SHOP MANUAL

KOMATSU

PC200, 200LC-6
PC210, 210LC-6
PC220, 220LC-6
PC230, 230LC-6

MACHINE MODEL	SERIAL NUMBER
PC200, 200LC-6 STD	**96514 and up**
PC200, 200LC-6 HYPER GX	**96514 and up**
PC210, 210LC-6 STD	**30980 and up**
PC220, 220LC-6 STD	**52852 and up**
PC230, 230LC-6 STD	**10177 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.
- PC200, 210-6 mount the S6D102-1 engine.
  PC220, 230-6 mount the SA6D102-1 engine.
  For details of the engine, see the 102 Series Engine Shop Manual.

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FOREWORD
GENERAL

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

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

STRUCTURE AND FUNCTION

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

TESTING AND ADJUSTING

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

DISASSEMBLY AND ASSEMBLY

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

MAINTENANCE STANDARD

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

OTHERS

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

NOTICE

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

Millimeters to Inches

1 mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0	0	0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
50	1.969	2.008	2.047	2.087	2.126	2.165	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

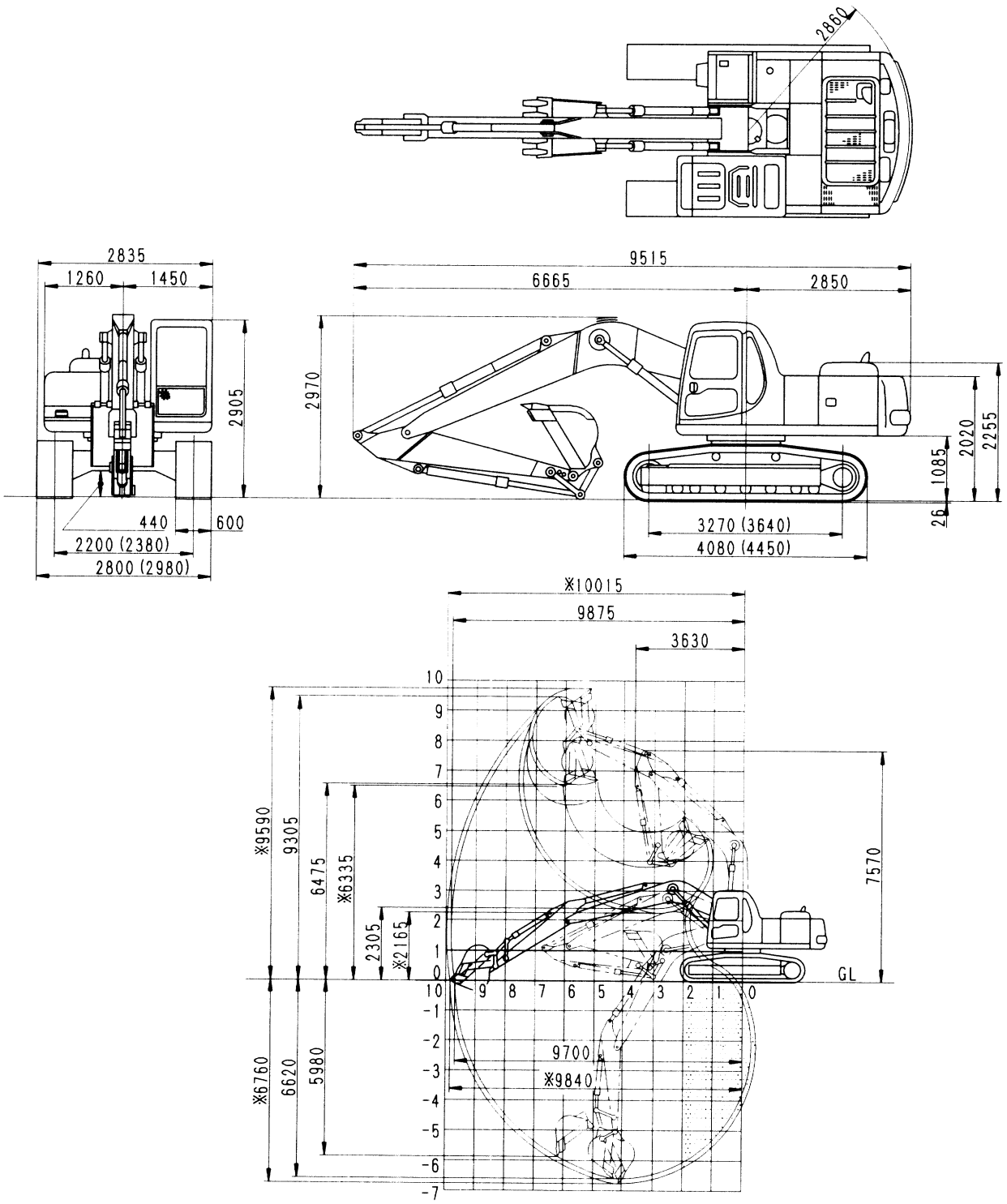
Kilogram to Pound

1 kg = 2.2046 lb

	0	1	2	3	4	5	6	7	8	9
0	0	2.20	4.41	6.61	8.82	11.02	13.23	15.43	17.64	19.84
10	22.05	24.25	26.46	28.66	30.86	33.07	35.27	37.48	39.68	41.89
20	44.09	46.30	48.50	50.71	51.91	55.12	57.32	59.53	61.73	63.93
30	66.14	68.34	70.55	72.75	74.96	77.16	79.37	81.57	83.78	85.98
40	88.18	90.39	92.59	94.80	97.00	99.21	101.41	103.62	105.82	108.03
50	110.23	112.44	114.64	116.85	119.05	121.25	123.46	125.66	127.87	130.07
60	132.28	134.48	136.69	138.89	141.10	143.30	145.51	147.71	149.91	152.12
70	154.32	156.53	158.73	160.94	163.14	165.35	167.55	169.76	171.96	174.17
80	176.37	178.57	180.78	182.98	185.19	187.39	189.60	191.80	194.01	196.21
90	198.42	200.62	202.83	205.03	207.24	209.44	211.64	213.85	216.05	218.26

PC210, 210LC-6

Unit: mm



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★ The figures in ( ) indicate the PC210LC.
★ The values marked ※ are for shovel operations.

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Machine model				PC210-6		
				STD		
Serial Number				30980 and up		
Engine		Model		S6D102-1		
		Type		4-cycle, water-cooled, in-line, vertical, direct injection, with turbocharger		
		No. of cylinders – bore × stroke	mm	6 – 102 × 120		
		Piston displacement	ℓ {cc}	5.883 {5,883}		
	Performance	Flywheel horsepower	kW/rpm {HP/rpm}	99.3/2,000 {133/2,000}		
		Max. torque	Nm/rpm {kgm/rpm}	562.9/1,350 {57.4/1,350}		
		Max. speed at no load	rpm	2,200 ± 60		
		Min. speed at no load	rpm	1,000 ± 25		
		Min. fuel consumption	g/kWh {g/HPh}	218 {160}		
	Starting motor			24V, 4.5 kW		
	Alternator			24V, 35A		
	Battery			12V, 110 Ah × 2		
	Radiator core type			Corrugated CWX-4		
Under-carriage	Carrier roller			2 on each side		
	Track roller			7 on each side		
	Track shoe			Assembly-type triple grouser, 45 on each side		
Hydraulic system	Hydraulic pump	Type × no.		HPV95+95, variable displacement piston type × 2		
		Delivery	ℓ/min	Piston type: 206 × 2		
		Set pressure	MPa {kg/cm²}	Piston type: 34.8 {355}		
	Control valve	Type × No.		6-spool type × 1		
		Control method		Hydraulic		
	Hydraulic motor	Travel motor		HMV110-2, Piston type (with brake valve, parking brake: × 2		
		Swing motor		KMF90ABE-3, Piston type (with safety valve, parking brake): × 1		
	Hydraulic cylinder			Boom	Arm	Bucket
		Type		Double acting piston	Double acting piston	Double acting piston
		Inside diameter of cylinder	mm	120	135	115
		Diameter of piston rod	mm	85	95	80
		Stroke	mm	1,285	1,490	1,120
		Max. distance between pins	mm	3,155	3,565	2,800
		Min. distance between pins	mm	1,870	2,075	1,680
	Hydraulic tank			Box-shaped, sealed		
	Hydraulic filter			Tank return side		
	Hydraulic cooler			CFT-1 (Air cooled)		

Machine model				PC220LC-6	PC230LC-6
				STD	STD
Serial Number				52852 and up	10177 and up
Engine		Model		SA6D102-1	
		Type		4-cycle, water-cooled, in-line, vertical, direct injection, with turbocharger, water-cooled aftercooler	
		No. of cylinders – bore × stroke	mm	6 – 102 × 120	
		Piston displacement	ℓ {cc}	5.883 {5,883}	
	Performance	Flywheel horsepower	kW/rpm {HP/rpm}	118/2,100 {158/2,100}	
		Max. torque	Nm/rpm {kgm/rpm}	618/1,400 {63/1,400}	
		Max. speed at no load	rpm	2,300 ± 60	
		Min. speed at no load	rpm	1,000 ± 25	
		Min. fuel consumption	g/kWh {g/HPh}	218 {160}	
	Starting motor			24V, 4.5 kW	
	Alternator			24V, 35A	
	Battery			12V, 110 Ah × 2	
	Radiator core type			Corrugated CWX-4	
Under-carriage	Carrier roller			2 on each side	
	Track roller			10 on each side	
	Track shoe			Assembly-type triple grouser, 51 on each side	
Hydraulic system	Hydraulic pump	Type × no.		HPV95+95, variable displacement piston type × 2	
		Delivery	ℓ/min	Piston type: 216 × 2	
		Set pressure	MPa {kg/cm²}	Piston type: 34.8 {355}	
	Control valve	Type × No.		6-spool type × 1	
		Control method		Hydraulic	
	Hydraulic motor	Travel motor		HMV110-2, Piston type (with brake valve, parking brake: × 2	
		Swing motor		KMF90ABE-3, Piston type (with safety valve, parking brake): × 1	
	Hydraulic cylinder	Type		Boom: Double acting piston	Arm: Double acting piston	Bucket: Double acting piston
		Inside diameter of cylinder	mm	130	140	130
		Diameter of piston rod	mm	90	100	90
		Stroke	mm	1,285	1,635	1,020
		Max. distance between pins	mm	3,155	3,870	2,625
		Min. distance between pins	mm	1,870	2,235	1,605
	Hydraulic tank			Box-shaped, sealed		
	Hydraulic filter			Tank return side		
	Hydraulic cooler			SF-3 (Air cooled)		

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Unit: kg

Machine model	PC200LC-6	
	STD	STD Rotary arm
Serial Number	96514 and up	96514 and up
Track shoe ass'y		
• Standard triple grouser shoe (600 mm)	1,225 × 2	1,225 × 2
• Standard triple grouser shoe (700 mm)	1,435 × 2	1,435 × 2
• Wide triple grouser shoe (800 mm)	1,565 × 2	1,565 × 2
• Wide triple grouser shoe (900 mm)	1,690 × 2	1,690 × 2
• Swamp shoe (860 mm)	1,645 × 2	1,645 × 2
• Flat shoe (610 mm)	1,450 × 2	1,450 × 2
• Road liner (rubber pad type) (600 mm)	1,470 × 2	1,470 × 2
Boom ass'y	1,334	1,334
Arm ass'y	620	620
Bucket ass'y	619	530
Boom cylinder ass'y	176 × 2	176 × 2
Arm cylinder ass'y	244	244
Bucket cylinder ass'y	148	148
Link ass'y (large)	68	68
Link ass'y (small)	22 × 2	22 × 2
Boom pin	43+10×2+25+10+20	43+10×2+25+10+20
Arm pin	10 × 2	10 × 2
Bucket pin	20 × 2	20 × 2
Link pin	13 × 2	13 × 2

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10 STRUCTURE AND FUNCTION

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Category	Use	Precautions when using
A	Rocky ground, normal river soil	• Travel in Lo speed when traveling on rough ground with obstacles such as large boulders and fallen trees.
B	Normal soil, soft land	• Cannot be used on rough ground where there are large obstacles such as boulders and fallen trees. • Travel in Hi speed only on flat ground; when it is impossible to avoid traveling over obstacles, lower the travel speed to approx. half of Lo speed.
C	Extremely soft ground (swampy ground)	• Use only for ground where "A" and "B" sink and are impossible to use. • Cannot be used on rough ground where there are large obstacles such as boulders and fallen trees. • Travel in Hi speed only on flat ground; when it is impossible to avoid traveling over obstacles, lower the travel speed to approx. half of Lo speed.
D	Paved surface	• The shoes are flat, so they have low gradeability.
E	Paved surface	• The shoes are made of rubber, so be careful when traveling on rough ground.

★ Categories "B" and "C" are wide shoes, so there are restrictions on their use. Therefore, before using, check the restrictions and consider carefully the conditions of use before recommending a suitable shoe width. If necessary, give the customer guidance in their use.

★ When selecting the shoe width, select the narrowest shoe possible within the range that will give no problem with flotation and ground pressure.
If a wider shoe than necessary is used, there will be a large load on the shoe, and this may lead to bending of the shoe, cracking of the links, breakage of the pins, loosening of the shoe bolts, or other problems.

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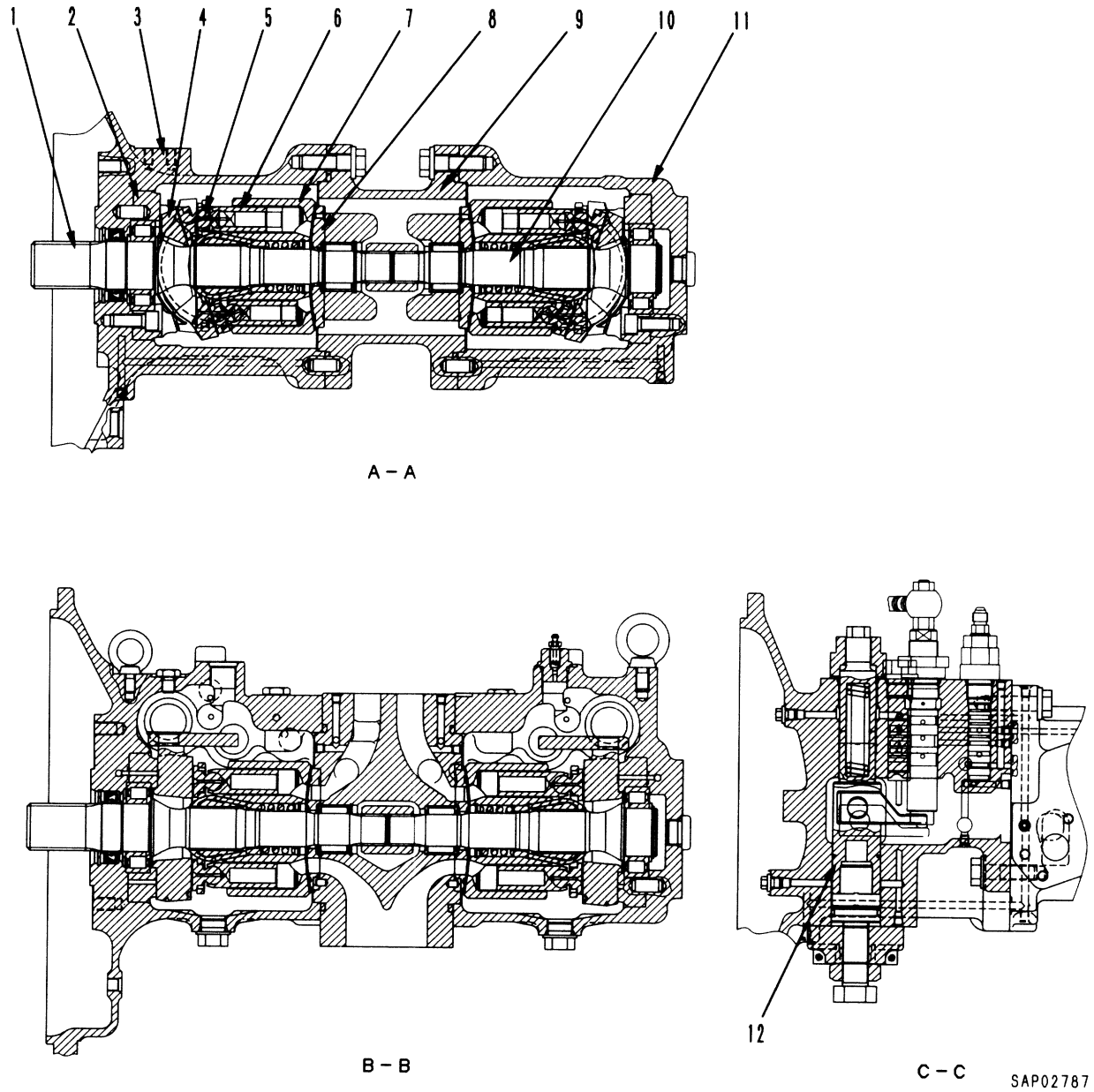
PC200-6 Serial No.: 96514 – 102134
PC210-6 Serial No.: 30980 – 31420
PC220-6 Serial No.: 52852 – 53547
PC230-6 Serial No.: 10177 – 10246



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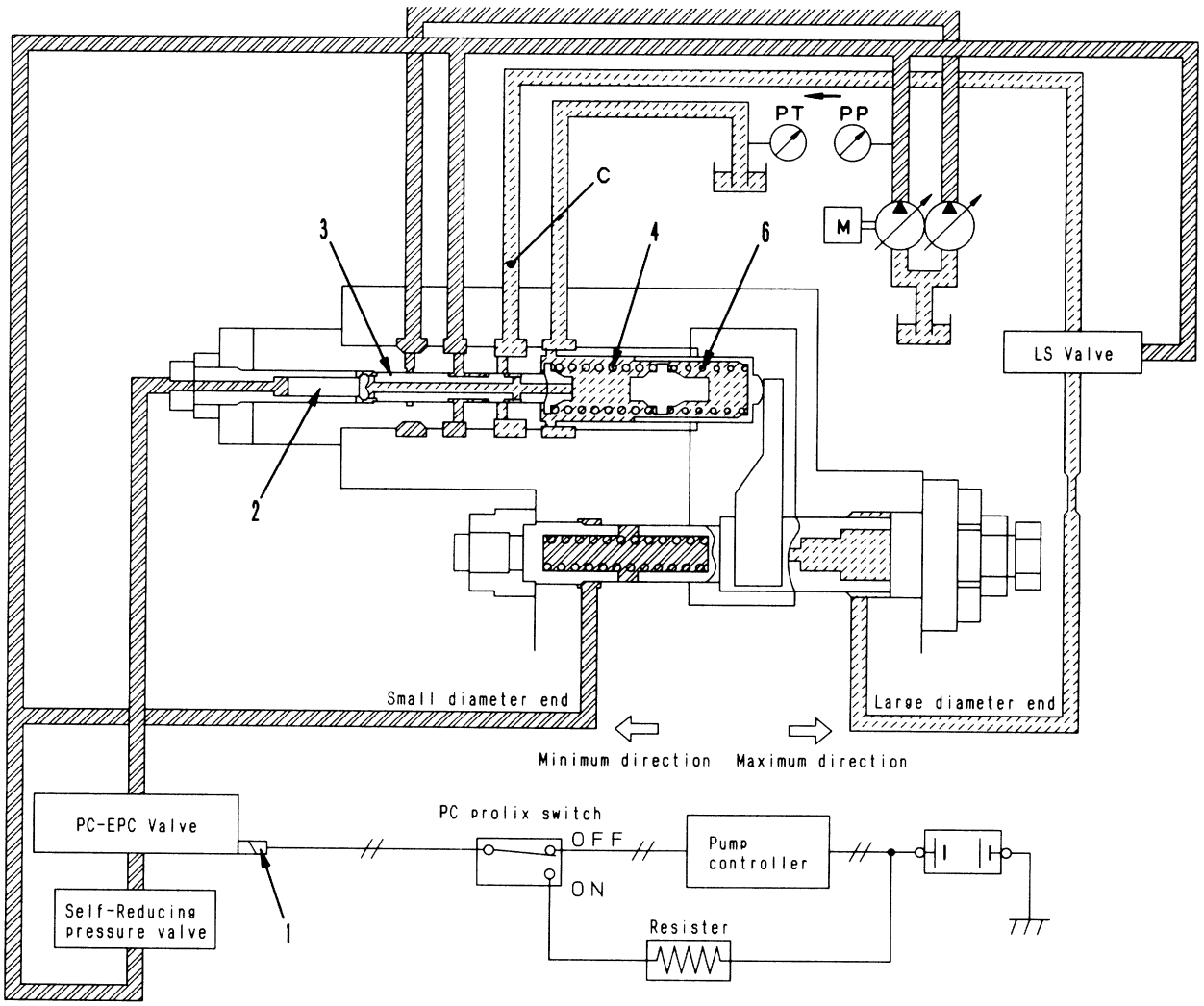
1. Shaft (front)
2. Cradle
3. Case (front)
4. Rocker cam
5. Shoe
6. Piston
7. Cylinder block
8. Valve plate
9. End cap
10. Shaft (rear)
11. Case (rear)
12. Servo piston



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(2) PC valve

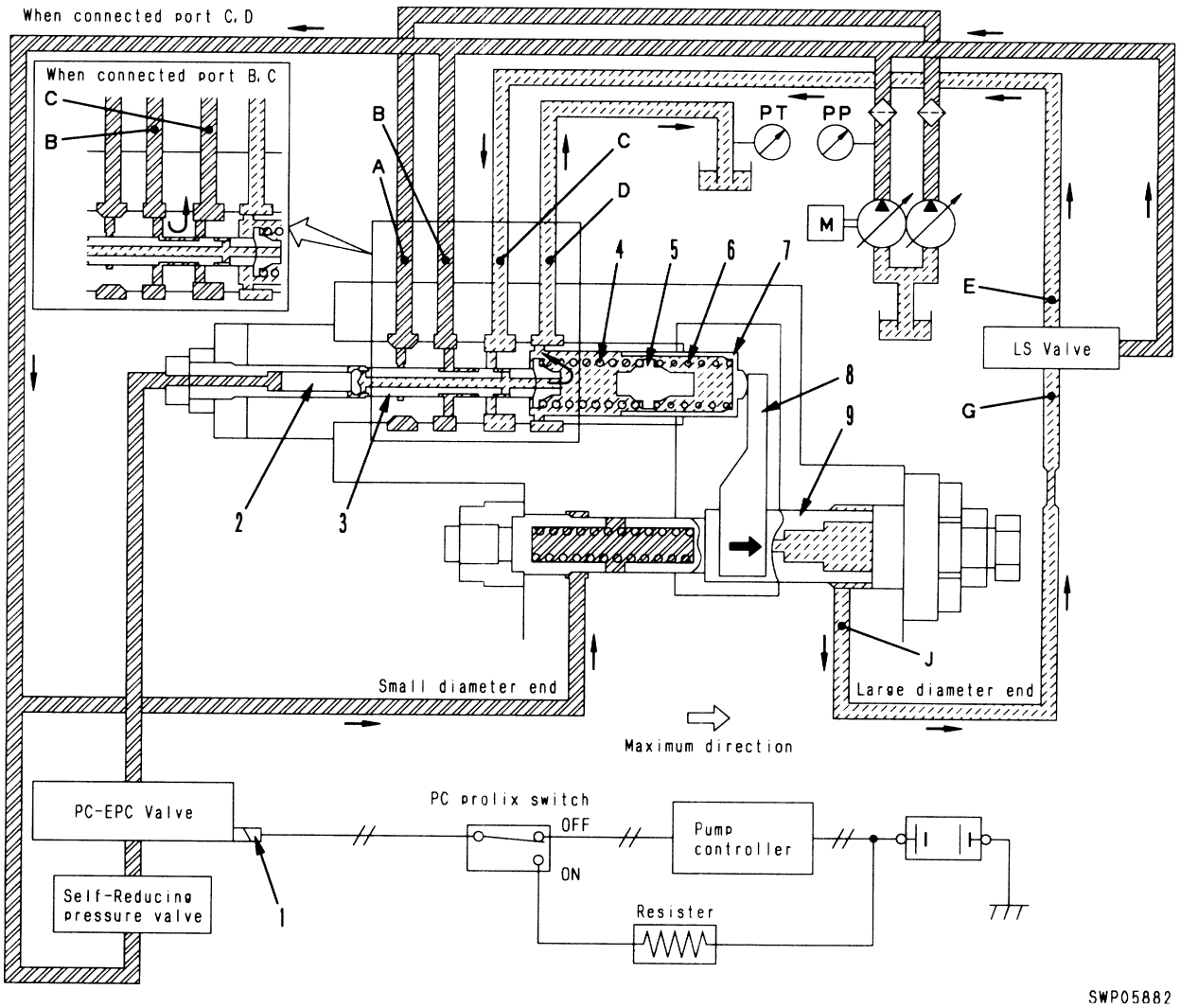
1) When pump controller is normal

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



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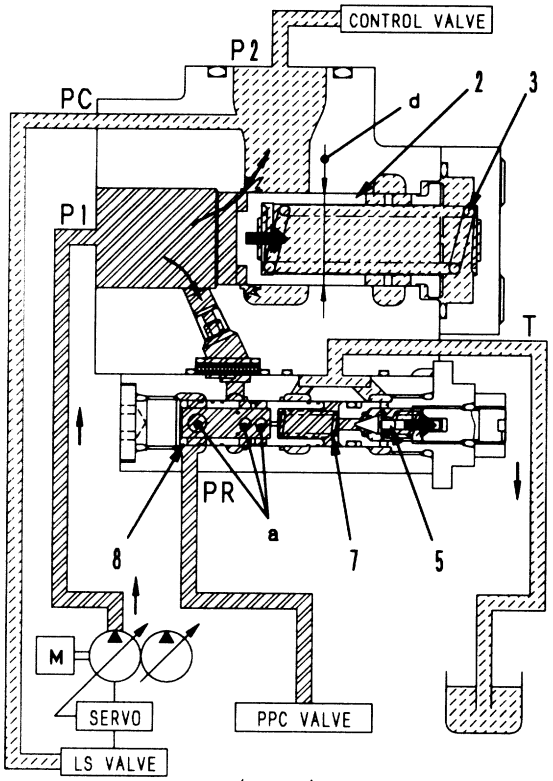
② **Action of spring**

- The spring load of springs (4) and (6) in the PC valve is determined by the swash plate position.
- When servo piston (9) moves, piston (7), which is connected to slider (8), also moves to the right or left.
- If piston (7) 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 (5) extending or compressing springs (4) and (6).
- If the command current 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 value of the PC-EPC valve solenoid command current.

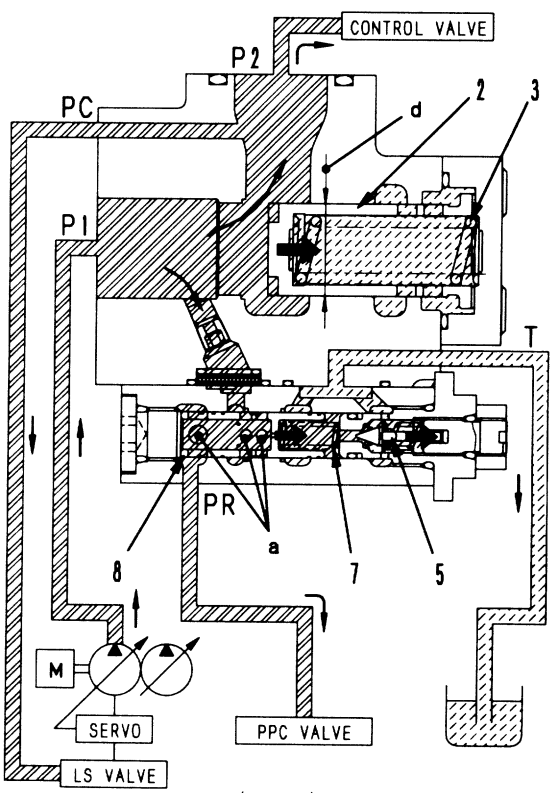
2. **At neutral and**
When load pressure P2 is low (when moving down under own weight (boom LOWER or arm IN))
Note: When load pressure **P2** is lower than output pressure **PR** of the self-reducing pressure valve.
- Valve (2) receives force in the direction to close the passage from port **P1** → **P2** from spring (3) and pressure **PR** (when the engine is stopped, the pressure is 0 MPa {0 kg/cm²}). However, when hydraulic oil flows in from port **P1**, the pressure is balanced so that pressure **P1** ≒ force of spring (7) + (area ød x pressure **PR**), and the opening from port **P1** → **P2** is adjusted so that pressure **P1** is kept at a certain value above pressure **PR**.
- When pressure **PR** goes above the set pressure, poppet (5) opens, and the hydraulic oil flows in the following circuit: port **PR** → hole **a** inside spool (8) → opening of poppet (5) → tank port **T**.
As a result, a pressure difference is created on both sides of hole **a** inside spool (8), so spool (8) moves in the direction to close the opening from port **P1** → **PR**. Pressure **P1** is reduced to a certain pressure (set pressure) by the amount of opening at this point, and is supplied as pressure **PR**. (See Fig. 2)



(Fig. 2) SAP03301

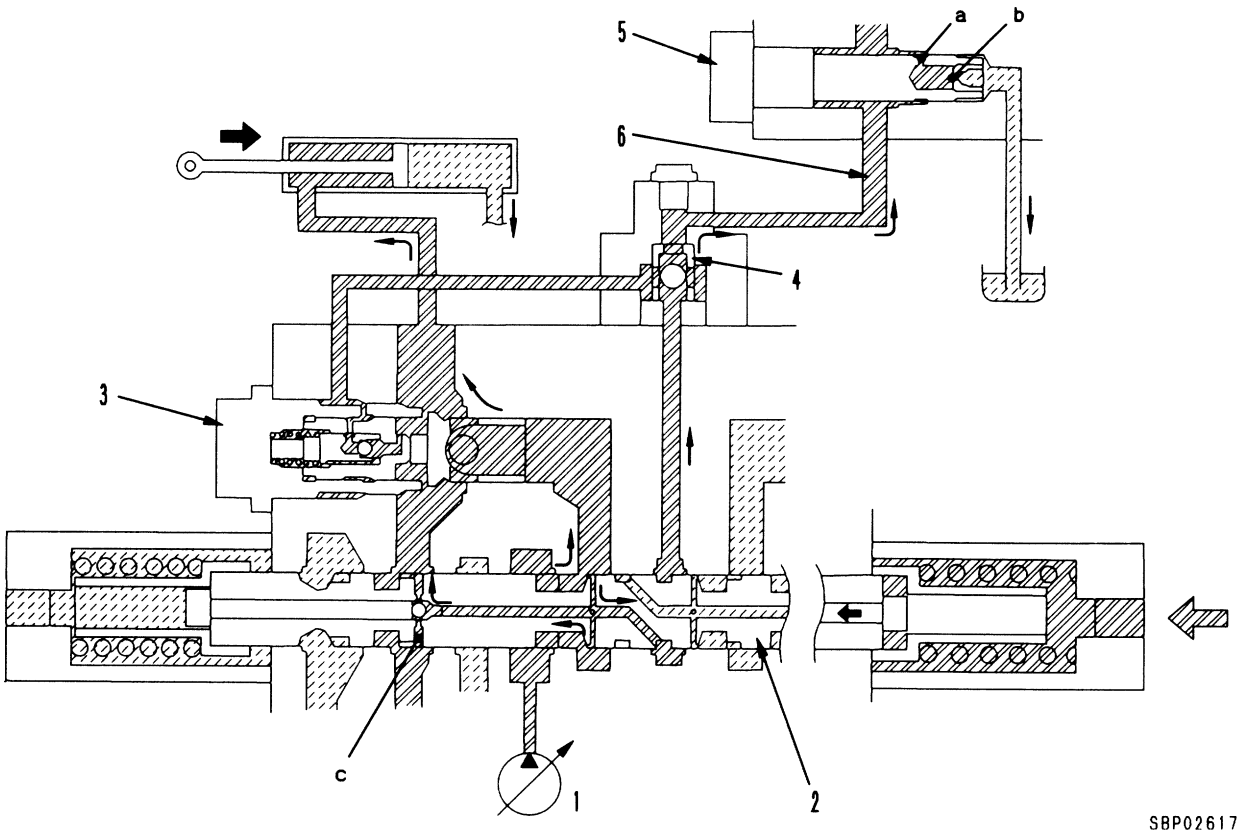
3. **When load pressure P2 is high**
If load pressure **P2** increases and the pump discharge amount also increases because of digging operations, pressure **P1** also increases (pressure **P1** > force of spring (7) + (area ød x pressure **PR**), so valve (2) moves to the right to the end of the stroke.
As a result, the amount of opening from port **P1** → **P2** increases and the resistance in the passage is reduced, so the loss of engine horsepower is reduced.

- If pressure **PR** goes above the set pressure, poppet (5) opens and the hydraulic oil flows in the following circuit: port **PR** → hole **a** inside spool (8) → opening of poppet (5) → tank port **T**.
As a result, a pressure difference is created on both sides of hole **a** is inside spool (8), so spool (8) moves in the direction to close the opening from port **P1** → **PR**. Pressure **P1** is reduced to a certain pressure (set pressure) by the amount of opening at this point, and is supplied as pressure **PR**. (See Fig. 3)



(Fig. 3) SAP03302

4. LS bypass valve



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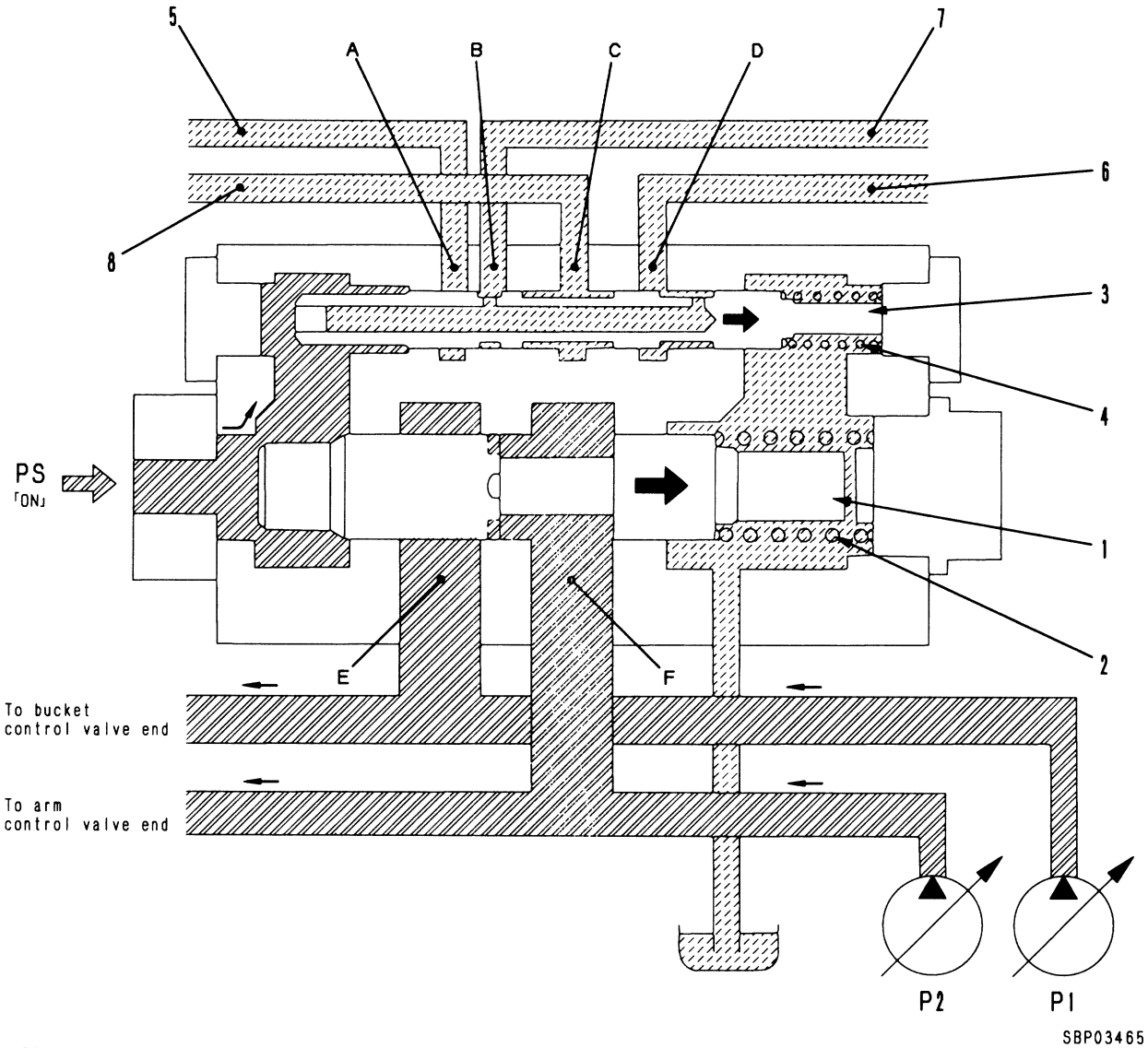
1. Main pump
2. Main spool
3. Pressure compensation valve
4. LS shuttle valve
5. LS bypass valve
6. LS circuit

Function

- The residual pressure in LS circuit (6) is released from orifices **a** and **b**.
- This reduces the speed of the rise in the LS pressure, and prevents any sudden change in the oil pressure. Furthermore, a pressure loss is generated by the circuit resistance between LS shuttle valve (4) and throttle **c** of main spool (2) according to the bypass flow from LS bypass valve (5). As a result, the effective LS differential pressure drops, and the dynamic stability of the actuator is increased.



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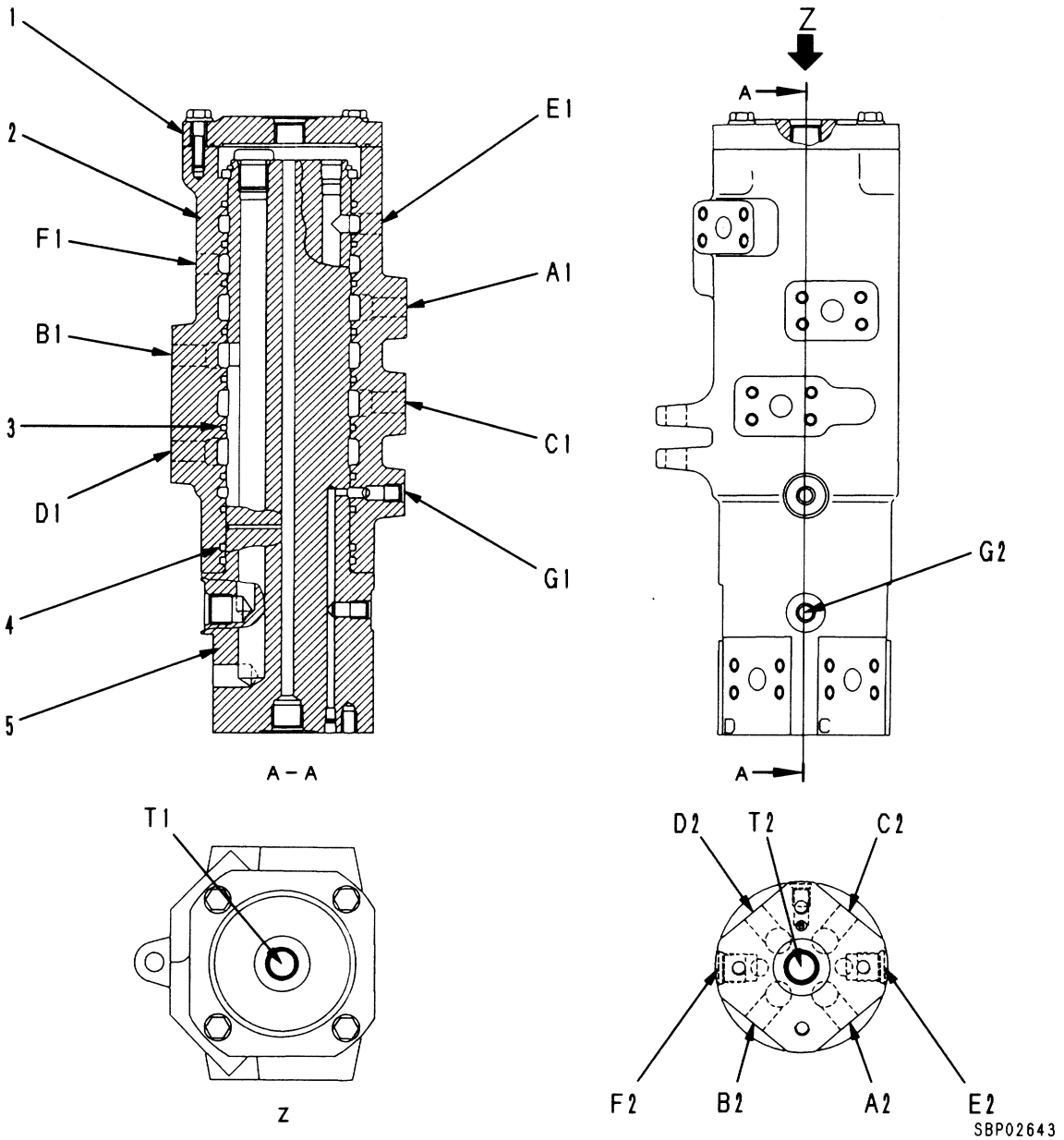
2) When dividing pump flow (when pilot pressure PS is ON)

- When pilot pressure **PS** is ON, main spool (1) is moved to the right by the **PS** pressure, and ports **E** and **F** are disconnected.
  Therefore, the pressurized oil discharged from each pump is sent to its own control valve group.
  Pressure **P1**: To bucket, R.H. travel, boom group
  Pressure **P2**: To swing, L.H. travel, arm group
- In the same way, LS spool (3) is also moved to the right by the **PS** pressure, and the ports are connected as follows.
  Connected ports: **B** ↔ **D**, others are not connected.
  Therefore, LS circuits (5), (6), (7), and (8) are all sent to their own control valve group.

6-PORT SWIVEL



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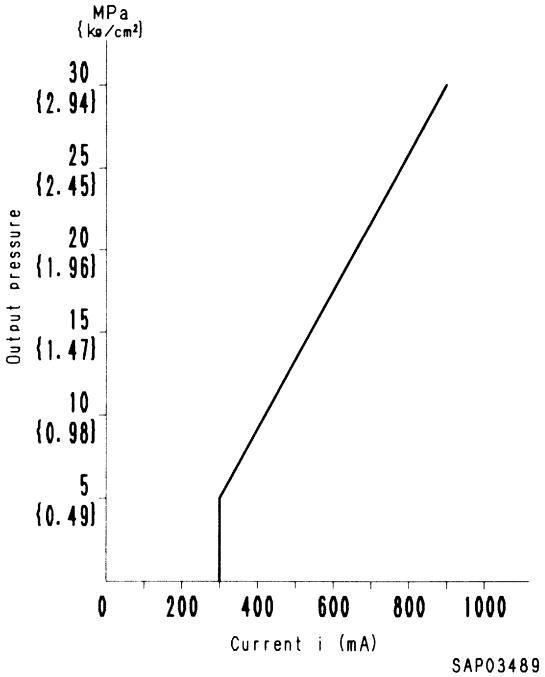
1. Cover
2. Body
3. Slipper seal
4. Oil seal
5. Shaft

A1. From control valve port **B2**
A2. To R.H. travel motor port **PB**
B1. From control valve port **B5**
B2. To. L.H. travel motor port **PA**
C1. From control valve port **A2**
C2. To R.H. travel motor port **PA**
D1. From control valve port **A5**
D2. To L.H. travel motor port **PB**
E1. From control valve port **A3**
E2. Blind
F1. From control valve port **B3**
F2. Blind
G1. From travel speed solenoid valve
G2. To L.H. and R.H. travel motors port **P**
T1. To tank
T2. From L.H. and R.H. travel motors port **T**

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 control valve.



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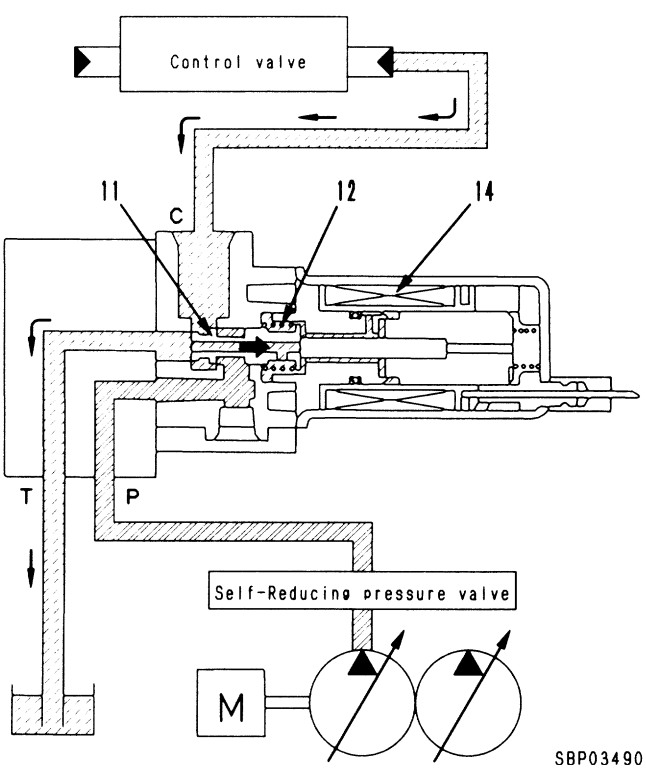
Operation

1. When signal current is 0 (coil deactivated)

- There is no signal current flowing from the controller to coil (14) is deactivated.
- For this reason, spool (11) is pushed to the right in the direction of the arrow by spring (12).
- As a result, port **P** closes and the pressurized oil from the main pump does not flow to the control valve.
  At the same time, the pressurized oil from the control valve passes from port **C** through port **T** and is drained to the tank.



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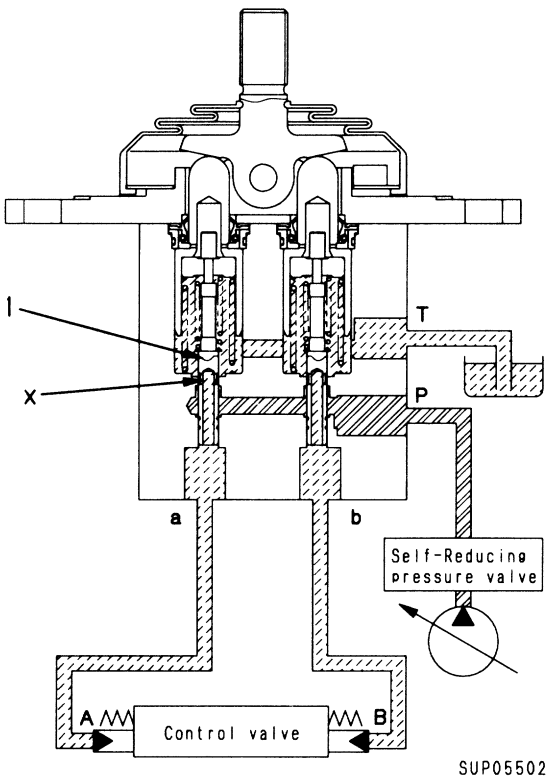
OPERATION

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).



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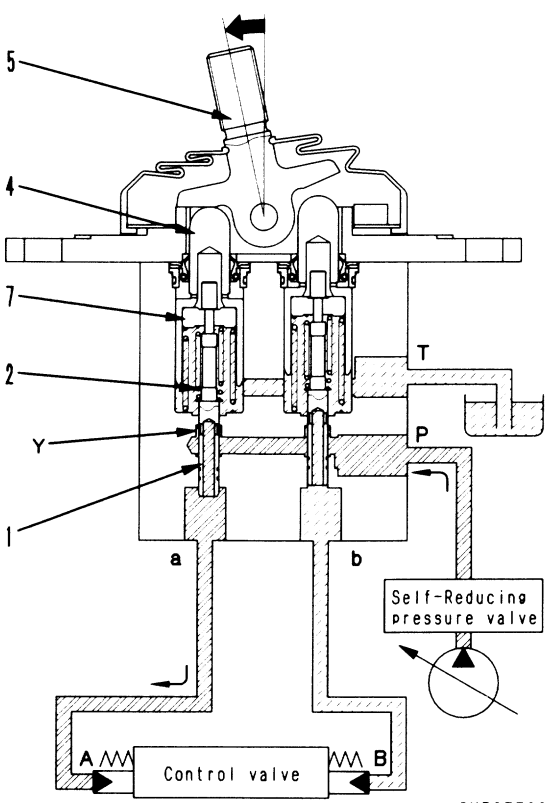
When operated

- 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.



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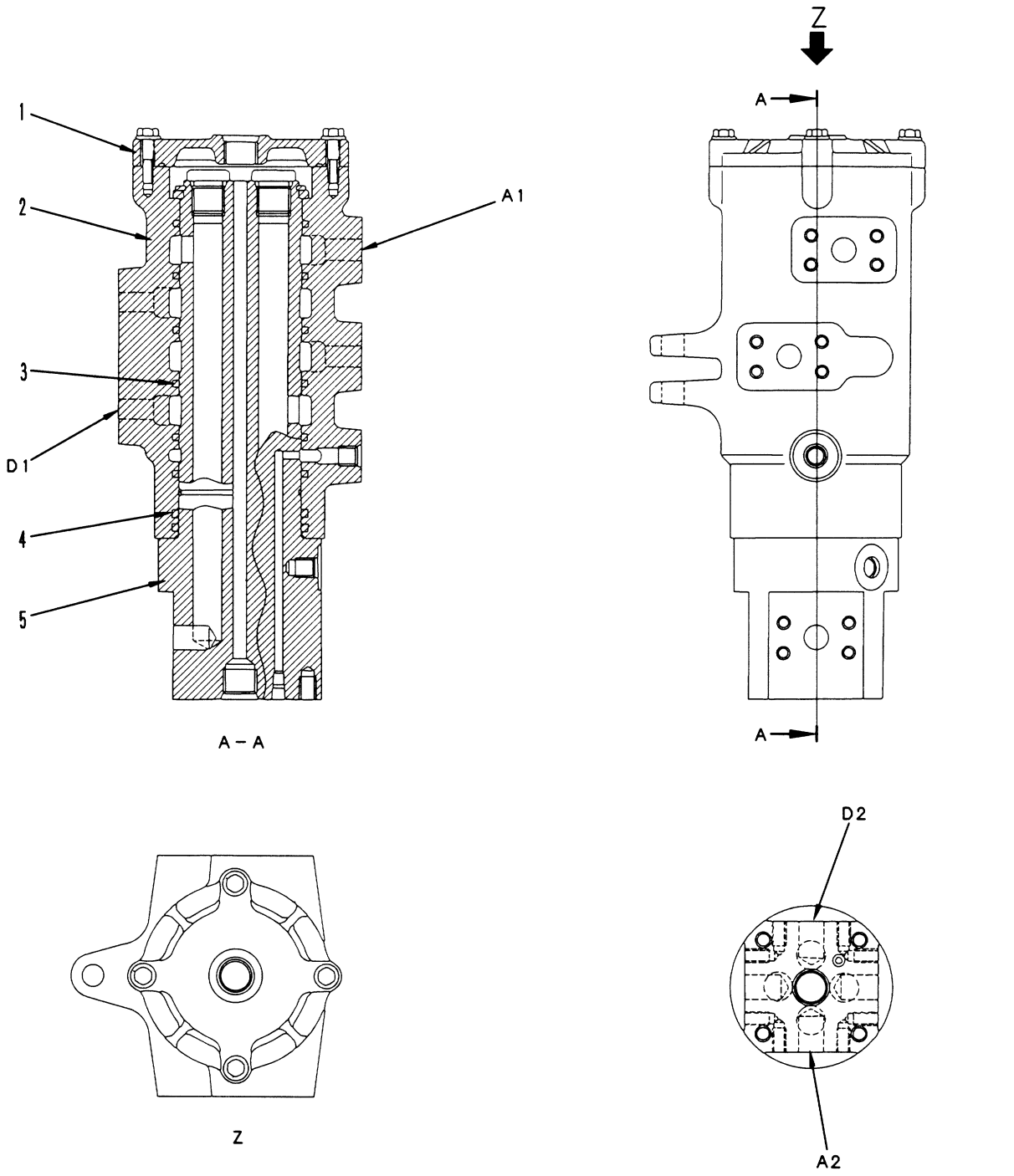
SWIVEL JOINT FOR ARM ROTATION



020Y06

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

A1. From control valve
A2. To bucket cylinder head
D1. From control valve
D2. To bucket cylinder bottom

1. Bucket cylinder stroke sensor (HYPER GX)
2. Arm angle sensor (HYPER GX)
3. Working lamp
4. Arm cylinder head pressure sensor (HYPER GX)
5. Arm cylinder bottom pressure sensor (HYPER GX)
6. LS control EPC valve
6. Hydraulic oil level sensor
7. Bucket cylinder head pressure sensor (HYPER GX)
8. Bucket cylinder bottom pressure sensor (HYPER GX)
9. PC control EPC valve
10. LS control EPC valve
11. Rear lamp
12. Engine speed sensor
13. Governor motor
14. Engine oil pressure sensor (for low pressure)
15. Rear pump pressure sensor
16. Front pump pressure sensor
17. Air cleaner clogging sensor
18. Radiator water level sensor
19. Left swing EPC valve
20. Right swing EPC valve
21. Window washer motor
22. Bucket DUMP EPC valve
23. Bucket CURL EPC valve
24. Arm OUT EPC valve
25. Arm IN EPC valve
26. Boom LOWER EPC valve
27. Boom RAISE EPC valve
28. GX controller (HYPER GX)
29. Valve controller
30. GX automatic operation cancel switch (HYPER GX)
31. Boom control switch
32. Boom prolix switch
33. Swing motor MA pressure sensor (HYPER GX)
34. Swing motor MB pressure sensor (HYPER GX)
35. Chassis angle sensor (HYPER GX)
36. Travel alarm
37. Boom cylinder head pressure sensor (HYPER GX)
38. Horn (high tone)
39. Boom cylinder bottom pressure sensor (HYPER GX)
40. Horn (low tone)
41. Boom angle sensor (HYPER GX)
42. Battery relay
43. Battery
44. Front lamp
45. Fuel level sensor
46. Engine water temperature sensor
47. Intake air heater
48. Air conditioner compressor magnet clutch
49. Engine oil level sensor
50. Alternator
51. Starting motor
52. Wiper motor
53. R.H. electric lever
54. Horn switch
55. R.H. additional front lamp
56. R.H. front lock
57. Room lamp
58. Auto pull-up motor
59. Rear limit switch
60. L.H. front lock
61. Front limit switch
62. L.H. additional front lamp
63. L.H. electric lever
64. L.H. knob switch
65. Heater relay
66. Fuse box
67. Alarm buzzer
68. Starting switch
69. Fuel control dial
70. Cigarette lighter
71. Swing lock switch
72. Wiper, washer switch
73. Light switch
74. Buzzer cancel switch
75. Front window auto pull-up switch
76. Kerosene mode connector
77. Speaker
78. Air conditioner control panel
79. Governor, pump controller
80. GX panel
81. Prolix switch
82. Wiper motor controller
83. Light relay
84. Light relay
85. EPC relay 2
86. EPC relay 1
87. Monitor panel
88. Swing prolix switch
89. Prolix switch
90. Arm OUT oil pressure switch
91. Arm IN oil pressure switch
92. Travel oil pressure switch
93. Right swing switch
94. Bucket DUMP oil pressure switch
95. Boom RAISE oil pressure switch
96. Bucket CURL oil pressure switch
97. Left swing switch
98. Boom LOWER oil pressure switch
99. Swing holding brake solenoid valve
100. Travel speed selector solenoid valve
101. Merge/flow divider solenoid valve
102. 2-stage relief solenoid valve
103. Active mode solenoid valve
※1 104. Swing storke limit solenoid valve

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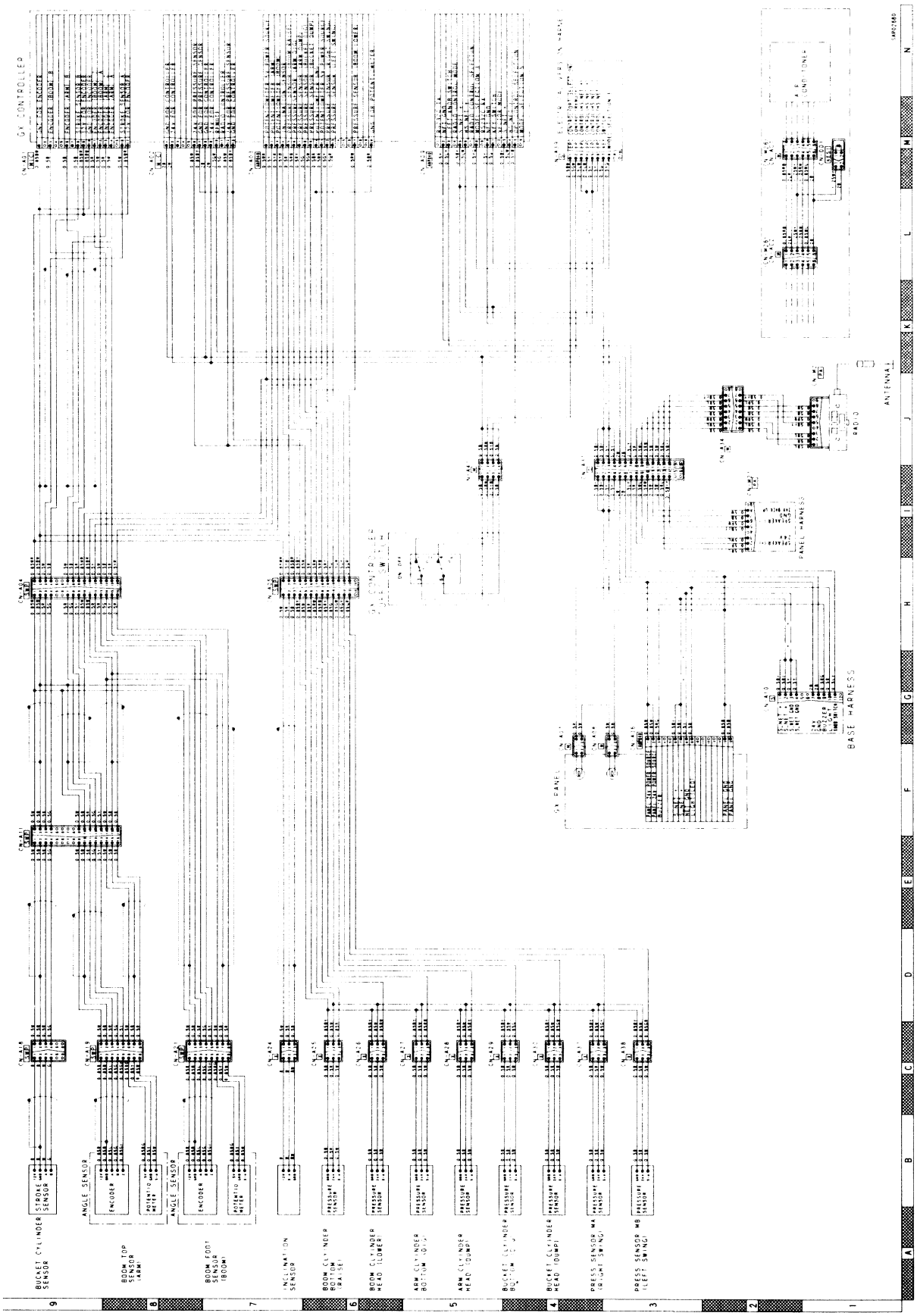
PC200-6 HYPER GX Serial No.: 102229 and up

★ For details of this page, see section 90.



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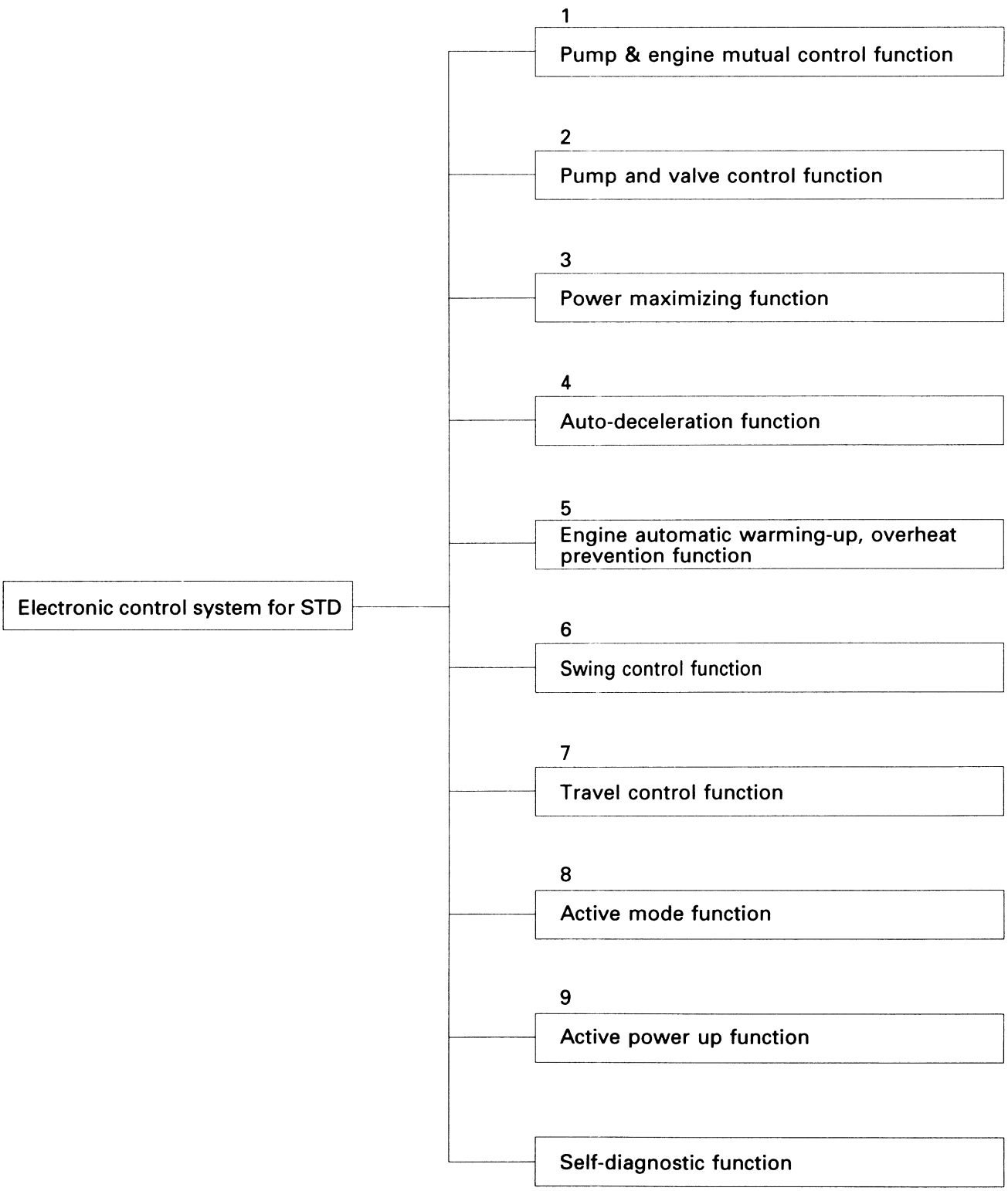
ELECTRONIC CONTROL SYSTEM FOR STD

CONTROL FUNCTION



020Y06

★ For details of the self-diagnostic function, see TROUBLESHOOTING.

3) 2-stage relief function

- The relief pressure for normal operations is 31.85 MPa {325 kg/cm²}, but when the 2-stage relief function is actuated, the relief pressure rises to approx. 34.79 MPa {355 kg/cm²}.
  Because of this, the hydraulic pressure is increased by one stage.

- Actuating conditions for 2-stage relief function

Conditions	Relief pressure
• When traveling • When swing lock switch is ON • In lifting operation (L/O) mode • When power max. function or swift slow-down function are actuated	31.85 MPa {325 kg/cm²} ⇩ 34.79 MPa {355 kg/cm²}

020Y06

4) Fine control mode function

- When the finishing operation (F/O) mode is selected from the working mode, the pump LS valve is controlled, and the pump discharge amount is reduced to improve the ease of fine control and the precision when finishing.

- Relationship between working mode and pump discharge amount (for independent operation)

(%)

Mode \ Actuator	Boom		Arm		Bucket	Swing	Breaker
	RAISE	LOWER	IN	OUT			
Heavy-duty operation (H/O)	100	40	100	100	50	50	–
General operation (G/O)							
Finishing operation (F/O)	100<50>	40	50	100	40 (50)	40 (50)	–
Lifting operation (L/O)	50		50	50	35	35	–
Breaker operation (B/O)	100	40	100	100	50	50	60

★ The figures in ( ) are for the PC220.
★ The figures in < > are for when arm IN is operated.
★ In each working mode, the full flow of the pump at the set engine speed is taken as 100%.

FUNCTION

- When traveling, the pump control is carried out, and the travel speed can be selected manually or automatically to give a travel performance that suits the nature of the work or the jobsite.

1) Pump control function when traveling

- If the travel is operated in any working mode other than the heavy-duty operation (H/O) mode, this increases the pump absorption torque while keeping the working mode and engine speed as they are.

★ For details, see PUMP & ENGINE MUTUAL CONTROL SYSTEM.

2) Travel speed selection function

i) Manual selection using travel speed switch

If the travel speed switch is set to Lo, Mi, or Hi, the pump controller controls the pump flow and motor volume at each speed range as follows to switch the travel speed.

Travel speed switch	Lo (Low speed)		Mi Mid-range speed)		Hi (High speed)	
Pump flow (%)	80		80		100	
Motor volume	Max.		Min.		Min.	
Travel speed (km/h)	PC200 PC210	PC220 PC230	PC200 PC210	PC220 PC230	PC200 PC210	PC220 PC230
	3.0	3.0	4.1	4.1	5.5	5.5

ii) Automatic selection according to engine speed

If the engine speed is reduced to below 1400 rpm by the fuel control dial:

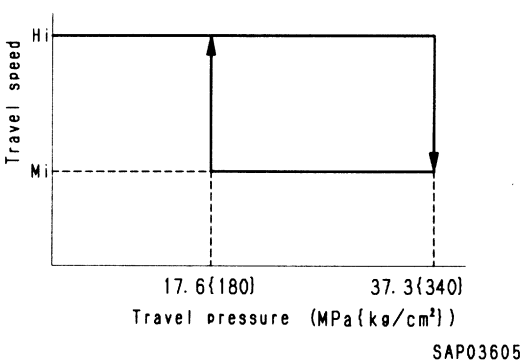
- If the machine is traveling in Lo, it will not shift even if Mi or Hi are selected.
- If the machine is traveling in Mi, it will not shift even if Hi is selected.
- If the machine is traveling in Hi, it will automatically shift to Mi.

iii) Automatic selection according to pump discharge pressure

If the machine is traveling with the travel speed switch at Hi, and the load increases, such as when traveling up a steep hill, if the travel pressure continues at 33.32 MPa {340 kg/cm²} for more than 0.5 sec, the motor volume is automatically switched and the travel speed changes to Mi.

(The travel speed switch stays at Hi.)

The machine continues to travel in Mi, and when the load is reduced, such as when the machine travels again on flat ground or goes downhill, and the travel pressure stays at 17.64 MPa {180 kg/cm²} or less for more than 0.5 sec, the motor volume is automatically switched and the travel speed returns to Hi.



SAP03605

020Y06

Input and output signals

CN-1

Pin No.	Name of signaloutput	Input/ output
1	Battery relay drive output	Output
2	Pump merge-divider solenoid	Output
3	Swing holding brake solenoid	Output
4	NC	—
5	Swing stroke limit solenoid valve	—
6	GND	Input
7	Power source (+24V)	Input
8	Active mode solenoid	Output
9	Travel selector solenoid	Output
10	2-stage relief solenoid	Output
11	NC	—
12	GND	Input
13	Power source (+24V)	Input

CN-2

Pin No.	Name of signaloutput	Input/ output
1	Solenoid power source (+24V)	Input
2	Governor motor phase A (+)	Output
3	Governor motor phase A (–)	Output
4	Governor motor phase B (+)	Output
5	Governor motor phase B (–)	Output
6	NC	—
7	LS-EPC solenoid (+)	Output
8	PC-EPC solenoid (+)	Output
9	NC	—
10	NC	—
11	PGND	Input
12	Solenoid power source (+24V)	Input
13	NC	—
14	NC	—
15	NC	—
16	NC	—
17	LS-EPC solenoid (–)	Output
18	PC-EPC solenoid (–)	Output
19	NC	—
20	NC	—
21	PGND	Input

CN-3

Pin No.	Name of signaloutput	Input/ output
1	Engine water temperature sensor	Input
2	Fuel level sensor	Input
3	Pump F pressure input	Input
4	Throttle potentiometer input	Input
5	NC	—
6	Pressure sensor power source (+24V)	Output
7	Potentiometer power source (+5V)	Output
8	Starting switch (ACC)	Input
9	Knob switch	Input
10	NC	—
11	NC	—
12	Battery charge (alternator terminal R)	Input
13	Pump R pressure input	Input
14	Feedback potentiometer input	Input
15	NC	—
16	Pressure sensor GND	Input
17	Potentiometer GND	Input
18	Starting switch (terminal C)	Input
19	Automatic greasing controller abnormality	Input
20	NC	—
21	PPC pressure	Input
22	Boom RAISE pressure switch	Input
23	Arm IN pressure switch	Input
24	S-NET (+)	Input, output
25	Model selection 1	Input
26	Model selection 3	Input
27	Model selection 5	Input
28	Swing prolix switch	Input
29	Overload sensor (if equiped)	Input
30	Boom LOWER pressure switch	Input
31	Arm OUT pressure switch	Input
32	S-NET (+)	Input, output
33	Model selection 2	Input
34	Model selection 4	Input
35	Kerosene mode selection	Input
36	Swing lock switch	Input

CN-5

Pin No.	Name of signaloutput	Input/ output
1	Engine speed sensor GND	Input
2	Engine speed sensor	Input
3	GND	Input
4	GND	Input
5	Swing pressure switch	Input
6	Service valve pressure switch	Input
7	NC	—
8	Radiator water level sensor	Input
9	Hydraulic oil level sensor	Input
10	Engine speed sensor GND	Input
11	Bucket CURL pressure switch	Input
12	Bucket DUMP pressure switch	Input
13	Travel pressure switch	Input
14	NC	—
15	Engine oil pressure sensor L	Input
16	Engine oil level sensor	Input
17	Air cleaner clogging sensor	Input

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OPERATION

- The output voltage from each electric lever is converted to a flow command value inside the valve controller.
  When this happens, the converted flow command value is calculated by the determined priority ratio according to the set priority mode.
- A current value in accordance with the calculated flow command value is output to the EPC valve.

Example: When boom mode is selected

- When the above mode is selected, if both the right swing and boom RAISE are operated to the end of the stroke, the flow command value remains at 100% for the boom RAISE circuit, but in accordance with the set priority ratio, the flow command value for the right swing is calculated at 70%.
- As a result, the current value output from the valve controller to the EPC valve is 70% for the right swing and 100% for the boom RAISE, so compared with the situation when the priority mode is OFF, the lifting speed for the bucket is increased.

EACH MODE

1) Boom boost mode

- Compared with the normal situation when the priority mode is not used, the flow of oil sent to the boom is increased, so the bucket lifting speed during swing and load operations is increased.

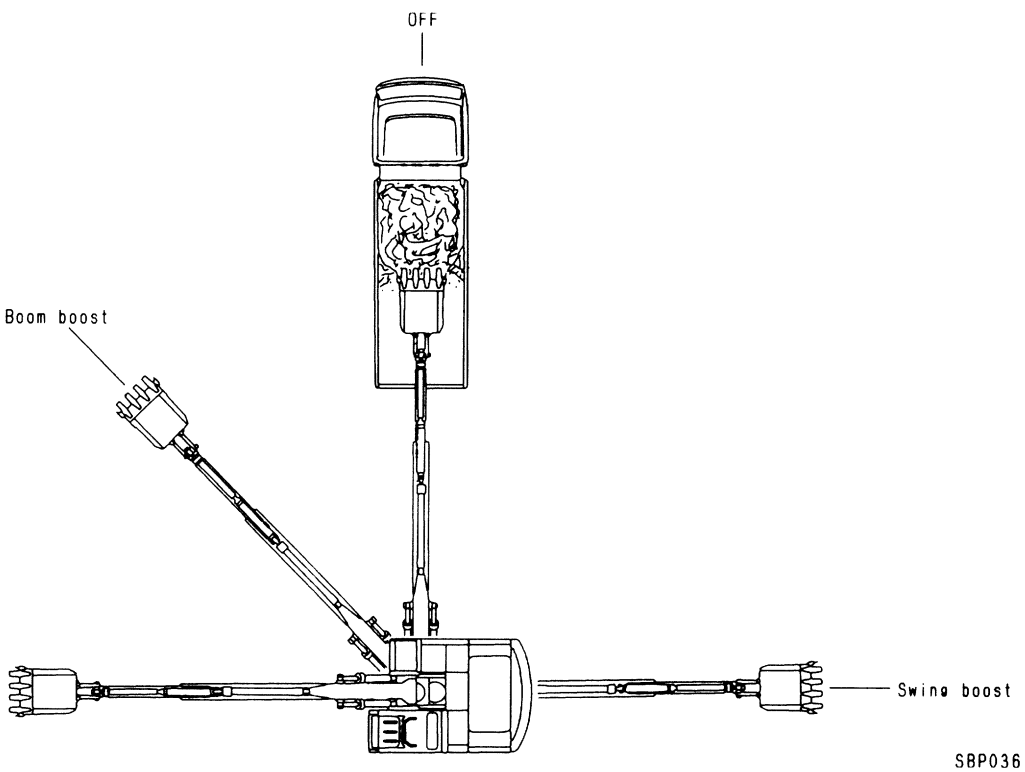
2) Swing boost mode

- Compared with the normal situation when the priority mode is not used, the flow of oil sent to the swing is increased, so the bucket lifting speed during swing and load operations is reduced.

★ With swing and load operations, the position of the matching dump truck is the main target, but the actual situation may change according to the condition of the load, the attachment installed, and the method of operation used by the operator.

★ The priority mode is only used for compound operations; with independent operations, there is no change in the speed according to the mode.
However, with swing boost 2 mode, the boom and arm speeds become slower with independent operations.

020Y06



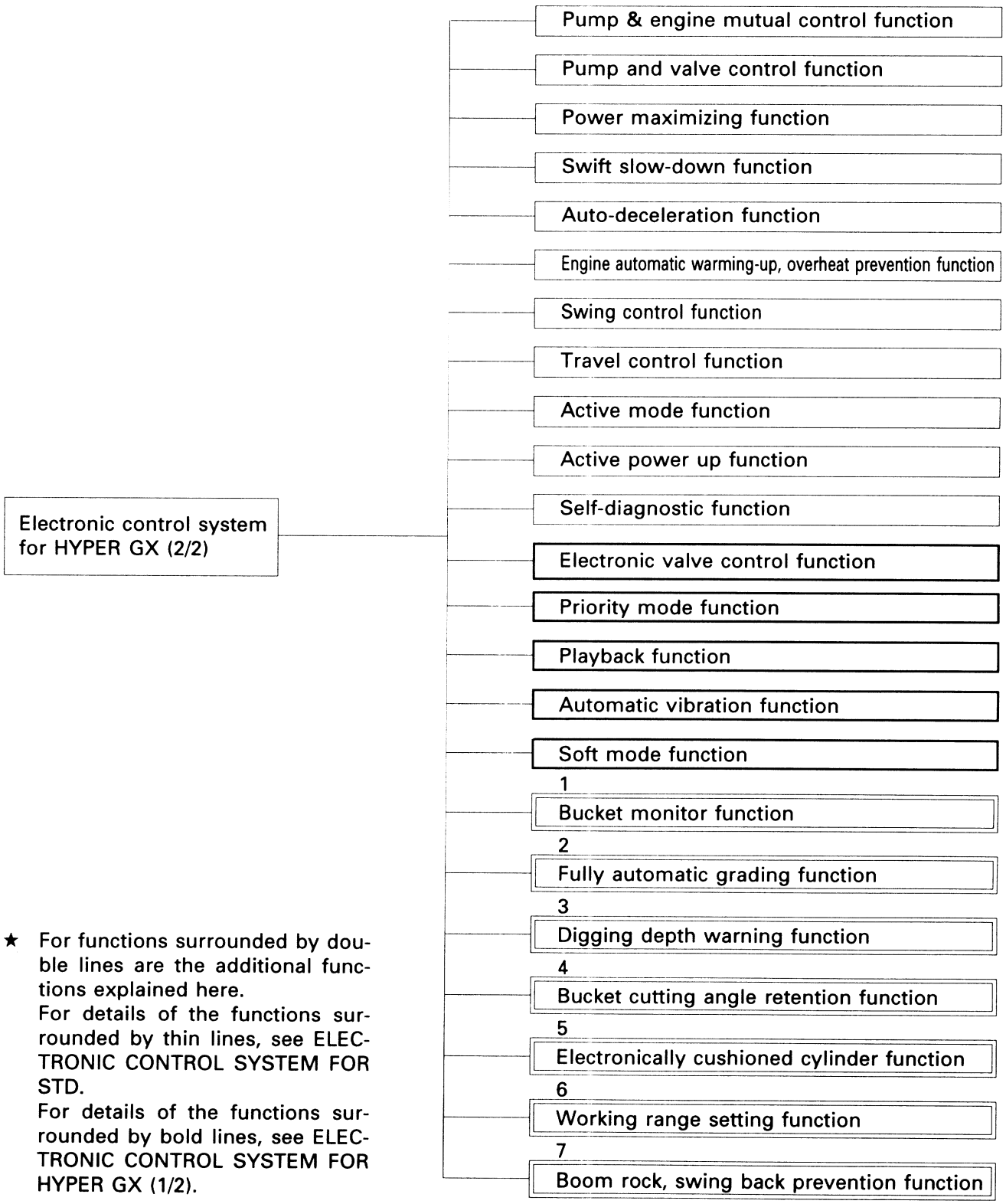
SBP03617

ELECTRONIC CONTROL SYSTEM FOR HYPER GX (2/2)

PC200, 200LC-6 HYPER GX

CONTROL FUNCTION (ADDITIONAL FUNCTIONS ON MONITOR PANEL)

020Y06

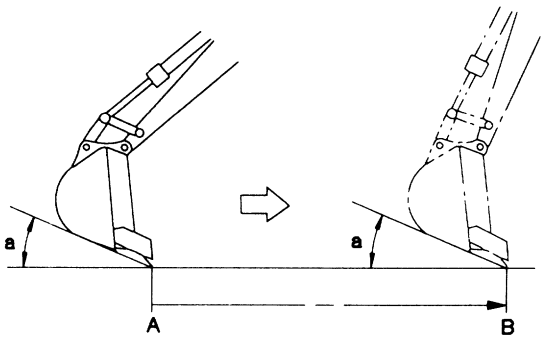


★ For functions surrounded by double lines are the additional functions explained here.
For details of the functions surrounded by thin lines, see ELECTRONIC CONTROL SYSTEM FOR STD.
For details of the functions surrounded by bold lines, see ELECTRONIC CONTROL SYSTEM FOR HYPER GX (1/2).

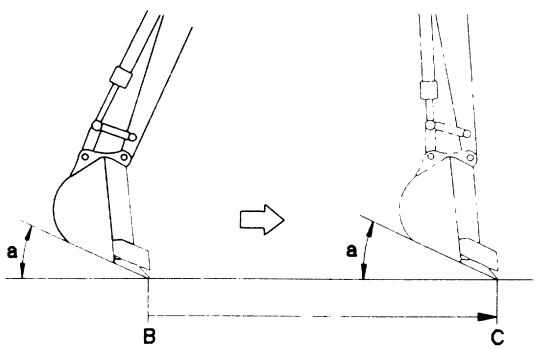
Operating pattern

1) When the GX controller receives the start signal from the L.H. knob switch, it sends a signal to the engine throttle • pump controller, and sets the working mode to H/O. (But the display does not change.)
2) It uses the signals from the work equipment sensors to calculate the present position of the cutting edge and the cutting angle. (Point **A**)
3) Based on the present data, it calculates the ideal cutting edge position and cutting angle after a fixed time.
4) It uses the difference between the present position and the target position to calculate the movement of the boom, arm, and bucket to bring the work equipment to the ideal condition after a fixed time, and outputs a command current through the value controller to the appropriate EPC valve. (Point **A** → Point **B**)
5) After moving for the fixed time, it takes the cutting edge position and cutting angle as the present position, and repeats the above procedures 2) – 4). (Point **B** → Point **C**)
6) If the boom or bucket lever is operated during the movement (Point **B** → Point **C'**), it takes the position after the lever is operated as the present position, and repeats the above procedures 2) – 4). (Point **C'** → Point **D**)
7) The GX controller stops the movement if the operator releases the L.H. knob switch or if the work equipment comes near to the end of its stroke.

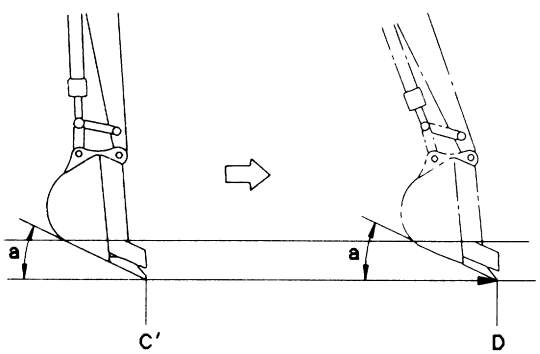
- In the case of the floor digging mode, it controls the three axes of the boom, arm, and bucket to maintain angle **a** constant between the bottom face of the bucket and the ground surface.
- In the cutting edge digging mode, it controls the two axes of the boom and arm to maintain digging angle **b** constant between the arm and bucket.
- The pressure sensors installed in the actuator circuits detect the load condition of the boom, arm, and bucket, and output the data to the controller.
  In the controller, these signals are used when calculating the current value to send to the EPC valve.



SBP01955



SBP01956



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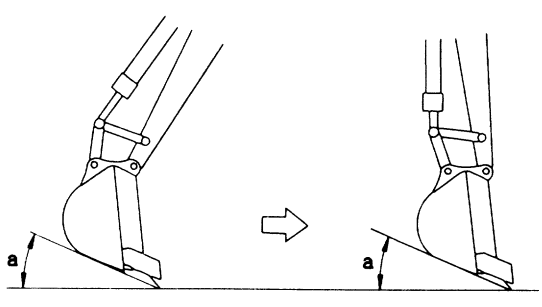

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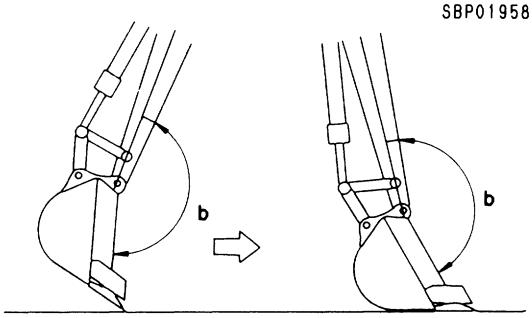


SBP01959

020Y06

OPERATION

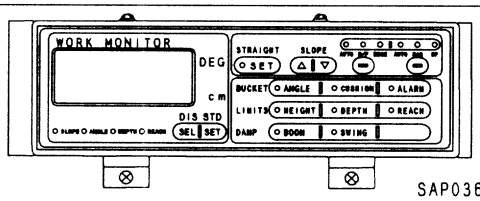
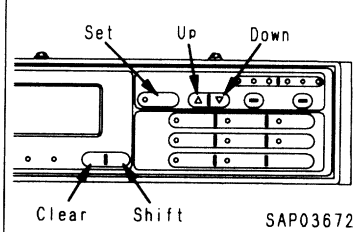
- When the control lever is moved from the operating position to near the neutral position, the pressure sensor detects the pressure at both ports of the actuator and sends the data to the GX controller.
- The controller compares the pressure of both ports, and sends a command current to the EPC valve to release the pressure at the port where the pressure is high.
- The determined command current and the manual control command from the control lever are compared, and the larger one is output to the EPC valve.
- If the manual control command is smaller, it is taken that the operation is stopping, and the command current determined by the controller is output to the EPC valve.
- In this way, there is no closed in pressure after the lever is operated, so there is no shock when stopping.

★ When this function is being used, if the lever is operated, the control command is larger than the command current determined by the controller, so the manual control signal is output by priority to the EPC valve.

★ This function acts to suppress the residual vibration after the lever is operated, and does not function when the lever is being operated.
It carries out control according to the size of the change in the load pressure, so if the change in the load pressure for that operation is small, it does not function.
If the lever is operated suddenly, the swing back prevention does not function.

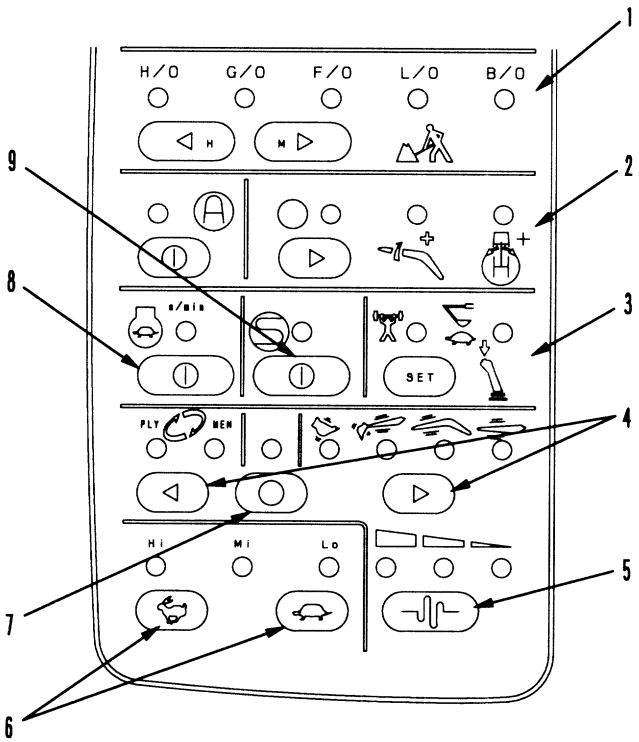
020Y06

Condition inside controller and panel display

Display code	Operation and display
Operation when normal All light up for 5 sec. All go out for 1 sec. • When normal Operate bucket to both stroke ends ※Started as GX 123 • Bucket cutting angle display and some of LEDs light up	Starting switch ON
 SAP03671 ★To check ON/OFF operation of LED and LCD on GX panel, all lamps light up and go out (※operator check)	
• When abormal E ※Becomes HYPER function machine	• When GX automatic operation is disconnected	When GX automatic operation is disconnected, switch is set to "Disconnected"
EEE ★When communications between panel and GX controller are impossible	• When network communication are impossible	Displayed when abnormality occurs
E Example: Correct angle cannot be displayed because of failure in boom angle sensor	• When erros occur which prevent bucket monitor from function	Displayed when abnormality occurs
※Except when EEE display is given, go from all above condition to below b	• Drop in power source (below 15V)	Displayed when controller power source voltage drops to less than 15V
d	• When GX monitoring mode is selected	Keep the [SHIFT] + [0] switches pressed for at least 3 seconds. The buzzer sounds, the left display changes, and the d display flashes
E02 ※After 2 sec. -082	• When GX error code display mode is selected • Displays details of error code	When error occurs Example: when there are 2 errors Keep the [SHIFT] + [–] switches pressed for at least 3 seconds. ※After displaying number of errors, error code is displayed To change the code No. press [UP] or [DOWN]
★ GX panel switches used for inputting code  SAP03672		
C	• When GX adjustment mode is selected	Keep the [0] + [9] switches pressed for at least 3 seconds. Press [SET] switch within 1 sec. after buzzer sounds.

020Y06

PC200, 200LC-6 HYPER GX



SAP03679

1. Working mode switch
2. Boom/swing priority mode switch
3. Power max./swift slow-down switch
4. Automatic mode selection switch
5. Vibration mode switch
6. Travel speed switch
7. Automatic mode OFF switch
8. Auto-deceleration switch
9. Soft mode switch

020Y06

- The switch portion consists of eight mode selection switches, and the condition of the machine changes each time that any switch is pressed. The LED above the switch lights up to display the present condition of the machine.

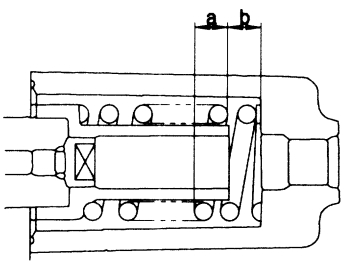
Switch actuation table

Item	Actuation
WORKING MODE	H/O↔**G/O**↔F/O↔L/O↔B/O
LEVER SWITCH	**POWER UP** → SPEED DOWN
AUTO DECEL	**ON** ↔ OFF
TRAVEL SPEED	Hi ↔ Mi ↔ **Lo**
SWING ACCEL	<Boom> Boost ↔ **OFF** ↔ <Swing> Boost
AUTO DECEL	**OFF** ↔ ON
AUTOMATIC MODE	PLAYBACK ↔ TEACH ↔ **OFF** ↔ BUCKET ↔ BUCKET•ARM ↔ BOOM ↔ ARM
AMPLITUDE	L ↔ M ↔ **S**
ACTIVE MODE	**ON** ↔ OFF

★ The bold letters indicate the default position of the switch when the starting switch is turned ON.

• FOR CHASSIS

★ The Standard values and permissible values shown in this table are all values for H/O (heavy-duty operation) mode.

Applicable model				PC200, 210, 220, 230-6			
Category	Item	Measurement conditions	Unit	Standard value		Permissible value	
Engine speed	2 pumps at relief	· Hydraulic oil temperature: 45 – 55°C · Coolant temperature: Within operating range · 2-pump relief: Arm relief	rpm	PC200, 210: 1,950±100	PC220, 230: 2,150	PC200, 210: —	PC220, 230: —
	At 2-pump relief + one touch power up	· Arm relief · One touch power up · Engine at high idling		2,000±100	2,100	2,000±100	2,100
	Speed when auto-deceleration is operated	· Fuel control dial at MAX. · Control lever at neutral		1,400 ± 120		1,400 ± 120	
Spool stroke	Boom control valve	 TUP01366	mm	a	b	a	b
	Arm control valve			9.5±0.5	9.5±0.5	9.5±0.5	9.5±0.5
	Bucket control valve			Boom LOWER only (11.5±0.5)	Boom LOWER only (11.5±0.5)	Boom LOWER only (11.5±0.5)	Boom LOWER only (11.5±0.5)
	Swing control valve						
	Travel control valve						
Travel of control levers	Boom control lever	· Center of lever knob · Read max. value to end of travel · Engine stopped · Excluding neutral play		85 ± 10		Max. 95 Min. 75	
	Arm control lever			85 ± 10		Max. 95 Min. 75	
	Bucket control lever			85 ± 10		Max. 95 Min. 75	
	Swing control lever			85 ± 10		Max. 95 Min. 75	
	Travel control lever			115 ± 12		Max. 127 Min. 103	
	Play of control lever			Max. 10		Max. 15	
Operating force of control levers	Boom control lever	· Engine at high idling · Oil temperature: 45 – 55°C · Fit push-pull scale to center of control lever knob to measure · Measure max. value to end of travel	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}	
		Pedal		74.5 ± 18.6 {7.6 ± 1.9}		Max. 107.6 {Max. 11}	

020Y06

System	Name of component	Connector No.	Inspection method	Judgment table	Measurement conditions
Control system	LS-EPC solenoid	C10 (male)	Measure resistance	If the condition is within the range shown in the table below, it is normal Between (1) – (2): 7 – 14 Ω Between(1), (2) – chassis: Min. 1 MΩ	1) Turn starting switch OFF. 2) Disconnect connector C10.
Engine throttle • pump controller	Power source voltage	C01 C02	Measure voltage	If the condition is within the range shown in the table below, it is normal Between C01 (7),(13) – (6),(12): 20 – 30 V Between C02 (11),(21) - (6),(12): 20 – 30 V	1) Turn starting switch ON. 2) Insert T – adapter.
	Fuel control dial	C03	Measure voltage	If the condition is as shown in the table below, it is normal Between (7) – (17) (power source): 4.75 – 5.25 V Between (4) – (17) (low idling): 4.0 – 4.75 V Between (4) – (17) (high idling): 0.25 – 1.0 V	1) Turn starting switch ON. 2) Insert T – adapter.
	Governor potentiometer	C03	Measure voltage	If the condition is as shown in the table below, it is normal Between (14) – (17) (low idling): 2.9 – 3.3 V Between (14) – (17) (high idling): 0.5 – 0.9 V Between (7) – (17) (power source): 4.75 – 5.25 V	1) Turn starting switch ON. 2) Insert T – adapter.
	Coolant temperature sensor	P07 (male)	Measure resistance	If the condition is as shown in the table below, it is normal Normal temperature (25°C): Approx. 37 – 50 kΩ 100°C: Approx. 3.5 – 4.0 kΩ	1) Turn starting switch OFF. 2) Disconnect connector P07. 3) Insert T – adapter. into connector at sensor end.
	Governor motor	C02	Measure voltage	If the condition is within the range shown in the table below, it is normal Between (2) – (3): 1.8 – 4.6 V Between (4) – (5): 1.8 – 4.6 V	1) Turn starting switch ON. 2) Insert T – adapter.
	Battery relay	C01	Measure voltage	If the condition is within the range shown in the table below, it is normal Between (1) – (6): 20 – 30 V ★ This is only for 2.5 sec after the starting switch is operated ON → OFF; at other times it must be 0 V.	1) Turn starting switch ON. 2) Insert T – adapter.

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TOOLS FOR TESTING, ADJUSTING, AND TROUBLESHOOTING

Check or measurement item	Symbol		Part No.	Part Name	Remarks
Engine speed	A		799-203-8001 or 799-608-1000	Multi-tachometer Tachometer (electrical type)	0 – 3,000 rpm Digital display L: 60 – 2,000 rpm H: 60 – 19,999 rpm
Coolant and oil temperatures	B		799-101-1502	Digital temperature gauge	–99 – 1,299°C
Oil pressure	C	1	799-101-5002	Hydraulic tester	Pressure gauge 2.5, 5.9, 39.2, 58.8 MPa {25, 60, 400, 600 kg/cm^2}
			790-261-1203	Digital hydraulic tester	Pressure gauge 69 MPa {700 kg/cm^2}
		2	799-401-2320	Hydraulic gauge	1.0 MPa {10 kg/cm^2}
		3	•790-261-1311	Adapter	Both male and female 14 x 1.5 (female PT 1/8)
			•790-261-1321		Both male and female 18 x 1.5 (female PT 1/8)
			•790-261-1331		Both male and female 22 x 1.5 (female PT 1/8)
		4	799-401-2700	Differential pressure gauge	(12V)
		5	790-261-1360	Adapter	Both male and female 14 x 1.5 (female PT 1/8)
			790-261-1370	Nut	For 14 x 1.5 blind
			07003-31419	Gasket	For blind
			07040-11409	Plug	For 14 x 1.5 blind
Compression pressure	D	1	795-502-1205	Compression gauge	0 – 6.9 MPa {0 –70 kg/cm^2}
		2	795-502-1700	Adapter	
Blow-by pressure	E		799-201-1504	Blow-by checker	0 – 4.9 MPa {0 – 500 mmH$_2$O}
			795-790-1950	Tool	For 102 series engine
Valve clearance	F		Commercially available	Feeler gauge	—
Exhaust color	G	1	799-201-9000	Handy Smoke Checker	Discoloration 0 – 70% (with standard color) (Discoloration % x 1/10 = Bosch index)
		2	Commercially available	Smoke meter	
Air supply pressure (boost pressure)	H		799-401-2201	Pressure gauge	199.9 kPa {–760 – 1,500 mmHg}
Operating effort	J		79A-264-0020	Push-pull scale	0 – 294N {0 – 30 kg}
			79A-264-0090		0 – 490N {0 – 50 kg}
Stroke, hydraulic drift	K		Commercially available	Scale	—
Work equipment speed	L		Commercially available	Stop watch	—
Measuring voltage and resistance values	M		79A-264-0210	Tester	—
Troubleshooting of wiring harnesses and sensors	N	1	799-601-7100	T-adapter assembly	—
		2	799-601-7070	Adapter	For SWP14P
			799-601-7360		For relay 5P
Measuring wear of sprocket	P		796-427-1190	Wear gauge	—
Fuel injection timing valve clearance	Q		795-799-1130	Adapter	—

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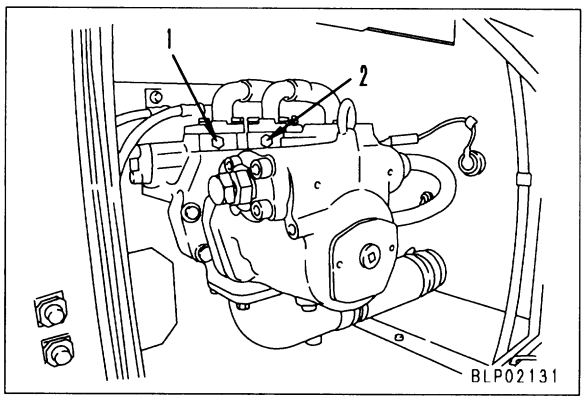
2. Adjusting

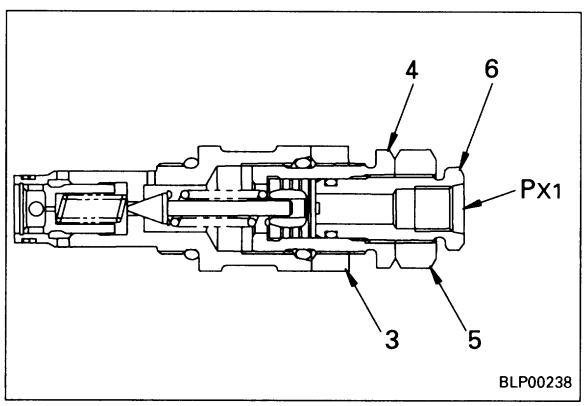
- (1): For front pump.
- (2): For rear pump.

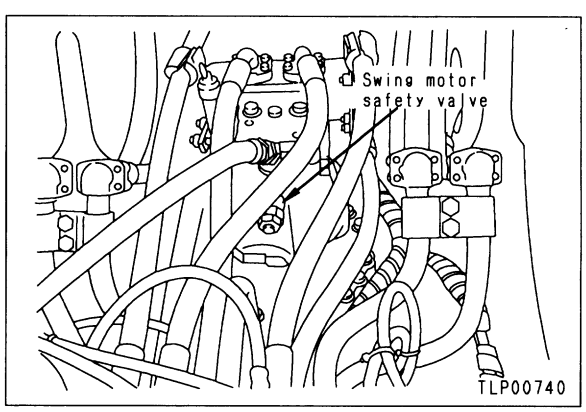
1) Adjusting high pressure setting
Loosen locknut (3), then turn holder (4) to adjust.
★ Turn the holder to adjust as follows.
To INCREASE pressure, turn CLOCKWISE.
To DECREASE pressure, turn COUNTER-CLOCKWISE.
★ Amount of adjustment for one turn of holder: Approx. 12.5 MPa {128 kg/cm²}
kgm Locknut
: **53.5 ± 4.9 Nm {5.5 ± 0.5 kgm}**
★ When the high pressure setting is adjusted, the low pressure setting will also change, so adjust the low pressure setting also.

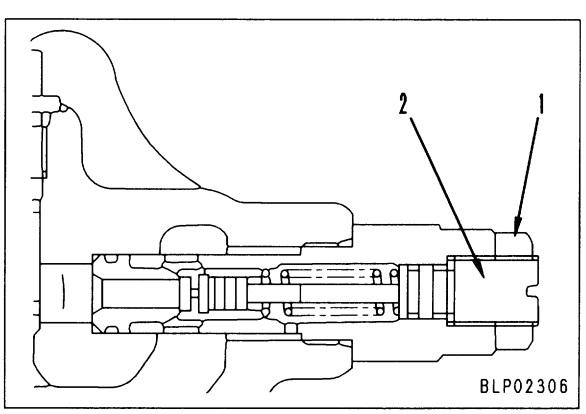
2) Adjusting low pressure setting
Loosen locknut (5), then turn holder (6) to adjust.
★ Turn the holder to adjust as follows.
To INCREASE pressure, turn CLOCKWISE.
To DECREASE pressure, turn COUNTER-CLOCKWISE.
★ Amount of adjustment for one turn of holder: Approx. 12.5 MPa {128 kg/cm²}
kgm Locknut:
53.5 ± 4.9 Nm {4.0 ± 0.5 kgm}
★ Normally, the pressure applied to port **PX1** is 0 MPa {0 kg/cm²}; at the high pressure setting, it is 2.9 MPa {30 kg/cm²}.

3) Swing motor safety valve
Loosen locknut (1), then turn adjustment screw (2) to adjust.
★ Turn the adjustment screw to adjust as follows.
To INCREASE pressure, turn CLOCKWISE.
To DECREASE pressure, turn COUNTER-CLOCKWISE.









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MEASURING EPC SOLENOID VALVE OUTPUT PRESSURE AND CHECKING EPC SHUTTLE VALVE

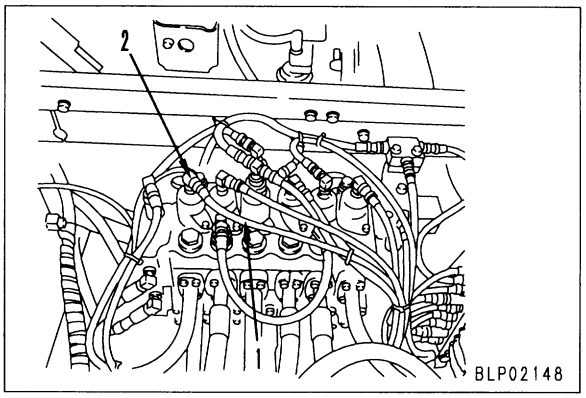
(HYPER specification)

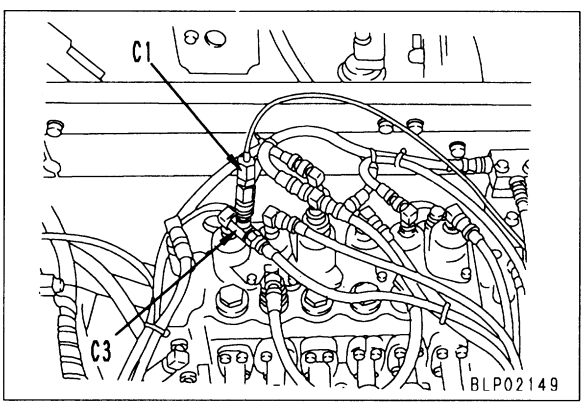
★ The PPC hose became different after the periodic modification, but the content of the operation is the same.

★ Oil temperature when measuring: 45 – 55°C

1. Measuring EPC solenoid valve output pressure

1) Disconnect hose (1) of the circuit to be measured.
2) Install adapter **C3** between hose (1) and elbow (2).
3) Install oil pressure gauge **C1** (5.9 MPa {60 kg/cm²}) to adapter **C3**.
4) Run the engine at full throttle, operate the control lever of the circuit to be measured, and measure the oil pressure.





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2. Bleeding air from hydraulic cylinders

1) Start the engine and run at idling for approx. 5 minutes.
2) Run the engine at low idling, then raise and lower the boom 4 – 5 times in succession.
   ★ Operate the piston rod to approx. 100 mm before the end of its stroke. Do not relieve the circuit under any circumstances.
3) Run the engine at full throttle and repeat Step 2). After that, run the engine at low idling, and operate the piston rod to the end of its stroke to relieve the circuit.
4) Repeat Steps 2) and 3) to bleed the air from the arm and bucket cylinders.

★ When the cylinder has been replaced, bleed the air before connecting the piston rod.
Be particularly careful not to operate the cylinder to the end of its stroke when the piston rod has been connected to the LOWER end of the boom cylinder.

Bleeding air from hydraulic cylinders (HYPER GX specification)

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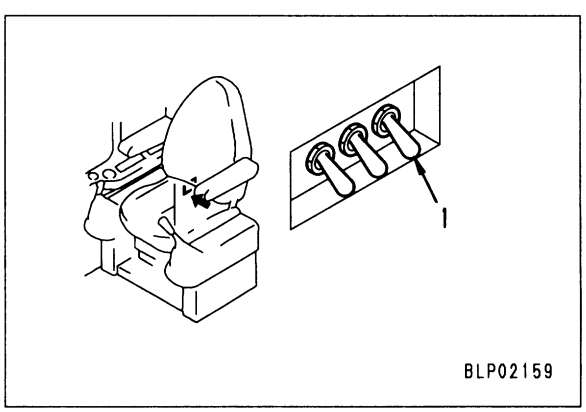
1) Turn the starting switch off, then set automatic operation disconnection switch (1) to the DISCONNECT position.
2) Turn the starting switch ON again.
3) Start the engine and run at idling for approx. 5 minutes.
4) Run the engine at low idling, then raise and lower the boom 4 – 5 times in succession.
   ★ Operate the piston rod to approx. 100 mm before the end of its stroke. Do not relieve the circuit under any circumstances.
5) Set to governor adjustment mode (engine at full throttle) and repeat Step 4). After that, run the engine at low idling, and operate the piston rod to the end of its stroke to relieve the circuit.
6) Repeat Steps 4) and 5) to bleed the air from the arm and bucket cylinders.

★ When the cylinder has been replaced, bleed the air before connecting the piston rod.
Be particularly careful not to operate the cylinder to the end of its stroke when the piston rod has been connected to the LOWER end of the boom cylinder.

★ When the starting switch is turned OFF and the automatic operation disconnection switch is turned to AUTOMATIC OPERATION, it acts as the GX function.



Operation	Display
2) To save input data: • Input C [00] with the numeric switches, then press the [SET] switch. • [c] lights up for 2 seconds (writing data). The new data is automatically saved and the screen exits the GX adjustment mode. ※ After saving the data, turn the starting switch OFF, then turn it ON again to load the data that was saved. 4) To exit the GX adjustment mode without saving the data, carry out the same operation as when entering the GX adjustment mode.	

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Item		Posture of machine when correcting
Q	Saving data	No connection

Note: During the above adjustment operation, the GX controller may take the situation as a failure and display an error, but this does not indicate any abnormality. However, if the error message does not go out when the starting switch is turned OFF, this indicates that the adjustment is defective.

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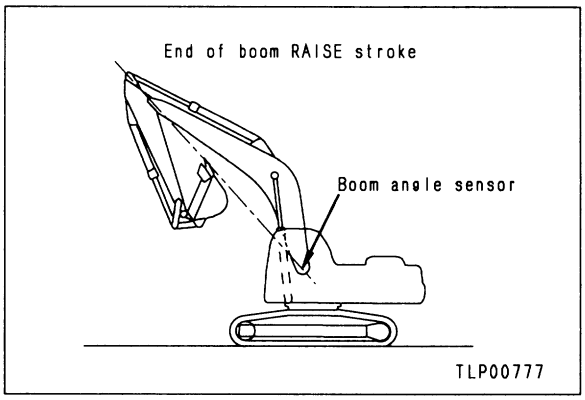
4. Check that the boom angle sensor is installed correctly.
   ★ If it is not installed correctly, an error will be given when correcting the sensor, or an error will occur during operation after the completion of correction.
   ★ Method of checking
   Set the work equipment in the posture given below and check the value of the boom angle sensor potentiometer with monitoring mode d11. (See "Method for the monitoring display".)
   Boom angle sensor (check with monitoring d11)

Posture	Content of data	Permitted value
End of boom RAISE stroke	Monitoring reading	776 ± 30
	Voltage (V)	3.79 ± 0.15



★ After completing the replacement operation, adjust the boom angle sensor.
Order of operation: **A → E → H → Q**
For details, see TESTING AND ADJUSTING, Table for order of operations in GX adjustment mode.

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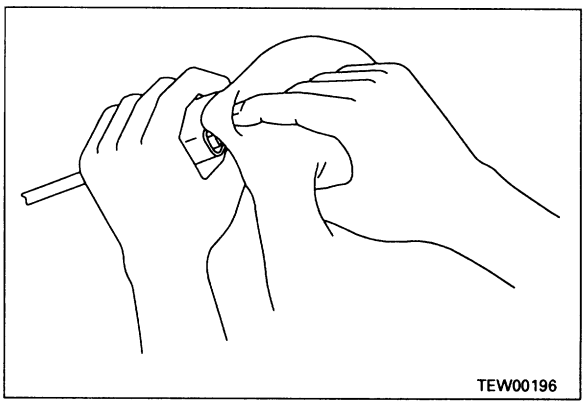
- **Drying wiring harness**
  If there is any oil or dirt on the wiring harness, wipe it off with a dry cloth. Avoid washing it in water or using steam. If the connector must be washed in water, do not use high-pressure water or steam directly on the wiring harness.

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


TEW00196

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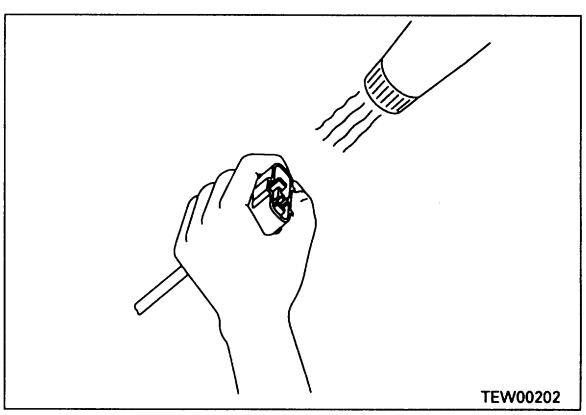
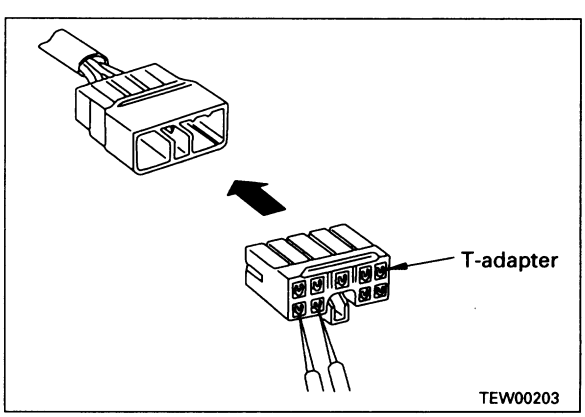
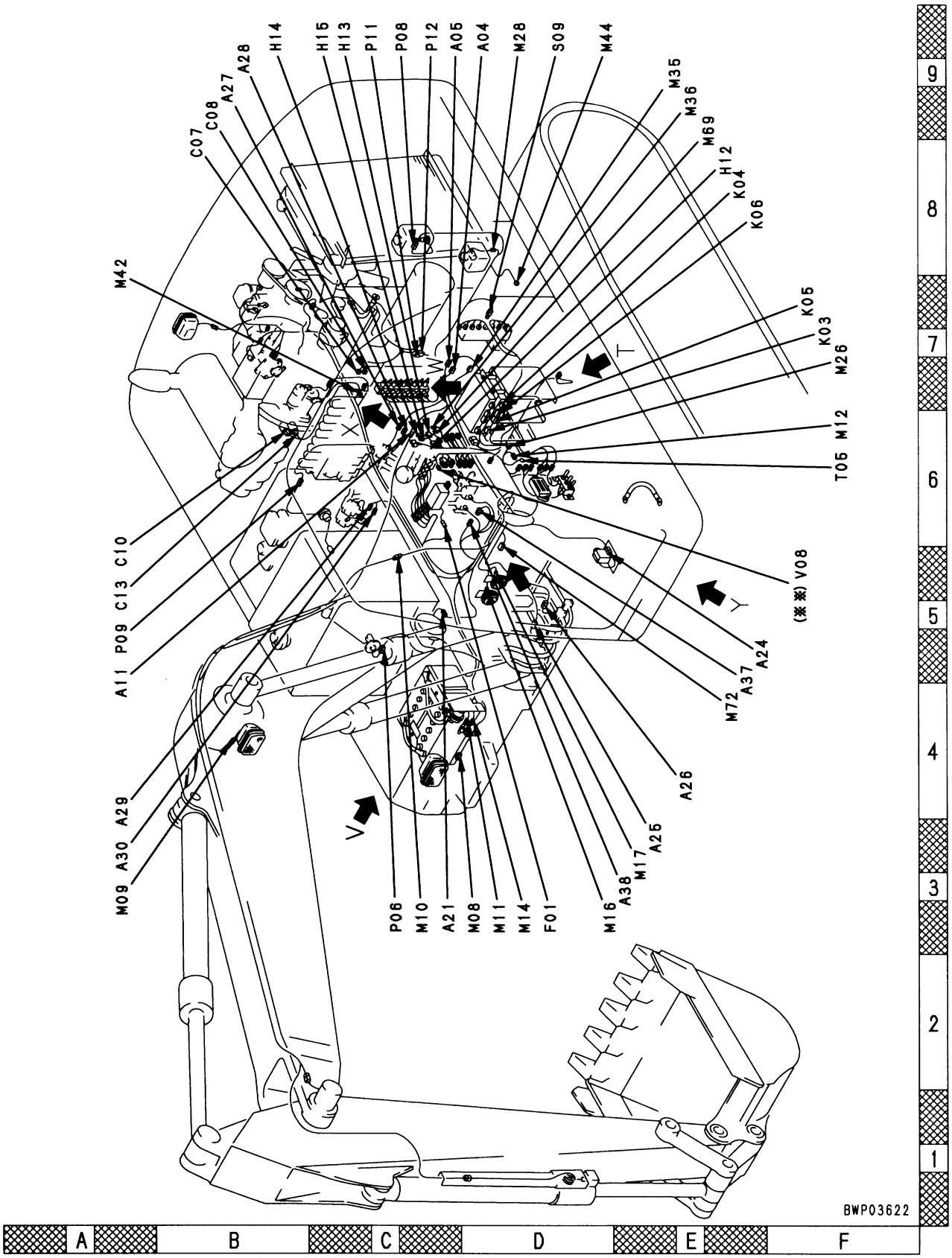
② Dry the inside of the connector with a dryer.
If water gets inside the connector, use a dryer to dry the connector.
★ Hot air from the dryer can be used, but regulate the time that the hot air is used in order not to make the connector or related parts too hot, as this will cause deformation or damage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


TEW00202

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.



TEW00203



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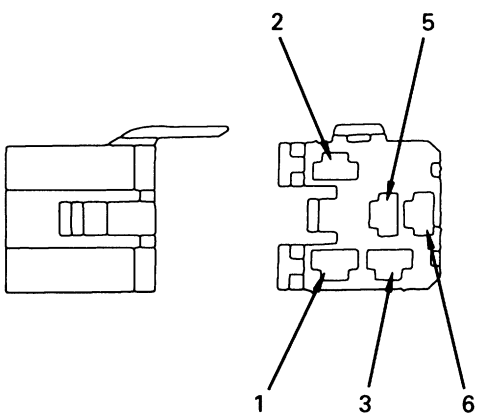
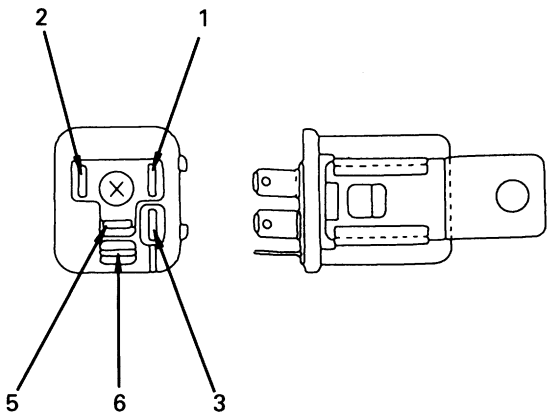
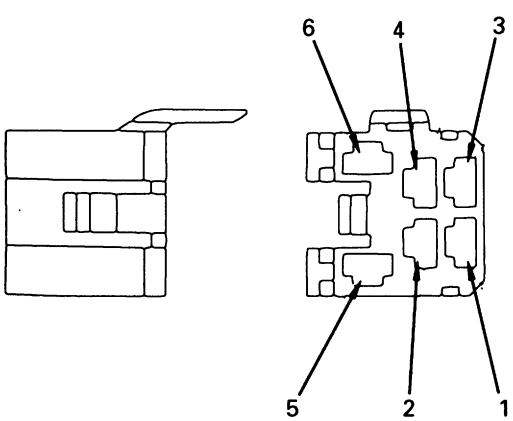
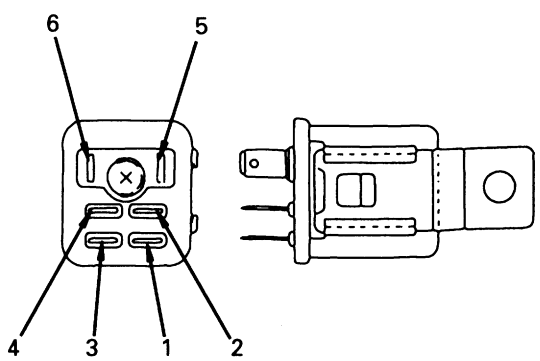
Note) ※ : PC200-6 HYPER GX Serial No.: 96514 – 102228 ※※ : PC200-6 HYPER GX Serial No.: 102229 and up

No. of pins	Relay connector	
	Male (female housing)	Female (male housing)
5	 BLP00073	 BLP00074
6	 BLP00075	 BLP00076

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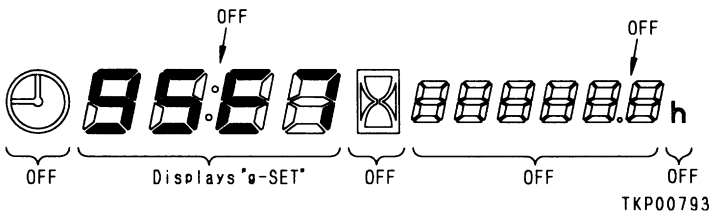
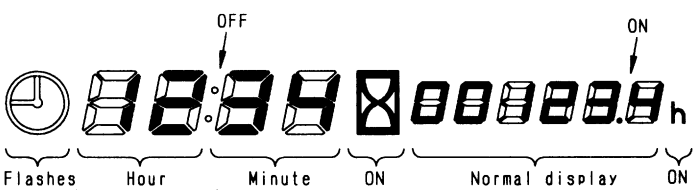
4. Governor motor adjustment mode

This is used when adjusting the linkage between the governor motor and the injection pump. (For details of the procedure, see TESTING AND ADJUSTING.)

Operation	Display
1. To set to the governor motor adjustment mode, press the time switch + R.H. travel speed switch + R.H. working mode switch.	1.  TKP00793
2. To return to the time display mode use the same procedure as in Step 1.	2. Buzzer sounds once a second

5. Time adjustment mode

To adjust the time, do as follows.

Operation	Display
1. To set to the time adjustment mode, keep the time switch depressed for 2.5 seconds. 2. Use the L.H. working mode switch to advance the hour. 3. Use the R.H. working mode switch to advance the minute. 4. To return to the time display mode use the same procedure as in Step 1.	1. The time mark portion flashes  TKP00794 ★ The example shows the situation when setting to 12:34.

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Service code	Abnormal system	User code
E436	Abnormality 2 in drive circuit system for arm OUT EPC solenoid valve	E06+CALL (CALL)
E437	Abnormality 2 in drive circuit system for bucket DUMP EPC solenoid valve	E06+CALL (CALL)
E438	Abnormality 2 in drive circuit system for right swing EPC solenoid valve	
E441	Abnormality 1 in boom control lever system	E06+CALL
E442	Abnormality 1 in arm control lever system	CALL
E443	Abnormality 1 in bucket control lever system	
E444	Abnormality 1 in swing control lever system	
E445	Abnormality 2 in boom control lever system	E06+CALL
E446	Abnormality 2 in arm control lever system	CALL
E447	Abnormality 2 in bucket control lever system	
E448	Abnormality 2 in swing control lever system	
E451	Abnormality in S-NET communications	E06+CALL (CALL)
E452	Abnormality in HS-NET communications	
E453	Abnormality 1 in GX controller procedure	E01
E454	Abnormality 2 in GX controller procedure	
E455	Abnormality in ROM, RAM of CPU	E06+CALL
E456	Abnormality in teaching playback RAM data	E01
E457	Abnormality in knob switch	E06+CALL (CALL)
E458	Abnormality in interlock PLD	E06+CALL
E601	Abnormality in boom pressure sensor system	E09
E602	Abnormality in arm pressure sensor system	
E603	Abnormality in bucket pressure sensor system	
E604	Abnormality in swing pressure sensor system	
E606	Abnormality in clinometer input value	
E607	Abnormality in boom potentiometer system	
E608	Abnormality in arm potentiometer system	
E611	Abnormality in boom variable angle	
E612	Abnormality in arm variable angle	
E613	Abnormality in bucket variable angle	
E614	Abnormality in comparison of two boom sensor signals	
E615	Abnormality in comparison of two arm sensor signals	
E616	No change in signal when work equipment should move	
E617	Over-range of cutting edge angle	
E618	Abnormality in ROM data	

Service code	Abnormal system	User code
E621	Abnormality in starting	E09
E622	Change in wiring harness after starting Abnormality in controller power source	
E623	Abnormality in 12V power source (over-current detected) Abnormality in 24V power source (over-current detected)	
E624	Abnormality in buzzer drive system (over-current)	
E625	Impossible for network to receive signals	
E626	Abnormality in non-volatile memory data range	
E627	Read error in non-volatile memory	
E628	Write error in non-volatile memory	

★ For E101 – E114 see troubleshooting for the monitor panel system (M mode), for E203 – E237 see troubleshooting for the engine throttle · pump controller [pump control system] (C mode), for E306 – E318 see troubleshooting for the engine throttle · pump controller [governor control system] (E mode), for E401 – E458 see troubleshooting for the valve controller system (K mode) and for E601 – E628 see troubleshooting for the GX controller system (A mode).

★ E401 – E458 apply to the HYPER specification and E601 – E628 apply to the HYPER GX specification.

★ For service codes where the user code portion gives E06+CALL (CALL) or E06+CALL (E01), when an abnormality occurs, either the user code without ( ) or the user code with ( ) is displayed.

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JUDGEMENT TABLE FOR ENGINE THROTTLE · PUMP CONTROLLER (GOVERNOR CONTROL SYSTEM) AND ENGINE RELATED PARTS

Failure mode			Abnormality in engine throttle · pump controller power source system	Engine throttle · pump controller, engine related parts (E3: system)					
				Self-diagnostic display					
				Abnormality in fuel control dial input value	Abnormality (disconnection) in motor drive system	Abnormality (short circuit) in motor drive system	Abnormality in feedback potentiometer system	Abnormality (short circuit) in battery relay output	Abnormality (step-out) in motor
		User code		E05					
		Service code		308	317	318	306	315	316
1	Engine does not start easily								
2	Engine does not start								
3	Engine speed stays at low idling, and does not follow accelerator; or engine pickup is poor		●	●	●	●	●		
4	Engine stops during operation								
5	Engine rotation is irregular	When idling speed is irregular							
		When there is hunting		●	●	●	●		●
6	Lack of output (engine high idling speed is too low)			●			●		
7	Auto-deceleration does not work								
8	Engine does not stop		●		●	●	●	●	
9	Warming-up operation is defective								
10	Exhaust gas is black								
11	Oil consumption is excessive, or exhaust gas is blue								
12	Oil becomes dirty prematurely								
13	Fuel consumption is excessive, or exhaust gas is blue								
14	Oil is mixed in coolant								
15	Engine oil pressure caution lamp lights up								
16	Oil level rises								
17	Coolant temperature rises too high (overheating)								
18	Abnormal noise is generated								
19	There is excessive vibration								
20	Engine speed does not change even when working mode is switched								
Troubleshooting code when service code is displayed			E-1	E-2	E-3	E-4	E-5	E-6	E-7
Troubleshooting code when there is abnormality in monitoring or machine monitor check			—	—	—	—	—	—	—

● : This shows applicable item for service code
※ : This shows item that needs only checking with monitoring

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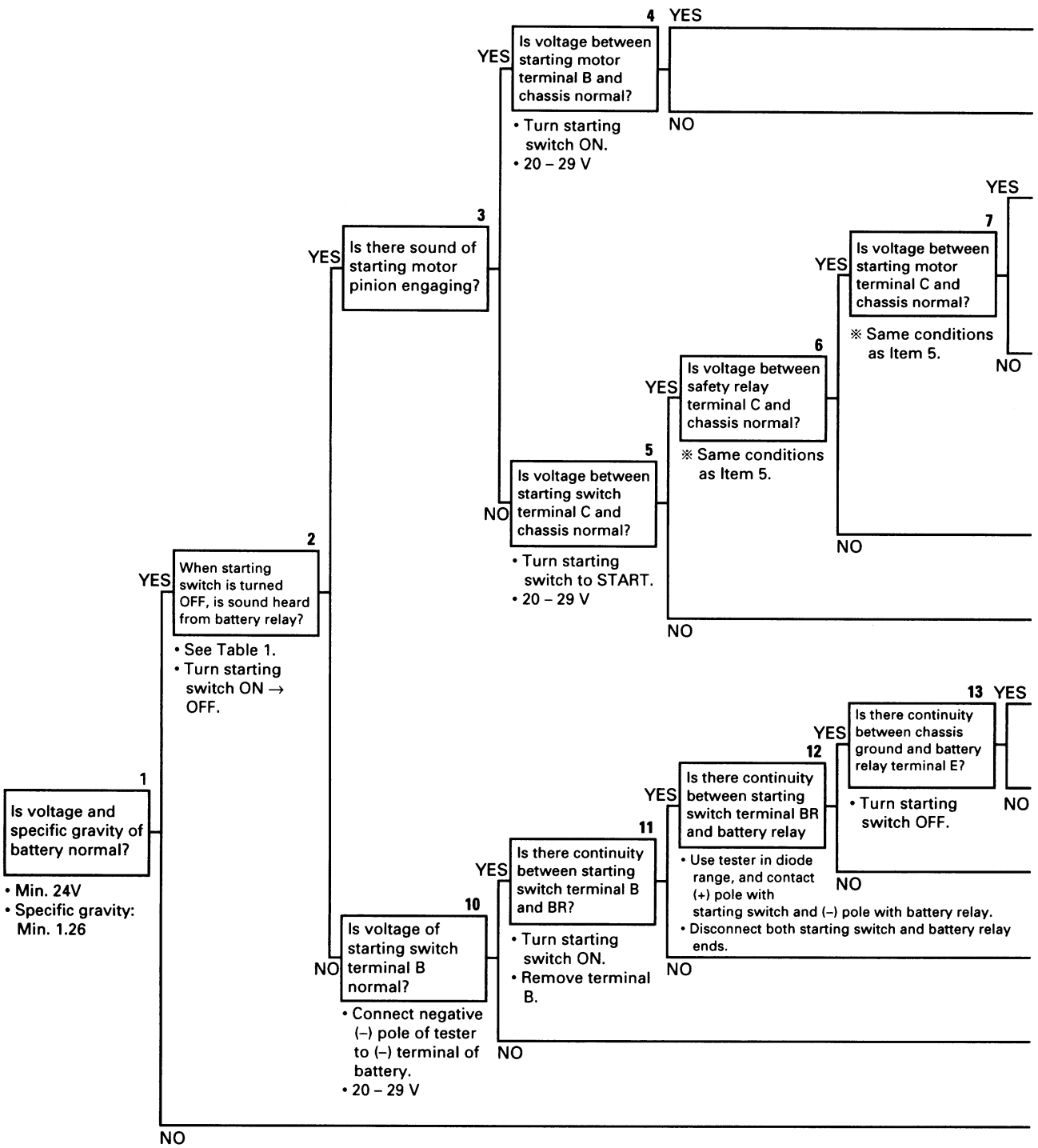
E-8 Engine does not start

★ When starting motor does not rotate.
★ Check that fuse 14 is not blown before starting troubleshooting.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.



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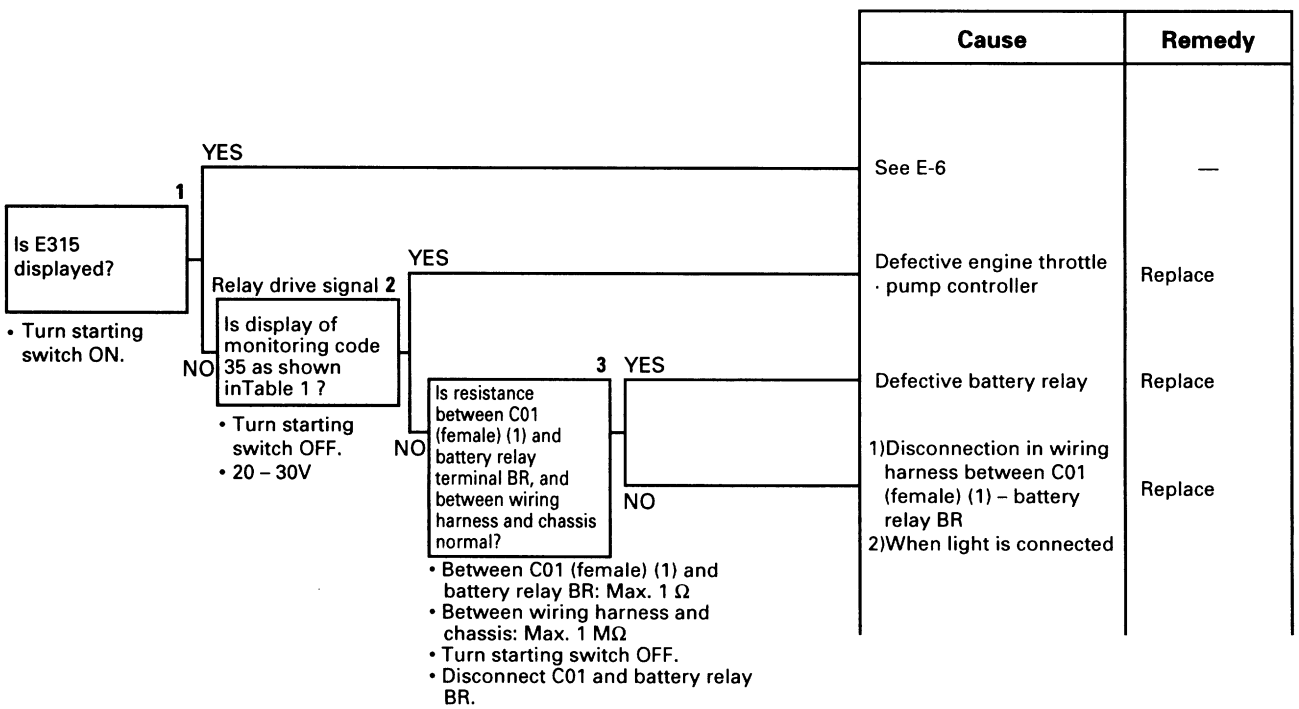
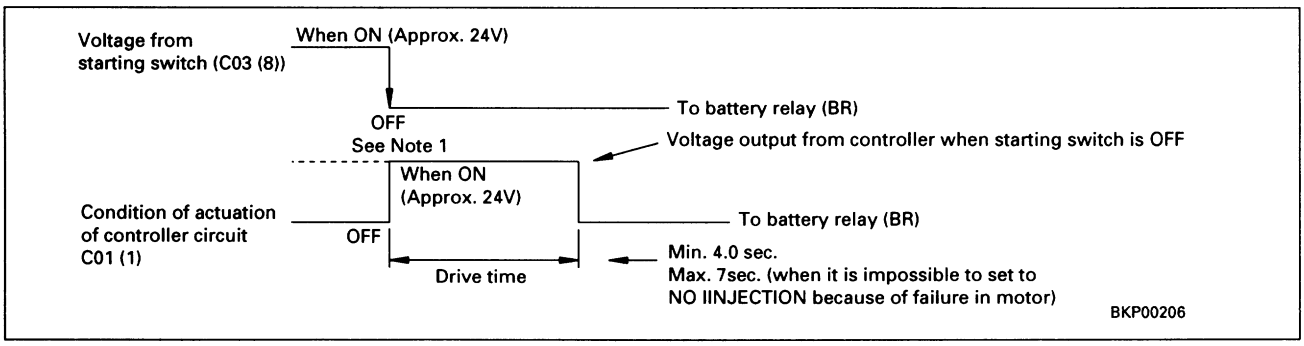
E-12 Defective operation of battery relay system (engine does not stop)

★ This only occurs when the engine is stopped and the starting switch is turned OFF.
⚠ Check with the engine stopped (push the fuel control lever of the fuel injection pump to the NO INJECTION position).
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.



020Y06

Table 1



Note 1: When the starting switch is ON, the controller end is OFF, but a voltage of approx. 20 – 30V is always flowing from starting switch BR, so if the voltage is measured at C01 (1), there is a voltage of 20 – 30V.

S-3 Engine does not pick up smoothly (follow-up is poor)

★ Check that the monitor panel does not display any abnormality in the governor control system.

General causes why engine does not pick up smoothly

- Insufficient intake of air
- Insufficient supply of fuel
- Improper condition of fuel injection
- Improper fuel used

Legend
◯ : Possible causes (judging from Questions and check items)
◎ : Most probable causes (judging from Questions and Check items)
△ : Possible causes due to length of use (used for a long period)
● : Items to confirm the cause.

			Causes: Clogged air cleaner element	Clogged fuel filter, strainer	Clogged feed pump strainer	Clogged injection nozzle, defective spray	Seized injection pump plunger	Worn piston ring, cylinder liner	Seized turbocharger, interference	Improper valve clearance	Clogged air breather hole in fuel tank cap	Clogged, leaking fuel piping	Defective contact of valve and valve seat
Questions	Confirm recent repair history												
	Degree of use of machine	Operated for long period	△	△	△			△					△
	Replacement of filters has not been carried out according to Operation Manual		◎	◎	◎								
	Non-specified fuel is being used			◎	◎	◎	◎						
	Engine oil must be added more frequently						◎						
Check items	Rust and water are found when fuel tank is drained		◎										
	Air cleaner clogging caution lamp flashes		◎										
	Noise of interference is heard from around turbocharger							◎					
	Engine pick-up suddenly became poor					◯		◎		◯	◯		
	Color of exhaust gas	Blue under light load					◎						
		Black	◎			◎		◎					◯
	Clanging sound is heard from around cylinder head								◎				
	Mud is stuck to fuel tank cap									◎			
	There is leakage from fuel piping										◎		
	High idling speed under no load is normal, but speed suddenly drops when load is applied			◎	◎					◯			
	There is hunting from engine (rotation is irregular)			◯	◎	◯				◯			
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low					◎	◯						
	20. Blow-by gas is excessive						◎						
Troubleshooting	When air cleaner element is inspected directly, it is found to be clogged		●										
	When fuel filter, strainer are inspected directly, they are found to be clogged			●									
	When feed pump strainer is inspected directly, it is found to be clogged				●								
	Speed does not change when operation of certain cylinders is stopped					●							
	When control rack is pushed, it is found to be heavy, or does not return						●						
	When compression pressure is measured, it is found to be low							●					●
	When turbocharger is rotated by hand, it is found to be heavy								●				
	When valve clearance is checked directly, it is found to be outside standard value									●			
	When fuel cap is inspected directly, it is found to be clogged										●		
	When feed pump is operated, operation is too light or too heavy											●	
		Remedy	Clean	Clean	Clean	Correct	Replace	Replace	Replace	Adjust	Clean	Correct	Replace

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S-15 Abnormal noise is made

★ Judge if the noise is an internal noise or an external noise.

General causes why abnormal noise is made

- Abnormality due to defective parts
- Abnormal combustion
- Air sucked in from intake system

Legend
◯ : Possible causes (judging from Questions and check items)
◎ : Most probable causes (judging from Questions and Check items)
△ : Possible causes due to length of use (used for a long period)
● : Items to confirm the cause.

			Causes: Excessive wear of piston ring, cylinder liner	Seized turbocharger, interference	Missing, seized bushing	Clogged, seized injection nozzle	Defective injection pump (rack, plunger seized)	Defective injection pump (excessive injection)	Deformed fan, fan belt interference	Defective adjustment of valve clearance	Broken dynamic valve system (valve, rocker lever, etc.)	Improper gear train backlash	Leakage of air between turbocharger and head	Defect inside muffler (dividing board out of position)
Questions	Confirm recent repair history													
	Degree of use of machine	Operated for long period	△											
	Condition of abnormal noise	Gradually occurred	◯						◯					
		Suddenly occurred		◯	◯					◯				
	Non-specified fuel is being used					◯	◯							
	Engine oil must be added more frequently		◎											
	Color of exhaust gas	Blue under light load	◎											
		Black		◎					◯			◯		
Check items	Metal particles are found in oil filter		◎		◎									
	Blow-by gas is excessive		◎											
	Noise of interference is heard from around turbocharger			◎										
	Engine pickup is poor and combustion is abnormal					◎								
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low					◎	◯							
	Seal on injection pump has come off							◎						
	Abnormal noise is loud when accelerating engine					◯	◯	◯	◯	◯		◯		
	Clanging sound is heard from around cylinder head								◎	◎				
	Leakage of air between turbocharger and head, loose clamp												◎	
	Vibrating noise is heard from around muffler													◎
Troubleshooting	When compression pressure is measured, it is found to be low		●											
	When turbocharger is rotated by hand, it is found to be heavy			●										
	Remove gear cover and inspect directly				●							●		
	Speed does not change when operation of certain cylinders is stopped					●								
	When control rack is pushed, it is found to be heavy, or does not return						●							
	Injection pump test shows that injection amount is incorrect							●						
	Fan is deformed, belt is loose								●					
	When valve clearance is checked, it is found to be outside standard value									●				
	Remove cylinder head cover and inspect directly										●			
	When muffler is removed, abnormal noise disappears													●
	Remedy		Replace	Replace	Replace	Replace	Correct	Replace	Correct	Replace	Correct	Replace	Replace	Replace

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User code	Service code	Abnormal system	Nature of abnormality
——	E225	Abnormality in rear pump pressure sensor system	1. Disconnection, defective contact, short circuit, short circuit with ground inside rear pump pressure sensor 2. Disconnection, defective contact, short circuit in wiring harness between controller C03 (6) and pressure sensor C07 (2) ((+) side) and between C03 (16) and C07 (1) ((-) side) 3. Disconnection, defective contact, short circuit with power source, short circuit with ground in wiring harness between controller C03 (13) and pressure sensor C07 (3) (SIG side) 4. Defective engine throttle · pump controller
——	E226	Abnormality in pressure sensor power source system	1. Short circuit, short circuit with ground inside front pump pressure sensor or rear pump pressure sensor 2. Short circuit, short circuit with ground in wiring harness between controller C03 (6) and front pressure sensor C08 (2) or rear pressure sensor C07 (2) ((+) side) 3. Defective engine throttle · pump controller
——	E227	Abnormality in speed sensor system	1. Disconnection, defective contact, short circuit inside engine speed sensor 2. Disconnection, defective contact, short circuit with ground in wiring harness between controller C16 (1) and speed sensor E07 (2) ((-) side) and between C16 (2) and E07 (1) (SIG side) 3. Defective engine throttle · pump controller
——	E302	Short circuit in swing stroke limit solenoid	1. Internal short circuit in solenoid 2. Short circuit with chassis ground in wiring harness between controller C01 (5) and V08 (1) 3. Defective controller
——	E303	Disconnection in swing stroke limit solenoid	1. Internal disconnection in solenoid 2. Short circuit with power source, or defective contact or disconnection in wiring harness between controller C01 (5) and V08 (1) 3. Defective contact or disconnection in wiring harness between solenoid V08 (2) and chassis ground 4. Defective controller

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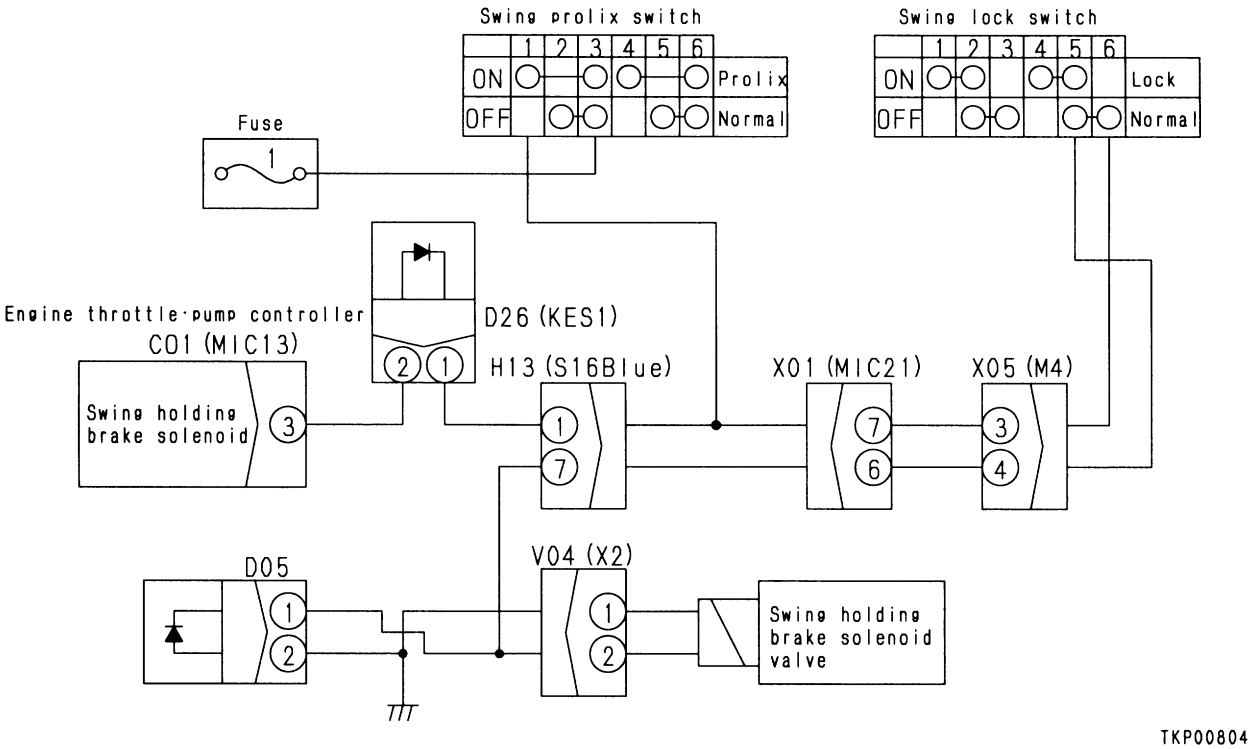
C-4 Related electric circuit diagram



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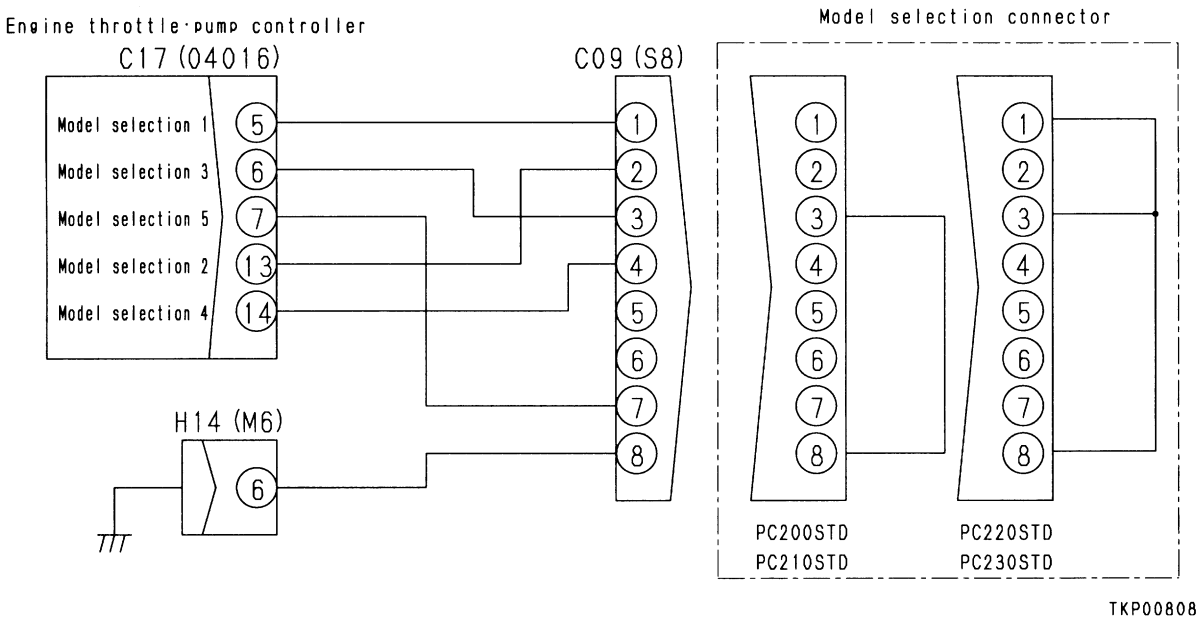
C-14 Related electric circuit diagram



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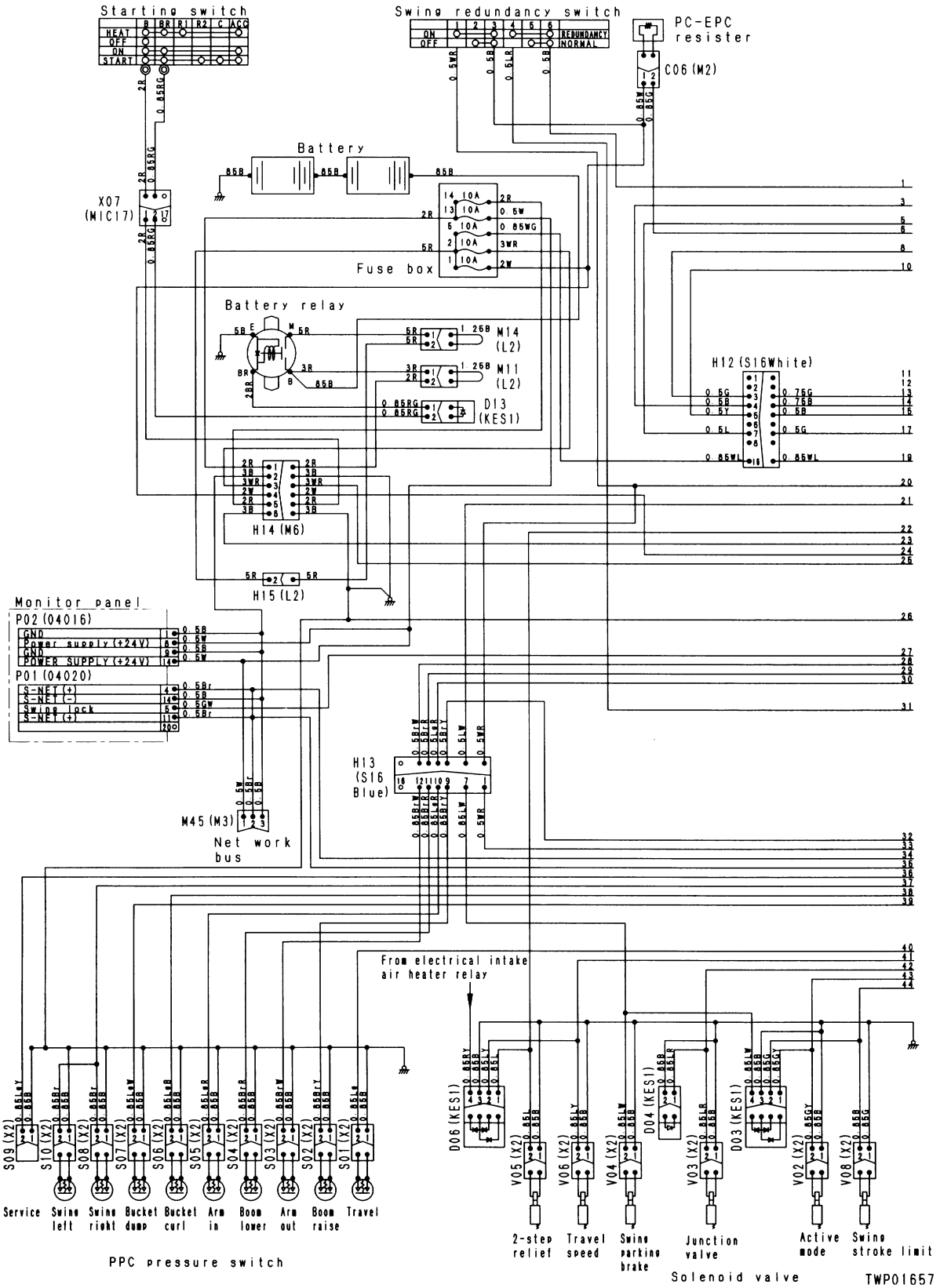
PC200-6 STD Serial No.: 102229 and up
PC220-6 STD Serial No.: 53562 and up

PC210-6 STD Serial No.: 31425 and up
PC230-6 STD Serial No.: 10247 and up



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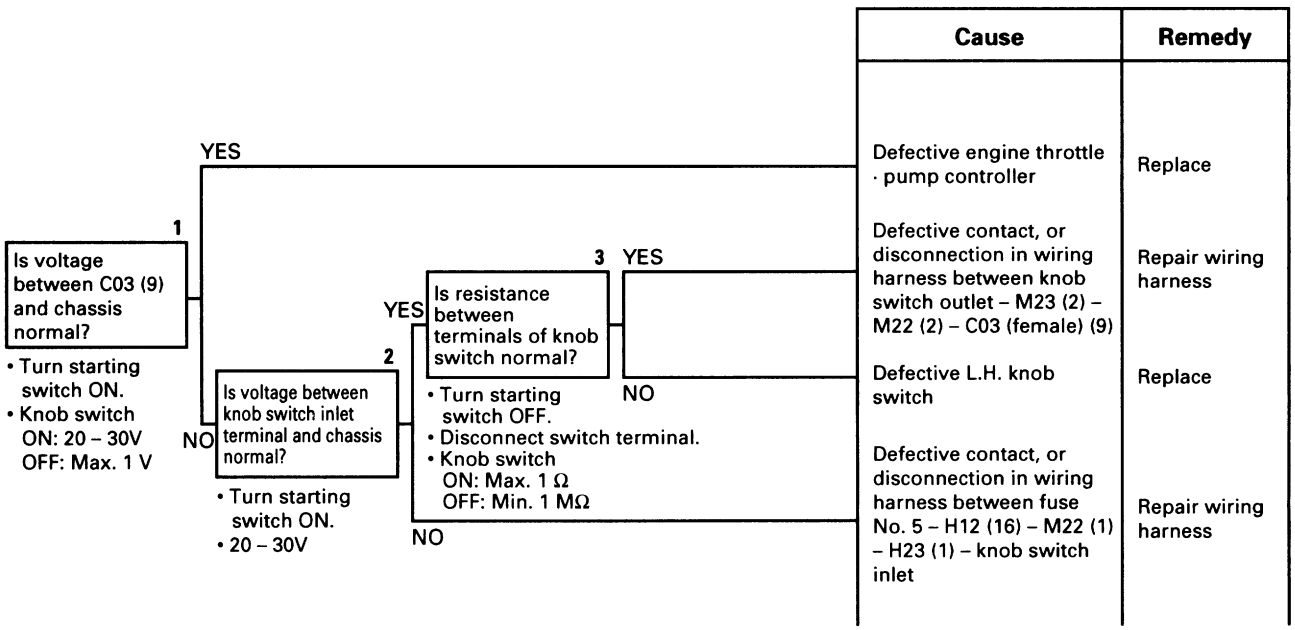
F-11 Bit pattern 22-(6) L.H. knob switch does not light up

★ **This troubleshooting is carried out when there is still an abnormality, so when disconnecting the connector and inserting the T-adapter, or when removing the T-adapter and returning the connector to its original position, if the monitor code display returns to normal, the problem has been removed.**
★ When fuse No. 5 is not blown.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.



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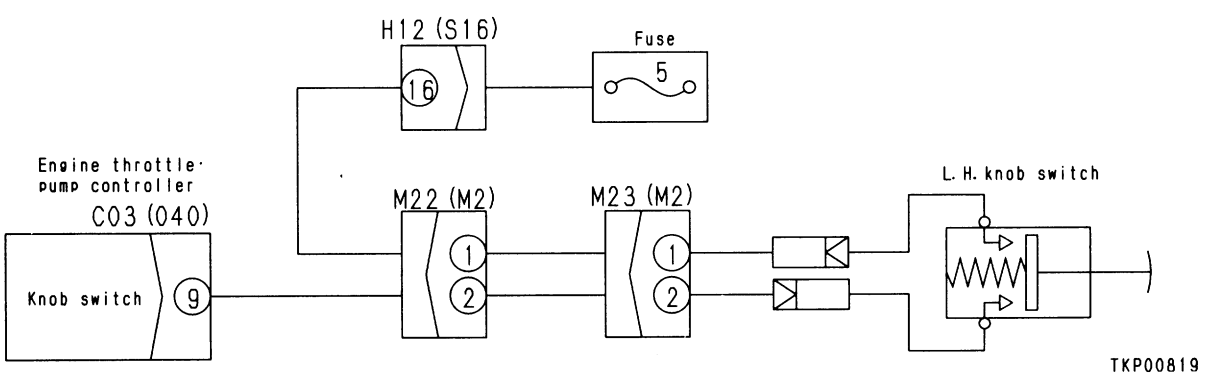
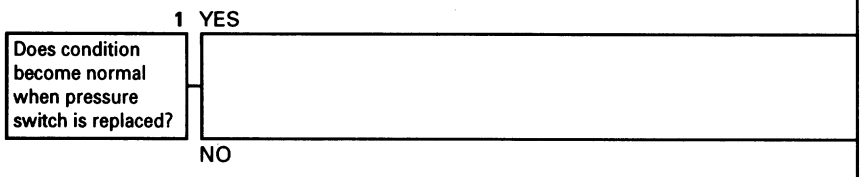
F-11 Related electric circuit diagram



H-5 Auto-deceleration does not work (PPC shuttle valve is equipped only in travel PPC valve)

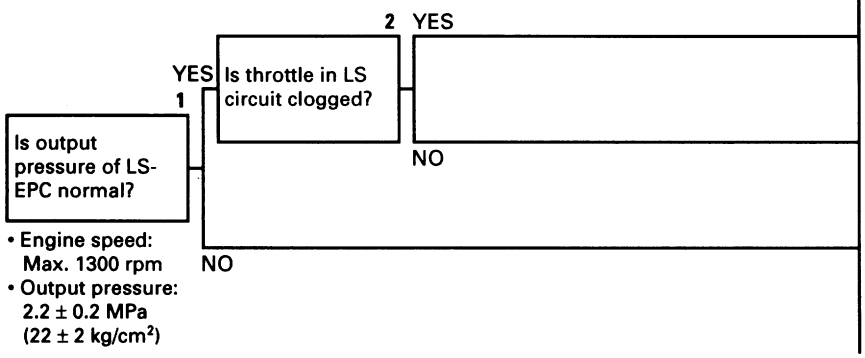
★ The control pressure for the travel passes through the PPC shuttle valve and is supplied to the pressure switch.



Cause	Remedy
Defective pressure switch	Replace
Defective operation of PPC shuttle valve with travel PPC valve	Repair or replace

020Y06

H-6 Fine control ability is poor or response is poor

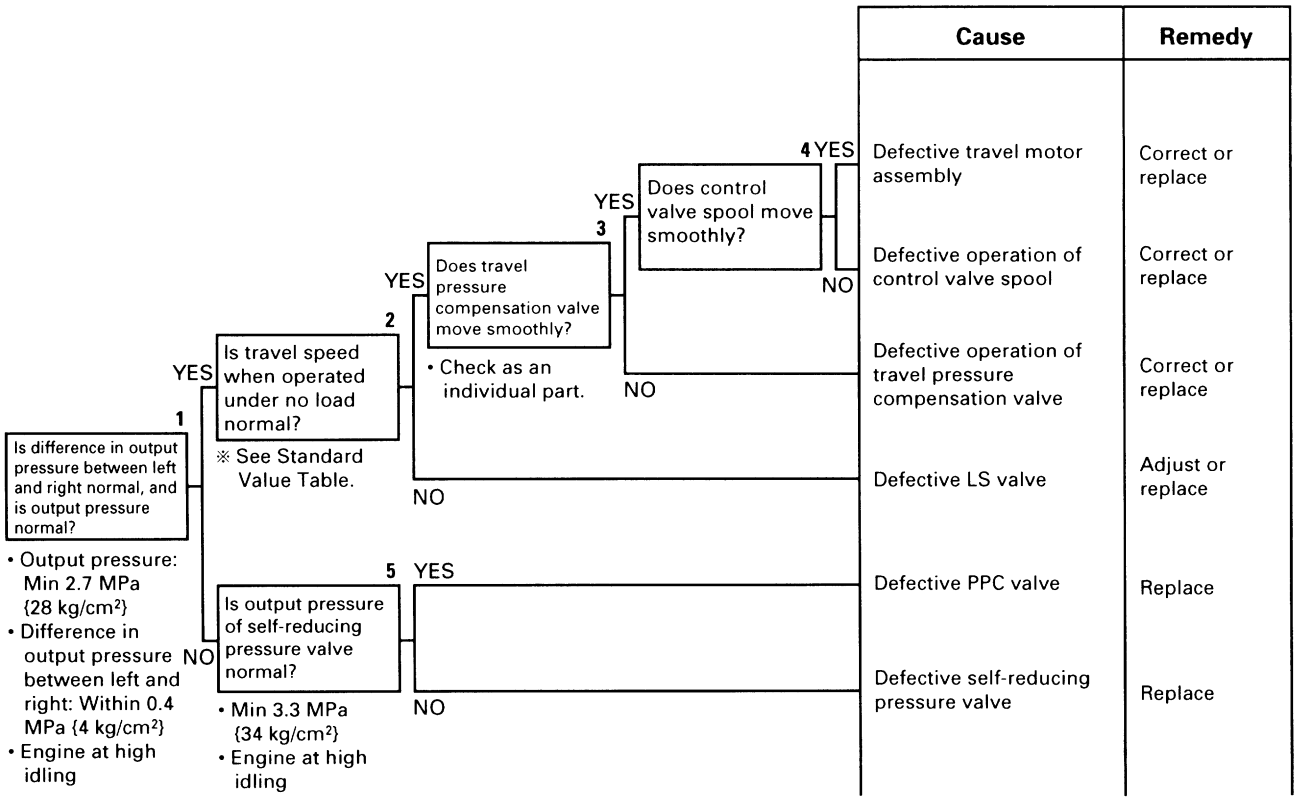


Cause	Remedy
Clogged throttle in LS circuit	Clean
Defective LS valve, or defective servo piston	Replace
Defective LS-EPC valve	Repair or replace

H-19 Travel deviation

★ Carry out troubleshooting in the H/O mode.
★ When swing and work equipment speeds are normal

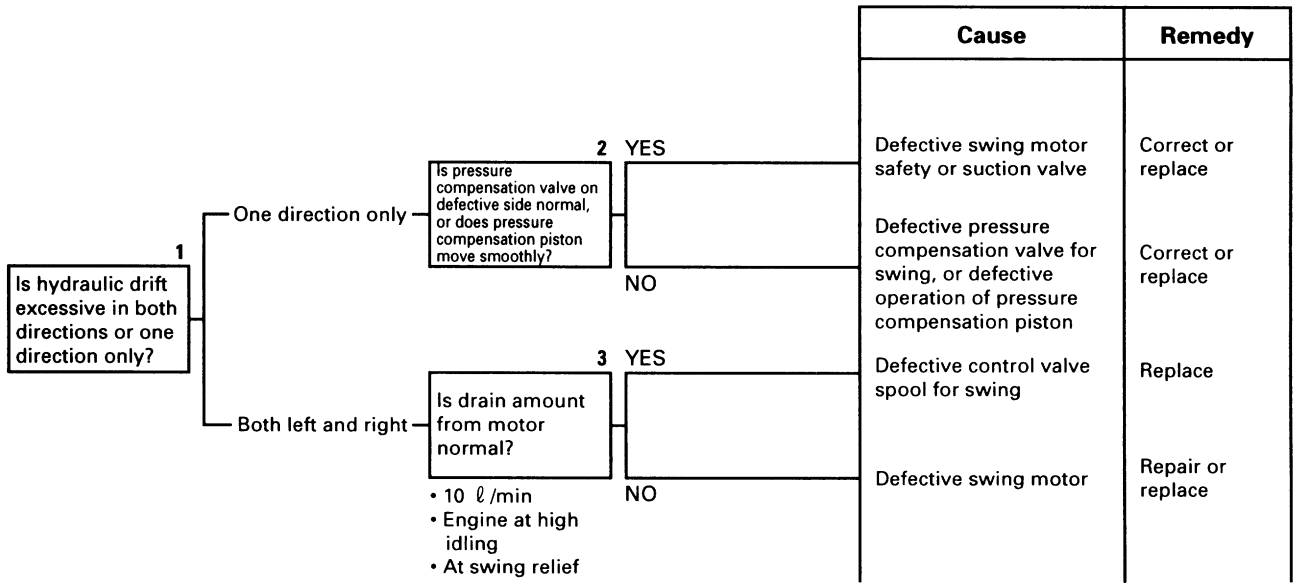
a) When there is deviation in normal travel



020Y06

H-29 Excessive hydraulic drift of swing

a) When swing holding brake is released



Cause	Remedy
Defective swing motor safety or suction valve	Correct or replace
Defective pressure compensation valve for swing, or defective operation of pressure compensation piston	Correct or replace
Defective control valve spool for swing	Replace
Defective swing motor	Repair or replace

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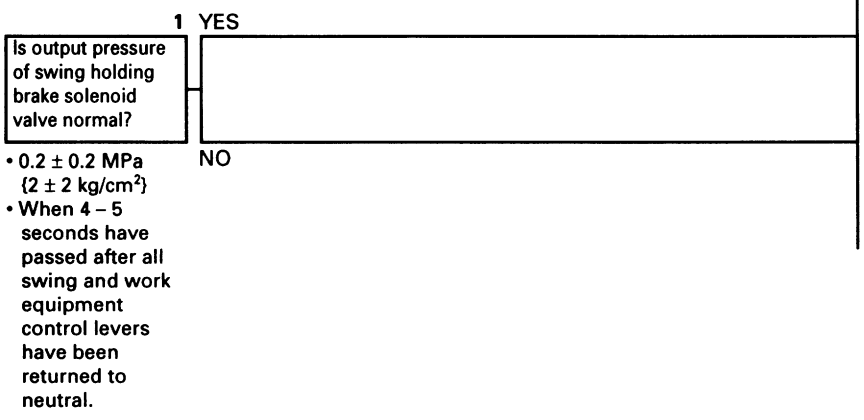
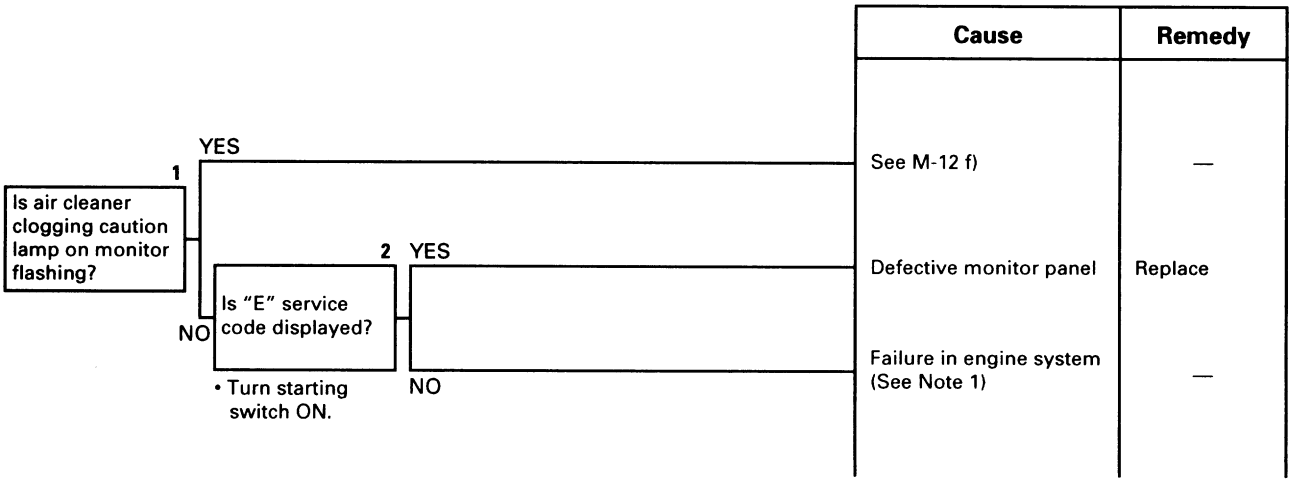
b) When swing holding brake is applied



Cause	Remedy
Defective operation of swing holding brake	Repair or replace
Defective operation of swing holding brake solenoid valve	Correct or replace

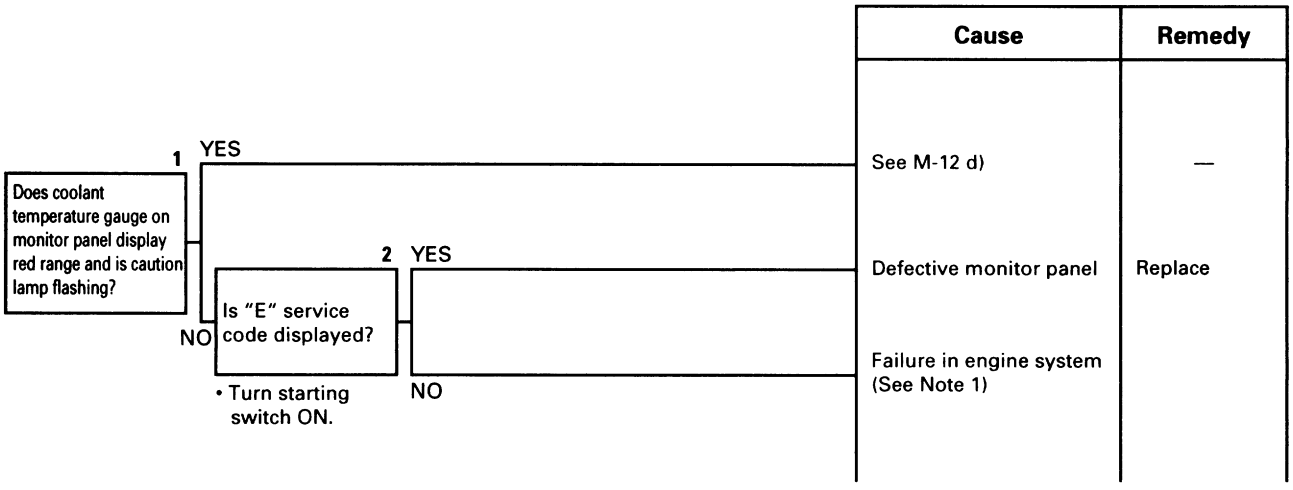
M-3 [E104] Air cleaner clogging detected is displayed



Note 1: The monitor panel display has returned to normal, but the air cleaner clogging sensor has detected symptoms of clogging in the past, so carry out troubleshooting of the engine to remove the problem.

020Y06

M-4 [E108] Engine water temperature 105°C detected is displayed



Note 1: The monitor panel display has returned to normal, but the coolant temperature sensor has detected symptoms of the coolant temperature reaching 105°C in the past, so carry out troubleshooting of the engine to remove the problem.

M-12 When starting switch is turned ON and engine is started, caution items, emergency items flash (when there is no abnormality in engine or items to check before troubleshooting)

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.

a)  (engine oil pressure) flashes

SAP00520

★ Check that the engine oil pressure is normal before carrying out troubleshooting.

Cause	Remedy
See M-11 b)	—

b)  (coolant level) flashes

SAP00519

★ Check that the coolant level is normal before carrying out troubleshooting.

Cause	Remedy
See M-9 a)	—

c)  (battery charge) flashes

SAP00522

Cause	Remedy
See M-11 a)	—

020Y06

M-27 Defective coolant level sensor system

★ Remove the coolant level sensor when carrying out troubleshooting.

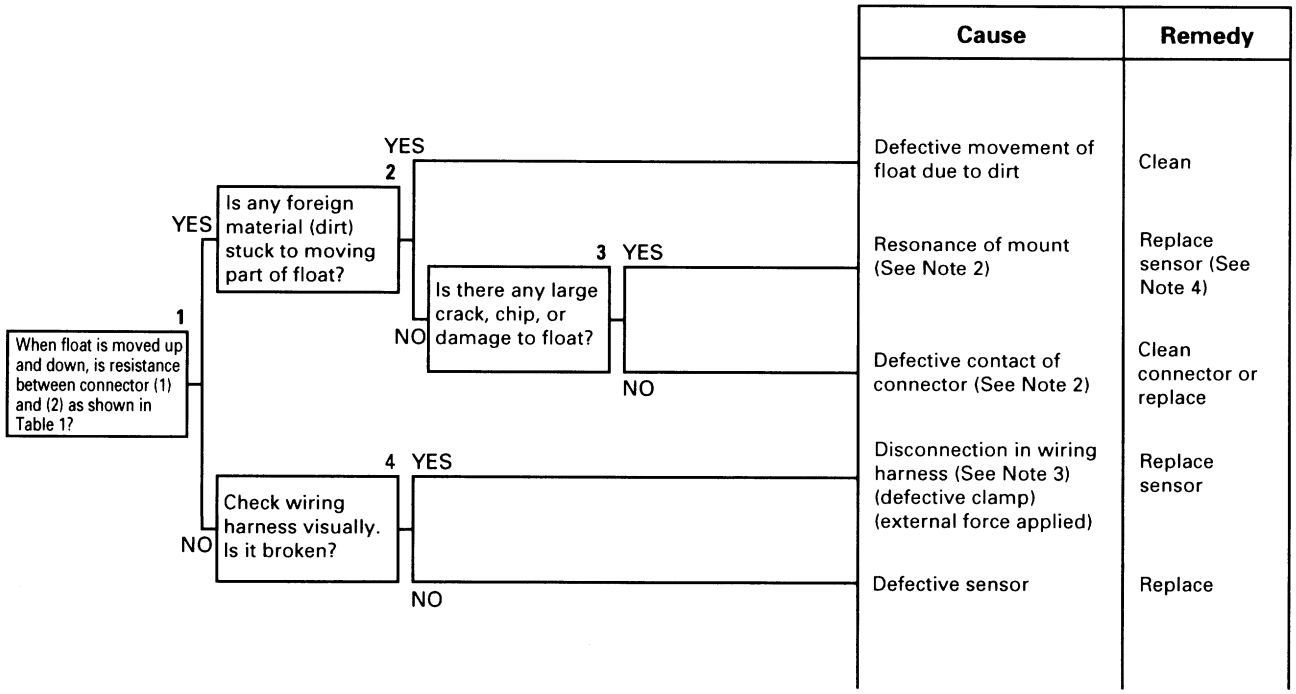
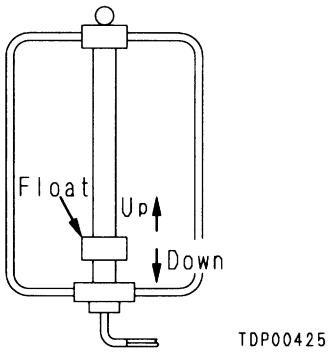


Table 1

Float UP	Max. 1 Ω
Float DOWN	Min. 1 MΩ



020Y06

Note 1: Variations in coolant level
The coolant level may change according to the angle of the machine, or the swaying of the machine, so if there is any display, check the coolant level again with the machine at a horizontal place.

Note 2: If the problem occurs again, the connector (female) at the chassis end is probably defective, so check the connector and wiring harness at the chassis end.

Note 3: Check for vibration at the connector mount. If there is excessive vibration, take the appropriate action.

Note 4: Defective installation is a possible cause, so be careful when installing. If the problem occurs again, check for any vibration of the mount, and if there is excessive vibration, take the appropriate action.

PROCEDURE FOR TROUBLESHOOTING HYPER GX

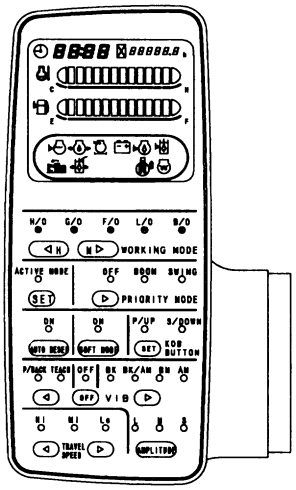
Judge if the problem is a failure peculiar to the HYPER GX specification machine.

- If the problem is a failure peculiar to GX machines, the system will display one of the following conditions.

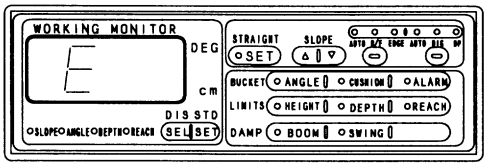
① "E09" is displayed on the HYPER monitor, and all parts of the work equipment stop.
Note: With E09, CALL is not displayed.

② "E" is displayed on the GX panel, and the bucket monitor functions cannot be used.

③ If an attempt is made to select an automatic function on the GX panel, the buzzer sounds 3 times and the selection cannot be made.
Note: The following cases are not failure.
1) Before the GX is started, the GX functions cannot be selected.
2) Before the preparatory, the working range selection cannot be selected.
3) Functions which cannot be selected together according to the function combination table cannot be used together.



TKP00830



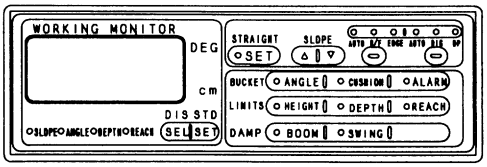
TKP00831

020Y06

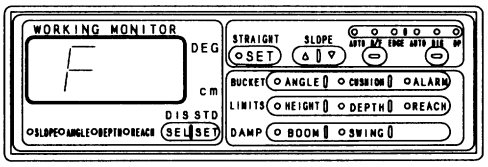
In the case of a failure peculiar to the GX specification machine, ask the user to carry out the following operation and confirmation.

- When the work equipment is completely stopped and does not move, if all the functions on the GX panel (excluding the bucket monitor) are turned OFF, E09 goes out and the all-stop is canceled.
- Turn the starting switch OFF, then start again, and check if the machine returns to normal or not.
(If it does not return to normal, it is possible to select only GX functions which are not related to the failure.)

Reference: If the GX automatic operation disconnection switch at the rear right of the operator's seat is set to the DISCONNECTION position, and the starting switch is turned ON, the machine starts as a normal HYPER specification machine.
(In this case, "F" is displayed on the GX panel.)



TKP00832



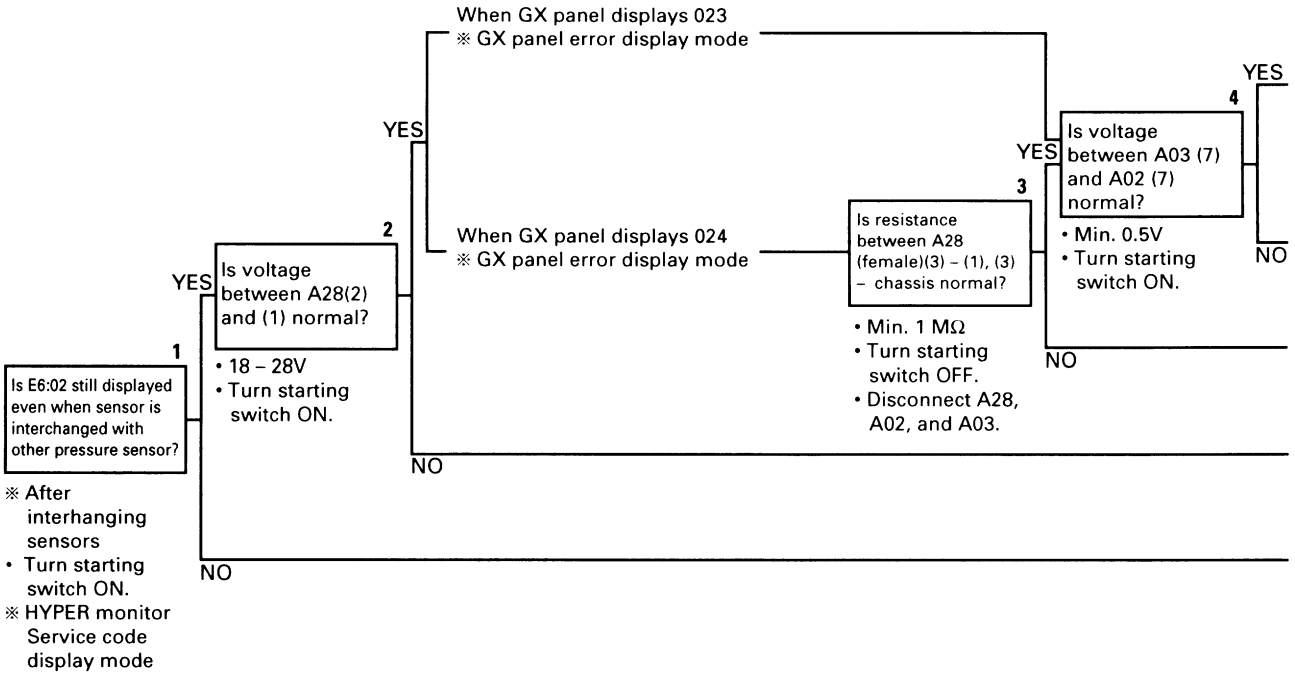
TKP00833

HYPER monitor		Abnormal system		GX panel	Nature of abnormality
User code	Service code			Service code	
	E6:26	EPC correction value		263	※ If value in memory for EPC starting current is not within range of 400 ± 120 mmA when engine picks up
		Others (custom bucket)		264	※ If the value of the data in memory for the custom bucket is not within the range below when the engine picks up 1) Angle: 0 – 125° 2) Length: 0 – 2500 mm
	E6:27	Error in writing to non-volatile memory	Abnormality in block 1 SUM check	271	※ Abnormality in SUM when reading data in non-volatile memory block 1 1) Abnormality in non-volatile memory data 2) Mistaken setting in memory
			Abnormality in block 2 SUM check	272	※ Abnormality in SUM when reading data in non-volatile memory block 2 1) Abnormality in non-volatile memory data 2) Mistaken setting in memory
			Data for block 1, 2 do not match	273	Data saved to above two places is not the same
	E6:28	Error in writing to non-volatile memory	Abnormality in block 1 SUM check	281	※ Abnormality in SUM when reading data in non-volatile memory block 1 1) Abnormality in non-volatile memory data 2) Mistaken setting in memory
			Abnormality in block 2 SUM check	282	※ Abnormality in SUM when reading data in non-volatile memory block 2 1) Abnormality in non-volatile memory data 2) Mistaken setting in memory
			EPC correction value	283	※ Number of times of writing has exceeded 10,000 times or abnormality in timing
			Others	284	※ Data written to memory has exceeded range 1) Defective correction

020Y06

A-5 E6:02 (GX panel 023, 024) [Abnormality in arm (OUT) pressure sensor system] is displayed

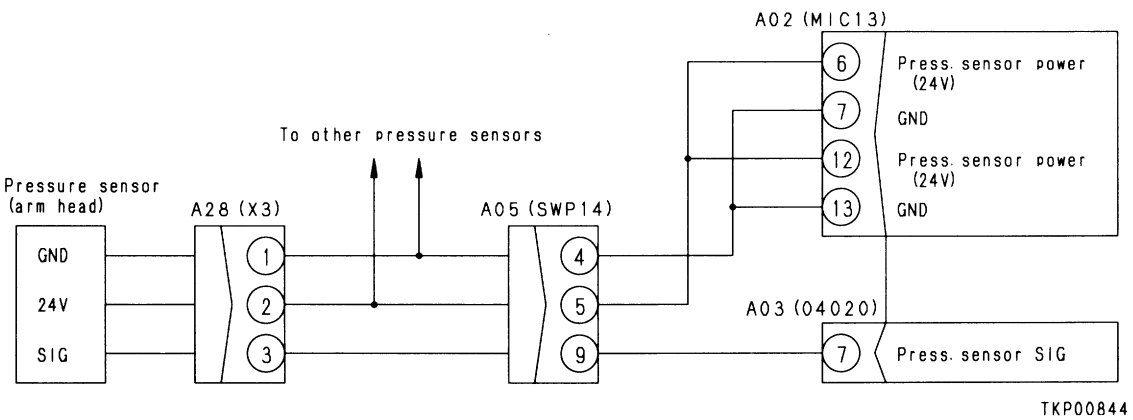
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.
★ If [E6:01], [E6:03], [E6:04] are displayed at the same time, go to Troubleshooting A-1.
★ The error code displayed on the HYPER monitor or GX panel does not go out until the starting switch is turned OFF.



020Y06

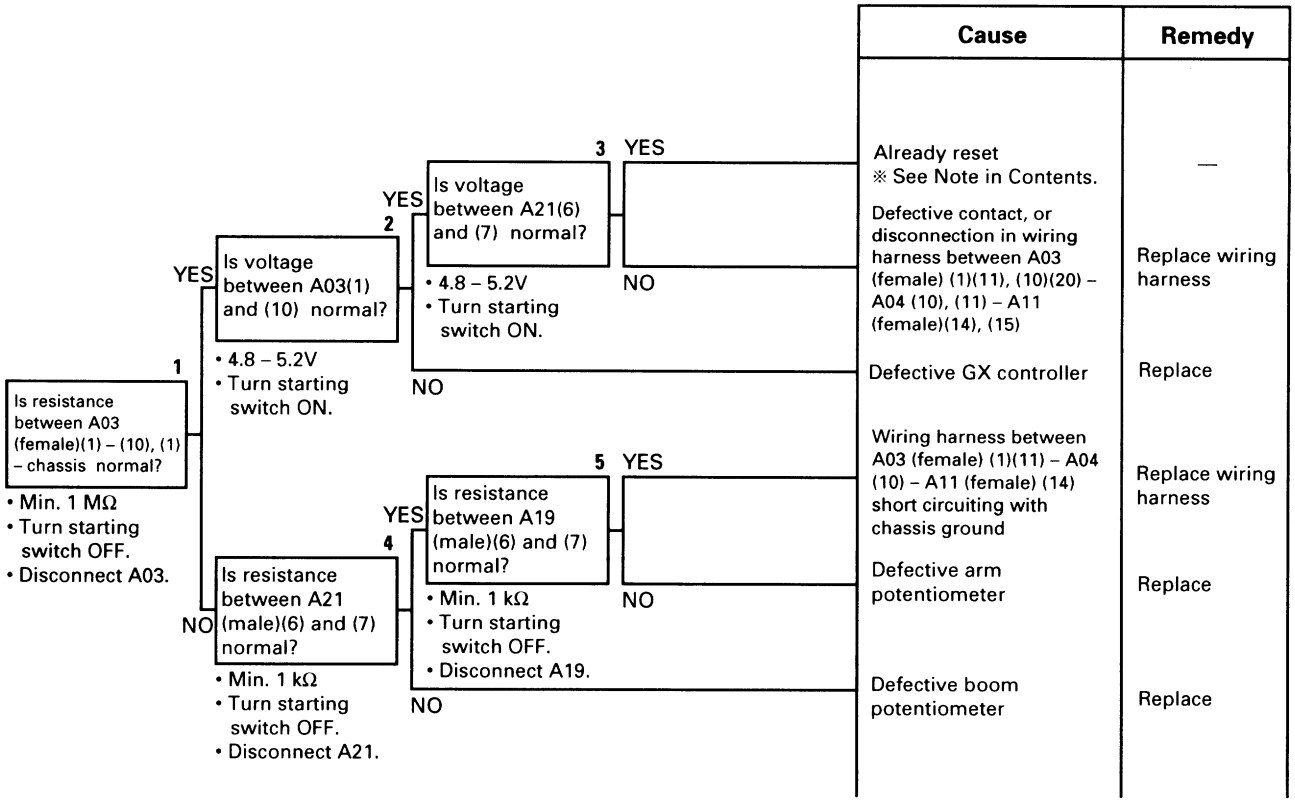
※ When the GX controller has been replaced, carry out the operation in the TABLE FOR ORDER OF OPERATIONS IN GX ADJUSTMENT MODE.

A-5 Related electric circuit diagram



A-11 E6:07 and E6:08 [Abnormality in potentiometer power source] are displayed at the same time

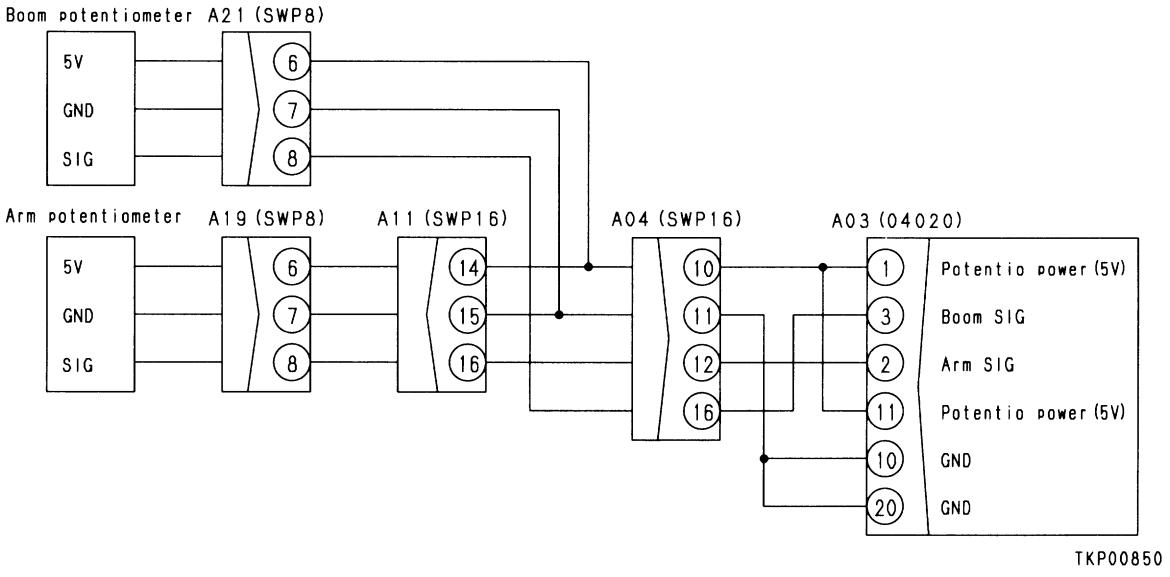
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.
★ The error code displayed on the HYPER monitor or GX panel does not go out until the starting switch is turned OFF.



020Y06

※ When the GX controller or boom, arm angle sensor assembly have been replaced, carry out the operation in the TABLE FOR ORDER OF OPERATIONS IN GX ADJUSTMENT MODE.

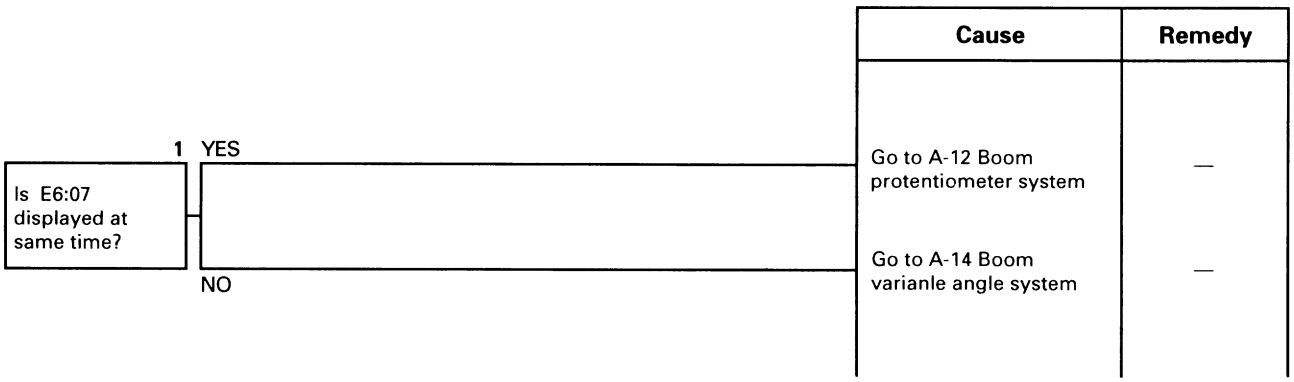
A-11 Related electric circuit diagram



TKP00850

A-17 E6:14 (GX panel 141) [Abnormality in comparison of two boom sensor signals] is displayed

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.
★ The error code displayed on the HYPER monitor or GX panel does not go out until the starting switch is turned OFF.

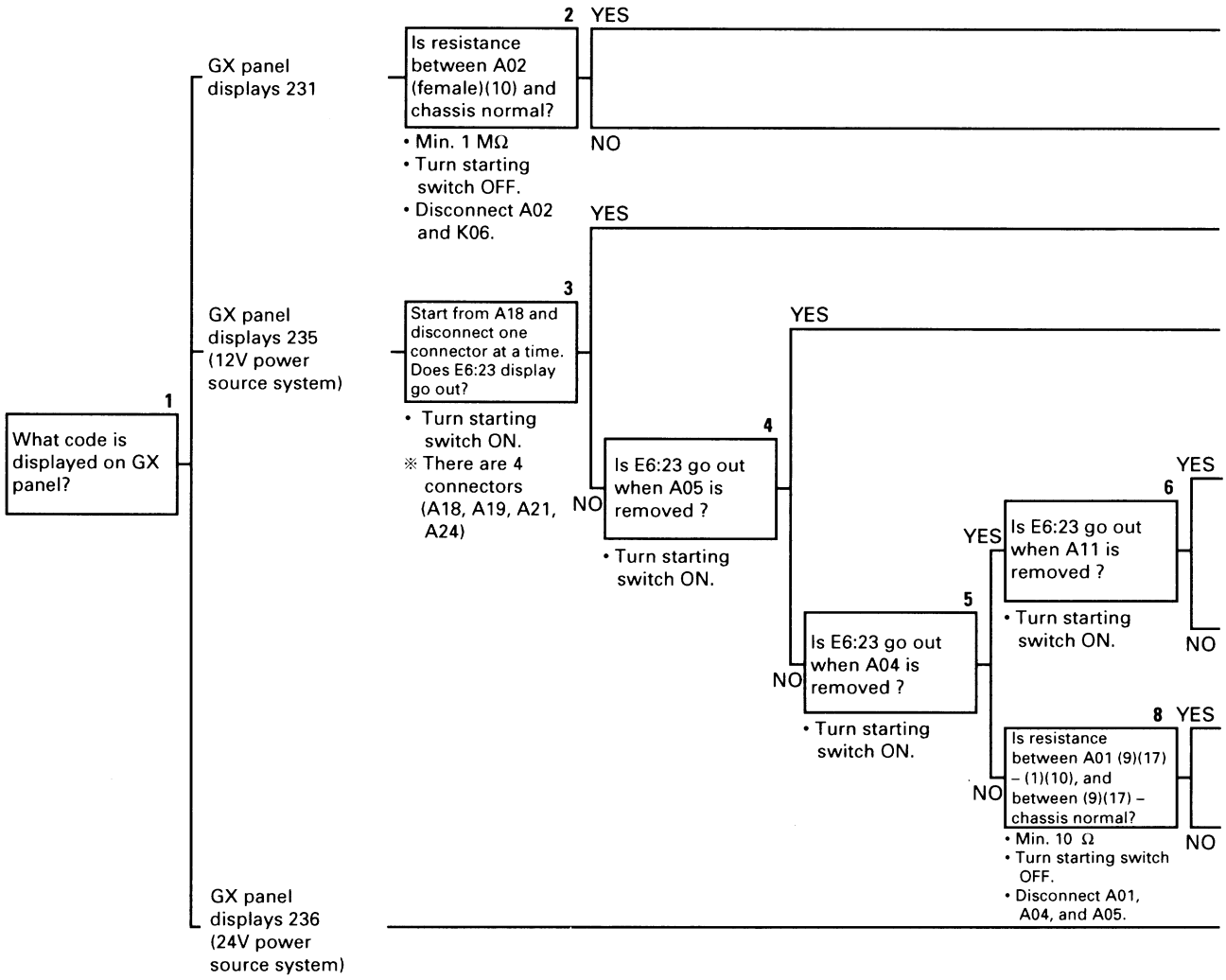


020Y06

※ When the GX controller has been replaced, carry out the operation in the TABLE FOR ORDER OF OPERATIONS IN GX ADJUSTMENT MODE.

A-24 E6:23 (GX panel 231) [Abnormality in remote signal] is displayed (GX panel 235) [Abnormality in 12V power source (overcurrent detection)] is displayed (GX panel 236) [Abnormality in 24V power source (overcurrent detection)] is displayed

★ Turn the starting switch OFF before disconnecting the connector.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.
★ The error code displayed on the HYPER monitor or GX panel does not go out until the starting switch is turned OFF.



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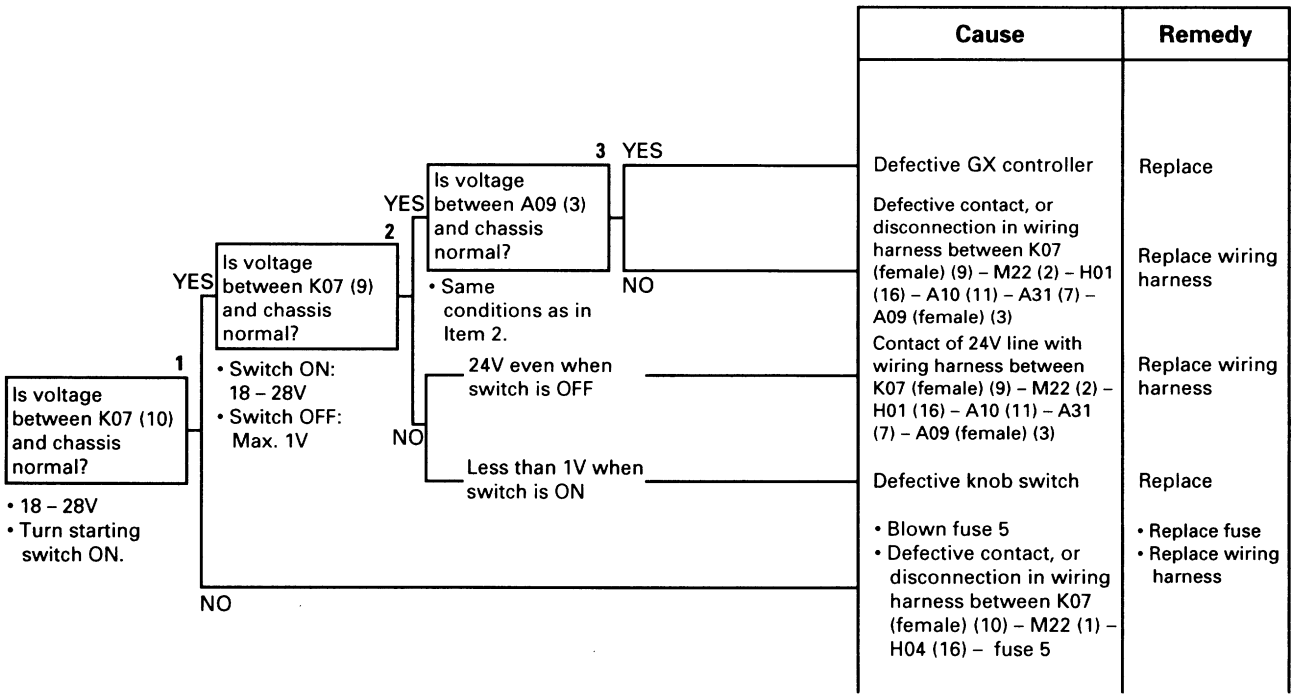
※ When the GX controller or arm angle sensor assembly has been replaced, carry out the operation in the TABLE FOR ORDER OF OPERATIONS IN GX ADJUSTMENT MODE.

A-31 Automatic mode is not actuated when knob switch is pressed (when there is no abnormal dipslay)

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.



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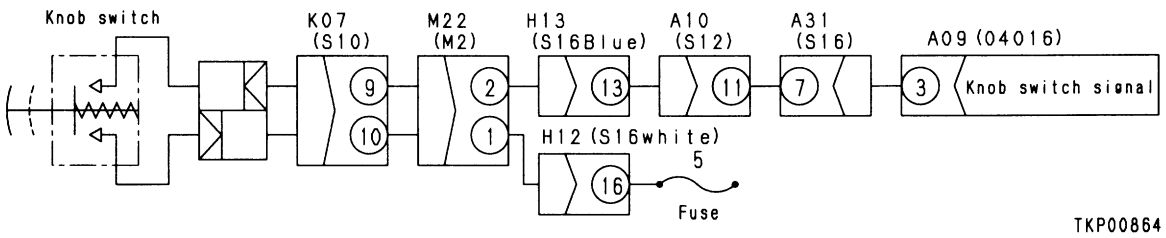
※ Precautions when operating knob switch
1) It must be double clicked for it be actuated. (Keep the switch depressed after double clicking it.)
2) It does not work when the work equipment has reached the end of its stroke.
3) The double click operation of the knob switch does not work when the boom, arm, bucket, or swing levers are being operated.

A-31 Related electrical circuit diagram



User code	Service code	Abnormal system	Nature of abnormality
E06 + CALL	E4:41	Abnormality in boom lever potentiometer system	• Over-range for output signal for SIG system or SWITCH system 1. Defective potentiometer 2. Disconnection, short circuit with ground in wiring harness between K22(2)(3) – K05(19)(5) or K22(11)(12) – K05(9)(5), or contact with other wiring harness
	E4:45	Abnormality in boom lever potentiometer system	• Excessive error in output signal for SIG system or SWITCH system 1. Defective potentiometer 2. Disconnection, short circuit with ground in wiring harness between K22(2)(3) – K05(19)(5) or K22(11)(12) – K05(9)(5), or contact with other wiring harness
	E4:55	Abnormality in ROM, RAM of CPU	Abnormality inside controller
	E4:58	Abnormality in interlock PLD	Abnormality inside controller

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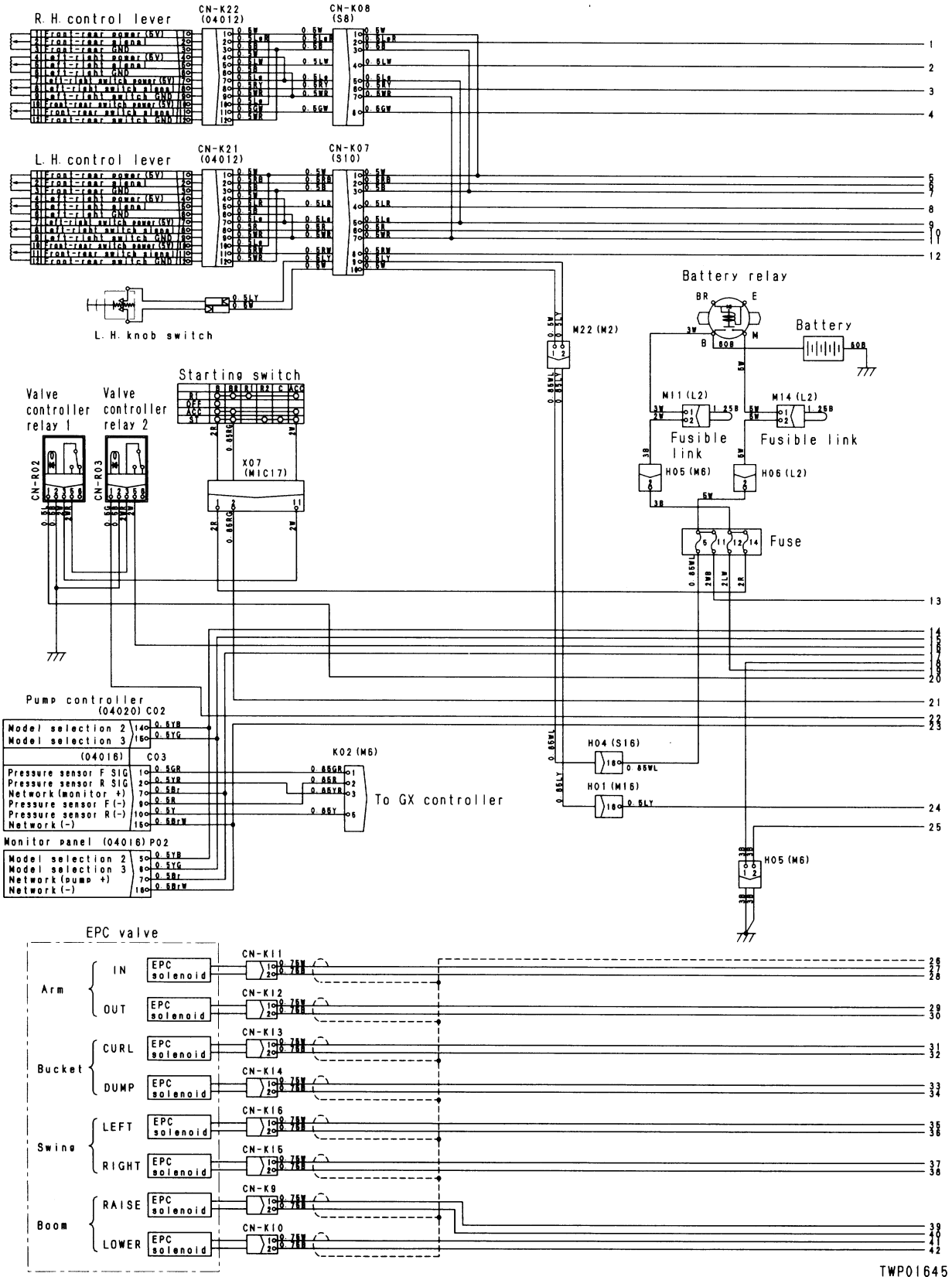
ELECTRICAL CIRCUIT DIAGRAM OF VALVE CONTROLLER SYSTEM



020Y06

K-8 [E4:04] Abnormality in control lever potentiometer power source system is displayed

★ **This troubleshooting is carried out when there is still an abnormality, so when disconnecting the connector and inserting the T-adapter, or when removing the T-adapter and returning the connector to its original position, if the service code is not displayed, the problem has been removed.**
★ Turn the starting switch ON and check if E4:04 is displayed. (If it is not displayed, the system has been reset.)
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.

	Cause	Remedy
1 Is voltage between K05 (10) (20) and (5) (15) normal? • 5 ± 0.25V • Turn starting switch ON.		
YES	Defective valve controller	Replace
NO	Wiring harness between K05 (female) (10) – K07 (1), K08(1) – CN21(1)(10), CN22 (female)(1)(10), or between K05 (female) (20) – K07 (5), K08(5) – CN21(4)(7), CN22 (female) (4)(7) short circuiting with chassis ground	Replace wiring harness

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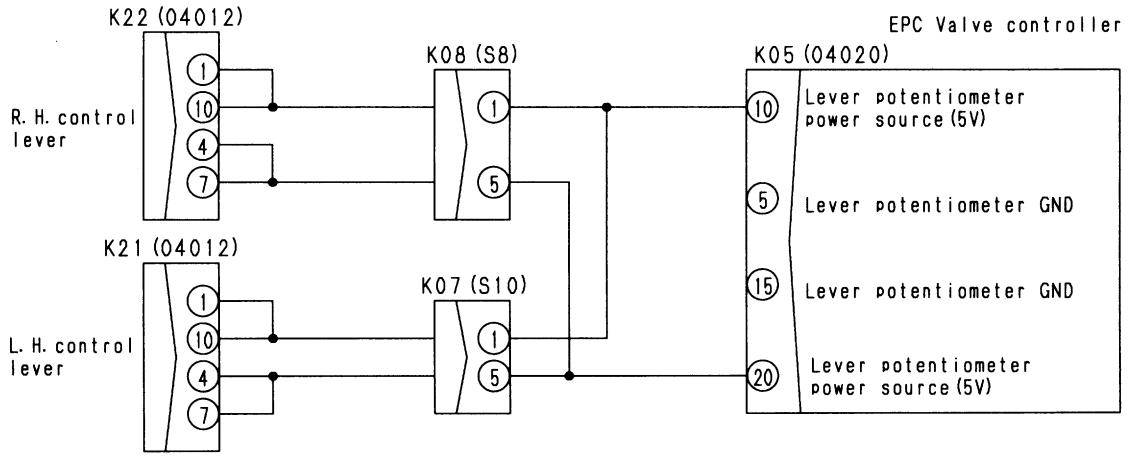
K-8 Related electrical circuit diagram



TKP00872

K-17 [E4:21] Abnormality 1 in drive circuit system for boom LOWER EPC valve is displayed
[E4:25] Abnormality 1 in drive circuit system for boom RAISE EPC valve is displayed

★ **This troubleshooting is carried out when there is still an abnormality, so when disconnecting the connector and inserting the T-adapter, or when removing the T-adapter and returning the connector to its original position, if the service code is not displayed, the problem has been removed.**
★ Turn the starting switch ON, operate according to the conditions in the table, and check if the service code is displayed. (If it is not displayed, the system has been reset.)
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on the next step.
★ Always turn the boom prolix switch OFF.

When E4:21 or E4:25 are displayed independently

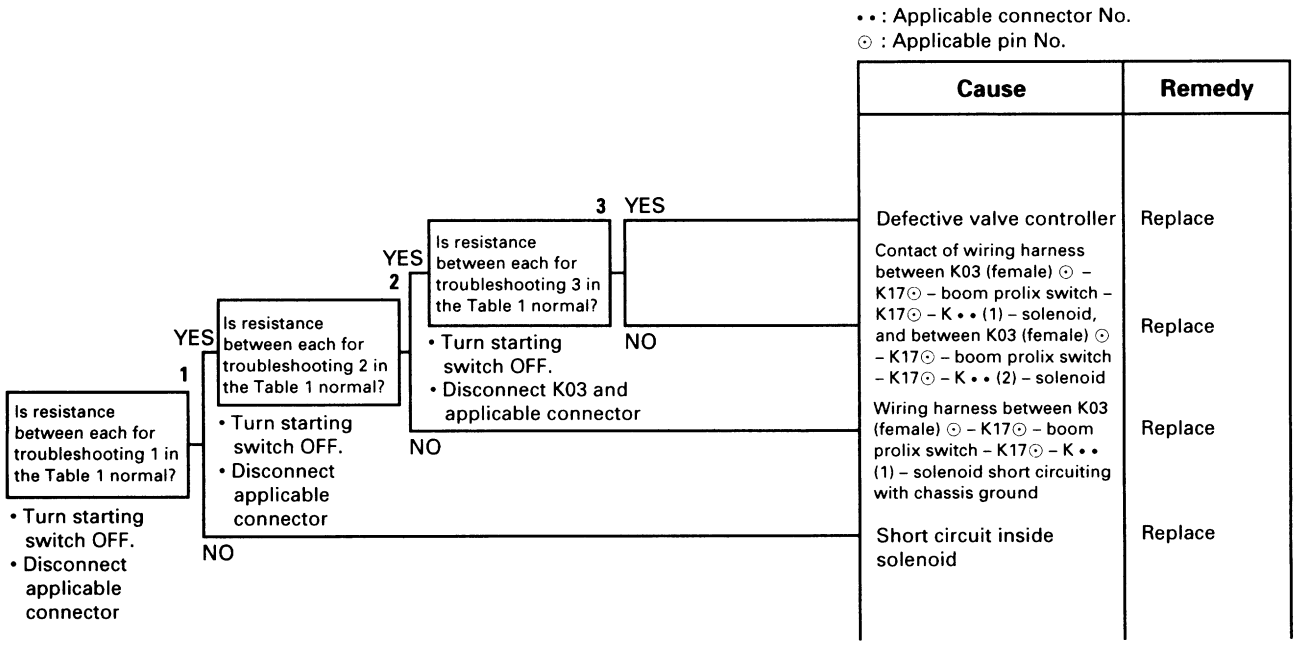


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Table 1

Service code	Measurement location						Condition
	Troubleshooting 1		Troubleshooting 2		Ttroubleshooting 3		
E4:21	Between K10 (male) (1) and (2)	7 – 15 Ω	Between K10 (female) (1) and GND	Min. 1 MΩ	Between K10 (female) (1) and (2)	Min. 1 MΩ	Operate boom LOWER
E4:25	Between K09 (male) (1) and (2)	7 – 15 Ω	Between K09 (female) (1) and GND	Min. 1 MΩ	Between K09 (female) (1) and (2)	Min. 1 MΩ	Operate boom RAISE

K-20 [E4:41] [E4:42] [E4:43] [E4:44] Over-range in control lever potentiometer signal system is displayed

★ **This troubleshooting is carried out when there is still an abnormality, so when disconnecting the connector and inserting the T-adapter, or when removing the T-adapter and returning the connector to its original position, if the service code is not displayed, the problem has been removed.**

★ Turn the starting switch ON, operate according to the conditions in the table, and check if the service code is displayed. (If it is not displayed, the system has been reset.)

★ When E4:45, E4:46, E4:47 or E4:48 are displayed at the same time, there is probably a short circuit with the ground or a disconnection in the wiring harness for the power source, or there is contact with the 24V wiring harness, or there is a disconnection in the GND line wiring harness.

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.

★ Always connect any disconnected connectors before going on the next step.

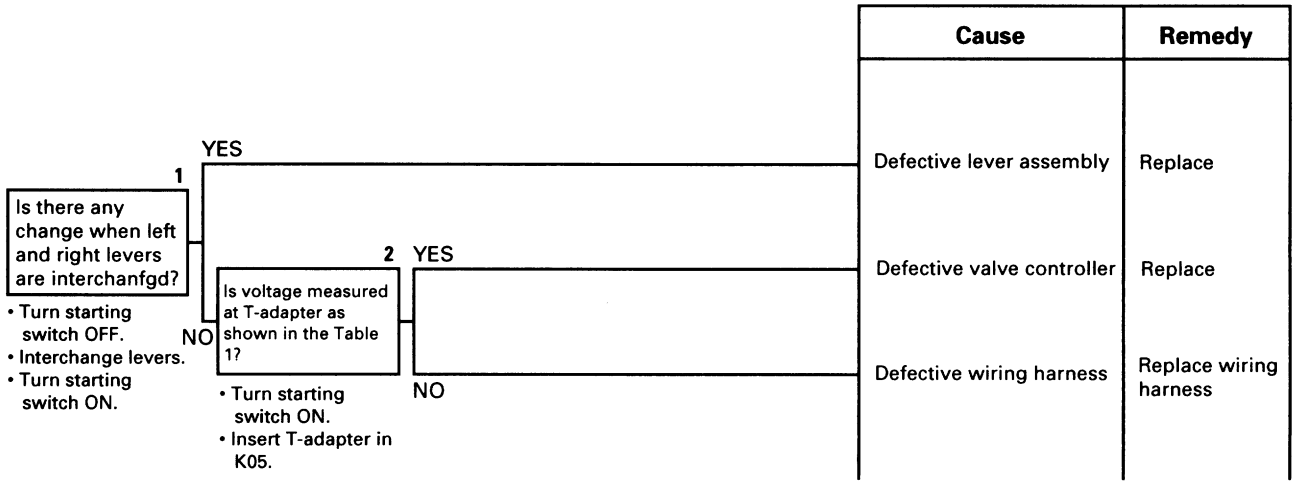

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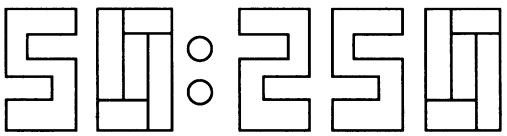
Table 1

Monitoring display Example  Unit × 10mV

Service code	K22	K21	K05	Voltage measured by tester (V)		
				At neutral	At full stroke	
E4:41 Boom	Between (2) and (3)	–	Between (19) and (5)	2.5 ± 0.25	3.87 – 4.52	0.66 – 0.97
	Between (11) and (12)	–	Between (9) and (5)			
E4:42 Arm	–	Between (2) and (3)	Between (17) and (5)			
	–	Between (11) and (12)	Between (7) and (5)			
E4:43 Bucket	Between (5) and (6)	–	Between (18) and (15)			
	Between (8) and (9)	–	Between (8) and (15)			
E4:44 Swing	–	Between (5) and (6)	Between (16) and (15)			
	–	Between (8) and (9)	Between (6) and (15)			

PRECAUTIONS WHEN CARRYING OUT OPERATION

[When carrying out removal or installation (disassembly or assembly) of units, be sure to follow the general precautions given below when carrying out the operation.]

1. Precautions when carrying out removal work

- If the coolant contains antifreeze, dispose of it correctly.
- After disconnecting hoses or tubes, cover them or fit 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 when assembling.
- To prevent any excessive force from being applied to the wiring, always hold the connectors when disconnecting the connectors. Do not pull the wires.
- Fit wires and hoses with tags to show their installation position to prevent any mistake when installing.
- Check the number and thickness of the shims, and keep in a safe place.
- When raising components, be sure to use lifting equipment of ample strength.
- When using forcing screws to remove any components, tighten the forcing screws uniformly in turn.
- Before removing any unit, clean the surrounding area and fit a cover to prevent any dust or dirt from entering after removal.

★ Precautions when handling piping during disassembly

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

1) 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)

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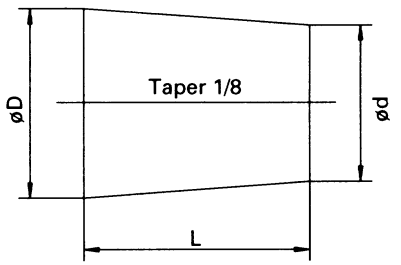
2) Split flange type hoses and tubes

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

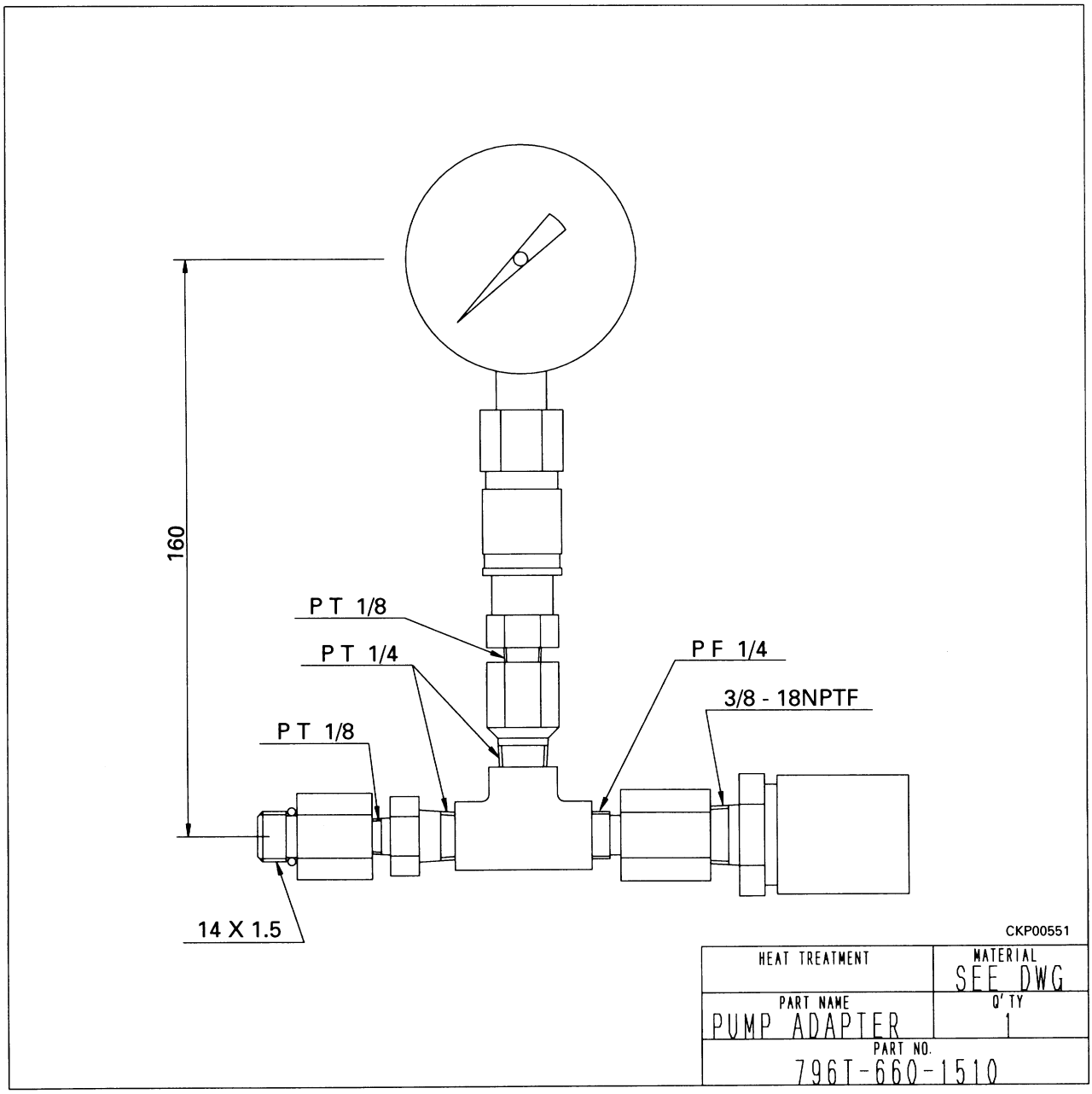
3) If the part is not under hydraulic pressure, the following corks can be used.

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



DEW00401

FF-3 Pump adapter



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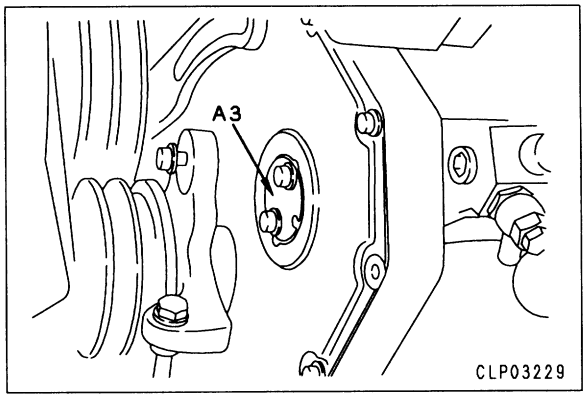
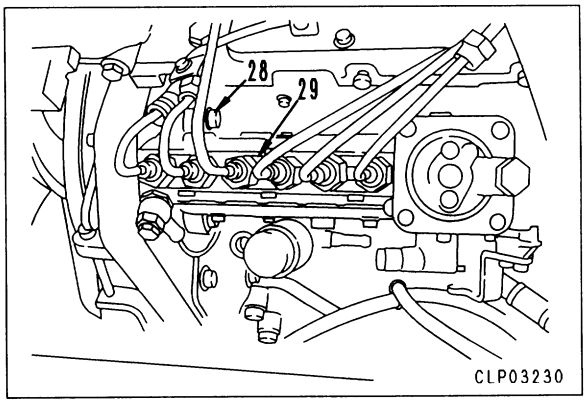
17. Using tool **A3**, pull drive gear of fuel injection pump and loosen from shaft.



18. Remove 4 nuts (28), then remove fuel injection pump assembly (29). ※ 5



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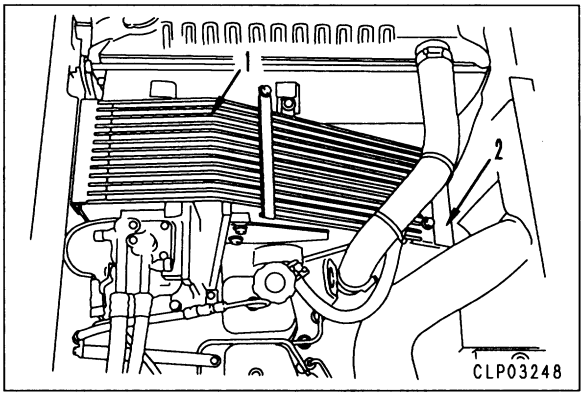
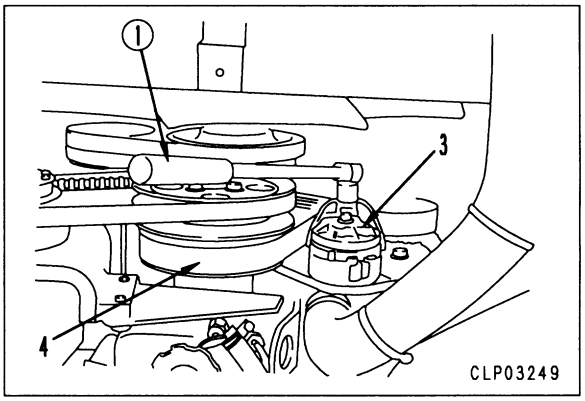
REMOVAL OF THERMOSTAT ASSEMBLY

1. Drain coolant.

2. Open engine hood, and remove fan guard (1) and right side guard mounting bracket (2).



3. Using wrench ①, raise tensioner (3), then remove fan belt (4).
   ⚠ Be extremely careful not to get your fingers caught when removing the belt.



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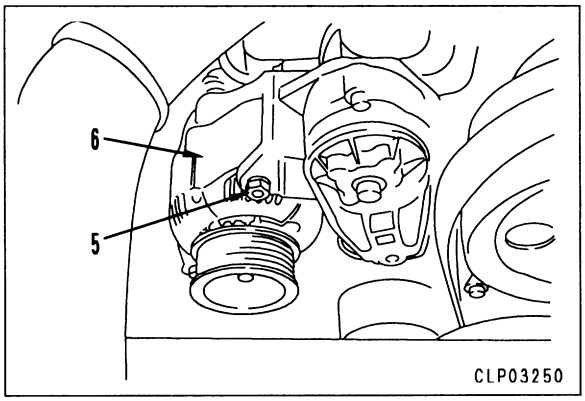
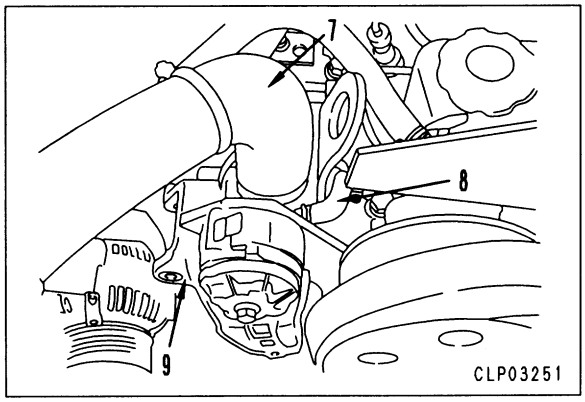
4. Remove alternator assembly top mounting bolt (5) from bracket, then move alternator assembly (6) towards partition plate end.
   ★ Loosen the mounting bolts at the bottom of the alternator assembly.



5. Disconnect radiator inlet hose (7) and aeration hose (8).

6. Remove alternator bracket (9).

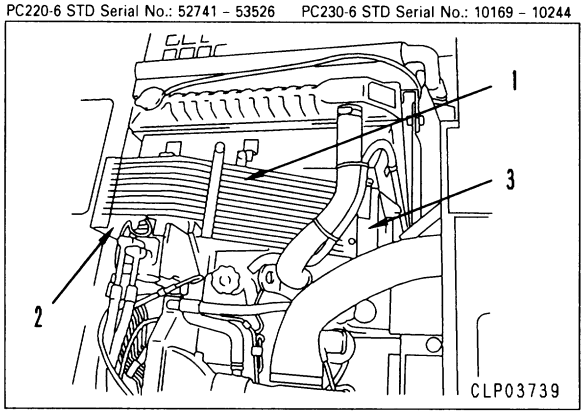


REMOVAL OF CYLINDER HEAD ASSEMBLY (PC220, 230-6)

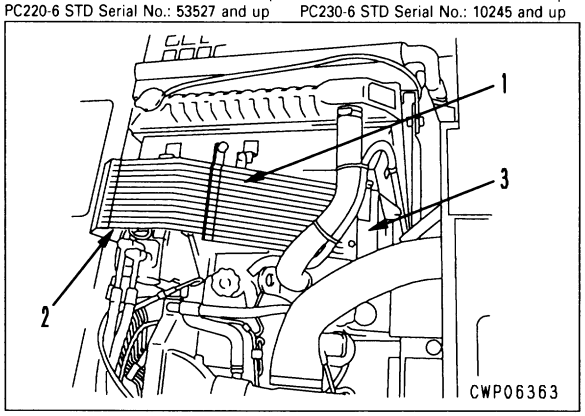
⚠ Disconnect the cable from the negative (–) terminal of the battery.

1. Drain coolant.
2. Open engine hood.
3. Remove fan guard (1), then remove left and right side covers (2) and (3) of fan guard mount.

PC200-6 STD Serial No.: 94999 - 101893 PC210-6 STD Serial No.: 30916 - 31389
PC220-6 STD Serial No.: 52741 - 53526 PC230-6 STD Serial No.: 10169 - 10244



PC200-6 STD Serial No.: 101894 and up PC210-6 STD Serial No.: 31390 and up
PC220-6 STD Serial No.: 53527 and up PC230-6 STD Serial No.: 10245 and up



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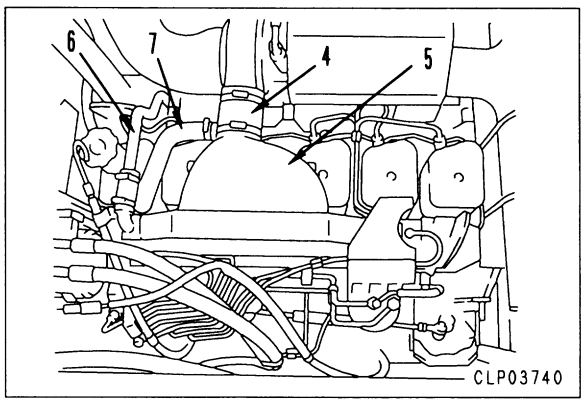
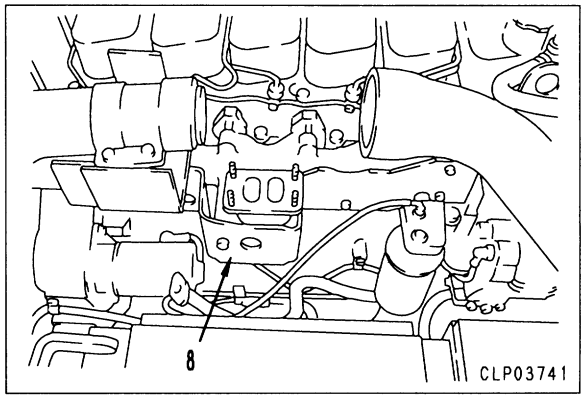
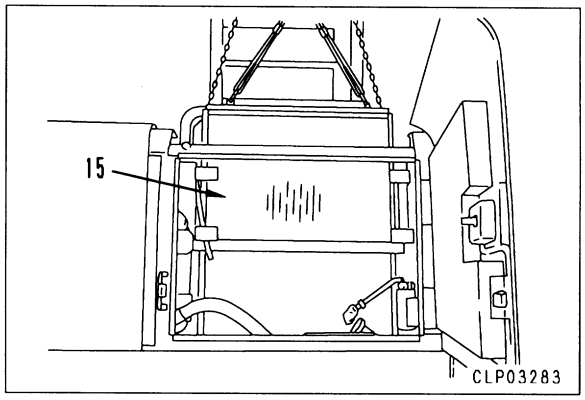
4. Loosen clamp of hose (4), then remove hose (4) and air connector portion (5) of aftercooler.
5. Disconnect tube (6) and hose (7).
6. Remove turbocharger assembly.
   For details, see REMOVAL OF TURBOCHARGER ASSEMBLY.



7. Remove exhaust manifold cover (8).



11. Sling radiator and hydraulic cooler assembly (15), remove bottom mounting bolts, then lift off radiator and hydraulic cooler assembly.
    ★ When raising the radiator and hydraulic cooler assembly, check the position carefully and do not let it hit the fan when removing it.
    kg Radiator, hydraulic cooler assembly: **112 kg**



INSTALLATION OF RADIATOR, HYDRAULIC OIL COOLER ASSEMBLY (PC200, 210-6)

- Carry out installation in the reverse order to removal.

※1 ※2
kgm Radiator hose band clip : **8.83 ± 0.98 Nm {0.9 ± 0.1 kgm}**

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

- **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.

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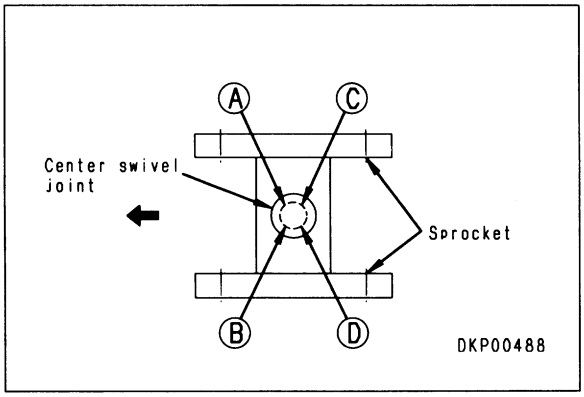
INSTALLATION OF CENTER SWIVEL JOINT ASSEMBLY

- Carry out installation in the reverse order to removal.

※ 1

★ Assemble the center swivel as shown in the diagram below.

- **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 form the travel motor. For details, see TESTING AND ADJUSTING, Bleeding air.



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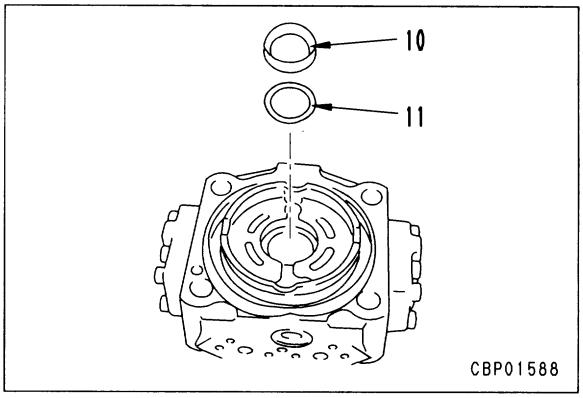
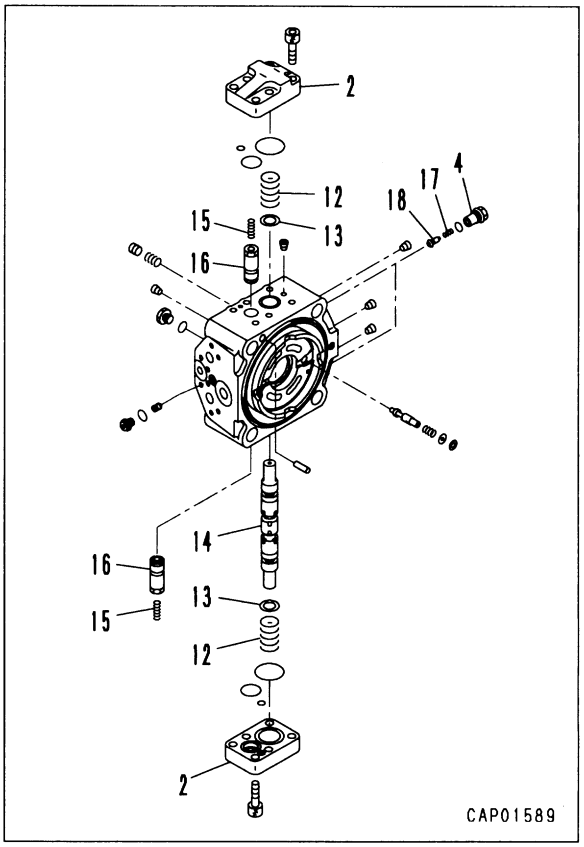
6) Remove bearing outer race (10) and spacer (11).



7) Disassembly of end cover
   i) Remove cover (2), then remove spring (12), spacer (13), and counterbalance valve (14).
      ★ Loosen the cover mounting bolts on both sides slowly in turn, loosen the spring tension, and remove.
   ii) Remove spring (15) and safety valve (16).
   iii) Remove plug (4), then remove spring (17) and check valve (18).



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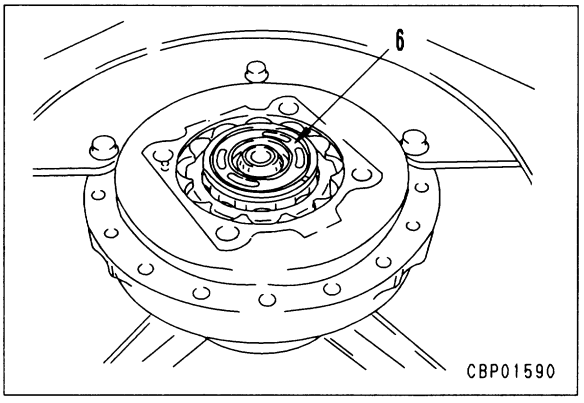
4. Valve plate

Remove valve plate (6).

★ When using again, keep in a safe place and be careful not to scratch or damage the cylinder block contact surface.



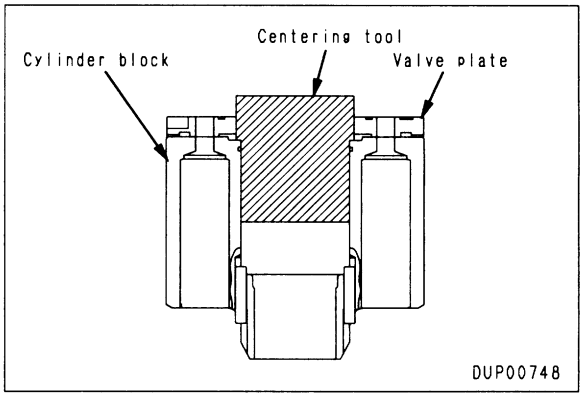
CHECKING CONTACT BETWEEN CYLINDER BLOCK AND VALVE PLATE

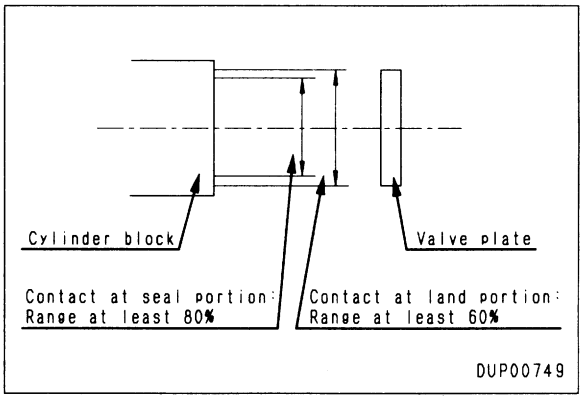
★ This check is unnecessary if both the cylinder block and valve plate are replacement parts (new parts).
★ This check applies if one of the parts is a replacement part or a restored part.
★ If the contact is defective, use a surface plate and correct by lapping.

1) Make a centering tool for the cylinder block and valve plate.
   ★ The tool can be made from plastic, bakelite or any other soft material.
2) Remove all oil and grease from the parts to be checked.
   ★ Do not wipe with a cloth.
3) Set the tool in position, then paint the cylinder block with inspection paint.
   ★ Coat thinly with paint.
4) Push the valve plate with a force of 39 – 49 N {4 – 5 kg} against the cylinder block, turn the valve plate 90°, then turn it back to the original position. Repeat this process 2 or 3 times.
5) Remove the valve plate, transfer the contact surface to a tape, and check the contact surface.
   ★ The contact of the plane surface of the valve plate and cylinder block must fulfill the conditions below and must cover the whole circumference without any break.
   i) The contact at the seal portion (range of ϕ84.4 – ϕ116.5 mm from the inside) must be at least 80%.
   ii) The contact at the land portion (range of ϕ128 – ϕ142 mm) must be at least 60%.

	Seal portion	Land portion
Valve plate	Min. 80%	Min. 60%
Cylinder block	Min. 80%	Min. 60%

★ For details of the operation, see the Parts Judgement Guide.





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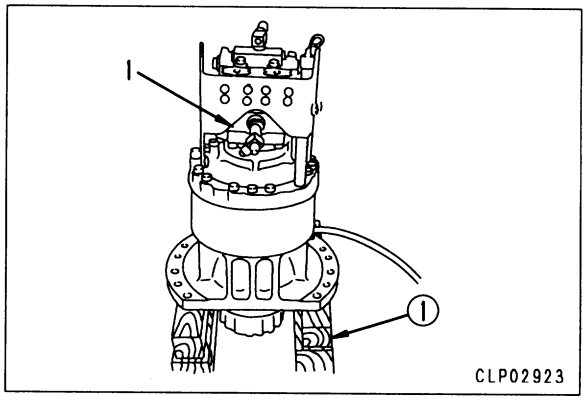
13. Swing motor assembly

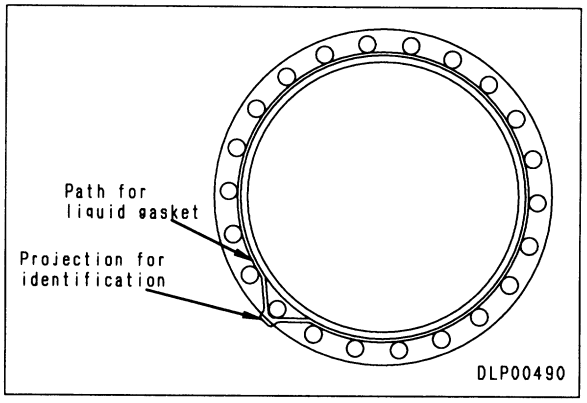
Install swing motor assembly (1).

Ring gear side mounting surface :
Gasket sealant (LG-6)



★ Coat the outside diameter of the hole only at the hole in the ring gear where there is a distinguishing protrusion on the case. (See the diagram on the right.)

kgm Mounting bolt :
176.5 ± 19.6 Nm {18 ± 2.0 kgm}



14. Refilling with oil

Tighten drain plug and add engine oil through oil filler to specified level.

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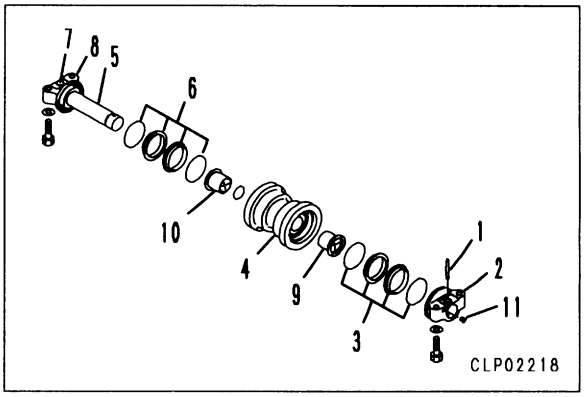
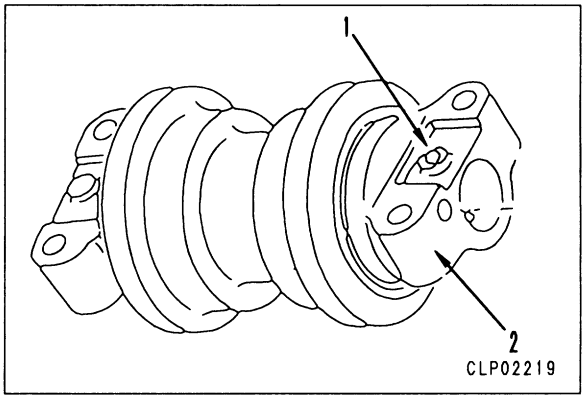
DISASSEMBLY OF TRACK ROLLER ASSEMBLY

1. Remove pin (1), then remove collar (2).





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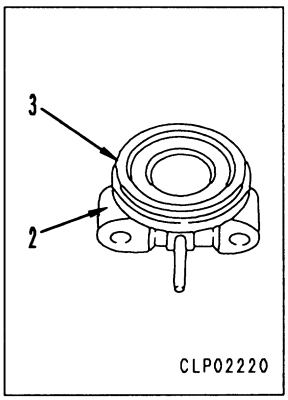
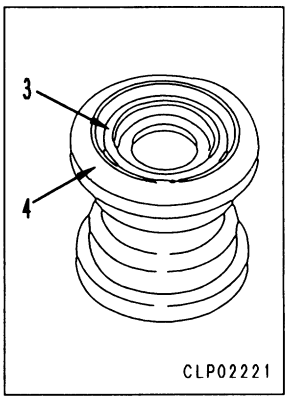
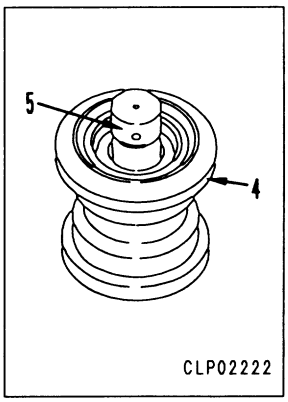
2. Remove floating seal (3) from collar (2) and roller (4).

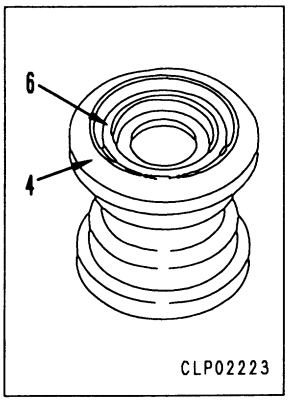




3. Pull out roller (4) from shaft (5).
   ★ It is filled with 190 – 215 cc. of oil, so drain the oil at this point or lay a cloth to prevent the area from becoming dirty.

4. Remove floating seal (6) on opposite side from roller (4) and shaft (5).

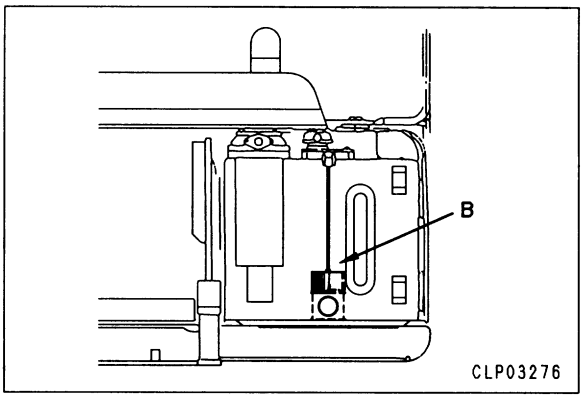




REMOVAL OF MAIN PUMP ASSEMBLY

⚠ Disconnect the cable from the negative (–) terminal of the battery.

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

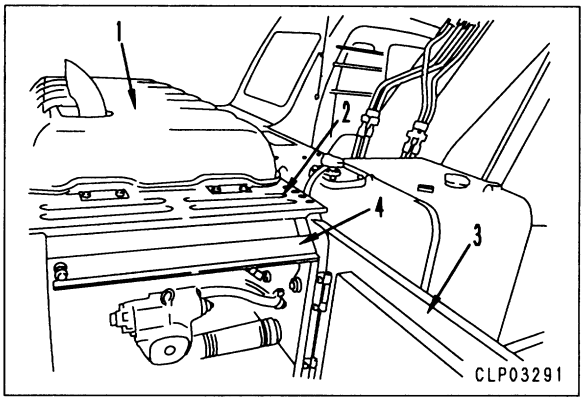


- Remove the hydraulic tank strainer, and using tool **B**, stop the oil.
  - When not using tool **B**, remove the drain plug, and drain the oil from the hydraulic tank and inside the system.

  Hydraulic tank : **Approx. 170 ℓ**

- Drain oil from damper case.

1. Remove engine hood cover (1).
2. Remove main pump top cover (2).
3. Remove right side cover (3) together with cover mounting frame (4).



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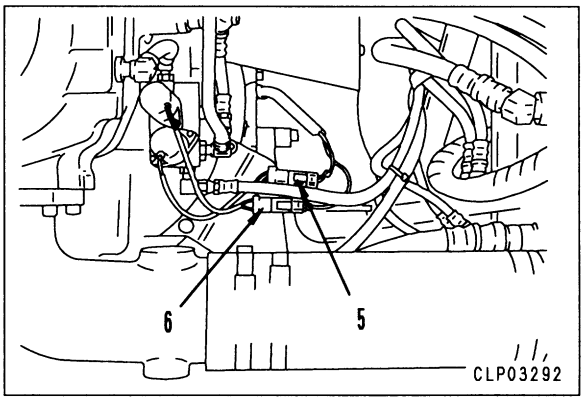
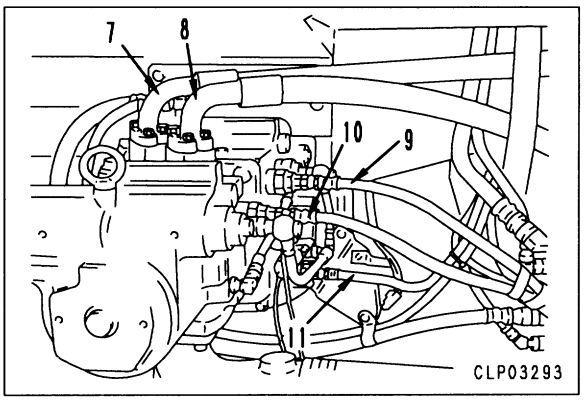
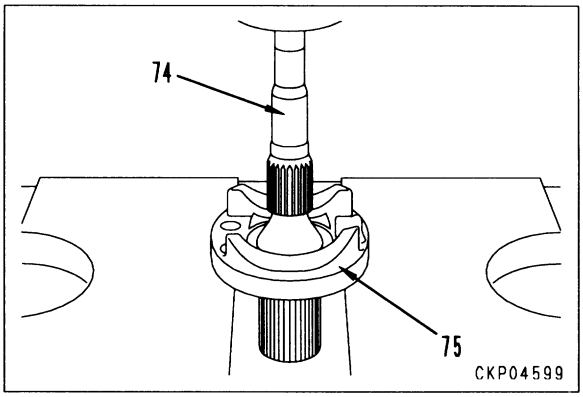
4. Remove connectors (5) and (6) from bracket and disconnect.



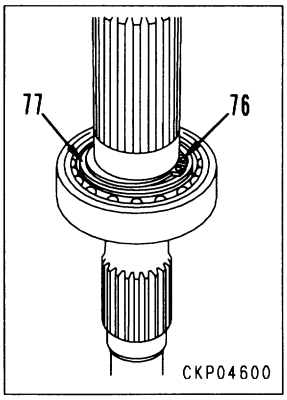
5. Disconnect F and R pump discharge hoses (7) and (8), F and R LS pressure hoses (9) and (10), and EPC basic pressure hose (11).
   ★ Protect with the sleeve nut to prevent damage to the nipple or elbow taper seal portion.

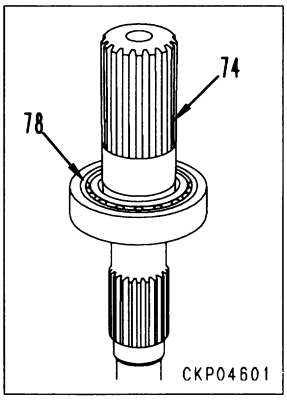


2) Disassemble front shaft and cradle assembly as follows.
   i) Using press, remove shaft (74) from cradle (75).
      ★ Be careful not to drop the shaft.



   ii) Remove snap ring (76), then remove washer (77).
      ★ Check the thickness of the washer.
   iii) Remove roller bearing (78) from shaft (74).





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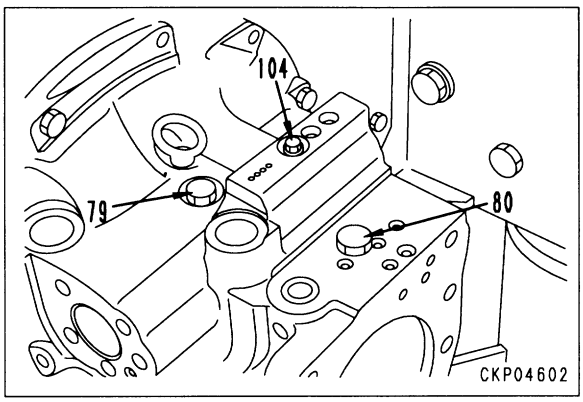
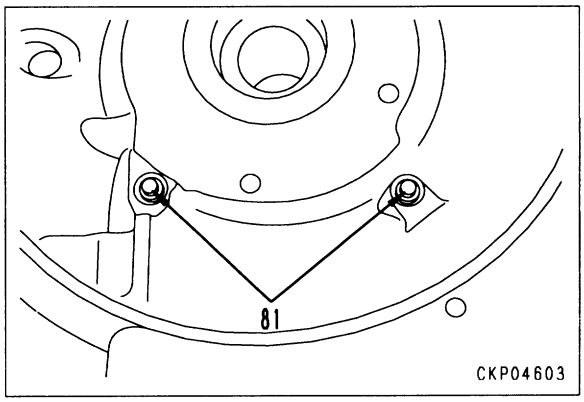
12. Front pump case
1) Remove one plug (79).
2) Remove plug (80).
3) Remove plug (104).
4) Remove drain plug.



5) Remove 2 plugs (81).



★ Assemble with the chamfered portion on the inside diameter of seat (19) facing plug (16).

iv) Install plug (16) to sleeve (23), and tighten locknut (15) temporarily.

v) Assemble piston (14).

vi) Assemble piston (13) to sleeve (12).

vii) Install sleeve (12) to sleeve (23).

★ The connecting portion is eccentric, so align the connecting portion and turn 90°.

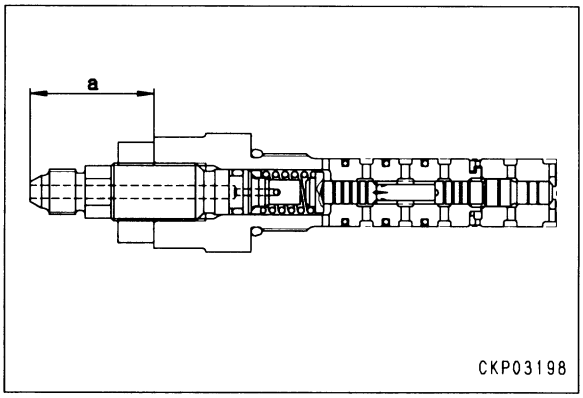
★ Align with screwed-in dimension **a** of the sleeve measured before disassembly, then secure with a locknut.

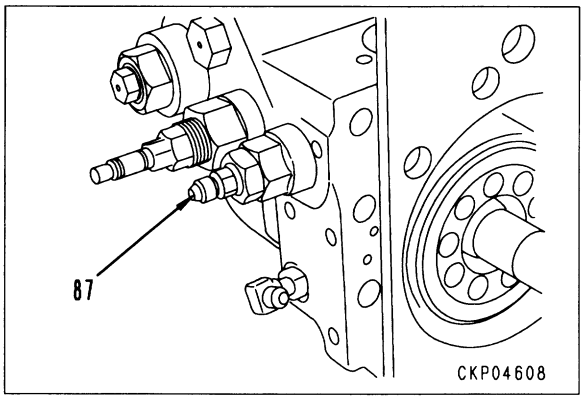
• Standard screwed-in dimension **a** : 38.1 mm

kgm Locknut :
56.4 ± 7.35 Nm {5.75 ± 0.75 kgm}

2) Fit O-ring and install rear LS valve assembly (87).

kgm LS valve assembly :
145 ± 12.5 Nm {14.7 ± 1.25 kgm}





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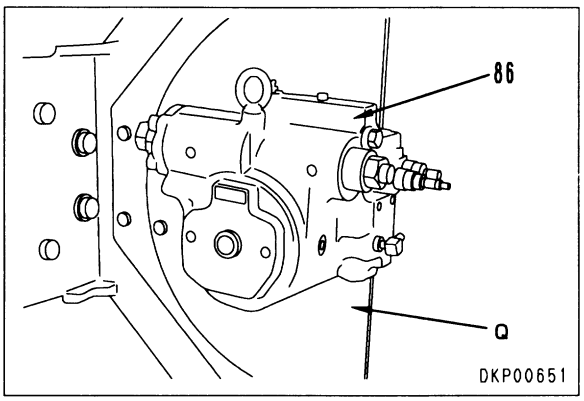
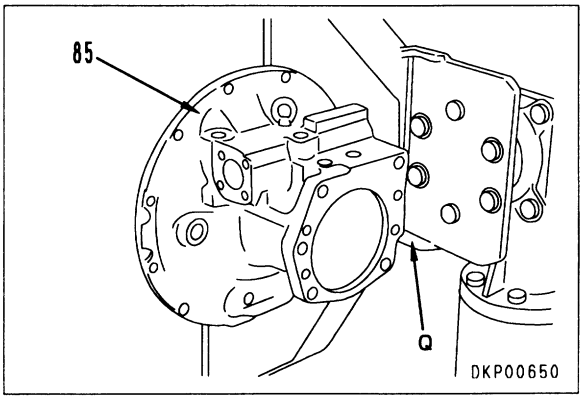
9. Rear pump assembly

Remove rear pump assembly (86) from tool **Q**.

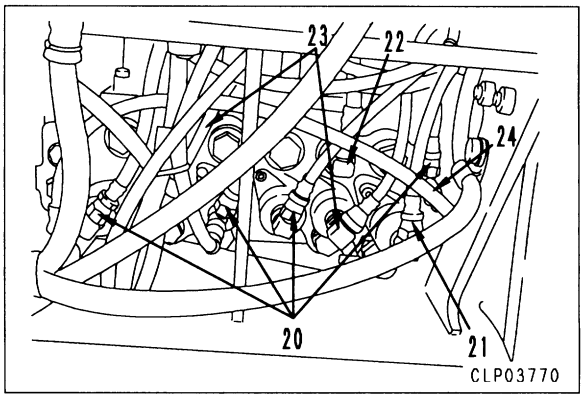


10. Front pump case

1) Set front pump case (85) to tool **Q**.



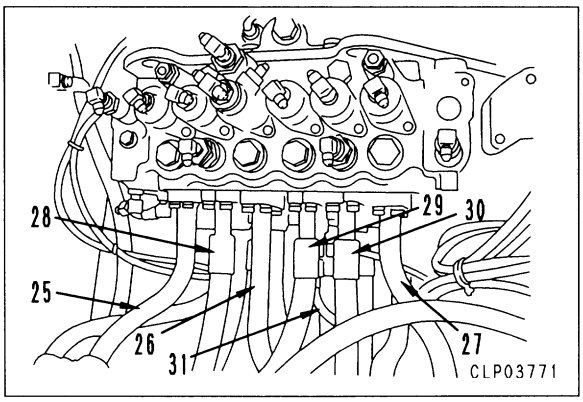
10. Disconnect 4 hoses (20) between control valve and relay block, hose (21) between control valve and timing valve, travel valve junction hose (22), travel valve pilot hoses (23), and pilot hose (24) between arm and bucket.
    - ★ After disconnecting the hoses, fit tags to distinguish them.
    - ★ Protect with the sleeve nut to prevent damage to the nipple or elbow taper seal portion.



11. Disconnect 2 each of bucket valve tube (25), boom valve tube (26), and arm valve tube (27).

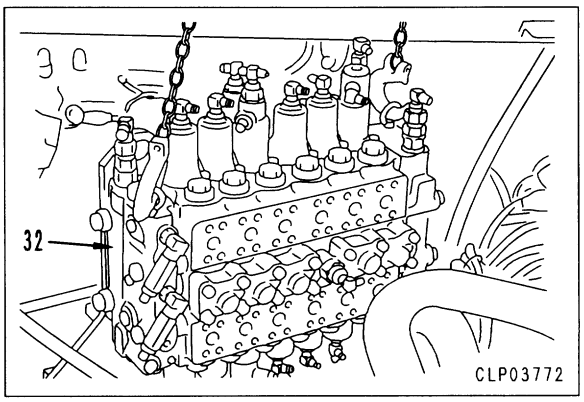
12. Disconnect 2 each of right travel valve hose (28), swing valve hose (29), and left travel valve hose (30).

13. Disconnect 2 LS select valve pilot hoses (31).



14. Sling control valve assembly (32), then remove mounting bolts, and lift off control valve assembly.

    kg Control valve assembly : **170 kg**



INSTALLATION OF CONTROL VALVE ASSEMBLY

- Carry out installation in the reverse order to 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, Bleeding air.

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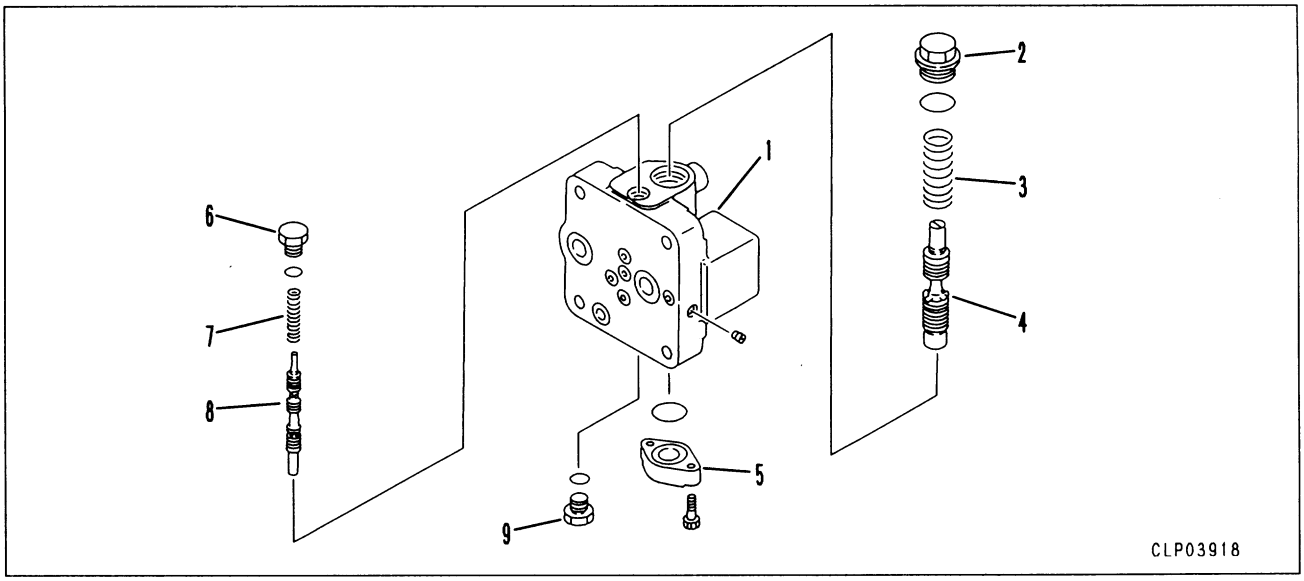
DISASSEMBLY OF PUMP MERGE-DIVIDER VALVE ASSEMBLY



1. Remove plug (2) from valve body (1), then remove spring (3) and spool (4).
2. Remove plate (5).
3. Remove plug (6), then remove spring (7) and spool (8).
4. Remove plug (9).

★ After disassembling, if there is any abnormality in body (1) or spools (4) or (8), replace the whole pump merge-divider valve assembly.

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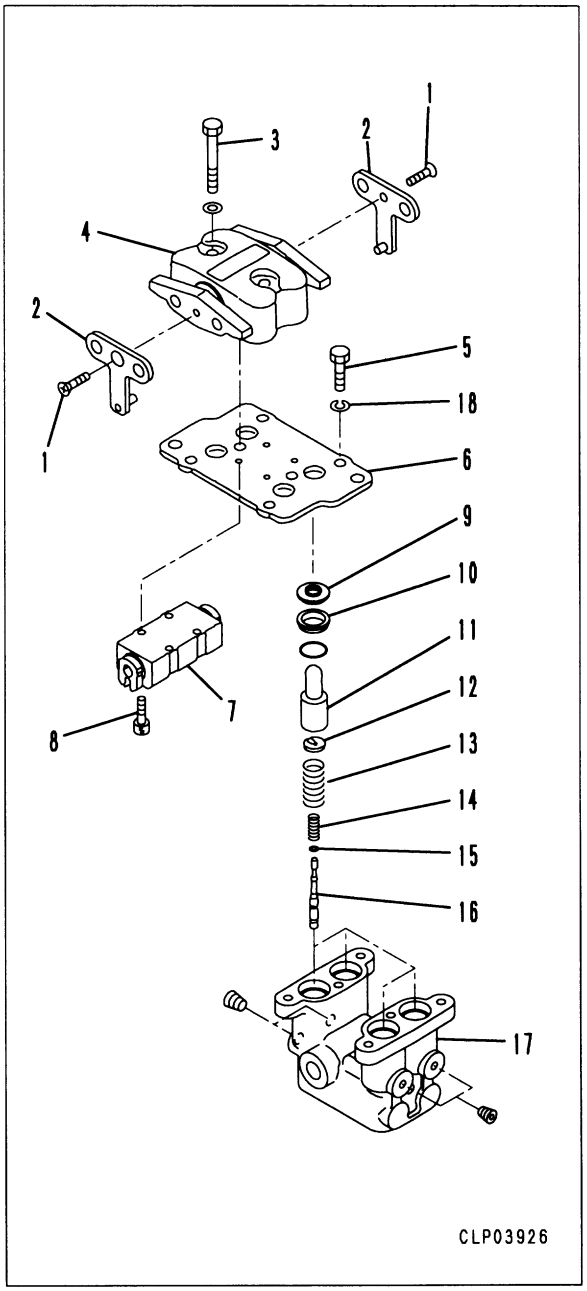
ASSEMBLY OF PUMP MERGE-DIVIDER VALVE ASSEMBLY

- Before assembling, coat the sliding surface with engine oil.

1. Fit O-ring to plug (9) and install to valve body (1).
   kgm Plug (9) : **39.2 ± 5.88 Nm {4.0 ± 0.6 kgm}**
2. Assemble spool (8) and spring (7), then fit O-ring to plug (6) and install.
   kgm Plug (6) : **39.2 ± 5.88 Nm {4.0 ± 0.6 kgm}**
3. Fit O-ring to plate (5) and install to valve body.
4. Assemble spool (4) and spring (3), then fit O-ring to plug (2) and install.
   kgm Plug (2) :
   151.9 ± 24.5 Nm {15.5 ± 2.5 kgm}

DISASSEMBLY OF TRAVEL PPC VALVE ASSEMBLY

1. Remove screws (1), then remove levers (2).
2. Remove mounting bolts (3), then remove case and shaft assembly (4).
3. Remove mounting bolts (5), then remove plate (6) and damper assembly (7) as one unit.
   ★ Check the thickness and mounting position of washer (18).
   ★ Never disassemble damper assembly (7).
4. Remove mounting bolts (8), then remove damper assembly (7) from plate (6).
5. Remove seal (9) and collar (10).
6. Pull out piston (11), and remove retainer (12), springs (13) and (14), and shims (15).
   ★ Check the number and thickness of shims (15) for each mounting position, and keep in a safe place.
7. Pull out valve (16) from body (17).



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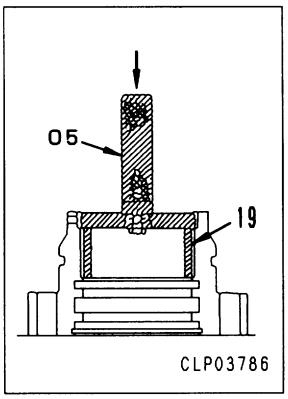
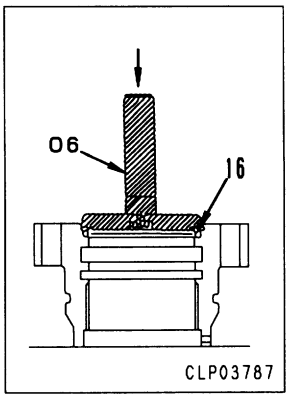
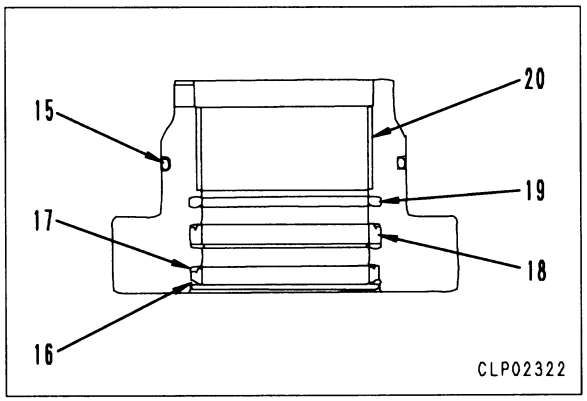
ASSEMBLY OF HYDRAULIC CYLINDER ASSEMBLY

★ Be careful not to damage the packings, dust seals, and O-rings.
★ Do not try to force the backup ring into position. Warm it in warm water (50 – 60°C) before fitting it.

1. Assembly of head assembly
1) Using tool **O5**, press fit bushing (20).
2) Assemble buffer ring (19).
3) Assemble rod packing (18).
4) Using tool **O6**, install dust seal (17), and secure with snap ring (16).
5) Install backup ring and O-ring (15).







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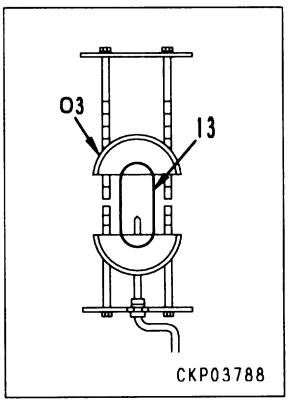
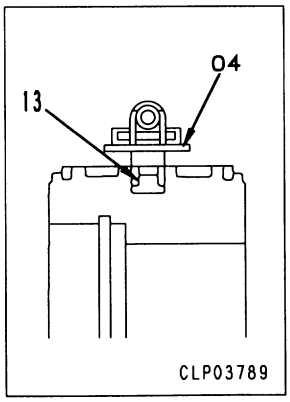
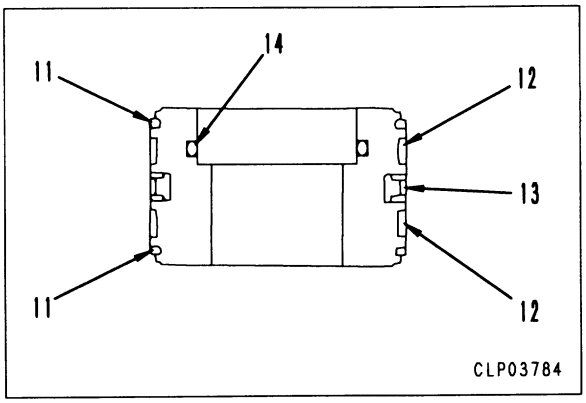
2. Assembly of piston assembly
1) Using tool **O3**, expand piston ring (13).
★ Set the piston ring on tool **O3**, and turn the handle 8 – 10 times to expand the ring.
2) Set tool **O4** in position, and compress piston ring (13).





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 groove : **Grease (G2-LI)**



REMOVAL OF BOOM ASSEMBLY

1. Remove bucket and arm assembly. For details, see REMOVAL OF BUCKET, ARM ASSEMBLY.

2. Lower boom assembly completely to ground, and set safety lock lever to LOCK position.

3. Disconnect grease hose (1).

4. Sling boom cylinder assembly (2), and remove lock bolt (3). ※ 1

5. Remove plate, then remove head pin (4). ※ 2
   ★ There are shim installed, so check the number and thickness, and keep in a safe place.

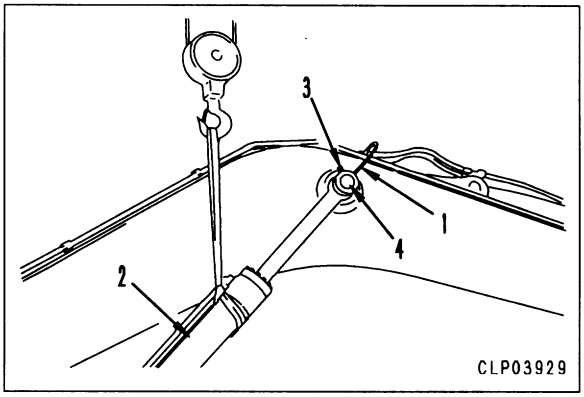
6. Start engine, and retract piston rod, then tie piston rod with wire to prevent it from coming out, and lower it onto block.
   ★ Disconnect the boom cylinder on the opposite side in the same way.
   ⚠ Release the remaining pressure in the hydraulic circuit. For details, see TESTING AND ADJUSTING, Releasing remaining pressure in hydraulic circuit.

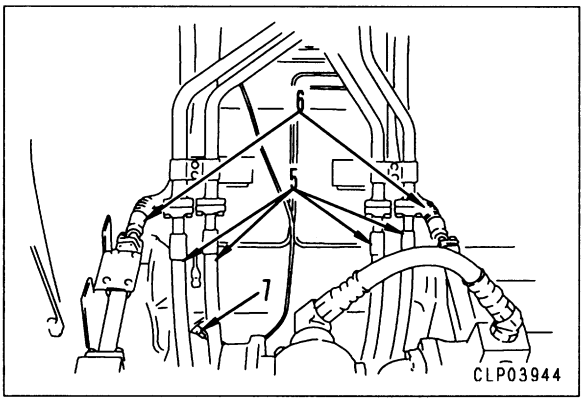
7. Disconnect hoses (5) and (6), and secure to valve with rope.
   ★ Hoses (6) are for machines equipped with an additional attachment circuit.

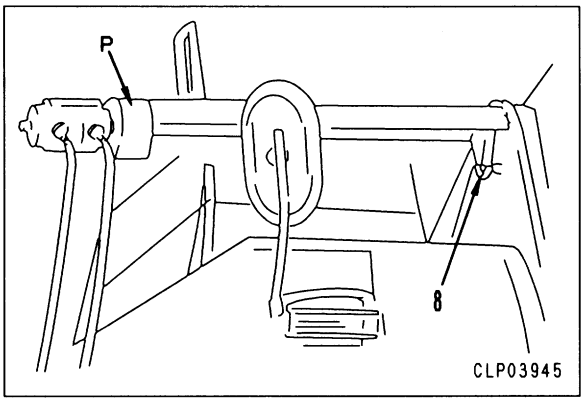
8. Disconnect wiring connector (7) for working lamp.

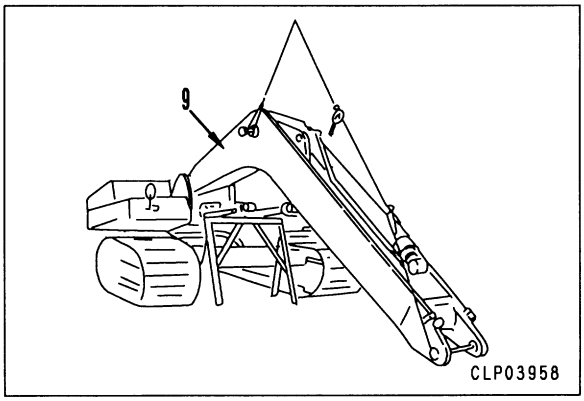
9. Raise boom assembly and remove plate, remove foot pin (8) using tool **P**, then remove boom assembly (9). ※ 3
   ★ There are shims installed, so check the number and thickness, and keep in a safe place.

kg Boom assembly : PC200-6: **1,650 kg**
PC210-6: **1,750 kg**
PC220-6: **1,950 kg**
PC230-6: **2,000 kg**









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REMOVAL OF SWING MOTOR ASSEMBLY

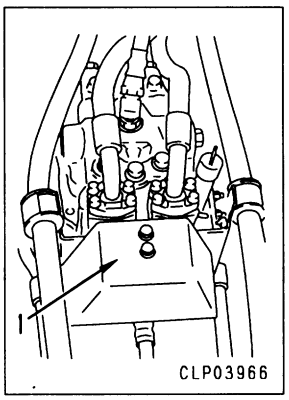
PC200, 200LC-6 HYPER GX

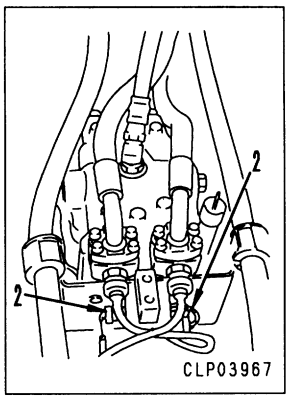
⚠ Lower the work equipment completely to the ground and stop the engine. Loosen the oil filler cap slowly to release the pressure inside the hydraulic tank. Then set the safety lock lever to the LOCK position.

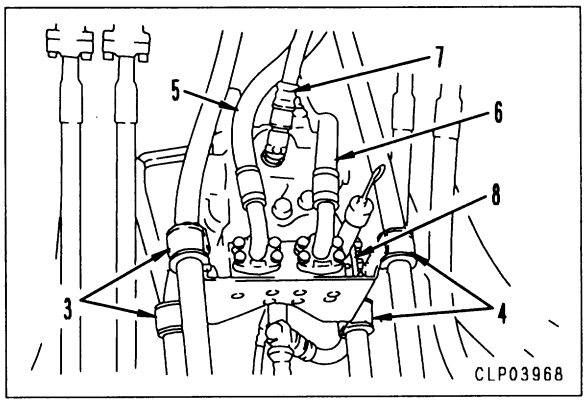
⚠ Disconnect the cable from the negative (–) terminal of the battery.

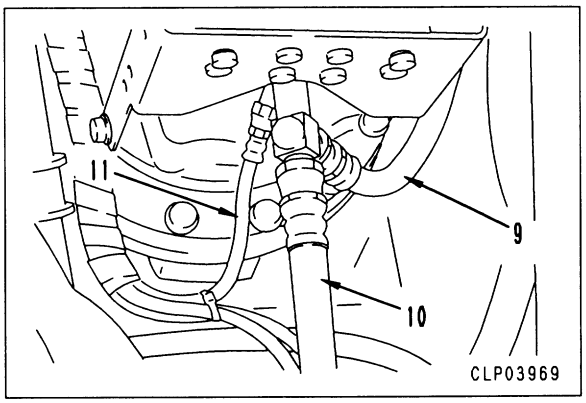
1. Remove cover (1).
2. Disconnect wiring connectors (2).
3. Remove hose clamps (3) and (4).
4. Disconnect swing motor inlet and outlet hoses (5), (6), and (7).
5. Remove bracket (8).
6. Disconnect drain hoses (9) and (10).
7. Disconnect pilot hose (11).
8. Remove swing motor assembly (12).

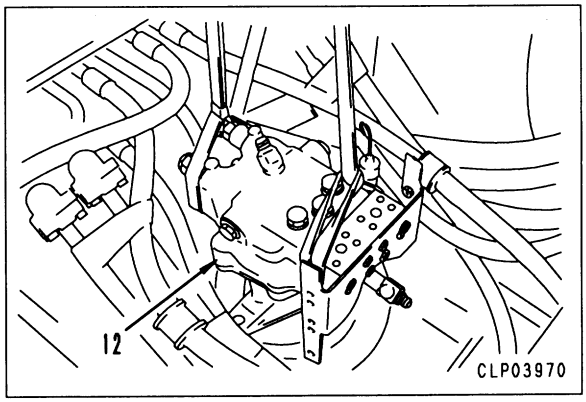
kg Swing motor assembly : **65 kg**











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INSTALLATION OF SWING MOTOR ASSEMBLY

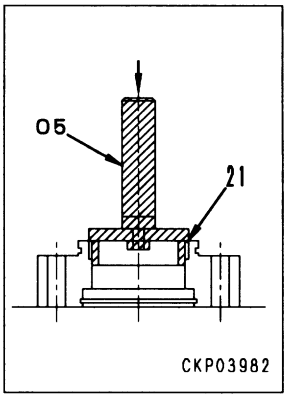
PC200, 200LC-6 HYPER GX

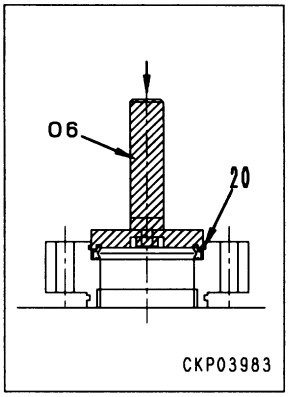
- Carry out installation in the reverse order to removal.
- **Refilling with oil (hydraulic tank)**
  ★ Add oil through the oil filler to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.
- **Bleeding air**
  ★ Bleed the air from the cylinder. For details, see TESTING AND ADJUSTING, Bleeding air.

ASSEMBLY OF BUCKET CYLINDER ASSEMBLY

PC200, 200LC-6 HYPER GX

★ Be careful not to damage the packing, dust seals, or O-rings.
★ Do not try to force the backup ring into position. Warm it in warm water (50 – 60°C) before fitting it.



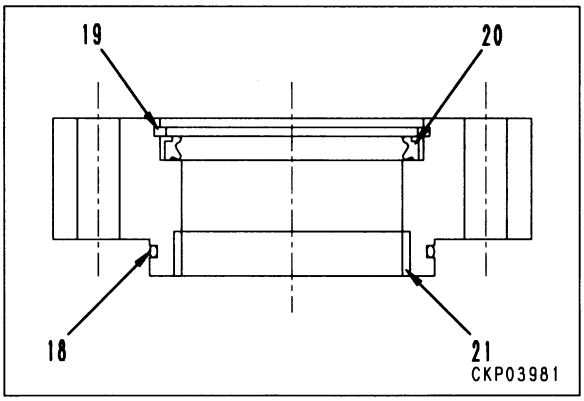


1. Assembly of head assembly

1) Using tool **O5**, press fit bushing (21).

2) Using tool **O6**, install dust seal (20), and secure with snap ring (19).

3) Install O-ring (18).



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2. Assembly of cylinder head assembly

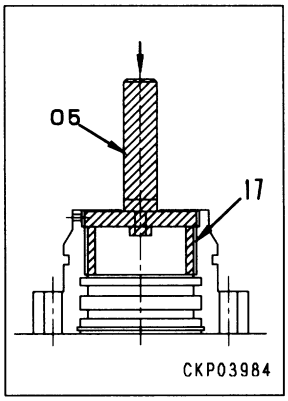
1) Using tool **O5**, press fit bushing (17).

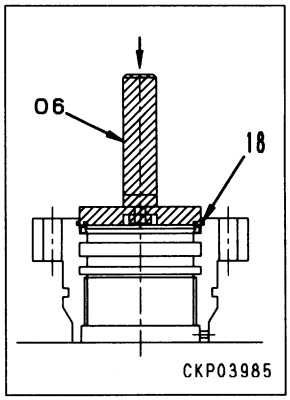
2) Assemble buffer ring (16).

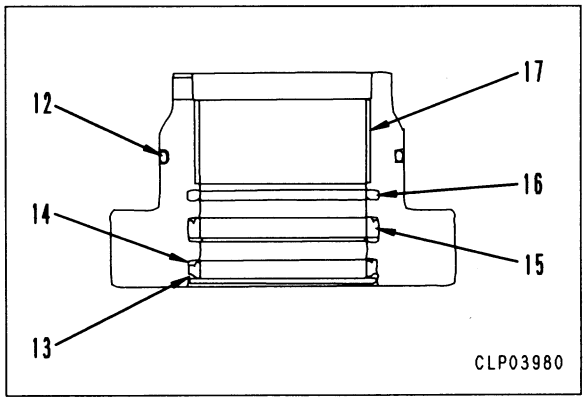
3) Assemble rod packing (15).

4) Using tool **O6**, install dust seal (14), and secure with snap ring (13).

5) Install backup ring and O-ring (12).







INSTALLATION OF BUCKET • ARM ASSEMBLY

PC200, 200LC-6 HYPER GX

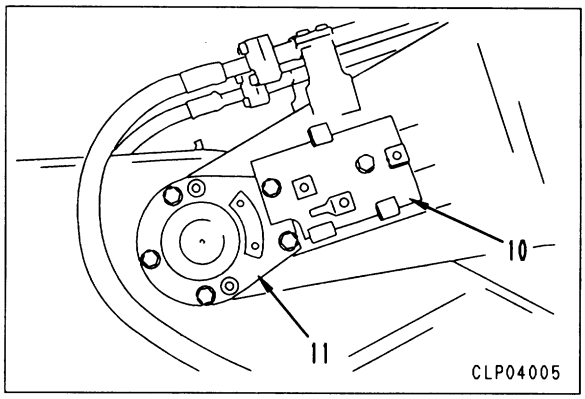
- Carry out installation in the reverse order to removal.

※ 1

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

Grease after assembling pin :
Grease (LM-G)

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



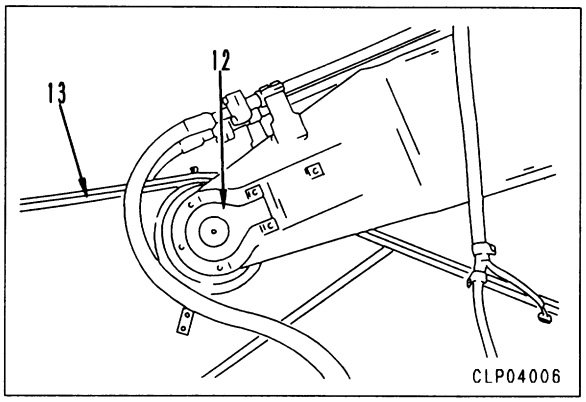
※ 2

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 in the pin hole.

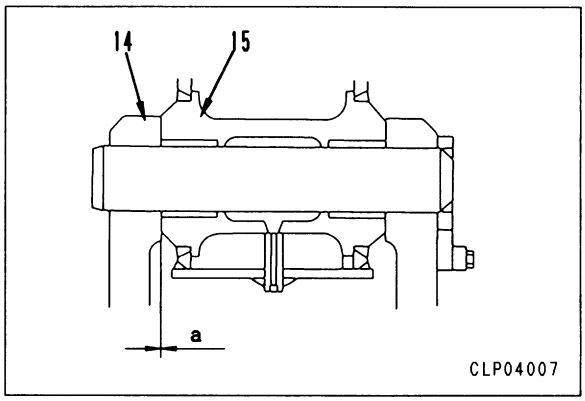
★ Adjust the shim thickness so that clearance **a** between boom top (14) and arm bottom (15) is below 1 mm.
  ★ Standard shim thickness : 0.8 mm



- **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 cylinder. For details, see TESTING AND ADJUSTING, Bleeding air from hydraulic cylinder.

★ After completing all operations, carry out adjustment in the following order : **A→E→J→Q**
For details, see TESTING AND ADJUSTING, Table for order of operations in GX adjustment mode.



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