Shop Manual

PC290LC-10

HYDRAULIC EXCAVATOR

SERIAL NUMBERS **PC290LC-10 A25001 and up**

ENGINE **6D107E-2**

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SAFETY

Safety Notice

Important Safety Notice

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

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

General Precautions

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

1. Before performing any greasing or repairs, read all the precautions given on the decals which are fixed to the machine.

2. When performing any operation, always wear safety shoes and helmet. Do not wear loose work clothes, or clothes with buttons missing.
   - Always wear safety glasses when hitting parts with a hammer.
   - Always wear safety glasses when grinding parts with a grinder, etc.

3. If welding repairs are needed, always have a trained, experienced welder perform the work. When performing welding work, always wear welding gloves, apron, glasses, cap and other clothes suited for welding work.

WARNING! Never modify, weld, cut, or drill on any part of a ROPS structure. Doing so may weaken the structure which could lead to possible failure in a rollover situation.

4. When performing any operation with two or more workers, always agree on the operating procedure before starting. Always inform your fellow workers before starting any step of the operation. Before starting work, hang UNDER REPAIR signs on the controls in the operator's compartment.

5. Only qualified workers must perform the work and operation which require license or qualification.

6. Keep all tools in good condition and learn the correct way to use them. Before starting work, thoroughly check the tools, machine, forklift truck, service car, etc.

7. Decide a place in the repair workshop to keep tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.

8. Before starting work, warm up your body thoroughly to start work under good conditions. Avoid continuous work for long hours and take rests at proper intervals to keep your body in good condition. Take rests in specified safe places.

Safety Points

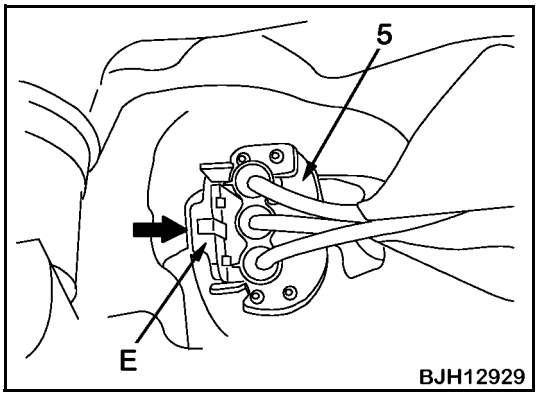
1	Good arrangement
2	Correct work clothes
3	Following work standard
4	Making and checking signs
5	Prohibition of operation and handling by unlicensed workers
6	Safety check before starting work
7	Wearing protective goggles (for cleaning or grinding work)
8	Wearing shielding goggles and protectors (for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

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

★ Pull the connector straight up.

B. Connection

i. Insert the connector straight in until it “clicks.”



12. Turn-housing type (Round green connector)
- 140 series

- Example: Charge (boost) pressure sensor in the air intake manifold: PIM (CANNON-4), etc.

A. Disconnection

i. Turn housing (H1) in the direction of the arrow.

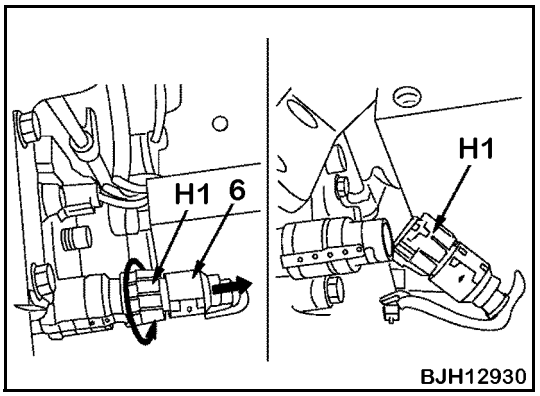
★ When the connector is unlocked, housing (H1) becomes heavy to turn.

ii. Pull out housing (H1) in the direction of the arrow.

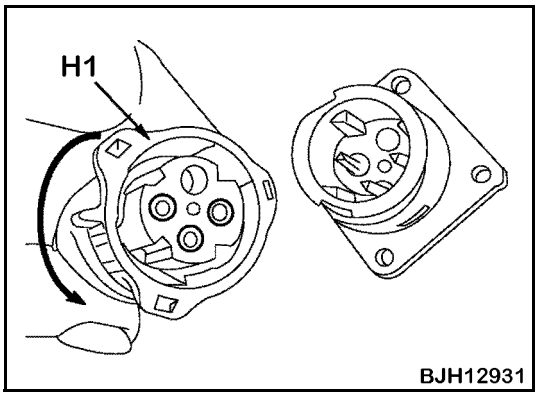
★ Housing (H1) is left on the wiring harness.

B. Connection

i. Insert the connector to the end, while aligning its groove to the other.



ii. Turn housing (H1) in the direction of the arrow until it “clicks.”



3. Color Codes Table

(Table 3)

Color Code	Color of wire
B	Black
Br	Brown
BrB	Brown & Black
BrR	Brown & Red
BrW	Brown & White
BrY	Brown & Yellow
Ch	Charcoal
Dg	Dark green
G	Green
GB	Green & Black
GL	Green & Blue
Gr	Gray
GR	Green & Red
GW	Green & White
GY	Green & Yellow
L	Blue
LB	Blue & Black
Lg	Light green
LgB	Light green & Black
LgR	Light green & Red

Color Code	Color of wire
LgW	Light green & White
LgY	Light green & Yellow
LR	Blue & Red
LW	Blue & White
LY	Blue & Yellow
O	Orange
P	Pink
R	Red
RB	Red & Black
RG	Red & Green
RL	Red & Blue
RW	Red & White
RY	Red & Yellow
Sb	Sky Blue
Y	Yellow
YB	Yellow & Black
YG	Yellow &Green
YL	Yellow & Blue
YR	Yellow & Red
YW	Yellow & White

- 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.
  Example: “GW” means that the background is Green and marking is White.

★ Types of circuits and color codes

(Table 4)

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	–	–	–	–	–	–	–

01 GENERAL

1. Reservoir tank
2. Oil cooler
3. Radiator cap
4. Radiator
5. Aftercooler
6. Fuel cooler inlet
7. Fuel cooler
8. Fuel cooler outlet
9. Condenser
10. Air conditioner condenser switching bracket
11. Oil cooler outlet
12. Aftercooler outlet hose
13. Fan guard
14. Radiator inlet hose
15. Oil cooler intlet
16. Aftercooler inlet hose
17. Shroud
18. Fan
19. Radiator outlet hose
20. Radiator drain valve

Specifications

	Radiator	Oil cooler	Aftercooler	Fuel cooler
Core type	Aluminum wave type, 4 rows	CF40-1	Aluminum wave type	Drawn cup
Fin pitch (mm)	3.5/2	3.5/2	4.0/2	4.0/2
Total heat dissipation area (m^2)	64.81	11.75 x 3	12.71	0.59
Pressure valve cracking pressure	0.05 MPa (0.5kg/cm^2) {7 psi}	—	—	—
Vacuum valve cracking pressure	-0.005 MPa (-0.05 kg/cm^2) {-1 psi}	—	—	—

Features

- Fine control not influenced by load
- Control performance that allows digging even when fine control operation is turned on
- Ease of combined operation enabled by the flow divider function that is determined by the opening areas of spools during combined operations
- Energy saving by variable pump control

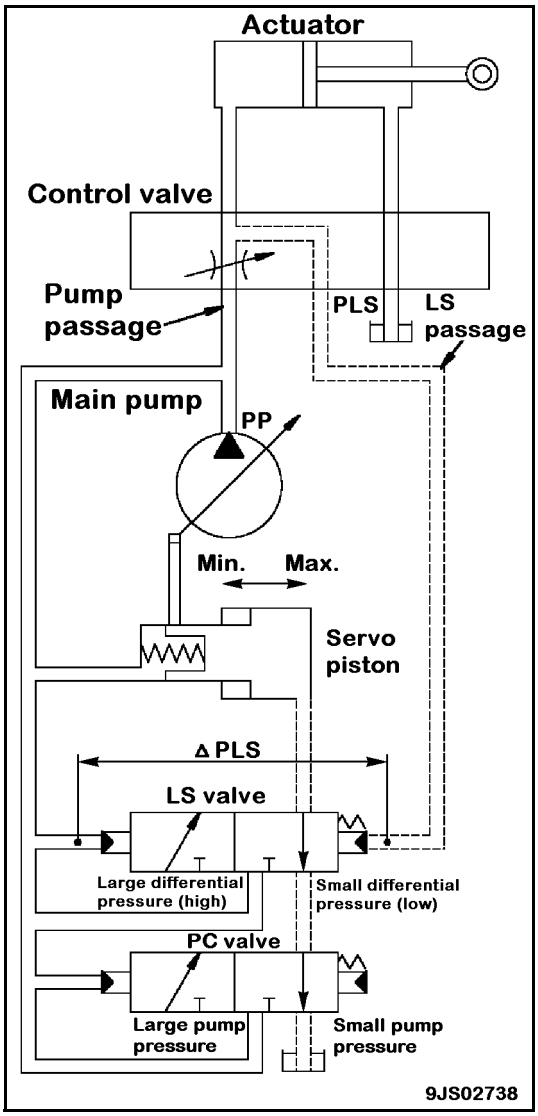
Configuration

- CLSS consists of variable capacity piston pump, control valve, and actuators.
- The main pump consists of pump itself, PC valve and LS valve.

Basic Principle

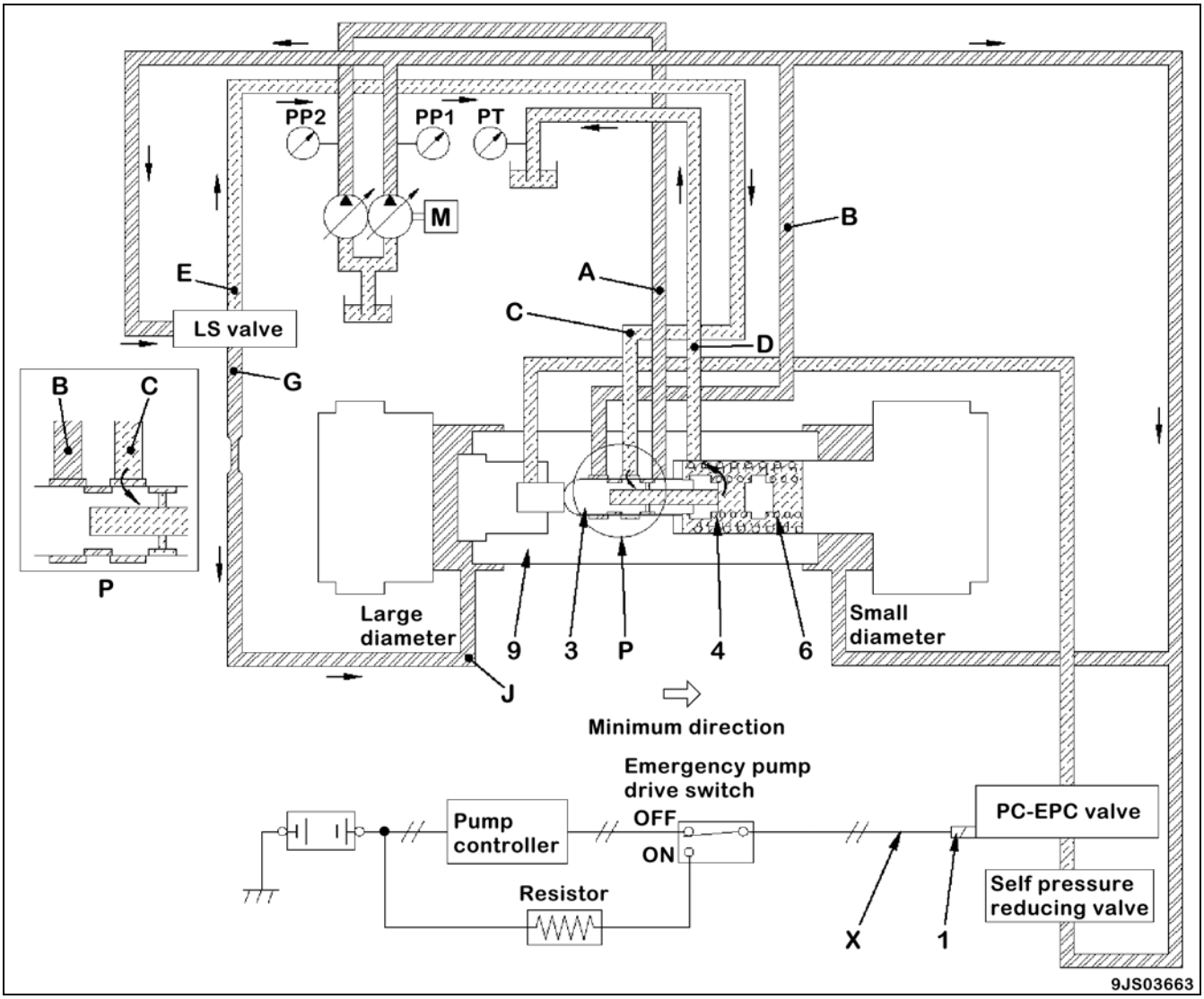
Pump swash plate angle control

- The pump swash plate angle (pump delivery) is controlled so that LS differential pressure (△PLS), which is the difference between pump delivery pressure (PP) and LS pressure (PLS) (load pressure of actuator) at control valve outlet, is constant.
- [LS differential pressure (△PLS) = Pump delivery pressure (PP) - LS pressure (PLS)]
- The pump swash plate angle shifts toward the maximum position if LS differential pressure (△PLS) is lower than the set pressure of the LS valve (when the actuator load pressure is high).
- If it becomes higher than the set pressure (when the actuator load pressure is low), the pump swash plate angle shifts toward the minimum position.



- Springs (4) and (6) extend according to the movement of servo piston (9), and the reaction force of spring decreases.
- When the reaction force of spring decreases, spool (3) moves to the right. Ports (C) is disconnected from port (D), and pump delivery pressure port (B) is connected to port (C).
- Since the pressure in port (C) and the pressure at the large diameter side of the piston increase, servo piston (9) stops moving to the left.
- Accordingly, the stop position (= pump delivery) of servo piston (9) is determined by the position where the force exerted by pressures (PP1) and (PP2), the thrust generated by the PC-EPC valve solenoid, and the force exerted by springs (4) and (6) acting on the spool (3) are balanced.

When load on the actuator is large and pump pressures (PP1) and (PP2) are high



Outline

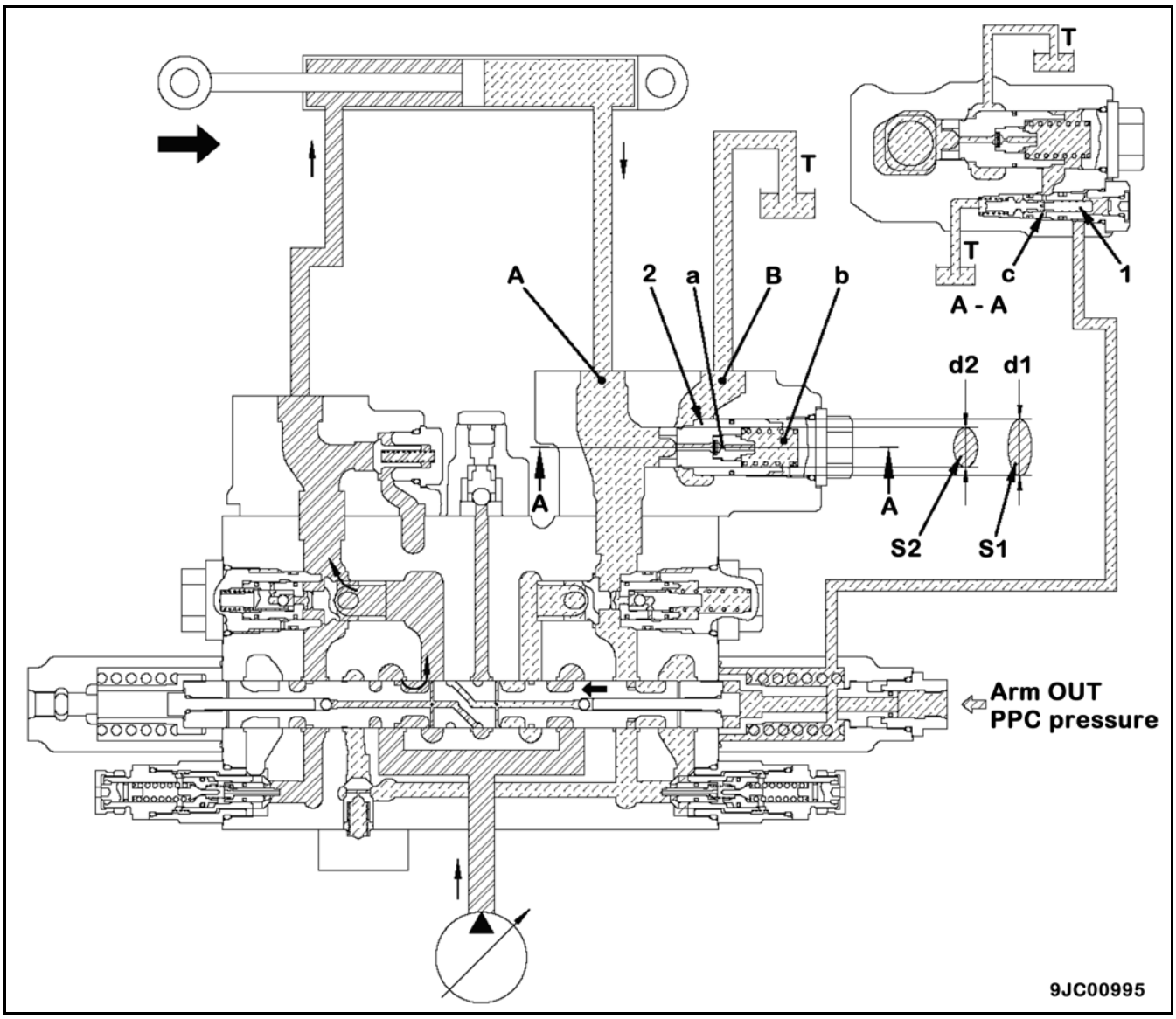
- When the load is large and the pump delivery pressures (PP1) and (PP2) are high, the thrust moving spool (3) to the right increases, and spool (3) comes to a position as shown above.
- The pressure from port (C) to the LS valve becomes approximately half of pump pressure (PP2), because a part of the pressure from port (B) flows through the LS valve and port (C) to port (D), as shown above.
- When spool (3) moves to the left, the opening of ports (C) and (D) widens.
- The pressure in port (C) (=J) decreases, and the movement of servo piston (9) to the right stops.
- Servo piston (9) stops at a position further to the right than the position when pump pressures (PP1) and (PP2) are low.

MEMORANDUM

Operation

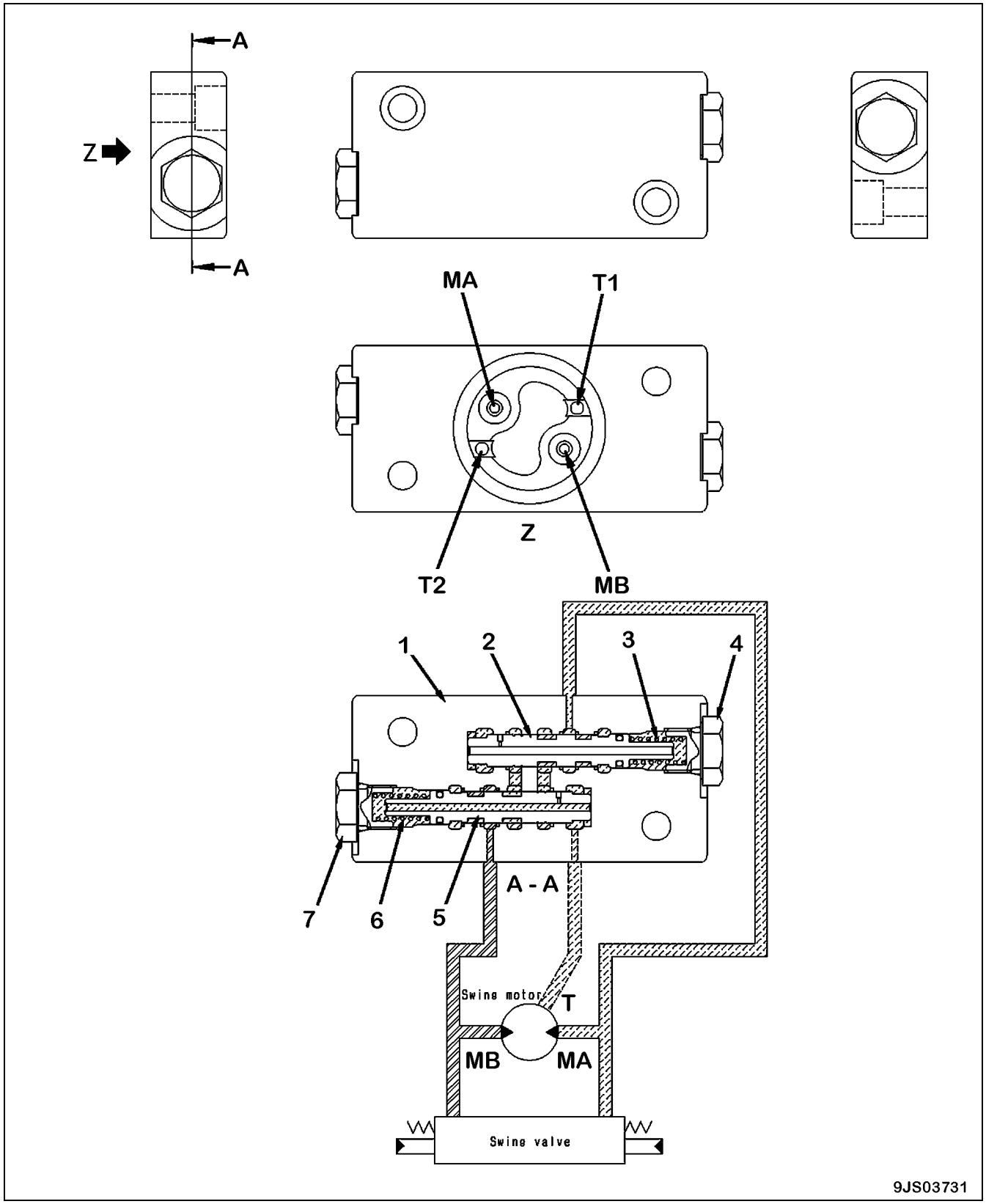
- Since drive signal (IS1) of the EPC valve for the main spool is OFF, the output pressure of the pump merge-divider EPC valve is 0 MPa (0 kg/cm²) {0 psi}.
- Main spool (1) is pressed to the right by spring (2). As a result, port (E) and (F) are interconnected.
- Pressurized oil (P1) and (P2) discharged from the two pumps merge at ports (E) and (F), and flow to the control valve which requires the oil.
- Since drive signal (IS2) of the EPC valve for LS spool (3) is also OFF, LS spool (3) is pressed to the right by spring (4). As a result, port (A) and (B) are interconnected and port (B) and (C) are interconnected.
- The LS pressures transmitted from respective control valve spools through LS circuits (5), (6), (7), and (8) are transmitted to all the pressure compensation valves.

3. In arm “IN” operation



- When arm is operated "IN", the pilot pressure from the PPC valve pushes pilot piston (2).
- The pressurized oil of the arm cylinder head flows from orifice (c) to drain port (T) through orifice (a) and chamber (b).
- Chamber (b) inside poppet and drain port (T) are interconnected, and the pressure of chamber (b) drops.
- As the pressure of chamber (b) becomes less than the pressure of port (B), poppet (5) opens.
- As poppet (5) opens, the pressurized oil from port (B) flows to port (A) and then flows to the control valve.

Swing Motor Reverse Prevention Valve

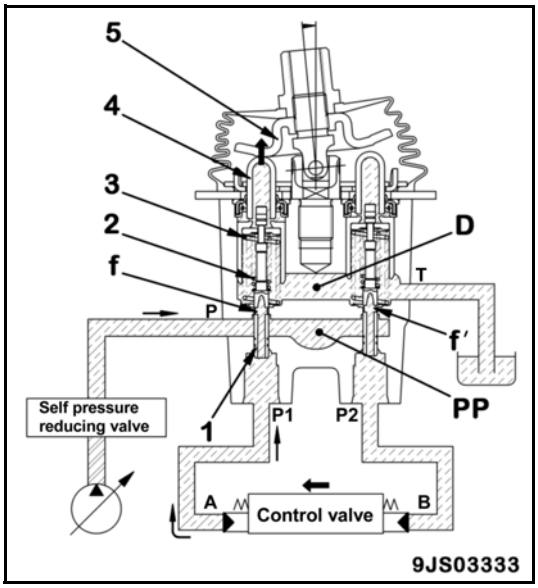


MA: From control valve (left swing port)
MB: From control valve (right swing port)
T1: To hydraulic tank
T2: To hydraulic tank

1. Valve body
2. Spool (MA side)
3. Spring (MA side)
4. Plug (MA side)
5. Spool (MB side)
6. Spring (MB side)
7. Plug (MB side)

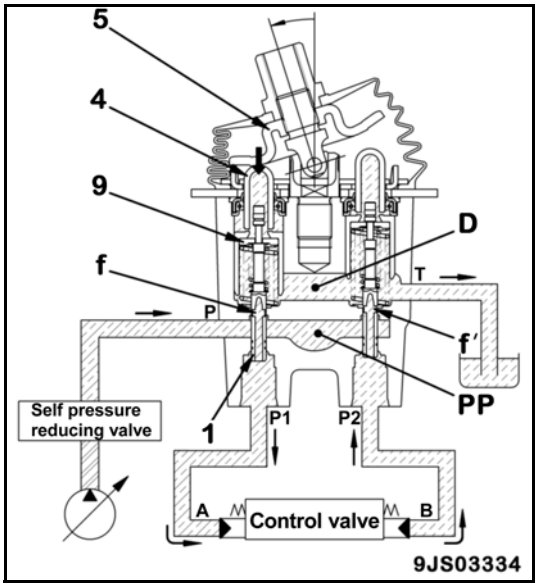
When control lever is in fine control range
(When returned to fine control range)

- When disc (5) begins to return, spool (1) is pushed up by the force of centering spring (3) and the force exerted by the pressure in port (P1).
- Fine control hole (f) is connected to drain chamber (D), and the pressurized oil in port (P1) is released.
- If the pressure in port (P1) is excessively reduced, spool (1) is depressed by metering spring (2).
- Fine control hole (f) is disconnected from drain chamber (D), and at almost the same time, it is connected to pump pressure chamber (PP).
- The pump pressure is supplied until the pressure at port (P1) recovers to the level corresponding to the lever position.
- When the spool of the 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 port (B) to replenish the port with pressurized oil.

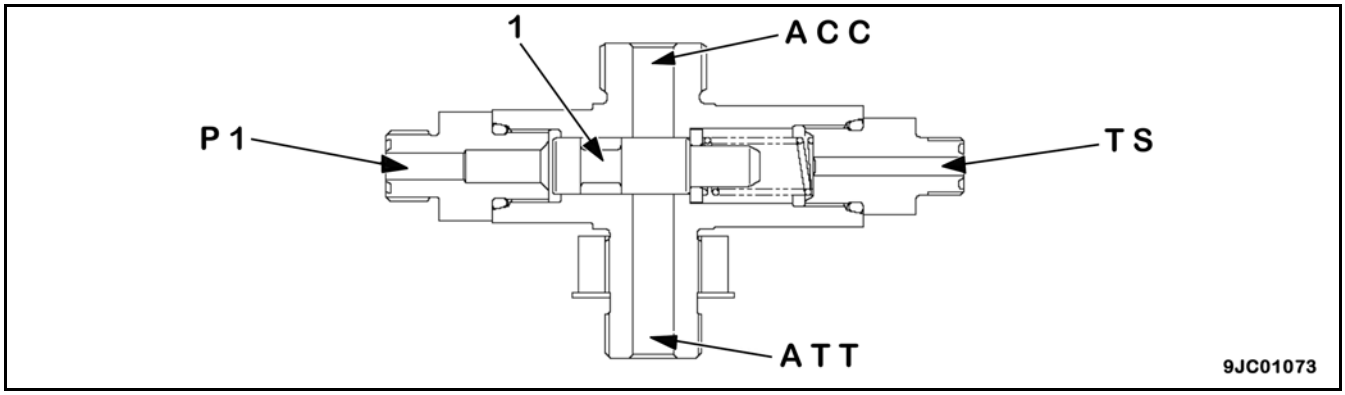


When control lever is moved to stroke end

- Disc (5) depresses piston (4), and retainer (9) depresses spool (1).
- Fine control hole (f) is disconnected from drain chamber (D), and it is connected to pump pressure chamber (PP).
- The pilot pressure oil from the self-pressure reducing valve passes through fine control hole (f) and flows from port (P1) to port (A) and pushes the control valve spool.
- The oil returning from port (B) flows from port (P2) into drain chamber (D) through fine control hole (f').



Attachment Circuit Selector Valve (For High Pressure Circuit) (If Equipped)



PI: From attachment circuit selector solenoid valve
ACC: To accumulator
ATT: To attachment
TS: To hydraulic tank

1. Spool

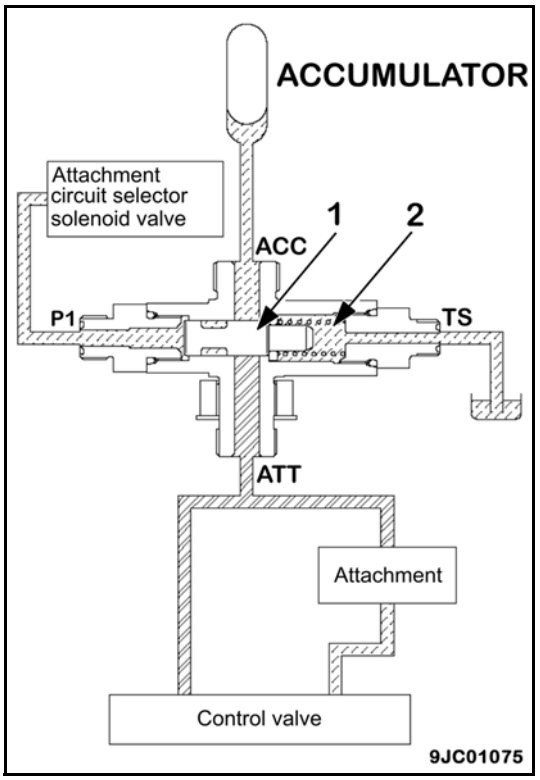
Function

- For a machine equipped with a breaker, this valve allows the oil from the breaker to return directly to the hydraulic tank without passing through the main valve.
- For a machine equipped with other attachment (crusher, etc.), this valve serves to interconnect the attachment to the main valve.

Operation

When attachment other than breaker is installed

- Spool (1) is pressed to the left by the force of spring (2).
- Since port (ATT) is disconnected from port (ACC), no oil flows to the accumulator.

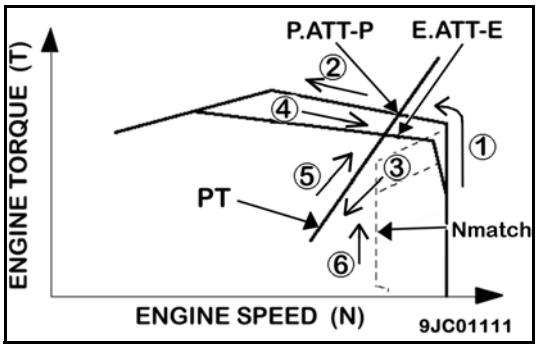


Control method in each mode

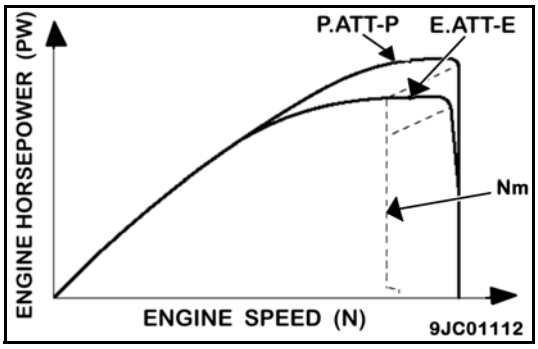
P, E, L, ATT-P and ATT-E modes

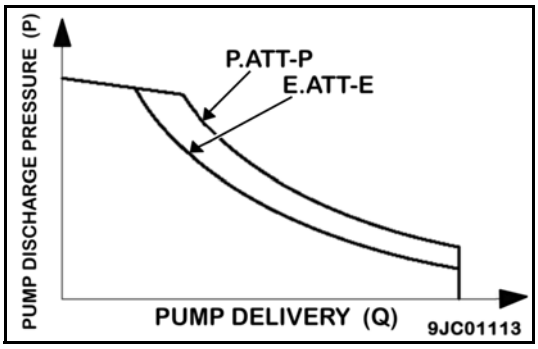
Matching point

Working mode	Matching point
P and ATT-P (During work)	127.1 kW/1,750 rpm {170 HP/1,750 rpm}
E and ATT-E (During work)	108.2 kW/1,750 rpm {145 HP/1,750 rpm}

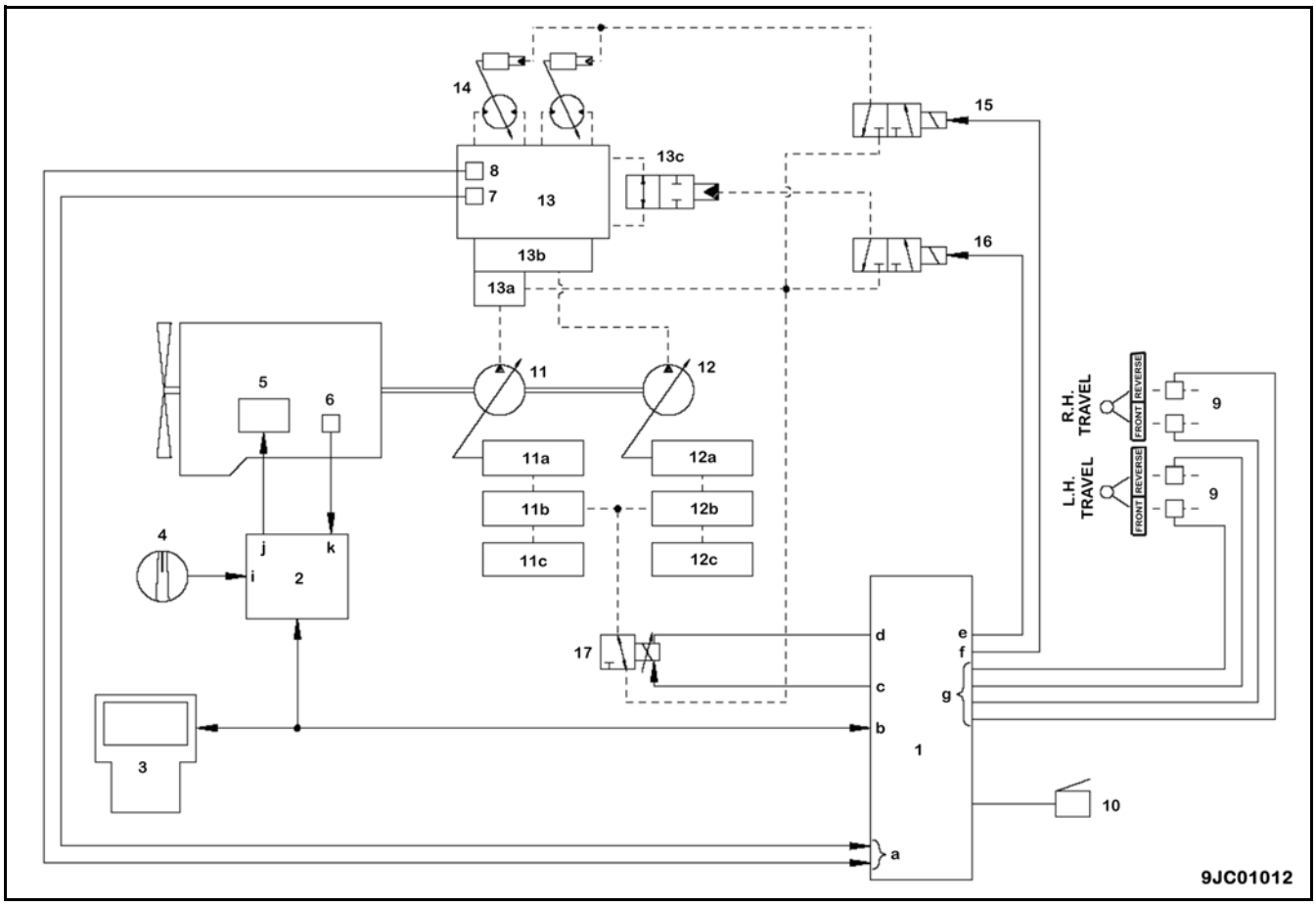


- In P, E, ATT-P and ATT-E modes, the engine speed is always controlled so that it is kept around the matching point specified for each mode.
- At light loads, the engine operates at high speeds. As the load increases, the engine speed decreases while the torque is increased, until the matching point with pump absorption torque upper limit (PT) is reached. [See (1) in graph]
- As the load increases further, the engine speed decreases further. [See (2) in graph]
- The controller lowers the pump absorption upper limit torque (PT) to reduce the load on the engine. [See (3) in graph]
- As the engine load decreases, the engine speed increases. [See (4) in graph]
- The controller raises the pump absorption upper limit torque (PT) to maintain it near the matching point. [See (5) in graph]
- To save fuel consumption, the controller lowers the engine matching speed (Nmatch) at low loads (low delivery and torque). [See (6) in graph]





Travel Control Function



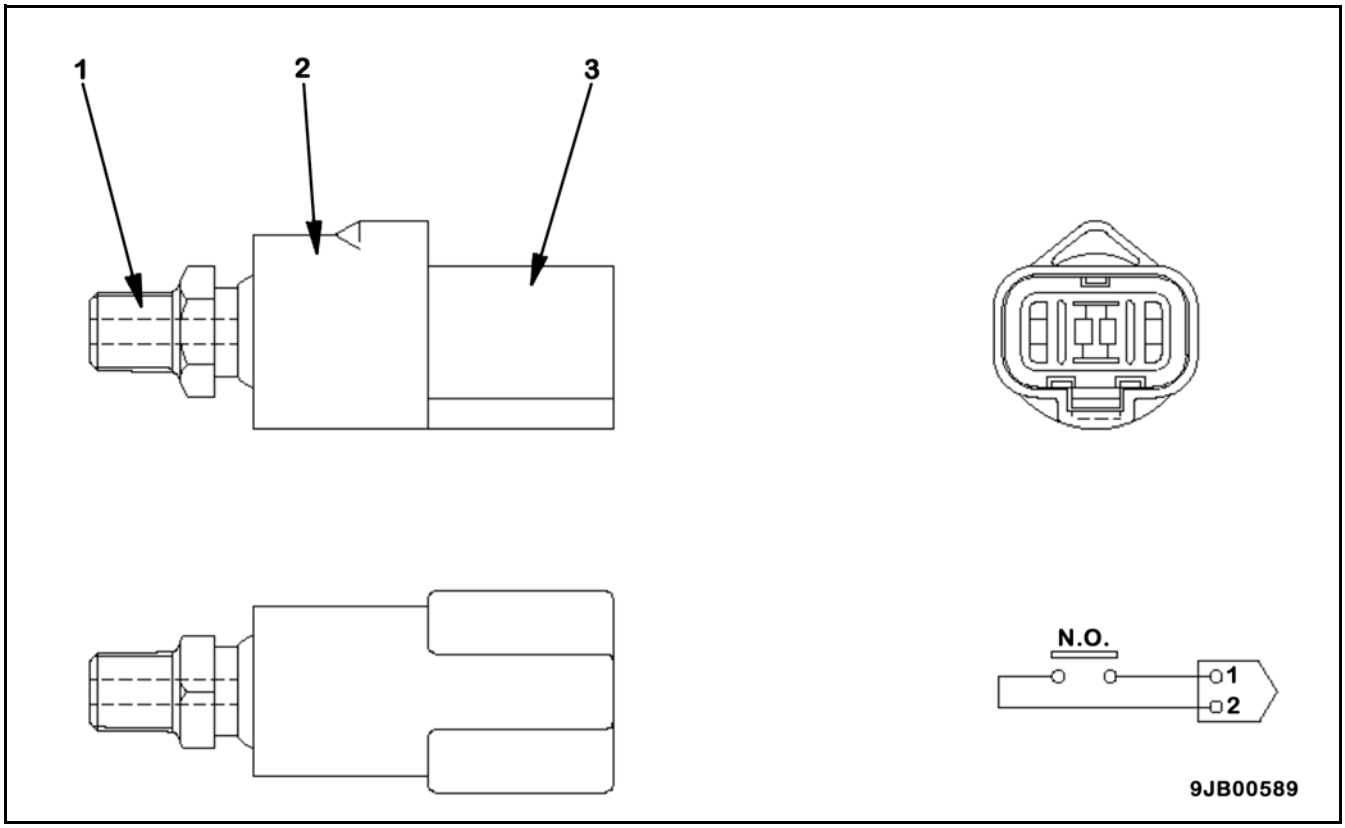
1. Pump controller
2. Engine controller
3. Machine monitor
4. Fuel control dial
5. Fuel supply pump
6. Sensors
7. Front pump oil pressure sensor
8. Rear pump oil pressure sensor
9. Oil pressure sensor
10. Travel alarm
11. Front pump
    - 11a. Servo
    - 11b. LS valve
    - 11c. PC valve
12. Rear pump
    - 12a. Servo
    - 12b. LS valve
    - 12c. PC valve
13. Control valve
    - 13a. Self-pressure reducing valve
    - 13b. Merge-divider valve
    - 13c. Travel junction valve
14. Travel motor
15. Travel speed increase solenoid valve
16. Travel junction solenoid valve
17. LS-EPC valve

Input and output signals

a. Oil pressure sensor signal
b. CAN signal
c. LS-EPC valve drive signal
d. Solenoid valve GND
e. Travel junction solenoid valve drive signal
f. Travel speed increase solenoid valve drive signal
g. Oil pressure sensor signal
h. Travel alarm buzzer operation signal
i. 1st throttle signal
j. Fuel supply pump control signal
k. Sensor signals

PPC Oil Pressure Switch

PPC: Abbreviation for Proportional Pressure Control



1. Plug
2. Switch
3. Connector

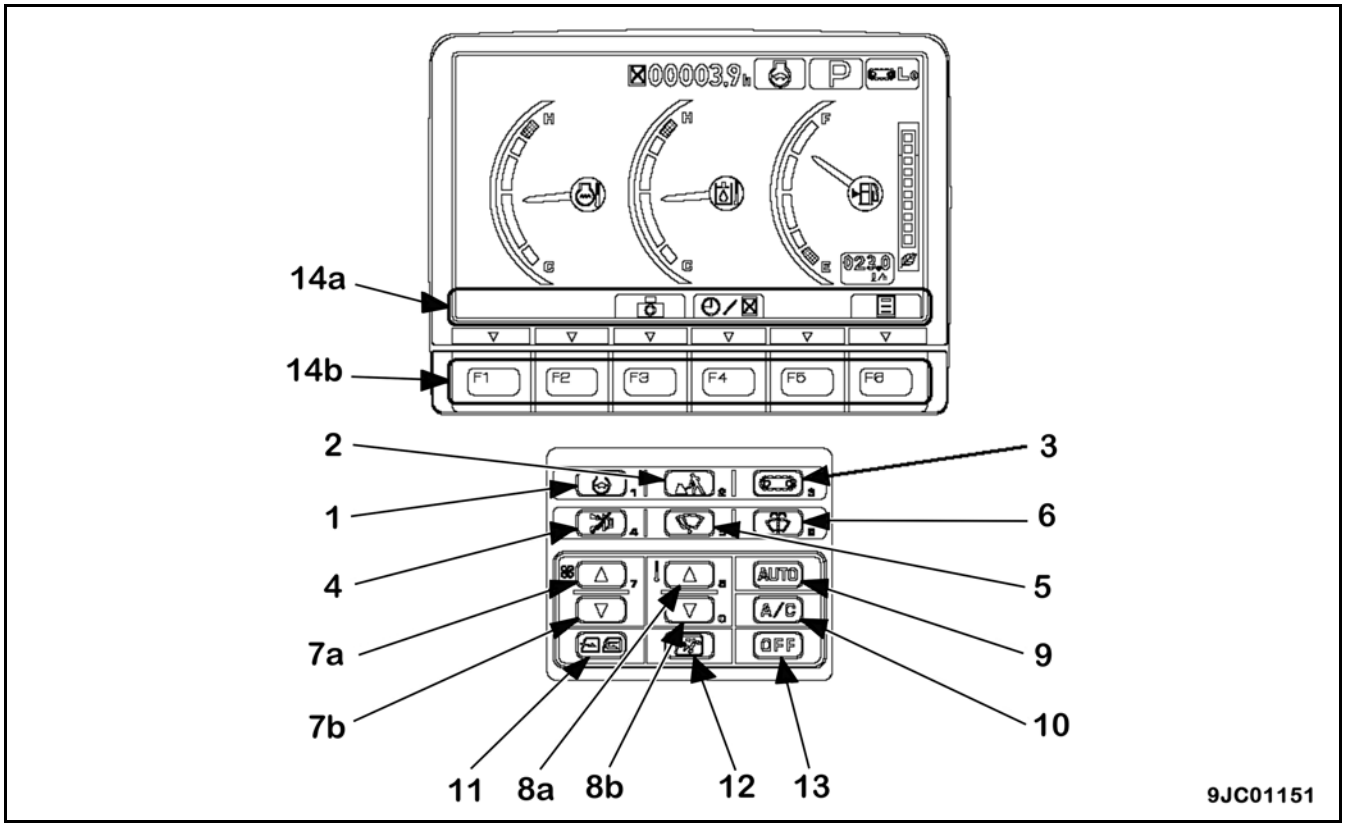
Specifications

Contact type: . . . . . Normally open
Operating (ON) pressure: . . . . . 490 ±98.1 kPa (5.0 ±1.0 kg/cm²) {71 ±14 psi}
Resetting (OFF) pressure: . . . . . 294 ±49.0 kPa (3.0 ±0.5 kg/cm²) {43 ±7 psi}

Function

- Two sensors are installed to attachment PPC valve. They detect PPC oil pressure during attachment operation and turn the switch to "ON" position if the pressure is equal or higher than the specified pressure.

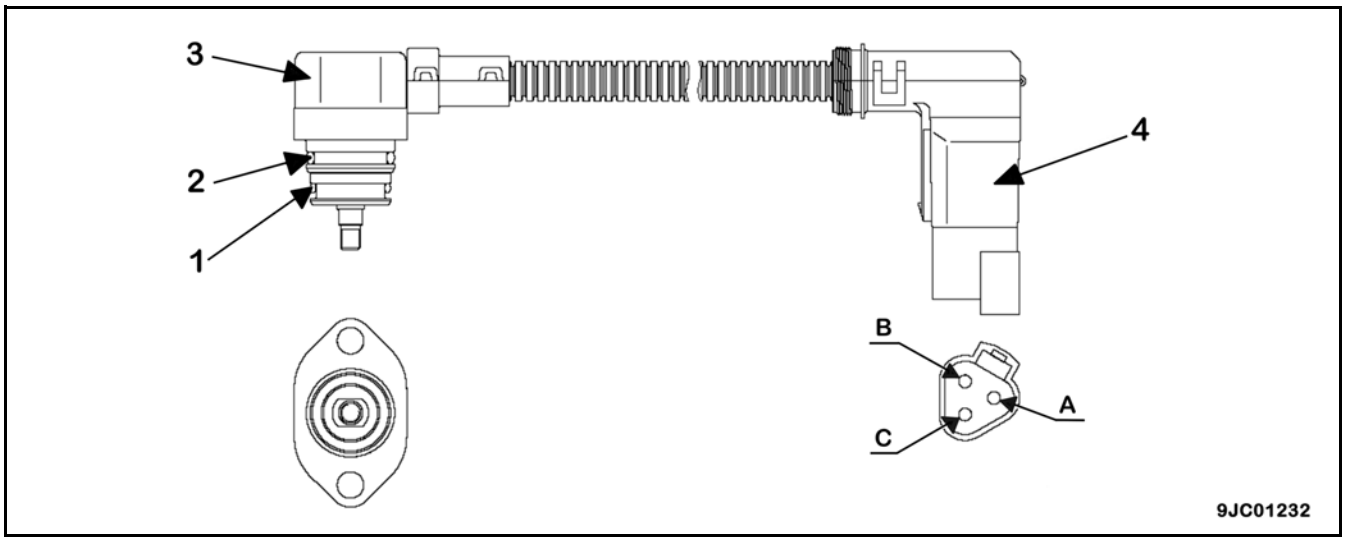
Switches



No.	Name	Function	Operation
1	Auto-deceleration switch [Numeric keypad: 1]	Switches the auto-deceleration function ON/OFF. Lights up: ON Not lighting: OFF	● When working mode is "L", this switch is always "OFF" after the engine is started. OFF ⇔ ON
2	(*1) Working mode selector switch [Numeric keypad: 2]	Displays the working mode selector screen.	P: Heavy-duty operation E: Low-fuel operation L: Fine operation B: Breaker operation ATT-P: Double-acting attachment operation ATT-E: Double-acting attachment and low-fuel operation
3	Travel speed selector switch [Numeric keypad: 3]	Changes the travel speed. Lo lights up: Low speed Mi lights up: Medium speed Hi lights up: High speed	● Speed is sequentially changed as shown below. Lo (Low speed) → Mi (Medium speed) → Hi (High speed) → Lo (Low speed)
4	Buzzer cancel switch [Numeric keypad: 4]	Stops the alarm buzzer. (Some alarm buzzer does not stop sounding even if the switch is pressed.)	● The alarm buzzer stops sounding. ● The alarm buzzer sounds again if another error worth alarming is detected.
5	(*2) Wiper switch [Numeric keypad: 5]	Operates the front glass wiper. INT: Intermittent operation ON: Continuous operation Not lighting: Holds in position	● Pressing the switch sequentially changes the wiper operation. INT (Intermittent) → ON (Continuous) → OFF (Stop) → INT (Intermittent)

EGR Valve Lift Sensor

EGR: Abbreviation for Exhaust Gas Recirculation



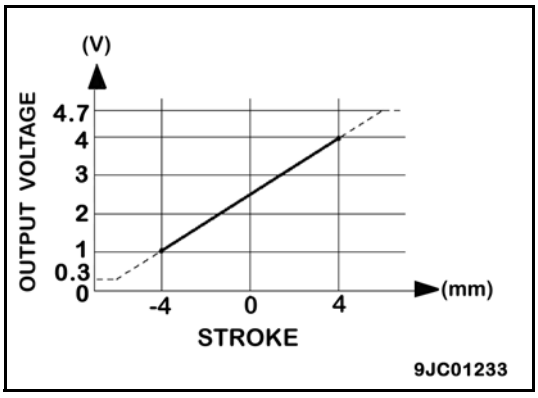
1. O-ring (small)
2. O-ring (large)
3. Sensor
4. Connector

Function

- This sensor, installed to EGR valve in the engine, detects the EGR valve opening to output the corresponding variable voltage.

Output characteristics

- The relation between stroke and output voltage is as shown in the following graph.



20 STANDARD VALUE TABLES

MEMORANDUM

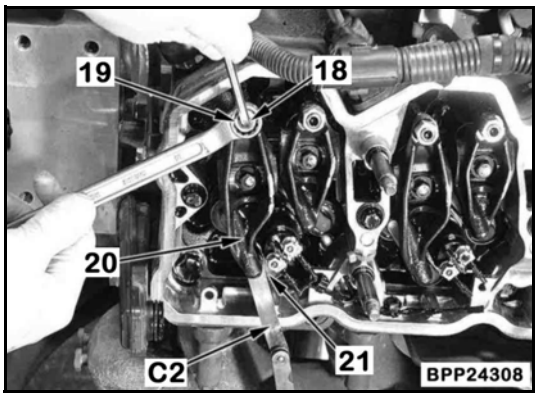
Adjusting

After testing, adjust the valve clearance according to the following procedure, if necessary.

1. While fixing adjustment screw (18), loosen lock nut (19).

2. Insert feeler gauge C2 in the clearance between rocker arm (20) and cross head (21) and adjust the valve clearance with adjustment screw (18).
   - ★ With feeler gauge C2 inserted, turn adjustment screw (18) to a degree that you can move feeler gauge C2 lightly.
   - ★ Adjust the valve clearance to within the following target value.

     Intake valve: . . . . . 0.25 ±0.05 mm {0.010 ±0.002 in.}
     Exhaust valve:. . . . . 0.51 ±0.05 mm {0.020 ±0.002 in.}



3. While fixing adjustment screw (18), tighten lock nut (19).

Lock nut (19): 24 ± 4 N•m {18 ±3 lbf ft}

   - ★ After tightening locknut (19), check the valve clearance again.

4. After finishing adjustment, remove the testing tools and return the removed parts.
   - ★ Be sure to remove gear C1.

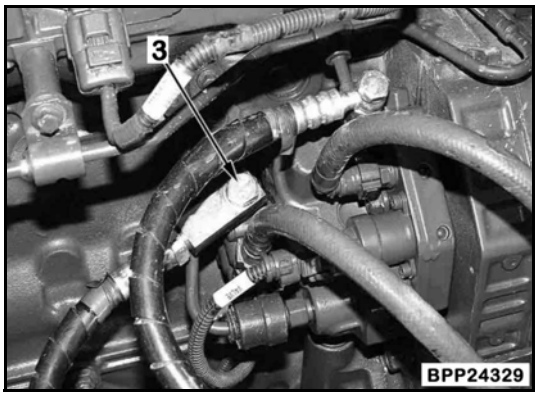
EGR circuit tube (6) (flange side): 24 ±4 N•m {18 ±3 lbf ft}
EGR circuit tube (6) (tube side): 10.5 ±0.5 N•m {93 ±4 lbf in}

Hose (7): 25 ±1.5 N•m {18 ±1 lbf ft}
Hose (8): 15 ±1 N•m {11 ±1 lbf ft}

Cylinder head cover (11) mounting nut: 24 ± 4 N•m {18 ±3 lbf ft}

Testing Negative-Pressure Circuit

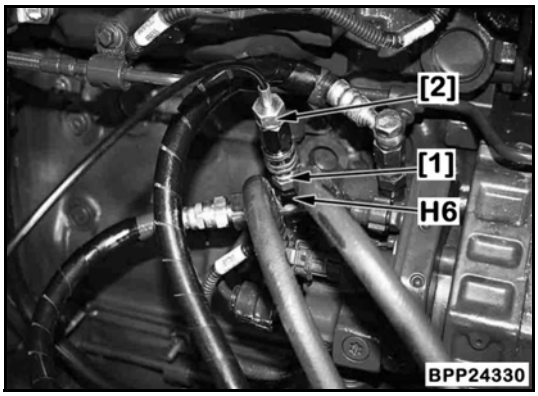
1. Remove joint bolt (3) of the fuel hose between the fuel pre-filter and supply pump.



2. Install screw H6, and nipple [1] and hose [2] of boost gauge kit H7 instead of joint bolt (3), and connect them to gauge [3].
   - ★ When installing screw H6, be sure to install the seal washer.

   Screw H6: 25.4 - 34.3 N•m {19 - 25 lbf ft}

   - ★ The nipples and hoses in digital hydraulic tester H2 may be used.

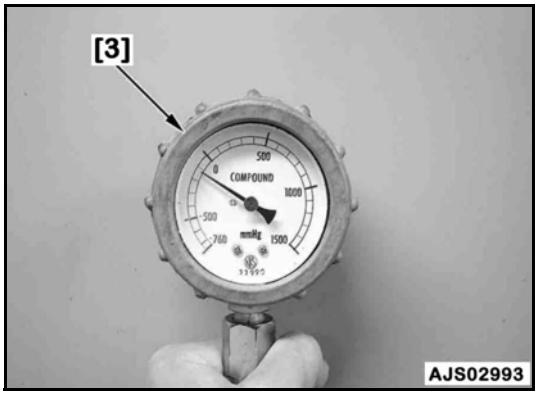


3. Start the engine and measure the pressure in the negative pressure circuit with the engine at high idle.
   - ★ If the pressure in the negative pressure circuit is in the following standard range, it is normal.

     At high idle: . . . . . 305 mmHg or below
   - ★ If the pressure is higher than the criteria, the fuel pre-filter may be clogged. In this case, replace the fuel pre-filter and test again.

4. After completing measurement, remove the measuring tools and return the machine to the original condition.

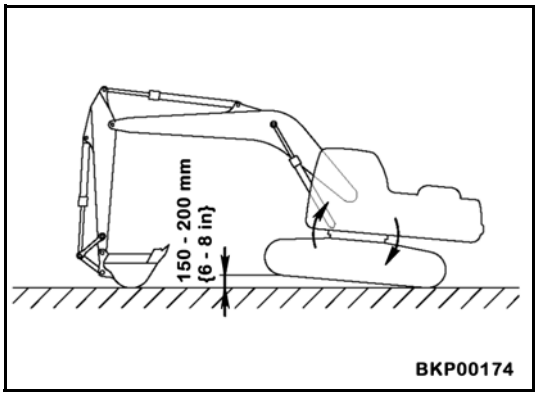
   Joint bolt (3): 25.4 - 34.3 N•m {19 - 25 lbf ft}



4. Set the arm almost perpendicular to the ground and lower the boom until the front part of the tracks float by 150 - 200 mm (5.906 - 7.874 in).
   ★ At this time the front of the upper structure rises and the rear lowers.

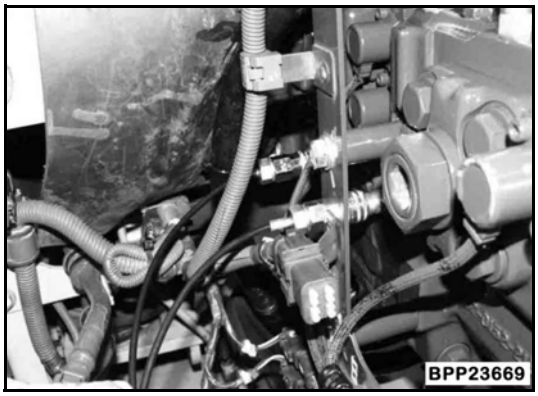
5. From this state, read the dial gauge K value.
   ★ The value indicated by dial gauge K is the clearance of the bearing.

6. Return the machine to the condition of step 2 and check that dial gauge K indicates zero point.
   ★ If zero value is not indicated, repeat the steps 3 through 5.

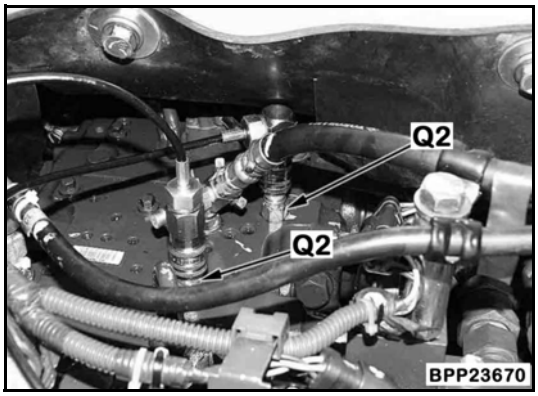


★ When using the oil pressure gauge:
Use the oil pressure gauge of 600 kg/cm² {8,702 psi} with the graduation by 10 kg/cm² {145 psi}.
The differential pressure is approximately 40 kg/cm² {580 psi} at the maximum, so perform the measurement by using a gauge alternately.

- The figure shows the pump discharge pressure side.

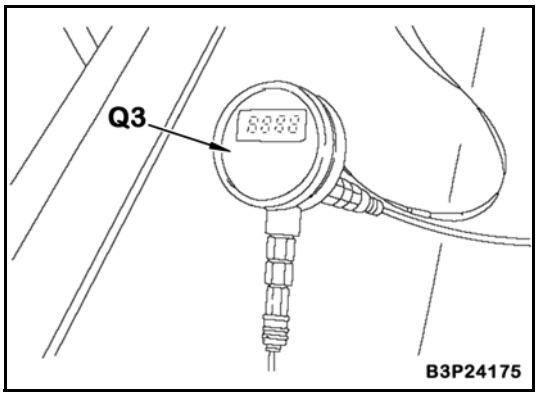


- The figure shows the LS pressure side.



C. Run the engine and raise the hydraulic oil temperature to the operating range and raise up the track to be tested.
- When measuring the front circuit: right track
- When measuring the rear circuit: left track

WARNING! Provide enough work space to run the track idle off the ground.



D. While running the engine at full speed under the following condition, measure the pump discharge pressure and LS pressure (actuator load pressure) simultaneously.
- Working mode: P mode
- Travel speed: Hi
- Work equipment, swing and travel:
Measure when all of these levers are in neutral and when the travel lever is moved halfway (to rotate the raised track shoe).

★ Run the raised track idle, paying enough attention to the surroundings for safety.
★ Calculating LS differential pressure (when the pressure gauge is used):
LS differential pressure = Pump discharge pressure - LS pressure
★ If LS differential pressure is in the following conditions, it is judged normal.

Lever control	LS differential pressure
When all control levers are in NEUTRAL position	36 ±10 kg/cm² {508 ±145 psi}
When a travel lever is moved halfway (Raised track runs idle)	18 +0.5/-1.0 kg/cm² {261 +7/-15}

E. After finishing measurement, remove the measuring tools and return the removed parts to their original position.

Bleeding Air From Hydraulic Circuit

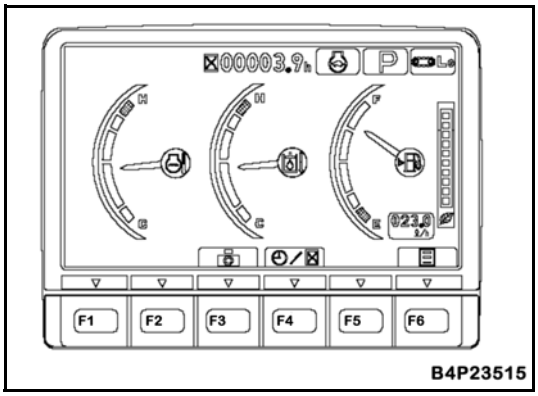
●: Execution of work
→: Go to next procedure

		Air bleeding procedure and item					
		1	2	3	4	5	6
		Bleeding air from hydraulic pump	Starting the engine	Bleeding air from cylinder	Bleeding air from swing motor	Bleeding air from travel motor	Checking oil level and operating machine
Detail of work, remarks	• Replacement of hydraulic oil • Cleaning strainer	●	●	●	● (See note)	● (See note)	●
	• Replacing return oil filter element		●	→	→	→	●
	• Replacing or repairing hydraulic pump • Removal of suction piping	●	●	●	→	→	●
	• Replacing or repairing control valve • Removal of control valve piping		●	●	→	→	●
	• Replacement or repair of cylinder • Removal of cylinder piping		●	●	→	→	●
	• Replacing or repairing swing motor • Removal of swing motor piping		●	→	●	→	●
	• Replacing or repairing travel motor • Removal of travel motor piping		●	→	→	●	●
	• Replacing or repairing swivel joint • Installing swivel joint piping		●	→	→	→	●

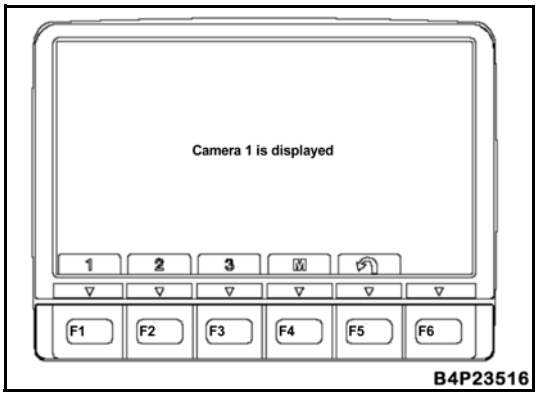
Note: Bleed air from the swing motor and travel motor only when the oil in the motor cases is drained.

Operation to Display Camera Mode (If Camera is Installed)

If [F3] is pressed, the multi-display changes to the camera image (Set the connection of the camera in the service mode).



★ Up to three cameras can be connected. When the camera mode is selected, however, only the image of camera 1 is always displayed at first.



★ If any caution is issued with the display panel in the camera mode, the corresponding caution monitor is displayed at the left top of the screen (excluding the low hydraulic oil temperature caution monitor).

★ If no control lever is operated for 10 seconds while a failure enough to display an user code is occurring with the display panel in the camera mode, the screen returns to the standard screen and displays information about that failure.

★ When two or more cameras are connected, the image of one of them or the images of two of them can be displayed.

★ When 2-camera image display [F4] is selected, images of cameras 1 and 2 are displayed on the right and left side of the screen.

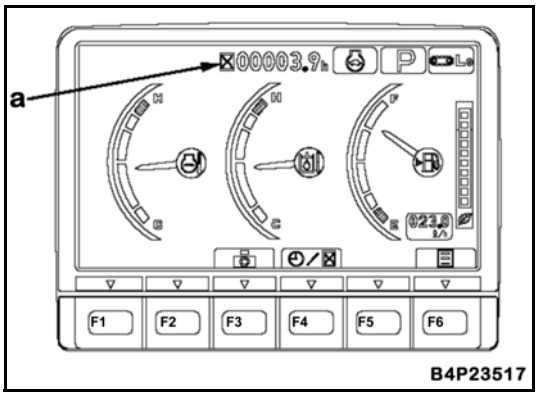
You can specify which of image of cameras 1 and 2 to appear on the right side and which on the left side from “Camera” in the service mode.

The image of camera 3 is displayed only singly.

Operation to Display Clock and Service Meter

While the standard screen is displayed, if [F4] is pressed, the service meter and the clock are displayed alternately in section (a).

★ When selecting the clock display, perform the time adjustment, 12-hour or 24-hour display setting, and summer time setting by using the user mode functions.



Support screen (5/14) Air intake/exhaust pressure, etc.

No.	ID	Item name	Unit (SI)	Applicable equipment
1	01002	Engine speed	r/min	ENG
2	37400	Ambient pressure	kPa	ENG
3	36500	Charge pressure-A	kPa	ENG
4	48300	Exhaust manifold pressure	kPa	ENG
5	48100	Turbo speed	r/min	ENG
6	48200	Mass air flow	kg/min	ENG

Support screen (6/14) Post treatment-related items

No.	ID	Item name	Unit (SI)	Applicable equipment
1	47000	KDPF outlet pressure	kPa	ENG
2	47100	KDPF delta pressure	kPa	ENG
3	47200	KDPF 1 outlet temperature	°C	ENG
4	47300	KDOC 1 inlet temperature	°C	ENG
5	47400	KDOC 1 outlet temperature	°C	ENG
6	36400	Rail pressure	MPa	ENG

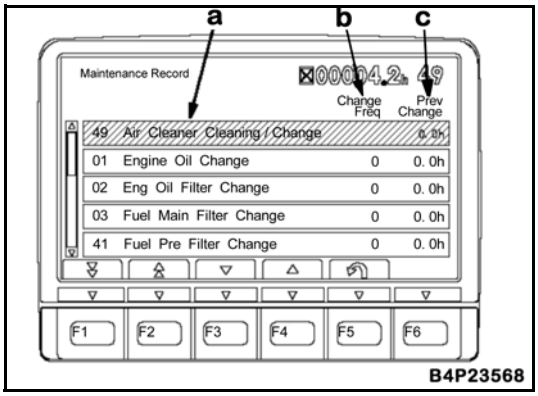
Support screen (7/14) Engine-related items

No.	ID	Item name	Unit (SI)	Applicable equipment
1	01002	Engine speed	r/min	ENG
2	37212	Engine oil switch	—	ENG
3	48400	Crankcase pressure	kPa	ENG
4	47300	KDOC 1 inlet temperature	°C	ENG
5	36500	Charge pressure-A	kPa	ENG
6	48100	Turbo speed	r/min	ENG

Support screen (8/14) F & R pumps basic items

No.	ID	Item name	Unit (SI)	Applicable equipment
1	01002	Engine speed	r/min	ENG
2	01100	F pump pressure	MPa	PUMP
3	01101	R pump pressure	MPa	PUMP
4	01300	PC-EPC sol current (F)	mA	PUMP
5	01302	PC-EPC sol current (R)	mA	PUMP
6	04401	Hydr. oil temperature	°C	PUMP

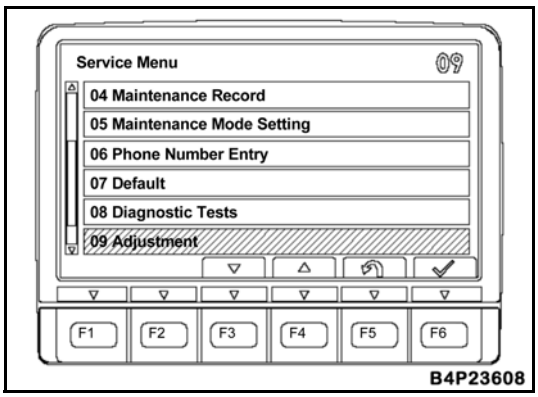
3. Items displayed on Maintenance Record screen
   The following information is displayed on the screen.
   (a): Maintenance items
   (b): Replacement time elapsed up to present
   (c): Service meter reading (SMR) at previous replacement



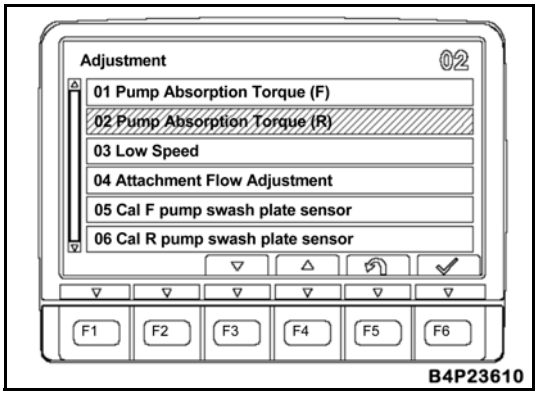
Adjustment (Pump Absorption Torque (R))

The machine monitor allows for adjustment of various items related to the machine with the machine monitor.
The sub menu of Pump Absorption Torque (R) is used to finely adjust the absorption torque of the front hydraulic pump.

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

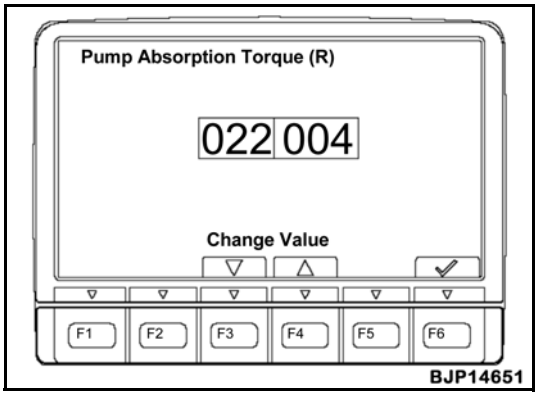


2. Selecting sub menu
   After the “Adjustment” screen is displayed, select “Pump Absorption Torque (R)” using the function switches or numeral input switches.
   ★ Select this sub menu as in the case of selecting a menu on the “Service Menu” screen.



3. Selecting pump absorption torque setting
   After the “Pump Absorption Torque (R)” screen is displayed, select a set value in the right column by using the function switches.
   - Set value code: For actual torque adjustment value, see the table shown in the below
   - [F3]: Increase set value
   - [F4]: Decrease set value
   - [F6]: Confirm setting and return to the adjustment menu screen

   ★ The 3-digit number in the left column does not change since it is the code of this function.



★ Relationship between set value code and torque offset value

Code	Set value coder	Torque offset value	Code	Set value coder	Torque offset value
022	000	+39.2 N•m {+29 lbf ft}	022	005	-9.8 N•m {-7 lbf ft}
	001	+29.4 N•m {+22 lbf ft}		006	-19.6 N•m {-15 lbf ft}
	002	+19.6 N•m {+15 lbf ft}		007	-29.4 N•m {-22 lbf ft}
	003	+9.8 N•m {+7 lbf ft}		008	-39.2 N•m {-29 lbf ft}
	004	0 N•m {0 lbf ft}			

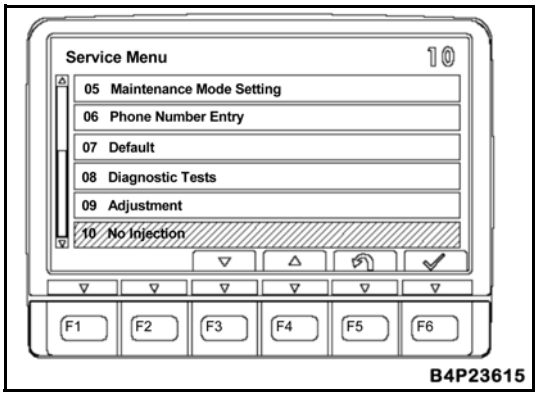
Cause code	Object			Description	Remedy
	MIN Calibration of swash plate	MAX Calibration of swash plate	Pump Calibration of IT		
E-6	—	—	●	When bucket CURL circuit is relieved, bucket CURL PPC pressure is below the specified value or bucket CURL PPC pressure sensor is within the normal range. Standard value: Below 22 kg/cm² {319 psi} or sensor voltage is out of 0.5 to 4.5 V (*1)	Set bucket CURL lever to full stroke.
E-7	—	—	●	Working mode is not set to [P] or [ATT/P]	Set working mode is to [P] or [ATT/P].
E-9	—	—	●	Swing lock switch is not set to ON position	Set swing lock switch to ON position.
E-A	—	—	●	Air conditioner is set to ON position	Set air conditioner to OFF position.
FF	●	●	—	Output voltage of pump swash plate sensor is out of calibration range	Perform troubleshooting of swash plate sensor
G-1	—	—	●	KDPF regeneration is underway	End KDPF regeneration.

(*1): When the sensor voltage is other than the standard range (0.5 - 4.5 V), pump controller recognizes the voltage as 0 kg/cm² {0 psi}, perform troubleshooting referring to “Section 40 Troubleshooting” (failure codes [DHPAMA] and [DHPBMA]).
(*2) Relief side standard value 360 ±20 kg/cm² {5,120 ±290 psi}.
(*3) MIN side standard value 40 ±20 kg/cm² {566 ±290 psi}.

No Injection

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

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



No.	Testing tool	Testing conditions				[1]	[2]	[3]	[4]	[5]	Temperature sensor system	NO
		Fuel control dial	Working mode	L.H. knob switch	Operation of work equipment	600 kg/cm² {8,702 psi} F pump main	600 kg/cm² {8,702 psi} R pump main	600 kg/cm² {8,702 psi} F pump LS	600 kg/cm² {8,702 psi} R pump LS	60 kg/cm² {870 psi} Control		
7	Main relief valve, travel motor safety valve, travel junction valve	MAX	P	OFF	Right track locked,Right track forward relief	G	—	—	—	—		
					Right track locked, Right track reverse relief	G	—	—	—	—		
					Left track locked, Left track forward relief	—	G	—	—	—		
					Left track locked, Left track reverse relief	—	G	—	—	—		

	Oil pressure to be checked	Unit	Standard	Service limit
New Machine.	A (Control source pressure)	kg/cm² {psi}	30 - 35 {425 - 498}	28 - 35 {399 - 498}
	B (Work equipment relief pressure, low)		343 - 370 {4,873 - 5,265}	338 - 380 {4,800 - 5,395}
	C (Work equipment relief pressure, high)		368 - 395 {5,236 - 5,628}	368 - 405 {5,236 - 5,758}
	D (Unload pressure)		D1 to D2 = 26 - 46 {D1 to D2 = 363 - 653}	D1 to D2 = 26 - 46 {D1 to D2 = 363 - 653}
	E (LS differential pressure)		E1 to E2 = 17 - 18.5 {E1 to E2 = 247 - 268}	E1 to E2 = 17 - 18.5 {E1 to E2 = 247 - 268}
	F (Swing relief pressure)		295 - 325 {4,177 - 4,612}	290 - 330 {4.119 - 4,685}
	G (Travel relief pressure)		375 - 405 {5,323 - 5,758}	375 - 410 {5,337 - 5,831}

* Gauge connection changing work: Exchange hoses of gauges [3] and [4].

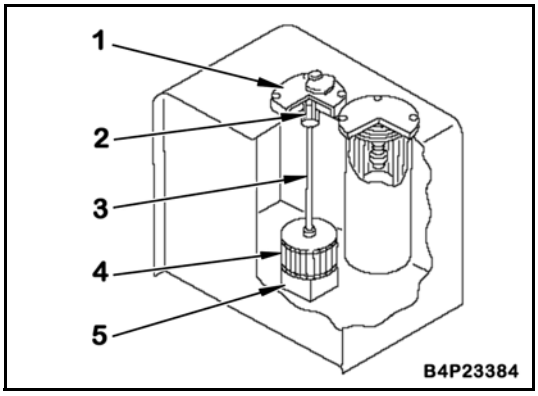
	No.	Item	Judgement value	Remedy
c: Electrical parts	1	Check battery terminal for looseness and corrosion - see page 40-37	—	Retighten or replace
	2	Check alternator terminal for looseness and corrosion - see page 40-37	—	Retighten or replace
	3	Check starting motor terminal for looseness and corrosion - see page 40-37	—	Retighten or replace
	4	Check battery voltage (with engine stopped) - see page 40-37	20 to 30 V	Charge or replace
	5	Check battery electrolyte level - see page 40-38	Between H and L	Add or replace
	6	Check wiring harness for discoloration, burnt areas and cover peeling - see page 40-39	—	Repair or replace
	7	Check for coming off of wiring harness clamp and sagging of wiring harness - see page 40-39	—	Correct
	8	Check grounding - see page 40-40	—	Correct
	9	Check for loose connector and damaged lock - see page 40-41	—	Repair or replace
	10	Check connector pins for corrosion, bends and deformation - see page 40-41	—	Repair or replace
	11	Check for water and foreign material in connector - see page 40-42	—	Dry, clean or replace
	12	Check wiring harness for open circuit and short circuit - see page 40-42	—	Repair or replace
	13	Check fuse for blowout and corrosion - see page 40-43	—	Replace
	14	Check alternator voltage (when engine speed is medium or higher) - see page 40-43	After few minutes of operation: 27.5 to 29.5 V	Replace
	15	Check battery relay operation sound (When the starting switch is turned to ON or OFF position) - see page 40-43	—	Replace
	16	Check and cleaning of rear view camera	—	Clean or repair
d: Exterior parts	1	Check undercarriage	—	Correct
	2	Check handrails and steps	—	Correct
	3	Check rear view mirrors	—	Clean or repair
e: Interior parts	1	Check gauges and monitors	—	Clean or replace
	2	Check seat belt	—	Replace

b4. Check of hydraulic oil strainer

WARNING! Immediately after the engine is stopped, its parts and oil will still be very hot may burn your hands on contact. Therefore, wait until they have cooled down before starting the work.

WARNING! If the oil filler cap is removed quickly, the oil may spurt out. Therefore rotate the oil filler cap slowly to release the internal pressure and then remove it.

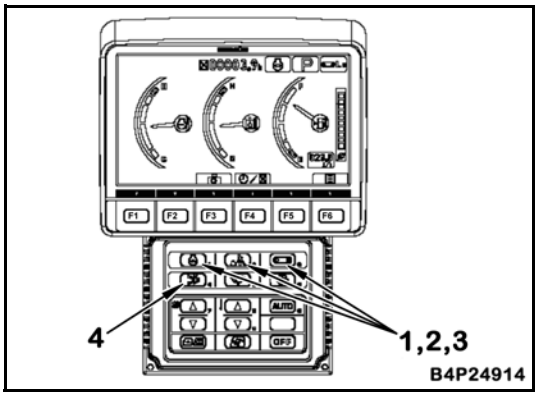
1. Stop the engine and remove oil filler cap (F) of the hydraulic tank to release the internal pressure.
2. Remove the bolts to remove cover (1).
3. When removing the bolts, keep pressing down cover (1) since it may be flung toward you by spring (2).
4. Pull out rod (3) from the top, and take out spring (2) and strainer (4).
5. Remove dirt from strainer (4) and clean it using cleaning oil. If strainer (4) is damaged, replace it with a new one.



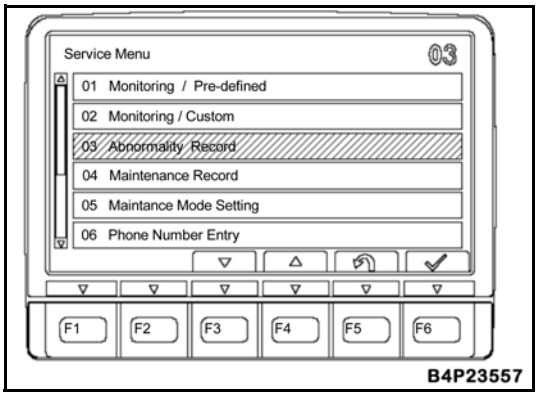
6. Insert and set strainer (4) in projected portion (5) of the tank.
7. While pressing down spring (2) with the projection at the bottom of cover (1), install the bolts. Tighten the mounting bolts.

[*1]□[*2]

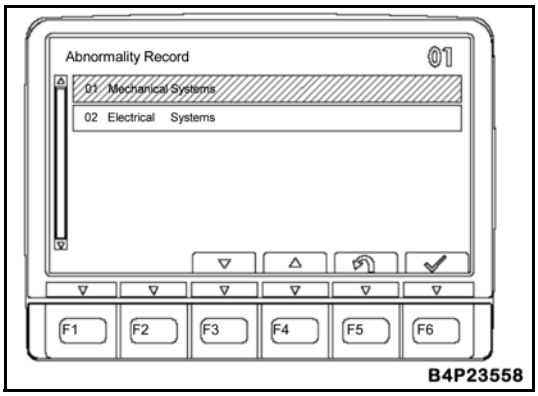
1. On the normal operation screen, while pressing number key [4] in the panel switch section, press [1], [2], and [3] in this order.



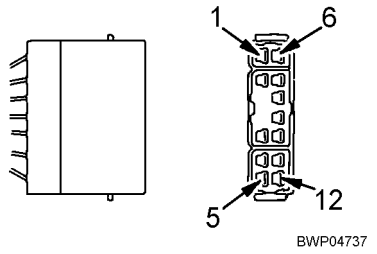
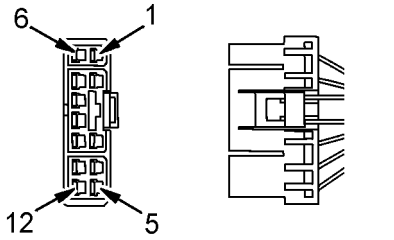
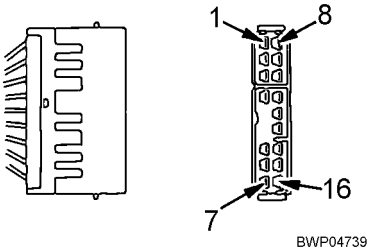
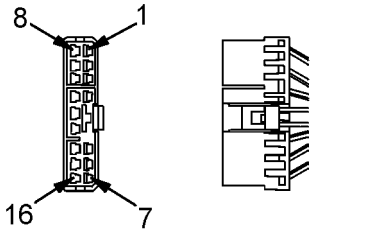
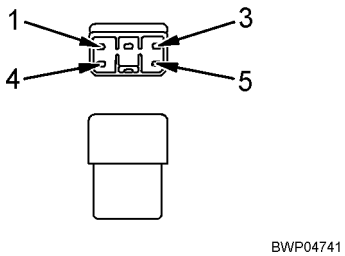
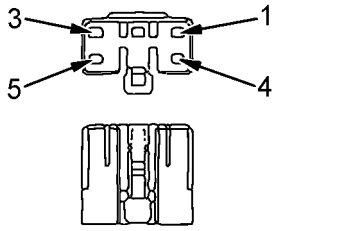
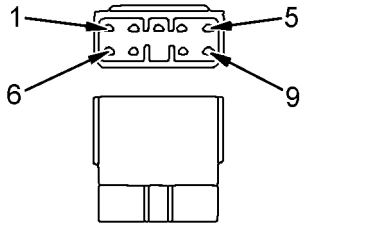
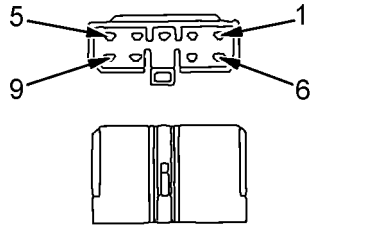
2. On the service menu screen, press switch [F3] (▽) in the panel switch section twice, and then select "03 Abnormality Record".
3. Press switch [F6] in the panel switch section to confirm, and then enter the "Abnormality record" screen.



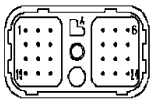
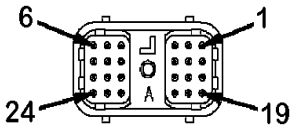
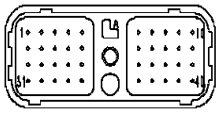
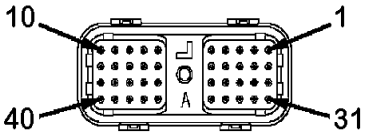
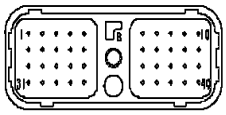
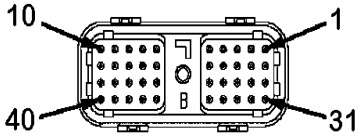
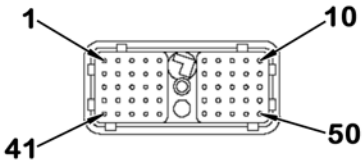
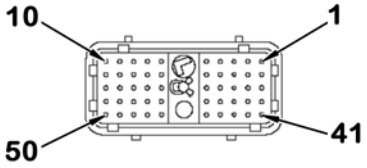
4. Press switch [F6] in the panel switch section to confirm, and then enter the "Mechanical system failure record" screen.
5. Press switch [F3] (▽) in the panel switch section to check failure codes one by one and take record of all information of all failure codes.
   ★ A failure code of the mechanical system cannot be deleted.
6. Press switch [F5] (return) in the panel switch section to return to the "Abnormality record" screen.
7. Similarly to 2 and 3, enter the "Electrical system abnormality record" screen.



8. Press switch [F3] (▽) in the panel switch section to check failure codes one by one and take record of all information of all failure codes.
   ★ If [E] is displayed on the left of a failure code, that failure code is "active" (the failure is still occurring or normal resetting is not confirmed yet). If [E] is not displayed on the left of a failure code, that failure code is "non-active" and disappears in the following clearing step. Accordingly be sure to take record of that failure code.
9. While pressing number key [4] in the panel switch section, press [1], [2], and [3] in this order to enter the "Clearing mode". (Same as 1)

12 (blue)			799-601-7160
	Part number: 08056-11272	Part number: 08056-11282	
16 (blue)			799-601-7170
	Part number: 08056-11672	Part number: 08056-11682	
Number of Pins	**MIC Type Connector**		
	Male (Female housing)	Female (Male housing)	T-adapter Part Number
7	Body part number: 79A-222-2640 (Quantity: 5 pieces)	Body part number: 79A-222-2630 (Quantity: 5 pieces)	—
11	Body part number: 79A-222-2680 (Quantity: 5 pieces)	Body part number: 79A-222-2670 (Quantity: 5 pieces)	—
5			799-601-2710
	Body part number: 79A-222-2620 (Quantity: 5 pieces)	Body part number: 79A-222-2610 (Quantity: 5 pieces)	
9			799-601-2950
	Body part number: 79A-222-2660 (Quantity: 5 pieces)	Body part number: 79A-222-2650 (Quantity: 5 pieces)	

★ The pin number is also marked on the connector (wire insertion end)

Type (shell size code)	DRC26 Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part Number
24	 BJD12722	 BJD12723	799-601-9360 (T-adapter) 799-601-9300 (Kit)
	—	Part No.: 08194-01101	
40 (A)	 BJD12724	 BJD12725	799-601-9350 (T-adapter) 799-601-9300 (Kit)
	—	Part No.: 08194-02101	
40 (B)	 BJD12726	 BJD12727	799-601-9350 (T-adapter) 799-601-9300 (Kit)
	—	Part No.: 08194-02102	
50	 9JS02951	 9JS02952	799-601-4211 (T-adapter) 799-601-4101 (Kit)
	—	Part No.: 08194-03103	

[Case 1: When replacing KCSF after removing KDPF]

★ Since existence of the following condition indicates that the soot load is beyond the regenerated level, you must remove KDPF and replace KCSF.

- The time from output of "CA2639: Stationary regeneration request (L01)" to output of "CA1921: KDPF soot load high error 1 (L03)" is >= 300 sec.
  and
  the time from output of "CA1921: KDPF soot load high error (L03)" to output of "CA1922: KDPF soot load high error 2 (L04)" is >= 300 sec.

[Contents of work]

Case 1-1 Stop the engine and wait until the temperature of piping around engine drops, then remove KCSF.
Case 1-2 Install another KDPF (new or used one).
Case 1-3 Turn starting switch to ON position and perform KDPF cleaning reset from the KDPF reset screen.
If you perform cleaning reset of KDPF, the changes provided in ( ) are reflected.
(Soot level: 9 g/ℓ → 8.1 g/ℓ, action level: L04 → L03, failure code: CA1922 → CA1921)
Case 1-4 Perform KDPF Change reset from the KDPF reset screen.
Case 1-5 Start the engine and warm it up at low idle.
Case 1-6 Perform active regeneration for service.
(This active regeneration for service ends when soot load becomes 2 g/ℓ. Therefore, this regeneration may last for two hours or so.)
Case 1-7 After the active regeneration for service is finished, confirm that the failure code (CA1922, CA1921 and/or CA2639) is not output.

[Case 2: When active regeneration for service is performed (removal of KDPF is unnecessary]

★ When the following condition exists, soot is not actually accumulated (9 g/ℓ or equivalent). It results from increase in differential pressure being caused by troubles such as plugging due to non-uniform accumulation of soot. Since actual soot load is not so large as to cause abnormal combustion when active regeneration is executed, you do not have to replace KCSF.
If you reduce the soot load by active regeneration for service, you can use KCSF continuously.

- After making sure through troubleshooting that a sensor system failure is not present, execute the active regeneration for service when any of the following exists.
- The time from output of "CA2639: Stationary regeneration request (L01)" to output of "CA1921: KDPF soot load high error 1 (L03)" is < 300 sec.
  or
  The time from output of "CA1921: KDPF soot load high error (L03)" to output of "CA1922: KDPF soot load high error 2 (L04)" is < 300 sec.

[Contents of work]

Case 2-1 Start the engine, warm it up at low idle, then perform KDPF cleaning reset from the KDPF reset screen.
Case 2-2 Perform active regeneration for service.
(This active regeneration for service ends when soot load becomes 2g/ℓ. Therefore, this regeneration may last for two hours or so.)
Case 2-3 After the active regeneration for service is finished, confirm that the failure code (CA1922, CA1921 and/or CA2639) is not output.

3. When cleaning or replacing KDOC

   A. If cracks or damages are detected

      i. If cracks or damages are detected on KDOC, replace KDOC.

      ii. Perform KDOC reset from the KDPF reset screen.

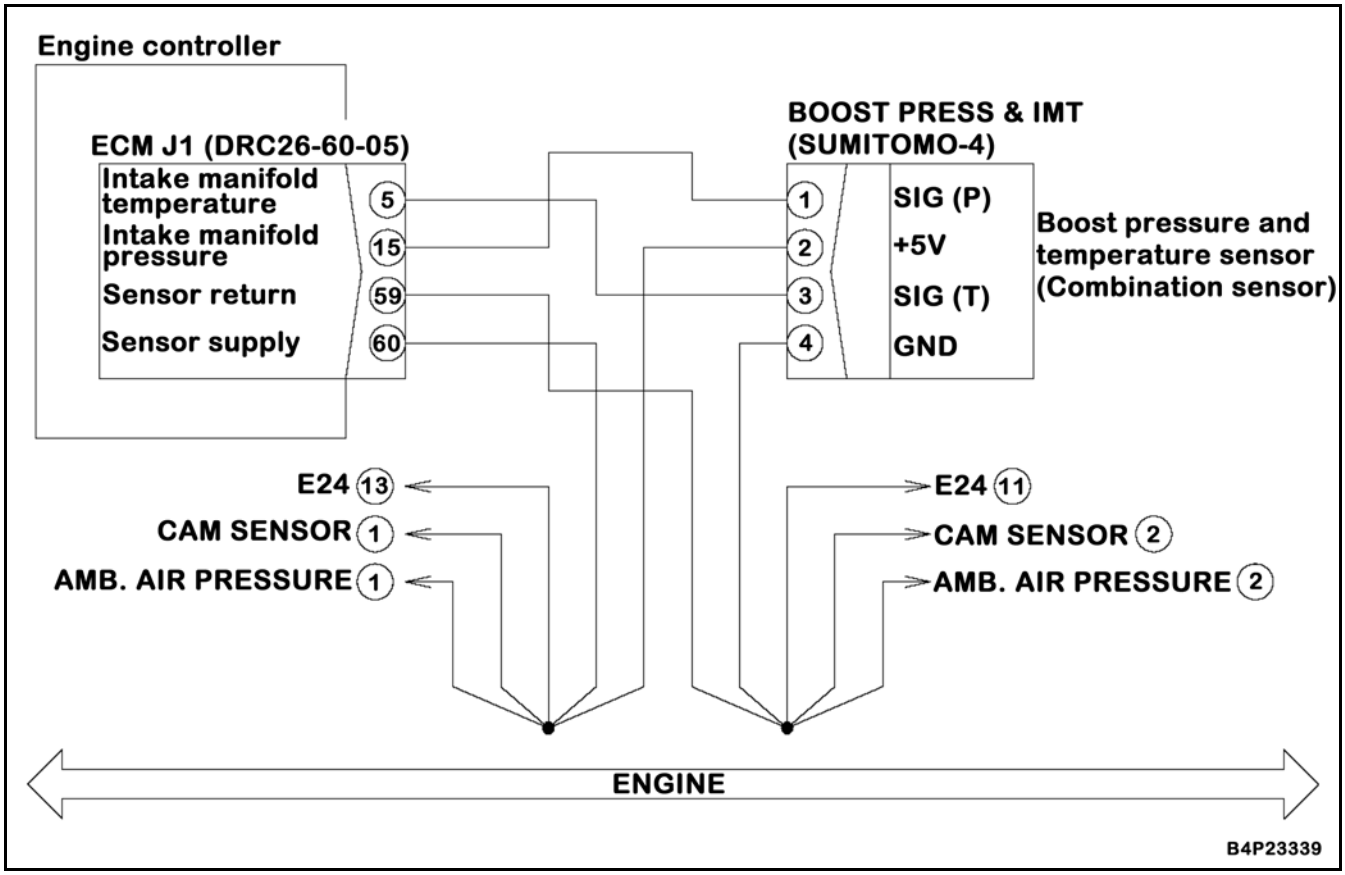
   B. When regeneration ineffective (CA1691) is output

No.	Cause	Procedure, measuring location, criteria and remarks
1	Execution of manual stationary regeneration (To dry KCSF)	1. Perform manual stationary regeneration according to instructions of monitor. If this failure code disappears after regeneration, repair is complete.
2	Defective wiring harness connector	1. Perform checkup referencing descriptions of wiring harness and connectors in "c: Electrical equipment" of "Checks before troubleshooting" in "General information on troubleshooting". 2. Turn starting switch to ON position.
		If this failure code disappears, wiring harness connector is defective. ★ If this failure code appears, perform the following.
3	Defective KDOC inlet temperature sensor	If failure code [CA3313], [CA3314], or [CA3315] appears, carry out troubleshooting for it first.
4	Soot accumulation in KCSF inside KDPF	1. Turn starting switch to ON position. 2. Monitor signal voltages from KDOC inlet temperature sensor and KDPF outlet temperature sensor, and record temperatures from respective temperature sensors in initial state and during manual stationary regeneration (see Related information). 3. Make sure that machine is in safe condition. 4. From service menu of machine monitor, display "Diagnostic Tests" screen and open "02 Regeneration for service" to execute "Manual Stationary Regeneration" (this operation is ended in about 40 minutes).
		If this failure code disappears after manual stationary regeneration, cause of failure is soot accumulation. ★ If another failure code appears during manual stationary regeneration, perform troubleshooting for it first. ★ If failure code [CA2639] appears after manual stationary regeneration, perform troubleshooting for [CA2639] first.
5	Defective engine controller	1. Turn starting switch to ON position. When this failure code appears and no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

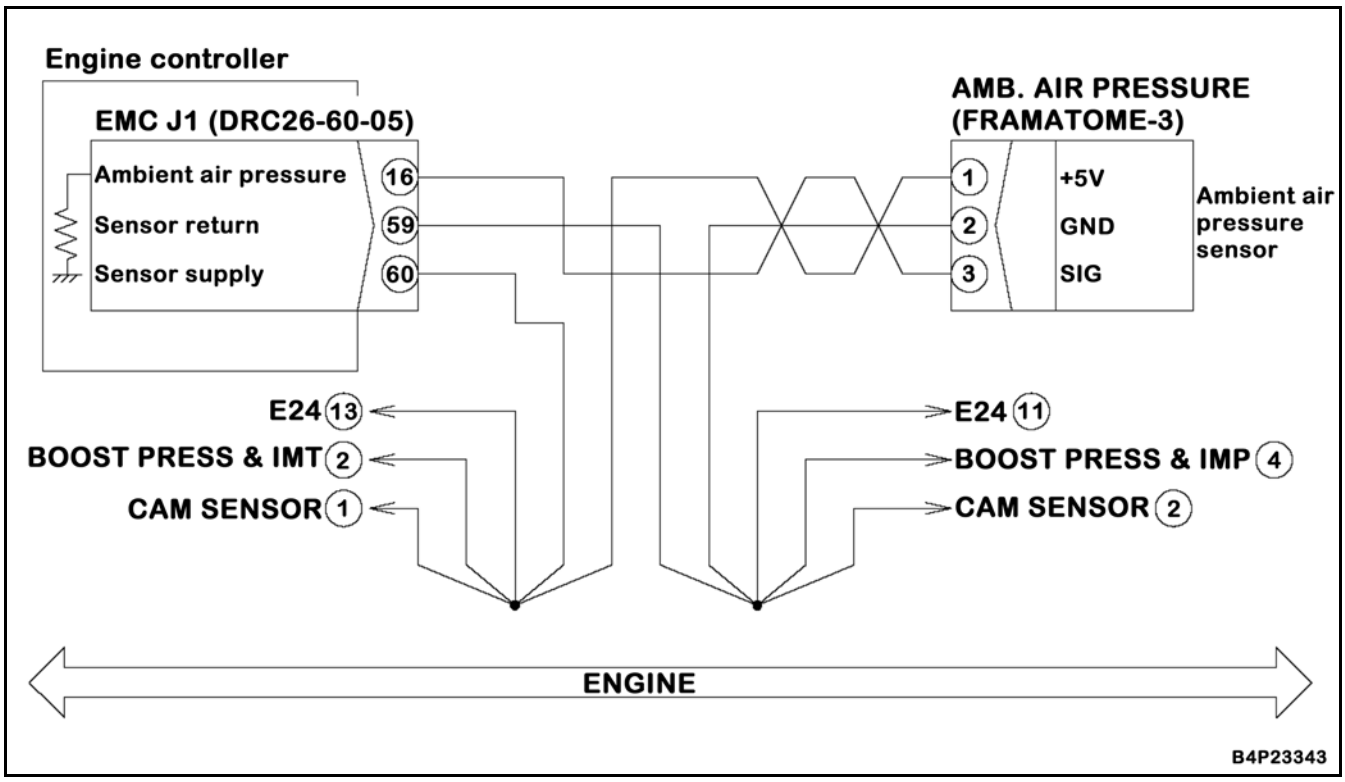
★ Turn starting switch to ON position and check that this failure code and failure code [CA2639] are not displayed.

6	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 charge pressure sensor

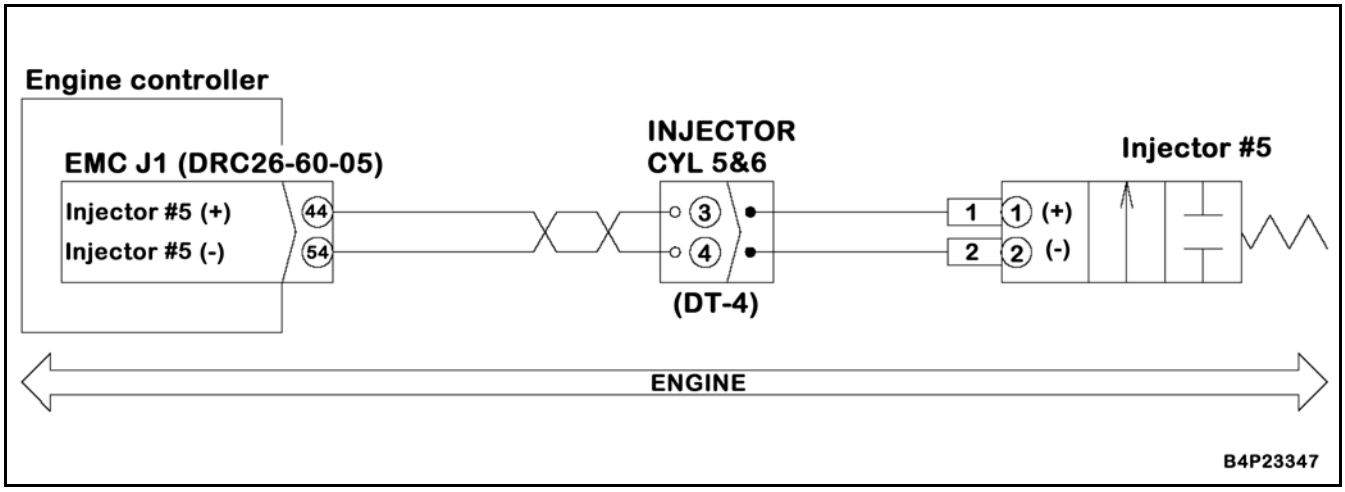


Circuit diagram related to ambient pressure sensor



<table>
<tr><td rowspan="2">5</td><td rowspan="2">Ground fault in wiring harness (contact with GND circuit)</td><td colspan="3">★ If no failure is found by check on cause 3, this check is not required.
1. Turn starting switch to OFF position.
2. Disconnect connectors ECM J1 and INJECTOR CYL 5 & 6, and connect T-adapter to either female side.</td></tr>
<tr><td>Resistance</td><td>Between ground and ECM J1 (female) (44) or INJECTOR CYL 5 & 6 (female) (3)</td><td>Min. 100 kΩ</td></tr>
<tr><td rowspan="3">6</td><td rowspan="3">Short circuit in wiring harness</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connectors ECM J1 and INJECTOR CYL 5 & 6, and connect T-adapter to female side of ECM J1.
★ Check by using multi-meter in continuity mode.</td></tr>
<tr><td rowspan="2">Continuity</td><td>Between ECM J1 (female) (44) and each pin other than (44)</td><td>No continuity (no sound is heard.)</td></tr>
<tr><td>Between ECM J1 (female) (54) and each pin other than (54)</td><td>No continuity (no sound is heard.)</td></tr>
<tr><td>7</td><td>Defective injector of other cylinder</td><td colspan="3">If failure code for other injector is also displayed, perform troubleshooting for it first.</td></tr>
<tr><td>8</td><td>Defective injector harness of other cylinder</td><td colspan="3">If failure code for other injector is also displayed, perform troubleshooting for it first.</td></tr>
<tr><td>9</td><td>Defective engine controller</td><td colspan="3">If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)</td></tr>
</table>

Circuit diagram related to No. 5 injector



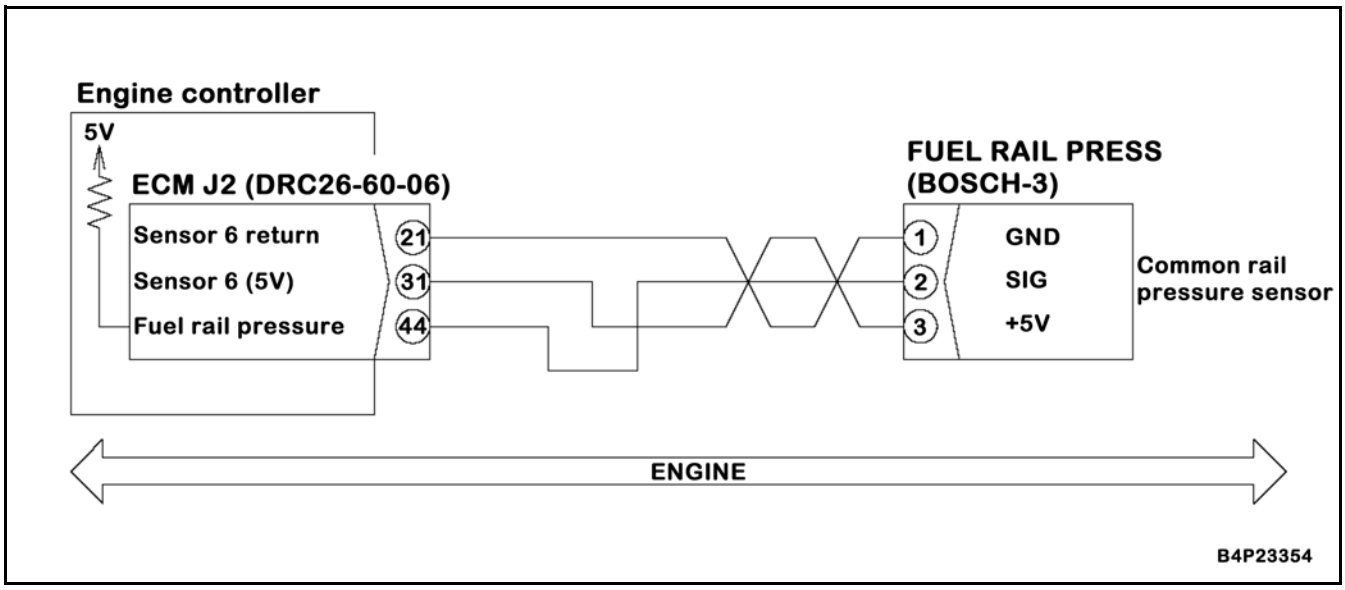
Failure Code [CA386] Sensor 1 Supply Volt High Error

Action level	Failure code	Failure	Sensor power supply 1 high error (Engine controller system)
L03	**CA386**		
Details of failure	• High voltage is detected in sensor power supply 1 circuit.		
Action of controller	• Controls EGR stroke sensor to close EGR valve and allows engine to run with output limited. • Controls KVGT stroke sensor to close EGR valve and allows engine to run with output limited. • Controls exhaust manifold sensor to close EGR valve and allows engine to run with output limited.		
Problem on machine	• Engine output decreases.		
Related information	• Method of reproducing failure code: Turn starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks
1	High sensor power supply voltage	Perform troubleshooting for failure code **[CA352]**.

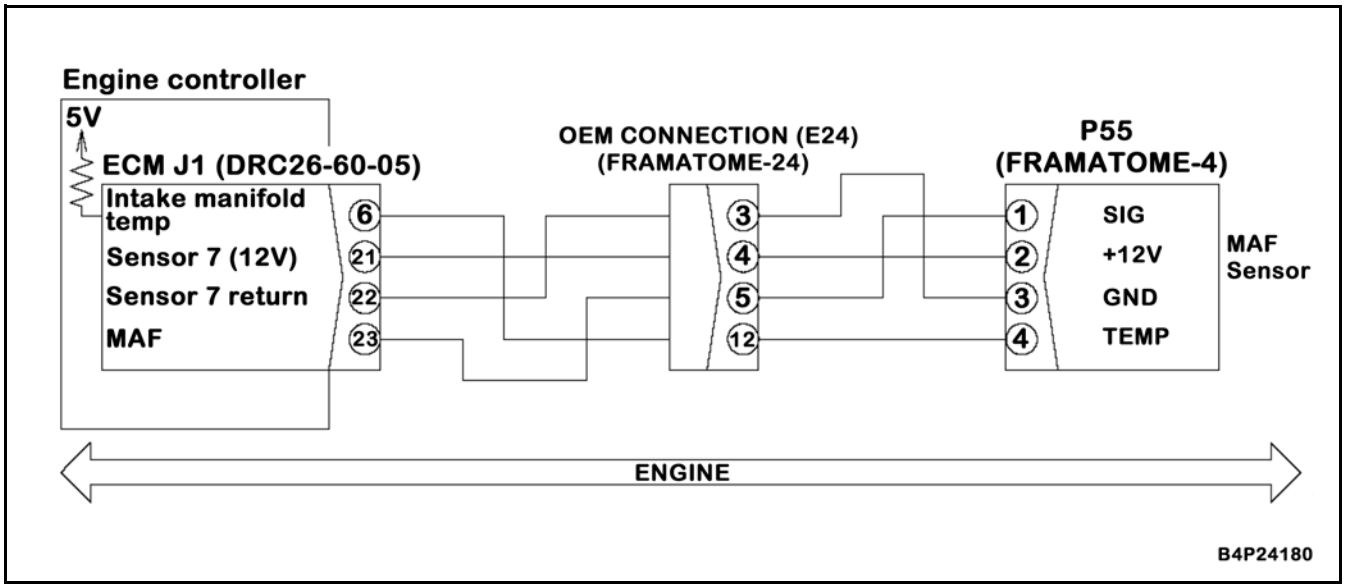
5	Defective engine controller	1. Turn starting switch to OFF position. 2. Disconnect connector ECM J2 and connect T-adapter. 3. Turn starting switch to ON position.		
		Voltage	Between ECM J2 (male) (31) and (21)	4.75 to 5.25 V
		If no failure is found by above checks, engine controller is defective. (Since this is an internal defect, troubleshooting cannot be performed.)		

Circuit diagram related to common rail pressure sensor

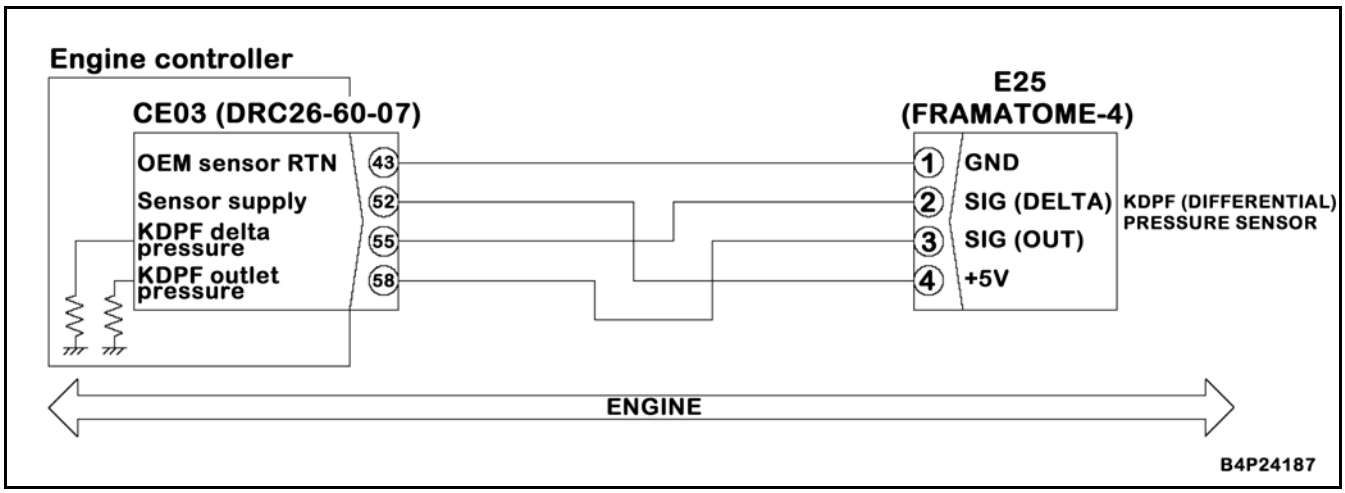


5	Ground fault in wiring harness (contact with GND circuit)	1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and P55, and connect T-adapter to either female side.		
		Resistance	Between ground and ECM J1 (female) (6) or between P55 (female) (4)	Min. 1 MΩ
6	Short circuit in wiring harness (between wiring harnesses)	1. Turn starting switch to OFF position. 2. Disconnect connectors ECM J1 and P55, and connect T-adapter to female side of ECM J1. ★ Check by using multi-meter in continuity mode.		
		Resistance	Between ECM J1 (female) (6) and each pin other than (6)	Min. 100 kΩ
7	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 intake air temperature sensor



Circuit diagram related to KDPF differential pressure sensor and KDPF outlet pressure sensor

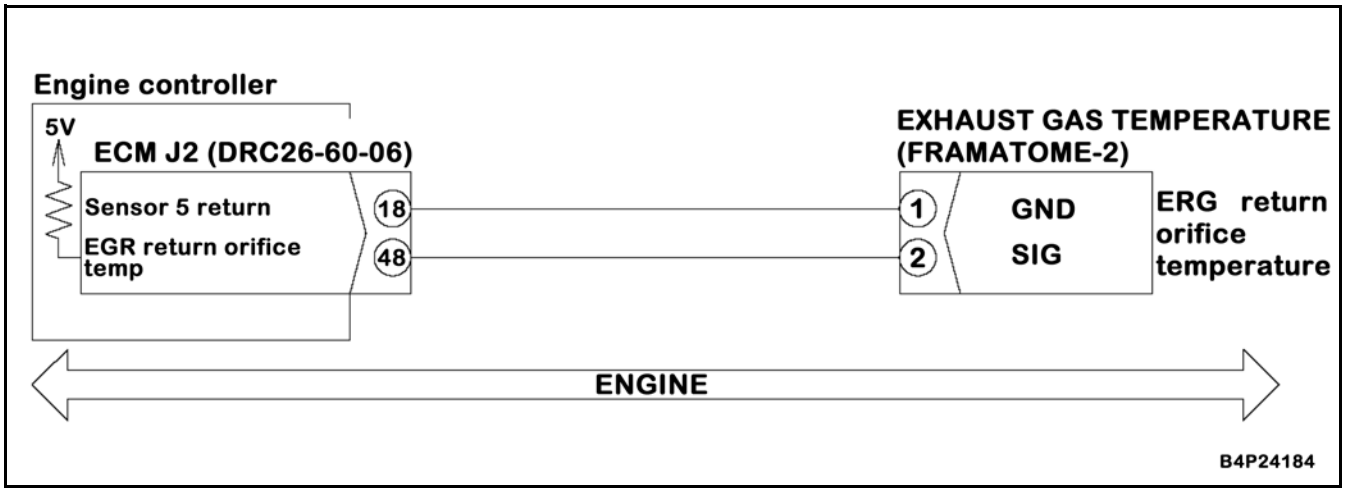


MEMORANDUM

MEMORANDUM

<table>
<tr><td rowspan="2">4</td><td rowspan="2">Hot short circuit in wiring harness (contact with 24 V circuit)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connector EXHAUST GAS TEMPERATURE and connect T-adapter to female side.</td></tr>
<tr><td>Voltage</td><td>Between EXHAUST GAS TEMPERATURE (female) (1) and (2)</td><td>Max. 5 V</td></tr>
<tr><td>5</td><td>Defective engine controller</td><td colspan="3">If no failure is found by above checks, engine controller is defective.
(Since this is an internal defect, troubleshooting cannot be performed.)</td></tr>
</table>

Circuit diagram related to EGR orifice temperature sensor



MEMORANDUM

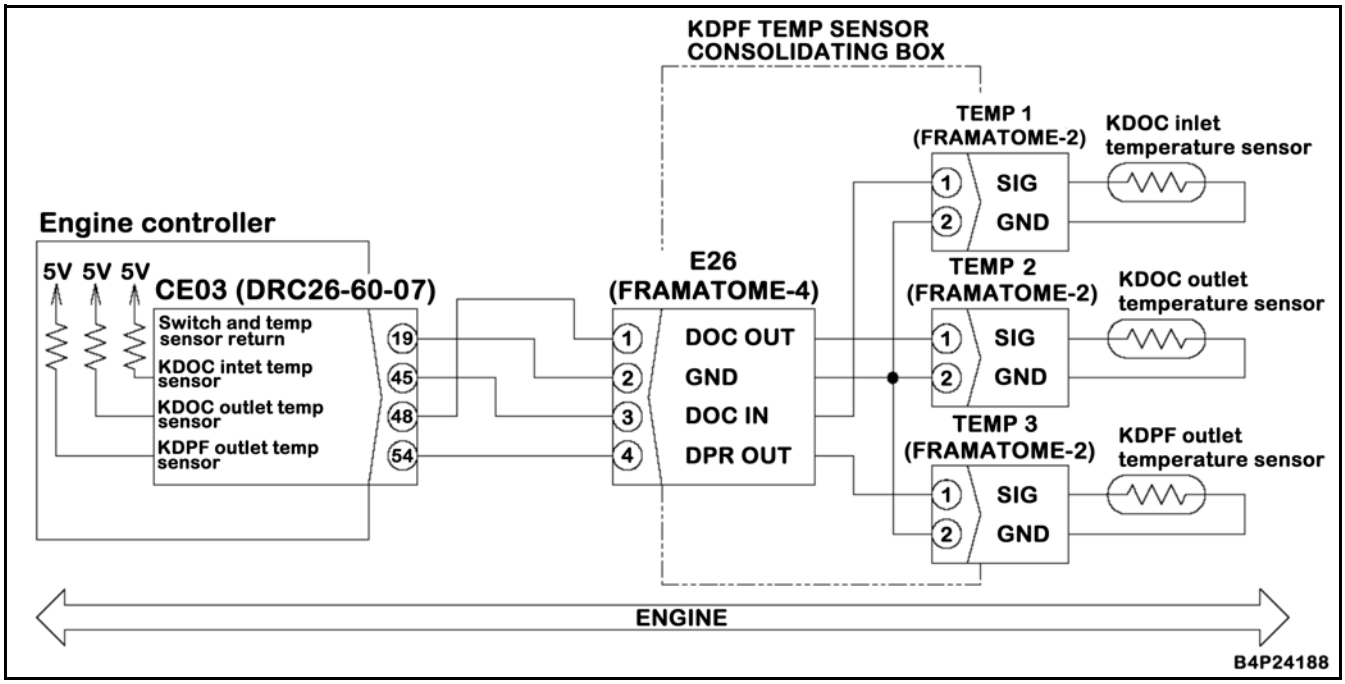
<table>
<tr><td rowspan="2">4</td><td rowspan="2">Defective sensor power supply line</td><td colspan="3">1. Starting switch: OFF
2. Disconnect connector E25 and connect T-adapter to female side.
3. Starting switch: ON</td></tr>
<tr><td>Voltage</td><td>Between E25 (female) (4) and (1)</td><td>4.75 - 5.25 V</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Defective wiring harness or engine controller</td><td colspan="3">1. Starting switch: OFF
2. Disconnect connector E25.
3. Starting switch: ON</td></tr>
<tr><td colspan="3">If failure code [CA3134] is not displayed, the wiring harness or engine controller is defective.
★ Carry out troubleshooting for cause 2 again.
★ Ignore other displayed failure codes.</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Defective wiring harness or engine controller</td><td colspan="3">1. Starting switch: OFF
2. Disconnect connector E25 and connect a short connector to female side.
★ Connect a source of 5 V to signal line (connect E25 pins (4) and (2) with a jumper wire).
3. Starting switch: ON</td></tr>
<tr><td colspan="3">If failure code [CA3133] is not displayed, the wiring harness or engine controller is defective.
★ Perform troubleshooting for cause 2 again.
★ Ignore other displayed failure codes.</td></tr>
<tr><td>7</td><td>Defective KDPF delta pressure sensor</td><td colspan="3">★ If no failure is found by check on checks on cause 5, KDPF delta pressure sensor is defective.</td></tr>
<tr><td rowspan="4">8</td><td rowspan="4">Open circuit in wiring harness (wire breakage or defective contact of connector)</td><td colspan="3">1. Starting switch: OFF
2. Disconnect connectors CE03 and E25, and connect T-adapter to each female side.</td></tr>
<tr><td rowspan="3">Resistance</td><td>★ If no failure is found by checks on cause 3, this check is not required.
Between CE03 (female) (43) and E25 (female) (1)</td><td>10 Ω Max.</td></tr>
<tr><td>★ If no failure is found by checks on cause 3, this check is not required.
Between CE03 (female) (52) and E25 (female) (4)</td><td>10 Ω Max.</td></tr>
<tr><td>Between CE03 (female) (58) and E25 (female) (3)</td><td>10 Ω Max.</td></tr>
<tr><td rowspan="2">9</td><td rowspan="2">Ground fault in wiring harness (contact with GND circuit)</td><td colspan="3">1. Starting switch: OFF
2. Disconnect connectors CE03 and E25, and connect T-adapter to either female side.</td></tr>
<tr><td>Resistance</td><td>Between CE03 (female) (58) or E25 (female) (3) and ground</td><td>Min. 100 kΩ</td></tr>
</table>

MEMORANDUM

<table>
<tr><td rowspan="8">2</td><td rowspan="8">Defective KDOC outlet temperature sensor</td><td colspan="4">1. Starting switch: OFF
2. Disconnect KDOC outlet temperature sensor (connector TEMP2) and connect T-adapter to female side.
3. Connect T-box to T-adapter and connect T-box pins (1) and (2) using a jumper wire.
• Connect signal wire to ground.
4. Starting switch: ON</td></tr>
<tr><td colspan="4">If failure code changes to [CA3316], KDOC outlet temperature sensor is defective.
★ If this failure code is still displayed, the wiring harness or engine controller is defective.</td></tr>
<tr><td colspan="4">• Reference
1. Starting switch: OFF
2. Disconnect connector TEMP2 and connect T-adapter to female side.</td></tr>
<tr><td rowspan="6">Resistance</td><td rowspan="6">Between TEMP2 (female) (1) and (2)</td><td>-10°C {14°F}</td><td>33 - 65 k Ω</td></tr>
<tr><td>0°C {32°F}</td><td>25 - 47 k Ω</td></tr>
<tr><td>50°C {122°F}</td><td>7.8 - 12.2 k Ω</td></tr>
<tr><td>100°C {212°F}</td><td>3.2 - 4.5 k Ω</td></tr>
<tr><td>400°C {752°F}</td><td>200 - 240 Ω</td></tr>
<tr><td>700°C {1292°F}</td><td>64 - 69 Ω</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Open or short circuit in wiring harness (including inside of KDPF temperature sensors integrated box)</td><td colspan="3">1. Starting switch: OFF
2. Disconnect connector CE03, and connect T-adapter to female side.</td></tr>
<tr><td>Resistance</td><td>Between CE03 (female) (48) and (19)
★ Resistance accords with value in the above Temperature-Resistance characteristics table.</td><td>64 Ω - 65 kΩ</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Open circuit in wiring harness system (wire breakage or defective contact of connector) (including inside of KDPF temperature sensors integrated box)</td><td colspan="3">★ If no failure is found by check cause 3, this check is not required.
1. Starting switch: OFF
2. Disconnect connectors CE03 and TEMP2, and connect T-adapter to female side of CE03 and male side of TEMP2.</td></tr>
<tr><td rowspan="2">Resistance</td><td>Between CE03 (female) (48) and TEMP2 (male) (1)</td><td>10 Ω Max.</td></tr>
<tr><td>Between CE03 (female) (19) and TEMP2 (male) (2)</td><td>10 Ω Max.</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Short circuit in wiring harness (including inside of KDPF temperature sensors integrated box)</td><td colspan="3">1. Starting switch: OFF
2. Disconnect connectors CE03 and TEMP2, and connect T-adapter to female side of connector CE03.
★ Check by using multi-meter in continuity mode.</td></tr>
<tr><td>Continuity</td><td>Between CE03 (female) (48) and each other pin</td><td>No continuity (No sound is heard)</td></tr>
</table>

<table>
<tr><td rowspan="2">12</td><td rowspan="2">Short circuit in wiring harness</td><td colspan="3">★ If no failure is found by checks cause 8, this check is not required.
1. Starting switch: OFF
2. Disconnect connectors CE03 and E26, and connect T-adapter to female side of connector CE03.
★ Check by using multi-meter in continuity mode.</td></tr>
<tr><td>Continuity</td><td>Between CE03 (female) (54) and each other pin</td><td>No continuity (No sound is heard)</td></tr>
<tr><td rowspan="2">13</td><td rowspan="2">Defective engine controller</td><td colspan="3">1. Turn starting switch to ON position.</td></tr>
<tr><td colspan="3">When this failure code appears and no failure is found by above checks, engine controller is defective.
(Since this is an internal defect, troubleshooting cannot be performed.)</td></tr>
</table>

Circuit diagram related to KDOC and KDPF temperature sensor



Failure Code [DA20MC] Pump Controller

Action level	Failure code	Failure	Malfunction of pump controller (Pump controller system)
—	**DA20MC**		
Details of failure	• Malfunction of pump controller		
Action of controller			
Problem on machine	• Pump controller does not operate normally		
Related information	• Method of reproducing failure code: Turn starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Malfunction of pump controller	If machine operates normally, replacement is not necessary.

Failure Code [DAF0MC] Monitor Error

Action level	Failure code	Failure	Monitor malfunctions (Machine monitor system)
—	**DAF0MC**		
Details of failure	• Machine monitor malfunctions.		
Action of controller			
Problem on machine	• Indication of machine monitor is unreliable. • Machine monitor is incapable of normally exchanging data with controllers.		
Related information	• Method of reproducing failure code: Turn starting switch to ON position.		

No.	Cause	Procedure, measuring location, criteria and remarks
1	Replacement of machine monitor	Machine monitor is defective. (Since this is an internal defect, troubleshooting cannot be performed.)

<table>
<tr><td rowspan="4">10</td><td rowspan="4">Short circuit or hot short circuit in wiring harness (contact with 24 V circuit)</td><td colspan="3">★ If no failure is found by check on cause 5 (no open circuit), measure at only one place each.
1. Turn starting switch to OFF position and battery disconnect switch to OFF position.
2. Disconnect connector to be measured and insert T-adapter into connector.
3. Turn battery disconnect switch to ON position.
4. Turn starting switch to ON position.
★ Since voltages of CAN_H and CAN_L lines are normally 2.5 ± 1 V including during communication, they should regard lines as normal if their voltages are between 1 and 4 V.</td></tr>
<tr><td rowspan="2">Voltage</td><td>Between ground and any of CM02 (female) (8), CP01 (female) (45), CK01 (female) (10), AC01 (female) (2), CC01 (female) (3) or CE03 (female) (17)</td><td>1 to 4 V</td></tr>
<tr><td>Between ground and any of CM02 (female) (9), CP01 (female) (64), CK01 (female) (11), AC01 (female) (1), CC01 (female) (9) or CE03 (female) (18)</td><td>1 to 4 V</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="3">11</td><td rowspan="3">Defective engine controller, pump controller, air conditioner unit, ID controller, or KOMTRAX terminal</td><td colspan="3">★ When all five failure codes of [DA2QKR], [DB2QKR], [D8AQKR], [DAZQKR], and [DAFQKR] are displayed
• Identify which controller fails by repeating following Steps 1 to 3 and disconnecting them one by one from CAN communication.
1. Turn starting switch to OFF position and battery disconnect switch to OFF position.
2. Disconnect CAN communication connectors of engine controller (connector CE03), pump controller (connector CP01), air conditioner unit (connector AC01), ID controller (connector CC01), and KOMTRAX terminal (connector CK01) in order one by one.
3. Turn battery disconnect switch to ON position, turn starting switch to ON position and perform troubleshooting.
4. Return to Step 1 and check the next controller.</td></tr>
<tr><td colspan="2">Is number of displayed failure codes less than 5?</td><td>If YES, the disconnected controller is defective.</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>12</td><td>Defective engine controller</td><td colspan="3">If no failure is found by above checks, engine controller is defective.
(Since this is an internal defect, troubleshooting cannot be performed.)</td></tr>
<tr><td>13</td><td>Defective machine monitor</td><td colspan="3">If no failure is found by above checks, machine monitor is defective.
(Since this is an internal defect, troubleshooting cannot be performed.)</td></tr>
</table>

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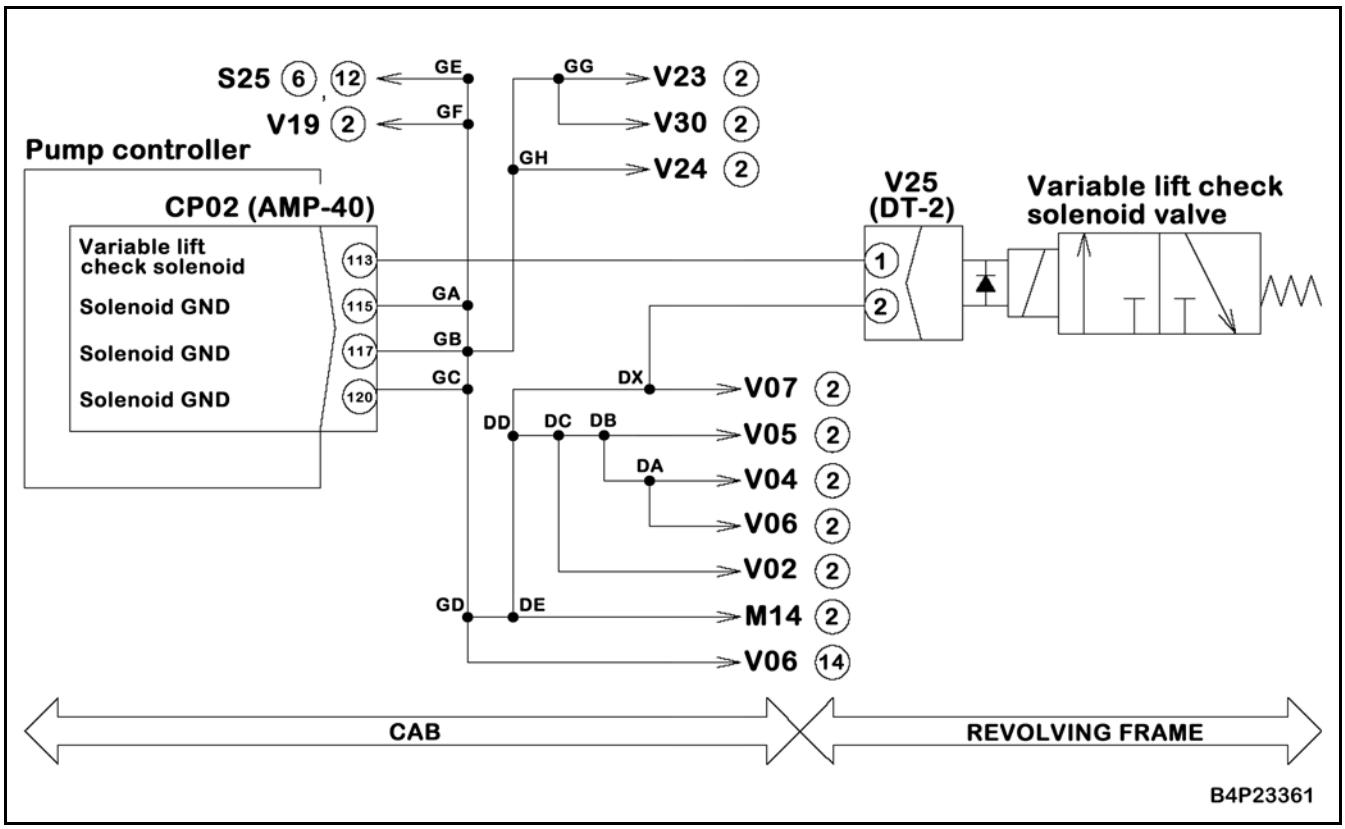
<table>
<tr><td rowspan="5">4</td><td rowspan="5">Open circuit in wiring harness (wire breakage or defective contact of connector)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connectors CP01 and P07, and connect T-adapter to each female side.</td></tr>
<tr><td rowspan="4">Resistance</td><td>★ If power supply voltage in check on cause 2 is normal, this check is not required.
Between CP01 (female) (18) and P07 (female) (1)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CP01 (female) (12) and P07 (female) (2)</td><td>Max. 1 Ω</td></tr>
<tr><td>★ If power supply voltage in check on cause 2 is normal, this check is not required.
Between CP01 (female) (6) and P07 (female) (3)</td><td>Max. 1 Ω</td></tr>
<tr><td></td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Ground fault in wiring harness (contact with GND circuit)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connectors CP01 and P07, and connect T-adapter to either female side.</td></tr>
<tr><td>Resistance</td><td>Between ground and CP01 (female) (12) or P07 (female) (2)</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Hot short circuit in wiring harness (contact with 24 V circuit)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connector P07.
3. Connect T-adapter to female side of connector P07.
4. Turn starting switch to ON position.</td></tr>
<tr><td>Voltage</td><td>Between P07 (female) (2) and ground</td><td>Max. 1 V</td></tr>
<tr><td>7</td><td>Defective pump controller</td><td colspan="3">If no failure is found by above checks, pump controller is defective.
(Since this is an internal defect, troubleshooting cannot be performed.)</td></tr>
</table>

MEMORANDUM

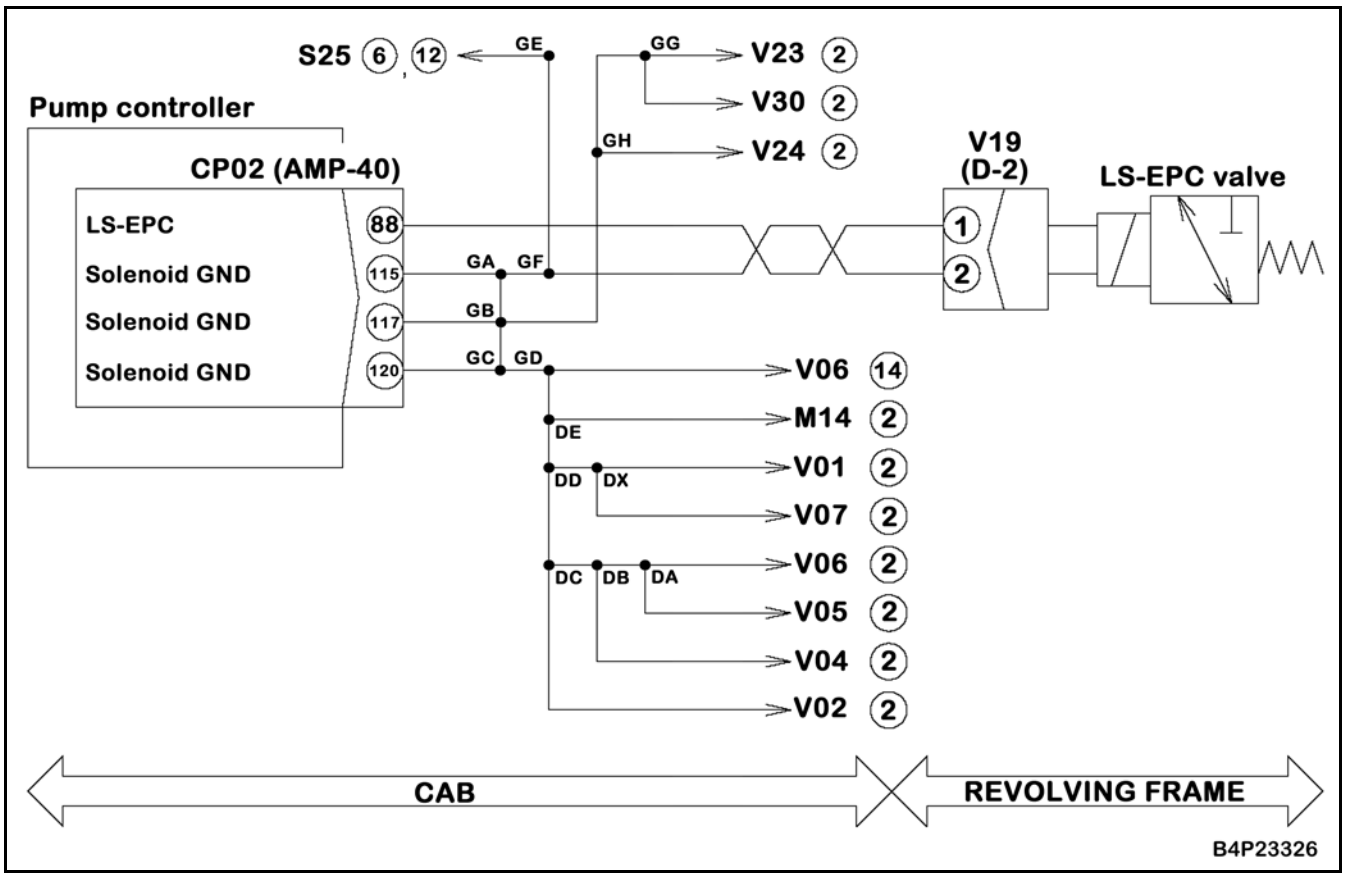
<table>
<tr><td>6</td><td>Defective R pump swash plate sensor (internal defect)</td><td colspan="3">★ If power supply voltage is normal and sensor output voltage is abnormal, it is difficult to judge whether cause is defective sensor, ground fault or hot short circuit of harness. Check as follows.
1. Turn starting switch to OFF position.
2. Replace connector P28 with connector P27.
3. Turn starting switch to ON position and display "Abnormality Record" screen of electrical system on machine monitor.
4. If E mark is not displayed in this failure code column, F pump swash plate sensor is defective.
★ After finishing test, restore connector.</td></tr>
<tr><td rowspan="4">7</td><td rowspan="4">Open circuit in wiring harness (wire breakage or defective contact of connector)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connectors CP01 and P28, and connect T-adapter to each female side.</td></tr>
<tr><td rowspan="3">Resistance</td><td>★ If power supply voltage in check on cause 2 is normal, this check is not required.
Between CP01 (female) (6) and P28 (female) (A)</td><td>Max. 1 Ω</td></tr>
<tr><td>★ If power supply voltage in check on cause 2 is normal, this check is not required.
Between CP01 (female) (18) and P28 (female) (B)</td><td>Max. 1 Ω</td></tr>
<tr><td>Between CP01 (female) (68) and P28 (female) (C)</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="2">8</td><td rowspan="2">Ground fault in wiring harness (contact with GND circuit)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connectors CP01 and P28, and connect T-adapter to either female side.</td></tr>
<tr><td>Resistance</td><td>Between ground and CP01 (female) (68) or P28 (female) (C)</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="2">9</td><td rowspan="2">Hot short circuit in wiring harness (contact with 24 V circuit)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connector P28.
3. Connect T-adapter to female side of connector P28.
4. Turn starting switch to ON position.</td></tr>
<tr><td>Voltage</td><td>Between P28 (female) (C) and ground</td><td>Max. 1 V</td></tr>
<tr><td>10</td><td>Defective pump controller</td><td colspan="3">If no failure is found by above checks, pump controller is defective.
(Since this is an internal defect, troubleshooting cannot be performed.)</td></tr>
</table>

<table>
<tr><td rowspan="3">5</td><td rowspan="3">Ground fault in harness
(Contact with GND circuit)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Remove No. 1 of fuse F01 (right top fuse, 5 A) and diode D01.
3. Disconnect connectors CP02 and V03.
4. Connect T-adapter to female sides of connectors CP02 and D01.</td></tr>
<tr><td rowspan="2">Resistance</td><td>Between CP02 (female) (101) and ground</td><td>Min. 1 MΩ</td></tr>
<tr><td>Between D01 (female) (3) and ground</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Short-circuiting of harness</td><td colspan="3">1. Turn starting switch to OFF position.
2. Remove No. 1 of fuse F01 (right top fuse, 5 A) and diode D01.
3. Disconnect connector CP02.
4. Connect T-adapter to female sides of connectors D01 and CP02.</td></tr>
<tr><td>Resistance</td><td>Between D01 (female) (3) and each of CP02 (female) (115), (117) and (120)</td><td>20 to 60 Ω</td></tr>
<tr><td rowspan="2">7</td><td rowspan="2">Hot short-circuiting of harness
(Contact with 24 V circuit)</td><td colspan="3">1. Turn starting switch to OFF position.
2. Disconnect connector V03.
3. Connect T-adapter to female side of connector V03.
4. Turn starting switch to ON position.</td></tr>
<tr><td>Voltage</td><td>Between V03 (female) (1) and ground</td><td>Max. 1 V</td></tr>
<tr><td>8</td><td>Defective pump controller</td><td colspan="3">If no failure is found by above checks, pump controller is defective.
(Since this is an internal defect, troubleshooting cannot be performed.)</td></tr>
</table>

Circuit diagram related to variable back pressure solenoid



Circuit diagram related to LS-EPC solenoid



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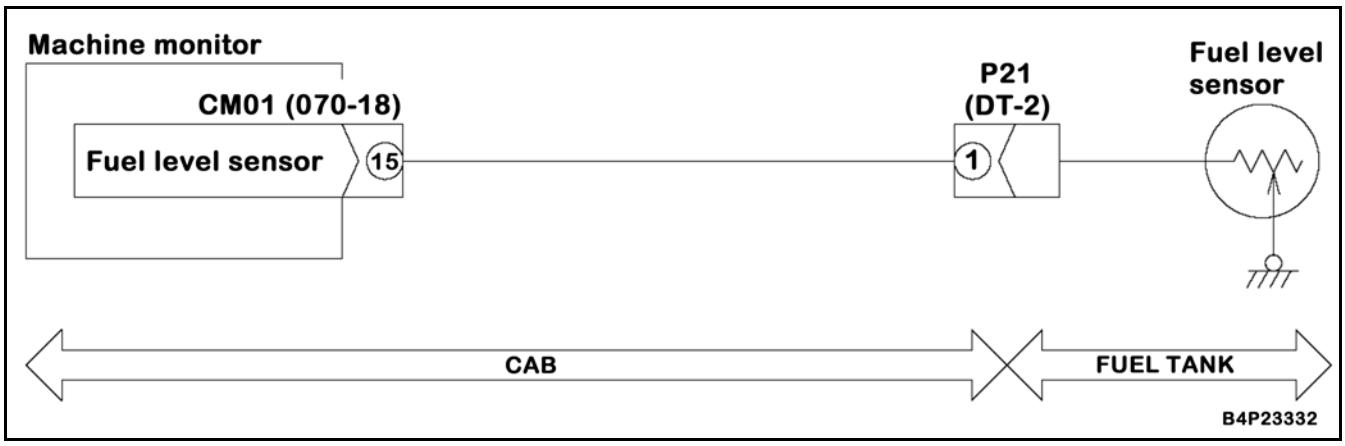
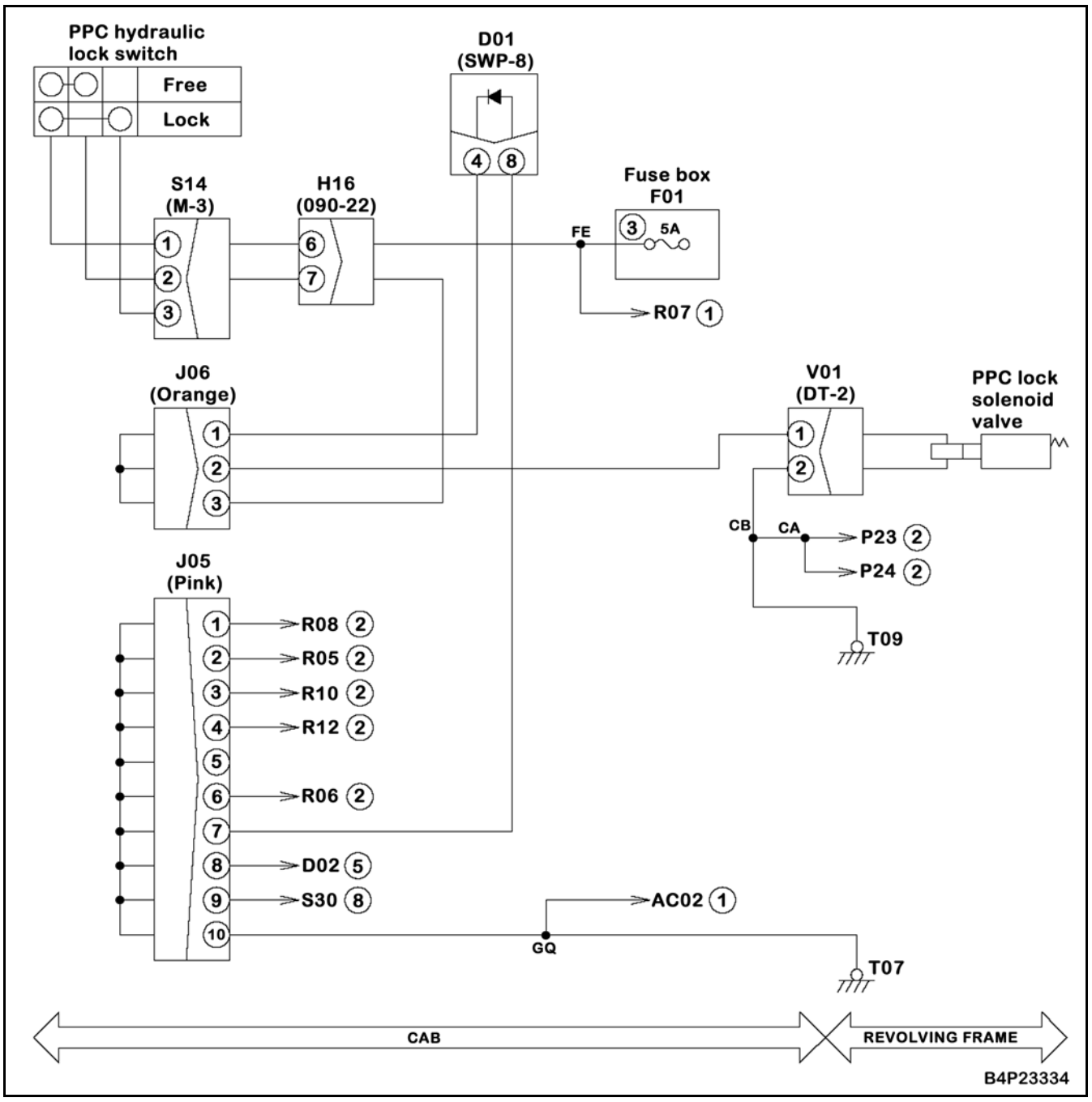
Circuit diagram related to fuel level sensor



Related circuit diagram



E-46 Wiper Monitor Does Not Light Up or Go Out When Wiper Switch is Operated

Failure	• When wiper switch is operated, wiper monitor does not light up or go off.
Related information	• Condition of wiper switch signal can be checked by using monitoring function. (Code: 04504 Monitor 1st & 2nd row switches)

No.	Cause	Procedure, measuring location, criteria and remarks
1	Defective machine monitor	Machine monitor may be defective. (Since this is an internal defect, troubleshooting cannot be performed.)

Failure mode	Failed parts		Engine system	Damper	Tank			Hydraulic pump							Diagnosis codes
					Hydraulic oil	Cap	Stainer	Piston pump	Servo piston	Pump swash plate sensor	PC-EPC valve	PC valve	LS-EPC valve	LS valve	
Travel	Machine deviates during travel.													●	H-19
	Travel speed is low.												●		H-20
	Machine is not steered well or steered-travel power is low.														H-21
	Travel speed does not switch or travel speed is too low or high.												●		H-22
	One of tracks does not run.														H-23
Swing	Machine does not swing.	Upper structure swings neither to the right nor left.													H-24
		Upper structure does not swing in only one direction.													H-25
	Swing acceleration is poor or swing speed is low.	Poor or low for both of the right and left.													H-26
		Poor or low for only in one direction.													H-27
	Upper structure overruns considerably when it stops swinging.	Largely for both of the right and left.													H-28
		Largely for only in one direction.													H-29
	Large shock is made when upper structure stops swinging.														H-30
	Large unusual noise is heard when upper structure stops swinging.														H-31
	Swing drift on a slope is excessive.	When swing brake works.													H-32
		When swing brake works													H-33
Attachment	Attachment circuit is not switched to desired one.														H-34
	Flow rate of attachment circuit cannot be adjusted.														H-35

<table>
<tr><td>16</td><td>Malfunction of L.H. travel control valve (LS shuttle valve)</td><td colspan="4">LS shuttle valve of L.H. travel control valve may malfunction. Check it.</td></tr>
<tr><td>17</td><td>Malfunction of bucket control valve (LS shuttle valve)</td><td colspan="4">LS shuttle valve of bucket control valve may malfunction. Check it.</td></tr>
<tr><td>18</td><td>Malfunction of service control valve (LS shuttle valve)</td><td colspan="4">LS shuttle valve of service control valve may malfunction. Check it.</td></tr>
<tr><td rowspan="2">19</td><td rowspan="2">Defective arm cylinder</td><td colspan="4">★ Be ready with engine stopped, then perform troubleshooting with engine at high idle.</td></tr>
<tr><td>Leakage from arm cylinder</td><td>L.H. work equipment control lever</td><td>Arm IN to hydraulic relief</td><td>20 cc/min</td></tr>
</table>

H-25 Upper Structure Swing Only to the Right or Left

Failure	• Upper structure does not swing only in one direction
Related information	• Perform all troubleshooting with working mode in power mode (P).

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.			
		PPC valve output pressure	L.H. work equipment control lever	NEUTRAL	0 kg/cm² {0 psi}
				Swing LEFT or RIGHT	29 to 35 kg/cm² {412 to 498 psi}
2	Malfunction of swing control valve (spool)	Spool of swing control valve may malfunction. Check it.			
3	Malfunction of swing motor (suction valve)	Suction valve of swing motor may malfunction. Check it. ★ You may interchange right and left swing suction valves of swing motor and check changes in symptom to determine whether suction valve is normal or not.			
4	Malfunction of swing motor (check valve)	Check valve of swing motor may malfunction. Check it. ★ You may interchange right and left swing check valves of swing motor and check changes in symptom to determine whether check valve is normal or not.			

14	Broken or seized piston connecting rod	• Metal particles are found in oil drained from oil pan. • Remove oil pan and check piston and connecting rod. (Reference: Engine is stopped after abnormal usual sound is heard or overheated.)	Replace piston and connecting rod.
15	Broken or seized crankshaft main bearing	• Metal particles are found in oil drained from oil pan. • Remove oil pan and check crankshaft main bearing.	Replace crankshaft main bearing.
16	Defective engine controller power supply wiring	• Check engine controller power supply wiring. (Reference: See Troubleshooting by failure code [CA343].)	Repair engine controller power supply wiring.
17	Defective starting switch wiring	• Check starting switch wiring.	Perform troubleshooting for E-1 and repair.
18	Malfunction of hydraulic system	• See H mode, "H-2 Engine speed lowers significantly or engine stalls".	Perform troubleshooting for H-2 and repair.

S-18 Unusual Noise is Heard

Failure	Unusual noise is heard
Related information	• Determine source of unusual noise, namely internal or external noise, before starting troubleshooting. • Engine runs in low-temperature mode if it is not warmed up sufficiently. As a result, engine sound may become a little larger but it does not mean any problem. • When engine is accelerated, it runs in acceleration mode and its sound becomes a little larger for 3 to 5 seconds. However, it does not indicate any problem. • If a failure code is displayed, perform troubleshooting for it first.

No.	Cause	Check item and remarks	Remedy
1	Gas leakage from each piping	• Gas may leak from piping between exhaust manifold and KVGT and that between KVGT outlet and KDPF. • Gas may leak from EGR piping	Repair or replace related parts.
2	Vibration of exhaust pipe and exhaust bellows	• Visually check for vibration.	Check and retighten pipe fixing bracket.
3	Seizure or damage of KVGT	• Check whether KVGT shaft rotates. (Check above by moving blades of KVGT in axial direction and in direction vertical to shaft.)	Replace KVGT.
4	Damaged inside of KDPF	• Check inside of KDPF.	Clean or replace KDPF.
5	Defective injector	• If exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low. • Even if a cylinder is cut out, engine speed does not change. (Reference: See Testing and adjusting, “Handling Cylinder Cut-Out Mode Operation” on page 30-51.)	Replace injector.
6	Incorrect valve clearance	• Check valve clearance. (Reference: See Testing and adjusting, “Measuring and Adjusting Valve Clearance” on page 30-18.)	Adjust valve clearance.
7	Seized pin bushing, front bearing, or main bearing	• Check inside of oil pan for metal powder.	Repair or replace damaged part.
8	Worn piston rings	• If metallic powders are recognized in oil pan or oil filter, disassemble engine and check piston ring. • Measure compression pressure (see standard value table). (Reference: see Testing and adjusting, “Measuring Compression Pressure” on page 30-22.)	Replace piston ring.
9	Damage of valve and rocker arm	• Disassemble engine and check parts of valve and rocker arm.	Replace valve and rocker arm.
10	Broken periphery parts of idler gear	• Disassemble engine and check parts of idler gear.	Replacement idler gear.

SPECIAL TOOLS LIST

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

★ Necessity:

■ .....Cannot be substituted, must always be equipped (used).

● .....Extremely useful if available or can be substituted with commercially available part.

★ New/Remodel:

N.....Tools with new part numbers, newly developed for this model.

R:.....Tools with upgraded part numbers, developed by improving existing tools for other models.

Blank: ...Tools already available for other models, can be used without any modification.

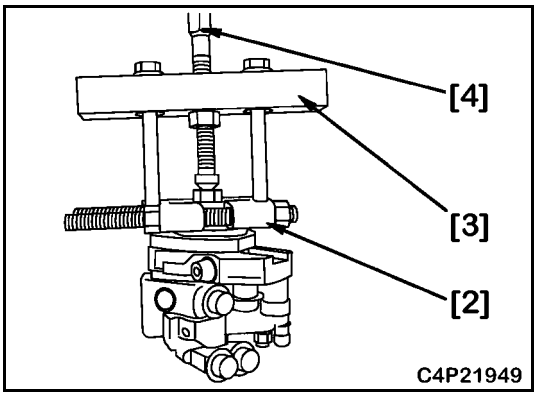
★ Tools marked ❍ in the Sketch column are tools introduced in the sketches of the special tools (see SKETCHES OF SPECIAL TOOLS).

Removal and installation	Sym-bol		Part number	Part name	Necessity	Qty	N/R	Sketch	Work content
Supply pump assembly	A	1	795-799-6130	Support	■	1			Holding of supply pump gear
Cylinder head assembly, fuel injector assembly		2	795-799-6700	Puller	■	1			Removal of fuel injector
		3	795-799-1131	Gear	■	1			Adjustment of valve clearance
		4	795-799-8150	Remover	●	1			Removal of inlet connector
Cylinder head assembly and engine front seal		5	790-331-1120	Wrench (Angle)	●	1			Angle tightening of bolt
Cylinder head assembly		6	795-790-4510	Gauge	●	1			Check of cylinder head bolt length
Engine front seal		7	795-799-6400	Seal puller	■	1			Installation of engine front seal
Engine rear seal		8	795-799-6500	Seal puller	■	1			Installation of engine rear seal
Engine and Main Pump Assembly		9	796T-401-1110	Plate	●	1		❍	Removal, installation of engine mounting bolts
		10	795-799-9300	Lifting tool	●	1			Removal and installation of engine and main pump assembly
KDPF Assembly		11	Commercially available	Long socket (1/2 in)	●	1			Removal and installation of V-clamp
Cylinder head assembly and KDPF assembly		12	Commercially Available	Long socket (7/16 in)	●	1			Removal and installation of V-clamp and band
Final Drive	F	1	796-627-1610	Wrench assembly	■	1			Removal and installation of ring nut
		2	791-580-1510	Installer	■	1			Installation of floating seal
		3	796T-627-1630	Push tool	■	1		❍	Installation of hub assembly
			791-830-1320	Rod	■	2			
			01580-11613	Nut	■	2			
			790-101-2570	Washer	■	2			
			01643-31645	Washer	■	2			
			790-101-2102	Jack assembly	■	1			
			790-101-1102	Pump	■	1			
		4	790-331-1110	Wrench	■	1			

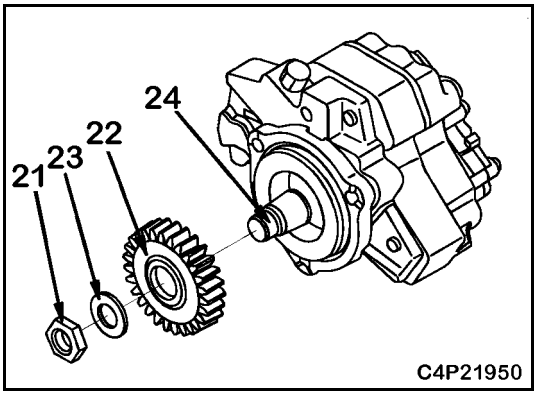
C. Install puller [3] onto puller [2] and the shaft.

D. Turn center bolt [4] until the gear is separated from the shaft.

E. Remove pullers [2] and [3].



F. Remove nut (21), lock washer (23), and gear (22) from shaft (24).



Installation

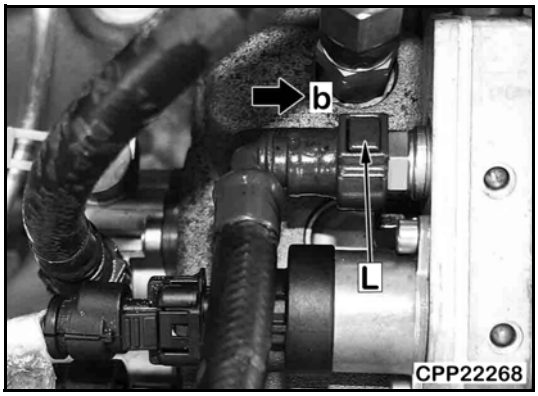
- Installation is done in the reverse order of removal.

[*1]

When installing a quick coupler connector, observe the following points.

★ The internal parts of the fitting may be damaged when the hose or tube is removed. Accordingly, do not reuse the hose or tube. When installing, replace it with a new one.

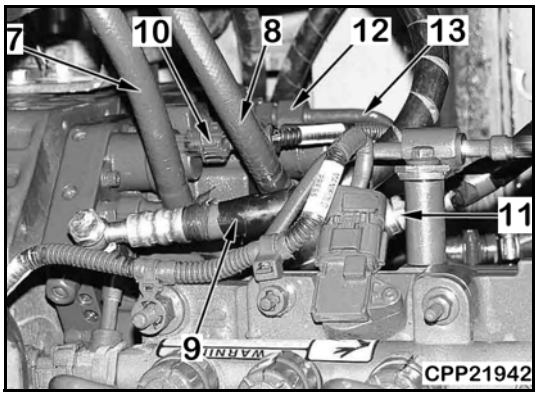
★ Ensure that mud or dirt is not sticking to the hose joint portions in advance.



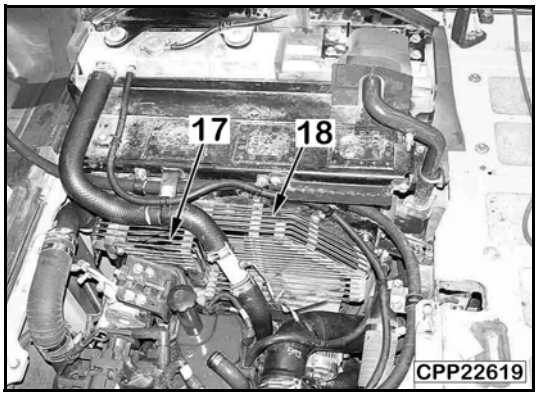
★ Push the connector straight (in the direction of (b)). Do not pry it in or shake it.
If it is difficult to insert the connector, do not push it in forcibly, but pull it out. Then, check the male and female couplings for damage and sticking mud.

[*2].

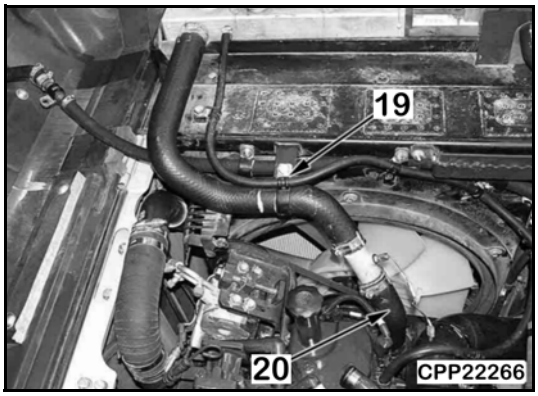
Fuel return hose (9) mounting bolt: 19.6 ± 29.4 N•m (14.46 ± 21.68 lbf ft)



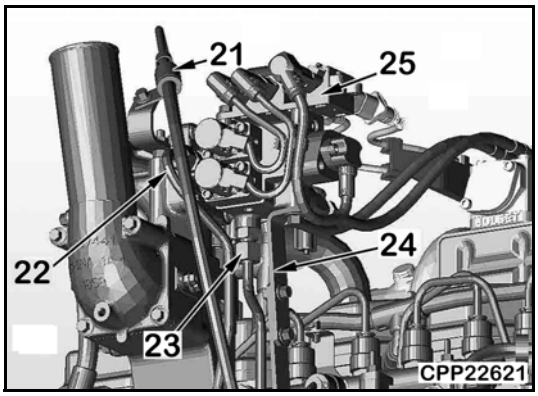
13. Remove fan guards (17) and (18).



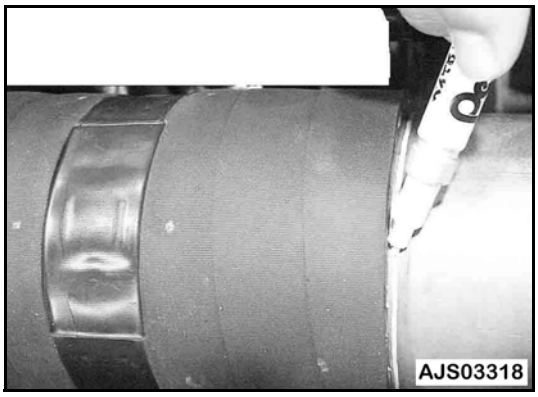
14. Disconnect hose clamp (19). **[*5]**
15. Disconnect radiator hose (20). **[*6]**



16. Disconnect dipstick pipe (21).
17. Disconnect tubes (22) and (23).
18. Remove lower bracket (24) of the EGR valve.
19. Remove EGR valve (25).



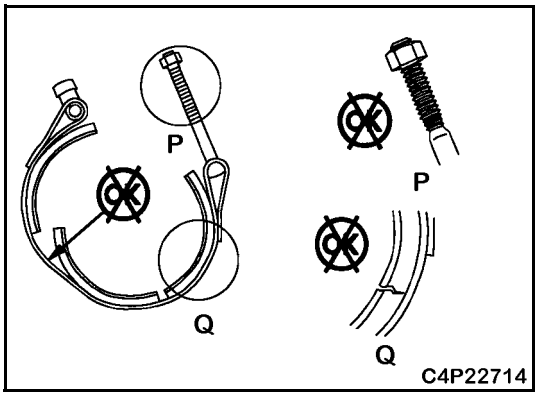
20. Remove air hose (26).
    ★ Put marks on the hose end and tube to indicate their fitting positions.



O. Install tube (48) with V-clamp by using tool A12 (long socket).

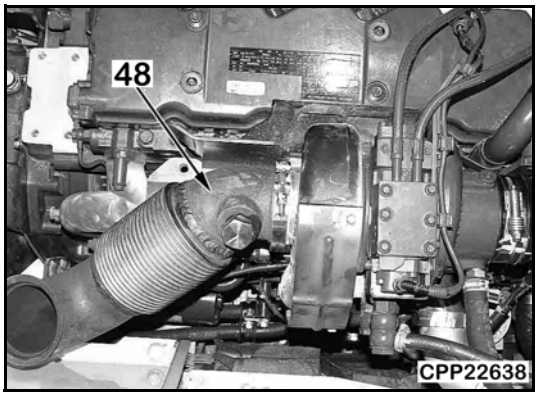
★ V-clamp can be reused however, replace it with a new one in the following conditions.

- Deformation of V-clamp
- Damage on T-bolt thread portion
- Crack at V groove
- Peeling at V groove

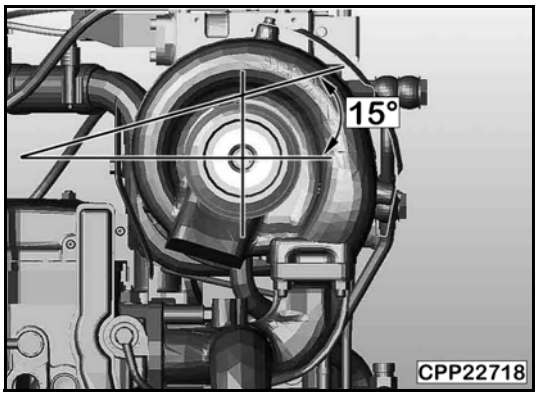


- Width across flats of V-clamp fastening nut: 7/16 in (11.1 mm)

V-clamp fastening nut: 13.6 ± 0.5 N•m
(10.03 ± 0.37 lbf ft)



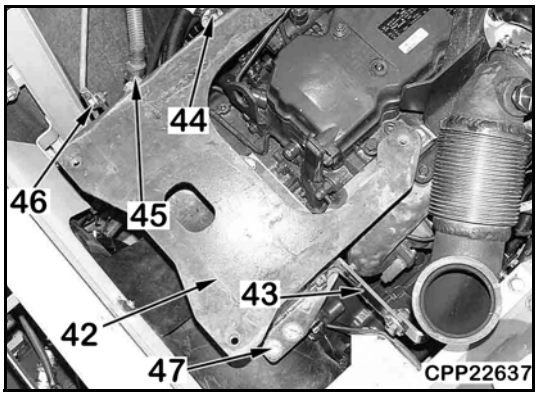
★ V-clamp mounting angle: 15°



11. Mounting of base brackets:

A. Sling and install base bracket (42).

Base bracket: 25 kg (56 lbs)

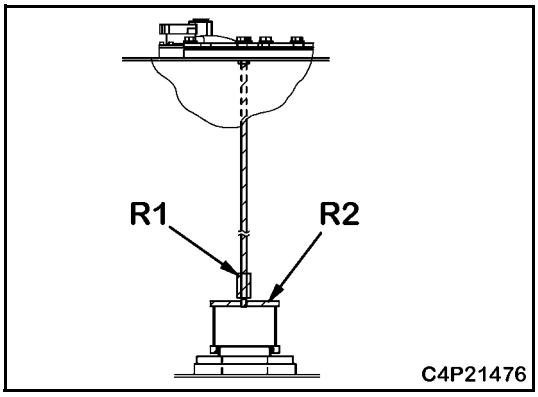


B. Install hose clamp (44), wiring harness clamp (45), and tube clamp (46) to base bracket (42).

C. Lightly tighten tube support bracket (43).

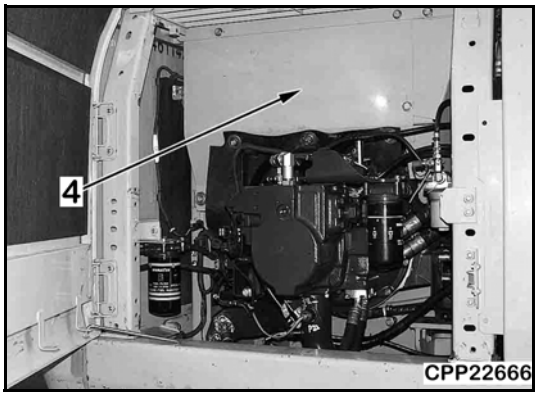
2. Remove the strainer of the hydraulic tank and stop oil from flowing by using tools R1 and R2.
   ★ If tools R1 and R2 are not used, remove the drain plug and drain oil from the hydraulic tank and piping.

Hydraulic tank:
Approximately 132 ℓ (34.87 gal)

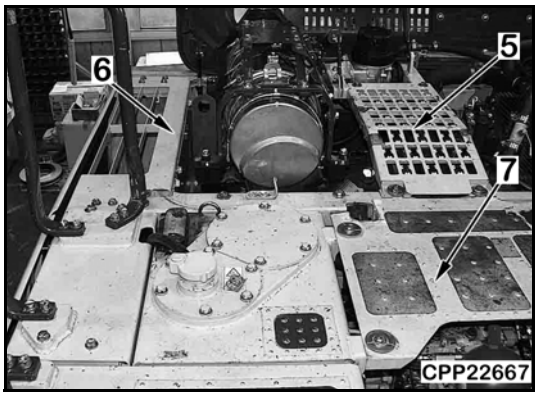


3. Drain coolant through the drain valve. Drain hose: inside diameter ϕ7 mm (0.28 in)

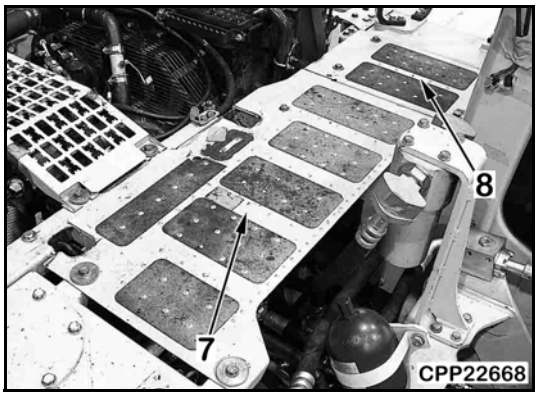
4. Open the right side cover and remove rubber-lined cover (4).



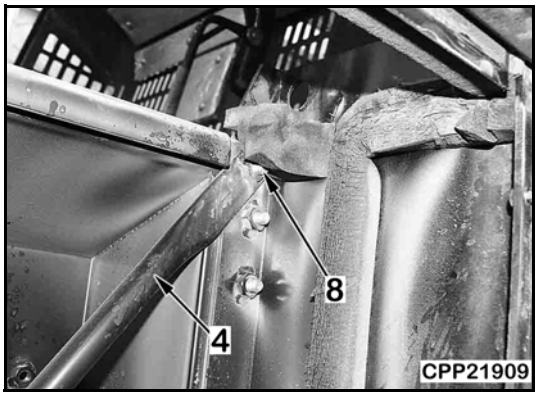
5. Remove engine hood referring to “Removal and Installation of Engine Hood Assembly” on page 50-117.



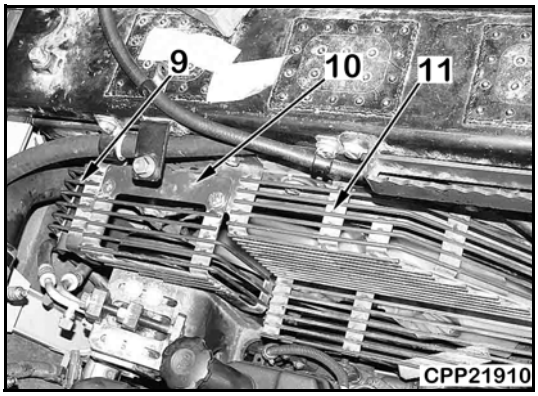
6. Remove steps (5) and covers (6), (7) and (8).



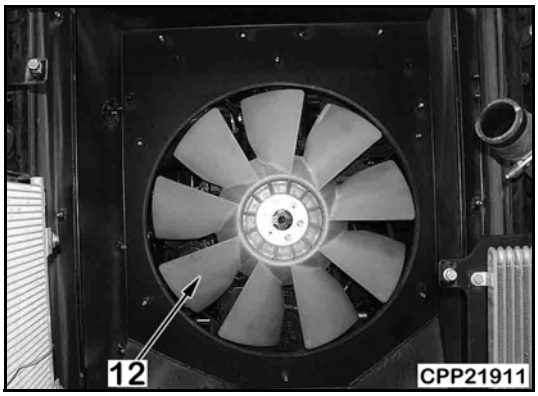
9. Remove mounting bolt (8), then remove stay (4).
   ★ Remove mounting bolt (8) from the upper side.



10. Remove fan guards (9), (10), and (11).



11. Remove fan (12). **[*1]**



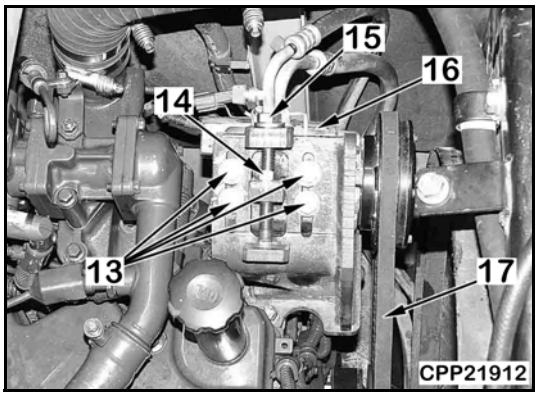
12. Remove air conditioner compressor belt (17) according to the following procedure. **[*2]**

    A. Loosen four bolts (13).

    B. Loosen lock nut (14).

    C. Turn jack bolt (15) and move air conditioner compressor (16) in the direction of loosening belt tension.

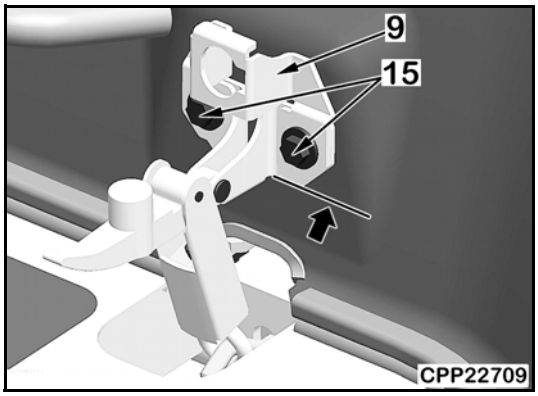
    D. Loosen the tension on air conditioner compressor belt (17) and remove the belt.



3. While pulling up catcher (9) to the end while keeping lever level, put a mark on the lower face of the catcher pedestal.

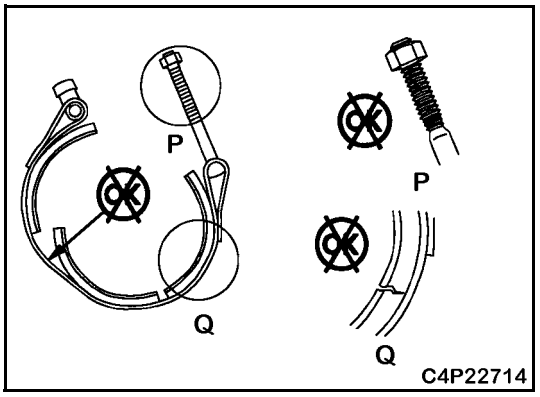
4. Tighten mounting bolt (15) to match with the mark.

5. Check that locking of catcher (9) is smooth.
   ★ Repeat steps 1 - 4 until locking of catcher (9) becomes smooth.



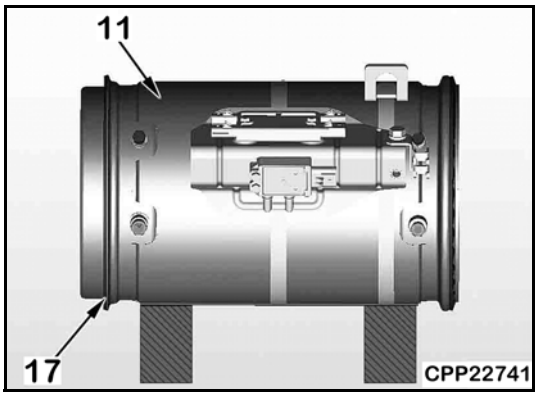
Assembly

1. Install KDPF assembly inlet body (9), KDPF filter assembly (11) and outlet body (10) in sequence.
   - ★ The blocks used at disassembly are used at assembly.
   - ★ Since lock nut is applied to the V-clamp, tighten lightly until V-clamp does not move when using tool **A11** (long socket).
   - ★ V-clamp can be reused, however, replace it under the following conditions.
     - Deformation of V-clamp
     - Damage on T-bolt thread portion
     - Crack at V groove
     - Peeling at V groove

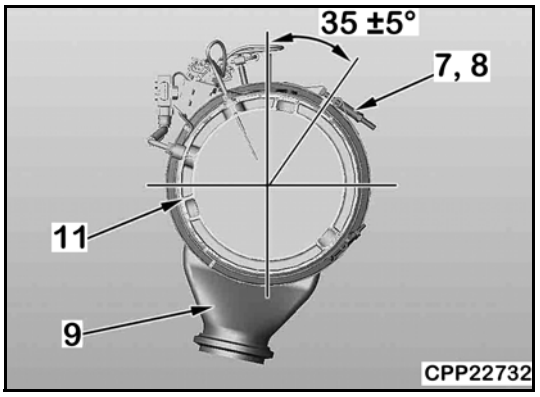


   A. Place new gasket (17) on end of KDPF filter assembly (11).

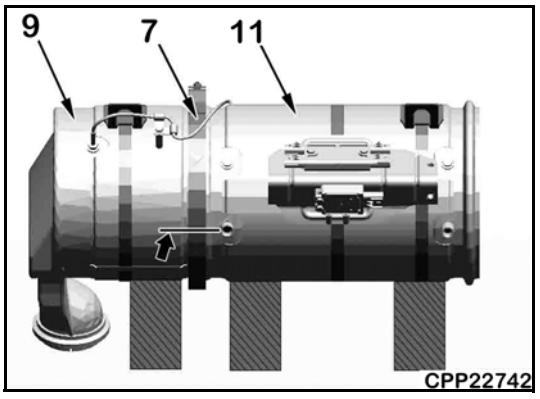
   B. Assemble inlet body (9) to KDPF filter assembly (11) matching the fitting location for differential pressure sensor pipe according to the mark put before removing.
      - ★ Place V-clamp (7) to inlet body (9) before installing them to KDPF filter assembly (11).
      - ★ When assembling inlet body (9) and KDPF filter assembly (11), take care that gasket (17) does not come out.



   C. Tighten V-clamp (7) lightly according to the marking put before removal and the angle shown to the right.



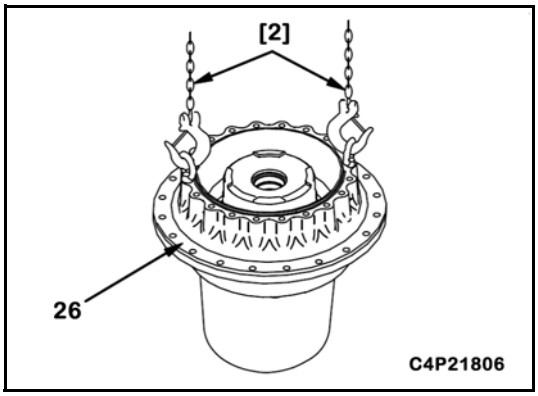
      - Width across flats of V-clamp fastening nut: 1/2 in (12.7 mm)
      - Mounting angle of V-clamp T-bolt: 35 ± 5°
      - Mounting angle of V-clamps (7) and (8)



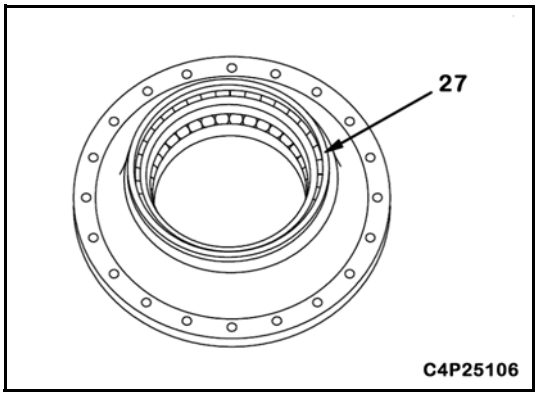
12. Hub assembly

A. Using eyebolts [2], sling and remove hub assembly (26) from the travel motor.

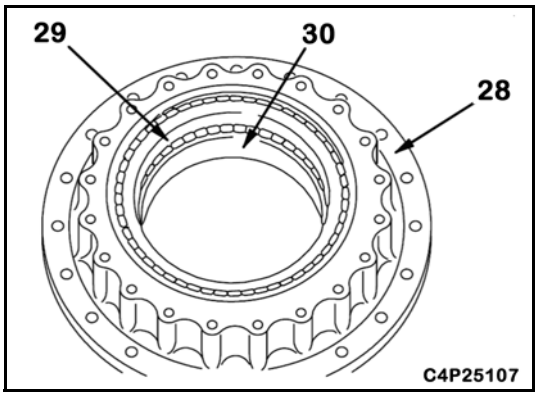
Hub assembly: 110 kg (242.5 lbs)



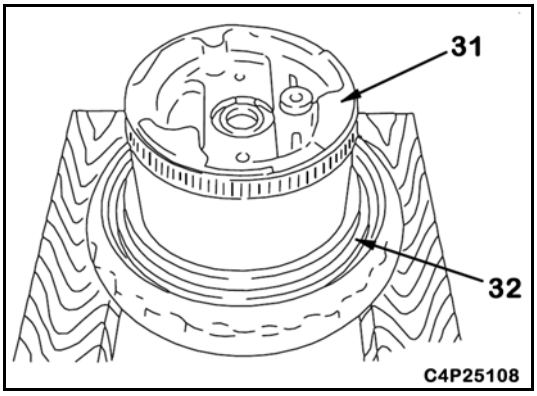
B. Remove floating seal (27).



C. Remove bearings (29) and (30) from hub (28).



13. Remove floating seal (32) from travel motor (31).

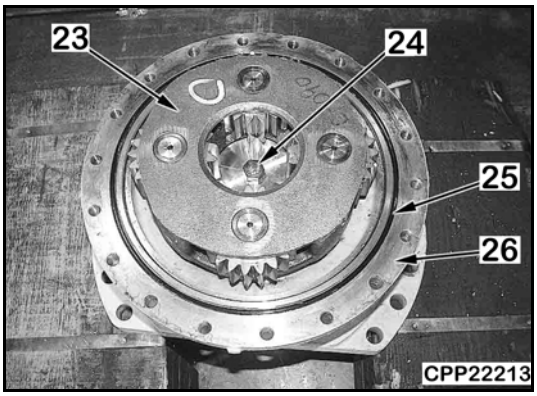


B. Install No. 2 planetary carrier assembly (23) and secure it in position with bolt (24).

No. 2 planetary carrier assembly (23) mounting bolt threads: Adhesive (LT-2)

No. 2 planetary carrier assembly (23) mounting bolt: 157 - 196 N•m (115.8 - 144.6 lbf ft)

C. Install O-ring (25) to case (26).

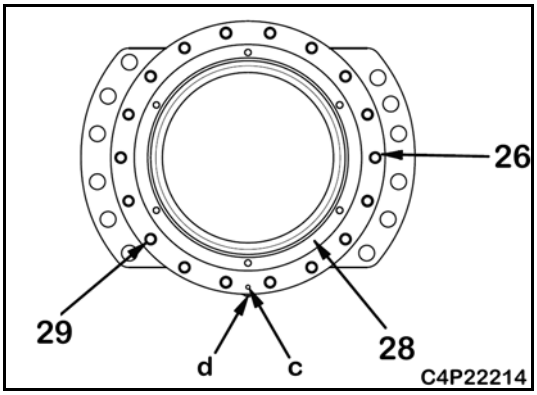


7. Install No. 2 sun gear (27).

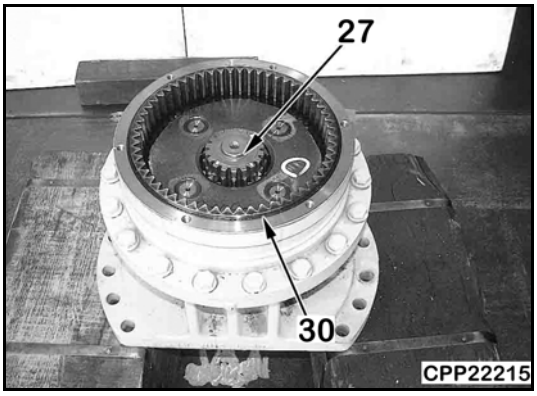
8. Assembly of ring gear
Using eyebolts (M10 x 1.5), install ring gear (28) in position.
★ Degrease the mating faces of ring gear (28) and case (26).
★ Do not deposit liquid gasket on the mating faces of ring gear (28) and case (26).
★ When installing ring gear (28), match its match mark (c) with convex part (d) of the flange as shown in the figure.

Ring gear (28) mounting bolt (29): 157 - 196 N•m (115.8 - 144.6 lbf ft)

★ PC290LC-10



9. Install O-ring (30).

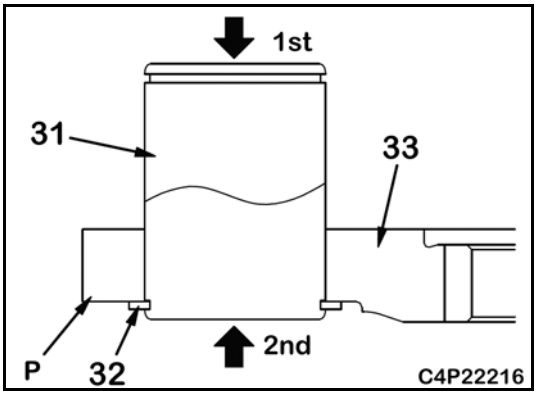


10. Assembly of No. 1 planetary carrier

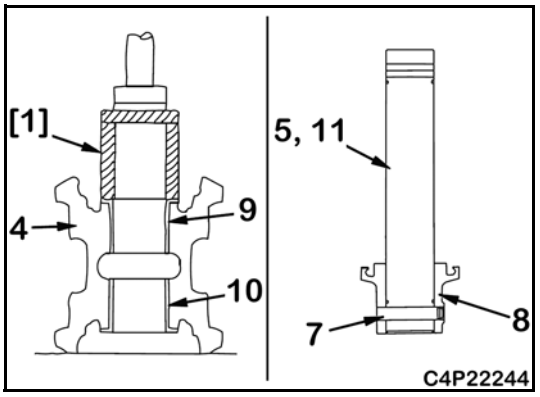
A. Assemble No. 1 planetary carrier according to the following procedure.

i. Press fit shaft (31) to carrier (33) until the snap ring (32) groove is seen from the direction of the arrow (1st direction).

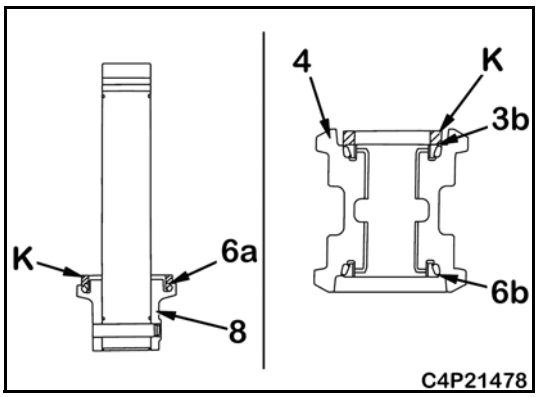
ii. After installing snap ring (32), push it back from the opposite side (2nd direction) until snap ring (33) contacts tightly with face P of the carrier. Take care not to push too hard.
★ Press-fit force of shaft: 13.5 - 30.8 kN{3,035 to 6,924 lbf}



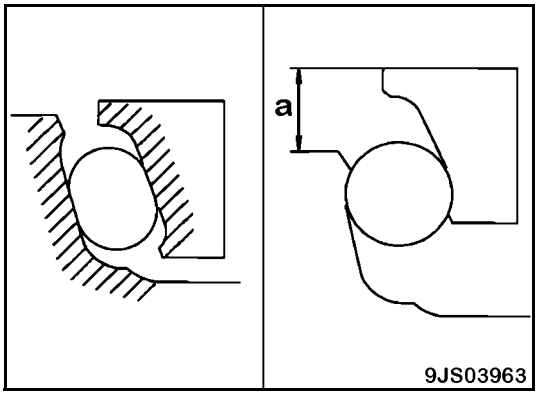
Assembly



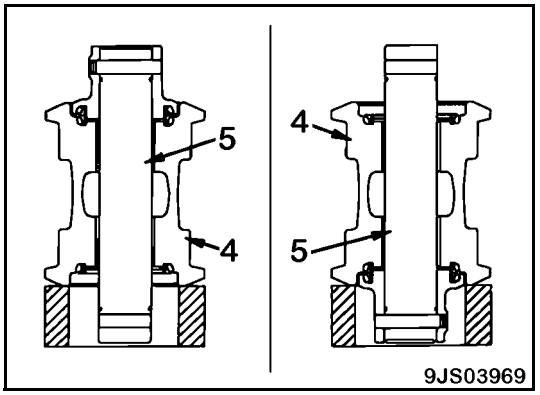
1. Using push tool [1], press fit bushings (9) and (10) to roller (4).
2. Install O-ring (11), install collar (8) on shaft (5), and install pin (7).
3. Using tool **K**, install floating seal (6a) to collar (8).
   - ★ Completely clean, degrease, and dry the contact surfaces (hatched area shown in the figure) of the floating seal and the O-ring.
   - ★ Be careful dirt does not stick to the contact face of the floating seal.
   - ★ After inserting the floating seals, check that the inclination is less than 1 mm (0.039 in) and the protrusion (a) is within the range of 7 - 11 mm (0.28 - 0.43 in).



4. Using tool **K**, install floating seals (6b) and (3b) to roller (4).
   - ★ As a precaution for installing floating seals (6b) and (3b), refer to the starred comments in step 3.

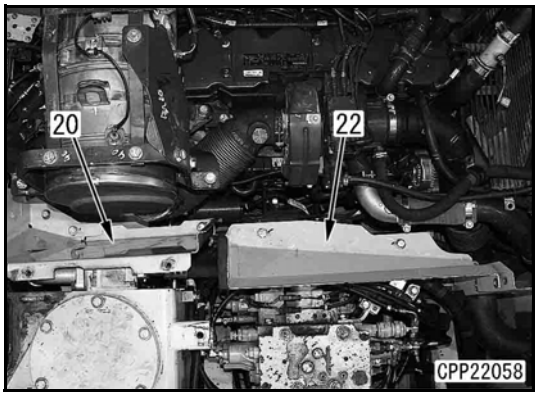


5. Assemble shaft (5) to roller (4).
6. Reverse the assembly of roller (4) and shaft (5).

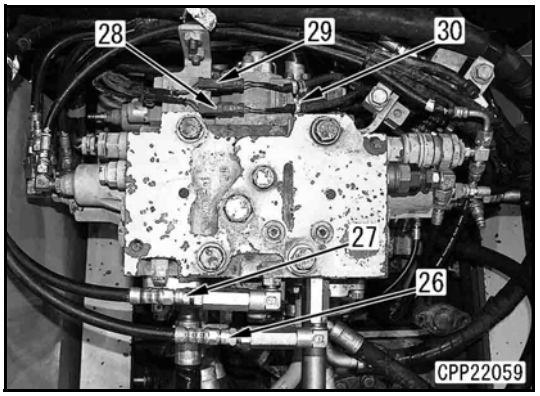


MEMORANDUM

12. Remove covers (20) and (22) by raising them. **[*2]**
    ★ Take care not to let the cover damage any wiring harness and hose.

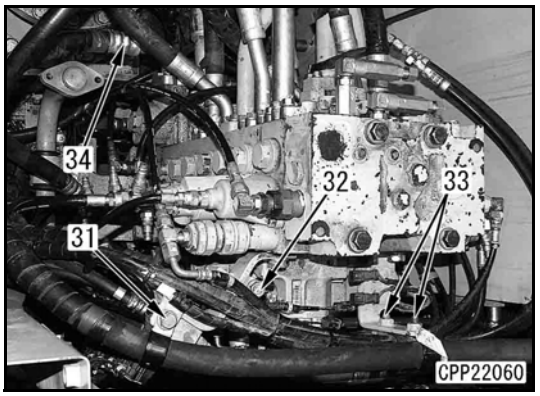


13. Disconnect hoses (26) and (27) and connectors (28) - (30) .
    ★ The bands are colored as follows:
    - Hose (26): Without band (port (PLS1))
    - Hose (27): Red (port (PLS2))
    - Connector (28): Red (merge-divider EPC valve (V23))
    - Connector (29): White (merge-divider EPC valve (V24))
    - Connector (30): Rear pump pressure sensor (P26)

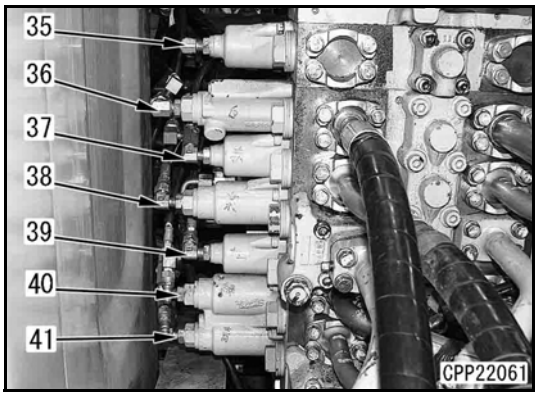


14. Remove mounting bolts (31) - (33) of the brackets.

15. Disconnect hose (34) .
    ★ Hose (34) is disconnected here to make it movable and thus facilitate the work.
    - Hose (34): Port (T1)



16. Disconnect hoses (35) - (41) on the right of the control valve. **[*3]**
    ★ The bands are colored as follows:
    - Hose (35): Without band (port (P-2)) (for machines equipped with attachment)
    - Hose (36): White (port (P2))
    - Hose (37): Red (port (P4))
    - Hose (38): Brown (port (P6))
    - Hose (39): Without band (port (P8))
    - Hose (40): Green (port (P10))
    - Hose (41): Blue (port (P12))



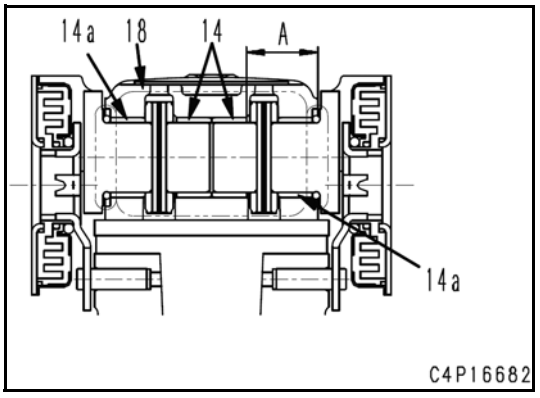
Disassembly

1. Remove screws (22) and remove damper assemblies (21).
2. Remove mounting bolt (19) and remove case (18), shafts (16) and levers (13) as a unit.
3. Remove pins (17).
4. Remove levers (13), bushings (14) and (14a), and shafts (16) from case (18).
5. Remove mounting bolts (11) to remove plate (10).
   ★ Note the thickness and installed position of washer (12).
   ★ Remove pin (24) from valve body (1).
6. Remove seals (9) and collars (8).
7. Remove pistons (7), and then remove retainers (6), springs (5) and (4), and shims (3).
   ★ Note the installed positions, quantity and thickness of shims (3) and keep them.
8. Remove valves (2) from valve body (1).

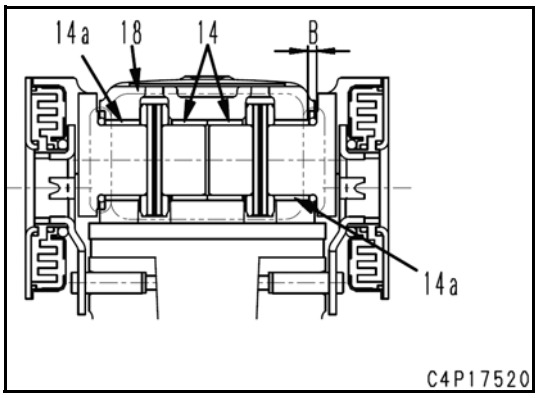
Assembly

★ Only precautions for assembly are described.
★ Before assembly, thoroughly clean the parts and check them for dirt, rust, or damage to prevent failure. Assemble the parts with utmost care.
★ When installing piston (7), apply grease (G2-LI) to its periphery and the inside of the valve body hole.
★ Install spring (4) with its small diameter end facing shim (3).
- Diameter of spring (inside diameter)
  Small diameter end: ϕ 4.9 mm (0.19 in)
  Large diameter end: ϕ 5.55 mm (0.22 in)

★ Install shaft (16) according to the following procedure.

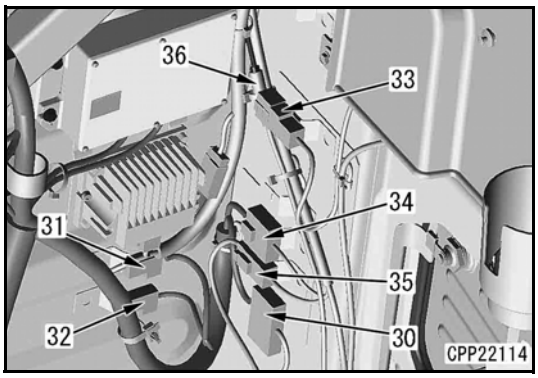


1. Using tool **Q1**, install bushing (14) to the case.
   ★ Install the bushing with its 10° chamfered side ahead.
   ★ Install the bushing so that dimension (A) is as follows.
      • Dimension (A): 20.4 ± 0.3 mm (0.80 ± 0.01 in)
   ★ Do not drive the pin directly with a hammer, etc.
2. Using tool **Q2**, install bushing (14a) to the case.
   ★ Insert bushing (14a) with its 10° chamfered side ahead.
   ★ Install bushing (14a) so that dimension (B) is as follows (bushing end face is flush with the case end face).
      • Dimension (B): 0 mm
   ★ Do not drive the pin directly with a hammer, etc.

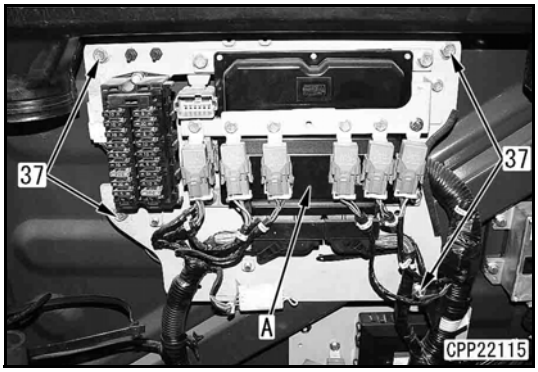


★ Neatly arrange and place the disconnected connectors on the floor apart from the operator's cab.

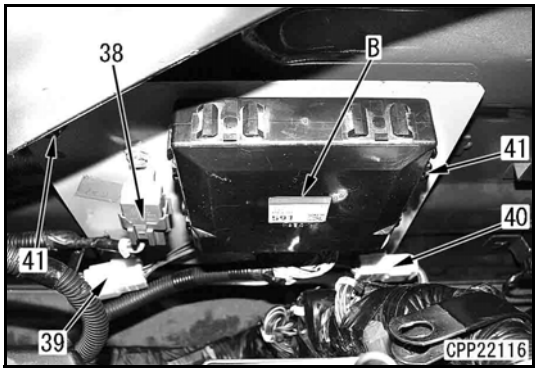
18. Disconnect radio antenna (36) .
    ★ Cut the cable ties holding the antenna.
    ★ Neatly arrange and place the removed antenna on the floor apart from the operator's cab.



19. Remove four mounting bolts (37) and remove pump controller assembly (A). Neatly arrange and place the assembly on the floor apart from the operator's cab.



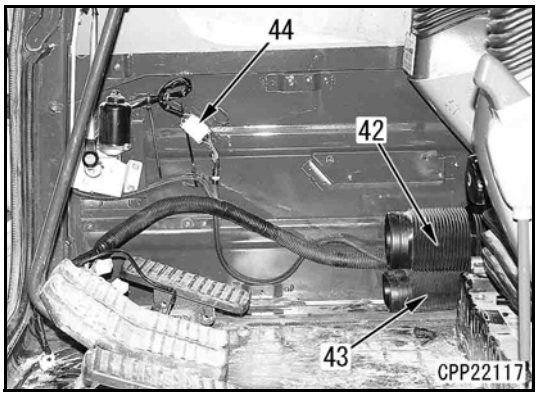
20. Disconnect connectors (38) to (40) from air conditioner controller assembly (B).
    • Connector (38): Air conditioner compressor electromagnetic clutch relay (R21)
    • Connector (39): Machine main harness (AC02)
    • Connector (40): Machine main harness (AC01)
    ★ Air conditioner controller assembly (B) can be easily removed after the above connectors are disconnected.
    ★ Neatly arrange and place the disconnected connectors on the floor apart from the operator's cab.



21. Remove two bolts (41) and remove air conditioner controller assembly (B). Neatly arrange and place the assembly on the floor apart from the operator's cab.

22. Remove ducts (42) and (43).
    ★ Cut the cable ties holding the ducts.

23. Disconnect connector (44).
    • Connector (44): Front window wiper motor (M05)



Installation

Perform installation in the reverse order of removal.

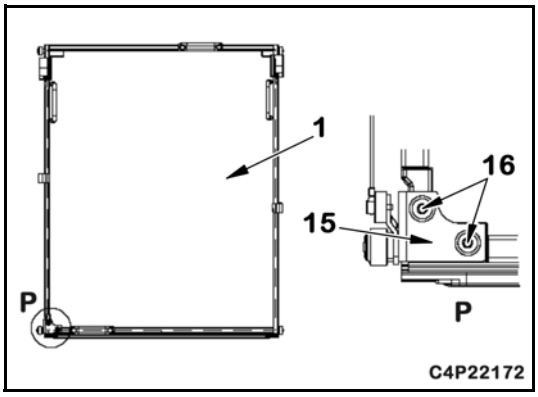
[*1]

- Adjust opening and closing of front window assembly (1) according to the following procedure.

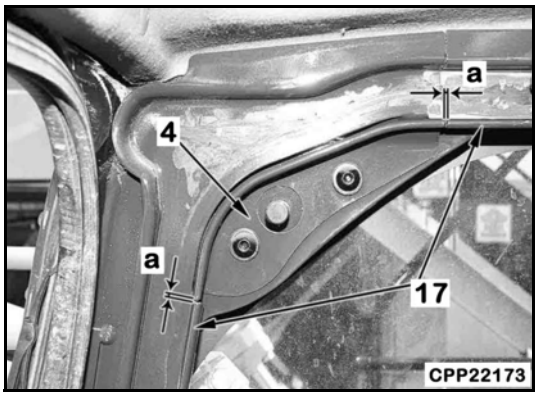
1. Open and close front window assembly (1) to check that it does not interfere with the rails and that the rollers are not caught.

2. If there is any problem opening or closing the front window assembly (1), loosen mounting bolts (16) of roller adjustment bracket (15) and adjust the condition of the front window, and then tighten the mounting bolts again.
   - ★ Make sure that bracket (15) is not slanted when mounted.

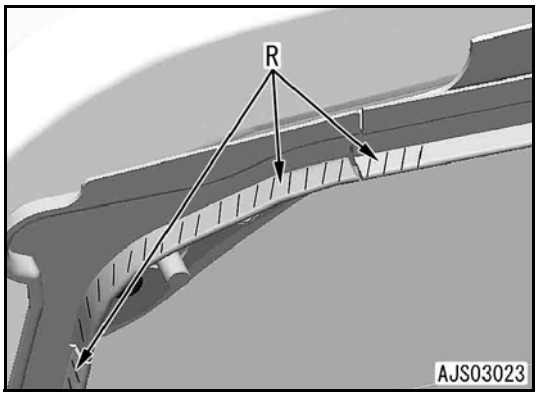
   Mounting bolt (16) of bracket (15): 19.6 - 25.0 N•m (14.5 - 18.4 lbf ft)



3. Pull up front window assembly (1) to the ceiling and lock it.
   - ★ Make sure that the assembly is locked.



4. Install right corner bracket (4).
   - ★ Lightly tighten bolts. Bolts are tightened to the specified torque after adjusting the locks for the front window assembly (1) in its “closed” position in the following step 6.
   - ★ Install right corner bracket (4) so that clearance (a) between rail (17) and right corner bracket (4) becomes 0 - 2.0 mm (0 - 0.08 in).
   - ★ There must be no level difference on rolling surface (R) for the roller.



Installation

Perform installation in the reverse order of removal.

[*1]

- Fill the air conditioner circuit with refrigerant (R134a).
  - ★ Filling quantity: 930 ± 50 g
- Refilling of air compressor oil
  For details, see “Filling Compressor Oil” on page 80-82.
- Refilling of coolant (radiator)
  Supply the coolant through the coolant filler port to the specified level. Run the engine to circulate the coolant through the system. Then, check the coolant level again.

Coolant (engine coolant): 36 l (For details, See “FUEL, COOLANT AND LUBRICANTS” on page 01-10)

[*2]

Removing cover (48) makes easier to install ducts (24) and (26).

★ Since the mounting bolts of cover (48) are hidden by cover (47), remove cover (47) first.

[*3]

★ When installing air conditioner hoses and tubes, take care so that dust, dirt or water does not enter them.

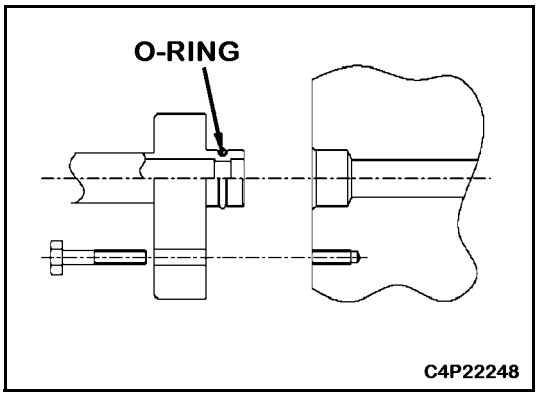
★ When connecting the air conditioner hoses and tubes, check that O-rings are fitted to their joints.

★ Do not reuse an O-ring since it is deformed and deteriorated once it is used.

★ When removing O-rings, use a soft tool to avoid damaging hoses and tubes.

★ Check that there is no defect or deterioration on the O-ring.

★ Apply compressor oil (Denso: ND-OIL8) for R134a refrigerant to O-rings.



Hose clamp (M6 bolt): 8 - 12 N•m (70.8 - 106.2 lb in)

[*4]

★ When installing the hoses of heater core, make white line (marking) of heater hoses straight to prevent kink of heater hoses.

MEMORANDUM

Removal and Installation of Pump Swash Plate Sensor

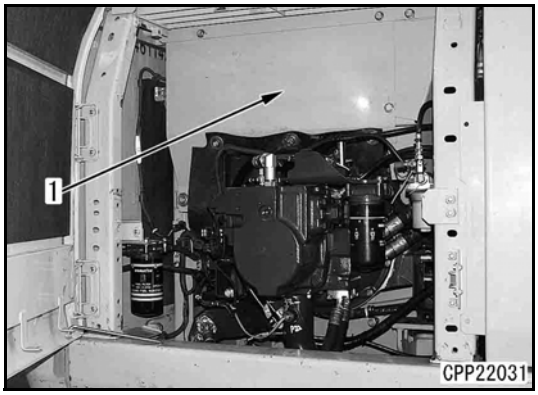
WARNING! Park the machine on level ground, lower the work equipment to the ground and stop the engine.

WARNING! Turn the battery disconnect switch to the OFF position and remove the key.

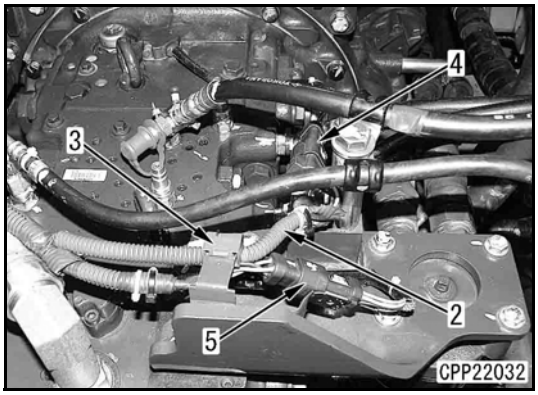
★ Note connector numbers and installed positions before disconnecting wiring and hoses.

Removal

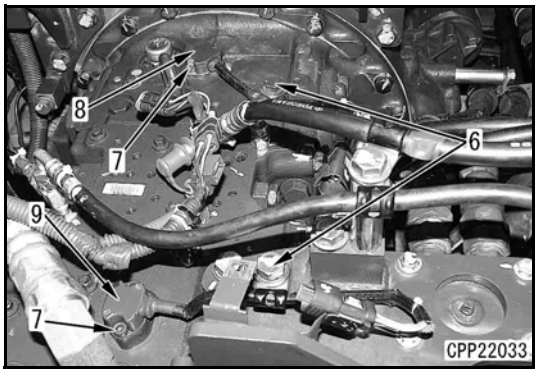
1. Open the right side cover and remove rubber-lined cover (1) (five bolts).



2. Remove harness (2) from clip (3).
3. Disconnect connectors (4) and (5).
   - Connector (4): Front pump swash plate sensor (P27)
   - Connector (5): Rear pump swash plate sensor (P28)



4. Remove clamp (6) (one bolt) holding the swash plate sensor harness.
5. Remove two swash plate sensor mounting bolts (7), then remove front pump swash plate sensor (8) and rear pump swash plate sensor (9).



Installation

Perform installation in the reverse order of removal.

Pump swash plate sensor mounting bolt: 11.8 - 14.7 N•m (8.7 - 10.8 lbf ft)

★ Adjust the pump swash plate sensor. For details, see “Special Functions of Machine Monitor” on page 30-99, “Adjustment (Cal F Pump Swash Plate Sensor)” on page 30-167, and “Adjustment (Cal R Pump Swash Plate Sensor)” on page 30-173.

No.	Check Item	Criteria		Remedy
1	Backlash between travel motor and No. 2 planetary carrier	**Standard Clearance**	**Allowable Clearance**	Replace
		0.06 to 0.25 mm {0.002 to 0.010 in}	—	
2	Backlash between No. 2 planetary gear and ring gear	0.19 to 0.66 mm {0.007 to 0.026 in}	1.30 mm {0.051 in)	
3	Backlash between No. 2 planetary gear and No. 2 sun gear	0.15 to 0.51mm {0.006 to 0.020 in}	1.00 mm {0.039 in)	
4	Backlash between No.1 planetary gear and ring gear	0.18 to 0.62 mm {0.007 to 0.024 in}	1.20 mm {0.047 in)	
5	Backlash between No. 1 planetary gear and No. 1 sun gear shaft	0.12 to 0.44 mm {0.004 to 0.017 in}	0.90 mm {0.035 in)	
6	Backlash between No.1 planetary carrier and No. 2 sun gear	0.39 to 0.80 mm {0.015 to 0.031 in}	1.60 mm {0.063 in)	
7	Amount of wear on sprocket tooth	Repair limit 6		Build-up welding for rebuilding or replace
8	Width of sprocket tooth	Standard dimension	Repair limit	
		87 mm {3.425 in}	81 mm {3.189 in}	

Torque Values	
a	59 - 78 N•m (44 - 58 lbf-ft)
b	640 - 785 N•m (472 - 579 lbf-ft)
c	49 - 74 N•m (36 - 55 lbf-ft)
d	1st: 98 N•m (72 lbf-ft) 2nd: 100 - 110°
e	490 - 608 N•m (361 - 448 lbf-ft)

Torque Values

a.	156.9 - 176.5 N•m (116 - 130 lbf ft)
b.	27.5 - 34.3 N•m (20 - 25 lbf ft)
c.	58.8 - 73.6 N•m (43 - 54 lbf ft)

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		If damaged or deformed, replace spring.
		Free length x Outside diameter	Installation length	Installation load	Free length	Installation load	
1	Centering spring (for ports P3 and P4)	42.5 x 15.5 mm (1.673 x 0.610 in)	34.0 mm (1.339 in)	17.7 N {1.80 kg} (3.98 lbf)	—	14.1 N {1.44 kg} (3.17 lbf)	
2	Centering spring (for ports P1 and P2)	44.5 x 15.5 mm (1.752 x 0.610 in)	34.0 mm (1.339 in)	29.4 N {3.0 kg} (6.61 lbf)	—	23.5 N {2.40 kg} (5.28 lbf)	
3	Metering spring	26.5 x 8.15 mm (1.043 x 0.321 in)	24.9 mm (0.980 in)	16.7 N {1.70 kg} (3.75 lbf)	—	13.3 N {1.36 kg} (2.99 lbf)	

Torque Values:	
a	34 - 49 N•m (25 - 36 lbf ft)
b	11.8 - 14.7 N•m (104 - 130 lbf in)
c	93.1 - 112.7 N•m (69 - 83 lbf ft)
d	34 - 44 N•m (25 - 32 lbf ft)

Unit: mm (in)

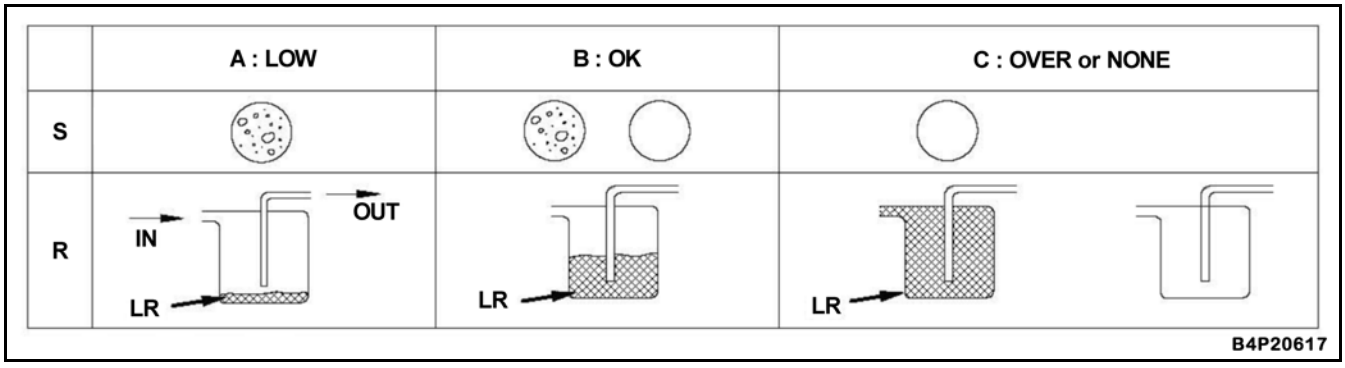
No.	Check item	Criteria					Remedy
		Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
1	Clearance between pin and bushing connecting revolving frame and boom	100 (3.937)	–0.036 (-0.001) –0.071 (-0.003)	+0.138 (+0.005) +0.078 (+0.003)	0.114–0.209 (0.004-0.008)	1.0 (0.039)	Replace
2	Clearance between pin and bushing connecting boom and arm	90 (3.543)	–0.036 (-0.001) –0.071 (-0.003)	+0.137 (+0.005) +0.077 (+0.003)	0.113–0.208 (0.005-0.008)	1.0 (0.039)	
3	Clearance between pin and bushing connecting arm and link	80 (3.150)	–0.030 (-0.001) –0.076 (-0.003)	+0.337 (+0.013) +0.273 (+0.011)	0.303–0.413 (0.012-0.016)	1.0 (0.039)	
4	Clearance between pin and bushing connecting arm and bucket	80 (3.150)	–0.030 (-0.001) –0.076 (-0.003)	+0.324 (+0.013) +0.270 (+0.011)	0.300–0.400 (0.012-0.016)	1.0 (0.039)	
5	Clearance between pin and bushing connecting link and bucket	80 (3.150)	–0.030 (-0.001) –0.076 (-0.003)	+0.337 (+0.013) +0.273 (+0.011)	0.303–0.413 (0.012-0.016)	1.0 (0.039)	
6	Clearance between pin and bushing connecting links	80 (3.150)	–0.030 (-0.001) –0.076 (-0.003)	+0.337 (+0.013) +0.273 (+0.011)	0.303–0.413 (0.012-0.016	1.0 (0.03937)	

Unit mm (inch)

No.	Item	Greasing interval	Criteria				Standard Clearance	Remedy
			Width of boss		Width of hinge			
			Standard dimension	Tolerance	Standard dimension	Tolerance		
7	Connecting part of revolving frame and boom		625.5 (24.626)	0 (0) -0.5 (-0.020)	632 (24.882)	+1 (+0.039) -2 (-0.079)	4.5 - 8.0 (0.178 - 0.315)	Adjust shim so that clearance will be 1.0 mm (0.039 in) or less
		(*2) 500 hours	L7:Adjust with the combination of shim thickness 2.0 mm {0.079 in} (2), 2.5 mm {0.098 in} (1), 3.0 mm {0.118 in} (1), and 3.5 mm {0.138 in} (1). R7:Insert 2.0 mm thickness shim (1).					
8	(*1) Connecting part of revolving frame and boom cylinder		96 (3.780)	±1.2 (±0.047)	99.3 (3.909)	+1.5 (+0.059) 0 (0)	2.1 - 6.0 (0.083 - 0.315)	Adjust shim so that clearance will be 1.5 mm (0.059 in) or less
		(*2) 500 hours	L8:Adjust with the combination of shim thickness 1.0 mm {0.039 in} (1) and 2.0 mm {0.079 in} (2). R8:Insert 1.0 mm {0.039 in} thickness shim (1).					

MEMORANDUM

*1: By error display or abnormal display on “Abnormality Record” screen on machine monitor.
*2: Simple checking of refrigerant volume through sight glass.
Start up the engine, set the air conditioner switch to ON, and then wait for five minutes before proceeding with the inspection.
A) If the continuous stream of bubbles can be seen, the system contains insufficient refrigerant.
B) If the bubbles can be seen intermittently, the refrigerant volume is sufficient.
C) If no bubbles can be seen (i.e., the liquid is perfectly clear), the system contains too much refrigerant or no refrigerant at all.
The above should be treated as general guidelines as certain exceptions do exist.
See “Troubleshooting with Gauge Pressure” on page 80-72 and use gauge pressure to determine whether or not the condition is normal.
S: Sight glass condition
R: Receiver drier internal condition
LR: Liquid refrigerant



*3: If any leakage of refrigerant is occurring, the compressor oil circulating within the air conditioner circuit will definitely be leaking from the same point.
In such a case, retighten in accordance with the table of retightening torques from “Precautions for disconnecting and connecting air conditioner piping.”
*4: Start the engine and perform the check with the air conditioner switch set to ON.

Testing Sunlight Sensor

WARNING! Park the machine on a level surface, lower the work equipment to the ground so that it is stable, and stop the engine.

WARNING! Turn the battery disconnect switch to the “OFF” position and pull out the key.

★ Note connector numbers and installed positions when disconnecting wiring and hoses.
- When [879DKZ] “Sunlight Sensor Open or Short Circuit” is displayed by the self-diagnosis (on “03 Air-conditioning System” screen of “Abnormality Record” in the machine monitor), test sunlight sensor connector SLS.
- To reset the self-diagnosis system (detection of abnormality), the starting switch must be turned OFF.

★ If the sunlight sensor is measured with the resistance range of the tester, the sunlight sensor may be destroyed, so do not measure with the resistance range of the tester.

Testing

1. Remove the machine monitor cover. For details, see “Testing Air Leakage (Duct)” on page 80-32, Steps 6 and 7.

2. Check connector P31 at the rear of the sunlight sensor. (Check whether the connector is coming off.)

3. Disconnect connector P31, remove the sunlight sensor, and measure the voltage between the terminals on the sensor side using a circuit tester in voltage range.
   - Approximate voltage of sunlight sensor unit

     Approximate voltage of sunlight sensor unit
     0.45 V: Cloudy
     0.40 V: Indoors