SHOP MANUAL

KOMATSU

PC340LC, 340NLC-7K

MACHINE MODEL	SERIAL NUMBER
PC340LC-7K	**K40001 AND UP**
PC340NLC-7K	**K40001 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.
- PC340LC/NLC-7K mount the SAA6D114E engine.
  For details of the engine, see the 114 Series Engine Shop Manual.

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Printed in Belgium 12-02

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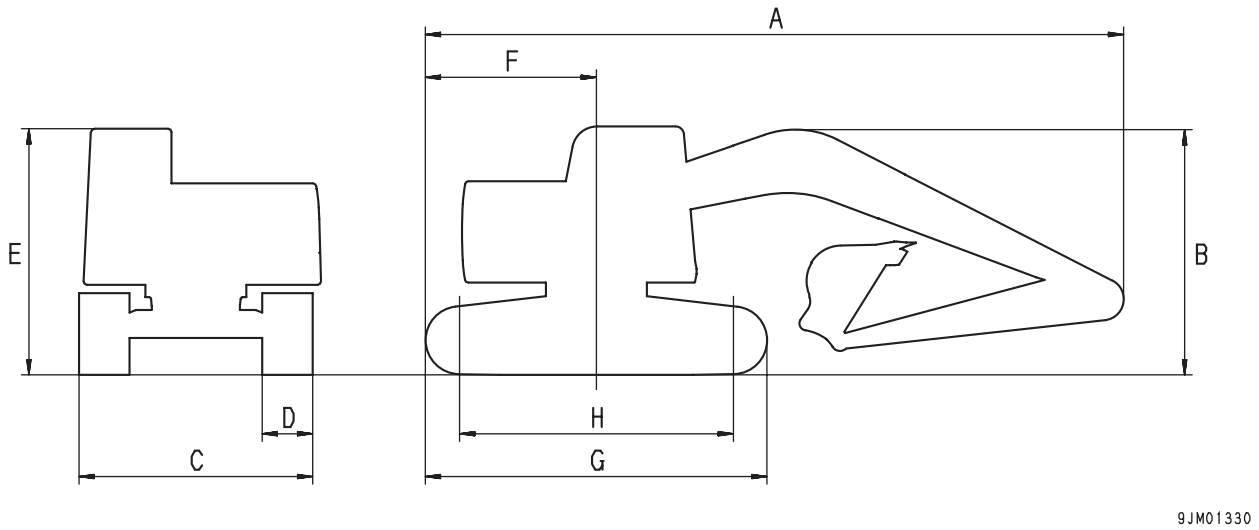
01 GENERAL

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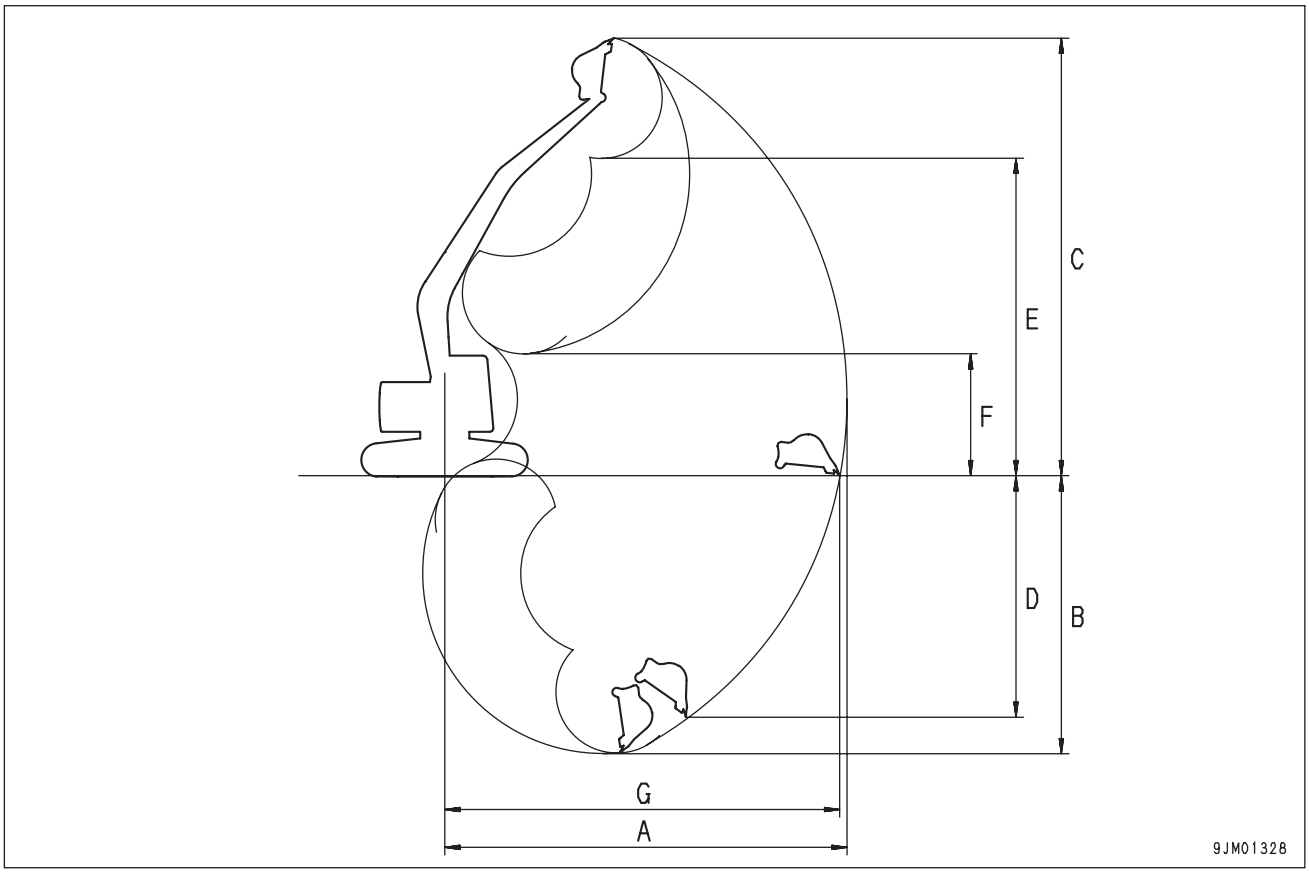
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SPECIFICATION DIMENSION DRAWINGS

DIMENSIONS



WORKING RANGES



DIMENSIONS

	Item	Unit	PC340LC-7	PC340NLC-7
A	Overall length	mm	11,140	11,140
B	Overall height	mm	3,290	3,280
C	Overall width	mm	3,190	2,990
D	Track shoe width	mm	700	600
E	Height of cab	mm	3,130	3,130
F	Tail swing radius	mm	3,450	3,450
G	Track overall length	mm	4,955	4,955
H	Length of track on ground	mm	4,030	4,030
	Min. ground clearance	mm	498	498

WORKING RANGES

	Item	Unit	PC340LC-7	PC340NLC-7
A	Max. digging reach	mm	11,100	11,100
B	Max. digging depth	mm	7,380	7,380
C	Max. digging height	mm	10,210	10,210
D	Max. vertical wall depth	mm	6,480	6,480
E	Max. dumping height	mm	7,110	7,110
F	Min. dumping height	mm	2,640	2,640
G	Max. reach at ground level	mm	10,920	10,920

SPECIFICATIONS

PC340LC-7, PC340NLC-7

Machine model				PC340LC-7	PC340NLC-7
Serial Number				40001 and up	
Bucket capacity			m³	1.4	1.4
Operating weight			kg	33,530	33,230
Performance	Working ranges	Max. digging depth	mm	7,380	7,380
		Max. vertical wall depth	mm	6,480	6,480
		Max. digging reach	mm	11,100	11,100
		Max. reach at ground level	mm	10,920	10,920
		Max. digging height	mm	10,210	10,210
		Max. dumping height	mm	7,110	7,110
	Max. digging force		kN {kg}	211.8 {21,600} (226.5	211.8 {21,600} (226.5
	(using power max. function)		kN {kg}	{23,100})	{23,100})
	Swing speed		rpm	9.5	9.5
	Swing max. slope angle		deg.	21	21
	Travel speed		km/h	Lo: 3.2 (※ Mi: 4.5)	Lo: 3.2 (※ Mi: 4.5)
				Hi: 5.5	Hi: 5.5
	Gradeability		deg.	35	35
	Ground pressure		kPa {kg/cm²}	53.0 {0.54}	61.8 {0.63}
	[standard shoe width]		[mm]	[700]	[600]
Dimensions	Overall length (for transport)		mm	11,140	11,140
	Overall width		mm	3,190	3,190
	Overall width of track		mm	3,290	2,990
	Overall height (for transport)		mm	3,280	3,280
	Overall height to chassis		mm	3,130	3,130
	Ground clearance to bottom of upper structure		mm	1,186	1,186
	Min. ground clearance		mm	498	498
	Tail swing radius		mm	3,450	3,450
	Min. swing radius of work equipment		mm	4,310	4,310
	Height of work equipment at min. swing radius		mm	8,520	8,520
	Length of track on ground		mm	4,030	4,030
	Track gauge		mm	2,590	2,590
	Height of machine cab		mm	3,130	3,130

※ : The "Mi" mode is on the multi-monitor specification machine only.

Machine model				PC340LC-7	PC340NLC-7
Serial Number				40001 and up	
Engine	Model			SAA6D114E	
	Type			4-cycle, water-cooled, in-line, vertical, direct injection, with turbo charger and aftercooler	
	No. of cylinders - bore x stroke		mm	6 - 114 x 135	
	Piston displacement		l {cc}	8.27 {8,270}	
	Performance	Flywheel horsepower	kW/rpm {HP/rpm}	180.3/1,900 {242/1,900}	
		Max. torque	Nm/rpm {kgm/rpm}	1,079/1,400 {110/1,400}	
		Max. speed at no load	rpm	2,160	
		Min. speed at no load	rpm	900	
		Min. fuel consumption	g/kWh {g/HPh}	205 {153}	
	Starting motor			24V, 7.5 kW	
	Alternator			24V, 35 A	
	Battery			12V, 126 Ah x 2	
	Radiator core type			CF19-4	
Under-carriage	Carrier roller			2 on each side	
	Track roller			7 on each side	8 on each side
	Track shoe			Assembly-type triple grouser, 45 on each side	Assembly-type triple grouser, 48 on each side
Hydraulic system	Hydraulic pump	Type x No.		HPV125+125, variable displacement, Piston type x2	
		Delivery	l/min	267.5 x 2	
		Set pressure	MPa (kg/cm²)	37.8 {380}	
	Control valve	Type x No.		6-spool type + 1-spool type x 1	
		Control method		Hydraulic	
	Hydraulic motor	Travel motor		HMV160ADT-2, Piston type (with brake valve, parking brake): x 2	
		Swing motor		KMF230ABE-5, Piston type (with safety valve, holding brake): x 1 reverse rotation check valve	
	Hydraulic cylinder	Type		Boom: Double acting piston	Arm: Double acting piston / Bucket: Double acting piston
		Inside diameter of cylinder	mm	140	160 / 140
		Diameter of piston rod	mm	100	110 / 100
		Stroke	mm	1,480	1,825 / 1,285
		Max. distance between pins	mm	3,525	4,255 / 3,155
		Min. distance between pins	mm	2,045	2,430 / 1,870
	Hydraulic tank			Closed box type	
	Hydraulic filter			Tank return side	
	Hydraulic cooler			CFT-1 (Air cooled)	

WEIGHT TABLE

This weight table is for use when handling components or when transporting the machine.

PC340LC-7, PC340NLC-7

Unit: kg

Machine model	PC340LC-7	PC340NLC-7
Serial Number	40001 and up	
Engine assembly	1,148	1,148
• Engine	860	860
• Damper	14.3	14.3
• Hydraulic pump	178	178
Radiator oil cooler assembly	153	153
Hydraulic tank, filter assembly (excluding hydraulic oil)	176	176
Fuel tank (excluding fuel)	238	238
Revolving frame	2,723	2,723
Operator's cab	292	292
Operator's seat	35	35
Counterweight	5,470	5,470
Swing machinery	442	442
Control valve	242	242
Swing motor	88	88
Travel motor	164 x 2	164 x 2
Center swivel joint	29.9	29.9
Track frame assembly	7,979	7,979
• Track frame	4,441	4096.79
• Swing circle	487	169 x 2
• Idler	169 x 2	287.5 x 2
• Idler cushion	287.5 x 2	31.3 x 4
• Carrier roller	31.3 x 4	52.9 x 16
• Track roller	52.9 x 14	583 x 2
• Final drive (including travel motor)	583 x 2	

Unit: kg

Machine model	PC340LC-7	PC340NLC-7
Serial Number	40001 and up	
Track shoe assembly		
• Standard triple grouser shoe (600 mm)	3,700	3,700
• Standard triple grouser shoe (700 mm)	4,300	4,300
• Wide triple grouser shoe (800 mm)	4,680	4,680
• Road liner (rubber pad type) (600 mm)	—	—
Boom assembly	2,290	2,290
Arm assembly	1,105	1,105
Bucket assembly	1,015	1,015
Boom cylinder assembly	254 x 2	254 x 2
Arm cylinder assembly	382	382
Bucket cylinder assembly	228	228
Link assembly (large)	316	316
Link assembly (small)	—	—
Boom pin	76 + 15 x 2 + 56 + 17 + 42	76 + 15 x 2 + 56 + 17 + 42
Arm pin	13 +17	13 +17
Bucket pin	30 x 2	30 x 2
Link pin	27 x 2	27 x 2

FUEL, COOLANT, AND LUBRICANTS

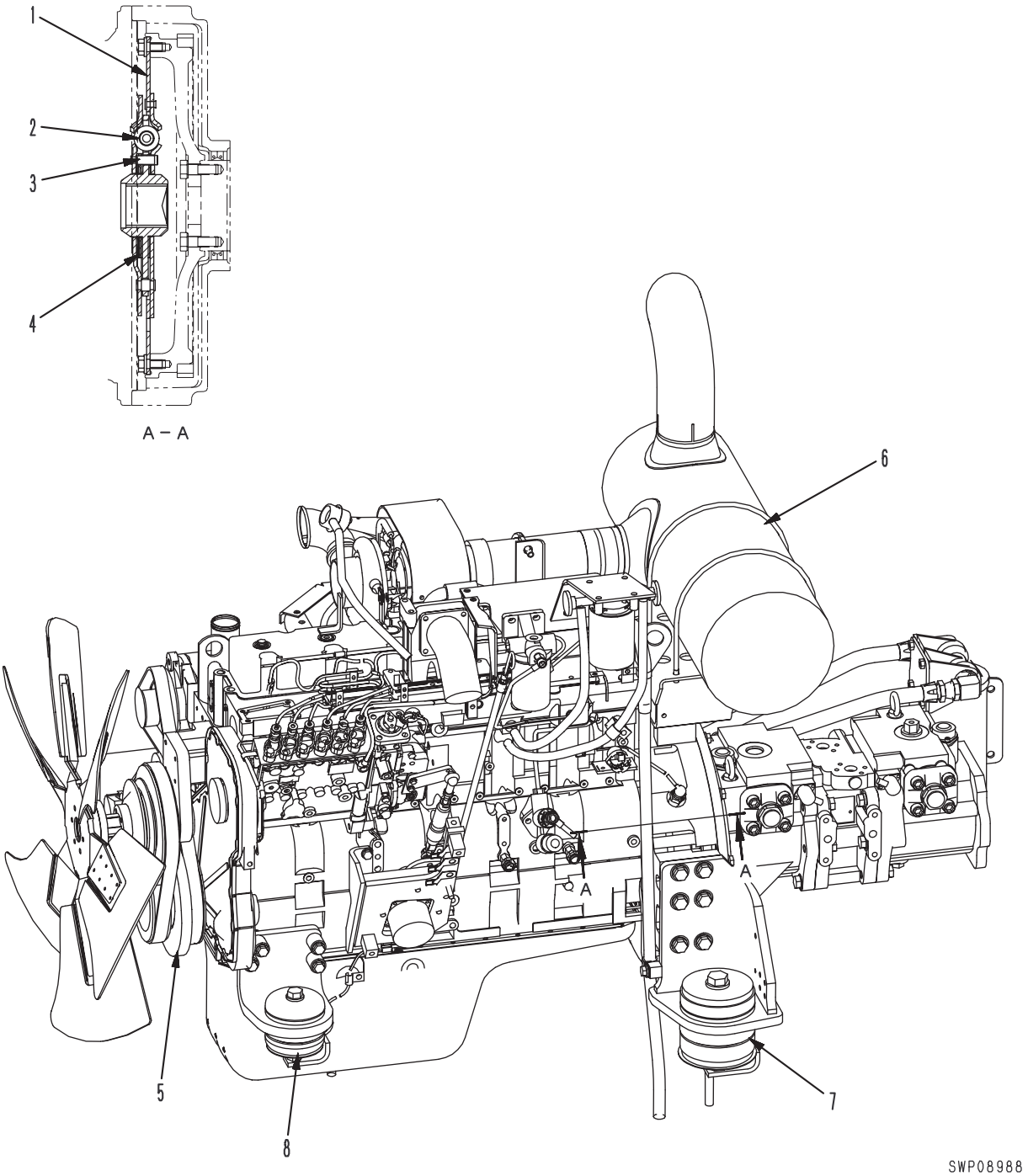
RESERVOIR	KIND OF FLUID	AMBIENT TEMPERATURE	CAPACITY (l)	
		-22 -4 14 32 50 68 86 104°F -30 -20 -10 0 10 20 30 40°C	Specified	Refill
Engine oil pan	Engine oil	SAE 30 / SAE 10W / SAE 10W-30 / SAE 15W-40	38	35
Damper case			1.3	—
Swing machinery case			13.4	13.4
Final drive case (each side)		SAE 30	8.5	8.5
Idler (1 each)			0.22 ~ 0.24	0.22 ~ 0.24
Track roller (1 each)			0.25 ~ 0.28	0.25 ~ 0.28
Carrier roller (1 each)			0.145 ~ 0.155	0.145 ~ 0.155
Hydraulic system	Engine oil	SAE 10W / SAE 10W-30 / SAE 15W-40	365	188
	Hydraulic oil	H046-HM (★)		
Fuel tank	Diesel fuel	ASTM D975 No. 2 / ASTM D975A No.1	605	—
Cooling system	Coolant	Add antifreeze	32	—

★ For the H-046-HM, use the oil recommended by Komatsu.

10 STRUCTURE, FUNCTION AND MAINTENANCE STANDARD

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ENGINE RELATED PARTS

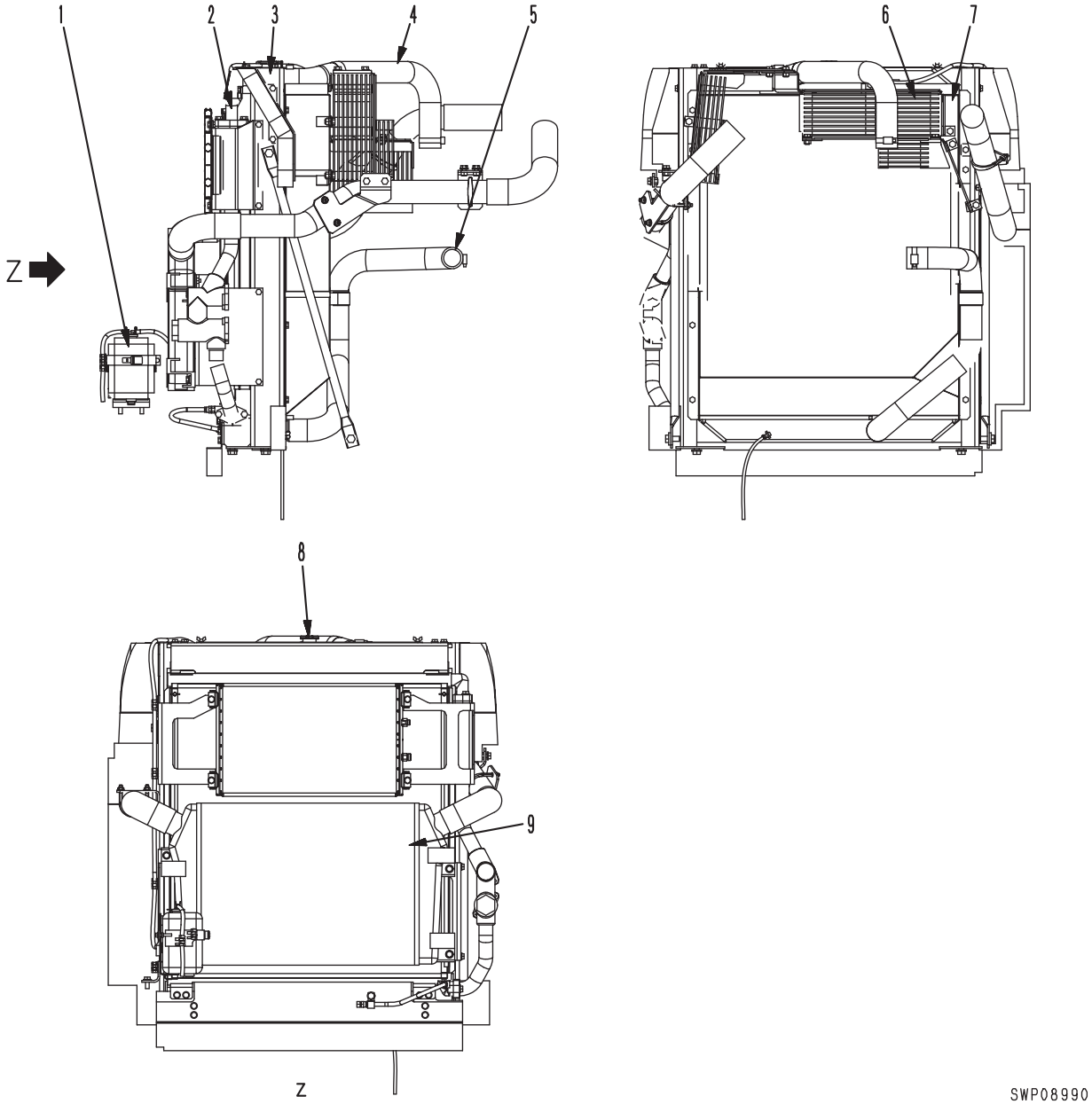


1. Drive plate
2. Torsion spring
3. Stopper pin
4. Friction plate
5. Damper assembly
6. Muffler
7. Rear engine mount
8. Front engine mount

OUTLINE

- The damper assembly is a wet type.
  Oil capacity: 1.3 **l**

RADIATOR • OIL COOLER • AFTERCOOLER

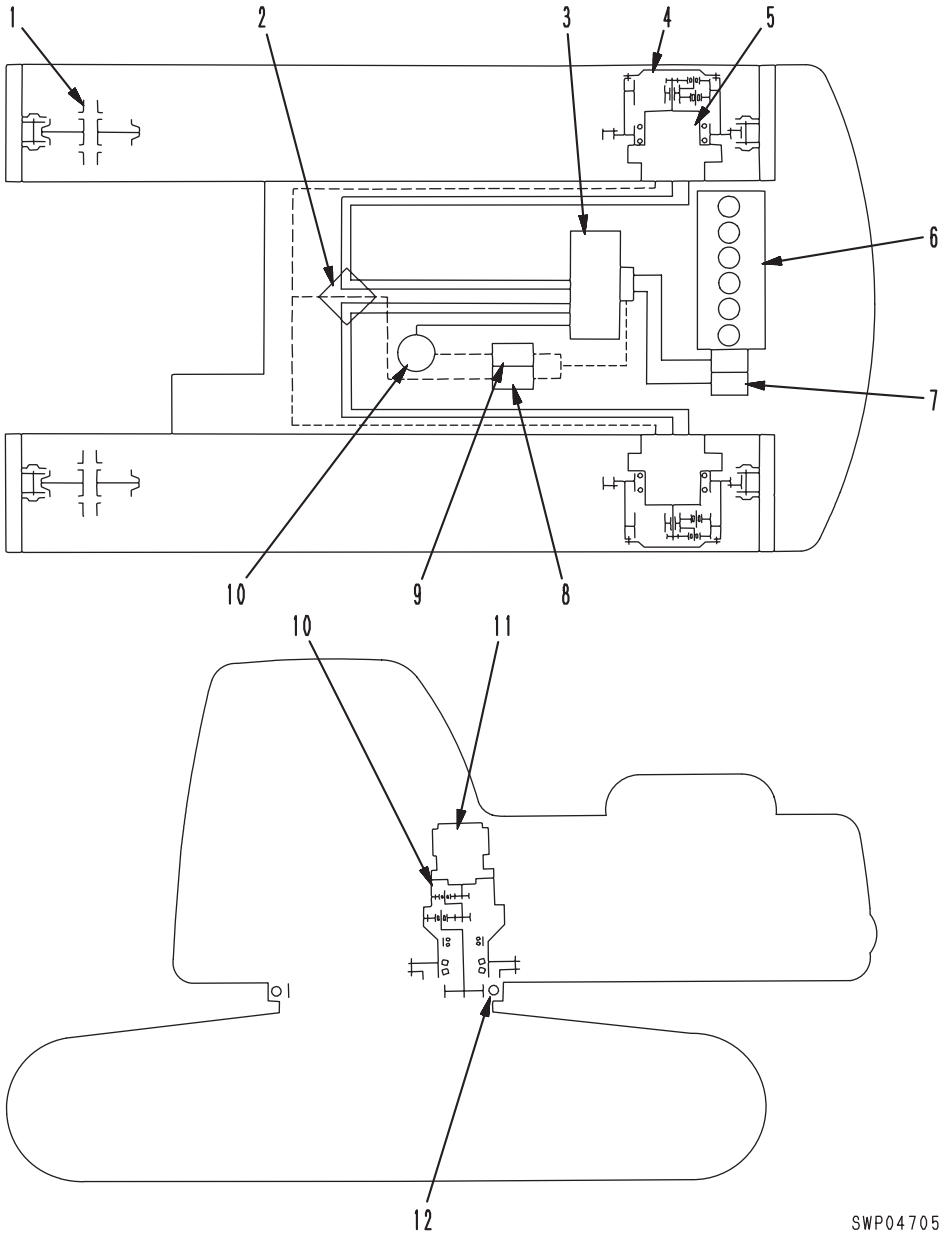


1. Reservoir tank
2. Oil cooler
3. Radiator
4. Radiator inlet hose
5. Radiator outlet hose
6. Net
7. Shroud
8. Radiator cap
9. Aftercooler

SPECIFICATIONS

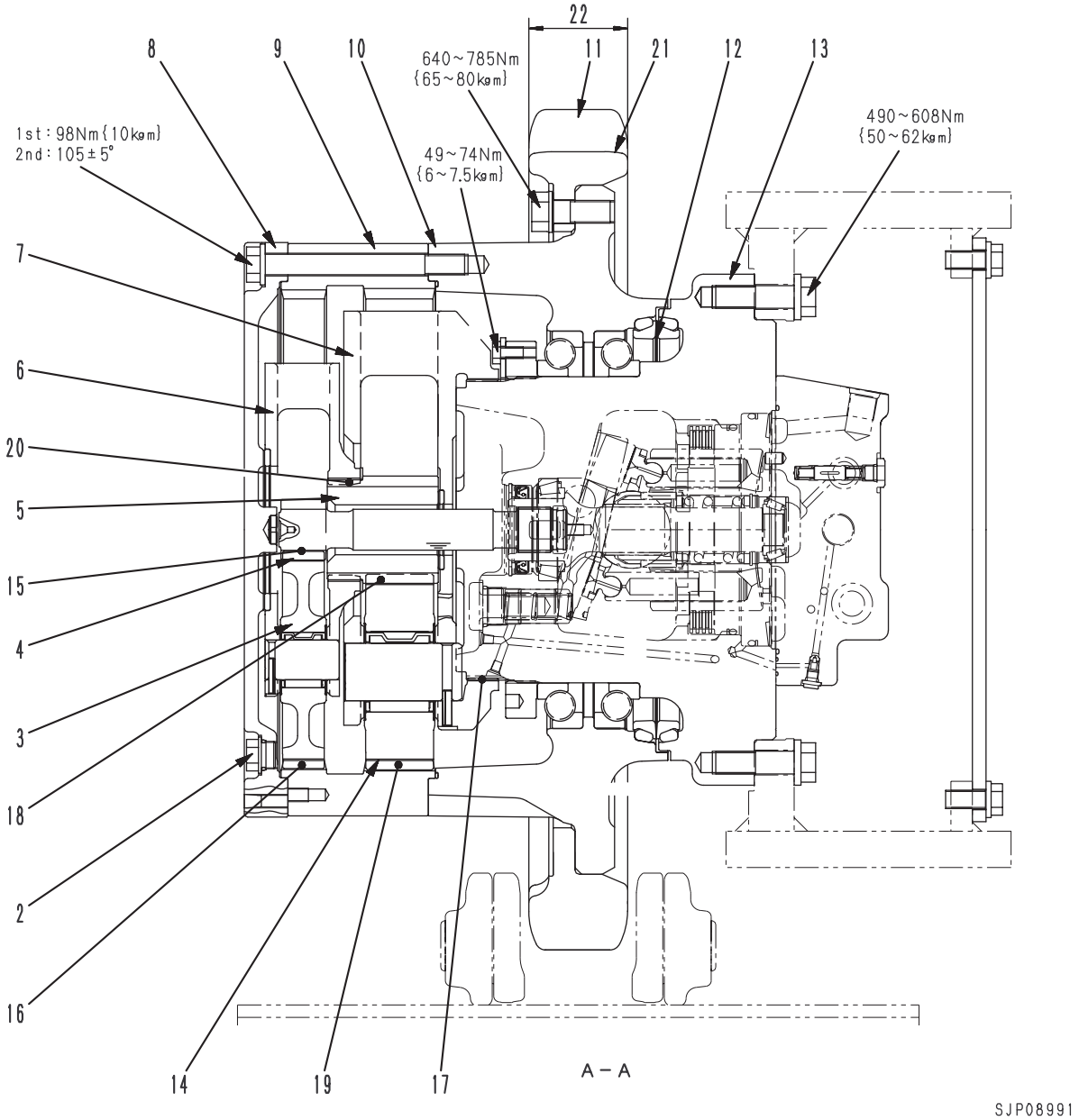
Radiator	: CF19-4
Oil cooler	: CF40-1

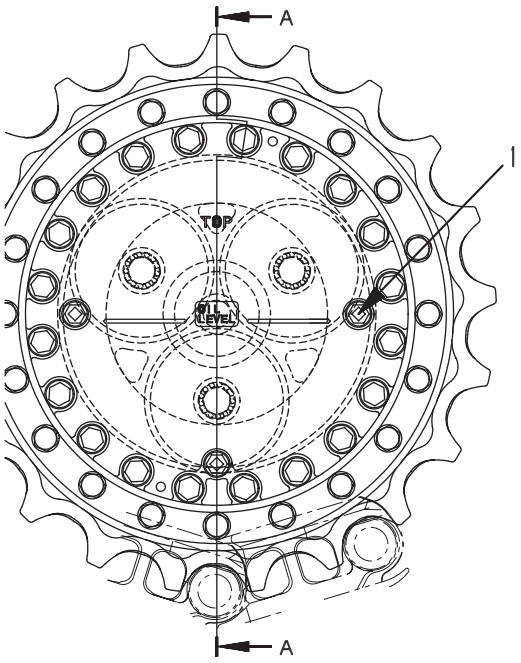
POWER TRAIN



1. Idler
2. Center swivel joint
3. Control valve
4. Final drive
5. Travel motor (HMV 160ADT-2)
6. Engine (SAA6D114E)
7. Hydraulic pump (HPV125+125)
8. Travel speed solenoid valve
9. Swing brake solenoid valve
10. Swing machinery
11. Swing motor (KMF230ABE-5)
12. Swing circle

FINAL DRIVE


22
8
9
10
640~785Nm
{65~80kgm}
11
21
12
13
490~608Nm
{50~62kgm}
1st : 98Nm{10kgm}
2nd : 105±5°
49~74Nm
{6~7.5kgm}
7
6
20
5
15
4
3
18
2
16
14
19
17
A-A
SJP08991



SJP08992

1. Level plug
2. Drain plug
3. No. 1 planetary gear (No. of teeth: 42)
4. No. 1 sun gear (No. of teeth: 11)
5. No. 2 sun gear (No. of teeth: 19)
6. No. 1 planetary carrier
7. No. 2 planetary carrier
8. Cover
9. Ring gear (No. of teeth: 97)
10. Hub
11. Sprocket
12. Floating seal
13. Travel motor
14. No. 2 planetary gear (No. of teeth: 38)

SPECIFICATIONS

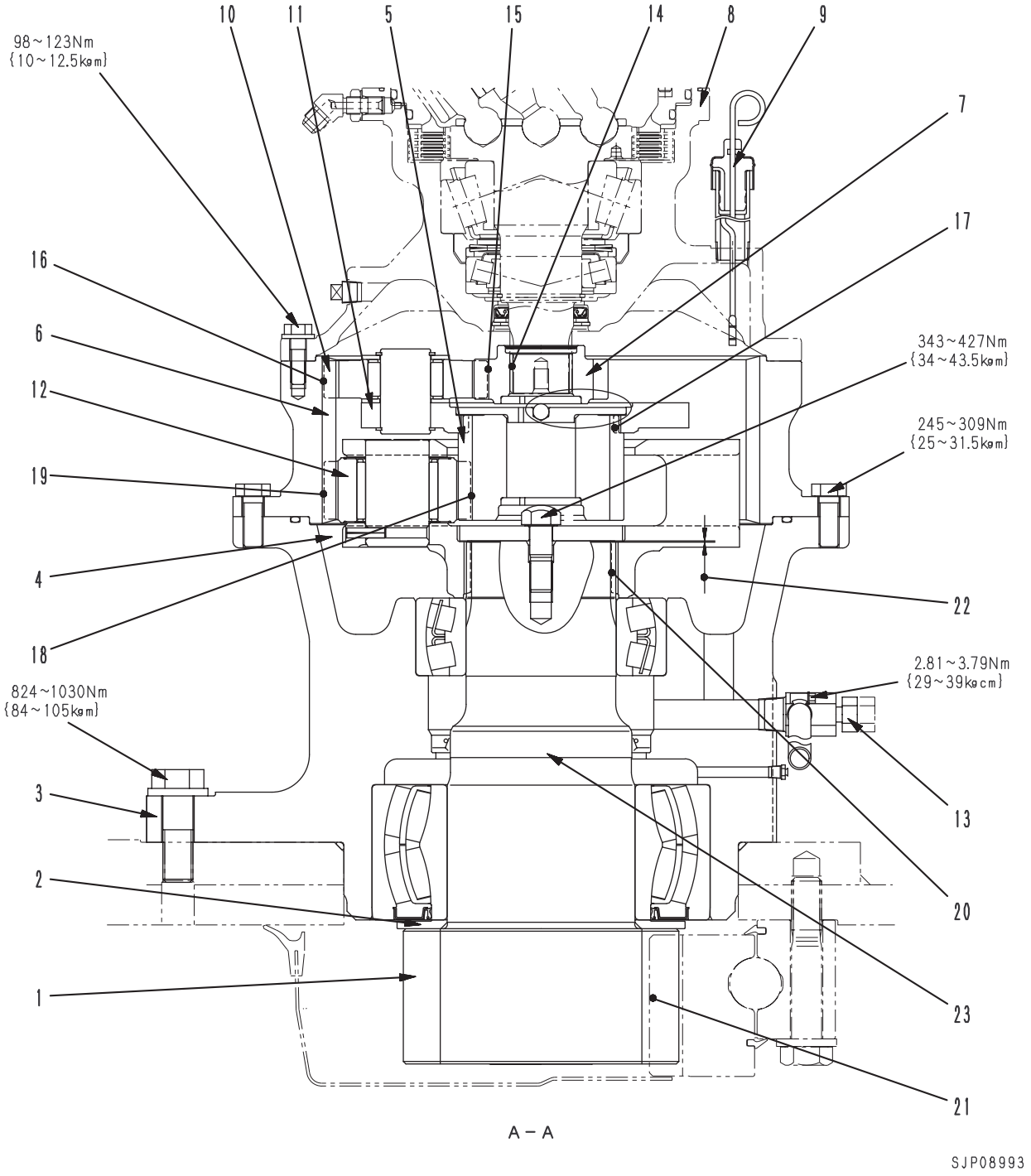
Reduction ratio:

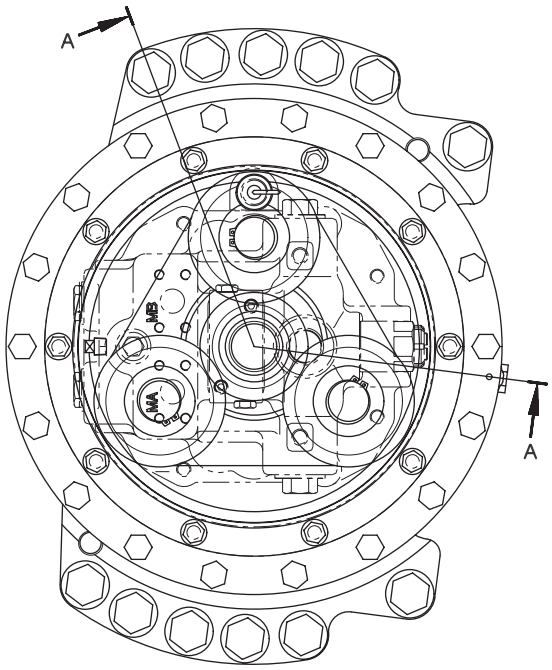
$$-\left(\frac{11+97}{11}\right)\times\left(\frac{19+97}{19}\right)=-58.943$$

Unit: mm

No.	Check item	Criteria		Remedy
15	Backlash between No. 1 sun gear and No. 1 planetary gear	Standard clearance	Clearance limit	Replace
		0.12 ~ 0.44	0.90	
16	Backlash between No. 1 planetary gear and ring gear	0.18 ~ 0.62	1.20	
17	Backlash between No. 2 planetary carrier and motor	0.06 ~ 0.25	—	
18	Backlash between No. 2 sun gear and No. 2 planetary gear	0.15 ~ 0.51	1.00	
19	Backlash between No. 2 planetary gear and ring gear	0.19 ~ 0.66	1.30	
20	Backlash between No. 2 planetary carrier and No. 2 sun gear	0.39 ~ 0.80	1.60	
21	Amount of wear on sprocket tooth	Repair limit: 6		Rebuild or replace
22	Width of sprocket tooth	Standard size	Repair limit	
		87	84	

SWING MACHINERY





SJP08994

1. Swing pinion (No. of teeth: 13)
2. Spacer
3. Case
4. No. 2 planetary gear
5. No. 2 sun gear
6. Ring gear
7. No. 1 sun gear
8. Swing motor
9. Oil level gauge
10. No. 1 planetary gear
11. No. 1 planetary carrier
12. No. 2 planetary carrier
13. Drain plug

SPECIFICATIONS

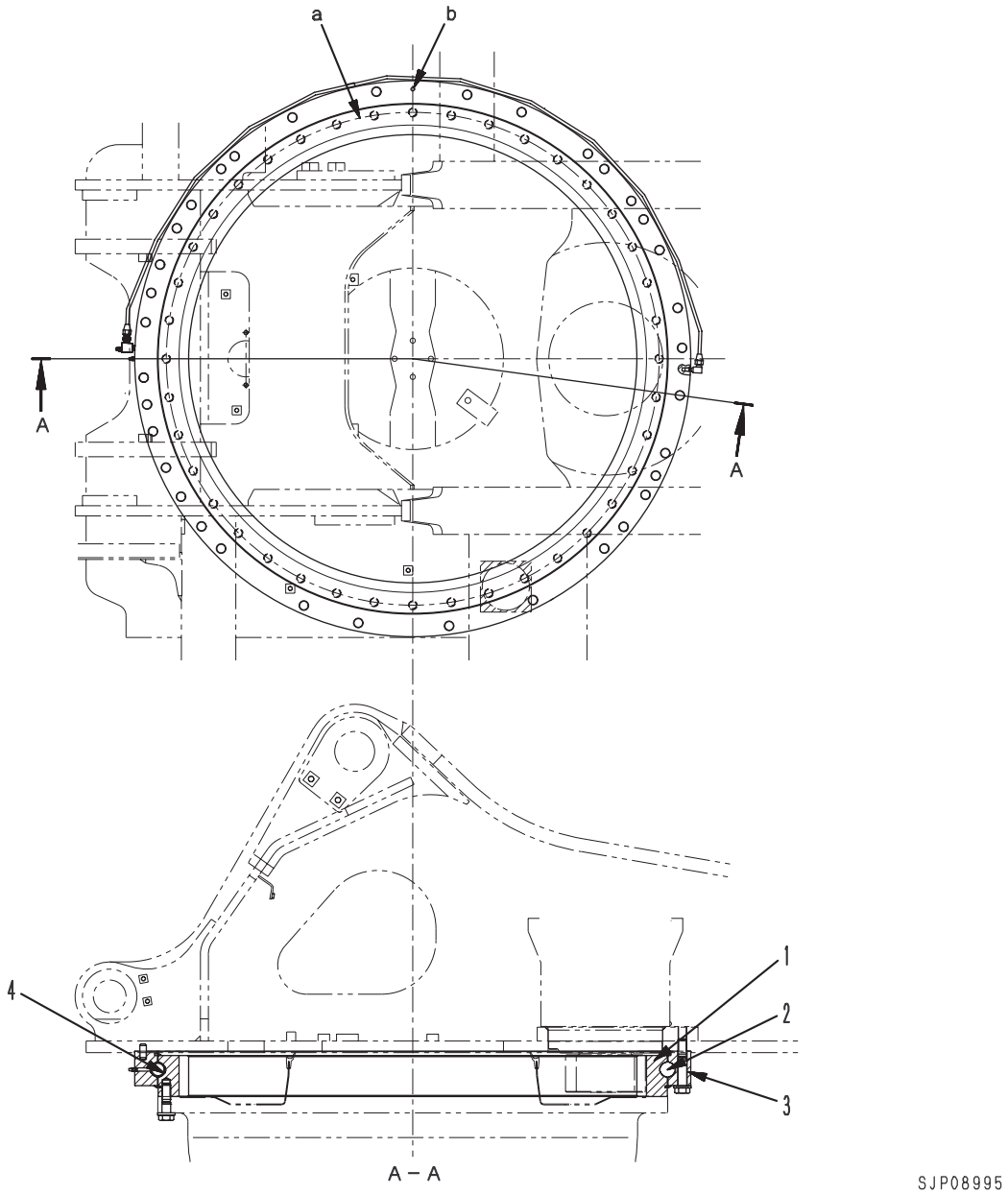
Reduction ratio:

$$\left(\frac{19+68}{19}\right)\times\left(\frac{24+68}{24}\right)=17.553$$

Unit: mm

No.	Check item	Criteria		Remedy
14	Backlash between swing motor shaft and No. 1 sun gear	Standard clearance	Clearance limit	Replace
		0.18 ~ 0.28	—	
15	Backlash between No. 1 sun gear and No. 1 planetary gear	0.15 ~ 0.51	1.00	
16	Backlash between No. 1 planetary gear and ring gear	0.17 ~ 0.60	1.10	
17	Backlash between No. 1 planetary carrier and No. 2 sun gear	0.40 ~ 0.75	1.20	
18	Backlash between No. 2 sun gear and No. 2 planetary gear	0.16 ~ 0.55	1.00	
19	Backlash between No. 2 planetary gear and ring gear	0.17 ~ 0.60	1.10	
20	Backlash between coupling and swing pinion	0.08 ~ 0.25	—	
21	Backlash between swing pinion and swing circle	0.00 ~ 1.21	2.00	
22	Clearance between plate and coupling	0.57 ~ 1.09	—	
23	Wear of swing pinion surface contacting with oil seal	Standard size	Repair limit	Apply hard chrome plating, recondition, or replace
		145 $^{0}_{-0.100}$	—	

SWING CIRCLE



1. Swing circle inner race (No. of teeth: 90)
2. Ball
3. Swing circle outer race

a. Inner race soft zone S position
b. Outer race soft zone S position

SPECIFICATIONS

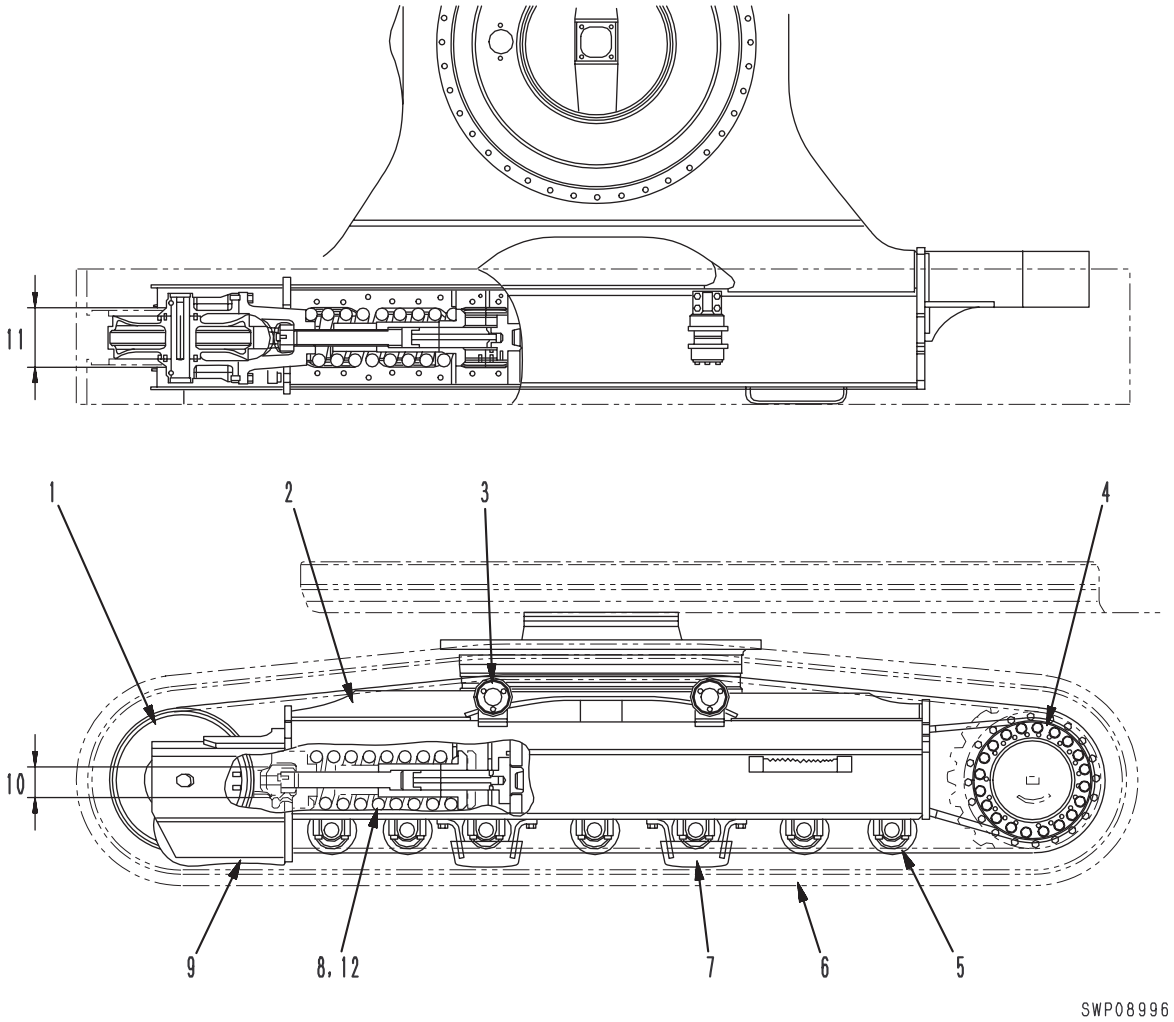
Reduction ratio: $-\frac{90}{13} = -6.923$

Amount of grease: 33 **l** (G2-LI)

Unit: mm

No.	Check item	Criteria		Remedy
4	Axial clearance of bearing (when mounted on chassis)	Standard clearance	Clearance limit	Replace
		0.5 ~ 1.6	3.2	

TRACK FRAME • RECOIL SPRING



1 Idler
2 Track frame
3 Carrier roller
4 Final drive
5 Track roller
6 Track shoe
7 Center guard
8 Recoil spring
9 Front guard

- The dimensions and the number of track rollers depend on the model, but the basic structure is not different.
- Number of track rollers

Model	Q'ty
PC340LC-7	8
PC340NLC-7	8

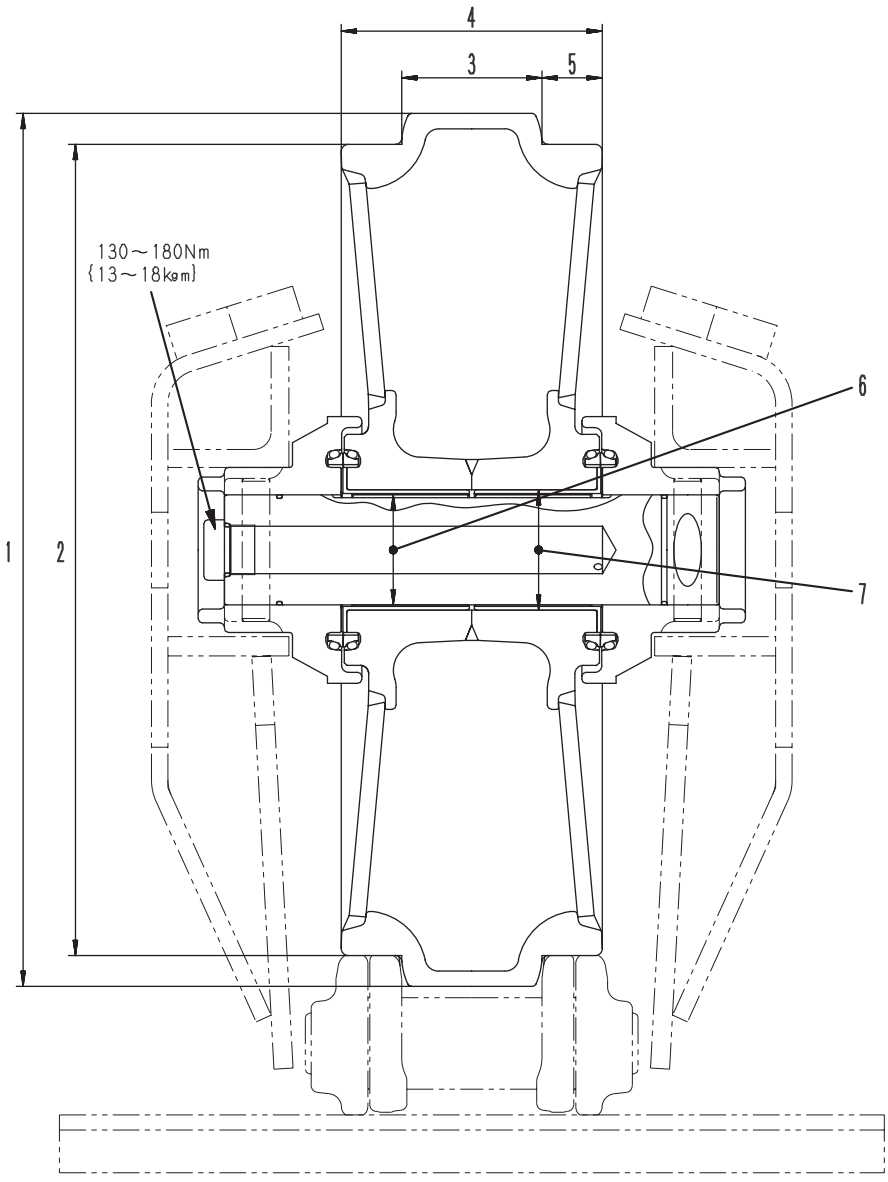
Standard shoe

Item \ Model	PC340LC-7	PC340NLC-7
Shoe width	700 mm	600 mm
Link pitch	216 mm	216 mm
No. on track (one side)	48 (pieces)	48 (pieces)

Unit: mm

No.	Check item	Criteria					Remedy
10	Vertical width of idler guide			Standard size	Tolerance	Repair limit	Rebuild or replace
		Track frame		123	+2 -1	127	
		Idler support		120	± 0.5	118	
11	Horizontal width of idler guide	Track frame		266	+3 -1	271	
		Idler support		261	—	259	
12	Recoil spring	Standard size			Repair limit		Replace
		Free length x O.D.	Installation length	Installation load	Free length	Installation load	
		795 X 241	648	173.3 kN (17,680 kg)	—	138.56 kN (14,140 kg)	

IDLER

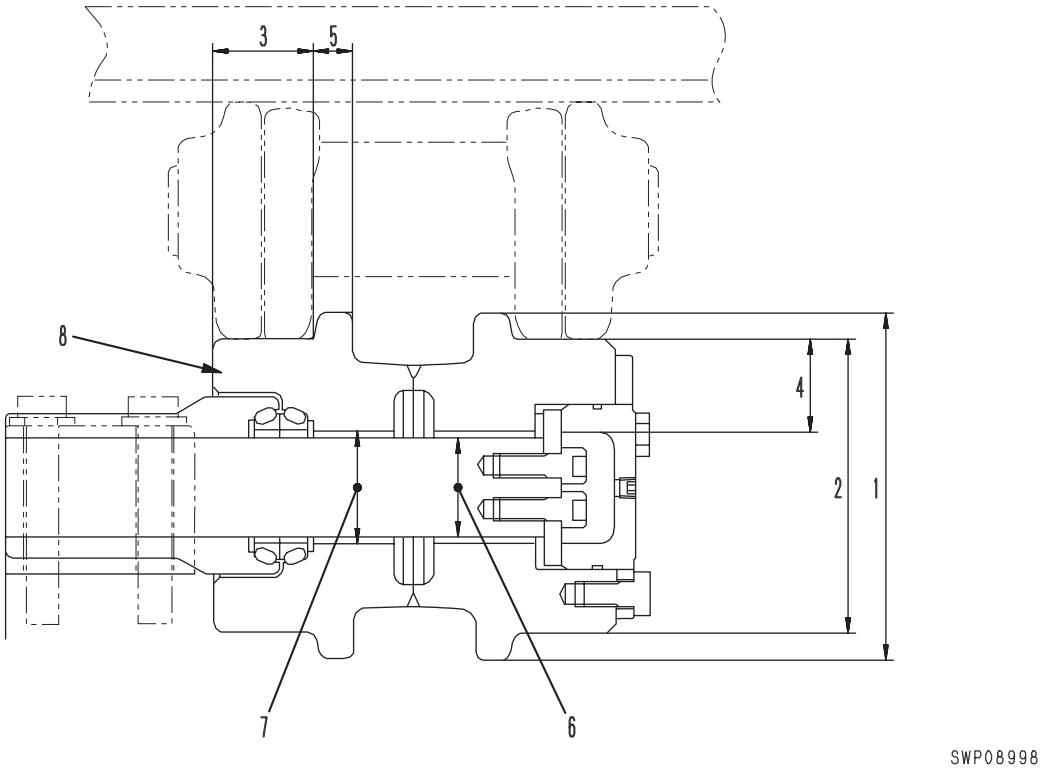


SJP08997

Unit: mm

<table>
<tr><th rowspan="2">No.</th><th rowspan="2">Check item</th><th colspan="5">Criteria</th><th rowspan="2">Remedy</th></tr>
<tr><td colspan="2">Standard size</td><td colspan="3">Repair limit</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Outside diameter of protruding</td><td colspan="2">635</td><td colspan="3">—</td><td rowspan="5">Rebuild or replace</td></tr>
<tr><td>2</td><td>Outside diameter of tread</td><td colspan="2">590</td><td colspan="3">578</td></tr>
<tr><td>3</td><td>Width of protrusion</td><td colspan="2">102</td><td colspan="3">—</td></tr>
<tr><td>4</td><td>Total width</td><td colspan="2">190</td><td colspan="3">—</td></tr>
<tr><td>5</td><td>Width of tread</td><td colspan="2">44</td><td colspan="3">50</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Clearance between shaft and bushing</td><td rowspan="2">Standard size</td><td colspan="2">Tolerance</td><td rowspan="2">Standard clearance</td><td rowspan="2">Clearance limit</td><td rowspan="4">Replace bushing</td></tr>
<tr><td>Shaft</td><td>Hole</td></tr>
<tr><td>80</td><td>-0.225
-0.325</td><td>+0.130
-0.024</td><td>0.201 ~ 0.455</td><td>1.5</td></tr>
<tr><td rowspan="2">7</td><td rowspan="2">Interference between idler and bushing</td><td rowspan="2">Standard size</td><td colspan="2">Tolerance</td><td rowspan="2">Standard interference</td><td rowspan="2">Interference limit</td></tr>
<tr><td>Shaft</td><td>Hole</td></tr>
<tr><td>87.6</td><td>+0.087
+0.037</td><td>-0.027
-0.079</td><td>0.064 ~ 0.166</td><td>—</td></tr>
</table>

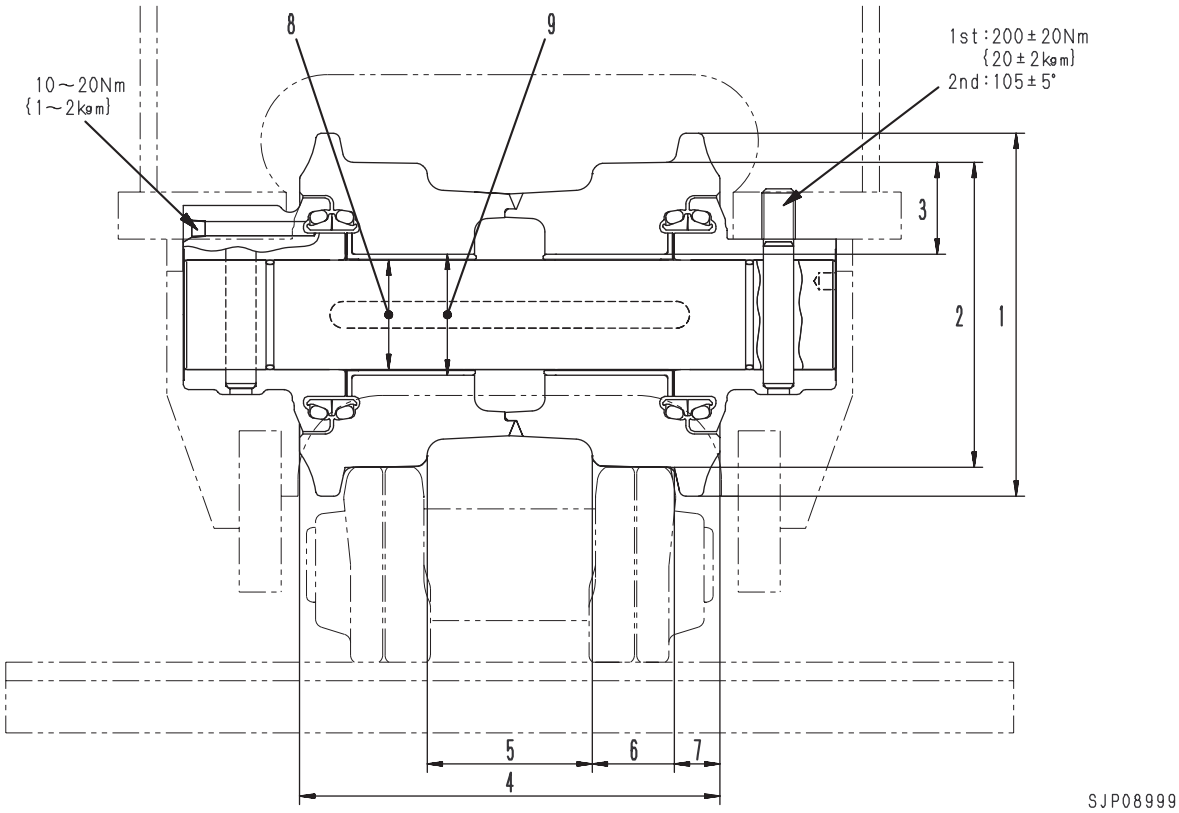
CARRIER ROLLER



Unit: mm

No.	Check item	Criteria					Remedy
1	Outside diameter of flange	Standard size		Repair limit			Replace
		175		—			
2	Outside diameter of tread	148		106			
3	Width of tread	50.3		—			
4	Thickness of tread	32		29.5			
5	Width of flange	19		—			
6	Interference between shaft and bushing	Standard size	Tolerance		Standard interference	Clearance limit	
			Shaft	Hole			
		50	-0.250 -0.270	+0.099 -0.032	0.218 ~ 0.369	—	
7	Interference between roller and bushing	Standard size	Tolerance		Standard interference	Interference limit	
			Shaft	Hole			
		57	+0.117 +0.087	0 -0.040	0.087 ~ 0.158	—	
8	Axial clearance of roller	Standard clearance			Clearance limit		
		0.60 - 0.80			—		

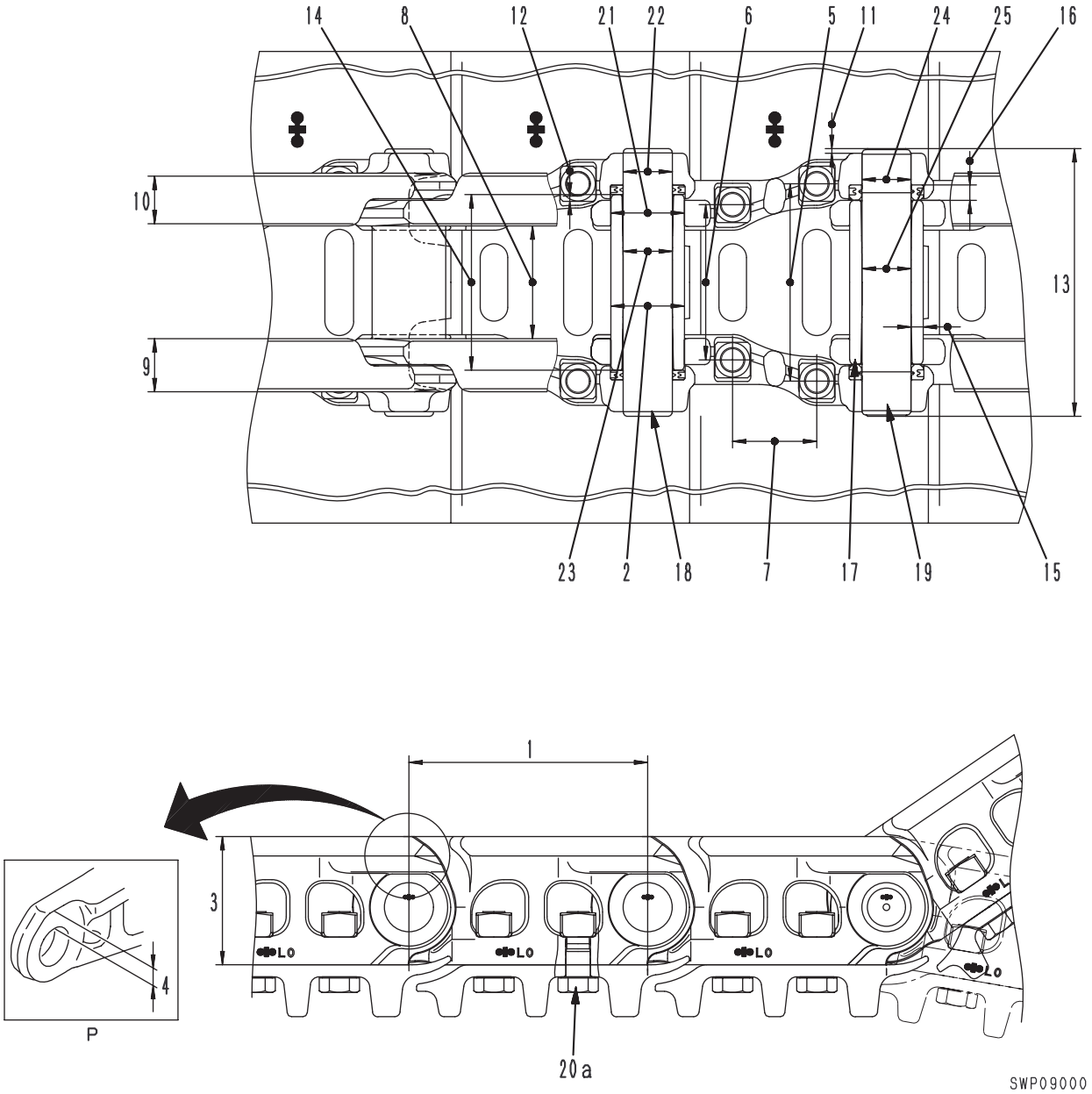
TRACK ROLLER



Unit: mm

No.	Check item	Criteria				Remedy
1	Outside diameter of flange	Standard size		Repair limit		Rebuild or replace
		216		—		
2	Outside diameter of tread	180		168		
3	Thickness of tread	44.5		38.5		
4	Overall width	225		—		
5	Inside width	85		—		
6	Width of tread	49		55		
7	Width of flange	27		—		
8	Clearance between shaft and bushing	Standard size	Tolerance		Standard clearance	Clearance limit	Replace bushing
			Shaft	Hole		
		65	-0.250 -0.350	+0.186 -0.064	0.186 ~ 0.536	1.5
9	Interference between roller and bushing	Standard size	Tolerance		Standard interference	Interference limit	
			Shaft	Hole		
		72	+0.108 +0.008	-0.006 -0.036	0.014 ~ 0.144	—

TRACK SHOE



★ P portion shows the link of bushing press fitting end.

Unit: mm

No.	Check item		Criteria			Remedy
1	Link pitch		Standard size	Repair limit		Reverse or replace
			216.3	219.3		
2	Bushing outside diameter		Standard size	When turned		
				Normal load	Impact load	
			66.5	—	61.9	
3	Link height		Standard size	Repair limit		Repair or replace
			116	107		
4	Thickness of link metal (bushing press-fitting portion)		41.8			Replace
5	Shoe bolt pitch		178.4			
6			140.4			
7			76.2			
8	Link	Inside width	102			Repair or replace
9		Overall width	47.8			
10		Tread width	42.6			
11	Protrusion of pin		4.2			Adjust or replace
12	Protrusion of regular bushing		5.25			
13	Overall length of pin		242			
14	Overall length of bushing		148.4			
15	Thickness of bushing metal		21.9			
16	Thickness of spacer		—			—
17	Press-fitting force	Bushing	98 ~ 264.6 kN {10 ~ 27 ton}			
18		Regular pin	147 ~ 362.6 kN {15 ~ 37 ton}			
※ 19		Master pin	98 ~ 215.6 kN {10 ~ 22 ton}			

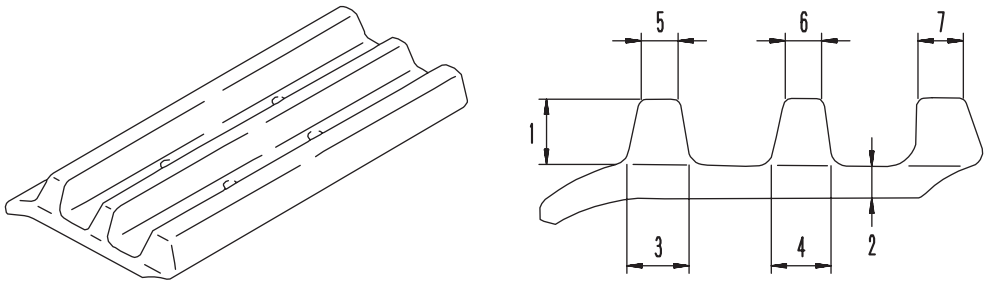
※ : Dry type track link

Unit: mm

<table>
<tr><th>No.</th><th colspan="2">Check item</th><th colspan="5">Criteria</th><th>Remedy</th></tr>
<tr><td rowspan="4">20</td><td rowspan="4">Shoe bolt</td><td rowspan="2">a. Regular link</td><td colspan="2">Tightening torque (Nm {kgm})</td><td colspan="3">Additional tightening angle (deg.)</td><td rowspan="4">Retighten</td></tr>
<tr><td>Triple shoe</td><td>393 ± 39 {40 ± 4}</td><td colspan="3">120 ± 10</td></tr>
<tr><td rowspan="2">b. Master link</td><td>Tightening torque (Nm {kgm})</td><td colspan="2">Additional tightening angle (deg.)</td><td colspan="2">Lower limit torque (Nm {kgm})</td></tr>
<tr><td>—</td><td colspan="2">—</td><td colspan="2">—</td></tr>
<tr><td></td><td colspan="2">No. of shoes (each side)</td><td colspan="5">PC340LC-7: 48
PC340NLC-7: 48</td><td>—</td></tr>
<tr><td rowspan="2">21</td><td colspan="2" rowspan="2">Interference between bushing and link</td><td rowspan="2">Standard size</td><td colspan="2">Tolerance</td><td rowspan="2">Standard interference</td><td rowspan="10">Adjust or replace</td></tr>
<tr><td>Shaft</td><td>Hole</td></tr>
<tr><td></td><td colspan="2"></td><td>66.5</td><td>+0.464
+0.424</td><td>+0.074
0</td><td>0.350 ~ 0.464</td></tr>
<tr><td>22</td><td colspan="2">Interference between regular pin and link</td><td>44.6</td><td>+0.235
+0.085</td><td>-0.188
-0.250</td><td>0.273 ~ 0.485</td></tr>
<tr><td rowspan="2">23</td><td colspan="2" rowspan="2">Clearance between regular pin and bushing</td><td rowspan="2">Standard size</td><td colspan="2">Tolerance</td><td rowspan="2">Standard clearance</td></tr>
<tr><td>Shaft</td><td>Hole</td></tr>
<tr><td></td><td colspan="2"></td><td>44.6</td><td>+0.235
+0.085</td><td>+0.915
+0.415</td><td>0.180 ~ 0.830</td></tr>
<tr><td rowspan="2">※
24</td><td colspan="2" rowspan="2">Interference between master pin and bushing</td><td rowspan="2">Standard size</td><td colspan="2">Tolerance</td><td rowspan="2">Standard interference</td></tr>
<tr><td>Shaft</td><td>Hole</td></tr>
<tr><td></td><td colspan="2"></td><td>44.6</td><td>+0.03
0</td><td>-0.188
-0.250</td><td>0.188 ~ 0.280</td></tr>
<tr><td rowspan="2">※
25</td><td colspan="2" rowspan="2">Clearance between master pin and bushing</td><td rowspan="2">Standard size</td><td colspan="2">Tolerance</td><td rowspan="2">Standard clearance</td></tr>
<tr><td>Shaft</td><td>Hole</td></tr>
<tr><td></td><td colspan="2"></td><td>44.3</td><td>+0.050
-0.050</td><td>+0.915
+0.415</td><td>0.365 ~ 0.965</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Height of grouser</td><td rowspan="2">Triple-grouser</td><td colspan="3">Standard size</td><td colspan="2">Repair limit</td><td rowspan="2">Lug welding, rebuild or replace</td></tr>
<tr><td colspan="3">30</td><td colspan="2">16</td></tr>
</table>

※ : Dry type track link

TRIPLE GROUSER SHOE



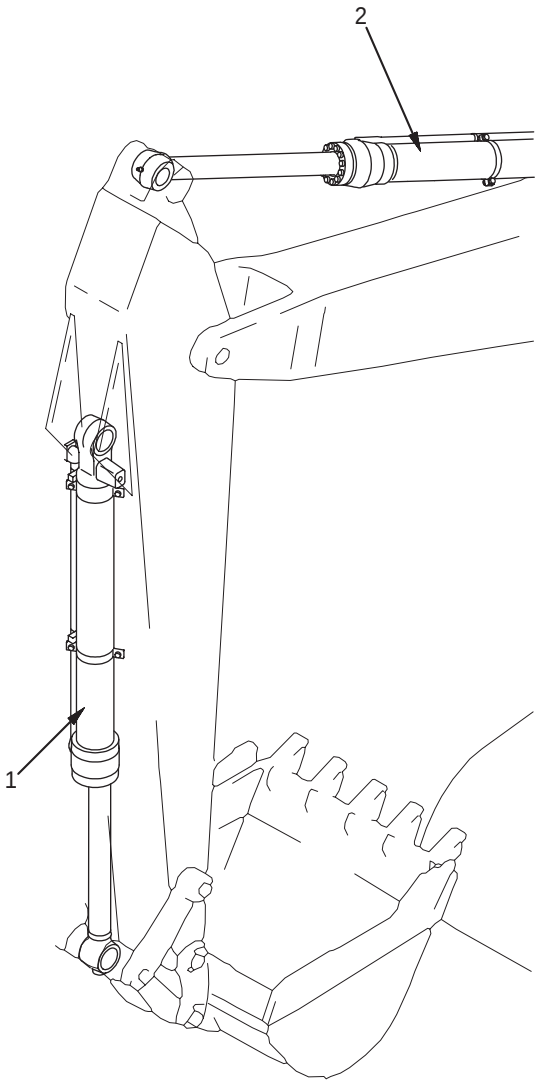
SDD01629

Unit: mm

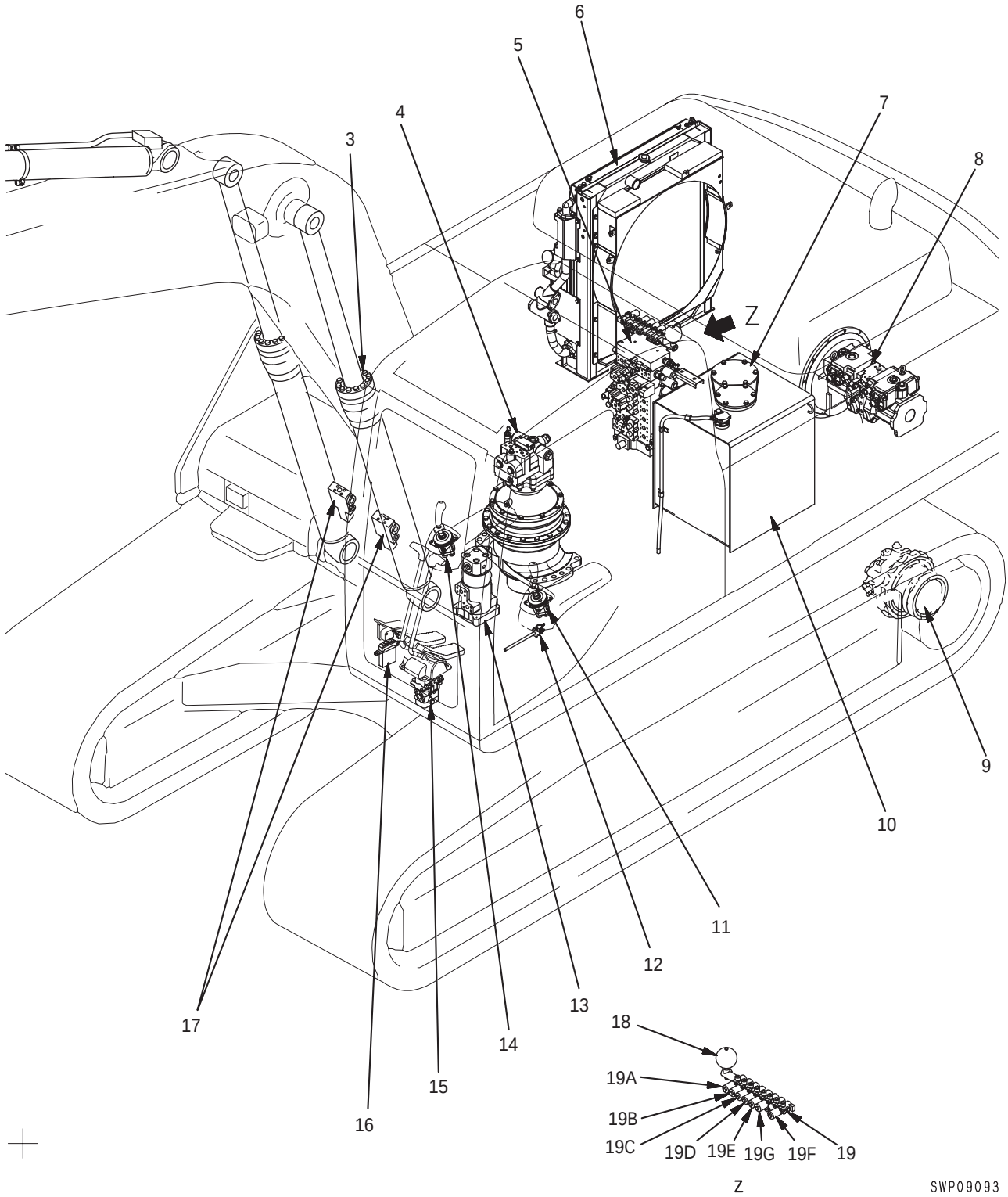
No.	Check item	Criteria		Remedy
1	Height	Standard size	Repair limit	Rebuild or replace
		30	21	
2	Thickness	11		
3	Length of base	29		
4		24		
5	Length at tip	22		
6		16		
7		22		

HYDRAULIC EQUIPMENT LAYOUT DRAWING

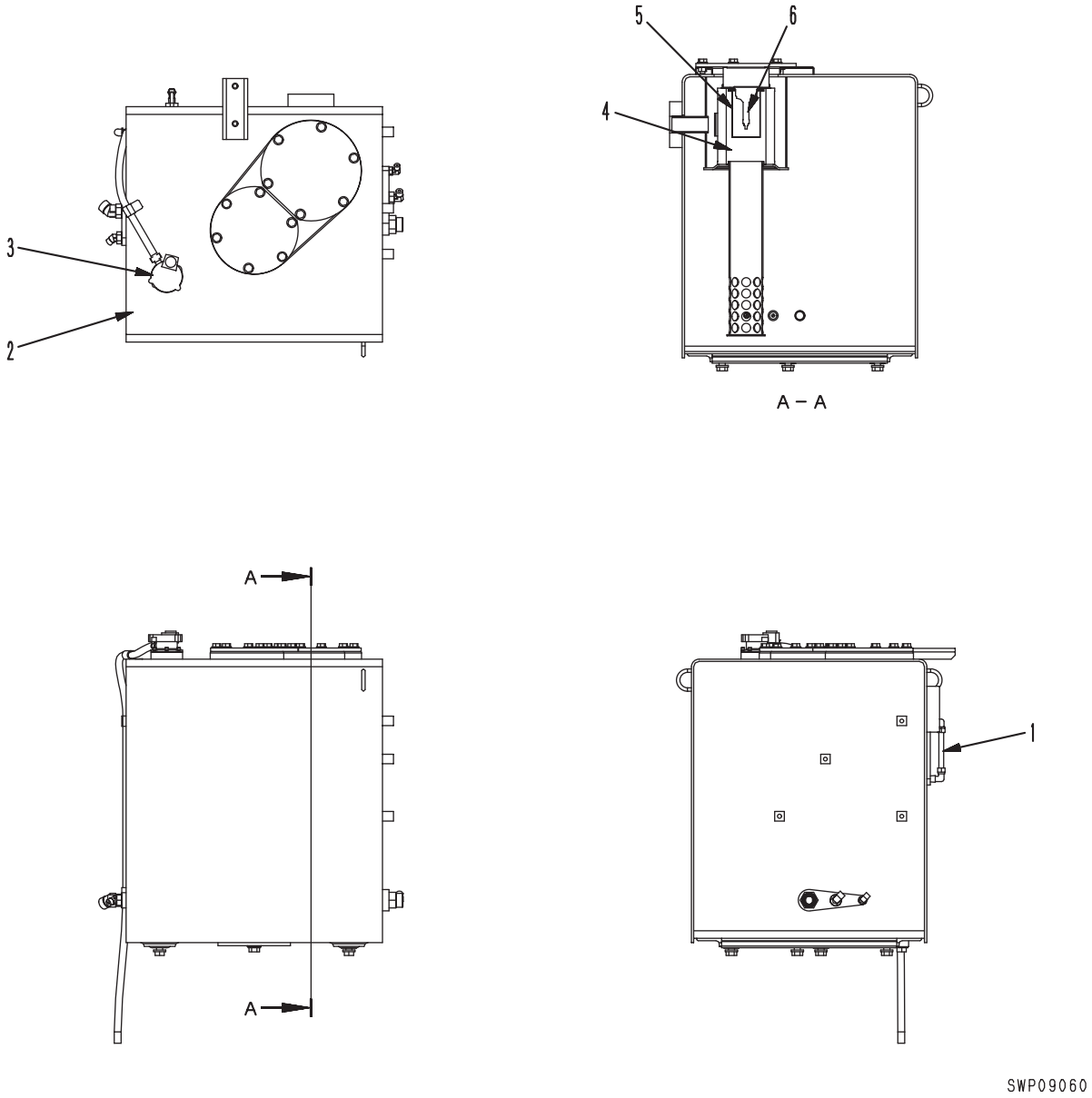
1. Bucket cylinder
2. Arm cylinder
3. Boom cylinder
4. Swing motor
5. Control valve
6. Oil cooler
7. Hydraulic filter
8. Hydraulic pump
9. L.H. travel motor
10. Hydraulic tank
11. L.H. PPC valve
12. Safety lever (electric type)
13. Center swivel joint
14. R.H. PPC valve
15. Travel PPC valve
16. Attachment circuit selector valve
17. Boom safety valve (Boom burst)
18. Accumulator
19. Solenoid valve assembly
    - 19A PPC lock solenoid
    - 19B Travel junction solenoid
    - 19C Pump merge/divider solenoid
    - 19D Travel speed solenoid
    - 19E Swing brake solenoid
    - 19F Machine push-up solenoid
    - 19G 2-stage relief solenoid



SVP08682


6
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19A
19B
19C
19D
19E
19G
19F
19
Z
SWP09093

HYDRAULIC TANK



1. Sight gauge
2. Hydraulic tank
3. Oil filler cap
4. Filter element
5. Strainer
6. Bypass valve

SPECIFICATIONS

Tank capacity: 275 **l**

Amount of oil inside tank: 188 **l**

Pressure valve

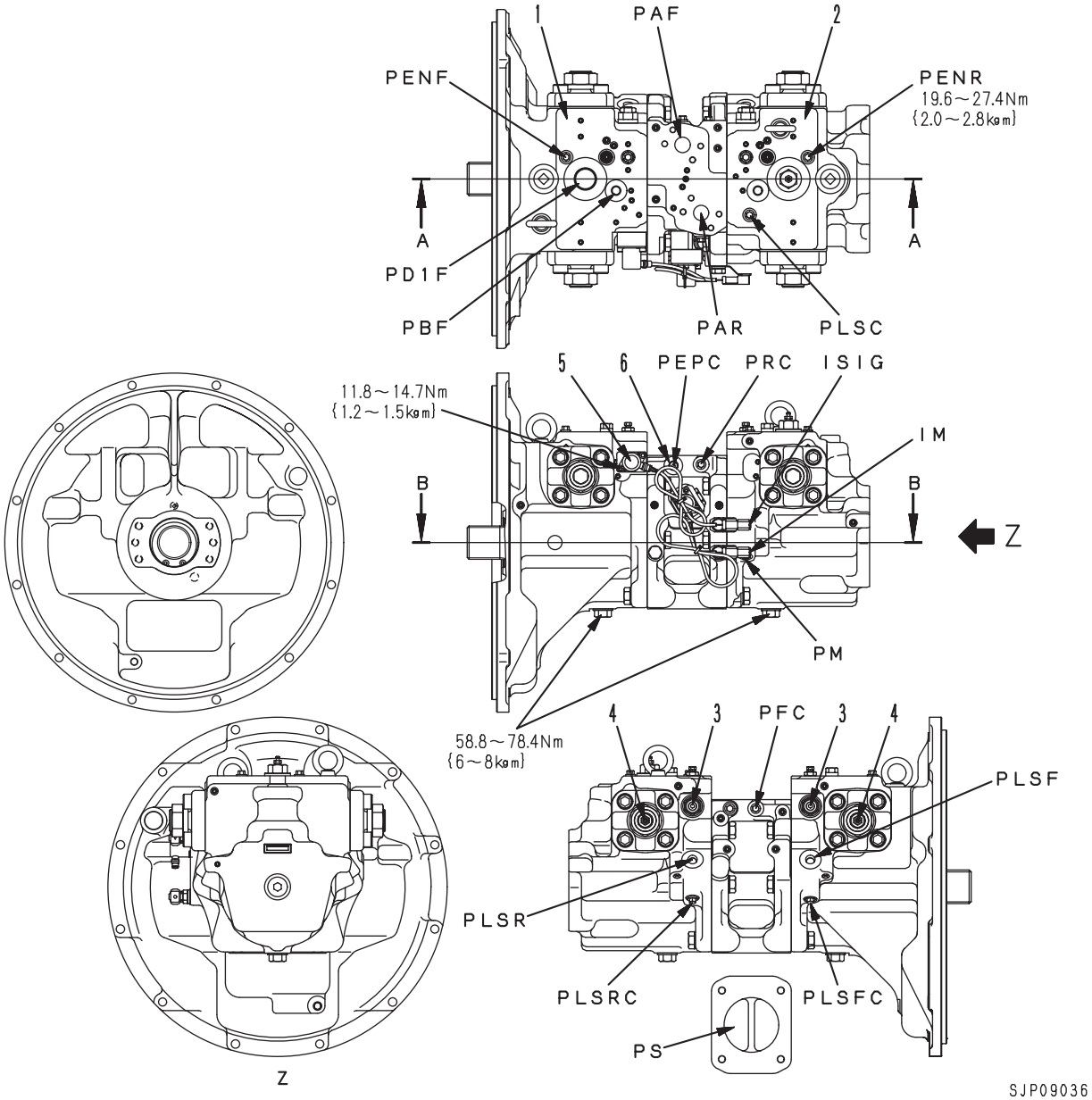
Relief cracking pressure:
16.7 ± 6.9 kPa
{0.17 ± 0.07 kg/cm²}

Suction cracking pressure:
0 - 0.49 kPa
{0 - 0.005 kg/cm²}

Bypass Valve set pressure:
150 ± 30 kPa
{1.5 ± 0.3 kg/cm²}

HYDRAULIC PUMP

HPV125 + 125



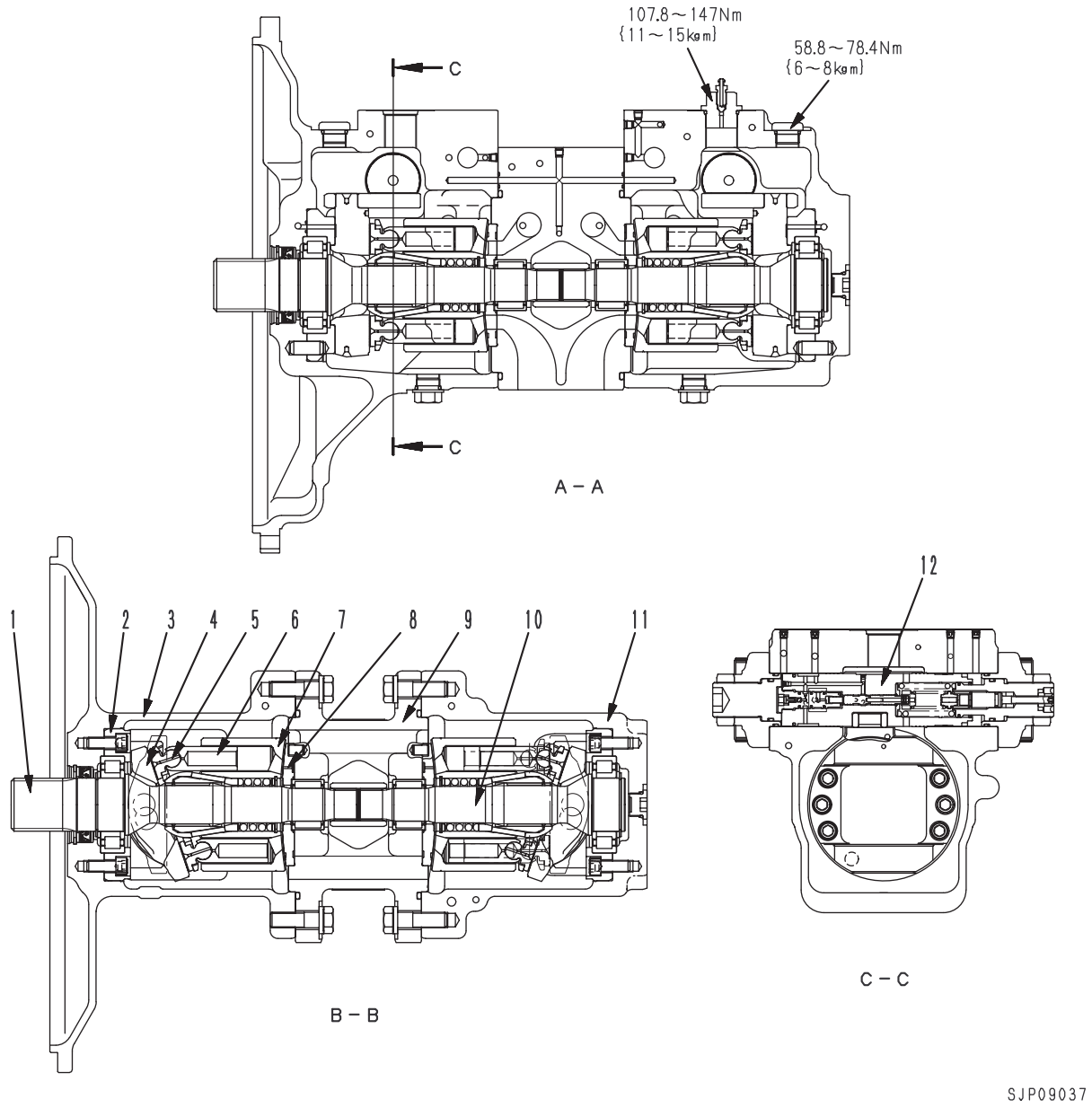
1. Front main pump
2. Rear main pump
3. LS valve
4. PC valve
5. LS-EPC valve
6. PC-EPC valve

IM : PC mode selector current
ISIG : LS set selector current
PAF : Front pump delivery port
PFC : Front pump delivery pressure detection port
PAR : Rear pump delivery port
PRC : Rear pump delivery pressure detection port
PBF : Pump pressure input port
PD1F: Case drain port
PENF: Front pump control pressure detection port

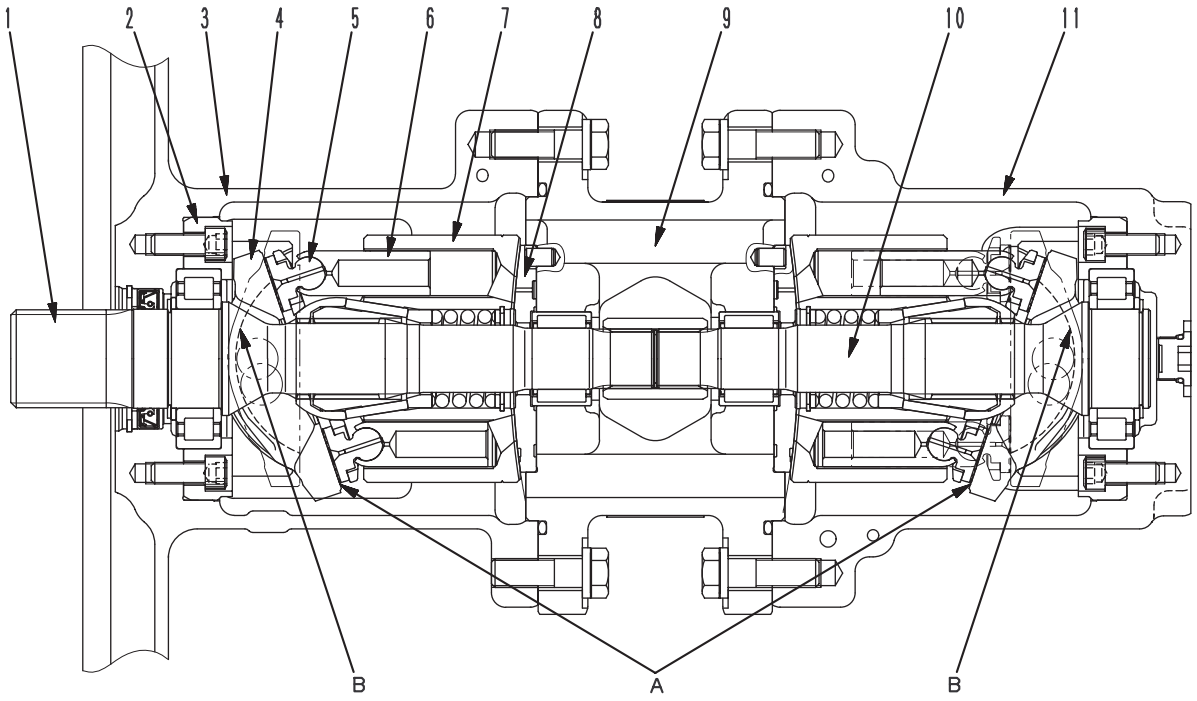
PENR : Rear pump control pressure detection port
PLSF : Front load pressure input port
PLSFC: Front load pressure detection port
PLSR : Rear load pressure input port
PLSRC: Rear load pressure detection port
PS : Pump suction port
PLSC : LS set selector pressure detection port
PM : PC set selector pressure detection port
PEPC : EPC basic pressure input port

Outline

- This pump consists of 2 variable capacity swash plate piston pumps, PC valve, LS valve, and EPC valve.



1. Shaft (Front)
2. Cradle
3. Case (Front)
4. Rocker cam
5. Shoe
6. Piston
7. Cylinder block
8. Valve plate
9. End cap
10. Shaft (Rear)
11. Case (Rear)
12. Servo piston



Function

- The rotation and torque transmitted to the pump shaft are converted into hydraulic energy, and pressurized oil is discharged according to the load.
- It is possible to change the discharge amount by changing the swash plate angle.

Structure

- Cylinder block (7) is supported to shaft (1) by a spline, and shaft (1) is supported by the front and rear bearings.
- The tip of piston (6) is a concave ball, and shoe (5) is caulked to it to form one unit. Piston (6) and shoe (5) form a spherical bearing.
- Rocker cam (4) has flat surface **A**, and shoe (5) is always pressed against this surface while sliding in a circular movement.

  Rocker cam (4) brings high pressure oil at cylinder surface **B** with cradle (2), which is secured to the case, and forms a static pressure bearing when it slides.
- Piston (6) carries out relative movement in the axial direction inside each cylinder chamber of cylinder block (7).
- The cylinder block seals the pressure oil to valve plate (8) and carries out relative rotation. This surface is designed so that the oil pressure balance is maintained at a suitable level. The oil inside each cylinder chamber of cylinder block (7) is sucked in and discharged through valve plate (8).

Operation

1) Operation of pump

i Cylinder block (7) rotates together with shaft (1), and shoe (5) slides on flat surface **A**.

When this happens, rocker cam (4) moves along cylindrical surface **B**, so angle α between center line **X** of rocker cam (4) and the axial direction of cylinder block (7) changes. (Angle α is called the swash plate angle.)

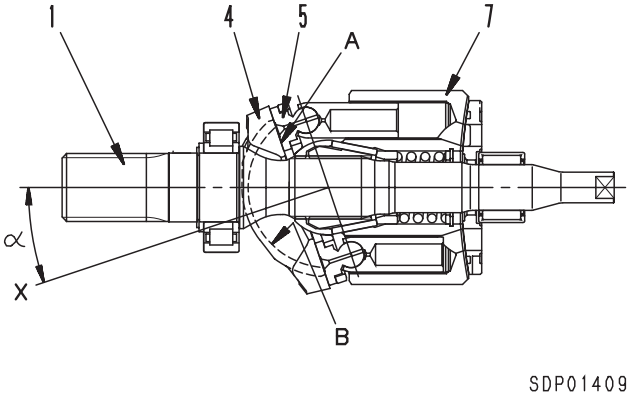
ii Center line **X** of rocker cam (4) maintains swash plate angle α in relation to the axial direction of cylinder block (7), and flat surface **A** moves as a cam in relation to shoe (5).

In this way, piston (6) slides on the inside of cylinder block (7), so a difference between volumes **E** and **F** is created inside cylinder block (7). The suction and discharge is carried out by this difference **F - E**.

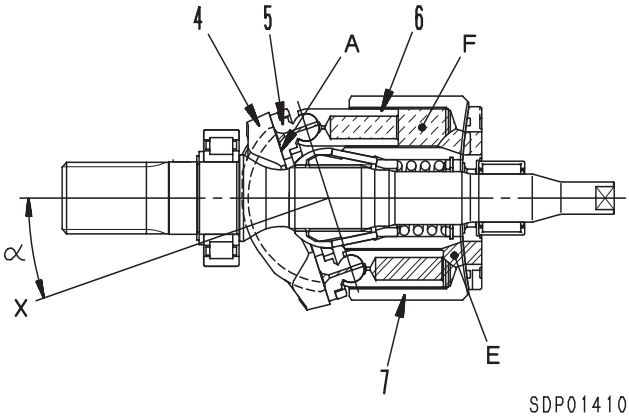
In other words, when cylinder block (7) rotates and the volume of chamber **E** becomes smaller, the oil is discharged during that stroke. On the other hand, the volume of chamber **F** becomes larger, and as the volume becomes bigger, the oil is sucked in.

iii If center line **X** of rocker cam (4) is in line with the axial direction of cylinder block (7) (swash plate angle = 0), the difference between volumes **E** and **F** inside cylinder block (7) becomes 0, so the pump does not carry out any suction or discharge of oil.

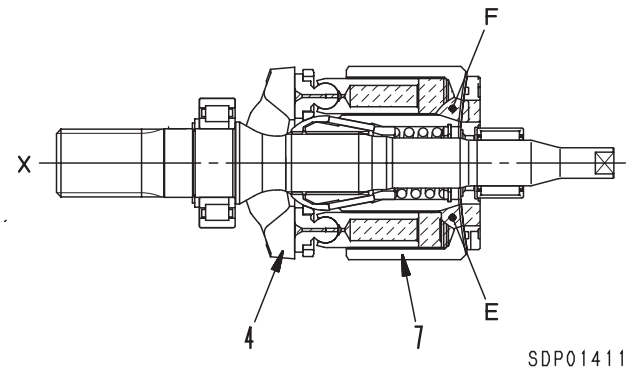
(In actual fact, the swash plate angle never becomes 0.)



SDP01409



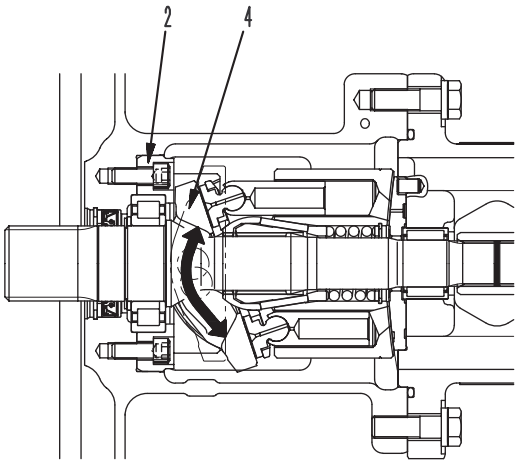
SDP01410



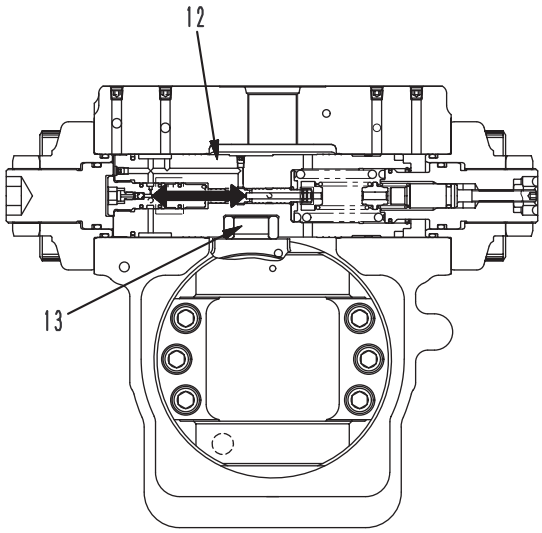
SDP01411

2) Control of discharge amount

- If the swash plate angle α becomes larger, the difference between volumes **E** and **F** becomes larger and discharge amount **Q** increases.
- Swash plate angle α is changed by servo piston (12).
- Servo piston (12) moves in a reciprocal movement (↔) according to the signal pressure from the PC and LS valves. This straight line movement is transmitted through rod (13) to rocker cam (4), and rocker cam (4), which is supported by the cylindrical surface to cradle (2), slides in a rotating movement in direction of arrow.
- With servo piston (12), the area receiving the pressure is different on the left and the right, so main pump discharge pressure (self pressure) **PP** is always brought to the chamber receiving the pressure at the small diameter piston end.
- Output pressure **Pen** of the LS valve is brought to the chamber receiving the pressure at the large diameter end. The relationship in the size of pressure **PP** at the small diameter piston end and pressure **Pen** at the large diameter end, and the ratio between the area receiving the pressure of the small diameter piston and the large diameter piston controls the movement of servo piston (12).

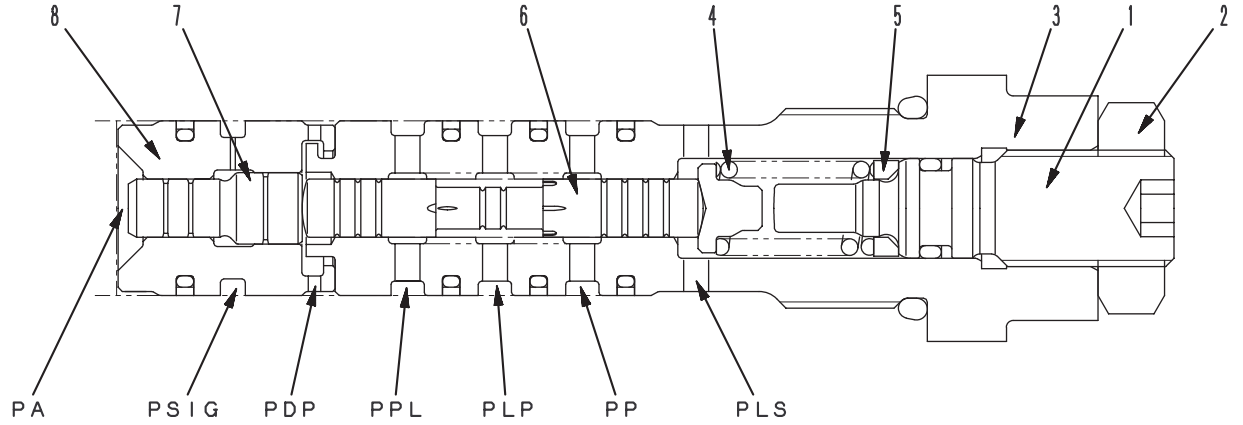


SJP09039



SJP09040

LS VALVE

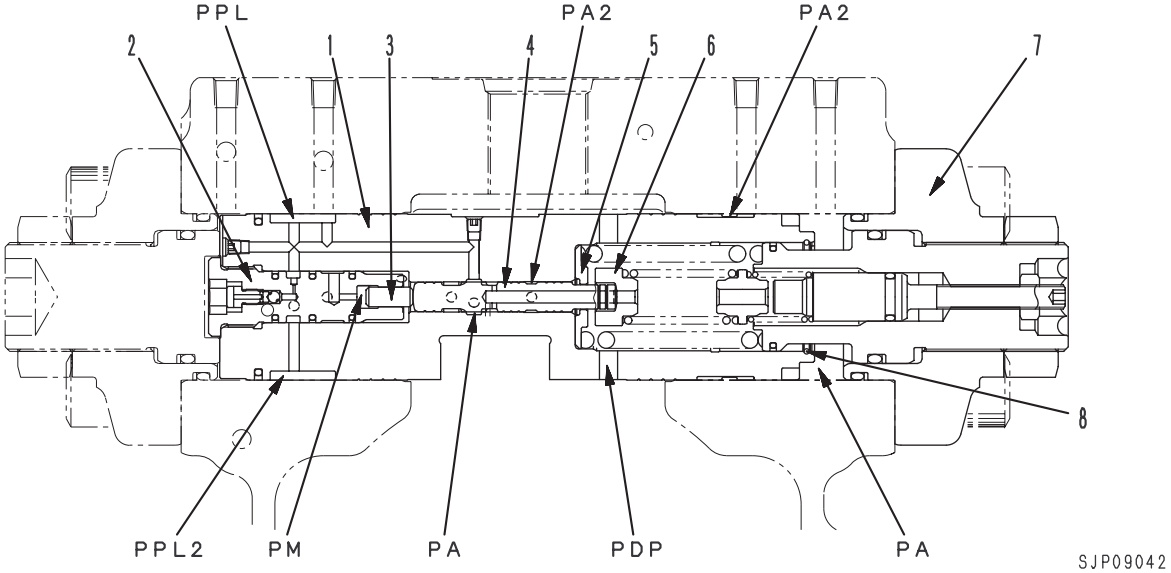


SJP09041

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

PA : Pump port
PP : Pump port
PDP : Drain port
PLP : LS control pressure output port
PLS : LS pressure input port
PPL : PC control pressure input port
PSIG : LS mode selection pilot port

PC VALVE



SJP09042

1. Servo piston assembly
2. Plug
3. Pin
4. Spool
5. Retainer
6. Seat
7. Cover
8. Wiring

PA : Pump port
PA2 : Pump pressure pilot port
PDP : Drain port
PM : PC mode selector pressure pilot port
PPL : PC control pressure output port
PPL2: LS control pressure output port

Function

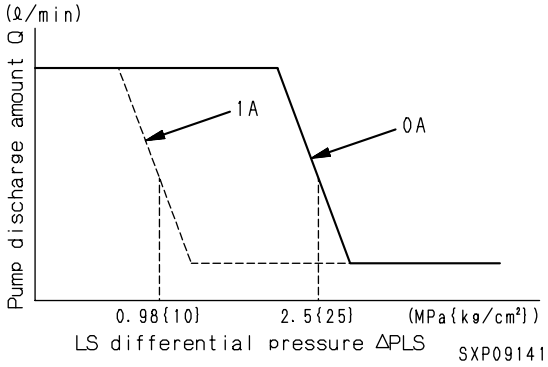
(1) LS valve

The LS valve detects the load and controls the discharge amount.

This valve controls main pump discharge amount **Q** according to differential pressure **ΔPLS** (=**PP - PLS**) [called the LS differential pressure] (the difference between main pump pressure **PP** and control valve outlet port pressure **PLS**).

Main pump pressure **PP**, pressure **PLS** {called the LS pressure} coming from the control valve output, and pressure **Psig** {called the LS selector pressure} from the proportional solenoid valve enter this valve. The relationship between discharge amount **Q** and differential pressure **ΔPLS**, (the difference between main pump pressure **PP** and LS pressure **PLS**) (= **PP - PLS**) changes as shown in the diagram at the right according to LS pressure selector current **isig** of the LS-EPC valve.

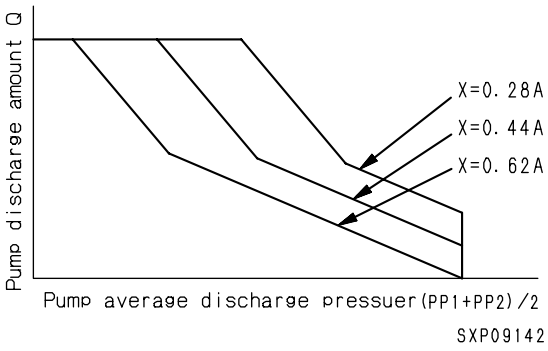
When isig changes between 0 and 1A, the set pressure of the spring changes according to this, and the selector point for the pump discharge amount changes at the rated central valve between 0.98 ↔ 2.5 MPa {10 ↔ 25 kg/cm²}.



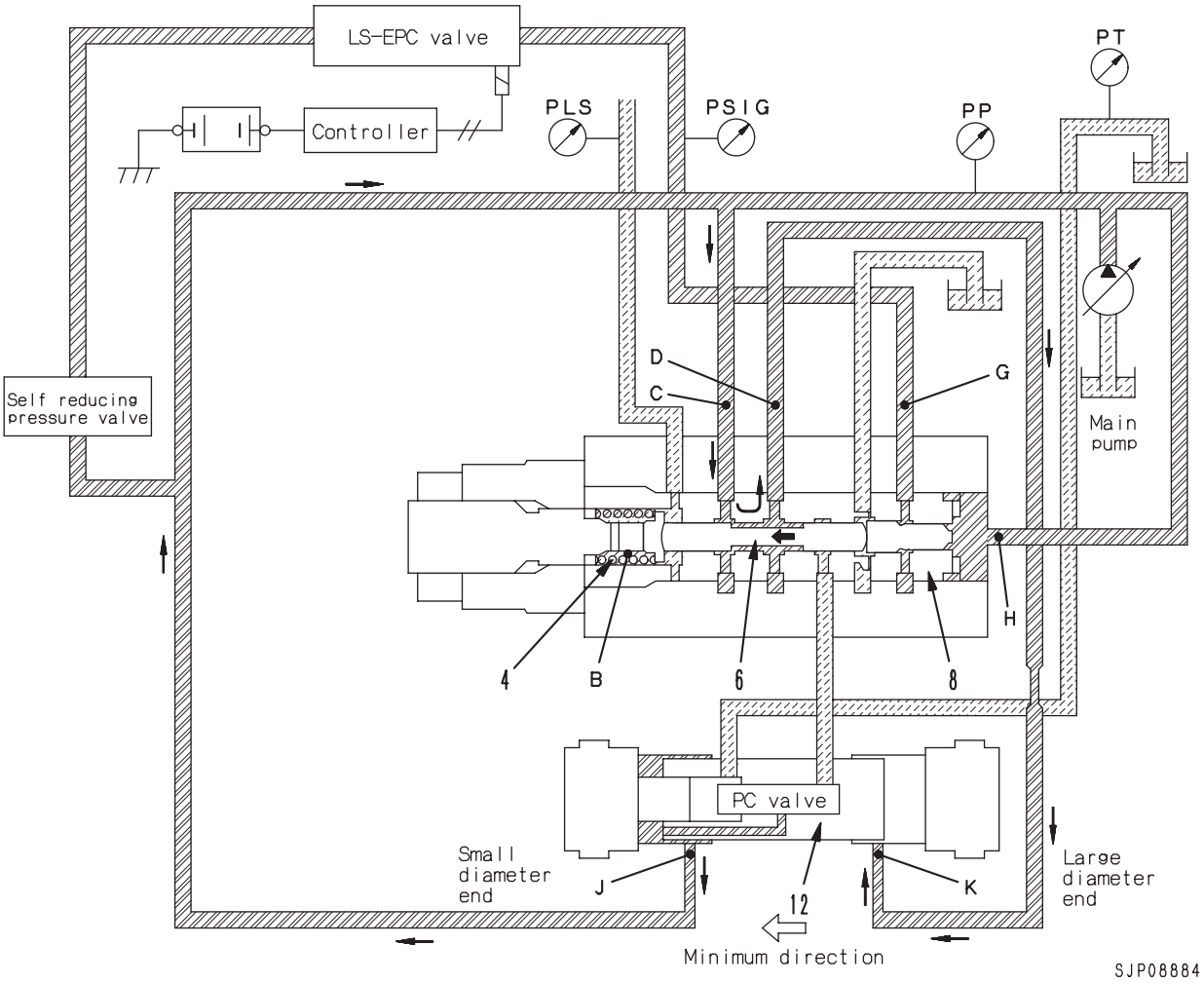
(2) PC valve

When the pump discharge pressure **PP1** (self-pressure) and **PP2** (other pump pressure) are high, the PC valve controls the pump so that no more oil than the constant flow (in accordance with the discharge pressure) flows even if the stroke of the control valve becomes larger. In this way, it carries out equal horsepower control so that the horsepower absorbed by the pump does not exceed the engine horsepower.

In other words, If the load during the operation becomes larger and the pump discharge pressure rises, it reduces the discharge amount from the pump; and if the pump discharge pressure drops, it increases the discharge amount from the pump. The relationship between the average of the front and rear pump discharge pressures (average discharge amount of F, R pumps (**PP1 + PP2)/2)** and pump discharge amount **Q** is shown on the right, with the current given to the PC-EPC valve solenoid shown as a parameter. The controller senses the actual speed of the engine, and if the speed drops because of an increase in the load, it reduces the pump discharge amount to allow the speed to recover. In other words, when the load increases and the engine speed drops below the set value, the command current to the PC-EPC valve solenoid from the controller increases according to the drop in the engine speed to reduce the pump swash plate angle.



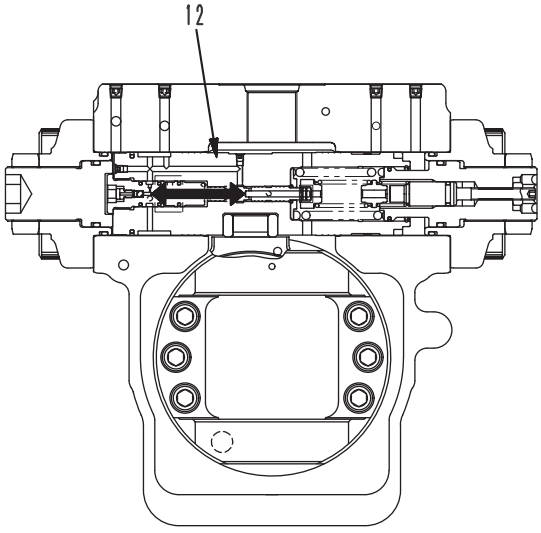
OPERATION



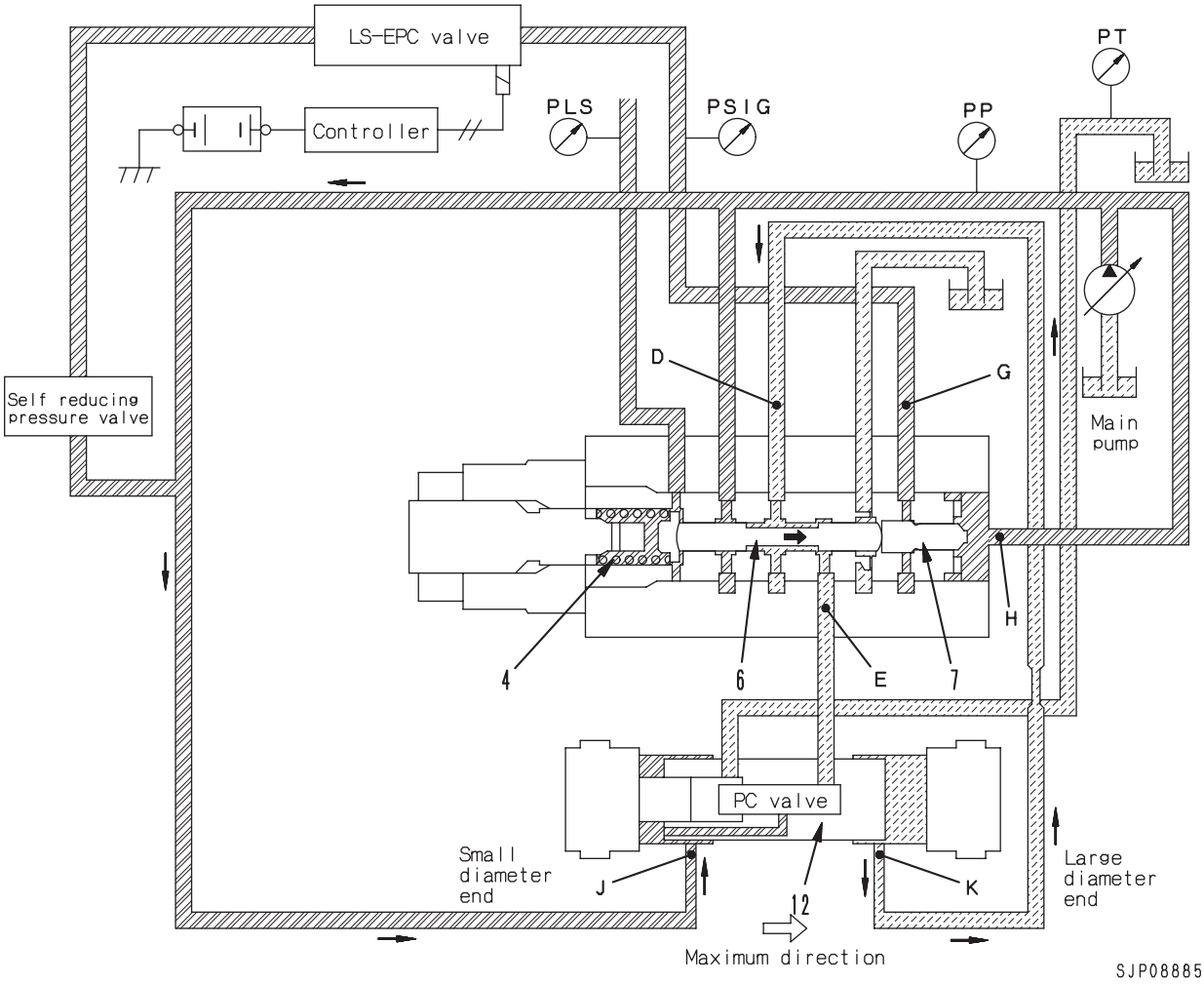
(1) LS valve

1) When control valve is at neutral position

- The LS valve is a three-way selector valve, with pressure **PLS** (LS pressure) from the inlet port of the control valve brought to spring chamber **B**, and main pump discharge pressure **PP** brought to port **H** of sleeve (8). The size of this LS pressure **PLS** + force **Z** of spring (4) and the main pump pressure (self pressure) **PP** determines the position of spool (6). However, the size of the output pressure **PSIG** (the LS selection pressure) of the EPC valve for the LS valve entering port **G** also changes the position of spool (6). (The set pressure of the spring changes).
- Before the engine is started, servo piston (11) is pushed to the right. (See the diagram on the right)
- When the engine is started and the control lever is at the neutral position, LS pressure **PLS** is 0 MPa {0 kg/cm²}. (It is interconnected with the drain circuit through the control valve spool.)

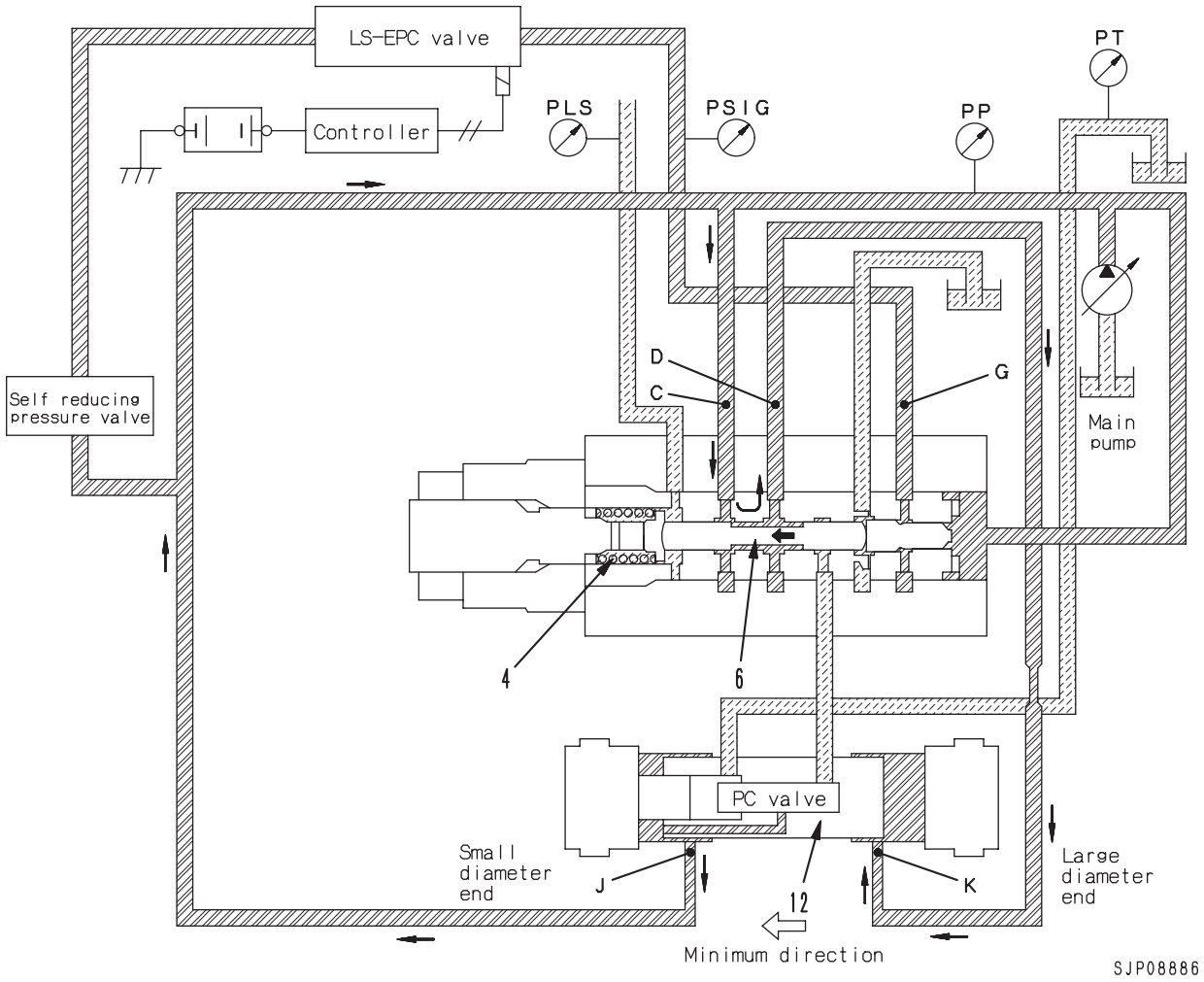


At this point, spool (6) is pushed to the left,and port **C** and port **D** are connected. Pump pressure **PP** enters the large diameter end of the piston from port **K** and the same pump pressure **PP** also enters port **J** at the small diameter end of the piston, so the swash plate is moved to the minimum angle by the difference in the area of the piston (12).



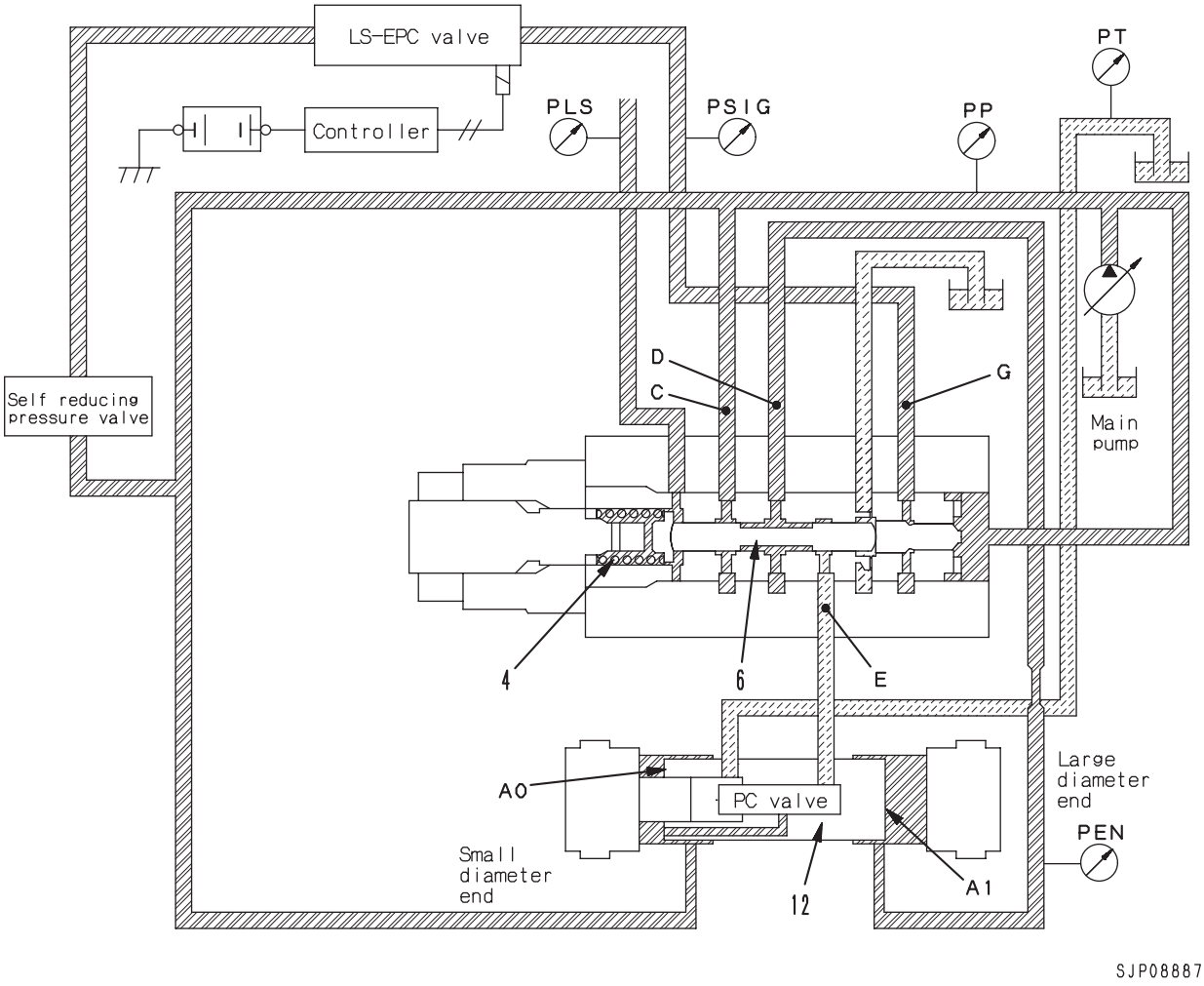
2) Operation in increase direction for pump discharge amount

- When the difference between the main pump pressure **PP** and LS pressure **PLS**, in other words, LS differential pressure Δ**PLS,** becomes smaller (for example, when the area of opening of the control valve becomes larger and pump **PP** drops), spool (6) is pushed to the right by the combined force of LS pressure **PLS** and the force of spring (4).
- When spool (6) moves, port **D** and port **E** are joined and connected to the PC valve. When this happens, the PC valve is connected to the drain port, so circuit **D - K** becomes drain pressure **PT**. (The operation of the PC valve is explained later).
- For this reason, the pressure at the large diameter end of servo piston (12) becomes drain pressure **PT**, and pump pressure **PP** enters port **J** at the small diameter end, so servo piston (12) is pushed to the right. Therefore, the swash plate moves in the direction to make the discharge amount larger. If the output pressure of the EPC valve for the LS valve enters port **G**, this pressure creates a force to move piston (7) to the left. If piston (7) is pushed to the left, it acts to make the set pressure of spring (4) weaker, and the difference between **PLS** and **PP** changes when ports **D** and **E** of spool (6) are connected.



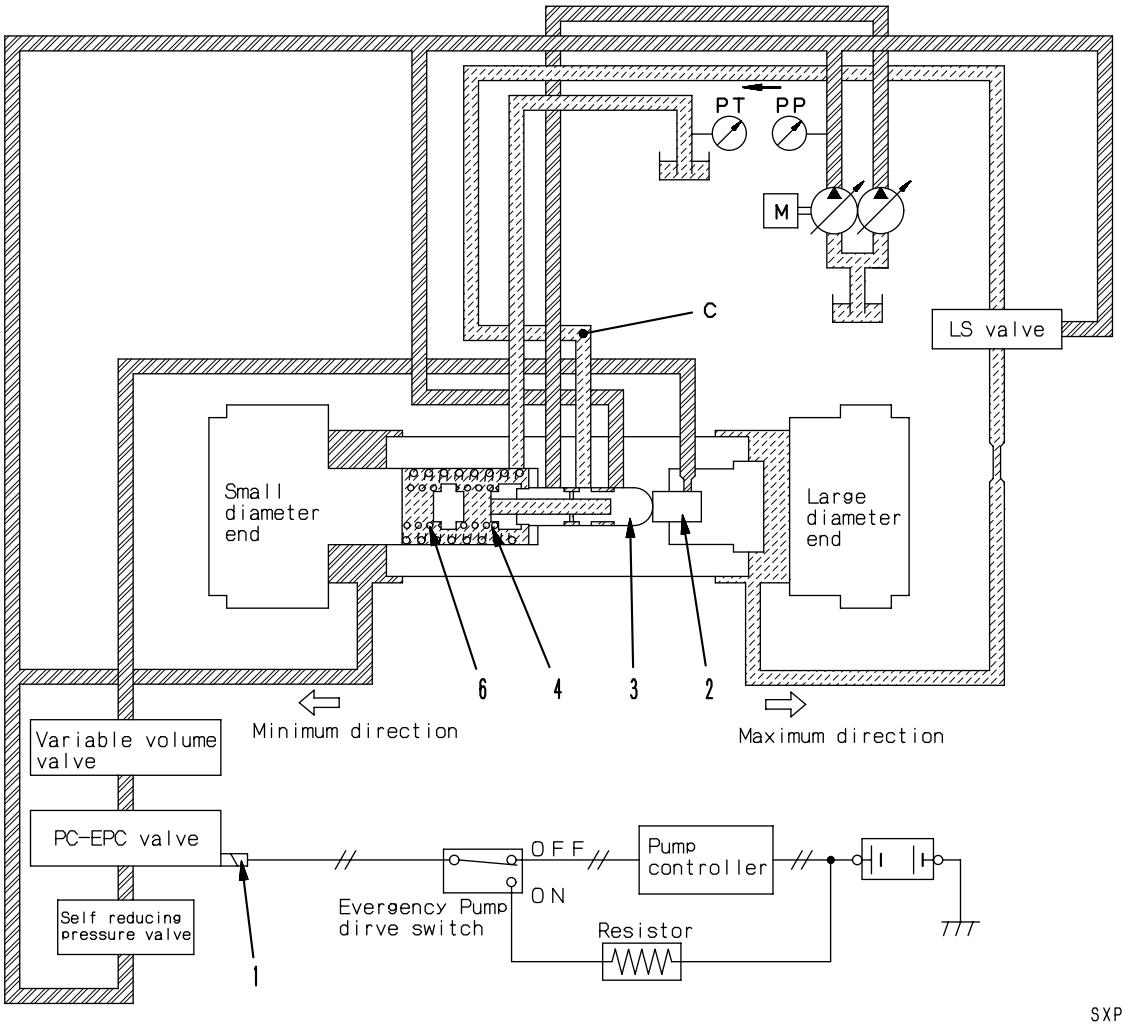
3) Operation in decrease direction for pump discharge amount

- The following explains the situation if the servo piston (12) moves to the left (the discharge amount becomes smaller). When LS differential pressure **ΔPLS** becomes larger (for example, when the area of opening of the control valve becomes smaller and pump pressure **PP** rises), pump pressure **PP** pushes spool (6) to the left.
- When spool (6) moves, main port pressure **PP** flows from port **C** and port **D** and from port **K**, it enters the large diameter end of the piston.
- Main pump pressure **PP** also enters port **J** at the small diameter end of the piston, but because of the difference in area between the large diameter end and the small diameter end of servo piston (12), servo piston (12) is pushed to the left.
- As a result, the swash plate moves in the direction to make angle smaller.
- If LS selection pressure **PSIG** enters port **G**, it acts to make the set pressure of spring (4) weaker.



4) When servo piston is balanced

- Let us take the area receiving the pressure at the large diameter end of the piston as **A1**, the area receiving the pressure at the small diameter end as **A0**, and the pressure flowing into the large diameter end of the piston as **Pen**. If the main pump pressure **PP** of the LS valve and the combined force of force **Z** of spring (4) and LS pressure **PLS** are balanced, and the relationship is **A0** x **PP** = **A1** x **Pen**, servo piston (12) will stop in that position, and the swash plate will be kept at an intermediate position. (It will stop at a position where the opening of the throttle from port **D** to port **E** and from port **C** to port **D** of spool (6) is approximately the same.)
- At this point, the relationship between the area receiving the pressure at both ends of piston (12) is **A0 : A1** = 1:2, so the pressure applied to both ends of the piston when it is balanced becomes **PP : Pen** = 2:1.
- The position where spool (6) is balanced and stopped is the standard center, and the force of spring (4) is adjusted so that it is determined when **PP - PLS** = 2.5 MPa {25 kg/cm²}. However, if **PSIG** (the output pressure of 0 ↔ 2.9 MPa {0 ↔ 30 kg/cm²} of the EPC valve of the LS valve) is applied to port **G**, the balance stop position will change in proportion to pressure **PSIG** between **PP - PLS** = 2.5 ↔ 0.98 MPa {25 ↔ 10 kg/cm²}.



(2) PC Valve

1) When pump controller is normal

a. When the load on the actuator is small and pump pressures PP1 and PP2 are low

① Movement of PC-EPC solenoid (1)

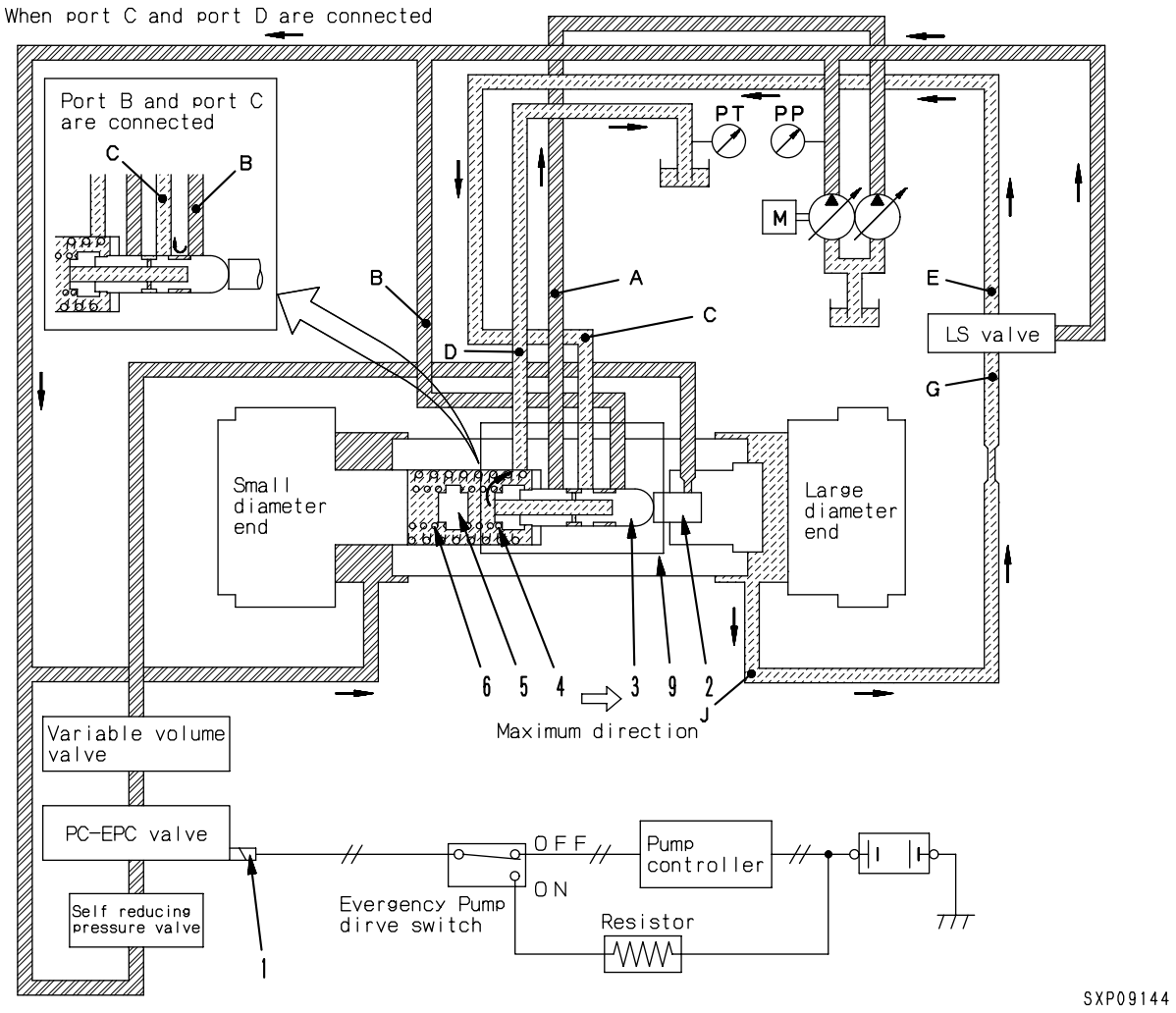
- The command current from the pump controller flows to PC-EPC solenoid (1).This command current acts on the PC-EPC valve and outputs the signal pressure. When this signal pressure is received, the force pushing piston (2) is changed.
- On the opposite side to the force pushing this piston (2) is the spring set pressure of springs (4) and (6) and pump pressure **PP1** (self pressure) and **PP2** (other pump pressure) pushing spool (3). Piston (2) stops at a position where the combined force pushing spool (3) is balanced, and
- the pressure (pressure of port **C**) output from the PC valve changes according to this position.
- The size of command current **X** is determined by the nature of the operation (lever operation), the selection of the working mode, and the set value and actual value for the engine speed.

★ Other pump pressure

This is the pressure of the pump at the opposite end.

For the F pump, it is the R pump pressure

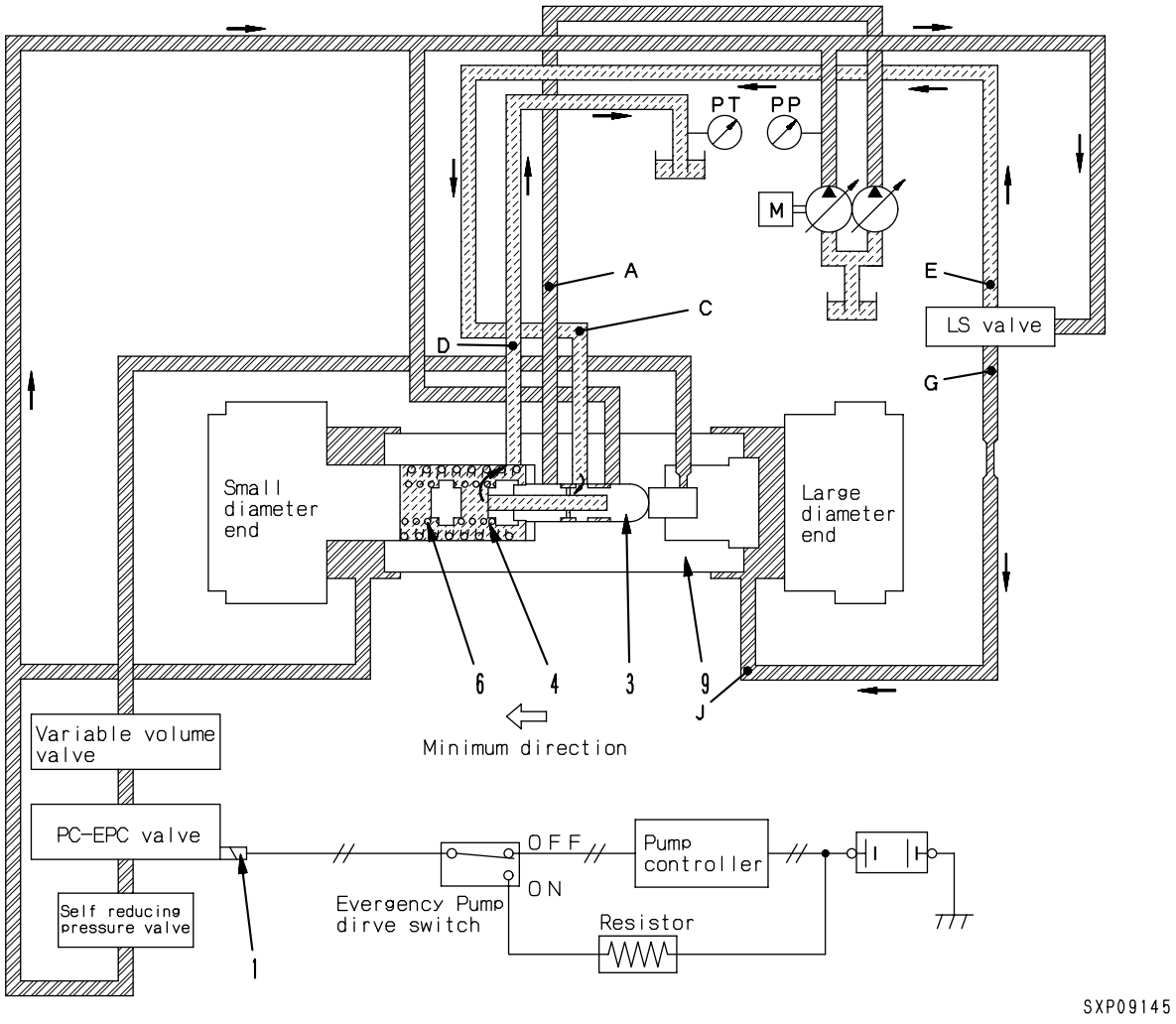
For the R pump, it is the F pump pressure



② **Action of spring**

- The spring load of springs (4) and (6) in the PC valve is determined by the swash plate position.
- If piston (9) moves to the left, spring (6) is compressed, and if it moves further to the left, spring (6) contacts seat (5) and is fixed in position. In other words, the spring load is changed by piston (9) extending or compressing springs (4) and (6).
- If the command circuit input to PC-EPC valve solenoid (1) changes further, the force pushing piston (2) changes, and the spring load of springs (4) and (6) also changes according to the valve of the PC-EPC valve solenoid command current.

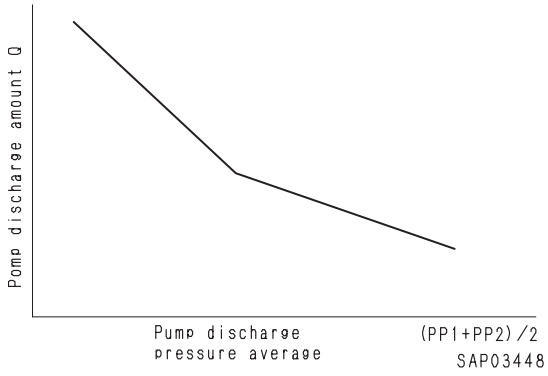
- Port **C** of the PC valve is connected to port **E** of the LS valve (see (1) LS valve). Self pressure **PP1** enters port **B** and the small diameter end of servo piston (9), and other pump pressure **PP2** enters port **A**.
- When pump pressures **PP1** and **PP2** are small, spool (3) is on the right. At this point, port **C** and **D** are connected, and the pressure entering the LS valve becomes drain pressure **PT**. If port **E** and port **G** of the LS valve are connected (see (1) LS valve), the pressure entering the large diameter end of the piston from port **J** becomes drain pressure **PT**, and servo piston (9) moves to the right. In this way, the pump discharge amount moves in the direction of increase.
- As servo piston (9) moves further, springs (4) and (6) expand and the spring force becomes weaker. When the spring force becomes weaker, spool (3) moves to the left, so the connection between port **C** and port **D** is cut, and the pump discharge pressure ports **B** and **C** are connected. As a result, the pressure at port **C** rises, and the pressure at the large diameter end of the piston also rises, so the movement of piston (9) to the right is stopped.
- In other words, the stop position for piston (9) (= pump discharge amount) is decided at the point where the force of springs (4) and (6) and the pushing force from the PC-EPC valve solenoid and the pushing force created by the pressures **PP1** and **PP2** acting on the spool (3) are in balance.



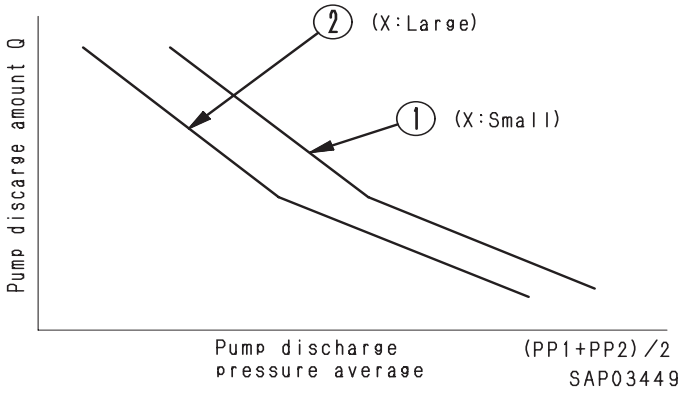
b. When load on actuator is large and pump discharge pressure is high

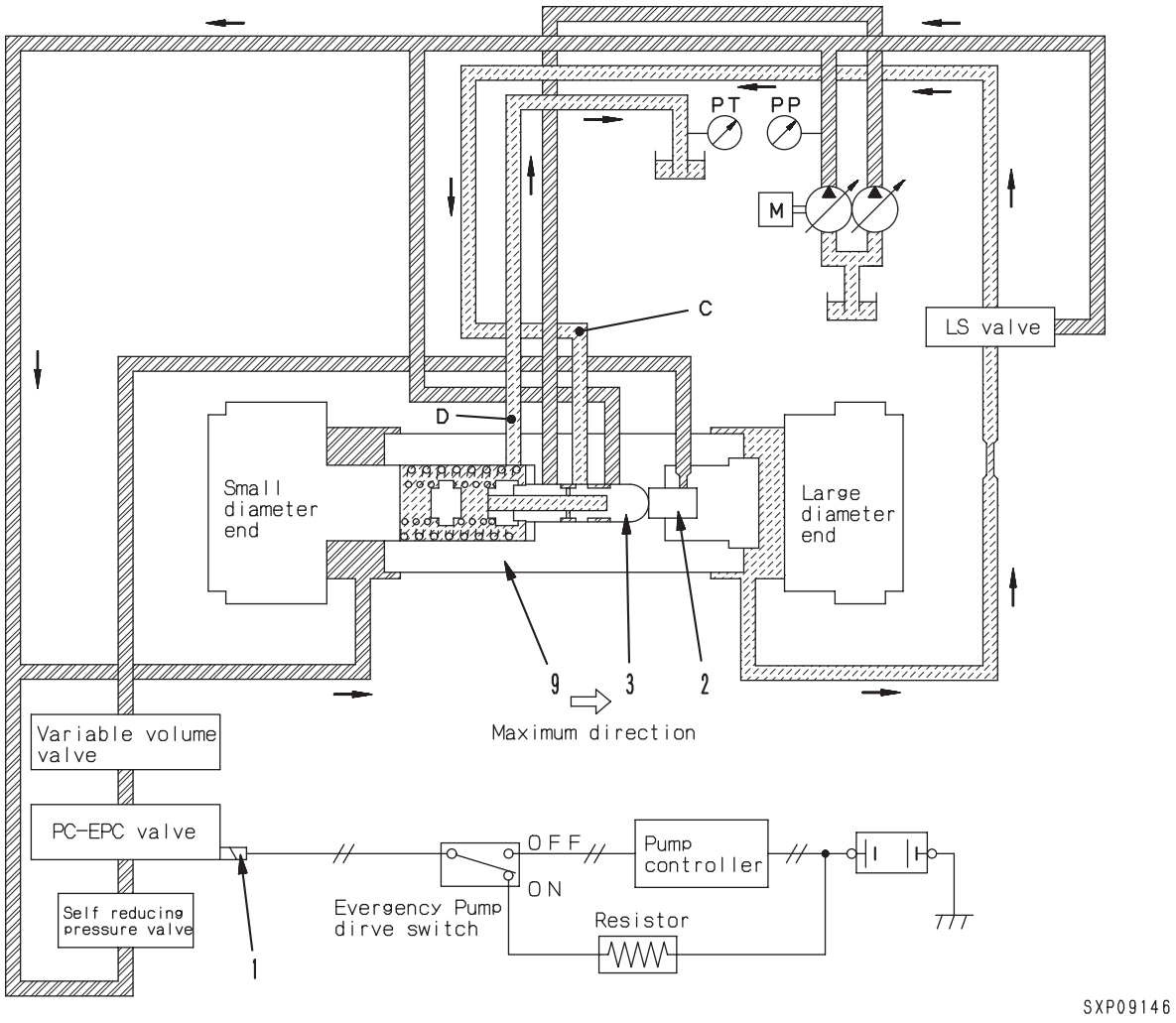
- When the load is large and pump discharge pressures **PP1** and **PP2** are high, the force pushing spool (3) to the left becomes larger and spool (3) moves to the position in the diagram above. When this happens, as shown in the diagram above, part of the pressurized oil from port **B** flows out through port **C** where the LS valve is actuated to port **D**, and the pressurized oil flowing from port **C** to the LS valve becomes approximately half of main pump pressure **PP.**
- When port **E** and port **G** of the LS valve are connected (see (1) LS valve), the pressure from port **J** enters the large diameter end of servo piston (9), and servo piston (9) stops.
- If main pump pressure **PP** increases further and spool (3) moves further to the left, main pump pressure **PP1** flows to port **C** and acts to make the discharge amount the minimum. When piston (9) moves to the left, springs (4) and (6) are compressed and push back spool (3). When spool (3) moves to the left, the opening of port **C** and port **D** becomes larger. As a result, the pressure at port **C** (= **J**) drops, and piston (9) stops moving to the left.
- The position in which piston (9) stops when this happens is further to the left than the position when pump pressures **PP1** and **PP2** are low.

- The relation of average pump pressure **(PP1 + PP2)/2** and the position of servo piston (9) forms a bent line because of the double-spring effect of springs (4) and (6). The relationship between average pump pressure **(PP1 + PP2)/2** and pump discharge amount **Q** is shown in the figure at the right.



- If command voltage **X** sent to PC-EPC valve solenoid (1) increases further, the relationship between average pump pressure **(PP1 + PP2)/2**, and pump discharge amount **Q** is proportional to the pushing force of the PC-EPC valve solenoid and moves in parallel. In other words, the pushing force of PC-EPC solenoid (1) is added to the force pushing to the left because of the pump pressure applied to the spool (3), so the relationship between the average pump pressure **(PP1 + PP2)/2** and **Q** moves from ① to ② in accordance with the increase in **X**.

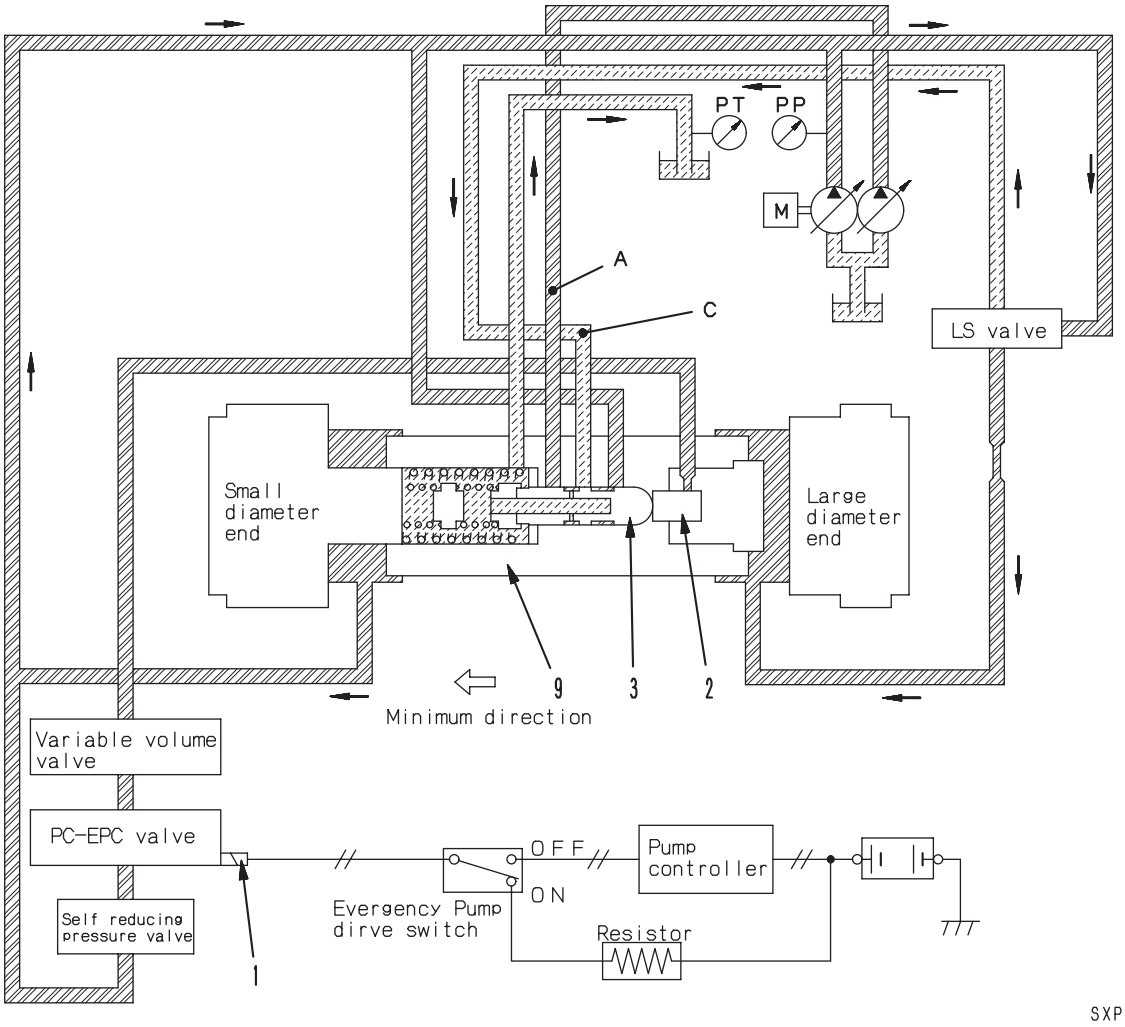




2) When pump controller is abnormal and PC prolix switch is ON

a. When load on main pump is light

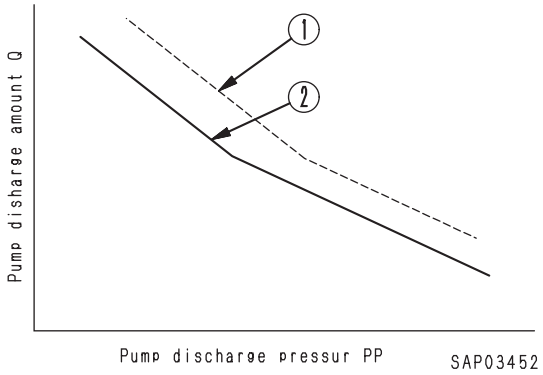
- If there is a failure in the pump controller, turn emergency pump drive switch **ON** to switch to the resistor side. In this case, the power source is taken directly from the battery. But if the current is used as it is, it is too large, so use the resistor to control the current flowing to PC-EPC valve solenoid (1).
- When this is done, the current becomes constant, so the force pushing piston (2) is also constant.
- If the main pump pressure **PP1** and **PP2** are low, the combined force of the pump pressure and the force of PC-EPC valve solenoid (1) is weaker than the spring set force, so spool (3) is balanced at a position to the left.
- At this point, port **C** is connected to the drain pressure of port **D**, and the large diameter end of the piston of servo piston (9) also becomes the drain pressure **PT** through the LS valve. When this happens, the pressure at the small diameter end of the piston is large, so servo piston (9) moves in the direction to make the discharge amount larger.



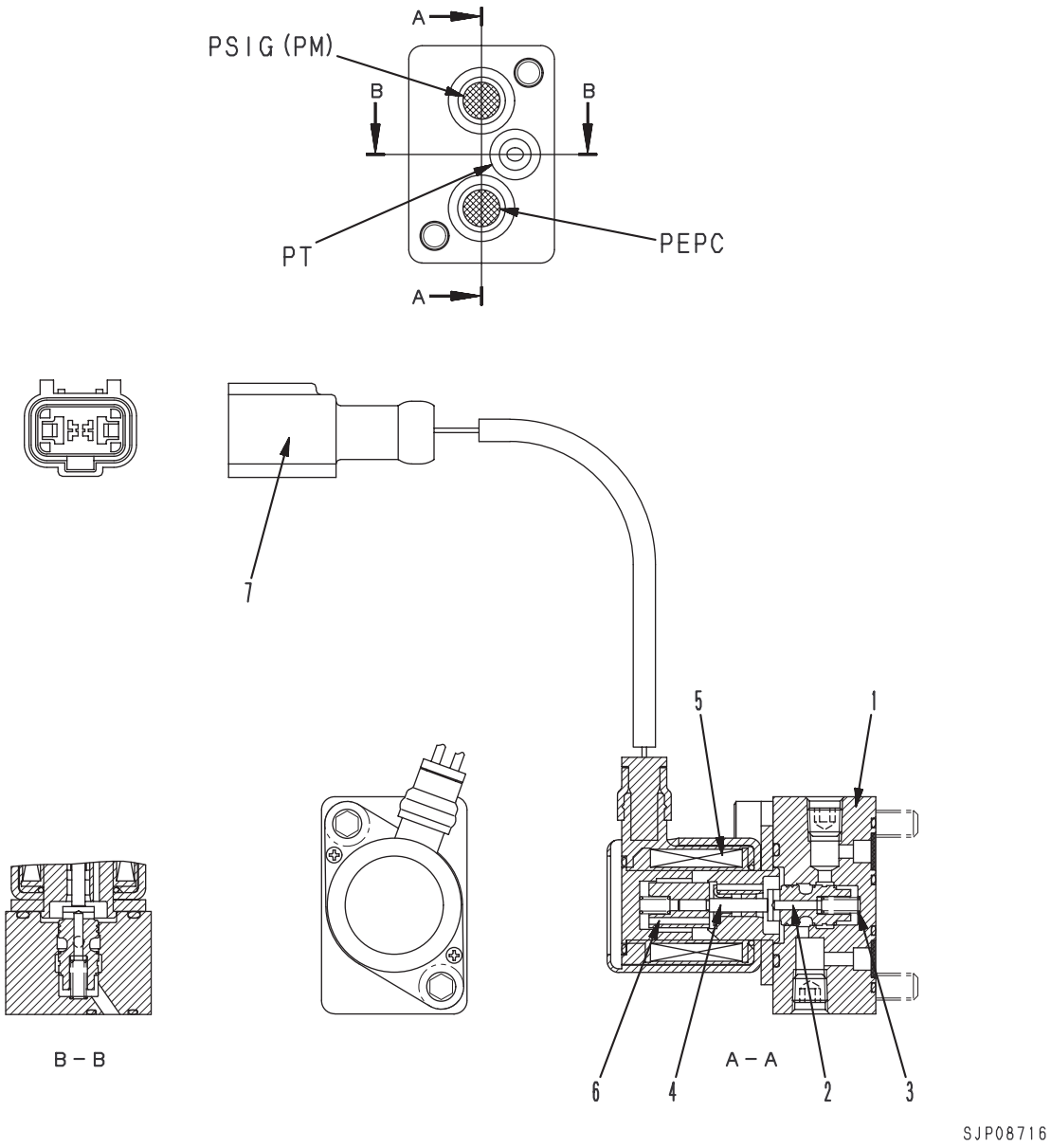
b. When main pump load is heavy

- In the same way as in the previous item, when the emergency pump drive switch is **ON**, the command current sent to PC-EPC valve solenoid (1) becomes constant. For this reason, the force of piston (2) pushing spool (3) is constant.
- If main pump pressures **PP1** and **PP2** increase, spool (3) moves further to the left than when the main pump load is light, and is balanced at the position in the diagram above.
- In this case, the pressure from port **B** flows to port **C**, so servo piston (9) moves to the left (to make the discharge amount smaller) by the same mechanism as explained in item 2)-b, and stops at a position to the left of the position when the load on the pump is light. In other words, even when the emergency pump drive switch is **ON**, the curve for the pump pressure **PP** and discharge amount **Q** is determined as shown in the diagram for the valve of the current sent to the PC-EPC valve solenoid through the resistor.

The curve when the PC prolix switch is **ON** is curve ②, which is to the left of curve ① for when the pump controller is normal.



LS(PC)-EPC VALVE

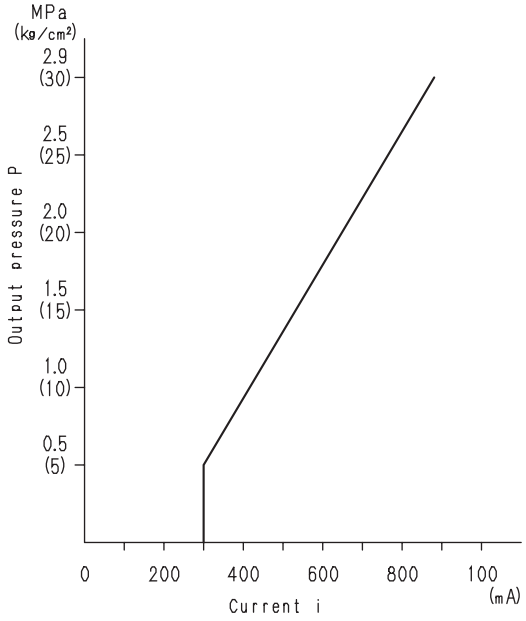


1. Body
2. Spool
3. Spring
4. Rod
5. Coil
6. Plunger
7. Connector

PSIG(PM) : To LS(PC) valve
PT : To tank
PEPC : From self-reducing pressure valve

FUNCTION

- The EPC valve consists of the proportional solenoid portion and the hydraulic valve portion.
- When it receives signal current **i** from the pump controller, it generates the EPC output pressure in proportion to the size of the signal, and outputs it to the LS valve.

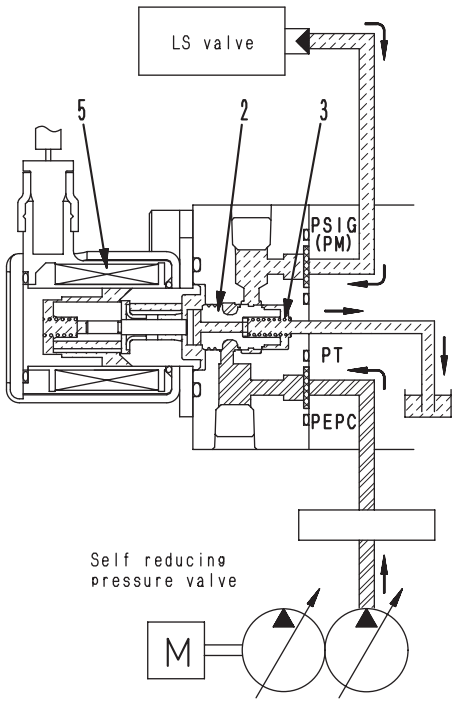


OPERATION

1. When signal current is 0 (coil de-energized)

- When there is no signal current flowing from the controller to coil (5), coil (5) is generalized.
- For this reason, spool (2) is pushed to the right in the direction of the arrow by spring (3).
- As a result, port **PEPC** closes and the pressurized oil from the main pump does not flow to the LS valve.

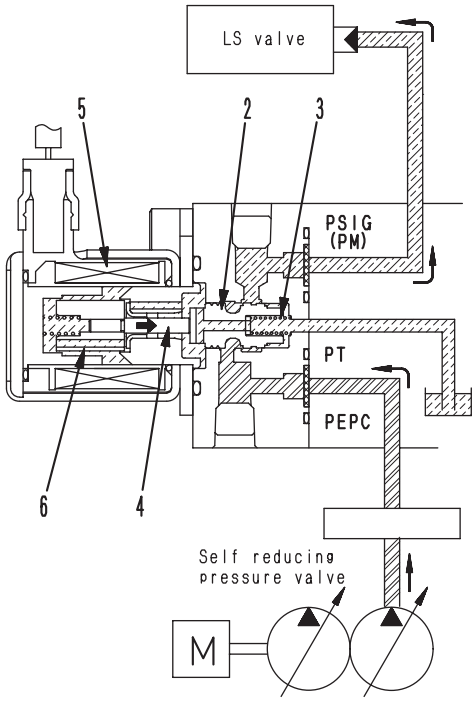
  At the same time, the pressurized oil from the LS valve passes from port **PSIG(PM)** through port **PT** and is drained to the tank.



SJP08890

2. When signal current is very small (coil energized)

- When a very small signal current flows to coil (5), coil (5) is energized, and a propulsion force is generated which pushes plunger (6) to the left.
- Push pin (4) pushes spool (2) to the left, and pressurized oil flows from port **PEPC** to port **PSIG(PM)**.
- When the pressure at port **PSIG(PM)** rises and the load of spring (3) + the force acting on surface **a** of spool (2) becomes greater than the propulsion force of plunger (6), spool (2) is pushed to the right. The circuit between port **PEPC** and port **PSIG(PM)** is shut off, and at the same time, port **PSIG(PM)** and port **PT** are connected.
- As a result, spool (2) is moved up or down until the propulsion force of plunger (6) is balanced with the load of spring (3) + pressure of port **PSIG(PM)**.
- Therefore, the circuit pressure between the EPC valve and the LS valve is controlled in proportion to the size of the signal current.

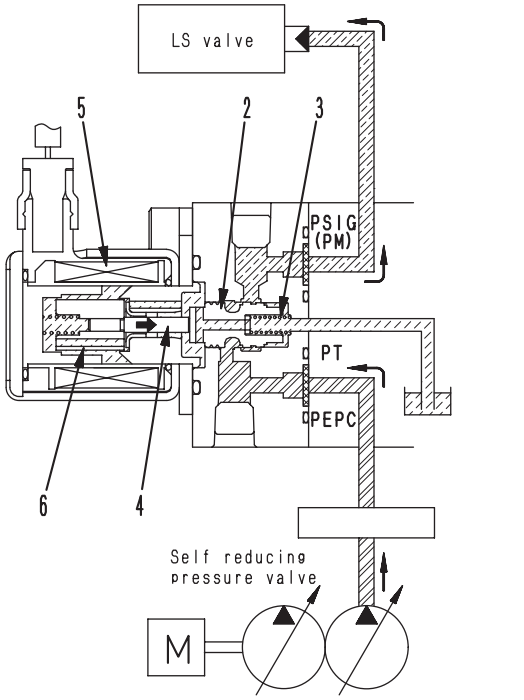


SJP08891

3. When signal current is maximum (coil energized)

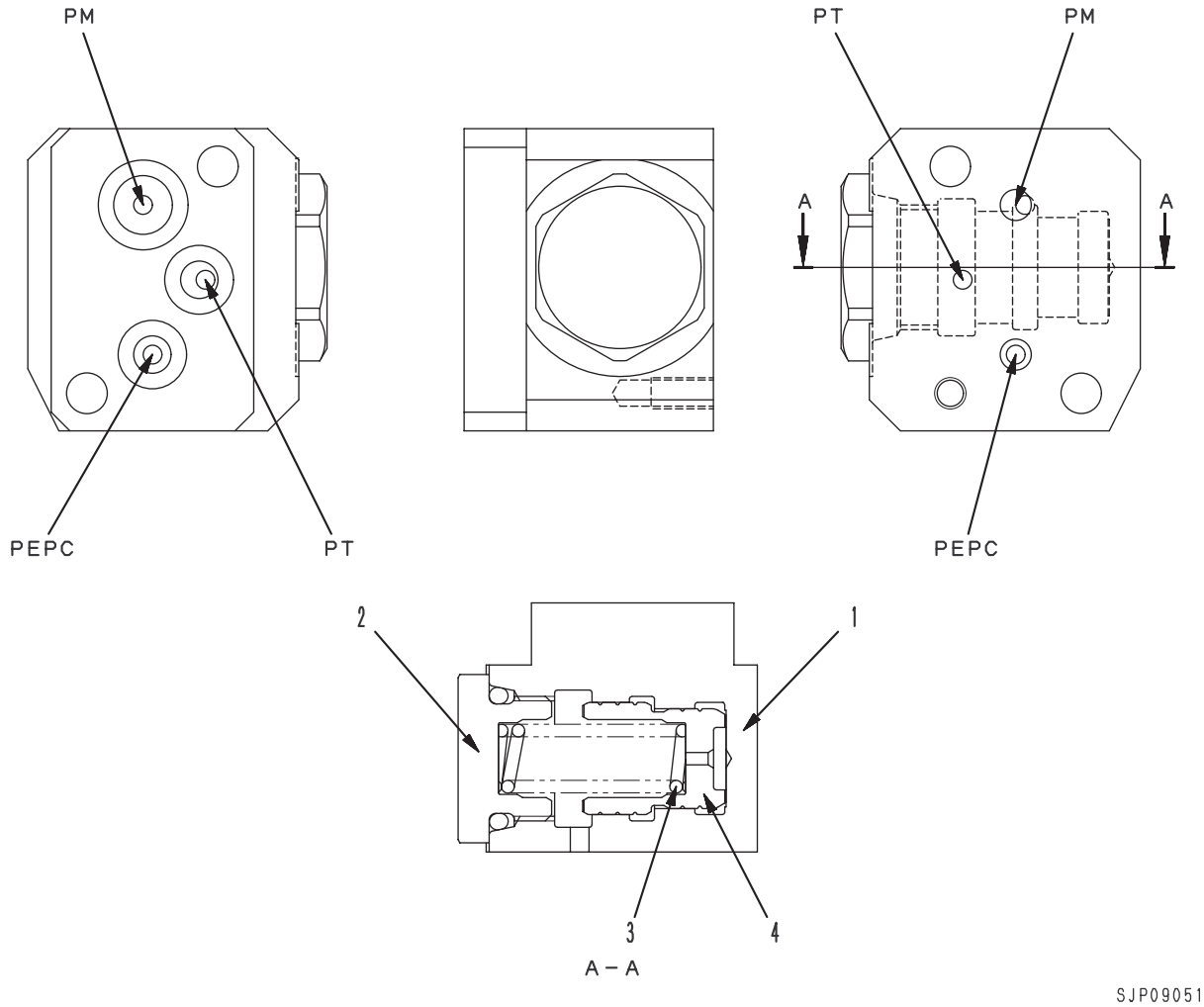
- When the signal current flows to coil (5), coil (5) is energized.
- When this happens, the signal current is at its maximum, so the propulsion force of plunger (6) is also at its maximum.
- For this reason, spool (2) is pushed fully to the left by push pin (4).
- As a result, the maximum flow of pressurized oil from port **PEPC** flows to port **PSIG(PM)**, and the circuit pressure between the EPC valve and LS valve becomes the maximum.

  At the same time, port **PT** closes and stops the oil from flowing to the tank.



SJP08892

VARIABLE VOLUME VALVE



1. Block
2. Plug
3. Spring
4. Piston

PM: To PC valve
PT: To tank
PEPC: From self-reducing pressure valve

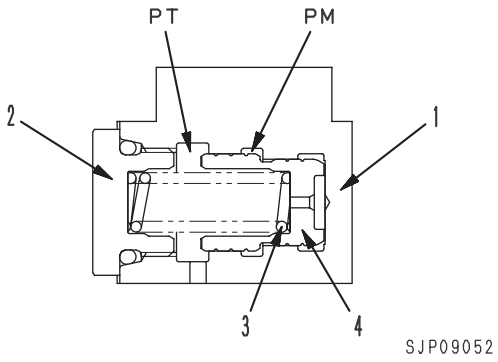
FUNCTION

- This stabilizes the EPC output pressure.

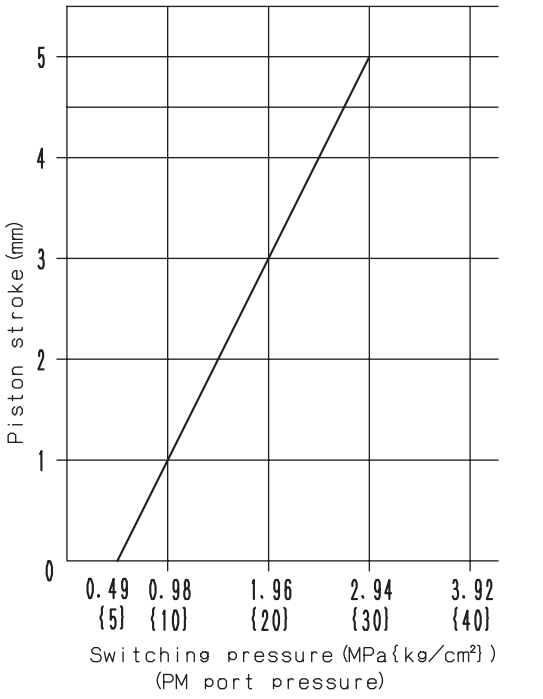
OPERATION

- The output pressure flows to port **PM**, and when the propulsion force of piston (4) becomes larger than the load of spring (3), piston (4) is pushed to the left and the volume at port **PM** increases.

  When the propulsion force of piston (4) becomes less than the load on spring (3), piston (4) is pushed to the right and the volume at port **PM** goes down.



SJP09052



SXP09148

CONTROL VALVE

1. 6-spool valve
2. Cover 1
3. Cover 2
4. Pump merge-divider valve
5. Back pressure valve
6. Boom lock valve
7. Boom, arm Hi valve
8. Service valve
9. Quick return valve
10. Boom Hi check valve

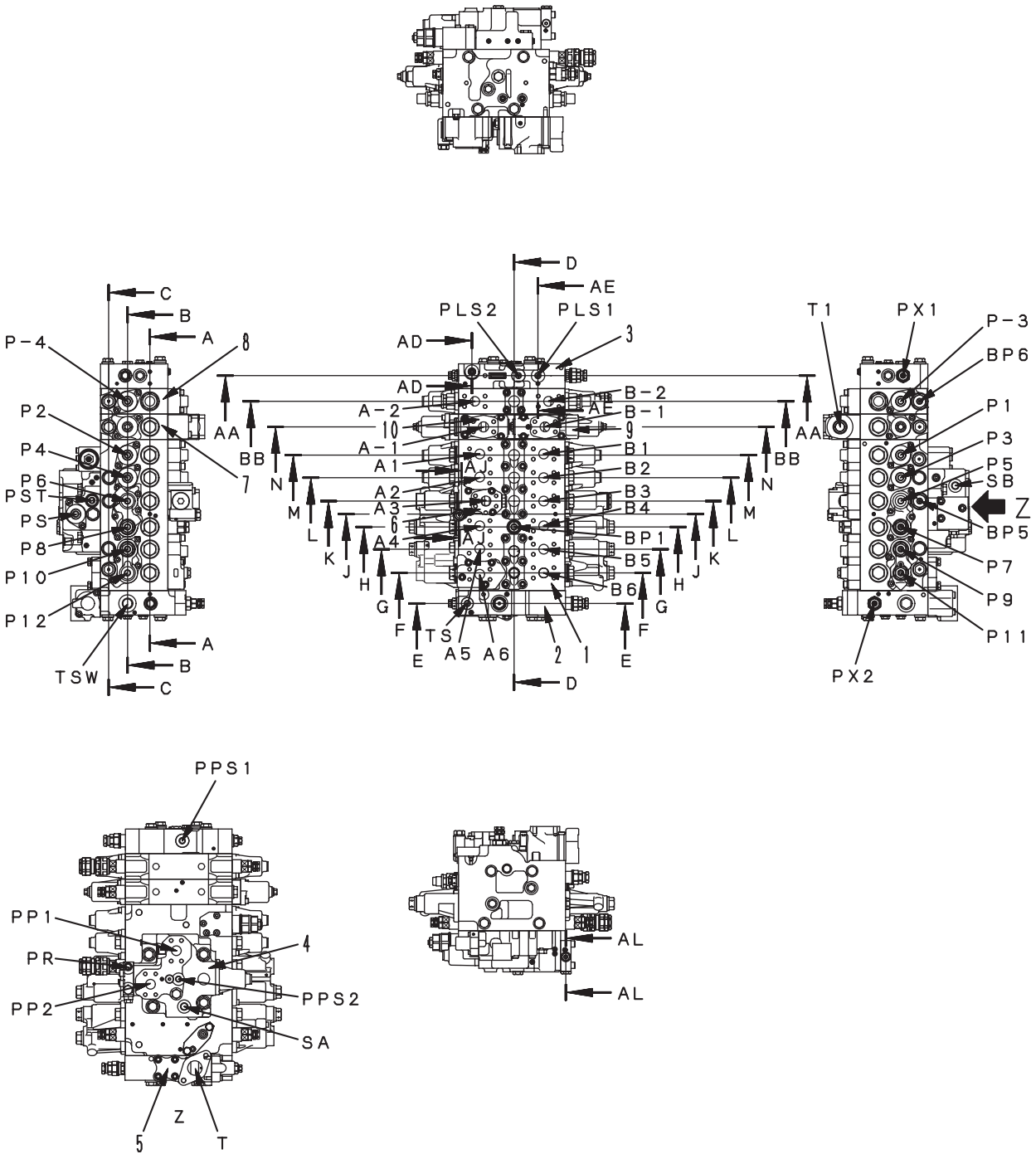
OUTLINE

- This control valve consists of a 7-spool valve (6 spool valve + Hi valve) and a service valve. A merge-divider valve, back-pressure valve, boom hydraulic drift prevention valve, quick return valve, and Hi valve check valve are installed to it.
- Since all the valves are assembled together with connecting bolts and their passes are connected to each other inside the assembly, the assembly is small in size and easy to maintain.
- Since one spool of this control valve is used for one work equipment unit, its structure is simple.

A1 : To bucket cylinder bottom
A2 : To left travel motor
A3 : To boom cylinder bottom
A4 : To swing motor
A5 : To right travel motor
A6 : To arm cylinder head
A-1 : To boom cylinder bottom
A-2 : To attachment
B1 : To bucket cylinder head
B2 : To left travel motor
B3 : To bottom cylinder head
B4 : To swing motor
B5 : To right travel motor
B6 : To arm cylinder bottom
B-1 : To arm cylinder bottom
B-2 : To attachment
P1 : From bucket PPC valve
P2 : From bucket PPC valve
P3 : From left travel PPC valve
P4 : From left travel PPC valve
P5 : From boom PPC valve
P6 : From boom PPC valve
P7 : From swing PPC valve
P8 : From swing PPC valve
P9 : From right travel PPC valve
P10 : From right travel PPC valve
P11 : From arm PPC valve
P12 : From arm PPC valve
P-3 : From service PPC valve
P-4 : From service PPC valve
BP1 : Boom RAISE PPC output pressure
PB5 : From 2-stage safety valve solenoid valve
BP6 : From attachment circuit selector solenoid valve
PLS1 : To rear pump control
PLS2 : To front pump control
PP1 : To rear pump control
PP2 : To front pump control
PPS1 : From rear main pump
PPS2 : From front main pump
PR : To solenoid valve, PPC valve, EPC valve
PS : From pump merge-divider solenoid valve
PST : From travel junction valve
PX1 : From 2-stage solenoid valve
PX2 : From 2-stage solenoid valve
SA : Pressure sensor fitting port
SB : Pressure sensor fitting port
T : To tank
T1 : To tank
TS : To tank
TSW : To swing motor

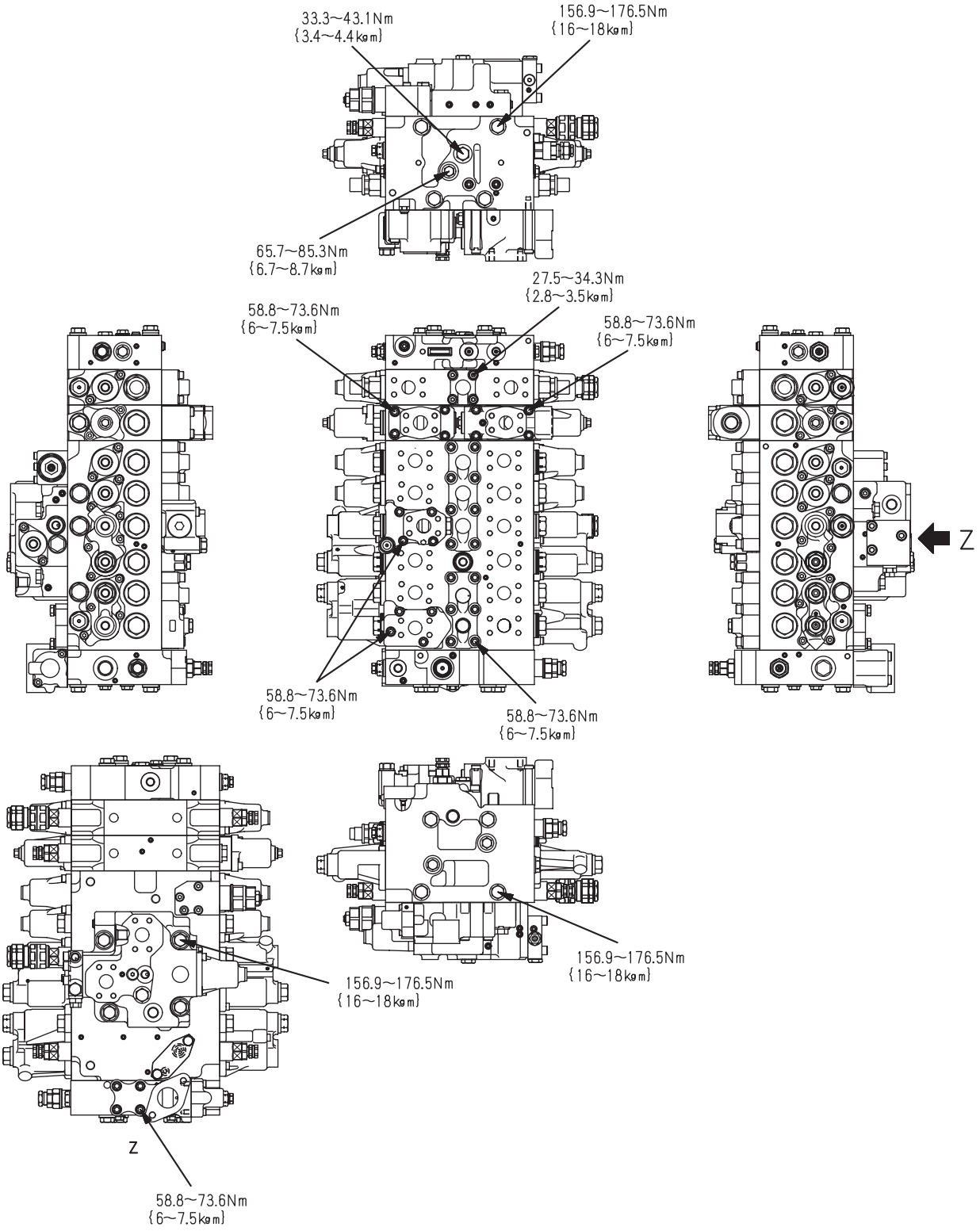
7-spool valve
(7-spool valve + 1 service valves)

(1/9)



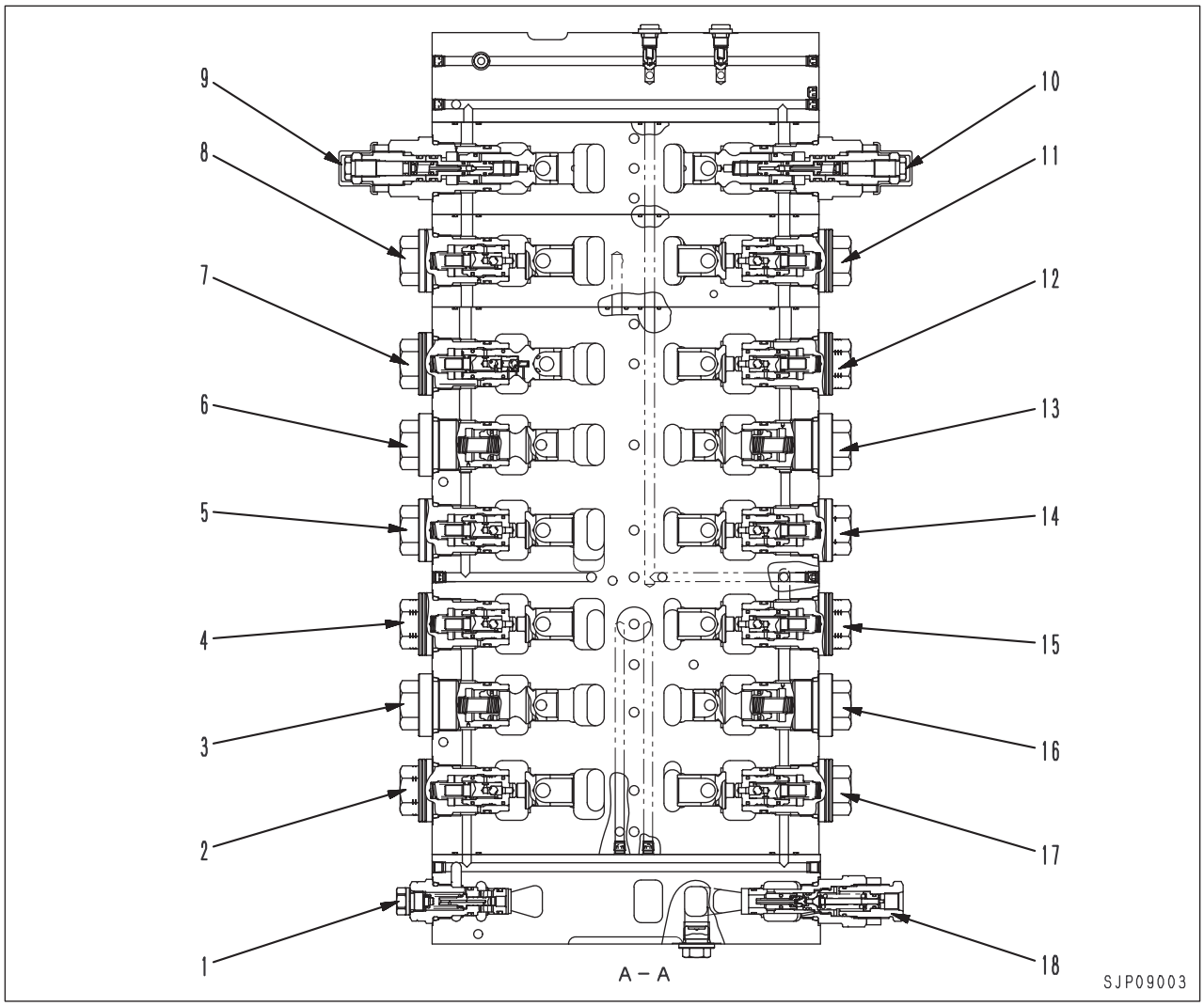
SJP09001

(2/9)


33.3~43.1Nm
{3.4~4.4kgm}
156.9~176.5Nm
{16~18kgm}
65.7~85.3Nm
{6.7~8.7kgm}
27.5~34.3Nm
{2.8~3.5kgm}
58.8~73.6Nm
{6~7.5kgm}
58.8~73.6Nm
{6~7.5kgm}
Z
58.8~73.6Nm
{6~7.5kgm}
58.8~73.6Nm
{6~7.5kgm}
156.9~176.5Nm
{16~18kgm}
156.9~176.5Nm
{16~18kgm}
Z
58.8~73.6Nm
{6~7.5kgm}

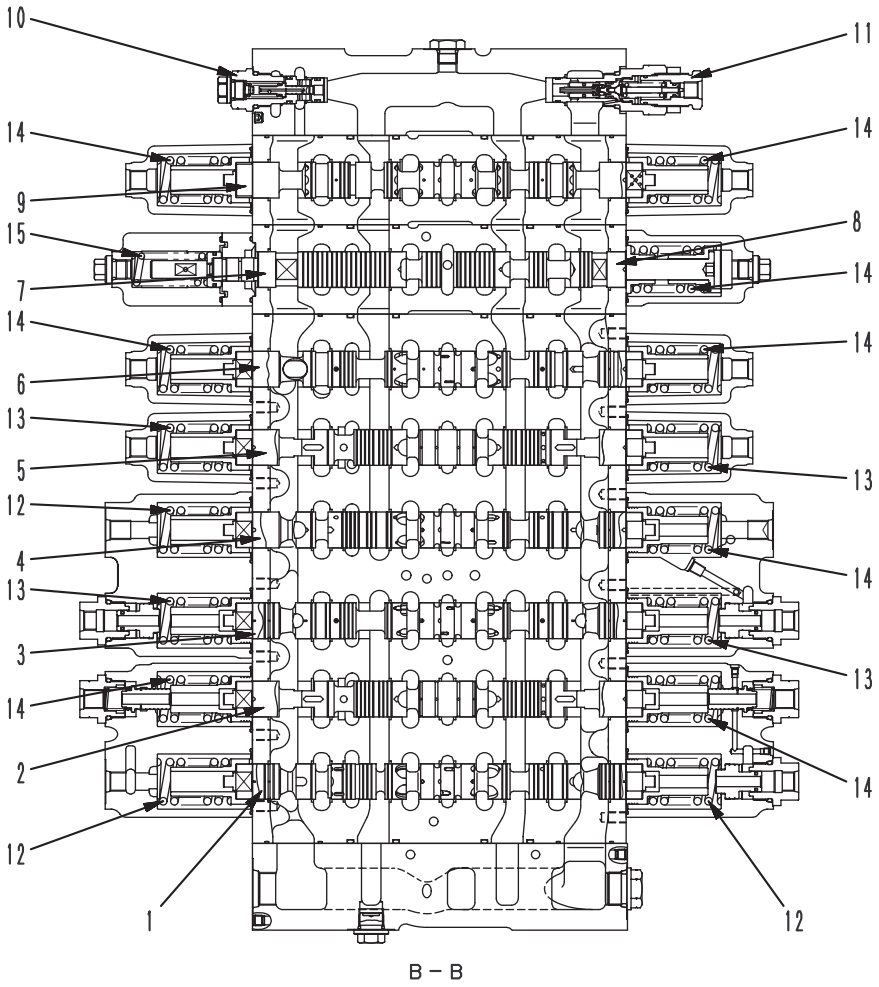
SJP09002

(3/9)



1. Unload valve
2. Pressure compensation valve (Arm OUT)
3. Pressure compensation valve (Right travel reverse)
4. Pressure compensation valve (Right swing)
5. Pressure compensation valve (Boom RAISE)
6. Pressure compensation valve (Left travel reverse)
7. Pressure compensation valve (Bucket CURL)
8. Pressure compensation valve (Boom RAISE)
9. Pressure compensation valve (Service)
10. Pressure compensation valve (Service)
11. Pressure compensation valve (Arm IN)
12. Pressure compensation valve (Bucket DUMP)
13. Pressure compensation valve (Left travel forward)
14. Pressure compensation valve (Boom LOWER)
15. Pressure compensation valve (Left swing)
16. Pressure compensation valve (Right travel forward)
17. Pressure compensation valve (Arm IN)
18. Main relief valve

(4/9)

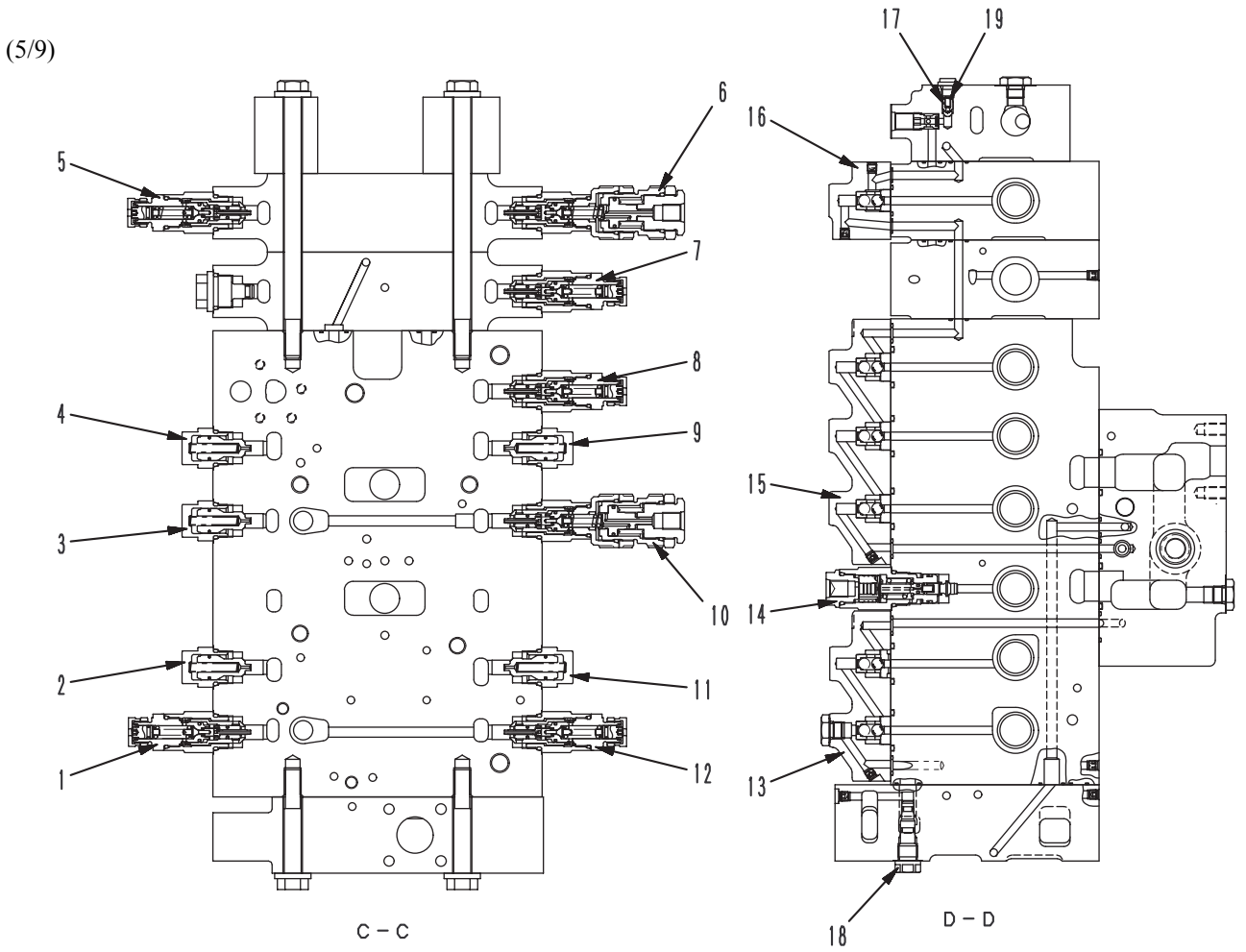


1. Spool (Arm)
2. Spool (Right travel)
3. Spool (Swing)
4. Spool (Boom)
5. Spool (Left travel)
6. Spool (Bucket)
7. Spool (Boom Hi)
8. Spool (Arm Hi)
9. Spool (Service)
10. Unload valve
11. Main relief valve

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
12	Spool return spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring
		54.2 x 34.8	51.2	416.5 N {42.5 kg}	—	333.2 N {34 kg}	
13	Spool return spring	54.6 x 34.8	51.2	429.9 N {42.9 kg}	—	336.1 N {34.3 kg}	
14	Spool return spring	54.5 x 34.8	51.2	393 N {40.1 kg}	—	314.6 N {32.1 kg}	
15	Spool return spring	54.9 x 24.2	51.2	251 N {25.1 kg}	—	201.0 N {20.5 kg}	

(5/9)

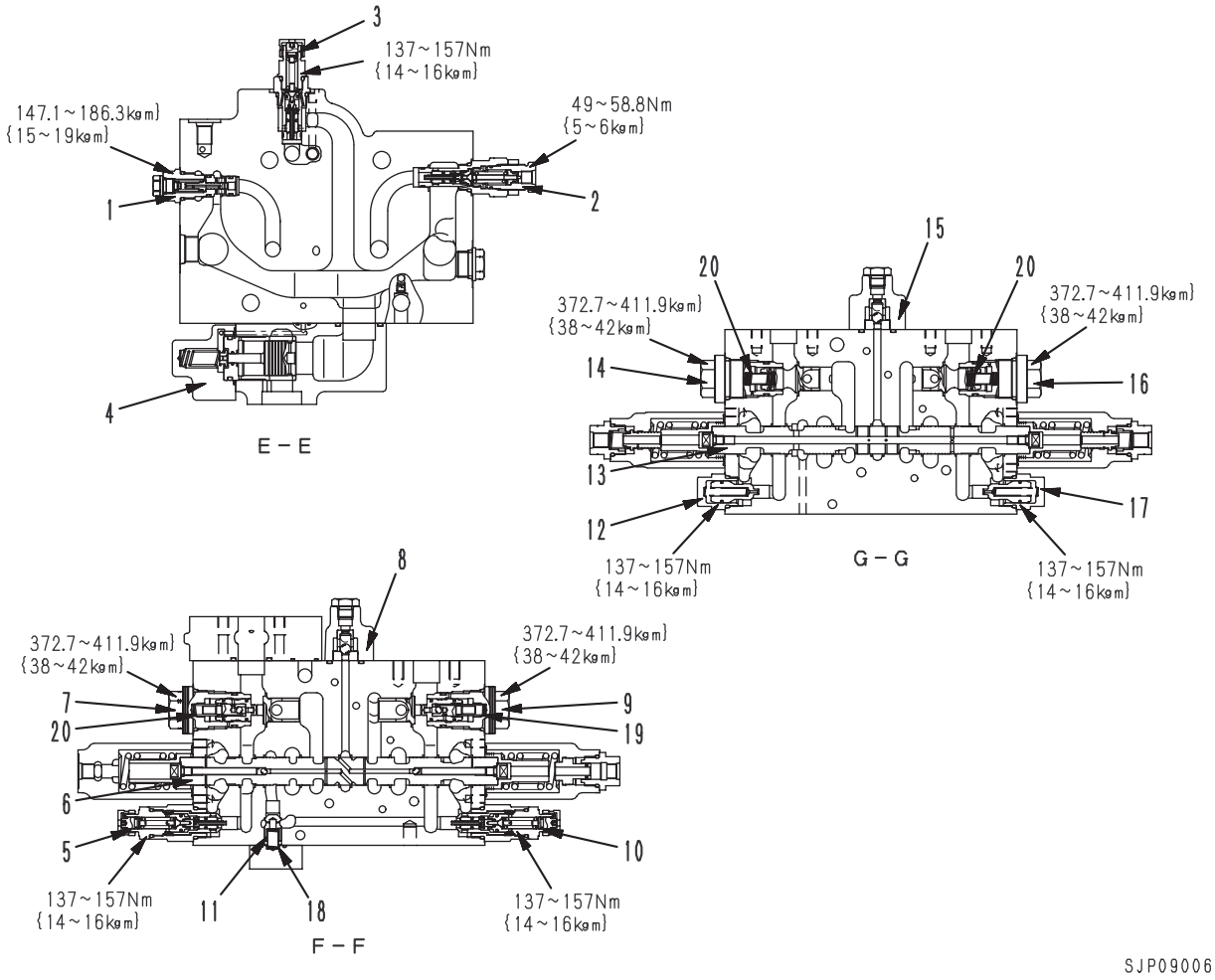


1. Safety-suction valve (Arm OUT)
2. Suction valve (Right travel reverse)
3. Suction valve (Boom RAISE)
4. Suction valve (Left travel reverse)
5. Safety-suction valve (Service)
6. Safety-suction valve (2-stage) (Service)
7. Safety-suction valve (Arm IN)
8. Safety-suction valve (Bucket DUMP)
9. Suction valve (Left travel forward)
10. Safety-suction valve (2-stage) (Boom LOWER)
11. Suction valve (Right travel forward)
12. Safety-suction valve (Arm IN)
13. LS shuttle valve (Arm, right travel)
14. LS select valve
15. LS shuttle valve (Boom, left travel, bucket)
16. LS shuttle valve (Service)
17. LS check valve
18. Pressure relief plug

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
19	Check valve spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring
		11.5 x 4.6	8.5	1.5 N {0.15 kg}	—	1.2 N {0.12 kg}	

(6/9)



ARM CONTROL VALVE

1. Unload valve
2. Main relief valve
3. Safety valve (Boom RAISE)
4. Lift check valve
5. Safety-suction valve
6. Spool
7. Pressure compensation valve (OUT)
8. LS shuttle valve
9. Pressure compensation valve (IN)
10. Safety-suction valve
11. Check valve for regeneration circuit

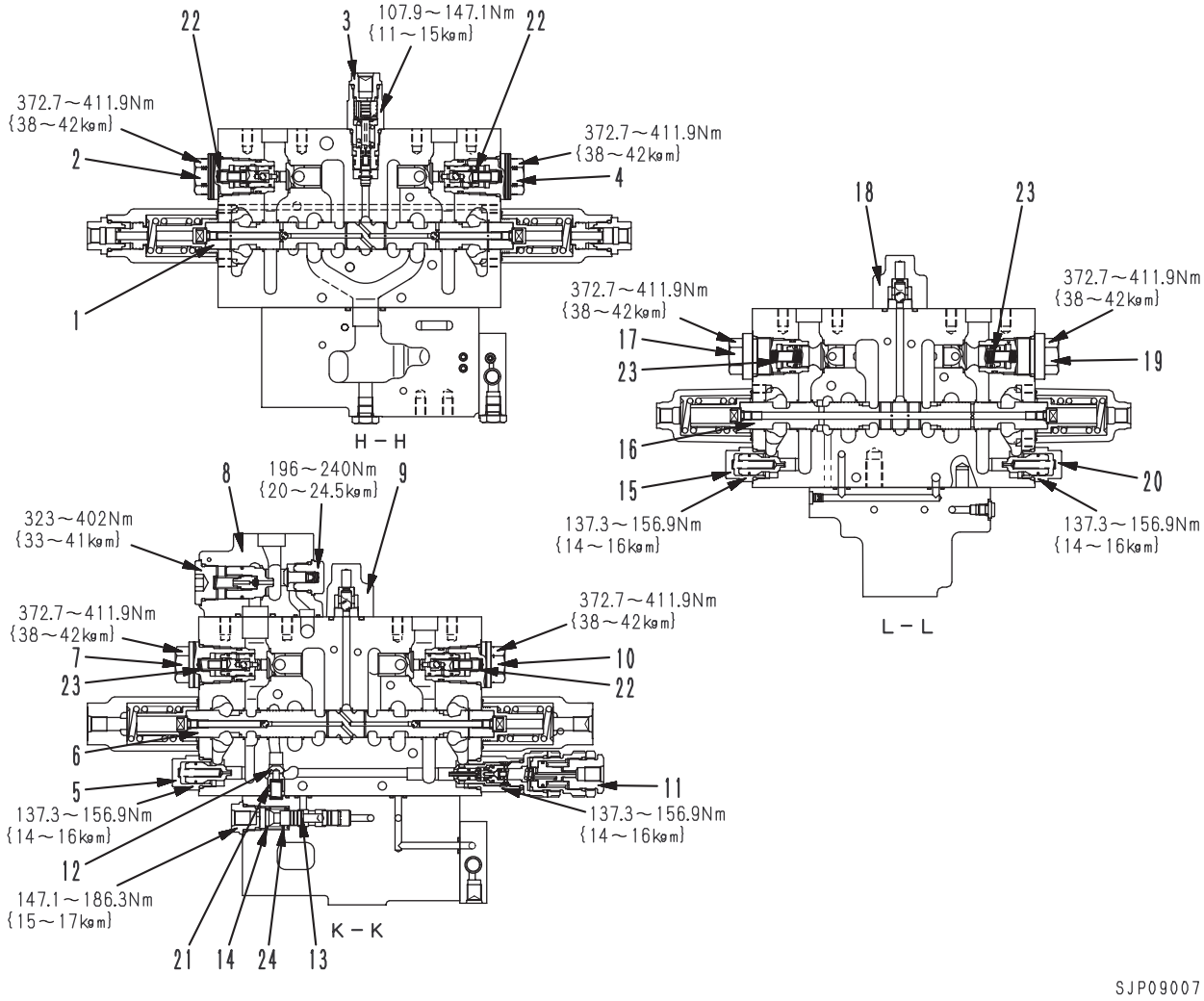
R. H. TRAVEL CONTROL VALVE

12. Suction valve
13. Spool
14. Pressure compensation valve (Reverse)
15. LS shuttle valve
16. Pressure compensation valve (Forward)
17. Suction valve

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
18	Regeneration valve spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring
		31.5 x 10.3	19.5	6.2 N {0.6 kg}	—	4.9 N {0.5 kg}	
19	Piston return spring	48.1 x 10.8	28	17.5 N {1.8 kg}	—	14.0 N {1.4 kg}	
20	Piston return spring	36.9 x 11.1	28	29.4 N {3 kg}	—	23.5 N {2.4 kg}	

(7/9)



SWING CONTROL VALVE

1. Spool
2. Pressure compensation valve (Right)
3. LS select valve
4. Pressure compensation valve (Left)

BOOM CONTROL VALVE

5. Suction valve
6. Spool
7. Pressure compensation valve (RAISE)
8. Hydraulic drift prevention valve
9. LS shuttle valve
10. Pressure compensation valve (Lower)
11. Safety-suction valve
12. Check valve for regeneration circuit

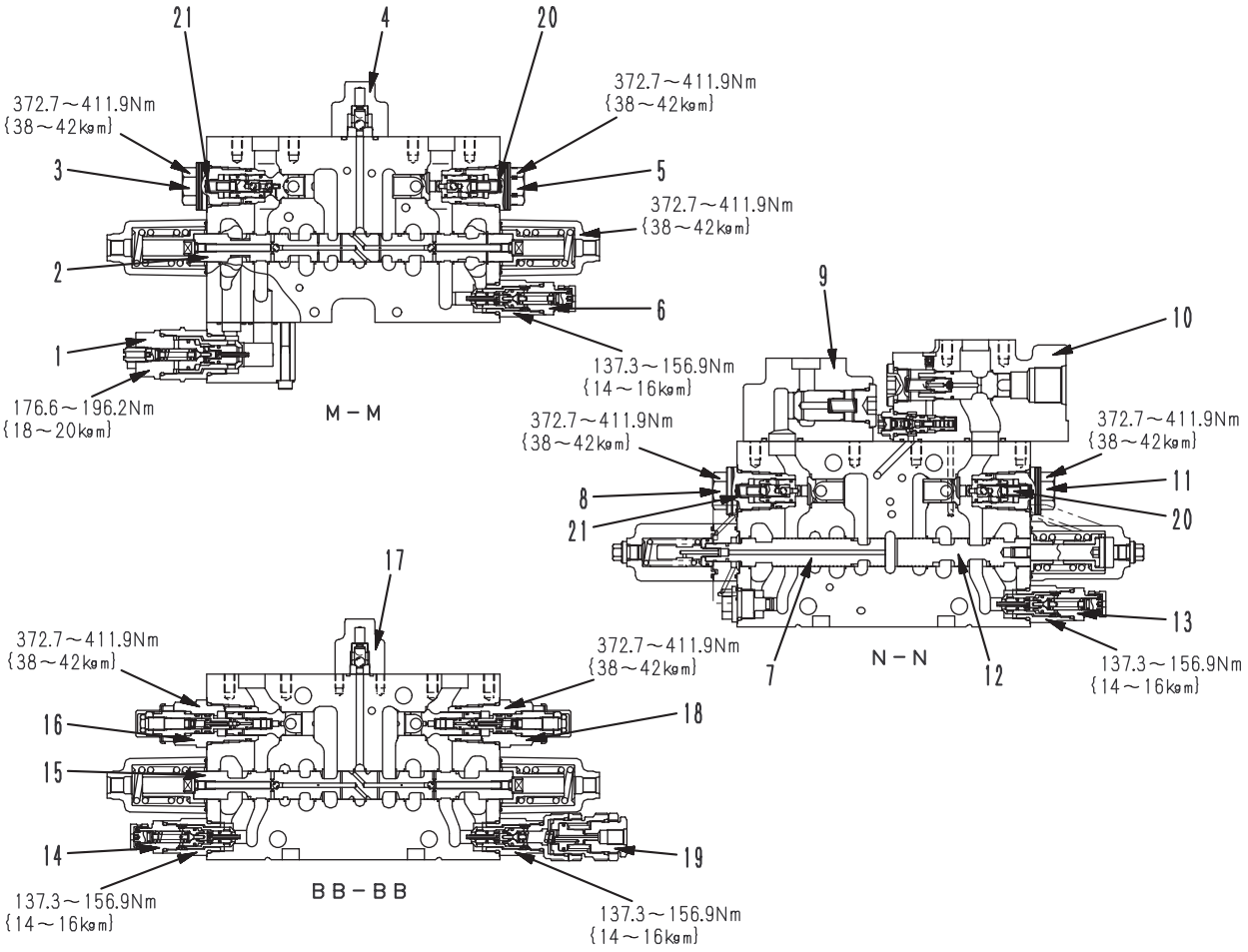
L. H. TRAVEL CONTROL VALVE

13. Pump merge-divider valve (Travel junction valve)
14. Return spring
15. Suction valve
16. Spool
17. Pressure compensation valve (Reverse)
18. LS shuttle valve
19. Pressure compensation valve (Forward)
20. Suction valve

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
21	Regeneration valve spring	Free length x Out-side diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring
		31.5 x 10.3	19.5	6.2 N {0.6 kg}	—	4.9 N {0.5 kg}	
22	Piston return spring	48.1 x 10.8	28	17.5 N {1.8 kg}	—	14.0 N {1.4 kg}	
23	Piston return spring	36.9 x 11.1	28	29.4 N {3 kg}	—	23.5 N {2.4 kg}	
24	Spool return spring	30.7 x 20.5	23	50.0 N {5.1 kg}	—	40.0 N {4.1 kg}	

(8/9)



SJP09008

BUCKET CONTROL VALVE

1. Safety-suction valve
2. Spool
3. Pressure compensation valve (CURL)
4. LS shuttle valve
5. Pressure compensation valve (DUMP)
6. Safety-suction valve

BOOM, ARM HI VALVE

7. Boom Hi spool
8. Pressure compensation valve (Boom RAISE)
9. Boom Hi check valve
10. Quick-return valve
11. Pressure compensation valve (Arm IN)
12. Arm Hi spool
13. Safety-suction valve

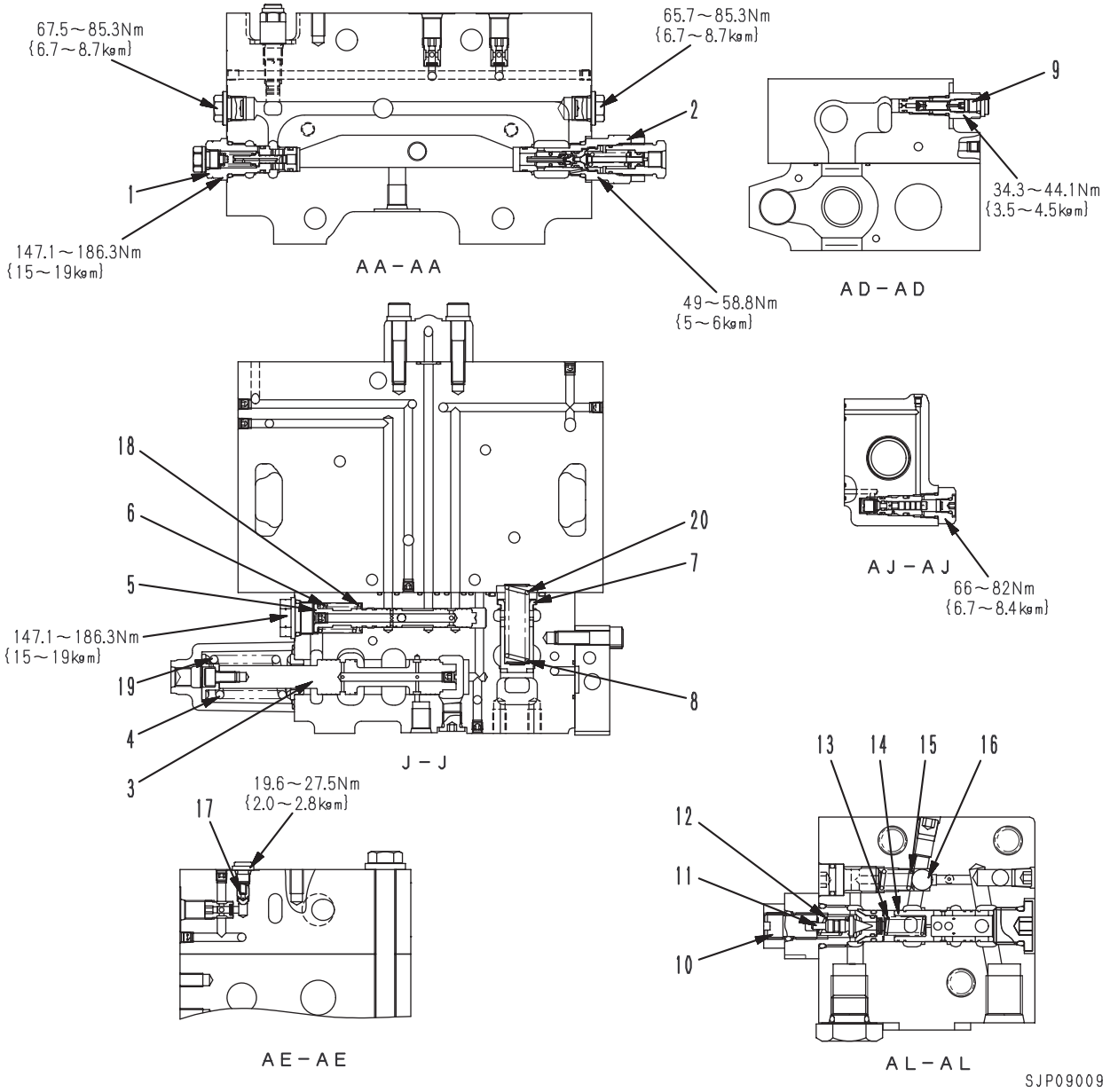
SERVICE VALVE

14. Safety-suction valve
15. Spool
16. Pressure compensation valve
17. LS shuttle valve
18. Pressure compensation valve
19. Safety-suction valve

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
20	Piston return spring	Free length x Out-side diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring
		48.1 x 10.8	28	17.5 N {1.8 kg}	—	14.0 N {1.4 kg}	
21	Piston return spring	36.9 x 11.1	28	29.4 N {3 kg}	—	23.5 N {2.4 kg}	

(9/9)

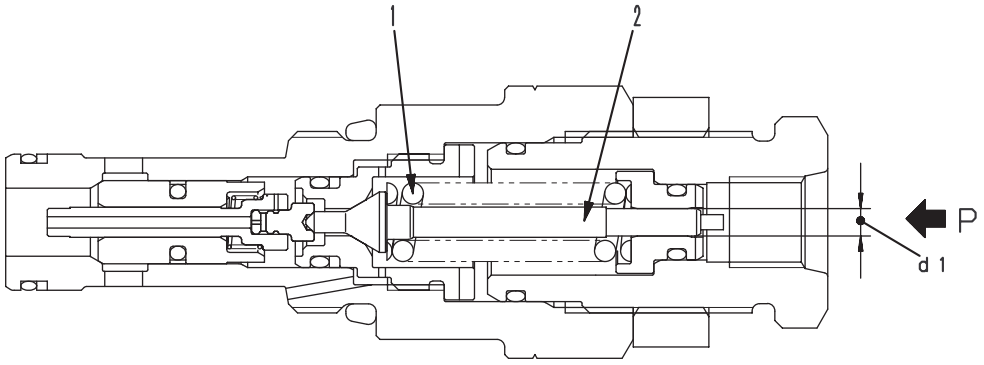


1. Unload valve
2. Main relief valve
3. Pump merge-divider valve (Main)
4. Return spring
5. Pump merge-divider valve (For LS)
6. Return spring
7. Valve (Sequence valve)
8. Spring (Sequence valve)
9. LS bypass plug
10. Screw
11. Poppet
12. Spring (Pressure reducing valve pilot)
13. Spring (Pressure reducing valve main)
14. Valve (Pressure reducing valve)
15. Spring (Safety valve)
16. Ball

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
17	Check valve spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring
		11.5 x 4.6	8.5	1.5 N {0.15 kg}	—	1.2 N {0.12 kg}	
18	Spool return spring	46.6 x 21.8	3.3	156.8 N {16.0 kg}	—	125.5 N {12.8 kg}	
19	Spool return spring	64.5 x 32.3	63	177.5 N {18.1 kg}	—	142.0 N {14.5 kg}	
20	Sequence valve spring	70.9 x 18.0	59	199.8 N {20.4 kg}	—	160.0 N {16.3 kg}	

MAIN RELIEF VALVE



SJP09020

1. Spring
2. Poppet

FUNCTION

- The relief valve set pressure is set to 2 stages.
  When power is needed, pilot pressure P is turned ON and the pressure is set to high pressure.

OPERATION

- The relief valve set pressure is determined by the installed load of spring (1). (First stage)
- It is unnecessary to set the first and second stage individually.
  The second stage is set when the first stage is set.

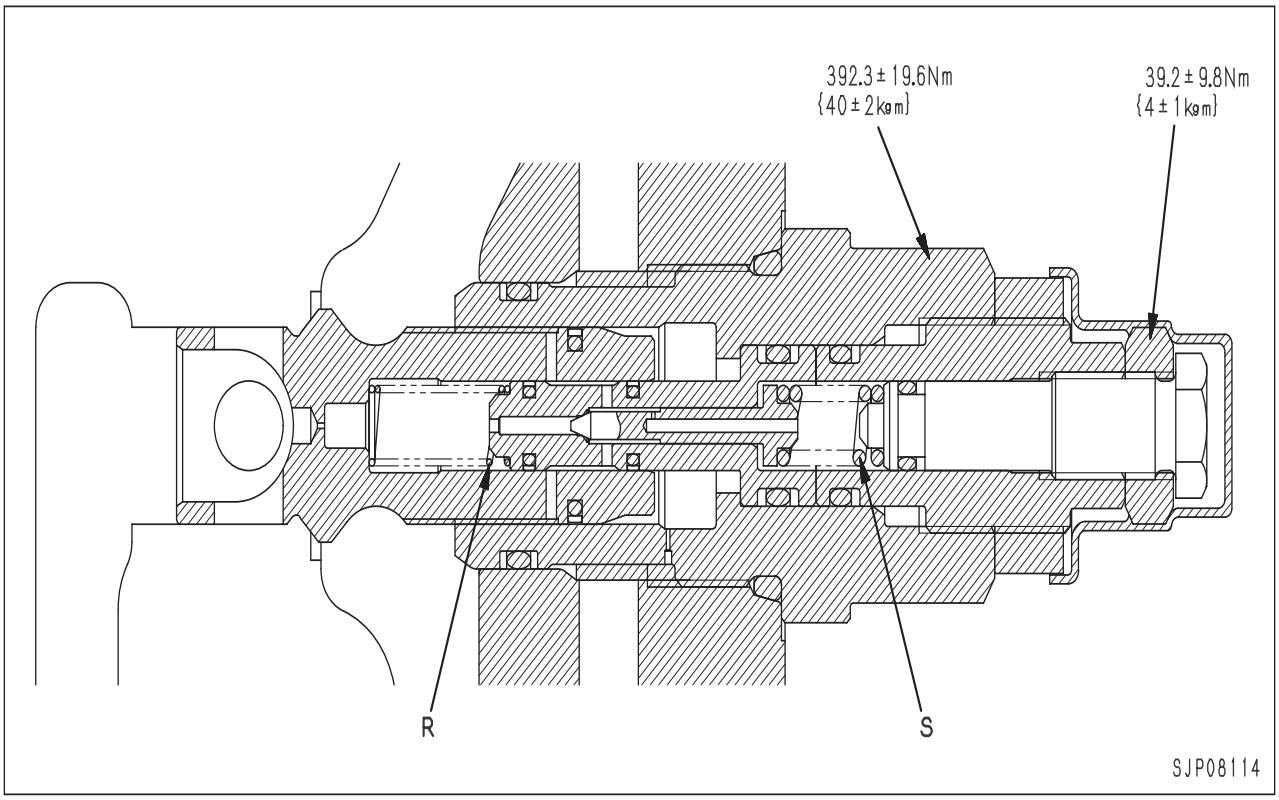
1. When pilot pressure P is OFF: Low-pressure setting

   The set pressure is determined by the installed load of spring (1).

2. When pilot pressure P is ON: High-pressure setting

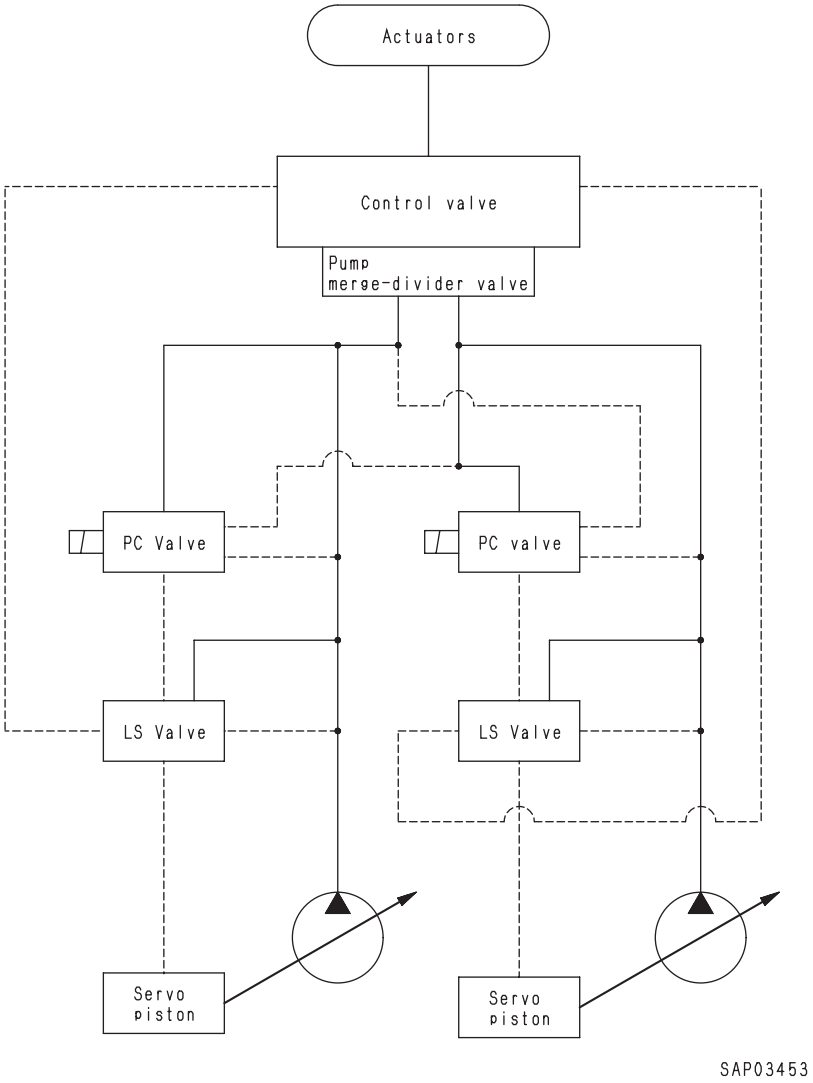
   In addition to the installed load of spring (1), pilot pressure P is applied to poppet diameter d1, so the set pressure becomes higher.

VARIABLE PRESSURE COMPENSATION VALVE



CLSS

OUTLINE OF CLSS



FEATURES

- CLSS stands for Closed center Load Sensing System, and has the following features.

1) Fine control not influenced by load
2) Control enabling digging even with fine control
3) Ease of compound operation ensured by flow divider function using area of opening of spool during compound operations
4) Energy saving using variable pump control

STRUCTURE

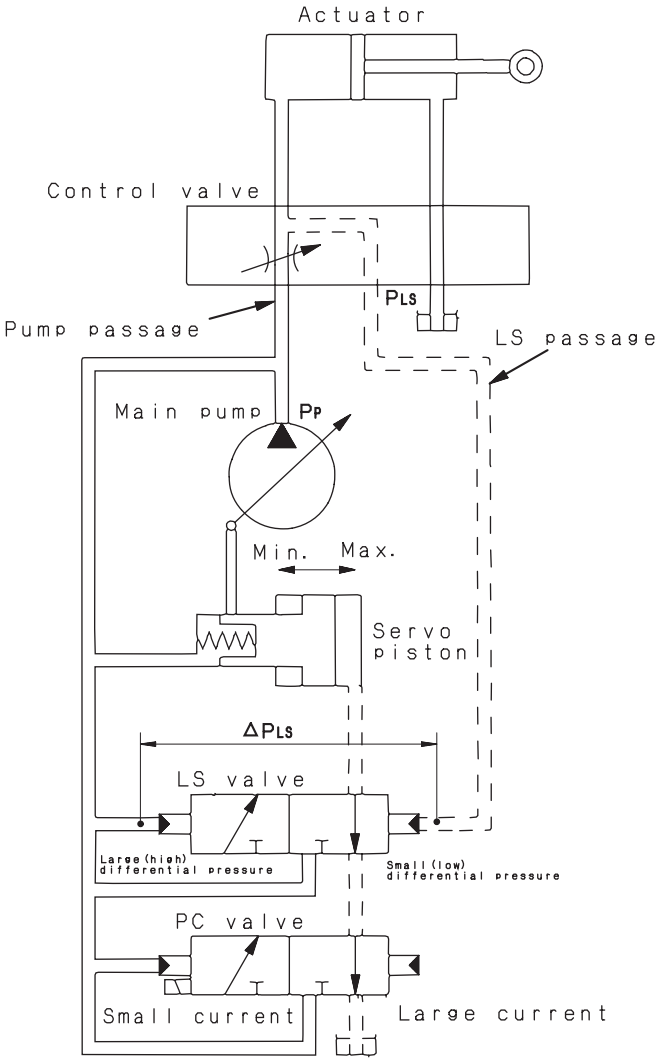
- The CLSS consists of a main pump (2 pumps), control valve, and actuators for the work equipment.
- The main pump body consists of the pump itself, the PC valve and LS valve.

Basic principle

1) Control of pump swash plate

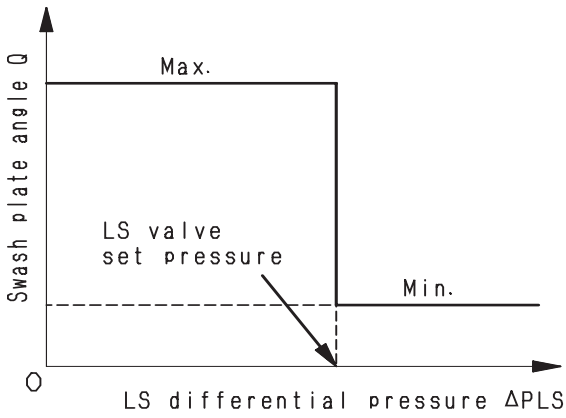
- The pump swash plate angle (pump discharge amount) is controlled so that LS differential pressure **ΔPLS** (the difference between pump pressure **PP** and control valve outlet port LS pressure **PLS**) (load pressure of actuator) is constant.

  (LS pressure **ΔPLS** = Pump discharge pressure **PP** – LS pressure **PLS**)



SBP03454

- If LS differential pressure **ΔPLS** becomes lower than the set pressure of the LS valve (when the actuator load pressure is high), the pump swash plate moves towards the maximum position; if it becomes higher than the set pressure of the LS valve (when the actuator load pressure is low), the pump swash plate moves towards the minimum position.

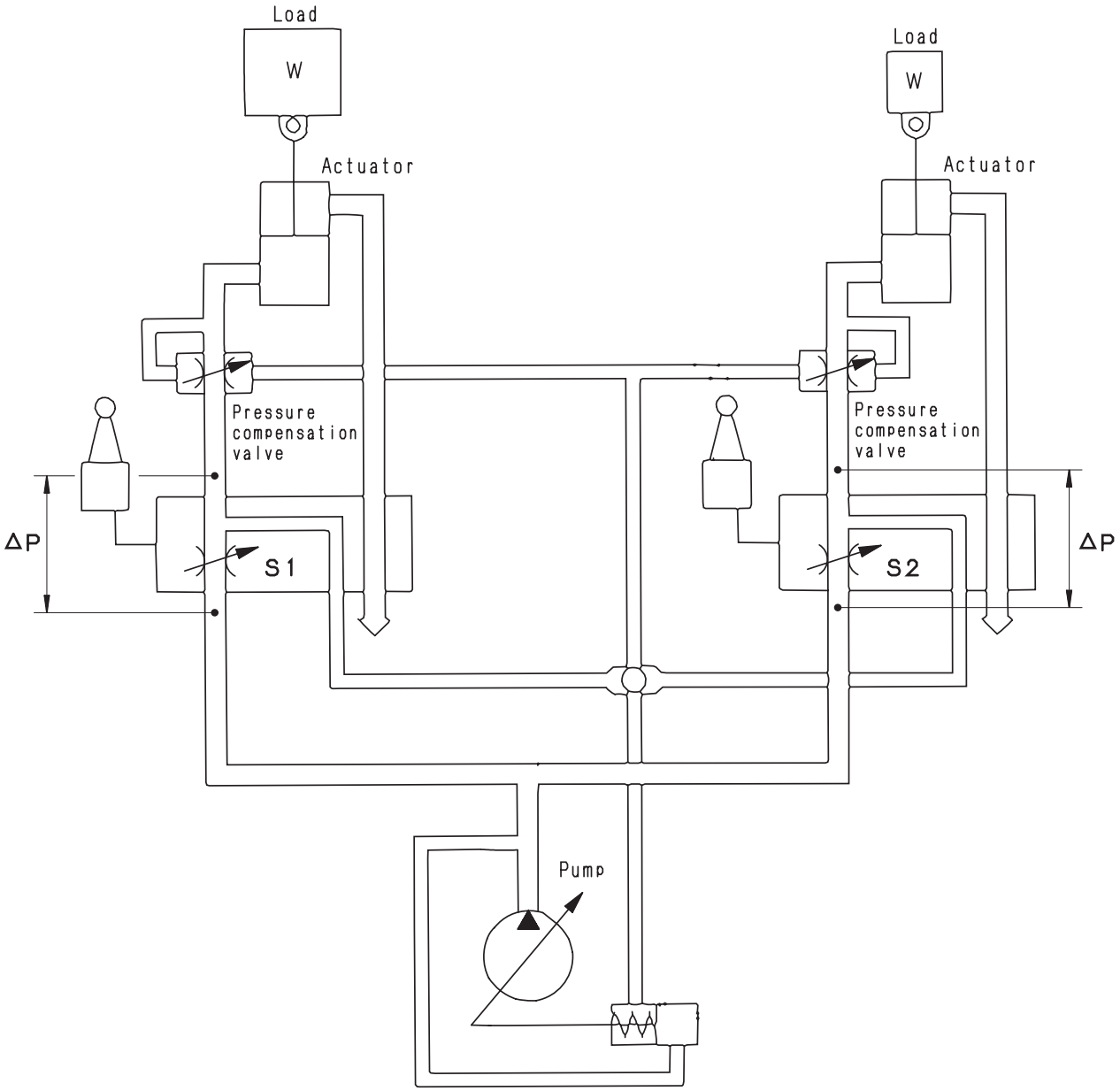


SAP03455

2) Pressure compensation

- A pressure compensation valve is installed to the outlet port side of the control valve to balance the load.
- When two actuators are operated together, this valve acts to make pressure difference **ΔP** between the upstream (inlet port) and downstream (outlet port) of the spool of each valve the same regardless of the size of the load (pressure).

In this way, the flow of oil from the pump is divided (compensated) in proportion to the area of opening **S1** and **S2** of each valve.



SBP03456

SELF PRESSURE REDUCING VALVE

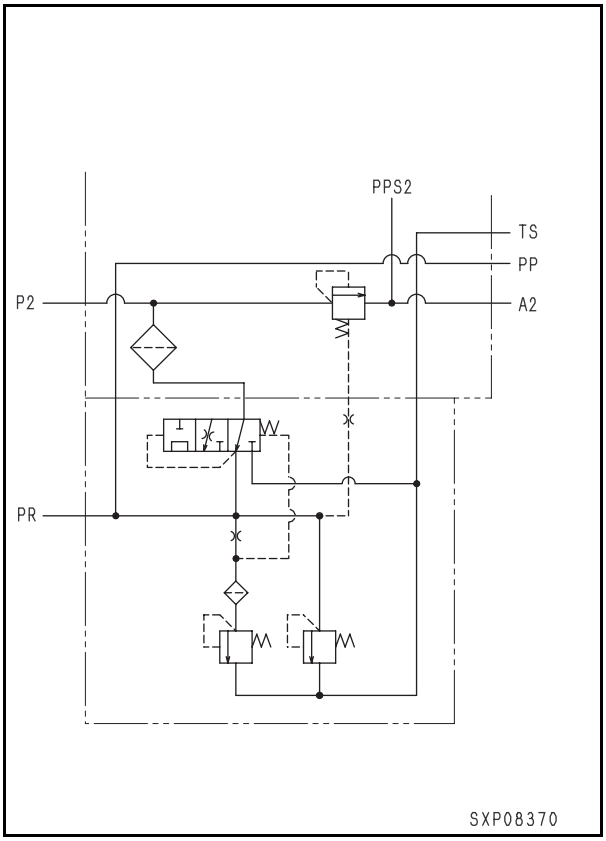
FUNCTION

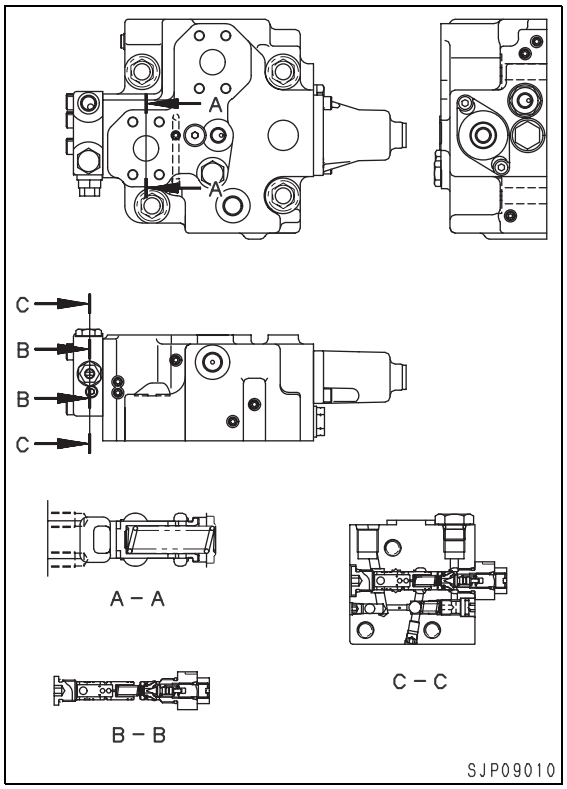
- This value reduces the discharge pressure of the main pump and supplies it as control pressure for the solenoid valves, PPC valves, etc.

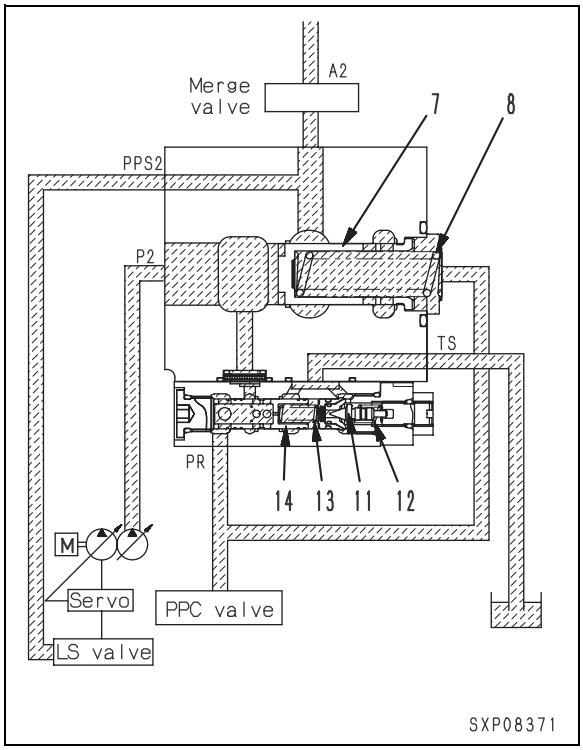
OPERATION

1. When engine is stopped

- Poppet (11) is pressed by spring (12) against the seat and port PR is not connected to TS.
- Valve (14) is pressed by spring (13) against the left side and port P2 is connected to PR.
- Valve (7) is pressed by spring (8) against the left side and port P2 is not connected to A2.





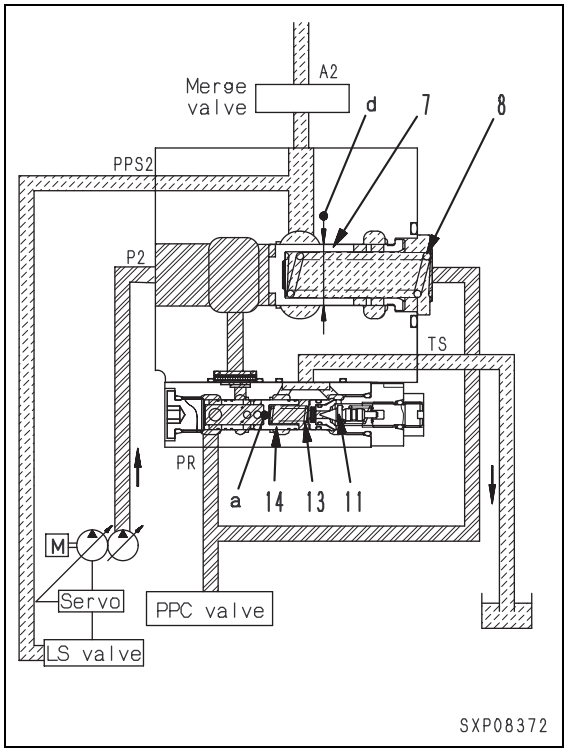


2. When in neutral or load pressure P2 is low (When boom is lowered and arm is in IN position and they are moving down under own weight)

Note: When load pressure A2 is lower than self-pressure reducing valve output pressure PR.

- Valve (7) receives the force of spring (8) and PR pressure (which is 0 MPa {0 kg/cm²} when the engine is stopped) in the direction to close the circuit between ports P2 and A2. If the hydraulic oil flows in port P2, the ϕdx P2 pressure becomes equal to the total of the force of spring (8) and the value of area of ∅d x PR pressure, then the area of the pass between ports P2 and A2 is so adjusted that the P2 pressure will be kept constant above the PR pressure.
- If the PR pressure rises above the set level, puppet (11) opens and the hydraulic oil flows from the PR port through orifice "a" in spool (14) and open part of poppet (11) to seal drain port TS.

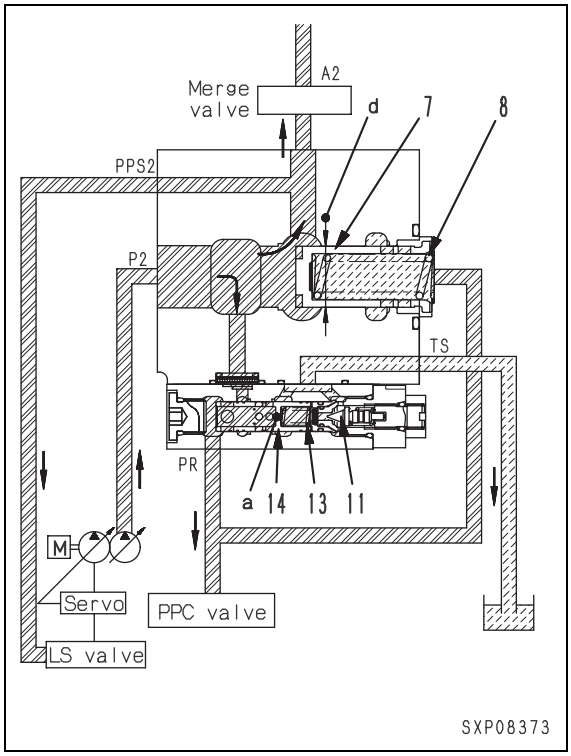
  Accordingly, differential pressure is generated between before and after orifice "a" in spool (14) and then spool (14) moves to close the pass between port P2 and PR. The P2 pressure is controlled constant (at the set pressure) by the area of the oil pass at this time and supplied as the PR pressure.



3. When load pressure P2 is high

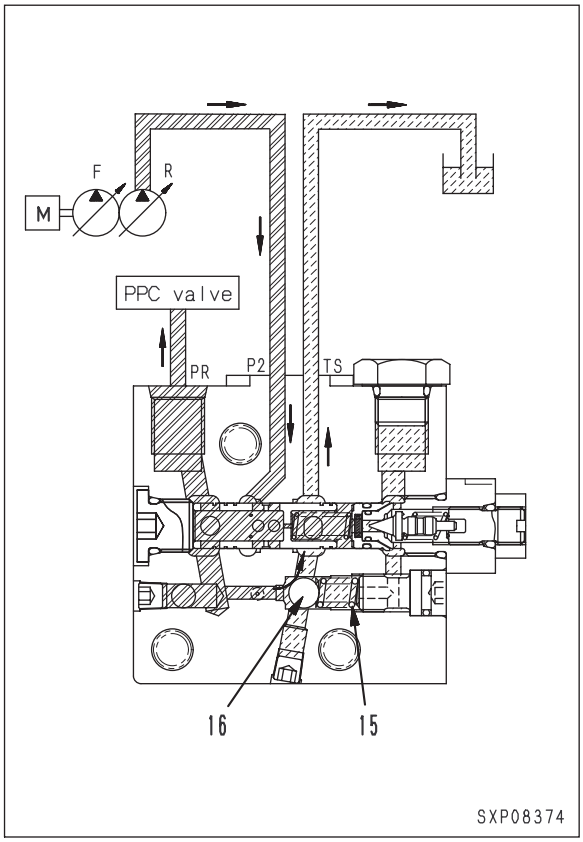
- If load pressure A2 rises and the pump discharge increases because of operation of the work equipment, the ϕdx P2 pressure rises higher than the total of the force of spring (8) and the value of ∅d x PR pressure, and then valve (7) moves to the right stroke end.
- As a result, the area of the pass between ports P2 and A2 increases and the pass resistance lowers and the loss of the engine power is reduced.
- If the PR pressure rises above the set pressure, poppet (11) opens and the hydraulic oil flows from the PR port through orifice "a" in spool (14) and open part of poppet (11) to seal drain port TS.

  Accordingly, differential pressure is generated between before and after orifice "a" in spool (14) and then spool (14) moves to close the pass between port P2 and PR. The P2 pressure is controlled constant (at the set pressure) by the area of the oil pass at this time and supplied as the PR pressure.



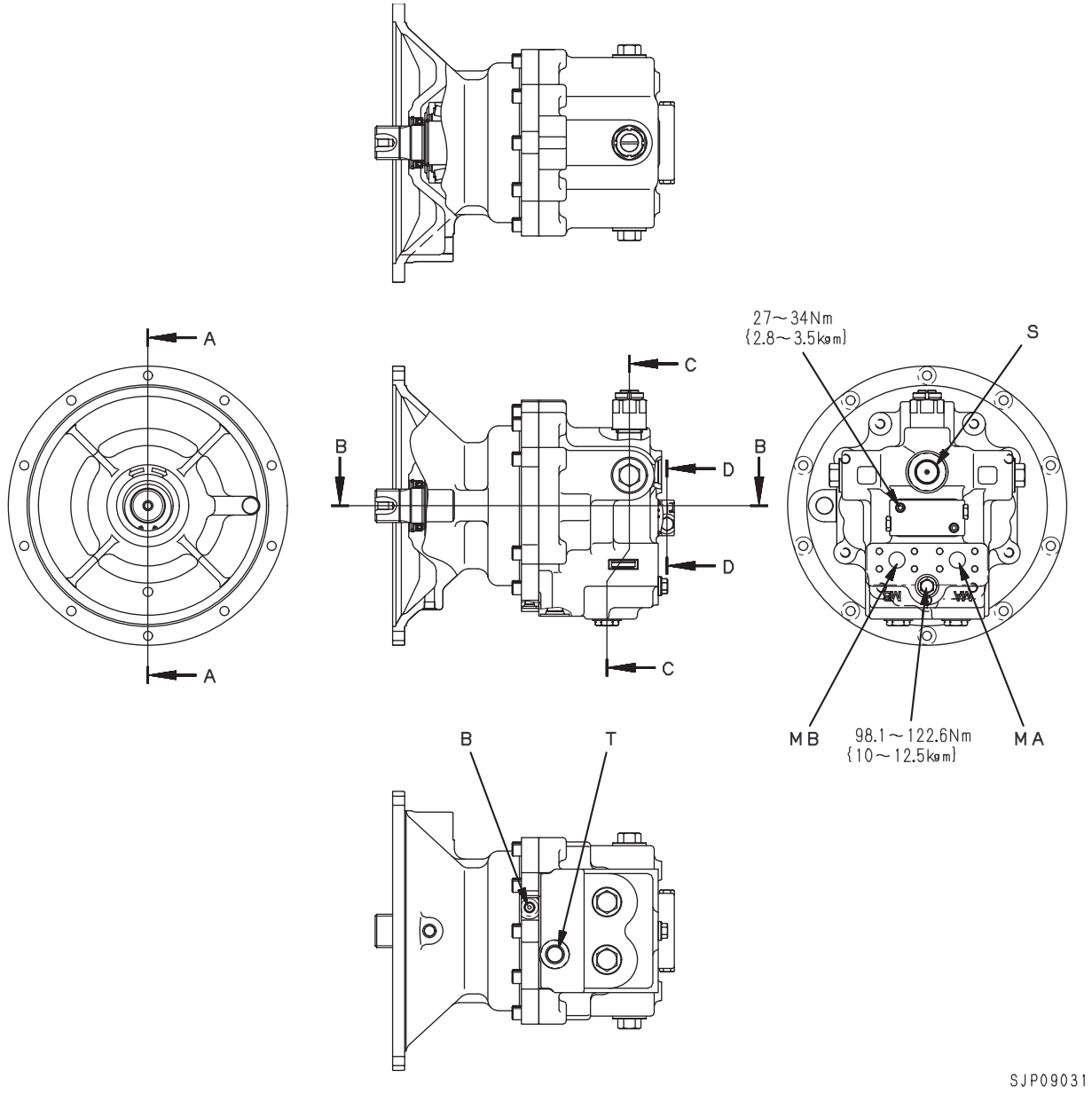
4. When abnormally high pressure is generated

- If the PR pressure on the self-pressure reducing valve rises high abnormally, ball (16) separates from the seat against the force of spring (15) and the hydraulic oil flows from output port PR to TS. Accordingly, the PR pressure lowers. By this operation, the hydraulic devices (PPC valves, solenoid valves, etc.) are protected from abnormal pressure.



SWING MOTOR

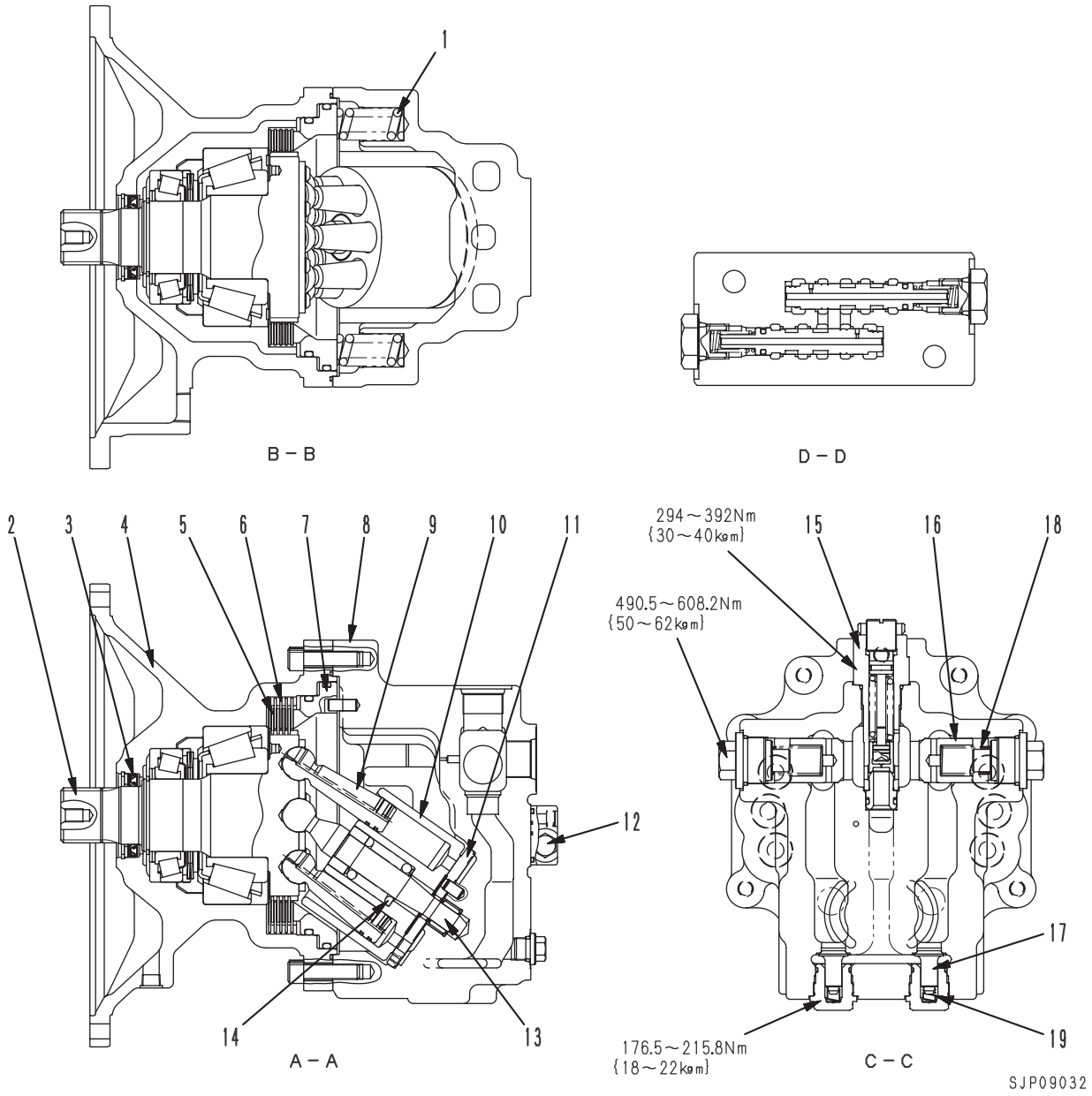
KMF230ABE-5



B : From swing lock solenoid valve
S : From control valve
T : To tank
MA : From control valve
MB : From control valve

SPECIFICATIONS

Model	KMF230ABE-5
Theoretical displacement	229.4 cm³/rev
Safety valve set pressure	27.9 $^{+0.5}_{0}$ MPa {285 $^{+0.5}_{0}$ kg/cm^2}
Rated revolving speed	1,130 rpm
Brake release pressure	1.9 ± 0.4 MPa {19 ± 4 kg/cm²}



1. Brake spring
2. Drive shaft
3. Spacer
4. Case
5. Disc
6. Plate
7. Brake piston
8. Housing
9. Piston
10. Cylinder block
11. Valve plate
12. Reverse prevention valve
13. Center shaft
14. Center spring
15. Safety valve
16. Check valve
17. Shuttle valve

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
18	Check valve spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring
		66.5 x 25.6	45	6.96 N {0.71 kg}	—	5.59 N {0.57 kg}	
19	Shuttle valve spring	24.5 x 11.6	14	7.7 N {0.79 kg}	—	6.18 N {0.63 kg}	

RELIEF VALVE PORTION

1) Outline

The relief portion consists of check valves (2) and (3), shuttle valves (4) and (5), and relief valve (1).

2. Function

When the swing is stopped, the outlet port circuit of the motor from the control valve is closed, but the motor continues to rotate under inertia, so the pressure at the output side of the motor becomes abnormally high, and this may damage the motor.

To prevent this, the abnormally high pressure oil is relieved to port **S** from the outlet port of the motor (high-pressure side) to prevent any damage.

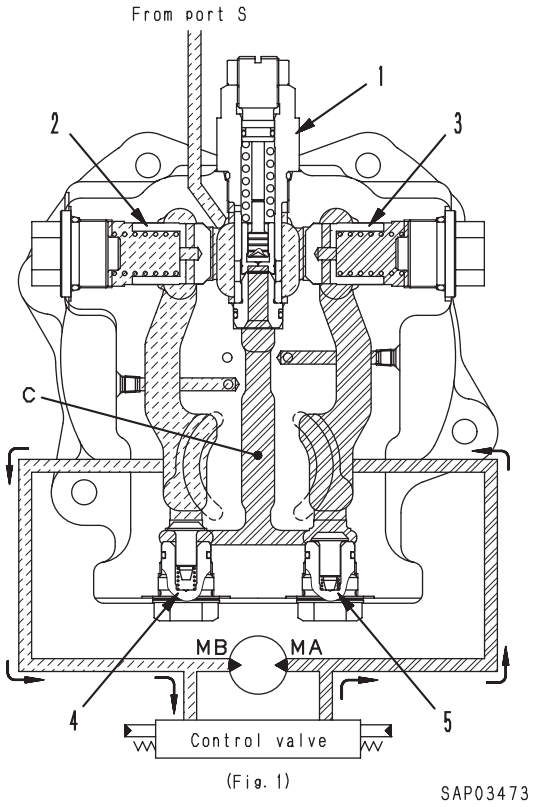
3. Operation

1) When starting swing

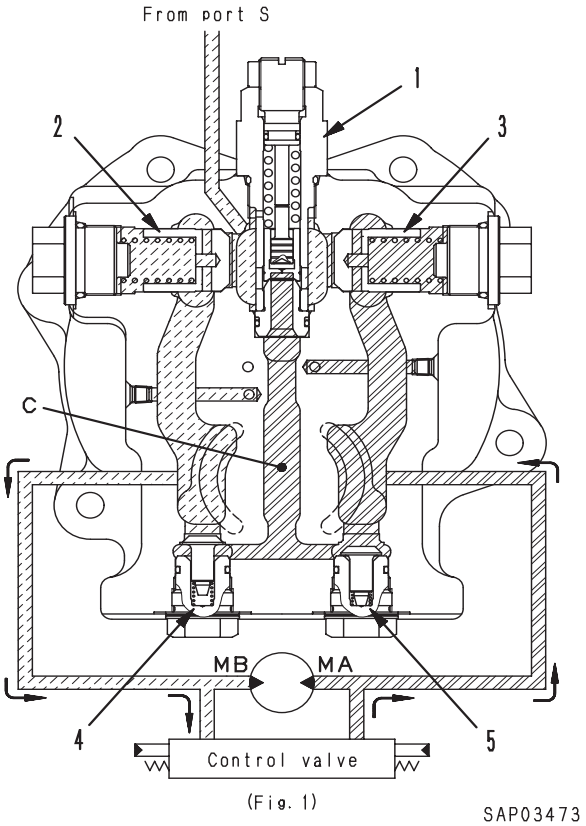
- When the swing control lever is operated to swing right, the pressure oil from the pump passes through the control valve and is supplied to port **MA**. As a result, the pressure at port **MA** rises, the starting torque is generated in the motor, and the motor starts to rotate. The oil from the outlet port of the motor passes from port **MA** through the control valve and returns to the tank. (Fig. 1)

2) When stopping swing

- When the swing control lever is returned to neutral, the supply of pressure oil from the pump to port **MA** is stopped. With the oil from the outlet port of the motor, the return circuit to the tank is closed by the control valve, so the pressure at port **MB** rises. As a result, rotation resistance is generated in the motor, so the braking effect starts.
- If the pressure at port **MB** becomes higher than the pressure at port **MA**, it pushes shuttle valve **A** (4) and chamber **C** becomes the same pressure as port **MB**. The oil pressure rises further until it reaches the set pressure of relief valve (1). As a result, a high braking torque acts on the motor and stops the motor. (Fig.2)
- When relief valve (1) is being actuated, the relief oil and oil from port **S** passes through check valve **B** (3) and is supplied to port **MA**. This prevents cavitation at port **MA**.



(Fig. 1) SAP03473



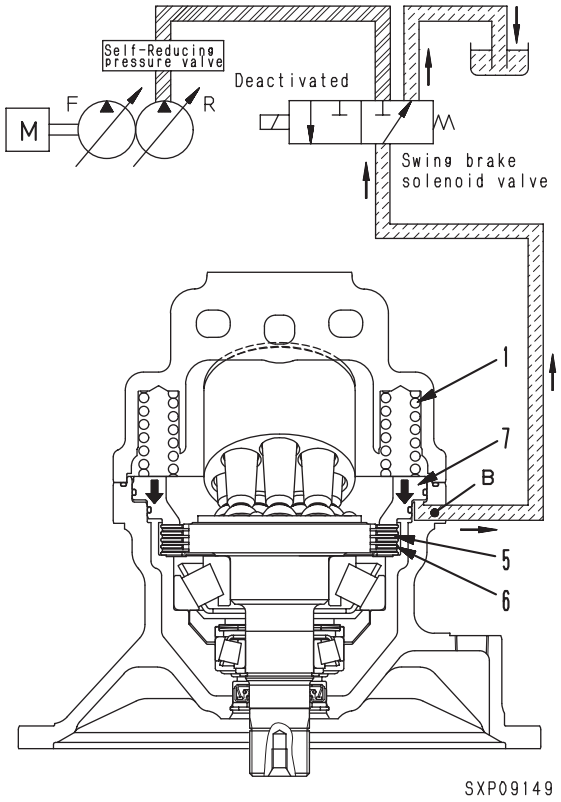
(Fig. 1) SAP03473

Operation of swing lock

1. When swing lock solenoid valve is deactivated

When the swing lock solenoid valve is deactivated, the pressurized oil from the main pump is shut off and port **B** is connected to the tank circuit.

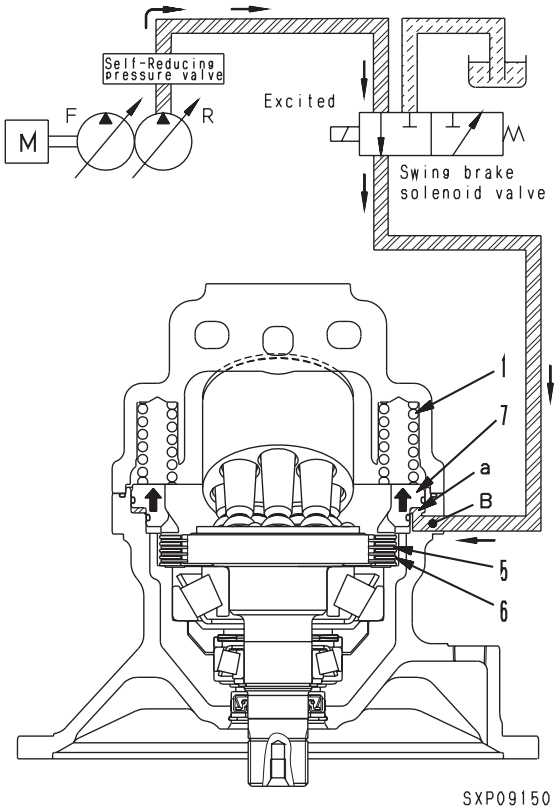
As a result, brake piston (7) is pushed down by brake spring (1), discs (5) and plates (6) are pushed together, and the brake is applied.



2. When swing lock solenoid valve is excited

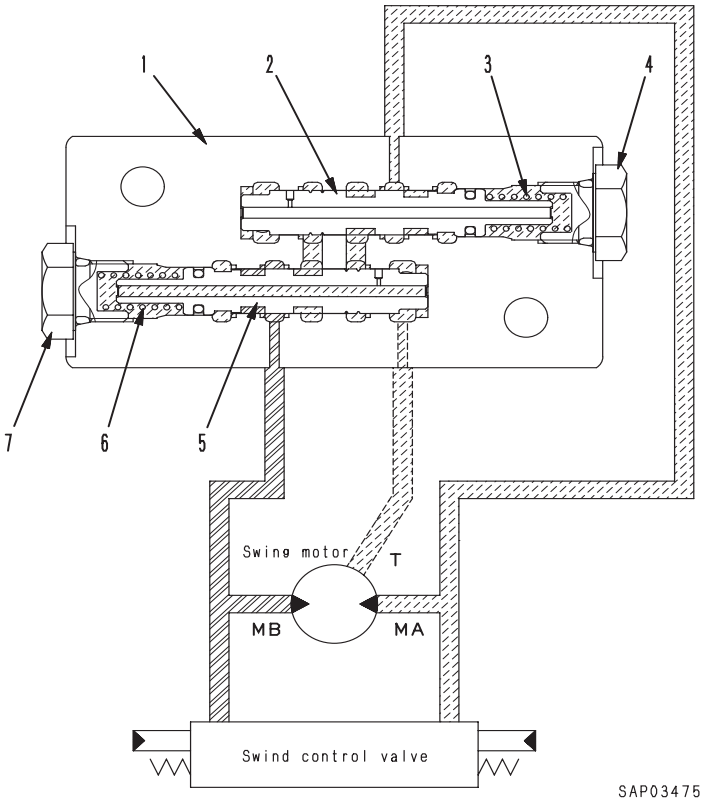
When the swing lock solenoid valve is excited, the valve is switched and the pressure oil from the main pump enters port **B** and flows to brake chamber **a**.

The pressure oil entering chamber **a** overcomes brake spring (1) and pushes brake piston (7) up. As a result, discs (5) and plates (6) are separated and the brake is released.



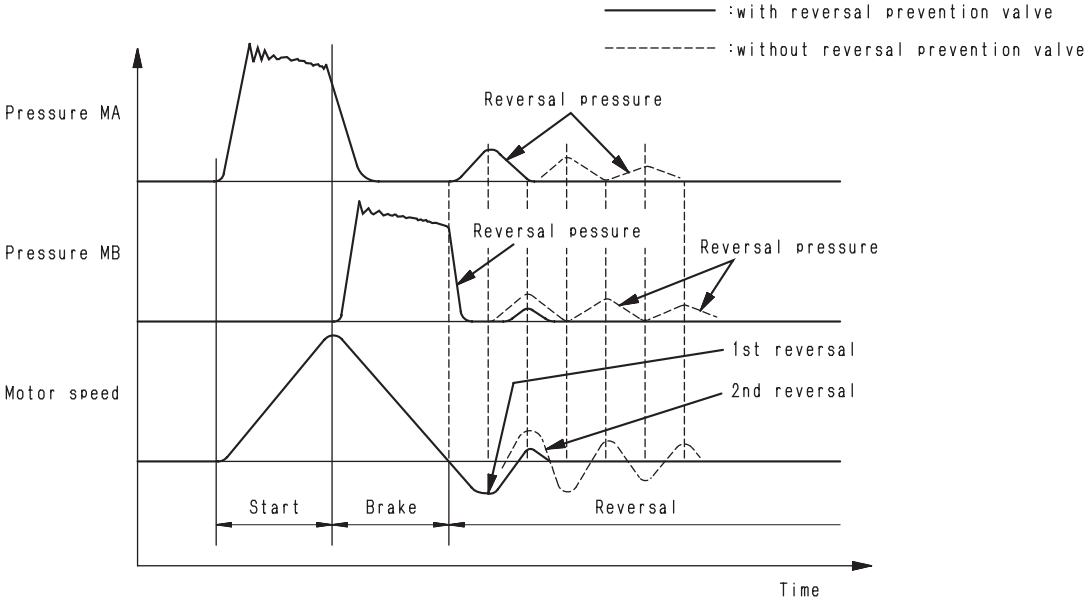
REVERSE PREVENTION VALVE

Operation diagram



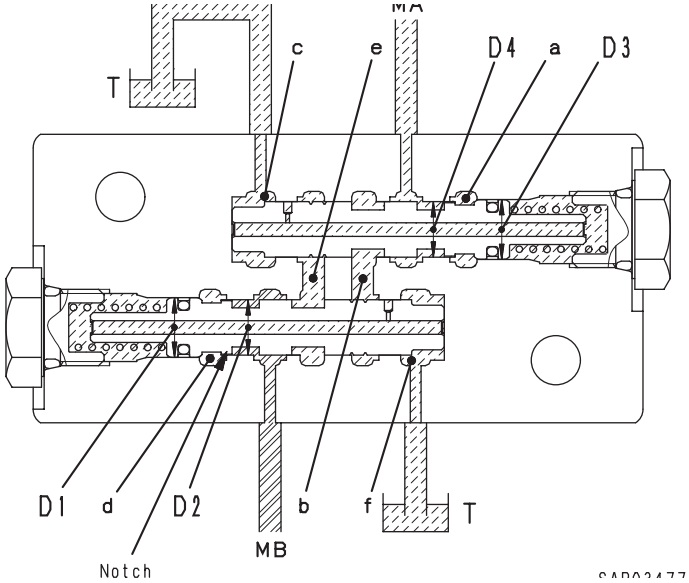
1. Valve body
2. Spool (**MA** side)
3. Spring (**MA** side)
4. Plug
5. Spool (**MB** side)
6. Spring (**MB** side)
7. Plug

Explanation of effect



Outline

This valve reduces the swing back generation in the swing body by the inertia of the swing body, the backlash and rigidity of the machinery system, and the compression of the hydraulic oil when the swing is stopped. This is effective in preventing spillage of the load and reducing the cycle time when stopping the swing (the positioning ability is good and it is possible to move swiftly to the next job.

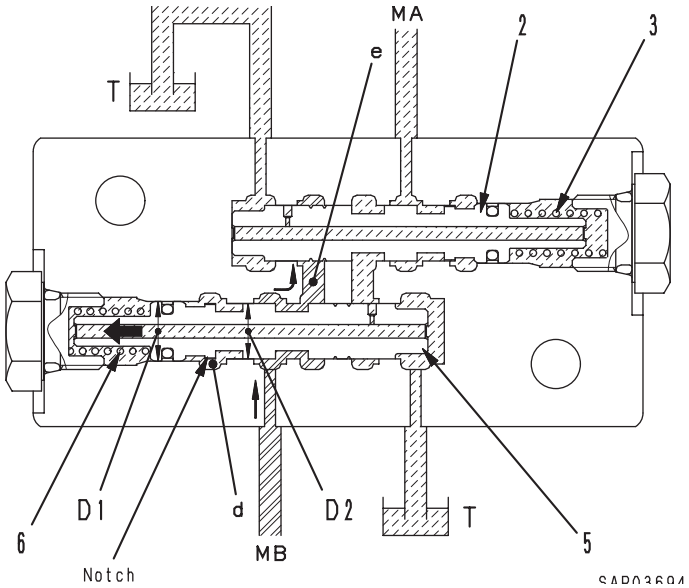


Operation

1) When brake pressure is being generated at port MB

- Pressure **MB** passes through the notch and goes to chamber **d**, spool (5) pushes spring (6) according to the difference in area **D1** > **D2**, moves to the left, and **MB** is connected to **e**.

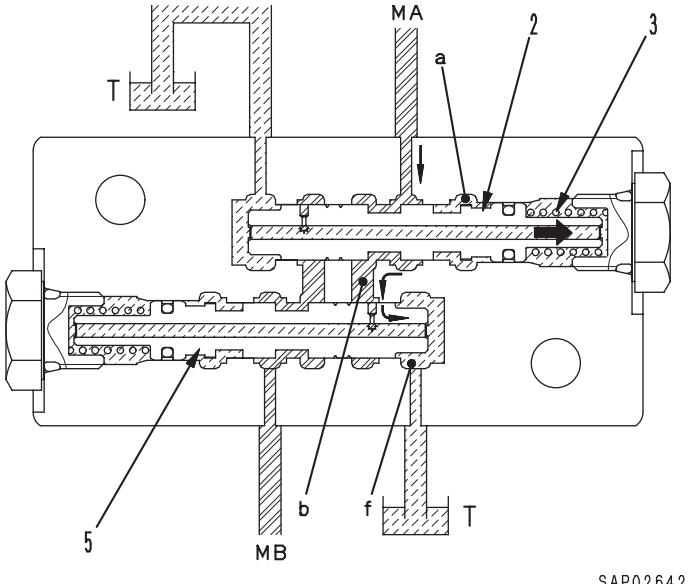
  When this happens, pressure **MA** is below the set pressure of spring (3), so spool (2) does not move. For this reason, the pressure oil is closed by spool (2), and the braking force is ensured.



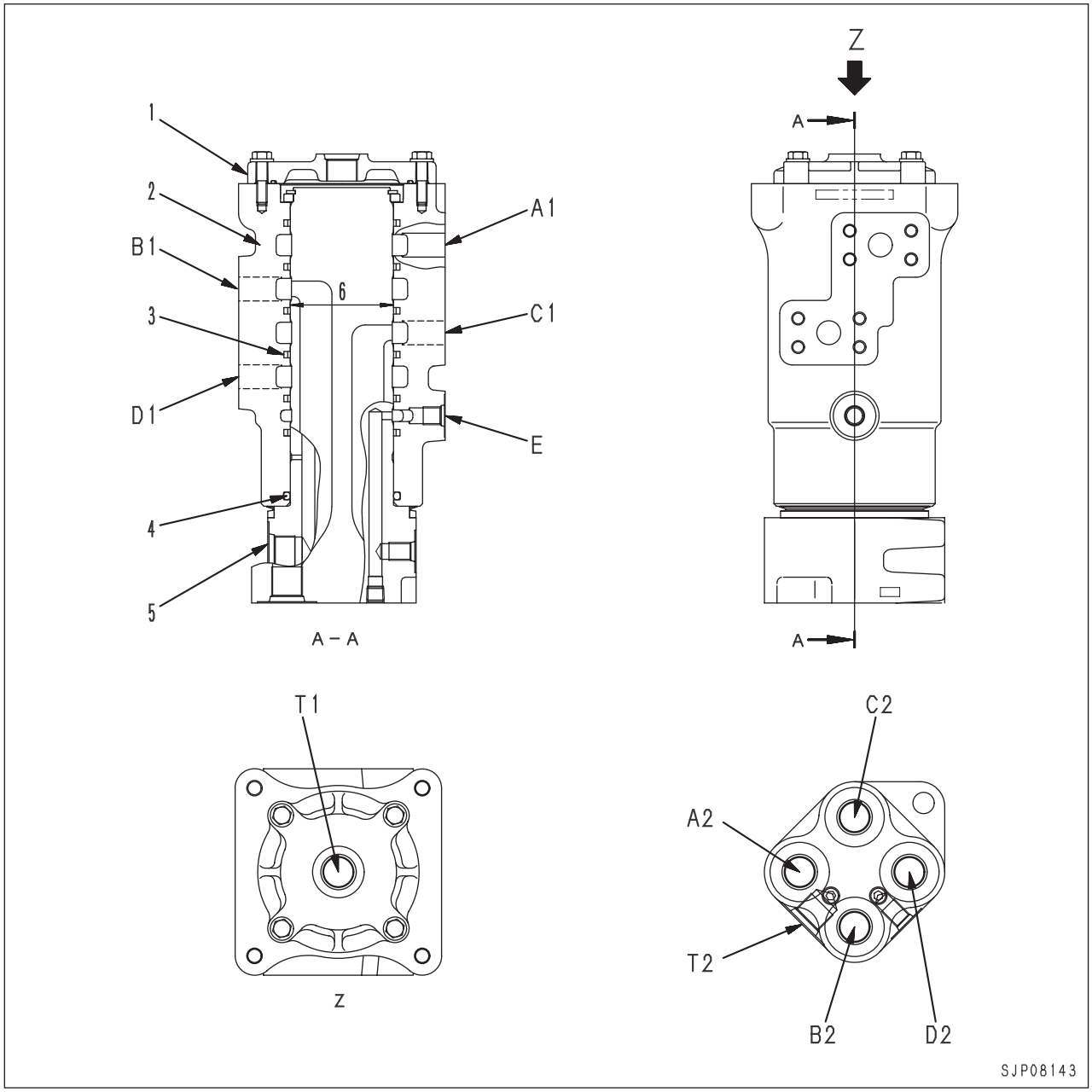
2) After motor stops

- The motor is reversed by the closing pressure generated at port **MB**. (1st reversal)

  When this happens, reversal pressure is generated at port **MA**. Pressure **MA** goes to chamber **a**, so spool (2) pushes spring (3) and moves to the right, and **MA** is connected to **B**. At the same time, **b** is connected to **f** through the drill hole in spool (5), so the reversal pressure at port **MA** is bypassed to port **T** to prevent the 2nd reversal.



CENTER SWIVEL JOINT



1. Cover
2. Body
3. Slipper seal
4. O-ring
5. Shaft

A1. To L.H. travel motor port PB
A2. From control valve port A2
C1. To R.H. travel motor port PA
B2. From control valve port B2
D1. To R.H. travel motor port PB
E. To L.H. and R.H. travel motors port P

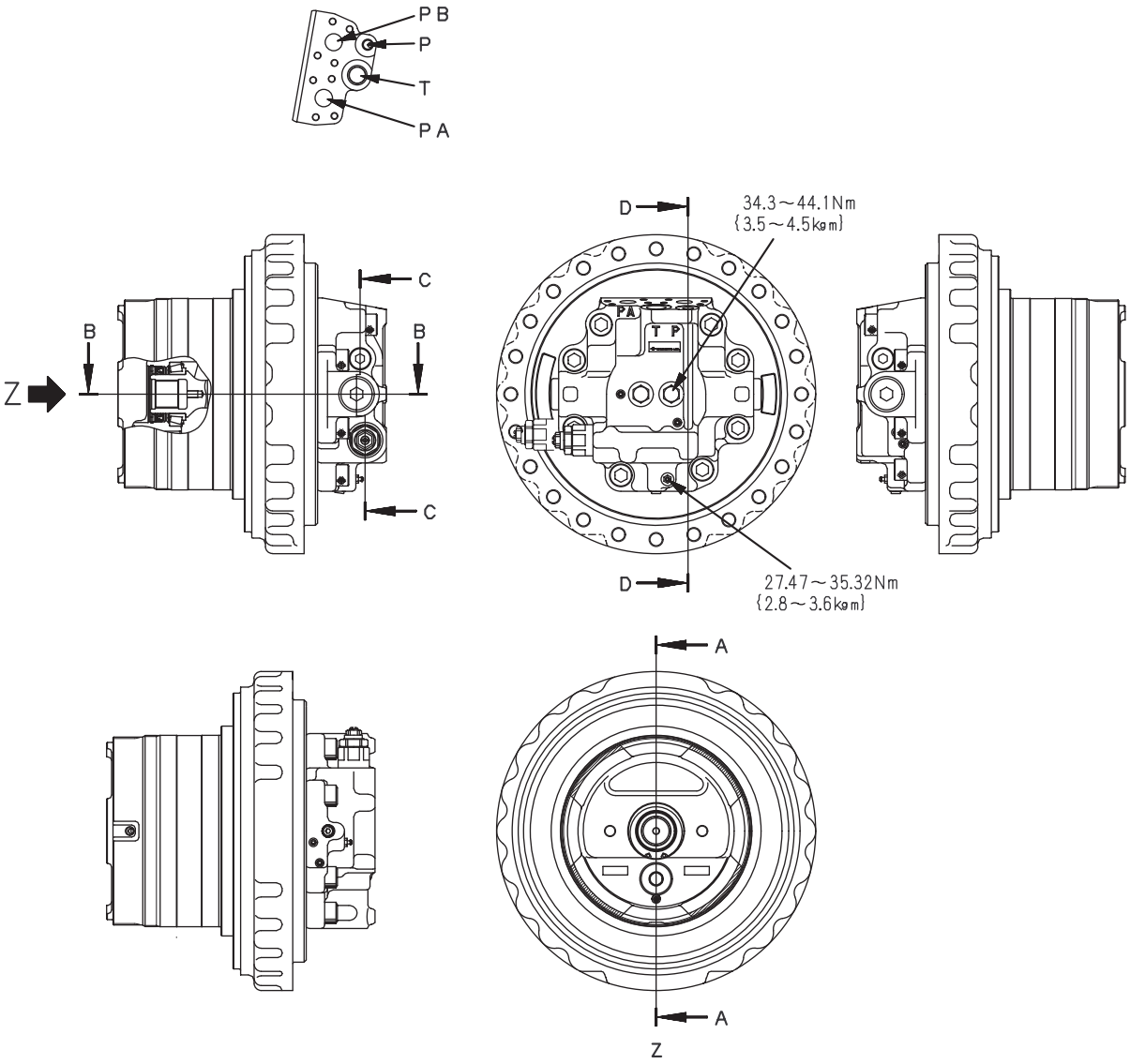
T2. To tank
T1. From L.H. and R.H. travel motors port T
D2. From control valve port B5
B1. To L.H. travel motor port PA
C2. From control valve port A5

Unit: mm

No.	Check Item	Criteria			Remedy
6	Clearance between rotor and shaft	Standard Size	Standard clearance	Repair limit	Replace
		80	—	—	

TRAVEL MOTOR

HMV160ADT-2

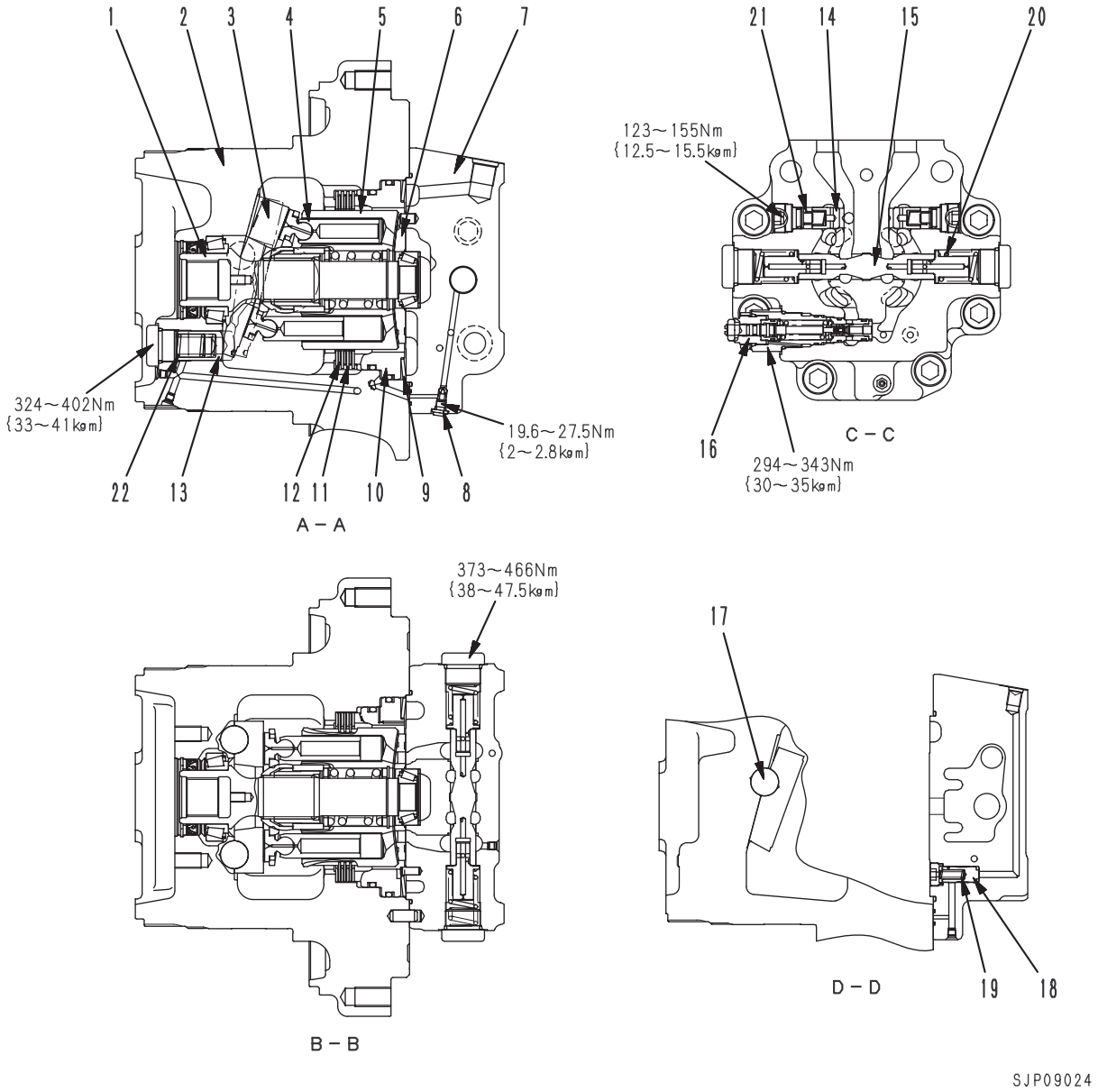


SJP09023

P : From travel speed solenoid valve
T : To tank
PA : From control valve
PB : From control valve

SPECIFICATIONS

Type		HMV160ADT-2
Theoretical Delivery	Min.	103.5 cm³/rev
	Max.	160.8 cm³/rev
Brake releasing pressure		1.2 MPa {12 kg/cm²}
Travel speed switching pressure	Differential pressure	0.8 MPa {8 kg/cm²}



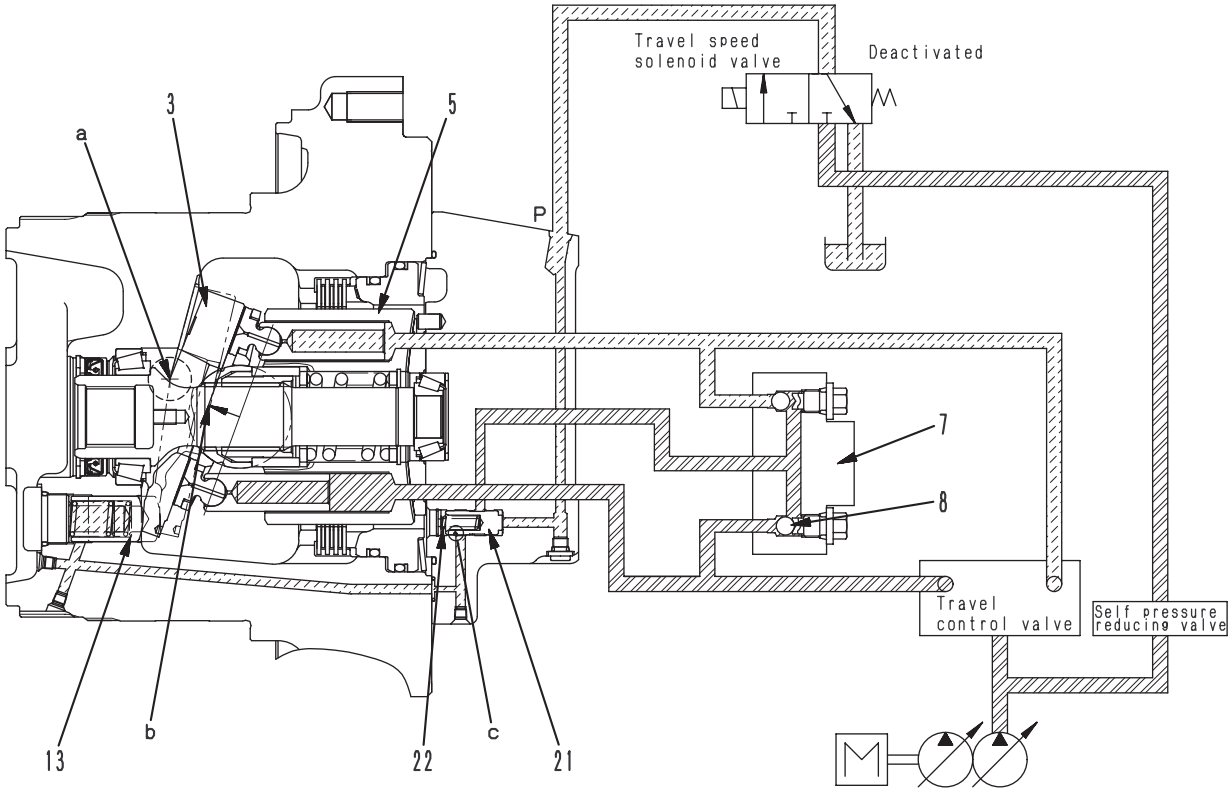
1. Output shaft
2. Motor case
3. Rocker cam
4. Piston
5. Cylinder
6. Valve plate
7. End cover
8. Slow return valve
9. Brake spring
10. Brake piston
11. Plate
12. Disc
13. Regulator piston
14. Check valve spring
15. Counterbalance valve
16. Safety valve
17. Ball
18. Regulator valve
19. Spring

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
20	Spool return spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring
		58.43 x 30.0	42.0	426.3 N {43.5 kg}	—	341 N {34.8 kg}	
21	Check valve spring	33.0 x 13.8	23.0	1.27 N {0.13 kg}	—	1.0 N {0.10 kg}	
22	Regulator piston spring	61.6 x 23.2	30.0	398.9 N {40.7 kg}	—	319.5 N {32.6 kg}	

OPERATION OF MOTOR

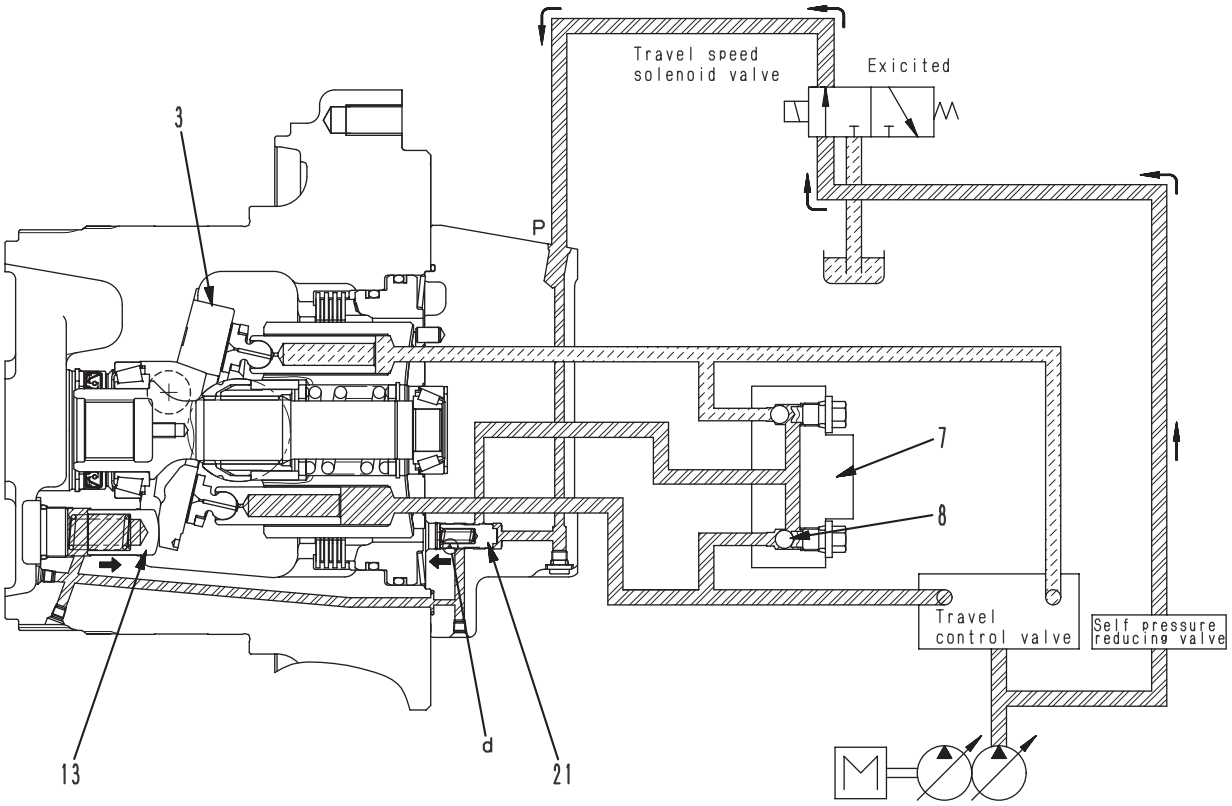
1) At low speed (motor swash plate angle at maximum)



SXP09151

- The solenoid valve is deactivated, so the pilot pressure oil from the main pump does not flow to port **P**.
  For this reason, regulator valve (21) is pushed to the right by spring (22).
- Because of this, it pushes slow return valve (8), and the main pressure oil from the control valve going to end cover (7) is shut off by regulator valve (21).
- Fulcrum **a** of rocker cam (3) is eccentric to point of force **b** of the combined force of the propulsion force of cylinder (5), so the combined force of the piston propulsion force acts as a moment to angle rocker cam (3) in the direction of the maximum swash plate angle.
- At the same time, the pressurized oil at regulator piston (13) passes through orifice **c** in regulator valve (21) and is drained to the motor case.
- As a result, rocker cam (3) moves in the maximum swash plate angle direction, the motor capacity becomes maximum, and the system is set to low speed.

2) At high speed (motor swash plate angle at minimum)

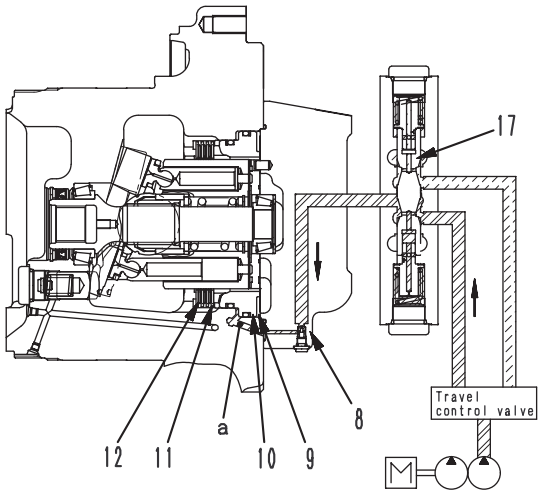


- When the solenoid valve is excited, the pilot pressure oil from the main pump flows to port **P**, and pushes regulator valve (21) to the left.
- Because of this, the main pressure oil from the control valve passes through passage **d** in regulator valve (21), enters regulator piston (13) at the bottom, and pushes regulator piston (13) to the right.
- As a result, rocker cam (3) moves in the minimum swash plate angle direction, the motor capacity becomes minimum, and the system is set to high travel speed.

OPERATION OF PARKING BRAKE

1) When starting to travel

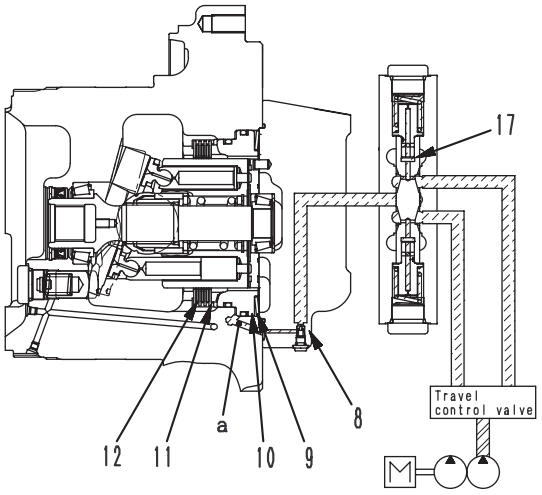
When the travel lever is operated, the pressurized oil from the pump actuates counterbalance valve spool (17), opens the circuit to the parking brake, and flows into chamber **a** of the brake piston (10). It overcomes the force of spring (9), and pushes piston (10) to the left in the direction of the arrow. When this happens, the force pushing plate (11) and disc (12) together is lost, so plate (11) and disc (12) separate and the brake is released.



SXP09153

2) When stopping travel

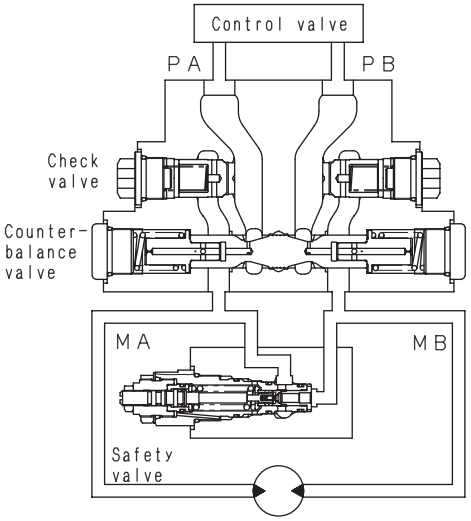
When the travel lever is placed in neutral, counterbalance valve spool (17) returns to the neutral position and the circuit to the parking brake is closed. The pressurized oil in chamber **a** of brake piston (10) is drained to the case from the orifice in the brake piston, and brake piston (10) is pushed to the right in the direction of the arrow by spring (9). As a result, plate (11) and disc (12) are pushed together, and the brake is applied. A time delay is provided by having the pressurized oil pass through a throttle in slow return valve (8) when the brake piston returns, and this ensures that the brake is still effective after the machine stops.



SXP09154

OPERATION OF BRAKE VALVE

- The brake valve consists of check valve, counterbalance valve, and safety valve in a circuit as shown in the diagram on the right. (Fig. 1)
- The function and operation of each component is as given below.



(Fig. 1)

SXP09155

1) Counterbalance valve, check valve

Function

- When traveling downhill, the weight of the machine makes it try to travel faster than the speed of the motor.

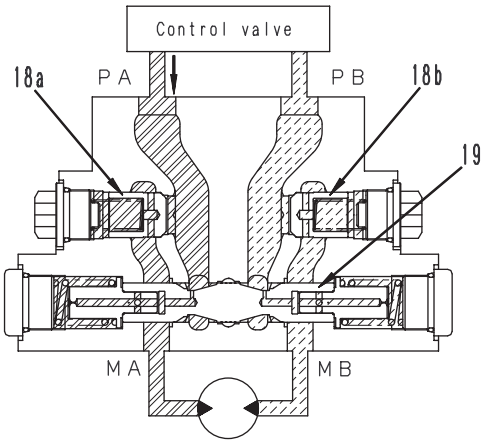
  As a result, if the machine travels with the engine at low speed, the motor will rotate without load and the machine will run away, which is extremely dangerous.

  To prevent this these valves act to make the machine travel according to the engine speed (pump discharge amount).

Operation when pressure oil is supplied

- When the travel lever is operated, the pressurized oil from the control valve is supplied to port **PA**. It pushes open suction safety valve (18a) and flows from motor inlet port **MA** to motor outlet port **MB**.

  However, the motor outlet port is closed by suction safety valve (18b) and spool (19), so the pressure at the supply side rises. (Fig. 2)

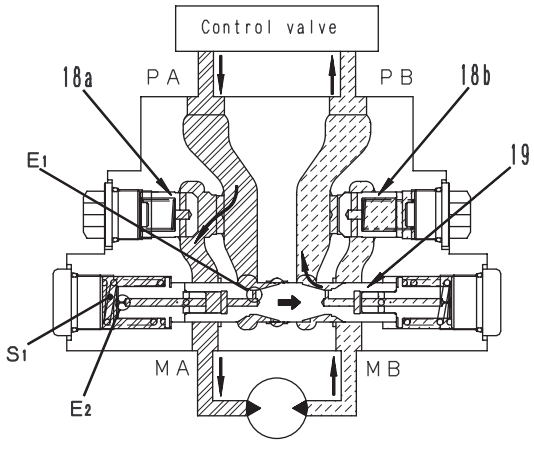


(Fig. 2)

SXP09156

- The pressurized oil at the supply side flows from orifice **E1** and **E2** in spool (19) to chamber **S1**. When the pressure in chamber **S1** goes above the spool switching pressure, spool (19) is pushed to the right in the direction of the arrow.

  As a result, port **MB** and port **PB** are connected, the outlet port side of the motor is opened, and the motor starts to rotate. (Fig. 3)



(Fig. 3)

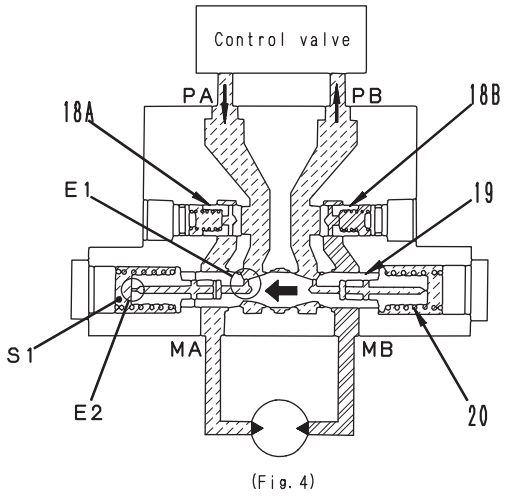
SXP09157

Operation of brake when traveling downhill

- If the machine tries to run away when traveling downhill, the motor will turn under no load, so the pressure at the motor inlet port will drop, and the pressure in chamber **S1** through orifices **E1** and **E2** will also drop. When the pressure in chamber **S1** drops below the spool switching pressure, spool (19) is returned to the left, in the direction of the arrow by spring (20), and outlet port **MB** is throttled.

  As a result, the pressure at the outlet port side rises, resistance is generated to the rotation of the motor, and this prevents the machine from running away.

  In other words, the spool moves to a position where the pressure at the outlet port **MB** balances the pressure at the inlet port and the force generated by the weight of the machine. It throttles the outlet port circuit and controls the travel speed according to the amount of oil discharged from the pump. (Fig. 4)



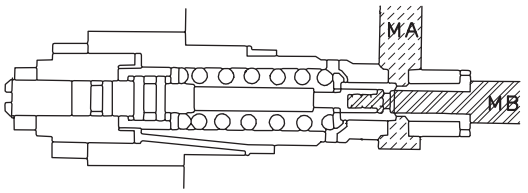
(Fig. 4)

SXP09158

2) Safety valve (2-direction operation, 2-stage set safety valve)

Function

- When travel is stopped (or when traveling downhill), the circuits at the inlet and outlet ports of the motor are closed by the counterbalance valve. However, the motor is rotated by inertia, so the pressure at the outlet port of the motor will become abnormally high and damage the motor or piping. The safety valve acts to release this abnormal pressure and send it to the inlet port side of the motor to prevent damage to the equipment.



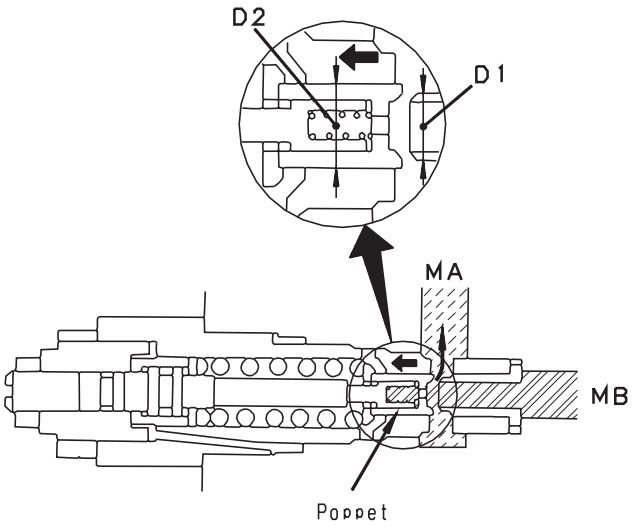
(Fig. 5)

SXP09159

Operation in both directions

1) When pressure in chamber MB has become high (when rotating clockwise)

- When the travel is stopped (or when traveling downhill), chamber **MB** in the outlet port circuit is closed by the check valve of the counterbalance valve, but the pressure at the outlet port rises because of the inertia. (Fig. 5)
- If the pressure goes above the set pressure, the force produced by the difference in are between **D1** and **D2** [$\pi 4(D1^2 - D2^2)$ x pressure] overcomes the force of the spring and moves the poppet to the left, so that the oil flows to chamber MA in the circuit on the opposite side. (Fig. 6)

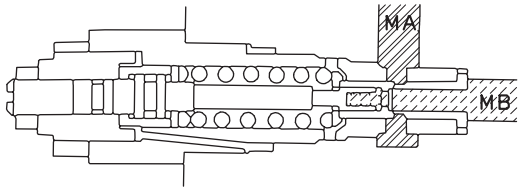


(Fig. 6)

SXP09160

2) When pressure in chamber MA has become high (when rotating counterclockwise)

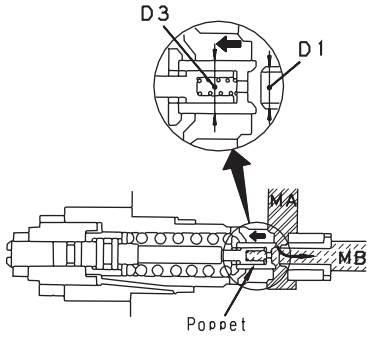
- When the travel is stopped (or when traveling downhill), chamber **MA** in the outlet port circuit is closed by the check valve of the counterbalance valve, but the pressure at the outlet port rises because of inertia. (Fig. 7)



(Fig. 7)

SXP09161

- If the pressure goes above the set pressure, the force produced by the difference in area between **D1** and **D3** [$\pi 4(D3^2 - D1^2)$ x pressure] overcomes the force of the spring and moves the poppet to the left, so the oil flows to chamber **MB** in the circuit on the opposite side. (Fig. 8)



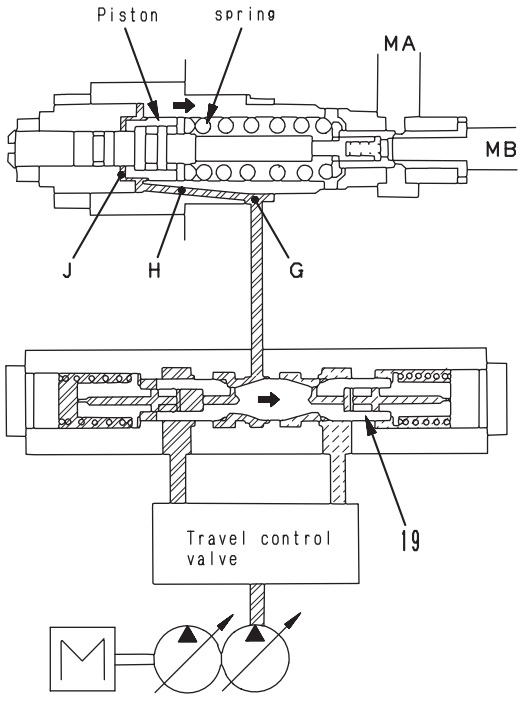
(Fig. 8)

SXP09162

Operation of mechanism for varying set pressure

1) When starting travel (high-pressure setting)

- When the travel lever is operated, the pressurized oil from the pump actuated counterbalance valve spool (19), and opens the pilot circuit to the safety valve. The oil passes from chamber **G** to passage **H** and flows into chamber **J**, pushes the piston to the right, and compresses the spring to make the set load larger. Because of this, the set pressure of the safety valve is switched to the high pressure setting, and a large drawbar pull is made available.



(Fig. 9)

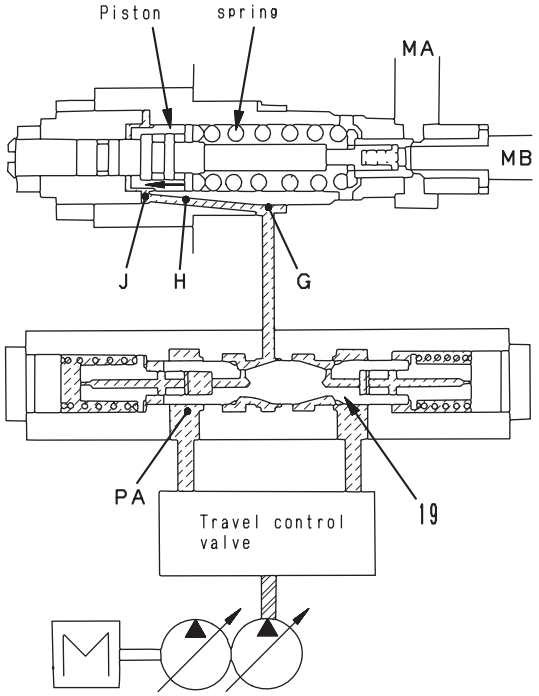
SXP09163

2) When stopping travel (low-pressure setting)

- When the travel lever is placed in neutral, the pressure in chamber **PA** drops and counterbalance valve spool (19) returns to the neutral position. While the counterbalance valve spool is returning to the neutral position, the pressurized oil in chamber **J** passes through passage **H**, and escapes to chamber **PA** from chamber **G**. The piston moves to the left, and the set load becomes smaller. Because of this, the set pressure of the safety valve is switched to the low-pressure setting and relieves the shock when reducing speed.

[Set pressure of safety valve]

When starting, when traveling: High-pressure setting	When stopping: Low-pressure setting
40.2 MPa {410 kg/cm^2}	27.5 MPa {280 kg/cm^2}



(Fig. 10)

SXP09164

TRAVEL JUNCTION VALVE

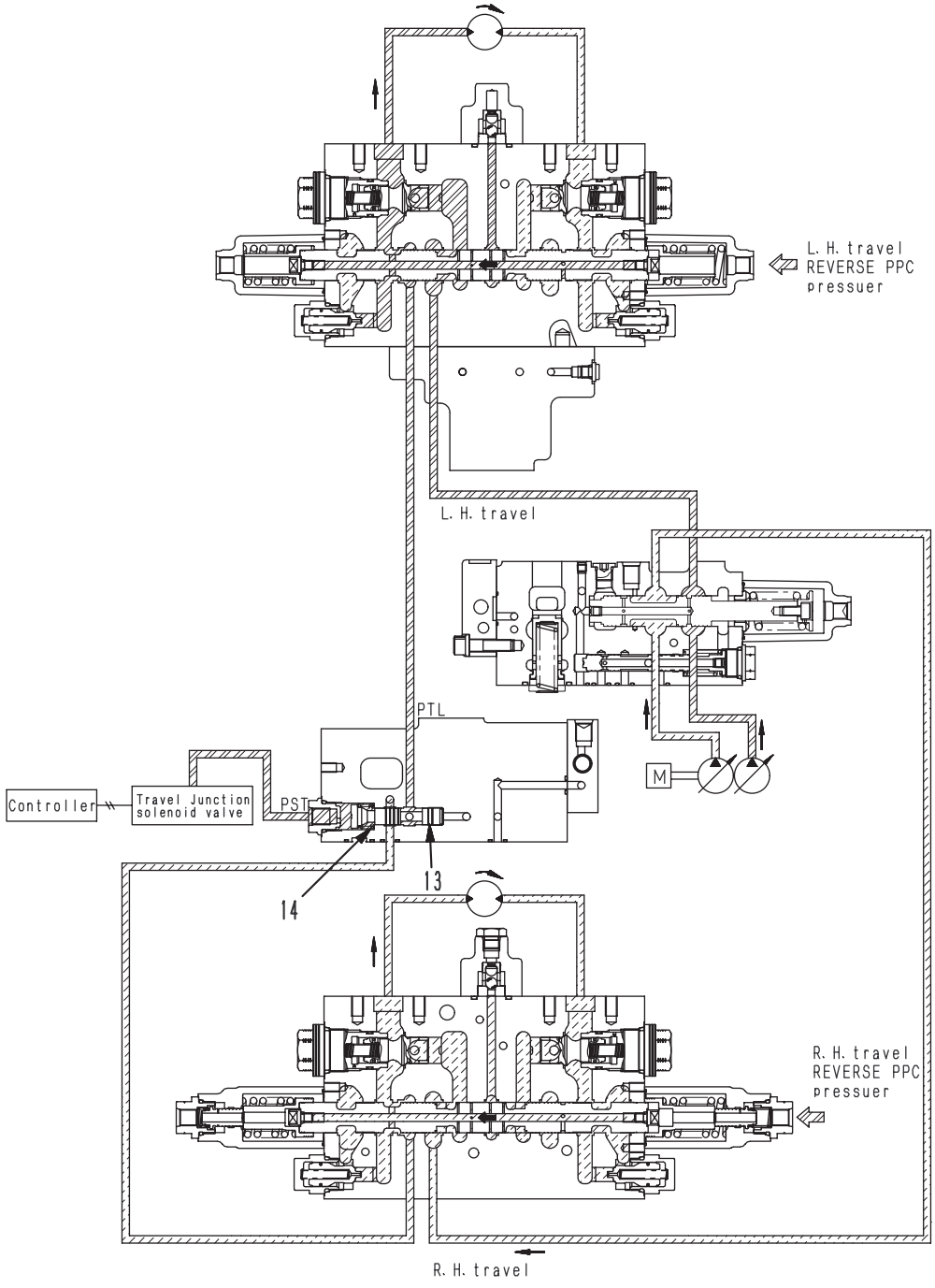
Function

- This valve connects both travel circuits to each other so that the hydraulic oil will be supplied evenly to both travel motors and the machine will travel straight.
- When the machine is steered, outside pilot pressure PST closes the travel junction valve to secure high steering performance.

Operation

When pilot pressure is turned ON

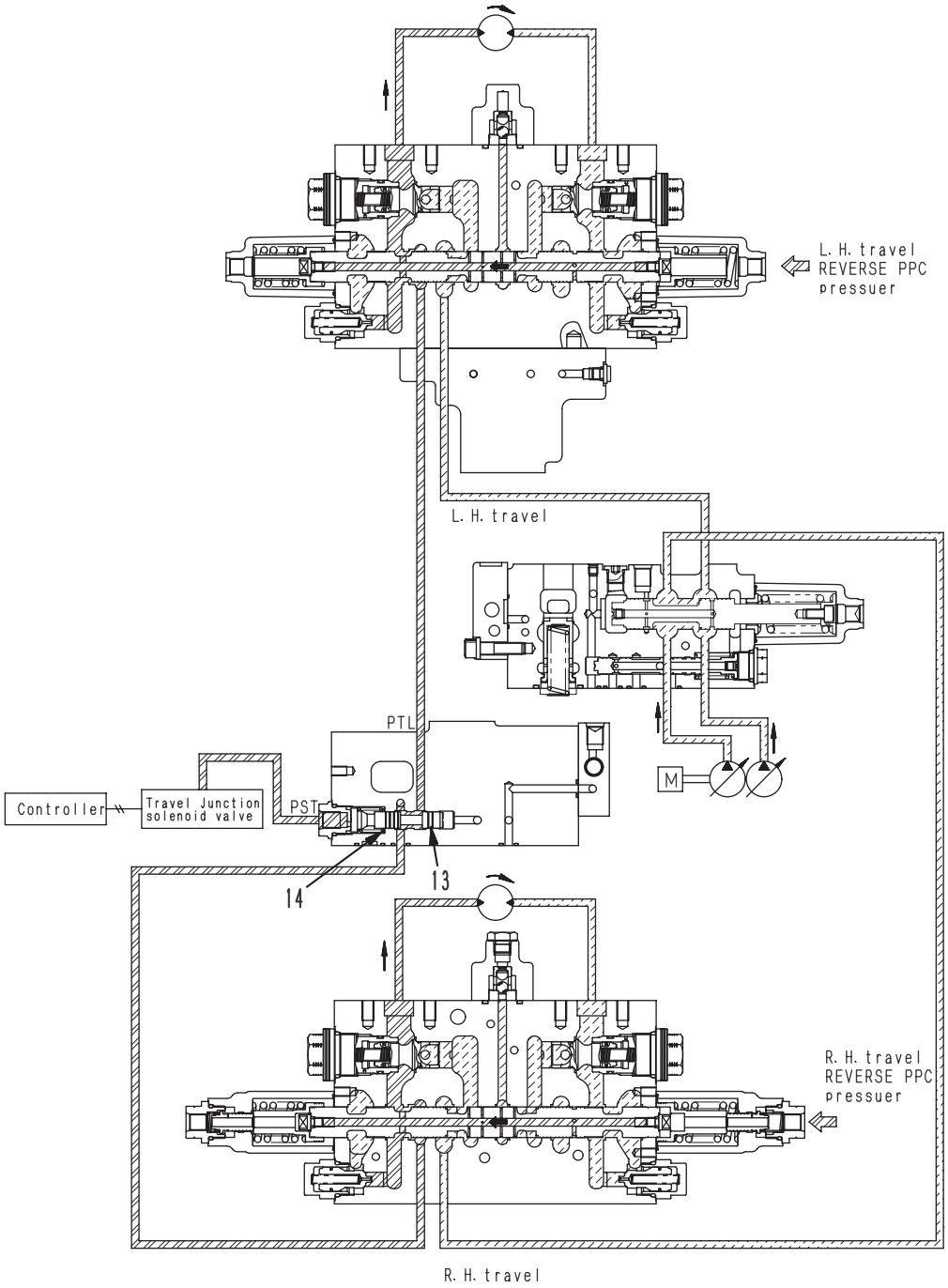
- If the pilot pressure from the travel junction solenoid valve becomes higher than the force of spring (14), travel junction spool (13) moves to the left stroke end and the junction circuit between port PTL (Left travel circuit) and PTR (Right travel circuit) is closed.



SXP09165

When pilot pressure is turned OFF

- If pilot pressure PST from the solenoid valve is 0, travel junction spool (13) is pressed by the force of spring (14) against the right side and the pass between ports PTL and PTR is open.
- If the oil flow rates in both travel motors become different from each other, the oil flows through the route between port PTL, travel junction spool (13), and port PTR so that the oil flow rates will be equalized again.



SXP09166

TRAVEL PPC SHUTTLE VALVE

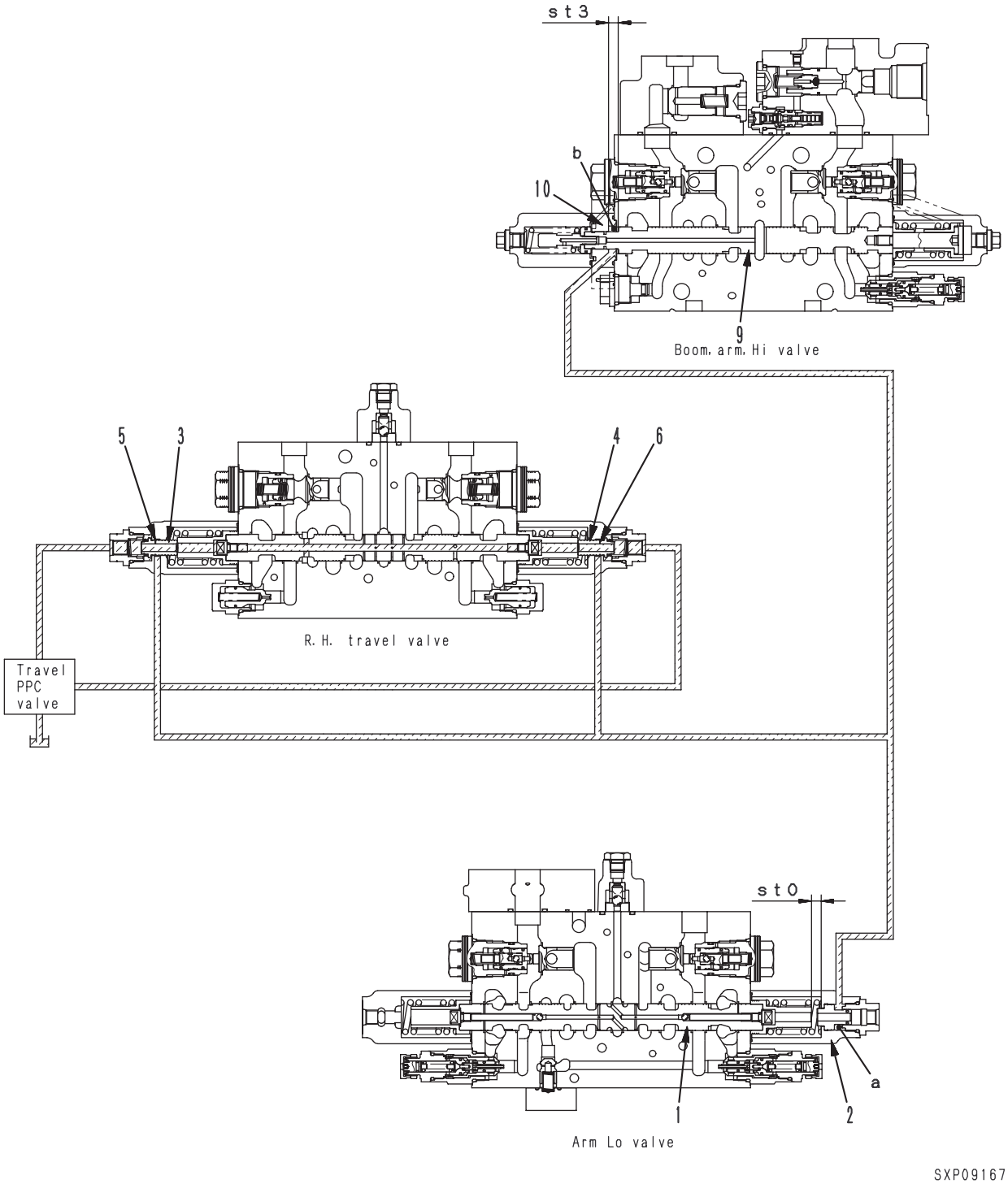
Function

- If boom RAISE or arm IN are operated when the machine is traveling, the stroke of the spools for the boom and arm is controlled by the travel PPC pressure and this limits the flow of oil to the boom and arm cylinders.
- When the boom and arm stroke is controlled, the travel PPC pressure passes through the circuit inside the control valve to actuate the system.

Operation

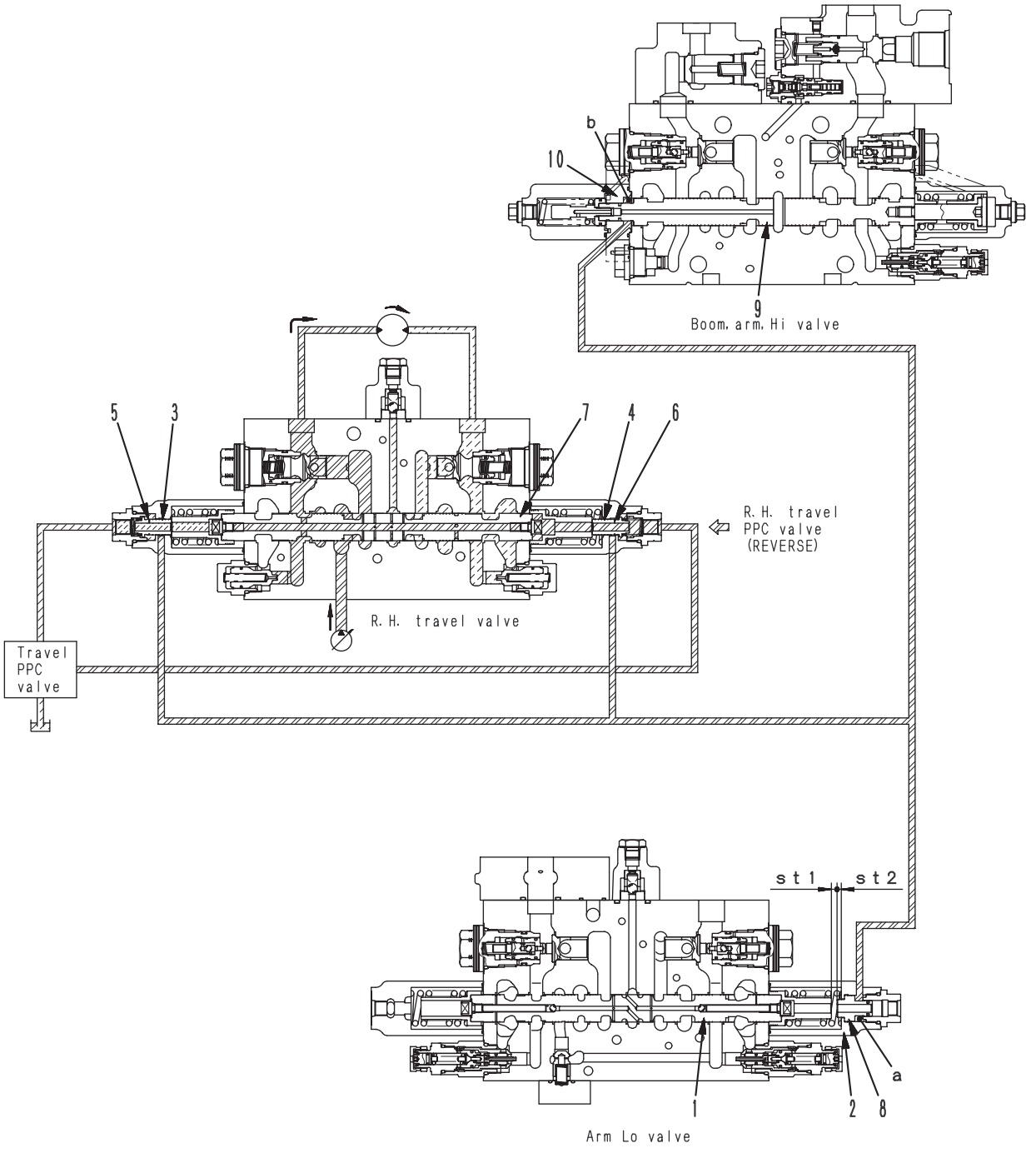
1 When travel is at neutral

- Stroke limit signal chambers **a** and **b** are connected to the travel PPC valve through orifices (5) and (6) in pistons (3) and (4) inside the travel spring case, and the is drained.
- When arm IN is operated, spool (1) moves to the right by stroke (st0) to a point where it contacts the end face of spring case (2).
- When boom RAISE is operated, spool (9) moves to the left by stroke (st3) to a point where it contacts the end face of spring case (10).

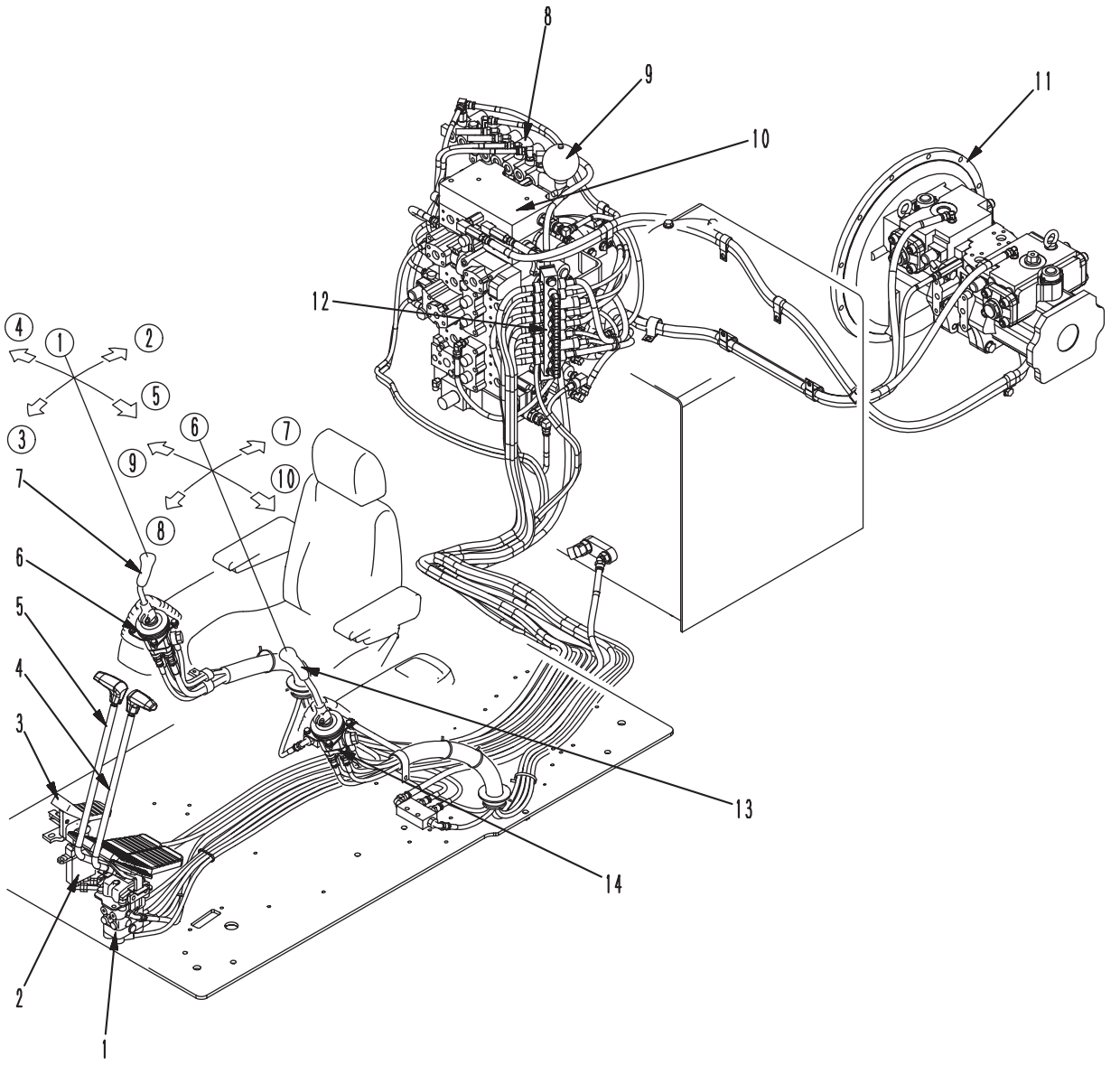

st3
b
10
9
Boom, arm, Hi valve
5
3
4
6
R.H. travel valve
Travel
PPC
valve
st0
a
1
2
Arm Lo valve
SXP09167

2. When travel is operated

- When the travel lever is operated to right REVERSE (or FORWARD), the right (REVESE (or FORWARD) PPC pressure pushes spool (7) to the left (or right).
- Spool (7) pushes piston (3), orifice (5) closes, and stroke limit signal chamber **a** is shut off from the drain circuit of the travel PPC valve.
- At the same time, the right REVERSE (or FORWARD) PPC pressure passes through orifice (6) in piston (4), acts on the right end face of piston (8), and pushes piston (8) to the left.
- If arm IN is operated, spool (1) moves to the right, but the maximum stroke of the spool is limited by the amount of movement **st2** of piston (8) and becomes **st1**.
- If boom RAISE is operated, spool (9) tries to move to the left, but the travel PPC pressure enters stroke control signal chamber **b**, so the spool does not move.


b
10
9
Boom, arm, Hi valve
5
3
7
4
6
R. H. travel
PPC valve
(REVERSE)
R. H. travel valve
Travel
PPC
valve
st 1
st 2
a
1
2
8
Arm Lo valve
SXP09168

VALVE CONTROL

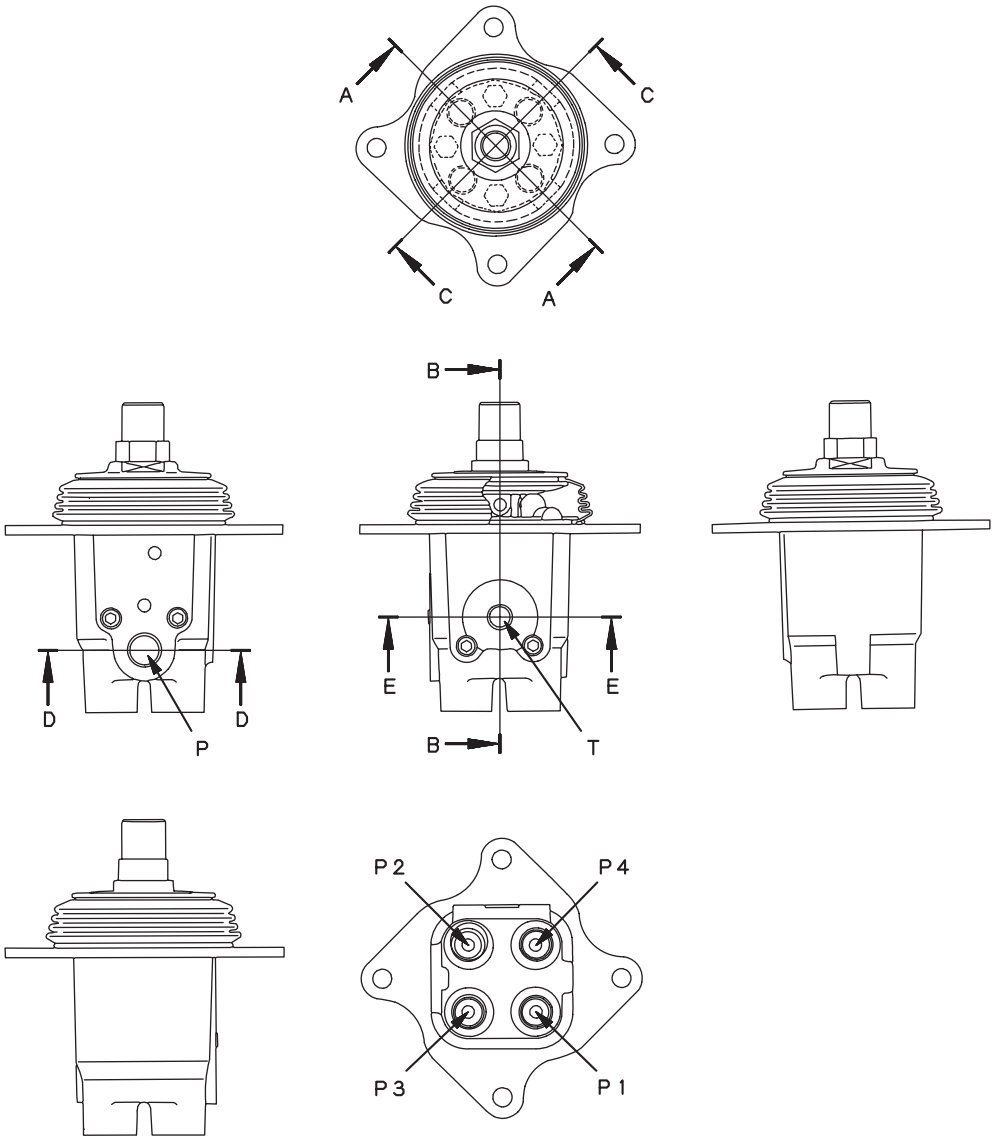


Lever positions

1. Travel PPC valve
2. Service PPC valve
3. Service pedal
4. L.H. travel lever
5. R.H. travel lever
6. R.H. PPC valve
7. R.H. work equipment control lever
8. Solenoid valve
9. Accumulator
10. Control valve
11. Hydraulic pump
12. Junction box
13. L.H. work equipment control lever
14. L.H. PPC valve

(1) Hold
(2) Boom "RAISE"
(3) Boom "LOWER"
(4) Bucket "DUMP"
(5) Bucket "CURL"
(6) Hold
(7) Arm "IN"
(8) Arm "OUT"
(9) Swing "RIGHT"
(10) Swing "LEFT"
(11) Neutral
(12) Travel "REVERSE"
(13) Travel "FORWARD"

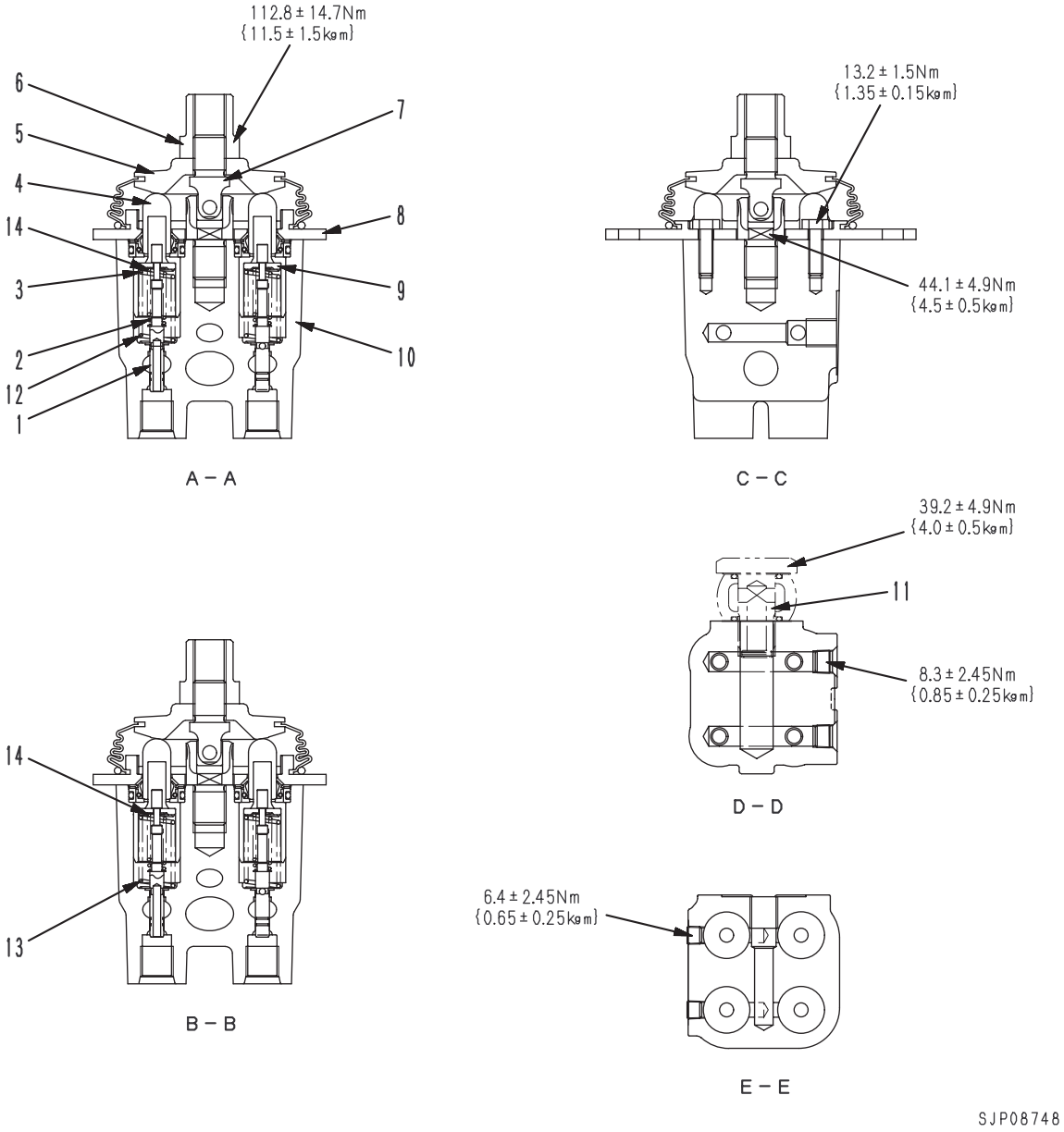
WORK EQUIPMENT • SWING PPC VALVE



SJP08747

P: From main pump
T: To tank

P1: Left: Arm OUT / Right: Boom LOWER
P2: Left: Arm IN / Right: Boom RAISE
P3: Left: Swing RIGHT / Right: Bucket CURL
P4: Left: Swing LEFT / Right: Bucket DUMP



1. Spool
2. Metering spring
3. Centering spring
4. Piston
5. Disc
6. Nut (For connection of lever)
7. Joint
8. Plate
9. Retainer
10. Body
11. Filter

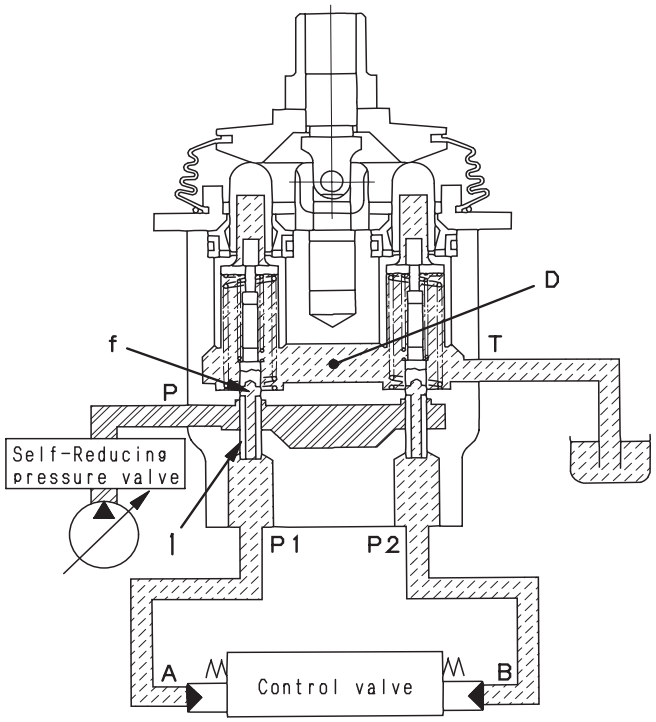
Unit: mm

No.	Check item	Criteria					Remedy
12	Centering spring (For P3 and P4)	Standard size			Repair limit		If damaged or deformed, replace spring
		Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	
		42.5 x 15.5	34	17.6 N {1.8 kg}	—	13.7 N {1.4 kg}	
13	Centering spring (For P3 and P4)	44.5 x 15.5	34	29.4 N {3.0 kg}	—	23.5 N {2.4 kg}	
14	Metering spring	26.5 x 8.2	24.9	16.7 N {1.7 kg}	—	13.7 N {1.4 kg}	

OPERATION

1) At neutral

Ports **A** and **B** of the control valve and ports **P1** and **P2** of the PPC valve are connected to drain chamber **D** through fine control hole **f** in spool (1). (Fig. 1)



(Fig. 1)

SBP03493

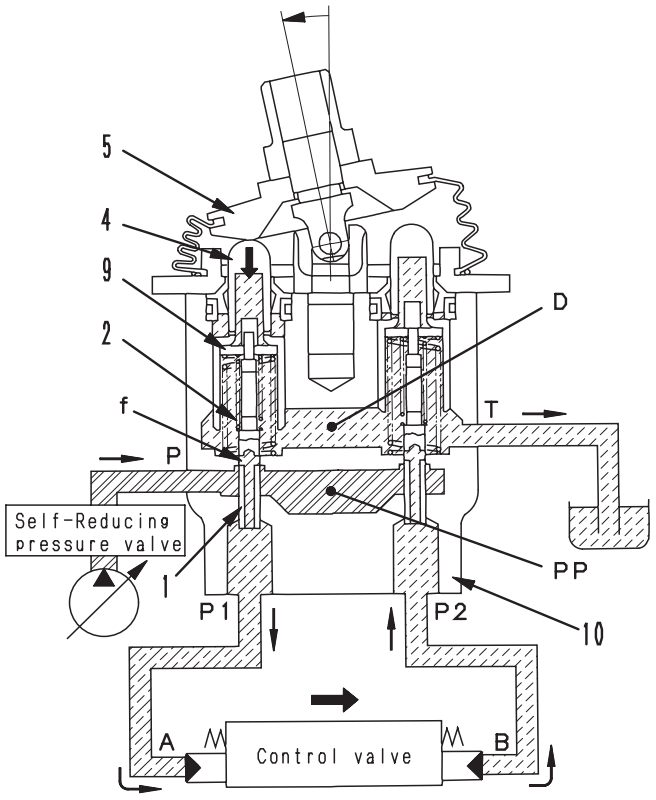
2) During fine control (neutral → fine control)

When piston (4) starts to be pushed by disc (5), retainer (9) is pushed; spool (1) is also pushed by metering spring (2), and moves down.

When this happens, fine control hole **f** is shut off from drain chamber **D**, and at almost the same time, it is connected to pump pressure chamber **PP**, so pilot pressure oil from the main pump passes through fine control hole **f** and goes from port **P1** to port **A**.

When the pressure at port **P1** becomes higher, spool (1) is pushed back and fine control hole **f** is shut off from pump pressure chamber **PP**. At almost the same time, it is connected to drain chamber **D** to release the pressure at port **P1**. When this happens, spool (1) moves up or down so that the force of metering spring (2) is balanced with the pressure at port **P1**. The relationship in the position of spool (1) and body (10) (fine control hole **f** is at a point midway between drain hole **D** and pump pressure chamber **PP**) does not change until retainer (9) contacts spool (1).

Therefore, metering spring (2) is compressed proportionally to the amount of movement of the control lever, so the pressure at port **P1** also rises in proportion to the travel of the control lever. In this way, the control valve spool moves to a position where the pressure in chamber **A** (the same as the pressure at port **P1**) and the force of the control valve spool return spring are balanced. (Fig. 2)



(Fig. 2)

SBP03494

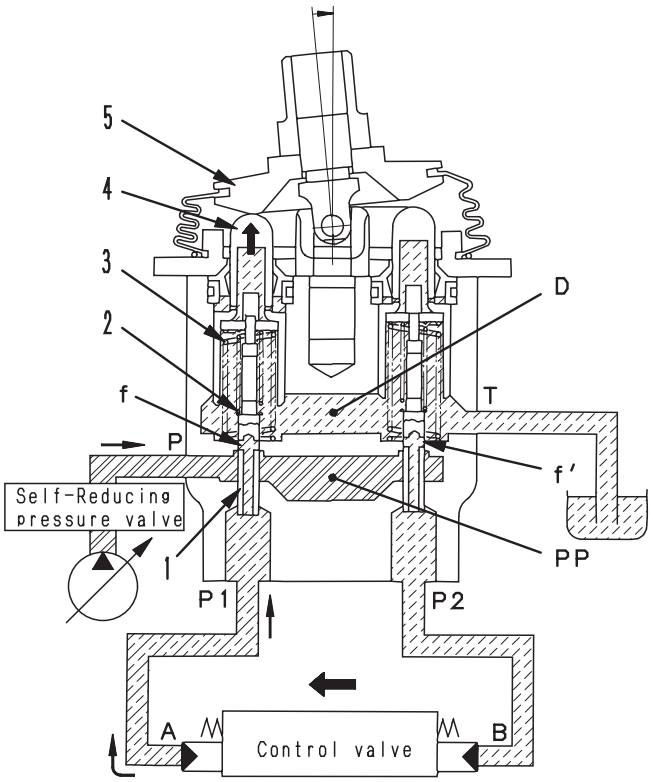
3) During fine control (when control lever is returned)

- When disc (5) starts to be returned, spool (1) is pushed up by the force of centering spring (3) and the pressure at port **P1**.

  When this happens, fine control hole **f** is connected to drain chamber **D** and the pressure oil at port **P1** is released.

  If the pressure at port **P1** drops too far, spool (1) is pushed down by metering spring (2), and fine control hole **f** is shut off from drain chamber **D**. At almost the same time, it is connected to pump pressure chamber **PP**, and the pump pressure is supplied until the pressure at port **P1** recovers to a pressure that corresponds to the lever position.

  When the spool of the control valve returns, oil in drain chamber **D** flows in from fine control hole **f** in the valve on the side that is not working. The oil passes through port **P2** and enters chamber **B** to fill the chamber with oil. (Fig. 3)



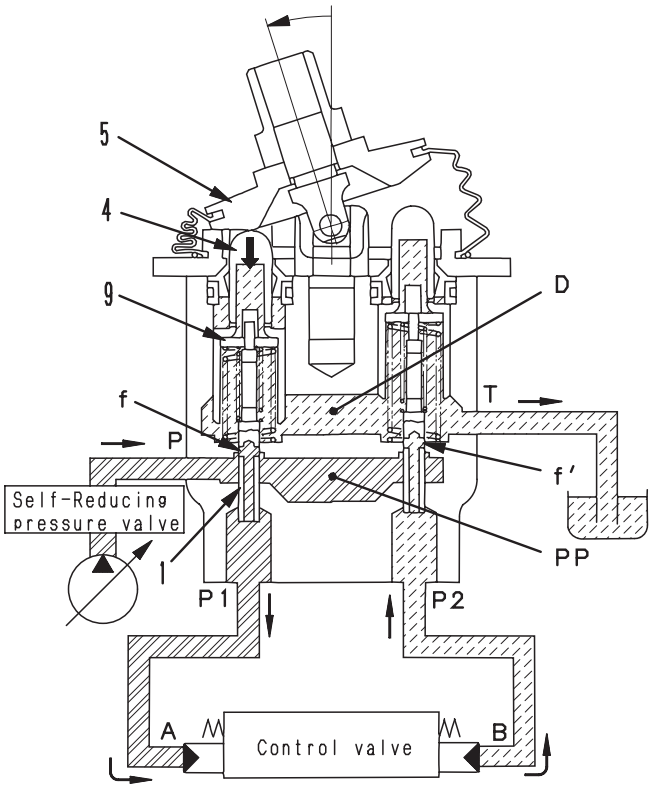
(Fig. 3)

SBP03495

4) At full stroke

When disc (5) pushes down piston (4), and retainer (9) pushes down spool (1), fine control hole **f** is shut off from drain chamber **D**, and is connected with pump pressure chamber **PP**. Therefore, the pilot pressure oil from the main pump passes through fine control hole **f** and flows to chamber **A** from port **P1**, and pushes the control valve spool.

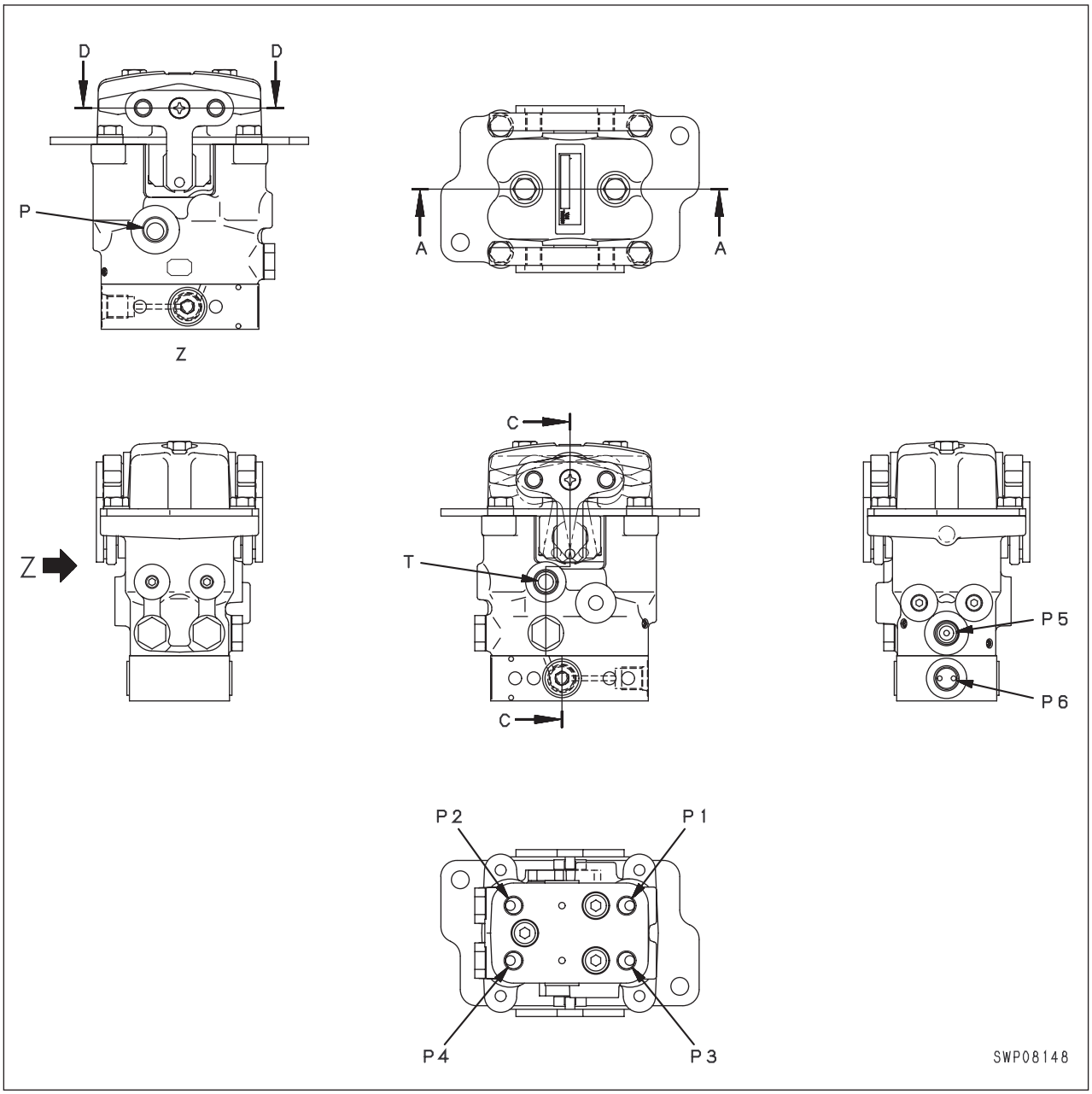
The oil returning from chamber **B** passes from port **P2** through fine control hole **f** and flows to drain chamber **D**. (Fig. 4)



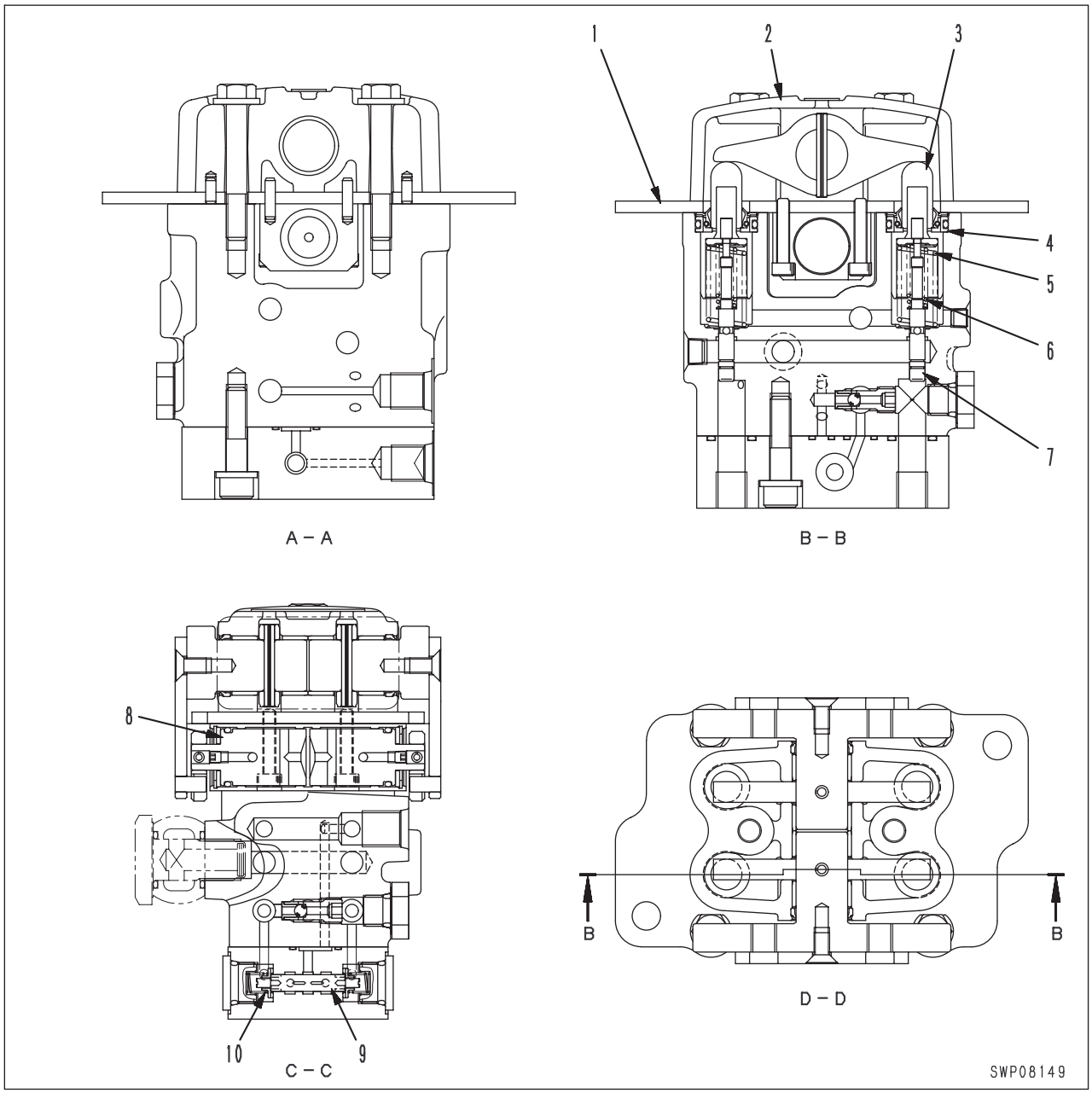
(Fig. 4)

SBP03496

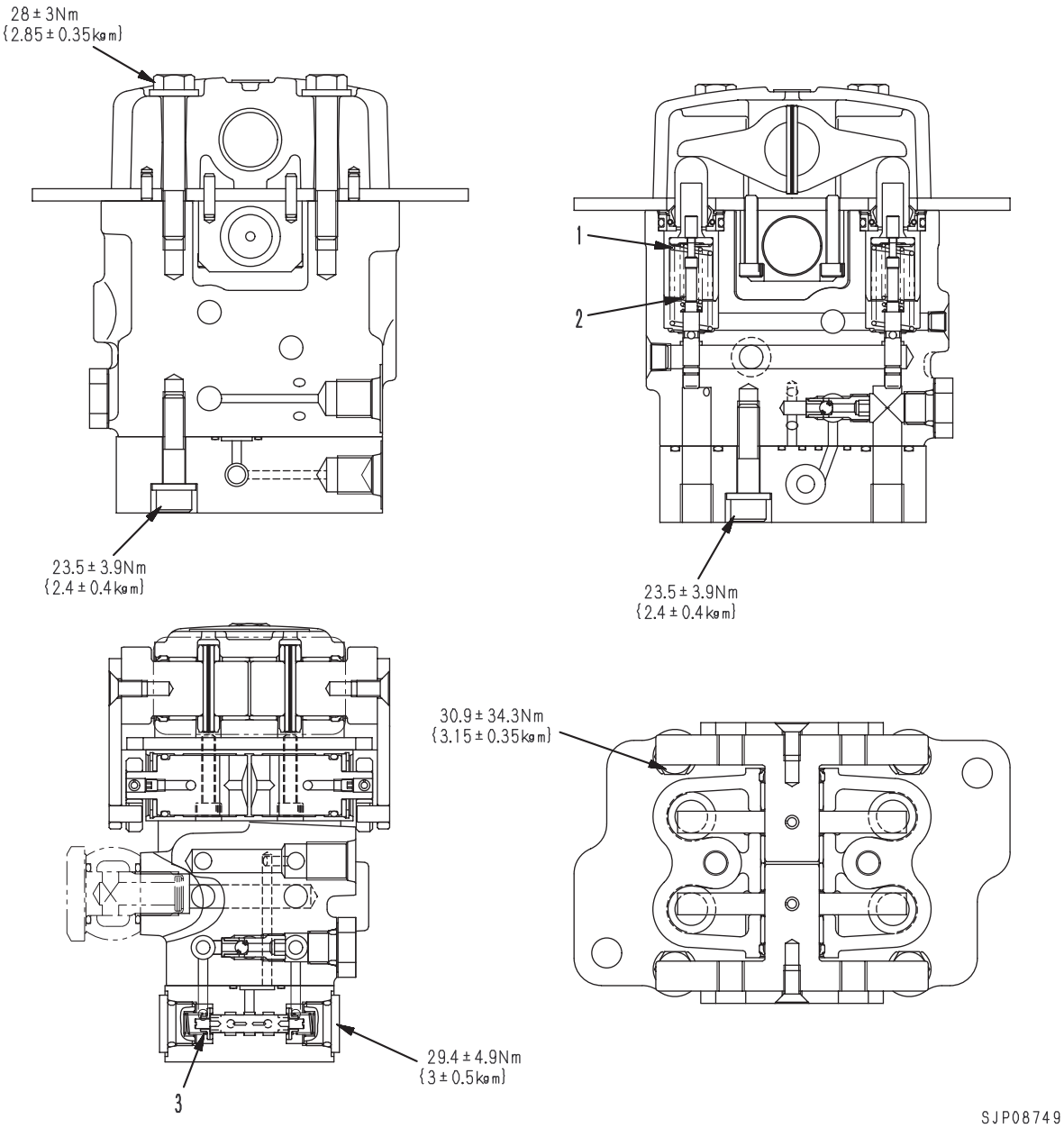
TRAVEL PPC VALVE



P : From main pump
T : To tank
P1 : Left reverse
P2 : Left forward
P3 : Right reverse
P4 : Right forward
P5 : Travel signal
P6 : Steering signal



1. Plate
2. Body
3. Piston
4. Collar
5. Metering spring
6. Centering spring
7. Valve
8. Damper
9. Steering signal
10. Steering signal valve spring



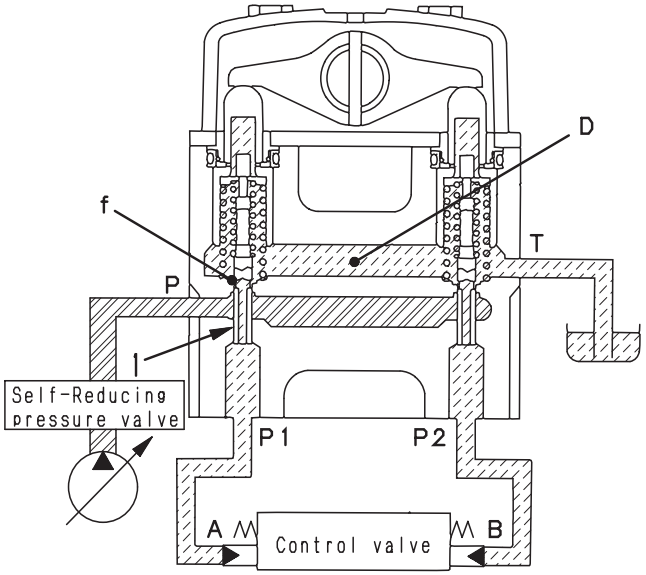
Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Metering spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring
		26.5 x 8.15	24.7	16.7 N {1.7 kg}	—	13.7 N {1.4 kg}	
2	Centering spring	48.1 x 15.5	32.5	108 N {11 kg}	—	86.3 N {8.8 kg}	
3	Steering signal spring	12.8 x 7.3	8.5	8.8 N {0.9 kg}	—	7.1 N {0.72 kg}	

OPERATION

1) At neutral

Ports **A** and **B** of the control valve and ports **P1** and **P2** of the PPC valve are connected to drain chamber **D** through fine control hole **f** in spool (1). (Fig. 1)



(Fig. 1)

SBP03497

2) Fine control (neutral → fine control)

When piston (4) starts to be pushed by disc (5), retainer (9) is pushed. Spool (1) is also pushed by metering spring (2), and moves down.

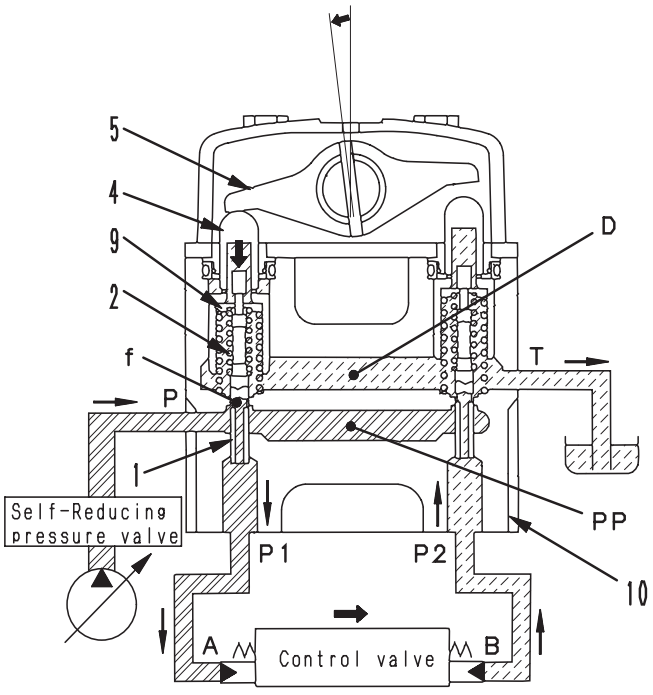
When this happens, fine control hole **f** is shut off from drain chamber **D**. At almost the same time, it is connected to pump pressure chamber **PP**, and the pilot pressure of the main pump is sent from port **A** through fine control hole **f** to port **P1.**

When the pressure at port **P1** rises, spool (1) is pushed back. Fine control hole **f** is shut off from pump pressure chamber **PP**. At almost the same time, it is connected to drain chamber **D,** so the pressure at port **P1** escapes.

As a result, spool (1) moves up and down until the force of metering spool (2) is balanced with the pressure at port **P1**.

The relationship of the position of spool (1) and body (10) (fine control hole **f** is in the middle between drain hole **D** and pump pressure chamber **PP**) does not change until retainer (9) contacts spool (1).

Therefore, metering spring (2) is compressed in proportion to the travel of the control lever, so the pressure at port **P1** also rises in proportion to the travel of the control lever. In this way, the spool of the control valve spool moves to a position where the pressure of chamber **A** (same as pressure at port **P1**) and the force of the return spring of the control valve spool are balanced. (Fig. 2)



(Fig. 2)

SBP03498

3) Fine control (control lever returned)

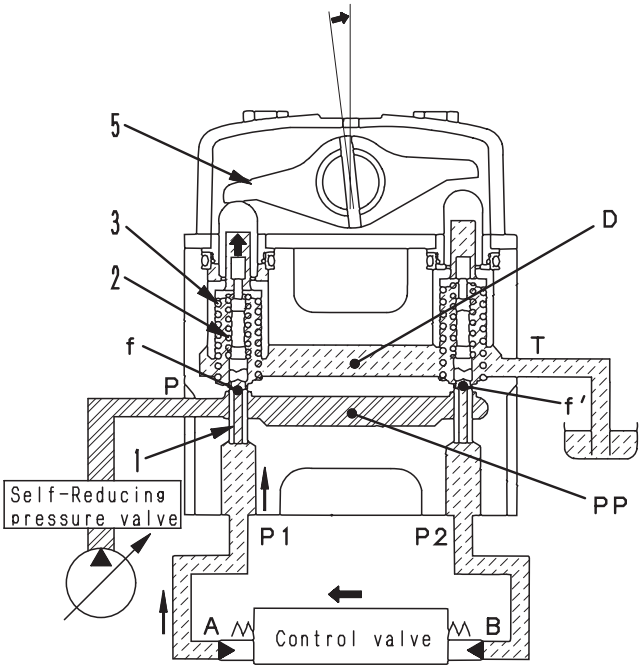
When lever (5) starts to be returned, spool (1) is pushed up by the force of centering spring (3) and the pressure at port **P1**.

Because of this, fine control hole **f** is connected to drain chamber **D**, and the pressurized oil at port **P1** is released.

If the pressure at port **P1** drops too much, spool (1) is pushed up by metering spring (2), so fine control hole **f** is shut off from drain chamber **D**. At almost the same time, it is connected to pump pressure chamber **PP**, so the pressure at port **P1** supplies the pump pressure until the pressure recovers to a pressure equivalent to the position of the lever.

When the control valve returns, oil in drain chamber **D** flows in from fine control hole **f** of the valve on the side that is not moving.

It passes through port **P2** and goes to chamber **B** to charge the oil. (Fig. 3)

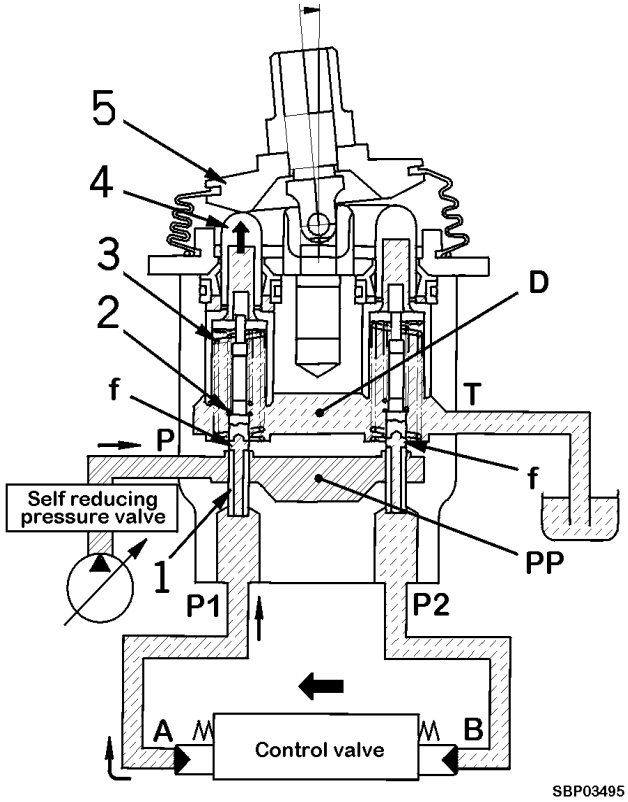


(Fig. 3)

SBP03499

4) At full stroke

Lever (5) pushes down piston (4), and retainer (9) pushes down on spool (1). Fine control hole **f** is shut off from drain chamber **D**, and is connected to pump pressure chamber **PP**. Therefore, the pilot pressure oil from the main pump passes through fine control hole **f** and flows to chamber **A** from port **P1** to push the control valve spool. The return oil from chamber **B** passes from port **P2** through fine control hole **f** and flows to drain chamber **D**. (Fig. 4)



SBP03495

2. Travel signal/Steering function

- Travel signal

  If either of the travel levers is operated, the maximum PPC output pressure on both sides is output as the travel signal. Accordingly, if the machine is traveling is judged by the signal of port P5.

- Steering signal

  If the operation quantities of both levers are different from each other as in the steering operation, the higher one of the PPC output pressures on both sides is output as the steering signal.

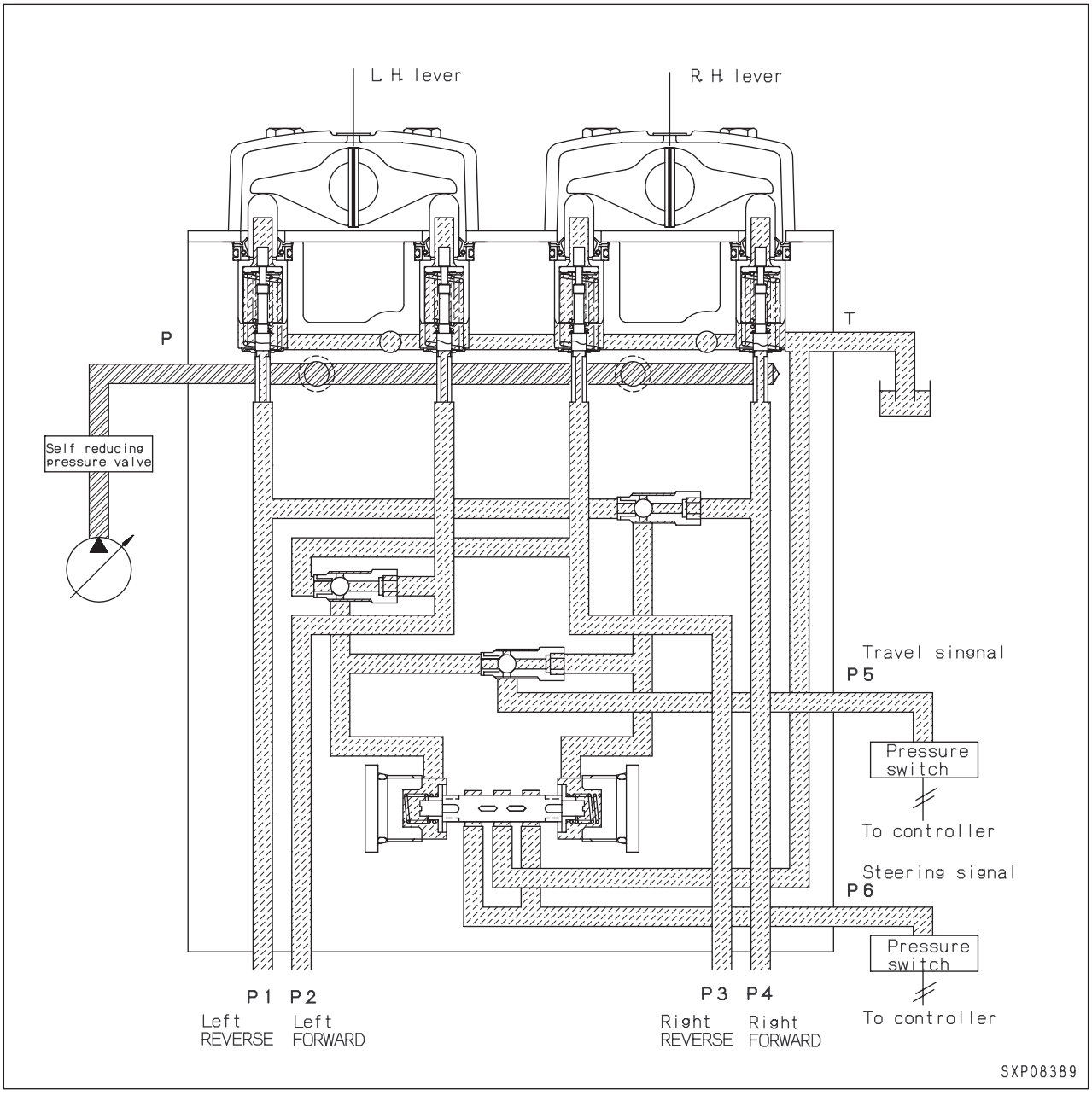
  Any signal is not output from port P6 while the machine is travelling straight (forward or reverse) or in neutral.

  Accordingly, if the machine is being steered is judged by the signal of port P6.

Operation

1) While in NEUTRAL

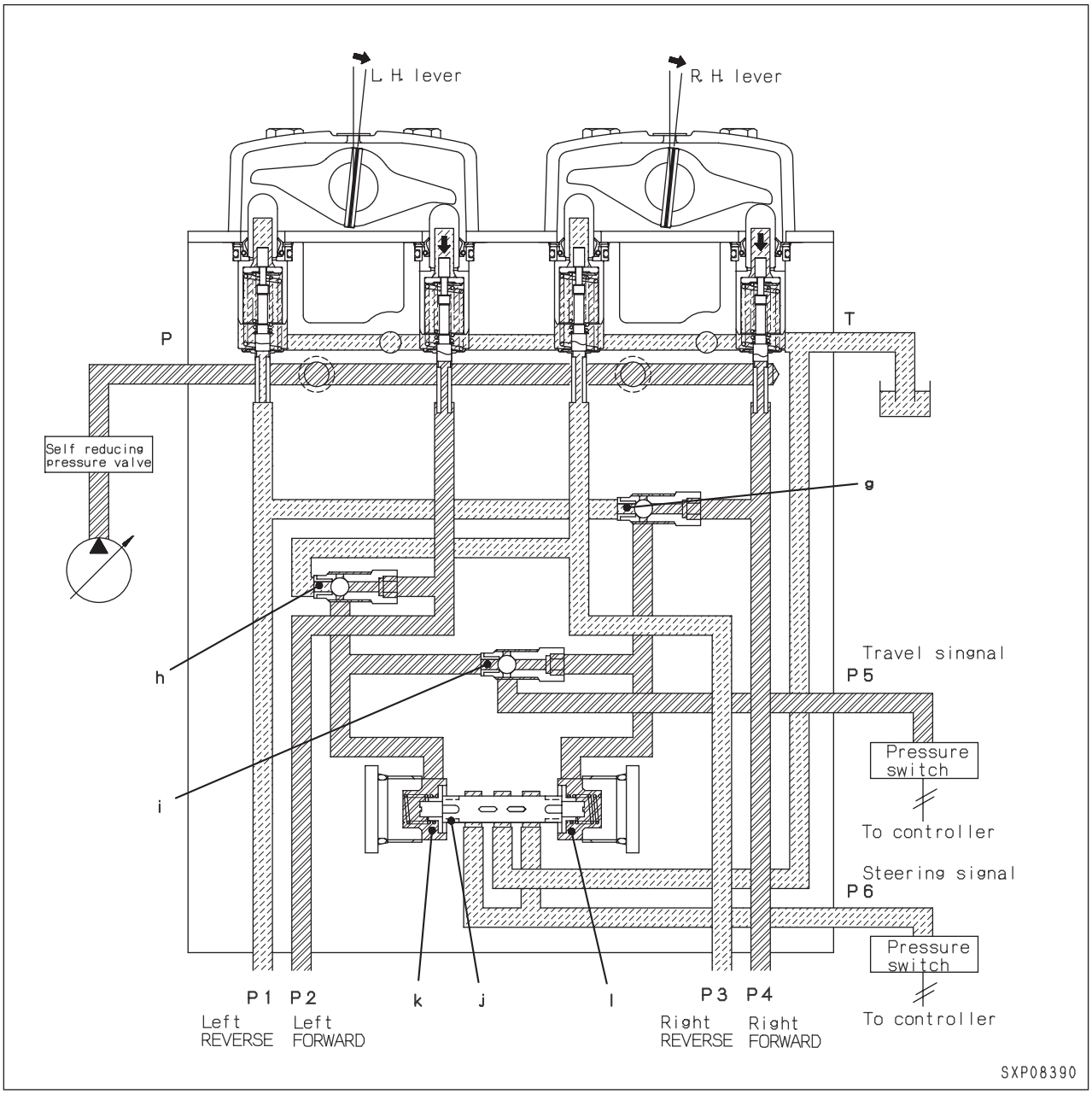
   The signals of the output ports (P1 - P4), travel signal (Port P5), and steering signal (Port P6) are not output.



2) While travelling straight

(The following drawing shows the circuit for traveling straight forward.)

While the left motor is operating for forward travel (the signal of port P2 is output) and the right motor is also operating for forward travel (the signal of port P4 is output), the pressures in left spring chamber (k) and right spring chamber (l) of steering signal valve (j) are set high. Accordingly, the steering signal valve is kept in neutral and the steering signal (Port P6) is not output.



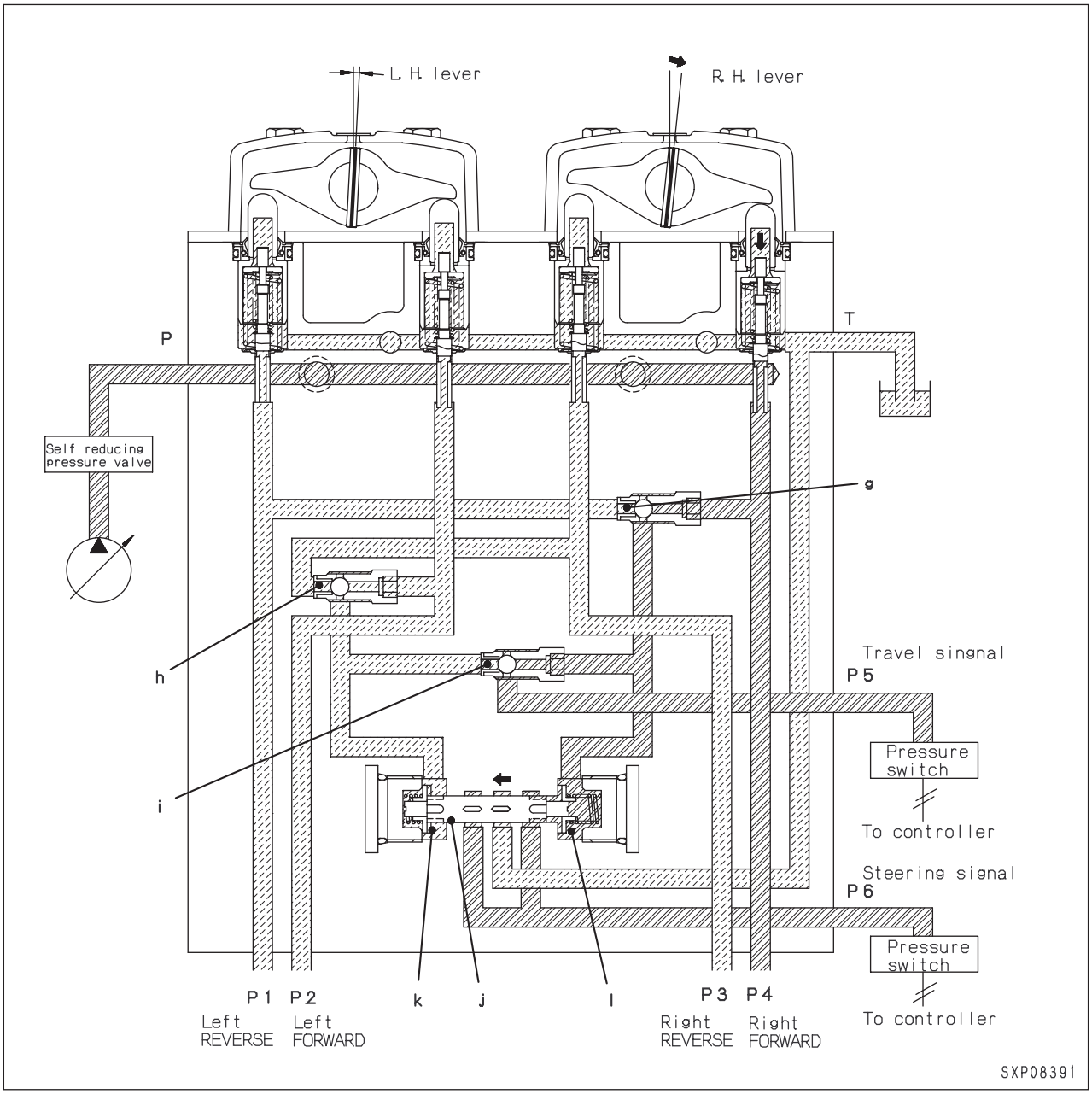
3) When steered or pivot-turned

(The following drawing shows the circuit for left forward (slow) and right forward (fast) operation.)

If the operation quantities of both levers are different from each other as in the steering operation (If the difference of the pilot pressure between both sides is higher than a certain level), the pilot pressure is output as the steering signal.

In the case of the following drawing, the pressure in left spring chamber (k) of steering signal valve (j) is P2. The pressure in right spring chamber (l) is P4.

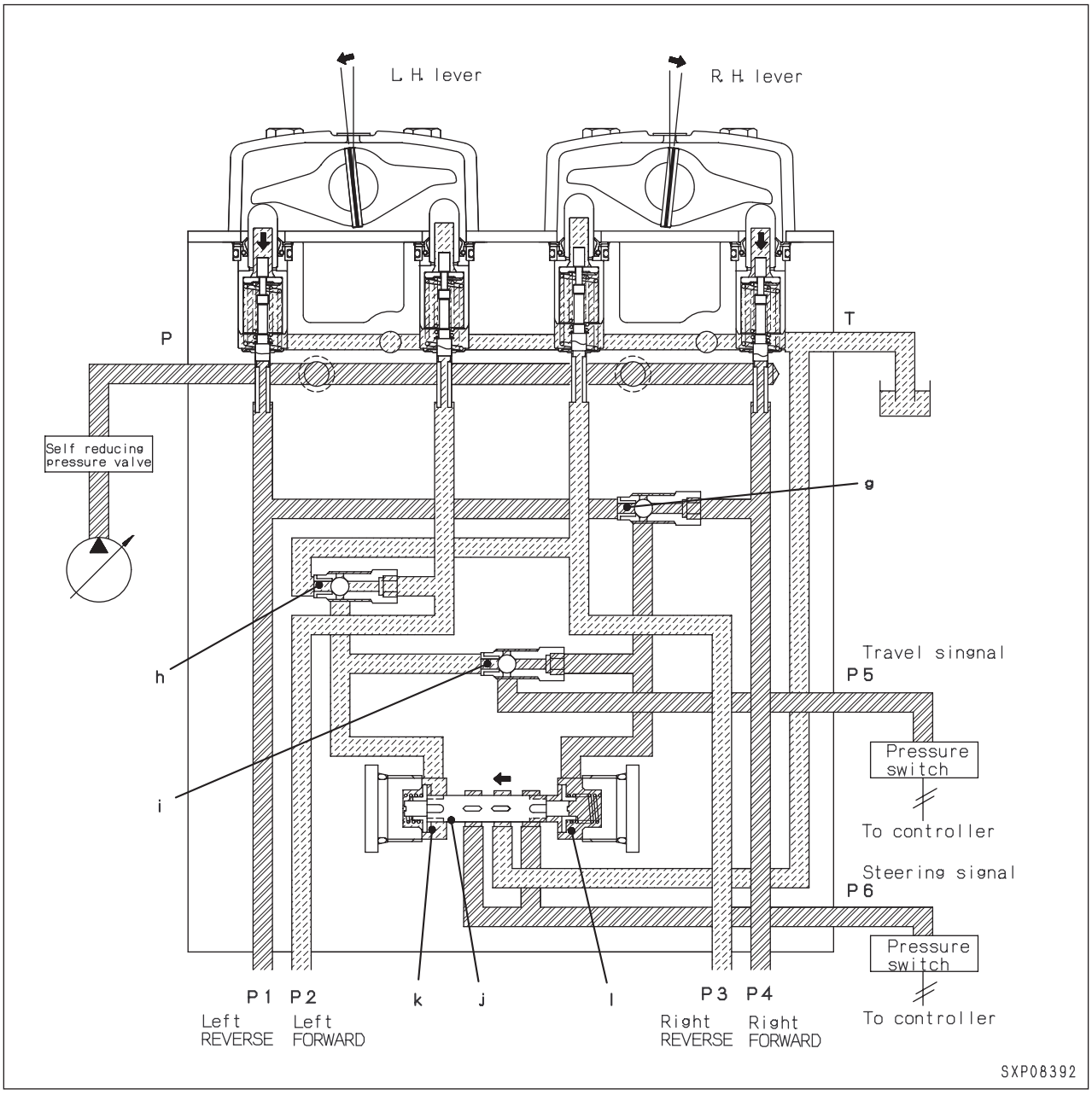
If (P4 - P2) x (Sectional area of spool) > Set spring load, the spool is changed to the direction of the arrow and the higher one of both PPC output pressures (the pressure of port P4 in this drawing) is output as the steering signal to port P6.



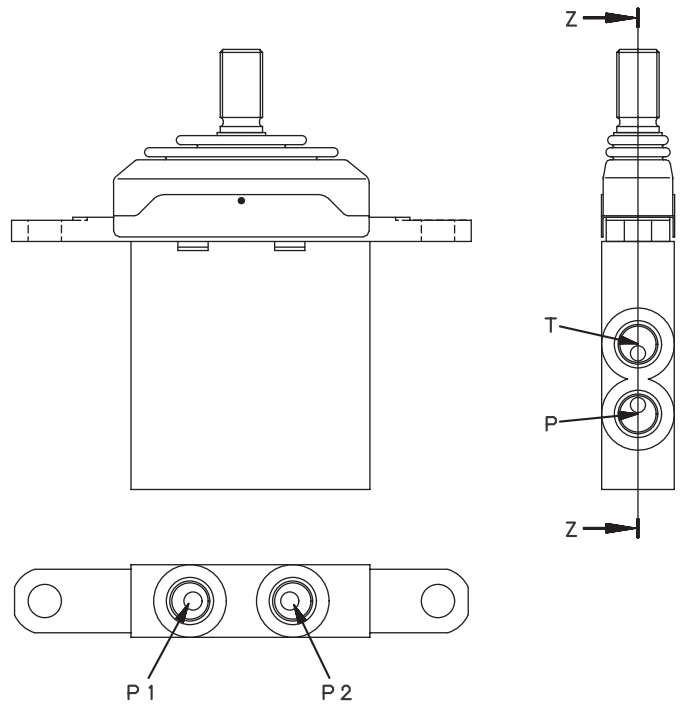
4) When pivot-turned

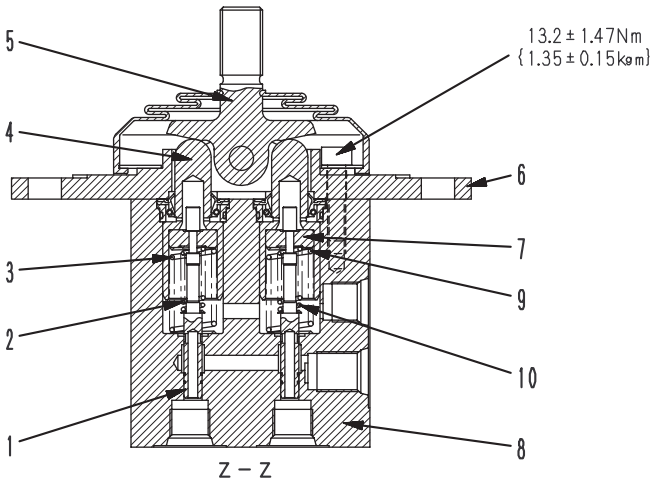
(The following drawing shows the circuit for left reverse and right forward operation.)

While the left motor is operating for reverse travel (the signal of port P1 is output) and the right motor is operating for forward travel (the signal of port P4 is output), only the pressure in right spring chamber (l) of steering signal valve (j) is set high. Accordingly, the steering signal valve moves to the left and outputs the steering signal (port P6).



SERVICE PPC VALVE





SJP08750

1. Spool
2. Metering spring
3. Centering spring
4. Piston
5. Lever
6. Plate
7. Retainer
8. Body

T : To tank
P : From main pump
P1 : Port
P2 : Port

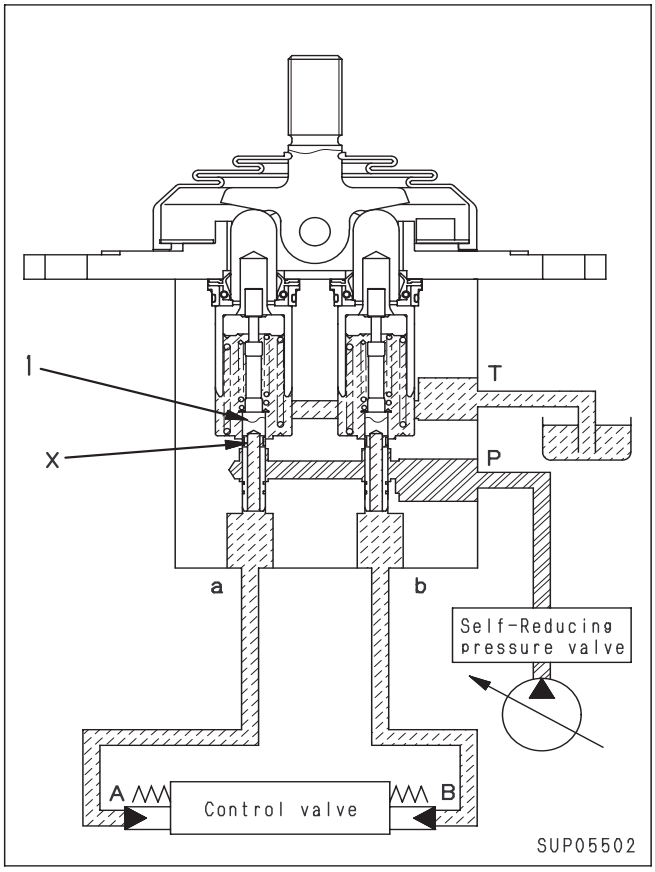
Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
9	Centering spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring
		33.9 x 15.3	28.4	124.5 N {12.7 kg}	—	100 N {10.2 kg}	
10	Metering spring	22.7 x 8.1	22	16.7 N {1.7 kg}	—	13.7 N {1.4 kg}	

OPERATION

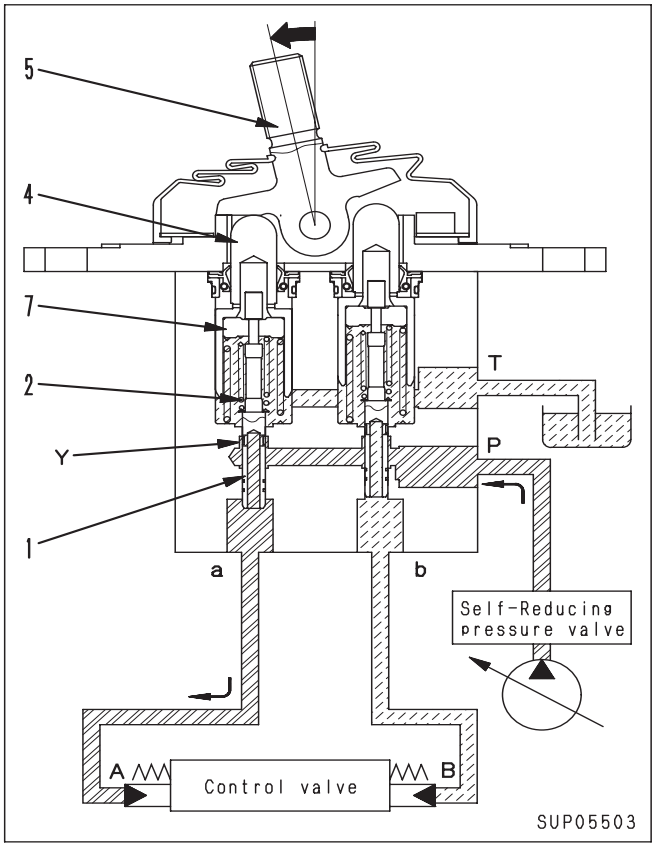
At neutral

- The pressurized oil from the main pump enters from port **P** and is blocked by spool (1).
- Ports **A** and **B** of the control valve and ports **a** and **b** of the PPC valve are connected to drain port **T** through fine control hole **X** of spool (1).



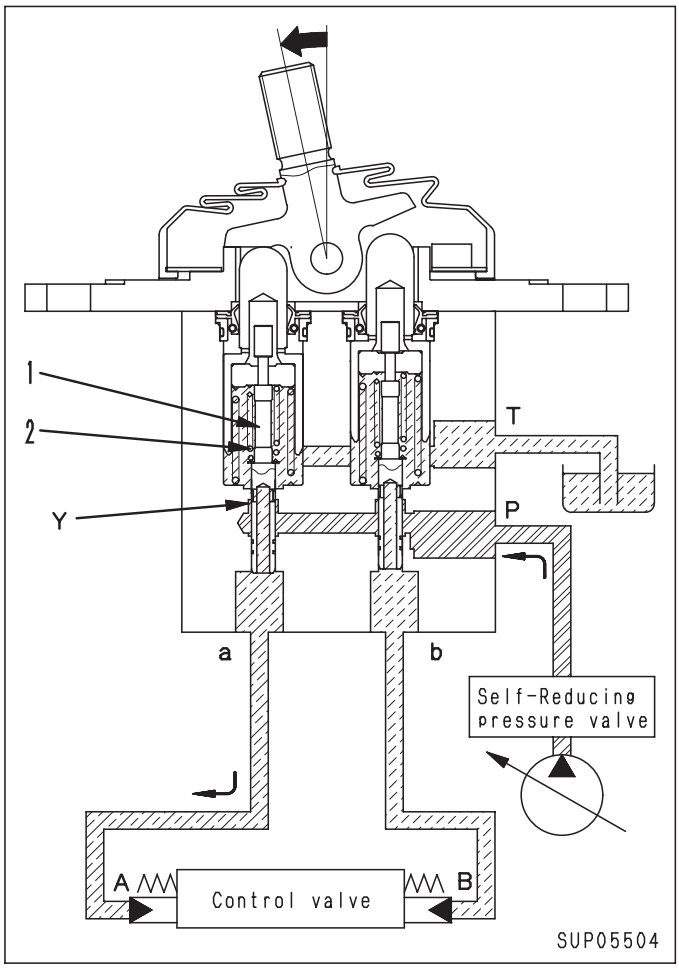
WHEN OPERATED

- When lever (5) is moved, metering spring (2) is pushed by piston (4) and retainer (7), and spool (1) is pushed down by this.
- As a result, fine control portion **Y** is connected with port **a**, and the pressurized oil from port **P** flows from port **a** to port **A** of the control valve.



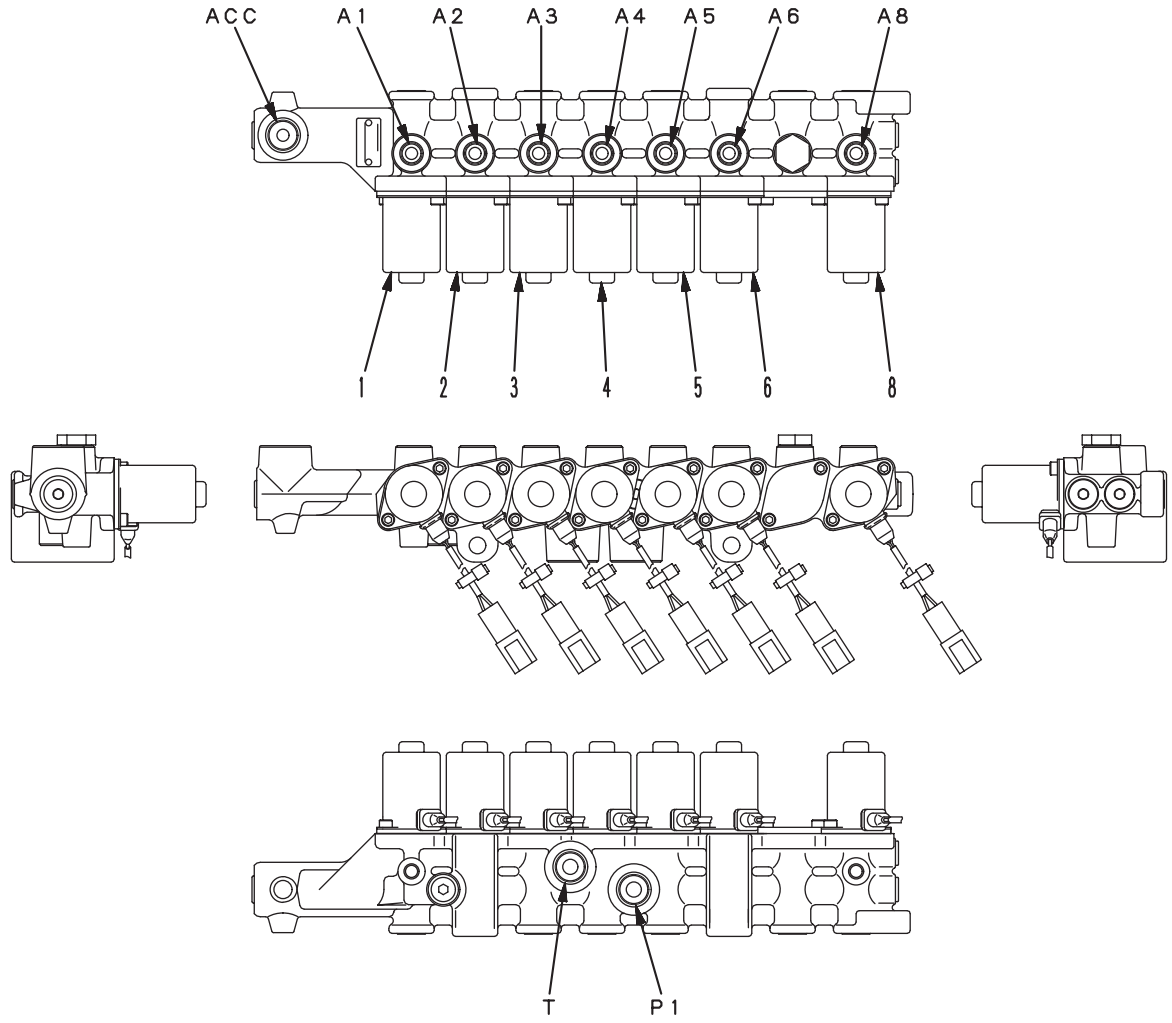
- When the pressure at port **a** becomes higher, spool (1) is pushed back by the force acting on the end of the spool, and fine control portion **Y** closes.
- As a result, spool (1) moves up and down to balance the force at port **a** and the force at metering spring (2).
- Therefore, metering spring (2) is compressed in proportion to the amount the control lever is moved. The spring force becomes larger, so the pressure at port **a** also increases in proportion to the amount the control lever is operated.

  In this way, the control valve spool moves to a position where the pressure of port **A** (the same as the pressure at port **a**) is balanced with the force of the return spring of the control valve spool.



SOLENOID VALVE

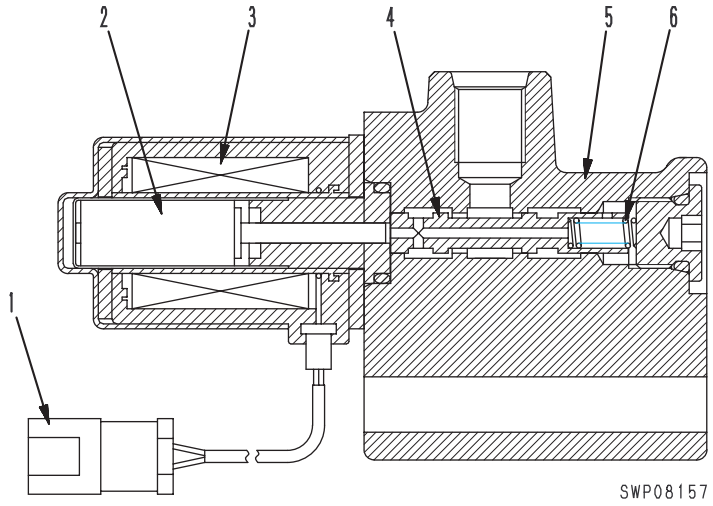
PPC lock, 2-stage relief, travel speed, swing brake, merge-divider, machine push-up, travel junction solenoid valves



SJP09067

1. PPC lock solenoid valve
2. Travel junction solenoid valve
3. Merge-divider solenoid valve
4. Travel speed solenoid valve
5. Swing brake solenoid valve
6. Machine push-up solenoid valve
8. 2-stage relief solenoid valve

T : To tank
A1 : To PPC valve
A2 : To main valve (Travel junction valve)
A3 . To main valve (Merge-divider valve)
A4 : To both travel motors
A5 : To swing motor
A6 : To 2-stage safety valve at boom cylinder head
A8 : To main valve (2-stage relief valve)
P1 : From main pump
ACC: To accumulator



1. Connector
2. Moving core
3. Coil
4. Spool
5. Block
6. Spring

OPERATION

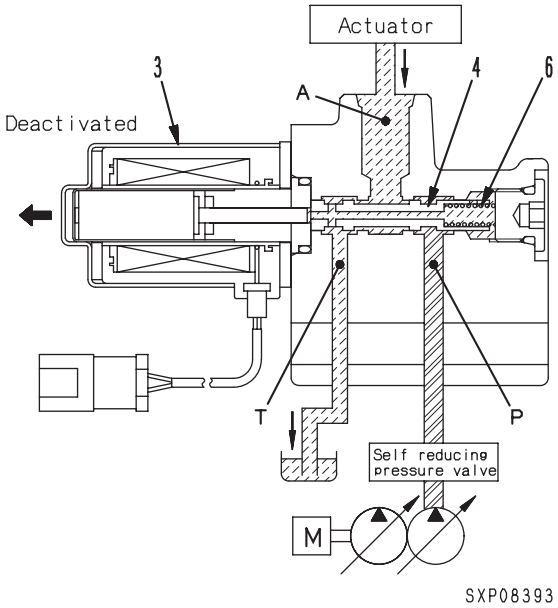
WHEN SOLENOID IS TURNED OFF

- Since the signal current does not flow from the controller, solenoid (3) is turned off.

  Accordingly, spool (4) is pressed by spring (6) against the left side.

  By this operation, the pass from **P** to **A** is closed and the hydraulic oil from the main pump does not flow into the actuator.

  At this time, the oil from the actuator is drained through ports **A** and **T** into the tank.



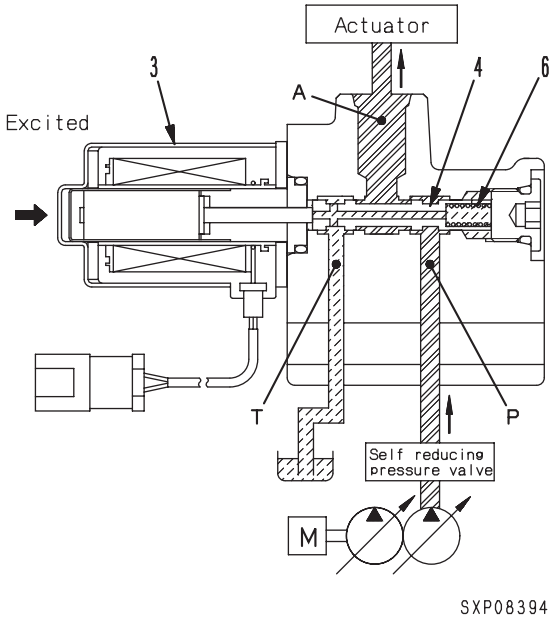
WHEN SOLENOID IS TURNED ON

The signal current flows from the controller to solenoid (3), and the latter is turned on.

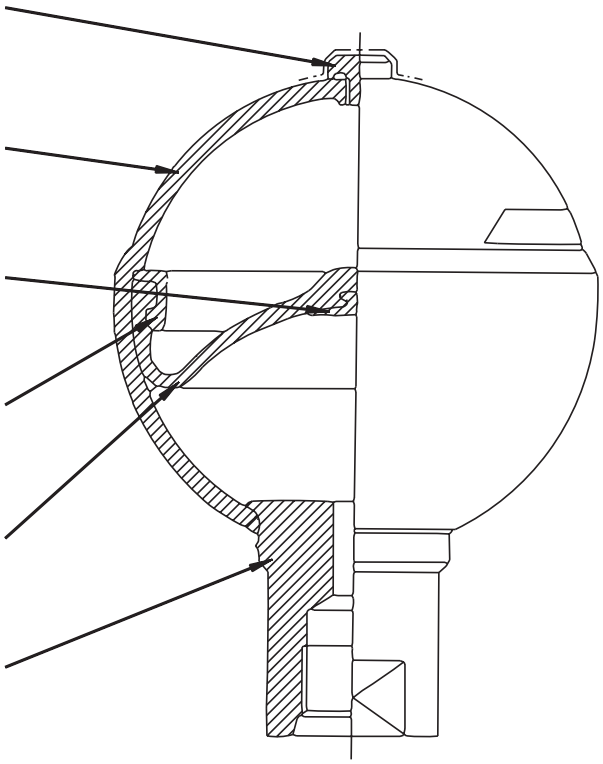
Accordingly, spool (4) is pressed against to the right side.

By this operation, the hydraulic oil from the main pump flows through port **P** and spool (4) to port **A**, then flows into the actuator.

At this time, port **T** is closed and the oil does not flow into the tank.



PPC ACCUMULATOR



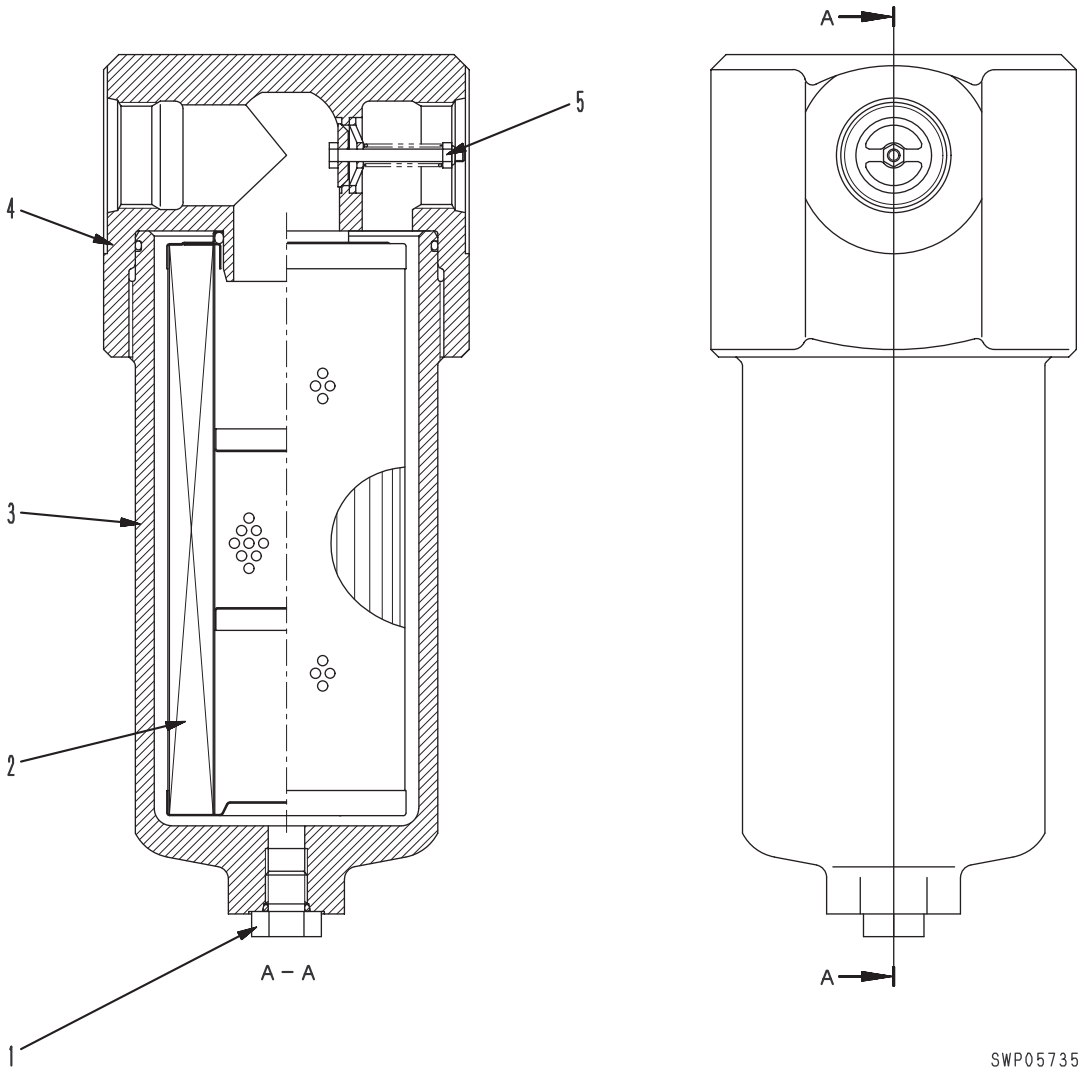
SBP00290

1. Gas plug
2. Shell
3. Poppet
4. Holder
5. Bladder
6. Oil port

SPECIFICATIONS
Gas capacity:300 cc (for PPC)

RETURN OIL FILTER

FOR BREAKER



1. Drain plug
2. Element
3. Case
4. Head cover
5. Relief valve

SPECIFICATIONS

Rated pressure:		6.9 MPa {70 kg/cm^2}
Flow	:	200 **l**/min.
Relief valve cracking pressure:		
		0.34 ± 0.05 MPa
		{3.5 ± 0.5 kg/cm^2}
Filter mesh size:		6 μm
Filtering area	:	4,570 cm^2

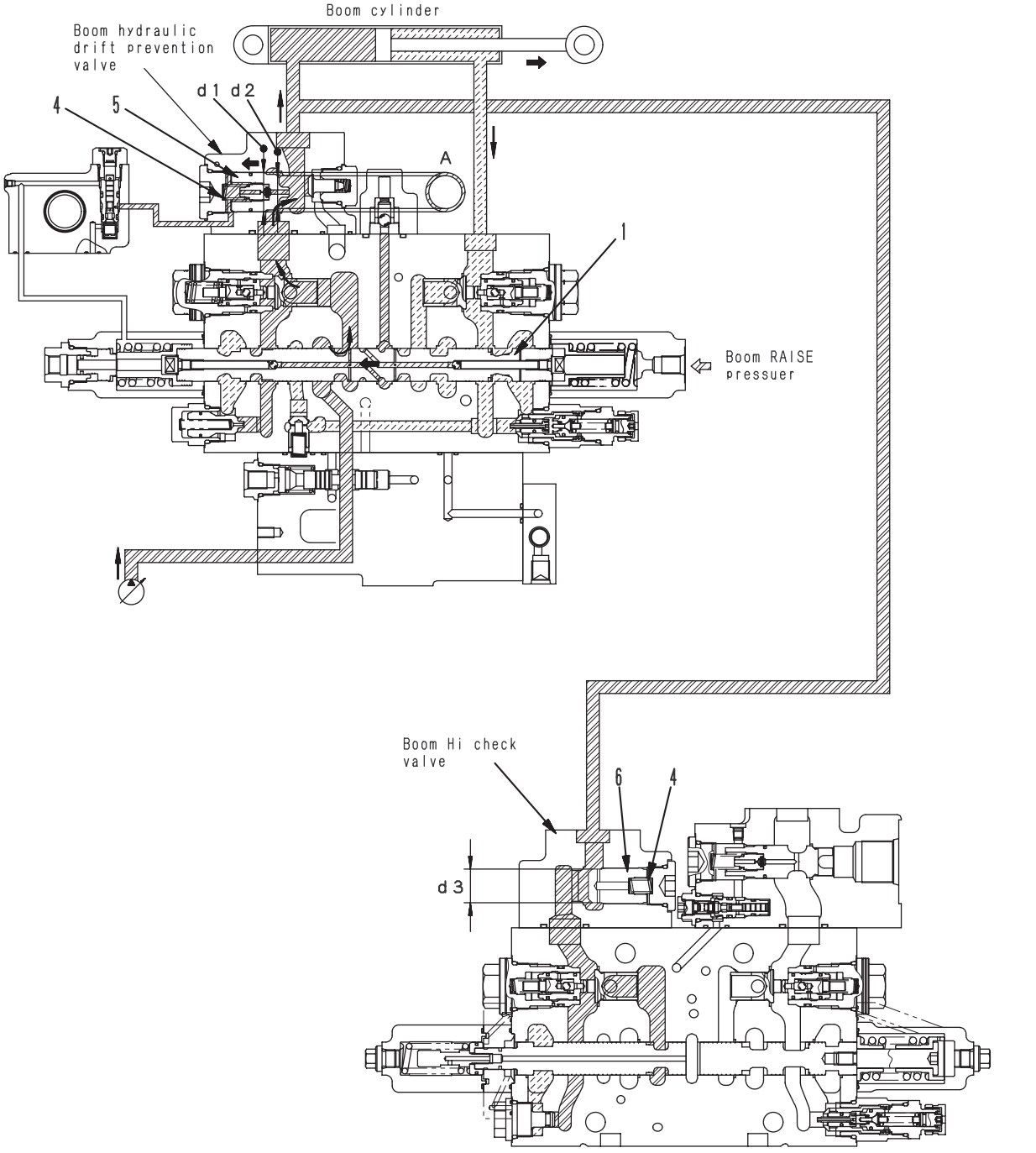
BOOM HYDRAULIC DRIFT PREVENTION VALVE

Function

- When the boom lever is not being operated, these valves act to prevent the oil at the boom bottom from leaking from spool (1) and prevent the boom from moving down.

Operation

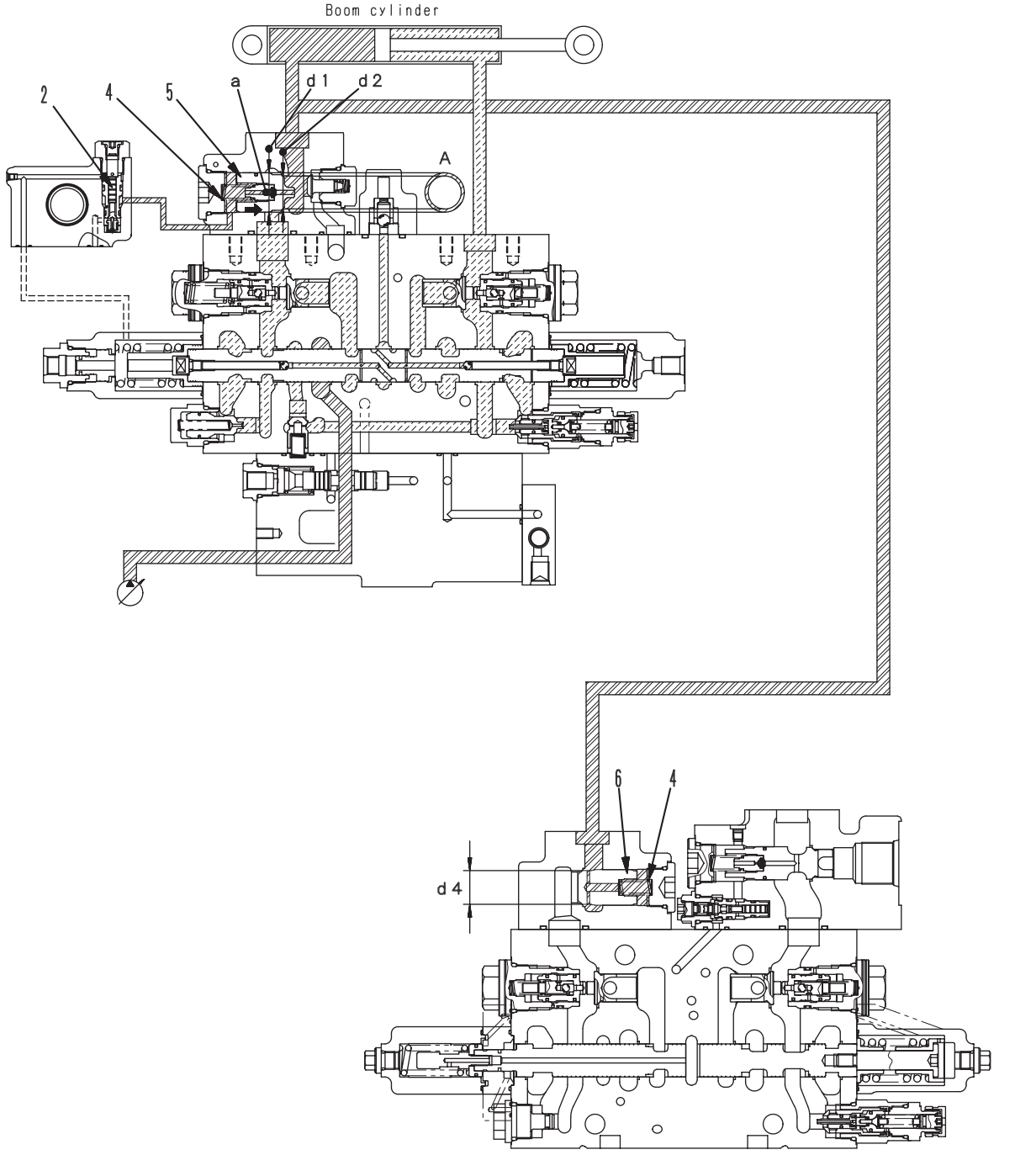
1. **Boom RAISE**
   When the boom RAISE is operated, the main pressure oil acts in the left direction on ring-shaped area **A** (= Area of ∅d1 - Area of ∅d2) because of the difference in the outside diameter **d1** of poppet (5) and seat diameter **d2**. When it overcomes the force of spring (4), poppet (5) moves to the left.
   In addition, the main pressure oil acts in the right direction on seat diameter **d3** of valve (6). When it overcomes the force of spring (4), valve (6) moves to the right.
   As a result, the main pressure oil prom the control valve passes through the opening of poppet (5) and flows to the bottom end of the boom cylinder.


Boom cylinder
Boom hydraulic drift prevention valve
d1 d2
4
5
A
1
Boom RAISE pressuer
Boom Hi check valve
6
4
d3
SXP09169

2. Boom at HOLD

- When the boom is raised and the control lever is returned to the HOLD position, the oil that has flowed into the inside of poppet (5) through orifice **a** in poppet (5) is closed by pilot piston (2).

  The main pressure oil and hold pressure at the bottom of the boom cylinder are shut off.
- At the same time, the hold pressure at the bottom end of the boom cylinder acts in the right direction on ring-shaped area **A** (= Area of ∅d1 - Area of ∅d2) because of the difference in the outside diameter **d1** of poppet (5) and seat diameter **d2**. Poppet (5) is closed by the total of this force and the force of spring (4), so the main pressure oil and hold pressure at the bottom of the boom cylinder are shut off.
- In addition, the hold pressure at the bottom of the boom cylinder acts in the left direction on outside diameter **d4** of valve (6).
- Valve (6) is closed by the total of this force and the force of spring (4), so the main pressure oil and hold pressure at the bottom of the boom cylinder are shut off. As a result, the boom is held in position.



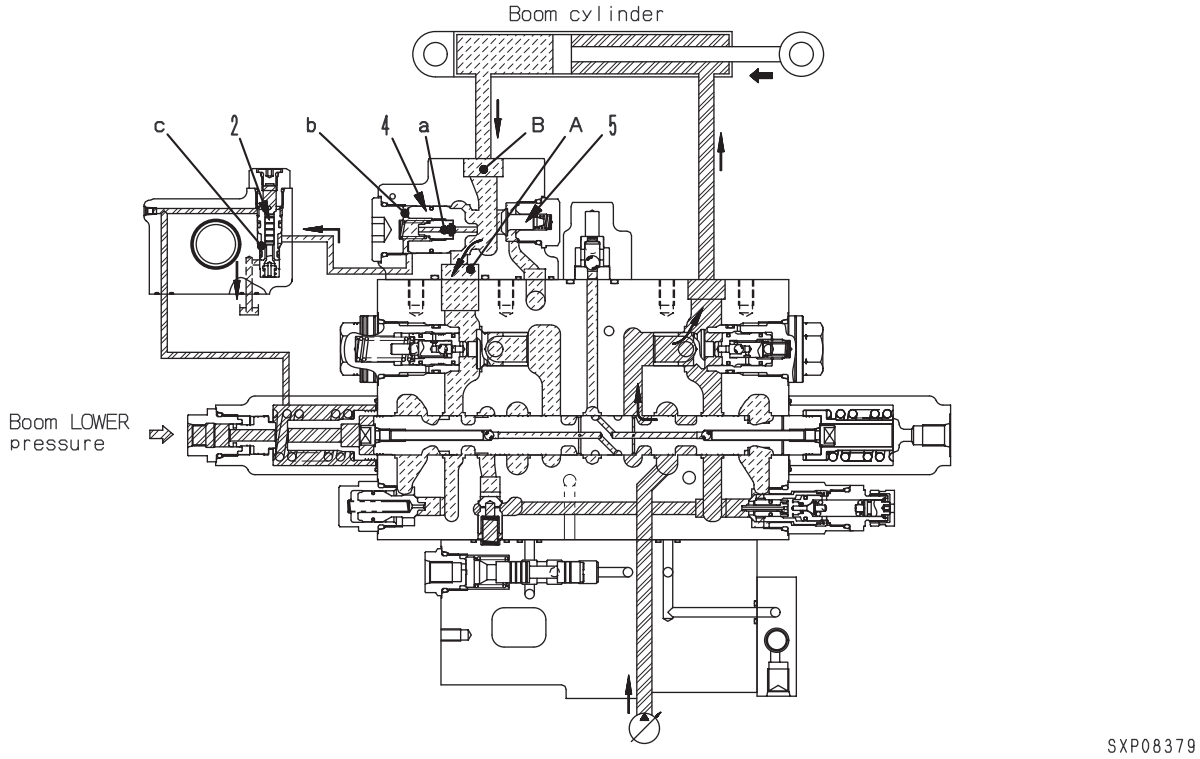
SXP09170

3. Boom LOWER

- When boom LOWER is operated, the pilot pressure from the PPC valve pushes pilot spool (2), and the pressure oil chamber **b** inside the poppet is drained through orifice **c**.

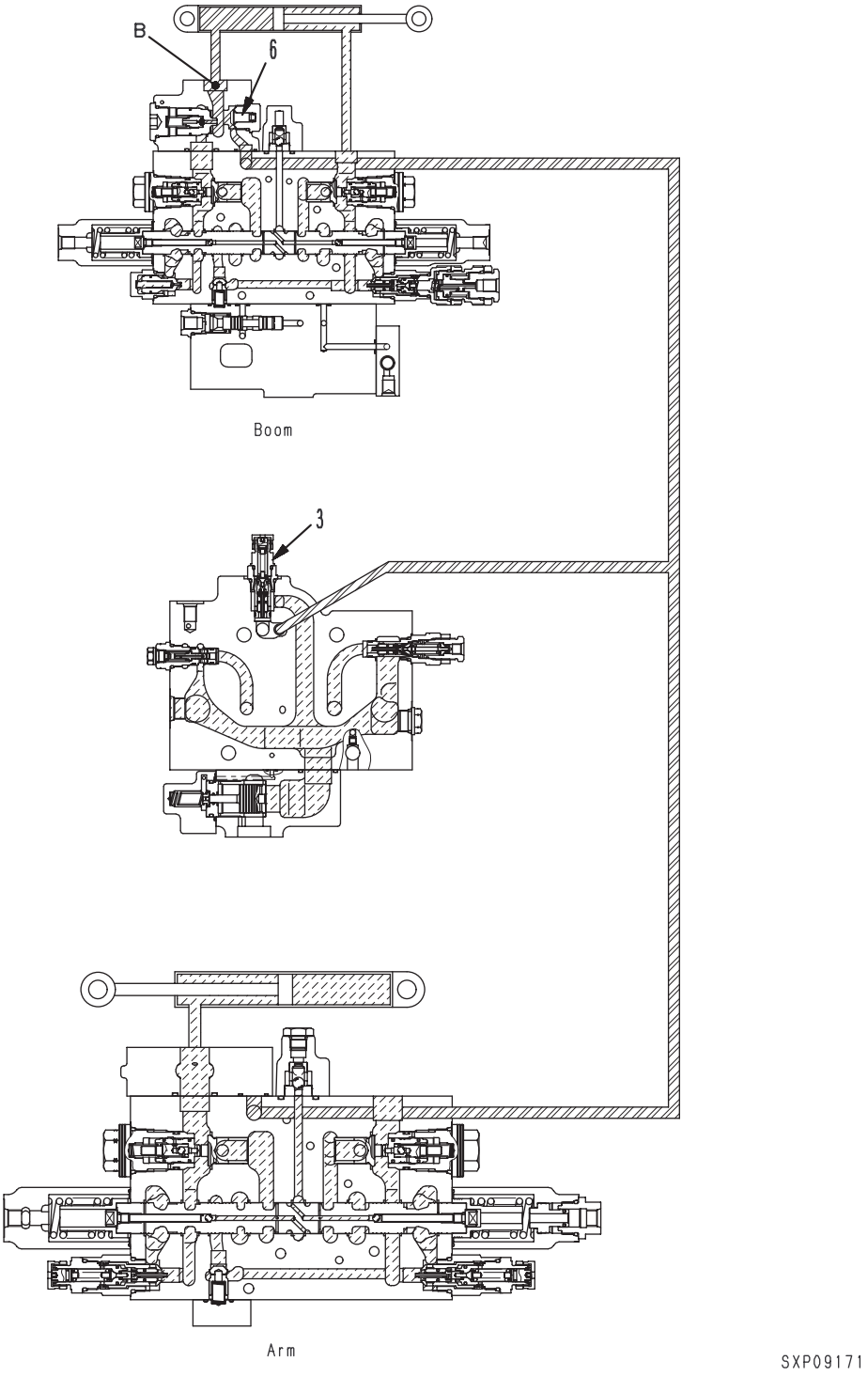
  The oil at the bottom end of the boom flows from orifice **a** to chamber **b** to orifice **c** to drain, so the oil pressure in chamber **b** drops.

  When the pressure in chamber **b** drops below the pressure at port **b**, poppet (4) opens, and the pressure oil from port **B** goes to port **A** and flows to the control valve.



4. When abnormally high pressure is generated

- If abnormally high pressure is generated in the boom cylinder bottom circuit, the hydraulic oil in port B pushes check valve (6) open, then safety valve (3) operates.
- If the hydraulic drift prevention valve for the arm cylinder head circuit is installed (optional), the hydraulic oil in the boom cylinder bottom circuit or that in the arm cylinder head circuit, having higher pressure, pushes check valve (6) open, then safety valve (3) operates.



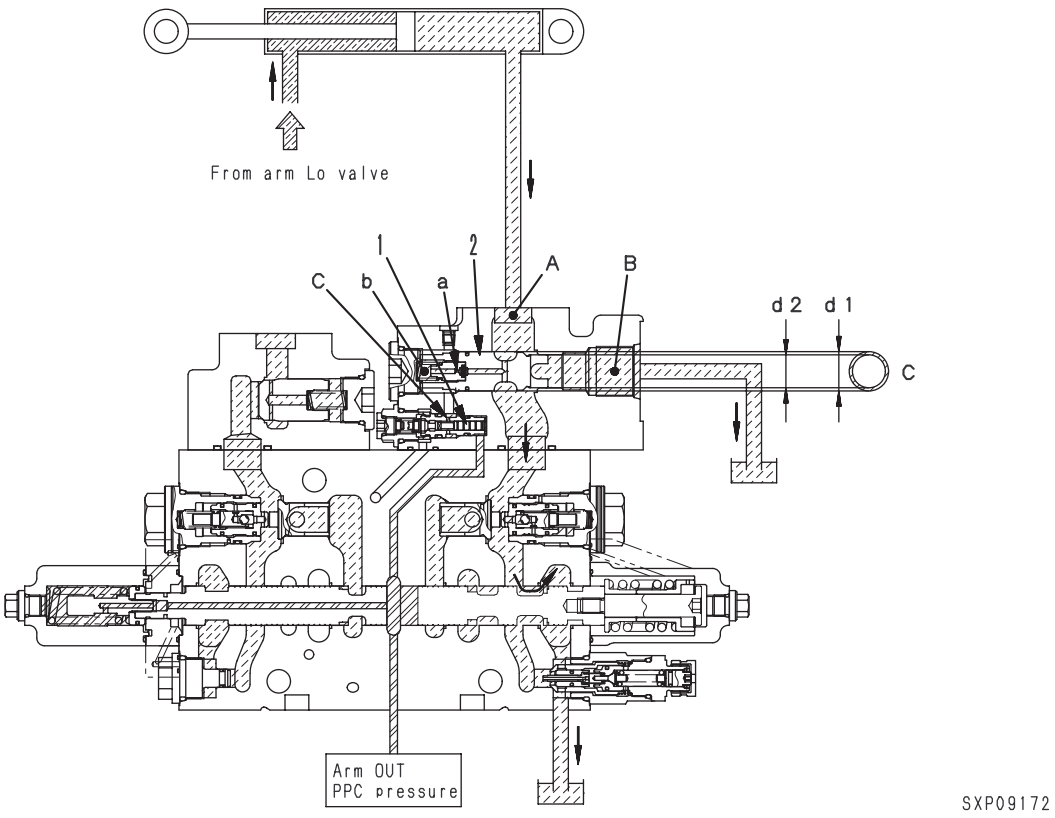
QUICK RETURN VALVE

FUNCTION

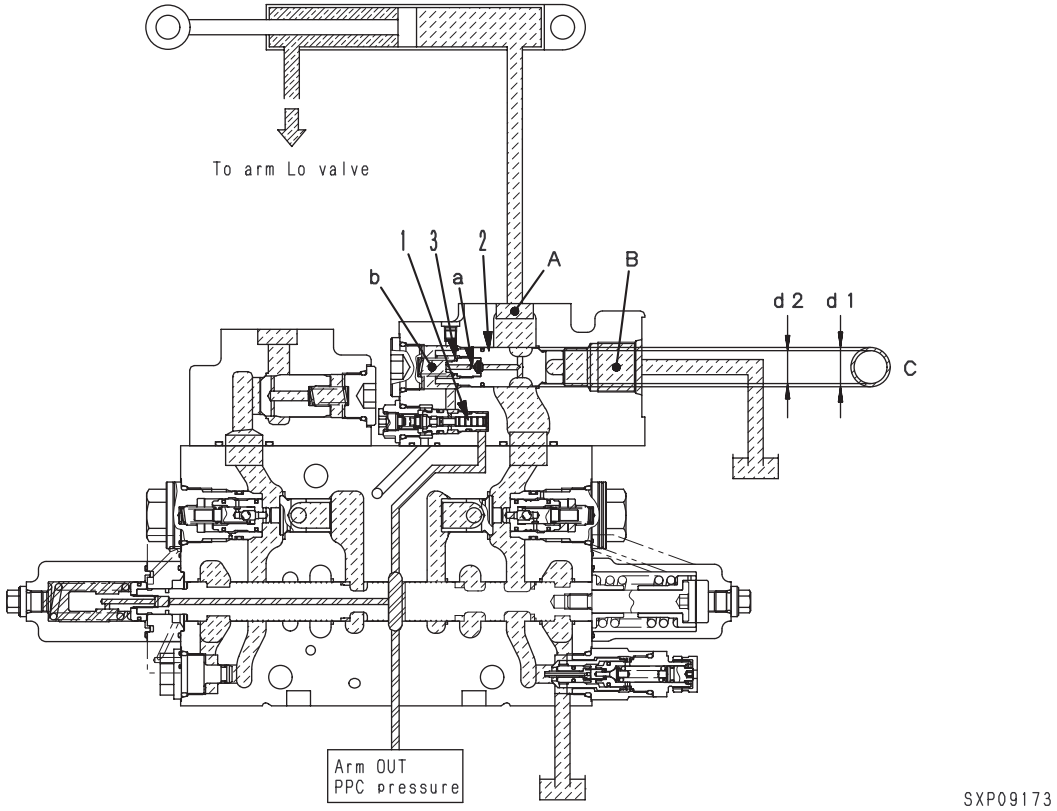
When arm OUT is operated, this valve reduces the pressure loss of the large amount of oil returning from the cylinder bottom.

OPERATION

1. Arm at OUT
   When arm OUT is operated, the pilot pressure from the PPC valve pushes pilot spool (1), and the pressure oil from chamber **b** inside the poppet is drained through orifice **c**.
   The oil at the bottom end of the arm flows from orifice **a** to chamber **b** to orifice **c** to drain, so the oil pressure in chamber **b** drops.
   When the pressure in chamber **b** drops below the pressure at port **A**, the pressure at port **A** and acts on ring -shaped area **C** (= Area of ⌀d1 - Area of ⌀d2) because of the difference in the outside diameter **d1** of valve (2) and seat diameter **d2**. Valve (2) moves to the left and the pressure oil from port **A** goes to port **B**. From port **B**, the oil is drained directly to the tank.



2. Arm at HOLD
   The oil that has flowed through orifice **a** in valve (2) is closed by pilot piston (1). At the same time, the hold pressure at the bottom end of the arm acts in the right direction on ring-shaped area **C** (= Area of ∅d1 - Area of ∅d2) because of the difference in the outside diameter **d1** of valve (2) and seat diameter **d2**. Valve (2) is closed by the total of this force and the force of spring (3), so port **A** and port **B** are shut off.



LIFT CHECK VALVE

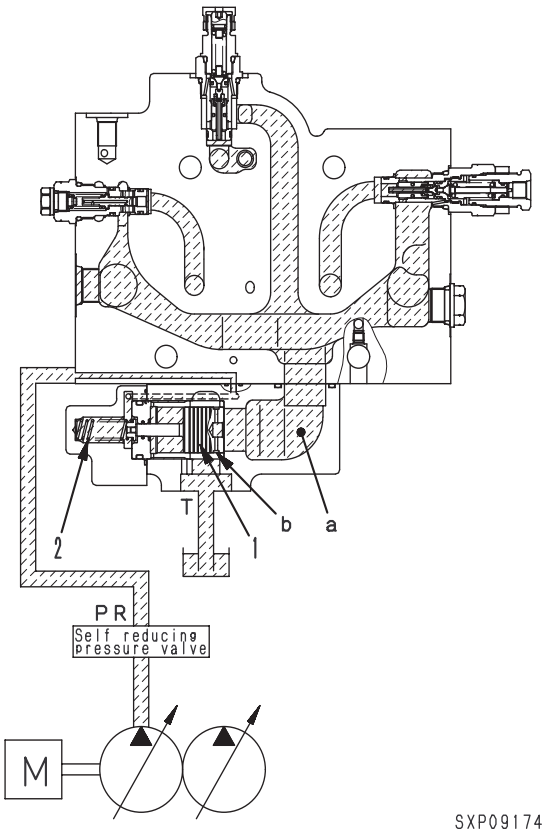
Function

This valve applies back pressure to the drain circuit to prevent generation of negative pressure on the hydraulic devices for the work equipment (motors, cylinders, etc.)

Operation

1. While engine is stopped

Any oil is not supplied from the pump to the self-pressure reducing valve and valve (1) is pressed by only the force of spring (2) toward the right and drain circuit "a" of the control valve is connected through orifice "b" of valve (1) to port T.

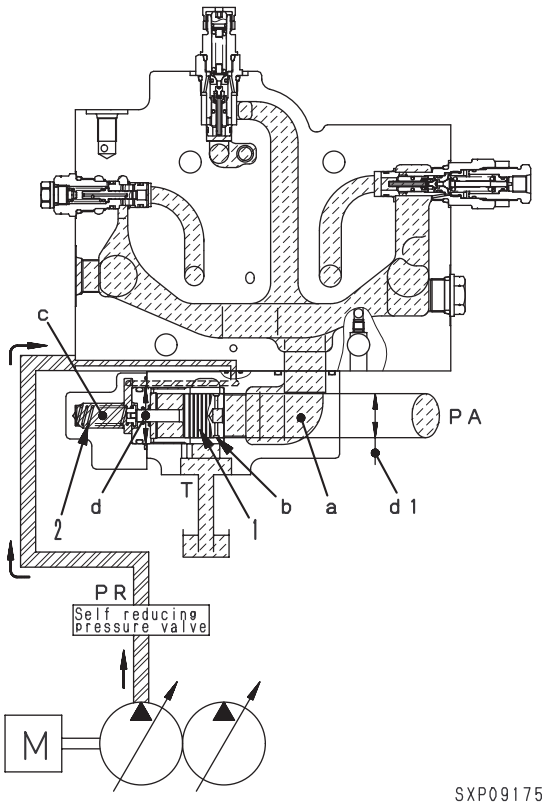


SXP09174

2. While engine is running

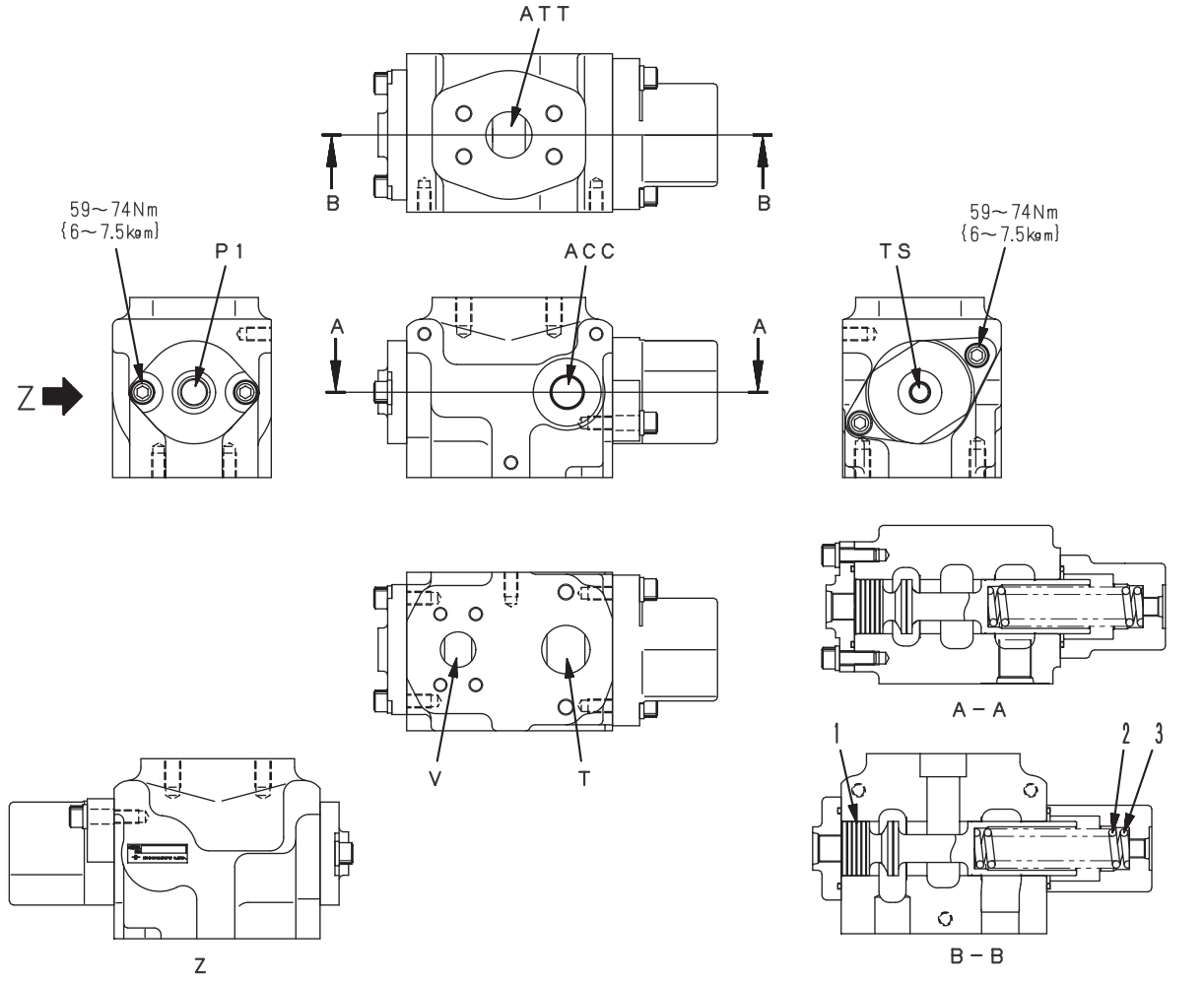
- Output pressure PR of the self-pressure reducing valve is applied through the control valve to spring chamber "c" of the back pressure valve.
- Output pressure PR applied to spring chamber "c" is applied to the left end of valve (1) (area of ⌀d) to push valve (1) to the right.
- At this time, pressure PA of drain circuit "a" of the control valve is applied to the right end of valve (1) (area of ⌀d1) to push valve (1) to the left.
- Valve (1) is balanced so that the back pressure PA will be as follows.

  PA = {(Area of ⌀d) x PR + Force of spring (2)} / (Area of ⌀d1)



SXP09175

ATTACHMENT CIRCUIT SELECTOR VALVE



1. Spool
2. Spring

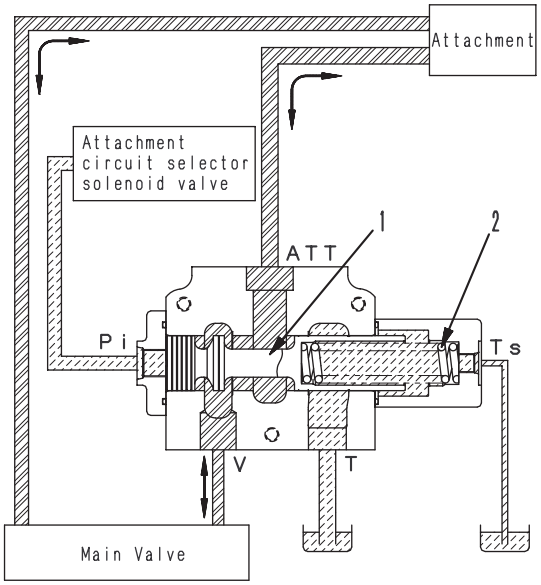
V : To control valve
T : To hydraulic tank
ATT: To attachment
ACC: To accumulator
P1 : From attachment circuit selector solenoid valve
TS : To hydraulic tank

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
3	Spool return spring	Free length x Outside Dia.	Installed length	Installed load	Free length	Installed load	Replace spring if any damages or deformations are found
		132.0 x 29	114.5	833 N {85.0 Kg}	--	666 N {68.0 Kg}	

Function

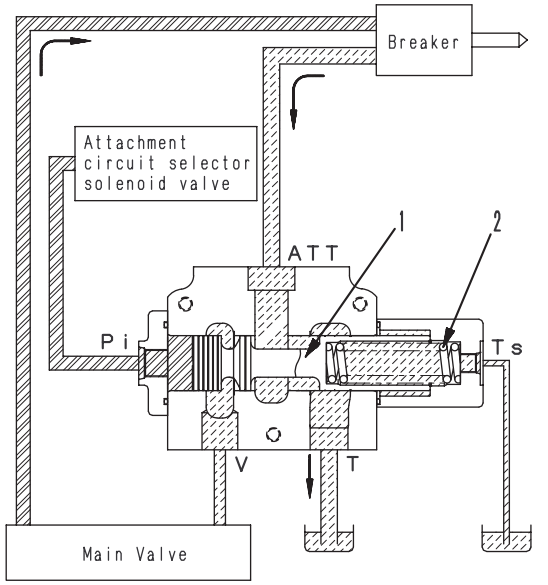
When a breaker is installed, the return oil from the breaker does not pass through the main valve, but returns directly to the hydraulic tank. When other attachments (crusher, etc.) are installed, the attachment and the main valve are interconnected.



SJP08901

Operation

1. **When attachment other than breaker is installed**
   Spool (1) is pushed fully to the left by the force of spring (2), ATT port and port V are interconnected, and ATT port and port T are shut off, so the attachment and main valve are interconnected.

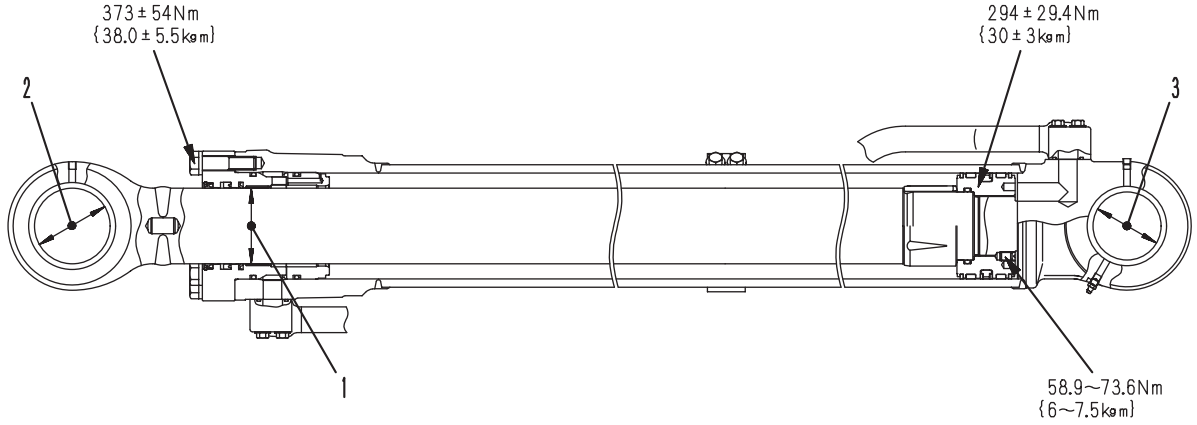


SJP08902

2. **When breaker is installed**
   When the pilot pressure from the attachment circuit selector solenoid valve overcomes the force of spring (2), the spool (1) moves fully to the right. ATT port and port V are shut off and ATT port and port T are interconnected, so the oil returning from the breaker does not pass through the main valve, but passes through port T and returns directly to the hydraulic tank.

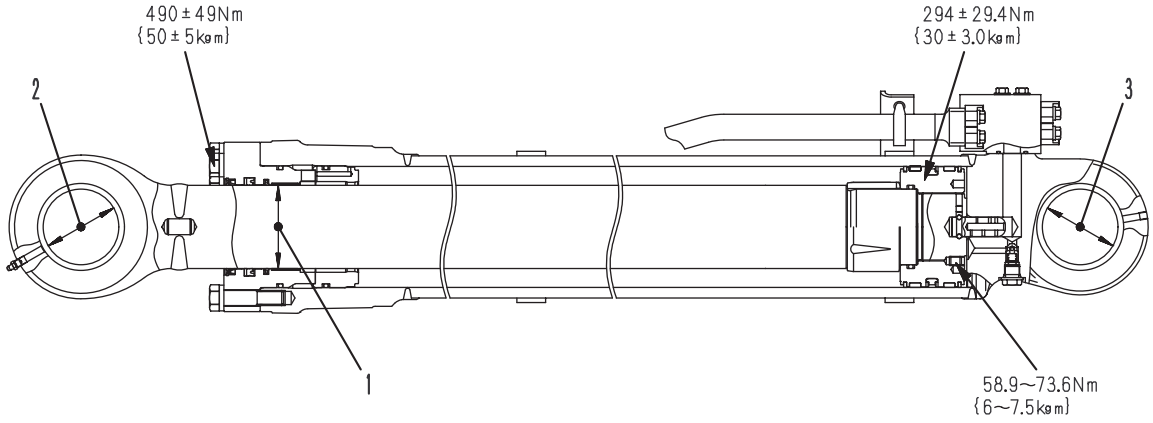
HYDRAULIC CYLINDER

BOOM CYLINDER



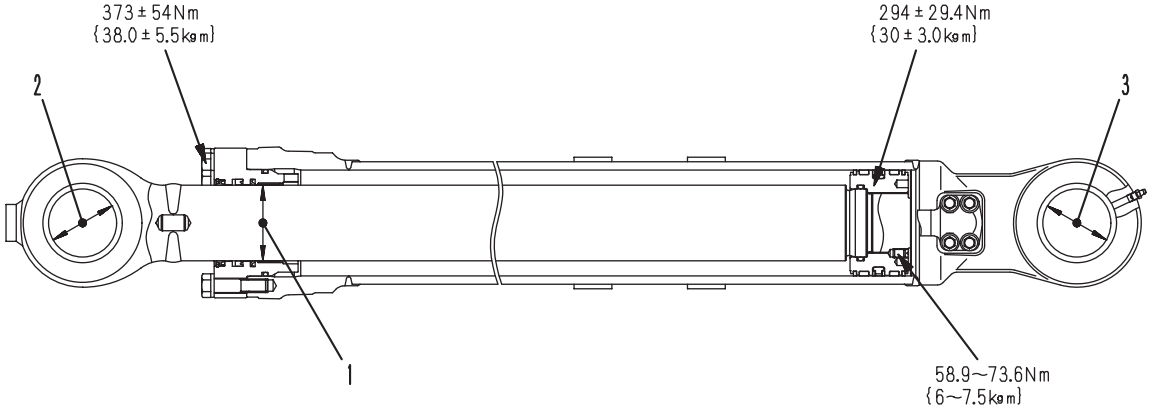
SJP09061

ARM CYLINDER



SJP09062

BUCKET CYLINDER

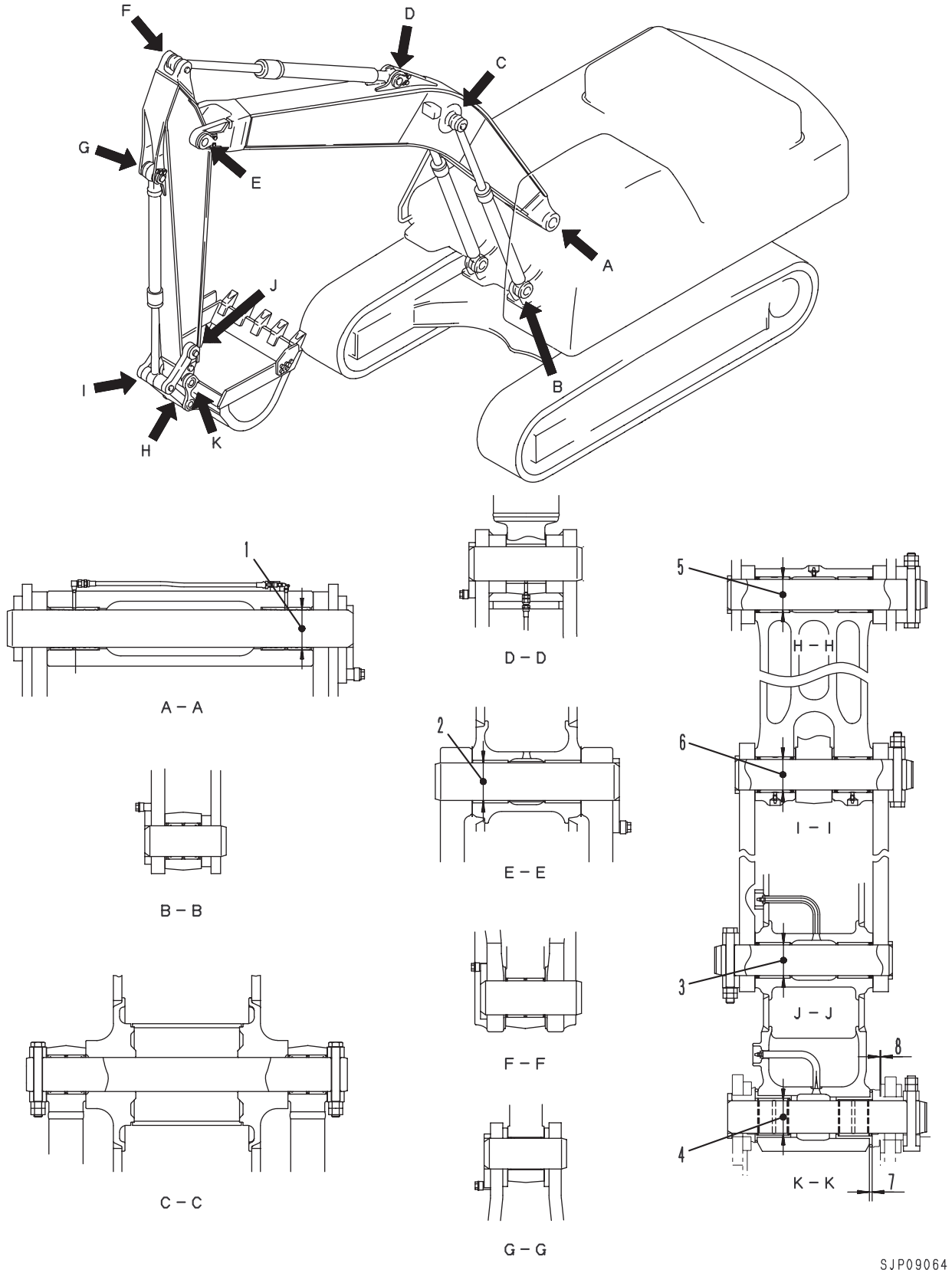


SJP09063

Unit: mm

No.	Check item		Criteria					Remedy
		Cylinder	Standard size	Tolerance		Standard clearance	Clearance limit	
				Shaft	Hole			
1	Clearance between piston rod and bushing	Boom	100	-0.036 -0.090	+0.035 +0.005	0.041 ~ 0.125	0.412	Replace bushing
		Arm	110	-0.036 -0.090	+0.261 +0.047	0.083 ~ 0.351	0.412	
		Bucket	100	-0.030 -0.076	+0.257 +0.047	0.083 ~ 0.347	0.447	
2	Clearance between piston rod support pin and bushing	Boom	100	-0.030 -0.060	+0.190 +0.070	0.100 ~ 0.250	—	Replace pin or bushing
		Arm	100	-0.030 -0.076	+0.190 +0.070	0.105 ~ 0.251	—	
		Bucket	90	-0.030 -0.076	+0.190 +0.070	0.100 ~ 0.246	—	
3	Clearance between cylinder bottom support pin and bushing	Boom	90	-0.030 -0.060	+0.190 +0.070	0.075 ~ 0.225	—	
		Arm	100	-0.030 -0.076	+0.190 +0.070	0.105 ~ 0.251	—	
		Bucket	90	-0.030 -0.060	+0.190 +0.070	0.100 ~ 0.230	—	

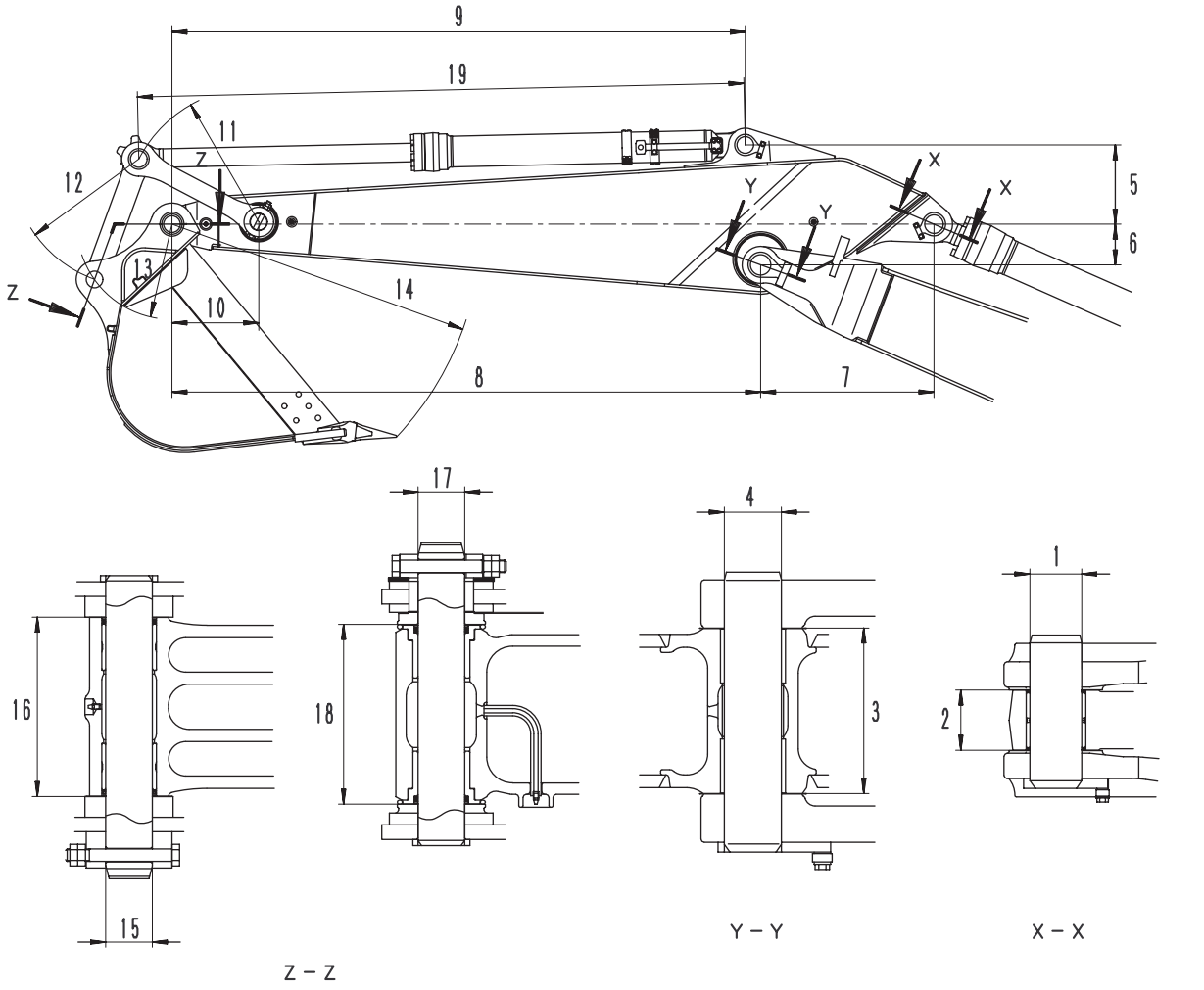
WORK EQUIPMENT



Unit: mm

No.	Check item	Criteria					Remedy
1	Clearance between connecting pin and bushing of revolving frame and boom	Standard size	Tolerance		Standard clearance	Clearance limit	Replace
			Shaft	Hole			
		110	-0.036 -0.090	+0.157 +0.079	0.115 ~ 0.247	1.0	
2	Clearance between connecting pin and bushing of boom and arm	110	-0.036 -0.090	+0.179 +0.081	0.117 ~ 0.269	1.0	
3	Clearance between connecting pin and bushing of arm and link	90	-0.036 -0.090	+0.165 +0.072	0.108 ~ 0.255	1.0	
4	Clearance between connecting pin and bushing of arm and bucket	90	-0.036 -0.090	+0.145 +0.083	0.119 ~ 0.235	1.0	
5	Clearance between connecting pin and bushing of link and bucket	90	-0.036 -0.090	+0.165 +0.072	0.108 ~ 0.255	1.0	
6	Clearance between connecting pin and bushing of link and link	90	-0.036 -0.090	+0.163 +0.069	0.105 ~ 0.253	1.0	
7	Bucket clearance (a)	0.5 ~ 1.0					Adjust shims
8	Bucket clearance (b)	2.0					

1. DIMENSION OF ARM

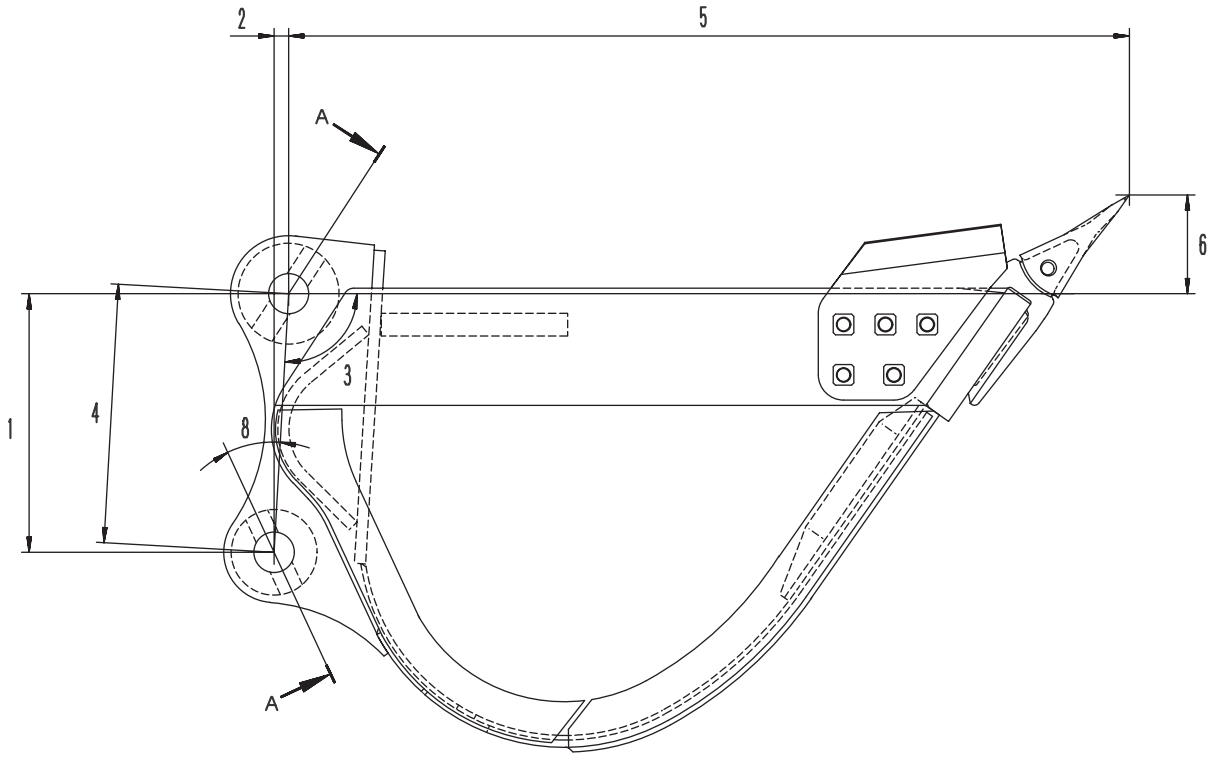


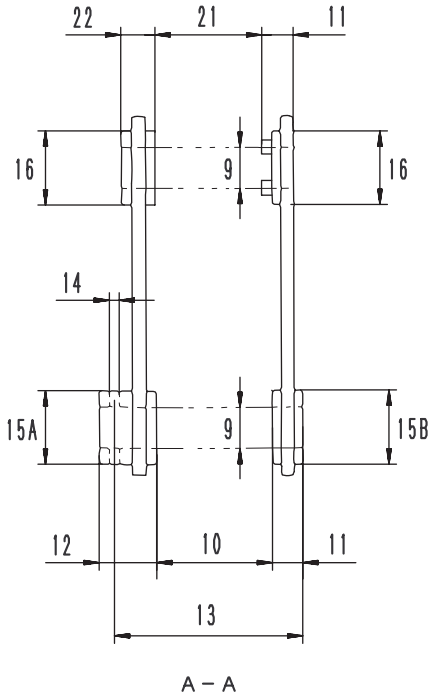
SAP00446

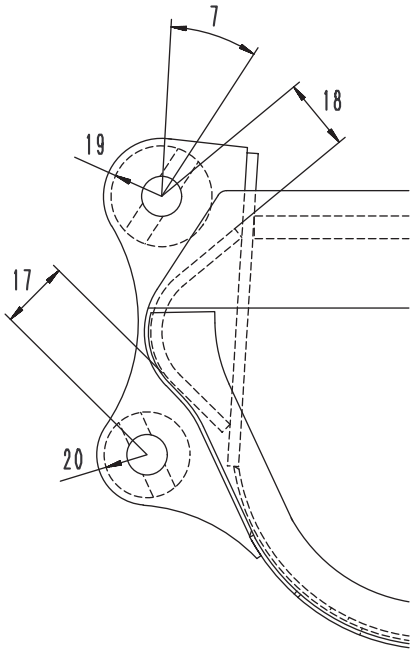
Unit: mm

No. \ Model		PC340LC-7, PC340NLC-7
1		$\phi 100\ ^{+0.1}_{0}$ / $^{-0.036}_{-0.071}$
2		$119.3\ ^{+1.5}_{0}$ / 116 ± 1.2
3		$320\ ^{+0.5}_{0}$ / $316\ ^{-0.3}_{-0.8}$
4		$\phi 110\ ^{0}_{-0.5}$ / $^{-0.036}_{-0.090}$
5		470.6 ± 1
6		236.5 ± 0.5
7		1022.4 ±1
8		3,178 ± 3
9		2,975.6 ± 1
10		472.5
11		731.0 ± 0.2
12		728.0 ± 0.5
13		513.6
14		1,670
15		$\phi 90\ ^{+0.2}_{0}$ / $^{-0.036}_{-0.090}$
16		345.0 ± 0.5
17		$\phi 90\ ^{+0.2}_{0}$ / $^{-0.036}_{-0.090}$
18	Arm as individual part	$330\ ^{0}_{-0.5}$
	When pressfitting bushing	345
19	Min.	1,870
	Max.	3,155

2.DIMENSION OF BUCKET







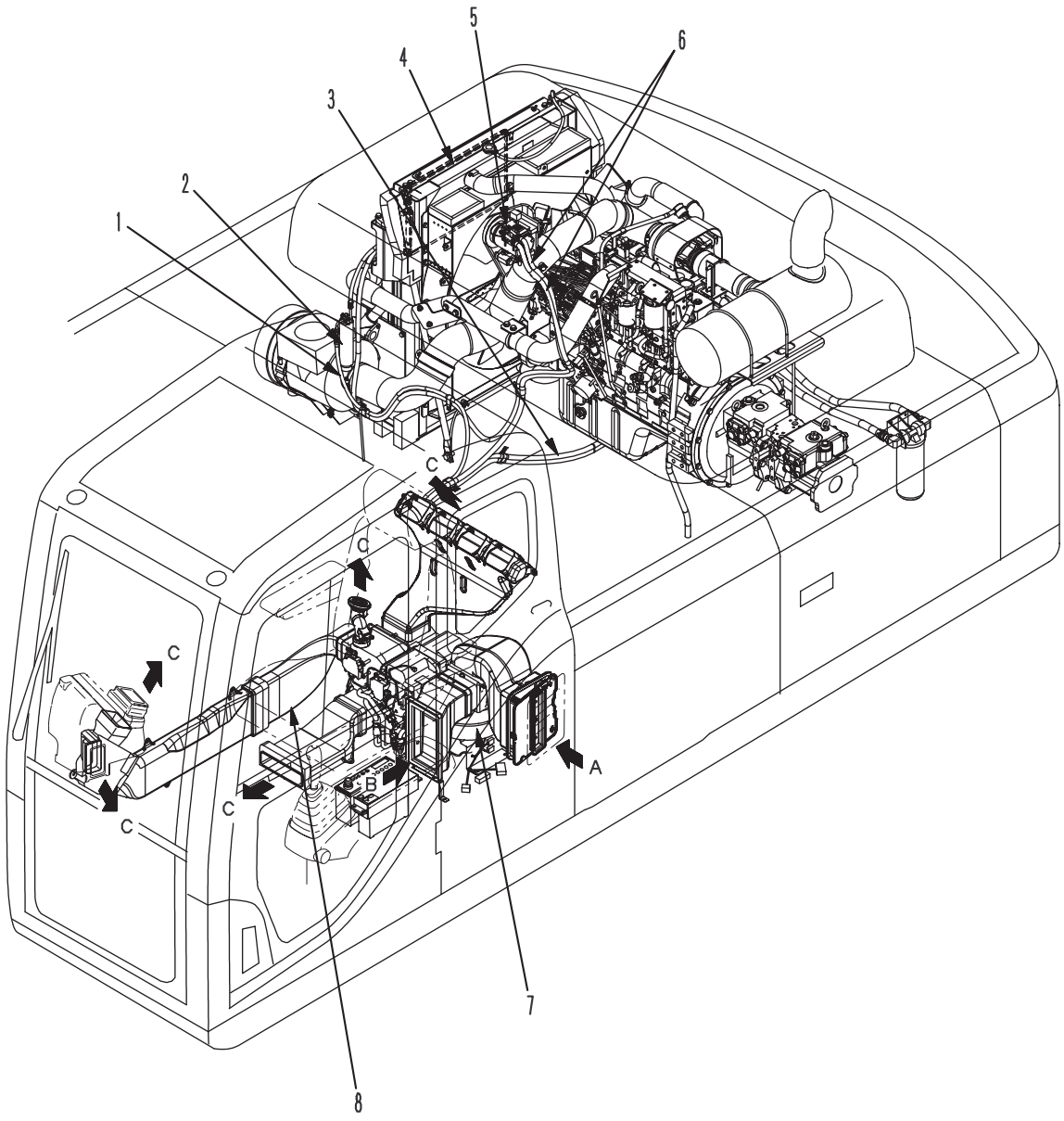
SJP09065

Unit: mm

No.	Model	PC340LC-7, PC340NLC-7
1		512.2 ± 0.5
2		37.9 ± 0.5
3		94° 19’
4		513.6
5		1,658
6		193
7		—
8		50°
9		$\phi 90\ ^{+0.2}_{0}$
10		$346\ ^{+1}_{0}$
11		68
12		138
13		525.5 ± 0.5
14		∅ 26
15	A	∅ 165
	B	∅ 150
16		∅ 200
17		146.1
18		137.6
19		R115
20		R100
21		$370\ ^{+2}_{0}$
22		60

AIR CONDITIONER

AIR CONDITIONER PIPING

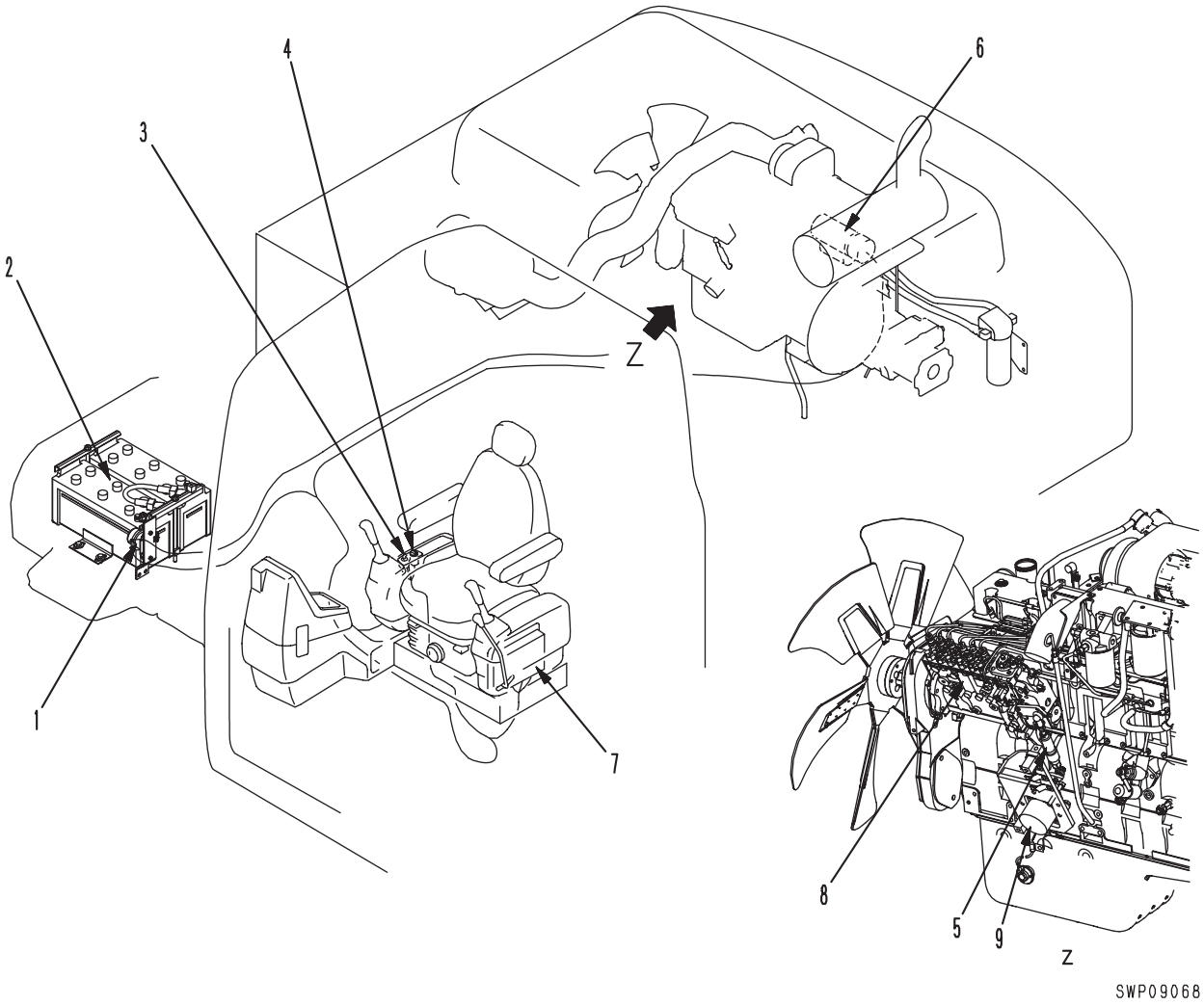


SWP09066

1. Hot water pickup piping
2. Receiver tank
3. Hot water return piping
4. Condenser
5. Air conditioner compressor
6. Refrigerant piping
7. Air conditioner unit
8. Duct

A. Fresh air
B. Recirculated air
C. Hot air/cold air

ENGINE CONTROL



1. Battery relay
2. Battery
3. Starting switch
4. Fuel control dial
5. Linkage
6. Starting motor
7. Engine throttle and pump controller
8. Fuel injection pump
9. Governor motor

OUTLINE

- The engine can be started and stopped with only starting switch (3).
- The engine throttle and pump controller(7) receives the signal of fuel control dial (4) and transmits the drive signal to governor motor (9) to control the governor lever angle of fuel injection pump (8) and control the engine speed.

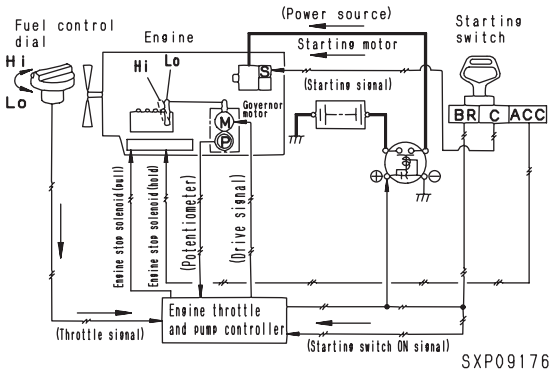
1. OPERATION OF SYSTEM

Starting engine

- When the starting switch is turned to the START position, the starting signal flows to the starting motor, and the starting motor turns to start the engine.

  When this happens, the engine throttle and pump controller checks the signal from the fuel control dial and sets the engine speed to the speed set by the fuel control dial.
- If the engine stop solenoid (shut-off valve) is not driven before starting the engine, the engine will not start.

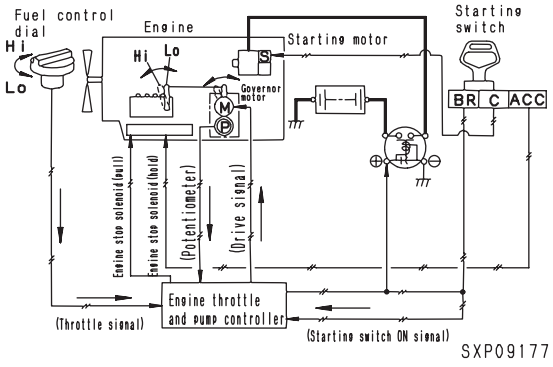
  (At the same time as the starting signal for the starting motor is input from the controller, the drive signal is output for 3 seconds.)



Engine speed control

- The fuel control dial sends a signal to the engine throttle and pump controller according to the position of the dial. The engine throttle and pump controller calculates the angle of the governor motor according to this signal, and sends a signal to drive the governor motor so that it is at that angle.

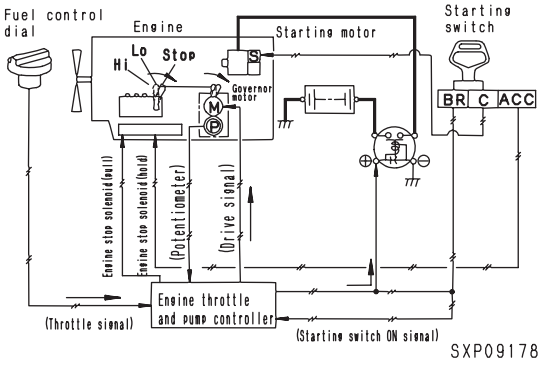
  When this happens, the operating angle of the governor motor is detected by the potentiometer, and feedback is sent to the engine throttle and pump controller, so that it can observe the operation of the governor motor.



Stopping engine

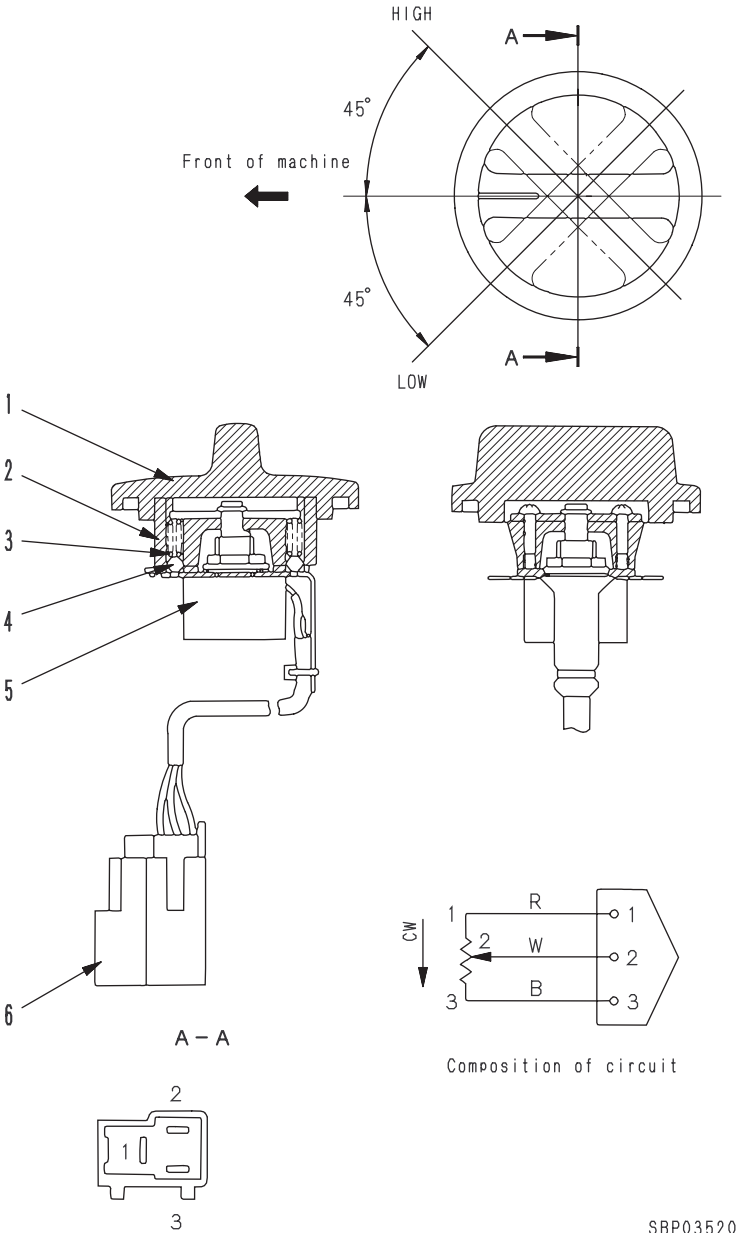
- When the engine throttle and pump controller detects that the starting switch has been turned to the STOP position, it drives the governor motor so that it is set to the low idling angle position.

  The engine stop solenoid signal (HOLD) which drives directly from the ACC signal is turned OFF and the engine stops.
- When this happens, to maintain the electric power in the system until the engine stops completely, the engine throttle and pump controller itself drives the battery relay.



1. COMPONENT

Fuel control dial

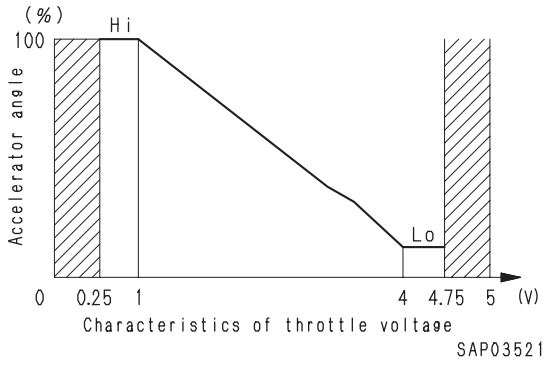


1. Knob
2. Dial
3. Spring
4. Ball
5. Potentiometer
6. Connector

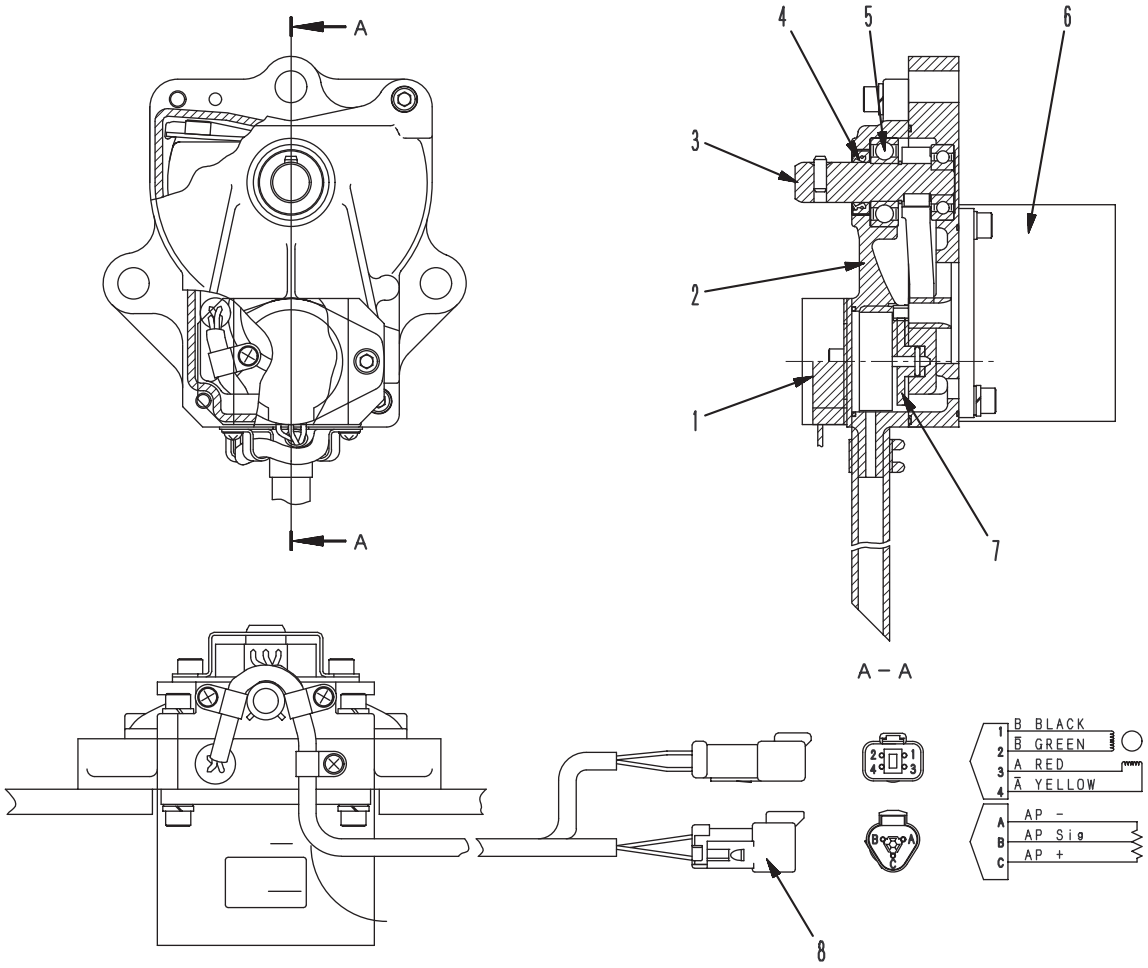
Function

- The fuel control dial is installed under the monitor panel, and a potentiometer is installed under the knob. The potentiometer shaft is turned by turning the knob.
- As the potentiometer shaft is turned, the resistance of the variable resistor in the potentiometer changes and a throttle signal is sent to the engine throttle and pump controller.

  The hatched area in the graph shown at right is the abnormality detection area.



Governor motor



SJP09072

1. Potentiometer
2. Cover
3. Shaft
4. Dust seal
5. Bearing
6. Motor
7. Gear
8. Connector

Function

- The motor is turned according to the drive signal from the engine throttle and pump controller to control the governor lever of the fuel injection pump.

  This motor used as the motive power source is a stepping motor.
- A potentiometer for feedback is installed to monitor the operation of the motor.
- Revolution of the motor is transmitted through the gear to the potentiometer.

Operation

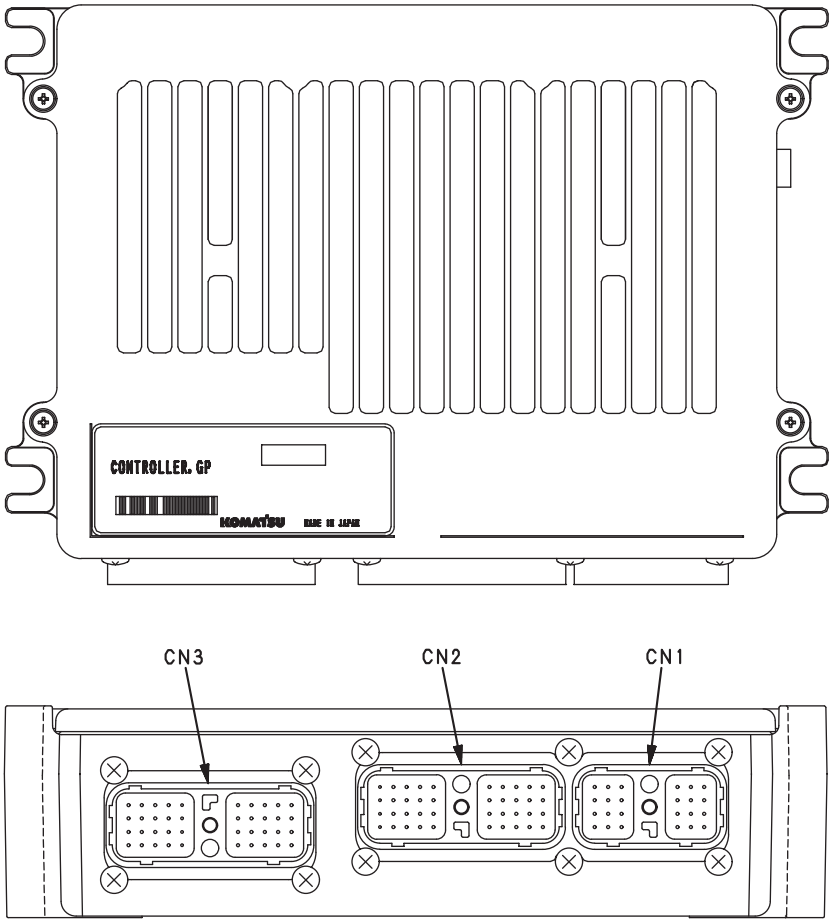
While motor is stopped

- Electric power is applied to both phases A and B of the motor.

While motor is running

- The engine throttle and pump controller supplies a pulse current to phases A and B, and the motor revolves, synchronizing to the pulse.

Engine throttle and pump controller



SJP09073

Input and output signals

CN-1

Pin No.	Signal name	Input/ output
1	—	
2	R pump pressure sensor	
3	—	Input
4	Signal GND	Input
5	Abnormality in auto-greasing controller	Input
6	NC	Input
7	Overload sensor (analog)	Input
8	F boom pressure sensor	Input
9	—	
10	Signal GND	Input
11	Knob SW	Input
12	NC	Input
13	Governor motor FB potentiometer	Input
14	—	
15	NC	Input
16	SENS_PWR	Output
17	Key Switch (Terminal C)	Input
18	NC	Input
19	Throttle potentiometer	Input
20	NC	Input
21	GND (analog GND)	
22	POT_PWR	Output
23	Key switch (terminal ACC)	Input
24	—	

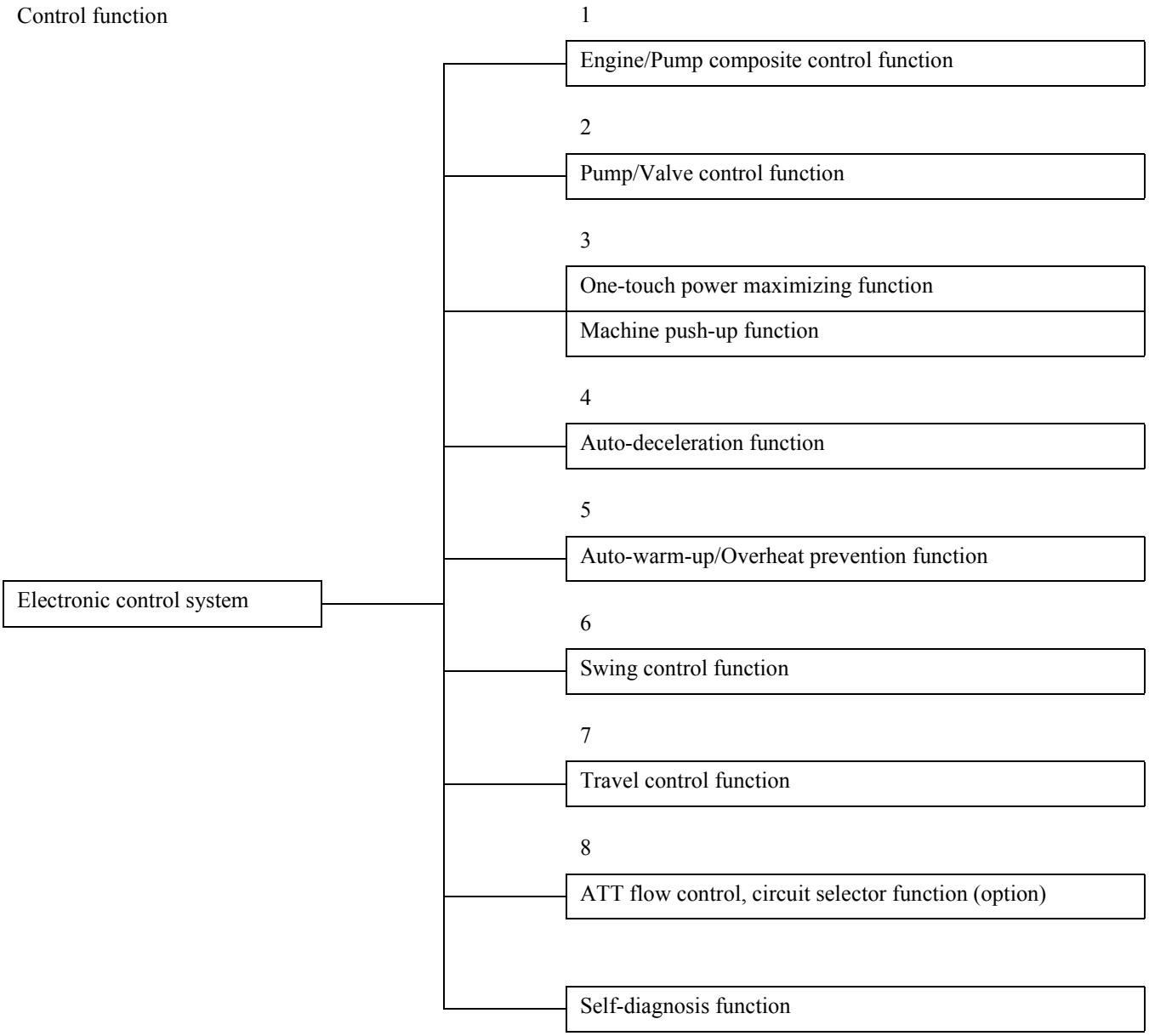
CN-2

Pin No.	Signal name	Input/ output
1	NC	Output
2	Swing emergency switch	Input
3	NC	Input
4	232C_RxD	Input
5	Overload sensor (ON/OFF)	Input
6	Overload alarm valid switch	Input
7	Model selection 4	Input
8	Attachment circuit selector signal	Output
9	NC	Output
10	NC	Input
11	NC	Output
12	CAN shield	
13	Model selection 5	Input
14	232C_TxD	Output
15	NC	Input
16	Travel steering signal pressure SW	Input
17	Model selection 3	Input
18	—	
19	NC	Output
20	NC	Input
21	S_NET	Input/ output
22	CAN0_L	Input/ output
23	CAN1_L	Input/ output
24	—	
25	NC	Input
26	NC	Input
27	Model selection 2	Input
28	NC	Input
29	GND (pulse GND)	
30	NC	Input
31	GND (S_NET GND)	Input
32	CAN0_H	Input/ output
33	CAN1_H	Input/ output
34	GND (232C GND)	
35	Service valve pressure switch	Input
36	NC	Input
37	Model selection switch 1	Input
38	Swing lock switch	Input
39	GND (pulse GND)	
40	Engine speed sensor	Input

CN-3

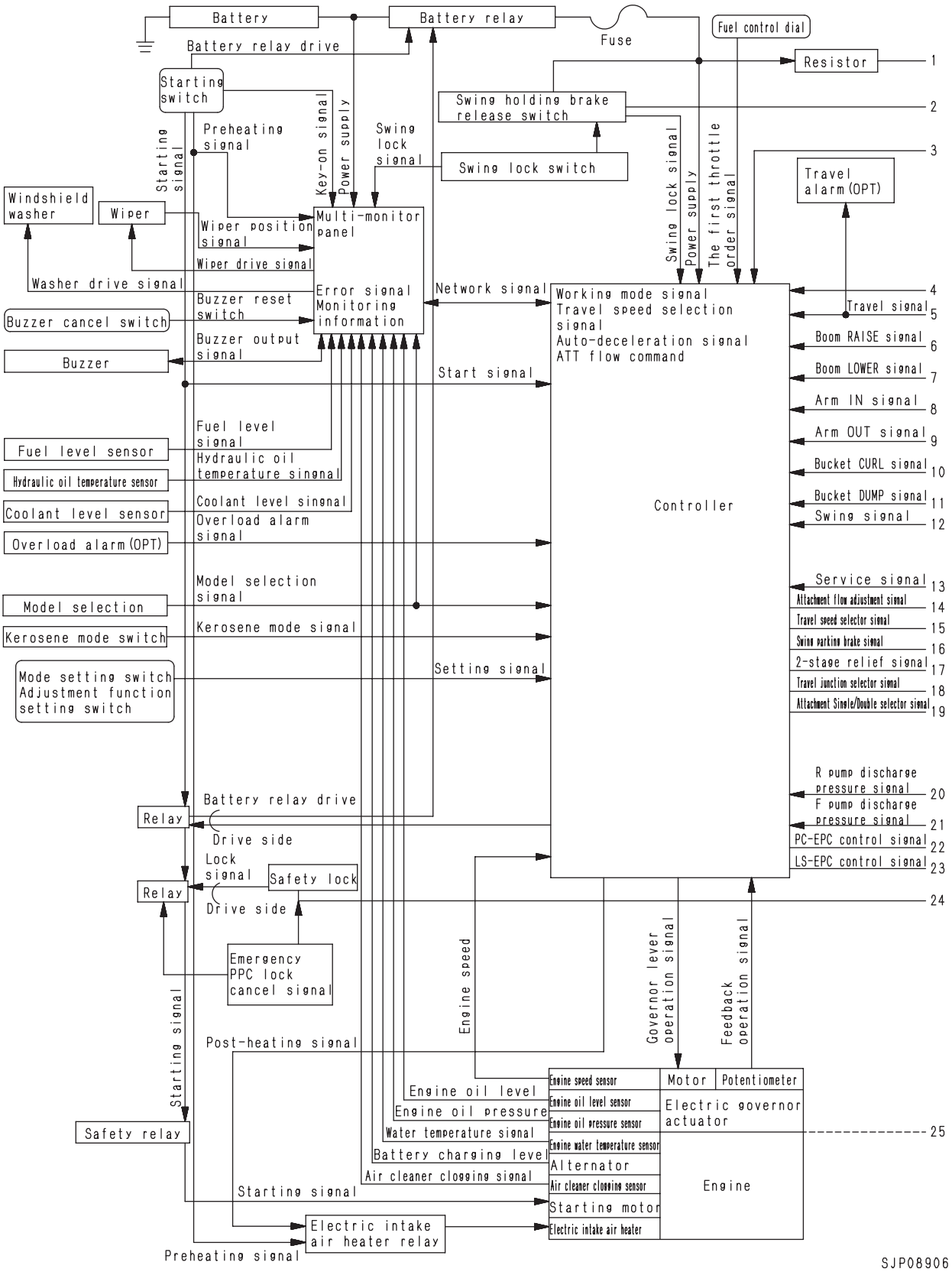
Pin No.	Signal name	Input/ output
1	VB (controller power)	Input
2	VIS (solenoid power)	Input
3	SOL_COM (solenoid common gnd)	
4	Battery relay drive	Output
5	Governor motor A phase (+)	Output
6	LS-EPC	Output
7	Travel junction SOL	Output
8	Engine stop solenoid (Pull)	Output
9	Bucket CURL pressure SW	Input
10	Boom RAISE pressure SW	Input
11	VB (controller power)	Input
12	VIS (solenoid power)	Input
13	SOL_COM (solenoid common gnd)	
14	KEY_SIG	Input
15	Governor motor A phase (-)	Output
16	PC-EPC	Output
17	Pump merge/divider solenoid	Output
18	Heater relay drive	Output
19	Bucket DUMP pressure switch	Input
20	Boom LOWER pressure switch	Input
21	GND (controller GND)	
22	VIS (solenoid PWR)	Input
23	SOL_COM (solenoid common gnd)	
24	KEY_SIG	Input
25	Governor motor B phase (+)	Output
26	Service flow adjustment EPC (1)	Output
27	Travel Hi/Lo selector solenoid	Output
28	2-stage relief solenoid	Output
29	Swing pressure switch	Input
30	Arm IN pressure switch	Input
31	GND (controller GND)	
32	GND (controller GND)	
33	GND (controller GND)	
34	NC	
35	Governor motor B phase (-)	Output
36	NC	Output
37	Swing parking brake solenoid	Output
38	NC	Output
39	Travel pressure switch	Input
40	Arm OUT pressure switch	Input

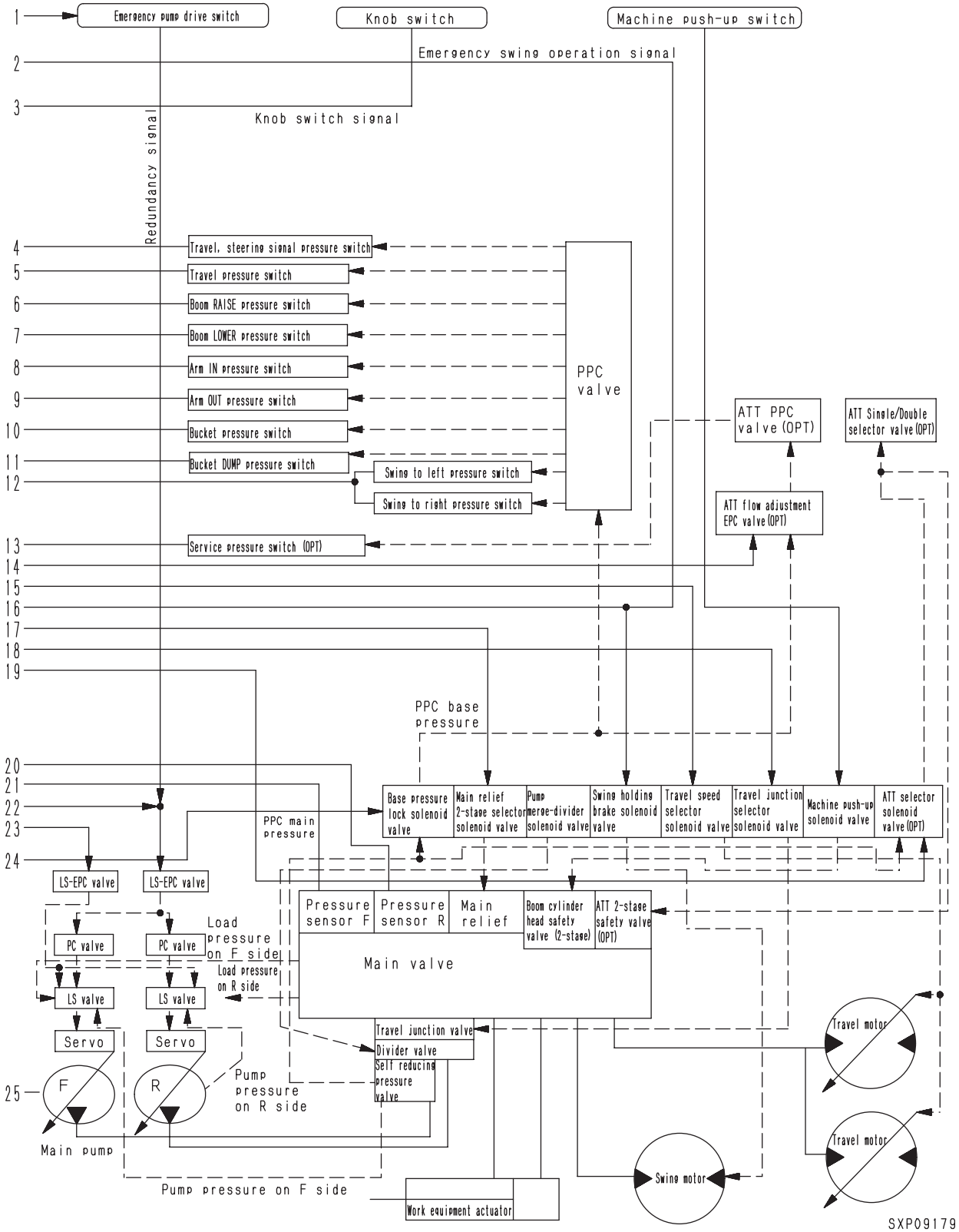
ELECTRONIC CONTROL SYSTEM



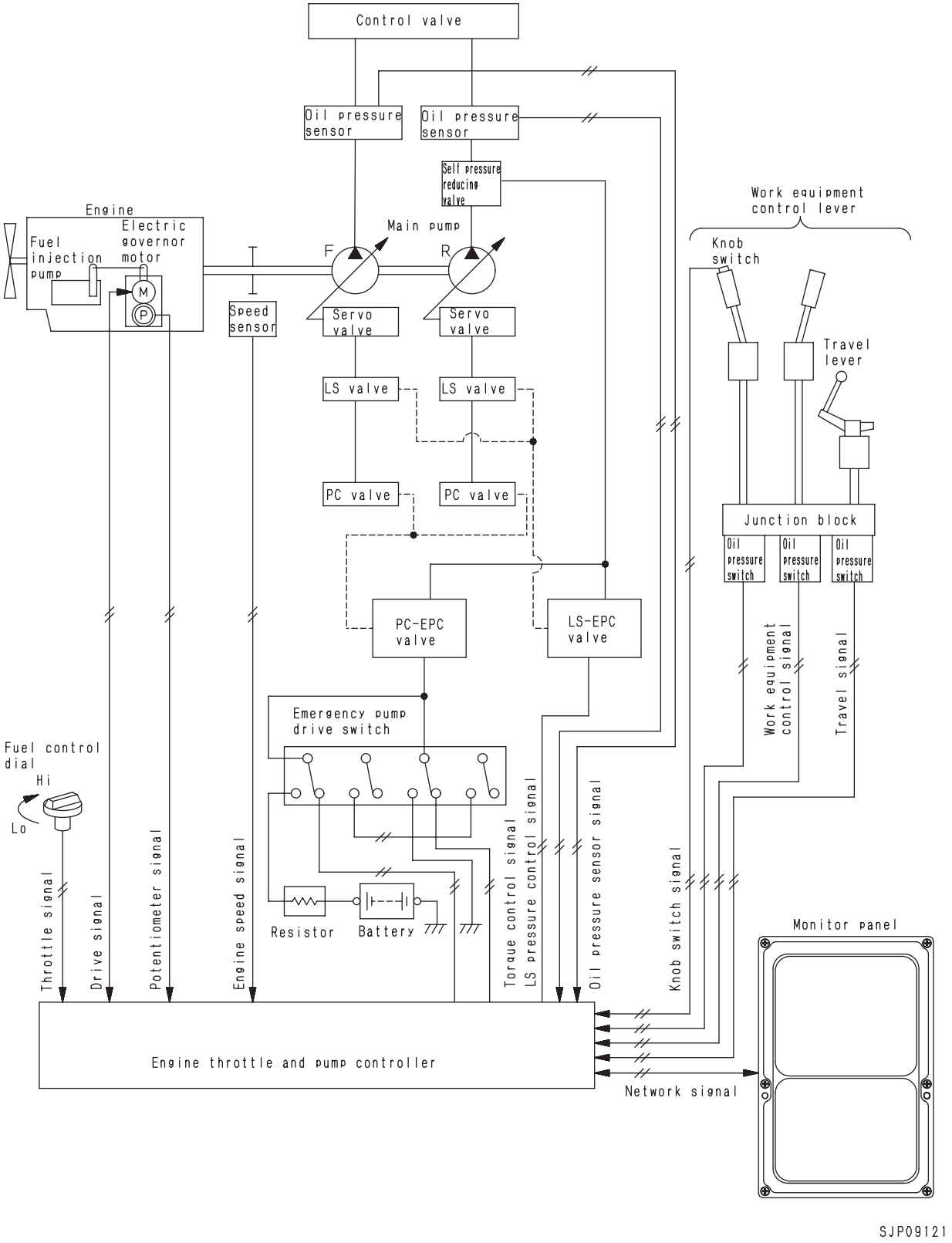
★ For the self-diagnosis function, see "TROUBLE SHOOTING".

TOTAL SYSTEM DIAGRAM




1
Emergency pump drive switch
Knob switch
Machine push-up switch
2
Emergency swing operation signal
3
Knob switch signal
Redundancy signal
4
Travel, steering signal pressure switch
5
Travel pressure switch
6
Boom RAISE pressure switch
7
Boom LOWER pressure switch
8
Arm IN pressure switch
9
Arm OUT pressure switch
10
Bucket pressure switch
11
Bucket DUMP pressure switch
12
Swing to left pressure switch
Swing to right pressure switch
PPC valve
ATT PPC valve (OPT)
ATT Single/Double selector valve (OPT)
ATT flow adjustment EPC valve (OPT)
13
Service pressure switch (OPT)
14
15
16
17
18
19
PPC base pressure
20
21
22
23
24
Base pressure lock solenoid valve
Main relief 2-stage selector solenoid valve
Pump merge-divider solenoid valve
Swing holding brake solenoid valve
Travel speed selector solenoid valve
Travel junction selector solenoid valve
Machine push-up solenoid valve
ATT selector solenoid valve (OPT)
PPC main pressure
LS-EPC valve
LS-EPC valve
Pressure sensor F
Pressure sensor R
Main relief
Boom cylinder head safety valve (2-stage)
ATT 2-stage safety valve (OPT)
Load pressure on F side
Load pressure on R side
PC valve
PC valve
Main valve
LS valve
LS valve
Servo
Servo
Travel junction valve
Divider valve
Self reducing pressure valve
Travel motor
Travel motor
25
F
R
Pump pressure on R side
Main pump
Pump pressure on F side
Swing motor
Work equipment actuator
SXP09179

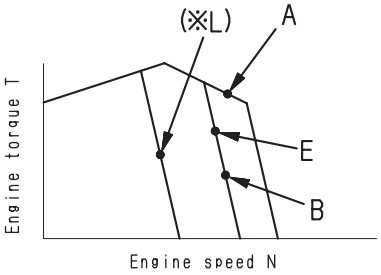
1. Engine and Pump control function



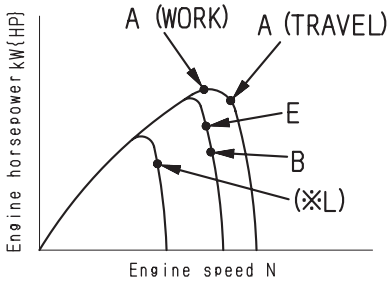
FUNCTION

- The operator can set the work mode switch on the monitor panel to mode A, E, or B (or ※L) and select proper engine torque and pump absorption torque according to the type of work.
- The engine throttle and pump controller detects the speed of the engine governor set with the fuel control dial and the actual engine speed and controls them so that the pump will absorb all the torque at each output point of the engine, according to the pump absorption torque set in each mode.

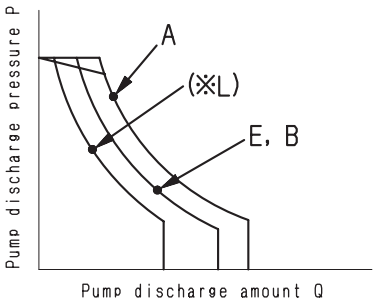
※: The L mode is on the multi-monitor specification machine only.



SJP09122



SXP09180



SJP09124

1) Control method in each mode

Mode A, Mode E

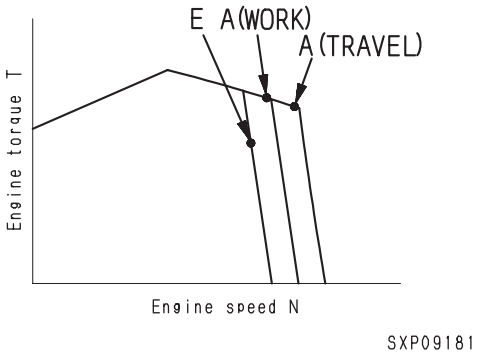
- Matching point in mode A: Rated speed

Mode A (Work)	180.2 kW/1,950 rpm {242 HP/1,950 rpm}
Mode A (Travel)	180.2 kW/1,900 rpm {242 HP/1,900 rpm}
Mode E	154.4 kW/1,750 rpm {207 HP/1,750 rpm}

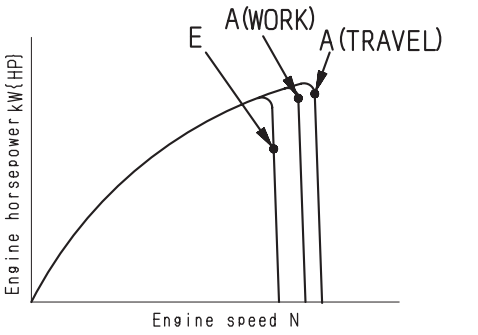
- If the pump load increases and the pressure rises, the engine speed lowers.

  At this time, the controller lowers the pump discharge so that the engine speed will be near the full output point. If the pressure lowers, the controller increases the pump discharge so that the engine speed will be near the full output point.

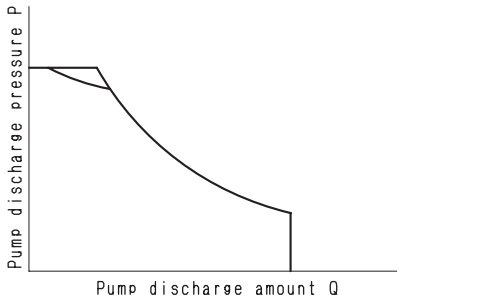
  By repeating these operations, the controller constantly uses the engine near the full output point.



SXP09181



SXP09182



SJP08914

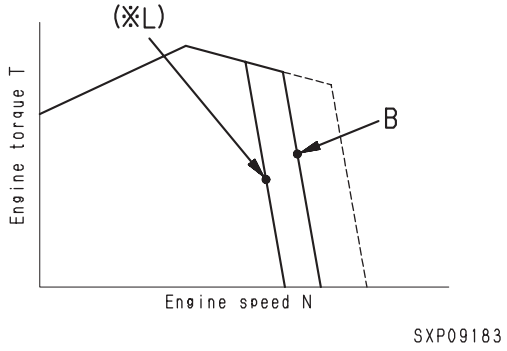
Mode B / (Mode ※L)

Mode	Mode B	Mode ※L
Partial output point	82%	61%

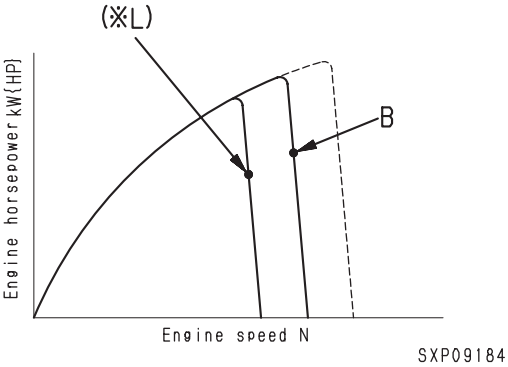
Mode B	147.1 kW/1,800 rpm {197 HP / 1,800 rpm}
(Mode ※L)	110.3 kW/1,550 rpm {148 HP / 1,550 rpm}

- At this time, the controller keeps the pump absorption torque along the constant horsepower curve and lower the engine speed by the composite control of the engine and pump.
  By this method, the engine is used in the low fuel consumption area.

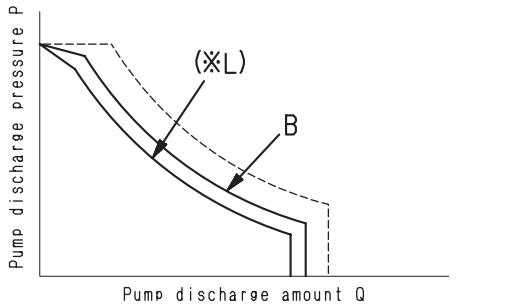
※ : The L mode is on the multi-monitor specification machine only.



SXP09183



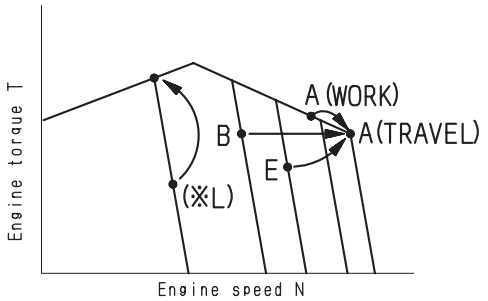
SXP09184



SXP09185

2) Function to control pump during travel

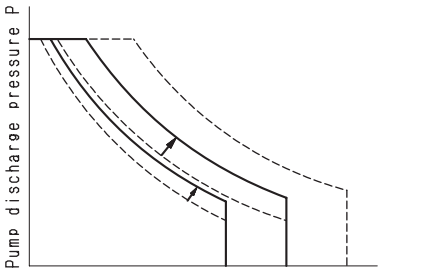
- When the travel is operated in A operation, or E or B working mode, the working mode stays as it is, and the pump absorption torque and engine speed rise to A travel mode.



SXP09186

- If the machine travels in mode L, the working mode and engine speed do not change, but the pump absorption torque is increased.

※ : The L mode is on the multi-monitor specification machine only.

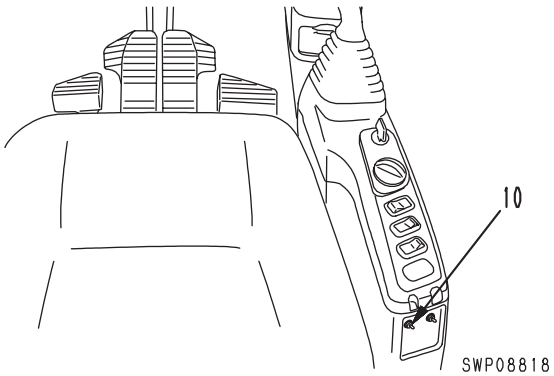


SAP03542

3) Function to control when emergency pump drive switch is turned ON

- Even if the controller or a sensor has a trouble, the functions of the machine can be secured with pump absorption torque almost equivalent to mode E by turning on emergency pump drive switch (10).

  In this case, a constant current flows from the battery to the EPC valve for PC and the oil pressure is sensed by only the EPC valve for PC.

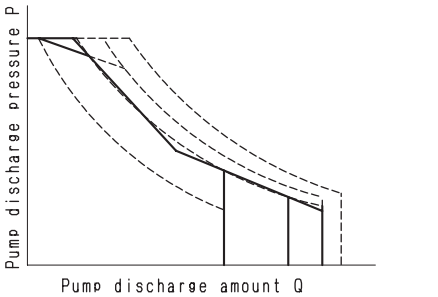


SWP08818

4) Function of engine drive switch when emergency occurs

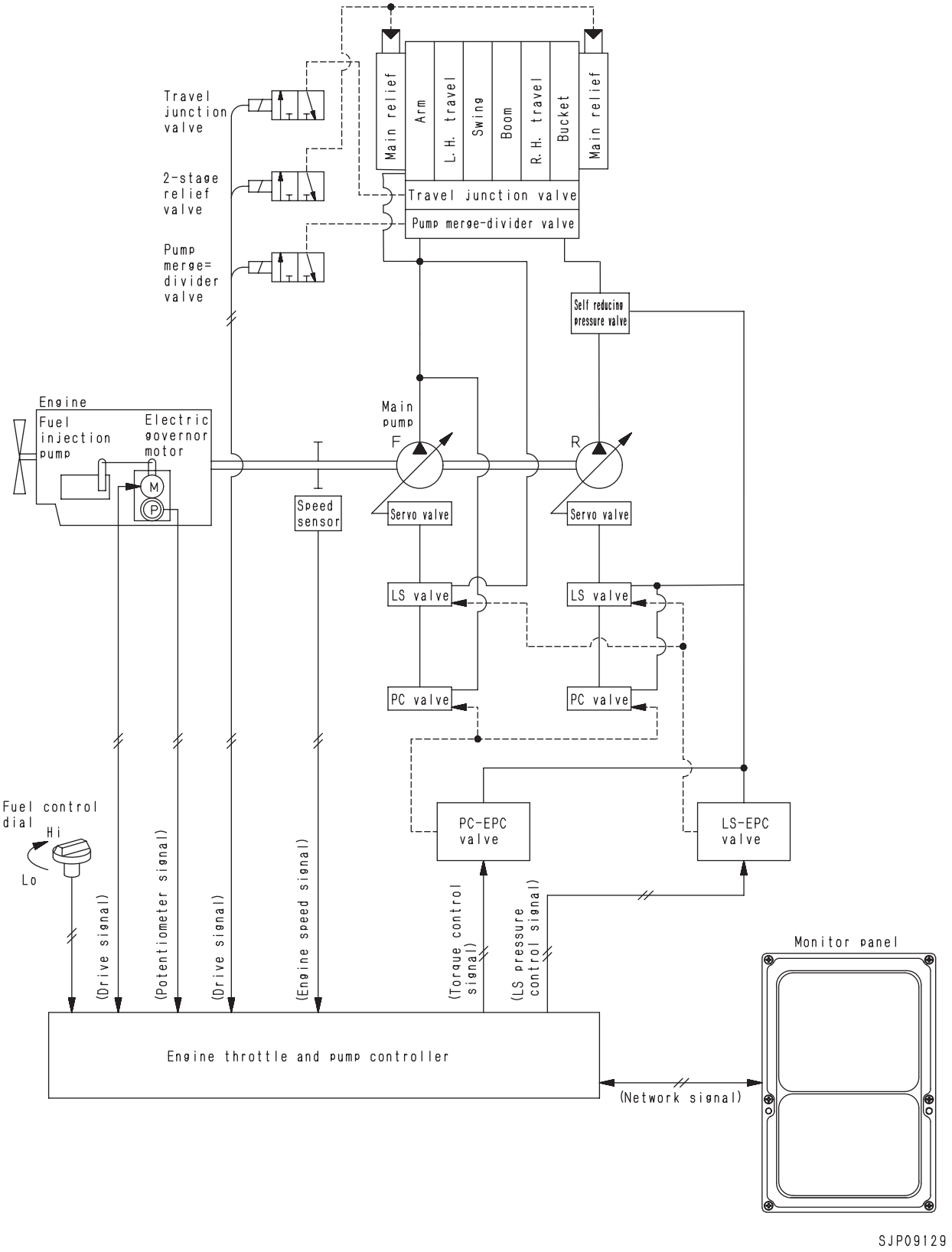
- If there is a failure in the controller or any problem in the chassis wiring or relays, and the engine cannot be started because the engine stop solenoid cannot drive, turn the switch ON for approx. 5 seconds before the starting signal comes ON. This makes it possible to drive the solenoid forcibly.

  (However, if current flows through this solenoid continuously for more than 30 seconds, there is danger that it will burn out, so correctly control the time that the current flows.)



SAP03544

2. Pump/Valve control function

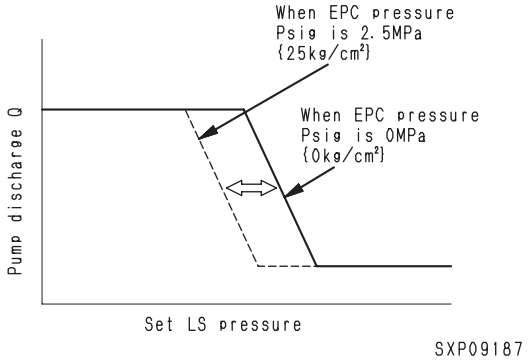


Function

- The machine is matched to various types of work properly with the 2-stage relief function to increase the digging force, etc.

1) LS control function

- The change point (LS set differential pressure) of the pump discharge in the LS valve is changed by changing the output pressure from the LS-EPC valve to the LS valve according to the operating condition of the actuator.
- By this operation, the start-up time of the pump discharge is optimized and the composite operation and fine control performance is improved.

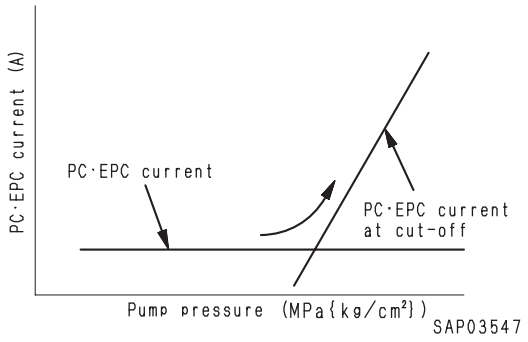


2) Cut-off function

- When the cut-off function is turned on, the PC-EPC current is increased to near the maximum value.

  By this operation, the flow rate in the relief state is lowered to reduce fuel consumption.
- Operating condition for turning on cut-off function

Condition
• The average value of the front and rear pressure sensors is above 27.9 MPa {285 kg/cm²} and the one-touch power maximizing function is not turned on



The cut-off function does not work, however, while the machine is travelling in mode A or the arm crane operation width swing lock switch is turned on.

1. 2-stage relief function

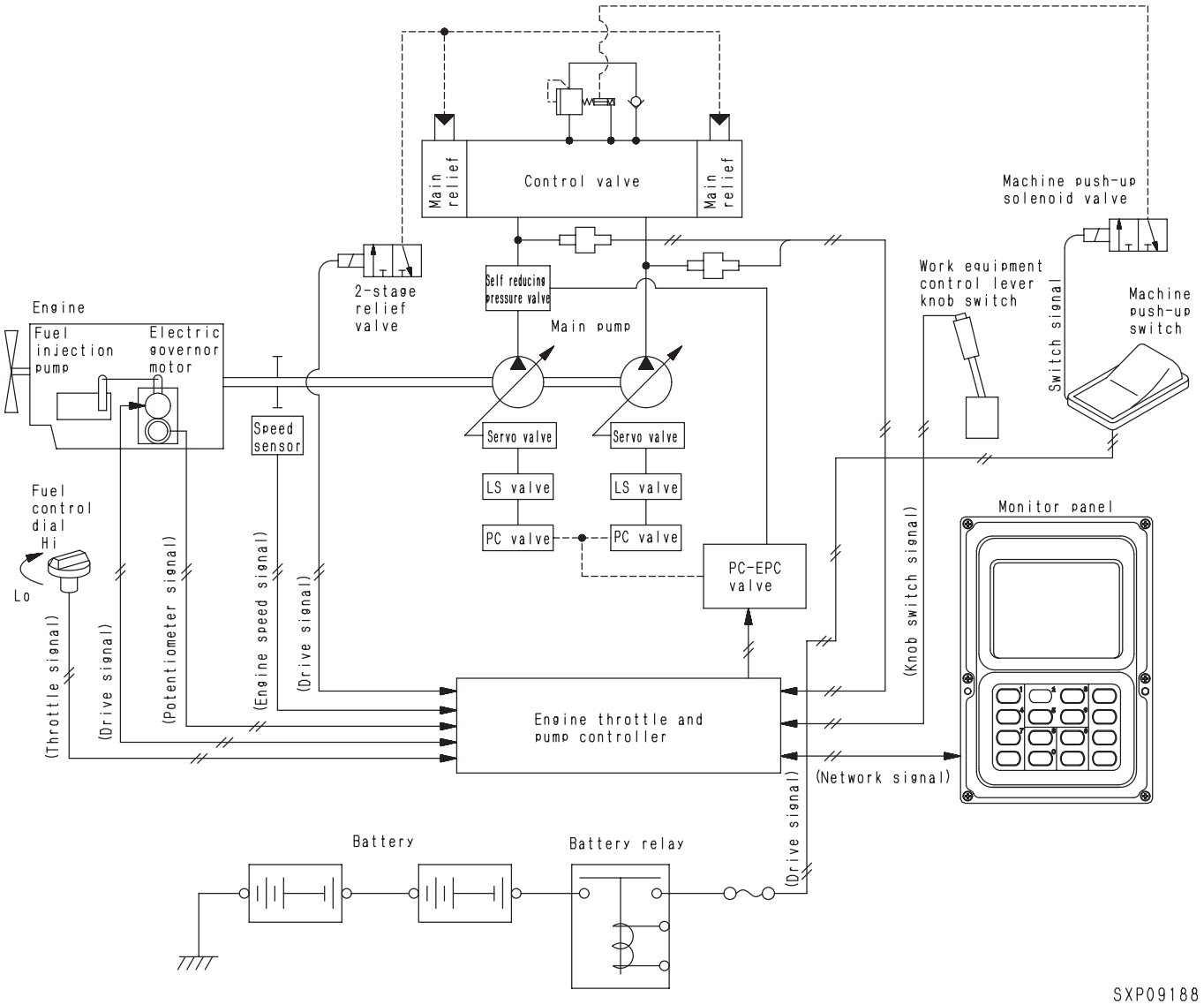
- The relief pressure in the normal work is 34.8 MPa {355 kg/cm²}. If the 2-stage relief function is turned on, however, the relief pressure rises to about 37.2 MPa {380 kg/cm²}.

  By this operation, the hydraulic force is increased further.
- Operating condition for turning on 2-stage relief function

Condition	Relief pressure
• During travel • When swing lock switch is turned on • When boom is lowered • When one-touch power maximizing function is turned on • When ※L mode is operated	34.8 MPa {355 kg/cm²} ⇓ 37.2 MPa {380 kg/cm²}

※ : The L mode is on the multi-monitor specification machine only.

3. One-touch power maximizing/machine push-up function



FUNCTION

- Power can be increased for a certain time by operating the left knob switch.
- When the machine push-up switch is operated, the boom pushing force is increased.

1) One-touch power maximizing function

- When the operator needs more digging force to dig up a large rock, etc., if the left knob switch is pressed, the hydraulic force is increased about 7% to increase the digging force.
- If the left knob switch is turned on in working mode "A" or "E", each function is set automatically as shown below.

⇓

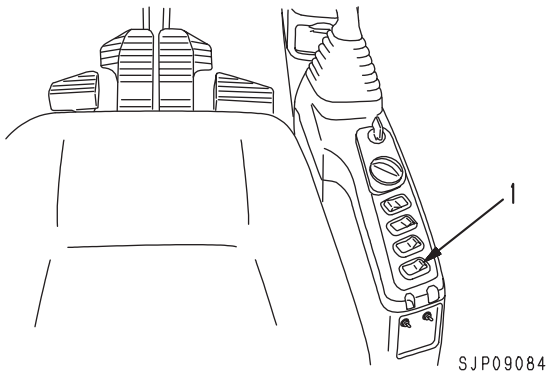
Software cut-off function

Working mode	Engine/Pump control	2-stage relief function	Operation time	Software cut-off function
A, E	Matching at rated output point	34.8 MPa {355 kg/cm²} ⇓ 37.2 MPa {380 kg/cm²}	Automatically reset at 8.5 sec	Cancel

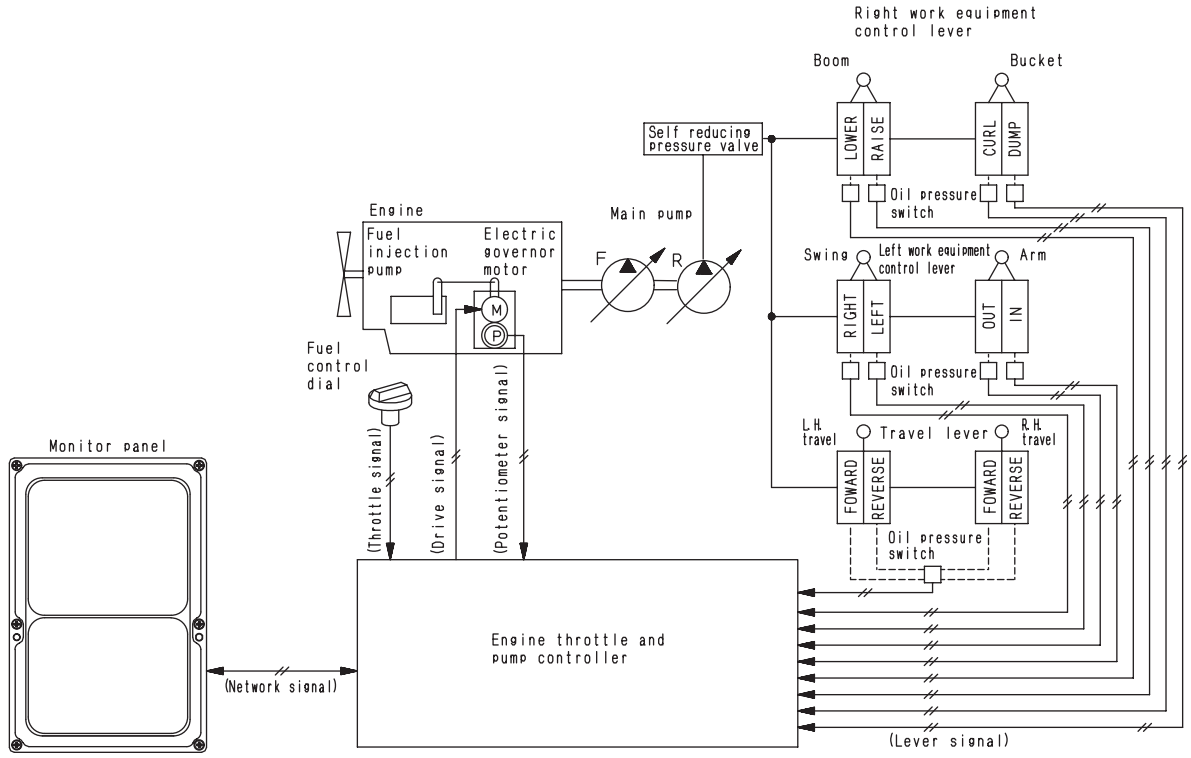
2) Machine push-up function

- Operate switch (1) to increase the boom pushing force when digging ditches or holes on hard ground.

Switch	2-stage safety valve function
OFF	Setting of safety valve at boom cylinder 14.7 MPa {150 kg/cm²}
ON	Setting of safety valve at boom cylinder 28.4 MPa {290 kg/cm²}



4. Auto-deceleration function



SJP09131

FUNCTION

- If the all control levers are set in NEUTRAL while waiting for a dump truck or work, the engine speed is lowered to the medium level automatically to reduce the fuel consumption and noise.
- If any lever is operated, the engine speed rises to the set level instantly.

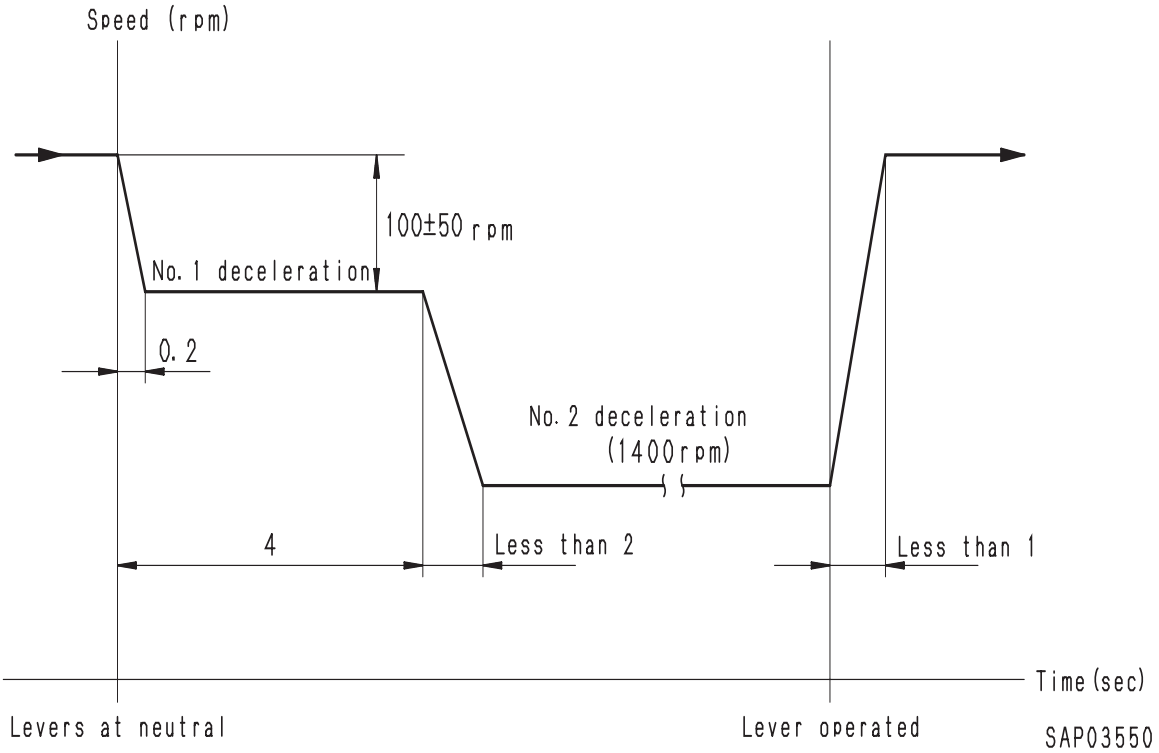
OPERATION

WHEN CONTROL LEVERS ARE SET IN NEUTRAL

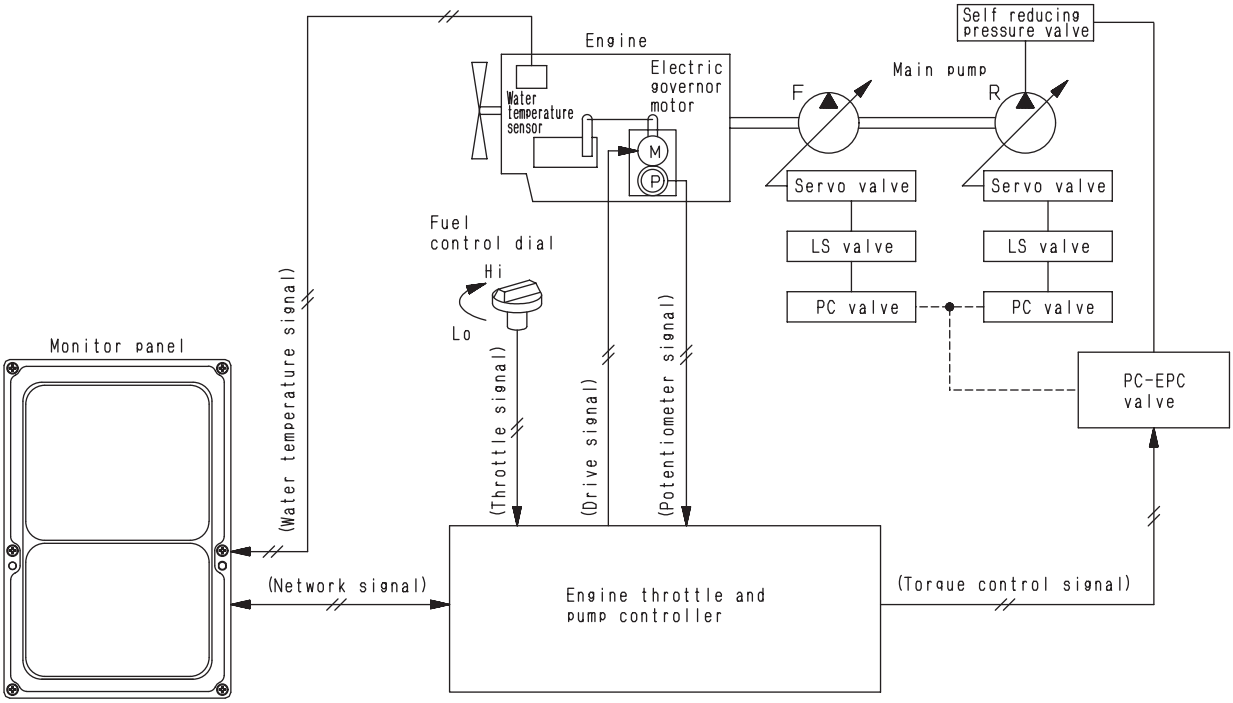
- If all the control levers are set in NEUTRAL while the engine speed is above the decelerator operation level (about 1,400 rpm), the engine speed lowers instantly to the first deceleration level about 100 rpm lower than the set speed.
- If 4 more seconds pass, the engine speed lowers to the second deceleration level (about 1,400 rpm) and keeps at that level until any lever is operated again.

WHEN ANY CONTROL LEVER IS OPERATED

- If any control lever is operated while the engine speed is kept at the second deceleration level, the engine speed rises instantly to the level set with the fuel control dial.



5. Auto-warm-up/Overheat prevention function



SJP09132

FUNCTION

- After the engine is started, if the engine cooling water temperature is low, the engine speed is raised automatically to warm up the engine. If the engine cooling water temperature rises too high during work, the pump load is reduced to prevent overheating.

1) Auto-warm-up function

- After the engine is started, if the engine cooling water temperature is low, the engine speed is raised automatically to warm up the engine.

Operating condition (All)
Water temperature: Below 30°C. Engine speed: Max. 1,200 rpm

⇒

Operated
Engine speed: Max. 1,200 rpm

⇓

Resetting condition (Any one)	
Auto	Water temperature: Above 30°C
	Auto-warm-up operation time: Min. 10 minutes
Manual	Fuel control dial: Kept at 70% of full level for 3 sec. or longer

⇒

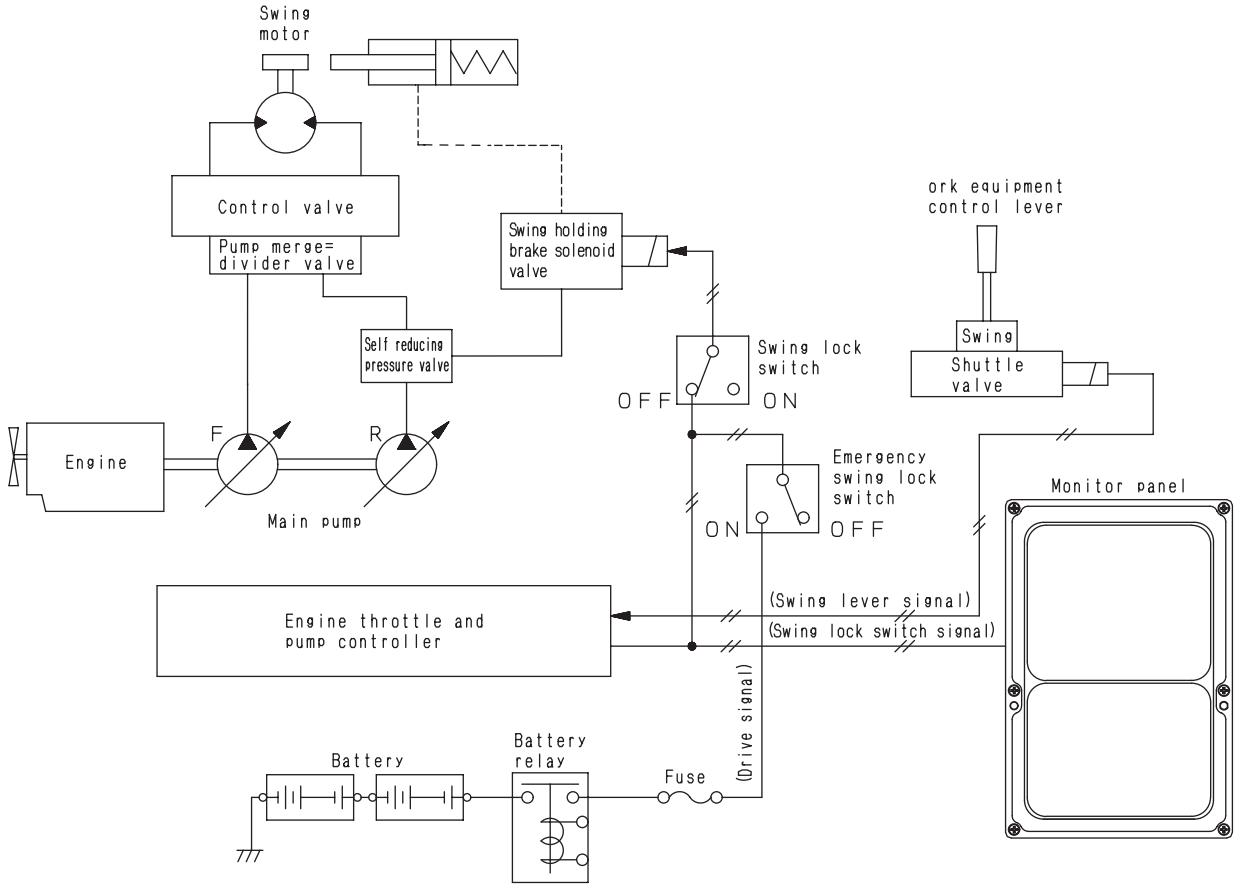
Reset
Engine speed: Any level

2) Overheat prevention function

- If the engine cooling water temperature rises too high during work, the pump load and engine speed are reduced to prevent overheating.
- This function is turned on when the water temperature rises above 95°C.

Operating condition	Operation/Remedy	Resetting condition
Water temperature: Above 105°C	Work mode: Any mode Engine speed: Low idle Monitor alarm lamp: Lights up Alarm buzzer: Sounds	Water temperature: Below 105°C Fuel control dial: Return to low idle position once. • Under above condition, controller is set to condition before operation of function. (Manual reset)
Water temperature: Above 102°C	Work mode: Mode A, E, OR B Engine speed: Keep as is. Monitor alarm lamp: Lights up. Lower pump discharge.	Water temperature: Below 102°C • Under above condition, controller is set to condition before operation of function. (Automatic reset)
Water temperature: Above 100°C	Work mode: Mode A Engine speed: Keep as is. Lower pump discharge.	Water temperature: Below 100°C • Under above condition, controller is set to condition before operation of function. (Automatic reset)
Water temperature: Above 95°C	Work mode: Travel Engine speed: Keep as is. Lower travel speed.	Water temperature: Below 95°C • Under above condition, controller is set to condition before operation of function. (Automatic reset)

6. Swing control function



SJP09133

FUNCTION

The swing lock and swing holding brake functions are installed.

1) Swing lock and swing holding brake functions

- The swing lock function (manual) is used to lock machine from swinging at any position. The swing holding brake function (automatic) is used to prevent hydraulic drift after the machine stops swinging.
- Swing lock switch and swing lock/holding brake

Lock switch	Lock lamp	Function	Operation
OFF	OFF	Swing holding brake	If swing lever is set in neutral, swing brake operates in about 7 sec. If swing lever is operated, brake is released and machine can swing freely.
ON	ON	Swing lock	Swing lock operates and machine is locked from swinging. Even if swing lever is operated, swing lock is not reset and machine does not swing.

※ Operation of swing holding brake release switch

- If the controller, etc. has a problem, the swing holding brake does not work normally, and the machine cannot swing, the swing lock can be reset with the swing holding brake release switch.

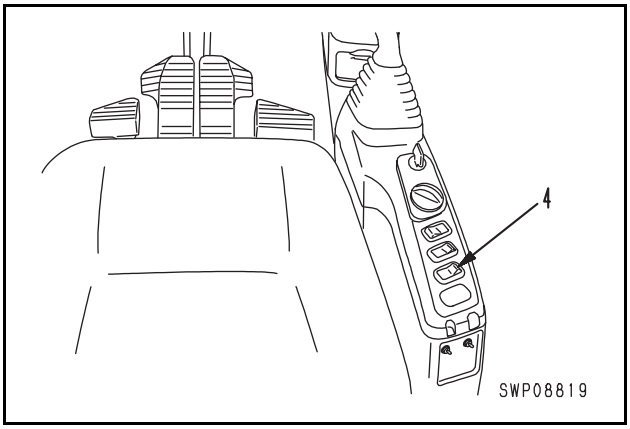
Swing holding brake release switch	ON (When control has trouble)		OFF (When controller is normal)	
Swing lock switch	ON	OFF	ON	OFF
Swing brake	Swing lock is turned on.	Swing lock is canceled.	Swing lock is turned on.	Swing holding brake is turned on.

★ Even if the swing holding brake release switch is turned on, if the swing lock switch is turned on, the swing brake is not released.

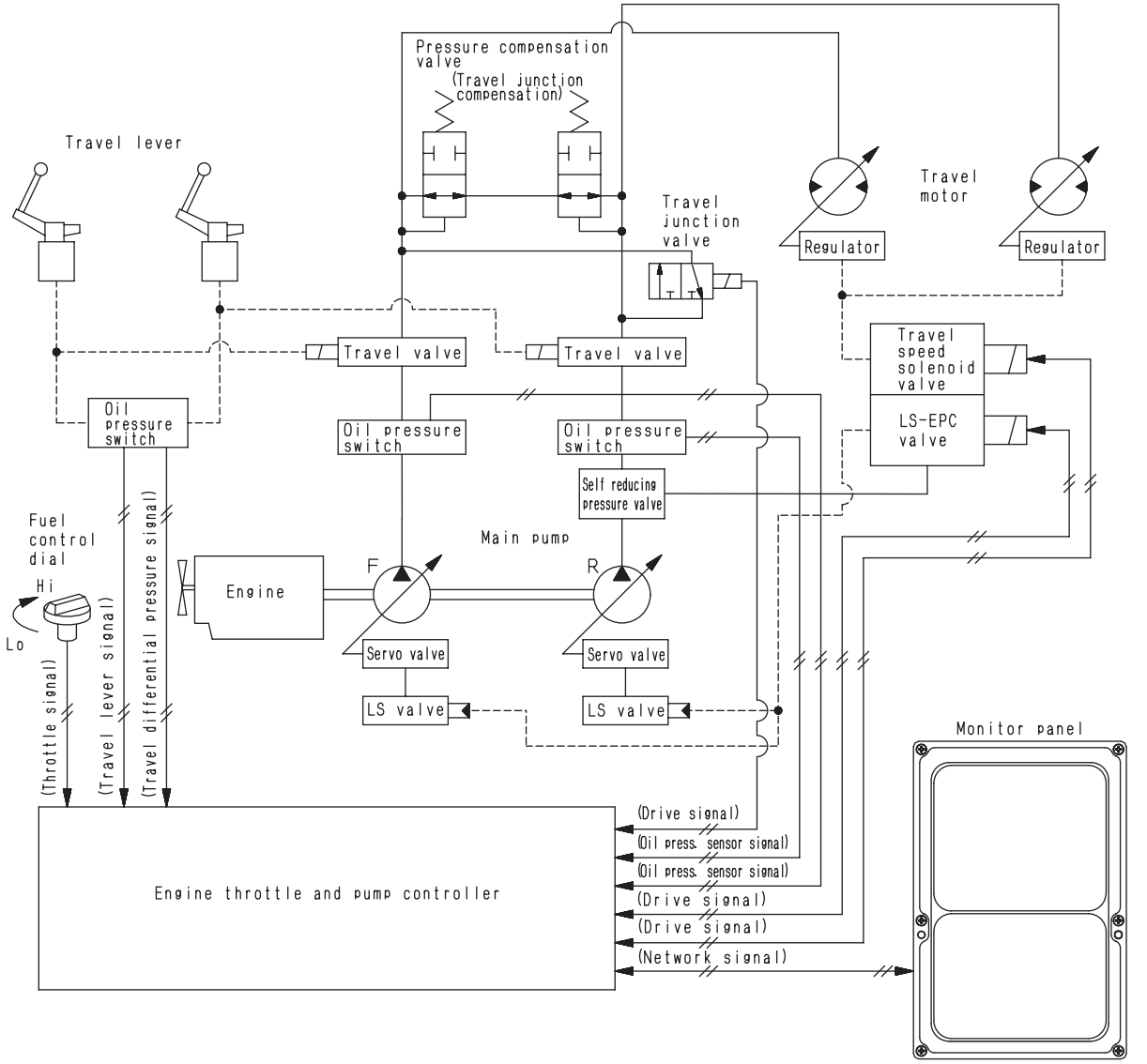
★ If the swing lock is reset, swinging is stopped by only the hydraulic brake of the safety valve. Accordingly, if swinging is stopped on a slope, the upper structure may drift hydraulically.

2) Quick hydraulic oil warm-up function when swing lock switch is turned on

- If swing lock switch (4) is turned on, the pump-cut function is cancelled and the relief pressure rises from 34.8 MPa {355 kg/cm²} to 37.2 MPa {380 kg/cm²}. If the work equipment is relieved under this condition, the hydraulic oil temperature rises quickly and the warm-up time can be shortened.



7. Travel control function



FUNCTION

- The pumps are controlled and the travel speed is changed manually or automatically, to secure proper travel performance matched to the type of work and jobsite during travel.

1) Pump control function during travel

- If the machine travels in a work mode other than mode A, the work mode and the engine speed are kept as they are and the pump absorption torque is increased.

★ For details, see ENGINE/PUMP COMPOSITE CONTROL FUNCTION.

1. Travel speed change function

i) Manual change with travel speed switch

If the travel speed switch is changed between Lo, (※ Mi), and Hi, the governor/pump controller controls the pump capacity and motor capacity at each gear speed as shown at right to change the travel speed.

Travel speed switch	Lo (Low speed)	(※ Mi) (Middle Speed)	Hi (High speed)
Pump capacity (%)	90	82	100
Motor capacity	Max.	Max.	Min.
Travel speed (km/h)	3.2	4.5	5.5

ii) Automatic change according to engine speed

If the fuel control dial is used to set the engine speed to less than 1,200 rpm:

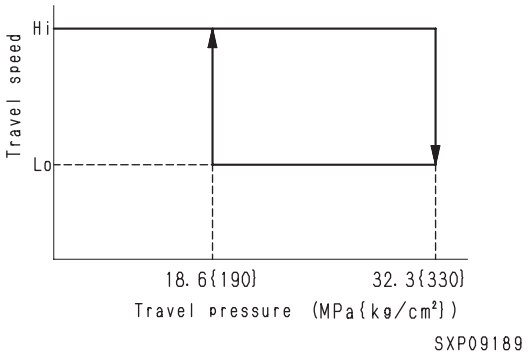
- When traveling in Lo, it will not switch even when set to Hi or Mi.
- When traveling in Hi or Mi, it will switch automatically to Lo.

iii) Automatic changes according to pump discharge pressure

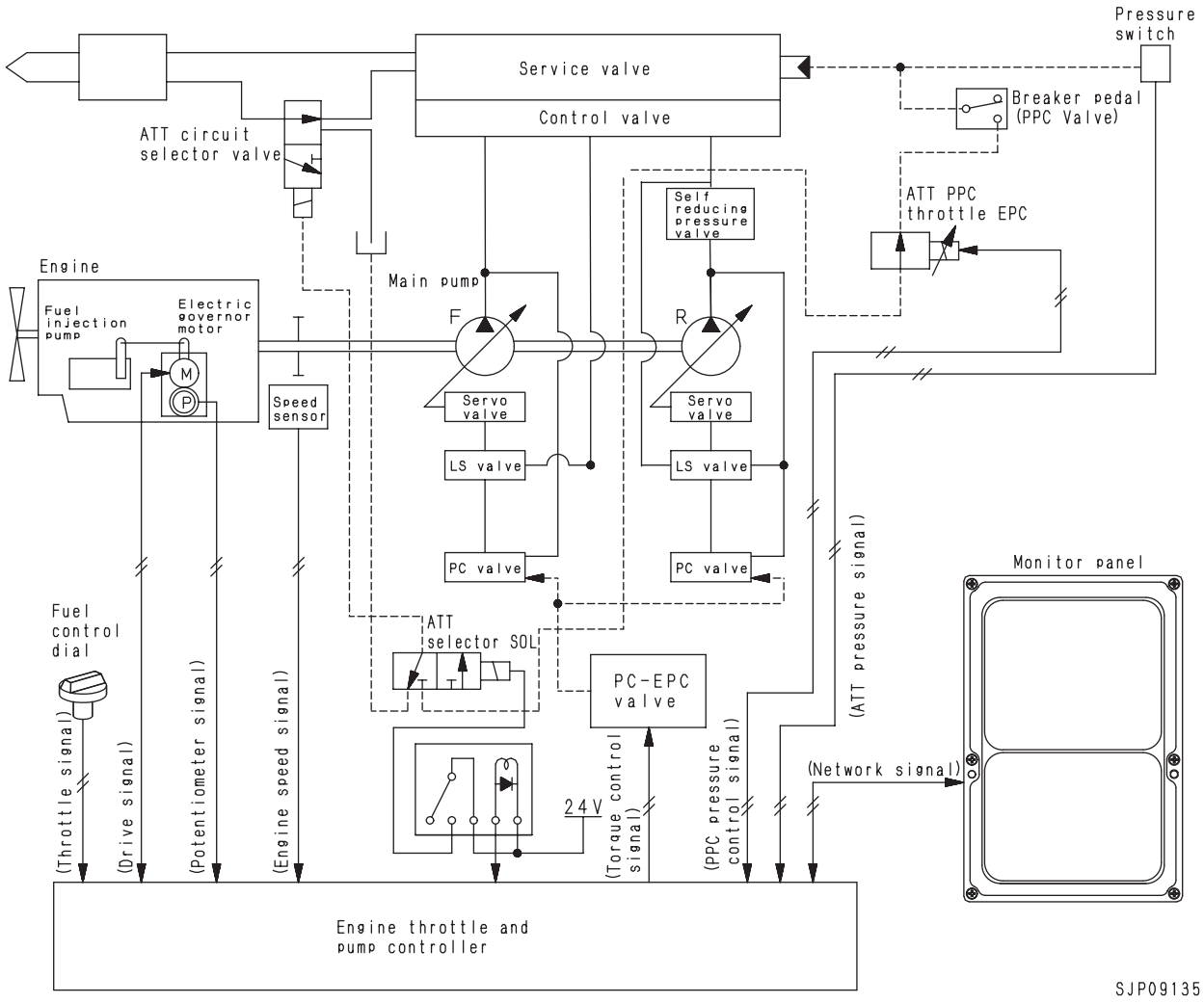
When traveling with the travel speed switch set to Hi or Mi, it the load increases, such as when traveling uphill, and the travel pressure goes above 3.23 MPa {330 kg/cm²} for more than 0.5 sec, the travel motor capacity will automatically change to low speed (equivalent to Lo). (The travel speed switch will stay at Hi or Mi.)

After continuing to travel in Lo, if the load increases, such as when traveling on level ground or traveling downhill, and the travel pressure goes below 18.6 MPa {190 kg/cm²} for more than 0.5 sec, the travel motor capacity will automatically change and will return to Hi or Mi.

※ : The "Mi" mode is on the multi-monitor specification machine only.



8. ATT flow control, circuit selector function (if equipment)



9. System component parts

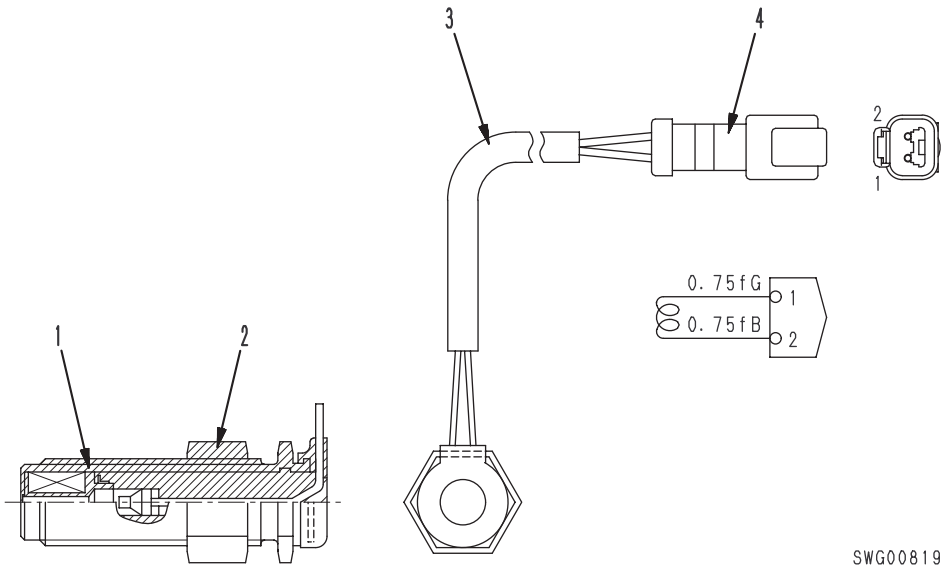
1) Engine revolution sensor

FUNCTION

This function is available only with the ATT specification.
The function acts as follows according to the flow command and working mode from the monitor.

1) It throttles the ATT PPC pressure and controls the flow when the pedal is depressed fully.
2) In mode B and the other modes, it switches to ATT single acting (B) or double acting (other modes).

※ : The ATT flow control adjustment function is on the multi-monitor specification machine only.

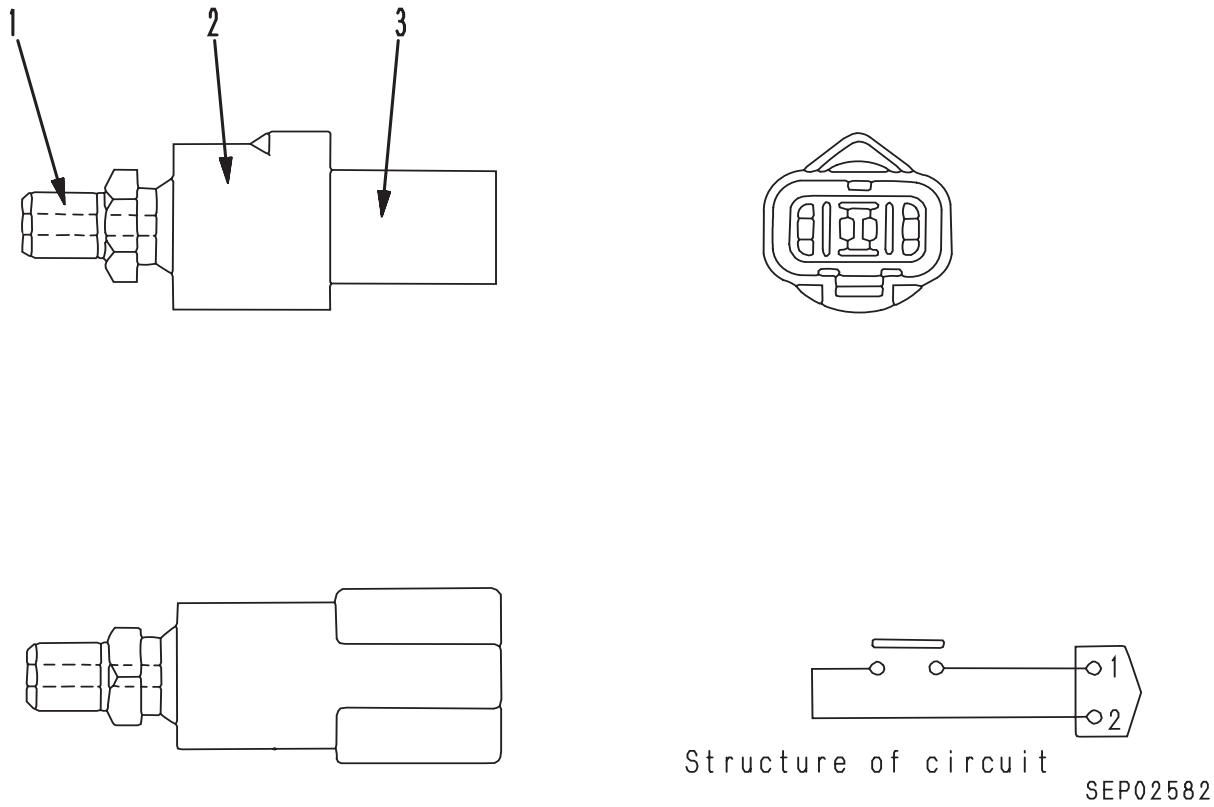


1. Sensor
2. Locknut
3. Wiring harness
4. Connector

FUNCTION

- The engine revolution sensor is installed to the ring gear of the engine flywheel. It electrically calculates the number of the gear teeth which pass in front of it and transmits the result to the engine throttle and pump controller.
- A magnet is used to sense the gear teeth. Each time a gear tooth passes in front of the magnet, a current is generated.

2) PPC oil pressure switch



1. Plug
2. Switch
3. Connector

SPECIFICATIONS

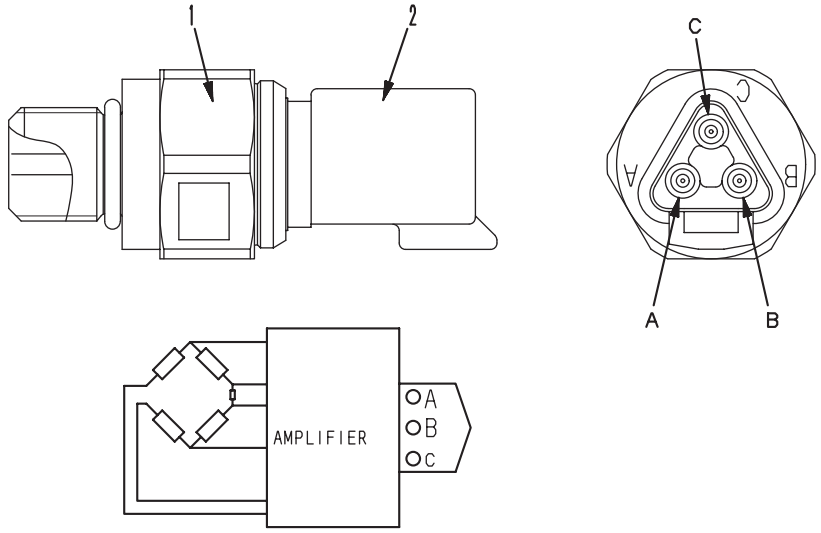
Type of contacts: Normally open contacts

Operating (ON) pressure:	0.5 ± 0.1 MPa {5.0 ± 1.0 kg/cm²}
Resetting (OFF) Pressure:	0.3 ± 0.5 MPa {3.0 ± 0.5 kg/cm²}

FUNCTION

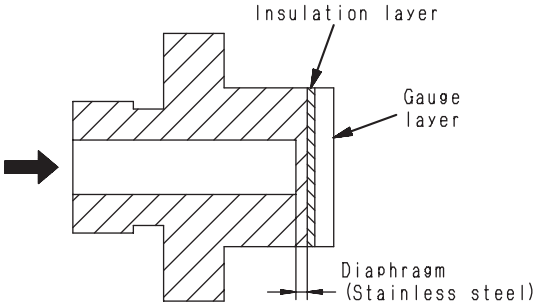
- The junction block has 9 pressure switches, which check the operating condition of each actuator by the PPC pressure and transmit it to the engine throttle and pump controller.

3) Pump pressure sensor



SJP08773

1. Sensor
2. Connector



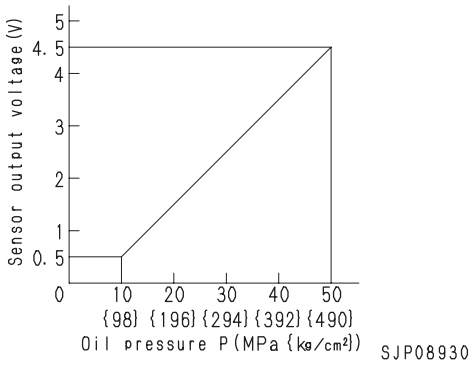
SDP02585

FUNCTION

- The pump pressure sensor is installed to the inlet circuit of the control valve. It converts the pump discharge pressure into a voltage and transmits it to the engine throttle and pump controller.

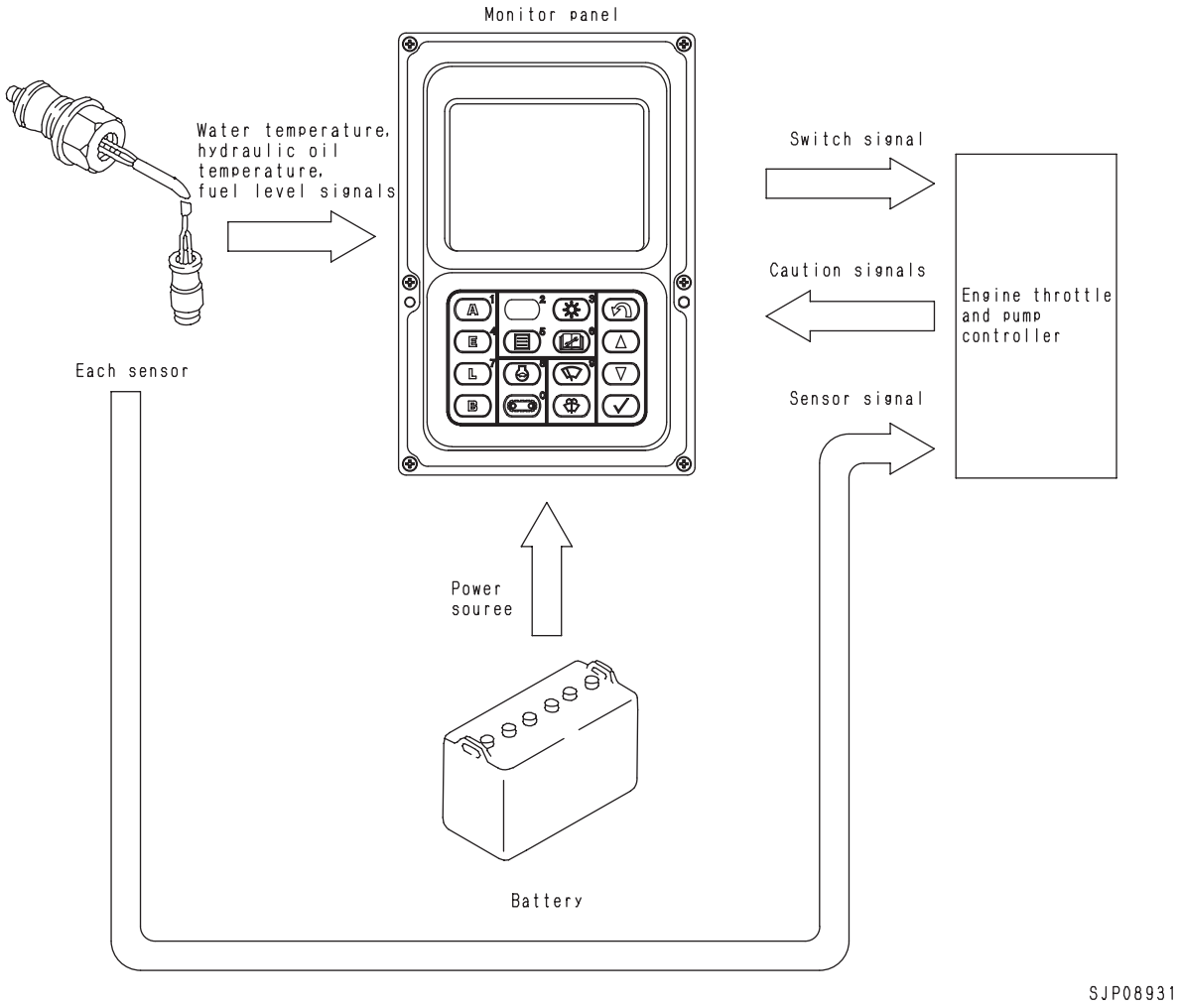
OPERATION

- The oil pressure applied from the pressure intake part presses the diaphragm of the oil pressure sensor, the diaphragm is deformed.
- The gauge layer facing the diaphragm measures the deformation of the diaphragm by the change of its resistance, then converts the change of the resistance into a voltage and transmits it to the amplifier (voltage amplifier).
- The amplifier amplifies the received voltage and transmits it to the engine throttle and pump controller.
- Relationship between pressure P (MPa {kg/cm²}) and output voltage (V) is as follows.
  V = 0.08 [0.008] x P + 0.5



SJP08930

MULTI MONITOR SYSTEM



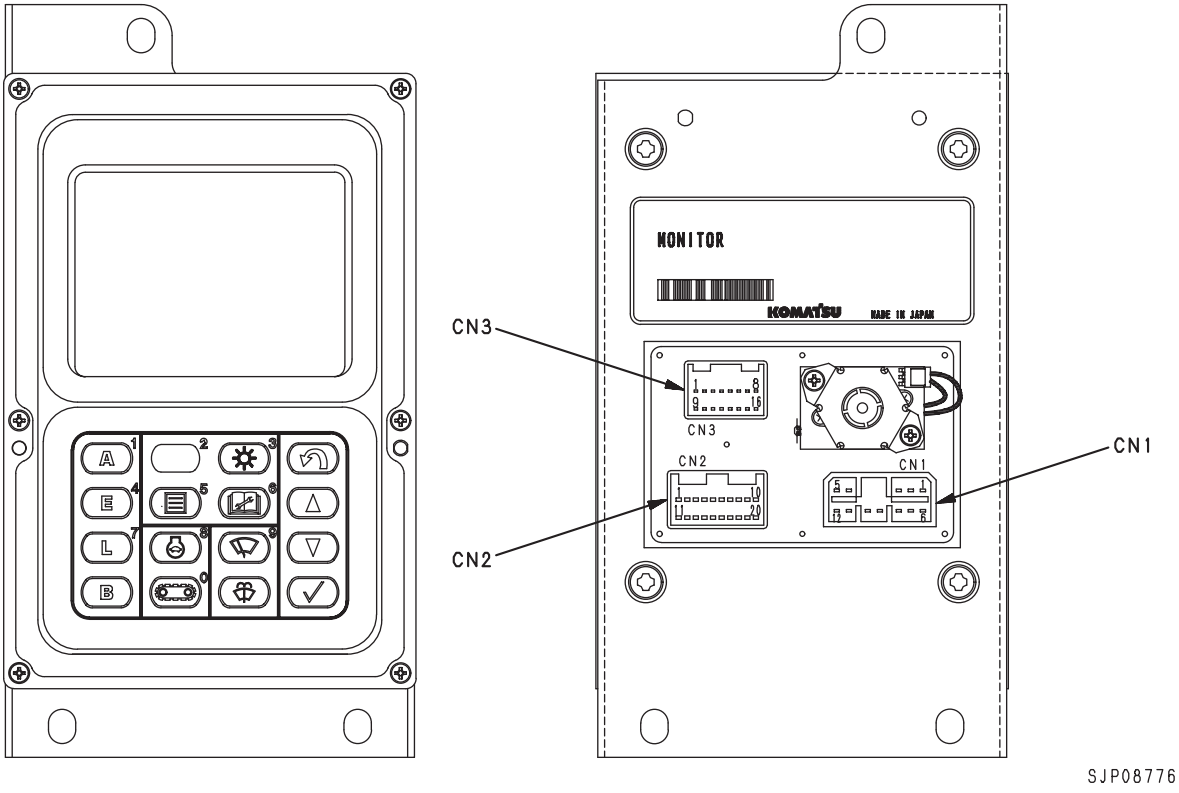
- The monitor system monitors the condition of the machine with sensors installed on various parts of the machine. It processes and immediately displays the obtained information on the panel notifying the operator of the condition of the machine.

  The panel is roughly divided as follows.

  1. Monitor section to output alarms when the machine has troubles
  2. Gauge section to display the condition constantly (Coolant temperature, hydraulic oil temperature, fuel level, etc.)

- The monitor panel also has various mode selector switches and functions to operate the machine control system.

1. Monitor panel



OUTLINE

- The monitor panel has the functions to display various items and the functions to select modes and electric parts.

  The monitor panel has a CPU (Central Processing Unit) in it to process, display, and output the information.

  The monitor display unit consists of LCD (Liquid Crystal Display). The switches are flat sheet switches.

Input and output signals

CN-1

Pin No.	Signal name	Input/ output
1	Key ON	Input
2	Key ON	Input
3	Washer motor output	Output
4	Starting signal	Input
5	Limit switch (W)	Input
6	GND	
7	GND	
8	VB +	Input
9	Wiper motor (+)	Output
10	Wiper motor (-)	Output
11	Buzzer ON signal	Input
12	Limit switch (P)	Input

CN-2

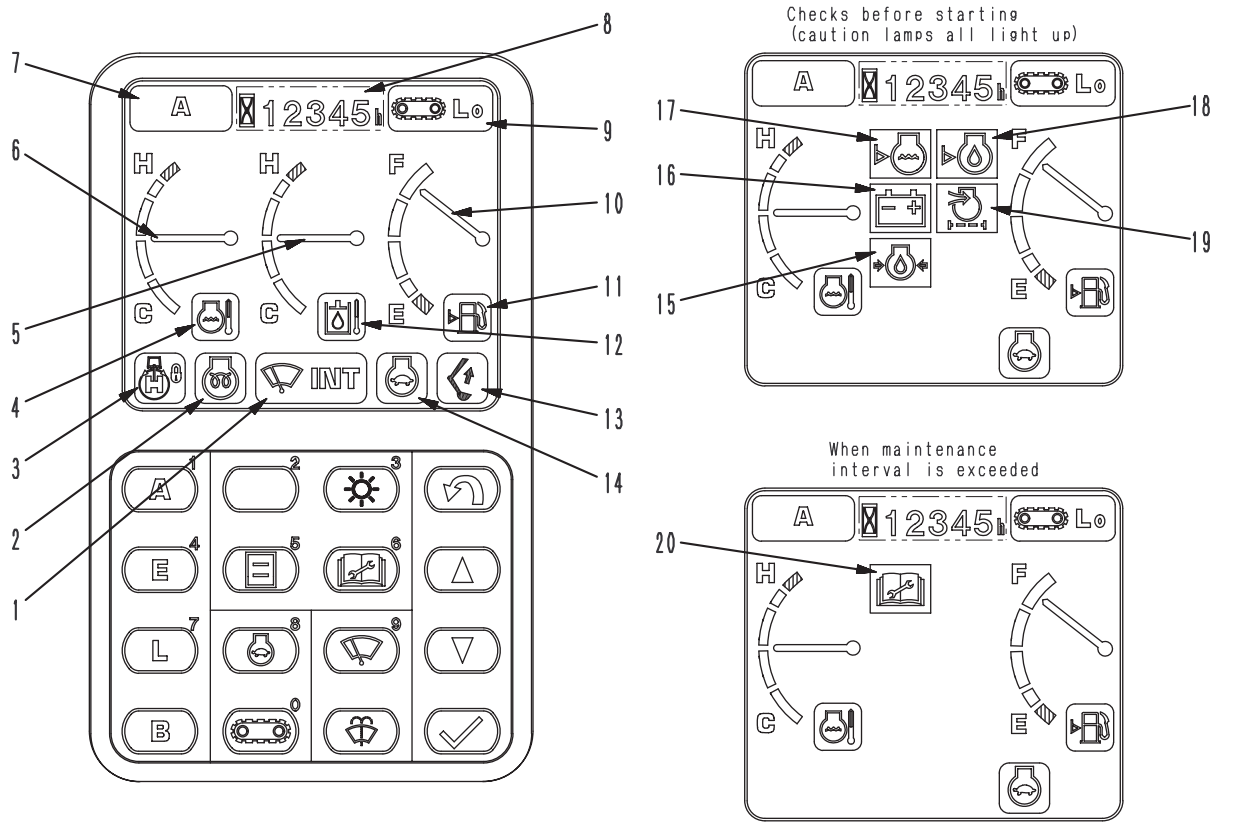
Pin No.	Signal name	Input/ output
1	Engine water temperature	Input
2	Fuel level	Input
3	Radiator water level	Input
4	(Hydraulic oil level)	Input
5	Air cleaner clogging	Input
6	NC	Input
7	Engine oil pressure	Input
8	Engine oil level	Input
9	N/W signal	Input/ Output
10	N/W signal	Input/ Output
11	Battery charge	Input
12	Hydraulic oil temperature (analog)	Input
13	GND (for analog signal)	
14	Buzzer drive	Input
15	Limit SW (window)	Input
16	Buzzer cancel	Input
17	Swing lock	Input
18	Preheat	Input
19	Light switch	Input
20	N/W GND	

CN-3

Pin No.	Signal name	Input/ output
1	NC	Input
2	NC	Input
3	NC	Input
4	NC	Input
5	NC	Input
6	NC	Input
7	RS230C CTS	Input
8	RS230C RXD	Input
9	RS230C RXD	Input/ Output
10	RS230C RXD	Input/ Output
11	BOOTSW	Input
12	NC	Input
13	GND	
14	CAN (SHIELD)	Input
15	CAN (+)	Input
16	CAN (-)	Input

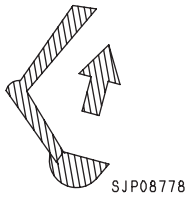
MONITOR CONTROL, DISPLAY PORTION

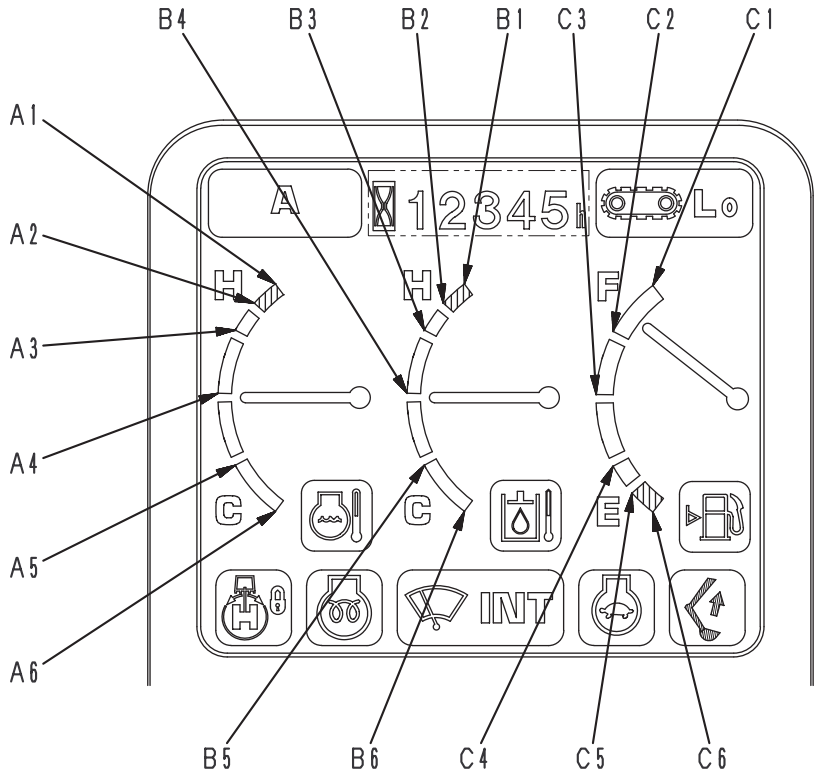
MONITOR PORTION



1. Wiper motor
2. Preheating monitor
3. Swing lock monitor
4. Engine water temperature monitor
5. Hydraulic oil temperature gauge
6. Engine water temperature gauge
7. Working mode monitor
8. Service monitor
9. Travel speed monitor
10. Fuel gauge
11. Fuel level monitor
12. Hydraulic oil temperature monitor
13. Power max. monitor
14. Auto-deceleration monitor
15. Engine oil pressure caution
16. Battery charge caution
17. Radiator water level caution
18. Engine oil level caution
19. Air cleaner clogging
20. Maintenance time warning caution

MONITOR ITEMS AND DISPLAY

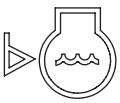
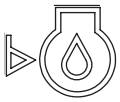
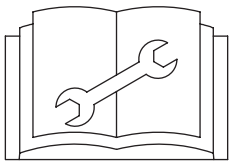
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<tr><th>Symbol</th><th>Display item</th><th>Display method</th></tr>
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SAT00098</td><td>Swing lock</td><td>
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<tr><th>Swing lock switch</th><th>Swing holding brake release switch</th><th>Swing lock monitor</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>ON</td><td>OFF</td><td>ON</td></tr>
<tr><td>OFF</td><td>ON</td><td>Flashes</td></tr>
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SAP00526</td><td>Preheating</td><td>
<table>
<tr><th>Continuous set time</th><th>Preheating monitor status</th></tr>
<tr><td>Up to 30 sec.</td><td>ON</td></tr>
<tr><td>From 30 sec. to 40 sec.</td><td>Flashes</td></tr>
<tr><td>More than 40 sec.</td><td>OFF</td></tr>
</table>
</td></tr>
<tr><td> 
SJP08778</td><td>Power Max.</td><td>
<table>
<tr><th>Power Max. switch status</th><th>Power max. monitor status</th></tr>
<tr><td>Being pressed</td><td>Lights up but goes out after approx. 9 sec. when kept pressed</td></tr>
<tr><td>Not being pressed</td><td>Flashes</td></tr>
</table>
</td></tr>
<tr><td rowspan="3"></td><td>Engine water temperature</td><td rowspan="3">See gauge display on the next page</td></tr>
<tr><td>Hydraulic oil temperature</td></tr>
<tr><td>Fuel level</td></tr>
</table>



SJP08779

Gauge	Range	Temperature, volume	Indicator	Buzzer sound
Engine water temperature (°C)	A1	105	Red	❍
	A2	102	Red	
	A3	100	Green	
	A4	80	Green	
	A5	60	Green	
	A6	30	White	
Hydraulic oil temperature (°C)	B1	105	Red	
	B2	102	Red	
	B3	100	Green	
	B4	80	Green	
	B5	40	Green	
	B6	20	White	
Fuel level (L)	C1	417	Green	
	C2	347.5	Green	
	C3	277.5	Green	
	C4	139	Green	
	C5	100	Green	
	C6	62	Red	

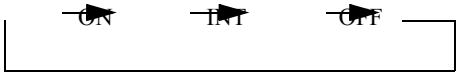
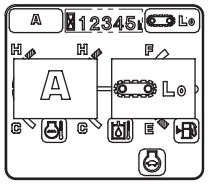
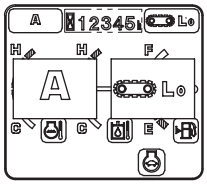
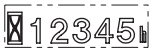
Checks before starting (caution lamps all light up), when maintenance interval is exceeded.
If the checks before starting or maintenance interval is exceeded items light up, the display of the hydraulic oil temperature gauge and the hydraulic oil temperature monitor are stopped, and the following cautions 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
 SAP00519	Radiator water level	●	Lights up when abnormal	When abnormal, lights up and buzzer sounds
 SAP00523	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.	

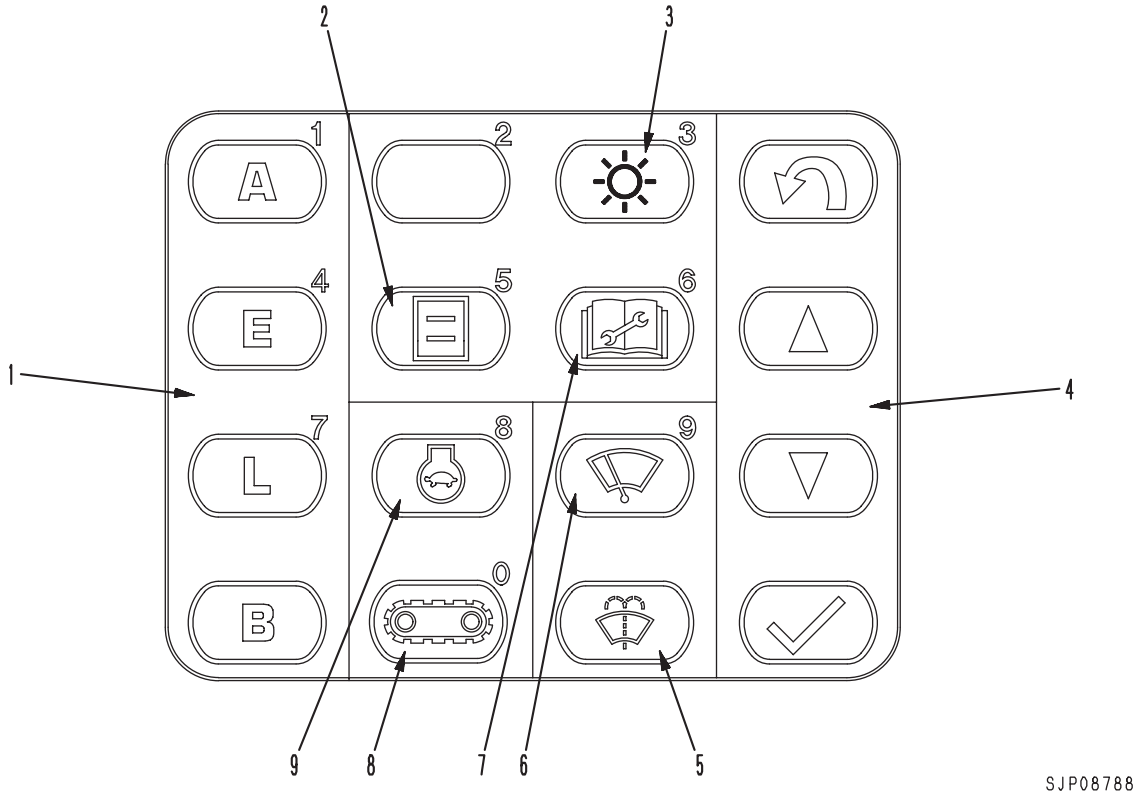
The problems that have occurred are displayed in order from the left.

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 (below B2)	White on red letters

Display category	Symbol	Display item	Display range	Display method
Monitor	 SJP08781	Wiper		Displays set condition
	 SJP08782	Working mode	 A, E, L, B SJP08786	Displays set mode
	 SJP08783	Travel speed	 Lo, Mi, Hi SJP08787	Displays set speed
	 SJP08784	Auto-deceleration	ON ⇔ OFF	Displays actuation status
Service meter	 SJP08785	Service meter indicator	When service meter is working	Lights up when service meter is working

SWITCHES



1. Working mode selector switch
2. Selector switch
3. Display brightness, contrast adjustment switch
4. Control switch
5. Window washer switch
6. Wiper switch
7. Maintenance switch
8. Travel speed selector switch
9. Auto-deceleration switch

- Working mode selector switch
  The condition of the machine changes according to the switch that is pressed (A, E, L, B). It is possible to check the condition on the working mode monitor display. The relationship between each working mode and the monitor display is shown in the table on the right.

- Selector switch
  This is used when making detailed settings in each working mode. (For details, see ATTACHMENT FLOW CONTROL FUNCTION for modes A and E.)

- Maintenance switch
  Check the condition of the maintenance items. (For details, see MAINTENANCE FUNCTION.)

- Auto-deceleration switch
  Each time the auto-deceleration switch is pressed, the auto-deceleration function is switched ON/OFF.
  Use the auto-deceleration monitor display to check the present condition.
  When the working mode switch is operated to switch the working mode, it is automatically set to ON.

- Travel speed selector switch
  Each time the travel speed selector switch is pressed, the travel speed changes.
  Lo → Mi → Hi → Lo. . . . . .
  Use the travel speed monitor display to check the present condition.
  The relationship between the set speed and the monitor display in the table on the right.

- Wiper switch
  Each time the wiper switch is pressed, the wiper setting changes OFF → INT → ON → OFF → . . . . . .
  Use the wiper monitor display to check the present condition.
  The relationship between the wiper setting and the monitor display is as shown in the table on the right.

Switch that is pressed	Display	Working mode status after setting
[A]	A	A mode (default)
[E]	E	E mode
[L]	L	L mode
[B]	B	B mode

Display	Setting
Crawler symbol + Lo	Low speed (default)
Crawler symbol + Mi	Medium speed
Crawler symbol + Hi	High speed

Display	Setting	Wiper actuation status
None	OFF	Stowing stopped or now stowing
Wiper symbol + INT	INT	Intermittent actuation
Wiper symbol + ON	ON	Continuous actuation

- Window washer switch
  While the switch is being pressed, window washer liquid is sprayed out. There is a time delay before the wiper starts.

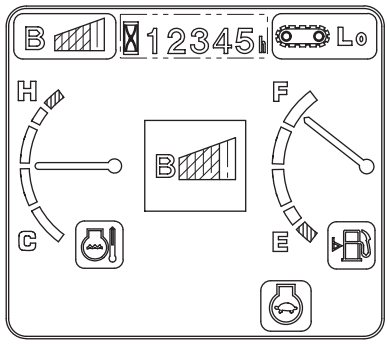
- Control switch
  This is used for control when using the maintenance function or select function.
  (For details, see each function.)

- Display brightness, contrast adjustment switch
  Use this switch when adjusting the display brightness and contrast.
  (For details, see each function.)

SELECT MODE FUNCTION

- This is used when setting the flow in each working mode. It is possible to make the setting when genuine attachment piping is installed and the initial value setting function on the service menu has been used to set to ATTACHMENT INSTALLED.
- It is possible to check on the working mode monitor if this function can be set.

Working mode	Monitor display
A mode	[A] + crusher symbol
E mode	[E] + crusher symbol
B mode	[B] + flow symbol



SJP08789

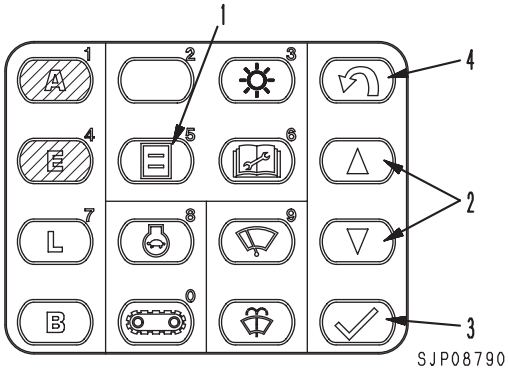
METHOD OF USE

★ Carry out the setting on the normal screen

1. A mode, E mode

   1) Press select switch (1) on the monitor to move to the adjustment screen.

   2) Press control switch (2) to select the flow level.



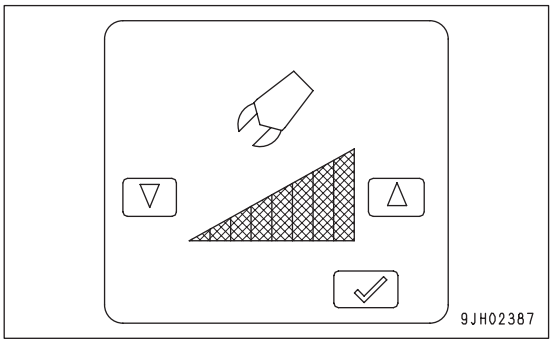
SJP08790

Control switch	Actuation
△ SJP08933	Flow level bar graph extends to the right
▽ SJP08934	Flow level bar graph retracts to the left

   3) After completing the level selection, press input confirmation switch (3).
   The selection flow level is confirmed and the screen moves to the normal screen.
   From the moment that the flow level is selected, the content of the selection is reflected for the attachment flow.

   ★ Before the input confirmation switch is pressed, the flow level is not confirmed, so press return switch (4) to return to the normal screen. This function can be used to return to the previously set flow.

   The relationship between the set flow level and the flow value is as shown in the table on the right.

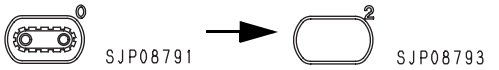
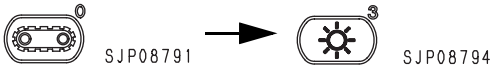

9JH02387

Flow level	Flow (L/min.)	Remarks
8	530	❉ Default
7	430	
6	370	
5	300	
4	230	
3	165	
2	100	
1	30	

2. B mode

1) Press select switch (1) on the monitor to move to the screen for selecting the 3-stage flow level.

2) Press control switch (2), or input [01] - [03] with the numeral 10-key pad to choose one on the three flow levels.

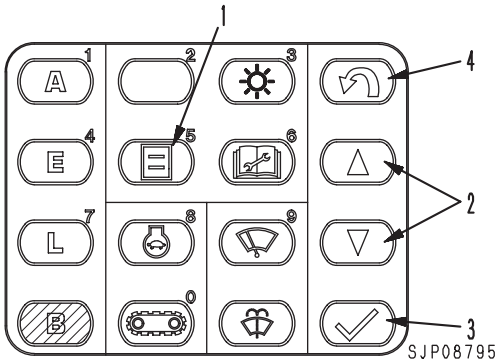
No.	10-key pad operation
01	 SJP08791 SJP08792
02	 SJP08791 SJP08793
03	 SJP08791 SJP08794

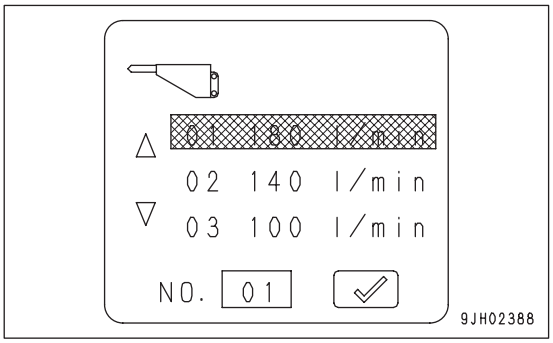
3) After completing the level selection, press input confirmation switch (3).
The selected flow level is selected.
★ Before the input confirmation switch is pressed, the flow level is not confirmed, so press return switch (4) to return to the operator screen. This function can be used to return to the previously set flow.

4) After the flow level is confirmed, the screen changes to the screen shown in the diagram on the right.
With this screen, it is possible to make fine adjustment to the flow.

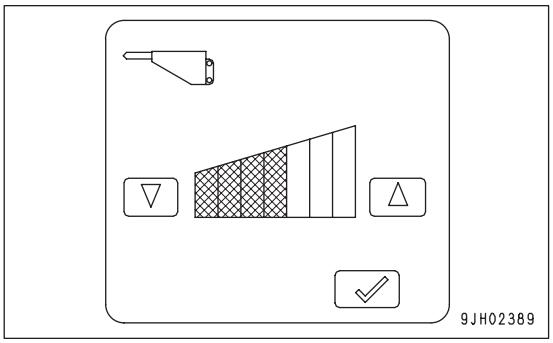
5) Press control switch (2) and select the flow level.

Control switch	Actuation
 SJP08933	Flow level bar graph extends to the right
 SJP08934	Flow level bar graph retracts to the left





No.	Flow level (L/min.)	Remarks
01	230	❊ Default
02	190	
03	150	



6) After completing the level selection, press input confirmation switch (3).

The selected flow level is confirmed and the screen moves to the operator screen.
From the moment that the flow level is selected, the content of the selection is reflected for the attachment flow.

★ Before the input confirmation switch is pressed, the flow level is not confirmed, se press return switch (4) to return to the normal screen. This function can be used to return to the previously set flow.

The relationship between the set flow level and the flow value is as shown in the table on the right.

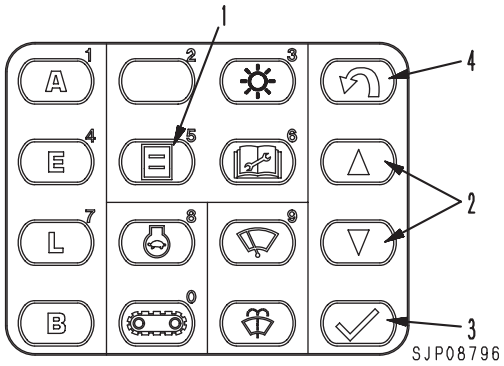
Flow level	When flow is 100 **l**/ min.	When flow is 140 **l**/ min.	When flow is 180 **l**/ min.	Remarks
7	180	220	250	
6	170	210	250	
5	160	200	240	
4	150	190	230	❉ Default
3	140	180	220	
2	130	170	210	
1	120	160	200	

7) Check the set value with the working mode monitor.
The relationship between the display level and the set value is as shown in the table on the right, and it is possible to check the level of the flow that can be set.

Display level	Set value (**l**/min.)
8	250 or 260
7	230 or 240
6	210 or 220
5	190 or 200
4	170 or 180
3	150 or 160
2	130 or 140
1	120

MAINTENANCE FUNCTION

When the maintenance time for replacement, inspection, or filling has approached for the 10 maintenance items, press maintenance switch (1) and the caution display (yellow or red) appears on the monitor display for 30 seconds after the key is turned ON to remind the operator to carry out lubrication maintenance.



★ Maintenance items

No.	Item	Replacement interval (hours)
01	Engine oil	500
02	Engine oil filter	500
03	Fuel filter	500
04	Hydraulic filter	1000
05	Hydraulic tank breather	500
06	Corrosion resistor	❊ (1000)
07	Damper case oil	1000
08	Final case oil	2000
09	Machinery case oil	1000
10	Hydraulic oil	5000

❊ Option, so not set

★ The above replacement intervals are set for each item, and the time remaining to maintenance is reduced as the machine is operated.

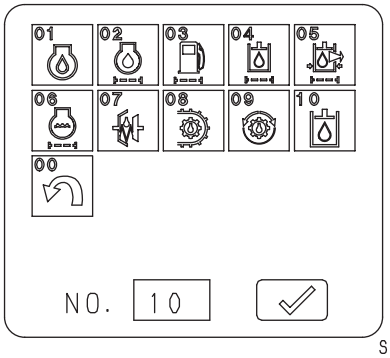
The content of the caution display differs according to the remaining time. The relationship is as shown in the table below.

Display	Condition
None	Remaining time for maintenance for all items is more than 30 hours
Notice display (black symbol displayed on yellow background)	There is one or more items with less than 30 hours remaining time for maintenance
Warning display (wiper symbol displayed on red background)	There is one or more items with less than 0 hours remaining time for maintenance

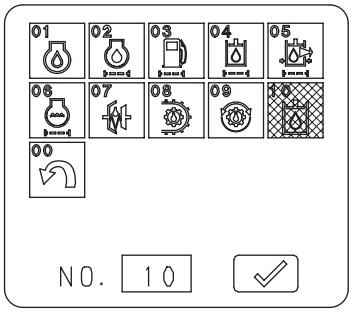
METHOD OF CHECKING STATUS MAINTENANCE ITEMS

★ Operate as follows when on the operator screen.

1. Press maintenance switch (1) and switch to the maintenance list display screen.
   ★ The maintenance items are displayed as symbols on the screen.
2. Press control switch (2), or use the 10-key pad to input the number (01 - 10) of the maintenance item to select the item.
   ★ The cursor moves and the item is highlighted.
   ★ The display method is the same as described on the previous page (relationship between remaining time and caution display). If the remaining time is less than 30 hours, the item is displayed in yellow, and if it is less than 0 hours, it is displayed in red.



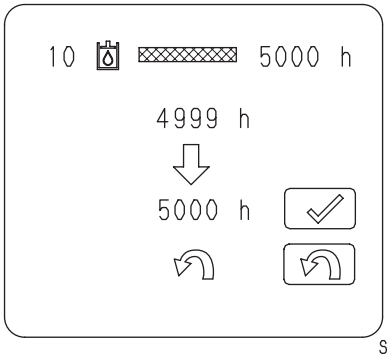
SJP08797



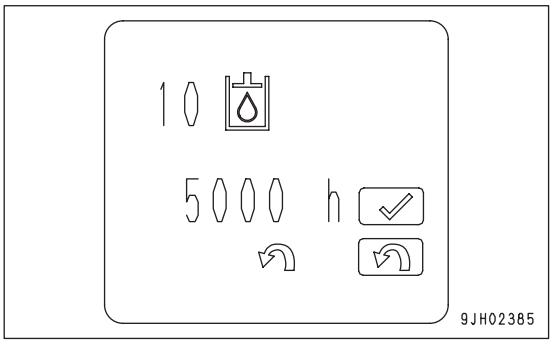
9JH02375

MAINTENANCE OPERATION

1. After completing the selection, press input confirmation switch (3).
   The screen will change to the maintenance reset screen.
2. Use the maintenance reset screen to check the content, and if there is any problem, press input confirmation switch (3) to move to the check screen.
   If the wrong item is selected, press return switch (4) to return to the maintenance list screen.
3. Check the content on the check screen, and if there is no problem, press input confirmation switch (3) to reset the maintenance time.
   After the reset is completed, the screen returns to the maintenance list display screen. To check the remaining time, or if the wrong item is selected, press return switch (4) to return to the maintenance list screen.
   ★ The check screen shows the symbol for the maintenance item and the set time in large letters.
   ★ The background color of the symbol for the item where the maintenance item was reset is the same as the background of the screen, so it is possible to check that it has been reset.



SJP08798



9JH02385

BRIGHTNESS, CONTRAST ADJUSTMENT FUNCTION

This function is used to adjust the brightness and contrast of the display.

ADJUSTMENT METHOD

★ Operate as follows when on the operator screen.

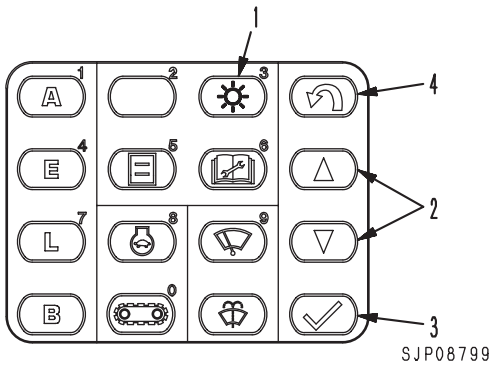
1. Press display brightness/contrast adjustment switch (1) and switch to the adjustment screen.

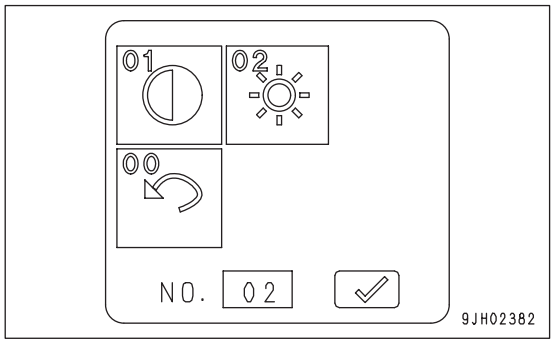
★ Relationship between menu symbol and content.

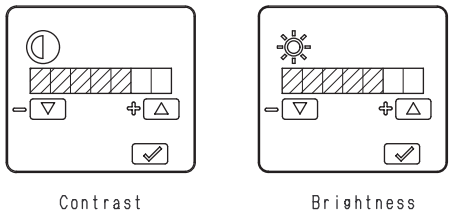
No.	Symbol	Content
01	Return mark	Return
02	 SJP08935	Contrast
03	 SJP08936	Brightness

2. Press control switch (2), or use the 10-key pad to input the number (00 - 02) to select either contrast or brightness.
   After completing the selection, press input confirmation switch (3) and return to the adjustment screen.
   Then press return switch (4) or use the 10-key pas to set to [00] and press input confirmation switch (3) to return to the normal screen.
3. Press control switch (2) and adjust the brightness and contrast as desired.

Control switch	Actuation
 SJP08933	Flow level bar graph extends to the right
 SJP08934	Flow level bar graph retracts to the left





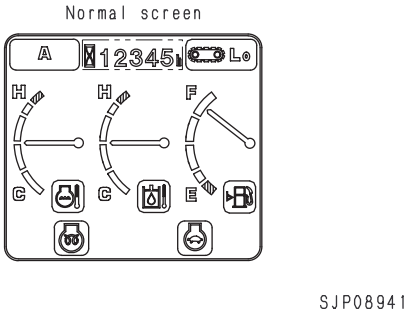


SJP08937

PASSWORD FUNCTION

- If a passport is input, the engine will not start unless the password is input correctly when starting.

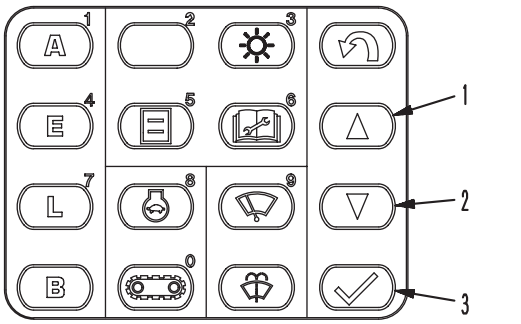
- When setting this function or when changing the password, it is necessary to go from the normal screen to the setting screen and input the password.
  This becomes possible 10 minutes after the starting switch is turned ON and the monitor screen has changed to the normal screen.



SJP08941

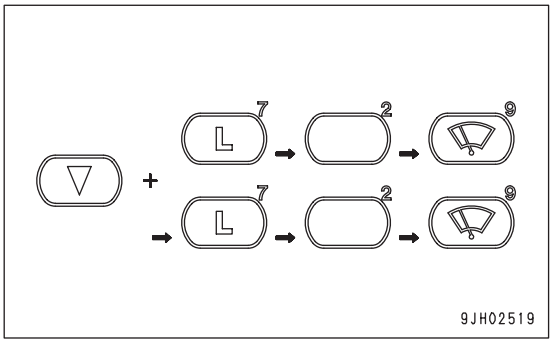
METHOD OF SETTING, CHANGING PASSWORD

1. Turn the starting switch ON, keep starting switch (2) pressed, use the 10-key pad to input 7 → 2 → 9 → 7 → 2 → 9 in succession, and the screen will change to the 8-digit numeral input screen.

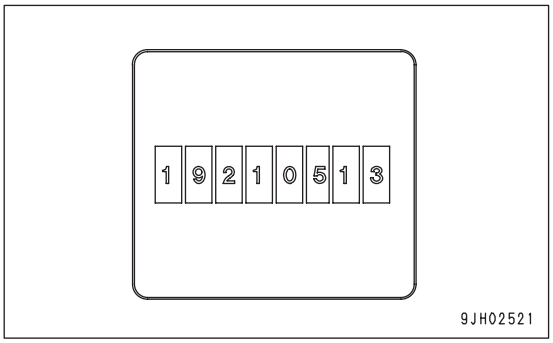


SJP08806

2. On the input screen, use the 10-key pad to input an 8-digit number [19210513]. When the final digit [number 3] is input, the screen will change to the Valid/ Invalid screen for the password function.

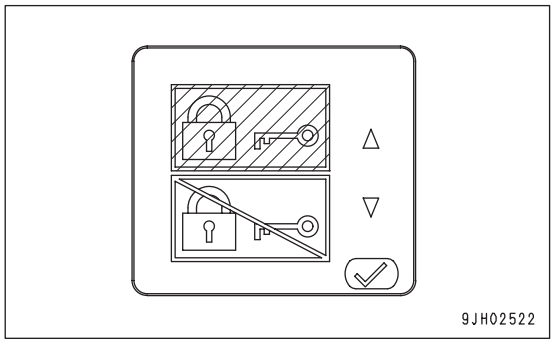


9JH02519

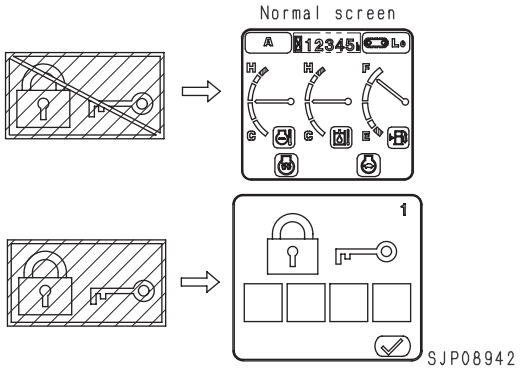


9JH02521

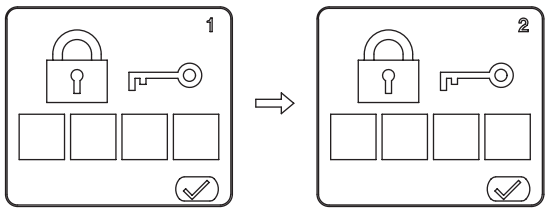
3. Press control switch (1) or (2) to set to Valid/Invalid.
   The diagram on the right shows the screen when control switch (1) is pressed and the screen is set to [Valid].



   If [Invalid] is selected and input confirmation switch (3) is pressed, the password function will be made invalid, and the screen will return to the normal screen.
   If [Valid] is selected and input confirmation switch (3) is pressed, the password function will be made valid, and the screen will change to the screen for inputting the 4-digit number.



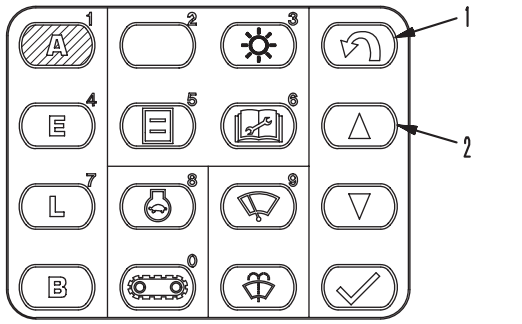
4. Input a 4-digit number on the input screen (the lock and key symbol are displayed), then press input confirmation switch (3).
   When the input confirmation switch is pressed, you will be requested to input the same 4-digit number again, so input the same 4-digit number, then press input confirmation switch (3) to confirm the password.
   Numerals 1 and 2 are displayed at the top right corner of the screen to distinguish between the 1st input screen and the 2nd input screen.
   When the password is confirmed, the screen will return to the normal screen.
   ★ If the number input the second time is different from the number input the first time, the password will not be confirmed and the screen will return to the first screen, so input the same 4-digit password 2 times in succession.



SERVICE METER CHECK FUNCTION

- When the starting switch is at the OFF position, keep return switch (1) and control switch (2) of the monitor pressed at the same time, and the service meter is shown on the display.
- This display is shown only while the two switches are being pressed. When the switches are released, the display goes out.

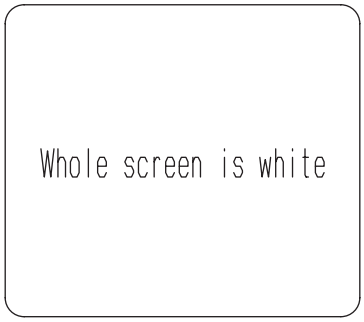
  Note that it takes 3 - 5 seconds after the switches are pressed for the service meter display to appear.



SJP08809

DISPLAY LCD CHECK FUNCTION

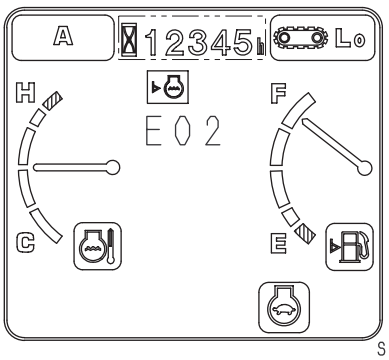
- On the password input screen or on the normal screen, if monitor return switch (1) and working mode (A) switch are kept pressed at the same time, all the LCD display will light up and the whole screen will become white, so the display can be checked.
- If any part of the display is black, the LCD is broken.



SJP08943

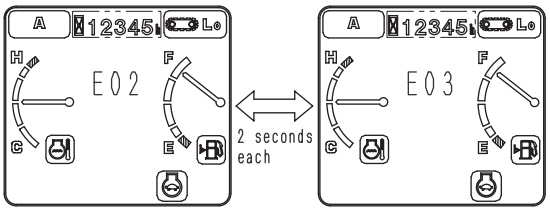
USER CODE DISPLAY FUNCTION

- If there is any problem in operating the machine, the user code is displayed on the monitor to advise the operator of the steps to take.
  This code display appears on the operator screen.
- On the operator screen, the user code is displayed on the portion for the hydraulic oil temperature gauge.



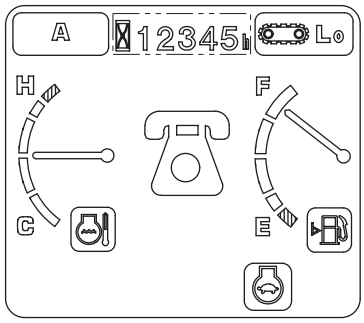
SJP08810

- If more than one user code is generated at the same time, the user codes are displayed in turn for 2 seconds each to display all the user codes.



SJP08945

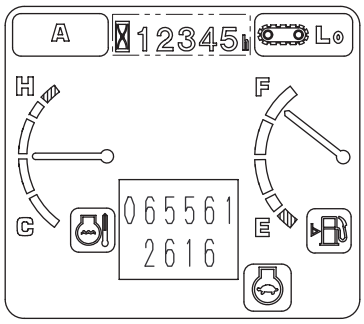
- While the user code is being displayed, if the input confirmation switch is pressed, the service code and failure code can be displayed.



BWP10529

- If there is more than one service code or failure code, the display switches every 2 seconds and displays all the service codes/failure codes that caused the user code to be displayed.

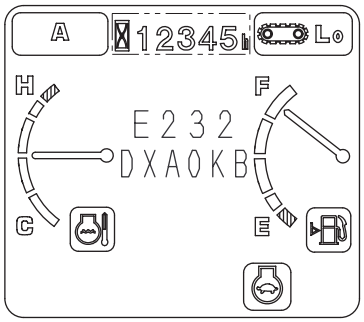
  Even if service codes/failure codes have occurred, if they did not cause the user code to be displayed, this function does not display them.



SJP09136

- 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.



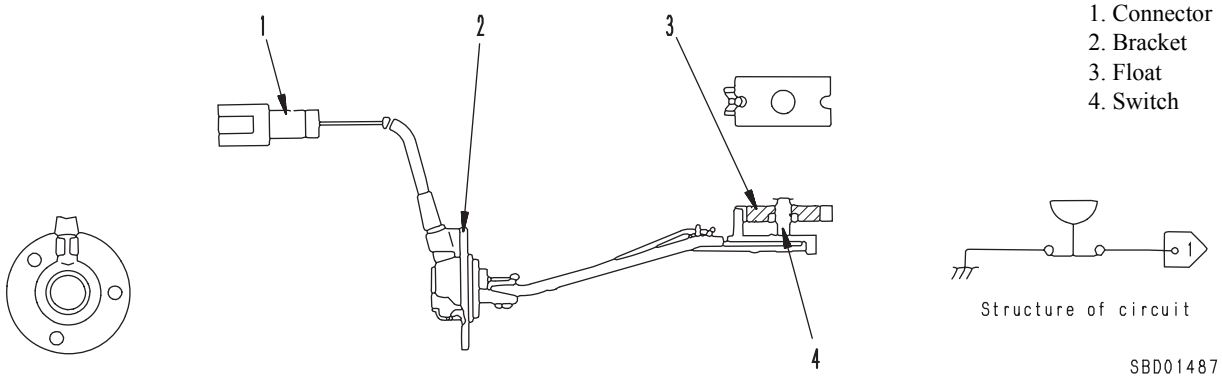
BWP10531

SENSOR

- The signals from the sensors are input to the panel directly. Either side of a sensor of contact type is always connected to the chassis ground.

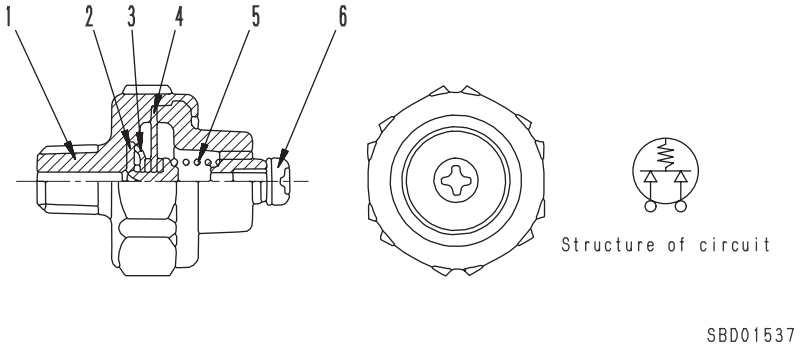
Sensor name	Type of sensor	When normal	When abnormal
Engine oil level	Contact	ON (Closed)	OFF (Open)
Engine oil pressure	Contact	OFF (Open)	ON (Closed)
Hydraulic oil temperature	Resistance	—	—
Coolant temperature	Resistance	—	—
Fuel level	Resistance	—	—
Air cleaner clogging	Contact	OFF (Closed)	ON (Open)

Engine oil level sensor



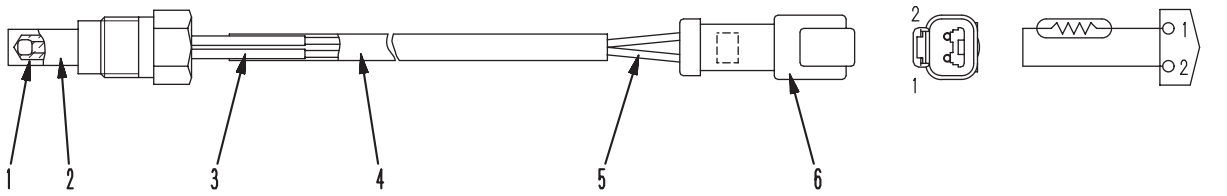
1. Connector
2. Bracket
3. Float
4. Switch

Engine oil pressure sensor (For low pressure)



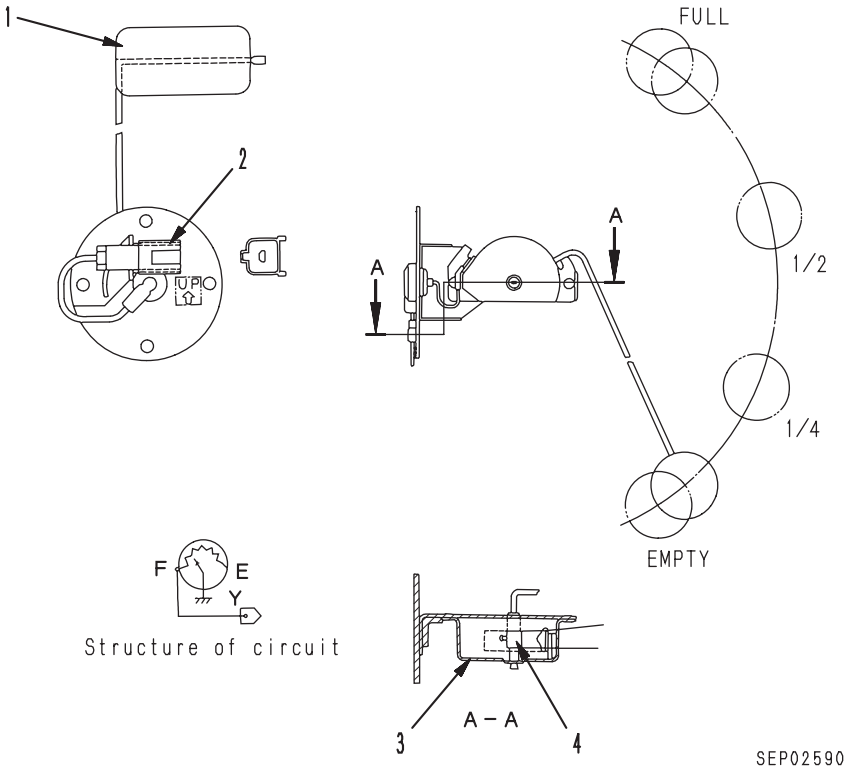
1. Plug
2. Contact ring
3. Contact
4. Diaphragm
5. Spring
6. Terminal

Coolant temperature sensor
Hydraulic oil temperature sensor



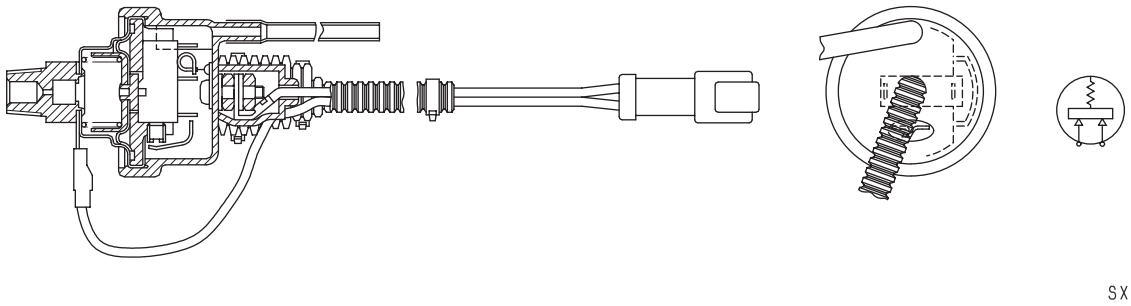
1. Thermistor
2. Body
3. Tube
4. Tube
5. Wire
6. Connector

Fuel level sensor



1. Float
2. Connector
3. Cover
4. Variable resistor

Air cleaner clogging sensor



20 TESTING AND ADJUSTING

STANDARD VALUE TABLE FOR ENGINE RELATED PARTS 20- 2
STANDARD VALUE TABLE FOR CHASSIS RELATED PARTS..... 20- 3
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.

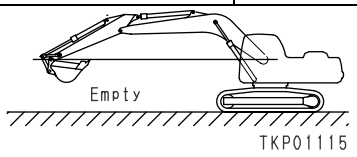
- When carrying out testing, adjusting, or troubleshooting, park the machine on level ground, insert the safety pins, and use blocks to prevent the machine from moving.
- When carrying out work together with other workers, always use signals and do not let unauthorized people near the machine.
- When checking the water level, always wait for the water to cool down. If the radiator cap is removed when the water is still hot, the water will spurt out and cause burns.
- Be careful not to get caught in the fan, fan belt or other rotating parts.

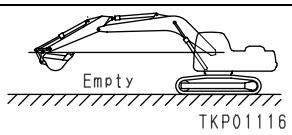
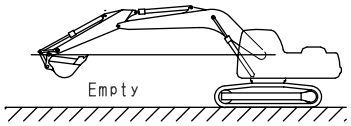
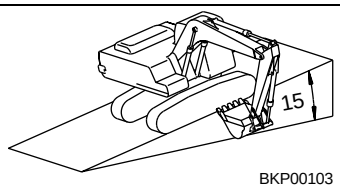
STANDARD VALUE TABLE FOR ENGINE RELATED PARTS

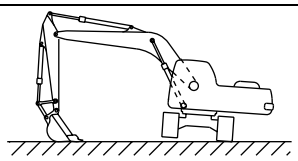
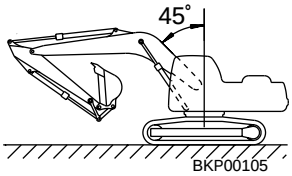
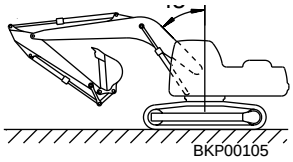
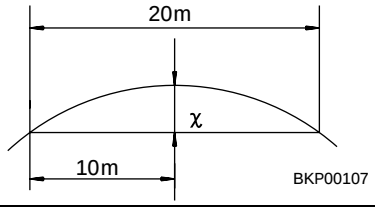
Applicable model			PC340LC,340NLC-7	
Engine			SAA6D114E-2	
Item	Measurement condition	Unit	Standard value for new machine	Service limit value
Engine speed	High idling	rpm	2,160±70	2,160±70
	Low idling		900^{+25}_{-50}	900^{+25}_{-50}
	Rated speed		1,900	1,900
Intake air pressure (boost pressure)	At rated output	kPa {mmHg.}	133–160 {1,000–1,200}	Max. 120 {Max. 900}
Exhaust gas color	At sudden acceleration	Bosch index	Max. 4.5	Max. 6.5
	At high idling		Max. 1.0	Max. 2.0
Valve clearance (Normal temperature)	Intake valve	mm	0.30	—
	Exhaust valve		0.56	—
Compression pressure	Oil temperature: 40–60ºC Engine speed: 250–300rpm	MPa {kg/cm^2}	Min. 2.4 {Min. 24.6}	Difference between cyinders Min. 2.0 {Min. 20.5} Max. 0.7 {Max. 6.9}
Blow-by pressure	(Water temperature: operating range) At rated output	kPa {mmH_2O}	Max. 1.0 {Max. 100}	20 {200}
Oil pressure (SAE15W-40)	(Water temperature: operating range) At high idling At low idling	MPa {kg/cm^2}	0.36–0.61 {3.5–6.0} Min. 0.10 {Min. 1.0}	0.18 {1.8} 0.07 {0.7}
Oil temperature	Whole speed range (inside oil pan)	°C	90–120	120
Fuel injection timing	Before Top Dead Center	°(degree)	9.5	9.5
Fan belt tension	Deflection when pressed with finger force of approx. 58.8 N{6 kg}	mm	8	Min. 6, Max. 10
Air conditioner compressor belt tension	Deflection when pressed with finger force of approx. 63.7 N{6.5 kg}	mm	5–8	5–8

STANDARD VALUE TABLE FOR CHASSIS RELATED PARTS

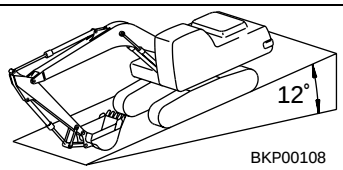
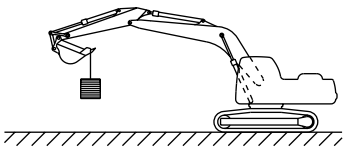
Applicable model					PC340LC,340NLC-7	
Cate-gory	Item		Measurement Condition	Unit	Standard value	Permissible value
Engine speed	2 pumps at relief		• Engine water temperature: Within operation range • Hydraulic oil temperature: Within operation range • Engine at high idling • Arm in relief condition	rpm	1,980±100	1,980±100
	At 2-pump relief + one touch power up		• Engine water temperature: Within operation range • Hydraulic oil temperature: Within operation range • Engine at high idling • Arm relief + One-touch power max. switch in ON condition		1,870±100	1,870±100
	Speed when auto-deceleration is operated		• Engine at high idling • Auto-deceleration switch in ON condition • All control levers in NEUTRAL condition		1,400±100	1,400±100
Spool stroke	Boom control valve			mm	9.5±0.5	9.5±0.5
	Arm control valve					
	Bucket control valve					
	Swing control valve					
	Travel control valve					
Travel of control levers	Boom control lever		• Engine stopped • At center of control lever grip • Max. reading up to stroke end (excepting lever play in NEUTRAL position)	mm	85±10	85±10
	Arm control lever				85±10	85±10
	Bucket control lever				85±10	85±10
	Swing control lever				85±10	85±10
	Travel control lever				115±12	115±12
	Play of control lever				Max. 10	Max. 15
Operating force of control levers	Boom control lever		• Hydraulic oil temperature: Within operation range • Engine at high idling • At center of control lever grip • At tip in case of pedal • Max. reading up to stroke end	N{kg}	15.7±3.9 {1.6±0.4}	Max. 24.5 {Max. 2.5}
	Arm control lever				15.7±3.9 {1.6±0.4}	Max. 24.5 {Max. 2.5}
	Bucket control lever				12.7±2.9 {1.3±0.3}	Max. 21.6 {Max. 2.2}
	Swing control lever				12.7±2.9 {1.3±0.3}	Max. 21.6 {Max. 2.2}
	Travel control lever	Lever			24.5±5.9 {2.5±0.6}	Max. 39.2 {Max. 4.0}
		Papel			74.5±18.6 {7.6±1.9}	Max. 107.6 {Max. 11}

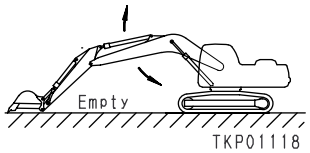
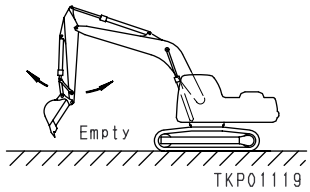
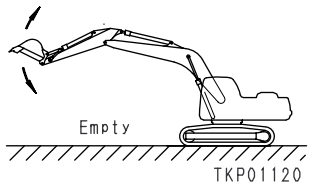
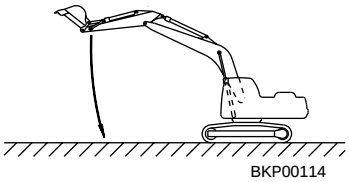
Applicable model					PC340LC,340NLC-7	
Category	Item	Measurement Condition		Unit	Standard value	Permissible value
Hydraulic pressure	Unload pressure	• Hydraulic oil temperature: Within operation range • Engine at high idling • Working mode: A mode • Hydraulic pump output pressure with all control levers in NEUTRAL position		MPa {kg/cm^2}	3.9±1.0 {40±10}	3.9±1.0 {40±10}
	Boom	• Hydraulic oil temperature: Within operation range • Engine at high idling • Working mode: A mode • Hydraulic pump output pressure with all measurement circuits relieved • Values inside parenthesis: Hydraulic oil pressure with one-touch power max. switch in ON mode (reference only)	RAISE		$34.81^{+1.47}_{-0.98}$ $(37.26^{+1.47}_{-0.98})$ $\{355^{+15}_{-10}(380^{+15}_{-10})\}$	33.34–37.23 (35.80–39.23) {340–375(365–400)}
			LOWER	At low-pressure setting	18.13±0.98 {185±10}	16.66–19.6 {170–200}
				At high-pressure setting	31.36±1.47 {320±15}	29.4–33.32 {170–200}
	Arm				$34.81^{+1.47}_{-0.98}$ $(37.26^{+1.47}_{-0.98})$ $\{355^{+15}_{-10}(380^{+15}_{-10})\}$	33.34–37.23 (35.80–39.23) {340–375(365–400)}
	Bucket					
	Swing				$30.87^{+1.47}_{-2.45}$ $\{315^{+15}_{-25}\}$	28.42–32.85 {285–335}
	Travel				$37.27^{+2.94}_{-0.98}$ $\{380^{+30}_{-10}\}$	35.80–40.70 {365–415}
	Control circuit source pressure	• Hydraulic oil temperature: Within operation range • Engine running at high idling • Self-reducing pressure valve output pressure with all control levers in NEUTRAL position			3.23±0.2 {33±2}	2.84–3.43 {29–35}
	Self-reducing pressure valve	• Hydraulic oil temperature: Within operation range • Engine at high idling • Working mode: A mode • Traveling speed: Hi • Hydraulic oil pump pressure - LS pressure		When all control levers in NEUTRAL position	3.9±1.0 {40±10}	3.9±1.0 {40±10}
				When traveling at half stroke (without load)	2.45±0.1 {25±1}	2.45±0.1 {25±1}
Swing	Swing brake angle	 • Hydraulic oil temperature: Within operation range • Engine running at high idling • Working mode: A mode • Swing circle misalignment amount when stopping after one turn		deg. (mm)	PC340LC, 340NLC: Max. 110	PC340LC, 340NLC: Max. 140

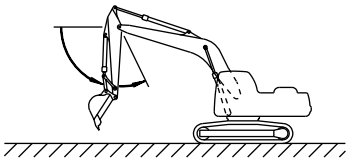
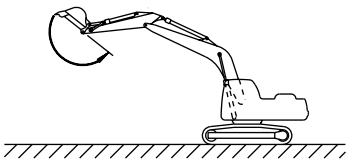
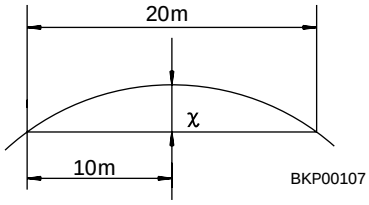
Applicable model					PC340LC,340NLC-7	
Category	Item	Measurement Condition		Unit	Standard value	Permissible value
Swing	Time taken to start swing	 TKP01116 • Hydraulic oil temperature: Within operation range • Engine running at high idling • Working mode: A mode • Time required for passing points 90 and 180 degrees from starting point	90°	sec.	3.3±0.4	Max. 4.2
			180°		4.7±0.5	Max. 5.7
	Time taken to swing	 TKP01115 • Hydraulic oil temperature: Within operation range • Engine running at high idling • Working mode: A mode • Time required for 5 more turns after making initial one turn		sec.	31.6±2.9	Max. 38
	Hydraulic drift of swing	 BKP00103 • Hydraulic oil temperature: Within operation range • Engine stopped • Keeping upper structure transverse on slope of 15 degrees • Notching a mating mark on inner and outer races of swing circle • Mating mark misalignment amount during 5 minutes		mm	0	0
	Leakage from swing motor	• Hydraulic oil temperature: Within operation range • Engine running at high idling • Swing lock switch: ON • Leakage amount for one minute during swing relief		¶/min	Max. 5.5	Max. 11

Applicable model					PC340LC,340NLC-7	
Category	Item	Measurement Condition		Unit	Standard value	Permissible value
Travel	Travel speed (1)	 BKP00104 • Hydraulic oil temperature: Within operation range • Engine running at high idling • Working mode: A mode • Time required for track shoes to make 5 turns after making one initial idle turn	Lo	sec.	58.0±11.5	45.0–74.5
			(※Mi)		41.5±6.0	34.0–51.5
			Hi		34.0±2.0	32.0–41.5
	Travel speed (2)	 BKP00105 • Hydraulic oil temperature: Within operation range • Engine running at high idling • Working mode: A mode • Flat ground • Time required for traveling 20 m after 10 m trial run	Lo		23.3±4.4	18.9–31.0
			(※Mi)		16.7±2.2	14.4–21.0
			Hi		13.1±0.7	12.1–15.1
	Travel deviation	 BKP00105 • Hydraulic oil temperature: Within operation range • Engine at high idling • Working mode: A mode • Travel speed: Lo • Solid and flat ground • Swerving amount while traveling 20 m (X) after initial 10 m trial run  BKP00107		mm	Max. 200	Max. 300

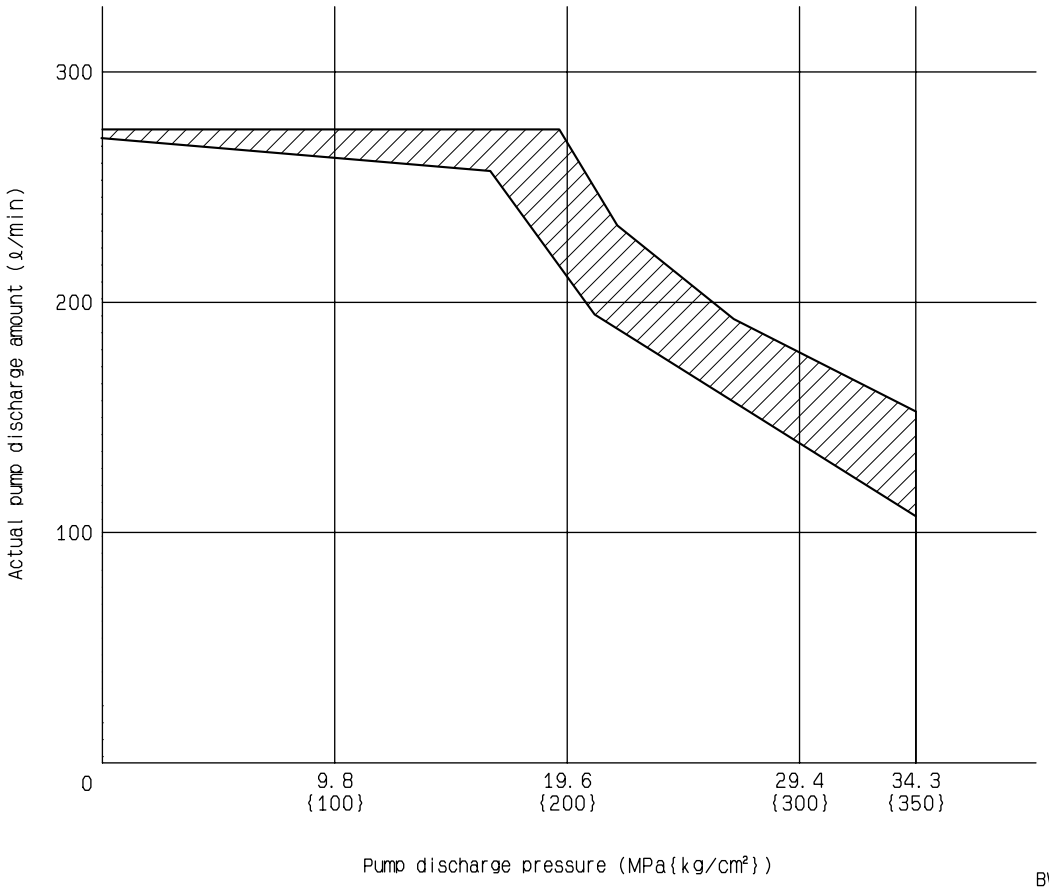
※: The “Mi” mode is on the multi-monitor specification machine only.

Applicable model					PC340LC,340NLC-7	
Category	Item		Measurement Condition	Unit	Standard value	Permissible value
Travel	Hydraulic drift of travel		 BKP00108 • Hydraulic oil temperature: Within operation range • Engine stopped • Parking machine on slope of 12 degrees with sprocket facing upslope • Sliding distance for 5 minutes	mm	0	0
	Leakage of travel motor		• Hydraulic oil temperature: Within operation range • Engine at high idling • Traveling with sprocket locked • Oil leakage amount for one minute with traveling in relief condition	¶/min	Max. 15	Max. 30
Work equipment	Hydraulic drift of work equipment	Whole work equipment (tooth tip fall amount)	 BKP00110 • Hydraulic oil temperature: Within operation range • Flat and level ground • Work equipment in measurement posture as illustrated above • Bucket load: 2,160 kg • Engine stopped • Work equipment control lever in NEUTRAL position • Fall amount for 15 minutes as measured every 5 minutes starting immediately after initial setting	mm	PC340LC,340NLC Max. 450	PC340LC,340NLC Max. 675
		Boom cylinder (cylinder retraction amount)			PC340LC,340NLC Max. 25	PC340LC,340NLC Max. 38
		Arm cylinder (cylinder extension amount)			PC340LC,340NLC Max. 135	PC340LC,340NLC Max. 203
		Bucket cylinder (cylinder retraction amount)			PC340LC,340NLC Max. 20	PC340LC,340NLC Max. 30

Applicable model						PC340LC,340NLC-7	
Cate-gory	Item		Measurement Condition		Unit	Standard value	Permissible value
Work equipment	Work equipment speed	Boom	 • Hydraulic oil temperature: Within operation range • Engine running at high idling • Working mode: A mode • Time required from raise stroke end till bucket touches ground	RAISE	sec.	PC340LC,340NLC 3.7±0.4	PC340LC,340NLC Max. 4.5
				LOWER		2.5±0.3	Max. 3.0
		Arm	 • Hydraulic oil temperature: Within operation range • Engine running at high idling • Working mode: A mode • Time required from dumping stroke end to digging stroke end	IN		3.8±0.4	Max. 4.5
				OUT		PC340LC,340NLC 2.9±0.3	PC340LC,340NLC Max. 3.5
		Bucket	 • Hydraulic oil temperature: Within operation range • Engine running at high idling • Working mode: A mode • Time required from dumping stroke end to digging stroke end	CURL		3.2±0.3	Max. 3.8
				DUMP		2.3±0.3	Max. 2.9
	Time lag	Boom	 • Hydraulic oil temperature: Within operation range • Engine running at low idling • Working mode: A mode • Time required from raise stroke end till bucket touches ground and pushes up machine front		sec.	Max. 3.0	Max. 3.6

Applicable model					PC340LC,340NLC-7	
Category	Item		Measurement Condition	Unit	Standard value	Permissible value
Work equipment	Time lag	Arm	 BKP00115 • Hydraulic oil temperature: Within operation range • Engine running at low idling • Working mode: A mode • Time required from dumping stroke end till bucket stops momentarily after control lever is tilted to digging and starts to move again	sec.	PC340LC,340NLC Max. 3.0	PC340LC,340NLC Max. 3.6
		Bucket	 BKP00116 • Hydraulic oil temperature: Within operation range • Engine running at low idling • Working mode: A mode • Time required from dumping stroke end till bucket stops momentarily after control lever is tilted to digging and starts to move again		Max. 3.0	Max. 5.0
	Internal leackage	Cylinders	• Hydraulic oil temperature: Within operation range • Engine running at high idling • Leakage amount for one minute with cylinder or travel to be measured in relief condition	cc/min	4.5	20
		Center swivel joint			10	50
Performance in compound operation	Swerving amount in simultaneous operation of work equipment and travel		• Hydraulic oil temperature: Within operation range • Engine at high idling • Working mode: A mode • Traveling speed: Lo • Flat and level ground • Swerving amount (X) when traveling 20 m after initial trial run of 10 m  BKP00107	mm	Max. 400	Max. 440
Performance of hydraulic pump	Hydraulic pump delivery		See next page	¶/min	See next page	

Applicable model				PC340LC,340NLC-7	
Cate-gory	Item	Measurement Condition	Unit	Standard value	Permissible value
Performance of hydraulic pump	Discharge amount of hydraulic pump (A mode)				



• Pump speed: At 1,950 rpm, PC current 280 mA

Check point	Test pump discharge pressure (MPa {kg/cm^2})	Discharge pressure of other pump (MPa {kg/cm^2})	Average pressure (MPa {kg/cm^2})	Standard value for discharge amount Q (¶/min)	Judgement standard lower limit Q (¶/min)
As desired	P1	P2	$\frac{P1+P2}{2}$	See graph	See graph

★ As far as possible, bring pump discharge pressure P1 and P2 as close as possible to the average pressure when measuring.
The error is large near the point where the graph curves, so avoid measuring at this point.

★ When measuring with the pump mounted on the machine, if it is impossible to set the engine speed to the specified speed with the fuel control dial, take the pump discharge amount and the engine speed at the point of measurement, and use them as a base for calculating the pump discharge amount at the specified speed.

TESTING AND ADJUSTING

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MEASUREMENT OF AIR BOOST PRESSURE 20-104
MEASUREMENT OF EXHAUST GAS COLOR 20-105
ADJUSTMENT OF VALVE CLEARANCE 20-106
MEASUREMENT OF COMPRESSION PRESSURE 20-108
MEASUREMENT OF BLOW-BY PRESSURE 20-109
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INSPECTION AND ADJUSTMENT OF ENGINE RPM

★ Engine inspection and maintenance tools

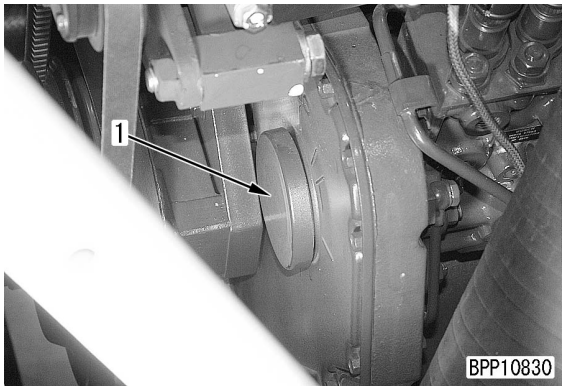
Mark		Part No.	Part Name
A	1	799-203-8001	Multi-tachometer
	2		Adapter

★ Engine RPM may be detected using a monitoring function in the monitor panel (special function furnished to the monitor panel).

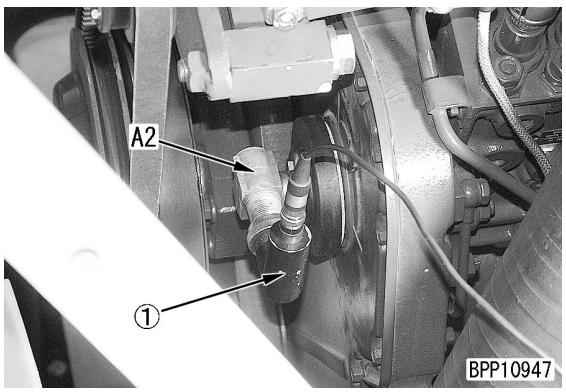
k Be careful not to touch the strongly heated portion of the engine by accident while installing a measurement equipment.

Inspection

1. Open up the engine hood and take off cover (1).



2. Fit adapter **A2**, and connect pickup set ① and meter ② of multi-tachometer **A1**.



3. Measure the engine RPM after setting each measurement condition.

1) RPM at low idling:
   i) Set the fuel dial at low idling (MIN).
   ii) Move all the control levers of work equipment, swing and travel to the NEUTRAL position.
2) RPM at high idling:
   i) Turn the auto-decelerator OFF.
   ii) Set the fuel dial at high idling (MAX).
   iii) Operate any of the work equipment, swing and travel control levers.
   ★ Operate the lever lightly enough to turn on the PPC hydraulic switch, but not to start the work equipment, swing or travel.
3) RPM at fuel pump relief
   i) Set the fuel dial at high idling (MAX)
   ii) Put the arm in the digging relief position.
4) RPM when 2 pump relief and one-touch power max. switch are set (near rated RPM)
   i) Set the fuel dial at high idling (MAX).
   ii) Put the arm in digging relief position and keep the one-touch max. power switch depressed.
   ★ The one-touch power max. function is automatically released in 8.5 seconds, even if the knob switch is kept depressed. Take measurement during the period.
5) RPM when auto-decelerator is set
   i) Turn the auto-decelerator ON.
   ii) Set the fuel dial at high idling (MAX).
   iii) Move all the control levers of work equipment, swing and travel to the NEUTRAL position.
   ★ Approx. 5 seconds after all the control levers are moved to the NEUTRAL position, the rpm falls automatically. That is when the rpm with the auto-decelerator in motion should be measured.



4. Detach all the measurement tools after the inspection, and make sure that the machine is back to normal condition.

Adjustment

1. **Adjustment of RPM at low idling**
   - ★ If the rpm at low idling deviates from the standard value, make adjustment using the adjustment function provided in the monitor panel.
   - ★ For the adjustment procedures, refer to the section, "Special Function of Monitor Panel"

2. **Adjustment of Governor Spring**
   - ★ If the rpm at high idling deviates from the standard value, or it is unsteady (hunting), adjust the governor spring securing dimensions, using the adjustment function in the monitor panel.
   - ★ For the adjustment procedures, refer to the section, "Special Function of Monitor Panel"

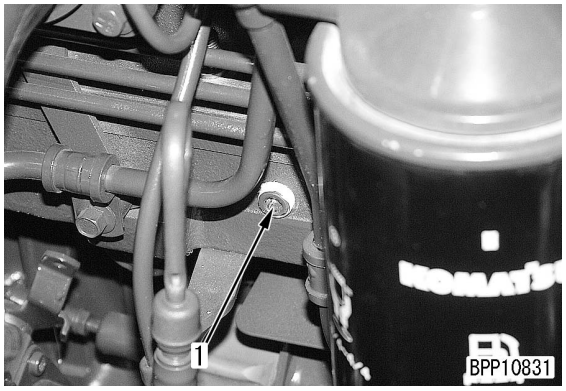
MEASUREMENT OF AIR BOOST PRESSURE

★ Air boost pressure measurement tool

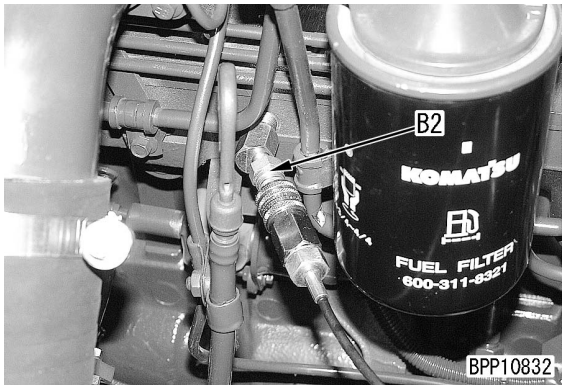
Mark		Part No.	Part Name
B	1	799-201-2202	Boost gauge kit
	2	799-101-5210	Fitting (PT1/4)

1. Open up the engine hood.

2. Remove air boost pressure measurement plug (1).



3. Install fitting **B2** and connect it with gauge ① of air boost gauge kit **B1**.



4. Start the engine and wait for the engine cooling water temperature and hydraulic oil temperature to rise to the operation range.

5. Run the engine at a medium speed and drain oil in the hose.
- ★ Oil can be drained by inserting the gauge into the hose halfway and then repeating to open and close the self- seal on the hose side.
- ★ If Pm Kit (A) is available, an air bleeding coupling (790-261-1130) included in the kit may well be used.
- ★ Be sure to drain oil thoroughly. If there is oil remaining in the hose, the gauge does not function properly.

6. Take measurement of air boost pressure at high idling after setting the following measurement conditions.
- Working mode: A mode
- Swing lock switch: ON (High pressure relief)
- Work equipment, swing and travel: Arm digging relief



7. Detach the measurement tool after the measurement, and return the machine to the normal condition.

MEASUREMENT OF EXHAUST GAS COLOR

★ Exhaust gas color measurement tool

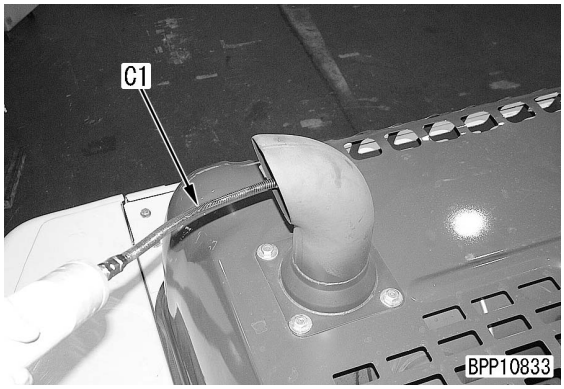
Mark		Part No.	Part Name
C	1	799-201-9000	Handy Smoke Checker
	2	Commercial product	Smoke Meter

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

★ If no compressed air or power is not available in the field, use Handy Smoke Checker **C1**. For recording official data, use Smoke Meter **C2**.

1. Measurement with Handy Smoke Checker C1

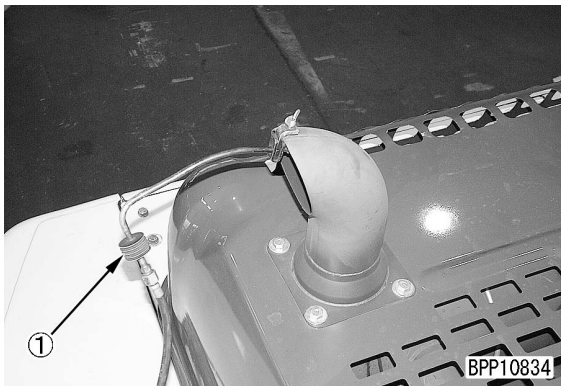
1) Fit a filtering paper to Handy Smoke Checker **C1**.
2) Insert the exhaust gas intake pipe into the exhaust pipe.
3) Start the engine and keep it running until the engine cooling water temperature comes within the operating range.
4) Let the exhaust gas stay on the filtering paper by operating a handle of Handy Smoke Checker **C1**, when the engine speed is suddenly accelerated or kept at high idling.



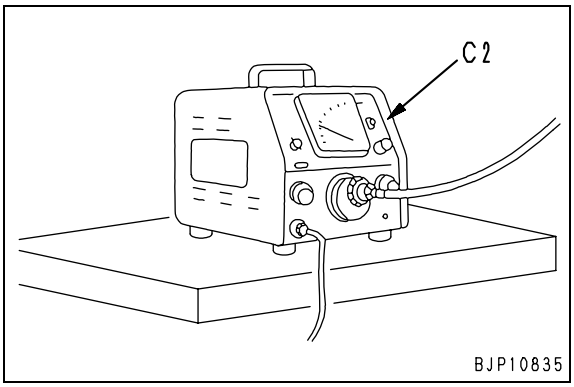
5) Take out the filtering paper and compare it with the attached scale for judgement.
6) Detach the measurement tool after the measurement, and make sure the machine is back to normal condition.

2. Measurement with Smoke Meter C2

1) Insert probe ① of the Smoke Meter **C2** into the exhaust gas pipe outlet, and fasten it to the outlet with a clip.



2) Connect the probe hose, accelerator switch outlet and air hose to the Smoke Meter **C2**.
   ★ Keep the pressure of the supplied compressed air below 1.5 MPa {15 kg/cm^2}.
3) Connect the power cable to an outlet of AC100V.
   ★ Confirm that the Smoke Meter power switch is in the OFF position, before connecting the power cable to an outlet.
4) Fit a filtering paper by loosening the suction pump cap nut.
   ★ Fit the filtering paper securely so that air may not leak.
5) Move the Smoke Meter **C2** power switch to the ON position.



6) Start the engine and keep it running until the engine water temperature rises to the operating range.
7) Let the exhaust gas stay on the filtering paper by depressing the accelerator pedal of Smoke Meter **C2**, when the engine speed is suddenly accelerated or kept at high idling.
8) Put the polluted filtering paper on non-polluted filtering paper (more than 10 sheets) in the filtering paper holder, and read the indicated value.
9) Detach the measurement tool after the measurement, and make sure that the machine is back to normal condition.

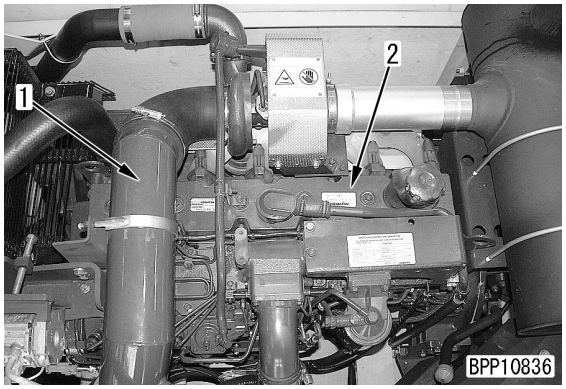
ADJUSTMENT OF VALVE CLEARANCE

★ Valve clearance adjustment tools

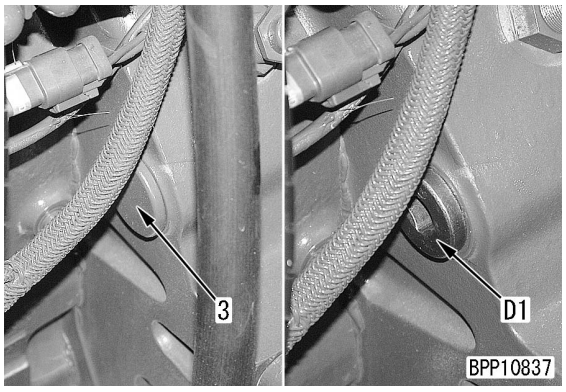
Mark		Part No.	Part Name
D	1	795-799-1131	Gear
	2	Commercial product	Filler Gauge
	3	795-799-1900	Pin assembly

1. Open up the engine hood and remove air intake connector (1).

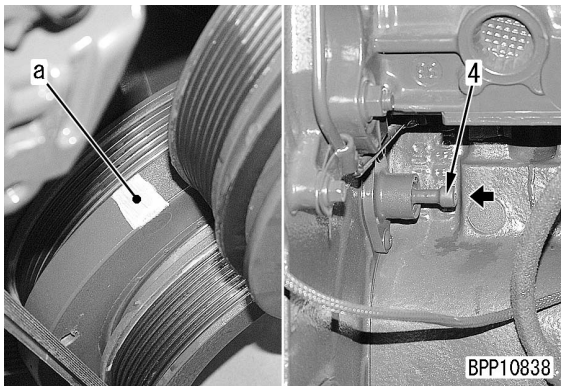
2. Remove cylinder head covers (2).



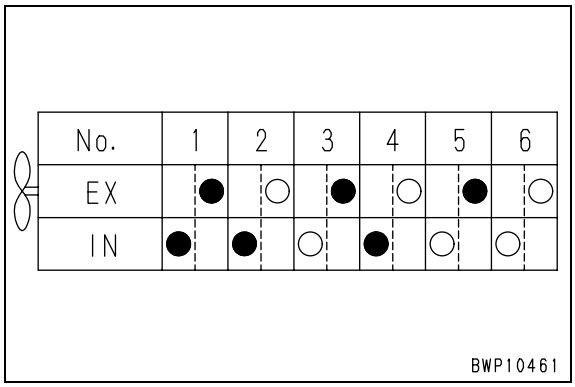
3. Take off cap (3) and fit gear **D1**.



4. Turn the crankshaft clockwise (normal rotation) with gear **D1** until yellow paint mark **a** on the crank pulley comes up to the top. Then set the No. 1 cylinder to the top dead center with timing pin (4).
- ★ When No. 1 cylinder is at the top dead center, its rocker arm can be manually moved as much as the valve clearance. If it cannot be moved, that means that No. 1 cylinder is not yet at the top dead center. In that case, rotate it by one more turn.
- ★ Timing pin push-in depth: 8 mm
- ★ If it proves difficult to make this check with the timing pin installed in the engine, metallic pin assembly **D3** may be used instead.
- ★ After setting the No. 1 cylinder to the top dead center, stamp a counter mark on the crank pulley and the front cover.

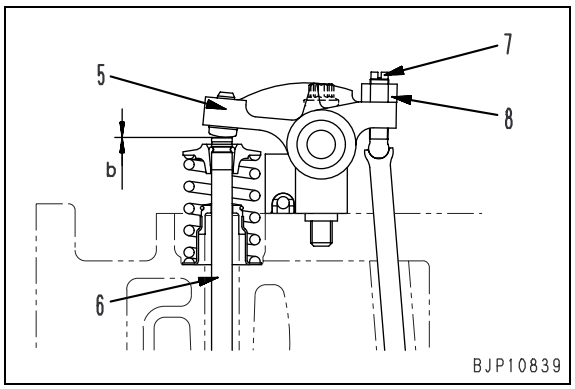


5. When No. 1 cylinder is at the top dead center, adjust valve clearances indicated with a black bullet mark (●) in the chart below in the following manner.



1) Insert filler gauge **D2** in between rocker arm (5) and valve stem (6), and adjust the valve clearance with adjusting screw (7).
   - ★ For the adjustment, turn the adjusting screw with filler gauge **D2** inserted to the extent that filler gauge **D2** can be lightly moved.
2) Fix adjusting screw (7) and then tighten lock nut (8).
   3 Lock nut: **24±4 Nm{2.45±0.41kgm}**
   - ★ Check the valve clearance again after tightening lock nut (8).

★ Return timing pin (4) to the original position and proceed to the next step, once all the measurements of valve clearance indicated with a black bullet mark (●) have been completed.



6. Turn the crankshaft clockwise (normal rotation) with gear **D1** so as to match the counter marks on the crank pulley and the front cover, and bring up No. 6 cylinder to the top dead center.

7. When No. 6 cylinder is at the top dead center, adjust valve clearances indicated with a white bullet mark (O) in the chart.
★ The adjustment procedures are the same as introduced in Item 5 above.

8. After the adjustment, make sure that the machine is back to normal condition.
3 Cylinder head cover securing bolt:
24±4 Nm{2.45±0.41 kgm}

MEASUREMENT OF COMPRESSION PRESSURE

★ Compression pressure measurement tools

Mark	Part No.	Part Name
E		Compression Gauge

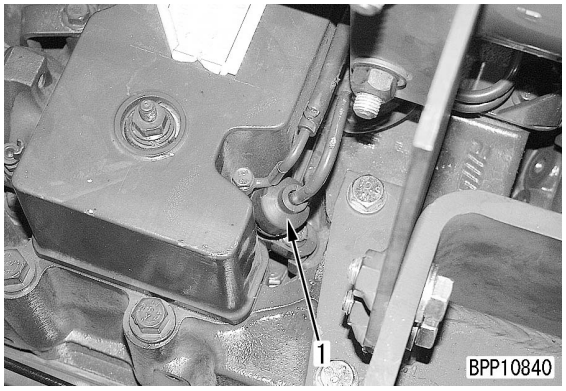
k Be careful not to get burnt by touching the exhaust manifold or muffler, or get caught with a rotating parts, while taking measurement of compression pressure.

1. Adjust the valve clearances.
★ For the adjustment, refer to the section, "Adjustment of Valve Clearance".

2. Make preparations for measuring the engine rpm.
★ For the preparations, refer to the section, "Inspection and adjustment of Engine RPM".

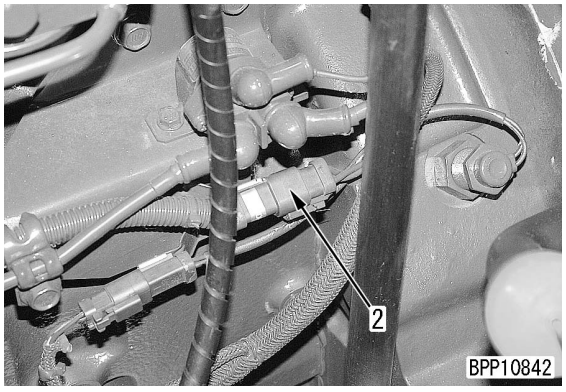
3. Warm up the engine until the engine oil temperature rises up to 40 – 60°C.

4. Detach nozzle holder (1) of a cylinder to be measured.



5. Fit compression gauge **E** to the nozzle holder mounting.

6. Disconnect E10 connector (2) of the engine stop solenoid.



7. Crank up the engine with the engine starting motor, and measure the compression pressure.
★ Read off the value, when the needle of the compression gauge steadies itself.
★ When taking measurement of the compression pressure, be sure to measure the engine rpm, too, so that it stays within the range of designated measurement conditions.

8. Detach the measurement tools after the measurement, and make sure that the machine is back to normal condition.
2 Nozzle holder rubber boot:
Engine oil (EO10-CD)

MEASUREMENT OF BLOW-BY PRESSURE

★ Blow-by pressure measurement tools

Mark		Part No.	Part Name
F	1	799-201-1504	Blow-by Kit
	2	795-790-3300	Tool (Nozzle)

1. Remove the engine under cover.

2. Fit tool **F2** to blow-by hose and connect it with gauge ① of blow-by kit **F1**.



3. Start the engine and keep it running until the engine cooling water temperature rises to the operating range.

4. Measure the blow-by pressure at high idling and under the following conditions.
- Working mode: A mode
- Swing lock switch: ON (High pressure relief)
- Work equipment, swing and travel: Arm IN relief

★ Read off the blow-by pressure value, when the needle of the gauge steadies itself.



5. Detach the measurement tools after the measurement, and make sure that the machine is back to normal condition.

INSPECTION AND ADJUSTMENT OF FUEL INJECTION TIMING

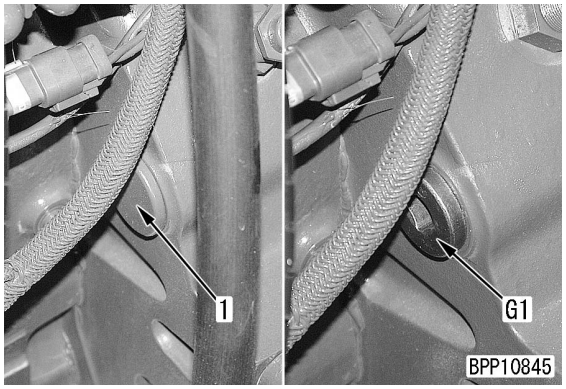
★ Fuel injection timing inspection and adjustment tools

Mark		Part No.	Part Name
G	1	795-799-1131	Gear
	2	795-799-1900	Pin Ass'y
	3	795-799-1950	Lock Pin

Inspection

1. Open up the engine hood.

2. Take off cover (1) and fit gear **G1**.



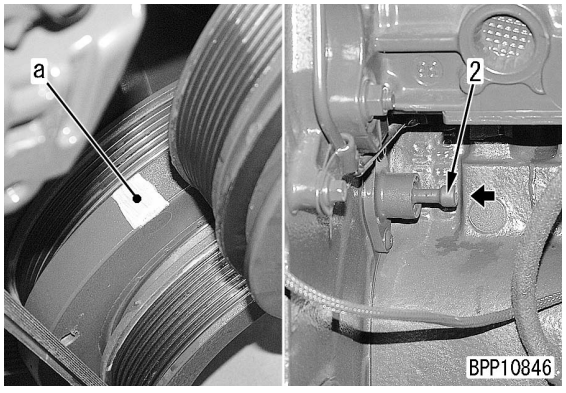
3. Turn the crankshaft clockwise (normal rotation) with gear **G1** until yellow paint mark **a** on the crank pulley comes up to the top. Then set the No. 1 cylinder to the top dead center with timing pin (2).

★ Remove the head cover and check that No. 1 cylinder rocker arm moves as much as the valve clearance. If not, that means that the No. 1 cylinder is not yet at the top dead center. In that case, turn the crankshaft by one more turn.

★ Timing pin push-in depth: 8 mm

★ If the pin cannot be pushed in, turn the crankshaft slightly back and forth with gear **G1**.

★ If it proves difficult to make this checking with the pin installed in the engine, metallic pin assembly **G2** may be used instead.



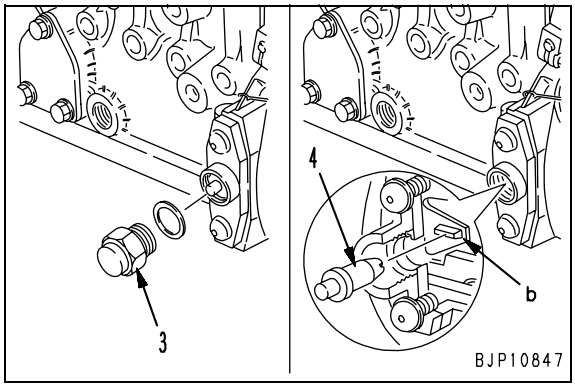
4. Disconnect plug (3) of the fuel injection pump.

5. Reverse and push in timing pin (4) of the fuel injection pump, and confirm its cut-out portion matches with protruding portion **b** inside the pump.

★ If timing pin (4) can be pushed in smoothly, then injection timing is correct.

★ If timing pin (4) cannot be pushed in smoothly, injection timing is incorrect and requires adjustment.

★ If it is found difficult to confirm the push-in depth with timing pin (4) as installed in the engine, metallic pin ass'y **G3** may well be used instead.



6. Detach the measurement tools after the measurement, and make sure that the machine is back to normal condition.

3 Cylinder head cover securing bolt:
24±4 Nm{2.45±0.45 kgm}

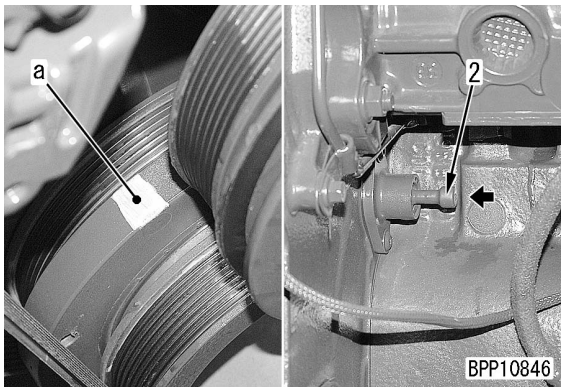
k Do not forget to bring driving gear timing pin (2) and injection pump timing pin (4) back to the pre-inspection condition.

★ In case the adjustment follows, leave gear **G1** and timing pin (2) as they are.

Adjustment

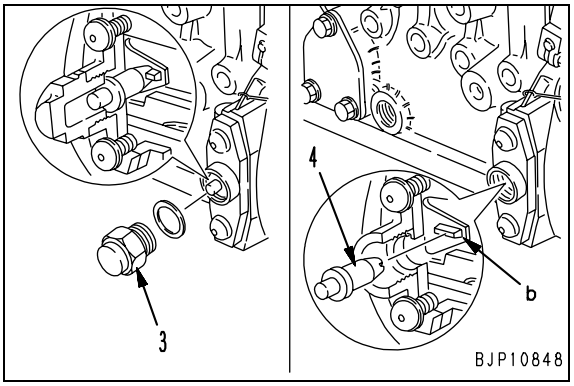
★ If fuel injection timing is found incorrect, adjust it in the following manner.

1. Confirm that drive gear injection timing is fixed with driving gear timing pin (2).
   ★ If timing pin was pulled back after the inspection had been completed, push it in again following the foregoing inspection procedures.



2. Dismantle the fuel injection pump.
   ★ For dismantling the fuel injection pump, refer to the section, "FUEL INJECTION PUMP ASSEMBLY" in the chapter of "DISASSEMBLY AND ASSEMBLY".

3. Reverse and push in timing pin (4) of the fuel injection pump, then match the pin cut-out portion and protruding portion "**b**" inside the fuel injection pump by turning the shaft.
   ★ After fuel timing has been set, fix it by fitting plug (3).



4. Mount the fuel injection pump.
   ★ For mounting the pump, refer to the same section mentioned in Item 2 above.

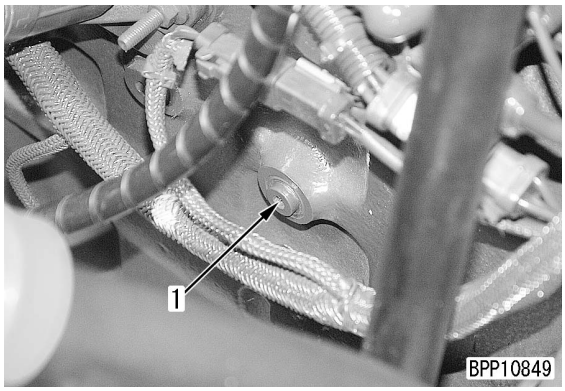
5. Detach the measurement tools after the adjustment, and make sure that the machine is back to normal condition.
   k Before starting the engine again, check that driving gear timing pin (2) and fuel injection pump timing pin (4) have been brought back to the pre-adjustment condition.

MEASUREMENT OF ENGINE OIL PRESSURE

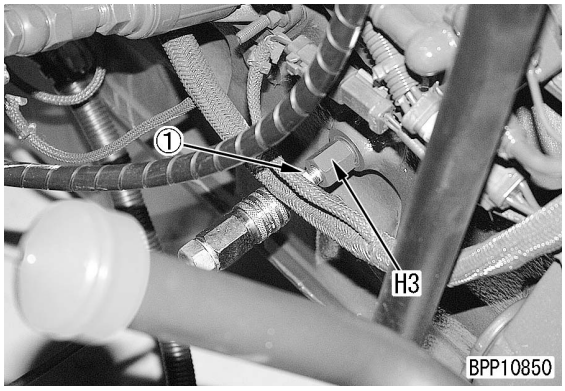
★ Engine oil pressure measurement tools

Mark		Part No.	Part Name
G	1	799-101-5002	Hydraulic Tester
		790-261-1203	Digital type hydraulic tester
	2	799-401-2320	Hydraulic Tester (1.0MPa{10 kg/cm^2})
	3	6732-81-3170	Joint
		6215-81-9710	O-ring

1. Remove hydraulic measurement plug (1) on the cylinder block.



2. Install joint **H3**, then fix fitter ① and connect it with hydraulic tester **H2**.



3. Start the engine and keep it running until the engine cooling water temperature rises to the operating range.

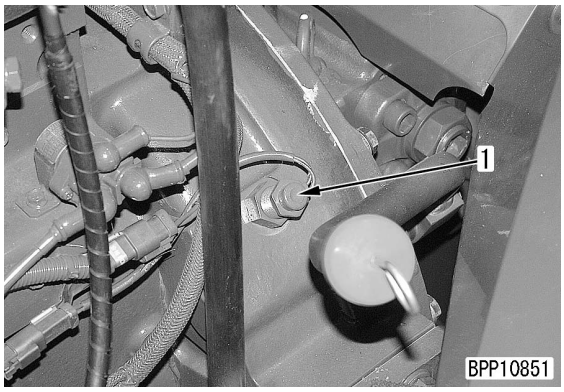
4. Measure engine oil pressure at low idling as well as at high idling.



5. Detach the measurement tools after the measurement, and make sure that the machine is back to normal condition.

ADJUSTMENT OF ENGINE SPEED SENSOR

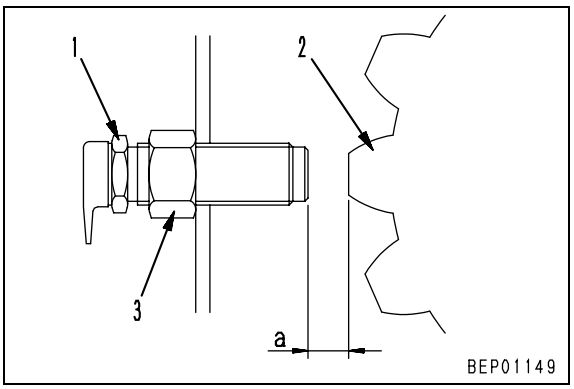
★ Detach engine speed sensor (1) before the adjustment, then check that there is no metal dust stuck or damage at the tip and fit it again.



1. Screw in sensor (1) until its tip comes to contact with the tip of flywheel ring gear teeth (2).
3 Threaded portion:
Gasket sealant (LG-6)

2. Screw back sensor (1) from that position by the prescribed angle.
★ Screw-back angle: 1±1/6 turn
★ Adjust clearance "**a**" between the sensor tip and gear tooth tip to be 1.25–1.75 mm.

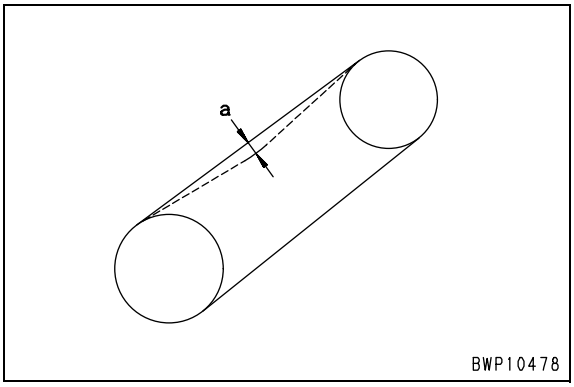
3. Fasten sensor (1) with nut (3).
3 Nut: **49.0–68.6 Nm{5–7 kgm}**



4. After the adjustment, confirm that correct engine speed is displayed in the monitor panel, using the special monitoring function.
★ For monitoring engine speed, refer to the section, "Special Function of Monitor Panel".

INSPECTION AND ADJUSTMENT OF AIR COMPRESSOR BELT TENSION

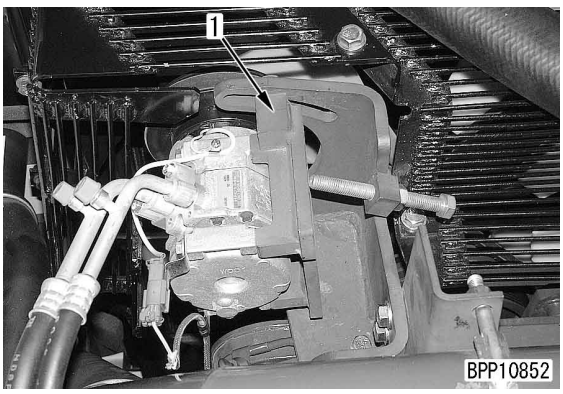
Inspection
Check belt deflection amount **a** when depressing the mid point between the fan pulley and the compressor with a thumb.
• Belt depressing force:
Equivalent to **63.7 N{6.5 kg}**



Adjustment
★ If the belt deflection amount is not proper, adjust it in the following manner.
1. Loosen two compressor bracket securing bolts (1) (upper and lower).

2. Shift compressor mounting bracket (1) to adjust the belt tension.

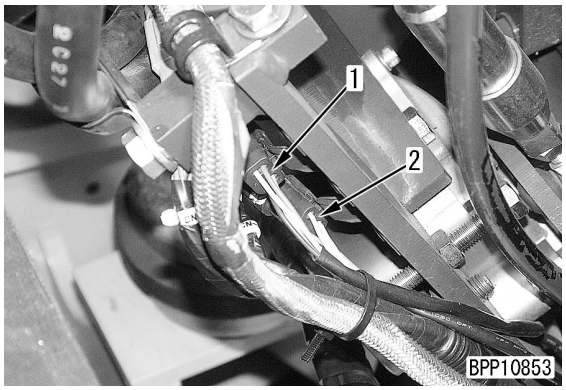
3. Tighten two compressor bracket (1) securing bolts.
★ Check the belt tension again after the adjustment.



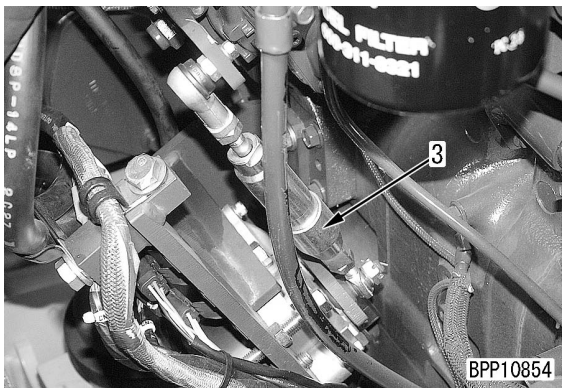
EMERGENT ESCAPE FROM FAILURE IN ENGINE CONTROL SYSTEM

★ If a failure occurs on any of the engine control devices like fuel dial, governor pump controller or governor motor • potentiometer, and the engine gets out of control, first fix the engine rpm and take the following steps to avoid the immediate danger.
★ The suggested steps are provisional ones. Identify the cause for the failure and carry out repairs promptly thereafter.

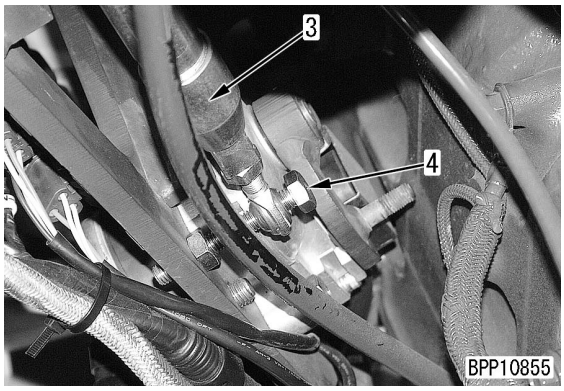
1. Disconnect **E11** connector (1) of the governor motor from **E10** connector (2) of the governor potentiometer.
k If the governor motor • potentiometer connector is left connected, the governor motor will be suddenly activated while the engine is running, causing a mechanical damage. Be sure to disconnect it.



2. Detach governor spring (3) on the governor motor side.

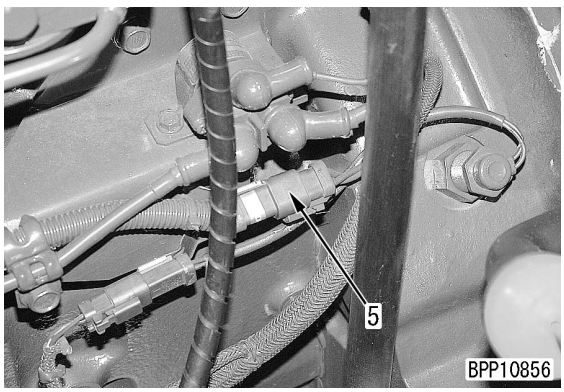


3. Remove bolt (4), connect governor spring (3) and fix it at the original position.
★ Tilt the governor motor lever to the fuel injection pump side, but stop short of the governor spring.
★ The governor lever of the fuel injection pump is fixed at a near-idling position.



4. Start the engine again and travel the machine to a safe place.

5. Disconnect **E10** connector (5) of the engine stop solenoid.
k Operation of stopping the engine is to be carried out while the engine is running at high speed. Be careful not to touch the parts of high temperature or get caught in rotating parts.



MEASUREMENT OF CLEARANCE IN SWING CIRCLE BEARINGS

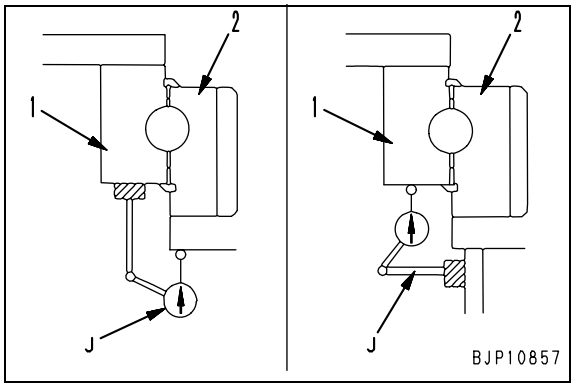
★ Swing circle bearing clearance measurement tools

Mark	Part No.	Part Name
J	Commercial Product	Dial Gauge

★ Follow the steps explained below, when measuring clearance in the swing circle bearing in the actual machine.

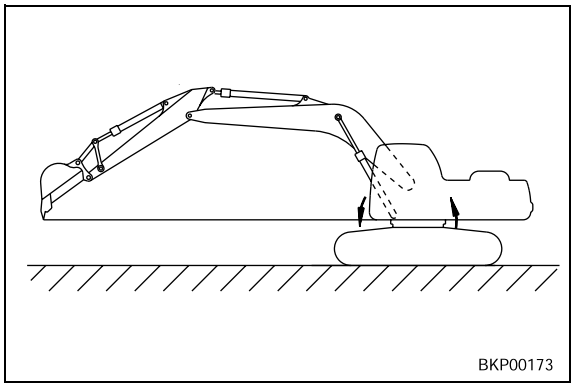
k Be careful not to put a hand or foot under the undercarriage, while taking measurement.

1. Fasten dial gauge **J** to swing circle outer race (1) or inner race (2), and contact the probe with the end surface of inner race (2) or outer race (1) on the opposite side.
★ Set dial gauge **J** at the machine front or rear.



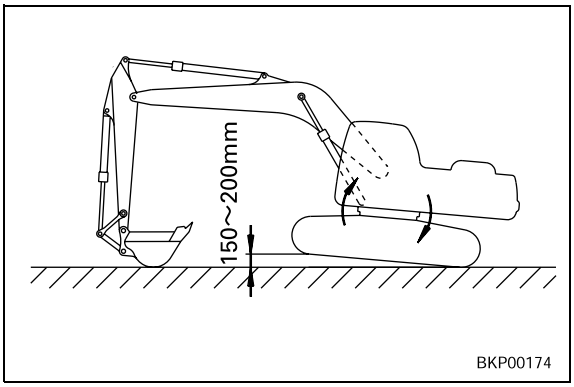
2. Keep the work equipment in the max. reach posture and keep the height of the bucket teeth tip level with the lower height of the revolving frame.
★ The upper structure is lowered at the front and raised at the rear at that time.

3. Set dial gauge **J** at zero point.



4. Hold the arm nearly perpendicular to the ground, and lower the boom until the track shoes will be lifted at the machine front.
★ The upper structure is raised at the front and lowered at the rear at that time.

5. Read off the value in dial gauge **J** in this condition.
★ The value indicated in dial gauge **J** expresses clearance in the bearings.



6. Return the machine to the posture in Item 2 above, and confirm reading of dial gauge **J** is zero.
★ If zero value is not indicated, repeat the steps in Items 3 through 5.

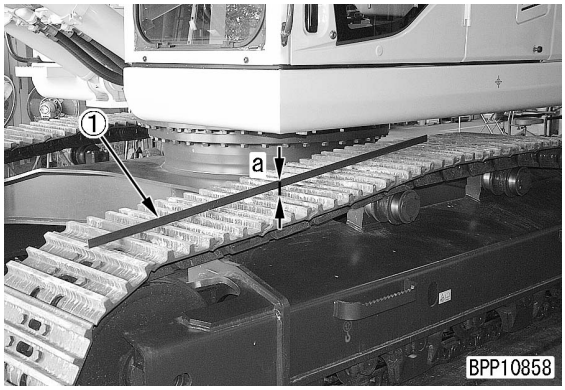
INSPECTION AND ADJUSTMENT OF TRACK SHOE TENSION

Inspection

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

2. Place straight bar ① on the track shoe between the idler and the 1st carrier roller.
   ★ L beam is recommended for bar ①, because of its deflection-free nature.

3. Measure max. clearance **a** between bar ① and the track shoe.
   • Max. standard clearance **a**: 10–30 mm

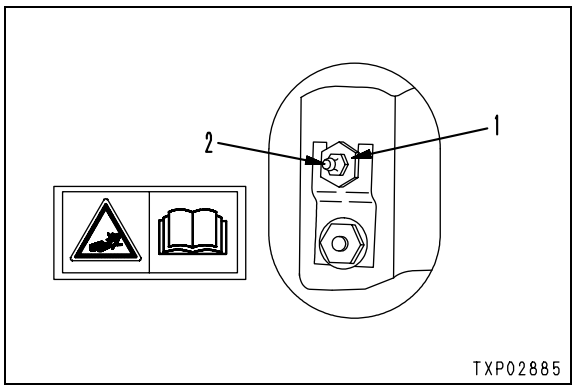


Adjustment

★ If the track shoe tension is not proper, adjust it in the following manner.

1. **When the tension is too strong**
   Discharge grease by loosening valve (1).
   k Do not loosen valve (1) by more than one turn, because grease will spurt out due to its internal high pressure.

2. **When the tension is too weak**
   Add grease through grease fitting (2).
   ★ If the normal track shoe tension is not restored even after greasing, move the machine slowly back and forth.



INSPECTION OF WEAR ON SPROCKET

★ Inspection tool for sprocket wear

Mark	Part No.	Part Name
K	796-627-1130	Wear gauge

INSPECTION AND ADJUSTMENT OF HYDRAULIC OIL PRESSURE IN HYDRAULIC CIRCUIT FOR WORK EQUIPMENT, SWING AND TRAVEL

★ Inspection and adjustment tools for hydraulic oil pressure in hydraulic circuit for work equipment, swing and travel

Mark		Part No.	Part Name
L	1	799-101-5002	Hydraulic Tester
		790-261-1203	Digital Type Hydraulic Tester
	2	799-101-5220	Nipple (10 x 1.25 mm)
		07002-11023	O-ring

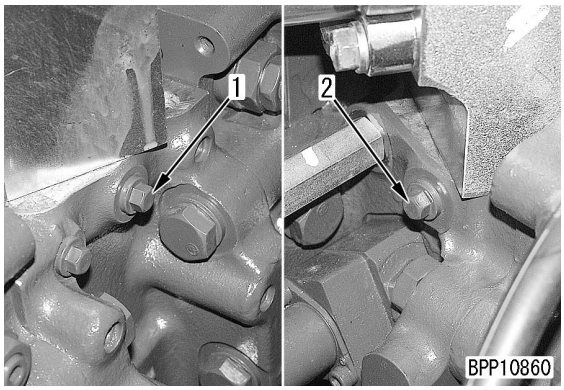
★ Hydraulic oil pressure in the hydraulic circuit for work equipment, swing and travel (hydraulic pump output pressure) may be also confirmed with a monitoring function in the monitor panel (special function of monitor panel).

Measurement

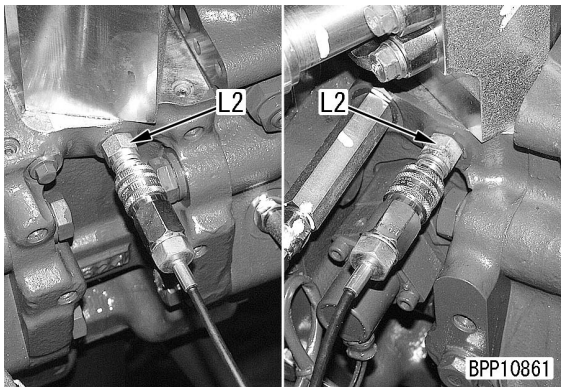
1. Pre-measurement work

k Lower the work equipment to the ground, then release the remaining pressure in the piping by operating the control lever several times after stopping the engine, and release the pressure inside the hydraulic tank by gradually loosening the oil filler cap.

1) Remove hydraulic oil pressure measuring plugs (1) and (2).
   - Plug (1): For the circuit of front hydraulic pump (at the machine rear part)
   - Plug (2): For the circuit of rear hydraulic pump (at the machine front part)



2) Fit nipple **L2** and connect it to oil pressure gauge ① of hydraulic tester **L1**.
   ★ Use an oil pressure gauge with the capacity of 58 MPa{600 kg/cm^2}.



3) Start the engine and keep it running until the hydraulic oil temperature rises to the operating range.



2. Combination of pump, actuator and valve

★ You will know that when oil flow from the pumps is divided, the front and rear pumps work independently of each other for each actuator, as well as that different relief valves are activated then.

★ Oil flow from the pumps is merged in the single pressure relief when the work equipment swings, while it is divided in the single pressure relief when the machine travels.

★ The actuators in the table below are arranged in the order that the control valves are viewed from the machine front.

Pump	Actuator	Relieve valve activated
Front pump	(Unload)	R unload valve
	Service	Safety valve
	Boom Hi / Arm Hi	R main relief valve
	Bucket	R main relief valve
	Travel, left	R main relief valve
	Boom Lo	RAISE: R main relief valve LOWER: Safety valve
Rear pump	Swing	Swing motor safety valve
	Travel, right	F main relief valve
	Arm Lo	F main relief valve
	(Unload)	F unload valve

3. Measurement of Unload Pressure

1) Start the engine.
2) Measure hydraulic oil pressure, when the engine is running at high idling and all the control levers are moved to the NEUTRAL position.

★ Hydraulic oil pressure when the unload valve unloads is displayed.

4. Measurement of work equipment relief pressure

1) Start the engine and move the cylinder to be measured to its stroke end.
2) Measure hydraulic oil pressure, when the engine is running at high idling and the cylinder is in relief condition.

★ Except in boom LOWER, the relief pressure of the main relief valve is indicated.
★ Except in boom LOWER, the relief pressure of low pressure is indicated when the one-touch power max. switch is not depressed and the relief pressure of high pressure is indicated, when it is depressed.
★ Except in boom LOWER, the constant 2-stage relief solenoid valve is turned ON and the relief pressure of high pressure is indicated, when the swing lock switch is turned ON. For this reason, keep the swing lock switch in the OFF position, while in the measurement.
★ In boom LOWER, pressure when the safety valve is relieved is indicated.
★ The relief pressure in boom LOWER is lower than the main relief pressure.
★ In boom LOWER, the relief pressure of low pressure is indicated if the machine push-up switch is turned OFF, and the relief pressure of high pressure is indicated if it is turned ON.

5. Measurement of swing relief pressure

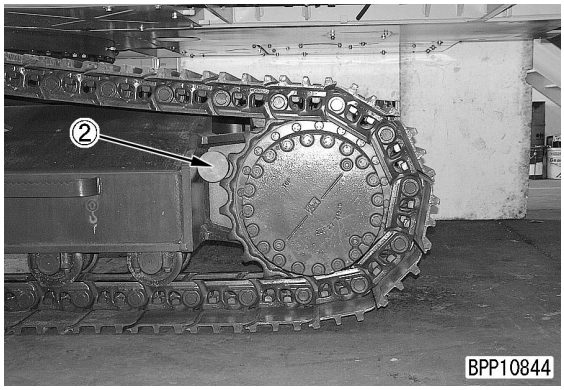
1) Start the engine and move the swing lock switch to the ON position.
2) Measure hydraulic oil pressure when the engine is running at high idling and the swing circuit is relieved.

★ Hydraulic oil pressure when the swing motor safety valve is relieved is displayed.
★ The swing motor relief pressure is lower than the main relief pressure.

6. Measurement of travel circuit relief pressure

1) Start the engine and lock travel.

k Put pin ② in between the sprocket and the track frame to make sure locking travel.



2) Measure hydraulic oil pressure when the engine is running at high idling and the travel circuit is relieved.

★ Hydraulic oil pressure with the main relief valve in relief condition is displayed. In the travel circuit relief, the pressure is high pressure relief all the time.

Adjustment

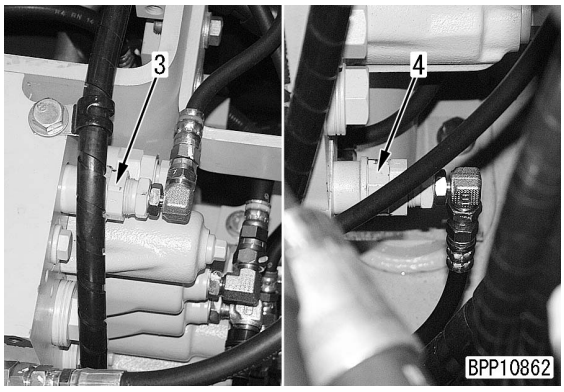
★ The unload valve cannot be adjusted.

1. Adjustment of main relief pressure

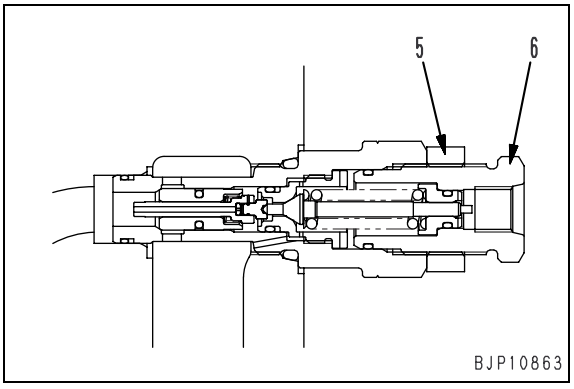
★ If relief pressure in the work equipment and travel circuits is not normal, adjust the high pressure setting side of main relief valves (3) and (4) in the following manner.
- Main relief valve (3): For the front hydraulic pump circuit
- Main relief valve (4): For the rear hydraulic pump circuit

★ The main relief valve adjusts the relief pressure of high pressure. (When the relief pressure of low pressure is adjusted, the relief pressure of high pressure is also adjusted automatically)

★ The relief pressure of low pressure is such condition that the 2-stage relief solenoid valve is in the OFF position and no pilot pressure is applied to the switching port.



1) Disconnect the pilot hose.
2) Loosen lock nut (5) and adjust the pressure by turning holder (6).
   ★ If the holder is turned to the right, the pressure rises.
   If the holder is turned to the left, the pressure falls.
   ★ Adjustment amount per turn of holder:
   Approx. 20.5 MPa{approx. 209 kg/cm^2}
   3 Lock nut:
   49.0–58.8 Nm{5–6 kgm}

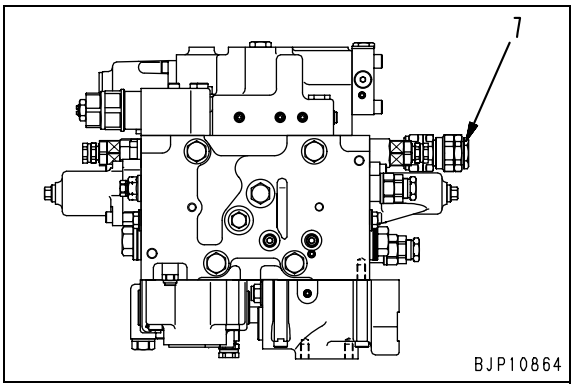


3) Check the pressure again after the adjustment, following the aforementioned steps for measurement.
   ★ When measuring the pressure, connect the pilot hose.

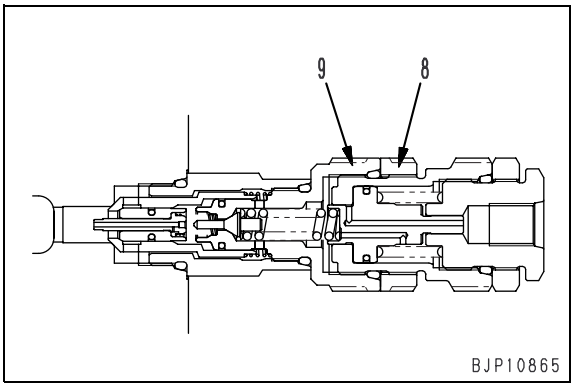
2. Adjustment of relief pressure in boom LOWER (High pressure setting side)

★ If the relief pressure of high pressure in boom LOWER is not normal, adjust the high pressure setting side of safety and suction valve (7) for boom LOWER in the following manner.

★ The relief pressure of high pressure is such condition that the machine push-up switch is in the ON position, and the switching port and the pilot pressure do not function.



1) Disconnect pilot hose.
2) Loosen lock nut (8) and adjust the pressure by turning holder (9).
   ★ If the holder is turned to the right, the pressure rises.
   If the holder is turned to the left, the pressure falls.
   ★ Adjustment amount per turn of holder:
   Approx. 21.8 MPa{approx. 222 kg/cm^2}
   3 Lock nut:
   93–123 Nm{9.5–12.5 kgm}



3) Check the pressure again after the adjustment, following the aforementioned steps for measurement.
   ★ When measuring the pressure, connect the pilot hose.

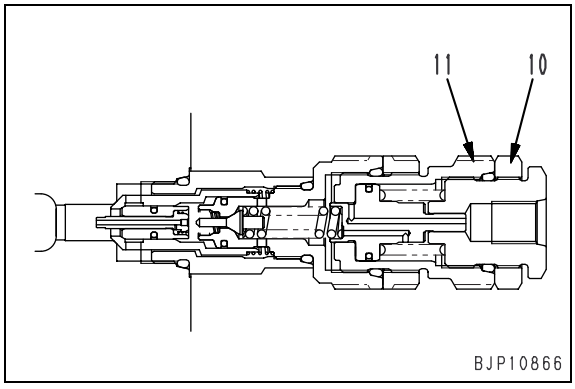
3. Adjustment of relief pressure in boom LOWER (Low pressure setting side)

★ If the relief pressure of low pressure in boom LOWER is not normal, or the high pressure setting side has been adjusted, adjust the low pressure setting side of safety and suction valve for boom LOWER in the following manner.

★ The relief pressure of low pressure is such condition that the machine push-up switch is in the OFF position, and the pilot pressure is applied to the switching port.

1) Disconnect the pilot hose.
2) Loosen lock nut (10) and turn holder (11) for adjustment.
   ★ Turn the holder:
   - To the right to increase the pressure
   - To the left to lower the pressure

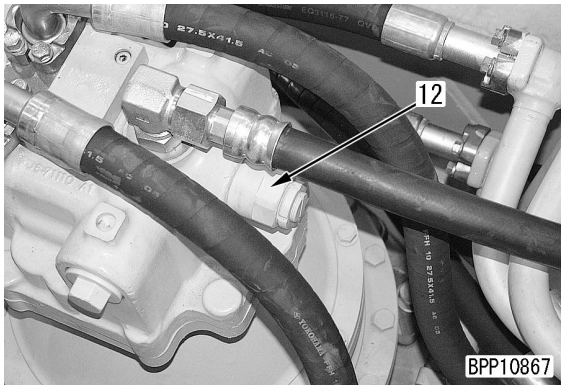
   ★ Adjustment volume of holder per turn:
   Approx. 21.8 MPa{Approx. 222 kg/cm^2}
   3 Lock nut: **78–93 Nm{8.0–9.5 kgm}**



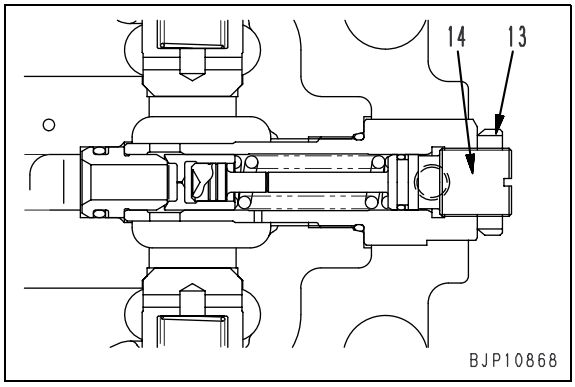
3) Check the pressure again after the adjustment, following the aforementioned steps for measurement.
   ★ When measuring the pressure, connect the pilot hose.

4. Adjustment of swing relief pressure

★ If the swing relief pressure is not normal, adjust it with swing motor safety valve (12) in the following manner.



1) Loosen lock nut (13) and adjust the pressure by turning adjusting screw (14).
   ★ If the holder is turned to the right, the pressure rises.
   If the holder is turned to the left, the pressure falls.
   ★ Adjustment amount per turn of adjusting screw:
   Approx. 4.70 MPa{approx. 47.9 kg/cm^2}
   3 Lock nut:
   147–196 Nm{15–20 kgm}



2) Check the pressure again after the adjustment, following the aforementioned steps for measurement.

INSPECTION AND ADJUSTMENT OF CONTROL CIRCUIT OIL PRESSURE

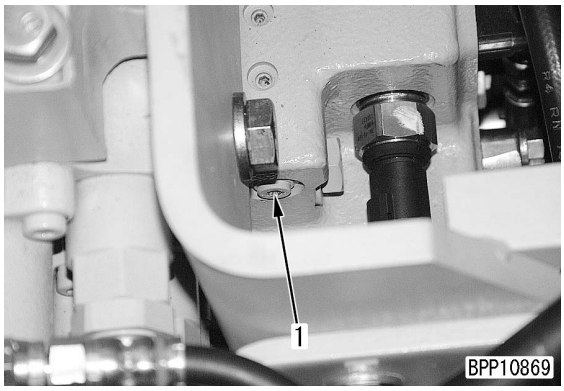
★ Control circuit oil pressure inspection and adjustment tools

Mark		Part No.	Part Name
L	1	799-101-5002	Hydraulic Tester
		790-261-1203	Digital Type Hydraulic Tester
	2	799-101-5220	Nipple (10 x 1.25 mm)
		07002-11023	O-ring

Measurement

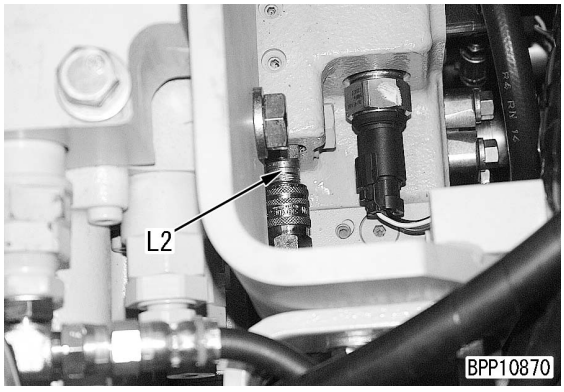
k Lower the work equipment to the ground and stop the engine. After the engine stops, operate the control lever several times to release the remaining pressure in the piping. Then loosen the oil filler cap to release the pressure inside the hydraulic tank.

1. Remove oil pressure measurement plug (1).



2. Fit nipple **L2** and connect it to oil pressure gauge ① of hydraulic tester **L1**.

★ Use an oil pressure gauge with the capacity of 5.9 MPa{60 kg/cm^2}.



3. Start the engine and keep it running until the hydraulic oil temperature rises to the operating range.

4. Measure oil pressure with the engine running at high idling and all the control levers in the NEUTRAL position.



5. Detach all the measurement tools after the measurement, and make sure that the machine is back to normal condition.

★ Do not attempt to adjust the control circuit oil pressure relief valve.

INSPECTION AND ADJUSTMENT OF PUMP PC CONTROL CIRCUIT OIL PRESSURE

★ Pump PC control circuit oil pressure inspection and adjustment tools

Mark		Part No.	Part Name
L	1	799-101-5002	Hydraulic Tester
		790-261-1203	Digital Type Hydraulic Tester
	2	799-101-5220	Nipple (10 x 1.25 mm)
		07002-11023	O-ring

Measurement

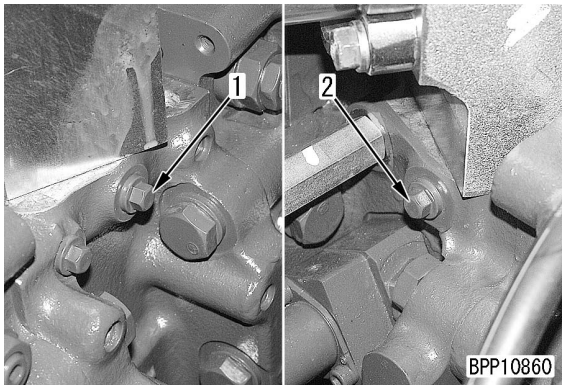
★ Implement measuring the pump PC control circuit oil pressure after confirming that the work equipment, swing and travel circuit oil pressure as well as the control circuit original oil pressure are normal.

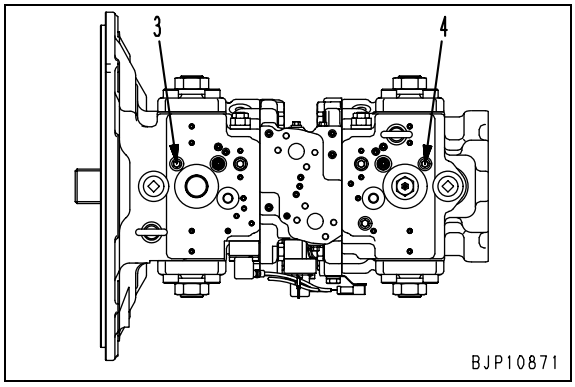
k Lower the work equipment to the ground and stop the engine. After the engine stops, operate the control lever several times to release the remaining pressure in the piping. Then loosen the oil filler cap to release the pressure inside the hydraulic tank.

1. Measurement of PC valve output pressure (servo piston inlet pressure)

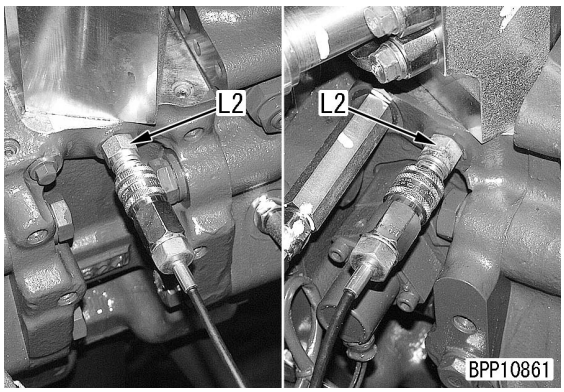
★ Measure PC valve output pressure (servo piston inlet pressure) and pump delivery pressure together, and compare the two pressures.

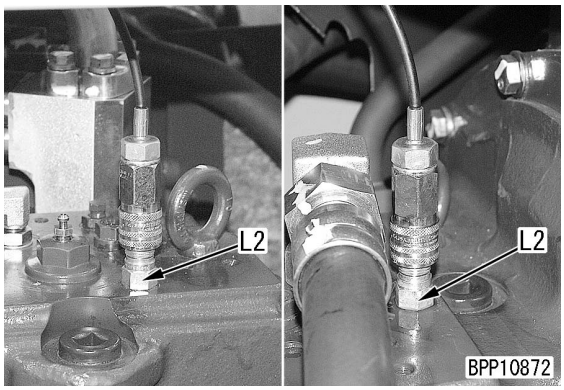
1) Remove oil pressure measurement plugs (1), (2), (3) and (4).
   - Plug (1): For measuring the front pump delivery pressure (at the machine rear part)
   - Plug (2): For measuring the rear pump delivery pressure (at the machine front part)
   - Plug (3): For measuring the front pump PC valve delivery pressure
   - Plug (4): For measuring the rear pump PC valve delivery pressure





2) Fit nipple **L2** and connect to oil pressure gauge ① of hydraulic tester **L1**.
   ★ Use an oil pressure gauge with the capacity of 58.8 MPa{600 kg/cm^2}.





3) Start the engine and keep it running until the hydraulic oil temperature rises to the operating range.



4) Measure the pump delivery pressure and PC valve output pressure (servo piston inlet pressure) together with the engine running at high idling, after setting the machine at the following conditions.
   - Working mode: A mode
   - Swing lock switch: ON (switched to high pressure relief with 2-stage relief turned ON)
   - Work equipment, swing and travel circuit: Arm digging relief

   ★ Judgement method:
   When the ratio between the pump delivery pressure and PC valve output pressure (servo piston output pressure) reaches the following values, both pressures are judged normal.

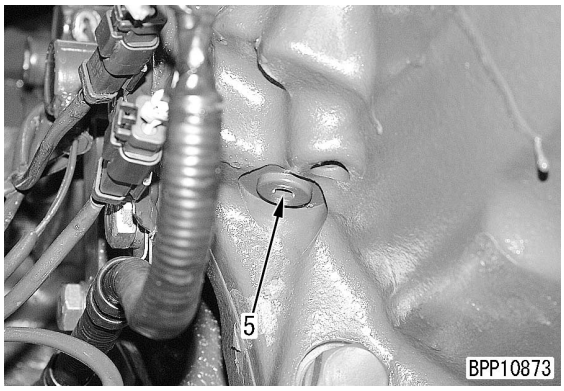
Pressure to be measured	Pressure ratio
Pump delivery pressure	1
PC valve outlet pressure	Approx. 3/5

   ★ If there is any abnormality with PC valve or servo piston, the PC valve output pressure (servo piston output pressure) equals to the pump delivery pressure, or approximates to 0 pressure.

2. Measurement of PC-EPC output pressure

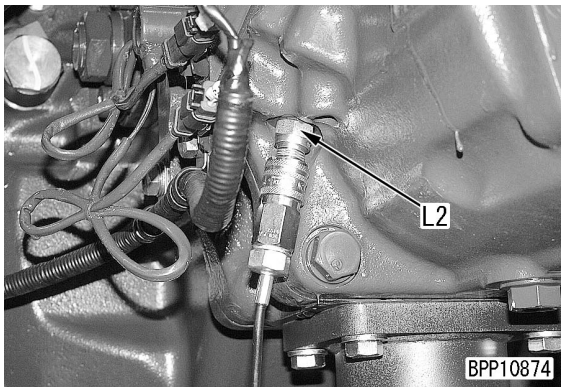
1) Remove oil pressure measurement plug (5).

★ The plug is fitted at the machine front.



2) Fit nipple **L2** and connect it to oil pressure gauge ① of hydraulic tester **L1**.

   ★ Use an oil pressure gauge with the capacity of 5.9 MPa{60 kg/cm^2}.



3) Start the engine and keep it running until the hydraulic oil pressure rises to the operating range.

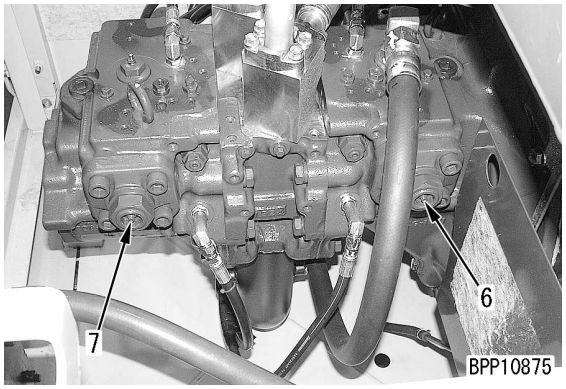


4) Measure the hydraulic oil pressure with all the control levers kept in the NEUTRAL position and the engine running at high idling and at low idling.
   ★ If PC-EPC valve output pressure changes to the following values, it is judged normal.

Engine speed	Control lever	Hydraulic oil pressure
Low idling	Neutral	2.9 MPa {30 kg/cm^2}
High idling		0{0}

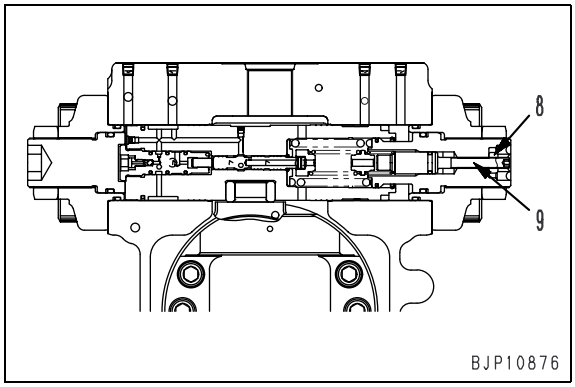
Adjustment

★ If any of the phenomena mentioned below occurs and PC valve malfunctioning is suspected, adjust PC valves (6) and (7) in the following manner.
- As workload increases, the engine rpm sharply drops.
- While the engine rpm is normal, the work equipment moves slowly.



1. Loosen lock nut (8) and make adjustment, turning adjusting screw (9).
   ★ If the holder is turned to the right, the pump absorption torque rises.
   If the holder is turned to the left, the pump absorption torque falls.
   ★ The adjustable range with the adjusting screw is as shown below.
   - Left turn: Less than 1 turn
   - Right turn: Less than 1/2 turn (less than 180 degrees)

   3 Lock nut:
   27.50–34.3 Nm{2.8–3.5 kgm}



2. Confirm that the PC valve output pressure (servo piston inlet pressure) is normal after the adjustment, following the measurement steps explained earlier.

INSPECTION AND ADJUSTMENT OF PUMP LS CONTROL CIRCUIT OIL PRESSURE

★ Pump LS control circuit oil pressure inspection and adjustment tools

Mark		Part No.	Part Name
M	1	799-101-5002	Hydraulic Tester
		790-261-1203	Digital Type Hydraulic Tester
	2	799-101-5220	Nipple (10 x 1.25 mm)
		07002-11023	O-ring
	3	799-401-1340	Differential Pressure Gauge

Measurement

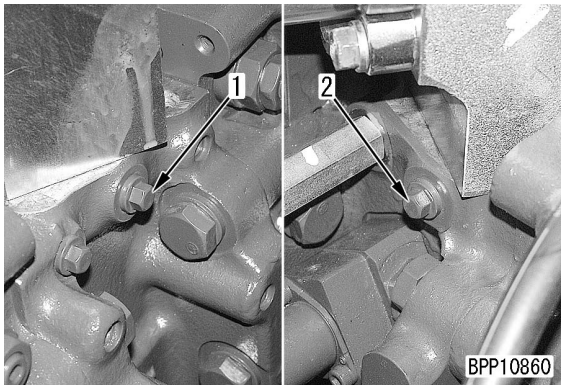
★ Measure pump LS control circuit oil pressure after confirming that the work equipment, swing and travel circuit oil pressure as well as control circuit original pressure are normal.

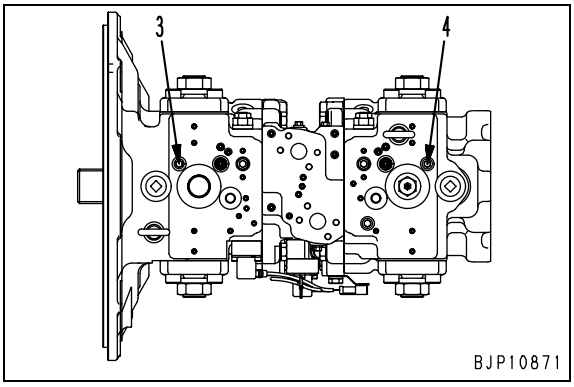
k Lower the work equipment to the ground and stop the engine. After the engine stops, operate the control lever several times to release the remaining pressure in the piping. Then loosen the oil filler cap to release the pressure inside the hydraulic tank.

1. Measurement of LS valve output pressure (servo piston inlet pressure)

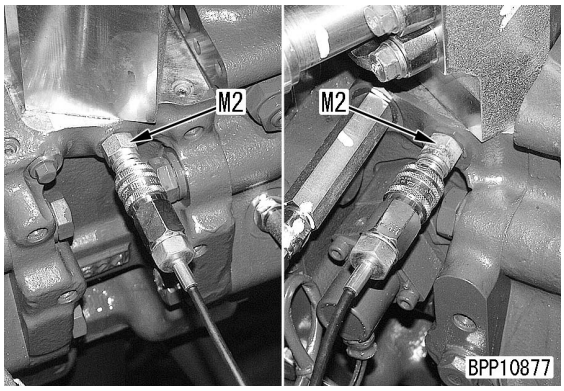
★ Measure LS valve output pressure (servo piston inlet pressure) and pump delivery pressure together, and compare both pressures thereafter.

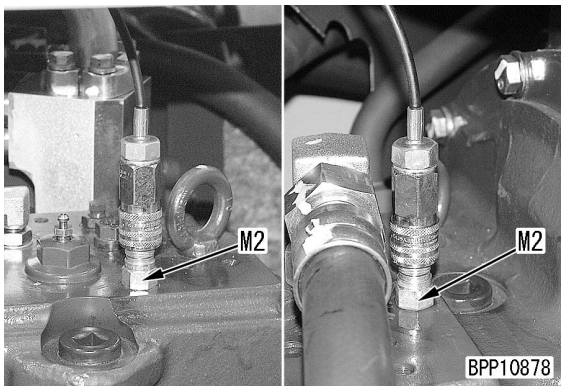
1) Remove oil pressure measurement plugs (1), (2), (3) and (4).
   - Plug (1): For measuring the front pump delivery pressure (at the machine rear part)
   - Plug (2): For measuring the rear pump delivery pressure (at the machine front part)
   - Plug (3): For measuring the front pump LS valve delivery pressure
   - Plug (4): For measuring the rear pump LS valve delivery pressure





2) Fit nipple **M2** and connect it to oil pressure gauge ① of hydraulic tester **M1**.
   ★ Use an oil pressure gauge with the capacity of 58.5 MPa{600 kg/cm2}.





3) Start the engine and raise the track shoe to be measured with the work equipment.
   - For measuring oil pressure in front circuit: Right track shoe
   - For measuring oil pressure in rear circuit: Left track shoe

k Provide a working area of sufficient space, as the raised track shoe will be idly rotated.

4) Wait until the hydraulic oil temperature rises to the operating range.



5) Measure pump delivery pressure and PC valve output pressure (servo piston inlet pressure) together with the machine set at the following conditions and the engine running at high idling.
   - Working mode: A mode
   - All the control levers of the work equipment, swing and travel are kept in the NEUTRAL position and the travel control lever is kept at half stroke (one side of the track shoes idly rotates).

   ★ Let the raised track shoe idly rotate, paying enough attention to the surroundings for safety.

   ★ Judgement method:
   When the ratio between the pump delivery pressure and LS valve output pressure (servo piston output pressure) reaches the following values, both pressures are judged normal.

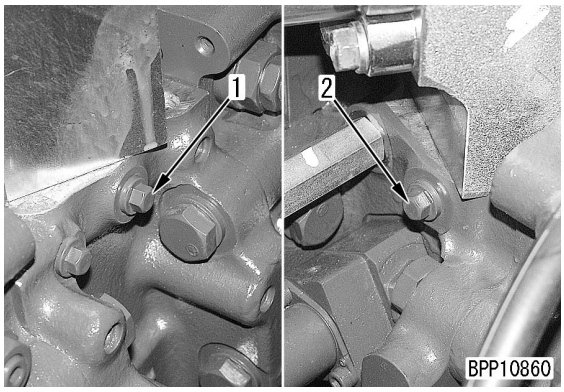
Oil pressure to be measured	Oil pressure ratio	
	All control levers in NEUTRAL	Travel at half stroke
Pump delivery pressure	Nearly equal pressure	1
LS valve delivery pressure		Approx. 3/5

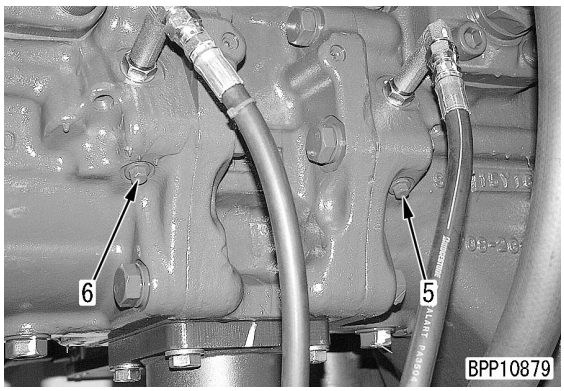
6) Detach all the measurement tools after the measurement and make sure that the machine is back to normal condition.

2. Measurement of LS differential pressure

★ LS differential pressure can be obtained by measuring pump delivery pressure and LS pressure (actuator loaded pressure) at the same time and computing the difference of both pressures.

1) Remove oil pressure measurement plugs (1), (2), (5) and (6).
   - Plug (1): For measuring the front pump delivery pressure (at the machine rear part)
   - Plug (2): For measuring the rear pump delivery pressure (at the machine front part)
   - Plug (5): For measuring the front pump LS pressure (at the machine rear part)
   - Plug (6): For measuring the rear pump LS pressure (at the machine rear part)

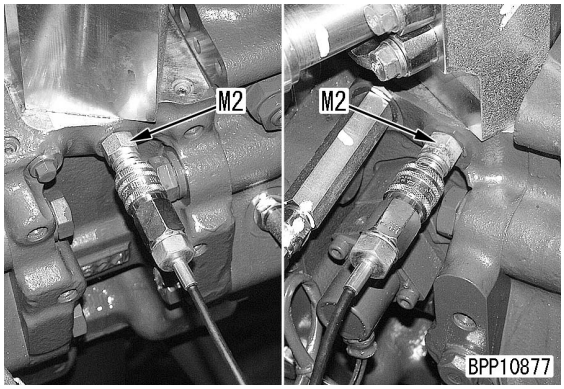


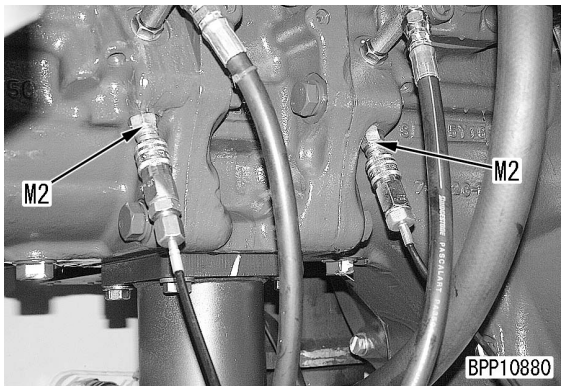


2) Fit nipple **M2** and connect it to oil pressure gauge ① of hydraulic tester **M1** or differential pressure gauge **M3**.

   ★ When using a differential pressure gauge:
   Connect pump delivery pressure to the high pressure side and LS pressure to the low pressure side.
   A differential pressure gauge requires DC 12V power. Connect it with one battery.

   ★ When using an oil pressure gauge:
   Use an oil pressure gauge with the capacity of 58.8 MPa{600 kg/cm^2}.
   The max. differential pressure is no more than approx. 40 MPa{3.9 kg/cm^2}.
   The same gauge may be used throughout the measurement.





3) Start the engine and raise the track shoe to be measured with the work equipment.
   - For measuring oil pressure in front circuit: Left track shoe
   - For measuring oil pressure in rear circuit: Right track shoe

   k Provide a working area of sufficient space, as the raised track shoe will be idly rotated.
4) Wait until the hydraulic oil temperature rises to the operating range.



5) Measure pump delivery pressure and LS pressure (actuator loaded pressure) together with the machine set at the following conditions and the engine running at high idling.
   - Working mode: A mode
   - Traveling speed: Hi
   - All the control levers of the work equipment, swing and travel are kept in the NEUTRAL position and the travel control lever is kept at half stroke (one side of the track shoes idly rotates).

   ★ Let the raised track shoe idly rotate, paying enough attention to the surroundings for safety.

   ★ Calculation of LS differential pressure: LS differential pressure = Pump delivery pressure – LS pressure

   ★ If LS differential pressure is in the following conditions, it is judged normal.

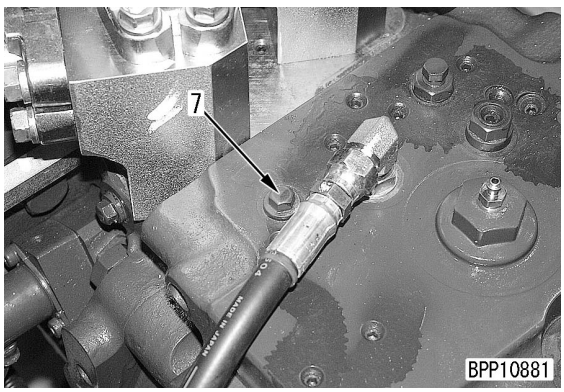
Control lever position	LS differential pressure
All levers in NEUTRAL	Unload pressure (see standard value table)
Travel lever at half stroke	Max. LS differential pressure (see standard value table)

6) Detach all the measurement tools after the measurement, and make sure that the machine is back to normal condition.

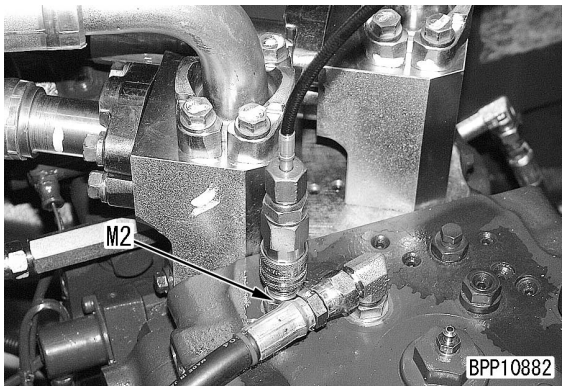
3. Measurement of LS-EPC valve output pressure

1) Remove oil pressure measurement plug (7).

   ★ The plug is fitted on the rear pump.



2) Fit nipple **M2** and connect it with oil pressure gauge ① of hydraulic tester **M1**.
   ★ Use an oil pressure gauge with the capacity of 5.9 MPa{60 kg/cm^2}.



3) Start the engine and keep it running until the hydraulic oil temperature rises to the operating range.



4) Measure the oil pressure when the engine is running at high idling and the travel speed switch and travel lever are operated.
   ★ If LS-EPC valve output pressure changes to the following values, the pressure is normal.

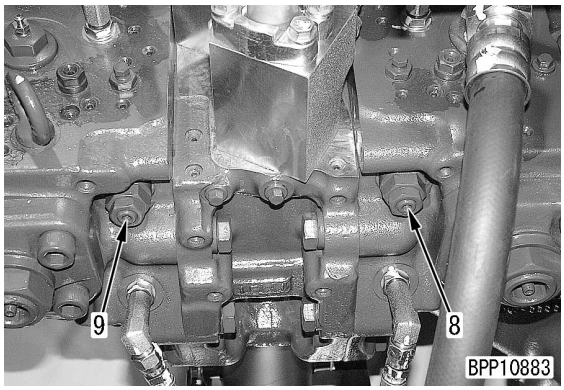
Travel Speed	Travel Control Lever	Hydraulic Pressure
Lo	Neutral	Approx. 1.4 MPa {approx. 14 kg/cm^2}
Hi	Fine control (Note)	0{0}

Note: Operate the travel control lever slightly to the extent that the PPC hydraulic oil pressure is turned ON. (Stop the operation short of starting the machine)

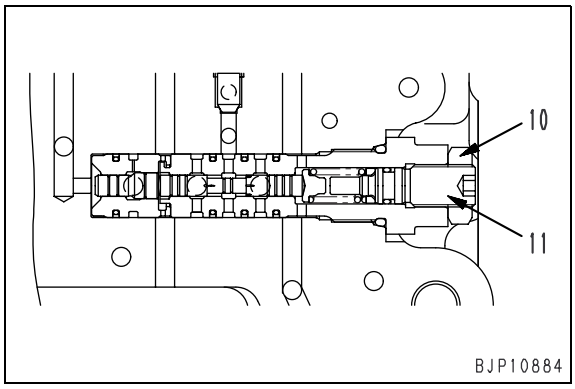
5) Detach all the measurement tools after the measurement, and make sure that the machine is back to normal condition.

Adjustment

★ When LS differential pressure is not normal, adjust it with LS valves (8) and (9).



1. Loosen lock nut (10) and adjust the pressure by tuning adjusting screw (11).
   ★ If the adjusting screw is turned to the right, the differential pressure rises.
   If the adjusting screw is turned to the left, the differential pressure falls.
   ★ Adjustment amount (LS differential pressure) per turn of adjusting screw:
   1.3 MPa{13.3 kg/cm^2}
   3 Lock nut: **49–64 Nm{5–7 kgm}**



2. After the adjustment, confirm that LS differential pressure is normal, following the steps for measurement explained earlier.

MEASUREMENT OF SOLENOID VALVE OUTPUT PRESSURE

★ Solenoid valve output pressure measurement tools

Mark		Part No.	Part Name
N	1	799-101-5002	Hydraulic Tester
		790-261-1203	Digital Type Hydraulic Tester
	2	799-401-2910	Nipple (Size 02)
		07002-*1423	O-ring
	3	799-401-2920	Nipple (Size 03)
		07002-*1823	O-ring

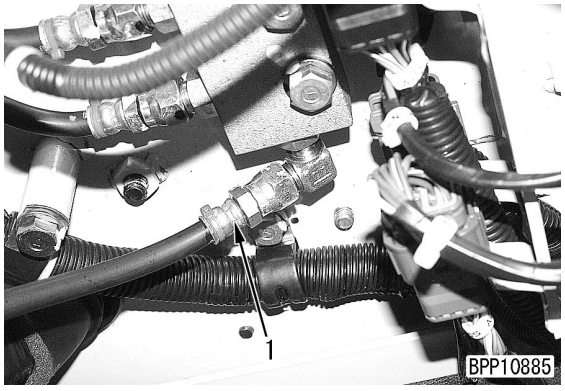
★ Measure solenoid valve output pressure after confirming that control circuit original pressure is normal.

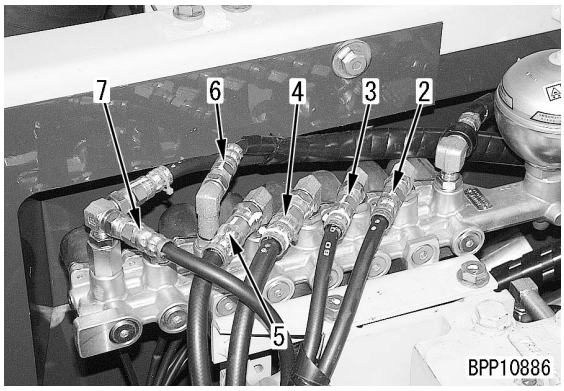
k Lower the work equipment to the ground and stop the engine. After the engine stops, operate the control lever several times to release the remaining pressure in the piping. Then loosen the oil filler cap to release the pressure inside the hydraulic tank.

1. Disconnect the hoses of solenoid valve to be measured at the outlet side.

No.	Solenoid valve to be measured
1	PPC lock solenoid valve
2	Travel interconnection solenoid valve
3	Merge/divide solenoid valve
4	Travel speed shifting solenoid valve
5	Swing and parking brake solenoid valve
6	Machine push-up solenoid valve
7	2-stage relief solenoid valve

★ Hose (1) is installed at the rear of operator's cab, and hoses (2) through (7) are installed at the center of revolving frame.

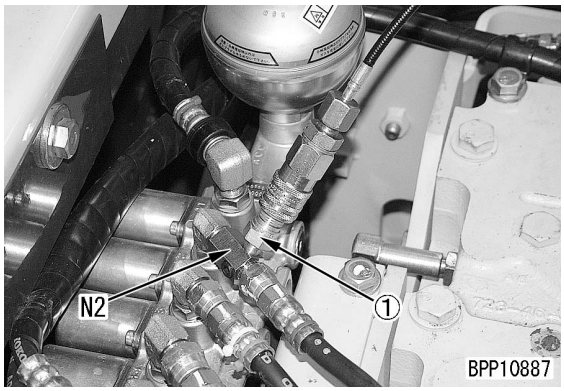




2. Fix nipple **N2** or **N3** and connect the disconnected hose again.

3. Fit fitting ① of hydraulic tester **N1** and connect it to oil pressure gauge ②.

★ Use an oil pressure gauge with the capacity of 5.9 MPa{60 kg/cm^2}.



4. Start the engine and keep it running until the hydraulic oil temperature rises to the operating range.



5. Run the engine at full throttle, then turn each solenoid valve ON or OFF by operating the control lever switch, and measure the pressure.
- ★ For conditions for turning each solenoid valve ON or OFF, refer to the ensuing "Table for Functioning Conditions" for each solenoid valve.
- ★ How each solenoid valve functions can be confirmed with monitoring function in the monitor panel. (Special Function of Machine Monitor)
- ★ When each output pressure shows the following values, it is judged normal.

Solenoid Valve	Output Pressure
OFF (Demagnetization)	0{0}
ON (Excitation)	3 MPa{30 kg/cm^2}

6. Detach all the measurement tools after the measurement, and make sure that the machine is back to normal condition.

Table for Functioning Conditions
- PPC lock solenoid valve

Functioning Condition		Functioning
Safety lock lever	Locked	OFF
	Released	ON

Table for Functioning Conditions
- Machine push-up solenoid valve

Functioning Condition		Functioning
Machine push-up switch	OFF	ON
	ON	OFF

Table for Functioning Conditions
- Swing and parking brake solenoid

Functioning Condition		Functioning
Work equipment, swing, travel, signaling	When all of them is OFF	OFF
	When any of them is ON	ON

Table for Functioning Conditions - Travel interconnection solenoid valve

Functioning Condition			Functioning
When the travel steering signal is ON			ON
When the travel steering signal is OFF	Traveling operation only	If front or rear pump pressure is over 24.5 MPa{250 kg/cm^2}	ON
	In conditions other than above		OFF

Table for Functioning Conditions - Travel speed shifting solenoid valve

Functioning Condition			Functioning
When overheat setting of the 2nd stage is ON			OFF
When the fuel dial indicates less than 1200 rpm			
When the travel speed switch is at Lo (or ※Mi)			
When the travel speed switch is at Hi	The travel signal is OFF		
	The travel signal is ON	If front or rear pump pressure is 32.3 MPa{330 kg/cm^2}	
		If front or rear pump pressure is 18.6 MPa{190 kg/cm^2}	ON
In conditions other than above			

※: The "Mi" mode is on the multi-monitor specification machine only.

Table for Functioning Conditions - 2-stage relief solenoid valve

Functioning Condition			Functioning
When overheat setting of the 1st stage is ON			OFF
When all the signals for work equipment, swing and travel are OFF			
When swing lock switch is ON			ON
When travel signal is ON			
When working mode is ※L mode			
When boom LOWER signal is ON			
When working mode is A or E mode	When left knob switch is ON	If signals other than swing operation only is ON	
		If swing operation only is ON	OFF
In conditions other than above			

Table for Functioning Conditions - Merge/divide solenoid valve

Functioning Condition				Functioning
When working mode is B mode		When service signal is ON		ON
When travel signal only is ON				
When the travel signal is OFF	When the work equipment and swing signals are ON	Other than L mode	When F or R pump pressure is higher than 19.6 MPa{200 kg/cm^2}	
			When F or R pump pressure is lower than 14.7 MPa{150 kg/cm^2}	OFF
		※L mode	When F or R pump pressure is higher than 16.7 MPa{170 kg/cm^2}	ON
			When F or R pump pressure is lower than 11.8 MPa{120 kg/cm^2}	OFF
In conditions other than above				

※: The "L" mode is on the multi-monitor specification machine only.

MEASUREMENT OF PPC VALVE OUTPUT PRESSURE

★ PPC valve output pressure measurement tools

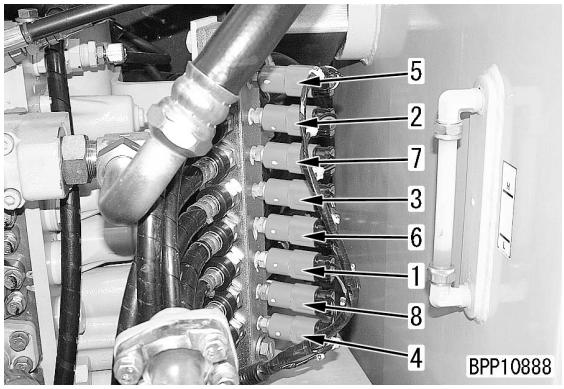
Mark	Part No.	Part Name
P	799-101-5002	Hydraulic Tester
	790-261-1203	Digital Type Hydraulic Tester

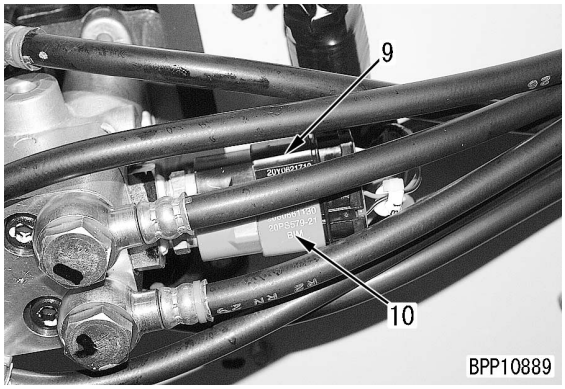
★ Measure PPC valve output pressure after confirming that control circuit original pressure is normal.

1. Remove PPC oil pressure switches (1) through (12) in the hydraulic circuits to be measured.

No.	Circuit to be measured	No.	Circuit to be measured
1	Boom, RAISE	7	Swing, left
2	Boom, LOWER	8	Swing, right
3	Arm, DIGGING	9	Travel (black)
4	Arm, DUMPING	10	Steering (red)
5	Bucket, DIGGING		
6	Bucket, DUMPING		

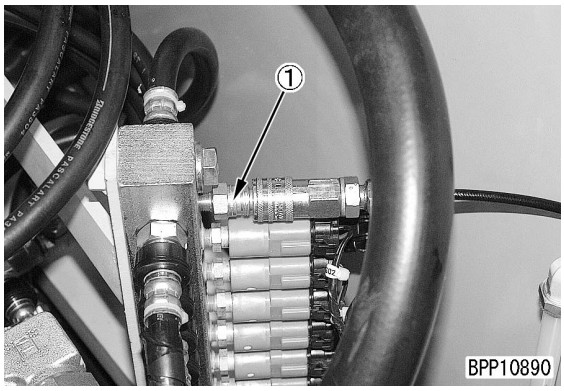
★ Oil pressure switches (1) through (8) are installed in the PPC relay block, and (9) and (10) are installed at the rear of operator's cab.





2. Fit nipple ① of hydraulic tester **P** and connect oil pressure gauge ②.

★ Use an oil pressure gauge with the capacity of 5.9 MPa{60 kg/cm^2}.



3. Start the engine and keep it running until the hydraulic oil temperature rises to the operating range.



4. Measure the pressure when the engine is running at high idling and the control lever of the circuit to be measured is kept in the NEUTRAL position and at the full stroke.

★ If PPC valve output pressure is at the level shown below, it is judged normal.

Lever Control	Hydraulic Pressure
In NEUTRAL	0{0}
At full stroke	Nearly equal to control original pressure (see standard value table)

5. Detach all the measurement tools, and make sure that the machine is back to normal condition.

ADJUSTMENT OF WORK EQUIPMENT AND SWING PPC VALVE

★ If there is excessive play in the work equipment or swing lever, adjust it in the following manner.

1. Remove work equipment and swing PPC valve ass'y.

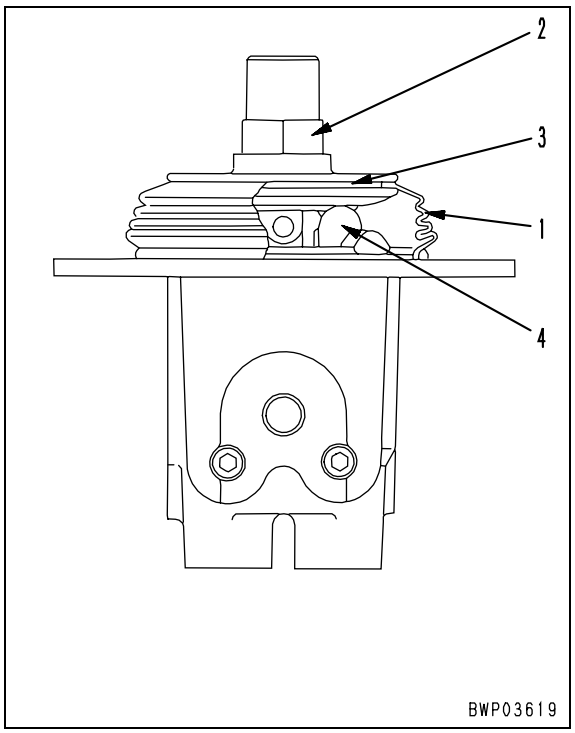
2. Take off boot (1).

3. Loosen lock nut (2) and screw in disc (3) until it contacts the heads of four pistons (4).
★ Do not move the piston while doing this work.

4. Keep disc (3) in place and tighten lock nut (2) to the specified tightening torque.
3 Lock nut: **98–127 Nm{10–13 kgm}**

5. Install boot (1).

6. Install work equipment and swing PPC valve ass'y.

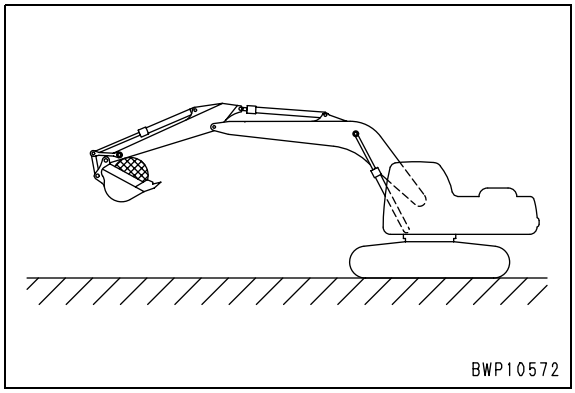


INSPECTION OF LOCATIONS OF HYDRAULIC DRIFT OF WORK EQUIPMENT

★ If there is any hydraulic drift in the work equipment (cylinders), check in the following manner to determine if the cause is in the cylinder packing or in the control valve.

1. Inspection of boom and bucket cylinders

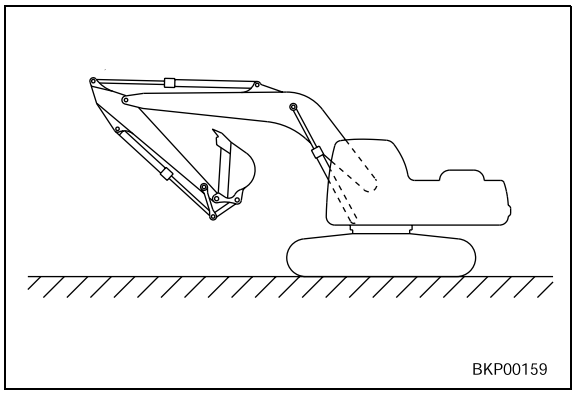
1) Set the work equipment in the same posture as when measuring hydraulic drift, and stop the engine.
   ★ Fill the bucket with earth or apply the rated load to the bucket.



2) Operate the control lever to the RAISE position or the bucket control lever to the CURL position.
   - If the lowering speed increases, the cylinder packing is defective.
   - If there is no change, the control valve is defective.
   ★ Operate the control lever with the engine starting switch in the ON position.
   ★ If pressure in the accumulator has dropped, run the engine for approx. 10 seconds to charge the accumulator again.

2. Inspection of arm cylinder

1) Operate the arm cylinder to move the arm to the position 100 mm before the digging stroke end, and stop the engine.



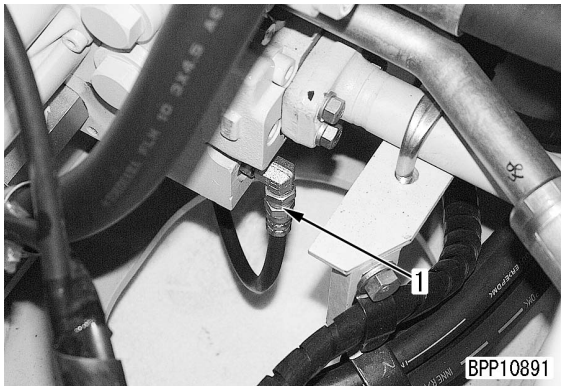
2) Operate the arm control lever to move the arm to the digging side.
   - If the lowering speed increases, the cylinder packing is defective.
   - If there is no change, the control valve is defective.
   ★ Operate the control lever with the engine starting switch in the ON position.
   ★ If pressure in the accumulator has dropped, run the engine for approx. 10 seconds to charge the accumulator again.

[Reference] If the cause of the hydraulic drift is in the defective packing, and the above operation is carried out, downward movement is accelerated for the following reasons.

1) If the work equipment is set to the above posture (holding pressure applied to the bottom end), the oil at the bottom end leaks to the head end. However, the volume at the head end is small than the volume at the bottom end by the volume of the rod end, so the internal pressure at the head end increases because of the oil flowing in from the bottom end.
2) When the internal pressure at the head end increases, the pressure at the bottom end also rises in proportion to this. The balance is maintained at a certain pressure (this differs according to the amount of leakage) by repeating this procedure.
3) When the pressure is balanced, the downward movement becomes slower. If the lever is then operated according to the procedure given above, the circuit at the head end is opened to the drain circuit (the bottom end is closed by the check valve), so the oil at the head end flows to the drain circuit and the downward movement becomes faster.

3. Inspection of boom lock valve

1) Set the work equipment at the maximum reach and the boom top horizontal. Then stop the engine.
   - k Lock the work equipment control levers and release the pressure inside the hydraulic tank.
   - k Do not allow anyone to come under the work equipment during the work.
2) Disconnect drain hose (1) of the control valve, and install a blind plug in the hose.
   - Part No. for the blind hose: 07376-70210
   - ★ Leave the control valve end open.
   - ★ If any oil leaks out from the port that is left open, following hydraulic drift of the work equipment, the boom lock valve is defective (loose contact).



4. Inspection of PPC valve

Measure the amount of hydraulic drift of the work equipment when the accumulator is charged with pressure and the safety lock lever is put to the LOCK and FREE positions.

- ★ Operate the control lever with the engine starting switch in the ON position.
- ★ If pressure in the accumulator has dropped, run the engine for approx. 10 seconds to charge the accumulator again.
- ★ If there is any difference in the hydraulic drift between LOCK and FREE positions, the PPC valve is defective (some internal failure).

RELEASE OF REMAINING PRESSURE IN HYDRAULIC CIRCUIT

- k If the piping between the hydraulic cylinders or the hydraulic motor and control valves is to be disconnected, release the remaining pressure in the following manner.
- ★ There is no pressure remaining in the swing motor circuit and travel motor circuit, but the internal pressure in the hydraulic tank affects them. So open the oil filler cap of the hydraulic tank.

1. Stop the engine, and loosen the oil filler cap gradually to release the pressure inside the tank.

2. Turn the engine starting switch to the ON position and operate the control levers several times.
- ★ There must be power supply to the PPC lock valve. Be sure to operate the control levers with the engine starting switch in the ON position.
- ★ When the levers are operated 2-3 times, the pressure stored in the accumulator is removed.

3. Start the engine, run at low idling for approx. 10 seconds to accumulate pressure in the accumulator, then stop the engine.

4. Repeat the steps in Item 2 to 3 above several times.

MEASUREMENT OF OIL LEAKAGE AMOUNT

1. Measurement of oil leakage amount from boom cylinder

1) Start the engine and keep it running until the hydraulic oil temperature rises to the operating range. Then extend the boom cylinder to the stroke end.

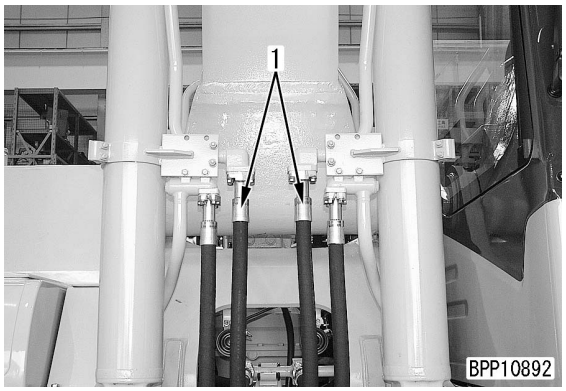
k Release the pressure remaining in the piping, referring to the foregoing section of "Release of Remaining Pressure in Hydraulic Circuit".

2) Disconnect hose (1) at the cylinder head end and block the hose end with a plate.

k Be careful not to disconnect the hose at the cylinder bottom end.

3) Start the engine and apply the relief pressure to the bottom end of the cylinder with the engine running at high idling.

4) Continue this condition for 30 seconds, then measure the oil leakage amount for one minute.



5) After the measurement, make sure that the machine is back to normal condition.

2. Measurement of oil leakage amount from arm cylinder

1) Start the engine and keep it running until the hydraulic oil temperature rises to the operating range. Then extend the arm cylinder to the digging stroke end.

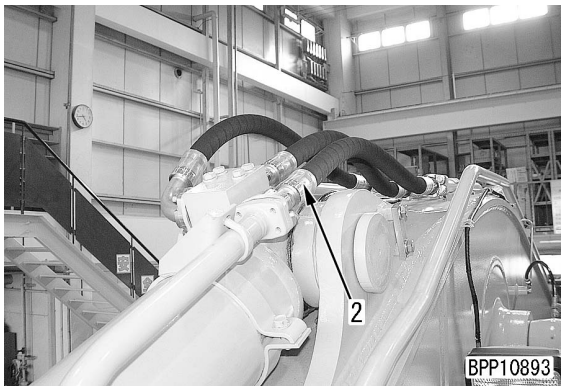
k Release the pressure remaining in the piping, referring to the foregoing section of "Release of Remaining Pressure in Hydraulic Circuit".

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

k Be careful not to disconnect the hose at the cylinder bottom end.

3) Start the engine and apply the relief pressure to the bottom end of the cylinder with the engine running at high idling.

4) Continue this condition for 30 seconds, then measure the oil leakage amount for one minute.



5) After the measurement, make sure that the machine is back to normal condition.

3. Measurement of oil leakage amount from bucket cylinder

1) Start the engine and keep it running until the hydraulic oil temperature rises to the operating range. Then extend the bucket cylinder to the digging stroke end.

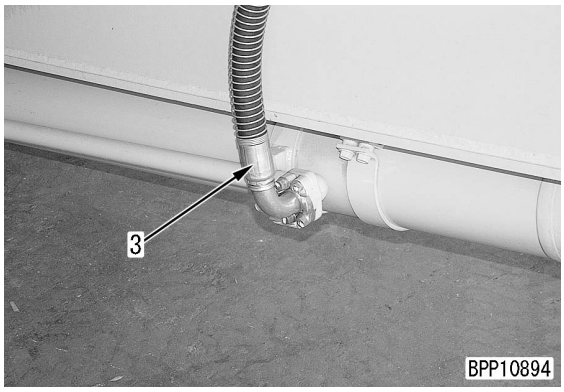
k Release the pressure remaining in the piping, referring to the foregoing section of "Release of Remaining Pressure in Hydraulic Circuit".

2) Disconnect hose (3) at the cylinder head end block the hose end with a plate.

k Be careful not to disconnect the hose at the cylinder bottom end.

3) Start the engine and apply the relief pressure to the bottom end of the cylinder with the engine running at high idling.

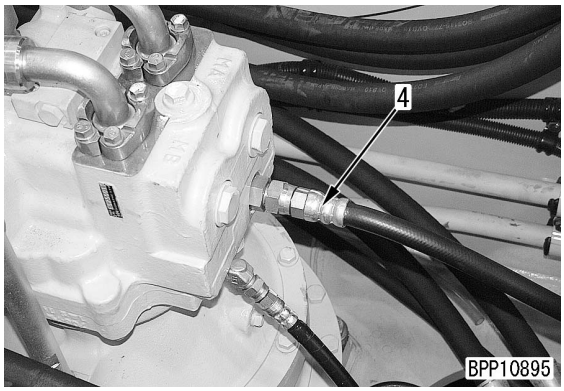
4) Continue this condition for 30 seconds, then measure the oil leakage amount for one minute.



5) After the measurement, make sure that the machine is back to normal condition.

4. Measurement of oil leakage amount from swing motor

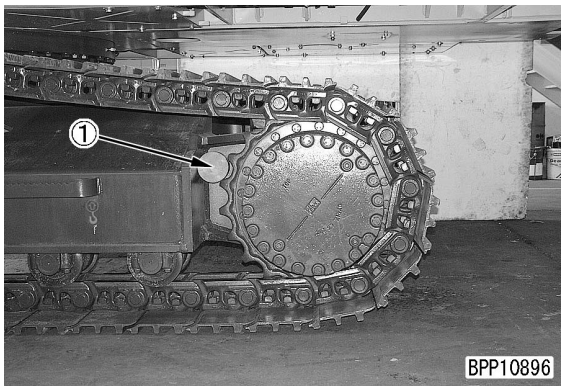
1) Disconnect drain hose (4) and fit a blind plug in the hoses.
2) Turn the swing lock switch to the ON position.
3) Start the engine. Apply the swing relief pressure with the engine running at high idling and measure an oil leakage amount under such conditions.
   - ★ After keeping the conditions in 3) above for 30 seconds, measure the oil leakage amount for one minute.
   - ★ After the first measurement, turn the upper structure by 180 degrees and take measurement again in the same way.



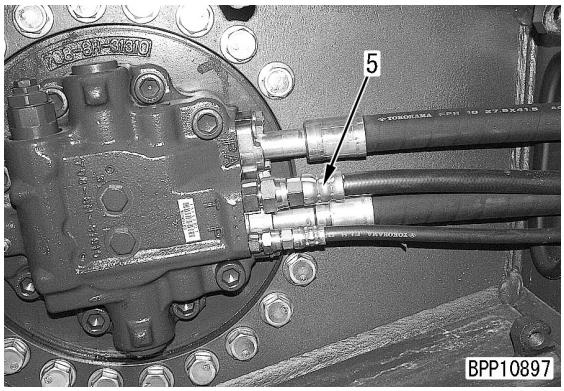
4) After the measurement, make sure that the machine is back to normal condition.

5. Measurement of oil leakage amount from travel motor

1) Take off the travel motor cover.
2) Start the engine and lock the travel.
   - k Put pin ① in between the sprocket and the track frame to block the travel.



3) Disconnect drain hose (5) of the travel motor and fit a blind plug in the hose end.
4) Start the engine and apply the travel relief pressure with the engine running at high idling, then measure an oil leakage amount under such conditions.
   - k In this measurement, an erroneous operation of the control lever will likely lead to a serious accident. Make sure that all the signals and confirmations are followed without fail.
   - ★ After keeping the conditions in 4) above for 30 seconds, measure the oil leakage amount for one minute.
   - ★ Repeat the measurement several times, slightly rotating the motor, i.e. shifting the position of valve plate and cylinder, and the position of cylinder and piston, and take measurement several times.



5) After the measurement, make sure that the machine is back to normal condition.

AIR BLEEDING OF VARIOUS PARTS

Air bleeding item / Contents of Work	Steps for air bleeding					
	1	2	3	4	5	6
	Hydraulic pump air bleeding	Engine start	Cylinder air bleeding	Swing motor air bleeding	Travel motor air bleeding	Operation start
• Change of hydraulic oil • Cleaning of strainer	O →	O →	O →	O (Note) →	O (Note) →	O
• Replacement of return filter element		O →	→	→	→	O
• Repair or replacement of hydraulic pump • Removing suction pipe	O →	O →	O →	→	→	O
• Repair or replacement of control valve		O →	O →	→	→	O
• Replacement of cylinder • Removing cylinder piping		O →	O →	→	→	O
• Replacement of swing motor • Removing swing motor piping		O →	→	O →	→	O
• Replacement of travel motor swivel • Removing travel motor swivel piping		O →	→	→	O →	O

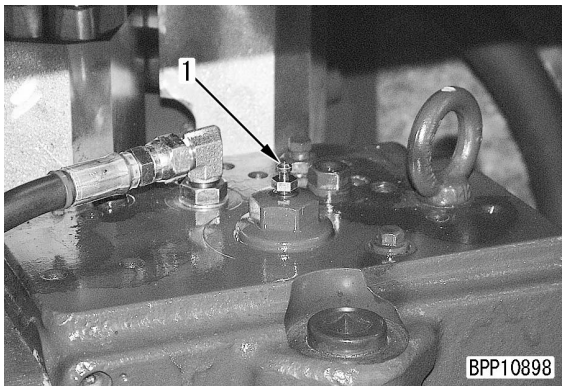
Note: Bleed air from the swing motor and travel motor only when oil in the casing is drained.

1. Air bleeding from hydraulic pump

1) Loosen air bleeding plug (1) and confirm that oil seeps out from the plug.
2) If the oil seepage is confirmed, tighten air bleeding plug (1).

3 Air bleeding plug:
7.8–9.8 Nm{0.8–1.0 kgm}

★ Precautions for starting engine
When starting the engine after the air bleeding work explained above, run the engine at low idling for 10 minutes.
If the engine cooling water temperature is low and an automatic engine warming-up function is relied on, use the fuel dial, when it becomes necessary to cancel it.



2. Air bleeding from hydraulic cylinder

1) Start the engine and kept it running at low idling for 5 minutes.
2) Raise and lower the boom 4 to 5 times with the engine running at low idling.
   ★ Be careful not to apply the relief pressure, stopping the piston rod approx. 100 mm before its stroke end.
3) Repeat the steps in Item 2) above, but this time with the engine running at high idling.
4) Apply the relief pressure by extending the piston rod to its stroke end and with the engine running at low idling.
5) For bleeding air from the arm cylinder and bucket cylinder, follow the same steps explained in Item 2) through 4) above.

★ In case a cylinder is replaced with new one, it is advised to bleed air from the new one before mounting the work equipment. It is especially so with the boom cylinder, because its rod does not extend to the stroke end of LOWER side, after the work equipment is mounted.

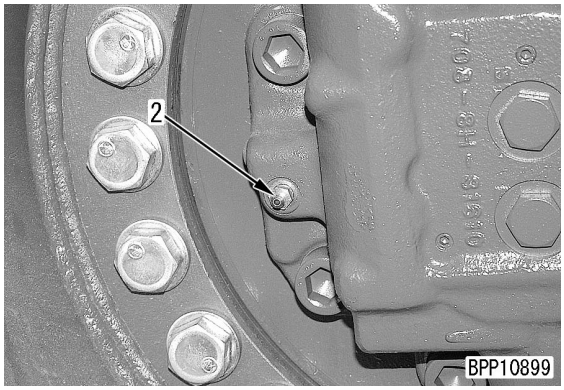
3. Air bleeding from swing motor

1) Start the engine and run it at low idling.
2) Bleed air from the motor by swinging the upper structure slowly.

4. Air bleeding from travel motor

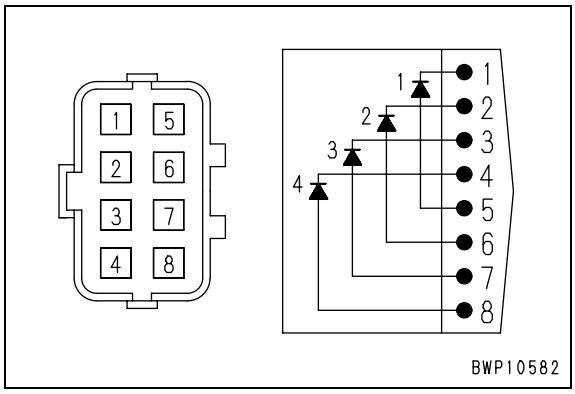
1) Start the engine and run it at low idling.
2) Loosen air bleeding plug (2) and confirm that oil seeps out from the plug.
3) If the oil seepage is confirmed, tighten air bleeding plug (2).

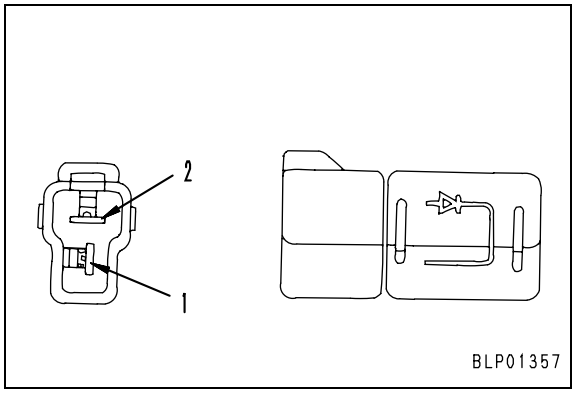
3 Air bleeding plug:
27.5–35.3 Nm{2.8–3.6 kgm}



INSPECTION PROCEDURES FOR DIODE

★ Check an assembled-type diode (8 pins) and single diode (2 pins) in the following manner.
★ The continuity direction of an assembled-type diode is as shown in the diagram below.
★ The continuity direction of a single diode is shown on the diode surface.

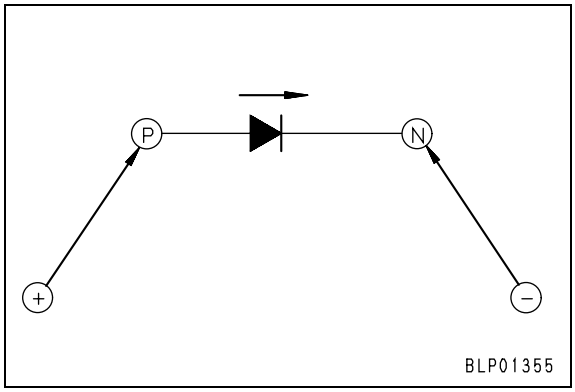




1. When using digital type circuit tester

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

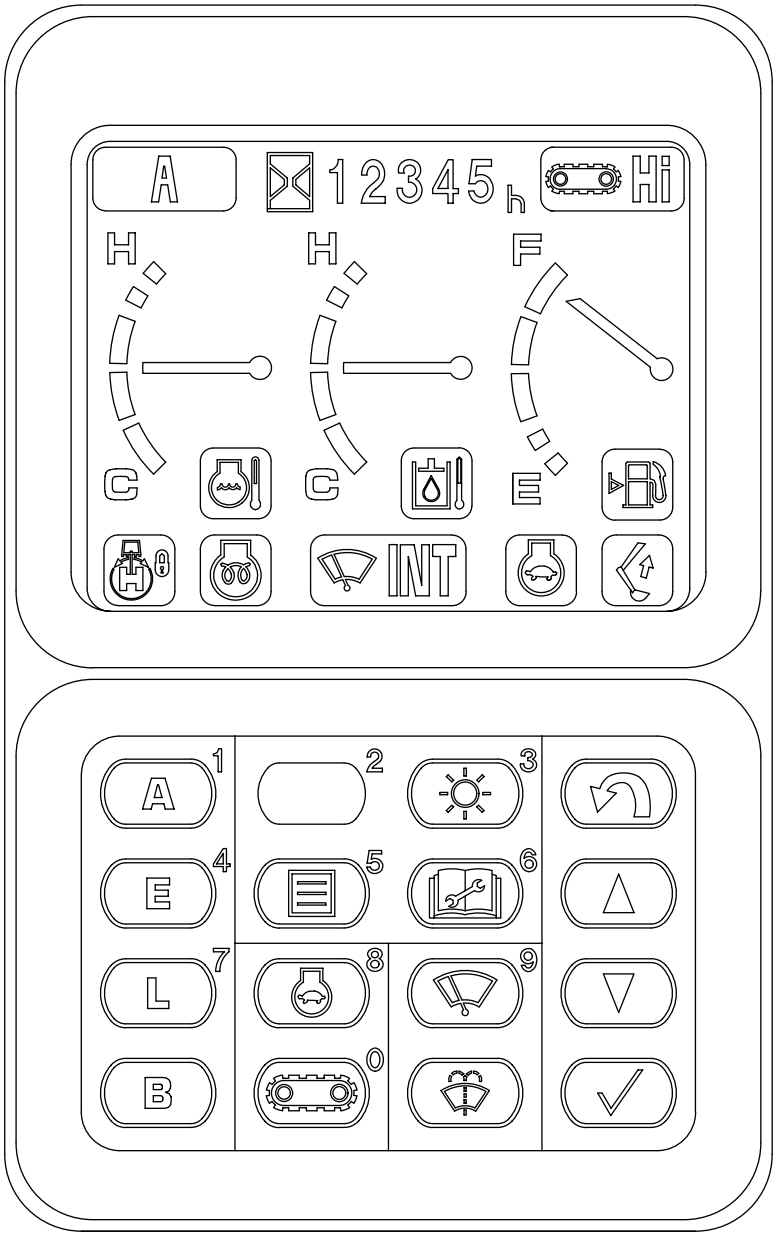
   Note: A silicon diode shows a value between 400 and 600.



2. When using analog type circuit tester

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

SPECIAL FUNCTION OF MULTI-MONITOR PANEL



[1] Figure input switch 1
[2] Figure input switch 2
[3] Figure input switch 3
[4] Figure input switch 4
[5] Figure input switch 5
[6] Figure input switch 6
[7] Figure input switch 7
[8] Figure input switch 8
[9] Figure input switch 9
[0] Figure input switch 0
[↩] Return switch
[△] Upward move switch
[▽] Downward move switch
[✓] Input confirmation switch

Monitor panel functions - conventional and special

The monitor panel is provided with conventional and special functions, and various kind of information are shown in the multi-display. Display items consists of automatic display items that are preset in the monitor panel and others that are shown by switch operations.

1. **Conventional function: Operator's Menu**
   This is a function by which an operator can set or show displays by switch operations. The display contents are those which are normally shown.

2. **Special function: Service Menu**
   This is a function by which a service mechanic can set or show displays by special switch operations. The display contents are those which are not normally shown. It is mainly used for inspection, adjustment, trouble-shooting or special setting of machines.

Operator's Menu	
1	Function for inputting and setting password
2	Function for showing Komatsu's logo
3	Function for machine inspection before starting day's work
4	Function for showing machine maintenance
5	Function for showing precaution items
6	Function for confirming working mode and travel speed
7	Function for display of ordinary items
8	Function for adjusting display luminance and contrast
9	Function for adjusting breaker and attachment flow rate
10	Function for confirming maintenance information
11	Function for showing service meter reading
12	Function for checking display LCD
13	Function for showing occurrence of caution item
14	Function for showing users' code No.
15	Function for showing service code No. and failure code No.

Service Menu		
16	Function for monitoring [01]	
17	Function for failure history [02]	Electrical system
		Mechanical system
18	Function for maintenance history [03]	
19	Function for maintenance mode change [04]	
20	Function for recording phone No. [05]	
21	Function for initial value setting and default [06]	Mode with key ON
		Language
		Unit
		Attachment installed/No attachment installed
22	Function for adjustment [07]	Adjustment of governor lever stroke
		Fuel pump absorbin torque
		RPM at low idling
		Adjustment of oil flow to attachment

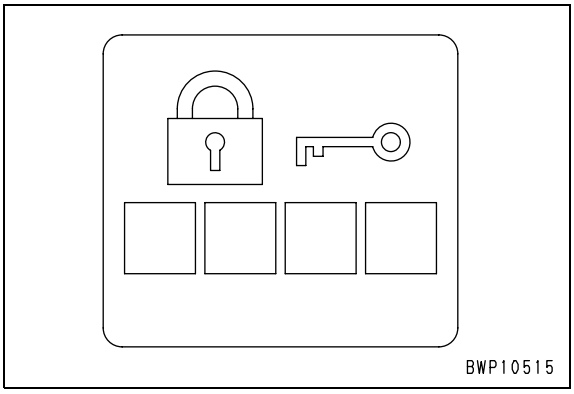
Operation of Operator's Menu and Display (Outline)

★ This section introduces only the outline of the operator's menu. For details on the contents and operation steps of each menu, refer to the operation and maintenance manual or the chapter of "STRUCTURE AND FUNCTION" in this shop manual.

1. Function for inputting and setting password

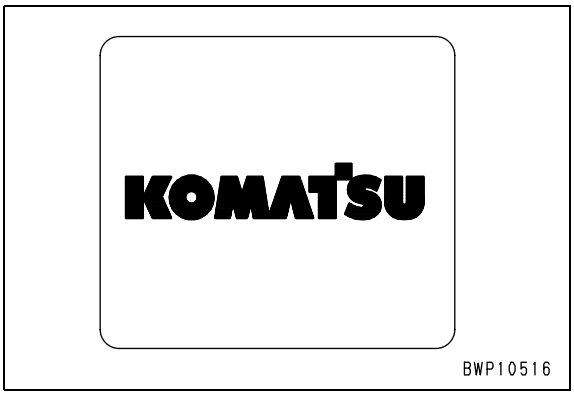
When the engine starting switch is turned ON, the password inputting display is shown.

★ This display is shown only when a password is registered.



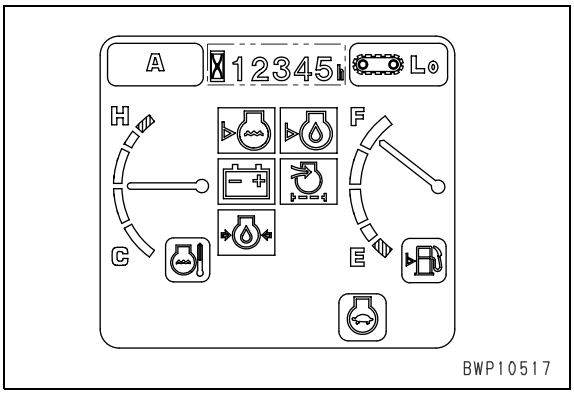
2. Function for showing KOMATSU logo

When a password is inputted, or when the engine starting switch is turned ON, KOMATSU logo is shown for two seconds.



3. Function for machine inspection before starting day's work

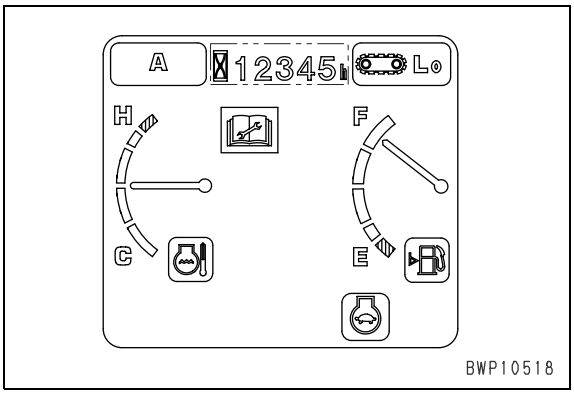
Following the KOMATSU logo, the display of machine inspection before starting day's work is shown for 2 seconds.



4. Function for machine maintenance

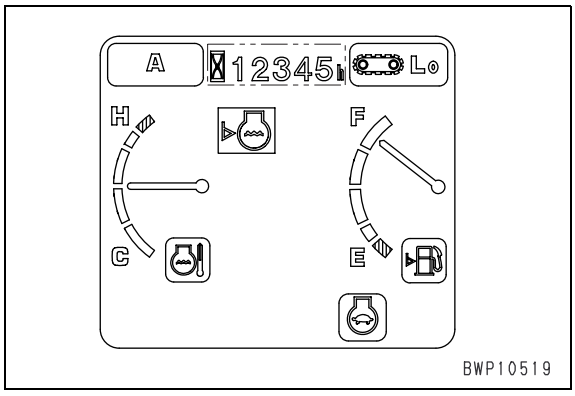
Following the display of machine inspection before starting day's work, the maintenance mark appears for 30 seconds, if there is an oil filter whose maintenance time is approaching or has just passed.

★ This display appears only when the maintenance function is set.



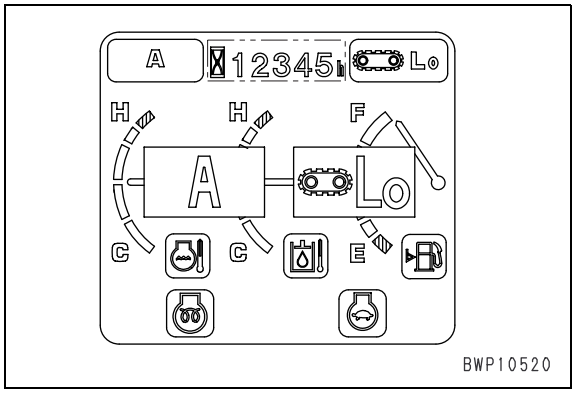
5. Function for showing precaution items

If there is any item of machine inspection before starting day's work that indicates some abnormality, a corresponding symbol mark is shown after the display of machine inspection before starting day's work.



6. Function for confirming working mode and travel speed

After the display of machine inspection before day's work, amplified symbol marks for working mode and travel speed are shown for two seconds to urge an operator to confirm the setting.

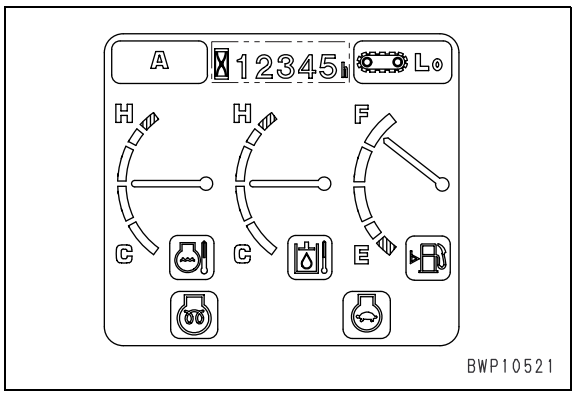


7. Function for display of ordinary items

The display of confirming working mode and travel speed is switched to this display of ordinary items.

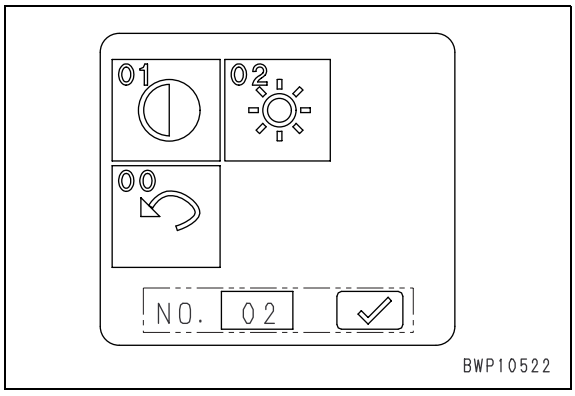
★ If the working mode setting or travel speed setting is changed, or auto-deceleration or windshield wiper setting is activated while this is in display, an amplified corresponding symbol mark is shown for two seconds.

★ In this display, a symbol mark for preheat monitor is shown only when preheating is carried out.



8. Function for adjusting display luminance and contrast

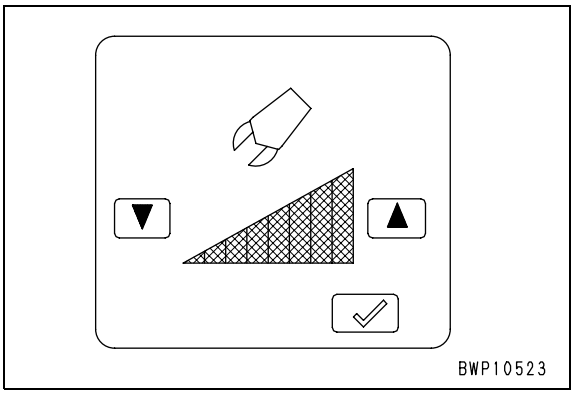
Luminance as well as contrast of the display can be adjusted by operating the display adjusting switch.



9. Function for adjusting breaker and attachment flow rate (For machines equipped with breaker attachment)

When a breaker or other attachments are used, hydraulic pump flow rate can be adjusted by operating the select switch.

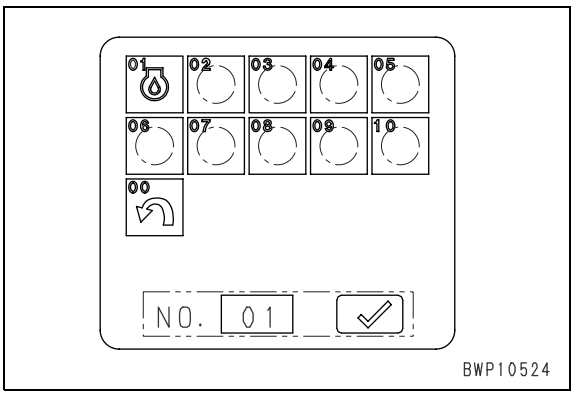
★ Note that the symbol mark and contents of display partially differ between the breaker and the other attachments.



10. Function for confirming maintenance information

Detailed information on maintenance items (set time and elapse of time) can be confirmed and resetting after the confirmation is feasible by operating the maintenance switch.

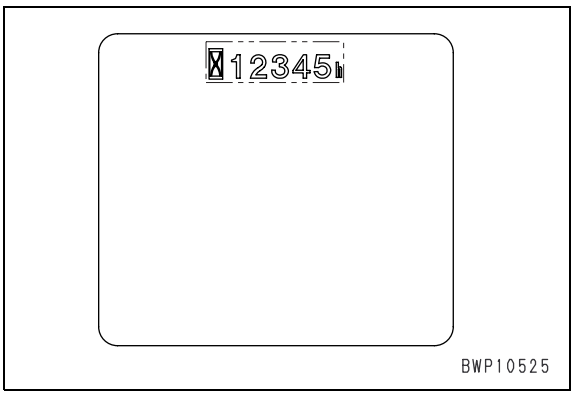
★ Use service Menu for setting or releasing maintenance items and setting maintenance time.



11. Function for showing service meter reading

Only the service meter reading can be shown by the following switching operation, when the engine starting switch is turned OFF.

• Switching operation: [↓] + [△] (synchronized switching operation)



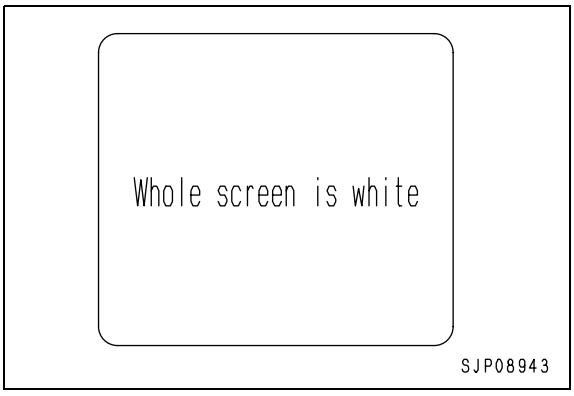
12. Function for checking display LCD

Display of the Display LCD can be confirmed by the following switching operation in the display of inputting and setting password as well as in the display of ordinary items

• Switching operation: [↓] + [A] (synchronized switching operation)

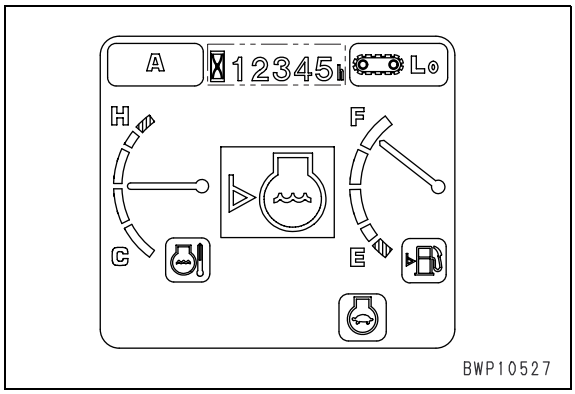
★ All the LCD light up, turning the entire screen white. If there is no showing in black, the display is normal.

★ This display returns to the immediately preceding one, if making any other switching operation.



13. Function for showing occurrence of caution item

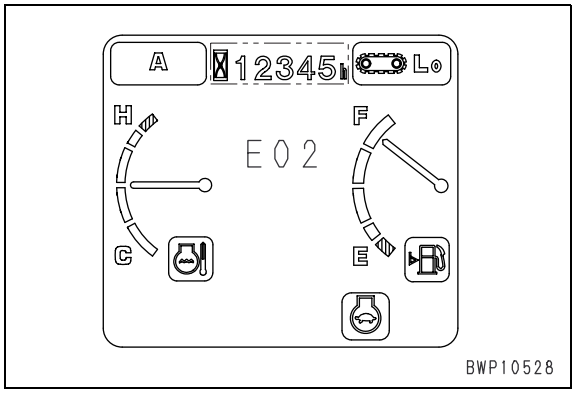
If any of the caution items occurs, the magnified corresponding symbol mark is shown for two seconds and thereafter stays on the display as a small symbol mark until it is dissolved.



14. Function for showing users' code No.

When a trouble occurs on the machine, the user's code is automatically displayed depending on the magnitude of the trouble to call attention of the operator for a proper action.

★ This display turns to the display of service code and failure code, if operating the switch (Refer to Item No. 15)



★ Relation between User Code and Action Directed to Operator

User Code	Failed System	Action Directed to Operator
E02	PC-EPC Valve	Ordinary work may be resumed by turning the emergency pump drive switch ON, but call for the inspection service immediately.
E03	Swing Brake	Release the brake after turning emergency swing and parking brake switch ON. When applying the swing brake, operate the swing lock switch manually. The swing brake may not be released depending on the nature of the trouble. In either case, call for the inspection service immediately.
E05	Governor	The governor control has become inoperable. Operate the governor control lever manually. For fixing the lever at full throttle position, use a fixing bolt provided at the bracket. In this case, call for the inspection service immediately.

15. Function for showing service code No. and failure code No.

If the following switching operation is made while the users' code No. is shown, a phone symbol (if registered), phone numbers (if registered), service code No. and failure code No. are shown in turn.

- Switching operation: [✓] (keep the switch depressed)

★ The following display is repeated in turn, while the switch is depressed.

① Telephone symbol mark

⇩

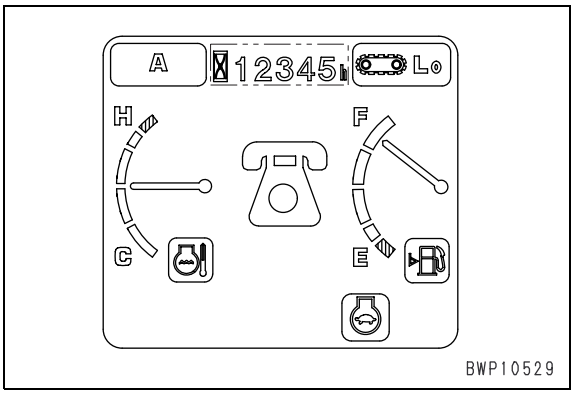
② Telephone No.

⇩

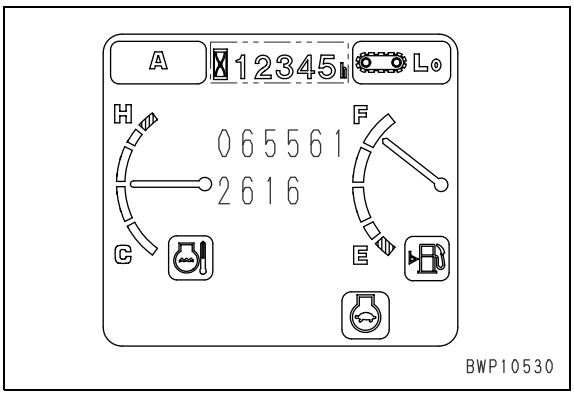
③ Service code No. and failure code No.

★ The telephone symbol mark and telephone No. are shown only when they are registered in the monitor panel.
For registration, correction and deletion of telephone No., use Service Menu.

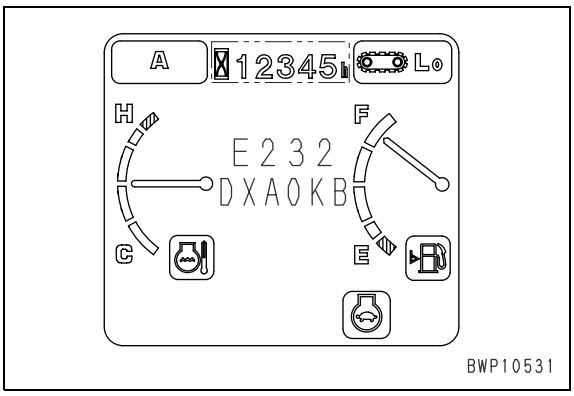
★ For details on the displayed service code No. and failure code No., refer to the Table for Service and Failure Code Nos.



BWP10529



BWP10530



BWP10531

Table for Service and Failure Code Nos.

User Code No.	Service Code		Failure Code			Failure Classification
	Code No.	Content	Code No.	Location	Phenomenon	
–	E101	Abnormal data in error history	DAF0KT	Failure history	Abnormality in data	Electrical system
–	E112	Short circuit in wiper motor drive, normal rotation system	DY2DKB	Windshield wiper motor (normal rotation)	Short circuit	
–	E113	Short circuit in wiper motor drive, reverse rotation system	DY2EKB	Windshield wiper motor (reverse rotation)	Short circuit	
–	E114	Short circuit in windshield washer drive	DY2CKB	Windshield washer motor	Short circuit	
–	E115	Abnormality of windshield wiper in motion	DY20KA	Windshield wiper motor	Disconnection	
–	E116	Abnormality of windshield wiper in retraction	DY20MA	Windshield wiper motor	Malfunctioning	
–	E201	Short circuit in travel interconnection solenoid	DW91KB	Travel interlocking solenoid valve	Short circuit	
E03	E203	Short circuit in swing holding brake solenoid	DW45KB	Swing holding solenoid valve	Short circuit	
–	E204	Short circuit in merge/divide solenoid	DWJ0KB	Merge solenoid valve	Short circuit	
–	E205	Short circuit in 2-stage relief solenoid	DWK0KB	2-stage relief solenoid valve	Short circuit	
–	E206	Short circuit in travel speed shifting solenoid	DW43KB	Travel Hi-Lo shifting solenoid valve	Short circuit	
–	E211	Disconnection in travel interlocking solenoid	DW91KA	Travel interlocking solenoid valve	Disconnection	
E03	E213	Disconnection in swing holding brake solenoid	DW45KA	Swing holding solenoid valve	Disconnection	
–	E214	Disconnection in merge/divide solenoid	DWJ0KA	Merge solenoid valve	Disconnection	
–	E215	Disconnection in 2-stage relief solenoid	DWK0KA	2-stage relief solenoid valve	Disconnection	
–	E216	Disconnection in travel speed shifting solenoid	DW43KA	Travel Hi-Lo shifting solenoid valve	Disconnection	
–	E217	Abnormality in model code input	DA2SKQ	S_NET	Nonconformance in model selecting signal	
–	E218	Disconnection in S_NET signal	DA2SKA	S_NET	Disconnection	
–	E222	Short circuit in LS-EPC solenoid	DXE0KB	LS-EPC solenoid valve	Short circuit	
–	E223	Disconnection in LS-EPC solenoid	DXE0KA	LS-EPC solenoid valve	Disconnection	
–	E224	Abnormality in F pump pressure sensor	DHPAMA	F pump pressure sensor	Malfunctioning	
–	E225	Abnormality in R pump pressure sensor	DHPBMA	R pump pressure sensor	Malfunctioning	
–	E226	Abnormality in pressure sensor power source	DA25KP	Governor pump controller	Lowering in output voltage	
–	E227	Abnormality in engine revolution sensor	DLE2MA	Engine revolution sensor	Malfunctioning	
–	E228	Short circuit in ATT return switching relay	D196KB	ATT switching relay	Short circuit	
E02	E232	Short circuit in PC-EPC solenoid	DXA0KB	TVC solenoid valve	Short circuit	
E02	E233	Disconnection in PC-EPC solenoid	DXA0KA	TVC solenoid valve	Disconnection	
–	E238	Disconnection in ATT return switching relay	D196KA	ATT switching relay	Disconnection	
–	E245	Short circuit in ATT flow rate adjusting EPC	DXE4KB	ATT flow rate throttling EPC valve	Short circuit	
–	E246	Disconnection in ATT flow rate adjusting EPC	DXE4KA	ATT flow rate throttling EPC valve	Disconnection	
–	E256	Incorrect nonvolatile memory data	DA20KT	Nonvolatile memory	Abnormality in data	
–	E304	Short circuit in engine stop solenoid relay	DY45KB	Engine stop solenoid relay	Short circuit	
–	E306	Abnormality in motor potentiometer	DK54KZ	Governor motor feedback potentiometer	Malfunctioning	

User Code No.	Service Code		Failure Code			Failure Classification
	Code No.	Content	Code No.	Location	Phenomenon	
E05	E308	Abnormality in throttle potentiometer	DK10KZ	Throttle potentiometer	Malfunctioning	Electrical system
–	E314	Disconnection in engine stop solenoid relay	DY45KA	Engine stop solenoid relay	Disconnection	
–	E315	Short circuit in battery relay output	D110KB	Battery relay	Short circuit	
–	E316	Abnormality in governor motor step-out	DY10K4	Governor motor	Out of control	
E05	E317	Disconnection in both governor motors A and B	DY10KA	Governor motor	Disconnection	
E05	E318	Short circuit in both governor motors A and B	DY10KB	Governor motor	Short circuit	
–	None	Engine high idling out of rate	A000N1	Engine	Overrunning	Mechanical system
–	None	Engine low idling out of rate	A000N2	Engine	Low idling out of rate	
–	None	Air cleaner clogged	AA10NX	Air cleaner element	Clogging	
–	None	Charging voltage abnormally low	AB00KE	Alternator	Insufficient charging	
–	None	Engine oil pressure abnormally low	B@BAZG	Engine oil	Oil pressure lowered	
–	None	Engine oil level abnormally low	B@BAZK	Engine oil	Oil level lowered	
–	None	Engine cooling water overheated	B@BCNS	Engine cooling water	Overheating	
–	None	Radiator water level abnormally low	B@BCZK	Engine cooling water	Cooling water level lowered	
–	None	Hydraulic oil overheated	B@HANS	Hydraulic oil	Overheating	
–	None	Auto-lubrication system abnormal	DA80MA	Auto-lubrication system controller	Malfunction	

★ This table is arranged in the sequence of Service Code No.
★ In case there is no number assigned in the column of User Code No., or in case "none" is described in the column of Code No. of Service Code, the corresponding service code or failure code is not shown in the display of ordinary items, even if some abnormality occurs. It is recorded only in the failure history (either in electrical system or mechanical system) of Service Menu.
★ History Classification indicates that a specific failure is classified as belonging to either electrical system or mechanical system, when it is recorded in Service Menu.
★ "E" at the head of Code No. of Service Code means the following status of a specific failure.
- With "E": The failure is yet to be dissolved and continues.
- Without "E": The failure has already been dissolved.

Operation and Display of Service Menu

Way of switching to Service Menu

★ When using Service Menu, change the display to Service Menu display through the following special operation.

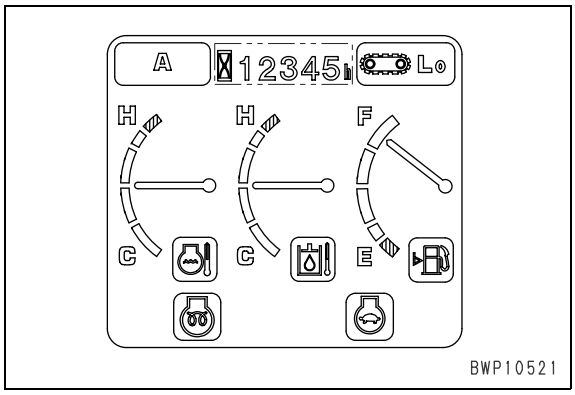
1) Confirmation of display
Confirm that the display of ordinary items is shown.
★ Changing to Service Menu cannot be made from displays other than this.

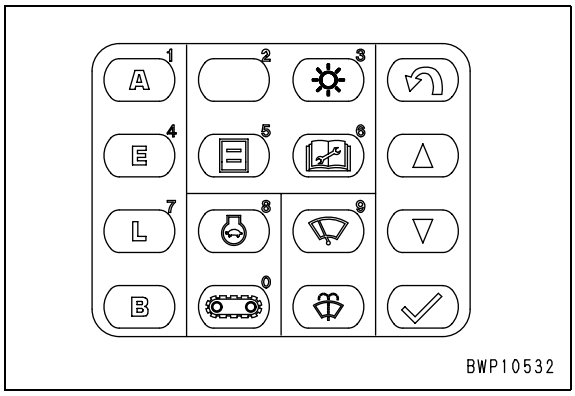
2) Switch operation
Operate the switch as instructed below.
• Switch operation: [△] + [1] → [2] → [3]
(Enter a figure, depressing [△])

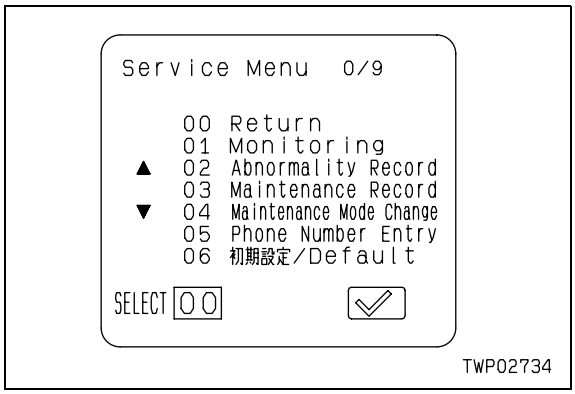
3) Showing Service Menu display
The display is changed to the initial display of Service Menu program. Select an appropriate item from among the menu.

No.	Service Menu
00	Return (Termination of Service Menu)
01	Monitoring
02	Abnormality Record
03	Maintenance Record
04	Maintenance Mode Change
05	Phone Number Entry
06	☆☆☆☆☆ / Default
07	Adjustment
08	–

4) Termination of Service Menu function
When terminating the initial display or any subsequent display of Service Menu, do that through any one of the following methods.
① Depress [↩] switch. (This method may be used for terminating any display)
② If "Return" switch is shown, depress it.
③ If "Return" menu is shown, call that menu and depress [✓] switch.







16. Function of monitoring [01]

The monitor panel monitors signals from an assortment of switches, sensors and actuators installed in various parts of the machine. Monitored information can be put in display or confirmed on a real time basis through the following operations.

1) Selection of menu
Select "01 Monitoring" in the initial display of Service Menu and depress [✓] switch.

2) Setting of monitoring item
Select or register an item to be monitored through the following switch operation.

- [△] switch: Selection
- [▽] switch: Selection
- [✓] switch: Registration

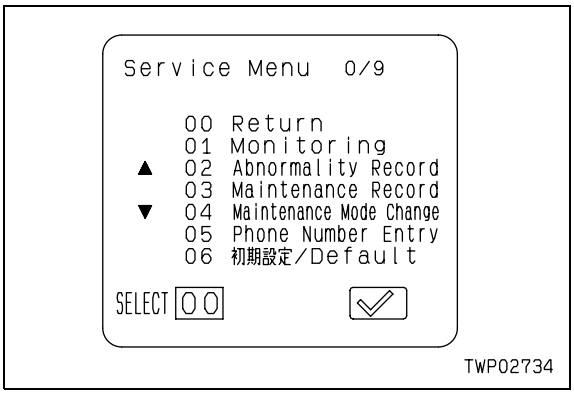
★ A monitoring item can be set in any number between the min. one to the max. four. (Depending upon the selected item, the max. number is less than four)

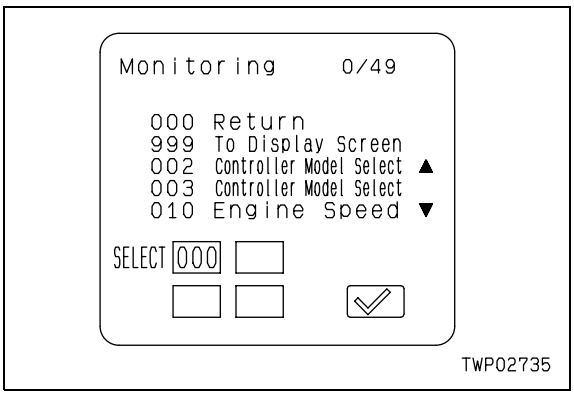
★ In case of monitoring 1 to 3 items, move to the monitored information display through any of the following switch operations, after the registration work has been completed.
  - Keep [✓] switch depressed. (For about 3 seconds)
  - Select Menu 999 and depress [✓] switch.

★ The display automatically moves to the display of monitored information, when all of the registrable items have been duly registered.

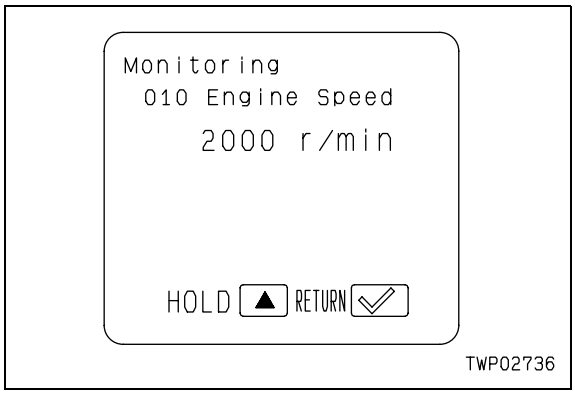
★ Monitored information are transmitted via communication circuits. Thus the number of selected items can impact the communication speed. If truly real time monitoring is required, reduce the selected items to the minimum.

★ For details on the monitoring items, display unit, etc., refer to the Table for Monitoring Items.

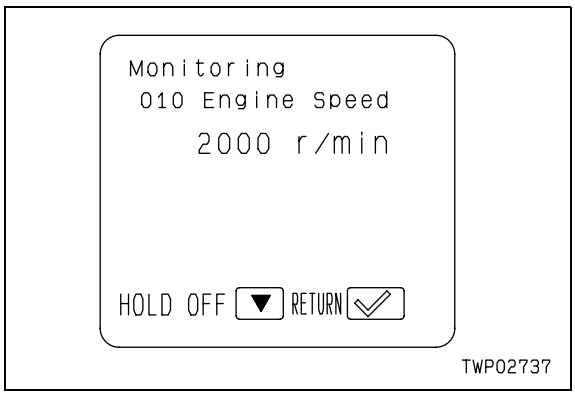




3) Monitoring operation
Call the monitoring information display and confirm the monitored information, while operating the machine.



4) Monitored information holding function
If [△] switch is depressed while monitoring, all the monitored information are put on hold. If [▽] switch is depressed in this condition, information holding is released.



5) Machine setting mode switching function
If it becomes necessary to change settings of working mode, select mode, travel speed and auto-decel while monitoring, depress the corresponding switch, then the mode confirmation display is shown.
★ An illustration at right shows the display in A mode and E mode. Symbol marks are partially different in B mode.
★ When a specific setting is confirmed, depress [✓] switch, then the display returns to that of monitoring.
★ In case a specific setting has been changed while monitoring, the new setting is still maintained when returning from Service Menu to Operator's Menu after the monitoring is finished.

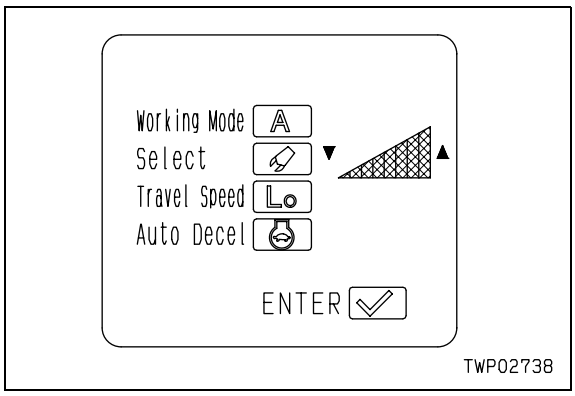


Table for Monitoring Items

Code No.	Item to be monitored		Unit (Default: ISO)			Remark
			ISO	Meter	Inch	
000	Return		(Not displayed)			Termination menu
999	To Display Screen		(Not displayed)			Execute Command menu
002	Controller Model Select		Figure			
003	Controller Model Select		Figure			
010	Engine Speed		r/min	rpm	rpm	
011	F Pump Pressure		MPa	kg/cm^2	PSI	
012	R Pump Pressure		MPa	kg/cm^2	PSI	
013	PC-EPC Sol. Curr.		mA	mA	mA	
015	LS-EPC Sol. Curr.		mA	mA	mA	
016	2nd Eng. Speed Command		r/min	rpm	rpm	
017	Service Sol. Curr.		mA	mA	mA	
019	Pressure Switch 1	Swing	ON/OFF			
		Travel	ON/OFF			
		Boom Lower	ON/OFF			
		Boom Raise	ON/OFF			
		Arm Curl	ON/OFF			
		Arm Dump	ON/OFF			
021	Pressure Switch 2	Bucket Curl	ON/OFF			
		Bucket Dump	ON/OFF			
		Service	ON/OFF			
		Travel Steering	ON/OFF			
022	Switch Input 1	Lever Sw.	ON/OFF			
		Swing Release Sw.	ON/OFF			
		Swing Brake Sw.	ON/OFF			
023	Solenoid valve 1	Travel Junction	ON/OFF			
		Swing Brake	ON/OFF			
		Merge-divider	ON/OFF			
		2-stage Relief	ON/OFF			
		Travel Speed	ON/OFF			
024	Solenoid valve 2	Service Return	ON/OFF			
027	Switch Input 2	Model Select 1	ON/OFF			
		Model Select 2	ON/OFF			
		Model Select 3	ON/OFF			
		Model Select 4	ON/OFF			
		Model Select 5	ON/OFF			
030	Fuel Dial Vol.		V	V	V	
031	Gov. Motor Potentio Vol.		V	V	V	
032	Battery Voltage		V	V	V	
033	Gov. Motor Phase A Curr.		mA	mA	mA	
034	Gov. Motor Phase B Curr.		mA	mA	mA	
035	Battery Relay O/P Vol.		V	V	V	
036	Switch Input 3	Key Switch	ON/OFF			
037	Controller Output	Batt. Relay Dr.	ON/OFF			
		Engine Stop SOL.	ON/OFF			
041	Engine Water Temperature		ºC	ºC	ºF	
042	Fuel Lever Sensor Vol.		V	V	V	

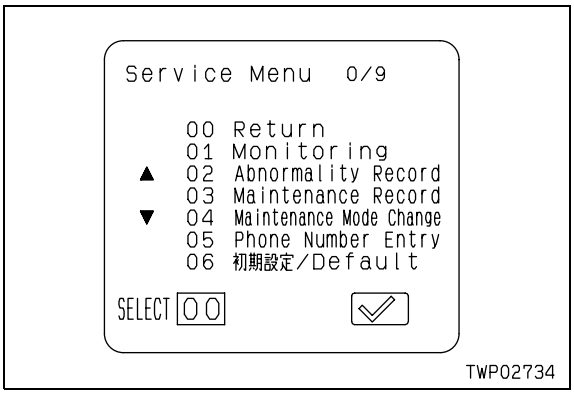
Code No.	Item to be monitored		Unit (Default: ISO)			Remark
			ISO	Meter	Inch	
043	Battery Charge Vol.		V	V	V	
044	Hydr. Oil Temperature		ºC	ºC	ºF	
045	Monitor Input 1	Key Switch	ON/OFF			
		Start	ON/OFF			
		Preheat	ON/OFF			
		Light	ON/OFF			
		Rad. level	ON/OFF			
		Hydr. Oil Level	ON/OFF			
046	Monitor Input 2	Aircleaner	ON/OFF			
		Eng. Oil Press.	ON/OFF			
		Eng. Oil Level.	ON/OFF			
		Spare	ON/OFF			
		Battery Charge	ABN•NOR			
049	Monitor Input 3	Swing Brake Sw.	ON/OFF			
		Buzzer cancel Sw.	ON/OFF			
		Window Limit Sw.	ON/OFF			
		W Limit Sw.	ON/OFF			
		P Limit Sw.	ON/OFF			
200	Monitor Prog. Version		Figure			
201	Controller Prog. Version		Figure			

★ Select the most favorite display unit from among the prepared three kinds, i.e. ISO, meter and inch. When changing one display unit for another, refer to "Unit" in the initial value setting of Service Menu.
★ Abbreviations, ABN and NOR, stand for the following conditions.
ABN: Abnormal, NOR: Normal
★ It cannot be monitored how the machine push-up solenoid valve works.

17. Function for Abnormality Record [02]

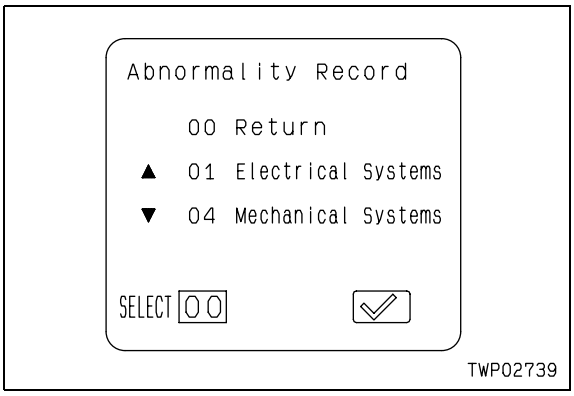
The monitor panel records failures that occurred on the machines in the past after classifying them into failures in the electric system and those in the mechanical system. Information on them can be displayed through the following operation.

1) Selection of menu
Select 02 Abnormality Record in the initial display of Service Menu and depress [✓] switch.

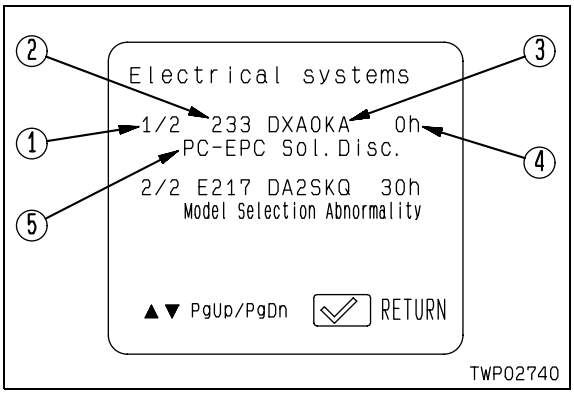


2) Selection of Submenu
Select an appropriate item from Submenu in the Abnormality Record display and depress [✓] switch.

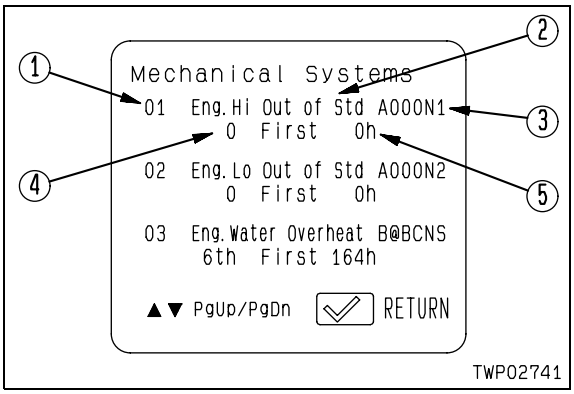
No.	Abnormality Record Submenu
00	Return (termination of Abnormality Record)
01	Electrical System
02	Mechanical Systems



3) Information shown in display of Abnormality Record in the electrical system
①: The numerator expresses sequence of failure occurrence, counting from the latest one. The denominator expresses the total number of a specific failure recorded.
②: Service Code
③: Abnormality Code No. (system in 4 digits and phenomenon in 2 digits)
④: Time elapsed since the occurrence of the first failure
⑤: Contents of failure
★ Refer to "Table for Service Code and Abnormality Code" in Operator's Menu.



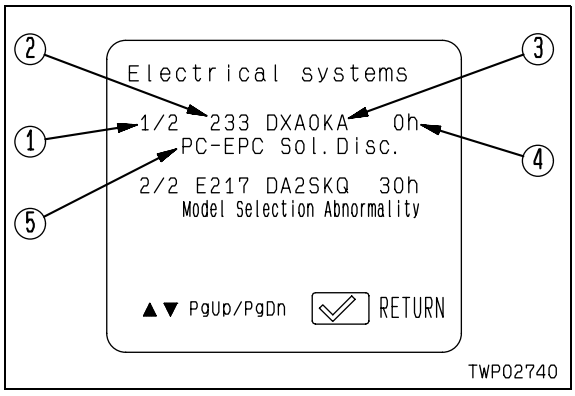
4) Information shown in display of Failure History in the mechanical systems
①: Record No.
②: Contents of Abnormality
③: Abnormality Code No. (system in 4 digits and phenomenon in 2 digits)
④: Total number of occurrence
⑤: Service meter reading at the initial occurrence
★ Refer to "Table for Service Code and Abnormality Code" in Operator's Menu.

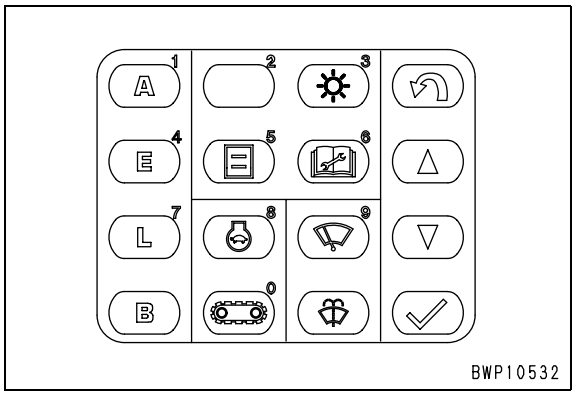


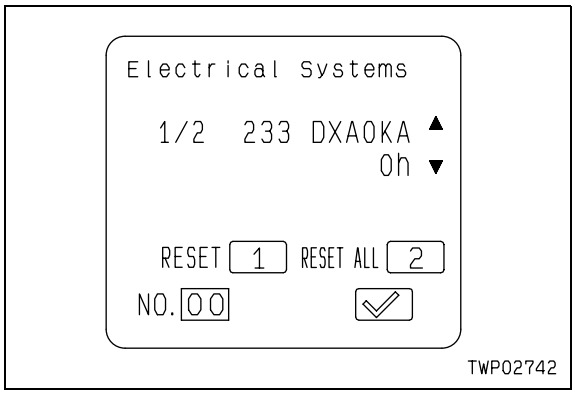
5) Resetting Electrical Systems
   - ★ Resetting Electrical Systems (deletion) is possible only with the electrical system. The failure history in the mechanical system cannot be reset.
   - ★ For resetting any specific or all information in the Electrical Systems, follow the operation explained below.

   i) Through the following switch operation, call the resetting display in the display of Electrical Systems.
      - Switch operation: [△] +[1] → [2] → [3]
      - ★ This is the same switch operation in changing the display to Service Menu.

   ii) Operate the switch, following the instructions shown in the resetting display.
      - ★ When resetting specific information only, call the display of that specific information and reset it with either [△] switch or [▽] switch.
      - ★ When resetting all the information, a display of any information will do.



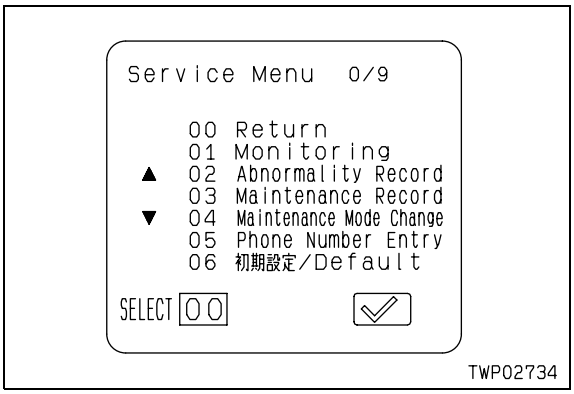




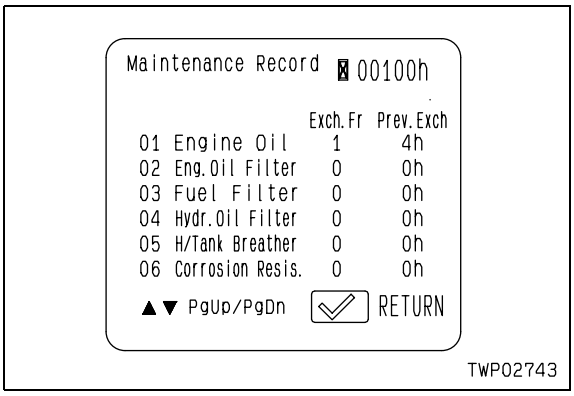
18. Function for Maintenance Record [03]

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

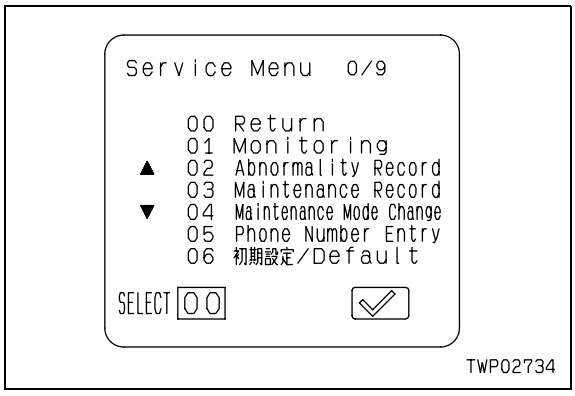


19. Function for Maintenance Mode Change [04]

Conditions set for controlling maintenance display function can be changed in the following manner.

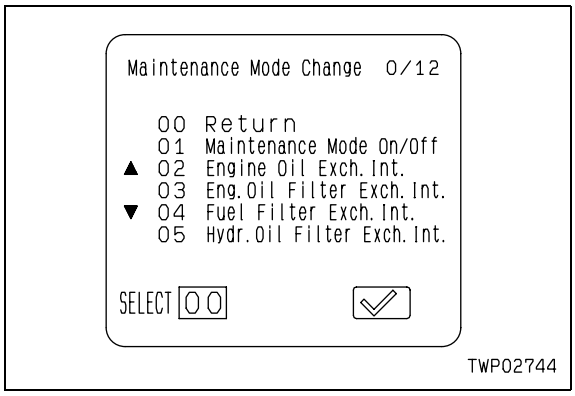
- Turn the function effectual or ineffectual.
- Change the set interval for replacement.

1) Selection of menu
Select 04 Maintenance Mode Change in the initial display of Service Menu, and depress [✓] switch.



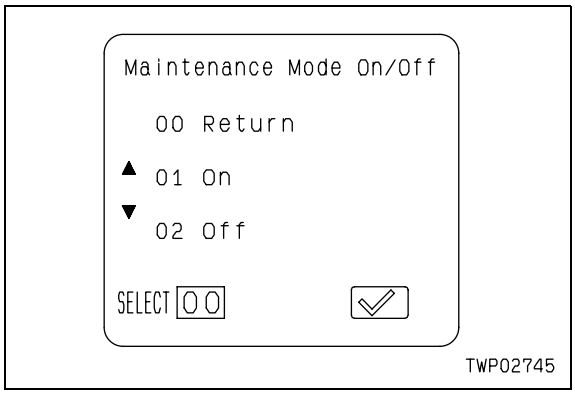
2) Selection of item to be changed
Select an item to be changed in the display of Maintenance Mode Change Selecting Menu.

No.	Maintenance mode change item
00	Return
01	Maintenance Mode On/Off
02	Engine Oil Exch. Int.
03	Engine Oil Filter Exch. Int.
04	Fuel Filter Exch. Int.
05	Hydr. Oil Filter Exch. Int.
06	H/Tank Breather Exch. Int.
07	Corro. Resis. Exch. Int.
08	PTO Oil Service Int.
09	Final Drive Oil Exch. Int.
10	S/Machinery Oil Exch. Int.
11	Hydraulic Oil Exch. Int.
12	Use Default Values



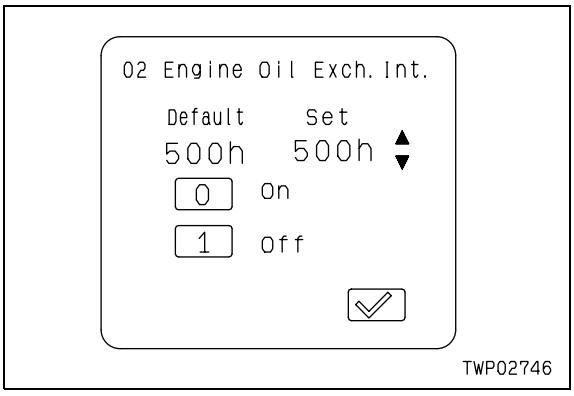
★ 01 and 12 menus are provided for setting the whole maintenance mode, while those from 02 through 11 are for setting individual items.

3) Contents of Maintenance Mode On/Off
- Use: The maintenance display function of all oil and filter-related items are turned effectual. (Irrespective of whether "On" or "Off" set for individual items, this setting prevails)
- Do not use: The maintenance display function of all oil and filter-related items are turned ineffectual. (Irrespective of whether "On" or "Off" set for individual items, this setting prevails)



4) Set contents of individual items
   ①: Default: The maintenance time set in the monitor (recommended by the manufacturer and cannot be changed).
   ②: Set: Maintenance time that can be freely set. The maintenance mode program functions based on this maintenance time. (The maintenance time can be increased or decreased by 50 hours with [△] or [▽] switch)
   ③: On: Maintenance display function with this instruction becomes effectual.
   ④: Off: Maintenance display with this instruction becomes ineffectual.
   ★ The lowest maintenance time is 50 h.

5) Set contents of "Use Default Values"
   When selecting this menu and depressing the switch [✓], all individual time settings are reduced to the initial settings.

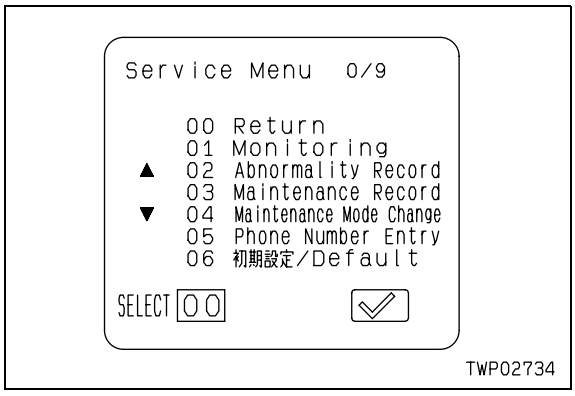


20. Function for Phone Number Entry [05]

In the display of User Code, a telephone number and Service Code are shown alternately. Phone number can be inputted or modified in the following manner.

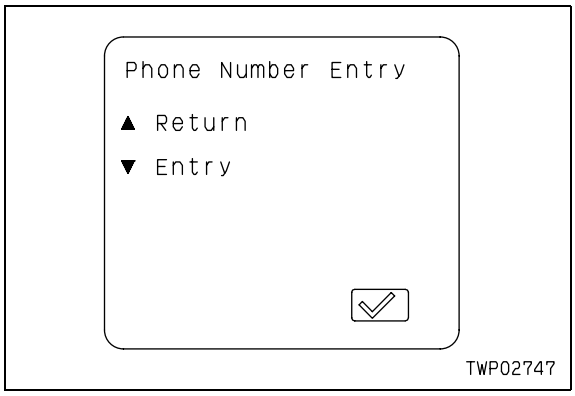
★ If there is no Phone number registered, the display for Phone numbers does not appear.

1) Selection of menu
Select 05 Phone Number Entry menu in the display of Service Menu, and depress [✓] switch.



2) Changing the display
Select Entry next to change the display to the Phone Number Entry display.

★ Even if a Phone number is already inputted, it is deleted, upon switching to the Phone Number Entry display.



3) Entry and setting Phone number
Following the method explained below, Entry a Phone number in the Phone Number Entry display. (Entry automatically begins with a cursor at the left end)

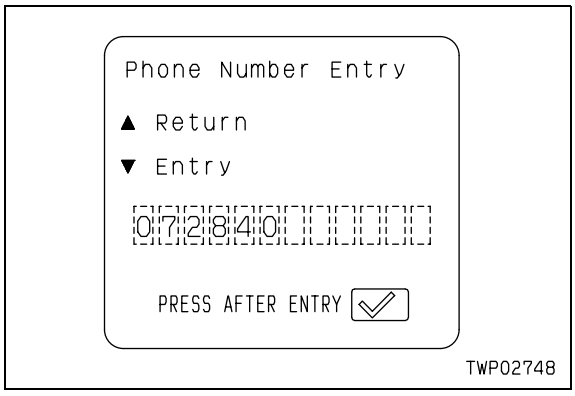
i) Enter a number into a cursor at the left end with a ten-key.

ii) Depress [✓] switch when all the numbers have been entered.

★ Numbers can be entered up to the max. 12 digits, but omit unnecessary digits.

★ When entering a wrong number, depress [B] switch, then the cursor goes back by one digit.

★ When input is finished, the display changes to Entry display shown above. If the inputted Phone number is shown in this display, the input is normal.

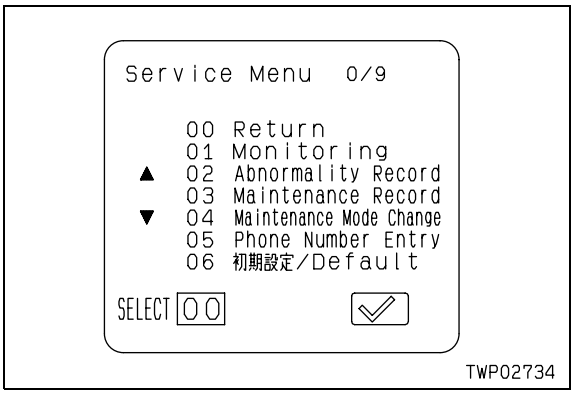


21. Function for ☆☆☆☆☆/Default [06]

It is possible to change the following settings for the monitor panel as well as the machine. Make a change as is required.

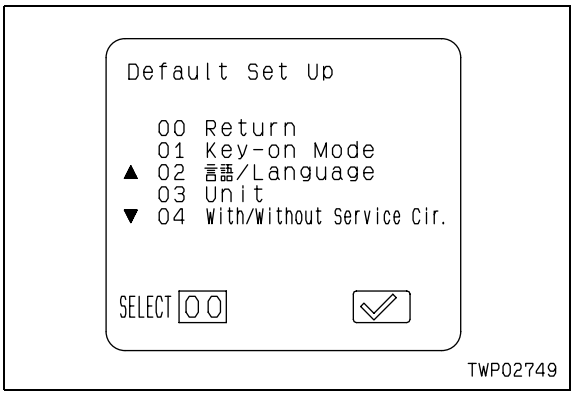
- Working mode when the engine starting switch is in the ON position.
- Display language in Service Menu
- Display unit in the monitoring function
- With/Without Service Cir.

1) Selection of menu
Select 06 "☆☆☆☆☆/Default menu" in the initial display of Service Menu, and depress [✓] switch.

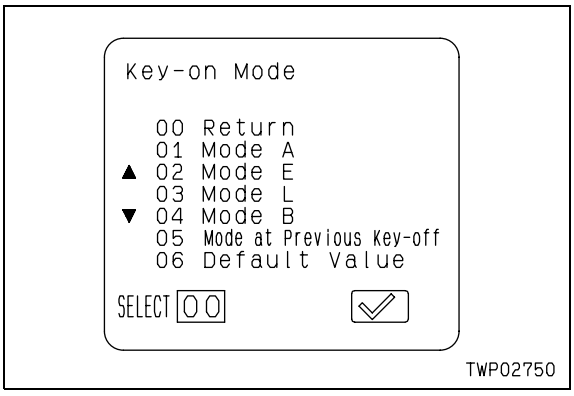


2) Selection of submenu
Select an item to change from the submenu, and depress [✓] switch.

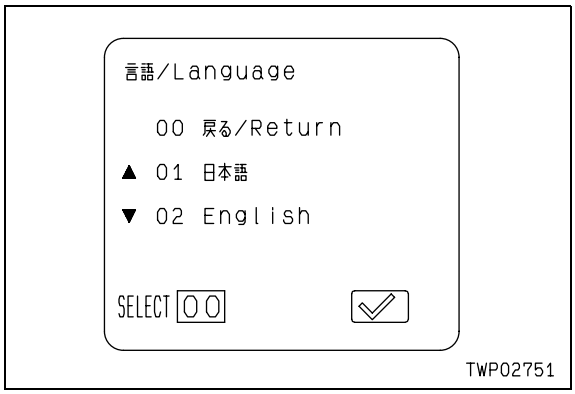
No.	☆☆☆☆☆/Default submenu
00	Return (termination of ☆☆☆☆☆/Default)
01	Key-on Mode
02	☆☆/Language
03	Unit
04	With/Without Service Cir.



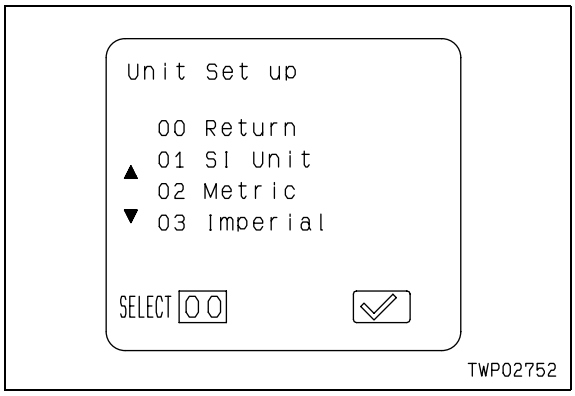
3) Function for Key-on Mode
When the engine starting switch is turned ON, a working mode can be set that is shown in the monitor panel.
   - A, E, L and B Modes: If any of them is set, the machine always ramps up with that working mode, when turning the engine starting switch ON.
   - Mode at Previous Key-off: If this mode is set, the machine ramps up with the working mode that was last used in the previous machine operation.
   - Default Value: If this mode is set, the machine ramps up with the default mode (A mode) that was originally set at the time of delivery from the factory.
   - ★ Irrespective of this setting mode, a machine "With attachment" always ramps up with B mode, when the engine starting switch is turned ON at the subsequent operation, if that was the working mode used in the last machine work.



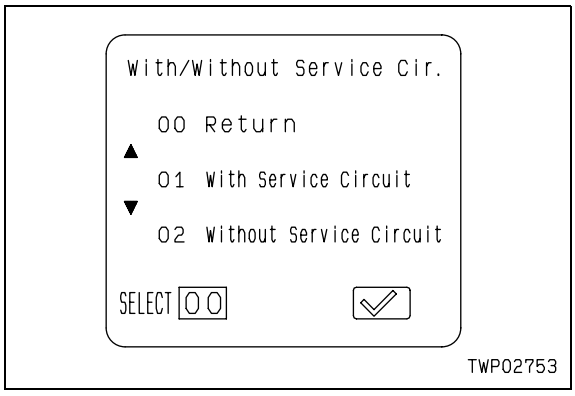
4) Function for ☆☆/Language
In Service Menu, the language in use can be changed between Japanese and English.
★ English is used as the language for default setting in the monitor panel.
★ If the monitor panel for spare parts is to be used in a Japanese-speaking region or organization, change the language from English to Japanese, using this function.



5) Function for unit selection
As the unit to be used in the monitoring function display of Service Menu, three kinds of unit are provided.
★ Unit used for default setting in the monitor panel is SI, i.e. International System of Units.



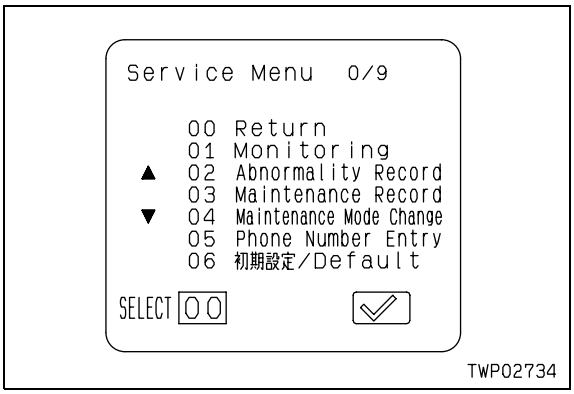
6) Function for selecting distinction of With/Without Service Cir.
It is possible in this function to set a distinction between with or without attachment.
• With Service Circuit: When an attachment is installed.
• Without Service Circuit: When no attachment is installed.
★ If "With Service Circuit" setting is not made in this display, while it is actually installed on a specific machine, SELECT function in Operator's Mode (attachment oil flow rate adjustment) cannot be utilized.



22. Function for Adjustment [07]

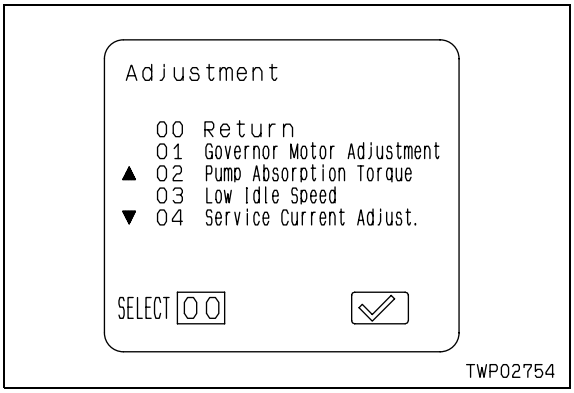
The monitor panel has a function of making various adjustments of the machine.

1) Selection of menu
   Select 07 adjustment in the initial display of Service Menu, and depress [✓] switch.

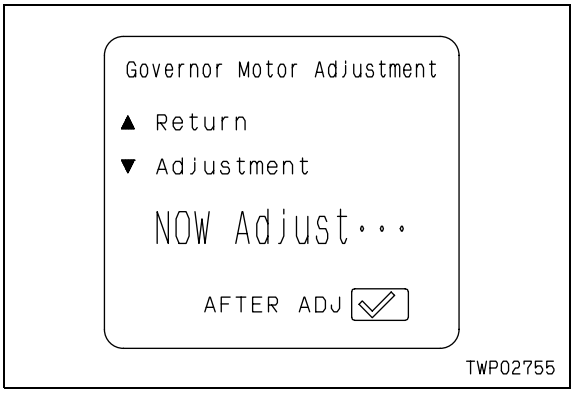


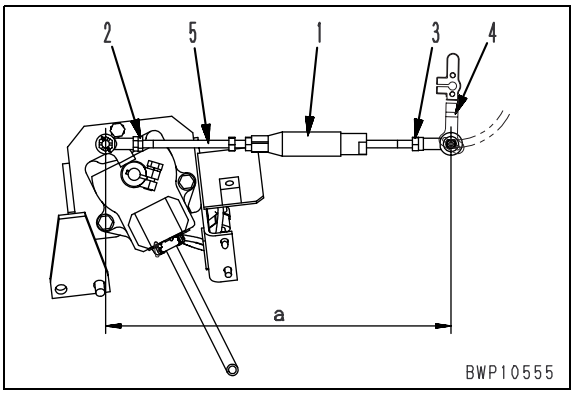
2) Selection of submenu
   Select an item to change from the submenu and depress [✓] switch.

No.	Adjustment submenu
00	Return (termination of adjustment)
01	Governor Motor Adjustment
02	Pump Absorption Torque
03	Low Idle Speed
04	Service Current Adjust.



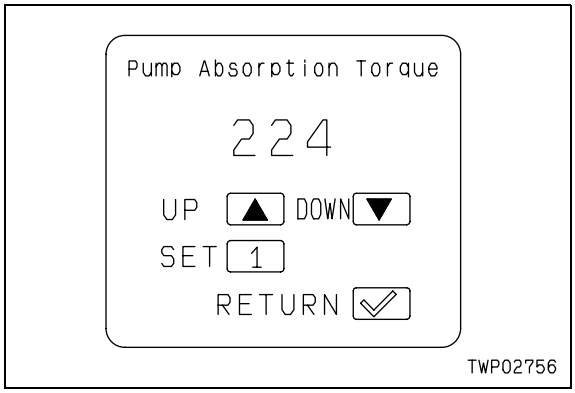
3) Function for Governor Motor Adjustment
   - ★ When adjusting the securing position of governor actuator, fuel injection pump and governor spring, call this display and carry out the work in the following manner.
   - i) Set the fuel dial at MAX.
     - ★ In this condition, the governor actuator lever shifts to the full throttle. Hold this display while in adjustment.
   - ii) Loosen nuts (2) and (3) of governor spring (1).
     - ★ Nut (2) is of inverse thread (left).
   - iii) Turn rod (5) so that governor lever (4) of the fuel injection pump contacts the full stopper.
   - iv) Screw in rod (5) by 1 turn from this position to reduce distance **a** between the pins of governor spring (1) by 2.0 mm.
     - ★ Make adjustment while measuring distance **a** between the two pins.
   - v) Tighten nuts (2) and (3).
     - 3 Nut:
       11.8–19.6 Nm{1.2–2.0 kgm}
   - vi) Confirm that governor spring (1) stretches by 2.0 mm, when the fuel dial is returned to the MIN position and operated to the MAX side again.





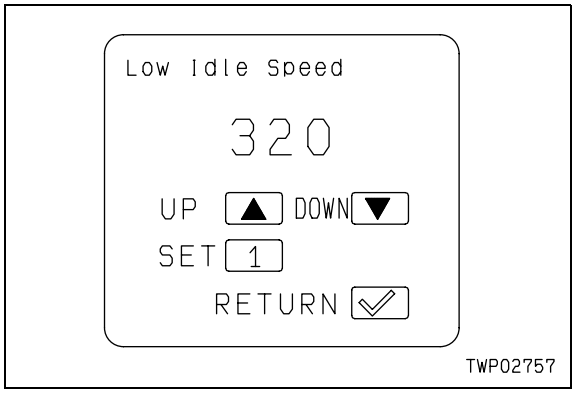
4) Function for Pump Absorption Torque adjustment
The pump absorption torque can be adjusted within the range shown in the table below.

Adjustment value	Torque adjustment value
220	+4.0 kgm
221	+3.0 kgm
222	+2.0 kgm
223	+1.0 kgm
224	0.0 kgm
225	–1.0 kgm
226	–2.0 kgm
227	–3.0 kgm
228	–4.0 kgm



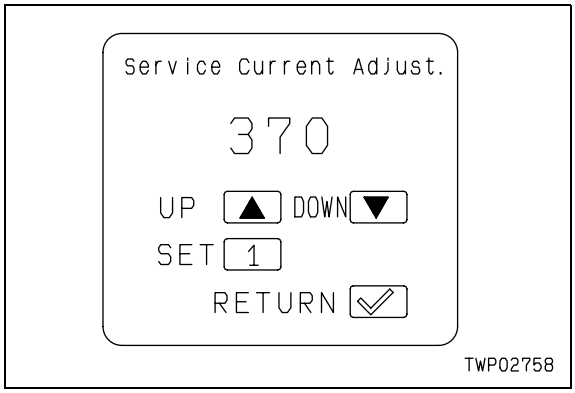
5) Function for Low Idle Speed adjustment
The engine rotation at low idling can be adjusted within the range shown in the table below.

Adjustment value	Low idling rotation
320	900 rpm
321	1,000 rpm
322	1,100 rpm
323	1,200 rpm



6) Function for Service Current Adjust.
When a machine is used for a compound operation, distribution of hydraulic pump oil flow can be adjusted within the range shown in the table below.

Adjustment value	Distribution of oil flow to attachment
370	0.5 Time
371	0.7 Time
372	1.0 Time
373	0.4 Time



DISPLAY METHOD AND SPECIAL FUNCTIONS OF 7-SEGMENT MONITOR PANEL

1. Troubleshooting function of lamps, gauges, buzzer

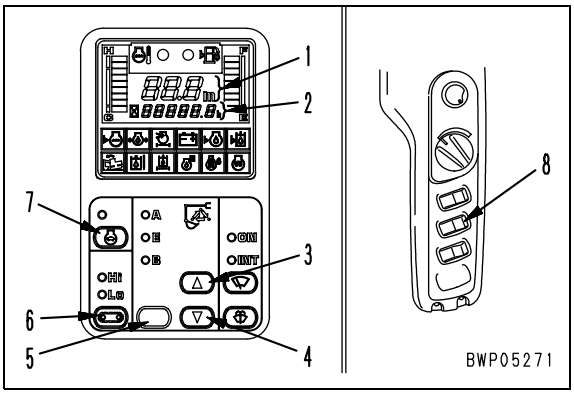
When the starting switch is turned on, all the lamps and gauges light up for approx. 3 seconds, and the buzzer sounds for approx. 1 second. During this time, the monitor itself carries out self-diagnosis, and after it has finished, it gives the normal display (if any lamp does not light up during the visual check, the lamp bulb is blown).

2. User code display function

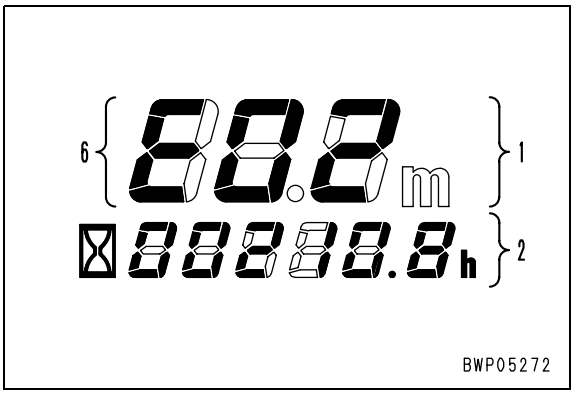
All the abnormality data for the engine controller and pump controller are transmitted to the monitor panel. Of the abnormality data, items with a high emergency level are displayed as a user code automatically on digital meter display (1) of the monitor panel to advise the operator of the action to take.

★ On digital meter display (1) and service meter display (2), only the places marked [x] in the illustration below light up. All the other places are OFF.

1) User code display
   (1) Digital meter display
   (2) Service meter display
   (3) Working mode selector (UP) switch
   (4) Working mode selector (DOWN) switch
   (5) Setting switch
   (6) Travel speed switch
   (7) Auto-deceleration switch
   (8) Buzzer cancel switch



Example: When user code [E02] is displayed



2) Table of user codes

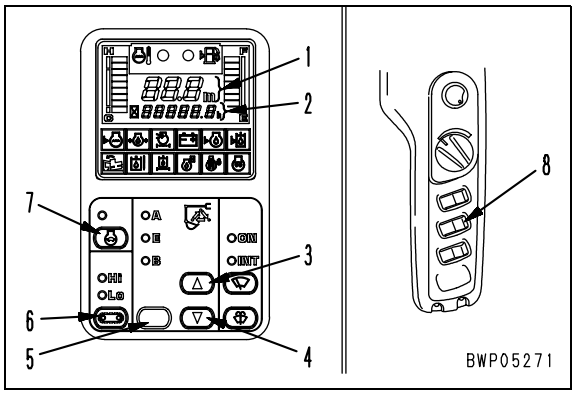
User code	Abnormal system
E02	PC-EPC system
E03	Swing holding brake system
E05	Governor motor system
E06	Boom RAISE stroke end throttle EPC system

3. User code display function

All the abnormality data for the engine controller and pump controller are transmitted to the monitor panel. These abnormality data, regardless of whether they are necessary to display as a user code or not, are all stored inside the monitor panel as service codes.

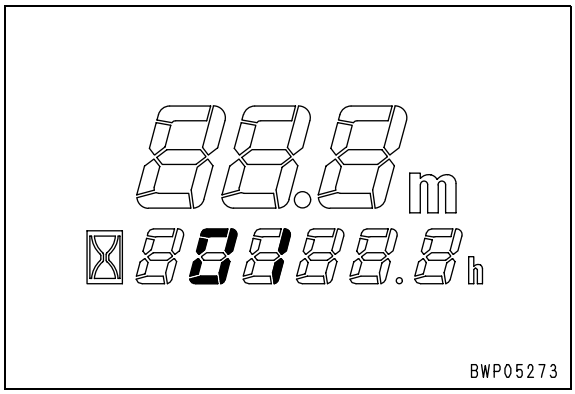
When the following operations are carried out, the service codes are displayed on the monitor panel digital display; the existing problems are marked with "E" and are displayed together with the elapsed time data (time on the service meter) on the service meter display panel.

1) Method of displaying and deleting service codes
   i) To switch to the service code display mode, do as follows:
      ① Keep [Buzzer cancel switch (8)] + [Auto-deceleration switch (7)] pressed for at least 2.5 seconds.
      ② Press [Buzzer cancel switch (8)] + [Working mode selector (UP) switch (3)] (or [Working mode selector (DOWN) switch (4)] and set so that [01] is displayed in the 2nd and 3rd digits from the left on service meter display (2).
      ③ Press [setting switch (5)].



(1) Digital meter display
(2) Service meter display
(3) Working mode selector (UP) switch
(4) Working mode selector (DOWN) switch
(5) Setting switch
(6) Travel speed switch
(7) Auto-deceleration switch
(8) Buzzer cancel switch

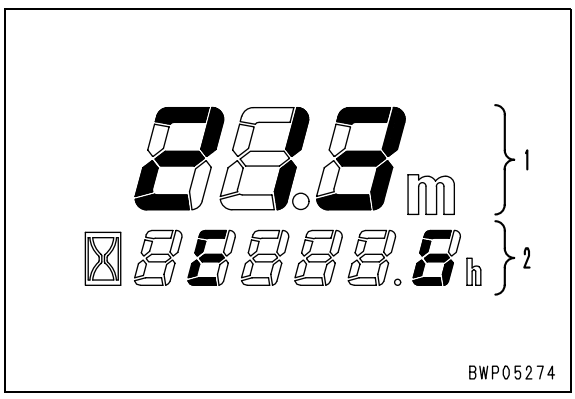
Example 1: When [01] is displayed on service meter display (2)



Example 2: When [E213] occurred 6 hours before

★ If the problem still exists, "E" is displayed at the 2nd digit from the left on service meter display (2); if the situation has returned to normal, "E" is not displayed.

★ The 3 digits on the right from service meter display (2) show the elapsed time.



Example 3: When no service code is recorded, all digits on digital meter display (1) and service meter display (2) show [-].

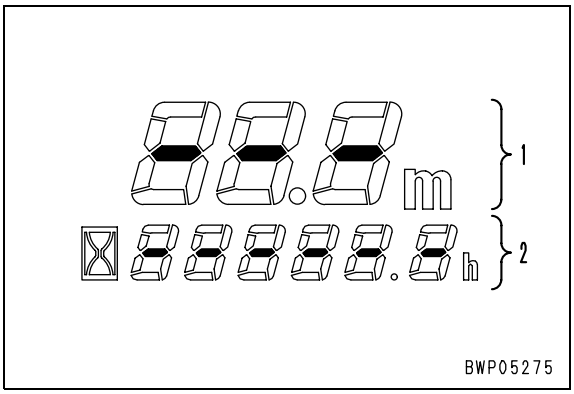
ii) To go on to the next service code display, press [Buzzer cancel switch (8)] + [Working mode selector (UP) switch (3)].

iii) To go back to the previous service code display, press [Buzzer cancel switch (8)] + [Working mode selector (DOWN) switch (4)].

iv) To finish using the service code display mode, press [Buzzer cancel switch (8)] + [Auto-deceleration switch (7)].

v) To delete the service codes from memory, keep [Buzzer cancel switch (8)] pressed and turn the starting switch OFF. Then turn the starting switch ON again and keep [Buzzer cancel switch (8)] pressed for 5 seconds.

★ If the number of service codes in memory exceeds 20, the oldest service codes are deleted in turn.



2) Table of service codes

Service code	Abnormal system	User code
E101	Abnormality in data	—
E104	Abnormality in air cleaner clogging sensor detected	—
E108	Engine water temperature over 105°C detected	—
E112	Short circuit in wiper drive normal rotation system	—
E113	Short circuit in wiper drive reverse rotation system	—
E114	Short circuit in window washer drive system	—
E115	Wipe failure continues for 10 seconds	—
E116	Stow failure continues for 10 seconds	—
E201	Short circuit in travel junction solenoid system	—
E203	Short circuit in swing holding brake solenoid system	E03
E204	Short circuit in pump merge/divider solenoid system	—
E205	Short circuit in 2-stage relief solenoid system	—
E206	Short circuit in travel speed Hi/Lo selector solenoid system	—
E211	Disconnection in travel junction solenoid system	—
E213	Disconnection in swing holding brake solenoid system	E03
E214	Disconnection in pump merge/divider solenoid system	—
E215	Disconnection in 2-stage relief solenoid system	—
E216	Disconnection in travel speed Hi/Lo selector solenoid system	—
E217	Error in machine model selection input	—
E218	Abnormality in S-NET communication	—
E222	Short circuit in LS-EPC solenoid system	E02
E223	Disconnection in LS-EPC solenoid system	E02
E224	Abnormality in F pump pressure sensor system	—

Service code	Abnormal system	User code
E225	Abnormality in R pump pressure sensor system	—
E226	Abnormality in pressure sensor system power source	—
E227	Abnormality in engine speed sensor system	—
E228(※)	Short circuit in ATT return switching relay	—
E232	Short circuit in PC-EPC solenoid system	E02
E233	Disconnection in PC-EPC solenoid system	E02
E234	Short circuit in boom RAISE stroke end throttle EPC system	E06
E235	Disconnection in boom RAISE stroke end throttle EPC system	E06
E238(※)	Disconnection in ATT return switching relay	—
E241	Abnormality in boom angle potentiometer system (outside input value range)	—
E255	Abnormality in boom angle potentiometer compensation value (outside compensation range)	—
E256	Check sum abnormality	—
E306	Abnormality in feedback potentiometer system	—
E308	Abnormality in fuel control dial input value	E05
E313	Error in automatic greasing controller system	—
E315	Short circuit in battery relay output	—
E316	Step-out in governor motor	—
E317	Disconnection in governor motor system	E05
E318	Short circuit in governor motor system	E05

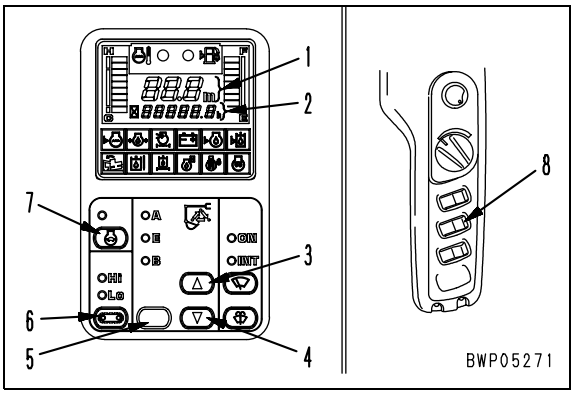
※: If there is any abnormality when a display of "With Attachment" is selected in the monitor panel, a service code is memorized for the abnormality.

4. Monitoring code display function

The input signals from the sensors to each component and the output signals to drive the solenoid can be checked in real time with the monitoring code.

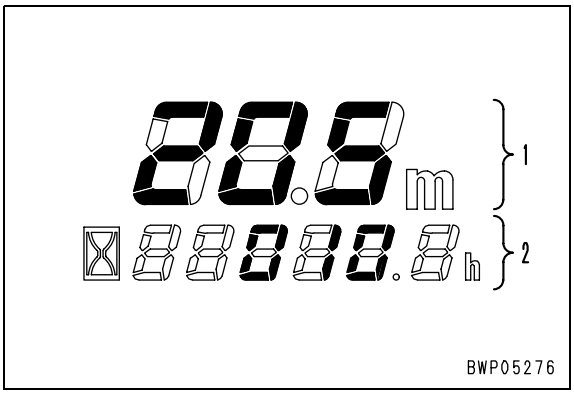
When the following operations are carried out, the monitoring code Nos. are displayed on the 3rd to 5th digits from the left on service meter display (2) and the monitoring data are displayed on digital meter display (1).

1) Method of displaying monitoring codes
   i) To switch to the monitoring code, do as follows.
      ① Keep [Buzzer cancel switch (8)] + [Auto-deceleration switch (7)] pressed for at least 2.5 seconds.
      ② Press [Buzzer cancel switch (8)] + [Working mode selector (UP) switch (3)] (or [Working mode selector (DOWN) switch (4)]) and set so that [02] is displayed in the 2nd and 3rd digits from the left on service meter display (2).
      ③ Press [Setting switch (5)].

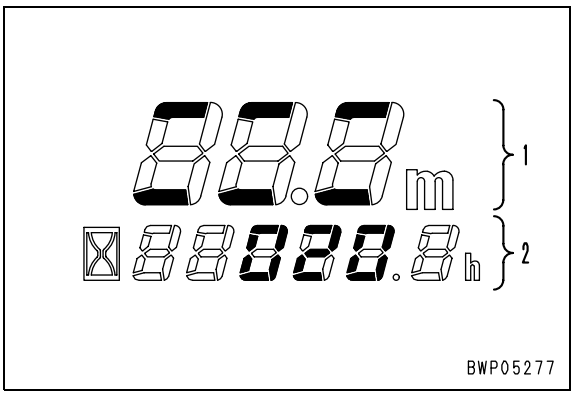


(1) Digital meter display
(2) Service meter display
(3) Working mode selector (UP) switch
(4) Working mode selector (DOWN) switch
(5) Setting switch
(6) Travel speed switch
(7) Auto-deceleration switch
(8) Buzzer cancel switch

Example 1: When a numeric display monitoring code (engine speed: 2050 rpm) is displayed



Example 2: When bit pattern display monitoring code No. 20 (switch input condition (1)) is displayed

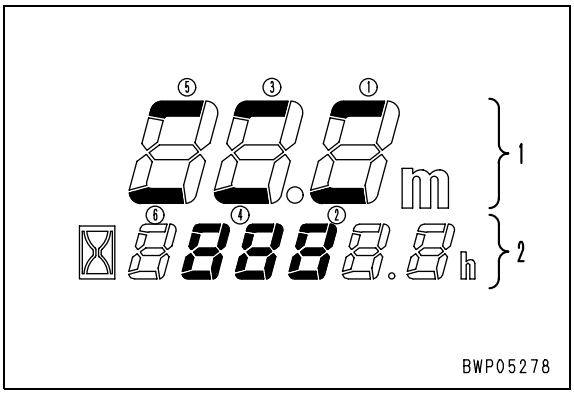


   ii) To go on to the next monitoring code display, press [Buzzer cancel switch (8)] + [Working mode selector (UP) switch (3)].
   iii) To go back to the previous service code display, press [Buzzer cancel switch (8)] + [Working mode selector (DOWN) switch (4)].
   iv) To finish using the monitoring code display mode, keep [Buzzer cancel switch (8)] + [Auto-deceleration switch (7)] pressed for at least 2.5 seconds.

2) Table of monitoring codes
★ For details of the code displayed as (6 bit) in the Unit column, see the bit pattern chart.

Code No.	Item	Unit	Name of component
002	Engine throttle, pump controller model code	—	Engine throttle, pump controller
010	Engine speed	10 rpm	Engine throttle, pump controller
011	Pump discharge pressure (F) input	kg/cm^2	Engine throttle, pump controller
012	Pump discharge pressure (R) input	kg/cm^2	Engine throttle, pump controller
013	PC-EPC output current	10 mA	Engine throttle, pump controller
015	LS-EPC current output	10 mA	Engine throttle, pump controller
016	No.2 throttle command value	10 rpm	Engine throttle, pump controller
018	Boom RAISE stroke end throttle EPC current	10 mA	Engine throttle, pump controller
019	ATT PPC throttle EPC current	10 mA	Engine throttle, pump controller
020	Engine throttle, pump controller switch input condition (1)	(6 bit)	Engine throttle, pump controller
021	Engine throttle, pump controller switch input condition (2)	(6 bit)	Engine throttle, pump controller
022	Engine throttle, pump controller switch input condition signal (3)	(6 bit)	Engine throttle, pump controller
023	Engine throttle, pump controller solenoid drive condition	(6 bit)	Engine throttle, pump controller
024	Engine throttle, pump controller solenoid drive condition (1)	(6 bit)	Engine throttle, pump controller
027	Engine throttle, pump controller switch input condition signal (4)	(6 bit)	Engine throttle, pump controller
030	Fuel control dial input value	10 mV	Engine throttle, pump controller
031	Governor potentiometer feedback voltage	10 mV	Engine throttle, pump controller
032	Battery voltage (VBB voltage)	100 mV	Engine throttle, pump controller
033	Governor motor phase A current	10 mA	Engine throttle, pump controller
034	Governor motor phase B current	10 mA	Engine throttle, pump controller
035	Battery relay output voltage	100 mV	Engine throttle, pump controller
036	Engine throttle, pump input condition	(6 bit)	Engine throttle, pump controller
037	Engine throttle, pump output condition	(6 bit)	Engine throttle, pump controller
041	Coolant temperature sensor input voltage	10 mV	Engine throttle, pump controller
042	Fuel level sensor input voltage	10 mV	Engine throttle, pump controller
043	Alternator (charge) input voltage	100 mV	Engine throttle, pump controller
044	Hydraulic oil temperature sensor voltage	10 mV	Engine throttle, pump controller
045	Sensor input condition (1)	(6 bit)	Engine throttle, pump controller
046	Sensor input condition (2)	(6 bit)	Engine throttle, pump controller
049	(Spare)	(6 bit)	Engine throttle, pump controller
060	Boom angle	10 mV	Engine throttle, pump controller
200	Program version (monitor)		
201	Program version (controller)		

3) Bit pattern display (bit for applicable No. lights up)
   - ★ (1) to (6) of digital display (1) indicate the bit Nos.
   - ★ The 2nd to 4th digits from the left on service meter display (2) indicate the monitoring code Nos.



Code	Content	Bit	Details (condition when bit is lighted up)	
020	Input condition of engine throttle and pump controller PPC pressure switches	①	Swing PPC pressure switch	(ON)
		②	Travel PPC pressure switch	(ON)
		③	Boom LOWER PPC pressure switch	(ON)
		④	Boom RAISE PPC pressure switch	(ON)
		⑤	Arm IN PPC pressure switch	(ON)
		⑥	Arm OUT PPC pressure switch	(ON)
021	Input condition of engine throttle and pump controller PPC pressure switches and other switches	①	Bucket CURL PPC pressure switch	(ON)
		②	Bucket DUMP PPC pressure switch	(ON)
		③		
		④	Service PPC pressure switch	(ON)
		⑤	Travel steering pressure switch	(ON)
		⑥		
022	Input condition of engine throttle and pump controller for switches	①		
		②		
		③	Knob switch	(24 V connected)
		④	Swing holding brake cancel switch	(GND connected)
		⑤	Swing lock switch	(GND connected)
		⑥		
023	Solenoid drive condition (0) of engine throttle and pump controller	①		
		②	Travel junction solenoid	(ON)
		③	Swing holding brake solenoid	(ON)
		④	Pump merge/divider solenoid	(ON)
		⑤	2-stage relief solenoid	(ON)
		⑥	Travel speed Hi/Lo selector solenoid	(ON)
024	Solenoid drive condition (1) on engine throttle and pump controller	①		
		②		
		③		
		④		
		⑤		
		⑥		
027	Input condition (2) of engine throttle and pump controller for switches	①	Model selection 1	(GND connected)
		②	Model selection 2	(GND connected)
		③	Model selection 3	(GND connected)
		④	Model selection 4	(GND connected)
		⑤	Model selection 5	(GND connected)
		⑥	Kerosene mode input	(GND connected)

Code	Content	Bit	Details (condition when bit is lighted up)
036	Input/output condition of engine throttle and pump controller	①	
		②	
		③	
		④	
		⑤	Starting switch (ON)
		⑥	
037	Input condition of engine throttle and pump controller	①	Battery relay (when actuated)
		②	
		③	
		④	
		⑤	
		⑥	
045	Sensor input condition	①	Starting switch [ON] (ON)
		②	Starting switch [START] [START](ON)
		③	Preheating switch (ON)
		④	Light switch (ON)
		⑤	
		⑥	
046	Sensor input condition	①	(Always OFF)
		②	(Always OFF)
		③	(Always OFF)
		④	(Always OFF)
		⑤	(Always OFF)
		⑥	(Always ON)
047	(Spare)	①	Alarm buzzer (Actuated)
		②	
		③	
		④	
		⑤	
		⑥	
048 (※)		①	
		②	Washer on (ON)
		③	Wiper drive 1 (ON)
		④	Wiper drive 2 (ON)
		⑤	Wiper drive 3 (ON)
		⑥	Wiper drive 4 (ON)
049		①	Swing lock switch (ON)
		②	Buzzer cancel switch (ON)
		③	Window washer switch (ON)
		④	W contact (ON)
		⑤	P contact (ON)
		⑥	

※: Code No. [048]: When wiper is stopped, bit Nos. ④ and ⑥ light up
When wiper is actuated, bit Nos. ③ and ⑥ or ④ and ⑤ light up

5. Function for setting working mode default

The working mode on the monitor panel is set so that the A mode normally lights up when the starting switch in turned ON.

If the function for setting the default is used as follows, it is possible to change the setting so that the system starts with the working mode desired by the operator.

1) Method of setting default

i) To switch to the default setting mode, do as follows.

① Keep [Buzzer cancel switch (8)] + [Auto-deceleration switch (7)] pressed for at least 2.5 seconds.

② Press [Buzzer cancel switch (8)] + [Working mode selector (UP) switch (3)] (or [Working mode selector (DOWN) switch (4)] and set so that [05] is displayed in the 2nd and 3rd digits from the left on service meter display (2).

③ Press [Setting switch (5)].

★ ""d[]SET"" is displayed in service meter display (2) and indicator (10) for the mode set as default flashes.

ii) To change the default set mode, do as follows.

① Press [Working mode selector (UP) switch (3)] or [Working mode selector (DOWN) switch (4)].

② Press [Setting switch (5)].

iii) To finish using the default setting mode (default setting mode complete), keep [Buzzer cancel switch (8)] + [Auto-deceleration switch (7)] pressed for at least 2.5 seconds.

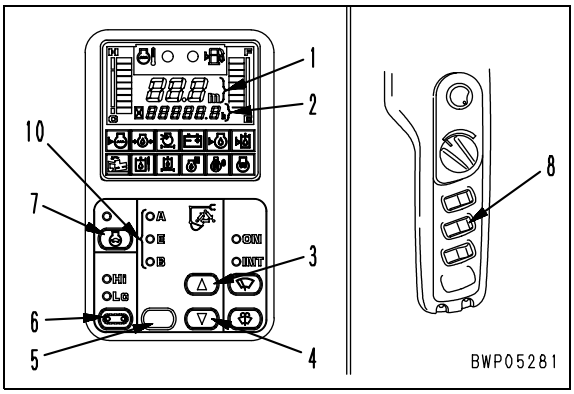
★ If the starting switch is turned OFF when the normal mode LED is flashing (default setting mode), the content of the working mode default is not changed.

iv) Method of checking after setting working mode default

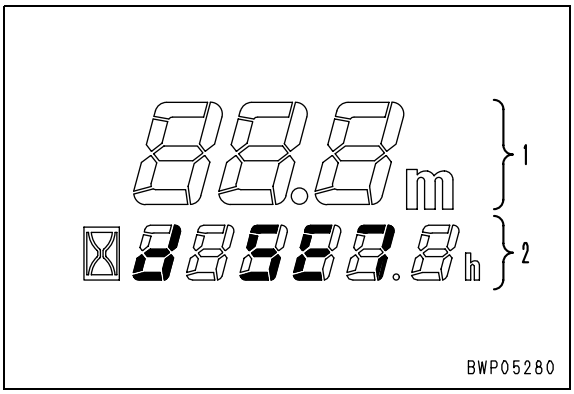
① Check that the LED has changed to continuous lighting up.

② Turn the starting switch OFF, then turn the starting switch ON again.

③ Check that the default for the working mode has changed to the new setting.



(1) Digital meter display
(2) Service meter display
(3) Working mode selector (UP) switch
(4) Working mode selector (DOWN) switch
(5) Setting switch
(6) Travel speed switch
(7) Auto-deceleration switch
(8) Buzzer cancel switch



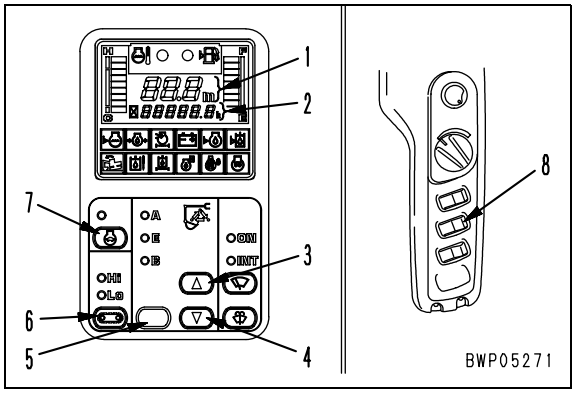
6. Governor motor adjustment mode

This is used when adjusting the linkage between the governor motor and the injection pump.

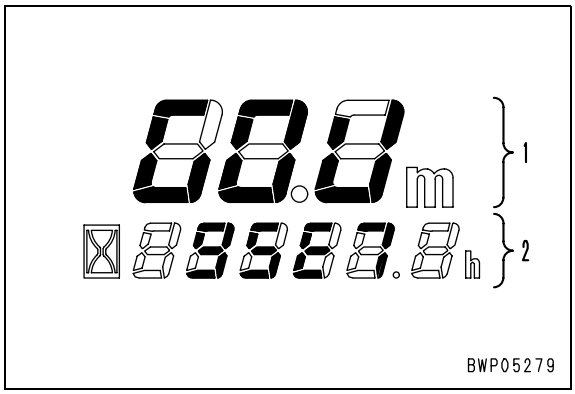
★ For details of the procedure, see TESTING AND ADJUSTING, Testing and adjusting governor motor lever stroke.

1) Method of displaying governor motor adjustment mode
   i) To switch to the governor motor adjustment mode, do as follows.
      ① Keep [Buzzer cancel switch (8)] + [Auto-deceleration switch (7)] pressed for at least 2.5 seconds.
      ② Press [Buzzer cancel switch (8)] + [Working mode selector (UP) switch (3)] (or [Working mode selector (DOWN) switch (4)]) and set so that [03] is displayed in the 2nd and 3rd digits from the left on service meter display (2).
      ③ Press [Setting switch (5)].
      ★ ""GOV"" is displayed on digital meter display (1) and ""GSET"" is displayed on service meter display (2).

   ii) To finish using the governor motor adjustment mode, keep [Buzzer cancel switch (8)] + [Auto-deceleration switch (7)] pressed for at least 2.5 seconds.

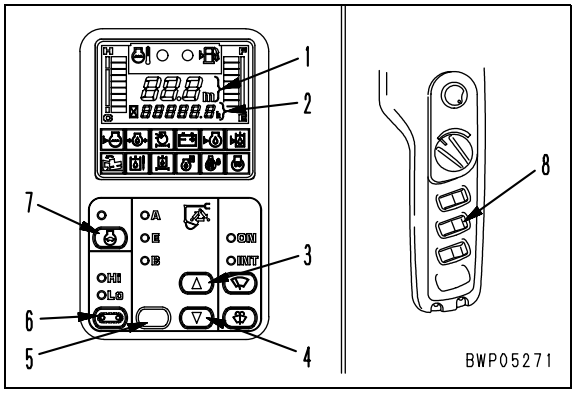


(1) Digital meter display (5) Setting switch
(2) Service meter display (6) Travel speed switch
(3) Working mode selector (UP) switch (7) Auto-deceleration switch
(4) Working mode selector (DOWN) switch (8) Buzzer cancel switch



7. "With or without Attachment" Setting mode

1) Follow the steps explained below for switching to ATT setting mode.
   i) To switch to the boom angle potentiometer compensation mode, do as follows.
      ① Keep [Buzzer cancel switch (8)] + [Auto-deceleration switch (7)] pressed for at least 2.5 seconds.
      ② Press [Buzzer cancel switch (8)] + [Working mode selector (UP) switch (3)] (or [Working mode selector (DOWN) switch (4)]) and set so that [16] is displayed in the 2nd and 3rd digits from the left on service meter display (2).
      ③ Press [Setting switch (5)].
      ★ Check that ""1[]SET"" is displayed on service meter display (2) (the center 3 segments on digital display (1) flash).

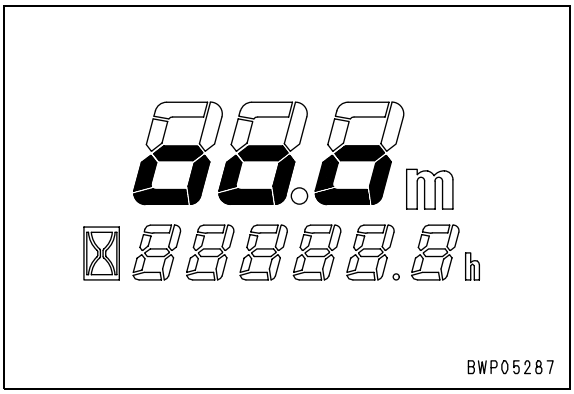


(1) Digital meter display (5) Setting switch
(2) Service meter display (6) Travel speed switch
(3) Working mode selector (UP) switch (7) Auto-deceleration switch
(4) Working mode selector (DOWN) switch (8) Buzzer cancel switch

④ If the compensation is carried out correctly (if the boom angle is within the theoretical value, ""ooo"" will be displayed for 5 seconds on digital meter display (1)), and the system will return to Step (1) (boom angle potentiometer compensation mode).

★ If compensation could not be carried out, ""---"" will flash on digital display (2), the buzzer will sound 5 times, and the system will return to Step (1).

★ If compensation is impossible, the mounting of the boom angle potentiometer is probably defective, so check it.



8. Adjusting service meter

1) Adjusting service meter

i) To switch to the service meter adjustment mode, keep [Buzzer cancel switch (8)] pressed and press each switch on the monitor panel in the following order ① to ④.

① Travel speed switch (6)

② Setting switch (5)

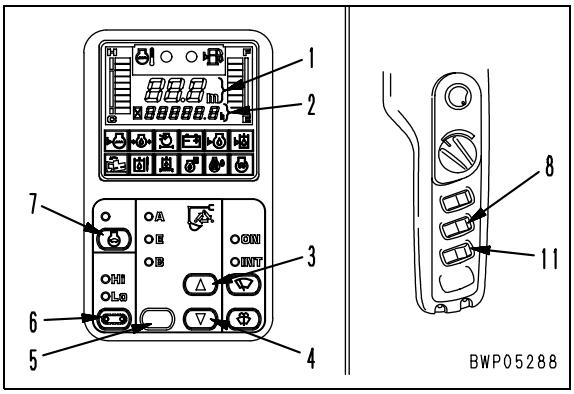
③ Auto-deceleration switch (7)

④ Working mode selector (UP) switch (3)

ii) To select the digit to be corrected, press [Swing lock switch (1)] + [Buzzer cancel switch (8)] + [Auto-deceleration switch (7)] + [Setting switch (5)] and move one digit at a time to the left (the movement is only to the left; from the last digit on the left, it moves to the first digit on the right).

iii) To set or change the number, press [Swing lock switch (1)] + [Buzzer cancel switch (8)] + [Auto-deceleration switch (7)] + [Working mode selector (UP) switch (3)].

iv) To finish using the service meter adjustment mode, repeat the procedure in Step i).
(It is impossible to set (return) to a lower value than the value presently saved in the service meter).



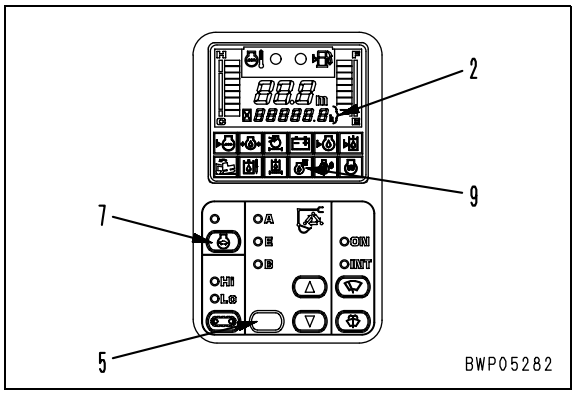
(1) Digital meter display
(2) Service meter display
(3) Working mode selector (UP) switch
(4) Working mode selector (DOWN) switch
(5) Setting switch
(6) Travel speed switch
(7) Auto-deceleration switch
(8) Buzzer cancel switch

9. Displaying and setting oil maintenance function

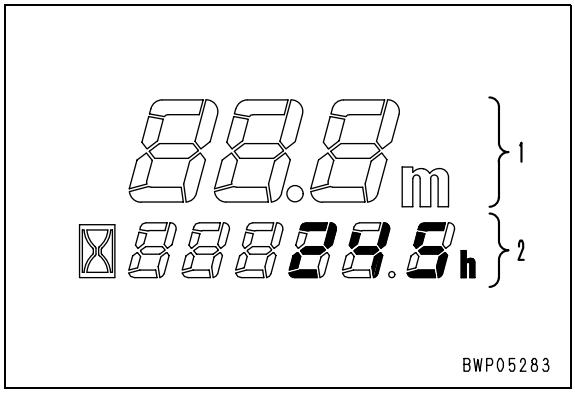
On machines equipped with the oil maintenance function, the LED of [Oil maintenance lamp (9)] on the monitor lights up from a point 10 hours before the time set for the oil change and stays lighted up until the system is reset. The elapsed time is displayed on service meter display (2). (It is displayed for 20 seconds after the starting switch is turned ON; after that, the display returns to the service meter time display.)

★ No display is given (does not light up) on digital meter display (1).
With the oil maintenance function, it is possible to set, change, or cancel the display.

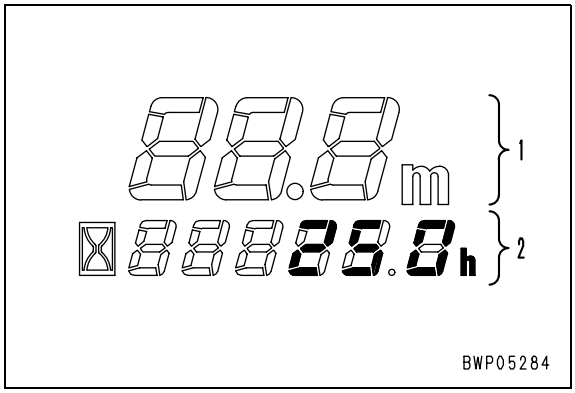
1) Oil maintenance function display
   i) As explained above, the oil maintenance display mode automatically gives a display when the remaining time is less than 10 hours from the set time.
   ii) To finish the oil maintenance function (within 20 seconds after the starting switch is turned ON), press [Setting switch (5)] quickly and return to the normal display mode.



Example: When the display shows the following:
Oil change interval setting: 250 h
Time elapsed since last oil change: 245 h



2) Setting interval and resetting elapsed time
   i) Setting interval
      ① Keep [Buzzer cancel switch (8)] + [Auto-deceleration switch (7)] pressed for at least 2.5 seconds.
      ② Press [Setting switch (5)] (the display switches each time the switch is pressed) and select the interval.
      Example: When selecting interval: 250 h (no display is given on digital meter display (1))
      ★ Interval display (displayed repeatedly in turn)
      0: Default mode (oil maintenance function not set)
      125h: Interval is set for every 125 hours
      250h: Interval is set for every 250 hours
      500h: Interval is set for every 500 hours
      d: Demo mode is set
      (See Step iv) for details.)
      ★ Set the interval according to the Operation and Maintenance Manual.
      ③ Keep [Buzzer cancel switch (8)] + [Auto-deceleration switch (7)] pressed for at least 2.5 seconds to complete the setting of the interval.



(1) Digital meter display
(2) Service meter display
(3) Working mode selector (UP) switch
(4) Working mode selector (DOWN) switch
(5) Setting switch
(6) Travel speed switch
(7) Auto-deceleration switch
(8) Buzzer cancel switch

ii) Checking elapsed time
★ Nothing is displayed until the elapsed time enters the period of 10 hours before the change interval. (If you want to see the elapsed time when there is no display, keep [Setting switch (5)] pressed and turn the starting switch ON. Continue to press [Setting switch (5)].)

iii) Resetting elapsed time after changing oil
Press [Setting switch (5)] and keep it depressed for 3 seconds while the elapsed time and telephone number are being displayed (within 20 seconds) on the monitor panel. The elapsed time will be reset and the display will show ""Elapsed time: 0h"" for one second.

iv) Demo mode
If the demo mode is used, a demonstration of the oil maintenance function can be carried out when the machine is delivered.

★ The same display is given as for the oil maintenance function. For the purpose of demonstration, the elapsed time is fixed at 240h.

★ After setting to the demo mode, turn the starting switch ON again to start the demonstration.
Note: If the starting switch is turned OFF ↔ ON four times, the demo mode is canceled (the demo mode can be used 3 times) and the system automatically switches to the default mode. (If you want to continue the demonstration, it is necessary to set to the demo mode again.)

PREPARATIONS FOR TROUBLESHOOTING ELECTRICAL SYSTEM

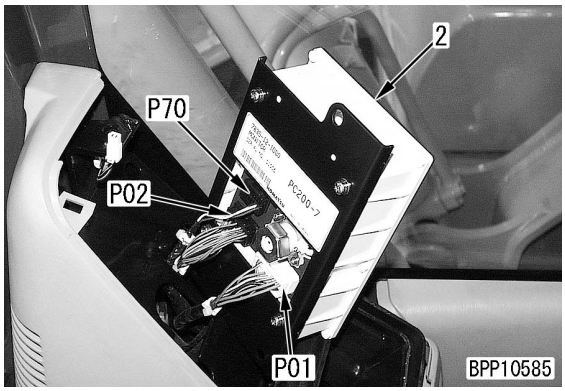
★ When diagnosing electric circuits related to the monitor panel and governor pump controller, first open up the connector portions in the following manner.

1. Monitor panel

1) Take off cover (1).
   ★ The cover is fixed with two upper and lower clips. Pull it up for the removal.
   ★ If a sunlight sensor is equipped for an air conditioner, detach **P15** connector at the cover rear side.



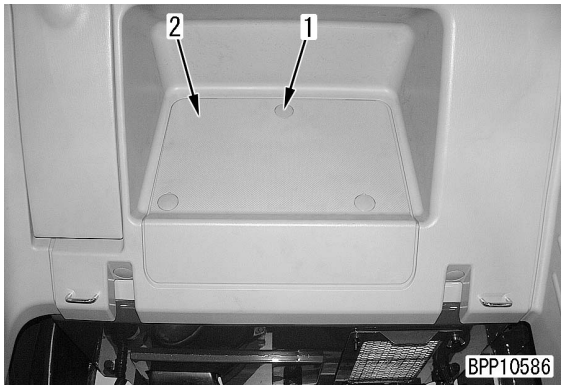
2) Remove three securing screws and take monitor panel (2) off the mount.
   ★ Be careful not to let fall the securing screws inside the console.
3) Insert or connect a T-adaptor for diagnosis with **P01**, **P02** and **P70** (multi-monitor only) connectors.



2. Governor pump controller

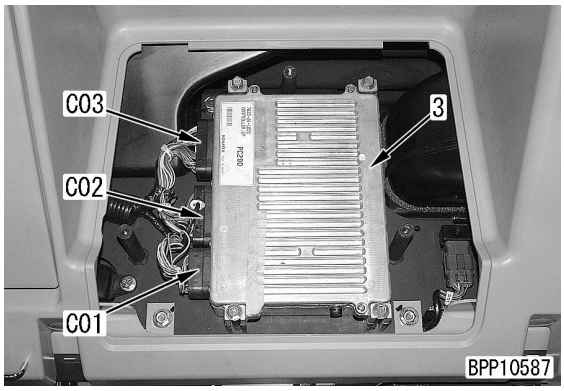
★ The governor pump controller is installed under a cover behind the operator's seat.

1) Remove three caps (1) and then three securing bolts.
   ★ When removing the caps, use of a thin flat-head screw driver is recommended.
2) Take off cover (2).



3) Insert or connect a T-adapter for diagnosis with **C01**, **C02** and **C03** connectors of governor pump controller (3).
   ★ The connectors are fixed with screws. Loosen the screws and detach the connectors.
   ★ When putting the connectors back into position, tighten them to the specified torque.

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



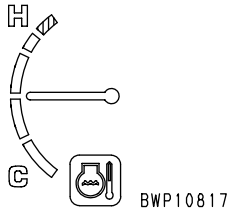
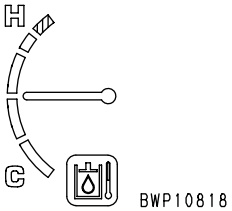
Pm - Tune up Service

Model	Serial No.	Service meter reading
☐ PC300-7 ☐ LC ☐ PC350-7		h

User's name	Implemented on:	Inspected by:
	／ ／	

Specifications		
Work equipment	Attachment	Shoe width
Boom ☐ Standard ☐ ( ) Arm ☐ Standard ☐ ( ) Bucket ☐ Standard ☐ ( )	☐ Breaker ☐ ( )	☐ 600 mm ☐ 700 mm ☐ ( )

Oil and cooling water level check		
☐ Radiator water	As required	
☐ Engine oil	☐ Damper case oil	☐ Final drive case oil
☐ Hydraulic oil	☐ Machinery case oil	☐ ( )

Max. range of engine cooling water temperature	Max. range of hydraulic oil temperature	Ambient temperature
 BWP10817	 BWP10818	˚C **Elevation** m

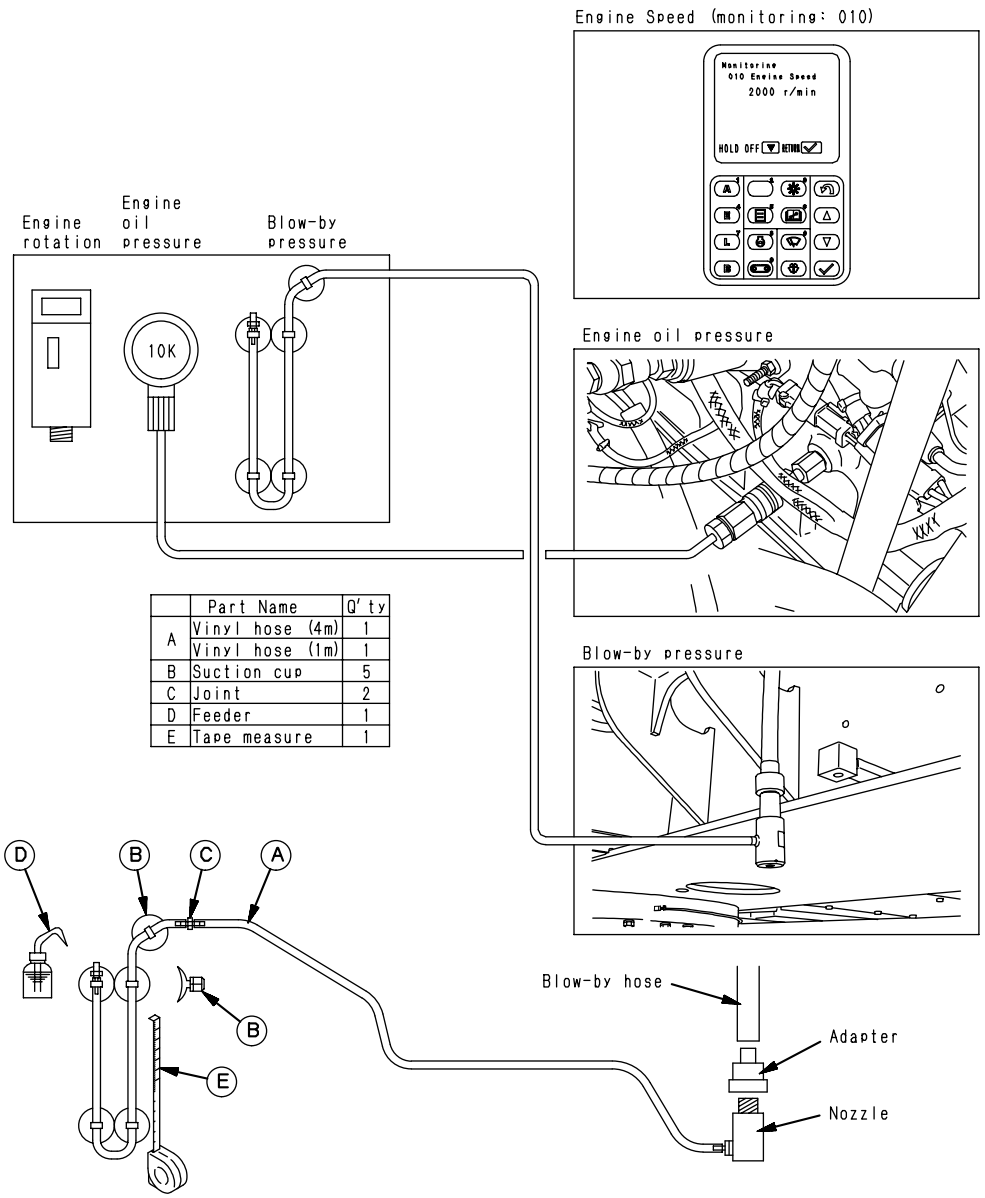
Operator's comment

Result of visual check

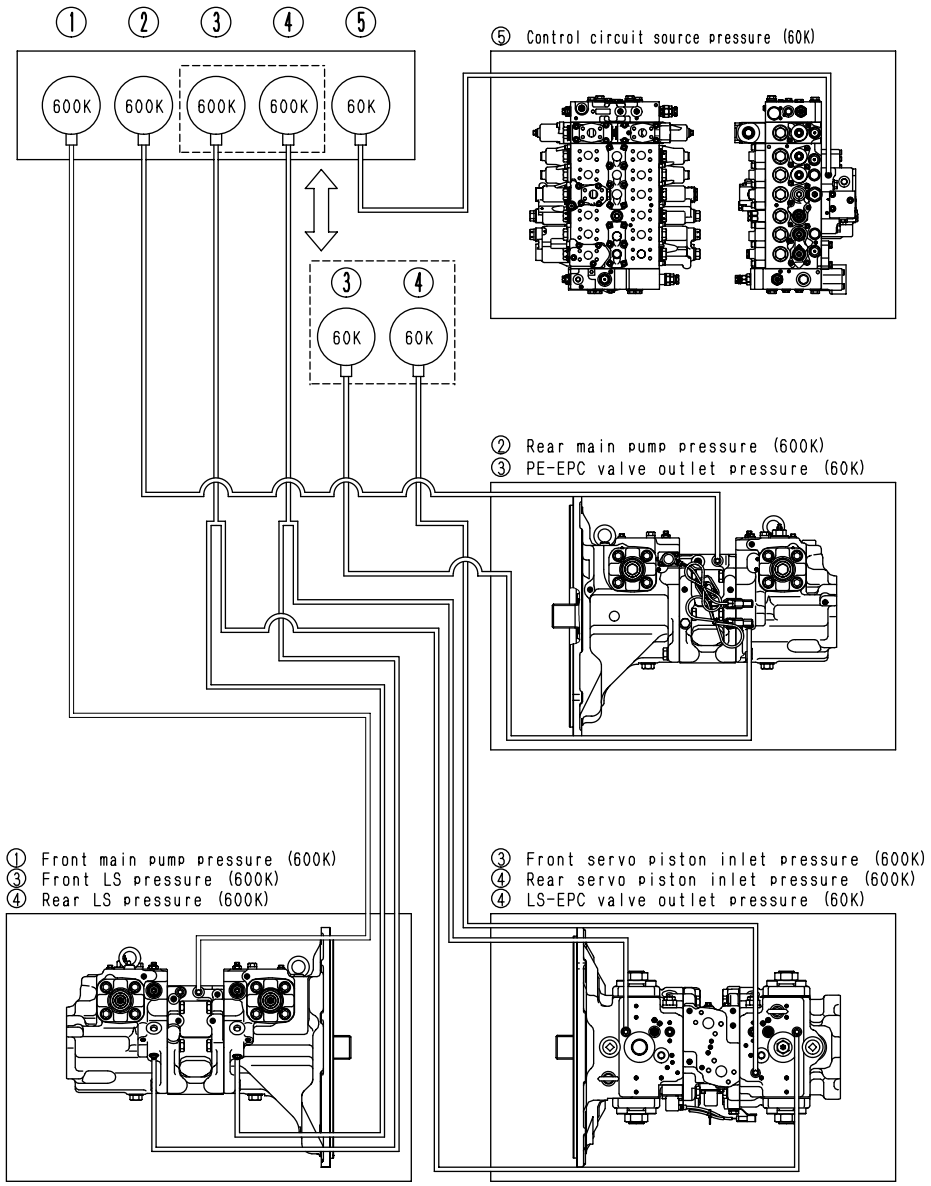
Failure code history

Electrical system	Mechanical system			
			Frequency	SMR at initial occurrence
☐☐☐☐☐☐ h Content:	A000N1	Engine rotation at high idling out of rate		
☐☐☐☐☐☐ h Content:	A000N2	Engine rotation at low idling out of rate		
☐☐☐☐☐☐ h Content:	B@BCNS	Engine cooling water overheated		
☐☐☐☐☐☐ h Content:	B@BAZG	Engine oil pressure abnormally low		
☐☐☐☐☐☐ h Content:	B@BAZK	Engine oil level abnormally low		
☐☐☐☐☐☐ h Content:	B@HANS	Hydraulic oil overheated		
	B@BCZK	Radiator water level abnormally low		
	AA10NX	Air cleaner clogged		
	AB00KE	Charging voltage abnormally low		
	DA80MA	Auto-lubrication system abnormal		

Engine



Hydraulic system



TXP02886

Model	Serial No.	Service meter reading	Client user's name	Implemented on:	Inspected by:

1. Engine

No.	Condition setting					Measurement item	Unit	Standard value		Measured value	Judgement
	Fuel dial	Working mode	Auto decelerator	One-touch power max. switch	Work equipment operation			New machine	Failure judgement		
1	Full	A	OFF	OFF	Operating travel control lever (Do not travel machine)	Engine rotation	rpm	2,090 – 2,230	—		Good / No good
2						Engine oil pressure	MPa{kg/cm²}	0.36 – 0.61{3.5– 6.0}	0.18{1.8}		Good / No good
3	Low				All control levers in NEUTRAL	Engine rotation	rpm	850 – 925	—		Good / No good
4						Engine oil pressure	MPa{kg/cm²}	Min. 0.10{Min. 1.0}	0.07{0.7}		Good / No good
5	Full			ON	Arm (extended) relief	Engine rotation	rpm	1,770 – 1,970	—		Good / No good
6						Blow-by pressure	kPa{mmH_2O}	Max. 1.0{Max. 100}	2.0{200}		Good / No good
7			ON	OFF	All control levers in NEUTRAL	Engine rotation	rpm	1,300 – 1,500	—		Good / No good

2. Work equipment speed

Hydraulic oil temperature (45 – 55°C)

No.	Condition setting			Measurement item			Unit	Standard value				Measured value	Judgement
								PC300, 300LC-7		PC350, 350LC-7			
	Fuel dial	Working mode	Work equipment posture					New model	Failure judgement	New model	Failure judgement		
1	Full	A	No load, fully extended	Boom RAISE			Sec.	3.3 – 4.1	Max. 4.5	3.4 – 4.2	Max. 4.6		Good / No good
2			Boom held level	Arm DUMPING				2.6 – 3.2	Max. 3.5	2.7 – 3.5	Max. 3.7		Good / No good
3				Arm DIGGING				3.4 – 4.2	Max. 4.5	3.4 – 4.2	Max. 4.5		Good / No good
4		E						3.6 – 4.6	Max. 4.9	3.5 – 4.5	Max. 4.8		Good / No good
5		(※L)						4.4 – 5.4	Max. 5.7	4.4 – 5.4	Max. 5.7		Good / No good
6		A	Boom and arm held level	Bucket DIGGING				2.9 – 3.5	Max. 3.8	2.9 – 3.5	Max. 3.8		Good / No good
7			Fully extended	Swing (5 turns)		Right		28.7 – 34.5	Max. 30	28.7 – 34.5	Max. 30		Good / No good
						Left							Good / No good
8			Track shoe raised at one side	Travel (5 turns)	Lo	Right		PC300: 30.0 – 34.0 PC300LC: 32.0 – 36.0	PC300: 28.0 – 39.0 PC300LC: 32.0 – 41.5	PC350: 30.0 – 34.0 PC350LC: 32.0 – 36.0	PC350: 28.0 – 39.0 PC350LC: 32.0 – 41.5		Good / No good
						Left							Good / No good
					(※Mi)	Right		PC300: 33.5 – 44.5 PC300LC: 35.5 – 47.5	PC300: 31.5 – 48.5 PC300LC: 34.0 – 51.5	PC350: 33.5 – 44.5 PC350LC: 35.5 – 47.5	PC350: 31.5 – 48.5 PC350LC: 34.0 – 51.5		Good / No good
						Left							Good / No good
					Hi	Right		PC300: 44.0 – 66.0 PC300LC: 46.5 – 69.5	PC300: 42.0 – 70.0 PC300LC: 45.0 – 74.5	PC350: 44.0 – 66.0 PC350LC: 46.5 – 69.5	PC350: 42.0 – 70.0 PC350LC: 45.0 – 74.5		Good / No good
						Left							Good / No good

※ : The "Mi" and "L" modes are on the multi-monitor specification machine only.

3. Work equipment hydraulic drift amount

Hydraulic oil temperature (45 – 55°C)

No.	Condition setting			Measurement item	Unit	Standard value				Measured value	Judgement
						PC300, 300LC-7		PC350, 350LC-7			
	Fuel dial	Working mode	Work equipment posture			New model	Failure judgement	New model	Failure judgement		
1	Engine stop		Boom and arm held level, Bucket loaded	Hydraulic drift amount at bucket tooth tip (15 min.)	mm	450	Max. 675	550	Max. 825		Good / No good

4. Inspection of hydraulic circuit

No.	Part to be checked	Condition setting: Fuel dial	Working mode	Auto-decelerator	One-touch power max. switch	Work equipment operation		① 600 kg/cm² F main pump	② 600 kg/cm² R main pump	③ 600 kg/cm² F pump LS	④ 600 kg/cm² R pump LS	⑤ 60 kg/cm² Control circuit pressure	Remarks
1	Self-decompression valve	Full	A	OFF	OFF	Arm dumping relief		■		■	■		Circuit pressure 3.2 MPa {33 kg/cm²}
2	Main relief valve											■	34.8 → 37.3 MPa
3	(When power increased)				ON							■	{355 → 380 kg/cm²}
4	LS valve (LS differential pressure valve)				OFF	Neutral						■	Main–LS=2.9 MPa{30 kg/cm²} (LS differential pressure ≒ Unload pressure)
						Travel without load, engine at Hi idling and control lever at half stroke	Right		■		■	■	Main–LS=2.5 MPa{25.0 kg/cm²} (LS pressure)
							Left	■		■		■	
5	Swing safety valve					Swing lock switch ON	Right relief			■	■	■	30.9 MPa {315 kg/cm²}
							Left relief			■	■	■	
6	Main relief valve, Travel safety valve, Travel interlocking valve					Track shoe locked	Right forward		■	■	■	■	38.2 MPa {390 kg/cm²}
							Right reverse		■	■	■	■	
							Left forward	■		■	■	■	
							Left reverse	■		■	■	■	

■ Connection to be changed to hoses ③ and ④

No.	Part to be checked	Condition setting: Fuel dial	Working mode	Auto-decelerator	One-touch power max. switch	Work equipment operation	① 600 kg/cm² F main pump	② 600 kg/cm² R main pump	③ 600 kg/cm² F pump servo	④ 600 kg/cm² R pump servo	⑤ 60 kg/cm² Control circuit pressure	Remarks
7	Servo	Full	A	OFF	OFF	Arm dumping relief					■	Main servo pressure balance ③ / ① ≒ ④ / ② ≒ 3/5

■ Connection to be changed to hoses ③ and ④, and gauge to be replaced with one with 60 K capacity.

No.	Part to be checked	Condition setting: Fuel dial	Working mode	Auto-decelerator	One-touch power max. switch	Work equipment operation	Travel lever	① 600 kg/cm² F main pump	② 600 kg/cm² R main pump	③" 60 kg/cm² PC EPC	④" 60 kg/cm² LS EPC	⑤ 60 kg/cm² Control circuit pressure	Remarks <Reference value: kg/cm²>
8	PC-EPC valve	Low	A	OFF	OFF	Neutral	Neutral	■	■		■	■	<32> Delivery variance by switching modes
		Full						■	■		■	■	< 0>
			E					■	■		■	■	<10>
			(※ L)					■	■		■	■	<11>
			B					■	■		■	■	<10>
9	LS-EPC valve	Full	A	OFF	OFF	Neutral	Neutral			■	←	■	At neutral: 2.9 MPa {30 kg/cm²}
			(※ L)			Arm dumping relief	Neutral			■	←	■	When 2 pumps relieved: 0 MPa {0 kg/cm²}
							Right lever at halfway position			■		■	When one pump relieved: 1.5 MPa {15 kg/cm²}
							Left lever at halfway position			■		■	
						Arm IN relief	Right lever at halfway position			■		■	
							Left lever at halfway position			■		■	

※ : The "L" mode is on the multi-monitor specification machine only

Do not travel the machine.

TROUBLESHOOTING

POINTS TO REMEMBER WHEN TROUBLESHOOTING 20-202
SEQUENCE OF EVENTS IN TROUBLESHOOTING 20-203
POINTS TO REMEMBER WHEN CARRYING OUT MAINTENANCE 20-204
CHECKS BEFORE TROUBLESHOOTING 20-212
CLASSIFICATION AND STEPS FOR TROUBLESHOOTING 20-213
CONNECTOR LOCATION CHART AND ELECTRICAL CIRCUIT DIAGRAM BY SYSTEM 20-218
CONNECTION TABLE FOR CONNECTOR PIN NUMBERS 20-236

TROUBLESHOOTING WHEN SERVICE CODE "ELECTRICAL SYSTEM" AND FAILURE CODE "MECHANICAL SYSTEM" ARE INDICATED 20-301
TROUBLESHOOTING OF ELECTRICAL SYSTEM (E-MODE) 20-501
TROUBLESHOOTING OF HYDRAULIC AND MECHANICAL SYSTEM (H-MODE) 20-601

POINTS TO REMEMBER WHEN TROUBLESHOOTING

- Stop the machine in a level place, and check that the safety pin, blocks, and parking brake are securely fitted.
- When carrying out the operation with two or more workers, keep strictly to the agreed signals, and do not allow any unauthorized person to come near.
- If the radiator cap is removed when the engine is hot, hot water may spurt out and cause burns, so wait for the engine to cool down before starting troubleshooting.
- Be extremely careful not to touch any hot parts or to get caught in any rotating parts.
- When disconnecting wiring, always disconnect the negative (–) terminal of the battery first.
- When removing the plug or cap from a location which is under pressure from oil, water, or air, always release the internal pressure first. When installing measuring equipment, be sure to connect it properly.

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

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

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

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

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

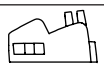
4. Confirming failure
- Confirm the extent of the failure yourself, and judge whether to handle it as a real failure or as a problem with the method of operation, etc.
  - ★ When operating the machine to reenact the troubleshooting symptoms, do not carry out any investigation or measurement that may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

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

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

SEQUENCE OF EVENTS IN TROUBLESHOOTING

Office, shop



TEW00180



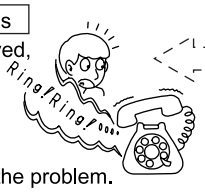
TEW00181

Jobsite

Step 1

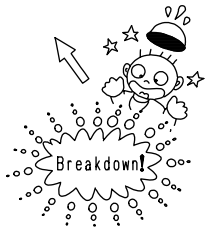
Examination, confirmation of symptoms

1) When a request for repairs is received, first ask the following points.
   - Name of customer
   - Type, serial number of machine
   - Details of jobsite, etc.
2) Ask questions to gain an outline of the problem.
   - Condition of failure
   - Work being carried out at the time of the failure
   - Operating environment
   - Past history, details of maintenance, etc.



TJP02876





TJP02838

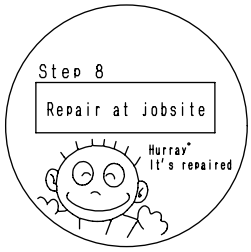
Step 2

Determining probable location of cause

1) Look at the troubleshooting section of the shop manual to find locations of possible causes.



TJP02839

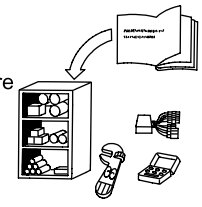


TEP01349

Step 3

Preparation of troubleshooting tools

1) Look at the table of troubleshooting tools in the shop manual and prepare the necessary tools.
   - T-adapter
   - Hydraulic pressure gauge kit, etc.
2) Look in the parts book and prepare the necessary replacement parts.

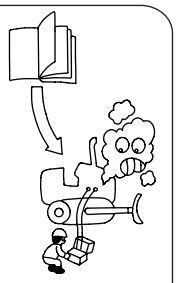


TEW00186

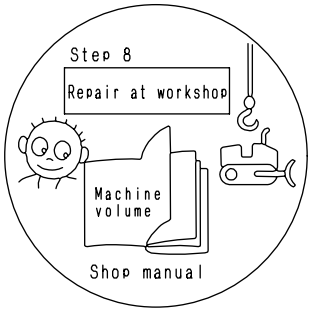
Step 7

- Pinpoint locations of failure (carry out troubleshooting)
- Decide action to take

1) Before starting troubleshooting, locate and repair simple failures.
   - Check before starting items
   - Other check items
2) See the Troubleshooting Section of the shop manual, select a troubleshooting flowchart that matches the symptoms, and carry out troubleshooting.



TEW00187



TJP02841

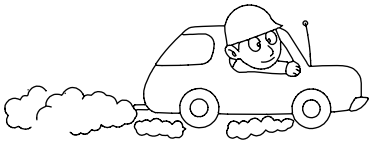
Step 6

Re-enacting failure

- Drive and operate the machine to confirm the condition and judge if there is really a failure.

Step 4

Go to jobsite

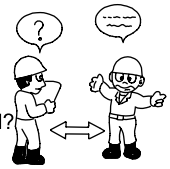


TEW00189

Step 5

Ask operator questions to confirm details of failure.

- Was there anything strange about the machine before the failure occurred?
- Did the failure occur suddenly?
- Had any repairs been carried out before the failure?



TEW00190

POINTS TO REMEMBER WHEN CARRYING OUT MAINTENANCE

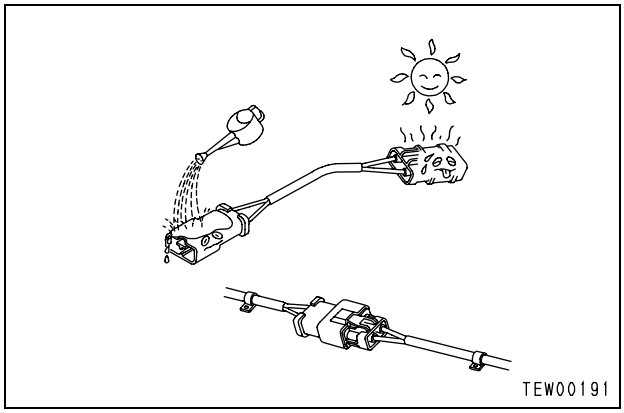
To maintain the performance of the machine over a long period, and to prevent failures or other troubles before they occur, correct operation, maintenance and inspection, troubleshooting, and repairs must be carried out. This section deals particularly with correct repair procedures for mechatronics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

1. Points to remember when handling electric equipment

1) Handling wiring harnesses and connectors

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

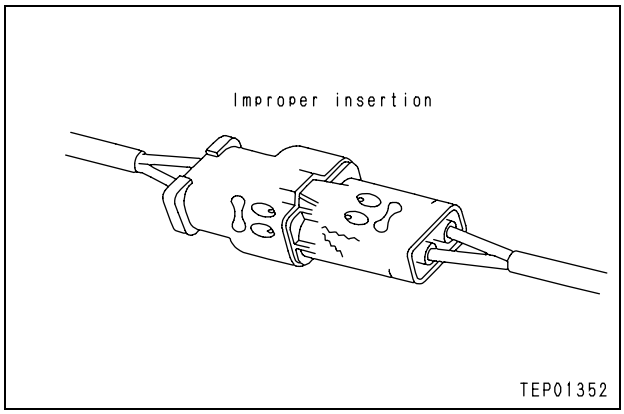
Compared with other electrical components fitted in boxes or cases, wiring harnesses are more likely to be affected by the direct effects of rain, water, heat, or vibration. Furthermore, during inspection and repair operations, they are frequently removed and installed again, so they are likely to suffer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



Main failures occurring in wiring harness

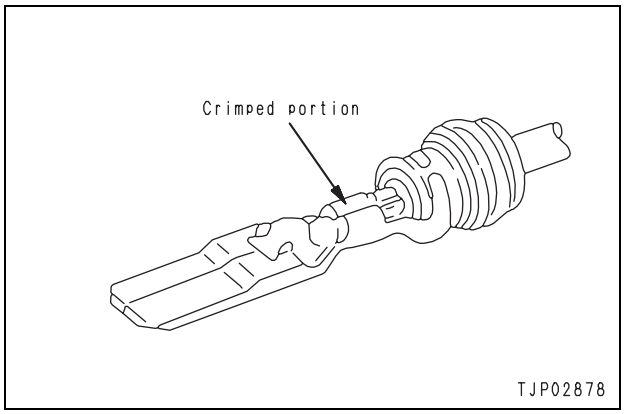
1) Defective contact of connectors (defective contact between male and female)

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

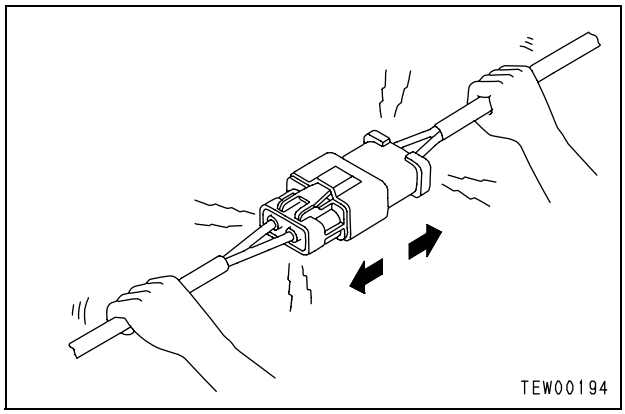


2) Defective crimping or soldering of connectors

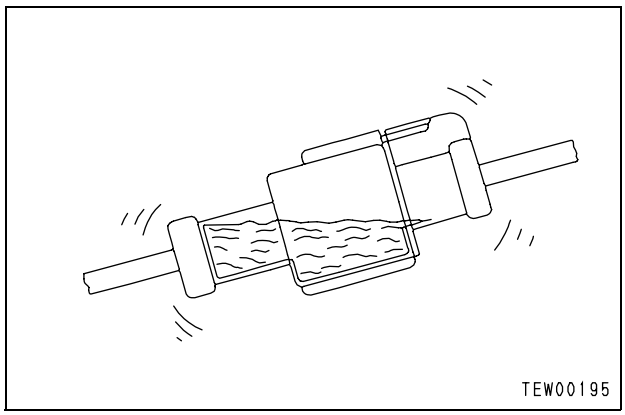
The pins of the male and female connectors are in contact at the crimped terminal or soldered portion, but if there is excessive force brought to bear on the wiring, the plating at the joint will peel and cause improper connection or breakage.



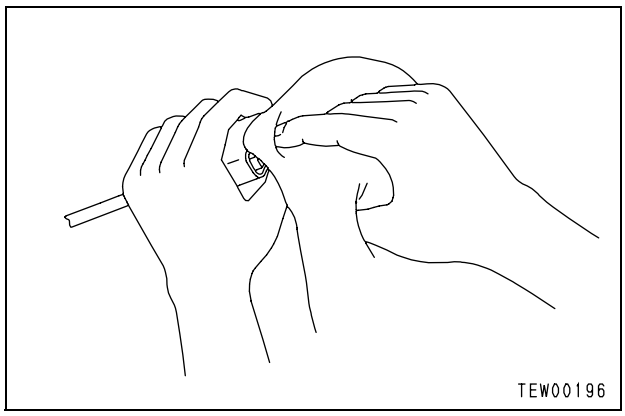
3) Disconnections in wiring
If the wiring is held and the connectors are pulled apart, or components are lifted with a crane with the wiring still connected, or a heavy object hits the wiring, the crimping of the connector may separate, or the soldering may be damaged, or the wiring may be broken.



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

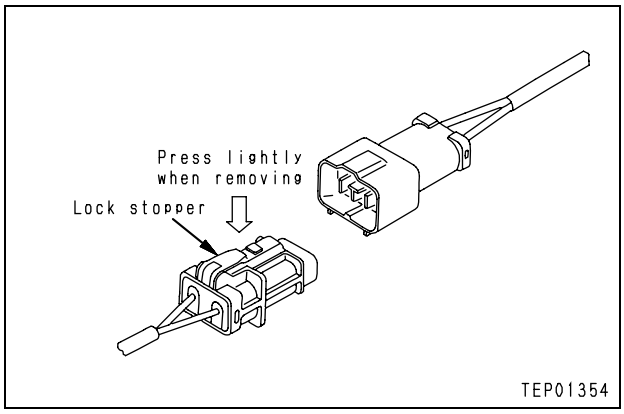


5) Oil or dirt stuck to connector
If oil or grease are stuck to the connector and an oil film is formed on the mating surface between the male and female pins, the oil will not let the electricity pass, so there will be defective contact.
If there is oil or grease stuck to the connector, wipe it off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

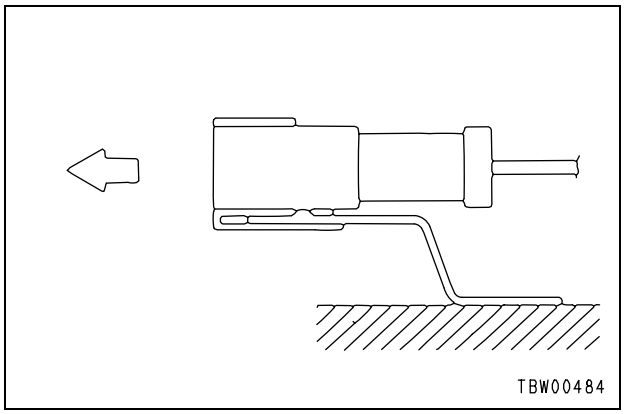


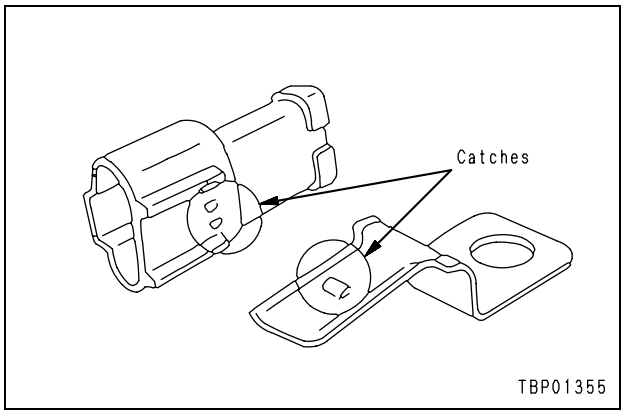
2) Removing, installing, and drying connectors and wiring harnesses

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

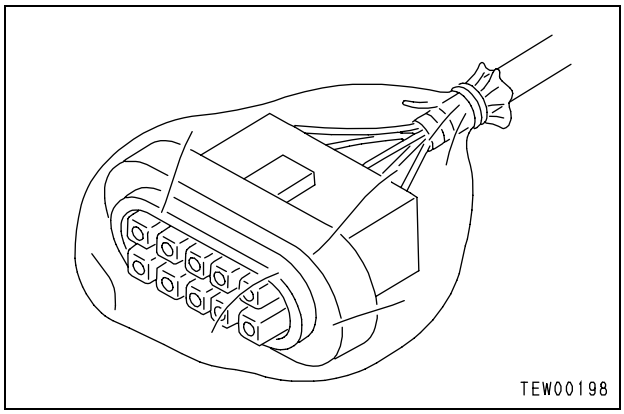


  2) When removing from clips
     When removing a connector from a clip, pull the connector in a parallel direction to the clip.
     ★ If the connector is twisted up and down or to the left or right, the housing may break.





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

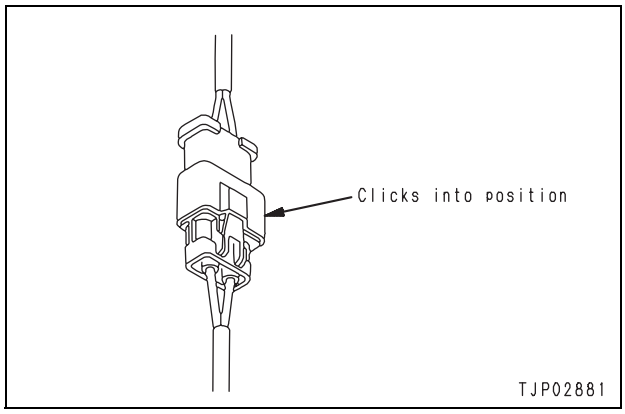


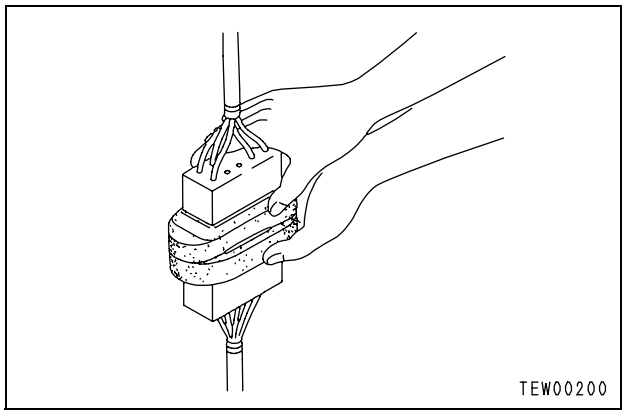
- **Connecting connectors**
  1) Check the connector visually.
     1) Check that there is no oil, dirt, or water stuck to the connector pins (mating portion).
     2) Check that there is no deformation, defective contact, corrosion, or damage to the connector pins.
     3) Check that there is no damage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

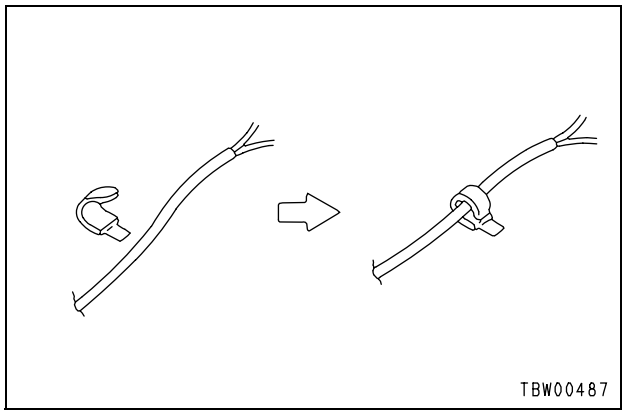
  2) Fix the connector securely.
     Align the position of the connector correctly, then insert it securely.
     For connectors with lock stopper, push in the connector until the stopper clicks into position.

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

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

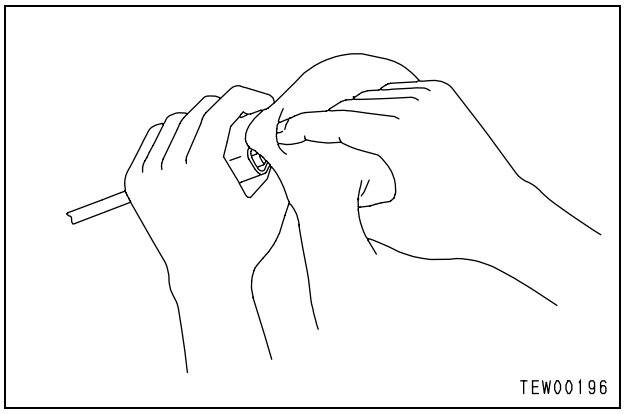




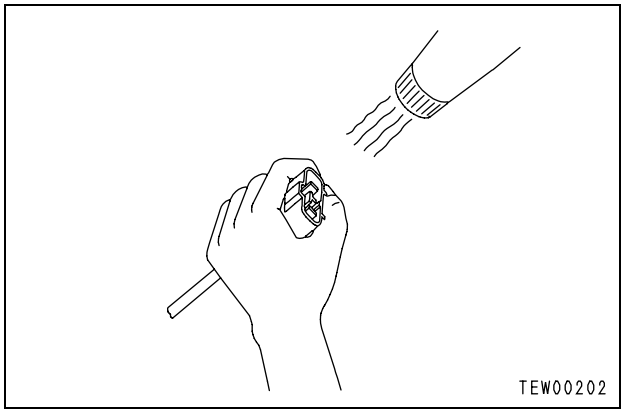


- **Drying wiring harness**
  If there is any oil or dirt on the wiring harness, wipe it off with a dry cloth. Avoid washing it in water or using steam. If the connector must be washed in water, do not use high-pressure water or steam directly on the wiring harness.

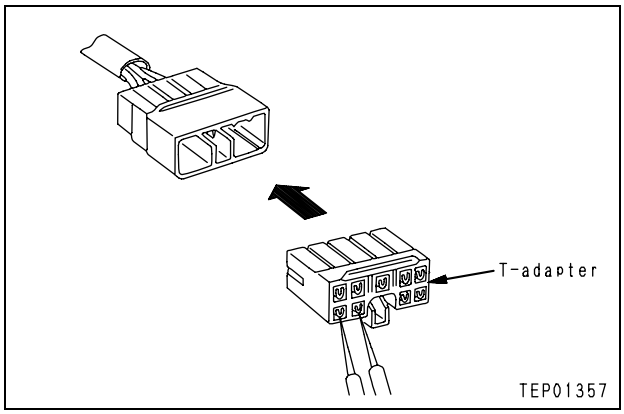
  If water gets directly on the connector, do as follows.
  1) Disconnect the connector and wipe off the water with a dry cloth.
     ★ If the connector is blown dry with compressed air, there is the risk that oil in the air may cause defective contact, so remove all oil and water from the compressed air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



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

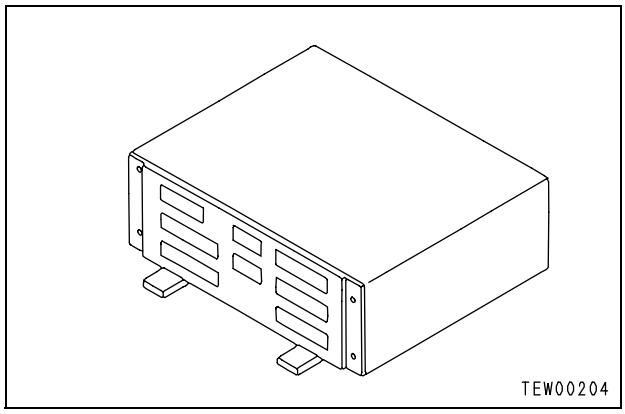


  3) Carry out a continuity test on the connector.
     After drying, leave the wiring harness disconnected and carry out a continuity test to check for any short circuits between pins caused by water.
     ★ After completely drying the connector, blow it with contact restorer and reassemble.

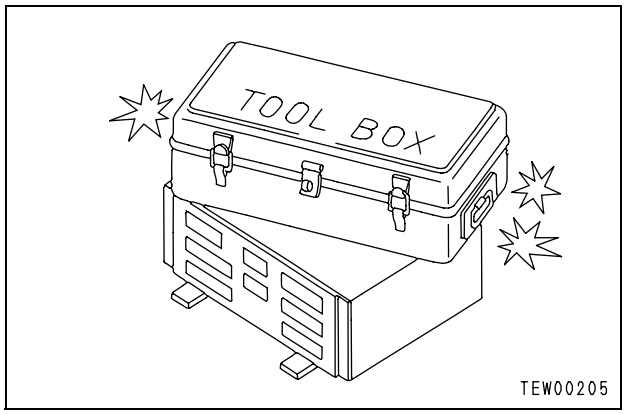


3) Handling control box

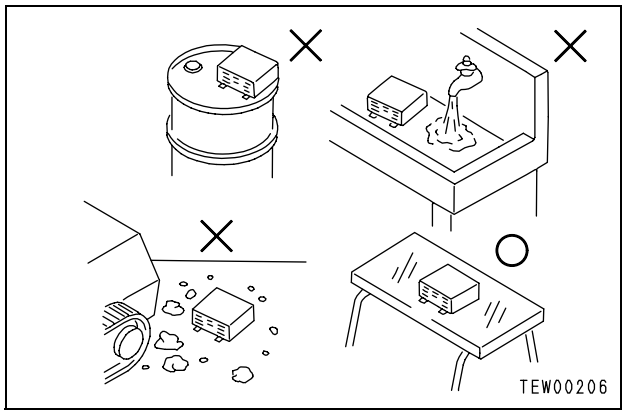
1) The control box contains a microcomputer and electronic control circuits. These control all of the electronic circuits on the machine, so be extremely careful when handling the control box.
2) Do not open the cover of the control box unless necessary.



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



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



2. Points to remember when troubleshooting electric circuits

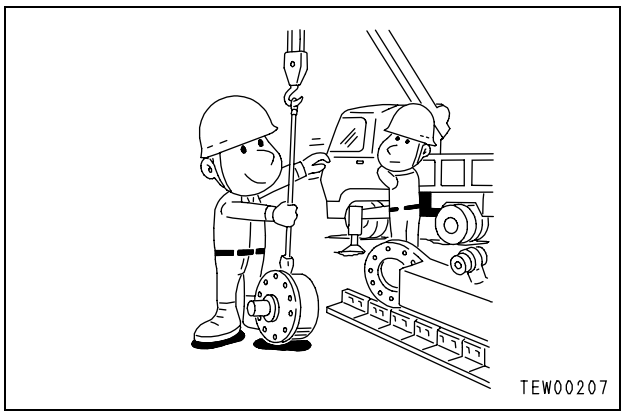
1) Always turn the power OFF before disconnecting or connect connectors.
2) Before carrying out troubleshooting, check that all the related connectors are properly inserted.
   ★ Disconnect and connect the related connectors several times to check.
3) Always connect any disconnected connectors before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

3. Points to remember when handling hydraulic equipment

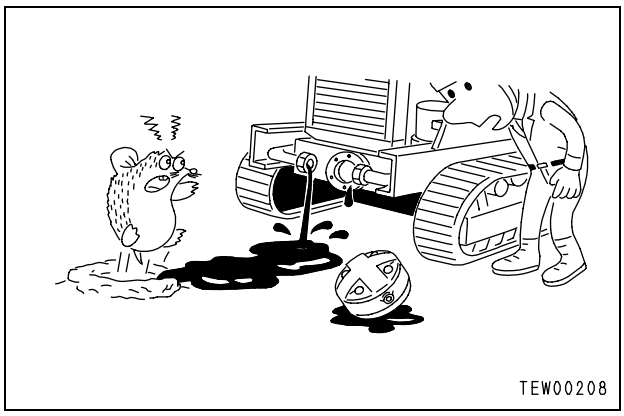
With the increase in pressure and precision of hydraulic equipment, the most common cause of failure is dirt (foreign material) in the hydraulic circuit. When adding hydraulic oil, or when disassembling or assembling hydraulic equipment, it is necessary to be particularly careful.

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

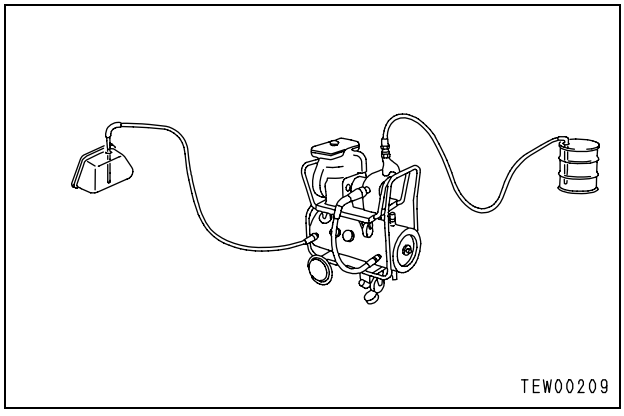
2) Disassembly and maintenance work in the field
If disassembly or maintenance work is carried out on hydraulic equipment in the field, there is danger of dust entering the equipment. It is also difficult to confirm the performance after repairs, so it is desirable to use unit exchange. Disassembly and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


TEW00207

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


TEW00208

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


TEW00209

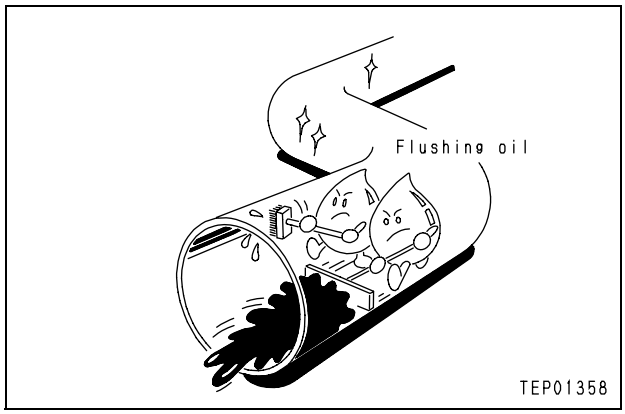
5) Change hydraulic oil when the temperature is high.

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

6) Flushing operations

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

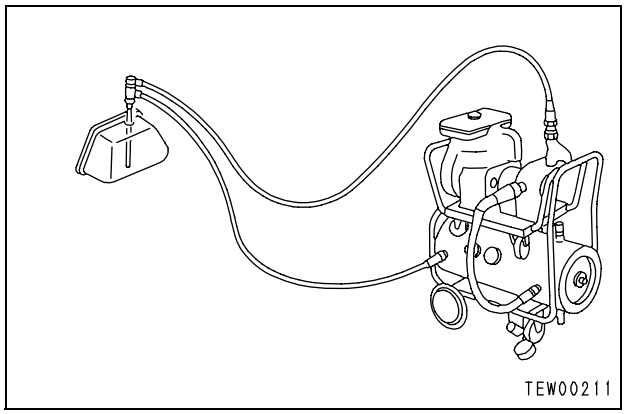
Normally, flushing is carried out twice: primary flushing is carried out with flushing oil, and secondary flushing is carried out with the specified hydraulic oil.



7) Cleaning operations

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

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



CHECKS BEFORE TROUBLESHOOTING

	Item	Judgement value	Action
Lubricating oil, coolant	1. Check fuel level, type of fuel	—	Add fuel
	2. Check for impurities in fuel	—	Clean, drain
	3. Check hydraulic oil level	—	Add oil
	4. Check hydraulic oil strainer	—	Clean, drain
	5. Check swing machinery oil level	—	Add oil
	6. Check engine oil level (oil pan oil level)	—	Add oil
	7. Check coolant level	—	Add water
	8. Check dust indicator for clogging	—	Clean or replace
	9. Check hydraulic filter	—	Replace
	10. Check final drive oil level	—	Add oil
Electrical equipment	1. Check for looseness, corrosion of battery terminal, wiring	—	Tighten or replace
	2. Check for looseness, corrosion of alternator terminal, wiring	—	Tighten or replace
	3. Check for looseness, corrosion of starting motor terminal, wiring	—	Tighten or replace
Hydraulic, mechanical equipment	1. Check for abnormal noise, smell	—	Repair
	2. Check for oil leakage	—	Repair
	3. Carry out air bleeding	—	Bleed air
Electrics, electrical equipment	1. Check battery voltage (engine stopped)	20 – 30V	Replace
	2. Check battery electrolyte level	—	Add or replace
	3. Check for discolored, burnt, exposed wiring	—	Replace
	4. Check for missing wiring clamps, hanging wiring	—	Repair
	5. Check for water leaking on wiring (be particularly careful attention to water leaking on connectors or terminals)	—	Disconnect connector and dry
	6. Check for blown, corroded fuses	—	Replace
	7. Check alternator voltage (engine running at 1/2 throttle or above)	After running for several minutes : 27.5 – 29.5V	Replace
	8. Check operating sound of battery relay (when switch is turned ON/OFF)	—	Replace

CLASSIFICATION AND STEPS FOR TROUBLESHOOTING

Classification of troubleshooting

Mode	Content
Code display	Troubleshooting when Service Code (electrical system) and Failure Code (mechanical system) are displayed.
E mode	Troubleshooting of electrical system
H mode	Troubleshooting of hydraulic and mechanical systems
(Engine)	Troubleshooting of engine assembly (refer to the shop manual for engine in 114 series)

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 Service Code. Following displayed Service Code for the electrical system, carry out the troubleshooting along the corresponding code display.

2. **Troubleshooting steps when the electrical system Service 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 Service Code or mechanical system Failure Code, using the failure history function of the monitor panel.
   - ★ If Service 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 or H mode troubleshooting related to the phenomenon in question.

Failure-looking Phenomenon and Troubleshooting No.

No.	Failure-looking phenomenon		Troubleshooting			
			Code display	E mode	H mode	(Engine)
Action to be taken concerning Service Code, User Code and Failure Code						
1	Display User Code in monitor panel		Accord-ing to dis-played code			
2	Display Service Code in electrical system after checking failure history					
3	Display Failure Code in mechanical system after checking failure history					
Engine-related failure						
4	Engine does not start up easily. (It always takes some time to start up the engine)					S-1
5	Engine does not start	Engine does not rotate		E-1		S-2 ①
6		Engine rotates, but there is no exhaust gas				S-2 ②
7		There is exhaust gas, but engine does not start				S-2 ③
8	Engine pickup is poor. (Engine does not follow acceleration)					S-3
9	Engine stops while in operation			E-2	H-2	S-4
10	Engine rotation is irregular. (There is hunting)			E-3		S-5
11	Engine is short of output, or lacks power				H-1	S-6
12	Color of exhaust gas is too dark. (Incomplete combustion)					S-7
13	Excessive engine oil consumption, or color of exhaust gas is blue					S-8
14	Premature engine oil contamination					S-9
15	Excessive fuel consumption					S-10
16	Engine cooling water is mixed with engine oil, spurts out or decreases					S-11
17	Engine oil amount increases. (Water or fuel gets in)					S-13
18	Abnormal noises are heard					S-15
19	Excessive vibrations are caused					S-16
20	Engine does not stop			E-4		
21	Auto-decelerator does not work			E-5	H-5	
22	Engine auto warming-up device does not work			E-6		
23	Engine preheater does not work			E-7		
Failure related to work equipment, swing and travel						
24	Speeds of all work equipment, travel and swing are slow, or they lack power				H-1	S-6
25	Engine rotation drops sharply or stalls				H-2	S-4
26	All work equipment, travel and swing do not move			E-8	H-3	
27	There are abnormal noises from around hydraulic pump				H-4	
28	Fine control mode function works poorly, or shows slow response				H-6	

No.	Failure-looking phenomenon	Troubleshooting			
		Code display	E mode	H mode	(Engine)
Work equipment-related failure					
29	Boom moves slowly or lacks power		E-21, 22	H-7	
30	Arm moves slowly or lacks power		E-23, 24	H-8	
31	Bucket moves slowly or lacks power		E-25, 26	H-9	
32	Boom, arm or bucket does not move			H-10	
33	Natural drift of work equipment is too fast			H-11	
34	Work equipment time lag is too big			H-12	
35	Other work equipment moves, when specific work equipment is relieved			H-13	
36	One-touch power max. switch does not work	E-9, 21–26		H-14	
Compound operation-related failure					
37	In compound operation, work equipment with larger load moves slowly			H-15	
38	In swing + boom RAISE operation, boom moves slowly			H-16	
39	In swing + travel operation, travel speed drops sharply			H-17	
Travel-related failure					
40	Machine tends to swerve while in travel			H-18	
41	Travel speed is slow		E-28	H-19	
42	Machine is difficult to steer, or lacks power		E-28, 29	H-20	
43	Travel speed cannot be shifted or is slow or fast		E-28	H-21	
44	Track shoe does not move (only on one side)			H-22	
Swing-related failure					
45	Machine does not swing		E-27	H-23	
46	Swing acceleration is poor, or swing speed is slow			H-24	
47	Upper structure overruns excessively, when stopping swing			H-25	
48	There is a big shock caused when stopping swing			H-26	
49	There is abnormal noise generated when stopping swing			H-27	
50	There is natural drift while in swing			H-28	
Monitor panel-related failure (Operator's Menu: ordinary display)					
51	No display appears in monitor panel at all		E-10		
52	Part of display is missing in monitor panel		E-11		
53	Descriptions on monitor panel do not apply to the machine model		E-12		
54	In startup inspection, radiator water level monitor lamp lights up red (※)	B@BCZK			
55	In startup inspection, engine oil level monitor lamp lights up red	B@BAZK			

※: The multi-monitor specification machine only.

No.	Failure-looking phenomenon	Troubleshooting			
		Code display	E mode	H mode	(Engine)
56	In startup inspection, maintenance hour monitor lamp lights up red	Refer to Operation and Maintenance Manual			
57	While engine is running, battery charging level monitor lamp lights up red	AB00KE			
58	While engine is running, fuel level monitor lamp lights up red		E-13		
59	While engine is running, air cleaner clogging monitor lamp lights up red	AA10NX			
60	While engine is running, engine cooling water temperature monitor lamp lights up red	B@BCNS			
61	While engine is running, hydraulic oil temperature monitor lamp lights up red (※)	B@HANS			
62	Engine cooling water temperature gauge does not display correctly		E-14		
63	Hydraulic oil temperature gauge does not display correctly (※)		E-15		
64	Fuel gauge does not display correctly		E-16		
65	Swing lock monitor does not display correctly		E-17		
66	When operating monitor switch, no display appears		E-18		
67	Windshield wiper does not work		E-19		
68	Warning buzzer cannot be stopped		E-20		
Monitor panel-related failure (Service Menu: Special Function Display)					
69	In monitoring function, "Boom RAISE" cannot be displayed correctly		E-21		
70	In monitoring function, "Boom LOWER" cannot be displayed correctly		E-22		
71	In monitoring function, "Arm DIGGING" cannot be displayed correctly		E-23		
72	In monitoring function, "Arm DUMPING" cannot be displayed correctly		E-24		
73	In monitoring function, "Bucket DIGGING" cannot be displayed correctly		E-25		
74	In monitoring function, "Bucket DUMPING" cannot be displayed correctly		E-26		
75	In monitoring function, "Swing" cannot be displayed correctly		E-27		
76	In monitoring function, "Travel" cannot be displayed correctly		E-28		
77	In monitoring function, "Travel Differential Pressure" cannot be displayed correctly		E-29		
78	In monitoring function, "Service" cannot be displayed correctly		E-30		
Other failure					
79	Air conditioner does not work		E-31		
80	Travel alarm does not sound		E-32		

※: The multi-monitor specification machine only.

CONNECTOR LOCATION CHART AND ELECTRICAL CIRCUIT DIAGRAM BY SYSTEM

Connector table

Connector No.	Type	No. of pin	Name of device	Address			
				Stereo -gram	M circuit	G circuit	P circuit
A01	X	4	Intermediate connector	T-1	H-6	I-6	I-8
A02	X	4	Intermediate connector	T-2	H-6	I-5	
A03	D	12	Intermediate connector	N-1	H-6	I-2	I-8
A04	SWP	12	Intermediate connector	O-1			I-7
A05	SWP	14	Intermediate connector	T-1	H-5		I-7
A06	SWP	14	Intermediate connector	N-1	H-5		I-5
A07	SWP	16	Intermediate connector	S-1	H-4	I-4	I-4
A09	SWP	8	Intermediate connector	N-2			I-3
A10	Terminal	1	Revolving frame grounding	H-1	H-1	J-3	J-4
A11	Terminal	1	Revolving frame grounding	H-2	I-1		
A12	Terminal	1	Revolving frame grounding	H-2	I-1		
A13	Terminal	1	Revolving frame grounding	I-2	I-1	J-6	J-8
A14	Terminal	1	Revolving frame grounding	C-2	I-1		
A15	Terminal	1	Revolving frame grounding	I-2	I-1		J-4
A16	Terminal	1	Revolving frame grounding	I-2	I-1		J-4
A20	Terminal	1	Battery relay (E terminal)	C-1	J-5	J-5	
A21	Terminal	1	Battery relay (BR terminal)	C-2	J-6	J-5	
A22	Terminal	1	Battery relay (M terminal)	C-1	J-5	K-5	
A23	Terminal	1	Battery relay (B terminal)	C-2	J-6	K-5	
A30	YAZAKI	2	Air conditioner outside air temperature sensor	L-4			
A31	D	2	Air cleaner clogging sensor	K-4	K-4		
A33	X	2	Radiator water level sensor	K-4	K-5		
A34	L	2	Fusible link (65A)	A-5	K-6	K-6	
A35	M	2	Fusible link (30A)	A-4	K-6	K-6	
A36	M	2	Fusible link (30A)	A-5		K-6	
A40	AMP	1	Alarm horn (low tone)	H-1			
A41	AMP	1	Alarm horn (high tone)	H-1			
A42	X	1	Intermediate connector	G-9	J-7		
A43	X	2	Travel alarm	J-2			K-4
A44	M	1	Front right lamp	A-5	K-7		

Connector No.	Type	No. of pin	Name of device	Address			
				Stereo -gram	M circuit	G circuit	P circuit
A50	KES0	2	Window washer monitor (tank)	K-3	K-5		
A51	D	3	F pump hydraulic oil pressure sensor	J-3			K-5
A52	D	3	R pump hydraulic oil pressure sensor	J-3			K-4
A60	X	1	Fuel level sensor	D-9	K-4		
A61	D	2	Hydraulic oil temperature sensor	L-5	K-5		
A80	D	8	Intermediate connector	S-1		I-3	
C01	DRC	24	Governor pump controller	V-9	A-3	A-8	A-8
C02	DRC	40	Governor pump controller	W-9		A-7	A-7
C03	DRC	40	Governor pump controller	W-9	A-3	A-4	A-4
C09	S	8	Model selection connector	W-6		C-9	
D01	SWP	8	Assembled type diode	W-7	A-9	D-1	G-1
D02	SWP	8	Assembled type diode	W-7	A-8	D-1	
D03	SWP	8	Assembled type diode	P-1			H-1
D04	SWP	8	Assembled type diode	Q-1	A-8		I-1
E06	M	3	Fuel dial	O-8		H-1	
E07	D	2	Engine speed sensor	L-8			L-8
E08	D	12	Intermediate connector	K-9	J-3	J-3	K-8
E10	D	3	Fuel shut-off valve			K-3	
E10	D	3	Governor potentiometer	J-9		K-2	
E11	D	4	Governor motor	J-9		K-2	
F02	YAZAKI	2	Revolving warning lamp	AA-9			
FB1	–	–	Fuse box	W-5	H-9	C-4	F-9
G01	–	–	–	V-2			
G02	–	–	–	V-3			
G03	–	–	–	V-3			
G04	–	–	–	V-2			
G05	–	–	–	V-3			
H08	M	8	Intermediate connector	W-4	J-8		
H09	S	8	Intermediate connector	W-4	J-8		
H10	S	16	Intermediate connector	T-9	D-6	I-8	
H11	S	16	Intermediate connector	S-9	D-5	I-8	B-9
H12	S	12	Intermediate connector	S-9	D-5	I-7	
H15	S090	20	Intermediate connector	N-7	C-2	G-2	C-2

Connector No.	Type	No. of pin	Name of device	Address			
				Stereo -gram	M circuit	G circuit	P circuit
J01	J	20	Junction connector (black)	W-8	C-9	D-9	C-9
J02	J	20	Junction connector (black)	W-8	D-9	D-9	D-9
J03	J	20	Junction connector (green)	W-8	D-9	E-9	D-9
J04	J	20	Junction connector (green)	W-7	D-9	E-9	E-9
J05	J	20	Junction connector (pink)	W-6	E-9	F-9	E-9
J06	J	20	Junction connector (orange)	W-6	F-9		G-9
J07	J	20	Junction connector (orange)	U-9	F-9	G-9	H-9
J08	J	20	Junction connector (pink)	U-9		H-9	H-9
K19	M	2	Pump resistor (for driving emergency pump)	U-2			E-3
K30	D	3	CAN terminating resistor	S-9	A-2	C-1	
K31	D	3	CAN terminating resistor	N-4	A-4	K-7	
M02	D	2	Starting motor	L-7	K-3		
M07	M	3	Lamp switch	O-8	C-1		
M09	M	1	Working lamp (front right)	E-9	K-7		
M13	KES0	2	Speaker (right)	AC-8			
M19	YAZAKI	2	Cigarette lighter	N-3			
M21	PA	9	Radio	U-2			
M22	Y090	2	Horn switch	N-7			
M23	Y090	2	One-touch power max. switch	T-1			B-9
M26	S	12	Air conditioner unit	W-5			
M27	SWP	16	Air conditioner unit	W-5			
M28	SWP	12	Air conditioner unit	W-4			
M29	040	20	Air control panel	W-3			
M30	040	16	Air control panel	W-3			
M31	M	2	Option power source (2)	U-2			
M32	M	2	Option power source (1)	S-9			
M33	M	2	Option power source (3)	–			
M33	SWP	8	Air conditioner unit	W-4			
M34	X	2	Air compressor electromagnetic clutch	W-8			
M38	M	2	Machine push-up switch	Q-9			D-2
M40	YAZAKI	2	Working lamp	Z-8	K-8		
M41	YAZAKI	2	Working lamp (additional)	Y-7	K-8		
M42	M	1	Intermediate connector	J-3	J-7		
M43	M	1	Working lamp (rear)	–	K-7		
M45	D	12	Intermediate connector	U-2			
M46	S090	4	RS232C relaying connector	U-9		C-9	
M71	M	2	Room lamp	Z-8			
M72	M	4	DC/AC converter	U-2			
M73	KES0	2	Speaker (left)	AD-8			
M79	YAZAKI	2	12V electrical equipment socket	V-9			

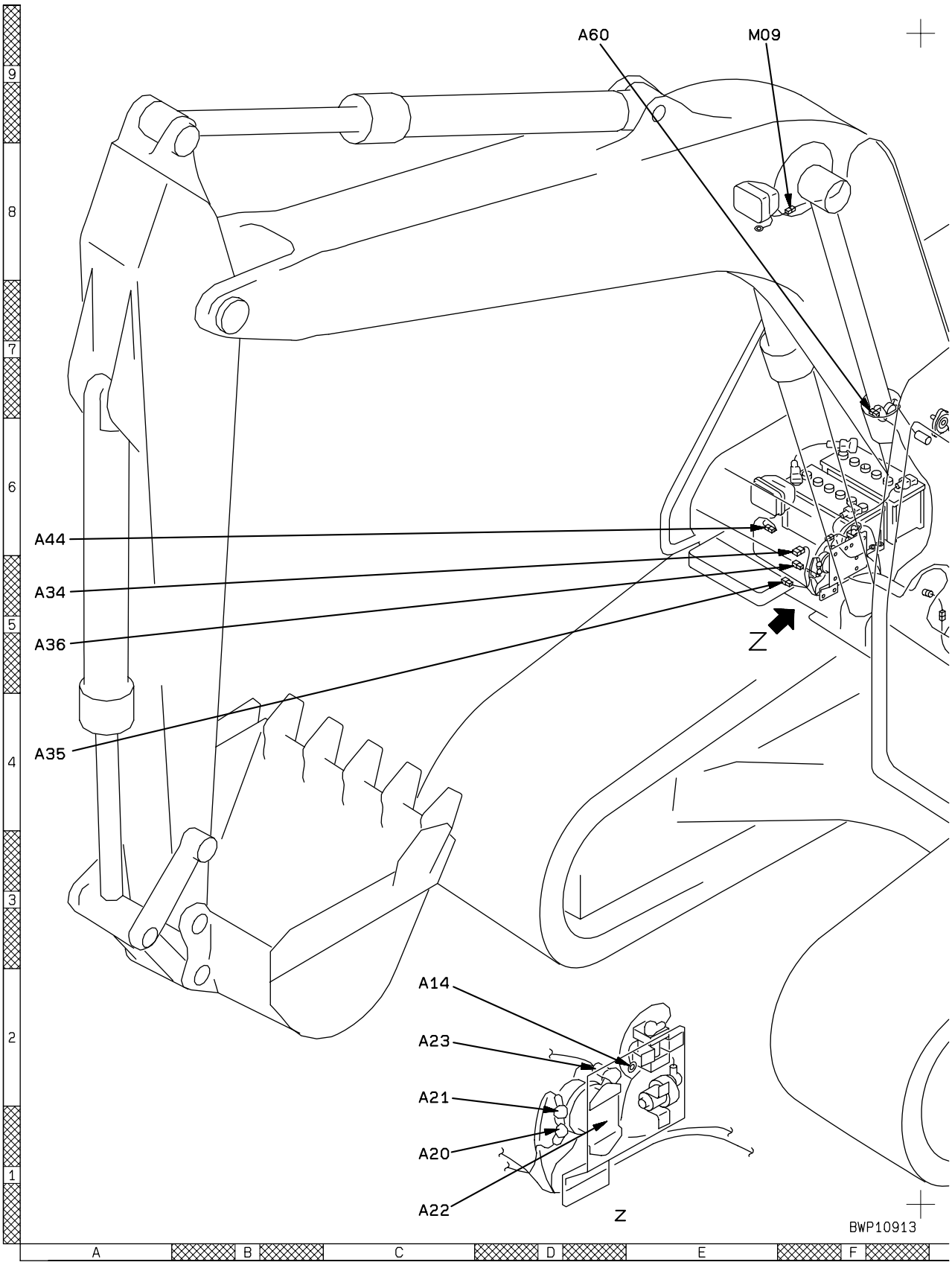
Connector No.	Type	No. of pin	Name of device	Address			
				Stereo -gram	M circuit	G circuit	P circuit
P01	070	12	Monitor panel	N-6	A-7	K-8	
P02	040	20	Monitor panel	N-5	A-6	K-8	A-9
P03	M	2	Buzzer canceling switch	P-9	D-1		
P05	M	2	Revolving warning lamp switch	W-3			
P05	D	2	Engine oil temperature switch	K-9	K-2		
P07	D	2	Engine cooling water switch	L-8	K-1		
P15	Y050	2	Air conditioner sun light sensor	N-6			
P70	040	16	Monitor panel	N-4	A-5	K-7	
R10	R	5	Lamp relay	O-8	E-1		
R11	R	5	Engine starting motor cutting relay (PPC lock)	P-8	E-1		
R13	R	5	Engine starting motor cutting relay (personal code)	P-9	F-1		
R20	R	5	Attachment circuit switching relay	W-6			C-9
R22	R	5	Engine stop solenoid relay	L-8		D-1	
S01	X	2	Bucket digging oil pressure switch	L-7			K-2
S02	X	2	Boom lowering oil pressure switch	L-7			K-3
S03	X	2	Swing oil pressure switch, left	L-6			K-2
S04	X	2	Arm digging oil pressure switch	L-6			K-3
S05	X	2	Bucket dumping oil pressure switch	L-5			K-2
S06	X	2	Boom raise oil pressure switch	L-5			K-3
S07	X	2	Swing oil pressure switch, right	K-3			K-2
S08	X	2	Arm dumping oil pressure switch	J-3			K-3
S09	X	2	Service oil pressure switch (intermediate connector)	K-3			K-1
S10	X	2	Service oil pressure switch, front	–			K-1
S11	X	2	Service oil pressure switch, rear	–			K-1
S14	M	3	Safety lever lock switch	S-1	K-9		F-8
S21	Terminal	6	Pump emergency driving switch	R-9			E-2
S22	Terminal	6	Swing and parking brake emergency releasing switch	Q-9			F-2
S23	Terminal	6	Emergency engine starting switch	R-9		F-1	
S25	S090	16	Intermediate connector	R-9			
S30	X	2	Travel hydraulic switch	O-1			A-1
S31	X	2	Travel steering hydraulic switch	O-1			A-1
T05	Terminal	1	Floor frame grounding	W-3	J-8		
T06	Terminal	1	Radio body grounding	–			
T06A	M	1	Intermediate connector	T-2			
T11	Terminal	1	Operator's cab grounding	AD-3			

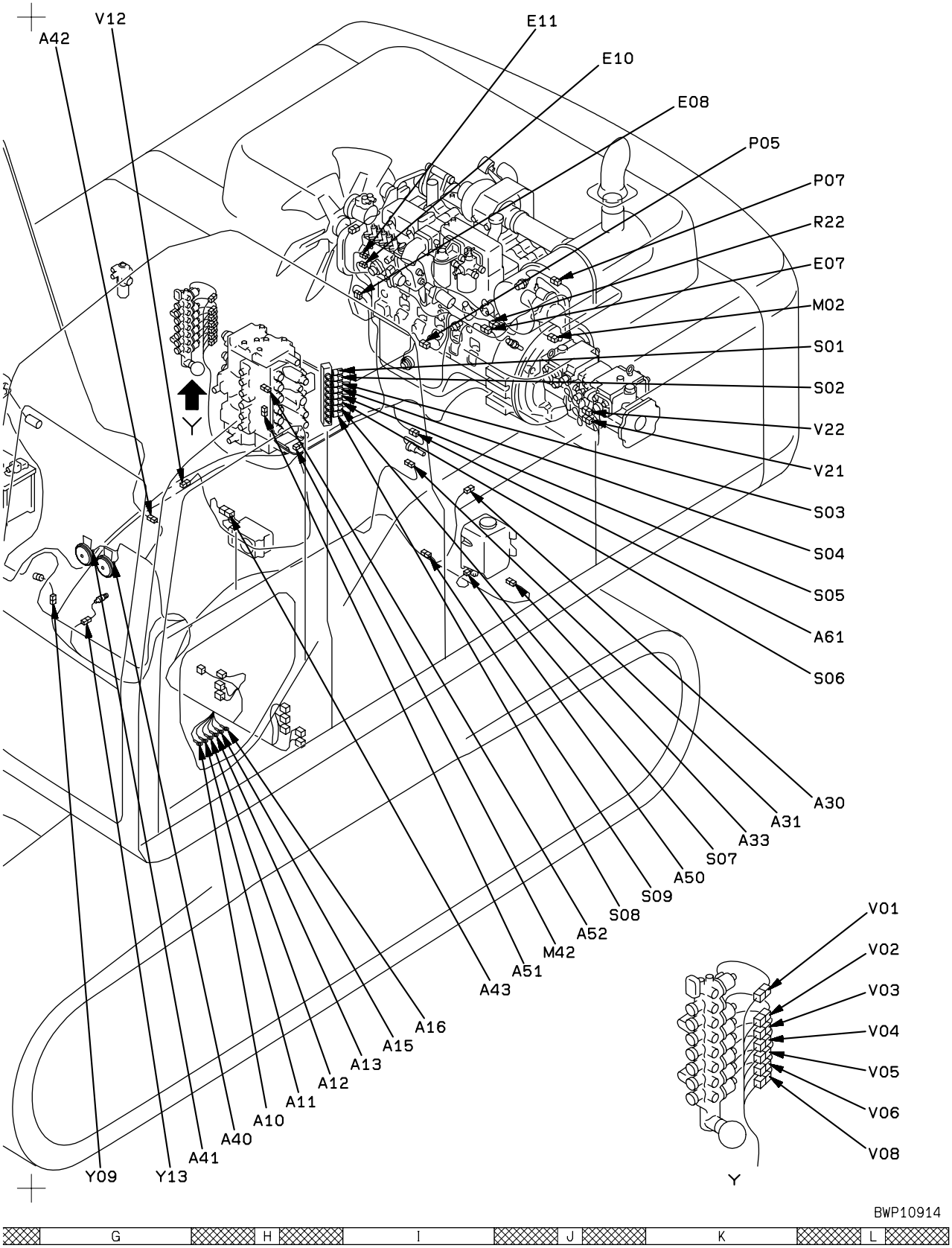
Connector No.	Type	No. of pin	Name of device	Address			
				Stereo -gram	M circuit	G circuit	P circuit
V01	D	2	PPC hydraulic lock solenoid valve	L-3			K-6
V02	D	2	Travel interlocking solenoid valve	L-3			K-6
V03	D	2	Merge/divide valve solenoid valve	L-2			K-7
V04	D	2	Travel speed solenoid valve	L-2			K-5
V05	D	2	Swing and parking brake solenoid valve	L-2			K-6
V06	D	2	Machine push-up solenoid valve	L-1			K-5
V08	D	2	2-stage relief solenoid valve	L-1			K-6
V12	D	2	Attachment return switching solenoid valve	G-9			K-4
V21	D	2	PC-EPC solenoid valve				K-7
V22	D	2	LS-EPC solenoid valve	L-6			K-7
V30	X	2	Attachment oil flow rate adjusting EPC solenoid valve	P-1			A-1
W03	X	2	Rear limit switch (window)	AB-9	K-8		
W04	M	6	Windshield wiper motor	Y-4	B-9		
X05	M	4	Swing lock switch	Q-9	D-1		C-2

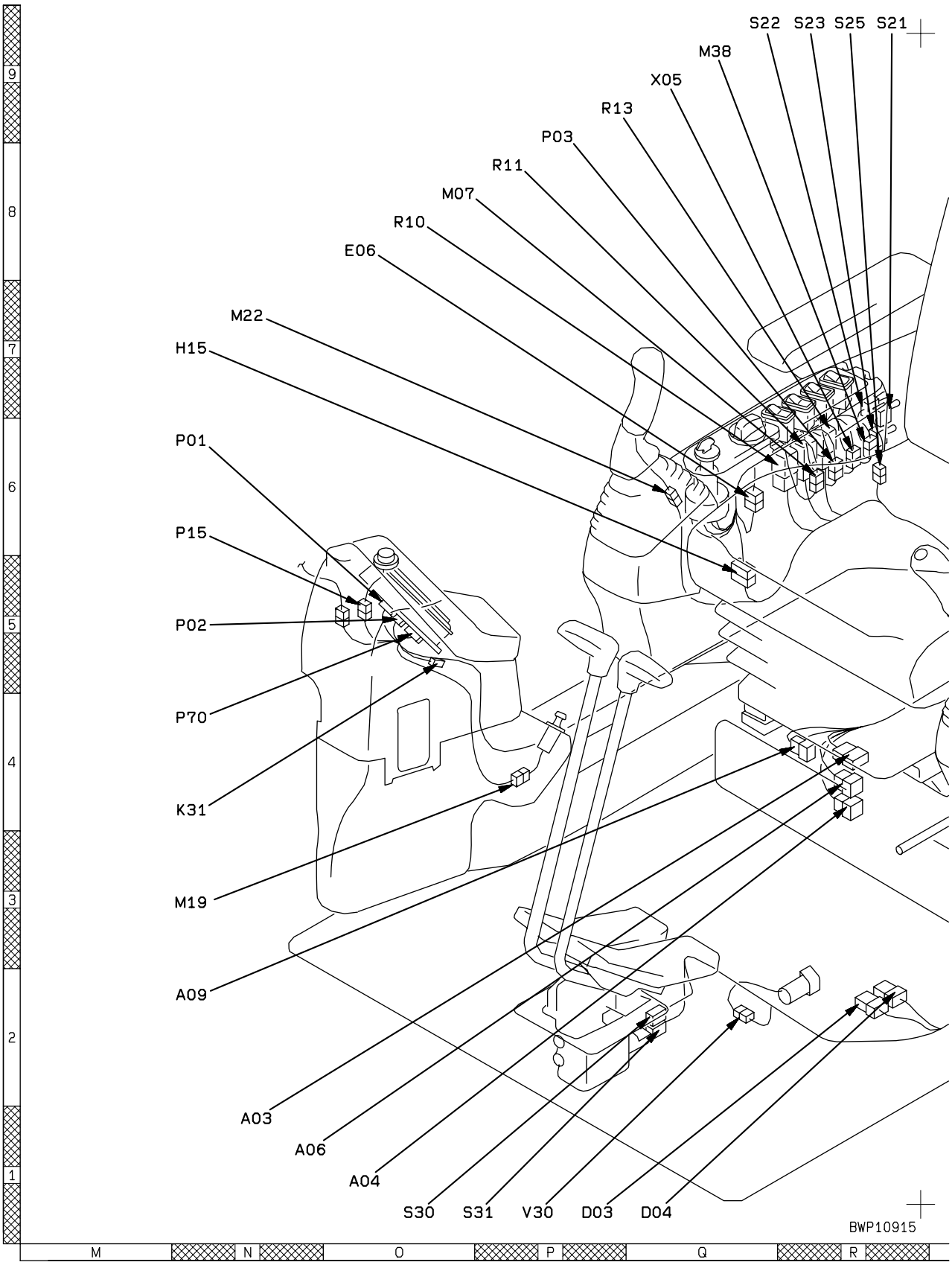
Connector No.	Detailed information
D or DT	Japanese and German makes DT type connector (08192-XXXXX)
L	Product of Yazaki Corporation L type connector (08056-2XXXX)
J	Product of Sumitomo Wiring Systems 090 type splice
M	Product of Yazaki M type connector (08056-0XXXX)
R	Product of Ryosei Electro-Circuit Systems* PH166-05020 type connector
S	Product of Yazaki S type connector (08056-1XXXX)
X	Product of Yazaki X type connector (08055-0XXXX)
PA	Product of Yazaki PA type connector
SWP	Product of Yazaki SWP type connector (08055-1XXXX)
DRC	Japanese and German makes DRC type connector
040	Product of Japan AMP 040 type connector
070	Product of Japan AMP 070 type connector
Y050	Product of Yazaki 050 type connector
S090	Product of Sumitomo 090 type connector
Y090	Product of Yazaki 090 type connector
YAZAKI	Yazaki-made connector
KES0	KESO type connector (08027-0XXXX)
Terminal	Round pin type single terminal connector
Terminal	Round terminal

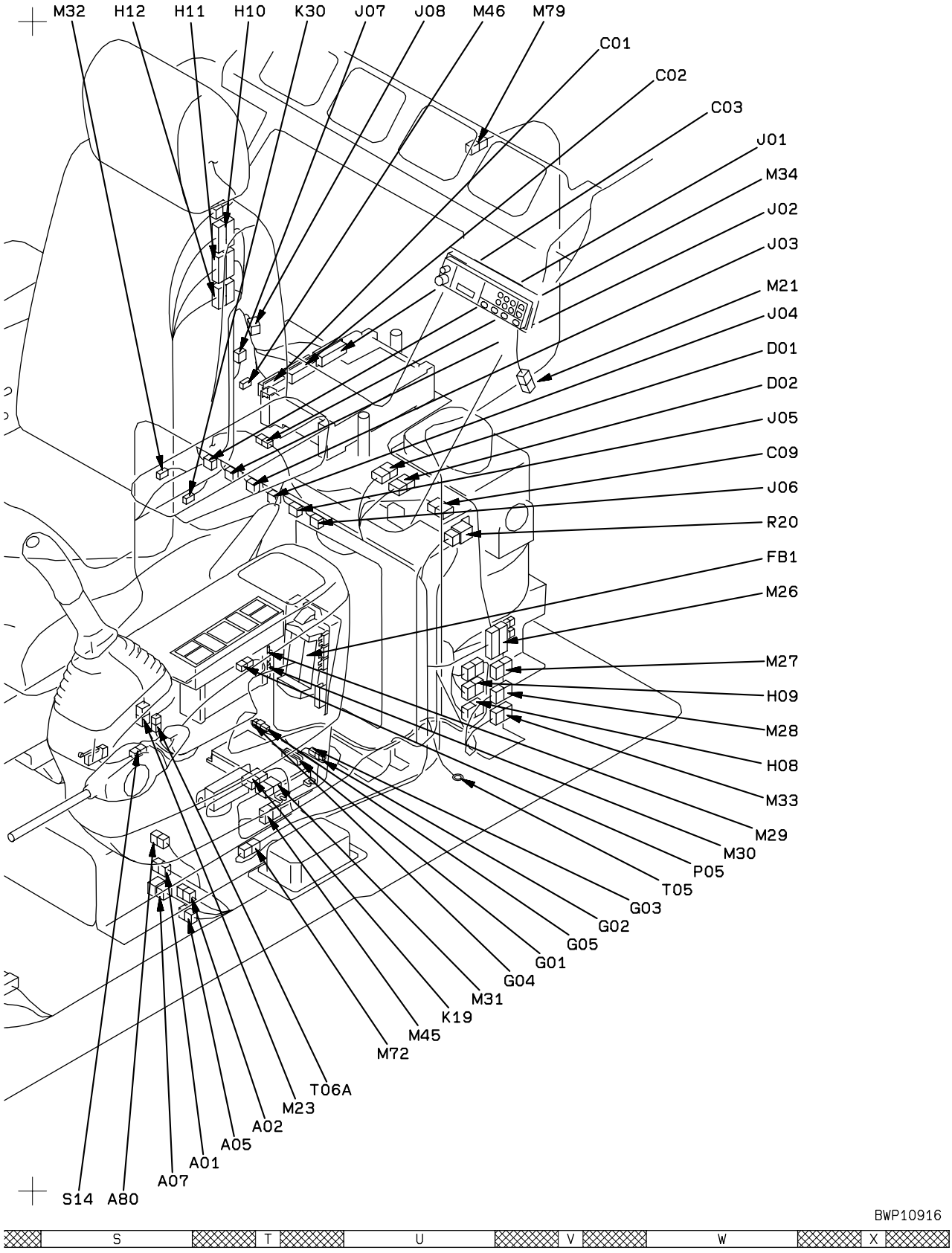
*An affiliated company of Mitsubishi Cable Industries, Ltd.

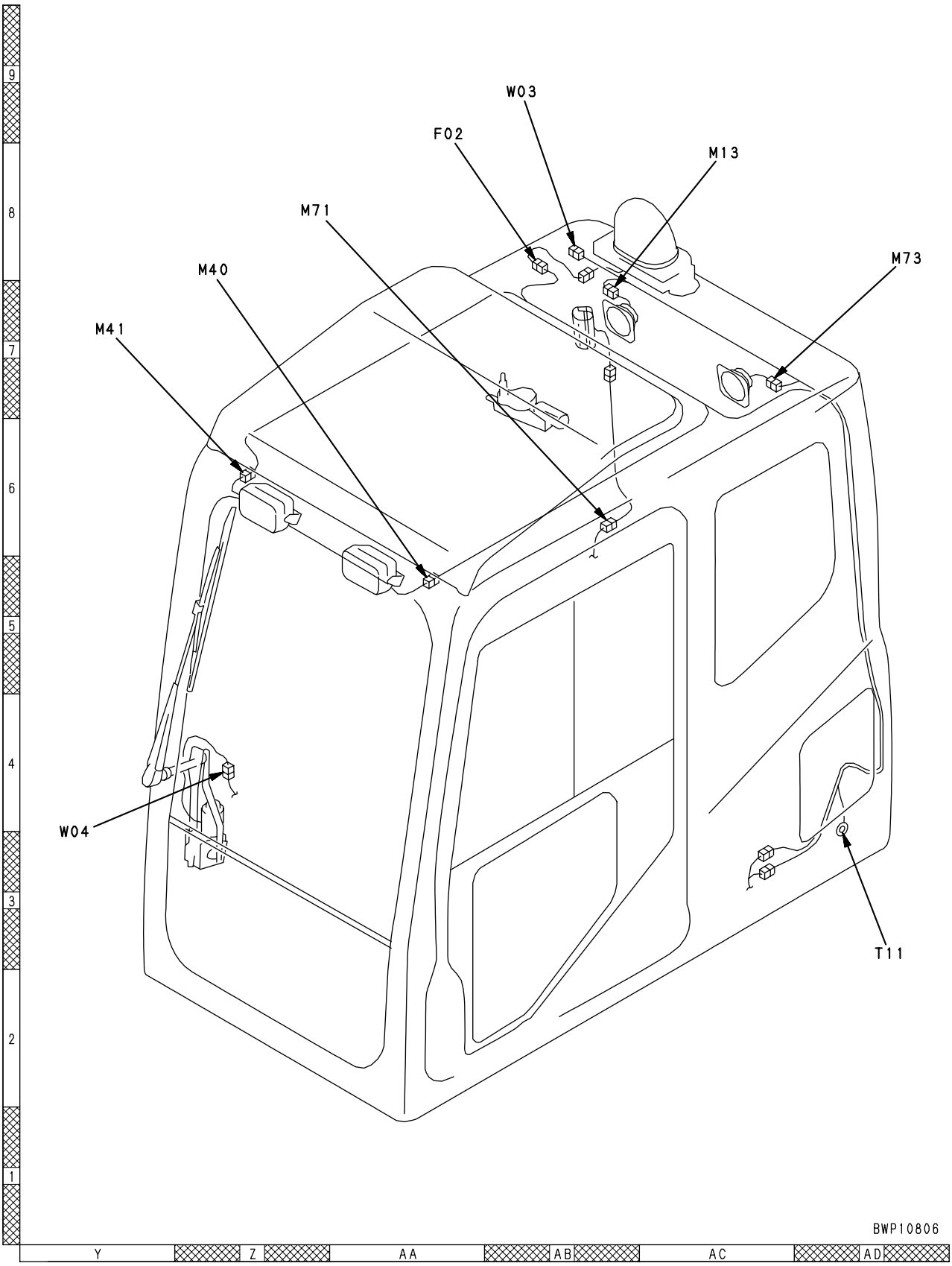
CONNECTOR LOCATION STEREOGRAM



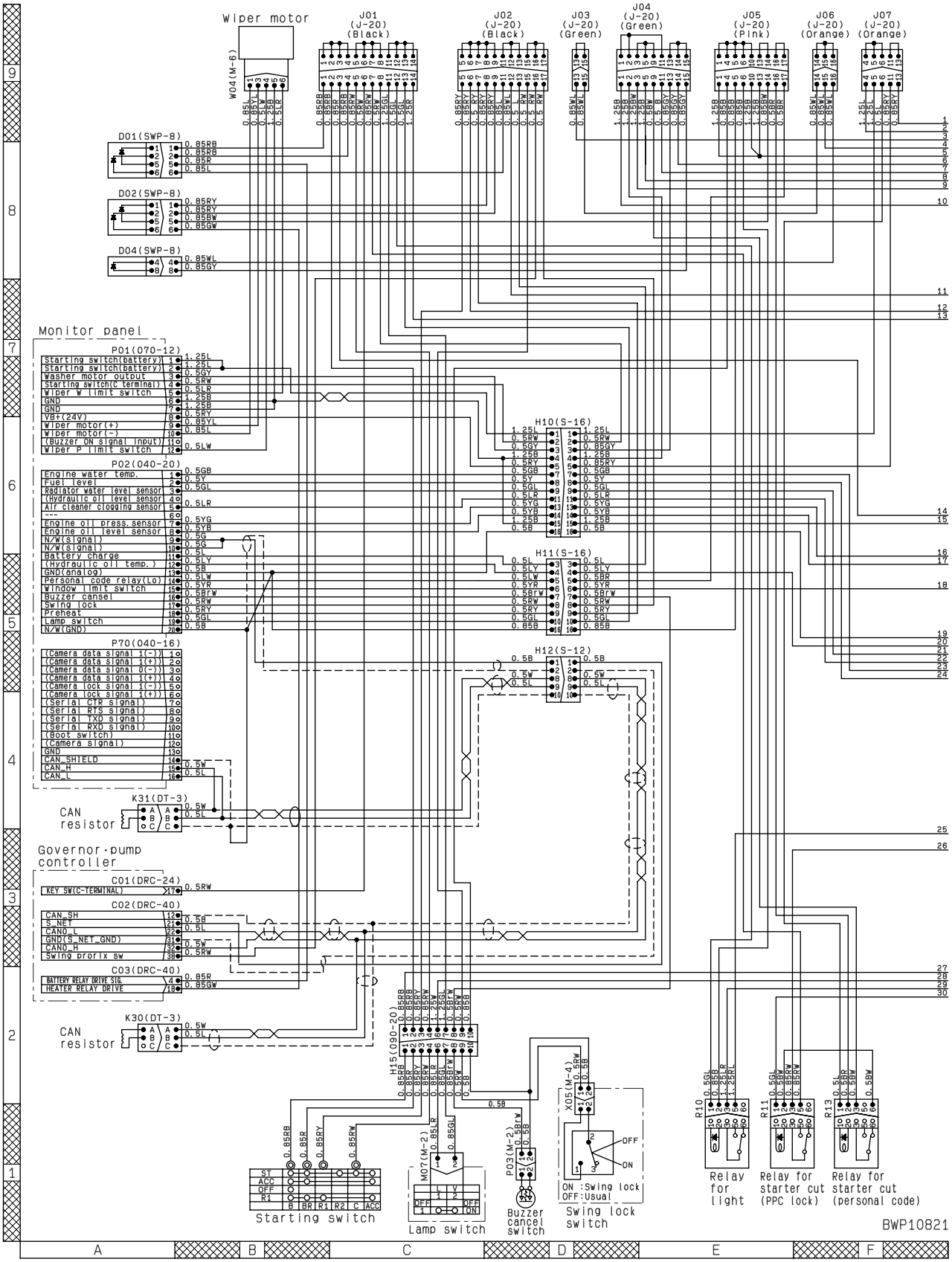

V12
A42
E11
E10
E08
P05
P07
R22
E07
M02
S01
S02
V22
V21
S03
S04
S05
A61
S06
A30
A31
A33
S07
A50
S09
S08
A52
M42
A51
A43
A16
A15
A13
A12
A11
A10
A40
A41
Y13
Y09
Y
V01
V02
V03
V04
V05
V06
V08
Y
BWP10914
G
H
I
J
K
L


S22
S23
S25
S21
M38
X05
R13
P03
R11
M07
R10
E06
M22
H15
P01
P15
P02
P70
K31
M19
A09
A03
A06
A04
S30
S31
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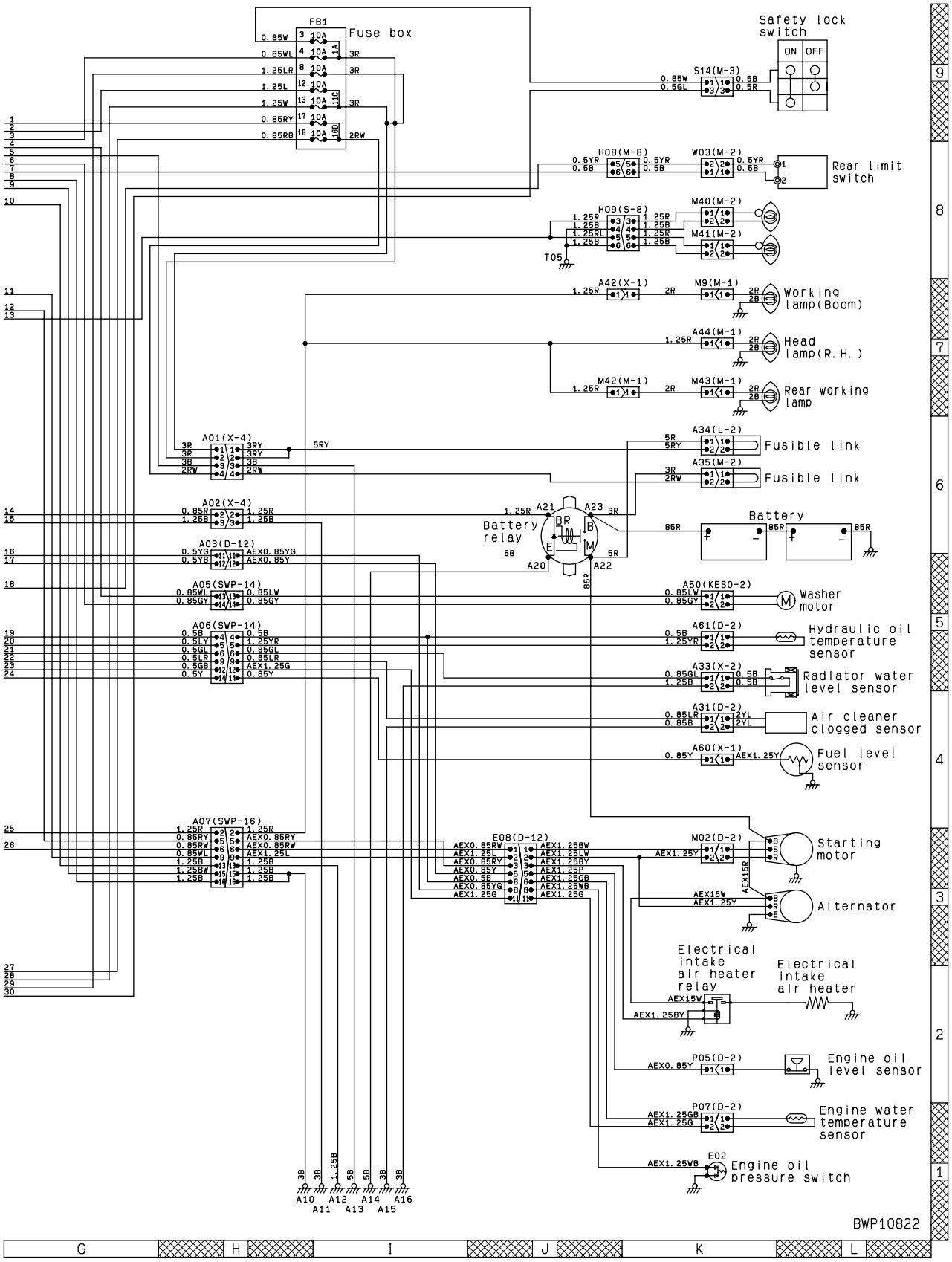

M32
H12
H11
H10
K30
J07
J08
M46
M79
C01
C02
C03
J01
M34
J02
J03
M21
J04
D01
D02
J05
C09
J06
R20
FB1
M26
M27
H09
M28
H08
M33
M29
M30
P05
T05
G03
G02
G05
G01
G04
M31
K19
M45
M72
T06A
M23
A02
A05
A01
A07
S14
A80
BWP10916
S
T
U
V
W
X


W03
F02
M13
M71
M73
M40
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AD

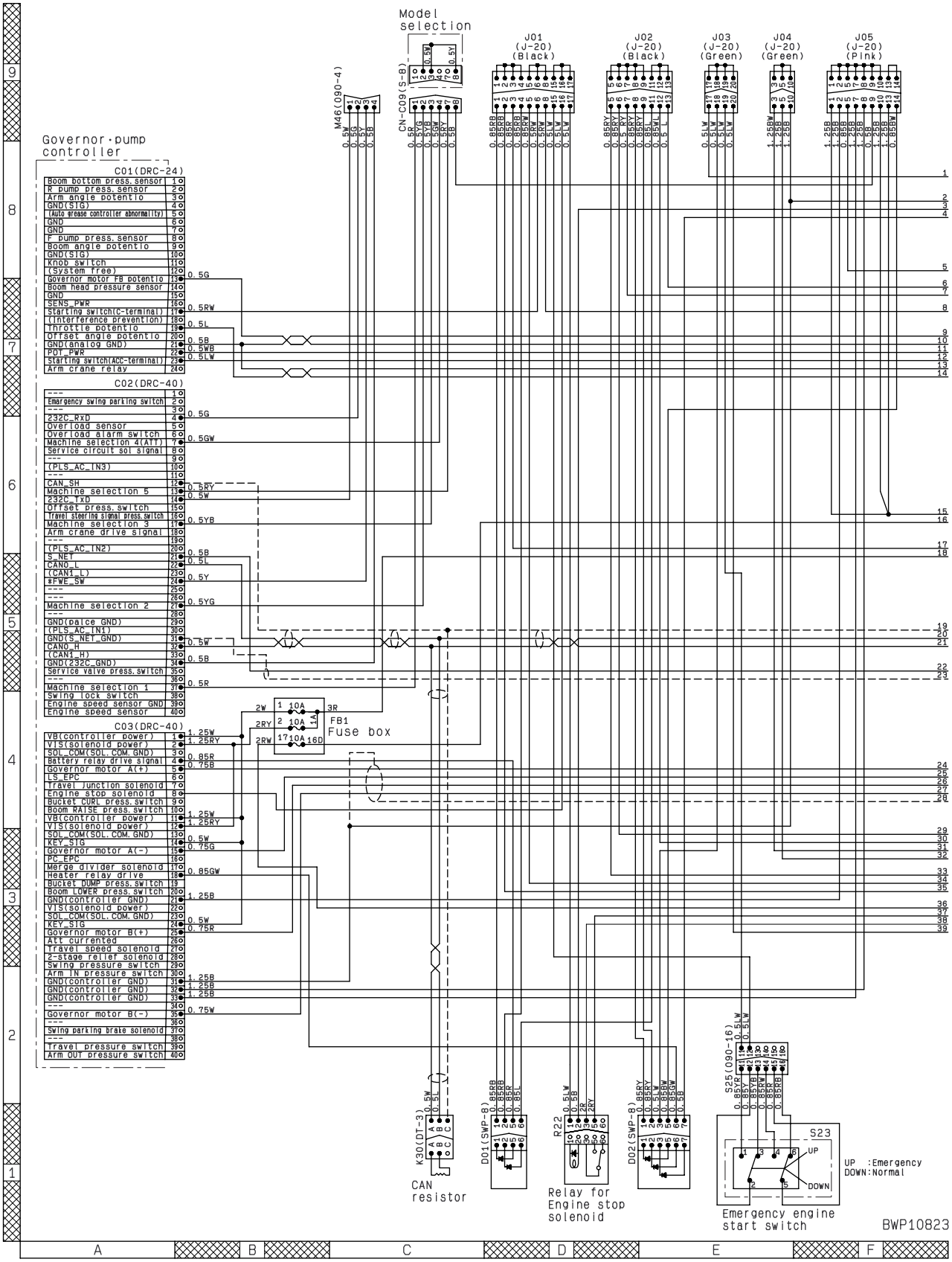
Monitor Panel System Circuit Diagram (M Circuit)



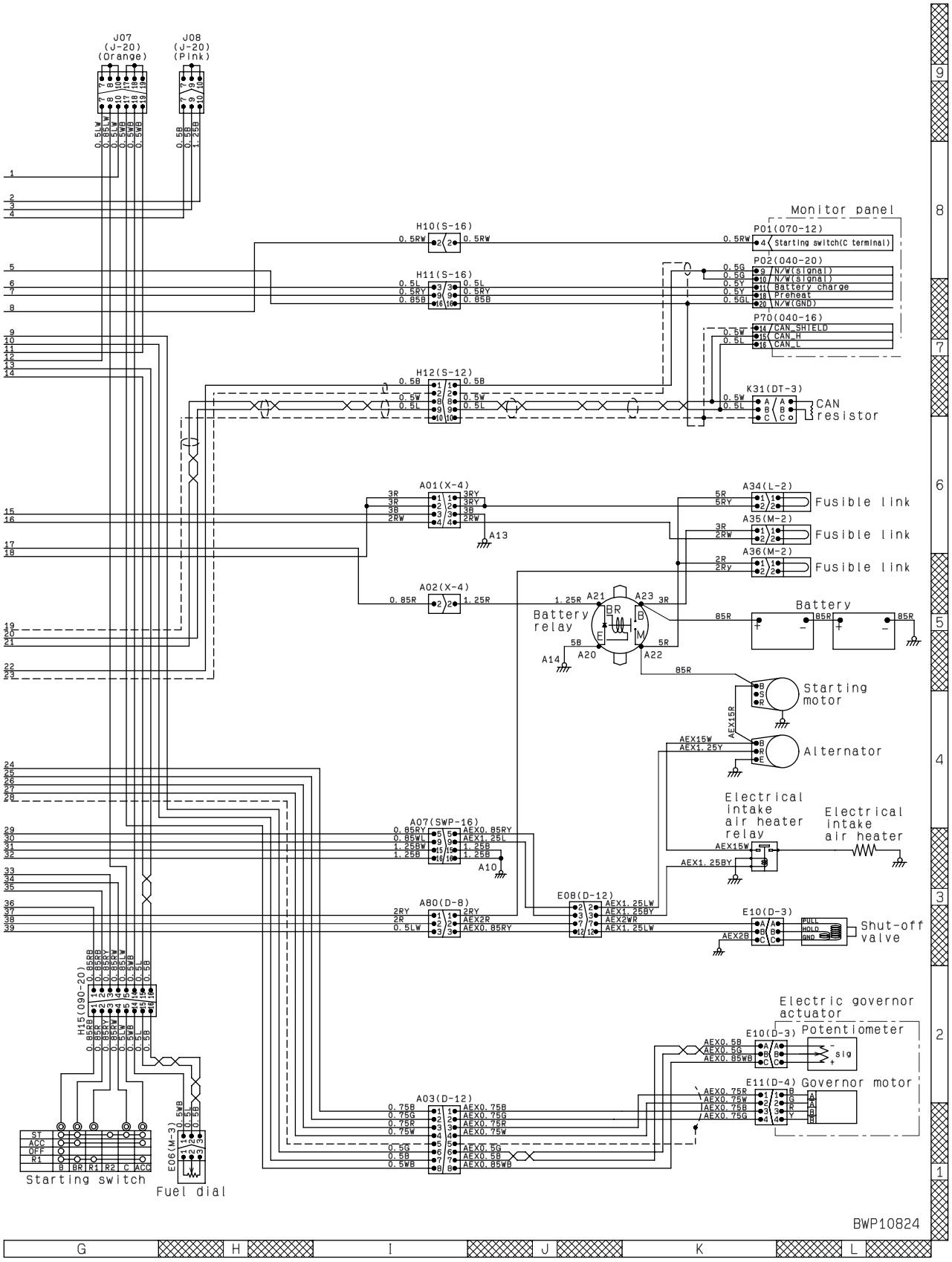
★ This circuit diagram has been compiled by extracting the monitor panel system and engine starting system from the overall electrical circuit diagram.



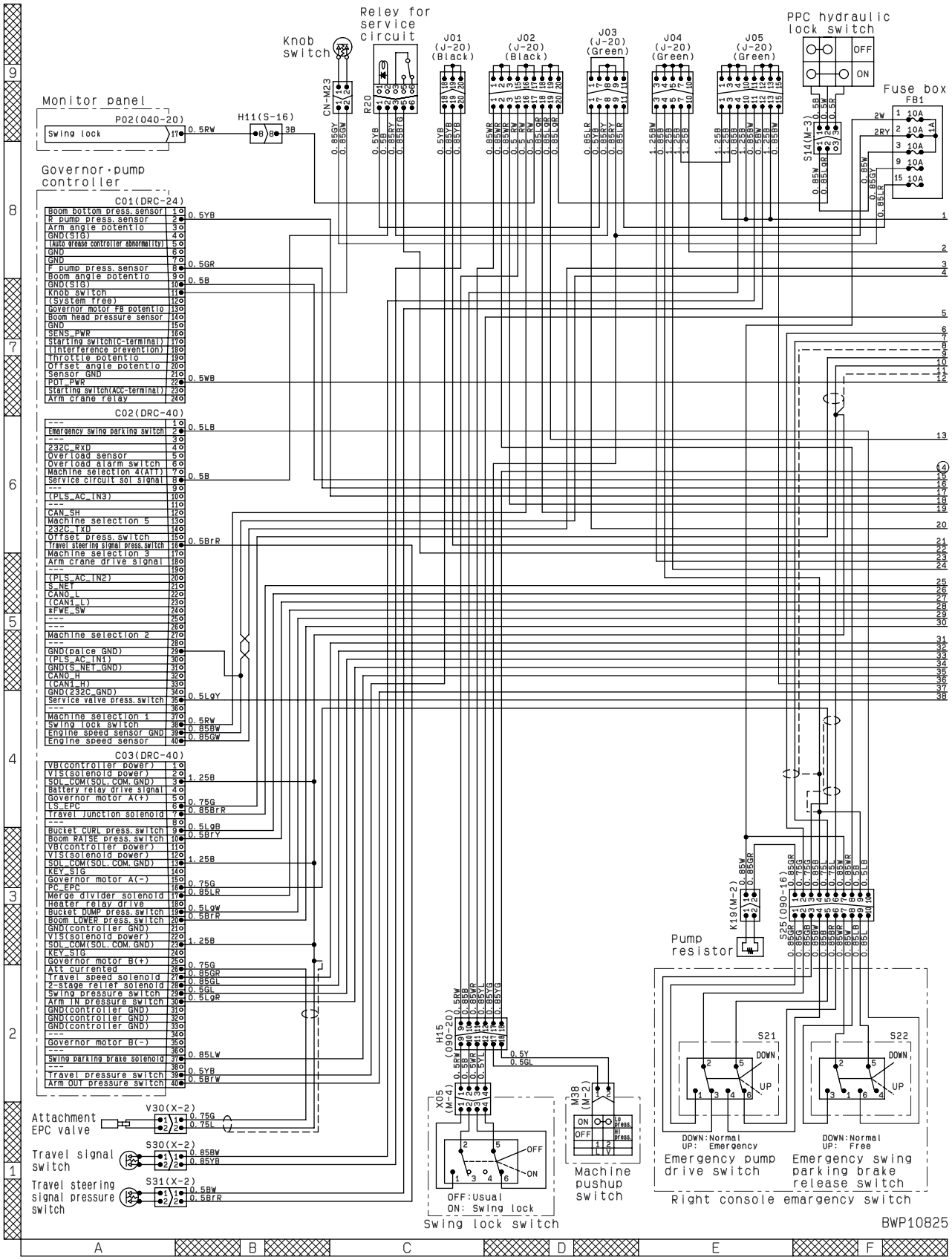
Governor Control System Circuit Diagram (G Circuit) of Governor•Pump Controller



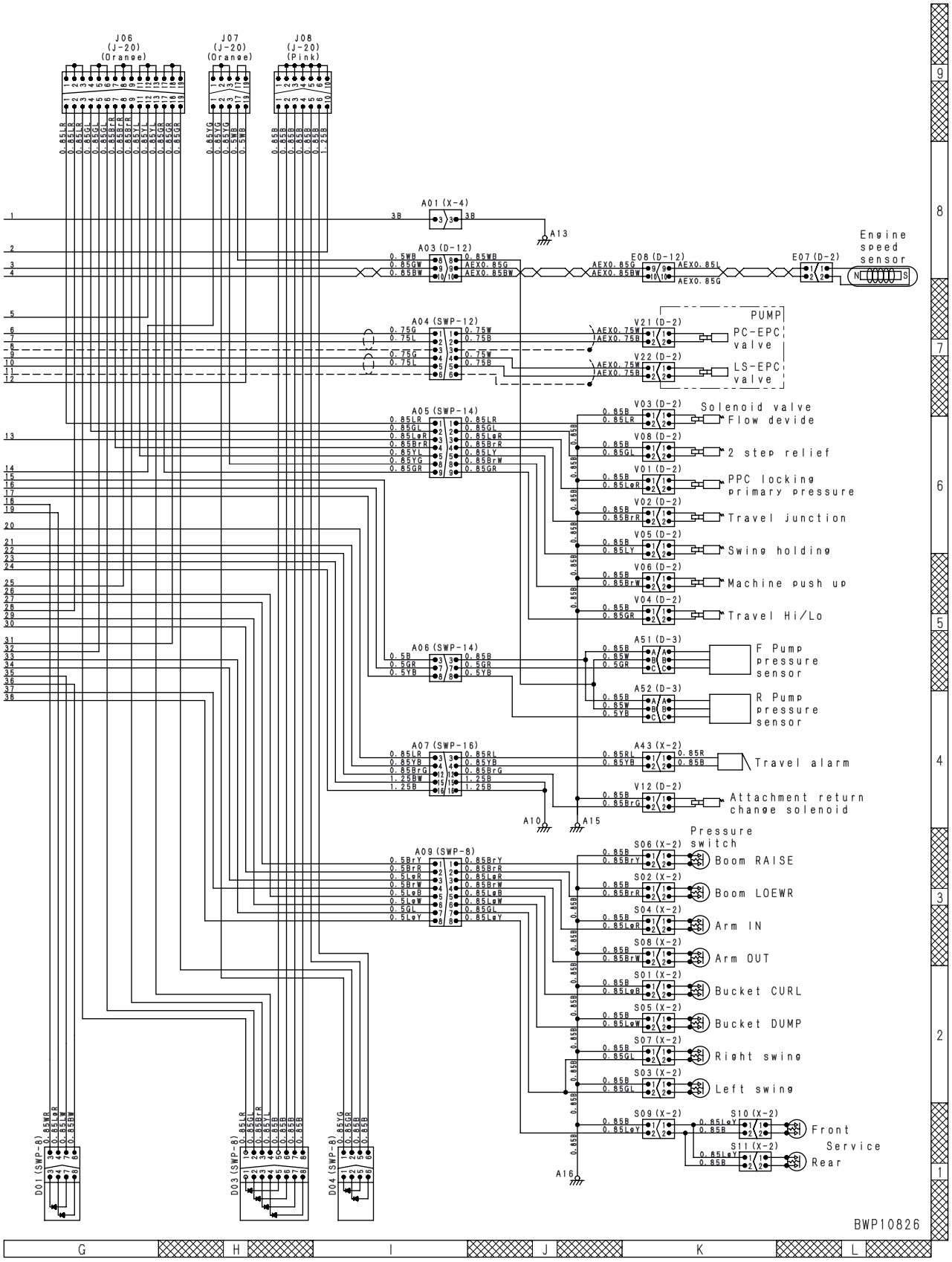
★ This circuit diagram has been compiled by extracting the governor•pump controller system (power source, governor control, model selection and communication) from the overall electrical circuit diagram.



Pump Control System Circuit Diagram (P Circuit) of Governor•Pump Controller

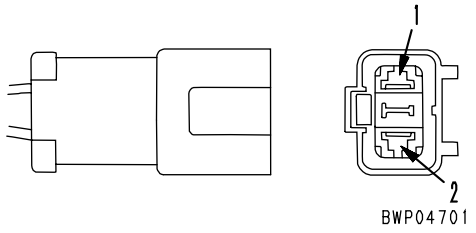
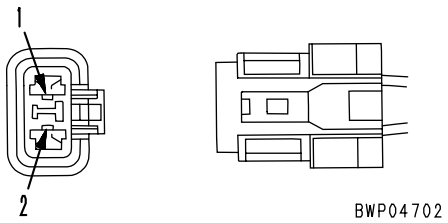
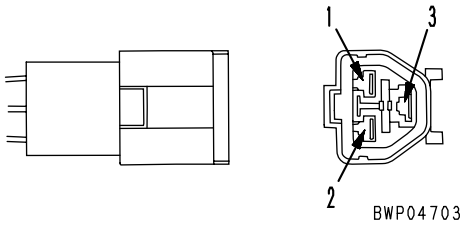
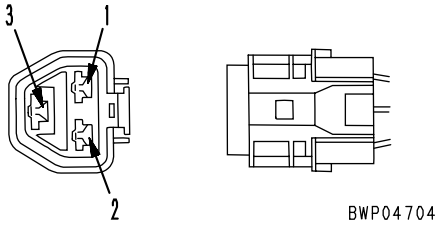
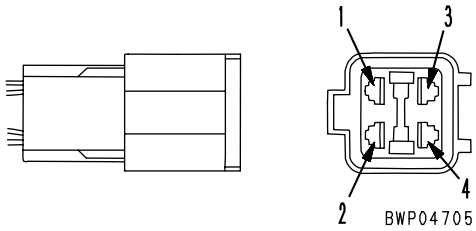
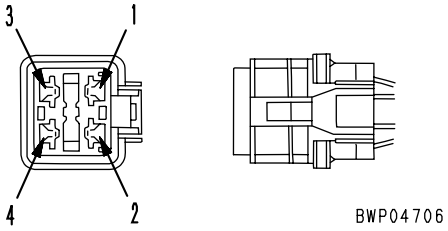


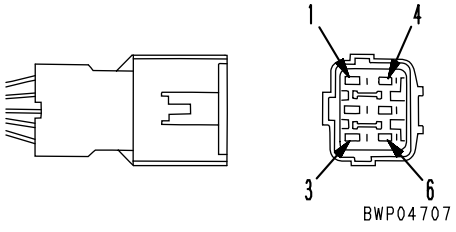
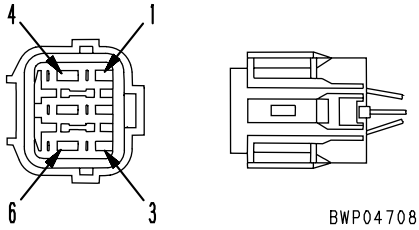
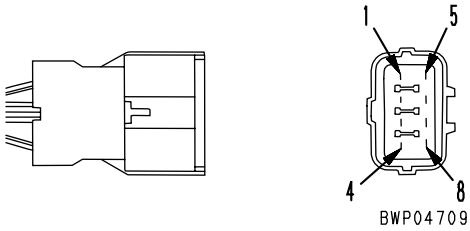
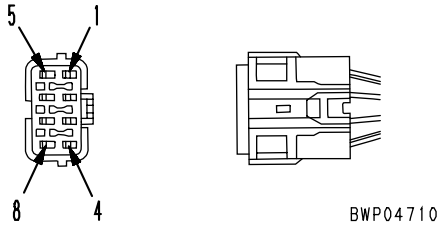
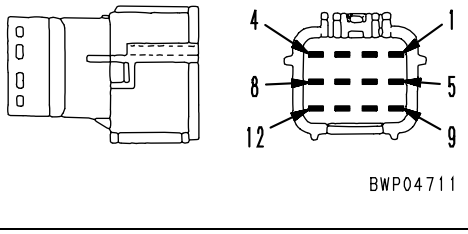
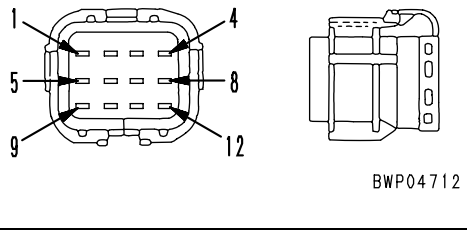
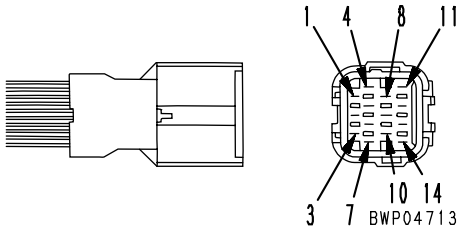
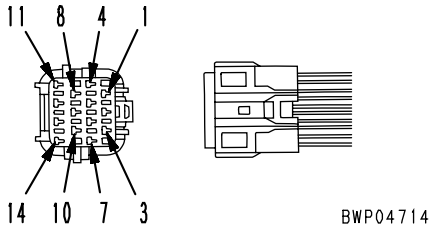
★ This circuit diagram has been compiled by extracting the governor•pump controller system (pump control), PPC lock system, machine push-up system and backup alarm system from the overall electrical circuit diagram.

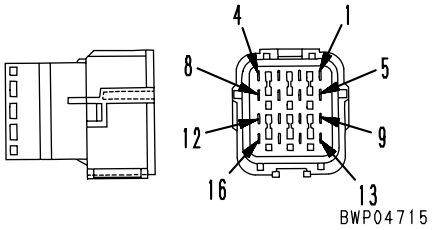
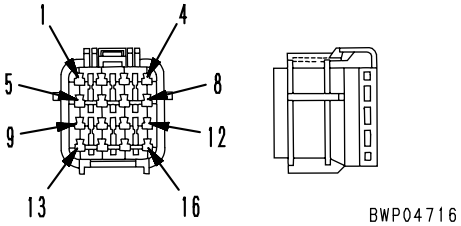


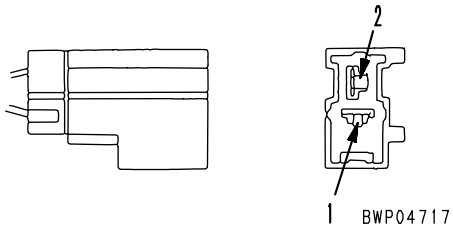
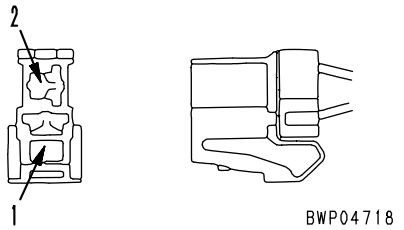
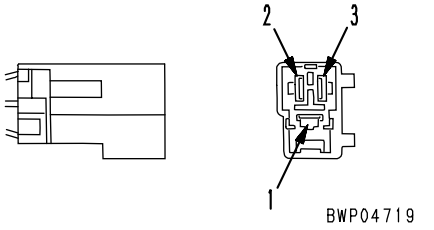
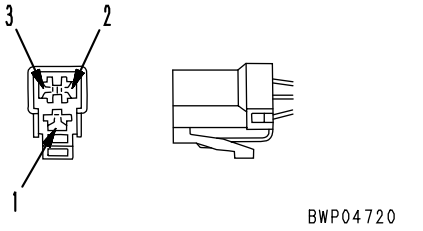
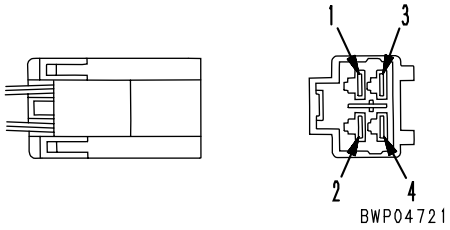
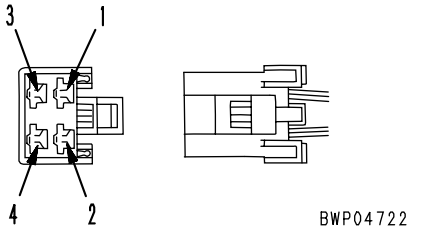
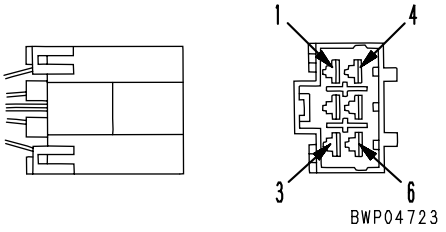
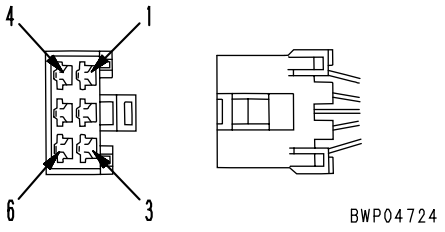
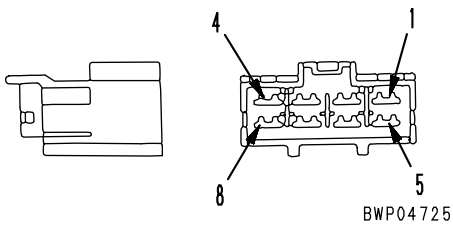
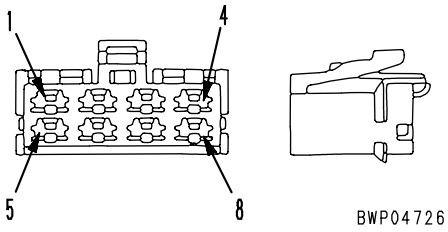
CONNECTION TABLE FOR CONNECTOR PIN NUMBERS

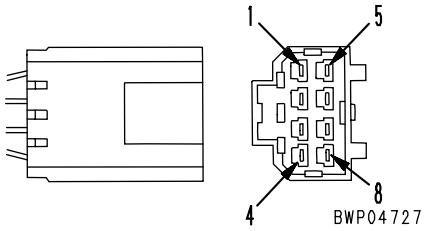
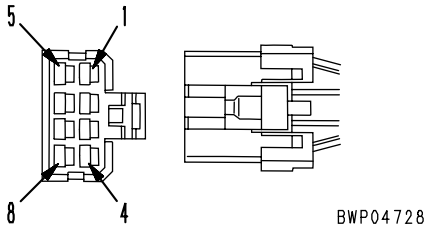
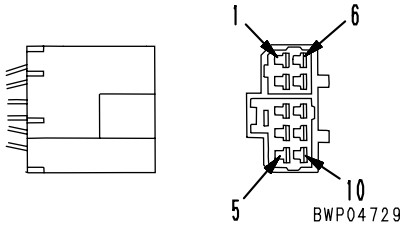
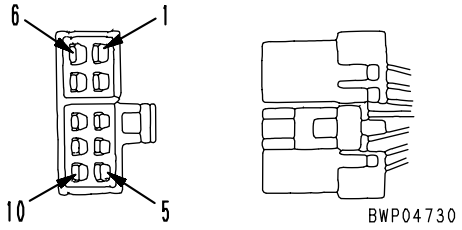
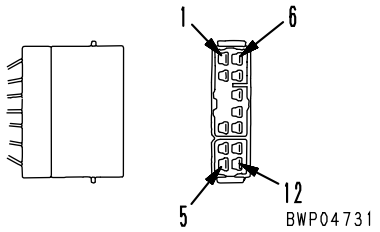
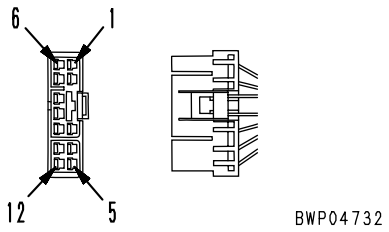
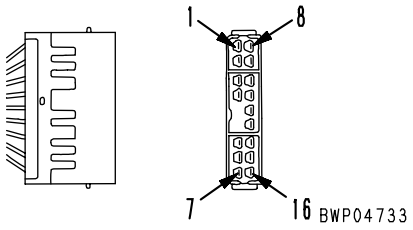
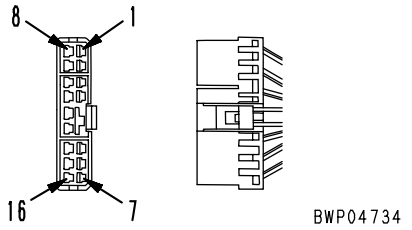
★ The terms male and female refer to the pins, while the terms male housing and female housing refer to the mating portion of the housing.

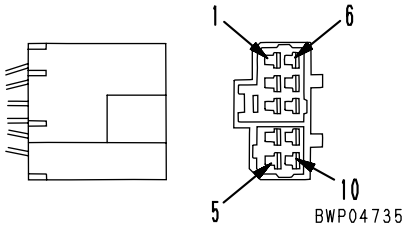
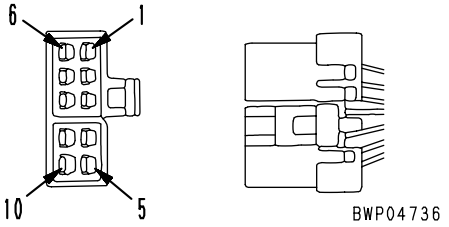
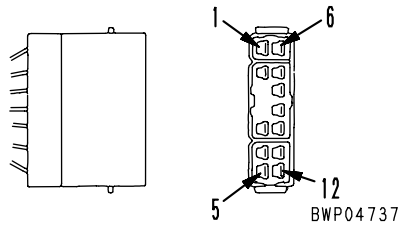
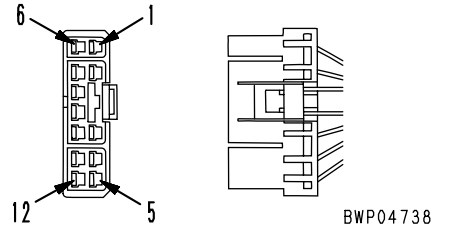
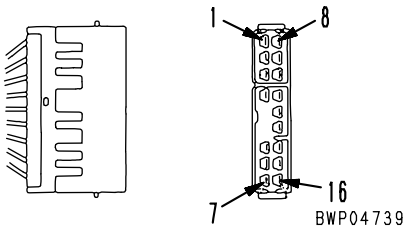
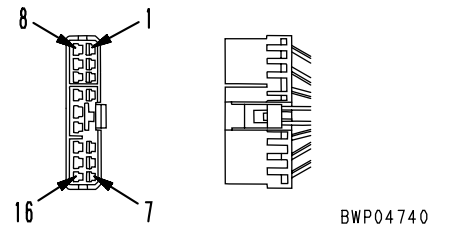
<table>
<tr><td rowspan="2">No.of pins</td><td colspan="2">X type connector</td><td rowspan="2">T-adapter Part No.</td></tr>
<tr><td>Male (female housing)</td><td>Female (male housing)</td></tr>
<tr><td>1</td><td>Part No.: 08055-00181</td><td>Part No.: 08055-00191</td><td>799-601-7010</td></tr>
<tr><td rowspan="2">2</td><td> 
</td><td> 
</td><td rowspan="2">799-601-7020</td></tr>
<tr><td>Part No.: 08055-00282</td><td>Part No.: 08055-00292</td></tr>
<tr><td rowspan="2">3</td><td> 
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</td><td rowspan="2">799-601-7030</td></tr>
<tr><td>Part No.: 08055-00381</td><td>Part No.: 08055-00391</td></tr>
<tr><td rowspan="2">4</td><td> 
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</td><td rowspan="2">799-601-7040</td></tr>
<tr><td>Part No.: 08055-00481</td><td>Part No.: 08055-00491</td></tr>
<tr><td>—</td><td>Terminal part No.: 79A-222-3370
• Electric wire size: 0.85
• Grommet: Black
• Q’ty: 20</td><td>Terminal part No.: 79A-222-3390
• Electric wire size: 0.85
• Grommet: Black
• Q’ty : 20</td><td>—</td></tr>
<tr><td>—</td><td>Terminal part No.: 79A-222-3380
• Electric wire size: 2.0
• Grommet: Red
• Q’ty: 20</td><td>Terminal part No.: 79A-222-3410
• Electric wire size: 2.0
• Grommet: Red
• Q’ty: 20</td><td>—</td></tr>
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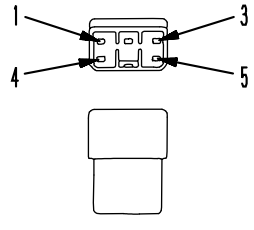
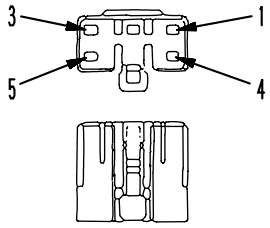
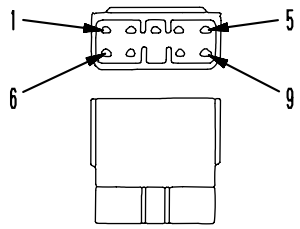
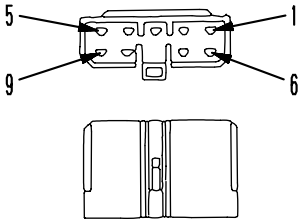
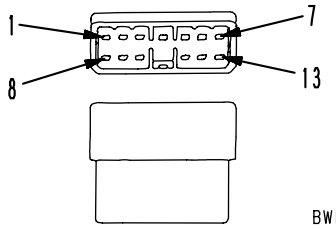
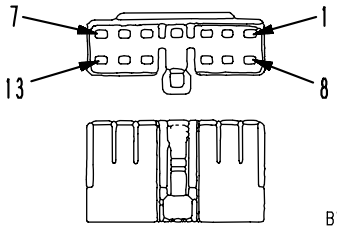
No.of pins	SWP type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
6			799-601-7050
	Part No.: 08055-10681	Part No.: 08055-10691	
8			799-601-7060
	Part No.: 08055-10881	Part No.: 08055-10891	
12			799-601-7310
	Part No.: 08055-11281	Part No.: 08055-11291	
14			799-601-7070
	Part No.: 08055-11481	Part No.: 08055-11491	

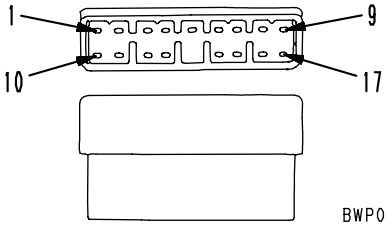
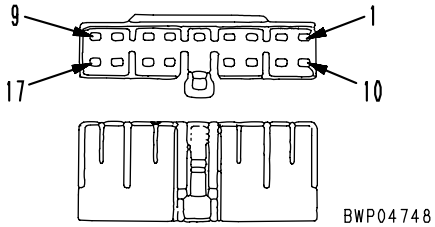
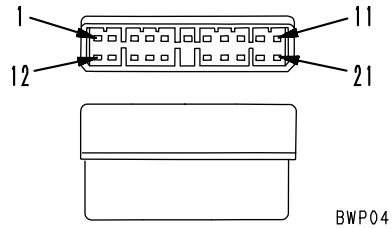
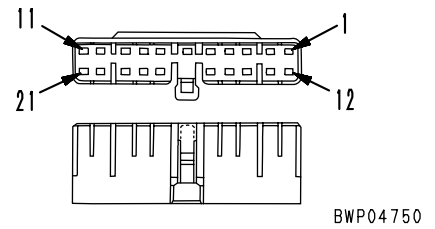
No. of pins	SWP type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
16			799-601-7320
	Part No.: 08055-11681	Part No.: 08055-11691	
—	Terminal part No.: • Electric wire size: 0.85 • Grommet: Black • Q'ty: 20	Terminal part No.: • Electric wire size: 0.85 • Grommet: Black •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

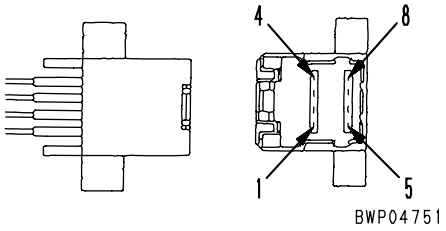
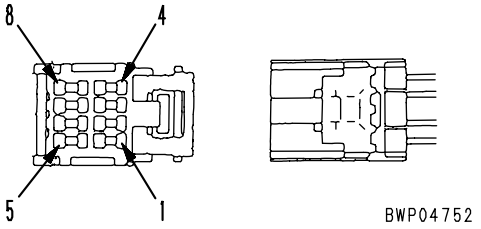
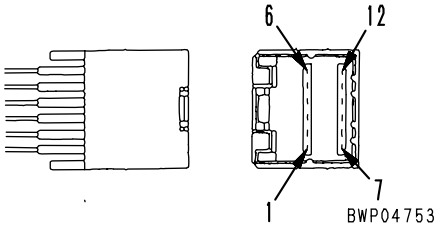
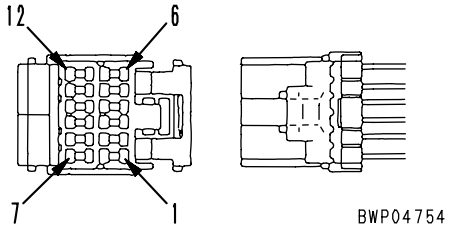
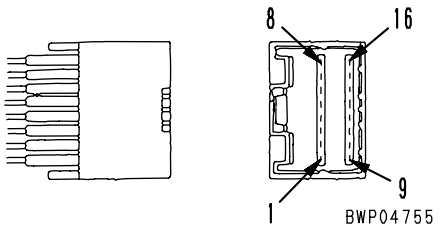
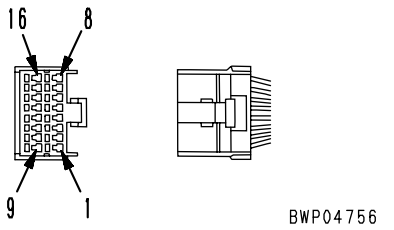
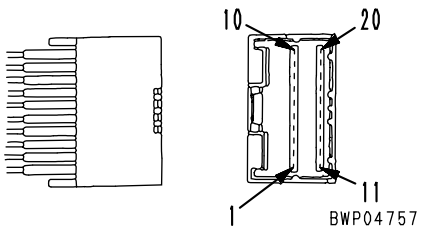
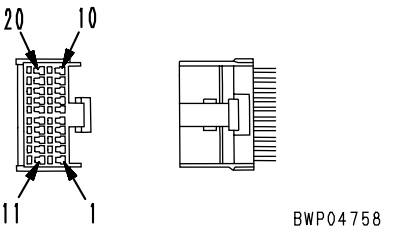
No.of pins	M type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
1	Part No.: 08056-00171	Part No.: 08056-00181	799-601-7080
2			799-601-7090
	Part No.: 08056-00271	Part No.: 08056-00281	
3			799-601-7110
	Part No.: 08056-00371	Part No.: 08056-00381	
4			799-601-7120
	Part No.: 08056-00471	Part No.: 08056-00481	
6			799-601-7130
	Part No.: 08056-00671	Part No.: 08056-00681	
8			799-601-7390
	Part No.: 08056-00871	Part No.: 08056-00881	

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

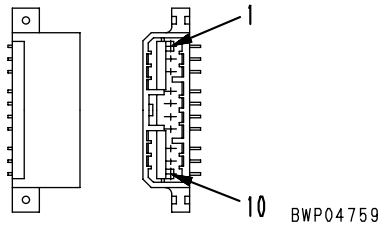
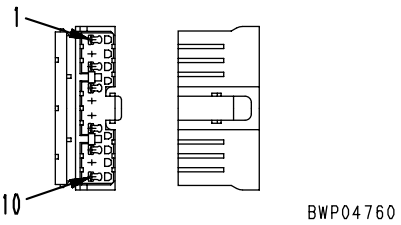
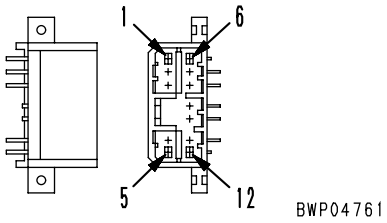
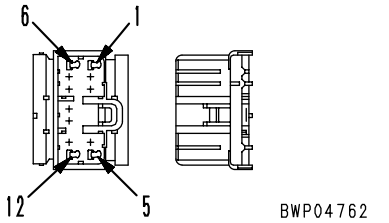
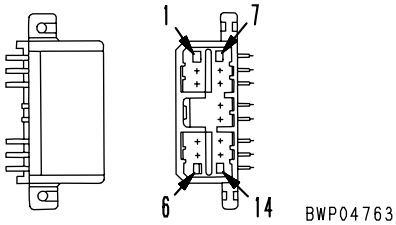
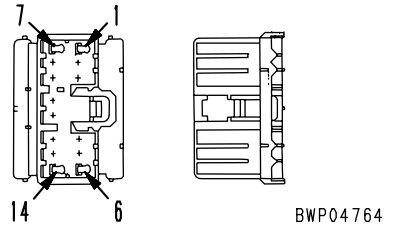
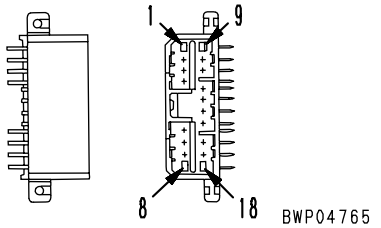
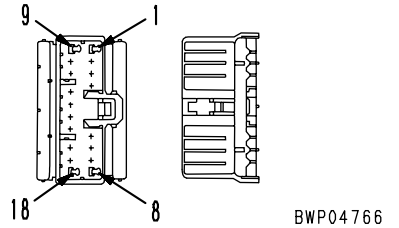
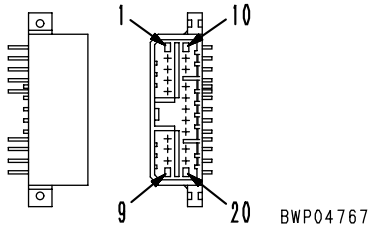
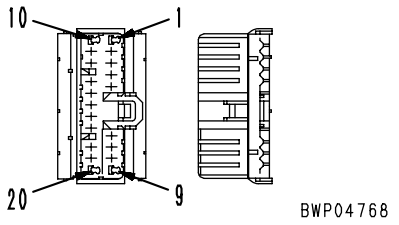
No.of pins	S type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
10 (Blue)			—
	—	—	
12 (Blue)			799-601-7160
	Part No.: 08056-11272	Part No.: 08056-11282	
16 (Blue)			799-601-7170
	Part No.: 08056-11672	Part No.: 08056-11682	

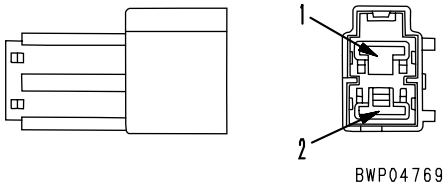
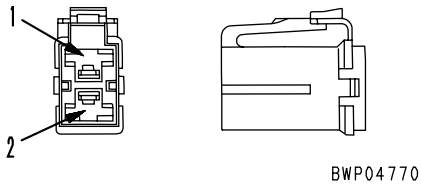
No.of pins	MIC type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
7	Body part No.: 79A-222-2640 (Q'ty: 5)	Body part No.: 79A-222-2630 (Q'ty: 5)	—
11	Body part No.: 79A-222-2680 (Q'ty: 5)	Body part No.: 79A-222-2670 (Q'ty: 5)	—
5	 BWP04741	 BWP04742	799-601-2710
	Body part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

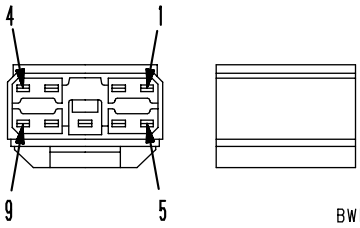
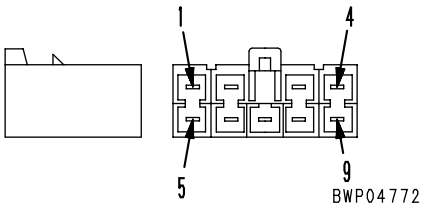
No.of pins	MIC type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
17			799-601-2730
	Body part No.: 79A-222-2730 (Q'ty: 2)	Body part No.: 79A-222-2720 (Q'ty: 2)	
21			799-601-2740
	Body part No.: 79A-222-2750 (Q'ty: 2)	Body part No.: 79A-222-2740 (Q'ty: 2)	
	Terminal part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

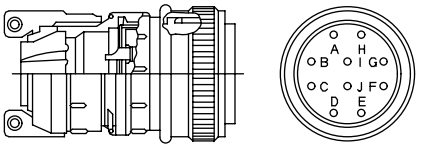
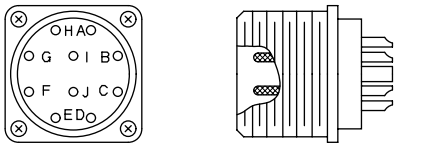
No.of pins	AMP040 type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
8			799-601-7180
	—	Housing part No.: 79A-222-3430 (Q'ty: 5)	
12			799-601-7190
	—	Housing part No.: 79A-222-3440 (Q'ty: 5)	
16			799-601-7210
	—	Housing part No.: 79A-222-3450 (Q'ty: 5)	
20			799-601-7220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

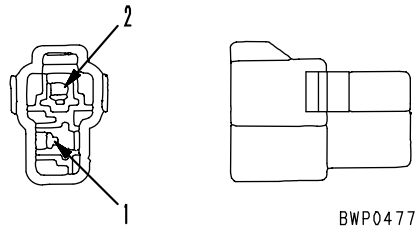
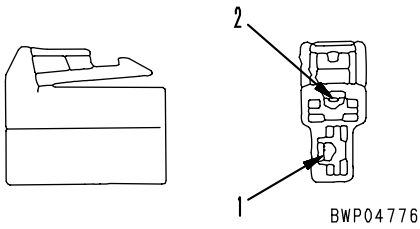
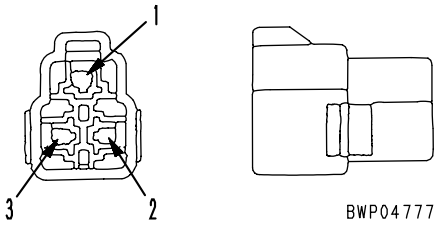
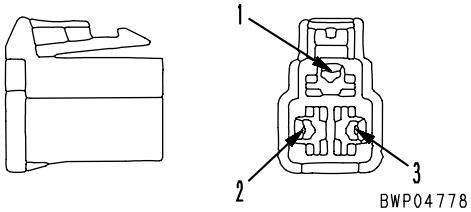
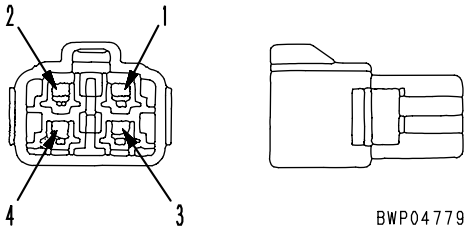
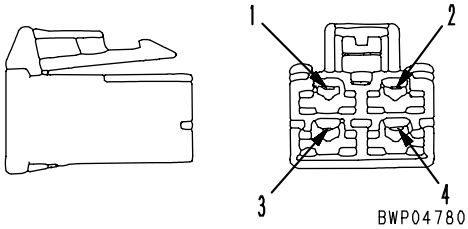
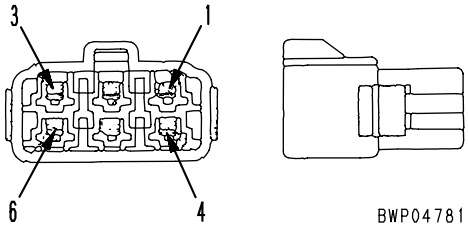
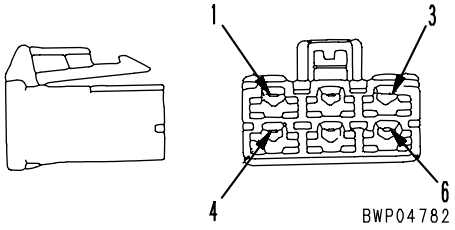
★ Terminal part No.: 79A-222-3470 (No relation with number of pins)

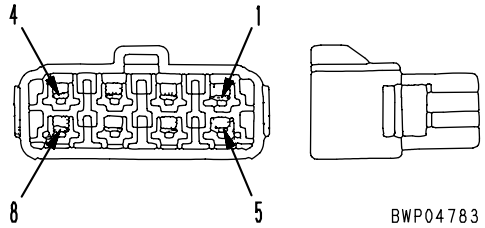
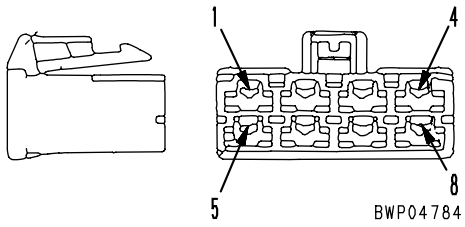
No.of pins	AMP070 type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
10			799-601-7510
	—	Part No.: 08195-10210	
12			799-601-7520
	—	Part No.: 08195-12210	
14			799-601-7530
	—	Part No.: 08195-14210	
18			799-601-7540
	—	Part No.: 08195-18210	
20			799-601-7550
	—	Part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

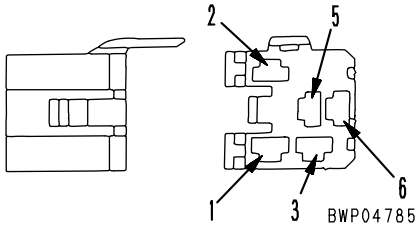
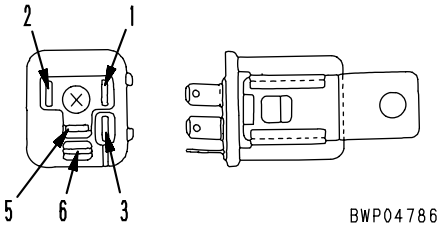
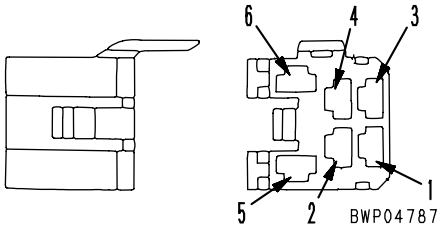
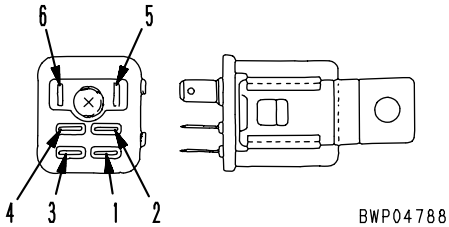
No.of pins	L type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
2	 BWP04769	 BWP04770	—
	—	—	

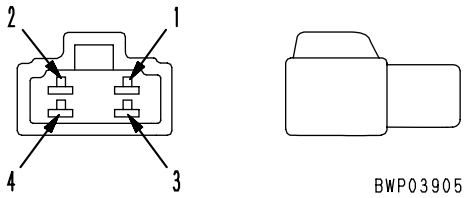
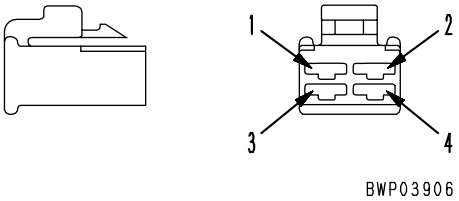
No.of pins	Connector for PA		
	Male (female housing)	Female (male housing)	T-adapter Part No.
9	 BWP04771	 BWP04772	—
	—	—	

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

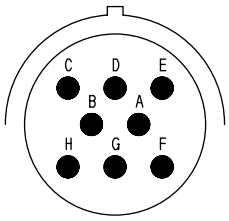
No.of pins	KES 1 (Automobile) connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
2			—
	Part No.: 08027-10210 (Natural color) 08027-10220 (Black)	Part No.: 08027-10260 (Natural color) 08027-10270 (Black)	
3			—
	Part No.:08027-10310	Part No.:08027-10360	
4			—
	Part No.: 08027-10410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

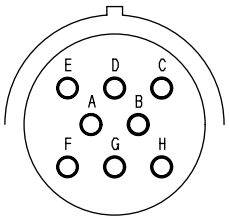
No.of pins	KES 1 (Automobile) connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
8			—
	Part No.: 08027-10810 (Natural color) 08027-10820 (Black)	Part No.: 08027-10860 (Natural color) 08027-10870 (Black)	

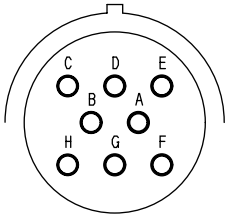
No.of pins	Connector for relay (Socket type)		
	Male (female housing)	Female (male housing)	T-adapter Part No.
5			799-601-7360
	—	—	
6			799-601-7370
	—	—	

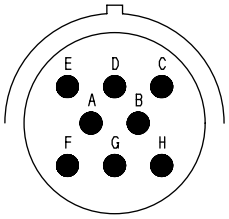
No.of pins	F type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
4	 BWP03905	 BWP03906	—
	—	—	

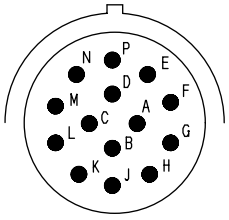
[The pin No. is also marked on the connector (electric wire insertion end)]

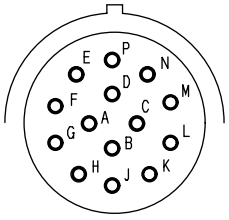
<table>
<tr><td rowspan="2">Type (shell size code)</td><td colspan="3">HD30 Series connector</td></tr>
<tr><td>Body (plug)</td><td>Body (receptacle)</td><td>T-adapter Part No.</td></tr>
<tr><td rowspan="4">18-8 (1)</td><td>Pin (male terminal)</td><td>Pin (female termial)</td><td rowspan="2">799-601-9210</td></tr>
<tr><td> 

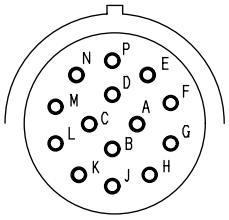
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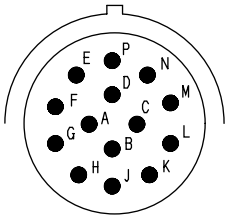
BWP05002</td></tr>
<tr><td>Part No.: 08191-11201, 08191-11202, 08191-11205, 08191-11206</td><td>Part No.: 08191-14101, 08191-14102, 08191-14105, 08191-14106</td></tr>
<tr><td>Pin (female terminal)</td><td>Pin (male termial)</td><td rowspan="2">799-601-9210</td></tr>
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BWP05003</td><td> 

BWP05004</td></tr>
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<tr><td rowspan="4">18-14 (2)</td><td>Pin (male terminal)</td><td>Pin (female termial)</td><td rowspan="2">799-601-9220</td></tr>
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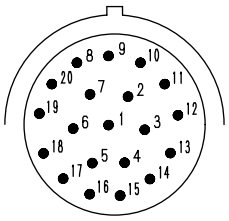
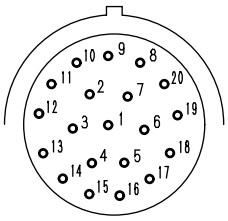
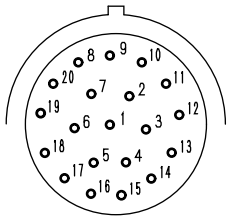
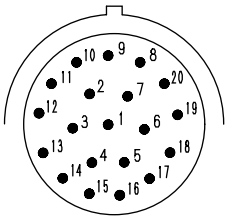
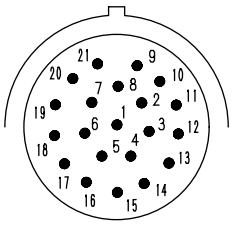
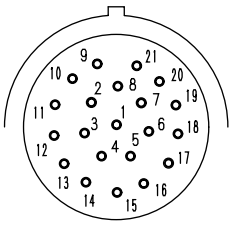
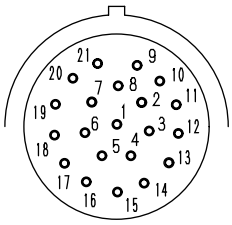
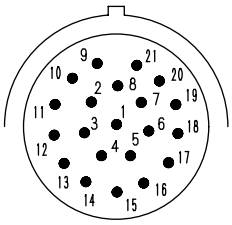
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BWP05006</td></tr>
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<tr><td>Pin (female terminal)</td><td>Pin (male termial)</td><td rowspan="2">799-601-9220</td></tr>
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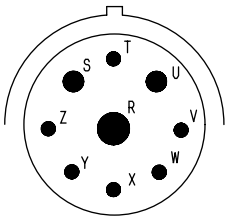
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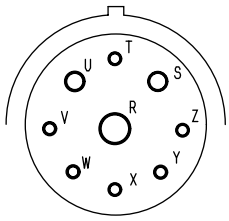
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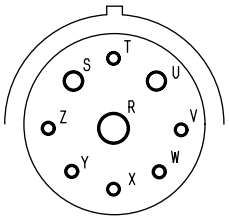
[The pin No. is also marked on the connector (electric wire insertion end)]

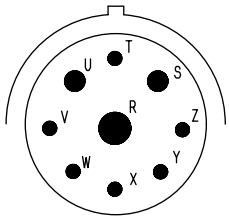
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<tr><td>Body (plug)</td><td>Body (receptacle)</td><td>T-adapter Part No.</td></tr>
<tr><td rowspan="4">18-20 (3)</td><td>Pin (male terminal)</td><td>Pin (female termial)</td><td rowspan="2">799-601-9230</td></tr>
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BWP05010</td></tr>
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<tr><td>Pin (female terminal)</td><td>Pin (male termial)</td></tr>
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BWP05011</td><td> 
BWP05012</td></tr>
<tr><td>Part No.:08191-32201, 08191-32202</td><td>Part No.:08191-33101, 08191-33102</td></tr>
<tr><td rowspan="4">18-21 (4)</td><td>Pin (male terminal)</td><td>Pin (female termial)</td><td rowspan="2">799-601-9240</td></tr>
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<tr><td>Part No.:08191-41201, 08191-42202</td><td>Part No.:08191-44101, 08191-44102</td><td rowspan="3">799-601-9240</td></tr>
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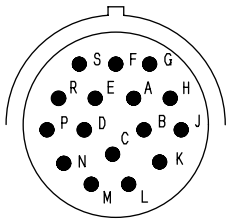
[The pin No. is also marked on the connector (electric wire insertion end)]

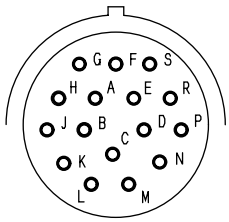
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<tr><td rowspan="6">24-9 (5)</td><td>Pin (male terminal)</td><td>Pin (female termial)</td><td rowspan="3">799-601-9250</td></tr>
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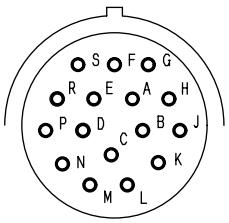
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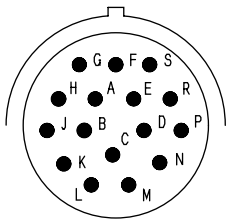
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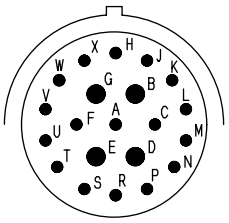
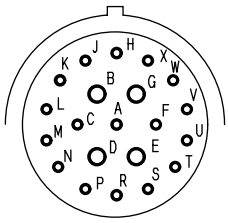
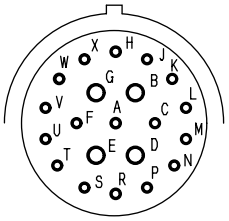
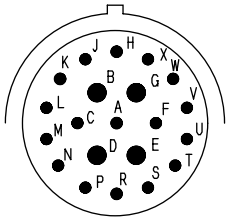
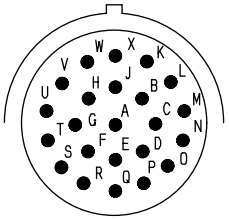
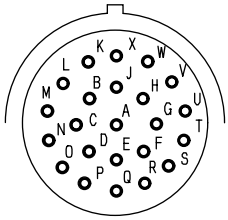
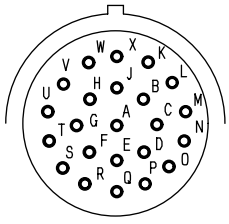
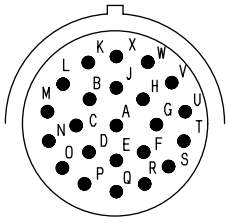
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08191-64105, 08191-64106</td></tr>
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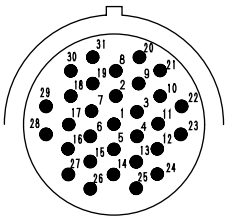
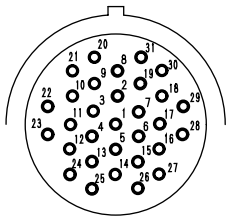
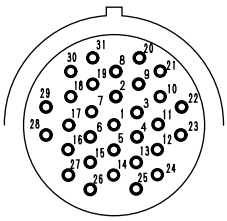
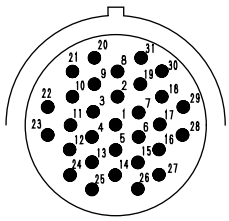
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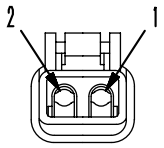
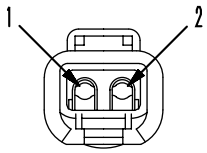
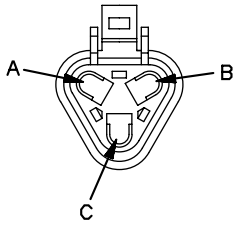
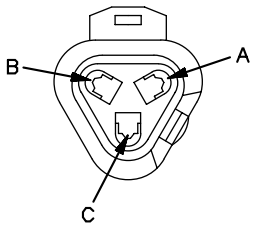
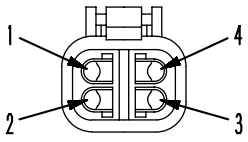
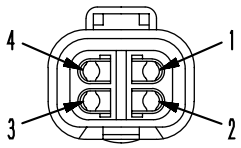
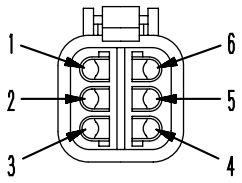
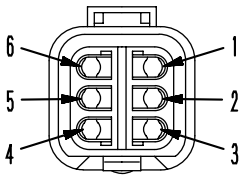
[The pin No. is also marked on the connector (electric wire insertion end)]

<table>
<tr><td rowspan="2">Type (shell size code)</td><td colspan="3">HD30 Series connector</td></tr>
<tr><td>Body (plug)</td><td>Body (receptacle)</td><td>T-adapter Part No.</td></tr>
<tr><td rowspan="6">24-21 (7)</td><td>Pin (male terminal)</td><td>Pin (female termial)</td><td rowspan="3">799-601-9270</td></tr>
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08191-82205, 08191-82206</td><td>Part No.: 08191-83101, 08191-83102
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08191-83105, 08191-83106</td></tr>
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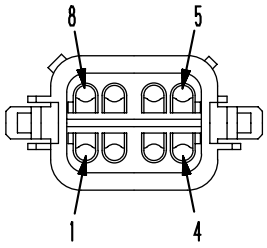
[The pin No. is also marked on the connector (electric wire insertion end)]

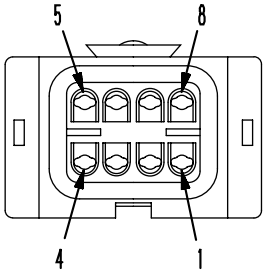
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<tr><td>Body (plug)</td><td>Body (receptacle)</td><td>T-adapter Part No.</td></tr>
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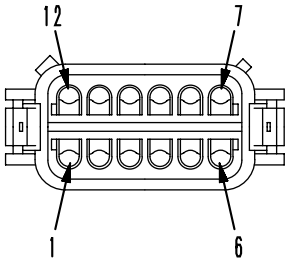
[The pin No. is also marked on the connector (electric wire insertion end)]

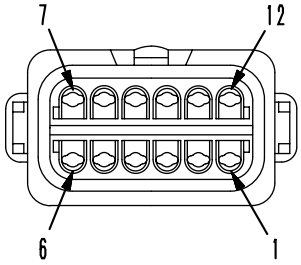
No.of pins	DT Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
2	 BWP05037	 BWP05038	799-601-9020
	Part No.: 08192-12200 (normal type) 08192-22200 (fine wire type)	Part No.: 08192-12100 (normal type) 08192-22100 (fine wire type)	
3	 BWP05039	 BWP05040	799-601-9030
	Part No.: 08192-13200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

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

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<tr><th rowspan="2">No.of pins</th><th colspan="3">DT Series connector</th></tr>
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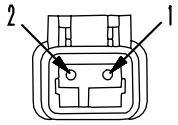
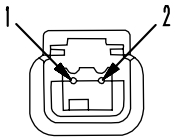
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BWP05046</td><td rowspan="2">8GR: 799-601-9060
8B: 799-601-9070
8G: 799-601-9080
8BR: 799-601-9090</td></tr>
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08192-2820☐ (fine wire type)</td><td>Part No.: 08192-1810☐ (normal type)
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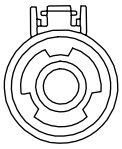
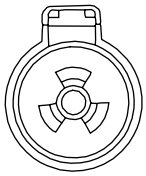
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BWP05048</td><td rowspan="2">12GR: 799-601-9110
12B: 799-601-9120
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12BR: 799-601-9140</td></tr>
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08192-2920☐ (fine wire type)</td><td>Part No.: 08192-1910☐ (normal type)
08192-2910☐ (fine wire type)</td></tr>
</table>

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

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

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

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

TROUBLESHOOTING WHEN SERVICE CODE "ELECTRICAL SYSTEM" AND FAILURE CODE "MECHANICAL SYSTEM" ARE INDICATED

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INFORMATION CONTAINED IN TROUBLESHOOTING TABLE

★ The troubleshooting table and the related circuit diagrams contain the following information. Grasp their contents fully before proceeding to actual troubleshooting work.

User Code	Service Code	Failure Code	Failure phenomenon	Title of failure phenomenon shown in failure history
Display in monitor panel	Display in monitor panel	Display in monitor panel		
Failure content	Failure status as detected by monitor panel or controller			
Response from monitor panel or controller	Action taken by the monitor panel or controller to protect an affected system or equipment, when they detect some failure.			
Phenomenon occurring on machine	Phenomenon that occurs on the machine, resulting from the above action taken by the monitor panel or controller			
Relative information	Information on the failure occurred as well as the troubleshooting			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Cause that presumably triggered failure in question (The assigned No. is for filing purpose only. It does not stand for any priority)	<Content Included> • Standard value in normalcy by which to pass "Good" or "No good" judgement over the presumed cause • Reference for passing the above "Good" or "No Good" judgement <Phenomenon of Wiring Harness Failure> • Disconnection There is a faulty contact at the connector or disconnection of wiring harness occurred. • Defective grounding A wiring harness that is not connected with a grounding circuit has a contact with the grounding circuit. • Short-circuiting A wiring harness that is not connected with a 24 V electric circuit has a contact with the electric circuit. <Precaution for Troubleshooting> 1) Connector No. display method and handling of T-adapter Insert or connect T-adapters in the following manner before starting troubleshooting unless otherwise instructed. • If there is no indication of "male" or "female" in a specific connector No., disconnect the connector and insert the T-adapter into both male and female sides. • If there is an indication of "male" or "female" in a specific connector No., disconnect the connector and connect the T-adepter with only one side of either "male" or "female". 2) Entry sequence of pin No. and handling of circuit tester lead Connect the positive (+) lead and the negative (–) lead OFF a circuit tester in the following manner unless otherwise instructed. • Connect the positive (+) lead with the pin No. indicated at the front or the wiring harness. • Connect the negative (–) lead with the pin No. indicated at the front or the wiring harness.
	2		
	3		
	4		
	5		

Relative Electrical Circuit Diagram

This is part of the electrical circuit diagram which shows the portion where the failure occurred.

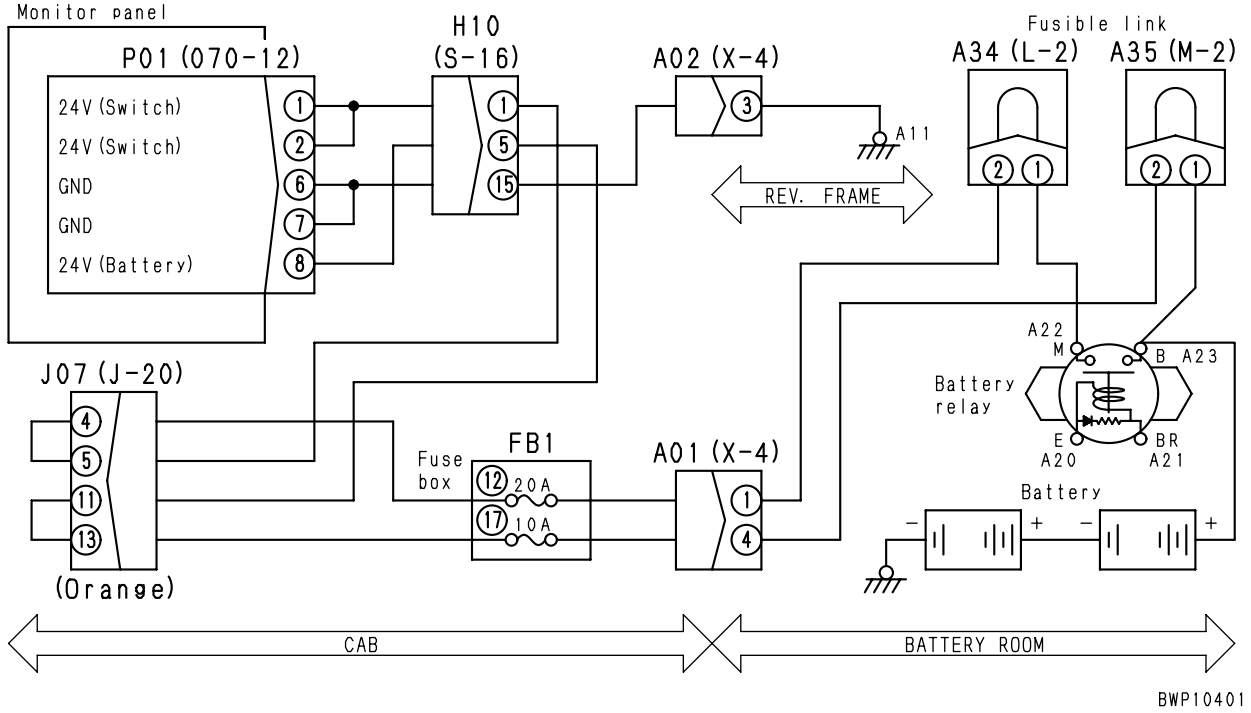
- Connector No.: Indicates (Type - numbers of a pin) (color)
- Arrow: Roughly indicates the location in the machine where it is installed.

Service Code in Electrical System E101 (Abnormal data in Error History)

User Code	Service Code	Failure Code	Failure phenomenon	Abnormal data in the error history (in Monitor Panel system)
—	**E101**	**DAF0KT**		
Failure content	• The voltage in the firm power source circuit for Monitor Panel (battery) has dropped below 12 V or exceeded 36 V.			
Response from Monitor Panel	• None in particular			
Phenomenon occurring on machine	• A display for information on the failure history (in the electrical system) cannot be called.			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting		
	1	Fuse No. 12 defective	If the fuse is blown, there is a big possibility that the circuit has a grounding fault.		
	2	Fusible link No. A35 defective	If the fusible link is blown, there is a big possibility that the circuit has a grounding fault.		
	3	Disconnection of wiring harness (Disconnection or connector contact fault)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position for the troubleshooting.		
			Wiring harness from P01 (female) ⑧ to J07 to FB1-17 outlet	Resistance value	Above 1 Ω
			Wiring harness between FB1-17 inlet and A35 (male) ②	Resistance value	Above 1 Ω
			Wiring harness between A35 (male) ① and A23 (B terminal)	Resistance value	Above 1 Ω
	4	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position for the troubleshooting.		
			Between wiring harness between P01 (female) ⑧ to J07 and FB1-17 outlet and grounding	Resistance value	Above 1 MΩ
			Between wiring harness between FB1-17 inlet and A35 (male) ② and grounding	Resistance value	Above 1 MΩ
			Between wiring harness between A35 (male) ① and A23 (B terminal) and grounding	Resistance value	Above 1 MΩ
	5	Monitor Panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position for the troubleshooting.		
			C03	Voltage	
			Between ⑧ and ⑥ ⑦	20 – 30 V	

Monitor Panel Power Source Electric Circuit Diagram

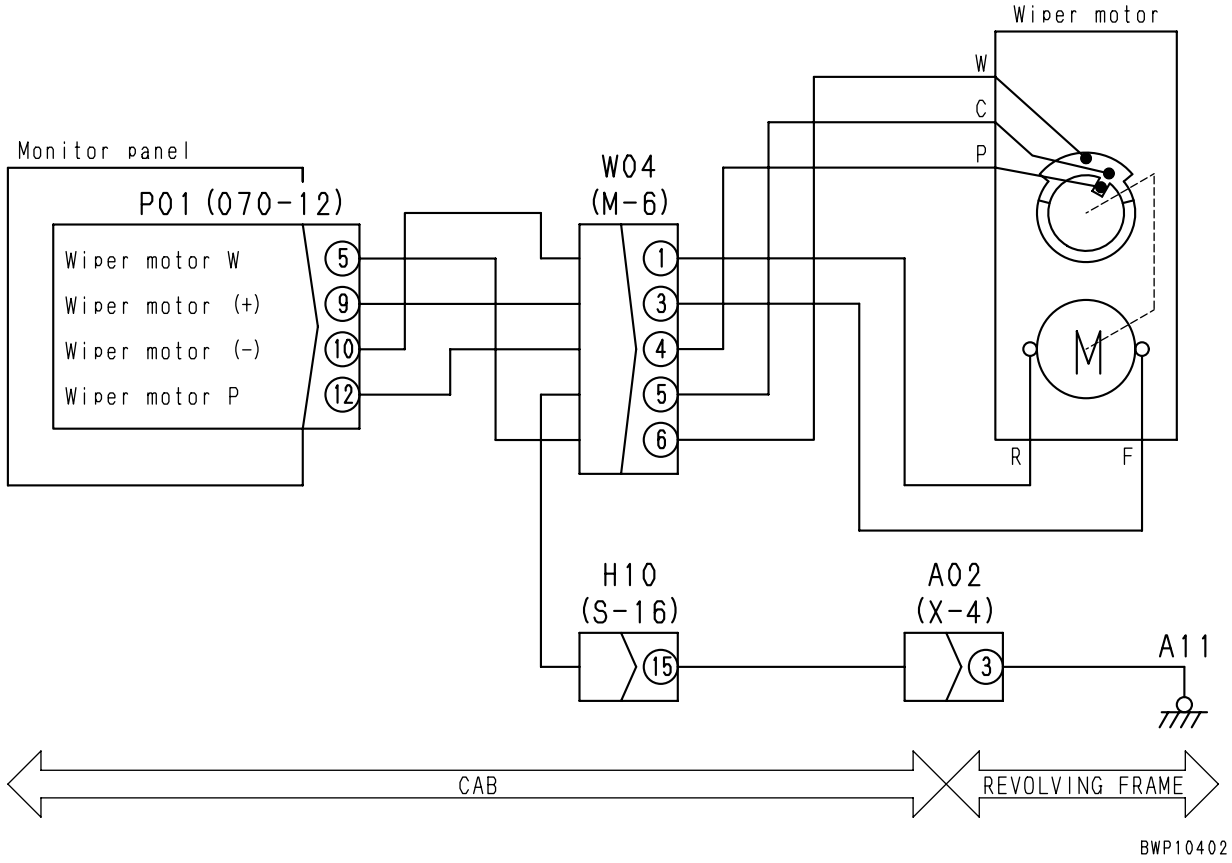


Service Code in Electrical System E112
(Short-circuiting in normal rotation system of windshield wiper motor drive)

User Code	Service Code	Failure Code	Failure phenomenon	Short-circuiting in normal rotation system of windshield wiper motor drive (in monitor panel system)
—	**E112**	**DY2DKB**		
Failure content	• Abnormal current flew to the windshield wiper motor normal rotation circuit, when power is provided.			
Response from Monitor Panel	• Power supply to the windshield wiper motor normal rotation circuit is turned OFF.			
Phenomenon occurring on machine	• The windshield wiper stops moving.			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Windshield wiper motor defective (Internal short-circuiting or grounding fault)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position for the troubleshooting.			
			W04 (female)		Continuity and resistance value	
			Between ③ and ①		Continued	
			Between ③ and grounding		Above 1 MΩ	
	2	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position for the troubleshooting.			
			Between wiring harness between P01 (female) ⑨ and W04 (male) ③ and grounding		Resistance value	Above 1 MΩ
	3	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position for the troubleshooting.			
			P01	Windshield wiper switch	Voltage	
			Between ⑨ and grounding	OFF	Below 3 V	
				ON	Below 3 V⇔20 – 30 V (at constant cycle)	

Electric Circuit Diagram for Monitor Panel Windshield Wiper Motor

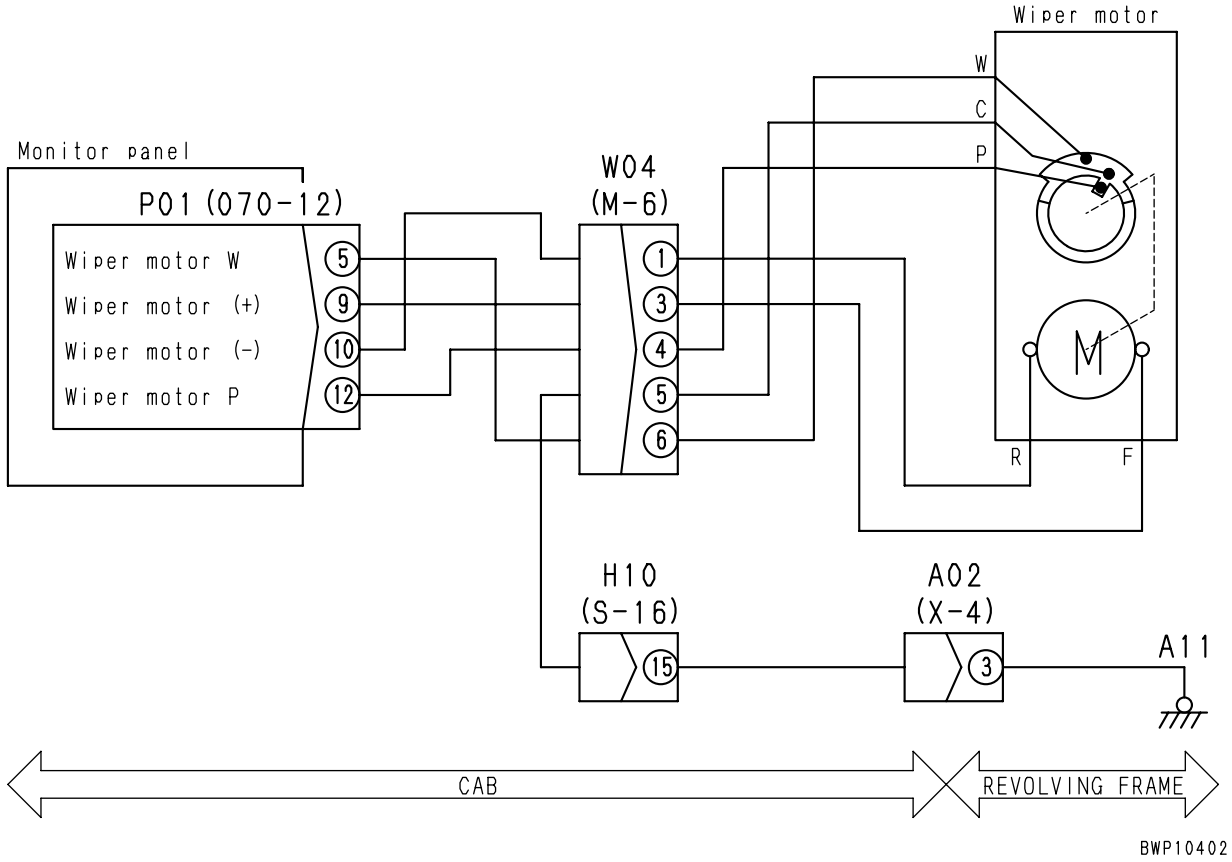


Service Code in Electrical System E113
(Short-circuiting in reverse rotation system of windshield wiper motor drive)

User Code	Service Code	Failure Code	Failure phenomenon	Short-circuiting in reverse rotation system of windshield wiper motor drive (in Monitor Panel system)
—	**E113**	**DY2EKB**		
Failure content	• Abnormal current flew to the reverse rotation circuit of the windshield wiper motor drive, when the windshield wiper was set in motion.			
Response from Monitor Panel	• Power supply to the reverse rotation circuit of the windshield wiper motor drive was switched OFF.			
Phenomenon occurring on machine	• The windshield wiper stopped moving.			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Windshield wiper motor defective (Internal short-circuiting or grounding fault)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position for the troubleshooting.			
			W04 (female)		Continuity and resistance value	
			Between ① and ③		Continued	
			Between ① and grounding		Above 1 MΩ	
	2	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position for the troubleshooting.			
			Between wiring harness between P01 (female) ⑩ and W04 (male) ① and grounding		Resistance value	Above 1 MΩ
	3	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position for the troubleshooting.			
			P01	Windshield wiper switch	Voltage	
			Between ⑩ and grounding	OFF	Below 3 V	
				ON	Below 3 V⇔20 – 30 V (at constant cycle)	

Electric Circuit Diagram for Monitor Panel Windshield Wiper Motor

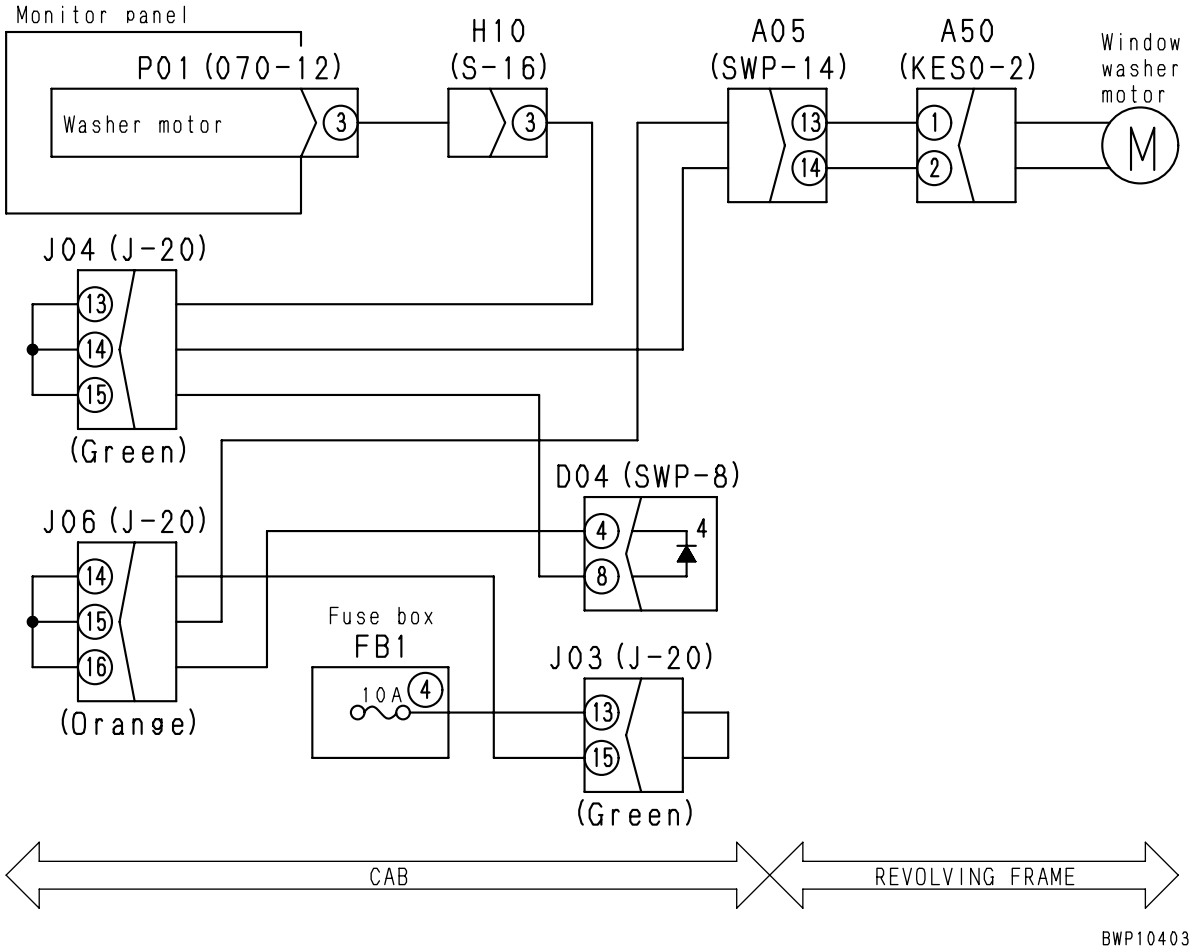


Service Code in Electrical System E114
(Short-circuiting in window washer drive system)

User Code	Service Code	Failure Code	Failure phenomenon	Short-circuiting in window washer drive system (in Monitor Panel system)
—	**E114**	**DY2CKB**		
Failure content	• Abnormal current flew to the window washer drive circuit, when the circuit was grounded and power was switched ON.			
Response from Monitor Panel	• Power supply to the grounding in the window washer motor circuit was switched OFF.			
Phenomenon occurring on machine	• The window washer stopped moving.			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Window washer drive motor defective (Internal short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position for the troubleshooting.			
			A50 (male)		Resistance value	
			Between ① and ②		5 – 20 Ω	
	2	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position for the troubleshooting.			
			Between wiring harness from P01 (female) ③ to J04 to A50 (female) ② and grounding, or between wiring harness between P01 (female) ③ and D04 (female) ⑧ and grounding		Voltage	Below 1 V
	3	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position for the troubleshooting.			
			P01	Window washer switch		Voltage
			Between ③ and grounding	OFF		20 – 30 V
				ON		Below 1 V

Monitor Panel Window Washer Motor Electrical Circuit Diagram

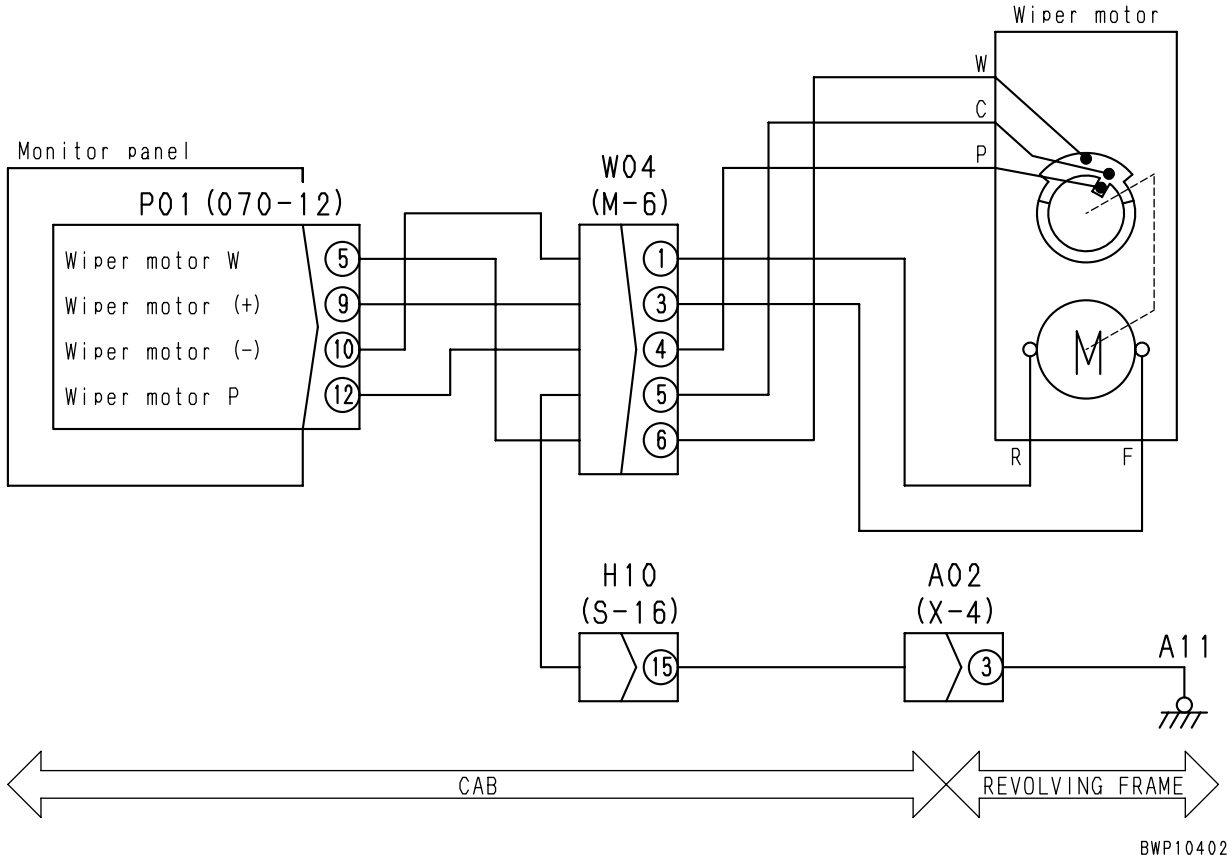


Service Code in Electrical System E115 (Abnormal Windshield Wiper Motion)

User Code	Service Code	Failure Code	Failure phenomenon	Abnormal operation of windshield wiper (in Monitor Panel system)
—	**E115**	**DY20KA**		
Failure content	• A W signal is not inputted at both ends of movement, when it is in motion.			
Response from Monitor Panel	• Power to the windshield wiper motor is turned OFF.			
Phenomenon occurring on machine	• The windshield wiper motor does not work.			
Relative information	• Input of W signal at both ends of movement (ON or OFF) can be confirmed in the monitor function. (Code No. 049: Monitor input 3)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Windshield wiper motor defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position for the troubleshooting.			
			W04 (female)	Windshield wiper blade	Resistance value	
			Between ⑥ and ⑤	At upper end of operation range	Below 1 Ω	
				Outside upper end of operation range	Above 1 MΩ	
	2	Disconnection of wiring harness (Disconnection or faulty contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position for the troubleshooting.			
			Wiring harness between P01 (female) ⑤ and W04 (male) ⑥		Resistance value	Below 1 Ω
			Wiring harness between W04 (male) ⑤ and grounding		Resistance value	Below 1 Ω
	3	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position for the troubleshooting.			
			P01	Windshield wiper blade	Voltage	
			Between ⑤ and grounding	At upper end of operation range	Below 1 V	
				Outside upper end of operation range	20 – 30 V	

Monitor Panel Windshield Wiper Motor Electrical Circuit Diagram

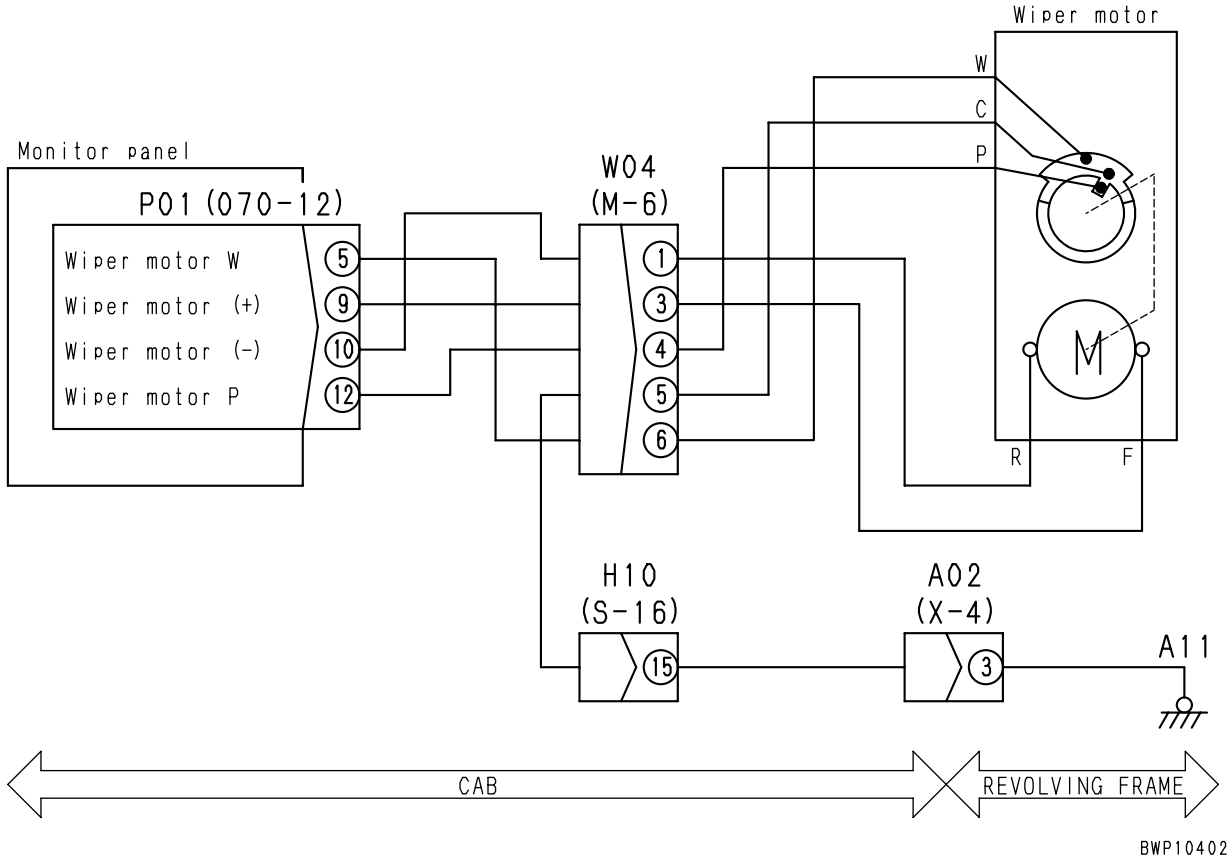


Service Code in Electrical System E116 (Abnormality in retracting windshield wiper)

User Code	Service Code	Failure Code	Failure phenomenon	Abnormal operation of retracting windshield wiper (in Monitor Panel system)
—	**E116**	**DY20MA**		
Failure content	• P signal in the retraction range is not inputted, when the wiper is retracted.			
Response from Monitor Panel	• Power supply to the windshield wiper motor is switched OFF, when the wiper is retracted.			
Phenomenon occurring on machine	• The windshield wiper cannot be retracted completely.			
Relative information	• It can be checked in the monitoring function whether P signal (ON or OFF) in the retraction operation range is inputted or not. (Code No. 049: Monitor Input 3)			

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting			
	1	Windshield wiper motor defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position for the troubleshooting.			
			W04 (female)	Windshield wiper blade	Resistance value	
			Between ④ and ⑤	Retraction range	Below 1 Ω	
				Operation range	Above 1 MΩ	
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between P01 (female) ⑫ and W04 (male) ④		Resistance value	Below 1 Ω
			Between wiring harness W04 (male) ⑤ and grounding		Resistance value	Below 1 Ω
	3	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			P01	Windshield wiper blade	Voltage	
			Between ⑫ and grounding	Retraction range	Below 1V	
				Operation range	20 – 30 V	

Monitor Panel Windshield Wiper Motor Electrical Circuit Diagram



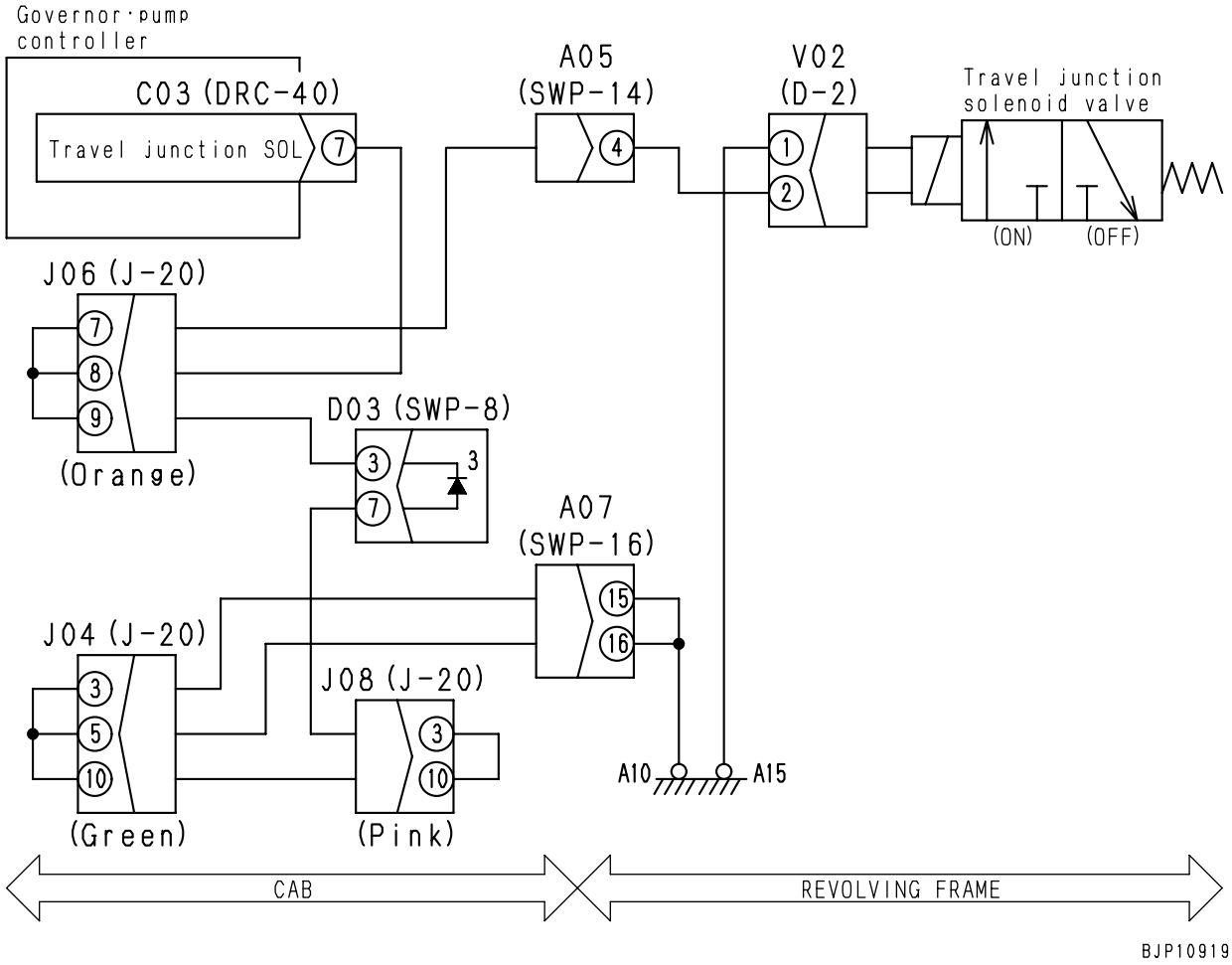
Service Code in Electrical System E201 (Short-circuiting in travel interlocking solenoid)

User Code	Service Code	Failure Code	Failure phenomenon	Short-circuiting in travel interlocking solenoid (in governor • pump controller system)
—	**E201**	**DW91KB**		
Failure content	• Abnormal current flew to the travel interlocking circuit, when power was supplied to the circuit.			
Response from controller	• Power supply to the travel interlocking circuit is switched OFF. • Even if the failure cause disappears of itself, the solenoid circuit does not return to normalcy, unless the engine starting switch is once turned OFF.			
Phenomenon occurring on machine	• It is difficult to steer the machine at turns.			
Relative information	• Operation of the travel interlocking solenoid (ON or OFF) can be checked in the monitoring function. (Code No. 023: Solenoid)			

Presumed cause and standard value in normalcy

	Cause	Standard value in normalcy and references for troubleshooting			
1	Travel interlocking solenoid defective (Internal short-circuiting or grounding fault)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		V02 (male)	Resistance value		
		Between ① and ②	20 – 60 Ω		
		Between ② and grounding	Above 1 MΩ		
2	Assembled-type diode D03 defective (Internal short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		D03 (male)	Resistance value		
		Between ③ and ⑦	Above 1 MΩ		
3	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Between wiring harness from C03 (female) ⑦ to J06 to V02 (female) ② and grounding, or between wiring harness between C03 (female) ⑦ and D03 (female) ③ and grounding	Resistance value	Above 1 MΩ	
4	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it running during the troubleshooting.			
		C03	Travel control lever	Voltage	
		Between ⑦ and grounding	Straight forward	Below 1 V	
			Steering	20 – 30 V	

Electrical Circuit for Travel Interlocking Solenoid in Governor • Pump Controller

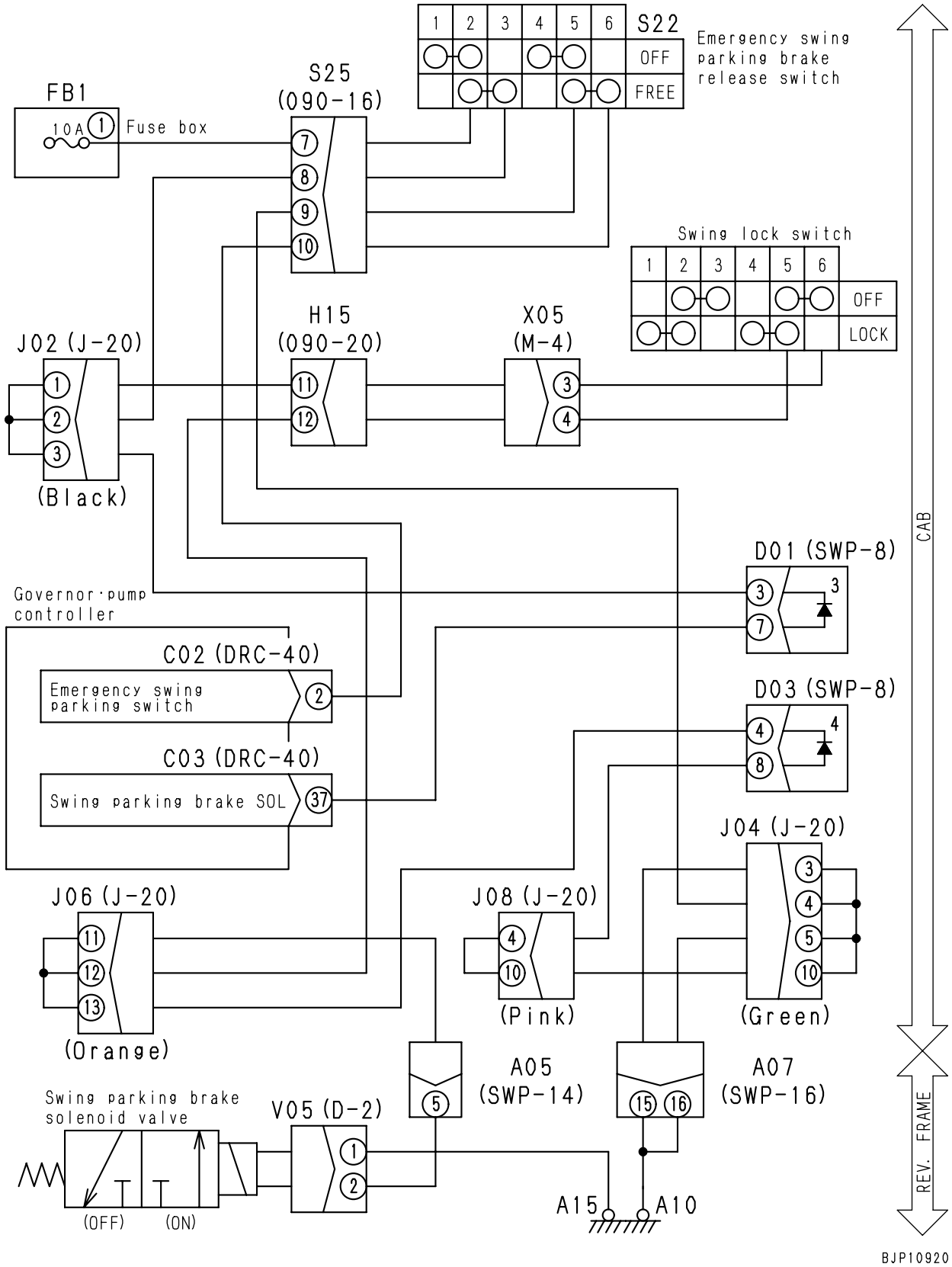


Service Code in Electrical System E203
(Short-circuiting in swing and parking brake solenoid - in governor • pump controller system)

User Code	Service Code	Failure Code	Failure phenomenon	Short-circuiting in swing and parking brake solenoid (in governor • pump controller system)
E03	**E203**	**DW45KB**		
Failure content	• Abnormal current flew to the swing and parking brake solenoid circuit, when power was supplied to the circuit.			
Response from controller	• Power supply to the swing and parking brake solenoid circuit is switched OFF. • Even after the failure cause disappears of itself, the swing and steering brake does not return to normalcy, unless the engine starting switch is once turned OFF.			
Phenomenon occurring on machine	• The upper structure cannot swing.			
Relative information	• Operation of the swing and parking brake solenoid (ON or OFF) can be checked in the monitoring function. (Code No. 023: Solenoid 1) • If there is no abnormality with the solenoid or wiring harness, the upper structure can swing by turning the emergency swing brake releasing switch to the FREE position. (In this case, however, the parking brake does not work, when stopping the machine)			

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting			
	1	Swing and parking brake solenoid defective (Internal short-circuiting or grounding fault)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			V05 (male)	Resistance value		
			Between ① and ②	20 – 60 Ω		
			Between ② and grounding	Above 1 MΩ		
	2	Assembled-type diode D03 defective (Internal short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			D03 (male)	Resistance value		
			Between ④ and ⑧	Above 1 MΩ		
	3	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from C03 (female) ㊲ to D01 to J02 to X05 to J06 to V05 (female) ②, or between wiring harness between C03 (female) ㊲ and D03 (female) ④ and grounding	Resistance value	Above 1 MΩ	
	4	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it running during the troubleshooting.			
			C03	Swing control lever	Voltage	
			Between ㊲ and grounding	NEUTRAL	Below 1 V	
				Swing	20 – 30 V	

Electrical Circuit Diagram for Swing and Parking Brake of Governor • Pump Controller

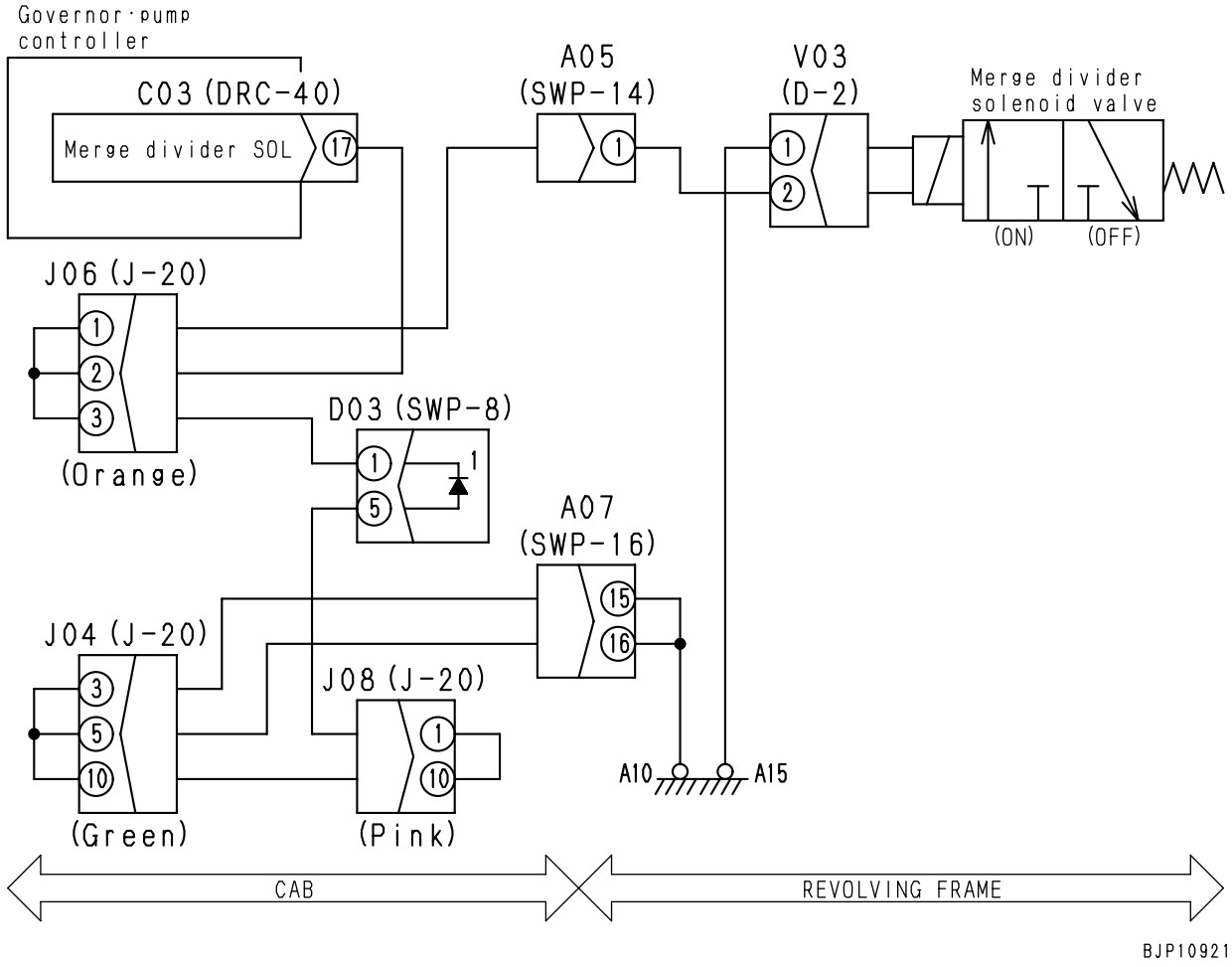


Service Code in Electrical System E204 (Short-circuiting in merge/divide solenoid)

User Code	Service Code	Failure Code	Failure phenomenon	Short-circuiting in merge/divide solenoid (in governor • pump controller system)
—	**E204**	**DWJ0KB**		
Failure content	• Abnormal current flew to the merge/divide solenoid circuit, when power was supplied to the circuit.			
Response from controller	• Power supply to the merge/divide solenoid circuit is switched OFF. • Even after the failure cause disappears of itself, the machine operation does not return to normalcy, unless the engine starting switch is once turned OFF.			
Phenomenon occurring on machine	• In L mode, the work equipment moves slowly, or the swing speed is slow in its single operation.			
Relative information	• Operation of the merge/divide solenoid (ON or OFF) can be checked in the monitoring function. (Code No. 023: Solenoid 1)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Merge/divide solenoid defective (Internal short-circuiting or grounding fault)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			V03 (male)	Resistance value		
			Between ① and ②	20 – 60 Ω		
			Between ② and grounding	Above 1 MΩ		
	2	Assembled-type diode D03 defective (Internal short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			D03 (male)	Resistance value		
			Between ① and ⑤	Above 1 MΩ		
	3	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from C03 (female) ⑰ to J06 to V03 (female) ②, or between wiring harness between C03 (female) ⑰ and D03 (female) ① and grounding	Resistance value	Above 1 MΩ	
	4	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it running during the troubleshooting.			
			C03	Travel control lever	Voltage	
			Between ⑰ and grounding	NEUTRAL	Below 1 V	
				When operating one side only	20 – 30 V	

Electrical Circuit Diagram for Merge/Divide Solenoid in Governor • Pump Controller

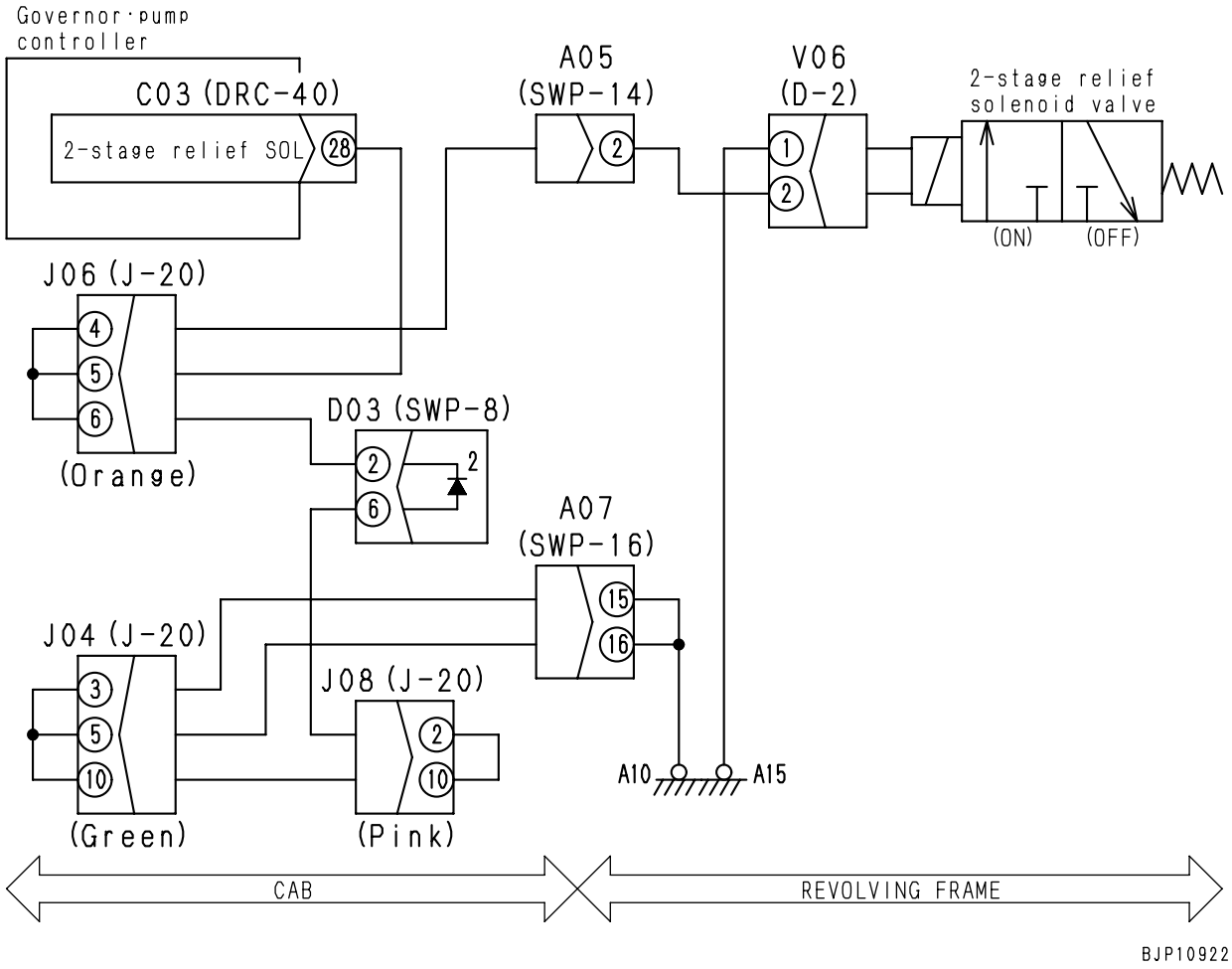


Service Code in Electrical System E205 (Short-circuiting in 2-stage relief solenoid)

User Code	Service Code	Failure Code	Failure phenomenon	Short-circuiting in 2-stage relief solenoid (in governor • pump controller system)
—	**E205**	**DWK0KB**		
Failure content	• Abnormal current flew to the 2-stage relief solenoid circuit, when power was supplied to the circuit.			
Response from controller	• Power supply to the 2-stage relief solenoid circuit is switched OFF. • Even after the failure cause disappears of itself, the machine operation does not return to normalcy, unless the engine starting switch is once turned OFF.			
Phenomenon occurring on machine	• The one-touch power max. switch does not work.			
Relative information	• Operation of the 2-stage relief solenoid (ON or OFF) can be checked in the monitoring function. (Code No. 023: Solenoid 1)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	2-stage relief solenoid defective (Internal short-circuiting or grounding fault)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			V06 (male)	Resistance value		
			Between ① and ②	20 – 60 Ω		
			Between ② and grounding	Above 1 MΩ		
	2	Assembled-type diode D03 defective (Internal short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			D03 (male)	Resistance value		
			Between ② and ⑥	Above 1 MΩ		
	3	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from C03 (female) ㉘ to J06 to V06 (female) ②, or between wiring harness between C03 (female) ㉘ and D03 (female) ② and grounding	Resistance value	Above 1 MΩ	
	4	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C03	Working mode	Voltage	
			Between ㉘ and grounding	Other than L mode	Below 1 V	
				L mode	20 – 30 V	

Electric Circuit Diagram for 2-stage Relief Solenoid in Governor • Pump Controller

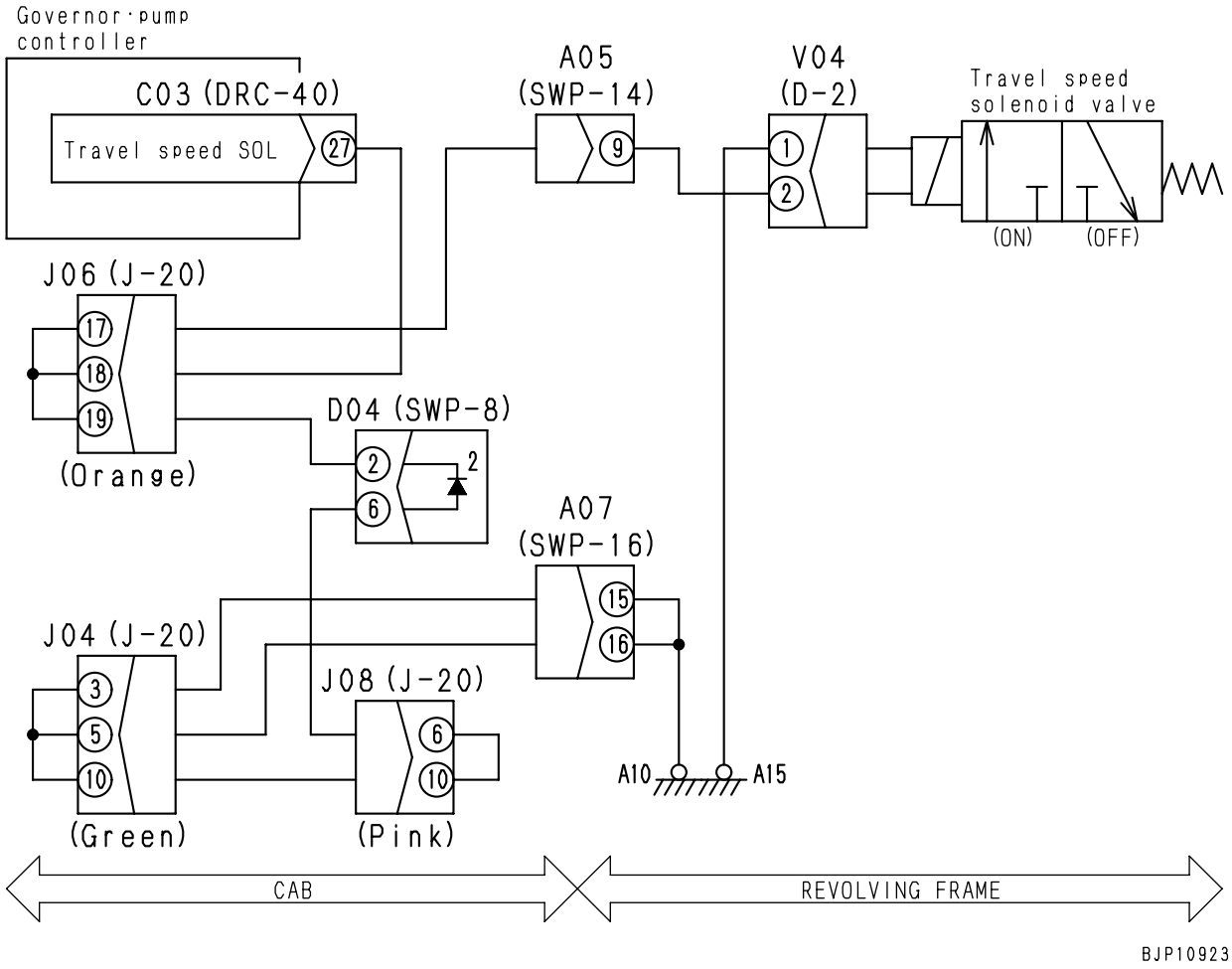


Service Code in Electrical System E206
(Short-circuiting in travel speed shifting solenoid)

User Code	Service Code	Failure Code	Failure phenomenon	Short-circuiting in travel speed shifting solenoid (in governor • pump controller system)
—	**E206**	**DW43KB**		
Failure content	• Abnormal current flew to the travel speed shifting solenoid, when power was supplied to the circuit.			
Response from controller	• Power supply to the travel speed shifting solenoid circuit is switched OFF. • Even after the failure cause disappears of itself, the machine operation does not return to normalcy, unless the engine starting switch is once turned OFF.			
Phenomenon occurring on machine	• The travel speed does not turn to Hi. (The display in the monitor panel changes correctly)			
Relative information	• Operation of the travel speed shifting solenoid (ON or OFF) can be checked in the monitoring function. (Code No. 023: Solenoid 1)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Travel speed shifting solenoid defective (Internal short-circuiting or grounding fault)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			V04 (male)	Resistance value		
			Between ① and ②	20 – 60 Ω		
			Between ② and grounding	Above 1 MΩ		
	2	Assembled-type diode D04 defective (Internal short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			D04 (male)	Resistance value		
			Between ② and ⑥	Above 1 MΩ		
	3	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from C03 (female) ㉗ to J06 to V04 (female) ②, or between wiring harness between C03 (female) ㉗ and D04 (female) ② and grounding	Resistance value	Above 1 MΩ	
	4	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it running during the troubleshooting.			
			C03	Travel speed	Voltage	
			Between ㉗ and grounding	Lo	Below 1 V	
				Hi + Travel operation	20 – 30 V	

Electrical Circuit Diagram for Travel Speed Shifting Solenoid in Governor • Pump Controller

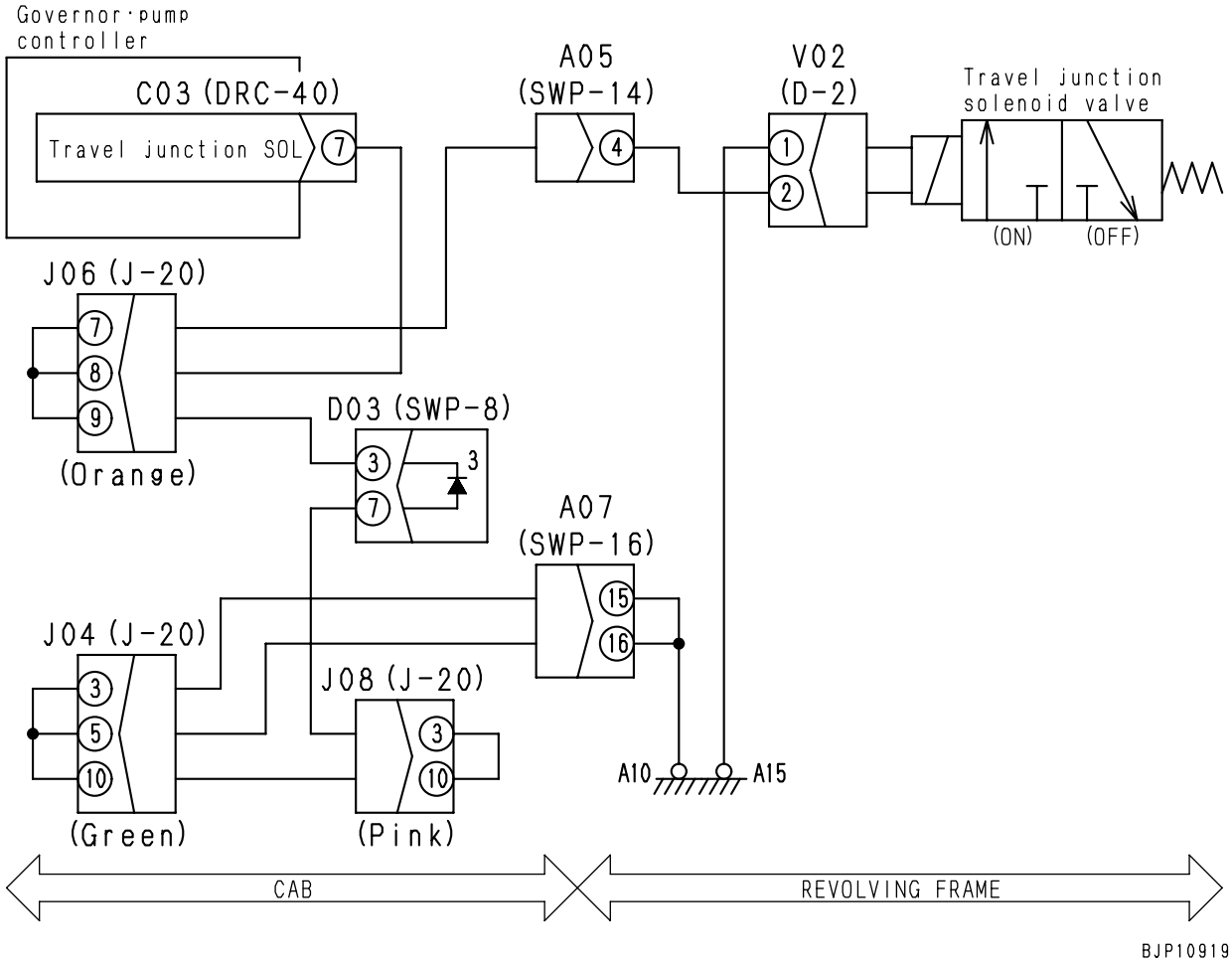


Service Code in Electrical System E211 (Disconnection in travel interlocking solenoid)

User Code	Service Code	Failure Code	Failure phenomenon	Disconnection in travel interlocking solenoid (in governor • pump controller system)
—	**E211**	**DW91KA**		
Failure content	• No current flows to the travel interlocking solenoid circuit, when power is supplied to the circuit.			
Response from controller	• None in particular (The solenoid does not function as there is current flowing to it) • When the failure cause disappears of itself, the machine operation returns to normalcy.			
Phenomenon occurring on machine	• It is difficult to steer the machine while traveling.			
Relative information	• Operation of the travel interlocking solenoid (ON or OFF) can be checked in the monitoring function. (Code No. 023: Solenoid 1) ★The solenoid detects disconnection, when power is ON. Hence be sure to check it with power ON after the repairs. (For how to turn power ON or OFF, refer to the troubleshooting under Service Code [E201].)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Travel interlocking solenoid defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			V02 (male)	Resistance value		
			Between ① and ②	20 – 60 Ω		
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from C03 (female) ⑦ to J06 to V02 (female) ②	Resistance value	Below 1 Ω	
			Wiring harness between V02 (female) ① and grounding	Resistance value	Below 1 Ω	
	3	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Wiring harness from C03 (female) ⑦ to J06 to V02 (female) ②, or between wiring harness C03 (female) ⑦ and D03 (female) ③ and grounding	Voltage	Below 1 V	
	4	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			C03 (female)	Resistance value		
			Between ⑦ and grounding	20 – 60 Ω		

Electrical Circuit Diagram for Travel Interlocking Solenoid in Governor • Pump Controller

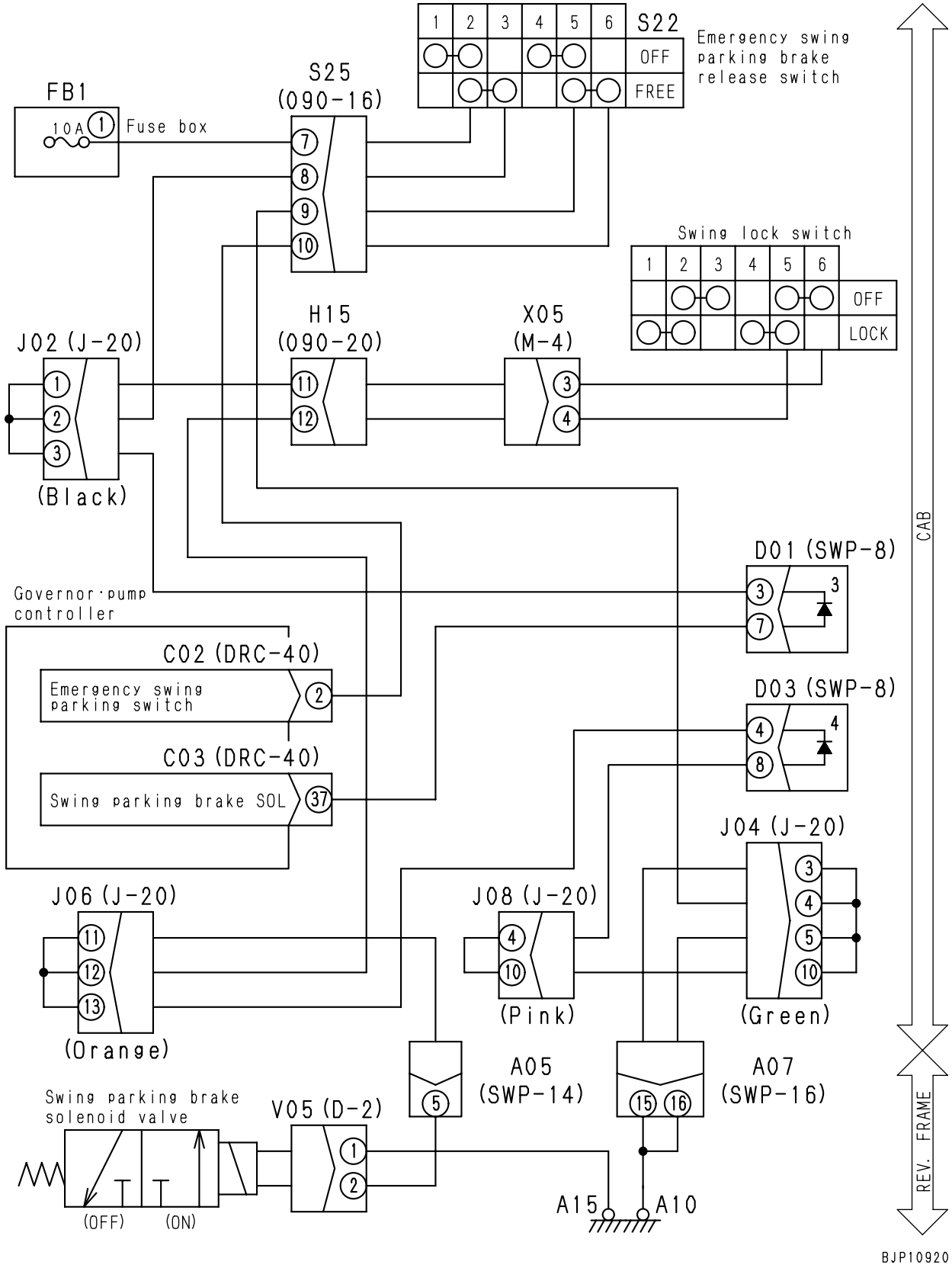


Service Code in Electrical System E213 (Disconnection in Swing Parking Brake Solenoid)

User Code	Service Code	Failure Code	Failure phenomenon	Disconnection in swing and parking brake solenoid (in governor • pump controller system)
E03	**E213**	**DW45KA**		
Failure content	• No current flows to the swing parking brake solenoid circuit, when power is supplied to the circuit.			
Response from controller	• None in particular (The solenoid does not function as there is no current flowing to it) • When the failure cause disappears of itself, the machine operation returns to normalcy.			
Phenomenon occurring on machine	• The machine's upper structure does not swing.			
Relative information	• Operation of the swing parking brake solenoid (ON or OFF) can be checked in the monitoring function. (Code No. 023: Solenoid 1) • If there is abnormality neither with the solenoid nor with wiring harnesses, the upper structure can swing by moving the emergency swing brake release switch to the FREE position. (In this case, however, the parking brake does not work, when stopping the machine) ★While in troubleshooting, hold both the swing lock switch and the emergency swing release switch in the OFF position. ★The solenoid detects disconnection, when power is ON. Hence be sure to check it with power ON after the repairs. (For how to turn power ON or OFF, refer to the troubleshooting under Service Code [E203].)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Swing parking brake solenoid defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			V05 (male)		Resistance value	
			Between ① and ②		20 – 60 Ω	
	2	Swing lock switch defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			X05 (female)	Swing lock switch	Resistance value	
			Between ③ and ④	OFF	Below 1 Ω	
				LOCK	Above 1 MΩ	
	3	Assembled-type diode D01 defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			D01 (male)	Digital type circuit tester	Continuity	
			Between ⑦ and ③	Diode mode	Continued	
	4	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between C03 (female) ㊲ and D01 (female) ⑦		Resistance value	Below 1 Ω
			Wiring harness from D01 (female) ③ to J02 to X05 (male) ③		Resistance value	Below 1 Ω
			Wiring harness from X05 (male) ④ to J06 to V05 (female) ②		Resistance value	Below 1 Ω
			Wiring harness between V05 (female) ① and grounding		Resistance value	Below 1 Ω
	5	Short-circuiting of Wiring harness (Contact with 24V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Between wiring harness between C03 (female) ㊲ and D01 (female) ⑦ and grounding		Voltage	Below 1 V
	6	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			C03 (female)	Disconnect D01 and connect pins ③ and ⑦ of the male side.	Resistance value	
			Between ㊲ and grounding		20 – 60 Ω	

Electrical Circuit Diagram for Swing and Parking Brake Solenoid in Governor • Pump Controller

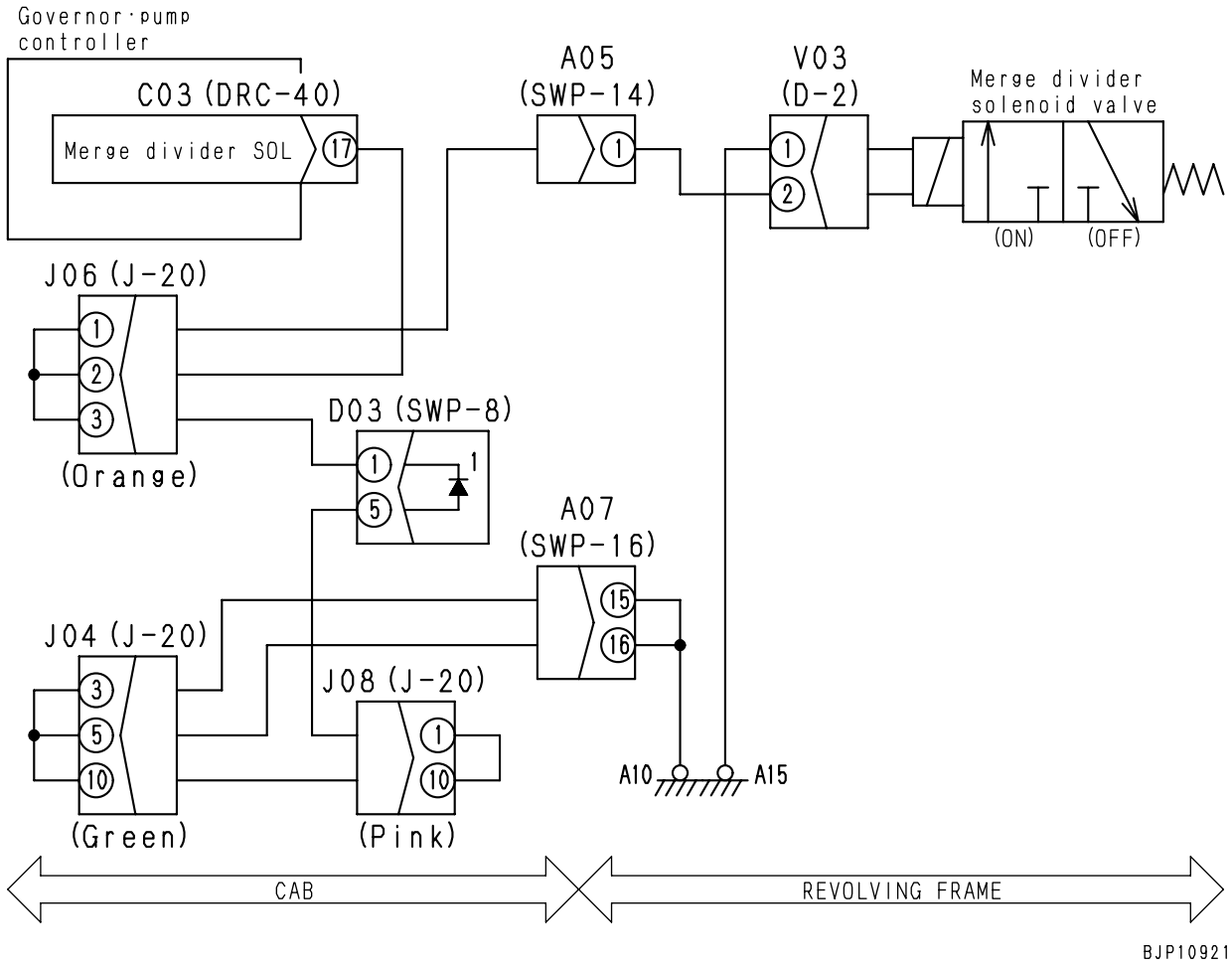


Service Code in Electrical System E214 (Disconnection of merge/divide solenoid)

User Code	Service Code	Failure Code	Failure phenomenon	Disconnection in merge/divide solenoid (in governor • pump controller system)
—	**E214**	**DWJ0KA**		
Failure content	• No current flows to the merge/divide solenoid circuit, when power is supplied to the circuit.			
Response from controller	• None in particular (The solenoid does not function as there is no current flowing to it) • When the failure cause disappears of itself, the machine operation returns to normalcy.			
Phenomenon occurring on machine	• In L mode, speeds of the work equipment and swing in its single operation are too fast			
Relative information	• Operation of the merge/divide solenoid (ON or OFF) can be checked in the monitoring function. (Code No. 023: Solenoid 1) ★The solenoid detects disconnection, when power is ON. Hence be sure to check it with power ON after the repairs. (For how to turn power ON or OFF, refer to the troubleshooting under Service Code [E204].)			

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting			
	1	Merge/divide solenoid defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			V03 (male)	Resistance value		
			Between ① and ②	20 – 60 Ω		
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from C03 (female) ⑰ to J06 to V03 (female) ②	Resistance value	Below 1 Ω	
			Wiring harness between V03 (female) ① and grounding	Resistance value	Below 1 Ω	
	3	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Wiring harness from C03 (female) ⑰ to J06 to V03 (female) ②, or between wiring harness between C03 (female) ⑰ and D03 (female) ① and grounding	Voltage	Below 1 V	
	4	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			C03 (female)	Resistance value		
			Between ⑰ and grounding	20 – 60 Ω		

Electrical Circuit Diagram for Merge/Divide Solenoid in Governor • Pump Controller

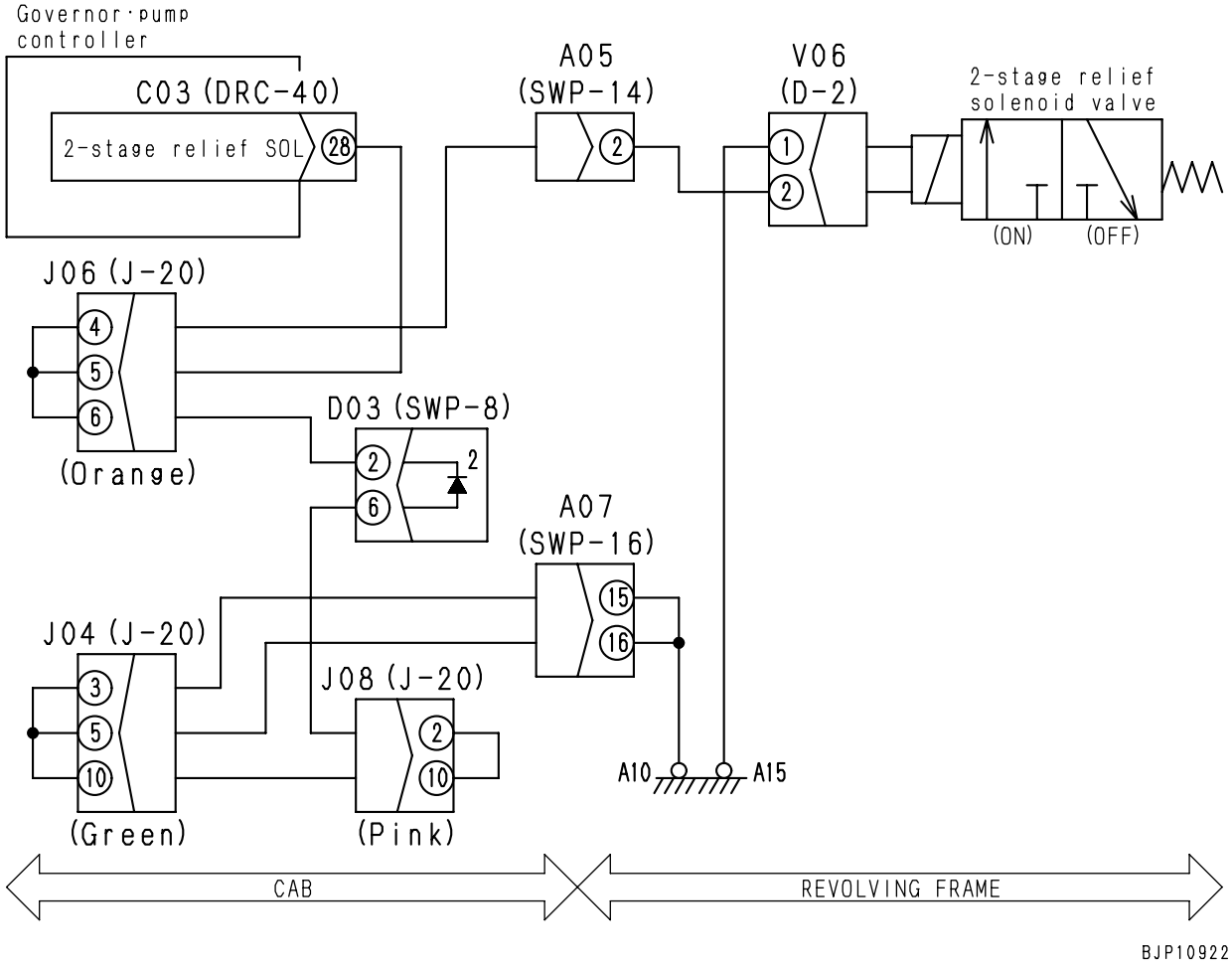


Service Code in Electrical System E215 (Disconnection in 2-stage relief solenoid)

User Code	Service Code	Failure Code	Failure phenomenon	Disconnection in 2-stage relief solenoid (in governor • pump controller system)
—	**E215**	**DWK0KA**		
Failure content	• No current flows to the 2-stage relief solenoid circuit, when power is supplied to the circuit.			
Response from controller	• None in particular (The solenoid does not function as there is no current flowing to it) • When the failure cause disappears of itself, the machine operation returns to normalcy.			
Phenomenon occurring on machine	• The one-touch power max. switch does not work.			
Relative information	• Operation of the 2-stage relief solenoid (ON or OFF) can be checked in the monitoring function. (Code No. 023: Solenoid 1) ★The solenoid detects disconnection, when power is ON. Hence be sure to check it with power ON after the repairs. (For how to turn power ON or OFF, refer to the troubleshooting under Service Code [E205].)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	2-stage relief solenoid defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			V06 (male)	Resistance value		
			Between ① and ②	20 – 60 Ω		
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from C03 (female) ㉘ to J06 to V06 (female) ②	Resistance value	Below 1 Ω	
			Wiring harness between V06 (female) ① and grounding	Resistance value	Below 1 Ω	
	3	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Wiring harness from C03 (female) ㉘ to J06 to V06 (female) ②, or between wiring harness between C03 (female) ㉘ and D03 (female) ② and grounding	Voltage	Below 1 V	
	4	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			C03 (female)	Resistance value		
			Between ㉘ and grounding	20 – 60 Ω		

Electrical Circuit Diagram for 2-stage Relief Solenoid in Governor • Pump Controller

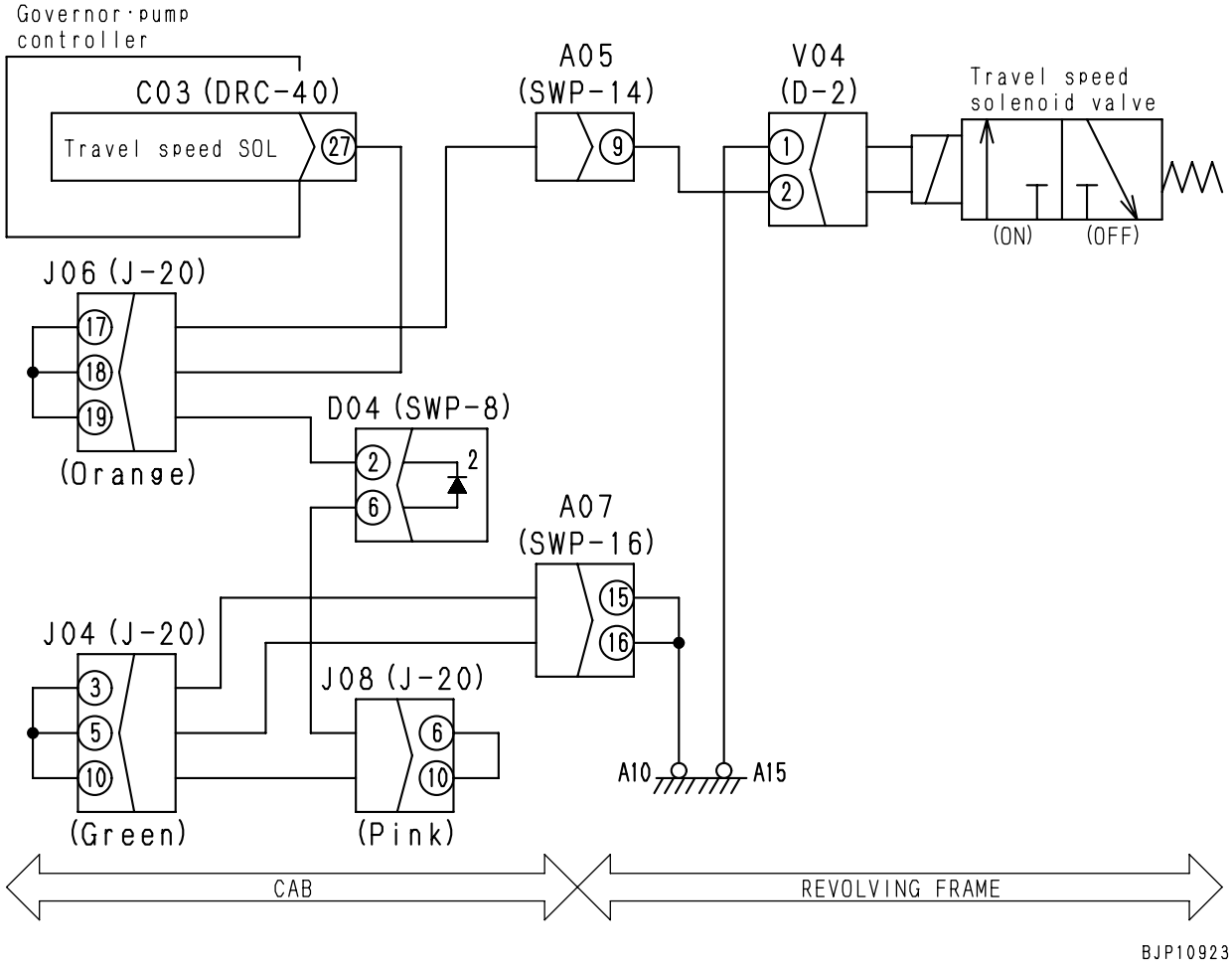


Service Code in Electrical System E216 (Disconnection in travel speed shifting solenoid)

User Code	Service Code	Failure Code	Failure phenomenon	Disconnection in travel speed shifting solenoid (in governor • pump controller system)
—	**E216**	**DW43KA**		
Failure content	• No current flows to the travel speed shifting solenoid circuit, when power is supplied to the circuit.			
Response from controller	• None in particular (The solenoid does not function as there is no current flowing to it) • When the failure cause disappears of itself, the machine operation returns to normalcy.			
Phenomenon occurring on machine	• The travel speed does not shift to Hi. (The display changes normally in the monitor panel)			
Relative information	• Operation of the travel speed shifting solenoid (ON or OFF) can be checked in the monitoring function. (Code No. 023: Solenoid 1) ★The solenoid detects disconnection, when power is ON. Hence be sure to check it with power ON after the repairs. (For how to turn power ON or OFF, refer to the troubleshooting under Service Code [E206].)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Travel speed shifting solenoid defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			V04 (male)	Resistance value		
			Between ① and ②	20 – 60 Ω		
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from C03 (female) ㉗ to J06 to V04 (female) ②	Resistance value	Below 1 Ω	
			Wiring harness between V04 (female) ① and grounding	Resistance value	Below 1 Ω	
	3	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Wiring harness from C03 (female) ㉗ to J06 to V04 (female) ②, or between wiring harness between C03 (female) ㉗ and D04 (female) ② and grounding	Voltage	Below 1 V	
	4	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			C03 (female)	Resistance value		
			Between ㉗ and grounding	20 – 60 Ω		

Electrical Circuit Diagram for Travel Speed Shifting Solenoid in Governor • Pump Controller

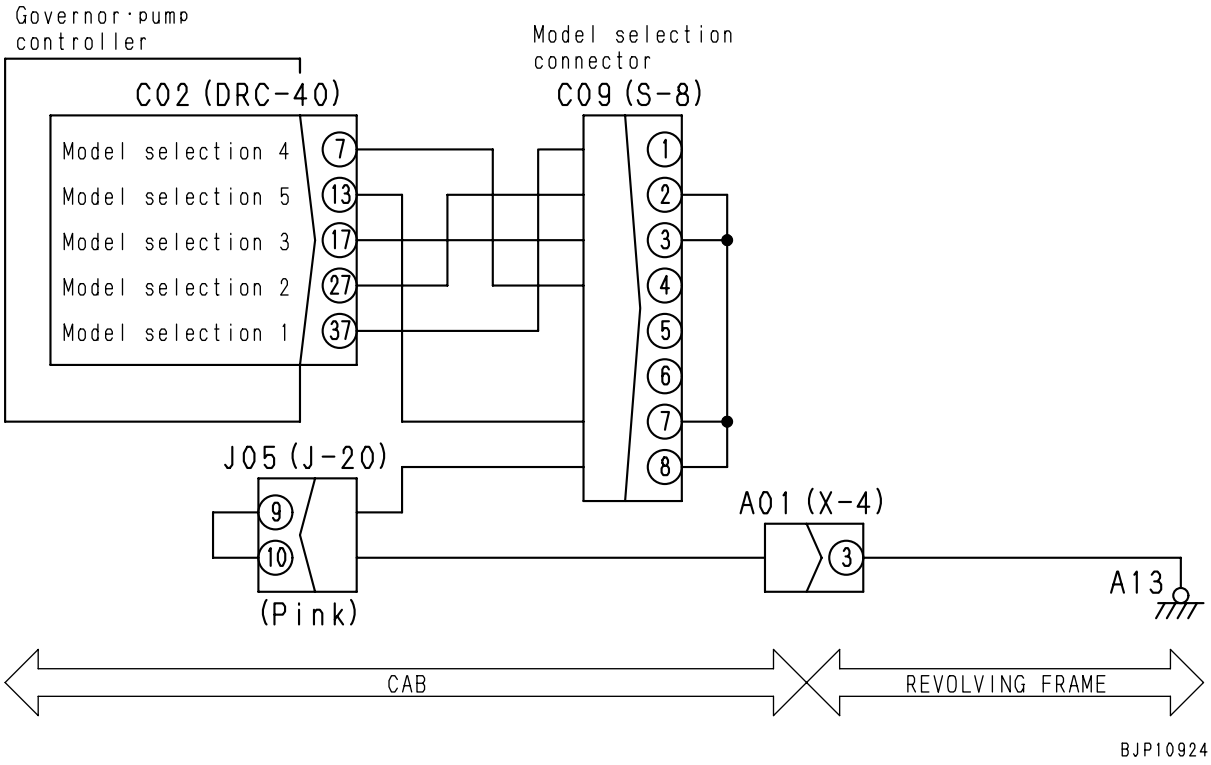


Service Code in Electrical System E217 (Abnormality in inputting model code)

User Code	Service Code	Failure Code	Failure phenomenon	Abnormality in inputting model code (in governor • pump controller system)
—	**E217**	**DA2SKQ**		
Failure content	• A model code signal was inputted which indicates another model that is not registered in the controller.			
Response from controller	• The controller treats it as a default-set model (PC300). • Even if the failure cause disappears of itself, the machine operation does not return to normalcy, unless the engine starting switch is once turned OFF.			
Phenomenon occurring on machine	• None in particular			
Relative information	• Model names (expressed in number) that the controller recognizes can be confirmed in the monitoring function. (Code No. 002 and 003: Controller Model Code) ★Input of model selecting signals (ON or OFF) can be confirmed in the monitoring function.(Code No. 027:Switch Input 2)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Model selecting connector defective (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			C09 (female)	Resistance value		
			Between ②, ③ and ⑧	Below 1 Ω		
			Between ①, ④ or ⑦ and ⑧	Above 1 MΩ		
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between C02 (female) ⑰ and C09 (male) ③	Resistance value	Below 1 Ω	
			Wiring harness between C02 (female) ㉗ and C09 (male) ①	Resistance value	Below 1 Ω	
			Between wiring harness between C09 (male) ⑧ and J05 and grounding	Resistance value	Below 1 Ω	
	3	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between C02 (female) ⑦ and C09 (male) ④ and grounding	Resistance value	Above 1 MΩ	
			Between wiring harness between C02 (female) ⑬ and C09 (male) ⑦ and grounding	Resistance value	Above 1 MΩ	
			Between wiring harness between C02 (female) ㊲ and C09 (male) ① and grounding	Resistance value	Above 1 MΩ	
	4	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C02	Voltage		
			Between ⑦, ⑬ or ㊲ and grounding	20 – 30 V		
			Between ⑰, ㉗ and grounding	Below 1 V		

Electrical Circuit Diagram for Model Selecting Connector in Governor • Pump Controller



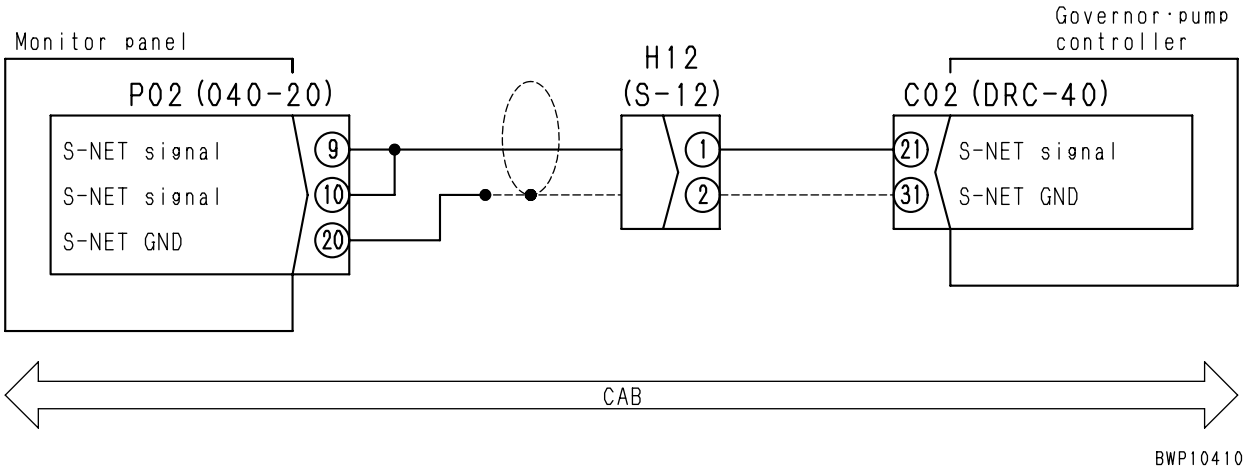
Service Code in Electrical System E218 Disconnection of S-NET signal)

User Code	Service Code	Failure Code	Failure phenomenon	Disconnection in S-NET signal (in governor • pump controller system)
—	**E218**	**DA2SKA**		
Failure content	• A failure occurred in S-NET communication between the monitor and controller in the past. (The machine operation returned to normalcy, when the display was resumed)			
Response from controller	• While the failure is still continuing, the machine operation is controlled by the following default setting. 1) Working mode: E mode 2) Travel speed: Lo 3) Auto-decelerator: ON 4) Attachment oil flow rate: Minimum (※) • When the failure cause disappears of itself, the machine operation returns to normalcy.			
Phenomenon occurring on machine	• The working mode cannot be changed. (The display changes normally in the monitor panel) • The travel speed cannot be shifted. (The display changes normally in the monitor panel) • The auto-decelerator cannot be released. (The display changes normally in the monitor panel) • The attachment oil flow rate cannot be changed. (The display changes normally in the monitor panel) (※)			
Relative information	• This Service Code No. is displayed to inform that there was a failure occurred in the past, when S-NET communication between the monitor panel and the governor • pump controller is returned to normalcy. • The communication has already returned to normalcy by the time this Service Code No. is displayed. But thoroughly diagnose all the related equipment and circuits, and remove all potential causes for a failure in order to prevent recurrence of failures.			

※: The multi-monitor specification machine only.

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting		
	1	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			Wiring harness between P02 (female) ⑨ ⑩ and C02 (female) ㉑	Resistance value	Below 1 Ω
			Wiring harness between P02 (female) ⑳ and C02 (female) ㉛	Resistance value	Below 1 Ω
	2	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			Between wiring harness between P02 (female) ⑨ ⑩ and C02 (female) ㉑ and grounding	Resistance value	Above 1 MΩ
	3	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
			Between wiring harness between P02 (female) ⑨ ⑩ and C02 (female) ㉑ and grounding	Voltage	Below 1 V
	4	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
			P02 (male)	Voltage	
			Between ⑨ ⑩ and ⑳	6 – 9 V	
	5	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
			C02 (male)	Voltage	
			Between ㉑ and ㉛	6 – 9 V	

Electrical Circuit Diagram for S-NET Communication between Monitor Panel and Governor • Pump Controller

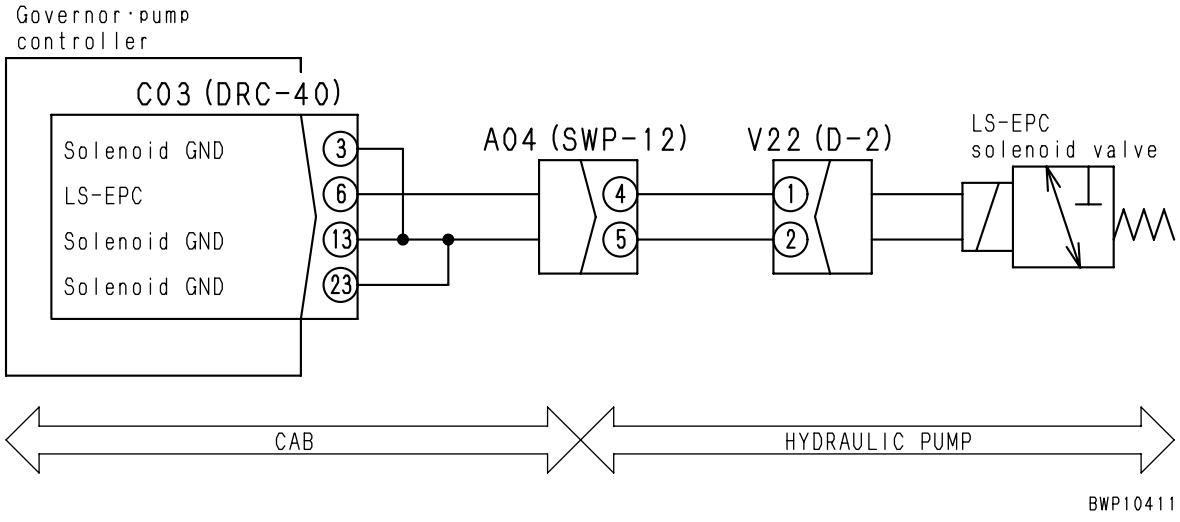


Service Code in Electrical System E222 (Short-circuiting in LS-EPC solenoid)

User Code	Service Code	Failure Code	Failure phenomenon	Disconnection in LS-EPC solenoid (in governor • pump controller system)
—	**E222**	**DXE0KB**		
Failure content	• Abnormal current flew to the LS-EPC solenoid circuit.			
Response from controller	• The controller reduces the output to the LS-EPC solenoid circuit to 0. • Even if the failure cause disappears, the current does not return to normalcy, unless the engine starting switch is once turned OFF.			
Phenomenon occurring on machine	• The travel speed is slow at Mi and Lo. • In L mode, speeds of the work equipment and swing are too fast.			
Relative information	• Output to LS-EPC solenoid (ampere) can be confirmed in the monitor function. (Code No. 015: LS-EPC solenoid current)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	LS-EPC solenoid defective (Internal short-circuiting or grounding fault)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			V22 (male)	Resistance value		
			Between ① and ②	7 – 14 Ω		
			Between ① and grounding	Above 1 MΩ		
	2	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between C03 (female) ⑥ and V22 (female) ① and grounding	Resistance value	Above 1 MΩ	
	3	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			C03 (female)	Resistance value		
			Between ⑥ and ③ ⑬ ㉓	7 – 14 Ω		
			Between ⑥ and grounding	Above 1 MΩ		

Electrical Circuit Diagram for LS-EPC Solenoid in Governor • Pump Controller

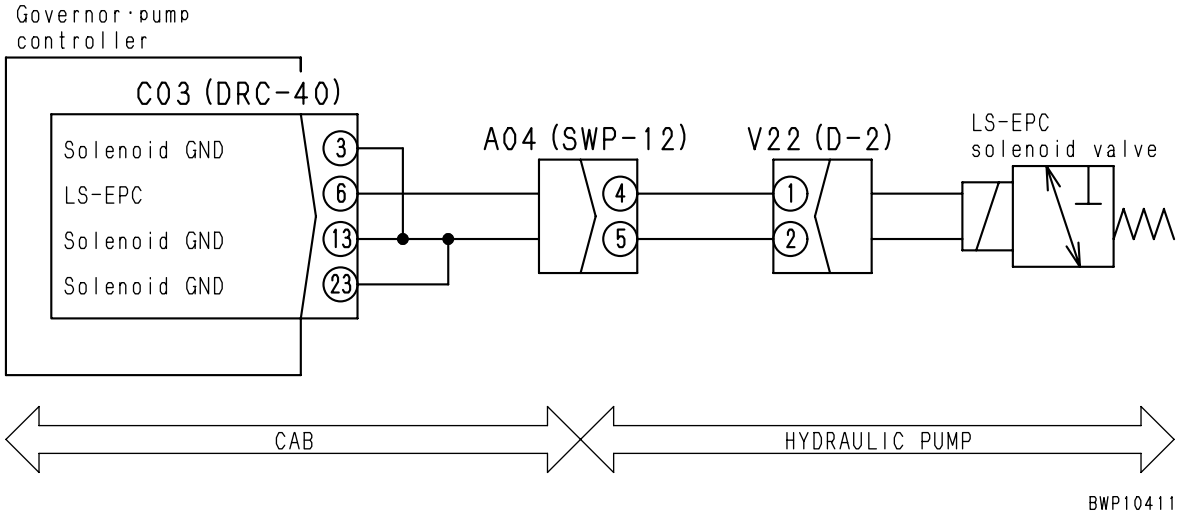


Service Code in Electrical System E223 (Disconnection in LS-EPC solenoid system)

User Code	Service Code	Failure Code	Failure phenomenon	Disconnection in LS-EPC solenoid (in governor • pump controller system)
—	**E223**	**DXE0KA**		
Failure content	• No current flows to the LS-EPC solenoid circuit.			
Response from controller	• None in particular (The solenoid does not function as there is no current flowing to it) • When the failure cause disappears of itself, the machine operation returns to normalcy.			
Phenomenon occurring on machine	• The travel speed is slow at Mi and Lo. • In L mode, speeds of the work equipment and swing are too fast.			
Relative information	• Output to LS-EPC solenoid (ampere) can be confirmed in the monitor function. (Code No. 015: LS-EPC solenoid current)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting		
	1	LS-EPC solenoid defective (Internal short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			V22 (male)	Resistance value	
			Between ① and ②	7 – 14 Ω	
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			Between wiring harness between C03 (female) ⑥ and V22 (female) ① and grounding	Resistance value	Below 1 Ω
			Wiring harness between C03 (female) ③ ⑬ ㉓ and V22 (female) ②	Resistance value	Below 1 Ω
	3	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
			Between wiring harness between C03 (female) ⑥ and V22 (female) ① and grounding	Voltage	Below 1 V
	4	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			C03 (female)	Resistance value	
			Between ⑥ and ③ ⑬ ㉓	7 – 14 Ω	

Electrical Circuit Diagram for LS-EPC Solenoid in Governor • Pump Controller



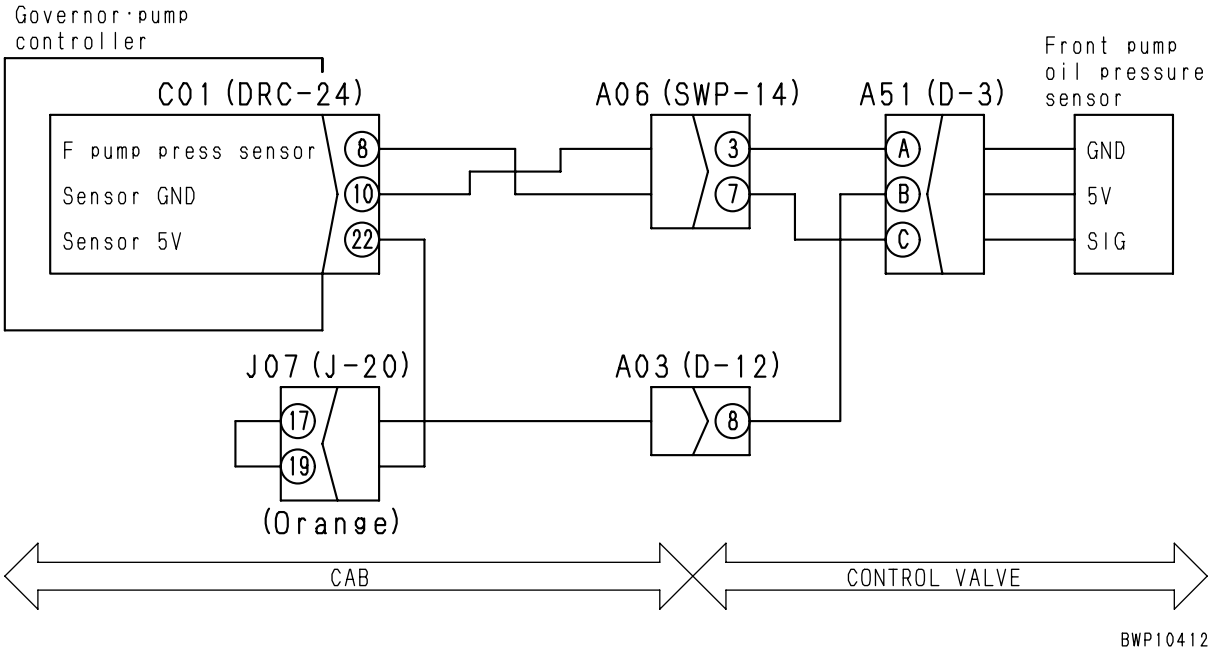
Service Code in Electrical System E224 (Abnormality in F pump pressure sensor)

User Code	Service Code	Failure Code	Failure phenomenon	Abnormality in F pump pressure sensor (in governor • pump controller system)
—	**E224**	**DHPAMA**		
Failure content	• Signal voltage from the F pump pressure sensor dropped below 0.3 V or exceeded 4.72 V.			
Response from controller	• The controller controls the F pump pressure at 0 MPa{0 kg/cm^2}. • If the failure cause disappears, the sensor returns to normalcy of itself.			
Phenomenon occurring on machine	• The travel speed does not shift automatically.			
Relative information	k If 5-volt circuit Ⓑ of the pressure sensor and GND circuit Ⓐ are connected in a reverse way, the pressure sensor will be damaged. Take good care while in the inspection. • Input from the F pump pressure sensor (pressure) can be confirmed in the monitor function. (Code No. 011: F pump pressure)			

Presumed cause and standard value in normalcy

	Cause	Standard value in normalcy and references for troubleshooting		
1	Sensor power source fault	If the Service Code No. [E226] is displayed, troubleshoot the failure first.		
2	F pump pressure sensor defective (Internal failure)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.		
		A51	Voltage	
		Between Ⓑ and Ⓐ	4.5 – 5.5 V	
		Between Ⓒ and Ⓐ	0.5 – 4.5 V	
3	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
		Wiring harness from C01 (female) ㉒ to J07 to A51 (female) Ⓑ	Resistance value	Below 1 Ω
		Wiring harness between C01 (female) ⑩ and A51 (female) Ⓐ	Resistance value	Below 1 Ω
		Wiring harness between C01 (female) ⑧ and A51 (female) Ⓒ	Resistance value	Below 1 Ω
4	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
		Between wiring harness between C01 (female) ⑧ and A51 (female) Ⓒ and grounding	Resistance value	Above 1 MΩ
5	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
		Between wiring harness between C01 (female) ㉒, J07 and A51 (female) Ⓑ and grounding	Voltage	Below 1 V
		Between wiring harness between C01 (female) ⑧ and A51 (female) Ⓒ ang grounding	Voltage	Below 1 V
6	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.		
		C01	Voltage	
		Between ㉒ and ⑩	4.5 – 5.5 V	
		Between ⑧ and ⑩	0.5 – 4.5 V	

Electrical Circuit Diagram for F Pump Pressure Sensor in Governor • Pump Controller



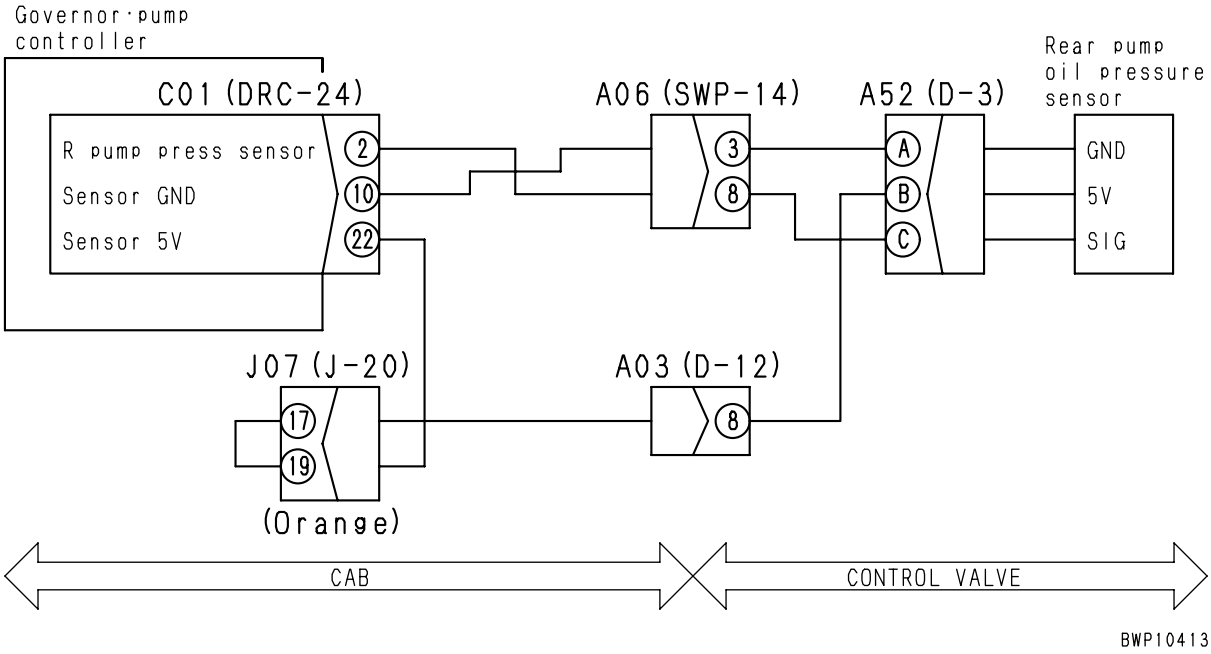
Service Code in Electrical System E225 (Abnormality in R pump pressure sensor)

User Code	Service Code	Failure Code	Failure phenomenon	Abnormality in R pump pressure sensor (in governor • pump controller system)
—	**E225**	**DHPBMA**		
Failure content	• Signal voltage from the R pump pressure sensor dropped below 0.3 V or exceeded 4.42 V.			
Response from controller	• The controller controls the R pump pressure as 0 MPa {0 kg/cm^2}. • If the failure cause disappears, the sensor returns to normalcy of itself.			
Phenomenon occurring on machine	• The travel speed does not shift automatically.			
Relative information	k If 5-volt circuit Ⓑ of the pressure sensor and GND circuit Ⓐ are connected in a reverse way, the pressure sensor will be damaged. Take good care while in the inspection. • Input from the R pump pressure sensor (pressure) can be confirmed in the monitor function. (Code No. 012: R pump pressure)			

Presumed cause and standard value in normalcy

	Cause	Standard value in normalcy and references for troubleshooting		
1	Sensor power source fault	If the Service Code No. [E226] is displayed, troubleshoot the failure first.		
2	R pump pressure sensor defective (Internal failure)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.		
		A52	Voltage	
		Between Ⓑ and Ⓐ	4.5 – 5.5 V	
		Between Ⓒ and Ⓐ	0.5 – 4.5 V	
3	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
		Wiring harness from C01 (female) ㉒ to J07 to A52 (female) Ⓑ	Resistance value	Below 1 Ω
		Wiring harness between C01 (female) ⑩ and A52 (female) Ⓐ	Resistance value	Below 1 Ω
		Wiring harness between C01 (female) ② and A52 (female) Ⓒ	Resistance value	Below 1 Ω
4	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
		Between wiring harness between C01 (female) ② and A52 (female) Ⓒ and grounding	Resistance value	Above 1 MΩ
5	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
		Between wiring harness between C01 (female) ㉒, J07 and A52 (female) Ⓑ and grounding	Voltage	Below 1 V
		Between wiring harness between C01 (female) ② and A52 (female) Ⓒ and grounding	Voltage	Below 1 V
6	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.		
		C01	Voltage	
		Between ㉒ and ⑩	4.5 – 5.5 V	
		Between ② and ⑩	0.5 – 4.5 V	

Electrical Circuit Diagram for R Pump Pressure Sensor in Governor • Pump Controller

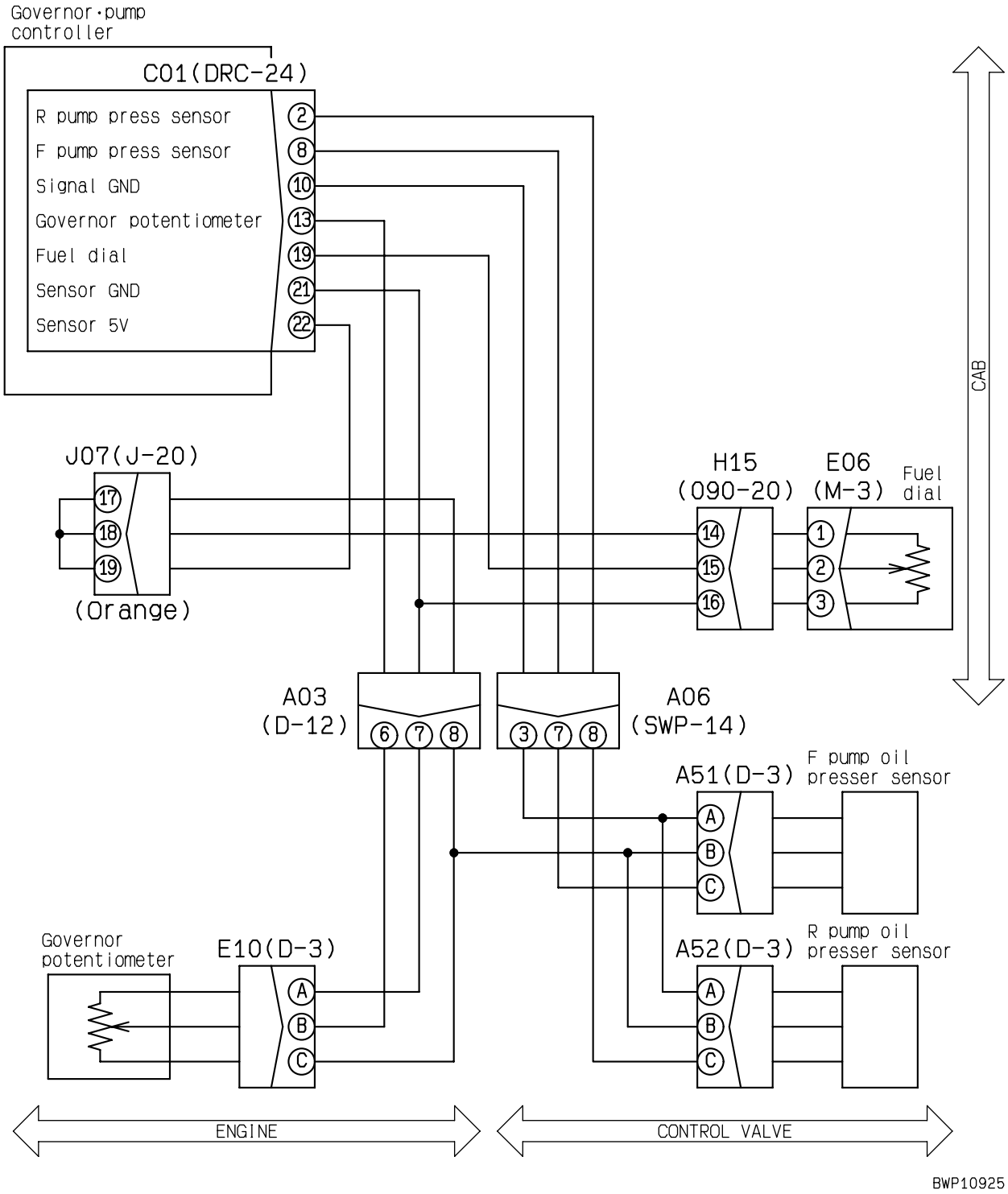


Service Code in Electrical System E226 (Abnormality in Pressure sensor power source)

User Code	Service Code	Failure Code	Failure phenomenon	Abnormality in pressure sensor power source (in governor • pump controller system)
—	**E226**	**DA25KP**		
Failure content	• Abnormal current flew to the power source circuit (5 V) for the pressure sensors and potentiometer.			
Response from controller	• The controller turns OFF power supply to the power source circuit (5 V). • Even when the failure cause disappears of itself, the current does not return to normalcy, unless the engine starting switch is once turned OFF.			
Phenomenon occurring on machine	• Signals from the pressure sensors and potentiometer are not inputted correctly. • The Service Code of "pressure sensor abnormal" and that of "potentiometer abnormal" are displayed at the same time.			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting		
	1	Pressure sensor or potentiometer defective (Internal short-circuit)	Disconnect the following equipment one by one. Equipment that shows no service code is defective, having an internal failure. ★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
			Fuel dial	E06 Connector	
			Governor motor potentiometer	E10 Connector	
			F pump pressure sensor	A51 Connector	
			R pump pressure sensor	A52 Connector	
	2	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			Between wiring harness from C01 (female) ㉒ to J07 to E06 (female) ① and grounding [Fuel dial system]	Resistance value	Above 1 MΩ
			Between wiring harness from C01 (female) ㉒ to J07 to E10 (female) Ⓒ and grounding [Governor potentiometer system]	Resistance value	Above 1 MΩ
			Between wiring harness from C01 (female) ㉒ to J07 to A51 (female) Ⓑ and grounding [F pump pressure sensor system]	Resistance value	Above 1 MΩ
			Between wiring harness from C01 (female) ㉒ to J07 to A52 (female) Ⓑ and grounding [R pump pressure sensor system]	Resistance value	Above 1 MΩ
	3	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
			C01	Voltage	
			Between ㉒ and ⑩ ㉑	4.5 – 5.5 V	

Electrical Circuit Diagram for Sensor Power Source in Governor • Pump Controller

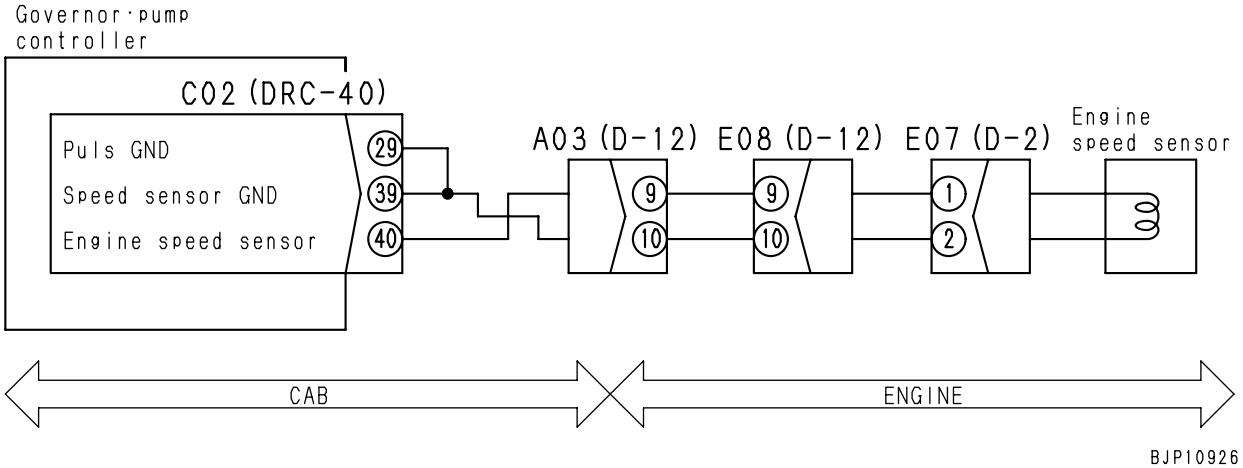


Service Code in Electrical System E227
(Abnormality in engine rotation sensor in governor • pump controller system)

User Code	Service Code	Failure Code	Failure phenomenon	Abnormality in engine rotation sensor (in governor • pump controller system)
—	**E227**	**DLE2MA**		
Failure content	• A normal pulse signal is not inputted to the signal circuit in the engine rotation sensor.			
Response from controller	• The controller exercises a control equivalent to E mode. • If the failure cause disappears of itself, the signal input returns to normalcy.			
Phenomenon occurring on machine	• The machine lacks power a bit.			
Relative information	• Input from the engine rotation sensor (rpm) can be confirmed in the monitor function. (Code No. 010: Engine RPM)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Engine rotation sensor fault (Internal short-circuiting or disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			E07 (male)	Resistance value		
			Between ① and ②	500 – 1,000 Ω		
			Between ① and grounding	Above 1 MΩ		
	2	Engine rotation sensor adjustment improper	For the inspection and adjustment, refer to the section of "Adjusting Engine Rotation Sensor" in this manual.			
	3	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between C02 (female) ㊵ and E07 (female) ①	Resistance value	Below 1 Ω	
			Wiring harness between C02 (female) ㉙ ㊴ and E07 (female) ②	Resistance value	Below 1 Ω	
	4	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Between wiring harness between C02 (female) ㊵ and E07 (female) ① and grounding	Voltage	Below 1 V	
	5	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C02 (female)	Resistance value		
			Between ㊵ and ㉙ ㊴	500 – 1,000 Ω		
			Between ㊵ and grounding	Above 1 MΩ		

Electrical Circuit Diagram for Monitor Panel Power Source

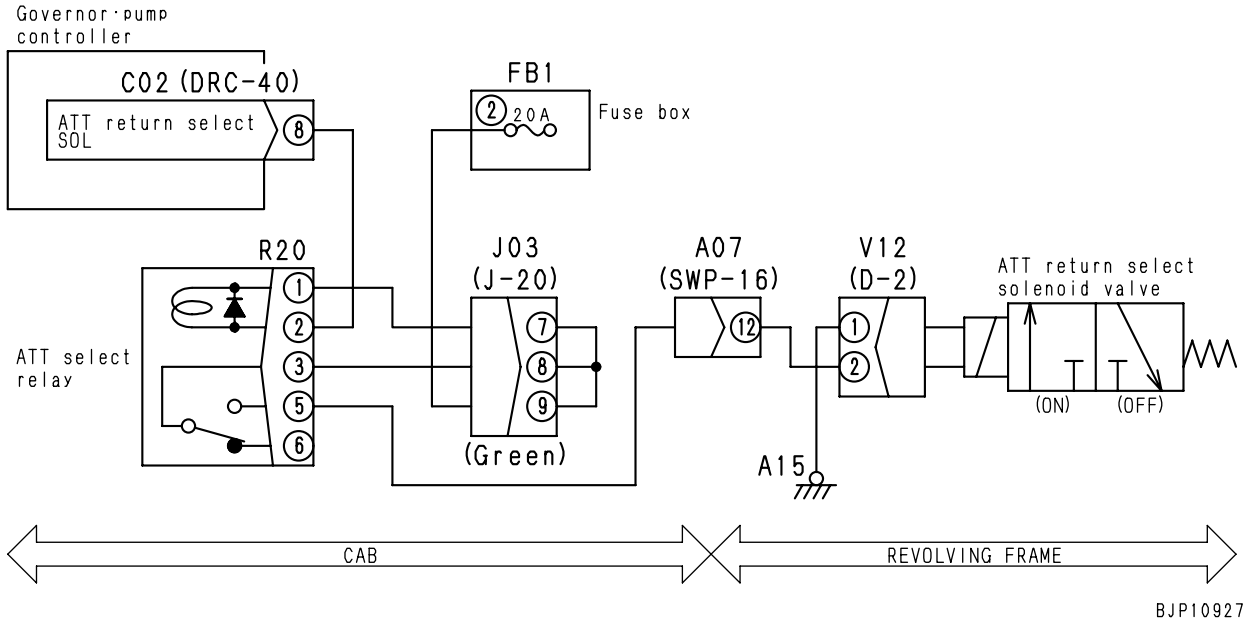


Service Code in Electrical System E228 (Short-circuiting in attachment return switching relay)

User Code	Service Code	Failure Code	Failure phenomenon	Short-circuiting in attachment return switching relay (in governor • pump controller system)
—	**E228**	**D196KB**		
Failure content	• Abnormal current flew to the attachment return switching relay circuit , when it was grounded (power ON).			
Response from controller	• The controller turned OFF power to the attachment return switching relay circuit. • Even when the failure cause disappears of itself, the current does not return to normalcy.			
Phenomenon occurring on machine	• The hydraulic circuit for attachments is not switched to the single operation circuit.			
Relative information	• In this code, a failure is diagnosed only when the setting mode is "with ATT". (Check the setting mode shown in the monitor panel) ★This code detects only failures occurring on the primary ATT return switching relay (coil side). If the ATT return switching solenoid is suspected of a defect, check the power source, wiring harness or solenoid of the secondary relay (contact side). • It can be confirmed in the monitor function how the attachment return switching relay circuit works (ON or OFF). (Code No. 024:Solenoid 2)			

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting		
	1	Attachment return switching relay defective (Internal short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			R20 (male)	Resistance value	
			Between ① and ②	100 – 500 Ω	
	2	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
			Between wiring harness between C02 (female) ⑧ and R20 (female) ② and grounding	Voltage	Below 1 V
	3	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
			C02	Working mode	Voltage
			Between ⑧ and grounding	Other than B mode	20 – 30 V
				B mode	Below 1 V

Electrical Circuit Diagram for Attachment Return Switching Relay and Solenoid

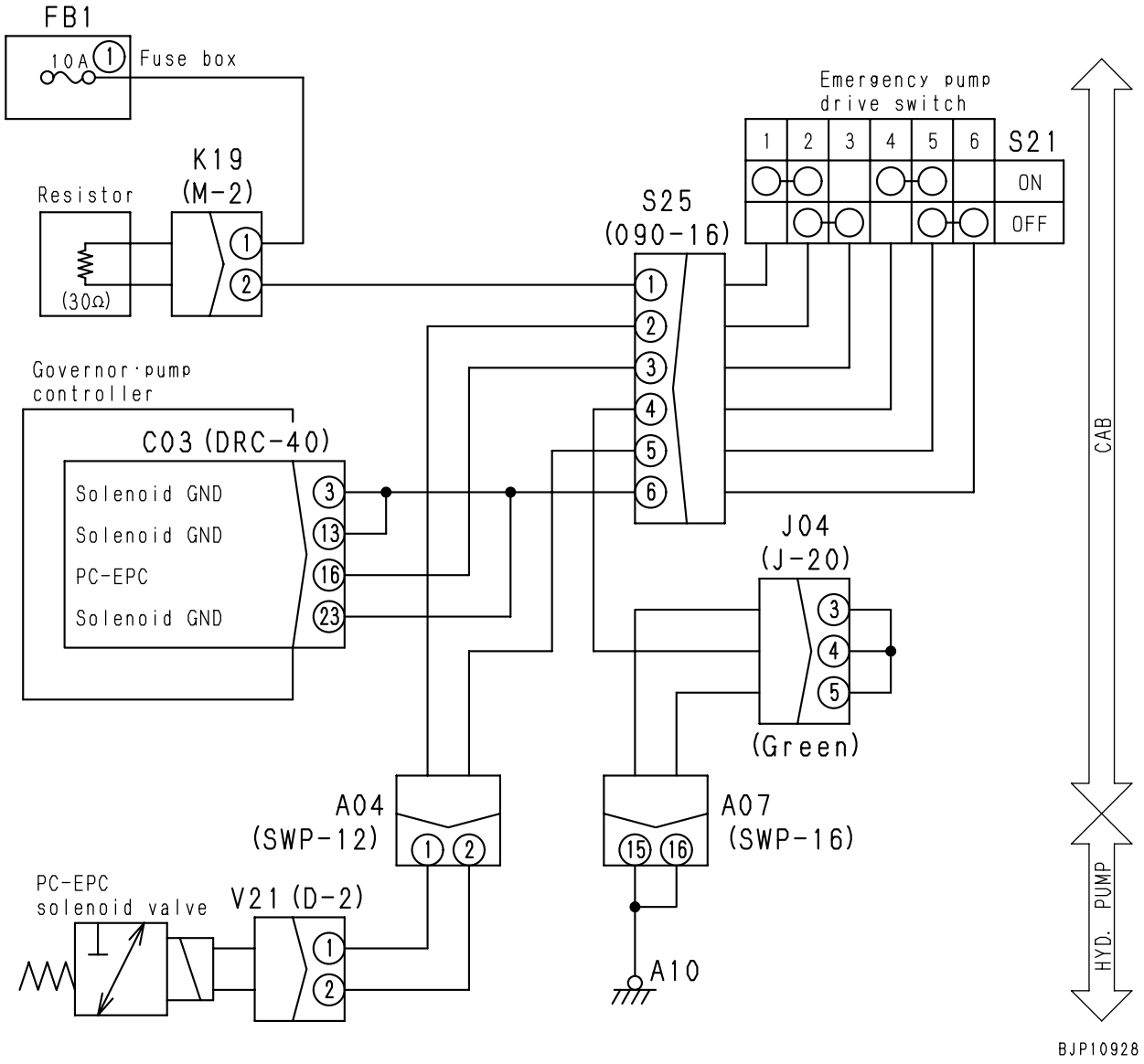


Service Code in Electrical System E232 (Short-circuiting in PC-EPC Solenoid

User Code	Service Code	Failure Code	Failure phenomenon	Disconnection in PC-EPC solenoid (in governor • pump controller system)
E02	**E232**	**DXA0KB**		
Failure content	• Abnormal current flew to the PC-EPC solenoid circuit.			
Response from controller	• The controller reduces the output to the PC-EPC solenoid circuit to 0. • Even if the failure cause disappears, the current does not return to normalcy, unless the engine starting switch is once turned OFF.			
Phenomenon occurring on machine	• As load to the pump increases, the engine rotation drops sharply and sometimes the engine stalls.			
Relative information	• Output to PC-EPC solenoid (ampere) can be confirmed in the monitor function. (Code No. 013: PC-EPC solenoid current) • If there is no abnormality with the solenoid or any of the wiring harnesses, the machine can be operated in a working mode equivalent to E mode by turning the emergency drive switch ON. (At that time the monitor panel continues to display service code No. [E232], but this is not abnormal) ★Turn the emergency driving switch ON during the troubleshooting.			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	PC-EPC solenoid defective (Internal short-circuiting or grounding fault)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			V21 (male)	Resistance value		
			Between ① and ②	7 – 14 Ω		
			Between ① and grounding	Above 1 MΩ		
	2	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness from C03 (female) ⑯ to S21 to V21 (female) ① and grounding	Resistance value	Above 1 MΩ	
	3	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			C03 (female)	Resistance value		
			Between ⑯ and ③ ⑬ ㉓	7 – 14 Ω		
			Between ⑯ and grounding	Above 1 MΩ		

Electrical Circuit Diagram for PC-EPC Solenoid in Governor • Pump Controller



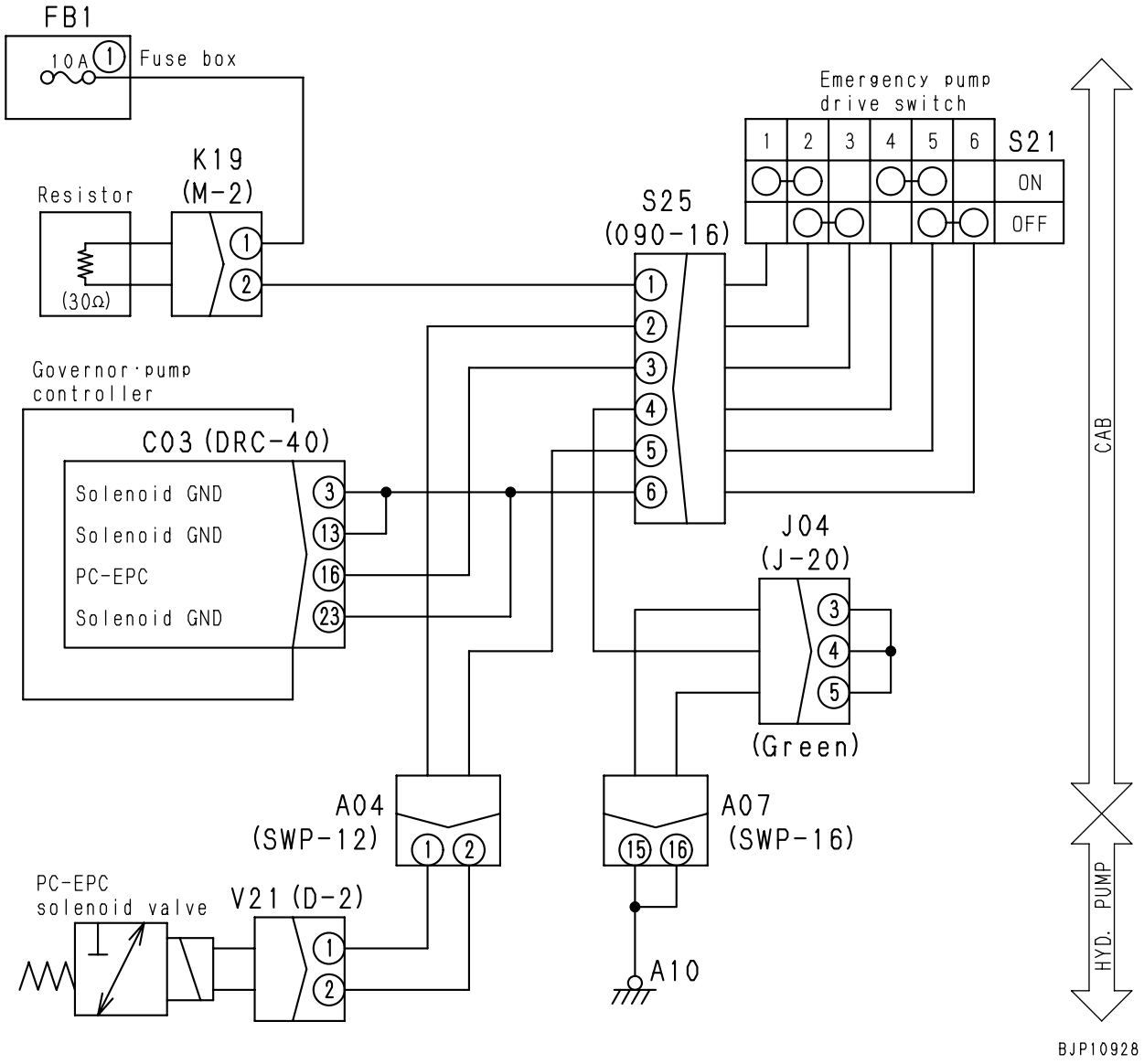
Service Code in Electrical System E233 (Disconnection in PC-EPC solenoid system)

User Code	Service Code	Failure Code	Failure phenomenon	Disconnection in PC-EPC solenoid (in governor • pump controller system)
E02	**E233**	**DXA0KA**		
Failure content	• No current flows to the PC-EPC solenoid circuit.			
Response from controller	• None in particular (The solenoid does not function as there is no current flowing to it) • When the failure cause disappears of itself, the current returns to normalcy.			
Phenomenon occurring on machine	• As load to the pump increases, the engine rotation drops sharply and sometimes the engine stalls.			
Relative information	• Output to PC-EPC solenoid (ampere) can be confirmed in the monitor function. (Code No. 013: PC-EPC solenoid current) • If there is no abnormality with the solenoid or any of the wiring harnesses, the machine can be operated in a working mode equivalent to E mode by turning the emergency driving switch ON. (At that time the monitor panel continues to display Service Code No. [E233], but this is not abnormal)			

Presumed cause and standard value in normalcy

	Cause	Standard value in normalcy and references for troubleshooting			
1	PC-EPC solenoid defective (Internal short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		V21 (male)	Resistance value		
		Between ① and ②	7 – 14 Ω		
2	Emergency pump driving switch defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		S21	Switch	Resistance value	
		Between ② and ③	OFF	Below 1 Ω	
			ON	Above 1 MΩ	
		Between ⑤ and ⑥	OFF	Below 1 Ω	
			ON	Above 1 MΩ	
3	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Wiring harness between C03 (female) ⑯ and S21 ③	Resistance value	Below 1 Ω	
		Wiring harness between S21 ② and V21 (female) ①	Resistance value	Below 1 Ω	
		Wiring harness between C03 (female) ③ ⑬ ㉓ and S21 ⑥	Resistance value	Below 1 Ω	
		Wiring harness between S21 ⑤ and V21 (female) ②	Resistance value	Below 1 Ω	
4	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
		Between wiring harness between C03 (female) ⑯ and S21 ③ and grounding	Voltage	Below 1 V	
		Between wiring harness between S21 ② and V21 (female) ① and grounding	Voltage	Below 1 V	
5	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		C03 (female)	Resistance value		
		Between ⑯ and ③ ⑬ ㉓	7 – 14 Ω		

Electrical Circuit Diagram for PC-EPC Solenoid in Governor • Pump Controller



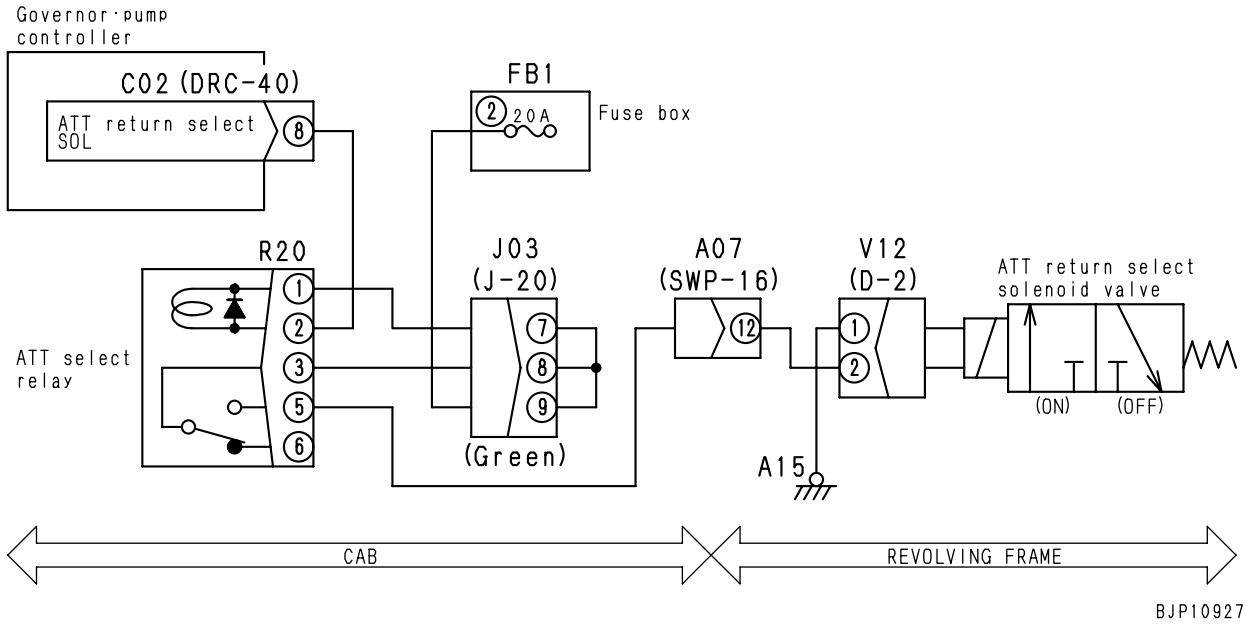
Service Code in Electrical System E238 (Disconnection in attachment return switching relay)

User Code	Service Code	Failure Code	Failure phenomenon	Disconnection in attachment return switching relay (in governor • pump controller system)
—	**E238**	**D196KA**		
Failure content	• When the attachment switching relay circuit is disconnected from grounding (power OFF), 24 V voltage is not generated.			
Response from controller	• None in particular • If the failure cause disappears, the governor returns to normalcy.			
Phenomenon occurring on machine	• The hydraulic circuit for attachments cannot be switched to the single operation			
Relative information	• In this code, a failure is diagnosed only when the setting mode is "with ATT". (Check the setting mode shown in the monitor panel) ★This code detects only failures occurring on the primary ATT return switching relay (coil side). If the ATT return switching solenoid is suspected of a defect, check the power source, wiring harness or solenoid of the secondary relay (contact side). • It can be confirmed in the monitor function how the attachment return switching relay circuit works (ON or OFF). (Code No. 024:Solenoid 2)			

Presumed cause and standard value in normalcy

	Cause	Standard value in normalcy and references for troubleshooting			
1	Fuse No. 2 fault	If the fuse has been blown, there is a big possibility that grounding fault occurred in the relay circuit.			
2	Attachment return switching relay defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		R20 (male)	Resistance value		
		Between ① and ②	100 – 500 Ω		
3	Emergency pump driving switch defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Wiring harness between C02 (female) ⑧ and R20 (female) ②	Resistance value	Below 1 Ω	
		Wiring harness from R20 (female) ① to J03 to FB1-2 outlet	Resistance value	Below 1 Ω	
4	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Between wiring harness between C02 (female) ⑧ and R20 (female) ② and grounding	Resistance value	Above 1 MΩ	
		Between wiring harness from R20 (female) ① to J03 to FB1-2 outlet and grounding	Resistance value	Above 1 MΩ	
5	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
		C03	Working mode	Voltage	
		Between ⑧ and grounding	Other than B mode	20 – 30 V	
			B mode	Below 1 V	

Electrical Circuit Diagram for Attachment Return Switching Relay and Solenoid in Governor • Pump Controller

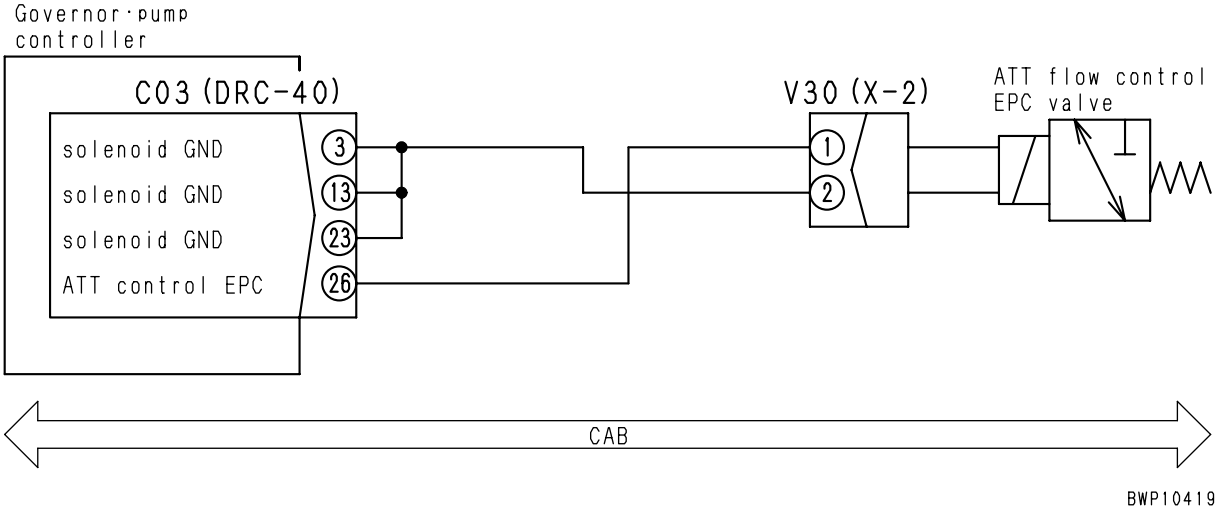


Service Code in Electrical Equipment E245 (Short-circuiting in attachment oil flow rate adjusting EPC) (Multi-monitor only)

User Code	Service Code	Failure Code	Failure phenomenon	Short-circuiting in attachment oil flow rate adjusting EPC (in governor • pump controller system)
—	**E245**	**DXE4KB**		
Failure content	• Abnormal current flew to the attachment oil flow rate adjusting EPC solenoid circuit.			
Response from controller	• The controller reduces to zero (0) power to the attachment oil flow rate adjusting EPC solenoid circuit. • Even when the failure cause disappears, the EPC solenoid circuit does not return to normalcy, unless the engine starting switch is once turned OFF.			
Phenomenon occurring on machine	• The attachments do not move.			
Relative information	• In this code, a failure is diagnosed only when the setting mode is "with ATT". (Check the setting mode shown in the monitor panel) • It can be confirmed in the monitor function how power (ampere) is supplied to the attachment oil flow rate adjusting EPC solenoid circuit. (Code No. 017: Service solenoid current)			

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting			
	1	Attachment oil flow rate adjusting EPC defective (Internal short-circuiting or grounding fault)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			V30 (male)	Resistance value		
			Between ① and ②	7 – 14 Ω		
			Between ① and grounding	Above 1 MΩ		
	2	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between C03 (female) ㉖ and V30 (female) ① and grounding	Resistance value	Above 1 MΩ	
	3	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			C03 (female)	Resistance value		
			Between ㉖ and ③ ⑬ ㉓	7 – 14 Ω		
			Between ㉖ and grounding	Above 1 MΩ		

Electrical Circuit Diagram for Attachment Oil Flow Rate Adjusting EPC Solenoid in Governor • Pump Controller

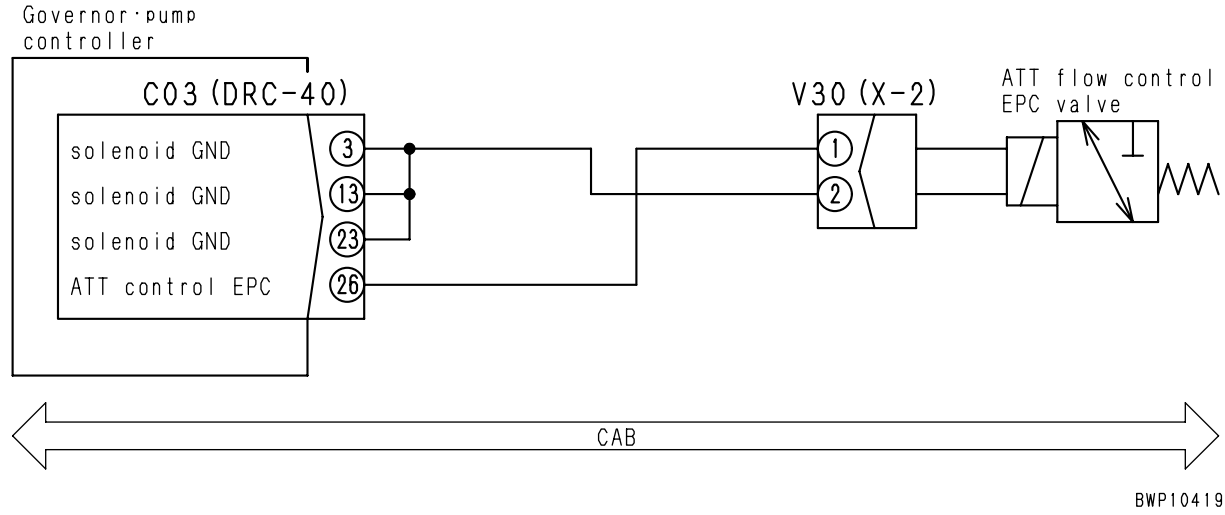


Service Code in Electrical System E246
(Disconnection in attachment oil flow rate adjusting EPC) (Multi-monitor only)

User Code	Service Code	Failure Code	Failure phenomenon	Disconnection in attachment oil flow rate adjusting EPC (in governor • pump controller system)
—	**E246**	**DXE4KA**		
Failure content	• No current flew to the attachment oil flow rate adjusting EPC solenoid circuit.			
Response from controller	• None in particular (The solenoid does not work, as there is no current flowing to it) • If the failure cause disappears, the EPC solenoid circuit returns to normalcy of itself.			
Phenomenon occurring on machine	• The attachments do not move.			
Relative information	• In this code, a failure is diagnosed only when the setting mode is "with ATT". (Check the setting mode shown in the monitor panel) • It can be confirmed in the monitor function how power (ampere) is supplied to the attachment oil flow rate adjusting EPC solenoid circuit. (Code No. 017: Service solenoid current)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Attachment oil flow rate adjusting EPC defective (Internal short-circuiting or grounding fault)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			V30 (male)	Resistance value		
			Between ① and ②	7 – 14 Ω		
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between C03 (female) ㉖ and V30 (male) ① and grounding	Resistance value	Below 1 Ω	
			Between wiring harness between C03 (female) ③ ⑬ ㉓ and V30 (male) ② and grounding	Resistance value	Below 1 Ω	
	3	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Between wiring harness between C03 (female) ㉖ and V30 (female) ① and grounding	Voltage	Below 1 V	
	4	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			C03 (female)	Resistance value		
			Between ㉖ and ③ ⑬ ㉓	7 – 14 Ω		

Electrical Circuit Diagram for Attachment Oil Flow Rate Adjusting EPC Solenoid in Governor • Pump Controller



Service Code in Electrical System E256 (Incorrect nonvolatile memory data)

User Code	Service Code	Failure Code	Failure phenomenon	Incorrect nonvolatile memory data (in governor • pump controller)
—	**E256**	**DA20KT**		
Failure content	• The data in the nonvolatile memory in the controller cannot be updated.			
Response from controller	• None in particular • Even if the failure cause disappears, the nonvolatile memory does not return to normalcy, unless the engine starting switch is once turned OFF.			
Phenomenon occurring on machine	• In some cases control parameters of the machines change, resulting in increase or decrease of the machine's power.			
Relative information	• Recorded in the nonvolatile memory are part of the machine control parameters			

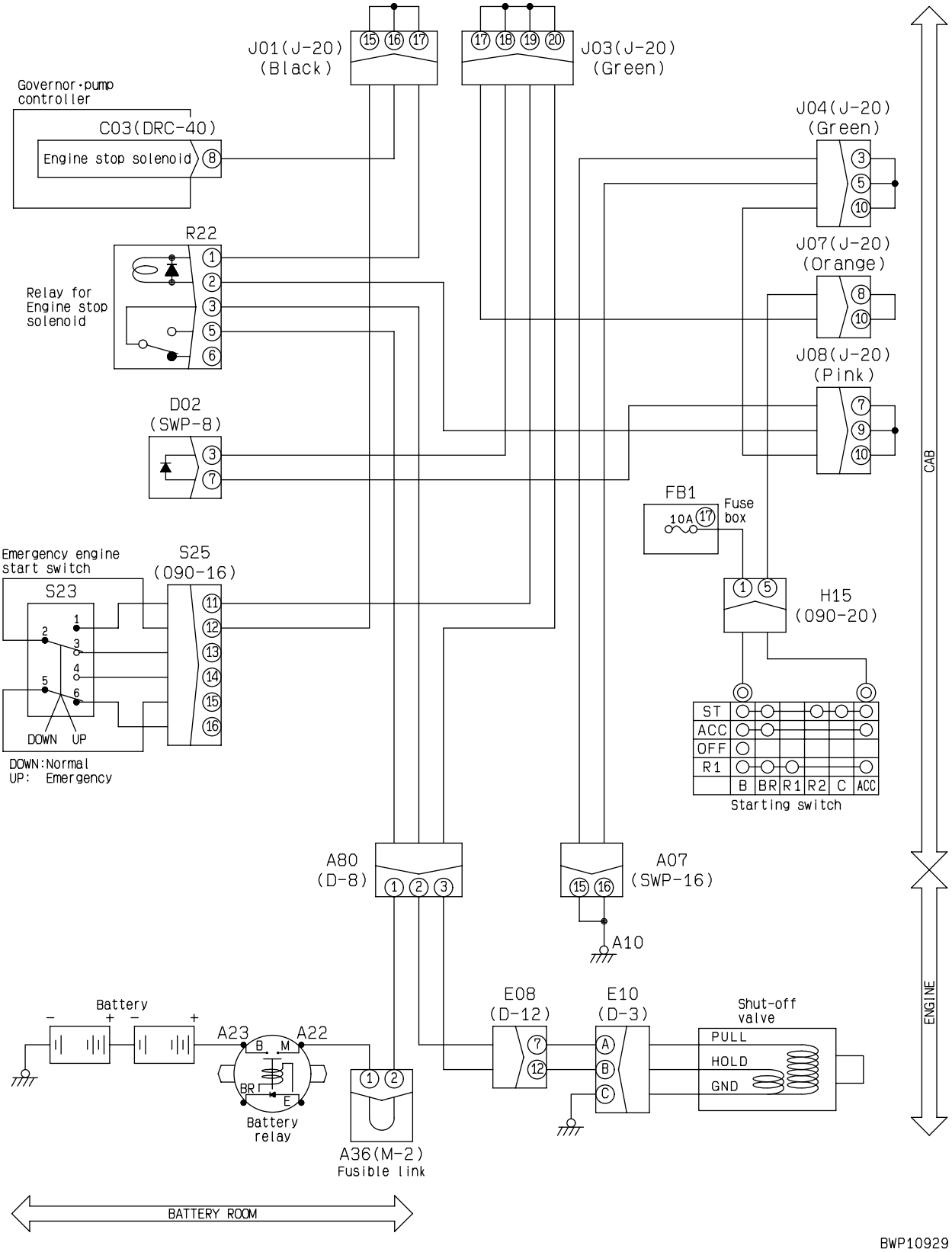
Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Governor • pump controller defective	As it is an internal failure, troubleshooting is impossible. (There is no problem with continuing with use of the controller, so long as no failure is visually evident)

Service Code in Electrical System E304 (Short circuit of engine stop solenoid relay)

User Code	Service Code	Failure Code	Failure phenomenon	Short circuit of engine stop solenoid relay (in governor • pump controller system)
—	**E304**	**DY45KB**		
Failure content	• Abnormal current flew to the engine stop solenoid relay circuit, when power is supplied to the circuit.			
Response from controller	• Switch OFF power to the engine stop solenoid relay circuit. • Even when the failure dissolves itself, the circuit does not return to normalcy, if the engine starting switch is not turned off once.			
Phenomenon occurring on machine	• The engine cannot be started.			
Relative information	• This code detects only failures occurring on the primary engine stop solenoid relay (coil side). If the engine stop solenoid is suspected of a defect, check the power source, wiring harness or solenoid of the secondary relay (contact side). • It can be checked in the monitoring function how the engine stop solenoid relay works (ON and OFF). (Code 023: Controller output) • If there is nothing abnormal with the relay or wiring harness, the engine can be started again by moving the emergency fuel solenoid driving switch to the EMERGENCY side.			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Fault of engine stop solenoid relay (Internal short circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			R22 (male)	Resistance value		
			Between ① and ②	100 – 500 Ω		
	2	Fault of emergency fuel solenoid driving switch (Internal short circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			S25 (male)	Resistance value		
			Between ⑪ and ⑫ grounding	Above 1 MΩ		
	3	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from C03 (female) ⑧ to J01 to R22 (female) ①, or between wiring harness between C03 (female) ⑧ and S25 (female).	Resistance value	Above 1 MΩ	
	4	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it running during the troubleshooting.			
			C03	Engine starting switch	Voltage	
			Between ⑧ and grounding	ON	Below 1 V	
				Engine start-up	20 – 30 V	

Electrical Circuit Diagram for Engine Stop Solenoid and Relay in Monitor Panel



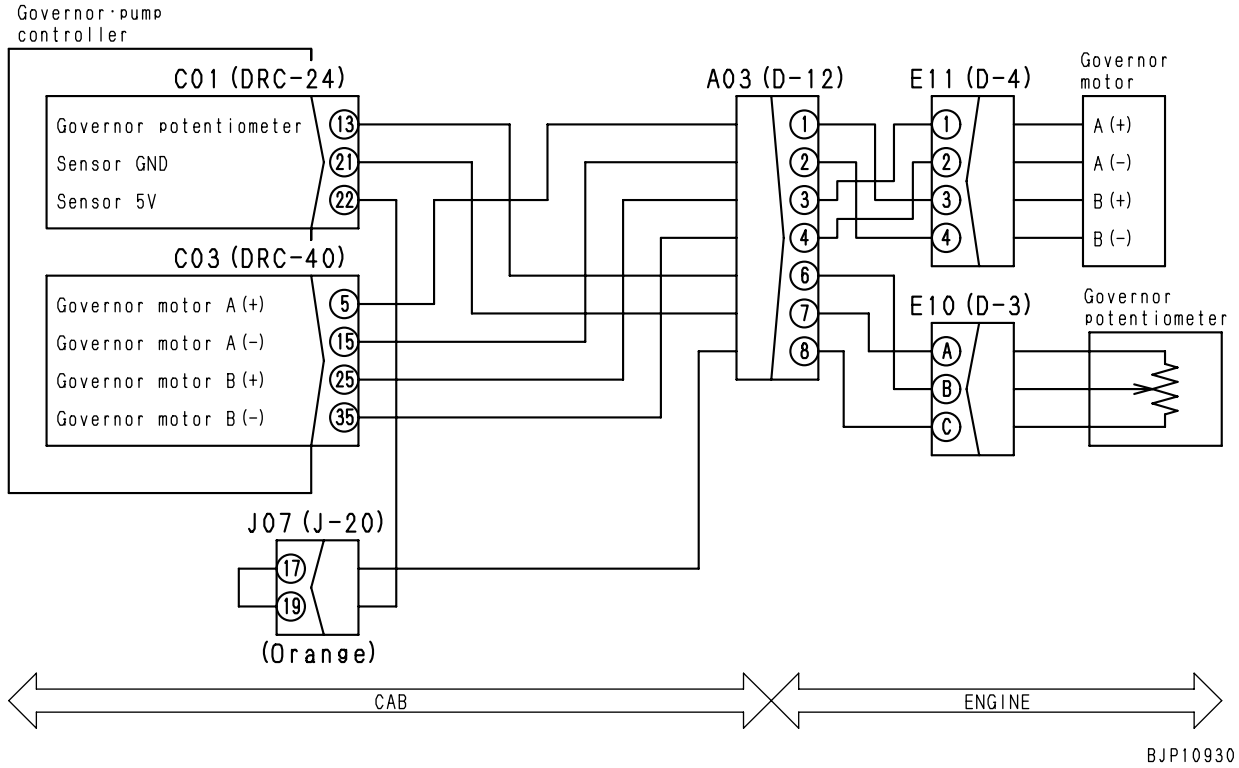
Service Code in Electrical System E306 (Abnormality in governor potentiometer)

User Code	Service Code	Failure Code	Failure phenomenon	Abnormality in governor potentiometer (in governor • pump controller)
—	**E306**	**DK54KZ**		
Failure content	• Signal voltage from the governor potentiometer dropped below 0.4 V or exceeded 4.6 V.			
Response from controller	• The controller exercises control by computing the motor position through voltage right before a failure occurred. • Even if the failure cause disappears of itself, the governor potentiometer does not return to normalcy, unless the engine starting switch is once turned OFF.			
Phenomenon occurring on machine	• The engine cannot attain the specified rotation at high idling. (A bit lower) • The engine cannot attain the specified rotation at low idling (A bit higher) • The auto-decelerator or automatic warming-up function does not work. • There is hunting while the engine is running. • The engine stalls. • The engine does not stop.			
Relative information	• Input from the governor potentiometer (voltage) can be confirmed in the monitor function. (Code No. 031: Governor potentiometer voltage)			

Presumed cause and standard value in normalcy

	Cause	Standard value in normalcy and references for troubleshooting			
1	Sensor power source defective	If Service Code No. [E226] is displayed, troubleshoot the failure first.			
2	Governor potentiometer defective (Internal failure)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		E10 (male)	Resistance value		
		Between Ⓐ and Ⓒ	4.0 – 6.0 kΩ		
		Between Ⓑ and Ⓐ	0.25 – 5.0 kΩ		
		Between Ⓑ and Ⓒ	0.25 – 5.0 kΩ		
3	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Wiring harness from C01 (female) ㉒ to J07 to E10 (female) Ⓒ	Resistance value	Below 1 Ω	
		Wiring harness between C01 (female) ㉑ and E10 (female) Ⓐ	Resistance value	Below 1 Ω	
		Wiring harness between C01 (female) ⑬ and E10 (female) Ⓑ	Resistance value	Below 1 Ω	
4	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Between wiring harness between C01 (female) ⑬ and E10 (female) Ⓑ and grounding	Resistance value	Above 1 MΩ	
5	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
		Between wiring harness from C01 (female) ㉒ to J07 to E10 (female) Ⓒ and grounding	Voltage	Below 1 V	
		Between wiring harness between C01 (female) ⑬ and E10 (female) Ⓑ and grounding	Voltage	Below 1 V	
6	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
		C01	Resistance value		
		Between ㉒ and ㉑	4.5 – 5.5 V		
		Between ⑬ and ㉑	0.5 – 4.5 V		

Electrical Circuit Diagram for Governor Motor in Governor • Pump Controller



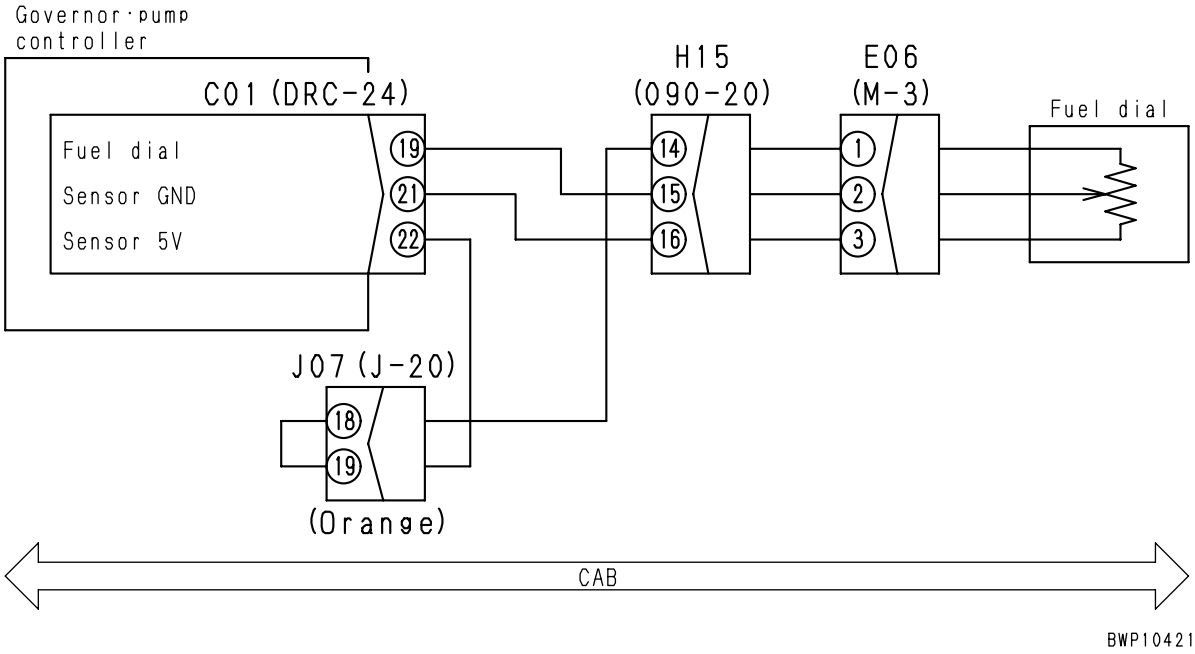
Service Code in Electrical System E308 (Abnormality in fuel dial)

User Code	Service Code	Failure Code	Failure phenomenon	Abnormality in governor fuel dial (in governor • pump controller)
E05	**E308**	**DK10KZ**		
Failure content	• Signal voltage from the from fuel dropped below 0.23 V or exceeded 4.77 V.			
Response from controller	• The controller exercises control by computing the fuel dial position through voltage right before a failure occurred. • If the failure cause disappears, the fuel dial returns to normalcy.			
Phenomenon occurring on machine	• If the fuel dial had been set at FULL before a failure occurred, it does not change to PARTIAL. • If the fuel dial had been set at PARTIALLY before a failure occurred, it does not change to FULL. • There is hunting while the engine is running. • The engine cannot attain the specified rotation at high idling and lacks power.			
Relative information	• Input from the fuel dial (voltage) can be confirmed in the monitor function. (Code No. 030: Fuel dial voltage)			

Presumed cause and standard value in normalcy

	Cause	Standard value in normalcy and references for troubleshooting			
1	Sensor power source defective	If Service Code No. [E226] is displayed, troubleshoot the failure first.			
2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		E06 (male)	Resistance value		
		Between ① and ③	4.0 – 6.0 kΩ		
		Between ② and ①	0.25 – 5.0 kΩ		
		Between ② and ③	0.25 – 5.0 kΩ		
3	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Wiring harness from C01 (female) ㉒ to J07 to E06 (female) ①	Resistance value	Below 1 Ω	
		Wiring harness between C01 (female) ㉑ and E06 (female) ③	Resistance value	Below 1 Ω	
		Wiring harness between C01 (female) ⑲ and E06 (female) ②	Resistance value	Below 1 Ω	
4	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Between wiring harness between C01 (female) ⑲ and E06 (female) ② and grounding	Resistance value	Above 1 MΩ	
5	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
		Between wiring harness from C01 (female) ㉒ to J07 to E06 (female) ① and grounding	Voltage	Below 1 V	
		Between wiring harness between C01 (female) ⑲ and E06 (female) ② and grounding	Voltage	Below 1 V	
6	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
		C01	Resistance value		
		Between ㉒ and ㉑	4.5 – 5.5 V		
		Between ⑲ and ㉑	0.5 – 4.5 V		

Electrical Circuit Diagram for Fuel Dial in Governor • Pump Controller

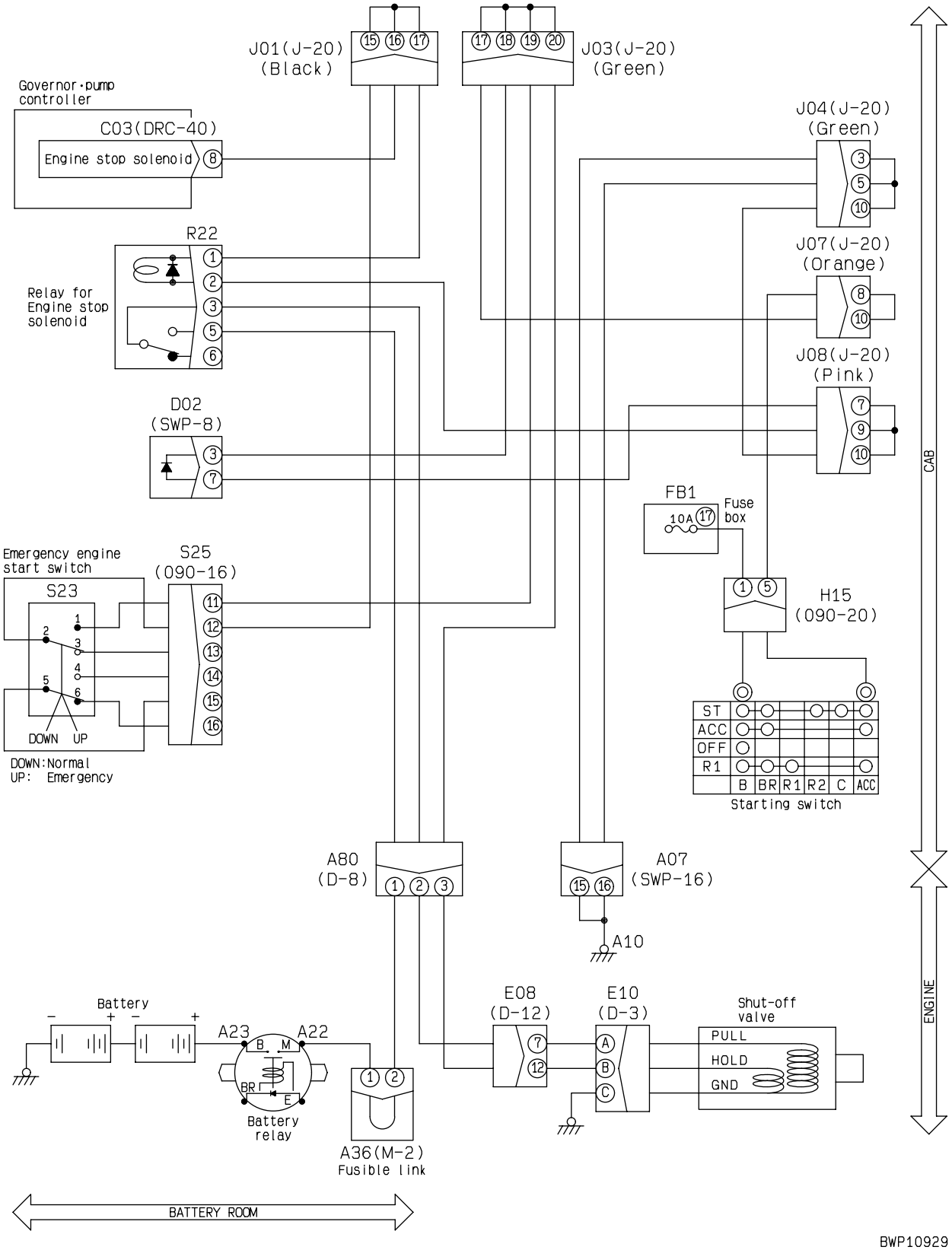


Service Code in Electrical System E314 (Disconnection of engine stop solenoid relay)

User Code	Service Code	Failure Code	Failure phenomenon	Disconnection of engine stop (in governor • pump controller system)
—	**E314**	**DY45KA**		
Failure content	• No current flows to the engine stop solenoid relay, when power is supplied to it.			
Response from controller	• No response in particular (The solenoid does not function without current) • When the failure dissolves itself, the relay returns to the normalcy.			
Phenomenon occurring on machine	• The engine cannot be started.			
Relative information	• This code detects only failures occurring on the primary engine stop solenoid relay (coil side). If the engine stop solenoid is suspected of a defect, check the power source, wiring harness or solenoid of the secondary relay (contact side). • It can be checked in the monitoring function how the engine stop solenoid relay works (ON and OFF). (Code 023: Controller output) • If there is nothing abnormal with the relay or wiring harness, the engine can be started again by moving the emergency fuel solenoid driving switch to the EMERGENCY side. ★The solenoid detects disconnection with power ON. Be sure to make a test for checking after the repair with power ON. (For the operation with power ON and OFF, refer to Diagnosis of Service Code [E201].			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Fault of engine stop solenoid relay (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			R22 (male)	Resistance value		
			Between ① and ②	100 – 500 Ω		
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from C03 (female) ⑧ to J01 to R22 (female) ①	Resistance value	Below 1 Ω	
			Wiring harness between R22 (female) to J08 to J04 and grounding	Resistance value	Below 1 Ω	
	3	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Wiring harness from C03 (female) ⑧ to J01 to R22 (female) ①, or between wiring harness C03 (female) ⑧ and S25 (female) ⑫ and grounding.	Voltage	Below 1 V	
	6	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			C03	Resistance value		
			Between ⑧ and grounding	100 – 500 Ω		

Electrical Circuit Diagram for Engine Stop Solenoid and Relay in Monitor Panel

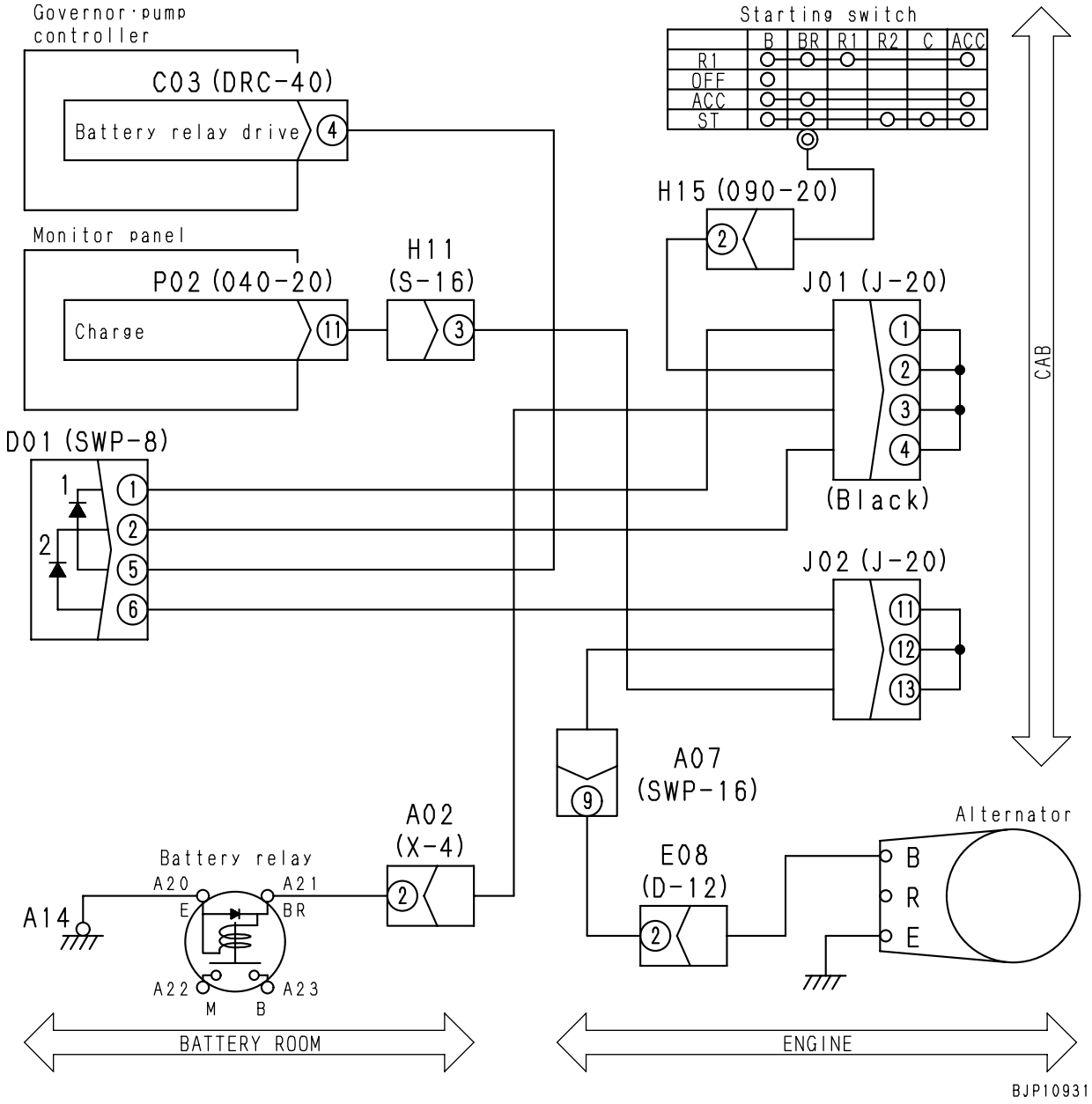


Service Code in Electrical System E315 (Short-circuiting in battery relay)

User Code	Service Code	Failure Code	Failure phenomenon	Short-circuiting in battery relay (in governor • pump controller)
—	**E315**	**D110KB**		
Failure content	• Abnormal current flew to the battery relay drive circuit, when power was supplied to the circuit.			
Response from controller	• The controller turns OFF power to the battery drive circuit. • Even when the failure cause disappears, the relay does not return to normalcy, unless the engine starting switch is once turned OFF.			
Phenomenon occurring on machine	• The engine does not stop.			
Relative information	• It can be confirmed in the monitor function how the battery relay works (ON or OFF). (Code No. 037: Controller output)			

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting			
	1	Battery relay defective (Internal failure)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Battery relay	Continuity & Resistance value		
			Between A21 (BR terminal) and A20 (E terminal)	Continued		
			Between A21 (BR terminal) and grounding	Above 1 MΩ		
	2	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness from C03 (female) ④ to D01 to J01 to A21 (BR terminal) and grounding	Resistance value	Above 1 MΩ	
	3	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C03 (female)	Engine starting switch OFF	Voltage	
			Between ④ and grounding	ON → OFF	20 – 30 V (for 4 to 7 seconds)	

Electrical Circuit Diagram for Battery Relay in Governor • Pump Controller



Service Code in Electrical System E316 (Step-out in governor motor)

User Code	Service Code	Failure Code	Failure phenomenon	Step-out in governor motor (in governor • pump controller)
—	**E316**	**DY10K4**		
Failure content	• There is a big difference between signals from the potentiometer and the set values in the controller.			
Response from controller	• The controller repeats the same controlling motions (step-out). • Even when the failure cause disappears, the governor motor does not return to normalcy, unless the engine starting switch is once turned OFF.			
Phenomenon occurring on machine	• The engine rotation cannot be controlled. • There is hunting in the rotation. • The engine does not stop.			

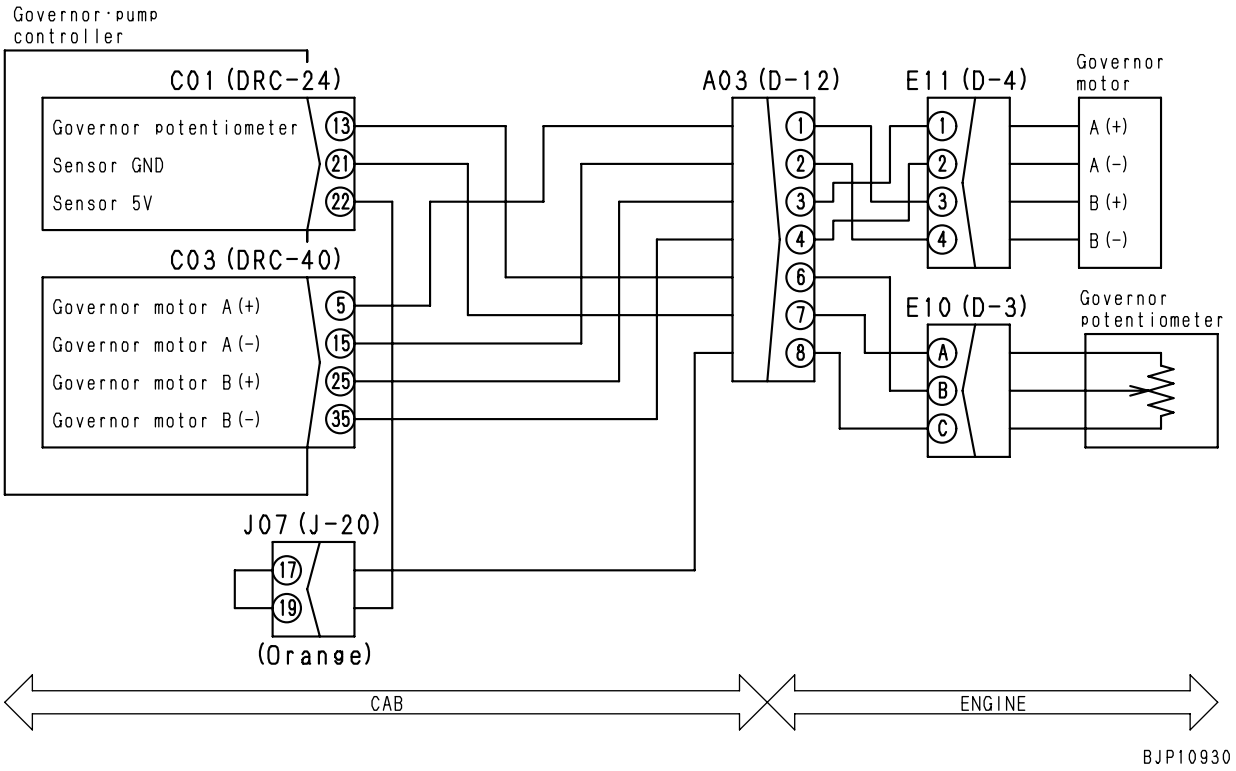
Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Fuel dial defective	If Service Code [E308] is displayed, troubleshoot that failure first.
	2	Governor potentiometer defective	If Service Code [E306] is displayed, troubleshoot that failure first.
	3	Governor motor defective (disconnection)	If Service Code [E317] is displayed, troubleshoot that failure first.
	4	Governor motor defective (short-circuiting)	If Service Code [E318] is displayed, troubleshoot that failure first.
	5	Governor lever adjustment improper	Refer to the section of "Inspection and Adjustment - Special Function of Monitor Panel" in this manual.
	6	Engine fuel control system defective	Refer to Engine Shop Manual.
	7	Governor • pump controller defective	As this is an internal failure, no troubleshooting can be carried out. (If there is none of the failures listed above, the controller is judged as defective)

Service Code in Electrical System E317 (Disconnection in governor motor Phase A and B)

User Code	Service Code	Failure Code	Failure phenomenon	Disconnection in governor motor Phase A and B (in governor • pump controller)
E05	**E317**	**DY10KA**		
Failure content	• No current flew to the governor motor, when power was supplied to the motor.			
Response from controller	• None in particular. • If the failure cause disappears, the governor returns to normalcy.			
Phenomenon occurring on machine	• The engine rotation drops to low idling. • There is hunting in the rotation • The engine does not stop. • The governor motor steps out.			
Relative information	• Operation of the governor motor (current) can be confirmed in the monitor function. (Code No. 033: Governor motor Phase A current, Code No. 034: Governor motor Phase B current)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Governor motor defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			E11 (male)	Resistance value		
			Between ① and ②	2.5 – 7.5 Ω		
			Between ③ and ④	2.5 – 7.5 Ω		
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between C03 (female) ⑤ and E11 (female) ③	Resistance value	Below 1 Ω	
			Wiring harness between C03 (female) ⑮ and E11 (female) ④	Resistance value	Below 1 Ω	
			Wiring harness between C03 (female) ㉕ and E11 (female) ①	Resistance value	Below 1 Ω	
			Wiring harness between C03 (female) ㉟ and E11 (female) ②	Resistance value	Below 1 Ω	
	3	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			C03 (female)	Resistance value		
			Between ⑤ and ⑮	2.5 – 7.5 Ω		
			Between ㉕ and ㉟	2.5 – 7.5 Ω		

Electrical Circuit Diagram for Governor Motor in Governor • Pump Controller



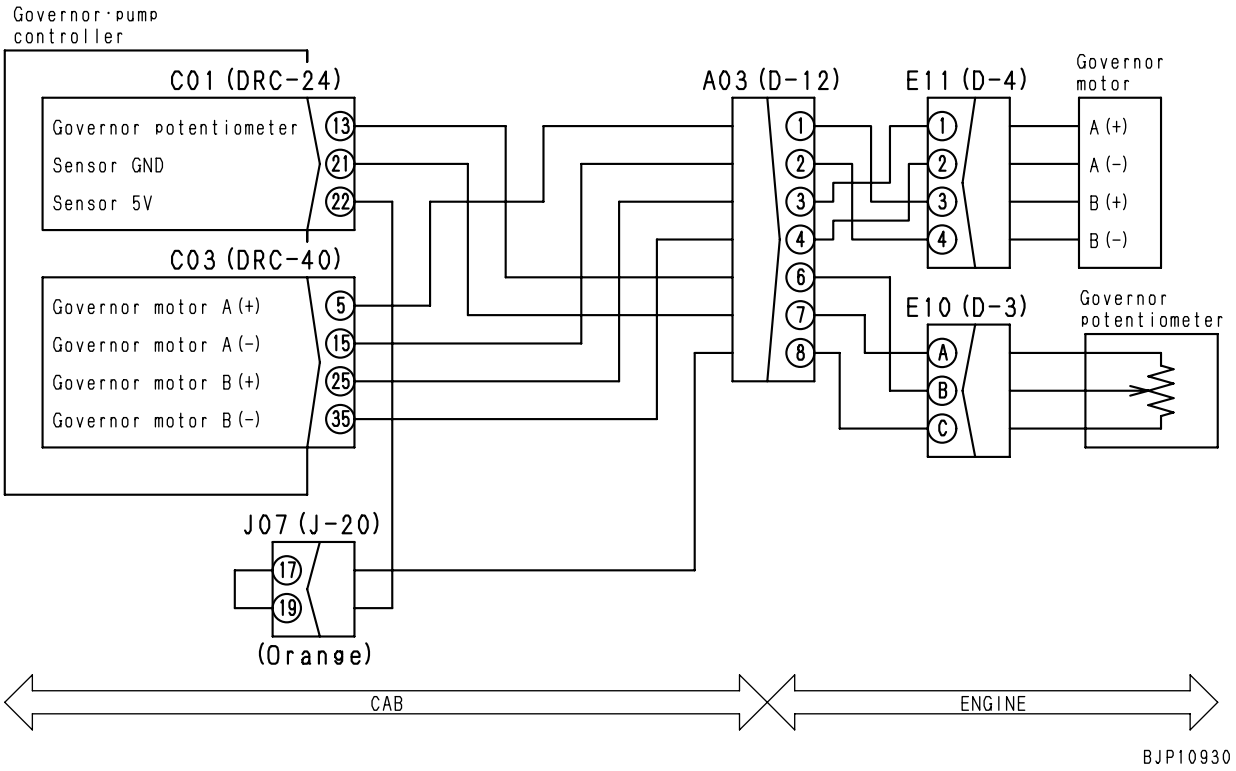
Service Code in Electrical System E318 (Short-circuiting in governor motor Phase A and Phase B)

User Code	Service Code	Failure Code	Failure phenomenon	Disconnection in governor motor Phase A and Phase B (in governor • pump controller system)
E05	**E318**	**DY10KB**		
Failure content	• Abnormal current flew to the governor motor, when power is supplied to the motor.			
Response from controller	• None in particular • If the failure cause disappears, the governor motor returns to normalcy.			
Phenomenon occurring on machine	• The engine rotation cannot be controlled. • The engine rotation drops to low idling. • There is hunting in the rotation. • The engine does not stop.			
Relative information	• Operation of the governor motor (current) can be confirmed in the monitor function. (Code No. 033: Governor motor Phase A current, Code No. 034: Governor motor Phase B current)			

Presumed cause and standard value in normalcy

Cause		Standard value in normalcy and references for troubleshooting			
1	Governor motor defective (Internal short-circuiting or grounding fault)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		E11 (male)	Resistance value		
		Between ① and ②	2.5 – 7.5 Ω		
		Between ③ and ④	2.5 – 7.5 Ω		
		Between ① and grounding	Above 1 MΩ		
		Between ③ and grounding	Above 1 MΩ		
2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Between wiring harness between C03 (female) ⑤ and E11 (female) ③ and grounding	Resistance value	Above 1 MΩ	
		Between wiring harness between C03 (female) ⑮ and E11 (female) ④ and grounding	Resistance value	Above 1 MΩ	
		Between wiring harness between C03 (female) ㉕ and E11 (female) ① and grounding	Resistance value	Above 1 MΩ	
		Between wiring harness between C03 (female) ㉟ and E11 (female) ② and grounding	Resistance value	Above 1 MΩ	
3	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		C03 (female)	Resistance value		
		Between ⑤ and ⑮	2.5 – 7.5 Ω		
		Between ㉕ and ㉟	2.5 – 7.5 Ω		
		Between ⑤ and grounding	Above 1 MΩ		
		Between ⑮ and grounding	Above 1 MΩ		
		Between ㉕ and grounding	Above 1 MΩ		
		Between ㉟ and grounding	Above 1 MΩ		

Electrical Circuit Diagram for Governor Motor in Governor • Pump Controller



Failure Code in Mechanical System A000N1 (Out-of-rate engine rotation at high idling)

User Code	Service Code	Failure Code	Failure phenomenon	Engine rotation at high idling out of rate (in mechanical system)
—	—	**A000N1**		
Failure content	• Engine rotation above 2,350 rpm was detected for more than 10 seconds, while the engine was running.			
Response from controller	• None in particular • If the failure cause disappears of itself, the engine rotation returns to normalcy.			
Phenomenon occurring on machine	• There is a possibility that the engine is damaged, if is used continuously without adjustment.			
Relative information	• Input from the engine rotation sensor (rpm) can be confirmed in the monitor function. (Code No. 010: Engine rotation)			

		Cause	Standard value in normalcy and references for troubleshooting
Presumed cause and standard value in normalcy	1	Failure in engine mechanical system	Check if there has been an internal or external factor that would cause the engine to overrun at high idling, and troubleshoot the mechanical system of the engine.
	2	Governor • pump controller defective	As this is an internal failure, troubleshooting cannot be conducted. (Unless there is any visible trouble found in the machine, use of the controller may be continued as it is)

Failure Code in Mechanical System A000N2 (Out-of-rate engine rotation at low idling)

User Code	Service Code	Failure Code	Failure phenomenon	Out-of-rate engine rotation at low idling (in mechanical system)
—	—	**A000N2**		
Failure content	• Engine rotation below 500 rpm was detected for more than 10 seconds, while the engine was running.			
Response from controller	• None in particular • If the failure cause disappears of itself, the rotation returns to normalcy.			
Phenomenon occurring on machine	• There is a possibility that the engine is damaged, if it is used continuously without adjustment.			
Relative information	• Input from the engine rotation sensor (rpm) can be confirmed in the monitor function. (Code No. 010: Engine rotation)			

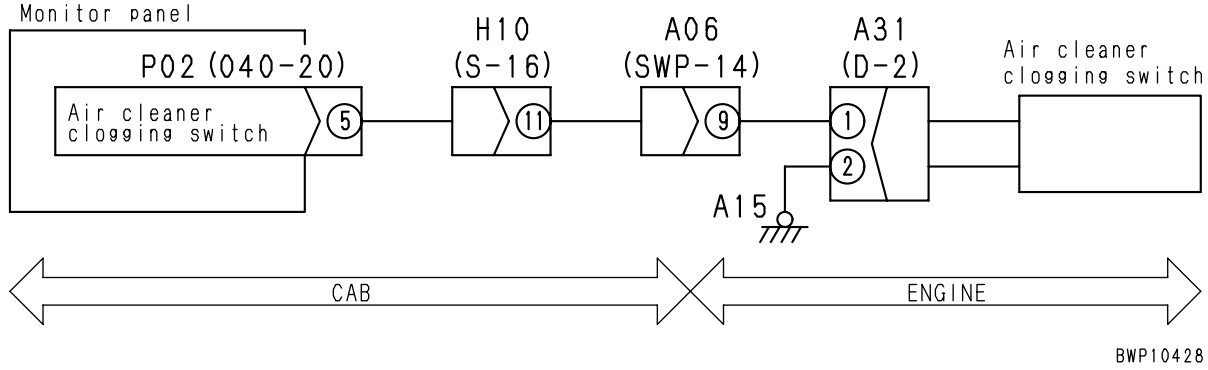
		Cause	Standard value in normalcy and references for troubleshooting
Presumed cause and standard value in normalcy	1	Failure in engine mechanical system	Check if there has been an internal or external factor that would cause the engine to overrun at high idling, and troubleshoot the mechanical system of the engine.
	2	Governor • pump controller defective	As this is an internal failure, troubleshooting cannot be conducted. (Unless there is any visible trouble found in the machine, use of the controller may be continued as it is)

Failure Code in Mechanical System AA10NX (Air cleaner clogging)

User Code	Service Code	Failure Code	Failure phenomenon	Air cleaner clogged (in mechanical system)
—	—	**AA10NX**		
Failure content	• While the engine was running, the signal circuit in the air cleaner clogging switch was opened (i.e. disconnected from grounding circuit).			
Response from controller	• None in particular			
Phenomenon occurring on machine	• There is a possibility that the engine is damaged, if it is used continuously without corrective action.			
Relative information	• This Failure Code is recorded, when the air cleaner clogging caution symbol is displayed in the monitor panel while the engine is running. • Input from the air cleaner clogging switch (ON or OFF) can be confirmed in the monitor panel. (Code No. 046: Monitor input 2)			

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting			
	1	Air cleaner clogged (when the system is in normal condition)	★Check the air cleaner for clogging. If it is clogged, clean or replace it with new one.			
	2	Air cleaner clogging switch defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
			A31 (male)	Air cleaner	Resistance value	
			Between ① and ②	When in normal condition	Below 1 Ω	
				When clogged	Above 1 MΩ	
	3	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it running during the troubleshooting.			
			Wiring harness between P02 (female) ⑤ and A31 (female) ①		Resistance value	Below 1 Ω
			Between wiring harness A31 (female) ② and grounding		Resistance value	Below 1 Ω
	4	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
			P02	Air cleaner	Voltage	
			Between ⑤ and grounding	When in normal condition	Below 1 V	
				When clogged	20 – 30 V	

Electrical Circuit for Air Cleaner Clogging Switch in Monitor Panel

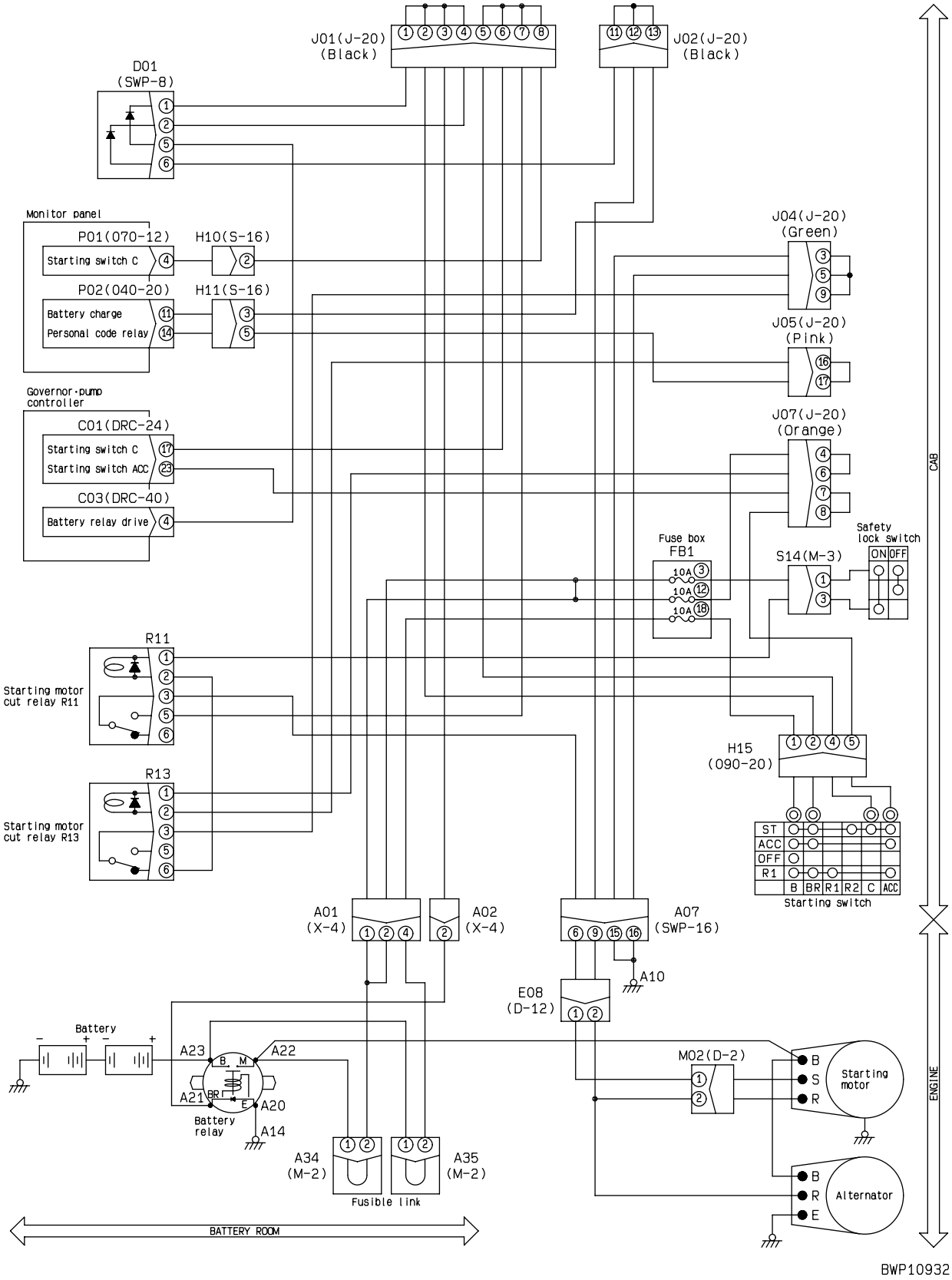


Failure Code in Mechanical System AB00KE (Abnormally lowered charging voltage)

User Code	Service Code	Failure Code	Failure phenomenon	Charging voltage abnormally lowered (in mechanical system)
—	—	**AB00KE**		
Failure content	• Generation signal from the alternator is not inputted, while the engine is running.			
Response from controller	• None in particular			
Phenomenon occurring on machine	• There is a possibility that the battery may not be charged, if charging is continued without corrective action.			
Relative information	• This Failure Code is recorded, if the charging caution symbol is displayed in the monitor panel, while the engine is running. • Input from the alternator (voltage) can be confirmed in the monitor function. (Code No. 043: Charging voltage)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Alternator defective (short generating output)	★Turn the engine starting switch OFF for the preparations, and hold it running during the troubleshooting.			
			E12 (male)	Engine rotation	Voltage	
			Between terminal R and grounding	Above medium speed	27.5 – 29.5 V	
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from P02 (female) ⑪ to J02 to alternator terminal R.		Resistance value	Below 1 Ω
	3	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Wiring harness from P02 (female) ⑪ to J02 to alternator terminal R, or between P02 (female) ⑪ and D01 (female) ⑥, or between P02 (female) ⑪ to M02 (female) ② and grounding		Resistance value	Above 1 MΩ
	4	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
			P02	Engine rotation	Voltage	
			Between ⑪ and grounding	Above medium speed	27.5 – 29.5 V	

Electrical Circuit Diagram for Engine Start, Stop and Charging in Monitor Panel

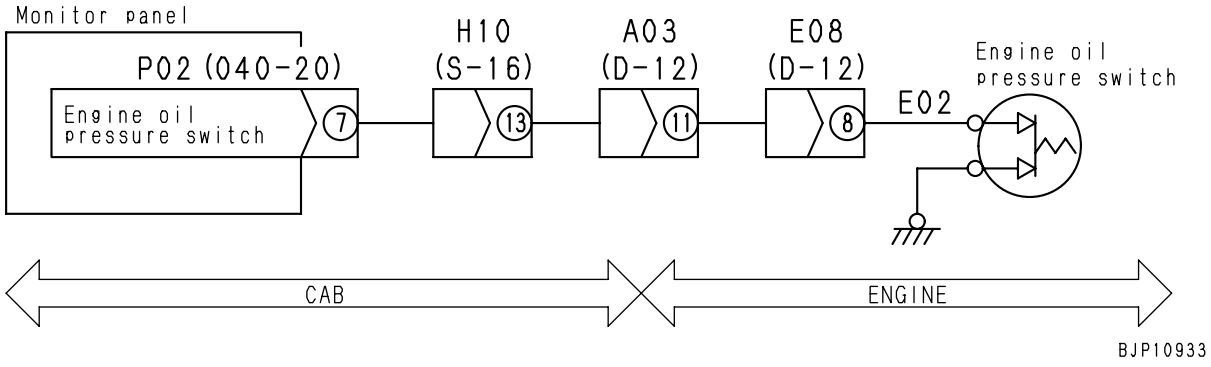


Failure Code in Mechanical System B@BAZG (Abnormally lowered engine oil pressure)

User Code	Service Code	Failure Code	Failure phenomenon	Engine oil pressure abnormally lowered (in mechanical system)
—	—	**B@BAZG**		
Failure content	• The signal circuit in the engine oil pressure switch was closed (i.e. connected with grounding), while the engine was running.			
Response from controller	• None in particular			
Phenomenon occurring on machine	• There is a possibility that the engine may seize, if the engine is kept running without corrective action.			
Relative information	• This Failure Code is recorded, if the engine oil pressure caution symbol is displayed in the monitor panel, while the engine is running. • Input from the engine oil pressure switch (ON or OFF) can be confirmed in the monitor function. (Code No. 046: Monitor input 2)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Engine oil pressure lowered (the system in normal condition)	★Check the failure cause and damage to the engine, and then make repairs.			
	2	Engine oil pressure switch defective (Internal short-circuiting)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
			E02 (on switch side)	Engine oil pressure	Resistance value	
			Between terminal and grounding	When in normal condition	Above 1 MΩ	
				When lowered	Below 1 Ω	
	3	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between P02 (female) (7) and E02 (terminal) and grounding		Resistance value	Above 1 MΩ
	4	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
			P02	Engine oil pressure	Voltage	
			Between ⑦ and grounding	When in normal condition	20 – 30 V	
				When lowered	Below 1 V	

Electrical Circuit Diagram for Engine Oil Pressure Switch in Monitor Panel

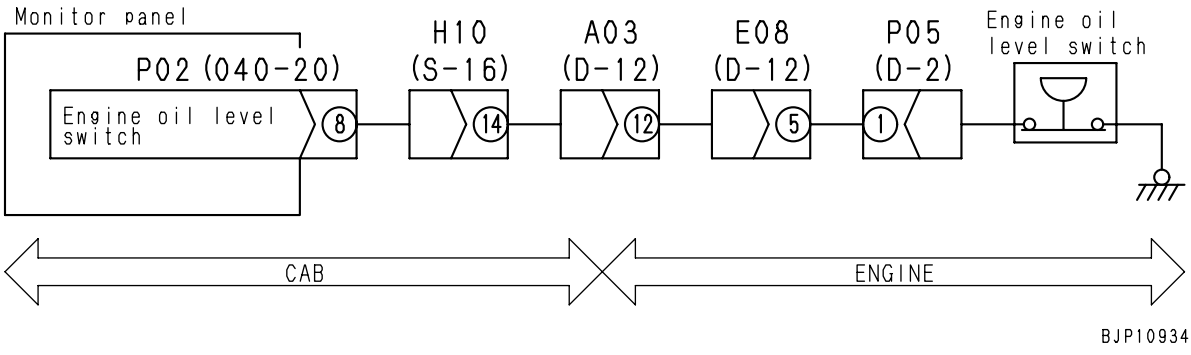


Failure Code in Mechanical System B@BAZK (Abnormally lowered engine oil level)

User Code	Service Code	Failure Code	Failure phenomenon	Engine oil level abnormally lowered (in mechanical system)
—	—	**B@BAZK**		
Failure content	• The signal circuit in the engine oil level switch was opened (i.e. disconnected from grounding), when the engine is stopped (with the starting switch in the ON position).			
Response from controller	• None in particular			
Phenomenon occurring on machine	• There is a possibility that the engine seizes if it is kept running without a corrective action.			
Relative information	• This Failure Code is recorded if the engine oil level caution symbol is displayed, when the engine is stopped (with the starting key in the ON position). • Input from the engine oil level switch (ON or OFF) can be confirmed in the monitor function. (Code No. 046: Monitor input 2)			

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting			
	1	Engine oil level lowered (System in normal condition)	★Check the engine oil level, and refill oil. (If the phenomenon occurs frequently, check the cause)			
	2	Engine oil level switch defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			P05 (male)	Engine oil level	Resistance value	
			Between ① and grounding	When in normal condition	Below 1 Ω	
				When lowered	Above 1 MΩ	
	3	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between P02 (female) ⑧ and P05 (female) ①		Resistance value	Below 1 Ω
	4	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			P02	Engine oil pressure	Voltage	
			Between ⑧ and grounding	When in normal condition	Below 1 V	
				When lowered	20 – 30 V	

Electrical Circuit Diagram for Engine Oil Level Switch in Monitor Panel

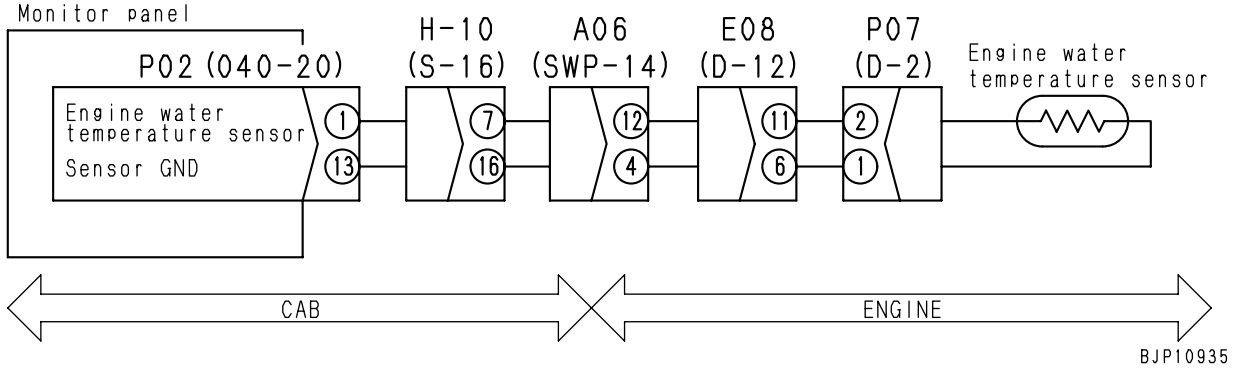


Failure Code in Mechanical System B@BCNS (Engine cooling water overheating)

User Code	Service Code	Failure Code	Failure phenomenon	Engine cooling water overheated (in mechanical system)
—	—	**B@BCNS**		
Failure content	• The engine cooling water sensor inputted a signal of 102°C, while the engine was running.			
Response from controller	• Response from controller			
Phenomenon occurring on machine	• There is a possibility that the engine seizes, if it is kept running without a corrective action.			
Relative information	• This Failure Code is recorded, if the engine cooling water temperature gauge is displayed in the red range, when the engine is running. • Input from the engine cooling water temperature sensor (temperature) can be confirmed in the monitor function. (Code No. 041: Engine cooling water temperature)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Engine Overheating (system in normal condition)	★Check the engine for the cause and damage, and repair it.			
	2	Engine cooling water temperature sensor defective (Internal short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			P07 (male)	Engine cooling water temperature	Resistance value	
			Between ① and ②	10 – 100 °C	90 – 3.5kΩ	
			Between ② and grounding		Above 1 MΩ	
	3	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between P02 (female) ① and P07 (female) ② and grounding		Resistance value	Above 1 MΩ
	4	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			P02 (female)	Engine water temperature	Resistance value	
			Between ① and ⑬	10 – 100 °C	90 – 3.5kΩ	
			Between ① and grounding		Above 1 MΩ	

Electrical Circuit Diagram for Engine Cooling Water Temperature Sensor in Monitor Panel



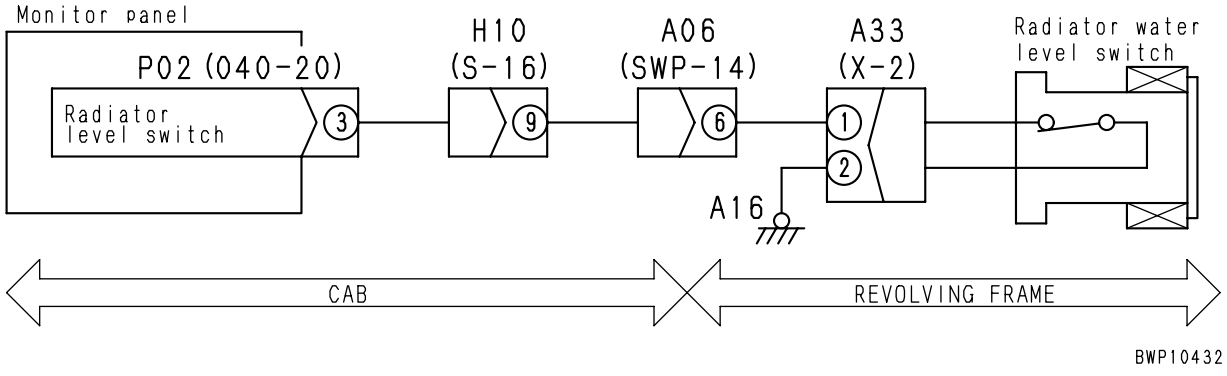
Failure Code in Mechanical System B@BCZK (Abnormally lowered radiator water level)

(Multi-monitor only)

User Code	Service Code	Failure Code	Failure phenomenon	Radiator water level abnormally lowered (in mechanical system)
—	—	**B@BCZK**		
Failure content	• The signal circuit in the radiator water level switch was opened (i.e. disconnected from grounding).			
Response from controller	• None in particular			
Phenomenon occurring on machine	• There is a possibility that the engine seizes, if it is kept running without a corrective action.			
Relative information	• This Failure Code is recorded, if the radiator water level caution symbol is displayed in the monitor panel, when the engine is running. • Input from the radiator water level switch (ON or OFF) can be confirmed in the monitor function. (Code No. 045: Monitor input 1)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Radiator water level lowered (system in normal condition)	★Check the water level and refill cooling water. (If this phenomenon occurs frequently, check the cause)			
	2	Radiator water level switch defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			A33 (male)	Engine cooling water level	Resistance value	
			Between ① and ②	When in normal condition	Below 1 Ω	
				When lowered	Above 1 MΩ	
	3	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between P02 (female) ③ and A33 (female) ①		Resistance value	Below 1 Ω
			Wiring harness between A33 (female) ② and grounding		Resistance value	Below 1 Ω
	4	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			P02	Engine water temperature	Resistance value	
			Between ③ and grounding	When in normal condition	Below 1 V	
				When lowered	20 – 30 V	

Electrical Circuit Diagram for Radiator Water Level Switch in Monitor Panel



BWP10432

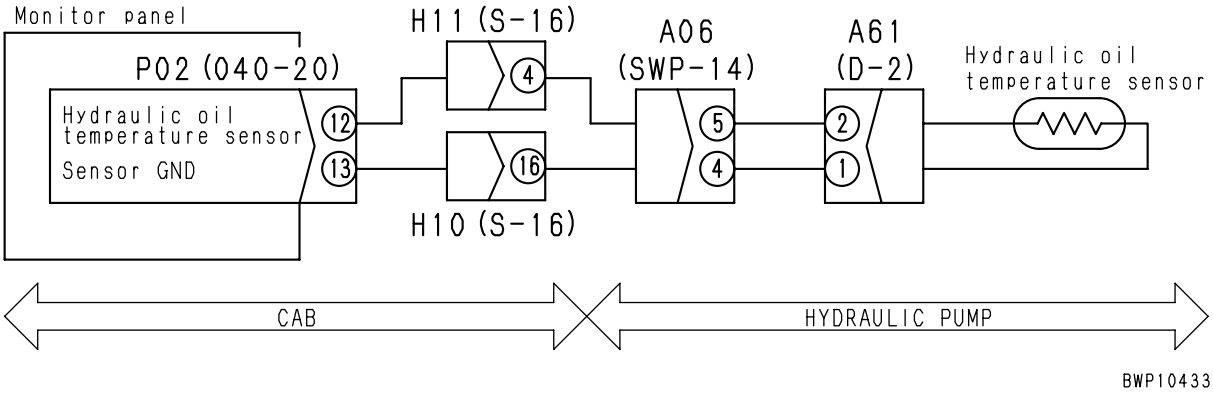
Failure Code in Mechanical System B@HANS (Hydraulic oil overheating)

(Multi-monitor only)

User Code	Service Code	Failure Code	Failure phenomenon	Hydraulic oil overheated (in mechanical system)
—	—	**B@HANS**		
Failure content	• The hydraulic oil temperature sensor inputted a signal of 102°C, while the engine was running.			
Response from controller	• None in particular			
Phenomenon occurring on machine	• There is a possibility that the engine seizes, if it is kept running without a corrective action.			
Relative information	• This Failure Code is recorded, if the hydraulic oil temperature gauge is displayed in the red range, when the engine is running. • Input from the hydraulic oil temperature sensor (temperature) can be confirmed in the monitor function. (Code No. 044: Engine cooling water temperature)			

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Hydraulic oil overheating (system in normal condition)	★Check the cause and damage to the hydraulic equipment, and repair it.			
	2	Hydraulic oil temperature sensor defective (Internal short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			A61 (male)	Hydraulic oil temperature	Resistance value	
			Between ① and ②	10 – 100 °C	90 – 3.5kΩ	
			Between ② and grounding		Above 1 MΩ	
	3	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between P02 (female) ⑫ and A61 (female) ② and grounding		Resistance value	Above 1 MΩ
	4	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			P02 (female)	Engine water temperature	Resistance value	
			Between ⑫ and ⑬	10 – 100 °C	90 – 3.5kΩ	
			Between ⑫ and grounding		Above 1 MΩ	

Electrical Circuit Diagram for Hydraulic Oil Temperature Sensor in Monitor Panel



TROUBLESHOOTING OF ELECTRICAL SYSTEM (E-MODE)

INFORMATION CONTAINED IN TROUBLESHOOTING TABLE 20-502
E-1 Engine does not start 20-503
E-2 Engine stops while in operation 20-508
E-3 Engine speed is irregular, or there is hunting 20-510
E-4 Engine does not stop 20-512
E-5 Auto-decelerator does not work 20-514
E-6 Auto engine warm-up device does not work 20-515
E-7 Preheater does not work 20-516
E-8 All work equipment, swing and travel do not move 20-518
E-9 One-touch Power Max. Switch does not work 20-520
E-10 No display in monitor panel at all 20-521
E-11 Part of display on monitor panel is missing 20-522
E-12 Monitor panel displays contents irrelevant to the model 20-522
E-13 Fuel level monitor red lamp lights up while engine is running 20-523
E-14 Engine cooling water temperature gauge does not indicate correctly 20-524
E-15 Hydraulic oil temperature gauge does not display correctly 20-525
E-16 Fuel gauge does not display correctly 20-526
E-17 Swing lock monitor does not display correctly 20-527
E-18 When the monitor switch is operated, no display appears 20-528
E-19 Windshield wiper does not work 20-530
E-20 Alarming buzzer cannot be cancelled 20-532
E-21 "Boom RAISE" is not correctly displayed in monitor function 20-533
E-22 "Boom LOWER" is not correctly displayed in monitor function 20-534
E-23 "Arm DIGGING" is not correctly displayed in monitor function 20-535
E-24 "Arm DUMPING" is not correctly displayed in monitor function 20-536
E-25 "Bucket DIGGING" is not correctly displayed in monitor function 20-537
E-26 "Bucket DUMPING" is not correctly displayed in monitor function 20-538
E-27 "SWING" is not correctly displayed in monitor function 20-540
E-28 "TRAVEL" is not correctly displayed in monitor function 20-542
E-29 "Travel Differential Pressure" is not correctly displayed in monitor function 20-544
E-30 "Service" is not correctly displayed in monitor function 20-546
E-31 Air Conditioner does not work 20-548
E-32 Travel alarm does not sound 20-549

INFORMATION CONTAINED IN TROUBLESHOOTING TABLE

★ The following information are edited and contained in the "Information Contained in Troubleshooting Table". You are required to proceed with troubleshooting after fully grasping the contents.

Failure information	Phenomena occurring on machine
Relative information	Information on occurred failures and troubleshooting

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Cause for presumed failure (The attached No. for filing and reference purpose only. It does not stand for any priority)	<Contents> • The standard values in normalcy by which to judge "good" or "no good" about presumed causes. • References for making judgement of "good" or "no good" <Phenomena of wiring harness fault> • Failure due to disconnection Defective contact with connector or disconnection of wiring harness has occurred. • Grounding fault A wiring harness that is not originally connected with a grounding circuit is in contact with it. • Failure due to short-circuiting A wiring harness that is not originally connected with a power source circuit (24 V) is in contact with it. <Points to remember in troubleshooting> 1) Connector denotation method and handling of T-adapters Insert or connect T-adapters in the following manner, unless specifically otherwise instructed. • If there is no indication of (male) or (female) in the connector No., pull off a connector and insert a T-adapter into both sides of male and female. • If there is an indication of (male9 and (female) in the connection No., pull off a connector and insert a T-adapter into only one side of (male) or (female). 2) Description sequence of pin No. and handling of circuit tester leads Connect the positive lead (+) and negative lead (–) for troubleshooting in the following manner unless specifically otherwise instructed. • Connect the positive lead (+) to a pin No. marked at the front or wiring harness. • Connect the negative lead (–) to a pin No. marked at the rear or wiring harness.
	2		
	3		
	4		
	5		

Relative Electrical Circuit Diagram

This is part of the electrical circuit diagram which shows the portion where the failure occurred.

- Connector No.: Indicates (Type - numbers of a pin) (color)
- Arrow: Roughly indicates the location in the machine where it is installed.

E-1 Engine does not start

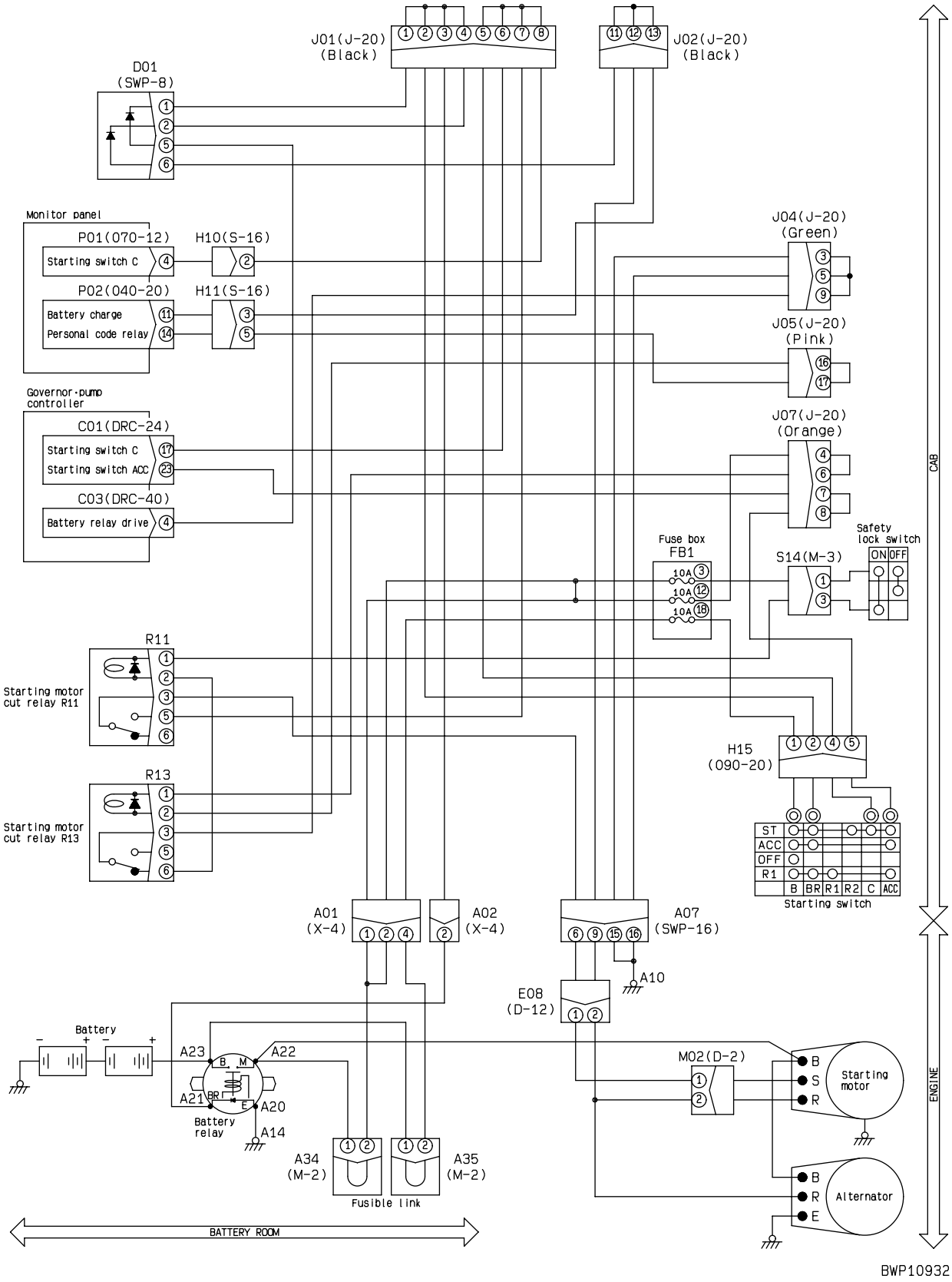
Failure information (1)	• The engine does not start (the engine does not rotate).
Relative information	• The following two engine start locking mechanisms are provided in the engine starting circuit. 1) Engine start locking by means of password in the monitor panel (※) 2) Engine start locking by means of safety lock lever

※: The multi-monitor specification machine only.

<table>
<tr><td rowspan="19">Presumed cause and standard value in normalcy</td><td colspan="2">Cause</td><td colspan="4">Standard value in normalcy and references for troubleshooting</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Shortage in battery capacity</td><td>Battery voltage</td><td colspan="3">Battery electrolyte specific gravity</td></tr>
<tr><td>Above 24 V</td><td colspan="3">Above 1.26</td></tr>
<tr><td>2</td><td>Fuse Nos. 3 and 18 and Fusible Link A35 fault</td><td colspan="4">When a fuse or fusible link is blown, there is a big possibility that grounding fault occurred in the circuit.
If a monitor lamp does not light up in the monitor panel, check the power source circuit between the battery and the specific fuse.</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Engine starting switch fault (Internal disconnection)</td><td colspan="4">★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.</td></tr>
<tr><td>H15 (male)</td><td>Position</td><td colspan="2">Resistance value</td></tr>
<tr><td>Between ① and ④</td><td>OFF</td><td colspan="2">Above 1 MΩ</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Safety lock switch fault (Internal short-circuiting)</td><td colspan="4">★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.</td></tr>
<tr><td>S14 (female)</td><td>Lock lever</td><td colspan="2">Resistance value</td></tr>
<tr><td>Between ① and ③</td><td>Release</td><td colspan="2">Below 1 Ω</td></tr>
<tr><td rowspan="5">5</td><td rowspan="5">Engine starting motor cut relay, R11 and R13 defective (Internal disconnection or short-circuiting)</td><td colspan="4">★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.</td></tr>
<tr><td colspan="2">R11 (female) & R13 (male)</td><td colspan="2">Resistance value</td></tr>
<tr><td colspan="2">Between ① and ②</td><td colspan="2">100 – 500 Ω</td></tr>
<tr><td colspan="2">Between ③ and ⑤</td><td colspan="2">Above 1 MΩ</td></tr>
<tr><td colspan="2">Between ③ and ⑥</td><td colspan="2">Below 1 Ω</td></tr>
<tr><td rowspan="4">6</td><td rowspan="4">Engine starting motor fault (Internal disconnection or damage)</td><td colspan="4">★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting. (If all of the power source, grounding (GND), generation signal and engine start input are normal and yet the engine start output is not normal, the engine starting motor relay is defective)</td></tr>
<tr><td colspan="2">Engine starting motor</td><td>Engine starting switch</td><td>Voltage</td></tr>
<tr><td colspan="2">Power source: B terminal and grounding</td><td rowspan="2">Start</td><td>20 – 30 V</td></tr>
<tr><td colspan="2">Engine start input: C terminal and grounding</td><td>20 – 30 V</td></tr>
<tr><td rowspan="3">7</td><td rowspan="3">Alternator fault (Internal short-circuit)</td><td colspan="4">★Turn the engine starting switch OFF for the preparations, and hold it in the ON position or running during the troubleshooting.</td></tr>
<tr><td colspan="2">Alternator</td><td colspan="2">Voltage</td></tr>
<tr><td colspan="2">R terminal and grounding</td><td colspan="2">Below 1 V</td></tr>
</table>

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting		
	8	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			Wiring harness between FB1-18 outlet and H15 (female) ①	Resistance value	Below 1 Ω
			Wiring harness from H15 (female) ④ to J01 to R11 (female) ⑤	Resistance value	Below 1 Ω
			Wiring harness between R11 (female) ③ and M02 (female) ①	Resistance value	Below 1 Ω
			Wiring harness between FB1-3 and S14 (female) ①	Resistance value	Below 1 Ω
			Wiring harness between S14 (female) ③ and R11 (female) ①	Resistance value	Below 1 Ω
			Wiring harness between R11 (female) ② and R13 (female) ⑥	Resistance value	Below 1 Ω
			Wiring harness from R13 (female) ③ to J04 to grounding	Resistance value	Below 1 Ω
	9	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			Between wiring harness from battery relay B terminal (A23) to A35 to FB1-18 and grounding	Resistance value	Above 1 MΩ
			Between wiring harness between FB1-18 outlet and H15 (female) ① and grounding	Resistance value	Above 1 MΩ
			Between wiring harness from H15 (female) ④ to J01 to R11 (female) ⑤ and grounding	Resistance value	Above 1 MΩ
			Between wiring harness between R11 (female) ③ and M02 (female) ① and grounding	Resistance value	Above 1 MΩ
			Between wiring harness between FB1-3 and S14 (female) ① and grounding	Resistance value	Above 1 MΩ
			Between wiring harness between S14 (female) ③ and R11 (female) ① and grounding	Resistance value	Above 1 MΩ
			Between wiring harness from R13 (female) ② to J05 to P02 (female) ⑭ and grounding	Resistance value	Above 1 MΩ
	10	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
			Wiring harness from P02 (female) ⑪ to J02 to M02 (female) ②, or wiring harness between P02 (female) ⑪ and D01 (female) ⑥, or between wiring harness between P02 (female) ⑪ and alternator R terminal and grounding	Voltage	Below 1 V

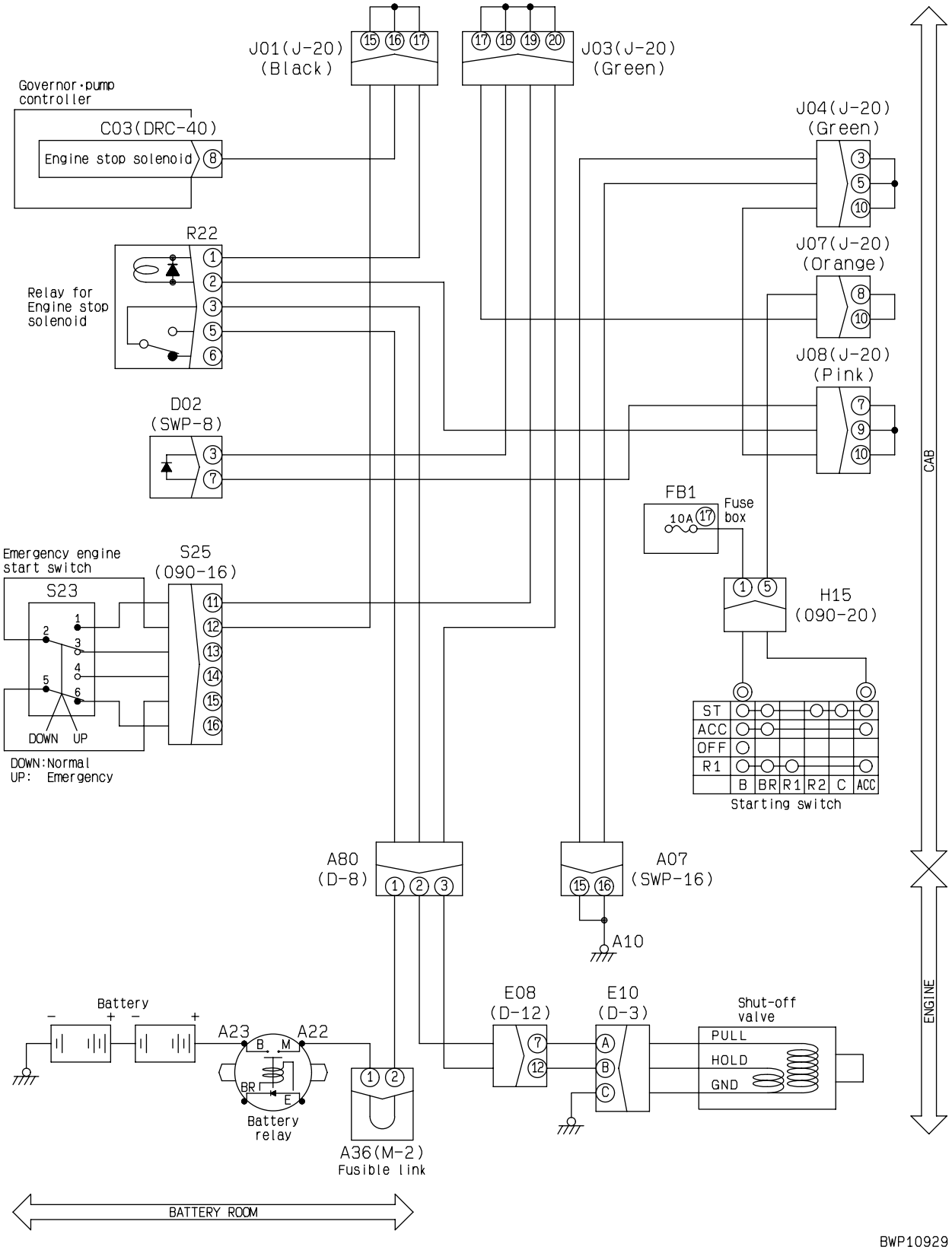
Electrical Circuit Diagram for Engine Start and Battery Charging



Failure information (2)	• The engine cannot be started. (The engine can be rotated)
Relative information	—

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Fault of engine stop solenoid (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			E10 (male)	Resistance value		
			Between Ⓐ and Ⓒ	0.6 – 1.0 Ω		
			Between Ⓑ and Ⓒ	37 – 46 Ω		
	2	Fault of engine stop solenoid relay	Check by replacing it with another relay			
	3	Fault of fusible link A36	When the fusible link is blown, there is a big possibility that grounding fault has occurred in the circuit.			
	4	Fault of assembled-type diode (Internal short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			D02 (male)	Resistance value		
			Between ③ and ⑦	Above 1 MΩ		
	5	Wiring harness disconnected (Disconnection or defective contact of connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from battery relay M terminal (A22) to A36 to R22 (female) ⑤	Resistance value	Below 1 Ω	
			Wiring harness between R22 (female) ③ and E10 (female) Ⓐ	Resistance value	Below 1 Ω	
			Wiring harness from the engine starting switch ACC terminal to J07 to J03 to E10 (female) Ⓑ	Resistance value	Below 1 Ω	
			Wiring harness between E10 (female) Ⓒ and grounding	Resistance value	Below 1 Ω	
	6	Grounding fault of wiring harness (Contact with GND circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from battery relay M terminal (A22) to A36 to R22 (female) ⑤, or between wiring harness from battery relay M terminal (A22) to A34 to FB1 inlet and grounding	Resistance value	Above 1 MΩ	
			Between wiring harness between R22 (female) ③ and E10 (female) Ⓐ and grounding	Resistance value	Above 1 MΩ	
			Wiring harness from engine starting switch ACC terminal to J07 to J03 to E10 (female) Ⓑ, or wiring harness between engine starting switch ACC terminal and C01 (female) ㉓, or wiring harness between the engine starting switch ACC terminal and D02 (female) ③, or wiring harness between S25 (female) ⑪ and grounding	Resistance value	Above 1 MΩ	
	7	Fault of governor • pump controller	If the engine can be started with the engine starting switch ON, after the emergency fuel solenoid driving switch is once moved to the EMERGENCY side, then the governor • pump controller is defective.			

Electrical Circuit Diagram for Engine Start and Battery Charging

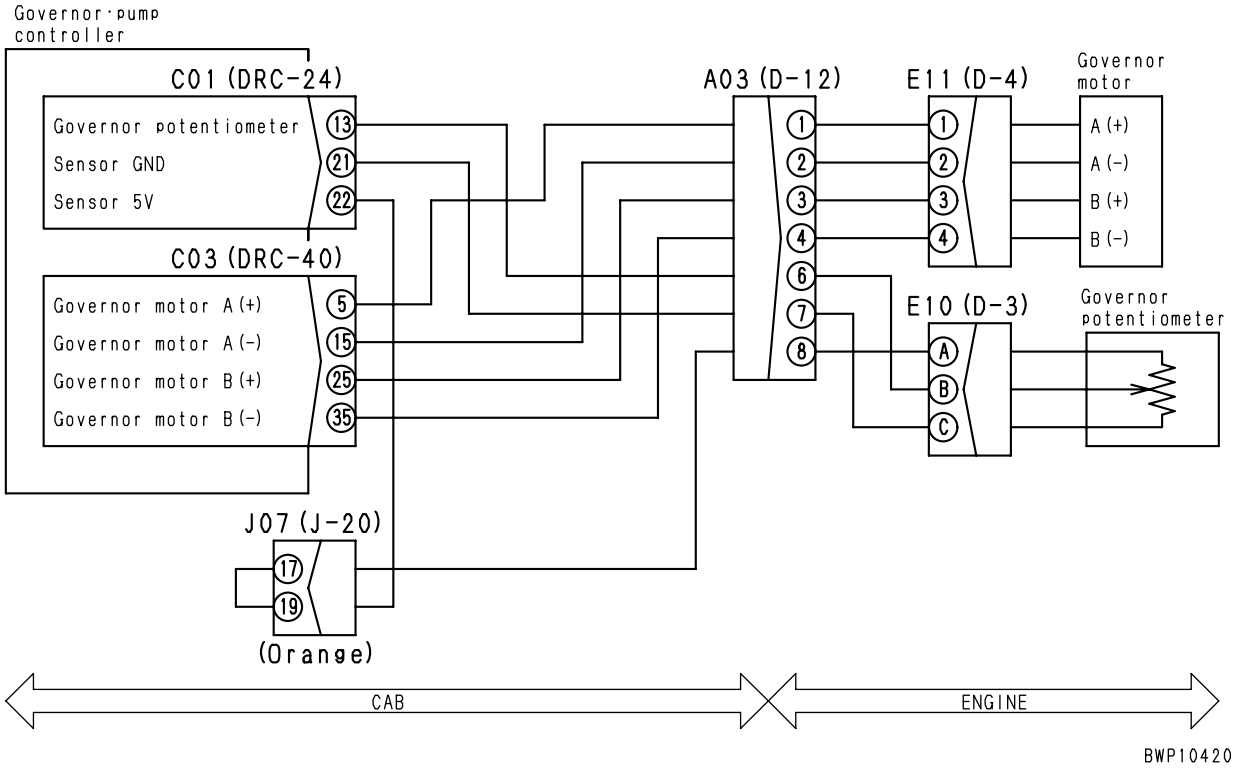


E-2 Engine stops while in operation

Failure information	• The engine suddenly stopped while in operation.
Relative information	• Input from the governor potentiometer (voltage) can be confirmed in the monitor function. (Code No. 031: governor potentiometer voltage)

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Governor potentiometer fault (Internal failure)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			E06 (male)	Resistance value		
			Between Ⓐ and Ⓒ	4.0 – 6.0 kΩ		
			Between Ⓑ and Ⓐ	0.25 – 5.0 kΩ		
			Between Ⓑ and Ⓒ	0.25 – 5.0 kΩ		
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between C01 (female) ⑬ and E10 (female) Ⓑ	Resistance value	Below 1 Ω	
	3	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between C01 (female) ⑬ and E10 (female) Ⓑ and grounding	Resistance value	Above 1 MΩ	
	4	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C01	Voltage		
			Between ㉒ and ㉑	4.5 – 5.5 V		
			Between ⑬ and ㉑	0.5 – 4.5 V		

Electrical Circuit Diagram for Fuel Dial

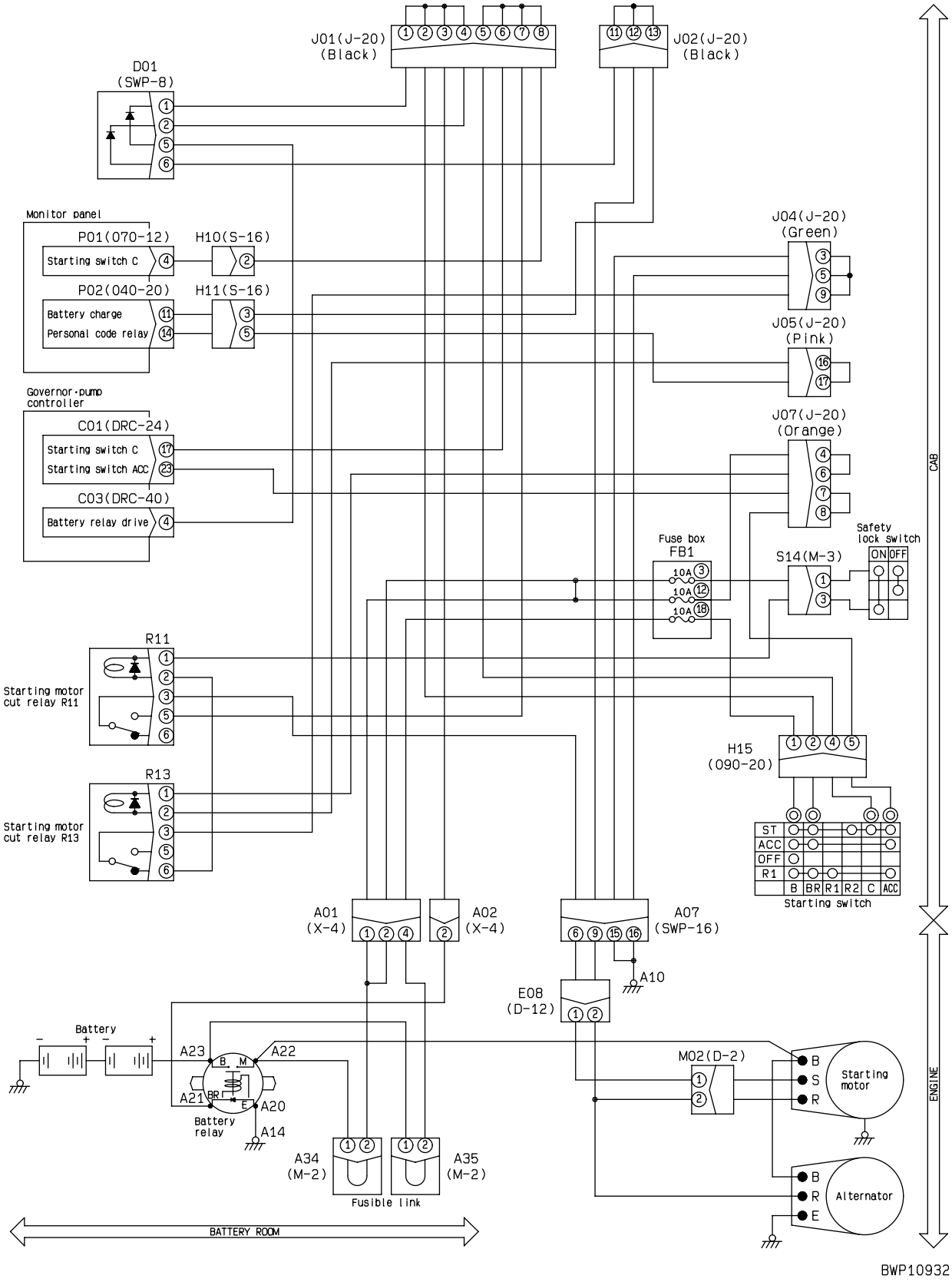


E-3 Engine speed is irregular, or there is hunting

Failure information	• Engine speed is irregular at low idling. • There is hunting. • Engine speed is lower than specified at high idling.
Relative information	• Engine rotation can be confirmed in the monitor function. (Code No. 010: Engine rotation)

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting			
	1	Model code signal fault (Internal failure)	If the monitor display is not normal, proceed to Service Code [E217].			
			Monitoring Code	Item	Normal display	
			002 003	Controller model code	200	
	2	Governor lever improperly adjusted	Refer to the section "Special Function of Monitor Panel" in this manual.			
	3	Governor motor improperly working	If the governor motor lever moves smoothly in the following operations, it is judged as normal. • The fuel dial is operated between low idling and high idling. • The engine is stopped with the fuel dial.			
	4	Engine fuel control system defective	Refer to the Engine Shop Manual.			
	5	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from C01 (female) ㉓ to J07 to H15 (female) ⑤	Resistance value	Below 1 Ω	
	6	Grounding fault of wiring harness (Contact with grounding circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between C01 (female) ㉓ to J17 and H15 (female) ⑤ and grounding	Resistance value	Above 1 MΩ	
	7	Governor • pump controller defective	As this is an internal failure, troubleshooting cannot be conducted. (If there is none of the causes from Item 1 to 6 above, the controller is judged as defective)			

Electrical Circuit Diagram for Engine Start and Battery Charging



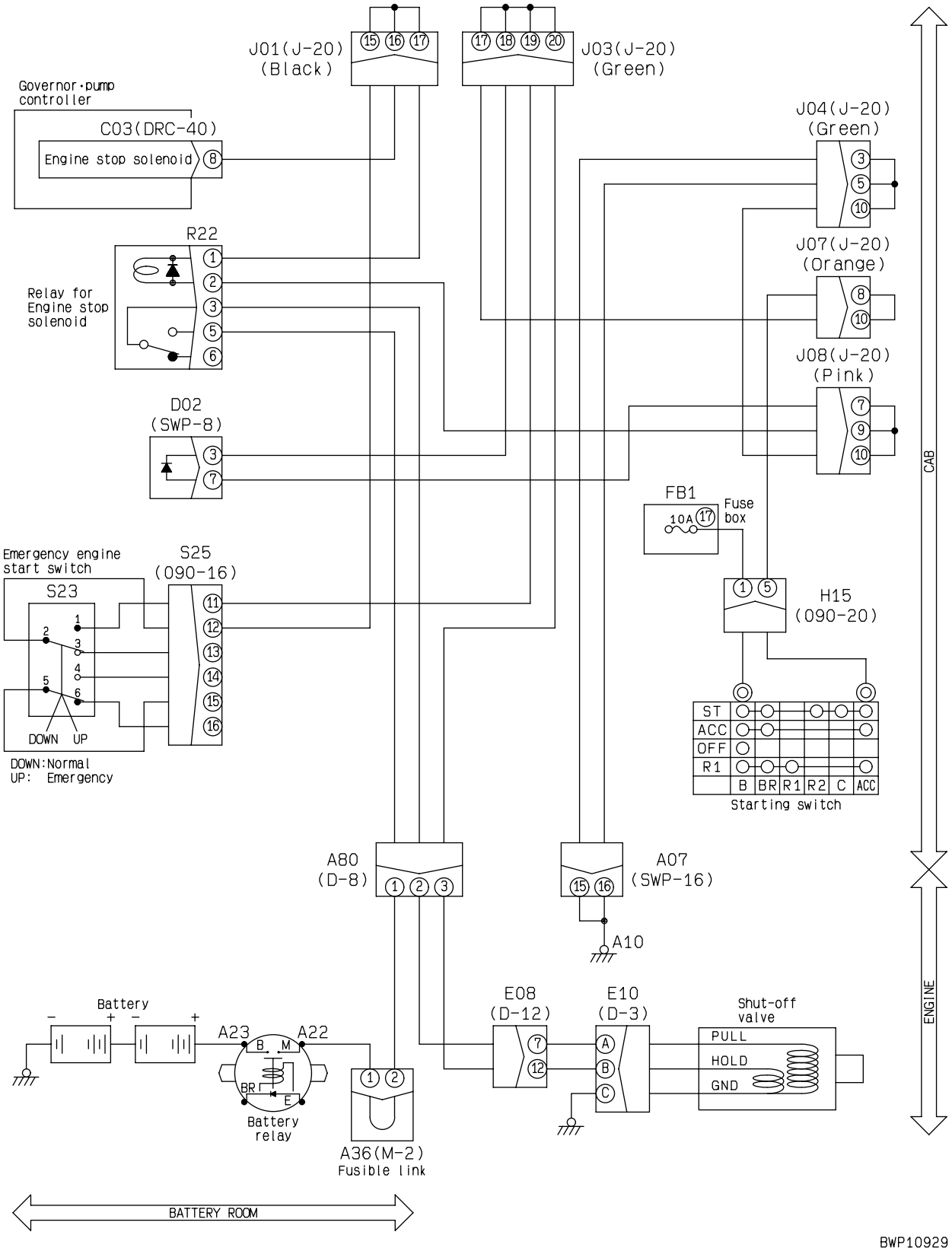
E-4 Engine does not stop

Failure information	• The engine does not stop.
Relative information	—

Presumed cause and standard value in normalcy

Cause		Standard value in normalcy and references for troubleshooting
1	Fault of engine stop solenoid (Internal fault)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.
		E10 (male) — Resistance value
		Between Ⓐ and Ⓒ — 0.6 – 1.0 Ω
		Between Ⓑ and Ⓒ — 37 – 46 Ω
		If the plunger rod can be moved smoothly by hand, then the engine stop solenoid is normal.
2	Fault of engine stop solenoid relay	Check by replacing it with another relay.
3	Fault of emergency fuel solenoid driving switch (Internal short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.
		S25 (male) — Switch — Resistance value
		Between ⑪ and ⑫ — In normalcy — Above 1 MΩ
		Between ⑪ and ⑫ — In emergency — Below 1Ω
4	Wiring harness short-circuited (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.
		Between wiring harness between R22 (female) ③ and E10 (female) Ⓐ and grounding — Voltage — Below 1 V
		Wiring harness from the engine starting switch ACC terminal to J07 to J03 to E10 (female) Ⓑ, or wiring harness between the engine starting switch ACC terminal and C01 (female) ㉓, or wiring harness between the engine starting switch ACC terminal and D02 (female) ③, or wiring harness between S25 (female) ⑪ and grounding — Voltage — Below 1 V

Electrical Circuit Diagram for Engine Stop



E-5 Auto-decelerator does not work

Failure information	• The auto-decelerator does not work.
Relative information	• Rotation of the auto-decelerator is set at 1,400 rpm. If the fuel dial is not set adjusting to this level, the auto-decelerator does not work. • Confirm the display on the monitor panel, when the engine is running.

Presumed cause and standard value in normalcy

Cause		Standard value in normalcy and references for troubleshooting		
1	Boom RAISE signal fault	If the display on the monitor panel is not normal, proceed to No. E-21 Troubleshooting.		
		Monitoring code	Item	Normal display
		019	Boom RAISE	Lever operation: ON Lever NEUTRAL: OFF
2	Boom LOWER signal fault	If the display on the monitor panel is not normal, proceed to No. E-22 Troubleshooting.		
		Monitoring code	Item	Normal display
		019	Boom LOWER	Lever operation: ON Lever NEUTRAL: OFF
3	Arm DIGGING signal fault	If the display on the monitor panel is not normal, proceed to No. E-23 Troubleshooting.		
		Monitoring code	Item	Normal display
		019	Arm DIGGING	Lever operation: ON Lever NEUTRAL: OFF
4	Arm DUMPING signal fault	If the display on the monitor panel is not normal, proceed to No. E-24 Troubleshooting.		
		Monitoring code	Item	Normal display
		019	Arm DUMPING	Lever operation: ON Lever NEUTRAL: OFF
5	Bucket DIGGING signal fault	If the display on the monitor panel is not normal, proceed to No. E-26 Troubleshooting.		
		Monitoring code	Item	Normal display
		021	Bucket DIGGING	Lever operation: ON Lever NEUTRAL: OFF
6	Bucket DUMPING signal fault	If the display on the monitor panel is not normal, proceed to No. E-27 Troubleshooting.		
		Monitoring code	Item	Normal display
		021	Bucket DUMPING	Lever operation: ON Lever NEUTRAL: OFF
7	Swing signal fault	If the display on the monitor panel is not normal, proceed to No. E-28 Troubleshooting.		
		Monitoring code	Item	Normal display
		019	Swing	Lever operation: ON Lever NEUTRAL: OFF
8	Travel signal fault	If the display on the monitor panel is not normal, proceed to No. E-29 Troubleshooting.		
		Monitoring code	Item	Normal display
		019	Travel	Lever operation: ON Lever NEUTRAL: OFF
9	Attachment signal fault	If the display on the monitor panel is not normal, proceed to No. E-30 Troubleshooting.		
		Monitoring code	Item	Normal display
		021	Service	Lever operation: ON Lever NEUTRAL: OFF
10	Governor • pump controller defective	As this is an internal failure, troubleshooting cannot be conducted. (If there is none of the causes listed in Item 1 through 9, the controller is judged as defective.		

E-6 Auto engine warm-up device does not work

Failure information	• The auto engine warm-up device does not work.
Relative information	• The auto engine warm-up device is activated, when the engine cooling water temperature is below 30°C, and raise the engine rotation up to 1,250 rpm. • The auto engine warm-up device is released by keeping the fuel dial opening at above 70% for more than 3 seconds, when the engine starting switch is in the ON position or after the engine is started.

<table>
<tr><td rowspan="4">Presumed cause and standard value in normalcy</td><td colspan="2">Cause</td><td colspan="3">Standard value in normalcy and references for troubleshooting</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Engine cooling water temperature signal fault</td><td colspan="3">If the display on the monitor panel is not normal, proceed to No. E-14 Troubleshooting.</td></tr>
<tr><td>Monitoring code</td><td>Item</td><td>Normal display</td></tr>
<tr><td>041</td><td>Engine cooling water temperature</td><td>Compare with the actual engine cooling water temperature.</td></tr>
<tr><td>2</td><td>Governor • pump controller defective</td><td colspan="3">As this is an internal failure, troubleshooting cannot be conducted.
(If the fault mentioned in the above item is not found, the Governor • pump controller is judged as defective)</td></tr>
</table>

E-7 Preheater does not work

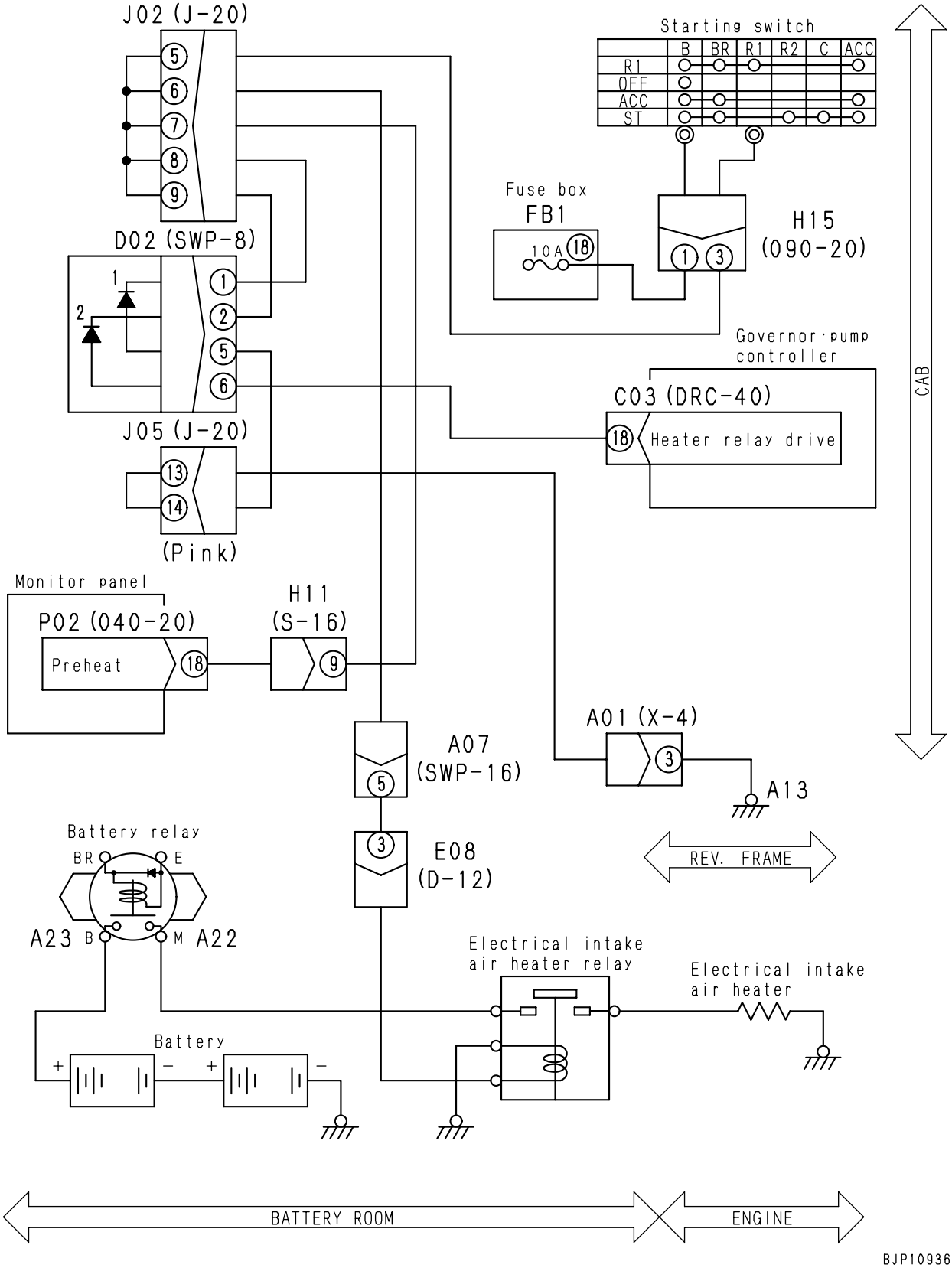
Failure information (1)	• Even if the preheater switch is turned to the PREHEAT position, the preheating monitor lamp does not light up.
Relative information	• Input of the preheating signal (ON or OFF) can be confirmed in the monitor function. (Code No. 045: Monitor input 1)

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Engine starting switch fault	If preheating does not occur (the heater is not warmed up), refer to Failure Phenomenon (2) below.			
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between P02 (female) ⑱ and J02		Resistance value	Below 1 Ω
	3	Monitor panel fault	★Turn the engine starting switch OFF for the preparations.			
			P02	Engine starting switch	Voltage	
			Between ⑱ and grounding	OFF	Below 1 V	
				HEAT	20 – 30 V	

Failure information (2)	• Even if the preheater switch is turned to the PREHEAT position, the preheater does not become warm.
Relative information	• In low cooling water temperature (lower than 30°C), the governor • pump controller drives the heater relay for 100 seconds after the engine is started and automatically warms up the engine.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Engine starting switch fault (Internal disconnection)	★Turn the engine starting switch OFF for the preparations.			
			H15 (male)	Engine starting switch	Resistance value	
			Between ① and ③	OFF	Above 1 MΩ	
				HEAT	Below 1 Ω	
	2	Heater relay fault (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Heater relay		Continuity and resistance value	
			Between coil terminal and grounding		Continued	
			Between contact terminals		Above 1 MΩ	
	3	Electrical intake air heater (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between heater terminals		Normal if continuity is established.	
	4	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from H15 (female) ③ to J02 to heater relay terminal		Resistance value	Below 1 Ω
			Wiring harness between battery relay M terminal (A22) and heater relay terminal		Resistance value	Below 1 Ω

Electrical Circuit Diagram for Engine Preheater



E-8 All work equipment, swing and travel do not move

Failure information	• All the work equipment, swing and travel do not move.
Relative information	—

Presumed cause and standard value in normalcy

	Cause	Standard value in normalcy and references for troubleshooting
1	Fuse No. 3 fault	If the fuse is blown, there is a big possibility that grounding fault occurred in the circuit.
2	Safety switch lock defective (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.

S14 (female)	Safety control lever	Resistance value
Between ① and ②	Lock	Above 1 MΩ
	Release	Below 1 Ω

3	PPC lock solenoid fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.

V01 (male)	Resistance value
Between ① and ②	20 – 60 Ω
Between ① and grounding	Above 1 MΩ

4	Assembled-type diode D01 fault (Internal short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.

D01 (male)	Resistance value
Between ⑧ and ④	Above 1 MΩ

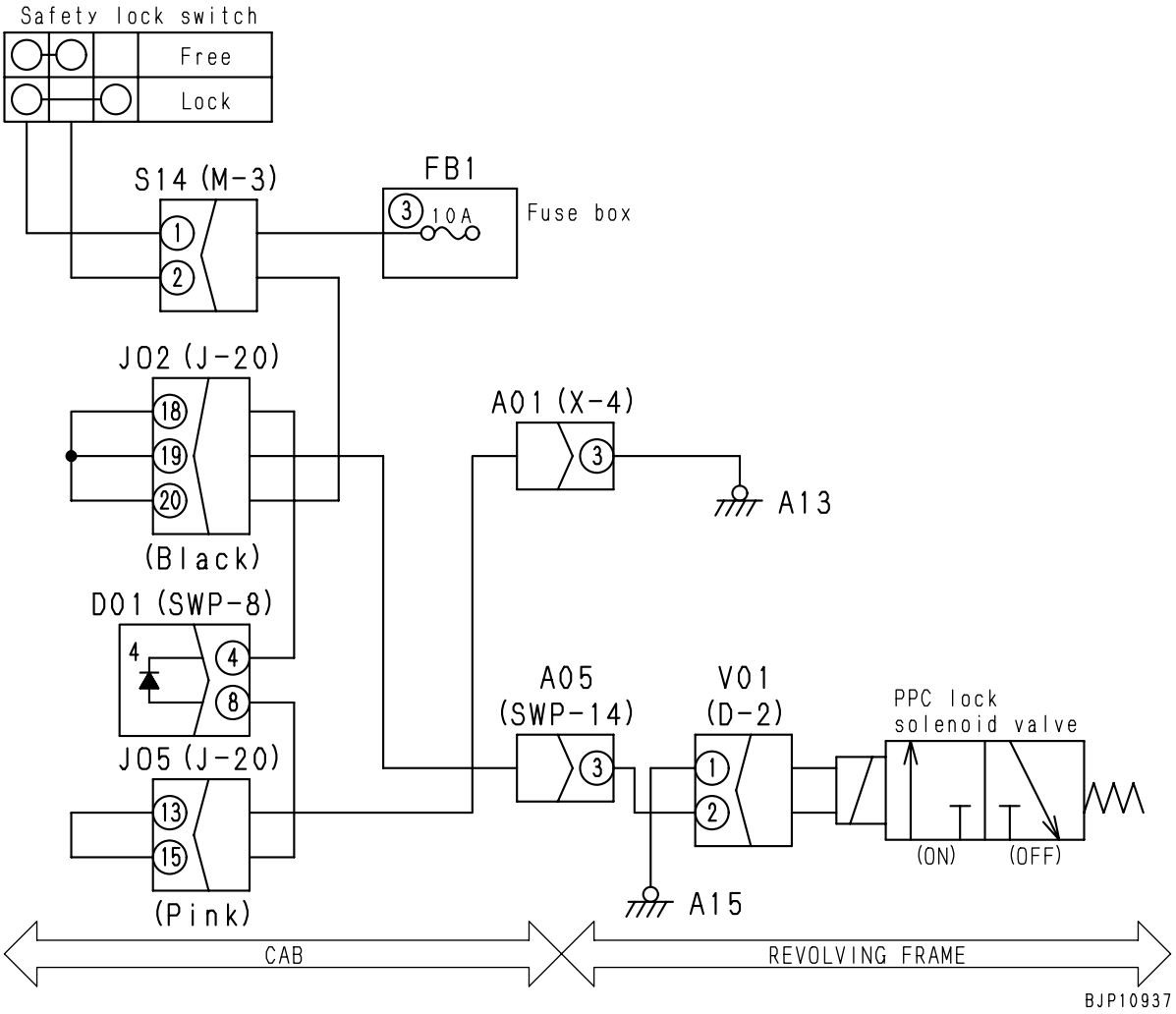
5	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.

Wiring harness between FB1-3 outlet and S14 (male) ①	Resistance value	Below 1 Ω
Wiring harness from S14 (male) ② to J02 to V01 (female) ②	Resistance value	Below 1 Ω
Wiring harness between V01 (female) ① and grounding	Resistance value	Below 1 Ω

6	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.

Between wiring harness between FB1-3 outlet and S14 (male) ① and grounding	Resistance value	Above 1 MΩ
Wiring harness from S14 (male) ② to J02 to V01 (female) ②, or between wiring harness between S14 (male) ② and D01 (female) ⑧ and grounding	Resistance value	Above 1 MΩ

Electrical Circuit Diagram for PPC Lock Solenoid

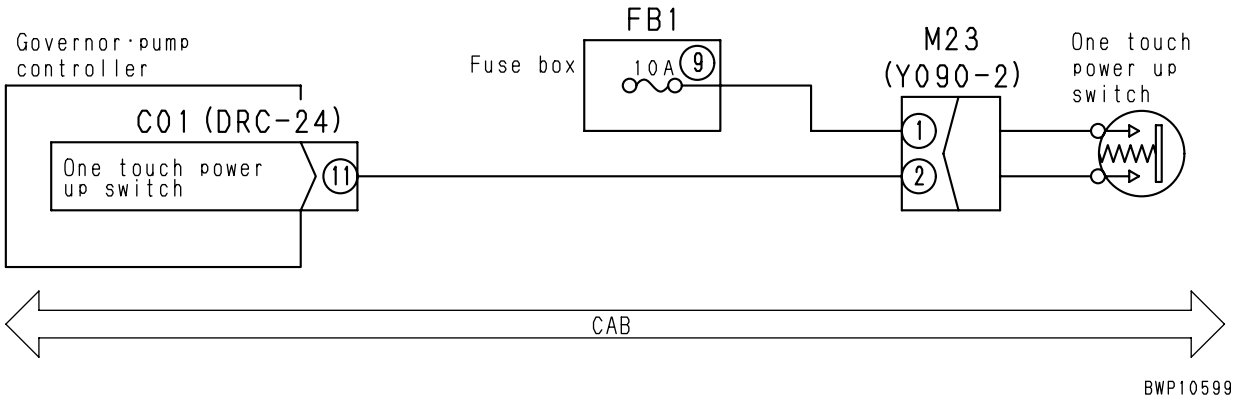


E-9 One-touch Power Max. Switch does not work

Failure information	• The one-touch power max. switch does not work.
Relative information	• If the one-touch power max. switch is depressed, while the engine is running and the work equipment is operated in either A mode or E mode, the symbol mark is displayed in the monitor panel. • Input from the one-touch power max. switch (left knob switch) can be confirmed in the monitor function. (Code No. 022: Switch input 1)

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Fuse No. 9 fault	If the fuse is blown, there is a big possibility that grounding fault occurred in the circuit.			
	2	One-touch power max. switch fault (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			M23 (male)	One-touch power max. switch	Resistance value	
			Between ① and ②	Release	Above 1 MΩ	
				Depress	Below 1 Ω	
	3	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between FB1-9 outlet and M23 (female) ①		Resistance value	Above 1 MΩ
			Wiring harness between M23 (female) ② and C01 (female) ⑪		Resistance value	Above 1 MΩ
	4	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between FB1-9 outlet and M23 (female) ① and grounding		Resistance value	Above 1 MΩ
			Between wiring harness between M23 (female) ② and C01 (female) ⑪ and grounding		Resistance value	Above 1 MΩ
	5	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C01	One-touch power max. switch	Voltage	
			Between ⑪ and grounding	Release	Below 1 V	
				Depress	20 – 30 V	

Electric Circuit Diagram for One-Touch Power Max. Switch

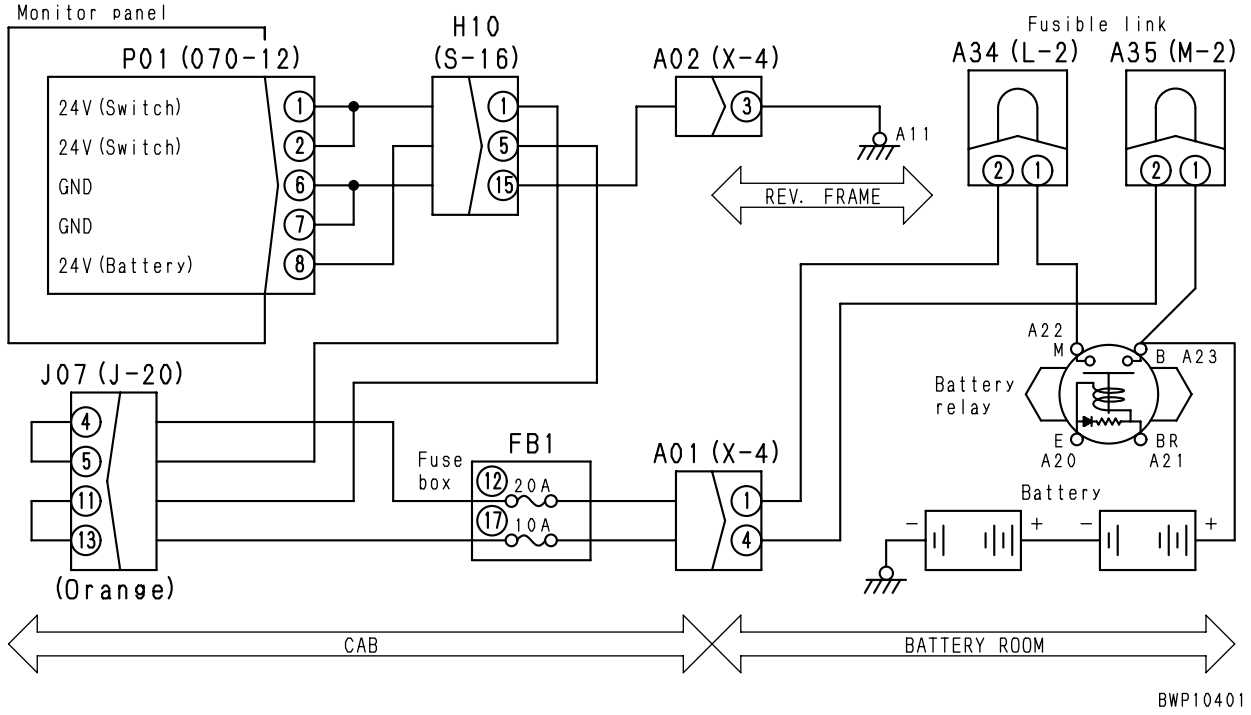


E-10 No display in monitor panel at all

Failure information	• When the engine starting switch is turned ON, there appears no display at all in the monitor panel.
Relative information	—

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting		
	1	Fuse No. 12 fault	If the fuse is blown, there is a big possibility that grounding fault occurred in the circuit.		
	2	Disconnection of wiring harness (Disconnection or defect contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			Wiring harness from P01 (female) ① ② to J07 to FB1-12	Resistance value	Below 1 Ω
			Wiring harness between P01 (female) ⑥ ⑦ and grounding	Resistance value	Below 1 Ω
	3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			Between wiring harness from P01 (female) ① ② to J07 to FB1-12 outlet and grounding	Resistance value	Above 1 MΩ
	4	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
			P01	Voltage and resistance value	
			Between ① ② and grounding	Voltage: 20 – 30 V	
			Between ⑥ ⑦ and grounding	Resistance value: Below 1 Ω	

Electrical Circuit Diagram for Power Source in Monitor Panel



E-11 Part of display on monitor panel is missing

Failure information	• Part of the display in the monitor panel is missing.
Relative information	—

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Monitor panel LCD fault	If all the LCD in the monitor panel light up (i.e. the screen becomes totally white) by the following switching operation, then the monitor panel is normal. • Switching operation: [↺] + [A] (simultaneous switching operation)
	2	Monitor panel defective	As this is an internal failure, troubleshooting cannot be conducted. (If there is no problem with the above switching operation, the controller is judged as defective)

E-12 Monitor panel displays contents irrelevant to the model

Failure information	• The monitor panels displays contents that have nothing to do with the model on which it is installed.
Relative information	—

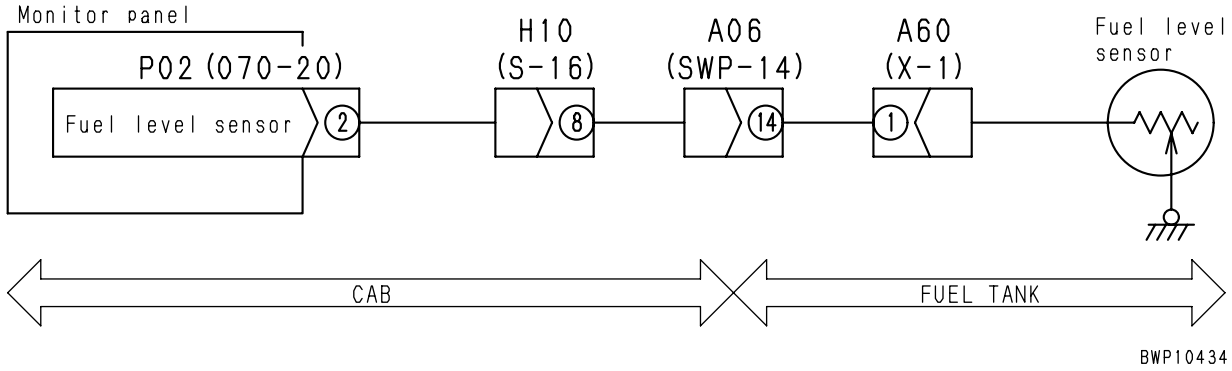
<table>
<tr><th rowspan="4">Presumed cause and standard value in normalcy</th><th colspan="2">Cause</th><th colspan="3">Standard value in normalcy and references for troubleshooting</th></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Model code signal fault
(Internal failure)</td><td colspan="3">If the display on the monitor panel is normal, proceed to Service Code [E217].</td></tr>
<tr><td>Monitoring code</td><td>Item</td><td>Normal display</td></tr>
<tr><td>002
003</td><td>Controller model code</td><td>300</td></tr>
<tr><td></td><td>2</td><td>Monitor panel defective</td><td colspan="3">As this is an internal failure, troubleshooting cannot be conducted. (If there is no problem with the above switching operation, the monitor panel is judged as defective)</td></tr>
</table>

E-13 Fuel level monitor red lamp lights up while engine is running

Failure information	• The fuel level monitor red lamp lighted up while the engine was running.
Relative information	• If the fuel gauge shows in a red range on the monitor panel, the fuel level monitor lamp lights up red. • (5) Input signal from the fuel level sensor (voltage) can be confirmed in the monitor function. (Code No. 042: Fuel level sensor)

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Fuel level lowered (system in normal condition)	★Refill fuel.			
	2	Fuel level sensor fault (Internal disconnection)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			A60 (male)	Fuel level	Resistance value	
			Between ① and grounding	FULL (Upper limit)	Approx. 12 Ω	
				EMPTY (Lower limit)	85 – 110 Ω	
	3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between P02 (female) ② and A60 (female) ①		Resistance value	Below 1 Ω
	4	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			P02 (female)	Fuel level	Resistance value	
			Between ② and grounding	FULL (Upper limit)	Approx. 12 Ω	
				EMPTY (Lower limit)	85 – 110 Ω	

Electrical Circuit Diagram for Fuel Level Sensor



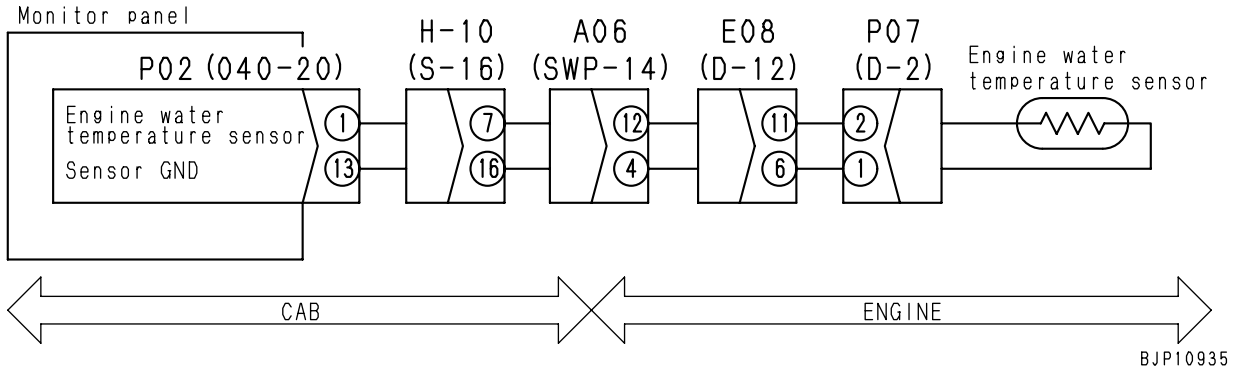
E-14 Engine cooling water temperature gauge does not indicate correctly

Failure information	• The engine cooling water rises normally, but the display does not exceed the white range (C). • The engine cooling water temperature remains stable, but the display rises to the red range (H).
Relative information	• Input from the engine cooling water temperature sensor can be confirmed in the monitor function. (Code No. 041: Engine cooling water temperature)

Presumed cause and standard value in normalcy

	Cause	Standard value in normalcy and references for troubleshooting			
1	Engine cooling water temperature sensor fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		P07	Engine cooling water temperature	Resistance value	
		Between ① and ②	10 – 100 °C	90 – 3.5 kΩ	
		Between ② and grounding		Above 1 MΩ	
2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Wiring harness between P02 (female) ① and P07 (female) ②		Resistance value	Below 1 Ω
		Wiring harness between P02 (female) ⑬ and P07 (female) ①		Resistance value	Below 1 Ω
3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Between wiring harness between P02 (female) ① and P07 (female) ② and grounding		Resistance value	Above 1 MΩ
4	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
		Between wiring harness between P02 (female) ① and P07 (female) ② and grounding		Voltage	Below 1 V
5	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		P02	Engine cooling water temperature	Resistance value	
		Between ① and ⑬	10 – 100 °C	90 – 3.5 kΩ	
		Between ① and grounding		Above 1 MΩ	

Electrical Circuit Diagram for Engine Cooling Water Temperature Sensor

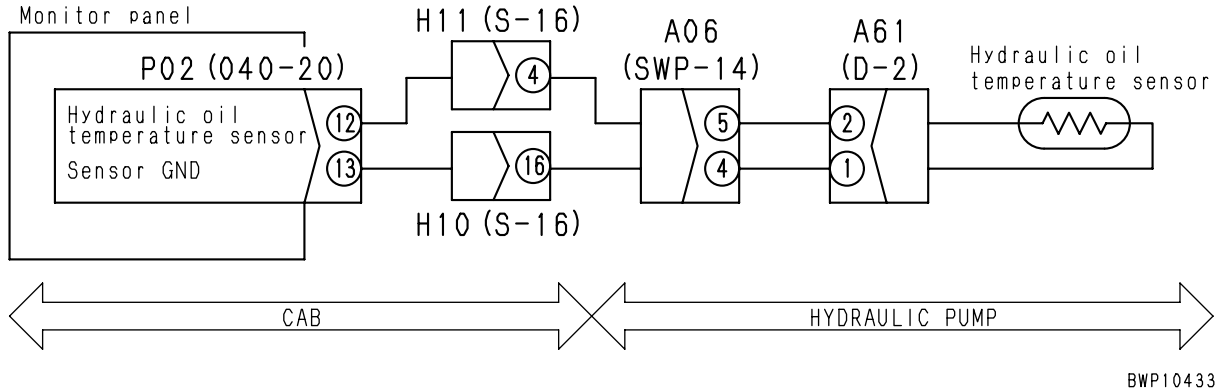


E-15 Hydraulic oil temperature gauge does not display correctly
(Multi-monitor only)

Failure information	• Hydraulic oil temperature rises normally, but the display does not exceed the white range (C). • Hydraulic oil temperature remains stable, but the display rises up the red range (H).
Relative information	• Input from the hydraulic oil temperature sensor can be confirmed in the monitor function. (Code No. 044: Hydraulic oil temperature)

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Hydraulic oil temperature sensor fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			A61	Engine cooling water temperature	Resistance value	
			Between ① and ②	10 – 100 °C	90 – 3.5 kΩ	
			Between ② and grounding		Above 1 MΩ	
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between P02 (female) ⑫ and A61 (female) ②		Resistance value	Below 1 Ω
			Wiring harness between P02 (female) ⑬ and A61 (female) ①		Resistance value	Below 1 Ω
	3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between P02 (female) ⑫ and A61 (female) ② and grounding		Resistance value	Above 1 MΩ
	4	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Between wiring harness between P02 (female) ⑫ and A61 (female) ② and grounding		Voltage	Below 1 V
	5	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			P02	Engine cooling water temperature	Resistance value	
			Between ⑫ and ⑬	10 – 100 °C	90 – 3.5 kΩ	
			Between ⑫ and grounding		Above 1 MΩ	

Electrical Circuit Diagram for Hydraulic Oil Temperature Sensor



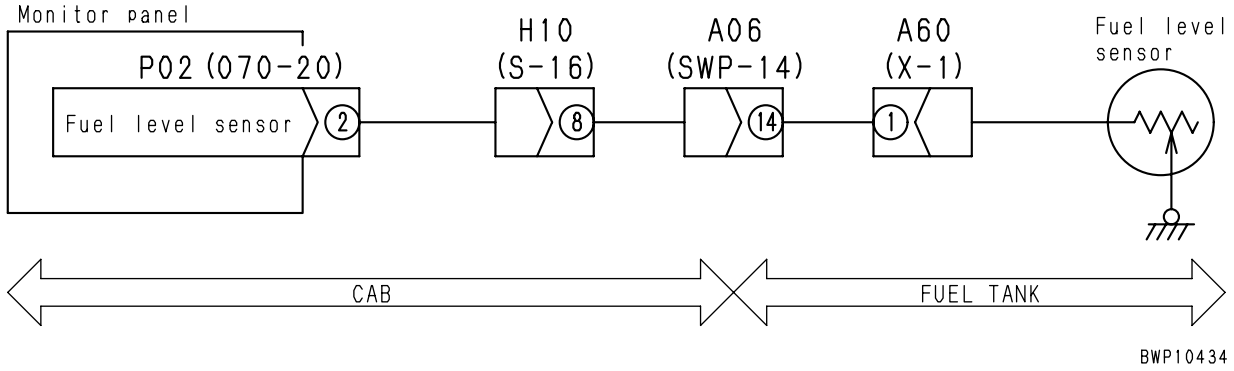
BWP10433

E-16 Fuel gauge does not display correctly

Failure information	• Though fuel was refilled, the display does not exceed the red range (E). • Though the remaining fuel level is low, the display does not drop below the green range (F).
Relative information	• Input from the fuel level sensor (voltage) can be confirmed in the monitor function. (Code No. 042: Fuel sensor voltage)

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Fuel level sensor fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			A60 (male)	Fuel level	Resistance value	
			Between ① and grounding	FULL (Upper limit)	Approx. 12 Ω	
				EMPTY (Lower limit)	85 – 110 Ω	
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between P02 (female) ② and A60 (female) ①		Resistance value	Below 1 Ω
	3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between P02 (female) ② and A60 (female) ① and grounding		Resistance value	Above 1 MΩ
	4	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Between wiring harness between P02 (female) ② and A60 (female) ① and grounding		Voltage	Below 1 V
	5	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			P02	Fuel level	Resistance value	
			Between ② and grounding	FULL (Upper limit)	Approx. 12 Ω	
				EMPTY (Lower limit)	85 – 110 Ω	

Electrical Circuit Diagram for Fuel Level Sensor

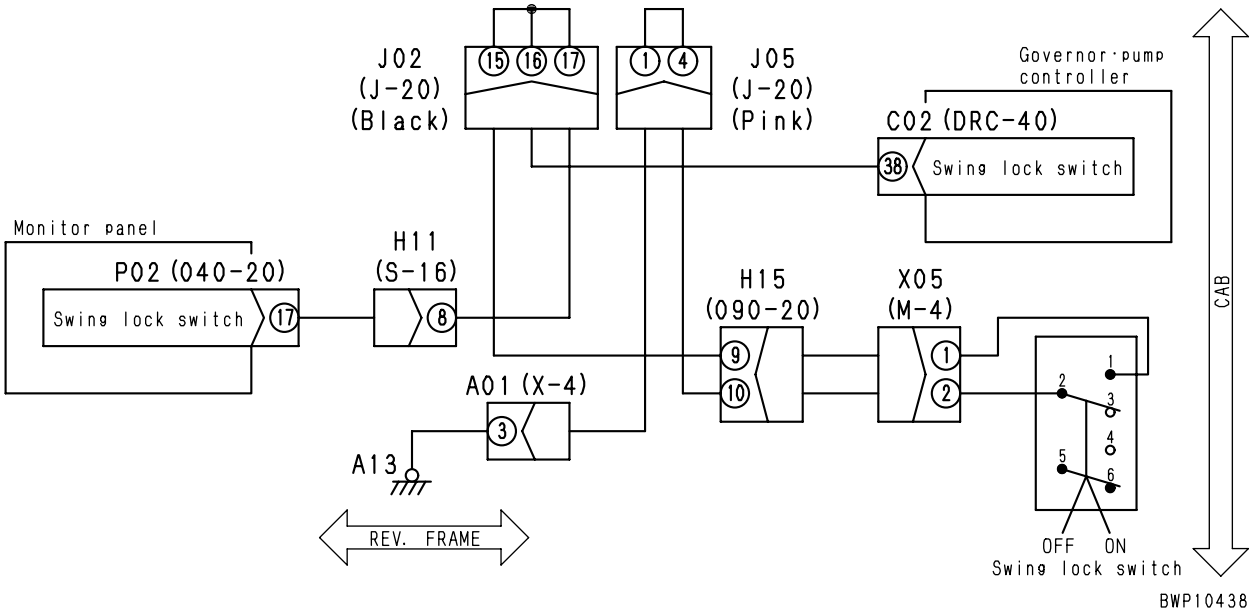


E-17 Swing lock monitor does not display correctly

Failure information	• Though the swing lock switch was turned ON, the swing lock monitor does not light up. • Though the swing lock switch was turned OFF, the swing lock monitor lights up.
Relative information	• Input from the swing lock switch (ON or OFF) can be confirmed in the monitor function. (Code No. 049: Monitor input 3)

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting		
	1	Swing lock switch fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			X05 (female)	Swing lock switch	Resistance value
			Between ① and ②	OFF	Above 1 MΩ
				ON	Below 1 Ω
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			Wiring harness from P02 (female) ⑰ to J02 to X05 (male) ①	Resistance value	Below 1 Ω
			Wiring harness from X05 (male) ② to J05 to grounding	Resistance value	Below 1 Ω
	3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			Between wiring harness from P02 (female) ⑰ to J02 to X05 (male) ① and grounding	Resistance value	Above 1 MΩ
	4	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
			Between wiring harness from P02 (female) ⑰ to J02 to X05 (male) ① and grounding	Voltage	Below 1 V
	5	Monitor panel defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
			P02	Swing lock switch	Voltage
			Between ⑰ and grounding	OFF	20 – 30 V
				ON	Below 1 V

Electrical Circuit Diagram for Swing Lock Switch



E-18 When the monitor switch is operated, no display appears

Failure information (1)	• When operating the working mode changing switch, the working mode monitor does not appear.
Relative information	—

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Monitor panel defective	As this is an internal failure, troubleshooting cannot be conducted.

Failure information (2)	• When operating the auto-decelerator switch, the auto-deceleration monitor does not appear.
Relative information	★If the auto-decelerator itself does not work, either, carry out No. E-5 Troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Monitor panel defective	As this is an internal failure, troubleshooting cannot be conducted.

Failure information (3)	• When operating the travel speed shifting switch, the travel speed monitor does not appear.
Relative information	★If the travel speed does not actually change, carry out No. H-21 Troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Monitor panel defective	As this is an internal failure, troubleshooting cannot be conducted.

Failure information (4)	• When operating the windshield wiper switch, the windshield wiper monitor does not appear.
Relative information	★If the windshield wiper itself does not work, either, carry out No. E-19 Troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Monitor panel defective	As this is an internal failure, troubleshooting cannot be conducted.

Failure information (5)	• When operating the select switch, the adjustment display does not appear. • When operating the LCD monitor adjusting switch, the adjustment display does not appear. • When operating the maintenance switch, the item display does not appear.
Relative information	—

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Monitor panel defective	As this is an internal failure, troubleshooting cannot be conducted.

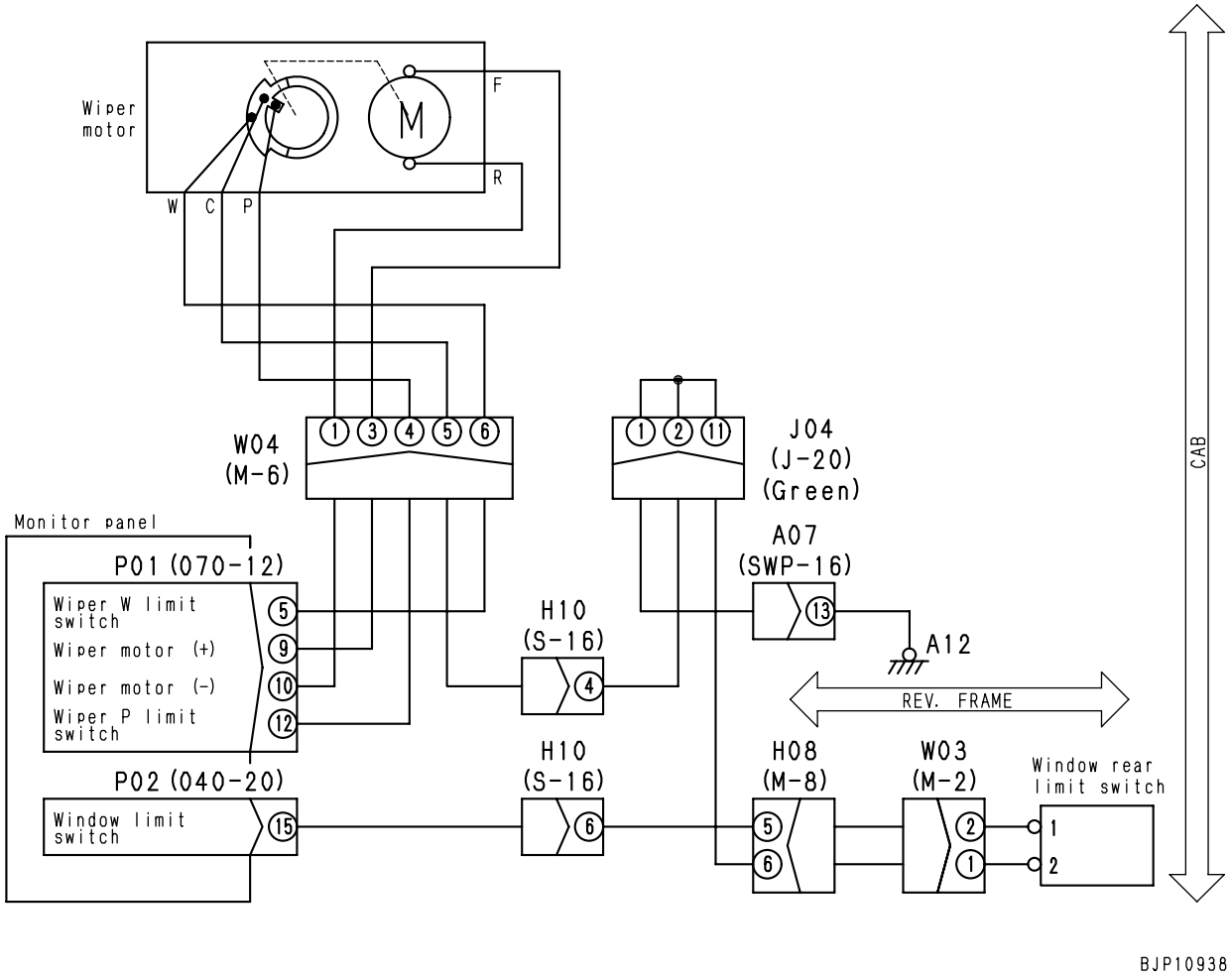
E-19 Windshield wiper does not work

Failure information	• The windshield wiper does not work.
Relative information	• Input from the window rear limit switch (ON or OFF) can be confirmed in the monitor function. (Code No. 049: Monitor input 3)

Presumed cause and standard value in normalcy

	Cause	Standard value in normalcy and references for troubleshooting			
1	Window rear limit switch fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		W03 (Switch side)	Front window	Resistance value	
		Between ① and ②	When installed at front	Above 1 MΩ	
			When retracted at rear	Below 1 Ω	
2	Windshield wiper motor fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		W04 (male)	Continuity and resistance value		
		Between ③ and ①	Continued		
		Between ③ ① and grounding	Above 1 MΩ		
3	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Wiring harness between P01 (female) ⑨ and W04 (female) ③	Resistance value	Below 1 Ω	
		Wiring harness between P01 (female) ⑩ and W04 (female) ①	Resistance value	Below 1 Ω	
4	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Between wiring harness between P02 (female) ⑮ and W03 ①	Resistance value	Above 1 MΩ	
5	Monitor panel fault (Rear limit switch system)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
		P02	Front window	Voltage	
		Between ⑮ and grounding	When installed at front	20 – 30 V	
			When retracted at rear	Below 1 V	
	Monitor panel fault (Windshield wiper motor system)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
		P02	Windshield wiper switch	Resistance value	
		Between ⑨ and grounding Between ③ and grounding	OFF	Below 3 V	
			ON	Below 3 V ⇔ 20 – 30 V (Constant cycle)	

Electrical Circuit Diagram for Windshield Wiper Motor

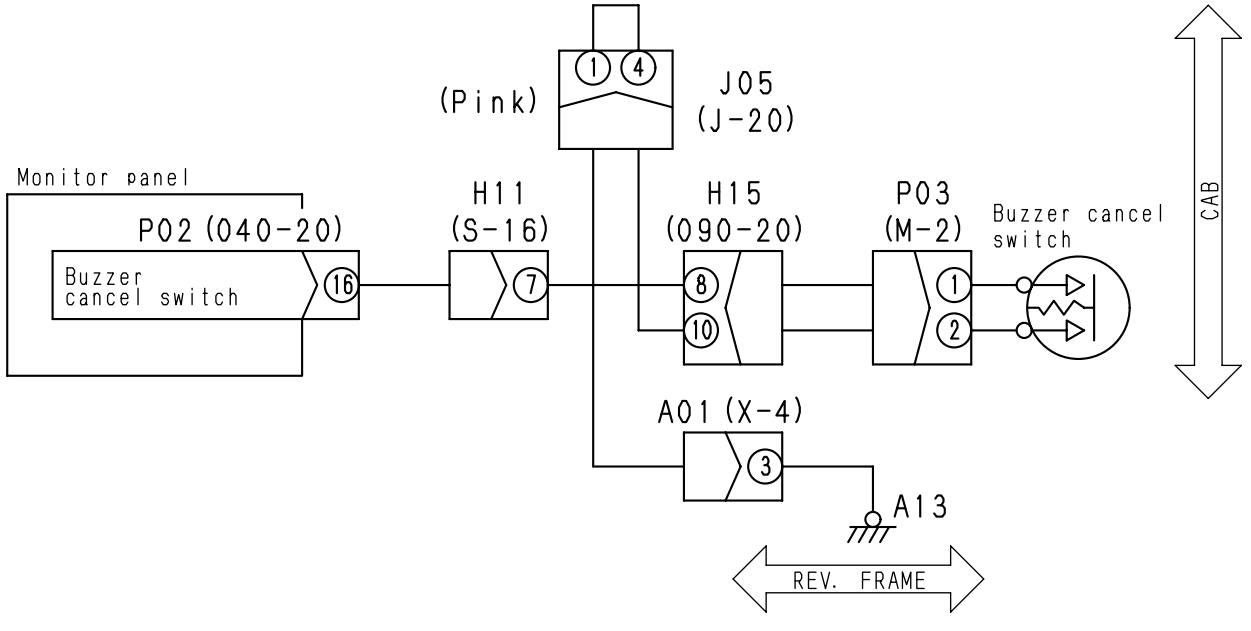


E-20 Alarming buzzer cannot be cancelled

Failure information	• The alarming buzzer cannot be cancelled.
Relative information	• Input from the alarming buzzer cancellation switch (ON or OFF) can be confirmed in the monitor function. (Code No. 049: Monitor input 3)

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Alarming buzzer cancellation switch fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			P03 (female)	Alarming buzzer cancellation switch	Resistance value	
			Between ① and ②	Release	Above 1 MΩ	
				Depress	Below 1 Ω	
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between P02 (female) ⑯ and P03 (male) ①		Resistance value	Below 1 Ω
			Wiring harness from P03 (male) ② to J05 to grounding		Resistance value	Below 1 Ω
	3	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Between wiring harness between P02 (female) ⑯ and P03 (male) ① and grounding		Voltage	Below 1 V
	4	Monitor panel fault	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			P02	Alarming buzzer cancellation switch	Voltage	
			Between ⑯ and grounding	Release	20 – 30 V	
				Depress	Below 1 V	

Electrical Circuit Diagram for Alarming Buzzer Cancellation Switch

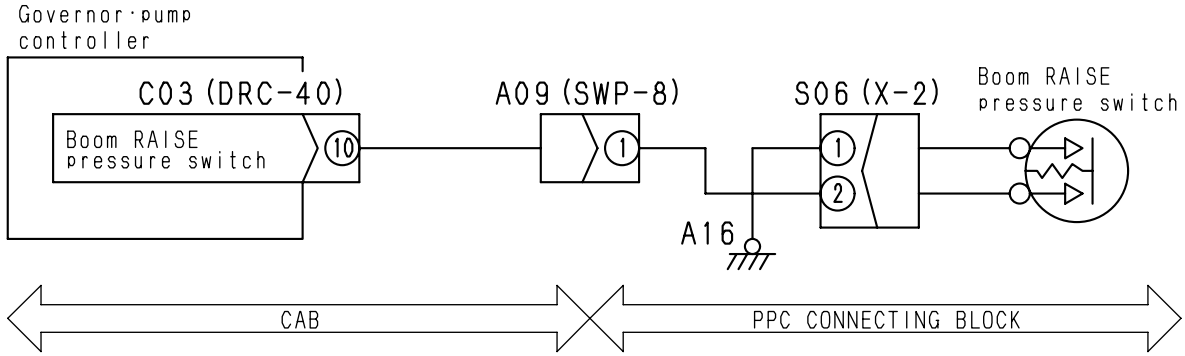


E-21 "Boom RAISE" is not correctly displayed in monitor function

Failure information	• "Boom RAISE" is not correctly displayed in the monitor function on the monitor panel.
Relative information	—

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Boom RAISE PPC hydraulic switch fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
			S06 (male)	Boom control lever	Resistance value	
			Between ① and ②	NEUTRAL	Above 1 MΩ	
				RAISE	Below 1 Ω	
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between C03 (female) ⑩ and S06 (female) ②		Resistance value	Below 1 Ω
			Wiring harness between S06 (female) ① and grounding		Resistance value	Below 1 Ω
	3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between C03 (female) ⑩ and S06 (female) ② and grounding		Resistance value	Above 1 MΩ
	4	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Between wiring harness between C03 (female) ⑩ and S06 (female) ② and grounding		Voltage	Below 1 V
	5	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C03	Boom control lever	Voltage	
			Between ⑩ and grounding	NEUTRAL	20 – 30 V	
				RAISE	Below 1 V	

Electrical Circuit Diagram for Boom RAISE PPC Hydraulic Switch



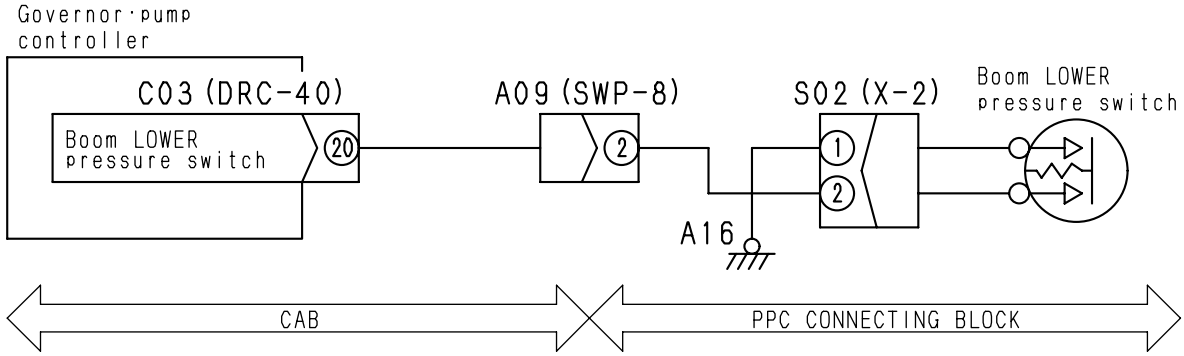
BJP10939

E-22 "Boom LOWER" is not correctly displayed in monitor function

Failure information	• "Boom LOWER" is not correctly displayed in the monitor function on the monitor panel.
Relative information	—

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting			
	1	Boom LOWER PPC hydraulic switch fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
			S02 (male)	Boom control lever	Resistance value	
			Between ① and ②	NEUTRAL	Above 1 MΩ	
				LOWER	Below 1 Ω	
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between C03 (female) ⑳ and S02 (female) ②		Resistance value	Below 1 Ω
			Wiring harness between S02 (female) ① and grounding		Resistance value	Below 1 Ω
	3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between C03 (female) ⑳ and S02 (female) ② and grounding		Resistance value	Above 1 MΩ
	4	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Between wiring harness between C03 (female) ⑳ and S02 (female) ② and grounding		Voltage	Below 1 V
	5	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C03	Boom control lever	Voltage	
			Between ⑳ and grounding	NEUTRAL	20 – 30 V	
				LOWER	Below 1 V	

Electrical Circuit Diagram for Boom LOWER PPC Hydraulic Switch



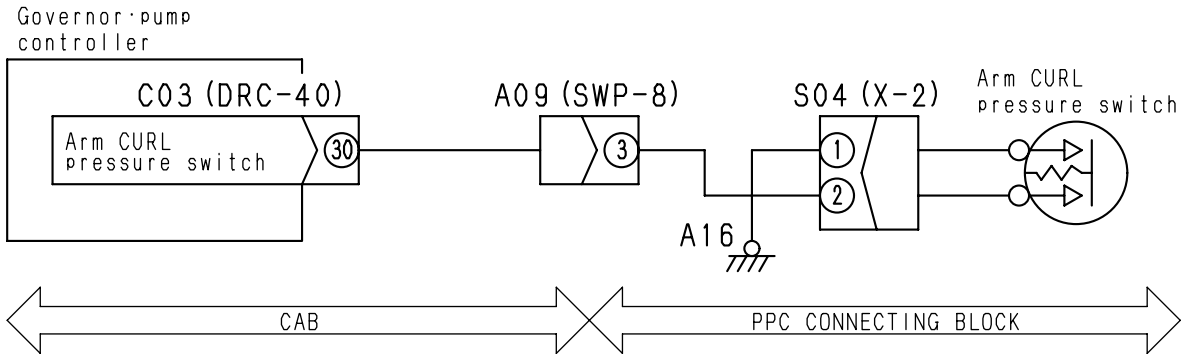
BJP10940

E-23 "Arm DIGGING" is not correctly displayed in monitor function

Failure information	• "Arm DIGGING" is not correctly displayed in the monitor function (special function) on the monitor panel.
Relative information	—

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Arm DIGGING PPC hydraulic switch fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
			S04 (male)	Arm control lever	Resistance value	
			Between ① and ②	NEUTRAL	Above 1 MΩ	
				DIGGING	Below 1 Ω	
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between C03 (female) ㉚ and S04 (female) ②		Resistance value	Below 1 Ω
			Wiring harness between S04 (female) ① and grounding		Resistance value	Below 1 Ω
	3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between C03 (female) ㉚ and S04 (female) ② and grounding		Resistance value	Above 1 MΩ
	4	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Between wiring harness between C03 (female) ㉚ and S04 (female) ② and grounding		Voltage	Below 1 V
	5	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C03	Arm control lever	Voltage	
			Between ㉚ and grounding	NEUTRAL	20 – 30 V	
				DIGGING	Below 1 V	

Electrical Circuit Diagram for Arm DIGGING PPC Hydraulic Switch



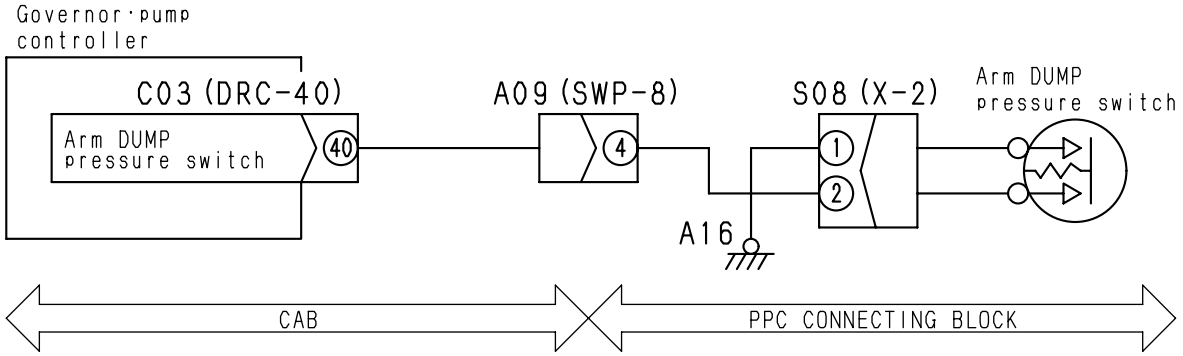
BJP10941

E-24 "Arm DUMPING" is not correctly displayed in monitor function

Failure information	• "Arm DUMPING" is not correctly displayed in the monitor function (special function) on the monitor panel.
Relative information	—

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Arm DUMPING PPC hydraulic switch defect (Internal disconnection and short-circuiting)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
			S08 (male)	Arm control lever	Resistance value	
			Between ① and ②	NEUTRAL	Above 1 MΩ	
				DUMPING	Below 1 Ω	
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between C03 (female) ㊵ and S08 (female) ②		Resistance value	Below 1 Ω
			Wiring harness between S08 (female) ① and grounding		Resistance value	Below 1 Ω
	3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between C03 (female) ㊵ and S08 (female) ② and grounding		Resistance value	Above 1 MΩ
	4	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Between wiring harness between C03 (female) ㊵ and S08 (female) ② and grounding		Voltage	Below 1 V
	5	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C03	Arm control lever	Voltage	
			Between ㊵ and grounding	NEUTRAL	20 – 30 V	
				DUMPING	Below 1 V	

Electrical Circuit Diagram for Arm DUMPING PPC Hydraulic Switch



BJP10942

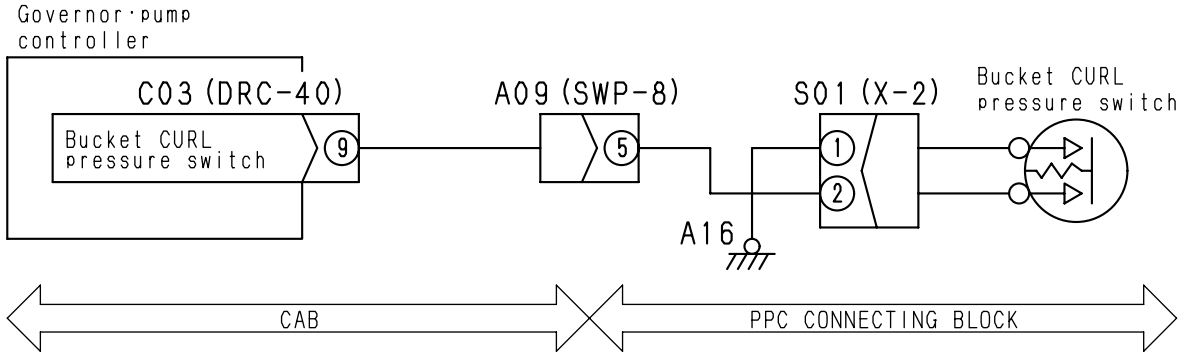
E-25 "Bucket DIGGING" is not correctly displayed in monitor function

Failure information	• "Bucket DIGGING" is not correctly displayed in the monitor function (special function) on the monitor panel.
Relative information	—

Presumed cause and standard value in normalcy

Cause		Standard value in normalcy and references for troubleshooting			
1	Bucket DIGGING PPC hydraulic switch fault (Internal disconnection and short-circuiting)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
		S01 (male)	Bucket control lever	Resistance value	
		Between ① and ②	NEUTRAL	Above 1 MΩ	
			DIGGING	Below 1 Ω	
2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Wiring harness between C03 (female) ⑨ and S01 (female) ②		Resistance value	Below 1 Ω
		Wiring harness between S01 (female) ① and grounding		Resistance value	Below 1 Ω
3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Between wiring harness between C03 (female) ⑨ and S01 (female) ② and grounding		Resistance value	Above 1 MΩ
4	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
		Between wiring harness between C03 (female) ⑨ and S01 (female) ② and grounding		Voltage	Below 1 V
5	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
		C03	Bucket control lever	Voltage	
		Between ⑨ and grounding	NEUTRAL	20 – 30 V	
			DIGGING	Below 1 V	

Electrical Circuit Diagram for Bucket DIGGING PPC hydraulic Switch



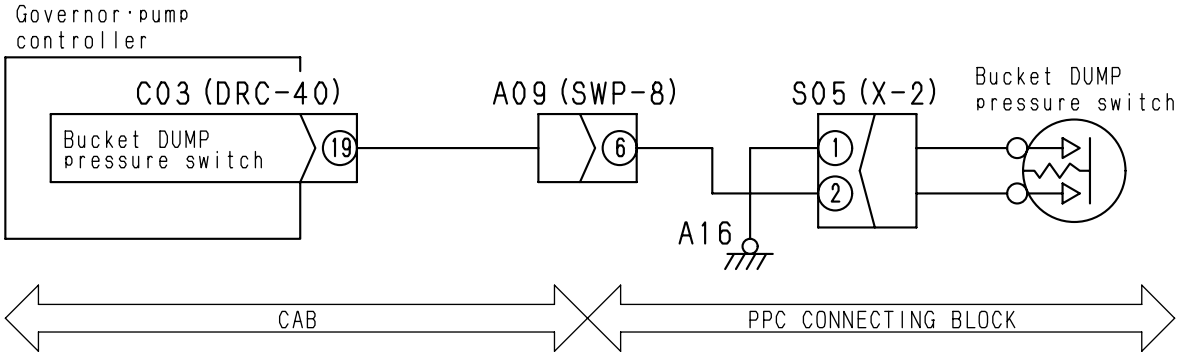
BJP10943

E-26 "Bucket DUMPING" is not correctly displayed in monitor function

Failure information	• "Bucket DUMPING" is not correctly displayed in the monitor function (special function) on the monitor panel.
Relative information	—

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Bucket DUMPING PPC hydraulic switch fault (Internal disconnection and short-circuiting)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
			S05 (male)	Bucket control lever	Resistance value	
			Between ① and ②	NEUTRAL	Above 1 MΩ	
				DUMPING	Below 1 Ω	
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between C03 (female) ⑲ and S05 (female) ②		Resistance value	Below 1 Ω
			Wiring harness between S05 (female) ① and grounding		Resistance value	Below 1 Ω
	3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between C03 (female) ⑲ and S05 (female) ② and grounding		Resistance value	Above 1 MΩ
	4	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Between wiring harness between C03 (female) ⑲ and S05 (female) ② and grounding		Voltage	Below 1 V
	5	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C03	Bucket control lever	Voltage	
			Between ⑲ and grounding	NEUTRAL	20 – 30 V	
				DUMPING	Below 1 V	

Electrical Circuit Diagram for Bucket DUMPING PPC hydraulic Switch



BJP10944

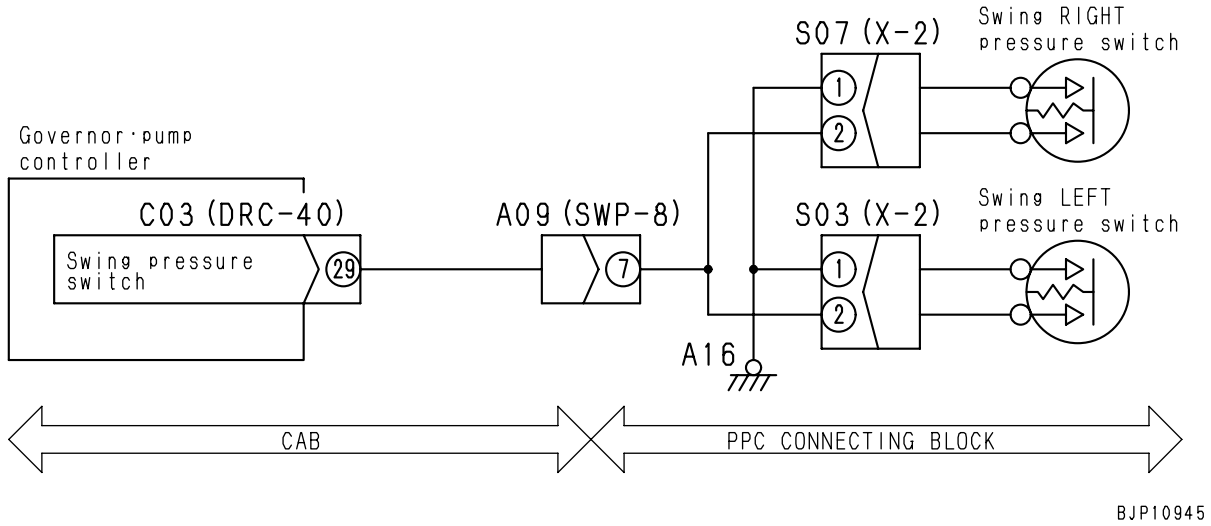
E-27 "SWING" is not correctly displayed in monitor function

Failure information	• "SWING" is not correctly displayed in the monitor function (special function) on the monitor panel.
Relative information	—

Presumed cause and standard value in normalcy

	Cause	Standard value in normalcy and references for troubleshooting			
1	Swing PPC hydraulic switch, left, fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
		S03 (male)	Swing control lever	Resistance value	
		Between ① and ②	NEUTRAL	Above 1 MΩ	
			Left	Below 1 Ω	
2	Swing PPC hydraulic switch, right, fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
		S07 (male)	Swing control lever	Resistance value	
		Between ① and ②	NEUTRAL	Above 1 MΩ	
			Right	Below 1 Ω	
3	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Wiring harness between C03 (female) ㉙ and S03 (female) ②, or wiring harness between C03 (female) ㉙ and S07 (female) ②		Resistance value	Below 1 Ω
		Wiring harness between S03 (female) ① and grounding		Resistance value	Below 1 Ω
		Wiring harness between S07 (female) ① and grounding		Resistance value	Below 1 Ω
4	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
		Wiring harness between C03 (female) ㉙ and S03 (female) ②, or wiring harness between C03 (female) ㉙ and S07 (female) ② and grounding		Resistance value	Above 1 MΩ
5	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
		Wiring harness between C03 (female) ㉙ and S03 (female) ②, or wiring harness between C03 (female) ㉙ and S07 (female) ② and grounding		Voltage	Below 1 V
6	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
		C03	Swing control lever	Voltage	
		Between ㉙ and grounding	NEUTRAL	20 – 30 V	
			Right or left	Below 1 V	

Electrical Circuit Diagram for Right and Left Swing PPC hydraulic Switches

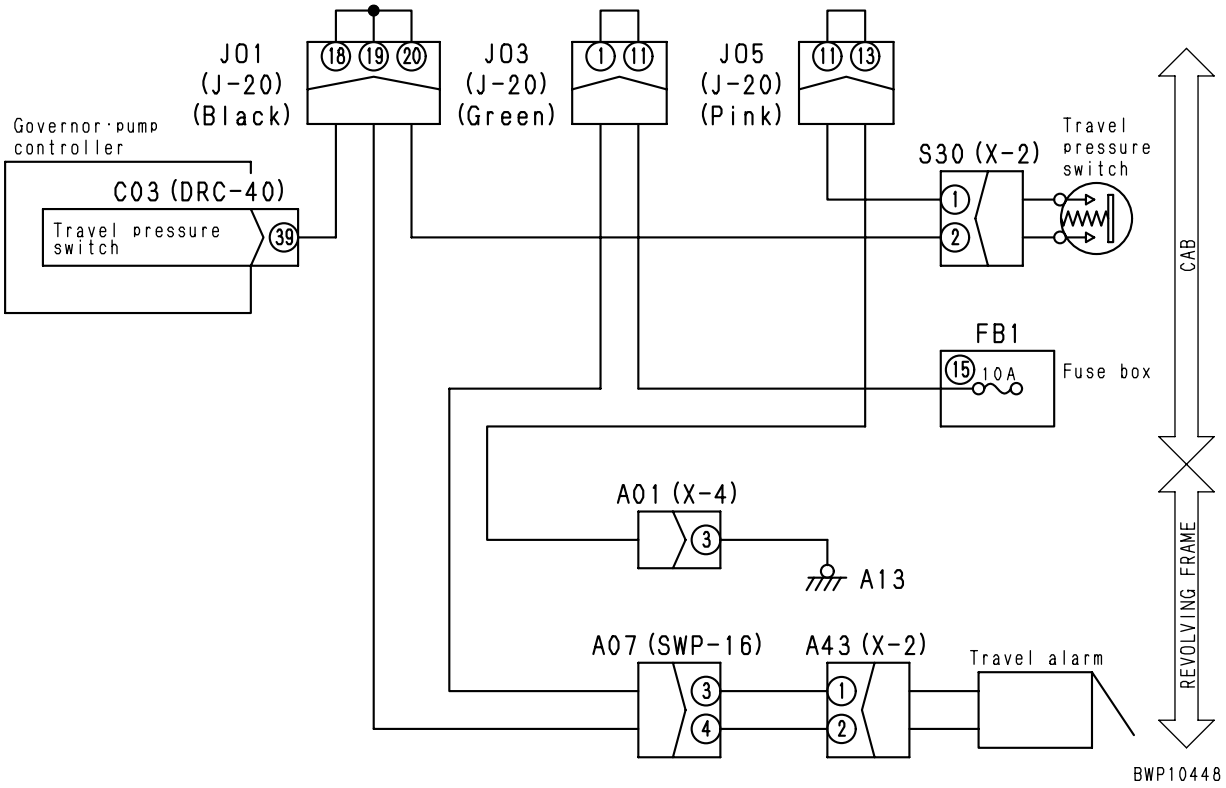


E-28 "TRAVEL" is not correctly displayed in monitor function

Failure information	• "TRAVEL" is not correctly displayed in the monitor function (special function) on the monitor panel.
Relative information	—

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Travel PPC hydraulic switch fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
			S30 (male)	Travel control lever	Resistance value	
			Between ① and ②	NEUTRAL	Above 1 MΩ	
				Forward or reverse	Below 1 Ω	
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from C03 (female) ㊴ to J01 to S30 (female) ②		Resistance value	Below 1 Ω
			Wiring harness from S30 (female) ② to J05 to grounding		Resistance value	Below 1 Ω
	3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness from C03 (female) ㊴ to J01 to S30 (female) ②, or between wiring harness between C03 (female) ㊴ and A43 (female) ② and grounding		Resistance value	Above 1 MΩ
	4	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Wiring harness from C03 (female) ㊴ to J01 to S30 (female) ②, or between wiring harness between C03 (female) ㊴ and A43 (female) ② and grounding		Voltage	Below 1 V
	5	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C03	Travel control lever	Voltage	
			Between ㊴ and grounding	NEUTRAL	20 – 30 V	
				Forward or backward	Below 1 V	

Electrical Circuit Diagram for Travel PPC hydraulic Switch and Travel Alarm

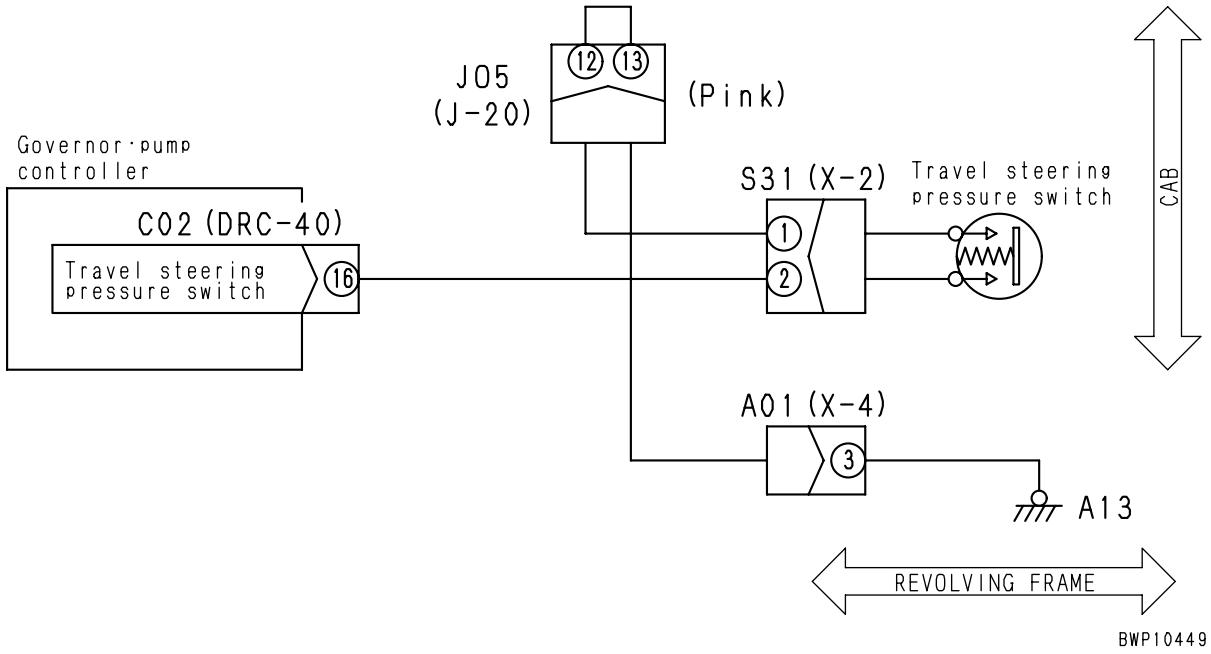


E-29 "Travel Differential Pressure" is not correctly displayed in monitor function

Failure information	• "Travel Differential Pressure" is not correctly displayed in the monitor function (special function) on the monitor panel.
Relative information	• When pressure difference is created between the right and left travel PPC circuits (in steering), the travel differential mechanism is turned ON.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Travel steering PPC hydraulic switch fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
			S31 (male)	Travel control lever	Resistance value	
			Between ① and ②	NEUTRAL	Above 1 MΩ	
				One side of right or left only	Below 1 Ω	
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between C02 (female) ⑯ and S31 (female) ②		Resistance value	Below 1 Ω
			Wiring harness from S31 (female) ② to J05 to grounding		Resistance value	Below 1 Ω
	3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between C02 (female) ⑯ and S31 (female) ② and grounding		Resistance value	Above 1 MΩ
	4	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Between wiring harness between C02 (female) ⑯ and S31 (female) ② and grounding		Voltage	Below 1 V
	5	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C02	Travel control lever	Voltage	
			Between ⑯ and grounding	NEUTRAL	20 – 30 V	
				One side of right or left only	Below 1 V	

Electrical Circuit Diagram for Travel and Steering PPC hydraulic Switch

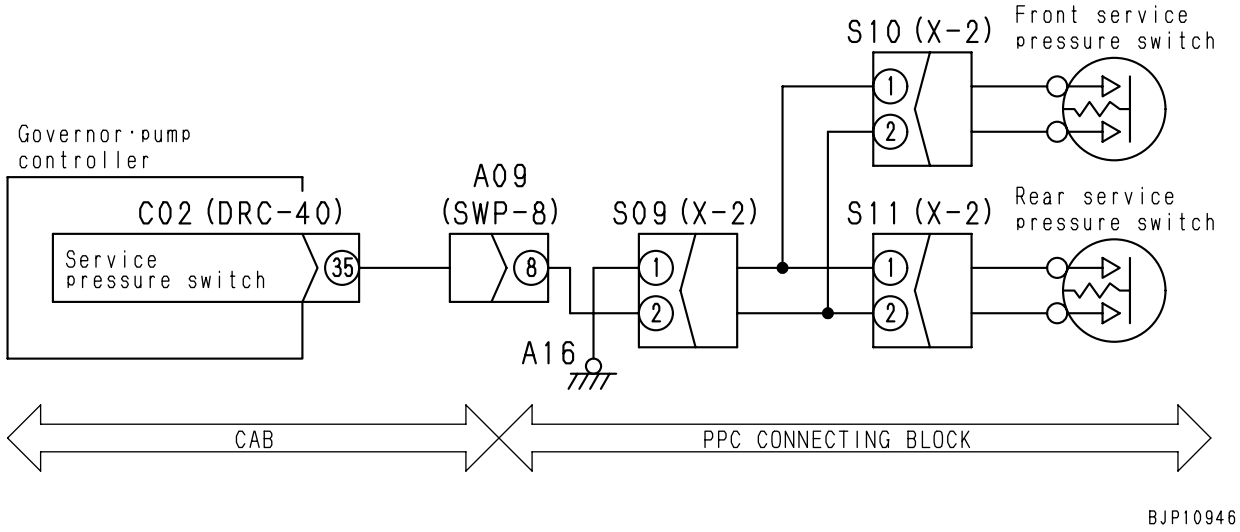


E-30 "Service" is not correctly displayed in monitor function

Failure information	• "Service" is not correctly displayed in the monitor function (special function) on the monitor panel.
Relative information	—

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Service (front) PPC hydraulic switch fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
			S10 (male)	Service pedal	Resistance value	
			Between ① and ②	NEUTRAL	Above 1 MΩ	
				Front	Below 1 Ω	
	2	Service (rear) PPC hydraulic switch fault (Internal disconnection or short-circuiting)	★Turn the engine starting switch OFF for the preparations, and keep the engine running during the troubleshooting.			
			S11 (male)	Service pedal	Resistance value	
			Between ① and ②	NEUTRAL	Above 1 MΩ	
				Rear	Below 1 Ω	
	3	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between C02 (female) ㉟ and S10 (female) ②, or wiring harness between C02 (female) ㉟ and S11 (female) ②		Resistance value	Below 1 Ω
			Wiring harness between S10 (female) ① and grounding		Resistance value	Below 1 Ω
	4	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between C02 (female) ㉟ and S10 (female) ②, or between wiring harness between C02 (female) ㉟ and S11 (female) ② and grounding		Resistance value	Above 1 MΩ
	5	Short-circuiting of wiring harness (Contact with 24 V circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			Wiring harness between C02 (female) ㉟ and S10 (female) ②, or between wiring harness between C02 (female) ㉟ and S11 (female) ② and grounding		Voltage	Below 1 V
	6	Governor • pump controller defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.			
			C02	Service pedal	Voltage	
			Between ㉟ and grounding	NEUTRAL	20 – 30 V	
				Front or rear	Below 1 V	

Electrical Circuit Diagram for Service PPC hydraulic Switch

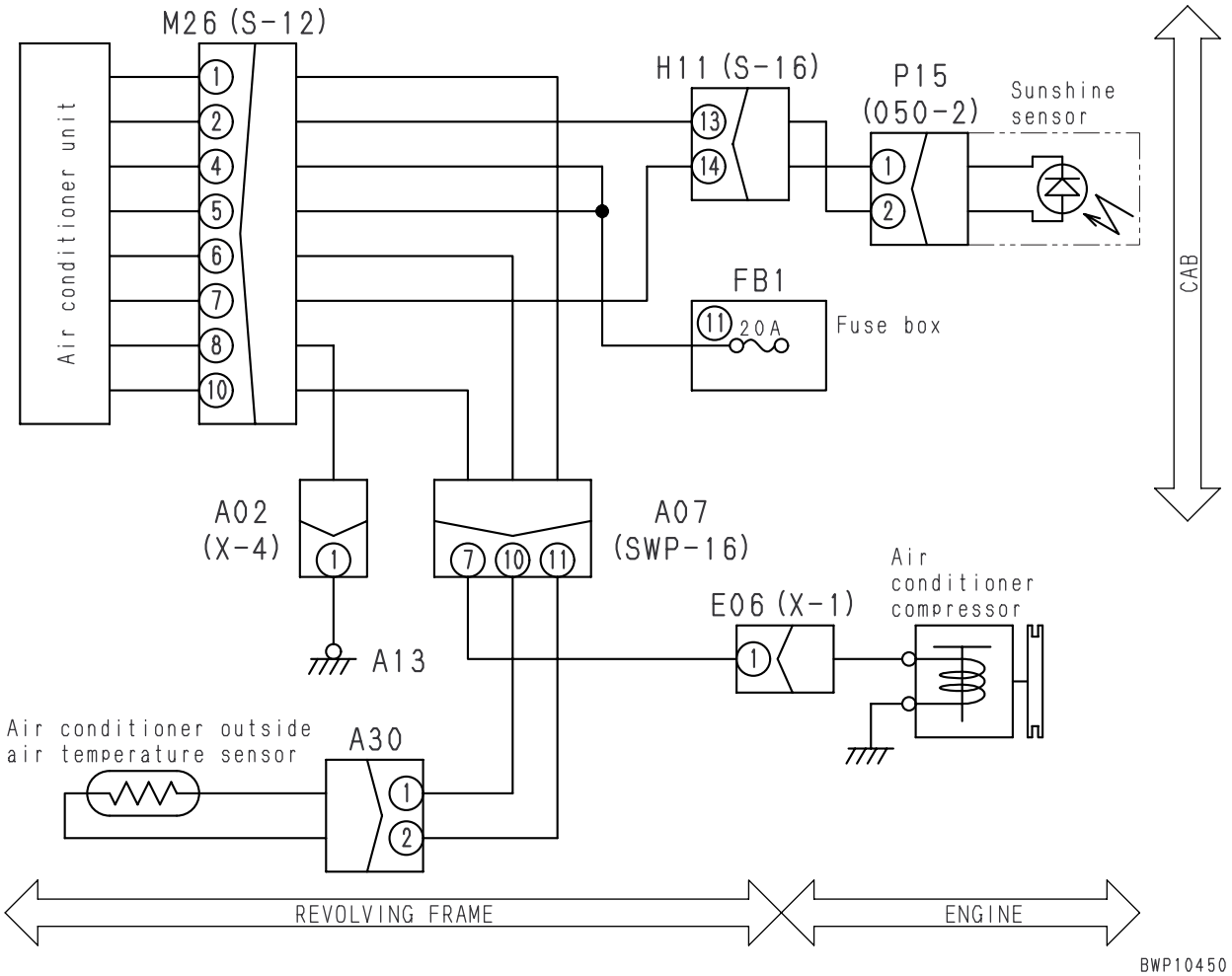


E-31 Air Conditioner does not work

Failure information	• The air conditioner does not work.
Relative information	• For the electrical circuit diagram inside the air conditioner unit, refer to the section of STRUCTURE AND FUNCTION - Air Conditioner in this manual.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting		
	1	Fuse No. 11 fault	When the fuse is blown, there is a big possibility that grounding fault occurred in the circuit.		
	2	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			Wiring harness between FB1-11 outlet and M26 (male) ④ ⑤	Resistance value	Below 1 Ω
			Wiring harness between M26 (male) ⑧ and grounding	Resistance value	Below 1 Ω
	3	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.		
			Between wiring harness between FB1-11 outlet and M26 (male) ④ ⑤ and grounding	Voltage	Above 1 MΩ
	4	Air conditioner unit defective	★Turn the engine starting switch OFF for the preparations, and hold it in the ON position during the troubleshooting.		
			M26	Voltage	
			Between ④ ⑤ and ⑧	20 – 30 V	

Electrical Circuit Diagram for Air Conditioner

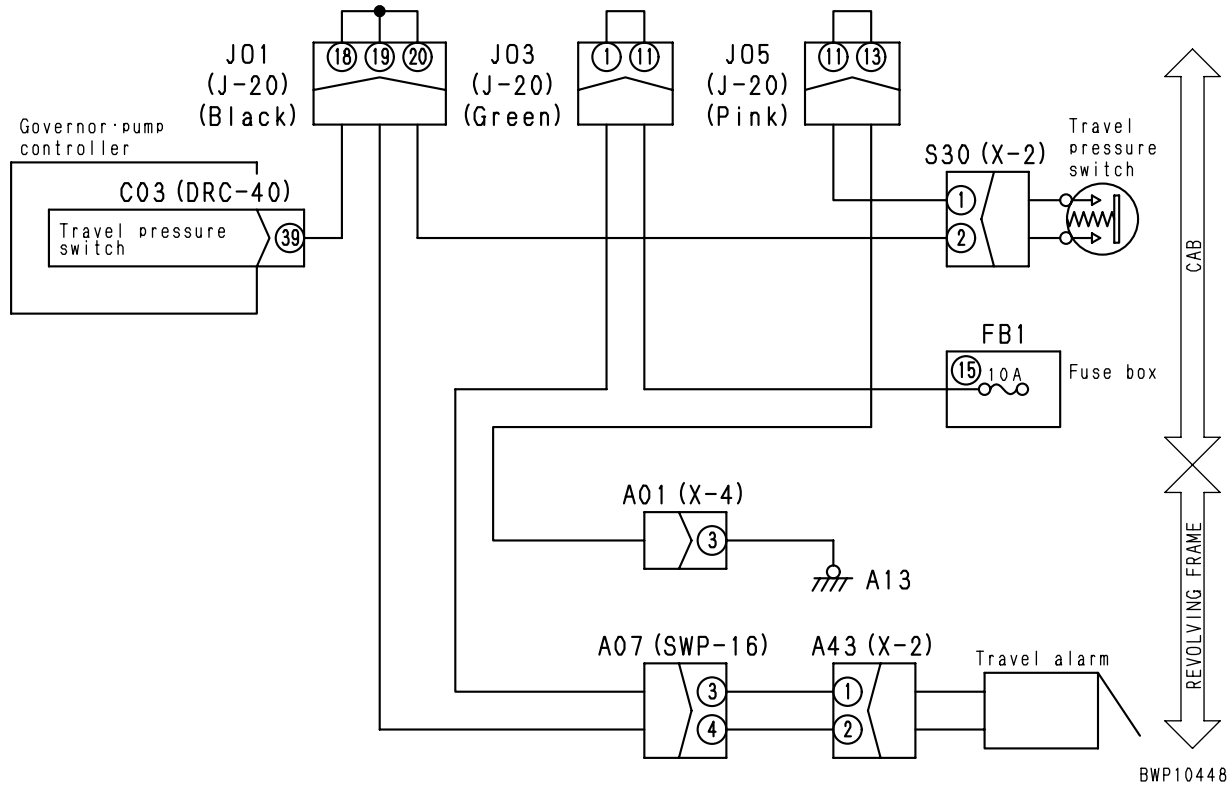


E-32 Travel alarm does not sound

Failure information	• The travel alarm does not sound while the machine is traveling. • The alarm begins to sound when the machine is at a standstill.
Relative information	—

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting			
	1	Fuse No. 15 fault	When the fuse is blown, there is a big possibility that grounding fault occurred in the circuit.			
	2	Travel signal fault	If the monitor display is not correct, proceed to No. E-21 Troubleshooting.			
			Monitoring code	Item	Normal display	
			019	Travel	Control lever operation: ON Control lever NEUTRAL: OFF	
	3	Disconnection of wiring harness (Disconnection or defective contact with connector)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Wiring harness between FB1-15 outlet to J03 and A43 (female) ①		Resistance value	Below 1 Ω
			Wiring harness between A43 (female) ② and J01 ⑲		Resistance value	Below 1 Ω
	4	Grounding fault of wiring harness (Contact with grounding (GND) circuit)	★Turn the engine starting switch OFF for the preparations, and hold it in the OFF position during the troubleshooting.			
			Between wiring harness between FB1-15 outlet to J03 and A43 (female) ① and grounding		Resistance value	Above 1 MΩ
	5	Travel alarm fault	As this is an internal failure, troubleshooting cannot be conducted. (If none of the causes listed in Item 1 through 4 above is found, the travel alarm is judged as defective)			

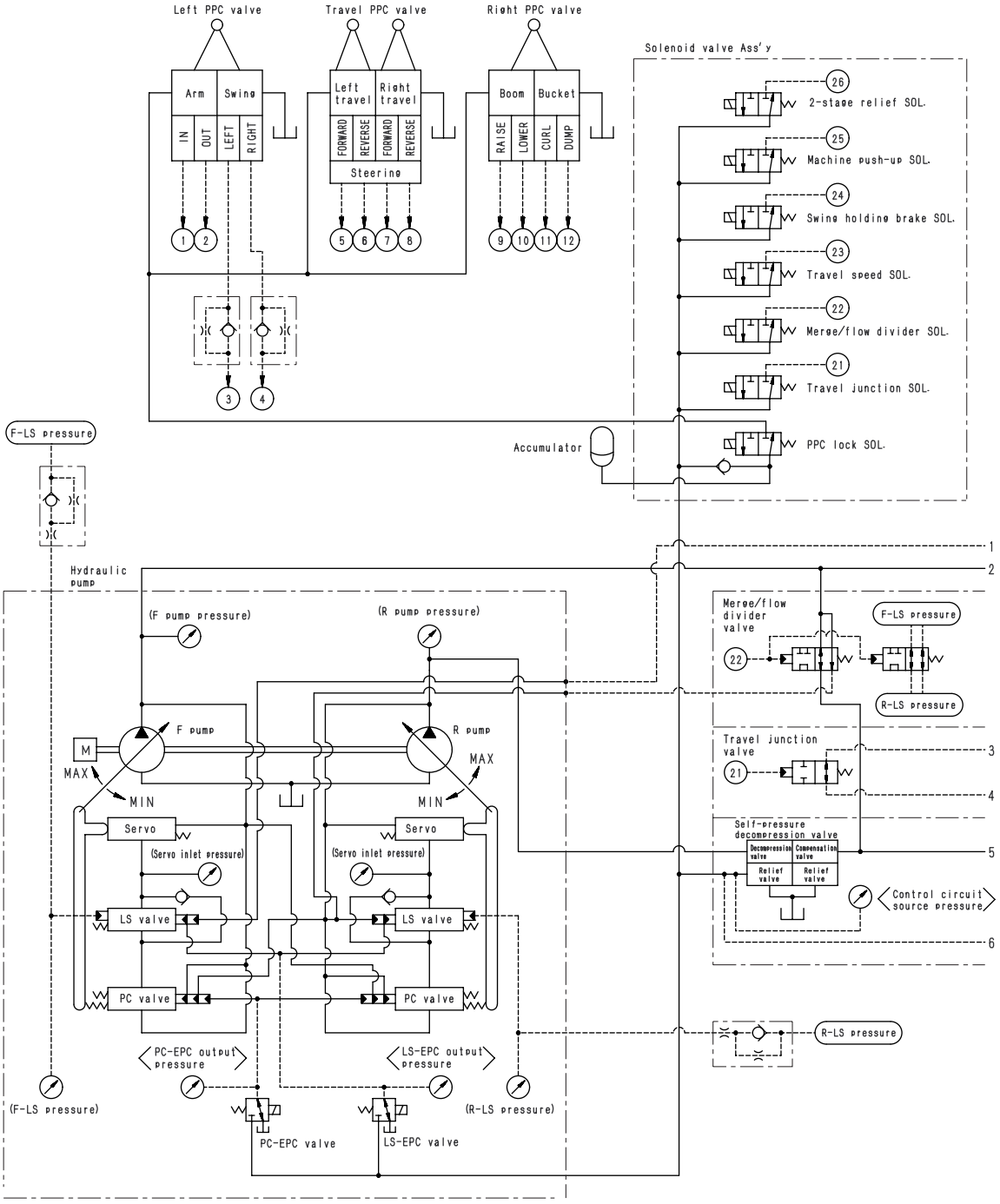
Electrical Circuit Diagram for Travel PPC Hydraulic Switch and Travel Alarm



TROUBLESHOOTING OF HYDRAULIC AND MECHANICAL SYSTEM (H-MODE)

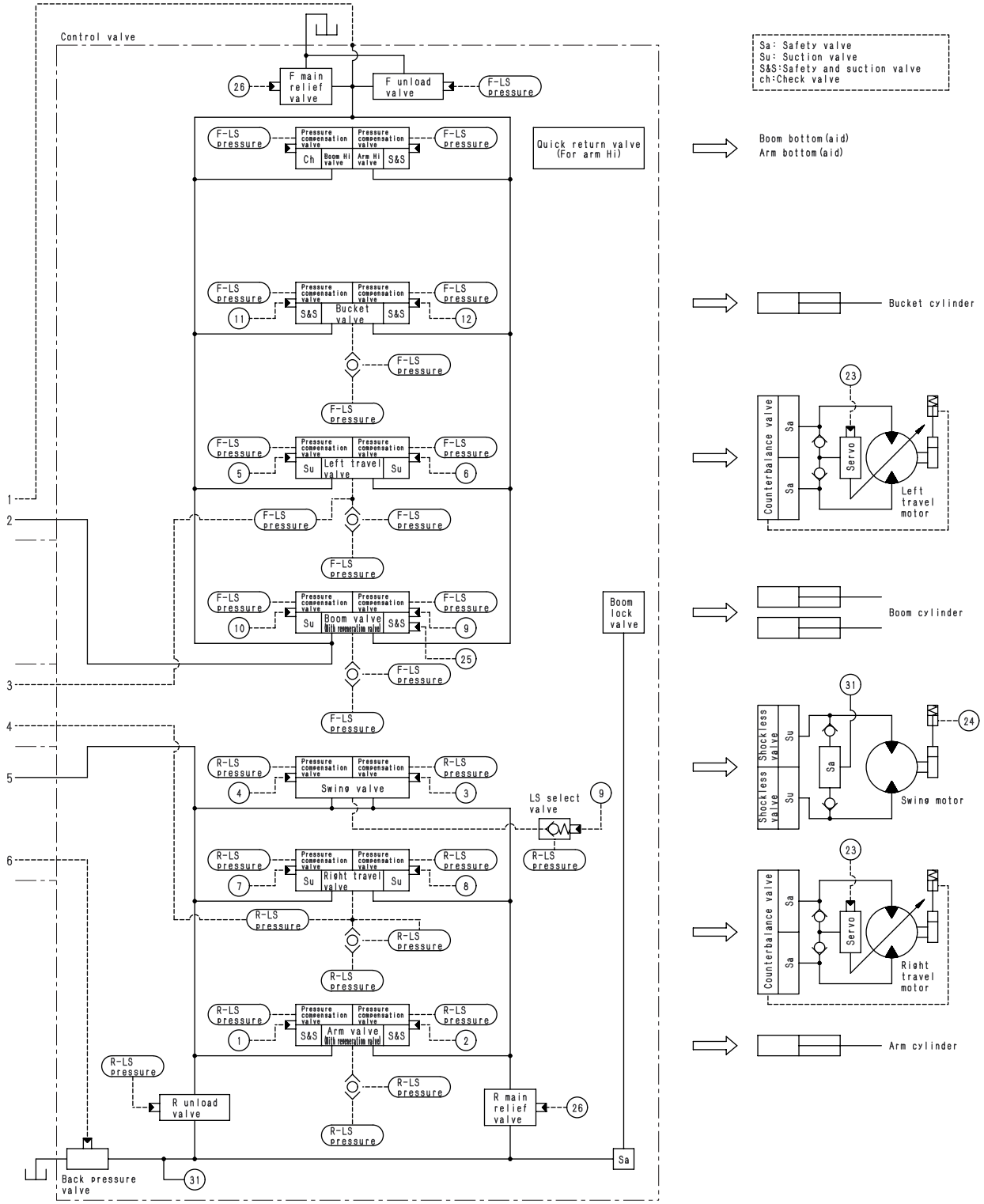
SYSTEM CHART FOR HYDRAULIC AND MECHANICAL SYSTEMS 20-602
INFORMATION CONTAINED IN TROUBLESHOOTING TABLE 20-604
H-1 All work equipment lack power, or travel and swing speeds are slow 20-605
H-2 Engine speed sharply drops or engine stalls 20-606
H-3 No work equipment, travel or swing move 20-607
H-4 Abnormal noise is heard from around hydraulic pump 20-607
H-5 Auto-decelerator does not work 20-608
H-6 Fine control mode does not function 20-608
H-7 Boom moves slowly or lacks power 20-609
H-8 Arm moves slowly or lacks power 20-610
H-9 Bucket moves slowly or lacks power 20-611
H-10 Work equipment does not move in its single operation 20-611
H-11 Work equipment has a bit too fast hydraulic drift 20-612
H-12 Work equipment has big time lag 20-613
H-13 Other work equipment moves when relieving single circuit 20-613
H-14 One-touch power max. switch does not operate 20-613
H-15 In compound operation, work equipment with larger load moves slowly 20-614
H-16 In swing + boom RAISE operation, boom moves slowly 20-614
H-17 In swing + travel, travel speed drops sharply 20-614
H-18 Machine swerves in travel 20-615
H-19 Machine travels slowly 20-616
H-20 Machine cannot be easily steered or lacks power 20-617
H-21 Travel speed does not shift, or it is too slow or fast. 20-618
H-22 Track shoe does not turn (on one side only) 20-618
H-23 Machine does not swing 20-619
H-24 Swing acceleration is poor, or swing speed is slow 20-620
H-25 Excessive overrun when stopping swing 20-621
H-26 There is big shock when stopping swing 20-622
H-27 There is big abnormal noise caused when stopping swing 20-622
H-28 Swing natural drift is too big 20-623

SYSTEM CHART FOR HYDRAULIC AND MECHANICAL SYSTEMS



TXP02887

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



INFORMATION CONTAINED IN TROUBLESHOOTING TABLE

★ Troubleshooting Table and Related Circuit Diagram collectively carry the following information. Carry out troubleshooting work after fully grasping their contents.

Failure information	Phenomena occurring on machine
Relative information	Information on occurred failures and troubleshooting

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Cause for presumed failure (The attached No. for filing and reference purpose only. It does not stand for any priority)	<Contents> • The standard values in normalcy by which to judge "good" or "no good" about presumed causes. • References for making judgement of "good" or "no good"
	2		
	3		
	4		
	5		

H-1 All work equipment lack power, or travel and swing speeds are slow

Failure information	• All the work equipment lack power, or their travel and swing speeds are slow.
Relative information	• Set the working mode at A mode for troubleshooting.

Presumed cause and standard value in normalcy

	Cause	Standard value in normalcy and references for troubleshooting
1	Malfunctioning of unload valve	★Stop engine for preparations. Start troubleshooting at engine high idling.

Control lever	Unload pressure
All control levers in NEUTRAL	3.9 ± 1.0 MPa {40 ± 10kg/cm^2}

	Cause	Standard value in normalcy and references for troubleshooting
2	Improper adjustment or malfunctioning of main relief valve	★Stop engine for preparations. Start troubleshooting at engine high idling.

Control lever	Main relief pressure
Arm, DIGGING	33.34 – 37.23 MPa {340 – 375kg/cm^2}

If the pressure does not return to normalcy even after the adjustment, malfunctioning of main relief valve or its internal failure is suspected. In that case, check the valve itself.

	Cause	Standard value in normalcy and references for troubleshooting
3	Malfunctioning of self pressure decompression valve	★Stop engine for preparations. Start troubleshooting at engine high idling.

Control lever	Control circuit source pressure
All control levers in NEUTRAL	2.83 – 3.43 MPa {29 – 35kg/cm^2}

	Cause	Standard value in normalcy and references for troubleshooting
4	Improper adjustment or malfunctioning of PC valve	★Stop engine for preparations. Start troubleshooting at engine high idling.

Oil pressure to be measured	Measurement condition	Oil pressure ratio
Pump delivery pressure	Swing lock: ON Arm digging relief	1
PC valve output pressure		Approx. 3/5

If the oil pressure does not return to normalcy even after the adjustment, malfunctioning of PC valve or its internal failure is suspected. In that case, check the valve itself.

	Cause	Standard value in normalcy and references for troubleshooting
5	Malfunctioning of LS-EPC valve	★Stop engine for preparations. Start troubleshooting at engine high idling.

Travel speed	Travel control lever	LS-EPC output pressure
Lo	NEUTRAL	Approx. 1.4 MPa {Approx. 14 kg/cm^2}
Hi	Travel control lever	0{0}

	Cause	Standard value in normalcy and references for troubleshooting
6	Improper adjustment or malfunctioning of LS valve	★Stop engine for preparations. Start troubleshooting at engine high idling.

Oil pressure to be measured	Oil pressure ratio	
	All control levers in NEUTRAL	Travel without load (control lever held at half stroke)
Pump delivery pressure	Nearly equal pressure	1
LS valve output pressure		Approx. 3/5

If the oil pressure does not return to normalcy even after the adjustment, malfunctioning of LS valve or its internal failure is suspected. In that case, check the valve itself.

7	Malfunctioning of servo piston	Malfunctioning of servo piston is suspected. Check the piston itself.
8	Piston pump defective	If none of the above listed causes is detected, the piston pump is suspected of deteriorated performance, malfunctioning or internal failure.

H-2 Engine speed sharply drops or engine stalls

Failure information	• The engine speed sharply drops or the engine stalls.
Relative information	• Relative Information

Presumed cause and standard value in normalcy

	Cause	Standard value in normalcy and references for troubleshooting
1	Improper adjustment or malfunctioning of main relief valve	★Stop engine for preparations. Start troubleshooting at engine high idling.
		Control lever: Arm, DIGGING — Main relief pressure: 33.34 – 37.23 MPa {340 – 375kg/cm^2}
		If the oil pressure does not return to normalcy even after the adjustment, malfunctioning of the main relief valve or its internal failure is suspected. In that case, check the valve itself.
2	Improper adjustment or malfunctioning of PC valve	★Stop engine for preparations. Start troubleshooting at engine high idling.
		Oil pressure to be measured: Pump delivery pressure — Measurement condition: Swing lock: ON, Arm digging relief — Oil pressure ratio: 1
		Oil pressure to be measured: PC valve output pressure — Measurement condition: Swing lock: ON, Arm digging relief — Oil pressure ratio: Approx. 3/5
		If the oil pressure does not return to normalcy even after the adjustment, malfunctioning of the PC valve or its internal failure is suspected. In that case, check the valve itself.
3	Improper adjustment or malfunctioning of LS valve	★Stop engine for preparations. Start troubleshooting at engine high idling.
		Oil pressure to be measured: Pump delivery pressure — Oil pressure ratio: All control levers in NEUTRAL: Travel without load (control lever held at half stroke) — Nearly equal pressure: 1
		Oil pressure to be measured: LS valve output pressure — Oil pressure ratio: All control levers in NEUTRAL: Travel without load (control lever held at half stroke) — Nearly equal pressure: Approx. 3/5
		If the oil pressure does not return to normalcy even after the adjustment, malfunctioning of the LS valve or its internal failure is suspected. In that case, check the valve itself.
4	Orifice or filter in servo equipment clogged	The orifice or filter in the pump servo equipment is suspected of clogging. Check the equipment itself.
5	Malfunction of servo piston	The servo piston is suspected of malfunction. Check the piston itself.

H-3 No work equipment, travel or swing move

Failure information	• No work equipment nor travel and swing functions can be set in motion.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting	
	1	Malfunctioning of PPC lock solenoid valve	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Safety lock lever	Main relief pressure
			Locked	0{0}
			Released	2.84 – 3.43 MPa {29 – 35kg/cm^2}
	2	Malfunctioning of self pressure decompression valve	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Control lever	Control circuit source pressure
			All control levers in NEUTRAL position	2.83 – 3.43 MPa {29 – 35kg/cm^2}
	3	Piston pump defective	The piston pump is suspected of malfunctioning or an internal failure. Diagnose it in the following manner. • Remove the oil pressure measurement plug and crank the engine. If oil flows out, it is in normal condition.	
	4	Damper defective	It is presumed that the pump shaft does not rotate due to some internal failure of the dumper. Check the damper itself.	

H-4 Abnormal noise is heard from around hydraulic pump

Failure information	• An abnormal noise is heard from around the hydraulic pump.
Relative information	—

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Hydraulic oil level lowered	Make a visual check.
	2	Quality of hydraulic oil bad	Air may have get mixed with the oil. Make a visual check.
	3	Hydraulic tank cap breather clogged	It is presumed that the breather in the cap of hydraulic tanks is clogged, thereby causing negative pressure inside the tank. Make a visual check.
	4	Hydraulic tank strainer clogged	It is presumed that the strainer in the hydraulic tank is clogged, thereby causing negative pressure in the suction circuit. Make a visual check.
	5	Piston pump defective	The piston pump is suspected of an internal failure. Check the pump itself.

H-5 Auto-decelerator does not work

Failure information	• The auto-decelerator does not work.
Relative information	• This troubleshooting mode is applied when the auto-decelerator does not work, while operating the travel control lever. (A shuttle valve is provided between PPC valve and the hydraulic switch only in the travel circuit -actually located inside PPC valve) • Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting	
	1	Malfunctioning of travel PPC valve (shuttle valve)	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Travel control lever	PPC valve output pressure
			NEUTRAL	0{0}
			Operation	Above 2.7 MPa {Above 28 kg/cm^2}

H-6 Fine control mode does not function

Failure information	• The fine control mode poorly functions or its response is slow.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting		
	1	Malfunctioning of LS-EPC valve	★Stop engine for preparations. Start troubleshooting at engine high idling.		
			Travel speed	Travel control lever	LS-EPC valve output pressure
			Lo	NEUTRAL	Approx. 1.4 MPa {Approx. 14 kg/cm^2}
			Hi	Travel control lever	0{0}
	2	Orifice in LS circuit clogged	The orifice in the LS circuit is presumed to be clogged. Check the orifice itself.		
	3	Improper adjustment or malfunctioning of LS valve	★Stop engine for preparations. Start troubleshooting at engine high idling.		
			Oil pressure to be measured	Oil pressure ratio	
				All control levers in NEUTRAL	Travel without load (control lever held at half stroke)
			Pump delivery pressure	Nearly equal oil pressure	1
			PC valve output pressure		Approx. 3/5
			If the oil pressure does not return to normalcy even after the adjustment, malfunctioning of the LS valve or its internal failure is suspected. In that case, check the valve itself.		
	4	Malfunctioning of servo piston	Malfunctioning of the servo piston is suspected. Check the piston itself.		

H-7 Boom moves slowly or lacks power

Failure information	• The boom moves slowly or lacks power
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting	
	1	Malfunctioning of right PPC valve (in boom circuit)	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Boom lever	PPC valve output pressure
			NEUTRAL	0{0}
			RAISE or LOWER	Above 2.7 MPa {Above 28 kg/cm^2}
	2	Malfunction of merge/divide solenoid valve	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Travel lever	Solenoid output pressure
			NEUTRAL	0{0}
			Operating one side only	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	3	Malfunctioning of merge/divide valve (main and LS valves)	The merge/divide valve (main and LS valves) is presumed to malfunction. Check the valve itself.	
	4	Malfunctioning of boom control valve (spool)	The spool in the boom control valve (Lo • Hi) is presumed to malfunction. Check the valve itself.	
	5	Malfunctioning of boom control valve (pressure compensation valve)	The pressure compensation valve in the boom control valve (Lo • Hi) is presumed to malfunction. Check the valve itself.	
	6	Malfunctioning of boom control valve (regeneration valve)	The regeneration valve in the boom control valve (Lo) or the seal is presumed to malfunction. Check the valve itself.	
	7	Malfunctioning of boom control valve (lock valve)	The lock valve in the boom control valve (Lo) is presumed to malfunction. Check the valve itself.	
	8	Malfunctioning of boom control valve (check valve)	The check valve in the boom control valve (Hi) is presumed to malfunction. Check the valve itself.	
	9	Malfunctioning of safety valve for lock valve or seal defective	The safety valve for the lock valve is presumed to malfunction, or the seal is suspected to be defective. Check the valve itself.	
	10	Malfunctioning of boom control valve (suction valve) or seal defective	The suction valve in the boom control valve (Lo) is presumed to malfunction, or the seal is suspected to be defective.	
	11	Malfunctioning of boom control valve (safety and suction valves) or seal defective	The safety and suction valves in the boom control valve (Lo) are presumed to malfunction, or the seal is suspected to be defective. Check those valves themselves.	
	12	Malfunctioning of LS shuttle valve (left travel, bucket and service valves)	LS shuttle valves in the left travel control valve, bucket control valve and service control valve are presumed to malfunction. Check those valves themselves.	
	13	Boom cylinder defective	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Boom lever	Amount oil leakage from cylinder
			Raise relief	20 cc/min

H-8 Arm moves slowly or lacks power

Failure information	• The arm moves slowly, or lacks power.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting	
	1	Malfunctioning of left PPC valve (arm circuit)	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Arm lever	PPC valve output pressure
			NEUTRAL	0{0}
			DIGGING or DUMPING	Above 2.7 MPa {Above 28 kg/cm^2}
	2	Malfunctioning of merge/divide solenoid valve	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Travel lever	Solenoid output pressure
			NEUTRAL	0{0}
			Operating one side only	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	3	Malfunctioning of merge/divide valve (main and LS valves)	The merge/divide valve (main and LS valves) is presumed to malfunction. Check the valve itself.	
	4	Malfunctioning of arm control valve (spool)	The spool in the arm control valve (Lo • Hi) is presumed to malfunction. Check the valve itself.	
	5	Malfunctioning of arm control valve (pressure compensation valve)	The pressure compensation valve in the arm control valve (Lo • Hi) is presumed to malfunction. Check the valve itself.	
	6	Malfunctioning of arm control valve (regeneration valve)	The regeneration valve in the arm control valve (Lo) is presumed to malfunction, or the seal is suspected to be defective. Check the valve itself.	
	7	Malfunctioning of arm control valve (safety and suction valves) or seal defective	The safety and suction valves in the arm control valve (Lo • Hi) are presumed to malfunction, or the seal is suspected of defect. Check those valves themselves.	
	8	Malfunctioning of arm control valve (quick return valve)	The quick return valve in the arm control valve (Hi) is presumed to malfunction. Check the valve itself.	
	9	Malfunctioning of LS shuttle valve (right travel, boom, left travel, bucket and service valves)	LS shuttle valves in the right travel control valve, boom control valve, left travel control valve, bucket control valve and service valve are presumed to malfunction. Check those valves themselves.	
	10	Arm cylinder defective	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Arm lever	Amount oil leakage from cylinder
			Digging relief	20 cc/min

H-9 Bucket moves slowly or lacks power

Failure information	• The bucket moves slowly, or lacks power.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting	
	1	Malfunctioning of right PPC valve (bucket circuit)	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Bucket lever	PPC valve output pressure
			NEUTRAL	0{0}
			DIGGING or DUMPING	Above 2.7 MPa {Above 28 kg/cm^2}
	2	Malfunctioning of bucket control valve (spool)	The spool in the bucket control valve is presumed to malfunction. Check the valve itself.	
	3	Malfunctioning of bucket control valve (pressure compensation valve)	The pressure compensation valve in the bucket control valve is presumed to malfunction. Check the valve itself.	
	4	Malfunctioning of bucket control valve (safety and suction valves) or seal defective	The safety and suction valves in the bucket control valve are presumed to malfunction, or the seal is suspected to be defective. Check those valves themselves.	
	5	Malfunction of LS shuttle valve (service valve)	The LS shuttle valve in the service control valve is presumed to malfunction. Check the valve itself.	
	6	Bucket cylinder defective	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Bucket lever	Amount oil leakage from cylinder
			Digging relief	20 cc/min

H-10 Work equipment does not move in its single operation

Failure information	• The boom does not move when operated independently. • The arm does not move when operated independently. • The bucket does not move when operated independently.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting	
	1	Malfunctioning of PPC valve	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Work equipment control lever	PPC valve output pressure
			NEUTRAL	0{0}
			Operation	Above 2.7 MPa {Above 28 kg/cm^2}
	2	Malfunctioning of work equipment control valve (spool)	The spool in the work equipment control valve is presumed to malfunction. Check the valve itself.	

H-11 Work equipment has a bit too fast hydraulic drift

Failure information (1)	• Hydraulic drift of the boom is a bit too fast.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting	
	1	Boom cylinder defective	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Boom control lever	Amount oil leakage from cylinder
			Raise relief	20 cc/min
	2	Boom control lever (lock valve) seal defective	The seal at lock valve in the boom control valve (Lo) is suspected to be defective. Check the valve itself.	
	3	Seal at safety valve for lock valve defective	The seal at the safety valve in the lock valve is suspected to be defective. Check the valve itself.	

Failure information (2)	• Hydraulic drift of the arm is a bit too fast.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting	
	1	Arm cylinder defective	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Arm control lever	Amount oil leakage from cylinder
			Digging relief	20 cc/min
	2	Arm control valve (safety and suction valves) seal defective	The seal for safety and suction valves in the arm control valve (Lo • Hi) is suspected to be defective. Check the valve itself. ★Whether the seal is defective or not may well be determined by changing for other safety and suction valves. (Do not attempt to change them for the safety and suction valves for the boom LOWER and the lock valve, because the set pressure differs)	
	3	Arm control valve (spool) seal defective	The seal for spool in the arm control valve (Lo • Hi) is suspected to be defective. Check the seal itself.	
	4	Arm control valve (pressure compensation valve) seal defective	The seal for pressure compensation valve in the arm control valve (Lo • Hi) is suspected to be defective. Check the seal itself.	

Failure information (3)	• Hydraulic drift of the bucket is a bit too fast.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting	
	1	Bucket cylinder defective	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Bucket control lever	Amount oil leakage from cylinder
			Digging relief	20 cc/min
	2	Bucket control valve (safety and suction valves) seal defective	The seal for the safety and suction valves in the bucket control lever is suspected to be defective. Check the seal itself. ★Whether the seal is defective or not may well be determined by changing for other safety and suction valves. (Do not attempt to change them for the safety and suction valves for the boom LOWER and the lock valve, because the set pressure differs)	
	3	Bucket control valve (spool) seal defective	The seal for spool in the bucket control valve is suspected to be defective. Check the seal itself.	
	4	Bucket control valve (pressure compensation valve) seal defective	The seal for pressure compensation valve in the bucket control valve is suspected to be defective. Check the seal itself.	

H-12 Work equipment has big time lag

Failure information	• The work equipment has a big time lag.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting		
	1	Malfunctioning of LS-EPC valve	★Stop engine for preparations. Start troubleshooting at engine high idling.		
			Travel speed	Travel control lever	LS-EPC valve output pressure
			Lo	NEUTRAL	Approx. 1.4 MPa {approx. 14 kg/cm^2}
			Hi	Operation	0{0}
	2	Malfunctioning of control valve (regeneration valve) - with boom and arm only	The regeneration valve in the control valve is presumed to malfunction. Check the valve itself.		
	3	Malfunctioning of control valves (safety & suction valve)	The safety and suction valves of the control valve are presumed to malfunction. Check those valves themselves directly. ★For the arm and boom, whether they are defective or not may well be determined by changing them for other safety and suction valves. (Do not attempt to change them for the safety and suction valves for the boom LOWER and the lock valve, because each set pressure differs)		
	4	Malfunctioning of control valve (pressure compensation valve)	The pressure compensation valve of the control valve is presumed to malfunction. Check the valve itself directly.		

H-13 Other work equipment moves when relieving single circuit

Failure information	• Other work equipment moves when relieving the single circuit of specific work equipment.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Control valve (pressure compensation valve) seal defective	The seal for pressure compression valve in the control valve is suspected to be defective. Check the seal itself.

H-14 One-touch power max. switch does not operate

Failure information	• The one-touch power max. switch does not operate.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting	
	1	Malfunctioning of 2-stage solenoid valve	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Swing lock switch	Solenoid valve output pressure
			OFF	0{0}
			ON	2.84 – 3.43 MPa {29 – 35kg/cm^2}
	2	Malfunctioning of main relief valve	The main relief valve is presumed to malfunction. Check the valve itself.	

H-15 In compound operation, work equipment with larger load moves slowly

Failure information	• In a compound operation, work equipment with larger load tends to move slowly.
Relative information	—

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting	
	1	Malfunctioning of pressure compensation valve for work equipment with larger load	The pressure compensation valve for the work equipment with larger load is presumed to malfunction. Check the valve itself.	
			Combination of compound operation	Work equipment with larger load
			Boom RAISE + arm DIGGING	Boom RAISE
			Boom RAISE + arm DUMPING	Arm DUMPING
			Boom RAISE + bucket DIGGING	Boom RAISE
			Arm DUMPING + bucket DIGGING	Arm DUMPING
			Boom LOWER + arm DUMPING	Arm DUMPING

H-16 In swing + boom RAISE operation, boom moves slowly

Failure information	• In a compound operation of swing + boom RAISE, the boom tends to move slowly.
Relative information	• If the boom moves slowly in the single operation of boom RAISE, carry out the H-7 check first.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Malfunctioning of LS select valve or seal defective	The LS select valve is presumed to malfunction, or the seal is suspected to be defective. Check the valve and seal themselves.

H-17 In swing + travel, travel speed drops sharply

Failure information	• In a compound operation of swing + travel, the travel speed drops sharply.
Relative information	• If the travel speed is slow in the single operation of travel, carry out the H-19 check first.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Malfunctioning of LS shuttle valve (left travel and swing)	The LS shuttle valve in the left travel control valve or the swing control valve is presumed to malfunction. Check both of them directly.

H-18 Machine swerves in travel

Failure information	• The machine tends to swerve while traveling.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy

Cause		Standard value in normalcy and references for troubleshooting		
1	Malfunctioning of travel PPC valve	★Stop engine for preparations. Start troubleshooting at engine high idling.		
		Travel control lever	PPC valve output pressure	
		Forward or reverse	Above 2.7 MPa {Above 28 kg/cm^2}	
		Differential output between right and left sides	Below 0.4 MPa {Below 4 kg/cm^2}	
2	Malfunctioning of self-pressure decompression valve	★Stop engine for preparations. Start troubleshooting at engine high idling.		
		Control lever	Control circuit source pressure	
		All control levers in NEUTRAL	2.83 – 3.43 MPa {29 – 35 kg/cm^2}	
3	Improper adjustment or malfunctioning of LS valve	★Stop engine for preparations. Start troubleshooting at engine high idling.		
		Oil pressure to be measured	Oil Pressure ratio	
			All control levers in NEUTRAL	Travel without load (control lever held at half stroke)
		Pump delivery pressure	Nearly equal pressure	1
		LS valve output pressure		Approx. 3/5
4	Malfunctioning of travel interlocking solenoid valve	★Stop engine for preparations. Start troubleshooting at engine high idling.		
		Travel control lever	Solenoid valve output pressure	
		Operating one side only	0 {0}	
		Operating both sides	2.84 – 3.43 MPa {29 – 35 kg/cm^2}	
5	Malfunctioning of travel interlocking valve	The travel interlocking valve is presumed to malfunction. Check the valve itself.		
6	Malfunctioning of travel control valve (spool)	The spool in the travel interlocking valve is presumed to malfunction. Check the spool itself.		
7	Malfunction of travel motor	★Stop engine for preparations. Start troubleshooting at engine high idling.		
		Travel control lever	Amount of oil leakage from travel motor	
		Travel relief	30 ¬/min	
8	Final drive defective	The final drive is suspected of an internal failure. Check the inside of the final drive directly. ★An internal failure in the final drive may well be determined by an abnormal noise from within, abnormal heat or metal chip or dust contained in the drained oil.		

H-19 Machine travels slowly

Failure information	• The machine's travel speed is slow.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy

Cause		Standard value in normalcy and references for troubleshooting		
1	Malfunctioning of travel PPC valve	★Stop engine for preparations. Start troubleshooting at engine high idling.		
		Travel control lever	PPC valve output pressure	
		Forward or reverse	Above 2.7 MPa {Above 28 kg/cm^2}	
		Output differential between right and left or front and rear	Below 0.4 MPa {Below 4 kg/cm^2}	
2	Malfunctioning of self-pressure decompression valve	★Stop engine for preparations. Start troubleshooting at engine high idling.		
		Control lever	Control circuit source pressure	
		All control levers in NEUTRAL	2.83 – 3.43 MPa {29 – 35kg/cm^2}	
3	Malfunctioning of LS-EPC valve	★Stop engine for preparations. Start troubleshooting at engine high idling.		
		Travel speed	Travel control lever	LS-EPC valve output pressure
		Lo	NEUTRAL	Approx. 1.4 MPa {approx. 14 kg/cm^2}
		Hi	Travel control lever	0 {0}
4	Malfunction of travel control valve (spool)	The spool in the travel control valve is presumed to malfunction. Check the spool itself.		
5	Malfunctioning of travel control valve (pressure compensation valve)	The pressure compensation valve in the travel control valve is presumed to malfunction. Check the valve itself.		
6	Malfunctioning of travel control valve (suction valve)	The suction valve in the travel control valve is presumed to malfunction. Check the valve itself.		
7	Malfunctioning of LS shuttle valve (bucket)	The LS shuttle valve in the bucket control valve is presumed to malfunction. Check the valve itself.		
7	Malfunction of travel motor	★Stop engine for preparations. Start troubleshooting at engine high idling.		
		Travel control lever	Amount of oil leakage from travel motor	
		Travel relief	30 ⊣/min	
8	Final drive defective	The final drive is suspected of an internal failure. Check the inside of the final drive directly. ★An internal failure in the final drive may well be determined by an abnormal noise from within, abnormal heat or metal chip or dust contained in the drained oil.		

H-20 Machine cannot be easily steered or lacks power

Failure information	• The machine cannot be easily steered.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy	Cause		Standard value in normalcy and references for troubleshooting	
	1	Malfunctioning of travel PPC valve (steering spool)	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Travel control lever	PPC valve output pressure (steering)
			NEUTRAL on both sides	0 {0}
			Operating one side only	Above 2.7 MPa {Above 28 kg/cm^2}
	2	Malfunctioning of travel inter-locking solenoid valve	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Travel control lever	Solenoid valve output pressure
			Operating both sides	0 {0}
			Operating one side only	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	3	Malfunctioning of travel inter-locking valve	The travel interlocking valve is presumed to malfunction. Check the valve itself.	
	4	Malfunctioning of merge/divide solenoid valve	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Travel control lever	Solenoid valve output pressure
			Operating both sides	0 {0}
			Operating one side only	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	5	Malfunctioning of merge/divide valve	The merge/divide valve is presumed to malfunction. Check the valve itself.	
	6	Malfunction of travel control valve (spool)	The spool in the travel control valve is presumed to malfunction. Check the spool itself.	
	7	Malfunctioning of travel control valve (pressure compensation valve)	The pressure compensation valve in the travel control valve is presumed to malfunction. Check the valve itself.	
	8	Malfunctioning of travel control valve (suction valve)	The suction valve in the travel control valve is presumed to malfunction. Check the valve itself.	
	9	Malfunctioning of LS shuttle valve (bucket)	The LS shuttle valve in the bucket control valve is presumed to malfunction. Check the valve itself.	
	10	Check valve seal defective at LS oil pressure pickup port	The seal in the check valve of LS oil pressure pickup port is suspected to be defective. Check the seal itself.	
	11	Malfunctioning of travel motor (safety valve)	The seal in the check valve of the travel motor is suspected to be defective. Check the seal itself. ★Whether the seal is defective or not may well be determined by swapping the motors between forward and reverse, or right and left.	
	12	Malfunctioning of travel motor (check valve)	The seal in the check valve of the travel motor is suspected of defect. Check the seal itself. ★Whether the seal is defective or not may well be determined by swapping the motors between forward and reverse, or right and left.	

H-21 Travel speed does not shift, or it is too slow or fast.

Failure information	• Travel speed does not shift, or it is either too fast or slow.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting		
	1	Malfunctioning of LS-EPC valve	★Stop engine for preparations. Start troubleshooting at engine high idling.		
			Travel speed	Travel control lever	Monitoring [15]
			Lo	Fine control (to the extent that the decelerator is released)	690 mA
			(※ Mi)		740 mA
			Hi		0 mA
			★Stop engine for preparations. Start troubleshooting at engine high idling.		
			Travel speed	Travel control lever	LS-EPC valve output pressure
			Lo	NEUTRAL	Approx. 1.4 MPa {approx. 14 kg/cm^2}
			Hi	Operation	0 {0}
	2	Malfunctioning of travel speed solenoid valve	★Stop engine for preparations. Start troubleshooting at engine high idling.		
			Travel speed	Travel control lever	Solenoid valve output pressure
			Lo	NEUTRAL	0 {0}
			Hi	Operation	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	3	Malfunctioning of travel motor (speed shifting)	The travel motor is presumed to malfunction when shifting speed. Check the speed shifting portion directly.		

※ : The "Mi" mode is on the multi-monitor specification machine only.

H-22 Track shoe does not turn (on one side only)

Failure information	• A track shoe does not turn (only on one side).
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting	
	1	Travel control valve (suction valve) seat defective	The suction valve seat in the travel control valve is suspected of defect. Check the seat itself.	
	2	Travel motor (safety valve) seat defective	The safety valve seat in the travel motor is suspected of defect. Check the seat itself.	
	3	Travel motor (check valve) seat defective	The check valve seat in the travel motor is suspected of defect. Check the seat itself.	
	4	Travel Motor speed reduced	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Travel control lever	Amount of oil leakage from travel motor
			Travel relief	30 −/min
	5	Final drive defective	The final drive is suspected of an internal failure. Check the inside of the final drive directly. ★A failure inside the final drive may well be determined by an abnormal noise from within, abnormal heat generated or metal dust or chips contained in the drained oil.	

H-23 Machine does not swing

Failure information (1)	• The machine swings neither to the right nor to the left.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Malfunctioning of swing parking brake solenoid valve	★Stop engine for preparations. Start troubleshooting at engine high idling. Swing: NEUTRAL / Operation; Solenoid valve: 0 {0} / 2.84 – 3.43 MPa {29 – 35 kg/cm²}
	2	Malfunctioning of swing motor (parking brake)	The parking brake portion of the swing motor is presumed to malfunction. Check it directly.
	3	Improper adjustment or malfunctioning of swing motor (safety valve)	★Stop engine for preparations. Start troubleshooting at engine high idling. Swing lock switch: ON; Swing control lever: Swing relief; Swing relief pressure: 28.42 – 32.85 MPa {285 – 335 kg/cm²} If the oil pressure does not return to normalcy even after the adjustment, the safety valve is presumed to malfunction, or suspected of an internal failure. Check the valve itself.
	4	Swing motor defective	★Stop engine for preparations. Start troubleshooting at engine high idling. Swing control lever: Swing relief; Amount of oil leakage from swing motor: Below 11 ⊐/min
	5	Swing machinery defective	The swing machinery is suspected of an internal failure. Check the inside of the swing machinery directly. ★A failure inside the swing machinery may well be determined by an abnormal noise from within, abnormal heat generated or metal dust or chips contained in the drained oil.

Failure information (2)	• The machine does not swing in one direction.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Malfunctioning of PPC valve	★Stop engine for preparations. Start troubleshooting at engine high idling. Left control lever: NEUTRAL / Swing operation; PPC valve output pressure: 0 {0} / Above 2.7 MPa {Above 28 kg/cm²}
	2	Malfunctioning of swing control valve (spool)	The spool in the swing control valve is presumed to malfunction. Check the spool itself.
	3	Swing motor (suction valve) seal defective	The seal in the suction valve of the swing motor is suspected of defect. Check the seal itself. ★Whether the seal is defective or not may well be determined by swapping the right and left suction valves and watching if there is any change.
	4	Swing motor (check valve) seal defective	The seal in the check valve of the swing motor is suspected of defect. Check the seal itself. ★Whether the seal is defective or not may well be determined by swapping the right and left check valves and watching the result.

H-24 Swing acceleration is poor, or swing speed is slow

Failure information (1)	• Swing acceleration is poor, or swing speed is slow.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting		
	1	Malfunctioning of LS shuttle valve (all LS shuttles)	The LS shuttle valves for all the control valves are presumed to malfunction. Check them directly.		
	2	Malfunctioning of swing motor (parking brake)	The parking brake portion of the swing motor is presumed to malfunction. Check it directly.		
	3	Improper adjustment or malfunctioning of swing motor (safety valve)	★Stop engine for preparations. Start troubleshooting at engine high idling.		
			Swing lock switch	Swing control lever	Swing relief pressure
			ON	Swing relief	28.42 – 32.85 MPa {285 – 335 kg/cm^2}
			If the oil pressure does not return to normalcy even after the adjustment, the safety valve is presumed to malfunction, or suspected of an internal failure. Check the valve itself.		
	4	Swing motor defective	★Stop engine for preparations. Start troubleshooting at engine high idling.		
			Swing control lever	Amount of oil leakage from swing motor	
			Swing relief	Below 11 ⊐/min	

Failure information (2)	• Swing acceleration is poor only on one side, or swing speed is slow.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting	
	1	Malfunctioning of PPC valve	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Swing control lever	PPC valve output pressure
			NEUTRAL	0 {0}
			Left or right	Above 2.7 MPa {Above 28 kg/cm^2}
	2	Malfunctioning of swing control valve (spool)	The spool in the swing control valve is presumed to malfunction. Check the valve itself.	
	3	Malfunctioning of swing motor (pressure compensation valve)	The pressure compensation valve in the swing motor is presumed to malfunction. Check the valve itself.	
	4	Swing motor (suction valve) seal defective	The seal in the suction valve of the swing motor is suspected of defect. Check the seal itself. ★Whether the seal is defective or not may well be determined by swapping the right and left suction valves and watching the result.	
	5	Swing motor (check valve) seal defective	The seal in the check valve of the swing motor is suspected of defect. Check the seal itself. ★Whether the seal is defective or not may well be determined by swapping the right and left check valves and watching the result.	

H-25 Excessive overrun when stopping swing

Failure information (1)	• The work equipment overruns excessively when stopping swing.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting		
	1	Improper adjustment or malfunctioning of swing motor (safety valve)	★Stop engine for preparations. Start troubleshooting at engine high idling.		
			Swing lock switch	Swing control lever	Swing relief pressure
			ON	Swing relief	28.42 – 32.85 MPa {285 – 335 kg/cm^2}
			If the oil pressure does not return to normalcy even after the adjustment, the safety valve is presumed to malfunction, or suspected of an internal failure. Check the valve itself.		
	2	Swing motor defective	★Stop engine for preparations. Start troubleshooting at engine high idling.		
			Control lever	Amount of oil leakage from swing motor	
			Swing relief	Below 11 ⊐/min	

Failure information (2)	• Swing acceleration is poor only on one side, or swing speed is slow.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting	
	1	Malfunctioning of PPC valve	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Swing control lever	PPC valve output pressure
			NEUTRAL	0 {0}
			Left or right	Above 2.7 MPa {Above 28 kg/cm^2}
	2	Swing PPC slow return valve clogged	The PPC slow return valve is suspected of clogging. Check the valve itself. ★Whether the valve is clogged or not may well be determined by swapping the right and left valves and watching the result.	
	3	Malfunctioning of swing control valve (spool)	The spool in the swing control valve is resumed to malfunction. Check the valve itself.	
	4	Swing motor (suction valve) seal defective	The seal in the suction valve of the swing motor is suspected of defect. Check the seal itself. ★Whether the seal is defective or not may well be determined by swapping the right and left suction valves and watching the result.	
	5	Swing motor (check valve) seal defective	The seal in the check valve of the swing motor is suspected of defect. Check the seal itself. ★Whether the seal is defective or not may well be determined by swapping the right and left check valves and watching the result.	

H-26 There is big shock when stopping swing

Failure information	• There is a big shock caused when stopping a swing motion.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting	
	1	Malfunctioning of swing PPC valve	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Swing control lever	PPC valve output pressure
			NEUTRAL	0 {0}
			Left or right	Above 2.7 MPa {Above 28 kg/cm^2}
	2	Malfunctioning of swing PPC slow return valve	The swing PPC slow return valve is presumed to malfunction. Check the valve itself. ★Whether the valve malfunctions or not may well be determined by swapping the right and left valves and watching the result.	

H-27 There is big abnormal noise caused when stopping swing

Failure information	• There is a big abnormal noise caused when stopping a swing motion.
Relative information	• Set the working mode at A mode for the troubleshooting.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Malfunctioning of backpressure valve	The backpressure valve is presumed to malfunction. Check the valve itself.
	2	Malfunction of swing motor (safety valve)	The safety valve in the swing motor is presumed to malfunction. Check the valve itself.
	3	Malfunction of swing motor (suction valve)	The seal in suction valve of the swing motor is suspected of defect. Check the seal itself. ★Whether the seal is defective or not may well be determined by swapping the right and left valves and watching the result.
	4	Swing machinery defective	The swing machinery is suspected of an internal failure. Check the inside of the machinery itself. ★A failure inside the swing machinery may well be determined by monitoring abnormal noise, abnormal heat generated or metal dust or chips contained in the drained oil.

H-28 Swing natural drift is too big

Failure information (1)	• Natural drift of the swing is too big (when the parking brake is activated).
Relative information	• When the emergency swing release switch is in the OFF position (this is a normal condition), the swing and parking brake is activated and the swing is fixed with a disc brake.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting	
	1	Swing and parking brake solenoid valve malfunctioned	★Stop engine for preparations. Start troubleshooting at engine high idling.	
			Swing control lever	Solenoid valve output pressure
			NEUTRAL	0 {0}
			Left or right	2.84 – 3.43 MPa {29 – 35 kg/cm^2}
	2	Swing motor (parking brake portion) malfunctioned	The parking portion of the swing motor is suspected of malfunctioning and interior failure. Check that portion directly.	

Failure information (2)	• Natural drift of the swing is too big (when the parking brake is released).
Relative information	• When the emergency swing release switch is in the ON condition (this is an emergent condition), the swing and parking brake is released and the swing is retained only hydraulically.

Presumed cause and standard value in normalcy		Cause	Standard value in normalcy and references for troubleshooting
	1	Swing control valve (spool) malfunctioned	The seal in the spool of the swing control valve is suspected of defect. Check the spool itself directly.
	2	Swing control valve (pressure compensation valve) malfunctioned	The pressure compensation valve seal in the swing control valve is suspected of defect. Check the valve itself directly.
	3	Swing motor (safety valve) defective	The safety valve seal in the swing motor is suspected of defect. Check the valve itself directly.
	4	Swing motor (suction valve) defective	The suction valve seal in the swing motor is suspected of defect. Check the valve itself directly.
	5	Swing motor (check valve) defective	The check valve seal in the swing motor is suspected of defect. Check the valve itself directly.

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HOW TO READ THIS MANUAL

REMOVAL AND INSTALLATION OF ASSEMBLIES

SPECIAL TOOLS

- Special tools that are deemed necessary for removal or installation of parts are listed.
- List of the special tools contains the following kind of information.
  1) Necessity
     ■: Special tools which cannot be substituted, should always be used.
     ●: Special tools which are very useful if available, can be substituted with commercially available tools.
  2) Distinction of new and existing special tools
     N: Tools with new part numbers, newly developed for this model.
     R: Tools with upgraded part numbers, remodeled from already available tools for other models.

  Blank: Tools already available for other models, used without any modification.
  3) Circle mark (○) in sketch column:
     A circle mark means that a sketch of the special tool is presented in the section of Sketches for Special Tools.

★ Part No. of special tools starting with 79*T means that they are locally made parts and as such not interchangeable with those made by Komatsu in Japan e.g. 79*T--- xxx --- xxxx.

REMOVAL OF PARTS

- The REMOVAL Section contains procedures, precautions and the amount of oil or water to be drained.
- Various symbols used in the REMOVAL Section are explained and listed below.


This mark indicates safety-related precautions which must be followed when doing the work.

★ This mark gives guidance or precautions when doing the procedure.

※1 This mark shows that there are instructions or precautions for installing parts.


This mark shows oil or water to be drained.

INSTALLATION OF PARTS

- Except where otherwise instructed, install parts is the reverse order of removal.
- Instructions and precautions for installing parts are shown with ※1 mark in the INSTALLATION Section, identifying which step the instructions are intended for.
- Marks shown in the INSTALLATION Section stand for the following.


This mark indicates safety-related precautions which must be followed when doing the work.

★ This mark gives guidance or precautions when doing the procedure.


This mark stands for a specific coating agent to be used.



This mark indicates the specified torque.


This mark indicates an amount of oil or water to be added.

SKETCHES OF SPECIAL TOOLS

- Various special tools are illustrated for the convenience of local manufacture.

DISASSEMBLY AND ASSEMBLY OF ASSEMBLIES

SPECIAL TOOLS

- Special tools which are deemed necessary for disassembly and assembly are listed in this section.
- List of the special tools contains the following kind of information.
  1) Necessity
     ■: Special tools which cannot be substituted, should always be used.
     ●: Special tools which are very useful if available, can be substituted with commercially available tools.
  2) Distinction of new and existing special tools
     N: Tools with new part numbers, newly developed for this model.
     R: Tools with upgraded part numbers, remodeled from already available tools for other models.

  Blank: Tools already available for other models, used without any modification.
  3) Circle mark (○) in sketch column:
     A circle mark means that a sketch of the special tool is presented in the section of Sketches for Special Tools.
  4) Part No. of special tools starting with 79*T means that they are locally made parts and as such not interchangeable with those made by Komatsu in Japan e.g. 79*T--- xxx --- xxxx.

DISASSEMBLY

- The DISASSEMBLY Section contains procedures, precautions and the amount of oil or water to be drained.
- Various symbols used in the DISASSEMBLY Section are explained and listed below.


This mark indicates safety-related precautions which must be followed when doing the work.

★ This mark gives guidance or precautions when doing the procedure.


This mark indicates installing parts.


This mark shows oil or water to be drained.

ASSEMBLY

- Section titled ASSEMBLY contain procedures, precautions and the know-how for the work, as well as the amount of oil or water to be added.
- Various symbols used in the ASSEMBLY Section are explained and listed below.


This mark indicates safety-related precautions which must be followed when doing the work.

★ This mark gives guidance or precautions when doing the procedure.


This mark stands for a specific coating agent to be used.



This mark indicates the specified torque.


This mark indicates an amount of oil or water to be added.

SKETCHES OF SPECIAL TOOLS

1) Various special tools are illustrated for the convenience of local manufacture.

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. Hoses and tubes using sleeve nuts

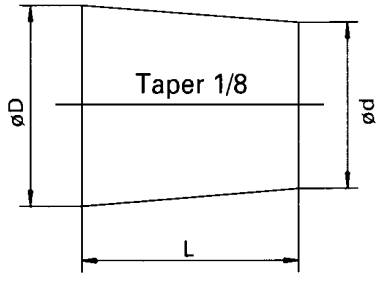
Nominal number	Plug (nut end)	Sleeve nut (elbow end) Use the two items below as a set
02	07376-50210	07221-20210 (Nut), 07222-00210 (Plug)
03	07376-50315	07221-20315 (Nut), 07222-00312 (Plug)
04	07376-50422	07221-20422 (Nut), 07222-00414 (Plug)
05	07376-50522	07221-20522 (Nut), 07222-00515 (Plug)
06	07376-50628	07221-20628 (Nut), 07222-00616 (Plug)
10	07376-51034	07221-21034 (Nut), 07222-01018 (Plug)
12	07376-51234	07221-21234 (Nut), 07222-01219 (Plug)

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



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2. Precautions when carrying out installation work

- Tighten all bolts and nuts (sleeve nuts) to the specified (KES) torque.
- Install the hoses without twisting or interference.
- Replace all gaskets, O-rings, cotter pins, and lock plates with new parts.
- Bend the cotter pin or lock plate securely.
- When coating with adhesive, clean the part and remove all oil and grease, then coat the threaded portion with two or three drops of adhesive.
- When coating with gasket sealant, clean the surface and remove all oil and grease, check that there is no dirt or damage, then coat uniformly with gasket sealant.
- Clean all parts, and correct any damage, dents, burrs, or rust.
- Coat rotating parts and sliding parts with engine oil.
- When press-fitting parts, coat the surface with anti-friction compound (LM-P).
- After installing snap rings, check that the snap ring is installed securely in the ring groove.
- When connecting wiring connectors, clean the connector to remove all oil, dirt, or water, then connect it securely.
- When using eye bolts, check that there is no deformation or deterioration. Screw them in fully, and align the direction of the hook.
- When tightening split flanges, tighten uniformly in turn to prevent excessive tightening on one side.

★ When operating the hydraulic cylinders for the first time after reassembling the cylinders, pumps and other hydraulic equipment removed for repair, bleed the air as follows:

1. Start the engine and run it at low idle.
2. Operate the work equipment control lever to operate the hydraulic cylinders, 4 - 5 times, stopping the cylinders 100 mm from the end of their stroke.
3. Next, operate the hydraulic cylinder 3 - 4 times to the end of its stroke.
4. After doing this run the engine at normal speed.

★ When using the machine for the first time after repair or long storage, follow the same procedure.

3. Precautions when completing the operations

- If the engine coolant water has been drained, tighten the drain valve, and add coolant water to the specified level. Run the engine to circulate the coolant water through the system. Then check the coolant water level again.
- If the hydraulic equipment has been removed and installed again, add engine oil to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.
- If the piping or hydraulic equipment have been removed for repair, bleed the air from the system after reassembling the parts.

★ For details, see TESTING AND ADJUSTING, Bleeding air.

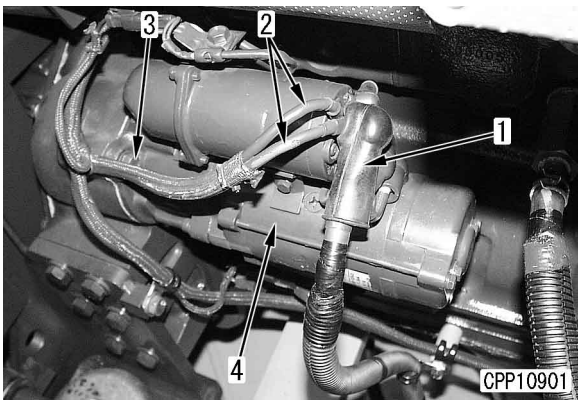
- Add the specified amount of grease (molybdenum disulphide grease) to the work equipment related parts.

REMOVAL AND INSTALLATION OF STARTING MOTOR ASSEMBLY

REMOVAL

Disconnect the cable from the negative (-) terminal of the battery.

1. Open up the engine hood.
2. Disconnect the two wires from the engine starting motor at: ※1
   - Wire (1) and (2) from terminal B.
3. Remove three mounting bolts (3) to detach engine starting motor assembly (4). ※2



INSTALLATION

- Install in reverse order of removal.

※1

N·m Engine starting motor Terminal B Securing nut:
19.6 to 25.5 Nm (2.0 to 2.6 kgm)

※2

Both faces of engine starting motor gasket:
Gasket sealant (LG-1)

REMOVAL AND INSTALLATION OF FUEL INJECTION PUMP ASSEMBLY

SPECIAL TOOLS

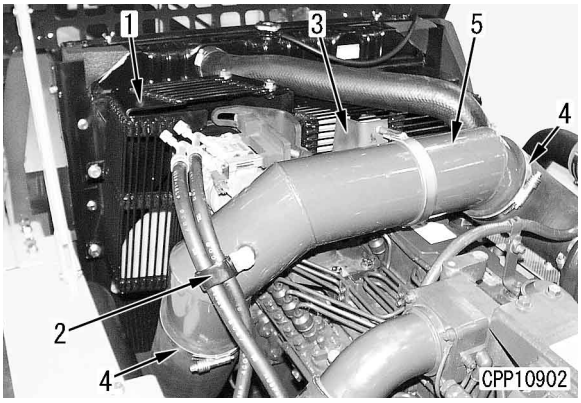
Mark	Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
A	795-799-1390	Puller	■	1		

*Distinction between new and existing part.

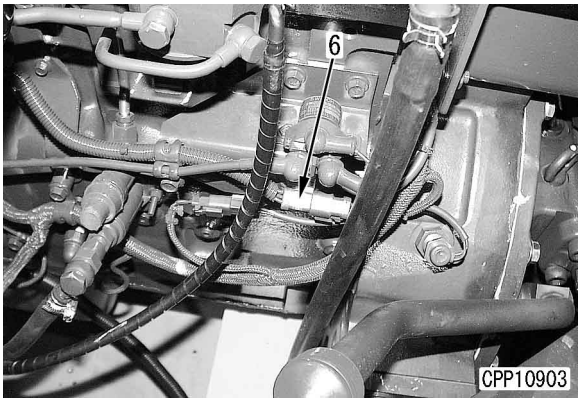
REMOVAL

⚠ Disconnect the negative (-) terminal of the battery.

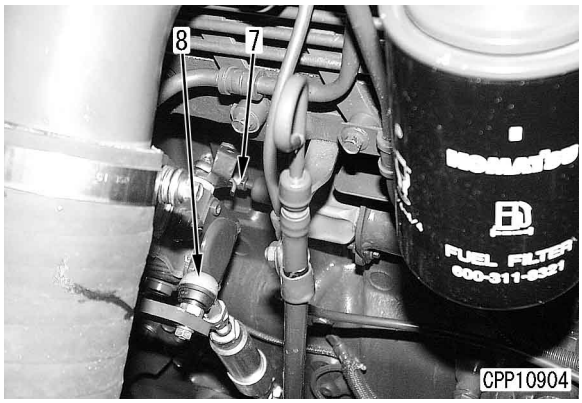
1. Open up the engine hood.
2. Remove radiator fan guard (1).
3. Disconnect air compressor hose clamp (2).
4. Remove bracket (3).
5. Remove two hose clamps (4).
6. Disconnect tube (5).



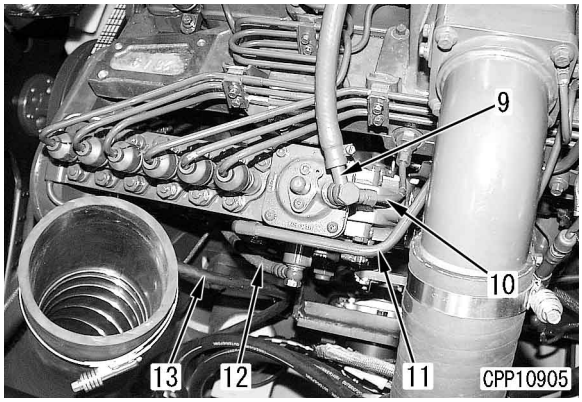
7. Disconnect engine stop motor connector (6).



8. Disconnect engine stop motor rod (7).
9. Disconnect governor rod (8).



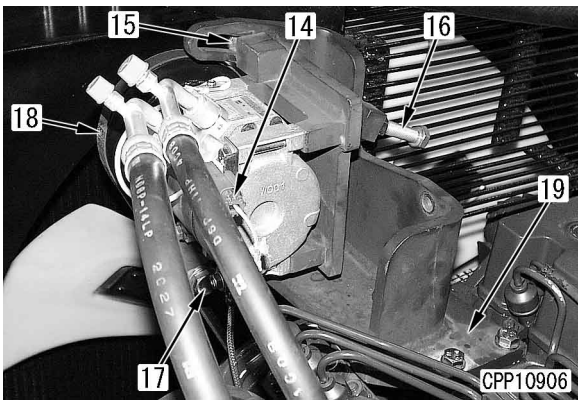
10. Disconnect exhaust brake hose (9) and lubrication tube (10).
11. Disconnect tube (11) between the fuel filter and the fuel injection pump. ※1
12. Disconnect fuel return hoses (12) and (13).
    ★ When disconnecting hoses, fuel flows out. Put a wooden plug in them to stop the spillage.



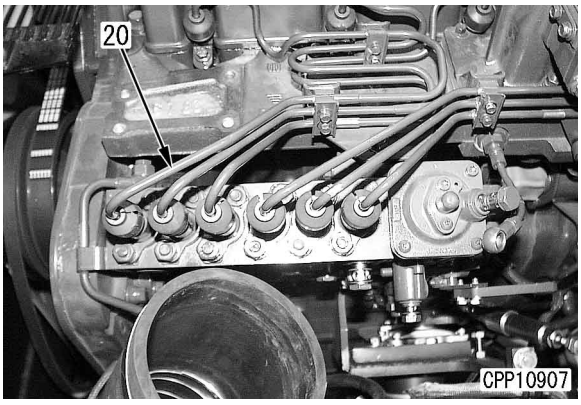
13. Disconnect M34 air compressor connector (14).

14. Loosen adjusting bolts (15), (16) and (17) to remove fan belt (18). ※2

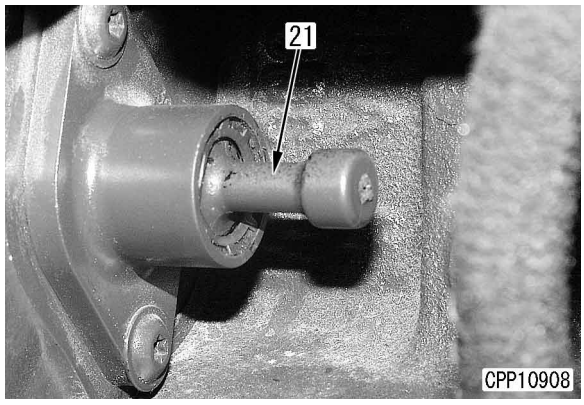
15. Remove bracket (19).



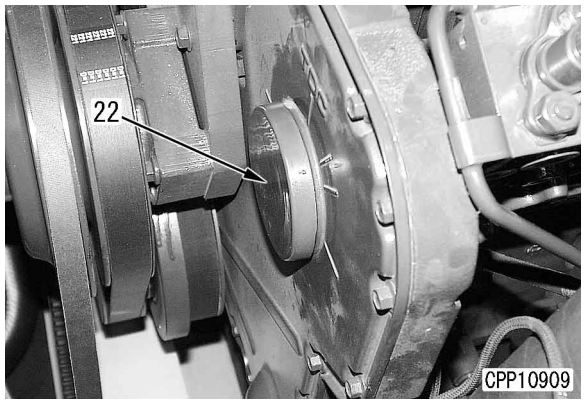
16. Disconnect six delivery tubes (20). ※3



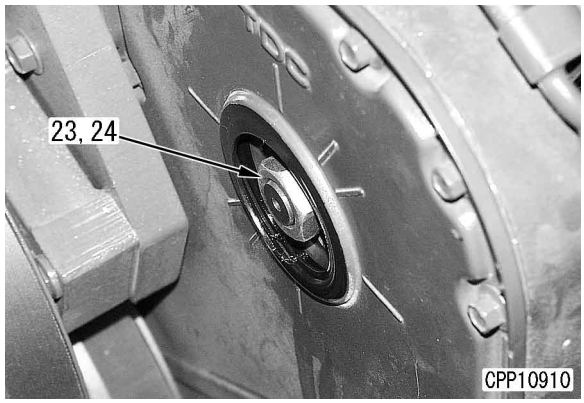
17. Adjust timing gear for injection timing. Use timing pin (21) on the timing gear side.
    ★ Refer to the Testing and Adjusting Fuel Injection Timing section in this manual.



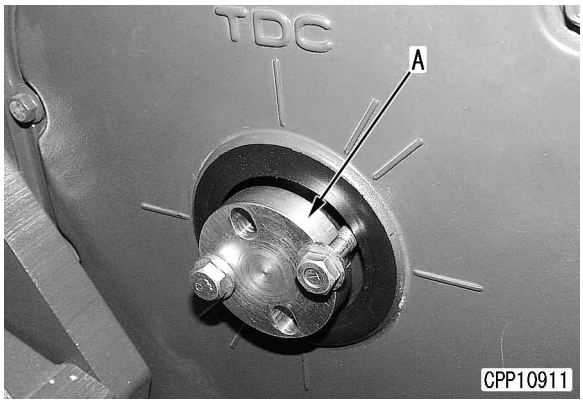
18. Turn cap (22) to remove it.
    ★ When removing the cap, use a filter wrench.



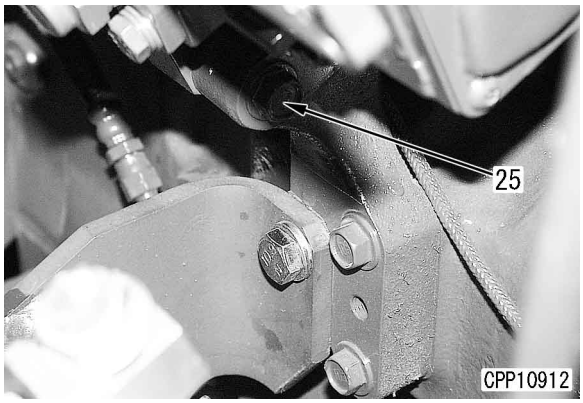
19. Remove nut (23) and washer (24) from the fuel injection pump. ※4
    ★ Be careful, do not let the nut and washer fall inside the case.



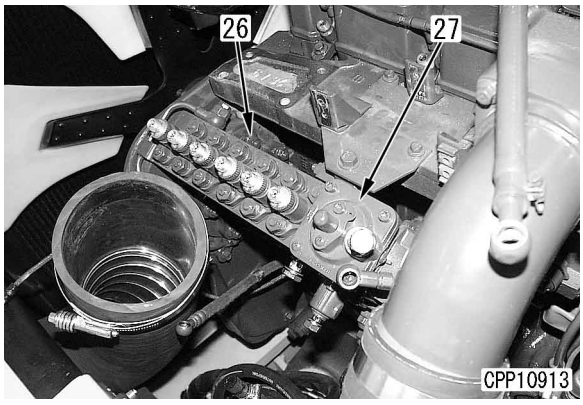
20. Separate shaft and drive gear from the fuel injection pump.



21. Remove two mounting brackets (25) at the lower part of the fuel injection pump.



22. Remove four nuts (26) and remove fuel injection pump assembly (27). ※5



INSTALLATION

- Install in reverse order of removal.

※1

N·m Joint bolt: 36 ± 5 Nm {3.67 ± 0.51 kgm}

※2

★ Refer to the Inspection and Adjustment of Air Compressor Belt Tension section of the TESTING AND ADJUSTING chapter in this manual.

※3

N·m Sleeve nut: 24 ± 4 Nm {2.45 ± 0.41 kgm}

※4

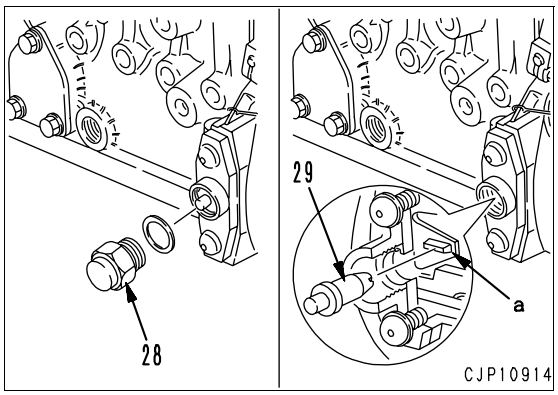
N·m Nut: 178 ± 13 Nm {18.2 ± 1.3 kgm)

※5

- Mount the fuel injection pump assembly in the following manner.
  1) Check that the timing pin is properly adjusted to the fuel injection timing.
     ★ Refer to Item 10 in the preceding REMOVAL procedure.
  2) Remove plug (28). Reverse fuel injection pump timing pin (29) and reinstall the plug.

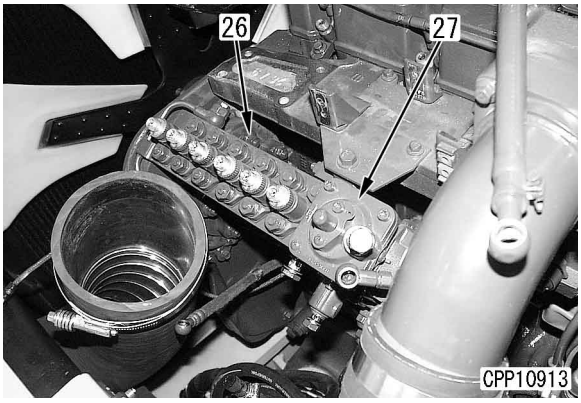
★ Check that the cutout on the timing pin is engaged with protrusion **a** inside the pump.

★ Refer to the Inspection and Adjustment of Fuel Injection Timing section in the TESTING AND ADJUSTING chapter, in this manual.



3) Install the fuel injection pump assembly (27) and secure it with four nuts (26).

N•m Securing nut:
44 ± 6 Nm {4.49 ± 0.61 kgm)

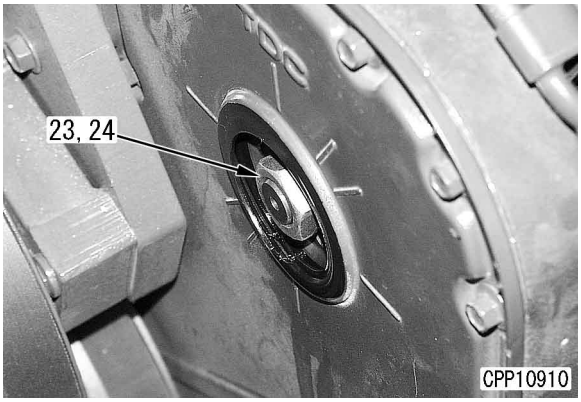


4) Install washer (24) and temporarily secure it with nut (23).

★ When installing the nut and washer, be careful not to let them fall into the case.

⚠ Tighten the nut temporarily to the following torque. Take care not to damage the timing pin.

N•m Nut:
178 ± 13 Nm {18.2 ± 1.3 kgm)



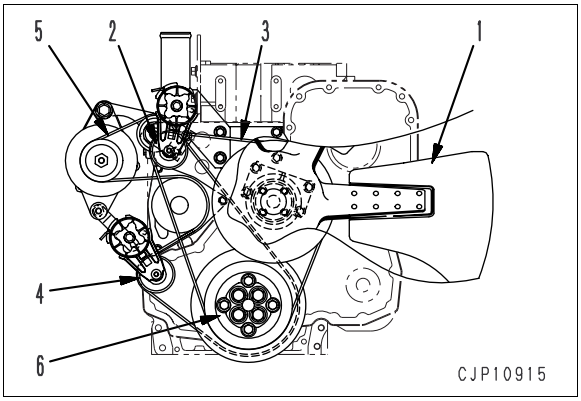
5) Disengage the fuel injector pump timing pin (on the timing gear side) from protrusion **a**, and return the pin to its original position.

- Air bleeding
  Bleed air from the fuel injection system.

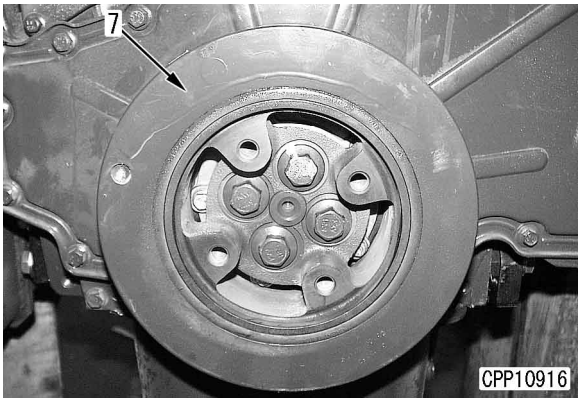
REMOVAL AND INSTALLATION OF ENGINE FRONT SEAL

REMOVAL

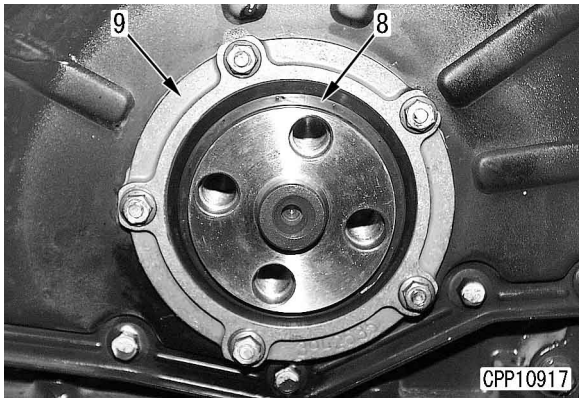
1. Remove the Radiator and Hydraulic Oil Cooler Assembly, refer to the Removal of Radiator and Hydraulic Oil Cooler Assembly in this manual.
2. Remove radiator fan (1).
3. Loosen tension pulley (2) to remove fan belt (3).
4. Loosen tension pulley (4) to remove alternator belt (5).
5. Remove the four mounting bolts to detach damper (6).



6. Remove the four mounting bolts to detach front pulley (7). ※1



7. Remove five mounting nuts to take off seal (8) and seal carrier (9). ※2



INSTALLATION

- Install in reverse order of removal.

※1

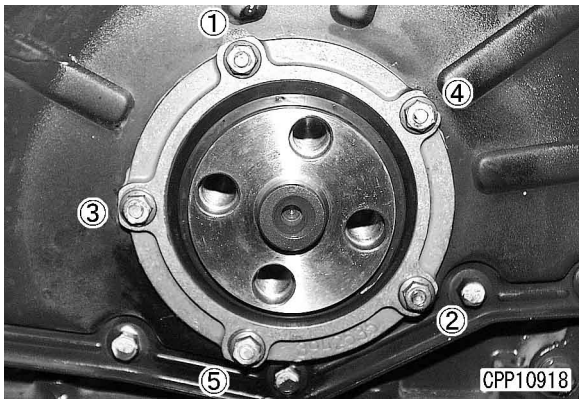
N·m Mounting bolt:
200 ± 10 Nm {20.4 ± 1 kgm}

※2

★ Coat the seal carrier mounting face with Three Bond 1207D or an equivalent to the line diameter of ∅ 1 - 2 mm.

N·m Mounting nut:
9.8 ± 2 Nm {1.0 ± 0.2 kgm}

★ Tighten the five seal carrier mounting nuts, (1) to (5), in the sequence shown below.

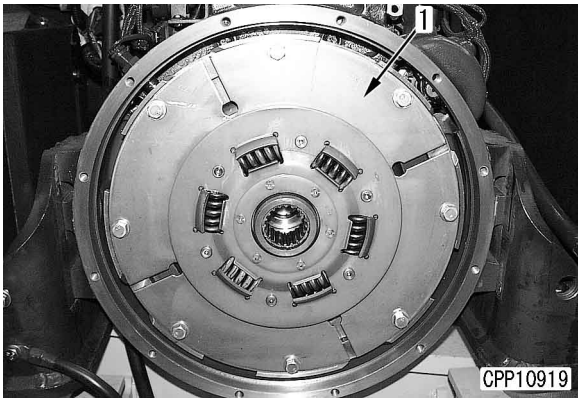


REMOVAL AND INSTALLATION OF ENGINE REAR SEAL

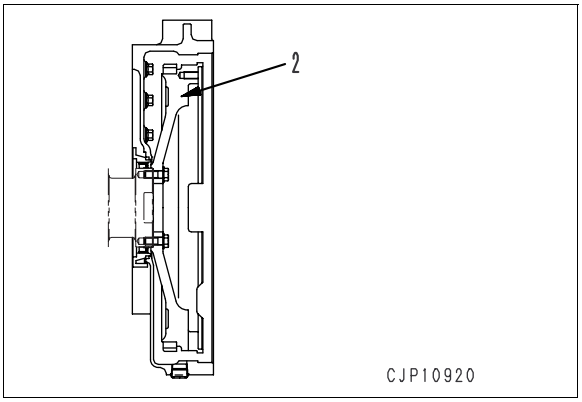
REMOVAL

1. Remove the Hydraulic Pump Assembly, refer to the Hydraulic Pump Assembly Removal section in this manual.

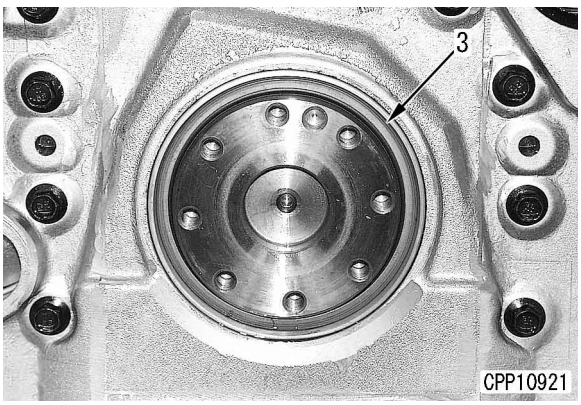
2. Remove damper assembly (1).



3. Remove flywheel assembly (2). ※1



4. Remove seal (3). ※2
   ★ Remove the seal, inflicting no damage to the crankshaft.



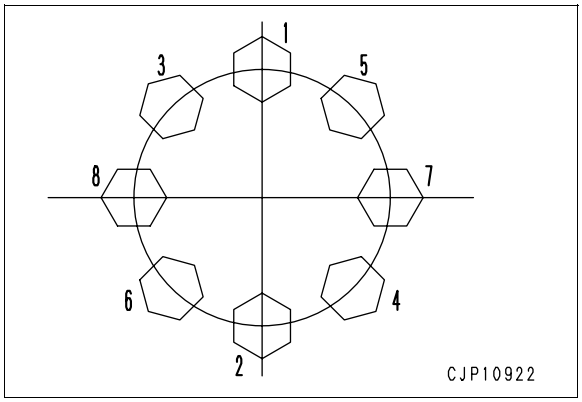
INSTALLATION

- Install in reverse order of removal.

※1

N·m Flywheel mounting bolt:
137 ± 7 Nm (13.97 ± 0.71 kgm)

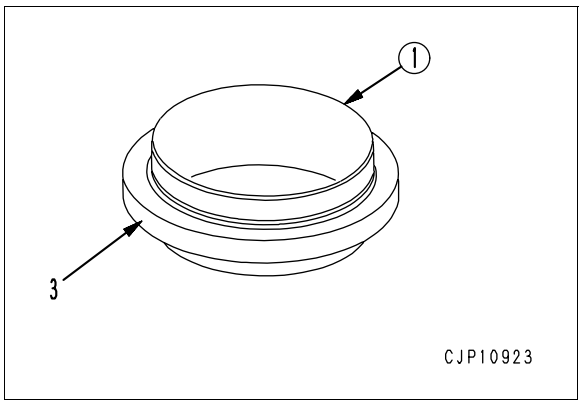
★ Tighten the mounting bolts in the sequence illustrated below.



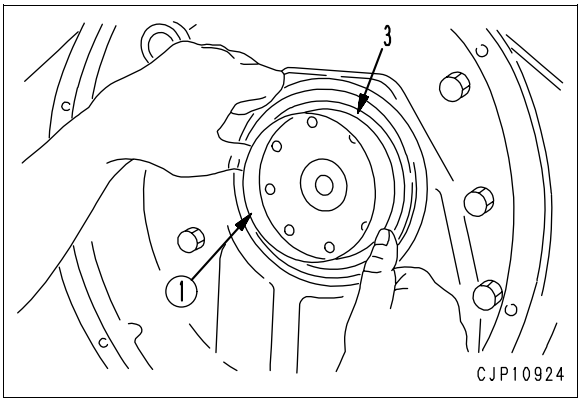
※2

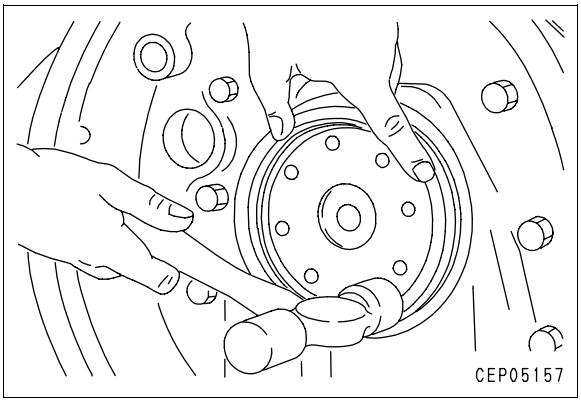
★ Install the oil seal in the following manner.

1) Fit pilot b to new oil seal (3).
   ★ Before installing the oil seal, clean the crankshaft sealing face and the seal lip face. Remove all oil and dry thoroughly to prevent oil leakage.



2) Push the oil seal into the flywheel by inserting pilot b with oil seal (3) into the crankshaft.
3) Pull out pilot b. Push the oil seal into the front cover from the inside to the outside.
4) Install the oil seal on the flywheel housing to the proper depth. Use an alignment tool.
   ★ Tap the head, bottom, right and left sides of the alignment tool to make sure that the seal carrier is not twisted, when it is being pushed in.





REMOVAL AND INSTALLATION OF CYLINDER HEAD ASSEMBLY

SPECIAL TOOLS

Mark		Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
B	1	795-799-1170	Puller	■	1		
	2	790-331-1110	Wrench	■	1		

*Distinction between new and existing part.

REMOVAL

Disconnect the cable from the negative (-) terminal of the battery.

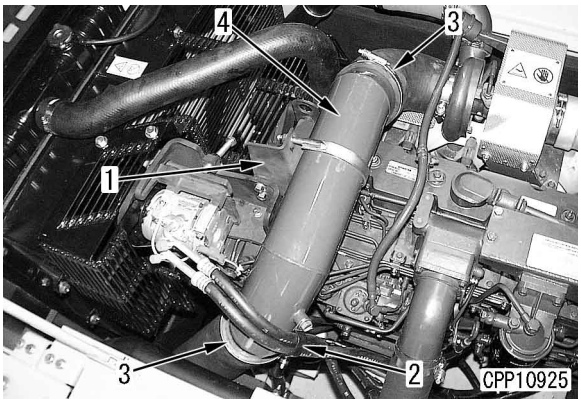
1. Drain engine coolant.

   Engine coolant: Approx. 32 **l**

2. Open up the engine hood.

3. Remove bracket (1), and then detach clamp (2) and hose clamp (3).

4. Disconnect tube (4).
   ★ Remove the tube in one piece with the bracket.



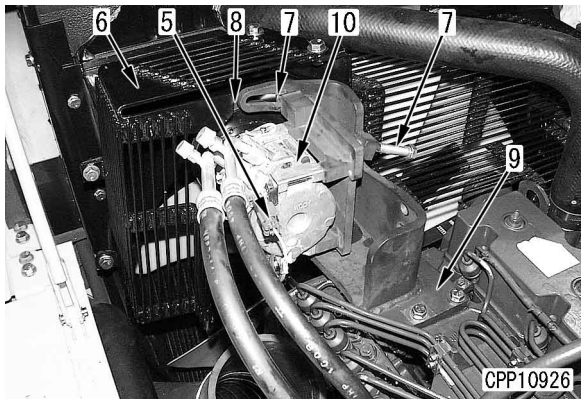
5. Disconnect air compressor wiring connector (5).

6. Remove radiator fan guard (6).

7. Loosen adjusting bolt (7) to remove belt (8).

※1

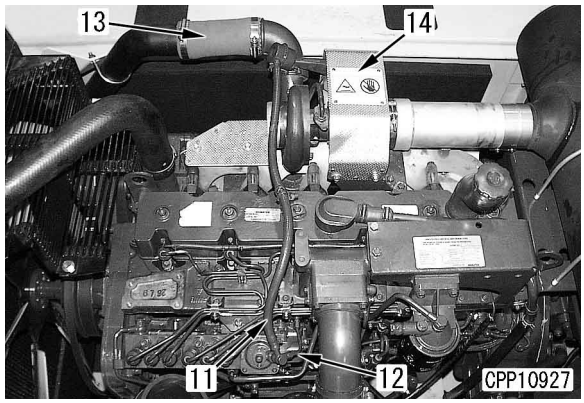
8. Remove bracket (9) and remove air compressor assembly (10).
   ★ Remove the air compressor assembly in one piece with the bracket and put them aside near the control valve upper cover.



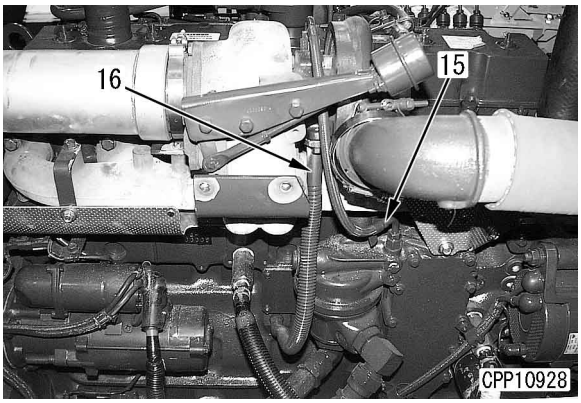
9. Disconnect exhaust brake hose (11) and lubrication tube (12).
   ★ When disconnecting the exhaust brake hose, also separate the clamp mounting plate from the head cover.

10. Disconnect after-cooler hose (13).

11. Remove protective cover (14).

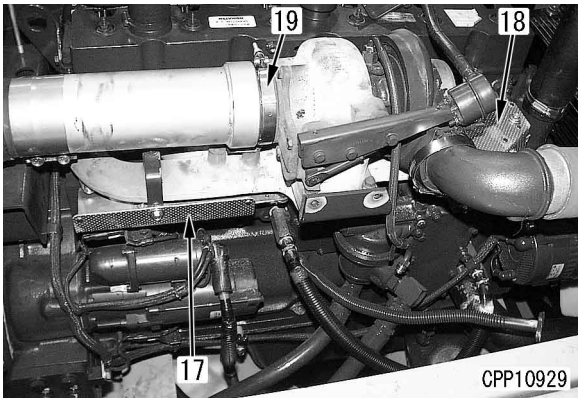


12. Disconnect lubrication inlet hose (15) and lubrication outlet hose (16).



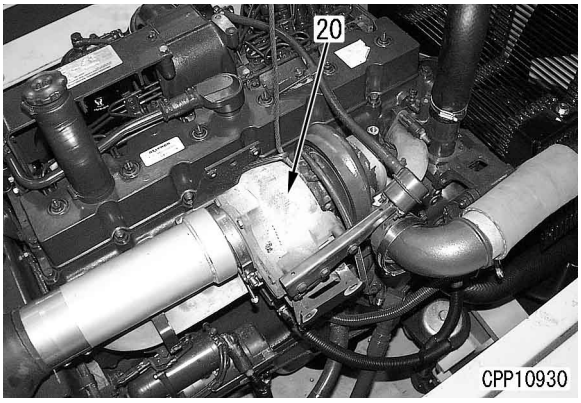
13. Remove protective covers (17) and (18).

14. Remove muffler connector V clamp (19). ※2



15. Lift off turbocharger and exhaust manifold assembly (20). ※3

★ Note that two different length mounting bolts are used for the exhaust manifold. Be careful when installing them.



16. Disconnect air feeding hose (21).

17. Separate gauge (22) from mounting plate.

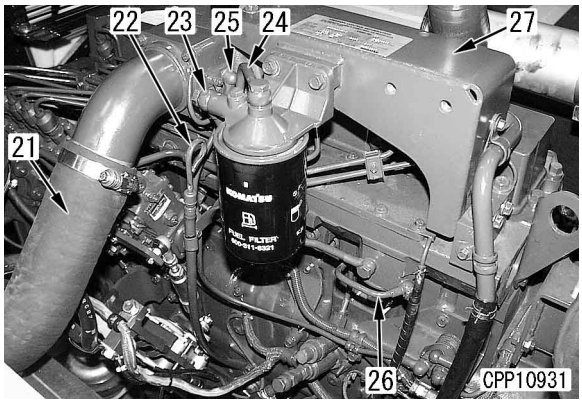
18. Disconnect fuel filter tubes (23) and (24). ※4

19. Disconnect electrical intake air heater wiring harness (25).

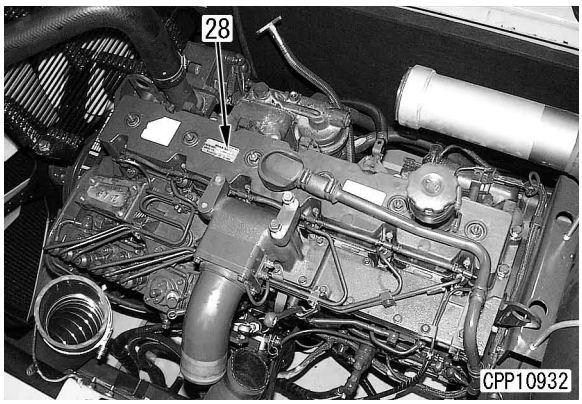
20. Disconnect tube (26).

21. Remove blow-by hose mounting clamp to detach bracket (27).

★ Detach the bracket in one piece with the fuel filter.

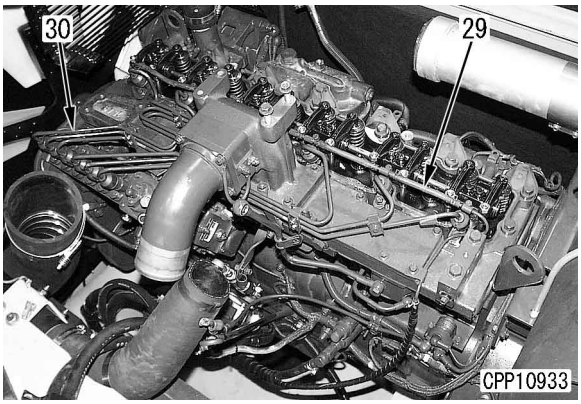


22. Remove head cover (28). ※5



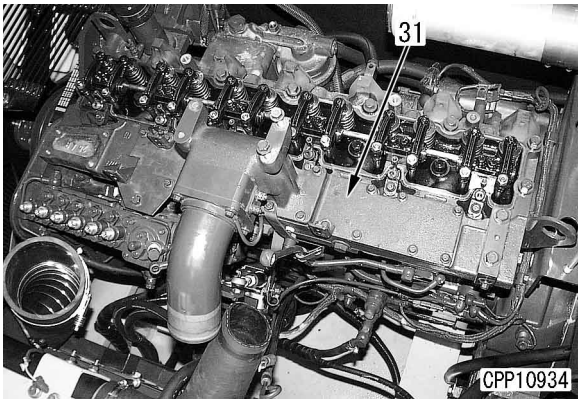
23. Disconnect fuel return tube (29).

24. Disconnect six delivery tubes (30). ※6



25. Remove cover (31). ※7

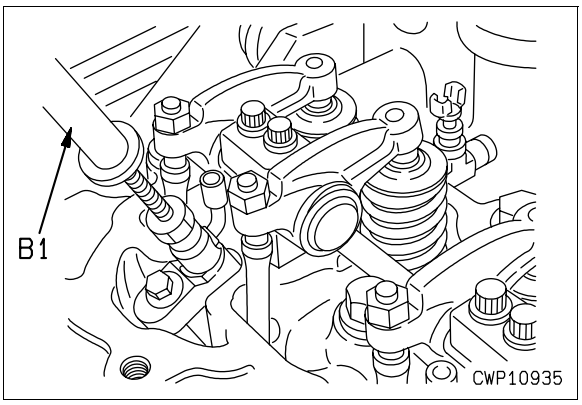
★ Know that the delivery tubes, fuel tube fixing plate and the mounting bolts have different lengths. Be careful when installing them.



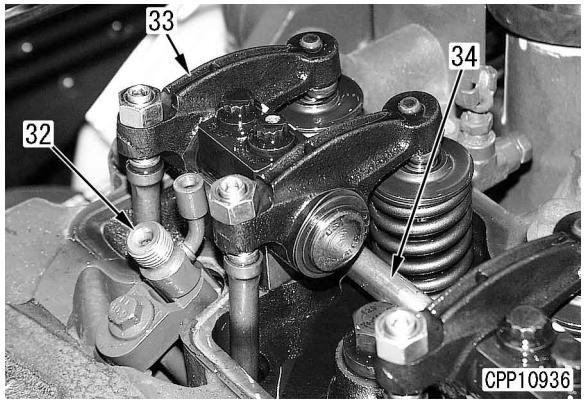
26. Remove six nozzle holder assemblies (32). ※8

★ Use tool **B1**, when it is difficult to remove the nozzle holder assembly.

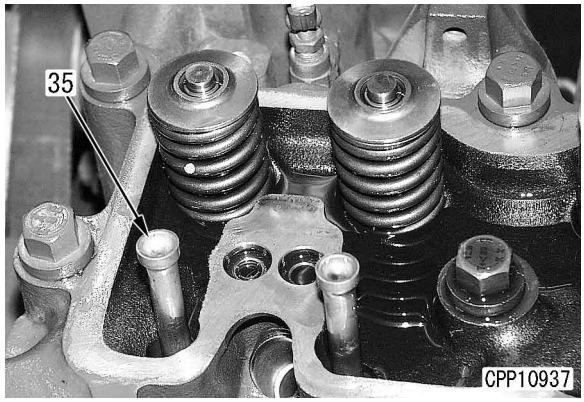
★ Take care so that no dust or foreign object enters through the base of the nozzle holder assembly.



27. Remove rocker arm assembly (33) to remove oil tube (34). ※9

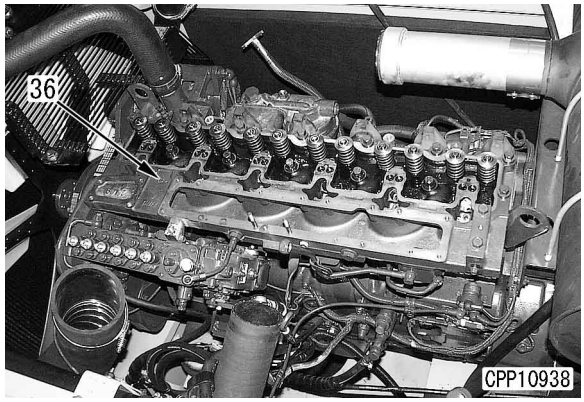


28. Remove push rod (35). ※10

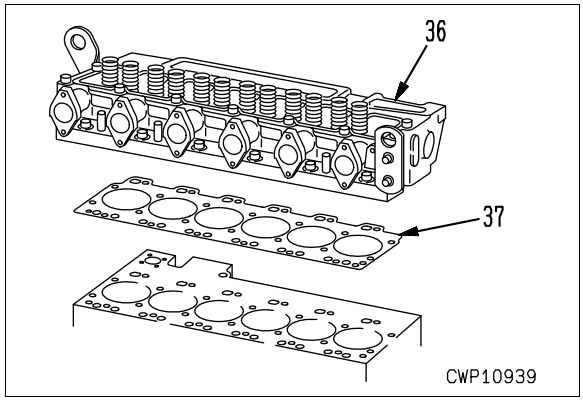


29. Lift off cylinder head assembly (36) after removing the 26 mounting bolts. ※11

kg Cylinder head assembly: 65 kg



30. Remove cylinder head gasket (37).



INSTALLATION

- Install in reverse order of removal.

※1

★ Refer to the Inspection and Adjustment of Air Compressor Belt Tension section in the TESTING AND ADJUSTING chapter in this manual.

※2

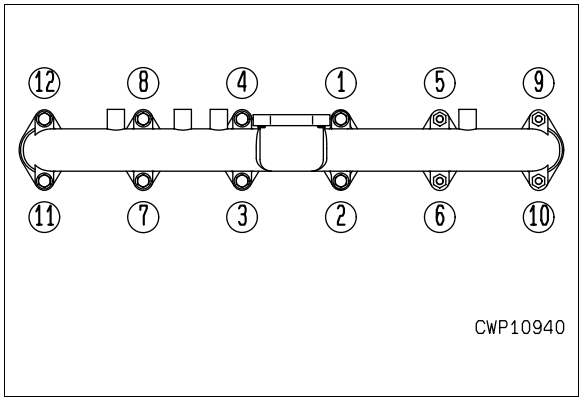
N·m V clamp:
6.9 - 8.8 Nm {0.7- 0.9 kgm}

※3

★ Tighten the bolts in the sequence indicated in the figure at right.

N·m Exhaust manifold mounting bolt:

1st step: Tighten to 23.5 ± 4 Nm {2.4 ± 0.41 kgm} in the sequence of b through 1@.
2nd step: Tighten to 23.5 ± 4 Nm {2.4 ± 0.41 kgm} in the sequence of b through e.
3rd step: Tighten to 43.1 ± 6 Nm {4.4 ± 0.61 kgm} in the sequence of b through 1@
4th step: Tighten to 43.1 ± 6 Nm {4.4 ± 0.61 kgm} in the sequence of b through e.



※4

N·m Fuel tube joint bolt:
36 ± 5 Nm {3.67 ± 0.51 kgm}

N·m Joint bolt :
24 ± 4 Nm {2.45 ± 0.41 kgm}

※5

N·m Head cover mounting bolt:
23.5 ± 3.9 Nm {2.4 ± 0.4 kgm}

※6

N·m Sleeve nut:
24 ± 4 Nm {2.45 ± 0.41 kgm}

※7

N·m Mounting bolt:
24 ± 4 Nm {2.45 ± 0.41 kgm}

※8

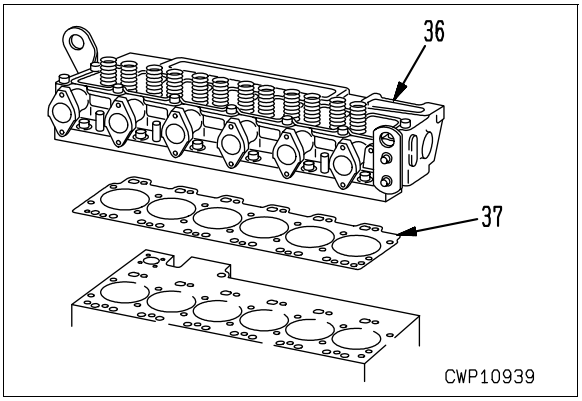
★ Coat the surface of the oil boot with oil when installing the nozzle holder assemblies.
★ Coat a shim at the tip of the nozzle holder assembly with a small amount of grease so that it will firmly stay on the tip.

※9, ※10, ※11

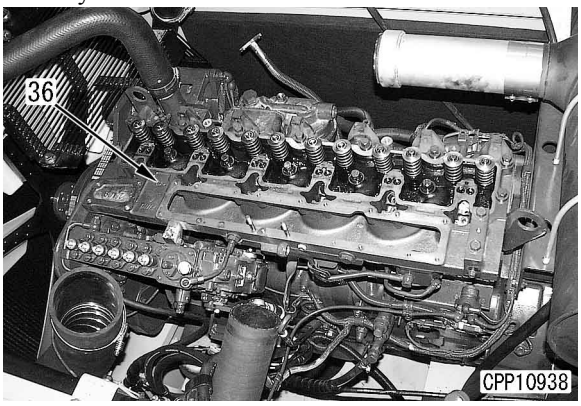
- Mount the rocker arm assembly and the cylinder head assembly in the following manner.

★ Check that there is no dust or foreign matter sticking to the cylinder head mounting face or inside the cylinders.

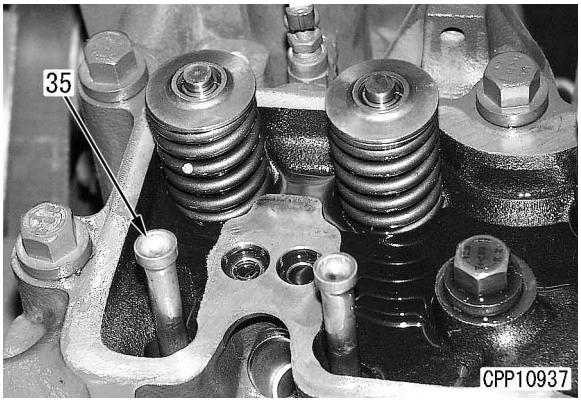
1) Set cylinder head gasket (37) on the cylinder block.
   ★ Check that the gasket is correctly aligned with the corresponding cylinder holes.



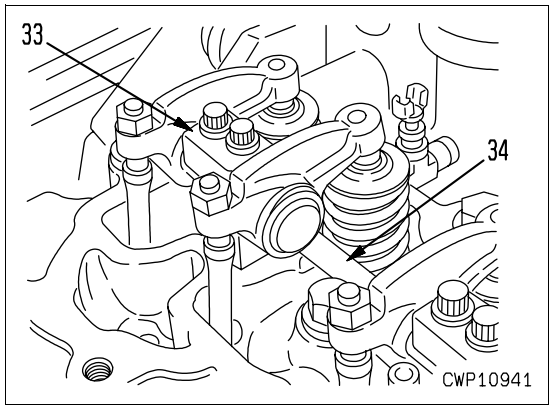
2) Lift the cylinder head assembly (36) and place it on the cylinder block.



3) Install push rods (35).



4) Install oil tube (34) and rocker arm assembly (33). Tighten their mounting bolts by hand.
   ★ Make sure that the ball portion of the adjusting screw is properly seated in the push rod socket.

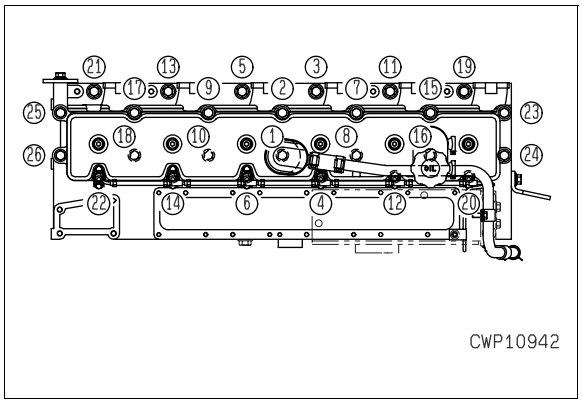


5) Tighten cylinder head mounting bolts in the sequence shown in the figure below.
   ★ Coat the threads and seat surface of the mounting bolts with engine oil (15W-40).

N•m Cylinder head mounting bolts:

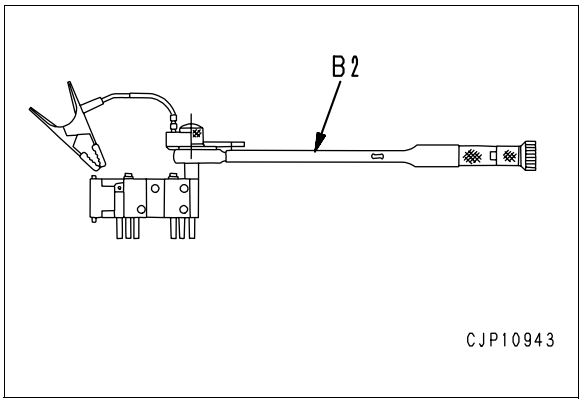
1st step: Tighten to 70 ± 5 Nm {7.1 ± 0.51 kgm} in the sequence of b through 2^.
   ★ Check that each bolt is tightened to the torque specified above, following the same sequence.

2nd step: Tighten to 145 ± 10 Nm {14.8 ± 1.0 kgm} in the sequence of b, c, h, i, j, 1), 1%, 1^, 1&, 1*, 2#, 2$, 2%, and 2^.
   ★ Check that each bolt is tightened to the torque specified above, following the same sequence.



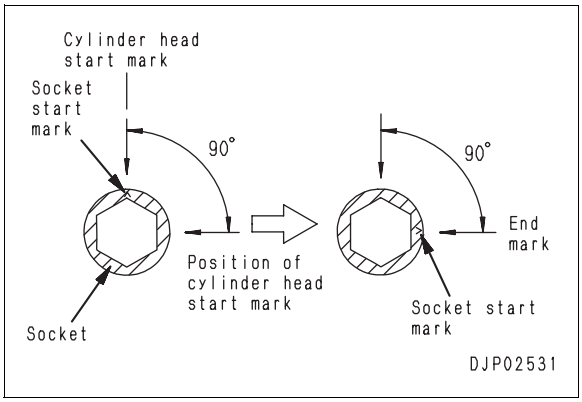
3rd step:

i) When using tool **B2.**
For tightening, turn the bolts with an angle tightening wrench by 90 ± 5° in the sequence of b to 2^.



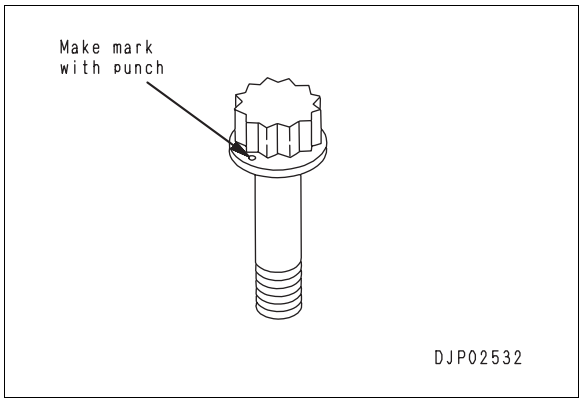
ii) When not using tool **B2.**
Tighten the bolts by turning them to 90 ± 5°. Put a punch mark on the bolt head after tightening the bolt to show the frequency of tightening.

- Do not use a bolt with 5 punch marks. Replace it with a new one.



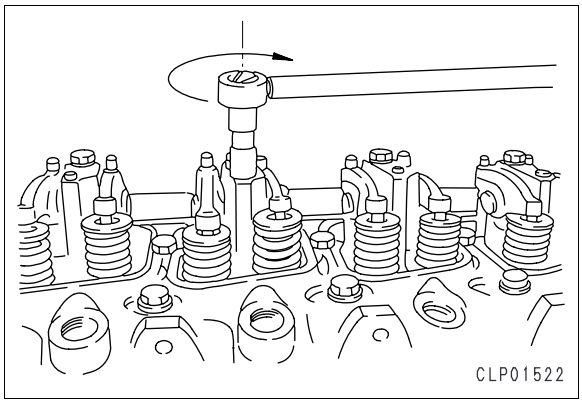
★ Install the rocker arm assembly and tighten the bolts by hand.

- Check that the adjusting screw ball is well seated in the push rod socket.



6) Tighten the rocker arm mounting bolts.

N·m Rocker arm assembly mounting bolt:
65 ± 5 Nm {6.6 ± 0.5 kgm}



7) Adjust the valve clearance.

★ Refer to the Adjustment of Valve Clearance section in the TESTING AND ADJUSTING chapter in this manual.

- **Refilling engine coolant**
Fill engine coolant through the water filler port up to the specified level. Start the engine to allow the coolant to circulate and release any air pockets. Check the water level again.

Engine coolant: Approx. 32 **l**

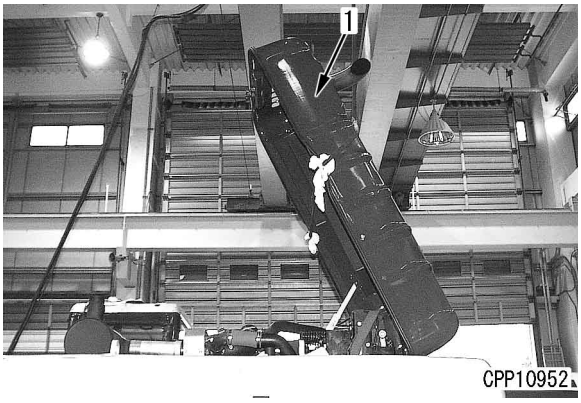
REMOVAL AND INSTALLATION OF RADIATOR ASSEMBLY

REMOVAL

1. Drain the engine coolant.

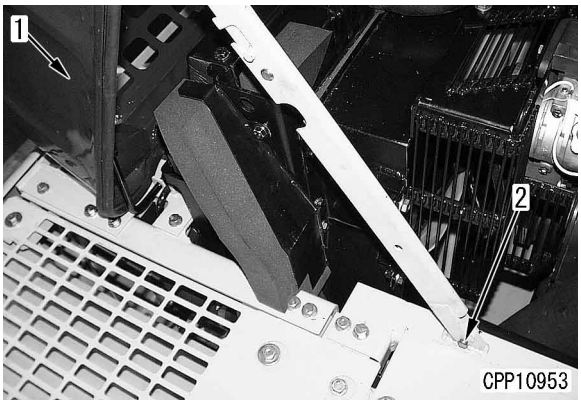
   Engine coolant: Approx. 32 **l**

2. Lift off engine hood (1) temporarily.
   - ★ Be careful not to damage the rubber seal when lifting the engine hood.
   - ★ Support the engine hood with an appropriate sling and lifting device.



3. Remove engine hood mounting bolt to remove pin (2).

4. Lift off engine hood (1).

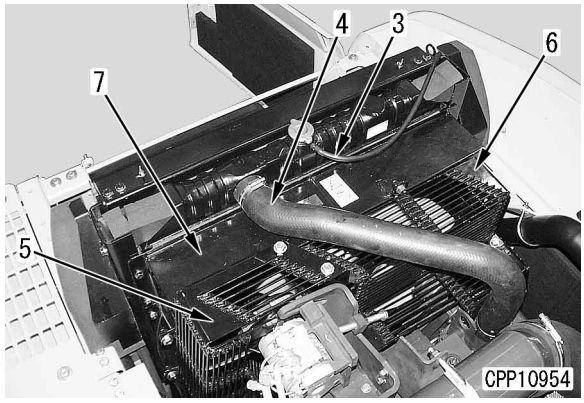


5. Disconnect reservoir tank hose (3).
   - ★ Disconnect the hose on the radiator side.

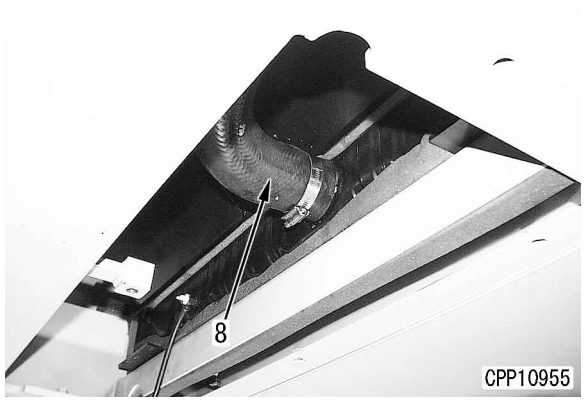
6. Disconnect radiator hose (4).

7. Remove fan guards (5) and (6).

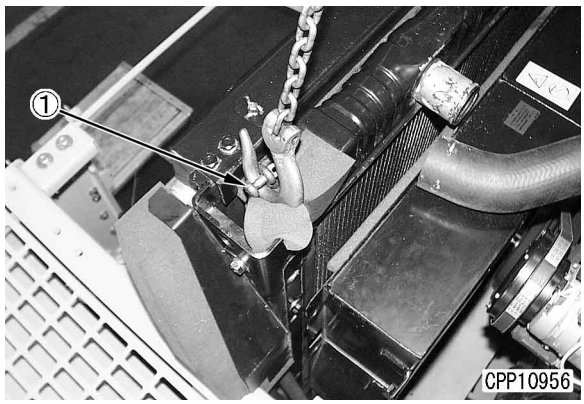
8. Remove fan cover (7).
   - ★ First remove the clamp for mounting the after-cooler hose which is tightened together and then remove the fan cover.



9. Disconnect radiator hose (8).

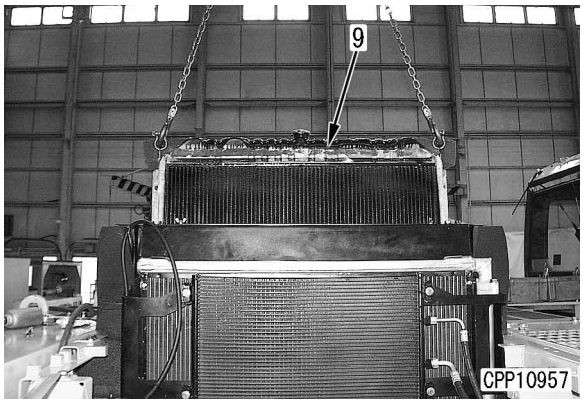


10. Lift off radiator assembly, using two slings b.



11. Lift off radiator assembly (9) after removing mounting bolts.

kg Radiator assembly: 45 kg



INSTALLATION

- Install in reverse order of removal.
- **Refilling engine coolant**
  Refill engine coolant through the water filler port up to the specified level. Start the engine to allow the coolant to circulate and release any air pockets. Check the water level again.

Engine coolant: Approx. 32 **l**

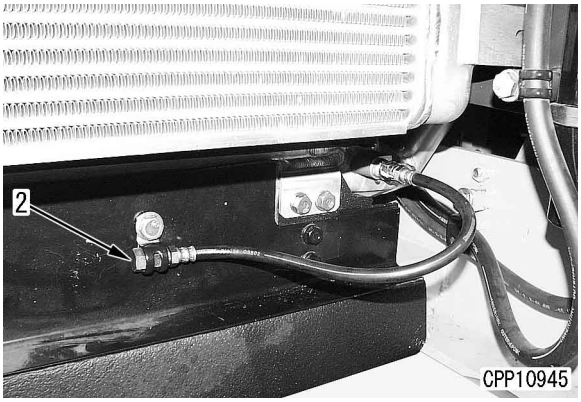
REMOVAL AND INSTALLATION OF HYDRAULIC OIL COOLER ASSEMBLY

REMOVAL

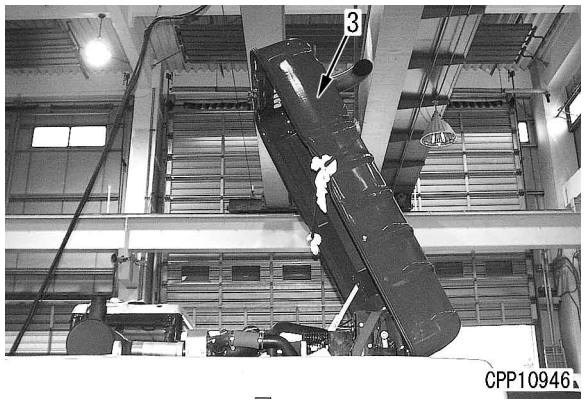
1. Remove cover (1).



2. Remove plug (2) from the hydraulic oil drain hose to drain the hydraulic oil.
   ★ Unscrew the cap on the hydraulic tank before draining oil to release the remaining pressure inside the tank. Then drain oil through the cooler hose.

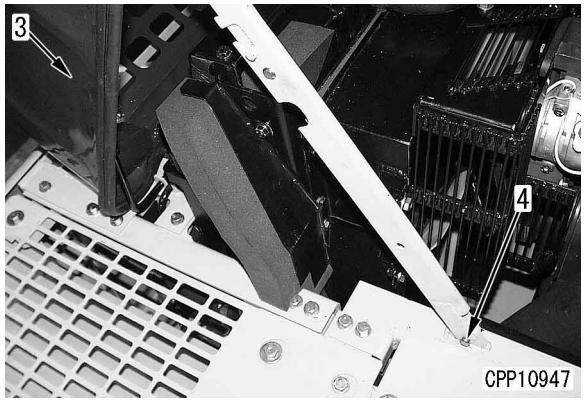


3. Lift off engine hood (3) temporarily.
   ★ Be careful not to damage the rubber seal when lifting off the engine hood.
   ★ Support the engine hood with an appropriate sling and lifting device.

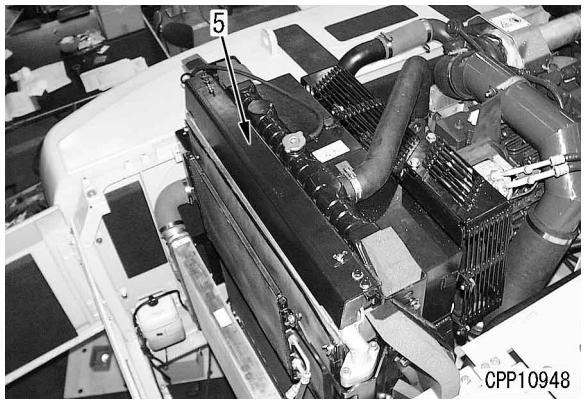


4. Remove engine hood mounting bolt and remove pin (4).

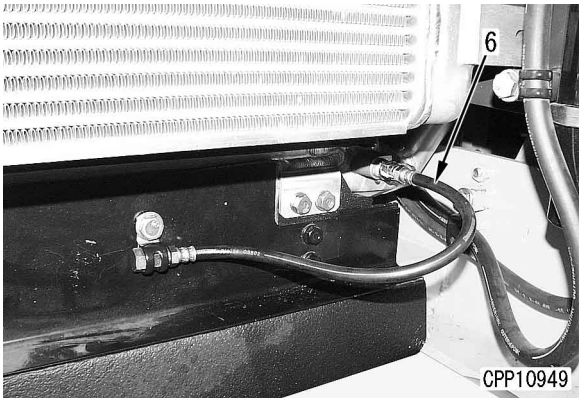
5. Lift off engine hood (3).



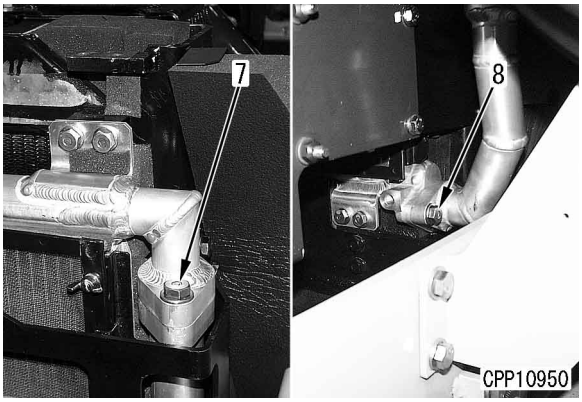
6. Remove cover (5).



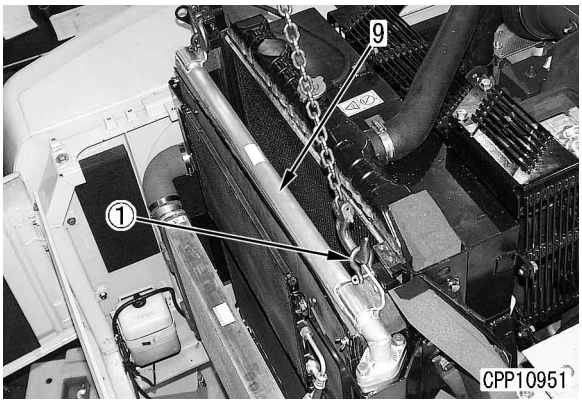
7. Remove hydraulic oil cooler drain hose (6).



8. Remove hydraulic oil cooler mounting bolts (7) and (8).



9. Lift off hydraulic oil cooler assembly (9), using two slings b.



INSTALLATION

- Install in reverse order of removal.
- **Refilling hydraulic oil (hydraulic tank)**
  Refill hydraulic oil through oil filler port up to the specified level and circulate oil in the hydraulic system by starting the engine. Then check the oil level again.

REMOVAL AND INSTALLATION OF ENGINE AND HYDRAULIC PUMP ASSEMBLIES

SPECIAL TOOLS

Mark	Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
C	796-460-1210	Oil Stopper	●	1		
	796-770-1320	Adapter	●	1		

*Distinction between new and existing part.

REMOVAL

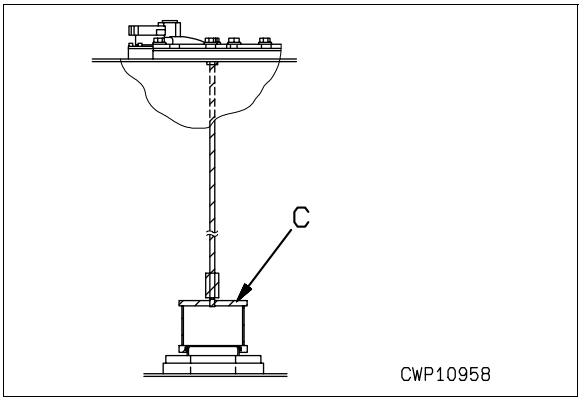
Lower the work equipment to the ground for safety and stop the engine. Disconnect the cable from the negative (-) terminal of the battery.

To release the internal pressure, gradually loosen the oil filler cap on the hydraulic tank.

★ Attach an identification tag to each pipe. This will avoid a possible mistake when reinstalling.

1. Remove the hydraulic tank strainer and stop the flow of oil, using Tool **C**.
   ★ When not using tool **C**, remove the drain plug to drain oil from the hydraulic tank and piping.

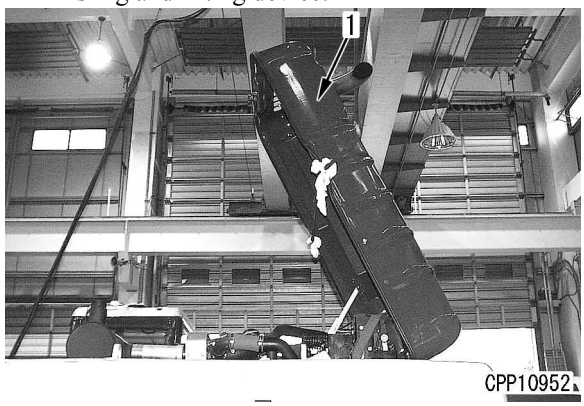
   Hydraulic tank: Approx. 365 **l**



2. Drain engine coolant.

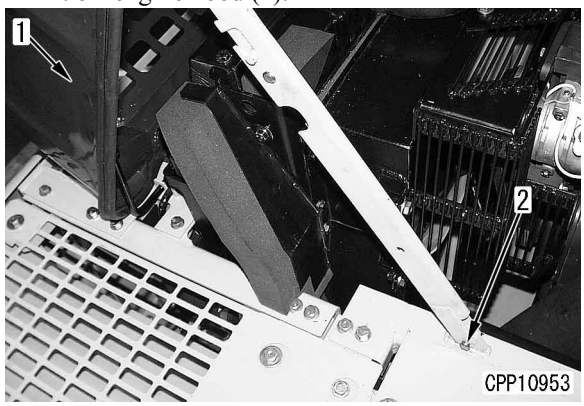
   Engine coolant: Approx. 32 **l**

3. Lift up engine hood (1).
   ★ Be careful not to damage the rubber seal when lifting off the engine hood.
   ★ Support the engine hood with an appropriate sling and lifting device.



4. Remove engine hood mounting bolts and then remove pin (2).

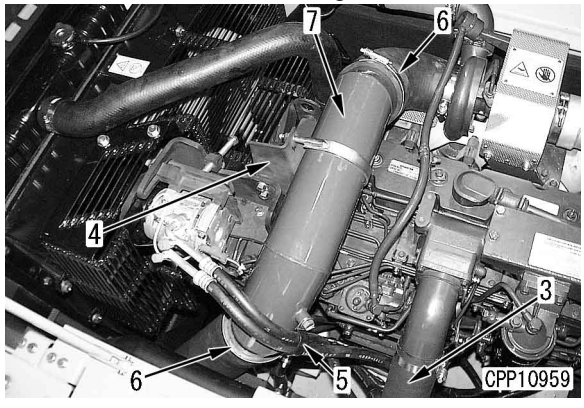
5. Lift off engine hood (1).



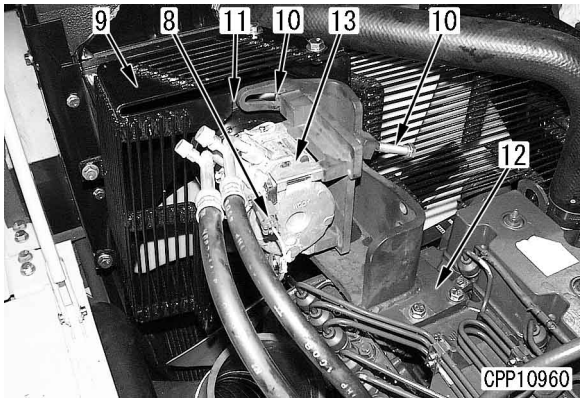
6. Disconnect air feeding hose (3).

7. Remove bracket (4) and disconnect clamp (5) and hose clamp (6).

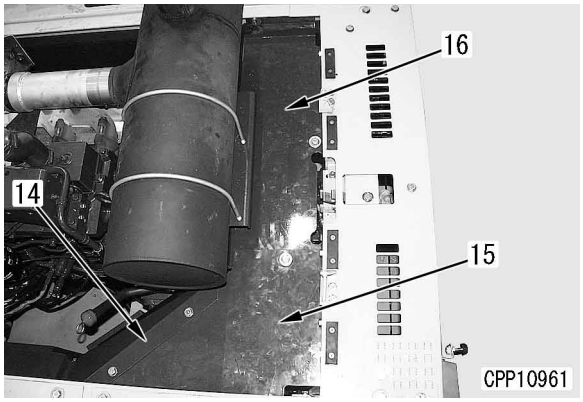
8. Disconnect tube (7).
   ★ Remove the tube in one piece with the bracket.



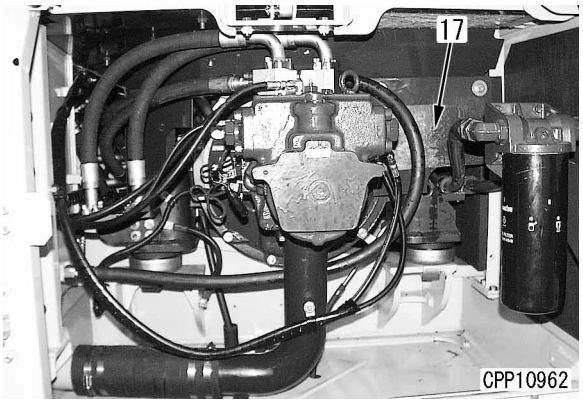
9. Disconnect air compressor wiring connector (8).
10. Remove fan guard (9).
11. Loosen adjusting bolt (10) to remove fan belt (1 ※1
12. Remove bracket (12) with compressor assembly (13).
    ★ Remove the compressor assembly in one piece with the bracket and put them aside near the control valve upper cover.



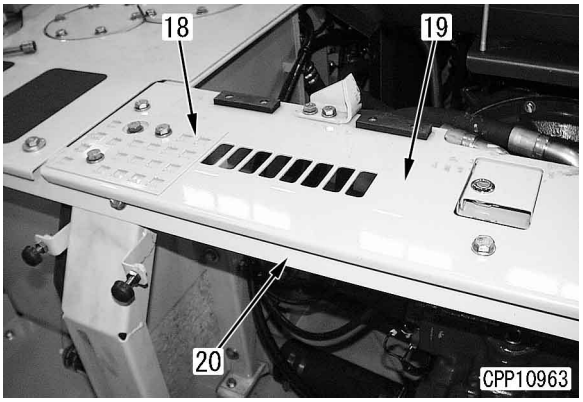
13. Remove covers (14), (15) and (16).



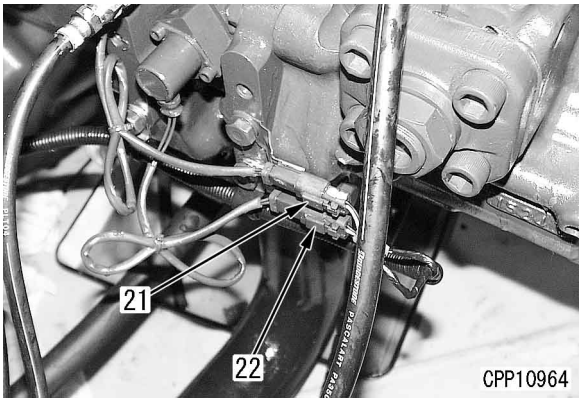
14. Remove cover (17).



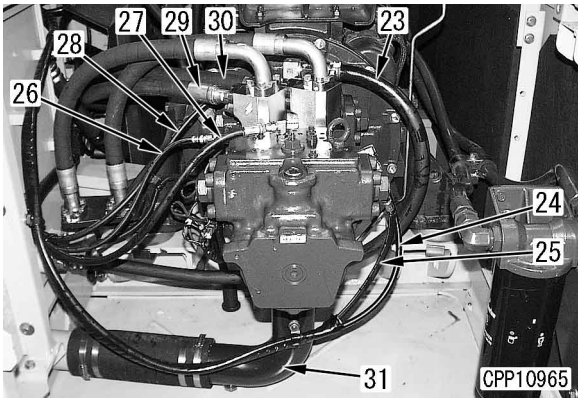
15. Remove covers (18), (19) and (20).



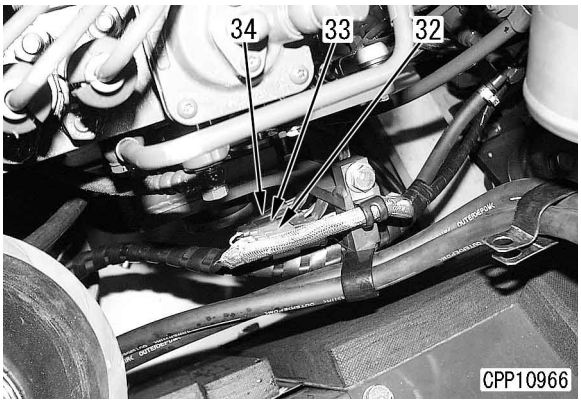
16. Disconnect hydraulic pump wiring connectors at two places.
    - (21): V22 (PC-EPC solenoid valve)
      Color band: Red
    - (22): V21 (LS-EPC solenoid valve)
      Color band: White



17. Disconnect eight hoses (23) through (30) and tube (31).
    - (23): Drain port hose
    - (24): Front load pressure input port hose
    - (25): Rear load pressure input port hose (Color band: Red)
    - (26): EPC source pressure port hose (Color band: Yellow)
    - (27): Rear pressure input port hose (Color band: Yellow)
    - (28): Front pressure input port hose
    - (29): Rear pump discharging port hose
    - (30): Front pump discharging port hose
    - (31): Pump suction port tube

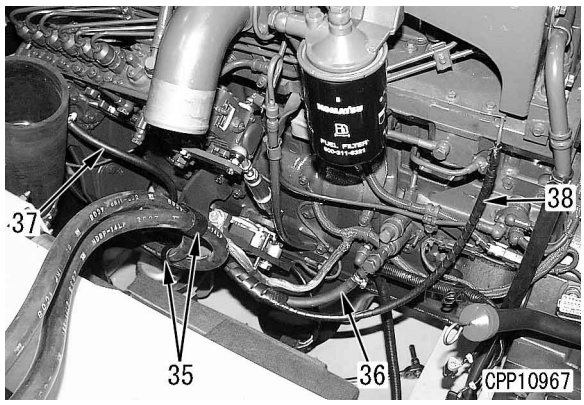


18. Disconnect wiring connectors (32), (33) and (34).
    - (32): E08 (Intermediate connector)
    - (33): E11 (Governor motor)
    - (34): E10 (Potentiometer)

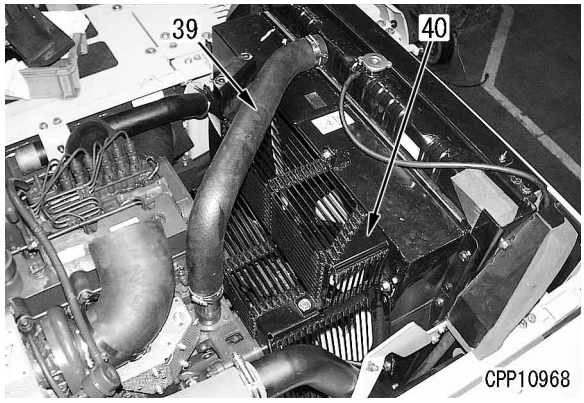


19. Disconnect compressor hose clamp (35).

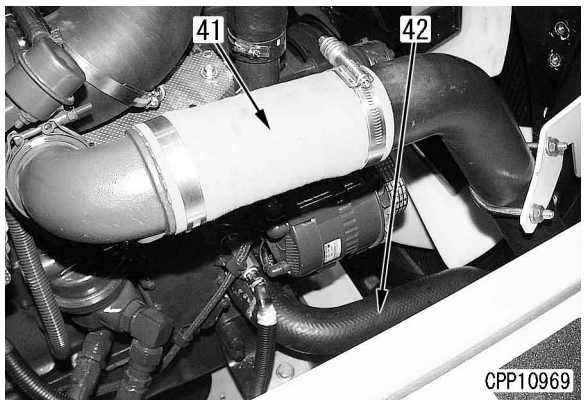
20. Disconnect fuel inlet hose (36), Fuel return hoses (37) and (38).



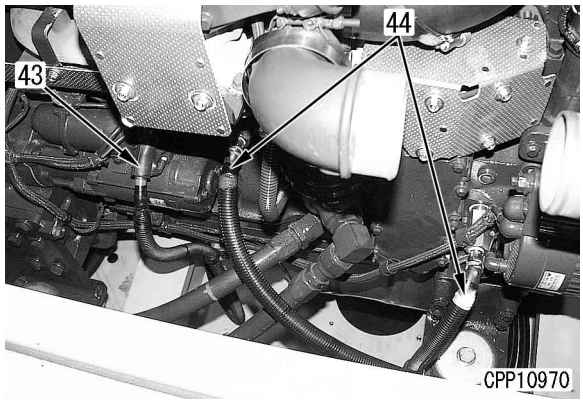
21. Disconnect radiator hose (39) and remove fan guard (40).



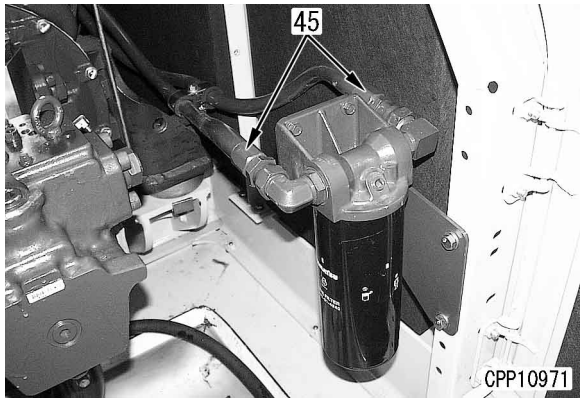
22. Disconnect after-cooler hose (41) and radiator hose (42).



23. Disconnect engine starting motor wiring (43) and heater hose (44).

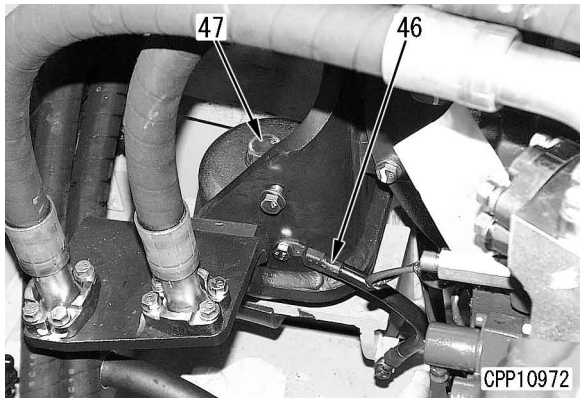


24. Disconnect two engine filter hoses (45).



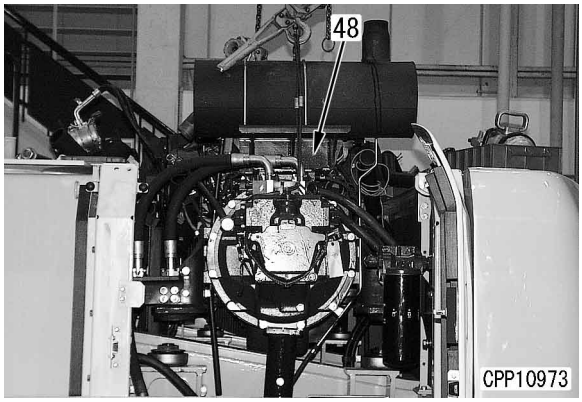
25. Disconnect engine grounding wiring (46).

26. Remove four front and rear engine mounting bolts (47). ※2



27. Lift off engine and hydraulic pump assembly (48).
    ★ Lift off the assembly only after making sure that there is no wiring or piping which is left still connected.

kg Engine and Hydraulic Pump Assembly: 1,200 kg



INSTALLATION

- Install in reverse order of removal.

※1

★ Refer to the Inspection and Adjustment of Air Compressor Belt Tension section in the TESTING AND ADJUSTING chapter of this manual.

※2

N·m Engine mounting bolt:
(Front) 384.9 ± 41.7 Nm {39.25 ± 4.25 kgm)
(Rear) 926.7 ± 103.0 Nm {94.5 ± 10.5 kgm}

- **Refilling engine coolant**
  Refilling engine coolant
  Refill engine coolant through the water filler port up to the specified level.

  Engine coolant: Approx. 32 **l**

- **Refilling hydraulic oil (hydraulic tank)**
  Refill hydraulic oil through oil filler port up to the specified level.

  Hydraulic tank: Approx. 365 **l**

★ Let the water circulate to release any air pockets by starting the engine. Check the water level again.

★ Circulate oil in the hydraulic system by starting the engine. Then check the oil level again.

- **Air bleeding**
  Refer to the Air Bleeding of Various Part section in the INSPECTION AND MAINTENANCE chapter of this manual.

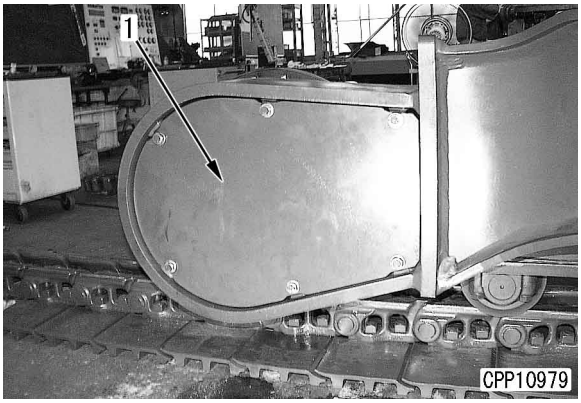
REMOVAL AND INSTALLATION OF FINAL DRIVE ASSEMBLY

REMOVAL

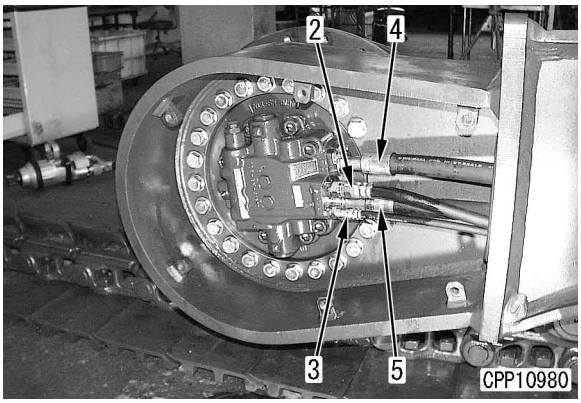
1. Remove the sprocket, refer to the Removing Sprocket section in this manual.

⚠ Lower the work equipment to the ground for safety. Stop the engine and loosen the oil filler cap on the hydraulic tank to release pressure inside.

2. Remove cover (1).



3. Disconnect drain hose (2), travel speed shifting hose (3) and travel motor hoses (4) and (5).

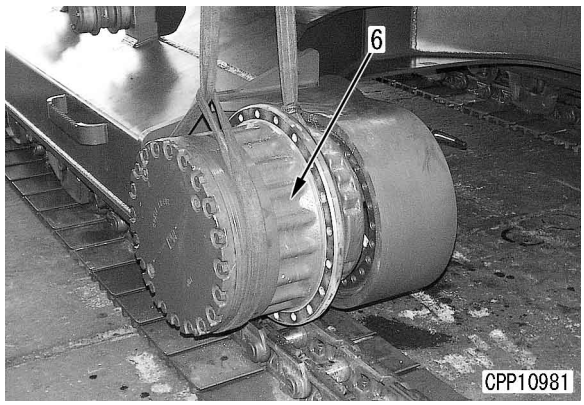


4. Remove the 21 mounting bolts from final drive assembly (6) and lift it off to remove.

※1

★ Be careful. Do not damage the face of the fitting seal at the base of the hose.
★ When lifting off the final drive assembly, do not use a tapped hole for lifting the cover.

kg Final drive assembly: 500 kg



INSTALLATION

- Install in reverse order of removal.

※1

N·m Final drive assembly mounting bolt:
490 - 608 Nm {50 - 62 kgm}

- **Refilling hydraulic oil**
  Refill hydraulic oil through the oil filler port to the specified level, and let the oil circulate in the hydraulic system by starting the engine. Then check the oil level again.
- **Air bleeding**
  Refer to the Air Bleeding of Various Part section in the TESTING AND ADJUSTING chapter of this manual.

DISASSEMBLY AND ASSEMBLY OF FINAL DRIVE ASSEMBLY

SPECIAL TOOLS

Mark		Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
D	1	796-627-1610	Wrench assembly	■	1	N	
		796-627-1620	• Wrench		1	N	
		796-427-1140	• Pin		3		
		01314-20612	• Screw		3		
	2	796T-627-1630	Push tool	■	1	N	○
		790-101-2510	Block	■	1		
		791-830-1320	Rod	■	2		
		01580-11613	Nut	■	2		
		790-101-2570	Washer	■	2		
		01643-31645	Washer	■	2		
		790-105-2100	Jack ass'y	■	1		
		790-101-1102	Pump	■	1		
	3	791-508-1510	Installer	■	1		

*Distinction between new and existing part.

DISASSEMBLY

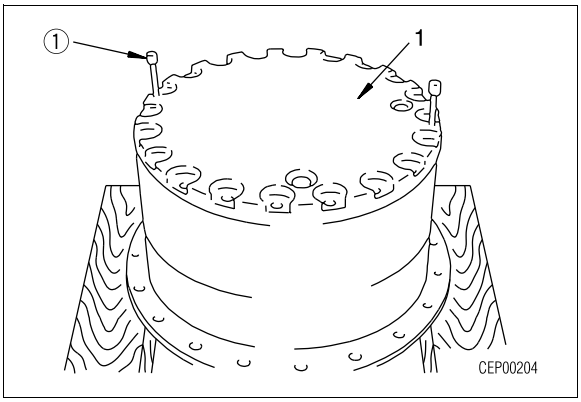
1. Draining Oil

Remove drain plug and drain oil from final drive case.

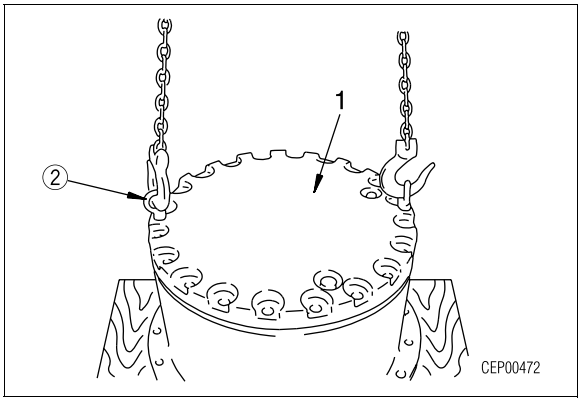
Final drive case: Approx. 8.5 **l**

2. Cover

1) Remove mounting bolts, then use forcing screws b to disconnect cover (1).

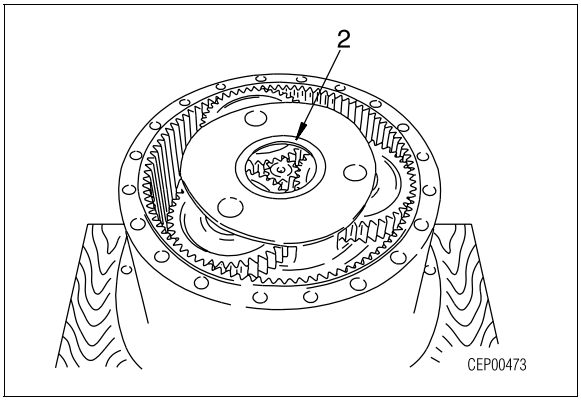


2) Use eyebolts c to remove cover (1).



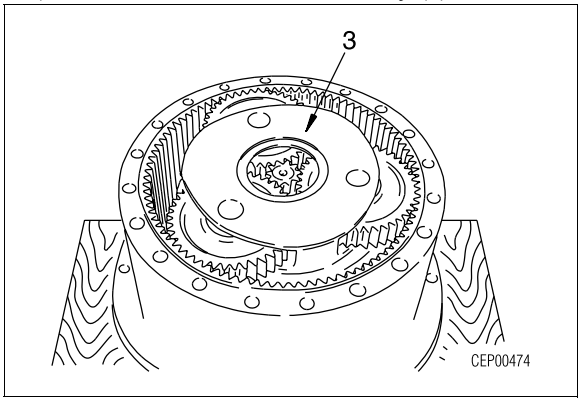
3. Spacer

Remove spacer (2).



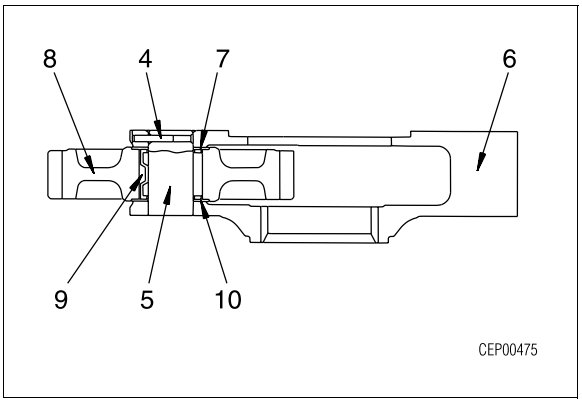
4. No. 1 carrier assembly

1) Remove No. 1 carrier assembly (3).



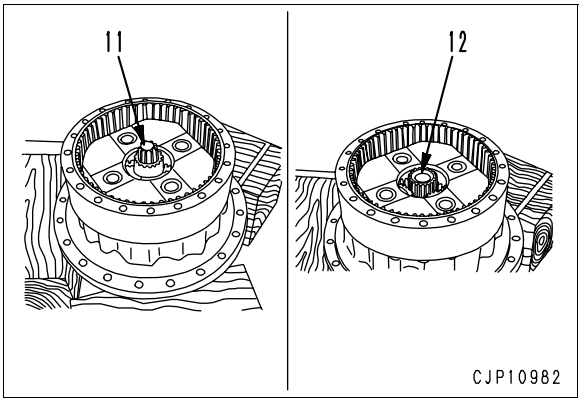
2) Disassemble No. 1 carrier assembly as follows.
   i) Push in pin (4) and pull out shaft (5) from carrier (6).
      ★ After removing the shaft (5), remove pin (4).

ii) Remove thrust washer (7), gear (8), bearing (9), and thrust washer (10).

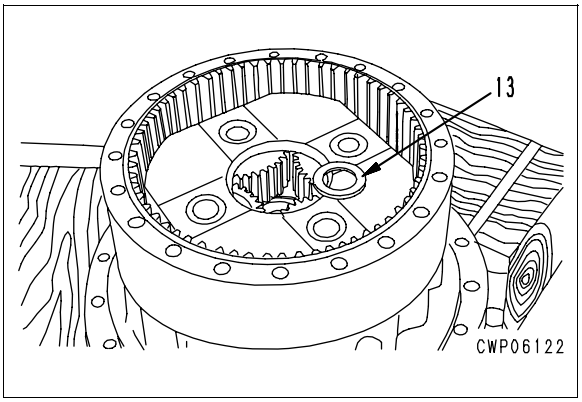


5. No. 1 sun gear shaft
Remove No. 1 sun gear shaft (11).

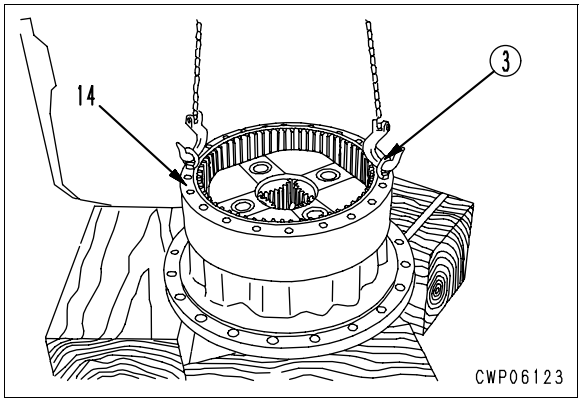
6. No. 2 sun gear
Remove No. 2 sun gear (12).



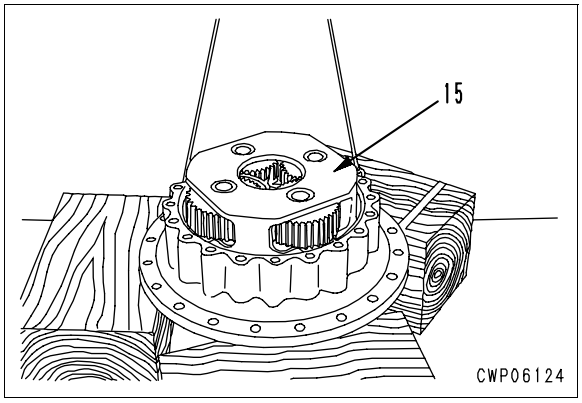
7. Thrust washer
Remove thrust washer (13).



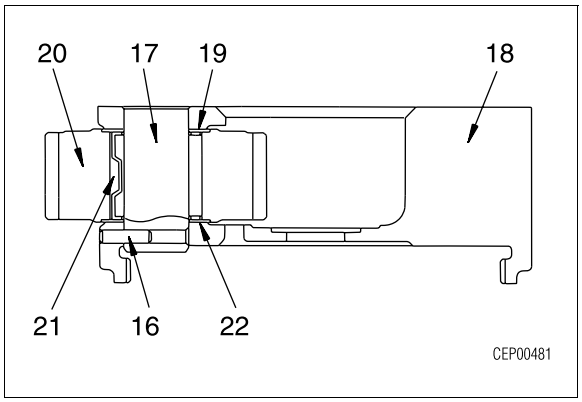
8. Ring gear
Using eyebolts d, remove ring gear (14).



9. No. 2 carrier assembly
1) Remove No. 2 carrier assembly (15)

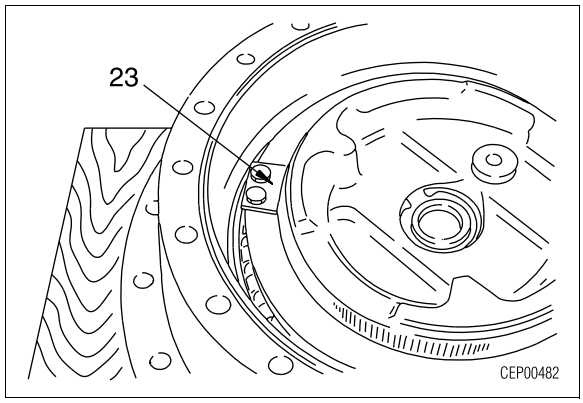


2) Disassemble No. 2 carrier assembly as follows.
i) Push in pin (16) and pull out shaft (17) from carrier (18).
★ After removing the shaft, remove pin (16).
ii) Remove thrust washer (19), gear (20), bearing (21), and thrust washer (22).

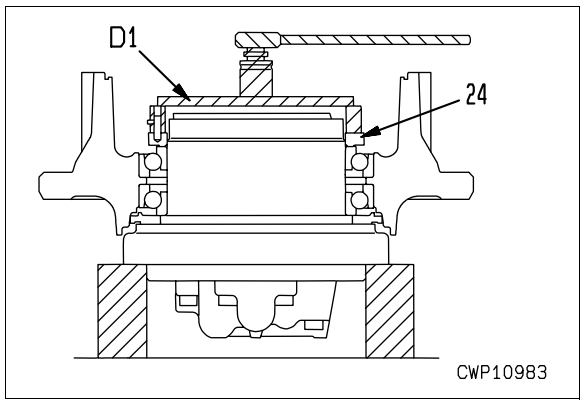


10. Nut

1) Remove lock plate (23).

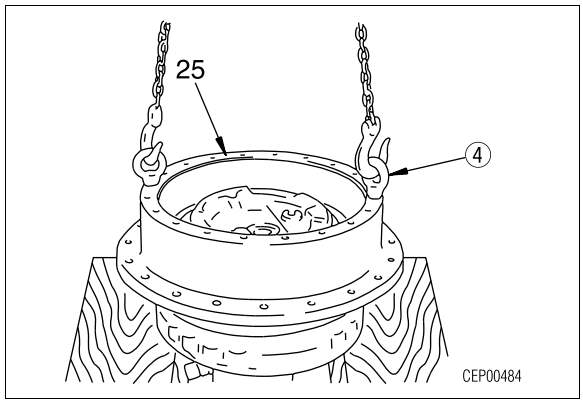


2) Use tool **D1** and remove nut (24).

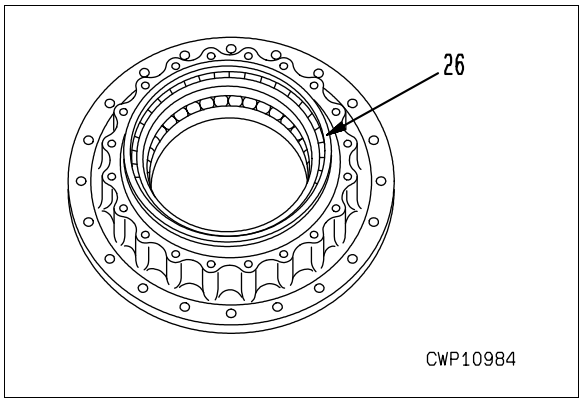


11. Hub assembly

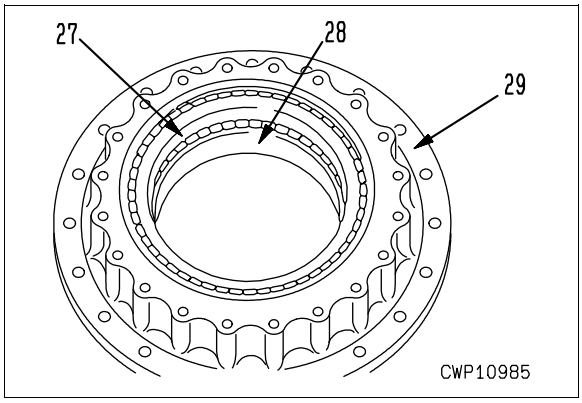
1) Using eyebolts e, remove hub assembly (25) from travel motor.



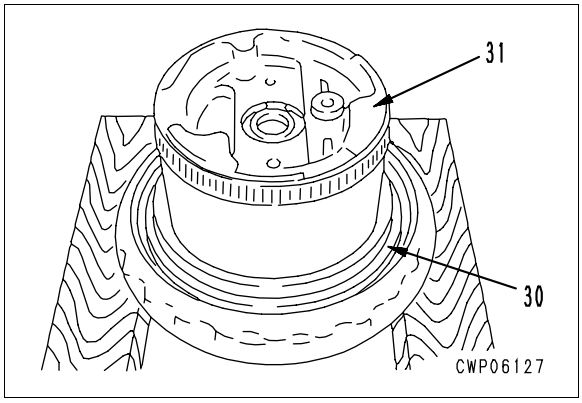
2) Disassemble hub assembly as follows.
   i) Remove floating seal (26).



   ii) Remove bearings (27) and (28) from hub (29).



3) Remove floating seal (30) from travel motor (31).

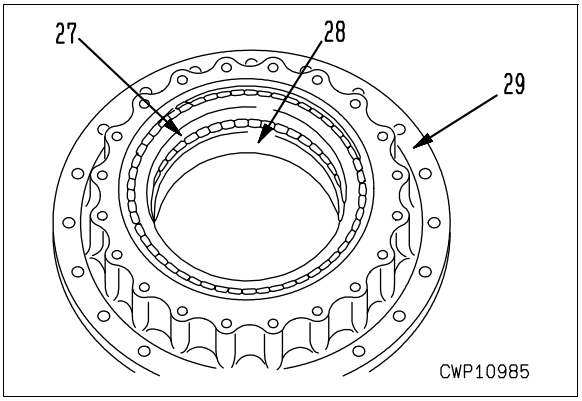


ASSEMBLY

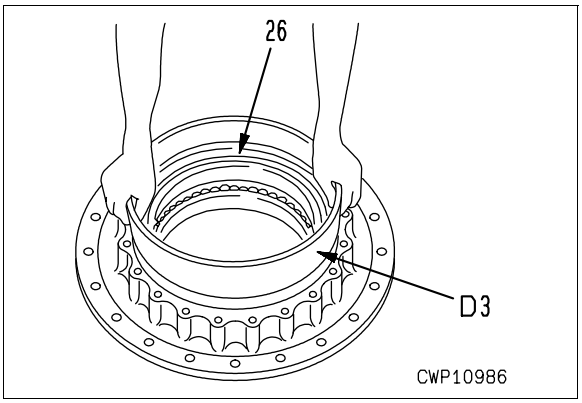
★ Clean all parts and check for dirt or damage.
Coat the sliding surfaces of all parts with engine oil before installing.

1. Hub assembly

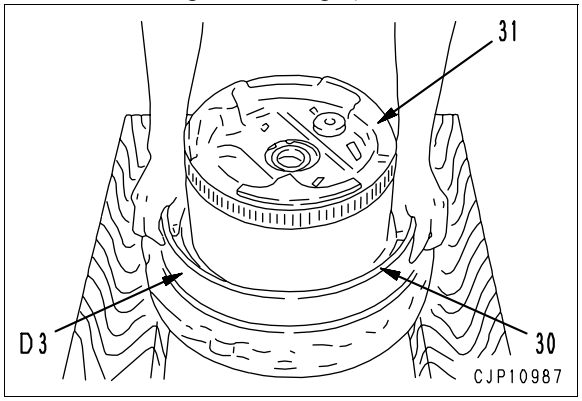
1) Assemble hub assembly as follows.
Using push tool, press fit bearings (27) and (28) to hub (29).



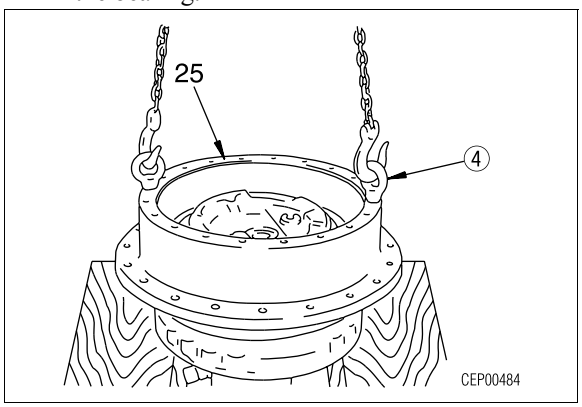
2) Using tool **D3**, install floating seal (26).
★ Remove all oil and grease from the O-ring and O-ring contact surface. Dry the parts before installing the floating seal.
★ After installing the floating seal, check that the angle of the floating seal is within 1 mm.
★ After installing the floating seal, coat the sliding surface thinly with engine oil.



3) Using tool **D3**, install floating seal (30) onto travel motor (31).
★ The procedure for installation is the same as in the previous Step 2).

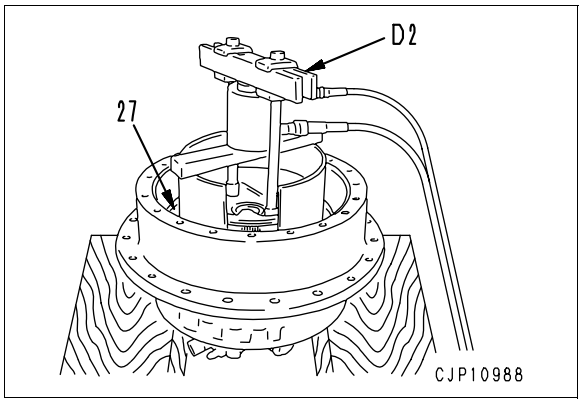


4) Using eyebolts e, set hub assembly (25) onto the travel motor. Use the push tool and tap to press fit the bearing.

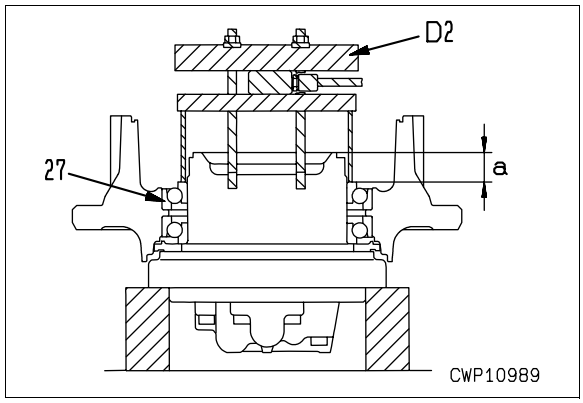


2. Nut

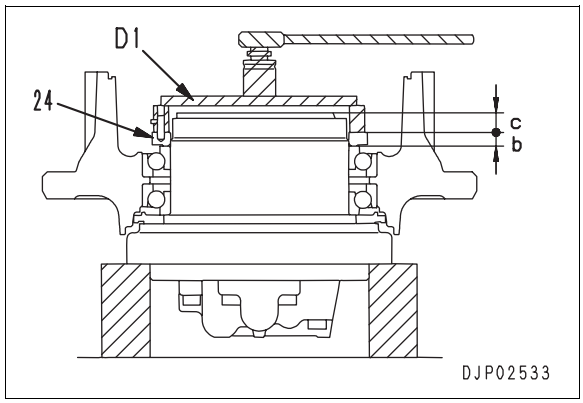
1) Install nut as follows.
i) Using tool **D2**, push bearing inner race (27).
★ Pushing force:
12.7 - 16.7 kN {1.3 - 1.7 tons}
★ Rotate the hub 2 - 3 times before applying the pushing force to the bearing inner race.



ii) Measure dimension **a** in the condition in Step 1) above.



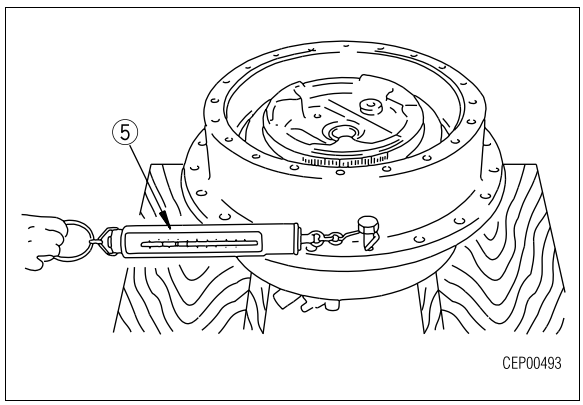
iii) Measure thickness **b** of the nut (24) as an individual part.
iv) Calculate **a - b = c.**
v) Tighten nut (24) with tool **D1** until dimension **c** is obtained.



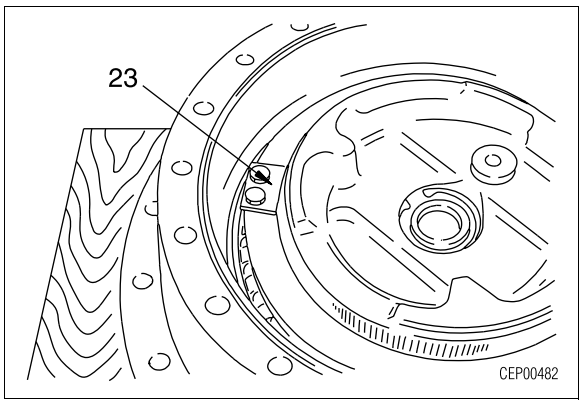
vi) Using push-pull scale f, measure tangential force in the direction of rotation of the hub in relation to the motor case.

★ Tangential force: **Max. 490 N {50 kg}**

★ The tangential force is the maximum force when starting rotation.



vii) Install lock plate (23).

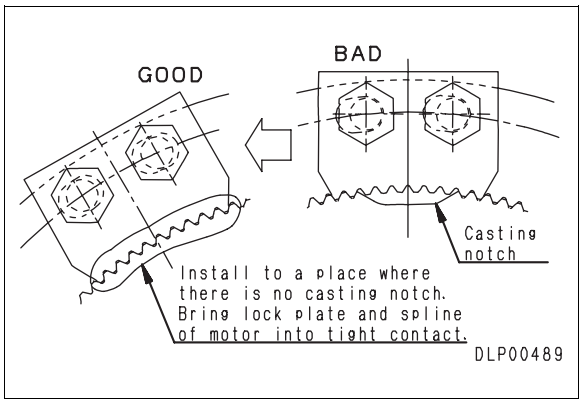


★ Install the lock plate as shown in the diagram below.

Thread of mounting bolt:
Thread tightener (LT-2)

★ Do no coat the threaded portion of the nut with thread tightener (LT-2).

N·m Mounting bolt: 49 - 74 Nm {6 - 7.5 kgm}



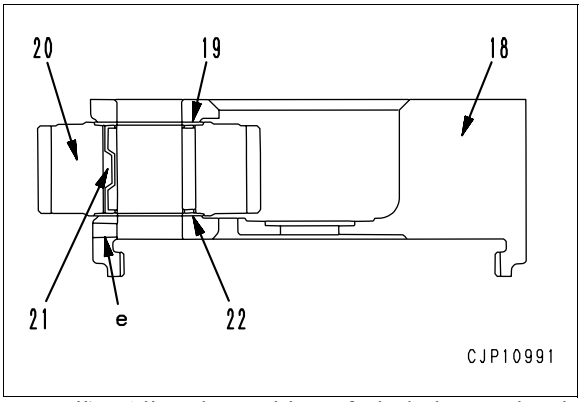
3. No. 2 carrier assembly

1) Assemble No. 2 carrier assembly as follows.

★ Replace thrust washers (19), (22) and pin (16) with new ones.

★ There are remains of caulking when the pin is inserted at the end face of hole **e** at the side of the carrier. Remove the caulked metal from the inside diameter of the hole before starting to assemble.

i) Assemble bearing (21) to gear (20), fit top and bottom thrust washers (19) and (22), and set gear assembly in carrier (18).

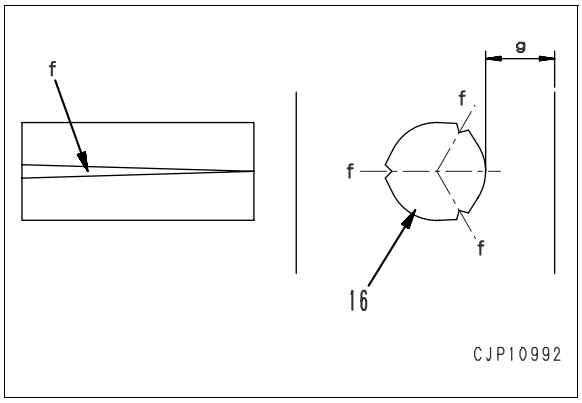


ii) Align the position of pin holes on the shaft and carrier, then tap with a plastic hammer to install shaft (17).

★ When installing the shaft, rotate the planetary gear. Be careful not to damage the thrust washer.

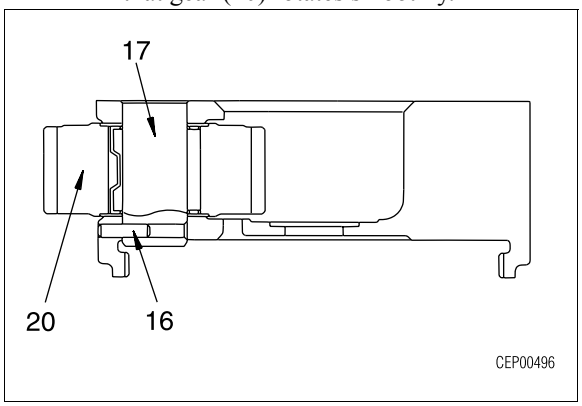
iii) Insert pin (16).

★ Insert the pin in such a way that any of the three claws (f portions) on the periphery will not fall on the slender (g) portion of the carrier. Take note, however, that depending on the actual carriers, this slender portion is on the opposite side. Hence when inserting the pin, check them carefully to see on which side of the carrier a thin portion is, and insert the pin the way its claw does not come to the thin portion. If there is a groove, meanwhile, avoid it.



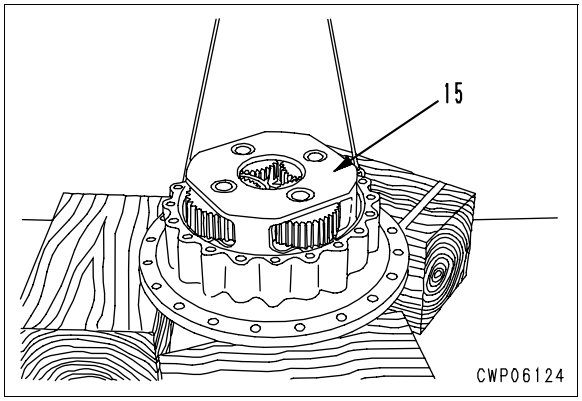
★ After inserting the pin, caulk the pin portion of the carrier.

★ After assembling the carrier assembly, check that gear (20) rotates smoothly.



2) Install No. 2 carrier assembly (15).

★ Align the three tips of the gear shafts of the carrier assembly (15) to enter the three hollows in the end face of the motor case, then install.

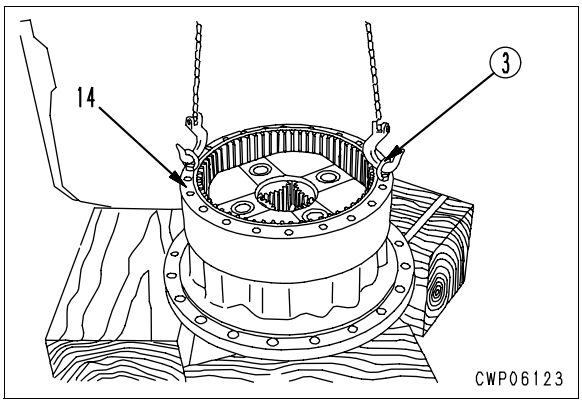


4. Ring gear

Install O-ring on hub end. Use eyebolts d to install ring gear (14).

★ Remove all grease and oil from the mating surface of the ring gear and hub.

★ Do not put any gasket sealant on the mating surface of the ring gear and hub under any circumstances.

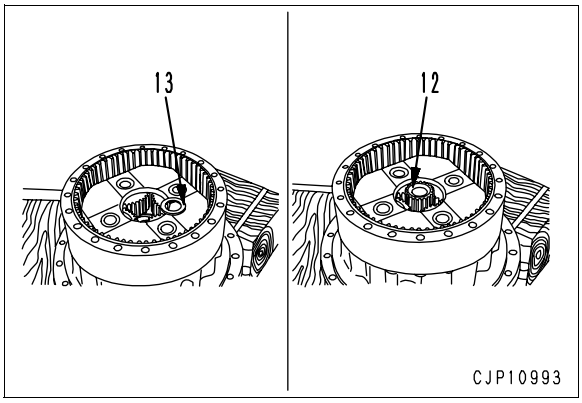


5. Thrust washer

Install thrust washer (13).

6. No. 2 sun gear

Install No. 2 sun gear (12).



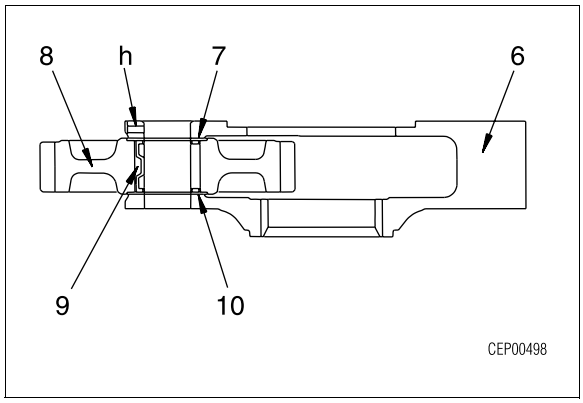
7. No. 1 carrier assembly

1) Assemble No. 1 carrier assembly as follows.

★ Replace thrust washers (7) and (10), and pin (4) with new ones.

★ There are remains of caulking when the pin is inserted at the end face of hole **h** at the side of the carrier. Remove the caulked metal from the inside diameter of the hole before starting to assemble.

i) Assemble bearing (9) to gear (8), fit top and bottom thrust washers (7) and (10), and set gear assembly in carrier (6).

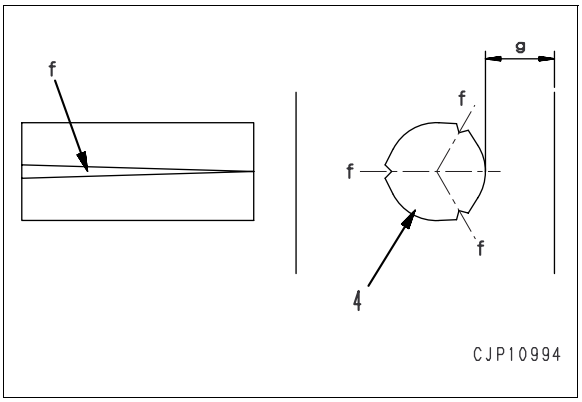


ii) Align the position of pin holes on the shaft and carrier, then tap with a plastic hammer to install shaft (5).

★ When installing the shaft, rotate the planetary gear. Be careful not to damage the thrust washer.

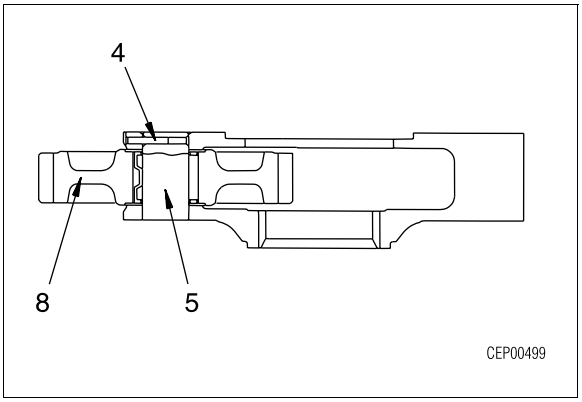
iii) Insert pin (4).

★ Insert the pin in such a way that any of the three claws (**f** portions) on the periphery will not fall on the slender (g) portion of the carrier. Take note, however, that depending on the actual carriers, this slender portion is on the opposite side. Hence when inserting the pin, check them carefully to see on which side of the carrier a thin portion is, and insert the pin the way its claw does not come to the thin portion. If there is a groove, meanwhile, avoid it.

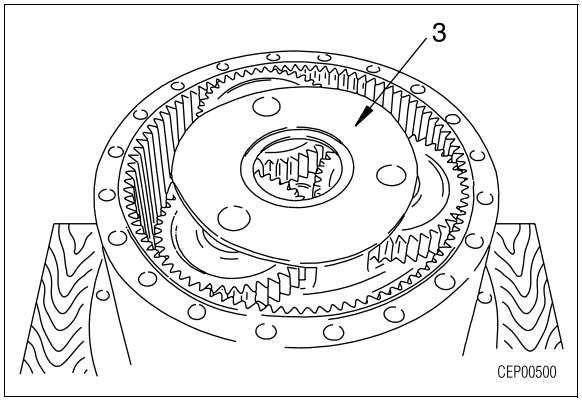


★ After inserting the pin, caulk the pin portion of the carrier.

★ After assembling the carrier assembly, check that gear (8) rotates smoothly.

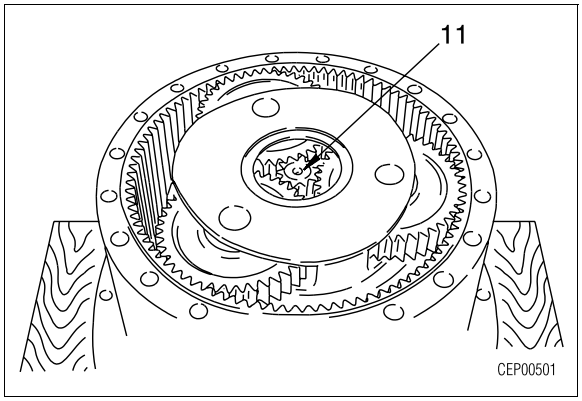


2) Install No. 1 carrier assembly (3).



8. No. 1 sun gear shaft

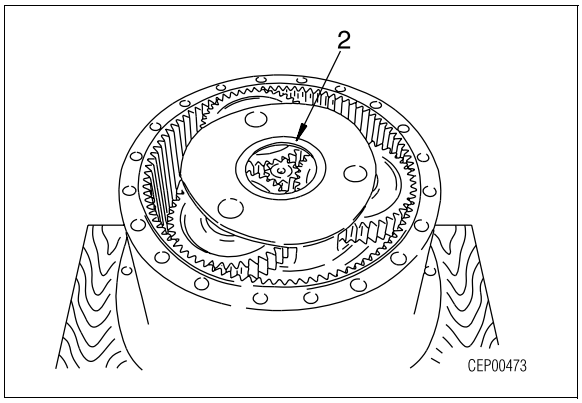
Install No. 1 sun gear shaft (11).

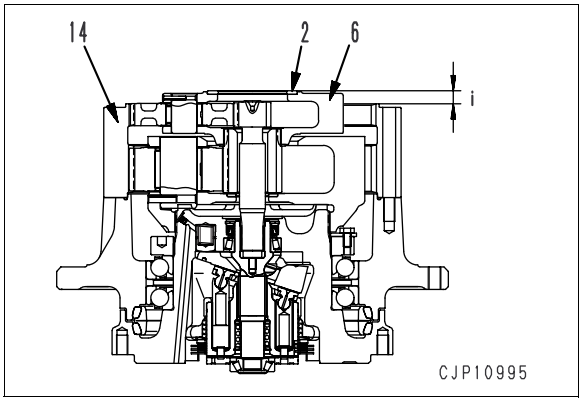


9. Spacer

Install spacer (2).

★ Take measurement of dimension "**i**" after installing the spacer. If "**i**" dimension exceeds 15 mm, the spacer is not installed correctly. In that case, check it again and if necessary, try to install it correctly once more.

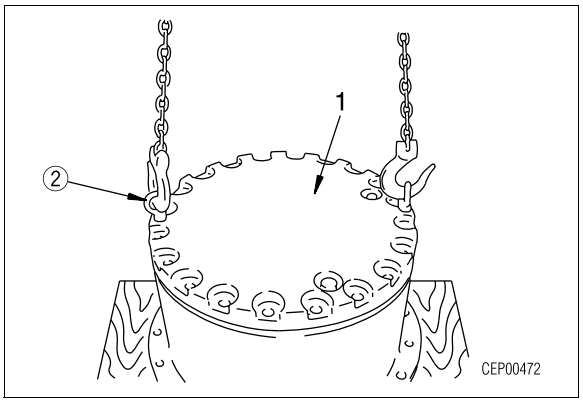




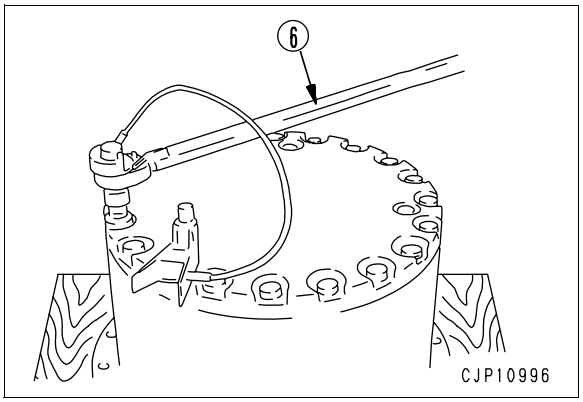
10. Cover

Using eyebolts c, lift and install cover (1), then tighten mounting bolts with angle tightening wrench G.

Mounting surface of cover:
Gasket sealant (LG-6)



N•m Mounting bolt:
Initial torque: **98.1 Nm {10 kgm}**
Additional tightening angle: **Turn 100 - 110°**



11. Refilling with oil

★ Tighten drain plug and add engine oil through oil filler.

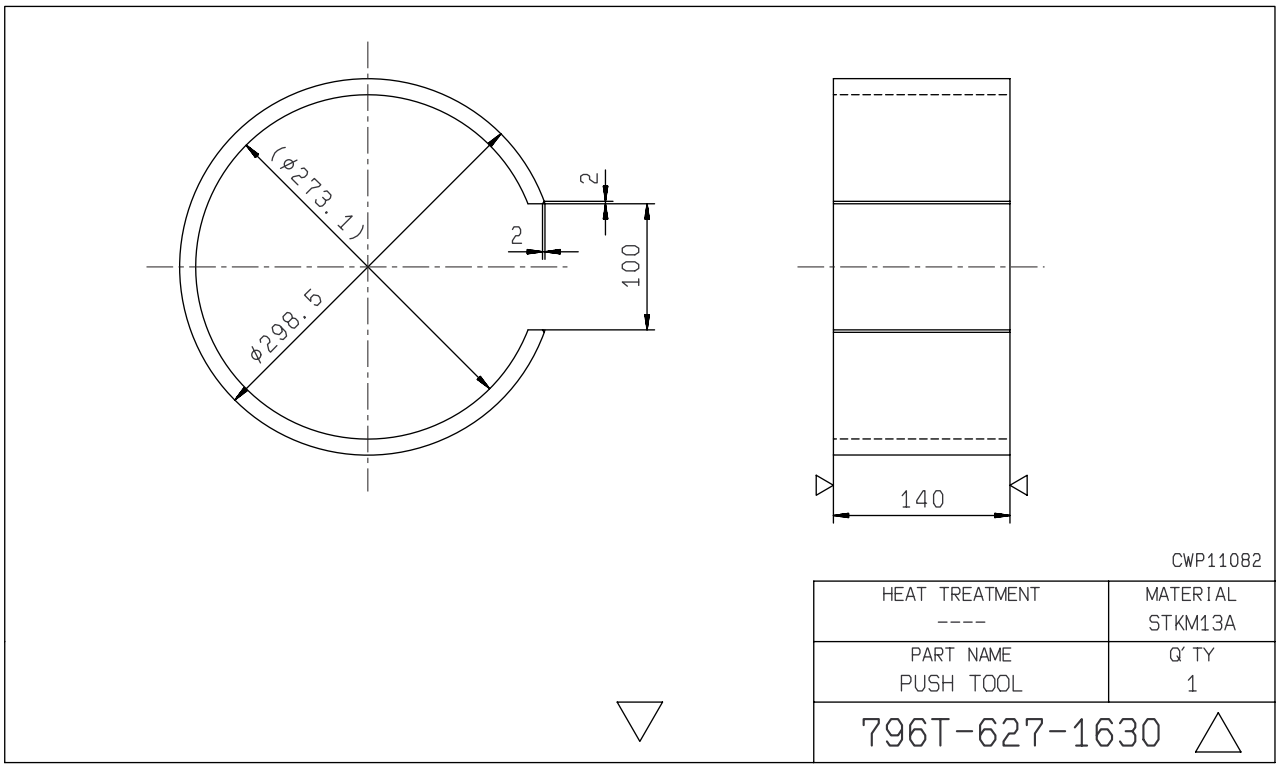
Final drive case: **Approx. 8.5 l**

★ Do a final check of the oil level at the determined position after installing the final drive assembly to the chassis.

SKETCHES OF SPECIAL TOOLS

Note: Komatsu cannot accept any responsibility for special tools manufactured according to these sketches.

D2 Push Tool



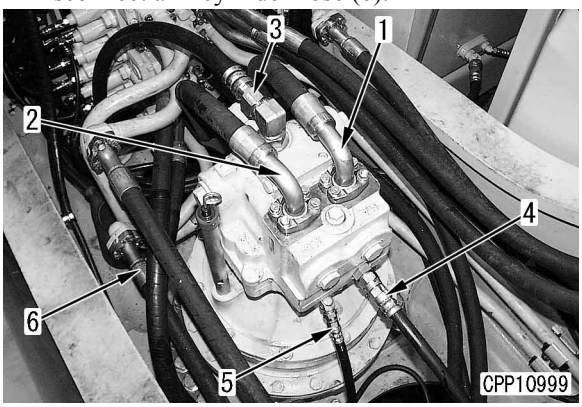
REMOVAL AND INSTALLATION OF SWING MOTOR, SWING MACHINERY ASSEMBLY

REMOVAL

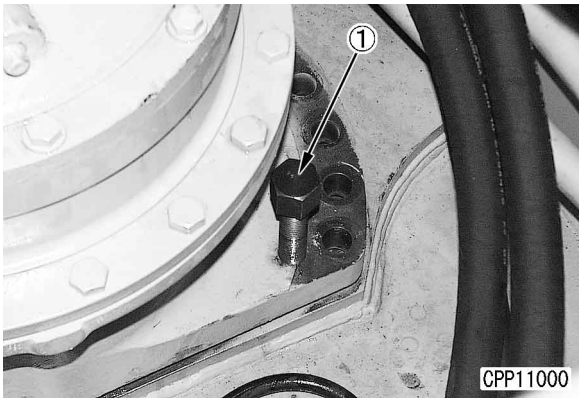
Release the residual pressure in the hydraulic circuit. Refer to the Releasing of Residual Pressure in Hydraulic Circuit section in the INSPECTION AND ADJUSTMENT chapter of this manual.

Lower the work equipment to the ground for safety. After stopping the engine, loosen the oil filler cap on the fuel tank to release the residual pressure inside the tank and move the safety lock lever to the LOCK position.

1. Disconnect five swing motor hoses (1) through (5).
   - (1): Between swing motor and control valve (MA port)
   - (2): Between swing motor and control valve (MB port)
   - (3): Suction hose (S port)
   - (4): Drain hose (T port)
   - (5): Swing brake releasing pilot hose (B port)
2. Disconnect arm cylinder hose (6).



3. Detach the swing motor and swing machinery assembly, using forcing screw b after removing the mounting bolts. ※1



4. Lift and remove swing motor and swing machinery assembly (7).

★ When lifting the swing motor and swing machinery assembly for removal, do so slowly so that the hoses and other parts will not be damaged.

★ Take good care, when lifting the assembly, until the spigot joint portion is pulled out.

kg Swing motor and swing machinery assembly: 450 kg



INSTALLATION

- Install in reverse order of removal.

※1

N·m Mounting bolt:
824 - 1,030 Nm (84 - 105 kgm)

- **Refilling hydraulic oil**
  Refill hydraulic oil through the oil filler port to the specified level. Let the oil circulate in the hydraulic system by starting the engine. Then check the oil level again.
- **Air bleeding**
  Refer to the Air Bleeding of Various Parts section in the TESTING AND ADJUSTING chapter of this manual.

DISASSEMBLY AND ASSEMBLY OF SWING MOTOR, SWING MACHINERY ASSEMBLY

SPECIAL TOOLS

Mark		Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
E	1	796T-626-1110	Push tool	●	1		○
	2	790-101-5401	Push tool kit	■	1		
		• 790-101-5531	• Plate		1		
		• 790-101-5421	• Grip		1		
		• 01010-51240	• Bolt		1		

*Distinction between new and existing part.

DISASSEMBLY

1. Draining oil

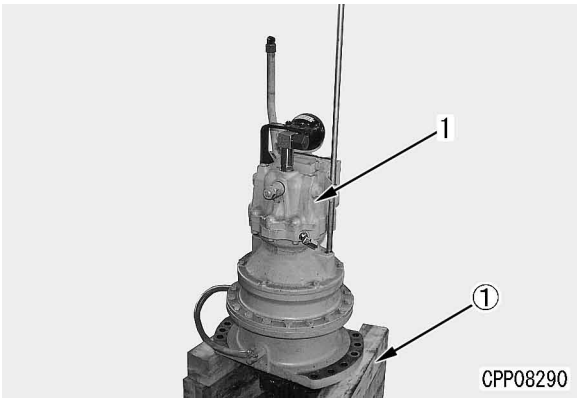
Loosen the drain plug and drain oil from the swing machinery case.

Swing machinery case: Approx. 13.4 **l**

2. Swing motor assembly

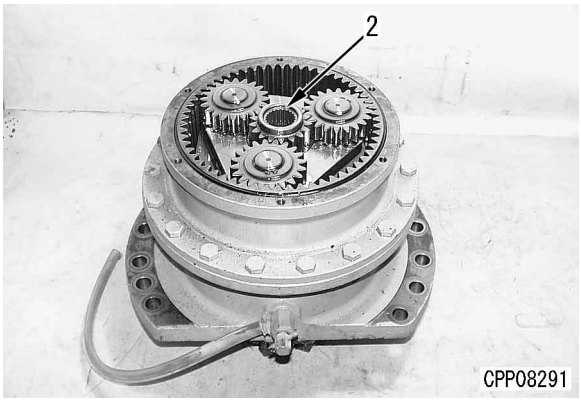
1) Place swing motor and swing machinery assembly on block b.
2) Remove the six mounting bolts to disconnect swing motor assembly (1).

kg Swing motor assembly: 70 kg



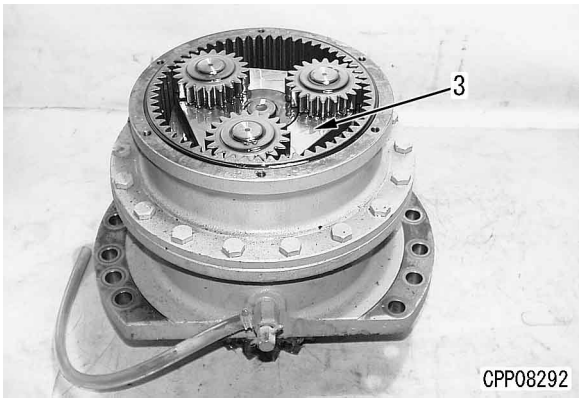
3. No. 1 Sun gear

1) Remove No. 1 sun gear (2).

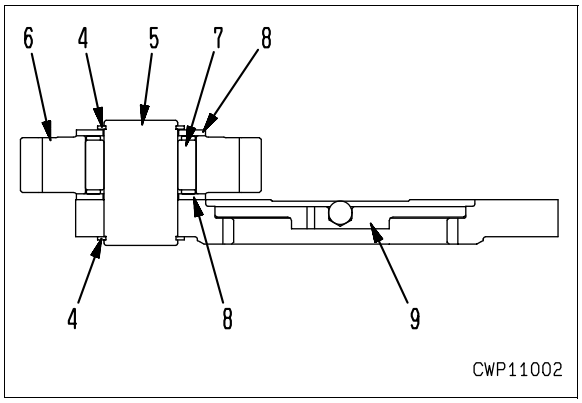


4. No. 1 carrier assembly

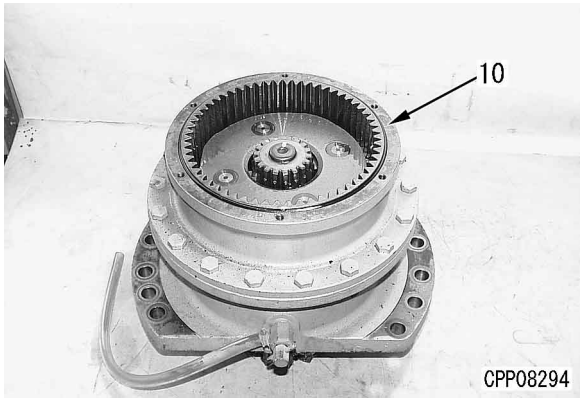
1) Disassemble No. 1 carrier assembly (3).



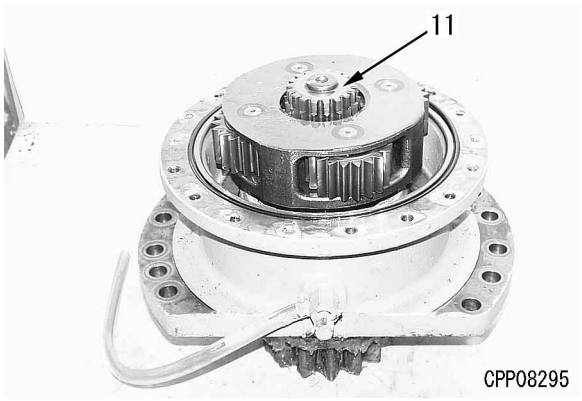
2) Disassemble the No. 1 carrier assembly in the following manner.
Remove snap ring (4) first and then remove shaft (5), gear (6), bearing (7), thrust washer (8) and plate (9).



5. Ring gear
Remove the mounting bolts and remove ring gear (10).



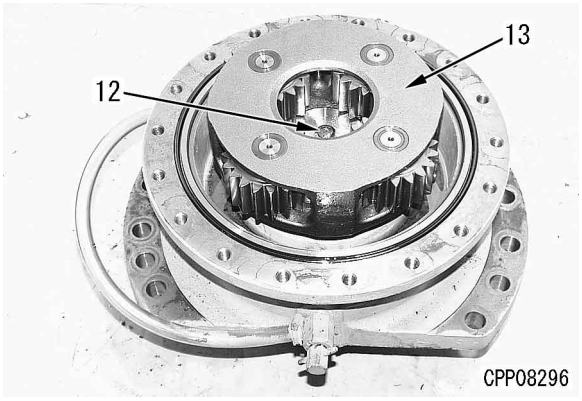
6. No. 2 sun gear
Remove No. 2 sun gear (11).



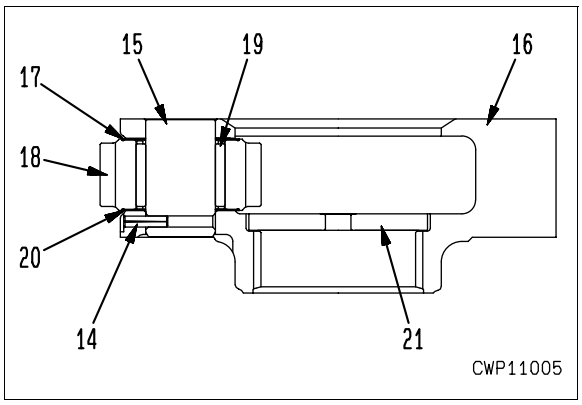
7. Bolt
Remove the holder mounting bolt (12).

8. No. 2 carrier assembly

1) Remove No. 1 carrier assembly (13).

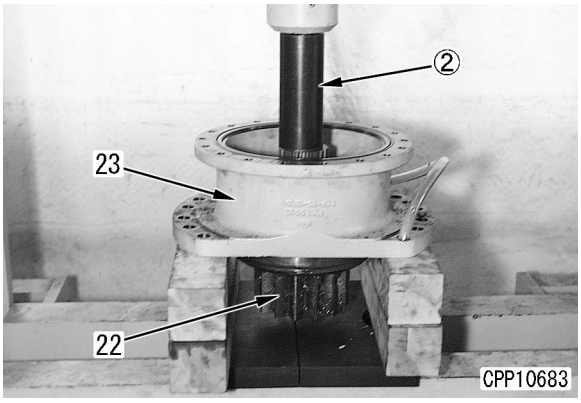


2) Disassemble the No. 2 carrier assembly by hand in the following manner.
   i) Push in pin (14) and knock out shaft (15) from carrier (16).
   ★ After removing the shaft, remove pin (14) .
   ii) Remove thrust washer (17), gear (18), bearing (19) and thrust washer (20).
   iii) Remove plate (21).

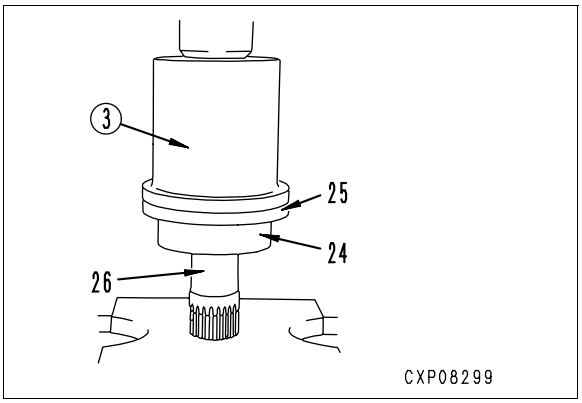


9. Shaft assembly

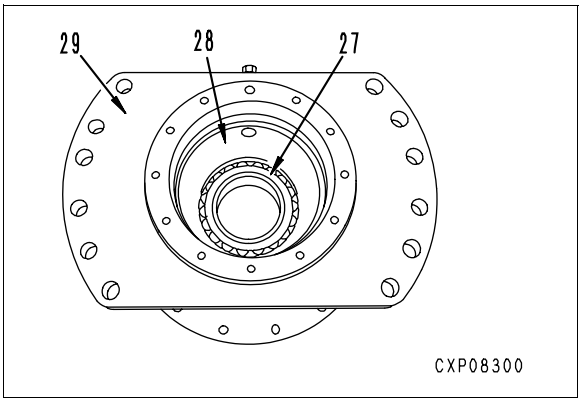
1) Place the shaft case assembly on a press, and push shaft assembly (22) out of shaft case assembly (23), using push tool c.



2) Disassemble the shaft assembly in the following manner.
Remove bearing (24) and plate (25) from shaft (26), using push tool d.



10. Bearing
Remove bearing (27) and oil seal (28) from case (29), using a push tool.



ASSEMBLY

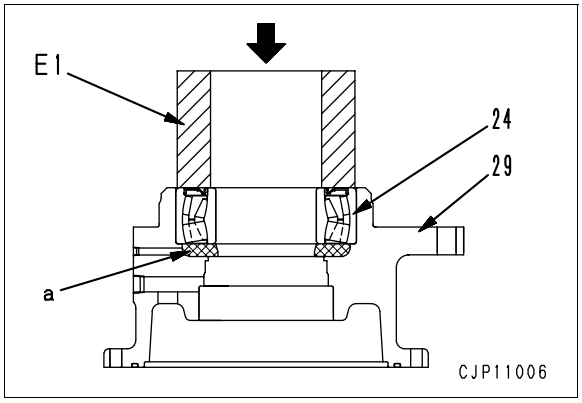
★ Clean all related parts and check that there is no dirt or damage on the surface. Coat sliding surfaces with engine oil and then assemble the parts.

1. Bearing

1) Fill the hatched area (Part **a**) with grease (G2-LI).

Injected grease amount:
Approx. 200 - 340 kg

2) Press-fit bearing (24) into case (29), using push tool **E1**.

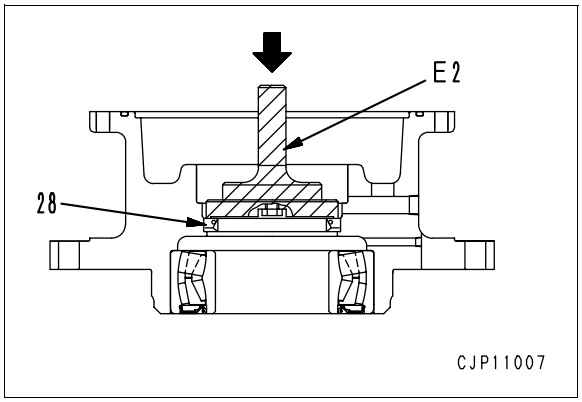


2. Oil seal
Press-fit oil seal (28), using tool **E2**.

Oil seal circumference:
Gasket sealant (LG-6)

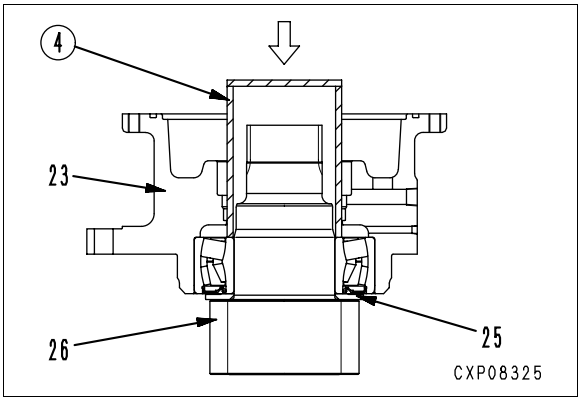
★ When press-fitting, take care so that gasket sealant (LG-6) will not stick to the lip surface of the oil seal.

Oil seal lip surface: Grease (G2-LI)



3. Case assembly

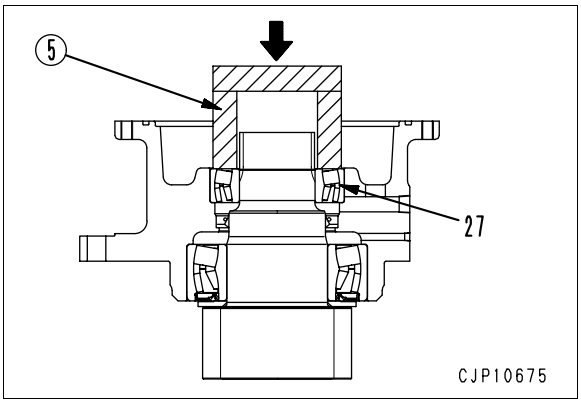
1) Set plate (25) onto shaft (26).
2) Set case assembly (23) onto shaft (26), and press-fit the bearing inner rail portion, using push tool e.



4. Bearing

Press-fit bearing (27), using tool f.

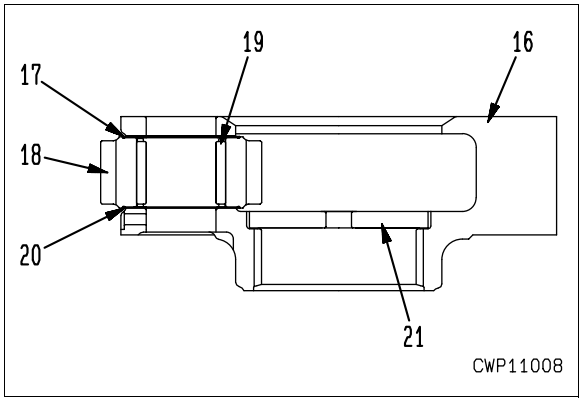
★ When press-fitting the bearing, press both inner and outer races of the bearing at the same time. Avoid pressing the inner race by itself.
★ After the bearing is press-fitted, check that the case will turn freely.



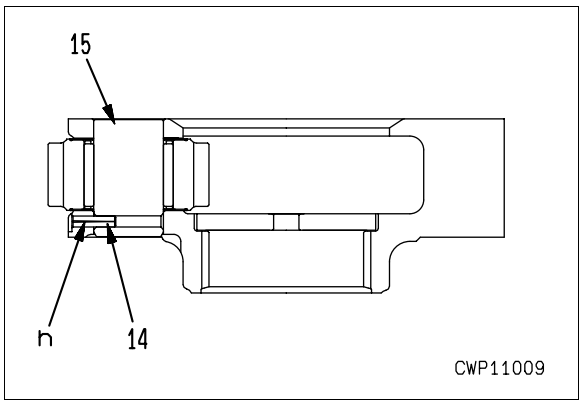
5. No. 2 carrier assembly

1) Reassemble the No. 2 carrier assembly in the following manner.
★ There are traces of expansion on the end surface of carrier side hole **h** which were originally caused when the pin was inserted. Make sure the end surfaces are smooth enough before reassembly.
i) Assemble plate (21) in carrier (16).

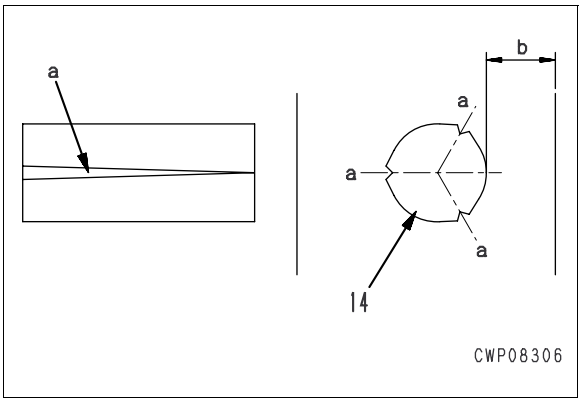
ii) Assemble bearing (19) in gear (18), then fit upper and lower thrust washers (17) and (20) to the gear and set the gear assembly to carrier (16).



iii) Align both pin holes of the shaft and the gear, and install shaft (15), tapping it with a plastic hammer.
★ Install the shaft, rotating the planetary gear. Take care so the thrust washer is not damaged.
iv) Insert pin (14).



★ When inserting the pin, take care so that any of the three pawls provided on the circumference (Portion **a**) will not come to the slender side of the carrier (Portion **b**). Take note, however, that the slender side is likely to be on the opposite side of the carrier, depending on actual individual items. Pay attention so that a pin pawl will not come to the slender side of the carrier either way.



★ Expand the pin of the carrier after inserting.

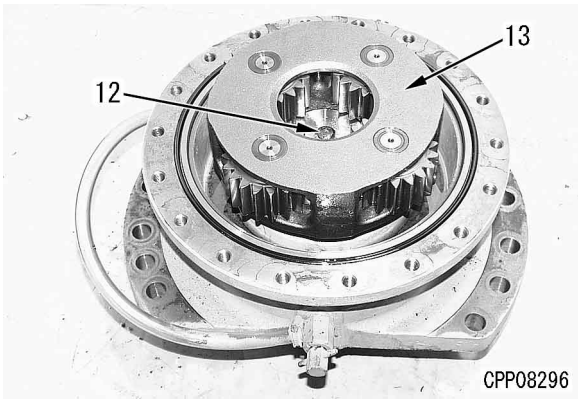
2) Assemble No. 2 carrier assembly (13).

6. Bolt

Tighten bolt (12).

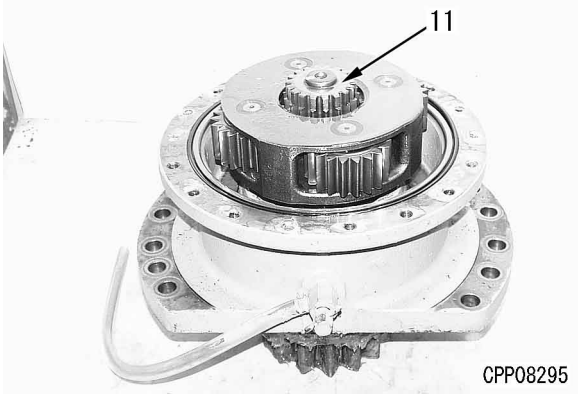
Mounting bolt thread:
Adhesive compound (LT-2)

Mounting bolt:
343 - 427 Nm (34 - 43.5 kgm)



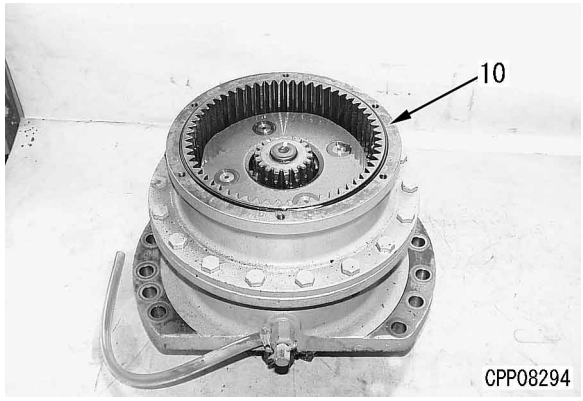
7. No. 2 sun gear

Install No. 2 sun gear (11).

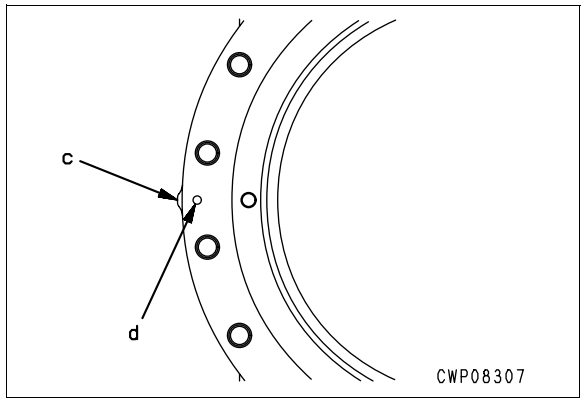


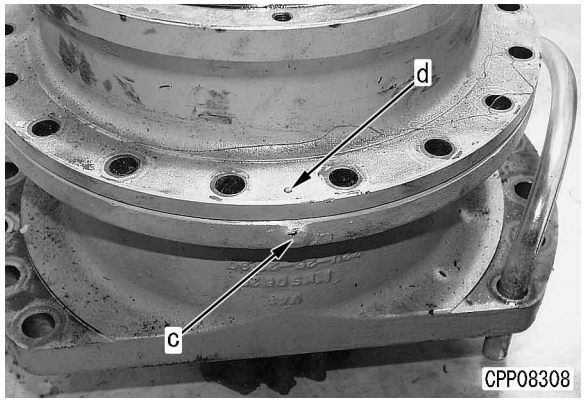
8. Ring gear

Install an O-ring on the case and then install ring gear (10), using an eyebolt (M10 x 1.5).



★ Bring the counter mark on the ring gear (Portion **c**) and the convex portion on the case flange (Portion **d**) to the positions illustrated below, and install the ring gear.





★ Degrease the mating faces of ring gear (10) and the case.

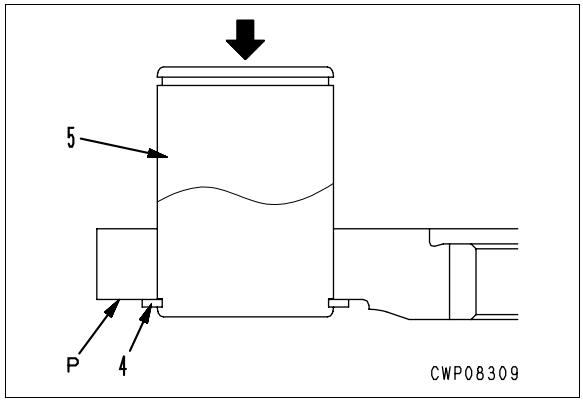
★ Never allow gasket sealant to stick to the mating faces of ring gear (10) and the case.

N•m Ring gear mounting bolt:
245 - 309 Nm (25 - 31.5 kgm)

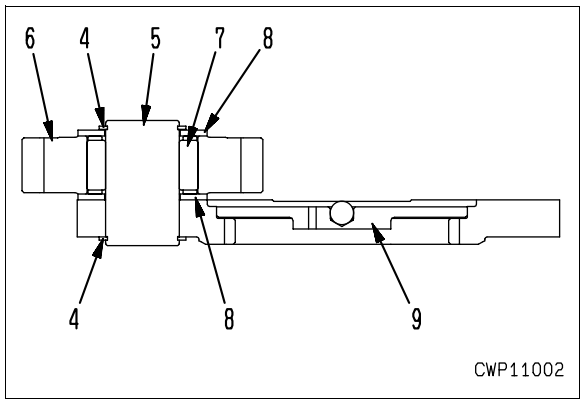
★ Do not install a washer.

9. No. 1 carrier assembly

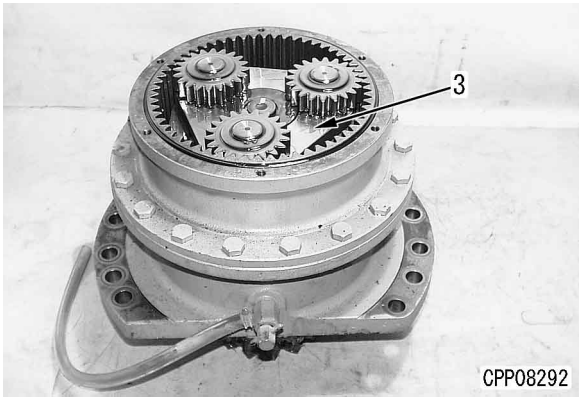
1) Assemble the No. 1 carrier in the following manner.
   i) Press-fit shaft (5) into the carrier in the direction of the arrow until the snap ring groove can be seen.
   ii) After installing snap ring (4), push it back from the opposite side until it comes to contact the **p** face on the carrier. Take care not to push it back excessively.



iii) After installing plate (9), install thrust washer (8), bearing (7), gear (6) and snap ring (4).

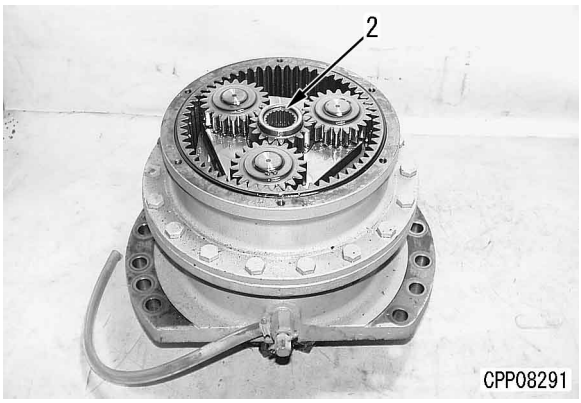


2) Install No. 1 carrier assembly (3).



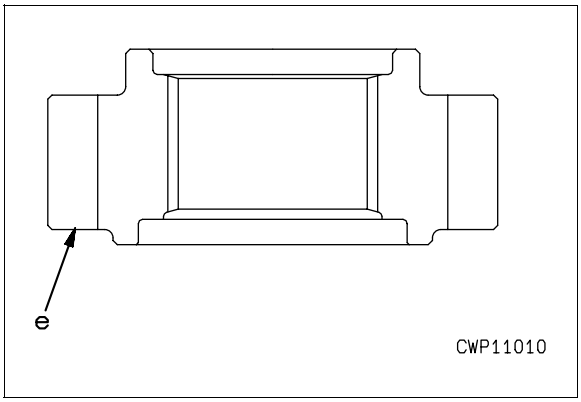
10. No. 1 sun gear assembly

Install No. 1 sun gear (2).



★ When installing the No. 1 sun gear, be careful not to install it upside down.

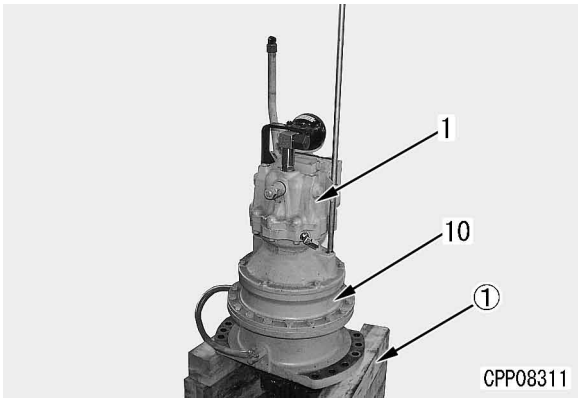
★ Install the No. 1 sun gear with the tooth portion (Portion **e**) facing down.



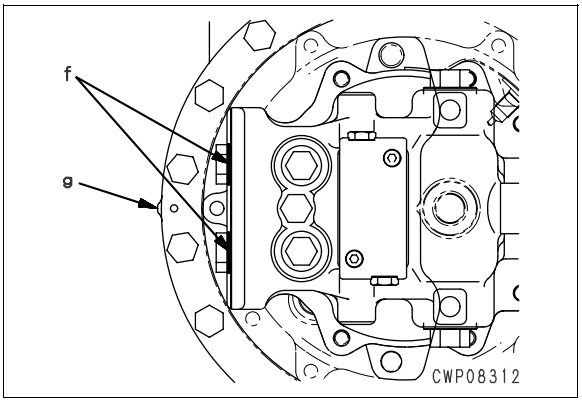
11. Swing motor assembly

After installing an O-ring to ring gear (10), mount the swing motor assembly (1).

kg Swing motor assembly: 70 kg



★ Align the motor port position (Portion **f**) and the case convex portion (Portion **g**) as illustrated below.



★ Degrease both mating surfaces of swing motor assembly (1) and ring gear (10).

★ Never allow gasket sealant to stick to the mating surfaces of swing motor assembly (1) and ring gear (10).

N·m Swing motor mounting bolt:
98 - 123 Nm (10 - 12.5 kgm)

12. Refilling hydraulic oil

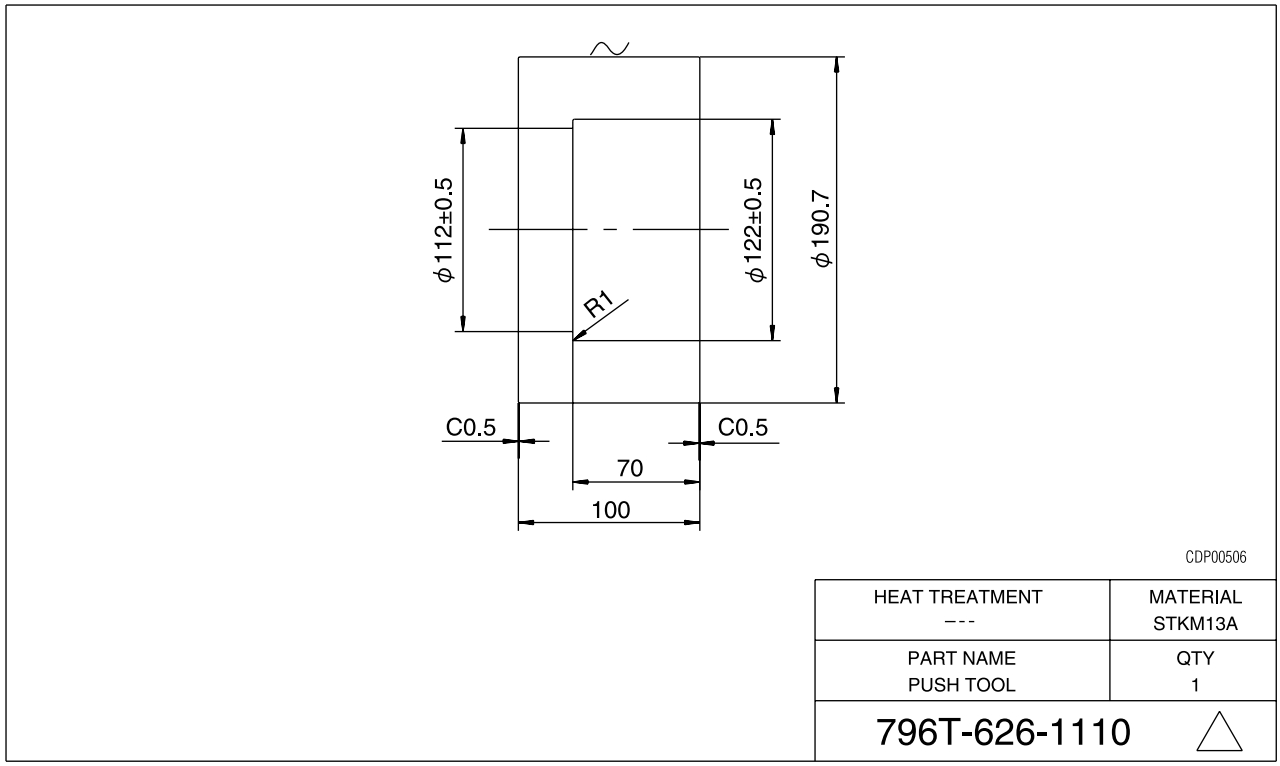
Screw in the drain plug and refill hydraulic oil through the oil filler port to the specified level.

Swing machinery case: Approx. 13.4 **l**

SKETCHES OF SPECIAL TOOLS

Note: Komatsu cannot accept any responsibility for special tools manufactured according to these sketches.

E1 Push Tool



DISASSEMBLY AND ASSEMBLY OF CARRIER ROLLER ASSEMBLY

★ This section deals only with precautions to be followed when reassembling the carrier roller assembly.

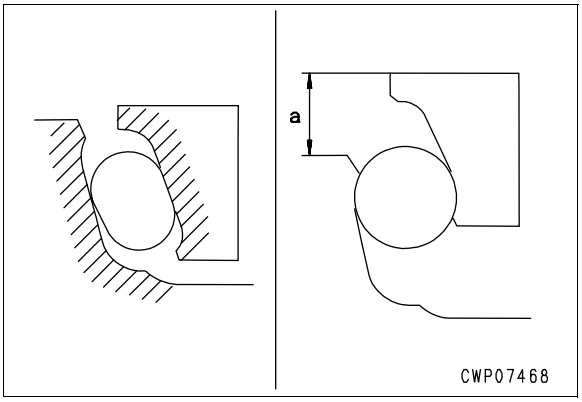
SPECIAL TOOLS

Mark	Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
F	791-601-1000	Installer	■	1		
	791-430-3230	Oil pump	■	1		

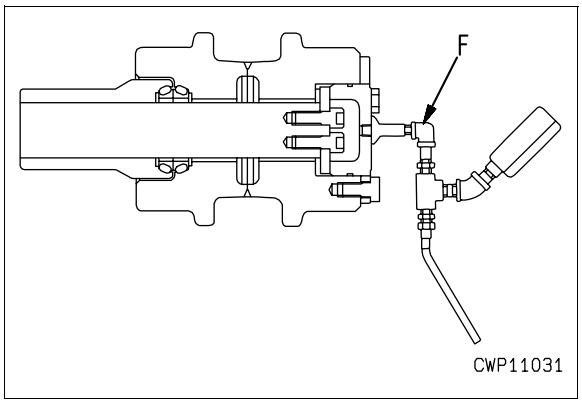
*Distinction between new and existing part.

ASSEMBLY

- Floating seal
  - ★ Before installing a floating seal, completely degrease both contact surfaces of the O-ring and the floating seal (hatched area in the illustration). Furthermore, take care so that no dust or dirt sticks to the contact surface of the floating seal.
  - ★ After inserting the floating seal, check that the inclination of the seal is less than 1 mm and that protrusion **a** of the seal remains within the range of 5 - 7 mm.

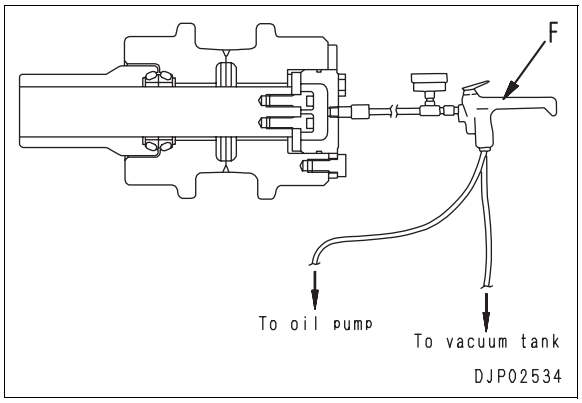


- ★ Check the amount of air leakage from the seal with tool **F** by applying the standard pressure to the oil filler port.
- ★ Check that the gauge needle does not go down, when the below standard pressure is applied for 10 seconds.
  Standard pressure: **0.1 MPa (1 kg/cm²)**



- ★ Fill the carrier roller assembly with oil, using tool **F**, and screw in the plug.

Carrier roller: 145 - 155 cc (E030-CD)



- Carrier roller

DISASSEMBLY AND ASSEMBLY OF TRACK ROLLER ASSEMBLY

★ This chapter deals only with precautions to be followed when reassembling the Track Roller Assembly.

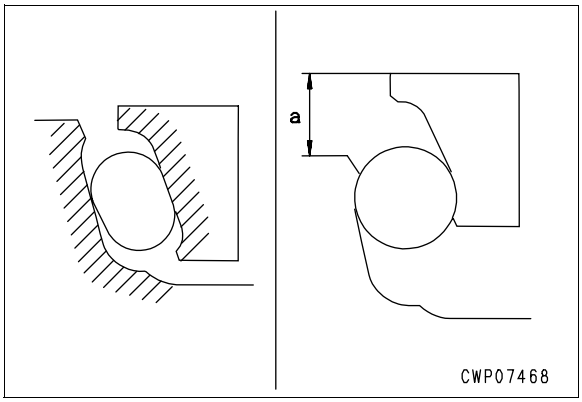
SPECIAL TOOLS

Mark	Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
G	796-670-1010	Installer	■	1		
	791-601-1000	Oil Pump	■	1		

*Distinction between new and existing part.

ASSEMBLY

- Floating seal
  - ★ Before installing a floating seal, completely degrease both contact surfaces of the O-ring and the floating seal (hatched area in the illustration). Furthermore, take care so that no dust or dirt sticks to the contact surface of the floating seal.
  - ★ After inserting the floating seal, check that inclination of the seal is less than 1 mm and that protrusion **a** of the seal remains within the range of 7 - 11 mm.



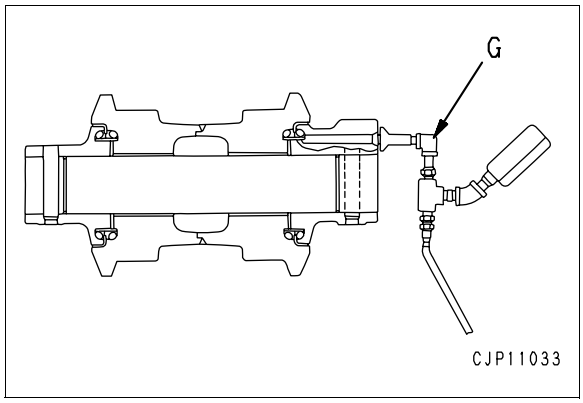
- Track roller cover mounting bolt.

  N·m Track roller cover mounting bolt: 44.12 - 53.93 Nm (4.5 - 5.5 kgm)

- Track roller

★ Using tool **G**, apply the specified air pressure to the oil filler port to check air leakage from the seal.

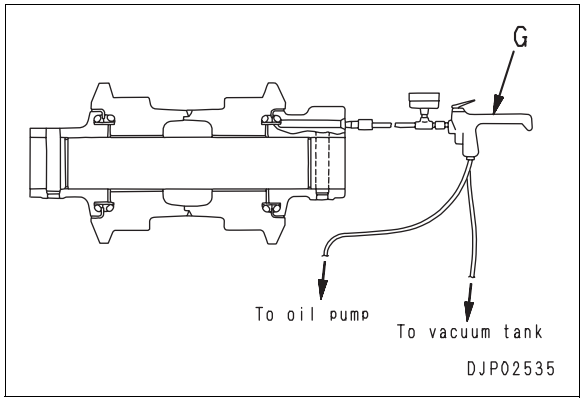
★ Keep applying the following specified air pressure for 10 seconds to check that the gauge needle does not go down.
Specified air pressure:
0.1 MPa (1 kg/cm²)



★ Fill the track roller assembly with hydraulic oil. Use tool **G** and screw in the plug.

Track roller: 250 - 280 cc (E030-CD)

N·m Plug: 10 - 20 Nm (1 - 2 kgm)



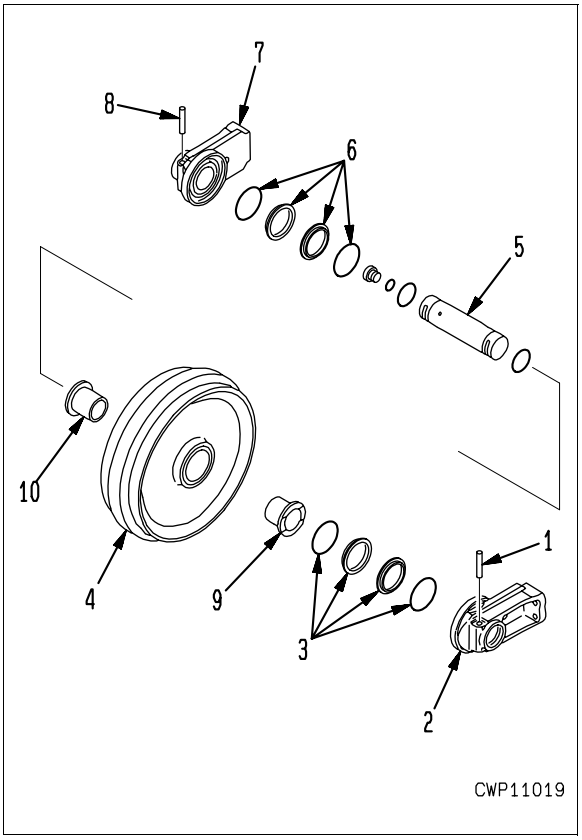
DISASSEMBLY AND ASSEMBLY OF IDLER ASSEMBLY

SPECIAL TOOLS

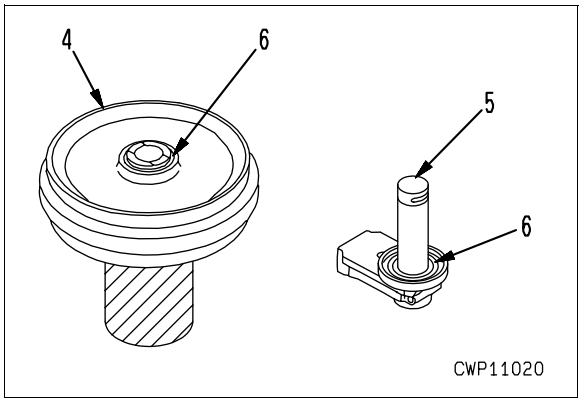
Mark	Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
H	796-570-1020	Installer	■	1		
	791-601-1000	Oil pump	■	1		

*Distinction between new and existing part.

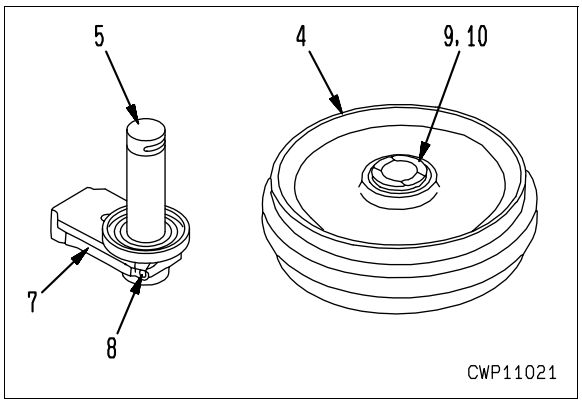
DISASSEMBLY



1. Remove dowel pin (1) and then support (2).
2. Remove floating seal (3) from support (2) and idler (4).
3. Detach idler (4) from shaft (5) and support assembly (7).
   ★ The idler contains 230 ± 10 cc of oil. Drain the oil at this stage of disassembly. Take care and spread a cloth on the floor to prevent smearing the floor with flushing oil.
4. Remove floating seal (6) on the opposite side of idler (4), shaft (5) and support assembly (7).



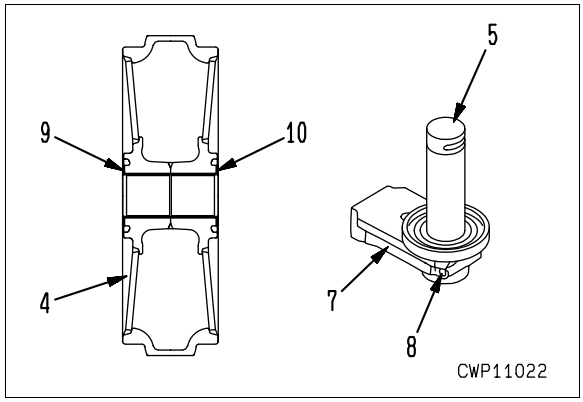
5. Remove dowel pin (8) to detach support (7) from shaft (5).
6. Remove bushings (9) and (10) from idler (4).



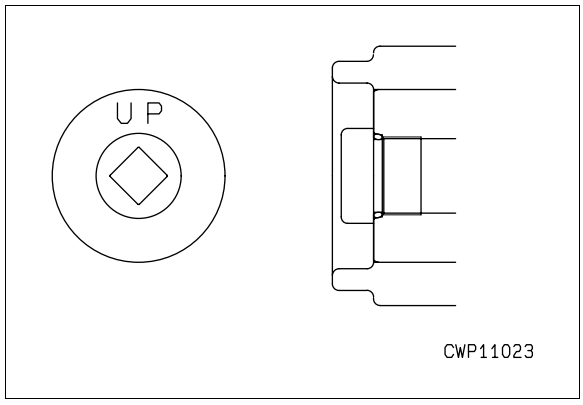
ASSEMBLY

1. Press fit bushing (9) and (10) to idler (4).

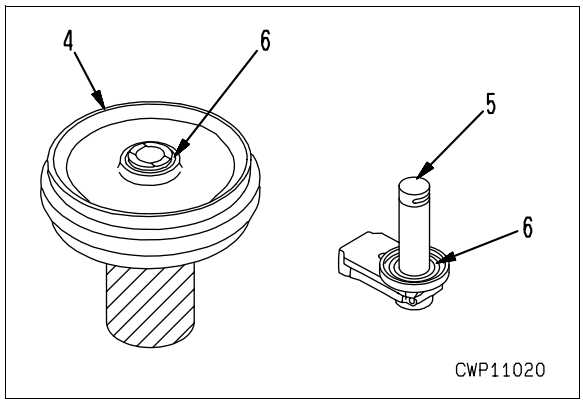
2. Fit O-ring and install support (7) to shaft (5) with dowel pin (8).



★ Install the shaft with UP mark facing upward.

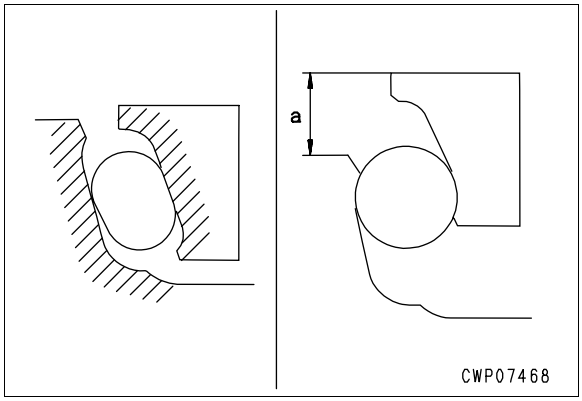


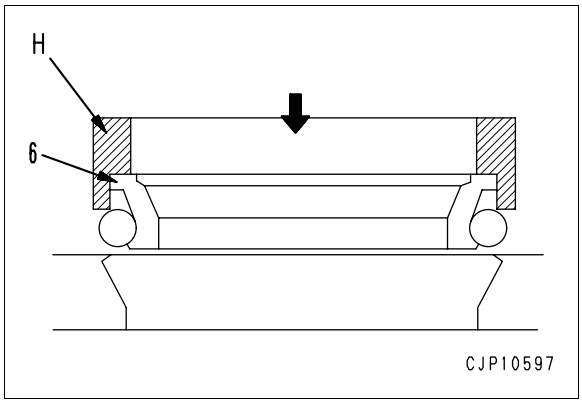
3. Using tool **H**, install floating seal (6) to idler (4), shaft (5) and support (7) assembly.



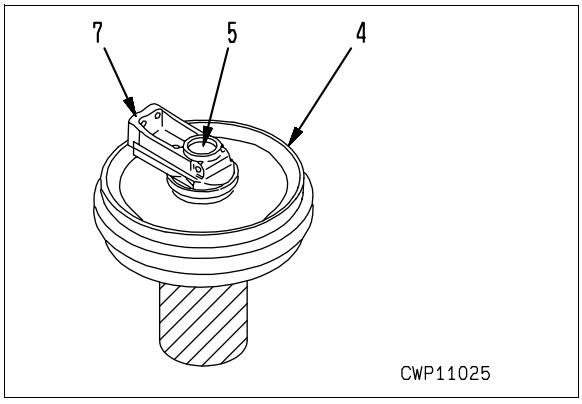
★ Before installing the floating seal, completely degrease both contact surfaces of the O-ring and the floating seal (hatched area in the illustration). Furthermore, take care so that no dust or dirt sticks to the contact surface of the floating seal.

★ After inserting the floating seal, check that inclination of the seal is less than 1 mm and that protrusion **a** of the seal remains within the range of 5 - 7 mm.

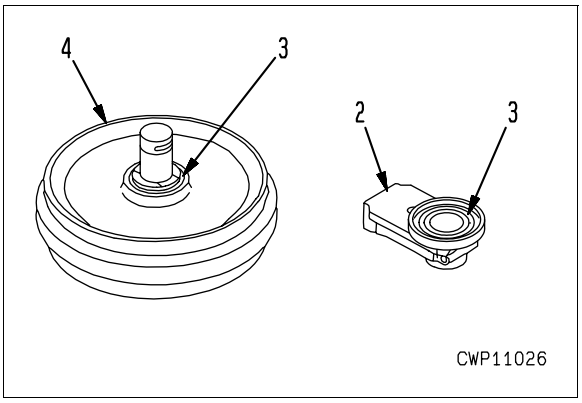




4. Assemble shaft (5) and support (7) assembly to idler (4).

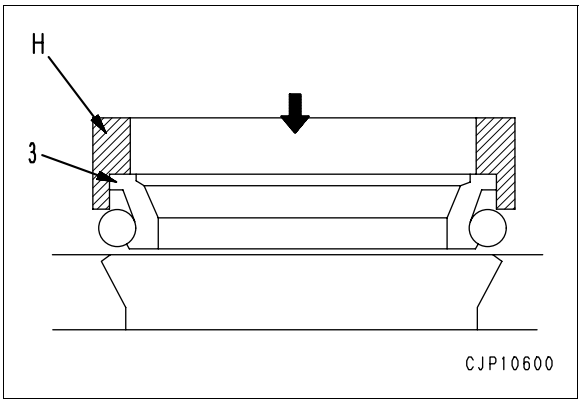


5. Using tool **H**, install floating seal (3) to idler (4) and support (2).



★ Coat the sliding surface of the floating seal with oil, and be careful not to let any dirt or dust get stuck to it.

★ Remove all grease and oil from the contact surface of the O-ring and the floating seal.



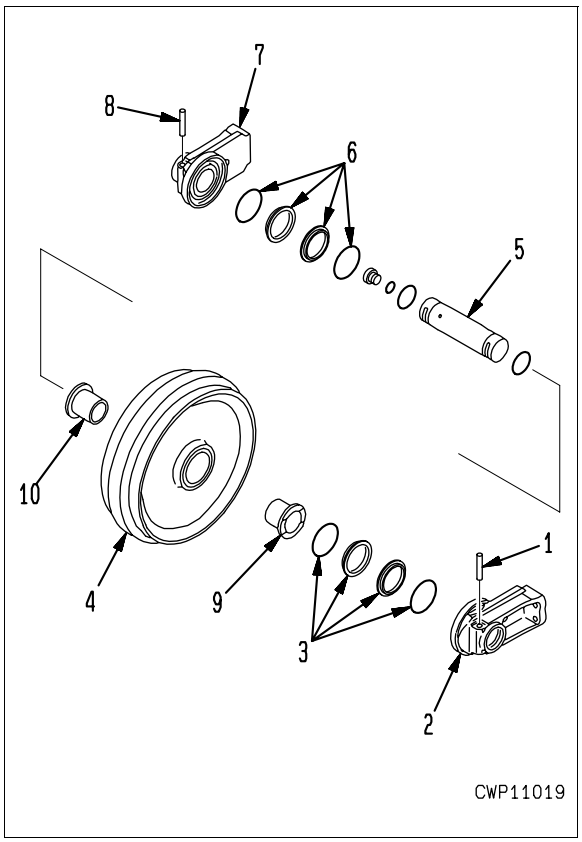
6. Install O-ring, then install support (2) with dowel pin (1).

★ After inserting the pin, caulk the support pin.

7. Add oil and tighten plug.

Oil: **Approx. 230 ± 10 cc (EO 30-CD)**

Plug: **130 - 180 Nm {13 - 18 kgm}**



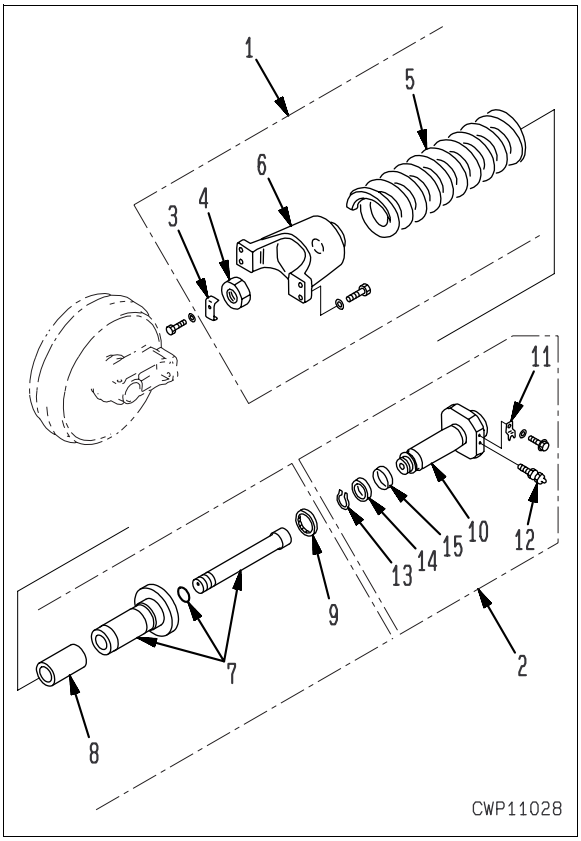
DISASSEMBLY AND ASSEMBLY OF RECOIL SPRING ASSEMBLY

SPECIAL TOOLS

Mark		Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
J	1	791-685-8006	Compressor	■	1		
		791-635-3160	Extension	■	1		
		790-101-1600	Cylinder 686 kN {70 T}	■	1		
		790-101-1102	Pump	■	1		
	2	790-201-1500	Push tool kit	■	1		
		• 790-201-1620	• Plate		1		
		• 790-101-5021	• Grip		1		
		• 01010-50816	• Bolt		1		

*Distinction between new and existing part.

DISASSEMBLY



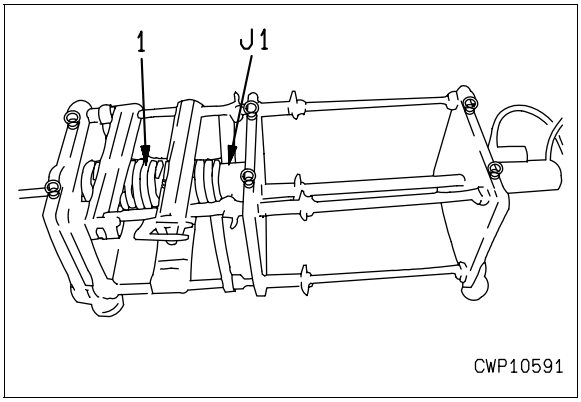
1. Remove piston assembly (2) from recoil spring assembly (1).

2. Disassembly of recoil spring assembly

1) Set tool **J1** to recoil spring assembly (1).

⚠ The recoil spring is under large installed load, so be very sure to set the tool properly.
Failure to do this is dangerous.

★ Installed load of spring: **208.6 kN {21,280 kg}**

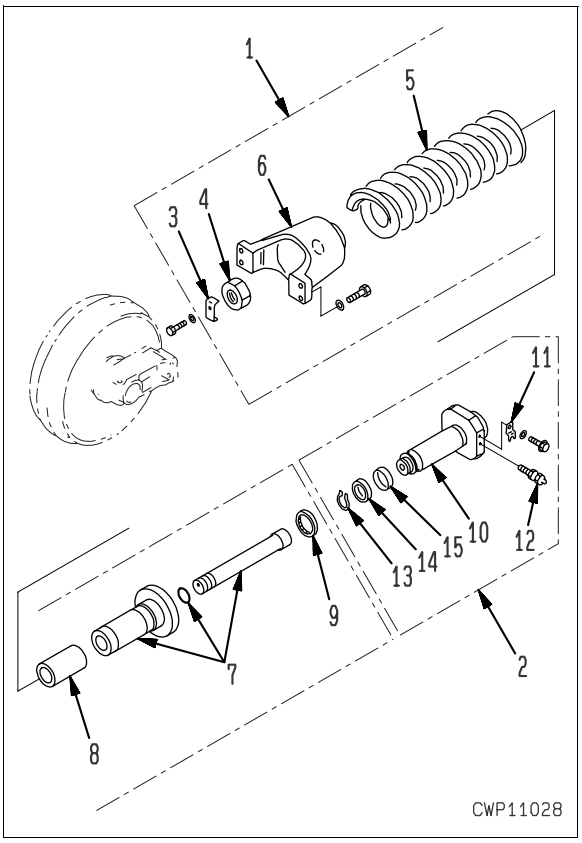


2) Apply hydraulic pressure slowly to compress the spring. Remove lock plate (3). Then remove nut (4).
   - ★ Compress the spring to a point where the nut becomes loose.
   - ★ Release the hydraulic pressure slowly to decompress the spring.
   - ★ Free length of spring: **814 mm**
3) Remove yoke (6), cylinder (7), collar (8), and dust seal (9) from spring (5).

3. Dissassembly of piston assembly

1) Remove lock plate (11) from piston (10), then remove valve (12).
2) Remove snap ring (13), then remove U-packing (14) and ring (15).

ASSEMBLY

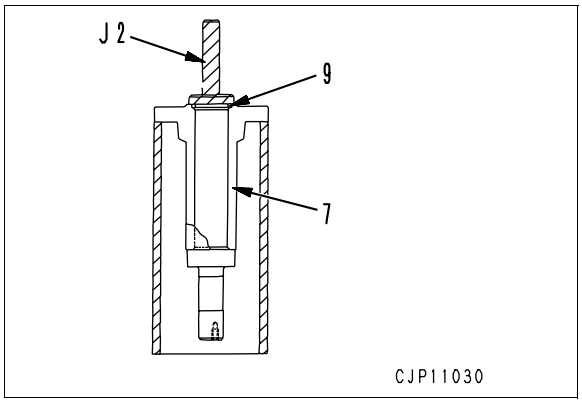


1. Assembly of piston assembly

1) Assemble ring (15) and U-packing (14) to piston (10) and secure with snap ring (13).
2) Tighten valve (12) temporarily, and secure with lock plate (11).

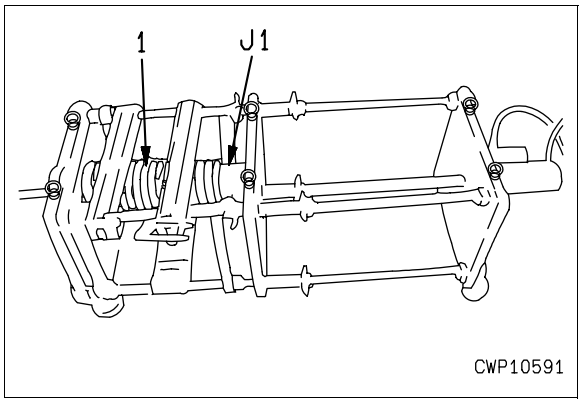
2. Assembly of recoil spring assembly

1) Using tool **J2**, install dust seal (9) to cylinder (7).

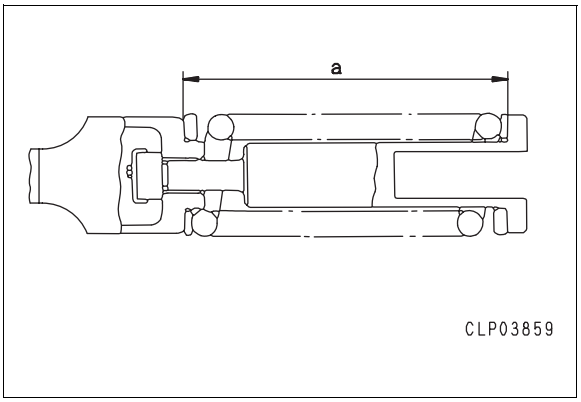


2) Assemble cylinder (7) collar (8), and yoke (6) to spring (5), and place in tool **J1**.

Sliding portion of cylinder:
Grease (G2-L1)



3) Apply hydraulic pressure slowly to compress the spring and tighten nut (4) so that the installed length of the spring is dimension **a**, then secure it with lock plate (3).
   ★ Installed length **a** of spring:
   655 mm



4) Remove recoil spring assembly (1) from tool **J1**.

3. Assemble piston assembly (2) to recoil spring assembly (1).

Sliding portion of wear ring:
Grease (G2-L1)

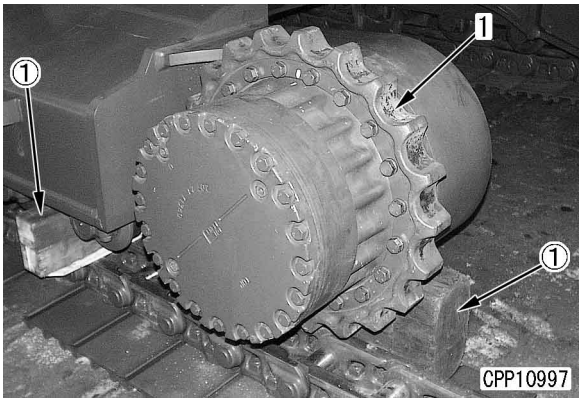
★ Install the piston assembly so the valve installing position is on the outside.
★ Fill the inside of the cylinder with 180 cc of grease (G2-L1), then bleed the air and check that grease comes out of the grease hole.

REMOVAL AND INSTALLATION OF SPROCKET

REMOVAL

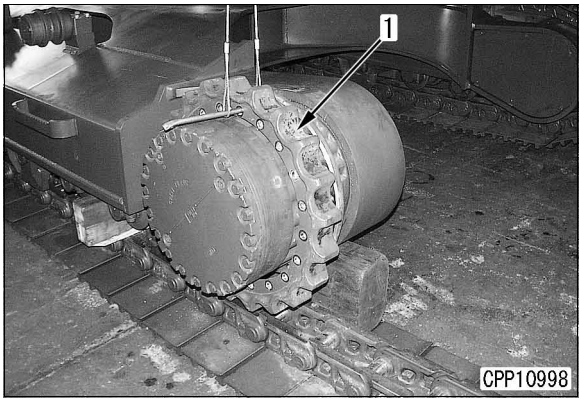
1. Remove track shoe assembly. For details, see TRACK SHOE ASSEMBLY, REMOVAL.

2. Swing work equipment 90°, push up chassis with work equipment and place block b between track frame and track shoe.



3. Remove mounting bolts and lift off sprocket (1). ※1

kg Sprocket: **65 kg**



INSTALLATION

• Install in reverse order of removal.

※1

Thread of sprocket mounting bolt:
Gasket sealant (LG-6)

N·m Sprocket mounting bolt:
640 - 785 Nm {65 - 80 kgm}

REMOVAL AND INSTALLATION OF TRACK SHOE ASSEMBLY

SPECIAL TOOLS

Mark	Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
K	791-630-3000	Remover & Installer	■	1		
	790-101-1300	Cylinder 980 kN {100 T}	■	1		
	790-101-1102	Pump	■	1		

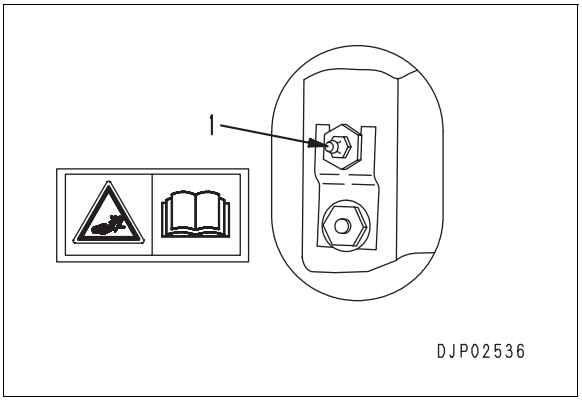
*Distinction between new and existing part.

EXPANSION OF TRACK SHOE

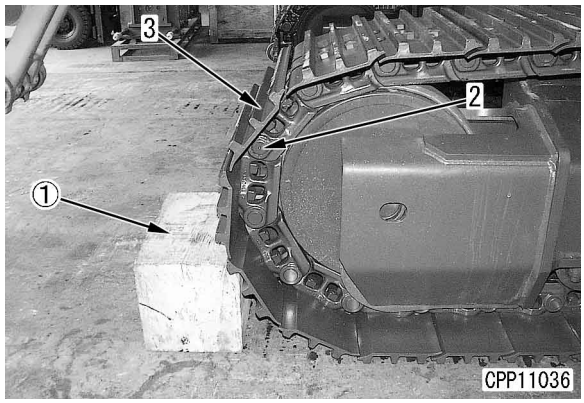
1. Set master pin at the position for expanding.
- ★ Start the engine and bring the master pin in front of the idler.
- ★ Put block b under the track shoe in front of the idler.

2. Lower the work equipment, then loosen lubricator (1), and relieve track tension. ※1

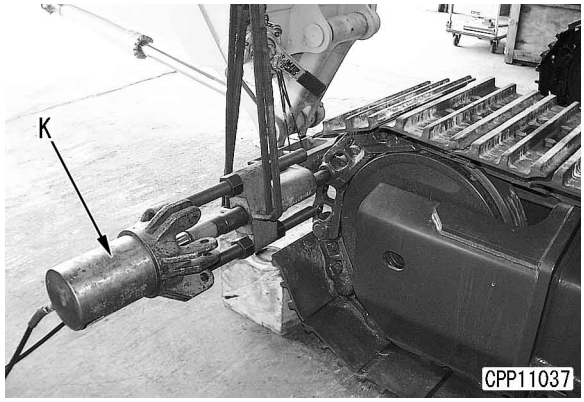
The adjustment cylinder is under extremely high pressure. Never loosen the lubricator more than one turn. If the grease does not come out, move the machine backwards and forwards.



3. Disassemble track shoe (3) above master pin (2). ※2



4. Pull out master pin (2). ※3



5. Travel machine backward to expand track shoe.

ASSEMBLY

- Assemble in reverse order of expansion.

※1

★ Refer to the Inspection and Adjustment of Track Shoe Tension section in the TESTING AND ADJUSTING chapter of this manual.

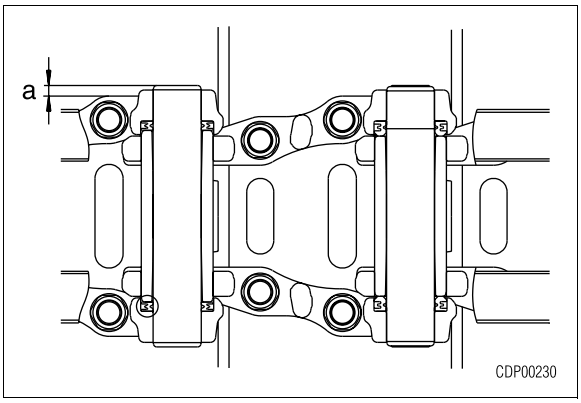
※2

Mounting bolt:
Anti-seizure compound
(equivalent to Maruzen Molymax No. 2)

N·m Mounting bolt: 393 ± 39 Nm
(40 ± 4 kgm)

※3

★ Press-fit the master pin with a proper tool until dimension **a**, master pin protrusion amount, is obtained.
Master pin protrusion amount **a**:
4.2 ± 2 mm

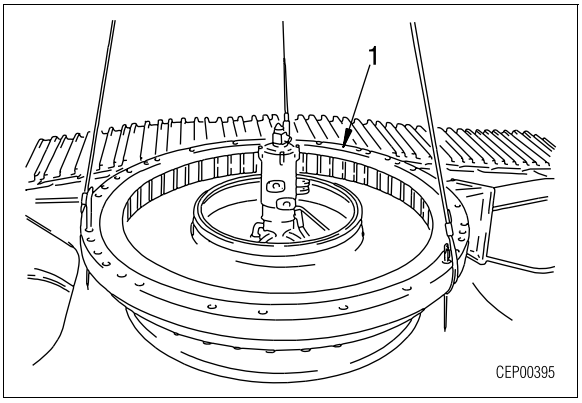


REMOVAL AND INSTALLATION OF SWING CIRCLE ASSEMBLY

REMOVAL

1. Remove revolving frame assembly. Refer to the Removal and Installation of Revolving Frame Assembly section in this manual.
2. Sling swing circle assembly (1) at three points. Remove the mounting bolts and lift off the swing circle assembly. ※1

kg Swing circle assembly: **500 kg**



INSTALLATION

- Install in reverse order of removal.

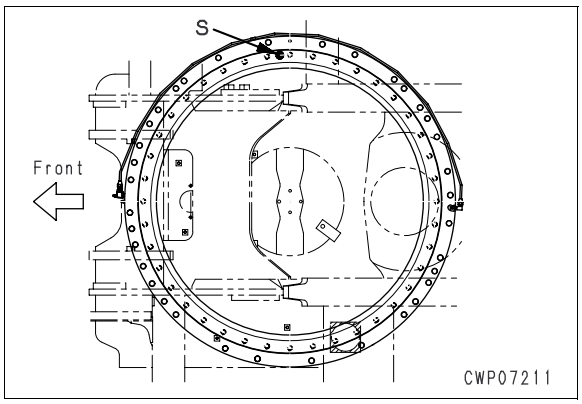
※1

Thread of swing circle mounting bolt:
Thread tightener (LT-2)

N·m Swing circle mounting bolt:
926.7 ± 103 Nm (94.5 ± 10.5 kgm)

★ Install the inner race to the track frame with the **S** mark of its inner soft zone spot facing the right side of machine as shown in the figure below.

Grease bath fill:
Grease (G2-L1) 33 l



REMOVAL AND INSTALLATION OF REVOLVING FRAME ASSEMBLY

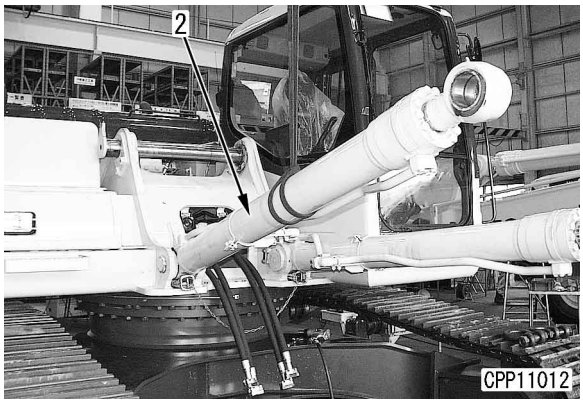
REMOVAL

Extend the arm and bucket fully, then lower the work equipment to the ground and move the safety lock lever to the LOCK position.

1. Remove the work equipment assembly, refer to the Removal of Work Equipment Assembly section in this manual.
2. Remove the counter weight assembly, refer to the Removal of Counterweight Assembly section in this manual.
3. Disconnect four boom cylinder hoses (1).
   ★ Plug the hose to stop oil flow-out.

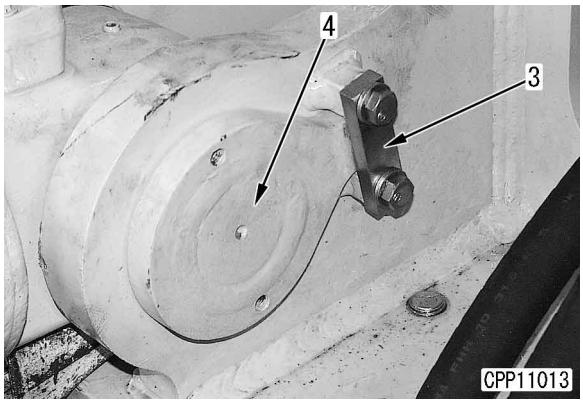


4. Sling boom cylinder assembly (2).

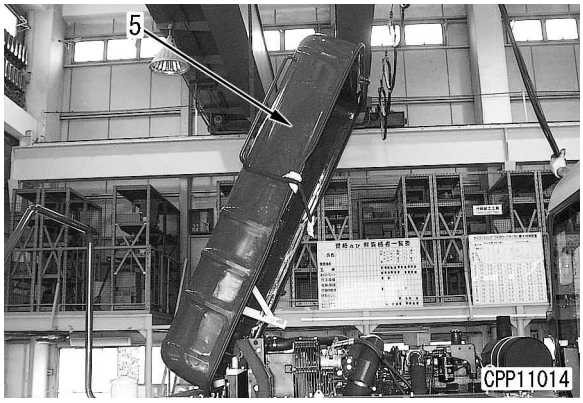


5. Remove plate (3) and pin (4). Lift and remove the boom cylinder assembly (2).
   ★ Remove the boom cylinder assembly on the opposite side in the same manner.

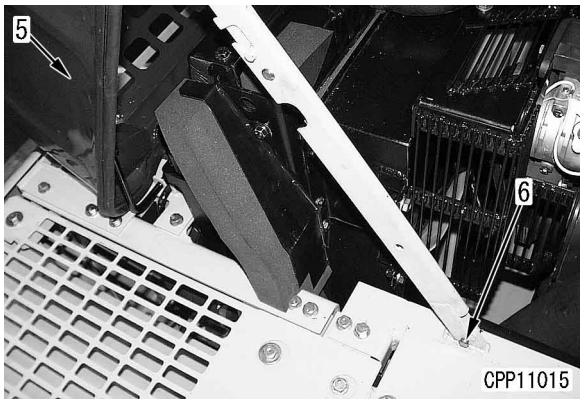
kg Boom cylinder assembly: 280 kg



6. Support the engine hood (5) with an appropriate sling and lifting device.
   ★ Remove any parts which may interfere with a sling, when removing the revolving frame.

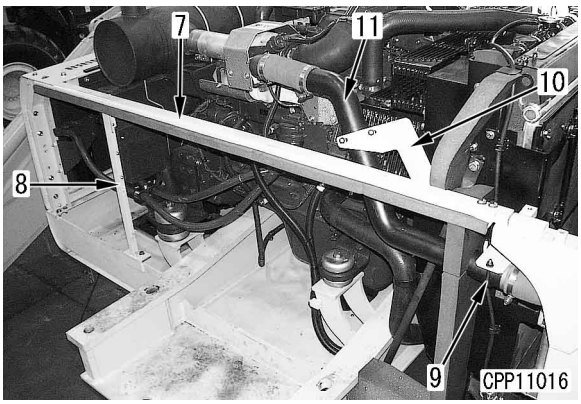


7. Remove engine hood mounting bolts to pull out pin (6).
8. Lift and remove engine hood (5).



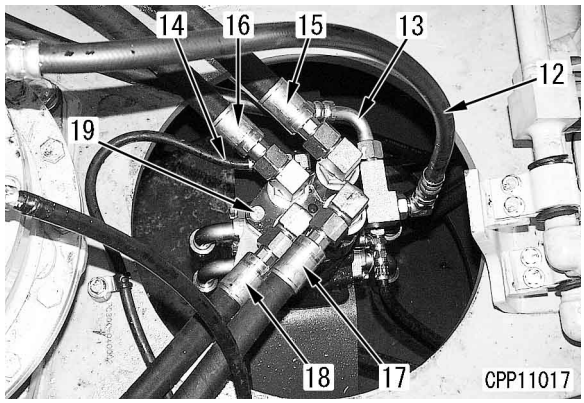
9. Remove plates (7) and (8).

10. Remove U bolt (9) and plate (10) to disconnect after-cooler tube (11).
    ★ If any other parts may interfere with the slings, remove them before lifting the assembly.



11. Disconnect seven hoses (12) through (18).
    - (12): Center swivel joint (D port) - Swing motor (T port)
    - (13): Center swivel joint (D port) - Hydraulic tank
    - (14): Center swivel joint (E port) - Solenoid valve
    - (15): Center swivel joint (B port) - Left travel control lever (B2 port)
    - (16): Center swivel joint (D port) - Right travel control lever (B5 port)
    - (17): Center swivel joint (A port) - Left travel control lever (A2 port)
    - (18): Center swivel joint (C port) - Right travel control lever (A5 port)

12. Pull out pin (19) on the side of center swivel joint and detach turning stopper plate from center swivel joint.



13. Sling revolving frame assembly (20) then remove 40 mounting bolts and lift off revolving frame assembly. ※1
    ★ Use two lever blocks.
    ★ Leave the two mounting bolts at the front and rear and adjust the center of gravity with the lever blocks while lifting off. Remove the mounting bolts afterwards..

⚠ When removing the revolving frame assembly, take care so that it will not bump the center swivel joint assembly

kg Revolving frame assembly: 7,800 kg



INSTALLATION

- Install in reverse order of removal.

※1

Swivel circle mating surface:
Gasket sealant (LG-4)

Threads of revolving frame mounting bolt:
Adhesive compound (LT-2)

N·m Revolving frame mounting bolt:
926.7 ± 103 Nm (94.5 ± 10.5 kgm)

- Refilling hydraulic oil
  Refill hydraulic oil through the oil filler port to the specified level, and let the oil circulate in the hydraulic system by starting the engine. Then check the level again.
- Air bleeding
  Bleed air from the travel motor, refer to the Air Bleeding of Various Parts section in the TESTING AND ADJUSTING chapter of this manual.

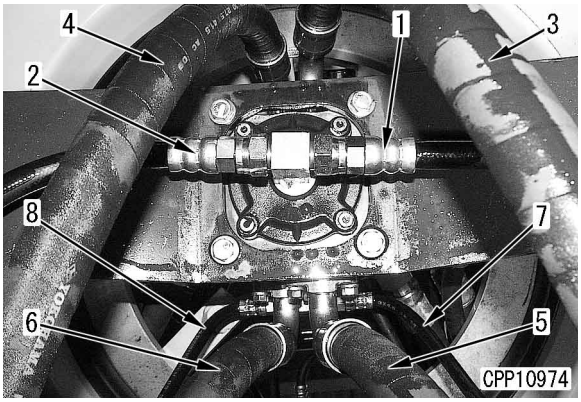
REMOVAL AND INSTALLATION OF CENTER SWIVEL JOINT ASSEMBLY

REMOVAL

Release the remaining pressure in the hydraulic circuit. For details, see TESTING AND ADJUSTING, release of remaining pressure in hydraulic circuit.

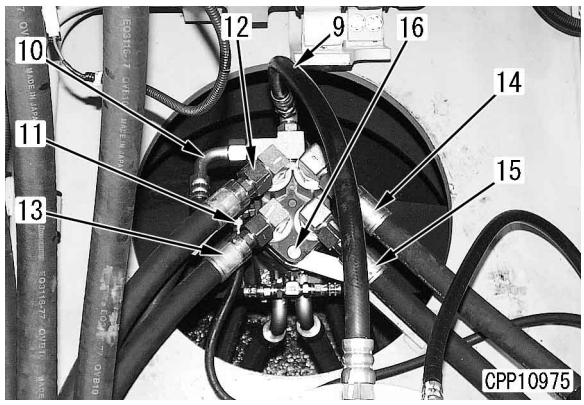
★ Mark all the piping with tags to prevent mistakes in the mounting position when installing.

1. Disconnect eight hoses (1) through (8) between travel motor and center swivel joint.
- (1): Center swivel joint (T port) - Left travel motor (T port)
- (2): Center swivel joint (T port) - Right travel motor (T port)
- (3): Center swivel joint (B port) - Left travel motor (PA port)
- (4): Center swivel joint (D port) - Right travel motor (PB port)
- (5): Center swivel joint (A port) - Left travel motor (PB port)
- (6): Center swivel joint (C port) - Right travel motor (PA port)
- (7): Center swivel joint (E port) - Left travel motor (P port)
- (8): Center swivel joint (E port) - Right travel motor (P port)

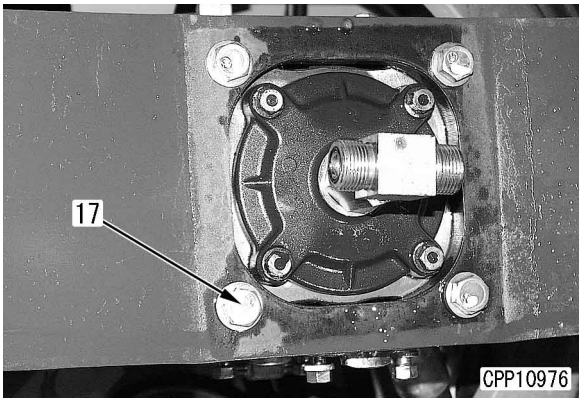


2. Disconnect seven hoses (9) through (15).
- (9): Center swivel joint (D port) - Swing motor (T port)
- (10): Center swivel joint (D port) - Hydraulic tank
- (11): Center swivel joint (E port) - Solenoid valve
- (12): Center swivel joint (B port) - Left travel control lever (B2 port)
- (13): Center swivel joint (D port) - Right travel control lever (B5 port)
- (14): Center swivel joint (A port) - | Left travel control lever (A2 port)
- (15): Center swivel joint (C port) - Right travel control lever (A5 port)

3. Pull out pin (16) on the side of center swivel joint and remove the jam plate from the center swivel joint.

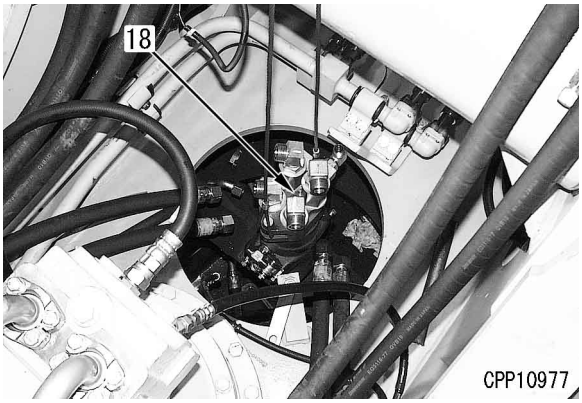


4. Remove four mounting bolts (17).



5. Remove center swivel joint assembly (18). ※1

kg Center swivel joint assembly: **40 kg**

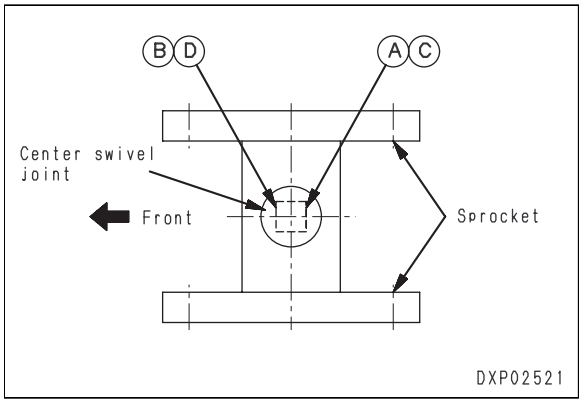


INSTALLATION

- Install in reverse order of removal.

※1

Install the center swivel joint facing in the direction shown in the diagram.
(The diagram shows the machine as seen from above)



- **Refilling with oil (hydraulic tank)**
  - ★ Add oil through the oil filter to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.
- **Bleeding air**
  - ★ Bleed the air from the travel motor. For details see TESTING AND ADJUSTING, Air Bleeding of Various Parts.

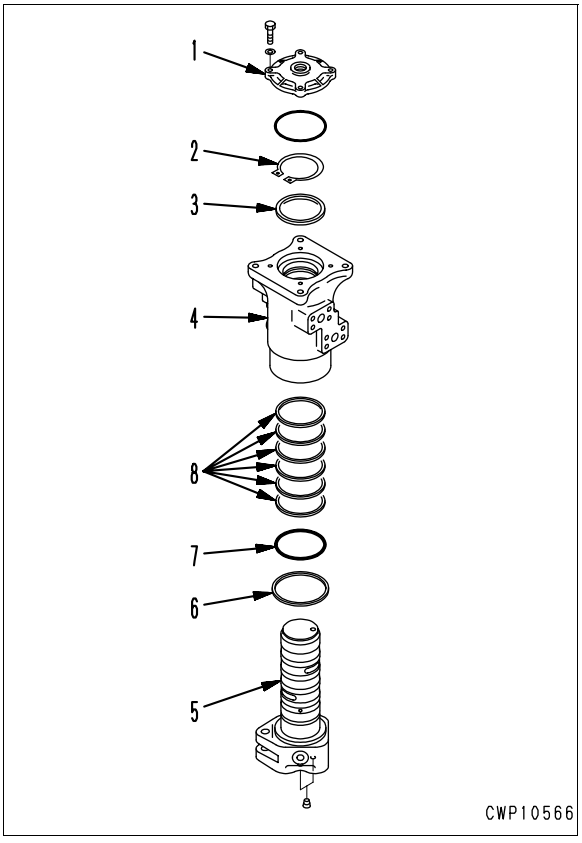
DISASSEMBLY AND ASSEMBLY OF CENTER SWIVEL JOINT ASSEMBLY

SPECIAL TOOLS

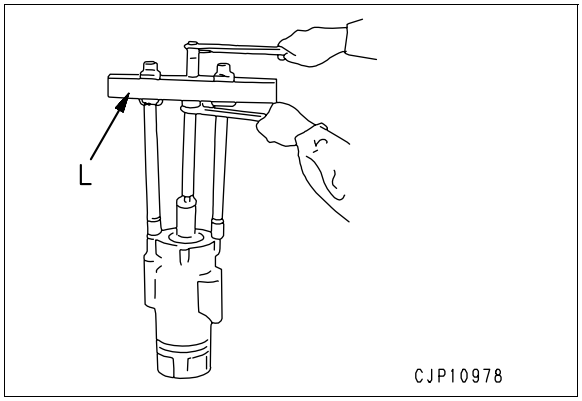
Mark		Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
L		790-101-2501	Push puller	●	1		
		• 790-101-2510	• Block		1		
		• 790-101-2520	• Screw		1		
		• 791-112-1180	• Nut		1		
		• 790-101-2540	• Washer		1		
		• 790-101-2630	• Leg		2		
		• 790-101-2570	• Plate		4		
		• 790-101-2560	• Nut		2		
		• 790-101-2650	• Adapter		2		

*Distinction between new and existing part.

DISASSEMBLY



1. Remove cover (1).
2. Remove snap ring (2).
3. Using tool **L**. pull out swivel rotor (4) and ring (3) from swivel shaft (5).
4. Remove seal (6) from swivel shaft (5).
5. Remove O-ring (7) and slipper seal (8) from swivel rotor (4).



ASSEMBLY

1. Assemble slipper seal (8) and O-ring (7) to swivel rotor (4).
2. Assemble seal (6) in swivel shaft (5).
3. Set swivel shaft (5) to block, then using push tool, tap swivel rotor (4) with a plastic hammer to install.

   Contact surface of rotor, shaft:
   Grease (G2-L1)

   ★ When installing the rotor, be extremely careful not to damage the slipper seal and the O-ring.
4. Install ring (3) and secure with snap ring (2).
5. Install O-ring and cover (1).

   Mounting bolt: **31.4 ± 2.9 Nm {3.2 ± 0.3 kgm)**

REMOVAL AND INSTALLATION OF HYDRAULIC TANK ASSEMBLY

REMOVAL

1. Remove covers (1) and (2).

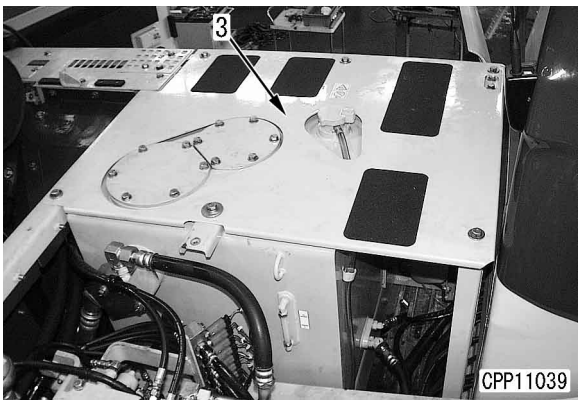


2. Drain oil from hydraulic tank.

Hydraulic tank: Approx. 365 **l**

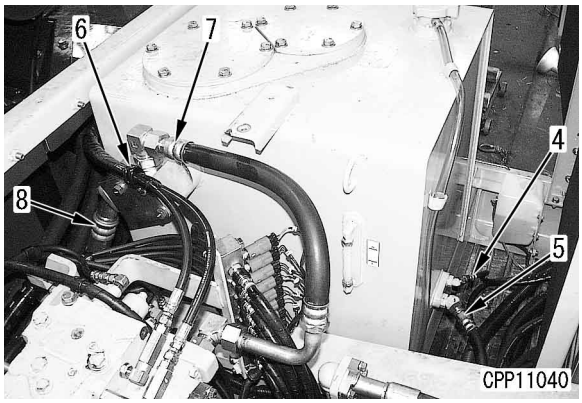
3. Open up engine hood.

4. Remove upper cover (3).



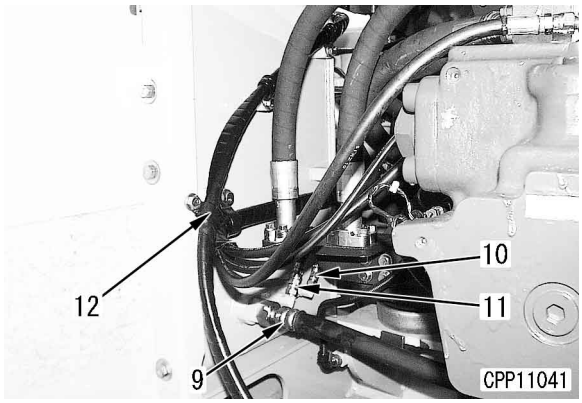
5. Disconnect drain hoses (4) and (5).

6. Detach clamp (6) and then disconnect control valve return hose (7) and oil cooler return hose (8).

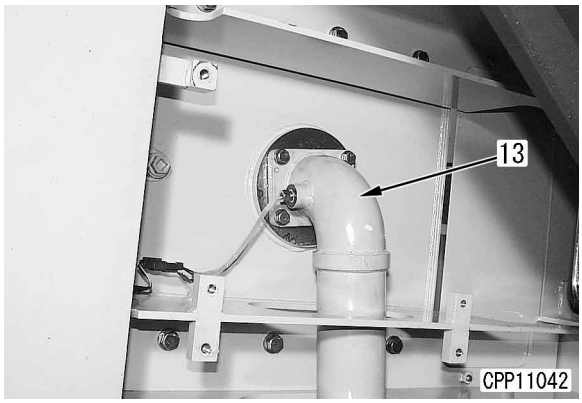


7. Disconnect drain hoses (9), (10) and (11).

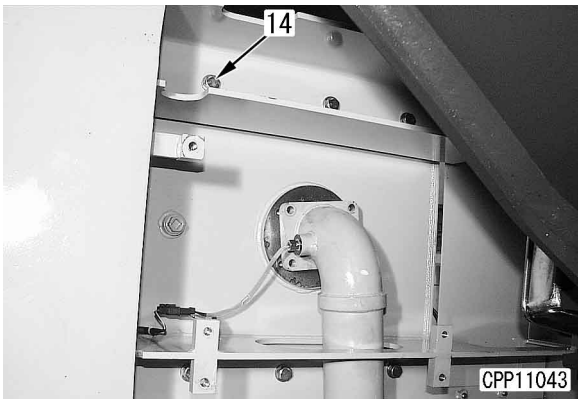
8. Detach clamps (12) at four points.



9. Disconnect suction tube (13) after removing four mounting bolts.

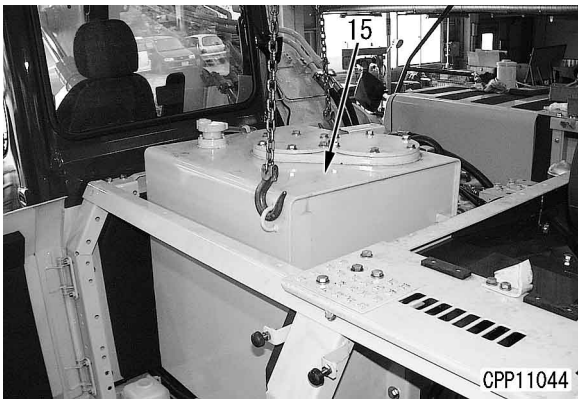


10. Lift hydraulic tank assembly temporarily to remove six mounting bolts (14).



11. Lift off and remove hydraulic tank assembly (15).

kg Hydraulic tank assembly: 200 kg



INSTALLATION

- Install in reverse order of removal.
- **Refilling with oil (hydraulic tank)**
  - ★ Add oil through the oil filler to the specified level.
    Start and run the engine to circulate the oil through the system. Then check the oil level again.

  Hydraulic tank: **Approx. 365 l**

- **Air Bleeding**
  - ★ Bleed the air.
    For details. see TESTING AND ADJUSTING. Air Bleeding of Various Parts.

REMOVAL AND INSTALLATION OF CONTROL VALVE ASSEMBLY

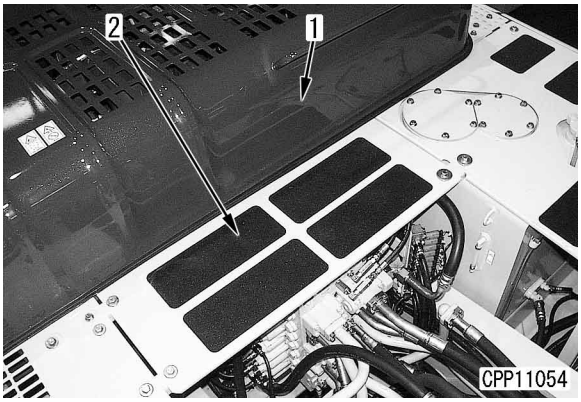
REMOVAL

⚠ Lower the work equipment to the ground completely and stop the engine. Then loosen the cap on the hydraulic tank slowly to release the remaining pressure inside the tank, and put the safety lock lever to the LOCK position.

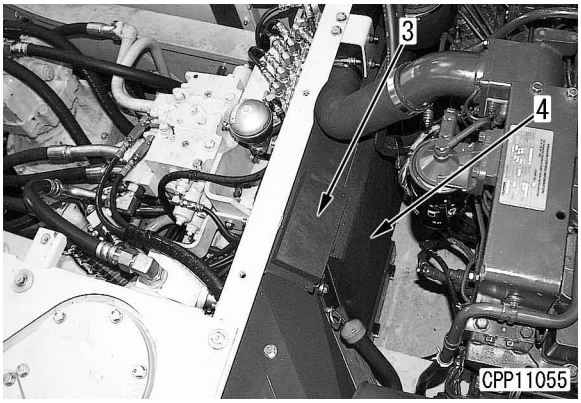
★ Attach a tag to each pipe to avoid making an error when installing them again later.

1. Open up engine hood (1).

2. Remove control valve upper cover (2).

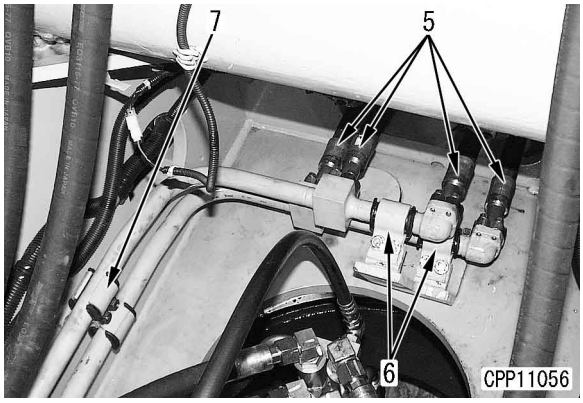


3. Remove partition covers (3) and (4) between engine and control valves.

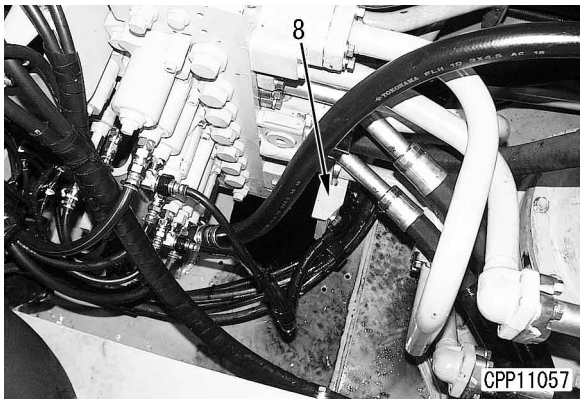


4. Disconnect four boom hoses (5).

5. Remove boom tube mounting clamps (6) and (7).

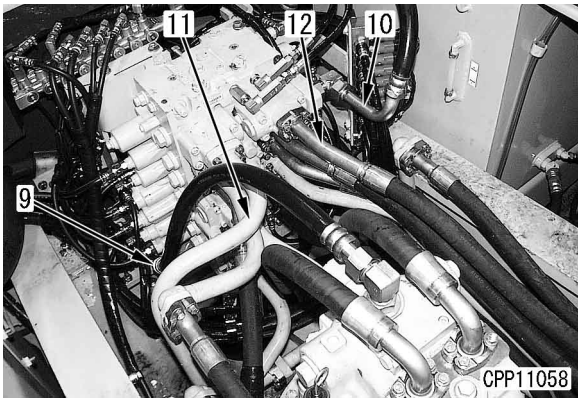


6. Remove plate (8).

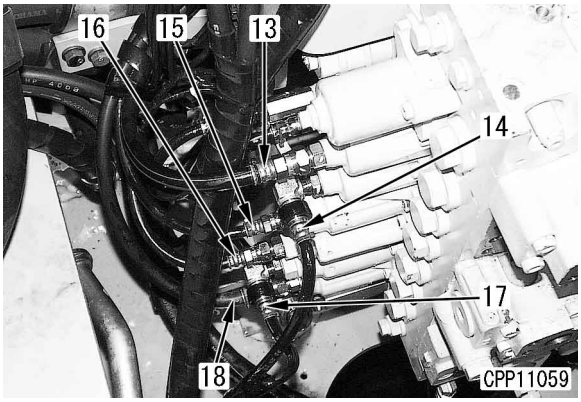


7. Disconnect eight control valve hoses and eight tubes.
   - (9): TSW port hose (Swing motor S port)
   - (10): T1 port hose (to hydraulic tank)
   - (11): In the sequence of top to bottom
     - A-1 port tube (Boom Hi bottom side)
     - A1 port tube (Bucket bottom side)
     - A2 port hose (Swivel joint A port)
     - A3 port tube (Boom bottom side)
     - A4 port hose (Swing motor MB port)
     - A5 port hose (Swivel joint C port)
     - A6 port tube (Arm head side)

- (12): In the sequence of top to bottom
  B-1 port hose (Arm Hi bottom side)
  B1 port hose (Bucket head side)
  B2 port hose (Swivel joint B port)
  B3 port tube (Boom head side)
  B4 port hose (Swing motor MA port)
  B5 port hose (Swivel joint D port)
  B6 port tube (Arm bottom side)

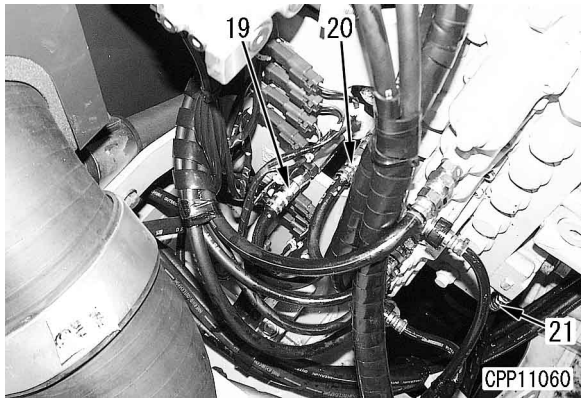


8. Disconnect six PPC hoses on the right side.
   - (13): Bucket DUMP (Hose band: Black)
   - (14): Left FORWARD (Hose band: Red)
   - (15): Boom LOWER (Hose band: Brown)
   - (16): Right SWING
   - (17): Right FORWARD (Hose band: Green)
   - (18): Arm DIGGING (Hose band: Green)

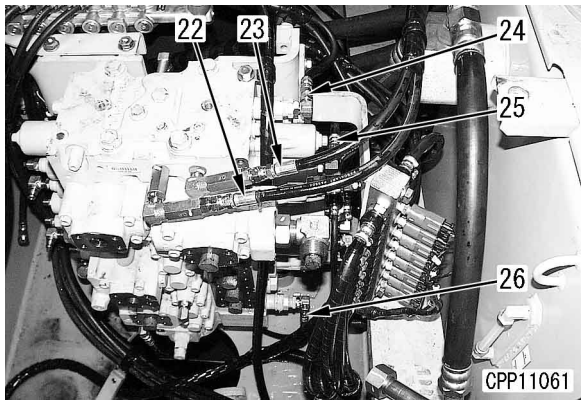


9. Disconnect two hoses between control valves and solenoid.
   - (19): PS port hose (Hose band: Yellow - blue)
   - (20): PST port hose (Hose band: Brown)

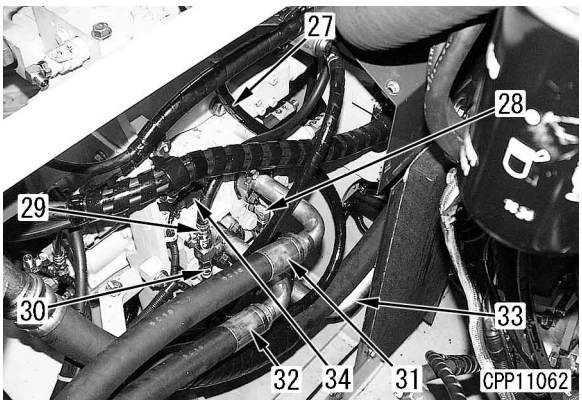
10. Disconnect drain hose (21).



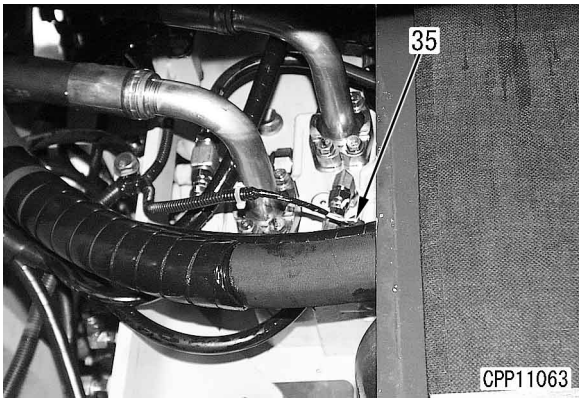
11. Disconnect seven PPC hoses and five control valve hoses on the left side.
   - (22): PLS2 port hose (Hose band: Red)
   - (23): PLS1 port hose
   - (24): PX1 port hose (Hose band: Green)
   - (25): In the sequence of top to bottom,
     Bucket DIGGING (Hose band: White)
     Left REVERSE
     Boom RAISE (Hose band: Green)
     SWING LS divider valve
     BP5 port hose (to solenoid)
     Left SWING (Hose band: Red)
     Right REVERSE (Hose band: Blue)
     Arm DUMP (Hose band: Yellow)
   - (26): PX2 port hose



12. Disconnect 7 hoses and wiring connectors at two points.
    - (27): PPS1 port hose (Front pump)
    - (28): PPS2 port hose (Rear pump)
    - (29): PR port hose (Solenoid)
    - (30): PR port hose (Pump)
    - (31): PP1 port hose (Front pump)
    - (32): PP2 port hose (Rear pump)
    - (33): T port hose (Oil cooler)
    - (34): A51 (Front pump pressure sensor)

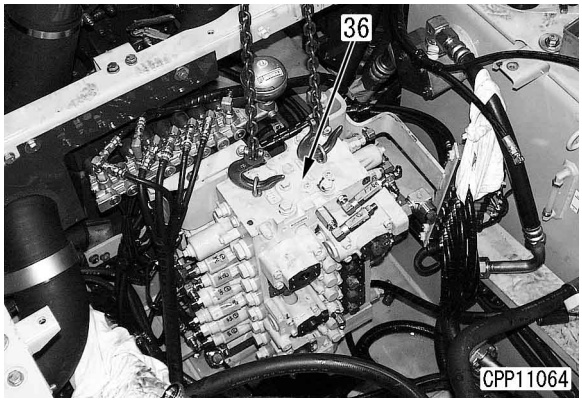


- (35): A52 (Rear pump pressure sensor)



13. Lift and remove control valve assembly (36) after removing three mounting bolts.

kg Control valve assembly: 250 kg



INSTALLATION

- Install in reverse order of removal.
- **Refilling with oil (hydraulic tank)**
  - ★ Add oil through the oil filler to the specified level.
    Run the engine to circulate the oil through the system. Then check the oil level again.
- **Bleeding air**
  - ★ Bleed the air from the circuit between the valve and the hydraulic cylinder.
    For details, see TESTING AND ADJUSTING, Air Bleeding of Various Parts.

DISASSEMBLY AND ASSEMBLY OF CONTROL VALVE ASSEMBLY

★ This chapter deals only with precautions to be followed when disassembling and reassembling the control valve assembly.

SPECIAL TOOLS

Mark		Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
M	1	796-946-1310	Guide		1		
		(For 723-46-40100 & 723-46-40601)					
		796-946-1810	Guide		1		
		(For 723-46-43100 & 723-46-43400)					
		796-946-2110	Guide		1		
		(For 723-46-44100)					
		796-946-2210	Guide		1		
		(For 723-46-45100)					
	2	796-946-1320	Guide		1		
		(For 723-46-40100 & 723-46-40601					
		796-946-1820	Guide		1		
		(For 723-46-43100 & 723-46-43400)					
		796-946-2120	Guide		1		
		(For 723-46-44100)					
		796-946-2220	Guide		1		
		(For 723-46-45100)					
	3	796-946-1330	Sleeve		1		
		(For 723-46-40100 & 723-46-40601)					
		796-946-1830	Sleeve		1		
		(For 723-46-43100 & 723-46-43400)					
		796-946-2130	Sleeve		1		
		(For 723-46-44100)					
		796-946-2230	Sleeve		1		
		(For 723-46-45100)					

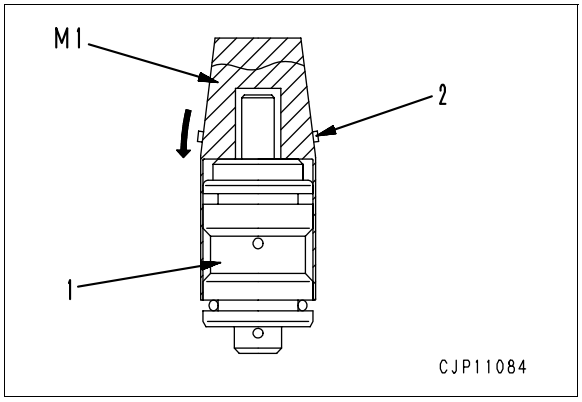
*Distinction between new and existing part.

Procedures for replacing pressure compensation valve seal

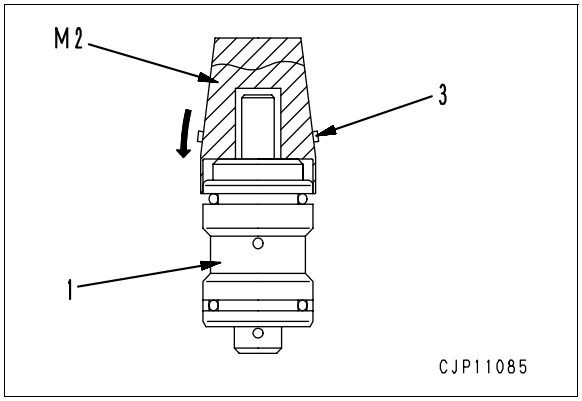
1. Remove the seal from pressure compensation valve.
   ★ Clean the pressure compensation valve thoroughly. Install the seal using a tool, as indicated in the diagram.

2. Install the O-ring onto piston (1).

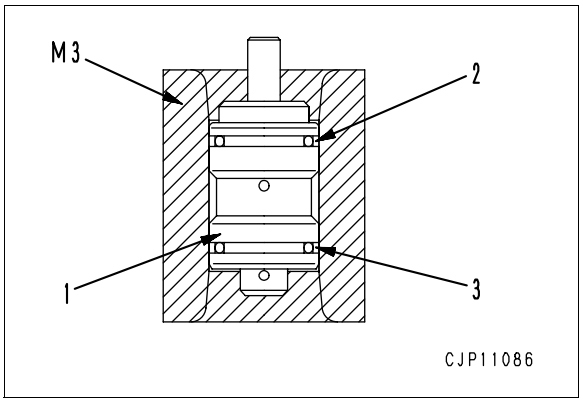
3. Place tool **M1** onto piston (1) and push it in slowly by hand so that seal (2) spreads out evenly.
   ★ The seal may be also installed by pushing it down to the flat surface of the tool and then pushing it in with the tool fitted to the piston.



4. Likewise, set tool **M2** to piston (1) in the same direction and push it slowly by hand so that the other seal (3) may be spread out evenly.
   ★ The seal may be also fitted by pushing it down to the flat surface of the tool and then pushing it in with the tool fitted to the piston.



5. Keep compensation tool **M3** fitted to piston (1) for about one minute so that seal (2) and (3) will become well adapted.
   ★ Check that there is no protrusion or cut on the seal.



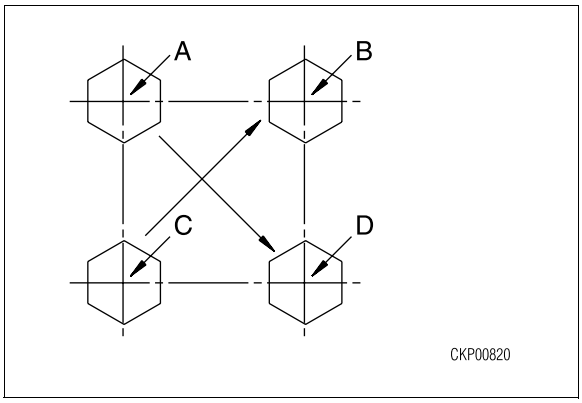
6. Assemble the piston in the sleeve.
   ★ If it is difficult to install the sleeve, do not attempt to push it in forcibly, but try it again after repeating the same process in Step 5. above and confirming the seals are well adapted.
   ★ After the installation, push the piston by hand and check that the piston reacts only with spring force.

ASSEMBLY

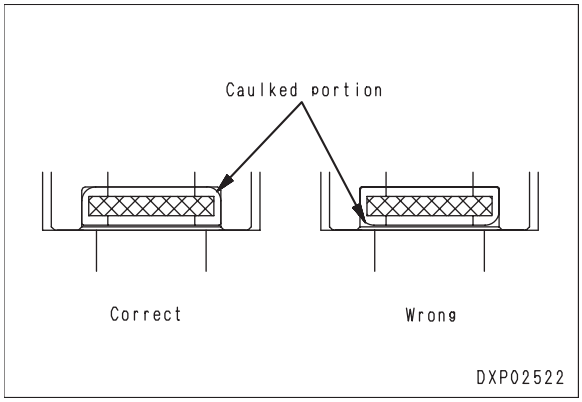
- Coat the sliding surface with engine oil and then reassemble the control valve assembly.
- Upper and lower control valve covers

  Mating surfaces of upper and lower control covers:
  Sealant 242 or equivalent
- Tighten the mounting bolts for the upper and lower control covers in the sequence illustrated below.

  N·m Mounting bolt for upper and lower control covers:
  156.9 - 176.5 Nm (16 - 18 kgm)



- A filter for the valve assembly is to be assembled in the direction shown in the illustration below.



- Merge-divider valve

  Mating surfaces of merge-divider valve:
  Sealant 242 or equivalent
- Tighten the mounting bolts for the merge-divider valve in the same sequence as that for the control valve cover mounting bolts.

  N·m Merge-divider valve mounting bolt:
  156.9 - 176.5 Nm (16 - 18 kgm)
- Back pressure valve

  N·m Back pressure valve mounting bolt:
  58.8 - 73.6 Nm (6 - 7 kgm)
- Tighten the mounting bolts for boom Hi check valve, quick return valve, lock valve and arm plate in the same sequence as for the control valve cover mounting bolts.

  N·m Boom Hi check valve mounting bolt: 59 - 74 Nm (6 - 7.5 kgm)

  N·m Quick return valve, lock valve and arm plate mounting bolts:
  58.8 - 73.6 Nm (6 - 7.5 kgm)
- Pressure compensation valve
  ★ Install each pressure compensation valve, paying attention to the counter mark that was put when removing it.
- Main relief valve assembly
  After building the main relief valve assembly in the control valves, refer to the Inspection And Adjustment of Hydraulic Oil Pressure In Hydraulic Circuit For Work Equipment, Swing And Travel section in the TESTING AND ADJUSTING chapter, in this manual.

REMOVAL AND INSTALLATION OF HYDRAULIC PUMP ASSEMBLY

SPECIAL TOOLS

Mark	Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
C	796-460-1210	Oil stopper	■	1		
	796-770-1320	Adapter	■	1		

*Distinction between new and existing part.

REMOVAL

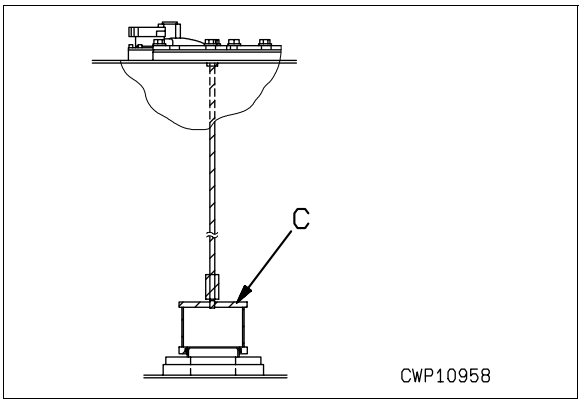
Disconnect the negative (-) terminal of the battery before starting with the work.

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

★ Attach identification tags to all piping to avoid mistakes when installing.

1. Remove hydraulic tank strainer and stop oil flow-out using tool **C**.
   ★ If tool **C** is not used, remove the drain plug and drain oil from the hydraulic tank and piping.

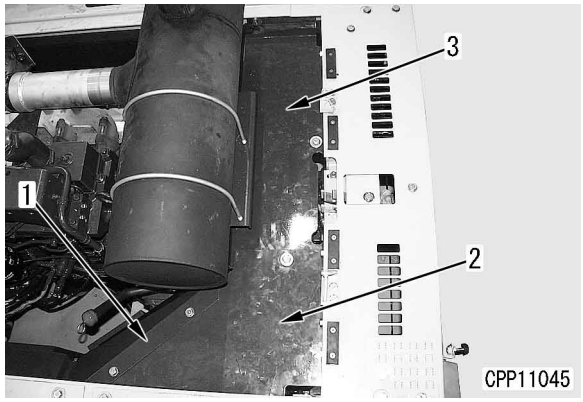
   Hydraulic tank: Approx. 365 **l**



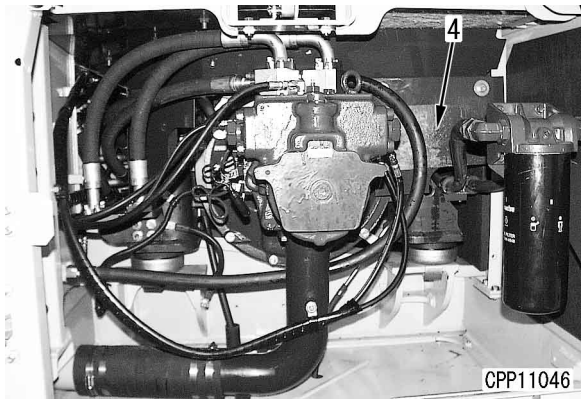
2. Drain oil from the damper case.

   Damper case: Approx. 13.5 **l**

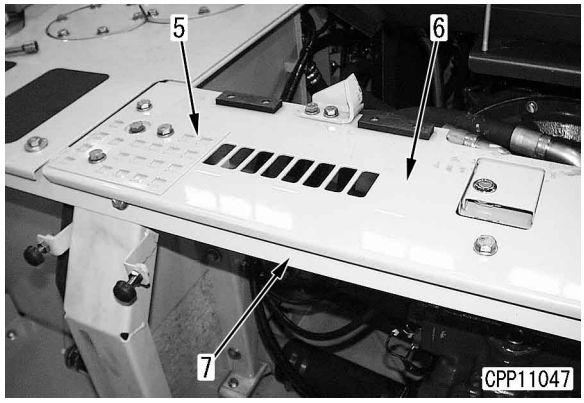
3. Remove covers (1), (2) and (3).



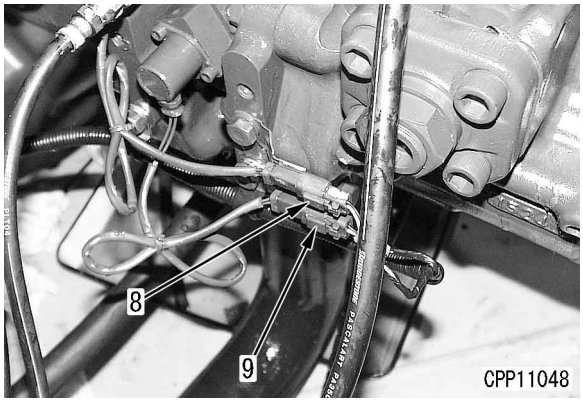
4. Remove cover (4).



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

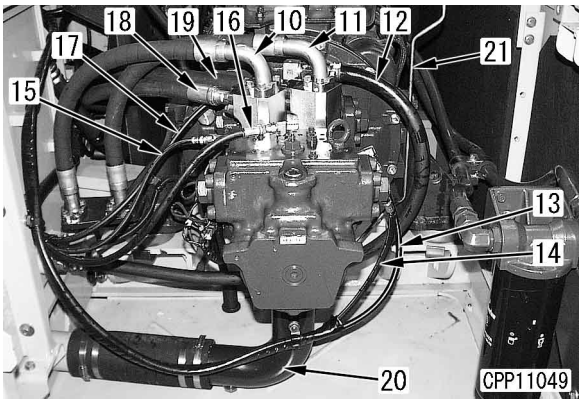


6. Disconnect pump wiring connectors at two points.
   - (8): V22 (PC-EPC solenoid valve)
     Color band: Red
   - (9): V21 (LS-EPC solenoid valve)
     Color band: White



7. Disconnect ten hoses and one tube.
   - (10): Rear pump discharging port hose
   - (11): Front pump discharging port hose
   - (12): Drain port hose
   - (13): Front load pressure input port hose
   - (14): Rear load pressure input port hose
     Color band: Red
   - (15): EPC source pressure port hose
     Color band: Yellow
   - (16): Rear pressure port hose
     Color band: Yellow
   - (17): Front pressure input port hose
   - (18): Rear pump discharging port hose
   - (19): Front pump discharging port hose
   - (20): Pump suction port tube

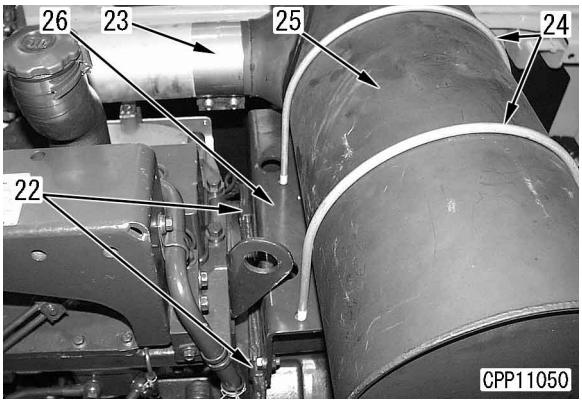
8. Disconnect muffler drain tube (21).



9. Disconnect clamps (22) at two points.

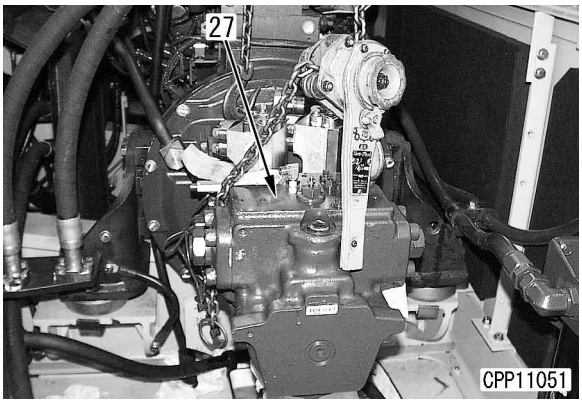
10. Remove muffler clamp (23) and two U bolts (24) to detach muffler (25).

11. Remove muffler bracket (26).



12. Lift and remove hydraulic pump assembly (27). ※1

kg Hydraulic pump assembly: 220 kg



INSTALLATION

- Install in reverse order of removal.

※1


Hydraulic pump involute spline:
Anti-friction compound (LM-G)


Hydraulic pump case mating surface:
Gasket sealant (LG-6)

- Refilling hydraulic oil (Damper case)
  Refill hydraulic oil through the oil filler port to the specified level.


Damper hydraulic oil : Approx. 13.5 **l**

- Refilling hydraulic oil (hydraulic tank)
  Refill hydraulic oil through the oil filler port to the specified level, and let the oil circulate in the hydraulic system by starting the engine. Then check the oil level again.

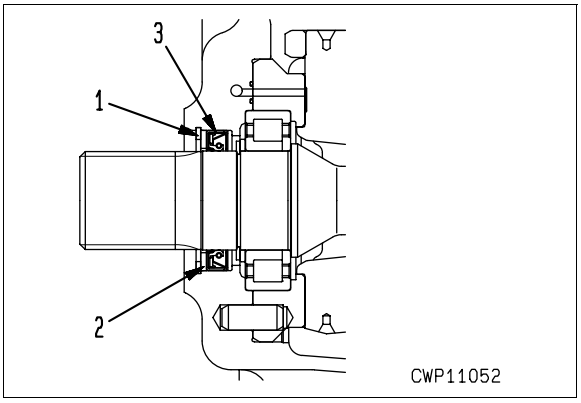

Hydraulic tank : Approx. 365 **l**

- **Bleeding air**
  ★ Bleed the air.
  For details. see TESTING AND ADJUSTING. Air Bleeding of Various Parts.

REMOVAL AND INSTALLATION OF OIL SEAL IN HYDRAULIC PUMP INPUT SHAFT

REMOVAL

1. Remove the hydraulic pump assembly. Refer to the Removing Hydraulic Pump Assembly section.
2. Remove snap ring (1) and then remove spacer (2).
3. Pry off oil seal (3) with a screwdriver. ※1
   - ★ When attempting to pry off the seal, do not damage the shaft.



INSTALLATION

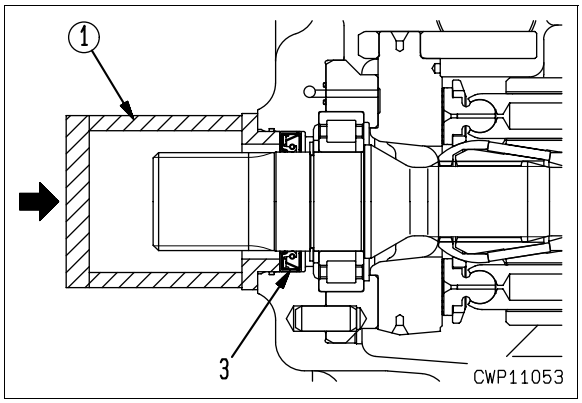
- Install in reverse order of removal.

※1

Oil seal lip portion: Grease (G2-LI)

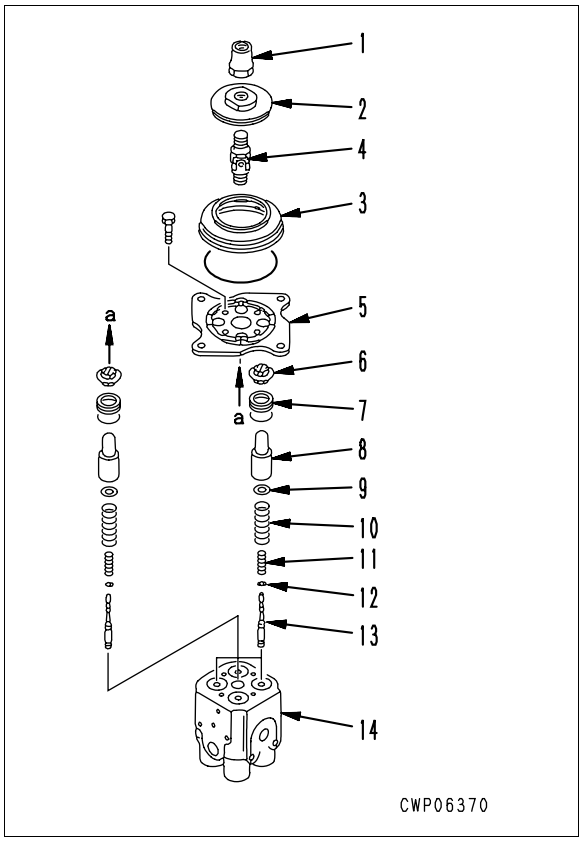
Oil seal outer circumference: Grease (G2-LI)

- ★ Coat the oil seal outer circumference thinly with grease.
- ★ Press-fit oil seal (3), using tool b.



DISASSEMBLY AND ASSEMBLY OF WORK EQUIPMENT PPC VALVE ASSEMBLY

★ This section deals only with precautions to be followed when reassembling the PPC valve assembly for work equipment.



ASSEMBLY

- Reassembling work equipment PPC valve assembly
  - ★ Install spring (11) so that the end surface of smaller end coil diameter (inner diameter) will face the shim (12) side.
  - ★ Springs (10) in use differ in the number of turns according to hydraulic ports as classified in the table below. Hence, take care when installing one.

Port location	Spring free length
P1, P2	44.4 mm
P3, P4	42.4 mm

  - ★ The location of each port is stamped in the lower part of the valve body.

Piston (8): Grease (G2-LI)

★ When assembling piston (8), coat the piston outer periphery and body hole inner periphery with grease.

N•m Plate (5) mounting bolt:
11.8 - 14.7 Nm (1.2 -1.5 kgm)

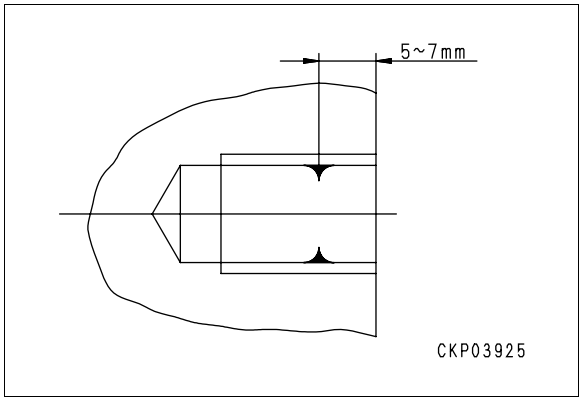
Joint (4) sliding surface:
Grease 2 - 4 cc (G2-LI)

Body female screw portion:
Adhesive compound (LT-2)

★ Coat the female screw body with Loctite at two spots as shown in the diagram below. Each spot is to be coated with a drop (approx. 0.02 g).

N•m Joint (4): 39 - 49 Nm (4 - 5 kgm)

★ Strictly follow the specified torque for the joint.



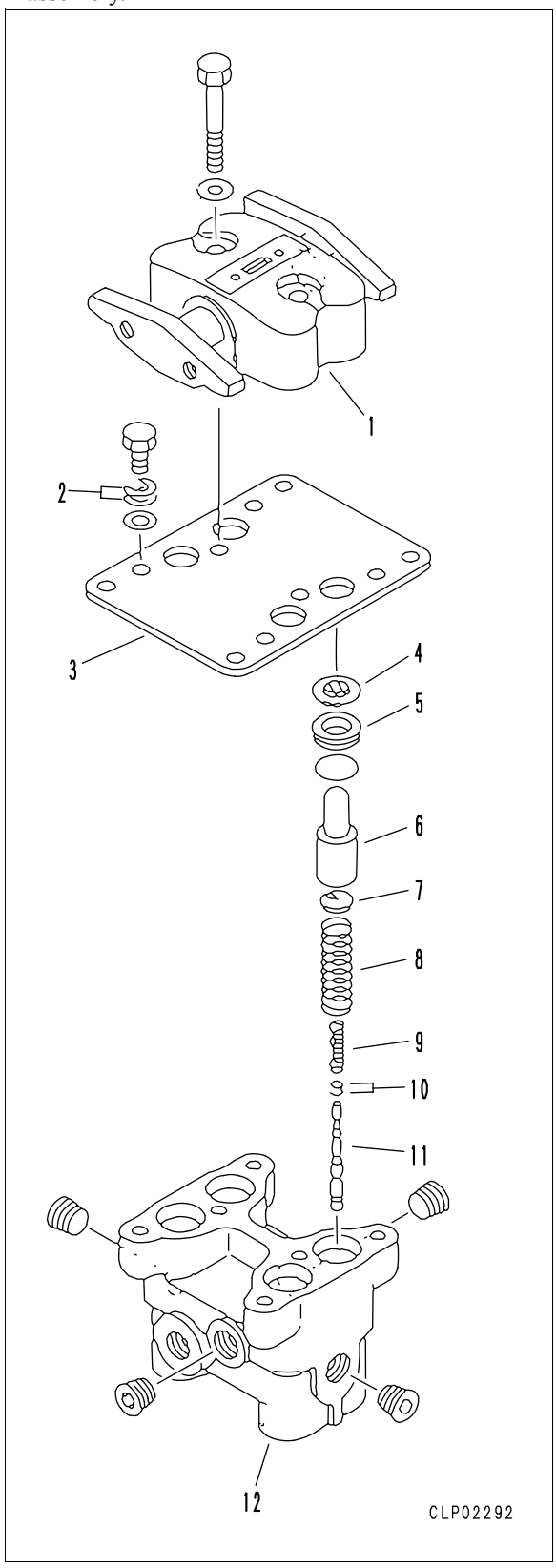
Contact surfaces of piston and disc (2):
Grease 0.3 - 0.8 cc (G2-LI)

N•m Nut (1): 98 - 127 Nm (10 - 13 kgm)

★ After assembling the disc, refer to the Adjustment of Work Equipment and Swing PPC Valve section of the TESTING AND ADJUSTING chapter of this manual.

DISASSEMBLY AND ASSEMBLY OF TRAVEL PPC VALVE ASSEMBLY

★ This chapter deals only with precautions to be followed when reassembling the travel PPC valve assembly.



ASSEMBLY

- Travel PPC valve assembly
  - ★ Before fitting a shim, check the required number and thickness, then fit it to the same position as confirmed when removing it.
    Thickness of standard shim: 0.3 mm
  - ★ The spring is symmetrical between the upper and lower sides, so fit it with the side of smaller end coil diameter (inner diameter) facing the shim side.


Piston outer periphery and body hole inner periphery:
Grease (G2-LI)


Shaft sliding portion and connecting portion of piston and lever:
Grease (G2-LI)

DISASSEMBLY AND ASSEMBLY OF HYDRAULIC CYLINDER ASSEMBLY

SPECIAL TOOLS

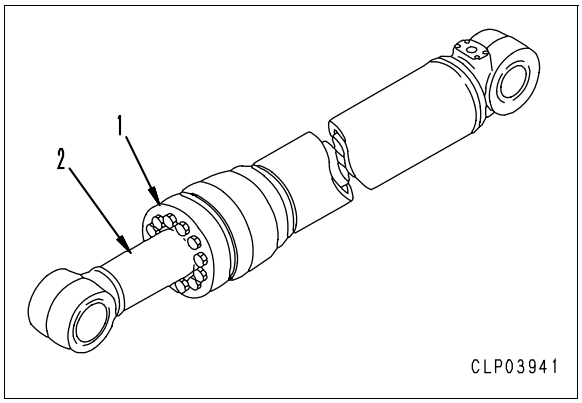
Mark		Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
N	1	790-502-1003	Cylinder repair stand	■	1		
	2	790-102-4300	Wrench Assembly	■	1		
		790-102-4310	Pin	■	2		
	3	790-720-1000	Expander	●	1		
	4	796-720-1680	Link	●	1		
		07281-01589	Clamp	●	1		
	5	790-201-1702	Push tool kit	■	1		
		• 790-201-1851	• Push tool (for bucket and boom)		1		
		• 790-201-1861	• Push tool (for arm)		1		
		• 790-101-5021	• Grip		1		
		• 01010-50816	• Bolt		1		
	6	790-201-1500	Push tool kit	■	1		
		• 790-101-5021	• Grip		1		
		• 01010-50816	• Bolt		1		
		790-201-1660	Plate (for boom and bucket)		1		
		790-201-1670	Plate (for arm)		1		

*Distinction between new and existing part.

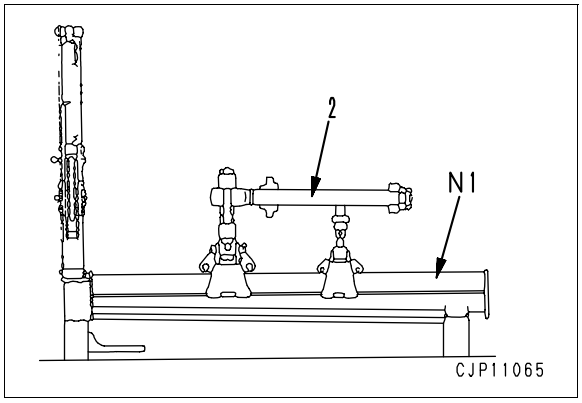
DISASSEMBLY

1. Piston rod assembly

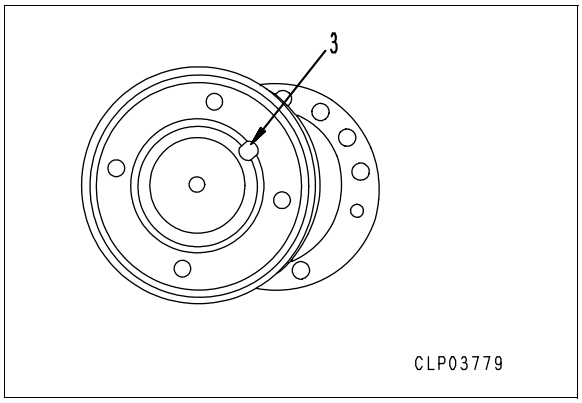
1) Remove piping from cylinder assembly.
2) Remove mounting bolts and disconnect head assembly (1).
3) Pull out piston rod assembly (2).
   ★ Place a container under the cylinder to catch the oil.



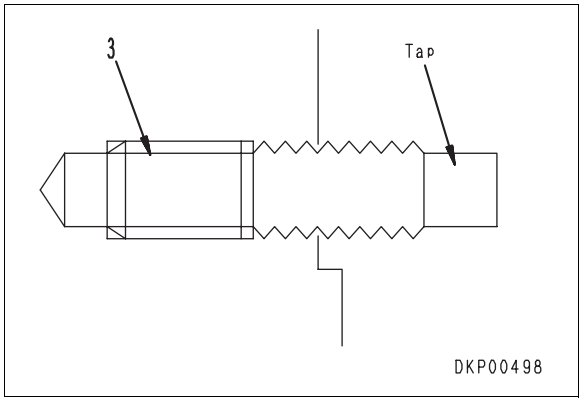
4) Disassemble piston rod assembly as follows.
   i) Set piston rod assembly (2) in tool **N1.**



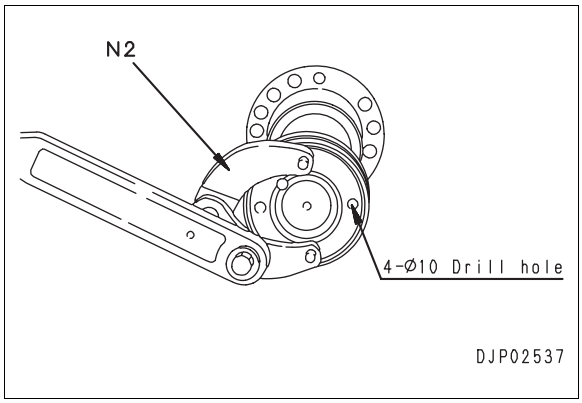
   ii) Remove stopper screw (3) of piston assembly.
   ★ Common screw size for boom, arm, and bucket cylinder:
   M12 x Pitch 1.75.



★ If the caulking of screw (3) is too strong and it cannot be removed, tighten the screw fully, then fit a tap to the thread and remove the screw.



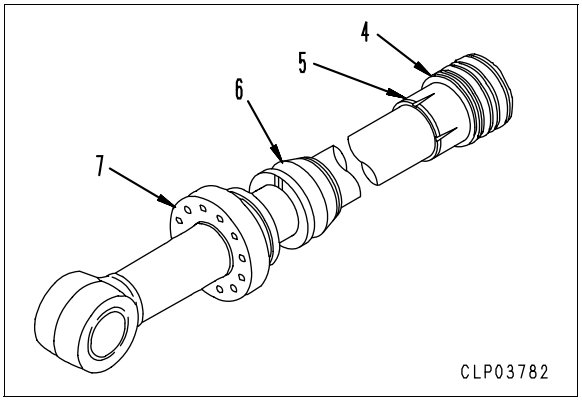
iii) Using tool **N2**, remove piston assembly (4).
- When not using tool **N2**, use the drill holes (∅ 10, 4 places) and loosen the piston assembly.



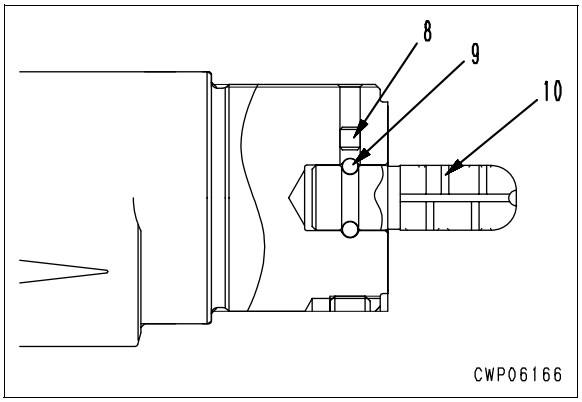
iv) Remove plunger (5).
- Boom and arm cylinder only

v) Remove collar (6).
- Boom and arm cylinder only

vi) Remove head assembly (7).

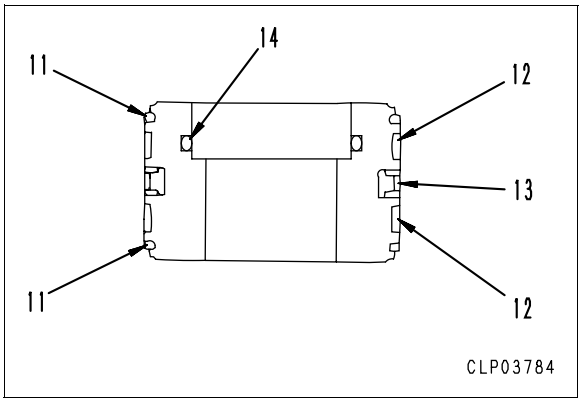


vii) Remove cap (8), and pull 12 balls (9), then remove plunger (10).
- Arm cylinder only



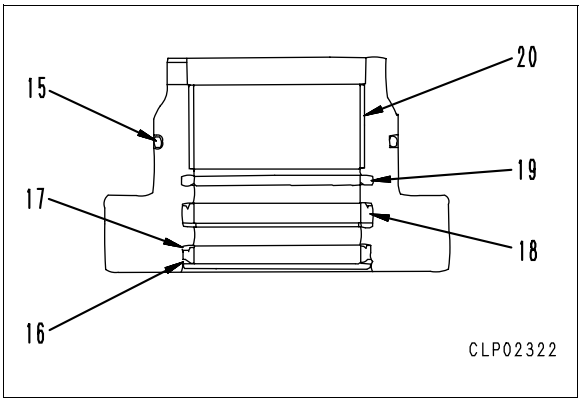
2. Disassembly of piston assembly

1) Remove rings (11).
2) Remove wear rings (12).
3) Remove piston ring (13).
4) Remove O-ring and backup ring (14).



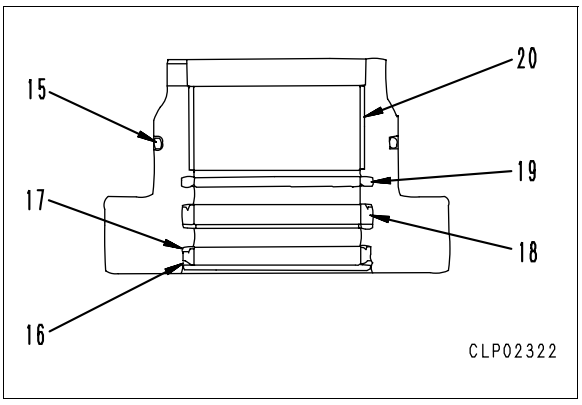
3. Disassembly of cylinder head assembly

1) Remove O-ring and backup ring (15).
2) Remove snap ring (16), then remove dust seal (17).
3) Remove rod packing (18).
4) Remove buffer ring (19).
5) Remove bushing (20).



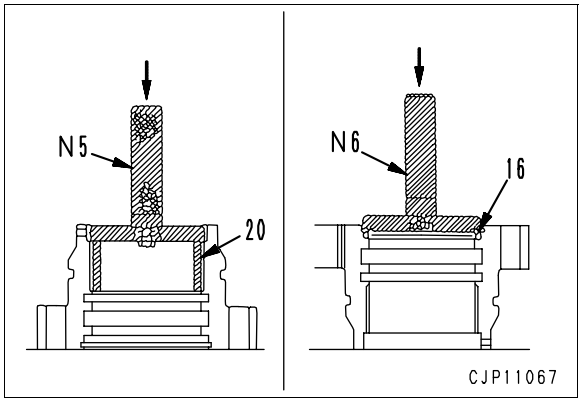
ASSEMBLY

★ Be careful not to damage the packing, dust seals, and O-rings.
★ Clean each part, then cover the piping ports and pin-inserting hole to prevent dust from entering them.
★ Do not try to force the backup ring into position. Warm it in warm water (50 - 60°C) before installing it.



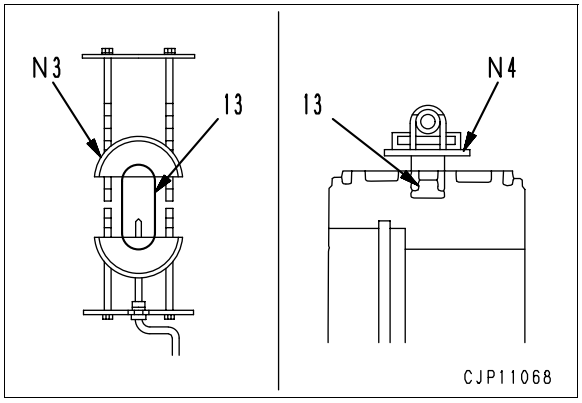
1. Assembly of head assembly

1) Using tool **N5**, press fit bushing (20).
2) Assemble buffer ring (19).
3) Assemble rod packing (18).
4) Using tool **N6**, install dust seal (17), and secure with snap ring (16).
5) Install backup ring and O-ring (15).



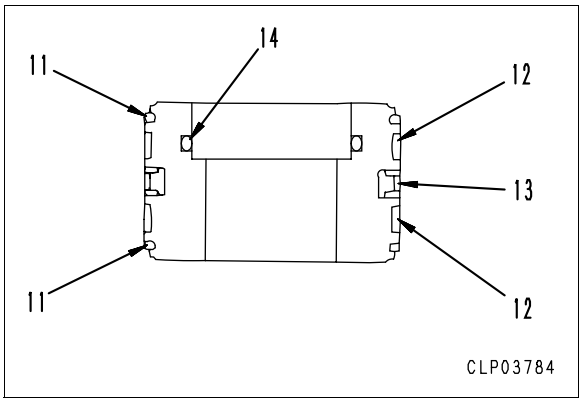
2. Assembly of piston assembly

1) Using tool **N3**, expand piston ring (13).
   ★ Set the piston ring on tool **N3**, and turn the handle 8 - 10 times to expand the ring.
2) Set tool **N4** in position, and compress piston ring (13).



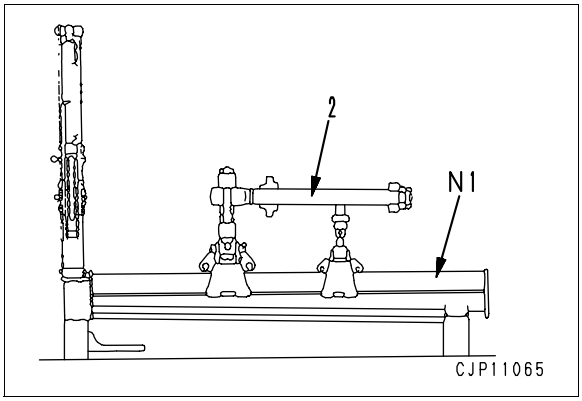
3) Install backup ring and O-ring (14).
4) Assemble wear ring (12).
5) Assemble ring (11).
   ★ Be careful not to open the end gap of the ring too wide.

Ring grove: **Grease (G2-L1)**

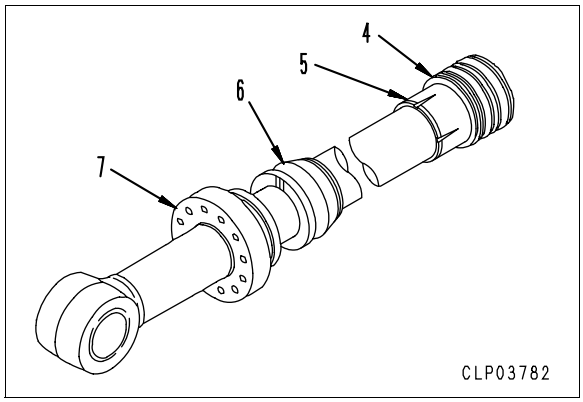


3. Piston rod assembly

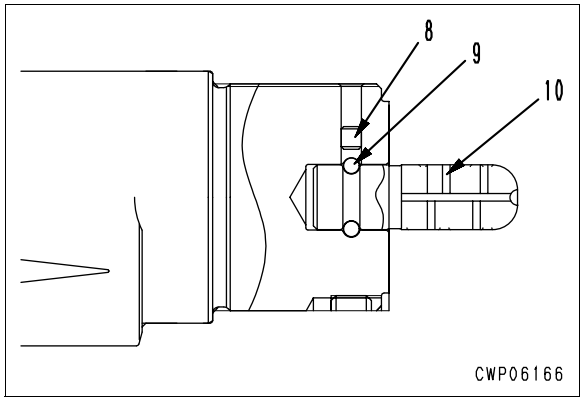
1) Set piston rod assembly (2) to tool **N1**.



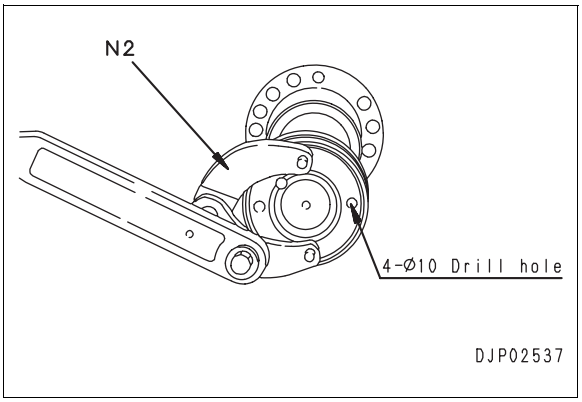
2) Assemble head assembly (7).
3) Fit O-ring and backup ring to collar (6), then assemble.
   • Boom and arm cylinder only
4) Assemble plunger (5).
   • Boom and arm cylinder only



5) Set cushion plunger (10) to piston rod, then assemble 12 balls (9) and secure with cap (8).
   ★ Check that there is a small amount of play at the tip of the plunger.
   • Arm cylinder only



6) Assemble piston assembly (4) as follows.
   - When using rod and piston (2) again:
     - ★ Wash thoroughly and remove all metal particles and dirt.
     - i) Screw in piston assembly (4), then use tool **N2** to tighten piston assembly (2) so the position of the screw thread hole matches
       - ★ Remove all burrs and flashes with a file.

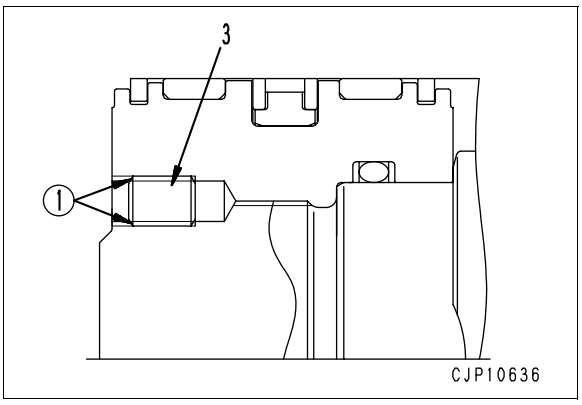


ii) Tighten screw (3).

Screw thread: Loctite No. 262

Screw: 58.9 - 73.6 Nm
{6 - 7.5 kgm}

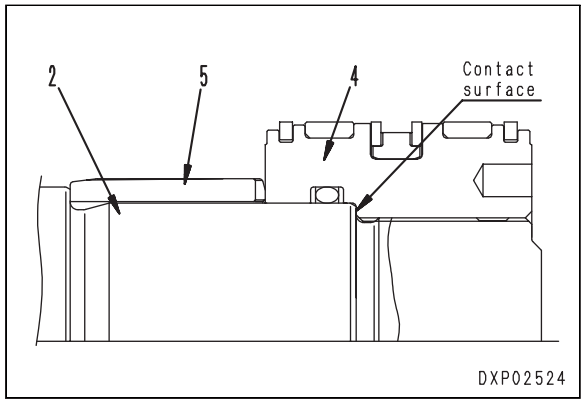
iii) Punch threads b at four points for caulking.



- When using a new part for either or both of rod piston assembly (2)
  - ★ For the rod with bottom cushion, mark the cushion plug position on the end of the rod.
  - Arm cylinder only
  - i) Screw in until piston assembly (4) contacts end face of rod, then use tool to tighten.

Piston assembly: **294 ± 29.4 Nm**
{30 ± 3.0 kgm)

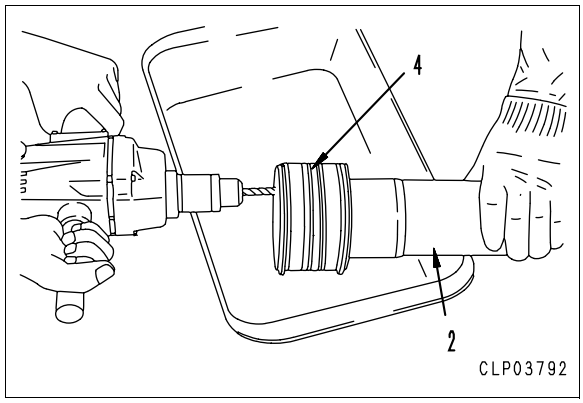
- ★ After tightening the piston, check that there is play in plunger (5).
- Boom, arm cylinder only



ii) Machine one of the holes used to install screw (3).
- ★ Align a drill horizontal with the V-groove of the thread of rod (2) and piston (4), then carry out machining.
- ★ For the cylinder with bottom cushion (arm cylinder), avoid the cushion plug position when machining.
- Screw machining dimension (mm)

Drill diameter	Bottom hole depth	Tap used	Tap depth
10.3	27	12 x 1.75	20

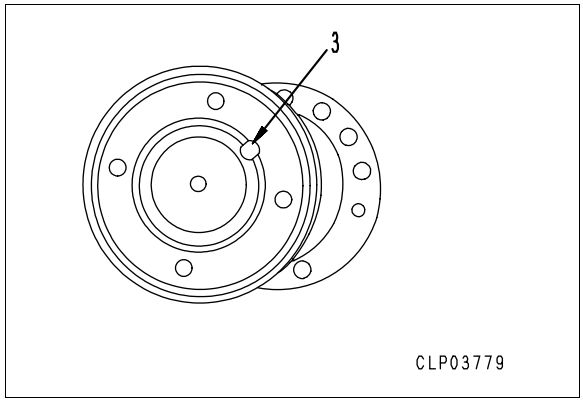
iii) After machining, wash thoroughly to remove all metal particles and dust.



iv) Tighten screw (3).

N·m Screw: 58.9 - 73.6 Nm {6 - 7 kgm}

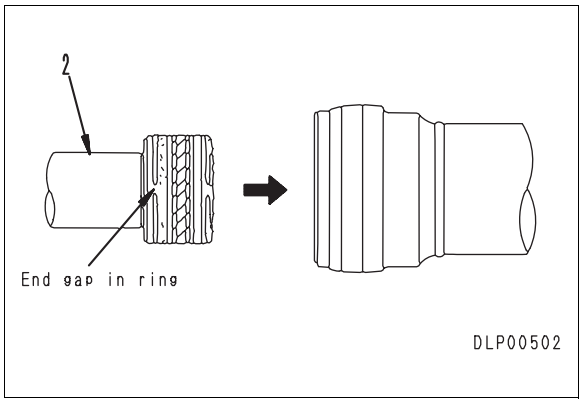
v) Caulk thread at 4 places with punch.



7) Assemble piston rod assembly (2).

★ Set the end gap of the ring horizontally (at the side position), align axial center of cylinder tube, then insert.

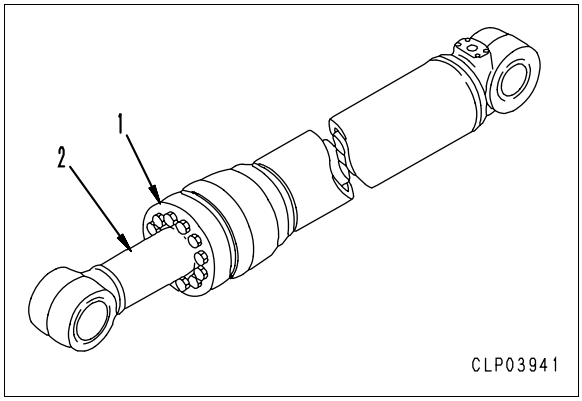
★ After inserting, check that the ring is not broken and has not come out, then push in fully.



8) Tighten head assembly (1) with mounting bolts.

N·m Mounting bolt:

Cylinder	Tightening torque
Bucket	373 ± 54 Nm {38.0 ± 5.5 kgm}
Arm	490 ± 49 Nm {50.0 ± 5.0 kgm}
Boom	373 ± 54 Nm {38.0 ± 5.5 kgm}



9) Install piping.

REMOVAL AND INSTALLATION OF WORK EQUIPMENT ASSEMBLY

SPECIAL TOOLS

Mark	Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
P	796-670-1100	Remover	■	1		
	• 796-670-1110	• Sleeve		1		
	• 796-670-1120	• Plate		1		
	• 796-670-1130	• Screw		1		
	• 791-775-1150	• Adapter		1		
	• 01643-33080	• Washer		1		
	• 01803-13034	• Nut		1		
	790-101-4000	Puller (490 kN {50T} long)	■	1		
	790-101-1102	Pump (294 kN {30T})	■	1		

*Distinction between new and existing part.

REMOVAL

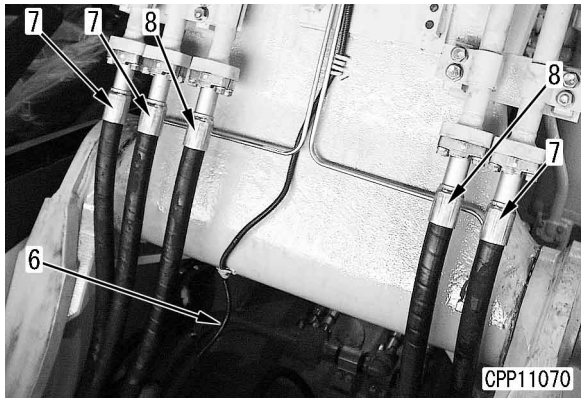
⚠ Extend the arm and bucket fully. Lower the work equipment to the ground and set the safety lock lever to the lock position.

⚠ Release the residual pressure in the hydraulic circuit. Refer to the Release of Remaining Pressure in Hydraulic Circuit section in the TESTING AND ADJUSTING chapter of this manual.

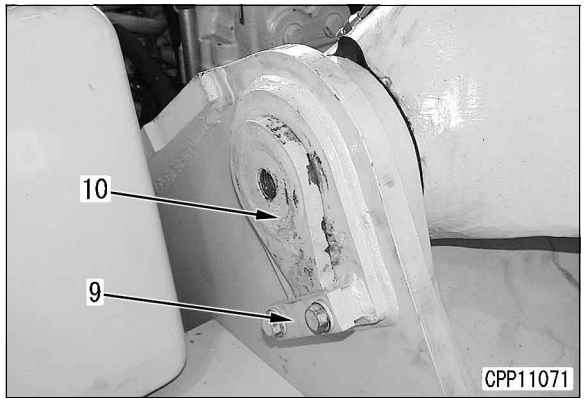
1. Disconnect grease hose (1).
2. Sling boom cylinder assembly (2), and remove lock bolt (3). ※1
3. Remove plate (4), then remove head pin (5). ※2
   - ★ There are shims installed, so check the number and thickness, and keep them in a safe place.



4. Start the engine and retract the piston rod.
   - ★ Fasten the piston rod with wire so that it will not slip out. Lower the cylinder onto a stand or place a support under the bottom of the cylinder to support it. In the latter case, remove the grease fitting on the bottom side first.
   - ★ Remove the boom cylinder on the other side in the same manner.
   - ★ Remove the working lamp on the work equipment if slings will hit the lamp when lifting the work equipment off.
5. Disconnect A42 intermediate connector (6) from working lamp.
6. Disconnect three arm cylinder hoses (7) and two bucket cylinder hoses (8).
   - ★ Plug them to stop oil spillage and fasten the hoses with a rope on the valve side.

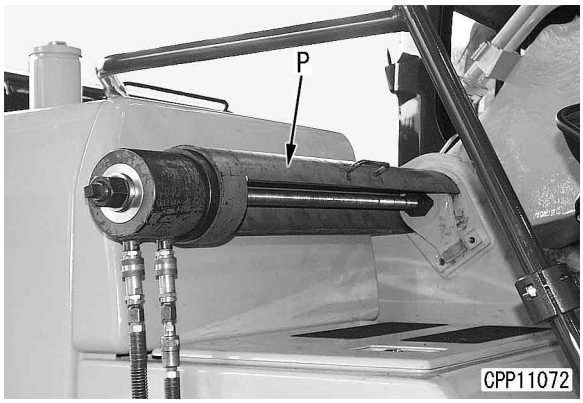


7. Lift off work equipment assembly, remove plate (9) and then pin (10) at the foot. ※3



- When removing them, first remove plate (9) and then remove pin (10) at the foot, using Tool **P**.

★ Shims are installed, so do not forget to check their number and each location of installation.



8. Lift off work equipment assembly (11) and disassemble it.

kg Work equipment assembly: 5,800 kg

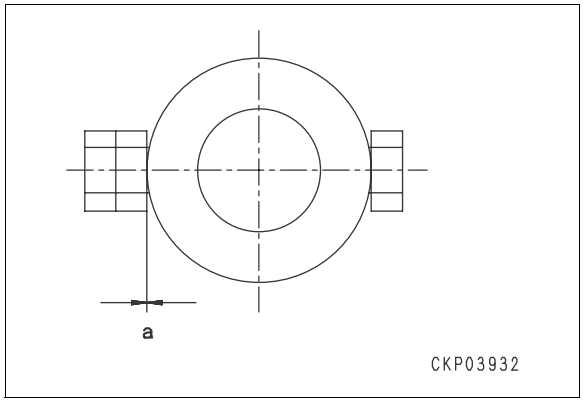


INSTALLATION

- Install in reverse order of removal.

※1

★ When tightening the locknut, tighten so that clearance **a** between the plate and nut is 0.5 - 1.5 mm.



※2

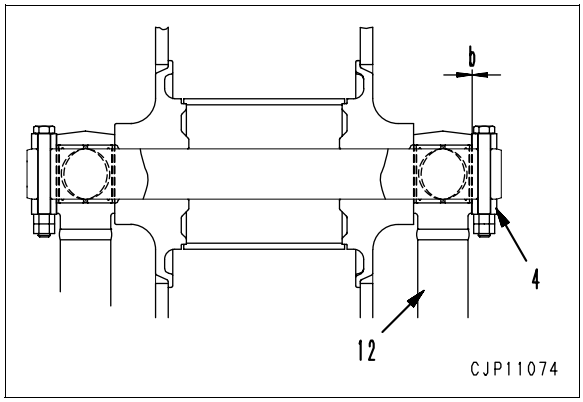
Inside surface of bushing when assembling pin:
Anti-friction compound (LM-P)

Grease after assembling pin:
Grease (LM-G)

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

★ Adjust the shim thickness so that clearance **b** between cylinder rod (12) and plate (4) is below 1.5 mm.

★ Standard shim thickness: 1.0 mm and 2.0 mm.



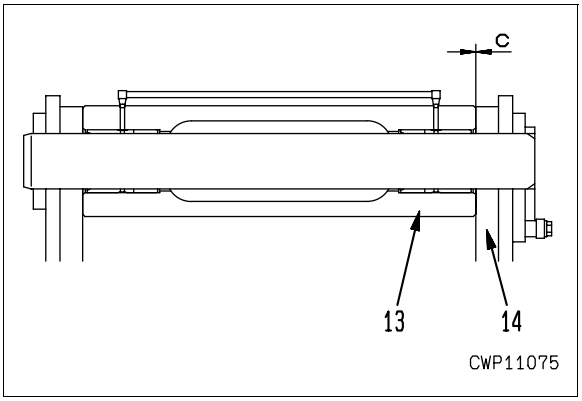
※3

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 into the pin hole.

★ Adjust clearance **c** between the foot end surface of boom (13) and bracket (14) with shims so that it will be less than 1 mm.
Thickness of standard shims: 2.0, 2.5 and 3.5 mm



- **Bleeding air**
  ★ Bleed the air from the cylinder. For details, see TESTING AND ADJUSTING, Air Bleeding of Various Parts.
- **Refilling with oil (hydraulic tank)**
  ★ Add oil through the oil filler to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.

REMOVAL AND INSTALLATION OF AIR CONDITIONER UNIT ASSEMBLY

SPECIAL TOOLS

Mark	Part No.	Part Name	Necessity	Qty	Distinction*	Sketch
Q	799-703-1200	Service tool kit	■	1		
	799-703-1100	Vacuum Pump (100 V)	■	1		
	799-703-1110	Vacuum Pump (220 V)	■	1		
	799-703-1120	Vacuum Pump (240 V)	■	1		
	799-703-1400	Gas leak tester	■	1		

*Distinction between new and existing part.

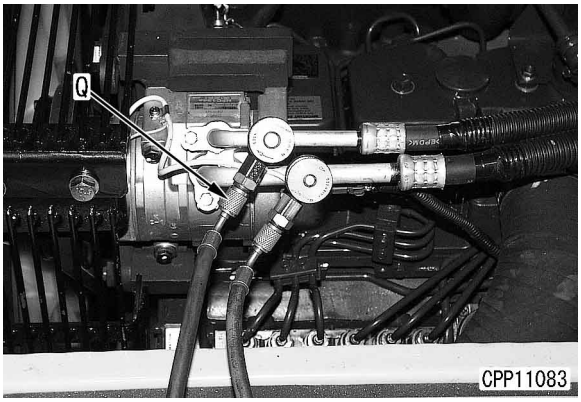
REMOVAL

⚠ First, disconnect the cable from the negative (-) terminal of the battery.

1. Drain coolant.

Coolant: Approx. 22.8 **l**

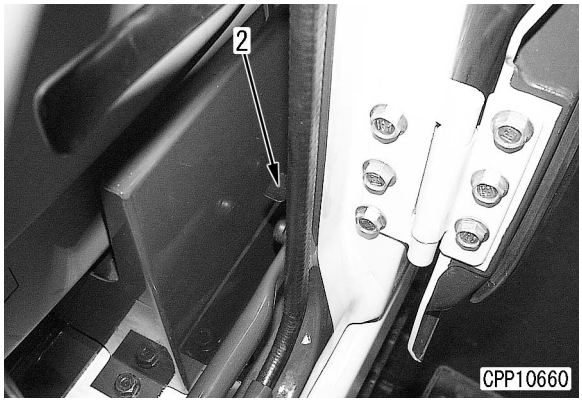
2. Bleed gas from the air conditioner, using tool **Q**.



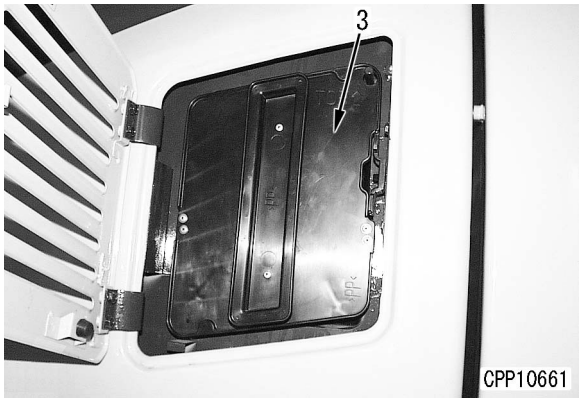
3. Remove floor mat (1).



4. Pull down outside air filter cover opening-closing lever (2).



5. Remove outside air filter (3).



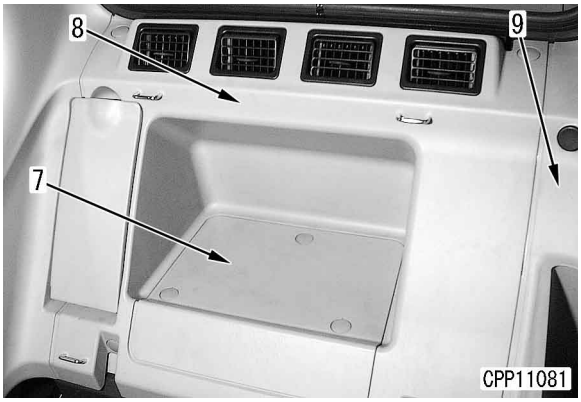
6. Remove monitor panel lower covers (4) and (5).
   ★ When removing cover (4), first remove the M19 wiring for cigarette lighter.



7. Remove duct (6) on the right side.



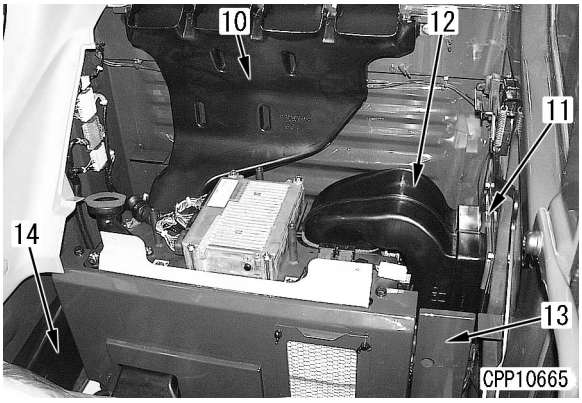
8. Remove rear covers (7), (8) and (9).



9. Remove rear duct (10).

10. Remove plate (11) and then remove duct (12).

11. Remove plate (13) and right duct (14).



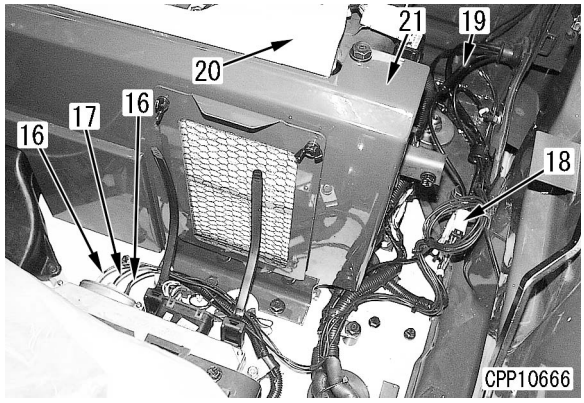
12. Remove cover (15).



13. Disconnect cab intermediate connectors (18) at the following two points.
    - H09: Upper side
    - H08: Lower side

14. Disconnect radio antenna (19).

15. Remove plate (20) and then remove cover (21).



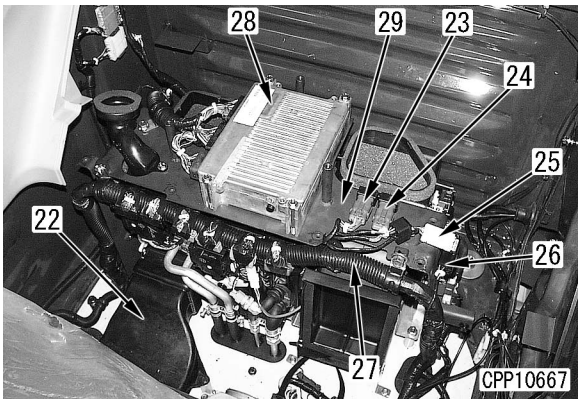
16. Remove duct (22).

17. Disconnect connectors at the following seven points.
    - (23): D01
      (Assembled-type diode connector)
    - (24): D02
      (Assembled-type diode connector)
    - (25): C09 (Model selection switch connector)
    - (26): Air conditioner unit connector
      From top to bottom, M26, M27, M28 and M33 option power source connector

18. Remove the mounting clamp and disconnect air conditioner wiring connector (27).

19. Remove the four mounting bolts and remove governor pump control assembly (28).
    ★ Put the governor pump control assembly aside.

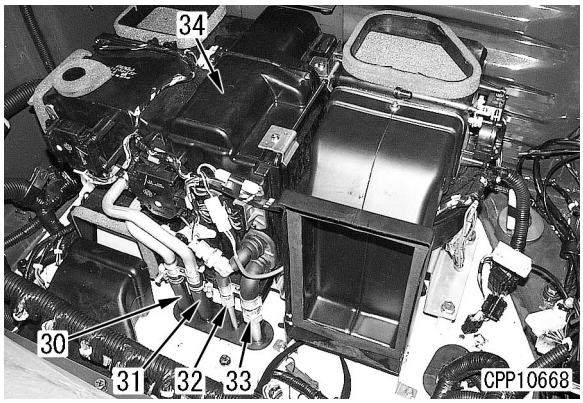
20. Remove cover (29).



21. Disconnect air conditioner hoses (30) and (31) as well as air conditioner tubes (32) and (33).

※1

22. Remove the eight mounting bolts and remove air conditioner unit assembly (34).
    ★ When removing the air conditioner unit assembly, do not forget to disconnect the two air conditioner hoses connected to the bottom.



INSTALLATION

- Install in reverse order of removal.
★ Install hoses in the air conditioner circuit with care so that dirt, dust, water, etc. may not enter them.
★ Install air conditioner hoses only after checking that an O-ring is in place at the connecting part.
★ Check that there is no damage on O-rings, or that they have not deteriorated.

※1

★ Coat the threads of the refrigerant piping at the connecting part with compressor oil (ND-OIL8), and then tighten the piping with a double-ended spanner.

N·m Hose clamp screw:
8.83 - 14.7 Nm (0.9 - 1.5 kgm)

N·m Hose screw M16 x 1.5:
11.8 - 14.7 Nm (1.2 - 1.5 kgm)

N·m Hose screw M24 x 1.5:
29.4 - 34.3 Nm (3.0 - 3.5 kgm)

- Filling air conditioner gas
  Fill the air conditioner circuit with air conditioner gas (R134a), using tool **Q**.

REMOVAL AND INSTALLATION OF COUNTERWEIGHT ASSEMBLY

REMOVAL

1. Attach eyebolts b to counterweight assembly (1), and sling.
2. Remove 4 mounting bolts (2) ※1
   ★ Take note of where shims were inserted.
3. Lift off counterweight (1) horizontally with wire or chain block. ※2
   ★ Be careful not to hit the engine, radiator or cooler.

kg Counterweight assembly: 5,500 kg



INSTALLATION

- Install in reverse order of removal.

※1

Thread of counterweight mounting bolt:
Thread tightener (LT-2)

N·m Counterweight mounting bolt:
1,814.1 ± 98.1 Nm {185 ± 10 kgm}

※2

★ Installing and adjusting counterweight
   1) Adjust clearance on the upper and lower sides with shims.
   2) Install counterweight in such a way that clearance between the door and counterweight as well as clearance between the revolving frame and counterweight become 10 ± 5 mm.

REMOVAL AND INSTALLATION OF OPERATOR'S CAB ASSEMBLY

REMOVAL

⚠ First, disconnect the cable from the negative (-) terminal of the battery.

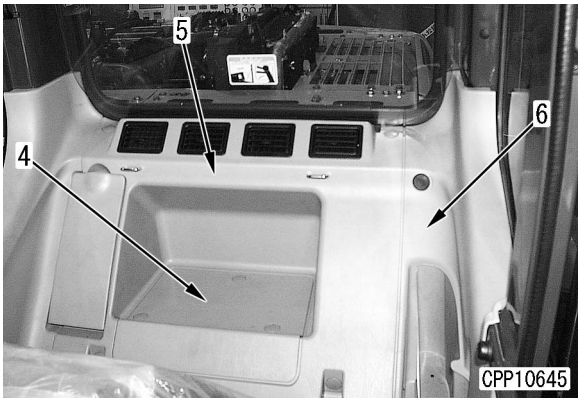
1. Remove floor mat (1).



2. Remove covers (2) and (3) under the monitor panel.
   ★ When removing cover (2), first disconnect the CN-M19 wiring for cigarette lighter.



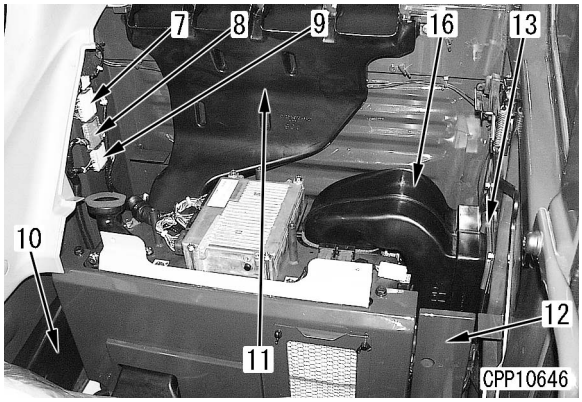
3. Remove rear covers (4), (5) and (6).



4. Disconnect cab wiring intermediate connectors H10 (7), H11 (8) and H12 (9).

5. Remove duct (10) on the right side and rear duct (11).

6. Remove left plates (12) and (13).



7. Pull down outside air filter cover opening-closing lever (14).



8. Remove outside air filter (15).



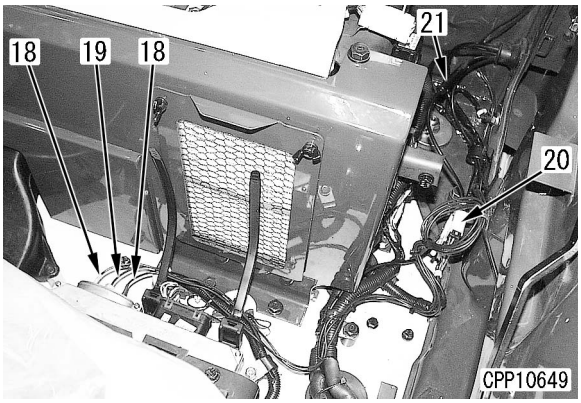
9. Remove duct (16).

10. Remove cover (17).



11. Disconnect cab wiring intermediate connectors (20) at the following two points.
    - H09: Upper side
    - H08: Lower side

12. Disconnect radio antenna (21).



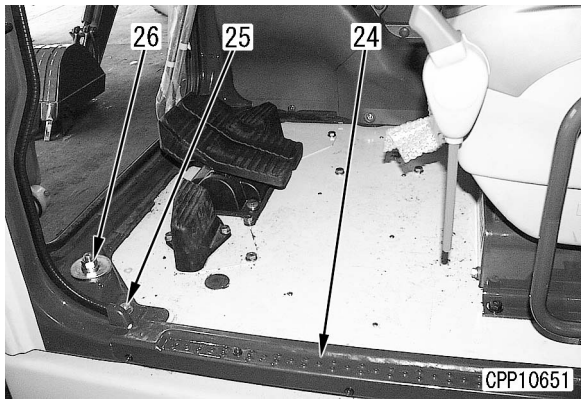
13. Remove duct (22) on the right side.

14. Remove window washer hose (23).



15. Remove step plate (24).

16. Remove five mounting bolts (25) and four mounting nuts (26).
    ★ Check the bolt length beforehand.



17. Lift and remove operator's cab assembly (27).

kg Operator's cab assembly: 290 kg



INSTALLATION

- Install in reverse order of removal.

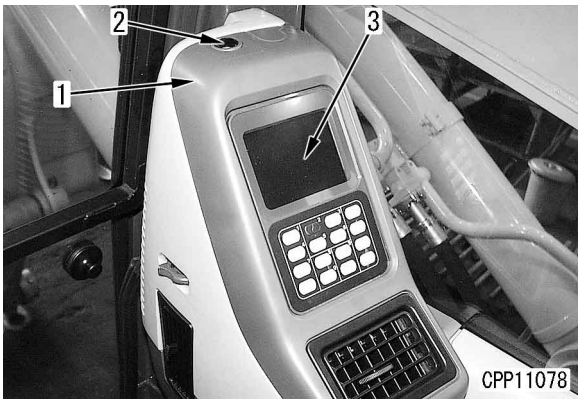
REMOVAL AND INSTALLATION OF MONITOR ASSEMBLY

REMOVAL

⚠ First, disconnect the cable from the negative (-) terminal of the battery.

1. Remove cover (1) and then disconnect the wiring connector P15 for air conditioner sunlight sensor (2).
   ★ Lift the cover up to remove it.

2. Remove the three mounting screws and remove monitor assembly (3).
   ★ Disconnect monitor panel wiring connectors P01, P02 and P03 at the three points, and then remove the monitor assembly.



INSTALLATION

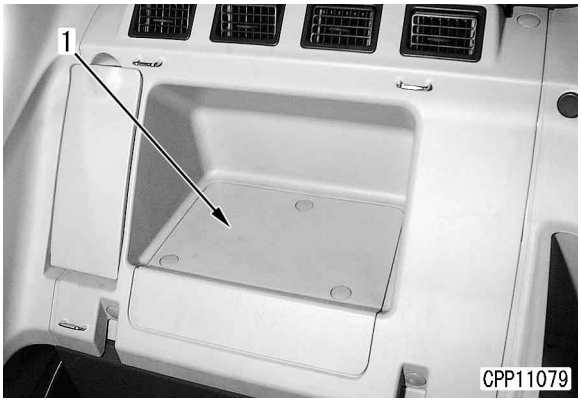
- Install in reverse order of removal.

REMOVAL AND INSTALLATION OF GOVERNOR PUMP CONTROLLER ASSEMBLY

REMOVAL

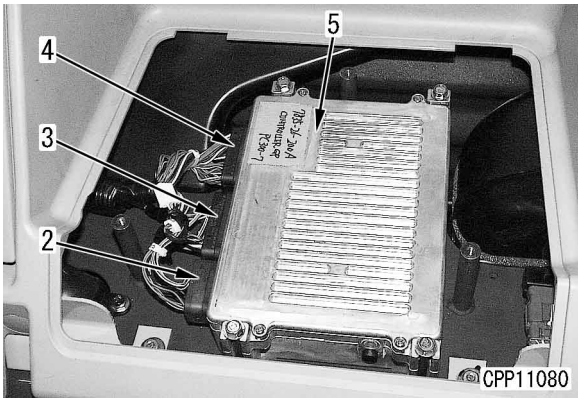
⚠ First, disconnect the cable from the negative (-) terminal of the battery.

1. Remove cover (1).



2. Disconnect governor pump controller wiring connectors C01 (2), C02 (3) and C03 (4).

3. Remove the four mounting bolts and remove governor pump controller assembly (5).



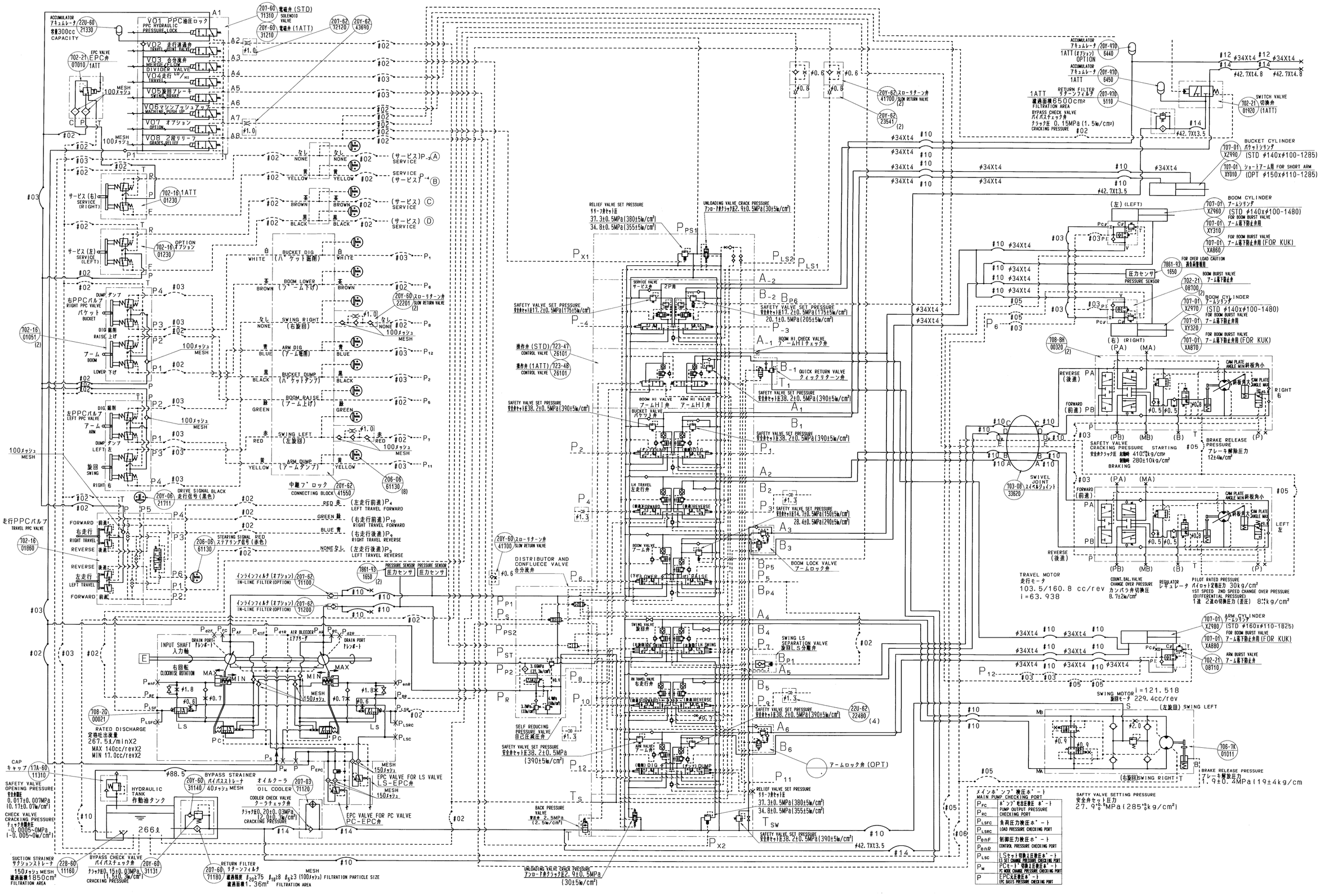
INSTALLATION

- Install in reverse order of removal.

90 OTHERS

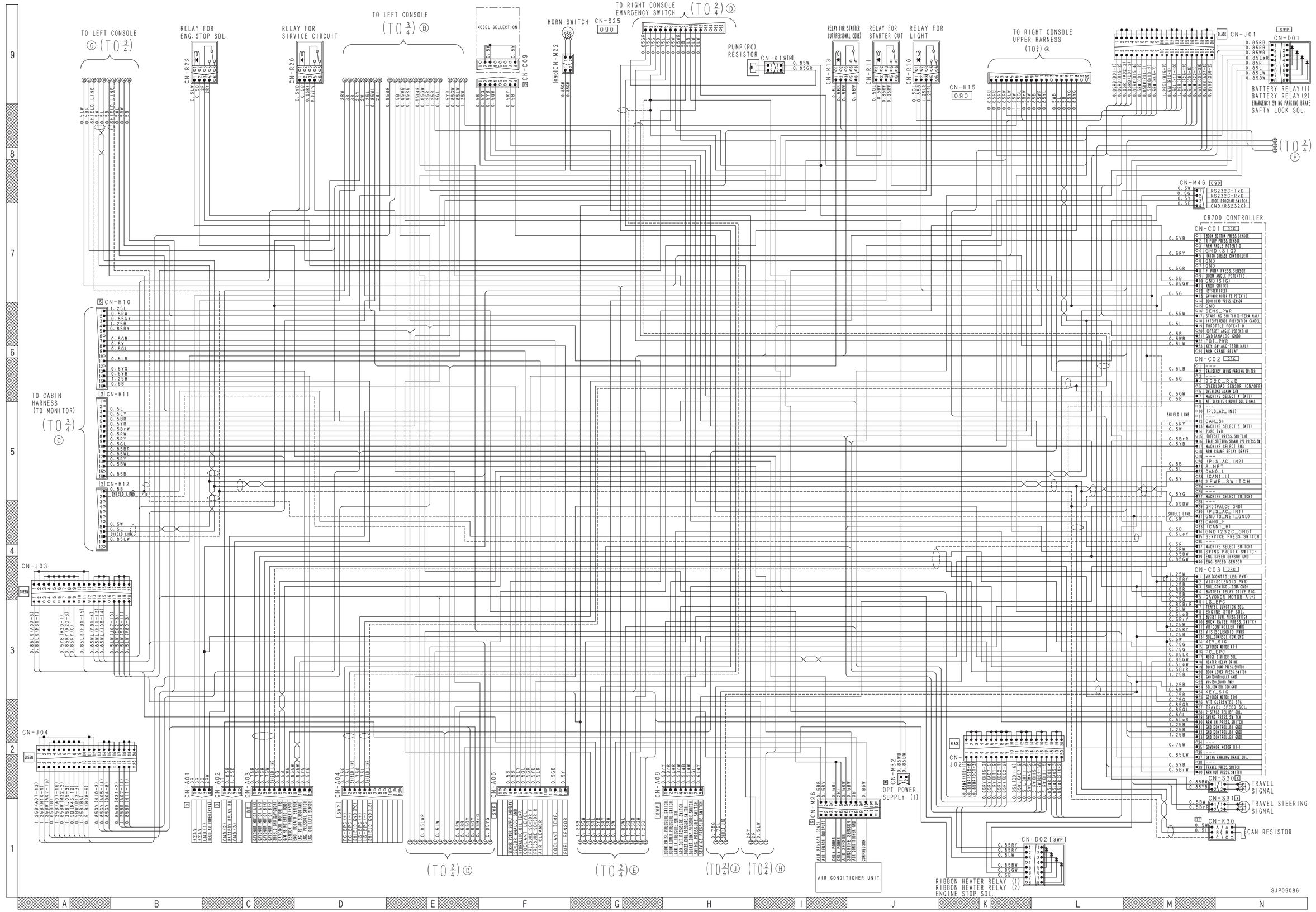
Hydraulic Circuit Diagram 90-3
Electrical Circuit Diagram (1/4) 90-5
Electrical Circuit Diagram (2/4) 90-7
Electrical Circuit Diagram (3/4) 90-9
Electrical Circuit Diagram (4/4) 90-11

HYDRAULIC CIRCUIT DIAGRAM



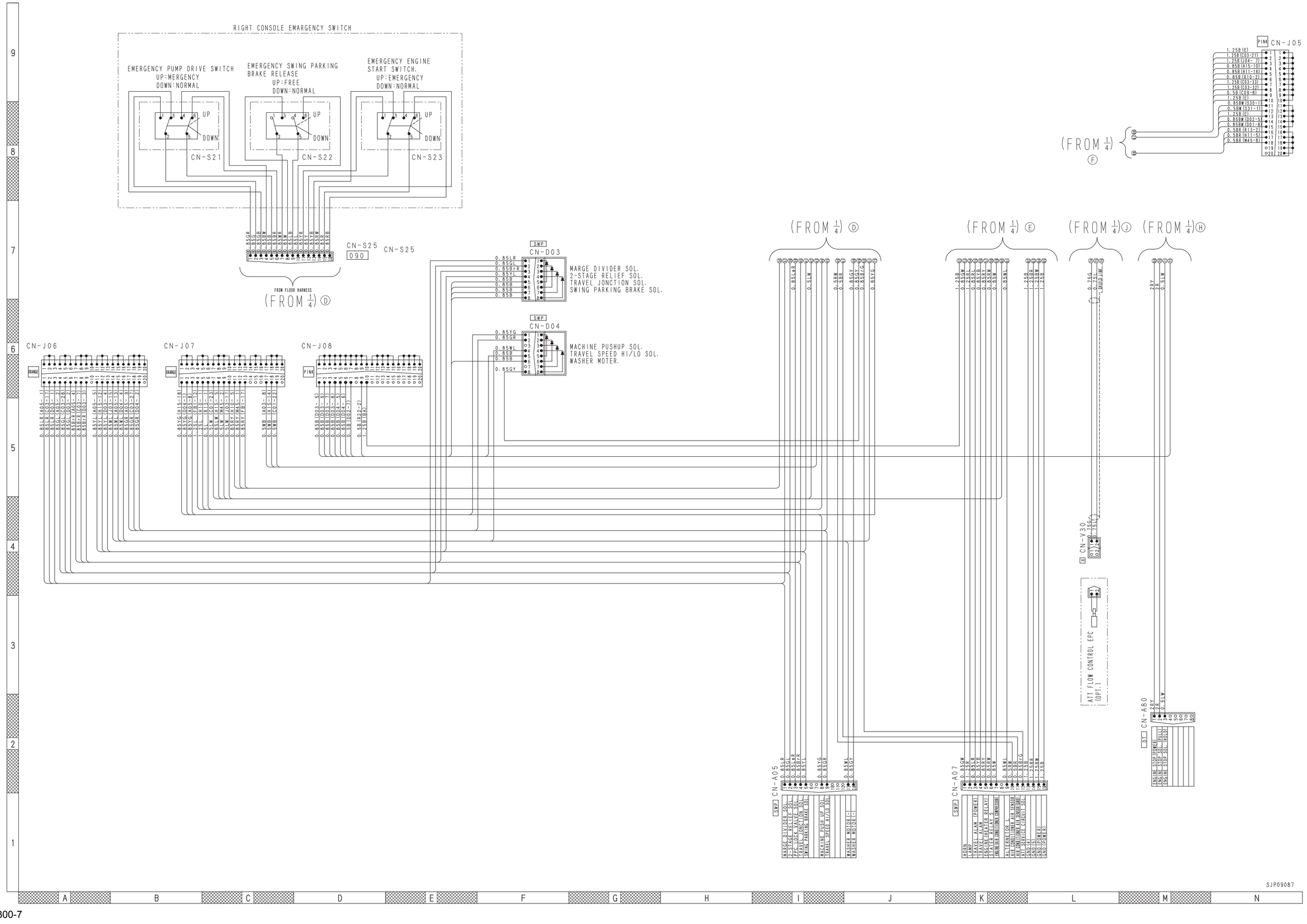
ELECTRICAL CIRCUIT DIAGRAM (1/4)

FOR MULTI MONITOR



ELECTRICAL CIRCUIT DIAGRAM (2/4)

FOR MULTI MONITOR



ELECTRICAL CIRCUIT DIAGRAM (3/4)

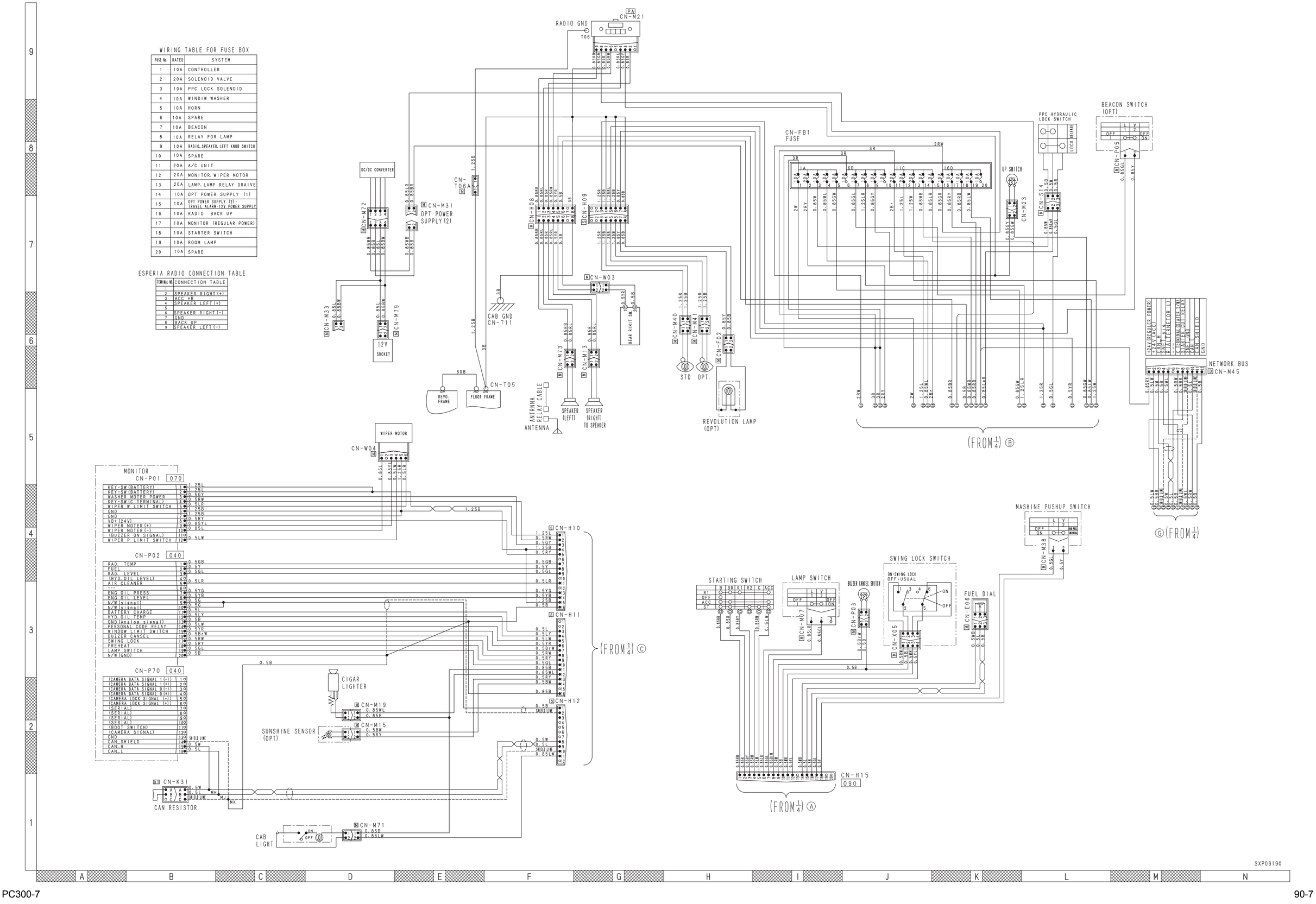
FOR MULTI MONITOR

WIRING TABLE FOR FUSE BOX

FUSE No.	RATED	SYSTEM
1	10A	CONTROLLER
2	20A	SOLENOID VALVE
3	10A	PPC LOCK SOLENOID
4	10A	WINDIW WASHER
5	10A	HORN
6	10A	SPARE
7	10A	BEACON
8	10A	RELAY FOR LAMP
9	10A	RADIO, SPEAKER, LEFT KNOB SWITCH
10	10A	SPARE
11	20A	A/C UNIT
12	20A	MONITOR, WIPER MOTOR
13	20A	LAMP, LAMP RELAY DRAIVE
14	10A	OPT POWER SUPPLY (1)
15	10A	OPT POWER SUPPLY (2) · TRAVEL ALARM·12V POWER SUPPLY
16	10A	RADIO BACK UP
17	10A	MONITOR (REGULAR POWER)
18	10A	STARTER SWITCH
19	10A	ROOM LAMP
20	10A	SPARE

ESPERIA RADIO CONNECTION TABLE

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



SXP09190

ELECTRICAL CIRCUIT DIAGRAM (4/4)

FOR MULTI MONITOR

