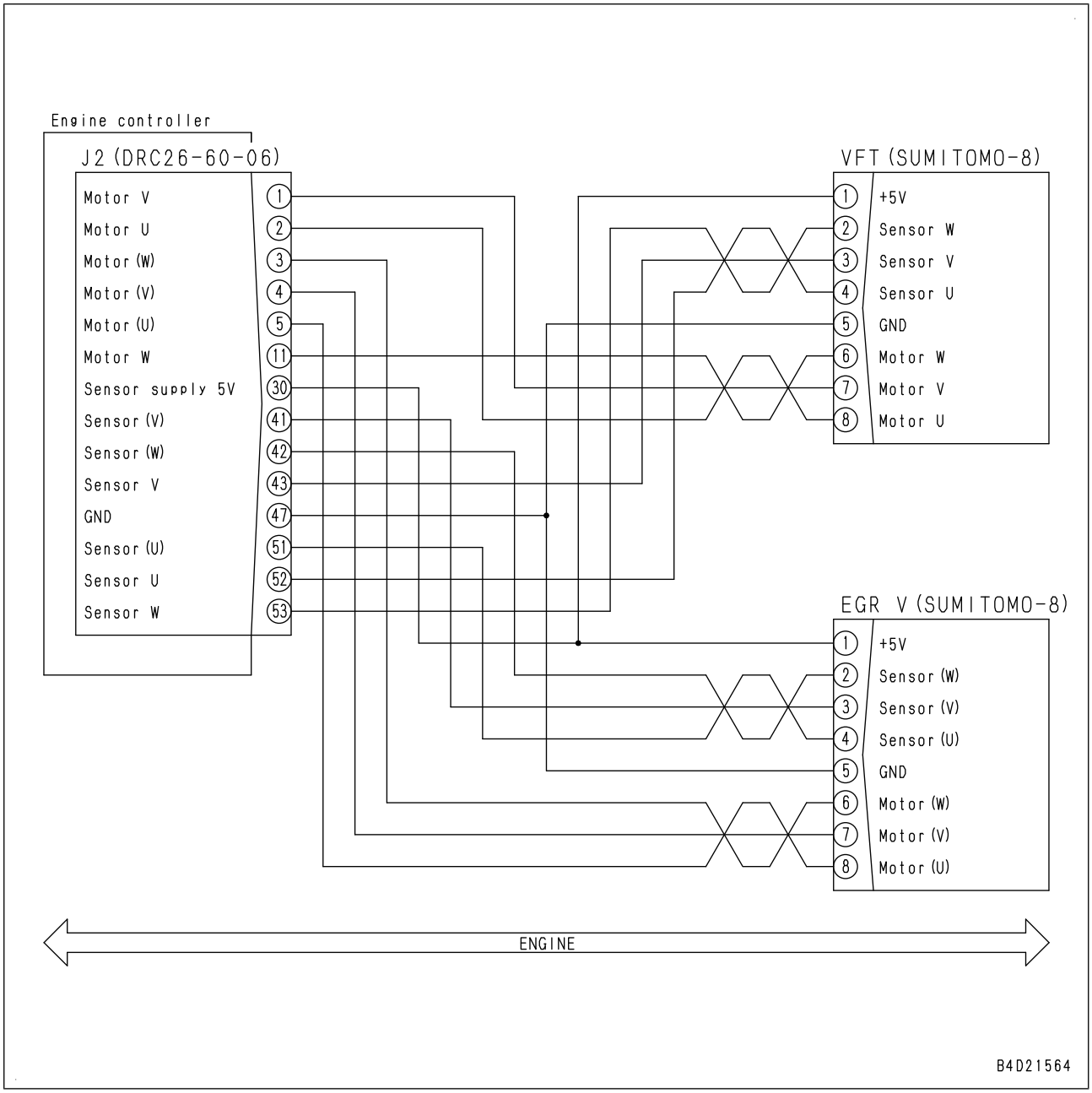
| Action level | Failure code | Failure | Ne Speed Sensor Supply Voltage High Error (Engine controller system) |
|---|---|---|---|
| L01 | CA239 | | |
| Detail of failure | • High voltage appears in Ne speed sensor power supply (5 V) circuit. | | |
| Action of controller | • Controls engine by using signals from engine Bkup speed sensor. | | |
| Problem on machine | • Running engine stops (when Bkup (G) speed sensor is also defective).<br>• Stopped engine cannot be started (when Bkup (G) speed sensor is also defective). | | |
| Related information | • Method of reproducing failure code: Turn starting switch to ON position. | | |

| No. | Cause | Procedure, measuring location, criteria and remarks | | |
|---|---|---|---|---|
| 1 | Defective harness connector | 1. See descriptions of wiring harness and connectors in "c: Electrical equipment" in "Checks before troubleshooting" of "General information on troubleshooting", and check it.<br>2. Turn starting switch to ON position. | | |
| | | If this failure code disappears, harness connector is defective.<br>★ If this failure code appears, perform following checks. | | |
| 2 | Defective Ne speed sensor | 1. Turn starting switch to OFF position.<br>2. Disconnect connector NE.<br>3. Turn starting switch to ON position. | | |
| | | If this failure code is not displayed, disconnected sensor or engine wiring harness is defective.<br>★ Other failure codes (many codes) are also displayed. They are generated because of disconnection of connector. Ignore failure codes other than [CA239]. | | |
| 3 | Defective wiring harness | 1. Turn starting switch to OFF position.<br>2. Disconnect connector J1.<br>3. Turn starting switch to ON position. | | |
| | | If this failure code disappears, wiring harness is defective.<br>★ Other failure codes (many codes) are also displayed. They are generated because of disconnection of connector. Ignore failure codes other than [CA239]. | | |
| 4 | Defective engine controller | 1. Turn starting switch to OFF position.<br>2. Disconnect connector J1 and connect T-adapters to male side.<br>3. Turn starting switch to ON position with engine wiring harness disconnected. | | |
| | | Voltage | Between J1 (male) (36) and (37) | 4.75 to 5.25 V |

**Circuit diagram related to Ne speed sensor**

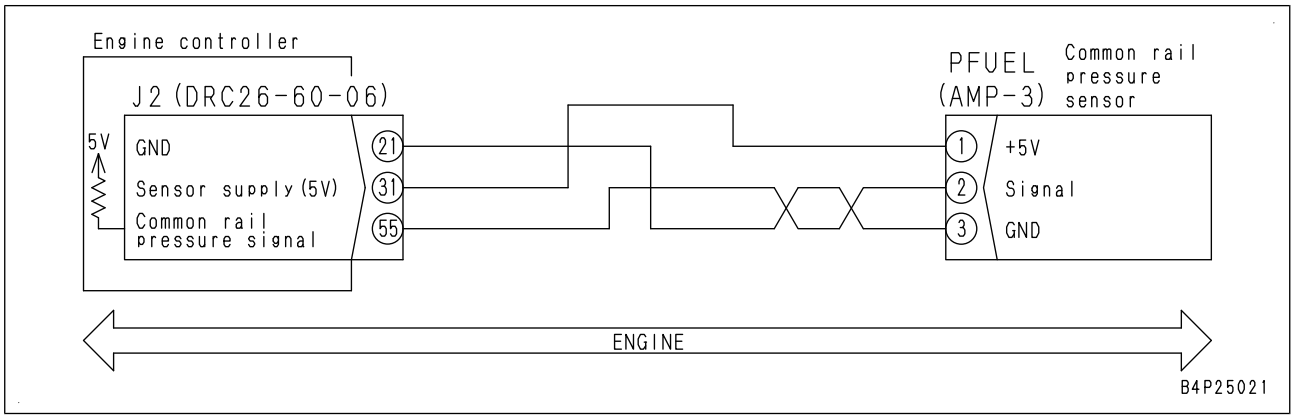


**Circuit diagram related to sensor power supply 1 (5 V)**



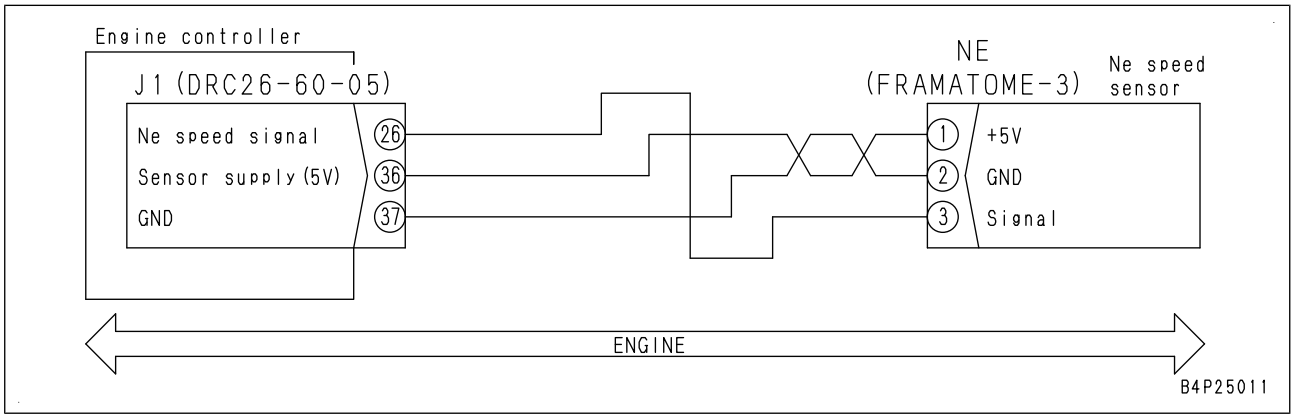
| No. | Cause | Procedure, measuring location, criteria and remarks | | |
|---|---|---|---|---|
| 6 | Short circuit in wiring harness | 1. Turn starting switch to OFF position.<br>2. Disconnect connectors J2 and PFUEL, and connect T-adapter to either female side. | | |
| | | Resistance | Between PFUEL (female) (2) and (3) or between J2 (female) (55) and (21) | Min. 1 MΩ |
| 7 | Defective engine controller | If no failure is found by above checks, engine controller is defective.<br>(Since this is an internal defect, troubleshooting cannot be performed.) | | |

**Circuit diagram related to common rail pressure sensor**

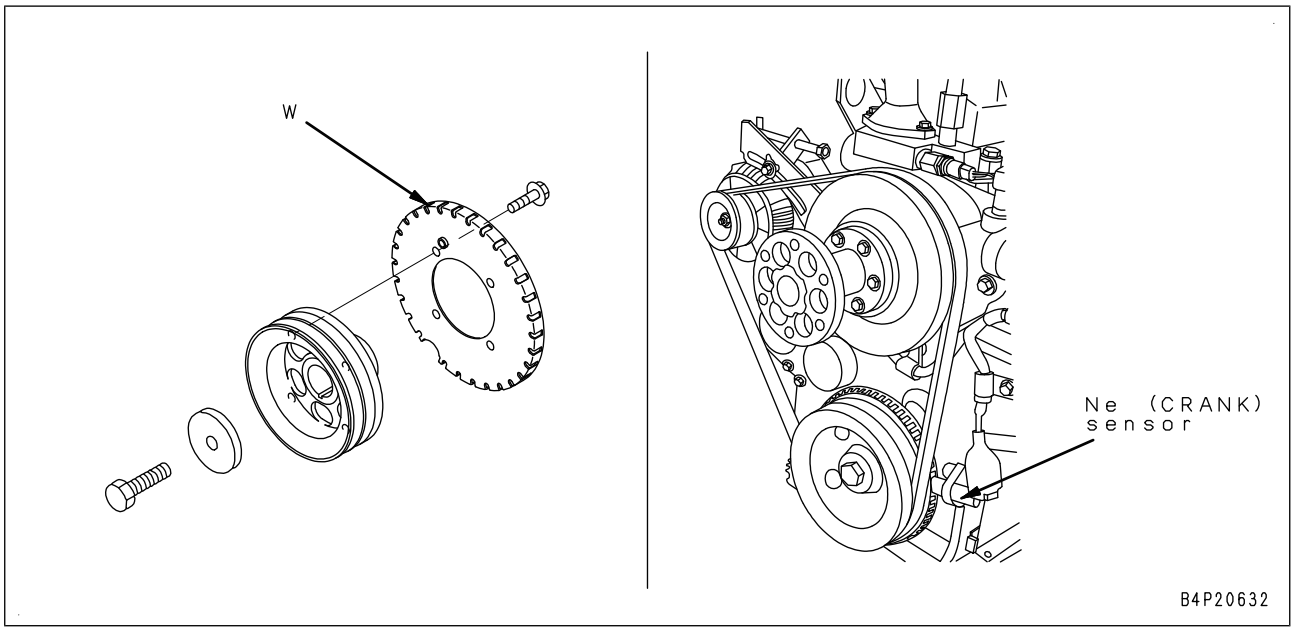


| No. | Cause | Procedure, measuring location, criteria, and remarks | | |
|---|---|---|---|---|
| 8 | Ground fault in wiring harness (contact with ground circuit) | 1. Turn starting switch to OFF position.<br>2. Disconnect connectors J1 and NE and connect T-adapter to either female side. | | |
| | | Resistance | Between ground and J1 (female) (26) or NE (female) (3) | Min. 1 MΩ |
| 9 | Hot short circuit in wiring harness | 1. Turn starting switch to OFF position.<br>2. Disconnect connector NE, and connect T-adapter to female side.<br>3. Turn starting switch to ON position. | | |
| | | Voltage | Between NE (female) (3) and ground | Max. 1 V |
| 10 | Defective engine Ne speed sensor | If no failure is found by above checks, engine Ne speed sensor may be defective. (Since this is an internal defect, troubleshooting cannot be performed.) | | |
| 11 | Defective engine controller | If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.) | | |

**Circuit diagram related to engine Ne speed sensor**




- The Ne speed sensor detects the wide area of hole (W) in the wheel, and the engine controller calculates the engine speed and signal phase.



## Failure code [CA1695] Sensor 5 Supply Volt High Error *(D37-CA1695-400-A-Z0-A)*

| Action level | Failure code | Failure | Sensor 5 Supply Voltage High Error (Engine controller system) |
|---|---|---|---|
| E03 | CA1695 | | |
| Detail of failure | • High voltage error occurs in sensor power supply 5 (5V) circuit. | | |
| Action of controller | • None in particular | | |
| Problem on machine | | | |
| Related information | • Method of reproducing failure code: Turn starting switch to ON position. | | |

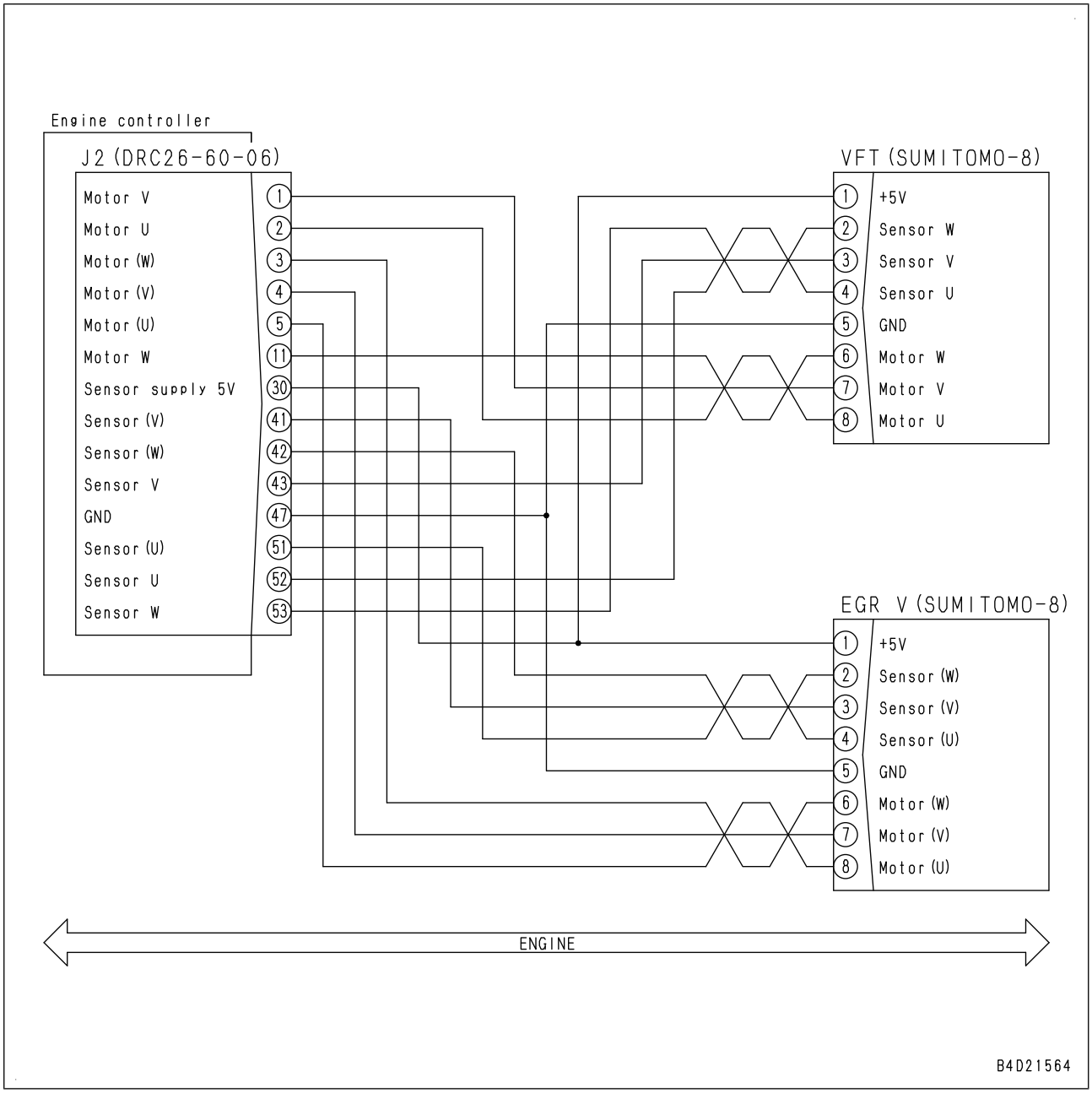
| Cause | Procedure, measuring location, criteria, and remarks |
|---|---|
| Perform troubleshooting for failure code [CA1696]. | |

# Failure code [CA2272] EGR Valve Pos Sens Low Error *(D37-CA2272-400-A-Z0-A)*

| Action level | Failure code | Failure | EGR Valve Position Sensor Low Error (Engine controller system) |
|---|---|---|---|
| L03 | CA2272 | | |
| Detail of failure | • EGR position error has occurred. | | |
| Action of controller | • Limits engine output and runs engine.<br>• Closes EGR valve and opens turbocharger fully. | | |
| Problem on machine | • Engine output reduces. | | |
| Related information | • Method of reproducing failure code: Start engine. | | |

| No. | Cause | Procedure, measuring location, criteria, and remarks | | | |
|---|---|---|---|---|---|
| 1 | Defective wiring harness connector | 1. See descriptions of wiring harness and connectors in "c: Electrical equipment" in "Checks before troubleshooting" of "Related information on troubleshooting", and check it.<br>2. Turn starting switch to ON position. | | | |
| | | If this failure code is not displayed, wiring harness connector is defective.<br>★ If this failure code is displayed, perform following checks. | | | |
| 2 | Defective sensor power supply system | If failure code [CA352] or [CA386] is also displayed, perform troubleshooting for it first. | | | |
| | | 1. Turn starting switch to OFF position.<br>2. Disconnect connector EGR V and connect T-adapter to female side.<br>3. Turn starting switch to ON position. | | | |
| | | Voltage | Between EGR V (female) (1) and (5) | Power supply | 4.75 to 5.25 V |
| 3 | Open circuit in wiring harness<br>(wire breakage or defective contact of connector) | 1. Turn starting switch to OFF position.<br>2. Disconnect connectors EGR V and J2, and connect T-adapters to each female side. | | | |
| | | Resistance | ★ If power supply voltage in check on cause 2 is normal, this check is not required.<br>Between J2 (female) (30) and EGR V (female) (1) | | Max. 1 Ω |
| | | | ★ If power supply voltage in check on cause 2 is normal, this check is not required.<br>Between J2 (female) (47) and EGR V (female) (5) | | Max. 1 Ω |
| | | | Between J2 (female) (42) and EGR V (female) (2) | | Max. 1 Ω |
| | | | Between J2 (female) (41) and EGR V (female) (3) | | Max. 1 Ω |
| | | | Between J2 (female) (51) and EGR V (female) (4) | | Max. 1 Ω |
| 4 | Ground fault in wiring harness<br>(contact with ground circuit) | 1. Turn starting switch to OFF position.<br>2. Disconnect connectors J2 and EGR V and connect T-adapter to either female side. | | | |
| | | Resistance | Between ground and J2 (female) (30) or EGR V (female) (1) | | Min. 1 MΩ |
| | | | Between ground and J2 (female) (42) or EGR V (female) (2) | | Min. 1 MΩ |
| | | | Between ground and J2 (female) (41) or EGR V (female) (3) | | Min. 1 MΩ |
| | | | Between ground and J2 (female) (51) or EGR V (female) (4) | | Min. 1 MΩ |

**Circuit diagram related to EGR V and turbocharger motor driver power (5 V)**

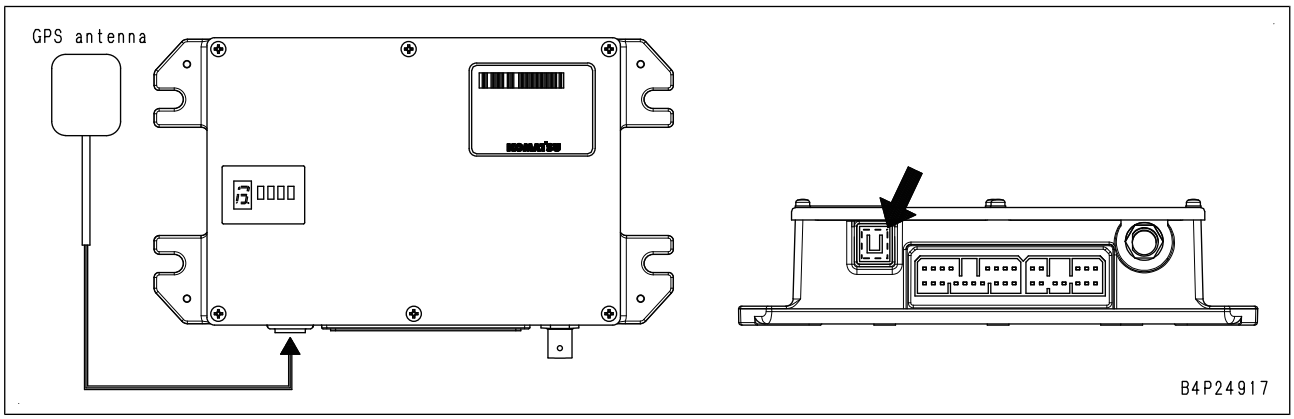


# Failure code [D862KA] GPS Antenna Open Circuit *(PC400-D862KA-400-A-Z0-A)*

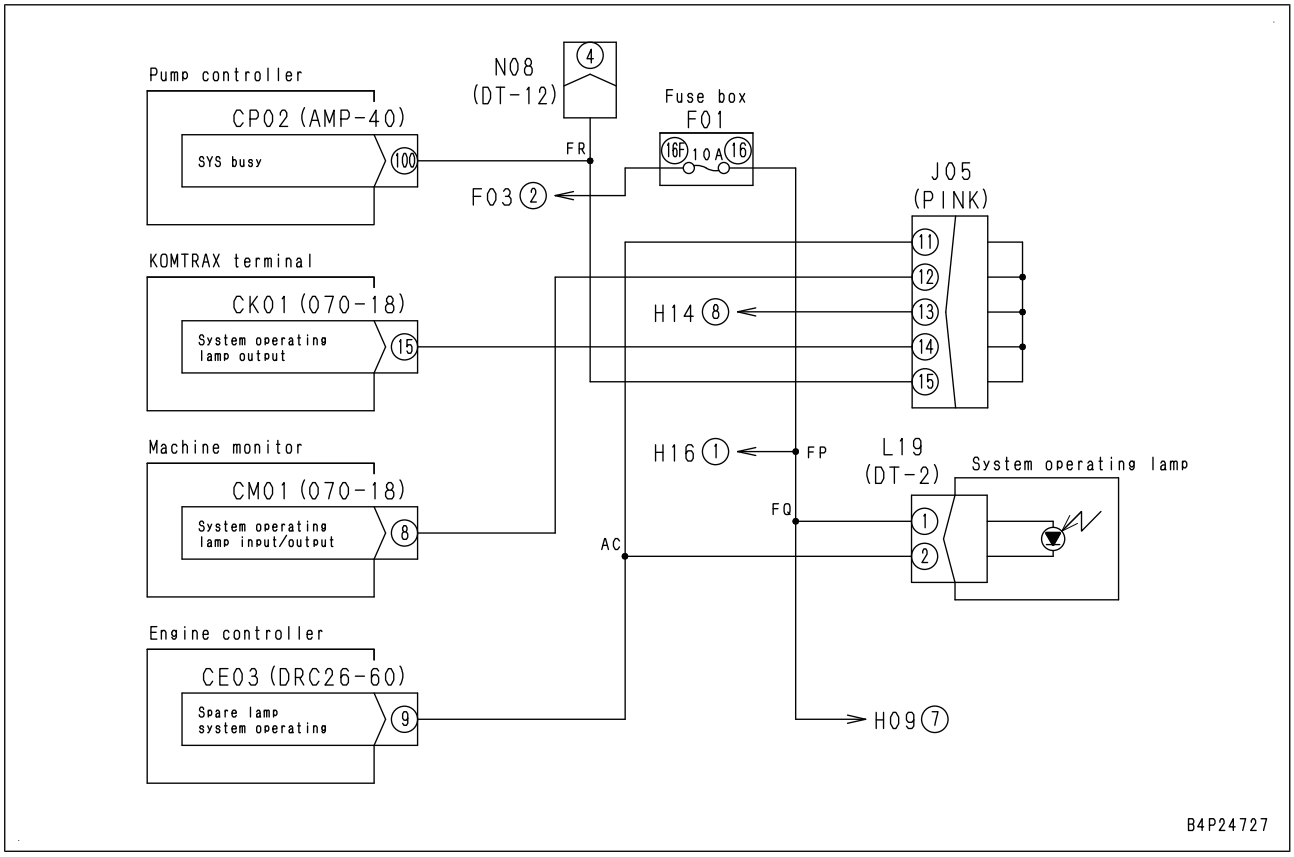
| Action level | Failure code | Failure | GPS Antenna Open Circuit (KOMTRAX system) |
|---|---|---|---|
| - | D862KA | | |
| Detail of failure | • Open circuit occurs in GPS antenna circuit. | | |
| Action of machine monitor | • None in particular<br>• If cause of failure disappears, machine becomes normal by itself. | | |
| Problem on machine | • GPS positioning system does not work. | | |
| Related information | • Method of reproducing failure code: Turn starting switch to ON position. | | |

| No. | Cause | Procedure, measuring location, criteria, and remarks |
|---|---|---|
| 1 | Defective GPS antenna or antenna cable | GPS antenna may be defective, or antenna cable may have open or short circuit, or poor contact at terminal area (GPS). |

**Figure of structure**



### Circuit diagram related to system operating lamp



## Failure code [DAFQKR] CAN2 Discon (Monitor) *(PC138-DAFQKR-400-A-Z0-A)*

| Action code | Failure code | Failure | CAN2 Disconnection (Monitor) |
|---|---|---|---|
| - | DAFQKR | | (KOMTRAX system) |
| Detail of failure | • KOMTRAX terminal does not recognize machine monitor through CAN communication 2 line. | | |
| Action of controller | | | |
| Problem on machine | • System may not function normally. | | |
| Related information | • Method of reproducing failure code: Turn starting switch to ON position.<br>• Start of CAN communication is recognized by each controller when ACC signal of starting switch is received.<br>• Failure code is transmitted to and displayed on machine monitor by CAN communication. Accordingly, if CAN communication with machine monitor fails, failure code [DAFQKR] is not displayed on machine monitor and it can be observed only through KOMTRAX system.<br>• Since each controller and machine monitor are connected directly to battery, they are supplied with power even after starting switch is turned to OFF position.<br>• Since signal of active CAN communication line is pulse voltage, it cannot be measured by using multimeter. | | |

| No. | Cause | Procedure, measuring location, criteria, and remarks |
|---|---|---|
| 1 | Defective power supply to machine monitor | Perform troubleshooting for "E-4" in E mode troubleshooting. |
| 2 | Defective CAN communication | Perform checks on causes 4 and after in troubleshooting for failure code [DB2QKR] |

## Failure code [DGH2KB] Hyd Oil Sensor Short Circuit *(PC138-DGH2KB-400-A-Z0-A)*

| Action level | Failure code | Failure | Hydraulic Oil Sensor Short Circuit |
|---|---|---|---|
| L01 | DGH2KB | | (Pump controller system) |
| Detail of failure | • Signal voltage of hydraulic oil temperature sensor circuit is below 1 V, so pump controller determines that circuit shorts. | | |
| Action of controller | • If cause of failure disappears, machine becomes normal by itself. | | |
| Problem on machine | • Hydraulic oil temperature gauge indicates 50 °C. | | |
| Related information | • Signal voltage from hydraulic oil temperature sensor can be checked with monitoring function. (Code: 04402)<br>• Method of reproducing failure code: Start engine.<br>⚠ **Loosen the oil filler cap of the hydraulic tank to release the pressure in the hydraulic tank. For details, see Testing and adjusting "Releasing remaining pressure in hydraulic circuit" when checking and replacing hydraulic oil temperature sensor. With monitoring function (Code: 04401), check that hydraulic oil temperature is 40 °C or lower and cool enough not to burn.** | | |

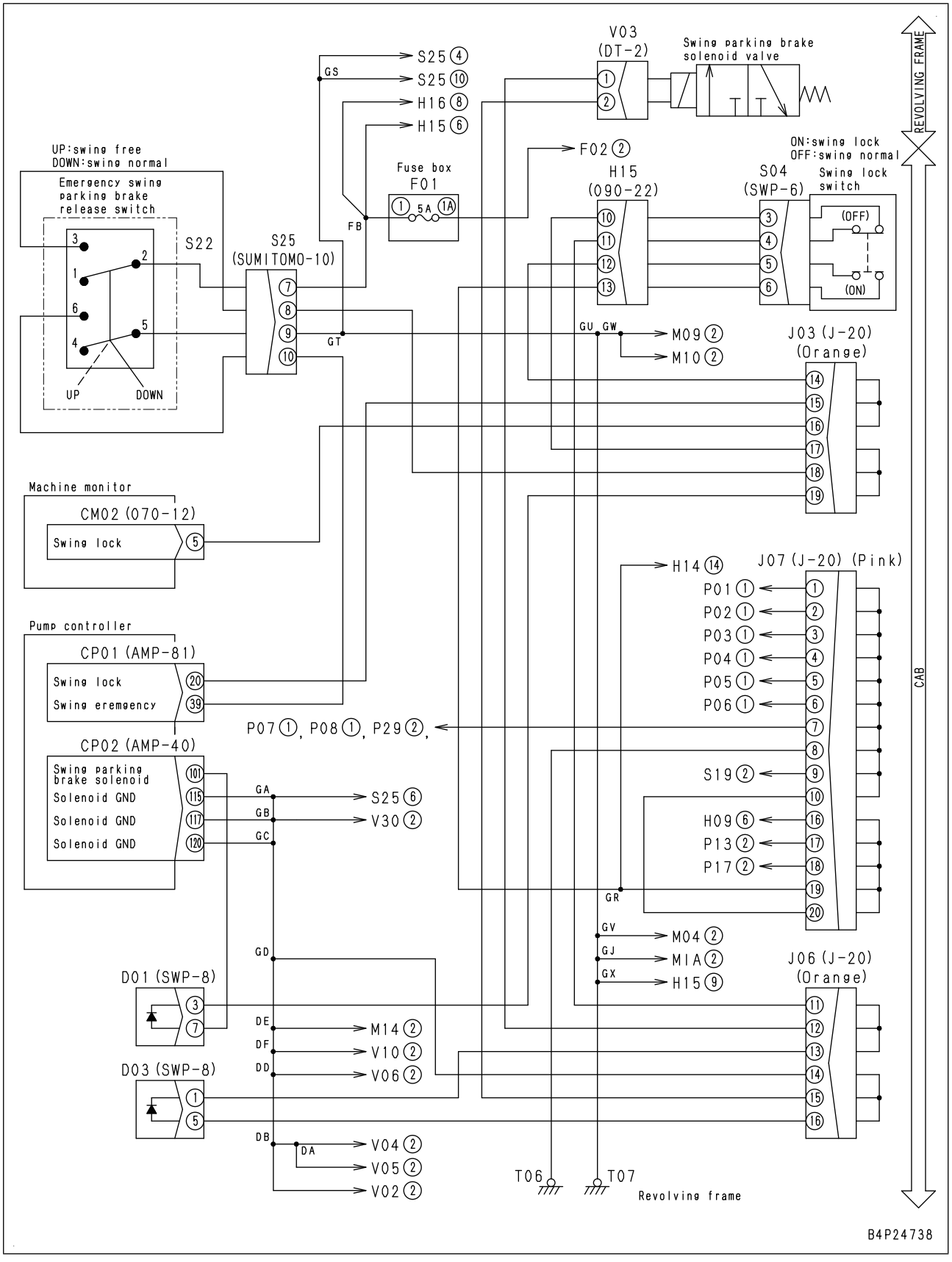
| No. | Cause | Procedure, measuring location, criteria, and remarks | | | |
|---|---|---|---|---|---|
| 1 | Defective hydraulic oil temperature sensor<br>(Internal open or short circuit) | 1. Turn starting switch to OFF position.<br>2. Disconnect connector P22 and connect T-adapter to male side. | | | |
| | | Resistance | Between P22 (male) (1) and (2)<br>★ Temperature-resistance characteristics of oil temperature sensor | 10 °C | Approx. 90 kΩ |
| | | | | 30 °C | Approx. 35 kΩ |
| | | | | 80 °C | Approx. 6.5 kΩ |
| | | | | 100 °C | Approx. 3.5 kΩ |
| | | | Between P22 (male) (2) and ground | | Min. 1 MΩ |
| 2 | Open circuit, short circuit, or ground fault in wiring harness | 1. Turn starting switch to OFF position.<br>2. Disconnect connector P22 and connect T-adapter to female side.<br>3. Turn starting switch to ON position.<br>★ If voltage is 0 V, wiring harness has open circuit, ground fault, or short circuit, and if voltage is 24 V, wiring harness has hot short circuit.<br>★ Voltage of approx. 5 V is applied to temperature sensor signal circuits through resistance in pump controller. | | | |
| | | Voltage | Between P22 (female) (1) and (2) | | Approx. 5 V |
| 3 | Short circuit or ground fault in wiring harness | 1. Turn starting switch to OFF position.<br>2. Disconnect connector CP01 and connect T-adapter to female side.<br>★ Use Temperature-Resistance characteristics table for troubleshooting on cause 1 as resistance criteria.<br>★ If resistance is 1 MΩ or higher, wiring harness has open circuit. If resistance is 1 Ω or below, wiring harness has short circuit. | | | |
| | | Resistance | Between CP01 (female) (28) and (46) | | 3.5 to 90 kΩ |
| | | | Between CP01 (female) (28) and ground | | Min. 1 MΩ |
| 4 | Ground fault in wiring harness<br>(Contact with ground circuit) | ★ If no failure is found by check on cause 2, this check is not required.<br>1. Turn starting switch to OFF position.<br>2. Disconnect connectors CP01 and P22, and connect T-adapter to either female side. | | | |
| | | Resistance | Between ground and CP01 (female) (28) or P22 (female) (2) | | Min. 1 MΩ |
| 5 | Pump controller is defective. | If cause is not found by above checks, pump controller is defective.<br>(Since this is an internal defect, troubleshooting cannot be performed.) | | | |

# Failure code [DHSLMA] Blade Lower PPC Press Sensor Abnormality *(PC138-DHSLMA-400-A-Z0-A)*

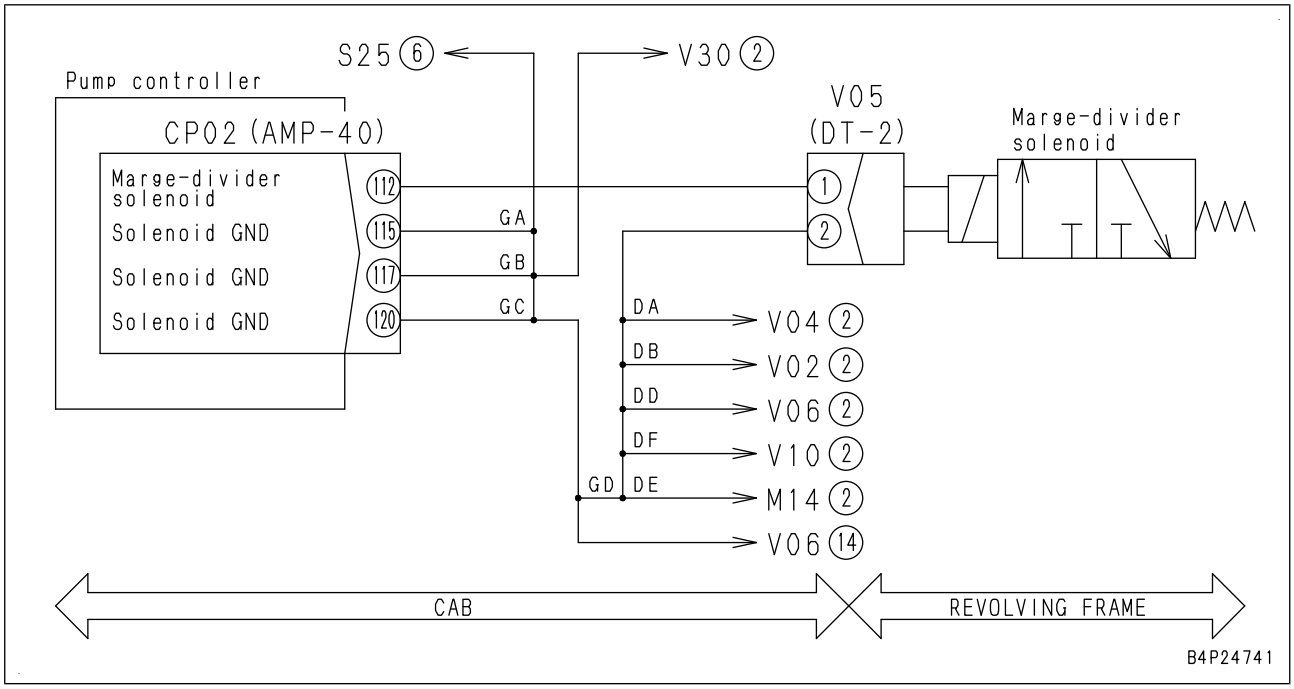
| Action level | Failure code | Failure | Blade LOWER PPC Pressure Sensor Abnormality |
|---|---|---|---|
| L01 | DHSLMA | | (pump controller system) |
| Detail of failure | • Signal voltage of blade LOWER PPC pressure sensor circuit is below 0.3 V or above 4.5 V. | | |
| Action of controller | • Fixes blade lower PPC pressure at 0 MPa {0 kg/cm²} and continues control.<br>• If cause of failure disappears, machine becomes normal by itself. | | |
| Problem on machine | • Automatic deceleration does not cancel.<br>• Poor operability of blade LOWER operation | | |
| Related information | ★ If 5 V circuit (3) and ground circuit (1) of pressure sensor are connected inversely, pressure sensor will break. Accordingly, take extreme care when checking.<br>• As T-adapter for pump controller connector is "socket-type box", operating voltage cannot be measured at pump controller connector.<br>• Blade lower PPC pressure can be checked with monitoring function. (Code: 07107)<br>• Method of reproducing failure code: Turn starting switch to ON position or start engine.<br>⚠ **Loosen the oil filler cap of the hydraulic tank to release the pressure in the hydraulic tank. For details, see Testing and adjusting "Releasing remaining pressure in hydraulic circuit" when checking and replacing oil pressure sensor. With monitoring function (Code: 04401), check that hydraulic oil temperature is 40 ° C or lower and cool enough not to burn.** | | |

| No. | Cause | Procedure, measuring location, criteria, and remarks | | | |
|---|---|---|---|---|---|
| 1 | Defective 5 V sensor power supply 1 system | If failure code [DA25KP] is also displayed, perform troubleshooting for it first. | | | |
| | | 1. Turn starting switch to OFF position.<br>2. Disconnect connector P11 and connect T-adapter to female side.<br>3. Turn starting switch to ON position.<br>★ If power supply voltage is abnormal, proceed to check on cause 3. | | | |
| | | Voltage | Between P11 (female) (3) and (1) | Power supply | 4.5 to 5.5 V |
| 2 | Defective blade LOWER PPC pressure sensor<br>(Internal defect) | 1. Turn starting switch to OFF position.<br>2. Insert T-adapter into connector P11.<br>3. Turn starting switch to ON position. | | | |
| | | Voltage | Between P11 (2) and (1) | Sensor output | 0.5 to 4.5 V |
| | | ★ If power supply voltage is normal and sensor output voltage is abnormal, it is difficult to judge whether cause of failure is defective sensor, ground fault or hot short circuit in wiring harness. Check as below.<br>1. Turn starting switch to OFF position.<br>2. Replace connector P11 with connector of other PPC pressure sensor.<br>3. Turn starting switch to ON position and display "Abnormality Record" screen of electrical system on machine monitor.<br>4. If E mark is not displayed again for this failure code, blade LOWER PPC pressure sensor is defective.<br>★ After finishing test, restore connectors. | | | |
| 3 | Open circuit in wiring harness<br>(Wire breakage or defective contact of connector) | 1. Turn starting switch to OFF position.<br>2. Disconnect connectors CP01 and P11, and connect T-adapters to each female side. | | | |
| | | Resistance | ★ If power supply voltage in check on cause 1 is normal, this check is not required.<br>Between CP01 (female) (18) and P11 (female) (1) | | Max. 1 Ω |
| | | | Between CP01 (female) (52) and P11 (female) (2) | | Max. 1 Ω |
| | | | ★ If power supply voltage in check on cause 1 is normal, this check is not required. | | Max. 1 Ω |

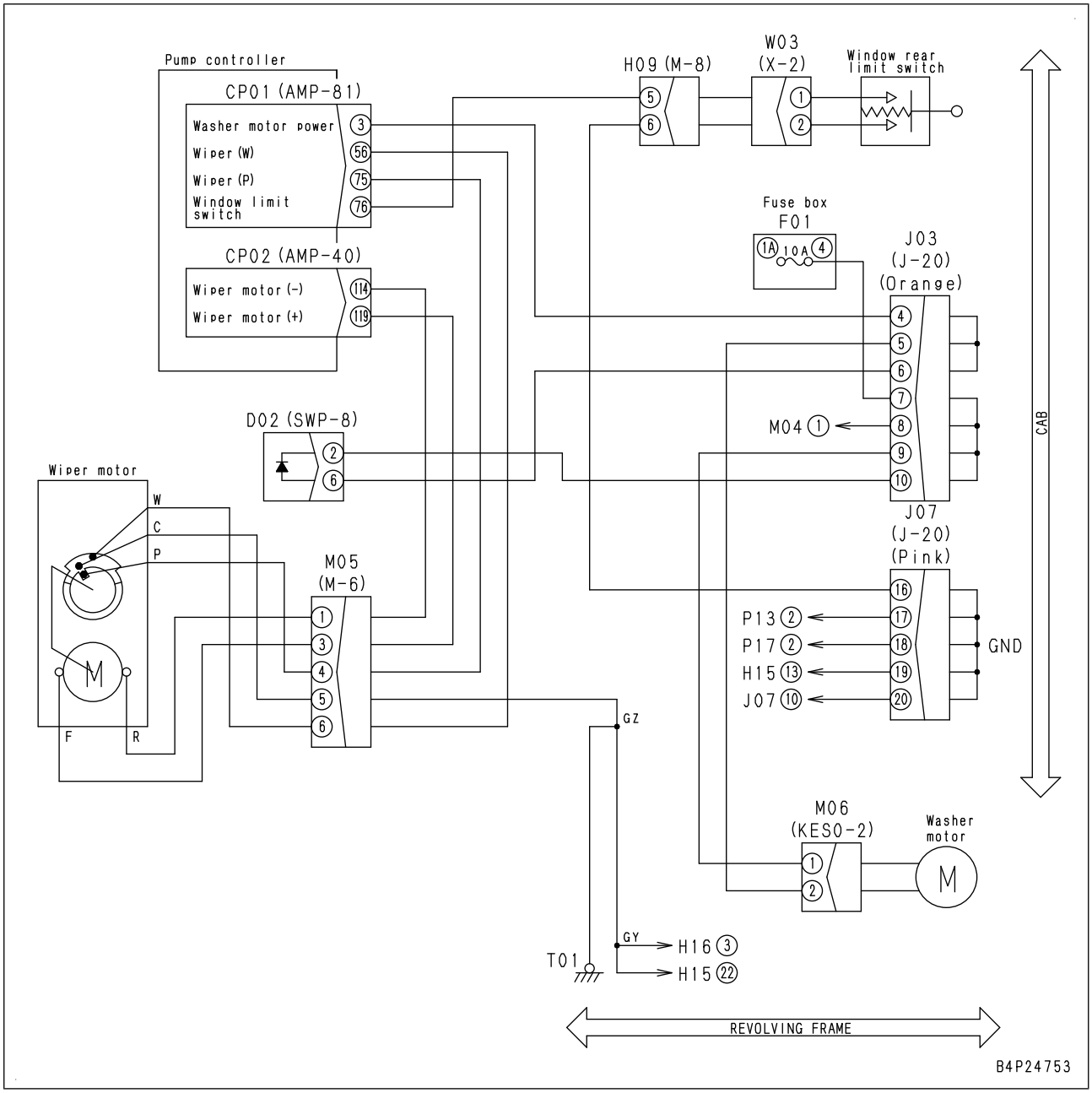
## Circuit diagram related to swing holding brake solenoid



**Circuit diagram related to pump merge-divider main solenoid**



### Circuit diagram related to window washer motor



## E-3 While preheating is working, preheating monitor does not light up *(PC138-FE2-400-A-Z0-A)*

| | |
|---|---|
| Failure | While preheating is working, preheating monitor does not light up. |
| Related information | • Check whether manual preheating function works first. |

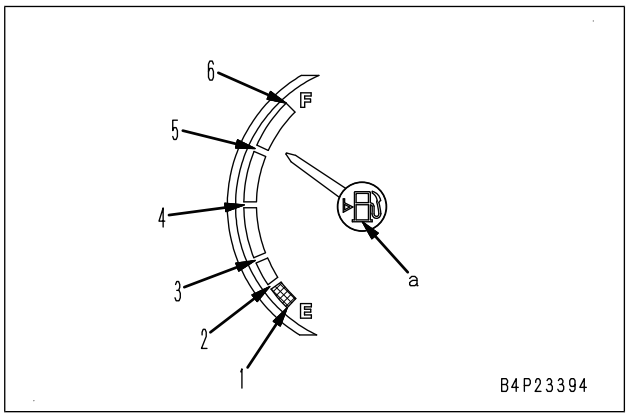
| No. | Cause | Procedure, measuring location, criteria, and remarks | | |
|---|---|---|---|---|
| 1 | Open circuit in wiring harness (Wire breakage or defective contact of connector) | 1. Turn starting switch to OFF position.<br>2. Disconnect connectors CM01 and HDT, and connect T-adapters to each female side. | | |
| | | Resistance | Between HIS (female) (3) and CM01 (female) (12) | Max. 1 Ω |
| 2 | Defective machine monitor | If no failure is found by preceding checks, machine monitor is defective.<br>• Reference<br>1. Turn starting switch to OFF position.<br>2. Insert T-adapter into connector CM01.<br>3. Disconnect heater relay terminal R16A.<br>★ To prevent current from flowing through heater when starting switch is turned to HEAT position<br>4. Turn starting switch to HEAT. | | |
| | | Resistance | Between CM01 (12) and (3) | 20 to 30 V |

# E-14 Fuel gauge indicates incorrect amount (indicates neither full nor empty) *(PC138-FGF-400-A-Z0-A)*

| | |
|---|---|
| Failure | 1) Indication of fuel gauge is different from actual fuel level.<br>2) Indication of fuel gauge does not accord with indication of fuel level monitor. |
| Related information | • Signal voltage of fuel sensor can be checked with monitoring function. (Code: 04200) |

| No. | Cause | Procedure, measuring location, criteria, and remarks | | | |
|---|---|---|---|---|---|
| 1 | Defective fuel level sensor | Perform troubleshooting for "E-13 Cause 1". | | | |
| 2 | Defective machine monitor | ★ Turn starting switch to ON position or start engine to perform troubleshooting. | | | |
| | | Color of monitor light (a) | Fuel level: 144 ℓ | Fuel gauge level: 6 | Blue |
| | | | Fuel level: 122 ℓ | Fuel gauge level: 5 | |
| | | | Fuel level: 99 ℓ | Fuel gauge level: 4 | |
| | | | Fuel level: 68 ℓ | Fuel gauge level: 3 | |
| | | | Fuel level: 52 ℓ | Fuel gauge level: 2 | |
| | | | Fuel level: 32 ℓ | Fuel gauge level: 1 | Red |

**Fuel gauge and fuel level monitor**

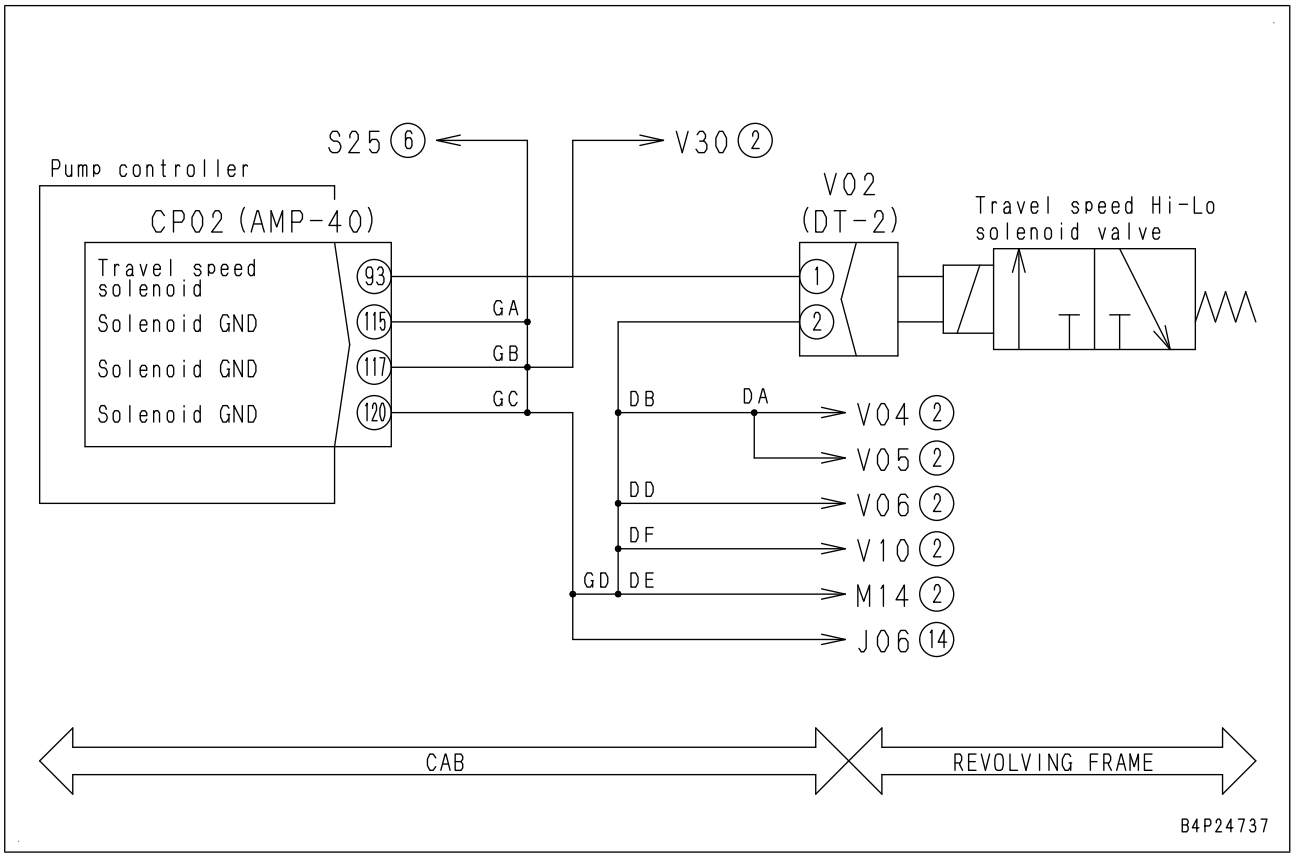


# E-27 Travel speed does not change while travel speed selection is changed *(PC138-BQ3-400-A-Z0-A)*

| | |
|---|---|
| Failure | Travel speed does not change while travel speed selection is changed. |
| Related information | • If Cause 1 occurs, actual travel speed does not lower when travel speed selection is changed to Lo.<br>• As T-adapter for pump controller connector is "socket-type box", operating voltage cannot be measured at pump controller connector. |

| No. | Cause | Procedure, measuring location, criteria, and remarks | | |
|---|---|---|---|---|
| 1 | Hot short circuit in wiring harness | 1. Turn starting switch to OFF position.<br>2. Disconnect connector V02 and connect T-adapter to female side.<br>3. Turn starting switch to ON position. | | |
| | | Voltage | Between V02 (female) (2) and ground | Max. 1 V |
| 2 | Defective machine monitor | If no failure is found by check on Cause 1, machine monitor may be defective.<br>(Since this is an internal defect, troubleshooting cannot be performed.) | | |
| 3 | Pump controller is defective. | If no failure is found by checks on Causes 1 and 2, pump controller may be defective.<br>(Since this is an internal defect, troubleshooting cannot be performed.) | | |

**Circuit diagram related to travel speed solenoid**

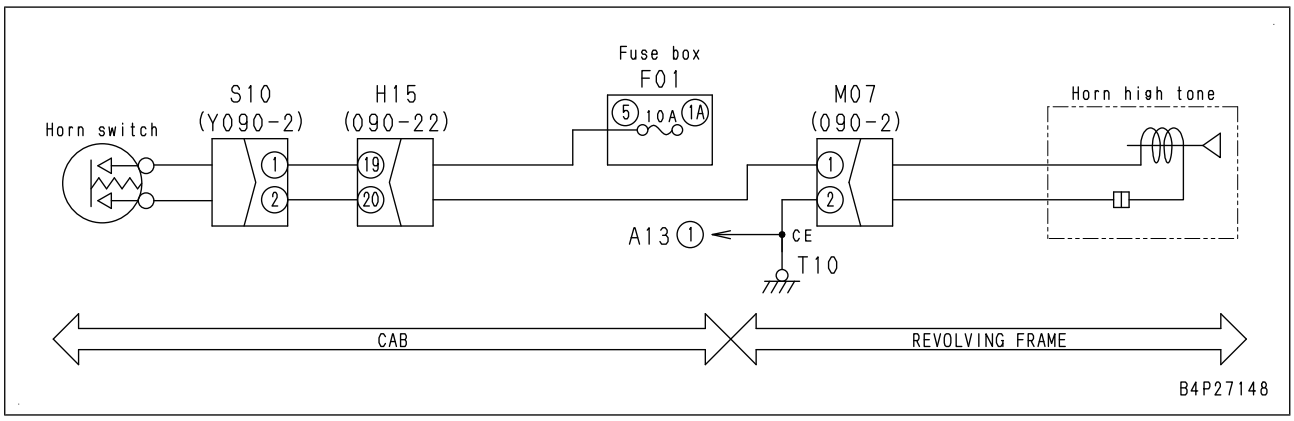


# E-37 Horn does not sound *(PC138-KA2-400-A-Z0-A)*

| | |
|---|---|
| Failure | Horn does not sound. |
| Related information | |

| No. | Cause | Procedure, measuring location, criteria, and remarks | | | |
|---|---|---|---|---|---|
| 1 | Defective fuse F01-5 | If fuse F01-15 is burnt out, circuit probably has ground fault. In this case, perform check on Cause 7 first. | | | |
| 2 | Defective horn switch (Internal open or short circuit) | 1. Turn starting switch to OFF position.<br>2. Disconnect connector S10 and connect T-adapter to male side. | | | |
| | | Resistance | Between S10 (male) (1) and (2) | Switch: OFF | Min. 1 MΩ |
| | | | | Switch: ON | Max. 1 Ω |
| 3 | Defective horn (M07) (internal open or short circuit) | 1. Turn starting switch to OFF position.<br>2. Disconnect connector M07 and connect T-adapter to male side. | | | |
| | | Continuity | Between M07 (male) (1) and (2) | | Continuity |
| 4 | Defective wiring harness | 1. Turn starting switch to OFF position.<br>2. Disconnect connector M07, and connect T-adapter to female side.<br>3. Turn starting switch to ON position.<br>4. Press R.H. knob switch. | | | |
| | | Voltage | Between M07 (female) (1) and (2) | | 20 to 30 V |
| 5 | Open circuit in wiring harness (Wire breakage or defective contact of connector) | 1. Turn starting switch to OFF position.<br>2. Disconnect connector M07, and connect T-adapter to female side. | | | |
| | | Continuity | Between M07 (female) (1) and ground | | Continuity |
| | | ★ If no failure is found by check on Cause 4 or preceding check, this check is not required.<br>1. Turn starting switch to OFF position.<br>2. Remove fuse F01-5.<br>3. Disconnect connectors M07 and S10, and connect T-adapters to each female side. | | | |
| | | Resistance | Between F01-5 and S10 (female) (1) | | Max. 1 Ω |
| | | | Between S10 (female) (2) and M07 (female) (1) | | Max. 1 Ω |
| | | | Between M07 (female) (2) and ground | | Max. 1 Ω |
| 6 | Ground fault in wiring harness (Contact with ground circuit) | ★ If fuse is not burnt out, this check is not required.<br>1. Turn starting switch to OFF position.<br>2. Remove fuse F01-5.<br>3. Disconnect connector M07, and connect T-adapter to female side of M07. | | | |
| | | Resistance | Between M07 (female) (1) and ground | | Min. 1 MΩ |
| 7 | Defective horn (Internal defect) | If no failure is found by preceding checks, horn may be defective. | | | |

**Circuit diagram related to horn**

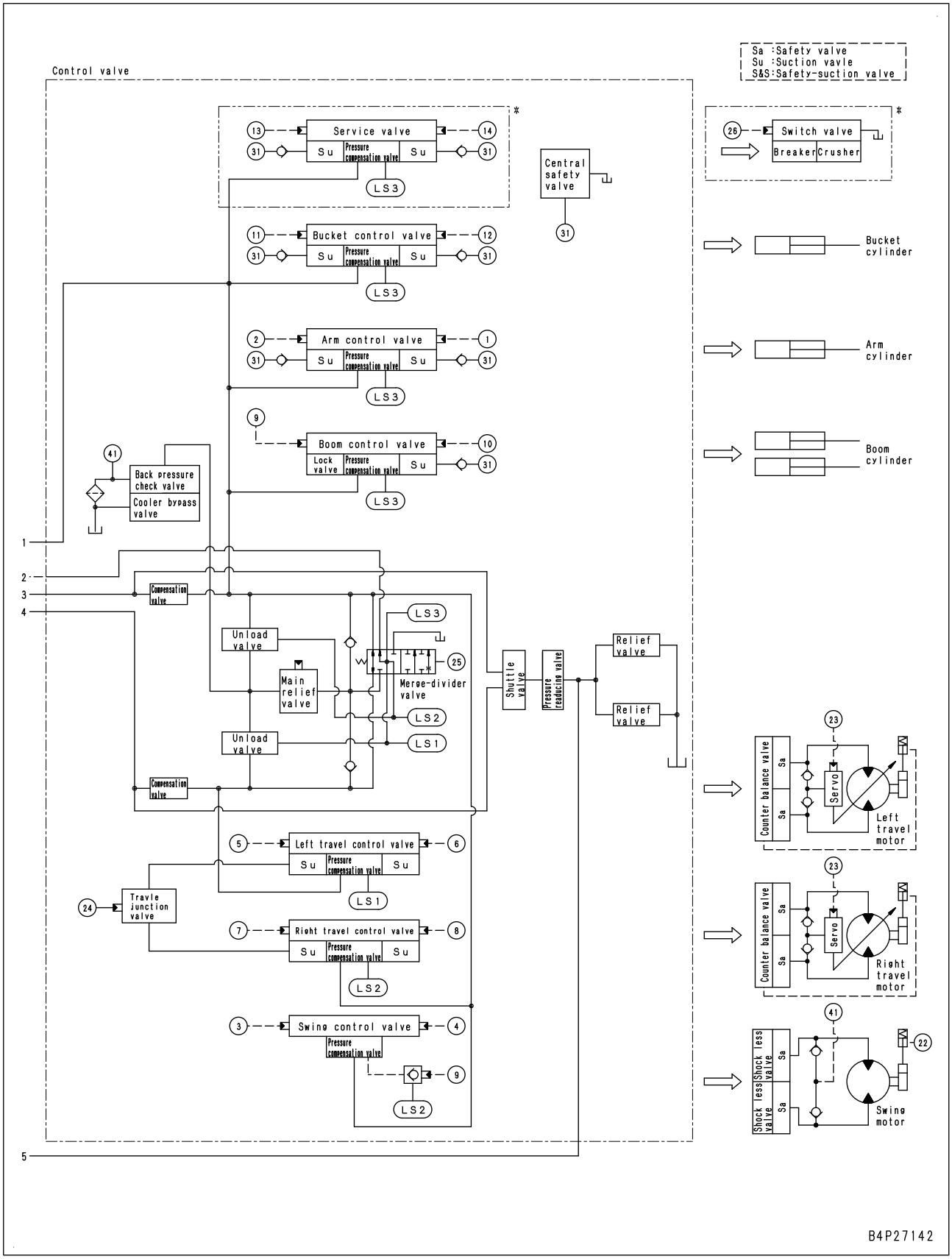


# E-46 Bucket Curl is not displayed correctly with monitoring function *(PC138-FFP-400-A-Z0-A)*

| | |
|---|---|
| Failure | "Bucket CURL" is not displayed correctly with monitoring function. |
| Related information | • Monitoring code: 01901<br>• Use "short socket adapter: 799-601-7230 for 2-pin X connector in test for Cause 6.<br>• As pump controller connector uses "socket-type box" T-adapter, operating voltage cannot be measured at pump controller connector. |

| No. | Cause | Procedure, measuring location, criteria, and remarks | | | |
|---|---|---|---|---|---|
| 1 | Defective bucket CURL PPC oil pressure switch (internal open or short circuit) | 1. Turn starting switch to OFF position.<br>2. Disconnect connector P04 and connect T-adapter to male side.<br>3. Start engine.<br>4. Operate R.H. work equipment control lever and perform troubleshooting. | | | |
| | | Resistance | Between P04 (male) (1) and (2) | R.H. work equipment control lever: NEUTRAL | Min. 1 MΩ |
| | | | | R.H. work equipment control lever: Bucket CURL | Max. 1 Ω |
| 2 | Defective harness or pump controller | 1. Turn starting switch to OFF position.<br>2. Insert T-adapter into connector P04.<br>3. Start engine.<br>4. Operate R.H. work equipment control lever and perform troubleshooting. | | | |
| | | Voltage | Between P04 (2) and (1) | R.H. work equipment control lever: NEUTRAL | Approx. 7 V |
| | | | | R.H. work equipment control lever: Bucket CURL | Max. 1 V |
| 3 | Open circuit in wiring harness (wire breakage or defective contact of connector) | ★ If no failure is found by check on Cause 2, this check is not required.<br>1. Turn starting switch to OFF position.<br>2. Disconnect connectors CP01 and P04 and connect T-adapters to each female side. | | | |
| | | Resistance | Between CP01 (female) (69) and P04 (female) (2) | | Max. 1 Ω |
| | | | Between P04 (female) (1) and ground (T06) | | Max. 1 Ω |
| 4 | Ground fault in wiring harness (contact with ground circuit) | ★ If no failure is found by check on Cause 2, this check is not required.<br>1. Turn starting switch to OFF position.<br>2. Disconnect connectors CP01 and P04, and connect T-adapter to either female side. | | | |
| | | Resistance | Between ground and CP01 (female) (69) or P04 (female) (2) | | Min. 1 MΩ |
| 5 | Hot short circuit in wiring harness | ★ If no failure is found by check on Cause 2, this check is not required.<br>1. Turn starting switch to OFF position.<br>2. Disconnect connector P04 and connect T-adapter to female side.<br>3. Turn starting switch to ON position. | | | |
| | | Voltage | Between P04 (female) (2) and ground | | Approx. 7 V |
| 6 | Pump controller is defective. | 1. Turn starting switch to OFF position.<br>2. Disconnect connector P04 and connect T-adapter to female side.<br>3. Connect "short socket adapter" to female side of T-adapter.<br>4. Turn starting switch to ON position. | | | |
| | | If voltage between P04 (2) and (1) is below 1 V but "Bucket CURL" is displayed "OFF", pump controller is defective. | | | |

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




*: Only machines with ATT

## H-5 Fine control performance or response is poor *(PC138-FTB-400-A-Z0-A)*

| | |
|---|---|
| Failure | • Fine control performance or response is poor. |
| Related information | • Perform all troubleshooting with working mode set in power (P) mode. |

<table>
<tr><th>No.</th><th>Cause</th><th colspan="3">Procedure, measuring location, criteria, and remarks</th></tr>
<tr><td>1</td><td>Clogged orifice in LS circuit</td><td colspan="3">Orifice may be clogged. Check it.</td></tr>
<tr><td rowspan="5">2</td><td rowspan="5">Defective adjustment of LS valve</td><td colspan="3">★ Be ready with engine stopped, then perform troubleshooting with engine at high idle.</td></tr>
<tr><td rowspan="2">Oil pressure to be measured</td><td colspan="2">Lever position and oil pressure ratio</td></tr>
<tr><td rowspan="2">All levers in NEUTRAL</td><td>Travel speed</td></tr>
<tr><td>Lever moved halfway</td></tr>
<tr><td>Pump discharge pressure</td><td>Almost same as LS valve output pressure</td><td>1</td></tr>
<tr><td>LS valve output pressure</td><td>Almost same as pump discharge pressure</td><td>Approx. 0.6 (Approx. 3/5)</td></tr>
<tr><td>3</td><td>Malfunction of LS valve</td><td colspan="3">When pressure cannot be adjusted to normal level, check LS valve for malfunction (fatigue of spring) or internal defect (stuck or seized LS spool).</td></tr>
<tr><td>4</td><td>Malfunction of servo piston</td><td colspan="3">Check orifices and filters in pump servo devices for clogging.</td></tr>
</table>

# H-14 In combined operation of work equipment , equipment having heavier load moves slower *(PC138-D34-400-A-Z0-A)*

| | |
|---|---|
| Failure | • In combined operation of work equipment, equipment having heavier load moves slower. |
| Related information | |

| No. | Cause | Procedure, measuring location, criteria, and remarks | | |
|---|---|---|---|---|
| 1 | Malfunction of control valve on smaller load side (pressure compensation valve) (arm IN) | Operations combined | Heavier load side | Smaller load side |
| | | Boom RAISE and arm IN | Boom RAISE | Arm IN |
| | | Pressure compensation valve of control valve on smaller load side may malfunction. | | |
| 2 | Malfunction of control valve on smaller load side (pressure compensation valve) (boom RAISE) | Operations combined | Heavier load side | Smaller load side |
| | | Boom RAISE and arm OUT | Arm OUT | Boom RAISE |
| | | Pressure compensation valve of control valve on smaller load side may malfunction. | | |
| 3 | Malfunction of control valve on smaller load side (pressure compensation valve) (bucket CURL) | Operations combined | Heavier load side | Smaller load side |
| | | Boom RAISE and bucket CURL | Boom RAISE | Bucket CURL |
| | | Pressure compensation valve of control valve on smaller load side may malfunction. | | |
| | | Operations combined | Heavier load side | Smaller load side |
| | | Arm OUT and bucket CURL | Arm OUT | Bucket CURL |
| | | Pressure compensation valve of control valve on smaller load side may malfunction. | | |
| 4 | Malfunction of control valve on smaller load side (pressure compensation valve) (boom LOWER) | Operations combined | Heavier load side | Smaller load side |
| | | Boom LOWER and arm OUT | Arm OUT | Boom LOWER |
| | | Pressure compensation valve of control valve on smaller load side may malfunction. | | |

★ Pressure compensation valve is equipped with outer seal, inner seal, and LS check valve (ball).
Since slipper seal is installed to inner seal, damage on O-ring inside inner seal cannot be checked visually.

## H-23 Upper structure swing only to the right or left *(PC138-L42-400-A-Z0-A)*

| | |
|---|---|
| Failure | • Upper structure swing only to the right or left. |
| Related information | • Perform all troubleshooting with working mode set in power (P) mode. |

| No. | Cause | Procedure, measuring location, criteria, and remarks | | | |
|---|---|---|---|---|---|
| 1 | Malfunction of swing PPC valve | ★ Be ready with engine stopped, then perform troubleshooting with engine at high idle. | | | |
| | | Swing PPC valve output pressure | Swing control lever | At NEUTRAL | 0 MPa {0 kg/cm$^2$} |
| | | | Swing control lever | Left swing and Right swing | Min. 2.7 MPa {Min. 28 kg/cm$^2$} |
| 2 | Malfunction of swing control valve (spool) | If no failure is found by check on cause (1) and upper structure does not swing when swing control lever is operated with pump pressure at approx. 4 MPa, check whether spool is stuck near NEUTRAL position. | | | |
| 3 | Malfunction of swing motor (safety valve) | ★ Be ready with engine stopped, then perform troubleshooting with engine at high idle. | | | |
| | | Swing relief pressure (pump pressure) | Swing lock switch ON | Swing hydraulic relief | 28.2 (+1.5/-2.5) MPa {288 (+15/-25) kg/cm$^2$} |
| 4 | Defective seating of swing motor (shuttle valve) | Interchange shuttle valves on left and right swing sides of swing motor, and check whether failure symptom changes to make judgment.<br>When removing valve, check it for sticking and defects. | | | |
| 5 | Defective seating of swing motor (check valve) | Interchange check valves on left and right swing sides of swing motor, and check whether failure symptom changes to make judgment.<br>When removing valve, check it for sticking and defects. | | | |

## S-3 Fuel is being injected but engine does not start (misfiring: engine cranks but does not start) *(D37-A28-400-A-Z0-A)*

| | |
|---|---|
| Failure | Fuel is being injected but engine does not start (incomplete combustion: engine cranks but does not start). |
| Related information | • If any failure code is displayed, perform troubleshooting for that code first. |

| No. | Cause | Point to check, remarks | Remedy |
|---|---|---|---|
| 1 | Defective battery | • Specific gravity of electrolyte and voltage of battery are low. | Add battery electrolyte and charge battery. |
| 2 | Insufficient fuel in tank | • Fuel tank is empty. | Add fuel. |
| 3 | Clogged air breather hole in fuel tank cap | • Air breather hole in fuel tank cap is clogged. | Flush air breather hole in fuel tank cap and clean surrounding area. |
| 4 | Clogged fuel filter element | • Check used hours of fuel filter. If used beyond specified hours, fuel filter element may be clogged. | Replace fuel filter element. |
| 5 | Foreign material in fuel | • Rust and water are found in fuel drained from fuel tank. | Replace fuel. |
| 6 | Air in fuel piping system | • Air is bled during air bleeding of fuel system. (Reference: See Testing and adjusting, "Bleeding air from fuel system".) | Perform air bleeding.<br>Repair or replace fuel piping. |
| 7 | Leakage from fuel piping system | • Fuel leaks from fuel piping. (Reference: See Testing and adjusting, "Testing fuel circuit for leakage".) | Repair or replace fuel piping related parts. |
| 8 | Fuel leakage from injector area | • Injector return rate is excessive. (Reference: See Testing and adjusting, "Testing fuel discharge, return and leakage".) | Check or replace injector. |
| 9 | Defective priming pump | • No resistance is felt or large effort is required when operating priming pump. | Replace priming pump. |
| 10 | Clogged air cleaner element | • Air cleaner dust indicator indicates that dust is at caution level. | Check and clean air cleaner element. |
| 11 | Defective intake air heater | • When preheating works, intake air heater mounting area does not become hot.<br>• When preheating works or when temperature is low, preheating monitor does not indicate properly. | Replace intake air heater. |
| 12 | Worn valve or rocker arm, etc. | • Check valve clearance. (Reference: See Testing and adjusting, "Testing and adjusting valve clearance".)<br>• When engine is cranked, unusual noise is heard from around cylinder head. | Replace valve or rocker arm. |
| 13 | Defective piston ring | • Testing compression pressure (Reference: See Testing and adjusting, "Testing compression pressure".) | Replace piston ring or piston. |
| 14 | Defective injector<br>(clogged injector or defective fuel spray) | • When engine is run in cylinder cutout mode with some cylinder cutout, engine speed does not change. (Reference: See Testing and adjusting, "Handling cylinder cutout mode operation".) | Replace injector. |
| 15 | Defective engine controller | • Since this is an internal defect, troubleshooting cannot be performed. | Replace engine controller. |

## S-12 Fuel consumption is excessive *(D37-B70-400-A-Z0-A)*

| | |
|---|---|
| Failure | Fuel consumption is excessive. |
| Related information | • If any failure code is displayed, perform troubleshooting for that code first. |

| No. | Cause | Point to check, remarks | Remedy |
|---|---|---|---|
| 1 | Excessive spill of fuel from injector | • Measure spill rate from injector. (Reference: See Testing and adjusting, "Testing fuel discharge, return and leakage".) | Replace injector. Lots of dusts are is probably in fuel. Check storage management of fuel. |
| 2 | Clogged fuel return piping | • Check fuel return piping for clogging. (Injection rate may be increased due to clogged fuel return piping.) | Correct or replace fuel return piping. |
| 3 | Defective injector | • Some cylinder is found to be cool when exhaust manifolds are touched by hand immediately after engine is started.<br>• When engine is run in cylinder cutout mode with some cylinder cutout, engine speed does not change. (Reference: See Testing and adjusting, "Handling cylinder cutout mode operation".) | Replace injector. |
| 4 | Fuel leakage from cylinder head | • Check for increased oil level.<br>• Check for smell of diesel fuel. | Repair defective parts. |
| 5 | Fuel leakage from supply pump oil seal | • Check for increased engine oil level and smell of diesel fuel.<br>• Check supply pump oil seal. | Replace supply pump. |
| 6 | Fuel leakage outside engine | • Check for fuel leakage outside engine. | Repair defective parts. |

- Marks used in the section of "Disassembly" are explained below.

**⚠ : This mark shows safety-related precautions which must be followed when performing the work.**

★ : This mark gives knowledge or precautions when performing the work.

**: This mark shows the amount of oil or coolant to be drained.**

**: This mark shows the weight of the part or equipment.**

Assembly

- "Assembly" describes the work procedure as well as the precautions, knowledge, and drain amounts of oil and water required for the work.
- The general tools required for "Assembly" are listed as [1], [2], ..., without description of part number, part name, and quantity.
- Marks used in the section of "Assembly" are explained below.

**⚠ : This mark shows safety-related precautions which must be followed when performing the work.**

★ : This mark gives knowledge or precautions when performing the work.

**: This mark shows the weight of the part or equipment.**

**: This mark shows a specific coating agent to be used.**

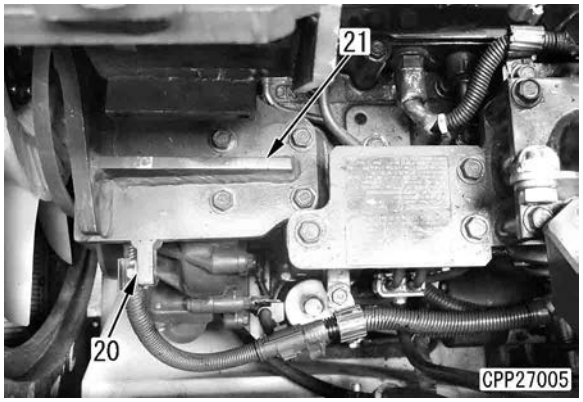
**: This mark shows the specified tightening torque.**

**: This mark shows the amount of oil or coolant to be added.**

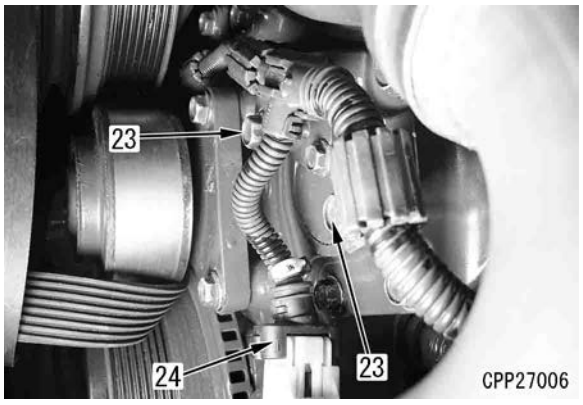
- **For details of oil or coolant to be added after installation, see Specification "Table of fuel, coolant and lubricants".**

★ Note that there is another clamp on the back side of bracket (21) as shown in the following figure

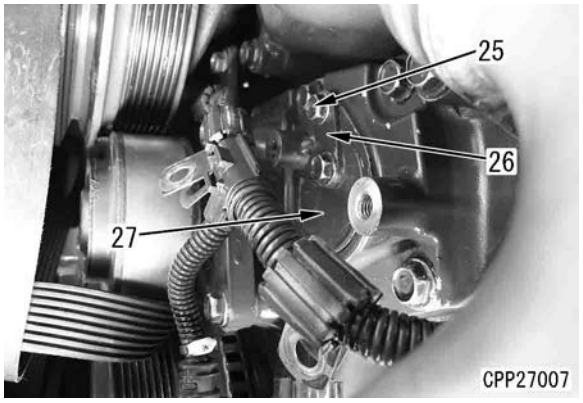
15.Remove bracket (21).



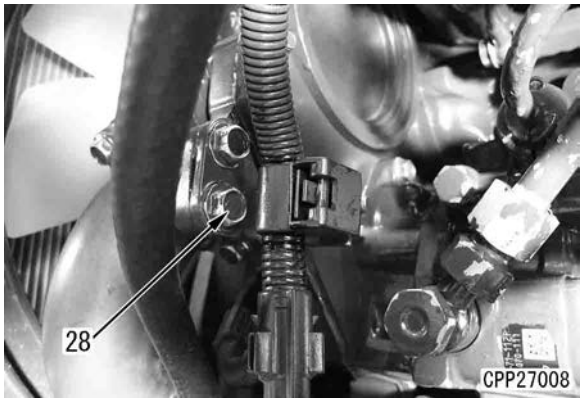

16.Remove clamp bolt (23) (2 pieces,) and disconnect the wiring harness.
17.Disconnect connector (24) of crankshaft speed sensor (NE).




18.Remove mounting bolts (25) (2 pieces), and remove plates (26) and (27). [*1]



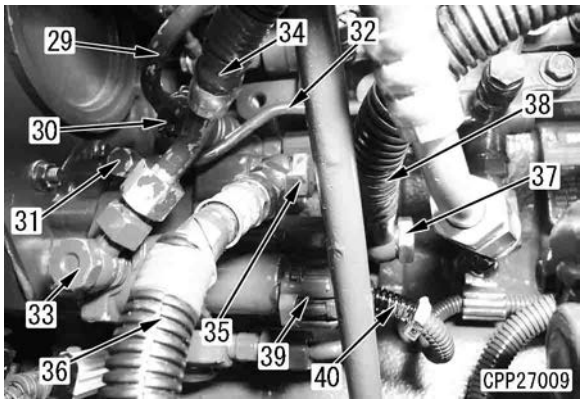

19.Remove bolts (28) (2 pieces,) and disconnect the wiring harness.




20.Remove fuel spray prevention caps (30) (2 pieces) of fuel high-pressure pipes (29). [*2]
21.Loosen sleeve nuts (2) (2 pieces) and remove high-pressure fuel pipes (29). [*3]
22.Remove joint bolts (31) (2 pieces), and remove fuel tube (32).

★ When removing the fuel high-pressure pipe, be careful not to apply excessive force to the tube.

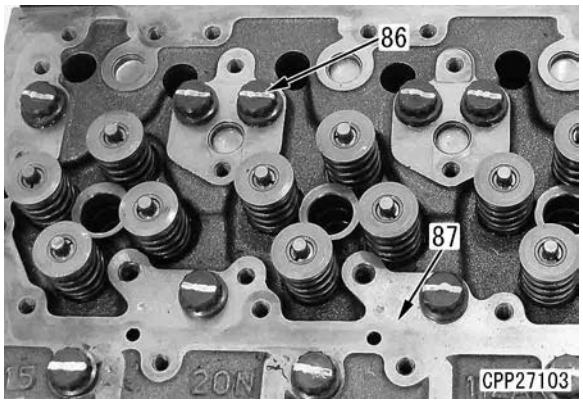
23.Remove joint bolt (33), and disconnect fuel hose (34). [*4]
24.Remove joint bolt (35), and disconnect fuel hose (36).
25.Remove joint bolt (37), and disconnect fuel hose (38). [*5]
26.Remove connector SCV (39) of the supply pump regulator and disconnect wiring harness (40).




27.Remove mounting bolts (41) (4 pieces).
28.Remove mounting bolts (42), and remove supply pump assembly (43) together with the gear. [*6]

52. Remove mounting bolt (86). Sling and remove cylinder head assembly (87).

**Cylinder head assembly:**
**60 kg**




53. Place cylinder head assembly (87) onto the block, and remove the intake and exhaust manifold, heater, and connector.

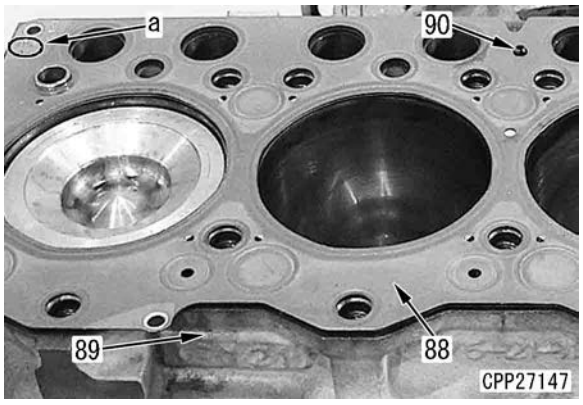
★ Remove the intake and exhaust manifold, heater, and connector. For details, see "General disassembly of engine" of Engine Shop Manual.

## Installation *(PC138-A100-720-K-00-A)*

1. Install the intake and exhaust manifold, heater, and connector. For details, see "General assembly of engine" of Engine Shop Manual.
2. Cylinder head assembly
   1) Check that the cylinder head and the cylinder block mounting face are free from dirt or foreign matter and install cylinder head gasket (88) to cylinder block assembly (89).

   ★ Stamp mark "TOP" (a) on the cylinder head gasket must face the upper side when the gasket is installed.

   ★ Check that pin (90) to prevent the wrong installation of cylinder head gasket on the upper side of the cylinder block and the hole of cylinder head gasket are aligned.



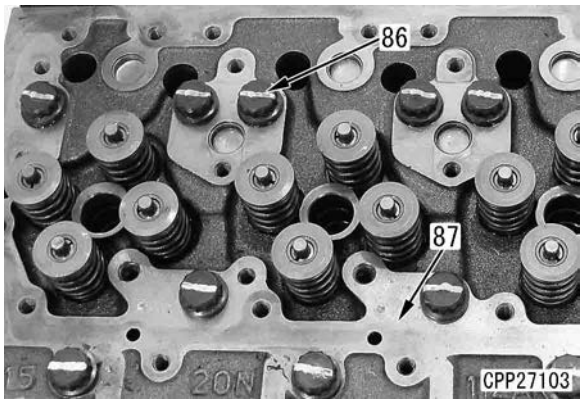

   2) Sling cylinder head assembly (87), and install it onto the cylinder block assembly.

**Cylinder head assembly:**
**60 kg**

   3) Apply molybdenum disulfide lubricant to the threads of cylinder head mounting bolts (86).

**Mounting bolt threads:**
**Lubricant containing molybdenum disulfide (LM-P)**

   ★ Finger-tighten mounting bolt (86) by 2 to 3 threads.




   4) Tighten mounting bolt (86) in the order of [1] to [17] in the following figure and with the following procedures.
   F: Indicates the engine front.
   A: Indicates the engine inlet side.
   B: Indicates engine exhaust side.

**Cylinder head mounting bolt:**
**1st time: 68.6 ± 9.8 Nm {7 ± 1 kgm}**
**2nd time: 107.8 ± 4.9 Nm {11 ± 0.5 kgm}**
**3rd time: Put mark (c) on the bolt head and cylinder head, then turn bolt 90 deg. (+30 deg. / 0 deg.) to tighten.**

   ★ After tightening, put a punch mark (d) on each bolt head to indicate the number of tightening.

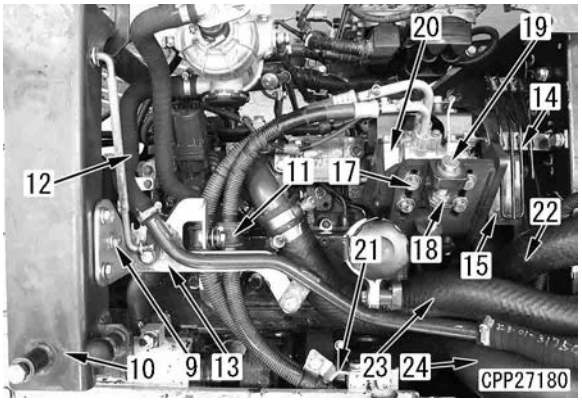
   ★ A bolt which already have 5 punch marks (d) must be replaced without being reused any more.

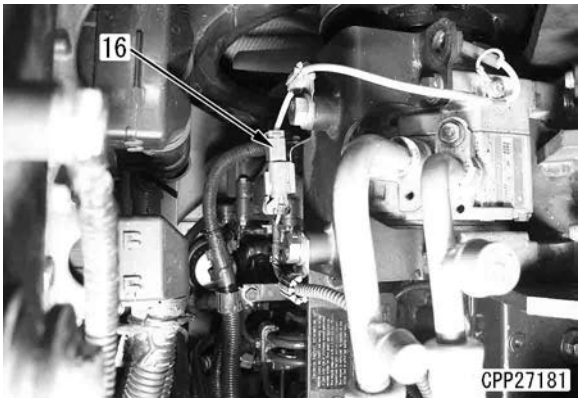
installation of counterweight assembly [For machines without additional counterweight]".
6. Remove bolts (9) (3 pieces) of the bracket and remove frame (10).
7. Disconnect air conditioner hose clamp (11).
8. Disconnect hose (12) and move it toward the machine side together with bracket (13). [*3]
9. Remove fan guard (14) and pulley cover (15).
10. Disconnect solenoid clutch connector AC03 (16).
11. Loosen bolts (17) (4 pieces).
12. Loosen lock nut (18) and rotate jack bolt (19) to slide air conditioner compressor (20) in the direction in which the compressor is loosened.
13. Remove the fan belt. For details, see "Removal and installation of fan belt".
14. Disconnect clamp (21), and move air conditioner compressor (20) to the machine side.

★ Do not disconnect the air conditioner hose.

15. Disconnect hoses (22), (23), and (24). [*4]

★ Make matchmarks on the tube so that it can be reconnected correctly.



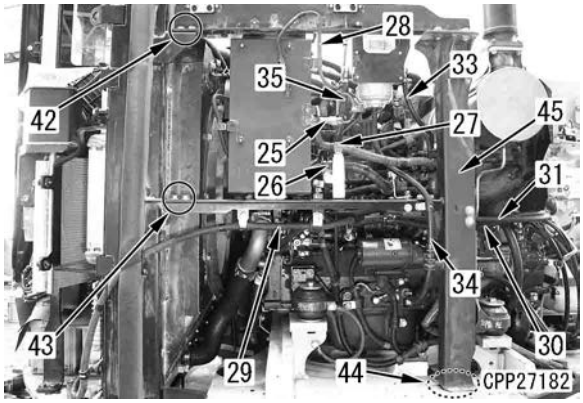



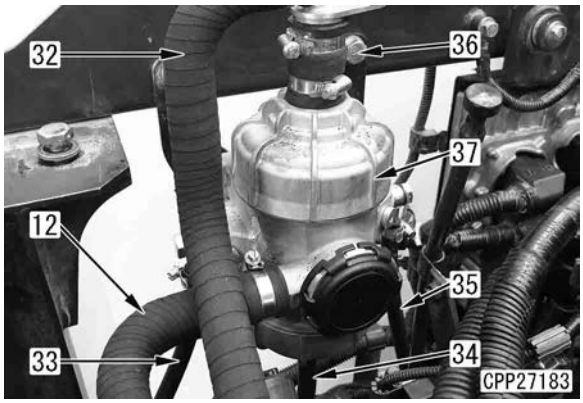

16. Disconnect connector K02 (25).
17. Disconnect clamps (26) and (27).
18. Disconnect camera wiring (28) from the frame.
19. Disconnect fuel hoses (29), (30), and (31) from the frame.
20. Disconnect hoses (32), (33), (34) and (35) of KCCV ventilator. [*5]

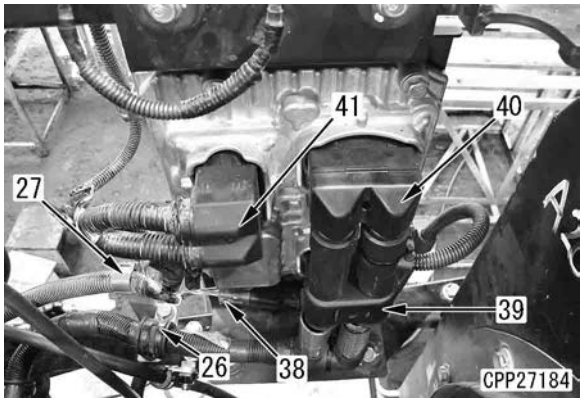
★ Disconnect hoses (33), (34), and (35) on the KCCV ventilator side.

21. Remove mounting bolts (36) (2 pieces) to remove KCCV ventilator (37).
22. Disconnect connector E24 (38).
23. Disconnect connectors J1 (CE01) (39), J2 (CE02) (40), and CE03 (41).
24. Remove mounting bolts (42), (43), and (44) (6 pieces in total) and remove frame (45).

★ Mounting bolts (44) (2 pieces) are indicated on the back side of the figure.




25. Disconnect radiator lower hose (46).
26. Disconnect heater hoses (47).
27. Disconnect fuel hoses (48) and (49).
28. Disconnect engine ground cable (50).
29. Disconnect starter C terminal SC (51) and starter B terminal SB (52). [*6]
30. Disconnect connector E01of the ribbon heater.
31. Disconnect clamps (4 pieces) of wiring harnesses (54) and disconnect the wiring harness.

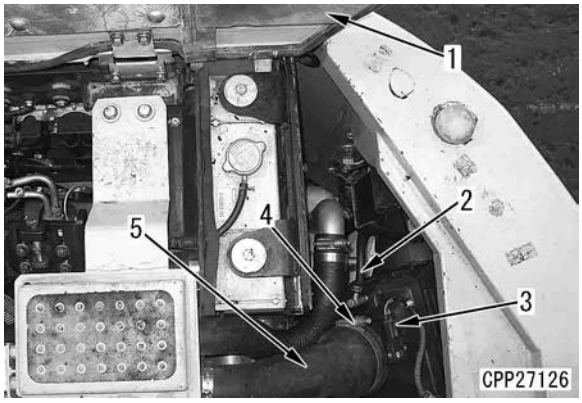
# Removal and installation of air cleaner assembly *(PC220-A910-924-K-00-A)*

**⚠ Turn the battery disconnect switch to the OFF position and remove the key.**

## Removal *(PC138-A910-520-K-00-A)*

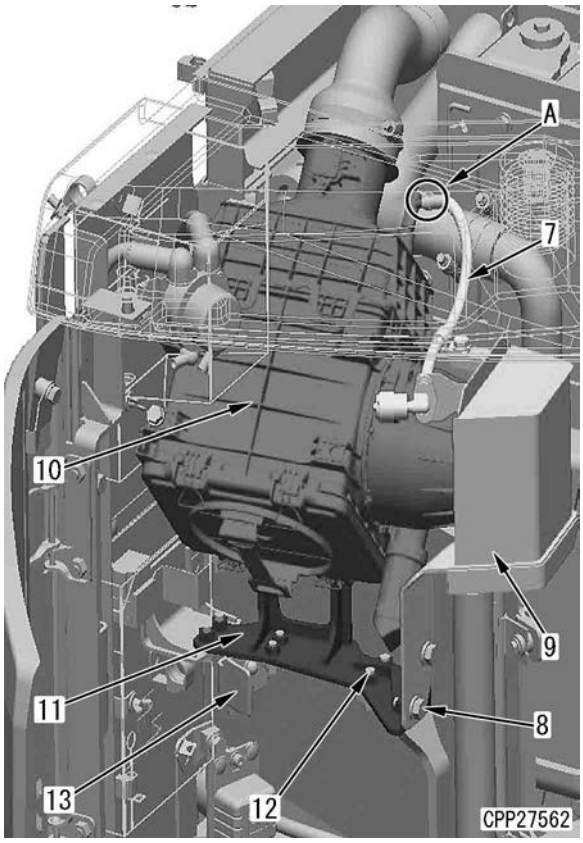
1. Open engine cover (1) and disconnect hose (2) and connector P55 (3) of the dust indicator
2. Loosen clamp (4) to disconnect hose (5). [*1]

   ★ Make matchmarks on the tube so that it can be reconnected correctly.

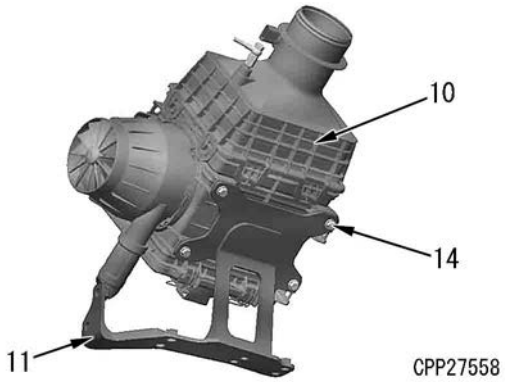



3. Open cover (6) at the rear left of the machine.
4. Disconnect hose (7) from tube (A).
5. Remove mounting bolts (8) (2 pieces), and remove air intake bracket (9).
6. Remove mounting bolts (12) of bracket (11) of air cleaner (10).
7. Remove bracket (13).
8. Remove air cleaner (10) together with bracket (11).

   ★ Be careful not to damage the air conditioner condenser.




9. Remove mounting bolts (14) (4 pieces) to remove air cleaner (10) from bracket (11). [*2]



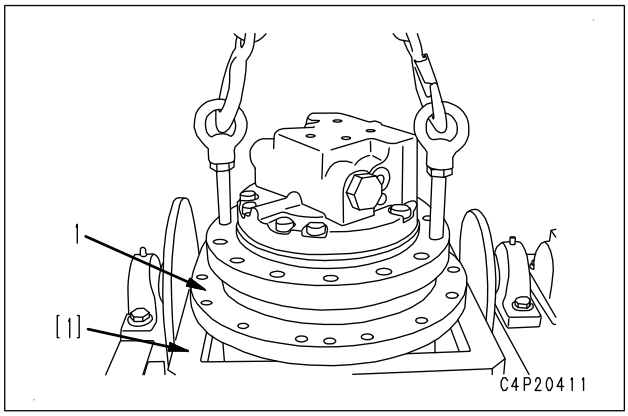

## Installation *(PC138-A910-720-K-00-A)*

- Perform installation in the reverse order of removal.

[*1]

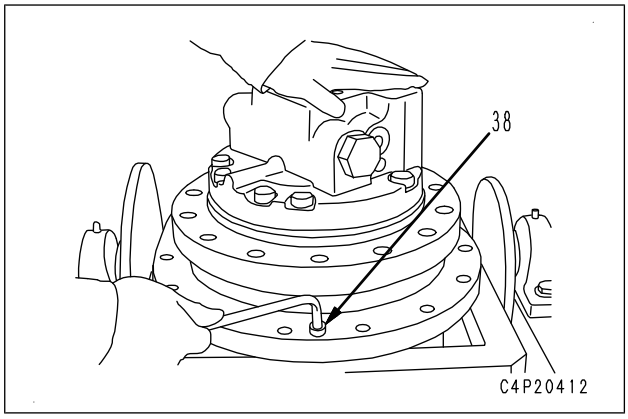
- Insertion position of hose (5) and the clamps must be as shown in the following figure.

  ★ Install the hoses and tubes to the positions marked at removal.



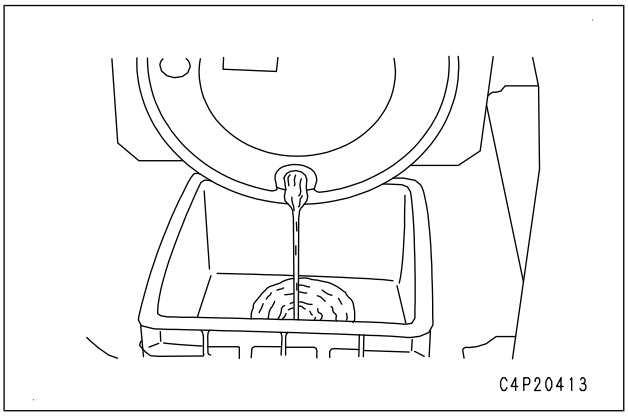

2) Install the hexagonal socket head bolts (2 pieces) symmetrically.

**⚠ Install hexagonal socket head bolts (38) (2 pieces) securely. (To prevent the travel motor assembly from removing when inverting it)**



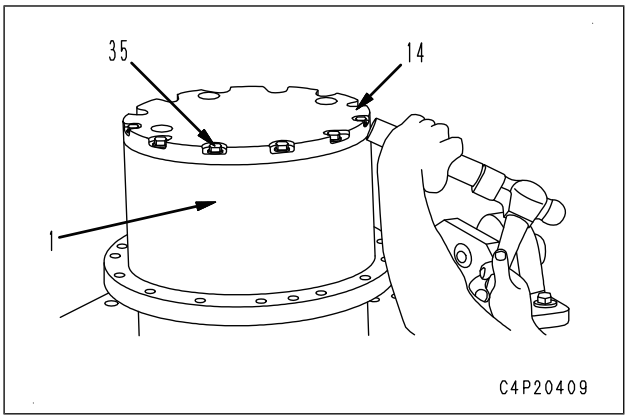

3. Draining oil in final drive case
   1) Place the travel motor assembly sideways so that the drain plug faces downward.
   2) Loosen plug (30) of the oil filler port to release pressure from the case, and then lightly tighten the plug. (See "Component parts figure".)
      ★ If the internal case is pressurized, the oil may spout when loosening the drain plug.
   3) If the does not come out sufficiently, slowly loosen the drain plug.
      ★ Remove O-ring (31) of plug (30). Do not reuse it. (See "Component parts figure".)
      ★ Set the oil pan under the travel motor to receive the oil.

**Final drive case:**
**2.1 ℓ**

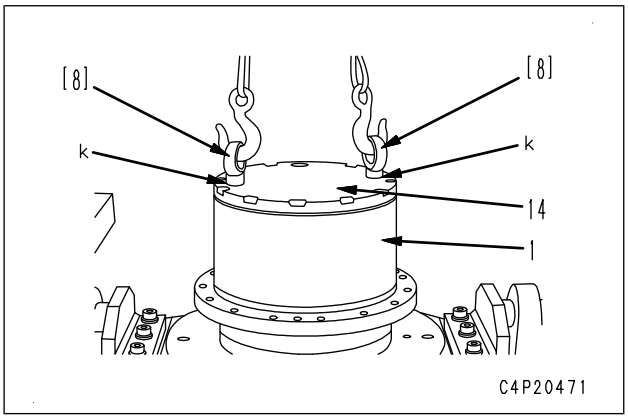



4. Removal of cover
   1) Invert the travel motor assembly so that the final drive faces upward.
   2) Remove bolt (35). Sealant is applied to the mating surfaces of cover (14) and hub (1). Therefore, put a backing metal to the protruding portion of the cover and tap it in diagonally upper direction to remove the cover.

**⚠ When tapping the cover in diagonally upper direction, the cover may leap and fall. Take care not to drop the cover to the foot, etc.**




   3) Install eyebolts [8] to port (k) and lift cover (14) to remove it from hub (1).

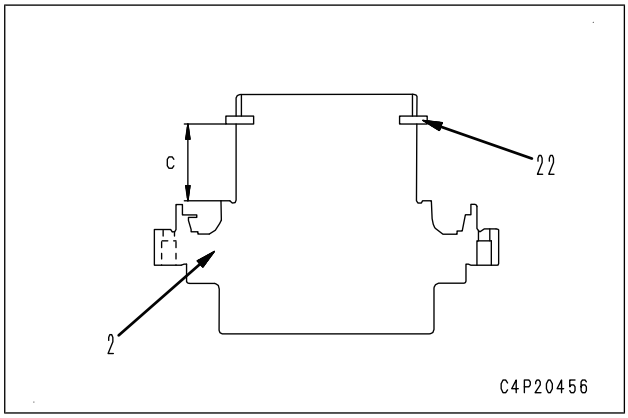



5. Removal of sun gear A

3. Adjustment of preload of ball bearing

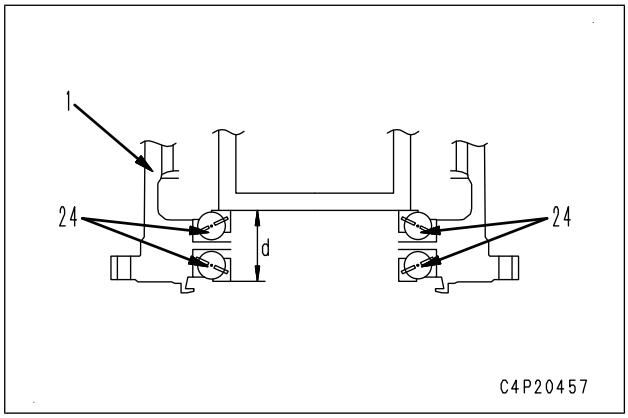
★ When hub (1), ball bearing (24), and spindle (2) have been replaced, adjust the preload. If the preload is not correct, the ball bearing may be damaged early. (See "Component parts figure".)

1) Temporarily install lock washer (22) to spindle (2) and measure dimension (c).




2) Measure installation width (d) of ball bearing (24).

★ Rotate hub (1) and ball bearing (24) a few times to reduce the flotation, and then measure the width.

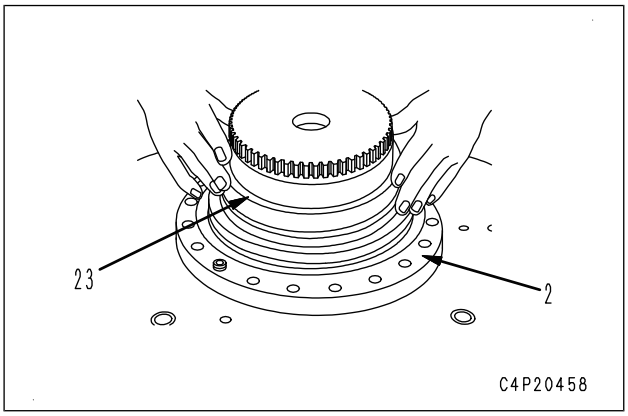



3) Select shim (23) so that clearance (e) is +0.13 to +0.17 mm.

• Clearance (e) = Dimension (c) - (d)

| Code | Thickness (mm) | Code | Thickness (mm) |
|---|---|---|---|
| A | 0.9 | G | 1.5 |
| B | 1.0 | H | 1.6 |
| C | 1.1 | I | 1.7 |
| D | 1.2 | J | 1.8 |
| E | 1.3 | K | 1.9 |
| F | 1.4 | L | 2.0 |

4) Install shim (23) to spindle (2).

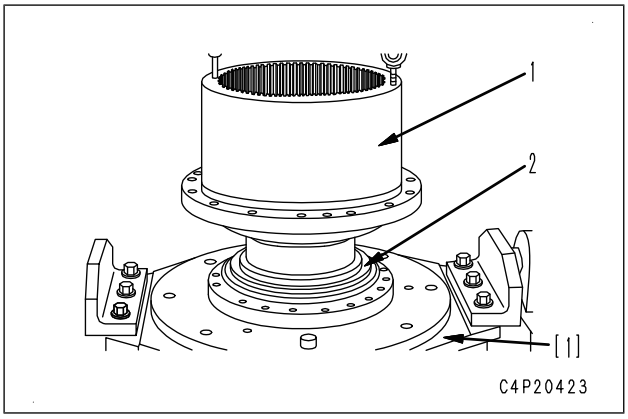


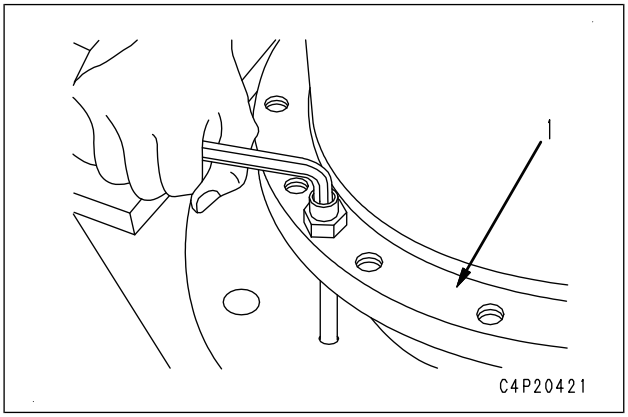

4. Installation of hub

1) Lower hub (1) so that the center shaft of spindle (2) becomes straight and press-fit the hub to ball bearing (24). (See "Component parts figure".)

**Hub (1):**
**50 kg**

2) Fix hub (1) to work stand [1] with hexagonal socket head bolts.
3) Lightly tap ball bearing (24) on the final drive side by using a hammer to reduce the flotation of the ball bearing. (See "Component parts figure".)




4) Invert the work stand and install lock washer (22) to the groove of spindle (2).

## Disassembly and assembly of swing machinery assembly *(PC138-J120-926-K-00-A)*

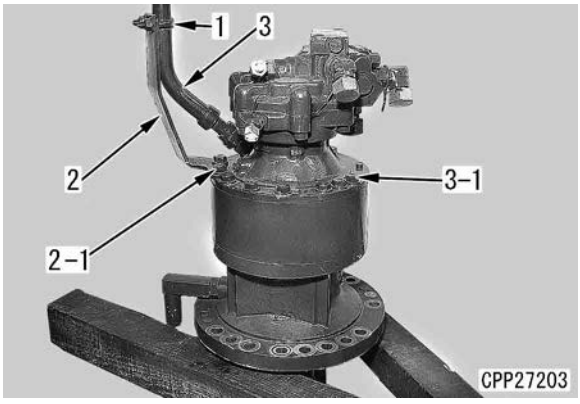
★ Special tools

| Symbol | | Part No. | Part name | Necessity | Q'ty |
|---|---|---|---|---|---|
| F | 1 | 790-201-2750 | Spacer | ■ | 1 |
| | 2 | 790-101-2501 | Push puller kit | ● | 1 |
| | | 790-101-2510 | • Block | | 1 |
| | | 790-101-2550 | • Leg | | 1 |
| | | 790-101-2560 | • Nut | | 2 |
| | | 790-101-2570 | • Plate | | 4 |
| | | 790-101-3101 | • Bearing puller | ● | 1 |
| | | 790-101-4200 | • Puller (294 kN {30 ton}) | ● | 1 |
| | | 790-101-1102 | Hydraulic pump | ● | 1 |
| | 3 | 790-101-5401 | Push tool kit (C) | ● | 1 |
| | | 790-101-5461 | • Plate | | 1 |
| | | 790-101-5441 | • Plate | | 1 |
| | | 790-101-5421 | • Grip | | 1 |
| | | 01010-51240 | • Bolt | | 1 |
| | 4 | 790-201-2850 | Spacer | ■ | 1 |
| | 5 | 790-201-2750 | Spacer | ■ | 1 |
| | 6 | 796T-426-1140 | Push tool | ■ | 1 |
| | | 790-201-2680 | Plate | ● | 1 |

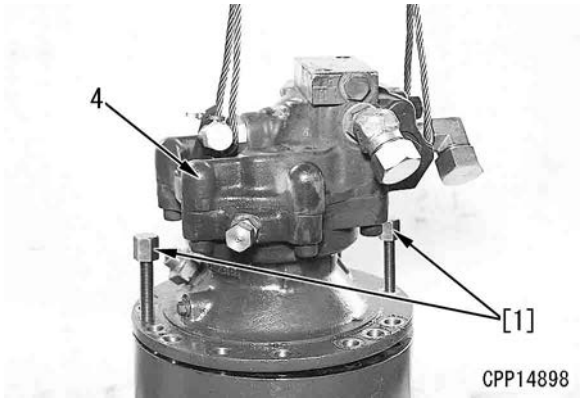
## Disassembly *(PC138-J120-530-K-01-A)*

1. Draining oil
   Remove the drain plug to drain the oil in the swing machinery.

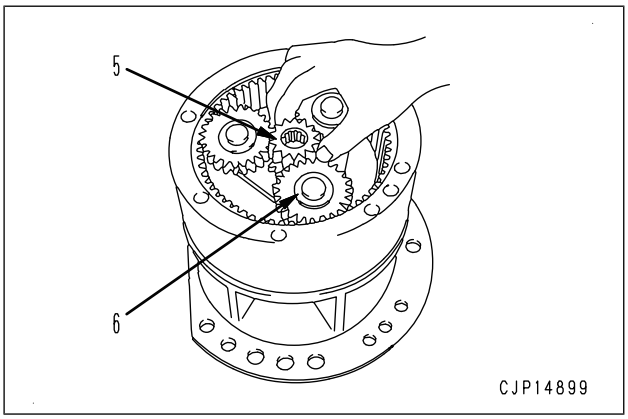
   **Swing machinery case:**
   **2.5 ℓ**
2. Swing motor assembly
   1) Remove U-bolt (1).
   2) Remove bracket mounting bolts (2-1) (2 pieces) and remove bracket (2).
   3) Remove oil filler pipe (3).
   4) Remove swing motor mounting bolts (3-1) (11 pieces).



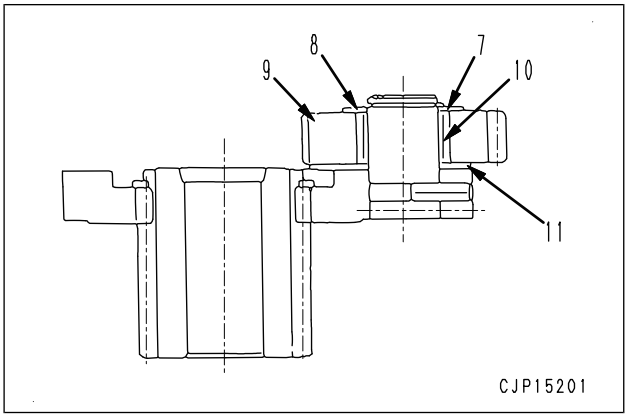

   5) By using forcing screws [1], disconnect swing motor assembly (4).
   6) Sling swing motor assembly (4), and remove it.



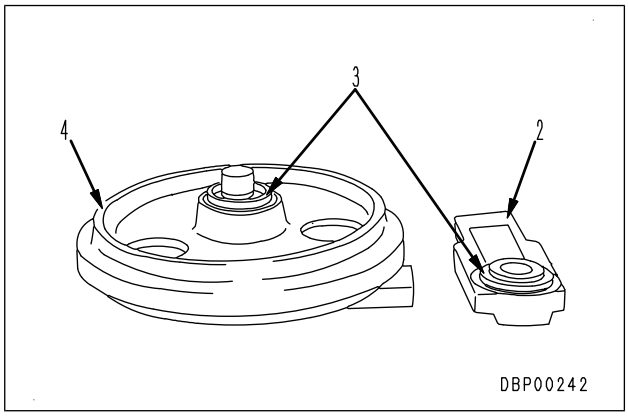

3. No.1 carrier and No.2 sun gear assembly
   1) Remove No.1 sun gear (5).
   2) Remove No.1 carrier and No.2 sun gear assembly (6).

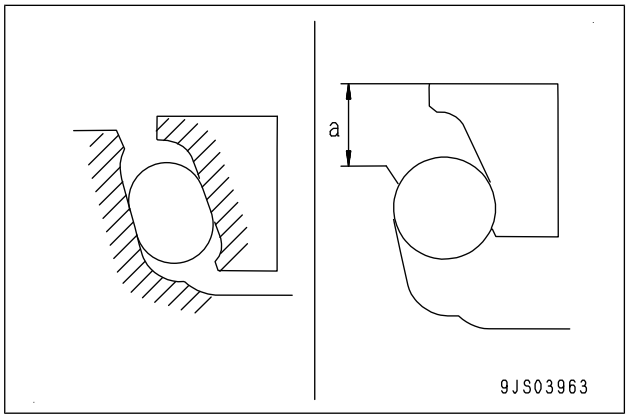



   3) Disassembly of No.1 carrier and No.2 sun gear assembly
      1] Remove snap ring (7) to remove thrust washer (8), gear (9), bearing (10), and thrust washer (11).

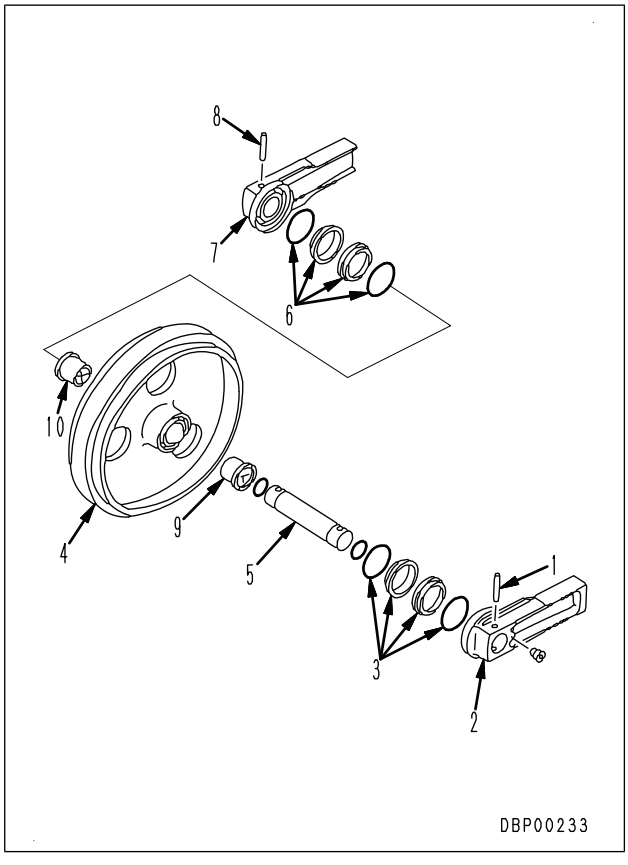



      2] Drive in pin (12) to remove shaft (13).
         ★ After removing the shaft, remove pin (12).
      3] Remove snap ring (14) and remove No.2 sun gear (15) from carrier (16).




7. Install O-ring and install support (2) with dowel pin (1).



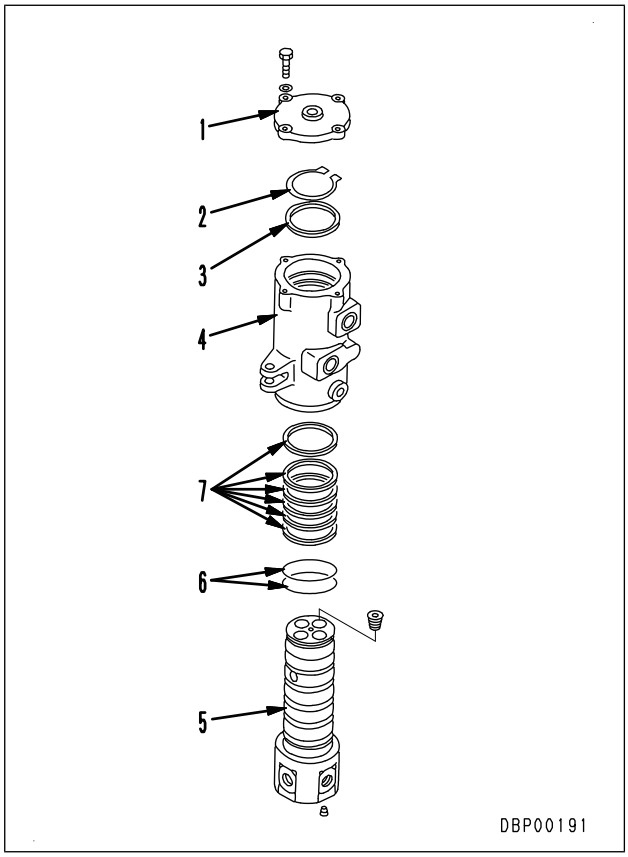
# Disassembly and assembly of center swivel joint assembly *(PC138-J8E0-926-K-00-A)*

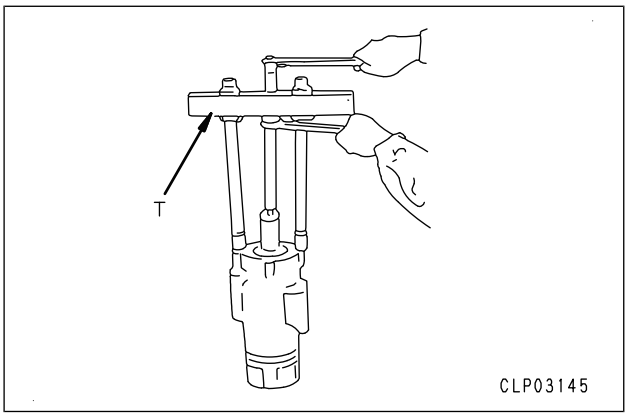
★ Special tools

| Sym-bol | Part No. | Part name | Necessity | Q'ty |
|---|---|---|---|---|
| T | 790-101-2501 | Push puller | ● | 1 |
| | 790-101-2510 | • Block | | 1 |
| | 790-101-2520 | • Screw | | 1 |
| | 790-101-2540 | • Washer | | 1 |
| | 791-112-1180 | • Nut | | 1 |
| | 790-101-2630 | • Leg | | 2 |
| | 790-101-2570 | • Washer | | 4 |
| | 790-101-2560 | • Nut | | 2 |
| | 790-101-2650 | • Adapter | | 2 |

## Disassembly *(PC138-J8E0-530-K-00-A)*

1. Remove cover (1).
2. Remove snap ring (2).
3. Pull out swivel rotor (4) and ring (3) from swivel shaft (5) by using tool T.
4. Remove O-ring (6) and slipper seal (7) from the swivel shaft.




## Assembly *(PC138-J8E0-710-K-00-A)*

1. Install slipper seal (7) and O-ring (6) to swivel rotor (4).
2. Set swivel shaft (5) to the block and install swivel rotor (4) by using the push tool while tapping it by using a hammer.

**Mating surfaces of rotor and shaft**
**Grease (G2-LI)**

★ Be careful not to damage slipper seal (7) and O-ring (6) when installing the rotor.

3. Install ring (3) and fix it with snap ring (2).
4. Install cover (1) together with the O-ring.

**Mounting bolt:**
**31.3 ± 2.9 Nm {3.2 ± 0.3 kgm}**

**Hydraulic tank:**

**69 ℓ (specified capacity: 120 ℓ For details, see "Table of fuel, coolant and lubricants")**

**Drain plug:**

**58.8 to 78.4 Nm {6.0 to 8.0 kgm}**

# Removal and installation of anti-drop valve for arm assembly *(PC138-LA1B-924-K-00-A)*

**⚠ Place the machine on a level ground.**

**⚠ Remove the anti-drop valve assembly from the machine body, and then perform disassembling of the anti-drop valve assembly.**

**⚠ High pressure may remain in the anti-drop valve assembly even after performing normal releasing procedure. Be sure to perform this procedure, and then perform the releasing procedure.**

**⚠ Anti-drop valve assembly is installed to the high place. Set the scaffolding and wear the safety belt always when performing this work.**

**⚠ When the arm cylinder moves only in one direction inside the anti-drop valve for arm, operate the cylinder to the stroke end in a movable direction. Lower the bucket to the ground, and then perform releasing the remaining pressure.**

**⚠ If the arm cylinder is not at the stroke end and it is removed from the cylinder of the anti-drop valve, it is very dangerous.**

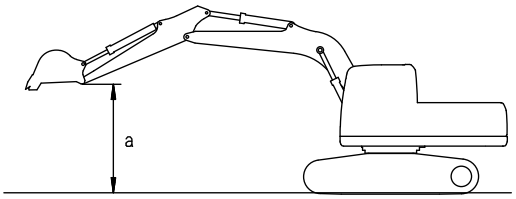
★ Wash around the anti-drop valve assembly in order to prevent any dust or dirt from entering it, and then perform the work.

★ Install a plug or flange in the place where a hydraulic hose is disconnected to prevent oil from flowing out.

★ Check the connector numbers and installed positions before disconnecting wirings and hoses, and record them.

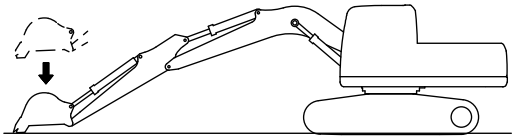
## Removal *(PC138-LA1B-520-K-00-A)*

1. Check for the function of PPC circuit accumulator.
   1) Set the arm cylinder and bucket cylinder to the most retracted position (maximum arm OUT/bucket DUMP position), and hold the work equipment at the height (a) off from the ground.
      ★ (a) : 1.5 m




B4P34032

   2) Keep the arm cylinder and bucket cylinder at the most retracted position. Turn the starting switch to OFF position to stop the engine.
   3) Turn the starting switch to ON position.
   4) Set the work equipment lock lever in FREE position.
   5) Check that the work equipment is lowered to the ground by slowly operating the work equipment control lever to the boom LOWER direction fully to the stroke end.



B4P34033

**⚠ Perform the step3. to 5 in 15 seconds after the engine stopped, since the battery charge in the PPC accumulator lowers gradually.**

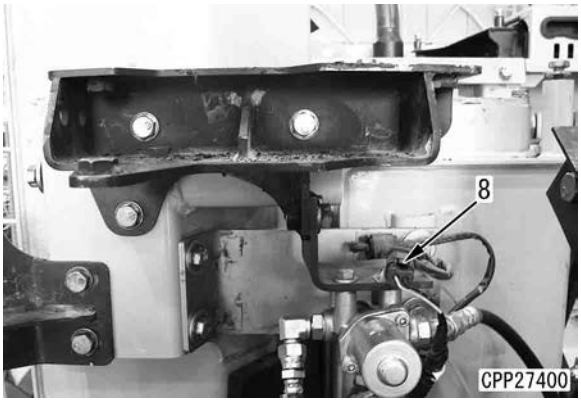
**⚠ If the work equipment is not lowered or stops on the way, the battery charge of the PPC accumulator may be lowered. In such case, the remaining pressure cannot be released with this procedure.**

★ If the work equipment is lowered by its own weight to the ground, the battery charge of the PPC accumulator is normal.

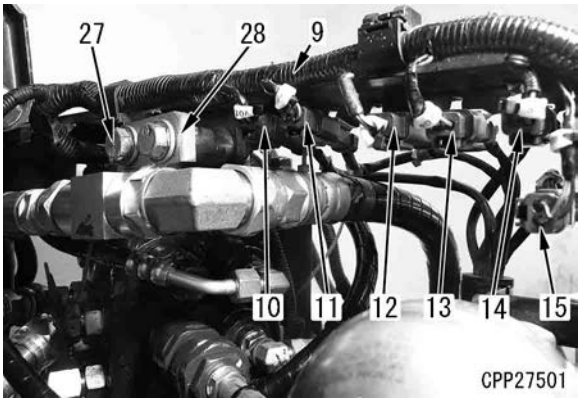
★ PPC accumulator is a periodic inspection item and an important periodic replacement part.

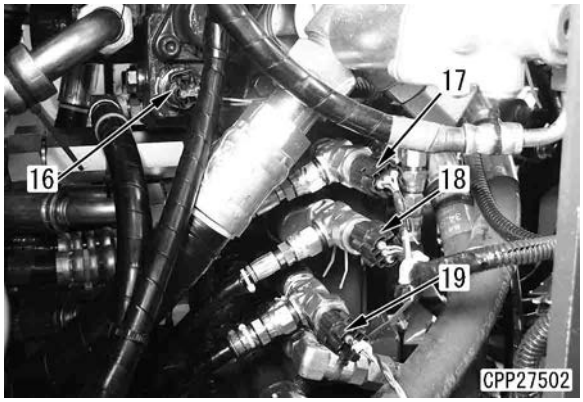
2. Releasing the remaining pressure in hydraulic cylinder circuit

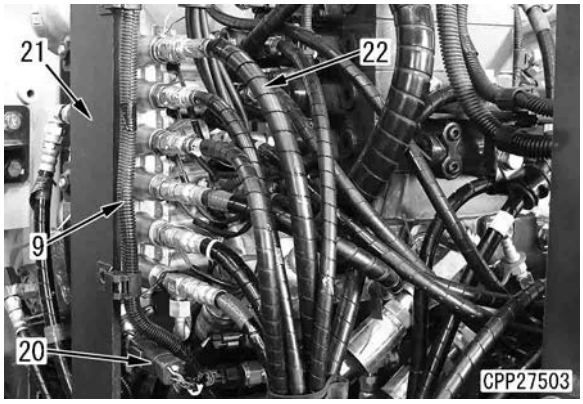
**Dove tails, stopper:**
**Grease (G2-L1)**




2) Disconnect connectors (10) to (20) around the solenoid valve connected to wiring harness (9).
(10): V01 (PPC source pressure solenoid valve)
(11): V02 (Travel HI/LO solenoid valve)
(12): V03 (Swing parking brake solenoid valve)
(13): V04 (Travel junction valve solenoid valve)
(14): V05 (Merge-divider selector solenoid valve)
(15): V06 (Attachment return selector solenoid valve)
(16): P25 (Pump pressure sensor)
(17): P26 (R. H. travel REVERSE pressure sensor)
(18): P27 (L. H. travel REVERSE pressure sensor)
(19): P28 (Blade RAISE pressure sensor)
(20): P29 (Intermediate connector)
3) Remove the harness mounting clamp and disconnect wiring harness (9) from solenoid valve mounting frame assembly (21).
4) Disconnect PPC source pressure hose (22) (color band: red/green).




5. Disconnection of wiring of pressure switch and pressure sensor connector
1) Disconnect connectors (24) to (31) connected to wiring harness (23).
(24): P01 (Bucket DUMP switch)
(25): P02 (Arm OUT switch)
(26): P03 (Boom RAISE switch)
(27): P04 (Bucket CURL switch)
(28): P05 (Arm IN switch)
(29): P06 (Boom LOWER switch)
(30): P07 (Right Swing switch)
(31): P08 (Left Swing switch)
(If the multi pattern valve is equipped.)
(32): P67 (Right Swing switch)
(If the multi pattern valve is equipped.)

★ Connector P67 is connected to connector P07.

★ Connector P08 of the machine that is not equipped with the multi pattern valve assembly is located under connector P07 in the mounting bracket.

(33): P12 (Intermediate connector)
2) Remove the wiring harness mounting clamp and disconnect wiring harness (23) from pressure switch connector mounting bracket (34).

# Removal and installation of operator's seat *(PC138-K2Q0-924-K-00-A)*

**⚠ Place the machine on a level ground, lower the work equipment to the ground in a stable posture, and stop the engine.**

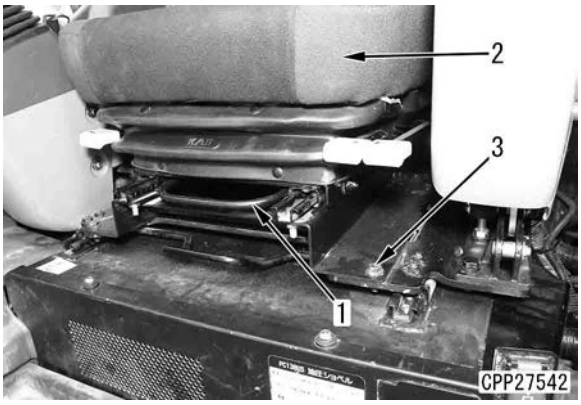
**⚠ Turn the battery disconnect switch to OFF position, and remove the key.**

**⚠ Removal and installation work must be done by a pair of workers.**

★ Note the connector numbers and installed positions before disconnecting wiring harnesses and hoses.

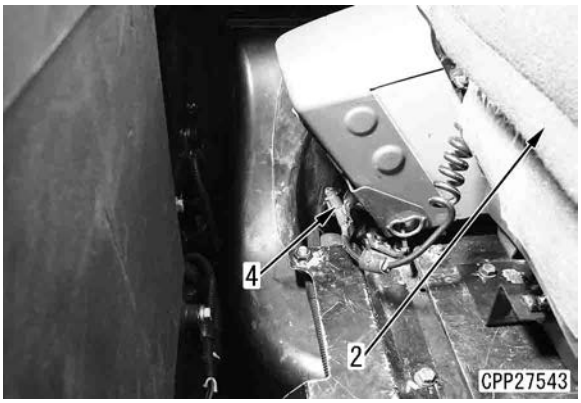
## Removal *(PC138-K2Q0-520-K-00-A)*

1. Pull lever (1) to your side and move operator's seat (2) backward.
2. Remove mounting bolts (3) (4 pieces).
   ★ Move the operator's seat forward, and remove mounting bolts (2 pieces) at the rear.




3. Disconnect connector S19 (4) at the rear of the operator's seat.
4. Remove operator's seat (2) while slowly lifting it by 2 persons.

**Operator's seat assembly:**
**30 kg**




## Installation *(PC138-K2Q0-720-K-00-A)*

- Perform installation in the reverse order of removal.

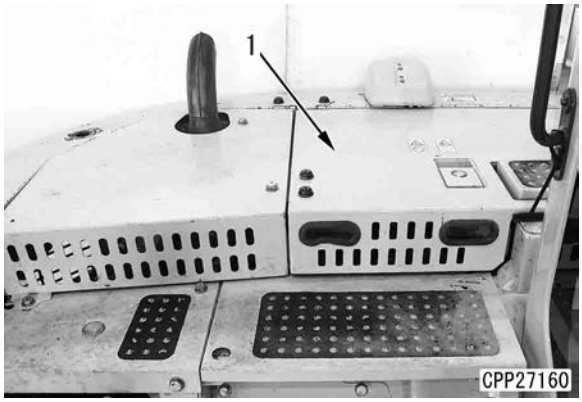
# Removal and installation of mass air flow and temperature sensor *(PC138-A96H-924-K-00-A)*

**⚠ Place the machine on a level ground, lower the work equipment to the ground, and stop the engine.**

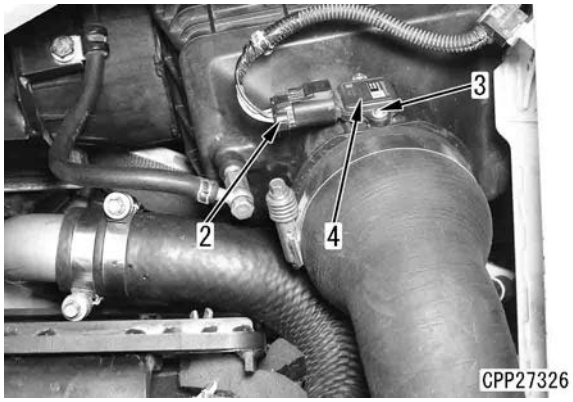
**⚠ Turn the battery disconnect switch to OFF position, and remove the key.**

## Removal *(PC138-A96H-520-K-00-A)*

1. Open engine cover (1).



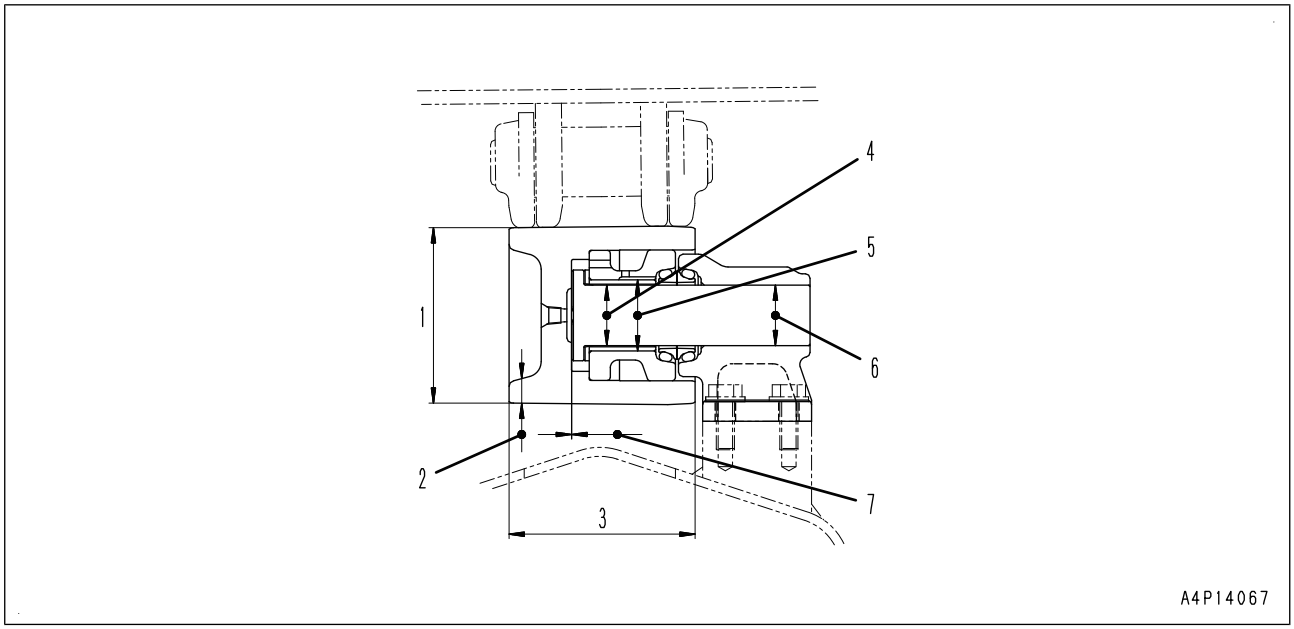

2. Disconnect connector P55 (2) between the air cleaner and hose.
3. Remove mounting bolts (3) to remove mass air flow and temperature sensor (4).




## Installation *(PC138-A96H-720-K-00-A)*

- Perform installation in the reverse order to removal.

## Carrier roller *(PC138-DTJ0-034-K-00-A)*




Unit: mm

| No. | Item | Criteria | | | | | Remedy |
|---|---|---|---|---|---|---|---|
| 1 | Outside diameter of tread | Standard dimension | | | Repair limit | | Rebuild by build-up welding or replace |
| | | 116 | | | 106 | | |
| 2 | Thickness of tread (Measure at 10 mm from outside end face of roller) | 17.7 | | | 12.7 | | |
| 3 | Width of tread | 123 | | | — | | — |
| 4 | Clearance between shaft and bushing | Standard dimension | Tolerance | | Standard clearance | Allowable clearance | Replace bushing |
| | | | Shaft | Hole | | | |
| | | 40 | +0.055<br>+0.035 | +0.261<br>+0.200 | 0.145 to 0.226 | — | |
| 5 | Interference between collar and bushing | Standard dimension | Tolerance | | Standard interfer-ence | Allowable interfer-ence | |
| | | | Shaft | Hole | | | |
| | | 47 | +0.061<br>+0.036 | +0.025<br>0 | 0.011 to 0.061 | — | |
| 6 | Interference between shaft and collar | 40 | +0.055<br>+0.035 | +0.005<br>-0.020 | 0.030 to 0.075 | — | Replace |
| 7 | Axial play of roller | Standard clearance | | | Allowable clearance | | |
| | | 0.36 to 0.54 | | | — | | |

Unit: mm

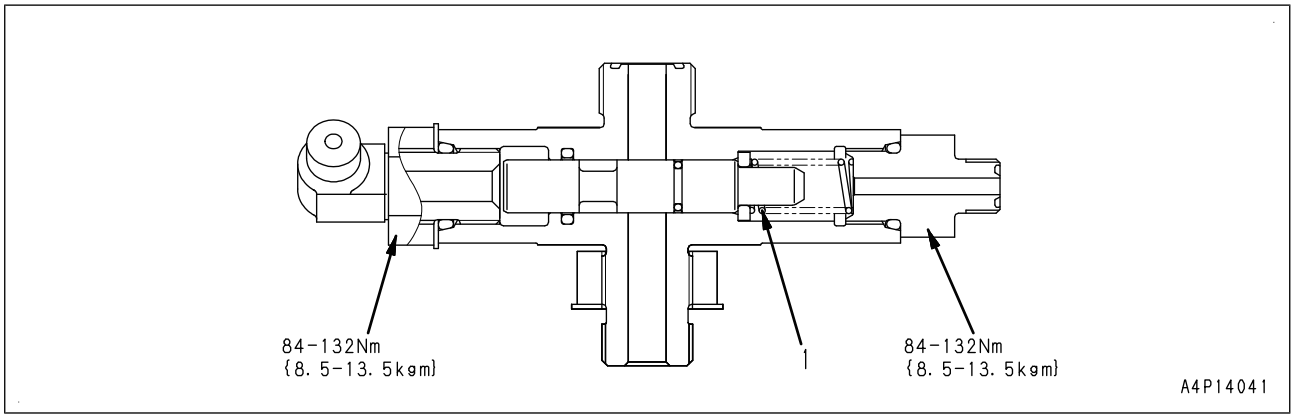
| No. | Item | Criteria | | | | | Remedy |
|---|---|---|---|---|---|---|---|
| | | Standard dimension | | | Repair limit | | |
| 1 | Check valve spring | Free length x Outside diameter | Installed length | Load at installed length | Free length | Load at installed length | Replace spring if damaged or deformed |
| | | 41.5 x 8.5 | 31.5 | 5.88 N {0.6 kg} | — | 4.71 N {0.48 kg} | |
| 2 | Check valve spring | 20.3 x 13.7 | 16 | 2.94 N {0.3 kg} | — | 2.35 N {0.24 kg} | |

Unit: mm

| No. | Item | Judgment criteria | | | | | Remedy |
|---|---|---|---|---|---|---|---|
| | | Standard dimensions | | | Repair limit | | |
| 1 | Check valve spring | Free length x outside diameter | Installed height | Load at installed height | Free length | Load at installed height | Replace (Replace spring if damaged or deformed as well) |
| | | 24.5×11.6 | 18 | 4.9 N {0.5 kg} | — | 3.9 N {0.4 kg} | |
| 2 | Spool return spring | 31.75×8.5 | 25 | 29.4 N {3.0 kg} | — | 23.5 N {2.4 kg} | |
| 3 | Spool return spring | 30.90×20.-6 | 29 | 69.6 N {7.1 kg} | — | 55.7 N {5.7 kg} | |

# Attachment circuit selector valve (for high pressure circuit) *(PC138-PQJ5-034-K-00-A)*

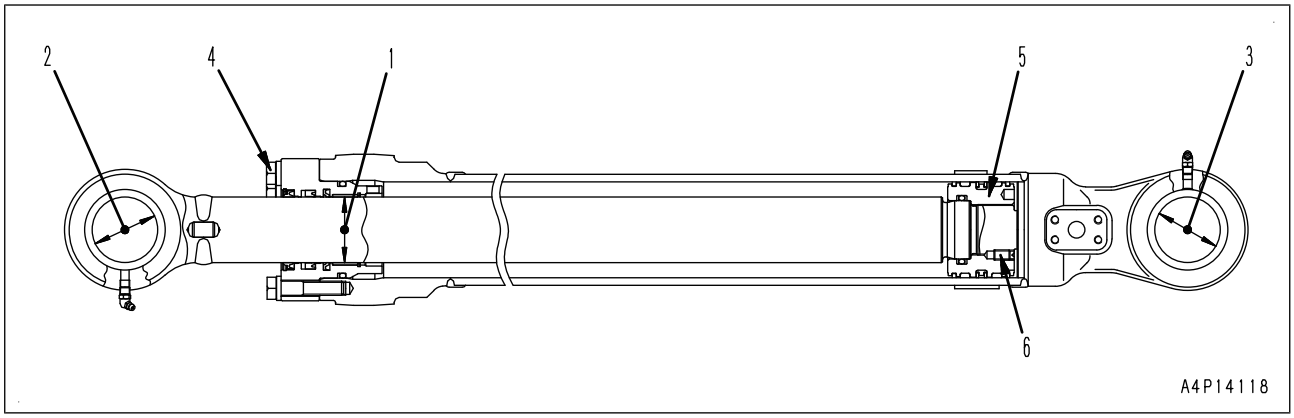
(Machines ready for installation of attachment)




Unit: mm

| No. | Item | Criteria | | | | | Remedy |
|---|---|---|---|---|---|---|---|
| | | Standard dimension | | | Repair limit | | |
| 1 | Spool return spring | Free length x Outside diameter | Installed length | Load at installed length | Free length | Load at installed length | Replace spring if damaged or deformed |
| | | 33.4 x 11.2 | 27.3 | 28.7 N {2.93 kg} | — | 22.9 N {2.34 kg} | |

## Bucket cylinder *(PC138-LCD0-034-K-00-A)*

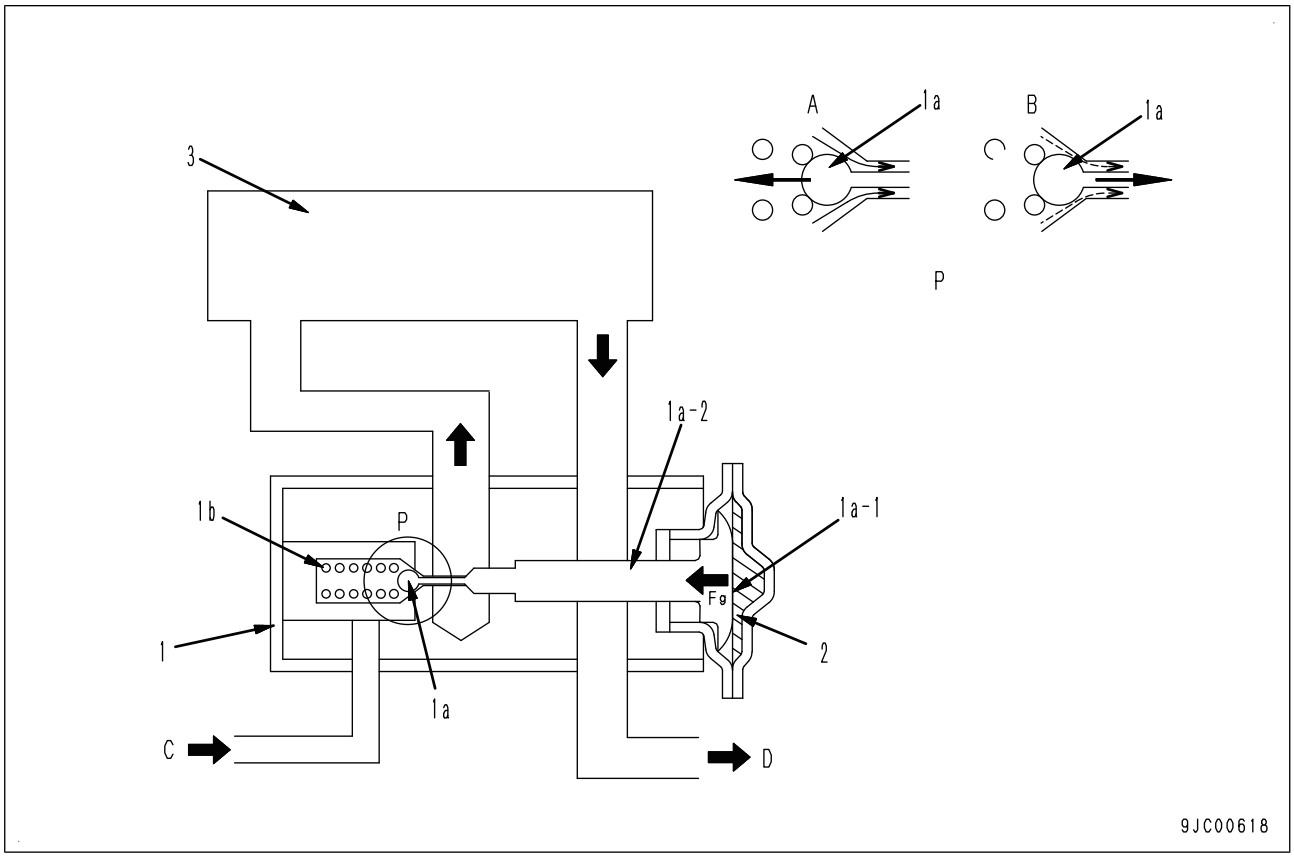



Unit: mm

| No. | Item | Criteria | | | | | Remedy |
|---|---|---|---|---|---|---|---|
| | | Standard dimension | Tolerance | | Standard clearance | Allowable clearance | |
| | | | Shaft | Hole | | | |
| 1 | Clearance between piston rod and bushing | 65 | -0.030<br>-0.076 | +0.250<br>+0.055 | 0.085 to 0.326 | 0.426 | Replace bushing |
| 2 | Clearance between piston rod support shaft and bushing | 65 | -0.030<br>-0.080 | +0.170<br>+0.070 | 0.100 to 0.250 | 1.0 | Replace pin or bushing |
| 3 | Clearance between cylinder bottom support shaft and bushing | 65 | -0.030<br>-0.080 | +0.170<br>+0.070 | 0.100 to 0.250 | 1.0 | |
| 4 | Tightening torque of cylinder head bolt | 172 ± 24.5 Nm {17.5 ± 2.5 kgm} | | | | | Retighten |
| 5 | Tightening torque of cylinder piston | 294 ± 29.4 Nm {30.0 ± 3.0 kgm} | | | | | |
| 6 | Tightening torque of cylinder piston lock screw | 27.5 to 34.3 Nm {2.8 to 3.5 kgm} | | | | | |

★ Do not try to drive a servomotor by supplying power directly between servomotor terminals (6) and (7) during inspection.

### Expansion valve *(ALL-K548-041-K-00-A)*




A: When evaporator outlet temperature is high

B: When evaporator outlet temperature is low

C: From capacitor (high-pressure refrigerant)

D: To compressor (low-pressure refrigerant)

1. Expansion valve

1a. Needle valve

1a-1. Diaphragm

1a-2. Thermoprobe

1b. Spring

2. Refrigerant gas

3. Evaporator

**Structure**

- Box-type expansion valve (1) consists of needle valve (1a), spring (1b), etc.
- Refrigerant gas (2) is sealed in the diaphragm chamber (hatched area) outside diaphragm (1a-1) of needle valve (1a).

### Function *(ALL-K548-042-K-00-A)*

- The expansion valve (1) converts high-pressure and high-temperature liquid refrigerant from the receiver drier to low-pressure, low-temperature misty refrigerant through the throttle action.
- It controls the flow rate of refrigerant by changing the level of throttling depending on the temperature in the cab.
- The temperature of the air blown out of the air vent is adjusted depending on the flow rate of refrigerant circulating in the evaporator (3).

## Input and output signals of the air conditioner controller *(ALL-K5G4-03C-K-00-A)*

Controller connector: AMP 025 - 32PM

Wiring harness connector: ACECU

AMP025 - 32PF

| Pin No. | Symbol | Signal name | Input/Output signal |
|---|---|---|---|
| 1 | +Bback | Backup power supply | Input |
| 2 | – | (*1) | – |
| 3 | SS | Sunlight sensor | Input |
| 4 | THOUT | Outside air temperature sensor | Input |
| 5 | THF | Evaporator temperature sensor | Input |
| 6 | THI | Inside air temperature sensor | Input |
| 7 | POT5 V | Servomotor potentiometer power supply (5 V) | Output |
| 8 | BWFB | Blower feedback signal | Input |
| 9 | PTRB | Power transistor control signal | Output |
| 10 | CAN_H | CAN communication signal (H) | Input/output |
| 11 | CAN_L | CAN communication signal (L) | Input/output |
| 12 | – | (*1) | – |
| 13 | MRFA | Fresh/recirculated air servomotor terminal A | Output |
| 14 | MRFB | Fresh/recirculated air servomotor terminal B | Output |
| 15 | MAMA | Air mix servomotor terminal A | Output |
| 16 | MAMB | Air mix servomotor terminal B | Output |
| 17 | +24 V | 24 V power supply | Input |
| 18 | – | (*1) | – |
| 19 | SAM | Air mix servomotor potentiometer signal | Input |
| 20 | SVI | Vent (mode) changeover servomotor potentiometer signal | Input |
| 21 | PRESS SW | Dual pressure switch | Input |
| 22 | – | (*1) | – |
| 23 | – | (*1) | – |
| 24 | – | (*1) | – |
| 25 | GNDS | Sensor GND | Input |
| 26 | GND | GND | Input |
| 27 | – | (*1) | – |
| 28 | – | (*1) | – |
| 29 | RLCC | Compressor clutch relay | Output |
| 30 | – | (*1) | – |
| 31 | MV1A | Vent (mode) changeover servomotor terminal A | Output |
| 32 | MV1B | Vent (mode) changeover servomotor terminal B | Output |

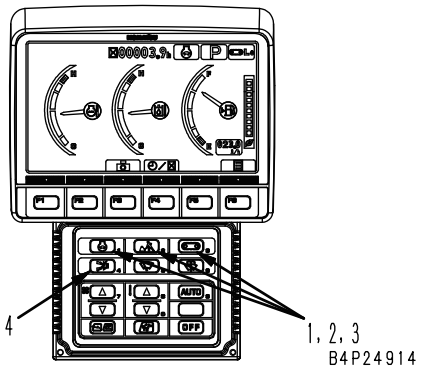
*1: Never connect these pins. Malfunctions or failures may occur.

## Function *(ALL-K5G4-042-K-00-A)*

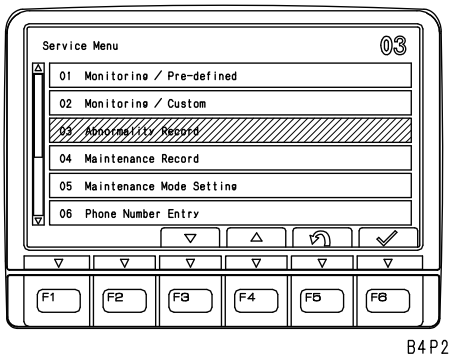
- Operation of air conditioner controller

1. Performing CAN communication with the machine monitor, the air conditioner controller controls the air conditioner unit by inputting switches associated with air conditioning.
2. The air conditioner controller controls three servomotors located inside the air conditioner unit in order to adjust the temperature (airmix), perform vent (mode) changeover, and perform FRESH/RECIRC air changeover.
3. The air conditioner controller controls the ON/OFF condition of the compressor clutch relay (i.e., a switch for activating the compressor).
4. The air conditioner controller controls the air flow volume using the power transistor.

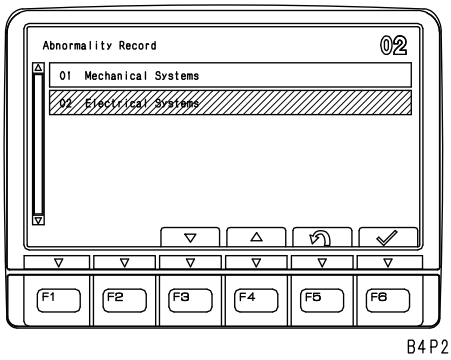
★ The power transistor has an overcurrent prevention fuse in it.




3. Press [F3] twice on the Service Menu screen to select 03 "Abnormality Record".
4. Validate the selection by pressing [F6].




5. Press [F3] once on the Failure Record screen to select 02 "Electrical System Abnormality Record".
6. Validate the selection by pressing [F6].




★ **For details, see the failure code list related to air conditioner.**

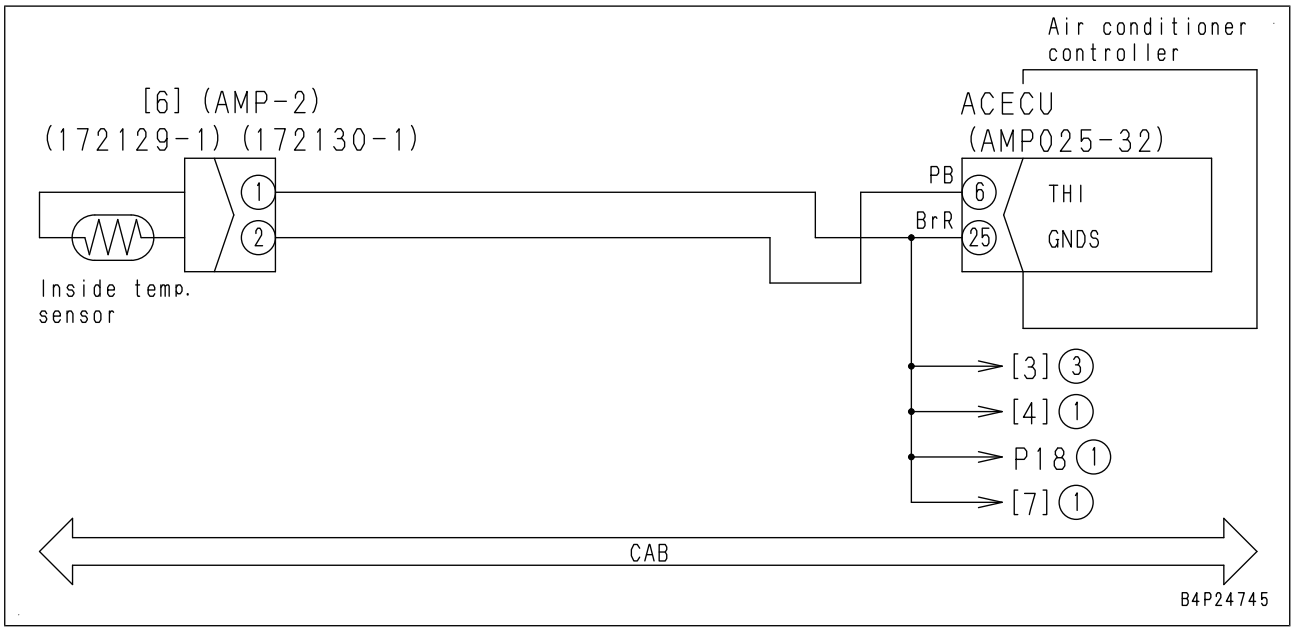
| Failure code | Failure (Displayed on screen) | Remarks |
|---|---|---|
| 879AKA | Air Conditioner Inner Sensor Open Circuit | * |
| 879AKB | Air Conditioner Inner Sensor Short Circuit | |
| 879BKA | Air Conditioner Outer Sensor Open Circuit | |
| 879BKB | Air Conditioner Outer Sensor Short Circuit | |
| 879CKA | Ventilating Sensor Open Circuit | * |
| 879CKB | Ventilating Sensor Short Circuit | |
| 879DKZ | Sunlight Sensor Open or Short Circuit | |

# Failure code [879AKA] A/C Inner Sensor Open Circuit *(PC138-879AKA-400-A-Z0-A)*

| Action level | Failure code | Failure | Open circuit in air conditioner inside air temperature sensor |
|---|---|---|---|
| — | 879AKA | | (Machine monitor system) |
| Detail of failure | • Air conditioner controller detected open circuit in inside (air) temperature sensor. | | |
| Action of controller | • The air conditioner controller sends information about the inside (air) temperature sensor open circuit to the machine monitor via CAN communication.<br>• Stops the air conditioner if it is in automatic mode. | | |
| Problem on machine | • The air conditioner does not operate in automatic mode because of a short circuit in the air conditioner inside air temperature sensor.<br>(The air conditioner can be operated in manual mode) | | |
| Related information | • Method of reproducing failure code: Turn starting switch to ON position.<br>• Check whether this failure code is displayed on the electrical system abnormality record screen in service mode of the machine monitor. | | |

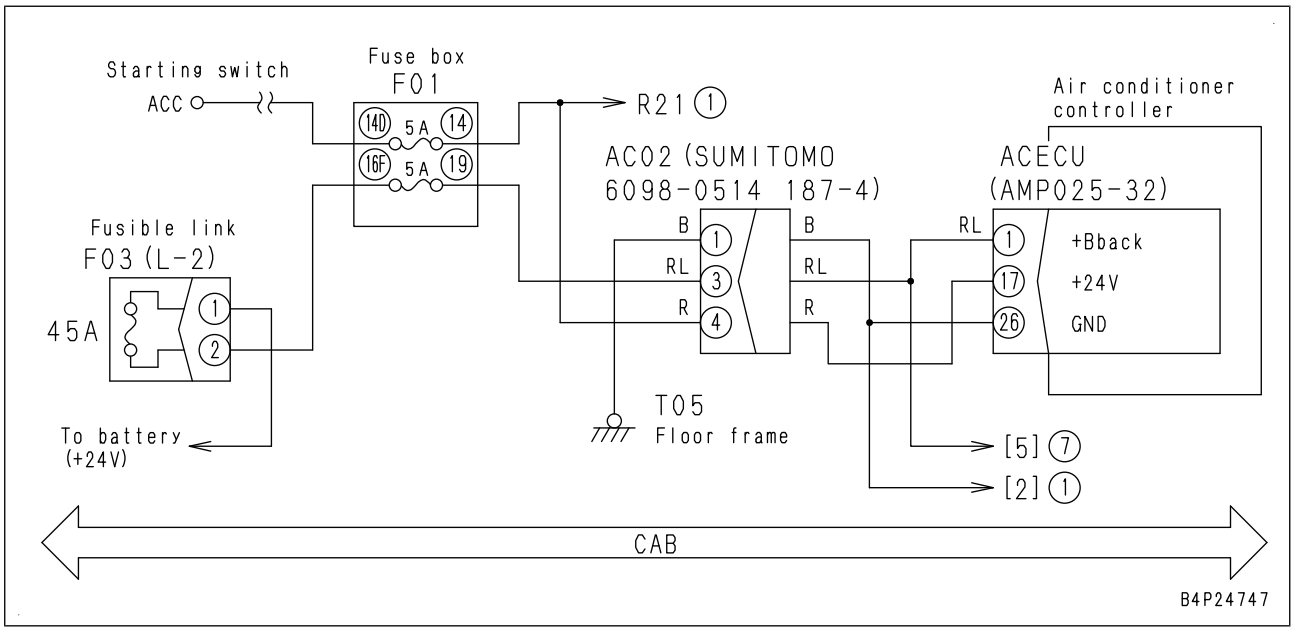
| No. | Cause | Procedure, measuring location, criteria, and remarks | | | |
|---|---|---|---|---|---|
| 1 | Defective inside air temperature sensor<br>(Replacement of air conditioner unit) | 1. Turn starting switch to OFF position.<br>2. Disconnect connector [6]. | | | |
| | | Resistance | Between connector [6] (male) (1) and (2) | 0 °C | Approx. 1.6 kΩ |
| | | | | 25 °C | Approx. 5 kΩ |
| 2 | Defective air conditioner controller | Air conditioner controller may be defective. (Since this is an internal defect, troubleshooting cannot be performed.) | | | |
| 3 | Defective air conditioner unit | Air conditioner unit may be defective. (Since this is an internal defect, troubleshooting cannot be performed.) | | | |

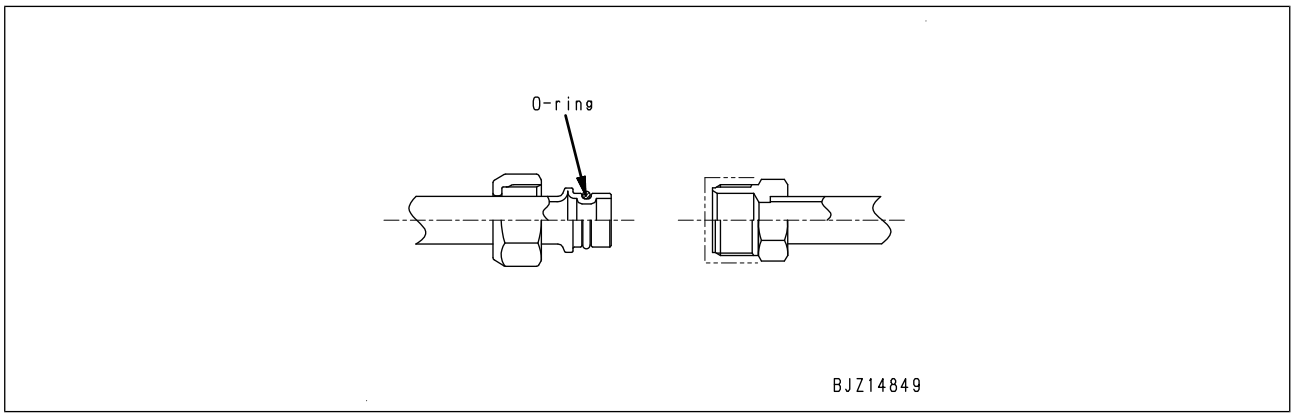
**Circuit diagram related to air conditioner inside air temperature sensor**



| No. | Cause | Procedure, measuring location, criteria, and remarks | | |
|---|---|---|---|---|
| 4 | Ground fault in wiring harness (Contact with ground circuit) | ★ If a fuse is blown again in the above test, perform the following procedure.<br>1. Turn starting switch to OFF position.<br>2. Turn the battery disconnect switch to OFF position.<br>3. Disconnect connector AC02.<br>4. Remove fuse No. 14 in fuse box F04. | | |
| | | Resistance | Between ground and connector AC02 (female) (4) (blue) or F01-14 | Min. 1 MΩ |
| 5 | Open circuit in wiring harness | 1. Turn starting switch to OFF position.<br>2. Turn the battery disconnect switch to OFF position.<br>3. Disconnect connector AC02.<br>4. Remove fuse No. 14 in fuse box F01. | | |
| | | Resistance | Between connector AC02 (female) (4) (red) and F01-14 | Max. 1 Ω |
| 6 | Defective air conditioner controller | Replace the air conditioner controller. | | |
| 7 | Defective air conditioner unit | If no failure is found by the above checks, the air conditioner unit may be defective. | | |
| 8 | Defective machine monitor | If no failure is found by above checks, machine monitor is defective. | | |

**Circuit diagram related to power supply system**





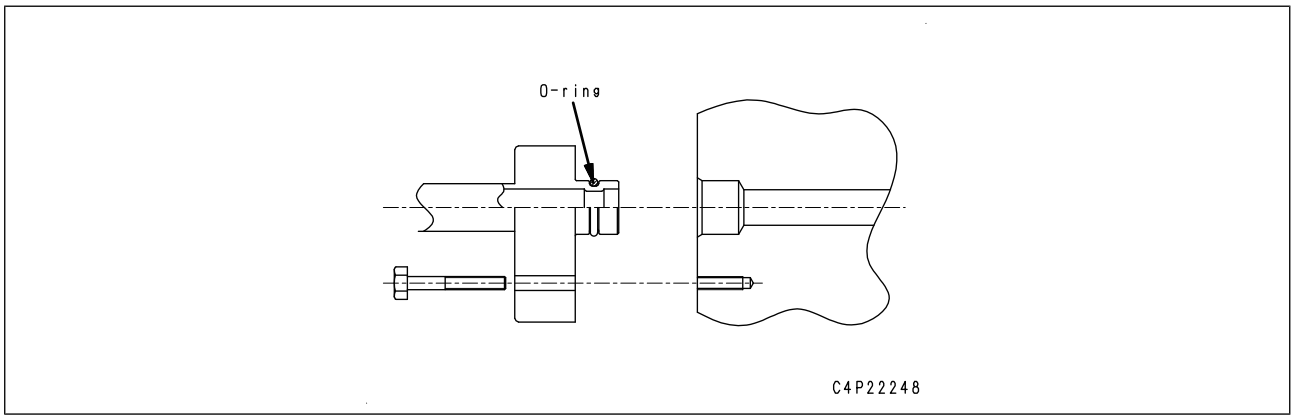
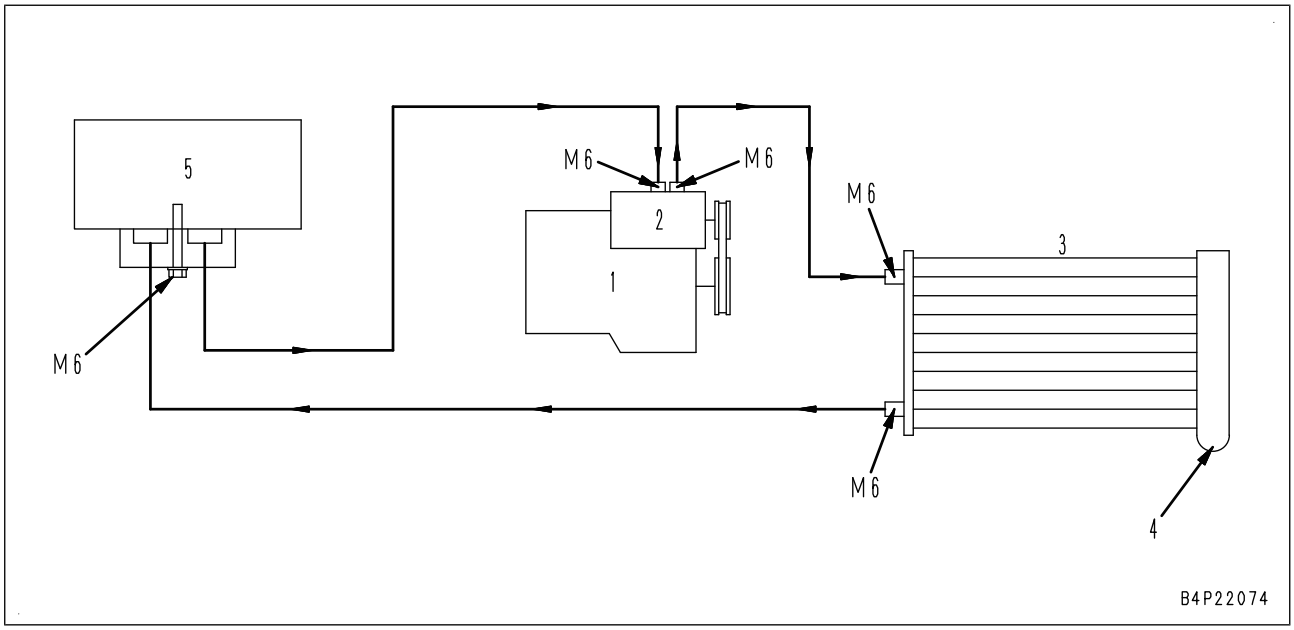




**Table of tightening torque for refrigerant pipe joint.**

| Thread size | Tightening torque: Nm {kgm} |
|---|---|
| M6 x 1.0 | 8 to 12 {0.8 to 1.2} (compressor)<br>4 to 7 {0.4 to 0.7} (condenser) |




1. Engine
2. Compressor
3. Condenser
4. Modulator
5. Air conditioner unit