SHOP MANUAL

KOMATSU

PC1250-7
PC1250SP-7
PC1250LC-7

MACHINE MODEL	SERIAL No.
PC1250-7	**20001 and up**
PC1250SP-7	**20001 and up**
PC1250LC-7	**20001 and up**

- This shop manual may contain attachments 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.
- PC1250-7 mounts the SAA6D170E-3 engine.
  For details of the engine, see the 6D170-3 Series Engine Shop Manual.

Printed in Japan 09-19 (01)

FOREWORD
GENERAL

This shop manual has been prepared as an aid to improve the quality of repairs by giving the serviceman an accurate understanding of the product and by showing him the correct way to perform repairs and make judgements. Make sure you understand the contents of this manual and use it to full effect at every opportunity.

This shop manual mainly contains the necessary technical information for operations performed in a service workshop. For ease of understanding, the manual is divided into the following chapters; these chapters are further divided into the each main group of components.

STRUCTURE AND FUNCTION

This section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting.
In addition, this section may contain hydraulic circuit diagrams, electric circuit diagrams, and maintenance standards.

TESTING AND ADJUSTING

This section explains checks to be made before and after performing repairs, as well as adjustments to be made at completion of the checks and repairs.
Troubleshooting charts correlating "Problems" with "Causes" are also included in this section.

DISASSEMBLY AND ASSEMBLY

This section explains the procedures for removing, installing, disassembling and assembling each component, as well as precautions for them.

MAINTENANCE STANDARD

This section gives the judgment standards for inspection of disassembled parts.
The contents of this section may be described in STRUCTURE AND FUNCTION.

OTHERS

This section mainly gives hydraulic circuit diagrams and electric circuit diagrams.
In addition, this section may give the specifications of attachments and options together.

NOTICE

The specifications contained in this shop manual are subject to change at any time and without any advance notice. Use the specifications given in the book with the latest date.

ELECTRIC WIRE CODE

In the wiring diagrams, various colors and symbols are employed to indicate the thickness of wires.
This wire code table will help you understand WIRING DIAGRAMS.
Example: 5WB indicates a cable having a nominal number 5 and white coating with black stripe.

CLASSIFICATION BY THICKNESS

Norminal number	Copper wire			Cable O.D. (mm)	Current rating (A)	Applicable circuit
	Number of strands	Dia. of strands (mm^2)	Cross section (mm^2)			
0.85	11	0.32	0.88	2.4	12	Starting, lighting, signal etc.
2	26	0.32	2.09	3.1	20	Lighting, signal etc.
5	65	0.32	5.23	4.6	37	Charging and signal
15	84	0.45	13.36	7.0	59	Starting (Glow plug)
40	85	0.80	42.73	11.4	135	Starting
60	127	0.80	63.84	13.6	178	Starting
100	217	0.80	109.1	17.6	230	Starting

CLASSIFICATION BY COLOR AND CODE

Priority	Classification \ Circuits		Charging	Ground	Starting	Lighting	Instrument	Signal	Other
1	Primary	Code	W	B	B	R	Y	G	L
		Color	White	Black	Black	Red	Yellow	Green	Blue
2	Auxiliary	Code	WR	—	BW	RW	YR	GW	LW
		Color	White & Red	—	White & Black	Red & White	Rellow & Red	Green & White	Blue & White
3		Code	WB	—	BY	RB	YB	GR	LR
		Color	White & Black	—	Black & Yellow	Red & Black	Yellow & Black	Green & Red	Blue & Yellow
4		Code	WL	—	BR	RY	YG	GY	LY
		Color	White & Blue	—	Black & Red	Red & Yellow	Yellow & Green	Green & Yellow	Blue & Yellow
5		Code	WG	—	—	RG	YL	GB	LB
		Color	White & Green	—	—	Red & Green	Yellow & Blue	Green & Black	Blue & Black
6		Code	—	—	—	RL	YW	GL	—
		Color	—	—	—	Red & Blue	Yellow & White	Green & Blue	—

DIMENSIONS

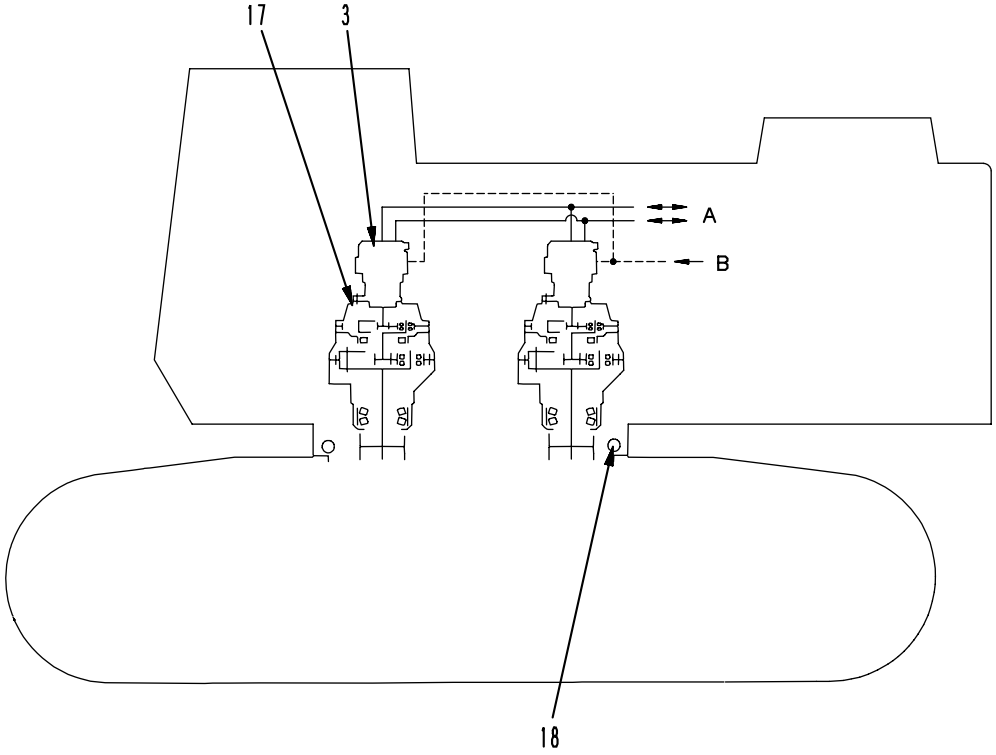
	Item	Unit	PC1250-7	PC1250SP-7	PC1250LC-7 (Only North America)
A	Overall length	mm	16,020	14,790	16,020
B	Overall height	mm	6,040	6,265	6,040
C	Overall width	mm	5,355	5,355	5,355
D	Track shoe width	mm	700	700	1,000
E	Height of cab	mm	4,120	4,120	4,120
F	Tail swing radius	mm	4,870	4,870	4,870
G	Track overall length	mm	6,425	6,425	7,400
H	Length of track on ground	mm	4,995	4,995	5,970
I	Min. ground clearance	mm	990	990	990

WORKING RANGES

	Item	Unit	PC1250-7	PC1250SP-7	PC1250LC-7 (Only North America)
A	Max. digging reach	mm	15,350	14,070	15,350
B	Max. digging depth	mm	9,350	7,900	9,350
C	Max. digging height	mm	13,400	13,000	13,400
D	Max. vertical wall depth	mm	7,610	5,025	7,610
E	Max. dumping height	mm	8,680	8,450	8,680
F	Max. reach at ground level	mm	15,000	13,670	15,000

Unit: kg

Machine model	PC1250-7 (Loading shovel specification)
Serial Number	20001 and up
Track shoe assembly	
• Standard shoe (700 mm)	10,630
• Wide shoe (1,000 mm)	12,940
• Wide shoe (1,200 mm)	—
Boom assembly (excl. piping)	6,190
Arm assembly (excl. piping)	4,970
Bucket assembly (excl. piping)	9,730
Boom cylinder assembly	1,073 x 2
Arm cylinder assembly	602 x 2
Bottom dump cylinder assembly	194 x 2
Bucket cylinder assembly	845 x 2
Boom foot pin	72 x 2
Boom cylinder foot pin	43.8 x 2
Boom cylinder top pin	43.8 x 2
Boom-arm connecting pin	80.6 x 2
Arm cylinder foot pin	24.2 x 2
Arm cylinder top pin	24.2 x 2
Bottom dump cylinder top pin	15.2 x 2
Bottom dump cylinder foot pin	23.1 x 2
Bucket cylinder top pin	50 x 2
Bucket cylinder foot pin	42.9 x 2
Arm-bucket connecting pin	67.9 x 2
Bucket connecting pin	33.1 x 2



SUP04896

1. Idler
2. Center swivel joint
3. Swing motor (KMF160AB-2)
4. L.H. 5-spool control valve
5. R.H. 4-spool control valve
6. Final drive, sprocket
7. Travel motor (MSF340VP)
8. Engine (SAA6D170E-3)
9. PTO
10. No. 3 pump (HPV160+160)
11. No. 1 pump (HPV95+95)
12. No. 2 pump (HPV95+95)
13. Control, PTO lubricating, aftercooler fan drive pump (SAR100+020+010)
14. Swing 4-spool control valve
15. Swing brake solenoid valve
16. Travel speed solenoid valve
17. Swing machinery
18. Swing circle

A. Swing 4-spool control valve
B. Swing brake solenoid valve

TRACK SHOE

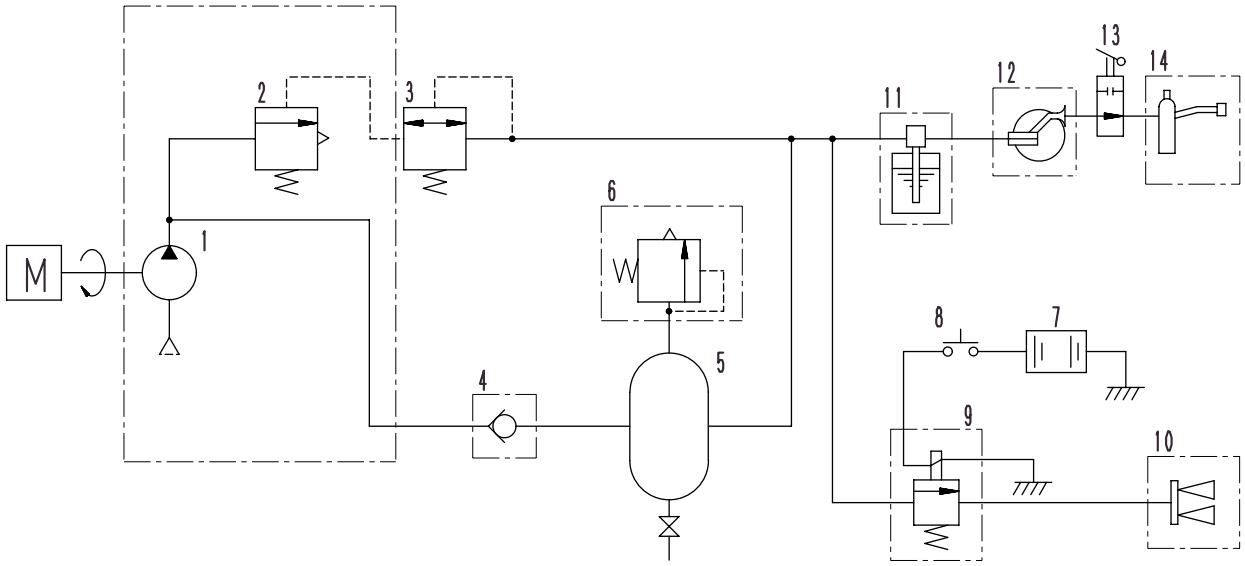
Standard shoe

Item \ Model	PC1250-7	PC1250SP-7	PC1250LC-7
Shoe width (double shoe)	700 mm	700 mm	1000 mm
Link pitch	280 mm	280 mm	280 mm
No. of shoes (each side)	48	48	55

Unit: mm

No.	Check item	Criteria					Remedy
10	Top-to-bottom width of idler guide			Standard size	Tolerance	Repair limit	Rebuild or replace
		Track frame		200	200±2	205	
		Idler support		195	195±1.2	185	Replace
11	Left-to-right width of idler guide	Track frame		395	395±2	405	Rebuild or replace
		Idler support		391	$391^{+1.4}_{-0.8}$	383	Replace
12	Recoil spring	Standard size			Repair limit		
		Free length x O.D.	Installation length	Installation load	Free length	Installation load	
		1,508 x 351	1,280	578.2 kN {58,957 kg}	—	460.9 kN {47,000 kg}	

AIR CIRCUIT DIAGRAM



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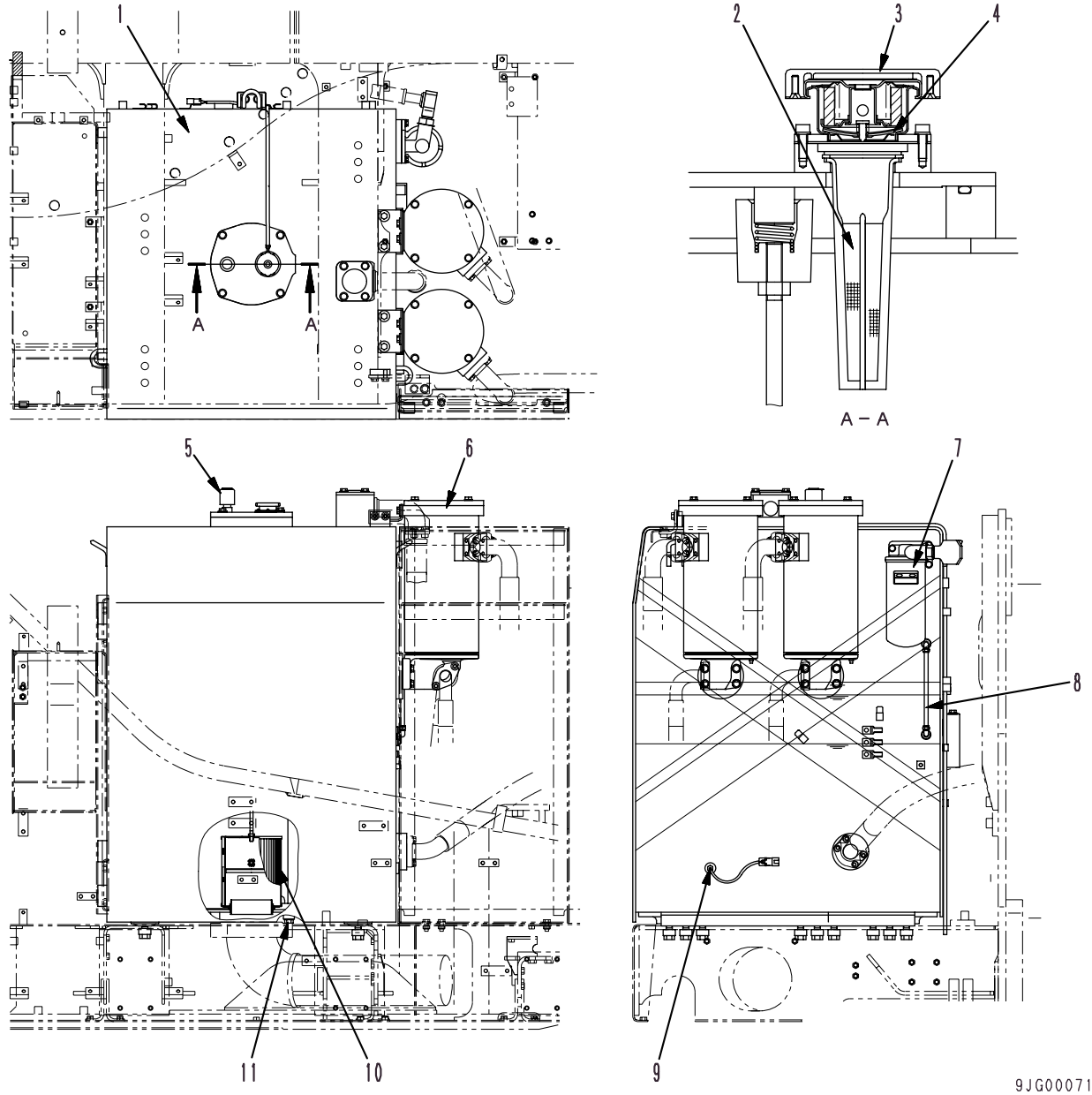
1. Air compressor (capacity: 70 ℓ/600 rpm)
2. Unloader valve
3. Air governor (cut-out pressure: 0.71 ± 0.03 MPa {7.2 ± 0.3 kg/cm²})
   (cut-in pressure: 0.59 ± 0.03 MPa {6.0 ± 0.3 kg/cm²})
4. Check valve
5. Air tank
6. Safety valve (set pressure: $0.95^{0}_{-0.05}$ MPa {$9.7^{0}_{-0.5}$ kg/cm²})
7. Battery
8. Horn switch
9. Horn valve
10. Air horn
11. Grease pump
12. Grease reel
13. Lock valve
14. Grease gun

HYDRAULIC TANK



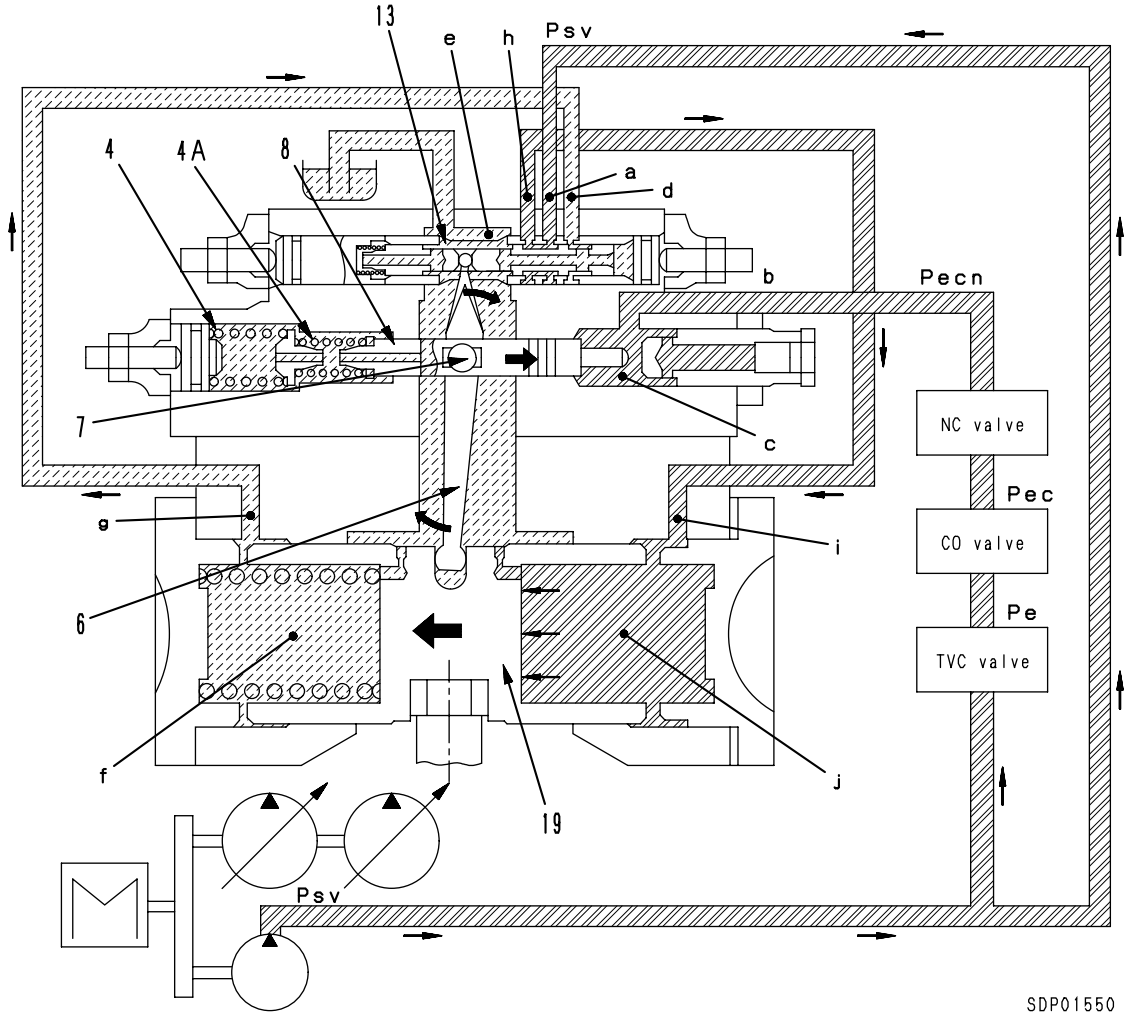
1. Hydraulic tank
2. Strainer
3. Oil filler cap
4. Pressure valve
5. Safety valve
6. Return filter
7. Drain filter
8. Sight guage
9. Hydraulic oil temperature gauge
10. Suction strainer
11. Drain valve

Specifications
Tank capacity: 1,146 ℓ
Amount of oil inside tank: 664 ℓ (at H level)

Pressure valve
Relief cracking pressure: 16.7 ± 6.9 kPa
{0.17 ± 0.07 kg/cm²}
Suction cracking pressure: 0 – 0.49 kPa
{0 – 0.005 kg/cm²}

Operation

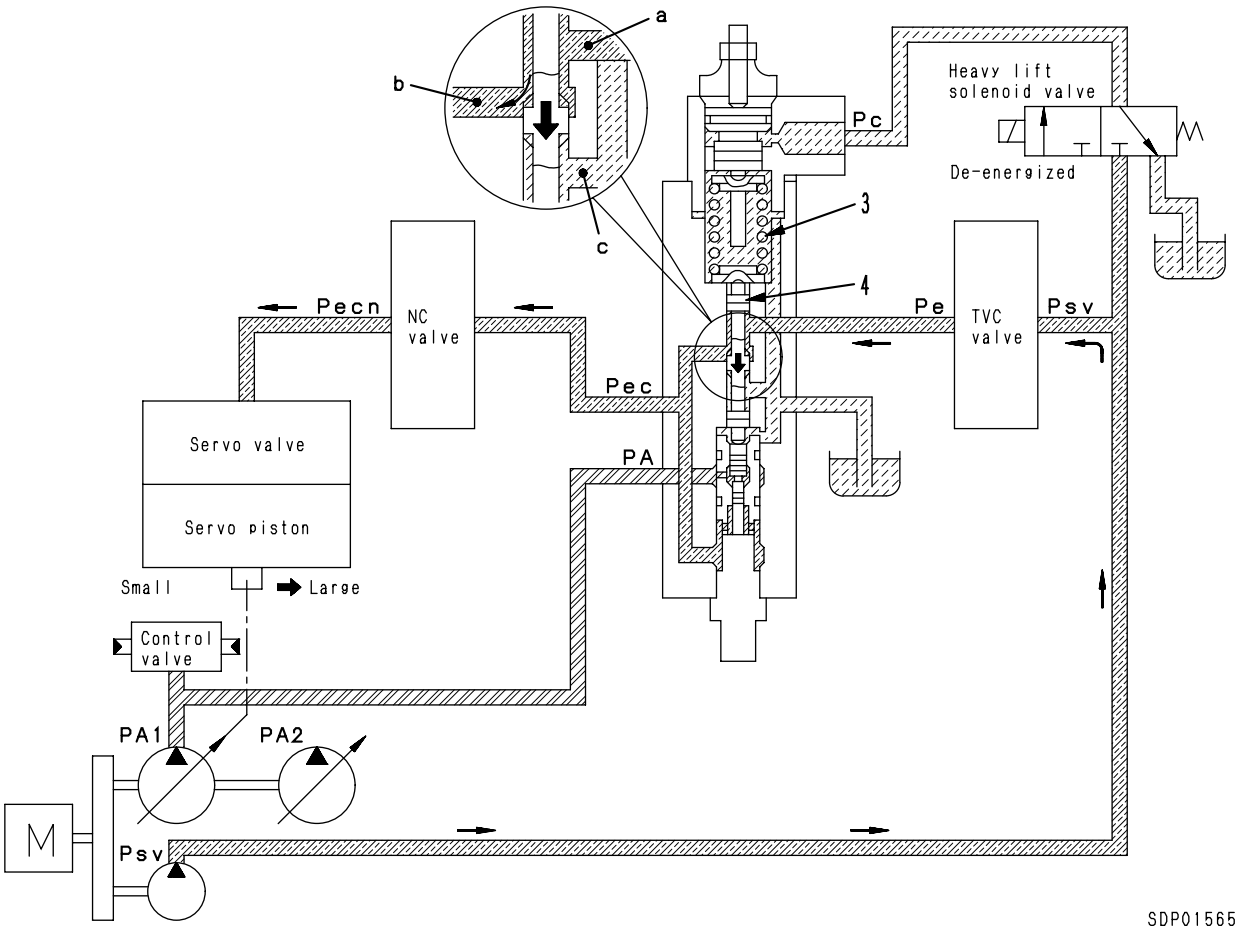
1) Operation in direction of increase of pump discharge amount (max. angle)



- The control pump pressure **Psv** is taken to port **a**.
  Signal pressure **Pecn** from the NC valve is taken from port **b** to chamber **c**.
- When signal pressure **Pecn** rises, control piston (8) is pushed to the left by the hydraulic pressure in chamber **c**, and stops at a point where it balances the pressure of springs (4) and (4A).
- At the same time, arm (6) uses servo piston (19) as a fulcrum and sways to the left in the same way as control piston (8). This moves guide spool (13) to the left.
- When guide spool (13) moves, port **a** and port **d** are closed and port **d** is connected to drain chamber **e**.
- As a result, servo piston chamber **f** is also interconnected with chamber **e** through port **g** and port **d**.
- At the same time, port **a** is interconnected with port **h**, so the oil flows through port **i** to servo piston chamber **j**, pushes servo piston (19) to the left, increases the swash plate angle in the main piston pump and increases the pump discharge amount.
- When servo piston (19) moves, arm (6) rotates clockwise with its center at pin (7). Guide spool (13) is moved to the right and closes port **a**, port **d** and port **h**, so the discharge increases by an amount that matches signal pressure **Pecn**.

FUNCTION AND OPERATION OF CO VALVE

1) When main pump discharge pressure is lower than relief pressure



Function

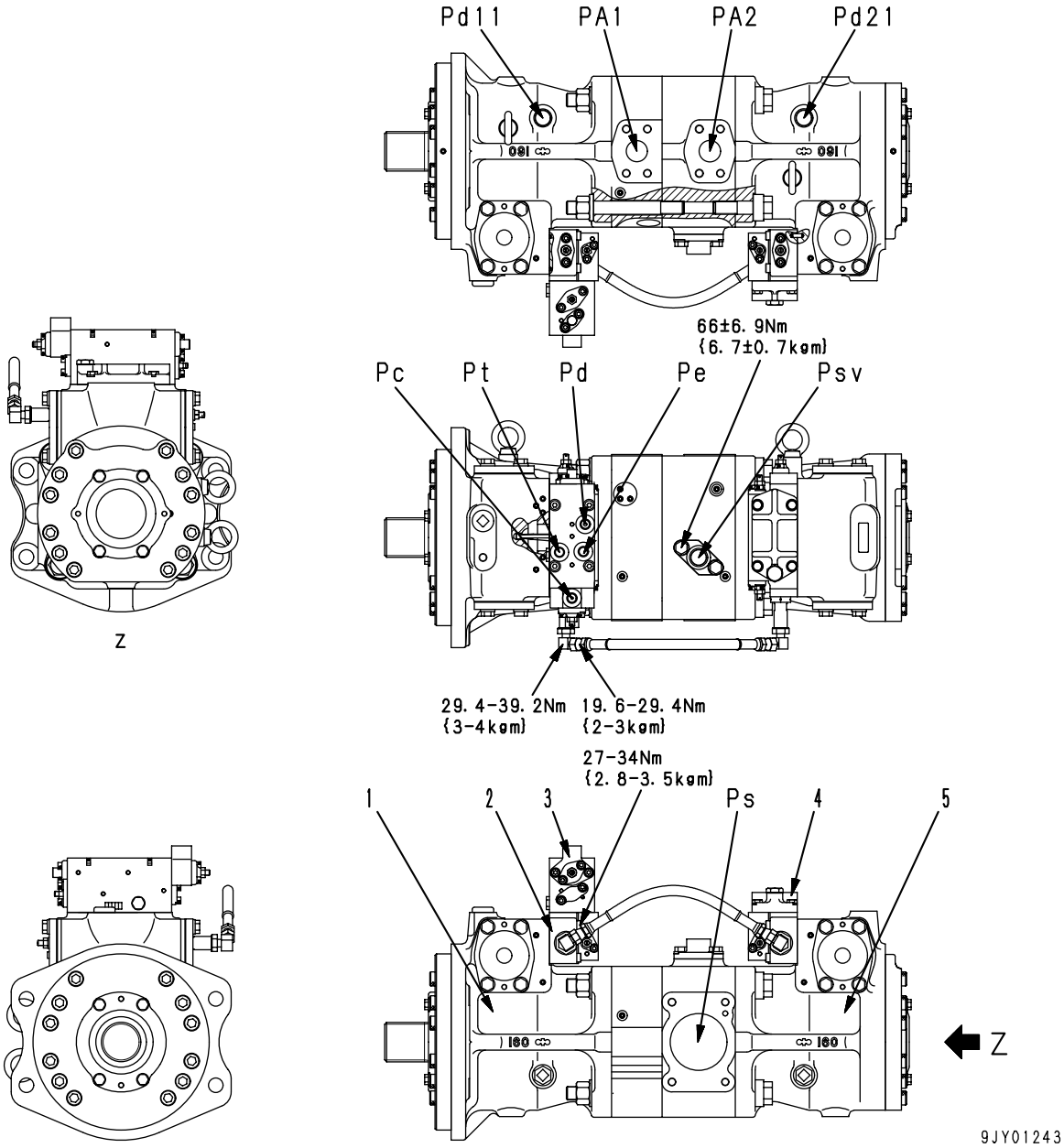
- When the load becomes large during operations and the main pump discharge pressure rises to a point close to relief pressure, the cut-off function of the CO valve acts to reduce the pump discharge in order to reduce relief loss.
- At the same time, it has a cut-off cancel function actuated by the pilot pressure from the heavy-lift solenoid valve.
- The CO valve is controlled by balancing the spring with the total of main pump discharge pressure **PA** and CO valve output pressure **Pec**.

Operation

- Spool (4) is being pushed down fully by spring (3).
- As a result, port **a** and port **b** are fully open and TVC valve output pressure **Pe** and CO valve output pressure **Pec** are equal.
- In this way, CO valve output pressure **Pec** becomes the maximum and the main pump discharge amount also becomes the maximum.

NO. 3 PUMP

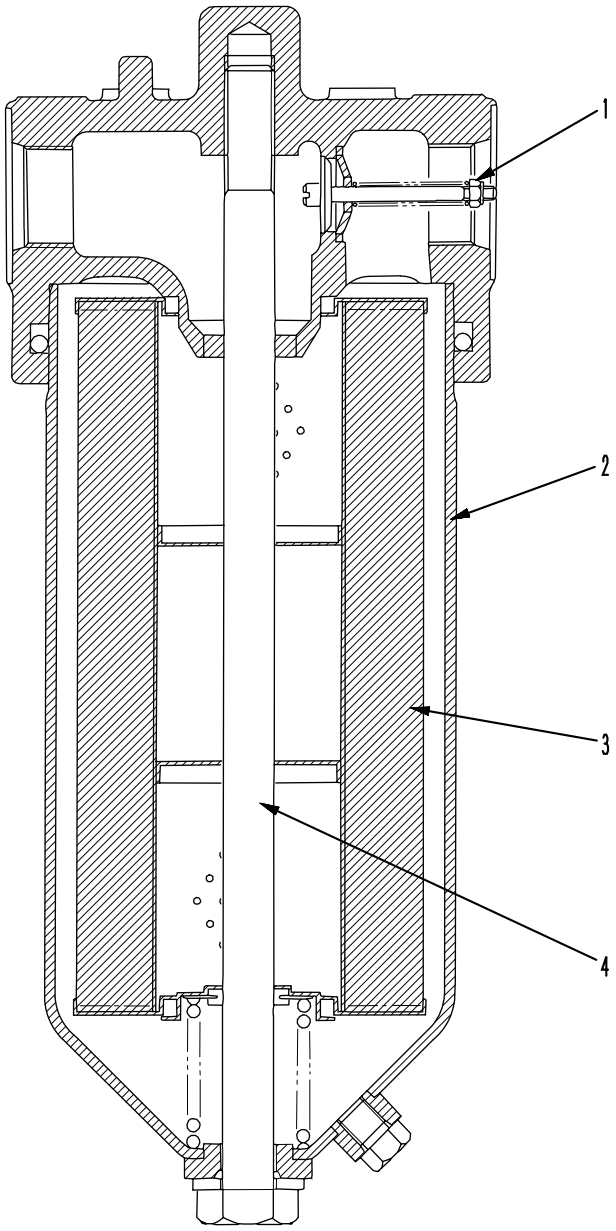
HPV160+160



1. Front pump
2. Front servo valve
3. Front CO, NC valve
4. Rear servo valve
5. Rear pump

PA1 : Discharge port
PA2 : Discharge port
Pd11 : Drain port
Pd21 : Drain port
Pc : CO selector pilot port
Pd : Jet sensor downstream pressure IN port
Pe : TVC valve output pressure IN port
Ps : Suction port
Pt : Jet sensor upstream pressure IN port
Psv: Servo basic pressure IN port

PILOT OIL FILTER



SUP04939

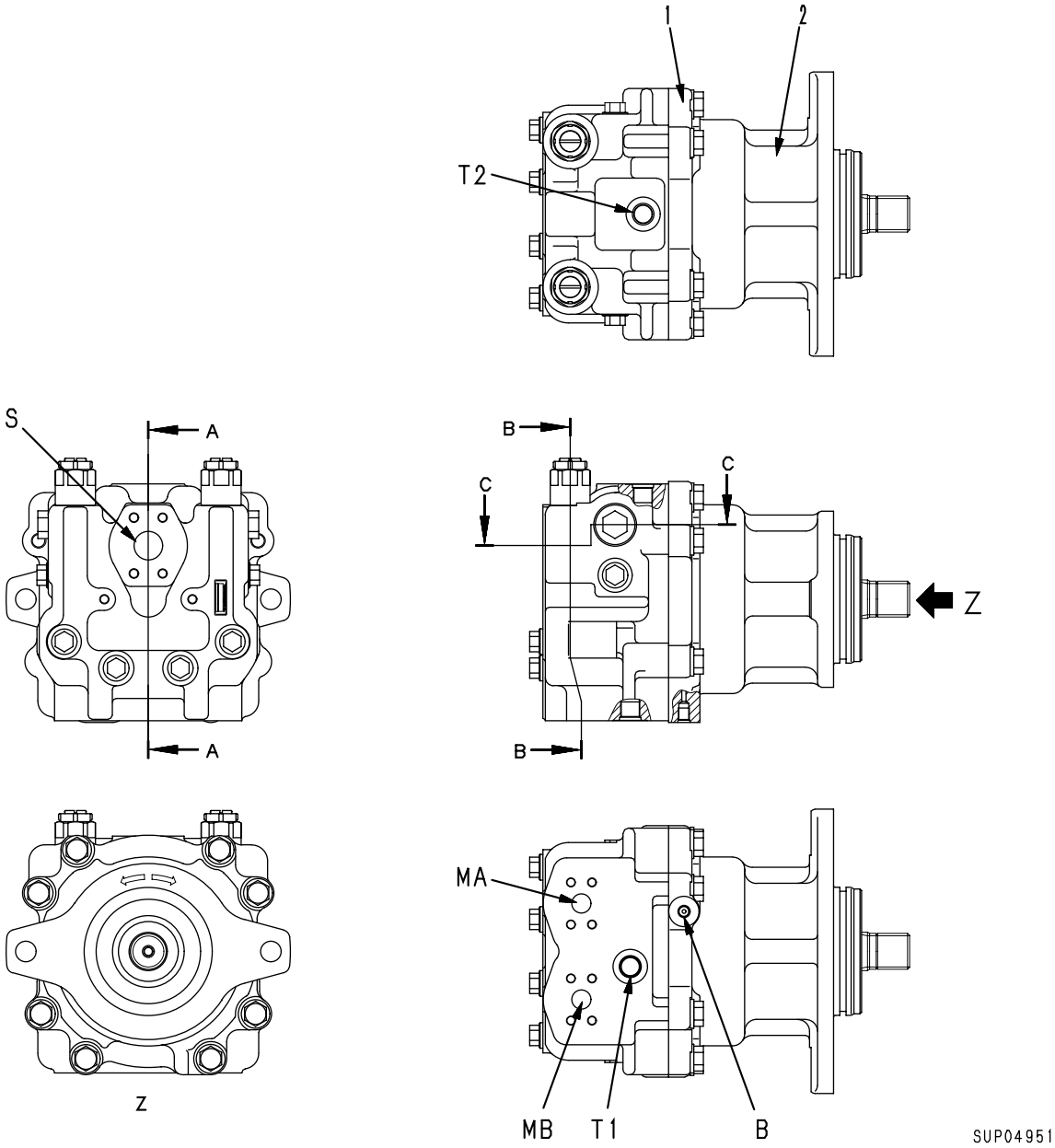
1. Relief valve
2. Case
3. Element
4. Center bolt

Outline
The pilot oil filter is installed to the discharge side of the control pump and protects the PPC valve and other pilot pressure equipment.

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Main relief valve, main valve spring	Free length x O.D.	Installation length	Installation load	Free length	Installation load	
		34.7 x 10.4	32.5	394.2 N {40.2 kg}	—	315.2 N {32.2 kg}	
2	Jet sensor relief valve, pilot poppet spring	34.5 x 10.8	29.4	30 N {3.1 kg}	—	24.3 N {2.5 kg}	
3	Jet sensor relief valve, main valve spring	37.4 x 11.4	33	49 N {5.0 kg}	—	39.2 N {4.0 kg}	Replace spring if damaged or deformed
4	Spool return spring	69.9 x 57	63	431 N {44 kg}	—	345 N {35.2 kg}	
5	Spool return spring	75 x 37	74.5	0 N {0 kg}	—	0 N {0 kg}	
6	Check valve spring	78.2 x 26.6	52	18.8 N {1.92 kg}	—	15.1 N {1.54 kg}	
7	Check valve spring	53.6 x 31	39	18.8 N {1.92 kg}	—	15.1 N {1.54 kg}	

SWING MOTOR
KMF160AB-2

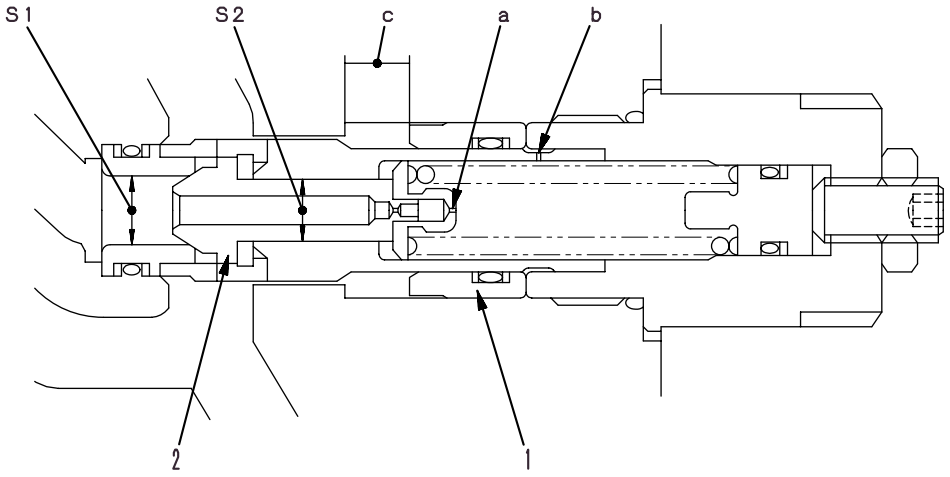


1. Swing motor
2. Swing holding brake

B : From swing holding brake solenoid valve
S : From tank
T1 : To tank
T2 : From cooling piping port S
MA: From swing control valve port B1
MB: From Swing control valve port A1

Specifications
Model: KMF160AB-2
Theoretical discharge: 160.7 cc/rev
Rated speed: 1830 rpm
Brake release pressure:
1.8 ± 0.4 MPa {18.4 ± 4 kg/cm^2}

1-4 Relief valve



SWP08666

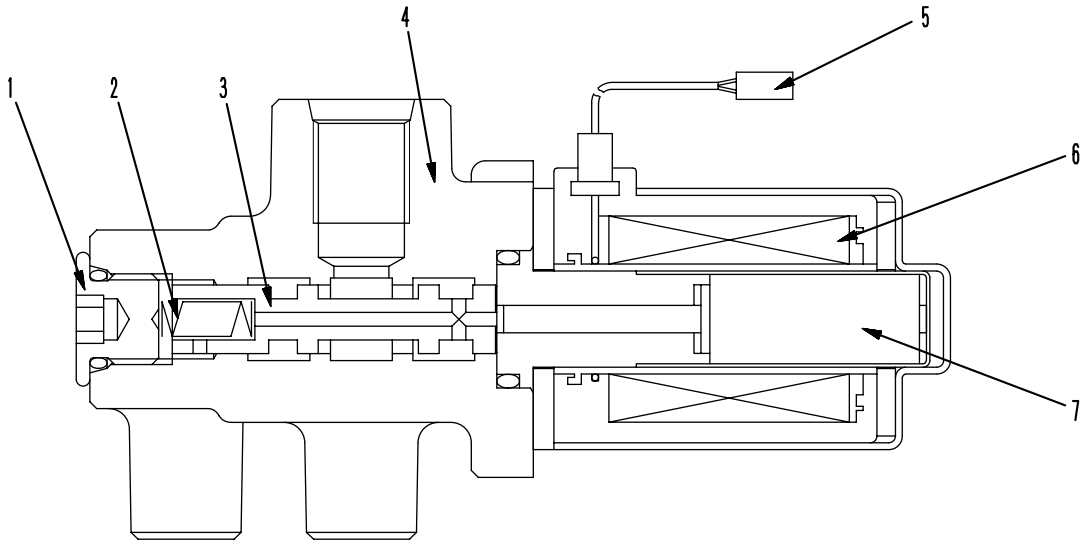
1. Shockless piston
2. Poppet
a. Poppet orifice
b. Relief housing orifice
c. Piston stroke

Function

In addition to the pressure control function, this relief valve has a shockless function (2-stage pressure increase function). This acts to reduce the shock generated at the beginning when the speed is reduced (when the machine is stopped).

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
11	Centering spring (for P3, P4)	Free length × OD	Installation length	Installation load	Free length	Installation load	Replace spring if damaged or deformed
		42.48 × 15.5	34	17.6 N {1.8 kg}	—	13.7 N {1.4 kg}	
12	Metering spring	26.7 × 8.14	24.9	16.6 N {1.69 kg}	—	13.2 N {1.35 kg}	
13	Centering spring (for P1, P2)	38.71 × 15.5	34	9.8 N {1 kg}	—	7.8 N {0.8 kg}	



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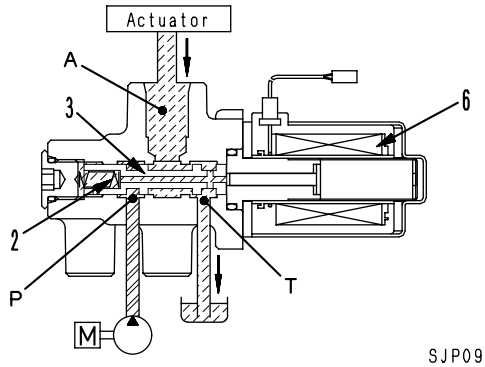
1. Plug
2. Spring
3. Spool
4. Block
5. Connector
6. Solenoid
7. Movable iron core

Operation

When solenoid is de-energized

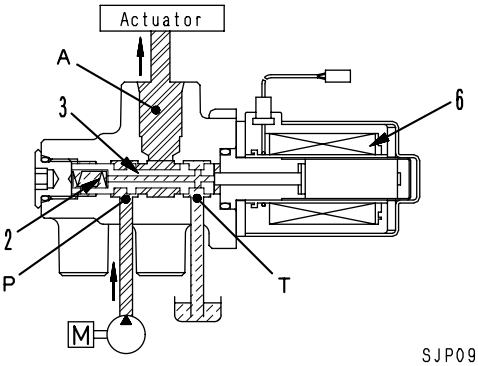
- When the signal current does not flow from the PPC lock switch or swing lock switch, solenoid (6) is de-energized.
  For this reason, spool (3) is pushed fully to the left by spring (2).
  As a result, the circuit between ports **P** and **A** closes and the pressurized oil from the control pump does not flow to the actuator.
  At the same time, the pressurized oil from the actuator flows from port **A** to port **T**, and is then drained to the tank.



SJP09434

When solenoid is energized

- When the signal current flows from the PPC lock switch or swing lock switch to solenoid (6), solenoid (6) is energized.
  For this reason, spool (3) is pushed to the right in the direction of the arrow.
  As a result, the pressurized oil from the control pump flows from port **P** through the inside of spool (3) to port **A**, and then flows to the actuator. At the same time, port **T** is closed, and this stops the oil from flowing to the tank.



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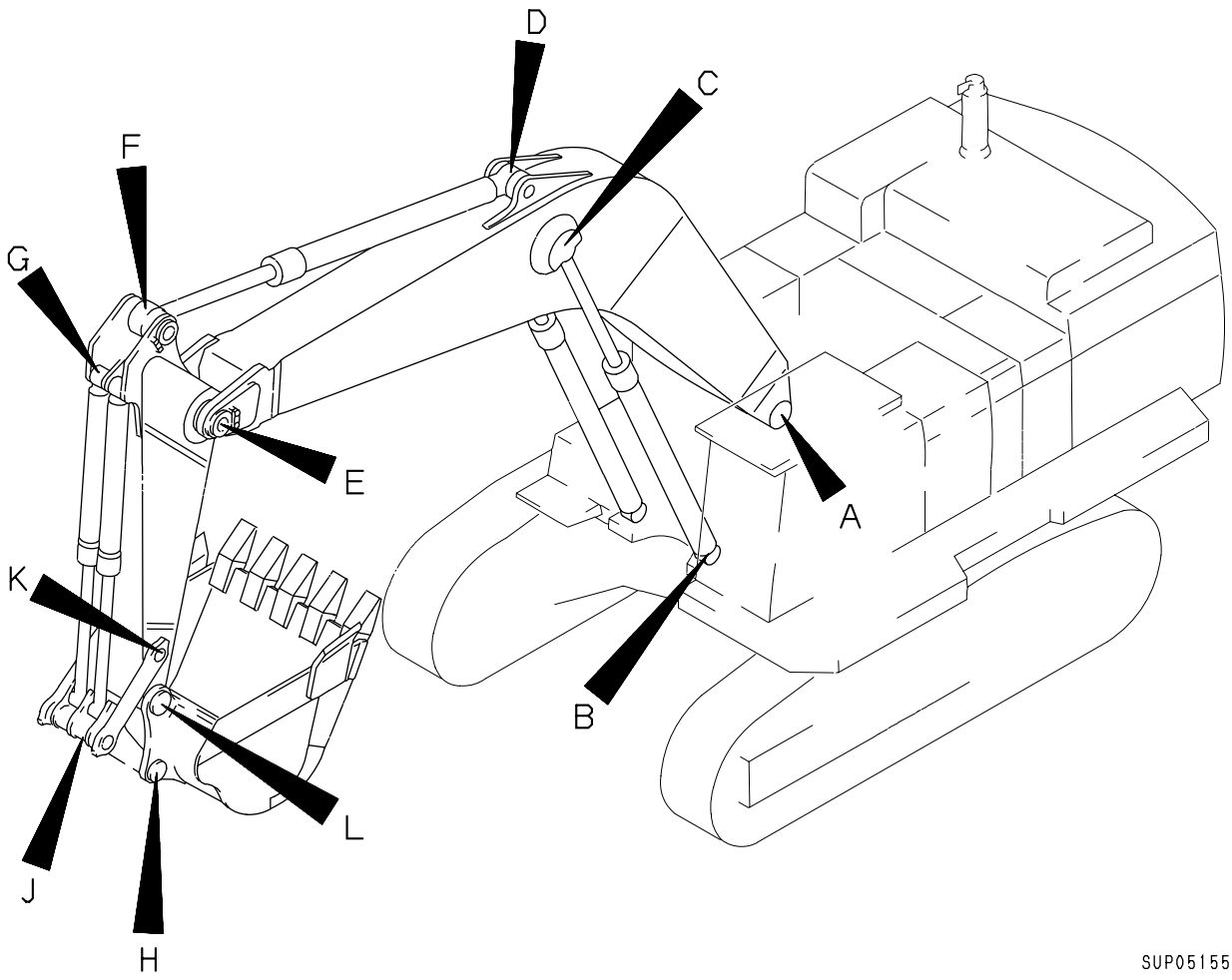

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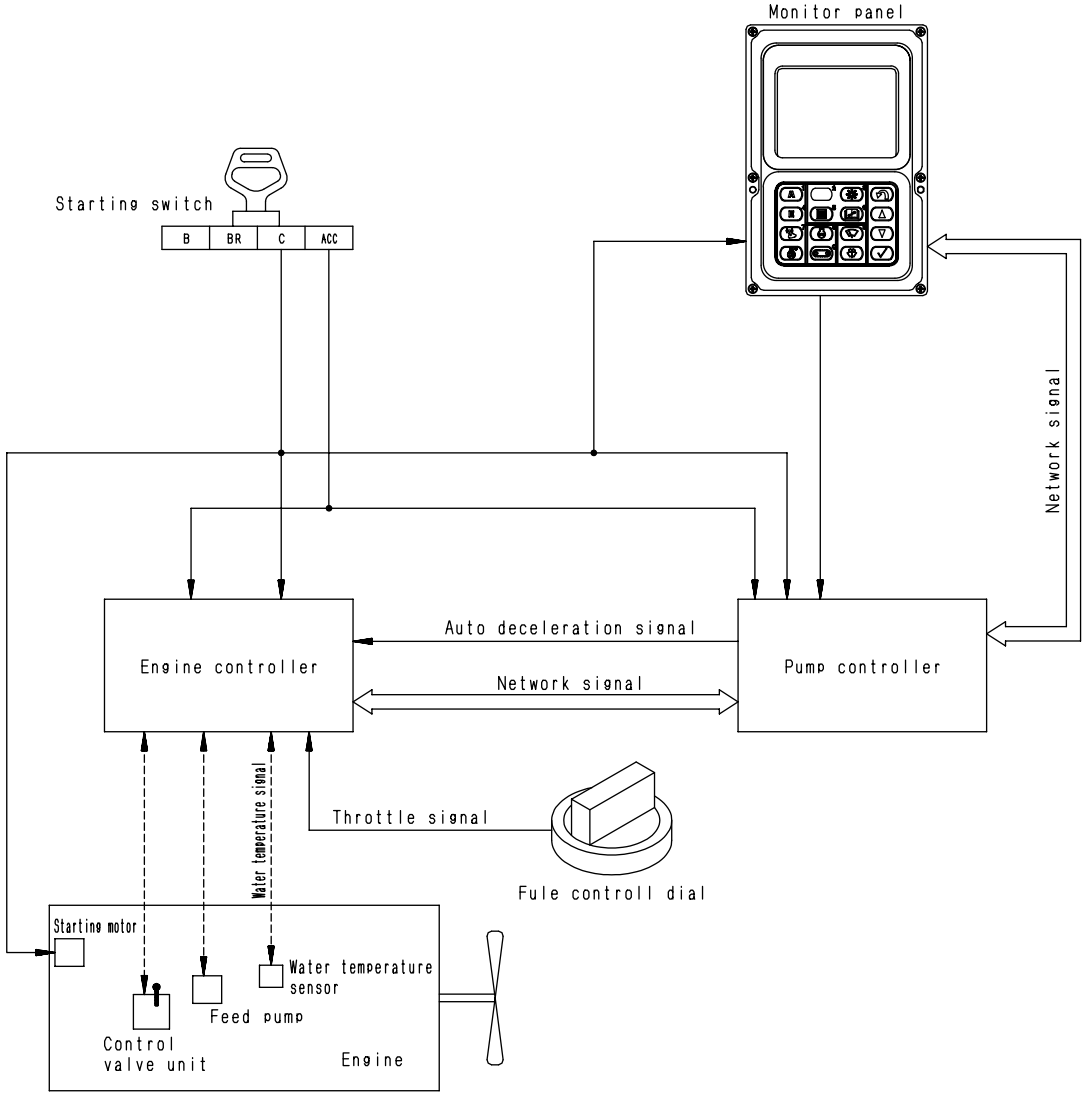
Unit: mm

No.	Check item	Criteria					Remedy
		Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
1	Clearance between bushing and mounting pin of boom and revolving frame	160	–0.043 –0.106	+0.436 +0.350	0.393 – 0.542	1.5	Replace
2	Clearance between bushing and mounting pin of boom and arm	160	–0.043 –0.106	+0.172 +0.085	0.128 – 0.278	1.5	
3	Clearance between bushing and mounting pin of arm and link	140	–0.043 –0.106	+0.404 +0.321	0.364 – 0.510	1.5	
4	Clearance between bushing and mounting pin of arm and bucket	140	–0.043 –0.106	+0.397 +0.312	0.355 – 0.503	1.5	
5	Clearance between bushing and mounting pin of link and link	140	–0.043 –0.106	+0.397 +0.312	0.355 – 0.503	1.5	
6	Clearance between bushing and mounting pin of link and bucket	140	–0.043 –0.106	+0.404 +0.321	0.364 – 0.510	1.5	
7	Bucket clearance	0.5 – 1.0					Adjust shims

Engine speed control

- The fuel control dial sends a signal voltage that matches the angle position to the engine controller.
  The engine controller calculates the engine speed to match that signal voltage and controls the control valve and fuel pump so that the engine runs at that speed.



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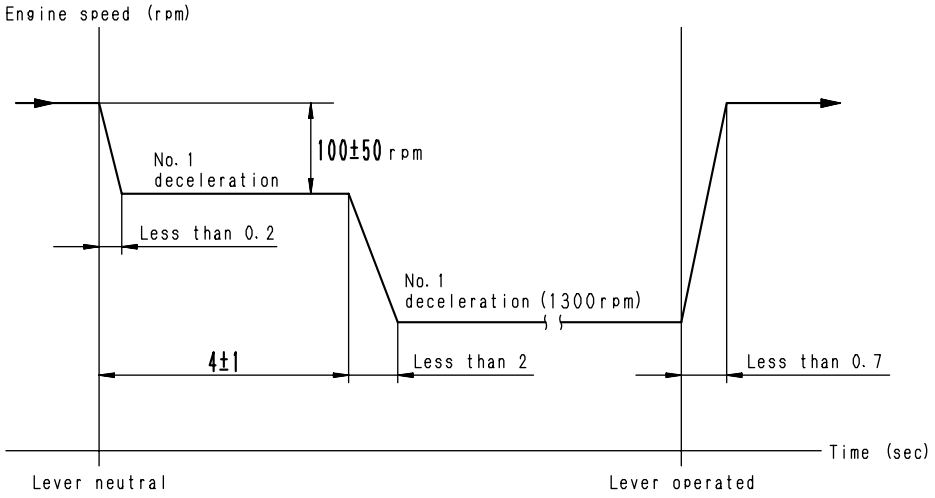
Operation

Control levers at neutral

- If the engine is running at above the deceleration actuation speed (approx. 1300 rpm), and all the control levers are returned to neutral, the engine speed drops immediately to approx. 100 rpm below the set speed to the No. 1 deceleration position.
- If another 4 seconds passes, the engine speed is reduced to the No. 2 deceleration position (approx. 1300 rpm), and is kept at that speed until a lever is operated.

When control lever is operated

- If any control lever is operated when the engine speed is at No. 2 deceleration, the engine speed will immediately rise to the speed set by the fuel control dial.



SJP09441

1) Engine automatic warming-up function
- After the engine is started, if the engine coolant temperature is low, the engine speed is automatically raised to warm up the engine.

Conditions for actuation (both are necessary)		Actuation
Coolant temperature: Less than 30°C Engine speed: Less than 1200 rpm	⇨	Engine speed: 1200 rpm

Conditions for cancellation (any one)		Cancellation
Automatic	Coolant temperature: 30°C or above	Engine speed: As desired
	Automatic warming-up time: 10 minutes or more	
Manual	Fuel control dial: Held at more than 70% of full throttle for more than 3 seconds	

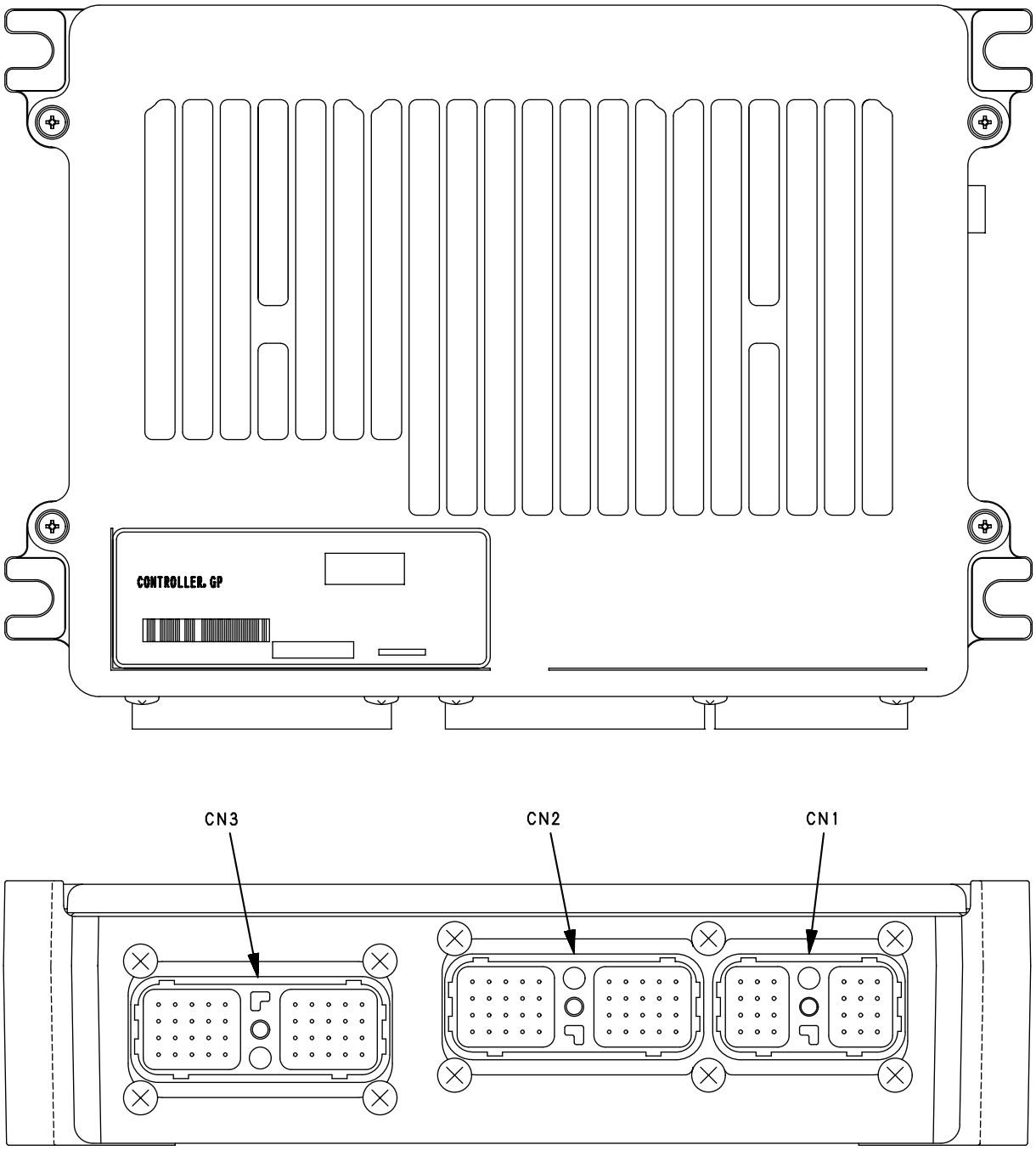
2) Engine overheat prevention function
- This function protects the engine by lowering the pump load and engine speed to prevent overheating when the engine coolant temperature has risen too high.
- This system is actuated at 105°C and above.

Actuation condition		Actuation, remedy
Coolant temperature: 105°C and above (Coolant temperature gauge: Red range)	⇨	Working mode : In any mode Engine speed : Low idle Monitor warning lamp : Lights up Alarm buzzer : Sounds

⇩

Cancel condition
Coolant temperature : Below 105°C

12. Components of system
Pump controller



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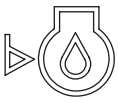
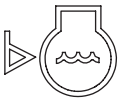
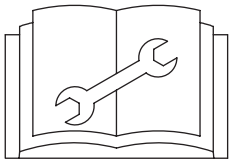
Checks before starting (caution lamps all light up), when maintenance interval is exceeded.
If the checks before starting or maintenance interval is exceeded items light up, the display of the hydraulic oil temperature gauge and the hydraulic oil temperature monitor are stopped, and the following cautions are displayed.

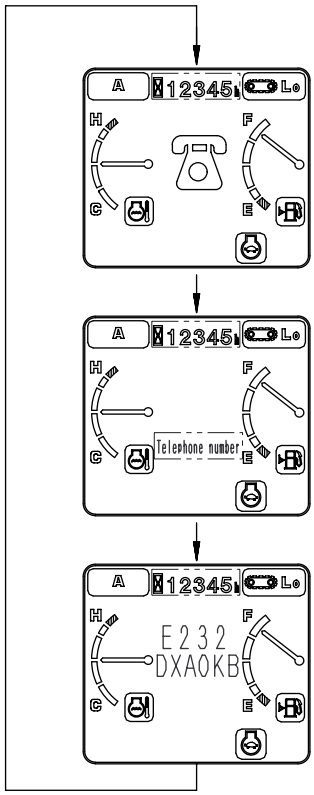
Symbol	Display item	Check before starting item	When engine is stopped	When engine is running
 SAP00520	Engine oil pressure	●	—	When abnormal, lights up and buzzer sounds
 SAP00522	Battery charge	●	—	Lights up when abnormal
 SAP00523	Radiator coolant level	●	Lights up when abnormal	When abnormal, lights up and buzzer sounds
 SAP00519	Engine oil level	●	Lights up when abnormal	—
 SAP00521	Air cleaner clogging	●	—	Lights up when abnormal
 SJP08780	Maintenance		Lights up when there is a warning. Lights up for only 30 sec. after key is turned ON, then goes out.	

The problems that have occurred are displayed in order from the left.

When the above cautions are displayed, if the hydraulic oil temperature is high or low, only the symbol is displayed.

Condition of hydraulic oil	Color of symbol
Low temperature (below B6 or equivalent)	Black on white background
Normal (B6 – B2)	No display
High temperature (above B2)	White on red background

- If the telephone number has been set using the telephone number input on the service menu, it is possible to switch on the service code/failure code and display the telephone symbol and telephone number.
  For details of inputting and setting the telephone number, see SPECIAL FUNCTIONS OF MONITOR PANEL in the TESTING AND ADJUSTING section.



SJP09581

20 TESTING AND ADJUSTING

STANDARD VALUE TABLE
STANDARD VALUE TABLE FOR ENGINE RELATED PARTS 20-2
STANDARD VALUE TABLE FOR CHASSIS RELATED PARTS 20-6

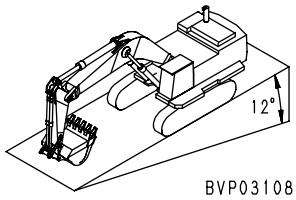
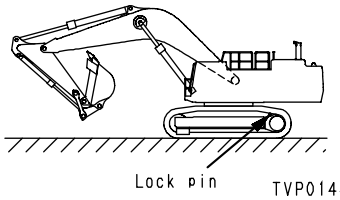
TESTING AND ADJUSTING 20-101

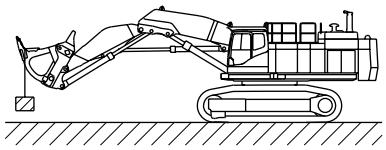
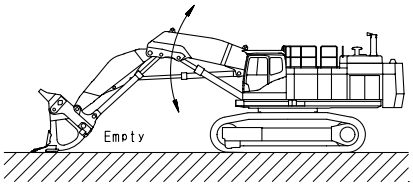
TROUBLESHOOTING 20-201

★ 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, insert 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 coolant level, always wait for the coolant to cool down. If the radiator cap is removed when the coolant is still hot, the coolant will spurt out and cause burns.**
⚠ **Be careful not to get caught in the fan, fan belt or other rotating parts.**

Applicable Model				PC1250-7, PC1250LC-7, PC1250SP-7	
Cate-gory	Item	Measuring Conditions	Unit	Standard value for new machine	Service limit value
Travel	Hydraulic drift of travel	Work equipment posture  BVP03108 • Engine stopped • Hydraulic oil temperature: 45 – 55°C • Stop machine on 12° slope with sprocket at uphill end of machine. • Do not place the work equipment on the ground. • Measure the distance the machine moves in 5 minutes.	mm	0	0
	Leakage of travel motor	Work equipment posture  TVP01443 • Engine at full throttle • Hydraulic oil temperature: 45 – 55°C • Lock shoes and relieve travel circuit.	ℓ/min	Max. 20	Max. 40

Applicable model						PC1250-7 (Loading shovel spec.)	
Category	Item		Measurement conditions		Unit	Standard value for new machine	Service limit value
Work equipment	Hydraulic drift of work equipment	Total work equipment (hydraulic drift at tip of bucket teeth)	Work equipment posture  BWP12292 • Place in above posture and measure extension or retraction of each cylinder and downward movement at tip of bucket teeth. • Engine stopped • Hydraulic oil temperature: 45 – 55°C • Horizontal, flat ground • All control levers at neutral • Bucket: Rated load or full load of soil Loading shovel specification: 114.7 kN {11,700 kg} • Start measuring immediately after setting. • Measure hydraulic drift every 5 minutes, and judge from results for 15 minutes. • Figures in ( ) are value when bucket is not loaded.		mm	Max. 1,400 (Max. 760)	Max. 2,100 (Max. 1,200)
		Boom cylinder (amount of retraction of cylinder)					
		Arm cylinder (amount of extension of cylinder)					
		Bucket cylinder (amount of retraction of cylinder)					
	Work equipment speed	Boom [Bucket teeth in contact with ground ↕ Cylinder fully extended]	• Work equipment posture  TJP03073 • Engine at full throttle • Hydraulic oil temperature: 45 – 55°C • In A mode • Bucket: No load	RAISE	sec	6.9 ± 0.7	Max. 8.3
				LOWER		4.8 ± 0.5	Max. 5.8

MEASURING AIR SUPPLY PRESSURE (BOOST PRESSURE)

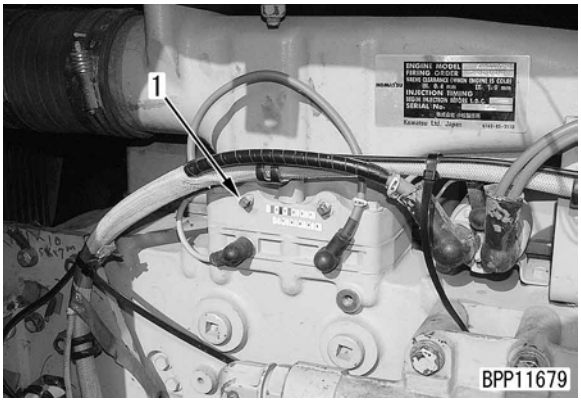
★ Tools for measuring air supply pressure (boost pressure)

Symbol	Part No.	Part Name
A	799-201-2202	Boost gauge kit

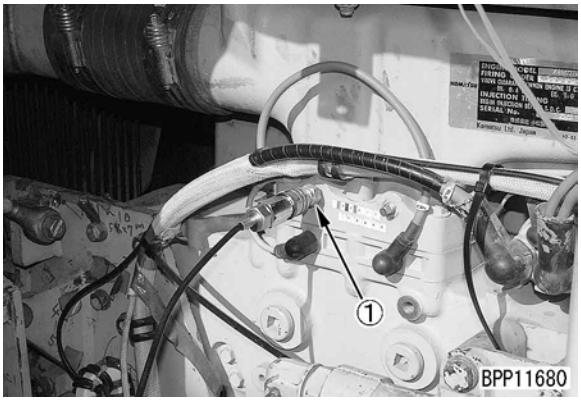
⚠ Be careful not to touch any hot parts when removing or installing the measuring tools.

★ Measure the air supply pressure (boost pressure) under the following conditions.
- Coolant temperature: Within operating range
- Hydraulic oil temperature: Within operating range

1. Remove air supply pressure measurement plug (1).



2. Fit nipple [1] of boost gauge kit **A**, then connect gauge [2].



3. Run the engine at a mid-range speed or above to bleed the oil from the hose.
★ Insert the connection of the hose and pressure gauge about half way, repeat the action to open the self-seal portion at the hose end, and bleed the oil.
★ If Pm kit (A) is available, the air bleed coupling (790-261-1130) inside the kit can be used.
★ If there is oil inside the hose, the gauge will not work, so always bleed the oil.

4. Run the engine at high idle under the following condition and measure the intake air pressure (boost pressure).
- Working mode switch: A-mode
- Heavy lift switch: ON
- Work equipment, swing, travel: Relieve circuit by raising boom.

5. After completing the measurement, remove the measuring equipment and set to the original condition.

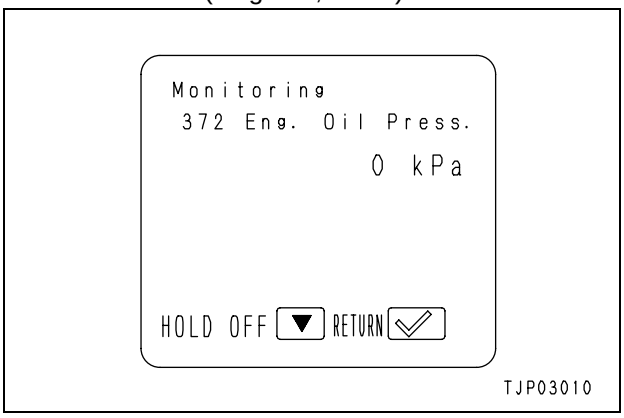
MEASURING ENGINE OIL PRESSURE

★ Tools for measuring engine oil pressure

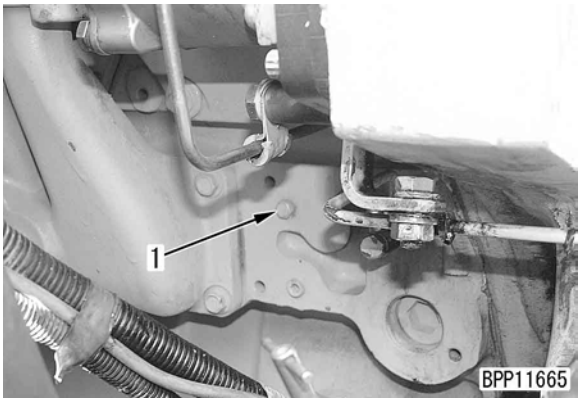
Symbol		Part No.	Part Name
H	1	799-101-5002	Hydraulic tester
		790-261-1203	Digital hydraulic tester
	2	799-401-2320	Hydraulic tester

★ Measure the engine oil pressure under the following conditions.
- Engine oil temperature: Min. 80°C
- Coolant temperature: Within operating range

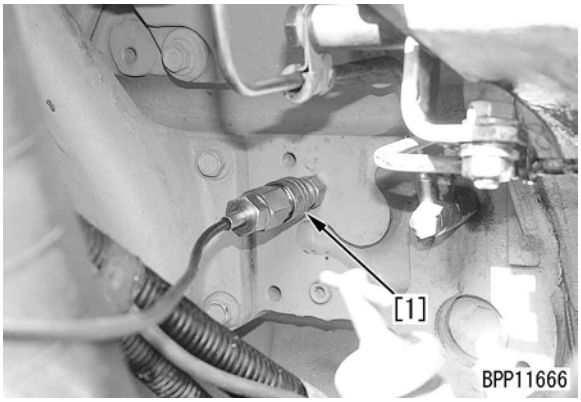
★ The engine oil pressure can be checked with the monitoring function of the monitor panel (For the operating method, see SPECIAL FUNCTION OF MONITOR PANEL).
- Monitoring code: **372** (Engine oil pressure)
- The engine oil pressure is displayed in units of 1 kPa (1 kg/cm^2, 1 PSI).



1. Remove oil pressure measurement plug (1).



2. Fit nipple [1] of hydraulic tester **H1**, then connect to hydraulic tester **H2**.



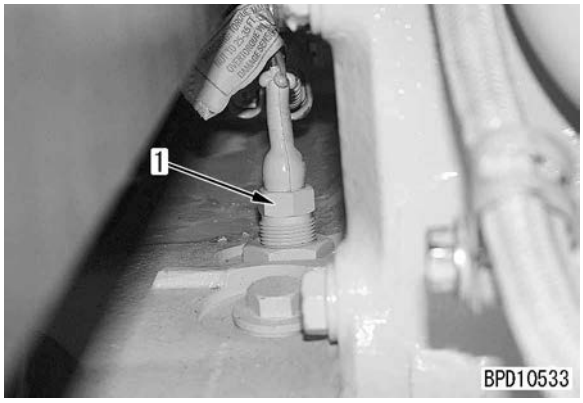
3. Start the engine, and measure the oil pressure at low idle and high idle.

4. After completing the measurement, remove the measuring equipment and set to the original condition.

ADJUSTING ENGINE SPEED SENSOR

★ If the engine speed sensor has been removed and installed or the flywheel has been removed or installed, adjust as follows.

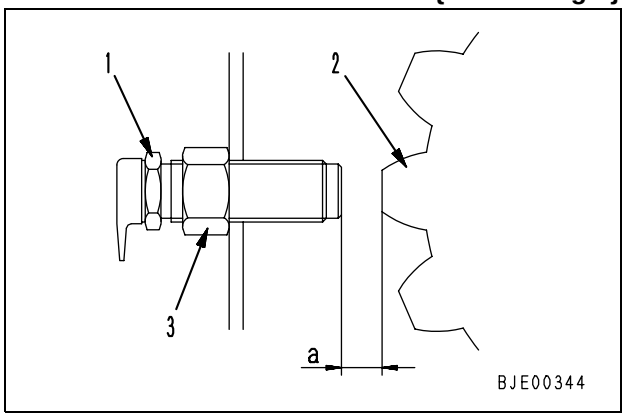
1. Remove engine speed sensor (1).
   ★ Before adjusting, remove the engine speed sensor, check that the tip of the sensor is not scratched and that there are no iron particles sticking to it, then install it again.



2. Screw in sensor (1) until the tip of the sensor contacts the tip of the tooth of flywheel ring gear (2).
   Thread: **Loctite hydraulic sealant (No. 21028)**

3. Return sensor (1) by the specified angle from that position.
   ★ Angle to return: 1/2 – 3/4 turns
   ★ Adjust clearance **a** between the tip of the sensor and the tip of the gear tooth so that it is 0.75 – 1.25 mm.

4. Secure sensor (1) in position, then tighten locknut (3).
   Locknut:
   33.9 – 47.5 Nm {3.5 – 4.8 kgm}



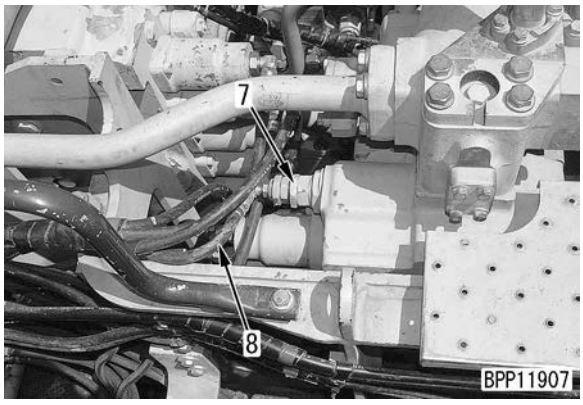
5. After completing the adjustment, switch the monitor panel to the monitoring display, and check that the engine speed is displayed normally.
   ★ For details of the method of operation, see SPECIAL FUNCTION OF MONITOR PANEL.
   • Monitoring code: 010 Engine speed

Adjusting

★ Do not adjust any safety valve other than the swing motor safety valve.

1. Adjusting main relief valve (high-pressure setting) of R.H. 4-spool control valve

★ If the work equipment hydraulic pressure in the front pump circuit (during machine push-up operation) and the right travel hydraulic pressure are abnormal, adjust the high pressure setting side of main relief valve (7) of the R.H. 4-spool control valve according to the following procedure.

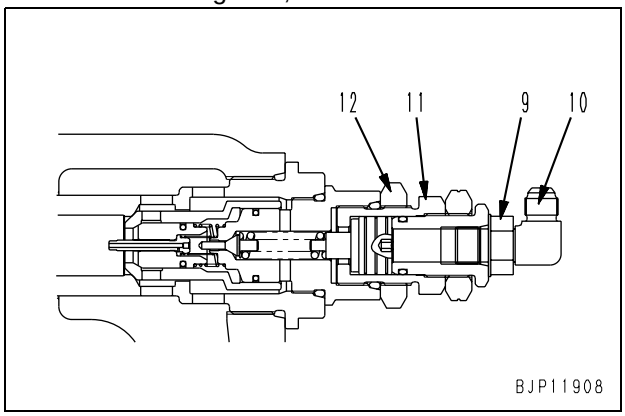


★ The high pressure setting is the state in which the 2-stage relief solenoid valve is turned ON and the pilot pressure is applied to the changeover port.

1) Disconnect hose (8).
2) Loosen locknut (9) and set elbow (10) free.
3) Fix holder (11) and loosen locknut (12).
4) Turn holder (11) to adjust the pressure.
   ★ If the holder is
   - turned to the right, the pressure rises.
   - turned to the left, the pressure lowers.

   ★ Pressure changed by 1 turn of holder: 21.8 MPa {222 kg/cm^2}
5) Fix holder (11) and tighten locknut (12).
   Locknut: **93 – 123 Nm {9.5 – 12.5 kgm}**

★ If the high pressure setting side is adjusted, the low pressure setting side changes. Accordingly, adjust the low pressure setting side, too.



6) Fix elbow (10) and tighten locknut (9).
7) Connect hose (8).
8) After finishing adjustment, check the hydraulic pressure again according to the above described measurement procedure.

2. Adjusting main relief valve (low-pressure setting) of R.H. 4-spool control valve

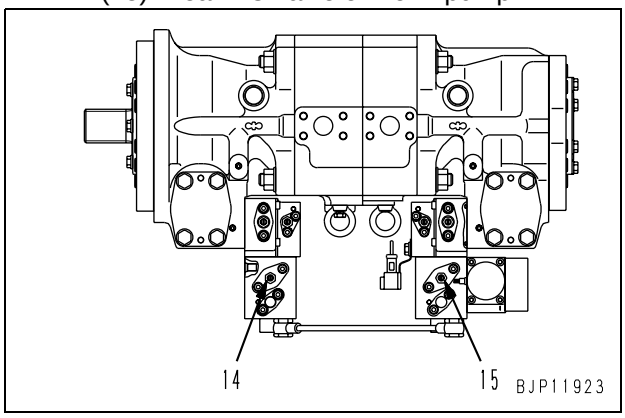
★ If the work equipment hydraulic pressure in the front pump circuit (during normal relief operation) is abnormal or the high pressure setting side was adjusted, adjust the low pressure setting side of main relief valve (7) of the R.H. 4-spool control valve according to the following procedure.

★ The low pressure setting is the state in which the 2-stage relief solenoid valve is turned OFF and the pilot pressure is not applied to the changeover port.

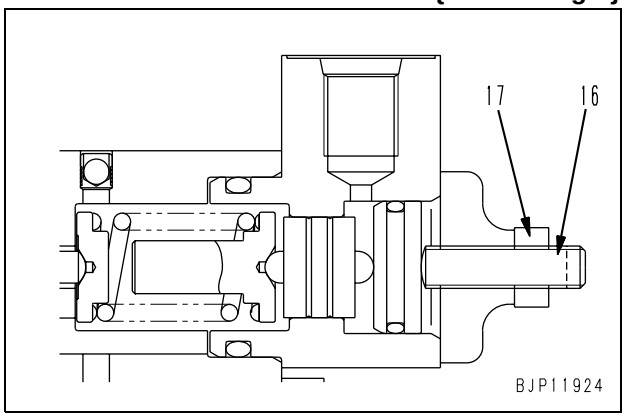
1) Disconnect hose (8).
2) Loosen locknut (9) and set elbow (10) free.
3) Fix union (14) and loosen locknut (15).
4) Turn union (14) to adjust the pressure.
   ★ If the union is
   - turned to the right, the pressure rises.
   - turned to the left, the pressure lowers.

   ★ Pressure changed by 1 turn of union: 21.8 MPa {222 kg/cm^2}

- (14): Front NC valve of No. 1 pump
- (15): Rear NC valve of No. 1 pump

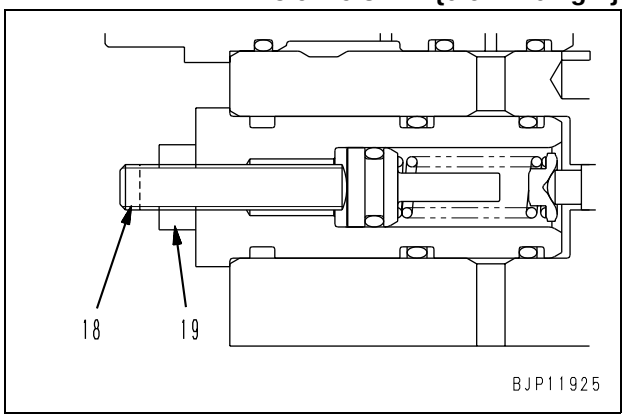


1) Adjusting CO valve side
   i) Fix adjustment screw (16) and loosen locknut (17).
   ii) Turn adjustment screw (16) to adjust the pressure.
      ★ If the adjustment screw is
         • turned to the right, the pressure rises.
         • turned to the left, the pressure lowers.
      ★ Pressure changed by 1 turn of adjustment screw: 2.20 MPa {22.4 kg/cm^2}
   iii) Fix adjustment screw (16) and tighten locknut (17).
      Locknut:
      5.9 – 9.8 Nm {0.6 – 1.0 kgm}



   iv) After finishing adjustment, check the oil pressure again according to the above described measurement procedure.

2) Adjusting NC valve side
   i) Fix adjustment screw (18) and loosen locknut (19).
   ii) Turn adjustment screw (18) to adjust the pressure.
      ★ If the adjustment screw is
         • turned to the right, the pressure rises.
         • turned to the left, the pressure lowers.
      ★ Pressure changed by 1 turn of adjustment screw: 0.42 MPa {4.3 kg/cm^2}
   iii) Fix adjustment screw (18) and tighten locknut (19).
      Locknut:
      5.9 – 9.8 Nm {0.6 – 1.0 kgm}

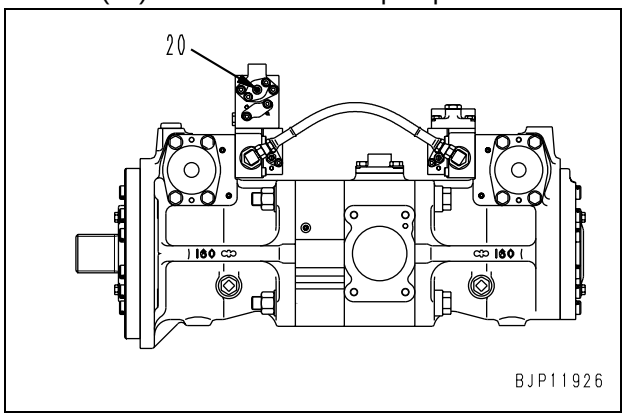


   iv) After finishing adjustment, check the oil pressure again according to the above described measurement procedure.

3. Adjusting CO-NC valves of No. 3

★ If the CO-NC valve output pressure of the No. 3 pump is abnormal, adjust CO valve (20) and NC valve (21) of the No. 3 pump according to the following procedure.

- (20): CO valve of No. 3 pump

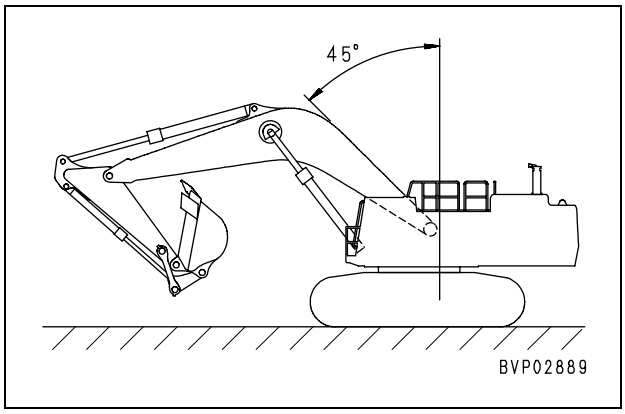


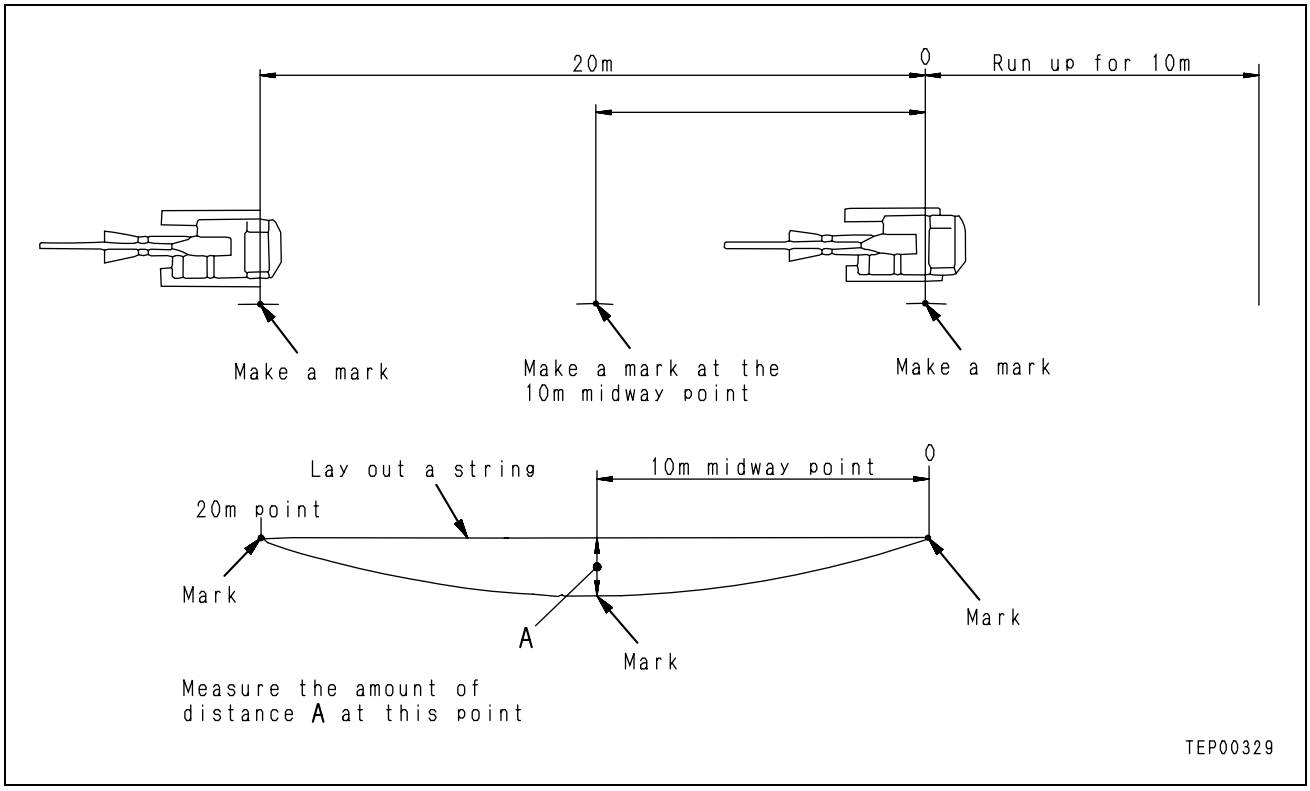
TESTING TRAVEL DEVIATION

★ When traveling on level ground.

1. Set the machine in the travel posture.
   ★ For the travel posture, extend the bucket and arm cylinder rods fully, and hold the boom angle at 45°.

2. Operate with the engine at full throttle, run up for 10 m, then measure the deviation **A** over the next 20 m.
   ★ Install the oil pressure gauge and measure the pump discharge pressure at the same time.





RELEASING REMAINING PRESSURE IN HYDRAULIC CIRCUIT

★ If the piping between the hydraulic cylinder and the control valve is to be disconnected, release the remaining pressure from the circuit as follows.
★ The travel circuit is an open circuit, so there is no remaining pressure. It is enough to remove the oil filler cap.

1. Loosen the oil filler cap slowly to release the pressure inside the tank.

2. Operate the control levers.
   ★ When the levers are operated 2 – 3 times, the pressure stored in the accumulator is removed.

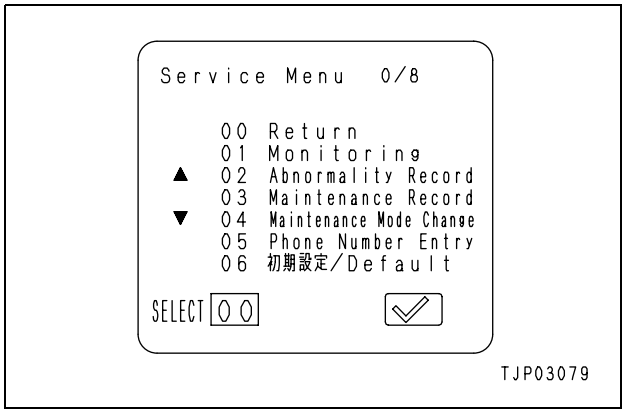
3. Start the engine, run at low idle for approx. 5 minutes, then stop the engine and operate the control levers.
   ★ Repeat the above operation 2 – 3 times to release all the remaining pressure.

User code	User code		Failure code			History division
	Code	Contents	Code	Component	Trouble	
E15	C441	Battery Voltage	C441KK	Battery voltage	Lowering of source voltage (Input)	Electrical system
E15	C442	Battery Voltage	C442KG	Battery voltage	Rise of source voltage (Overcharge)	Electrical system
E10	C451	Fuel Rail P. Sensor	C451KX	Fuel rail pressure sensor	Out of input signal range	Electrical system
E10	C452	Fuel Rail P. Sensor	C452KX	Fuel rail pressure sensor	Out of input signal range	Electrical system
E10	C455	Fuel Rail Actuator Circuit	C455KZ	Fuel rail actuator	Disconnection or short circuit	Electrical system
E11	C467	Timing Actuator Control	C467LK	Timing actuator	Disagreement of feedback signal and output signal	Electrical system
E11	C468	Rail Actuator Control	C468LK	Fuel rail actuator	Disagreement of feedback signal and output signal	Electrical system
E10	C514	Rail Actuator Stuck	C514LK	Fuel rail actuator	Disagreement of feedback signal and output signal	Electrical system
E11	C554	Fuel Rail P. In Range Error	C554L6	Fuel rail pressure sensor	Disagreement of signals and run/stop of engine	Electrical system
—	E101	Abnormality Error Record	DAF0KT	Monitor controller	Internal defect of controller	Electrical system
—	E112	Wiper Drive (For) S/C	DY2DKB	Wiper motor (Forward)	Short circuit	Electrical system
—	E113	Wiper Drive (Rev) S/C	DY2EKB	Wiper motor (Reverse)	Short circuit	Electrical system
—	E114	Washer Drive S/C	DY2CKB	Windshield washer motor	Short circuit	Electrical system
—	E115	Wiper Working Abnormality	DY20KA	Wiper motor	Disconnection	Electrical system
—	E116	Wiper Parking Abnormality	DY20MA	Wiper motor	Malfunction	Electrical system
—	E201	CO Cancel Sol. S/C	DW48KB	Cut-off cancel solenoid valve	Short circuit	Electrical system
—	E202	Travel Junction Sol. S/C	DW91KB	Travel neutral solenoid valve	Short circuit	Electrical system
E03	E203	Swing Brake Sol. S/C	DW45KB	Swing holding brake solenoid valve	Short circuit	Electrical system
—	E204	2-stage Relief Sol. S/C	DWK0KB	2-stage relief solenoid valve	Short circuit	Electrical system
—	E205	Swing Priority Sol. S/C	DW41KB	Swing solenoid valve	Short circuit	Electrical system
—	E206	Travel Speed Sol. S/C	DW43KB	Travel high-low selector solenoid valve	Short circuit	Electrical system
—	E207	Flash Light Relay S/C	D163KB	Flash light drive relay	Short circuit	Electrical system
—	E211	CO Cancel Sol. Disc.	DW48KA	Cut-off cancel solenoid valve	Disconnection	Electrical system
—	E212	Travel Junction Sol. Disc.	DW91KA	Travel neutral solenoid valve	Disconnection	Electrical system
E03	E213	Swing Brake Sol. Disc.	DW45KA	Swing holding brake solenoid valve	Disconnection	Electrical system
—	E214	2-stage Relief Sol. Disc.	DWK0KA	2-stage relief solenoid valve	Disconnection	Electrical system
—	E215	Swing Priority Sol. Disc.	DW41KA	Swing solenoid valve	Disconnection	Electrical system
—	E216	Travel Speed Sol. Disc.	DW43KA	Travel high-low selector solenoid valve	Disconnection	Electrical system
—	E217	Model selection Abnormality	DA2SKQ	Engine throttle and pump controller S-NET communication	Disagreement of model selection signals	Electrical system
—	E218	S-Net Comm. Disc.	DA2SKA	Engine throttle and pump controller S-NET communication	Disconnection	Electrical system
—	E221	J1939 Comm. Error	DA2RKR	Engine throttle and pump controller CAN communication	Defective communication (Abnormality in objective component system)	Electrical system
—	E222	Working Mode Output S/C (1)	D5ZJKB	Working mode signal	Short circuit	Electrical system
—	E223	Working Mode Output Disc. (1)	D5ZJKA	Working mode signal	Disconnection	Electrical system
—	E224	Working Mode Output S/C (2)	D5ZLKB	Working mode (Hi regulation) signal	Short circuit	Electrical system

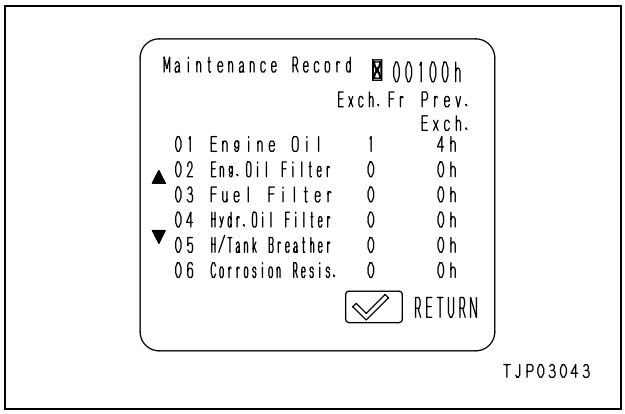
16. Function for Maintenance Record [03]

The monitor panel records information on the maintenance of filters and oils. The stored information can be displayed through the following switch operation.

1) Selection of menu
Select 03 Maintenance Record in Service Menu and depress [✓] switch.



2) Information to be displayed
[1]: Name of oils and filters
[2]: Times of replacement to date
[3]: Service meter reading at the latest replacement



3) Monitoring items of automatic snap shot function

Monitoring item	Failure code	Criterion for abnormality
Engine speed	C115KZ	Engine speed is not sensed.
Engine overspeed	C234N1	Engine speed exceeds 2,900 rpm.
	A000N1	Engine speed exceeds 2,625 rpm.
Low engine oil pressure	B@BAZG	Oil pressure is below straight line connecting each couple of following points. • Engine speed of 600 rpm and oil pressure of 49 kPa {0.5 kg/cm^2} • Engine speed of 1,000 rpm and oil pressure of 88 kPa {0.9 kg/cm^2} • Engine speed of 1,500 rpm and oil pressure of 147 kPa {1.5 kg/cm^2} • Engine speed of 1,800 rpm and oil pressure of 181 kPa {1.85 kg/cm^2} • Engine speed of 2,000 rpm and oil pressure of 206 kPa {2.1 kg/cm^2}
High fuel temperature	C261NS	Fuel temperature exceeds 76°C.
High pump relief pressure	DHPAZL	Relief pressure keeps above 37.3 MPa {380 kg/cm^2} for 1 second.
	DHPBZL	
	F@HCZL	
High PTO temperature	B@CBNS	PTO temperature keeps above 125°C for 1 second.
Abnormal gear pump pressure (for pilot)	J100L6	When engine speed is above 1,750 rpm and hydraulic oil temperature is above 50°C, • gear pump pressure keeps below 2.8 MPa {29 kg/cm^2} for 5 seconds. • gear pump pressure keeps above 3.7 MPa {38 kg/cm^2} for 5 seconds.
Abnormal gear pump pressure (for driving A/A fan)	j100L6	When engine speed is above 1,750 rpm and hydraulic oil temperature is above 50°C, • gear pump pressure keeps below 4.9 MPa {50 kg/cm^2} for 5 seconds. • gear pump pressure keeps above 22.5 MPa {230 kg/cm^2} for 5 seconds.
High exhaust temperature	F@BYNS	When engine speed is below 1,400 rpm, temperature keeps above 750°C for 1 second.
	F@BZNS	Exhaust temperature keeps above straight line connecting each couple of following points for 1 second. • Engine speed of 1,400 rpm and temperature of 750°C • Engine speed of 1,800 rpm and temperature of 700°C Engine speed is above 1,800 rpm and temperature keeps above 700°C for 1 second.
	F@BYNR	Engine speed is below 1,400 rpm and temperature keeps above 800°C for 10 seconds.
	F@BZNR	Exhaust temperature keeps above straight line connecting each couple of following points for 10 seconds. • Engine speed of 1,400 rpm and temperature of 800°C • Engine speed of 1,800 rpm and temperature of 750°C Engine speed is above 1,800 rpm and temperature keeps above 750°C for 10 seconds.
High blow-by pressure	F@BBZL	Blow-by pressure exceeds 8.83 kPa {900 mmAq}
High engine coolant temperature	B@BCNS	Engine coolant temperature exceeds 105°C for 5 seconds.

Operating procedure for Quick Pm

No.	Elapsed time		Time on snap data	Fuel dial	Swing lock switch	Operation of lever	Data read in Pm clinic after data are downloaded
1	Start ↓ Finish	0:00 ↓ 0:30	–330.00 ↓ –300.00	MIN (Low)	OFF	Set all levers in neutral.	• Engine speed (Low idle) • Engine oil pressure (Low idle) • Engine coolant temperature • Hydraulic oil temperature • Outside temperature • Control pump pressure (Low idle)
2	Start ↓ Finish	0:30 ↓ 1:00	–300.00 ↓ –270.00	MAX (High)	OFF	Set all levers in neutral (Turn decelerator on).	• Engine speed (2nd deceleration speed)
3	Start ↓ Finish	1:00 ↓ 1:30	–270.00 ↓ –240.00	MAX (High)	OFF	Move levers finely [Note] (Turn decelerator off).	• Engine speed (High idle) • Engine oil pressure (High idle) • Control pump pressure (High idle) • Fan pump pressure
4	Start ↓ Finish	1:30 ↓ 2:30	–240.00 ↓ –180.00	MAX (High)	OFF	Raise right-hand track shoe and drive it idle (Set lever to stroke end).	• Front pump oil pressure (Hydraulic pressure)
5	Start ↓ Finish	2:30 ↓ 3:30	–180.00 ↓ –120.00	MAX (High)	OFF	Swing 180°. Raise left-hand track shoe and drive it idle (Set lever to stroke end).	• Rear pump oil pressure (Hydraulic pressure)
6	Start ↓ Finish	3:30 ↓ 4:00	–120.00 ↓ –90.00	MAX (High)	ON	R.H. swing relief.	• Swing pump oil pressure (Relief pressure)
7	Start ↓ Finish	4:00 ↓ 4:30	–90.00 ↓ –60.00	MAX (High)	ON	L.H. swing relief.	• Swing pump oil pressure (Relief pressure)
8	Start ↓ Finish	4:30 ↓ 5:00	–60.00 ↓ –30.00	MAX (High)	ON	Arm OUT relief.	• Front, rear, swing pump oil pressure (Low relief pressure)
9	Start ↓ Finish	5:00 ↓ 5:30	–30.00 ↓ 00.00	MAX (High)	ON	Bucket DUMP relief.	• Front, rear pump oil pressure (Low relief pressure)
10	Start ↓ Finish	5:30 ↓ 6:00	00.00 ↓ 30.00	MAX (High)	ON	Bucket CURL relief.	• Front, rear, swing pump oil pressure (Low relief pressure)
11	Start ↓ Finish	6:00 ↓ 6:30	30.00 ↓ 60.00	MAX (High)	ON	Arm IN relief.	• Front, rear, swing pump oil pressure (Low relief pressure)
12	Start ↓ Finish	6:30 ↓ 7:00	60.00 ↓ 90.00	MAX (High)	ON	Boom RAISE relief.	• Front, rear, swing pump oil pressure (High relief pressure) • Engine speed • Blow-by pressure, exhaust temperature, PTO oil temperature
13	Start ↓ Finish	7:00 ↓ 7:30	90.00 ↓ 120.00	MAX (High)	ON	Set all levers in neutral (1st deceleration → 2nd deceleration)	• Engine speed (1st deceleration speed)
14	—	7:30	120.00	MIN (Low)	ON	Finish	

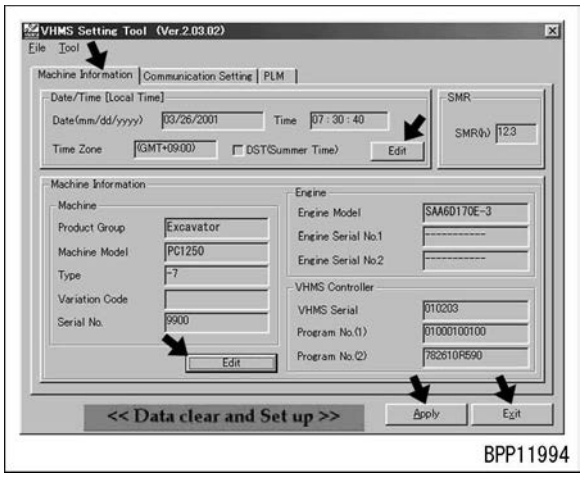
Note: To turn off the decelerator and set the engine speed to high idle, move one of both work equipment control levers and both travel levers to a degree that the work equipment does not move or the machine does not swing or travel. (If the PPC oil pressure switch is turned ON, the auto-decelerator is turned OFF.)

8. Resetting of VHMS Controller

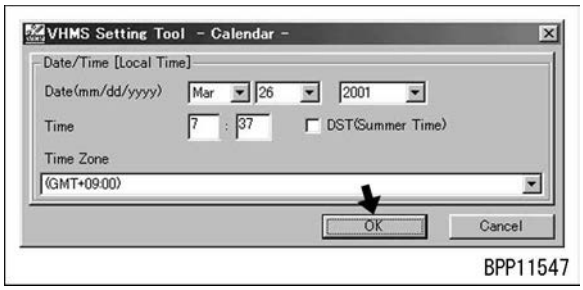
★ This step applies to works in the cab (on the personal computer).

[Machine Information]

1) Open the [Machine Information] tab.
   ★ The [Machine Information] tab is displayed first in the [Data clear and Set up] menu.
2) Change all the data to the latest one or to the data recorded before the replacement.

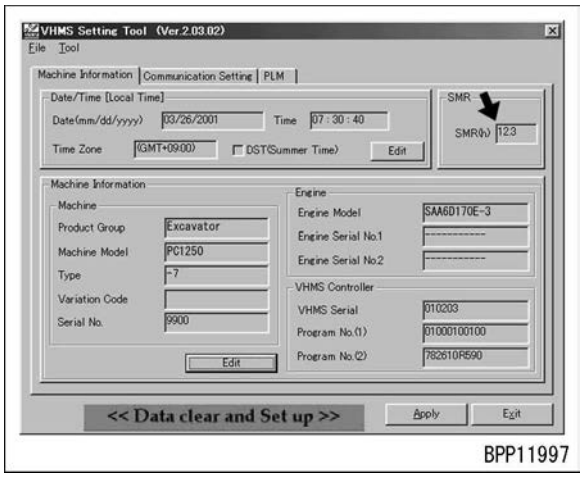


3) When correcting information in [Date/Time], follow the procedures below:
   ★ Change the data in [Date/Time] except for [Time Zone] to the correct data at the time of correction.
   i) Press the [Edit] button on the right lower part of the [Date/Time] box to display the correction screen.
   ii) Change the information to the correct one and then press the [OK] button.

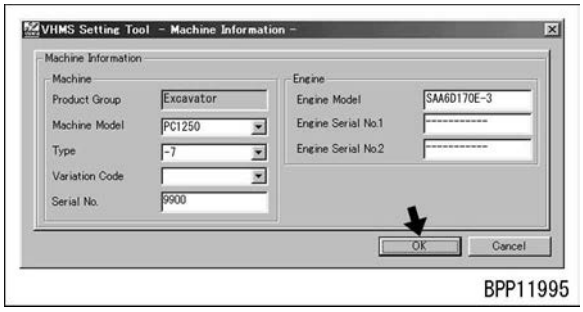


4) When correcting the information in [SMR], follow the procedures below:
   ★ Be sure to set the value obtained by adding 0.1h to the data recorded before the replacement to the service meter.
   Example :
   123.4h (before replacement)⇒
   123.5h (for resetting)
   ★ If an incorrect value is set to the service meter, data will come not to be managed on the WebCARE database. So, be sure to set correct values.

   Delete the value in the [SMR (h)] and input the new value to be set.

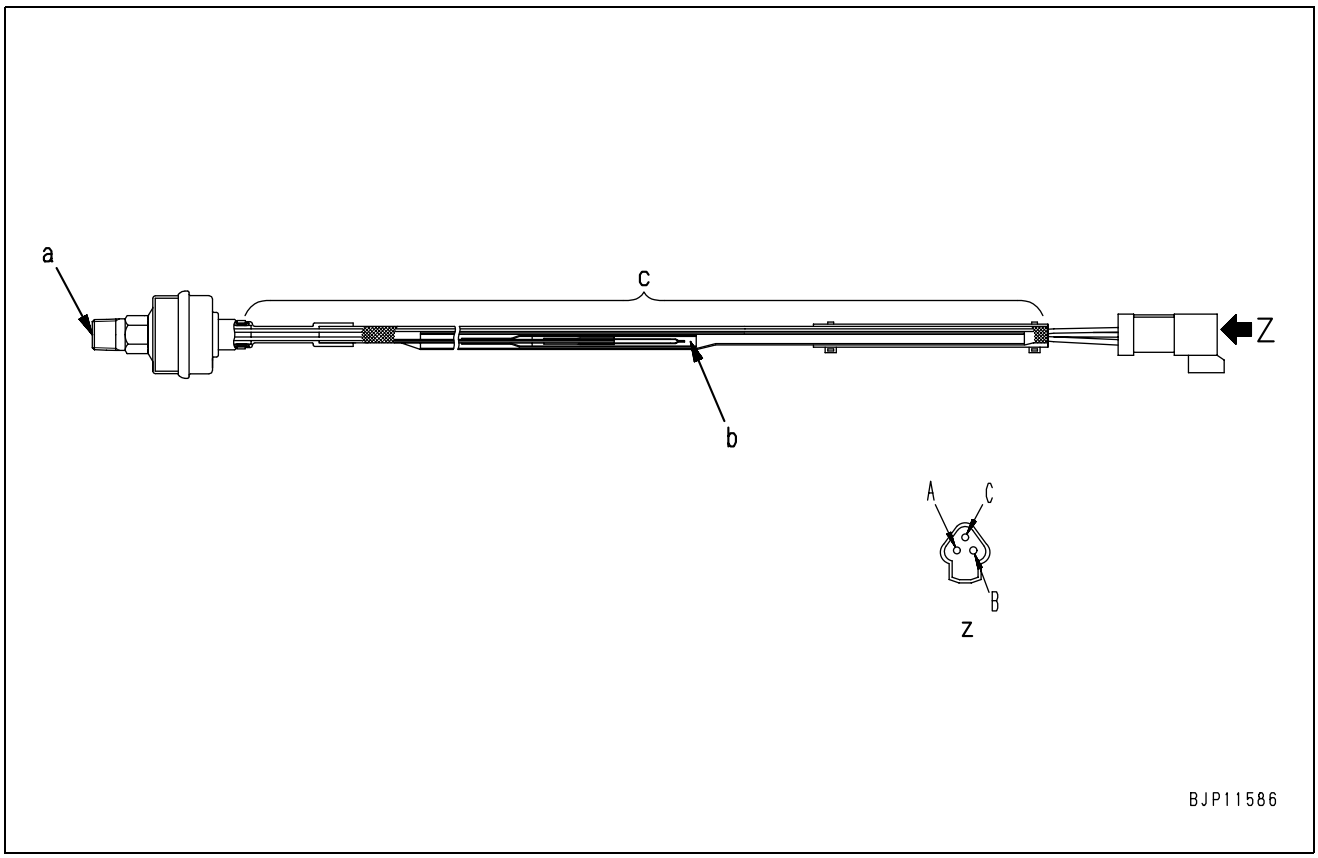


5) When correcting information in the [Machine Information], follow the procedures below:
   i) Press the [Edit] button on the right lower part of the [Machine Information] box to display the correction screen.
   ii) Change the information to the one recorded before the replacement and then press the [OK] button.



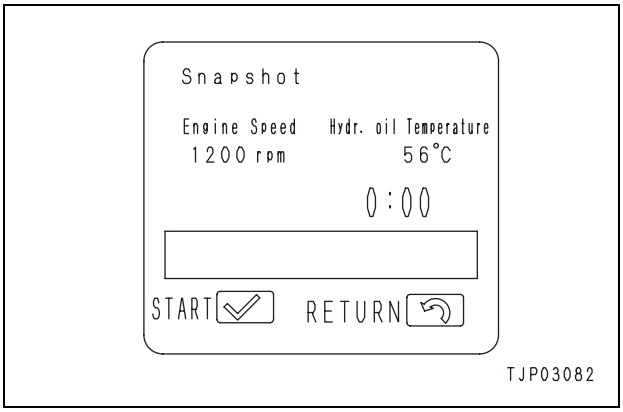
TESTING AND ADJUSTING DEVICES RELATED TO VHMS

1. Testing engine blow-by pressure sensor

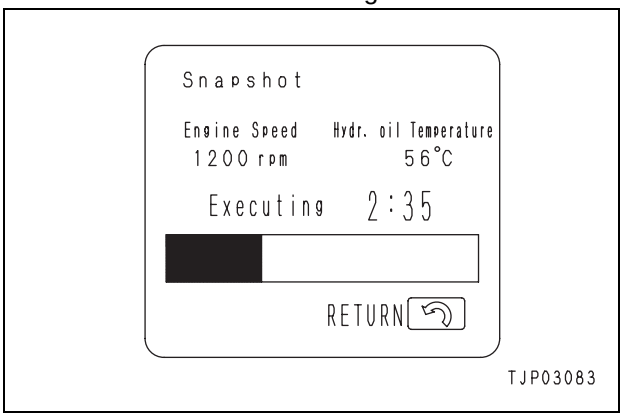


★ The engine blow-by pressure sensor is a fine relative pressure sensor which introduces the engine crankcase pressure from its end "**a**" and atmospheric pressure from intermediate part "**b**" of the wiring harness to measure the difference between those pressures.
★ Accordingly, if oil, dust, water, etc. sticks to part "**b**" to introduce atmospheric pressure, the atmospheric pressure cannot be introduced stably. As a result, the atmospheric pressure cannot be measured normally.
★ If VHMS detects abnormal blow-by pressure and the sensor seems to be defective, check whole wiring harness "**c**" including part "**b**" to introduce atmospheric pressure for oil, dust, water, etc. before replacing the sensor. If part "**b**" or "**c**" is not clear, clean it.
★ Part "**b**" to introduce atmospheric pressure is about 700 mm from the end of the sensor.

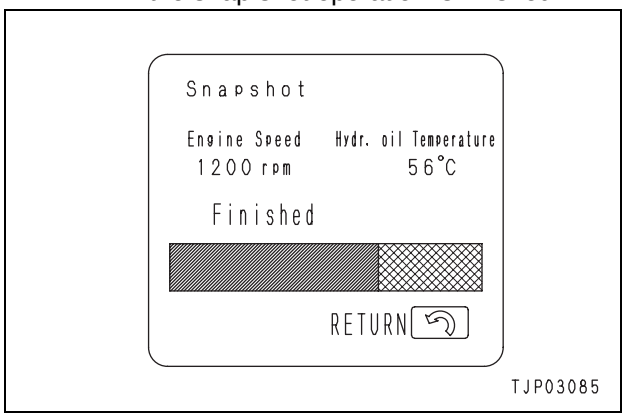
★ If the snap shot operation is interrupted, the data collected up to now are not recorded. In this case, repeat the operation from the first.



6) Operate the fuel dial, swing lock switch, both work equipment control levers, and both travel levers according to the "Operating procedure for Quick Pm" and elapsed time.
★ The elapsed time is displayed on the monitor panel.
⚠ Since the operator must operate the work equipment, swing the boom, and drive the machine actually for the Quick Pm, take extreme care of safety around the machine during the work.



7) If the following screen appears 7 minutes 30 seconds after the snap shot is started, the snap shot is finished.
★ The initial screen of the service menu appears automatically 5 seconds after the snap shot operation is finished.



5. Measuring and testing items other than snap shot items

Measure and test the items that cannot be measured and tested with the snap shot function according to the check sheet.

2-1: Visual inspection of strainer
3: Work equipment speed
4-5: TVC pressure
4-6: Front CO-NC pressure
4-7: Rear CO-NC pressure
4-8: Swing CO-NC pressure
5-1: Fan speed
6: Hydraulic drift of work equipment
7: Hydraulic oil return strainer

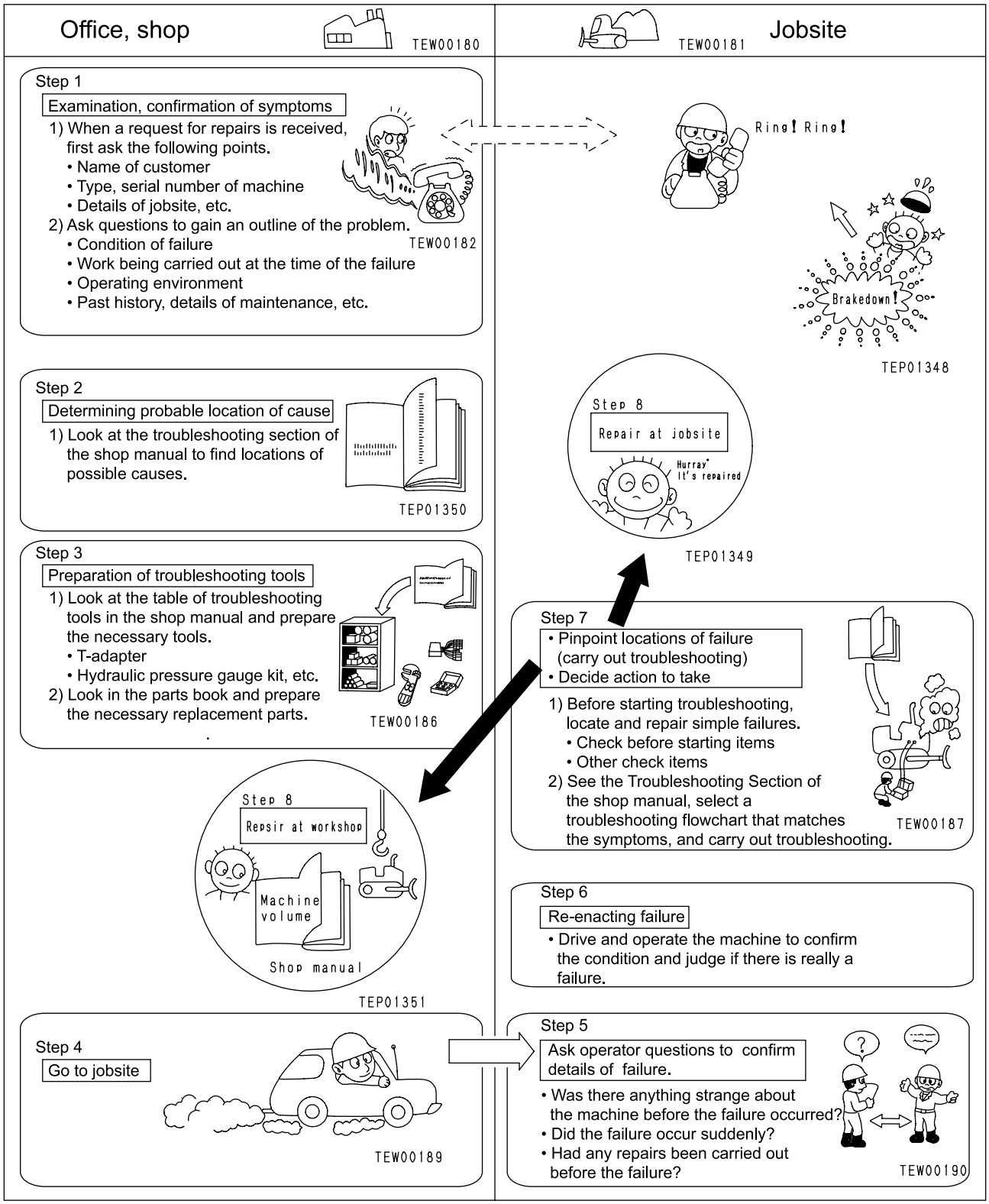
6. Downloading snap shot data

★ The following devices are necessary for downloading and using the snap shot data.

Symbol		Part No.	Part name
W	1	799-608-3101	Service kit
		799-608-3211	• Diskette
		799-608-3220	• Harness
	2	Purchased Part	Note type personal computer (Windows98/2000/ Me/XP/Vista)
	3	Purchased Part	RS232C-USB conversion cable

1) Check that the starting switch is in the OFF position.
⚠ When connecting and disconnecting the personal computer, be sure to turn the starting switch to the OFF position.

SEQUENCE OF EVENTS IN TROUBLESHOOTING



CLASSIFICATION AND STEPS FOR TROUBLESHOOTING

Classification of troubleshooting

Mode	Content
Code display	Troubleshooting when Error Code (electrical system) and Failure Code (mechanical system) are displayed.
E mode	Troubleshooting of electrical system
H mode	Troubleshooting of hydraulic and mechanical systems
S mode	Troubleshooting of engine body

Steps for troubleshooting

If some phenomenon occurs on a machine that looks like a failure, identify the corresponding troubleshooting No. and proceed to the explanations for diagnosis.

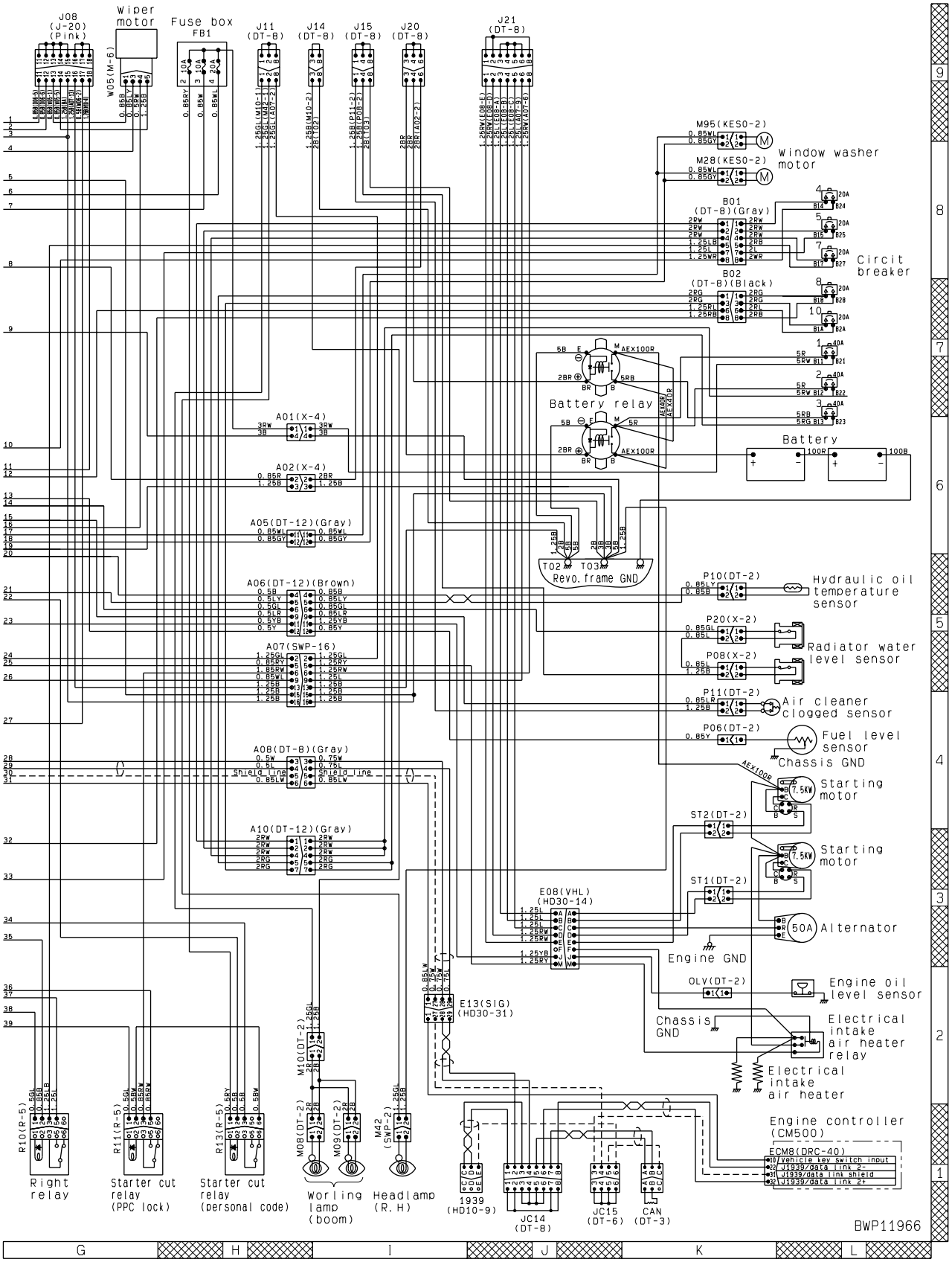
1. **Troubleshooting steps when calling User Code display in the monitor panel**
   In the User Code display, select and depress [✓] switch to display Error Code. Following displayed Error Code for the electrical system, carry out the troubleshooting along the corresponding code display.

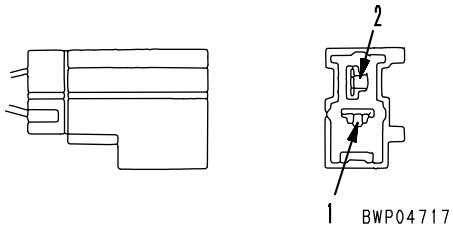
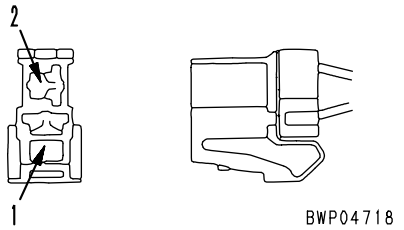
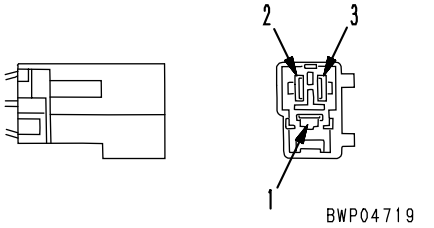
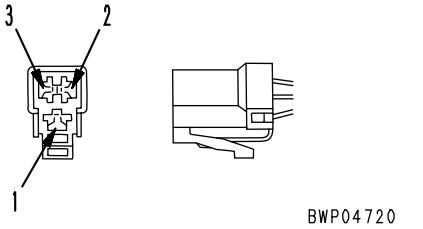
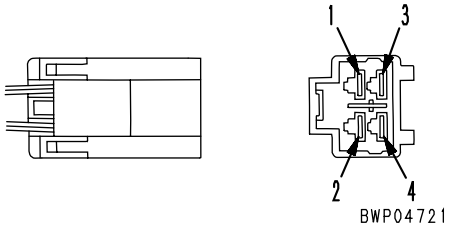
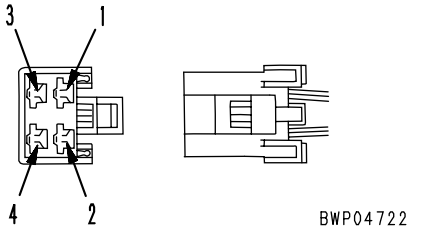
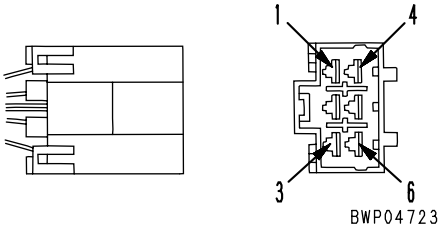
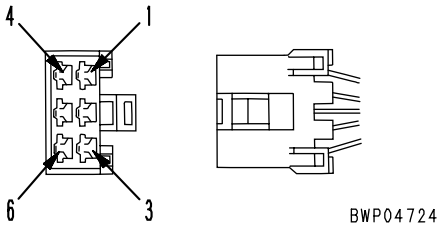
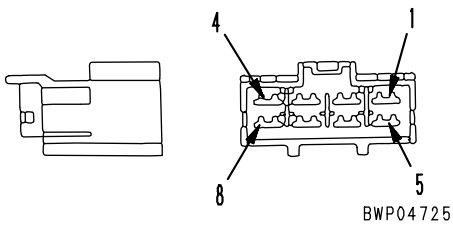
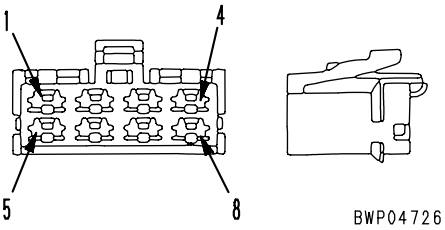
2. **Troubleshooting steps when the electrical system Error Code or mechanical system Failure Code is recorded in the failure history:**
   If not calling User Code in the monitor panel, check the electrical system Error Code or mechanical system Failure Code, using the failure history function of the monitor panel.
   - ★ If Error Code in the electrical system is recorded, delete the all codes once and revive the code in the display again to check if the same abnormality still persists.
   - ★ Failure Code in the mechanical system cannot be deleted.

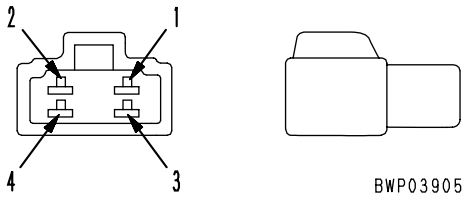
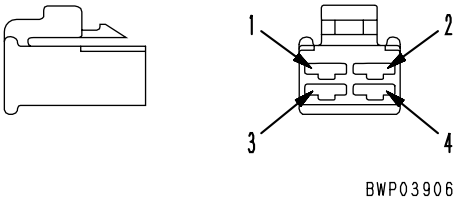
3. **Troubleshooting steps without User Code display and no failure history is available**
   If there is no display of User Code nor the failure history in the monitor panel, it is possible that a failure that the monitor panel cannot diagnose by itself may have occurred in any of the electrical, hydraulic or mechanical system. In such a case, reexamine the phenomenon, find out the most similar phenomenon from among "Failure like Phenomena and Troubleshooting No." and carry out E mode, H mode or S mode troubleshooting related to the phenomenon in question.

Connector No.	Connector Type	No. of pin	Place of use	Address				
				3-dimen-sional drawing	M circuit	E circuit	P circuit	V circuit
V07	DT	2	CO cancel solenoid valve	K-3			G-1	
V08	DT	2	PPC pressure lock solenoid valve	E-1			G-1	
V09	DT	2	Boom RAISE shockless solenoid valve	I-2			G-1	
V10	DT	2	Boom LOWER shockless solenoid valve	I-2			G-1	
VC1	070	20	VHMS controller (VHMS spec.)	N-6				A-8
VC2A	070	18	VHMS controller (VHMS spec.)	M-6				A-7
VC2B	070	14	VHMS controller (VHMS spec.)	M-6				A-6
VC3A	070	18	VHMS controller (VHMS spec.)	O-8	A-1			A-5
VC3B	070	12	VHMS controller (VHMS spec.)	N-9				A-4
VC4A	070	14	VHMS controller (VHMS spec.)	N-9	A-1	L-6	F-1	A-3
VC4B	070	10	VHMS controller (VHMS spec.)	N-9				A-2
VH01	DT	8	Intermediate connector	J-9			J-4	
VH02	DT	3	F pump pressure sensor	G-9			L-4	
VH03	DT	3	R pump pressure sensor	H-9			L-4	
VH04	DT	4	Swing pump pressure sensor	J-8			L-3	
VH05	DT	2	Engine oil temperature sensor (VHMS spec.)	AJ-5				I-2
VH06	DT	3	Engine front exhaust temp. sensor amplifier (VHMS spec.)	N-2				H-4
VH07	DT	3	Engine rear exhaust temp. sensor amplifier (VHMS spec.)	O-2				H-3
VH08	DT	3	Engine blow-by pres. sensor (VHMS spec.)	AI-8				I-2
VH09	DT	2	PTO oil temp. sensor (VHMS spec.)	K-6				I-2
VH10	DT	2	Intermediate connector	O-2				H-3
VH11	DT	3	Control pump pres. sensor (VHMS spec.)	J-2				I-2
VH12	DT	3	Aftercooler fan drive pump pres. sensor (VHMS spec.)	K-5				I-1
VH13	BENDIX	5	VHMS data download connector	N-3				H-1
VH14	DT	2	Engine F exhaust temp. sensor amplifier (VHMS spec.)	E-1				I-4
VH15	DT	2	Engine R exhaust temp. sensor amplifier (VHMS spec.)	F-1				I-3
VH16	DT	2	Engine F exhaust temp. sensor (VHMS spec.)	AG-8				I-4
VH17	DT	2	Engine R exhaust temp. sensor (VHMS spec.)	AH-8				I-3
VH18	DT	2	Atmospheric temp. sensor (VHMS spec.)	E-9				I-3
W03	X	2	Rear window limit switch (Optional for North America)	AB-9	A-8			
W04	M	6	Upper wiper motor	N-5	B-9			
W05	M	6	Lower wiper motor	P-1	G-9			
W06	M	2	Lower wiper switch	W-5	E-1			
X05	M	4	Swing lock switch	Q-8	E-1		A-1	

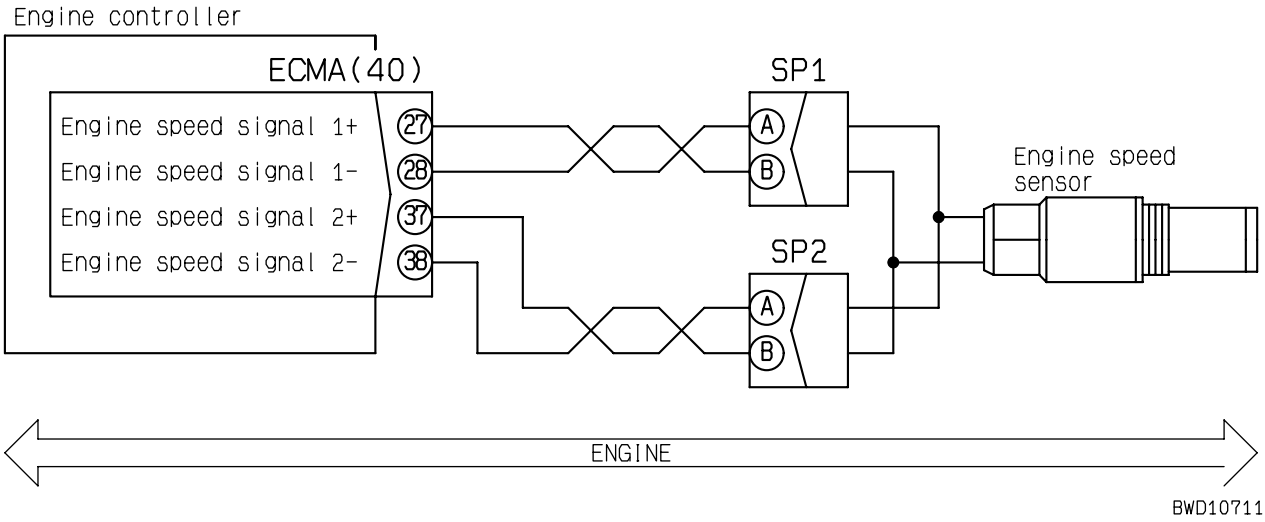
★ This circuit diagram is made by extracting the monitor panel system, engine preheating/starting/charging system, light system, and communication network system from the general electric circuit diagram.



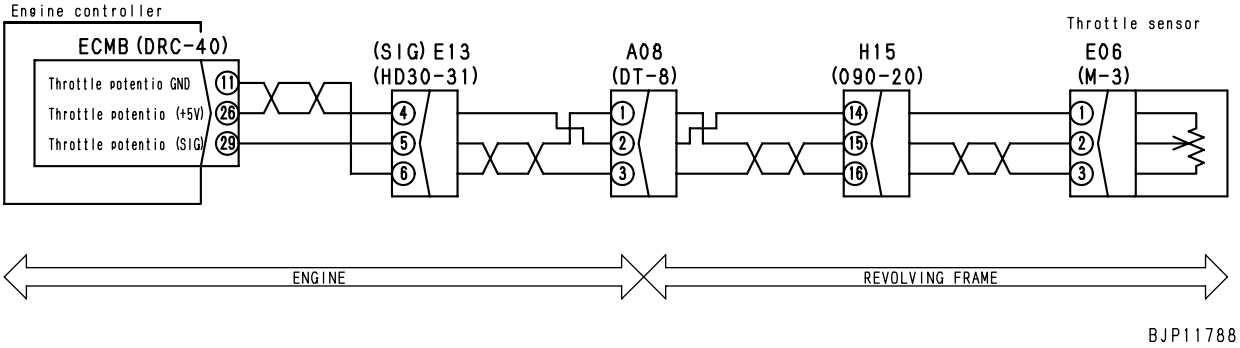
No.of pins	M type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
1	Part No.: 08056-00171	Part No.: 08056-00181	799-601-7080
2			799-601-7090
	Part No.: 08056-00271	Part No.: 08056-00281	
3			799-601-7110
	Part No.: 08056-00371	Part No.: 08056-00381	
4			799-601-7120
	Part 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	

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

Circuit diagram related to engine speed sensor



Circuit diagram related to throttle sensor

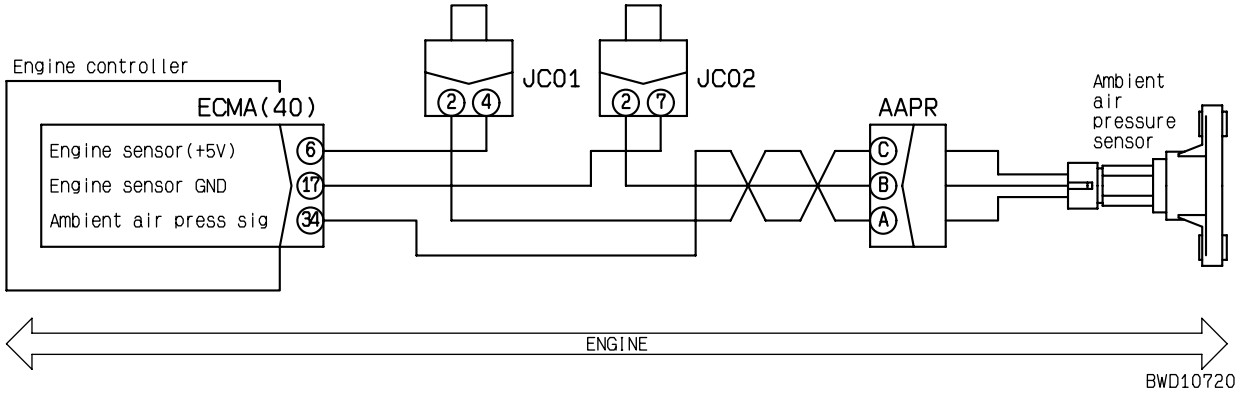


Error code in Electrical System C132 (Throttle Sensor)

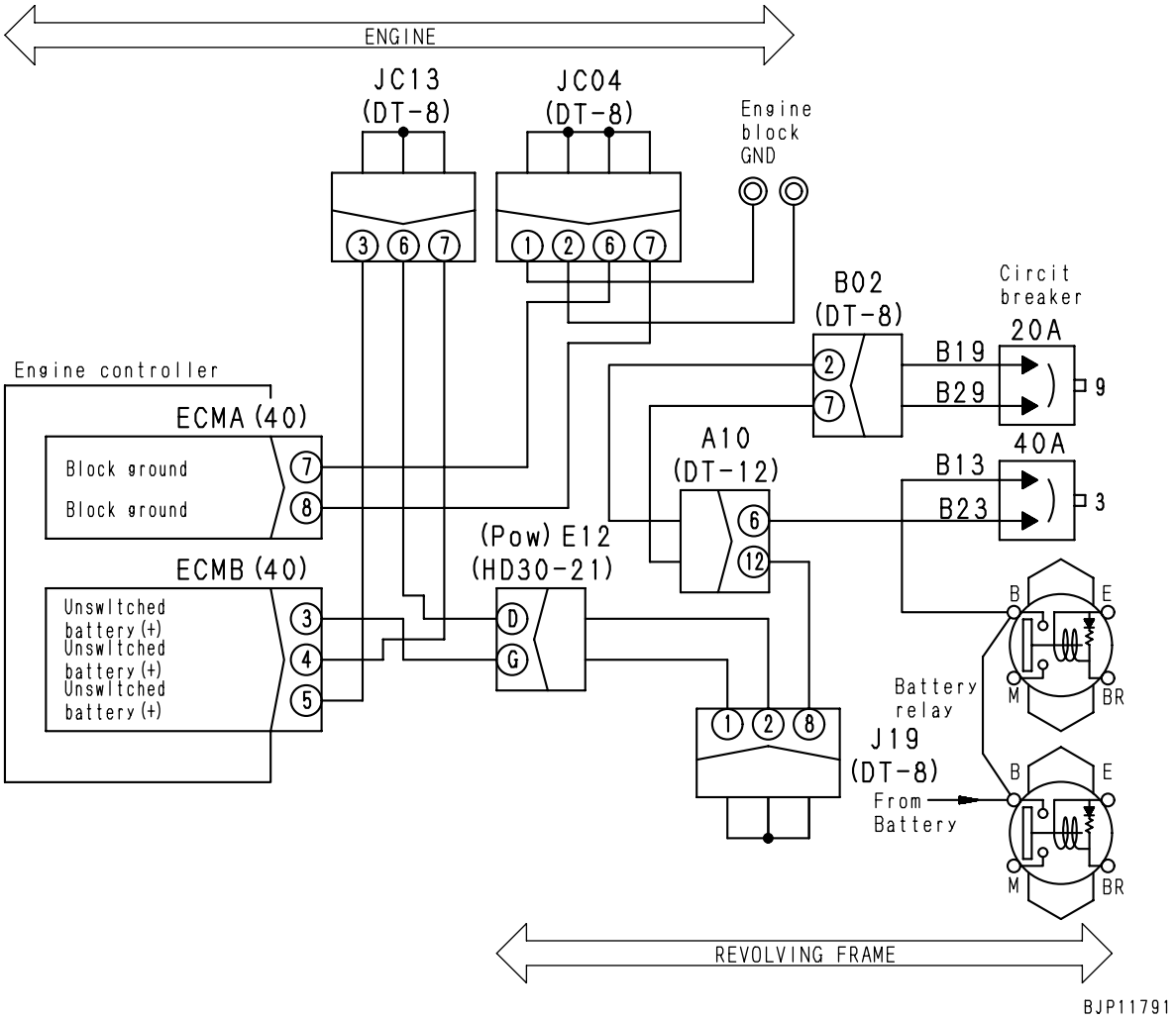
User code	Error code	Failure Code	Trouble	Throttle Sensor (Engine controller system)
E14	C132	C132KX		
Contents of trouble	• Signal voltage of throttle sensor circuit is below 0.30 V.			
Action of controller	• Flashes user code and turns on caution buzzer. • Keeps engine speed at constant level.			
Problem that appears on machine	• Engine speed and output lower suddenly.			
Related information	• Input of the throttle sensor to the engine controller (Voltage) can be checked in the monitoring mode. (Code 030: Thorottle sensor voltage) • Method of reproducing error code: Turn starting switch ON.			

Possible causes and standard value in normal state	Cause	Standard value in normal state/Remarks on troubleshooting
	Carry out troubleshooting for error code [C131].	

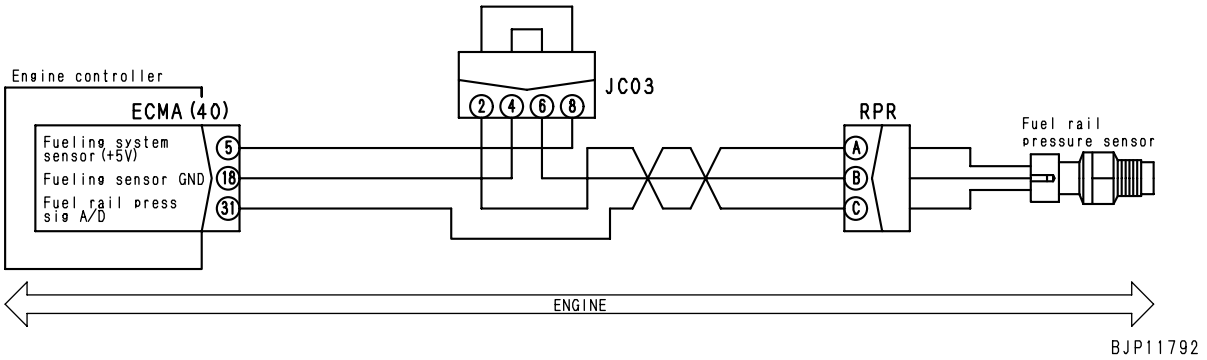
Circuit diagram related to atmospheric pressure sensor



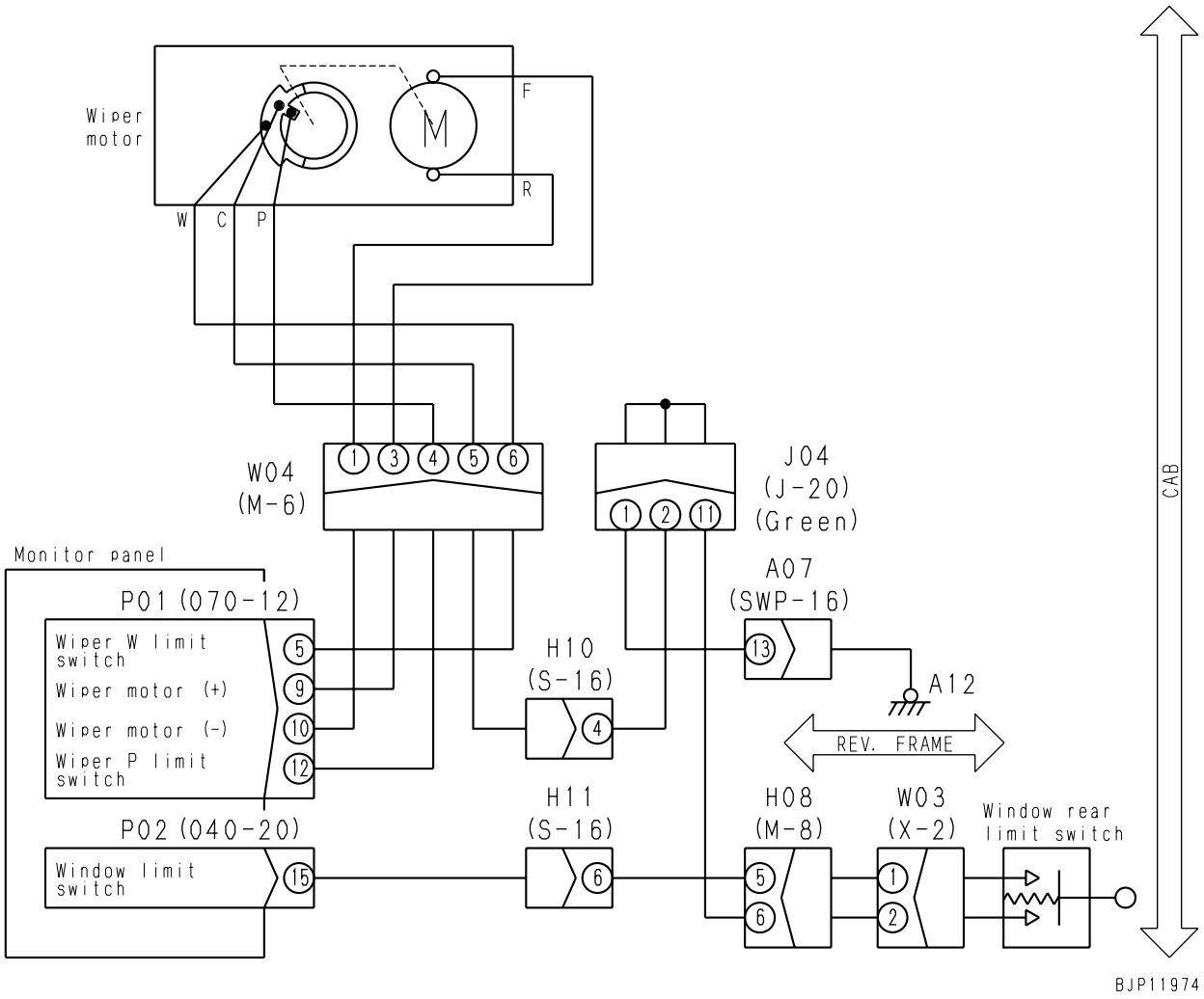
Circuit diagram related to engine controller power supply



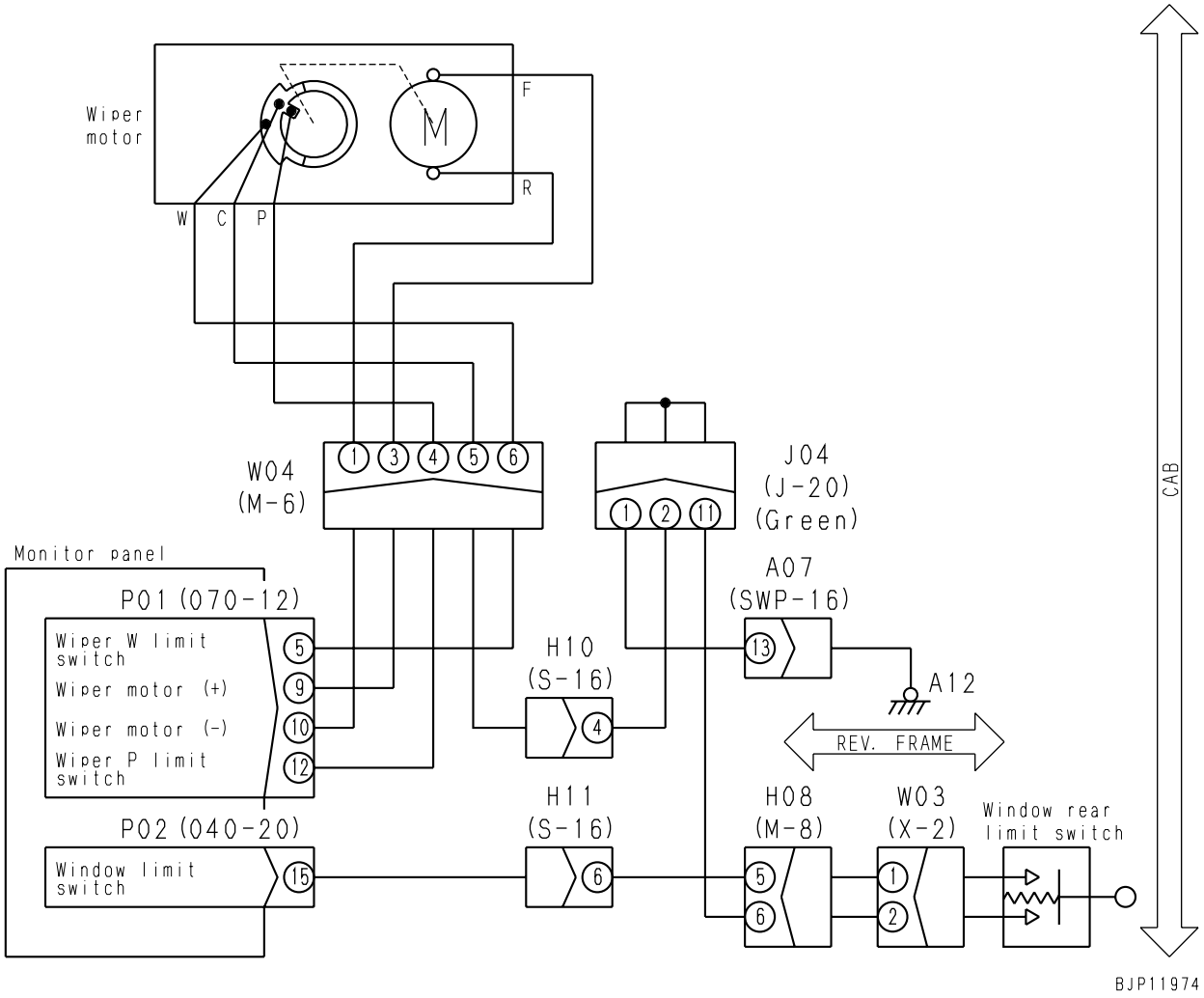
Circuit diagram related to fuel rail pressure sensor



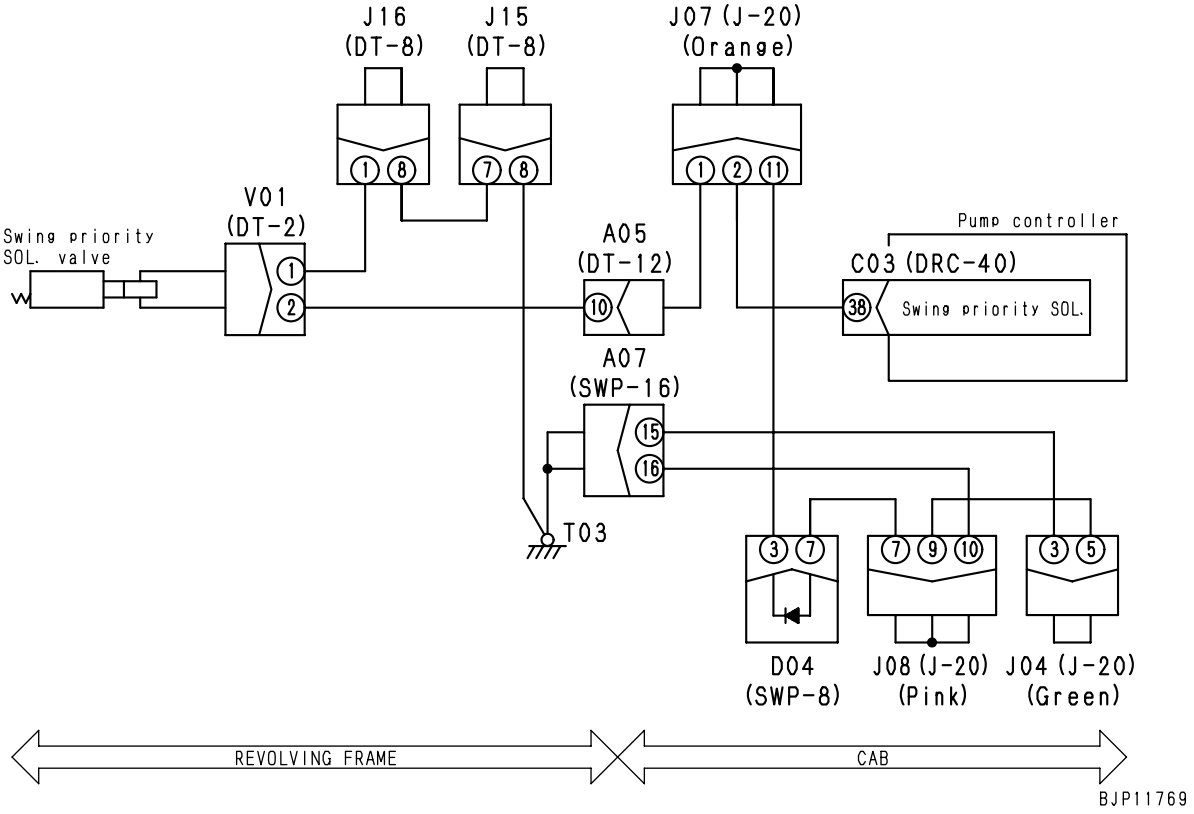
Electric circuit diagram related to wiper motor (Single-wiper specification)



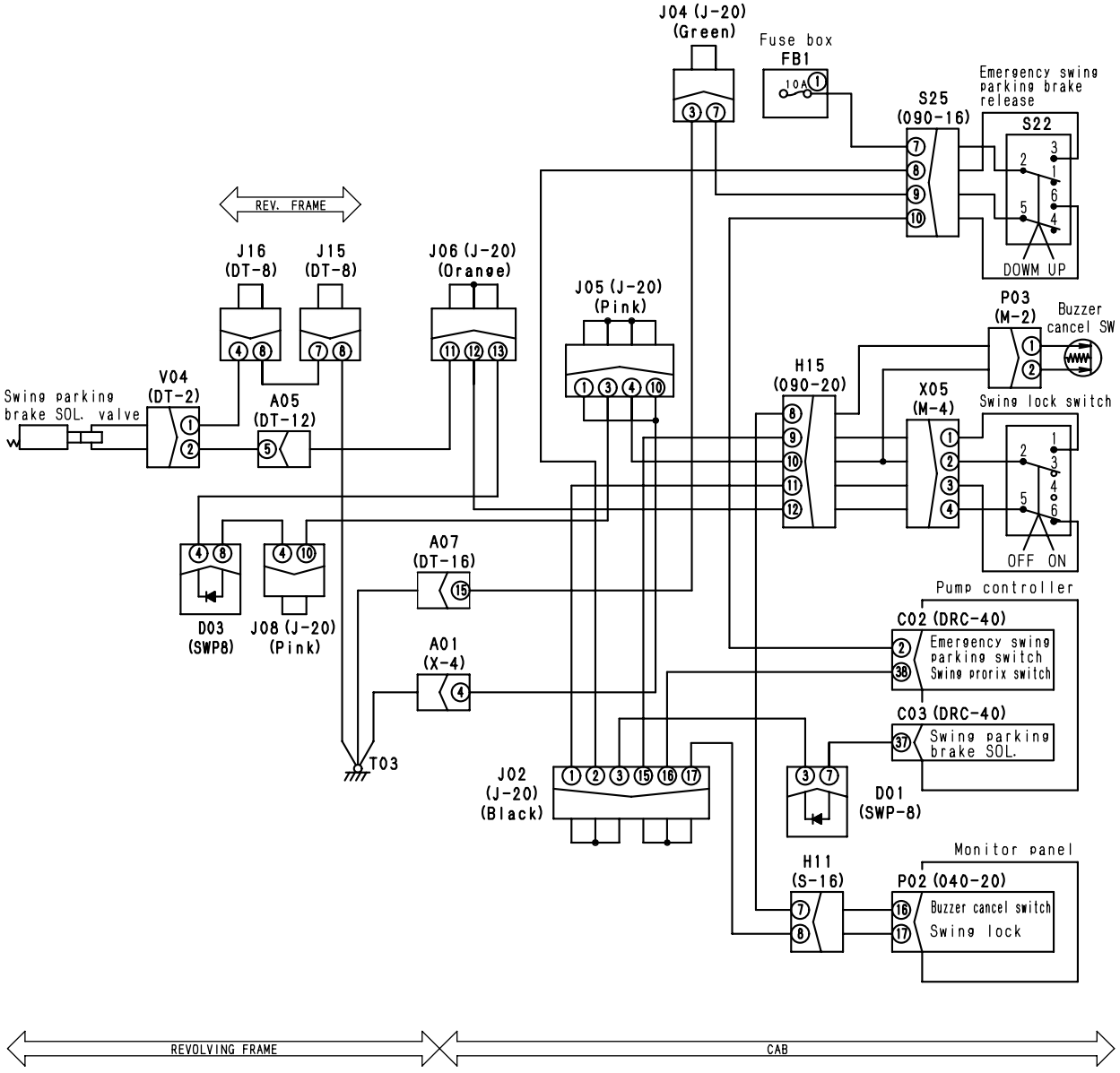
Electric circuit diagram related to wiper motor



Electric circuit diagram related to swing priority solenoid

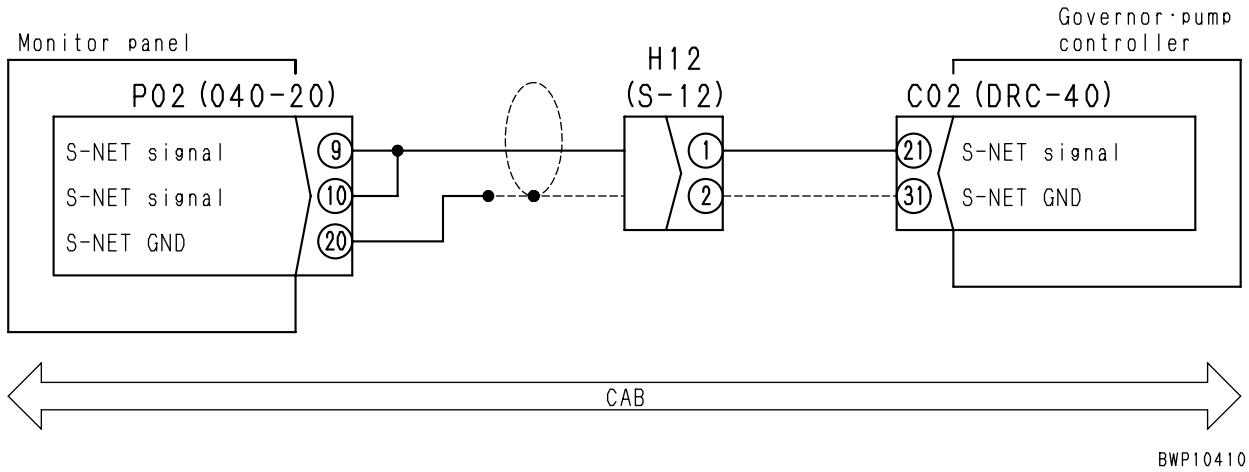


Electric circuit diagram related to swing holding brake

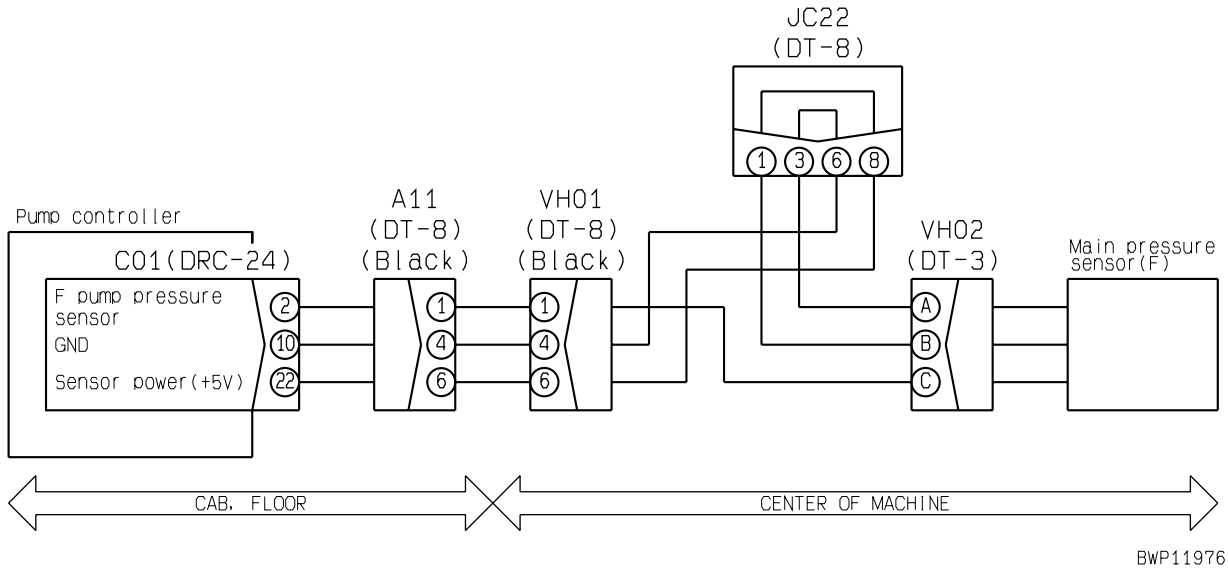


BJP11767

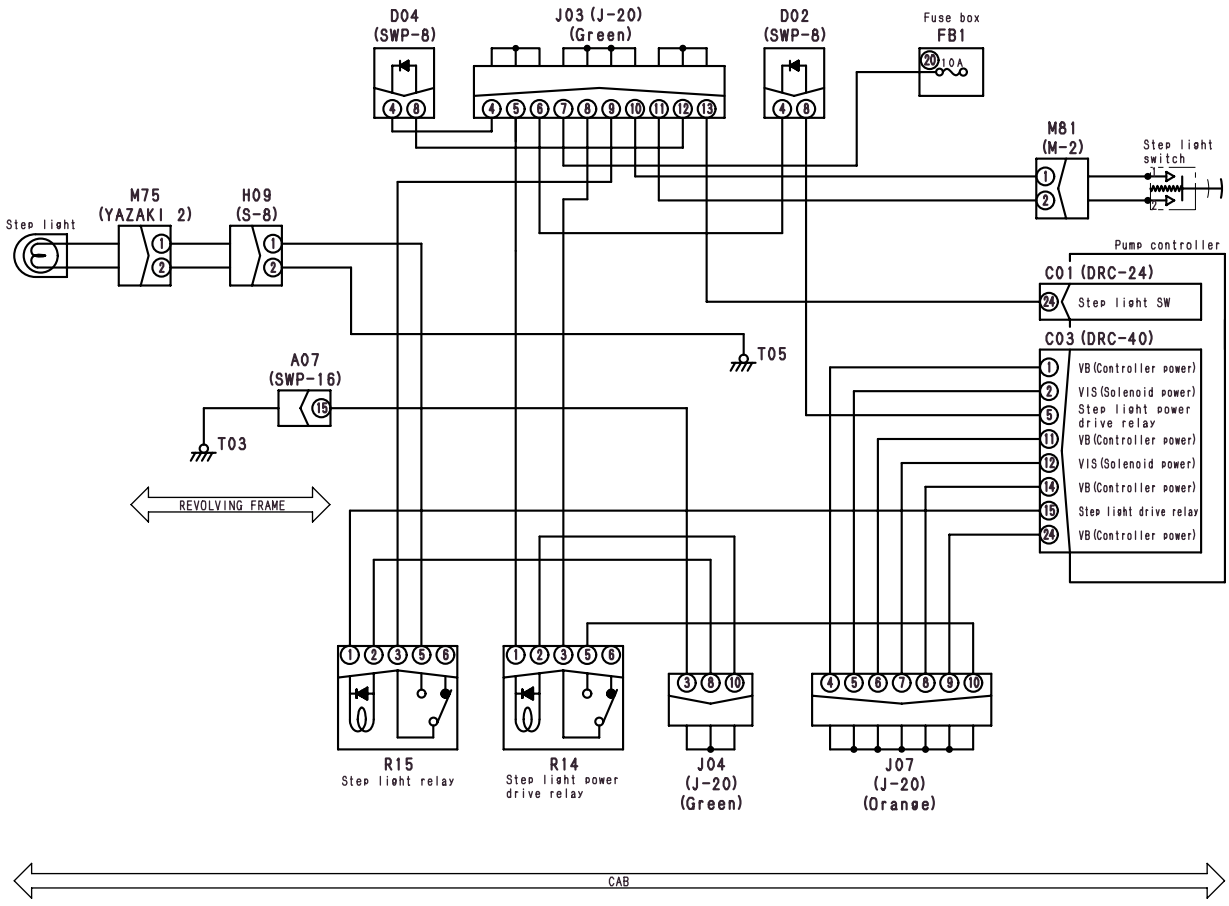
Electrical Circuit Diagram for S-NET Communication



Electric circuit diagram related to F pump pressure sensor

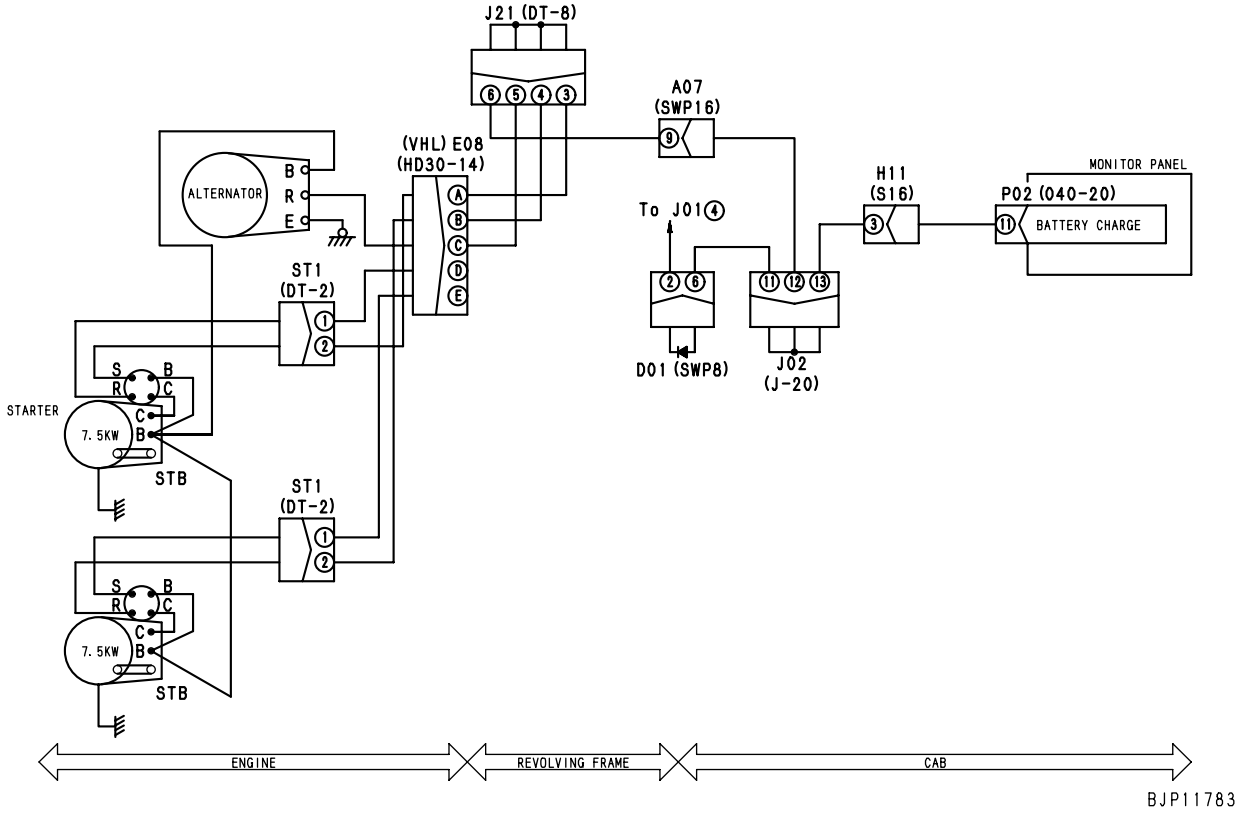


Electric circuit diagram related to step light

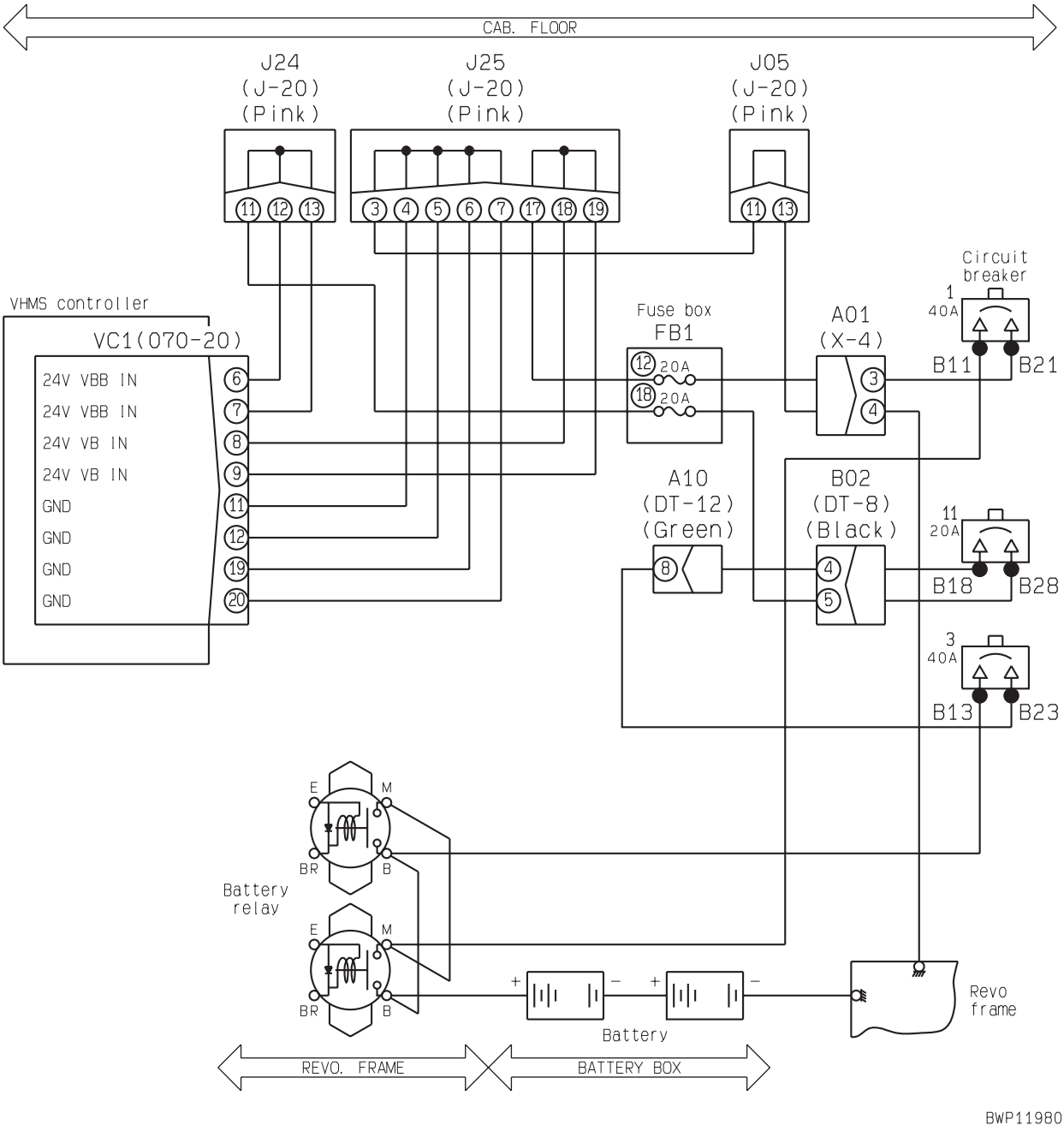


BJP11780

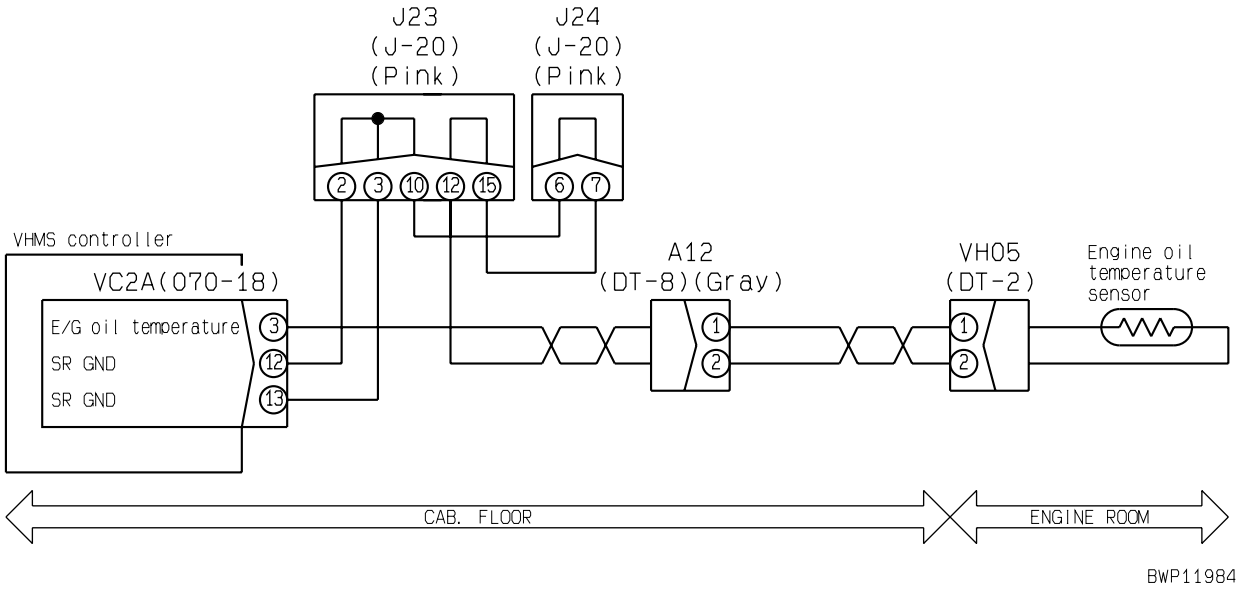
Electric circuit diagram related to charging voltage



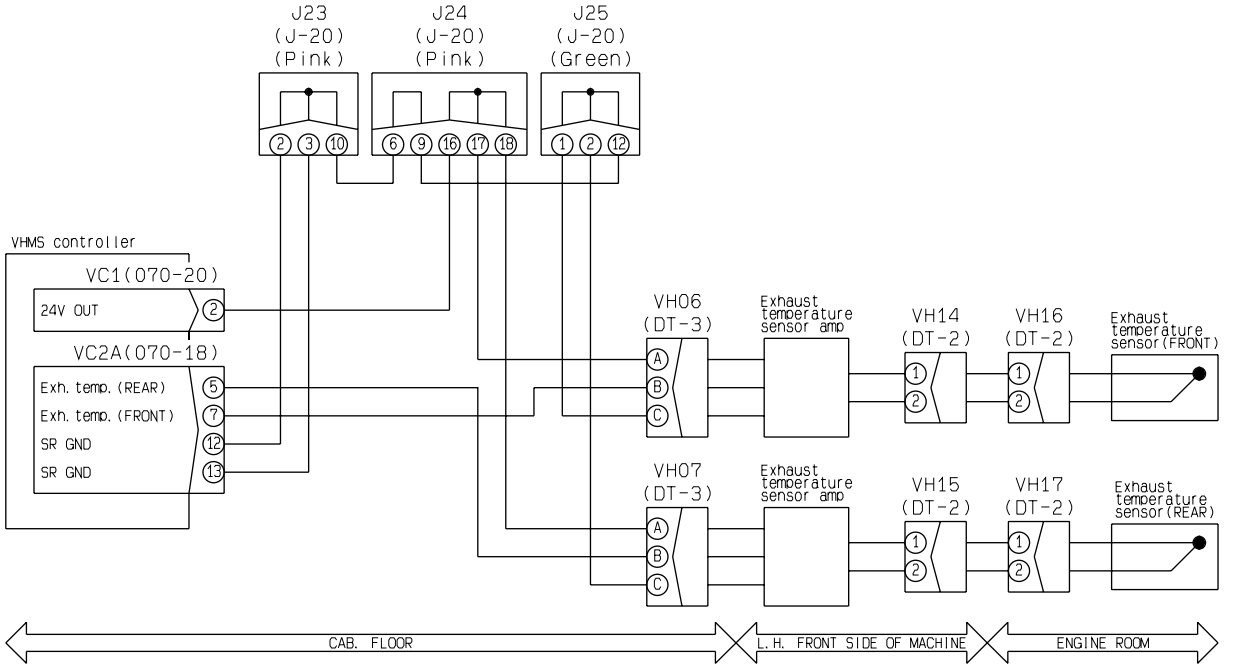
Electric circuit diagram related to VHMS controller power supply



Electric circuit diagram related to engine oil temperature sensor



Electric circuit diagram related to exhaust temperature sensors (front and rear)



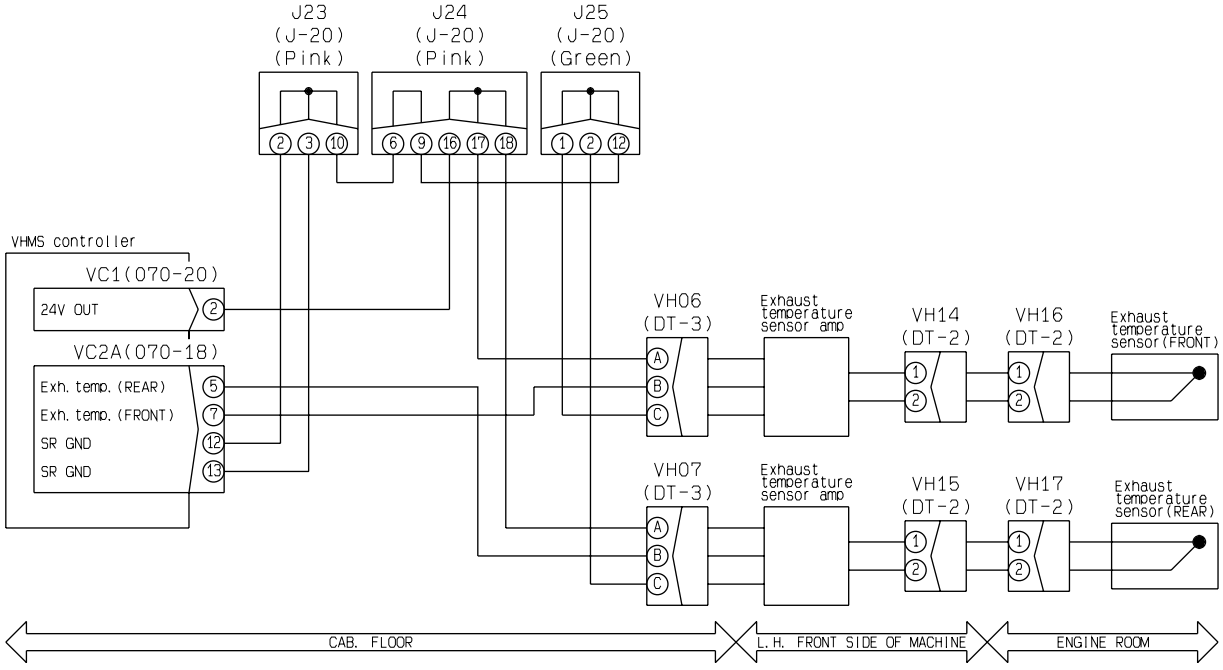
BWP11986

Failure Code in VHMS System F@BZNR (High R cyl. Exhaust Temp. 2)

User Code	Error Code	Failure Code	Failure phenomenon	High R cyl. Exhaust Temp. 2 (in VHMS controller system)
—	—	**F@BZNR**		
Failure content	• The signal circuit of the rear exhaust temperature sensor detected that the temperature had exceeded exhaust temperature limit line 2 for 10 seconds. (Exhaust temperature limit line 2: The straight line connecting 750°C point in the speed range above the rated output speed and 800°C point in the speed range below the maximum torque speed)			
Response from controller	• None in particular.			
Phenomenon occurring on machine	• If the machine is used as it is, the engine may be broken.			
Relative information	• The error codes of the VHMS system are not recorded in the failure history of the monitor panel. • The 7-segment LED of the VHMS controller displays **n372** (displays the error 2 characters by 2). • The exhaust temperature can be checked by downloading the data to a personal computer after performing the snap shot operation.			

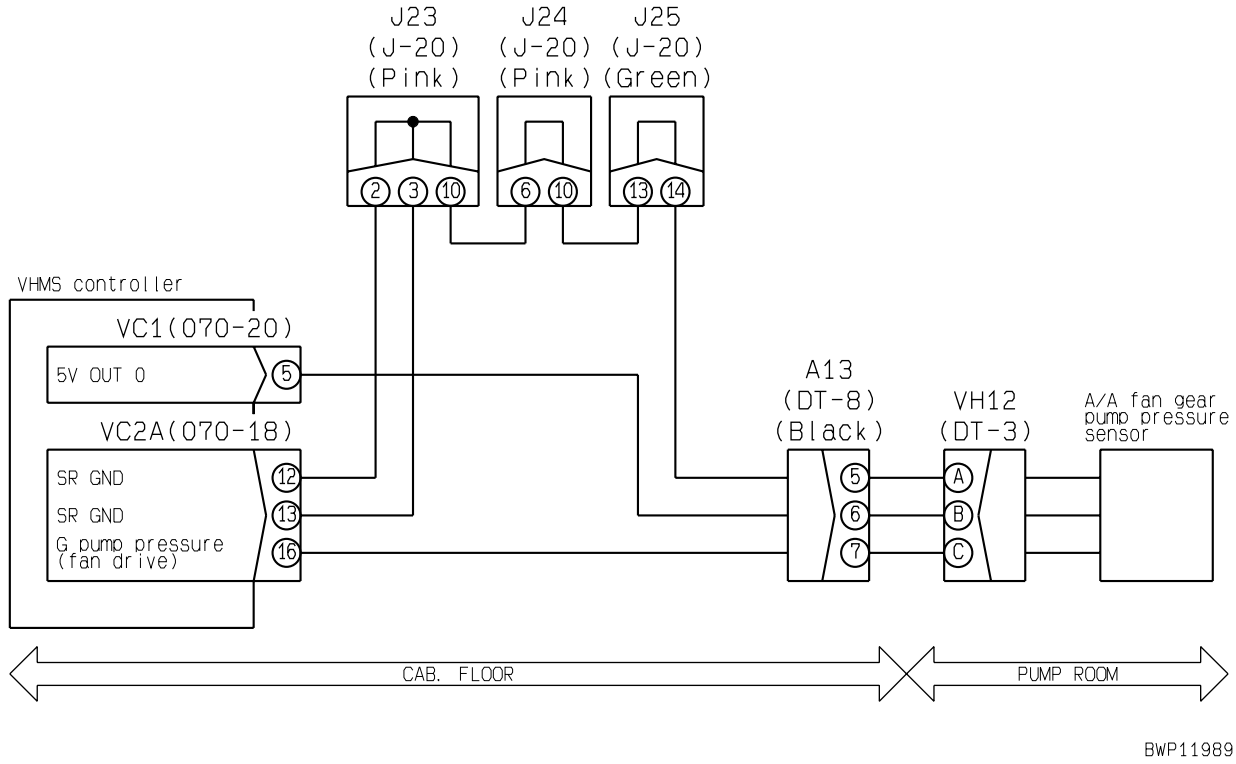
Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting		
	1	Abnormal rise of rear exhaust temperature (While system is normal)	Check the engine and repair all abnormality.		
	2	Rear exhaust temperature sensor system defective	If error code [**DGT5KA**] is displayed, perform troubleshooting for it.		
			If error code [**DGT5KB**] is displayed, perform troubleshooting for it.		
	3	VHMS controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position or run the engine during the troubleshooting.		
			VC2A	Exhaust temperature	Voltage
			Between (5) and (12), (13)	At 20°C	Approx. 0.9 – 1.2 V
				At 500°C	Approx. 2.6 – 3.5 V

Electric circuit diagram related to exhaust temperature sensors (front and rear)

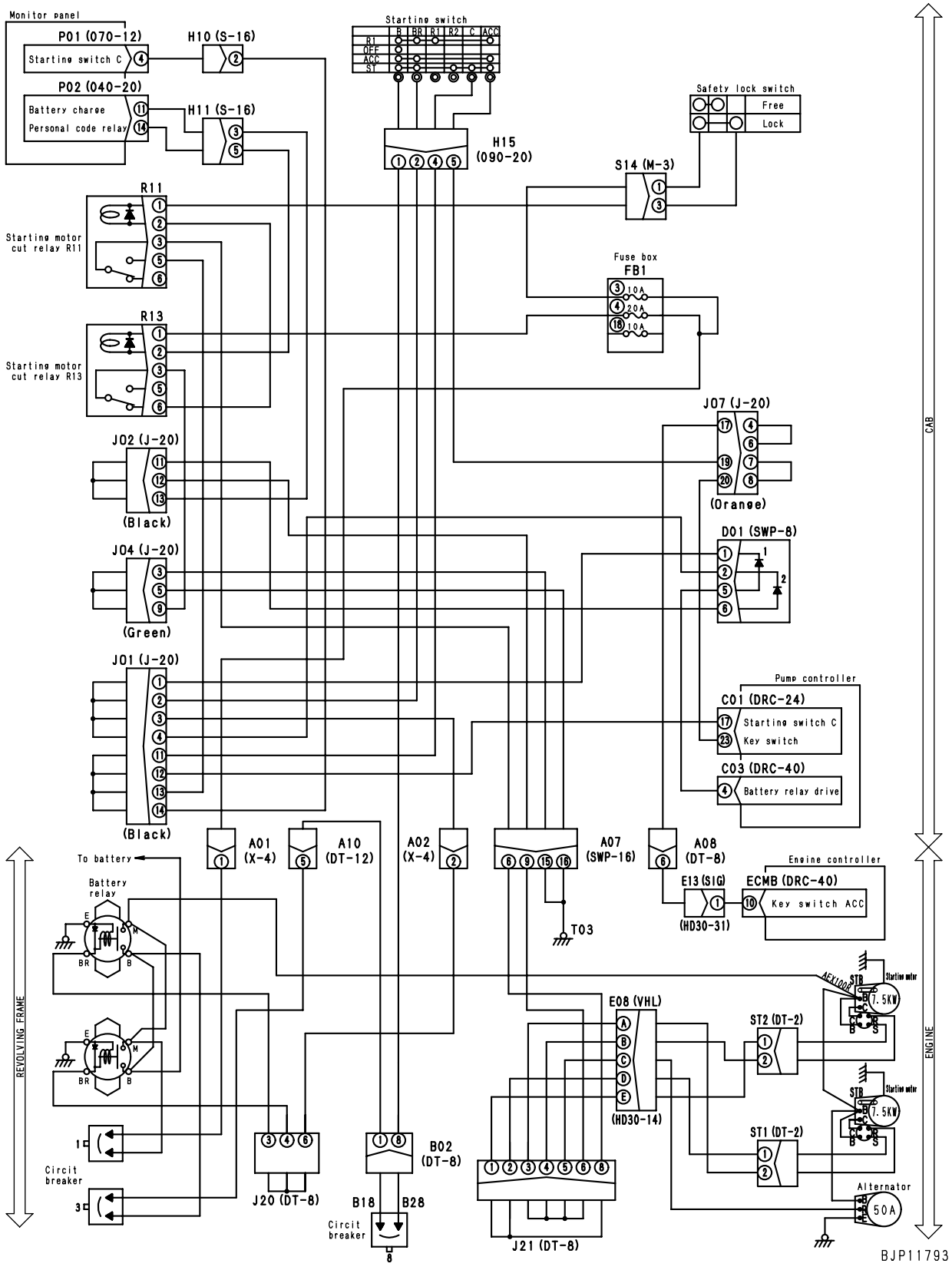


BWP11986

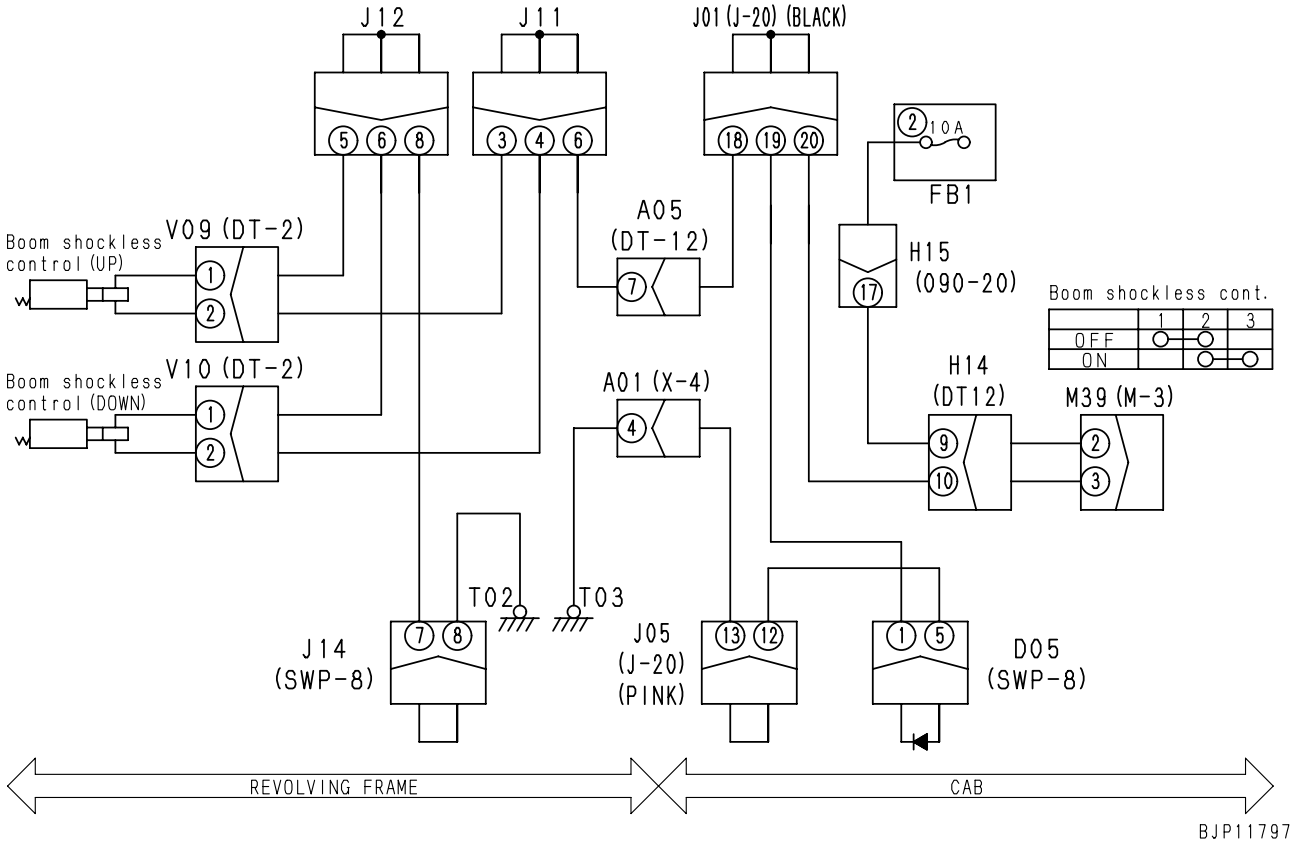
Electric circuit diagram related to fan pump pressure sensor



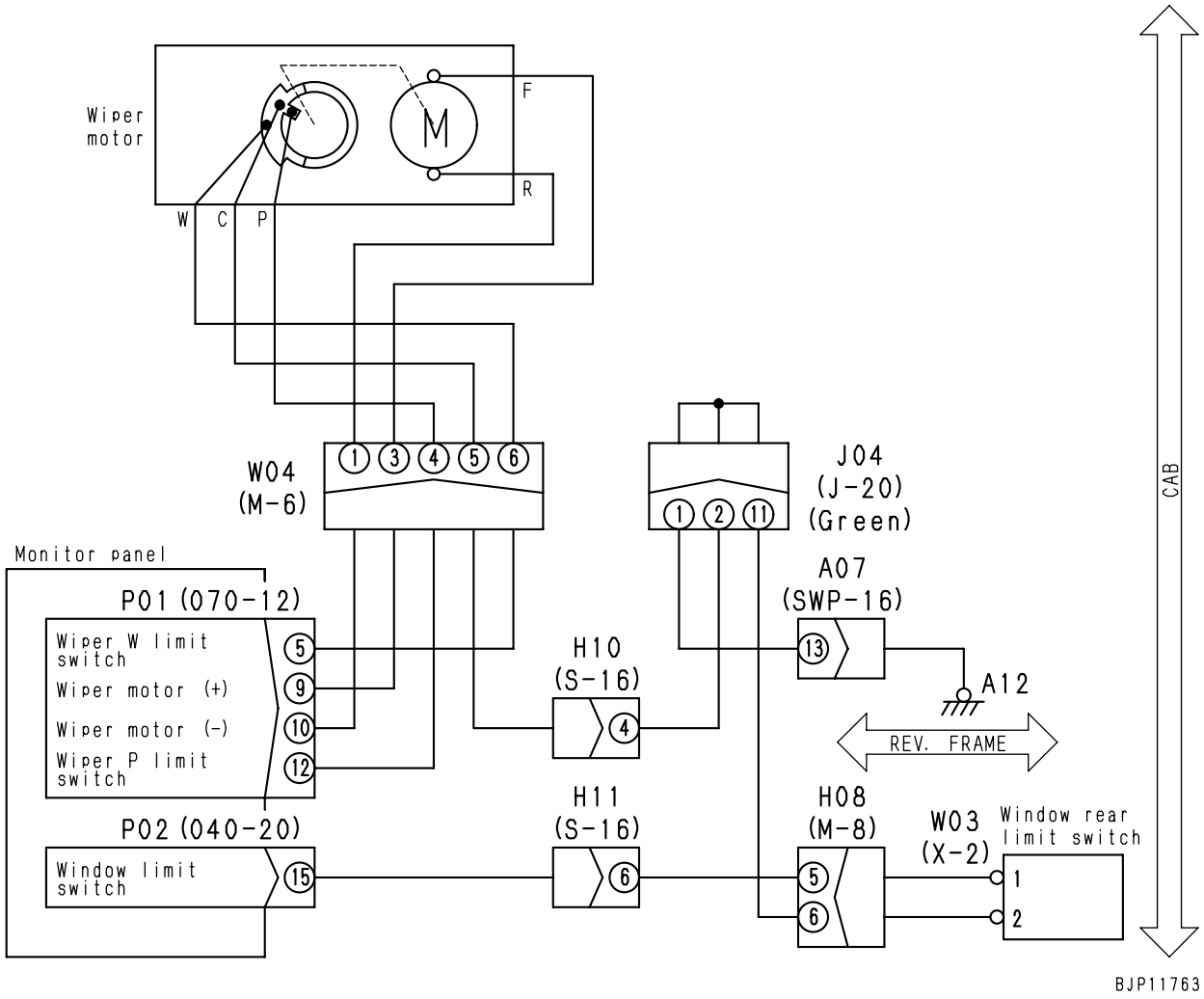
Electrical Circuit Diagram for Engine Start and Battery Charging



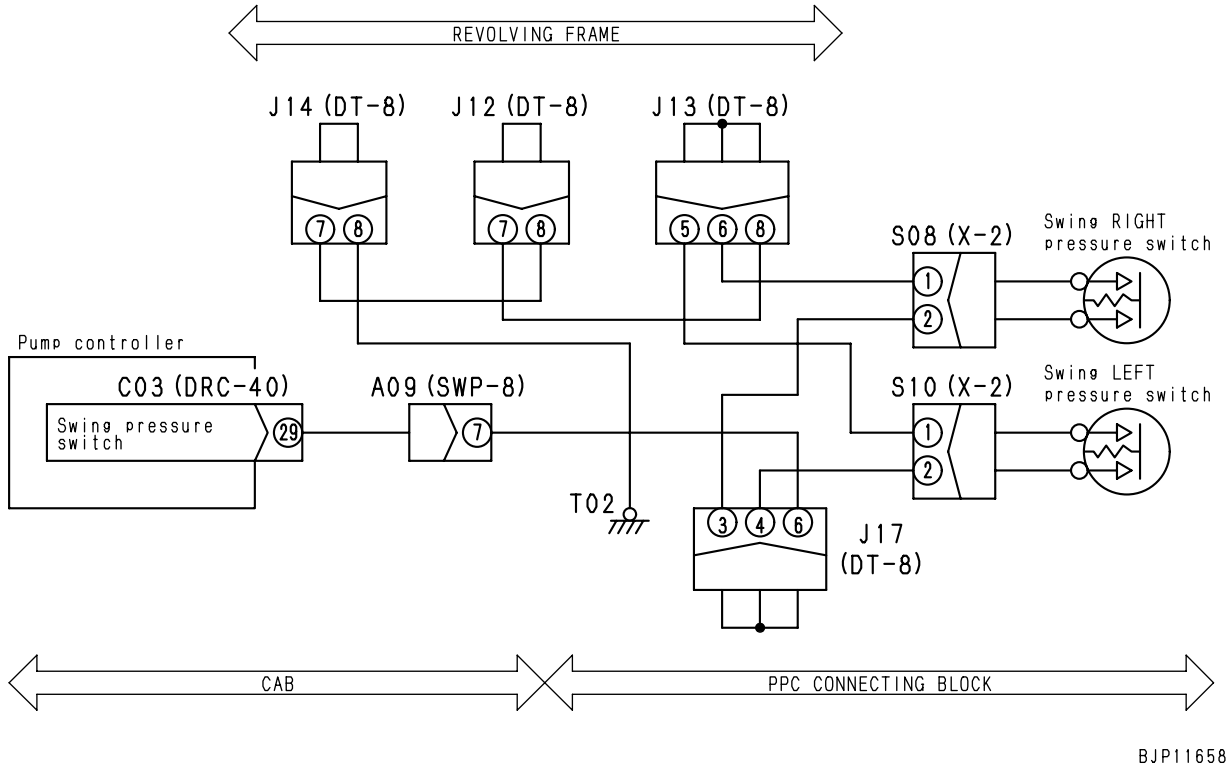
Electric Circuit Diagram for Boom shockless control



Electric circuit diagram related to wiper motor (Cab with pull-up front window) (When 1 wiper is set)



Electrical Circuit Diagram for Right and Left Swing PPC hydraulic Switches



TROUBLESHOOTING OF HYDRAULIC, MECHANICAL SYSTEM (H MODE)

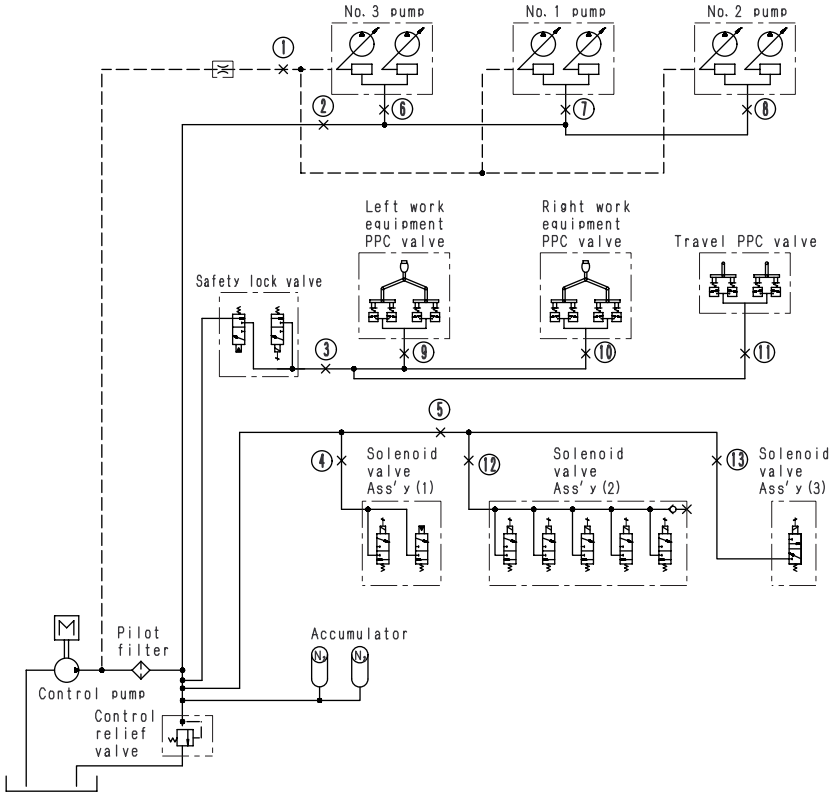
BEFORE TROUBLESHOOTING FOR HYDRAULIC AND MECHANICAL SYSTEMS 20-552
INFORMATION IN TROUBLESHOOTING TABLE 20-557
H-1 Speed or power of all work equipment, travel, and swing is low 20-558
H-2 Engine speed lowers remarkably or engine stalls 20-560
H-3 All work equipment, travel, and swing systems do not work 20-561
H-4 Abnormal sound is heard from around pump 20-562
H-5 Speed or power of boom is low 20-563
H-6 Speed or power of arm is low 20-565
H-7 Speed or power of bucket is low 20-566
H-8 Boom does not move 20-567
H-9 Arm does not move 20-567
H-10 Bucket does not move 20-567
H-11 Hydraulic drift of work equipment is large 20-568
H-12 Time lag of work equipment is large 20-569
H-13 Boom shockless function cannot be turned ON or OFF 20-570
H-14 Machine deviates in one direction 20-570
H-15 Machine deviates largely at start 20-572
H-16 Machine deviates largely during compound operation 20-573
H-17 Travel speed or power is low 20-573
H-18 Machine does not travel (only one track) 20-574
H-19 Travel speed does not change 20-575
H-20 Machine does not swing 20-576
H-21 Swing speed or acceleration is low 20-577
H-22 Swing speed or power is low in compound operation of travel and bucket 20-578
H-23 Swing speed or power is low in compound operation of travel and boom in swing priority mode 20-578
H-24 Upper structure overruns largely 20-579
H-25 Large shocks are made when upper structure stops swinging 20-580
H-26 Large abnormal sounds are made when upper structure stops swinging 20-581
H-27 Hydraulic drift of swing is large 20-581

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

Failure Phenomenon	• All work equipment, travel, and swing systems do not work
Related Information	• Carry out all the troubleshooting in working mode A.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting	
	1	Defective safety lock valve linkage	Since the safety lock valve linkage may be defective, check it directly.	
	2	Internal defect of PTO	Since the control pump may not revolve because of an internal defect of the PTO, check the PTO directly.	
	3	Internal defect of control pump	Since control pump may have a defect in it, check the inside of the pilot filter for metal chips.	
	4	Defective adjustment or malfunction of control relief valve	★Prepare with the engine stopped, then carry out troubleshooting with the engine at high idle.	
			Work equipment, swing, and travel levers	Control relief pressure
			All levers in neutral	$3.1\ ^{+0.4}_{0}$ MPa {$32\ ^{+3.5}_{0}$ kg/cm^2}
			If the oil pressure cannot be set normally by adjustment, check cause 3. If the result of check of cause 5 is normal, the control relief valve may have a malfunction. Check the control relief valve directly.	
	5	Leakage in control system devices	★Stop the engine and block (1) – (13) in the drawing in order, then carry out troubleshooting with the engine at high idle.	
			Work equipment, swing, and travel levers	Control relief pressure
			All levers in neutral	$3.1\ ^{+0.4}_{0}$ MPa {$32\ ^{+3.5}_{0}$ kg/cm^2}

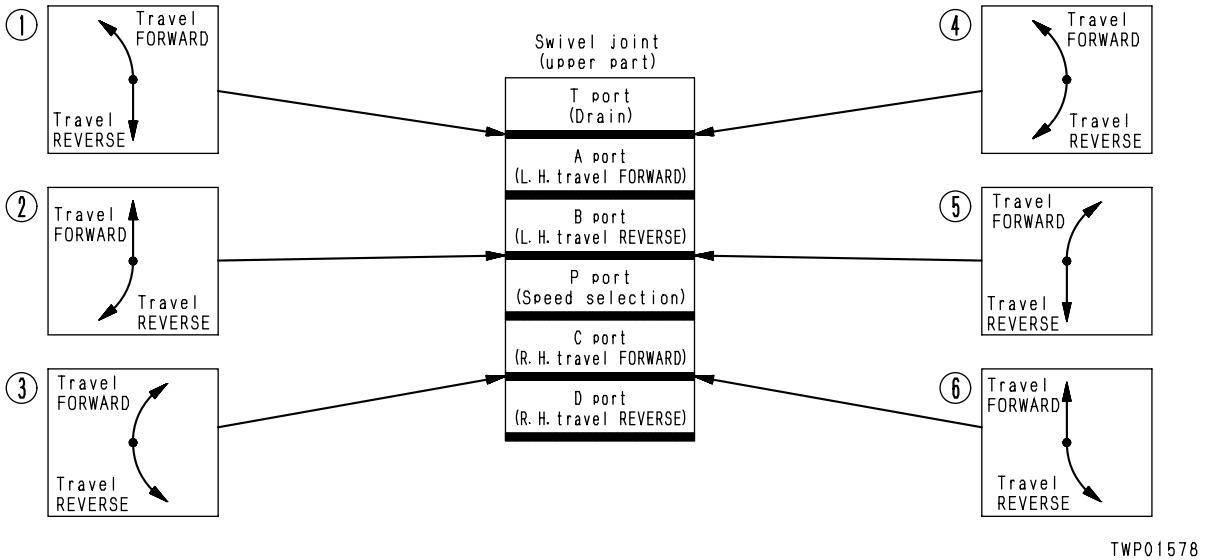
Control system devices



Failure Phenomenon (2)	• Machine deviates in different directions, depending on its travel direction
Related Information	• Check that the travel speed is normal. (If it is abnormal, carry out the related troubleshooting.) • Carry out all the troubleshooting in working mode A.

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting	
	1	Malfunction of travel PPC valve	★Prepare with the engine stopped, then carry out troubleshooting with the engine at high idle.	
			Travel lever	PPC valve output pressure
			Full stroke	$2.9\,^{+0.6}_{-0.2}$ MPa {$30\,^{+5.5}_{-1.5}$ kg/cm^2}
	2	Malfunction of travel control valve (spool)	Since the spool of the travel control valve may have a malfunction, check it directly.	
	3	Defective seal of center swivel joint	★Prepare with the engine stopped, then carry out troubleshooting with the engine at high idle.	
			Travel lever	Leakage from swivel joint
			Relieved on one side	Max. 100 cc/min
			If seal is defective, the machine deviates as shown in Fig.	
	4	Low set pressure of travel motor safety valve	★Prepare with the engine stopped, then carry out troubleshooting with the engine at high idle.	
			Travel lever	Travel relief pressure
			Relieved on one side	$34.3\,^{+1.0}_{-2.5}$ MPa {$350\,^{+10}_{-25}$ kg/cm^2}

Defective seals in center swivel joint and travel deviation directions



TWP01578

H-26 Large abnormal sounds are made when upper structure stops swinging

Failure Phenomenon (1)	• Large abnormal sounds are made when upper structure stops swinging in both directions
Related Information	

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Malfunction of back pressure compensation valve	Since the back pressure compensation valve may have a malfunction, check it directly.
	2	Internal defect of swing machinery	Since the swing machinery may have a defect in it, check it directly. (The defect can be judged by abnormal sound, abnormal heat, metal chips in drained oil, etc.)

Failure Phenomenon (2)	• Large abnormal sounds are made when upper structure stops swinging in one direction
Related Information	

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting	
	1	Defective adjustment or malfunction of swing motor (safety valve)	★Prepare with the engine stopped, then carry out troubleshooting with the engine at high idle.	
			Left control lever (swing)	Swing relief pressure
			Relieved	$31.4^{+1.0}_{-2.5}$ MPa $\{320^{+10}_{-25}$ kg/cm$^2\}$
			If the oil pressure cannot be set normally by adjustment, the safety valve may have a malfunction. Check the safety valve directly. (The malfunction can be judged from change of phenomenon after exchanging the safety valves with each other.)	
	2	Malfunction of swing motor (suction valve)	Since the suction valve of the swing motor may have a malfunction, check it directly. (The malfunction can be judged from change of phenomenon after exchanging the suction valves with each other.)	

H-27 Hydraulic drift of swing is large

Failure Phenomenon	• Hydraulic drift of swing is large
Related Information	

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting	
	1	Malfunction of swing holding brake solenoid valve	★Prepare with the engine stopped, then carry out troubleshooting with the engine at high idle.	
			Left control lever (swing)	Solenoid valve outlet pressure
			Neutral (At least 5 sec after)	0 MPa {0 kg/cm^2}
			Operation	2.9 ± 0.6 MPa {30 ± 5.5 kg/cm^2}
	2	Malfunction of swing motor (holding brake)	Since the holding brake of the swing motor may have a malfunction, check it directly.	

Causes												
Defective atmospheric pressure sensor	○	○	○									
Defective boost pressure sensor	○	○	○									
Defective fuel rail pressure sensor	○	○	○									
Defective timing rail pressure sensor	○	○	○									
Defective fuel pump pressure sensor	○	○	○									
Defective fuel pump actuator (Marked ∗1)	○	○	○									
Defective in throttle sensor	○	○	○									
Defective in speed sensor	○	○	○									
Clogged fuel rail actuator screen	○	○	○									
Clogged timing rail actuator screen	○	○	○									
Replace				●								
Replace				●								
Replace				●								
Replace				●								
Replace				●								
Replace					●							
—						●						
Replace				●								
Replace							●					
Replace								●				

∗1. If the following error code is displayed, carry out the troubleshooting in “Code display”. (If it is not displayed, it is not probably the cause of the trouble. In this case, inspect the other devices for the cause.)
[C318]: Abnormality in fuel pump actuator

S-13 OIL LEVEL RISES

★ If there is oil in the coolant, carry out Troubleshooting S-11.

General causes why oil level rises

- Coolant in oil (milky white)
- Fuel in oil (diluted, and smells of diesel fuel)
- Entry of coolant or oil from other component

		Causes											
		Broken cylinder head, head gasket	Defective cylinder head injector sleeve	Cracks inside cylinder block	Damaged cylinder liner O-ring, holes caused by pitting	Broken, broken rear oil seal face	Broken oil cooler core, O-ring	Clogged water pump drain hole (breather hole), defective seal	Defective thermostat seal	Worn fuel pump seal	Cut, worn injector O-ring	Defective auxiliary equipment (pump, compressor) seal
Questions	Confirm recent repair history											
	Degree of use of machine / Operated for long period		△		△	△		△				△
	Fuel must be added more frequently								◎	◎	◎	
	Engine oil smells of diesel fuel								◎	◎	◎	
Check items	There is oil in coolant	○	○	○	○		◎					
	When engine is first started, drops of water come from muffler		◎									
	When radiator cap is removed and engine is run at low idle, an abnormal number of bubbles appear, or coolant spurts back	◎										
	Exhaust smoke is white		◎						○		○	
	Water pump drain hole (breather hole) is clogged							◎				
	When water pump drain hole (breather hole) is cleaned, water comes out							◎				
	Oil level goes down in PTO chamber					◎						
	Oil level goes down in hydraulic tank											◎
Troubleshooting	When compression pressure is measured, it is found to be low	●										
	Carry out pressure-tightness test of cylinder head		●									
	Inspect cylinder block, liner directly			●	●							
	Inspect rear oil seal directly					●						
	Carry out pressure-tightness test of oil cooler						●					
	Inspect water pump directly							●				
	Inspect thermostat directly								●			
	Inspect fuel pump directly									●		
	Inspect injector directly										●	
	Inspect pump auxiliary equipment (pump, compressor) directly											●
	Remedy	Replace	Replace	Replace	Replace	Correct	Replace	Replace	Correct	Replace	Correct	Replace

PRECAUTIONS WHEN PERFORMING OPERATION

Be sure to follow the general precautions given below when performing removal or installation (disassembly or assembly) of units.

1. Precautions when performing removal work

- If the engine coolant water contains antifreeze, dispose of it properly.
- After disconnecting hoses or tubes, cover them or install blind plugs to prevent dirt or dust from entering.
- When draining oil, prepare a container of adequate size to catch the oil.
- Confirm the match marks showing the installation position, and make match marks in the necessary places before removal to prevent any mistake during assembly.
- To avoid loosening any wire contacts, do not pull on the wires. In-order to prevent excessive force to the wiring, hold onto the connectors when disconnecting them.
- Fasten tags to wires and hoses to identify them and show their installation position. This helps prevent any mistakes when re-installing.
- Count and check the number and thickness of the shims, and keep them in a safe place.
- When raising or lifting components, be sure to use proper lifting equipment of ample strength and safety.
- When using forcing screws to remove any components, tighten the forcing screws uniformly in turn.
- Before removing any unit, clean the surrounding area and install a cover to prevent any dust or dirt from entering after removal.

★ **Precautions when handling piping during disassembly**

Install the following blind plugs into the piping after disconnecting it during disassembly operations.

A. Face seal type hoses and tubes

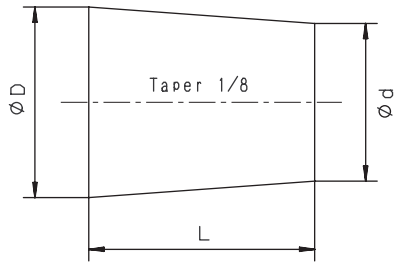
Nominal number	Plug (nut end)	Nut (elbow end)
02	07376-70210	02789-00210
03	07376-70315	02789-00315
04	07376-70422	02789-00422
05	07376-70522	02789-00522
06	07376-70628	02789-00628

B. Split flange type hoses and tubes

Nominal number	Flange (hose end)	Sleeve head (tube end)	Split flange
04	07379-00400	07378-10400	07371-30400
05	07379-00500	07378-10500	07371-30500

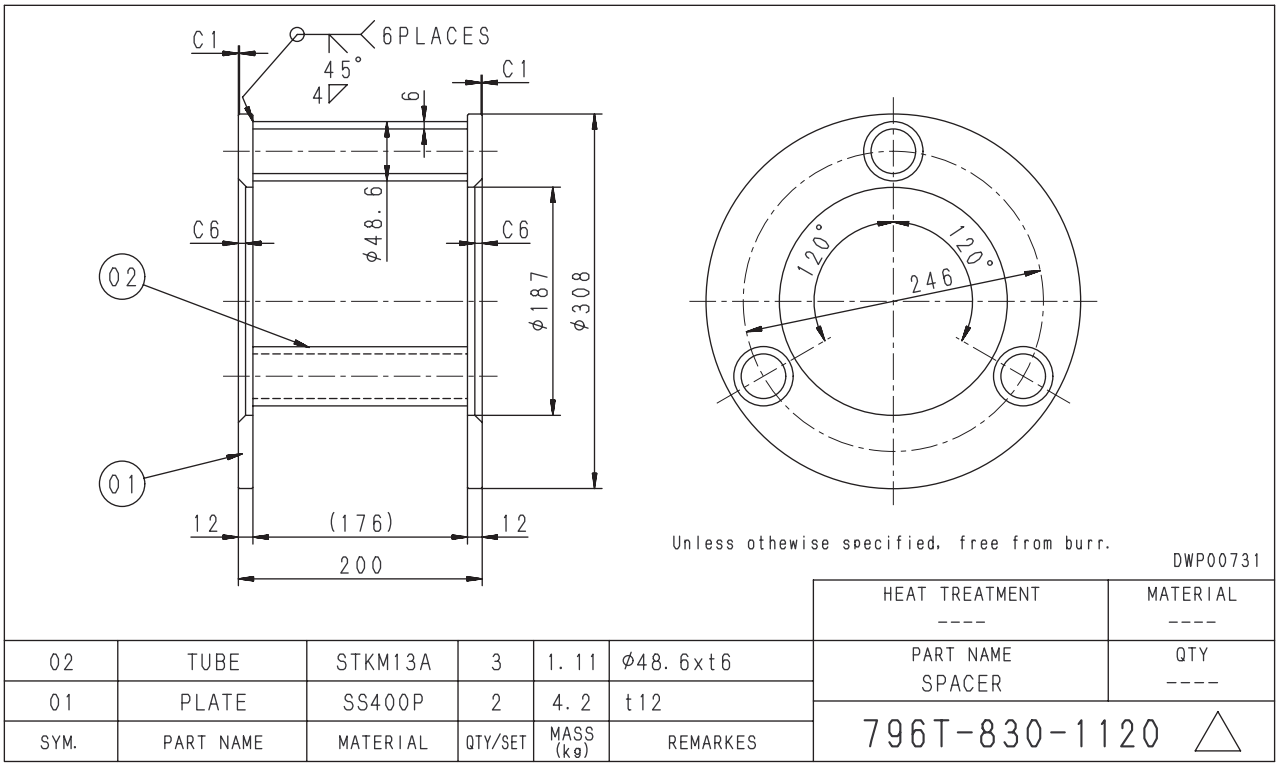
C. If the part is not under hydraulic pressure, the following corks can be used:

Nominal number	Part Number	Dimensions		
		D	d	L
06	07049-00608	6	5	8
08	07049-00811	8	6.5	11
10	07049-01012	10	8.5	12
12	07049-01215	12	10	15
14	07049-01418	14	11.5	18
16	07049-01620	16	13.5	20
18	07049-01822	18	15	22
20	07049-02025	20	17	25
22	07049-02228	22	18.5	28
24	07049-02430	24	20	30
27	07049-02734	27	22.5	34



DEW00401

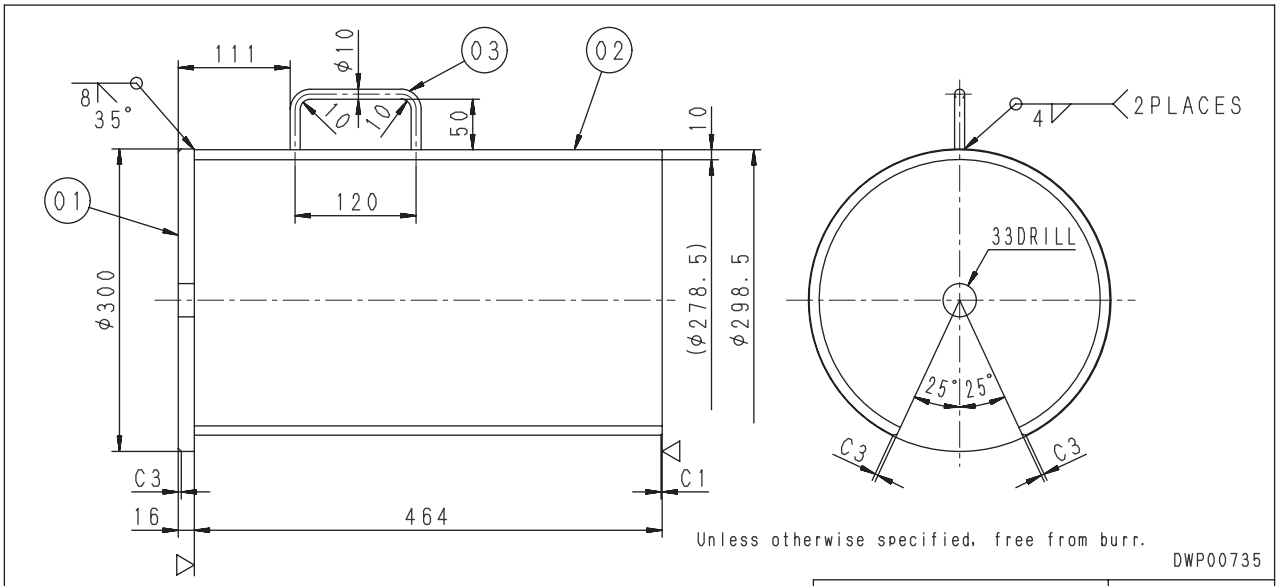
M1 Spacer



SYM.	PART NAME	MATERIAL	QTY/SET	MASS (kg)	REMARKS
02	TUBE	STKM13A	3	1.11	φ48.6xt6
01	PLATE	SS400P	2	4.2	t12

HEAT TREATMENT	MATERIAL
----	----
PART NAME: SPACER	QTY: ----
796T-830-1120 △	

V4 Sleeve



SYM.	PART NAME	MATERIAL	QTY/SET	MASS (kg)	REMARKS
03	BAR	SS400B	1	0.14	φ10
02	TUBE	STKM13A	1	28.4	φ298.5xt10
01	PLATE	SS400P	1	8.8	t16

HEAT TREATMENT	MATERIAL
----	----
PART NAME: SLEEVE	QTY: ----
796T-870-1150 △	

INSTALLATION

- Carry out installation in the reverse order to removal.

※ 1

Air tube joint bolt:
44.1 – 53.9 Nm {4.5 – 5.5 kgm}

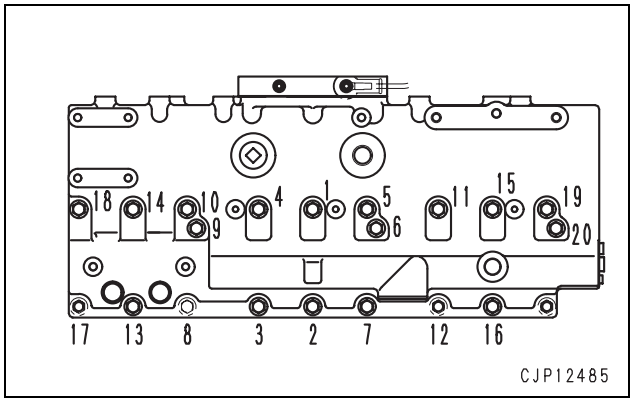
※ 2

Fuel tube :
92.5 ± 2.5 Nm {9.45 ± 0.25 kgm}

※ 3

★ Tighten the aftercooler mounting bolts in the order shown in the diagram below.

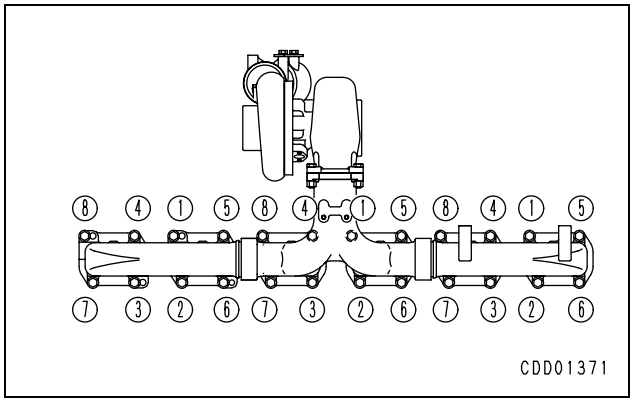
Mounting bolt:
66.15 ± 7.35 Nm {6.75 ± 0.75 kgm}



※ 4

★ Tighten the turbocharger and exhaust manifold mounting bolts in the order shown in the diagram below.

Turbocharger, exhaust manifold assembly mounting bolt:
110.35 ± 12.25 Nm {11.25 ± 1.25 kgm}



※ 5

Cylinder head cover mounting bolt:
31.85 ± 2.45 Nm {3.25 ± 0.25 kgm}

※ 6

★ Clean the hole of the mounting bolts and install.

★ Check that the ball portion of the adjustment screw is fitted securely in the socket portion of the push rod.

Rocker arm mounting bolt:
98 ± 4.9 Nm {10 ± 0.5 kgm}

Locknut:
67.62 ± 9.8 Nm {6.9 ± 1 kgm}

※ 7

★ Adjust the crosshead as follows.

1) Loosen the locknut, then turn back the adjustment screw.
2) Hold down the top surface of the crosshead lightly, and screw in the adjustment screw.
3) After the adjustment screw contacts the valve stem, screw it in a further 20°.
4) Tighten the locknut to hold the adjustment screw in position.

Locknut:
58.8 ± 5.88 Nm {6 ± 0.6 kgm}

※ 8

Injector mounting bolt:
1st step:
29.4 ± 4.9 Nm {3 ± 0.5 kgm}
2nd step: Tighten 90 – 120°

※ 9

Rocker arm housing mounting bolt:
98 ± 4.9 Nm {10 ± 0.5 kgm}

INSTALLATION

- Carry out installation in the reverse order to removal.

※ 1

N-m Mount bolt:
823.7 - 1,029.7 Nm {84 - 105 kgm}

- **Refilling with oil**
  Add oil to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.

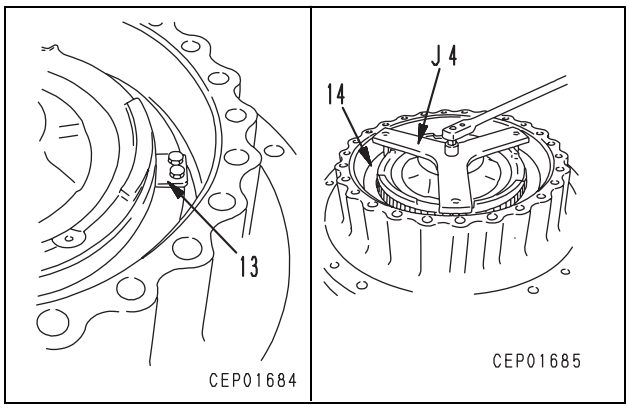
- **Refilling with coolant**
  Add coolant to the mouth of the radiator filler port. Tighten the cap and run the engine to circulate the coolant through the system. Then check the coolant level in the reserve tank.
  (Check if the coolant level goes up or down).

- **Bleeding air**
  Bleed the air from the main pump.
  For details, see TESTING AND ADJUSTING, Bleeding air from main pump.

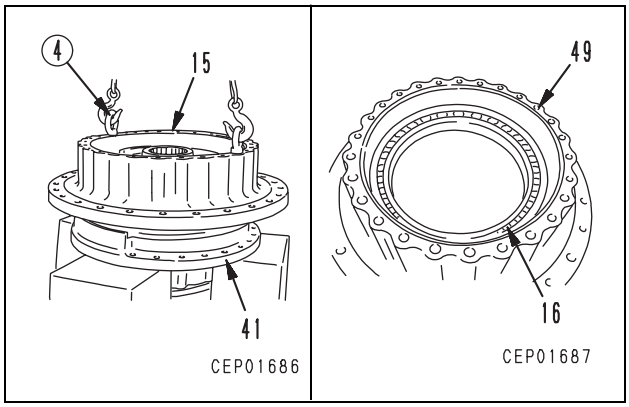
- **Adjusting drive belt tension.**
  Adjust the air conditioner compressor drive belt and fan belt.
  For details, see TESTING AND ADJUSTING, Adjusting belt tension.

7. Hub assembly

1) Remove lock plate (13).
2) Using tool **J4,** remove nut (14).



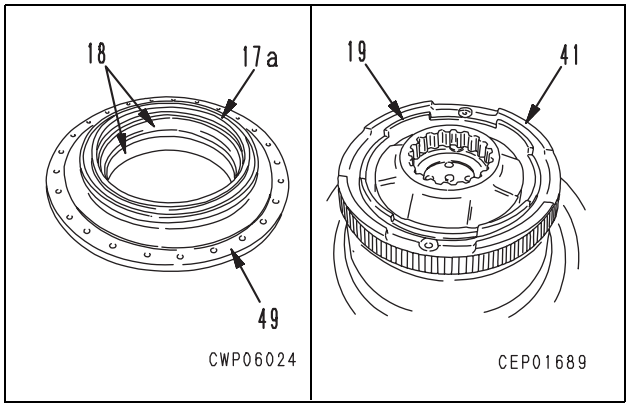
3) Using eyebolts ④, remove hub assembly (15) together with bearing (16) from shaft (41).
4) Remove bearing (16) from hub (49).



5) Remove floating seal (17a) from hub (49)
   ★ If the seal is to be used again, be careful not to damage the contact surface, and keep in a safe place.
6) Remove outer races (18).

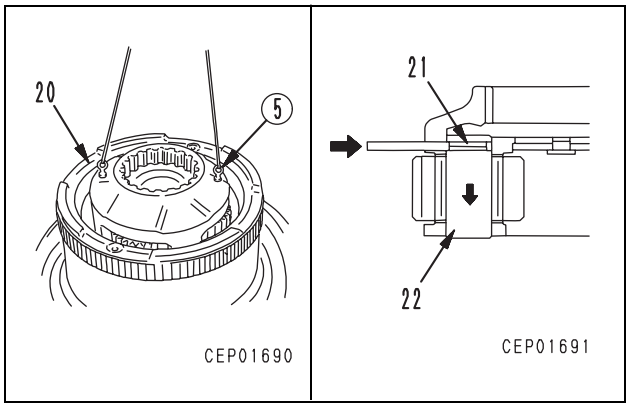
8. Spacer

1) Remove spacer (19) from shaft (41).

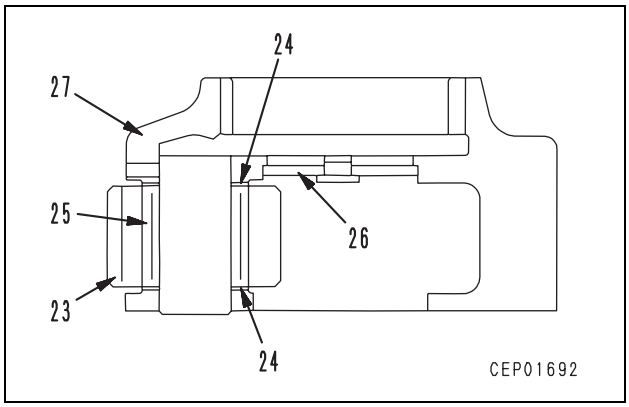


9. No. 2 carrier assembly

1) Using eyebolts ⑤, remove No. 2 carrier assembly (20).
2) Disassemble No. 2 carrier assembly as follows.
   i) Knock pin (21) into shaft (22).
   ii) Push shaft (22) from pin side to remove.
   ★ Remove the pin from the shaft.



   iii) Pull out gear (23) from carrier (27), then remove thrust washer (24) and bearing (25).
   iv) Remove thrust bearing assembly (26) from carrier (27).



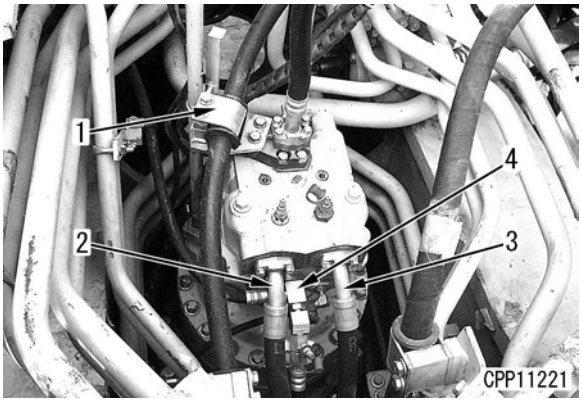
REMOVAL AND INSTALLATION OF SWING MACHINERY ASSEMBLY

REMOVAL

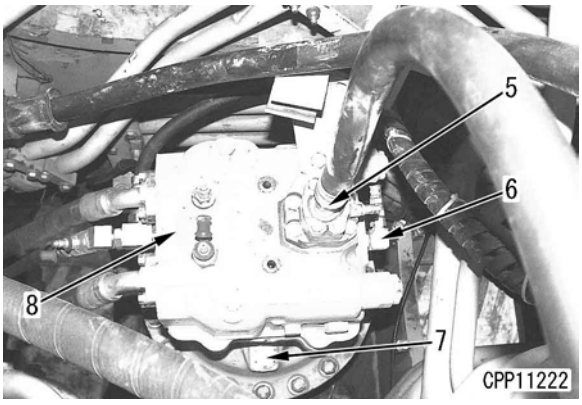
⚠ Lower the work equipment completely to the ground and stop the engine. Then loosen the oil filter cap slowly to release the pressure inside the hydraulic tank.

★ **Center of chassis**

1. Disconnect swing motor hose clamp (1).
2. Disconnect hoses (2) and (3) going to swing motor at front of chassis.
3. Disconnect drain hose (4).



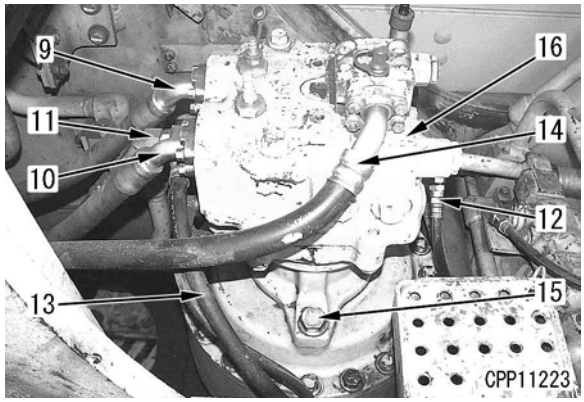
4. Disconnect hose (5) coming from the control valve.
5. Disconnect swing brake release hose (6).
6. Remove mounting bolts (7) and lift off swing motor assembly (8).



★ Front of chassis

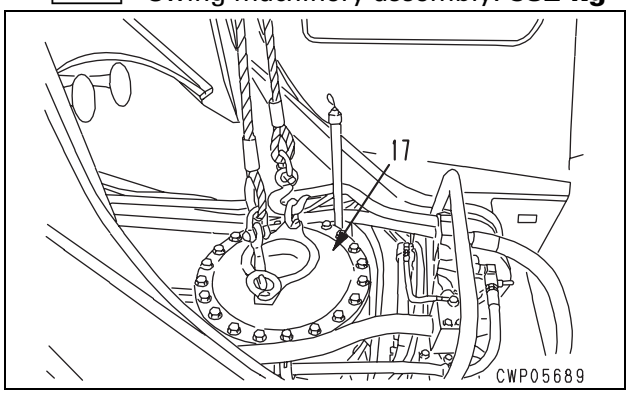
1. Disconnect hoses (9) and (10) coming from swing motor at center of chassis.
2. Disconnect drain hose (11).
3. Disconnect swing brake release hose (12).
4. Disconnect hose (13) going to boom LOWER regeneration valve.
5. Disconnect drain hose (14).
6. Remove mounting bolts (15), then lift off swing motor assembly (16).

Swing motor assembly: **126 kg**



7. Remove mounting bolts, then lift off swing machinery assembly (17). ※ 1

Swing machinery assembly: **532 kg**



INSTALLATION

- Carry out installation in the reverse order to removal.

※ 1

Mounting bolt:
927 ± 103 Nm {94.5 ± 10.5 kg}

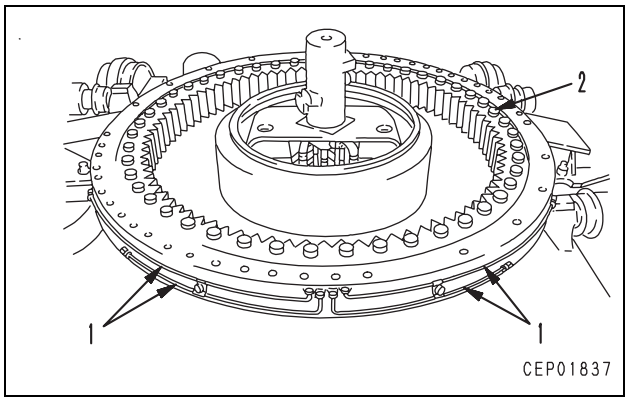
- Refilling with oil
  Add oil to the hydraulic tank to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.

Oil in swing machinery case:
Approx. 21.5 liters

REMOVAL AND INSTALLATION OF SWING CIRCLE ASSEMBLY

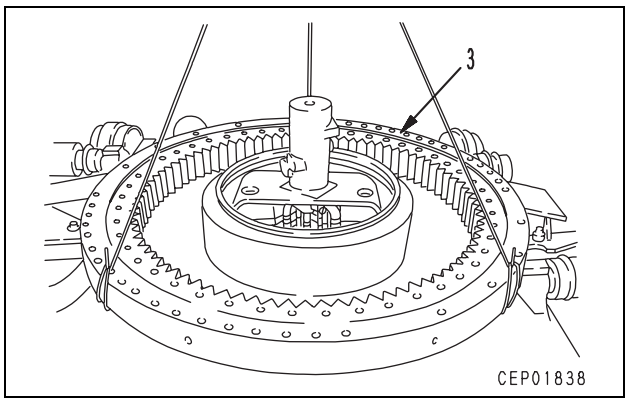
REMOVAL

1. Remove revolving frame assembly.
   For details, see REMOVAL OF REVOLVING FRAME ASSEMBLY.
2. Remove grease tubes (1).
3. Remove mounting bolts (2). ※ 1

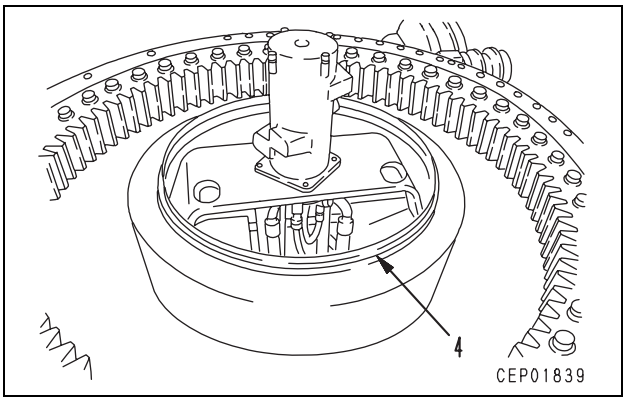


4. Pass a round bar through revolving frame mounting bolt holes, then fit wire and lift off swing circle assembly (3). ※ 2

   kg Swing circle assembly: **2,169 kg**



5. Remove seal (4).



INSTALLATION

- Carry out installation in the reverse order to removal.

※ 1

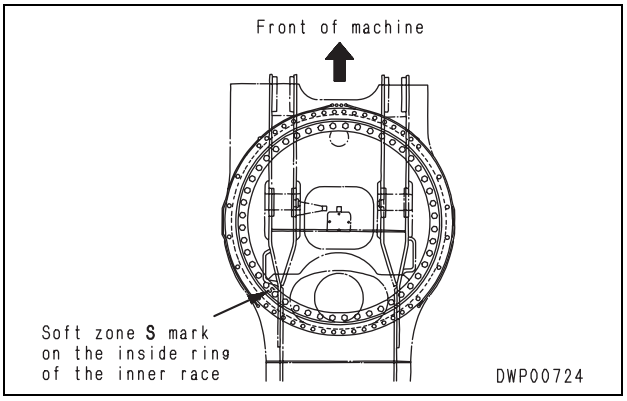
Mounting bolt:
Thread tightener (LT-2)

N-m Mounting bolt:
1,960 - 2,450 Nm {200 - 250 kgm}

※ 2

Mounting surface of swing circle:
Gasket sealant (LG-6)

★ Amount of grease (G2-LI) to fill oil bath: Approx. 75 ℓ
★ Coat the inner teeth with grease (G2-LI).
★ Set the soft zone **S** mark on the inner race facing the left side of the machine, then install.



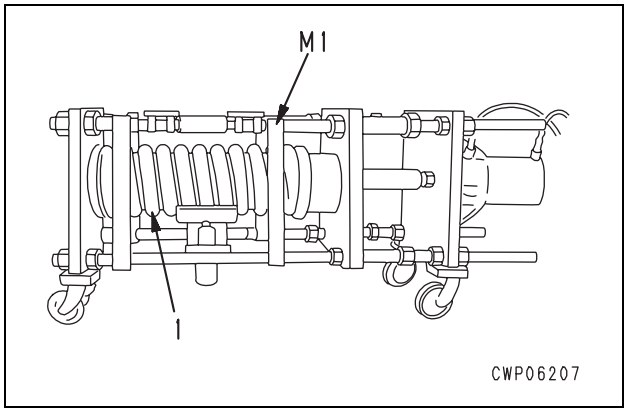
DISASSEMBLY AND ASSEMBLY OF RECOIL SPRING ASSEMBLY

SPECIAL TOOLS

Symbol		Part No.	Part Name	Necessity	Q'ty	New/Remodel	Sketch
M	1	791-685-8501	Compressor	■	1		
		791-635-3160	Extension	■	1		
		796T-830-1110	Plate	■	1	N	○
		796T-830-1120	Spacer	■	1	N	○
		01010-61640	Bolt	■	2		
		790-101-1600	Cylinder (70 tons)	■	1		
		790-101-1102	Hydraulic pump	■	1		

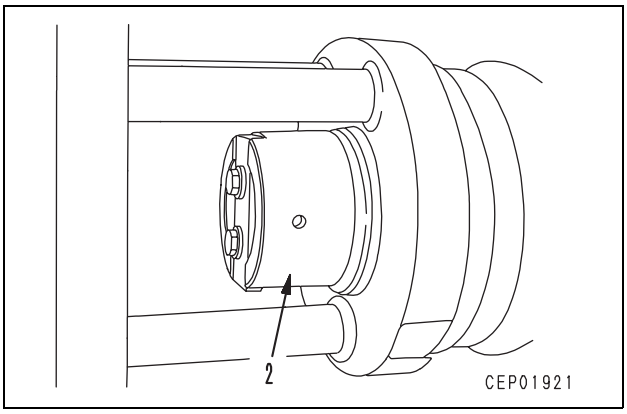
DISASSEMBLY

1. Set recoil spring assembly (1) to tool **M1**.
   - ⚠ The recoil spring is under a large installed load, so be sure to set the tool properly. Failure to do this is dangerous.
   - ★ Installed load of spring:
     578 kN {58,957 kg}

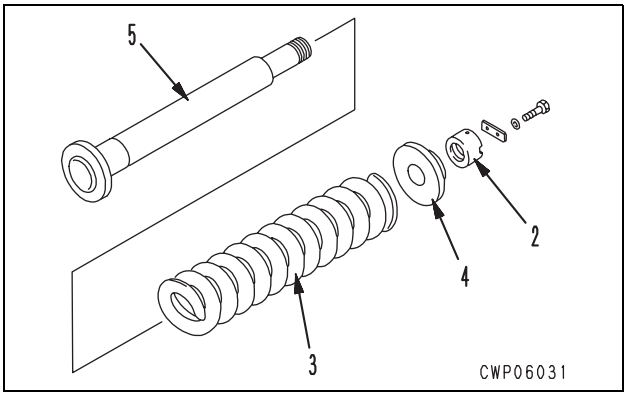


2. Apply hydraulic pressure slowly to compress spring, then remove lock plate, and remove nut (2).

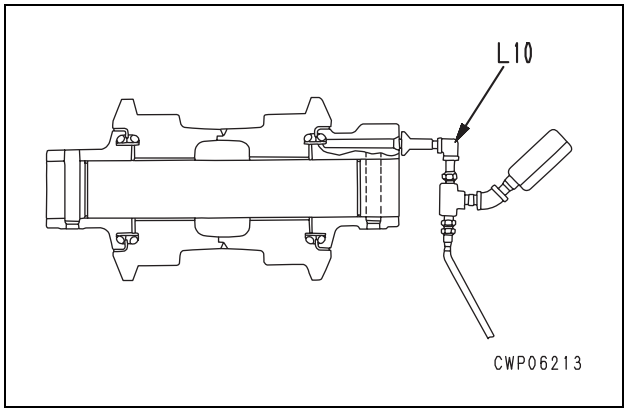
3. Release hydraulic pressure gradually to relieve tension of spring, then remove recoil spring assembly (1) from tool **M1**.



4. Remove rear pilot (4) and rod (5) from spring (3).



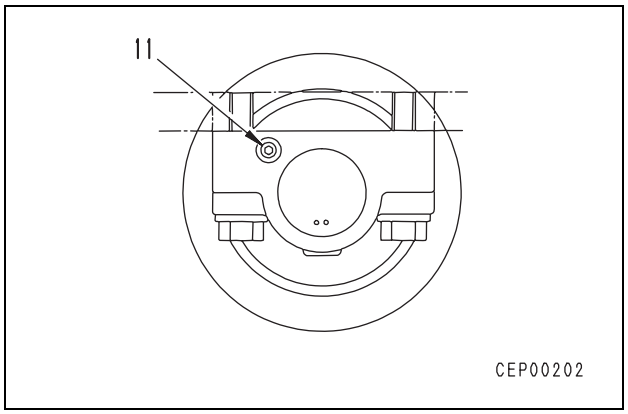
9. Using tool **L10**, apply standard pressure to roller oil filler port, and check for leakage of air from seal.
   - ★ Standard pressure: 0.1 MPa (1 kg/cm^2)
   - ★ Method of checking
     The standard pressure shall be maintained for 10 seconds and the indicator of the gauge shall not go down.

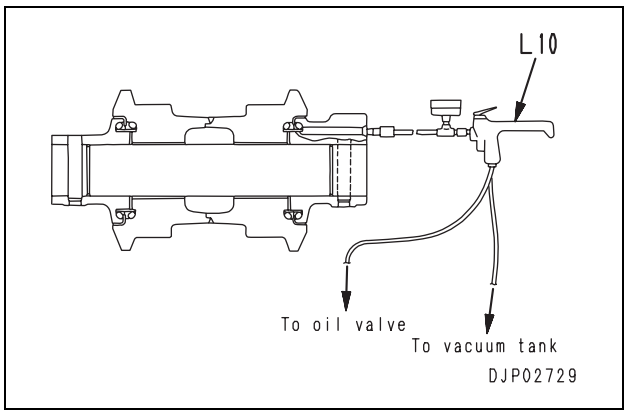


10. Using tool **L10**, fill track roller assembly with oil, then tighten plug (11).

    Track roller oil: **800 - 850 cc (EO30-CD)**

    Plug: **17 - 37 Nm {1.7 - 3.8 kgm}**





REMOVAL AND INSTALLATION OF 4-SPOOL CONTROL VALVE ASSEMBLY (NO. 3)

REMOVAL

⚠ Lower the work equipment completely to the ground and stop the engine. Then loosen the oil filler cap slowly to release the pressure inside the hydraulic tank.

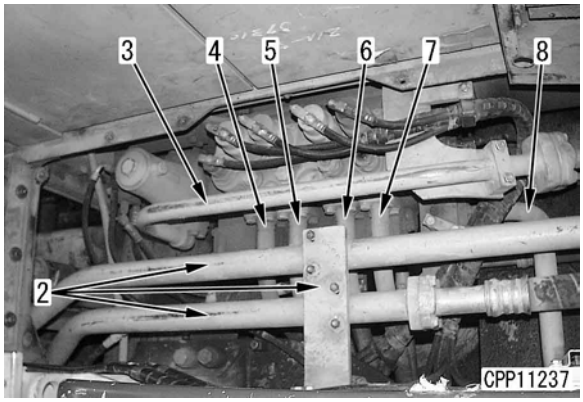
⚠ Release the remaining pressure inside the hydraulic circuit.
For details, see TESTING AND ADJUSTING, Releasing remaining pressure in hydraulic circuit.

★ Before disconnecting the PPC hoses, make counter marks to distinguish the mounting positions.

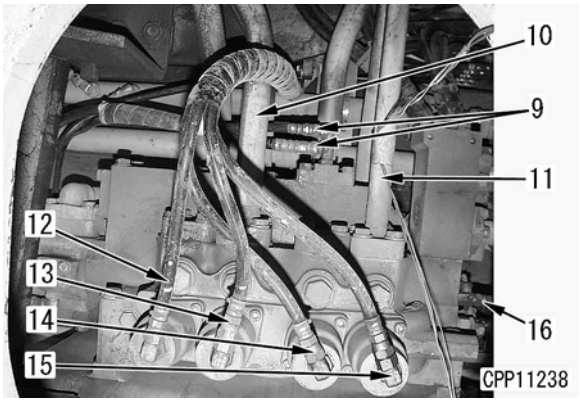
★ After disconnecting the hoses and tubes, fit blind plugs.

1. Remove control valve cover (1).

2. Remove tubes (2) and clamp.
3. Remove line filter tube (3).
4. Remove tube (4) for boom control valve.
5. Remove tube (5) for swing control.
6. Remove tube (6) for bucket control.
7. Remove tube (7) for arm control.
8. Remove tube (8) going to control valves No. 1 and No. 2.

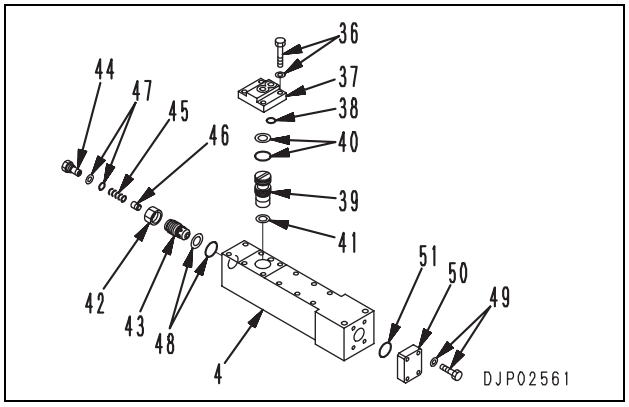


9. Disconnect hoses (9) coming from the pilot valve.
10. Disconnect swing control tube (10).
11. Disconnect arm control tube (11).
12. Remove pilot hoses (12), (13), (14), and (15), and then disconnect main relief valve (16).



26. Disassembly of swing priority valve assembly

1) Remove mounting bolts (36), then remove cover (37).
2) Remove O-ring (38) from cover (37).
3) Remove plug (39).
4) Remove backup ring, O-ring (40). and O-ring (41) from plug (39).
5) Loosen nut (42), and remove sleeve (43).
6) Remove plug (44). spring (45), and check valve (46) from sleeve (43).
7) Remove backup ring and O-rings (47) and (48) from plug (44) and sleeve (43).
8) Remove mounting bolts (49), then remove flange (50) and O-ring (51).



ASSEMBLY

1. Assembly of swing priority valve

1) Fit washer to bolt (49), then install O-ring (51) and flange (50) to valve body (4).
2) Fit backup ring and O-ring (48) to sleeve (43), and assemble to valve body.

Sleeve: **Liquid sealant {Seal end 242}**

N-m Sleeve: **177 - 216 Nm {18 - 22 kgm}**

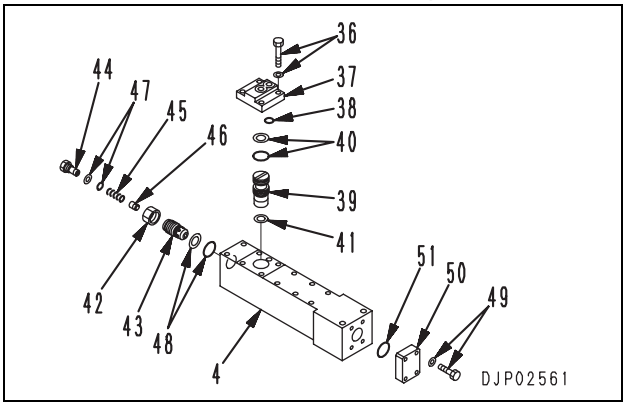
3) Tighten nut (42) to sleeve (43).

N-m Nut: **177 - 216 Nm {18 - 22 kgm}**

4) Fit backup ring and O-ring (47) to plug (44).
5) Insert check valve (46) and spring (45) in sleeve (43), then assemble plug (44).

N-m Plug: **29.4 - 39.2 Nm {3 - 4 kgm}**

6) Fit backup ring and O-ring (40) and O-ring (41) to plug (39). then insert In valve body (4).
7) Fit O-ring, then set cover (37) together with bolt (36) to valve body (4).



2. Fit O-ring to plug (35) and install.

N-m Plug: **58.8 - 78.5 Nm {6 - 8 kgm}**

3. Fit backup ring and O-ring (34) to plug (33) and install.

N-m Plug: **118 - 162 Nm {12 - 16.5 kgm}**

4. Install main relief valve (32).

N-m Main relief valve: **275 - 368 Nm {28 - 37.5 kgm}**

5. Install jet sensor relief valve (31).

N-m Jet sensor relief valve: **177 - 196 Nm {18 - 20 kgm}**

6. Install orifice (30).

N-m Orifice: **127 - 177 Nm {13 - 18 kgm}**

7. Install suction-safety valve (29).

N-m Suction-safety valve: **216 - 235 Nm {22 - 24 kgm}**

ASSEMBLY

1. Assemble valve (18) in body (19)
2. Assemble shim (17) and spring (16) to valve (18).
   - ★ Check the number and thickness of shim (17) for each mounting position, and assemble in the same position as before disassembly. Standard thickness of shim: 0.3 mm
   - ★ The top and bottom of spring (16) are not symmetrical, so set the small coil diameter (inside diameter) at the shim end when assembling.
3. Assemble spring (15). retainer (14), and piston (13).

   Outside circumference of piston, hole in body: **Grease (G2-LI)**
4. Fit O-ring to collar (12) and assemble in body (19), then install seal (11).
5. Install damper assembly (9) to plate (10) and tighten mounting bolts (8).

   Mounting bolt: **Thread tightener (LT-2)**

   N-m Mounting bolt: **4.41 ± 0.49 Nm {0.45 ± 0.05 kgm}**
6. Install plate and damper assembly (6), and tighten mounting bolts (8).
   - ★ Temporarily assemble a standard washer (1.6 mm) for washer (7).
     After the completion of assembly, measure the difference in the angle when the left and right levers are operated fully. If the difference in angle is greater than 0.7°, change the thickness of washer (7) to make the difference less than 0.7°.
     - Thickness of washer: 1.0. 1.3, 1.6 mm
     - ★ If the thickness of the washer is reduced by 0.3 mm, the angle when the lever is fully operated will be increased by 0.39°.

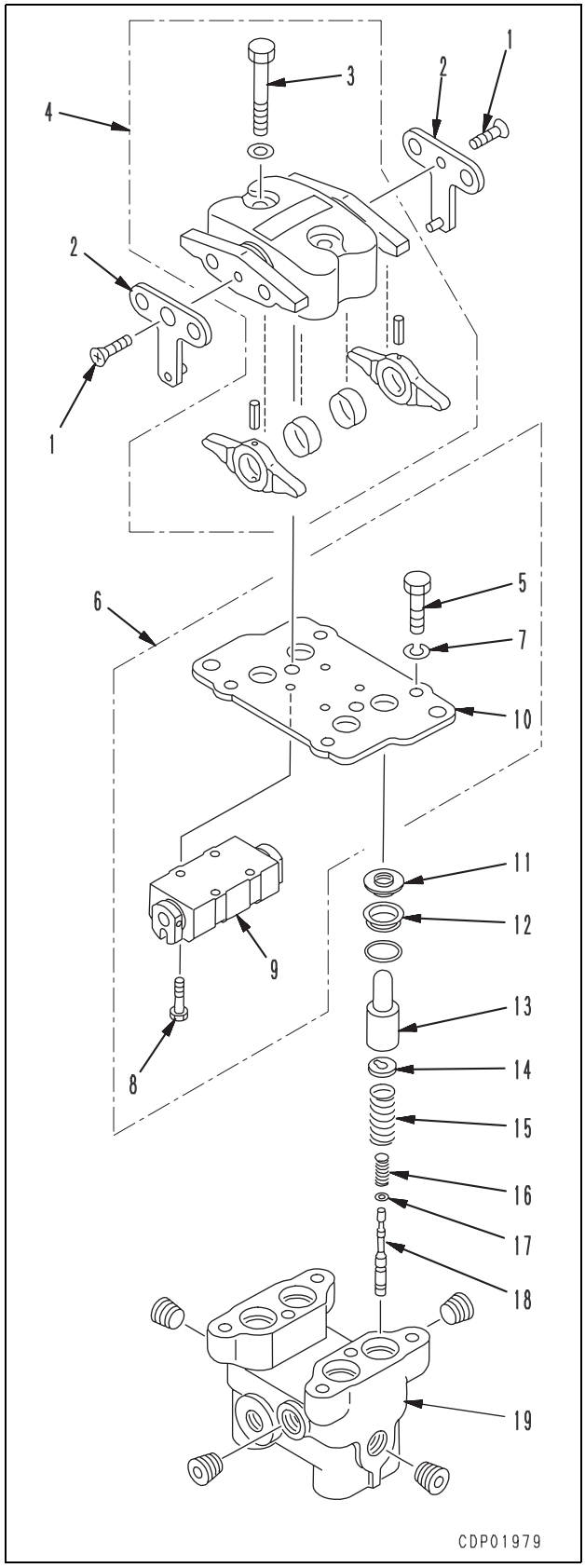
   N-m Mounting bolt: **30.87 ± 3.43 Nm {3.15 ± 0.35 kgm}**
7. Install case and shaft assembly (4) and tighten mounting bolts (3).

   Rocking portion of shaft, connection of lever and piston: **Grease (G2-LI)**

   N-m Mounting bolt: **27.93 ± 3.43 Nm {2.85 ± 0.35 kgm}**
8. Install levers (2) and tighten screws (1).

   Rocking portion of lever pin and plate: **Grease (G2-LI)**

   N-m Screw: **8.82 ± 0.98 Nm {0.9 ± 0.1 kgm}**



REMOVAL AND INSTALLATION OF ARM CYLINDER ASSEMBLY

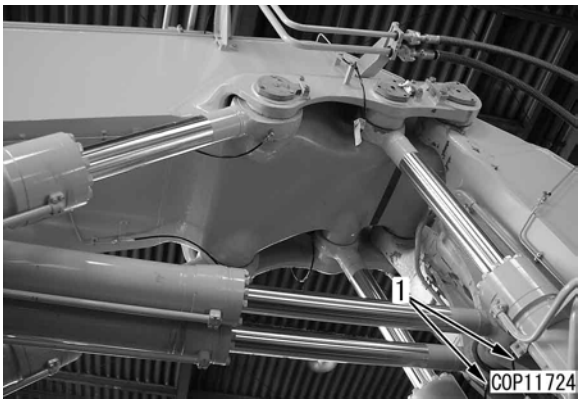
LOADING SHOVEL
REMOVAL

⚠ Retract boom cylinder fully, and extend arm cylinder, then set the bottom of the bucket horizontal, lower the work equipment completely to the ground and stop the engine. Operate the control levers several times to release the remaining pressure in the hydraulic piping.

⚠ Loosen the oil filler cap slowly to release the pressure inside the hydraulic tank.

★ Plug the hose to stop oil flow-out.

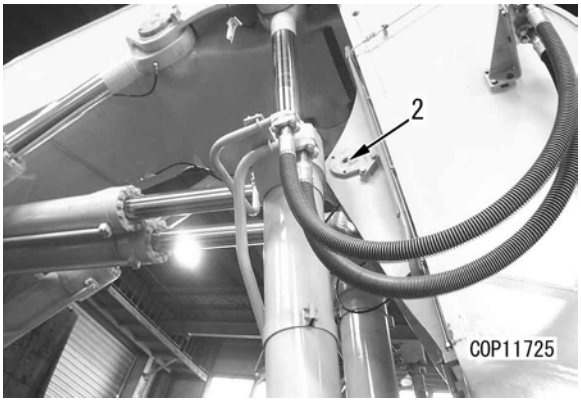
1. Disconnect grease tube (1) at piston rod end.



2. Sling arm cylinder assembly, and remove plate, then using forcing screws (Thread dia. = 16 mm, Pitch = 2.0 mm), pull out pin (2). ※ 1

   ★ Pull out the pin to a position where the piston rod can be disconnected.

   Pin: **24.2 kg**



3. Start engine and retract piston rod fully.

   ⚠ Tie the rod with wire to prevent it from coming out.

   ⚠ After stopping the engine, release the pressure inside the piping.
   For details, see TESTING AND ADJUSTING, Releasing pressure in PPC circuit.

4. Disconnect 4 arm cylinder hoses (3).

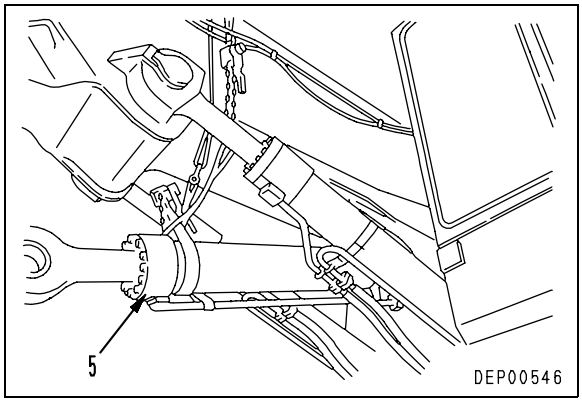
5. Sling piston rod end and bottom end, and remove plate, then using forcing screws (Thread dia. = 16 mm, Pitch = 2.0 mm), pull out pin (4). ※ 2

   ★ Pull out the pin to a position where the cylinder bottom can be disconnected.

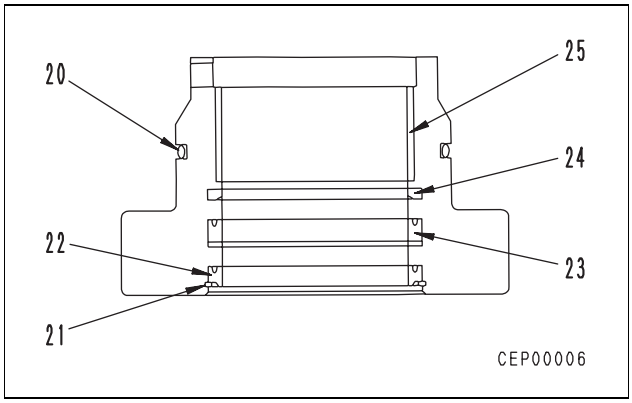
   Pin: **24.2 kg**

6. Lift off arm cylinder assembly (5) carefully.

   Arm cylinder assembly: **602 kg**



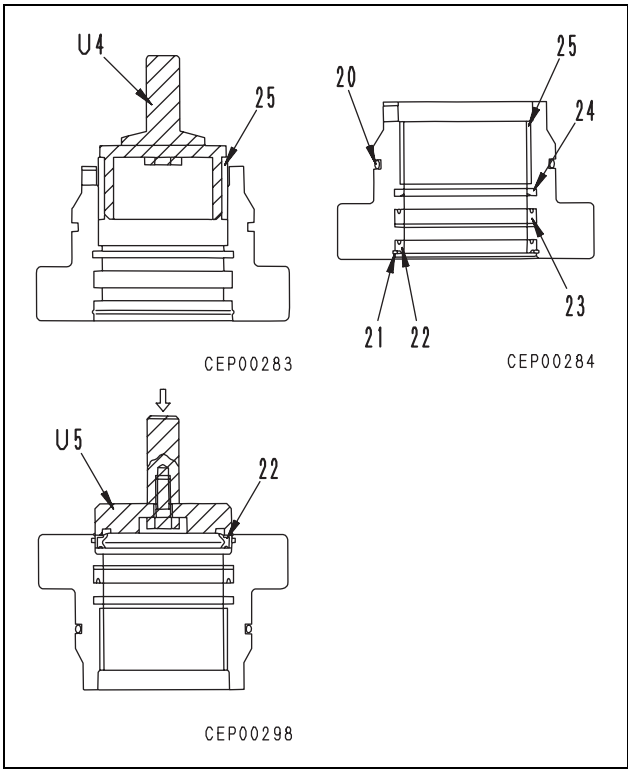
9) Disassembly of head assembly
   i) Remove the O-ring and backup ring (20).
   ii) Remove snap ring (21) and dust seal (22).
   iii) Remove rod packing (23).
   iv) Remove backup ring (24).
   v) Remove bushing (25).



ASSEMBLY

★ Take care not to damage the packings, dust seals, O-rings, etc.
★ Do not fit the backup rings forcibly. Warm them in water of about 50 - 60Žbefore fitting them.

1. Assembly of head assembly
1) Using tool **U4**, press fit bushing (25).
2) Fit backup ring (24).
3) Fit rod packing (23).
4) Using tool **U5**, fit dust seal (22) and fix it with snap ring (21).
5) Fit the O-ring and backup ring (20).



INSTALLATION

- Carry out installation in the reverse order to removal.

※ 1

Inside surface of bushing when assembling pin:
Anti-friction compound (LM-P)

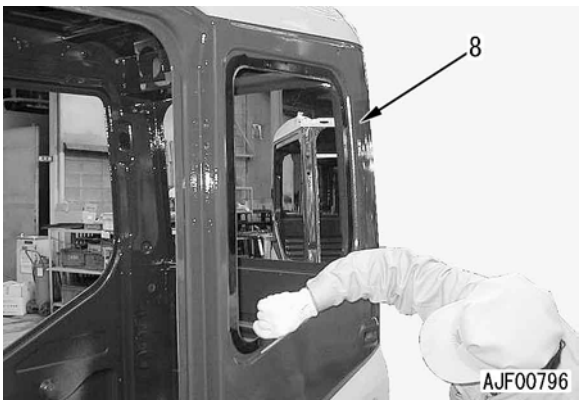
Grease after assembling pin:
Grease (LM-G)

⚠ When aligning the position of the pin hole, never insert your fingers in the hole.

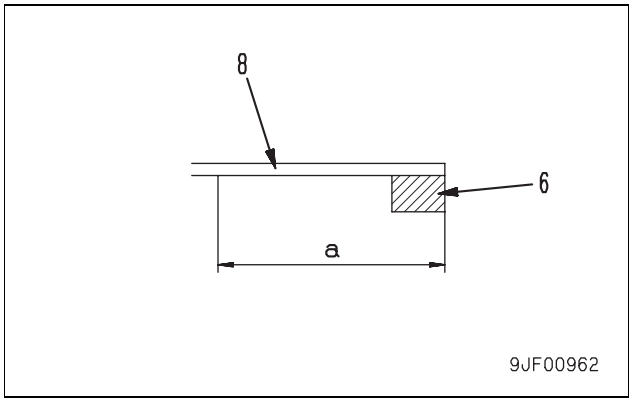
- **Bleeding air**
  ★ For details, see TESTING AND ADJUSTING, Air bleeding from each component.

- **Refilling with oil (hydraulic tank)**
  ★ Add oil through oil filler to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.

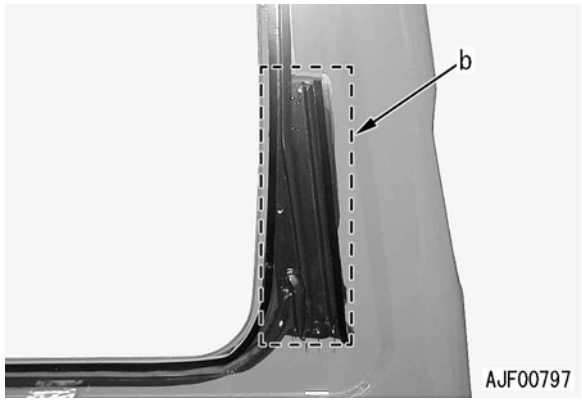
3) Evenly apply paint primer to the surfaces to stick both-sided adhesive tapes and the surfaces out of those surfaces on operator's cab (8) which will be coated with the adhesive.
   Paint primer:
   SUNSTAR PAINT PRIMER 580 SUPER or equivalent
   ★ Do not apply the primer more than 2 times. (If it is applied more than 2 times, its performance will be lowered.)

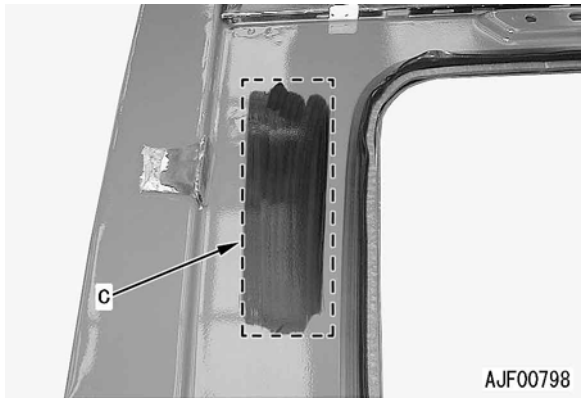


   ★ Parts to be coated with primer: Apply the primer all over dimension **a**.
   • Dimension to apply primer **a**: **25 mm**



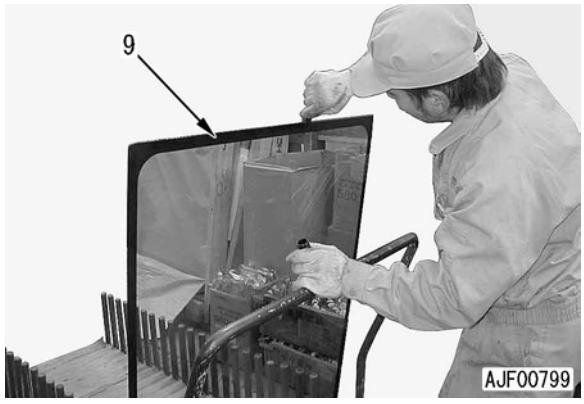
   ★ In addition to the above parts, apply the primer to right side window glass (1) and door lower window glass (3).
   • Range to apply primer additionally for right side window glass (1): **b**
   • Range to apply primer additionally for door lower window glass (3): **c**
   ★ After applying the primer,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



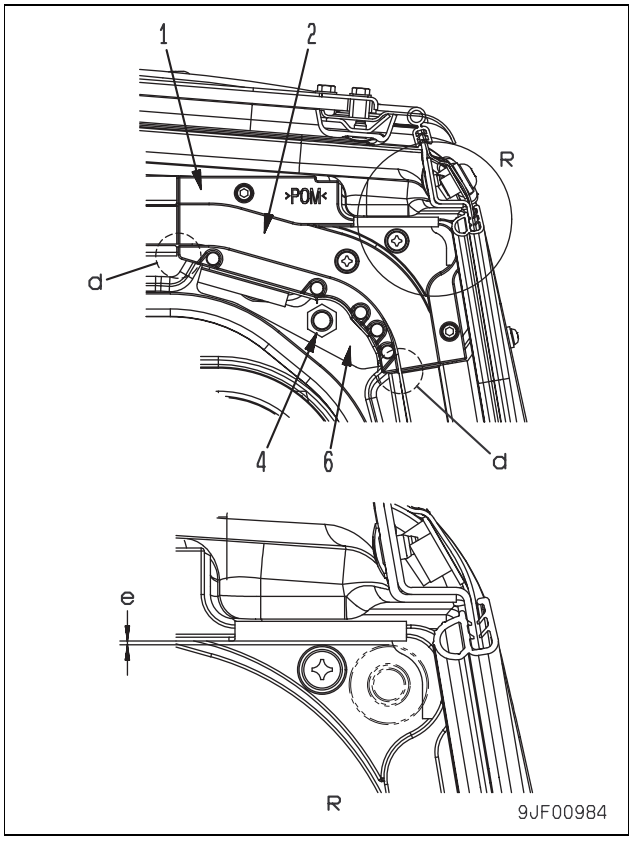


   ★ Never apply wrong primer. If the glass primer is applied by mistake, wipe it off with white gasoline.

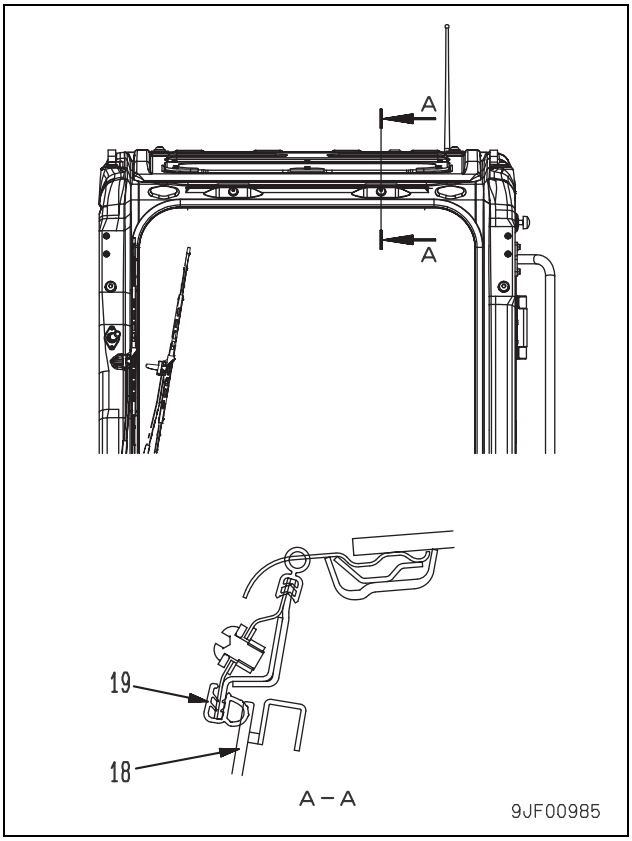
4) Evenly apply glass primer to the sticking surfaces of window glass (9).
   Glass primer:
   SUNSTAR GLASS PRIMER 580 SUPER or equivalent
   ★ Do not apply the primer more than 2 times. (If it is applied more than 2 times, its performance will be lowered.)

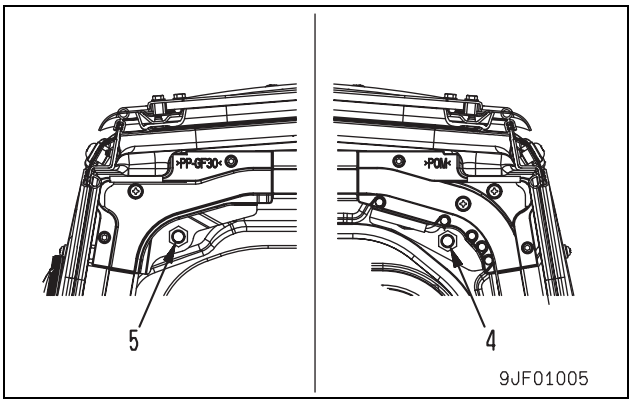


5. Install left corner blocks (1) and (2) and secure left corner bracket (6) with left striker bolt (4).
   - ★ Tighten the striker bolt securely after adjusting it in step 6.
   - ★ Install the left corner blocks so that there will be no level difference at 2 part **d**.
   - ★ Secure roller clearance **e**.



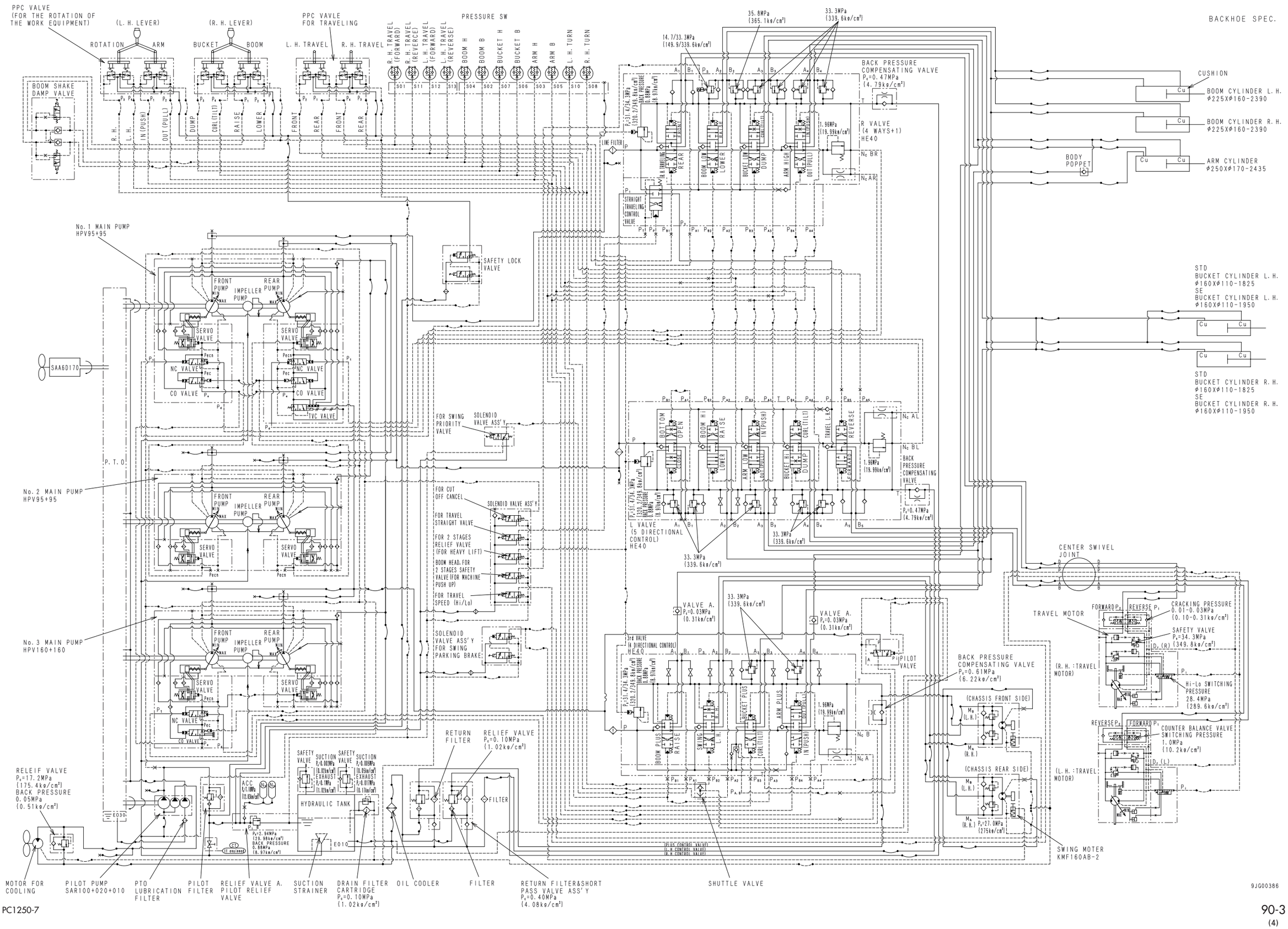
6. Adjust the striker bolts according to the following procedure (Adjust the "CLOSE" positions of the front window assembly locks).
   1) Tighten left striker bolt (4) and right striker bolt (5) at roughly right positions so that front window glass (18) will be fitted to cab-side trim seal (19).





HYDRAULIC CIRCUIT DIAGRAM (1/3)

BACKHOE SPECIFICATION



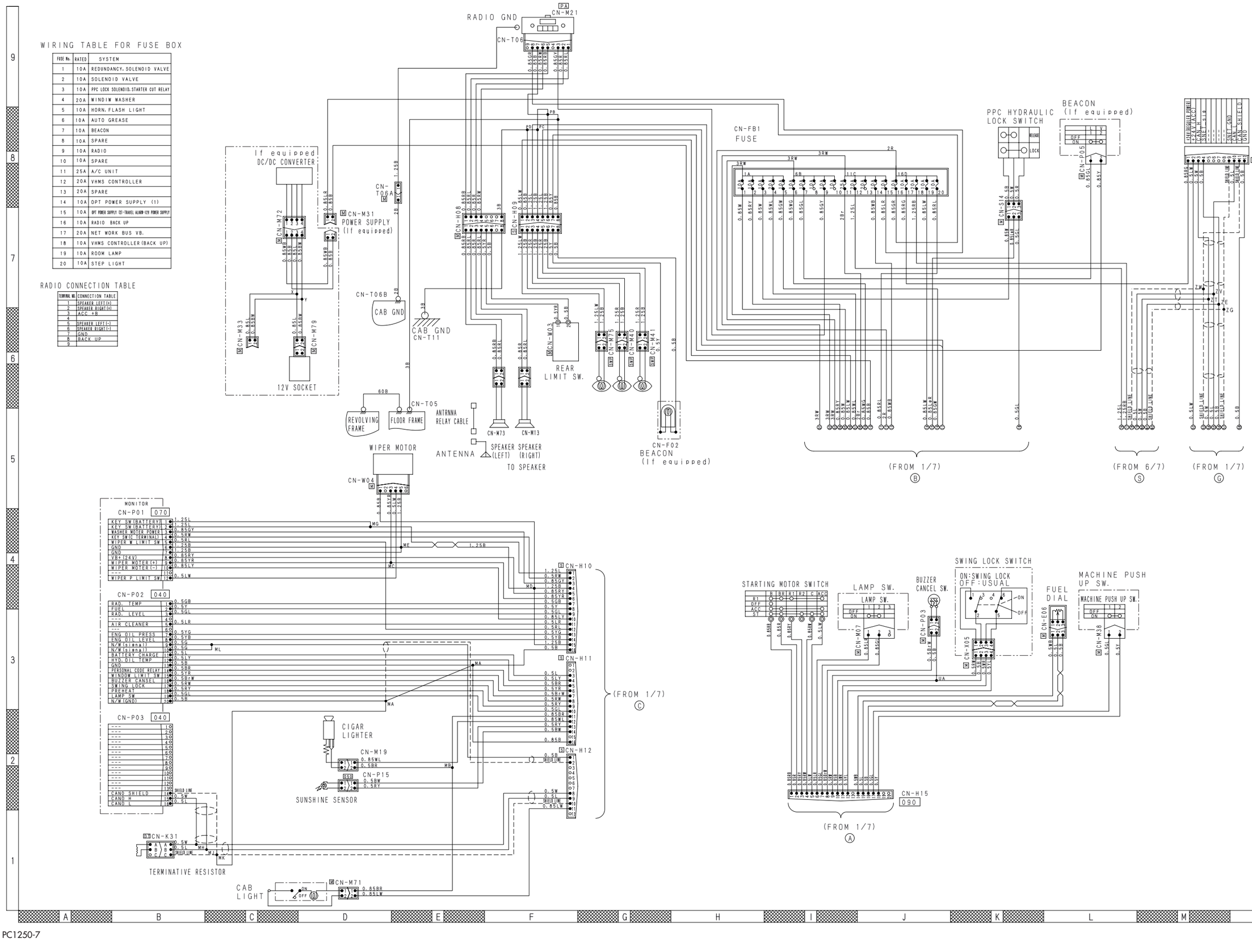
ELECTRICAL CIRCUIT DIAGRAM (3/7)

WIRING TABLE FOR FUSE BOX

FUSE No.	RATED	SYSTEM
1	10A	REDUNDANCY, SOLENOID VALVE
2	10A	SOLENOID VALVE
3	10A	PPC LOCK SOLENOID, STARTER CUT RELAY
4	20A	WINDIW WASHER
5	10A	HORN, FLASH LIGHT
6	10A	AUTO GREASE
7	10A	BEACON
8	10A	SPARE
9	10A	RADIO
10	10A	SPARE
11	25A	A/C UNIT
12	20A	VHMS CONTROLLER
13	20A	SPARE
14	10A	OPT POWER SUPPLY (1)
15	10A	OPT POWER SUPPLY (2)-TRAVEL ALARM-12V POWER SUPPLY
16	10A	RADIO BACK UP
17	20A	NET WORK BUS VB.
18	10A	VHMS CONTROLLER (BACK UP)
19	10A	ROOM LAMP
20	10A	STEP LIGHT

RADIO CONNECTION TABLE

TERMINAL NO.	CONNECTION TABLE
1	SPEAKER LEFT (+)
2	SPEAKER RIGHT (+)
3	ACC +B
4	
5	SPEAKER LEFT (-)
6	SPEAKER RIGHT (-)
7	GND
8	BACK UP
9	



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