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SEBM036301

SHOP MANUAL

KOMATSU

PC130-7

MACHINE MODEL

PC130-7

SERIAL NUMBER

70001 and up

- This shop manual may contain attachiments and optional equipment that are not available in your area. Please consult your local Komatsu distributor for those items you may require. Materials and specifications are subject to change without notice.
- PC130-7 mounts the SAA4D95LE-3 engine. For details of the engine, see the 95-3 Series Engine Shop Manual.

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Printed in Japan 04-04(02)

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20 TESTING AND ADJUSTING

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★ Note the following when making judgements using the standard value tables for testing, adjusting, or troubleshooting.

1. The standard value for a new machine given in the table is the value used when shipping the machine from the factory and is given for reference. It is used as a guideline for judging the progress of wear after the machine has been operated, and as a reference value when carrying out repairs.
2. The service limit value given in the tables is the estimated value for the shipped machine based on the results of various tests. It is used for reference together with the state of repair and the history of operation to judge if there is a failure.
3. These standard values are not the standards used in dealing with claims.

⚠ When carrying out testing, adjusting, or troubleshooting, park the machine on level ground, inset the safety pins, and use blocks to prevent the machine from moving.

⚠ When carrying out work together with other workers, always use signals and do not let unauthorized people near the machine.

⚠ When checking the water level, always wait for the water to cool down. If the radiator cap is removed when the water is still hot, the water will spurt out and cause burns.

⚠ Be careful not to get caught in the fan, fan belt or other rotating parts.

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STANDARD VALUE TABLE FOR ENGINE

Model name			PC130-7	
Engine			SAA4D95LE-3	
Item	Measurement condition	Unit	Standard value	Permissible value
Engine speed	High idling	rpm	2,350 ± 100	2,350 ± 100
	Low idling		1,100 ± 50	1,100 ± 50
	Rated speed		2,200	—
Exhaust gas color	During sharp acceleration	Bosch index	Max. 4.5	Max. 6.5
	During high idling		Max. 1.0	Max. 2.0
Valve clearance (Cooled)	Intake valve	mm	0.35	—
	Exhaust valve		0.50	—
Compression pressure	Oil temperature: 40 – 60 °C (Engine speed)	MPa {kg/cm^2} (rpm)	Min. 2.9 {Min. 30} (320 – 360)	2.0 {20} (320 – 360)
Blow-by pressure	Coolant temperature: Within operating range At rated output	kPa {mmH_2O}	Max. 0.49 {Max. 50}	0.98 {100}
Oil pressure	Coolant temperature: Within operating range	MPa {kg/cm^2}		
	At high idling (SAE30)		0.34 – 0.59 {3.5 – 6.0}	0.25 {2.5}
	At high idling (SAE10W)		0.29 – 0.54 {3.0 – 5.5}	0.21 {2.1}
	At low idling (SAE30)		Min. 0.1 {Min. 1.0}	0.07 {0.7}
	At high idling (SAE10W)		Min. 0.08 {Min. 0.8}	0.07 {0.7}
Oil temperature	Through speed range (In oil pan)	°C	90 – 110	120
Fuel injection timing	Before top dead center (BTDC)	°	6 ± 0.75	6 ± 0.75
Fan belt tension	Deflection under finger pressure of 58.8 N {6 kg}	mm	6 – 10	6 – 10
Air conditioner compressor belt tension	Deflection under finger pressure of 58.8 N {6 kg}	mm	6 – 10	6 – 10

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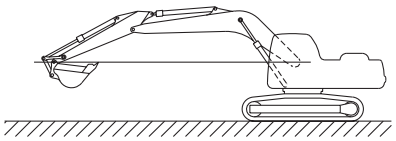
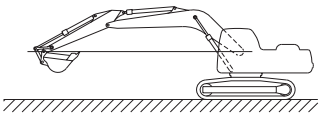
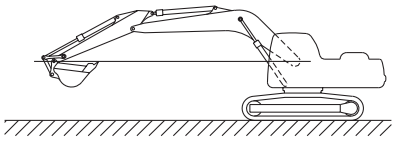
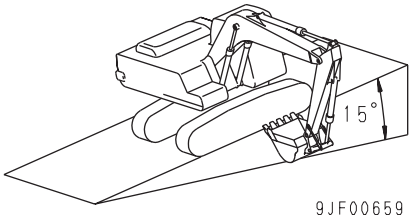
STANDARD VALUE TABLE FOR CHASSIS

Model name				PC130-7	
Category	Item	Measurement condition	Unit	Standard value	Permissible value
Engine speed	Pump relief	• Engine coolant temperature: Within operating range • Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Working mode: A • Arm OUT relief	rpm	2,120 ± 100	2,120 ± 100
	Pump relief + One-touch power maximizing	• Engine coolant temperature: Within operating range • Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Arm OUT relief + One-touch power maximizing switch ON	rpm	2,180 ± 100	2,180 ± 100
	During auto-deceleration	• Engine speed: High idling • Auto-decelerator switch: ON • All control levers in neutral	rpm	1,400 ± 100	1,400 ± 100
Control valve spool stroke	Boom control valve	• Engine: Stopped	mm	8.0 ± 0.5	8.0 ± 0.5
	Arm control valve	IN		9.5 ± 0.5	9.5 ± 0.5
		OUT		8.0 ± 0.5	8.0 ± 0.5
	Bucket control valve			8.0 ± 0.5	8.0 ± 0.5
	Swing control valve			8.0 ± 0.5	8.0 ± 0.5
	Travel control valve			8.0 ± 0.5	8.0 ± 0.5
Control lever stroke	Boom control lever	• Engine: Stopped • Center of lever grip • Read max. value to stroke end (Exclude play in neutral position).	mm	85 ± 10	85 ± 10
	Arm control lever			85 ± 10	85 ± 10
	Bucket control lever			85 ± 10	85 ± 10
	Swing control lever			85 ± 10	85 ± 10
	Travel control lever			112 ± 15	112 ± 15
	Play of control lever			10 ± 15	10 ± 15
Operating effort of control lever	Boom control lever	• Hydraulic oil temperature: Within operating range • Engine speed: High idling • Center of lever grip • Tip of pedal • Read max. value to stroke end	N {kg}	15.7 ± 3.9 {1.6 ± 0.4}	Max. 24.5 {Max. 2.5}
	Arm control lever			15.7 ± 3.9 {1.6 ± 0.4}	Max. 24.5 {Max. 2.5}
	Bucket control lever			12.7 ± 2.9 {1.3 ± 0.3}	Max. 21.6 {Max. 2.2}
	Swing control lever			12.7 ± 2.9 {1.3 ± 0.3}	Max. 21.6 {Max. 2.2}
	Travel control lever			24.5 ± 5.9 {2.5 ± 0.6}	Max. 39.2 {Max. 4.0}
	Travel control pedal			80.4 ± 20.1 {8.2 ± 2.0}	Max. 107.9 {Max. 11}

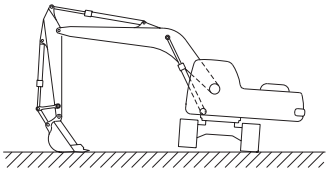
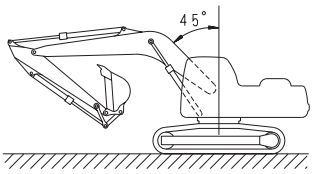
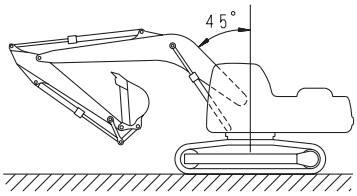
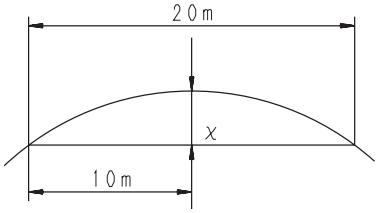
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Model name					PC130-7	
Category	Item	Measurement condition		Unit	Standard value	Permissible value
Oil pressure	Unload pressure	• Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Working mode: A • Pump outlet pressure when all levers are in neutral		MPa {kg/cm²}	2.9 ± 0.5 {30 ± 5}	2.9 ± 0.5 {30 ± 5}
	Boom relief pressure	• Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Working mode: A • Pump outlet pressure when measured circuit is relieved	At normal relief	MPa {kg/cm²}	$31.9^{+2.0}_{0}$ $\{325^{+20}_{0}\}$	33.3 – 36.8 {340 – 375}
			At power max.		34.8 ± 1.0 {355 ± 10}	36.3 – 39.2 {370 – 400}
	Arm relief pressure		At normal relief		$31.9^{+2.0}_{0}$ $\{325^{+20}_{0}\}$	33.3 – 36.8 {340 – 375}
			At power max.		34.8 ± 1.0 {355 ± 10}	36.3 – 39.2 {370 – 400}
	Bucket relief pressure		At normal relief		$31.9^{+2.0}_{0}$ $\{325^{+20}_{0}\}$	33.3 – 36.8 {340 – 375}
			At power max.		34.8 ± 1.0 {355 ± 10}	36.3 – 39.2 {370 – 400}
	Swing relief pressure				28.9 ± 1.5 {295 ± 15}	28.9 – 32.9 {295– 335}
	Travel relief pressure				34.8 ± 1.0 {355 ± 10}	36.3 – 39.2 {370 – 400}
	Control circuit basic pressure	• Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Outlet pressure of self-reducing pressure valve when all levers are in neutral		MPa {kg/cm²}	3.23 ± 0.2 {33 ± 2}	2.84 – 3.43 {29 – 35}
	LS differential pressure	• Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Working mode: A • Pump pressure - LS pressure	When all levers are in neutral	MPa {kg/cm²}	$2.7^{+1.0}_{-0.7}$ $\{28^{+10}_{-7}\}$	$2.7^{+1.0}_{-0.7}$ $\{28^{+10}_{-7}\}$
			When travel system runs idle at Hi		2.2 ± 0.1 {22.5 ± 1}	2.2 ± 0.1 {22.5 ± 1}

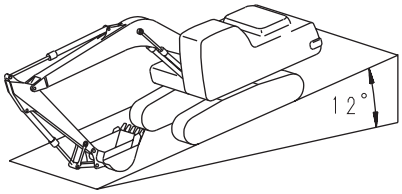
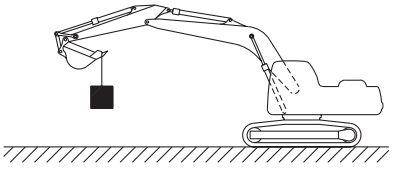
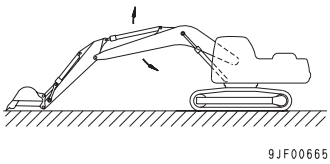
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Model name				PC130-7	
Category	Item	Measurement condition	Unit	Standard value	Permissible value
Swing	Overrun of swing	 9JF00656 • Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Working mode: A • Quantity of overrun of swing circle when it stops after 1 turn • ( ): Qty of overrun of periphery of swing circle	deg (mm)	75 ± 10 {730 ± 100}	Max. 90 (Max. 870)
	Time taken to start swinging	 9JF00656 • Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Working mode: A • Time taken to swing 90° and 180° after starting	90°	2.9 ± 0.3	Max. 3.5
			180°	4.0 ± 0.4	Max. 8.5
	Time taken to swing	 9JF00656 • Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Working mode: A • Time taken to swing 5 turns after swinging 1 turn	sec	28.6 ± 4.8	28.6 ± 5.8
	Hydraulic drift of swing	 9JF00659 • Hydraulic oil temperature: 45 – 55 °C • Engine: Stopped • Set upper structure at 90° to machine body on slope of 15°. • Make match marks on inner race and outer race of swing circle. • Measure deviation of match marks in 15 minutes.	mm	0	0

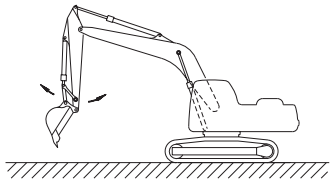
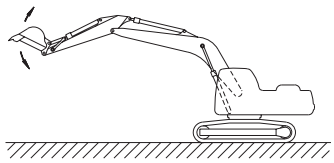
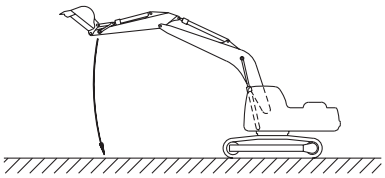
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Model name					PC130-7	
Cate-gory	Item	Measurement condition		Unit	Standard value	Permissible value
Swing	Leakage from swing motor	• Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Swing lock switch: LOCK • Measure leakage for 1 minutes while swing circuit is relieved.		ℓ/min	Max. 3	Max. 6
Travel	Travel speed (Idle run)	 9JF00660 • Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Working mode: A • Measure time taken to rotate track shoe 5 turns after 1 turn.	Lo	sec	46.1 ± 9.2	46.1 ± 9.2
			Hi		21.9 ± 2.2	23.1 ± 3.0
	Travel speed (Actual travel)	 9JF00661 • Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Working mode: A • Hard and level place • Measure time taken to travel 20 m after running up 10 m.	Lo		27.6 ± 5.1	27.6 ± 7.1
			Hi		13.2 ± 1.2	13.2 ± 1.7
	Travel deviation	 9JF00661 • Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Working mode: A • Travel speed: Lo • Hard and level place • Measure travel deviation in travel of 20 m after running up 10 m.  9JF00662		mm	Max. 200	Max. 220

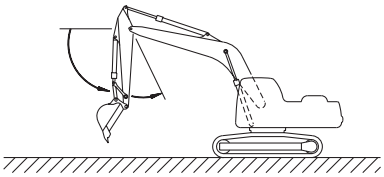
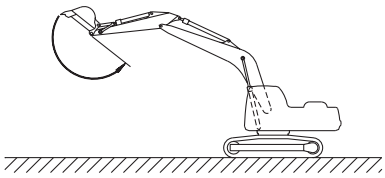
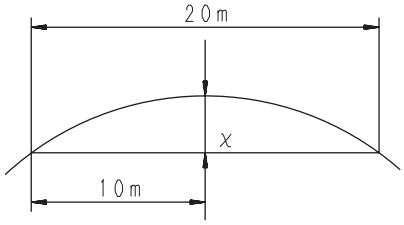
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Model name					PC130-7	
Category	Item		Measurement condition	Unit	Standard value	Permissible value
Travel	Hydraulic drift of travel		 9JF00663 • Hydraulic oil temperature: 45 – 55 °C • Engine: Stopped • Stop machine on slope of 12 degrees with sprocket on upper side. • Measure hydraulic drift of travel in 5 minutes.	mm	0	0
	Leakage from travel motor		• Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Lock sprocket. • Measure leakage for 1 minutes while travel circuit is relieved.	ℓ/min	Max. 5	Max. 10
Work equipment	Hydraulic drift of work equipment	Whole work equipment (Hydraulic drift of tooth tip)	 9JF00664 • Hydraulic oil temperature: 45 – 55 °C • Level and flat place • Bucket: Full of dirt and sand or filled with rated load (1,080 kg) • Level boom top, retract arm cylinder fully, and extract bucket cylinder fully. • Engine: Stopped • Work equipment control lever: Neutral • Start measuring hydraulic drift just after setting machine and measure every 5 minutes for 15 minutes.	mm	Max. 460	Max. 700
		Boom cylinder (Retraction of cylinder)			Max. 10	Max. 12
		Arm cylinder (Extension of cylinder)			Max. 80	Max. 90
		Bucket cylinder (Retraction of cylinder)			Max. 22	Max. 40
	Work equipment speed	Boom speed	 9JF00665 • Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Working mode: A • Measure time taken to move bucket between RAISE stroke end and ground touch point of bucket.	RAISE	sec	3.7 ± 0.4	Max. 4.3
				LOWER		2.6 ± 0.5	Max. 3.2

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Model name					PC130-7	
Category	Item		Measurement condition	Unit	Standard value	Permissible value
Work equipment	Work equipment speed	Arm speed	 9JF00666 • Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Working mode: A • Measure time taken to move arm between OUT stroke end and IN stroke end (between starting points of cushion).	CURL	3.2 ± 0.4	Max. 4.4
				DUMP	3.1 ± 0.3	Max. 3.7
		Bucket speed	 9JF00667 • Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Working mode: A • Measure time taken to move bucket between DUMP stroke end and CURL stroke end	CURL	2.9 ± 0.3	Max. 3.7
				DUMP	2.3 ± 0.2	Max. 2.9
	Time lag	Boom time lag	 9JF00668 • Hydraulic oil temperature: 45 – 55 °C • Engine speed: Low idling • Working mode: A • Lower boom from RAISE stroke end and measure time taken to start raising front of machine after bucket touches ground.	sec	Max. 3.0	Max. 4.0

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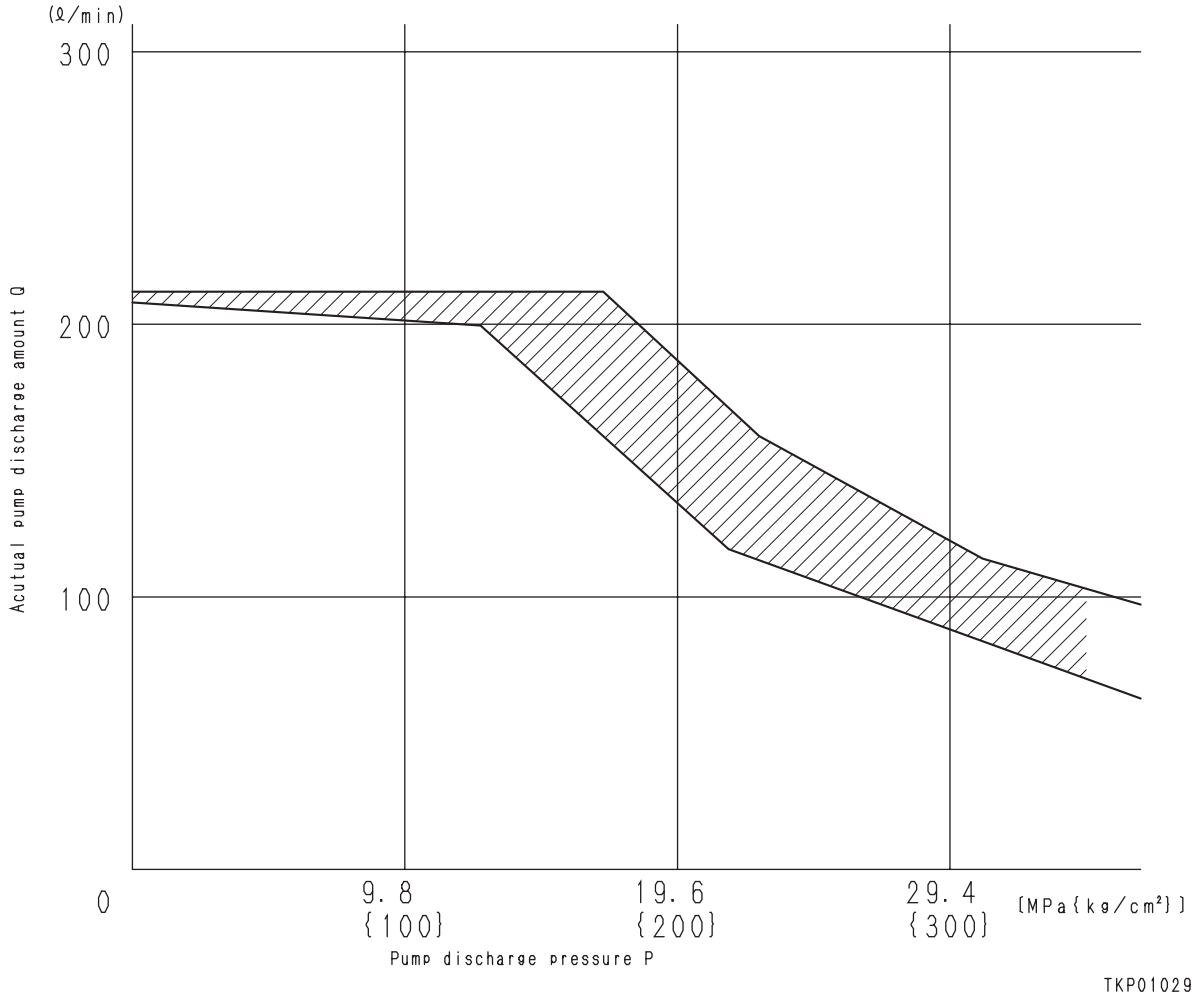
Model name					PC130-7	
Category	Item		Measurement condition	Unit	Standard value	Permissible value
Work equipment	Time lag	Arm time lag	 9JF00669 • Hydraulic oil temperature: 45 – 55 °C • Engine speed: Low idling • Working mode: A • Move IN arm from OUT stroke end and measure time taken to start moving arm again after it is stopped. • For measuring posture, see WORK EQUIPMENT 6.	sec	Max. 2.0	Max. 3.0
		Bucket time lag	 9JF00670 • Hydraulic oil temperature: 45 – 55 °C • Engine speed: Low idling • Working mode: A • Curl bucket from DUMP stroke end and measure time taken to start moving bucket again after it is stopped. • For measuring posture, see WORK EQUIPMENT 7.	sec	Max. 2.0	Max. 3.0
	Oil leakage	Cylinder	• Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Relieve cylinder to be measured or travel circuit and measure leakage in 1 minute.	cc/min	Max. 3.5	Max. 15
		Center swivel joint			Max. 10	Max. 50
Compound operation performance	Travel deviation in compound operation of work equipment and travel		• Hydraulic oil temperature: 45 – 55 °C • Engine speed: High idling • Working mode: A • Travel speed: Lo • Hard and level place • Measure travel deviation in travel of 20 m after running up 10 m.  9JF00662	mm	Max. 500	Max. 500

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Model name				PC130-7	
Category	Item	Measurement condition	Unit	Standard value	Permissible value
PC flow control characteristics	Time taken to swing 90° in compound operation of raising boom and starting swinging	• Hydraulic oil temperature: 45 – 55 °C • Engine: High idling • Working mode: A • Bucket: Filled with rated load • Hard and level place • Set arm vertically and lower back of bucket to ground. • Raise boom and start swinging simultaneously from above posture and measure time taken to pass 90° point.	sec	4.0 (Reference value)	
Pump performance	Hydraulic pump capacity	• See graph.	ℓ/min	See graph.	

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Model name				PC130-7	
Cate-gory	Item	Measurement condition	Unit	Standard value	Permissible value
Pump performance	Hydraulic pump performance				



- PC-EPC current: 400 mA
- Pump speed: 2,000 rpm

Check point	Test pump discharge pressure (MPa{kg/cm2})	Standard discharge (ℓ/min)	Lower limit of discharge (ℓ/min)
Any point	P	Q (See graph)	Q (See graph)

★ Avoid measuring near a broken point of the graph, since the error becomes large at that point.
★ When measuring without removing the pump from the machine, if the engine speed cannot be set to the specified speed with the fuel control dial, calculate the pump discharge pressure at the specified speed from the engine speed and pump discharge at the time of measurement.

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TOOLS FOR TESTING, ADJUSTING, AND TROUBLESHOOTING

Testing and adjusting item	Symbol		Part No.	Part name	Q'ty	Remarks
Measuring exhaust gas color	A	1	799-203-9000	Handy smoke checker	1	Pollution level: 0 – 70% (With standard color) (Pollution level x 1/10 ≒ Bosch index)
		2	Commercially available	Smoke meter	1	
Adjusting valve clearance	B		Commercially available	Feeler gauge	1	(Air intake side: 0.35 mm, Exhaust side: 0.50 mm)
Measuring compression pressure	C		795-502-1205	Compression gauge	1	0 – 6.9MPa {0 – 70kg/cm^2}
			795-502-1370	Adapter	1	For 95E-3 engine
			6204-11-3880	Gasket	1	
Measuring blow-by pressure	D		799-201-1504	Blow-by checker	1	—
Measuring engine oil pressure	E	1	799-101-5002	Hydraulic tester	1	Pressure gauge: 2.5,5.9,39.2,58.8MPa {25,60,400,600kg/cm^2}
			790-261-1203	Digital hydraulic tester	1	Pressure gauge: 58.8MPa {600kg/cm^2}
		2	799-401-2320	Hydraulic tester	1	Pressure gauge: 0.98MPa {10kg/cm^2}
		3	799-401-3500	Adapter	1	Size: 06
		4	799-101-5220	Nipple	1	Size: 10 x 1.25mm
			07002-11023	O-ring	1	
Measuring fuel injection timing	F	1	795-102-2103	Spring pusher	1	For delivery valve method
		2	Commercially available	Dial gauge	1	
Measuring clearance of swing circle bearing	G		Commercially available	Dial gauge	1	—
Testing and adjusting oil pressure in work equipment, swing, and travel circuits	H	1	799-101-5002	Hydraulic tester	1	* Same as E1
			790-261-1203	Digital hydraulic tester	1	
		2	799-101-5220	Nipple	1	* Same as E4
			07002-11023	O-ring	1	
Measuring control circuit basic pressure	J	1	799-101-5002	Hydraulic tester	1	* Same as E1
			790-261-1203	Digital hydraulic tester	1	
		2	799-101-5230	Nipple	1	Size: 14 x 1.5mm
			07002-11423	O-ring	1	
Testing and adjusting oil pressure in pump PC control circuit	K	1	799-101-5002	Hydraulic tester	1	* Same as H (Only quantity is different)
			790-261-1203	Digital hydraulic tester	1	
		2	799-101-5230	Nipple	2	
			07002-11423	O-ring	2	

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Testing and adjusting item	Symbol		Part No.	Part name	Q'ty	Remarks
Testing and adjusting oil pressure in pump LS control circuit	L	1	799-101-5002	Hydraulic tester	1	* Same as H (Only quantity is different)
			790-261-1203	Digital hydraulic tester	1	
		2	799-101-5230	Nipple	2	
			07002-11423	O-ring	2	
		3	799-401-2701	Differential pressure gauge	1	—
Measuring solenoid valve output pressure	M	1	799-101-5002	Hydraulic tester	1	* Same as E1
			790-261-1203	Digital hydraulic tester	1	
		2	799-401-3100	Adapter	1	Size: 03
Measuring PPC valve output pressure	N	1	799-101-5002	Hydraulic tester	1	* Same as E1
			790-261-1203	Digital hydraulic tester	1	
		2	799-401-3100	Adapter	1	* Same as M2
Measuring oil leakage	P		Commercially available	Measuring cylinder	1	
Measuring water temperature and oil temperature	—		799-101-1502	Digital thermometer	1	-99.9 – 1,299°C
Measuring operating effort and pressing force	—		79A-264-0021	Push-pull scale	1	0 – 294N {0 – 30kg}
			79A-264-0091	Push-pull scale	1	0 – 490N {0 – 50kg}
Measuring stroke and hydraulic drift	—		Commercially available	Scale	1	—
Measuring work equipment speed	—		Commercially available	Stopwatch	1	—
Measuring voltage and resistance	—		Commercially available	Circuit tester	1	—

★ For the model names and part Nos. of the T-adapters and boxes used for troubleshooting for the monitor panel, controllers, sensors, actuators, and wiring harnesses, see TROUBLESHOOTING, Layout of connectors and electric circuit diagram of each system.

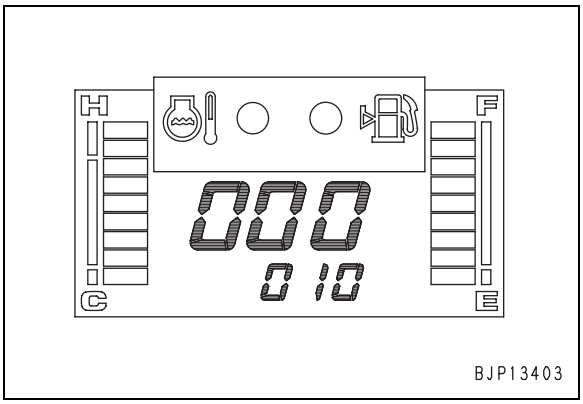
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TESTING AND ADJUSTING ENGINE SPEED

MEASURING

1. Preparation work

1) Turn the starting switch ON and set the monitor panel in the "Monitoring function [02]" to prepare for measurement of the engine speed.
   - ★ For the operating method, see "Special functions of monitor panel".
   - • Monitoring code: 010 (Engine speed)
   - ★ The engine speed is displayed in rpm.
2) Warm up the engine to the following operating condition.
   - • Engine coolant temperature: Within operating range
   - • Hydraulic oil temperature: 45 – 55°C
   - ★ Measure the engine speed with the working mode switch in the A-mode position.



1. Measuring low idling speed

1) Set the fuel control dial in the low idling (MIN) position.
2) Set the work equipment control, swing control, and travel levers in neutral and measure the engine speed.

2. Measuring high idling speed

1) Turn the auto-decelerator switch OFF.
2) Set the fuel control dial in the high idling (MAX) position.
3) Set the work equipment control, swing control, and travel levers in neutral and measure the engine speed.

3. Measuring pump relief speed

1) Set the fuel control dial in the high idling (MAX) position.
2) Relieve the arm circuit by moving the arm IN and measure the engine speed.

4. Measuring pump relief and one-touch power maximizing speed

1) Set the fuel control dial in the high idling (MAX) position.
2) Relieve the arm circuit by moving the arm IN, keeping pressing the one-touch power maximizing switch, and measure the engine speed.
   - ★ The one-touch power maximizing function is reset automatically in about 8.5 seconds even if the switch is kept held. Accordingly, measure the engine speed in that period.

5. Measuring auto-deceleration speed

1) Start the engine and set the fuel control dial in the high idling position (MAX).
2) Set the work equipment control, swing control, and travel levers in neutral and measure the engine speed.
   - ★ The engine speed lowers to a certain level about 5 seconds after all the levers are set in neutral. This level is the auto-deceleration speed.

ADJUSTING

Adjusting governor spring

★ If the high idling speed is out of the standard range or the engine speed is unstable (the engine hunts), adjust the governor spring with "Governor adjustment function [03]" of the monitor panel.

★ For the adjustment procedure, see SPECIAL FUNCTIONS OF MONITOR PANEL.

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MEASURING EXHAUST GAS COLOR

★ Measuring instruments for exhaust gas color

Symbol		Part No.	Part name
A	1	799-201-9000	Handy Smoke Checker
	2	Commercially available	Smoke Meter

⚠ When installing and removing the measuring instruments, take care not to touch a hot part.

★ If an air source and an electric power source are not available in the field, use handy smoke checker **A1**. When recording official data, use smoke meter **A2**.

1. Measuring with handy smoke checker A1

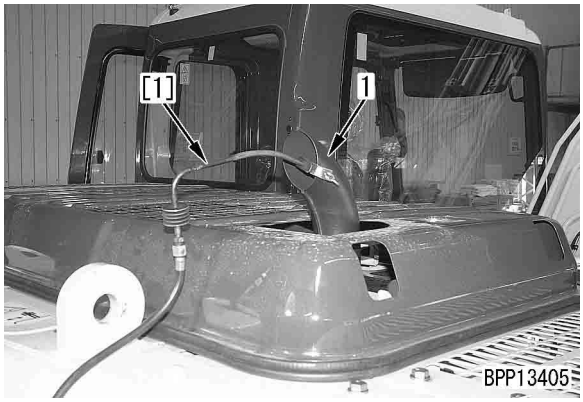
1) Stick a sheet of filter paper to smoke checker **A1**.
2) Insert the exhaust gas intake pipe in exhaust pipe (1).
3) Run the engine.
4) Accelerate the engine suddenly or run it at high idling and operate the handle of smoke checker **A1** so that the filter paper will absorb the exhaust gas.



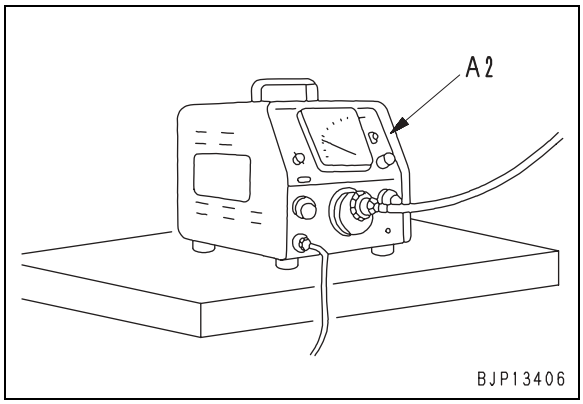
5) Remove the filter paper and compare it with the attached scale.
6) After finishing measurement, remove the measuring instrument and return the removed parts.

2. Measuring with smoke meter A2

1) Insert probe [1] of smoke meter **A2** in the outlet of exhaust pipe (1) and fix it to the exhaust pipe with a clip.



2) Connect the probe hose, receptacle of the accelerator switch, and air hose to smoke meter **A2**.
   ★ Limit the supplied air pressure to 1.5 MPa {15 kg/cm^2}.
3) Connect the power cable to a receptacle of AC 100 V.
   ★ Before connecting the cable, check that the power switch of the smoke meter is turned OFF.
4) Loosen the cap nut of the suction pump and fit the filter paper.
   ★ Fit the filter paper securely so that the exhaust gas will not leak.
5) Turn on the power switch of smoke meter **A2**.



6) Start the engine and heighten the engine coolant temperature to the operating range.

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7) Accelerate the engine suddenly or run it at high idling and press the accelerator pedal of smoke meter **A2** and collect the exhaust gas into the filter paper.
8) Place the contaminated filter paper on the clean filter paper (at least 10 sheets) in the filter paper holder and read the indicated value.
9) After finishing measurement, remove the measuring instrument and return the removed parts.

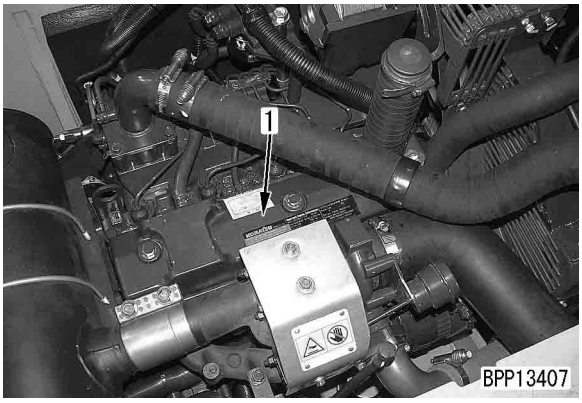
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ADJUSTING VALVE CLEARANCE

★ Adjusting instrument for valve clearance

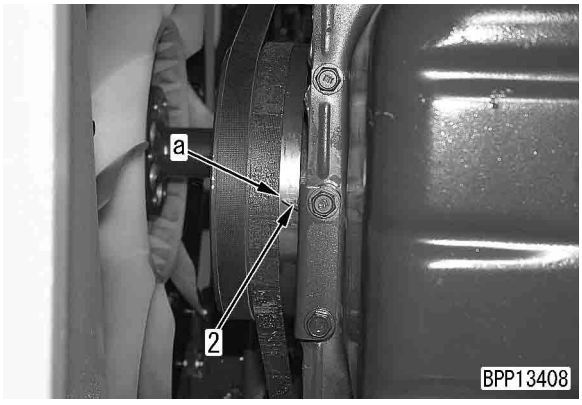
Symbol	Part No.	Part name
B	Commercially available	Feeler gauger

1. Open the engine hood and remove all cylinder head covers (1).

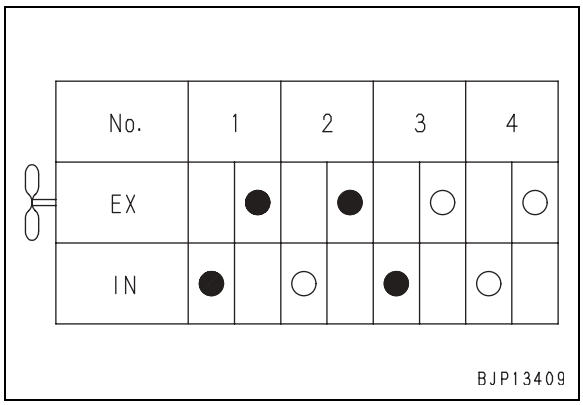


2. Remove the engine undercover (on the radiator side).

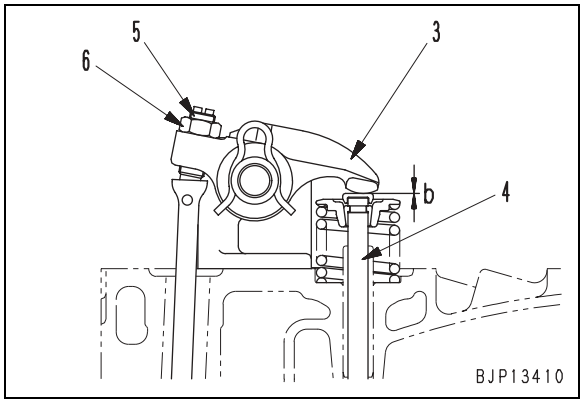
3. Rotate the crankshaft forward to bring the stamped "1.4TOP" line (a) of the crank pulley to pointer (2) and set the No. 1 cylinder to the compression top dead center.
   ★ Crank the crankshaft with the crank pulley mounting bolt.
   ★ There are 2 stamped "1.4TOP" lines on the crank pulley. Use the one at the diagonal position of "2.3TOP".
   ★ When the No. 1 cylinder is at the compression top dead center, the rocker arm of the No. 1 cylinder can be moved by the valve clearance with the hand. If the rocker arm cannot be moved, the No. 1 cylinder is not at the compression top dead center. In this case, rotate the crankshaft one more turn.



4. While the No. 1 cylinder is at the compression top dead center, adjust the valve clearances marked with ● in the valve arrangement drawing according to the following procedure.



   1) Insert feeler gauge **B** in clearance (b) between rocker arm (3) and valve stem (4) and adjust the clearance with adjustment screw (5).
      ★ With the feeler gauge inserted, turn the adjustment screw to a degree that you can move the filler gauge lightly.
   2) Secure adjustment screw (5) and tighten locknut (6).
      Locknut: **39.2 – 49 Nm {4 – 5 kgm}**
      ★ After tightening the locknut, check the valve clearance again.
      ★ After adjusting all of the valves marked with ●, go to the next procedure.



5. Rotate the crankshaft forward to bring the stamped "1.4TOP" line (a) of the crank pulley to pointer (2) and set the No. 4 cylinder to the compression top dead center.

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6. While the No. 4 cylinder is at the compression top dead center, adjust the valve clearances marked with ○ in the valve arrangement drawing.
   ★ Adjust the valve clearance according to step **4** above.

7. After finishing adjustment, return the removed parts.
   Cylinder head cover mounting bolt:
   7.84 – 9.8 Nm {0.8 – 1.0 kgm}

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MEASURING COMPRESSION PRESSURE

★ Measuring instruments for compression pressure

Symbol	Part No.	Part name
C	795-502-1205	Compression gauge
	795-502-1370	Adapter
	6204-11-3880	Gasket

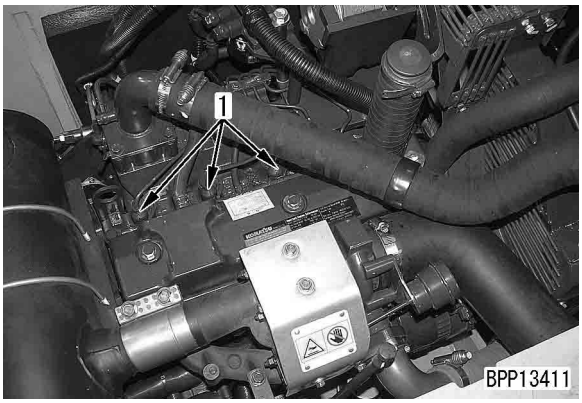
★ When measuring the compression pressure, take care not to burn yourself on the exhaust manifold, muffler, etc. or get caught in a rotating part.

1. Adjust the valve clearance.
   ★ See Adjusting valve clearance.

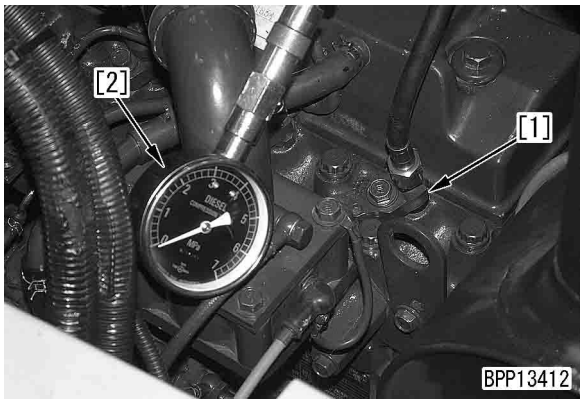
2. Warm up the engine until the engine oil temperature is 40 – 60°C.

3. Prepare for measuring the engine speed.
   ★ See Testing and adjusting engine speed.

4. Open the engine hood and remove nozzle holder (1) of the cylinder to measure the compression pressure.

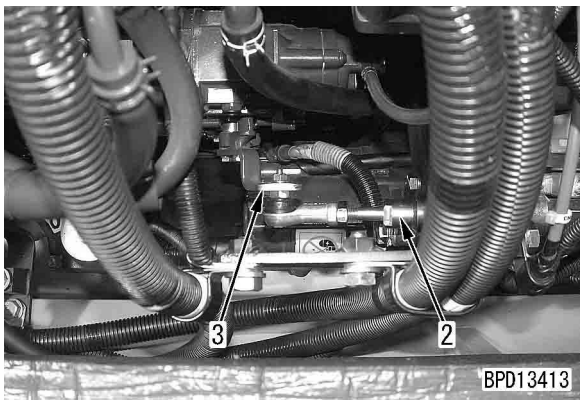


5. Install adapter [1] of compression gauge **C** to the mounting part of the nozzle holder and connect gauge [2].
   ★ Install the gasket to the end of the adapter.
   ★ Secure the adapter with the clamping holder and mounting bolt for the nozzle holder.
   Mounting bolt: **39.2 – 49 Nm {4 – 5 kgm}**



6. Remove governor spring (2).

7. Put governor lever (3) of the fuel injection pump to the STOP side stopper and fix it.



8. Crank the engine with the starting motor and measure the compression pressure.
   ★ Read the compression gauge when its pointer is stabilized.
   ★ When measuring the compression pressure, measure the engine speed, too, and check that it is in the measurement condition range.

9. After finishing measurement, remove the measuring instruments and return the removed parts.
   ★ Check that the fulcrum of the clamping holder for the nozzle holder is seated on the cylinder head, and then tighten the mounting bolt.
   Mounting bolt: **39.2 – 49 Nm {4 – 5 kgm}**

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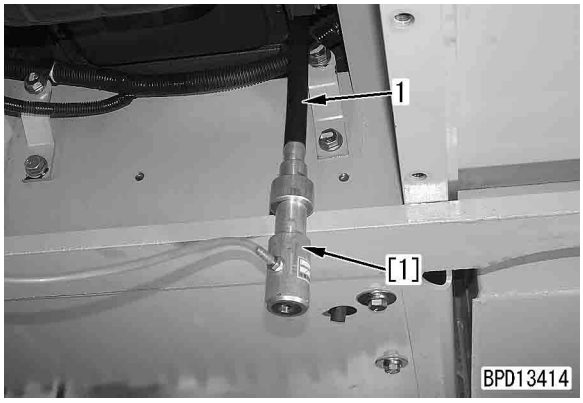
MEASURING BLOW-BY PRESSURE

★ Measuring instruments for blow-by pressure

Symbol	Part No.	Part name
D	799-201-1504	Blow-by checker

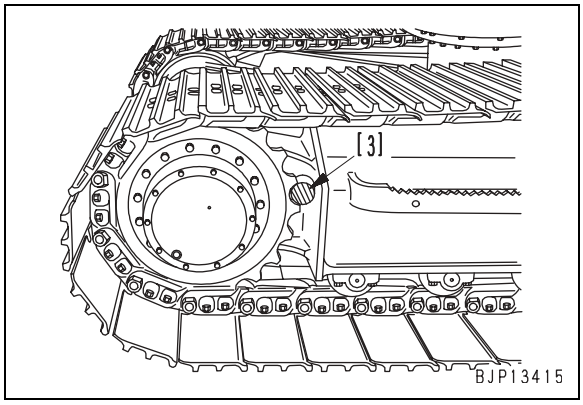
1. Remove the engine undercover (on the flywheel side).

2. Install nozzle [1] of blow-by checker **C** to the end of blow-by hose (1) and connect it to gauge [2].



3. Start the engine and lock the travel mechanism.

   ⚠ Put pin [3] between the sprocket and track frame to lock the travel mechanism securely.



4. Start the engine and warm it up to the operating range.
   - Engine coolant temperature: Within operating range
   - Hydraulic oil temperature: 45 – 55°C

5. Run the engine at high idling and measure the blow-by pressure.
   - Working mode: A
   - Work equipment, swing, and travel circuit: Relieve the travel circuit.



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

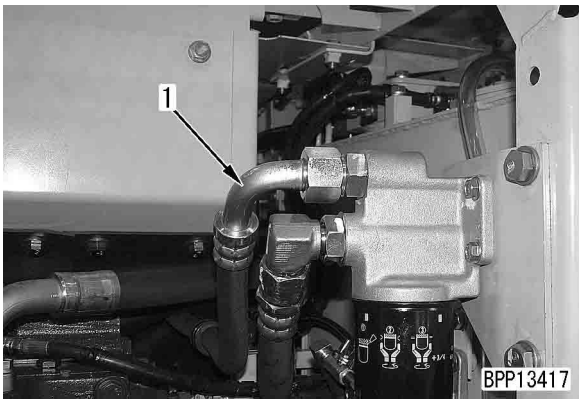
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MEASURING ENGINE OIL PRESSURE

★ Measuring instruments for engine oil pressure

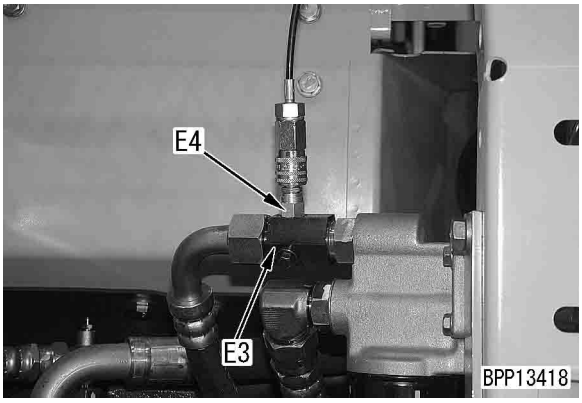
Symbol		Part No.	Part name
E	1	799-101-5002	Hydraulic tester
		790-261-1203	Digital hydraulic tester
	2	799-401-2320	Hydraulic tester
	3	799-401-3500	Adapter (Size: 06)
	4	799-101-5220	Nipple (10 x 1.25 mm)
		07002-11023	O-ring

1. Open the pump room cover and disconnect outlet hose (1) of the engine oil filter.



2. Install adapter **E3** and connect the disconnected hose again.

3. Install nipple **E4** and connect it to hydraulic tester **E2**.



4. Start the engine and heighten the engine coolant temperature to the operating range.

5. Measure the oil pressure during low idling and high idling.



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

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TESTING AND ADJUSTING FOR FUEL INJECTION TIMING

★ Testing and adjusting instruments for fuel injection timing (for delivery valve method)

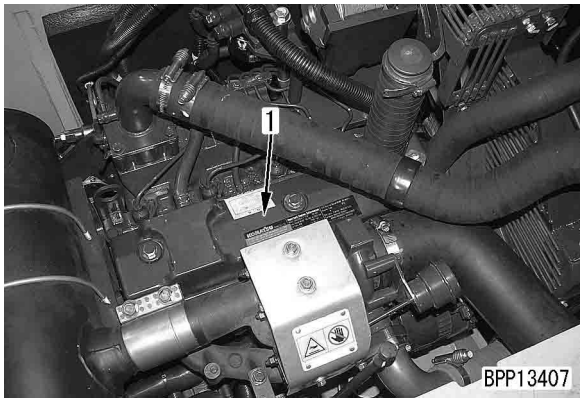
Symbol		Part No.	Part name
F	1	795-102-2103	Spring pusher
	2	Commercially available	Dial gauge

TESTING AND ADJUSTING BY MATCH MARK METHOD

★ After removing and installing the fuel injection pump without repairing it or when only checking the injection timing, test and adjust the injection timing according to the following procedure.

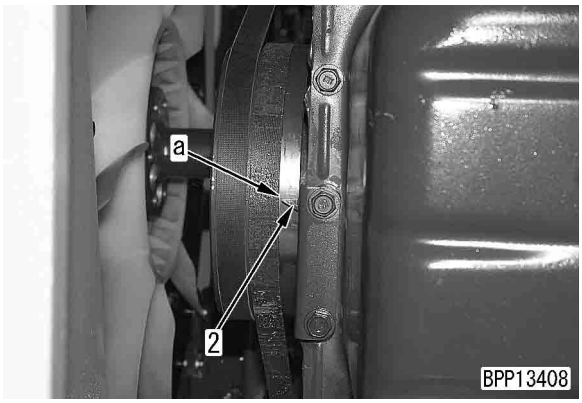
TESTING

1. Open the engine hood and remove all cylinder head covers (1).



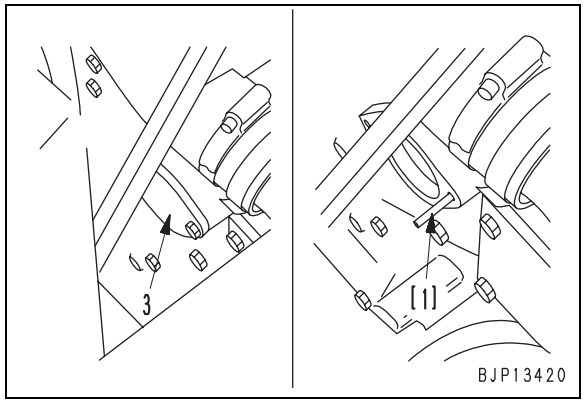
2. Remove the engine undercover (on the radiator side).

3. Rotate the crankshaft forward to bring the stamped "1.4TOP" line (a) of the crank pulley to pointer (2) and set the No. 1 cylinder to the compression top dead center.
   ★ Crank the crankshaft with the crank pulley mounting bolt.
   ★ There are 2 stamped "1.4TOP" lines on the crank pulley. Use the one at the diagonal position of "2.3TOP".
   ★ When the No. 1 cylinder is at the compression top dead center, the rocker arm of the No. 1 cylinder can be moved by the valve clearance with the hand. If the rocker arm cannot be moved, the No. 1 cylinder is not at the compression top dead center. In this case, rotate the crankshaft one more turn.



4. Remove cover (3) of the fuel injection pump drive shaft.

5. Insert pin [1] in the mounting bolt hole of the front cover (on the outside of the engine) to check the fuel injection timing.
   ★ Use a pin 4.0 – 4.5 mm in diameter and about 80 mm in length.
   ★ If the pin enters smoothly to inside of the drive gear of the fuel injection pump, the fuel injection timing is normal. In this case, return the removed parts.
   ★ If the pin touches the drive gear of the fuel pump, the fuel injection timing is abnormal. In this case, adjust the fuel injection timing.



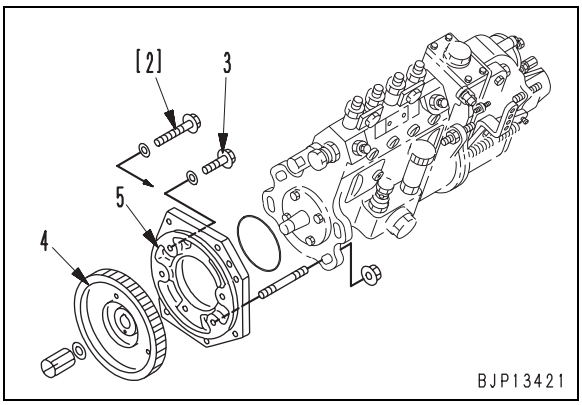
ADJUSTING

★ If the fuel injection timing is abnormal, adjust it according to the following procedure.

1. Remove the fuel pump, holder, and drive gear together.
   ★ See DISASSEMBLY AND ASSEMBLY, Removal, installation of fuel pump assembly.

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2. Remove bolt (3) and fix drive gear (4) to holder (5) with fixing bolt [2].
   ★ As fixing bolt [2], use a bolt 6 mm in thread diameter and 35 mm in length.
   ★ Pass the fixing bolt through the screw hole of bolt (3) and tighten it into the screw hole of the drive gear, and the fuel injection pump is fixed in the fuel injection timing.



3. Install the fuel injection pump, holder, and drive gear together.
   ★ See DISASSEMBLY AND ASSEMBLY, Removal, installation of fuel pump assembly.
   ★ After installing the fuel injection pump temporarily, check the fuel injection timing according to the above described procedure.

4. After finishing adjustment, remove the measuring tools and return the removed parts.

   ⚠ Be sure to remove pin [1] and fixing bolt [2].

   Cylinder head cover mounting bolt:
   7.84 – 9.8 Nm {0.8 – 1.0 kgm}

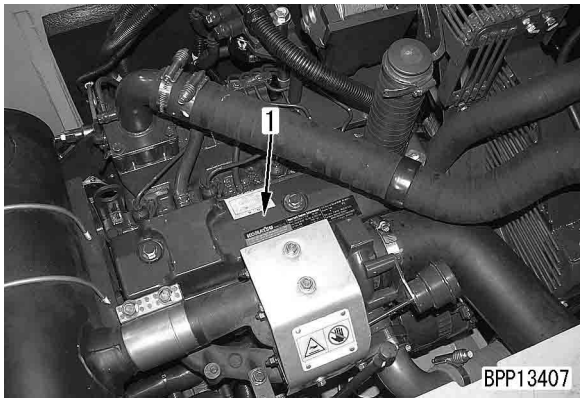
ADJUSTING BY DELIVERY VALVE METHOD

★ After repairing or replacing the fuel injection pump or timing gear, adjust the injection timing according to the following procedure.

ADJUSTING

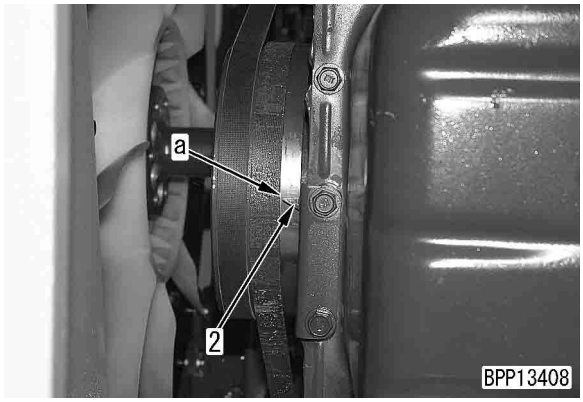
★ Apply the delivery valve method to only adjustment of the injection timing.

1. Open the engine hood and remove all cylinder head covers (1).



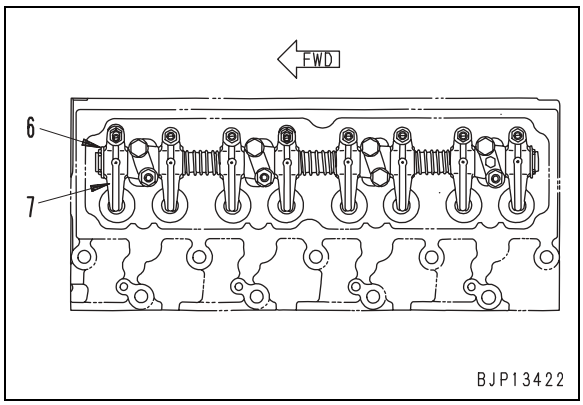
2. Remove the engine undercover (on the radiator side).

3. Rotate the crankshaft forward to bring the stamped "1.4TOP" line (a) of the crank pulley to pointer (2) and set the No. 1 cylinder to the compression top dead center.
   ★ Crank the crankshaft with the crank pulley mounting bolt.
   ★ There are 2 stamped "1.4TOP" lines on the crank pulley. Use the one at the diagonal position of "2.3TOP".
   ★ When the No. 1 cylinder is at the compression top dead center, the rocker arm of the No. 1 cylinder can be moved by the valve clearance with the hand. If the rocker arm cannot be moved, the No. 1 cylinder is not at the compression top dead center. In this case, rotate the crankshaft one more turn.



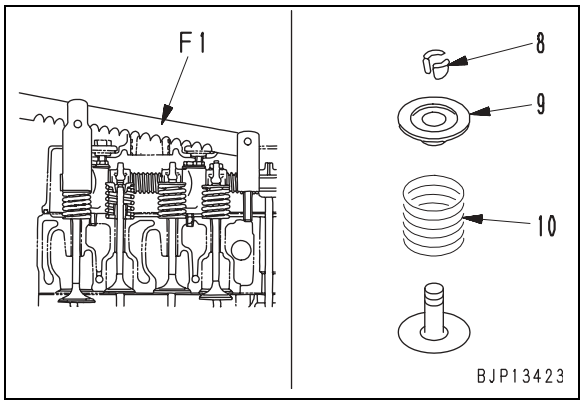
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4. Remove snap ring (6) of the rocker arm shaft on the No. 1 cylinder side, and then remove rocker arm (7) of the No. 1 air intake valve.
   ★ Remove the valve stem cap, too.

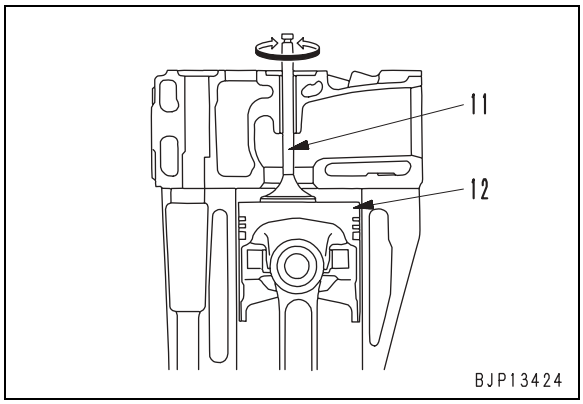


5. Using spring pusher **F1**, remove valve cotter (8) of the No. 1 air intake valve.

6. Loosen spring pusher **F1** and remove seat (9) and spring (10).



7. While No. 1 air intake valve (11) is in contact with the top of piston (12), turn the valve stem with the hand to press No. 1 air intake valve (11) against the piston.
   ★ Since the piston stroke will be measured at the valve stem top, check that the valve bottom is in contact with the piston top securely.

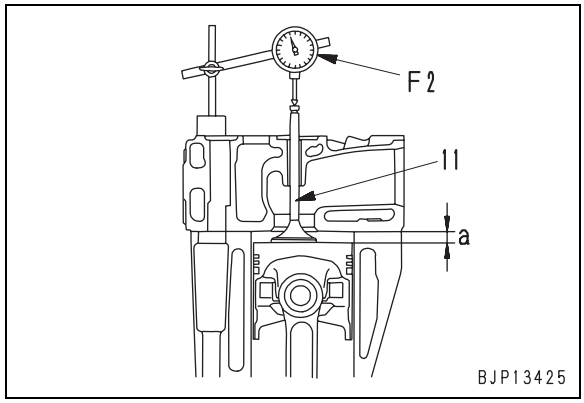


8. Install dial gauge **F2** on the valve stem of No. 1 air intake valve (11) and set it to the 0 point.
   ★ Since the No. 1 cylinder is at the compression top dead center, set this point as the 0 point.

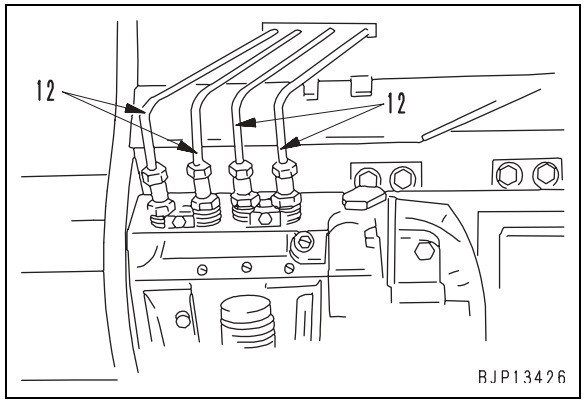
9. Rotate the crankshaft about 45° in reverse.

10. Rotate the crankshaft forward slowly so that dial gauge **F2** will indicate fuel injection timing dimension (a).
    ★ When adjusting the crankshaft to fuel injection timing dimension (a), be sure to rotate it forward so that the adjustment will not be affected by the backlash of the drive gear. (If the crankshaft passes the adjustment dimension, return it sufficiently, and then adjust it again forward.)
    ★ Fuel injection timing dimension (a) and fuel injection timing

Fuel injection timing dimension (a)	**mm**	**0.42 ± 0.08**
Fuel injection timing (Reference)	°	6 ± 0.75

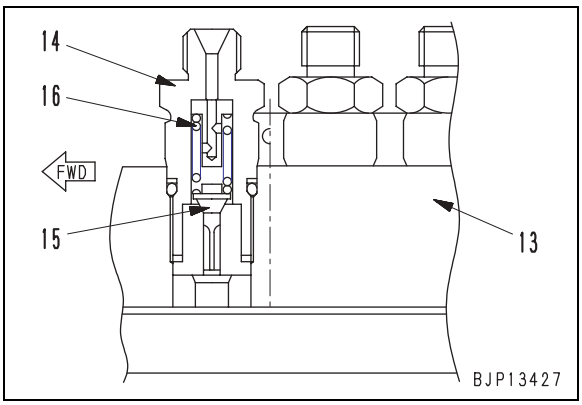


11. Disconnect all of connected fuel injection tubes (12), if there are any.

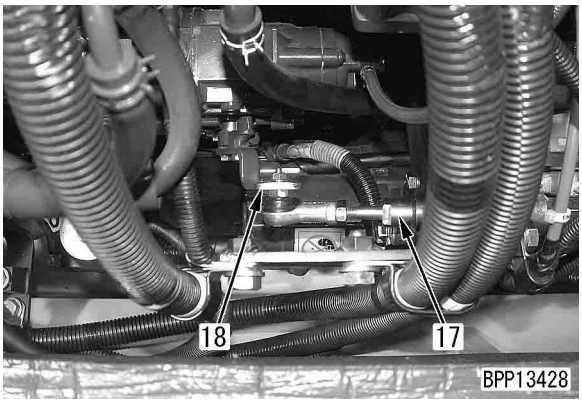


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12. Remove delivery valve holder (14) for the No. 1 cylinder of fuel pump (13), delivery valve (15), and spring (16), and then install delivery valve holder (14) again.



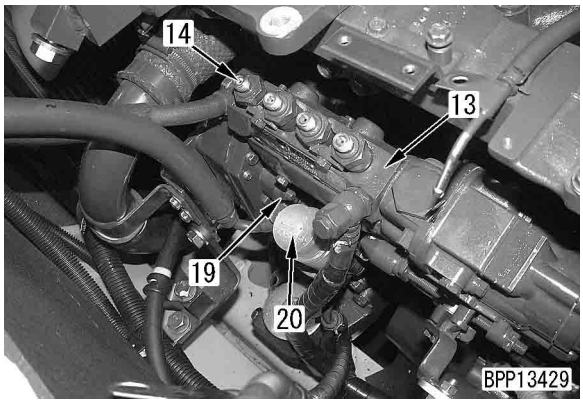
13. Remove governor spring (17), and then put the governor lever (18) of the fuel injection pump to the stopper on the FULL side and fix it.



14. Remove the fixing bracket and lubrication tube of fuel injection pump (13), loosen 4 mounting nuts (19), and lean the fuel injection pump outward fully.
    ★ Loosen the mounting nuts to a degree that the fuel injection pump can be moved in and out within the range of the oblong hole (Do not loosen them so much that the fuel injection pump will have play).

15. Operating priming pump (20) of fuel injection pump 13, move the injection pump gradually toward the cylinder block and stop when the fuel stops flowing out of No. 1 delivery valve holder (14), and then tighten the mounting nuts temporarily.
    ★ The position where fuel stops flowing out of the No. 1 delivery valve holder is the position to start fuel injection in the No. 1 cylinder (fuel injection timing).

16. Tighten 4 mounting nuts (19) of fuel injection pump (13) securely and alternately.



17. After finishing adjustment, remove the adjusting tools and return the removed parts.
    ★ Replace the O-ring and copper gasket of the delivery valve with new ones.

    ⚠ Tighten the delivery valve securely in 3 times. (If it is not tightened sufficiently, the gasket may be broken.)

    Delivery valve holder:
    39.2 – 44.1 Nm {4 – 4.5 kgm}

    Fuel injection tube sleeve nut:
    19.6 – 24.5 Nm {2 – 2.5 kgm}

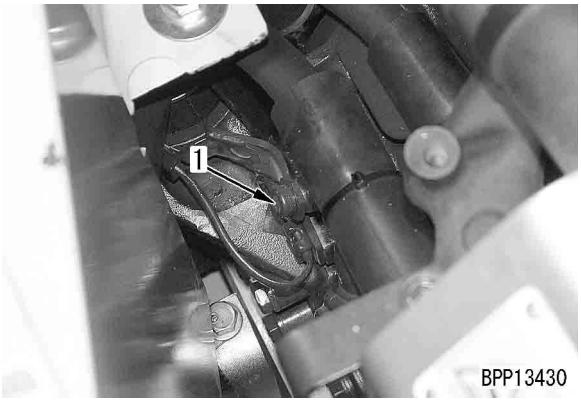
    Cylinder head cover mounting bolt:
    7.84 – 9.8 Nm {0.8 – 1.0 kgm}

    ★ After finishing adjustment, if the stamped lines of the fuel injection pump and holder are not at the same position or there is not a stamped line on the fuel injection pump, stamp a new line to show that the fuel injection timing has been adjusted.

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ADJUSTING ENGINE SPEED SENSOR

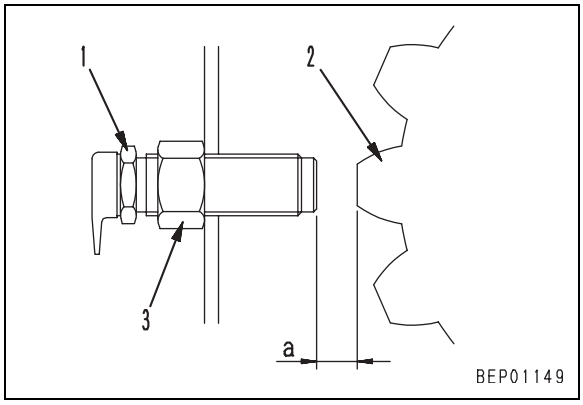
★ If the engine speed sensor has been removed and installed or its signal contains an error, adjust it according to the following procedure.
★ Remove engine speed sensor (1) before adjusting it and check that its tip is free from steel chips (The engine speed sensor is installed to the right side of the flywheel housing).



1. Screw in sensor (1) until its tip touches the tooth tip of flywheel ring gear (2).
   Threads: **Gasket sealant (LG-6)**

2. Return sensor (1) by the specified angle.
   ★ Returning angle of sensor: 1 ± 1/6 turn
   ★ After this adjustment, clearance (a) between the sensor tip and gear tooth tip is 1.25 – 1.75 mm.

3. Fixing sensor (1), tighten nut (3).
   Nut: **49 – 68.6 Nm {5 – 7 kgm}**



4. After finishing adjustment, check that the monitor panel displays the engine speed normally in the "Monitoring mode".
   ★ For the operating method, see "Special functions of monitor panel".
   • Monitoring code: 010 (Engine speed)

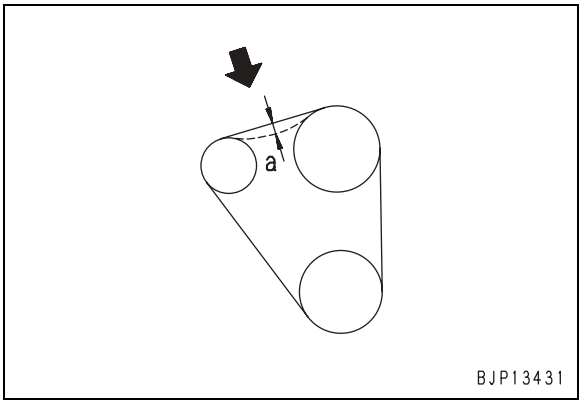
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TESTING AND ADJUSTING FAN BELT TENSION

TESTING

1. Open the engine hood and remove the belt cover from above the alternator.

2. Press the intermediate point of the belt between the fan pulley and alternator pulley with a finger and measure deflection (a) of the belt.
   - Force to press belt: Approx. 58.8 N {6 kg}
   - Deflection (a): 6 – 10 mm



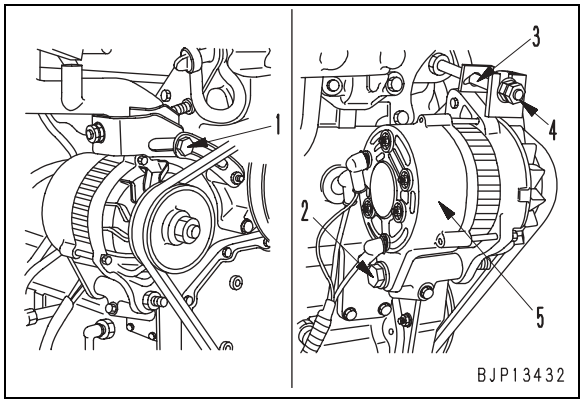
ADJUSTING

★ If the deflection of the belt is abnormal, adjust it according to the following procedure.

1. Loosen alternator mounting bolts (1) and (2).

2. Adjust the belt tension by moving alternator (5) with adjustment bolt (4).
   ★ Turn the adjusting belt to left, the belt tension tight.

3. Tighten locknut (3) and mounting bolts (2) and (1).
   ★ Check breakage of the pulleys, wear of the V-grooves, and contact of the belts and V-grooves.
   ★ If a belt is lengthened to the adjustment limit, cut, or cracked, replace it with new one.



4. After finishing adjustment, return the covers.
   ★ If a V-belt is replaced, adjust its tension again after 1 operating hour.

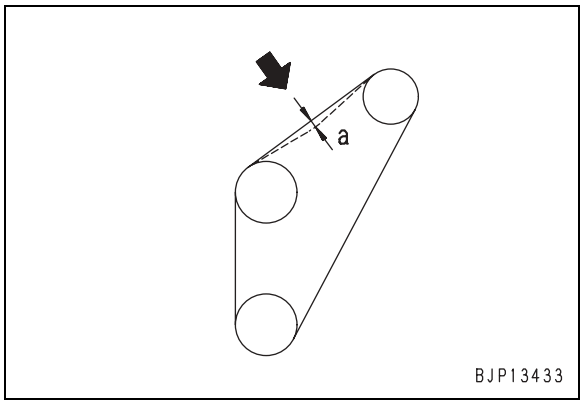
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TESTING AND ADJUSTING AIR CONDITIONER COMPRESSOR BELT TENSION

TESTING

1. Open the engine hood and remove the belt cover from above the air conditioner compressor.

2. Press the intermediate point of the belt between the fan pulley and alternator pulley with a finger and measure deflection "a" of the belt.
   - Force to press belt: Approx. 58.8 N {6 kg}
   - Deflection (a): 6 – 10 mm



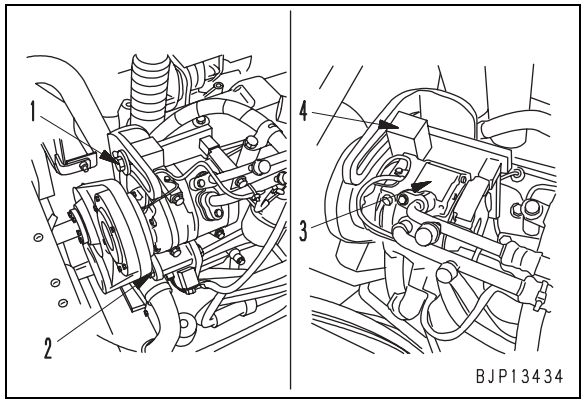
ADJUSTING

★ If the deflection of the belt is abnormal, adjust it according to the following procedure.

1. Loosen compressor bracket mounting bolts (1) and (2).

2. Adjust the belt tension by moving compressor (3) and bracket (4) together.
   ★ Use a bar, etc. to move the bracket (Do not push the compressor directly with a bar, etc.)

3. Tighten mounting bolts (2) and (1).
   ★ Check breakage of the pulleys, wear of the V-grooves, and contact of the belts and V-grooves.
   ★ If a belt is lengthened to the adjustment limit, cut, or cracked, replace it with new one.



4. After finishing adjustment, return the covers.
   ★ If a V-belt is replaced, adjust its tension again after 1 operating hour.

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MEASURING CLEARANCE OF SWING CIRCLE BEARING

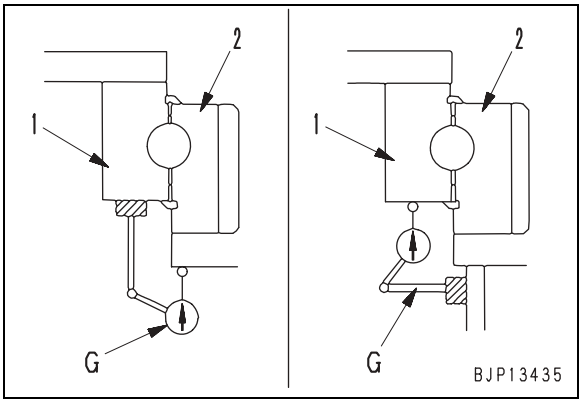
★ Measuring instrument for clearance of swing circle bearing

Symbol	Part No.	Part name
G	Commercially available	Dial gauge

★ When measuring the clearance of the swing circle bearing on the actual machine, observe the following procedure.

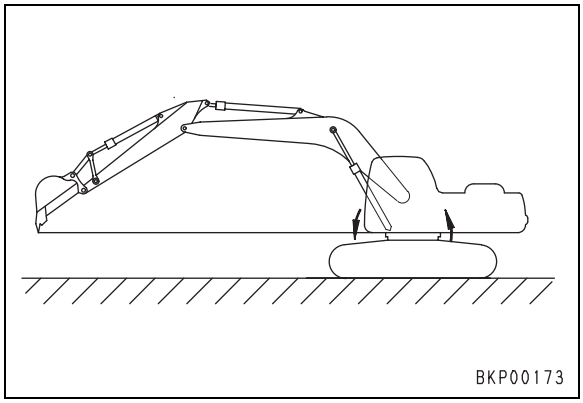
⚠ While measuring, do not put your hands or foot under the undercarriage.

1. Fix dial gauge **G** to outer race (1) or inner race (2) of the swing circle and apply the probe to the end face of inner race (2) or outer race (1) on the opposite side.
   ★ Set dial gauge **G** on the front or at rear side of the machine



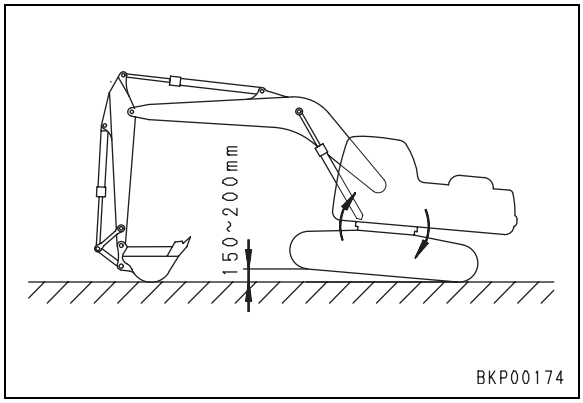
2. Set the work equipment in the maximum reach posture and set the bucket tip to the height of the revolving frame bottom.
   ★ At this time, the front end of the upper structure lowers and the rear end rises.

3. Set the dial gauge **G** to the 0 point.



4. Set the arm at almost a right angle to the ground and lower the boom until the track shoe at the front side of the machine is floated.
   ★ At this time, the front end of the upper structure rises and the rear end lowers.

5. Under this condition, read dial gauge **G**.
   ★ Dial gauge **G** indicates the clearance of the bearing.



6. Return the machine to the posture of step **2** and check that dial gauge **G** indicates 0 again.
   ★ If dial gauge **G** does not indicate 0, repeat steps **3 – 5**.

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

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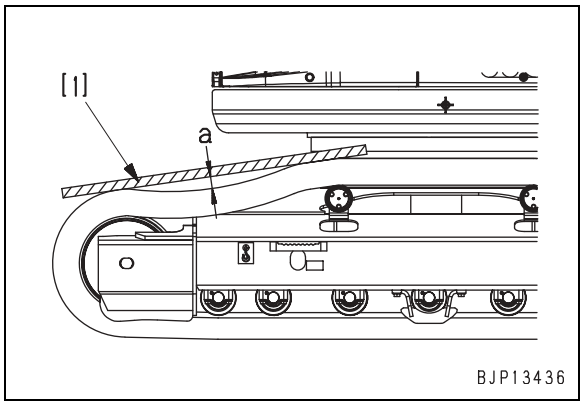
TESTING AND ADJUSTING TRACK SHOE TENSION

TESTING

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

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

3. Measure maximum clearance (a) between straight bar [1] and track shoe.
   • Standard maximum clearance (a):
   10 – 30 mm



ADJUSTING

★ If the track shoe tension is out of the standard range, adjust it according to the following procedure.

1. When tension is too high

1) Loosen valve (1) gradually to discharge the grease.

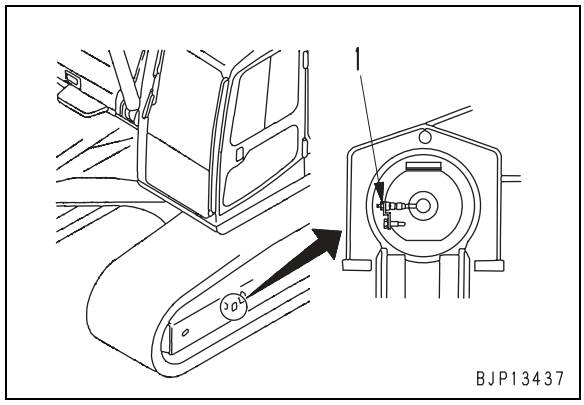
   ⚠ Since the valve may jump out because of the high-pressure grease in it, do not loosen it more than 1 turn.

   ★ If the grease is not discharged well, drive the machine forward and in reverse slowly.

2) Tighten valve (1).

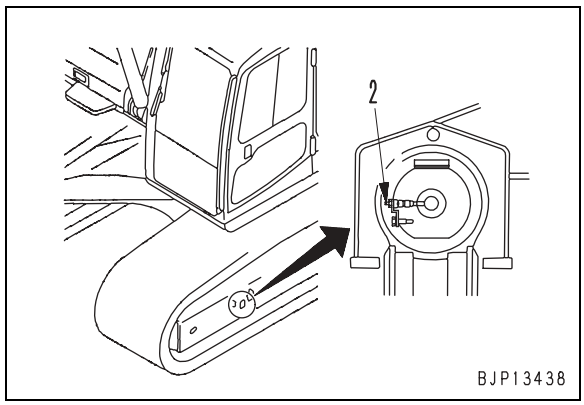
   Valve: **58.8 – 88.2 Nm {6 – 9 kgm}**

3) After finishing adjustment, check again that the track shoe tension is normal according to the above described procedure.



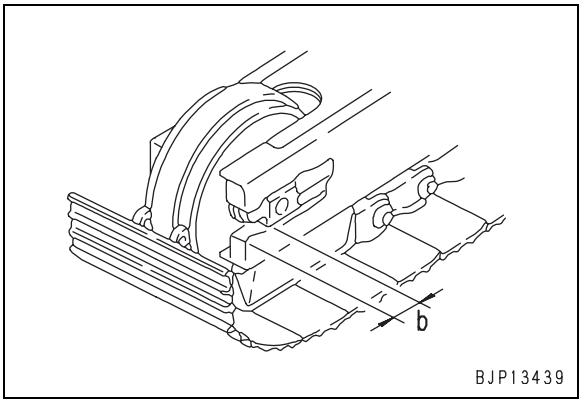
2. When tension is low

1) Add grease through valve (2).
   ★ If the track shoe is not tensed well, drive the machine forward and in reverse slowly.
2) After finishing adjustment, check again that the track shoe tension is normal according to the above described procedure.



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★ 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.



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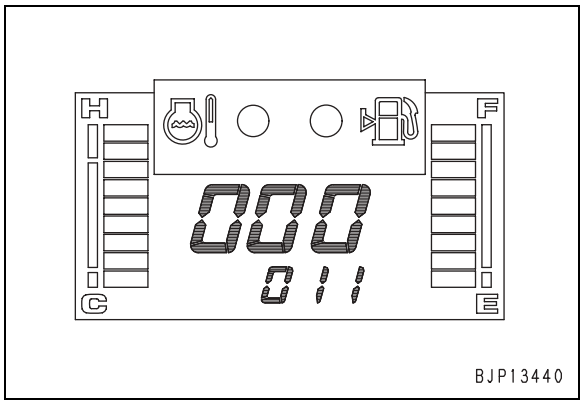
TESTING AND ADJUSTING OIL PRESSURE IN WORK EQUIPMENT, SWING, AND TRAVEL CIRCUITS

★ Testing and adjusting instruments for oil pressure in work equipment, swing, and travel circuits

Symbol		Part No.	Part name
H	1	799-101-5002	Hydraulic tester
		790-261-1203	Digital hydraulic tester
	2	799-101-5220	Nipple (10 x 1.25 mm)
		07002-11023	O-ring

★ The oil pressure in work equipment, swing, and travel circuits (pump discharge pressure) can be checked with monitoring function [02] of the monitor panel.
- Monitoring code: 011, 012 (Pump discharge pressure)

★ The pump discharge pressure is displayed in 1 kg/cm^2.

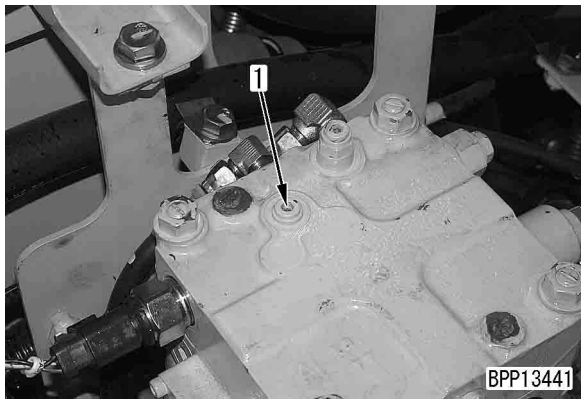


MEASURING

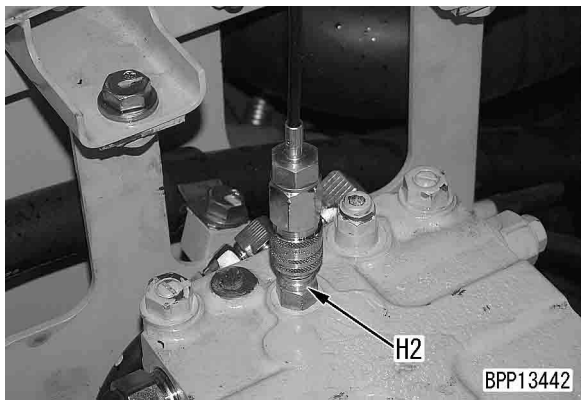
1. Preparation work

⚠ Lower the work equipment to the ground and stop the engine. Operate the control levers several times to release the residual pressure in the piping, and then loosen the oil filler cap of the hydraulic tank slowly to release the internal pressure of the hydraulic tank.

1) Remove the top cover of the control valve, and then remove pump pressure pickup plug (1) from the top of the control valve.



2) Install nipple **H2** and connect it to oil pressure gauge [1] of hydraulic tester **H1**.
★ Use the oil pressure gauges of 58.8 MPa {600 kg/cm^2}.



3) Run the engine and heighten the hydraulic oil temperature to 45 – 55°C.



2. Measuring unload pressure

1) Start the engine.
2) Run the engine at high idling and set all the control levers in neutral and measure the oil pressure.
★ The pressure measured when the unload valve is unloaded is indicated.

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3. Measuring work equipment circuit relief pressure

1) Start the engine and move the cylinder to be measured to the stroke end.
2) Run the engine at high idling and relieve the cylinder and measure the oil pressure.

★ The pressure measured when the main relief valve is relieved is indicated.
★ If the one-touch power maximizing switch is released, the main relief valve is relieved at low pressure. If the former is pressed, the latter is relieved at high pressure.
★ If the swing lock switch is set in the LOCK position, the 2-stage relief solenoid valve is turned ON and the main relief valve is relieved at high pressure. Accordingly, keep the swing lock switch turned OFF.

4. Measuring swing circuit relief pressure

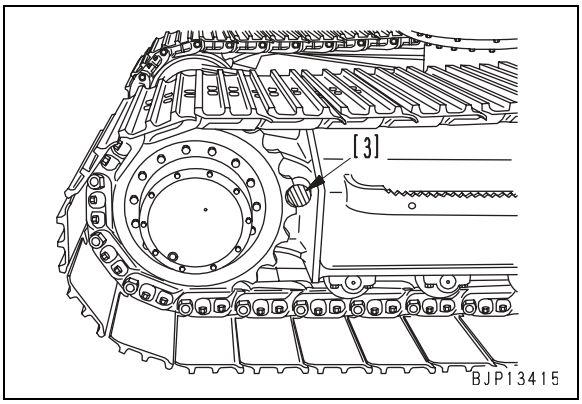
1) Start the engine and set the swing lock switch in the LOCK position.
2) Run the engine at high idling and relieve the swing circuit and measure the oil pressure.

★ The pressure measured when the swing motor safety valve is relieved is indicated.
★ The swing motor relief pressure is lower than the main relief pressure.

5. Measuring travel circuit relief pressure

1) Start the engine and lock the travel mechanism.

⚠ Set pin [2] between the sprocket and track frame to lock the travel mechanism securely.



2) Run the engine at high idling and relieve the travel circuit and measure the oil pressure.

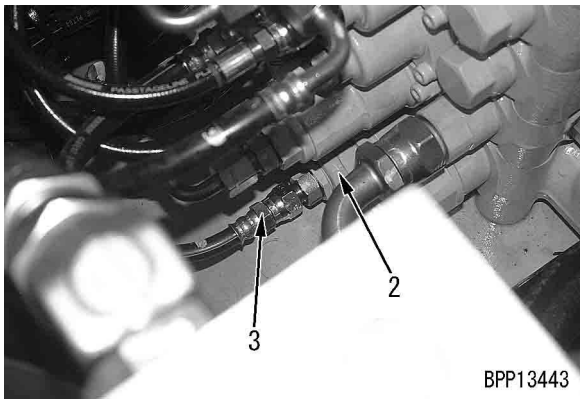
★ The pressure measured when the main relief valve is relieved is indicated. The travel circuit is always relieved at high pressure.

ADJUSTING

★ The unload valve cannot be adjusted.

1. Adjusting main relief pressure (High pressure setting side)

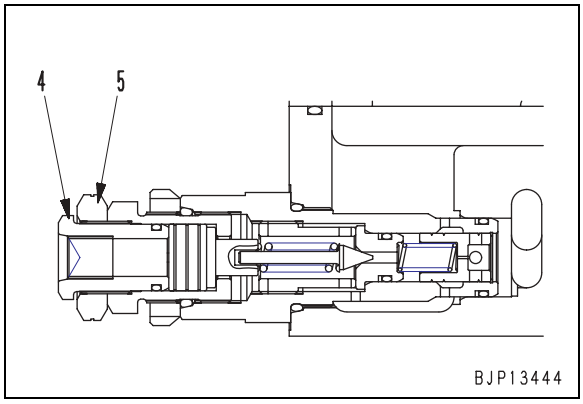
★ If the high relief pressure of the work equipment circuit and travel circuit is abnormal, adjust the high pressure setting side of main relief valve (2) according to the following procedure.
★ The high relief pressure is the pressure applied when the 2-stage relief solenoid valve is turned ON and the pilot pressure is applied to the selector port.



1) Disconnect pilot hose (3).
2) Fixing holder (4), loosen locknut (5).
3) Turn holder (4) to adjust the pressure.
   ★ If the holder is
   - turned to the right, the pressure rises.
   - turned to the left, the pressure lowers.

   ★ Quantity of adjustment per turn of holder: Approx. 12.6 MPa {Approx. 128 kg/cm^2}
4) Fixing holder (4), tighten locknut (5).

Locknut: **39.2 – 49 Nm {4 – 5 kgm}**



5) Connect pilot hose (3).

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6) After finishing adjustment, check again that the pressure is normal according to the above described measurement procedure.
   ★ If the high pressure setting side is adjusted, the low pressure setting side changes. Accordingly, adjust the low pressure setting side, too.

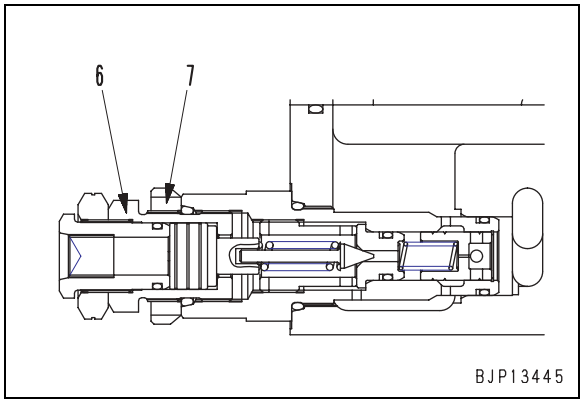
2. Adjusting main relief pressure (Low pressure setting side)

★ If the low relief pressure of the work equipment circuit is abnormal or the high pressure setting was adjusted, adjust the low pressure setting side of main relief valve (2) according to the following procedure.

★ The low relief pressure is the pressure applied when the 2-stage relief solenoid valve is turned OFF and the pilot pressure is not applied to the selector port.

1) Disconnect pilot hose (3).
2) Fixing holder (6), loosen locknut (7).
3) Turn holder (6) to adjust the pressure.
   ★ If the holder is
   - turned to the right, the pressure rises.
   - turned to the left, the pressure lowers.

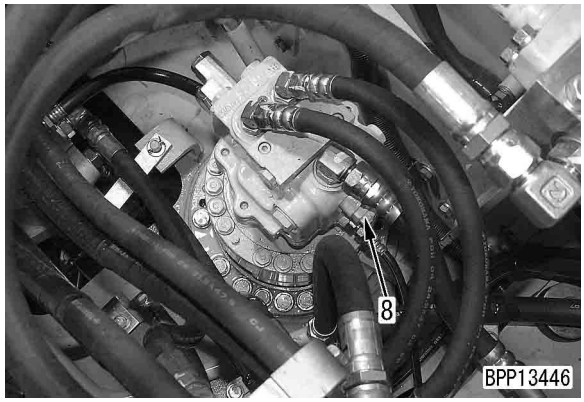
   ★ Quantity of adjustment per turn of holder: Approx. 12.6 MPa {Approx. 128 kg/cm^2}
4) Fixing holder (6), tighten locknut (7).
   Locknut:
   53.9 – 63.7 Nm {5.5 – 6.5 kgm}



5) Connect pilot hose (3).
6) After finishing adjustment, check again that the pressure is normal according to the above described measurement procedure.

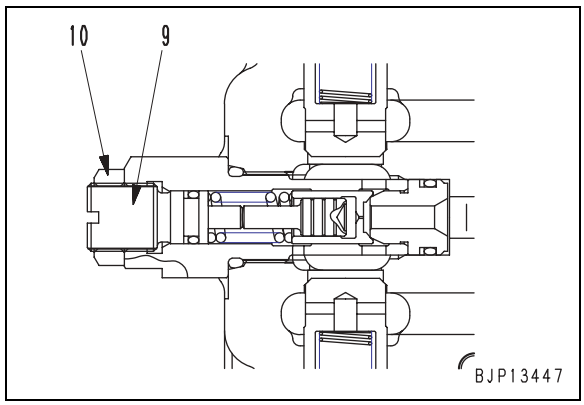
3. Adjusting swing relief pressure

★ If the relief pressure of the swing circuit is abnormal, adjust swing motor safety valve (8) according to the following procedure.



1) Fixing adjustment screw (9), loosen locknut (10).
2) Turn adjustment screw (9) to adjust the pressure.
   ★ If the adjustment screw is
   - turned to the right, the pressure rises.
   - turned to the left, the pressure lowers.

   ★ Quantity of adjustment per turn of adjustment screw: Approx. 14 MPa {Approx. 143 kg/cm^2}
3) Fixing adjustment screw (9), tighten locknut (10).
   Locknut:
   53.9 – 73.5 Nm {5.5 – 7.5 kgm}



4) After finishing adjustment, check again that the pressure is normal according to the above described measurement procedure.

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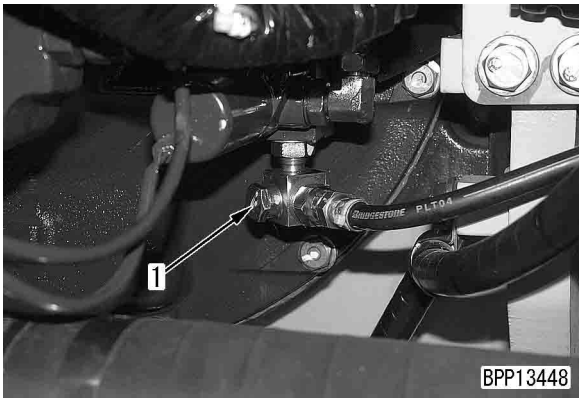
MEASURING CONTROL CIRCUIT BASIC PRESSURE

★ Measuring instruments for control circuit basic pressure

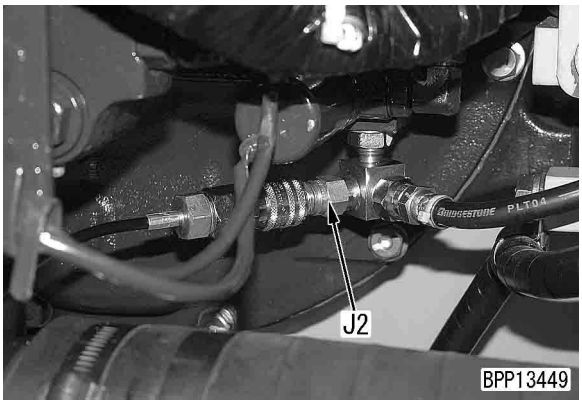
Symbol		Part No.	Part name
J	1	799-101-5002	Hydraulic tester
		790-261-1203	Digital hydraulic tester
	2	799-101-5230	Nipple (10 x 1.25 mm)
		07002-11423	O-ring

⚠ Lower the work equipment to the ground and stop the engine. Operate the control levers several times to release the residual pressure in the piping, and then loosen the oil filler cap of the hydraulic tank slowly to release the internal pressure of the hydraulic tank.

1. Open the pump room cover and remove control circuit basic pressure pickup plug (1) under the hydraulic pump.



2. Install nipple **J2** and connect it to oil pressure gauge [1] of hydraulic tester **J1**.
   ★ Use the oil pressure gauges of 5.9 MPa {60 kg/cm^2}.



3. Run the engine and heighten the hydraulic oil temperature to 45 – 55°C.

4. Run the engine at high idling and set all the control levers in neutral and measure the oil pressure.



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

★ Do not adjust the relief valve for the control circuit basic pressure is not adjustable.

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TESTING AND ADJUSTING OIL PRESSURE IN PUMP PC CONTROL CIRCUIT

★ Testing and adjusting instruments for oil pressure in pump PC control circuit

Symbol		Part No.	Part name
K	1	799-101-5002	Hydraulic tester
		790-261-1203	Digital hydraulic tester
	2	799-101-5220	Nipple (10 x 1.25 mm)
		07002-11023	O-ring

MEASURING

Measuring PC valve output pressure (servo piston inlet pressure)

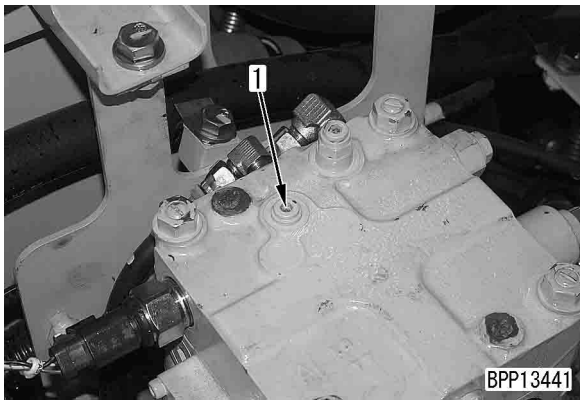
★ Before measuring the PC valve output pressure (servo piston inlet pressure), check that the oil pressure in the work equipment, swing, and travel circuits and the basic pressure in the control circuit are normal.

★ Measure the PC valve output pressure (servo piston inlet pressure) and pump discharge pressure simultaneously and compare them.

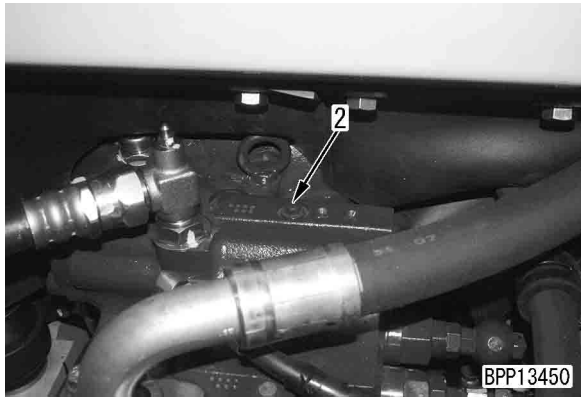
⚠ Lower the work equipment to the ground and stop the engine. Operate the control levers several times to release the residual pressure in the piping, and then loosen the oil filler cap of the hydraulic tank slowly to release the internal pressure of the hydraulic tank.

1. Remove the top cover of the control valve and open the pump room cover.

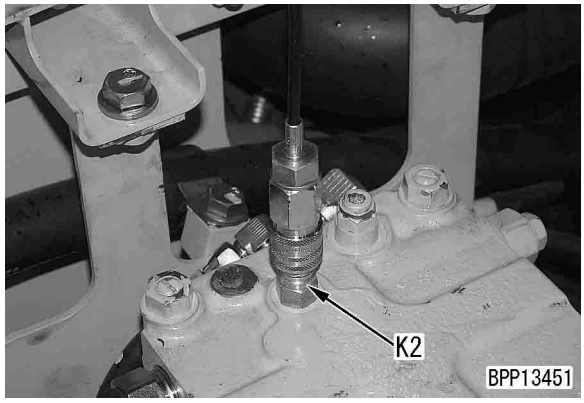
2. Remove oil pressure pickup plugs (1) and (2).
   - (1): Pump discharge pressure pickup plug (at top of control valve)



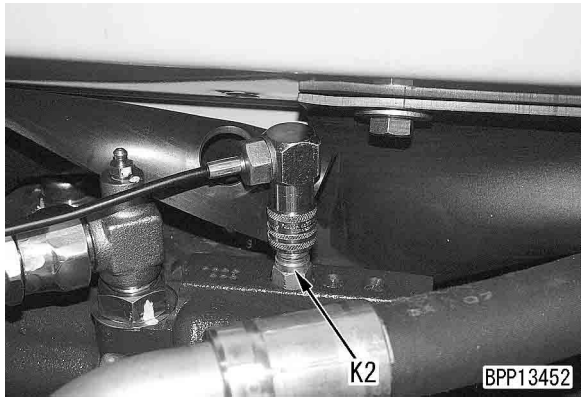
   - (2): PC valve output pressure pickup plug (at top of hydraulic pump)



3. Install nipple **K2** and connect it to oil pressure gauge [1] of hydraulic tester **K1**.
   ★ Use the oil pressure gauge of 58.8 MPa {600 kg/cm^2}.
   - The drawing shows the pump discharge pressure side.



   - The drawing shows the PC valve output pressure side.



4. Run the engine and heighten the hydraulic oil temperature to 45 – 55°C.

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5. While running the engine at high idling, measure the pump discharge pressure and PC valve output pressure (servo piston inlet pressure) simultaneously.
   - Working mode: A
   - Swing lock switch: LOCK (2-stage relief valve is turned ON and relief pressure is set high)
   - Work equipment, swing, and travel circuits: Relieve arm circuit by moving arm IN.

   ★ Method of judgment:
   If the pump discharge pressure and PC valve output pressure (servo piston output pressure) are in the following ratio, they are normal.

Measured oil pressure	Ratio of oil pressure
Pump discharge pressure	1
PC valve output pressure (Servo piston inlet pressure)	Approx. 3/5

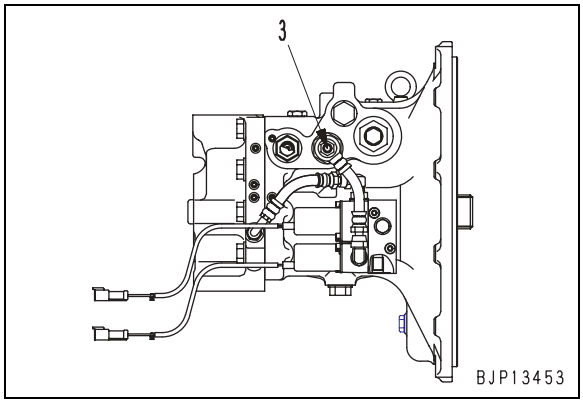
   ★ If the PC valve or the servo piston is abnormal, the PC valve output pressure (servo piston inlet pressure) is "the same as the pump discharge pressure" or "almost 0".

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

ADJUSTING
Adjusting PC valve

★ If either of the following phenomena occurs and the PC valve seems to be defective, adjust PC valve (3) according to the procedure shown below.
   - As the working load increases, the engine speed lowers remarkably.
   - The engine speed is normal but the work equipment speed is low.

★ The figure shows the hydraulic pump seen from the front side of the machine.



1. Loosen hose fixing (4).

2. Fixing sleeve (5), loosen locknut (6).

3. Turn sleeve (5) to the right or left to adjust the pump absorption torque.
   ★ If the sleeve is
      - turned to the right, the pump absorption torque increases.
      - turned to the left, the pump absorption torque decreases.

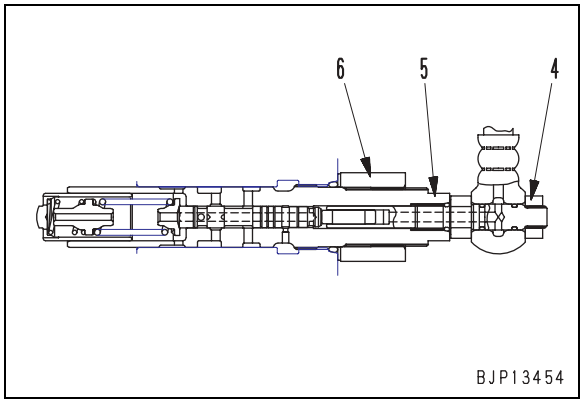
   ★ Limit the turning angle of the sleeve to the following range.
      - Right turning: Max. 1 turn (360°)
      - Left turning: Max. 1/2 turn (180°)

   ★ Change of servo piston stroke per turn of sleeve: 1.5 mm

4. Fixing sleeve (5), tighten locknut (6).
   Locknut: **88 – 113 Nm {9 – 11.5 kgm}**

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5. Tighten hose fixing nut (4).



6. After finishing adjustment, check that the pressure is normal according to the above described procedure.

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TESTING AND ADJUSTING OIL PRESSURE IN PUMP LS CONTROL CIRCUIT

★ Testing and adjusting instruments for oil pressure in pump LS control circuit

Symbol		Part No.	Part name
L	1	799-101-5002	Hydraulic tester
		790-261-1203	Digital hydraulic tester
	2	799-101-5220	Nipple (10 x 1.25 mm)
		07002-11023	O-ring
	3	799-400-2701	Differential pressure gauge

MEASURING

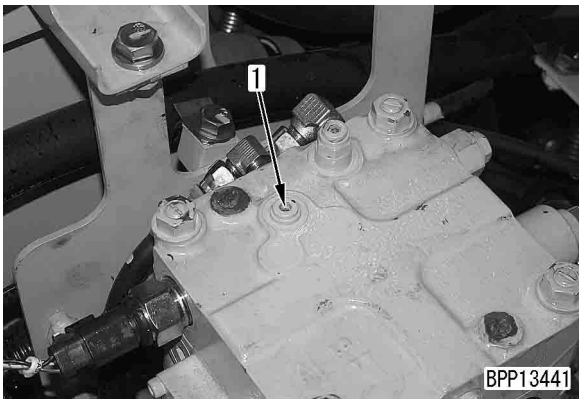
1. Measuring LS valve output pressure (servo piston inlet pressure)

★ Before measuring the LS valve output pressure (servo piston inlet pressure), check that the oil pressure in the work equipment, swing, and travel circuits and the basic pressure in the control circuit are normal.

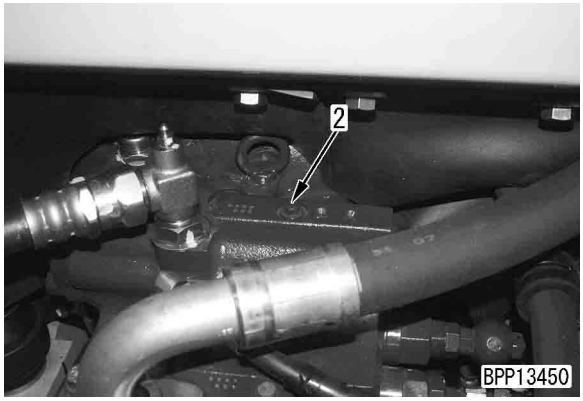
★ Measure the LS valve output pressure (servo piston inlet pressure) and pump discharge pressure simultaneously and compare them.

⚠ Lower the work equipment to the ground and stop the engine. Operate the control levers several times to release the residual pressure in the piping, and then loosen the oil filler cap of the hydraulic tank slowly to release the internal pressure of the hydraulic tank.

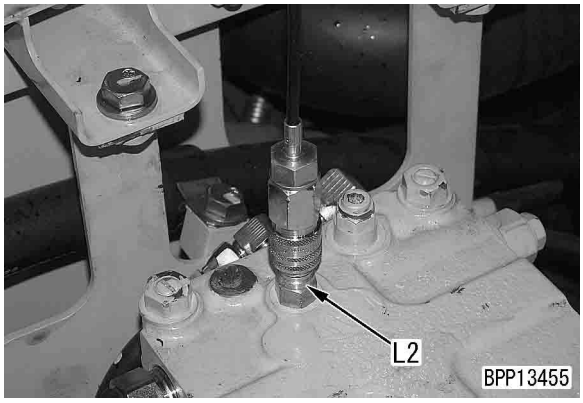
1) Remove the top cover of the control valve and open the pump room cover.
2) Remove oil pressure pickup plugs (1) and (2).
   • (1): Pump discharge pressure pickup plug (at top of control valve)



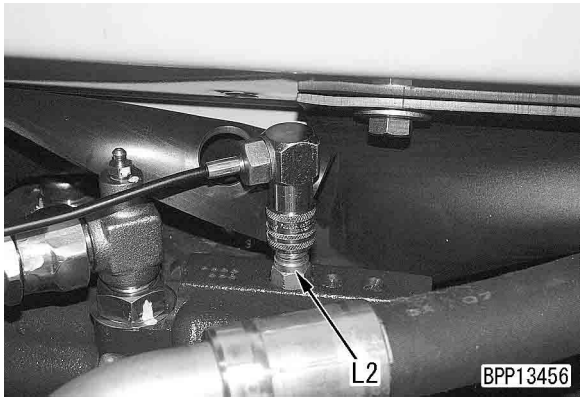
• (2): LS valve output pressure pickup plug (at top of hydraulic pump)



3) Install nipple **L2** and connect it to oil pressure gauge [1] of hydraulic tester **L1**.
   ★ Use the oil pressure gauge of 58.8 MPa {600 kg/cm^2}.
   • The drawing shows the pump discharge pressure side.

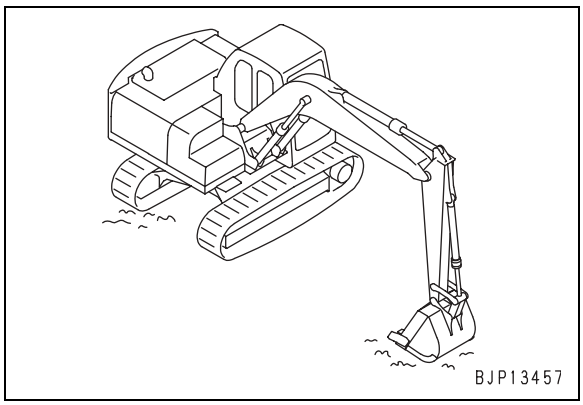


• The drawing shows the LS valve output pressure side.



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4) Run the engine and heighten the hydraulic oil temperature to 45 – 55°C, and then push up the track shoe on either side with the work equipment.



5) While running the engine at high idling, measure the pump discharge pressure and LS valve output pressure (servo piston inlet pressure) simultaneously.
   - Working mode: A
   - Travel speed switch: Hi
   - Work equipment, swing, and travel circuits:
     Set all levers in neutral and run track shoe on one side idle.

   ⚠ Checking the safety around the machine, run the track shoe pushed up idle.

   ★ Method of judgment:
   If the pump discharge pressure and LS valve output pressure (servo piston output pressure) are in the following ratio, they are normal.

Travel lever	Pump discharge pressure	LS valve output pressure	Ratio of oil pressure
	MPa {kg/cm^2}		
Neutral	2.9±0.5 {30±5}	2.9±0.5 {30±5}	Almost same pressure (1:1)
Full (Idle running)	7.8±2.0 {80±20}	4.4±1.0 {45±10}	Almost 3/5 (1:0.6)

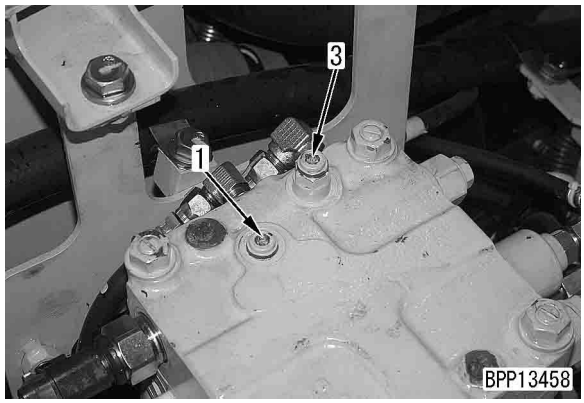


6) After finishing measurement, remove the measuring instruments and return the removed parts.

2. Measuring LS differential pressure

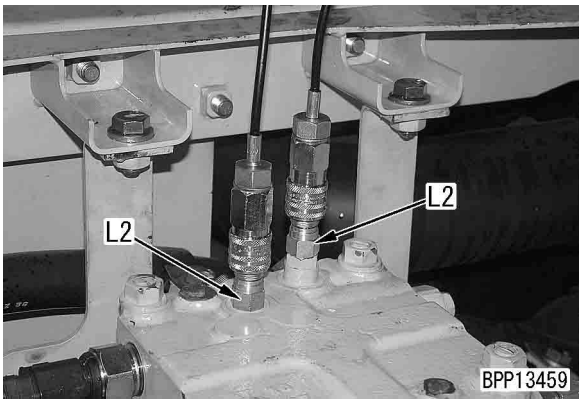
★ Measure the pump discharge pressure and LS pressure (actuator load pressure) simultaneously and calculate the difference between them.

1) Remove the top cover of the control valve and remove oil pressure pickup plugs (1) and (3).
   - (1): Pump discharge pressure pickup plug
   - (3): LS pressure pickup plug

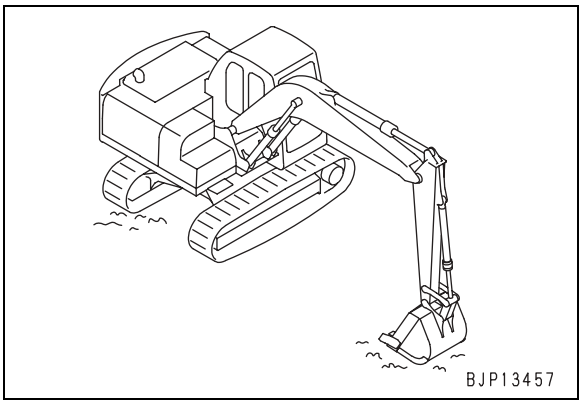


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2) Install nipple **L2** and connect it to the oil pressure gauge of hydraulic tester **L1**.
   ★ When using differential pressure gauge:
   Connect the pump discharge pressure to the high pressure side (back side) and connect the LS pressure to the low pressure side (lower side).
   Since the differential pressure gauge needs a 12-V power source, connect it to a battery.
   ★ When using oil pressure gauge:
   Use the oil pressure gauge of 58.8 MPa {600 kg/cm^2}.
   Since the differential pressure is about 2.9 MPa {30 kg/cm^2} at maximum, measure it by installing the same gauge to the pickup plugs alternately.



3) Run the engine and heighten the hydraulic oil temperature to 45 – 55°C, and then push up the track shoe on either side with the work equipment.



4) While running the engine at high idling, measure the pump discharge pressure and LS valve output pressure (servo piston inlet pressure) simultaneously.
   • Working mode: A
   • Travel speed switch: Hi
   • Work equipment, swing, and travel circuits:
   Set all levers in neutral and run track shoe on one side idle.

   ⚠ Checking the safety around the machine, run the track shoe pushed up idle.

   ★ Calculation of LS differential pressure (when oil pressure gauge is used):
   LS differential pressure = Pump discharge pressure - LS pressure
   ★ If the LS differential pressure is as follows, it is normal.

Travel lever	LS differential pressure
Neutral	LS differential pressure in neutral (See standard values table)
Full (Idle running)	Specified LS differential pressure (See standard values table)

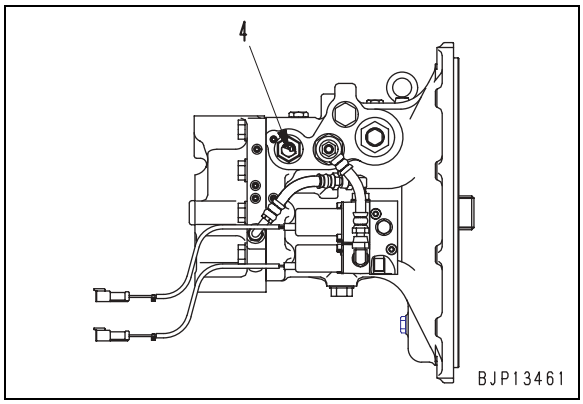


5) After finishing measurement, remove the measuring instruments and return the removed parts.

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ADJUSTING
Adjusting LS valve

★ If the LS differential pressure is abnormal, adjust LS valve (4) according to the procedure shown below.
★ The figure shows the hydraulic pump seen from the front side of the machine.



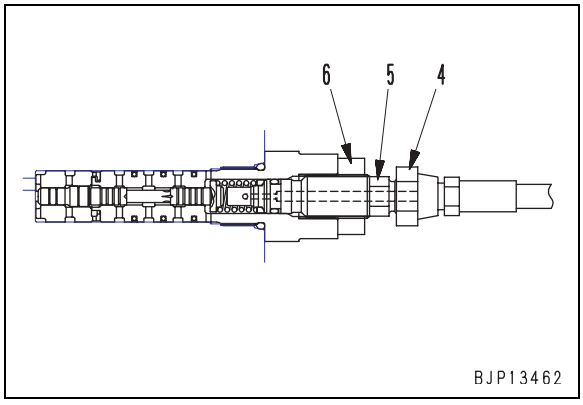
1. Loosen hose sleeve nut (4).

2. Fixing plug (5), loosen locknut (6).

3. Turn plug (5) to adjust the differential pressure.
   ★ If the plug is
      • turned to the right, the differential pressure rises.
      • turned to the left, the differential pressure lowers.
   ★ Quantity of adjustment (LS differential pressure) per turn of plug:
   1,304 kPa {13.3 kg/cm^2}
   ★ Tighten the hose sleeve nut (4) temporarily and turn the plug, while checking the LS differential pressure.

4. Fixing plug (5), tighten locknut (6).
   Locknut: **98 – 122.5 Nm {10 – 12.5 kgm}**

5. Tighten hose sleeve nut (4).



6. After finishing adjustment, check that the pressure is normal according to the above described procedure.

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MEASURING SOLENOID VALVE OUTPUT PRESSURE

★ Measuring instruments for solenoid valve output pressure

Symbol		Part No.	Part name
M	1	799-101-5002	Hydraulic tester
		790-261-1203	Digital hydraulic tester
	2	799-401-3100	Adapter (Size 02)

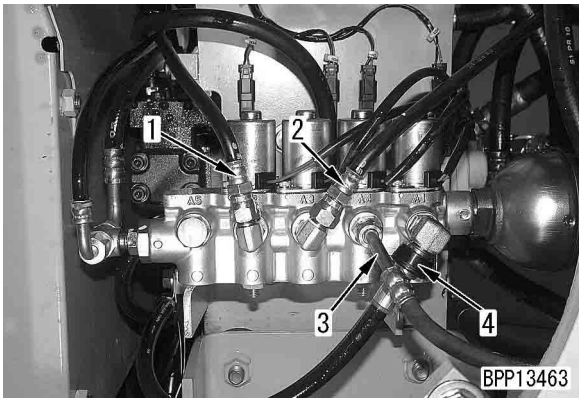
★ Before measuring the solenoid valve output pressure, check that the basic pressure in the control circuit is normal.

⚠ Lower the work equipment to the ground and stop the engine. Operate the control levers several times to release the residual pressure in the piping, and then loosen the oil filler cap of the hydraulic tank slowly to release the internal pressure of the hydraulic tank.

1. Remove the undercover of the control valve and disconnect outlet hoses (1) – (4) of the solenoid valves to be measured.

No.	Solenoid valve to be measured
1	2-stage relief solenoid valve
2	Swing holding brake solenoid valve
3	Travel speed solenoid valve
4	PPC pressure lock solenoid valve

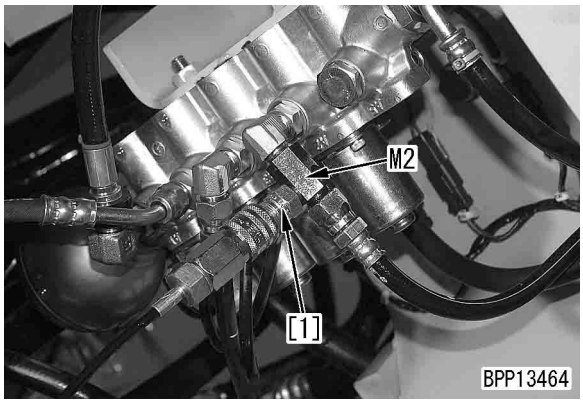
★ Since outlet hose (4) of the PPC pressure lock solenoid valve has a quick coupler, measure the output pressure on the PPC valve side.



2. Install adapter **M2** and connect the disconnected hose again.

3. Install nipple [1] of hydraulic tester **M1** and connect it to hydraulic gauge [2].

★ Use the oil pressure gauges of 5.9 MPa {60 kg/cm^2}.
★ The figure shows the measuring instruments connected to the outlet hose of the 2-stage relief solenoid valve.



4. Run the engine and heighten the hydraulic oil temperature to 45 – 55°C.



5. Run the engine at high idling, operate the control levers and switches to turn the solenoid valve ON or OFF, and measure the oil pressure.
★ For the conditions for turning the solenoid valve ON and OFF, see the operations table of each solenoid valve.
★ The operating condition of the solenoid valve can be also checked with the monitoring function [02] of the monitor panel (excluding the PPC pressure lock solenoid valve).
★ If the output pressure is as follows, the solenoid valve is normal.

Solenoid valve	Output pressure
OFF (Deenergized)	0 MPa {0kg/cm^2}
ON (Energized)	Almost same as control basic pressure (See standard values table)

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

Operation table of 2-stage relief solenoid valve

Operating condition	Operation
One-touch power maximizing switch: ON (8.5-sec timer)	ON
Tr avel signal	
Swing lock switch	
Other than above condition	OFF

Operation table of swing holding brake solenoid valve

Operating condition		Operation
Work equipment, swing, and travel signals	Any one is turned ON	ON
Swing holding brake release switch: RELEASE (Upper) position		
Other than above condition		OFF

Operation table of travel speed brake solenoid valve

Operating condition		Operation
Travel speed switch: Lo		OFF
Auto shift function operates during run at Hi	Engine speed: Below 1,500 rpm	
	Pump pressure: Above 30.4 MPa {310 kg/cm^2}	
Overheat prevention function operates during run at Hi	Hydraulic oil temperature: Above 95°C	
Other than above condition		ON

Operation table of PPC pressure lock solenoid valve

Operating condition		Operation
Safety lock lever	LOCK position	OFF
	FREE position	ON

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MEASURING PPC VALVE OUTPUT PRESSURE

★ Measuring instruments for PPC valve output pressure

Symbol	Part No.	Part name
N	799-101-5002	Hydraulic tester
	790-261-1203	Digital hydraulic tester

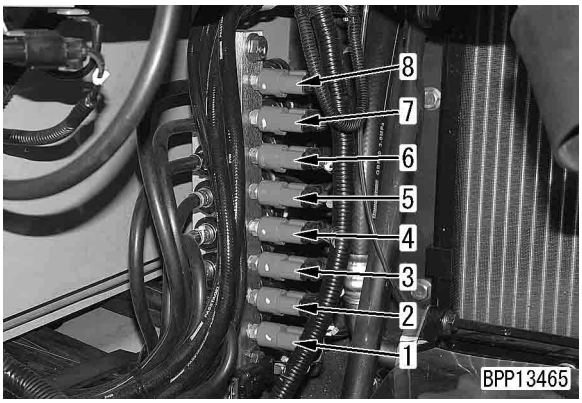
★ Before measuring the PPC valve output pressure, check that the basic pressure in the control circuit is normal.

⚠ Lower the work equipment to the ground and stop the engine. Operate the control levers several times to release the residual pressure in the piping, and then loosen the oil filler cap of the hydraulic tank slowly to release the internal pressure of the hydraulic tank.

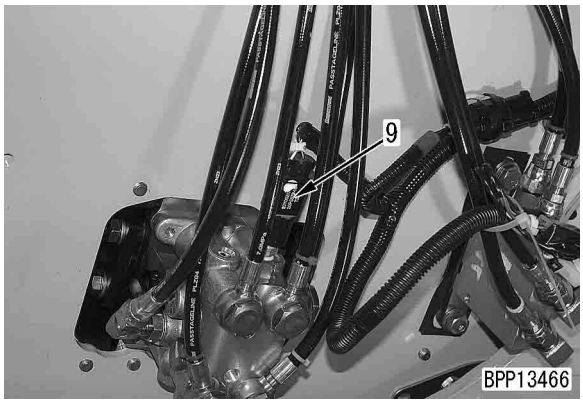
1. Disconnect PPC oil pressure switches (1) – (4) of the circuit to be measured.

No.	Circuit to be measured	No.	Circuit to be measured
1	Boom RAISE (S06)	7	Swing RIGHT (S07)
2	Boom LOWER (S02)	8	Swing LEFT (S03)
3	Arm IN (S04)	9	Travel (S30)
4	Arm OUT (S04)	10	1ATT on front side (S10)
5	Bucket CURL (S08)	11	1ATT on rear side (S11)
6	Bucket DUMP (S01)		

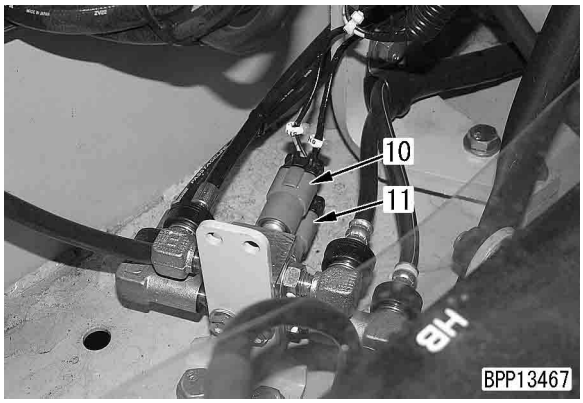
★ Since PPC oil pressure switches (1) – (8) are installed in the battery room, open the battery room cover.



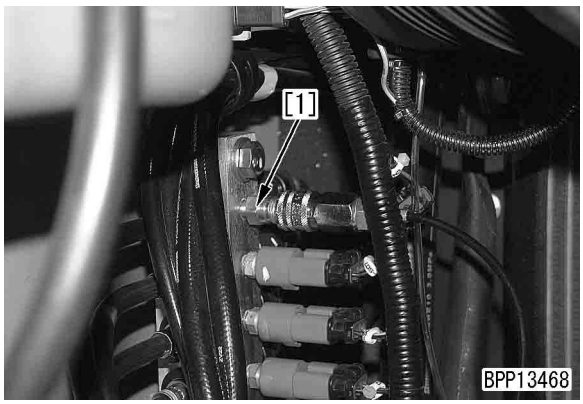
★ Since PPC oil pressure switch (9) is installed on the under side of the floor frame, remove the cab undercover (on the front side).



★ Since PPC oil pressure switches (10) and (11) are installed in the battery room, open the battery room cover.



2. Install nipple [1] of hydraulic tester **N** and connect it to oil pressure gauge [2].
   ★ Use the oil pressure gauges of 5.9 MPa {60 kg/cm^2}.
   ★ The figure shows the measuring instruments installed to the mounting part of the swing LEFT PPC pressure switch.



3. Run the engine and heighten the hydraulic oil temperature to 45 – 55°C.

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

Lever/Pedal	Output pressure
In neutral	0 MPa {0kg/cm^2}
Operated to stroke end	Almost same as control basic pressure (See standard values table)

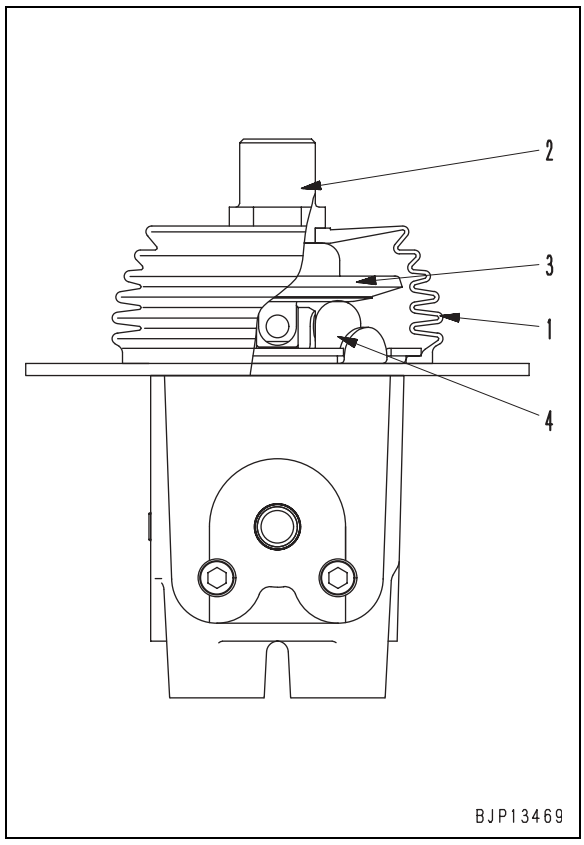
5. After finishing measurement, remove the measuring instruments and return the removed parts.

ADJUSTING PLAY OF WORK EQUIPMENT AND SWING PPC VALVES

★ If the work equipment and swing levers have large play, adjust them according to the following procedure.

1. Remove the work equipment and swing PPC valve assembly.
2. Remove bellows (1).
3. Loosen locknut (2) and tighten disc (3) until it touches the heads of 4 pistons (4).
   ★ Do not move the piston at this time.
4. Fix disc (3) and tighten locknut (2) to the specified torque.

   Locknut: **69 – 88 Nm {7 – 9 kgm}**
5. Install bellows (1).
6. Install the work equipment and swing PPC valve assembly.



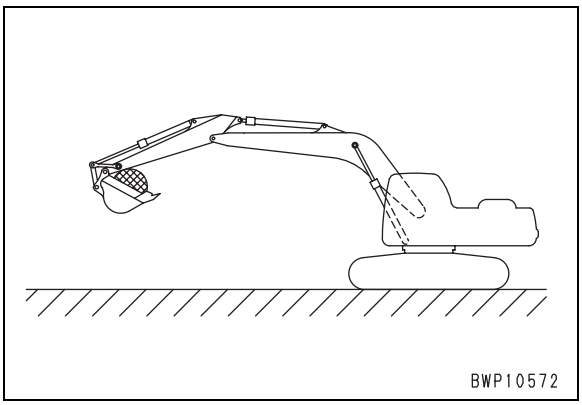
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TESTING PARTS WHICH CAUSE HYDRAULIC DRIFT OF WORK EQUIPMENT

★ If the work equipment (cylinder) drifts hydraulically, check to see if the cause is on the cylinder packing side or control valve side or hydraulic drift prevention valve side (if equipped) according to the following procedure.

1. Testing boom cylinder and bucket cylinder

1) Set the machine in the position of measuring hydraulic drift and stop the engine.
   ★ Fill the bucket with a rated load or with dirt and sand.

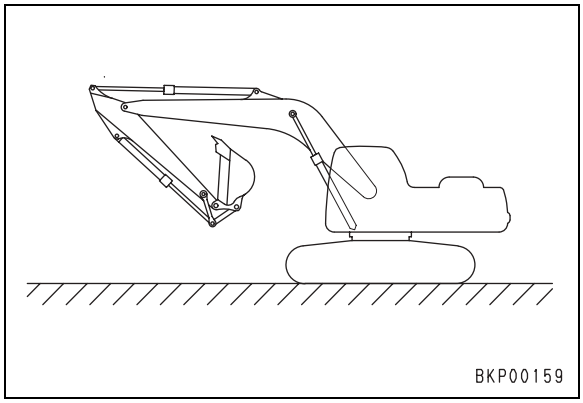


2) When testing the boom cylinder, set the boom control lever in the RAISE position. When testing the bucket cylinder, set the bucket control lever in the CURL position.
   - If the lowering speed is increased at this time, the cylinder packing is defective.
   - If the lowering speed does not change at this time, the control valve or hydraulic drift prevention valve (if equipped) is defective.

   ★ Operate the control lever while the starting switch is in the ON position.
   ★ If the pressure in the accumulator is lost, run the engine for about 10 seconds to heighten the pressure in the accumulator.

2. Testing arm cylinder

1) Stop the arm cylinder about 100 mm before the IN stroke end and stop the engine.



2) Operate the arm control lever in the IN position.
   - If the lowering speed is increased at this time, the cylinder packing is defective.
   - If the lowering speed does not change at this time, the control valve is defective.

   ★ Operate the control lever while the starting switch is in the ON position.
   ★ If the pressure in the accumulator is lost, run the engine for about 10 seconds to heighten the pressure in the accumulator.

[Reference]

Reason why the lowering speed is increased by the above operation when the cylinder packing is the cause of the hydraulic drift:

1) If the machine is set in the above position (where the holding pressure is applied to the bottom side), the oil leaks from the bottom side to the head side. Since the volume on the head side is less than that on the bottom side by the volume of the rod, the pressure in the head side is increased by the oil flowing in from the bottom side.
2) As the pressure in the head side is increased, it is balanced at a certain level (which depends on the leakage), and then the lowering speed is lowered.
3) If the circuit on the head side is opened to the drain circuit by the above operation of the lever (the bottom side is closed by the check valve at this time), the oil on the head side flows in the drain circuit. As a result, the pressure is unbalanced and the lowering speed is increased.

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3. Testing PPC valve

While the pressure in the accumulator is high, set the safety lock lever in the LOCK/FREE position and measure the lowering distance.

★ Operate the control lever while the starting switch is in the ON position.
★ If the pressure in the accumulator is lost, run the engine for about 10 seconds to heighten the pressure in the accumulator.
★ If there is a difference in the lowering distance between the LOCK position and FREE position, the PPC valve is defective (it has an internal defect).

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MEASURING OIL LEAKAGE

★ Measuring instruments fro oil leakage

Symbol	Part No.	Part name
P	Commercially available	Measuring cylinder

1. Measuring oil leakage from boom cylinder

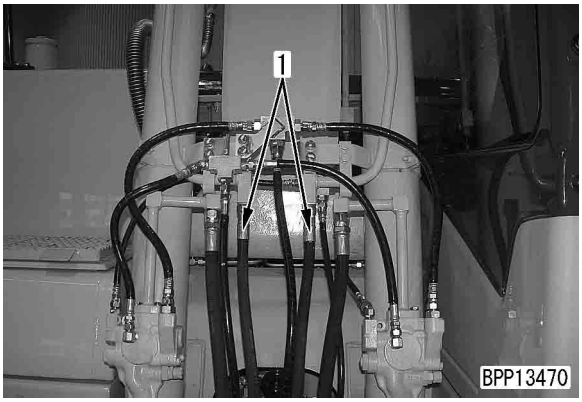
1) Run the engine and heighten the engine oil temperature to 45 – 55°C, and then move the boom cylinder to the RAISE stroke end.

⚠ Release the residual pressure in the piping on the boom cylinder head side. For details, see RELEASING RESIDUAL PRESSURE IN HYDRAULIC CIRCUIT (Operate the lever in the boom RAISE direction only, however).

2) Disconnect hose (1) on the cylinder head side and block the hose side with a plate.

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

★ Use the following part to block the hose side.
07376-50422 (Plug No. 04)



3) Run the engine at high idling and relieve the boom circuit by raising the boom.

⚠ Take care not to "lower the boom".

4) Measure the oil leakage for 1 minute after 30 seconds since relieving is started.
5) After finishing measurement, return the removed parts.

2. Measuring oil leakage from arm cylinder

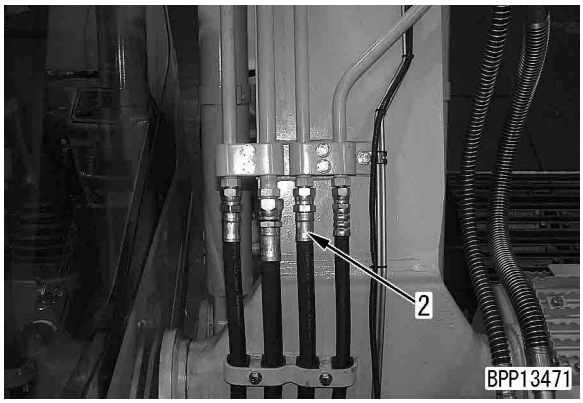
1) Run the engine and raise the engine oil temperature to 45 – 55°C, and then move the arm cylinder to the IN stroke end.

⚠ Release the residual pressure in the piping on the arm cylinder head side. For details, see RELEASING RESIDUAL PRESSURE IN HYDRAULIC CIRCUIT (Operate the lever in the arm IN direction only, however).

2) Disconnect hose (2) on the cylinder head side and block the hose side with a plate.

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

★ Use the following part to block the hose side.
07376-50522 (Plug No. 05)



3) Run the engine at high idling and relieve the arm circuit by moving the arm IN.

⚠ Take care not to "move the arm OUT".

4) Measure the oil leakage for 1 minute after 30 seconds since relieving is started.
5) After finishing measurement, return the removed parts.

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3. Measuring oil leakage from bucket cylinder

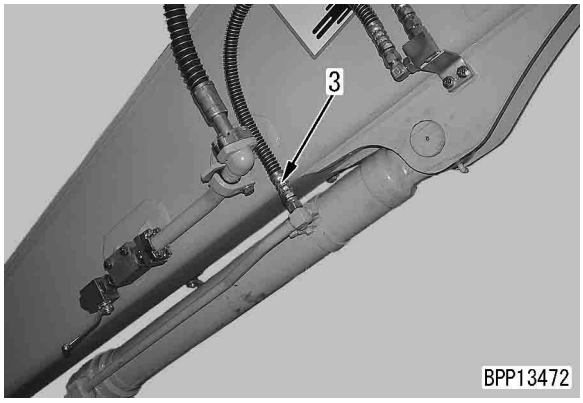
1) Run the engine and raise the engine oil temperature to 45 – 55°C, and then move the bucket cylinder to the CURL stroke end and stop the engine.

   ⚠ Release the residual pressure in the piping on the bucket cylinder head side. For details, see RELEASING RESIDUAL PRESSURE IN HYDRAULIC CIRCUIT (Operate the lever in the arm CURL direction only, however).

2) Disconnect hose (3) on the cylinder head side and block the hose side with a plate.

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

   ★ Use the following part to block the hose side.
   07376-50422 (Plug No. 04)



3) Run the engine at high idling and relieve the bucket circuit by curling the bucket.

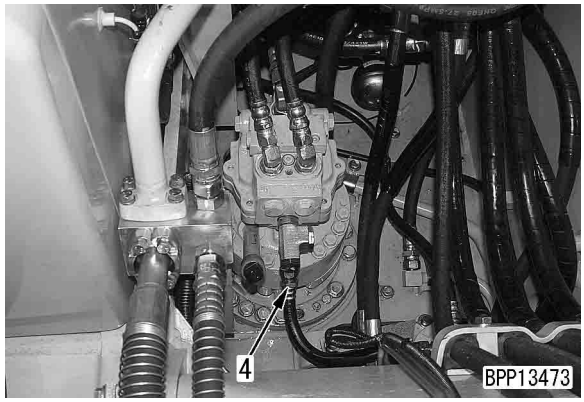
   ⚠ Take care not to "dump the bucket".

4) Measure the oil leakage for 1 minute after 30 seconds since relieving is started.
5) After finishing measurement, return the removed parts.

4. Measuring oil leakage from swing motor

1) Run the engine and raise the engine oil temperature to 45 – 55°C.
2) Disconnect drain hose (4) and block the hose side with a plug.

   ★ Use the following part to block the hose side.
   07376-50522 (Plug No. 05)



3) Turn the swing lock switch ON.
4) Run the engine at high idling and relieve the swing circuit by swinging.

   ★ Measure the oil leakage for 1 minute after 30 seconds since relieving is started.

   ★ After measuring 1 time, swing 180°, and then measure again.

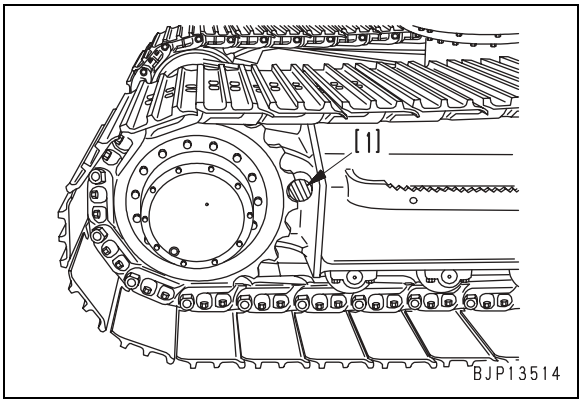
5) After finishing measurement, return the removed parts.

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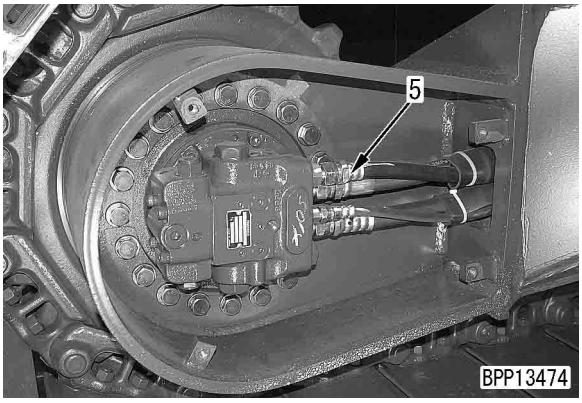
5. Measuring oil leakage from travel motor

1) Run the engine and raise the engine oil temperature to 45 – 55°C, and then remove the travel motor cover.
2) Run the engine and lock the travel system.

   ⚠ Put pin [1] between the sprocket and track frame to lock the travel system securely.



3) Disconnect drain hose (5) of the travel motor and block the hose side with a plug.
   ★ Use the following part to block the hose side.
   07376-50422 (Plug No. 04)



4) Run the engine at high idling, relieve the travel circuit, and measure the oil leakage.

   ⚠ Wrong operation of the lever can cause an accident. Accordingly, make signs and checks securely.
   ★ Measure the oil leakage for 1 minute after 30 seconds since relieving is started.
   ★ Measure several times, moving the motor a little (changing the position of the valve plate and cylinder and that of the cylinder and piston) each time.
5) After finishing measurement, return the removed parts.

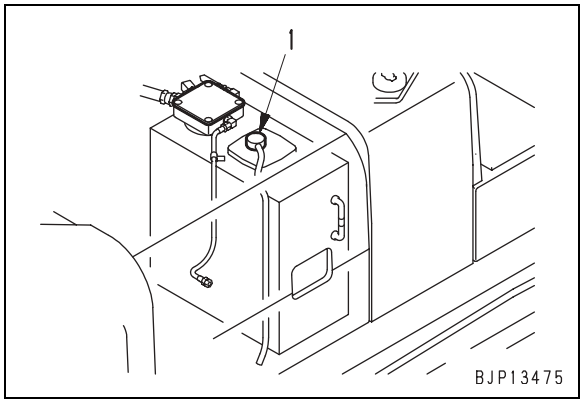
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RELEASING RESIDUAL PRESSURE IN HYDRAULIC CIRCUIT

1. Releasing residual pressure in hydraulic tank

⚠ Since the hydraulic tank is enclosed and pressurized, release the residual pressure in it when removing a hose or a plug connected to it.

1) Lower the work equipment to the ground in a stable position and stop the engine.
2) Loosen oil filler cap (1) of the hydraulic tank gradually to release the air in the tank.
   ★ If you open the pump room cover, you can loosen the oil filler cap from the right side of the machine.



2. Releasing residual pressure in hydraulic cylinder circuit

⚠ When disconnecting a pipe between a hydraulic cylinder and the control valve, release the residual pressure in the piping according to the following procedure.

1) Release the residual pressure in the hydraulic tank. For details, see RELEASING RESIDUAL PRESSURE IN HYDRAULIC TANK.
   ★ Keep the oil filler cap of the hydraulic tank removed.
2) Turn the starting switch ON and set the safety lock lever in the FREE position, and then operate the work equipment control levers on both sides forward, backward, to the right, and to the left.
   ★ The control valve is operated by the pressure in the accumulator. The pressure in the accumulator is used up, however, after the control valve is operated 2 – 3 times.
3) Run the engine at low idling for 10 seconds to heighten the pressure in the accumulator.
4) Repeat steps 2) and 3) above 2 – 3 times, and the residual pressure in the piping is released completely.

3. Releasing residual pressure in swing motor circuit

★ The residual pressure in the swing motor circuit can be released by performing the operation for RELEASING RESIDUAL PRESSURE IN HYDRAULIC CYLINDER CIRCUIT (Operate the lever in the swing direction only, however).

4. Releasing residual pressure in travel motor circuit

★ Since the control valve spool of the travel motor circuit is open, the pressure in this circuit can be released by performing RELEASING RESIDUAL PRESSURE IN HYDRAULIC TANK.

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BLEEDING AIR FROM EACH PART

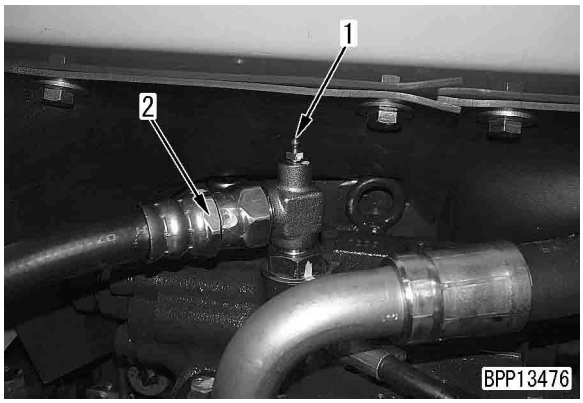
Air bleeding item / Contents of work	Air bleeding procedure					
	1	2	3	4	5	6
	Bleeding air from hydraulic pump	Starting engine	Bleeding air from cylinder	Bleeding air from swing motor	Bleeding air from travel motor	Checking oil level and starting operation
• Replacing hydraulic oil • Cleaning strainer	●	●	●	● (See note)	● (See note)	●
• Replacing return filter element		● →	→	→	→	→ ●
• Replacing and repairing hydraulic pump • Removing suction piping	●	●	● →	→	→	→ ●
• Replacing and repairing control valve • Removing control valve piping		●	● →	→	→	→ ●
• Replacing and repairing cylinder • Removing cylinder piping		●	● →	→	→	→ ●
• Replacing and repairing swing motor • Removing swing motor piping		● →	→	● →	→	→ ●
• Replacing and repairing travel motor • Removing travel motor piping		● →	→	→	● →	●
• Replacing and repairing swivel joint • Removing swivel joint piping		● →	→	→	→	→ ●

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

1. Bleeding air from hydraulic pump

1) Open the pump room cover, loosen bleeder (1), and check that oil flows out.
2) If the oil does not flow out, disconnect drain hose (2) and fill the pump case with oil through the drain port.
   - ★ Fix the drain hose adapter to a place higher than the oil level in the hydraulic tank.
   - ★ Fill the pump case with oil until oil containing no bubbles flows out of the bleeder.
3) After oil containing no bubbles flows out of bleeder (1), tighten the bleeder.

   Air bleeder:
   7.8 – 9.8 Nm {0.8 – 1.0 kgm}
   - ★ If the drain hose has been disconnected, connect it after tightening the bleeder.



2. Starting engine

When running the engine after performing step 1, keep its speed at low idling for 10 minutes.
- ★ If the engine coolant temperature is low and the automatic warm-up operation is started, stop the engine temporarily and reset the automatic warm-up operation with the fuel control dial (Set the starting switch in the ON position and hold the fuel control dial in the MAX position for 3 seconds, and the automatic warm-up operation is reset).

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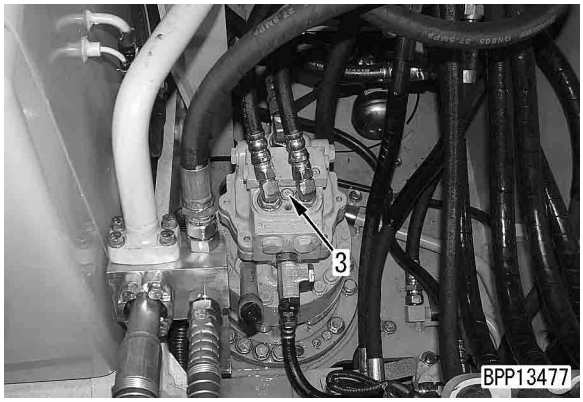
3. Bleeding air from cylinder

★ If a cylinder was replaced, bleed air from it before connecting the work equipment. In particular, the boom cylinder does not move to the lowering stroke end, if it is installed to the work equipment.

1) Run the engine at low idling for about 5 minutes.
2) Running the engine at low idling, raise and lower the boom 4 – 5 times.
   ★ Stop the piston rod about 100 mm before each stroke end. Do not relieve the oil.
3) Running the engine at high idling, perform step 2).
4) Running the engine at low idling, move the piston rod to the stroke end and relieve the oil.
5) Bleed air from the arm cylinder and bucket cylinder according to steps 2) – 4).

4. Bleeding air from swing motor

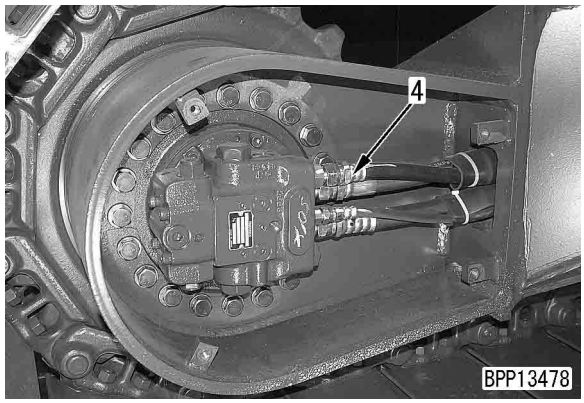
1) Run the engine at low idling.
2) Loosen air bleeding plug (3) and check that the oil oozes out, and then tighten the air bleeding plug.
   Air bleeding plug:
   25.5 – 34.3 Nm {2.5 – 3.5 kgm}
3) If the oil does not oozes out, remove air bleeding plug (3) and fill the pump case with oil.



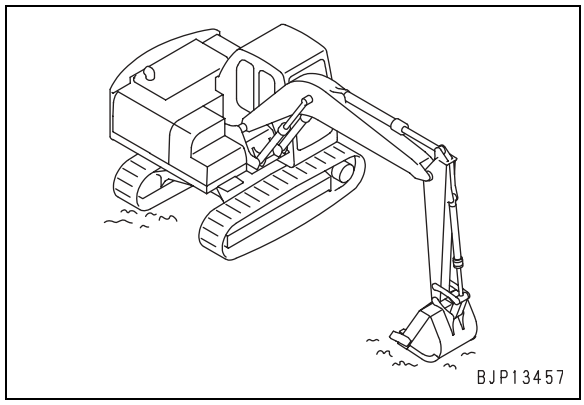
4) Run the engine at low idling and swing slowly 2 turns or more in each direction.

5. Bleeding air from travel motor

1) Remove the travel motor cover and run the engine at low idling.
2) Loosen drain hose (4) and check that oil oozes out, and then tighten the drain hose.



3) Running the engine at low idling and using the work equipment, raise the track shoe on either side.

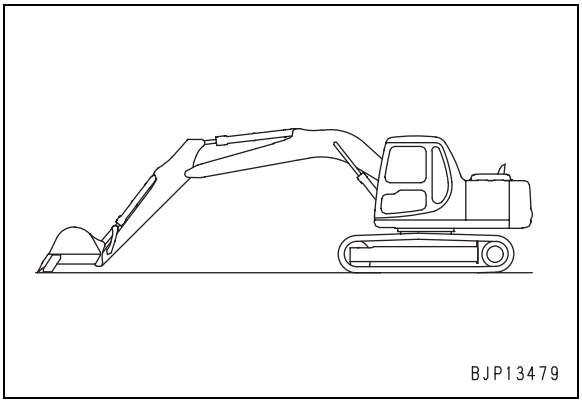


4) Running the engine at low idling, run the raised track shoe idle slowly for about 2 minutes.
   ★ Run the track shoe forward and in reverse as evenly as possible.
   ★ Run the track shoe on the opposite side idle similarly.

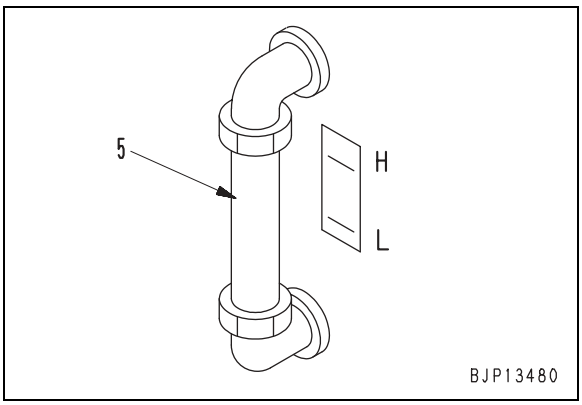
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6. Checking oil level and starting work

1) Run the engine, retract the arm cylinder and bucket cylinder to the stroke ends, lower the work equipment to the ground, and stop the engine.



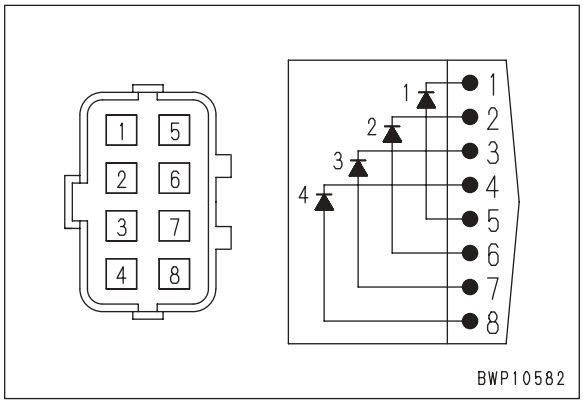
2) Check the oil level by sight gauge (5) on the side of the hydraulic tank.
   - ★ If the oil level is between lines H and L, it is normal.
   - ★ If the oil level is below line L, add new oil.



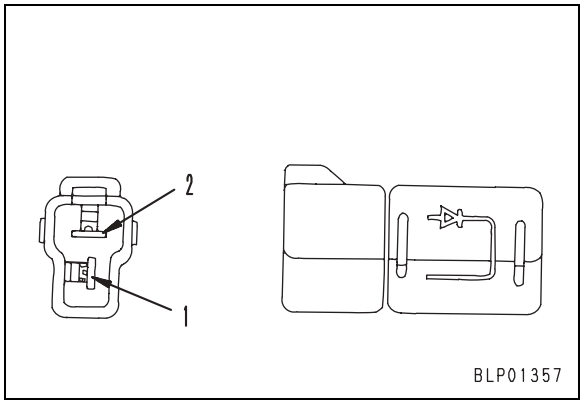
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TESTING PROCEDURE FOR DIODE

★ Test an assembled-type diode (18-pin) or a diode (2-pin) according to the following procedure.
★ The conductive direction of an assembled-type diode is shown in the following figure.



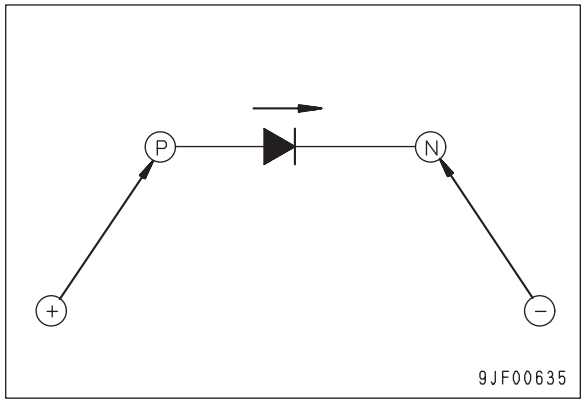
★ The conductive direction of a diode is marked on its surface.



1. When using a digital circuit tester

1) Set the circuit tester in the diode range and check the indicated value.
   ★ If an ordinary tester is used, the voltage of the battery in itself is indicated.
2) Apply the red (+) test pin to the anode (P) side of the diode and the black (-) test pin to the cathode (N) side and read the indicated value.
3) Judge the condition of the diode from the indicated value.
   - The indicated value does not change: There is not continuity (Defective).
   - The indicated value changes: There is continuity (Normal) (Note).

   Note) In the case of a silicon diode, the circuit tester indicates a value of 460 – 600.

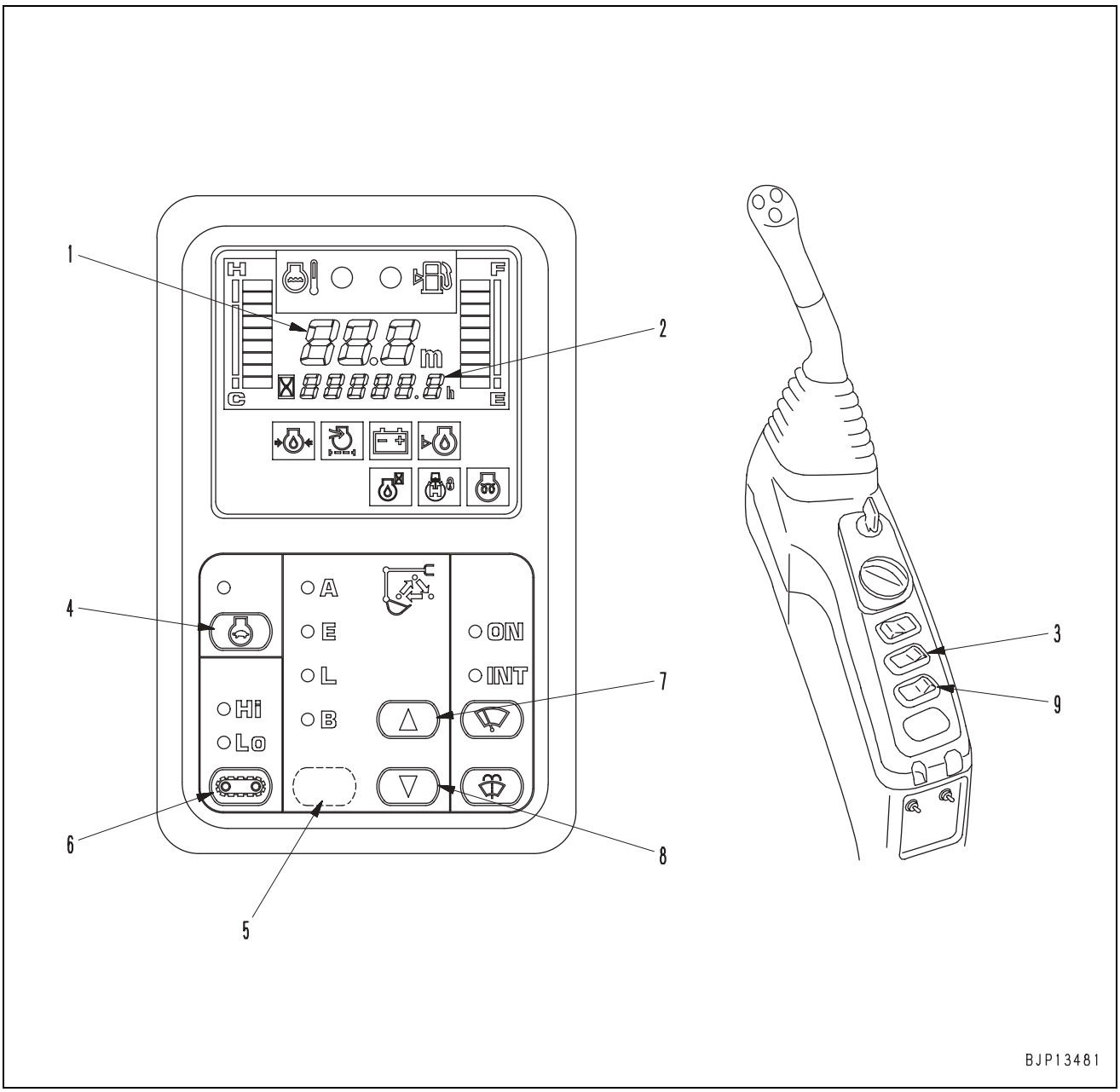


2. When using an analog circuit tester

1) Set the circuit tester in the resistance range.
2) Apply the test pins as shown below and check movement of the pointer.
   i) Apply the red (+) test pin to the anode (P) side of the diode and the black (-) test pin to the cathode (N) side.
   ii) Apply the red (+) test pin to the cathode (N) side of the diode and the black (-) test pin to the anode (P) side.
3) Judge the condition of the diode from movement of the pointer.
   - The pointer does not move in i) above but moves in ii): Normal (Moving angle (Resistance) depends on the type and measurement range of the circuit tester, however)
   - The pointer moves in both i) and ii): Defective (Internal short circuit)
   - The pointer does not move in either of i) and ii): Defective (Internal disconnection)

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SPECIAL FUNCTIONS OF MONITOR PANEL



Section to display special functions
1. Display section
2. Service meter section

Section to operate special function 1 (Basic operation)
3. Caution buzzer stop switch
4. Auto-decelerator switch
5. Setting switch (Black switch)
6. Travel speed shifting switch

Section to operate special function 2 (Selecting operation and special operation)
7. Working mode selector switch (UP)
8. Working mode selector switch (DOWN)
9. Swing lock switch

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Ordinary functions and special functions of monitor panel

The monitor panel has the ordinary functions and special functions and displays various pieces of information on display section (1) and service meter section (2).

Some items are displayed automatically according to the internal setting of the monitor panel and the others are displayed by operating switches.

1. Ordinary functions: Operator menu
   The items in this menu are displayed normally or displayed automatically when a trouble occurs.
2. Special functions: Service menu
   The items in this menu are not displayed normally. Each serviceman can display them by operating special switches. These functions are used for special setting, testing, adjusting, or troubleshooting.

Flow of each function

Ordinary functions (Operator menu)	
1	Function of displaying service meter
↓ <Automatic>	
2	Function of displaying user code

<Operation of switch> →

Special functions (Service menu)	
3	Function of displaying error code [01]
4	Monitoring function [02]
5	Function of adjusting governor [03]
6	Function of selecting maintenance period [04]
7	Function of selecting default working mode [05]
8	Function of adjusting service meter
9	Special function of monitoring replacement of engine oil

★ Each number in [ ] is a code No. displayed in the service meter section when the menu is selected.

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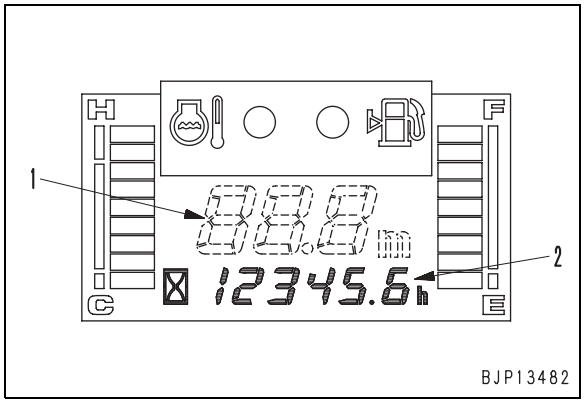
Display of operator menu

★ Only outline of the operator menu is described in this section. For details of each menu, see OPERATION MANUAL or the volume of STRUCTURE AND OPERATION.

1. Function of displaying service meter

While the machine is used normally, the monitor panel displays the following information.

- Display section (1): Nothing is displayed
- Service meter section (2): Service meter



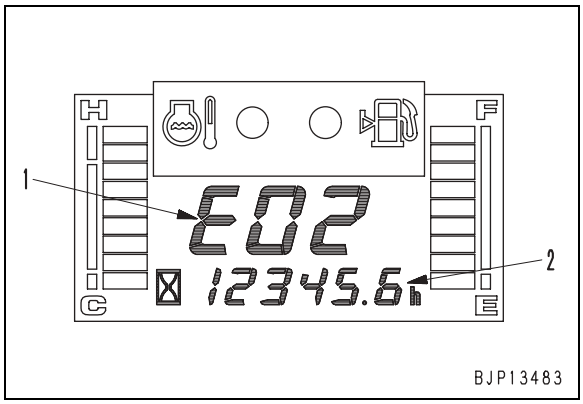
2. Function of displaying user code

If the machine has any trouble, the corresponding user code is displayed automatically in display section (1) and the caution buzzer is turned ON to urge the operator to take a proper remedy, depending on the degree of the trouble.

★ Service meter section (2) continues displaying the service meter.

★ For displayed user codes and the remedies shown to the operator, see "User codes and remedies shown to operator".

★ Each user code simply shows occurrence of a trouble to the operator. To find out the cause of the trouble, a serviceman must check the error code with the "Function of displaying error code [01]" in the service menu.



<Reference>
A user code is displayed only when a serious trouble occurs.
Even if a user code is not displayed, a trouble may have occurred. If you feel any abnormality, be sure to check for an error code with the "Function of displaying error code [01]" in the service menu.

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★ User codes and remedies shown to operator

User code	Error mode	Remedy (shown to operator)	Caution buzzer
E02	Error in pump control system	If the emergency pump drive switch is set in the upper position, the machine can operate normally. Have the machine inspected immediately, however.	●
E03	Error in swing brake system	Set the swing holding brake release switch in the upper position to release the brake. Apply the swing brake manually with the swing lock switch, if necessary. The brake may not be released, depending on the cause of the failure. In any case, have the machine inspected immediately.	●
E05	Error in governor system	Have the machine inspected immediately.	●

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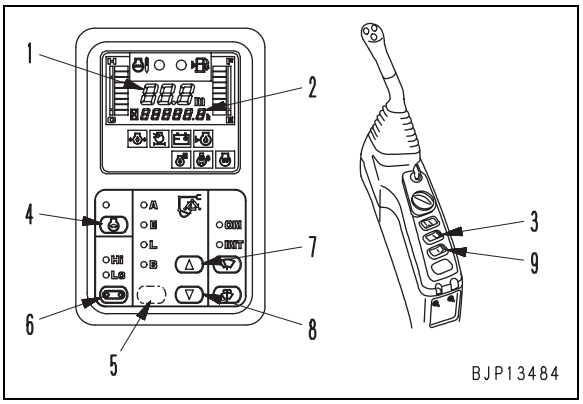
Operation and display of service menu

How to select service menu

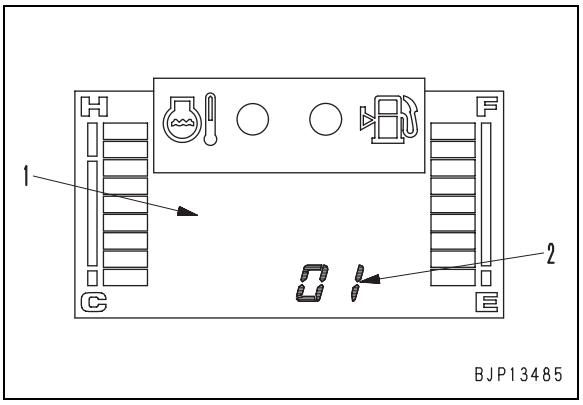
★ When using the general functions in the service menu, perform the following switch operation to change the screen of the monitor panel.

3. **Function of displaying error code [01]**
4. **Monitoring function [02]**
5. **Function of adjusting governor [03]**
6. **Function of selecting maintenance period [04]**
7. **Function of selecting default working mode [05]**

1) Operating switches
Holding caution buzzer stop switch (3), hold auto decelerator switch (4) for 2.5 seconds.



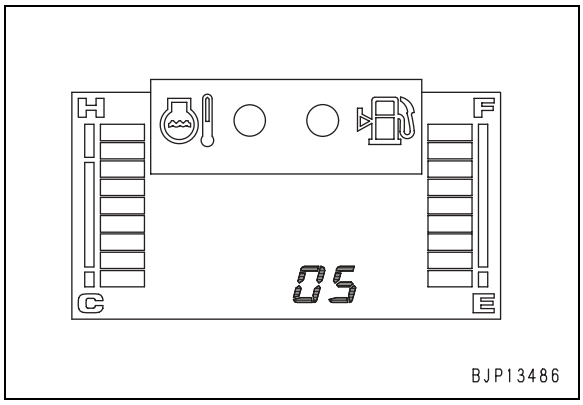
2) Displaying display section and service meter section
If the switches are operated as shown above, the first menu No. [01] (Monitoring function) is displayed in service meter section (2).
★ Nothing is displayed in display section (1).



3) Selecting menu
Holding caution buzzer stop switch (3), operate working mode selector switches (7) and (8) to select a menu you will use.
- UP switch (7): Menu No. increases.
- DOWN switch (8): Menu No. decreases.

Menu No.	Service menu (Excluding special functions)
01	Function of displaying error code
02	Monitoring function
03	Function of adjusting governor
04	Function of selecting maintenance period
05	Function of selecting default working mode

4) Executing menu
Select a menu you will use and press set switch (5), and the menu is executed.



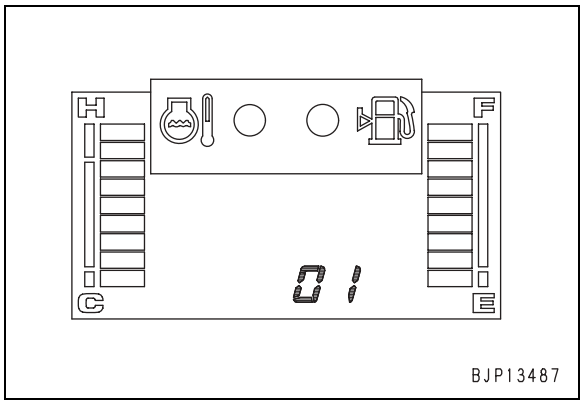
5) Finishing service menu
Holding caution buzzer stop switch (3), hold auto decelerator switch (4) for 2.5 seconds (similarly to the selecting operation).
★ The service menu is finished and the ordinary screen appears.
★ The service menu can be also finished by turning the starting switch OFF while the service menu is selected. (In this case, the ordinary screen appears when the starting switch is turned ON again.)

★ To use the special functions in the service menu, you must operate the switches differently from the above. See details of each menu.
8. **Function of adjusting service meter**
9. **Special function of monitoring replacement of engine oil**

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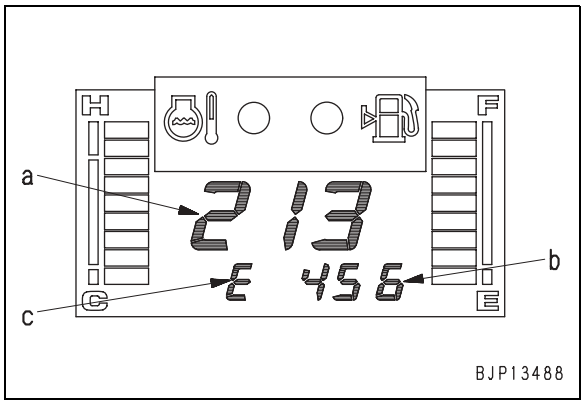
3. Function of displaying error code [01]

With this function, you can check the error code of a trouble which is occurring at present or has occurred in the past.

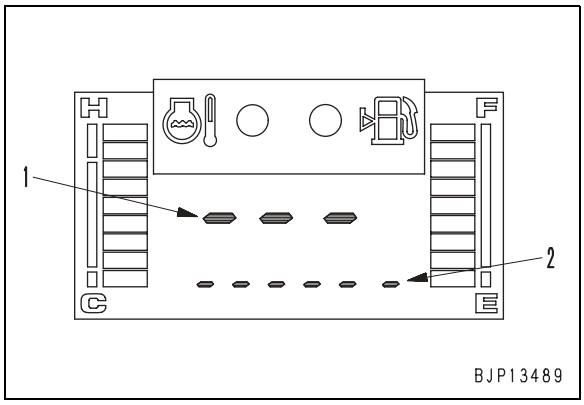


1) Selecting and executing function
   i) Select menu No. [01] in the menu selection mode.
   ii) Press set switch (5) to execute this function.

2) Information displayed in display section and service meter section 1 (When error code is recorded)
   If an error code is recorded, the following information is displayed in display section (1) and service meter section (2).
   (a): Error code
   (b): Service meter reading increased after trouble occurred
   (c): Mark [E] to indicate that trouble is occurring at present
   ★ Mark [E] to indicate that a trouble is occurring at present indicates that the error code is being detected now. It is not displayed if the trouble has been repaired or the error code is not detected.
   ★ For the error codes which the monitor panel and governor and pump controller can detect, see the "Error codes table".



3) Information displayed in display section and service meter section 2 (When error code is not recorded)
   If an error code is not recorded, display section (1) and service meter section (2) display as shown below.



4) Number of recorded error codes and display order of them
   This function can record up to 20 error codes, which are displayed in order from the latest one.
   ★ If a new trouble occurs while 20 error codes are recorded, the oldest error code is deleted and the error code of the new trouble is recorded.

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5) Change of displayed error codes
   Holding caution buzzer stop switch (3), operate working mode selector switches (7) and (8) to change the displayed error codes.
   - UP switch (7): Next error code appears.
   - DOWN switch (8): Previous error code appears.

6) How to delete error code
   i) Holding caution buzzer stop switch (3), turn the starting switch OFF and keep holding caution buzzer stop switch (3).
   ii) Under the above condition, turn the starting switch ON again and hold caution buzzer stop switch (3) for 5 seconds.
   ★ An error code having the mark [E] cannot be deleted.

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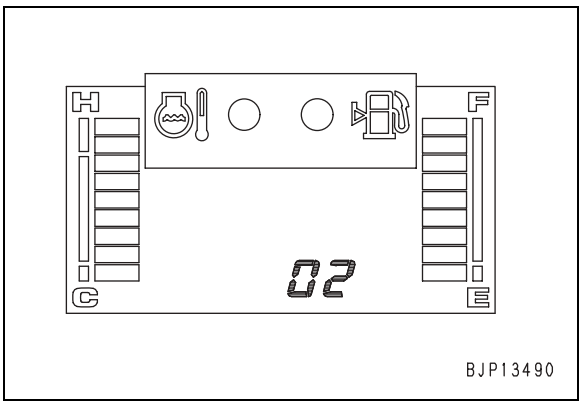
Error codes table

User code	Error code	Trouble
—	**104**	Clogging of air cleaner
—	**108**	Overheating of engine coolant
—	**112**	Short circuit in wiper motor drive forward system
—	**113**	Short circuit in wiper motor drive reverse system
—	**114**	Short circuit in windshield washer drive system
—	**115**	Trouble in operation of windshield wiper
—	**116**	Trouble in storage of windshield wiper
E03	**203**	Short circuit in swing holding brake solenoid
—	**205**	Short circuit in 2-stage relief solenoid
—	**206**	Short circuit travel speed shifting solenoid
E03	**213**	Disconnection in swing holding brake solenoid
—	**215**	Disconnection in 2-stage relief solenoid
—	**216**	Disconnection travel speed shifting solenoid
—	**217**	Abnormality in input model code
—	**218**	Disconnection in S-NET signal line
—	**222**	Short circuit in LS-EPC solenoid
—	**223**	Disconnection in LS-EPC solenoid
—	**224**	Abnormality in pump pressure sensor
—	**226**	Abnormality in pressure sensor power supply
—	**227**	Abnormality in engine speed sensor
E02	**232**	Short circuit in PC-EPC solenoid
E02	**233**	Disconnection in PC-EPC solenoid
—	**251**	Abnormality in overload pressure sensor
—	**301**	Engine low idling speed out of standard range
—	**302**	Engine high idling speed out of standard range
—	**306**	Abnormality in governor potentiometer
E05	**308**	Abnormality in fuel control dial
—	**315**	Short circuit in battery relay output line
—	**316**	Step-out of governor motor
E05	**317**	Disconnection in phases A and B of governor motor
E05	**318**	Short circuit in phases A and B of governor motor

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4. Monitoring function [02]

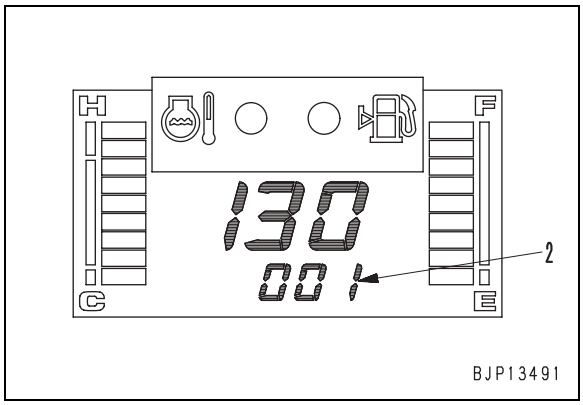
With this function, you can monitor the revolution speed, oil pressure, current, voltage, input condition, output condition, etc. in real time by the signals from the sensors, switches, and solenoids installed to various parts of the machine.



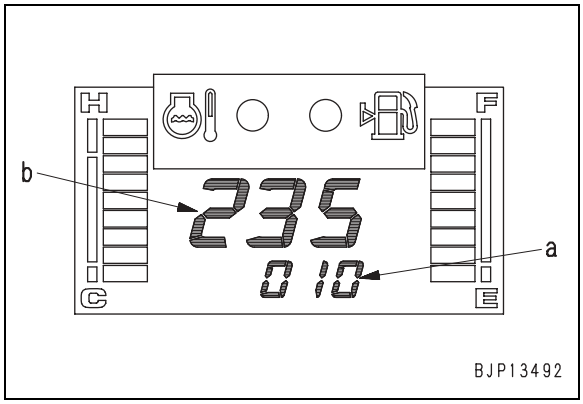
1) Selecting and executing function
   i) Select menu No. [02] in the menu selection mode.
   ii) Press set switch (5) to execute this function.

2) Selecting and executing monitoring code
   Holding caution buzzer stop switch (3), operate working mode selector switches (7) and (8) to select a monitoring code displayed in service meter section (1).
   - UP switch (7): Code No. increases.
   - DOWN switch (8): Code No. decreases.

   ★ This function displays monitoring code [001] and its information first.
   ★ For the items and code Nos. which you can monitor, see the "Monitoring codes table".

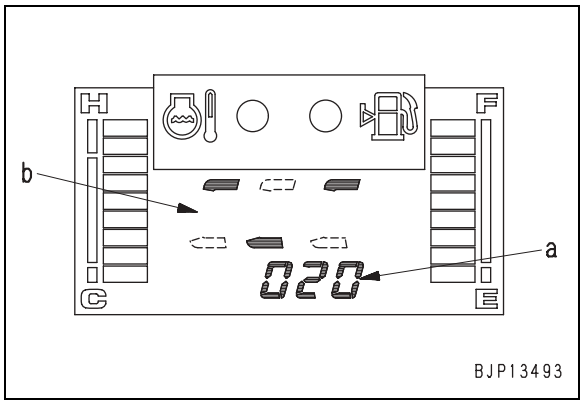


3) Information displayed in display section and service meter section 1 (When numeral code is displayed)
   If a numeral monitoring code is selected, the following information is displayed in display section (1) and service meter section (2).
   (a): Monitoring code
   (b): Monitoring information (Value is displayed)



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4) Information displayed in display section and service meter section 2 (When 6-bit code is displayed)
   If a 6-bit monitoring code is selected, the following information is displayed in display section (1) and service meter section (2).
   (a): Monitoring code
   (b): Monitoring information (6 pieces of information are displayed in bits)
   ★ In the 6-bit display mode, only the top and bottom of the 7-segment mark are used to display. "Solid black" indicates the ON state, and "white on black background" indicates the OFF state.
   ★ For the No. of each bit, see the "Monitoring codes table" and the drawing attached to it.



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Monitoring codes table

Code	Monitoring item			Unit	Remarks
001	Monitor panel model code			Numeral	
002	Governor and pump controller model code (Pump side)			Numeral	
003	Governor and pump controller model code (Engine throttle side)			Numeral	
008	Connecting condition of network			Numeral	
010	Engine speed			10rpm	
011	Pump discharge pressure			kg/cm^2	
012	Pump discharge pressure			kg/cm^2	
013	PC-EPC solenoid output current			10mA	
015	LS-EPC solenoid output current			10mA	
016	2nd throttle speed			10rpm	
018	(Unused)			—	
019	(Unused)			—	
020	Input condition of switch 1	a	Swing oil pressure switch (ON)	(6bit)	
		b	Travel oil pressure switch (ON)	(6bit)	
		c	Boom LOWER oil pressure switch (ON)	(6bit)	
		d	Boom RAISE oil pressure switch (ON)	(6bit)	
		e	Arm IN oil pressure switch (ON)	(6bit)	
		f	Arm OUT oil pressure switch (ON)	(6bit)	
021	Input condition of switch 2	a	Bucket CURL oil pressure switch (ON)	(6bit)	
		b	Bucket DUMP oil pressure switch (ON)	(6bit)	
		c	(Unused)	(6bit)	
		d	Service oil pressure switch (ON)	(6bit)	
		e	(Unused)	(6bit)	
		f	(Unused)	(6bit)	
022	Input condition of switch 3	a	(Unused)	(6bit)	
		b	(Unused)	(6bit)	
		c	One-touch power maximizing switch (ON)	(6bit)	
		d	Swing holding brake release switch (RELEASE)	(6bit)	
		e	Swing lock switch (LOCK)	(6bit)	
		f	(Unused)	(6bit)	
023	Drive condition of solenoid valve	a	(Unused)	(6bit)	
		b	(Unused)	(6bit)	
		c	Swing holding brake solenoid (ON)	(6bit)	
		d	(Unused)	(6bit)	
		e	2nd relief solenoid (ON)	(6bit)	
		f	Travel speed shifting solenoid (ON)	(6bit)	

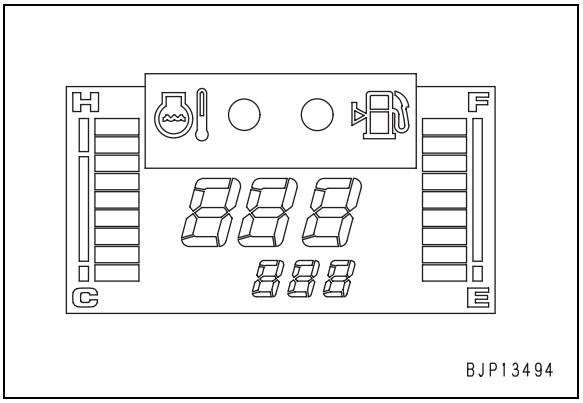
https://truckmanualshub.com/

Code	Monitoring item			Unit	Remarks
024	(Unused)			—	
027	Input condition of model selection signal	a	Model selection 1 (Connected to ground)	(6bit)	
		b	Model selection 2 (Connected to ground)	(6bit)	
		c	Model selection 3 (Connected to ground)	(6bit)	
		d	Model selection 4 (Connected to ground)	(6bit)	
		e	Model selection 5 (Connected to ground)	(6bit)	
		f	(Unused)	(6bit)	
030	Fuel control dial input voltage			10mV	
031	Governor potentiometer input voltage			10mV	
032	Controller power source voltage			100mV	
033	Governor motor phase A output current			10mA	
034	Governor motor phase B output current			10mA	
035	Battery relay BR output voltage			100mV	
036	Input condition of signal	a	(Unused)	(6bit)	
		b	(Unused)	(6bit)	
		c	(Unused)	(6bit)	
		d	(Unused)	(6bit)	
		e	Starting switch signal C (START)	(6bit)	
		f	(Unused)	(6bit)	
037	Output condition of signal	a	Battery relay (DRIVEN)	(6bit)	
		b	(Unused)	(6bit)	
		c	(Unused)	(6bit)	
		d	(Unused)	(6bit)	
		e	(Unused)	(6bit)	
		f	(Unused)	(6bit)	
041	Engine coolant sensor input voltage			10mV	
042	Fuel level sensor input voltage			10mV	
043	Alternator input voltage			10mV	
044	(Unused)			—	
045	Input condition 4 of switch	a	Starting switch signal ACC (ON)	(6bit)	
		b	Starting switch signal C (START)	(6bit)	
		c	Starting switch signal R1 (HEAT)	(6bit)	
		d	Lamp switch (ON)	(6bit)	
		e	(Unused)	(6bit)	
		f	(Unused)	(6bit)	

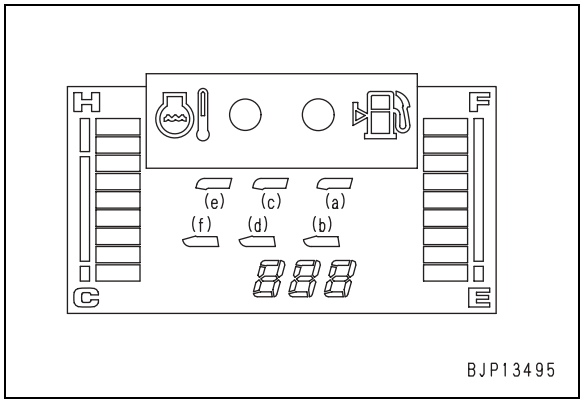
https://truckmanualshub.com/

Code	Monitoring item			Unit	Remarks
046	Input condition of sensor	a	Air cleaner clogging switch (OPEN)	(6bit)	
		b	(Unused)	(6bit)	
		c	Engine oil pressure switch (OPEN)	(6bit)	
		d	Engine oil level switch (OPEN)	(6bit)	
		e	(Unused)	(6bit)	
		f	Alternator (Normal generation)	(6bit)	
049	Input condition 5 of switch	a	Swing lock switch (LOCK)	(6bit)	
		b	Caution buzzer stop switch (ON)	(6bit)	
		c	Windows limit switch (ON)	(6bit)	
		d	Wiper contact W (ON)	(6bit)	
		e	Wiper contact P (ON)	(6bit)	
		f	(Unused)	(6bit)	
200	Monitor panel program version			Numeral	
201	Governor and pump controller program version			Numeral	

Display of numeral code



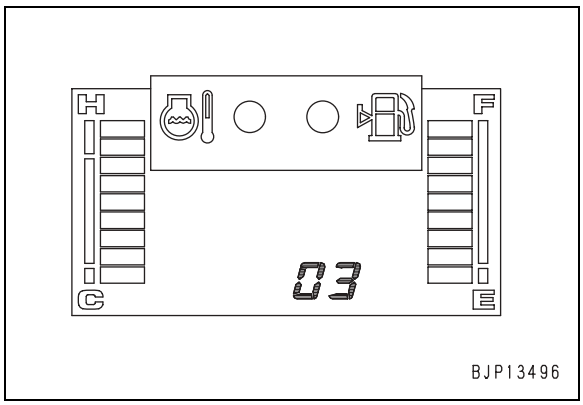
Display of 6bit



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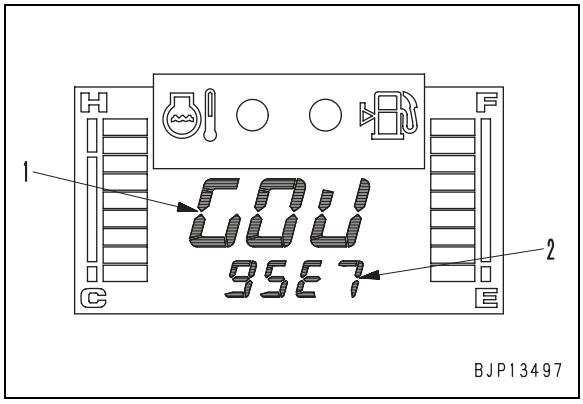
5. Function of adjusting governor [03]

This function is used to adjust the governor lever stroke after the governor actuator, fuel injection pump, or governor spring is removed and installed or replaced, or when the high idling speed is low or engine speed is not stabilized.



1) Selecting and executing function
   i) Select menu No. [03] in the menu selection mode.
   ii) Press set switch (5) to execute this function.

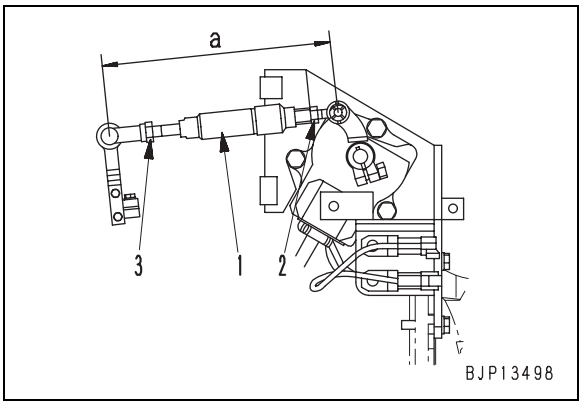
2) Condition of governor motor
   If this function is executed, all the governor control functions are cancelled, and then the operating angle of the governor actuator follows up only the operation signal of the fuel control dial.
   ★ While this function is executed, [GOV] is displayed in display section (1) and [gSET] is displayed in service meter section (2).



3) Adjusting governor lever stroke
   ★ The turning direction of the governor spring described below is the direction when the governor actuator is seen from the fuel injection pump side.
   i) Keep the fuel control dial in the MAX position.
   ii) Loosen locknut (2) on the governor actuator side of governor spring (1).
   iii) Turn governor spring (1) clockwise to reduce its installed length (a) and return governor lever (3) of the fuel injection pump to a position where it does not touch the full stopper.
   iv) Turn governor spring (1) counterclockwise to increase its installed length (a) and stop it when governor lever (3) of the fuel injection pump touches the full stopper.
      • Standard installed length (a) (Reference): 262 mm
   v) Turn governor spring (1) counterclockwise further by 2.5 turns to compress the spring in governor spring (1).
      ★ Since the inside spring is compressed, only the outer cylinder of governor spring (1) moves toward the fuel injection pump by about 3.1 mm (the installed length does not change).
   vi) Fixing governor spring (1), tighten locknut (2) on the governor actuator side.
      ★ Before fixing the locknut, check that the water drain hole of the governor spring is directed down. If the water drain hole is not directed down, loosen locknut (4) on the fuel injection pump side and turn the whole governor spring to adjust (Take care not to change the adjustment dimension of the governor spring).

      Locknut:
      11.8 – 19.6 Nm {1.2 – 2.0 kgm}

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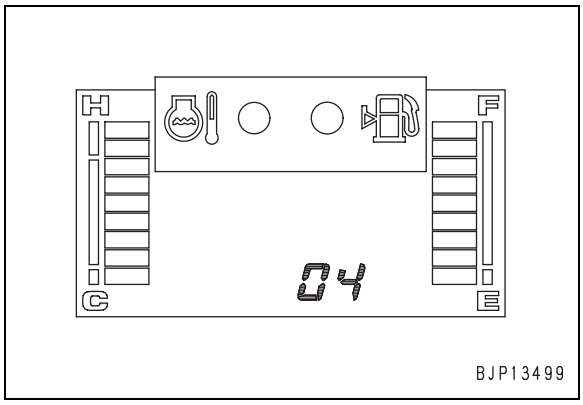


vii) Return the fuel control dial to the MIN position, and then turn it again slowly toward the MAX position. At this time, check that governor spring is compressed by about 3.1 mm after governor lever (3) reaches the full stopper.

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6. Function of selecting maintenance period [04]

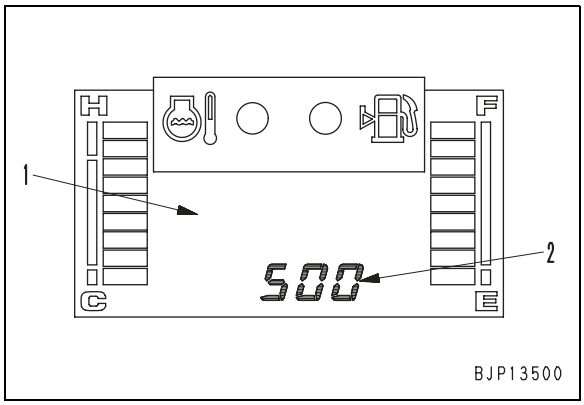
With this function, you can adjust the maintenance period of the engine oil for the function of the engine oil replacement monitor.



1) Selecting and executing function
   i) Select menu No. [04] in the menu selection mode.
   ii) Press set switch (5) to execute this function.

2) Selecting maintenance period
   The current display mode or maintenance period is displayed in service meter section (2). Press set switch (5) to select a maintenance period.
   ★ Nothing is displayed in display section (1).
   ★ Each time the set switch is pressed, the display mode or maintenance period changes in the following order.

Display	Display mode/Maintenance period
0	Reset maintenance function
125	125-hour interval
250	250-hour interval
500	500-hour interval
d	Demonstration mode



3) Settling maintenance period
   The display or maintenance period becomes effective when it is selected. Accordingly, perform the ordinary finishing operation.

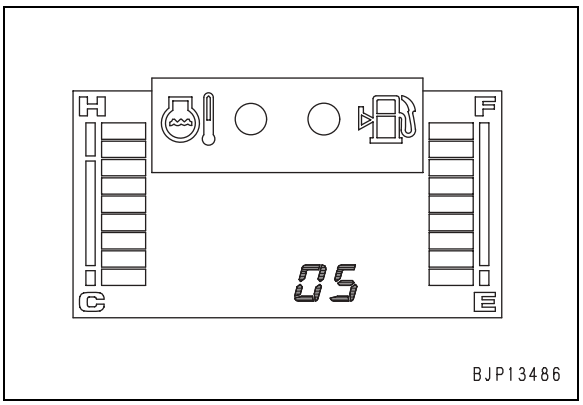
<Special functions of engine oil replacement monitor>

★ For the method of displaying the engine oil replacement monitor, method of checking the elapsed time after replacement of engine oil, method of clearing the elapsed time, and method of displaying demonstration mode, see "9. Special functions of engine oil replacement monitor".

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7. Function of selecting default working mode [05]

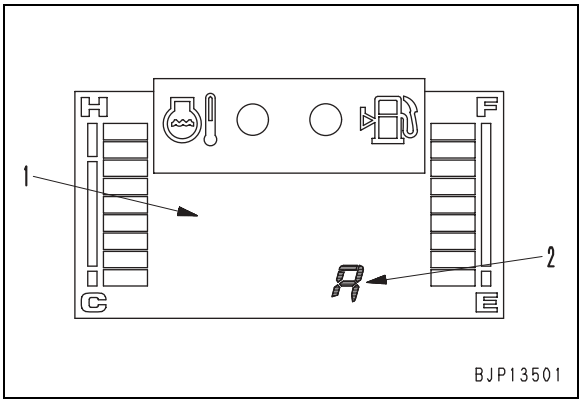
With this function, you can freely select the working mode which is set automatically when the starting switch is turned ON (When the machine is delivered, mode A is set).



1) Selecting and executing function
   i) Select menu No. [05] in the menu selection mode.
   ii) Press set switch (5) to execute this function.

2) Selecting default working mode
   The currently set working mode is displayed in service meter section (2). Press working mode selector switches (7) and (8) to select a working mode.
   - UP switch (7): Next mode is displayed.
   - DOWN switch (8): Previous mode is displayed.

   ★ Nothing is displayed in display section (1).
   ★ The working mode changes in the following order.
   A → E → B
   ★ Mode L cannot be set as the default.



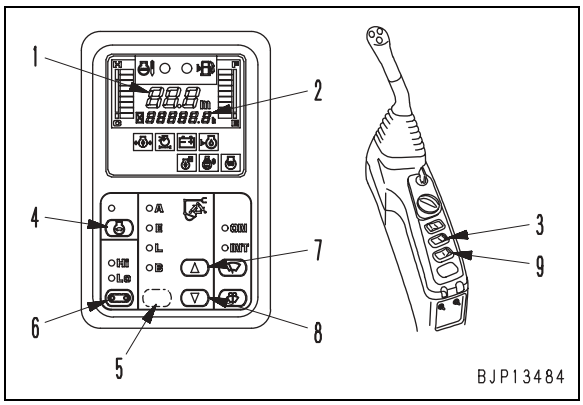
3) Settling default working mode
   Press set switch (5) to settle the selected working mode.

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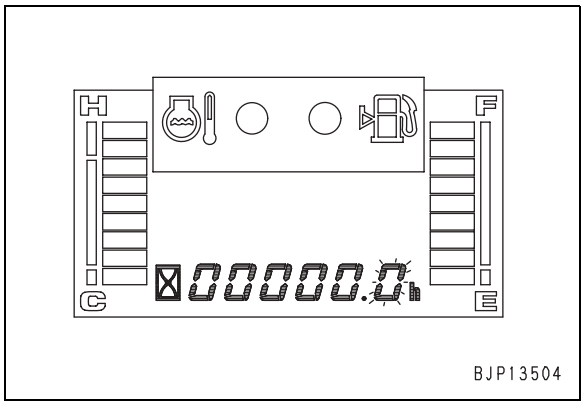
8. Function of adjusting service meter

When the monitor panel is replaced, you can set its service meter to the reading at the time of replacement.

1) How to select this function
   i) Set swing lock switch (9) in the LOCK position.
      ★ While using this function, keep the swing lock switch in the LOCK position.
   ii) Holding caution buzzer stop switch (3), press the switches in the following order.
      1. Travel speed shifting switch (6)
      2. Set switch (5)
      3. Auto decelerator switch (4)
      4. Working mode selector (UP) switch (7)



2) Information displayed in display section and service meter section
   The currently set service meter information is displayed in service meter section (2) and only the figure selected for correction flashes (When a new monitor panel is installed, 0h is displayed).
   ★ Nothing is displayed in display section (1).
   ★ When this function is selected, the figure at the right end is selected automatically and it flashes.



3) Selecting figure to be corrected
   Holding caution buzzer stop switch (3), press auto decelerator switch (4) and set switch (5) simultaneously, and the figure on the left side starts flashing.
   ★ If the above operation is performed while the figure at the left end is flashing, the figure at the right end starts flashing.

4) Increasing or decreasing figure to be corrected
   Holding caution buzzer stop switch (3), operate auto decelerator switch (4) and working mode selector switches (7) and (8).
   • UP switch (7): Figure increases.
   • DOWN switch (8): Figure decreases.
   ★ If the figure at a position does not need to be corrected, input "0".

5) How to finish function
   Perform the operation of selecting this function.

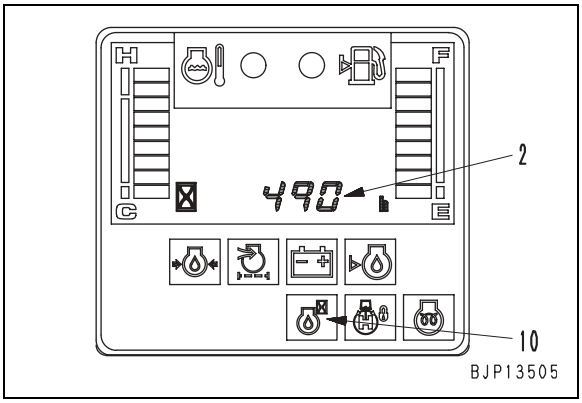
<How to save service meter reading>

★ If the service meter reading is increased, the new value is saved.
★ If the service meter reading is decreased, the new value is not accepted, but the caution buzzer sounds 3 times.

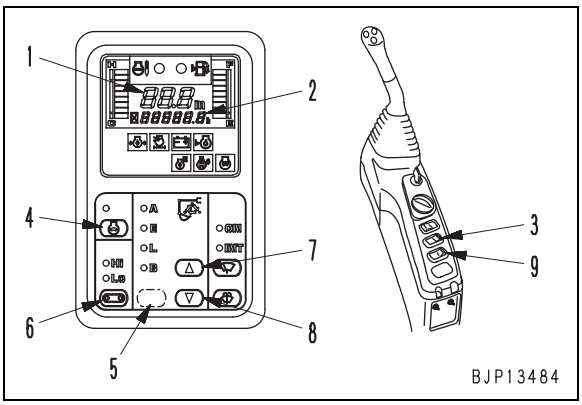
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9. Special functions of engine oil replacement monitor

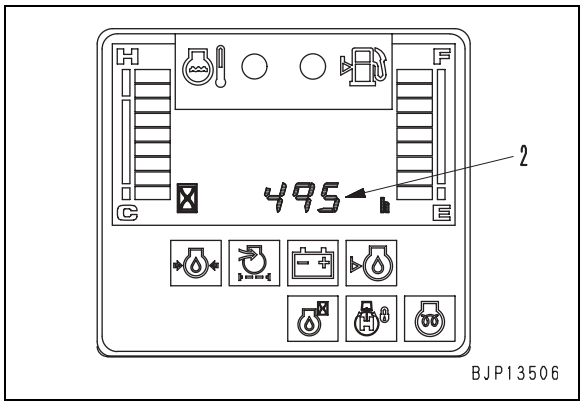
1) Ordinary display of engine oil replacement monitor
If the rest of time before the set engine oil replacement time is 10 hours or shorter, engine oil replacement monitor (10) lights up and display the elapsed time in service meter section for 20 seconds each time the starting switch is turned ON.



2) Checking elapsed time
To check the elapsed time while engine oil replacement monitor (10) is OFF, turn the starting switch OFF and press set switch (5) and then turn the starting switch ON and keep holding set switch (5).



3) Clearing elapsed time
To clear the elapsed time after replacing the engine oil, hold set switch (5) for 3 seconds while the elapsed time is displayed.
★ If the above operation is performed, the elapsed time in the monitor panel is set to 0 hour.



4) Function of demonstration mode
If the demonstration mode is selected, you can perform demonstration of the oil maintenance function when teaching the operation to a customer.
The functions and display of the demonstration mode are as follows.

1. The internally set interval is recognized as 250 hours and the elapsed time is recognized as 240 hours.
2. When the starting switch is turned ON after the demonstration mode is set, the ordinary display is repeated up to 3 times (number of the times of turning the starting switch ON).
3. After the demonstration is finished, resetting of maintenance setting [0] is recognized.

★ When the demonstration is repeated 3 times, resetting of maintenance setting is recognized. If setting is necessary at this time, see "Function of selecting maintenance period".

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PREPARATION WORK FOR TROUBLESHOOTING FOR ELECTRIC SYSTEM

★ When carrying out troubleshooting for an electric circuit related to the monitor panel and governor and pump controller, expose the related connectors according to the following procedure.

1. Monitor panel

1) Remove cover (1)
   ★ The cover is fixed with 2 clips at the top and bottom. Just pull it up to remove it.
   ★ If the daylight sensor of the air conditioner is installed, disconnect connector P15 on the back side of the cover.



2) Remove the 3 mounting screws, and then remove monitor panel (2) from the mount.
   ★ Take care not to drop the mounting screws into the console.
3) Insert or connect testing T-adapters in or to connectors P01 and P02 of the monitor panel.
   ★ Connector P70 clamped near the above connectors is not used.



2. Governor and pump controller

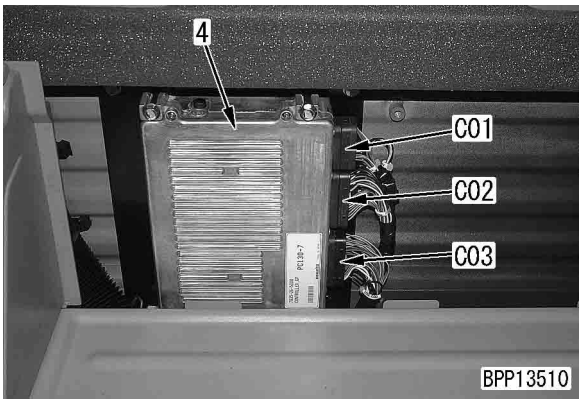
★ The governor and pump controller is installed in the cover at the rear of the operator's seat.

1) Remove the 3 mounting bolts and cover (3).



2) Insert or connect testing T-adapters in or to connectors C01, C02, and C03 of governor and pump controller (4).
   ★ Since the connectors are secured with screws, loosen those screws before disconnecting.
   ★ When connecting the connectors again, tighten their screws to the specified torque.

   Screw: **2.82 Nm {0.288 kgm}**



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Pm-Clinic Service

Model	Serial No.	Service meter
PC130-7		h

User's name	Date of inspection	Inspector
	/ /	

Specifications		
Main parts	Attachments	Shoe width
Boom ☐ Standard ☐ ( ) Arm ☐ Standard ☐ ( ) Bucket ☐ Standard ☐ ( )	☐ 1 att. ☐ ( ) ☐ Blade ☐ ( ) ☐ 2-piece boom	☐ 500 mm ☐ ( ) ☐ 600 mm ☐ 700 mm

Check of oil and coolant levels		
☐ Radiator coolant ☐ Engine oil ☐ Hydraulic oil	When necessary ☐ Damper case oil ☐ Machinery case oil	☐ Final drive case oil ☐ ( )
Max. range of engine coolant temperature	Max. range of hydraulic oil temperature	Ambient temperature
(Up) ☐☐☐☐☐☐☐☐☐ (Down)	°C	°C
		Altitude
		m

Operator's opinion

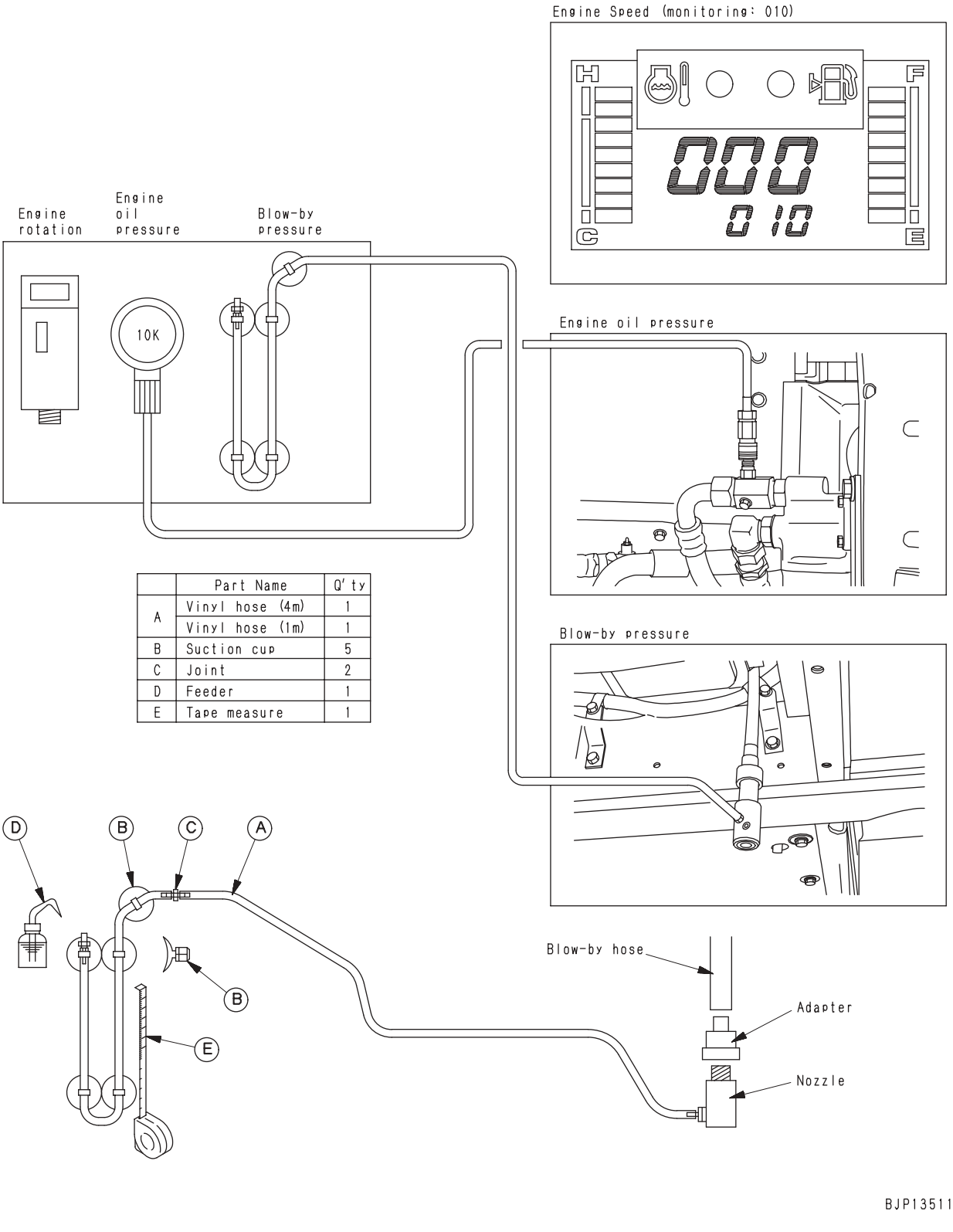
Visual inspection result

Error code history
☐☐☐ _____
☐☐☐ _____
☐☐☐ _____
☐☐☐ _____
☐☐☐ _____

Memo

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Items related to engine

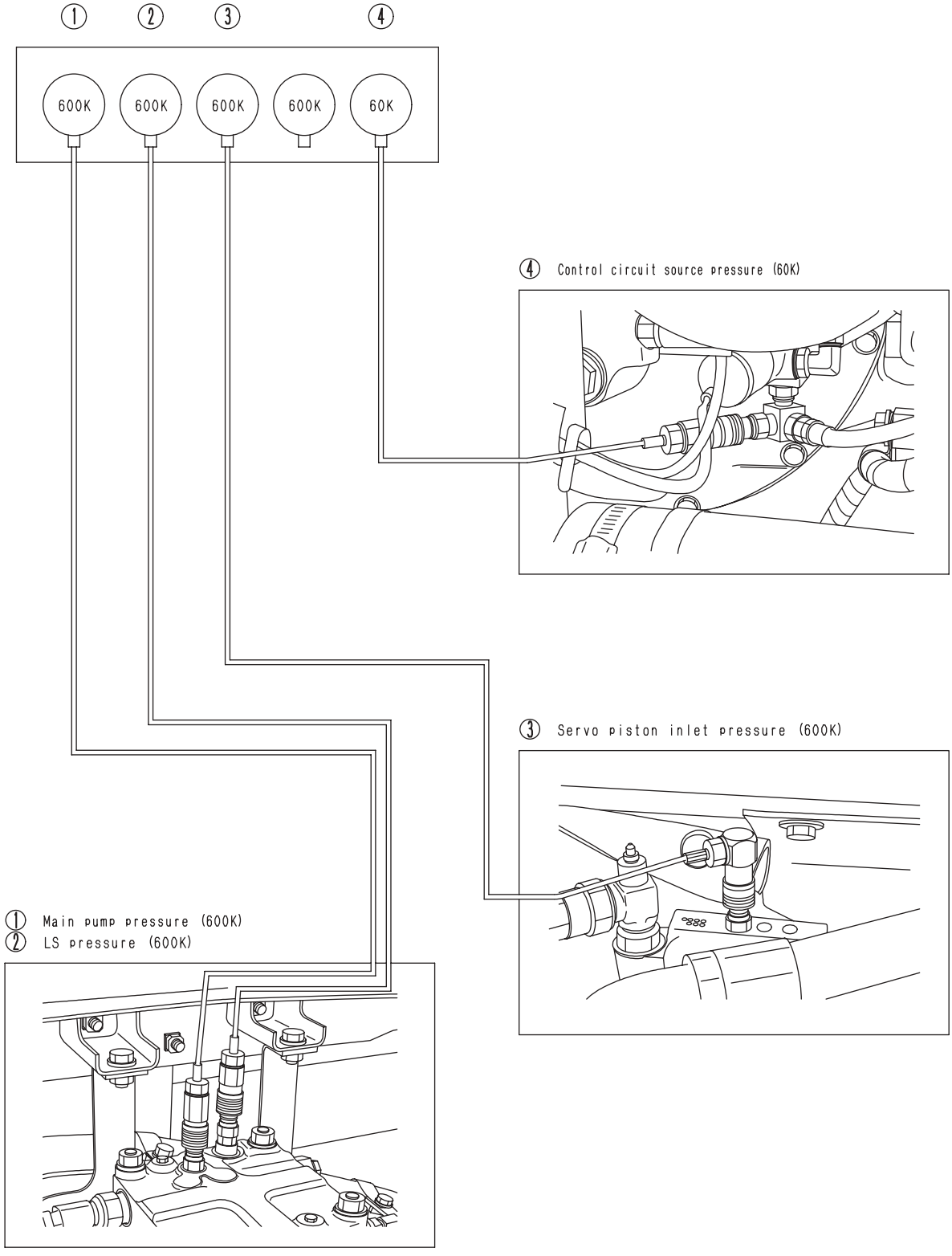


	Part Name	Q'ty
A	Vinyl hose (4m)	1
	Vinyl hose (1m)	1
B	Suction cup	5
C	Joint	2
D	Feeder	1
E	Tape measure	1

BJP13511

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Items related to hydraulic equipment



BJP13512

Model	Serial No.	Service meter	User's name	Date of inspection	Inspector

1. Engine

No.	Condition					Measured item	Unit	Standard value		Measured value	Judgment
	Fuel control dial	Working mode	Auto decelerator	One-touch power max. switch	Operation of work equipment			Standard value for new machine	Service limit value		
1	Full (MAX)	A	OFF	OFF	All levers in neutral	Engine speed	rpm	2,250 – 2,450	2,250 – 2,450		Good/Bad
2	Full (MAX)	A	OFF	OFF	All levers in neutral	Engine oil pressure	MPa{kg/cm^2}	0.34–0.54{3.5–5.5}	0.25 {2.5}		Good/Bad
3	Low (MIN)	A	OFF	OFF	All levers in neutral	Engine speed	rpm	1,050 – 1,150	1,050 – 1,150		Good/Bad
4	Low (MIN)	A	OFF	OFF	All levers in neutral	Engine oil pressure	MPa{kg/cm^2}	Min. 0.18{Min. 1.8}	0.15 {1.5}		
5	Full (MAX)	A	OFF	ON	Arm DUMP relief	Engine speed	rpm	2,080 – 2,280	2,080 – 2,280		
6	Full (MAX)	A	OFF	ON	Arm DUMP relief	Blow-by pressure	kPa{mmH_2O}	Max. 0.49{Max. 50}	0.98 {100}		
7	Full (MAX)	A	ON	OFF	All levers in neutral	Engine speed	rpm	1,300 – 1,500	1,300 – 1,500		

2. Work equipment, switch, and travel speed

Hydraulic oil temperature: 45 – 55 °C

No.	Condition			Measured item			Unit	Standard value		Measured value	Judgmen
	Fuel control dial	Working mode	Position of work equipment					Standard value for new machine	Service limit value		
1	Full (MAX)	A	Max. reach, no load	Boom RAISE (*1)			sec	3.3 – 4.1	Max. 4.3		
2	Full (MAX)	A	Boom top on level, no load	Arm OUT (*1)				2.8 – 3.4	Max. 3.7		
3	Full (MAX)	A	Boom top on level, no load	Arm IN (*1)				2.8 – 3.6	Max. 4.4		
4	Full (MAX)	E	Boom top on level, no load	Arm IN (*1)				3.0 – 3.8	Max. 4.6		
5	Full (MAX)	L	Boom top on level, no load	Arm IN (*1)				3.7 – 5.1	Max. 5.4		
6	Full (MAX)	A	Arm top and boom foot on level, no load	Bucket CURL				2.6 – 3.2	Max. 3.7		
7	Full (MAX)	A	Max. reach	Swing (5 turns)		Right		23.8 – 33.4	22.8 – 34.4		
						Left		23.8 – 33.4	22.8 – 34.4		
8	Full (MAX)	A	Push up track shoe 1 side by 1	Travel (5 turns)	Lo	Right		36.9 – 55.3	36.9 – 55.3		
						Left		36.9 – 55.3	36.9 – 55.3		
					Hi	Right		19.7 – 24.1	20.1 – 26.1		
						Left		19.7 – 24.1	20.1 – 26.1		

*1: Until cylinder cushion starts working

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3. Hydraulic drift of work equipment

Hydraulic oil temperature: 45 – 55 °C

No.	Condition			Measured item	Unit	Standard value		Measured value	Judgment
	Fuel control dial	Working mode	Position of work equipment			Standard value for new machine	Service limit value		
1	Engine stopped		Arm top and boom foot on level, rated load on bucket	Lowering distance of bucket tip (in 15 min)	mm	Max. 460	Max. 700		Good/Bad

4. Oil pressure

Hydraulic oil temperature: 45 – 55 °C

No.	Condition					Measured item (Tested part)		Unit	(1) 600kg/cm^2 Pump pressure	(2) 600kg/cm^2 LS pressure	(3) 600kg/cm^2 Servo inlet pressure	(4) 60kg/cm^2 Control basic pressure	Point (Service limit value)
	Fuel control dial	Working mode	Auto decelerator	One-touch power max. switch	Operation of work equipment								
1	Full (MAX)	A	OFF	OFF	All levers in neutral	Control basic pressure (Self-reducing pressure valve)		MPa {kg/cm^2}					2.84–3.43MPa {29–35kg/cm^2}
2	Full (MAX)	A	OFF	OFF	Arm DUMP relief	Pump relief pressure (Main relief valve: Low pressure)							33.3–37.0MPa {343–378kg/cm^2}
	Full (MAX)	A	OFF	ON	Arm DUMP relief	Pump relief pressure (Main relief valve: High pressure)							36.3–39.2MPa {370–400kg/cm^2}
3	Full (MAX)	A	OFF	OFF	All levers in neutral	LS differential pressure (LS valve: Neutral)							1.96–3.7MPa {21–38kg/cm^2}
	Full (MAX)	A	OFF	OFF	Idle travel (With shoe raised)	LS differential pressure (LS valve: Operated)							2.1–2.3MPa {21.5–23.5kg/cm^2}
4	Full (MAX)	A	OFF	OFF	Swing lock (Switch: LOCK)	Swing relief pressure (Motor safety valve)	Right						28.9–32.9MPa {295–335kg/cm^2}
							Left						
5	Full (MAX)	A	OFF	OFF	Travel lock (With sprocket fixed)	Travel relief pressure (Main relief valve) (Motor safety valve)	Right front						36.3–39.2MPa {370–400kg/cm^2}
							Right rear						
							Left front						
							Left rear						
6	Full (MAX)	A	OFF	OFF	Swing lock (Switch: LOCK)	PC control pressure (PC valve)							(1):(3)=1:0.5

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TROUBLESHOOTING

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POINTS TO REMEMBER WHEN TROUBLESHOOTING

⚠ Stop the machine in a level place, and check that the safety pin, blocks, and parking brake are securely fitted.

⚠ When carrying out the operation with two or more workers, keep strictly to the agreed signals, and do not allow any unauthorized person to come near.

⚠ If the radiator cap is removed when the engine is hot, hot water may spurt out and cause burns, so wait for the engine to cool down before starting troubleshooting.

⚠ Be extremely careful not to touch any hot parts or to get caught in any rotating parts.

⚠ When disconnecting wiring, always disconnect the negative (–) terminal of the battery first.

⚠ When removing the plug or cap from a location which is under pressure from oil, water, or air, always release the internal pressure first. When installing measuring equipment, be sure to connect it properly.

The aim of troubleshooting is to pinpoint the basic cause of the failure, to carry out repairs swiftly, and to prevent reoccurrence of the failure.
When carrying out troubleshooting, and important point is of course to understand the structure and function.
However, a short cut to effective troubleshooting is to ask the operator various questions to form some idea of possible causes of the failure that would produce the reported symptoms.

1. When carrying out troubleshooting, do not hurry to disassemble the components.
   If components are disassembled immediately any failure occurs:
   - Parts that have no connection with the failure or other unnecessary parts will be disassembled.
   - It will become impossible to find the cause of the failure.

   It will also cause a waste of manhours, parts, or oil or grease, and at the same time, will also lose the confidence of the user or operator.
   For this reason, when carrying out troubleshooting, it is necessary to carry out thorough prior investigation and to carry out troubleshooting in accordance with the fixed procedure.

2. Points to ask user or operator
   1) Have any other problems occurred apart from the problem that has been reported?
   2) Was there anything strange about the machine before the failure occurred?
   3) Did the failure occur suddenly, or were there problems with the machine condition before this?
   4) Under what conditions did the failure occur?
   5) Had any repairs been carried out before the failure?
      When were these repairs carried out?
   6) Has the same kind of failure occurred before?

3. Check before troubleshooting
   1) Check the oil level
   2) Check for any external leakage of oil from the piping or hydraulic equipment.
   3) Check the travel of the control levers.
   4) Check the stroke of the control valve spool.
   5) Other maintenance items can be checked externally, so check any item that is considered to be necessary.

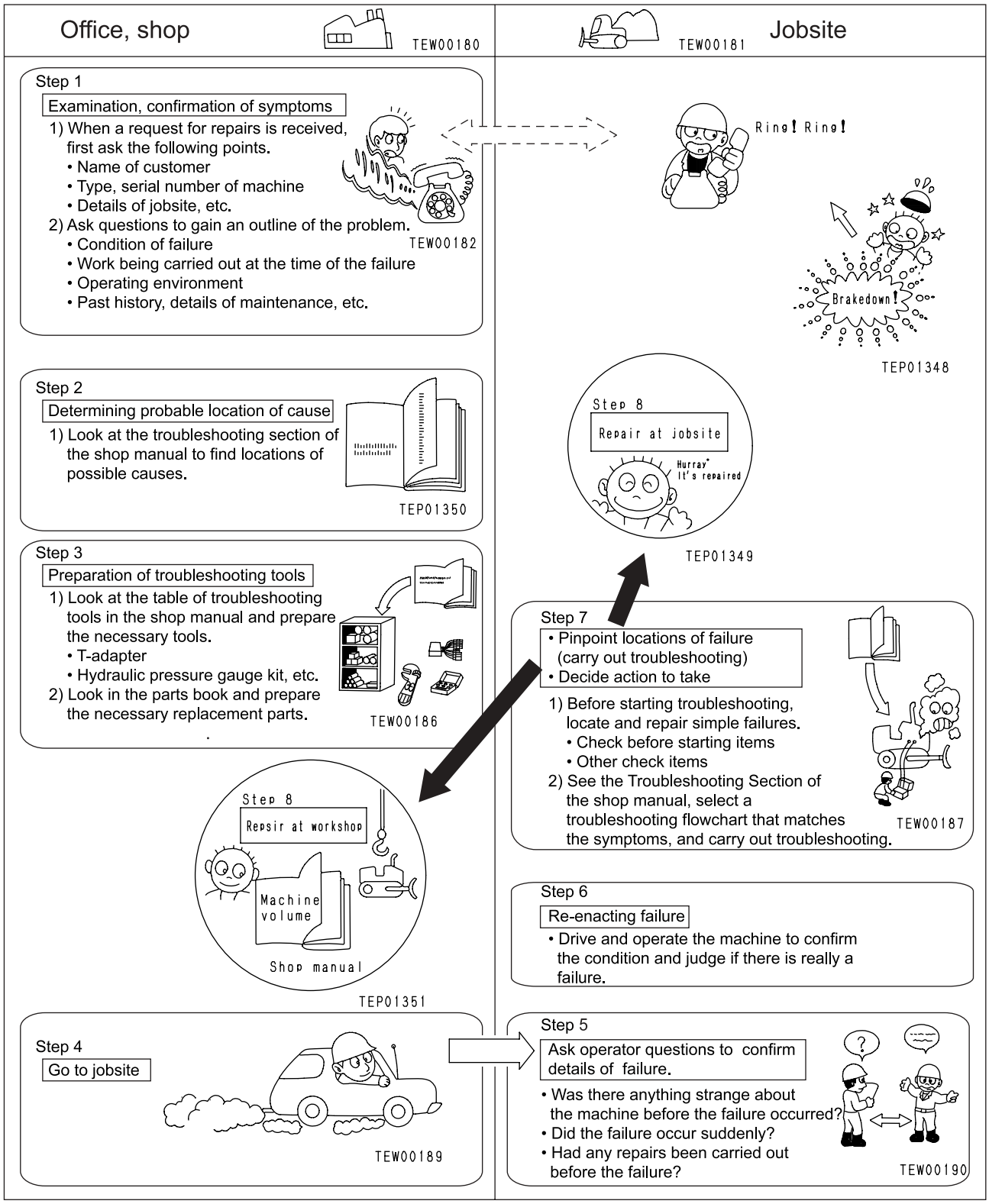
4. Confirming failure
   - Confirm the extent of the failure yourself, and judge whether to handle it as a real failure or as a problem with the method of operation, etc.
     ★ When operating the machine to reenact the troubleshooting symptoms, do not carry out any investigation or measurement that may make the problem worse.

5. Troubleshooting
   - Use the results of the investigation and inspection in Items 2 – 4 to narrow down the causes of failure, then use the troubleshooting flowchart to locate the position of the failure exactly.
     ★ The basic procedure for troubleshooting is as follows.
       1) Start from the simple points.
       2) Start from the most likely points.
       3) Investigate other related parts or information.

6. Measures to remove root cause of failure
   - Even if the failure is repaired, if the root cause of the failure is not repaired, the same failure will occur again.
     To prevent this, always investigate why the problem occurred. Then, remove the root cause.

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SEQUENCE OF EVENTS IN TROUBLESHOOTING



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POINTS TO REMEMBER WHEN CARRYING OUT MAINTENANCE

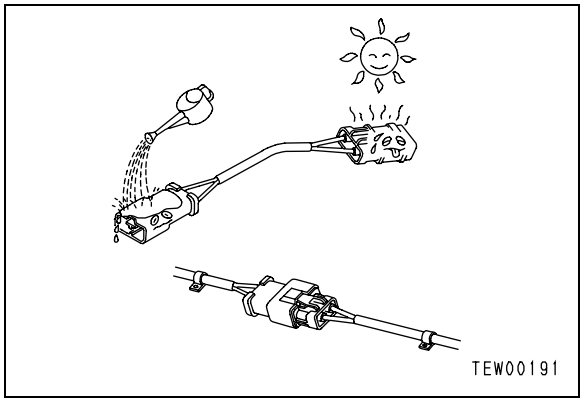
To maintain the performance of the machine over a long period, and to prevent failures or other troubles before they occur, correct operation, maintenance and inspection, troubleshooting, and repairs must be carried out. This section deals particularly with correct repair procedures for mechatronics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

1. Points to remember when handling electric equipment

1) Handling wiring harnesses and connectors

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

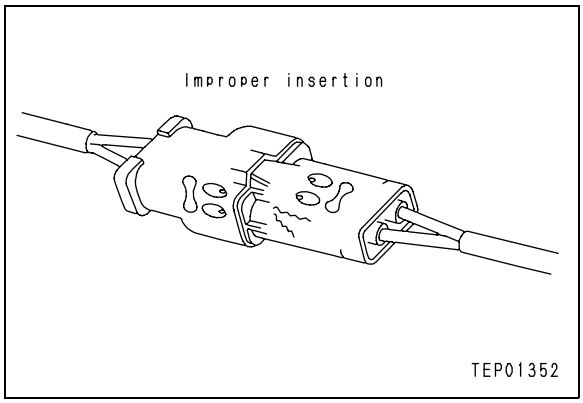
Compared with other electrical components fitted in boxes or cases, wiring harnesses are more likely to be affected by the direct effects of rain, water, heat, or vibration. Furthermore, during inspection and repair operations, they are frequently removed and installed again, so they are likely to suffer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



Main failures occurring in wiring harness

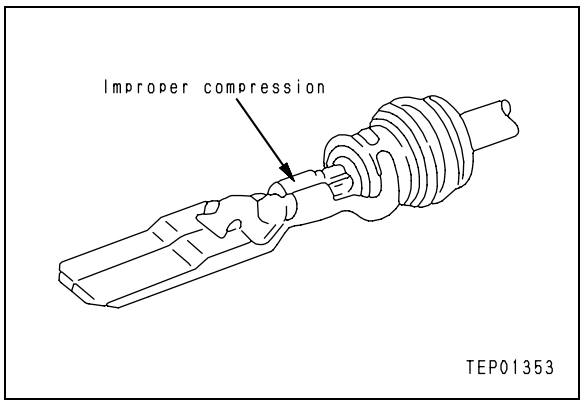
1) Defective contact of connectors (defective contact between male and female)

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



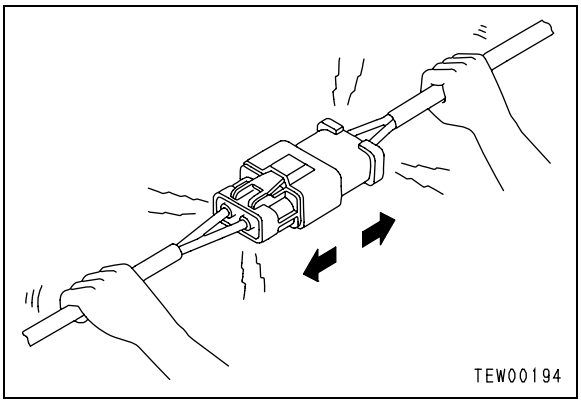
2) Defective crimping or soldering of connectors

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

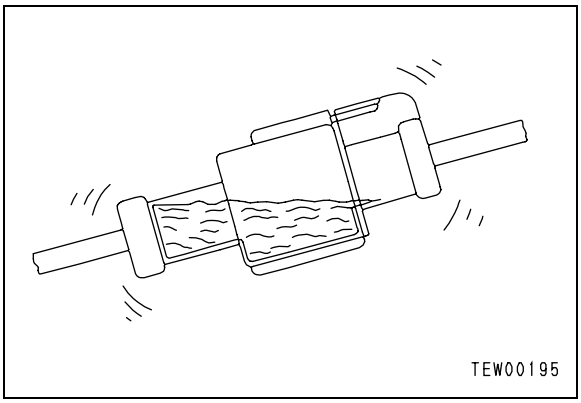


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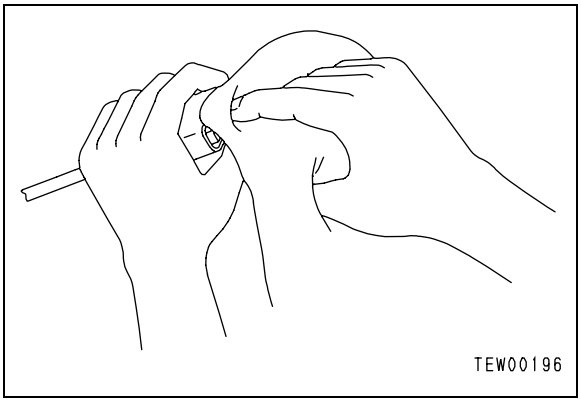
3) Disconnections in wiring
If the wiring is held and the connectors are pulled apart, or components are lifted with a crane with the wiring still connected, or a heavy object hits the wiring, the crimping of the connector may separate, or the soldering may be damaged, or the wiring may be broken.



4) High-pressure water entering connector
The connector is designed to make it difficult for water to enter (drip-proof structure), but if high-pressure water is sprayed directly on the connector, water may enter the connector, depending on the direction of the water jet.
As already said, the connector is designed to prevent water from entering, but at the same time, if water does enter, it is difficult for it to be drained. Therefore, if water should get into the connector, the pins will be short-circuited by the water, so if any water gets in, immediately dry the connector or take other appropriate action before passing electricity through it.



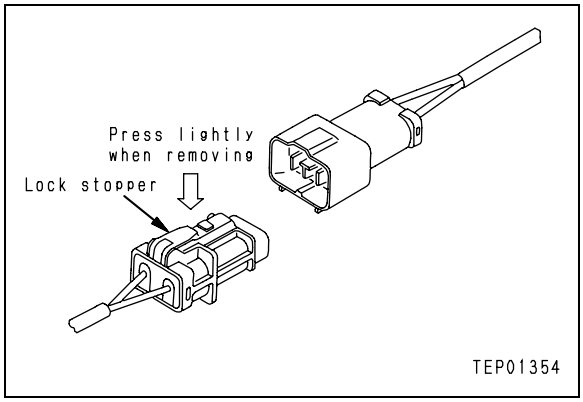
5) Oil or dirt stuck to connector
If oil or grease are stuck to the connector and an oil film is formed on the mating surface between the male and female pins, the oil will not let the electricity pass, so there will be defective contact.
If there is oil or grease stuck to the connector, wipe it off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



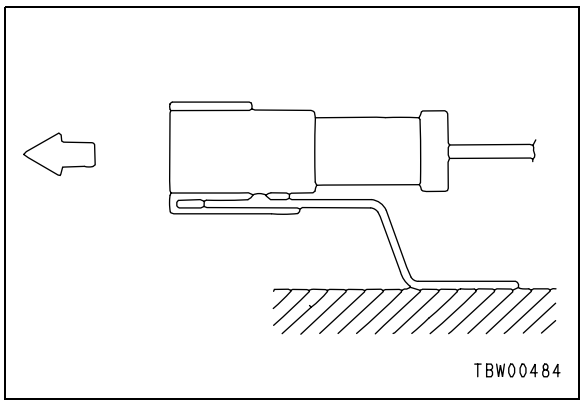
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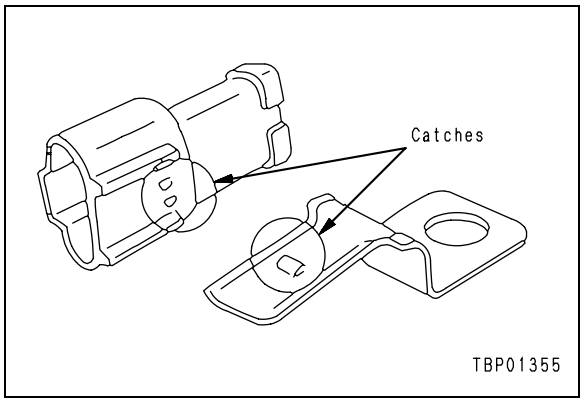
2) Removing, installing, and drying connectors and wiring harnesses

- **Disconnecting connectors**
  1) Hold the connectors when disconnecting.
     When disconnecting the connectors, hold the connectors and not the wires. For connectors held by a screw, loosen the screw fully, then hold the male and female connectors in each hand and pull apart. For connectors which have a lock stopper, press down the stopper with your thumb and pull the connectors apart.
     ★ Never pull with one hand.

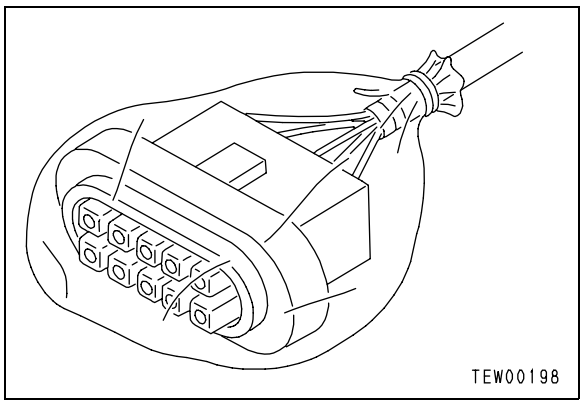


  2) When removing from clips
     When removing a connector from a clip, pull the connector in a parallel direction to the clip.
     ★ If the connector is twisted up and down or to the left or right, the housing may break.





  3) Action to take after removing connectors
     After removing any connector, cover it with a vinyl bag to prevent any dust, dirt, oil, or water from getting in the connector portion.
     ★ If the machine is left disassembled for a long time, it is particularly easy for improper contact to occur, so always cover the connector.



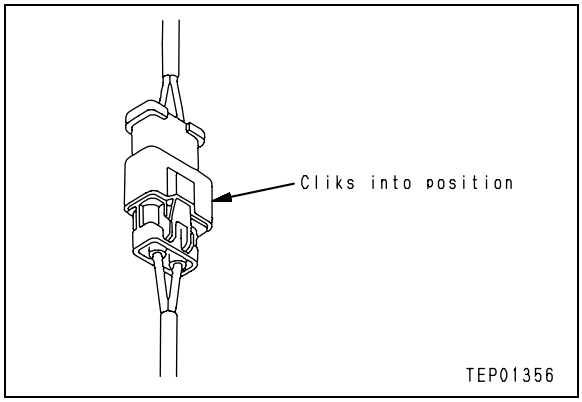
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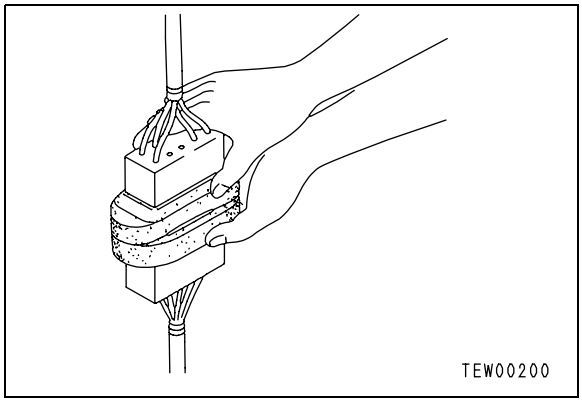
- **Connecting connectors**
  1) Check the connector visually.
     1) Check that there is no oil, dirt, or water stuck to the connector pins (mating portion).
     2) Check that there is no deformation, defective contact, corrosion, or damage to the connector pins.
     3) Check that there is no damage or breakage to the outside of the connector.
     ★ If there is any oil, water, or dirt stuck to the connector, wipe it off with a dry cloth. If any water has got inside the connector, warm the inside of the wiring with a dryer, but be careful not to make it too hot as this will cause short circuits.
     ★ If there is any damage or breakage, replace the connector.

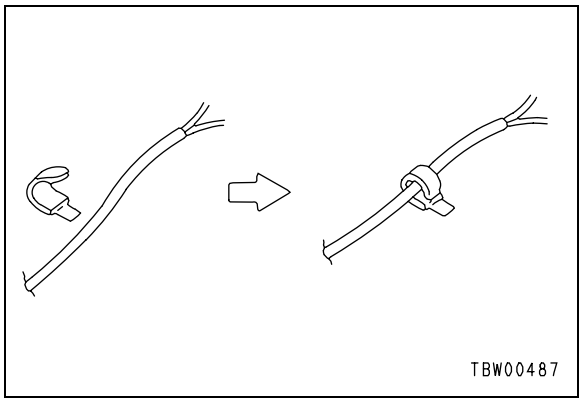
  2) Fix the connector securely.
     Align the position of the connector correctly, then insert it securely.
     For connectors with lock stopper, push in the connector until the stopper clicks into position.

  3) Correct any protrusion of the boot and any misalignment of the wiring harness
     For connectors fitted with boots, correct any protrusion of the boot. In addition, if the wiring harness is misaligned, or the clamp is out of position, adjust it to its correct position.
     ★ If the connector cannot be corrected easily, remove the clamp and adjust the position.

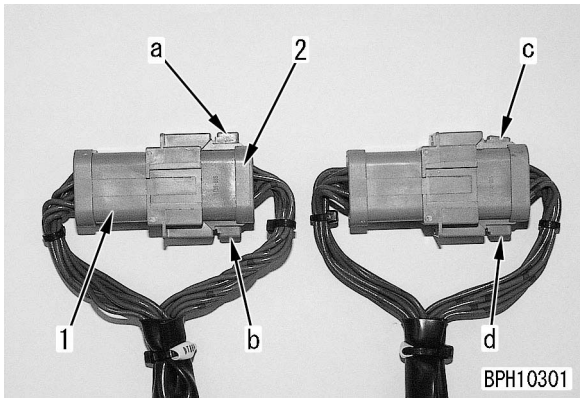
  4) If the connector clamp has been removed, be sure to return it to its original position. Check also that there are no loose clamps.







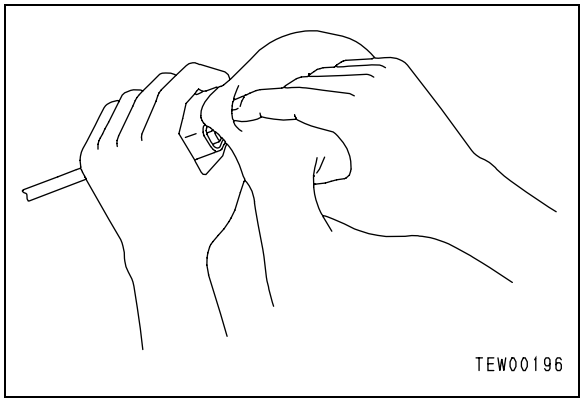
- **Connecting connectors (DT type connector)**
  Since the DT 8-pole and 12-pole DT type connectors have 2 latches respectively, push them in until they click 2 times.
  1. Male connector, 2. Female connector
  - Normal locking state (Horizontal): **a**, **b**, **d**
  - Incomplete locking state (Diagonal): **c**



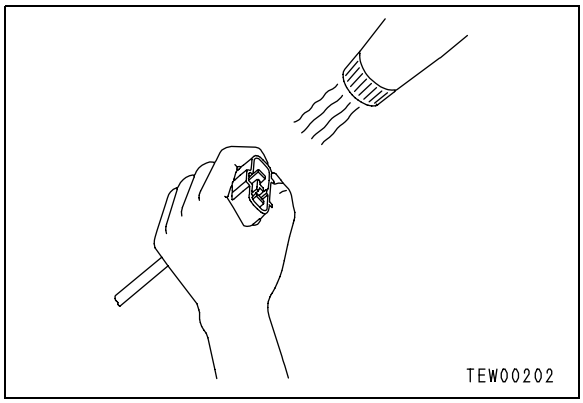
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- **Drying wiring harness**
  If there is any oil or dirt on the wiring harness, wipe it off with a dry cloth. Avoid washing it in water or using steam. If the connector must be washed in water, do not use high-pressure water or steam directly on the wiring harness.

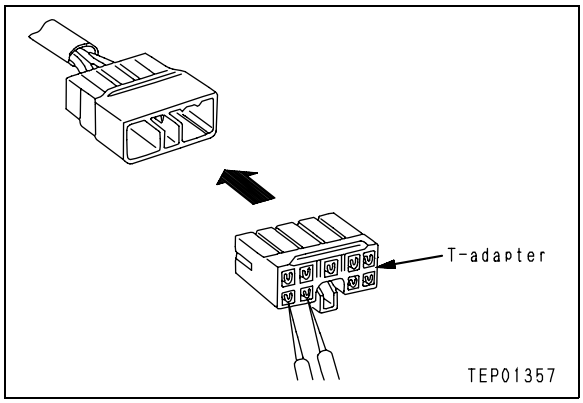
  If water gets directly on the connector, do as follows.
  1) Disconnect the connector and wipe off the water with a dry cloth.
     ★ If the connector is blown dry with compressed air, there is the risk that oil in the air may cause defective contact, so remove all oil and water from the compressed air before blowing with air.



  2) Dry the inside of the connector with a dryer.
     If water gets inside the connector, use a dryer to dry the connector.
     ★ Hot air from the dryer can be used, but regulate the time that the hot air is used in order not to make the connector or related parts too hot, as this will cause deformation or damage to the connector.



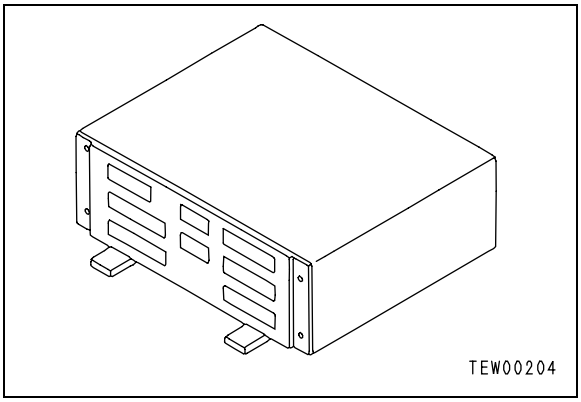
  3) Carry out a continuity test on the connector.
     After drying, leave the wiring harness disconnected and carry out a continuity test to check for any short circuits between pins caused by water.
     ★ After completely drying the connector, blow it with contact restorer and reassemble.



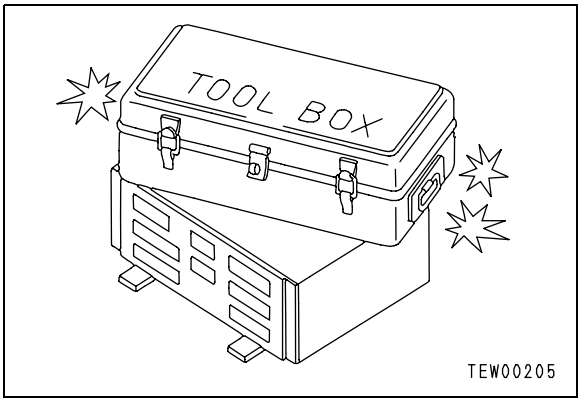
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3) Handling control box

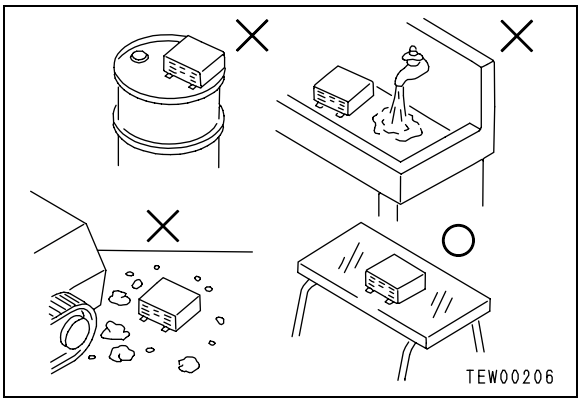
1) The control box contains a microcomputer and electronic control circuits. These control all of the electronic circuits on the machine, so be extremely careful when handling the control box.
2) Do not open the cover of the control box unless necessary.



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.

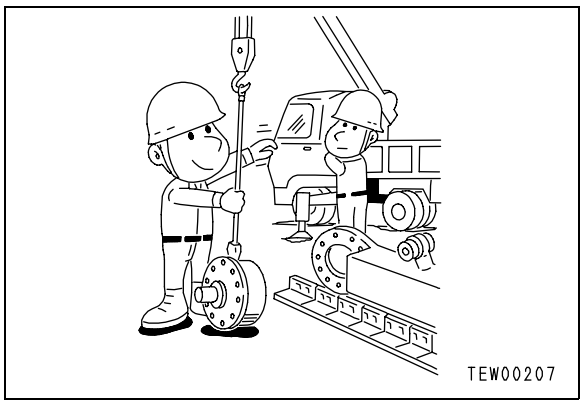
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3. Points to remember when handling hydraulic equipment

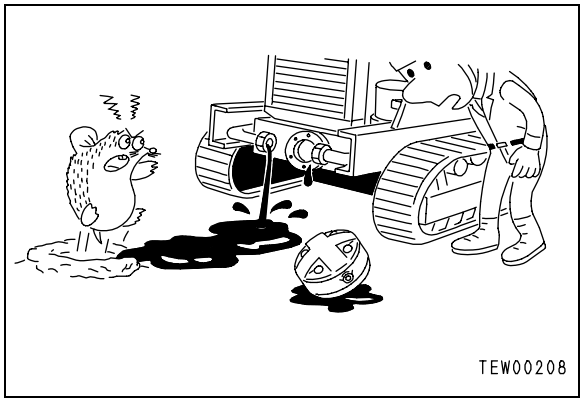
With the increase in pressure and precision of hydraulic equipment, the most common cause of failure is dirt (foreign material) in the hydraulic circuit. When adding hydraulic oil, or when disassembling or assembling hydraulic equipment, it is necessary to be particularly careful.

1) Be careful of the operating environment.
Avoid adding hydraulic oil, replacing filters, or repairing the machine in rain or high winds, or places where there is a lot of dust.

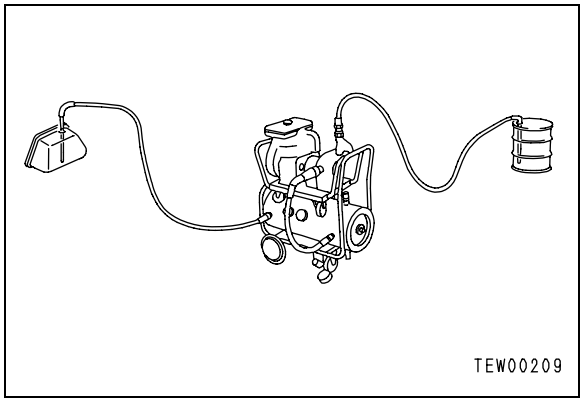
2) **Disassembly and maintenance work in the field**
If disassembly or maintenance work is carried out on hydraulic equipment in the field, there is danger of dust entering the equipment. It is also difficult to confirm the performance after repairs, so it is desirable to use unit exchange. Disassembly and main-tenance of hydraulic equipment should be carried out in a specially prepared dustproof workshop, and the performance should be confirmed with special test equipment.


TEW00207

3) Sealing openings
After any piping or equipment is removed, the openings should be sealed with caps, tapes, or vinyl bags to prevent any dirt or dust from entering. If the opening is left open or is blocked with a rag, there is danger of dirt entering or of the surrounding area being made dirty by leaking oil so never do this.
Do not simply drain oil out on to the ground, collect it and ask the customer to dispose of it, or take it back with you for disposal.


TEW00208

4) Do not let any dirt or dust get in during refilling operations.
Be careful not to let any dirt or dust get in when refilling with hydraulic oil. Always keep the oil filler and the area around it clean, and also use clean pumps and oil containers. If an oil cleaning device is used, it is possible to filter out the dirt that has collected during storage, so this is an even more effective method.


TEW00209

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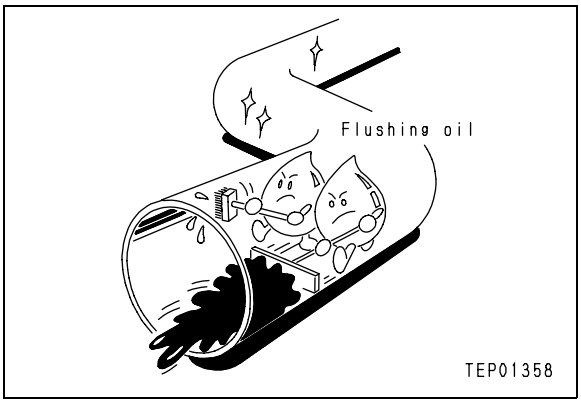
5) Change hydraulic oil when the temperature is high.

When hydraulic oil or other oil is warm, it flows easily. In addition, the sludge can also be drained out easily from the circuit together with the oil, so it is best to change the oil when it is still warm. When changing the oil, as much as possible of the old hydraulic oil must be drained out. (Drain the oil from the hydraulic tank; also drain the oil from the filter and from the drain plug in the circuit.) If any old oil is left, the contaminants and sludge in it will mix with the new oil and will shorten the life of the hydraulic oil.

6) Flushing operations

After disassembling and assembling the equipment, or changing the oil, use flushing oil to remove the contaminants, sludge, and old oil from the hydraulic circuit.

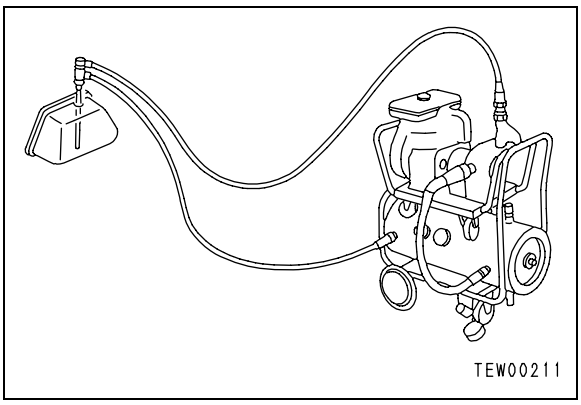
Normally, flushing is carried out twice: primary flushing is carried out with flushing oil, and secondary flushing is carried out with the specified hydraulic oil.



7) Cleaning operations

After repairing the hydraulic equipment (pump, control valve, etc.) or when running the machine, carry out oil cleaning to remove the sludge or contaminants in the hydraulic oil circuit.

The oil cleaning equipment is used to remove the ultrafine (about 3μ) particles that the filter built into the hydraulic equipment cannot remove, so it is an extremely effective device.



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INSPECTION BEFORE TROUBLESHOOTING

	Item	Criterion	Remedy
Lubricating oil/Coolant	1. Check of level and type of fuel	—	Add fuel
	2. Check of fuel for foreign matter	—	Clean or drain
	3. Check of fuel filter cartridge for clogging	—	Replace
	4. Check of level and type of oil in engine oil pan	—	Add oil
	5. Check of engine oil filter for clogging	—	Replace
	6. Check of coolant level	—	Add coolant
	7. Check of air cleaner for clogging	—	Clean or replace
	8. Check of level and type of hydraulic oil	—	Add oil
	9. Check of hydraulic oil strainer for clogging	—	Clean or drain
	10. Check of hydraulic oil filter for clogging	—	Replace
	11. Check of level and type of swing machinery oil	—	Add oil
	12. Check of level and type of final drive oil	—	Add oil
Electrical equipment	1. Check of battery terminal wires for looseness and corrosion	—	Retighten or replace
	2. Check of alternator terminal wires for looseness and corrosion	—	Retighten or replace
	3. Check of starting motor terminal wires for looseness and corrosion	—	Retighten or replace
Hydraulic and mechanical equipment	1. Check for abnormal sound and smell	—	Repair
	2. Check for oil leakage	—	Repair
	3. Air bleeding operation	—	Bleed air
Electrical parts	1. Check of battery voltage (with engine stopped)	20 – 30V	Charge or replace
	2. Check of electrolyte level	—	Add distilled water or replace electrolyte
	3. Check of wires for discoloration, burn, and removal of covers	—	Replace
	4. Check of wires for removal of clamps and looseness	—	Repair
	5. Check of wires for wetting with water (Particularly check connectors and terminals for wetting)	—	Disconnect and dry connectors
	6. Check of fuses for breakage and corrosion	—	Replace
	7. Check of alternator voltage (with engine at medium or higher speed)	Must be 27.5 - 29.5 V after operation of several minutes.	Replace
	8. Check of operating sound of battery relay (when starting switch is turned OFF and ON)	—	Replace

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CLASSIFICATION OF AND PROCEDURES FOR TROUBLESHOOTING

Classification of troubleshooting

Mode	Contents
Code display	Troubleshooting when error code is displayed
E-mode	Troubleshooting for electric system
H-mode	Troubleshooting for hydraulic and mechanical system
S-mode	Troubleshooting for engine unit

Procedure for troubleshooting

If a phenomenon looking like a trouble occurs in the machine, select a proper troubleshooting No. according to the following procedure, and then go to the corresponding troubleshooting section.

1. **Procedure for troubleshooting to be taken when user code is displayed on monitor panel:**
   If a user code is displayed on the monitor panel, display the error code by using the error code display function of the monitor panel.
   Carry out the troubleshooting for the corresponding "Code display" according to the displayed error code.

2. **Procedure for troubleshooting when electrical system error code or mechanical system error code is recorded in error history:**
   If a user code is not displayed on the monitor panel, check the error code with the error code display function of the monitor panel.
   If the error code is recorded, carry out troubleshooting for the corresponding "Code display" according to the displayed error code.
   ★ If error codes are recorded, delete all of them and reproduce them, and then see if the trouble is still detected.
   ★ If an error code is still output, the mark of "E" is displayed at the left end of the lower line.

3. **Procedure for troubleshooting to be taken when user code is not displayed and error history is not recorded:**
   If a user code is not displayed in the monitor panel and an error code is not recorded, a trouble that the machine cannot find out by itself may have occurred in the electrical system or hydraulic and mechanical system.
   In this case, check the phenomenon looking like a trouble again and select the same phenomenon from the table of "Phenomena looking like troubles and troubleshooting Nos.", and then carry out troubleshooting related to that phenomenon in the "E mode", "H mode", or "S mode".

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Phenomena looking like troubles and troubleshooting Nos.

No.	Phenomenon looking like trouble		Troubleshooting			
			Code display	E-mode	H-mode	S-mode
Phenomena related to user code or error code						
1	User codes are displayed on monitor panel		According to displayed code			
2	If error code display function is checked, error codes are displayed					
Phenomena related to engine						
3	Engine does not start easily (It always takes time to start)					S-1
4	Engine does not start	Engine does not crank		E-1		S-2 a)
5		Engine cranks but exhaust smoke does not come out (Fuel is not injected)				S-2 b)
6		Exhaust smoke comes out but engine does not start (Fuel is injected)				S-2 c)
7	Engine speed does not rise sharply (Follow-up performance is low)					S-3
8	Engine stops during operation			E-2		S-4
9	Engine rotation is abnormal (Engine hunts)			E-3		S-5
10	Output is insufficient (Power is low)					S-6
11	Exhaust gas color is bad (Incomplete combustion)					S-7
12	Oil is consumed much (or exhaust gas color is bad)					S-8
13	Oil becomes dirty quickly					S-9
14	Fuel is consumed much					S-10
15	Coolant contains oil (or it blows back or reduces)					S-11
16	Engine oil pressure caution lamp lights up (Oil pressure lowers)					S-12
17	Oil level rises (Water or fuel is mixed in oil)					S-13
18	Water temperature rises too high (Overheating)					S-14
19	Abnormal sound comes out					S-15
20	Vibration is excessive					S-16
21	Engine does not stop			E-4		
22	Auto-decelerator does not operate			E-5	H-5	
23	Automatic warm-up system does not operate			E-6		
24	Preheater does not operate			E-7		
Phenomena related to work equipment, swing, and travel						
25	Speed or power of whole work equipment, travel, and swing is low				H-1	S-6
26	Engine speed lowers extremely or engine stalls				H-2	S-4
27	Work equipment, travel, and swing systems do not work			E-8	H-3	
28	Abnormal sound comes out from around hydraulic pump				H-4	
29	Fine control performance or response is low				H-6	

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No.	Phenomenon looking like trouble	Troubleshooting			
		Code display	E-mode	H-mode	S-mode
Phenomena related to work equipment					
30	Speed or power of boom is low			H-7	
31	Speed or power of arm is low			H-8	
32	Speed or power of bucket is low			H-9	
33	Work equipment does not move singly			H-10	
34	Hydraulic drift of work equipment is large			H-11	
35	Time lag of work equipment is large			H-12	
36	One-touch power maximizing function does not work		E-9	H-13	
Phenomena related to compound operation					
37	In compound operation of work equipment, speed of part loaded more is low			H-14	
38	When machine swings and raises boom simultaneously, boom rising speed is low			H-15	
39	When machine operates work equipment or swings and travels simultaneously, travel speed lowers largely			H-16	
Phenomena related to travel					
40	Machine deviates during travel			H-17	
41	Travel speed is low			H-18	
42	Machine is not steered well or steering power is low			H-19	
43	Travel speed does not change			H-20	
44	Travel motor does not work (only 1 side)			H-21	
45	Travel alarm does not sound or does not stop sounding		E-33		
Phenomena related to swing					
46	Upper structure does not swing			H-22	
47	Swing acceleration or swing speed is low			H-23	
48	Upper structure overruns remarkably when it stops swinging			H-24	
49	Large shock is made when upper structure stops swinging			H-25	
50	Large sound is made when upper structure stops swinging			H-26	
51	Hydraulic drift of swing is large			H-27	
Phenomena related to monitor panel (Operator menu: Ordinary screen)					
52	No items are displayed on monitor panel		E-10		
53	7-segment LED's of monitor panel display partially		E-11		
54	Monitor lamp of monitor panel is different from mounted model		E-12		
55	When starting switch is turned ON, basic check items light up or flash		E-13		
56	While engine is running, caution items flash		E-14		
57	While engine is running, emergency stop items flash		E-15		
58	Engine coolant thermometer does not display normally		E-16		
59	Fuel level gauge does not display normally		E-17		
60	Swing lock monitor does not display normally		E-18		

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No.	Phenomenon looking like trouble	Troubleshooting			
		Code display	E-mode	H-mode	S-mode
61	When monitor switches are operated, display by lamps does not change		E-19		
62	Windshield wiper or windshield washer does not operate		E-20		
63	Lower wiper does not operate		E-21		
64	Caution buzzer cannot be stopped		E-22		
Phenomena related to monitor panel (Service menu: Special function screen)					
65	Monitoring function does not display "Boom RAISE" normally		E-23		
66	Monitoring function does not display "Boom LOWER" normally		E-24		
67	Monitoring function does not display "Arm IN" normally		E-25		
68	Monitoring function does not display "Arm OUT" normally		E-26		
69	Monitoring function does not display "Bucket CURL" normally		E-27		
70	Monitoring function does not display "Bucket DUMP" normally		E-28		
71	Monitoring function does not display "Swing" normally		E-29		
72	Monitoring function does not display "Travel" normally		E-30		
73	Monitoring function does not display "Service" normally		E-31		
Other phenomena					
74	Air conditioner does not operate (Troubleshooting for air conditioner system)		E-32		

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CONNECTOR ARRANGEMENT DRAWING AND ELECTRIC CIRCUIT DIAGRAM OF EACH SYSTEM

Connectors list

★ The address of each connector roughly shows the place of the connector in the connectors stereogram and the circuit diagram of each system.

Connector No	Type	No. of pins	Name of device	Address			
				Stereo-gram	M-circuit	G-circuit	P-circuit
A01	X	4	Intermediate connector	S-1	H-7	I-8	H-8
A02	X	4	Intermediate connector	T-1	H-7	I-8	H-7
A03	DT	12	Intermediate connector	N-3	H-6	I-6	H-7
A04	SWP	6	Intermediate connector	N-1			H-7
A05	SWP	14	Intermediate connector	T-1	H-6		H-6
A06	SWP	14	Intermediate connector	N-1	H-6		H-5
A07	SWP	16	Intermediate connector	S-1	H-4	I-7	H-5
A09	SWP	8	Intermediate connector	N-2			H-5
A10	Terminal	1	Revolving frame ground	I-1	I-1	G-1	I-1
A11	Terminal	1	Revolving frame ground	I-2	I-1		
A12	Terminal	1	Revolving frame ground	I-2	I-1		
A13	Terminal	1	Revolving frame ground	I-2	I-1	G-1	I-1
A14	Terminal	1	Revolving frame ground	L-1	I-1	H-1	
A15	Terminal	1	Revolving frame ground	J-2	I-1		J-1
A16	Terminal	1	Revolving frame ground	J-2	I-1		J-1
A20	Terminal	1	Battery relay (Terminal E)	L-2	J-3	J-4	
A21	Terminal	1	Battery relay (Terminal BR)	L-2	J-2	J-3	
A22	Terminal	1	Battery relay (Terminal M)	K-2	J-2	K-4	
A23	Terminal	1	Battery relay (Terminal B)	K-3	J-2	K-3	
A25	Terminal	1	Heater relay (Coil)	K-1	K-3	K-7	
A26	Terminal	1	Heater relay (Contact)	K-1	K-3	K-7	
A27	X	2	Starting motor safety relay (Terminals S, R)	L-1	K-3	K-5	
A29	Terminal	1	Starting motor safety relay (Terminals C)	K-2	K-3	L-5	
A31	D	2	Air cleaner clogging switch	L-7	K-5		
A33	X	2	Radiator coolant level sensor	L-5	K-5		
A34	L	2	Fusible link (65A)	L-3	K-7	L-3	
A35	M	2	Fusible link (30A)	L-3	K-7	L-3	
A41	090-II	1	Horn	G-1			
A42	X	1	Intermediate connector	G-9	G-2		
A43	X	2	Travel alarm (If equipped)	I-9			K-5
A44	One-pin connector	1	Working lamp (Right front)	D-9	H-1		
A50	X	2	Intermediate connector	E-9			
A50	KES0	2	Windshield washer motor (Tank)	E-9	K-6		
A51	D	3	Pump oil pressure sensor	I-9			K-6
A60	X	1	Fuel level sensor	G-9	K-5		
A61	D	2	Hydraulic oil temperature sensor	K-9	K-6		
A70	D	3	Overload alarm pressure sensor (If equipped)	G-9			A-70
A71K	D	2	Fuel priming pump (If equipped)	G-1			
A80	—	4	Spare connector	R-1			
A95	D	2	Spare connector	K-8			
A96	D	2	Spare connector	K-8			
A97	D	2	Spare connector	L-8			
A98	D	2	Spare connector	L-8			
A99	SWP	8	Intermediate connector	N-2	H-3		H-4

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Connector No	Type	No. of pins	Name of device	Address			
				Stereo-gram	M-circuit	G-circuit	P-circuit
C01	DRC	24	Governor and pump controller	U-9	A-4	A-8	A-8
C02	DRC	40	Governor and pump controller	V-9	A-3	A-7	A-7
C03	DRC	40	Governor and pump controller	W-9	A-3	A-4	A-4
C09	S	8	Model selection connector	U-9		C-8	
D01	SWP	8	Concentrated diode	W-9	A-8	D-1	G-8
D02	SWP	8	Concentrated diode	W-8	A-8	D-1	
D03	SWP	8	Concentrated diode	W-3	L-3		
E01	Terminal	1	Electrical intake air heater	J-9		L-7	
E02	Terminal	1	Engine oil pressure switch	K-8	L-4		
E03	D	2	Engine oil level switch	K-8	K-6		
E04	D	2	Engine speed sensor	H-9			K-9
E05	D	2	Engine coolant temperature sensor	K-8	K-5		
E06	M	3	Fuel control dial	O-8		F-1	
E06	X	1	Air conditioner compressor magnetic clutch	J-8			
E08	X	2	Intermediate connector	L-7	K-4	I-1	
E10	D	3	Governor potentiometer	J-9		K-6	
E11	D	4	Governor motor	J-8		K-6	
E12	X	2	Alternator [35-A alternator specification]	J-2	K-2	L-2	
F02A	SWP	2	Intermediate connector	AA-9			
F02B	DT	2	Rotary lamp (If equipped)	AA-9			
FB1	—	—	Fuse box	U-2	J-9	B-1	D-3
H07	M	2	Intermediate connector	Y-5			
H08	M	8	Intermediate connector	W-6	J-8		
H09	S	8	Intermediate connector	W-6	J-8		
H10	S	16	Intermediate connector	S-9	C-7	I-9	
H11	S	16	Intermediate connector	S-9	C-6	I-9	B-9
H12	S	12	Intermediate connector	S-9	C-5	I-8	
H15	090	20	Intermediate connector	N-7	C-3		C-3
J01	J	20	Junction connector (Black)	T-9	C-9	D-9	C-9
J02	J	20	Junction connector (Black)	V-3	C-9	D-9	D-9
J03	J	20	Junction connector (Green)	V-3	D-9		D-9
J04	J	20	Junction connector (Green)	V-3	D-9	E-9	E-9
J05	J	20	Junction connector (Pink)	V-3	E-9	E-9	E-9
J06	J	20	Junction connector (Orange)	W-3	E-9		
J07	J	20	Junction connector (Orange)	W-4	F-9	F-9	E-9
J08	J	20	Junction connector (Pink)	W-4			
J09	J	20	Junction connector (Pink)	W-3	F-9		E-9
J10	J	20	Junction connector (Orange)	W-3	G-9		
K19	M	2	Pump resistor (For driving pump in emergency)	W-3			G-8
K30	DT	3	CAN terminal resistance	W-7	A-3	C-1	
K31	DT	3	CAN terminal resistance	N-4	A-4	L-8	
M07	M	3	Light switch	P-8	B-1		
M09	M	1	Working lamp (Boom front)	F-9	G-1		
M13	—	2	Speaker (Right)	AC-8			
M19	—	2	Cigarette lighter	N-3			
M21	PA	9	Radio (If equipped)	U-2			
M22	090	6	Right lever knob switch	N-7			
M23	090	8	Left lever knob switch	T-1			B-8
M26	SWP	12	Intermediate connector	W-4			
M27	—	16	Air conditioner unit	W-5			
M29	040	20	Air conditioner control panel	U-2			

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Connector No	Type	No. of pins	Name of device	Address			
				Stereo-gram	M-circuit	G-circuit	P-circuit
M30	—	16	Air conditioner control panel	U-2			
M31	M	2	Optional power supply (2)	W-6			
M31B	M	2	Heated seat (If equipped)	U-2			
M32	M	2	Optional power supply (1)	Y-5			
M32B	M	2	Heated seat (If equipped)	V-2			
M33	M	2	Heated seat switch (If equipped)	W-2			
M33	SWP	8	Air conditioner unit	W-6			
M40	SWP	2	Headlamp (Left)	Z-8	K-8		
M40A	SWP	2	Intermediate connector	AA-8	K-8		
M40B	SWP	2	Rear lamp (If equipped)	AC-8	K-8		
M41	SWP	2	Headlamp (Right)	Y-7	K-7		
M42	X	1	Intermediate connector	I-9	H-2		
M43	M	1	Working lamp (Rear) (If equipped)	I-9	H-1		
M45	D	12	Network bus connector	W-8			
M46	090	4	RS232C junction connector	V-9		B-9	
M50	AMP	8	Radio cassette (If equipped)	AD-8			
M51	AMP	8	Radio cassette (If equipped)	AD-8			
M71	M	2	Room lamp	Z-8			
M72	M	4	DC/DC converter	W-7			
M73	—	2	Speaker (Left)	AD-7			
M91	M	1	Working lamp (Left front) (If equipped)	H-1	H-8		
M92	KES0	4	Lower wiper motor	H-1	H-8		
P01	070	12	Monitor panel	N-6	A-7	L-9	
P02	040	20	Monitor panel	N-5	A-6	L-9	A-9
P03	M	2	Caution buzzer stop switch	P-9	B-1		
P05	M	2	Rotary lamp switch (If equipped)	W-2			
P06	M	2	Lower wiper switch	W-1	F-1		
P15	Y050	2	Air conditioner daylight sensor (If equipped)	N-6			
P17	—	2	Air conditioner high/low pressure switch	N-4			
P70	040	16	Monitor panel	N-5	A-5	L-9	
R10	R	5	Light relay (1)	O-8	D-1		
R11	R	5	Starting motor cutout relay (PPC lock)	P-8	D-1	B-9	
R13	R	5	Starting motor cutout relay (Personal code)	Q-9	D-1		
R16	R	5	Light relay (2)	T-9	E-1		
R17	R	5	12-V selector relay	W-4			
R18	R	5	Lower wiper relay	T-9	E-1		
R20	R	5	Spare connector	T-9			C-9
R22	R	5	Spare connector	U-9			C-9
R30	R	5	Air conditioner blower relay	W-6			
R31	R	5	Air conditioner compressor relay	W-5			
S01	X	2	Bucket CURL pressure switch	L-6			K-4
S02	X	2	Boom LOWER oil pressure switch	L-4			K-4
S03	X	2	Swing LEFT oil pressure switch	L-7			K-3
S04	X	2	Arm IN pressure switch	L-5			K-4
S05	X	2	Bucket DUMP oil pressure switch	L-6			K-3
S06	X	2	Boom RAISE oil pressure switch	L-4			K-5
S07	X	2	Swing RIGHT oil pressure switch	L-6			K-3
S08	X	2	Arm OUT oil pressure switch	L-5			K-4
S09	X	2	Intermediate connector	L-3			H-3
S10	X	2	Service 1 (Front) oil pressure switch (If equipped)	L-3			G-2
S11	X	2	Service 1 (Rear) oil pressure switch (If equipped)	K-3			G-2

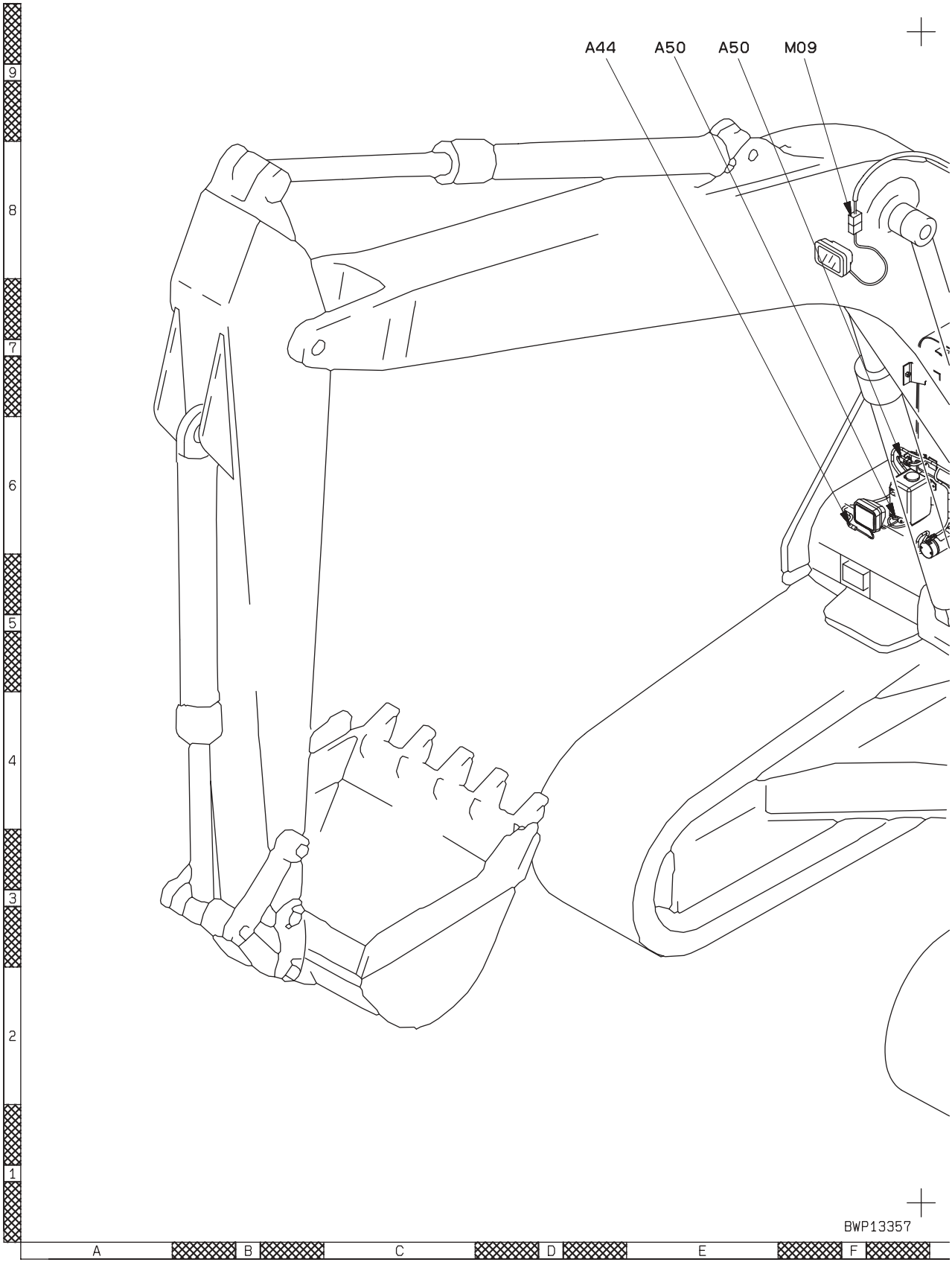
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Connector No	Type	No. of pins	Name of device	Address			
				Stereo-gram	M-circuit	G-circuit	P-circuit
S14	M	3	Safety lock switch	T-1	K-9		F-8
S21	Terminal	6	Emergency pump drive switch	R-9			E-2
S21	X	2	Service 2 (Front) oil pressure switch (If equipped)	K-3			G-1
S22	Terminal	6	Swing holding brake release switch	R-9			F-2
S22	X	2	Service 2 (Rear) oil pressure switch (If equipped)	K-3			G-1
S25	090	16	Intermediate connector	Q-9			E-3
S30	X	2	Travel oil pressure switch	O-1			A-1
S31	X	2	Spare connector	P-1			A-1
SC	Terminal	1	Starting motor (Terminal C)	J-8			
T05	Terminal	1	Floor frame ground	V-2			
T06	Terminal	1	Radio body ground	U-2			
T06A	M	1	Intermediate connector	T-2			
T11	Terminal	1	Cab ground	AD-3			
T13	D	1	Intermediate connector	K-8	K-4	I-2	
T91	D	1	Intermediate connector	K-8	K-4	I-2	
T92	D	1	Intermediate connector	K-8	K-4	I-1	
V01	D	2	PPC lock solenoid valve	J-2			K-8
V04	D	2	Travel speed shifting solenoid valve	J-2			K-7
V05	D	2	Swing holding brake solenoid valve	J-3			K-7
V06	D	2	2-stage relief solenoid	K-3			K-7
V21	D	2	PC-EPC solenoid valve	K-9			K-9
V22	D	2	LS-EPC solenoid valve	K-9			K-8
V30	X	2	Spare connector	N-2			A-1
W03	X	2	Window rear limit switch	AB-9	K-8		
W04	M	6	Wiper motor	Y-3	A-9		
X05	M	4	Swing lock switch	Q-9	C-1		C-2

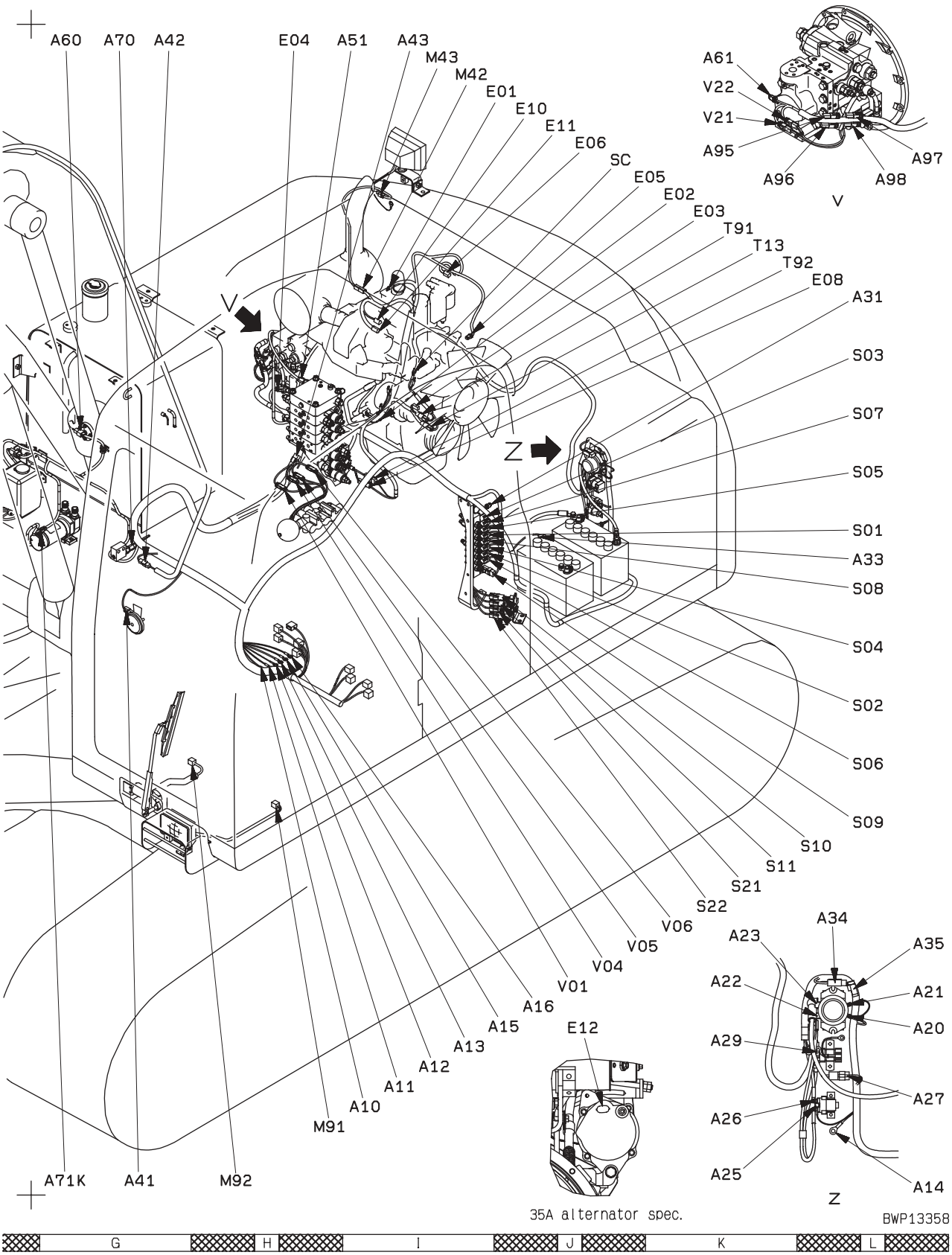
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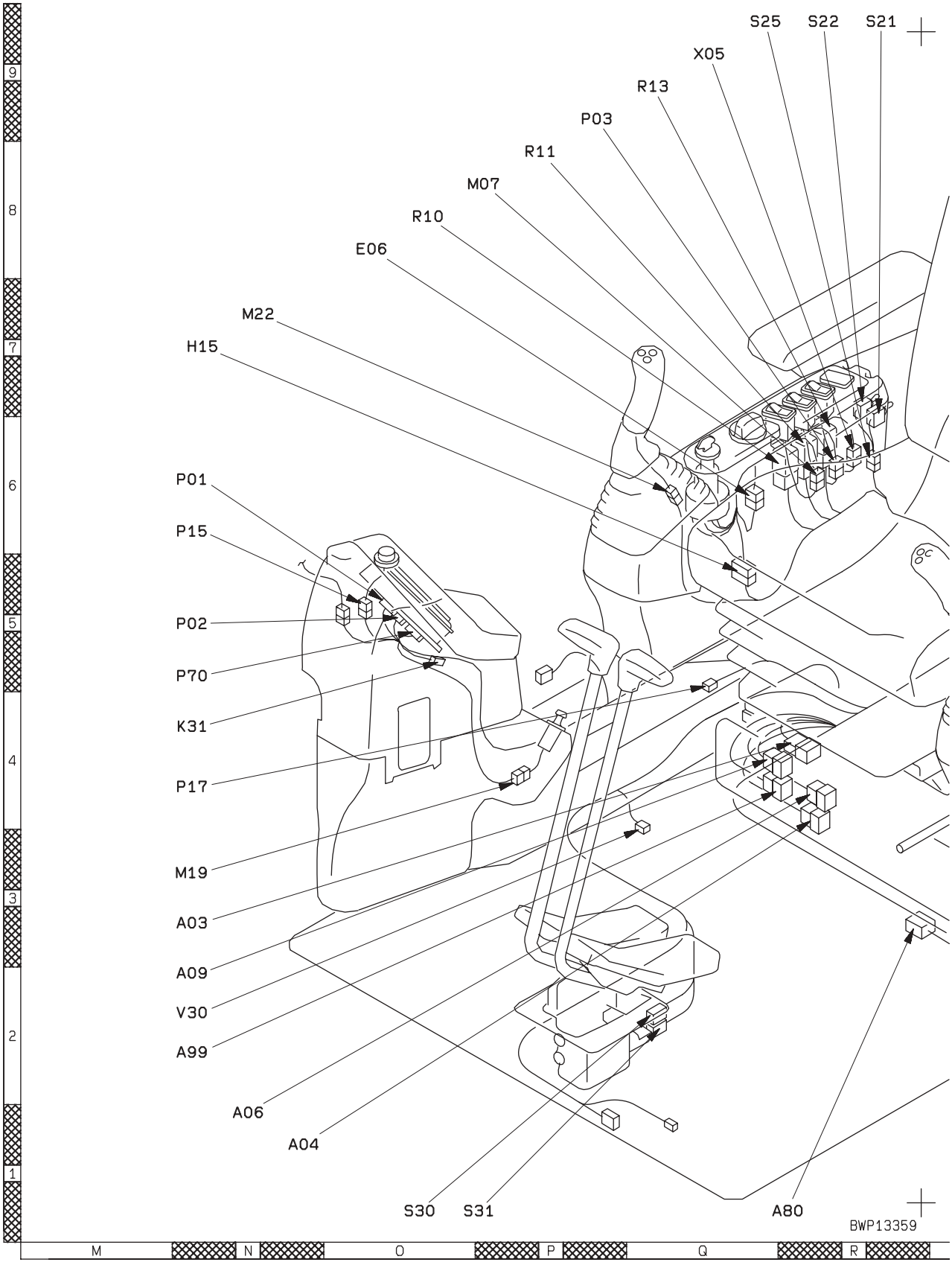
STEREOGRAM OF CONNECTORS



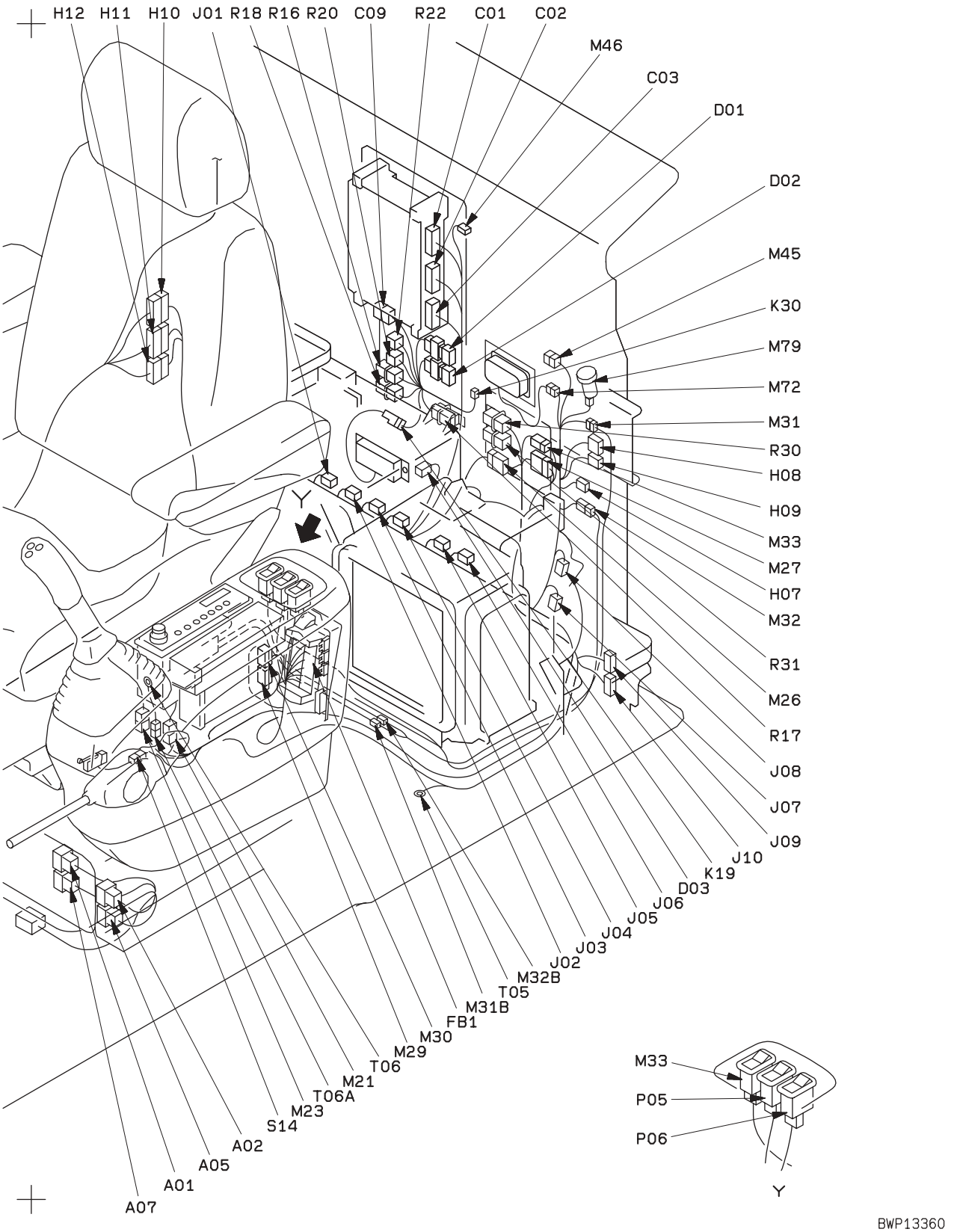
https://truckmanualshub.com/



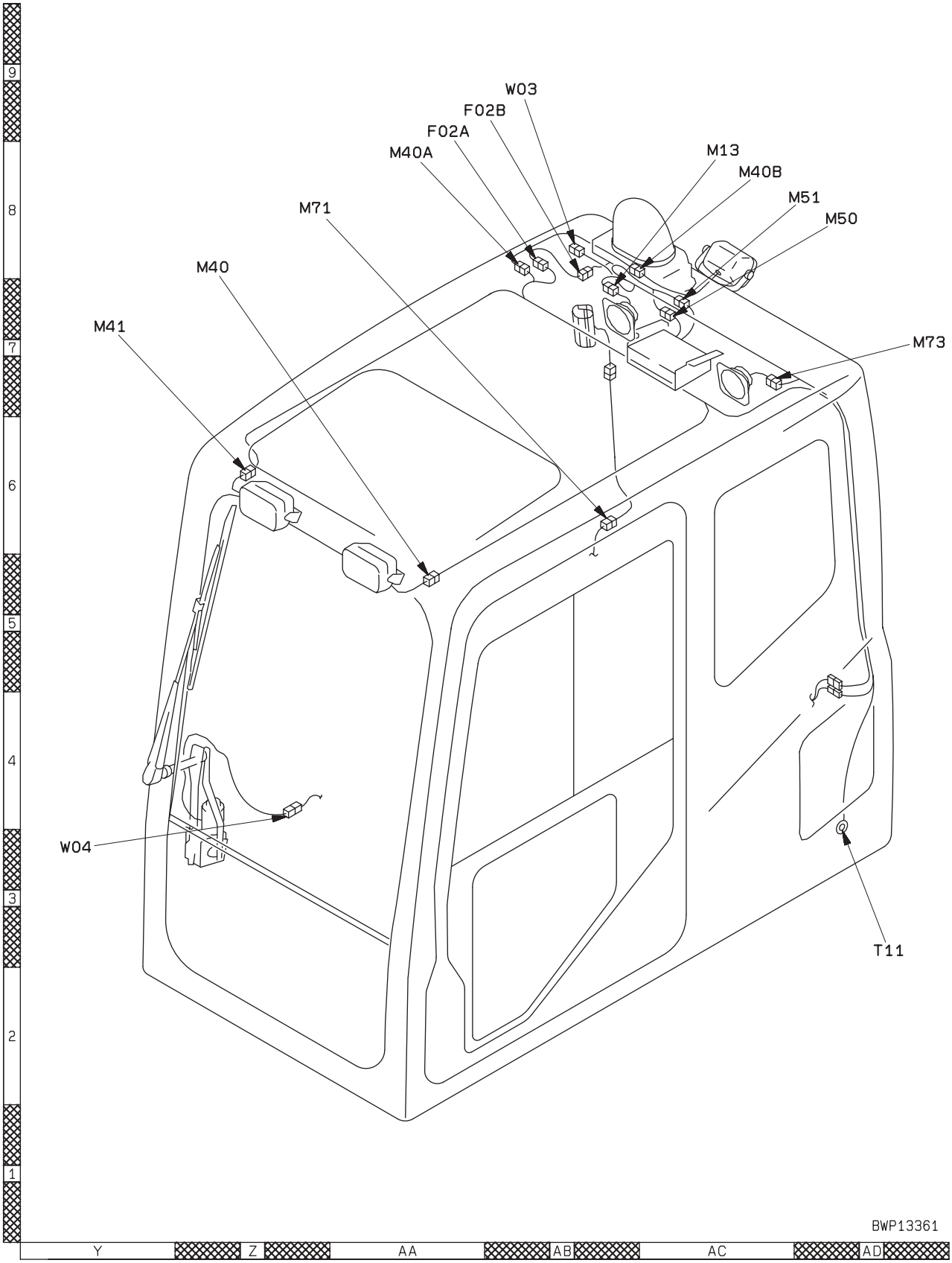
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https://truckmanualshub.com/



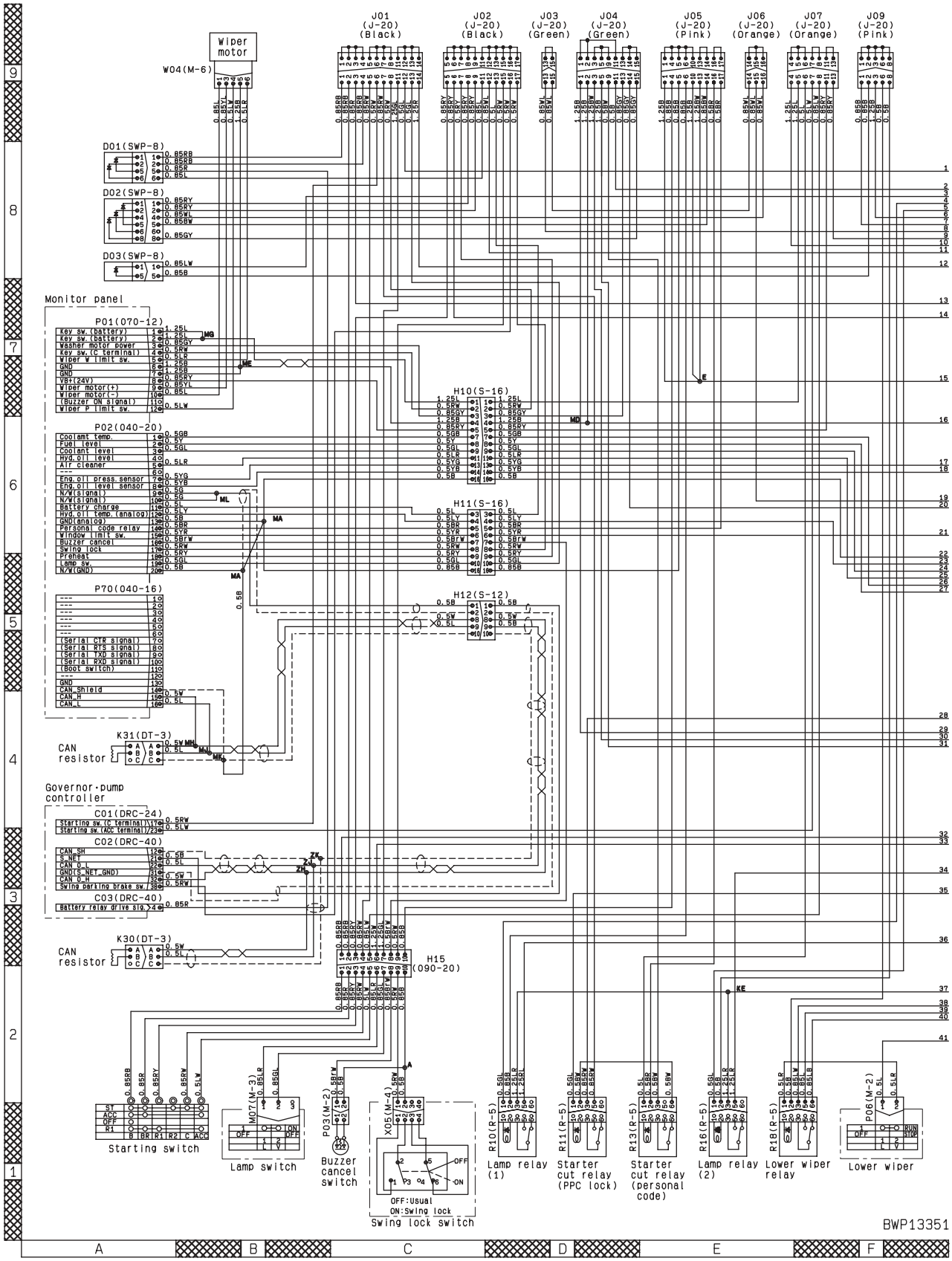
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https://truckmanualshub.com/

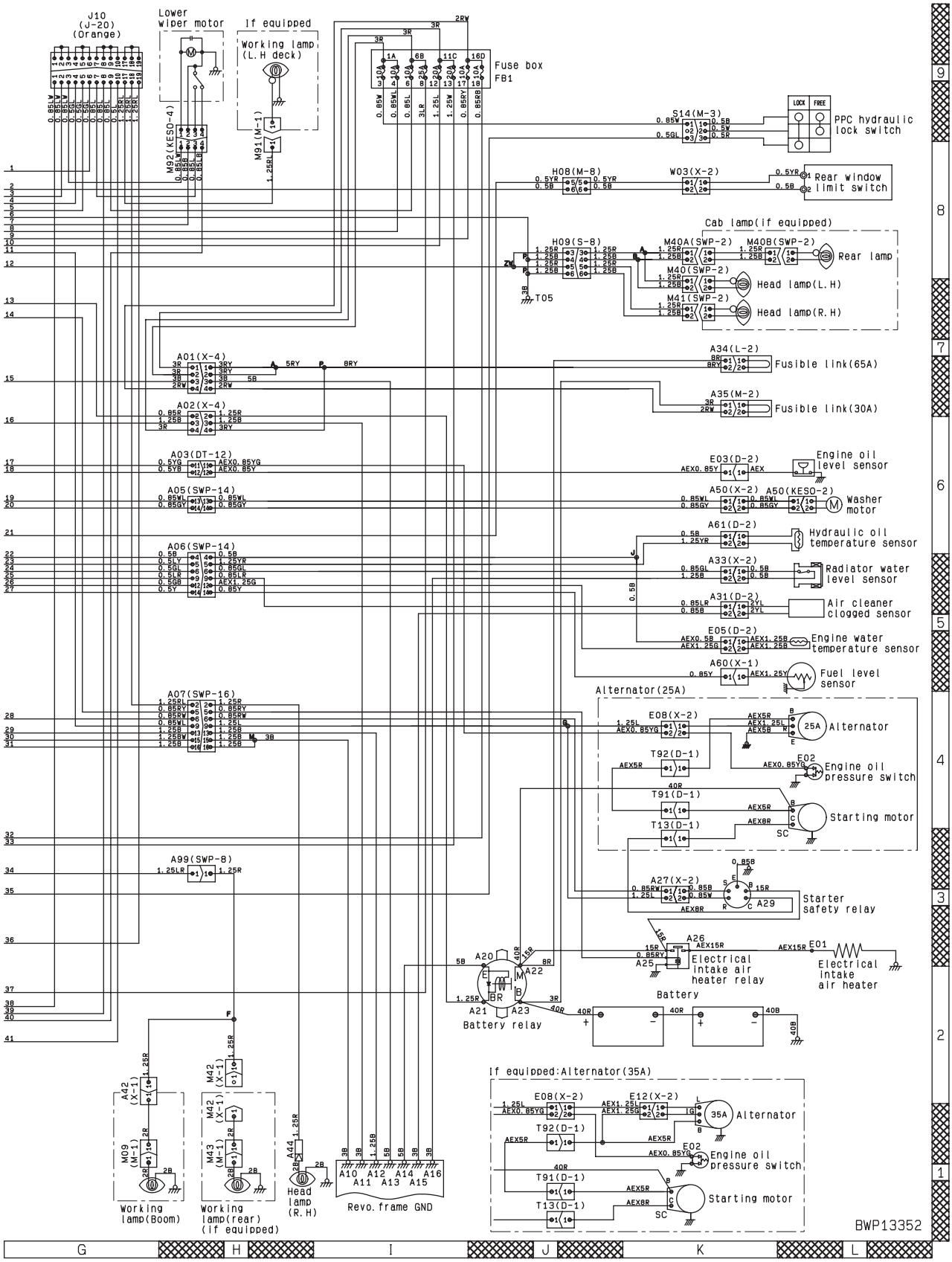
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CIRCUIT DIAGRAM OF MONITOR PANEL SYSTEM (M-CIRCUIT)



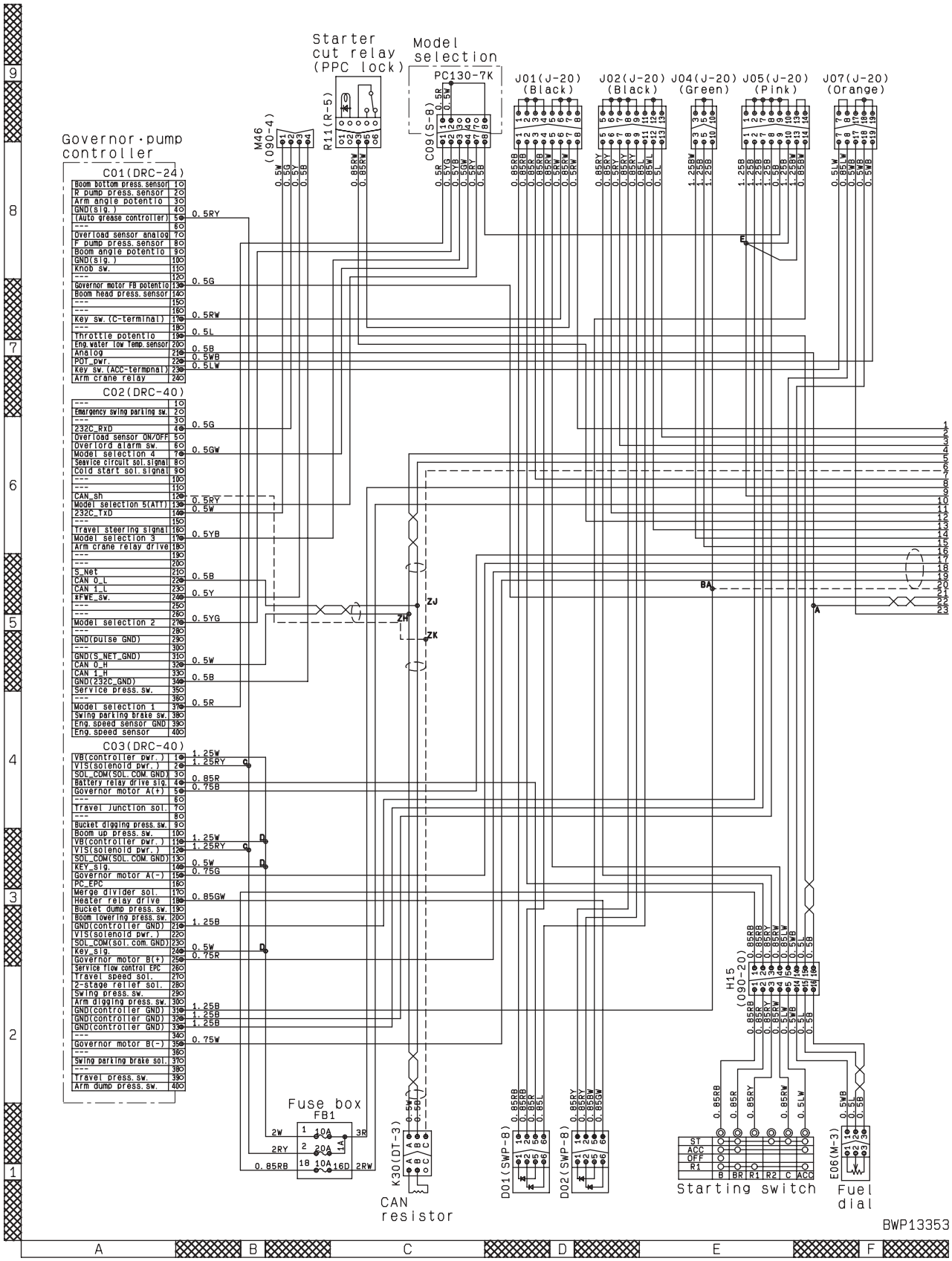
https://truckmanualshub.com/

★ This circuit diagram is made by excerpting the monitor panel system, engine preheating/starting/charging system, lower wiper system, and light system from the general electric circuit diagram.



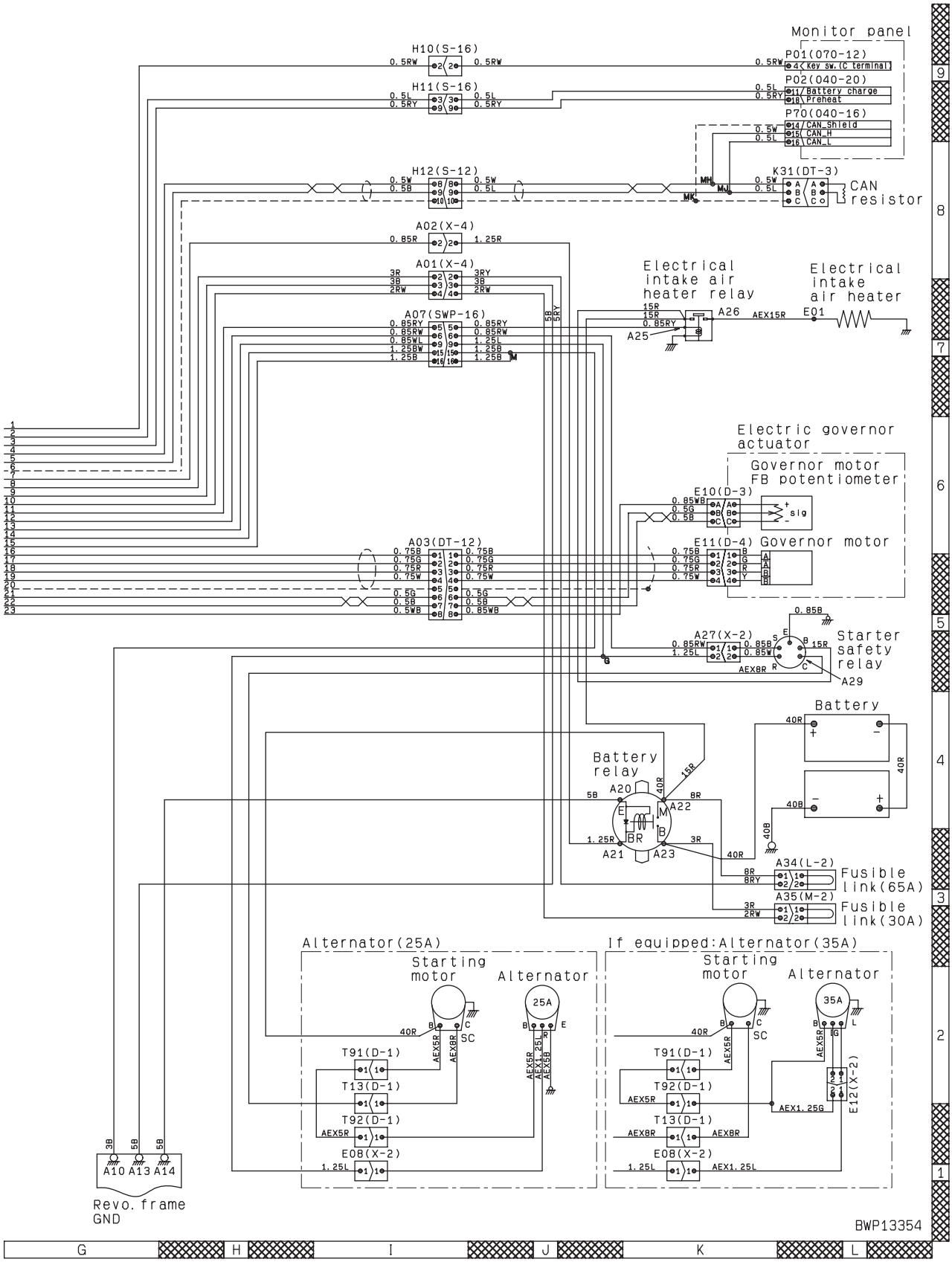
https://truckmanualshub.com/

CIRCUIT DIAGRAM OF ENGINE THROTTLE CONTROL SYSTEM OF GOVERNOR AND PUMP CONTROLLER (G-CIRCUIT)



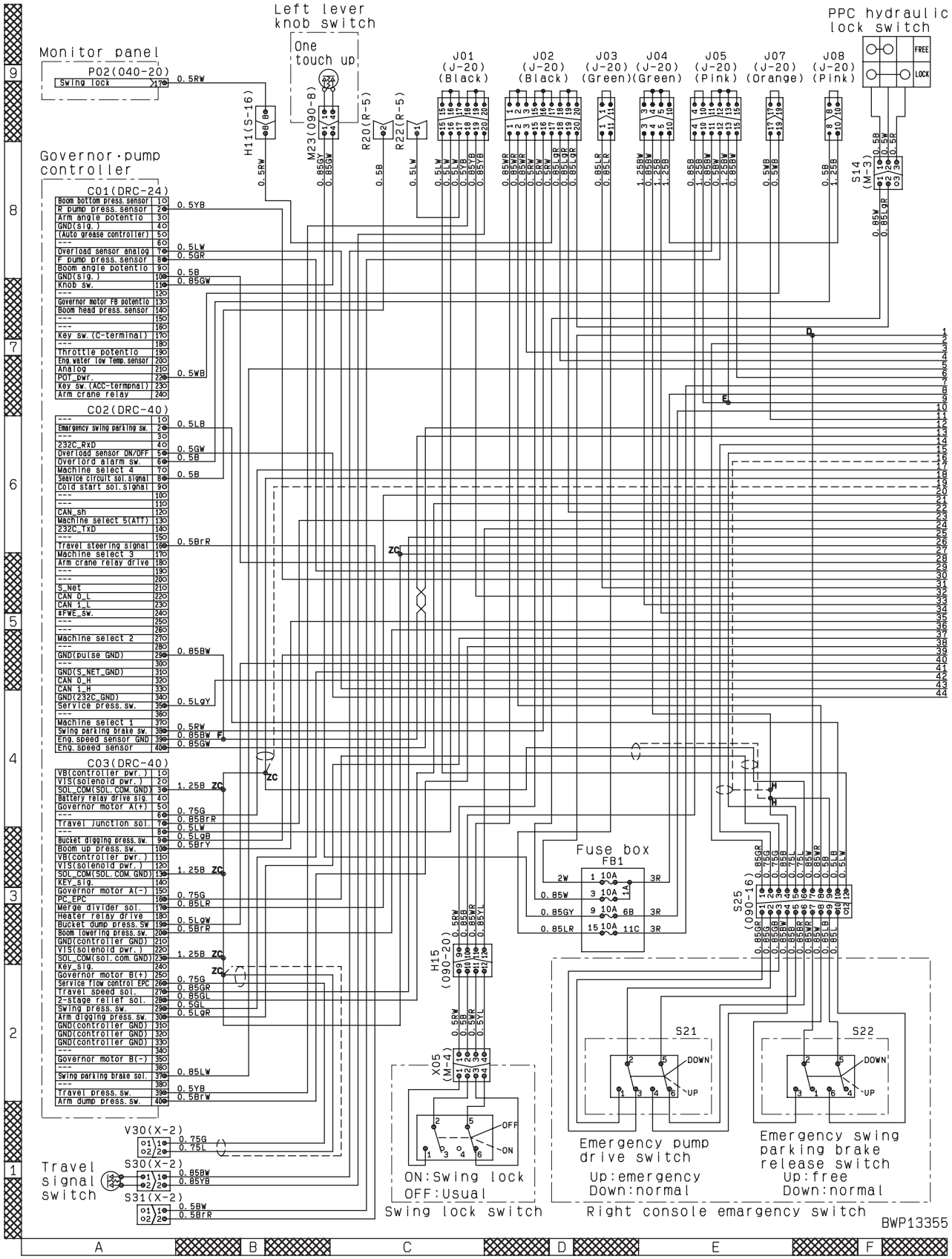
https://truckmanualshub.com/

★ This circuit diagram is made by excerpting the governor and pump controller system (engine throttle/power supply/model selection/communication system) from the general electric circuit diagram.



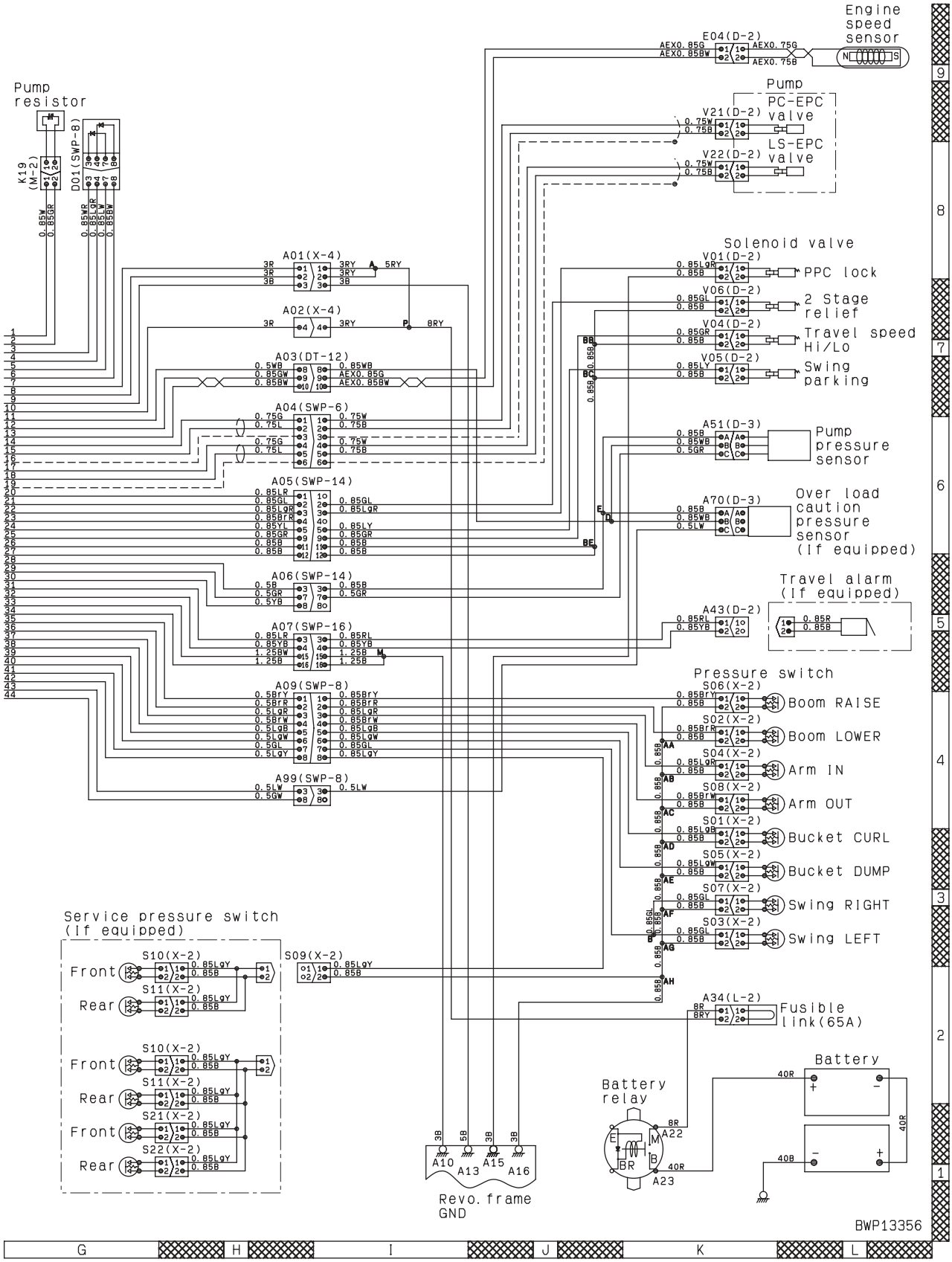
https://truckmanualshub.com/

CIRCUIT DIAGRAM OF PUMP CONTROL SYSTEM OF GOVERNOR AND PUMP CONTROLLER (P-CIRCUIT)



https://truckmanualshub.com/

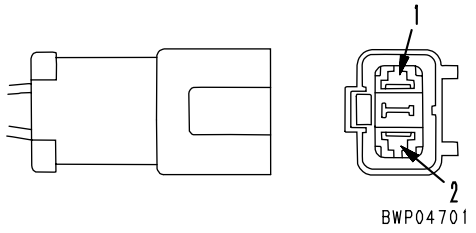
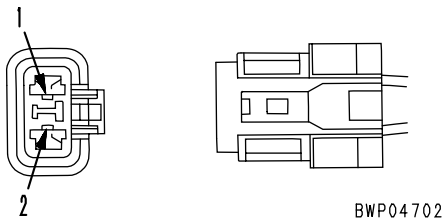
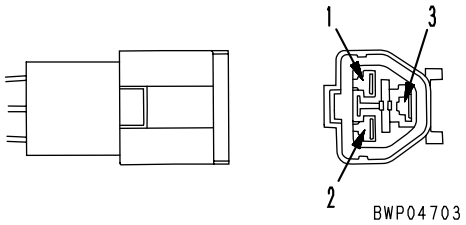
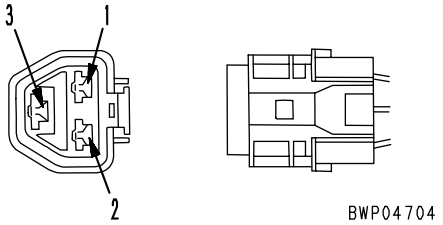
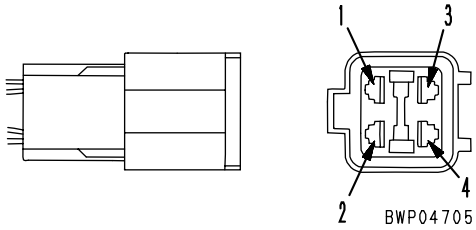
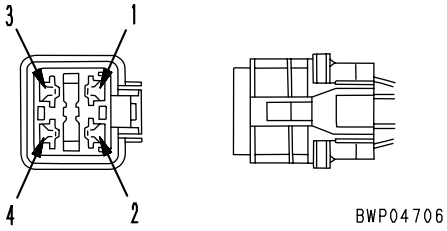
★ This circuit diagram is made by excerpting the governor and pump controller system (pump control), PPC lock system, and travel alarm system from the general electric circuit diagram.



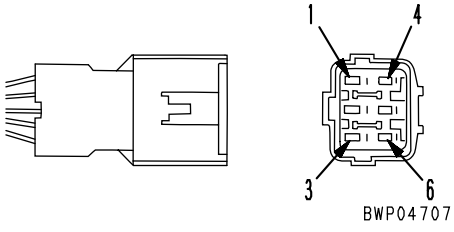
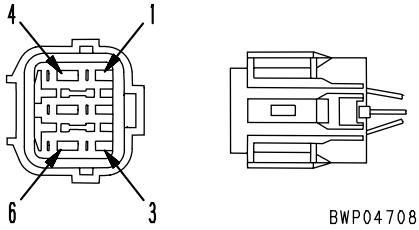
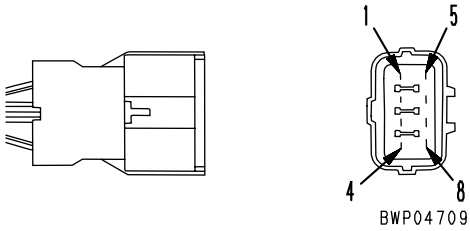
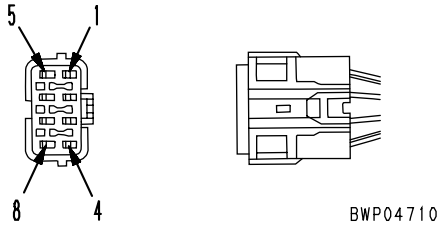
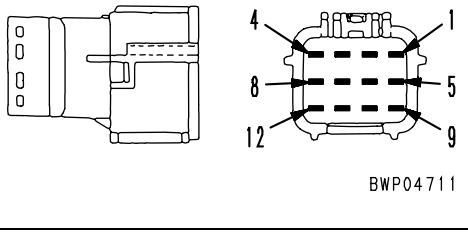
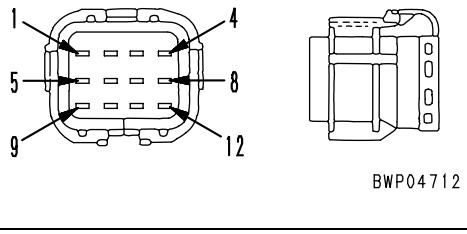
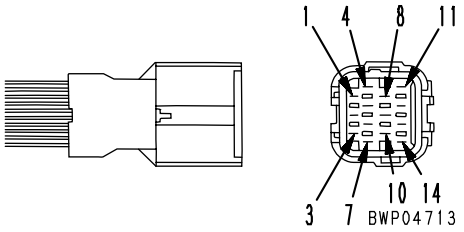
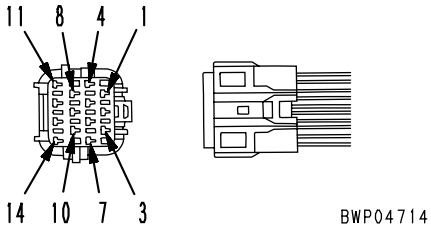
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CONNECTION TABLE FOR CONNECTOR PIN NUMBERS

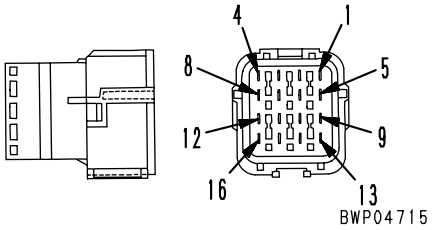
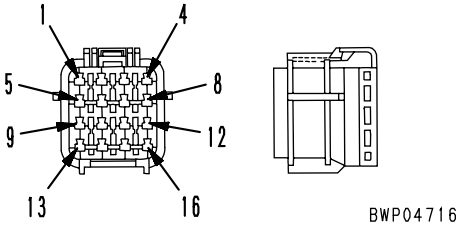
★ The terms male and female refer to the pins, while the terms male housing and female housing refer to the mating portion of the housing.

No.of pins	X type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
1	Part No.: 08055-00181	Part No.: 08055-00191	799-601-7010
2			799-601-7020
	Part No.: 08055-00282	Part No.: 08055-00292	
3			799-601-7030
	Part No.: 08055-00381	Part No.: 08055-00391	
4			799-601-7040
	Part No.: 08055-00481	Part No.: 08055-00491	
—	Terminal part No.: 79A-222-3370 • Electric wire size: 0.85 • Grommet: Black • Q'ty: 20	Terminal part No.: 79A-222-3390 • Electric wire size: 0.85 • Grommet: Black • Q'ty : 20	—
—	Terminal part No.: 79A-222-3380 • Electric wire size: 2.0 • Grommet: Red • Q'ty: 20	Terminal part No.: 79A-222-3410 • Electric wire size: 2.0 • Grommet: Red • Q'ty: 20	—

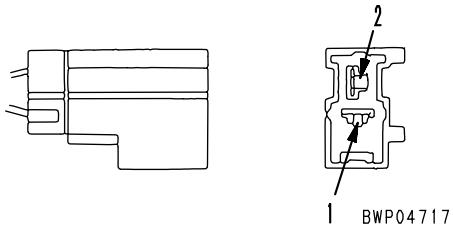
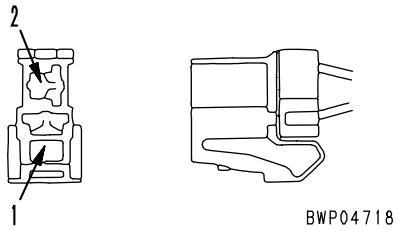
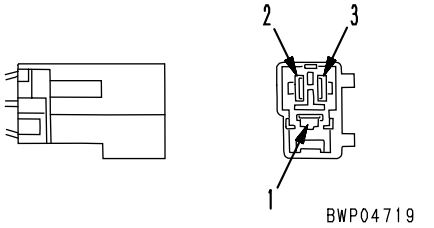
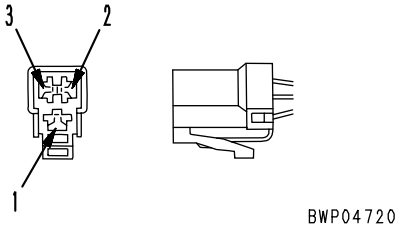
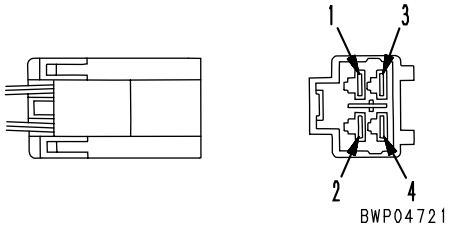
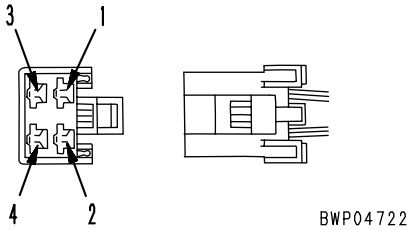
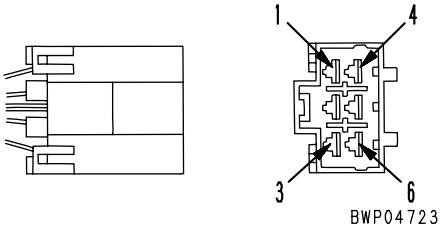
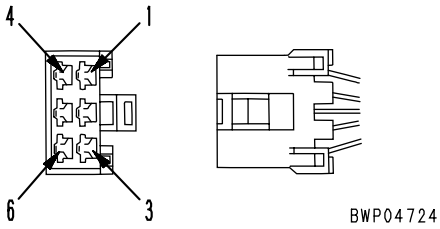
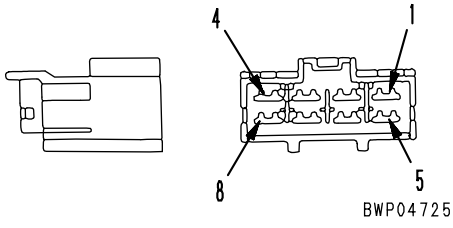
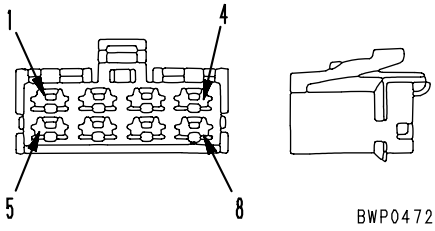
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No.of pins	SWP type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
6			799-601-7050
	Part No.: 08055-10681	Part No.: 08055-10691	
8			799-601-7060
	Part No.: 08055-10881	Part No.: 08055-10891	
12			799-601-7310
	Part No.: 08055-11281	Part No.: 08055-11291	
14			799-601-7070
	Part No.: 08055-11481	Part No.: 08055-11491	

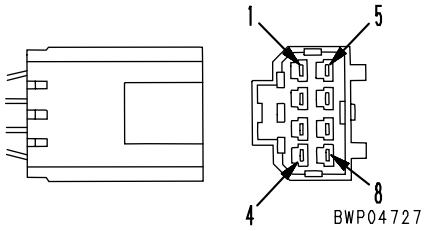
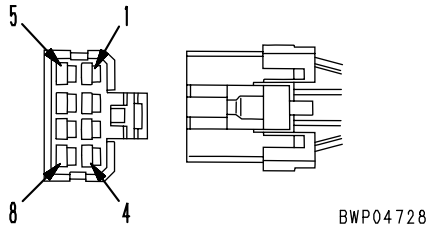
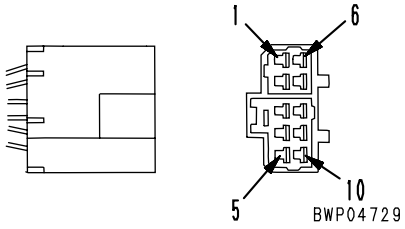
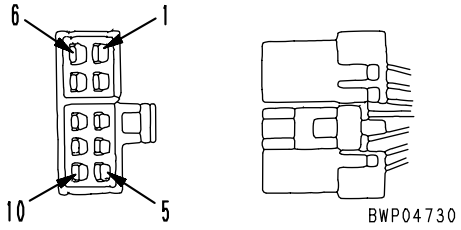
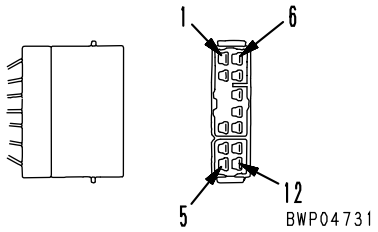
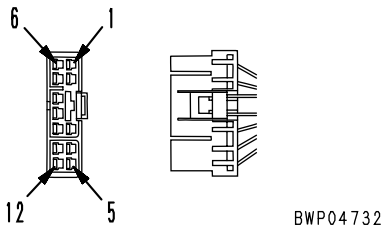
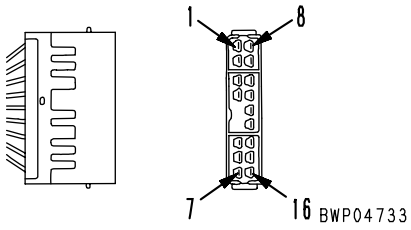
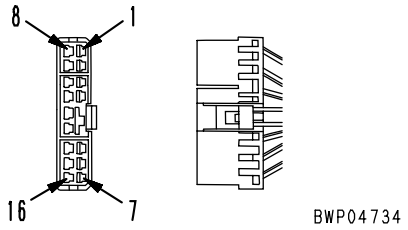
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No. of pins	SWP type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
16			799-601-7320
	Part No.: 08055-11681	Part No.: 08055-11691	
—	Terminal part No.: • Electric wire size: 0.85 • Grommet: Black • Q'ty: 20	Terminal part No.: • Electric wire size: 0.85 • Grommet: Black • Q'ty: 20	—
—	Terminal part No.: • Electric wire size: 1.25 • Grommet: Red • Q'ty: 20	Terminal part No.: • Electric wire size: 1.25 • Grommet: Red • Q'ty: 20	—

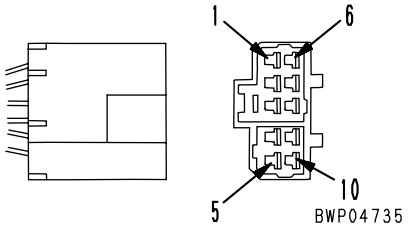
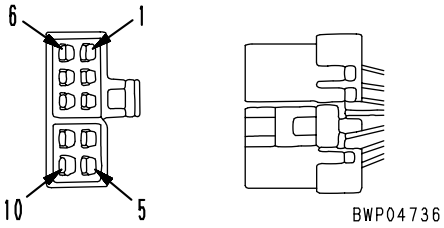
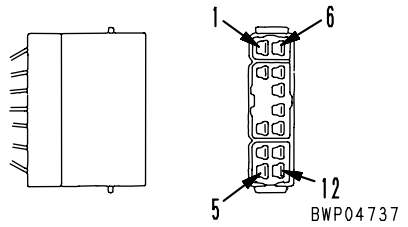
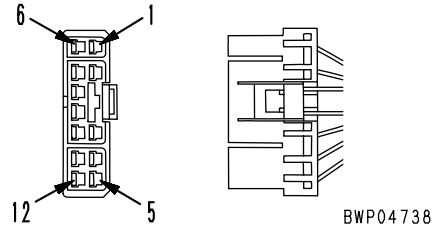
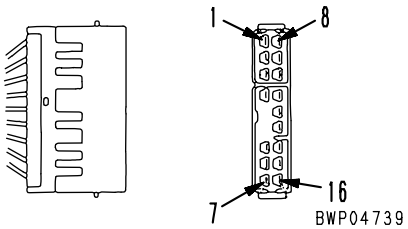
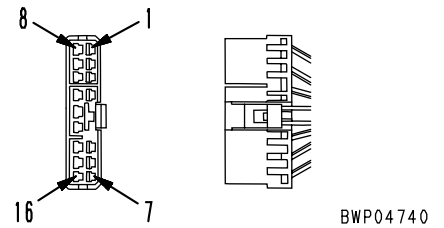
https://truckmanualshub.com/

No.of pins	M type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
1	Part No.: 08056-00171	Part No.: 08056-00181	799-601-7080
2			799-601-7090
	Part No.: 08056-00271	Part No.: 08056-00281	
3			799-601-7110
	Part No.: 08056-00371	Part No.: 08056-00381	
4			799-601-7120
	Part No.: 08056-00471	Part No.: 08056-00481	
6			799-601-7130
	Part No.: 08056-00671	Part No.: 08056-00681	
8			799-601-7340
	Part No.: 08056-00871	Part No.: 08056-00881	

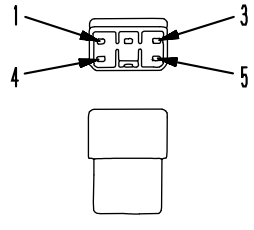
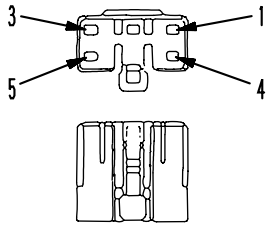
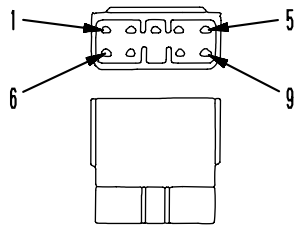
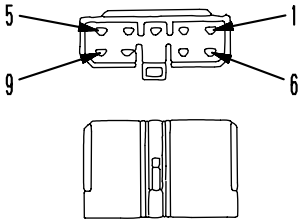
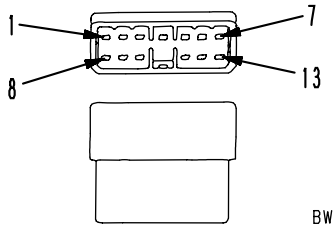
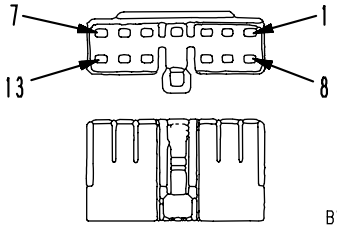
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No.of pins	S type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
8			799-601-7140
	Part No.: 08056-10871	Part No.: 08056-10881	
10 (White)			799-601-7150
	Part No.: 08056-11071	Part No.: 08056-11081	
12 (White)			799-601-7350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

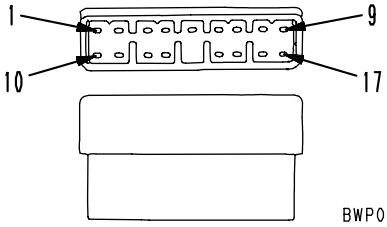
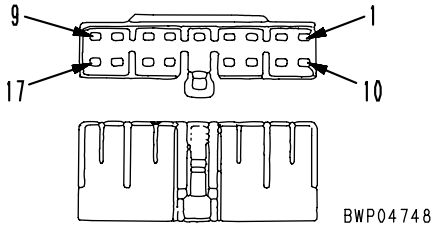
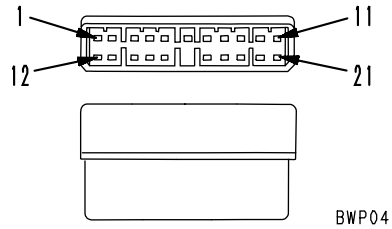
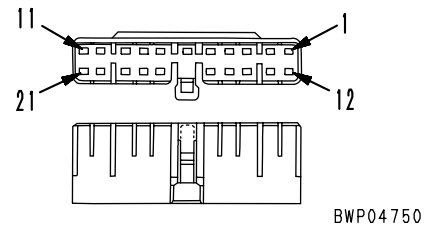
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<tr><td>—</td><td>—</td></tr>
<tr><td>12 (Blue)</td><td> 
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</td><td>799-601-7160</td></tr>
<tr><td>Part No.: 08056-11272</td><td>Part No.: 08056-11282</td></tr>
<tr><td>16 (Blue)</td><td> 
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</td><td>799-601-7170</td></tr>
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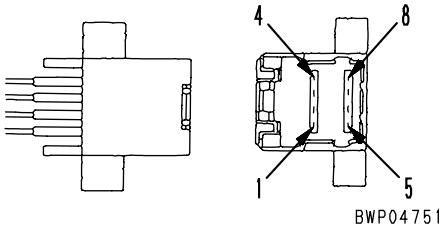
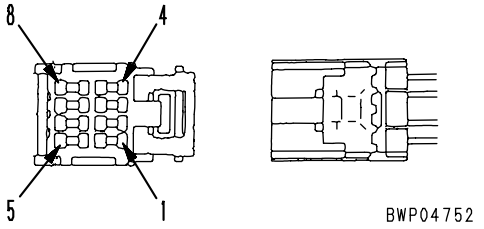
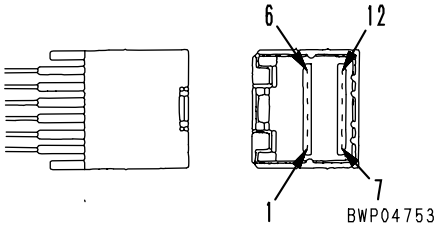
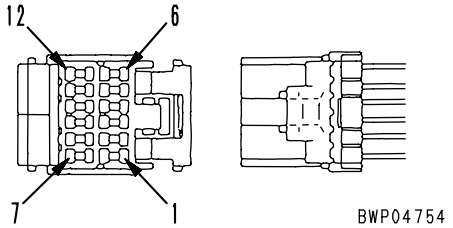
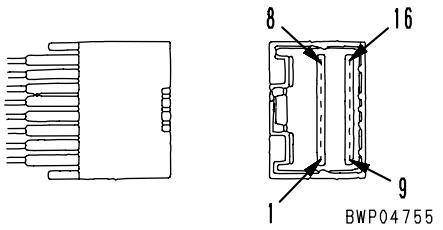
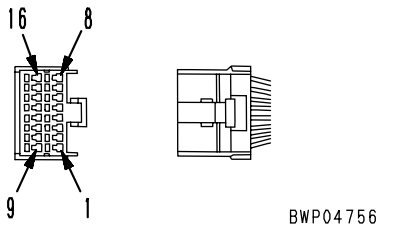
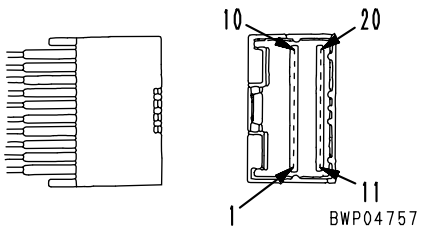
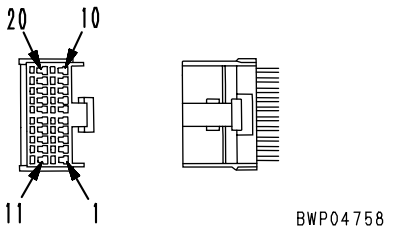
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No.of pins	MIC type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
7	Body part No.: 79A-222-2640 (Q'ty: 5)	Body part No.: 79A-222-2630 (Q'ty: 5)	—
11	Body part No.: 79A-222-2680 (Q'ty: 5)	Body part No.: 79A-222-2670 (Q'ty: 5)	—
5	 BWP04741	 BWP04742	799-601-2710
	Body part No.: 79A-222-2620 (Q'ty: 5)	Body part No.: 79A-222-2610 (Q'ty: 5)	
9	 BWP04743	 BWP04744	799-601-2950
	Body part No.: 79A-222-2660 (Q'ty: 5)	Body part No.: 79A-222-2650 (Q'ty: 5)	
13	 BWP04745	 BWP04746	799-601-2720
	Body part No.: 79A-222-2710 (Q'ty: 2)	Body part No.: 79A-222-2690 (Q'ty: 2)	

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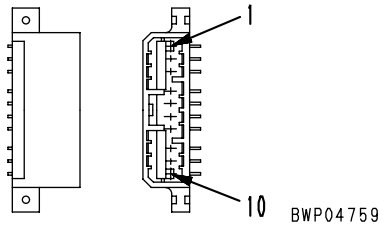
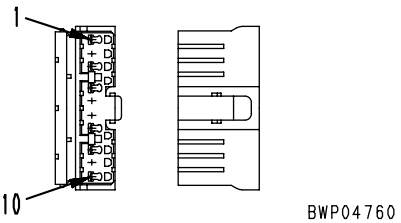
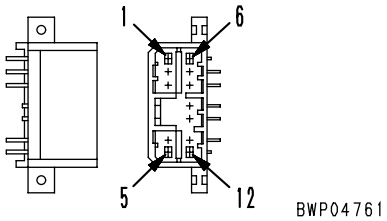
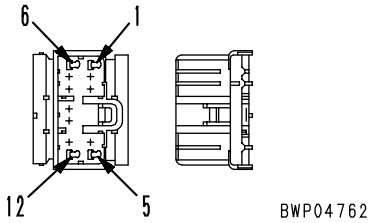
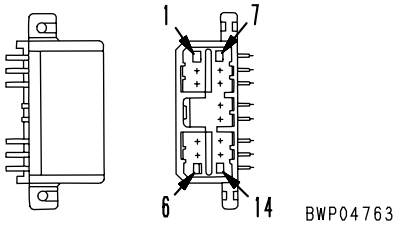
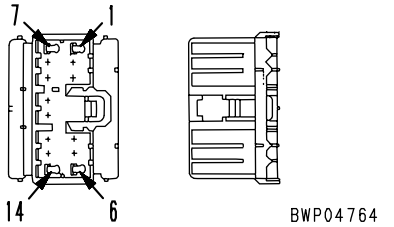
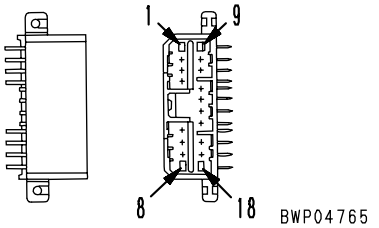
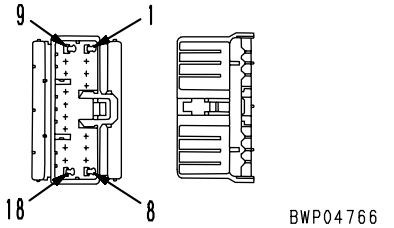
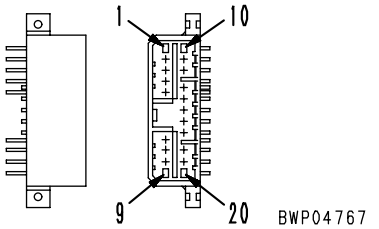
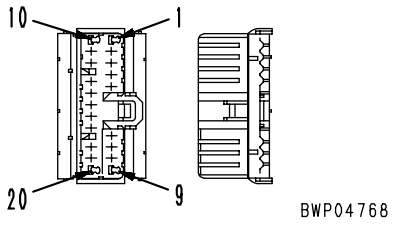
No.of pins	MIC type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
17			799-601-2730
	Body part No.: 79A-222-2730 (Q'ty: 2)	Body part No.: 79A-222-2720 (Q'ty: 2)	
21			799-601-2740
	Body part No.: 79A-222-2750 (Q'ty: 2)	Body part No.: 79A-222-2740 (Q'ty: 2)	
	Terminal part No.: 79A-222-2770 (Q'ty: 50)	Terminal part No.: 79A-222-2760 (Q'ty: 50)	—

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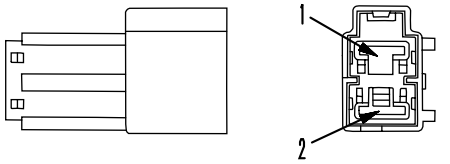
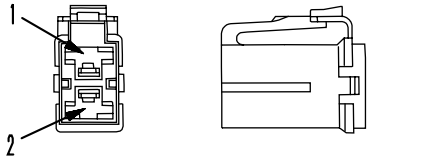
No.of pins	AMP040 type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
8			799-601-7180
	—	Housing part No.: 79A-222-3430 (Q'ty: 5)	
12			799-601-7190
	—	Housing part No.: 79A-222-3440 (Q'ty: 5)	
16			799-601-7210
	—	Housing part No.: 79A-222-3450 (Q'ty: 5)	
20			799-601-7220
	—	Housing part No.: 79A-222-3460 (Q'ty: 5)	

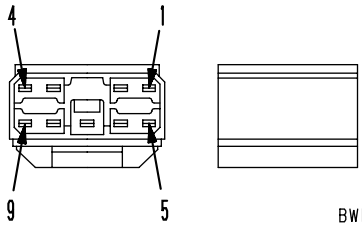
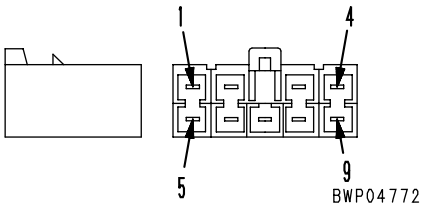
★ Terminal part No.: 79A-222-3470 (No relation with number of pins)

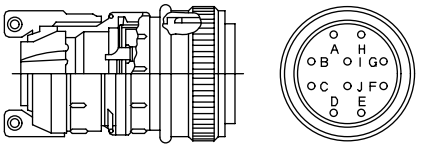
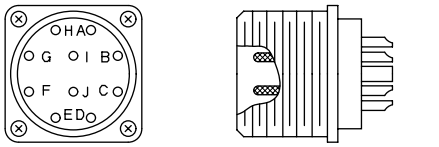
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No.of pins	AMP070 type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
10			799-601-7510
	—	Part No.: 08195-10210	
12			799-601-7520
	—	Part No.: 08195-12210	
14			799-601-7530
	—	Part No.: 08195-14210	
18			799-601-7540
	—	Part No.: 08195-18210	
20			799-601-7550
	—	Part No.: 08195-20210	

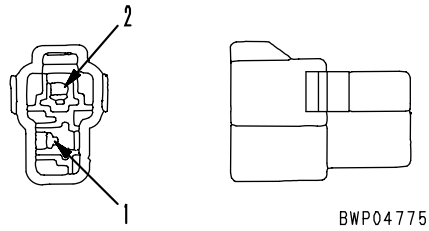
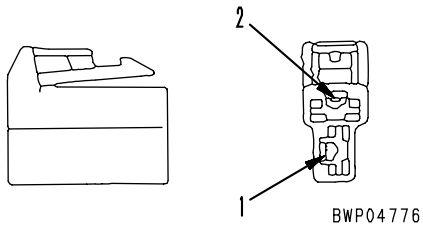
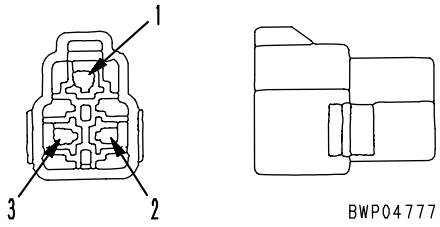
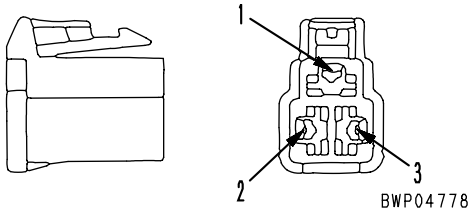
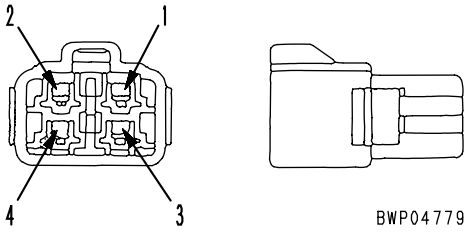
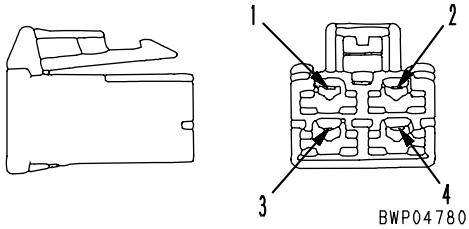
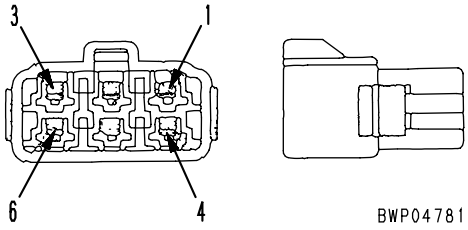
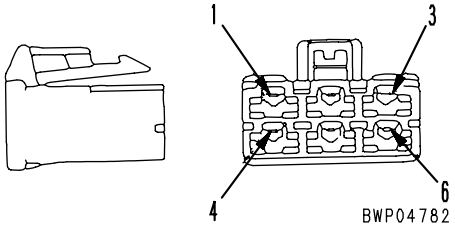
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No.of pins	L type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
2	 BWP04769	 BWP04770	—
	—	—	

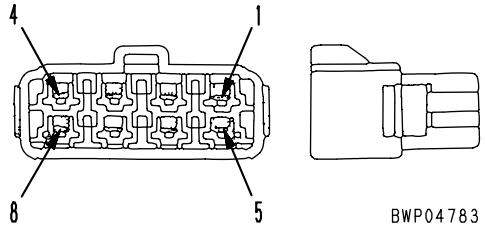
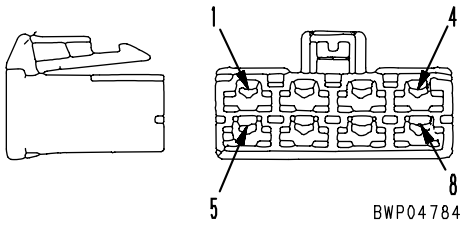
No.of pins	Connector for PA		
	Male (female housing)	Female (male housing)	T-adapter Part No.
9	 BWP04771	 BWP04772	—
	—	—	

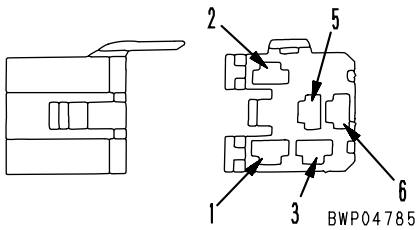
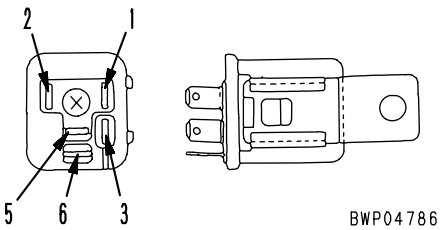
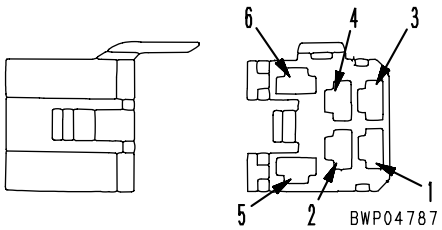
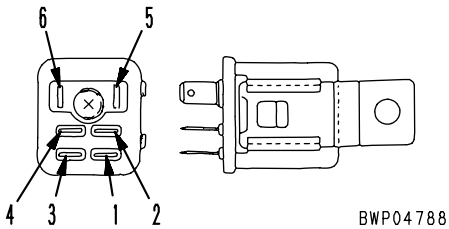
No.of pins	Bendix MS connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
10	 BWP04773	 BWP04774	799-601-3460
	—	—	

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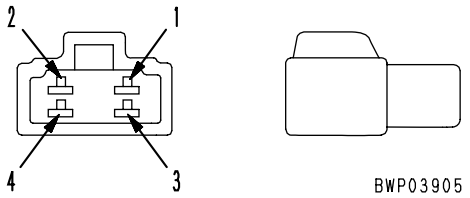
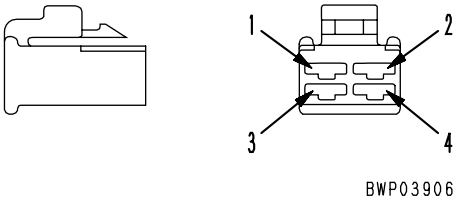
No.of pins	KES 1 (Automobile) connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
2			—
	Part No.: 08027-10210 (Natural color) 08027-10220 (Black)	Part No.: 08027-10260 (Natural color) 08027-10270 (Black)	
3			—
	Part No.:08027-10310	Part No.:08027-10360	
4			—
	Part No.: 08027-10410 (Natural color) 08027-10420 (Black)	Part No.: 08027-10460 (Natural color) 08027-10470 (Black)	
6			—
	Part No.: 08027-10610 (Natural color) 08027-10620 (Black)	Part No.: 08027-10660 (Natural color) 08027-10670 (Black)	

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No.of pins	KES 1 (Automobile) connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
8			—
	Part No.: 08027-10810 (Natural color) 08027-10820 (Black)	Part No.: 08027-10860 (Natural color) 08027-10870 (Black)	

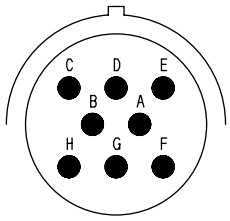
No.of pins	Connector for relay (Socket type)		
	Male (female housing)	Female (male housing)	T-adapter Part No.
5			799-601-7360
	—	—	
6			799-601-7370
	—	—	

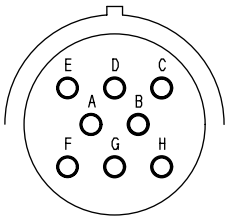
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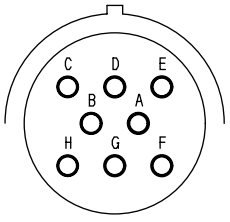
No.of pins	F type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
4	 BWP03905	 BWP03906	—
	—	—	

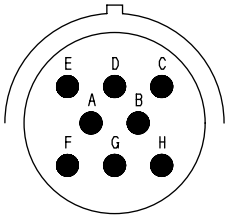
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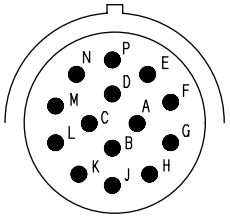
[The pin No. is also marked on the connector (electric wire insertion end)]

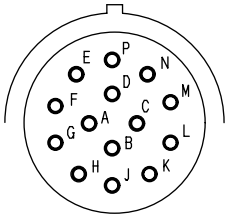
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<tr><td rowspan="2">Type (shell size code)</td><td colspan="3">HD30 Series connector</td></tr>
<tr><td>Body (plug)</td><td>Body (receptacle)</td><td>T-adapter Part No.</td></tr>
<tr><td rowspan="6">18-8 (1)</td><td>Pin (male terminal)</td><td>Pin (female termial)</td><td rowspan="3">799-601-9210</td></tr>
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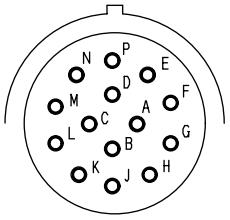
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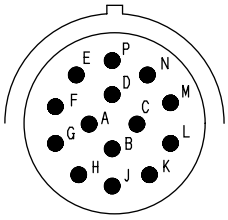
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<tr><td>Pin (female terminal)</td><td>Pin (male termial)</td><td rowspan="3">799-601-9210</td></tr>
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BWP05003</td><td> 

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BWP05005</td><td> 

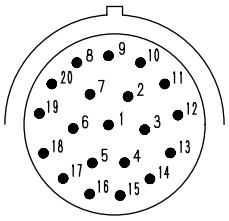
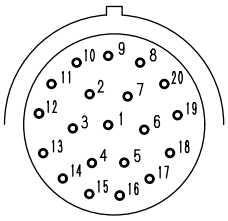
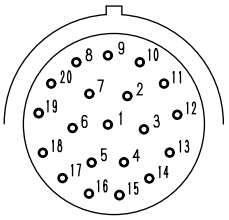
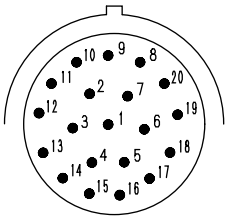
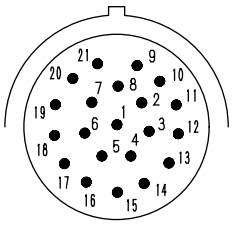
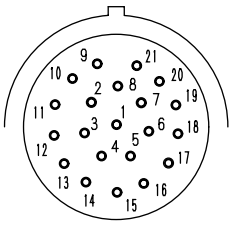
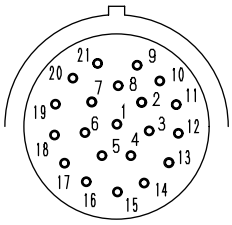
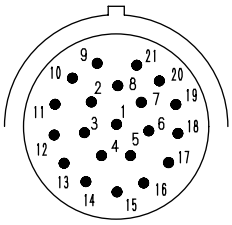
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08191-24105, 08191-24106</td></tr>
<tr><td>Pin (female terminal)</td><td>Pin (male termial)</td><td rowspan="3">799-601-9220</td></tr>
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BWP05007</td><td> 

BWP05008</td></tr>
<tr><td>Part No.: 08191-22201, 08191-22202,
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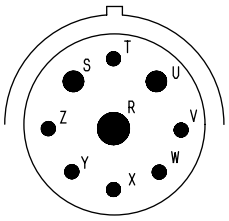
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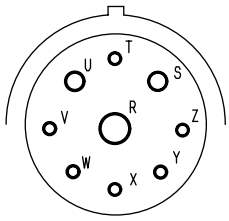
[The pin No. is also marked on the connector (electric wire insertion end)]

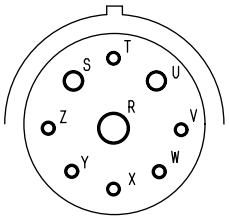
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<tr><td>Body (plug)</td><td>Body (receptacle)</td><td>T-adapter Part No.</td></tr>
<tr><td rowspan="6">18-20 (3)</td><td>Pin (male terminal)</td><td>Pin (female termial)</td><td rowspan="3">799-601-9230</td></tr>
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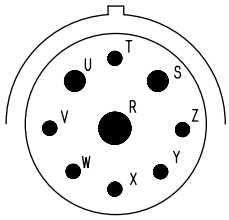
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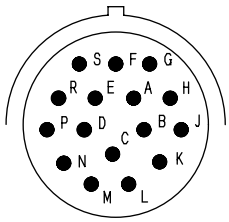
[The pin No. is also marked on the connector (electric wire insertion end)]

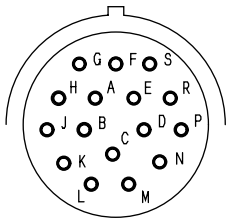
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<tr><td>Body (plug)</td><td>Body (receptacle)</td><td>T-adapter Part No.</td></tr>
<tr><td rowspan="6">24-9 (5)</td><td>Pin (male terminal)</td><td>Pin (female termial)</td><td rowspan="3">799-601-9250</td></tr>
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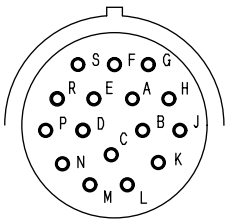
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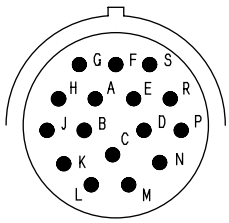
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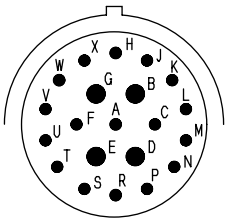
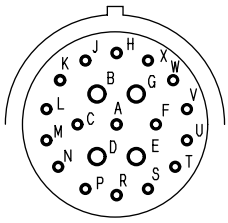
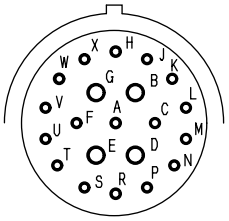
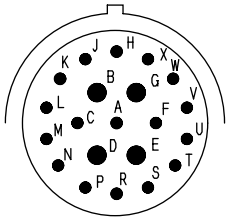
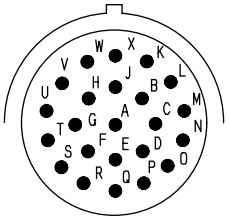
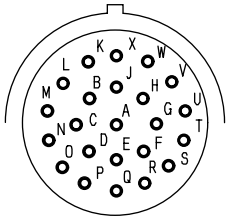
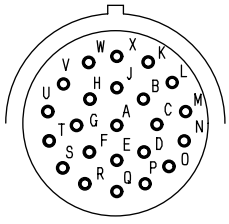
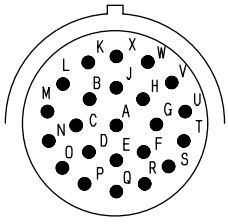
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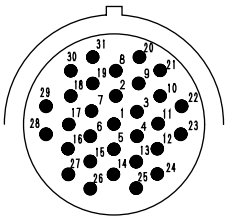
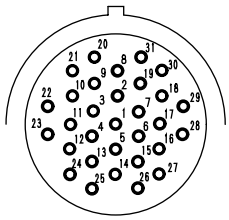
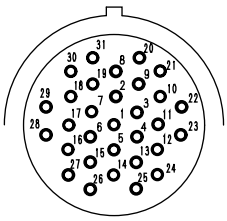
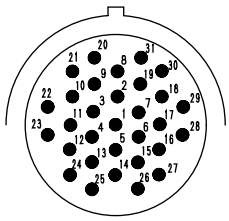
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[The pin No. is also marked on the connector (electric wire insertion end)]

<table>
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<tr><td>Body (plug)</td><td>Body (receptacle)</td><td>T-adapter Part No.</td></tr>
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08191-84105, 08191-84106</td></tr>
<tr><td>Pin (female terminal)</td><td>Pin (male termial)</td><td rowspan="3">799-601-9280</td></tr>
<tr><td> 
BWP05031</td><td> 
BWP05032</td></tr>
<tr><td>Part No.: 08191-82201, 08191-82202
08191-82203, 08191-82204
08191-82205, 08191-82206</td><td>Part No.: 08191-83101, 08191-83102
08191-83103, 08191-83104
08191-83105, 08191-83106</td></tr>
</table>

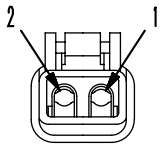
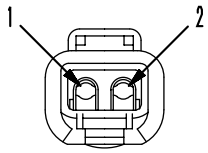
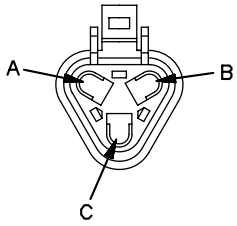
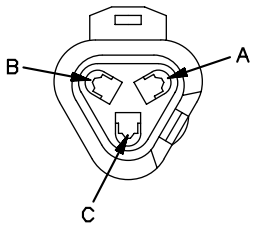
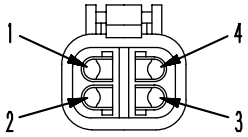
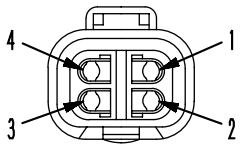
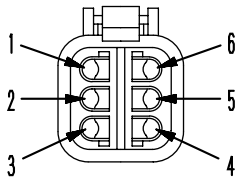
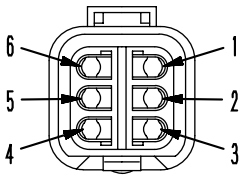
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[The pin No. is also marked on the connector (electric wire insertion end)]

<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">24-31 (9)</td><td>Pin (male termial)</td><td>Pin (female terminal)</td><td rowspan="2">799-601-9290</td></tr>
<tr><td> 
BWP05033</td><td> 
BWP05034</td></tr>
<tr><td>Part No.: 08191-91203, 08191-91204, 08191-91205, 08191-91206</td><td>Part No.: 08191-94103, 08191-94104, 08191-94105, 08191-94106</td></tr>
<tr><td>Pin (female terminal)</td><td>Pin (male termial)</td><td rowspan="2">799-601-9290</td></tr>
<tr><td> 
BWP05035</td><td> 
BWP05036</td></tr>
<tr><td>Part No.: 08191-92203, 08191-92204, 08191-92205, 08191-92206</td><td>Part No.: 08191-93103, 08191-93104, 08191-93105, 08191-93106</td></tr>
</table>

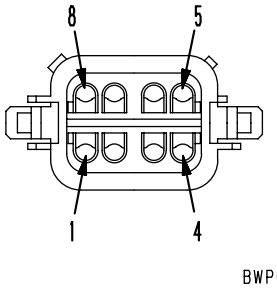
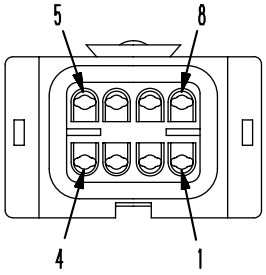
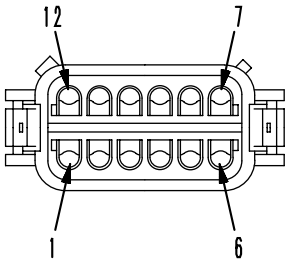
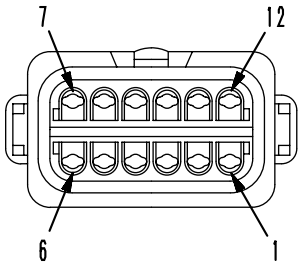
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[The pin No. is also marked on the connector (electric wire insertion end)]

No.of pins	DT Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
2	 BWP05037	 BWP05038	799-601-9020
	Part No.: 08192-12200 (normal type) 08192-22200 (fine wire type)	Part No.: 08192-12100 (normal type) 08192-22100 (fine wire type)	
3	 BWP05039	 BWP05040	799-601-9030
	Part No.: 08192-13200 (normal type) 08192-23200 (fine wire type)	Part No.: 08192-13100 (normal type) 08192-23100 (fine wire type)	
4	 BWP05041	 BWP05042	799-601-9040
	Part No.: 08192-14200 (normal type) 08192-24200 (fine wire type)	Part No.: 08192-14100 (normal type) 08192-24100 (fine wire type)	
6	 BWP05043	 BWP05044	799-601-9050
	Part No.: 08192-16200 (normal type) 08192-26200 (fine wire type)	Part No.: 08192-16100 (normal type) 08192-26100 (fine wire type)	

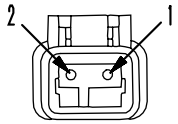
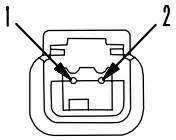
https://truckmanualshub.com/

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

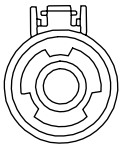
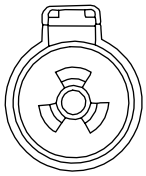
No.of pins	DT Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
8	 BWP05045	 BWP05046	8GR: 799-601-9060 8B: 799-601-9070 8G: 799-601-9080 8BR: 799-601-9090
	Part No.: 08192-1820□ (normal type) 08192-2820□ (fine wire type)	Part No.: 08192-1810□ (normal type) 08192-2810□ (fine wire type)	
12	 BWP05047	 BWP05048	12GR: 799-601-9110 12B: 799-601-9120 12G: 799-601-9130 12BR: 799-601-9140
	Part No.: 08192-1920□ (normal type) 08192-2920□ (fine wire type)	Part No.: 08192-1910□ (normal type) 08192-2910□ (fine wire type)	

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

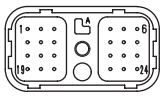
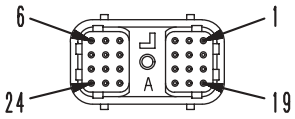
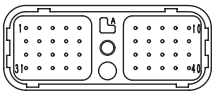
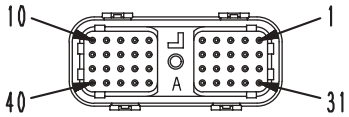
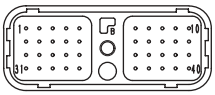
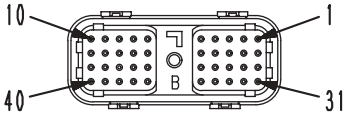
No.of pins	DTM Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
2	 BWP05049	 BWP05050	799-601-9010
	Part No.: 08192-02200	Part No.: 08192-02100	

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

No.of pins	DTHD Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
2	 BWP05051	 BWP05052	—
	Part No.: 08192-31200 (Contact size#12) 08192-41200 (Contact size #8) 08192-51200 (Contact size #4)	Part No.: 08192-31100 (Contact size#12) 08192-41100 (Contact size #8) 08192-51100 (Contact size #4)	

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

No.of pins	DRC26 Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
24	 BJD12722	 BJD12723	799-601-9360
	—	Part No.: 7821-93-3110	
40 (A)	 BJD12724	 BJD12725	799-601-9350
	—	Part No.: 7821-93-3120	
40 (B)	 BJD12726	 BJD12727	799-601-9350
	—	Part No.: 7821-93-3130	

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T-BRANCH BOX AND T-BRANCH TABLE

★ The vertical column shows part number of T-Branch Box or T-Branch, and horizontal column shows part number of Harness Checker Ass'y.

Part No.	Connector type or part name	No. of pins	799-601-2500	799-601-2700	799-601-2800	799-601-2900	799-601-3000	799-601-5500	799-601-6000	799-601-6500	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	—
799-601-2600	Measurement box	Econo-21P	○		○	○						○	○		○					
799-601-3100	Measurement box	MS-37P					○													
799-601-3200	Measurement box	MS-37P					○													
799-601-3300	Measurement box	Econo-24P							○											
799-601-3360	Plate	For MS box																		
799-601-3370	Plate	For MS box																		
799-601-3380	Plate	For MS box																		
799-601-3410	BENDIX (MS)	24P							○	○										
799-601-3420	BENDIX (MS)	24P							○	○										
799-601-3430	BENDIX (MS)	17P							○	○										
799-601-3440	BENDIX (MS)	17P							○	○										
799-601-3450	BENDIX (MS)	5P						○	○											
799-601-3460	BENDIX (MS)	10P							○	○										
799-601-3510	BENDIX (MS)	5P						○	○											
799-601-3520	BENDIX (MS)	14P						○	○											
799-601-3530	BENDIX (MS)	19P							○	○										
799-601-2910	BENDIX (MS)	14P						○	○											
799-601-3470	Case								○											
799-601-2710	MIC	5P	○	○		○							○							
799-601-2720	MIC	13P	○	○		○							○							
799-601-2730	MIC	17P	○	○	○	○						○	○		○					
799-601-2740	MIC	21P	○	○	○	○						○	○		○					
799-601-2950	MIC	9P									○	○	○		○					
799-601-2750	ECONO	2P	○	○																
799-601-2760	ECONO	3P	○	○																
799-601-2770	ECONO	4P	○	○																
799-601-2780	ECONO	8P	○	○																
799-601-2790	ECONO	12P	○	○																
799-601-2810	DLI	8P	○	○																
799-601-2820	DLI	12P	○	○																
799-601-2830	DLI	16P	○	○																
799-601-2840	Additional cable		○	○									○							
799-601-2850	Case		○																	
799-601-7010	X	1P											○		○					
799-601-7020	X	2P									○	○	○		○					
799-601-7030	X	3P									○	○	○		○					
799-601-7040	X	4P									○	○	○		○					
799-601-7050	SWP	6P									○	○	○							
799-601-7060	SWP	8P									○	○	○							
799-601-7310	SWP	12P																		○
799-601-7070	SWP	14P											○		○					
799-601-7320	SWP	16P																		○
799-601-7080	M	1P											○		○					
799-601-7090	M	2P									○	○	○		○					
799-601-7110	M	3P									○	○	○		○					
799-601-7120	M	4P									○	○	○		○					
799-601-7130	M	6P									○	○	○		○					
799-601-7340	M	8P																		○

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Part No.	Connector type or part name	No. of pins	799-601-2500	799-601-2700	799-601-2800	799-601-2900	799-601-3000	799-601-5500	799-601-6000	799-601-6500	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	—
799-601-7140	S	8P									○	○	○		○					
799-601-7150	S	10P-White									○	○	○		○					
799-601-7160	S	12P-Blue									○	○	○							
799-601-7170	S	16P-Blue									○	○	○		○					
799-601-7330	S	16P-White													○					
799-601-7350	S	12P-White																		○
799-601-7180	AMP040	8P											○							
799-601-7190	AMP040	12P											○		○					
799-601-7210	AMP040	16P									○	○	○		○					
799-601-7220	AMP040	20P									○	○	○		○					
799-601-7230	Short connector	X-2									○	○	○		○					
799-601-7240	Case										○	○								
799-601-7270	Case												○							
799-601-7510	070	10P												○						
799-601-7520	070	12P												○						
799-601-7530	070	14P												○						
799-601-7540	070	18P												○						
799-601-7550	070	20P												○						
799-601-7360	Relay connector	5P																		○
799-601-7370	Relay connector	6P																		○
799-601-7380	JFC connector	2P																		○
799-601-9010	DTM	2P														○		○		
799-601-9020	DT	2P														○		○		
799-601-9030	DT	3P														○		○		
799-601-9040	DT	4P														○		○		
799-601-9050	DT	6P														○		○		
799-601-9060	DT	8P-Gray														○		○		
799-601-9070	DT	8P-Black														○		○		
799-601-9080	DT	8P-Green														○		○		
799-601-9090	DT	8P-Brown														○		○		
799-601-9110	DT	12P-Gray														○		○		
799-601-9120	DT	12P-Black														○		○		
799-601-9130	DT	12P-Green														○		○		
799-601-9140	DT	12P-Brown														○		○		
799-601-9210	HD30	18-8														○	○			
799-601-9220	HD30	18-14														○	○			
799-601-9230	HD30	18-20														○	○			
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	Measurement box	For DT, HD														○	○		○	
799-601-9330	Case															○				
799-601-9340	Case																○			
799-601-9350	DRC	40P																	○	
799-601-9360	DRC	24P																	○	
799-601-9410	For NE, G sensor	2P																		○
799-601-9420	For fuel, boost press.	3P																		○
799-601-9430	PVC socket	2P																		○

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TROUBLESHOOTING WHEN ERROR CODE IS DISPLAYED (DISPLAY OF ERROR CODE)

BEFORE CARRYING OUT TROUBLESHOOTING WHEN CODE IS DISPLAYED 20-302
INFORMATION IN TROUBLESHOOTING TABLE 20-307
Error code [104] (Clogging of air cleaner) 20-310
Error code [108] (Overheating of engine coolant) 20-311
Error code [112] (Short circuit in wiper motor drive forward system) 20-312
Error code [113] (Short circuit in wiper motor drive reverse system) 20-314
Error code [114] (Short circuit in windshield washer drive system) 20-316
Error code [115] (Trouble in operation of windshield wiper) 20-318
Error code [116] (Trouble in storage of windshield wiper) 20-320
Error code [203] (Short circuit in swing holding brake solenoid) 20-322
Error code [205] (Short circuit in 2-stage relief solenoid) 20-324
Error code [206] (Short circuit in travel speed shifting solenoid) 20-326
Error code [213] (Disconnection in swing holding brake solenoid) 20-328
Error code [215] (Disconnection in 2-stage relief solenoid) 20-330
Error code [216] (Disconnection in travel speed shifting solenoid) 20-332
Error code [217] (Abnormality in input model code) 20-334
Error code [218] (Disconnection in S-NET signal line) 20-336
Error code [222] (Short circuit in LS-EPC solenoid) 20-338
Error code [223] (Disconnection in LS-EPC solenoid) 20-339
Error code [224] (Abnormality in pump pressure sensor) 20-340
Error code [226] (Abnormality in pressure sensor power supply) 20-342
Error code [227] (Abnormality in engine speed sensor) 20-344
Error code [232] (Short circuit in PC-EPC solenoid) 20-346
Error code [233] (Disconnection in PC-EPC solenoid) 20-348
Error code [251] (Abnormality in overload pressure sensor) 20-350
Error code [301] (Engine low idling speed out of standard range) 20-352
Error code [302] (Engine high idling speed out of standard range) 20-352
Error code [306] (Abnormality in governor potentiometer) 20-354
Error code [308] (Abnormality in fuel control dial) 20-356
Error code [315] (Short circuit in battery relay output line) 20-358
Error code [316] (Step-out of governor motor) 20-360
Error code [317] (Disconnection in phases A and B of governor motor) 20-362
Error code [318] (Short circuit in phases A and B of governor motor) 20-364

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BEFORE CARRYING OUT TROUBLESHOOTING WHEN CODE IS DISPLAYED

Error codes and possible causes of them

Error code	Possible causes																								
	Defective battery relay	Defective fuse or fusible link	Defective monitor panel	Defective governor and pump controller	Defective sensor power supply (5 V)	Defective wiper motor	Defective windshield washer motor	Defective swing lock switch	Defective emergency pump drive switch	Defective fuel control dial	Defective governor motor	Defective governor potentiometer	Defective engine speed sensor (including adjustment)	Defective engine coolant temperature sensor	Defective air cleaner clogging switch	Defective mechanical system of engine	Defective adjustment of governor lever	Defective fuel control of engine	Overheating of engine	Clogging of air cleaner	Defective PC-EPC solenoid	Defective LS-EPC solenoid	Defective swing holding brake solenoid	Defective 2-stage relief solenoid valve	Defective travel speed shifting solenoid
104			●																	●					
108			●											●											
112			●			●																			
113			●			●																			
114			●				●																		
115			●			●																			
116			●			●																			
203				●																			●		
205				●																				●	
206				●																					●
213				●				●															●		
215				●																				●	
216				●																					●
217				●																					
218			●	●																					
222				●																		●			
223				●																		●			
226				●						●		●													
224				●	●																				
227				●									●												
232				●					●												●				
233				●					●												●				
251				●																					
301				●												●									
302				●												●									
306				●	●							●													
308				●	●					●															
315	●			●																					
316				●						●	●	●					●	●							
317				●							●														
318				●							●														

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Possible causes					
Pump pressure sensor	Overload pressure sensor	Defective assembled-type diode	Disconnection in wiring harness	Grounding fault in wiring harness	Short circuit with power source in wiring harness
			●		
				●	
				●	
				●	
					●
			●		
			●		
				●	
				●	
				●	
		●	●		●
			●		●
			●		●
			●		
			●	●	●
				●	
			●		●
●	●			●	
●			●	●	●
			●		●
				●	
			●		●
	●		●	●	●
			●	●	●
			●	●	●
				●	
			●		
				●	

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Connection table of fuse box

★ This connection table shows the devices to which each power supply of the fuse box (FB1) supplies power (A switch power supply is a device which supplies power while the starting switch is at the ON position and a constant power supply is a device which supplies power while the starting switch is at the OFF position).
★ When carrying out troubleshooting related to the electrical system, you should check the fuse box and fusible link to see if the power is supplied normally.

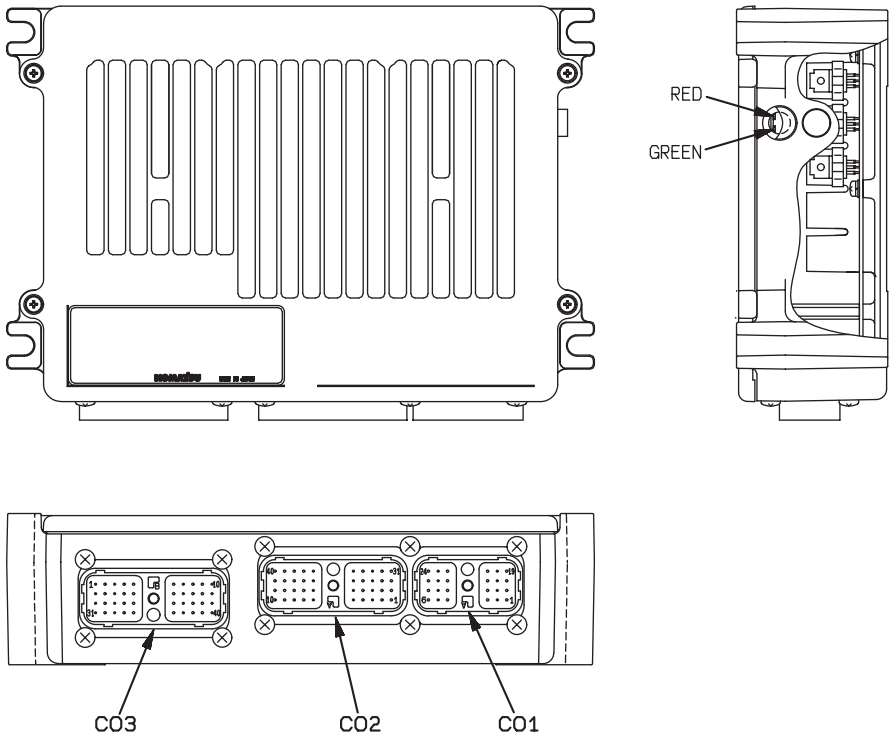
Type of power supply	Fuse No.	Fuse capacity	Destination of power
Switch power supply (Fusible link: A34)	1	10A	Governor and pump controller (Controller power supply)
			PC-EPC solenoid (Emergency pump drive switch circuit)
			Swing holding brake solenoid (Swing holding brake release switch circuit)
	2	20A	Governor and pump controller (Solenoid power supply)
	3	10A	PPC oil pressure lock solenoid
			Starting motor cutout relay (For PPC lock)
	4	10A	Cigarette lighter
			Windshield washer motor
	5	10A	Horn
	6	10A	Lower wiper motor [If equipped]
	7	10A	Rotary lamp [If equipped]
	8	10A	Working lamp (Boom and right front)
			Working lamp (Left front and rear) [If equipped]
	9	10A	One-touch power maximizing switch circuit
	10	10A	Fuel priming pump [If equipped]
	11	20A	Air conditioner unit
	12	20A	Starting motor cutout relay (For personal code)
			Monitor panel (Switch power supply)
	13	20A	Light relay 1
			Light relay 2
			Panel night light signal circuit
	14	10A	Heated seat [If equipped]
	15	10A	Heated seat [If equipped]
			Travel alarm [If equipped]
Constant power supply (Fusible link: A35)	16	10A	DC/DC converter (Power supply to 12-V devices)
	17	20A	Monitor panel (Constant power supply)
	18	10A	Starting switch
	19	10A	Room lamp
	20	10A	(Spare)

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Troubles which occur when controller power supply of governor and pump controller is defective

★ The controller power supply (FB1-1) of the governor and pump controller drives the controller system.
★ Accordingly, if the controller power supply is turned off, the controller cannot control the governor motor and battery relay and the following troubles occur.
  1) The engine can be started but cannot be stopped.
  2) The engine speed cannot be controlled with the fuel control dial.
★ If the above problems occur, check the related fuse (FB1-1) and "green LED" of the governor and pump controller to see if the power is supplied normally.
  • Lighting: The controller power is supplied (There is not an error and the power supply is normal).
  • Flashing: The controller power is supplied (There is an error).
  • Put out: The controller power is not supplied.

★ Green LED of governor and pump controller (GREEN)



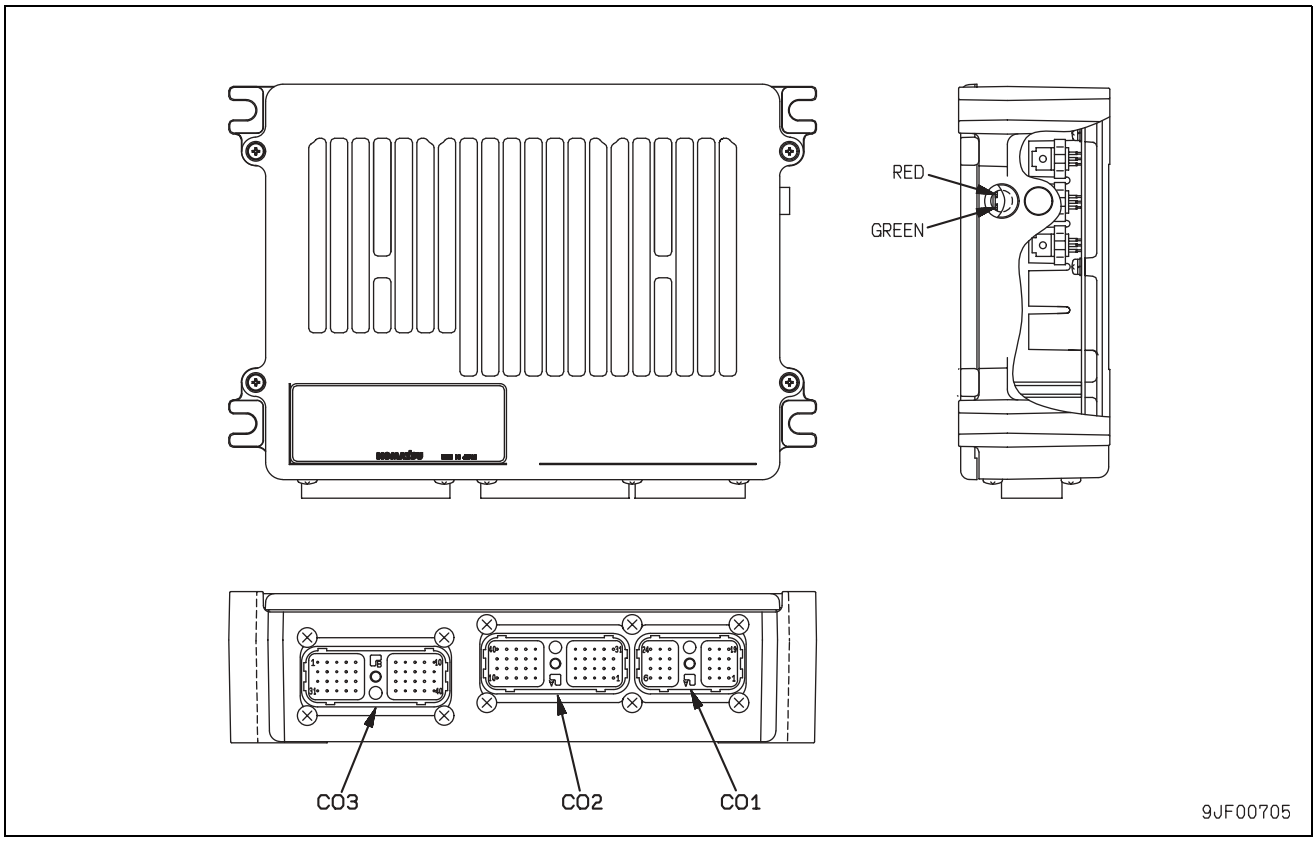
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Troubles which occur when solenoid power supply of governor and pump controller is defective

★ The solenoid power supply (FB1-2) of the governor and pump controller is used by the controller to drive the solenoids and relays.
★ Accordingly, if the solenoid power supply is turned off, when the controller outputs the power to the solenoids or relays, the power is not supplied to any of the solenoids and relays and all or some of the following error codes are displayed simultaneously.
  - [E213]: Disconnection in swing holding brake solenoid
  - [E215]: Disconnection in 2-stage relief solenoid
  - [E216]: Disconnection in travel speed shifting solenoid
  - [E222]: Disconnection in LS-EPC solenoid
  - [E223]: Disconnection in PC-EPC solenoid

★ If the above problems occur, check the related fuse (FB1-2) and inlet voltage of the governor and pump controller.
  1) Disconnect connector C03 of the controller and connect a T-adapter to the wiring harness side.
  2) Turn the starting switch ON.
  3) Measure the voltage between each of pins (2) and (12) and each of pins (31), (32), and (33).
     - Pins (2) and (3) are the power supply pins and pins (31), (32), and (33) are the ground pins.
     - Pins (2) and (3) are the power supply and pins (31), (32), and (33) are the chassis ground.
     - If the voltage is 20 – 30 V, it is normal.

★ Power supply connector (C03) of governor and pump controller



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INFORMATION IN TROUBLESHOOTING TABLE

★ The following information is summarized in the troubleshooting table and the related electrical circuit diagram. Before carrying out troubleshooting, understand that information fully.

User code	Error code	Trouble	Trouble indicated by error code
Display on panel	**Display on panel**		
Contents of trouble	Condition at the time when the monitor panel or controller detects the trouble		
Action of monitor panel or controller	The action taken by the monitor panel or controller to protect the system or devices when the monitor panel or controller detects the trouble		
Problem that appears on machine	The problem that appears on the machine as a result of the action taken by the monitor panel or controller (shown above)		
Related information	Information related to the detected trouble or troubleshooting		

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Possible causes of trouble (Given numbers are reference numbers, which do not indicate priority)	<Contents of description> • Standard value in normal state to judge possible causes • Remarks on judgment <Troubles in wiring harness> • Disconnection Connector is connected imperfectly or harness is broken. • Grounding fault Harness which is not connected to chassis ground circuit is in contact with chassis ground circuit. • Short circuit with power source Harness which is not connected to power source (24-V) circuit is in contact with power source (24-V) circuit. <Precautions for troubleshooting> 1) Method of indicating connector No. and handling of T-adapter Insert or connect T-adapter as explained below for troubleshooting, unless otherwise specified. • If connector No. has no marks of "male" and "female", disconnect connector and insert T-adapters in both male side and female side. • If connector No. has marks of "male" and "female", disconnect connector and connect T-adapter to only male side or female side. 2) Entry order of pin Nos. and handling of circuit tester leads Connect positive (+) lead and negative (-) lead of circuit tester as explained below for troubleshooting, unless otherwise specified. • Connect positive (+) lead to pin No. or harness entered on front side. • Connect negative (-) lead to pin No. or harness entered on rear
	2		
	3		
	4		

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Related circuit diagram

This is a circuit diagram of the part related to troubleshooting.
- Connector No.: Shows the "Type-Number of pin" and "Color".
- Branching/Merging point: Shows that there is a branching/merging point in the electric circuit to be checked.
- Arrow (⇔): Roughly shows the location on the machine.

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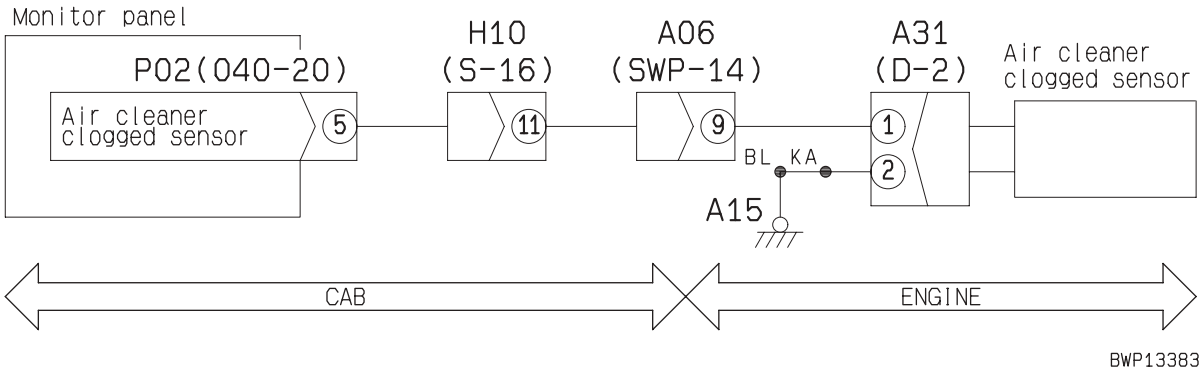
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Error code [104] (Clogging of air cleaner)

User code	Error code	Trouble	Clogging of air cleaner(Monitor panel system)
–	**104**		
Contents of trouble	• The signal circuit of the air cleaner clogging switch is opened (disconnected from the chassis ground) while the engine is running.		
Action of monitor panel	• None in particular.		
Problem that appears on machine	• If the machine is operated as it is, the engine may be damaged.		
Related information	• If the air cleaner clogging monitor of the monitor panel flashes while the engine is running, this error code is recorded. • The input state (ON/OFF) from the air cleaner clogging switch can be checked with the monitoring function. (Code: 046, Right of upper line)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Clogging of air cleaner (When system is normal)	Check the air cleaner. If it is clogged, clean or replace it.			
	2	Defective air cleaner clogging switch (Internal disconnection)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			A31 (male)	Air cleaner	Resistance	
			Between (1) and (2)	When normal	Max.1 Ω	
				When clogged	Min.1 MΩ	
	3	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between P02 (female) (5) and A31 (female) (1)		Resistance	Max.1 Ω
			Wiring harness between P11 (female) (2) and chassis ground (A15)		Resistance	Max.1 Ω
	4	Defective monitor panel	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			P02	Air cleaner	Voltage	
			Between (5) and chassis ground	When normal	Max. 1 V	
				When clogged	20 – 30 V	

Circuit diagram related to air cleaner clogging switch



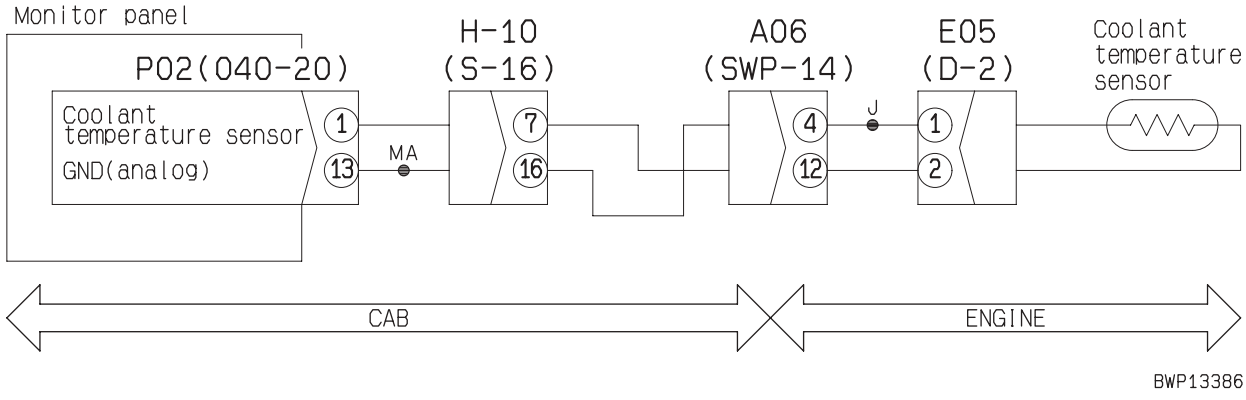
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Error code [108] (Overheating of engine coolant)

User code	Error code	Trouble	Overheating of engine coolant (Monitor panel system)
–	**108**		
Contents of trouble	• The signal circuit of the engine coolant temperature sensor inputs 99 o or higher temperature while the engine is running.		
Action of monitor panel	• None in particular.		
Problem that appears on machine	• If the machine is operated as it is, the engine may be seized.		
Related information	• If the engine coolant temperature monitor of the monitor panel flashes while the engine is running, this error code is recorded. • The input state (ON/OFF) from the engine coolant temperature sensor can be checked with the monitoring function. (Code: 041, by 10 mV)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Overheating of engine (When system is normal)	The engine may have overheated. Find the cause and check the engine for damage, and then repair.			
	2	Defective engine coolant temperature sensor (Internal short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			E05 (male)	Engine coolant temperature	Resistance	
			Between (1) and (2)	10 – 100 °C	3.5k – 90 kΩ	
			Between (2) and chassis ground		Min. 1 MΩ	
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between P02 (female) (1) – E05 (female) (2) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	4	Defective monitor panel	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			P02	Engine coolant temperature	Resistance	
			Between (1) and (13)	10 – 100 °C	3.5k – 90 kΩ	
			Between (1) and chassis ground		Min. 1 MΩ	

Circuit diagram related to engine coolant temperature sensor



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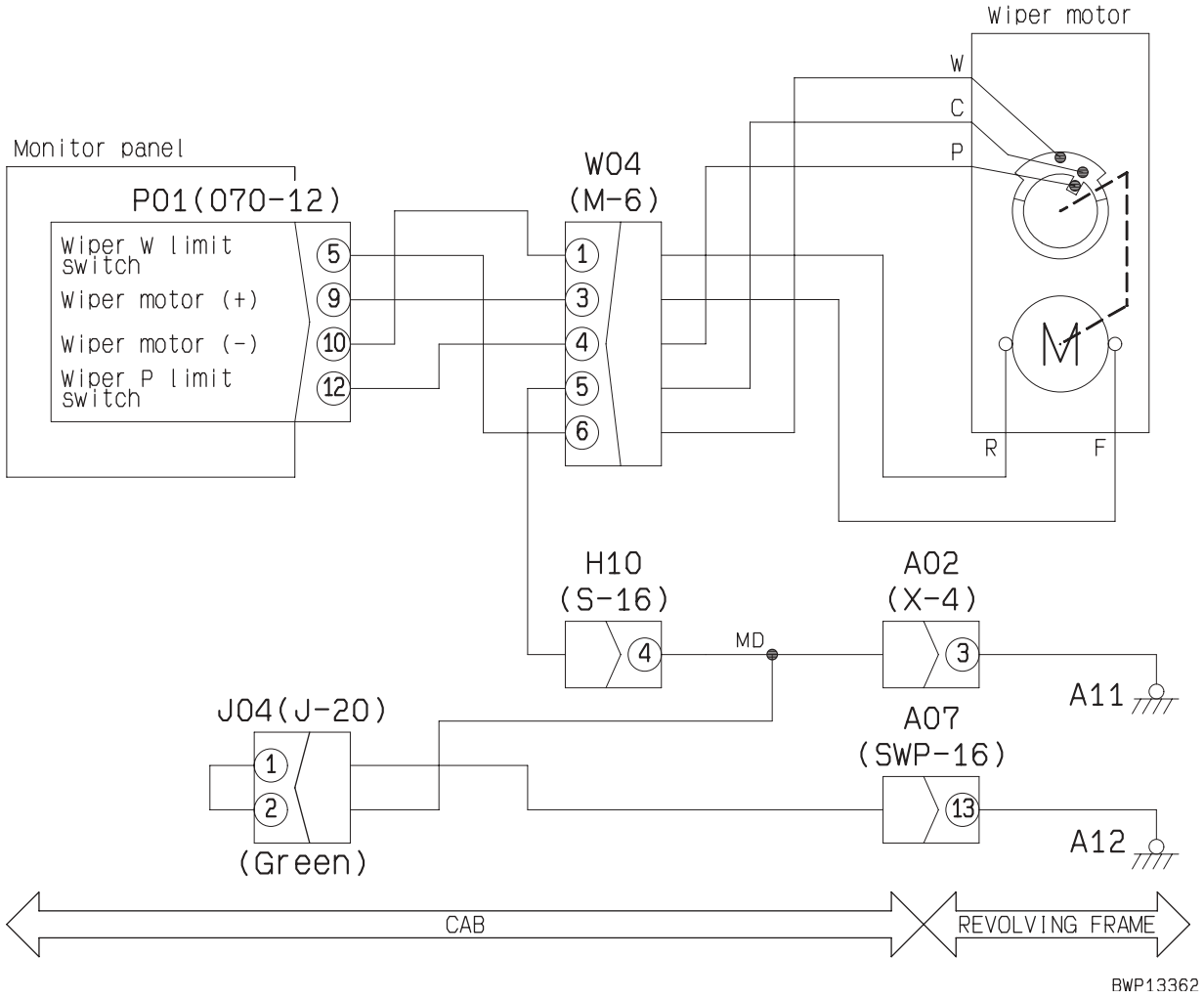
Error code [112] (Short circuit in wiper motor drive forward system)

User code	Error code	Trouble	Short circuit in wiper motor drive forward system (Monitor panel system)
–	**112**		
Contents of trouble	• When the signal is output to the wiper motor drive forward circuit, an abnormal current flows.		
Action of monitor panel	• Turns the output to the wiper motor drive forward circuit OFF.		
Problem that appears on machine	• Windshield wiper stops.		
Related information			

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective wiper motor (Internal short circuit or grounding fault)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			W04 (male)	Continuity/Resistance	
			Between (3) and (1)	There is continuity	
			Between (3) and chassis ground	Min. 1 MΩ	
	2	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Between P01 (female) (9) – W03 (female) (3) wiring harness and chassis ground	Resistance	Min. 1 MΩ
	3	Defective monitor panel	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			P01	Wiper switch	Resistance
			Between (9) and chassis ground	OFF	Max. 3 V
				ON	Max. 3 V⇔20 – 30 V (Constant period)

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Circuit diagram related to wiper motor



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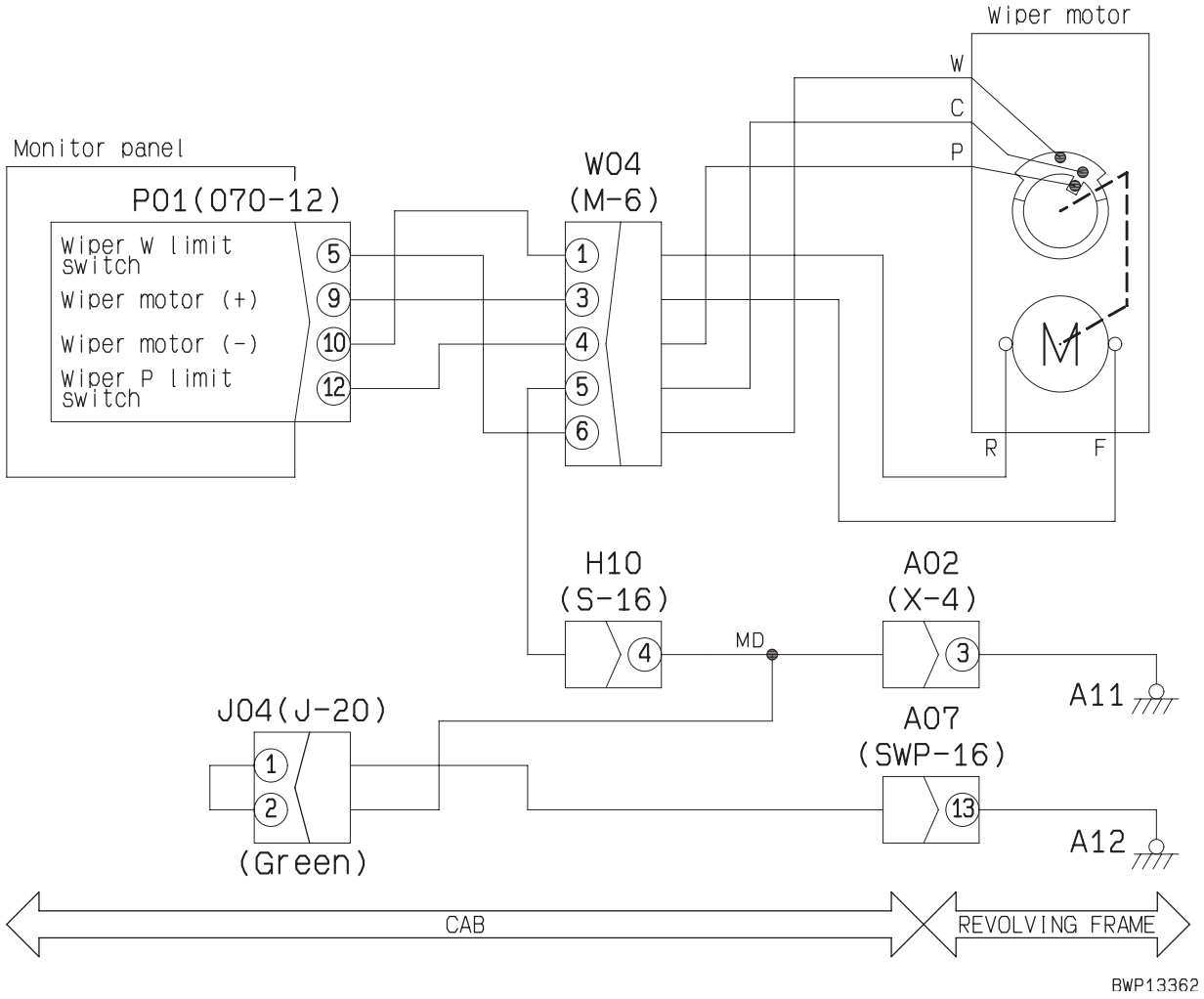
Error code [113] (Short circuit in wiper motor drive reverse system)

User code	Error code	Trouble	Short circuit in wiper motor drive reverse system (Monitor panel system)
–	**113**		
Contents of trouble	• When the signal is output to the wiper motor drive reverse circuit, an abnormal current flows.		
Action of monitor panel	• Turns the output to the wiper motor drive reverse circuit OFF.		
Problem that appears on machine	• Windshield wiper stops.		
Related information			

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective wiper motor (Internal short circuit or grounding fault)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			W04 (male)		Continuity/Resistance	
			Between (1) and (3)		There is continuity	
			Between (1) and chassis ground		Min. 1 MΩ	
	2	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between P01 (female) (10) – W03 (female) (1) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	3	Defective monitor panel	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			P01	Wiper switch	Resistance	
			Between (10) and chassis ground	OFF	Max. 3 V	
				ON	Max. 3 V⇔20 – 30 V (Constant period)	

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Circuit diagram related to wiper motor



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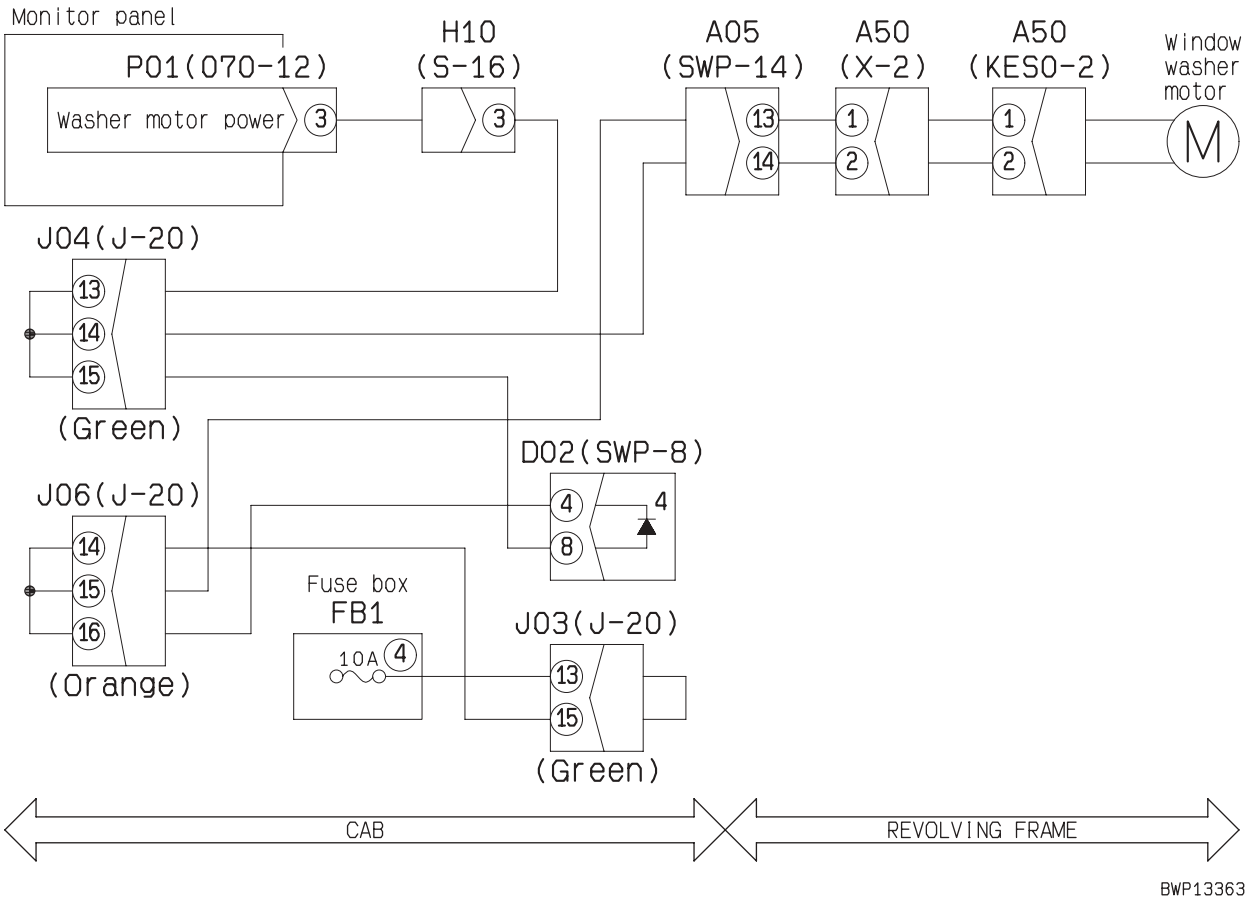
Error code [114] (Short circuit in windshield washer drive system)

User code	Error code	Trouble	Short circuit in windshield washer drive system (Monitor panel system)
–	**114**		
Contents of trouble	• When the windshield washer drive circuit is connected to the ground circuit (the output is turned ON), an abnormal current flows.		
Action of monitor panel	• Turns the ground output of the windshield washer motor circuit OFF.		
Problem that appears on machine	• The windshield washer stops.		
Related information			

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective washer motor (Internal short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			A50 (male)	Resistance	
			Between (1) and (2)	5 – 20 Ω	
	2	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between P01 (female) (3) – A50 (female) (2) or D02 (female) (8) wiring harness and chassis ground	Voltage	Max. 1 V
	3	Defective monitor panel	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			P01	Windshield washer switch	Voltage
			Between (3) and chassis ground	OFF	20 – 30 V
				ON	Max. 1 V

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Circuit diagram related to windshield washer motor



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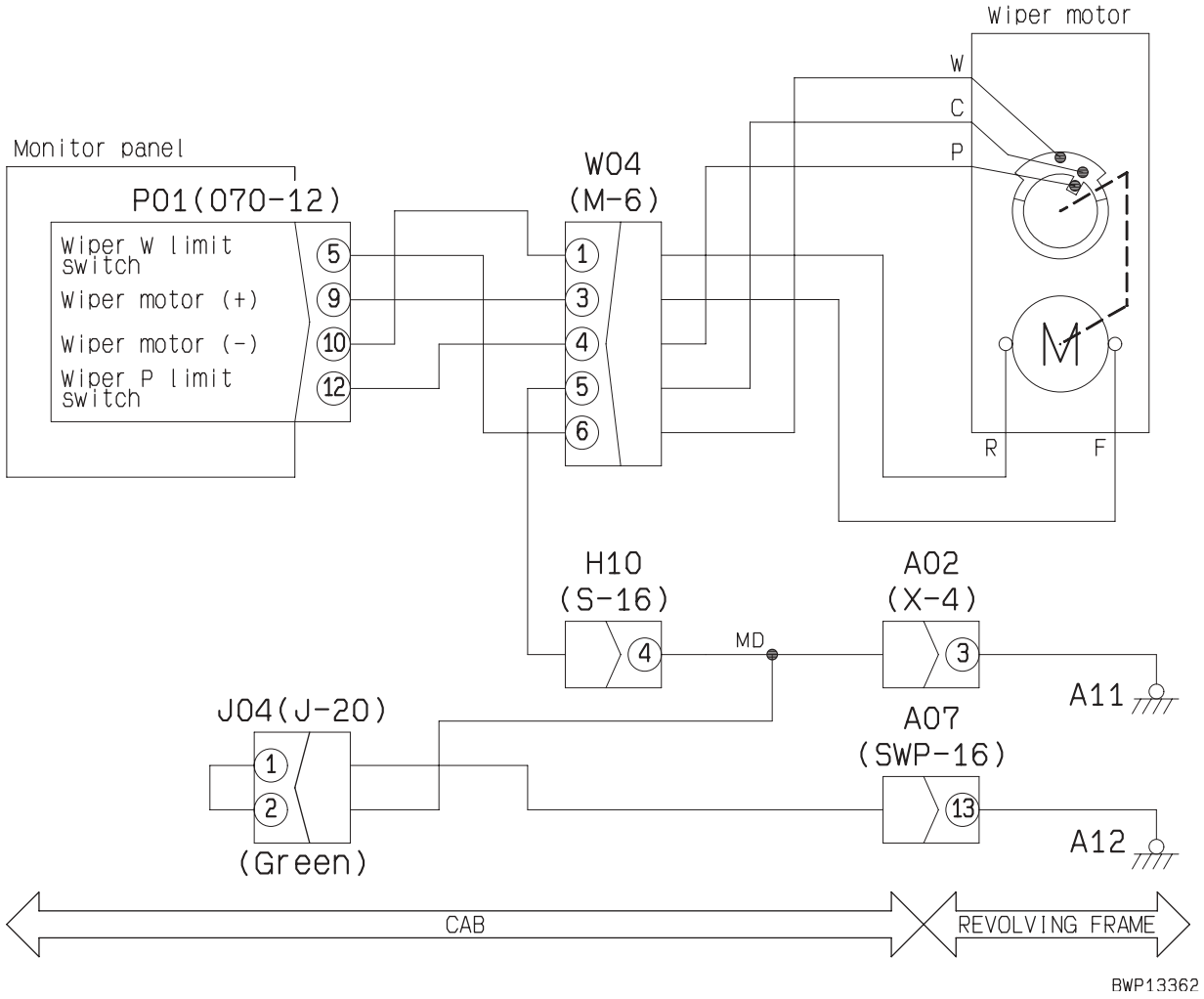
Error code [115] (Trouble in operation of windshield wiper)

User code	Error code	Trouble	Trouble in operation of windshield wiper (Monitor panel system)
–	**115**		
Contents of trouble	• When the wiper operates, the W-signals of both ends of the operating range are not input.		
Action of monitor panel	• Turns the operation signal to the wiper motor OFF.		
Problem that appears on machine	• The windshield wiper does not operate.		
Related information	• The input state (ON/OFF) from the W-signals of the wiper operating range can be checked with the monitoring function. (Code: 049, Center of lower line)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective wiper motor (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			W04 (male)	Wiper blade	Resistance	
			Between (6) and (5)	Top of operating range	Max. 1 Ω	
				Other than top of operating range	Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between P01 (female) (5) and W04 (female) (6)		Resistance	Max. 1 Ω
			Wiring harness between W04 (female) (5) and chassis ground (A11, A12)		Resistance	Max. 1 Ω
	3	Defective monitor panel	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			P01	Wiper blade	Voltage	
			Between (5) and chassis ground	Top of operating range	Max. 1 V	
				Other than top of operating range	20 – 30 V	

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Circuit diagram related to wiper motor



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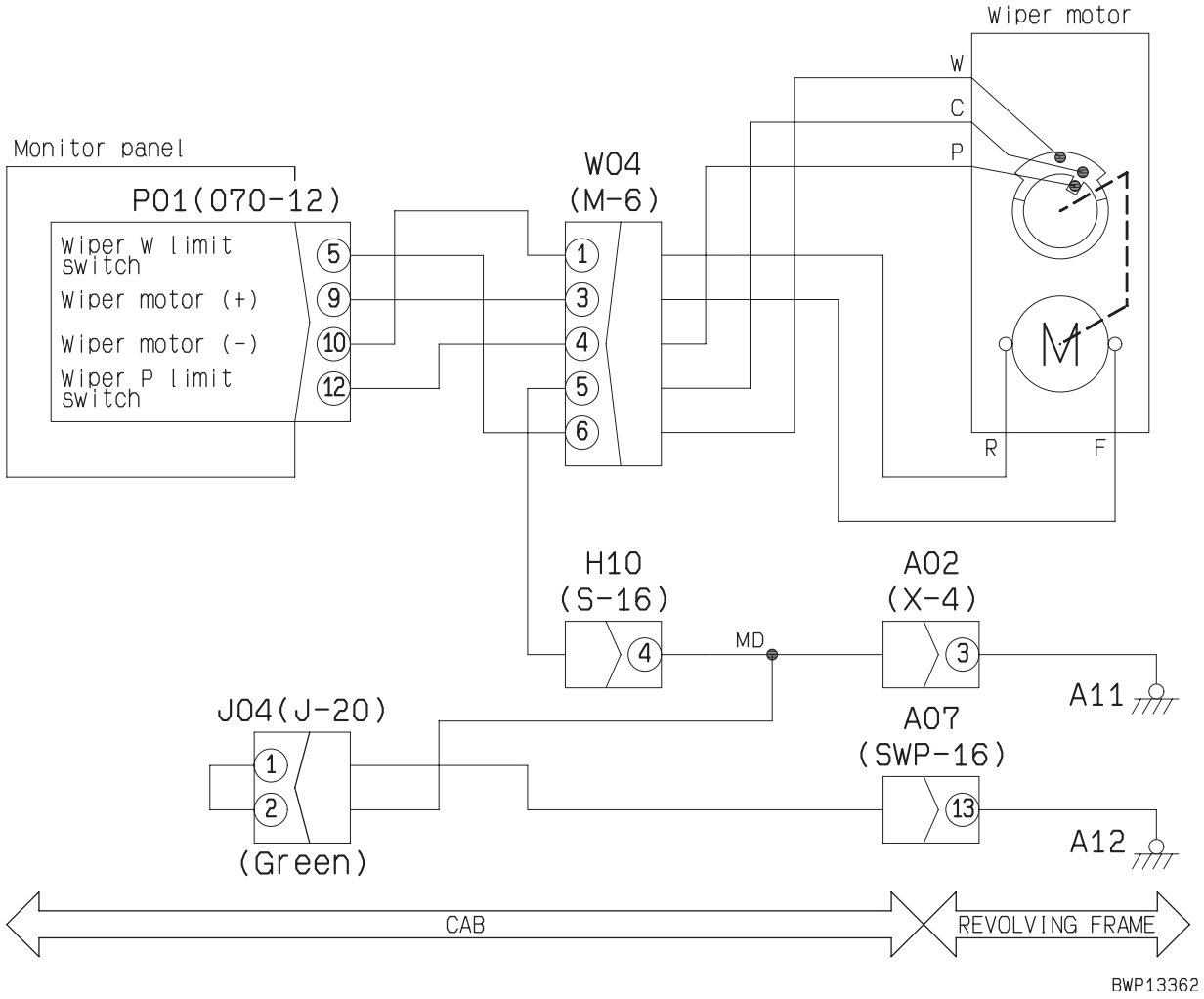
Error code [116] (Trouble in storage of windshield wiper)

User code	Error code	Trouble	Trouble in storage of windshield wiper (Monitor panel system)
–	**116**		
Contents of trouble	• When the wiper stored, the P-signals of the storage range is not input.		
Action of monitor panel	• Turns the storage signal to the wiper motor OFF.		
Problem that appears on machine	• The wiper is not stored.		
Related information	• The input state (ON/OFF) from the P-signals of the wiper operating range can be checked with the monitoring function. (Code: 049, Left of upper line)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective wiper motor (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			W04 (male)	Wiper blade	Resistance	
			Between (4) and (5)	Storage range	Max. 1 Ω	
				Operating range	Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between P01 (female) (12) and W04 (female) (4)		Resistance	Max. 1 Ω
			Wiring harness between W04 (female) (5) and chassis ground (A11, A12)		Resistance	Max. 1 Ω
	3	Defective monitor panel	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			P01	Wiper blade	Voltage	
			Between (12) and chassis ground	Storage range	Max. 1 V	
				Operating range	20 – 30 V	

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Circuit diagram related to wiper motor



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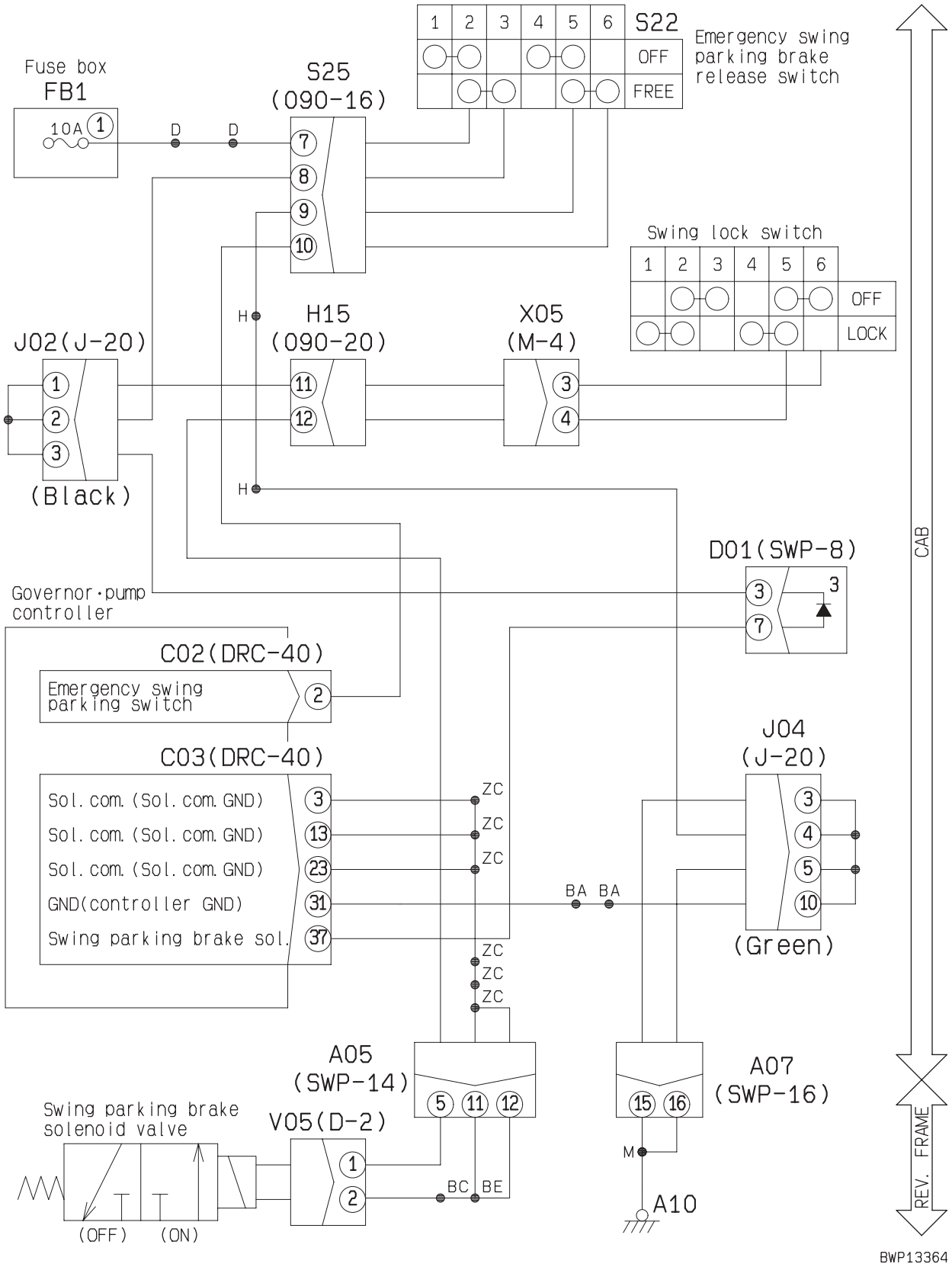
Error code [203] (Short circuit in swing holding brake solenoid)

User code	Error code	Trouble	Short circuit in swing holding brake solenoid (Governor and pump controller system)
E03	**203**		
Contents of trouble	• When the signal is output to the swing holding brake solenoid circuit, an abnormal current flows.		
Action of controller	• Turns the output to the swing holding brake solenoid circuit OFF. • Even if the cause of the failure disappears, the system does not reset itself until the starting switch is turned OFF.		
Problem that appears on machine	• The machine cannot swing (The swing holding brake is not released).		
Related information	• The operation state (ON/OFF) of the swing holding brake solenoid can be checked with the monitoring function. (Code: 023, Center of upper line) • If the solenoid and wiring harness are normal, the machine can swing by setting the swing holding brake release switch in the FREE position. (The swing holding brake does not operate when the machine stops swinging, however.)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective swing holding brake solenoid (Internal short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			V05 (male)		Resistance	
			Between (1) and (2)		20 – 60 Ω	
			Between (2) and chassis ground		Min. 1 MΩ	
	2	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C03 (female) (37) – D01 – J02 – X05 – V05 (female) (1) or S25 (female) (8) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	3	Defective governor and pump controller	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			C03	Left work equipment control lever		Voltage
			Between (37) and chassis ground	Neutral position		Max. 1 V
				Swing position		20 – 30 V

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Circuit diagram related to swing holding brake solenoid



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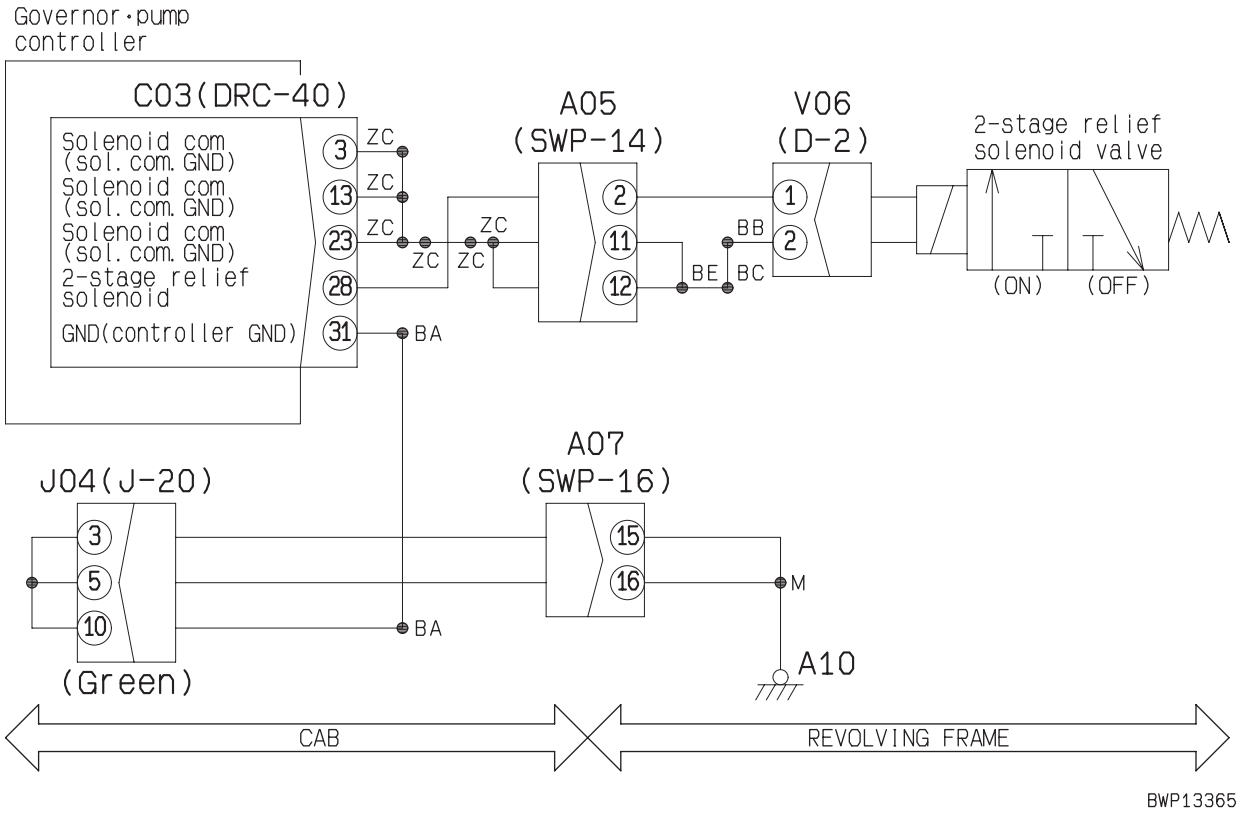
Error code [205] (Short circuit in 2-stage relief solenoid)

User code	Error code	Trouble	Short circuit in 2-stage relief solenoid (Governor and pump controller system)
–	**205**		
Contents of trouble	• When the signal is output to the 2-stage relief solenoid circuit, an abnormal current flows.		
Action of controller	• Turns the output to the 2-stage relief solenoid circuit OFF. • Even if the cause of the failure disappears, the system does not reset itself until the starting switch is turned OFF.		
Problem that appears on machine	• The one-touch power maximizing function does not work (The main relief valve is not set to high pressure).		
Related information	• The operation state (ON/OFF) of the 2-stage relief solenoid can be checked with the monitoring function. (Code: 023, Left of upper line)		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective 2-stage relief solenoid (Internal short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			V06 (male)	Resistance	
			Between (1) and (2)	20 – 60 Ω	
			Between (2) and chassis ground	Min. 1 MΩ	
	2	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Between C03 (female) (28) – V06 (female) (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ
	3	Defective governor and pump controller	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			C03	One-touch power maximizing switch	Voltage
			Between (37) and chassis ground	Released	Max. 1 V
				Kept pressed	20 – 30 V (With 8.5-sec timer)

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Circuit diagram related to 2-stage relief solenoid



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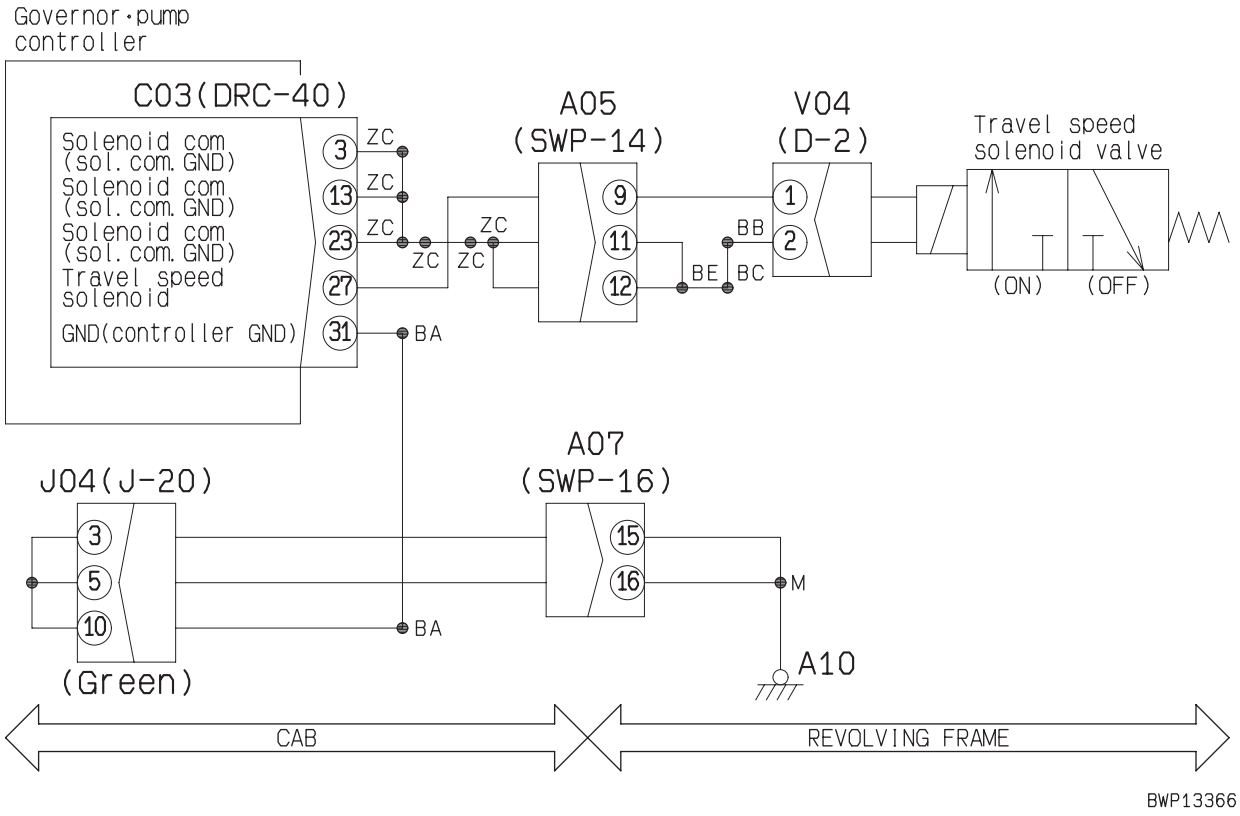
Error code [206] (Short circuit in travel speed shifting solenoid)

User code	Error code	Trouble	Short circuit travel speed shifting solenoid (Governor and pump controller system)
–	**206**		
Contents of trouble	• When the signal is output to the travel speed shifting solenoid circuit, an abnormal current flows.		
Action of controller	• Turns the output to the travel speed shifting solenoid circuit OFF. • Even if the cause of the failure disappears, the system does not reset itself until the starting switch is turned OFF.		
Problem that appears on machine	• The travel speed is not set to HI (The swash plate angle of the travel motor is not set to the minimum).		
Related information	• The operation state (ON/OFF) of the travel speed shifting solenoid can be checked with the monitoring function. (Code: 023, Left of lower line)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective travel speed shifting solenoid (Internal short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			V04 (male)	Resistance		
			Between (1) and (2)	20 – 60 Ω		
			Between (2) and chassis ground	Min. 1 MΩ		
	2	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C03 (female) (27) – V04 (female) (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ	
	3	Defective governor and pump controller	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			C03	Travel speed switch and travel lever	Voltage	
			Between (27) and chassis ground	Lo + Neutral	Max. 1 V	
				Hi + Travel position	20 – 30 V	

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Circuit diagram related to travel speed shifting solenoid



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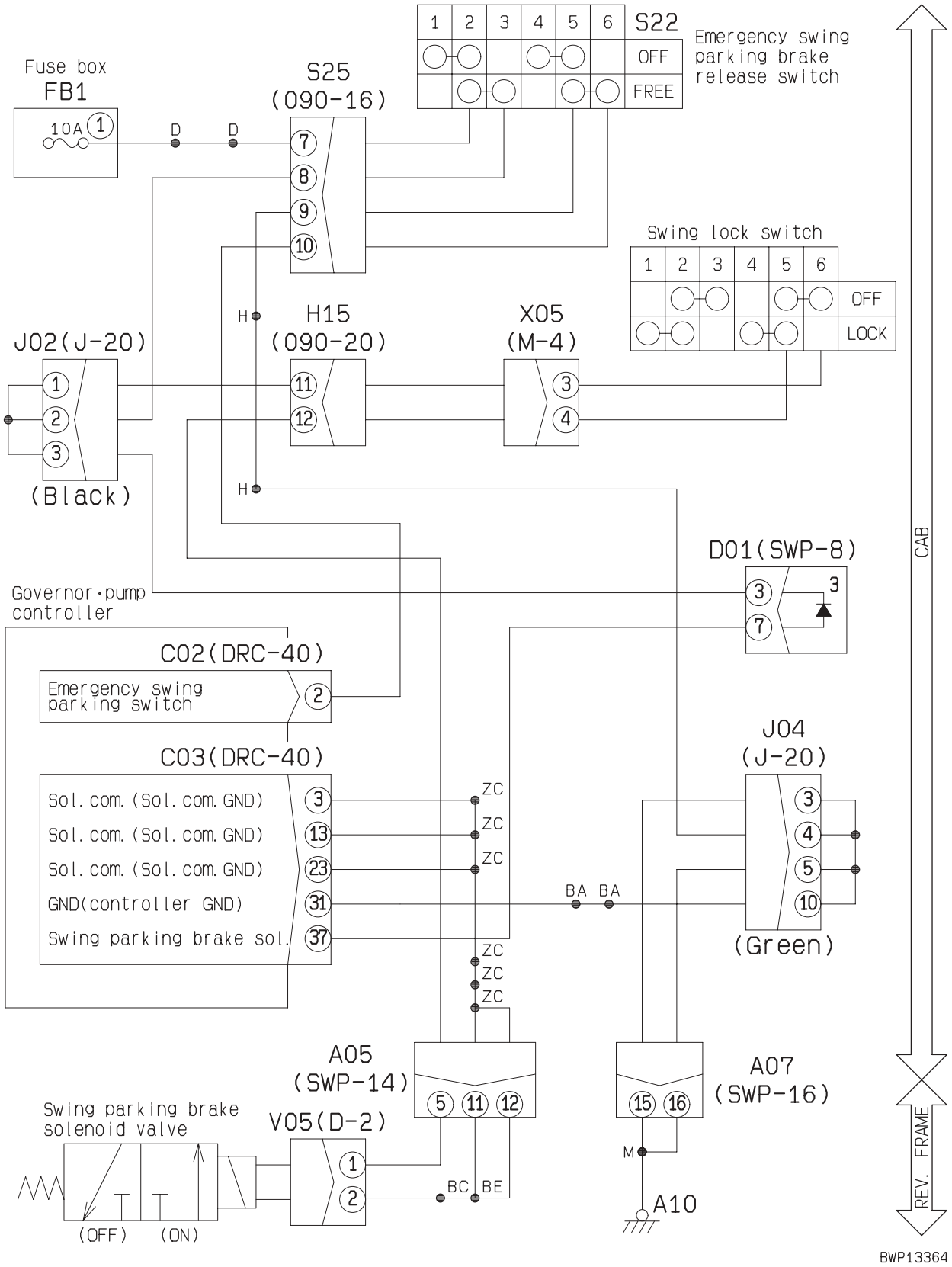
Error code [213] (Disconnection in swing holding brake solenoid)

User code	Error code	Trouble	Disconnection in swing holding brake solenoid (Governor and pump controller system)
E03	**213**		
Contents of trouble	• When the signal is output to the swing holding brake solenoid circuit, no current flows.		
Action of controller	• None in particular (Since no current flows, the solenoid does not operate). • If the cause of the failure disappears, the system resets itself.		
Problem that appears on machine	• The machine cannot swing (The swing holding brake is not released).		
Related information	• The operation state (ON/OFF) of the swing holding brake solenoid can be checked with the monitoring function. (Code: 023, Center of upper line) • If the solenoid and wiring harness are normal, the machine can swing by setting the swing holding brake release switch in the FREE position. (The swing holding brake does not operate when the machine stops swinging, however.) • During troubleshooting, keep the swing lock switch in the OFF position and the swing holding brake release switch in the RELEASE position. • Since the controller detects disconnection while the solenoid output is turned ON, be sure to turn the solenoid output ON when checking for reproduction of the failure after repair. (For the method of turning the solenoid output ON and OFF, see troubleshooting for error code [**203**].)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective swing holding brake solenoid (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			V05 (male)		Resistance	
			Between (1) and (2)		20 – 60 Ω	
	2	Defective swing lock switch (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			X05 (female)	Swing lock switch	Resistance	
			Between (3) and (4)	OFF	Max. 1 Ω	
				ON	Min. 1 MΩ	
	3	Defective assembled-type diode D01 (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			D01 (male)	Digital circuit tester	Continuity	
			Between (7) and (3)	Diode mode	There is continuity	
	4	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C03 (female) (37) and D01 (female) (7)		Resistance	Max. 1 Ω
			Wiring harness between D01 (female) (3) and J02 and X05 (male) (3)		Resistance	Max. 1 Ω
			Wiring harness between X05 (male) (4) and V05 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between C03 (female) (3), (13), (23) and V05 (female) (2)		Resistance	Max. 1 Ω
	5	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C03 (female) (37) – D01 (female) (7) wiring harness and chassis ground		Voltage	Max. 1 V
	6	Defective governor and pump controller	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			C03 (female)	Disconnect D01 and connect (3) and (7) on female side.	Resistance	
			Between (37) and (3), (13), (23)		20 – 60 Ω	

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Circuit diagram related to swing holding brake solenoid



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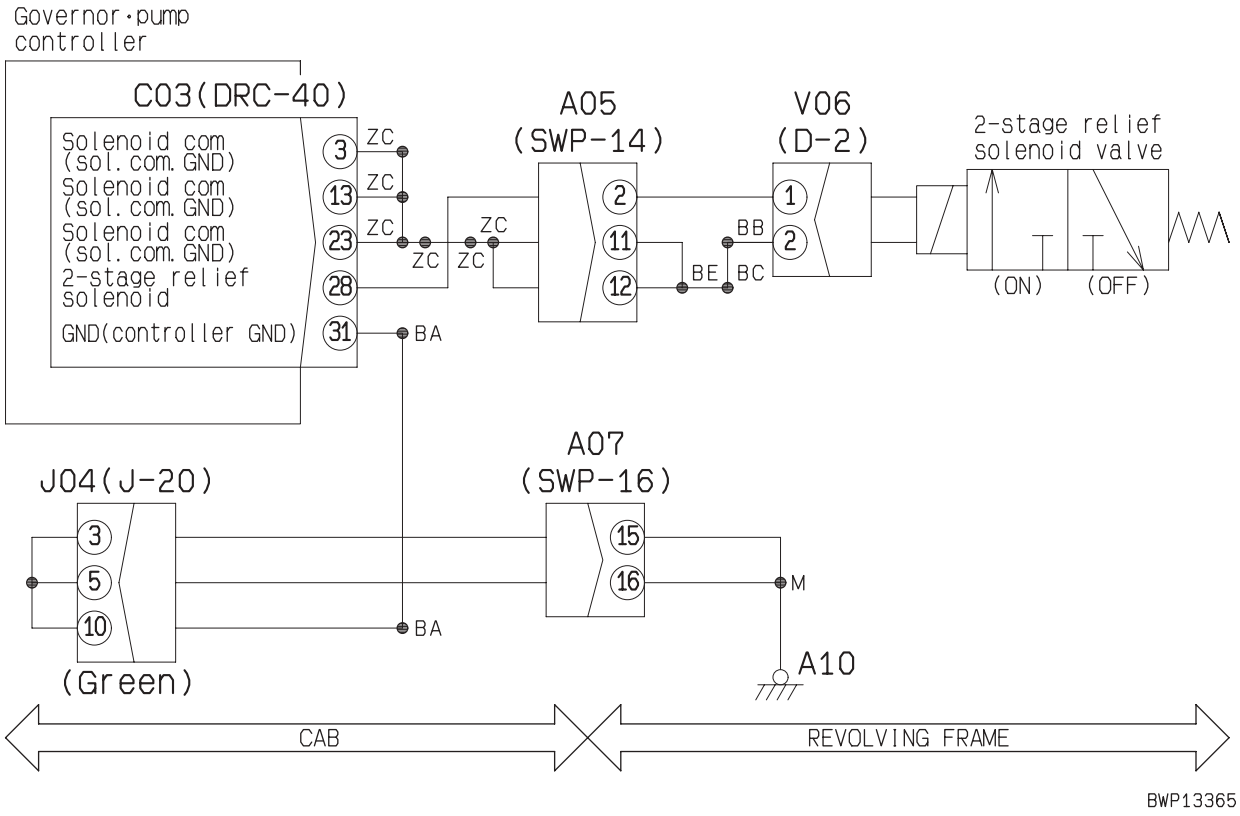
Error code [215] (Disconnection in 2-stage relief solenoid)

User code	Error code	Trouble	Disconnection in 2-stage relief solenoid (Governor and pump controller system)
–	**215**		
Contents of trouble	• When the signal is output to the 2-stage relief solenoid circuit, no current flows.		
Action of controller	• None in particular (Since no current flows, the solenoid does not operate). • If the cause of the failure disappears, the system resets itself.		
Problem that appears on machine	• The one-touch power maximizing function does not work (The main relief valve is not set to high pressure).		
Related information	• The operation state (ON/OFF) of the 2-stage relief solenoid can be checked with the monitoring function. (Code: 023, Left of upper line) • Since the controller detects disconnection while the solenoid output is turned ON, be sure to turn the solenoid output ON when checking for reproduction of the failure after repair. (For the method of turning the solenoid output ON and OFF, see troubleshooting for error code [**205**].)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective 2-stage relief solenoid (Internal short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			V06 (male)	Resistance		
			Between (1) and (2)	20 – 60 Ω		
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C03 (female) (28) and V06 (female) (1)	Resistance	Max. 1 Ω	
			Wiring harness between C03 (female) (3), (13), (23) and V06 (female) (2)	Resistance	Max. 1 Ω	
	3	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C03 (female) (28) – V06 (female) (1) wiring harness and chassis ground	Voltage	Max. 1 V	
	4	Defective governor and pump controller	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			C03 (female)	Resistance		
			Between (37) and (3), (13), (23)	20 – 60 Ω		

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Circuit diagram related to 2-stage relief solenoid



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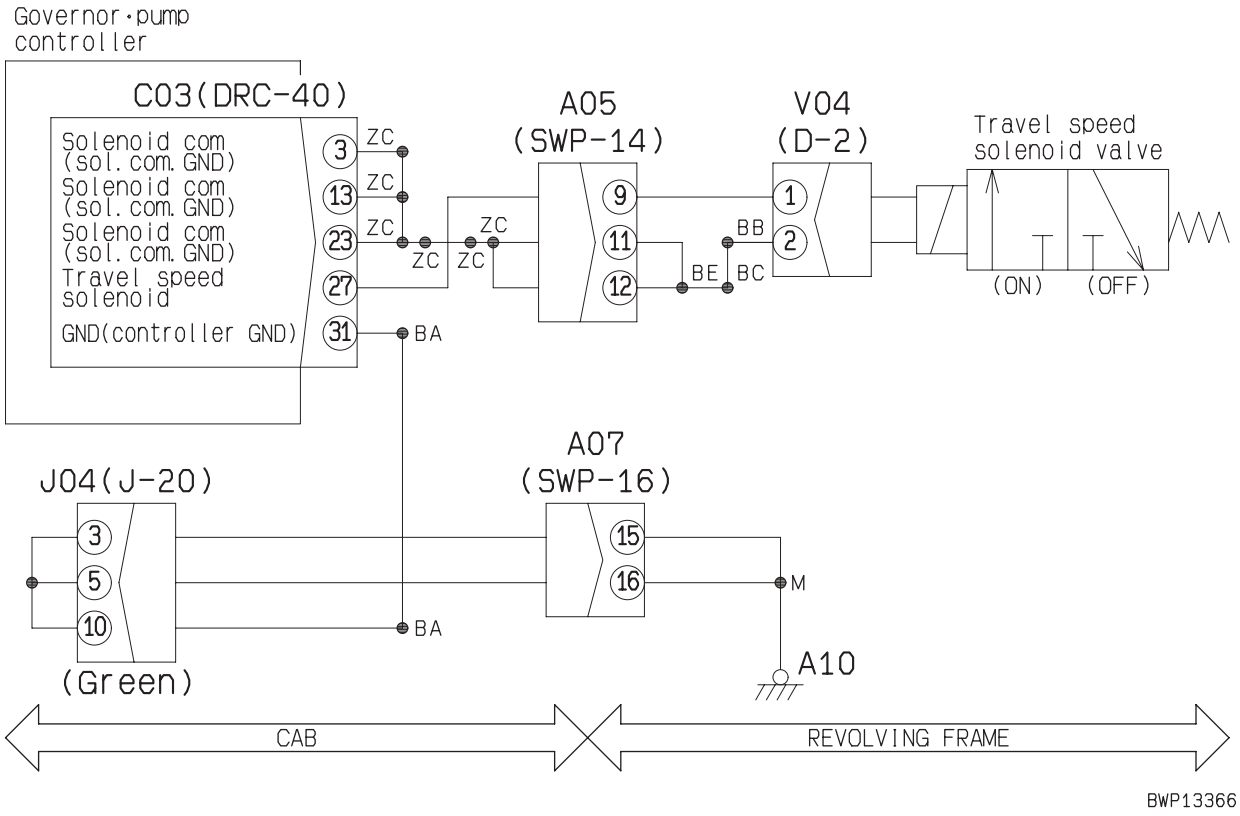
Error code [216] (Disconnection in travel speed shifting solenoid)

User code	Error code	Trouble	Disconnection in travel speed shifting solenoid (Governor and pump controller system)
–	**216**		
Contents of trouble	• When the signal is output to the travel speed shifting solenoid circuit, no current flows.		
Action of controller	• None in particular (Since no current flows, the solenoid does not operate). • If the cause of the failure disappears, the system resets itself.		
Problem that appears on machine	• The travel speed is not set to HI (The swash plate angle of the travel motor is not set to the minimum).		
Related information	• The operation state (ON/OFF) of the travel speed shifting solenoid can be checked with the monitoring function. (Code: 023, Left of lower line) • Since the controller detects disconnection while the solenoid output is turned ON, be sure to turn the solenoid output ON when checking for reproduction of the failure after repair. (For the method of turning the solenoid output ON and OFF, see troubleshooting for error code [**206**].)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective travel speed shifting solenoid (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			V04 (male)	Resistance		
			Between (1) and (2)	20 – 60 Ω		
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C03 (female) (27) and V04 (female) (1)	Resistance	Max. 1 Ω	
			Wiring harness between C03 (female) (3), (13), (23) and V04 (female) (2)	Resistance	Max. 1 Ω	
	3	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C03 (female) (27) – V04 (female) (1) wiring harness and chassis ground	Voltage	Max. 1 V	
	4	Defective governor and pump controller	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			C03 (female)	Resistance		
			Between (27) and (3), (13), (23)	20 – 60 Ω		

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Circuit diagram related to travel speed shifting solenoid



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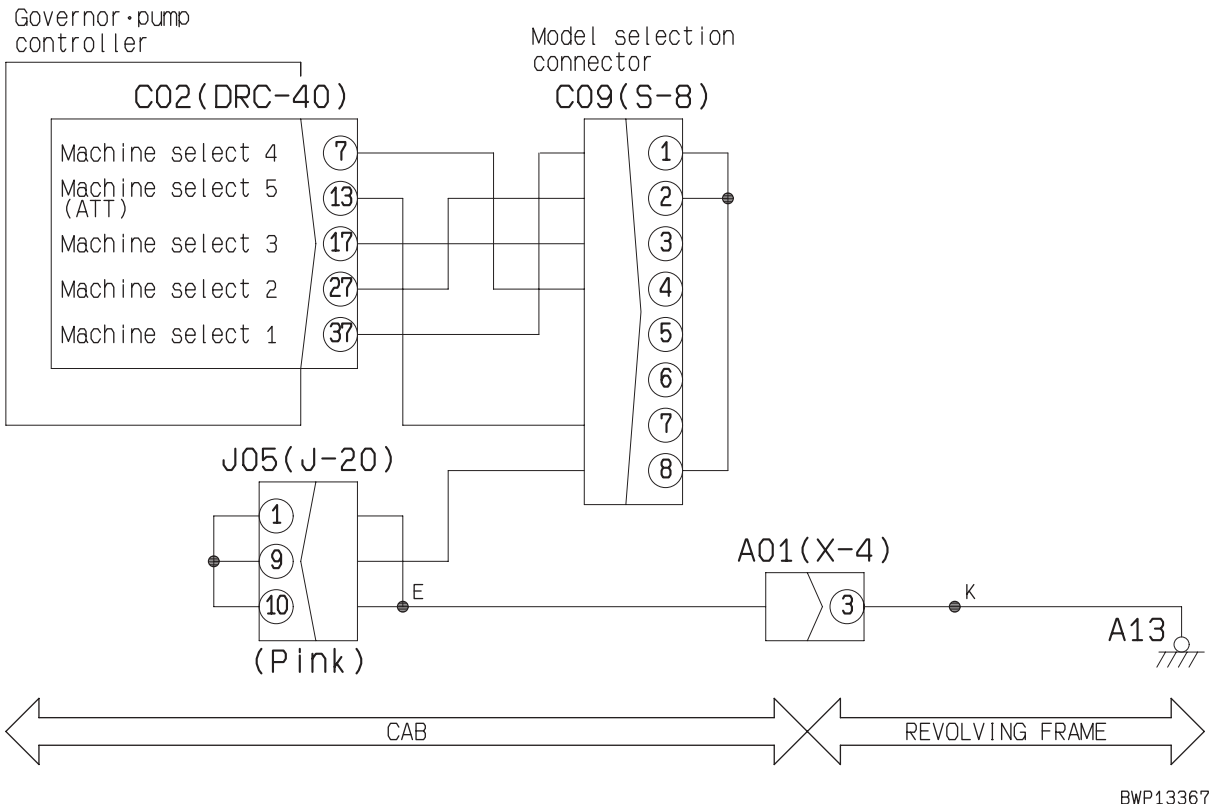
Error code [217] (Abnormality in input model code)

User code	Error code	Trouble	Abnormality in input model code (Governor and pump controller system)
–	**217**		
Contents of trouble	• A model code signal for a model which is not registered in the controller is input.		
Action of controller	• Uses the default model (PC200-7) for control. • Even if the cause of the failure disappears, the system does not reset itself until the starting switch is turned OFF.		
Problem that appears on machine	• The engine does not output sufficient power or may stall.		
Related information	• The model name (number) recognized by the controller can be checked with the monitoring function. (Code: 002, 003) • The input state (ON/OFF) of the model selection signal can be checked with the monitoring function. (Code: 027, Other than left of lower line)		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective model selection connector (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			C09 (female)	Resistance	
			Between (1), (2) and (8)	Max. 1 Ω	
			Between (3), (4), (7) and (8)	Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between C02 (female) (37) and C09 (male) (1)	Resistance	Max. 1 Ω
			Wiring harness between C02 (female) (27) and C09 (male) (2)	Resistance	Max. 1 Ω
			Wiring harness between C09 (female) (8) and chassis ground (A13)	Resistance	Max. 1 Ω
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Between C02 (female) (17) – C09 (male) (3) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between C02 (female) (7) – C09 (male) (4) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between C02 (female) (13) – C09 (male) (7) wiring harness and chassis ground	Resistance	Min. 1 MΩ
	4	Defective governor and pump controller	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			C02 (female)	Voltage	
			Between (7), (13), (17) and chassis ground	20 – 20 V	
			Between (27), (37), and chassis ground	Max. 1 V	

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Circuit diagram related to model selection connector



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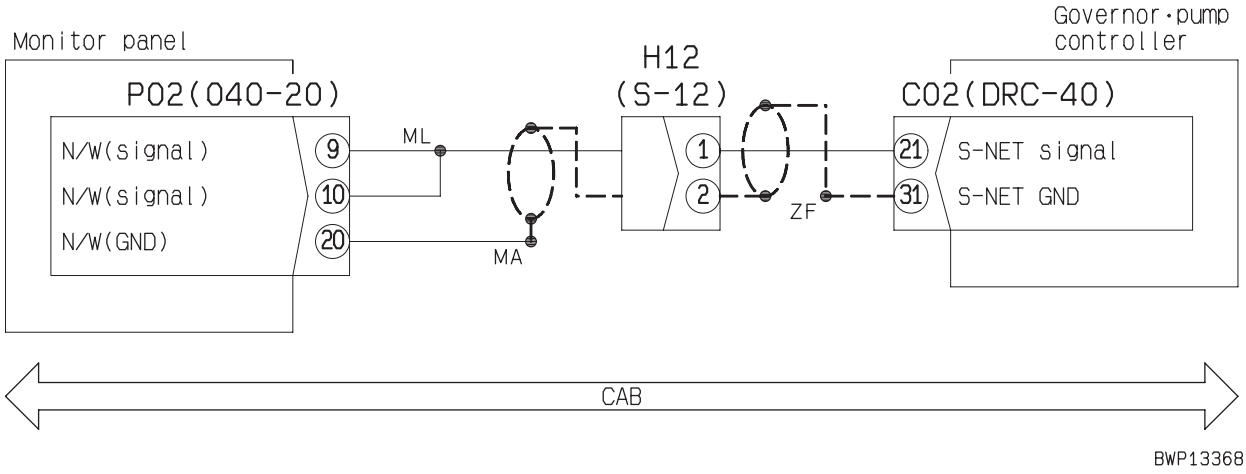
Error code [218] (Disconnection in S-NET signal line)

User code	Error code	Trouble	Disconnection in S-NET signal line (Governor and pump controller system)
–	**218**		
Contents of trouble	• A trouble has occurred in the S-NET communication between the monitor panel and controller (It has been repaired when this error code is displayed).		
Action of controller	• Uses the following default items for control until the trouble is repaired. 1) Working mode: E 2) Travel speed: Lo 3) Auto-decelerator: ON • Even if the cause of the failure disappears, the system does not reset itself until the starting switch is turned OFF.		
Problem that appears on machine	• The working mode cannot be changed (The working mode displayed in the monitor panel changes normally). • The travel speed cannot be changed (The travel speed displayed in the monitor panel changes normally). • The auto-decelerator cannot be reset (The auto-decelerator displayed in the monitor panel is reset normally.)		
Related information	• This error code is displayed to notify the operator that a trouble has occurred when the S-NET communication between the monitor panel and governor and pump controller becomes normal. • The system is normal when the error code is displayed. Check the related devices and circuits and remove the cause of the trouble, however, to prevent reoccurrence of the trouble.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between P02 (female) (9), (10) and C02 (female) (21).	Resistance	Max. 1 Ω
			Wiring harness between P02 (female) (20) and C02 (female) (31)	Resistance	Max. 1 Ω
	2	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Between P02 (female) (9), (10) – C02 (female) (21) wiring harness and chassis ground	Resistance	Min. 1 MΩ
	3	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between P02 (female) (9), (10) – C02 (female) (21) wiring harness and chassis ground	Voltage	Max. 1 V
	4	Defective monitor panel	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			P02	Voltage	
			Between (9), (10) and (20)	6 – 9 V	
	5	Defective governor and pump controller	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			C02	Voltage	
			Between (21) and (31)	6 – 9 V	

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Circuit diagram related to S-NET



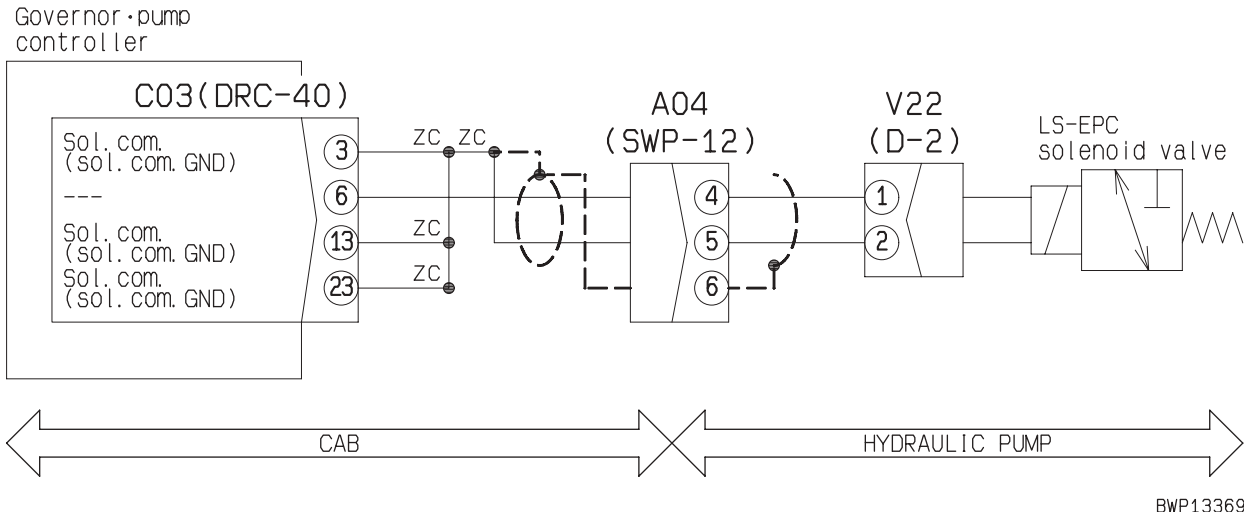
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Error code [222] (Short circuit in LS-EPC solenoid)

User code	Error code	Trouble	Short circuit in LS-EPC solenoid (Governor and pump controller system)
–	**222**		
Contents of trouble	• An abnormal current flows in the LS-EPC solenoid circuit		
Action of controller	• Reduces the output to the LS-EPC solenoid circuit 0. • Even if the cause of the failure disappears, the system does not reset itself until the starting switch is turned OFF.		
Problem that appears on machine	• The travel speed is fast at Lo. Amount of flow is large at model B. (The set pressure of the LS valve cannot be controlled)		
Related information	• The output state (current) to the LS-EPC solenoid can be checked with the monitoring function. (Code: 015, by 10 mA)		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective LS-EPC solenoid (Internal short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			V22 (male)	Resistance	
			Between (1) and (2)	7 – 14 Ω	
			Between (1) and chassis ground	Min. 1 MΩ	
	2	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Between C03 (female) (6) – V22 (female) (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ
	3	Defective governor and pump controller	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			C03	Resistance	
			Between (6) and (3), (13), (23)	7 – 14 Ω	
			Between (6) and chassis ground	Min. 1 MΩ	

Circuit diagram related to LS-EPC solenoid



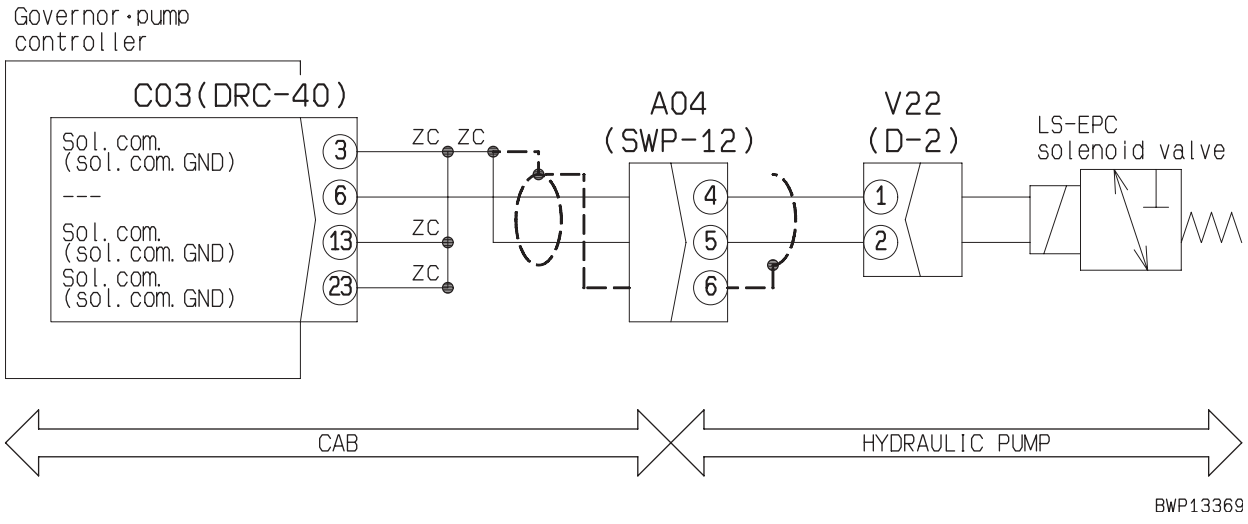
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Error code [223] (Disconnection in LS-EPC solenoid)

User code	Error code	Trouble	Disconnection in LS-EPC solenoid (Governor and pump controller system)
–	**223**		
Contents of trouble	• No current flows in the LS-EPC solenoid circuit		
Action of controller	• None in particular (Since no current flows, the solenoid does not operate). • If the cause of the failure disappears, the system resets itself.		
Problem that appears on machine	• The travel speed is fast at Lo. Amount of flow is large at model B. (The set pressure of the LS valve cannot be controlled)		
Related information	• The output state (current) to the LS-EPC solenoid can be checked with the monitoring function. (Code: 015, by 10 mA)		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective LS-EPC solenoid (Internal short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			V22 (male)	Resistance	
			Between (1) and (2)	7 – 14 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between C03 (female) (6) and V22 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between C03 (female) (3), (13), (23), and V22 (female) (2)	Resistance	Max. 1 Ω
	3	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between C03 (female) (6) – V22 (female) (1) wiring harness and chassis ground	Voltage	Max. 1 V
	4	Defective governor and pump controller	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			C03	Resistance	
			Between (6) and (3), (13), (23)	7 – 14 Ω	

Circuit diagram related to LS-EPC solenoid



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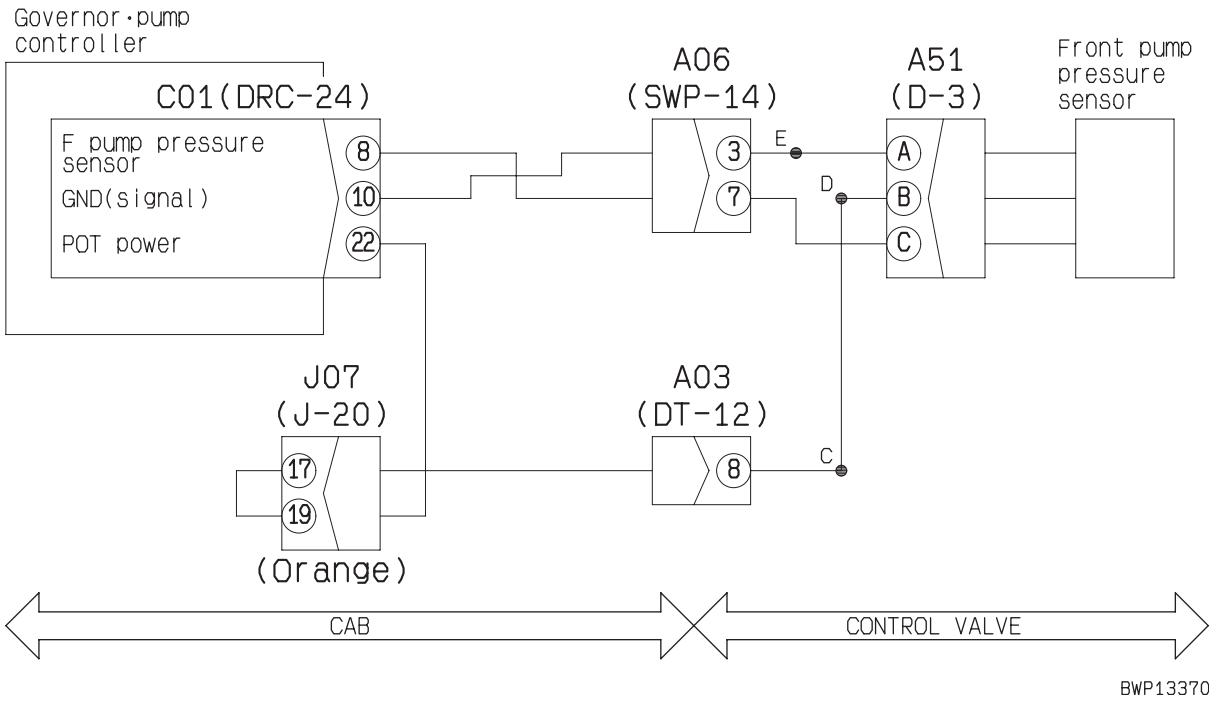
Error code [224] (Abnormality in pump pressure sensor)

User code	Error code	Trouble	Abnormality in pump pressure sensor (Governor and pump controller system)
–	**224**		
Contents of trouble	• The signal voltage from the pump pressure sensor is below 0.3 V or above 4.72 V.		
Action of controller	• Sets the pump pressure to 0 MPa {0 kg/cm^2} for control. • If the cause of the failure disappears, the system resets itself.		
Problem that appears on machine	• The travel speed does not change automatically (The travel load pressure cannot be sensed). • Cut-off function dose not work (The work equipment pressure can not be detected.)		
Related information	• If the 5-V circuit (B) and ground circuit (A) of the pressure sensor are connected inversely, the pressure sensor will be broken. Accordingly, take extreme care when checking. • The input state (ON/OFF) from the pump pressure sensor can be checked with the monitoring function. (Code: 011, 012, by 1 kg/cm^2)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective sensor power supply	If error code [**226**] is displayed, carry out troubleshooting for it first.			
	2	Defective pump pressure sensor (Internal defect)	★Prepare with starting switch OFF, then hold starting switch ON or start engine and carry out troubleshooting.			
			A51		Voltage	
			Between (B) and (A)	Power supply	4.5 – 5.5 V	
			Between (C) and (A)	Signal	0.5 – 4.5 V	
			The pressure sensor voltage is measured with the wiring harness connected. Accordingly, if the voltage is abnormal, check the wiring harness and controller, too, for another cause of the trouble, and then judge.			
	3	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C01 (female) (22) and J07 and A51 (female) (B)		Resistance	Max. 1 Ω
			Wiring harness between C01 (female) (10) and A51 (female) (A)		Resistance	Max. 1 Ω
			Wiring harness between C01 (female) (8) and A51 (female) (C)		Resistance	Max. 1 Ω
	4	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C01 (female) (8) – A51 (female) (C) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	5	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C01 (female) (22) – J07 – A51 (female) (B) wiring harness and chassis ground		Voltage	Max. 1 V
			Between C01 (female) (8) – A51 (female) (C) wiring harness and chassis ground		Voltage	Max. 1 V
	6	Defective governor and pump controller	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			C01		Voltage	
			Between (22) and (10)	Power supply	4.5 – 5.5 V	
			Between (8) and (10)	Signal	0.5 – 4.5 V	

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Circuit diagram related to pump pressure sensor



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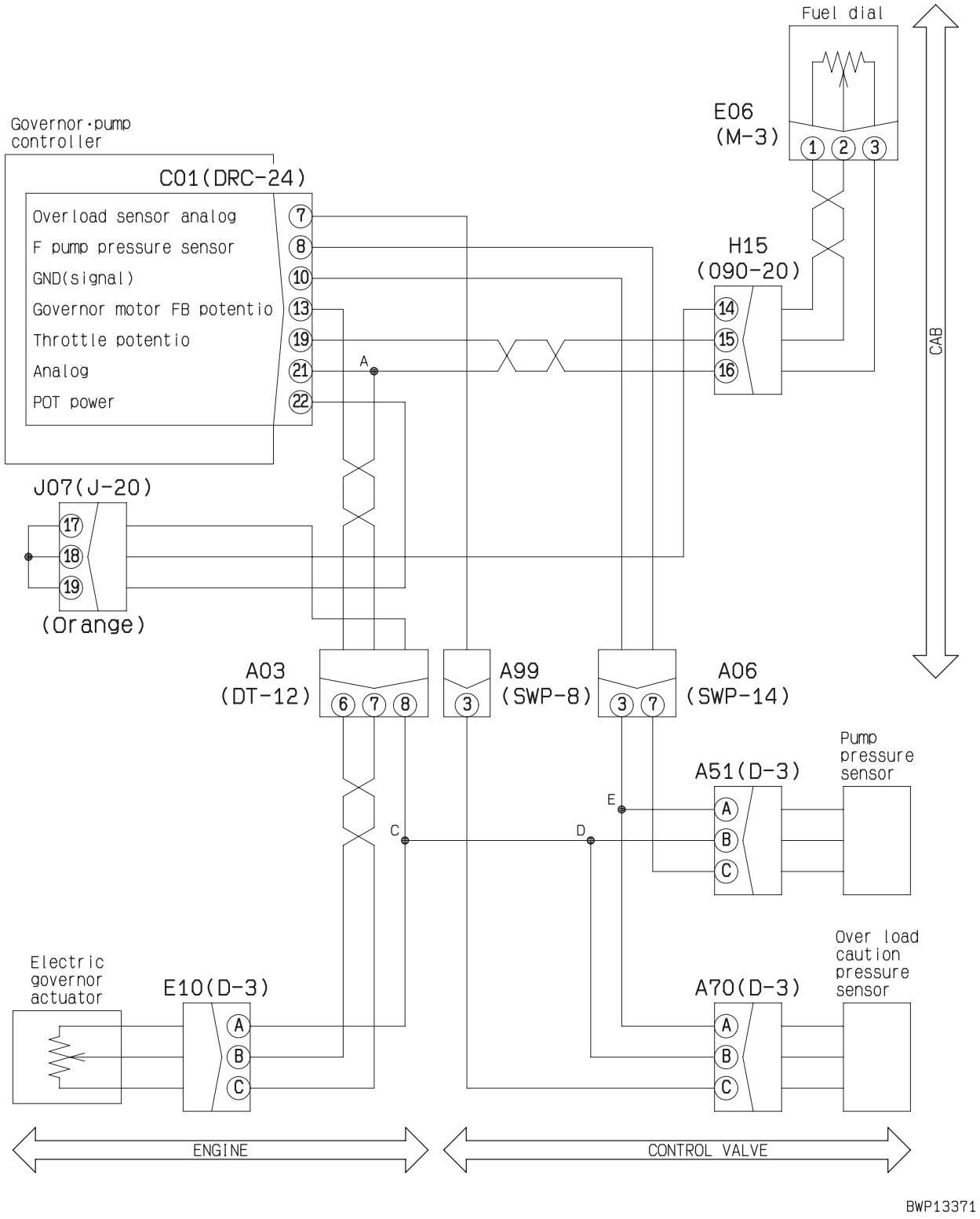
Error code [226] (Abnormality in pressure sensor power supply)

User code	Error code	Trouble	Abnormality in pressure sensor power supply (Governor and pump controller system)
–	**226**		
Contents of trouble	• An abnormal current flows in the power supply (5 V) circuit of the pressure sensor or potentiometer.		
Action of controller	• Turns the output to the power supply (5 V) circuit OFF. • Even if the cause of the failure disappears, the system does not reset itself until the starting switch is turned OFF.		
Problem that appears on machine	• The signals of the pressure sensor and potentiometer are not input normally. • The error codes of abnormality in the pressure sensor and abnormality in the potentiometer are displayed simultaneously.		
Related information			

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective pressure sensor or potentiometer (Internal short circuit)	★Disconnect connector with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Disconnect the devices at right in order. If the error code disappears when a device is disconnected, that device has a defect in it.	Fuel control dial	Connector E06	
				Governor potentiometer	Connector E10	
				Pump pressure sensor	Connector A51	
				Overload pressure sensor (If installed)	Connector A70	
	2	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C01 (female) (22) – J07 – E06 (female) (1) wiring harness and chassis ground [Fuel control dial system]		Resistance	Min. 1 MΩ
			Between C01 (female) (22) – J07 – E10 (female) (A) wiring harness and chassis ground [Governor potentiometer system]		Resistance	Min. 1 MΩ
			Between C01 (female) (22) – J07 – A51 (female) (B) wiring harness and chassis ground [Pump pressure sensor system]		Resistance	Min. 1 MΩ
			Between C01 (female) (22) – J07 – A70 (female) (B) wiring harness and chassis ground [Overload pressure sensor system: If installed]		Resistance	Min. 1 MΩ
	3	Defective governor and pump controller	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			C01		Voltage	
			Between (22) and (10)		4.5 – 5.5 V	

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Circuit diagram related to sensor power supply



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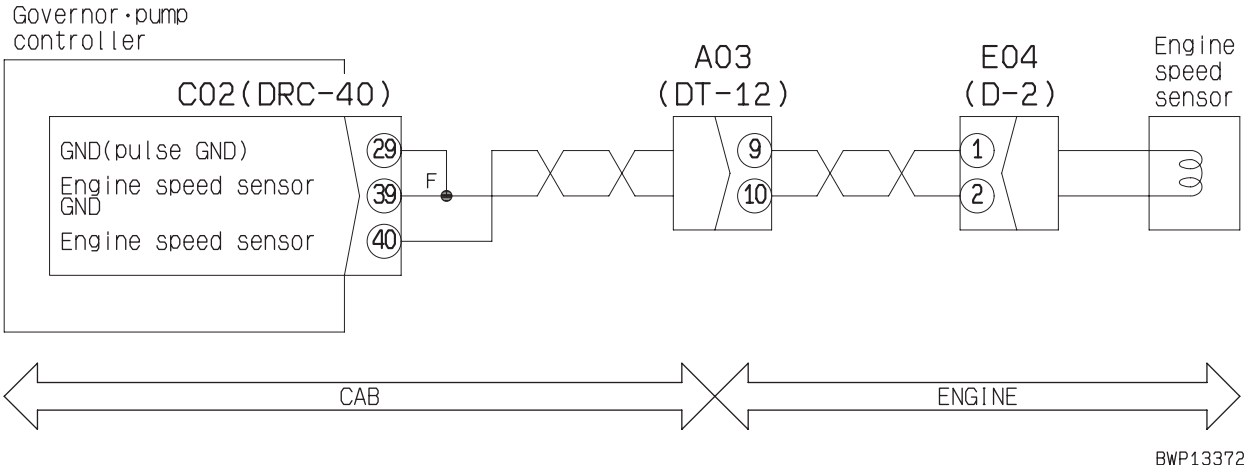
Error code [227] (Abnormality in engine speed sensor)

User code	Error code	Trouble	Abnormality in engine speed sensor (Governor and pump controller system)
–	**227**		
Contents of trouble	• Normal pulse signals are not input to the signal circuit of the engine speed sensor.		
Action of controller	• Controls as if in the E-mode. • If the cause of the failure disappears, the system resets itself.		
Problem that appears on machine	• The output power is a little low (The engine speed cannot be sensed).		
Related information	• The input state (ON/OFF) from the engine speed sensor can be checked with the monitoring function. (Code: 010, by 10 rpm)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective engine speed sensor (Internal short circuit or disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			E04 (male)	Resistance		
			Between (1) and (2)	500 – 1,000 Ω		
			Between (1) and chassis ground	Min. 1 MΩ		
	2	Defective adjustment of engine speed sensor	See TESTING AND ADJUSTING, Adjusting engine speed sensor.			
	3	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C01 (female) (40) and E04 (female) (1)	Resistance	Max. 1 Ω	
			Wiring harness between C01 (female) (29), (39) and E04 (female) (2)	Resistance	Max. 1 Ω	
	4	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C01 (female) (40) – E04 (female) (1) wiring harness and chassis ground	Voltage	Max. 1 V	
	5	Defective governor and pump controller	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			C02	Resistance		
			Between (40) and (29), (39)	500 – 1,000 Ω		
			Between (40) and chassis ground	Min. 1 MΩ		

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Circuit diagram related to engine speed sensor



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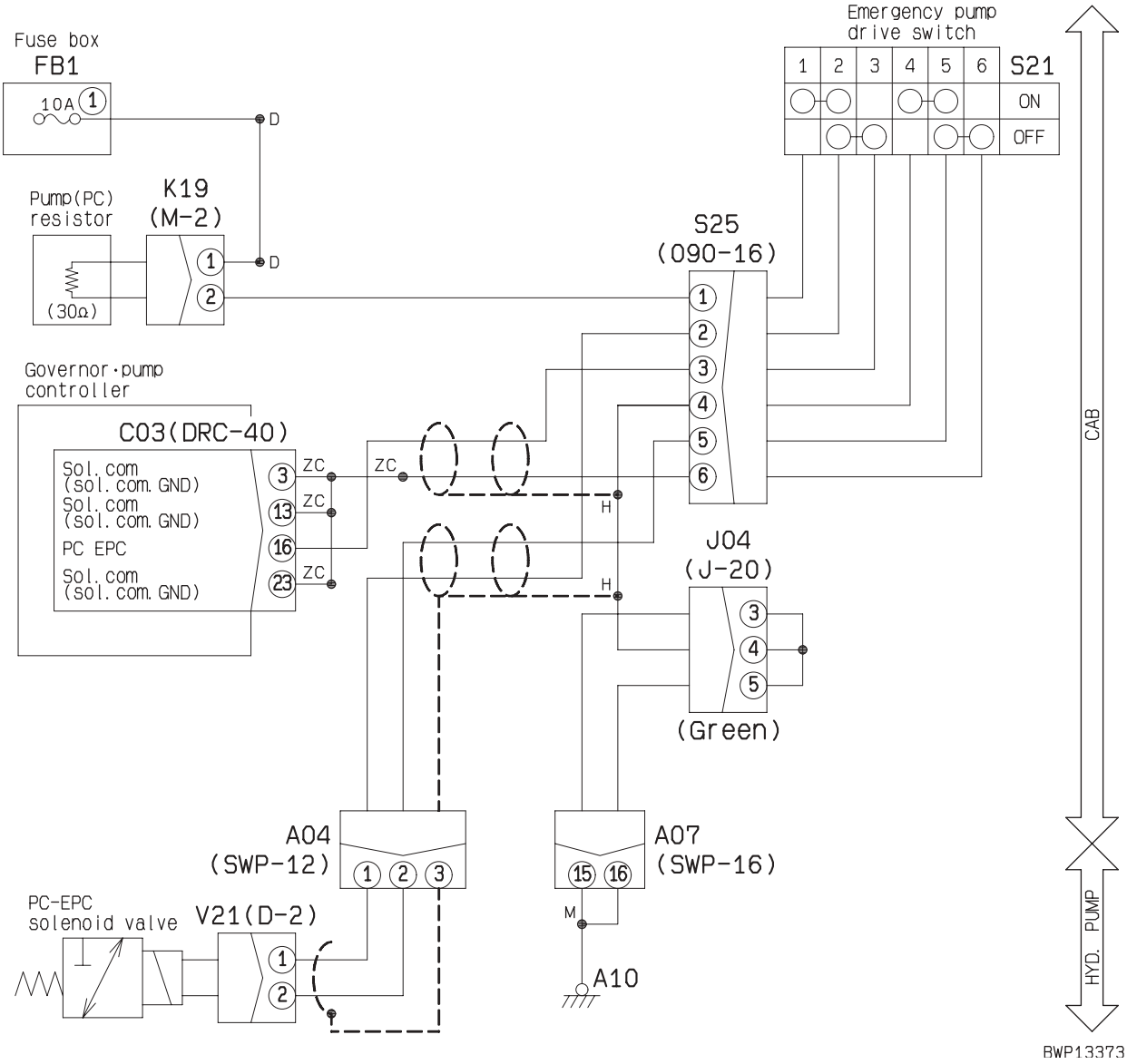
Error code [232] (Short circuit in PC-EPC solenoid)

User code	Error code	Trouble	Short circuit in PC-EPC solenoid (Governor and pump controller system)
E02	**232**		
Contents of trouble	• An abnormal current flows in the PC-EPC solenoid circuit.		
Action of controller	• Turns the output to the LS-EPC solenoid circuit OFF. • Even if the cause of the failure disappears, the system does not reset itself until the starting switch is turned OFF.		
Problem that appears on machine	• If the pump load increases, the engine speed lowers largely and the engine may stall (The pump absorption torque cannot be controlled).		
Related information	• The output state (current) to the PC-EPC solenoid can be checked with the monitoring function. (Code: 013, by 10 mA)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective PC-EPC solenoid (Internal short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			V21 (male)		Resistance	
			Between (1) and (2)		7 – 14 Ω	
			Between (1) and chassis ground		Min. 1 MΩ	
	2	Defective emergency pump drive switch (Internal short circuit or disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			S25 (male)	Emergency pump drive switch	Resistance	
			Between (3) and (4)	Normal	Min. 1 MΩ	
			Between (3) and chassis ground		Min. 1 MΩ	
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C03 (female) (16) – S25 (female) (3) wiring harness and chassis ground		Resistance	Min. 1 MΩ
			Between S25 (female) (2) – V21 (female) (1) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	4	Defective governor and pump controller	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			C03 (female)		Resistance	
			Between (16) and (3), (13), (23)		7 – 14 Ω	
			Between (16) and chassis ground		Min. 1 MΩ	

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Circuit diagram related to PC-EPC solenoid



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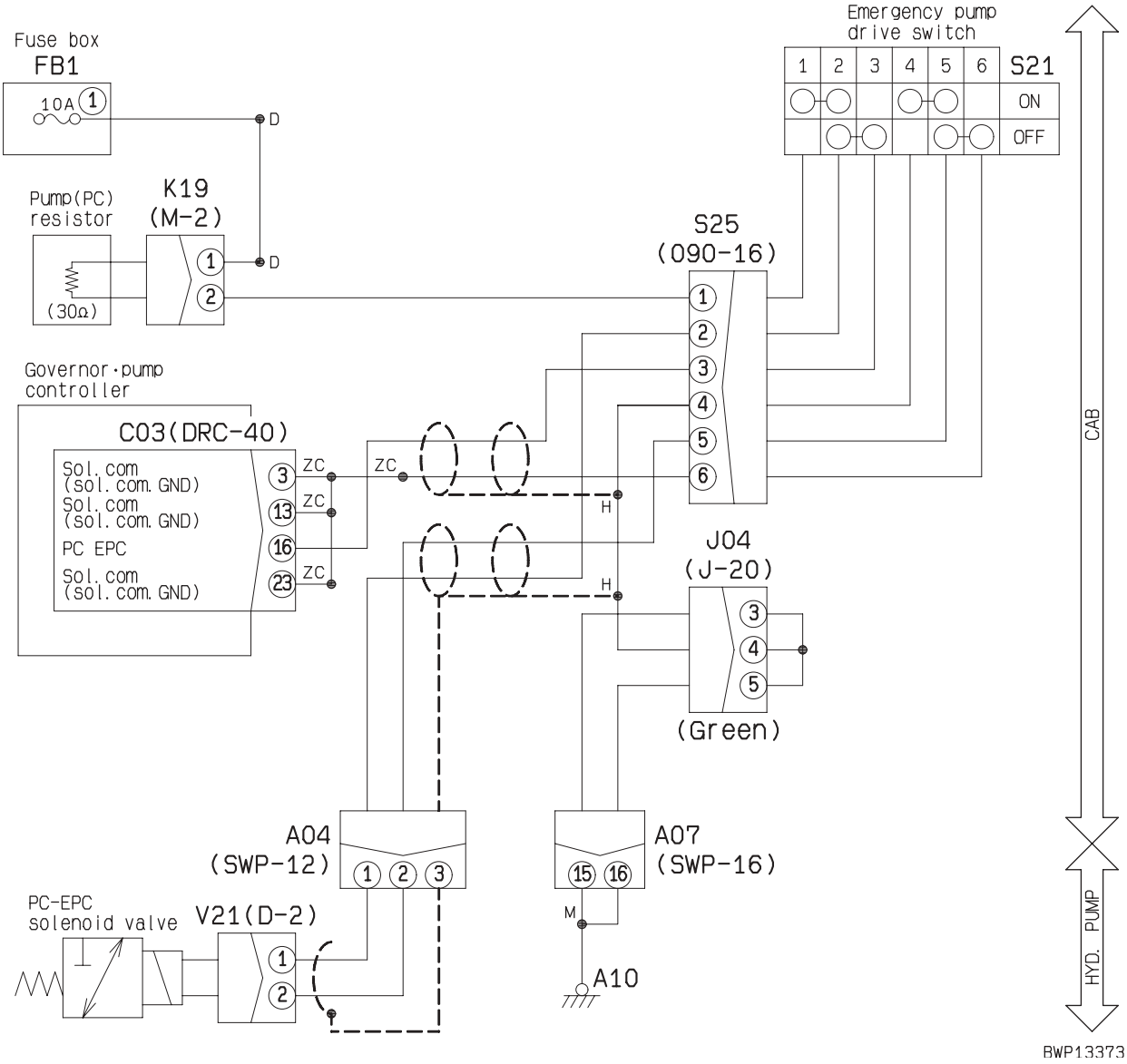
Error code [233] (Disconnection in PC-EPC solenoid)

User code	Error code	Trouble	Disconnection in PC-EPC solenoid (Governor and pump controller system)
E02	**233**		
Contents of trouble	• No current flows in the PC-EPC solenoid circuit.		
Action of controller	• None in particular (Since no current flows, the solenoid does not operate). • If the cause of the failure disappears, the system resets itself.		
Problem that appears on machine	• If the pump load increases, the engine speed lowers largely and the engine may stall (The pump absorption torque cannot be controlled).		
Related information	• The output state (current) to the PC-EPC solenoid can be checked with the monitoring function. (Code: 013, by 10 mA)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective PC-EPC solenoid (Internal short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			V21 (male)		Resistance	
			Between (1) and (2)		7 – 14 Ω	
	2	Defective emergency pump drive switch (Internal short circuit or disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			S25 (male)	Emergency pump drive switch	Resistance	
			Between (2) and (3)	Normal	Max. 1 Ω	
				Emergency	Min. 1 MΩ	
			Between (5) and (6)	Normal	Max. 1 Ω	
				Emergency	Min. 1 MΩ	
	3	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C03 (female) (16) and S25 (female) (3)		Resistance	Max. 1 Ω
			Wiring harness between S25 (female) (2) and V21 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between C03 (female) (3), (13), (23) and S25 (female) (6)		Resistance	Max. 1 Ω
			Wiring harness between S25 (female) (5) and V21 (female) (2)		Resistance	Max. 1 Ω
	4	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C03 (female) (16) – S25 (female) (3) wiring harness and chassis ground		Voltage	Max. 1 V
			Between S25 (female) (2) – V21 (female) (1) wiring harness and chassis ground		Voltage	Max. 1 V
	5	Defective governor and pump controller	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			C03 (female)		Resistance	
			Between (16) and (3), (13), and (23)		7 – 14 Ω	

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Circuit diagram related to PC-EPC solenoid



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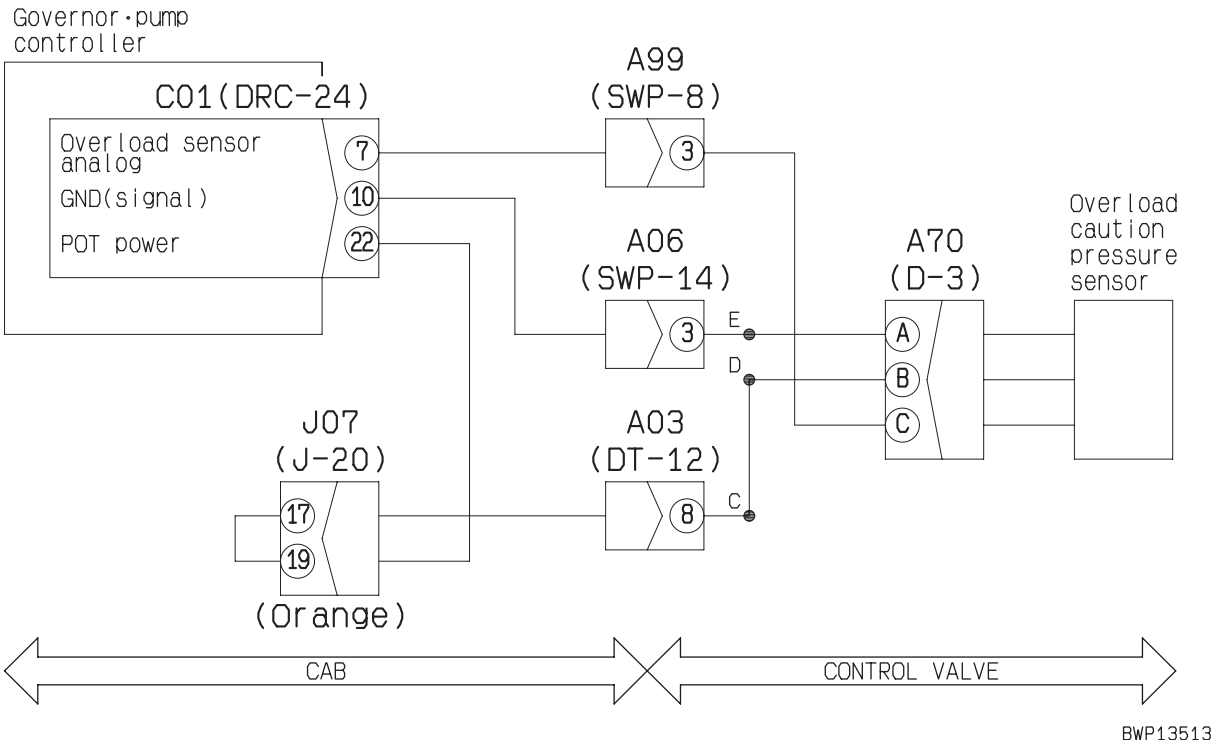
Error code [251] (Abnormality in overload pressure sensor)

User code	Error code	Trouble	Abnormality in overload pressure sensor (Governor and pump controller system)
–	**251**		
Contents of trouble	• The signal voltage from the overload pressure sensor is below 0.3 V or above 4.72 V.		
Action of controller	• Sets the boom cylinder bottom pressure to 0 MPa {0 kg/cm^2} for control. • If the cause of the failure disappears, the system resets itself.		
Problem that appears on machine	• The overload caution function does not operate (The load pressure on the boom cylinder bottom side cannot be sensed).		
Related information	★If the 5-V circuit (B) and ground circuit (A) of the pressure sensor are connected inversely, the pressure sensor will be broken. Accordingly, take extreme care when checking.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective sensor power supply system	If error code [**226**] is displayed, carry out troubleshooting for it first.			
	2	Defective overload pressure sensor (Internal defect)	★Prepare with starting switch OFF, then hold starting switch ON or start engine and carry out troubleshooting.			
			A70		Voltage	
			Between (B) and (A)	Power supply	4.5 – 5.5V	
			Between (C) and (A)	Signal	0.5 – 4.5V	
			The pressure sensor voltage is measured with the wiring harness connected. Accordingly, if the voltage is abnormal, check the wiring harness and controller, too, for another cause of the trouble, and then judge.			
	3	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C01 (female) (22) and J07 and A70 (female) (B)		Resistance	Max. 1 Ω
			Wiring harness between C01 (female) (10) and A70 (female) (A)		Resistance	Max. 1 Ω
			Wiring harness between C01 (female) (7) and A70 (female) (C)		Resistance	Max. 1 Ω
	4	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C01 (female) (7) - A70 (female) (C) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	5	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C01 (female) (22) – J07 – A70 (female) (B) wiring harness and chassis ground		Voltage	Max. 1 V
			Between C01 (female) (7) – A70 (female) (C) wiring harness and chassis ground		Voltage	Max. 1 V
	6	Defective governor and pump controller	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			C01		Voltage	
			Between (22) and (10)	Power supply	4.5 – 5.5 V	
			Between (7) and (10)	Signal	0.5 – 4.5 V	

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Circuit diagram related to overload pressure sensor



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Error code [301] (Engine low idling speed out of standard range)

User code	Error code	Trouble	Engine low idling speed out of standard range (Governor and pump controller system)
–	**301**		
Contents of trouble	• Engine speed below 500 rpm is sensed for continuous 10 seconds while the engine is running.		
Action of controller	• None in particular. • If the cause of the failure disappears, the system resets itself.		
Problem that appears on machine	• If the machine is operated as it is, the engine may be damaged.		
Related information	• The input state (rpm) from the engine speed sensor can be checked with the monitoring function. (Code: 010, by 10 rpm)		

		Cause	Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Abnormality in mechanical system of engine	Check for external and internal factors that have lowered the engine low idling speed, and then carry out troubleshooting for the mechanical system of the engine.
	2	Defective governor and pump controller	Troubleshooting cannot be carried out since the defect is in the governor and pump controller. (If there is not any visible trouble in the machine, the controller may be used as it is.)

Error code [302] (Engine high idling speed out of standard range)

User code	Error code	Trouble	Engine high idling speed out of standard range (Governor and pump controller system)
–	**302**		
Contents of trouble	• Engine speed above 2,600 rpm is sensed for continuous 10 seconds while the engine is running.		
Action of controller	• None in particular. • If the cause of the failure disappears, the system resets itself.		
Problem that appears on machine	• If the machine is operated as it is, the engine may be damaged.		
Related information	• The input state (rpm) from the engine speed sensor can be checked with the monitoring function. (Code: 010, by 10 rpm)		

		Cause	Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Abnormality in mechanical system of engine	Check for external and internal factors that have heightened the engine high idling speed, and then carry out troubleshooting for the mechanical system of the engine.
	2	Defective governor and pump controller	Troubleshooting cannot be carried out since the defect is in the governor and pump controller. (If there is not any visible trouble in the machine, the controller may be used as it is.)

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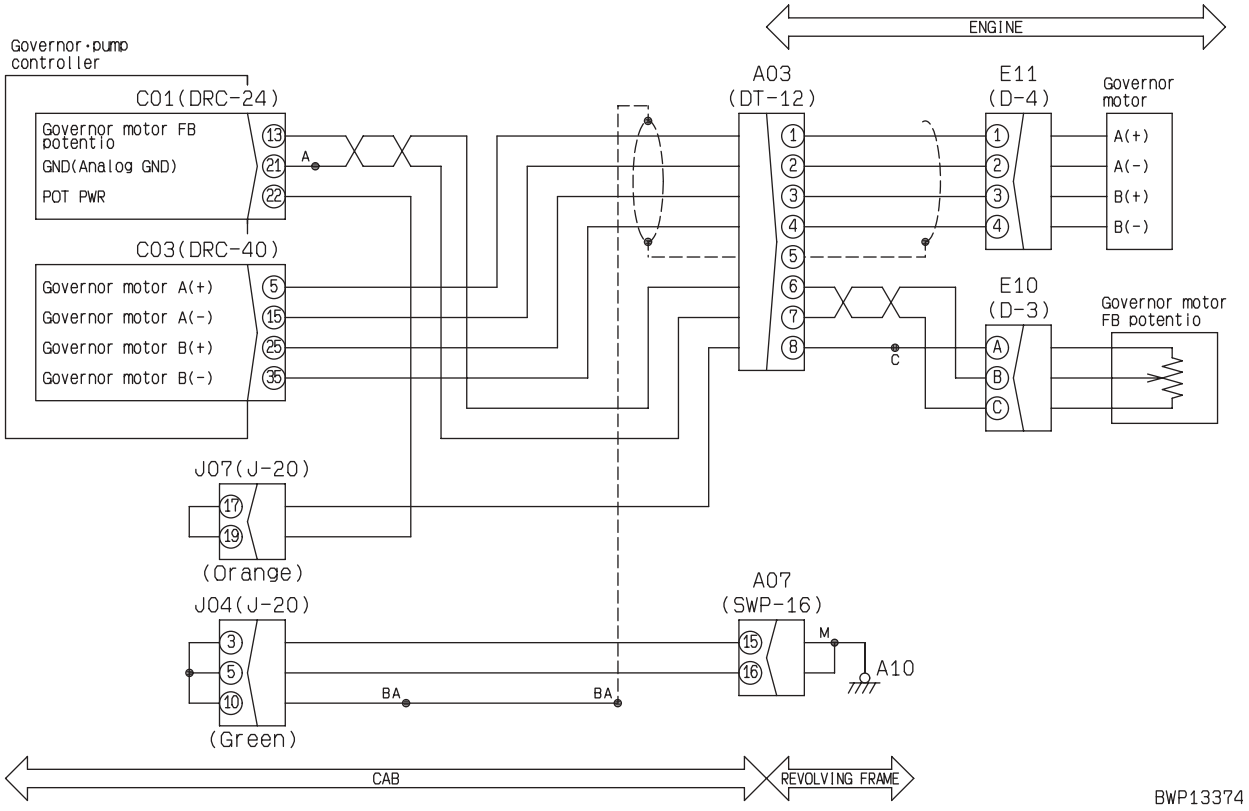
Error code [306] (Abnormality in governor potentiometer)

User code	Error code	Trouble	Abnormality in governor potentiometer (Governor and pump controller system)
–	**306**		
Contents of trouble	• The signal voltage from the governor potentiometer is below 0.4 V or above 4.6 V.		
Action of controller	• Calculates the motor position from the voltage just before occurrence of the trouble and uses it for control. • Even if the cause of the failure disappears, the system does not reset itself until the starting switch is turned OFF.		
Problem that appears on machine	• The high idling speed is not obtained (it is a little low). • The low idling speed is not obtained (it is a little high). • The auto-decelerator or automatic warm-up system does not operate. • The engine stalls. • The engine does not stop.		
Related information	• The input state (voltage) from the governor potentiometer can be checked with the monitoring function. (Code: 031, by 10 mV)		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective sensor power supply system	If error code [**226**] is displayed, carry out troubleshooting for it first.		
	2	Defective governor potentiometer (Internal defect)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			E10 (male)	Resistance	
			Between (A) and (C)	4.0 – 6.0 Ω	
			Between (B) and (A)	0.25 – 5.0 Ω	
			Between (B) and (C)	0.25 – 5.0 Ω	
	3	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between C01 (female) (22) and J07 and E10 (female) (A)	Resistance	Max. 1 Ω
			Wiring harness between C01 (female) (21) and E10 (female) (C)	Resistance	Max. 1 Ω
			Wiring harness between C01 (female) (13) and E10 (female) (B)	Resistance	Max. 1 Ω
	4	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between C01 (female) (13) – E10 (female) (B) wiring harness and chassis ground	Resistance	Min. 1 MΩ
	5	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between C01 (female) (22) – J07 – E10 (female) (A) wiring harness and chassis ground	Voltage	Max. 1 V
			Between C01 (female) (13) – E10 (female) (B) wiring harness and chassis ground	Voltage	Max. 1 V
	6	Defective governor and pump controller	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			C01		Voltage
			Between (22) and (21)	Power supply	4.5 – 5.5 V
			Between (13) and (21)	Signal	0.5 – 4.5 V

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Circuit diagram related to governor motor and potentiometer



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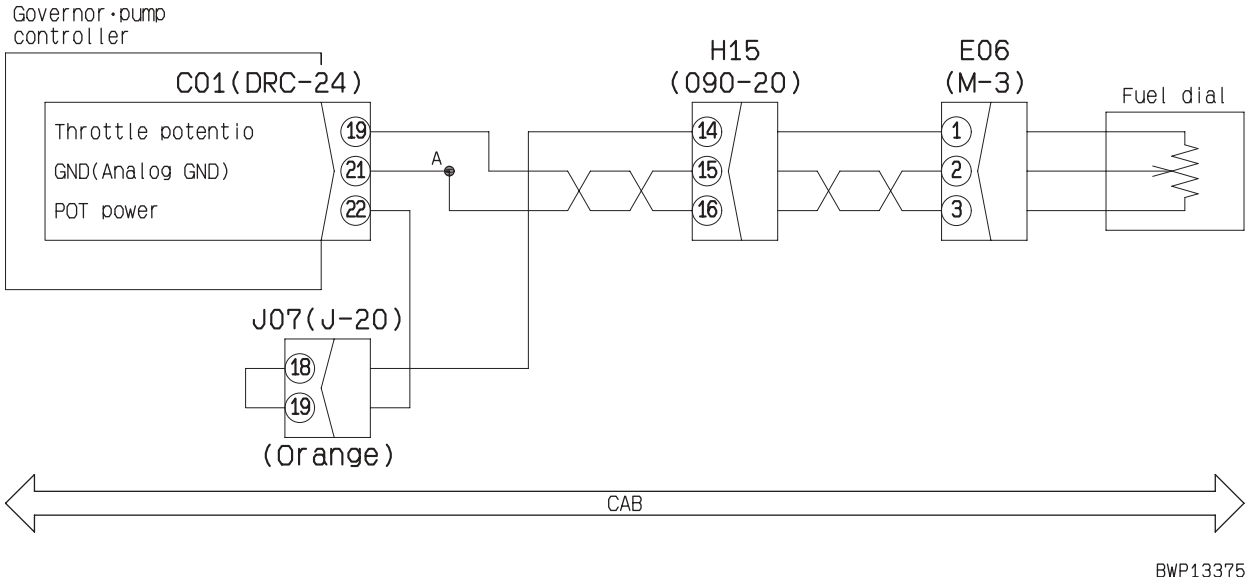
Error code [308] (Abnormality in fuel control dial)

User code	Error code	Trouble	Abnormality in fuel control dial (Governor and pump controller system)
E05	**308**		
Contents of trouble	• The signal voltage from the fuel control dial is below 0.23 V or above 4.77 V.		
Action of controller	• Calculates the fuel control dial position from the voltage just before occurrence of the trouble and uses it for control. • If the cause of the failure disappears, the system resets itself.		
Problem that appears on machine	• If the output was set in the full mode before occurrence of the failure, it is not set in the partial mode. • If the output was set in the partial mode before occurrence of the failure, it is not set in the full mode. • The engine hunts. • The high idling speed is not obtained and the output is insufficient.		
Related information	• The input state (voltage) from the fuel control dial can be checked with the monitoring function. (Code: 030, by 10 mV)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective sensor power supply system	If error code [**226**] is displayed, carry out troubleshooting for it first.			
	2	Defective fuel control dial (Internal defect)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			E06 (male)	Resistance		
			Between (A) and (C)	4.0 – 6.0 Ω		
			Between (B) and (A)	0.25 – 5.0 Ω		
			Between (B) and (C)	0.25 – 5.0 Ω		
	3	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C01 (female) (22) and J07 and E06 (female) (1)	Resistance	Max. 1 Ω	
			Wiring harness between C01 (female) (21) and E06 (female) (3)	Resistance	Max. 1 Ω	
			Wiring harness between C01 (female) (19) and E06 (female) (2)	Resistance	Max. 1 Ω	
	4	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C01 (female) (19) – E06 (female) (2) wiring harness and chassis ground	Resistance	Min. 1 MΩ	
	5	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C01 (female) (22) – J07 – E06 (female) (1) wiring harness and chassis ground	Voltage	Max. 1 V	
			Between C01 (female) (19) – E06 (female) (2) wiring harness and chassis ground	Voltage	Max. 1 V	
	6	Defective governor and pump controller	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			C01		Voltage	
			Between (22) and (21)	Power supply	4.5 – 5.5 V	
			Between (19) and (21)	Signal	0.5 – 4.5 V	

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Circuit diagram related to fuel control dial



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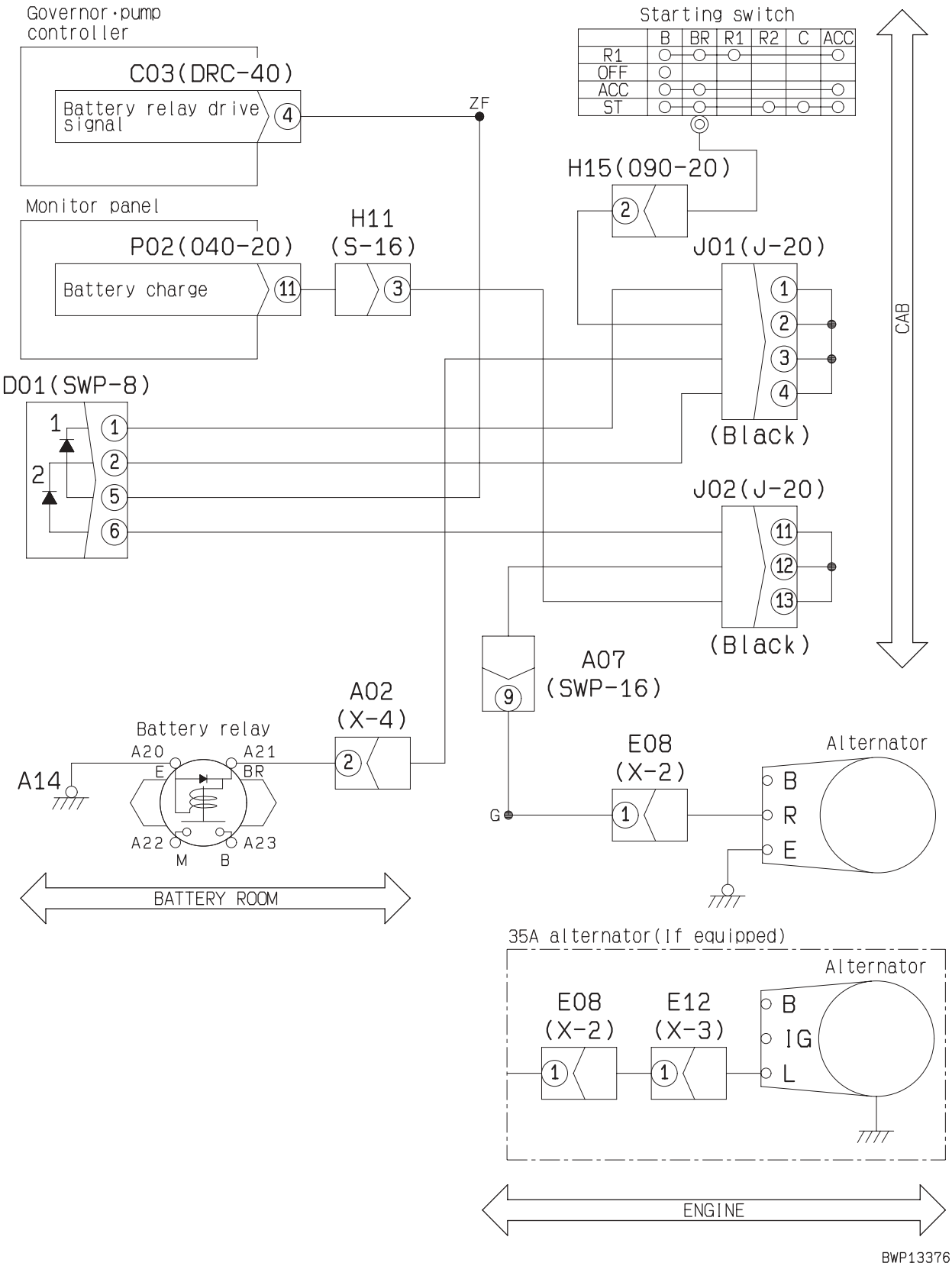
Error code [315] (Short circuit in battery relay output line)

User code	Error code	Trouble	Abnormality in battery relay output (Governor and pump controller system)
–	**315**		
Contents of trouble	• When the signal is output to the battery relay drive circuit, an abnormal current flows.		
Action of controller	• Turns off the output to the battery relay drive circuit OFF. • Even if the cause of the failure disappears, the system does not reset itself until the starting switch is turned OFF.		
Problem that appears on machine	• The engine does not stop (The controller power supply cannot be maintained until the engine stops).		
Related information	• The operation state (ON/OFF) of the battery relay can be checked with the monitoring function. (Code: 037, Right of upper line)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective battery relay (Internal short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Battery relay (unit)	Resistance		
			Between A21 (BR) and A20 (E)	Approx. 100 Ω		
			Between A21 (BR) and chassis ground	Min. 1 MΩ		
	2	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C03 (female) (4) – D01 – J01 – A21 (BR) wiring harness and chassis ground	Resistance	Min. 1 MΩ	
	3	Defective governor and pump controller	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			C03	Starting switch	Voltage	
			Between (4) and chassis ground	ON → OFF	20 – 30 V (For 4 – 7sec)	

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Circuit diagram related to battery relay



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Error code [316] (Step-out of governor motor)

User code	Error code	Trouble	Step-out of governor motor (Governor and pump controller system)
–	**316**		
Contents of trouble	• The input signal from the governor potentiometer is much different from the set value in the controller.		
Action of controller	• Repeats the control operation (steps out). • Even if the cause of the failure disappears, the system does not reset itself until the starting switch is turned OFF.		
Problem that appears on machine	• The engine speed cannot be controlled. • The engine hunts. • The engine does not stop.		
Related information			

		Cause	Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Defective fuel control dial system	If error code [**308**] is displayed, carry out troubleshooting for it first.
	2	Defective governor potentiometer system	If error code [**306**] is displayed, carry out troubleshooting for it first.
	3	Defective governor motor system (Disconnection)	If error code [**317**] is displayed, carry out troubleshooting for it first.
	4	Defective governor motor system (Short circuit)	If error code [**318**] is displayed, carry out troubleshooting for it first.
	5	Defective adjustment of governor lever	See TESTING AND ADJUSTING, Special functions of monitor panel
	6	Defective fuel control system of engine	See Shop Manual for 95-3 Series engine.
	7	Defective governor and pump controller	Troubleshooting cannot be carried out since the defect is in the controller (If none of causes 1 – 6 is the cause of the trouble, the controller is defective).

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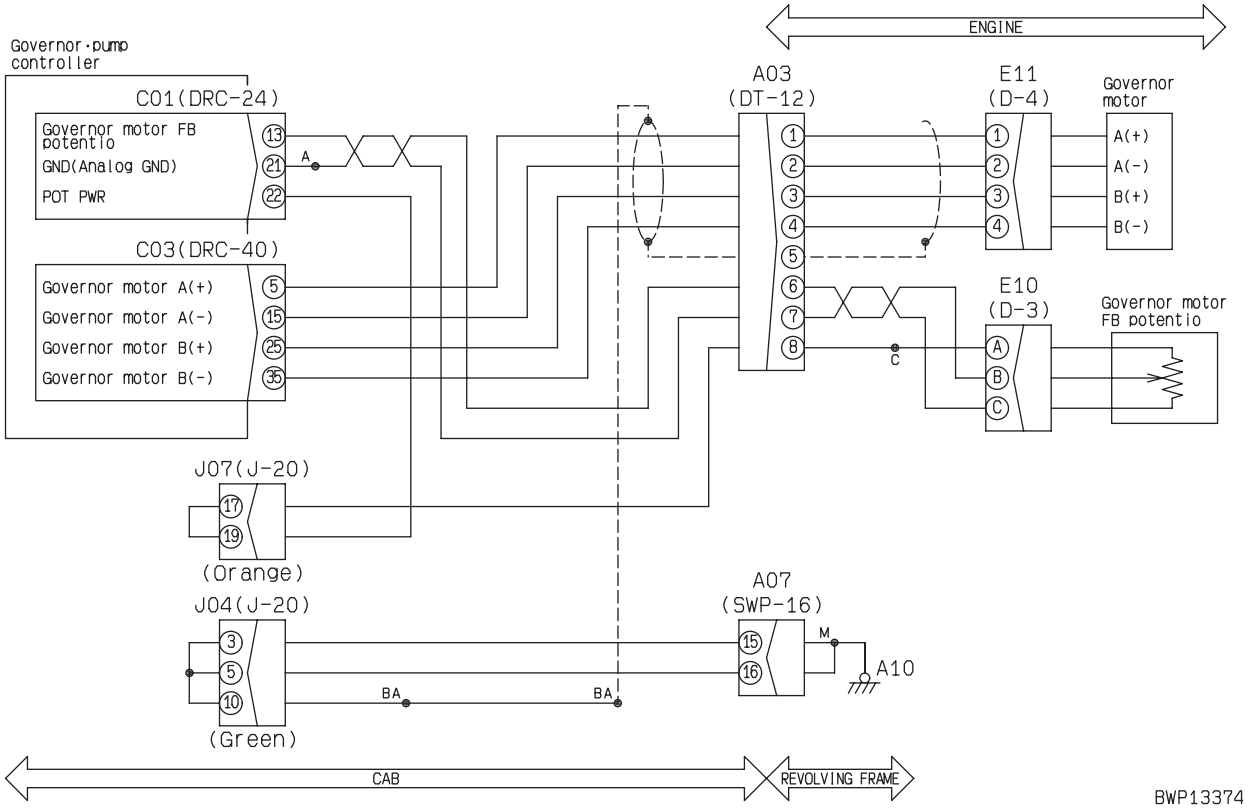
Error code [317] (Disconnection in phases A and B of governor motor)

User code	Error code	Trouble	Disconnection in phases A and B of governor motor (Governor and pump controller system)
E05	**317**		
Contents of trouble	• When the signal is output to the governor motor, no current flows.		
Action of controller	• None in particular. • If the cause of the failure disappears, the system resets itself.		
Problem that appears on machine	• The engine speed is set to low idling. • The engine hunts. • The engine does not stop. • The governor motor steps out.		
Related information	• The operation state (current) of the governor motor can be checked with the monitoring function. (Code: 033 - Phase A, 034 - Phase B, by 10 mA)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective governor motor (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			E11 (male)	Resistance		
			Between (1) and (2)	2.5 – 7.5 Ω		
			Between (3) and (4)	2.5 – 7.5 Ω		
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C03 (female) (5) and E11 (female) (1)	Resistance	Max. 1 Ω	
			Wiring harness between C03 (female) (15) and E11 (female) (2)	Resistance	Max. 1 Ω	
			Wiring harness between C03 (female) (25) and E11 (female) (3)	Resistance	Max. 1 Ω	
			Wiring harness between C03 (female) (35) and E11 (female) (4)	Resistance	Max. 1 Ω	
	3	Defective governor and pump controller	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			C03 (female)	Resistance		
			Between (5) and (15)	2.5 – 7.5 Ω		
			Between (25) and (35)	2.5 – 7.5 Ω		

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Circuit diagram related to governor motor and potentiometer



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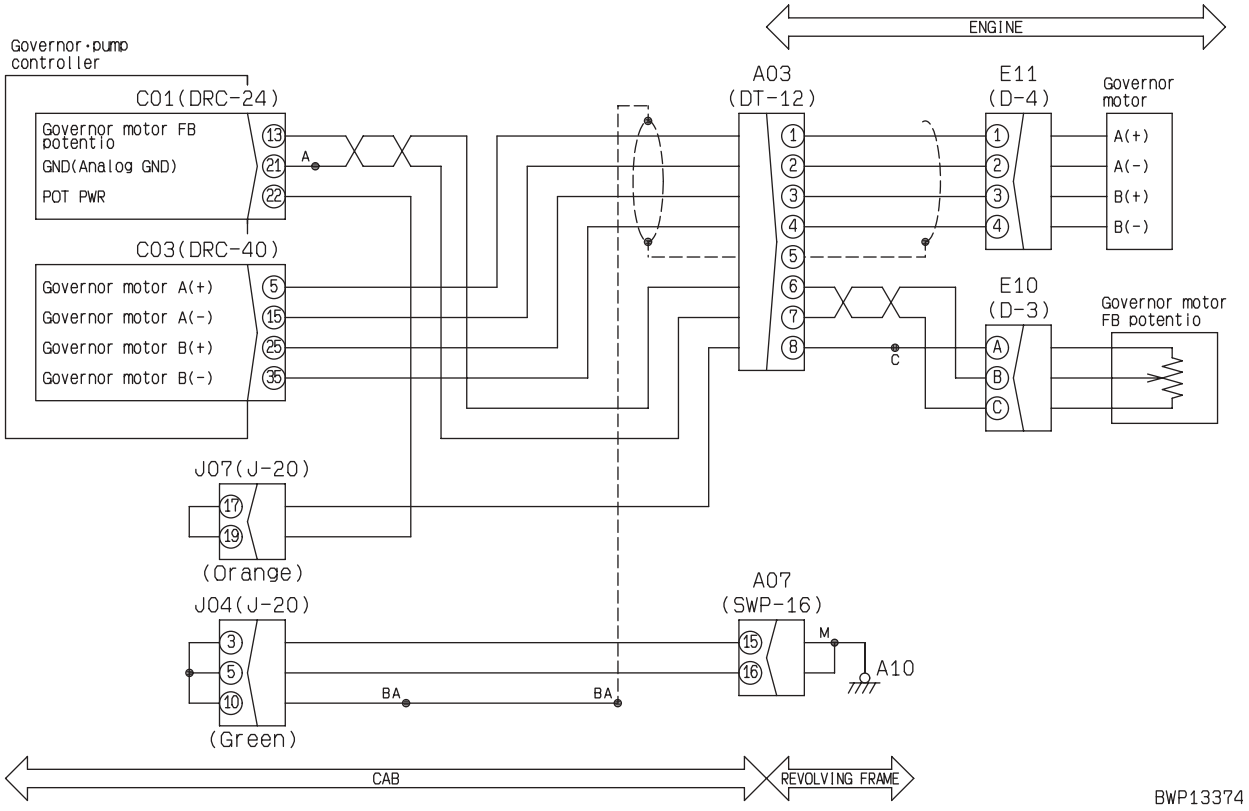
Error code [318] (Short circuit in phases A and B of governor motor)

User code	Error code	Trouble	Short circuit in phases A and B of governor motor (Governor and pump controller system)
E05	**318**		
Contents of trouble	• When the signal is output to the governor motor, an abnormal current flows.		
Action of controller	• None in particular. • If the cause of the failure disappears, the system resets itself.		
Problem that appears on machine	• The engine speed cannot be controlled. • The engine speed is set to low idling. • The engine hunts. • The engine does not stop.		
Related information	• The operation state (current) of the governor motor can be checked with the monitoring function. (Code: 033 - Phase A, 034 - Phase B, by 10 mA)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective governor motor (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			E11 (male)	Resistance		
			Between (1) and (2)	2.5 – 7.5 Ω		
			Between (3) and (4)	2.5 – 7.5 Ω		
			Between (1) and chassis ground	Min. 1 MΩ		
			Between (3) and chassis ground	Min. 1 MΩ		
	2	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C03 (female) (5) – E11 (female) (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ	
			Between C03 (female) (15) – E11 (female) (2) wiring harness and chassis ground	Resistance	Min. 1 MΩ	
			Between C03 (female) (25) – E11 (female) (3) wiring harness and chassis ground	Resistance	Min. 1 MΩ	
			Between C03 (female) (35) – E11 (female) (4) wiring harness and chassis ground	Resistance	Min. 1 MΩ	
	3	Defective governor and pump controller	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			C03 (female)	Resistance		
			Between (5) and (15)	2.5 – 7.5 Ω		
			Between (25) and (35)	2.5 – 7.5 Ω		
			Between (5) and chassis ground	Min. 1 MΩ		
			Between (15) and chassis ground	Min. 1 MΩ		
			Between (25) and chassis ground	Min. 1 MΩ		
			Between (35) and chassis ground	Min. 1 MΩ		

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Circuit diagram related to governor motor and potentiometer



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TROUBLESHOOTING FOR ELECTRICAL SYSTEM (E-MODE)

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BEFORE CARRYING OUT TROUBLESHOOTING WHEN CODE IS DISPLAYED

Connection table of fuse box

★ This connection table shows the devices to which each power supply of the fuse box (FB1) supplies power (A switch power supply is a device which supplies power while the starting switch is at the ON position and a constant power supply is a device which supplies power while the starting switch is at the OFF position).
★ When carrying out troubleshooting related to the electrical system, you should check the fuse box and fusible link to see if the power is supplied normally.

Type of power supply	Fuse No.	Fuse capacity	Destination of power
Switch power supply (Fusible link: A34)	1	10A	Governor and pump controller (Controller power supply)
			PC-EPC solenoid (Emergency pump drive switch circuit)
			Swing holding brake solenoid (Swing holding brake release switch circuit)
	2	20A	Governor and pump controller (Solenoid power supply)
	3	10A	PPC oil pressure lock solenoid
			Starting motor cutout relay (For PPC lock)
	4	10A	Cigarette lighter
			Windshield washer motor
	5	10A	Horn
Switch power supply (Fusible link: A34)	6	10A	Lower wiper motor [If equipped]
	7	10A	Rotary lamp [If equipped]
	8	10A	Working lamp (Boom and right front)
			Working lamp (Left front and rear) [If equipped]
	9	10A	One-touch power maximizing switch circuit
	10	10A	Fuel priming pump [If equipped]
Switch power supply (Fusible link: A34)	11	20A	Air conditioner unit
	12	20A	Starting motor cutout relay (For personal code)
			Monitor panel (Switch power supply)
	13	20A	Light relay 1
			Light relay 2
			Panel night light signal circuit
	14	10A	Heated seat [If equipped]
	15	10A	Heated seat [If equipped]
			Travel alarm [If equipped]
Constant power supply (Fusible link: A35)	16	10A	DC/DC converter (Power supply to 12-V devices)
	17	20A	Monitor panel (Constant power supply)
	18	10A	Starting switch
	19	10A	Room lamp
	20	10A	(Spare)

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INFORMATION IN TROUBLESHOOTING TABLE

★ The following information is summarized in the troubleshooting table and the related electrical circuit diagram. Before carrying out troubleshooting, understand that information fully.

Trouble	Trouble which occurred in the machine
Related information	Information related to the detected trouble or troubleshooting

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1 2 3 4	Possible causes of trouble (Given numbers are reference numbers, which do not indicate priority)	<Contents of description) • Standard value in normal state to judge possible causes • Remarks on judgment <Troubles in wiring harness> • Disconnection Connector is connected imperfectly or wiring harness is broken. • Grounding fault Wiring harness which is not connected to chassis ground circuit is in contact with chassis ground circuit. • Short circuit with power source Wiring harness which is not connected to power source (24-V) circuit is in contact with power source (24-V) circuit. <Precautions for troubleshooting> 1) Method of indicating connector No. and handling of T-adapter Insert or connect T-adapter as explained below for troubleshooting, unless otherrwise specified. • If connector No. has no marks of "male" and "female", disconnect connector and insert T-adapters in both male side and female side. • If connector No. has marks of "male" and "female", disconnect connector and connect T-adapter to only male side or female side. 2) Entry order of pin Nos. and handling of circuit tester leads Connect positive (+) lead and negative (-) lead of circuit tester as explained below for troubleshooting, unless otherwise specified. • Connect positive (+) lead to pin No. or harness entered on front side. • Connect negative (-) lead to pin No. or harness entered on rear side.

Related circuit diagram

This is a circuit diagram of the part related to troubleshooting.
- Connector No.: Shows the "Type-Number of pin" and "Color".
- Branching/Merging point: Shows that there is a branching/merging point in the electric circuit to be checked.
- Arrow (⇔): Roughly shows the location on the machine.

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E-1 Engine does not start

Trouble	• Engine does not start
Related information	• The engine starting circuit is equipped with the start lock function of safety lock lever type.

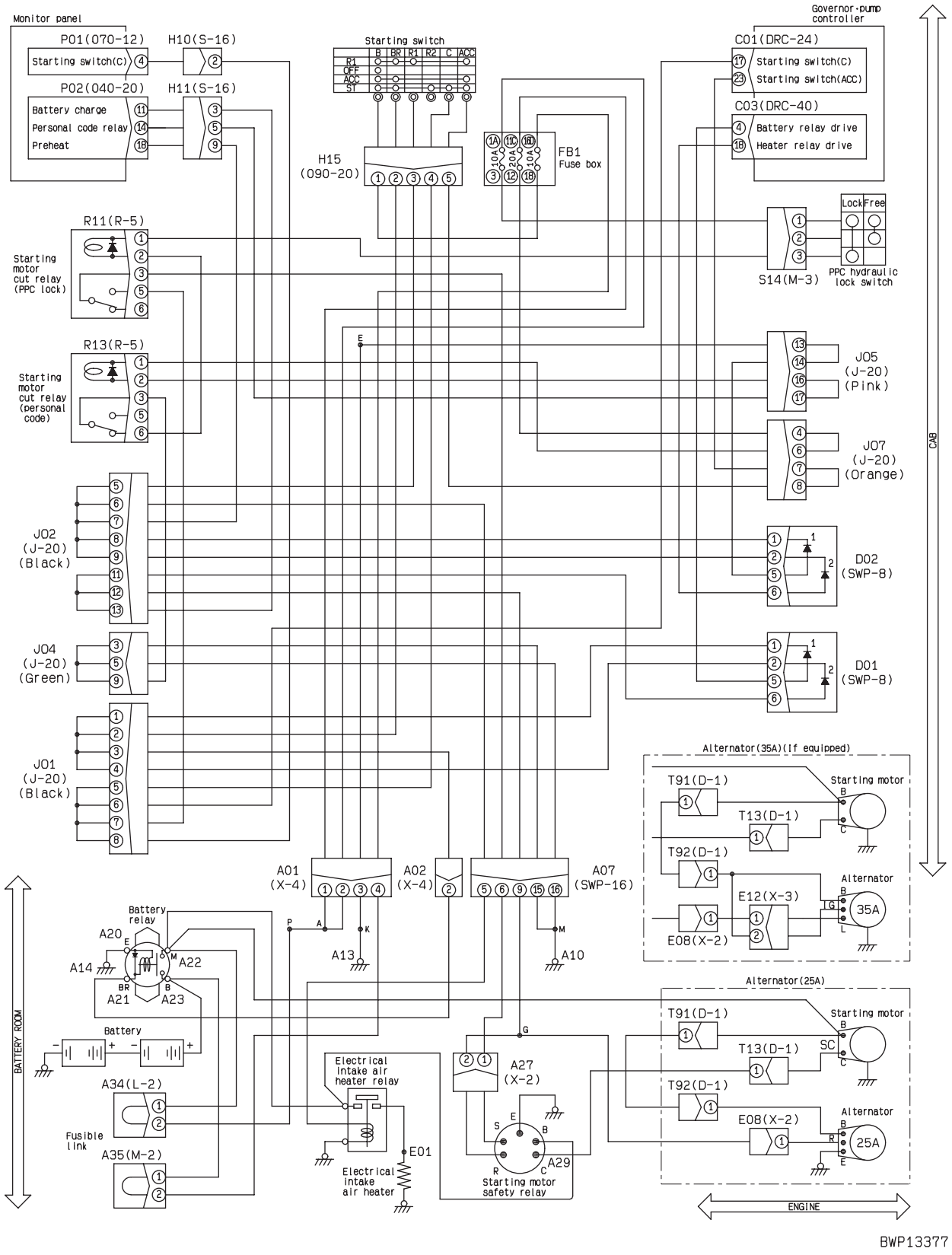
<table>
<tr><td rowspan="20">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="5">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td>1</td><td>Low charge level of battery</td><td colspan="3">Battery voltage</td><td colspan="2">Electrolyte specific gravity</td></tr>
<tr><td colspan="3">Min. 24 V</td><td colspan="2">Min. 1.26</td></tr>
<tr><td>2</td><td>Defective fuse No. 3 or 18</td><td colspan="5">If the fuse is broken, the circuit probably has a grounding fault, etc. (See Cause 10.)
If the fuse is not broken and the monitor panel does not light up, check the power supply circuit between the battery and fuse box, too.</td></tr>
<tr><td rowspan="4">3</td><td rowspan="4">Defective starting switch (Internal disconnection)</td><td colspan="5">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td>H15 (male)</td><td colspan="2">Starting switch</td><td colspan="2">Resistance</td></tr>
<tr><td rowspan="2">Between (1) and (4)</td><td colspan="2">OFF</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td colspan="2">START</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Defective safety lock switch (Internal disconnection)</td><td colspan="5">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td>S14 (female)</td><td colspan="2">Safety lock lever</td><td colspan="2">Resistance</td></tr>
<tr><td rowspan="2">Between (1) and (3)</td><td colspan="2">Free</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td colspan="2">Lock</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td rowspan="4">5</td><td rowspan="4">Defective starting motor cutout relay R11 or R13 (Internal disconnection or short circuit)</td><td colspan="5">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td colspan="3">R11 (female), R12</td><td colspan="2">Resistance</td></tr>
<tr><td colspan="3">Between (1) and (2)</td><td colspan="2">100 – 500 Ω</td></tr>
<tr><td colspan="3">Between (3) and (5)</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td rowspan="8">6</td><td rowspan="8">Defective starting motor safety relay (Internal defect)</td><td colspan="5">★Prepare with starting switch OFF (Disconnect only terminal C), then turn starting switch to START position and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Relay terminal, A27</td><td>Starting switch</td><td colspan="2">Voltage/Resistance</td></tr>
<tr><td>Between B and chassis ground</td><td>Power supply</td><td rowspan="5">START</td><td colspan="2">20 – 30 V</td></tr>
<tr><td>Between E and chassis ground</td><td>GND</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td>Between A27 (2) and chassis ground</td><td>Generation signal</td><td colspan="2">Max. 1 V</td></tr>
<tr><td>Between A27 (1) and chassis ground</td><td>Starting input</td><td colspan="2">20 – 30 V</td></tr>
<tr><td>Between C and chassis ground</td><td>Starting output</td><td colspan="2">20 – 30 V</td></tr>
<tr><td colspan="5">If the power supply, GND, generation signal, and starting input are normal and the starting output is not normal, the starting motor safety relay is defective.</td></tr>
<tr><td rowspan="4">7</td><td rowspan="4">Defective starting motor (Internal defect)</td><td colspan="5">★Prepare with starting switch OFF, then turn starting switch to START position and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Starting motor</td><td>Starting switch</td><td colspan="2">Voltage</td></tr>
<tr><td>Between B and chassis ground</td><td>Power supply</td><td rowspan="2">START</td><td colspan="2">20 – 30 V</td></tr>
<tr><td>Between C and chassis ground</td><td>Starting output</td><td colspan="2">20 – 30 V</td></tr>
<tr><td colspan="5">If the power supply and starting signal are normal and the starting motor does not rotate, the starting motor is defective.</td></tr>
</table>

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	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	8	Defective alternator (Internal defect)	★Prepare with starting switch OFF, then turn starting switch to ON or START position and carry out troubleshooting.		
			E12 (male)	Resistance	
			Between (1) and chassis ground	Max. 1 V	
	9	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between FB1-18 outlet and H15 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between H15 (female) (4) and J01 and R11 (female) (5)	Resistance	Max. 1 Ω
			Wiring harness between R11 (female) (3) and A27 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between starting safety relay C and starting motor C	Resistance	Max. 1 Ω
			Wiring harness between FB1-3 outlet and S14 (male) (1)	Resistance	Max. 1 Ω
			Wiring harness between S14 (male) (3) and R11 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between R11 (female) (2) and R13 (female) (6)	Resistance	Max. 1 Ω
			Wiring harness between R13 (female) (3) and J04 and chassis ground (A10)	Resistance	Max. 1 Ω
	10	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Between FB1-18 outlet – H15 (female) (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between H15 (female) (4) – J01 – R11 (female) (5) or P01 (female) (4) or C01 (female) (17) or other related circuit wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between R11 (female) (3) – A27 (female) (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between starting safety relay C – starting motor C wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between FB1-3 outlet – S14 (male) (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between S14 (male) (3) – R11 (female) (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between P02 (female) (14) – J05 – R13 (female) (2) wiring harness and chassis ground	Resistance	Min. 1 MΩ
	11	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			Between A27 (female) (2) – E08 (male) (1) or J02 or D01 (female) (6) or P02 (female) (11) or other related circuit wiring harness and chassis ground	Voltage	Max. 1 V

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Circuit diagram related to engine preheating, starting, charging, and stopping functions



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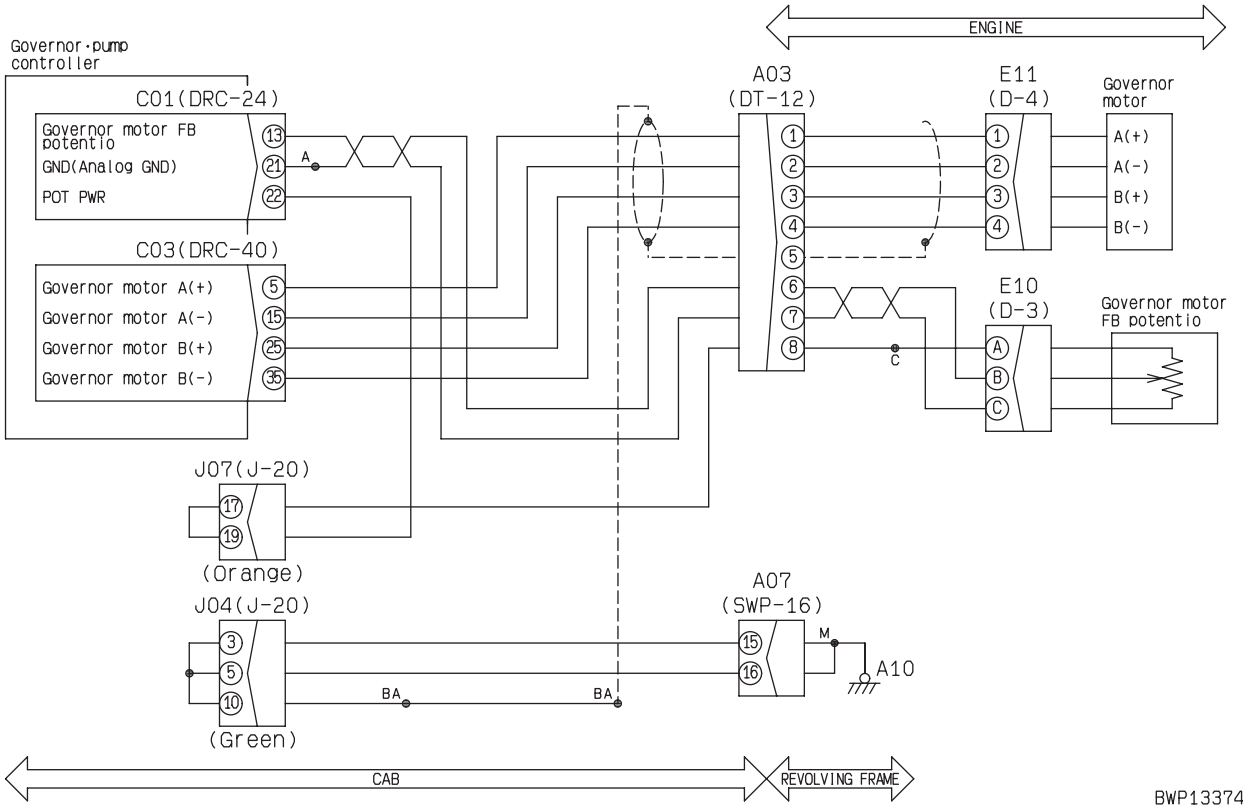
E-2 Engine stops during operation

Trouble	• Engine stops during operation.
Related information	• The input state (Voltage) from the governor potentiometer can be checked with the monitoring function. (Code: 031, by 10 mV)

<table>
<tr><td rowspan="15">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="5">1</td><td rowspan="5">Defective governor potentiometer (Internal defect)</td><td colspan="4">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td colspan="2">E10 (male)</td><td colspan="2">Resistance</td></tr>
<tr><td colspan="2">Between (A) and (C)</td><td colspan="2">4.0 – 6.0 Ω</td></tr>
<tr><td colspan="2">Between (B) and (A)</td><td colspan="2">0.25 – 5.0 Ω</td></tr>
<tr><td colspan="2">Between (B) and (C)</td><td colspan="2">0.25 – 5.0 Ω</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)</td><td colspan="4">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td colspan="2">Wiring harness between C01 (female) (13) and E10 (female) (B)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Short circuit with chassis ground in wiring harness (Contact with ground circuit)</td><td colspan="4">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td colspan="2">Between C01 (female) (13) – E10 (female) (B) wiring harness and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Defective governor and pump controller</td><td colspan="4">★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="2">C01</td><td colspan="2">Voltage</td></tr>
<tr><td>Between (22) and (21)</td><td>Power supply</td><td colspan="2">4.5 – 5.5 V</td></tr>
<tr><td>Between (13) and (21)</td><td>Signal</td><td colspan="2">0.5 – 4.5 V</td></tr>
</table>

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Circuit diagram related to governor motor and potentiometer



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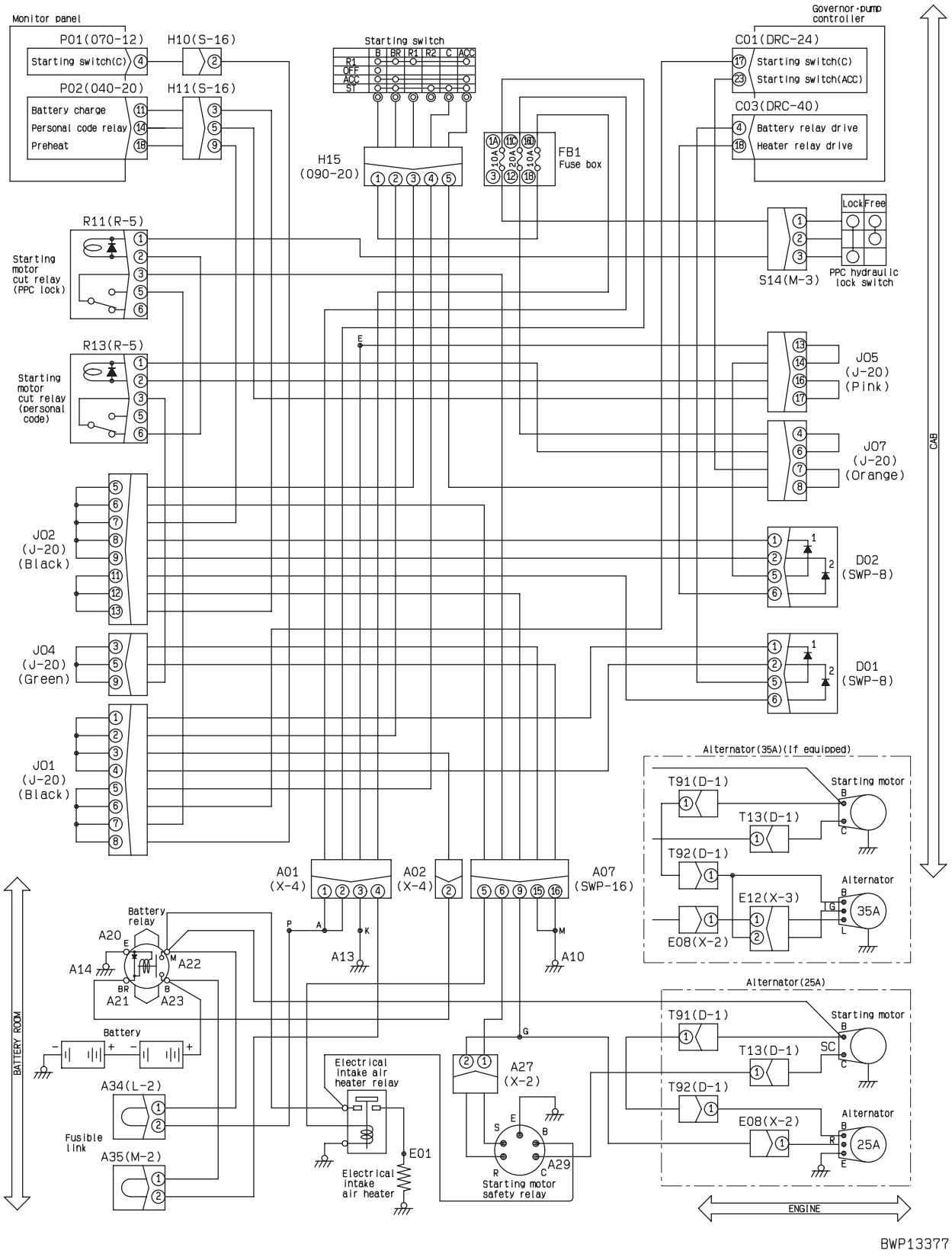
E-3 Engine speed is unstable or engine hunts

Trouble	(1) Low idling speed is unstable. (2) Engine hunts. (3) High idling speed is low.
Related information	• Since the governor and pump controller normally performs the following controls, the set opening angle of the fuel control dial does not always conform accurately to the control angle of the governor motor. 1) Governor control by selecting working mode 2) Governor control by setting automatic decelerating function 3) Governor control according to operating condition of control lever 4) Governor control by automatic warm-up function in cold state 5) Governor control by turbocharger protecting function when engine is started Accordingly, when checking the operation of the fuel control dial and governor motor, be sure to select GOVERNOR ADJUSTMENT FUNCTION [03]. (Since the governor control function does not operate in this mode, the set opening angle of the fuel control dial always conforms to the control angle of the governor motor.) • The engine speed can be checked with the monitoring function. (Code: 010, by 10 rpm)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective governor potentiometer (Internal defect)	★Turn starting switch ON and carry out troubleshooting (monitoring).			
			Monitoring code	Item	Normal display	
			002	Governor and pump controller model code	130	
			003			
			If the monitoring display is abnormal, carry out troubleshooting for error code [**217**].			
	2	Defective adjustment of governor lever	See TESTING AND ADJUSTING, Special functions of monitor panel.			
	3	Malfunction of governor motor	★Turn starting switch ON or start engine and carry out troubleshooting.			
			When the following operation is performed, if the governor motor lever moves smoothly, the governor motor is normal. • Operate the fuel control dial between low idling and high idling. • Stop the engine by turning the starting switch OFF.			
	4	Defective fuel control system of engine	See the Shop Manual for 95-3 Seriese, Engine.			
	5	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C01 (female) (23) and J07 and H15 (female) (5)	Resistance	Max. 1 Ω	
	6	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C01 (female) (23) – J07 – H15 (female) (5) or other related circuit wiring harness and chassis ground	Resistance	Min. 1 Ω	
	7	Defective governor and pump controller	Troubleshooting cannot be carried out since the defect is in the governor and pump controller (If none of causes 1 – 6 is the cause of the trouble, the governor and pump controller is defective).			

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Circuit diagram related to engine preheating, starting, charging, and stopping functions



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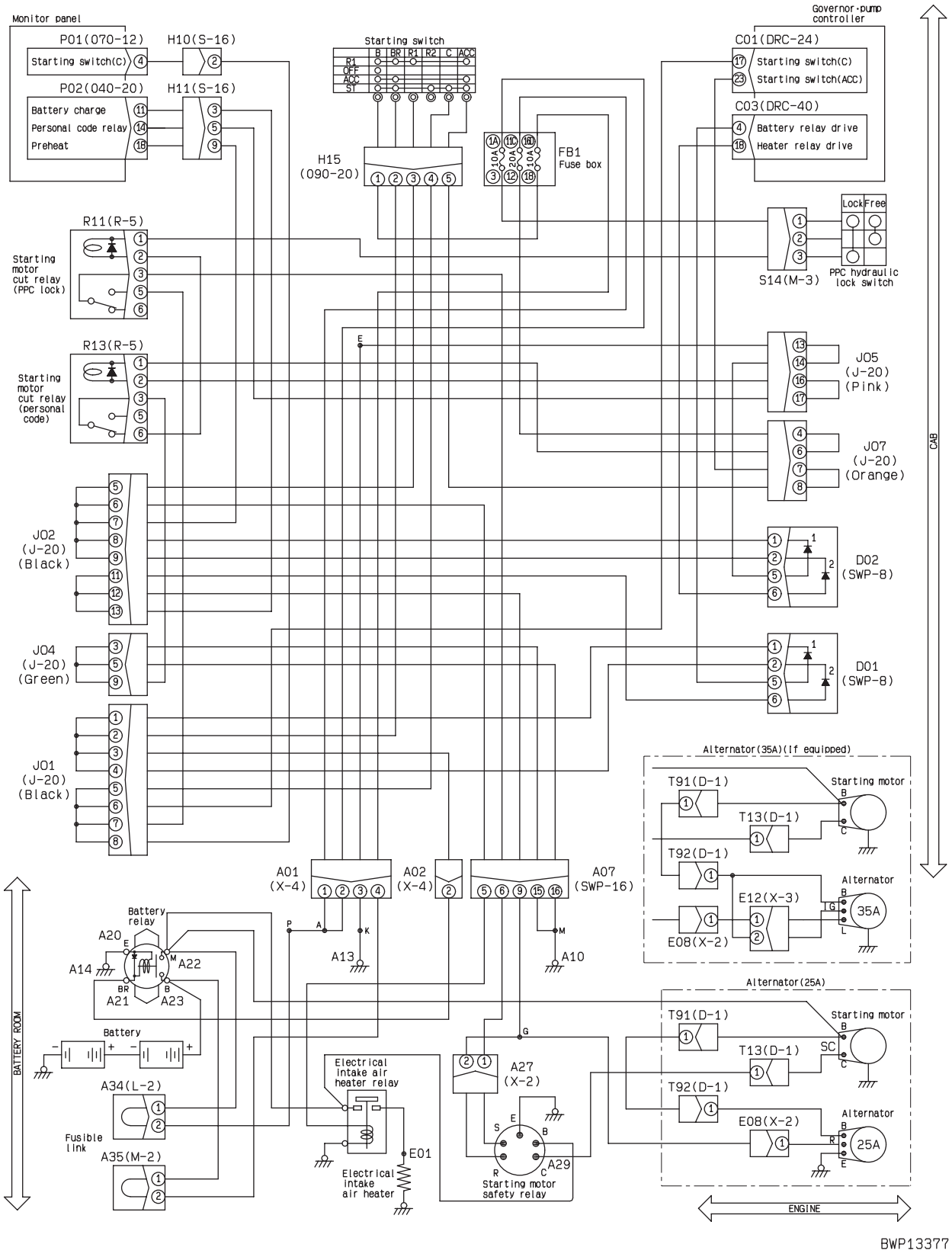
E-4 Engine does not stop

Trouble	• Engine does not stop.
Related information	• The governor and pump controller holds the battery relay for 4 seconds at shortest and 7 seconds at longest to secure the drive power for the governor motor after the starting switch is turned to the OFF position until the engine stops. • The drive state (ON/OFF) of the battery relay can be checked with the monitoring function. (Code: 037, Right of upper line)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective battery relay (Internal defect)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			When the starting switch is operated as follows, if the battery relay contacts make operating sounds, the battery relay is normal. • Starting switch OFF → ON → OFF			
	2	Defective assembled-type diode D01 (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			D01 (male)	Digital circuit tester	Continuity	
			Between (5) and (1)	Diode mode	There is continuity	
	3	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C03 (female) (4) and D01 (female) (5)		Resistance	Max. 1 Ω
			Wiring harness between D01 (female) (1) and J01 and A21 (BR)		Resistance	Max. 1 Ω
			Wiring harness between A20 (E) and chassis ground (A14)		Resistance	Max. 1 Ω
	4	Defective governor and pump controller	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			C03	Starting switch	Voltage	
			Between (4) and chassis ground	ON → OFF	20 – 30 V (4 – 7 sec)	

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Circuit diagram related to engine preheating, starting, charging, and stopping functions



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E-5 Auto-decelerator does not operate

Trouble	• Auto-decelerator does not operate.
Related information	• Since the auto-decelerator is set to 1,400 rpm, it does not operate if the fuel control dial is not set above this level. • Check the display on the monitor panel while the engine is running.

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective boom RAISE signal	Monitoring code	6-bit display (Center of lower line)	When lever is operated: ON
			020		When lever is in neutral: OFF
			If the display on the monitor panel is abnormal, carry out troubleshooting for E-23.		
	2	Defective boom LOWER signal	Monitoring code	6-bit display (Center of upper line)	When lever is operated: ON
			020		When lever is in neutral: OFF
			If the display on the monitor panel is abnormal, carry out troubleshooting for E-24.		
	3	Defective arm IN signal	Monitoring code	6-bit display (Left of upper line)	When lever is operated: ON
			020		When lever is in neutral: OFF
			If the display on the monitor panel is abnormal, carry out troubleshooting for E-25.		
	4	Defective arm OUT signal	Monitoring code	6-bit display (Left of lower line)	When lever is operated: ON
			020		When lever is in neutral: OFF
			If the display on the monitor panel is abnormal, carry out troubleshooting for E-26.		
	5	Defective bucket CURL signal	Monitoring code	6-bit display (Right of upper line)	When lever is operated: ON
			021		When lever is in neutral: OFF
			If the display on the monitor panel is abnormal, carry out troubleshooting for E-27.		
	6	Defective bucket DUMP signal	Monitoring code	6-bit display (Right of lower line)	When lever is operated: ON
			021		When lever is in neutral: OFF
			If the display on the monitor panel is abnormal, carry out troubleshooting for E-28.		
	7	Defective swing signal	Monitoring code	6-bit display (Right of upper line)	When lever is operated: ON
			020		When lever is in neutral: OFF
			If the display on the monitor panel is abnormal, carry out troubleshooting for E-29.		
	8	Defective travel signal	Monitoring code	6-bit display (Right of lower line)	When lever is operated: ON
			020		When lever is in neutral: OFF
			If the display on the monitor panel is abnormal, carry out troubleshooting for E-30.		
	9	Defective attachment signal	Monitoring code	6-bit display (Center of lower line)	When lever is operated: ON
			021		When lever is in neutral: OFF
			IIf the display on the monitor panel is abnormal, carry out troubleshooting for E-31.		
	10	Defective governor and pump controller	Troubleshooting cannot be carried out since the defect is in the governor and pump controller (If none of causes 1 – 9 is the cause of the trouble, the governor and pump controller is defective).		

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E-6 Automatic warm-up system does not operate

Trouble	• Automatic warm-up system does not operate.
Related information	• When the engine coolant temperature is below 30°C, the automatic warm-up system raises the engine speed to 1,200 rpm. • If the fuel control dial is opened more than 70% for 3 seconds when the starting switch is turned ON or after the engine is started, the automatic warm-up system is turned OFF.

<table>
<tr><td rowspan="5">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Defective engine coolant temperature sensor system</td><td colspan="3">★Turn starting switch ON and carry out troubleshooting (monitoring).</td></tr>
<tr><td>Monitoring code</td><td>Item</td><td>Normal display</td></tr>
<tr><td>041</td><td>Engine coolant temperature sensor voltage (Unit: 10 mV)</td><td>Approx. 480 – 440 (Coolant temperature: 0 – 30 °C)</td></tr>
<tr><td colspan="3">If the display on the monitor panel is abnormal, carry out troubleshooting for E-16.</td></tr>
<tr><td>2</td><td>Defective governor and pump controller</td><td colspan="3">Troubleshooting cannot be carried out since the defect is in the governor and pump controller (If none of the above causes is the cause of the trouble, the governor and pump controller is defective).</td></tr>
</table>

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E-7 Preheater does not operate

Trouble	(1) When the starting switch is set in the HEAT position, the preheating monitor does not light up.
Related information	• The preheater monitor lights up when the starting switch is turned to the HEAT position and starts flashing about 30 seconds after to notify the operator of completion of preheating (It stops flashing about 10 seconds after). • The input state (ON/OFF) of the preheating signal can be checked with the monitoring function. (Code: 045, Center of upper line)

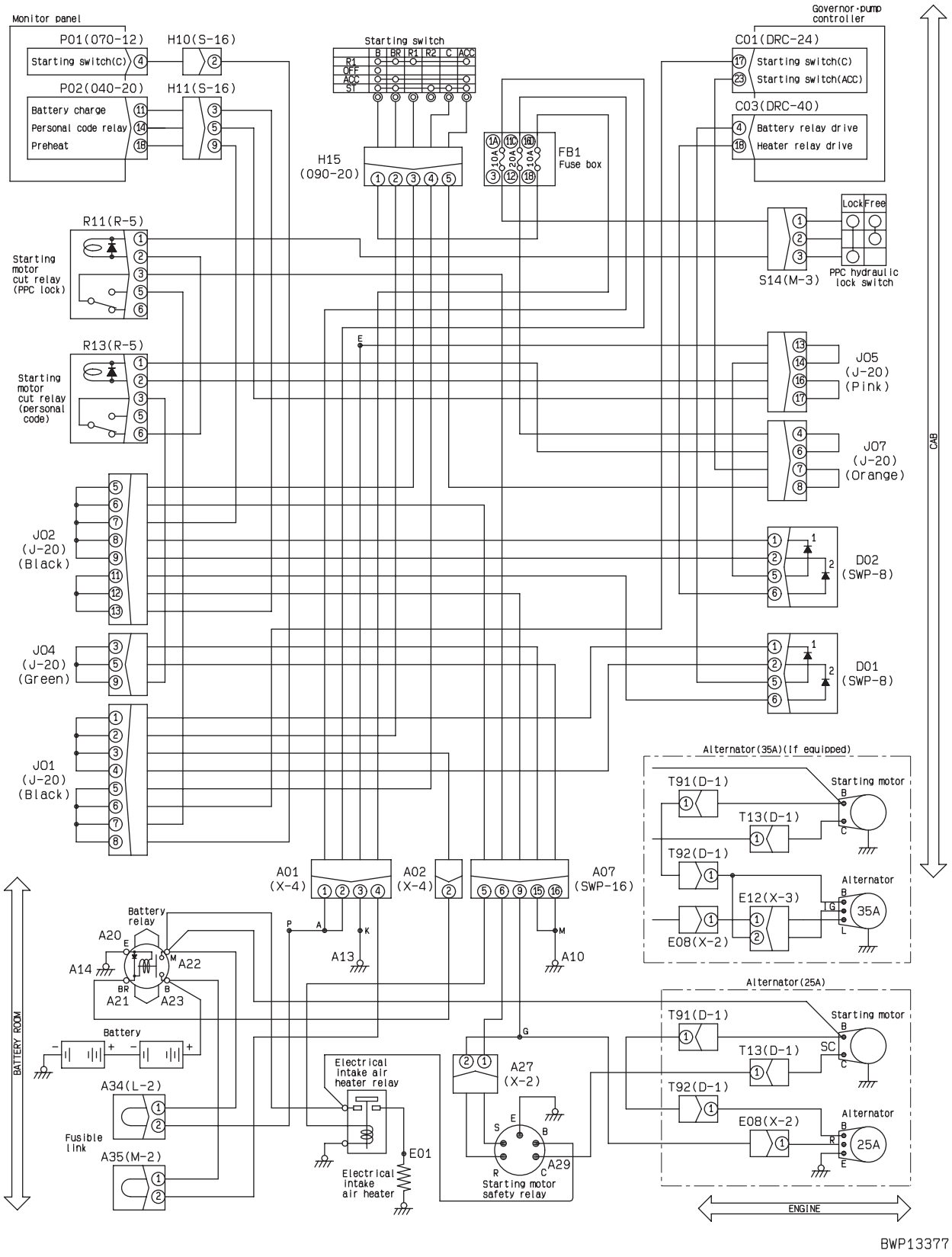
	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective starting switch	If the engine is not preheated (the heater unit does not become hot), carry out troubleshooting for trouble (2).			
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between P02 (female) (18) and J02 (male) (7)		Resistance	Max. 1 Ω
	3	Defective monitor panel	★Prepare with starting switch OFF.			
			P02	Starting switch	Voltage	
			Between (17) and chassis ground	OFF	Max. 1 V	
				HEAT	20 – 30 V	

Trouble	(2) When the starting switch is turned to the HEAT position, the heater unit does not become hot.
Related information	• If the engine is started while the temperature is low (the coolant temperature is below 30°C), the governor and pump controller drives the heater relay automatically to preheat the engine.

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective starting switch	★Prepare with starting switch OFF.			
			H15 (male)	Starting switch	Resistance	
			Between (1) and (3)	OFF	Min. 1 MΩ	
				HEAT	Max. 1 Ω	
	2	Defective heater relay (Internal disconnection)	★Prepare with starting switch OFF.			
			Heater relay	Starting switch	Continuity/Resistance	
			Between A25 and chassis ground	OFF	There is continuity	
			Between contact terminals	HEAT	Max. 1 Ω	
	3	Defective electrical intake air heater (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Electrical intake air heater		Continuity	
			Between E01 and chassis ground		There is continuity	
	4	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between H15 (female) (3) and J02 and A25		Resistance	Max. 1 Ω
			Wiring harness between A22 and heater relay		Resistance	Max. 1 Ω
			Wiring harness between A26 and E01		Resistance	Max. 1 Ω

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Circuit diagram related to engine preheating, starting, charging, and stopping functions



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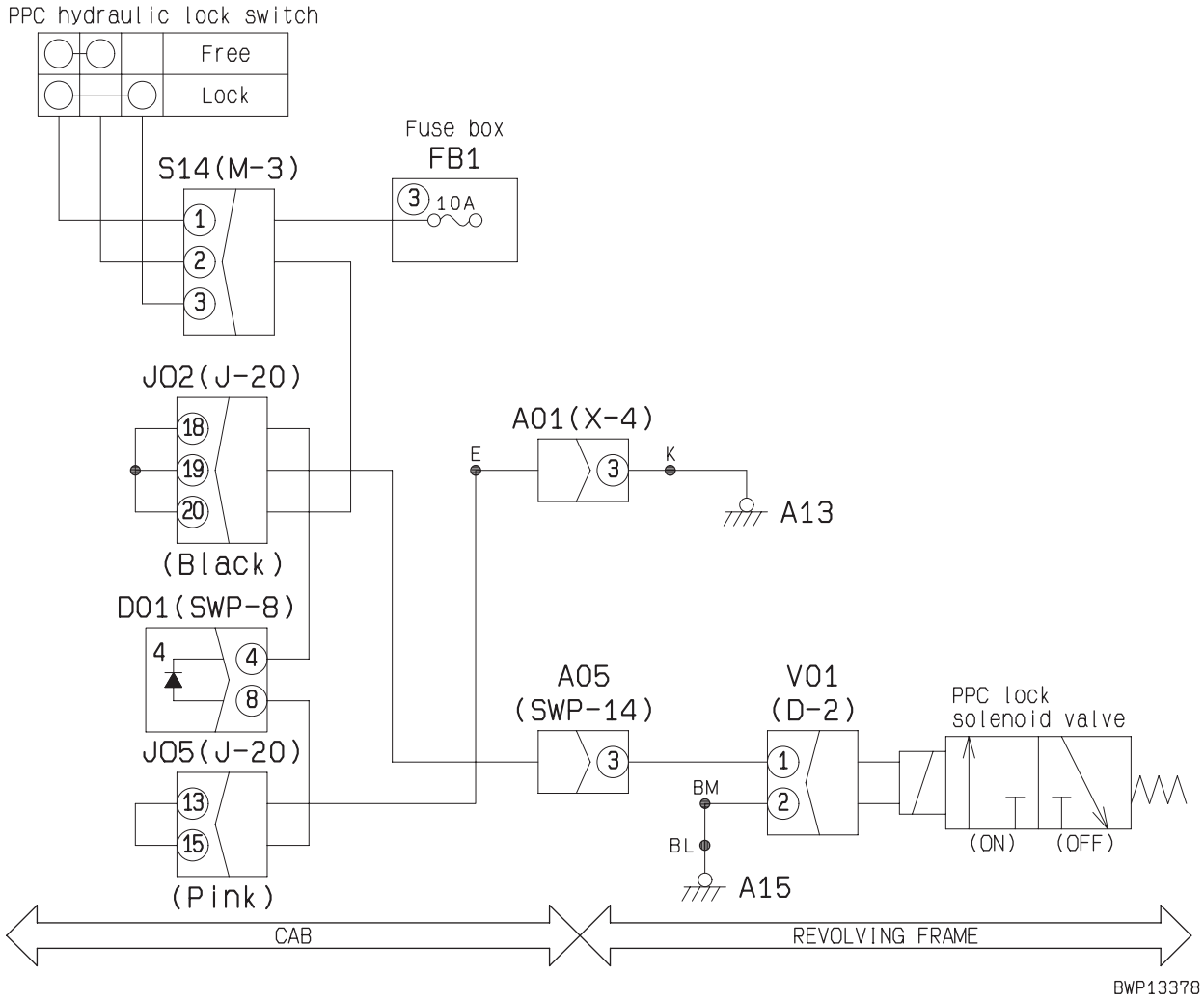
E-8 Work equipment, swing, and travel system do not operate

Trouble	• Work equipment, swing, and travel system do not operate
Related information	

<table>
<tr><th colspan="2" rowspan="2">Cause</th><th colspan="5">Standard value in normal state/Remarks on troubleshooting</th></tr>
<tr></tr>
<tr><td rowspan="20">Possible causes and standard value in normal state</td><td>1</td><td>Defective fuse No. 3</td><td colspan="5">If the fuse is broken, the circuit probably has a grounding fault, etc. (See cause 6.)</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Defective safety lock switch (Internal disconnection)</td><td colspan="5">★Prepare with starting switch OFF.</td></tr>
<tr><td>S14 (female)</td><td colspan="2">Safety lock lever</td><td colspan="2">Resistance</td></tr>
<tr><td rowspan="2">Between (1) and (2)</td><td colspan="2">Lock</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td colspan="2">Free</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td rowspan="4">3</td><td rowspan="4">Defective PPC lock solenoid (Internal disconnection or short circuit)</td><td colspan="5">★Prepare with starting switch OFF.</td></tr>
<tr><td colspan="3">V01 (male)</td><td colspan="2">Resistance</td></tr>
<tr><td colspan="3">Between (1) and (2)</td><td colspan="2">20 – 60 Ω</td></tr>
<tr><td colspan="3">Between (1) and chassis ground</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Defective assembled-type diode D01 (Internal short circuit)</td><td colspan="5">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td colspan="3">D01 (male)</td><td colspan="2">Resistance (Continuity)</td></tr>
<tr><td colspan="3">Between (4) and (8)</td><td colspan="2">Min. 1 MΩ (No continuity)</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td rowspan="4">5</td><td rowspan="4">Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)</td><td colspan="5">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td colspan="3">Wiring harness between FB1-3 outlet and S14 (male) (1)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="3">Wiring harness between S14 (male) (2) and J02 and V01 (female) (1)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="3">Wiring harness between V01 (female) (2) and chassis ground</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="3">6</td><td rowspan="3">Short circuit with chassis ground in wiring harness (Contact with ground circuit)</td><td colspan="5">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td colspan="3">Between FB1-3 outlet – S14 (male) (1) wiring harness and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="3">Between S14 (male) (2) – J02 – V01 (female) (1) or D01 (female) (4) wiring harness and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
</table>

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Circuit diagram related to PPC lock solenoid



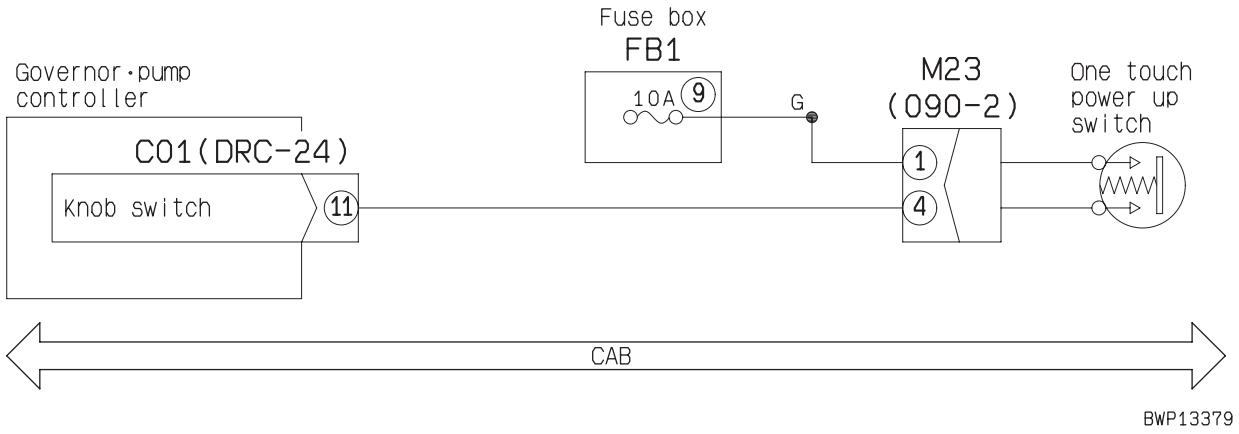
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E-9 One-touch power maximizing system does not operate

Trouble	• One-touch power maximizing system does not operate.
Related information	• The input state (ON/OFF) from the one-touch power maximizing switch (left knob switch) can be checked with the monitoring function. (Code: 022, Center of upper line)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective fuse No. 9	If the fuse is broken, the circuit probably has a grounding fault, etc. (See cause 4.)			
	2	Defective one-touch power maximizing switch (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			M23 (male)	One-touch power maximizing switch	Resistance	
			Between (1) and (4)	Released	Min. 1 MΩ	
				Pressed	Max. 1 Ω	
	3	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between FB1-9 outlet and M23 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between M23 (female) (4) and C01 (female) (1)		Resistance	Max. 1 Ω
	4	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between FB1-9 outlet – M23 (female) (1) wiring harness and chassis ground		Resistance	Min. 1 MΩ
			Between M23 (female) (4) – C01 (female) (1) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	5	Defective governor and pump controller	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			C01	One-touch power maximizing switch	Voltage	
			Between (11) and chassis ground	Released	Max. 1 V	
				Pressed	20 – 30 V	

Circuit diagram related to one-touch power maximizing switch



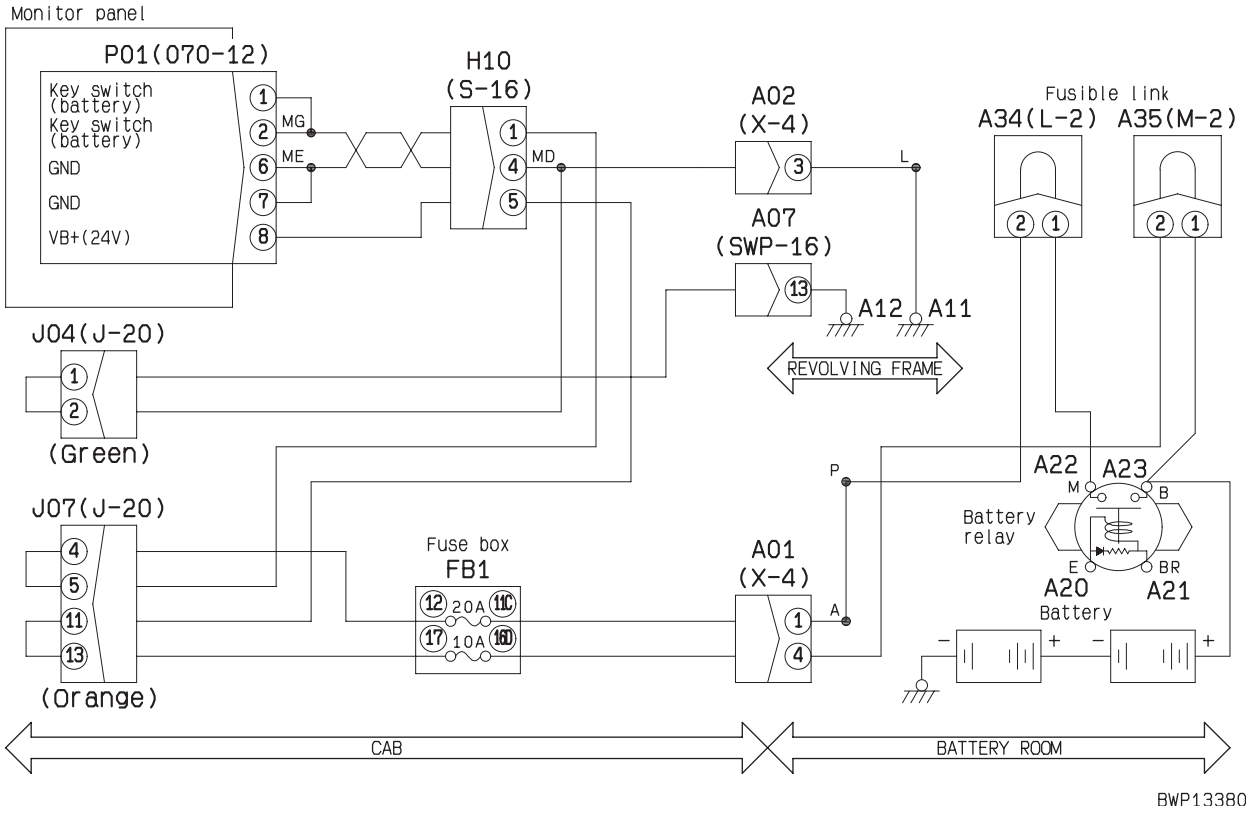
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E-10 No items of monitor panel light up

Trouble	• No items of monitor panel light up.	When the starting switch is turned ON, no items of monitor panel light up.
Related information		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fuse No.12	If the fuse is broken, the circuit probably has a grounding fault, etc. (See cause 3.)		
	2	Disconnection in wiring harness (Disconnection in wir ing harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between FB1-12 outlet and J07 and P01 (female) (1), (2)	Resistance	Max. 1 Ω
			Wiring harness between P01 (female) (6), (7) and chassis ground (A11)	Resistance	Max. 1 Ω
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Between FB1-12 outlet – J07 – P01 (female) (1), (2) wiring harness and chassis ground	Resistance	Min. 1 MΩ
	4	Defective monitor panel	★Prepare with starting switch OFF.		
			P01 (female)	Starting switch	Voltage/Resistance
			Between (1), (2) and chassis ground	ON	20 – 30 V
			Between (6), (7) and chassis ground	OFF	Max. 1 Ω

Circuit diagram related to monitor panel power supply



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E-11 7-segment LED's of monitor panel does not light up partially

Trouble	• 7-segment LED's of monitor panel does not light up partially.	When the starting switch is turned ON, 7-segment LED's of monitor panel does not light up partially.
Related information		

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective monitor panel	Troubleshooting cannot be carried out since the defect is in the monitor panel (The LCD that does not light up may be defective).

E-12 Monitor lamp of monitor panel is different from mounted model

Trouble	• Monitor lamp of monitor panel is different from mounted model	When the starting switch is turned ON, the monitor panel which lights up totally is different from the mounted model.
Related information		

<table>
<tr><td rowspan="5">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Defective model code signal</td><td colspan="3">★Turn starting switch ON and carry out troubleshooting (monitoring).</td></tr>
<tr><td>Monitoring code</td><td>Item</td><td>Normal display</td></tr>
<tr><td>001</td><td>Monitor panel model code</td><td>130</td></tr>
<tr><td colspan="4">If the display on the monitor panel is abnormal, carry out troubleshooting for error code [217].</td></tr>
<tr><td>2</td><td>Defective monitor panel</td><td colspan="3">Troubleshooting cannot be carried out since the defect is in the monitor panel (If none of the above causes is the cause of the trouble, the monitor panel is defective).</td></tr>
</table>

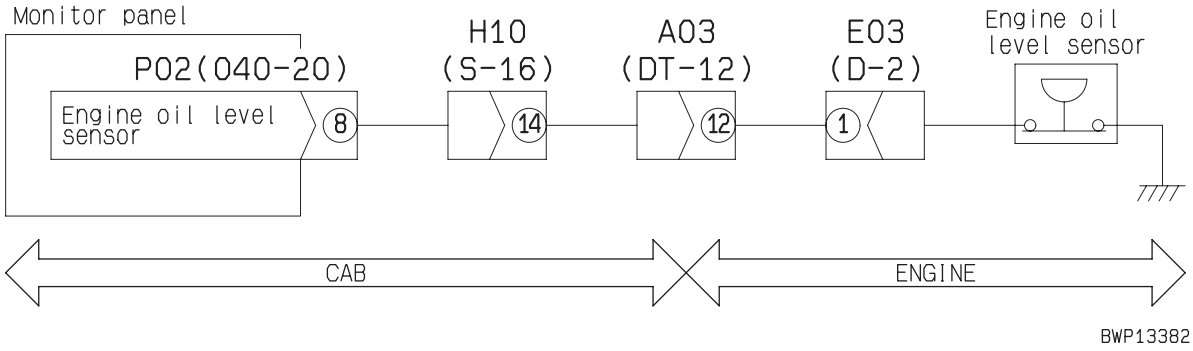
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E-13 When starting switch is turned ON, basic check items light up or flash

Trouble	(1) Engine oil level monitor flashes.
Related information	• When the starting switch is turned ON, if the engine oil level monitor detects lowering of the engine oil level, it flashes. • The input state (ON/OFF) from the engine oil level switch can be checked with the monitoring function. (Code: 046, Center of lower line)

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Low engine oil level (When system is normal)	Check the engine oil level. If it is low, add new oil.		
	2	Defective engine oil level switch (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			E03 (male)	Engine oil level	Resistance
			Between (1) and chassis ground	When normal	Max. 1 Ω
				When low	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between P02 (female) (8) and E03 (female) (1)	Resistance	Max. 1 Ω
	4	Defective monitor panel	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			P02	Engine oil level	Voltage
			Between (8) and chassis ground	When normal	Max. 1 V
				When low	20 – 30 V

Circuit diagram related to engine oil level switch



Trouble	(2) Engine oil replacement monitor lights up.
Related information	• When the starting switch iResistances turned ON near the engine oil replacement period, the engine oil replacement monitor lights. (Set up Machine only)

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Engine oil replacement period (When system is normal)	It is near the engine oil replacement period. Check the elapsed time and replace the oil.
	2	Defective monitor panel	If the time before the set engine oil replacement period is longer than 10 hours, the monitor panel is defective (Troubleshooting cannot be carried out since the defect is in the monitor panel).

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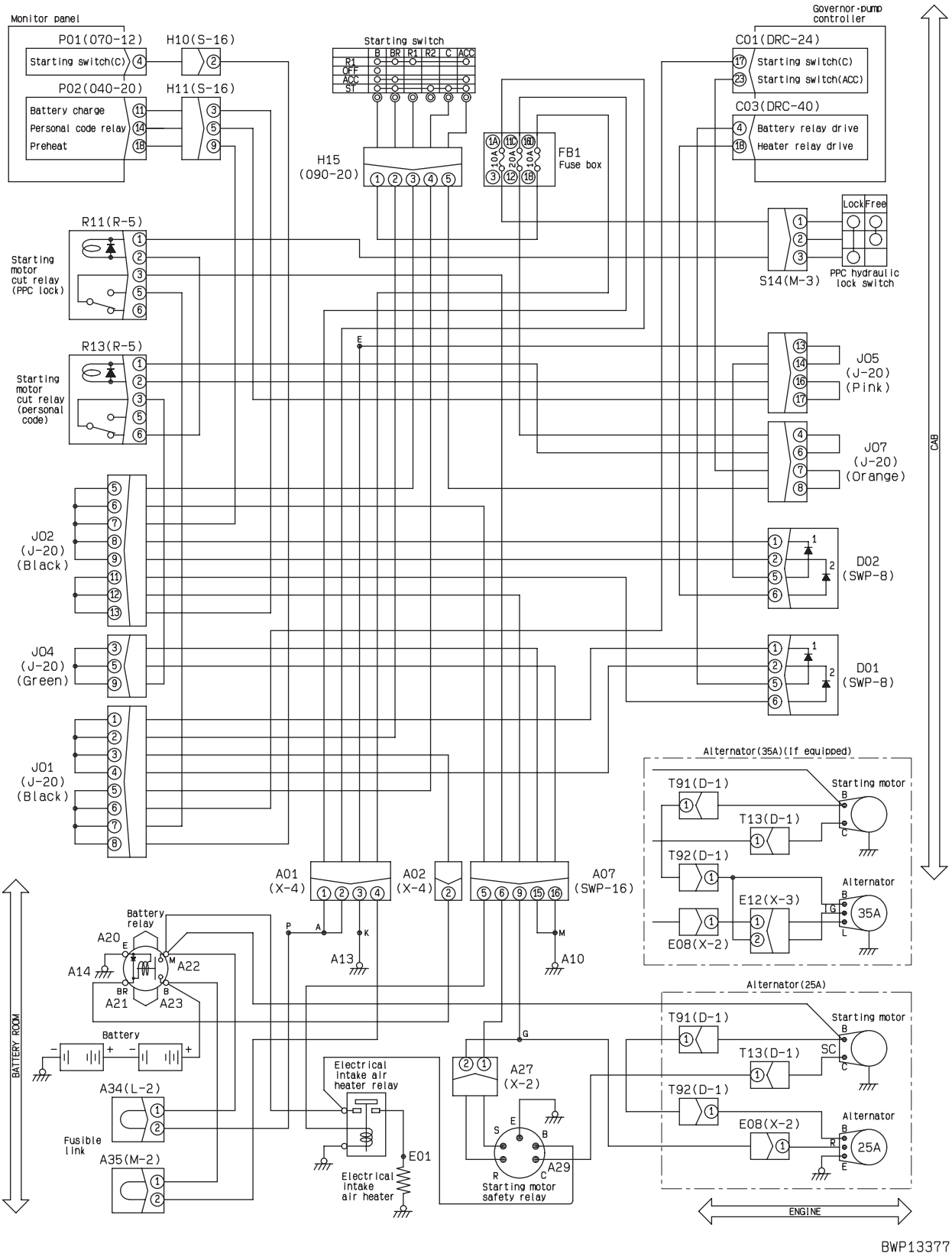
E-14 While engine is running, caution items flash

Trouble	(1) Battery charge level monitor flashes.
Related information	• While the engine is running, if the battery charge level monitor detects lowering of the charge voltage, it flashes. • The generation state (Voltage) of the alternator and the input state (ON/OFF) of the generation signal can be checked with the monitoring function. (Code: 043, by 10 mV, left of lower line)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective alternator (Defective charge)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			E08 (female)	Engine speed	Voltage	
			Between (1) and chassis ground	Above medium (half) speed	20 – 30 V	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between P02 (female) (11) and J02 and E08 (male) (1)		Resistance	Max. 1 Ω
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between P02 (female) (11) – J02 – E08 (male) (1) or A27 (female) (2) or D01 – J01 – D01 (female) (1) or H15 (female) (2) or A21 (BR) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	4	Defective monitor panel	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			E08 (female)	Engine speed	Voltage	
			Between (1) and chassis ground	Above medium (half) speed	20 – 30 V	

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Circuit diagram related to engine preheating, starting, charging, and stopping functions



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Trouble	(2) Fuel level monitor flashes.
Related information	• While the engine is running, if the fuel level monitor detects lowering of the fuel level (Fuel level gauge: Red range), it flashes.

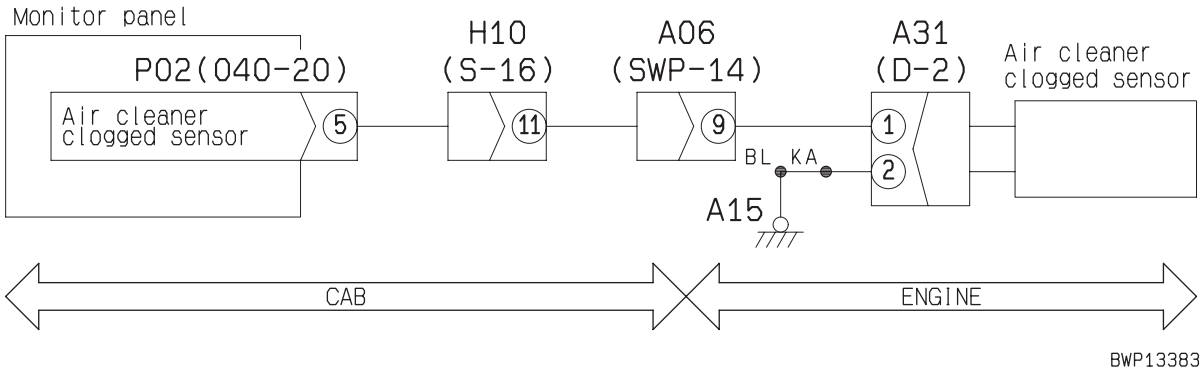
		Cause	Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Low fuel level (When system is normal)	Check the fuel level gauge. If the fuel level is low, add fuel.
	2	Defective monitor panel	If the monitor flashes while the fuel level gauge is not in the red range (level 1), the monitor panel is defective (Troubleshooting cannot be carried out since the defect is in the monitor panel).

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Trouble	(3) Air cleaner clogging monitor flashes.
Related information	• While the engine is running, if the air cleaner clogging monitor detects clogging of the air cleaner, it flashes. • The input state (ON/OFF) from the air cleaner clogging switch can be checked with the monitoring function. (Code: 046, Right of upper line)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Clogging of air cleaner (When system is normal)	Check the air cleaner. If it is clogged, clean or replace it.			
	2	Defective air cleaner clogging switch (Internal disconnection)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			A31 (male)	Air cleaner	Resistance	
			Between (1) and (2)	When normal	Max. 1 Ω	
				When clogged	Min. 1 MΩ	
	3	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between P02 (female) (5) and A31 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between P11 (female) (2) and chassis ground (A15)		Resistance	Max. 1 Ω
	4	Defective monitor panel	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			P02	Air cleaner	Voltage	
			Between (5) and chassis ground	When normal	Max. 1 V	
				When clogged	20 – 30 V	

Circuit diagram related to air cleaner clogging switch



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E-15 While engine is running, emergency stop items flash

Trouble	(1) Engine coolant temperature monitor flashes.
Related information	• If the engine coolant temperature monitor detects a rise of engine coolant temperature (Coolant thermometer: Red range), it flashes.

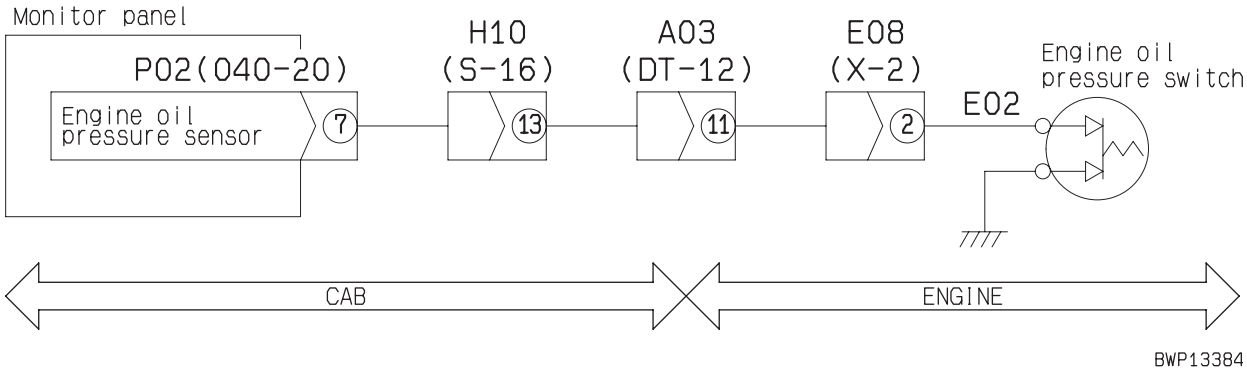
	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Engine overheating (When system is normal)	Check the engine coolant thermometer. If the engine coolant temperature is high, run the engine at low idling to cool it down.
	2	Defective monitor panel	If the monitor flashes while the engine coolant thermometer is not in the red range (level 8, 9), the monitor panel is defective (Troubleshooting cannot be carried out since the defect is in the monitor panel).

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Trouble	(2) Engine oil pressure monitor flashes.
Related information	• If the engine oil pressure monitor detects lowering of the engine oil pressure, it flashes. • The input state (ON/OFF) from the engine oil pressure switch can be checked with the monitoring function. (Code: 046, Center of upper line)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Lowering of engine oil pressure (When system is normal)	Check the engine oil pressure. If it is low, repair the troubled parts.			
	2	Defective engine oil pressure switch (Internal short circuit)	★Prepare with starting switch OFF, then hold starting switch OFF and start engine and carry out troubleshooting.			
			E02	Engine	Resistance	
			Between terminal and chassis ground	When stopped	Min. 1 MΩ	
				When operated	Max. 1 Ω	
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between P02 (female) (7) – E02 wiring harness and chassis ground		Resistance	Max. 1 Ω
	4	Defective monitor panel	★Prepare with starting switch OFF, then hold starting switch ON and start engine and carry out troubleshooting.			
			P02	Engine	Voltage	
			Between (7) and chassis ground	When stopped	20 – 30 V	
				When operated	Max. 1 V	

Circuit diagram related to engine oil pressure switch



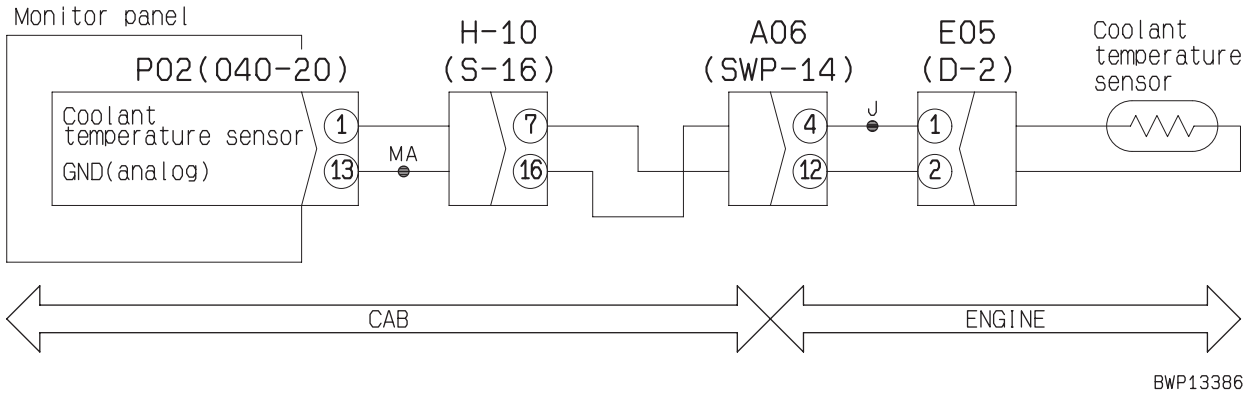
https://truckmanualshub.com/

E-16 Engine coolant thermometer is abnormal

Trouble	(1) While engine coolant temperature is rising normally, thermometer does not rise from white range (C). (2) While engine coolant temperature is stabilized normally, thermometer rises to red range (H).
Related information	• The input state (ON/OFF) from the engine coolant temperature sensor can be checked with the monitoring function. (Code: 041, by 10 mV)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective engine coolant temperature sensor (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			E05 (male)	Engine coolant temperature	Resistance	
			Between (1) and (2)	10 – 100 °C	3.5 k – 90 kΩ	
			Between (2) and chassis ground		Min. 1 MΩ	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between P02 (female) (1) and E05 (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between P02 (female) (13) and E05 (female) (1)		Resistance	Max. 1 Ω
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between P02 (female) (1) – E05 (female) (2) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	4	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between P02 (female) (1) – E05 (female) (2) wiring harness and chassis ground		Voltage	Max. 1 V
	5	Defective monitor panel	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			P02	Engine coolant temperature	Resistance	
			Between (1) and (13)	10 – 100 °C	3.5 k – 90 kΩ	
			Between (1) and chassis ground		Min. 1 MΩ	

Circuit diagram related to engine coolant temperature sensor



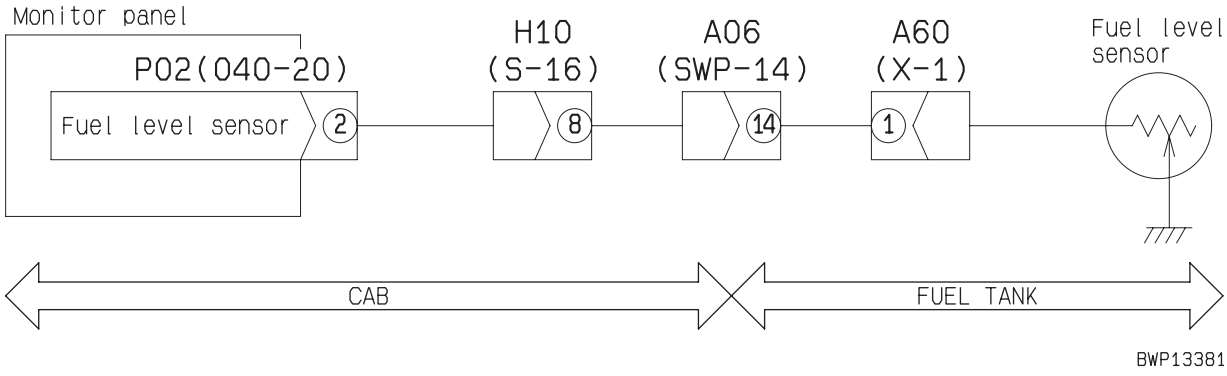
https://truckmanualshub.com/

E-17 Fuel level gauge is abnormal

Trouble	(1) While fuel level is high, gauge does not rise from red range (E). (2) While fuel level is low, gauge does not lower from green range (F).
Related information	• The input state (ON/OFF) from the fuel level sensor can be checked with the monitoring function. (Code: 042, by 10 mV)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective fuel level sensor (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			A60 (male)	Fuel level	Resistance	
			Between (1) and chassis ground	FULL (Upper limit)	Approx. 12 Ω	
				EMPTY (Lower limit)	85 – 120 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between P02 (female) (2) and A60 (female) (1)		Resistance	Max. 1 Ω
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between P02 (female) (2) – A60 (female) (1) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	4	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between P02 (female) (2) – A60 (female) (1) wiring harness and chassis ground		Voltage	Max. 1 V
	6	Defective monitor panel	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			P02	Fuel level	Resistance	
			Between (2) and chassis ground	FULL (Upper limit)	Approx. 12 Ω	
				EMPTY (Lower limit)	85 – 120 Ω	

Circuit diagram related to fuel level sensor



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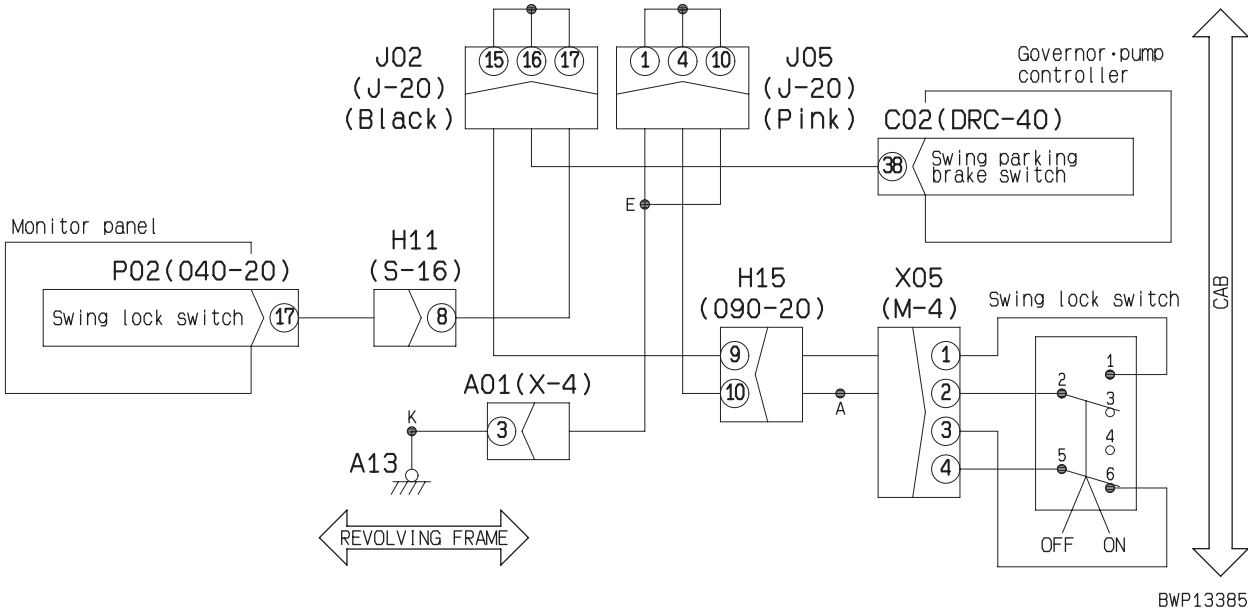
E-18 Swing lock monitor is abnormal

Trouble	(1) When swing lock switch is set in LOCK position, swing lock monitor does not light up. (2) When swing lock switch is set in OFF position, swing lock monitor does not go off.
Related information	• If the swing holding brake release switch is set in the RELEASE position, the swing lock monitor flashes. • The input state (ON/OFF) from the swing lock switch can be checked with the monitoring function. (Code: 022, Left of upper line, 049, Right of upper line)

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective swing lock switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			X05 (female)	Swing lock switch	Resistance	
			Between (1) and (2)	OFF	Min. 1 MΩ	
				LOCK	Max. 1 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between P02 (female) (17) and J02 and X05 (male) (1)		Resistance	Max. 1 Ω
			Wiring harness between X05 (male) (2) and J05 and chassis ground (A13)		Resistance	Max. 1 Ω
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between P02 (female) (17) – J02 – X05 (male) (1) or C02 (female) (38) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	4	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between P02 (female) (17) – J02 – X05 (male) (1) or C02 (female) (38) wiring harness and chassis ground		Voltage	Max. 1 V
	5	Defective monitor panel	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			P02	Swing lock switch	Voltage	
			Between (17) and chassis ground	OFF	20 – 30 V	
				LOCK	Max. 1 V	

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Circuit diagram related to swing lock switch



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E-19 When monitor switch is operated, display by lamp does not change

Trouble	• When monitor switch is operated, display by lamp does not change.
Related information	

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Defective monitor panel	Troubleshooting cannot be carried out since the defect is in the monitor panel.

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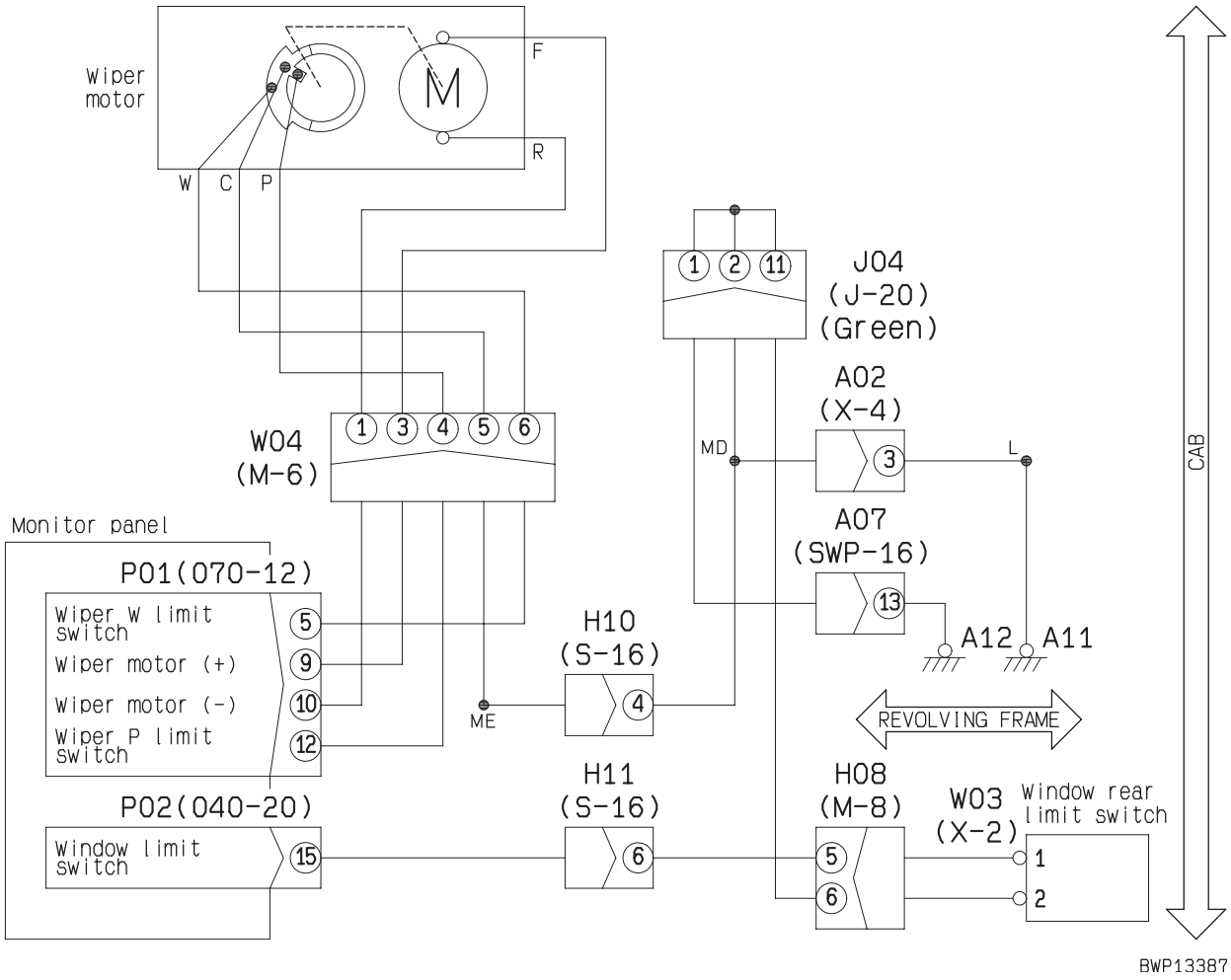
E-20 Windshield wiper and windshield washer do not operate

Trouble	(1) Windshield wiper does not operate.
Related information	• The input state (ON/OFF) from the window rear limit switch can be checked with the monitoring function. (Code: 049, Center of upper line)

<table>
<tr><td rowspan="20">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Defective window rear limit switch
(Internal disconnection or short circuit)</td><td colspan="4">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td>W03 (male)</td><td>Front window</td><td colspan="2">Resistance</td></tr>
<tr><td rowspan="2">Between (1) and (2)</td><td>When installed to front</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td>When stored in rear</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Defective wiper motor
(Internal disconnection)</td><td colspan="4">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td colspan="2">W04 (female)</td><td colspan="2">Continuity</td></tr>
<tr><td colspan="2">Between (3) and (1)</td><td colspan="2">There is continuity</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Disconnection in wiring harness
(Disconnection in wiring harness or defective contact in connector)</td><td colspan="4">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td colspan="2">Wiring harness between P01 (female) (9) and W04 (male) (3)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Wiring harness between P01 (female) (10) and W04 (male) (1)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Short circuit with chassis ground in wiring harness
(Contact with ground circuit)</td><td colspan="4">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td colspan="2">Between P02 (female) (15) – W03 (female) (1) wiring harness and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="5">5</td><td rowspan="3">Defective monitor panel
(Window rear limit switch system)</td><td colspan="4">★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td>P02</td><td>Front window</td><td colspan="2">Voltage</td></tr>
<tr><td rowspan="2">Between (15) and chassis ground</td><td>When installed to front</td><td colspan="2">20 – 30 V</td></tr>
<tr><td></td><td>When stored in rear</td><td colspan="2">Max. 1 V</td></tr>
<tr><td rowspan="3">Defective monitor panel
(Wiper motor system)</td><td colspan="4">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td>P01</td><td>Wiper switch</td><td colspan="2">Voltage</td></tr>
<tr><td rowspan="2">Between (9) and chassis ground
Between (10) and chassis ground</td><td>OFF</td><td colspan="2">Max. 1 V</td></tr>
<tr><td>ON</td><td colspan="2">Max. 1 V⇔20 – 30 V
(Constant period)</td></tr>
</table>

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Circuit diagram related to wiper motor and window rear limit switch



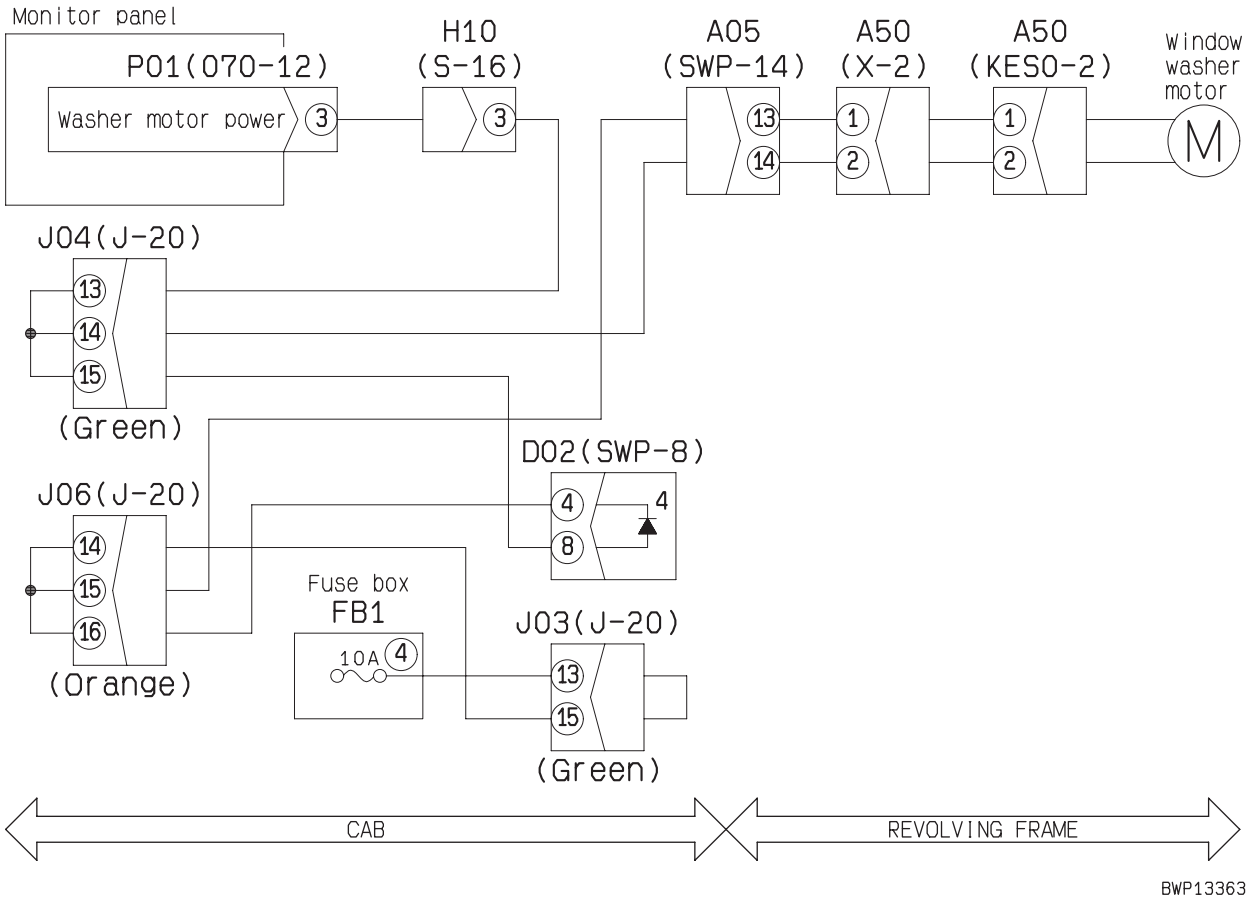
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Trouble	(2) Windshield washer does not operate.
Related information	

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective fuse No. 4	If the fuse is broken, the circuit probably has a grounding fault, etc. (See cause 4.)			
	2	Defective washer motor (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			A50 (male)		Resistance	
			Between (1) and (2)		5 – 20 Ω	
			Between (1) and chassis ground		Min. 1 MΩ	
	3	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between FB1 – 4 and J03 and J06 and A50 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between A50 (female) (2) and J04 and P01 (female) (3)		Resistance	Max. 1 Ω
	4	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between FB1-4 – J03 – J06 – A50 (female) (1) or D02 (female) (4) wiring harness and chassis ground		Resistance	Min. 1 MΩ
			Between A50 (female) (2) – J04 – P01 (female) (3) or D02 (female) (8) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	5	Defective monitor panel	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			P01	Windshield washer switch	Voltage	
			Between (3) and chassis ground	When OFF	20 – 30 V	
				When ON	Max. 1 V	

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Circuit diagram related to windshield washer motor



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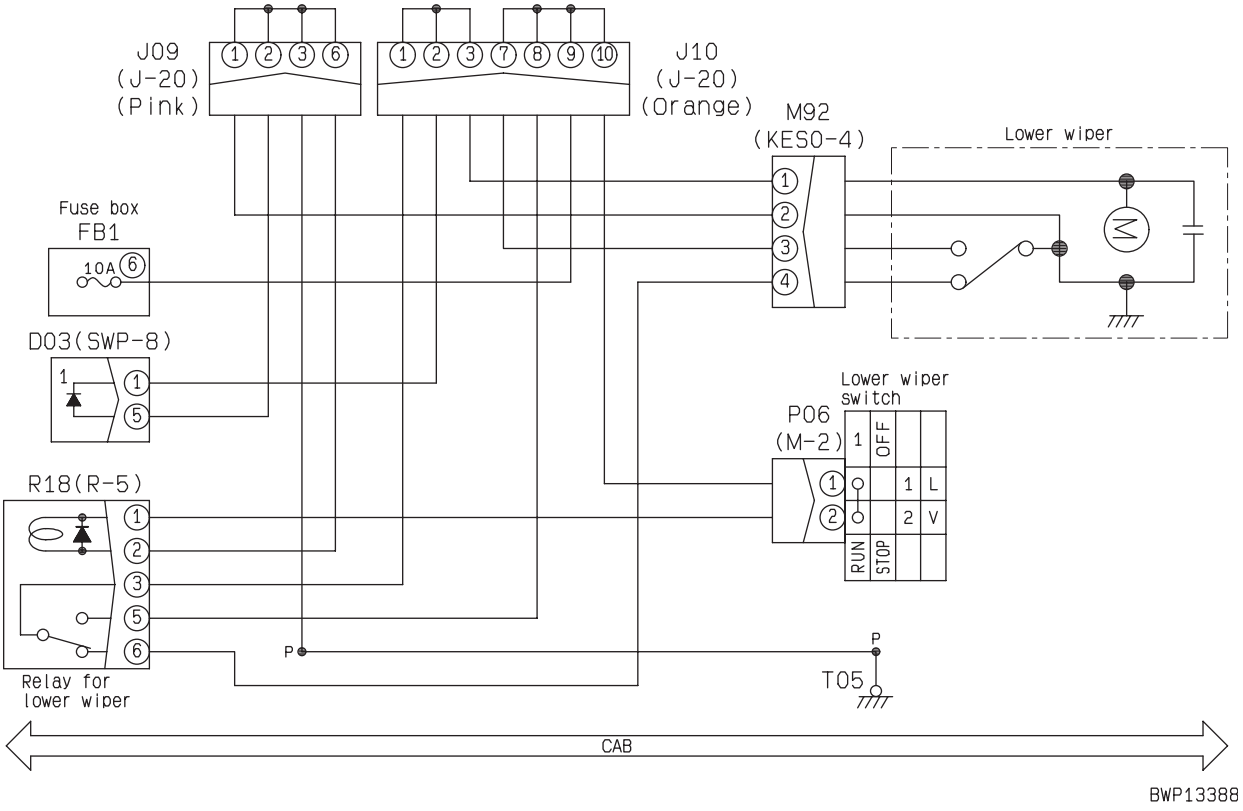
E-21 Lower windshield wiper does not operate

Trouble	• Lower windshield wiper does not operate.
Related information	

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fuse No. 6	If the fuse is broken, the circuit probably has a grounding fault, etc. (See cause 6.)		
	2	Defective lower wiper switch (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			P06 (female)	Lower wiper switch	Resistance
			Between (1) and (2)	When OFF	Min. 1 MΩ
				When ON	Max. 1 Ω
	3	Defective lower wiper motor (Internal disconnection)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			M92 (female)	Lower wiper switch	Resistance
			Between (1) and chassis ground	ON	20 – 30 V
			Between (2) and chassis ground		Max. 1 Ω
			Between (3) and chassis ground		20 – 30 V
			Between (4) and chassis ground		Max. 1 V
			If the voltage and resistance are normal and the lower windshield wiper does not operate, the lower wiper motor is defective.		
	4	Defective lower wiper relay (Internal disconnection)	★Replace relay while starting switch is OFF, then turn starting switch ON and carry out troubleshooting.		
			When the right lower wiper relay is replaced with another one, if the condition becomes normal, the relay is defective.		R18
	5	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between FB1-6 outlet and J10 and M92 (female) (3) or R18 (female) (5) or P06 (male) (1)	Resistance	Max. 1 Ω
			Wiring harness between R18 (female) (1) and P06 (male) (2)	Resistance	Max. 1 Ω
			Wiring harness between M92 (female) (2), D03 (female) (5), R18 (female) (2) and J09 and chassis ground (T05)	Resistance	Max. 1 Ω
			Wiring harness between R18 (female) (3) and D03 (female) (1) or M92 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between R18 (female) (6) and M92 (female) (6)	Resistance	Max. 1 Ω
	6	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Between FB1-6 outlet – J10 – M92 (female) (3) or R18 (female) (5) or P06 (male) (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between R18 (female) (1) – P06 (male) (2) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between R18 (female) (3) – D03 (female) (1) or M92 (female) (1) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between R18 (female) (6) – M92 (female) (6) wiring harness and chassis ground	Resistance	Min. 1 MΩ

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Circuit diagram related to lower windshield wiper



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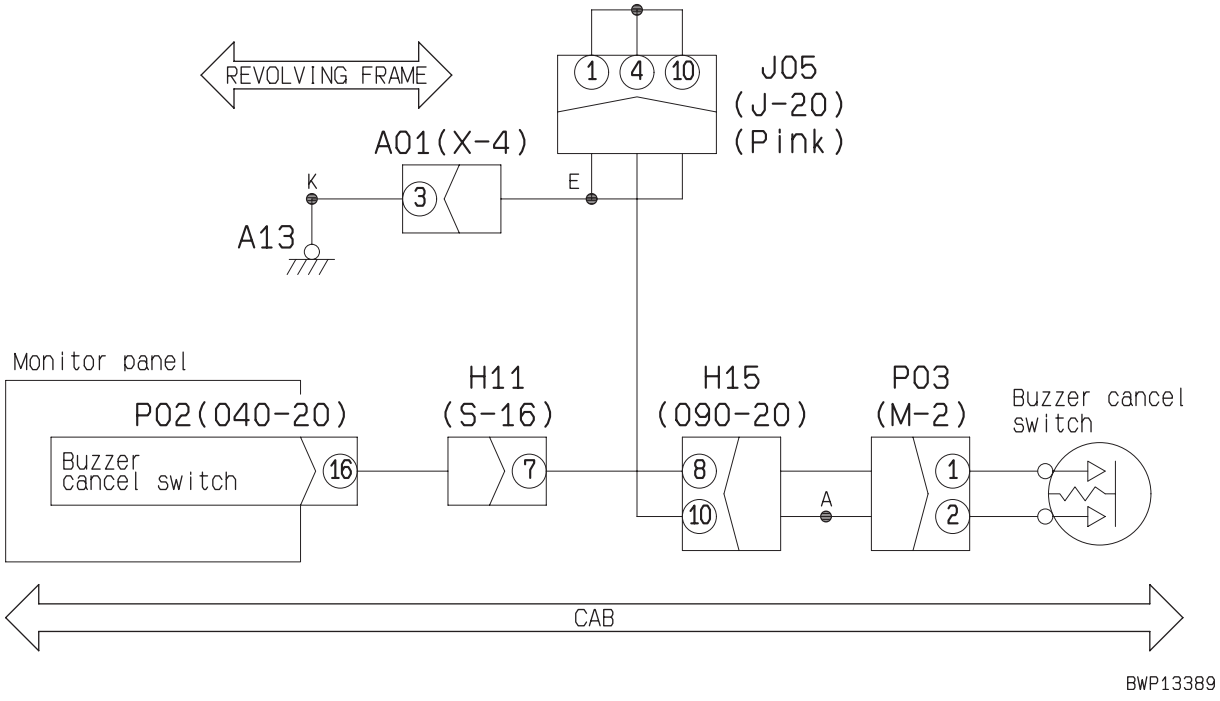
E-22 Caution buzzer does not stop

Trouble	• Caution buzzer does not stop.
Related information	• The input state (ON/OFF) from the caution buzzer stop switch can be checked with the monitoring function. (Code: 045, Right of upper line)

<table>
<tr><td rowspan="12">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Defective caution buzzer stop switch
(Internal disconnection)</td><td colspan="4">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td colspan="2">P03 (female)</td><td>Caution buzzer stop switch</td><td colspan="2">Resistance</td></tr>
<tr><td colspan="2" rowspan="2">Between (1) and (2)</td><td>Released</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td>Pressed</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Disconnection in wiring harness
(Disconnection in wiring harness or defective contact in connector)</td><td colspan="4">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td colspan="3">Wiring harness between P02 (female) (16) and P03 (male) (1)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="3">Wiring harness between P03 (male) (2) and J05 and chassis ground (A13)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Short circuit with power source in wiring harness
(Contact with 24-V circuit)</td><td colspan="4">★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="3">Between P02 (female) (16) – P03 (male) (1) wiring harness and chassis ground</td><td>Voltage</td><td>Max. 1 V</td></tr>
<tr><td rowspan="4">5</td><td rowspan="4">Defective monitor panel</td><td colspan="4">★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="2">P02</td><td>Caution buzzer stop switch</td><td colspan="2">Voltage</td></tr>
<tr><td colspan="2" rowspan="2">Between (16) and chassis ground</td><td>Released</td><td colspan="2">20 – 30 V</td></tr>
<tr><td>Pressed</td><td colspan="2">Max. 1 V</td></tr>
</table>

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Circuit diagram related to caution buzzer stop switch



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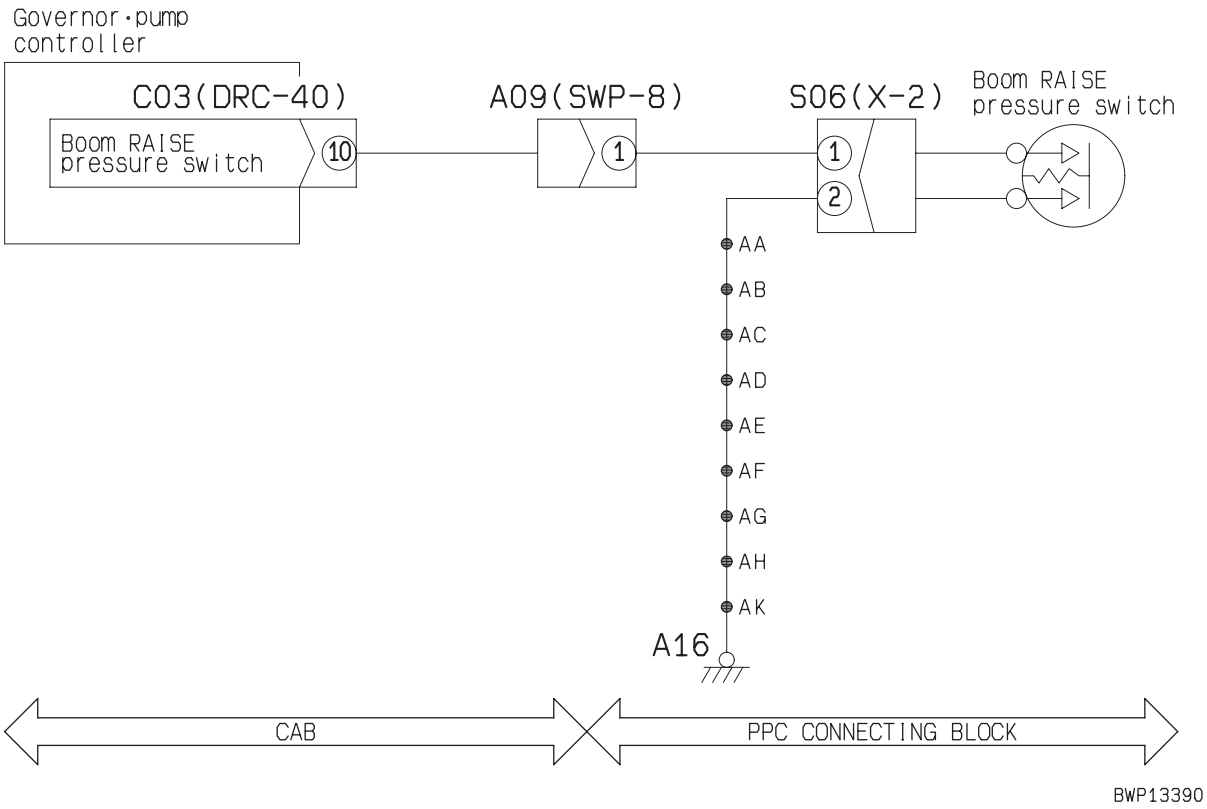
E-23 Monitoring function does not display "Boom RAISE" normally

Trouble	• Monitoring function does not display "Boom RAISE" normally.	The monitoring function (special function) of the monitor panel does not display "Boom RAISE" normally.
Related information	• 6-bit position of boom RAISE oil pressure switch (Code: 020, Center of lower line)	

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective boom RAISE oil pressure switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			S06 (male)	Right work equipment control lever	Resistance	
			Between (1) and (2)	Neutral position	Min. 1 MΩ	
				Boom RAISE position	Max. 1 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C03 (female) (10) and S06 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between S06 (female) (2) and chassis ground (A16)		Resistance	Max. 1 Ω
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C03 (female) (10) – S06 (female) (1) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	4	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C03 (female) (10) – S06 (female) (1) wiring harness and chassis ground		Voltage	Max. 1 V
	5	Defective governor and pump controller	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			C03	Right work equipment control lever	Voltage	
			Between (10) and chassis ground	Neutral position	20 – 30 V	
				Boom RAISE position	Max. 1 V	

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Circuit diagram related to boom RAISE oil pressure switch



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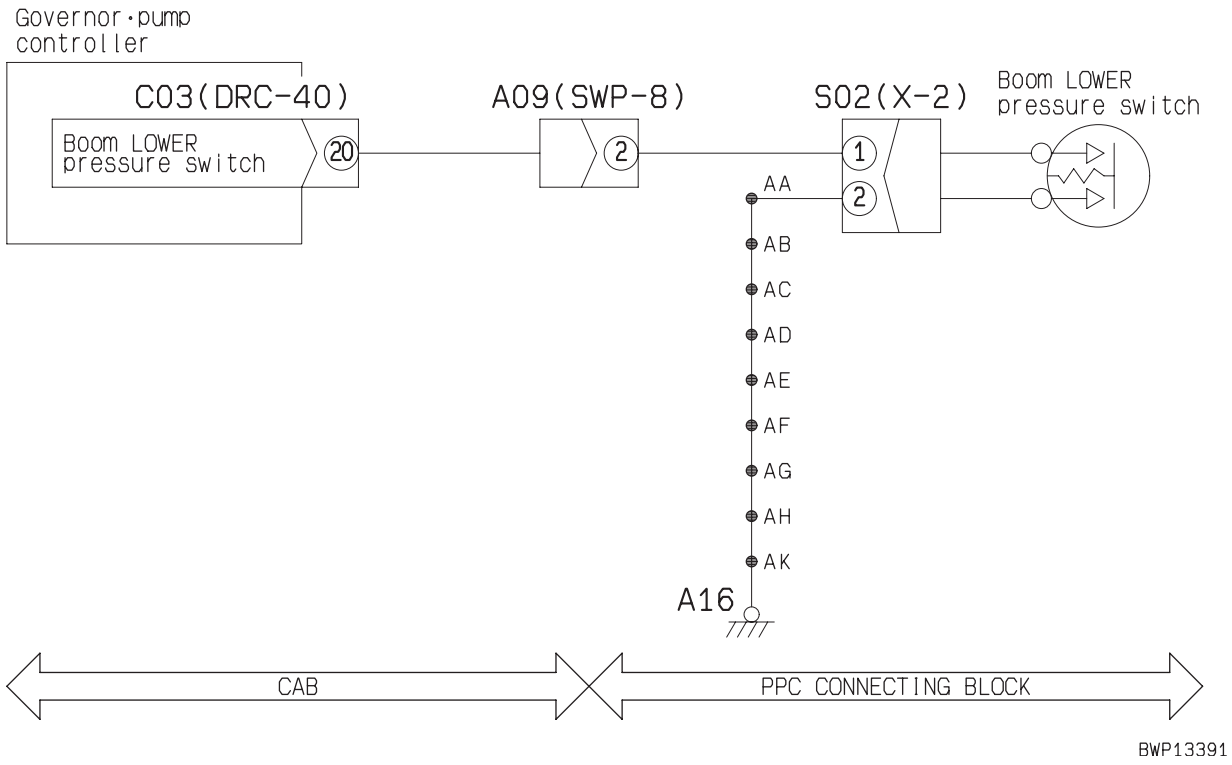
E-24 Monitoring function does not display "Boom LOWER" normally

Trouble	• Monitoring function does not display "Boom LOWER" normally.	The monitoring function (special function) of the monitor panel does not display "Boom LOWER" normally.
Related information	• 6-bit position of boom LOWER oil pressure switch (Code: 020, Center of upper line)	

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective boom LOWER oil pressure switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			S02 (male)	Right work equipment control lever	Resistance	
			Between (1) and (2)	Neutral position	Min. 1 MΩ	
				Boom LOWER position	Max. 1 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C03 (female) (20) and S02 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between S02 (female) (2) and chassis ground (A16)		Resistance	Max. 1 Ω
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C03 (female) (20) – S02 (female) (1) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	4	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C03 (female) (20) – S02 (female) (1) wiring harness and chassis ground		Voltage	Max. 1 V
	5	Defective governor and pump controller	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			C03	Right work equipment control lever	Voltage	
			Between (10) and chassis ground	Neutral position	20 – 30 V	
				Boom LOWER position	Max. 1 V	

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Circuit diagram related to boom LOWER oil pressure switch



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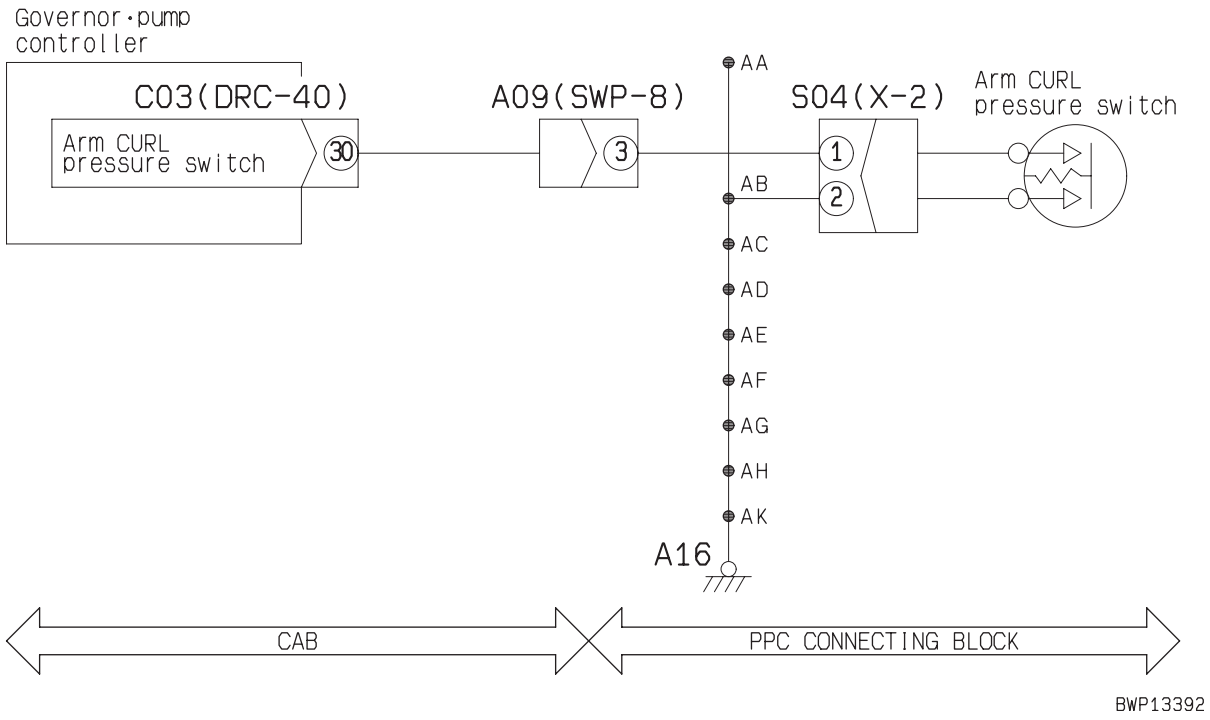
E-25 Monitoring function does not display "Arm IN" normally

Trouble	• Monitoring function does not display "Arm IN" normally.	The monitoring function (special function) of the monitor panel does not display "Arm IN" normally.
Related information	• 6-bit position of arm IN oil pressure switch (Code: 020, Left of upper line)	

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective arm IN oil pressure switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			S04 (male)	Left work equipment control lever	Resistance	
			Between (1) and (2)	Neutral position	Min. 1 MΩ	
				Arm IN position	Max. 1 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C03 (female) (30) and S04 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between S04 (female) (2) and chassis ground (A16)		Resistance	Max. 1 Ω
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C03 (female) (30) – S04 (female) (1) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	4	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C03 (female) (30) – S04 (female) (1) wiring harness and chassis ground		Voltage	Max. 1 V
	5	Defective governor and pump controller	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			C03	Left work equipment control lever	Voltage	
			Between (30) and chassis ground	Neutral position	20 – 30 V	
				Arm IN position	Max. 1 V	

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Circuit diagram related to arm IN oil pressure switch



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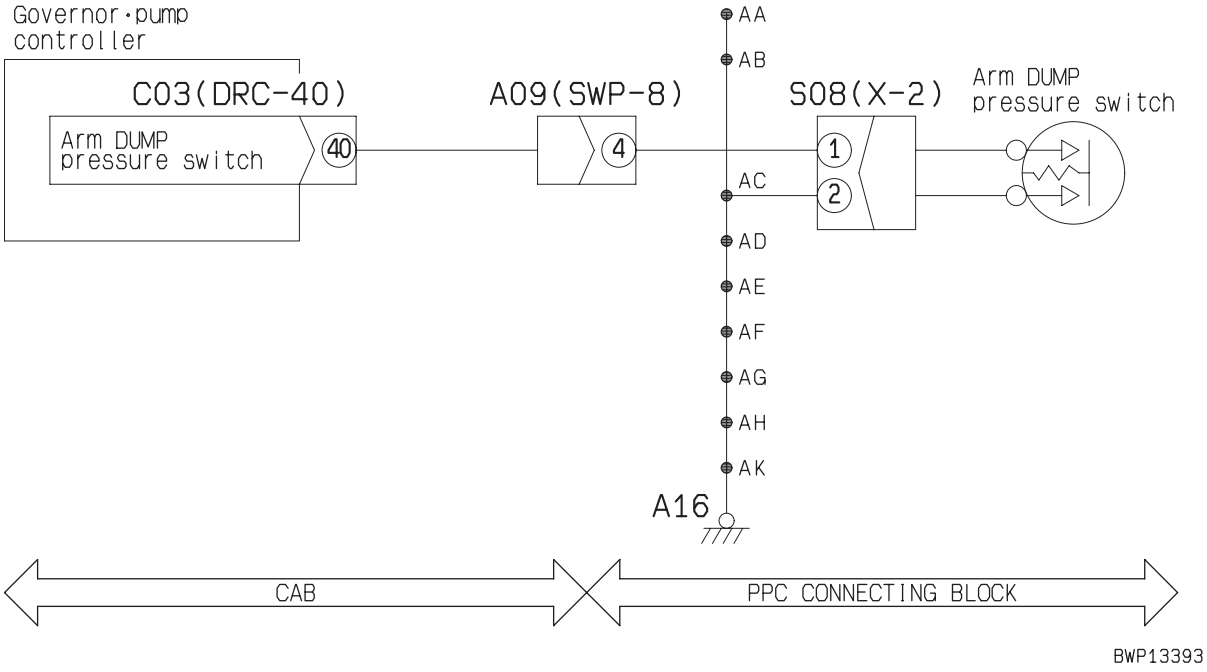
E-26 Monitoring function does not display "Arm OUT" normally

Trouble	• Monitoring function does not display "Arm OUT" normally.	The monitoring function (special function) of the monitor panel does not display "Arm OUT" normally.
Related information	• 6-bit position of arm OUT oil pressure switch (Code: 020, Left of lower line)	

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective arm OUT oil pressure switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			S08 (male)	Left work equipment control lever	Resistance	
			Between (1) and (2)	Neutral position	Min. 1 MΩ	
				Arm OUT position	Max. 1 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C03 (female) (40) and S08 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between S08 (female) (2) and chassis ground (A16)		Resistance	Max. 1 Ω
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C03 (female) (40) – S08 (female) (1) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	4	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C03 (female) (40) – S08 (female) (1) wiring harness and chassis ground		Voltage	Max. 1 V
	5	Defective governor and pump controller	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			C03	Left work equipment control lever	Voltage	
			Between (40) and chassis ground	Neutral position	20 – 30 V	
				Arm OUT position	Max. 1 V	

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Circuit diagram related to arm OUT oil pressure switch



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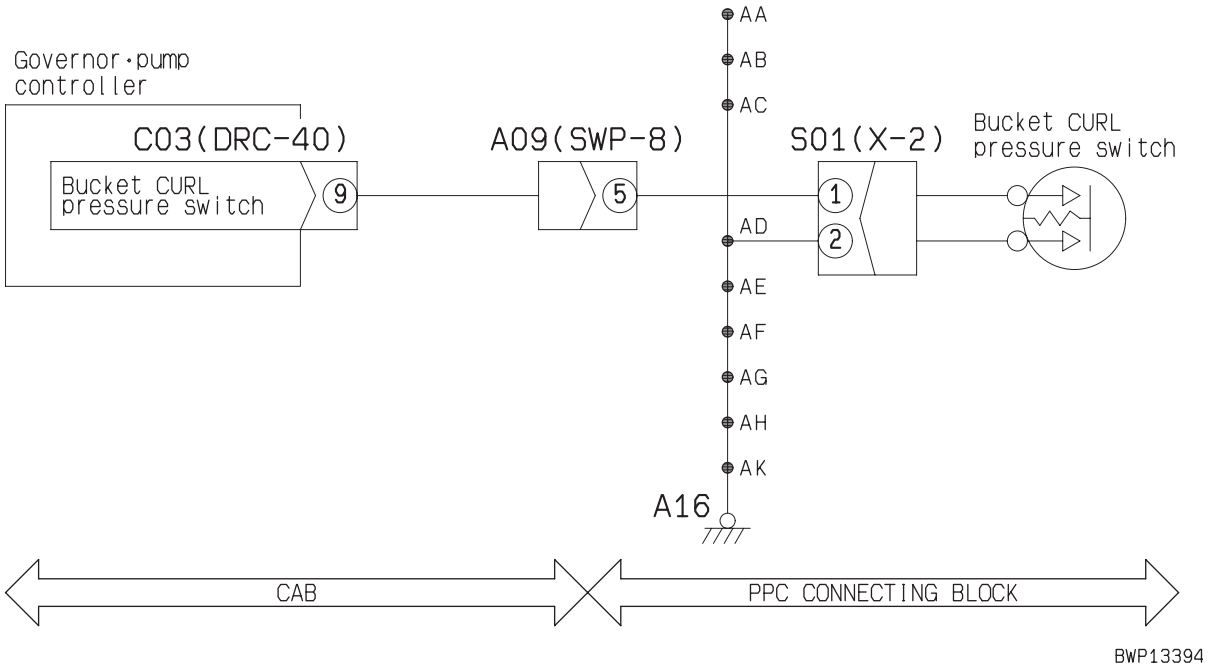
E-27 Monitoring function does not display "Bucket CURL" normally

Trouble	• Monitoring function does not display "Bucket CURL" normally.	The monitoring function (special function) of the monitor panel does not display "Bucket CURL" normally.
Related information	• 6-bit position of bucket CURL oil pressure switch (Code: 021, Right of upper line)	

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective bucket CURL oil pressure switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			S01 (male)	Right work equipment control lever	Resistance	
			Between (1) and (2)	Neutral position	Min. 1 MΩ	
				Bucket CURL position	Max. 1 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C03 (female) (9) and S01 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between S01 (female) (2) and chassis ground (A16)		Resistance	Max. 1 Ω
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C03 (female) (9) – S01 (female) (1) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	4	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C03 (female) (9) – S01 (female) (1) wiring harness and chassis ground		Voltage	Max. 1 V
	5	Defective governor and pump controller	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			C03	Right work equipment control lever	Voltage	
			Between (9) and chassis ground	Neutral position	20 – 30 V	
				Bucket CURL position	Max. 1 V	

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Circuit diagram related to bucket CURL oil pressure switch



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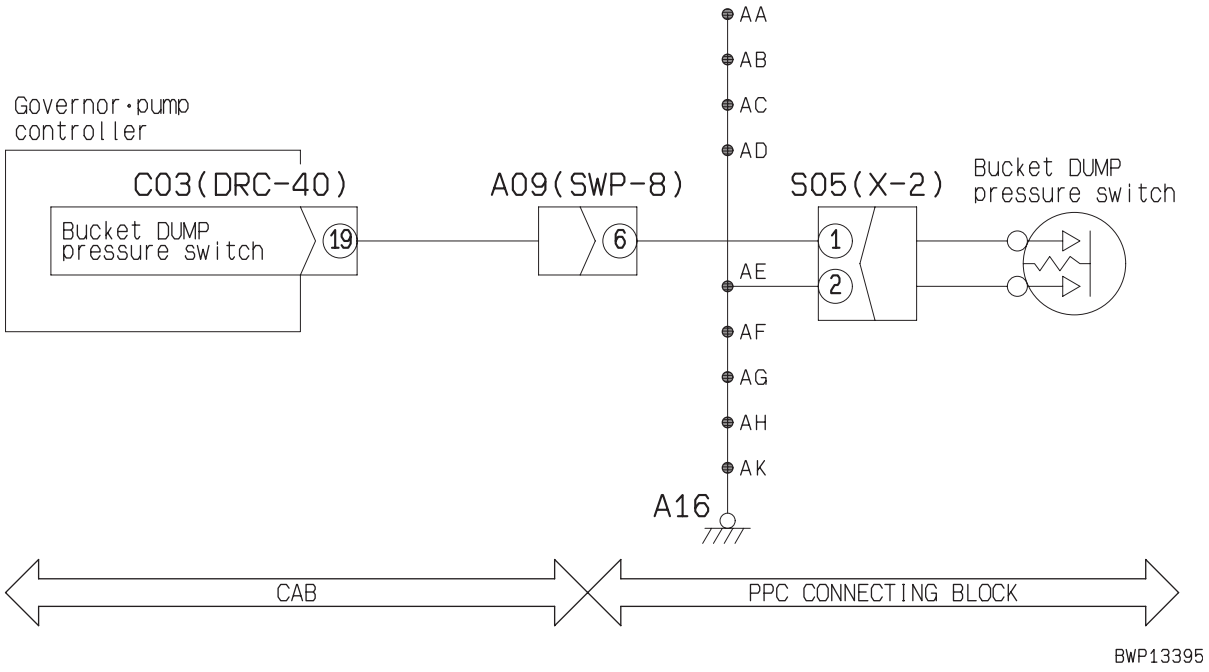
E-28 Monitoring function does not display "Bucket DUMP" normally

Trouble	• Monitoring function does not display "Bucket DUMP" normally.	The monitoring function (special function) of the monitor panel does not display "Bucket DUMP" normally.
Related information	• 6-bit position of bucket DUMP oil pressure switch (Code: 021, Right of lower line)	

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective bucket DUMP oil pressure switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			S05 (male)	Right work equipment control lever	Resistance	
			Between (1) and (2)	Neutral position	Min. 1 MΩ	
				Bucket DUMP position	Max. 1 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C03 (female) (19) and S05 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between S05 (female) (2) and chassis ground (A16)		Resistance	Max. 1 Ω
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C03 (female) (19) – S05 (female) (1) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	4	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C03 (female) (19) – S05 (female) (1) wiring harness and chassis ground		Voltage	Max. 1 V
	5	Defective governor and pump controller	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			C03	Right work equipment control lever	Voltage	
			Between (19) and chassis ground	Neutral position	20 – 30 V	
				Bucket DUMP position	Max. 1 V	

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Circuit diagram related to bucket DUMP oil pressure switch



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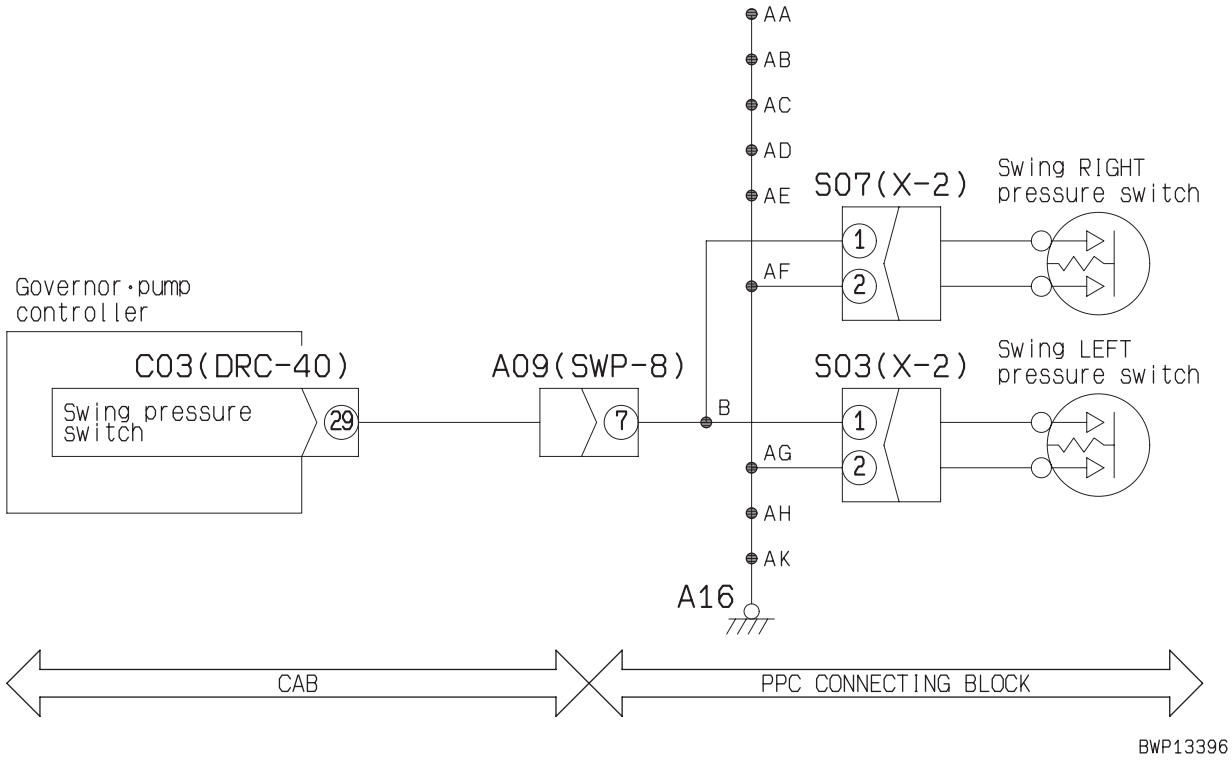
E-29 Monitoring function does not display "Swing" normally

Trouble	• Monitoring function does not display "Swing" normally.	The monitoring function (special function) of the monitor panel does not display "Swing" normally.
Related information	• 6-bit position of swing oil pressure switch (Code: 0201, Right of upper line)	

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective swing LEFT oil pressure switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			S03 (male)	Left work equipment control lever	Resistance	
			Between (1) and (2)	Neutral position	Min. 1 MΩ	
				Swing LEFT position	Max. 1 Ω	
	2	Defective swing RIGHT oil pressure switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			S07 (male)	Left work equipment control lever	Resistance	
			Between (1) and (2)	Neutral position	Min. 1 MΩ	
				Swing RIGHT position	Max. 1 Ω	
	3	Disconnection in wiring harness Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C03 (female) (29) and S03 (female) (1) or S07 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between S03 (female) (2) and chassis ground (A16)		Resistance	Max. 1 Ω
			Wiring harness between S07 (female) (2) and chassis ground (A16)		Resistance	Max. 1 Ω
	4	Short circuit with chassis ground in wiring harness (Contact with ground ircuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C03 (female) (29) – S03 (female) (1) or S07 (female) (1) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	5	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C03 (female) (29) – S03 (female) (1) or S07 (female) (1) wiring harness and chassis ground		Voltage	Max. 1 V
	6	Defective governor and pump controller	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			C03	Left work equipment control lever	Voltage	
			Between (29) and chassis ground	Neutral position	20 – 30 V	
				Swing LEFT or RIGHT position	Max. 1 V	

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Circuit diagram related to swing LEFT oil pressure switch and RIGHT oil pressure switch



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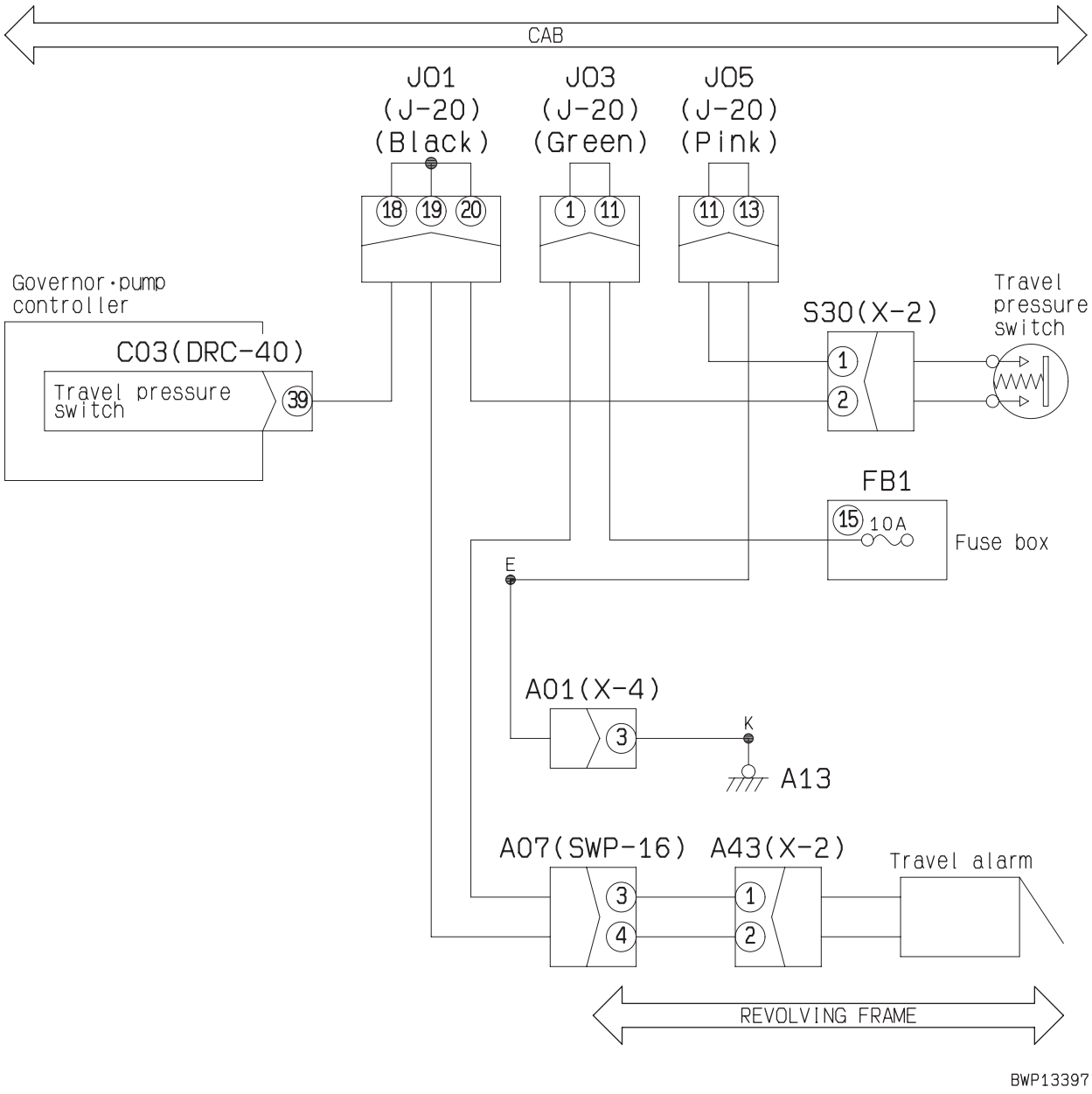
E-30 Monitoring function does not display "Travel" normally

Trouble	• Monitoring function does not display "Travel" normally.	The monitoring function (special function) of the monitor panel does not display "Travel" normally.
Related information	• 6-bit position of travel oil pressure switch (Code: 020, Right of lower line)	

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective travel oil pressure switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			S30 (male)	Travel lever	Resistance	
			Between (1) and (2)	Neutral position	Min. 1 MΩ	
				Forward or reverse operation	Max. 1 Ω	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C03 (female) (39) and S30 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between S30 (female) (1) and chassis ground (A13)		Resistance	Max. 1 Ω
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C03 (female) (39) – J01 – S30 (female) (1) and A43 (female) (2) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	4	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C03 (female) (39) – J01 – S30 (female) (1) wiring harness and chassis ground		Voltage	Max. 1 V
	5	Defective governor and pump controller	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			C03	Travel lever	Voltage	
			Between (39) and chassis ground	Neutral position	20 – 30 V	
				Forward or reverse operation	Max. 1 V	

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Circuit diagram related to travel oil pressure switch and travel alarm



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E-31 Monitoring function does not display "service" normally

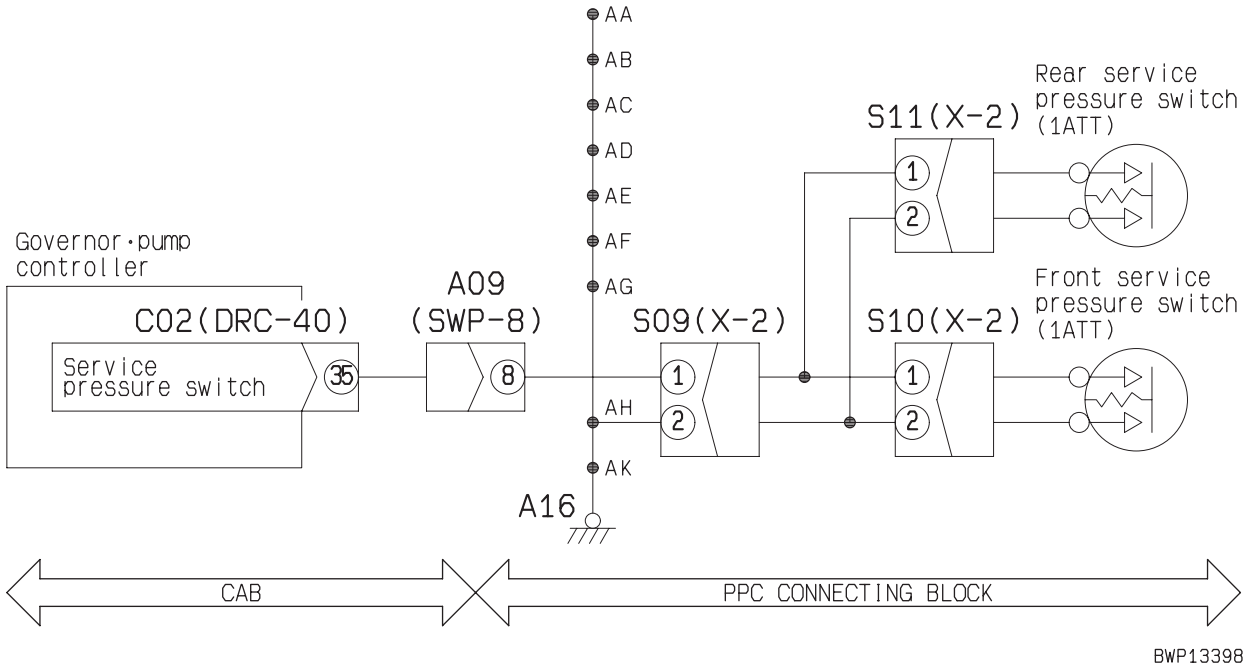
When 1 attachment is installed

Trouble	• Monitoring function does not display "Service" normally.	The monitoring function (special function) of the monitor panel does not display "Service" normally.
Related information	• 6-bit position of service oil pressure switch (Code: 0201, Center of lower line)	

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective service 1 (front) oil pressure switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			S10 (male)	Service pedal 1	Resistance	
			Between (1) and (2)	Neutral position	Min. 1 MΩ	
				Front position	Max. 1 Ω	
	2	Defective service 1 (rear) oil pressure switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			S11 (male)	Service pedal 1	Resistance	
			Between (1) and (2)	Neutral position	Min. 1 MΩ	
				Rear position	Max. 1 Ω	
	3	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C02 (female) (35) and S10 (female) (1) or S11 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between S10 (female) (2) and chassis ground (A16)		Resistance	Max. 1 Ω
			Wiring harness between S11 (female) (2) and chassis ground (A16)		Resistance	Max. 1 Ω
	4	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C02 (female) (35) – S10 (female) (1) or S11 (female) (1) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	5	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C02 (female) (35) – S10 (female) (1) or S11 (female) (1) wiring harness and chassis ground		Voltage	Max. 1 V
	6	Defective governor and pump controller	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			C02	Service pedal 1	Voltage	
			Between (35) and chassis ground	Neutral position	20 – 30 V	
				Front or rear position	Max. 1 V	

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Circuit diagram related to service 1 oil pressure switches (front and rear)



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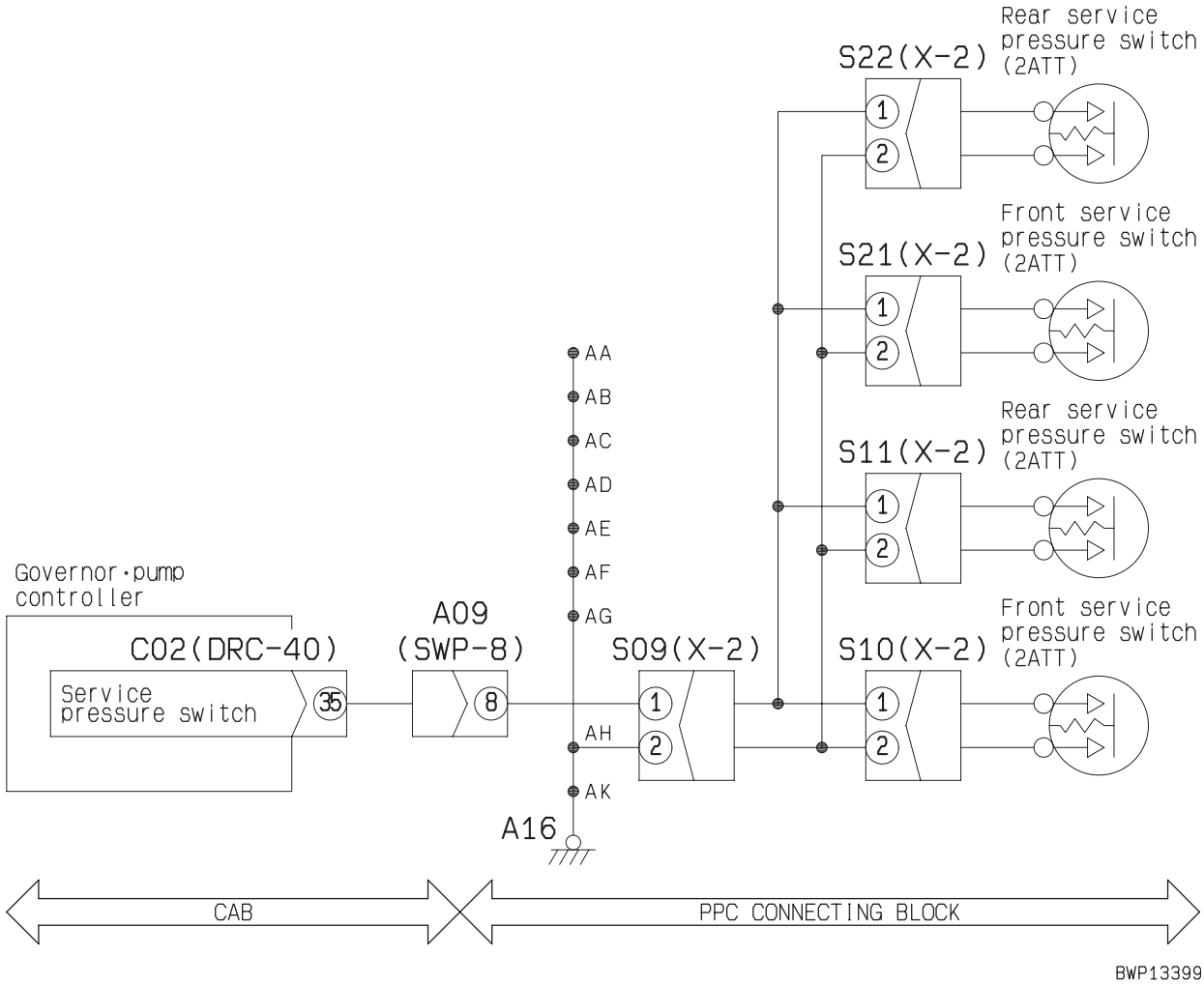
When 2 attachments are installed

Trouble	• Monitoring function does not display "Service" normally.	The monitoring function (special function) of the monitor panel does not display "Service" normally.
Related information	• 6-bit position of service oil pressure switch (Code: 0201, Center of lower line)	

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective service 1 (front) oil pressure switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			S10 (male)	Service pedal 1	Resistance	
			Between (1) and (2)	Neutral position	Min. 1 MΩ	
				Front position	Max. 1 Ω	
	2	Defective service 1 (rear) oil pressure switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			S11 (male)	Service pedal 1	Resistance	
			Between (1) and (2)	Neutral position	Min. 1 MΩ	
				Rear position	Max. 1 Ω	
	3	Defective service 2 (front) oil pressure switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			S21 (male)	Service pedal 2	Resistance	
			Between (1) and (2)	Neutral position	Min. 1 MΩ	
				Front position	Max. 1 Ω	
	4	Defective service 2 (rear) oil pressure switch (Internal disconnection or short circuit)	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			S22 (male)	Service pedal 2	Resistance	
			Between (1) and (2)	Neutral position	Min. 1 MΩ	
				Rear position	Max. 1 Ω	
	5	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between C02 (female) (35) and S10 (female) (1) or S11 (female) (1) or S21 (female) (1) or S22 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between S10 (female) (2) and chassis ground (A16)		Resistance	Max. 1 Ω
			Wiring harness between S11 (female) (2) and chassis ground (A16)		Resistance	Max. 1 Ω
			Wiring harness between S21 (female) (2) and chassis ground (A16)		Resistance	Max. 1 Ω
			Wiring harness between S22 (female) (2) and chassis ground (A16)		Resistance	Max. 1 Ω
	6	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Between C02 (female) (35) – S10 (female) (1) or S11 (female) (1) or S21 (female) (1) or S22 (female) (1) wiring harness and chassis ground		Resistance	Min. 1 MΩ
	7	Short circuit with power source in wiring harness (Contact with 24-V circuit)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Between C02 (female) (35) – S10 (female) (1) or S11 (female) (1) or S21 (female) (1) or S22 (female) (1) wiring harness and chassis ground		Voltage	Max. 1 V
	8	Defective governor and pump controller	★Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			C02	Service pedals 1 and 2	Voltage	
			Between (35) and chassis ground	Neutral position	20 – 30 V	
				Front or rear position	Max. 1 V	

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Circuit diagram related to service 1 oil pressure switches (front and rear) and service 2 oil pressure switches (front and rear)



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E-32 Troubleshooting of air conditioner

Troubleshooting procedure for air conditioner system

★ The control panel of the air conditioner constantly monitors the sensors and other devices in the system. When it detects any abnormality, it displays "Self-diagnosis notice" on the display monitor by operating switches specially.

★ If you feel any abnormality in the air conditioner system, check the "Self-diagnosis notice" first according to the procedure for "Troubleshooting by self-diagnosis notice", and then;
- If the "Self-diagnosis notice" is displayed, continue the "Troubleshooting by self-diagnosis notice".
- If the "Self-diagnosis notice" is not displayed, carry out the "Troubleshooting by trouble".

Troubleshooting by self-diagnosis notice

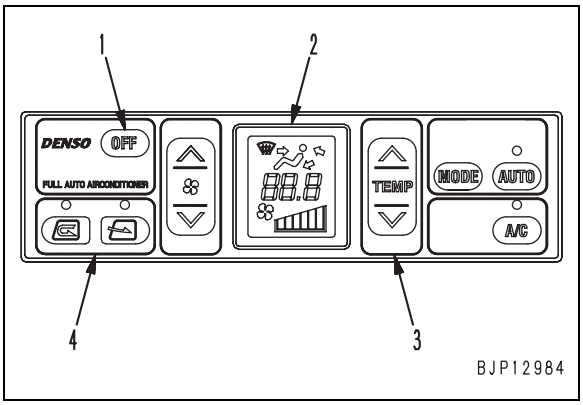
★ Check the "Self-diagnosis notice" on the control panel according to the following procedure.

- How to display "Self-diagnosis notice"
  1) Turn the starting switch ON.
  2) Press OFF switch (1) and check that anything is not displayed on display monitor (2).
  3) Hold the UP switch (∧) and DOWN switch (∨) of temperature setting switch (3) simultaneously for 3 seconds.
  4) Check the "Self-diagnosis notice" displayed on display monitor (2).

- How to select "Self-diagnosis notice"
  If multiple "Self-diagnosis notices" are recorded, press the UP switch (∧) or DOWN switch (∨) of temperature setting switch (3) to select another notice.

- How to delete "Self-diagnosis notice"
  When reproducing the "Self-diagnosis notices" or after removing the cause of a trouble, press the switches on both sides of EXTERNAL/INTERNAL air changeover switch (4) simultaneously for 3 seconds, and all the "Self-diagnosis notices" are deleted.

- Finishing display of "Self-diagnosis notice"
  To finish display of the "Self-diagnosis notice", press OFF switch (1) or turn the starting switch OFF.



Self-diagnosis notice	Trouble mode
E--	No trouble
E11	Disconnection in internal air sensor
E12	Short circuit in internal air sensor
E15	Disconnection in water temperature sensor
E16	Short circuit in water temperature sensor
E18	Short circuit in daylight sensor
E43	Abnormality in air outlet damper
E44	Abnormality in air mix damper
E45	Abnormality in internal and external air damper

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Self-diagnosis notice	Trouble	Disconnection in internal air sensor
E11		
Contents of trouble	• Disconnection in the internal air sensor is detected.	
Action of controller	• Fixes the internal air temperature for control. • If the following condition is satisfied, the trouble is reset. <Completion of removal of cause> + <Deletion of self-diagnosis notice> + <Turning starting switch OFF and ON> + <Starting air conditioner>	
Related information		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective internal air sensor (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			TH_1 (male)	Resistance	
			Between (1) and (2)	300 Ω – 430 kΩ	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between M30 (female) (12) and TH_1 (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between M29 (female) (11) and TH_1 (female) (1)	Resistance	Max. 1 Ω
	3	Defective air conditioner system	If neither of causes 1 and 2 is the cause of the trouble, the air conditioner system may be defective. See Shop Manual for Chassis Components, Troubleshooting for air conditioner.		

Self-diagnosis notice	Trouble	Short circuit in internal air sensor
E12		
Contents of trouble	• Short circuit in the internal air sensor is detected.	
Action of controller	• Fixes the internal air temperature for control. • If the following condition is satisfied, the trouble is reset. <Completion of removal of cause> + <Deletion of self-diagnosis notice> + <Turning starting switch OFF and ON> + <Starting air conditioner>	
Related information		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective internal air sensor (Internal short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			TH_1 (male)	Resistance	
			Between (1) and (2)	300 Ω – 430 kΩ	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between M30 (female) (12) and TH_1 (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between M29 (female) (11) and TH_1 (female) (1)	Resistance	Max. 1 Ω
	3	Defective air conditioner system	If neither of causes 1 and 2 is the cause of the trouble, the air conditioner system may be defective. See Shop Manual for Chassis Components, Troubleshooting for air conditioner.		

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Self-diagnosis notice	Trouble	Disconnection in water temperature sensor
E15		
Contents of trouble	• Disconnection in the water temperature sensor is detected.	
Action of controller	• Ignores the warm-up control and fixes the water temperature at 60 °C for control. • If the following condition is satisfied, the trouble is reset. <Completion of removal of cause> + <Deletion of self-diagnosis notice> + <Turning starting switch OFF and ON> + <Starting air conditioner>	
Related information		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective water temperature sensor (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			TH_W (male)	Resistance	
			Between (1) and (2)	95 Ω – 455 kΩ	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between M30 (female) (14) and TH_W (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between M29 (female) (11) and TH_W (female) (1)	Resistance	Max. 1 Ω
	3	Defective air conditioner system	If neither of causes 1 and 2 is the cause of the trouble, the air conditioner system may be defective. See Shop Manual for Chassis Components, Troubleshooting for air conditioner.		

Self-diagnosis notice	Trouble	Short circuit in water temperature sensor
E16		
Contents of trouble	• Short circuit in the water temperature sensor is detected.	
Action of controller	• Ignores the warm-up control and fixes the water temperature at 60 °C for control. • If the following condition is satisfied, the trouble is reset. <Completion of removal of cause> + <Deletion of self-diagnosis notice> + <Turning starting switch OFF and ON> + <Starting air conditioner>	
Related information		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective water temperature sensor (Internal short circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			TH_W (male)	Resistance	
			Between (1) and (2)	95 Ω – 455 kΩ	
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between M30 (female) (14) and TH_W (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between M29 (female) (11) and TH_W (female) (1)	Resistance	Max. 1 Ω
	3	Defective air conditioner system	If neither of causes 1 and 2 is the cause of the trouble, the air conditioner system may be defective. See Shop Manual for Chassis Components, Troubleshooting for air conditioner.		

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Self-diagnosis notice	Trouble	Short circuit in daylight sensor
E18		
Contents of trouble	• Short circuit in the daylight sensor is detected.	
Action of controller	• Assumes that the daylight sensor is not installed for control. • If the following condition is satisfied, the trouble is reset. <Completion of removal of cause> + <Deletion of self-diagnosis notice> + <Turning starting switch OFF and ON> + <Starting air conditioner>	
Related information		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective daylight sensor (Internal short circuit)	The daylight sensor may be defective. Check it directly.		
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between M30 (female) (16) and P15 (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between M30 (female) (3) and P15 (female) (1)	Resistance	Max. 1 Ω
	3	Defective air conditioner system	If neither of causes 1 and 2 is the cause of the trouble, the air conditioner system may be defective. See Shop Manual for Chassis Components, Troubleshooting for air conditioner.		

Self-diagnosis notice	Trouble	Abnormality in air outlet damper
E43		
Contents of trouble	• Abnormality in the air outlet servomotor system is detected.	
Action of controller	• Stops the servomotor. • If the following condition is satisfied, the trouble is reset. <Completion of removal of cause> + <Deletion of self-diagnosis notice> + <Turning starting switch OFF and ON> + <Starting air conditioner>	
Related information	★Do not connect the power cables to the motor terminals directly to drive the motor. Doing so can damage the motor output shaft and break the motor coils.	

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective air outlet servomotor (Internal defect)	The air outlet servomotor may be defective. Check it directly.		
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between Mv1 (female) (1) and M30 (female) (3)	Resistance	Max. 1 Ω
			Wiring harness between Mv1 (female) (3) and M29 (female) (11)	Resistance	Max. 1 Ω
			Wiring harness between Mv1 (female) (5) and M30 (female) (9)	Resistance	Max. 1 Ω
			Wiring harness between Mv1 (female) (6) and M29 (female) (8)	Resistance	Max. 1 Ω
			Wiring harness between Mv1 (female) (7) and M29 (female) (9)	Resistance	Max. 1 Ω
	3	Defective air conditioner system	If neither of causes 1 and 2 is the cause of the trouble, the air conditioner system may be defective. See Shop Manual for Chassis Components, Troubleshooting for air conditioner.		

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Self-diagnosis notice	Trouble	Abnormality in air mix damper
E44		
Contents of trouble	• Abnormality in the air mix servomotor system is detected.	
Action of controller	• Stops the air mix servomotor. • If the following condition is satisfied, the trouble is reset. <Completion of removal of cause> + <Deletion of self-diagnosis notice> + <Turning starting switch OFF and ON> + <Starting air conditioner>	
Related information	★Do not connect the power cables to the motor terminals directly to drive the motor. Doing so can damage the motor output shaft and break the motor coils.	

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective air mix servomotor (Internal defect)	The air mix servomotor may be defective. Check it directly.		
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between MAM (female) (1) and M29 (female) (11)	Resistance	Max. 1 Ω
			Wiring harness between MAM (female) (3) and M30 (female) (3)	Resistance	Max. 1 Ω
			Wiring harness between MAM (female) (5) and M30 (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between MAM (female) (6) and M29 (female) (4)	Resistance	Max. 1 Ω
			Wiring harness between MAM (female) (7) and M29 (female) (5)	Resistance	Max. 1 Ω
	3	Defective air conditioner system	If neither of causes 1 and 2 is the cause of the trouble, the air conditioner system may be defective. See Shop Manual for Chassis Components, Troubleshooting for air conditioner.		

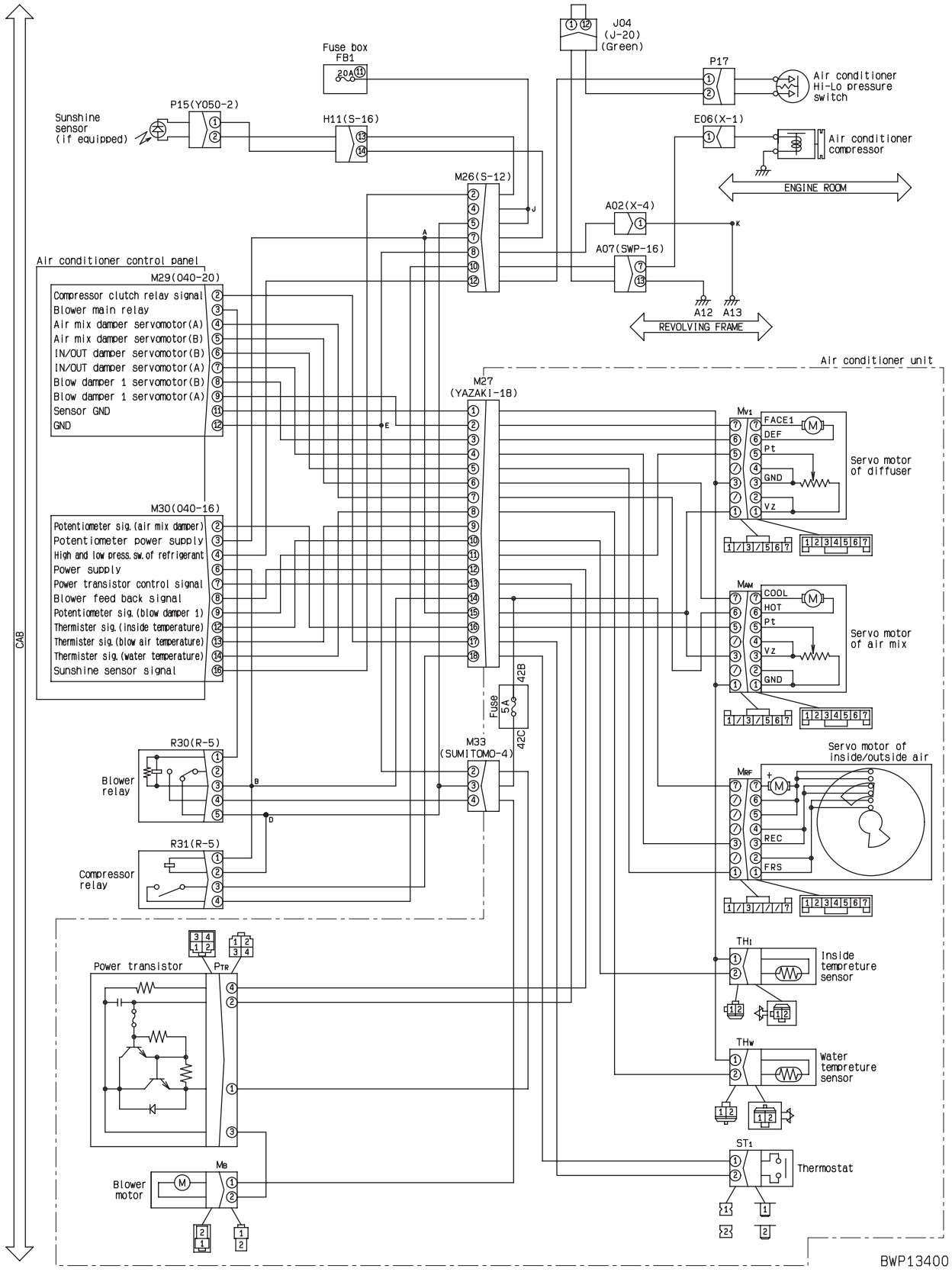
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Self-diagnosis notice **E45**	Trouble	Abnormality in air mix damper
Contents of trouble	• Abnormality in the internal and external air servomotor is detected.	
Action of controller	• Stops the internal and external air servomotor. • If the following condition is satisfied, the trouble is reset. <Completion of removal of cause> + <Deletion of self-diagnosis notice> + <Turning starting switch OFF and ON> + <Starting air conditioner>	
Related information	★Do not connect the power cables to the motor terminals directly to drive the motor. Doing so can damage the motor output shaft and break the motor coils.	

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective internal and external air servomotor (Internal defect)	The internal and external air servomotor may be defective. Check it directly.		
	2	Defective fuse (in unit)	If the fuse (in the unit) is broken, the circuit probably has a grounding fault, etc. Check the related circuits.		
	3	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between MRF (female) (1) and M29 (female) (6)	Resistance	Max. 1 Ω
			Wiring harness between MRF (female) (3) and M29 (female) (7)	Resistance	Max. 1 Ω
			Wiring harness between MRF (female) (7) and fuse in unit and M33 (male) (3)	Resistance	Max. 1 Ω
	4	Defective air conditioner system	If neither of causes 1 and 2 is the cause of the trouble, the air conditioner system may be defective. See Shop Manual for Chassis Components, Troubleshooting for air conditioner.		

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Circuit diagram related to air conditioner



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Troubleshooting by trouble

Trouble	(1) Air conditioner does not operate at all.
Related information	

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fuse No. 11	If the fuse is broken, the circuit probably has a grounding fault, etc. (See cause 3.)		
	2	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Wiring harness between FB1-11 outlet and M33 (female) (3)	Resistance	Max. 1 Ω
			Wiring harness between M27 (female) (14) and M30 (female) (6)	Resistance	Max. 1 Ω
			Wiring harness between M33 (female) (2) and chassis ground (A13)	Resistance	Max. 1 Ω
			Wiring harness between M29 (female) (12) and chassis ground (A13)	Resistance	Max. 1 Ω
	3	Short circuit with chassis ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.		
			Between FB1-11 outlet – M33 (female) (3) wiring harness and chassis ground	Resistance	Min. 1 MΩ
			Between M27 (female) (14) – M30 (female) (6) wiring harness and chassis ground	Resistance	Min. 1 MΩ
	4	Defective air conditioner unit	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			M33	Voltage	
			Between (2) and (3)	20 – 30 V	
			If the above voltage is normal and the air conditioner unit does not operate, the air conditioner unit is defective.		
	5	Defective control panel	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.		
			M30, M29	Voltage	
			Between M30 (6) and M29 (12)	20 – 30 V	
			If the above voltage is normal and the control panel does not operate, the control panel is defective.		

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Trouble	(2) Air does not come out (Air flow is insufficient).
Related information	

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective fuse (in unit)	If the fuse (in the unit) is broken, the circuit probably has a grounding fault, etc. Check the related circuits.			
	2	Defective blower relay (coil side)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			R30 (male)		Resistance	
			Between (1) and (3)		140 – 340 Ω	
	3	Defective blower relay (contact side)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			R30	Fan switch	Voltage	
			Between (4) and chassis ground	ON (Operation) position	20 – 30 V	
	4	Defective power transistor (Internal defect)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Fan switch		If air flow changes as fan switch is operated, power transistor is normal.	
			Operate between Low and Medium and High.			
	5	Defective blower motor (Internal defect)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			M_B (female)	Fan switch	Voltage	
			Between (1) and (2)	ON (Operation) position	20 – 30 V	
			If the above voltage is normal and the blower motor does not rotate, the blower motor is defective.			
	6	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between FB1-11 outlet and fuse in unit and R30 (female) (3) or R31 (female) (1) or M30 (female) (6)		Resistance	Max. 1 Ω
			Wiring harness between M29 (female) (3) and R30 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between M29 (female) (12) and chassis ground (A13)		Resistance	Max. 1 Ω
			Wiring harness between M_B (female) (1) and R30 (female) (4)		Resistance	Max. 1 Ω
			Wiring harness between M_B (female) (2) and P_{TR} (female) (3)		Resistance	Max. 1 Ω
			Wiring harness between P_{TR} (female) (1) and chassis ground (A13)		Resistance	Max. 1 Ω
			Wiring harness between P_{TR} (female) (2) and M30 (female) (7)		Resistance	Max. 1 Ω
			Wiring harness between P_{TR} (female) (4) and M30 (female) (8)		Resistance	Max. 1 Ω
	7	Defective air conditioner system	If none of causes 1 – 6 is the cause of the trouble, the air conditioner system may be defective. See Shop Manual for Chassis Components, Troubleshooting for air conditioner.			

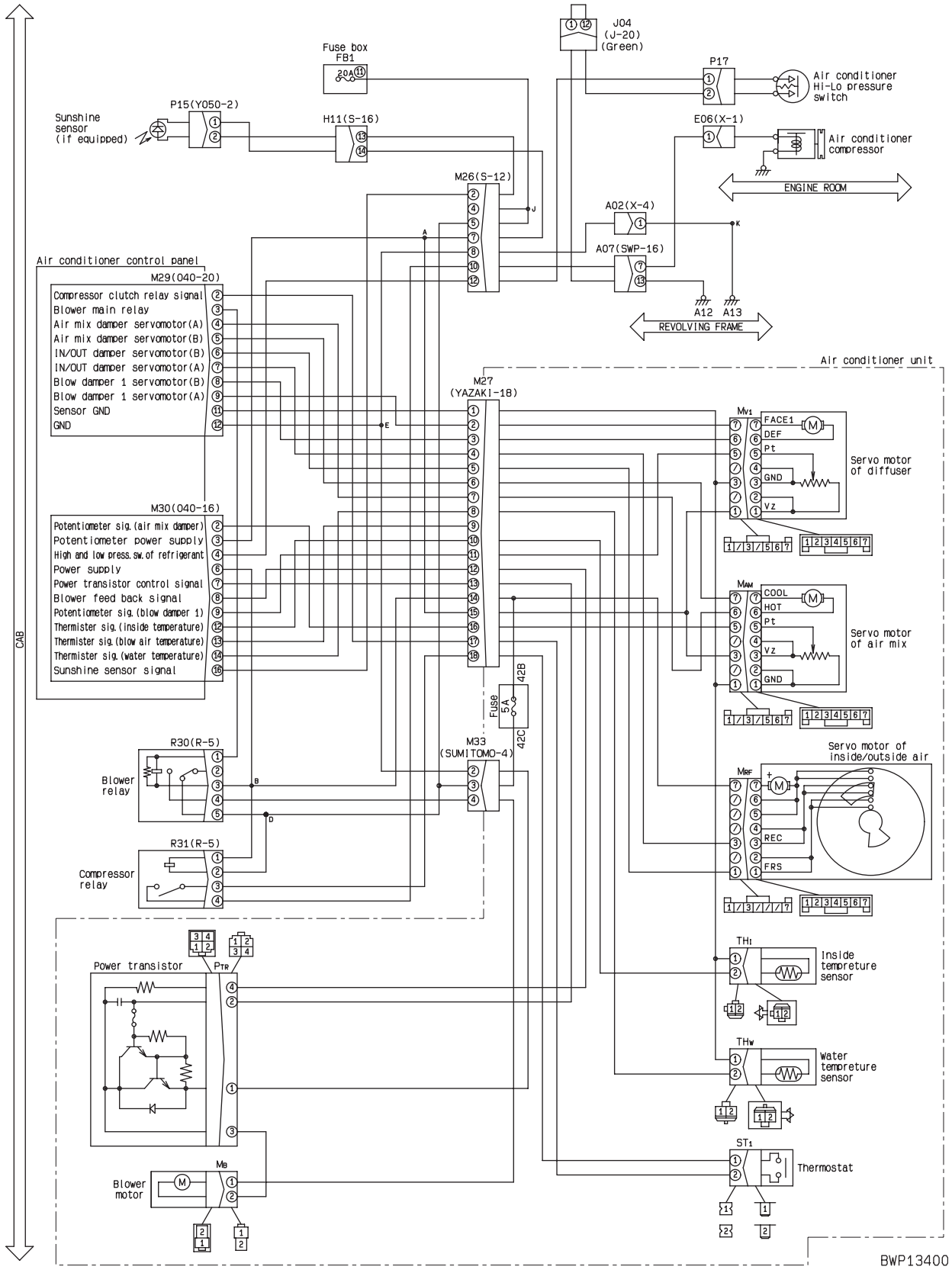
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Trouble	(3) Air is not cooled (Cooling performance is insufficient).
Related information	

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective fuse (in unit)	If the fuse (in the unit) is broken, the circuit probably has a grounding fault, etc. Check the related circuits.			
	2	Defective compressor relay (coil side)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			R31 (male)	Resistance		
			Between (1) and (2)	140 – 340 Ω		
	3	Defective compressor relay (contact side)	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting. (Set temperature: Max. cooling)			
			R31	Fan switch	Voltage	
			Between (4) and chassis ground	ON (Operation) position	20 – 30 V	
	4	Defective thermostat (Internal defect)	The thermostat may be defective. Check it directly.			
	5	Defective high/low pressure switch (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			P17 (male)	Resistance		
			Between (1) and (2)	Max. 1 Ω		
	6	Defective compressor (Internal defect)	The compressor clutch may be defective. Check it directly.			
	7	Defective compressor (Internal defect)	The compressor may be defective. Check it directly.			
	8	Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.			
			Wiring harness between M30 (female) (4) and P17 (female) (1)	Resistance	Max. 1 Ω	
			Wiring harness between P17 (female) (2) and J04 and chassis ground (A12)	Resistance	Max. 1 Ω	
			Wiring harness between FB1-11 outlet and R31 (female) (2) or fuse in unit and R31 (female) (1) or M30 (female) (6)	Resistance	Max. 1 Ω	
			Wiring harness between ST_1 (female) (1) and R31 (female) (3)	Resistance	Max. 1 Ω	
			Wiring harness between M29 (female) (2) and ST_1 (female) (2)	Resistance	Max. 1 Ω	
			Wiring harness between M29 (female) (12) and chassis ground (A13)	Resistance	Max. 1 Ω	
			Wiring harness between R31 (female) (4) and E06 (female) (1)	Resistance	Max. 1 Ω	
	9	Defective air conditioner system	If none of causes 1 – 8 is the cause of the trouble, the air conditioner system may be defective. See Shop Manual for Chassis Components, Troubleshooting for air conditioner.			

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Circuit diagram related to air conditioner



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E-33 Travel alarm does not sound or does not stop sounding

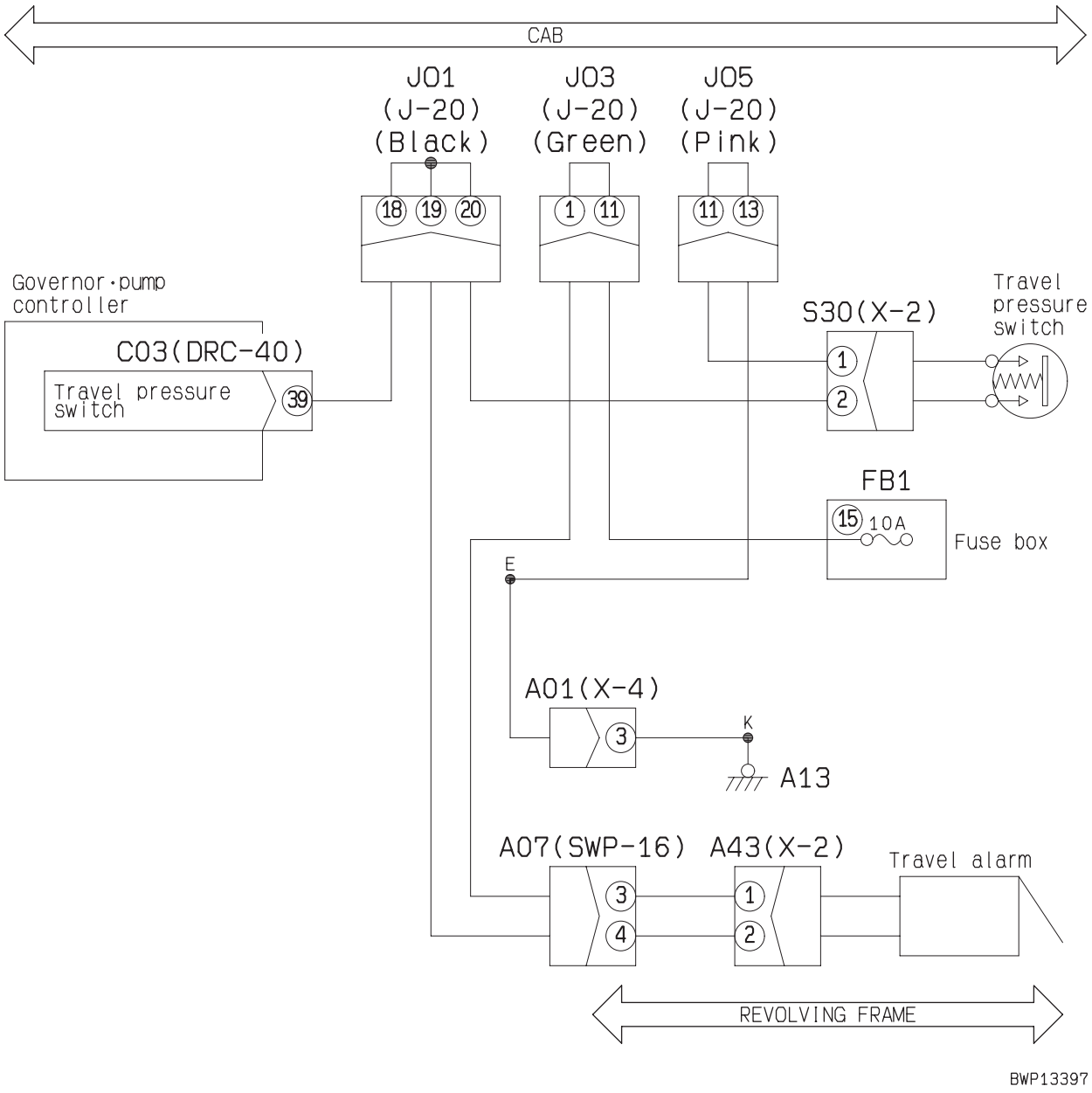
When travel alarm is installed

Trouble	(1) Alarm does not sound while machine is traveling. (2) Alarm sounds while machine is stopped.
Related information	

<table>
<tr><td rowspan="11">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td>1</td><td>Defective fuse No. 15</td><td colspan="4">If the fuse is broken, the circuit probably has a grounding fault, etc. (See cause 4.)</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Defective travel signal</td><td colspan="4">★Start engine and carry out troubleshooting (Travel lever).</td></tr>
<tr><td>Monitoring code</td><td rowspan="2">6-bit display (Right of lower line)</td><td colspan="2">When lever is operated: ON</td></tr>
<tr><td>020</td><td colspan="2">When lever is in neutral: OFF</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Disconnection in wiring harness (Disconnection in wiring harness or defective contact in connector)</td><td colspan="4">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td colspan="2">Wiring harness between FB1-15 outlet and J03 and A43 (female) (1)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Wiring harness between A43 (female) (2) and J01 (male) (19)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Short circuit with chassis ground in wiring harness (Contact with ground circuit)</td><td colspan="4">★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch.</td></tr>
<tr><td colspan="2">Between FB1-15 outlet – J03 – A43 (female) (1) or other related circuit wiring harness and chassis ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td>5</td><td>Defective travel alarm</td><td colspan="4">Troubleshooting cannot be carried out since the defect is in the travel alarm (If none of the above causes 1 – 4 is the cause of the trouble, the travel alarm is defective).</td></tr>
</table>

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Circuit diagram related to travel oil pressure switch and travel alarm



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TROUBLESHOOTING FOR HYDRAULIC AND MECHANICAL SYSTEM (H-MODE)

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HYDRAULIC AND MECHANICAL SYSTEM DIAGRAM 20-504
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H- 5 Auto-decelerator does not operate 20-509
H- 6 Fine control performance or response is low 20-509
H- 7 Speed or power of boom is low 20-510
H- 8 Speed or power of arm is low 20-511
H- 9 Speed or power of bucket is low 20-512
H-10 Work equipment does not move singly 20-513
H-11 Hydraulic drift of work equipment is large 20-514
H-12 Time lag of work equipment is large 20-515
H-13 One-touch power maximizing function does not work 20-515
H-14 In compound operation of work equipment, speed of part loaded more is low 20-516
H-15 When machine swings and raises boom simultaneously, boom rising speed is low 20-516
H-16 When machine operates work equipment or swings and travels simultaneously, travel speed lowers largely 20-516
H-17 Machine deviates during travel 20-517
H-18 Travel speed is low 20-518
H-19 Machine is not steered well or steering power is low 20-519
H-20 Travel speed does not change 20-519
H-21 Travel motor does not work (only one side) 20-520
H-22 Upper structure does not swing 20-521
H-23 Swing acceleration or swing speed is low 20-522
H-24 Upper structure overruns remarkably when it stops swinging 20-523
H-25 Large shock is made when upper structure stops swinging 20-524
H-26 Large sound is made when upper structure stops swinging 20-524
H-27 Hydraulic drift of swing is large 20-525

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INFORMATION IN TROUBLESHOOTING TABLE

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

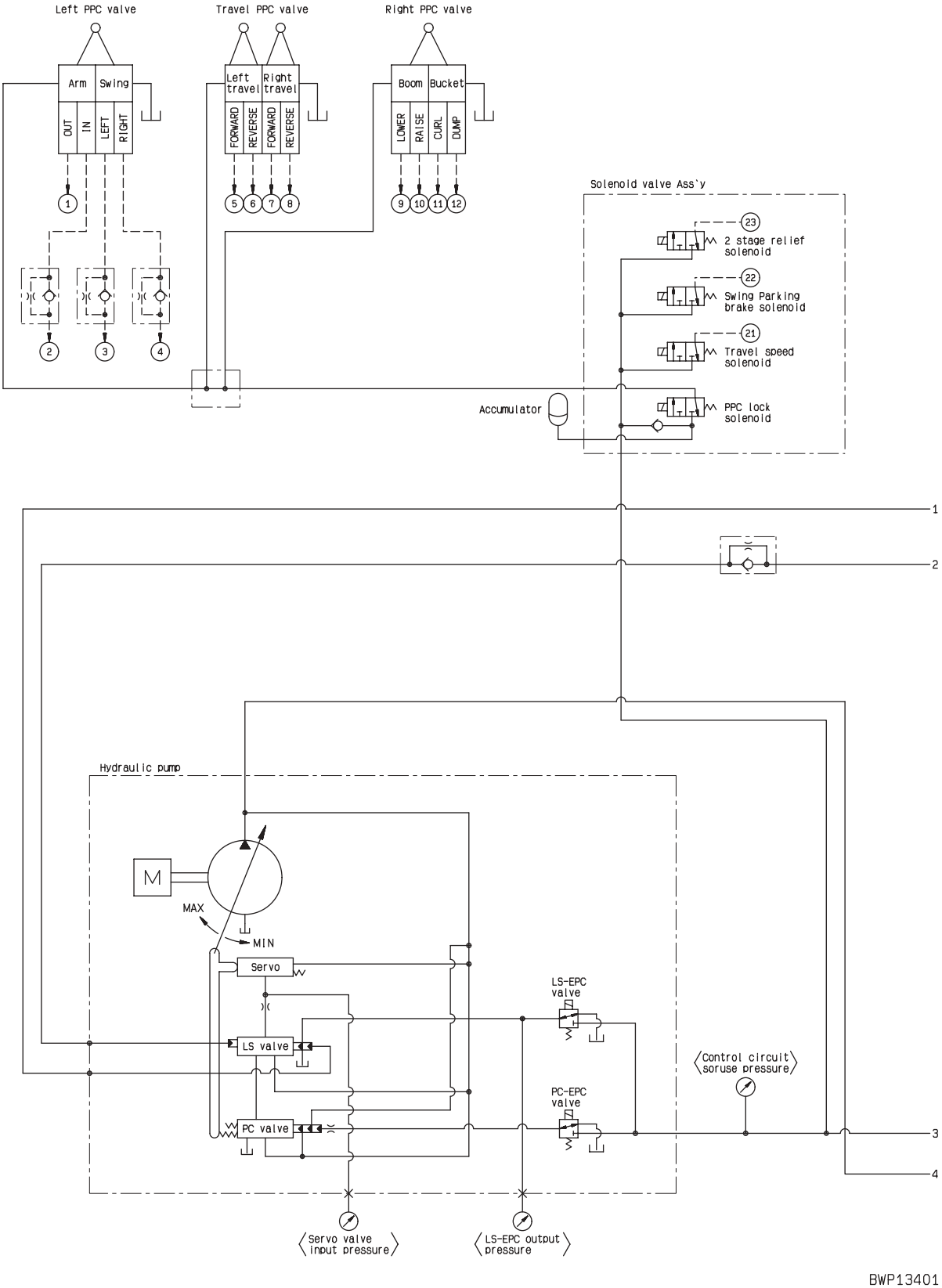
Trouble	• Trouble which occurred in the machine
Related information	• Information related to the detected trouble or troubleshooting

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Possible causes of trouble (Given numbers are reference numbers, which do not indicate priority)	<Contents of description> • Standard value in normal state to judge possible causes • Remarks on judgment
	2		
	3		
	4		

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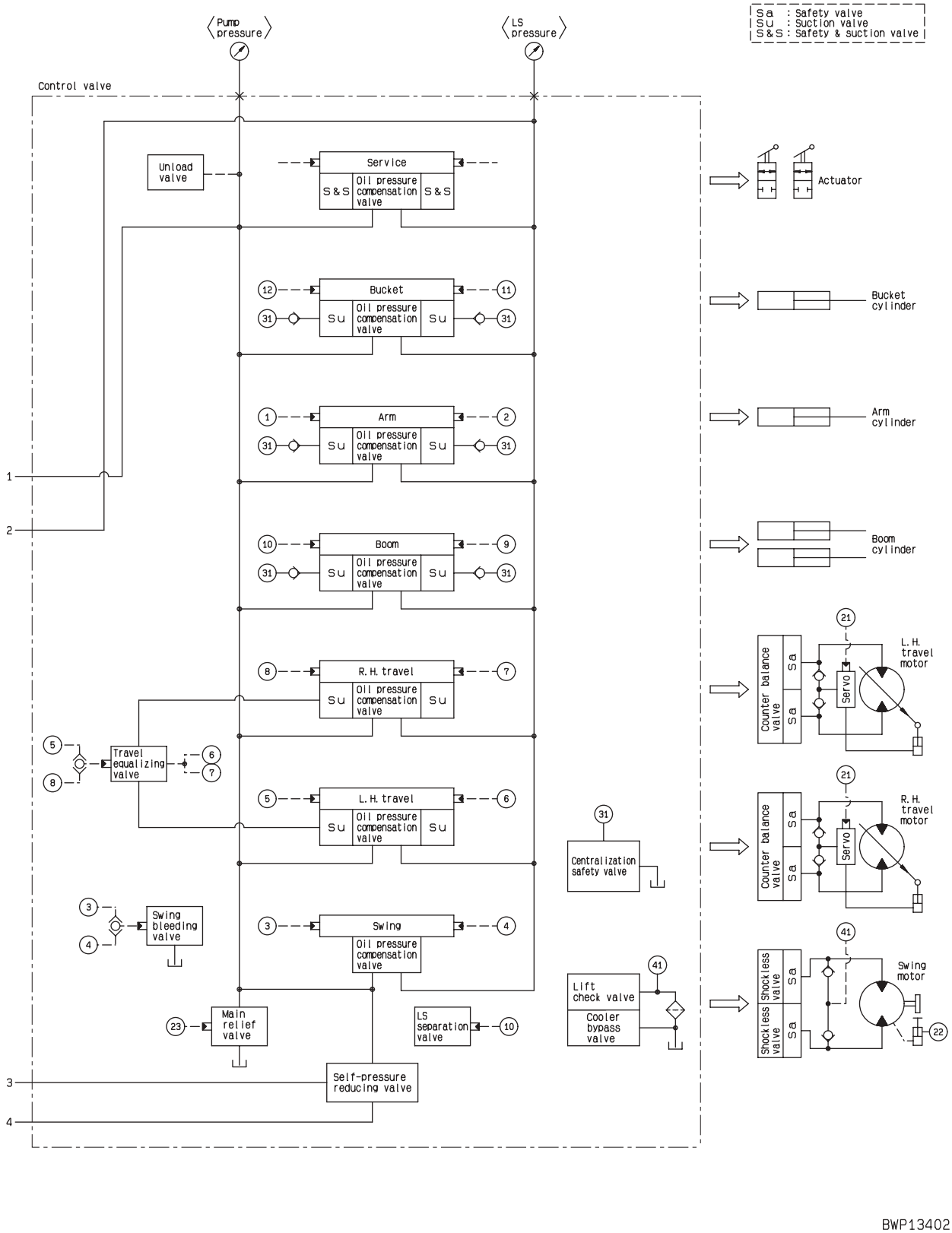
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HYDRAULIC AND MECHANICAL SYSTEM DIAGRAM



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★ This system diagram is a rough general hydraulic circuit diagram made as reference material for trouble-shooting of the hydraulic and mechanical systems.



BWP13402

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H-1 Speed or power of whole work equipment, swing, and travel is low

Trouble	• Speed or power of whole work equipment, swing, and travel is low.
Related information	• Carry out the troubleshooting in working mode A.

<table>
<tr><td rowspan="20">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Defective unload valve</td><td colspan="3">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.</td></tr>
<tr><td colspan="2">Control levers</td><td>Unload pressure</td></tr>
<tr><td colspan="2">All levers in neutral</td><td>2.4 – 3.4 MPa
{25 – 35 kg/cm^2}</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Defective adjustment or malfunction of main relief valve</td><td colspan="3">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting</td></tr>
<tr><td colspan="2">Control levers</td><td>Main relief pressure</td></tr>
<tr><td colspan="2">Arm-IN circuit relieved</td><td>33.6 – 37.0 MPa
{343 – 378 kg/cm^2}</td></tr>
<tr><td colspan="3">If the oil pressure does not become normal after adjustment, the main relief valve may have a malfunction or a defect in it. Check the main relief valve directly.</td></tr>
<tr><td rowspan="4">3</td><td rowspan="4">Defective self-reducing pressure valve</td><td colspan="3">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting</td></tr>
<tr><td colspan="2">Control levers</td><td>Control circuit basic pressure</td></tr>
<tr><td colspan="2">All levers in neutral</td><td>2.84 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Defective adjustment or malfunction of PC valve</td><td colspan="3">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting</td></tr>
<tr><td>Measured pump discharge pressure</td><td>Measurement conditions</td><td>Oil pressure ratio</td></tr>
<tr><td>Pump discharge pressure</td><td rowspan="2">Swing lock switch: LOCK
Arm-IN circuit relieved</td><td>1</td></tr>
<tr><td>PC valve output pressure</td><td>0.6 (3/5)</td></tr>
<tr><td colspan="3">If the oil pressure does not become normal after adjustment, the PC valve may have a malfunction or a defect in it. Check the PC valve directly.</td></tr>
<tr><td rowspan="4">5</td><td rowspan="4">Defective adjustment or malfunction of LS valve</td><td colspan="3">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting</td></tr>
<tr><td rowspan="2">Measured pump discharge pressure</td><td colspan="2">Oil pressure ratio</td></tr>
<tr><td>All levers in neutral</td><td>Either track shoe driven idle (Full stroke)</td></tr>
<tr><td>Pump discharge pressure</td><td rowspan="2">Almost same pressure</td><td>1</td></tr>
<tr><td>LS valve output pressure</td><td>0.6 (3/5)</td></tr>
<tr><td colspan="3">If the oil pressure does not become normal after adjustment, the LS valve may have a malfunction or a defect in it. Check the LS valve directly.</td></tr>
<tr><td>6</td><td>Malfunction of servo piston</td><td colspan="3">The servo piston may have a malfunction. Check it directly.</td></tr>
<tr><td>7</td><td>Defective piston pump</td><td colspan="3">If none of above causes is the cause of the trouble, the cause may be lowering performance, malfunction, or internal defect of the piston pump.</td></tr>
</table>

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H-2 Engine speed lowers extremely or engine stalls

Trouble	• Engine speed lowers extremely or engine stalls.
Related information	• Carry out the troubleshooting in working mode A.

<table>
<tr><td rowspan="16">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Defective adjustment or malfunction of main relief valve</td><td colspan="3">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.</td></tr>
<tr><td>Control levers</td><td colspan="2">Main relief pressure</td></tr>
<tr><td>Arm-IN circuit relieved</td><td colspan="2">33.6 – 37.0 MPa
{343 – 378 kg/cm^2}</td></tr>
<tr><td colspan="3">If the oil pressure does not become normal after adjustment, the main relief valve may have a malfunction or a defect in it. Check the main relief valve directly.</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Defective adjustment or malfunction of PC valve</td><td colspan="3">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.</td></tr>
<tr><td>Measured oil pressure</td><td>Measurement conditions</td><td>Oil pressure ratio</td></tr>
<tr><td>Pump discharge pressure</td><td rowspan="2">Swing lock switch: LOCK
Arm-IN circuit relieved</td><td>1</td></tr>
<tr><td>PC valve output pressure</td><td>0.6 (3/5)</td></tr>
<tr><td colspan="3">If the oil pressure does not become normal after adjustment, the PC valve may have a malfunction or a defect in it. Check the PC valve directly.</td></tr>
<tr><td rowspan="4">3</td><td rowspan="4">Defective adjustment or malfunction of LS valve</td><td colspan="3">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.</td></tr>
<tr><td rowspan="2">Measured oil pressure</td><td colspan="2">Oil pressure ratio</td></tr>
<tr><td>All levers in neutral</td><td>Either track shoe driven idle (Full stroke)</td></tr>
<tr><td>Pump discharge pressure</td><td rowspan="2">Almost same pressure</td><td>1</td></tr>
<tr><td>LS valve output pressure</td><td>0.6 (3/5)</td></tr>
<tr><td colspan="3">If the oil pressure does not become normal after adjustment, the LS valve may have a malfunction or a defect in it. Check the LS valve directly.</td></tr>
<tr><td>4</td><td>Clogging of orifice or filter in serve devices</td><td colspan="3">The orifices or filters in the pump servo devices may be clogged. Check them directly.</td></tr>
<tr><td>5</td><td>Malfunction servo piston</td><td colspan="3">The servo piston may have a malfunction. Check it directly.</td></tr>
</table>

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H-3 Work equipment, swing, and travel systems do not work

Trouble	• Work equipment, swing, and travel systems do not work.
Related information	• Carry out the troubleshooting in working mode A.

<table>
<tr><td rowspan="6">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Malfunction of PPC lock solenoid valve</td><td colspan="2">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.</td></tr>
<tr><td>Safety lock lever</td><td>Solenoid valve output pressure</td></tr>
<tr><td>LOCK</td><td>0 MPa
{0 kg/cm^2}</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Malfunction of self-reducing pressure valve</td><td>FREE</td><td>2.84 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td colspan="2">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.</td></tr>
<tr><td>Control levers</td><td>Control circuit basic pressure</td></tr>
<tr><td>3</td><td>Malfunction of piston pump</td><td>All levers in neutral</td><td>2.84 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td>4</td><td>Defective damper</td><td colspan="2">The piston pump may have a malfunction or has an internal defect. Check it by the following method.
• Remove the pump discharge pressure pickup plug and crank the engine. If the oil flows out at this time, the piston pump is normal.</td></tr>
<tr><td></td><td colspan="3">The pump shaft may not rotate because of an defect in the damper. Check the damper directly.</td></tr>
</table>

H-4 Abnormal sound comes out from around hydraulic pump

Trouble	• Abnormal sound comes out from around hydraulic pump.
Related information	• Carry out the troubleshooting in working mode A.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Lowering of hydraulic oil level	Check it directly.
	2	Defective hydraulic oil	Hydraulic oil may contain air. Check hydraulic oil directly.
	3	Clogging of hydraulic tank cap	Negative pressure may be applied to the hydraulic tank because of clogging of the hydraulic tank cap. Check the cap directly.
	4	Clogging of hydraulic tank strainer	Negative pressure may be applied to the suction circuit because of clogging of the hydraulic tank strainer. Check the strainer directly.
	5	Defective piston pump	The piston pump may have a defect in it. Check it directly.

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H-5 Auto-decelerator does not operate

Trouble	• Auto-decelerator does not operate.
Related information	• Apply this troubleshooting if the auto-decelerator does not operate when the travel lever is operated. (The shuttle valve (in the PPC valve) is installed between the PPC valve and oil pressure switch of only in the travel circuit.) • Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Malfunction of travel PPC valve (shuttle valve)	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Travel lever	PPC valve output pressure
			Neutral position	0 MPa {0 kg/cm^2}
			Travel position	2.84 – 3.43 MPa {29 – 35 kg/cm^2}

H-6 Fine control performance or response is low

Trouble	• Fine control performance or response is low.
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Clogging of LS circuit orifice	The LS circuit may be clogged. Check it directly.		
	2	Defective adjustment or malfunction LS valve	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.		
			Measured oil pressure	Oil pressure ratio	
				All levers in neutral	Either track shoe driven idle (Full stroke)
			Pump discharge pressure	Almost same pressure	1
			LS valve output pressure		0.6 (3/5)
			If the oil pressure does not become normal after adjustment, the LS valve may have a malfunction or a defect in it. Check the LS valve directly.		
	3	Defective servo piston	The servo piston may have a malfunction. Check it directly.		

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H-7 Speed or power of boom is low

Trouble	• Speed or power of boom is low.
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Malfunction of right PPC valve (boom circuit)	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Right work equipment control lever	PPC valve output pressure
			Neutral position	0 MPa {0 kg/cm^2}
			Boom RAISE position Boom LOWER position	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	2	Malfunction of boom control valve (spool)	The spool of the boom control valve may have a malfunction. Check it directly.	
	3	Malfunction of boom control valve (pressure compensation valve)	The pressure compensation valve of the boom control valve may have a malfunction. Check it directly.	
	4	Malfunction of boom control valve (regeneration valve)	The regeneration valve of the boom control valve may have a malfunction or a defective seal. Check it directly.	
	5	Malfunction or defective seal of boom control valve (suction valve)	The suction valve of the boom control valve may have a malfunction or a defective seal. Check it directly.	
	6	Malfunction or defective seal of centralized safety-suction valve	The centralized safety-suction valve may have a malfunction or a defective seal. Check it directly. (A trouble of the centralized safety-suction valve have bad effects on the arm and bucket.)	
	7	Malfunction of boom cylinder (lock valve)	The lock valve of the boom cylinder may have a malfunction. Check it directly.	
	8	Malfunction of boom cylinder (cylinder unit)	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Boom cylinder	Leakage from cylinder
			Relieved in RAISE position	15 cc/min

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H-8 Speed or power of arm is low

Trouble	• Speed or power of arm is low.
Related information	• Carry out the troubleshooting in working mode A.

<table>
<tr><td rowspan="11">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of left 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>Left work equipment control lever</td><td>PPC valve output pressure</td></tr>
<tr><td>Neutral position</td><td>0 MPa
{0 kg/cm^2}</td></tr>
<tr><td>Arm IN position
Arm OUT position</td><td>2.84 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td>2</td><td>Malfunction of arm control valve (spool)</td><td colspan="2">The spool of the arm control valve may have a malfunction. Check it directly.</td></tr>
<tr><td>3</td><td>Malfunction of arm control valve (pressure compensation valve)</td><td colspan="2">The pressure compensation valve of the arm control valve may have a malfunction. Check it directly.</td></tr>
<tr><td>4</td><td>Malfunction or defective seal of arm control valve (suction valve)</td><td colspan="2">The suction valve of the arm control valve may have a malfunction or a defective seal. Check it directly.</td></tr>
<tr><td>5</td><td>Malfunction or defective seal of centralized safety-suction valve</td><td colspan="2">The centralized safety-suction valve may have a malfunction or a defective seal. Check it directly.
(A trouble of the centralized safety-suction valve have bad effects on the boom and bucket.)</td></tr>
<tr><td rowspan="3">6</td><td rowspan="3">Malfunction of arm cylinder (cylinder unit)</td><td colspan="2">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.</td></tr>
<tr><td>Arm cylinder</td><td>Leakage from cylinder</td></tr>
<tr><td>Relieved in IN position</td><td>15 cc/min</td></tr>
</table>

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H-9 Speed or power of bucket is low

Trouble	• Speed or power of bucket is low.
Related information	• Carry out the troubleshooting in working mode A.

<table>
<tr><td rowspan="11">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="2">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of right PPC valve (bucket circuit)</td><td colspan="2">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.</td></tr>
<tr><td>Right work equipment control lever</td><td>PPC valve output pressure</td></tr>
<tr><td>Neutral position</td><td>0 MPa
{0 kg/cm^2}</td></tr>
<tr><td>Bucket CURL position
Bucket DUMP position</td><td>2.84 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td>2</td><td>Malfunction of bucket control valve (spool)</td><td colspan="2">The spool of the bucket control valve may have a malfunction. Check it directly.</td></tr>
<tr><td>3</td><td>Malfunction of bucket control valve (pressure compensation valve)</td><td colspan="2">The pressure compensation valve of the bucket control valve may have a malfunction. Check it directly.</td></tr>
<tr><td>4</td><td>Malfunction or defective seal of bucket control valve (suction valve)</td><td colspan="2">The suction valve of the bucket control valve may have a malfunction or a defective seal. Check it directly.</td></tr>
<tr><td>5</td><td>Malfunction or defective seal of centralized safety-suction valve</td><td colspan="2">The centralized safety-suction valve may have a malfunction or a defective seal. Check it directly.
(A trouble of the centralized safety-suction valve have bad effects on the boom and arm.)</td></tr>
<tr><td rowspan="3">6</td><td rowspan="3">Malfunction of bucket cylinder (cylinder unit)</td><td colspan="2">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.</td></tr>
<tr><td>Bucket cylinder</td><td>Leakage from cylinder</td></tr>
<tr><td>Relieved in CURL position</td><td>15 cc/min</td></tr>
</table>

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H-10 Work equipment does not move singly

Trouble	(1) Boom does not move singly. (2) Arm does not move singly. (3) Bucket does not move singly.
Related information	• Carry out the troubleshooting in working mode A.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting	
	1	Malfunction of PPC valve	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Work equipment control lever	PPC valve output pressure
			Neutral	0 MPa {0 kg/cm^2}
			Operated	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	2	Malfunction of control valve (spool)	The spool of the control valve may have a malfunction. Check it directly.	

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H-11 Hydraulic drift of work equipment is large

Trouble	(1) Hydraulic drift of boom is large.
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Defective boom cylinder (cylinder unit)	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Boom cylinder	Leakage from cylinder
			Relieved in RAISE position	15 cc/min
	2	Defective seal of boom cylinder (lock valve)	The seal of the lock valve of the boom cylinder may be defective. Check it directly.	

Trouble	(2) Hydraulic drift of arm is large.
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Defective arm cylinder (cylinder unit)	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Arm cylinder	Leakage from cylinder
			Relieved in IN position	15 cc/min
	2	Defective seal of arm control lever (spool)	The seal of the arm control valve spool may be defective. Check it directly.	
	3	Defective seal of arm control lever (suction valve)	The seal of the suction valve of the arm control valve may be defective. Check it directly.	
	4	Defective seal of centralized safety-suction valve	The seal of the centralized safety-suction valve of the control valve may defective. Check it directly. (A trouble of the centralized safety-suction valve have bad effects on bucket.)	

Trouble	(3) Hydraulic drift of bucket is large.
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Defective bucket cylinder (cylinder unit)	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Bucket cylinder	Leakage from cylinder
			Relieved in CURL position	15 cc/min
	2	Defective seal of bucket control valve (spool)	The seal of the bucket control valve spool may be defective. Check it directly.	
	3	Defective seal of bucket control valve (suction valve)	The seal of the suction valve of the bucket control valve may be defective. Check it directly.	
	4	Defective seal of centralized safety-suction valve	The seal of the centralized safety-suction valve of the control valve may defective. Check it directly. (A trouble of the centralized safety-suction valve have bad effects on arm.)	

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H-12 Time lag of work equipment is large

Trouble	• Time lag of work equipment is large.
Related information	• Carry out the troubleshooting in working mode A.

		Cause	Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Malfunction of control valve (regeneration valve) [Only boom]	The regeneration valve of the control valve may have a malfunction. Check it directly.
	2	Malfunction of control valve (Suction valve)	The suction valve of the control valve may have a malfunction. Check it directly.

H-13 One-touch power maximizing function does not work

Trouble	• One-touch power maximizing function does not work.
Related information	• Carry out installation in the reverse order to removal.

		Cause	Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Malfunction of 2-stage relief solenoid valve	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Swing lock switch	Solenoid valve output pressure
			OFF	0 MPa {0 kg/cm^2}
			LOCK	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	2	Malfunction of main relief valve	The main relief valve of the control valve may have a malfunction. Check it directly.	

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H-14 In compound operation of work equipment, speed of part loaded more is low

Trouble	• In compound operation of work equipment, speed of part loaded more is low.
Related information	• Carry out the troubleshooting in working mode A.

<table>
<tr><td rowspan="8">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="7">1</td><td rowspan="7">Malfunction of pressure compensation valve on less load side</td><td colspan="3">The pressure compensation valve of the control valve on the less load side may have a malfunction. Check it directly.</td></tr>
<tr><td>Compound operation</td><td>Larger load side</td><td>Less load side</td></tr>
<tr><td>Boom RAISE + Arm IN</td><td>Boom</td><td>Arm</td></tr>
<tr><td>Boom RAISE + Arm OUT</td><td>Arm</td><td>Boom</td></tr>
<tr><td>Boom RAISE + Bucket CURL</td><td>Boom</td><td>Bucket</td></tr>
<tr><td>Arm OUT + Bucket CURL</td><td>Arm</td><td>Bucket</td></tr>
<tr><td>Boom LOWER + Arm OUT</td><td>Arm</td><td>Boom</td></tr>
</table>

H-15 When machine swings and raises boom simultaneously, boom rising speed is low

Trouble	• When machine swings and raises boom simultaneously, boom rising speed is low.
Related information	• Carry out the troubleshooting in working mode A.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Malfunction of defective seal of LS selector valve	The LS selector valve of the control valve may have a malfunction or a defective seal. Check it directly.

H-16 When machine operates work equipment or swings and travels simultaneously, travel speed lowers largely

Trouble	• When machine operates work equipment or swings and travels simultaneously, travel speed lowers largely.
Related information	• Carry out the troubleshooting in working mode A.

Possible causes and standard value in normal state	Cause		Standard value in normal state/Remarks on troubleshooting
	1	Malfunction of work equipment control valve (pressure compensation valve)	The pressure compensation valve of the work equipment control valve may have a malfunction. Check it directly.
	2	Malfunction of swing control valve (pressure compensation valve)	The pressure compensation valve of the swing control valve may have a malfunction. Check it directly.
	3	Malfunction of travel control valve (pressure compensation valve)	The pressure compensation valve of the travel control valve may have a malfunction. Check it directly.

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H-17 Machine deviates during travel

Trouble	• Machine deviates during travel.
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Malfunction of self-reducing pressure valve	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Control levers	Control circuit basic pressure
			All levers in neutral	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	2	Malfunction of travel PPC valve	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Travel lever	PPC valve output pressure
			FORWARD or REVERSE position	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
			Difference between right and left of above	Max. 0.4 MPa {Max. 4 kg/cm^2}
	3	Malfunction of travel junction valve	The travel junction valve of the control valve may have a malfunction. Check it directly.	
	4	Malfunction of travel control valve (spool)	The spool of the travel control valve may have a malfunction. Check it directly.	
	5	Defective seal of center swivel joint	The seal of the center swivel joint may be defective. Check it directly.	
	6	Defective travel motor	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Travel lever	Relieved in TRAVEL position
			Leakage from travel motor	Max. 10 ℓ/min
	7	Defective final drive	The final drive may have a defect in it. Check it directly. (It may be checked by abnormal sound, abnormal heating, metal chips in drain oil, etc.)	

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H-18 Travel speed is low

Trouble	• Travel speed is low.
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Malfunction of self-reducing pressure valve	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Control levers	Control circuit basic pressure
			All levers in neutral	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	2	Malfunction of travel PPC valve	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Travel lever	PPC valve output pressure
			FORWARD or REVERSE position	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
			Difference between right and left of above	Max. 0.4 MPa {Max. 4 kg/cm^2}
	3	Malfunction of main relief valve	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Control levers	Main relief pressure
			Relieved in TRAVEL position	36.3 – 39.2 MPa {370 – 400 kg/cm^2}
			If the oil pressure does not become normal after adjustment, the main relief valve may have a malfunction or a defect in it. Check the main relief valve directly.	
	4	Malfunction of travel control valve (spool)	The spool of the travel control valve may have a malfunction. Check it directly.	
	5	Malfunction of travel control valve (pressure compensation valve)	The pressure compensation valve of the travel control valve may have a malfunction. Check it directly.	
	6	Malfunction of travel control valve (suction valve)	The suction valve of the travel control valve may have a malfunction. Check it directly.	
	7	Defective seal of center swivel joint	The seal of the center swivel joint may be defective. Check it directly.	
	8	Defective travel motor	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Travel lever	Leakage from travel motor
			Relieved in TRAVEL position	Max. 10 ℓ/min
	9	Defective final drive	The final drive may have a defect in it. Check it directly. (It may be checked by abnormal sound, abnormal heating, metal chips in drain oil, etc.)	

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H-19 Machine is not steered well or steering power is low

Trouble	• Machine is not steered well or steering power is low.
Related information	• Carry out the troubleshooting in working mode A.

<table>
<tr><td rowspan="8">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Malfunction of travel PPC valve</td><td colspan="3">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.</td></tr>
<tr><td>Travel lever</td><td colspan="2">PPC valve output pressure</td></tr>
<tr><td>Neutral position</td><td colspan="2">0 MPa
{0 kg/cm^2}</td></tr>
<tr><td>FORWARD or REVERSE position</td><td colspan="2">2.84 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td>2</td><td>Malfunction of travel junction valve</td><td colspan="3">The travel junction valve of the control valve may have a malfunction. Check it directly.</td></tr>
<tr><td>3</td><td>Malfunction of travel control valve (spool)</td><td colspan="3">The spool of the travel control valve may have a malfunction. Check it directly.</td></tr>
<tr><td>4</td><td>Malfunction of travel control valve (pressure compensation valve)</td><td colspan="3">The pressure compensation valve of the travel control valve may have a malfunction. Check it directly.</td></tr>
<tr><td>5</td><td>Malfunction of travel control valve (suction valve)</td><td colspan="3">The suction valve of the travel control valve may have a malfunction. Check it directly.</td></tr>
<tr><td>6</td><td>Malfunction of travel motor (safety-suction valve)</td><td colspan="3">The safety-suction valve of the travel motor may have a malfunction. Check it directly.</td></tr>
</table>

H-20 Travel speed does not change

Trouble	• Travel speed does not change.
Related information	• Carry out the troubleshooting in working mode A.

<table>
<tr><td rowspan="5">Possible causes and standard value in normal state</td><td colspan="2">Cause</td><td colspan="3">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Malfunction of travel speed shifting solenoid valve</td><td colspan="3">★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.</td></tr>
<tr><td>Travel speed switch</td><td>Travel lever</td><td>Solenoid valve output pressure</td></tr>
<tr><td>Lo position</td><td>Neutral position</td><td>0 MPa
{0 kg/cm^2}</td></tr>
<tr><td>Hi position</td><td>FORWARD or REVERSE position</td><td>2.84 – 3.43 MPa
{29 – 35 kg/cm^2}</td></tr>
<tr><td>2</td><td>Malfunction of travel motor (speed shifting section)</td><td colspan="3">The speed shifting section of the travel motor may have a malfunction. Check it directly.</td></tr>
</table>

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H-21 Travel motor does not work (only one side)

Trouble	• Travel motor does not work (only one side).
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Defective seal of travel control valve (suction valve)	The seal of the suction valve of the travel control valve may be defective. Check it directly.	
	2	Malfunction of travel motor (counterbalance valve)	The counterbalance valve of the travel motor may have a malfunction. Check it directly.	
	3	Malfunction of travel motor (safety-suction valve)	The safety-suction valve of the travel motor may have a malfunction. Check it directly.	
	4	Defective travel motor	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Travel lever	Leakage from travel motor
			Relieved in TRAVEL position	Max. 10 ℓ/min
	5	Defective final drive	The final drive may have a defect in it. Check it directly. (It may be checked by abnormal sound, abnormal heating, metal chips in drain oil, etc.)	

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H-22 Upper structure does not swing

Trouble	(1) Upper structure does not swing in either direction.
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Malfunction of swing holding brake solenoid valve	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.		
			Right work equipment control lever	Solenoid valve output pressure	
			Neutral position	0 MPa {0 kg/cm^2}	
			SWING position	2.84 – 3.43 MPa {29 – 35 kg/cm^2}	
	2	Malfunction of swing motor (parking brake)	The parking brake of the swing motor may have a malfunction. Check it directly.		
	3	Malfunction of swing motor (safety valve)	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.		
			Swing lock switch	Left work equipment control lever	Swing relief pressure
			LOCK	Relieved in SWING position	28.9 – 32.9 MPa {295 – 335 kg/cm^2}
	4	Defective swing motor (motor unit)	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.		
			Swing lock switch	Left work equipment control lever	Swing relief pressure
			LOCK	Relieved in SWING position	Max. 6 ℓ/min
	5	Defective swing machinery	The swing machinery may have a defect in it. Check it directly. (It may be checked by abnormal sound, abnormal heating, metal chips in drain oil, etc.)		

Trouble	(2) Upper structure swings only in 1 direction.
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Malfunction of swing PPC valve	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Right work equipment control lever	PPC valve output pressure
			Neutral position	0 MPa {0 kg/cm^2}
			SWING position	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	2	Malfunction of swing control valve (spool)	The spool of the swing control valve may have a malfunction. Check it directly.	
	3	Defective seal of swing motor (suction valve)	The seal of the suction valve of the swing motor may be defective. Check it directly.	

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H-23 Swing acceleration or swing speed is low

Trouble	(1) Swing acceleration or swing speed is low in both directions.
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Malfunction of swing control valve (pressure compensation valve)	The pressure compensation valve of the swing control valve may have a malfunction. Check it directly.		
	2	Malfunction of swing bleed valve	The swing bleed valve of the control valve may have a malfunction. Check it directly.		
	3	Malfunction of swing motor (parking brake)	The parking brake of the swing motor may have a malfunction. Check it directly.		
	4	Malfunction of swing motor (safety valve)	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.		
			Swing lock switch	Left work equipment control lever	Swing relief pressure
			LOCK position	Relieved in SWING position	28.9 – 32.9 MPa {295 – 335 kg/cm^2}
	5	Defective swing motor (motor unit)	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.		
			Swing lock switch	Left work equipment control lever	Leakage from swing motor
			LOCK position	Relieved in SWING position	Max. 6 ℓ/min
	6	Defective swing machinery	The swing machinery may have a defect in it. Check it directly. (It may be checked by abnormal sound, abnormal heating, metal chips in drain oil, etc.)		

Trouble	(2) Swing acceleration or swing speed is low in only 1 direction.
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Malfunction of swing PPC valve	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Right work equipment control lever	PPC valve output pressure
			In NEUTRAL position	0 MPa {0 kg/cm^2}
			In SWING position	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	2	Clogging of swing PPC slow return valve	The swing PPC slow return valve may be clogged. Check it directly.	
	3	Malfunction of swing control valve (spool)	The spool of the swing control valve may have a malfunction. Check it directly (including the stroke limiting mechanism).	
	4	Defective seal of swing motor (suction valve)	The seal of the suction valve of the swing motor may be defective. Check it directly.	

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H-24 Upper structure overruns remarkably when it stops swinging

Trouble	(1) Upper structure overruns remarkably when it stops swinging in both directions.
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Malfunction of swing motor (safety valve)	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.		
			Swing lock switch	Left work equipment control lever	Swing relief pressure
			LOCK position	Relieved in SWING position	28.9 – 32.9 MPa {295 – 335 kg/cm^2}
	2	Defective swing motor (motor unit)	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.		
			Swing lock switch	Left work equipment control lever	Leakage from swing motor
			LOCK position	Relieved in SWING position	Max. 6 ℓ/min

Trouble	(2) Upper structure overruns remarkably when it stops swinging in only 1 direction.
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Malfunction of swing PPC valve	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Right work equipment control lever	PPC valve output pressure
			In NEUTRAL position	0 MPa {0 kg/cm^2}
			In SWING position	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	2	Clogging of swing PPC slow return valve	The swing PPC slow return valve may be clogged. Check it directly.	
	3	Malfunction of swing control valve (spool)	The spool of the swing control valve may have a malfunction. Check it directly.	
	4	Defective seal of swing motor (suction valve)	The seal of the suction valve of the swing motor may be defective. Check it directly.	

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H-25 Large shock is made when upper structure stops swinging

Trouble	• Large shock is made when upper structure stops swinging.
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Malfunction of swing PPC valve	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Right work equipment control lever	PPC valve output pressure
			In NEUTRAL position	0 MPa {0 kg/cm^2}
			In SWING position	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	2	Malfunction of swing PPC slow return valve	The swing PPC slow return valve may have a malfunction. Check it directly.	
	3	Malfunction of swing motor (shockless valve)	The shockless valve of the swing motor may have a malfunction. Check it directly.	

H-26 Large sound is made when upper structure stops swinging

Trouble	• Large sound is made when upper structure stops swinging.
Related information	• Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Malfunction of back-pressure check valve	The back-pressure check valve may have a malfunction. Check it directly.
	2	Malfunction of swing motor (safety valve)	The swing motor (safety valves) may have a malfunction. Check it directly. (It may be checked by exchanging both valves and seeing the change of phenomenon.)
	3	Malfunction of swing motor (suction valve)	The swing motor (suction valves) may have a malfunction. Check it directly. (It may be checked by exchanging both valves and seeing the change of phenomenon.)
	4	Defective swing machinery	The swing machinery may have a defect in it. Check it directly. (It may be checked by abnormal sound, abnormal heating, metal chips in drain oil, etc.)

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H-27 Hydraulic drift of swing is large

Trouble	(1) When swing holding brake is applied
Related information	• When the swing lock switch is in the LOCK position or when the swing holding brake release switch is in the normal position, the swing holding brake operates and the upper structure is fixed with the disc brake. • Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting	
Possible causes and standard value in normal state	1	Malfunction of swing holding brake solenoid valve	★Prepare with engine stopped, then run engine at high idling and carry out troubleshooting.	
			Right work equipment control lever	Solenoid valve output pressure
			In NEUTRAL position	0 MPa {0 kg/cm^2}
			In SWING position	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	2	Malfunction or internal defect of swing motor (parking brake)	The parking brake of the swing motor may have a malfunction or a defect in it. Check it directly.	

Trouble	(2) When swing holding brake is released
Related information	• When the swing holding brake release switch is in the RELEASE position, the swing brake is released and the upper structure is secured by only hydraulic pressure. • Carry out the troubleshooting in working mode A.

	Cause		Standard value in normal state/Remarks on troubleshooting
Possible causes and standard value in normal state	1	Defective seal of swing control valve (spool)	The seal of the spool of the swing control valve may be defective. Check it directly.
	2	Defective seal of swing control valve (safety valve)	The seal of the safety valve of the swing control valve may be defective. Check it directly.
	3	Defective seal of swing control valve (suction valve)	The seal of the suction valve of the swing control valve may be defective. Check it directly.
	4	Defective seal of swing control valve (shockless valve)	The seal of the shockless valve of the swing control valve may be defective. Check it directly.

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TROUBLESHOOTING OF ENGINE (S-MODE)

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METHOD OF USING TROUBLESHOOTING CHARTS

This troubleshooting chart is divided into three sections: **questions, check items, and troubleshooting**. The questions and check items are used to pinpoint high probability causes that can be located from the failure symptoms or simple inspeciton without using troubleshooting tools.
Next, troubleshooting tools or direct inspection are used to check the high probability causes to make final confirmation.

[Questions]

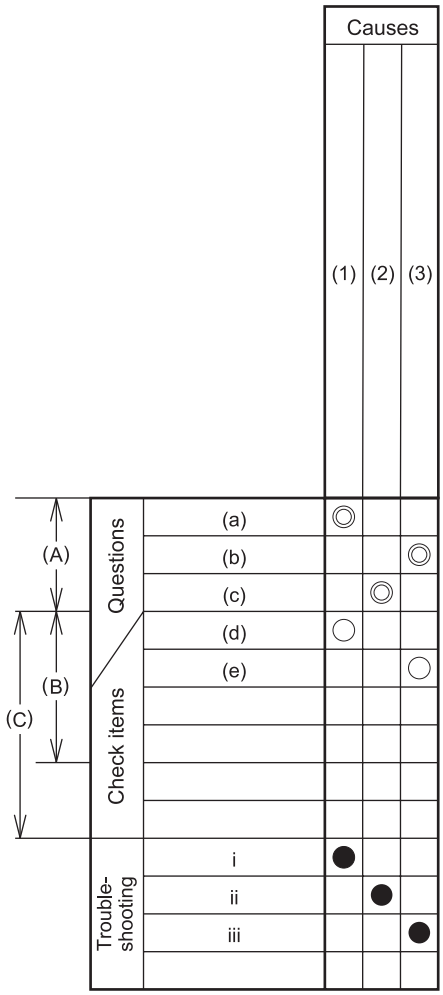
Sections (**A**) + (**B**) in the chart on the right corresponds to the items where answers can be obtained from the user. The items in (**B**) are items that can be obtained from the user, depending on the user's level.

[Check items]

The serviceman carries out simple inspection to narrow down the causes. The items under (**C**) in the chart on the right correspond to this.
The serviceman narrows down the causes from information (**A**) that he has obtained from the user and the results of (**C**) that he has obtained from his own inspection.

[Troubleshooting]

Troubleshooting is carried out in the order of probability, starting with the causes that have been marked as having the highest probability from information gained from **[Questions]** and **[Check items]**.



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The basic method of using the troubleshooting chart is as follows.
Items listed for **[Questions]** and **[Check items]** that have a relationship with the Cause items are marked with ○, and of these, causes that have a high probability are marked with ◎.
Check each of the **[Questions]** and **[Check items]** in turn, and marked the ○ or ◎ in the chart for items where the problem appeared. The vertical column (Causes) that has the highest number of points is the most probable cause, so start troubleshooting for that item to make final confirmation of the cause.

*1. For [Confirm recent repair history] in the [Questions] Section, ask the user, and mark the Cause column with △ to use as reference for locating the cause of the failure. However, do not use this when making calculations to narrow down the causes.
*2. Use the △ in the Cause column as reference for [Degree of use (Operated for long period)] in the **[Questions]** section as reference. As a rule, do not use it when calculating the points for locating the cause, but it can be included if necessary to determine the order for troubleshooting.

			Causes						
			Seized turbocherger, interference	Clogged air cleaner element	Worn piston ring, cylinder	Clogged, seized injection nozzle	Improper injection timing	Defective injection pump (excessive injection)	
*1	Confirm recent repair history								
*2	Degree of use	Operated for long period		△	△	△			
			◎						

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- **Example of troubleshooting when exhaust gas is black**
  Let us assume that [Clogged air cleaner] is taken to be the cause of black exhaust gas. Three symptoms have causal relationship with this problem: [Exhaust gas slowly became black], [Power slowly became weaker], and [Dust indicator is red].
  If we look from these three symptoms to find the causes, we find that there is a relationship with five causes. Let us explain here the method of using this causal relationship to pinpoint the most probable cause.

S-7 Exhaust gas is black (incomplete combustion)

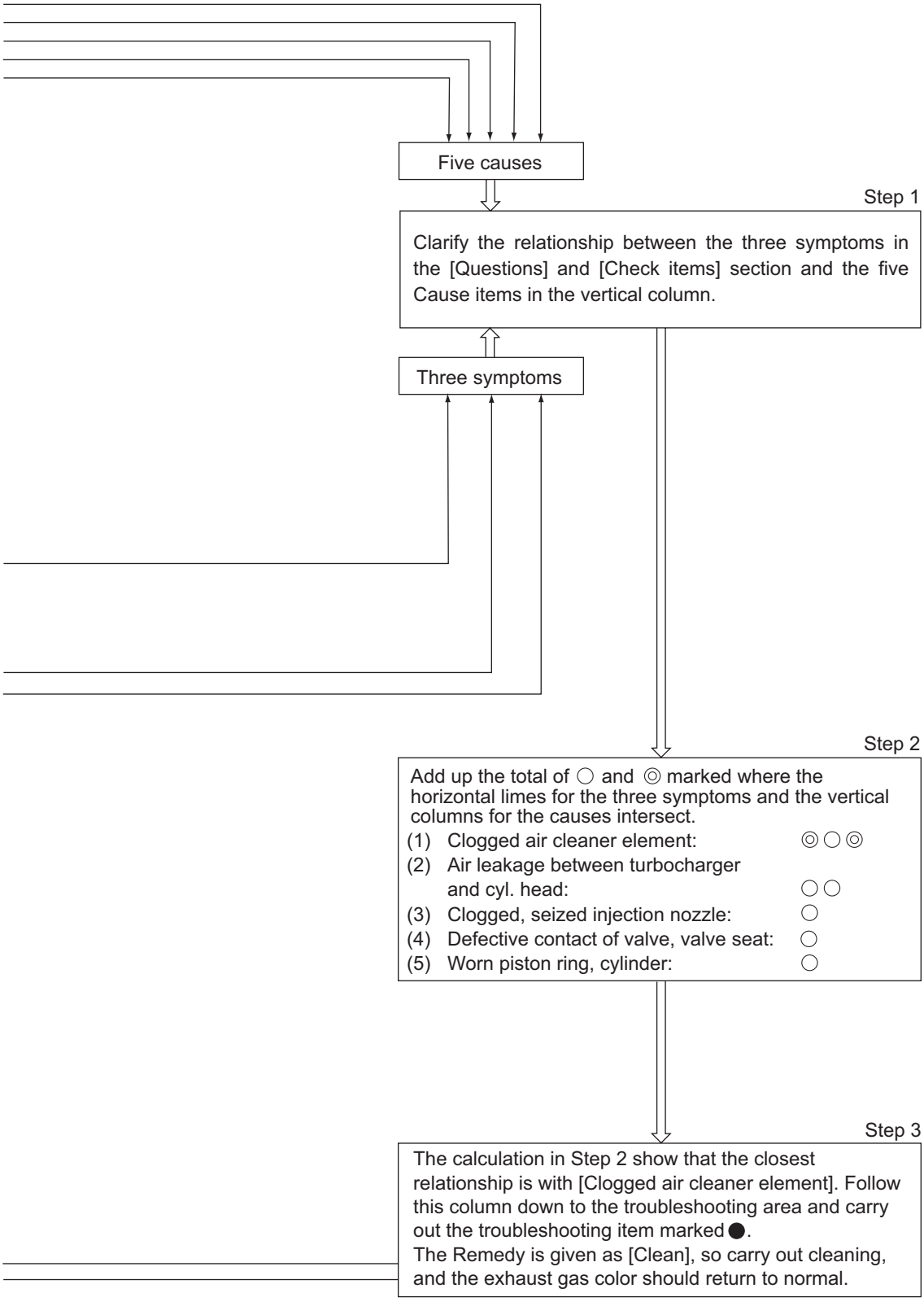
General causes why exhaust gas is black

- Insufficient intake of air
- Improper condition of fuel injection
- Excessive injection of fuel

Legend
◯ : Possible causes (judging from Questions and Check items)
◎ : Most probable causes (judging from Questions and Check items)
△ : Possible causes due to length of use (used for a long period)
● : Items to confirm the cause.

			Causes													
			Clogged air cleaner element	Seized turbocharger, interference	Defective contact of valve and valve seat	Improper valve clearance	Leakage of air between turbocharger and cylinder head	Crushed, clogged muffler	Worn piston ring, cylinder liner	Stuck, seized fuel supply pump plunger	Clogged, seized fuel injector	Worn fuel injector	Clogged fuel spill piping	Defective fuel injection timing	Defective fuel injection pressure	Defective water temperature sensor
Questions	Confirm recent repair history															
	Degree of use of machine	Operated for long period	△		△				△		△					
	Color of exhaust gas	Suddenly became black		◎						○	○					
		Gradually became black	◎				○				○	○				
		Blue under light load							◎							
	Non-specified fuel is being used									○	○					
	Engine oil must be added more frequently								◎							
	Power was lost	Suddenly		◎				○		○	○					
		Gradually	○		○		○		○							
	Dust indicator lamp is red		◎													
Check items	Muffler is crushed							◎								
	Leakage of air between turbocharger and cylinder head, loose clamp						◎									
	Operates in low-temperature mode even at normal temperatures													○	○	○
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low									○	◎					
	Noise of interference is heard from around turbocharger when engine is run			◎												
	Abnormal noise is heard from around cylinder head when engine is run					◎										
	Stall speed is too high (excessive injection of fuel)											○	○			
	Exhaust noise is abnormal			○				◎			○					
	Engine pickup is poor and combustion is irregular			○		○	○	○		○	◎					
	Blow-by gas is excessive								◎							
	When hose from the injector to spill collection portion is disconnected, spill flow is found to be abnormally high (See error code "AD10L3")											◎				
Troubleshooting	Check air cleaner directly		●													
	When turbocharger is rotated by hand, it is found to be heavy			●												
	When compression pressure is measured, it is found to be low				●				●							
	Check valve clearance directly					●										
	When muffler is removed, exhaust color returns to normal							●								
	Carry out troubleshooting for error code "AD10L3 : Fuel supply pump non-force feed"									●						
	Engine speed does not change when operation of certain cylinders is stopped in reduced cylinder mode										●					
	Check fuel spill piping directly												●			
	Carry out troubleshooting for error code "DGE3L6: Abnormality in watet temperature sensor"															●
		Remedy	Clean	Replace	Replace	Adjust	Correct	Replace	Replace	Replace	Replace	Replace	Correct	Adjust	Adjust	Replace

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S-1 Starting performance is poor (Starting always takes time)

General causes why exhaust smoke comes out but engine takes time to start

- Defective electrical system
- Insufficient supply of fuel
- Insufficient intake of air
- Improper selection of fuel
  (At ambient temperature of –10°C or below,
  ASTM D975 No. 2 diesel fuel is used)

★ Battery charging rate and gravity

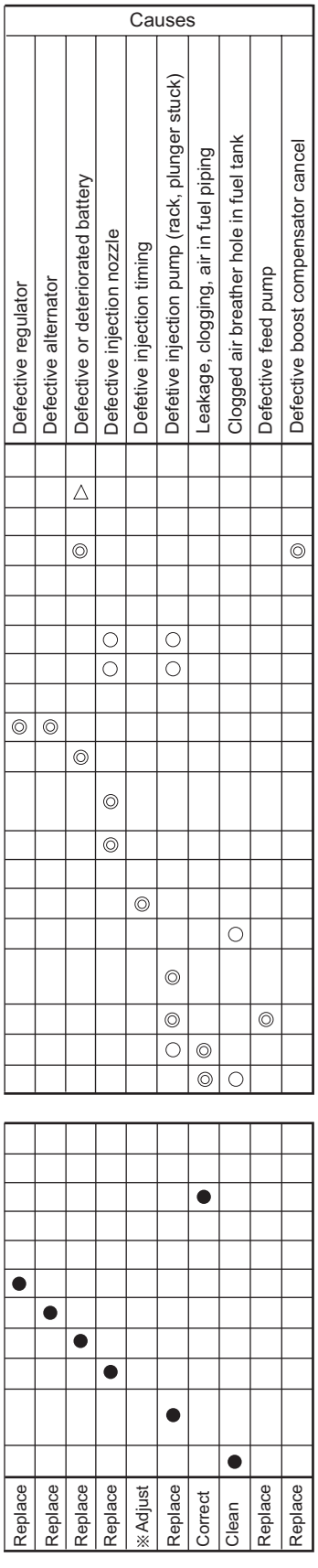
Ambient temperature \ Charging rate	100 %	90 %	80 %	75 %	70 %
20°C	1.28	1.26	1.24	1.23	1.22
0°C	1.29	1.27	1.25	1.24	1.23
–0°C	1.30	1.28	1.26	1.25	1.24

- The specific gravity should exceed the value for the charging rate of 70% in the above table.
- In cold areas the specific gravity must exceed the value for the charging rate of 75% in the above table.

			Causes: Worn piston ring, cylinder	Defective contact of valve, valve seat	Clogged air cleaner element	Clogged fuel filter, strainer	Clogged feed pump gauze filter	Electrical intake air heater
Questions	Confirm recent repair history							
	Degree of use of machine	Operated for long period			△	△	△	
	Ease of starting	Gradually became worse	◎	◎	○	○	○	
		Starts when warm						◎
	Indicator lamp does not light up							◎
	Engine oil must be added more frequently		◎					
	Replacement of filters has not been carried out according to operation Manual				◎	◎	◎	
	Non-specified fuel has being used					○	○	
Check items	Dust indicator lamp is red				◎			
	Battery charge lamp is ON							
	Starting motor cranks engine slowly							
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low							
	Engine does not pick up smoothly, and combustion is irregular		○	○				
	Blow-by gas is excessive		◎					
	Timing lock on fuel injection pump does not match							
	Mud is stuck to fuel tank cap							
	When engine is cranked with starting motor, 1) Little fuel comes out even when injection pump piping sleeve nut is loosened							
	2) Little fuel comes out even when fuel filter air bleed plug is loosened					◎	◎	
	Leakage from fuel piping							
	There is hunting from engine (rotation is irregular)					○	○	
Troubleshooting	When compression pressure is measured, it is found to be low		●	●				
	When air cleaner element is inspected directly, it is found to be clogged				●			
	When fuel filter, strainer are inspected directly, they are found to be clogged					●		
	When feed pump strainer is inspected directly, it is found to be clogged						●	
	Heater mount does not become warm							●
	Is voltage 26–30V between alternator terminal B and terminal E with engine at low idling?	Yes						
		No						
	Either specific gravity of electrolyte or voltage of battery is low							
	Speed does not change when operation of certain cylinders is stopped							
	When control rack is pushed, it is found to be heavy or does not return (check after removing fuel injection pump)							
	When fuel tank cap is inspected directly, it is found to be clogged							
	Remedy		Replace	Correct	Clean	Clean	Clean	Replace

※ Use a test stand when adjusting.

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S-2 Engine does not start

(1) Engine does not turn

General causes why engine does not turn

- Internal parts of engine seized

  ★ If internal parts of the engine are seized, carry out troubleshooting for “Engine stops during operations”.

- Defective electrical system
- Failure in power train

			Causes								
			Defective wiring of starting circuit	Defective or deteriorated battery	Defective starting motor	Broken ring gear	Defective safety relay or safety switch	Defective battery relay	Defective battery terminal connection	Defective fuel cut solenoid	Defective starting switch
Questions	Confirm recent repair history										
	Degree of use of machine	Operated for long period		△		△					
	Condition of horn when starting switch is turned ON	Horn sounds	◎						○		○
		Horn volume is low		◎							
	When starting switch is turned to START, pinion moves out, but	Speed of rotation is low		◎							
		Makes grating noise			◎	◎					
		Soon disengages pinion again					◎				
		Makes rattling noise and does not turn		○	○		○				
Check items	When starting switch is turned to START, pinion does not move out		◎	○							○
	When starting switch is turned to ON, there is no clicking sound		Troubleshooting of defective wiring in starting circuit	○				◎			
	Battery terminal is loose								◎		
	When starting switch is turned ON, linkage is not actuated									◎	
	When battery is checked, battery electrolyte is found to be low			◎							
Troubleshooting	Specific gravity of electrolyte, voltage of battery is low			●							
	For the following conditions 1) - 5), turn the starting switch OFF, connect the cord, and carry out troubleshooting 1) When terminal B and terminal C of starting switch are connected, engine starts										●
	2) When terminal B and terminal C of starting motor are connected, engine starts				●						
	3) When terminal B and terminal C of safety relay are connected, engine starts						●				
	4) When terminal of safety switch and terminal B of starting motor are connected, engine starts						●				
	5) There is no 24V between battery relay terminal b and terminal E							●			
	When ring gear is inspected directly, tooth surface is found to be chipped					●					
	Cannot be moved by hand even when linkage of fuel cut solenoid is disconnected									●	
		Remedy	—	Replace	Replace	Replace	Replace	Replace	Replace	Replace	Replace

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(2) Engine turns but no exhaust smoke comes out (Fuel is not being injected)

General causes why engine turns but no exhaust smoke comes out

- Supply of fuel impossible
- Supply of fuel is extremely small
- Improper selection of fuel (particularly in winter)

★ Standards for use of fuel

KIND OF FLUID	AMBIENT TEMPRATURE				
	-4 -20	14 -10	32 0	50 10	68°F 20°C
Diesel fuel			**ASTM D975 No.2**		
	ASTM D975 No.1				

		Causes									
		Broken injection pump drive shaft, key	Defective injection pump (rack, plunger seized)	Seized, broken feed pump piston	Clogged fuel filter, strainer	Clogged feed pump strainer	Insufficient fuel in tank	Clogged, leaking fuel piping	Clogged air breather hole in fuel tank	Defective fuel cut solenoid	Improper fuel used
Questions	Confirm recent repair history										
	Degree of use of machine — Operated for long period				△	△			△		
	Exhaust smoke suddenly stops coming out (when starting again)	◎	◎	◎							
Check items	Replacement of filters has not been carried out according to Operation Manual				◎	◎					
	Fuel tank is found to be empty						◎				
	There is leakage from fuel piping							◎			
	Mud is stuck to fuel tank cap								◎		
	When starting switch is turned ON, linkage is not actuated									◎	
	When fuel filter is drained, fuel does not come out										◎
	When engine is cranked with starting motor, 1) No fuel comes out even when fuel filter air bleed plug is loosened	◎			○	○					○
	2) No fuel spurts out even when injection pump piping sleeve nut is loosened	◎	◎	◎							
	Rust and water are found when fuel tank is drained				○	○					○
Troubleshooting	Inspect injection pump directly	●									
	When control rack is pushed, it is found to be heavy, or does not return		●								
	Inspect feed pump directly			●							
	When fuel filter, strainer are inspected directly, they are found to be clogged				●						●
	When feed pump strainer is inspected directly, it is found to be clogged					●					
	When fuel cap is inspected directly, it is found to be clogged								●		
	Cannot be moved by hand even when linkage of fuel cut solenoid is disconnected									●	
	Remedy	Replace	Replace	Replace	Replace	Replace	Replace	Replace	Replace	Replace	Replace

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(3) Exhaust smoke comes out but engine does not start (Fuel is being injected)

General causes why exhaust smoke comes out but engine not start

- Lack of rotating force due to defective electrical system
- Insufficient supply of fuel
- Insufficient intake of air
- Improper selection of fuel and oil

			Causes												
			Defective, broken valve system (valve, rocker lever, etc.)	Defective injection pump (rack, plunger stuck)	Worn piston ring, cylinder liner	Clogged fuel filter, strainer	Clogged feed pump strainer	Clogged air cleaner element	Defective electrical intake air heater	Defective or deteriorated battery	Leakage, clogging, air in fuel system	Clogged injection nozzle, defective spray	Clogged air breather hole in fuel tank cap	Improper fuel used
Questions	Confirm recent repair history													
	Degree of use of machine	Operated for long period			△	△	△					△		
	Suddenly failed to start		◎	◎										
	When engine is cranked, abnormal noise is heard from around cylinder head		◎											
	Engine oil must be added more frequently				◎									
	Non-specified fuel is being used			○								○		
	Replacement of filters has not been carried out according to Operation Manual					◎	◎	◎						
Check items	Rust and water are found when fuel tank is drained					◎	◎							
	Dust indicator lamp is red							◎						
	Indicator lamp does not light up								◎					
	Starting motor cranks engine slowly									◎				
	Mud is stuck to fuel tank cap												○	
	When fuel lever is placed at FULL position, it does not contact stopper			○										
	When engine is cranked with starting motor, 1) Little fuel comes out even when injection pump piping sleeve nut is loosened			◎										
	2) No fuel comes out even when fuel filter air bleed plug is loosened					◎	◎							○
	There is leakage from fuel piping										◎			
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low											◎		
	When fuel filter is drained, no fuel comes out													◎
Troubleshooting	Remove head cover and check directly		●											
	When control rack is pushed, it is found to be heavy, or does not return			●										
	When compression pressure is measured, it is found to be low				●									
	When fuel filter, strainer are inspected directly, they are found to be clogged					●								●
	When feed pump strainer is inspected directly, it is found to be clogged						●							
	When air cleaner element is inspected directly, it is found to be clogged							●						
	Heater mount does not become warm								●					
	Either specific gravity of electrolyte or voltage of battery is low									●				
	When feed pump is operated, there is no response, or operation is too heavy										●			
	Speed does not change when operation of certain cylinders is stopped											●		
	When fuel tank cap is inspected directly, it is found to be clogged												●	
	Remedy		Replace	Replace	Replace	Clean	Clean	Clean	Correct	Replace	Correct	Clean	Clean	

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S-3 Engine does not pick-up smoothly (Follow-up is poor)

General causes why engine does not pick up smoothly

- Insufficient intake of air
- Insufficient supply of fuel
- Improper condition of fuel injction
- Improper fuel used

			Causes											
			Clogged air cleaner element	Clogged fuel filter, strainer	Clogged feed pump strainer	Clogged injection nozzle, defective spray	Seized injection pump plunger	Worn piston ring, cylinder liner	Seized turbocharger, interference	Improper valve clearance	Clogged air breather hole in fuel tank cap	Clogged, leaking fuel piping	Defective contact of valve and valve seat
Questions	Confirm recent repair history												
	Degree of use of machine	Operated for long period	△	△	△			△					△
	Replacement of filters has not been carried out according to Operation Manual		◎	◎	◎								
	Non-specified fuel is being used			◎	◎	◎	◎						
	Engine oil must be added more frequently							◎					
	Engine pick-up suddenly became poor					○			◎		○	○	
Check items	Rust and water are found when fuel tank is drained			◎	◎								
	Dust indicator lamp is red		◎										
	Noise of interference is heard from around turbocharger								◎				
	Color of exhaust gas	Blue under light load				○		◎					
		Black	◎			◎			◎				○
	Clanging sound is heard from around cylinder head									◎			
	Mud is stuck to fuel tank cap										◎		
	There is leakage from fuel piping											◎	
	High idling speed under no load is normal, but speed suddenly drops when load is applied			◎	◎						○		
	There is hunting from engine (rotation is irregular)			○	◎	○					○		
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low					◎	○						
	Blow-by gas is excessive							◎					
Troubleshooting	When air cleaner element is inspected directly, it is found to be clogged		●										
	When fuel filter, strainer are inspected directly, they are found to be clogged			●									
	When feed pump strainer is inspected directly, it is found to be clogged				●								
	Speed does not change when operation of certain cylinders is stopped					●							
	When control rack is pushed, it is found to be heavy, or does not return						●						
	When compression pressure is measured, it is found to be low							●					●
	When turbocharger is rotated by hand, it is found to be heavy								●				
	When valve clearance is checked directly, it is found to be outside standard value									●			
	When fuel tank cap is inspected directly, it is found to be clogged										●		
	When feed pump is operated, operation is too light or too heavy											●	
		Remedy	Clean	Clean	Clean	Correct	Replace	Replace	Replace	Adjust	Clean	Correct	Replace

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S-4 Engine stops during operations

General causes why engine stops during operations
- Seized parts inside engine
- Insufficient supply of fuel
- Overheating
  - ★ If there is overheating and the engine stops, carry out troubleshooting for overheating.
- Failure in power train
  - ★ If the engine stops because of a failure in the power train, carry out troubleshooting for the chassis.

			Causes													
			Broken, seized piston, connecting rod	Broken, seized crankshaft bearing	Broken dynamic valve system (valve, rocker lever, etc.)	Broken, seized gear train	Broken pump auxiliary equipment	Broken fuel pump drive shaft, key	Insufficient fuel in tank	Clogged fuel filter, strainer	Clogged feed pump strainer	Broken, seized feed pump piston	Clogged, leaking fuel piping	Clogged air breather hole in fuel tank	Defective injection pump (rack, plunger stuck)	Failure in power train
Questions	Confirm recent repair history															
	Degree of use of machine	Operated for long period								△	△					
	Condition when engine stopped	Abnormal noise was heard and engine stopped suddenly	◎	◎	◎	◎	◎	◎				○			○	◎
		Engine overheated and stopped	◎	○			○									
		Engine stopped slowly							◎	○	○					
		There was hunting and engine stopped							◎	○	○			○		
	Replacement of filters has not been carried out according to Operation Manual									◎	◎					
	Non-specified fuel is being used									○	○	○			○	
Check items	Fuel level lamp lights up								◎							
	Fuel tank is found to be empty								◎							
	When feed pump is operated, operation is too light or too heavy									○	○		◎			
	Mud is stuck to fuel tank cap													◎		
	Engine rotates, but stops when power train is operated															◎
	When it is attempted to turn by hand using barring tool	Does not turn at all	◎	◎												Troubleshooting of chassis
		Turns in opposite direction			◎											
		Moves amount of backlash				◎	◎									
		Shaft does not turn						◎								
	Rust and water are found when fuel tank is drained									◎	◎					
	Metal particles are found when oil is drained		◎	◎						○	○					
Troubleshooting	Remove oil pan and inspect directly		●	●												
	Remove head cover and inspect directly				●											
	When gear train is inspected, it does not turn					●										
	Rotates when pump auxiliary equipment is removed						●									
	When fuel filter, strainer are inspected directly, they are found to be clogged									●						
	When feed pump strainer is inspected directly, it is found to be clogged										●					
	Inspect feed pump directly											●				
	When control rack is pushed, it is found to be heavy, or does not return														●	
		Remedy	Replace	Replace	Replace	Replace	Replace	Add	Clean	Clean	Replace	Replace	Correct	Clean	Replace	—

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S-5 Engine does not rotate smoothly (Hunting)

General causes why engine does not rotate smoothly

- Air in fuel system
- Defective governor mechanism
- Defective electric governor mechanism (engine with electric governor)

★ If hunting stops when electric governor rod is disconnected, carry out troubleshooting for the chassis.

			Causes									
			Defective operation of governor	Defective adjustment of governor	Defective operation of control rack	Low idling speed is too low	Insufficient fuel in tank	Clogged feed pump strainer	Clogged fuel filter, strainer	Clogged, air in circuit between fuel tank and feed pump	Clogged, air in circuit between feed pump and nozzle	Clogged air breather hole in fuel tank
Questions	Confirm recent repair history											
	Degree of use of machine	Operated for long period						△	△			
	Condition of hunting	Occurs at a certain speed range	◎	◎	◎	○						
		Occurs at low idling	○			◎		○	○	○	○	
		Occurs even when speed is raised	○	○	○							○
		Occurs on slopes					◎					
	Replacement of filters has not been carried out according to Operation Manual							◎	◎			
Check items	Fuel tank is found to be empty						◎					
	Rust, water are found when fuel tank is drained							○	○			
	Leakage from fuel piping									◎	◎	
	When feed pump is operated, 1) No response, light, return is quick									◎		
	2) No response, light, return is normal									◎		
	Engine speed sometimes rises too far		◎	◎								
	Engine is sometimes difficult to stop		◎		◎							
	Seal on injection pump has come off			◎		◎						
Troubleshooting	When governor lever is moved it is found to be stiff		●		●							
	When injection pump is tested, governor is found to be improperly adjusted			●								
	When control rack is pushed, it is found to be heavy, or does not return				●							
	When fuel tank cap is inspected directly, it is found to be clogged					●						●
	When feed pump strainer is inspected directly, it is found to be clogged							●				
	When fuel filter, strainer are inspected directly, they are found to be clogged								●			
		Remedy	Adjust	Adjust	Adjust	Adjust	Add	Clean	Clean	Correct	Correct	Clean

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S-6 Engine lacks output (or lacks power)

General causes why engine lacks output

- Insufficient intake of air
- Insufficient supply of fuel
- Improper condition of fuel injection
- Improper fuel used
  (if non-specified fuel is used, output drops)
- Lack of output due to overtaking

★ If there is overheating and lack of output, carry out troubleshooting for overheating.

			Causes														
			Clogged air cleaner element	Seized turbocharger, interference	Worn piston ring, cylinder	Clogged fuel filter, strainer	Clogged feed pump strainer	Clogged injection nozzle, defective spray	Seized injection pump plunger	Improper valve clearance	Defective contact of valve and valve seat	Bent fuel lever linkage, defective adjustment	Clogged, leaking fuel piping	Clogged air breather hole in fuel tank	Defective boost compensator diaphragm	Defective westgate diaphragm
Questions	Confirm recent repair history															
	Degree of use of machine	Operated for long period	△		△	△	△				△					
	Power was lost	Suddenly		◎											◎	◎
		Gradually	○		○	○	○	○			○					
	Engine oil must be added more frequently				◎											
	Replacement of filters has not been carried out according to Operation Manual		◎			◎	◎									
	Non-specified fuel is being used					◎	◎	◎	◎							
Check items	Dust indicator lamp is red		◎													
	Color of exhaust gas	Black	◎	◎												
		Blue under light load			◎											
	Noise of interference is heard from around turbocharger			◎												
	Blow-by gas is excessive				◎										○	
	Engine pickup is poor and combustion is irregular			◎				○					○	○		
	High idling speed under no load is normal, but speed suddenly drops when load is applied					◎	◎							○		
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low							◎	○							
	There is hunting from engine (rotation is irregular)					○	○						○	○		
	Clanging sound is heard from around cylinder head									◎						
	High idling speed of engine is low								○			◎				
	Leakage from fuel piping												◎			
Troubleshooting	When air cleaner element is inspected directly, it is found to be clogged		●													
	When turbocharger is rotated by hand, it is found to be heavy			●												
	When compression pressure is measured, it is found to be low				●						●					
	When fuel filter, strainer are inspected directly, they are found to be clogged					●										
	When feed pump strainer is inspected directly, it is found to be clogged						●									
	Speed does not change when operation of certain cylinders is stopped							●								
	When control rack is pushed, it is found to be heavy, or does not return								●							
	When valve clearance is checked directly, it is found to be outside standard value									●						
	When lever is placed at FULL position, it does not contact stopper											●				
	When feed pump is operated, operation is too light or too heavy												●			
	When fuel tank cap is inspected directly, it is found to be clogged													●		
	Remedy		Clean	Replace	Replace	Clean	Clean	Correct	Replace	Adjust	Replace	Adjust	Correct	Clean	Replace	Replace

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S-7 Exhaust smoke is black (Incomplete combustion)

General causes why exhaust smoke is black
- Insufficient intake of air
- Improper condition of fuel injection
- Excessive injection of fuel

			Causes											
			Seized turbocharger, interference	Clogged air cleaner element	Worn piston ring, cylinder	Clogged injection nozzle, defective spray	Improper injection timing	Defective injection pump (excessive injection)	Improper valve clearance	Crushed, clogged muffler	Leakage of air between turbocharger and head	Defective contact of valve and valve seat	Defective injection pump (rack, plunger seized)
Questions	Confirm recent repair history												
	Degree of use of machine	Operated for long period		△	△	△						△	
	Color of exhaust gas	Suddenly became black	◎			○							○
		Gradually became black		◎		○					○		
		Blue under light load			◎								
	Engine oil must be added more frequently				◎								
	Power was lost	Suddenly	◎			○				○			○
		Gradually		○	○						○	○	
	Non-specified fuel is being used					○							○
Check items	Noise of interference is heard from around turbocharger		◎										
	Dust indicator lamp is red			◎									
	Blow-by gas is excessive				◎								
	Engine pickup is poor and combustion is irregular		○			◎			○	○	○		○
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low					◎							○
	Timing lock on fuel injection pump does not match						◎						
	Seal on injection pump has come off							◎					
	Clanging sound is heard from around cylinder head								◎				
	Exhaust noise is abnormal		○			○				◎			
	Muffler is crushed									◎			
	Leakage of air between turbocharger and head, loose clamp										◎		
Troubleshooting	When turbocharger is rotated by hand, it is found to be heavy		●										
	When air cleaner element is inspected directly, it is found to be clogged			●									
	When compression pressure is measured, it is found to be low				●							●	
	Speed does not change when operation of certain cylinders is stopped					●							
	When check is made using delivery method, injection timing is found to be incorrect						●						
	Injection pump test shows that injection amount is incorrect							●					
	When valve clearance is checked directly it is found to be outside standard value								●				
	When muffler is removed, exhaust color returns to normal									●			
	When control rack is pushed, it is found to be heavy, or does not return												●
		Remedy	Replace	Clean	Replace	Replace	Adjust	Adjust	Adjust	Replace	Correct	Replace	Replace

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S-8 Oil consumption is excessive (or exhaust smoke is blue)

★ Do not run the engine at idling for more than 20 minutes continuously. (Both low and high idling)

General causes why oil consumption is excessive

- Abnormal combustion of oil
- External leakage of oil
- Wear of lubrication system

			Causes													
											Turbocharger					
			Broken piston ring	Worn piston ring, cylinder (liner less engine)	Clogged breather or breather hose	Leakage from oil filter or oil cooler	Leakage from oil piping	Leakage from oil drain plug	Leakage from oil pan or cylinder head	Broken oil cooler	Worn seal at turbine end	Worn seal at blower end	Worn, broken rear seal, seal surface	Dust sucked in from intake system	Worn valve (stem, guide), broken seal
Questions / Check items	Confirm recent repair history														
	Degree of use of machine	Operated for long period		△							△	△			△
	Oil consumption suddenly increased		◎							○					
	Engine oil must be added more frequently			◎						○					
	Engine oil becomes contaminated quickly		○	◎	○										
	Exhaust smoke is blue under light load		◎	◎											
	Amount of blow-by gas	Excessive	◎	◎								○			○
		None			◎										
	Area around engine is dirty with oil					◎	◎	◎	◎						
	There is oil in engine cooling water									◎					
	When exhaust pipe is removed, inside is found to be dirty with oil										◎				○
	When turbocharger air supply pipe is removed, inside is found to be dirty with oil											◎			
	Oil level in clutch or TORQFLOW transmission damper chamber rises												◎		
	Clamps for intake system are loose													◎	
Troubleshooting	When compression pressure is measured, it is found to be low		●	●											
	When breather element is inspected, it is found to be clogged with dirty oil				●										
	There is external leakage of oil from engine					●	●	●	●						
	Pressure-tightness test of oil cooler shows there is leakage									●					
	Excessive play of turbocharger shaft										●	●			
	Inspect rear seal directly												●		
	When intake manifold is removed, dust is found inside													●	
	When intake manifold is removed, inside is found to be dirty with oil														●
	Remedy		Replace	Replace	Clean	Correct	Correct	Correct	Correct	Replace	Replace	Replace	Correct	Correct	Correct

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S-9 Oil becomes contaminated quickly

General causes why oil becomes contaminated quickly

- Entry of exhaust gas due to internal wear
- Clogging of lubrication passage
- Improper fuel
- Improper oil used
- Operation under excessive load

			Causes							
			Worn piston ring, cylinder liner	Clogged breather, breather hose	Clogged oil filter	Worn valve, valve guide	Clogged oil cooler	Clogged turbocharger oil drain tube	Defective seal at turbocharger turbine end	Exhaust smoke is black
Questions / Check items	Confirm recent repair history									
	Degree of use of machine	Operated for long period	△			△			△	
	Engine oil must be added more frequently		◎							
	Non-specified oil is being used				○					
	Color of exhaust gas	Blue under light load	◎							
		Black								◎
	Amount of blow-by gas	Excessive	◎			○		○	○	
		None		◎						
	When oil filter is inspected, metal particles are found		○		◎	○				
	When exhaust pipe is removed, inside is found to be dirty with oil					◎				
	Engine oil temperature rises quickly						◎			
Troubleshooting	When compression pressure is measured, it is found to be low		●			●				Carry out troubleshooting for "Exhaust smoke is black".
	When breather element is inspected directly, hose is broken or is found to be clogged with dirty oil			●						
	When oil filter is inspected directly, it is found to be clogged				●					
	When oil cooler is inspected directly, it is found to be clogged						●			
	Turbocharger oil drain tube is clogged							●		
	Excessive play of turbocharger shaft								●	
	When safety valve is directly inspected, spring is found to be catching or broken									
		Remedy	Replace	Clean	Replace	Replace	Clean	Clean	Replace	—

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S-10 Fuel consumption is excessive

General causes why fuel consumption is excessive

- Leakage of fuel
- Improper condition of fuel injection
- Excessive injection of fuel

			Causes: Defective injection pump (excessive injection)	Defective nozzle holder spray	Defective injection pump plunger	Defective fuel injection timing	External leakage from fuel piping, fuel filter	Leakage of fuel inside head cover	Defective oil seal inside feed pump (piston)	Defective adjustment of fuel control linkage
Questions	Confirm recent repair history									
	Degree of use of machine	Operated for long period		△	△				△	
	Condition of fuel consumption	More than for other machines of same model	◎			○				
		Gradually increased		○	○					
		Suddenly increased					○	○		
Check items	Exhaust smoke color	Black	◎	○		○				○
		White						○		
	Seal on injection pump has come off		◎							
	There is irregular combustion			◎						
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low			◎	○					
	Match mark on injection pump is misaligned					◎				
	There is external leakage of fuel from engine						◎			
	Engine oil level rises and smells of diesel fuel		○					◎	◎	
	Engine low idling and high idling speeds are high		○							◎
Troubleshooting	Injection pump measurement shows that injection amount is excessive		●							
	Speed does not change when operation of certain cylinders is stopped			●						
	When control rack is pushed, it is found to be heavy, or does not return				●					
	When check is made using delivery method, injection timing is found to be incorrect					●				
	Remove head cover and inspect directly							●		
	Remove feed pump and inspect directly								●	
	When engine speed is measured, low idling and high idling speeds are found to be high									●
		Remedy	Adjust	Replace	Replace	Adjust	Correct	Correct	Correct	Adjust

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S-11 Oil is in cooling water, or water spurts back, or water level goes down

General causes why oil is in cooling water

- Internal leakage in lubrication system
- Internal leakage in cooling system

			Causes				
			Broken oil cooler core, O-ring	Broken cylinder head, head gasket	Broken power train oil cooler	Holes caused by pitting	Internal cracks in cylinder block
Questions / Check items	Confirm recent repair history						
	Degree of use of machine	Operated for long period	△			△	
	Oil level	Suddenly increased	○	○	○		
		Gradually increased				○	○
	Hard water is being used as cooling water		○			○	
	Engine oil level has risen, oil is cloudy white		◎			○	○
	Excessive air bubbles inside radiator, spurts back			◎			
	Hydraulic oil, transmission oil is cloudy white				◎		
	When hydraulic oil, transmission oil is drained, water is found				◎		
Trouble-shooting	Pressure-tightness test of oil cooler shows there is leakage		●		●		
	Pressure-tightness test of cylinder head shows there is leakage			●			
	Remove oil pan and inspect directly					●	●
		Remedy	Replace	Replace	Replace	Replace	Replace

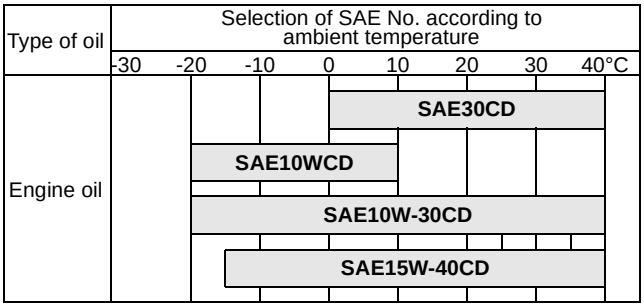
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S-12 Oil pressure caution lamp lights up (Drop in oil pressure)

General causes why oil pressure lamp lights up

- Leakage, clogging, wear of lubricating system
- Defective oil pressure control
- Improper oil used (improper viscosity)
- Deterioration of oil due to overheating

★ Standards for engine oil selection



			Causes												
			Clogged oil filter	Worn bearing, journal	Clogged strainer inside oil pan	Clogged oil pipe inside oil pan	Broken suction pipe brazing	Defective oil pump	Lack of oil in oil pan	Defective regulator valve	Defective relief valve	Leaking, crushed hydraulic piping	Defective oil pressure sensor	Defective oil level sensor	Water, fuel in oil
Questions	Confirm recent repair history														
	Degree of use of machine	Operated for long period	△	△				△							
	Replacement of filters has not been carried out according to Operation Manual		◎												
	Non-specified oil is being used		○	○											
	Caution lamp lights up		◎								○				
	Condition when oil pressure lamp lights up	Lights up at low idling		◎							○				
		Lights up at low, high idling			◎	◎	◎	◎	○	○	○				
		Lights up on slopes							◎						
		Sometimes lights up								◎	◎		○	○	
Check items	There is crushing, leakage from hydraulic piping (external)											◎			
	Oil level sensor lamp lights up								◎				◎		
	When oil level in oil pan is inspected, it is found to be low								◎						
	Metal particles are found when oil is drained			◎											
	Metal particles are stuck to oil filter element			◎				○							
	Oil is cloudy white or smells of diesel oil														◎
Troubleshooting	When oil filter is inspected, it is found to be clogged		●	●											Carry out troubleshooting for "Oil level rises".
	Remove oil pan and inspect directly				●	●	●								
	Oil pump rotation is heavy, there is play							●							
	There is catching of relief valve or regulator valve, spring or valve guide is broken								●	●					
	When oil level sensor is replaced, oil level sensor lamp goes out												●		
	When oil pressure is measured, it is found to be within standard value													●	
	Remedy		Clean	Clean	Clean	Clean	Correct	Replace	Add	Adjust	Adjust	Correct	Replace	Replace	—

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S-13 Oil level rises (Water, fuel in oil)

★ If there is oil in the cooling water, carry out troubleshooting for “Oil is in cooling water”.

General causes why oil level rises

- Water in oil (milky white)
- Fuel in oil (diluted, and smells of diesel fuel)
- Entry of oil from other component

			Causes									
			Broken oil cooler core, O-ring	Defective nozzle holder sleeve	Broken cylinder head, head gasket	Worn, damaged rear seal surface	Defective pump auxiliary equipment seal	Leakage of fuel from piping inside head cover	Defective part inside injection pump	Defective thermostat	Holes made by pitting	Cracks inside cylinder block
Questions / Check items	Confirm recent repair history											
	Degree of use of machine	Operated for long period		△		△	△				△	
	There is oil in radiator cooling water		◎	○	○						○	○
	Fuel must be added more frequently							◎	◎	◎		
	Exhaust smoke is white			◎				○		○		
	When engine is first started, drops of water come from muffler			◎								
	Leave radiator cap open. When engine is run at idling, an abnormal number of bubbles appear, or water spurts back				◎						○	
	Oil level goes down in clutch, TORQFLOW transmission, or damper chamber					◎						
	Oil level goes down in hydraulic tank						◎					
	Engine oil smells of diesel fuel							◎	◎	◎		
	Water temperature is low									◎		
Troubleshooting	Pressure-tightness test of oil cooler shows there is leakage		●									
	Pressure-tightness test of cylinder head shows there is leakage			●								
	When compression pressure is measured, it is found to be low				●							
	Inspect rear seal directly					●						
	When pump auxiliary equipment is removed, seal is found to be damaged						●					
	Remove head cover and inspect directly							●				
	Remove injection pump and inspect directly								●			
	Defective contact with thermostat seal valve									●		
	Remove oil pan and check directly										●	●
		Remedy	Replace	Replace	Replace	Correct	Replace	Correct	Replace	Correct	Replace	Replace

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S-14 Water temperature becomes too high (Overheating)

General causes why water temperature becomes too high

- Lack of cooling air (deformation, damage of fan)
- Drop in heat dissipation efficiency
- Defective cooling circulation system
- Rise in oil temperature in power train

★ Carry out troubleshooting for chassis.

			Causes												
			Broken water pump	Clogged, crushed radiator fins	Clogged radiator core	Defective thermostat (does not open)	Defective water temperature gauge	Lack of cooling water	Fan belt slipping, worn fan pulley	Clogged, broken oil cooler	Defective pressure valve	Broken cylinder head, head gasket	Holes made by pitting	Rise in torque converter oil temperature
Questions	Confirm recent repair history													
	Degree of use of machine	Operated for long period		△	△							△	△	
	Condition of overheating	Suddenly overheated	◎					○	○					
		Always tends to overheat		◎	◎	○			○					
	Water temperature gauge	Rises quickly				◎		○						
		Does not go down from red range					◎							
Check items	Radiator water level sensor lights up							◎						
	Fan belt whines under sudden load								◎					
	Cloudy white oil is floating on cooling water									◎				
	Cooling water flows out from overflow hose										◎			
	Excessive air bubbles inside radiator, water spurts back											◎		
	Engine oil level has risen, oil is cloudy white									○			◎	
	There is play when fan pulley is rotated		◎											
	Radiator shroud, inside of underguard are clogged with dirt or mud			◎					◎					
	When light bulb is held behind radiator, no light passes through			◎										
	Water is leaking because of cracks in hose or loose clamps							◎						
	When belt tension is inspected, it is found to be loose								◎					
	Power train oil temperature enters red range faster than engine water temperature													◎
Troubleshooting	Temperature difference between top and bottom radiator tanks is excessive		●											Carry out troubleshooting for chassis.
	Temperature difference between top and bottom radiator tanks is slight			●										
	When water filler port is inspected, core is found to be clogged				●									
	When function test is carried out on thermostat, it does not open even at cracking temperature					●								
	When water temperature is measured, it is found to be normal						●							
	When oil cooler is inspected directly, it is found to be clogged									●				
	When measurement is made with radiator cap tester, set pressure is found to be low										●			
	When compression pressure is measured, it is found to be low											●		
	Remove oil pan and inspect directly												●	
		Remedy	Replace	Correct	Correct	Replace	Replace	Add	Correct	Replace	Replace	Replace	Replace	—

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S-15 Abnormal noise is made

★ Judge if the noise is an internal noise or an external noise.

General causes why abnormal noise is made

- Abnormality due to defective parts
- Abnormal combustion
- Air sucked in from intake system

			Causes											
			Excessive wear of piston ring, cylinder (liner less engine)	Seized turbocharger, interference	Missing, seized bushing	Clogged, seized injection nozzle	Defective injection pump (rack, plunger seized)	Defective injection pump (excessive injection)	Deformed fan, fan belt interference	Defective adjustment of valve clearance	Broken dynamic valve system (valve, rocker lever, etc.)	Improper gear train backlash	Leakage of air between turbocharger and cylinder head	Defect inside muffler (dividing board out of position)
Questions	Confirm recent repair history													
	Degree of use of machine	Operated for long period	△											
	Condition of abnormal noise	Gradually occurred	○						○					
		Suddenly occurred		○	○						○			
	Non-specified fuel is being used					○	○							
	Engine oil must be added more frequently		◎											
	Color of exhaust gas	Blue under light load	◎											
		Black		◎						○			○	
Check items	Metal particles are found in oil filter		◎		◎									
	Blow-by gas is excessive		◎											
	Noise of interference is heard from around turbocharger			◎										
	Engine pickup is poor and combustion is abnormal					◎								
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low					◎	○							
	Seal on injection pump has come off							◎						
	Abnormal noise is loud when accelerating engine					○	○	○	○	○		○		
	Clanging sound is heard from around cylinder head									◎	◎			
	Leakage of air between turbocharger and cylinder head, loose clamp												◎	
	Vibrating noise is heard from around muffler													◎
Troubleshooting	When compression pressure is measured, it is found to be low		●											
	When turbocharger is rotated by hand, it is found to be heavy			●										
	Remove gear cover and inspect directly				●							●		
	Speed does not change when operation of certain cylinders is stopped					●								
	When control rack is pushed, it is found to be heavy, or does not return						●							
	Injection pump test shows that injection amount is incorrect							●						
	Fan is deformed, belt is loose								●					
	When valve clearance is checked, it is found to be outside standard value									●				
	Remove cylinder head cover and inspect directly										●			
	When muffler is removed, abnormal noise disappears													●
		Remedy	Replace	Replace	Replace	Replace	Correct	Replace	Correct	Replace	Correct	Replace	Replace	Replace

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S-16 Vibration is excessive

★ If there is abnormal noise together with the vibration, carry out troubleshooting also for “Abnormal noise is made”.

General causes why vibration is excessive

- Defective parts (abnormal wear, breakage)
- Improper alignment
- Abnormal combustion

			Causes: Worn connecting rod, main bearing	Worn cam bushing	Loose engine mounting bolts, broken cushion	Broken part inside output shaft (damper)	Center of engine and power train misaligned	Improper gear train backlash	Defective dynamic valve system (valve, rocker lever, etc. stuck)	Defective injection pump (excessive fuel injection)
Questions	Confirm recent repair history									
	Degree of use of machine	Operated for long period	△	△	△					
	Condition of vibration	Suddenly increased				○			○	
		Gradually increased	○	○	○					
	Non-specified oil is being used		○	○						
Check items	Metal particles are found in oil filter		◎	◎						
	Metal particles are found when oil is drained		◎	◎						
	Oil pressure is low at low idling		○	○						
	Vibration occurs at mid-range speed				○	○				
	Vibration follows engine speed				○	○	○	○		
	Exhaust smoke is black								◎	○
	Seal on injection pump has come off									◎
Troubleshooting	Remove oil pan and inspect directly		●							
	Remove side cover and inspect directly			●						
	Inspect directly for loose engine mounting bolts, broken cushion				●					
	Inspect inside of output shaft (damper) directly					●				
	When face runout and radial runout are inspected, they are found to be incorrect						●			
	Remove front cover and inspect directly							●		
	Remove head cover and inspect directly								●	
	Injection pump test shows that injection amount is incorrect									●
		Remedy	Replace	Replace	Replace	Replace	Correct	Correct	Replace	Adjust

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90 OTHERS

HYDRAULIC CIRCUIT DIAGRAM 90- 3
ELECTRICAL CIRCUIT DIAGRAM (1/4)
PC130-7 Serial No.: 70001 – 70013 ..... 90- 5
ELECTRICAL CIRCUIT DIAGRAM (2/4)
PC130-7 Serial No.: 70001 – 70013 ..... 90- 7
ELECTRICAL CIRCUIT DIAGRAM (3/4)
PC130-7 Serial No.: 70001 – 70013 ..... 90- 9
ELECTRICAL CIRCUIT DIAGRAM (4/4)
PC130-7 Serial No.: 70001 – 70013 90-11
ELECTRICAL CIRCUIT DIAGRAM (1/4)
PC130-7 Serial No.: 70014 and up 90-13
ELECTRICAL CIRCUIT DIAGRAM (2/4)
PC130-7 Serial No.: 70014 and up 90-15
ELECTRICAL CIRCUIT DIAGRAM (3/4)
PC130-7 Serial No.: 70014 and up 90-17
ELECTRICAL CIRCUIT DIAGRAM (4/4)
PC130-7 Serial No.: 70014 and up 90-19

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