SEBM0037001

SHOP MANUAL

GALEO

PC20MR-2

HYDRAULIC EXCAVATOR

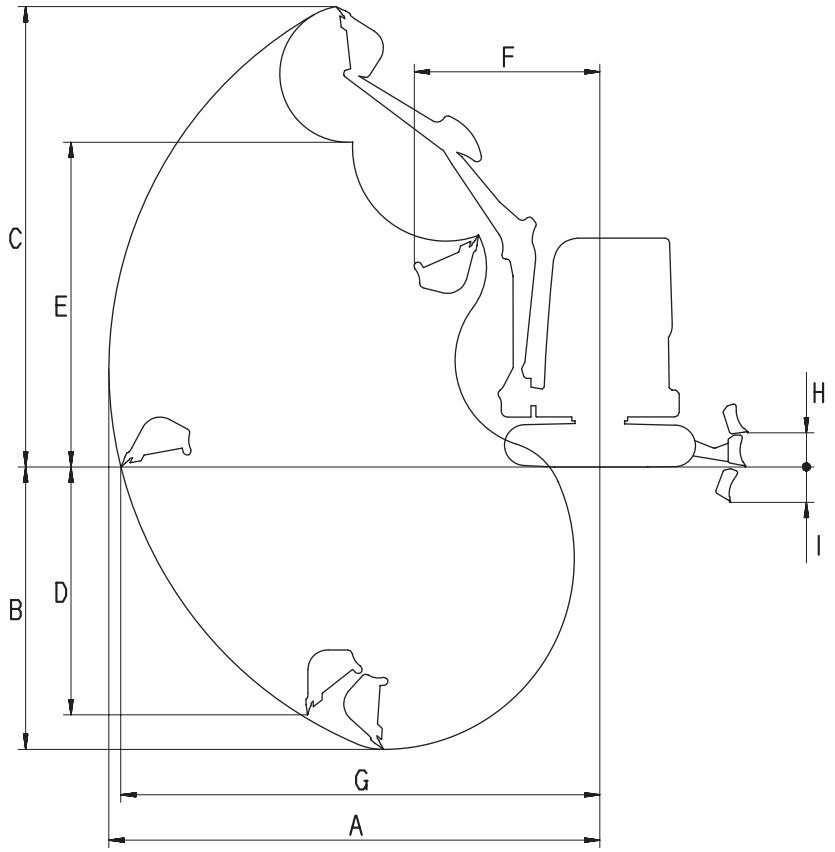
SERIAL NUMBER

PC20MR-2 15001 and up

KOMATSU

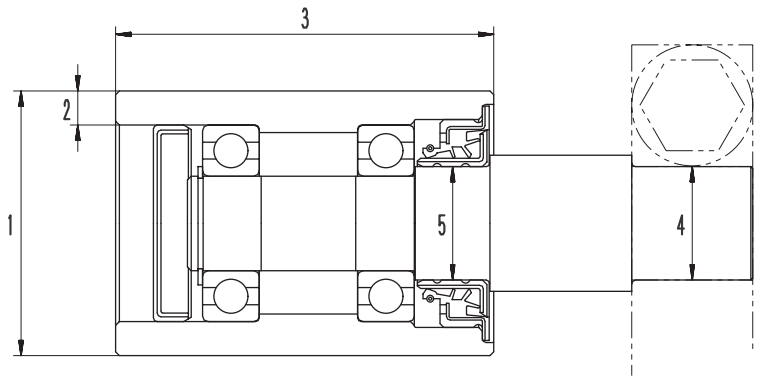
Utility

Working range drawing



	Working range (mm)	PC20MR-2
A	Max. digging radius	4,300
B	Max. digging depth	2,350
C	Max. digging height	4,100
D	Max. vertical wall depth	1,950
E	Max. dumping height	2,820
F	Swing radius of work equipment <Values in ( ) are boom swing radii>	1,790 (1,450)
G	Max. reach at ground level	4,170
H	Blade lifting height	340
I	Blade lowering depth	230

Carrier roller



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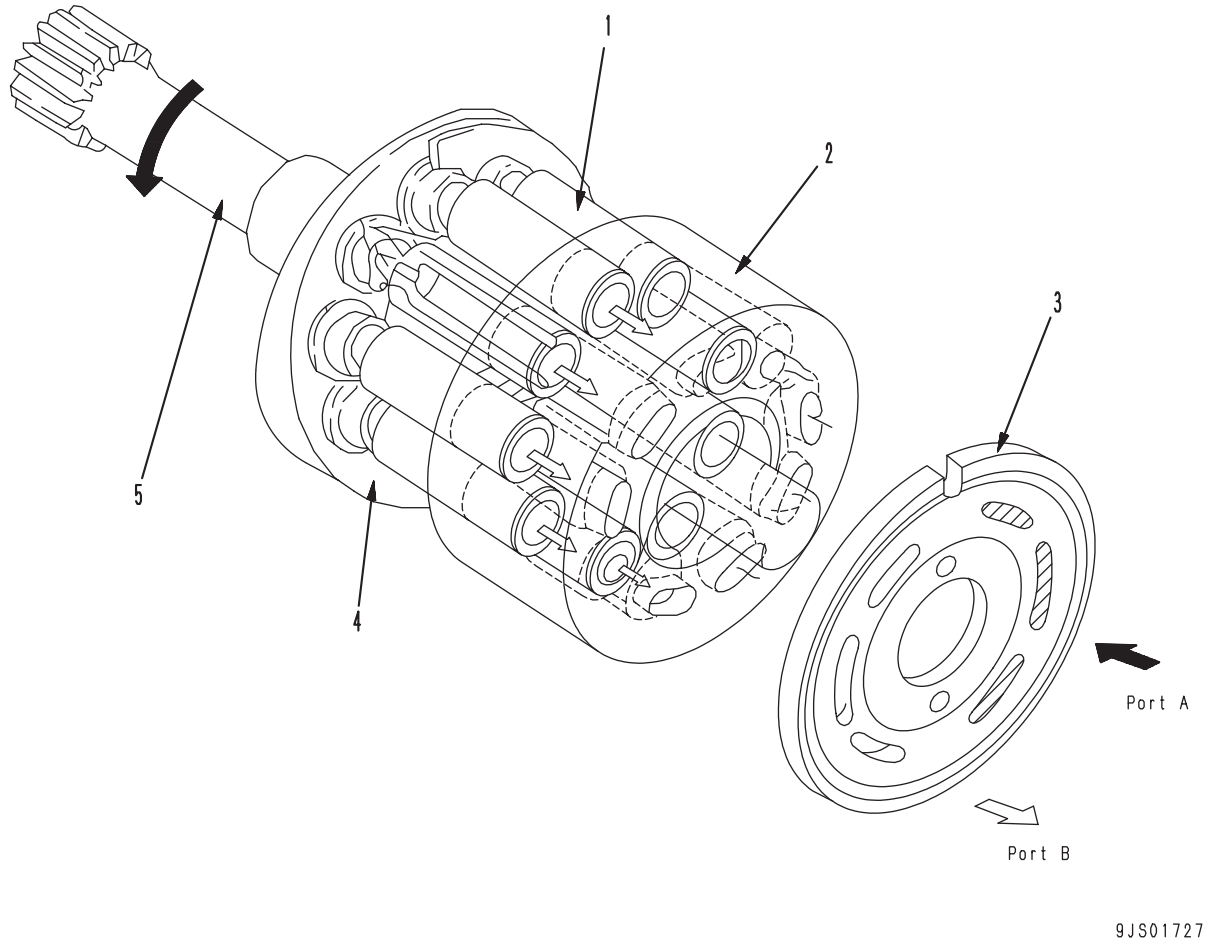
Unit: mm

No.	Check item	Criteria					Remedy
1	Outside diameter of tread	Standard size			Repair limit		Repair by overlaying welding or replace
		ø70			ø65		
2	Thickness of tread	9			6.5		
3	Width of tread	100			—		
4	Clearance between shaft and support	Standard size	Tolerance		Standard clearance	Clearance limit	Replace
			Shaft	Hole			
		ø30	–0.050 –0.100	+0.210 0	0.050 – 0.310	—	
5	Interference between shaft and seal	Standard size	Tolerance		Standard interference	Interference limit	
			Shaft	Hole			
		ø30	0 –0.052	–0.200 –0.400	0.148 – 0.400	—	

2. Hydraulic motor



Function

- This hydraulic motor is an axial piston motor (rotary cylinder swash plate type). It converts the hydraulic energy from the pump into rotary movement.

Operation

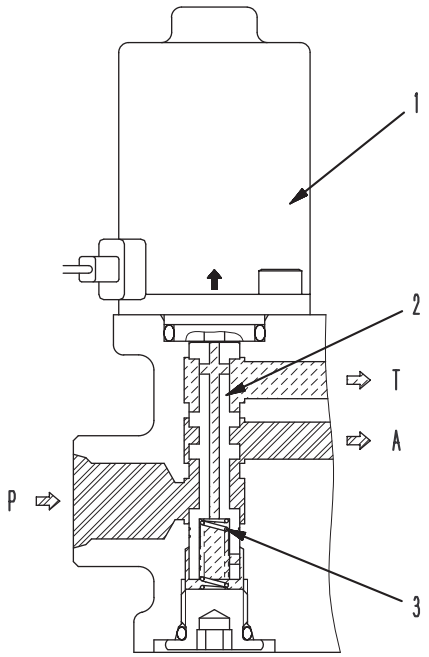
- The hydraulic oil flowing in through the hydraulic valve is supplied to valve plate (3).
- The hydraulic oil supplied to port **A** flows into the cylinder port in cylinder barrel (2) corresponding to port **A** and pushes piston (1).
- The pushing force of the above hydraulic oil is converted through rocker cam (4) into rotary force and output to shaft (5) coupled with cylinder barrel (2).
- The return oil in the cylinder port flows out through port **B** of valve plate (3).
- When the motor revolves in reverse, the hydraulic oil flows in through port **B** and the return oil flows out through port **A**.

Tilt-angle selector solenoid valve and bucket dump stop solenoid valve

Operation

When solenoid is "deenergized"
(When circuit is turned ON)

- If the signal current does not flow from the tilt-angle selector switch or controller, solenoid (1) is deenergized.
  Accordingly, spool (2) is pressed up by spring (3).
- As a result, port **P** is connected to port **A** and the pilot pressure flows into the actuator. At the same time, port **T** is closed and the oil does not flow into the hydraulic tank.



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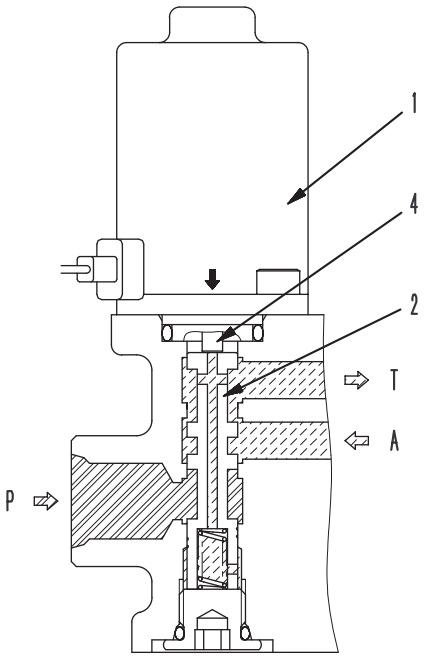
When solenoid is "energized"
(When circuit is turned OFF)

- If the signal current does not flow from the tilt-angle selector switch or controller to solenoid (1), the latter is energized.
- Accordingly, spool (2) is pressed down by push pin (4).
- As a result, port **P** is disconnected from port **A** and the pilot pressure does not flow into the actuator. At the same time, the oil from the actuator flows through port **A** to port **T** and is drained into the hydraulic tank.



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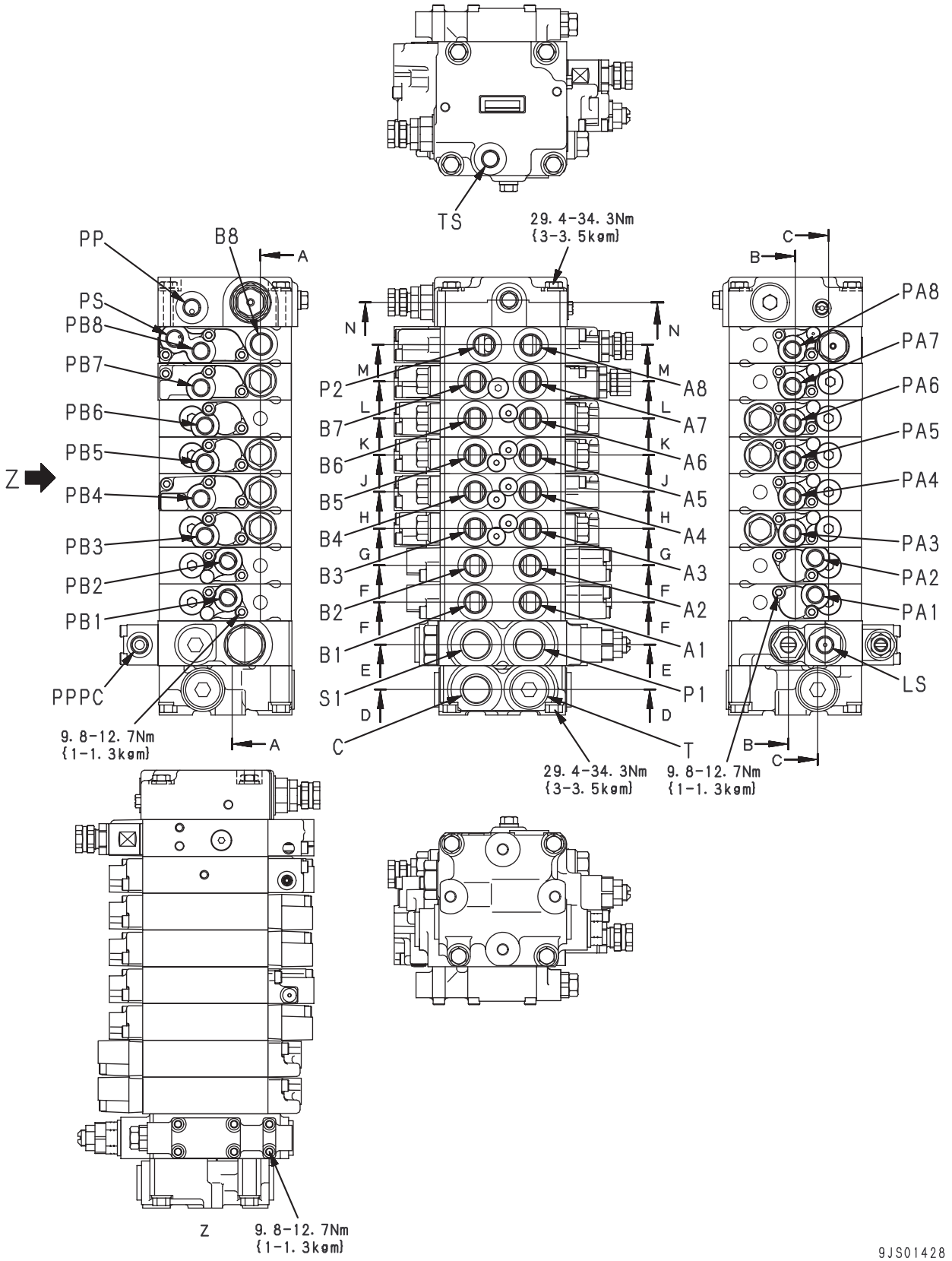
1. 8 spool valve

(1/5)



A9: To stop valve
B9: To stop valve
PA9: To attachment PPC valve
PB9: To attachment PPC valve

1. Pressure compensation valve (F/attachment)
2. Pressure compensation valve (R/attachment)
3. Spool (Attachment)
4. Port relief valve

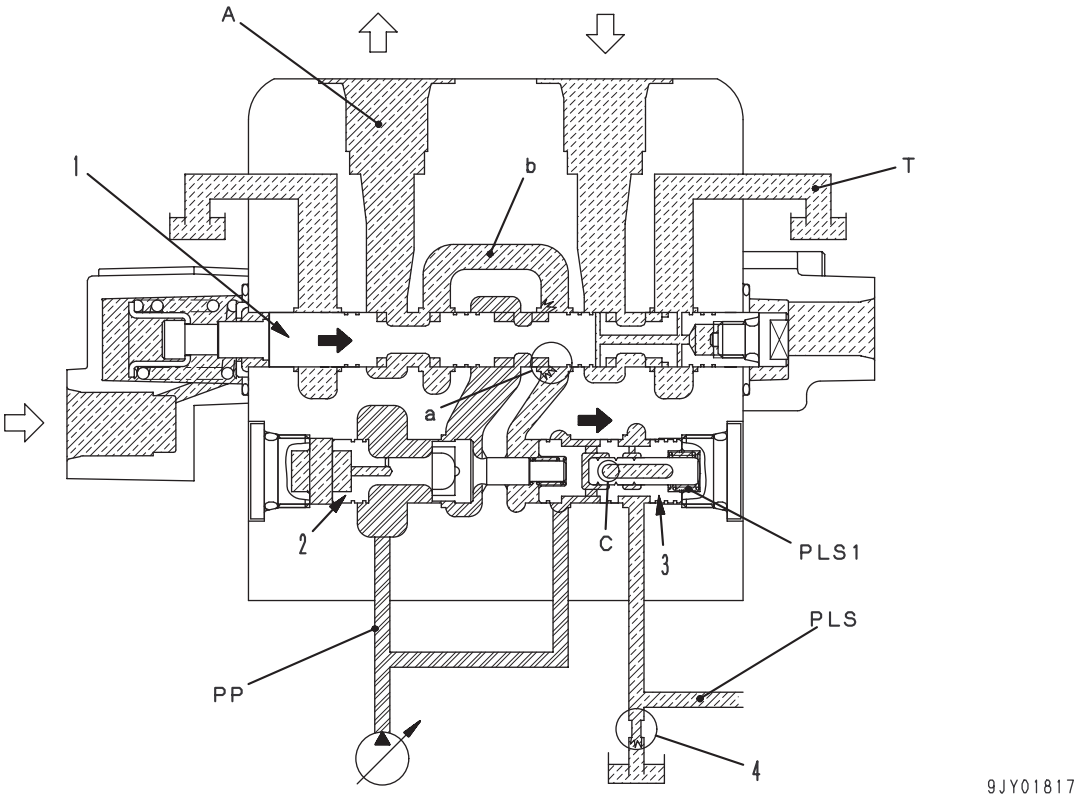
F: Flow control valve
R: Pressure reducing valve

Unit: mm

No.	Check item	Criteria					Remedy
		Standard clearance			Repair limit		
5	Pressure compensation valve spring	Free length x OD	Installed length	Installed load	Free length	Installed load	Replace spring if damaged or deformed
		20.0 x 8.40	12.0	6.86 N {0.70 kg}	—	5.49 N {0.56 kg}	
6	Spool return spring (Attachment)	29.0 x 17.5	28.5	22.6 N {2.30 kg}	—	18.1 N {1.80 kg}	

Introduction of LS pressure

1. Work equipment valve (boom, arm, bucket, boom swing, travel)

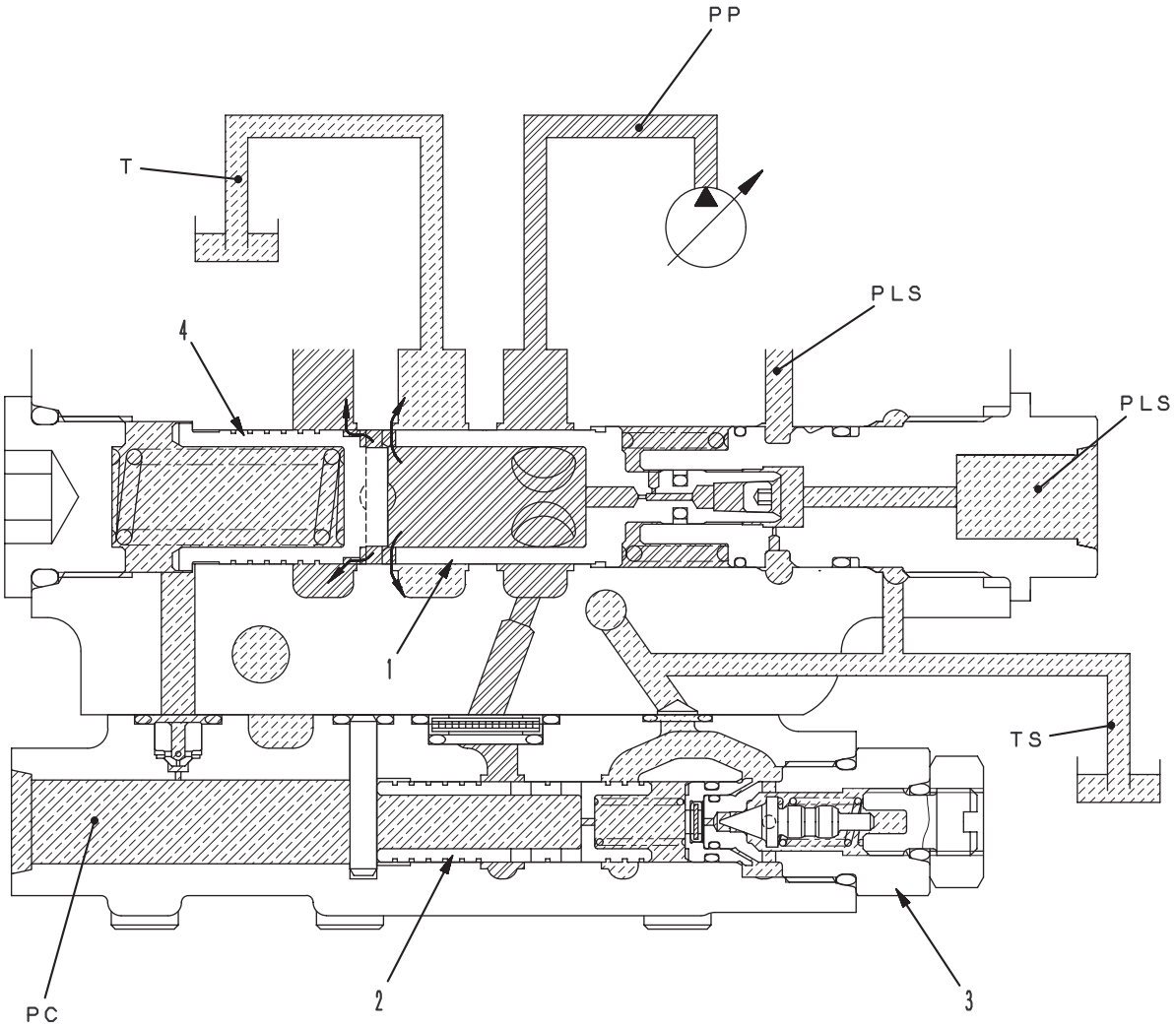


Function

- The LS pressure is the actuator load pressure at the outlet port end of the control valve.
- With the control valve, it actually reduces pump pressure **PP** at reducing valve (3) of the pressure compensation valve to the same pressure as actuation circuit pressure **A**, and sends it to the LS circuit **PLS**.

Operation

- When spool (1) operated, pump pressure **PP** flows from flow control valve (2) and notch **a** in the spool through bridge passage **b** to actuator circuit **A**.
- At the same time, reducing valve (3) also moves to the right, so pump pressure **PP** is reduced by the pressure loss at notch **c**, and then applied though LS circuit **PLS** to spring chamber **PLS1**.
- When this happens, LS circuit **PLS** is connected to tank circuit **T** from LS bypass plug (4) (see the section on the LS bypass plug).
- The actuator circuit pressure **A** acts on the left end of reducing valve (3). The reduced pump pressure **PP** acts on at the other end.
- As a result, reducing valve (3) is balanced at a position where actuator circuit pressure **A** and the pressure of spring chamber **PLS1** are the same. Pump pressure **PP** reduced at notch a becomes actuator circuit pressure **A** and is taken to LS circuit **PLS**.



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Operation

- When pump discharge pressure **PP** is below 2.90 MPa {30.0 kg/cm²}, self-pressure sequence valve (4) moves to the right to reduce the opening area between **PP** and actuator circuit (5).
- As a result, differential pressure is made between **PP** and actuator circuit (5) and **PP** is raised to above 2.90 MPa {30.0 kg/cm²}, then it is reduced to 2.90 MPa {30.0 kg/cm²} by self-pressure reducing spool (2) and self-pressure reducing pilot relief valve (3), and the pressure oil is supplied through the **PC** port to the PPC valve.

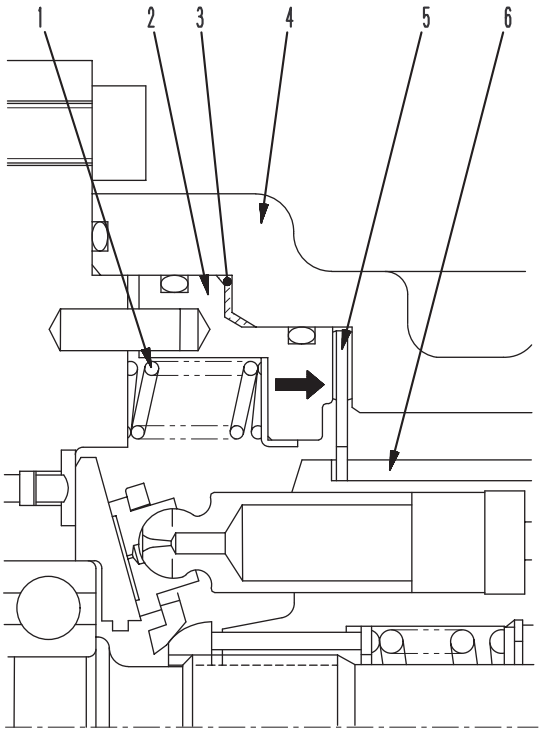
Swing holding brake

Function

- When the swing motor is stopped, the swing holding brake fixes the swing motor output shaft mechanically.

1. When brake release pressure is turned OFF

- When the brake release pressure is turned OFF, brake piston (2) is pressed to the right by spring (1).
- At this time, disc plate (5) fixed by the semilunar groove of cylinder barrel (6) is fixed between body (4) and brake piston (2).
- Cylinder barrel (6) cannot revolve because of the friction force and the swing motor output shaft is fixed.



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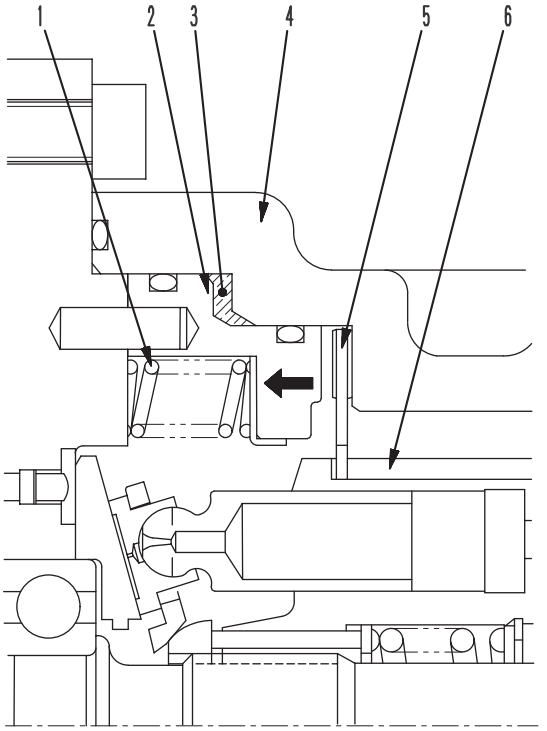
2. When brake release pressure is turned ON

- When the brake release pressure is turned ON, the hydraulic oil is led into chamber (3).
- This hydraulic oil moves brake piston (2) to the left against the force of spring (1).
- As a result, disc plate (5) is released and the friction force is lost and cylinder barrel (6) can revolve.



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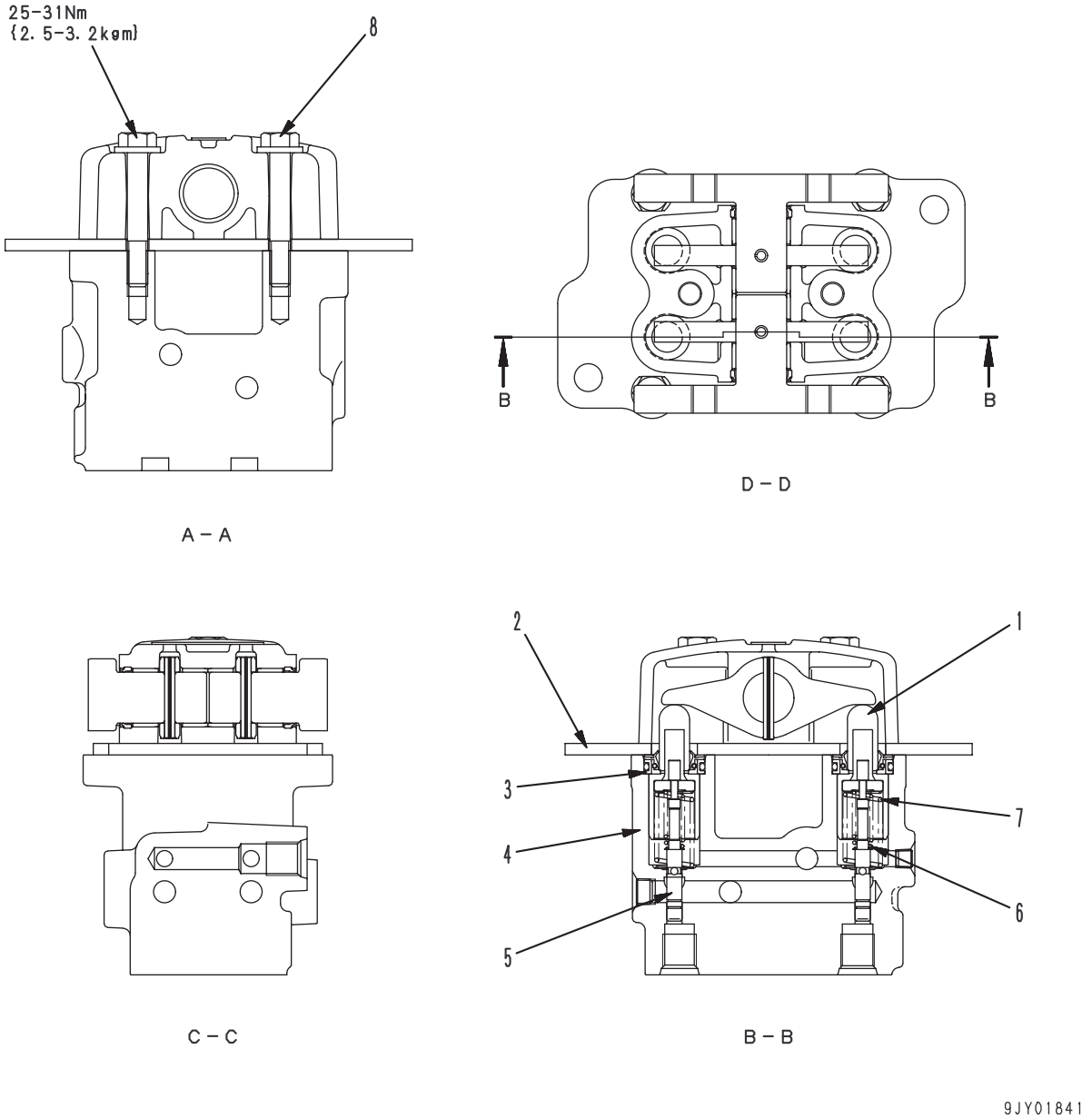
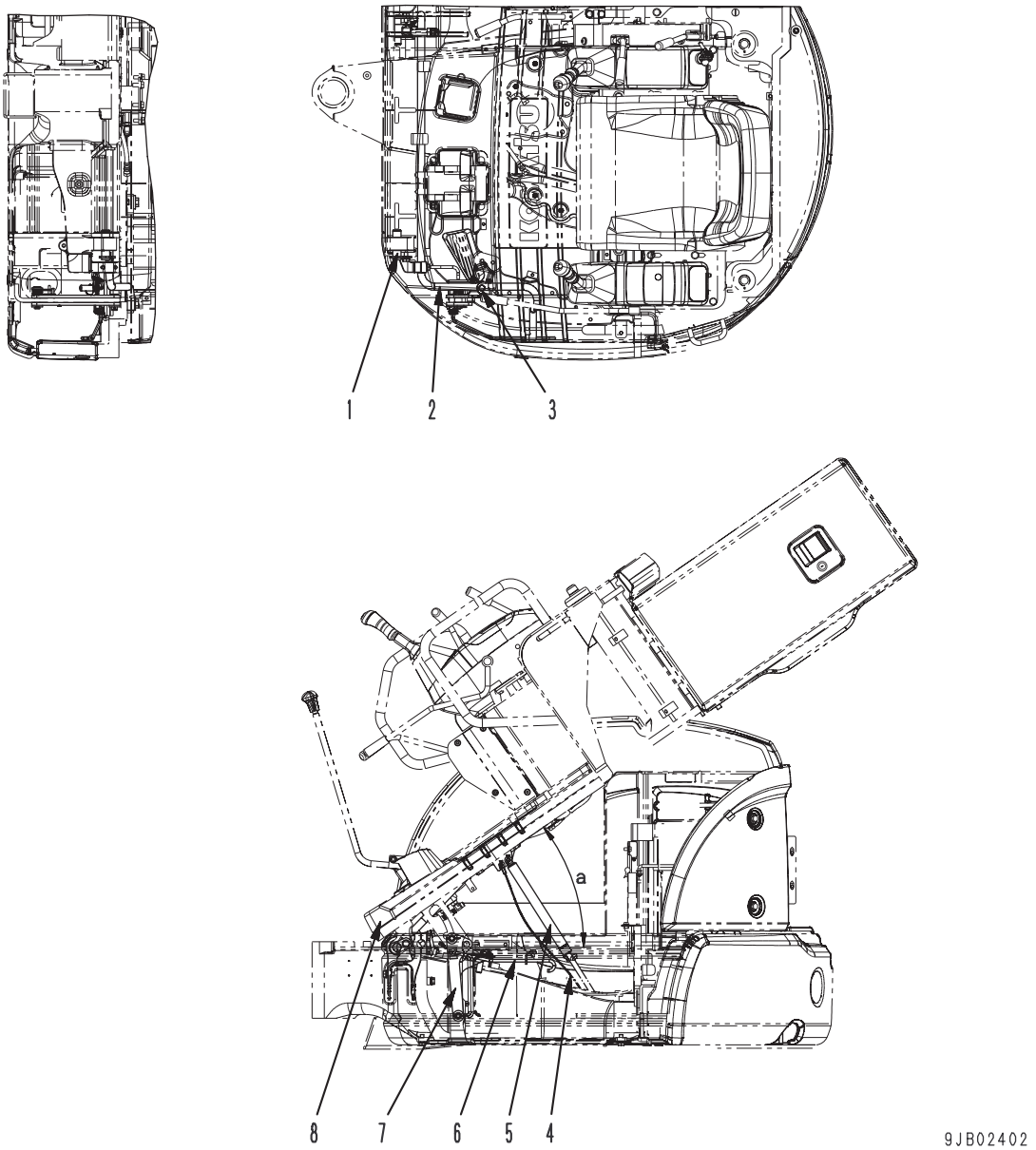


1. Piston
2. Plate
3. Collar
4. Body
5. Valve
6. Metering spring
7. Centering spring
8. Bolt

Floor

Tilt floor

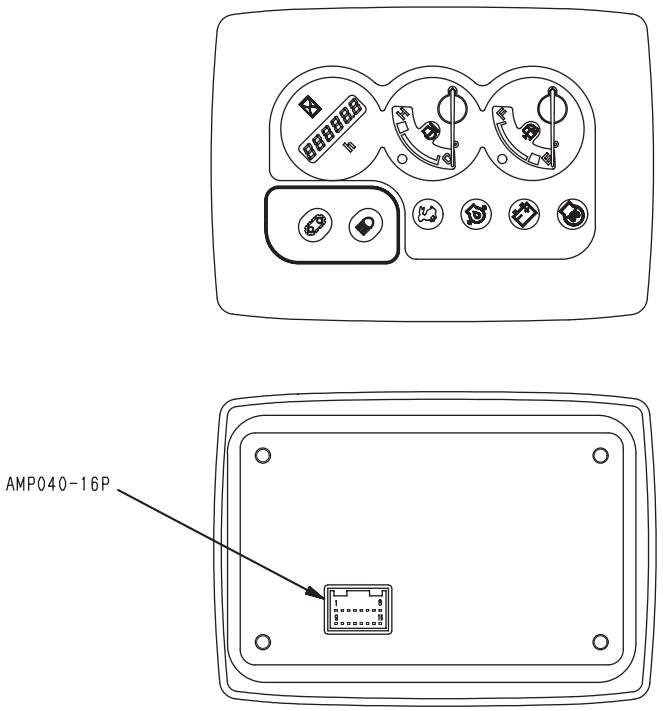


1. Hinge pin
2. Torsion bar
3. Lock pin
4. Wire
5. Gas spring
6. Reset lever
7. Tilt lock bracket
8. Floor assembly

Outline

- The tilt floor can be tilted open for the ease of adjusting of the fan belt, inspection and maintenance such as replacement of the hydraulic hoses, etc.
  Tilt open angle **a**: Approx. 35°

Monitor panel



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Outline
- The monitor panel has the monitor display function, gauge display function, and service meter function.
- The monitor switch section consists of 2 flat-type sheet switches. Each time either switch is pressed, the machine condition changes.
- There is a CPU (Center Processing Unit) in the monitor panel to process, display, and output the information.
- If the monitor panel has a failure, it does not display normally.

Input and output signals
AMP040-16P [CN-F15]

Pin No.	Signal name	Input/Output signal
1	Service power supply (12 V)	–
2	ACC power supply	–
3	NC	–
4	GND	–
5	Charge level	Input
6	Coolant temperature (+)	Input
7	Fuel level	Input
8	Working lamp relay	Output

Pin No.	Signal name	Input/Output signal
9	NC	–
10	Alarm buzzer	Output
11	Coolant temperature (-)	Input
12	Engine start	Input
13	Preheating	Input
14	Engine oil pressure	Input
15	NC	–
16	2nd travel speed selection solenoid relay	Output

Machine model						PC20MR-2	
Cate-gory	Item		Measurement conditions		Unit	Standard value for new machine	Service limit value
Work equipment	Work equipment speed	Boom swing speed	• Hydraulic oil temperature: 45 – 55°C • Run engine at full throttle. • Measure time required to move cylinder between extension and retraction stroke ends. • For measuring posture, see Fig. Work equipment 5 at end of this section.	Swing boom to LEFT		7.0 ± 1.5	10
				Swing boom to RIGHT		7.0 ± 1.5	10
		Blade speed	• Hydraulic oil temperature: 45 – 55°C • Run engine at full throttle. • Measure time required to move cylinder between position at which blade is in contact with ground and maximum blade raising position. • For measuring posture, see Fig. Work equipment 6 at end of this section.	RAISE	sec	1.0 ± 0.3	1.6
				LOWER		1.0 ± 0.3	1.6
	Time lag	Boom time lag	• Hydraulic oil temperature: 45 – 55°C • Run engine slow. • Set arm to OUT stroke end, bucket to DUMP stroke end, and boom at RAISE stroke end. Then, lower bucket and measure time required to raise machine after bucket touches ground. • For measuring posture, see Fig. Work equipment 7 at end of this section.			Max. 2	Max. 3.9
		Arm time lag	• Hydraulic oil temperature: 45 – 55°C • Run engine slow. • Set upper side of boom horizontally, bucket to DUMP stroke end, and arm to IN stroke end. Then, move arm IN and measure time required to start it again after it stops temporarily. • For measuring posture, see Fig. Work equipment 8 at end of this section.			Max. 1	Max. 2
		Bucket time lag	• Hydraulic oil temperature: 45 – 55°C • Run engine slow. • Set upper side of boom horizontally, arm to IN stroke end, and bucket to DUMP stroke end. Then, CURL bucket and measure time required to start it again after it stops temporarily. • For measuring posture, see Fig. Work equipment 9 at end of this section.			Max. 1	Max. 2
		Blade time lag	• Hydraulic oil temperature: 45 – 55°C • Run engine slow. • Lower blade from RAISE stroke end and measure time required to raise machine after blade touches ground. • For measuring posture, see Fig. Work equipment 10 at end of this section.			Max. 2	Max. 3.9
	Internal leakage	Leakage from each cylinder	• Hydraulic oil temperature: 45 – 55°C • Run engine at full throttle. • Relieve circuit to be measured.		cc/min	Max. 2	10
		Leakage from center swivel joint				—	—
—	Performance of hydraulic pump		See section of Performance of hydraulic pump.				

Measurement of exhaust gas color

★ Exhaust gas color measurement tool

Symbol		Part No.	Part Name
B	1	799-201-9000	Handy smoke checker
	2	Commercially available	Smoke meter

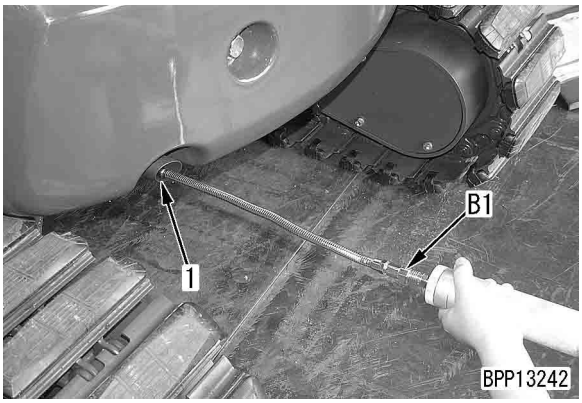
★ Measurement of exhaust gas color under the following condition.
Coolant temperature: Within operating range

⚠ Be careful not to touch the highly heated parts, while fitting and detaching a measurement tool.

★ If no compressed air or power is not available in the field, use handy smoke checker **B1**. For recording official data, use smoke meter **B2**.

1. Measurement with handy smoke checker B1

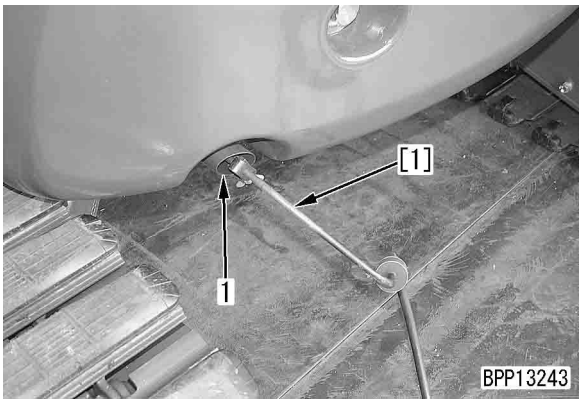
1) Fit a filtering paper to handy smoke checker **B1**.
2) Insert the exhaust gas intake pipe into the exhaust pipe (1).
3) Start the engine.
4) Accelerate the engine suddenly or run it at high idling and operate the handle of smoke checker **B1** so that the filter paper will absorb the exhaust gas.



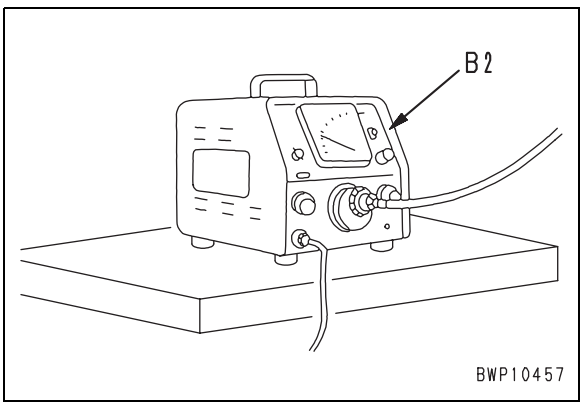
5) Remove the filter paper and compare it with the attached scale.
6) After finishing measurement, remove the measuring instruments and return the removed parts.

2. Measurement with smoke meter B2

1) Insert probe [1] of the smoke meter **B2** into the exhaust gas pipe (1) outlet, and fasten it to the outlet with a clip.



2) Connect the probe hose, accelerator switch outlet and air hose to the smoke meter **B2**.
   ★ Keep the pressure of the supplied compressed air below 1.5 MPa {15 kg/cm²}.
3) Connect the power cable to AC socket.
   ★ Confirm that the smoke meter power switch is in the OFF position, before connecting the power cable to an outlet.
4) Fit a filtering paper by loosening the suction pump cap nut.
   ★ Fit the filtering paper securely so that air may not leak.
5) Move the smoke meter **B2** power switch to the ON position.



6) Accelerate the engine suddenly or run it at high idling and press the accelerator pedal of smoke meter **B2** and collect the exhaust gas into the filter paper.
7) Put the polluted filtering paper on non-polluted filtering paper (more than 10 sheets) in the filtering paper holder, and read the indicated value.
8) After finishing measurement, remove the measuring instruments and return the removed parts.

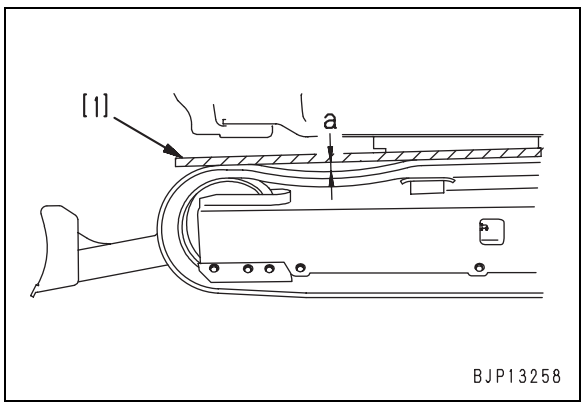
Testing and adjusting track shoe tension

Testing

1. Run the engine at low idling and move the machine by the length of track on ground, then stop slowly.

2. Place bar [1] on the track shoe between the idler and the shoe plate.
   ★ As bar [1], use an L-shape steel, etc. which will be deflected less.

3. Measure maximum clearance (a) between bar [1] and track shoe.
   • Standard maximum clearance (a)
   Steel shoe specification or load liner specification: 5 – 15 mm
   Rubber shoe specification: 1 – 3 mm

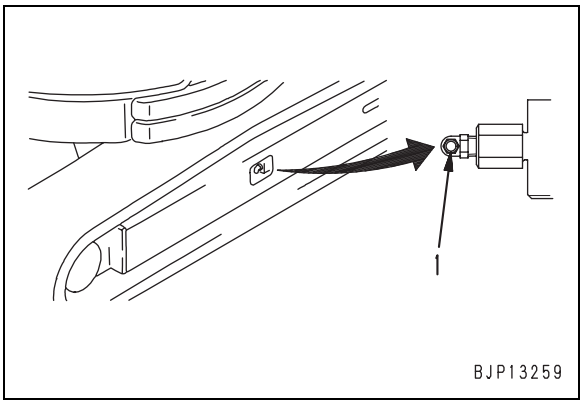


Adjusting

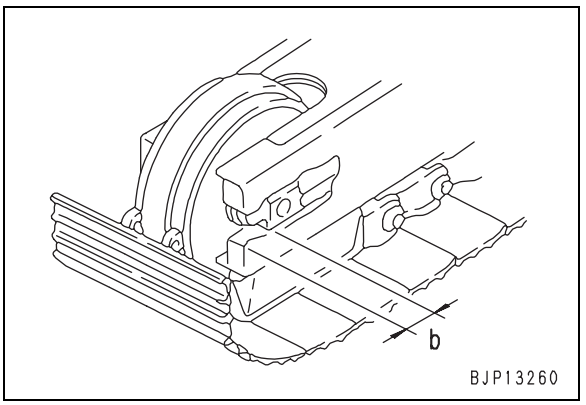
★ If the track shoe tension is abnormal, adjust it according to the following procedure.

1. To heighten tension

1) Supply grease througn grease fitting (1).
2) To check that the tension is normal, run the engine at low idling and move the machine forward by the length of track on ground, then stop slowly.
3) After finishing adjustment, check again that the tension is normal according to the above procedure.



★ When steel shoe is installed
You may supply grease until distance (b) between the idler guide and track frame end is 0 mm. If the tension is still low, the pin and bushing are worn excessively. In this case, turn over or replace the pin and bushing.



2. To lower tension

1) Loosen valve (2) to discharge the grease.
   ⚠ Since the valve may jump out because of the internal high-pressure grease, do not loosen it more than 1 turn.
2) Tighten valve (2).
3) To check that the tension is normal, run the engine at low idling and move the machine forward by the length of track on ground, then stop slowly.
4) After adjusting, check the tension again according to the procedure described above.

Measuring PPC valve output pressure

★ Measuring instruments for PPC valve output pressure

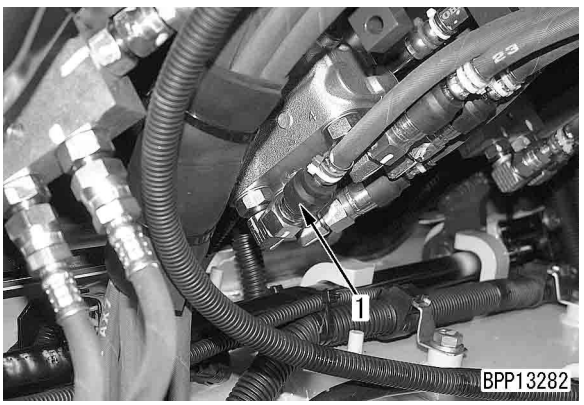
Symbol		Part No.	Part Name
L	1	799-101-5002	Hydraulic multimeter
		790-261-1203	Hydraulic multimeter (Digital)
	2	799-401-3100	Adapter (02)

★ Before measuring the PPC valve output pressure, check that the basic pressure in the control circuit is normal.
★ Measure the PPC valve output pressure under the following condition.
- Hydraulic oil temperature: 45 – 55 °C

⚠ Release the residual pressure from the hydraulic tank. For details, see Releasing residual pressure from hydraulic circuit.

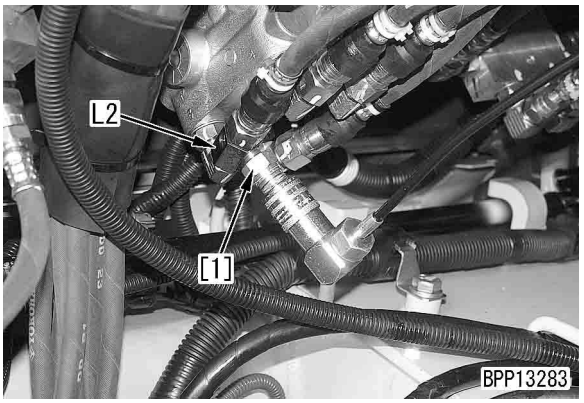
1. Tilt the floor open. For details, see How to tilt (open and close) floor.

2. Disconnect PPC hose (1) of the solenoid valve to be measured.
   ★ The figure shows the hose of the left travel forward circuit.



3. Install adapter **L2** and connect the disconnected hose again.

4. Install nipple [1] of hydraulic tester **L1** and pull the oil pressure measurement hose out of the revolving frame.
   ★ The figure shows the measuring instruments connected to the hose of the left travel forward circuit.



5. Tilt down the floor and connect the hose to oil pressure gauge [2] of hydraulic tester **L1**.
   ★ Use oil pressure gauge of 5.9 MPa {60 kg/cm²}.

6. Pressurize the hydraulic tank. For details, see Pressurizing hydraulic tank.

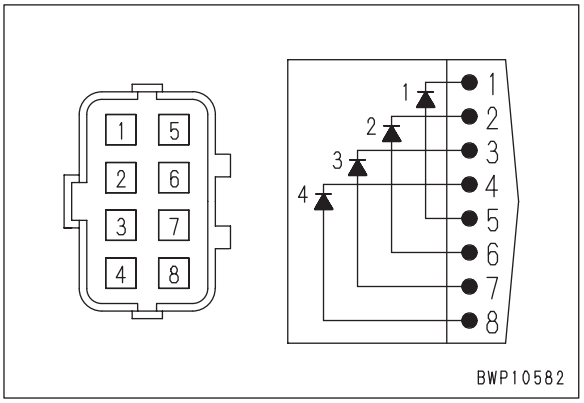
7. Run the engine at high idling, set the control lever or pedal of the circuit to be measured in the neutral position and stroke end, and measure the oil pressure.
   ★ If the output pressure of PPC valve is as follows, it is normal.

Control lever/pedal	PPC valve output pressure
Neutral	0 MPa {0 kg/cm²}
Stroke end	Almost same as basic pressure in control circuit (See Standard values table)

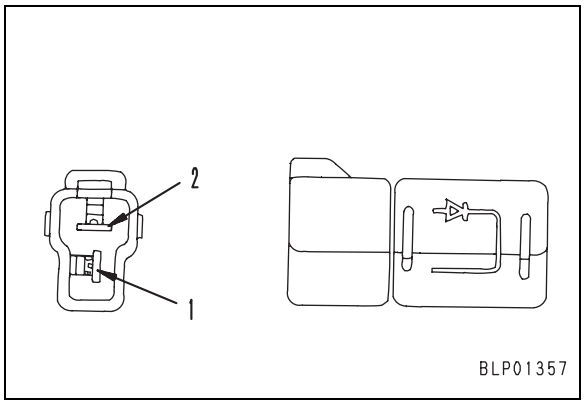
8. After finishing measurement, remove the measuring instruments and return the removed parts.

Inspection procedures for diode

★ Check an assembled-type diode (8 pins) and single diode (2 pins) in the following manner.
★ The continuity direction of the assembled-type diode is as follows.



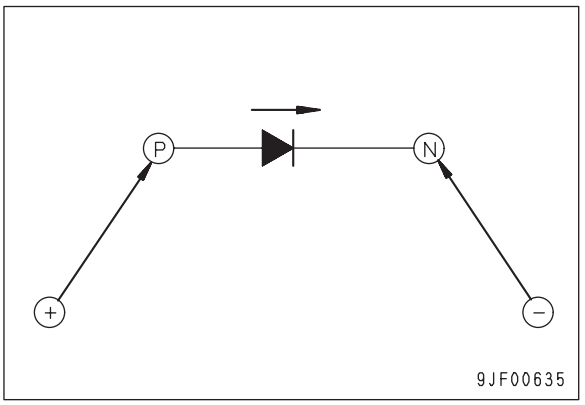
★ The conductive direction of each diode is marked on its surface as shown below.



1. When using digital type circuit tester

1) Switch the testing mode to diode range and confirm the indicated value.
   ★ Voltage of the battery inside is displayed with conventional circuit testers.
2) Put the red probe (+) of the test lead to the anode (P) and the black probe (–) to the cathode (N) of diode, and confirm the displayed value.
3) Determine if a specific diode is good or no good with the indicated value.
   - No change in the indicated value: No continuity (defective).
   - Change in the indicated value: Continuity established (normal) (Note)

   Note: A silicon diode shows a value between 460 and 600.

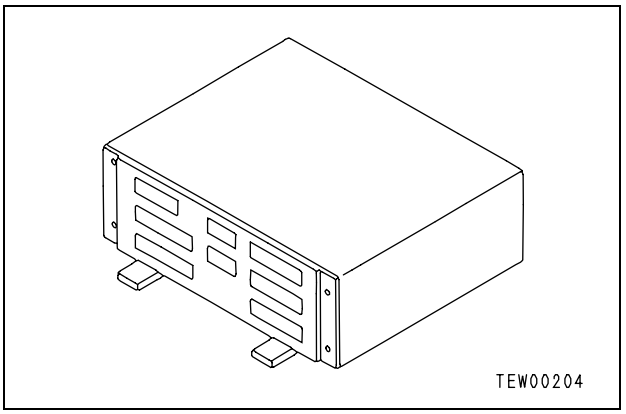


2. When using analog type circuit tester

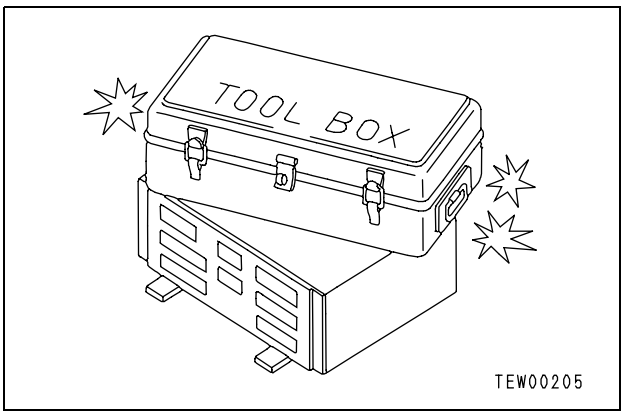
1) Switch the testing mode to resistance range.
2) Check the needle swing in case of the following connections.
   i) Put the red probe (+) of the test lead to the anode (P) and the black probe (–) to the cathode (N) of diode.
   ii) Put the red probe (+) of the test lead to the cathode (N) and the black probe (–) to the anode (P) of diode.
3) Determine if a specific diode is good or no good by the way the needle swings.
   - If the needle does not swing in Case i), but swings in Case ii): Normal (but the breadth of swing (i.e. resistance value) will differ depending on a circuit tester type or a selected measurement range)
   - If the needle swings in either case of i) and ii): Defective (short-circuited internally)
   - If the needle does not swing in any case of i) and ii): Defective (short-circuited internally)

3) Handling control box

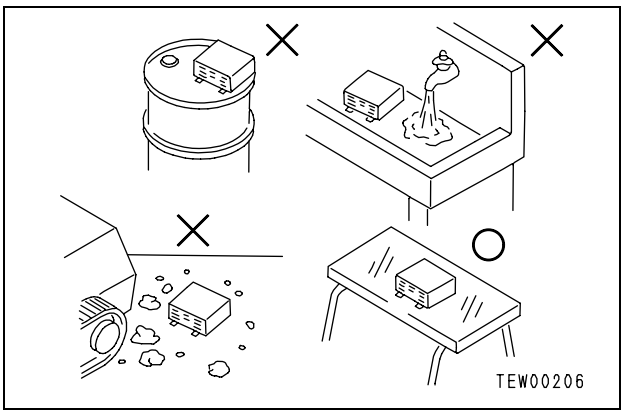
(1) The control box contains a microcomputer and electronic control circuits. These control all of the electronic circuits on the machine, so be extremely careful when handling the control box.
(2) Do not open the cover of the control box unless necessary.



(3) Do not place objects on top of the control box.
(4) Cover the control connectors with tape or a vinyl bag.
Never touch the connector contacts with your hand.
(5) During rainy weather, do not leave the control box in a place where it is exposed to rain.

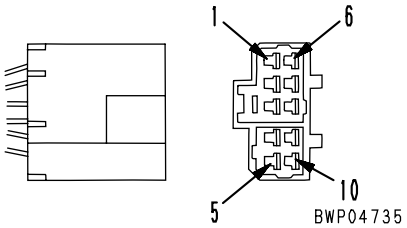
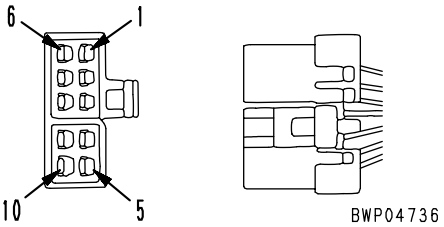
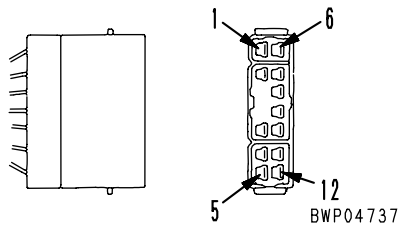
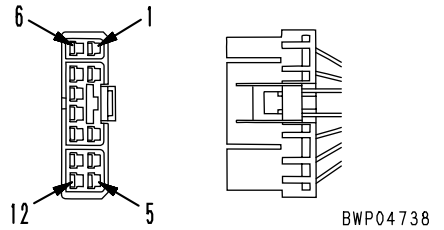
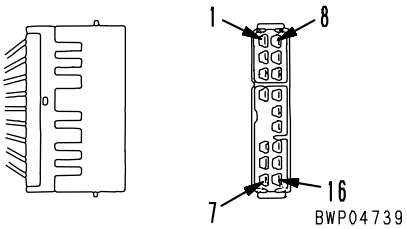
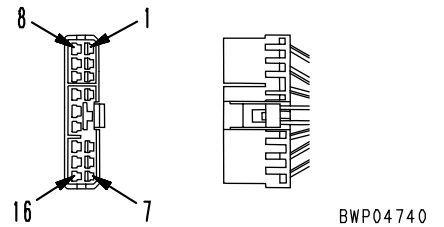


(6) Do not place the control box on oil, water, or soil, or in any hot place, even for a short time. (Place it on a suitable dry stand).
(7) Precautions when carrying out arc welding
When carrying out arc welding on the body, disconnect all wiring harness connectors connected to the control box. Fit an arc welding ground close to the welding point.

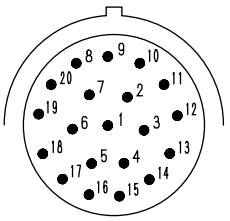
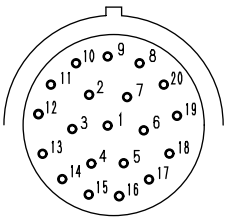
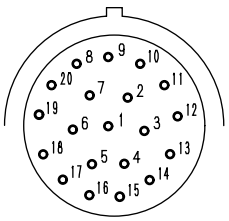
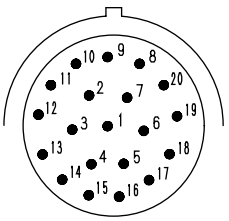
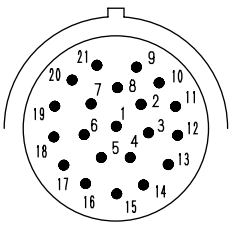
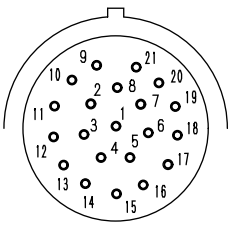
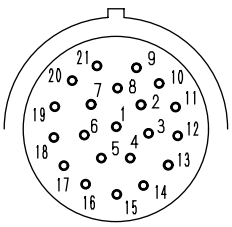
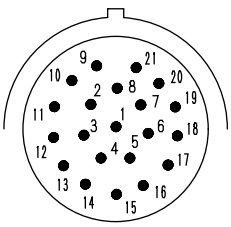


2. Points to remember when troubleshooting electric circuits

1) Always turn the power OFF before disconnecting or connect connectors.
2) Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Disconnect and connect the related connectors several times to check.
3) Always connect any disconnected connectors before going on to the next step.
★ If the power is turned ON with the connectors still disconnected, unnecessary abnormality displays will be generated.
4) When carrying out troubleshooting of circuits (measuring the voltage, resistance, continuity, or current), move the related wiring and connectors several times and check that there is no change in the reading of the tester.
★ If there is any change, there is probably defective contact in that circuit.

No.of pins	S type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
10 (Blue)			—
	—	—	
12 (Blue)			799-601-7160
	Part No.: 08056-11272	Part No.: 08056-11282	
16 (Blue)			799-601-7170
	Part No.: 08056-11672	Part No.: 08056-11682	

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

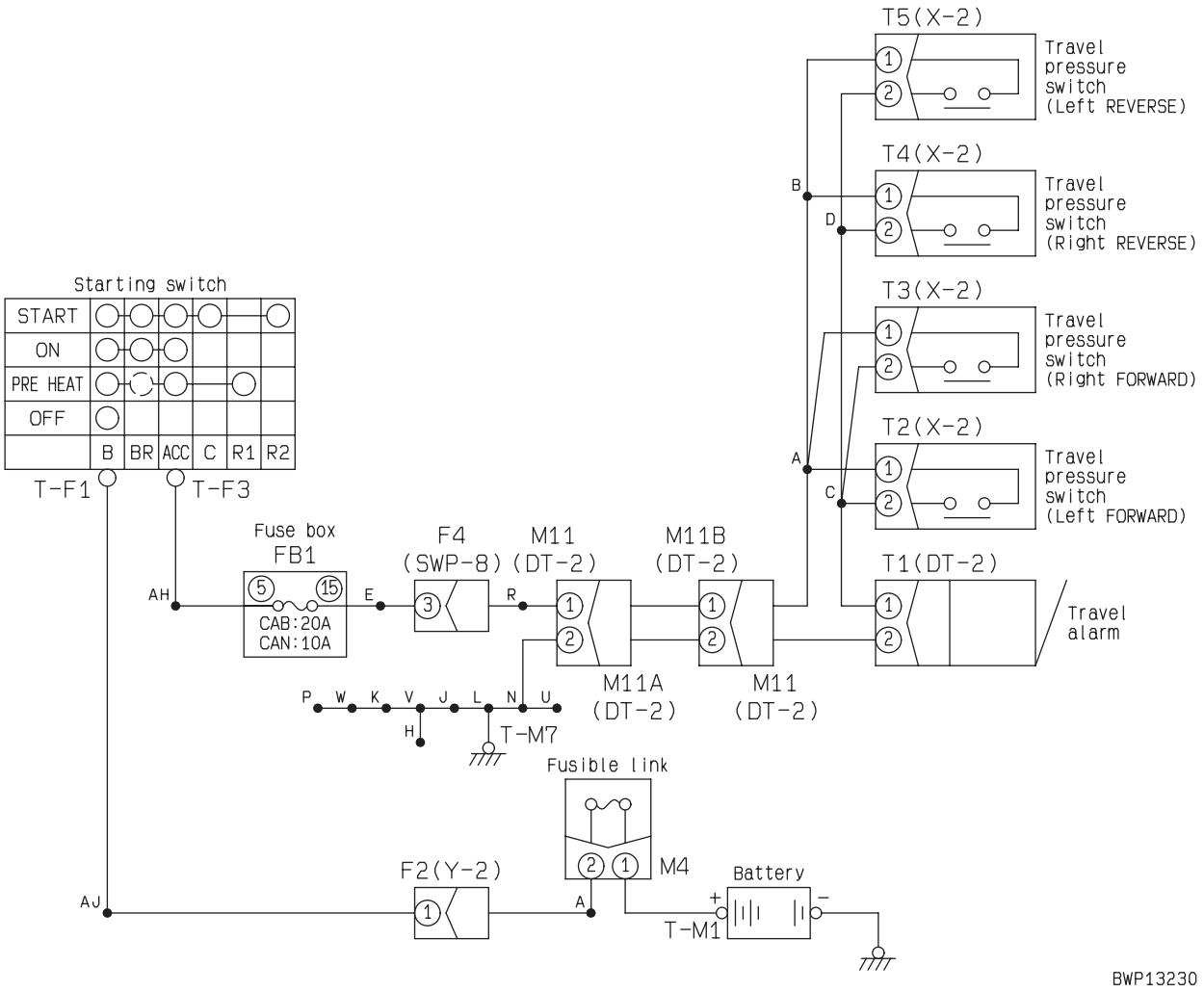
<table>
<tr><td rowspan="2">Type (shell size code)</td><td colspan="3">HD30 Series connector</td></tr>
<tr><td>Body (plug)</td><td>Body (receptacle)</td><td>T-adapter Part No.</td></tr>
<tr><td rowspan="4">18-20 (3)</td><td>Pin (male terminal)</td><td>Pin (female termial)</td><td rowspan="2">799-601-9230</td></tr>
<tr><td> 
BWP05009</td><td> 
BWP05010</td></tr>
<tr><td>Part No.:08191-31201, 08191-31202</td><td>Part No.:08191-34101, 08191-34102</td><td rowspan="3">799-601-9230</td></tr>
<tr><td>Pin (female terminal)</td><td>Pin (male termial)</td></tr>
<tr><td> 
BWP05011</td><td> 
BWP05012</td></tr>
<tr><td>Part No.:08191-32201, 08191-32202</td><td>Part No.:08191-33101, 08191-33102</td></tr>
<tr><td rowspan="4">18-21 (4)</td><td>Pin (male terminal)</td><td>Pin (female termial)</td><td rowspan="2">799-601-9240</td></tr>
<tr><td> 
BWP05013</td><td> 
BWP05014</td></tr>
<tr><td>Part No.:08191-41201, 08191-42202</td><td>Part No.:08191-44101, 08191-44102</td><td rowspan="3">799-601-9240</td></tr>
<tr><td>Pin (female terminal)</td><td>Pin (male termial)</td></tr>
<tr><td> 
BWP05015</td><td> 
BWP05016</td></tr>
<tr><td>Part No.:08191-42201, 08191-42202</td><td>Part No.:08191-43101, 08191-43102</td></tr>
</table>

Part No.	Type of connector	No. of pins	KIT Part No.																	
			799-601-2500	799-601-2700	799-601-2800	799-601-2900	799-601-3000	799-601-5500	799-601-6000	799-601-6500	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	|
799-601-9240	HD30	18-21														○	○			
799-601-9250	HD24	24-9														○	○			
799-601-9260	HD30	24-16														○	○			
799-601-9270	HD30	24-21														○	○			
799-601-9280	HD30	24-23														○	○			
799-601-9290	HD30	24-31														○	○			
799-601-9310	Plate	For HD30														○	○		○	
799-601-9320	Box for measurement	For DT, HD														○	○		○	
799-601-9330	Case															○				
799-601-9340	Case																○			
799-601-9350	DEUTSCH	40P																	○	
799-601-9360	DEUTSCH	24P																	○	
799-601-9410	For NE, G sensor	2P																		○
799-601-9420	For fuel, boost pressure	3P																		○
799-601-9430	PVC socket	2P																		○

	Cause		Standard value in normalcy and references for troubleshooting		
Presumed cause and standard value in normalcy	8	Grounding fault in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Between T-F2 (BR) – FB1 (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between FB1 (11) – M3 (female) (4) or RM2 (female) (1) or M9 (female) (1) or D1 (female) (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between M3 (female) (1) – RM1 (female) (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between M3 (female) (2) – RM1 (female) (2) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between RM3 (female) (1) – M9 (female) (2) wiring harness and chassis ground	Resistance	Min. 1 MΩ

	Cause		Standard value in normalcy and references for troubleshooting		
Presumed cause and standard value in normalcy	8	Disconnection in wiring harness (Disconnection or defective contact of connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between T-F3 (ACC) and FB1 (5)	Resistance	Max. 1 Ω
			Wiring harness between FB1 (15) and T2 (female) (1) or T3 (female) (1) or T4 (female) (1) or T5 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between T2 (female) (2) or T3 (female) (2) or T4 (female) (2) or T5 (female) (2) and T1 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between T1 (female) (2) and chassis ground (T-M7)	Resistance	Max. 1 Ω
	9	Grounding fault in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Between T-F3 (ACC) – FB1 (5) or other related circuit wiring harness and chassis ground	Voltage	Min. 1 MΩ
			Between FB1 (15) – T2 (female) (1), T3 (female) (1), T4 (female) (1), or T5 (female) (1) wiring harness and chassis ground	Voltage	Min. 1 MΩ
			Between T2 (female) (2), T3 (female) (2), T4 (female) (2), or T5 (female) (2) – T1 (female) (1) wiring harness and chassis ground	Voltage	Min. 1 MΩ

Circuit diagram related to travel alarm



BWP13230

Troubleshooting of hydraulic and mechanical system (H mode)

H-6 Speed or power of boom is low

Failure information	• Speed or power of boom is low
Relative information	• Before carrying out troubleshooting, check that other work equipment, travel system, swing system, and blade system are normal. (If any of them is abnormal, perform troubleshooting for "H-1 Speed or power of whole work equipment, travel, swing, and blade speed is low".) • Before carrying out troubleshooting, check that the oil level in the hydraulic tank is normal. • Check the oil pressure and leakage from the cylinder while the hydraulic oil temperature is 45 – 55 °C.

<table>
<tr><td rowspan="11">Presumed cause and standard value in normalcy</td><td colspan="2">Cause</td><td colspan="2">Standard value in normalcy and references for troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of right PPC valve (boom circuit)</td><td colspan="2">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.</td></tr>
<tr><td>Right work equipment control lever</td><td>PPC valve output pressure</td></tr>
<tr><td>Set in neutral</td><td>0 MPa
{0 kg/cm²}</td></tr>
<tr><td>Operate to raise boom
Operate to lower boom</td><td>2.84 – 3.43 MPa
{29 – 35 kg/cm²}</td></tr>
<tr><td>2</td><td>Malfunction of boom control valve (spool)</td><td colspan="2">The boom control valve spool may have a malfunction. Check it directly.</td></tr>
<tr><td>3</td><td>Malfunction of boom control valve (pressure compensation valve)</td><td colspan="2">The pressure compensation valve of the boom control valve may be malfunction. Check it directly.</td></tr>
<tr><td>4</td><td>Malfunction or defective seal of boom control valve (suction valve)</td><td colspan="2">The suction valve of the boom control valve may have a malfunction or defective seal. Check it directly.</td></tr>
<tr><td>5</td><td>Malfunction or defective seal of centralized safety-suction valves</td><td colspan="2">The centralized safety valve may be malfunctioning or its seal may be defective. Check the centralized safety valve directly. (A trouble in the centralized safety valve has effects on the arm, bucket, boom swing, and blade, too.)</td></tr>
<tr><td rowspan="3">6</td><td rowspan="3">Defective seal of boom cylinder</td><td colspan="2">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.</td></tr>
<tr><td>Boom cylinder</td><td>Leakage from cylinder</td></tr>
<tr><td>Relieve by raising boom</td><td>10 cc/min</td></tr>
</table>

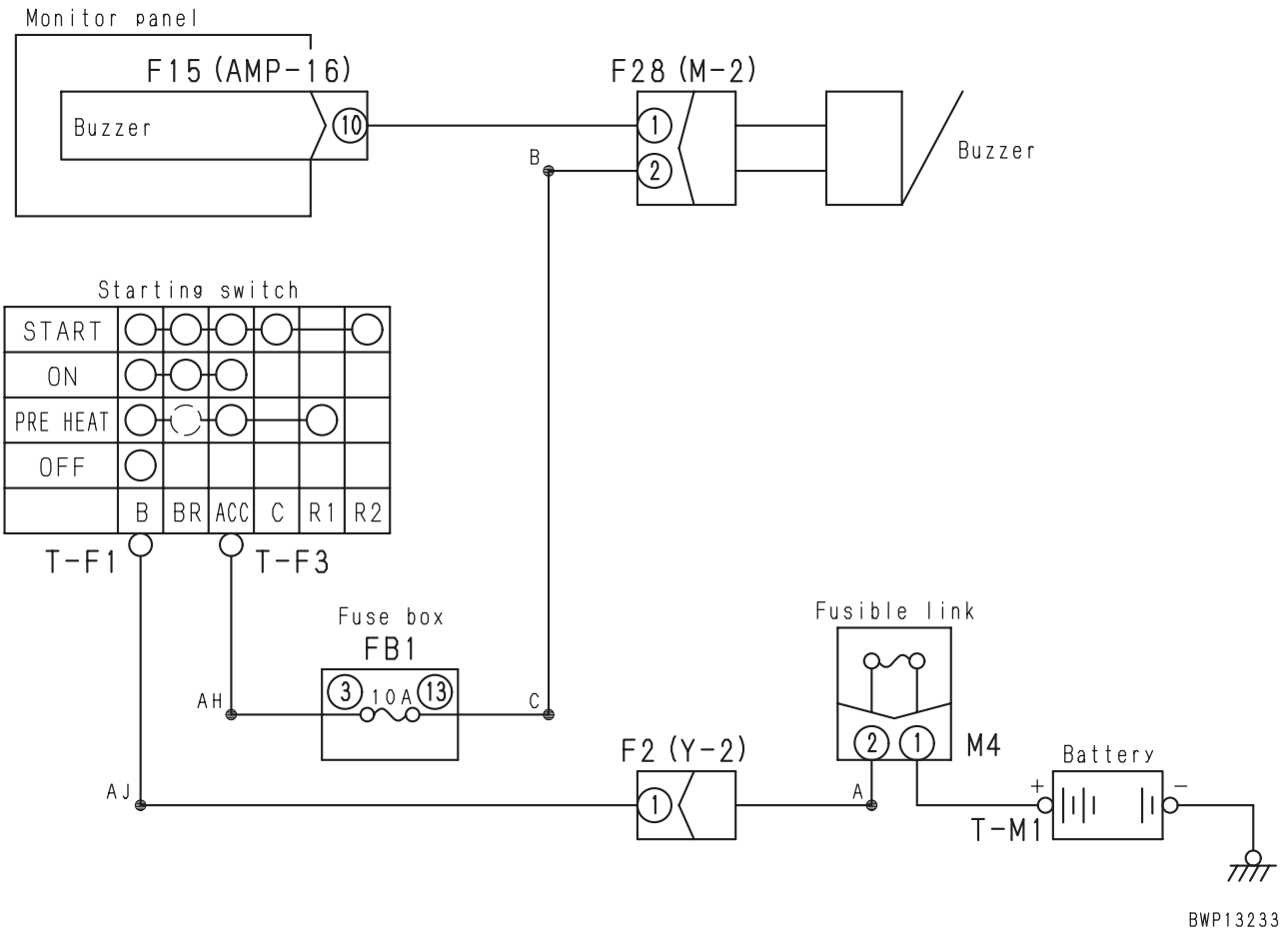
H-19 Speed or power of swing is low

Failure information	(1) Speed or power of swing is low in both directions
Relative information	• Before carrying out troubleshooting, check that work equipment, travel system, and blade system are normal. (If any of them is abnormal, perform troubleshooting for "H-1 Speed or power of whole work equipment, travel, swing, and blade speed is low".) • Before carrying out troubleshooting, check that the oil level in the hydraulic tank is normal. • Check the oil pressure while the hydraulic oil temperature is 45 – 55 °C.

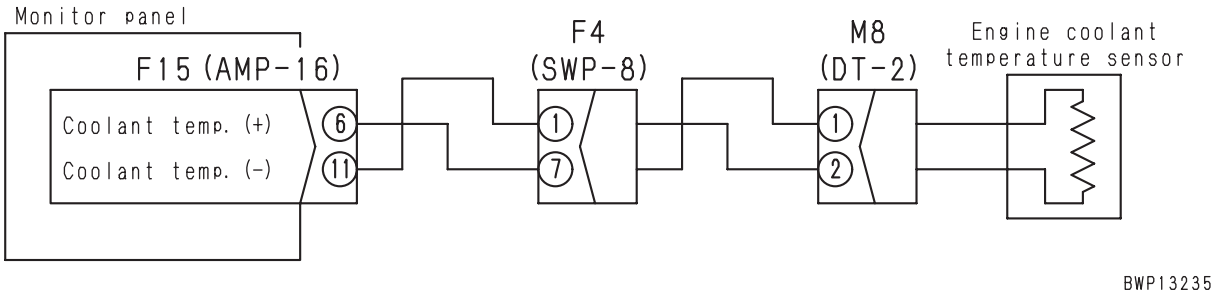
<table>
<tr><td rowspan="6">Presumed cause and standard value in normalcy</td><td colspan="2">Cause</td><td colspan="2">Standard value in normalcy and references for troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Malfunction of shuttle valve for swing holding brake</td><td colspan="2">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.</td></tr>
<tr><td>Work equipment control levers</td><td>Swing holding brake inlet pressure</td></tr>
<tr><td>All levers in neutral</td><td>0 MPa
{0 kg/cm²}</td></tr>
<tr><td>Operated to swing LEFT
Operated to swing RIGHT
Operated to arm IN</td><td>2.84 – 3.43 MPa
{29 – 35 kg/cm²}</td></tr>
<tr><td>2</td><td>Malfunction of swing control valve (spool)</td><td colspan="2">The swing control valve spool may be malfunctioning. Check it directly.</td></tr>
<tr><td>3</td><td>Malfunction or clogging of swing motor (parking brake section)</td><td colspan="2">The parking brake section (selector valve, pressure reducing valve, and orifice) of the swing motor may be malfunctioning or clogged. Check it directly.</td></tr>
<tr><td>4</td><td>Malfunction of swing motor (machinery section)</td><td colspan="2">The machinery section of the swing motor may be malfunctioning. Check it directly.</td></tr>
</table>

Troubleshooting of monitor panel system (M mode)

Circuit diagram related to alarm buzzer



Circuit diagram related to engine coolant temperature sensor

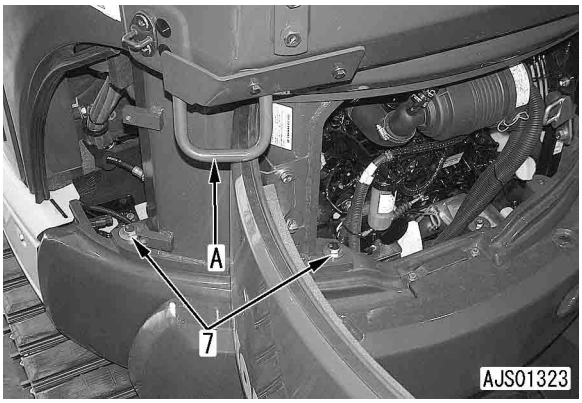


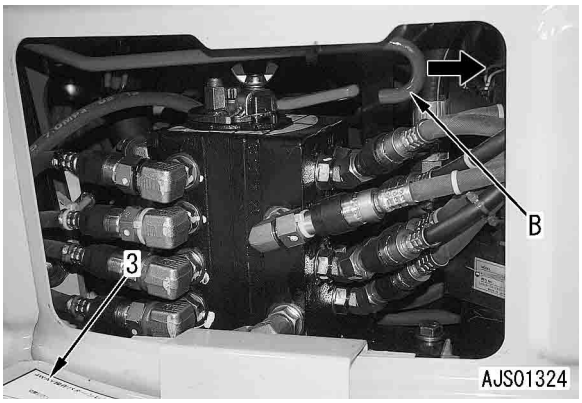
	Cause		Standard value in normalcy and references for troubleshooting			
Presumed cause and standard value in normalcy	7	Grounding fault in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between T-F3 (ACC) – FB1 (3) or other related circuit wiring harness and chassis ground		Resistance	Min. 1 MΩ
			Between FB1 (13) – F15 (female) (2) or related circuit wiring harness and chassis ground		Resistance	Min. 1 MΩ
			Between F15 (female) (8) – R3 (female) (1) or R5 (female) (1) or related circuit wiring harness and chassis ground		Resistance	Min. 1 MΩ
			Between FB1 (18) – R3 (female) (3) or R5 (female) (3) or other related circuit wiring harness and chassis ground		Resistance	Min. 1 MΩ
			Between R3 (female) (5) – W1 (male) (1) or other related circuit wiring harness and chassis ground		Resistance	Min. 1 MΩ
			Between W1 (female) – working lamp wiring harness and chassis ground		Resistance	Min. 1 MΩ
			Between R5 (female) (5) – F22 (male) (1) wiring harness and chassis ground		Resistance	Min. 1 MΩ
			Between F22 (female) – additional working lamp wiring harness and chassis ground		Resistance	Min. 1 MΩ
	8	Defective monitor panel	★Prepare with starting switch OFF, then hold starting switch ON and carry out troubleshooting.			
			F15	Lamp switch	Voltage	
			Between (8) and chassis ground	OFF	10 – 15 V	
				ON	Max. 1 V	

30 Disassembly and assembly

6) Remove bolts (7). [*1]
   ★ Be sure to remove bolts (6) before removing bolts (7).
7) While pulling lever **B** toward the rear with your left hand, grasp and raise knob **A** with your right hand to tilt the floor frame forward until it is locked. (The floor frame is locked when pin **C** is fitted to lock plate **D**.) [*2]
   ★ If the floor is not raised, lever **B** is not set in the free position. (In this case, pull lever **B** further with your left hand to unlock it.)

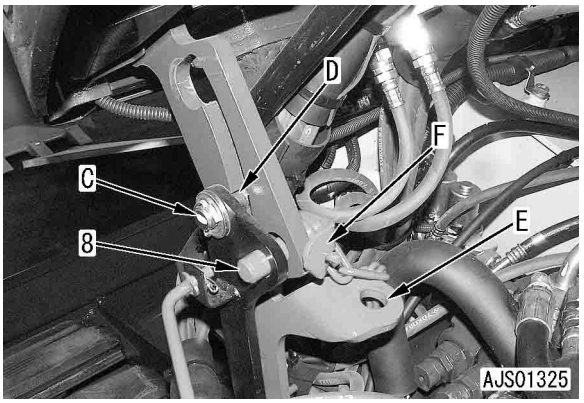
   ⚠ When opening or closing the floor, do not put any part of your body under the floor.





8) Take lock pin (8) (red) out of bracket **E** (red) and insert it in the following position.

   ⚠ Check that lock pin (8) is locked as shown in Part **F**.



2. Release the pressure from the hydraulic tank. For details, see Testing and adjusting, Releasing pressure from hydraulic tank.

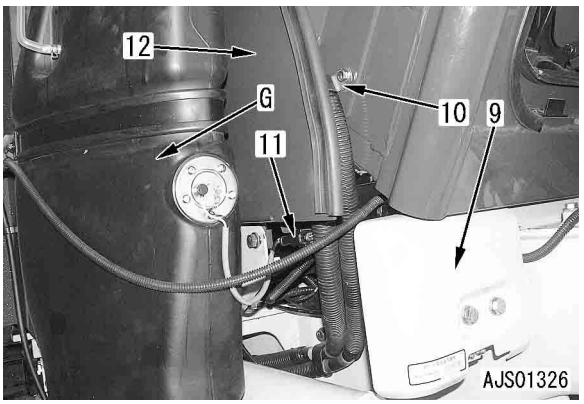
3. Drain the hydraulic oil.
   Hydraulic oil: **19 ℓ**

4. Drain the coolant.
   Coolant: **3.0 ℓ**

5. Remove cover (9).

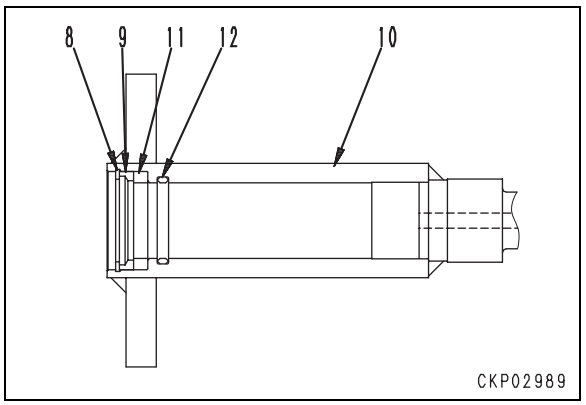
6. Disconnect clip (10).

7. Disconnect connector (11) from the clip.
   ★ Part **G** is the fuel tank.



3. Cylinder

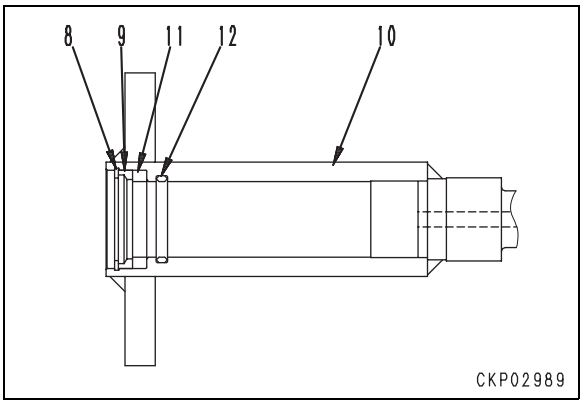
1) Remove snap ring (8), then remove spacer (9) from cylinder (10).
2) Remove dust seal (11)
3) Remove O-ring (12).



Assembly

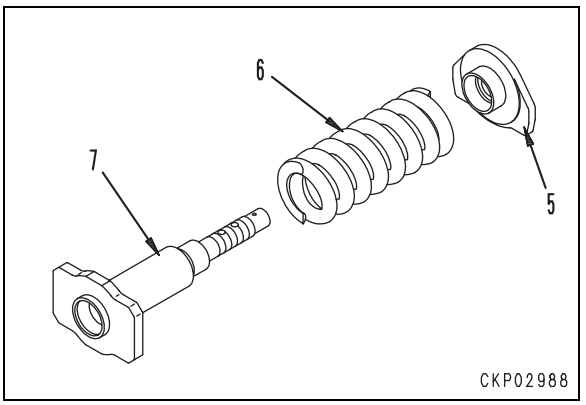
1. cylinder

1) Install O-ring (12) to cylinder (10).
2) Install dust seal (11).
3) Fit spacer (9) and secure with snap ring (8).



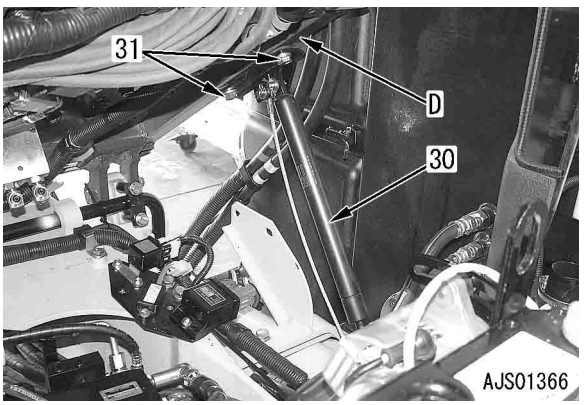
2. Recoil spring

1) Assemble cylinder assembly (7), spring (6), and stopper (5).



17. Remove 2 upper mounting bolts (31) of damper (30).

⚠ Since damper (30) is pressed strongly, it may jump out to right and left. Do not approach it after removing the upper mounting bolts.

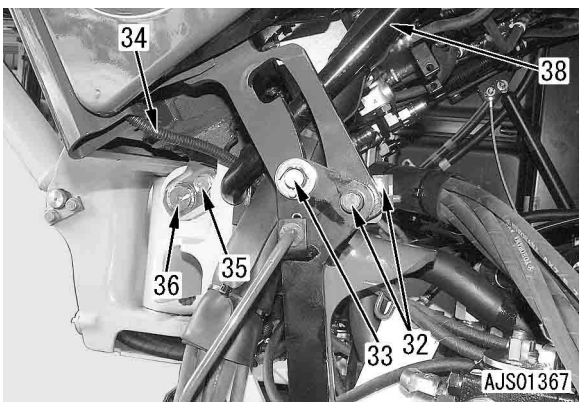


18. Pull out lock pin (32) and remove pin (33).

19. Lift up the operator's cab and floor frame (canopy and floor frame) assembly a little further until damper (30) expands to the end (until damper (30) projects and a space is made in part **D**), and then remove the damper.

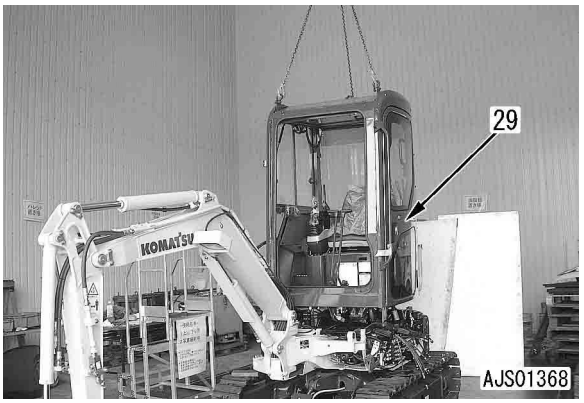
20. Disconnect windshield washer hose (34).

21. Remove right and left bolts (35) and pull out pin (36).
★ Pull out the right pin first (since the force of spring (38) is applied).



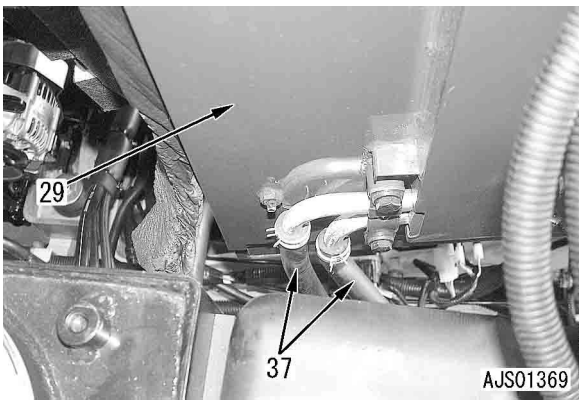
22. Sling operator's cab and floor frame (canopy and floor frame) assembly (29) horizontally.

Canopy and floor frame assembly: **290 kg**
Cab and floor frame assembly: **420 kg**



23. Disconnect heater hose (37) through the space between the fuel tank and the operator's cab and floor frame (canopy and floor frame) assembly.

⚠ Since operator's cab and floor frame (canopy and floor frame) assembly (29) is not fixed, take care not to catch your hands in it.

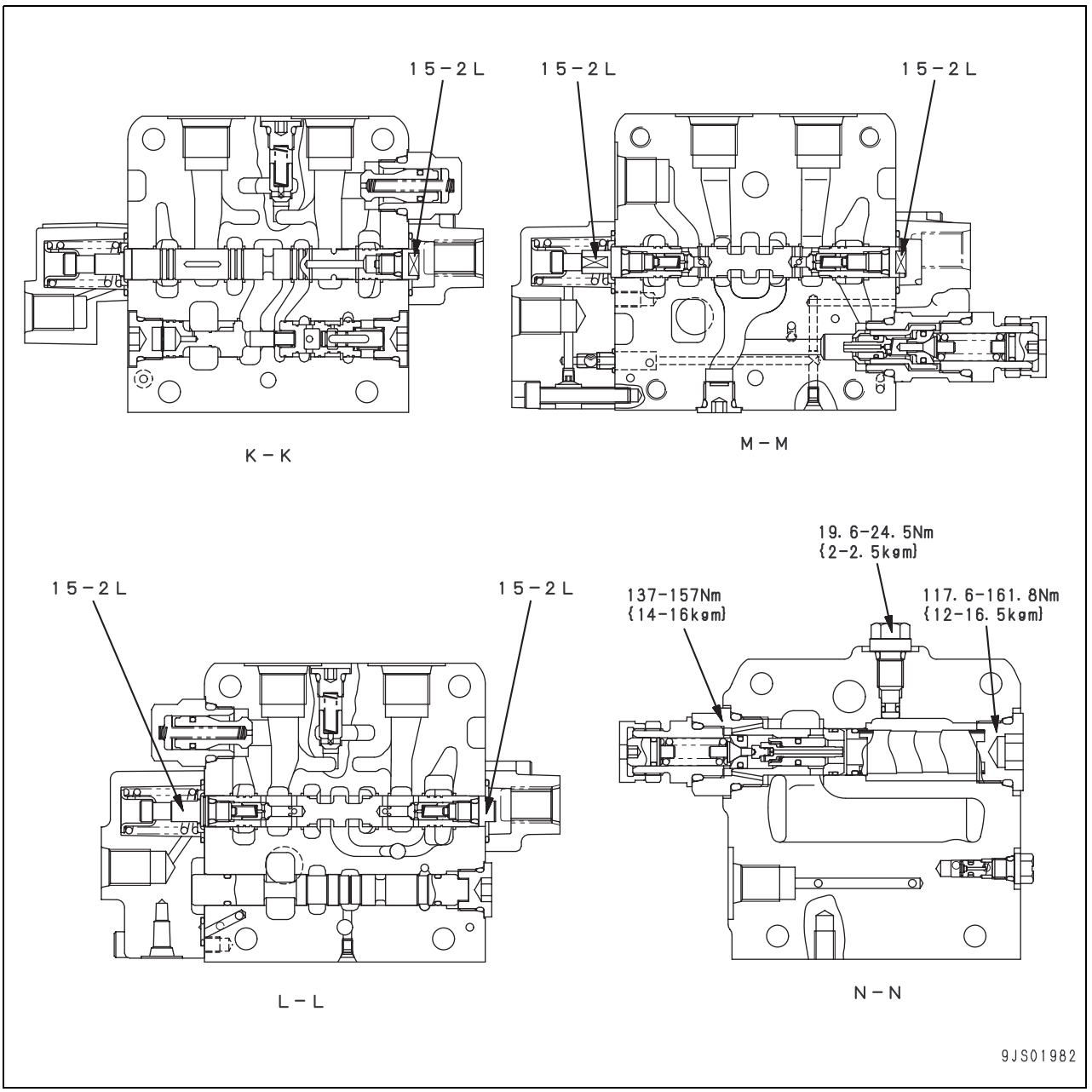


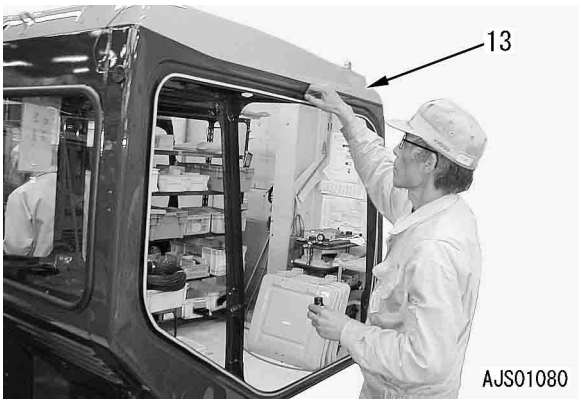
★ Before removing the assembly, check that all the wires and pipes are disconnected.
★ Remove operator's cab and floor frame (canopy and floor frame) assembly (29), taking care of its balance.

★ Sections K-K, L-L, and M-M: See section B-B.

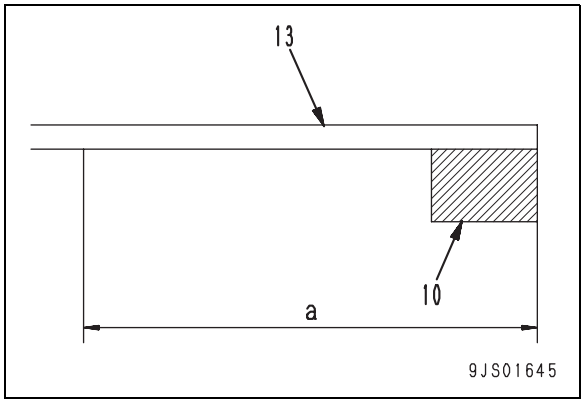
15-2L:
Apply a drop (about 0.02 g) of Loctite (No. 638) to the threads.

15-2L: **14.7 – 19.6 Nm {1.5 – 2.0 kgm}**



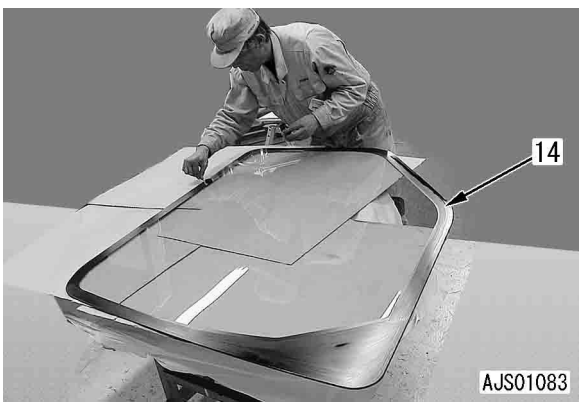


★ Parts to be coated with primer: Apply the primer all over dimension (**a**).
• Dimension to apply primer (**a**): **25 mm**

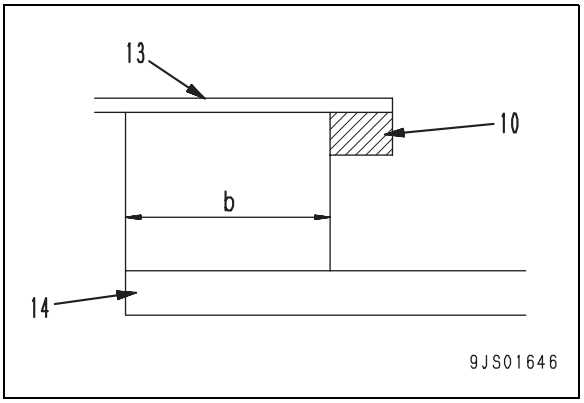


★ After applying the primer, leave it for at least 5 minutes (within 8 hours) to dry.

4) Evenly apply glass primer to the sticking surfaces of window glass (14).
Glass primer:
Sunstar glass primer 435-41
★ Do not apply the primer more than 2 times. (If it is applied more than 2 times, its performance will be lowered.)



★ Parts to be coated with primer: Apply the primer to the sticking surfaces of window glass (14) and all over dimension (**b**) which will be on both-sided adhesive tape (10) and operator's cab (13).
★ Do not apply the primer to the boarder about 5 mm wide between the black part and transparent part of the glass.
★ After applying the primer, leave it for at least 5 minutes (within 8 hours) to dry.



4. Stick both-sided adhesive tape (10) along the inside edge of the glass sticking section.
★ The both-sided adhesive tape is used to stop the adhesive from flowing out, finish the appearance neatly, apply the adhesive evenly and stabilize its strength, and protect the glass until the adhesive is set.
★ The both-sided adhesive tape is classified into 2 types by the sectional dimensions. Use those types according to the following table.

Both-sided adhesive tape	Sectional size of both-sided adhesive tape
For general use	5 mm thick × 7 mm wide
For front sash	5 mm thick × 5 mm wide

★ Do not remove the release tape of the both-sided adhesive tape on the glass sticking side before sticking the glass.
★ When sticking the both-sided adhesive tape, do not touch the cleaned surface as long as possible.
★ Take that the both-sided adhesive tape will not float at each corner of the window frame.