SEN03862-06

Shop Manual

WHEEL LOADER

WA200 -6
WA200PZ -6

SERIAL NUMBERS WA200- 70001 and up
WA200PZ- 70001

ecot3

KOMATSU

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Explanation of terms for maintenance standard

The maintenance standard values necessary for judgment of products and parts are described by the following terms.

1. Standard size and tolerance

- To be accurate, the finishing size of parts is a little different from one to another.
- To specify a finishing size of a part, a temporary standard size is set and an allowable difference from that size is indicated.
- The above size set temporarily is called the “standard size” and the range of difference from the standard size is called the “tolerance”.
- The tolerance with the symbols of + or – is indicated on the right side of the standard size.

Example:

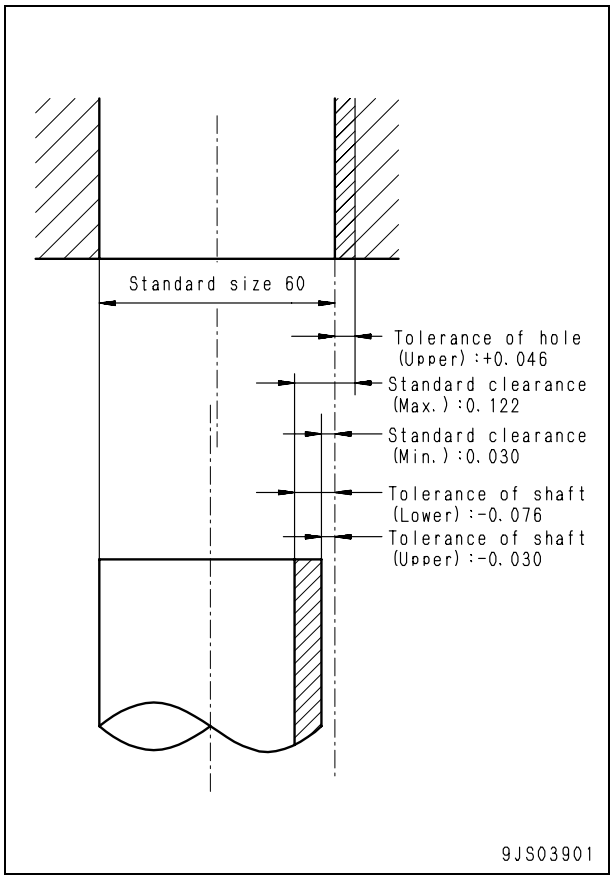
Standard size	Tolerance
120	–0.022 –0.126

★ The tolerance may be indicated in the text and a table as [standard size (upper limit of tolerance/lower limit of tolerance)].
Example) 120 (–0.022/–0.126)

- Usually, the size of a hole and the size of the shaft to be fitted to that hole are indicated by the same standard size and different tolerances of the hole and shaft. The tightness of fit is decided by the tolerance.
- Indication of size of rotating shaft and hole and relationship drawing of them

Example:

Standard size	Tolerance	
	Shaft	Hole
60	–0.030 –0.076	+0.046 0



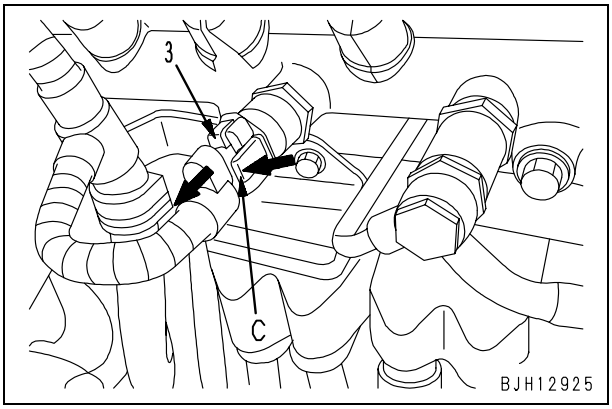
3. Push lock type

- 107, 114 engines
  Example)
  Fuel pressure sensor in common rail
  (**BOSCH-03**)

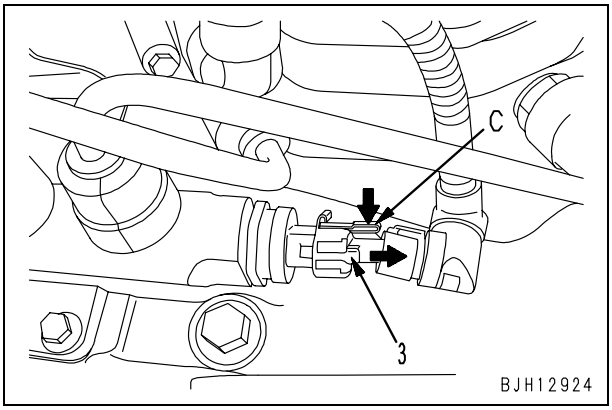
Disconnect connector (3) according to the following procedure.

1) While pressing lock (C), pull out connector (3) in the direction of the arrow.

- 114 engine

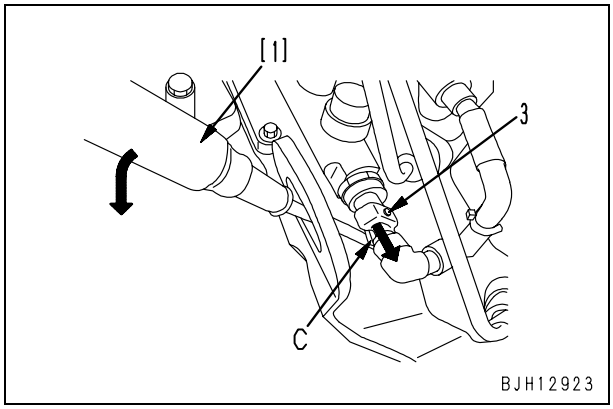


- 107 engine



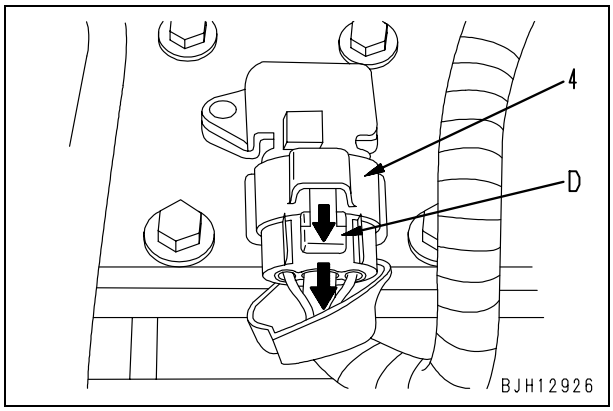
★ If the lock is on the underside, use flat-head screwdriver [1] since you cannot insert your fingers.

2) While pressing up lock (C) of the connector with flat-head screwdriver [1], pull out connector (3) in the direction of the arrow.



- 107, 114 engine
  Example)
  Intake air pressure/temperature sensor in intake manifold
  (**SUMITOMO-04**)

3) While pressing lock (D), pull out connector (4) in the direction of the arrow.



2. Table of tightening torques for split flange bolts

★ Unless there are special instructions, tighten split flange bolts to the torque below.

Thread diameter of bolt	Width across flats	Tightening torque	
mm	mm	Nm	kgm
10	14	59 – 74	6.0 – 7.5
12	17	98 – 123	10.0 – 12.5
16	22	235 – 285	23.5 – 29.5

3. Table of tightening torques for O-ring boss piping joints

★ Unless there are special instructions, tighten O-ring boss piping joints to the torque below.

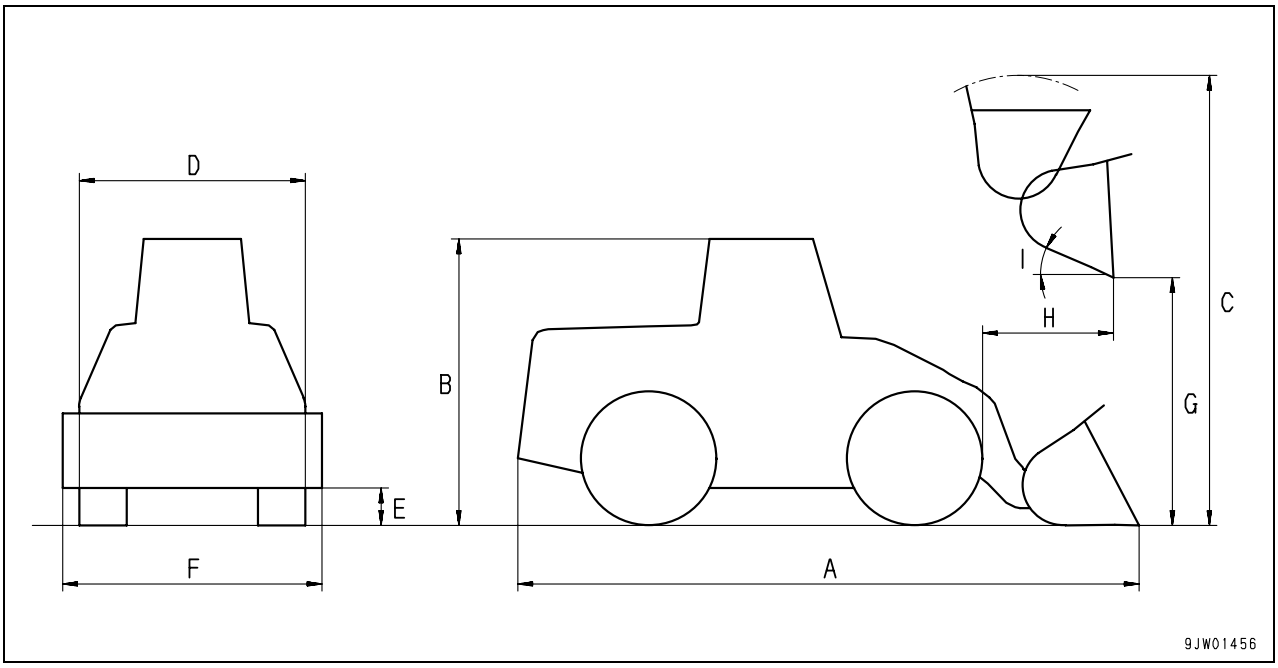
Nominal No.	Thread diameter	Width across flats	Tightening torque Nm {kgm}	
	mm	mm	Range	Target
02	14	Varies depending on type of connector.	35 – 63 { 3.5 – 6.5}	44 { 4.5}
03,04	20		84 – 132 { 8.5 – 13.5}	103 {10.5}
05,06	24		128 – 186 {13.0 – 19.0}	157 {16.0}
10,12	33		363 – 480 {37.0 – 49.0}	422 {43.0}
14	42		746 – 1,010 {76.0 – 103}	883 {90.0}

4. Table of tightening torques for O-ring boss plugs

★ Unless there are special instructions, tighten O-ring boss plugs to the torque below.

Nominal No.	Thread diameter	Width across flats	Tightening torque Nm {kgm}	
	mm	mm	Range	Target
08	8	14	5.88 – 8.82 {0.6 – 0.9}	7.35 {0.75}
10	10	17	9.81 – 12.74 {1.0 – 1.3}	11.27 {1.15}
12	12	19	14.7 – 19.6 {1.5 – 2.0}	17.64 {1.8}
14	14	22	19.6 – 24.5 {2.0 – 2.5}	22.54 {2.3}
16	16	24	24.5 – 34.3 {2.5 – 3.5}	29.4 {3.0}
18	18	27	34.3 – 44.1 {3.5 – 4.5}	39.2 {4.0}
20	20	30	44.1 – 53.9 {4.5 – 5.5}	49.0 {5.0}
24	24	32	58.8 – 78.4 {6.0 – 8.0}	68.6 {7.0}
30	30	32	93.1 – 122.5 { 9.5 – 12.5}	107.8 {11.0}
33	33	–	107.8 – 147.0 {11.0 – 15.0}	127.4 {13.0}
36	36	36	127.4 – 176.4 {13.0 – 18.0}	151.9 {15.5}
42	42	–	181.3 – 240.1 {18.5 – 24.5}	210.7 {21.5}
52	52	–	274.4 – 367.5 {28.0 – 37.5}	323.4 {33.0}

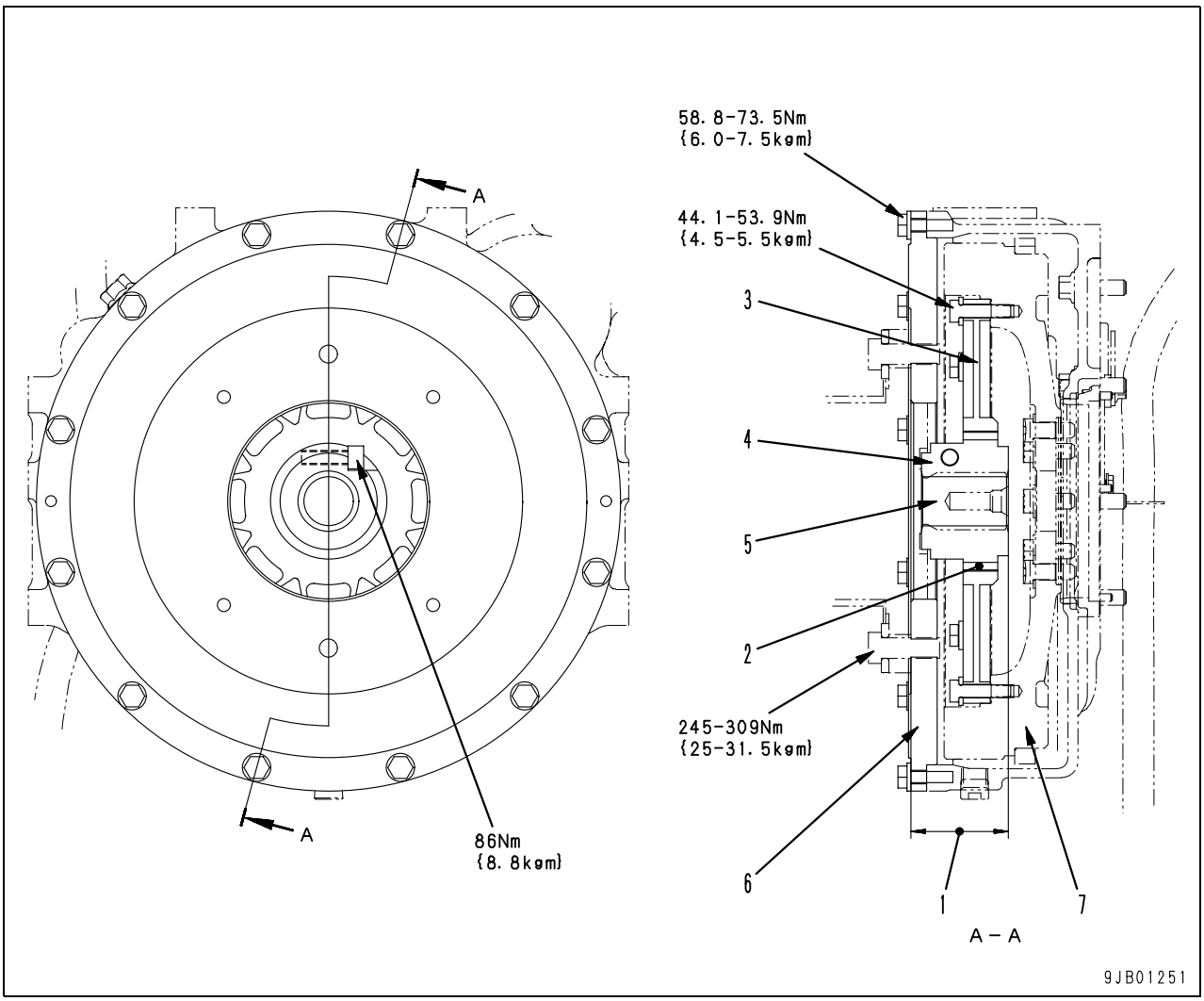
Specification dimension drawing



	Item		Unit	WA200-6	WA200PZ-6
	Machine weight (with BOC)		kg	9,890	11,740
	Normal load		kN {kg}	31.4{3,200}	31.4{3,200}
	Bucket capacity (heaped, with BOC)		m^3	2.0	2.0
	Engine model		—	Komatsu SAA4D107E-1 Diesel engine	
	Engine rated output • Net [ISO 9249/SAE J1349] (*1) • Gross [SAE J1955] (*2)		kW{HP}/rpm	94 {126}/2,000 95.2 {128}/2,000	
A	Overall length (with BOC)		mm	6,985	7,230
B	Overall height		mm	3,110	3,110
C	Overall height with bucket lifted up		mm	4,885	5,150
D	Overall width		mm	2,375	2,375
E	Minimum ground clearance		mm	425	425
F	Bucket width		mm	2,550	2,550
G	Dumping clearance (*3)	Bucket tip/BOC tip	mm	2,820/2,760	2,925/2,865
H	Dumping reach (*3)	Bucket tip/BOC tip	mm	975/1,000	1,000/1,025
I	Bucket dump angle (max. height)		degree	45	48
	Min. turning radius	Bucket tip/BOC tip	mm	5,830/5,850	5,730/5,755
		Center of outside tire	mm	5,100	5,100
	Permissible towing load		kN {kg}	71.0 {7,250}	71.0 {7,250}
	Travel speed	1st (forward/reverse)	km/h	4.0 – 13.0/4.0 – 13.0	4.4 – 14.3/4.4 – 14.3
		2nd (forward/reverse)		13.0/13.0	14.3/14.3
		3rd (forward/reverse)		20.0/20.0	22.0/22.0
		4th (forward/reverse)		34.5/34.5	38.0/38.0

*1: Indicates the value at the lowest cooling fan speed.
*2: Indicates the value of the engine alone (without cooling fan).
*3: Indicates the value at the 45° bucket dump angle.
★ The engine rated output is indicated in the net value and gross value. Gross denotes the rated output measured of an independent engine. While, net denotes the value measured of an engine under the condition essentially the same as that when it is installed on machine.
★ Following shows the rated output (net) at the maximum cooling fan speed.
91 kW {122 HP}/2,000 rpm
★ BOC: Abbreviation for Bolt-On Cutting edge

Damper



Unit: mm

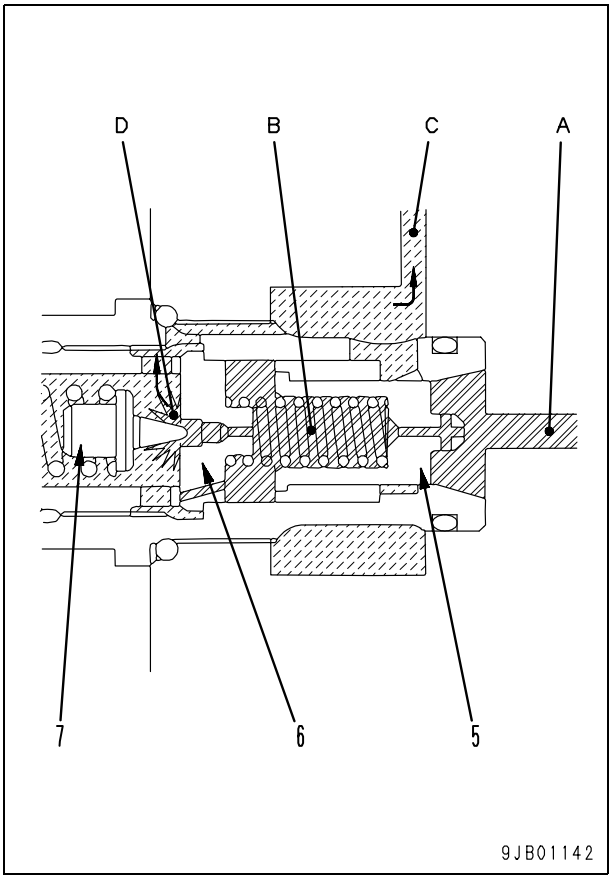
No.	Check item	Criteria		Remedy
1	Distance between HST pump installation surface and boss tip	Standard size	Repair limit	Adjust
		75.1	±0.8	
2	Wear on internal teeth of coupling (resin)	Repair limit: 1.0		Replace

3. Coupling
4. Boss
5. HST pump input shaft
6. Cover
7. Flywheel

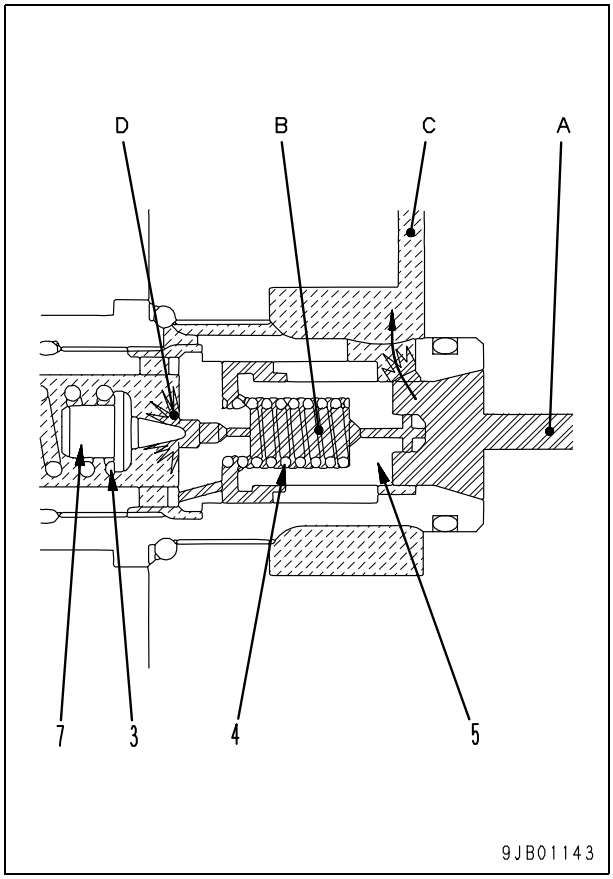
Outline

- The damper protects the drive systems on and after the engine from torsional vibrations by reducing the torsional vibrations of the engine due to the fluctuations in torque.
- The power from the engine is transmitted to coupling (3) through flywheel (7), absorbing torsional vibrations on coupling (3). Then it is transmitted to HST pump through boss (4).

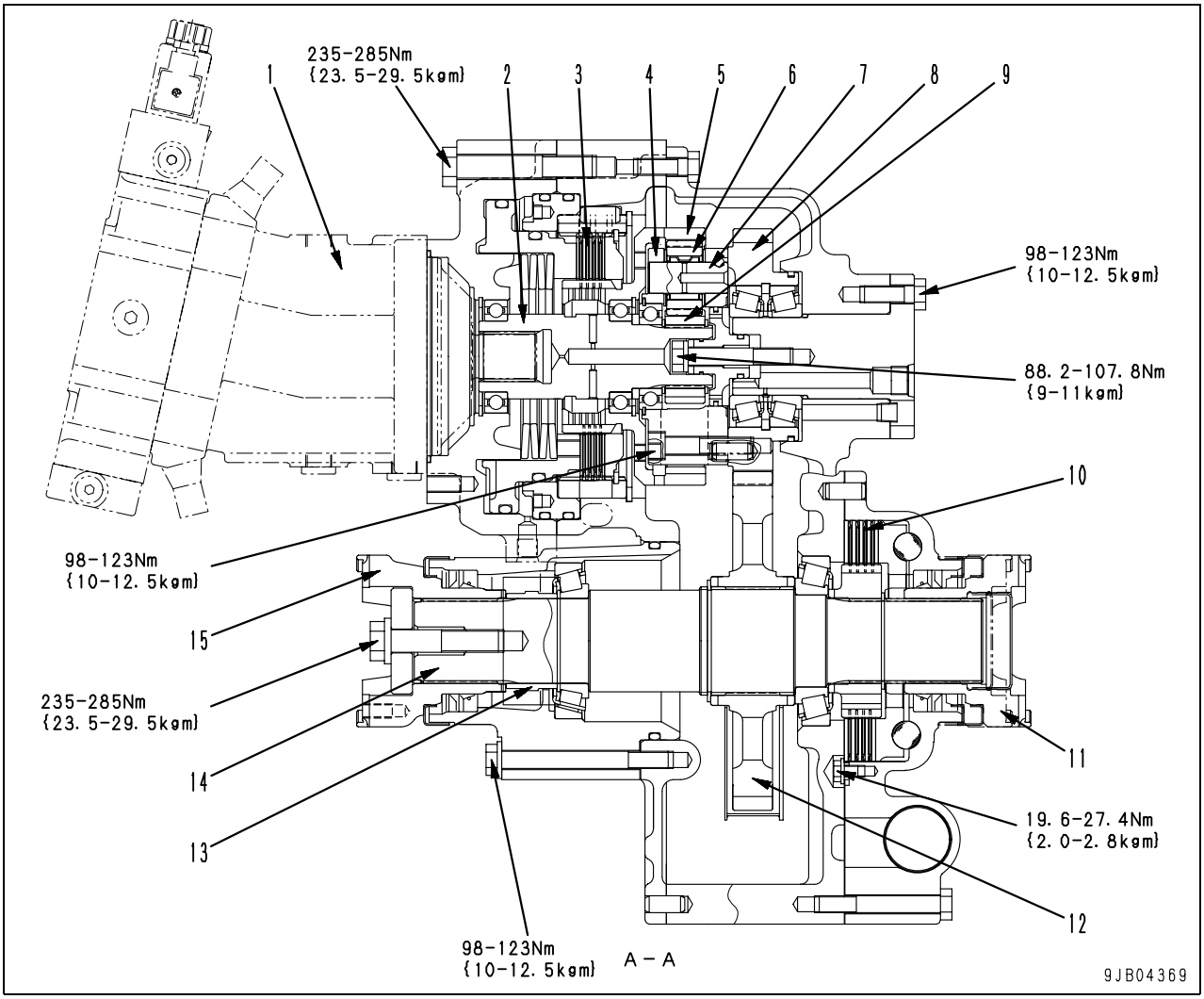
Operation



- Port (A) is connected to the high pressure circuit side of the HST pump, and ports (C) and (D) are connected to the low pressure circuit side of the pump.
- Oil fills up chamber (B) after flowing through the orifice of main piston (5).
- Pilot poppet (7) is seated on valve seat (6).
- If oil pressure in port (A) and chamber (B) goes beyond the set pressure, pilot poppet (7) is pushed in the left direction. As a result, the oil pressure in chamber (B) is released to port (C) through chamber (D) and the oil pressure in chamber (B) is decreased.

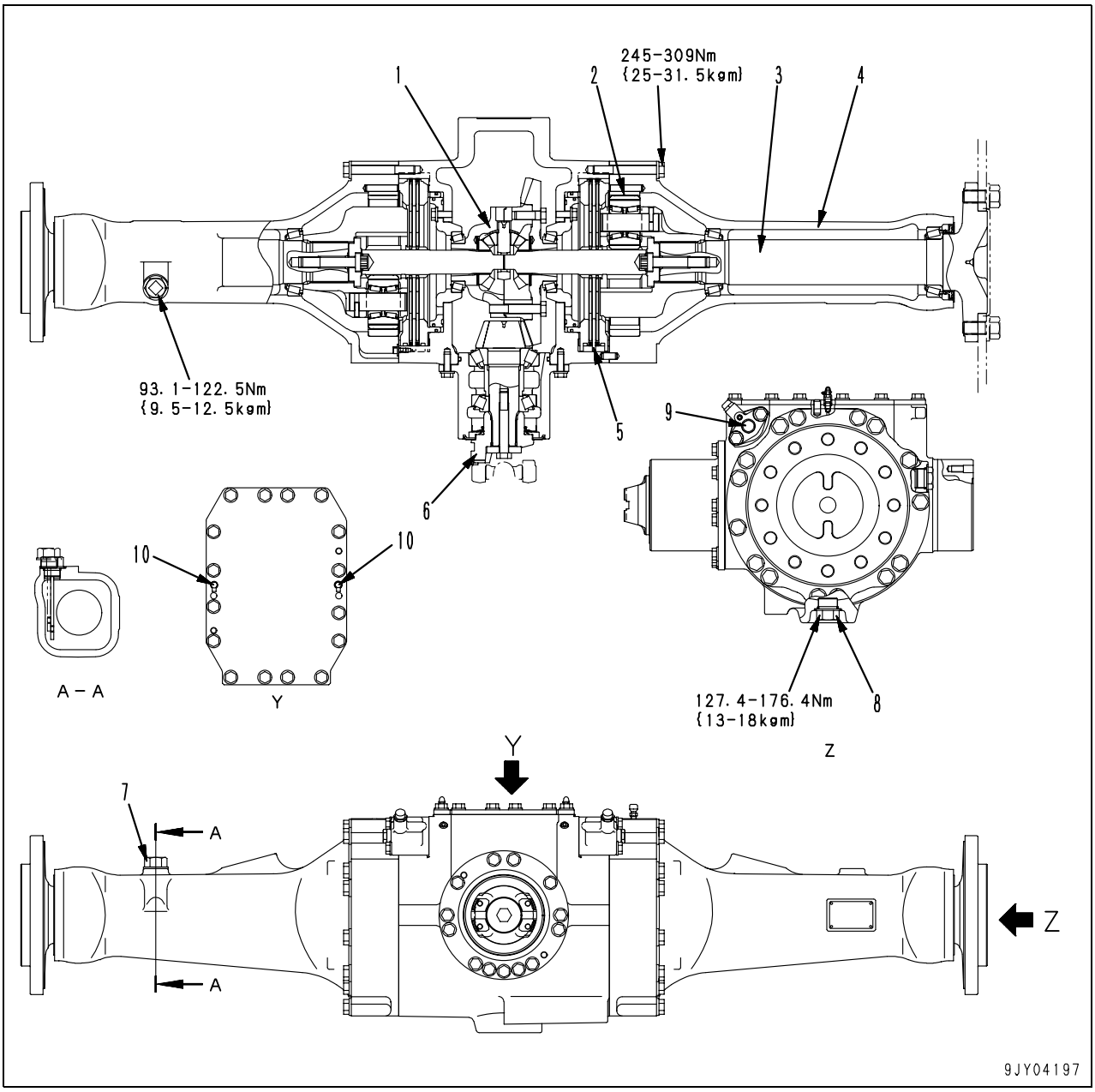


- As the oil pressure in chamber (B) goes lower, the orifice of main piston (5) is activated and differential pressure is generated in port (A) and chamber (B).
- The oil pressure in port (A) pushes main piston (5) in the left direction, relieving the abnormal pressure generated in port (A) to port (C).
- As the oil pressure in port (A) goes lower than that in port (C), check spring (4) pushes back main piston (5) in the right direction.
- The oil in port (C) is conducted to port (A) through chamber (D) so that the oil level in port (A) may not go low.
- Increasing or decreasing the repulsive force of poppet spring (3) allows adjusting the set pressure.
- When increasing the set pressure, remove the nut to loosen the locknut and screw the adjustment screw. When decreasing, loosen the adjustment screw.



1. HST motor 1
2. Input shaft
3. Transfer clutch
4. Carrier
5. Ring gear (number of teeth: 80)
6. Planetary pinion (number of teeth: 24)
7. Planetary shaft
8. Motor 1 gear (number of teeth: 44)
9. Sun gear (number of teeth: 28)
10. Parking brake
11. Rear coupling
12. Output gear (number of teeth: 58)
13. Spacer
14. Output shaft
15. Front coupling

Rear axle



1. Differential
2. Final drive
3. Axle shaft
4. Axle housing
5. Wet multiple disc type brake
6. Coupling
7. Oil filler port and level plug
8. Drain plug
9. Brake oil port
10. Air bleeder

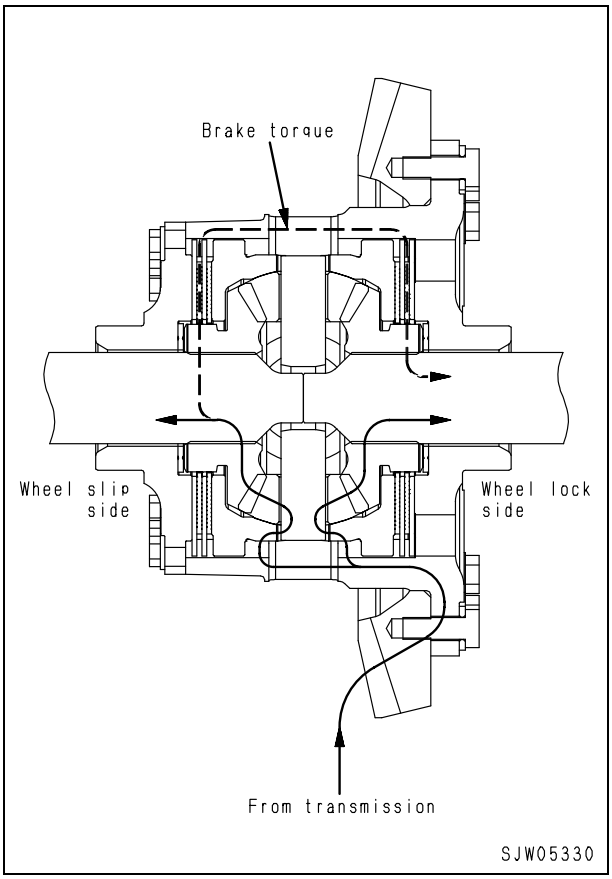
When the drive forces of the right and left wheels are unbalanced

[When the road conditions (coefficient of friction) under both wheels and the wheel loads are uneven, and either wheel slips more easily]

Example 1. When either wheel is on soft ground in digging work

Example 2. When either wheel is on snow and the other one is on asphalt in snow removing work

Example 3. When the right and left wheel loads are unbalanced in travel on a slope



- The power from the transmission is evenly divided between the right and left by the differential gear. If, however, the divided drive force exceeds the wheel slip limit of the slip side, surplus of the driving force is transmitted to the opposite side (lock side) brake through the brake and case on the gear back side. Then the power is distributed to the lock side wheel.
- The differential starts working only as the surplus portion of the drive force has exceeded the braking force.

Difference in wheel drive force by type of differentials when either wheel slipped

	Wheel drive force (drive force of slipping wheel is 1)		
	Slipping wheel	Locked wheel	Total (ratio)
Limited slip differential (if equipped)	1	2.64	3.64 (1.53)
Torque proportioning differential (standard)	1	1.38	2.38 (1)
Conventional differential	1	1	2 (0.84)

Torque proportioning differential

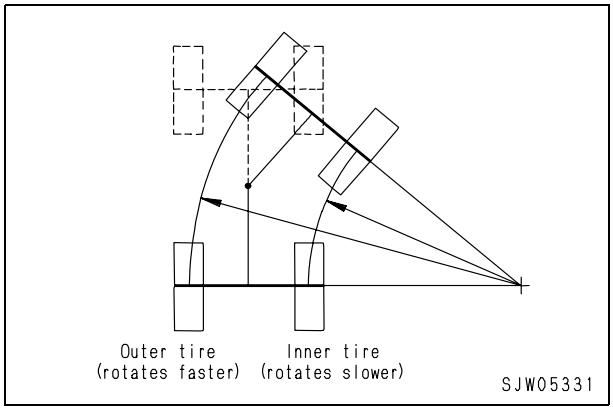
- On a road where either wheel slips easily, the drive force of the limited slip differential increases to 1.53 times of the torque proportioning differential.

Conventional differential

(this is not applied with this machine.)

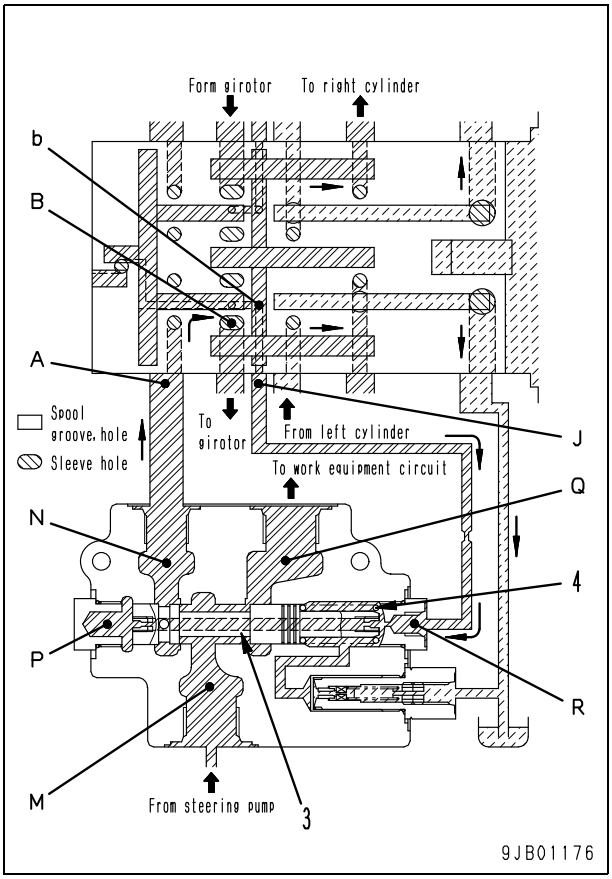
- On a road where either wheel slips easily, the drive force of the limited slip differential increases to 1.82 times of the conventional differential.

While machine is turning



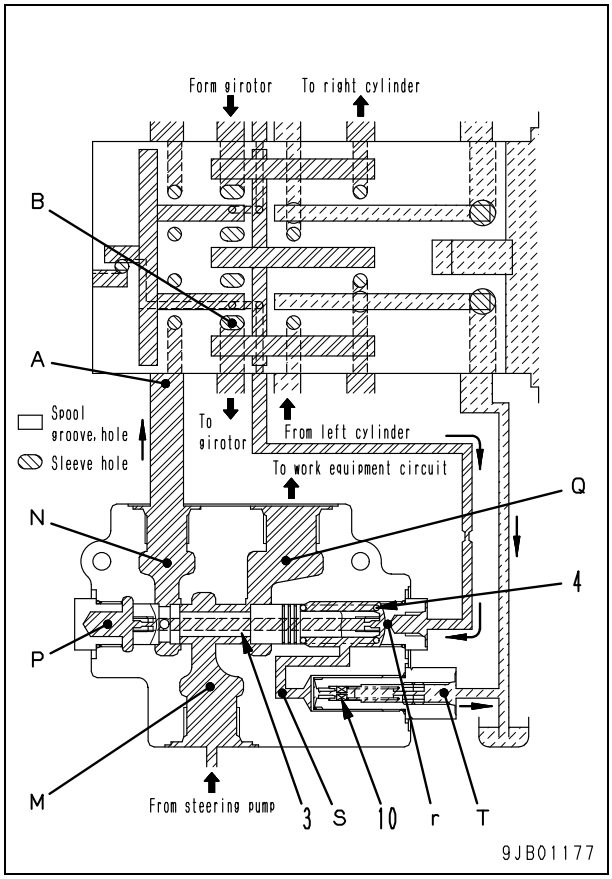
- The same gears as that for the conventional differential are employed for the limited slip differential. Thus, they allow to smoothly generate a difference in rotation speed between the outer and inner wheels that is necessary for tuning.

When steering wheel is "turned left"



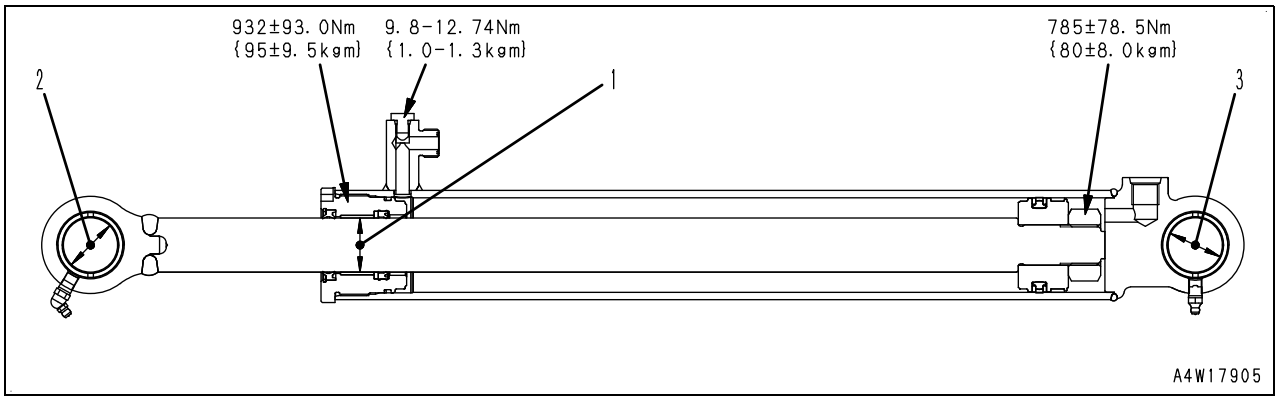
- Turning the steering wheel left changes the angle between the sleeve and spool on the Orbit-roll valve, switching flow of the oil. (see "Orbit-roll valve".)
- Part of the oil from the pump that has flown to port (A) is then conducted to the R.H. steering cylinder through port (B) and Gerotor, and the remaining portion of the oil flows to chamber (R) through orifice (b) and port (J).
- Change in the angle between the sleeve and spool on the Orbit-roll valve generates a difference pressure between the oil pressure up to port (A) and that after port (B).
- Spool (3) stabilizes at a position where the difference pressure between that of up to port (A) and after port (B) [chamber (P) pressure - chamber (R) pressure] is balanced with the repulsive force of spring (4).
- The ratio of diversion is determined by the displacement in angle between the spool and sleeve on the Orbit-roll valve, namely the opening ratio of port (A) and port (B). And changing the operating distance of the steering wheel enables its stepless adjustment.

When steering cylinder is at stroke end



- Trying to continuously turn the steering wheel after the steering cylinder has reached the stroke end increases oil pressure in port (S).
- As the oil pressure in port (S) goes beyond the set pressure of relief valve (10), the relief valve (10) releases the oil pressure in port (S) to the hydraulic tank through port (T).
- It generates differential pressure before and after orifice (r), breaking down the balance between the difference pressure up to port (A) and after port (B) and the repulsive force of spring (4). As a result, oil pressure up to port (A) becomes relatively higher.
- As port (A) oil pressure is increased, oil in chamber (P) pushes spool (3) in the right direction by compressing spring (4).
- Port (M) and port (N) are almost closed, and port (M) and port (N) are nearly fully opened to stabilize spool (3).

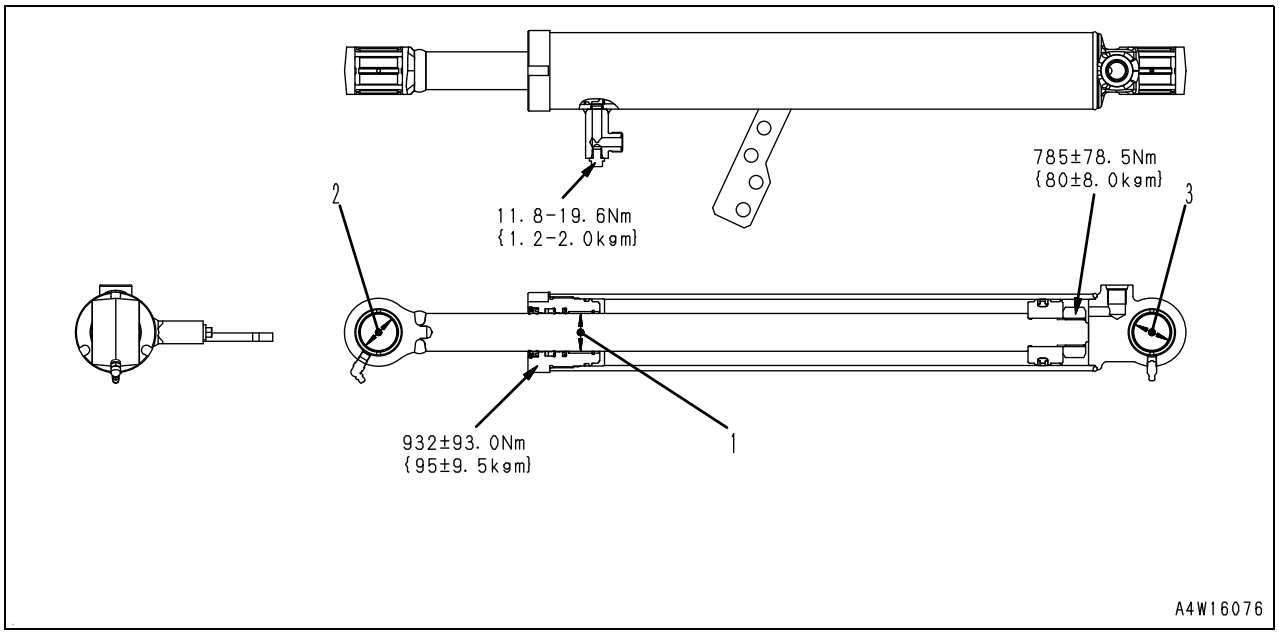
Serial number: 70001 - 73439



Unit: mm

No.	Check item	Criteria					Remedy
		Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
1	Clearance between piston rod and bushing	40	–0.025 –0.064	+0.167 +0.080	0.080 – 0.167	0.496	Replace pin and bushing
2	Clearance between piston rod supporting shaft and bushing	40	0 –0.025	+0.167 +0.080	0.080 – 0.167	1.0	
3	Clearance between cylinder bottom supporting shaft and bushing	40	0 –0.025	+0.180 +0.042	0.042 – 0.205	1.0	

Serial number: 73440 and up



Unit: mm

No.	Check item	Criteria					Remedy
		Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
1	Clearance between piston rod and bushing	40	–0.025 –0.064	+0.121 +0.005	0.030 – 0.167	0.485	Replace pin and bushing
2	Clearance between piston rod supporting shaft and bushing	40	0 –0.025	+0.142 +0.080	0.080 – 0.167	1.0	
3	Clearance between cylinder bottom supporting shaft and bushing	40	0 –0.025	+0.142 +0.080	0.080 – 0.167	1.0	

P: From brake and cooling fan pump
T: To hydraulic tank
A: To cooling fan motor
ACC1: To accumulator (rear side)
ACC2: To accumulator (front side)
S: Brake operation sensor port
G: Gauge port

1. Valve body
2. Inverse shuttle valve
3. Plunger
4. Unload relief valve
5. Unload valve
6. Relief valve

Unit: mm

No.	Check item	Criteria					Remedy
7	Clearance between inverse shuttle valve and body	Standard size	Tolerance		Standard clearance	Clearance limit	Replace
			Shaft	Hole			
		12	–0.006 –0.014	+0.011 0	0.006 – 0.025	0.029	
8	Clearance between plunger and body	8	–0.005 –0.012	+0.009 0	0.005 – 0.021	0.024	
9	Clearance between unload valve and body	18	–0.006 –0.017	+0.011 0	0.006 – 0.028	0.032	
10	Inverse shuttle valve return spring	Standard size			Repair limit		
		Free length	Installed length	Installed load	Free length	Installed load	
		21.6	18.3	9.8 N {1.0 kg}	—	8.3 N {0.85 kg}	
11	Unload relief valve return spring (inside)	35.9	30.0	188 N {19.2 kg}	—	160 N {16.3 kg}	
12	Unload relief valve return spring (outside)	39.8	27.5	137 N {14.0 kg}	—	116 N {11.8 kg}	
13	Unload valve return spring	51.6	45.0	49 N {5.0 kg}	—	42 N {4.3 kg}	
14	Check valve return spring	11.5	9.0	4.9 N {0.5 kg}	—	4.2 N {0.43 kg}	

Function

- The charge valve maintains the oil pressure from the pump to the set pressure and accumulates it in the accumulator.
- If the oil pressure from the pump goes beyond the relief valve set pressure, this valve releases the oil pressure to the drain circuit in order to reduce the load to the pump.

Unit: mm

No.	Check item	Criteria			Remedy
10	Thickness of plate	Standard size	Tolerance	Repair limit	Replace
		6	±0.1	5.5	
11	Thickness of brake disc	6.5	±0.15	5.7	
	Depth of lining groove	0.8 (min.)	—	0.4	
	Thickness of lining	1.0	0.8 (min.)	—	
12	Wear of disc contact surface of brake outer ring	Standard size	Tolerance	Wear limit	
		19.0	±0.1	18.7	
13	Load of spring (when 2 pieces are piled)	Standard size		Repair limit	
		Installed height	Installed load	Installed load	
		6.5	2,253 N {230 kg}	1,800 N {184 kg}	

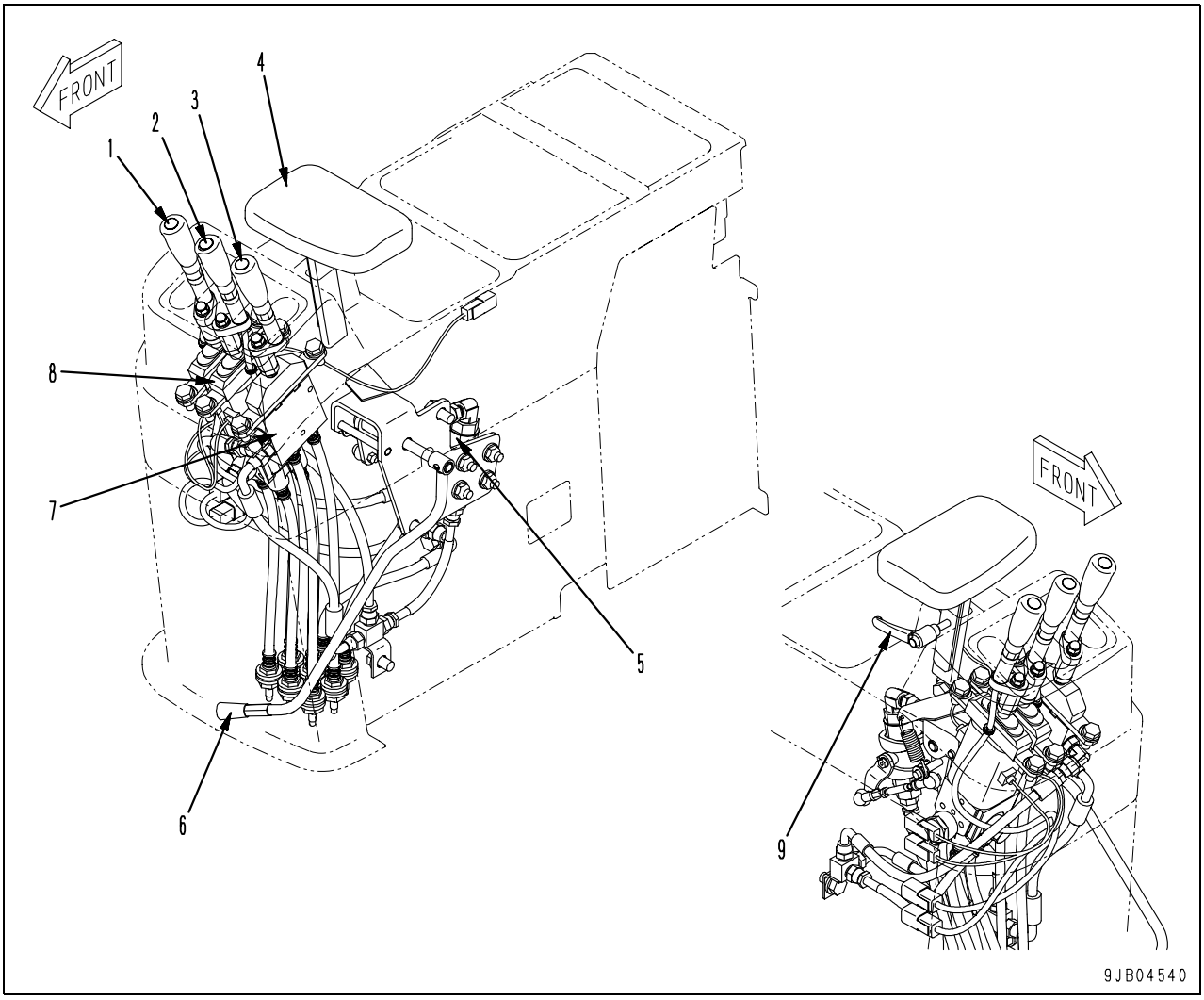
Outline

- The front brake is a wet multiple disc type brake, which consists of piston (3), inner ring (5), disc (9), outer ring (8), and spring (4).
- The brake cylinder consists of differential housing (1) and bearing carrier (2). And piston (3) is assembled to them.
  Inner ring (5) and outer ring (8) are coupled with the spline of differential housing (1).
- Disc (9) has linings stuck to its both sides and is installed between inner ring (5) and outer ring (8), and they are coupled together by the spline of sun gear shaft (6).

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
1	Clearance between upper hinge pin and rear frame (Small)	50	–0.038 –0.068	+0.100 0	0.038 – 0.168	—	Replace
2	Clearance between upper hinge pin and spacer	50	–0.038 –0.068	+0.25 0	0.038 – 0.318	—	
3	Clearance between upper hinge pin and bearing	50	–0.038 –0.068	0 –0.012	0.026 – 0.068	—	
4	Clearance between upper hinge pin and rear frame (Large)	66	–0.073 –0.103	±0.05	0.023 – 0.153	—	
5	Clearance between front frame and spacer	105	–0.08 –0.68	–0.02 –0.12	–0.04 – 0.66	—	
6	Clearance between front frame and upper hinge bearing	105	0 –0.015	–0.02 –0.12	–0.120 – –0.005	—	
7	Clearance of press fitting part of upper hinge pin seal	89	+0.07 –0.02	–0.05 –0.15	–0.220 – –0.030	—	
8	Clearance between lower hinge pin and rear frame bushing	70	–0.20 –0.21	+0.083 +0.123	0.077 – 0.127	—	
9	Clearance between lower hinge pin and bearing	70	–0.20 –0.21	–0.097 –0.122	0.078 – 0.113	—	
10	Clearance between front frame and lower hinge bearing	89	–0.1 –0.12	–0.05 –0.15	–0.05 – 0.07	—	
11	Clearance between rear frame and bushing	80	+0.084 +0.059	+0.054 0	–0.084 – –0.005	—	
12	Height of upper hinge spacer	Standard size		Tolerance		Repair limit	
		23		±0.1		—	
13	Standard thickness of shim between upper hinge and retainer	1.3					Adjust
14	Standard thickness of shim between upper hinge and retainer	0.8					
15	Tightening torque of upper hinge retainer mounting bolt	3.92 – 5.88 Nm {0.4 – 0.6 kgm} (when shim is adjusted)					
		59 – 74 Nm {6.0 – 7.5 kgm} (final value)					

WA200PZ-6
2-lever type
(if equipped)



1. Lift arm control lever
2. Bucket control lever
3. Auxiliary control lever
4. Wrist rest
5. Lock valve
6. Work equipment lock lever
7. Attachment PPC valve
8. Work equipment PPC valve
9. Wrist rest height adjustment lever

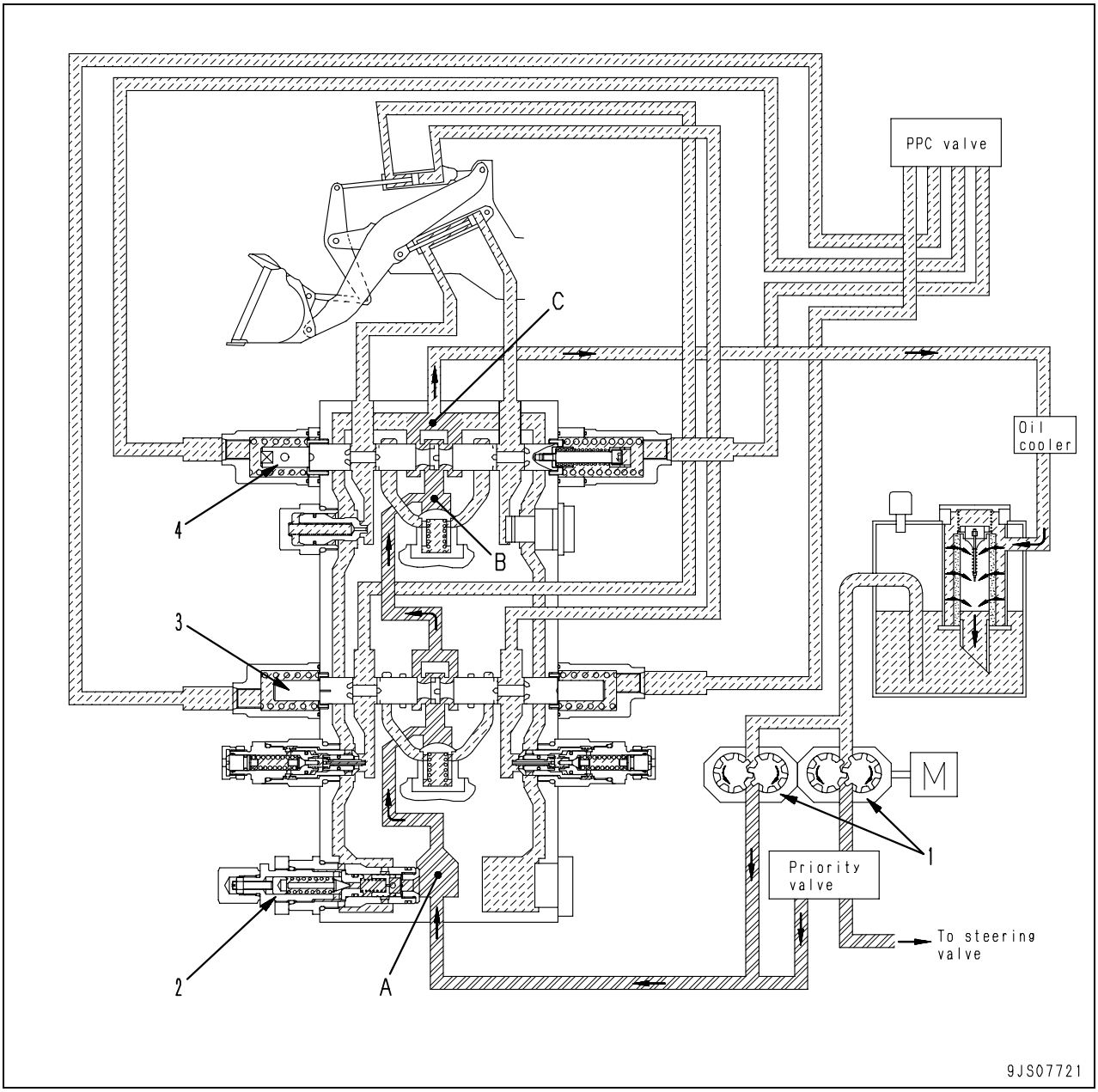
1. Main relief valve
2. Service spool
3. Bucket spool
4. Lift arm spool
5. Suction safety valve
6. Check valve
7. Suction valve

Unit: mm

No.	Item	Criteria					Remedy
		Standard size			Repair limit		
8	Spool return spring	Free length x Outside diameter	Installed length	Installed load	Free length	Installed load	If damaged or deformed, replace spring
		42.53 x 27.5	41	92.2 N {9.4 kg}	—	73.7 N {7.52 kg}	
9	Spool return spring	58.87 x 26.3	57.3	55.9 N {5.7 kg}	—	44.7 N {4.56 kg}	
10	Spool return spring	53.35 x 12	38.5	111 N {11.3 kg}	—	88.7 N {9.04 kg}	
11	Spool return spring	42 x 27.5	41	72.6 N {7.4 kg}	—	58.1 N {5.92 kg}	
12	Check valve spring	39.5 x 11.2	25	29.4 N {3 kg}	—	23.5 N {2.4 kg}	

Operation of work equipment control valve

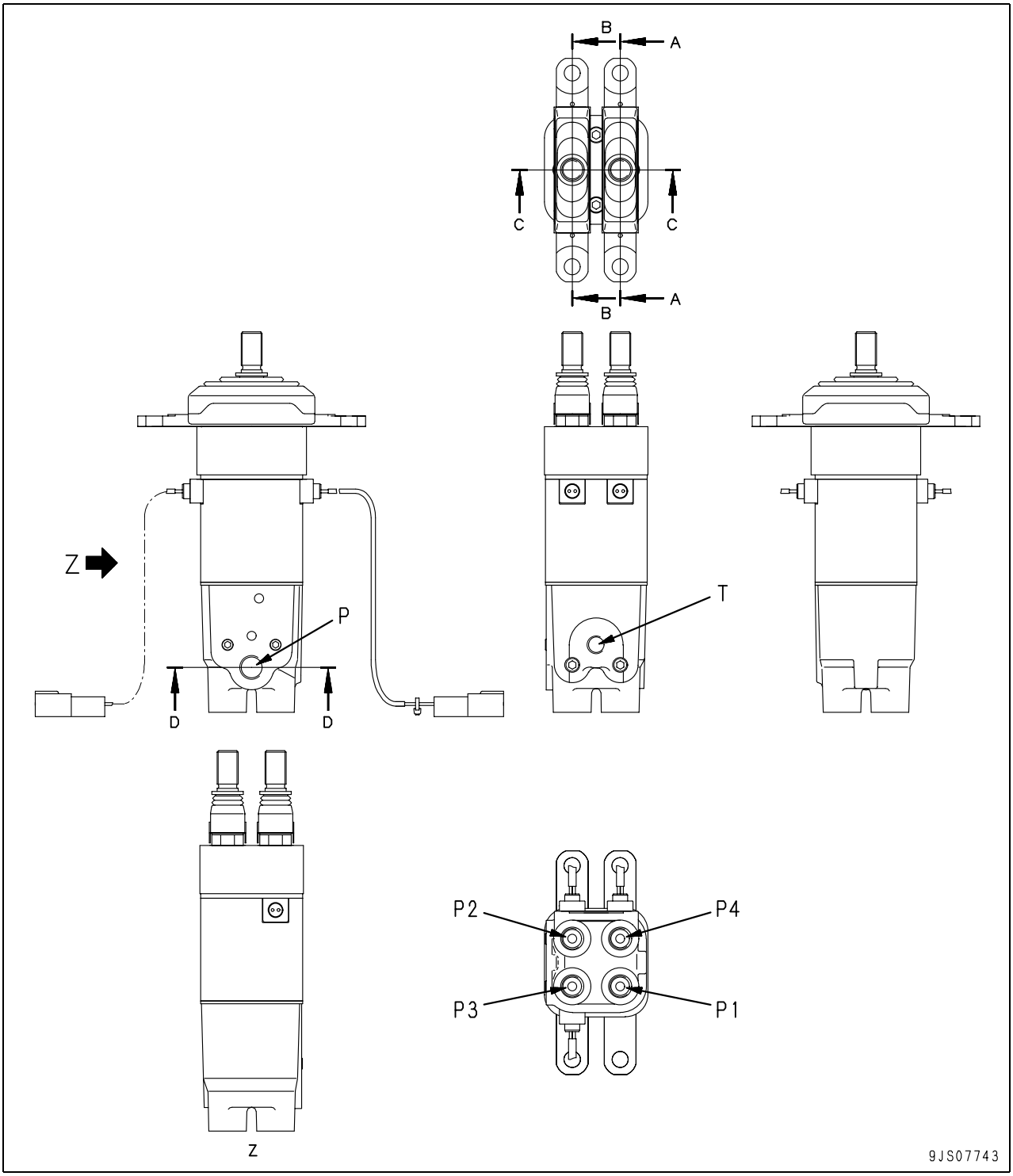
1. When lift arm and bucket spool are at the neutral position



Operation

- The pressurized oil flows to port (A) through pump (1) and the priority valve. And the maximum pressure is regulated by relief valve (2).
- The bypass circuit is open since bucket spool (3) is at the neutral position. Thus, the pressurized oil in port (A) flows to port (B) passing through in vicinity of the spool.
- The bypass circuit is open since lift arm spool (4) is at the neutral position. Thus, the pressurized oil in port (B) enters port (C) of the drain circuit passing through in vicinity of the spool, and returns to the hydraulic tank through the filter.

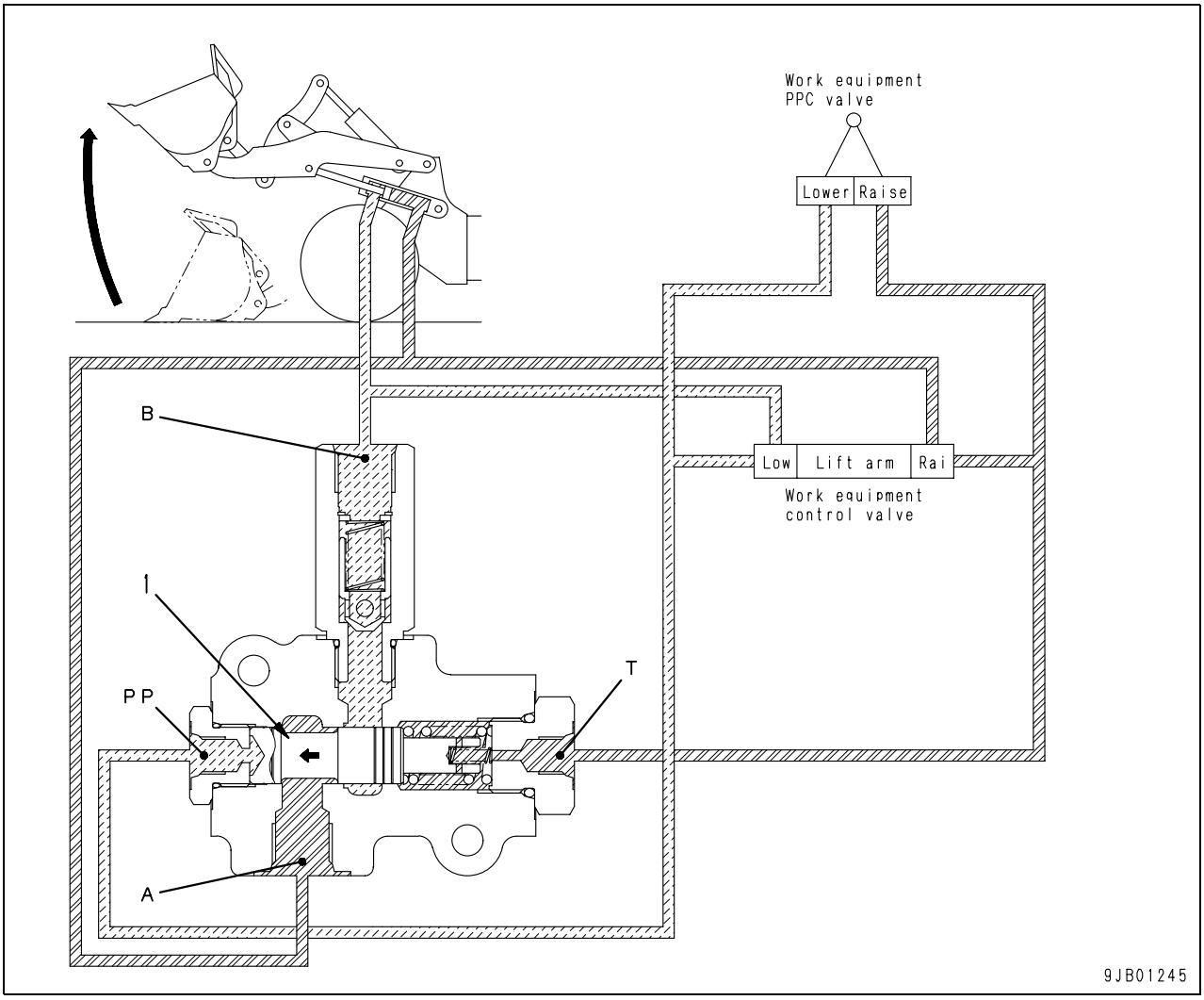
2-lever type



P: From HST charge pump
P1: To bucket tilt valve
P2: To lift arm LOWER (FLOAT) valve
P3: To lift arm RAISE valve
P4: To bucket DUMP valve
T: To hydraulic tank

Operation

When lift arm is "RAISE" operation



- If the lift arm is "RAISE" operation, the oil of the work equipment PPC valve operates the work equipment control valve and the oil from the work equipment pump flows to the lift cylinder bottom side.
- At this time, the oil of the work equipment PPC valve flows to port (T) to push spool (1) to the left and closes ports (A) and (B).
- The oil on the lift cylinder head side flows through the work equipment control valve into the hydraulic tank, thus the lift arm rises.

1. Bucket
2. Bell crank
3. Bucket cylinder
4. Lift cylinder
5. Lift arm
6. Bucket link
7. Quick coupler

Unit: mm

No.	Check item	Criteria					Remedy
8	Clearance between bushing and pin at each end of bucket link	Standard size	Tolerance		Standard clearance	Clearance limit	Replace (Replace pin when it has scuff marks, too.)
			Shaft	Hole			
		70	–0.030 –0.076	+0.174 +0.100	0.130 – 0.250	1.0	
9	Clearance between bushing and pin connecting lift arm and quick coupler	70	–0.030 –0.076	+0.174 +0.100	0.130 – 0.250	1.0	
10	Clearance between bushing and pin connecting lift arm and frame	75	–0.030 –0.076	+0.174 +0.100	0.130 – 0.250	1.0	
11	Clearance between bushing and pin connecting bucket cylinder bottom and frame	85	–0.036 –0.090	+0.207 +0.120	0.156 – 0.297	1.0	
12	Clearance between bushing and pin connecting bucket cylinder rod and bell crank	85	–0.036 –0.090	+0.207 +0.120	0.156 – 0.297	1.0	
13	Clearance between bushing and pin connecting bell crank and lift arm	85	–0.036 –0.090	+0.207 +0.120	0.156 – 0.297	1.0	
14	Clearance between bushing and pin connecting lift cylinder rod and lift arm	65	–0.030 –0.076	+0.174 +0.100	0.130 – 0.250	1.0	
15	Clearance between bushing and pin connecting lift cylinder bottom and frame	65	–0.030 –0.076	+0.174 +0.100	0.130 – 0.250	1.0	
16	Connecting part of bucket cylinder and frame	Width of boss		Width of hinge		Standard clearance	Adjust shim so that clearance will be below 1.5 mm on each side
		Standard size	Tolerance	Standard size	Tolerance		
		90	0 –0.5	93	±1.5	1.5 – 5.0	
17	Connecting part of lift arm and frame	85	—	89	±1.5	2.5 – 5.5	
18	Connecting part of lift arm and quick coupler	100	—	103	+1.5 0	3.0 – 4.5	
19	Connecting part of bucket link and quick coupler	98	±1.0	103	+1.5 0	4.0 – 7.5	
20	Connecting part of lift cylinder and frame	85	0 –0.5	89	±1.5	2.5 – 6.0	
21	Connecting part of bell crank and bucket link	98	±1.0	101	±1.5	0.5 – 5.5	
22	Connecting part of bell crank and lift arm	167	—	170	±0.5	2.5 – 3.5	Replace
23	Connecting part of bucket cylinder and bell crank	90	0 –0.5	101	±1.5	9.5 – 13.0	Adjust shim so that clearance will be below 1.5 mm on each side
24	Connecting part of lift arm and lift cylinder	86	—	89	±1.5	1.5 – 4.5	

Outline

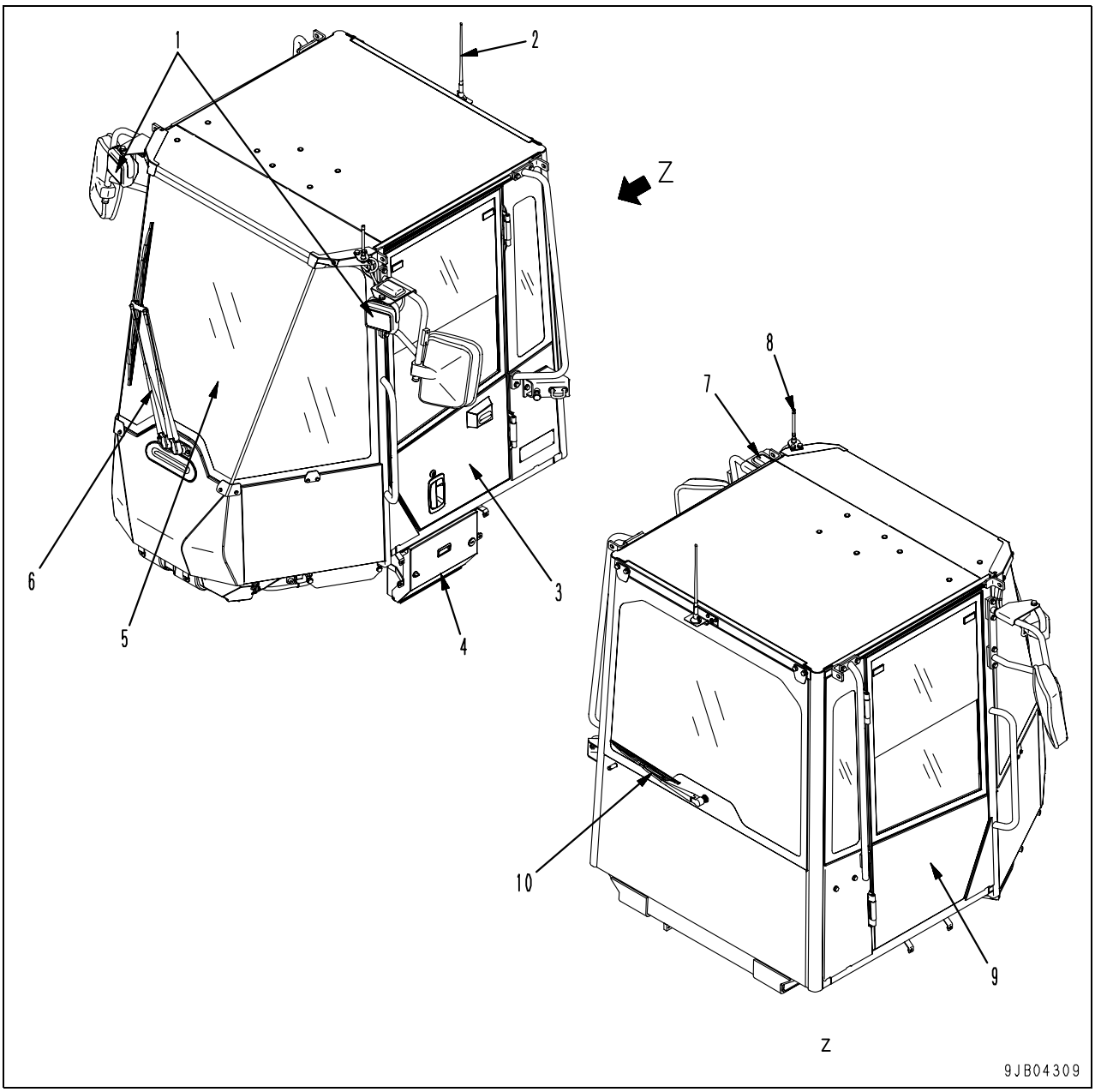
Bucket positioner or fork positioner

- The bucket positioner is driven electrically. When the bucket or fork is returned to an angle from the dump position to the tilt position, the bucket positioner returns the work equipment (bucket or fork) control lever from the "tilt" position to the "hold" position to automatically stop the bucket or fork at a proper digging angle or lift angle.
- Bar (4) is fixed to the rod side of bucket cylinder (5). And proximity switches (1) and (2) are fixed to the cylinder side.
- Moving the work equipment (bucket or fork) control lever from "dump" position to "tilt" position moves the rod of bucket cylinder (5) toward the machine front side.
  As bar (4) moves a specific distance, proximity switches (1) and (2) detect that it is away from the sensing face, and return the work equipment (bucket or fork) control lever to "hold" position.
- While the attachment selector switch of the right-hand console is in the "BUCKET" position, proximity switch (2) operates. While the former is in the "FORK" position, proximity switch (1) operates.

Boom kick-out

- The boom kick-out is driven electrically. As the lift arm is raised to an angle before reaching the maximum height, the boom kick-out returns the work equipment (lift arm) control lever from the "raise" position to the "hold" position to stop the lift arm automatically at a desired height.
- Plate (7) is fixed to lift arm (6). And proximity switch (3) is fixed to the front frame.
- Moving the work equipment (lift arm) control lever from "lower" position to "raise" position moves lift arm (6) upward.
  As plate (7) moves a specific distance, proximity switch (3) detects that it is away form the sensing face, and returns the work equipment (lift arm) control lever to "hold" position.

Cab



1. Front working lamp
2. Radio antenna
3. Door (left)
4. Air conditioner external air filter
5. Front glass
6. Front wiper
7. KOMTRAX GPS antenna
8. KOMTRAX communication antenna
9. Door (right)
10. Rear wiper

Outline

- CPU (central processing unit) installed on the panel processes input signals from respective sensors and operation signals of the panel switches to display and output them.
- The self-diagnosis function of CPU makes the troubleshooting easier.

Input and output signals

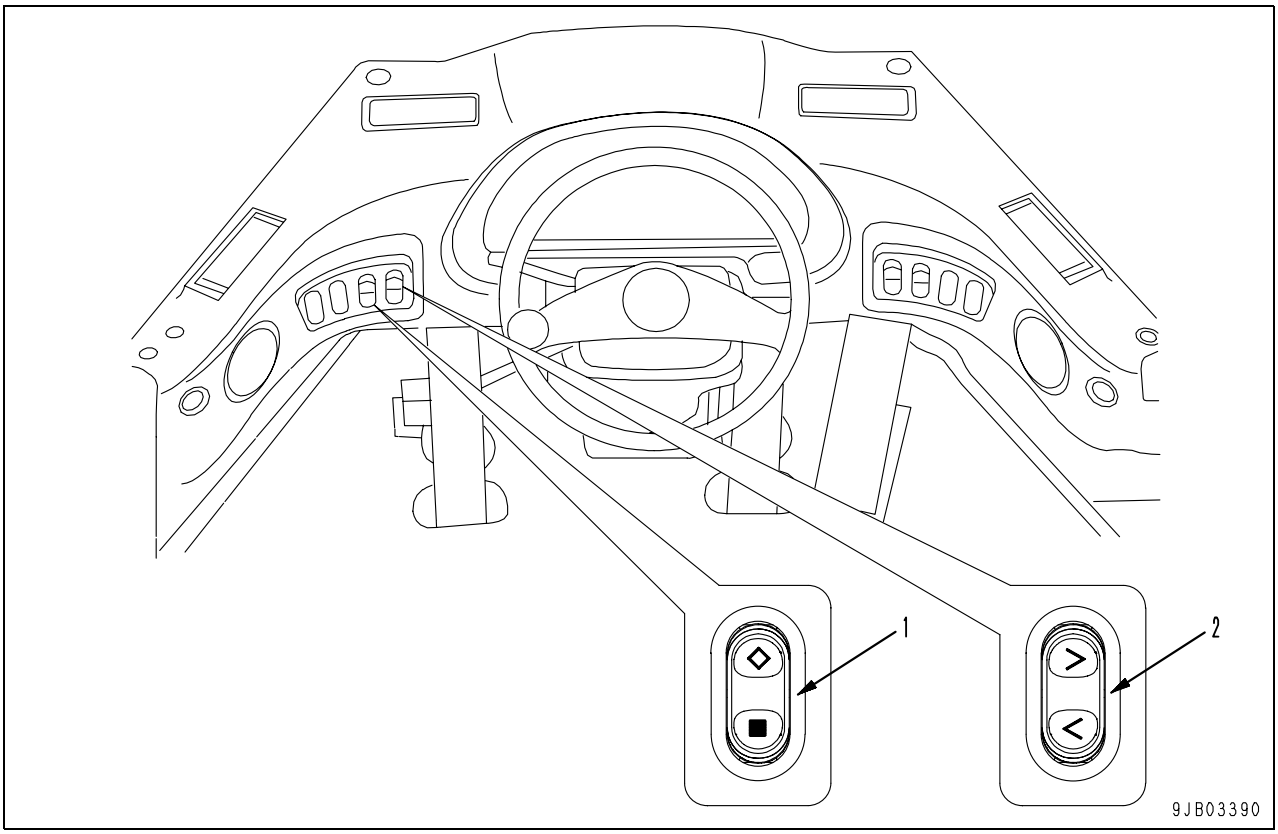
JAE IL-AG5-14P [CN-C48]

Pin No.	Signal name	Input and output signals
1	GND	—
2	Sensor ground	—
3	Internal/external air changeover damper actuator limiter	Input
4	External air temperature sensor	Input
5	Evaporator temperature sensor	Input
6	Internal air temperature sensor	Input
7	Starting switch (ON)	Input
8	Night lamp signal	Input
9	NC	—
10	NC	—
11	NC	—
12	NC	—
13	Day light sensor 2	Input
14	Day light sensor 1	Output

JAE IL-AG5-22P [CN-C47]

Pin No.	Signal name	Input and output signals
1	NC	—
2	NC	—
3	Blower motor relay	Input
4	Internal/external air changeover damper actuator output 1	Output
5	Internal/external air changeover damper actuator output 2	Output
6	Mode selector actuator output 2	Output
7	Mode selector actuator output 1	Output
8	Air mix damper actuator output 2	Output
9	Air mix damper actuator output 1	Output
10	Actuator potentiometer power supply (5 V)	—
11	NC	—
12	NC	—
13	NC	—
14	NC	—
15	Magnet clutch	Input
16	Air mix damper actuator limiter	Input
17	Mode selector actuator limiter	Input
18	Air mix damper actuator potentiometer	Input
19	Mode selector actuator potentiometer	Input
20	Blower gate	Input
21	Blower feedback	Input
22	Actuator potentiometer ground	—

Machine monitor operation switch



1. Machine monitor mode selector switch 1
2. Machine monitor mode selector switch 2

AMP070-18P(1)[CN-L25]

Pin No.	Specifications	I/O	Group	Form of use	Signal name	Remarks
1	D_IN_0 (24 V, 5 mA)	I	B	D/I (+24 V)	Head lamp	
2	D_IN_2 (24 V, 5 mA)	I	B	D/I (+24 V)	Starting switch C signal	
3	(NC)	—	—	—	—	
4	D_IN_6 (24 V, 5 mA)	I	B	D/I (+24 V)	Quick coupler	If equipped
5	D_IN_8 (24 V, 5 mA)	I	B	D/I (+24 V)	ECSS switch	If equipped
6	(NC)	—	—	—	—	
7	D_IN_12 (NSW24 V, 5 mA)	I	C	D/I (+24 V)	Turn signal lamp, right	
8	D_IN_14 (NSW24 V, 5 mA)	I	C	D/I (+24 V)	◇ switch	
9	GND	O	—	GND	Signal GND	
10	D_IN_1 (24 V, 5 mA)	I	B	D/I (+24 V)	Cooling fan automatic reverse rotation switch (manual)	
11	(NC)	—	—	—	—	
12	(NC)	—	—	—	—	
13	(NC)	—	—	—	—	
14	D_IN_9 (24 V, 5 mA)	I	B	D/I (+24 V)	Cooling fan automatic reverse rotation switch (automatic)	
15	(NC)	—	—	—	—	
16	D_IN_13 (NSW24 V, 5 mA)	I	C	D/I (+24 V)	Turn signal lamp, left	
17	D_IN_15 (NSW24 V, 5 mA)	I	C	D/I (+24 V)	■ switch	
18	A_IN_0 (0 – 30 V)	I	H	A/I	Alternator L signal	

AMP070-12P(1)[CN-L26]

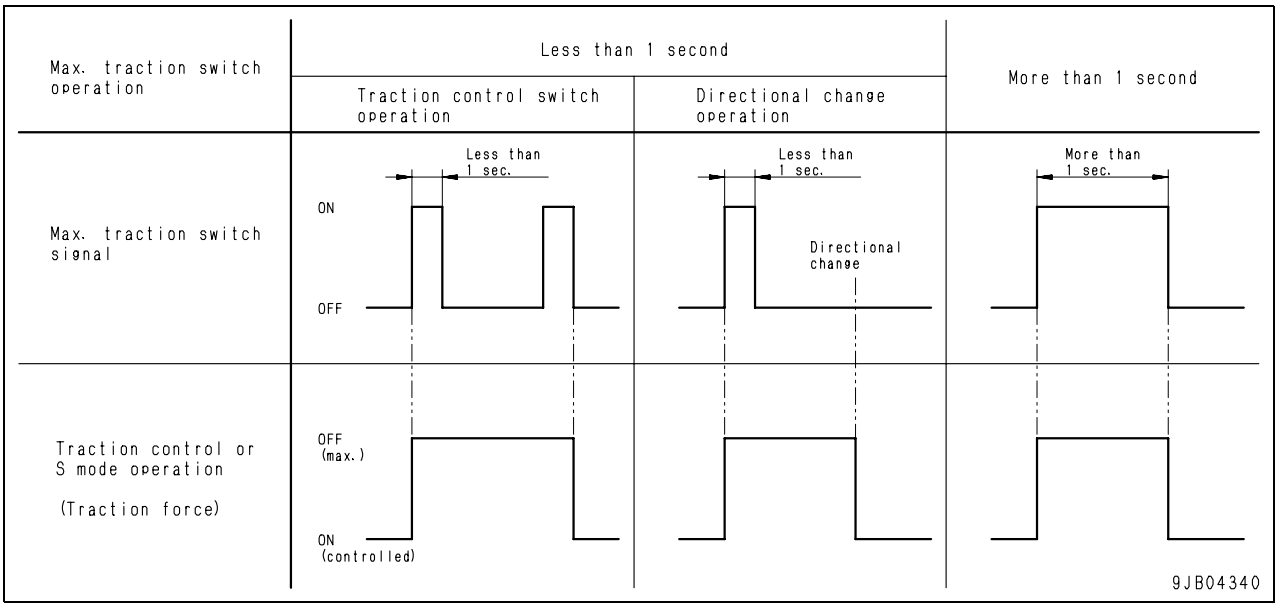
Pin No.	Specifications	I/O	Group	Form of use	Signal name	Remarks
1	D_IN_16 (24 V/GND, 5 mA)	I	D	D/I (GND)	Brake oil pressure	
2	(NC)	—	—	—	—	
3	D_IN_20 (24 V/GND, 5 mA)	I	D	D/I (GND)	(air cleaner clogging)	
4	D_IN_22 (24 V/GND, 5 mA)	I	D	D/I (GND)	Traction control switch (S mode)	
5	D_IN_24 (24 V/GND, 5 mA)	I	E	D/I (GND)	HST oil filter clogging	
6	GND	O	—	GND	Sensor ground	
7	D_IN_17 (24 V/GND, 5 mA)	I	D	D/I (GND)	ECSS cut off switch	If equipped
8	D_IN_19 (24 V/GND, 5 mA)	I	D	D/I (GND)	(service mode 2 and 3)	
9	D_IN_21 (24 V/GND, 5 mA)	I	D	D/I (GND)	ECSS cut off switch dummy	If equipped
10	(NC)	—	—	—	—	
11	D_IN_25 (24 V/GND, 5 mA)	I	E	D/I (GND)	(optional switch)	
12	A_IN_1 (0 – 30 V)	I	H	A/I	Clearance lamp and tail lamp	

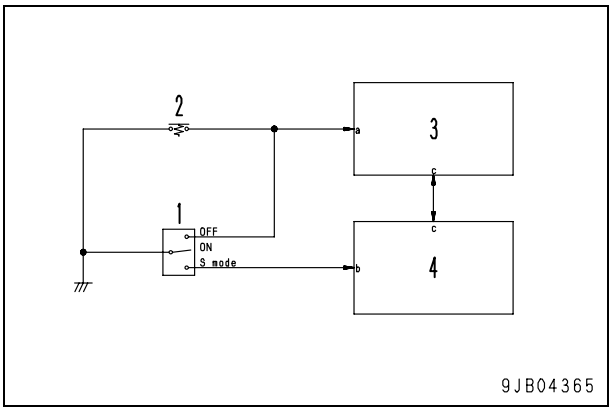
Max. traction function

- Pressing the max. traction switch while the traction control is "ON" or the S mode is selected cancels the traction control or the S mode temporarily to increase the maximum drawbar pull.
- If the directional lever or directional selector switch is operated, or the max. traction switch is pressed again while the traction control or S mode is cancelled from the max. traction switch, the traction "ON" state or S mode is restored.
- As long as the traction control or S mode is cancelled from the max. traction switch, the traction control operation pilot lamp or S mode operation pilot lamp of the machine monitor remains turned off.

★ Holding down the max. traction switch for a second or longer cancels the traction control or S mode as long as it is held down. The traction control or S mode is restored at the moment the switch is released.

★ If the traction control is sequentially turned "ON" and "OFF" in less than a second, the traction control or S mode is cancelled temporarily just like the max. traction switch is held down for less than a second.





1. Traction control switch
2. Max. traction switch
3. HST controller
4. Machine monitor

a. Traction control switch signal
b. S mode signal
c. CAN signal

When the parking brake lever is set to "Lock" position

- Pulling the parking brake lever fully opens both the intermediate switch (1) and bottom switch (2).
- The parking brake pilot lamp comes on only when the starting switch is "ON".
- The parking brake reminder caution lamp goes off independent of the given state.
- As bottom switch (2) opens, the output to the forward and reverse solenoid valves of HST pump is stopped to prevent dragging of the parking brake. And, at the same time, the directional lever and the directional selector switch are disabled to turn on the machine travel in both the forward and reverse direction.
- The parking brake is activated.

WHEEL LOADER

WA200-6
WA200PZ-6

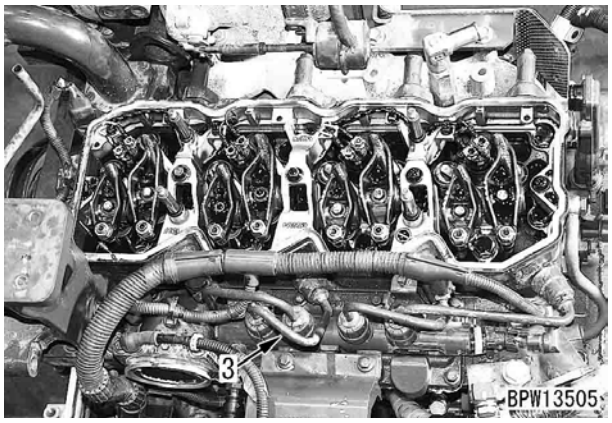
Machine model	Serial number
WA200-6	70001 and up
WA200PZ-6	70001 and up

20 Standard value table
100 Standard service value table

Testing and adjusting item	Symbol		Part No.	Part Name	Q'ty	Remarks
Testing clutch control pressure	M	1	799-101-5002	Analog hydraulic tester	1	Pressure gauge: 2.5, 6, 40, 60 MPa {25, 60, 400, 600 kg/cm²}
			790-261-1204	Digital hydraulic tester	1	Pressure gauge: 60 MPa {600 kg/cm²}
		2	799-401-3100	Adapter	1	For hose size #02
			02896-11008	O-ring	1	
Testing steering wheel	N		79A-264-0021	Push-pull scale	1	0 – 300 N {0 – 30 kg}
Testing and adjusting steering oil pressure	P		799-101-5002	Analog hydraulic tester	1	Pressure gauge: 2.5, 6, 40, 60 MPa {25, 60, 400, 600 kg/cm²}
			790-261-1204	Digital hydraulic tester	1	Pressure gauge: 60 MPa {600 kg/cm²}
Testing hydraulic fan	Q	1	799-205-1100	Tachometer kit	1	Digital display: 6 – 99999.9 rpm
		2	799-101-5002	Analog hydraulic tester	1	Pressure gauge: 2.5, 6, 40, 60 MPa {25, 60, 400, 600 kg/cm²}
			790-261-1204	Digital hydraulic tester	1	Pressure gauge: 60 MPa {600 kg/cm²}
		3	799-401-3300	Adapter	1	For hose size #04
			02896-11012	O-ring	1	
Testing and adjusting accumulator charge pressure	R		799-101-5002	Analog hydraulic tester	1	Pressure gauge: 2.5, 6, 40, 60 MPa {25, 60, 400, 600 kg/cm²}
			790-261-1204	Digital hydraulic tester	1	Pressure gauge: 60 MPa {600 kg/cm²}
Testing wheel brake oil pressure	S	1	793-605-1001	Brake test kit	1	
		2	790-101-1430	Coupler	1	
		3	790-101-1102	Pump	1	
		4	790-301-1720	Adapter	1	20 × 1.5 mm → R1/8
		5	799-101-5160	Nipple	1	
		6	799-401-2220	Hose	1	Length: 5 m
		7	790-261-1130	Coupling	1	
Holding work equipment position	T		793-463-1100	Stopper	1	
Testing wear of brake disc	U		418-98-31110	Testing gauge	1	Component part of tool kit
Testing and adjusting parking brake control cable	V		79A-264-0021	Push-pull scale	1	0 – 300 N {0 – 30 kg}
Testing work equipment lever	W	1	79A-264-0021	Push-pull scale	1	0 – 300 N {0 – 30 kg}
		2	Commercially available	Scale	1	
Testing and adjusting work equipment oil pressure	X		799-101-5002	Analog hydraulic tester	1	Pressure gauge: 2.5, 6, 40, 60 MPa {25, 60, 400, 600 kg/cm²}
			790-261-1204	Digital hydraulic tester	1	Pressure gauge: 60 MPa {600 kg/cm²}
Testing and adjusting work equipment PPC oil pressure	Y		799-101-5002	Analog hydraulic tester	1	Pressure gauge: 2.5, 6, 40, 60 MPa {25, 60, 400, 600 kg/cm²}
			790-261-1204	Digital hydraulic tester	1	Pressure gauge: 60 MPa {600 kg/cm²}

6) Permanently tighten retainer (6) of fuel inlet connector (7).
Retainer:
50 ± 5 Nm {5.1 ± 0.51 kgm}

7) Tighten the sleeve nut of the fuel high-pressure tube on the head side and then tighten that on the common rail side.
Sleeve nut:
35 ± 3.5 Nm {3.6 ± 0.4 kgm}



8) Connect the injector harness connector.

★ After installing the rocker arm assembly, adjust the valve clearance. For details, see “Adjusting valve clearance”.
Rocker arm assembly mounting bolt:
36 ± 5 Nm {3.67 ± 0.51 kgm}

★ Tighten the injector terminal nut to the following torque.
Terminal nut:
1.5 ± 0.25 Nm {0.15 ± 0.025 kgm}

★ Tighten the head cover to the following torque.
Head cover mounting nut:
24 ± 4 Nm {2.45 ± 0.41 kgm}

Bleeding air from fuel circuit

★ If fuel is used up or if a fuel circuit part is removed and installed, bleed air from the fuel circuit according to the following procedure.

⚠ **Stop the machine on a level ground, lower the work equipment to the ground, and set chocks under the tire securely.**

1. Fill the fuel tank with fuel.

2. Open the right side cover of the engine.

3. Turn feed pump knob (1) to the left to pull it out and operate it forward and backward.
   ★ Keep the operation of the knob until becomes hard to operate.
   ★ The plug at the top of the fuel main filter does not need to be removed.

4. After bleeding air, push in knob (1) and turn it to the right to fix it.

Testing and adjusting HST oil pressure

Necessary tools

Symbol		Part No.	Part Name
L	1	799-101-5002	Analog type hydraulic tester
		790-261-1204	Digital type hydraulic tester
	3	790-301-1730	Joint
	4	07000-12011	O-ring

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

★ HST oil temperature when measuring: Within operating range

★ The high-pressure relief pressure is the same as the safety pressure of the main circuit, so it cannot be measured. (Normally, the cut-off valve is actuated first, so it does not rise to the safety valve set pressure)

Testing

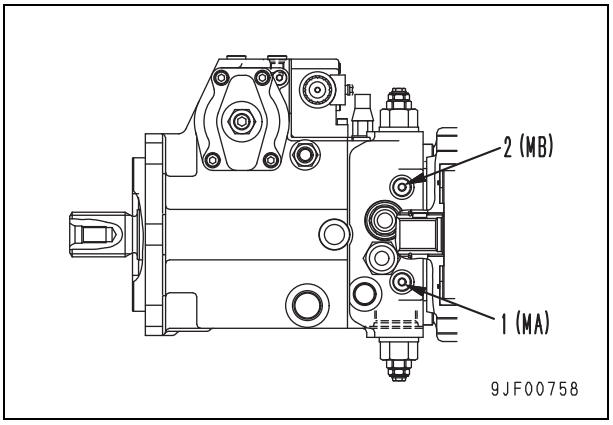
Testing high-pressure cut-off oil pressure

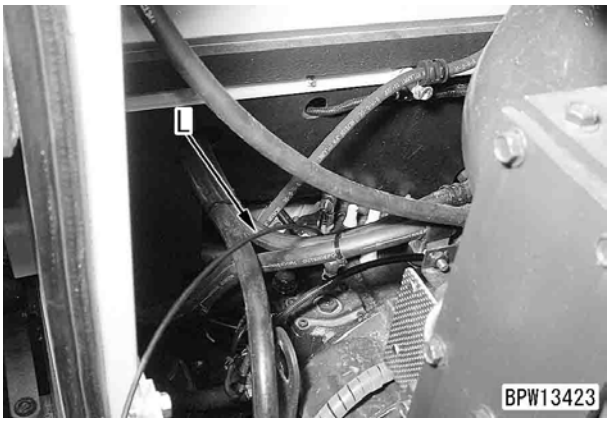
[Testing with monitoring function]

1. Referring to “Special functions of machine monitor (EMMS)”, select the real-time monitoring function in the service mode.
2. Display “HST PRESS” among the monitoring items of the machine monitor.
   ★ Monitoring item
   Code No. 32600: HST PRESS (HST oil pressure)

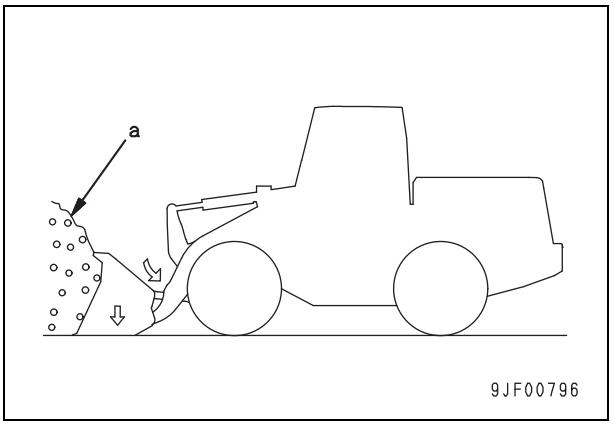
[Testing with tools]

1. Open the engine hood side cover.
2. Install oil pressure measurement nipple (1) or (2).
   ★ Oil pressure measurement plug:
   (G1/4) with hexigonal hole, width across flats 6 mm
   - Nipple (1): For FORWARD circuit (port: MA)
   - Nipple (2): For REVERSE circuit (port: MB)
3. Install joint **L3**.
   ★ Install O-ring **L4** to the port side of joint **L3**.
4. Install hydraulic tester **C1** (60 MPa {600 kg/cm^2}).



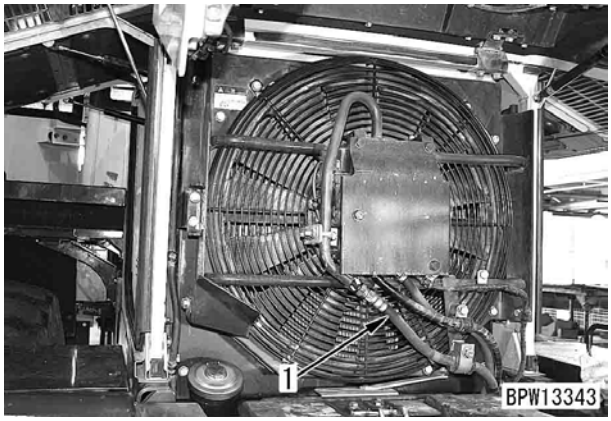


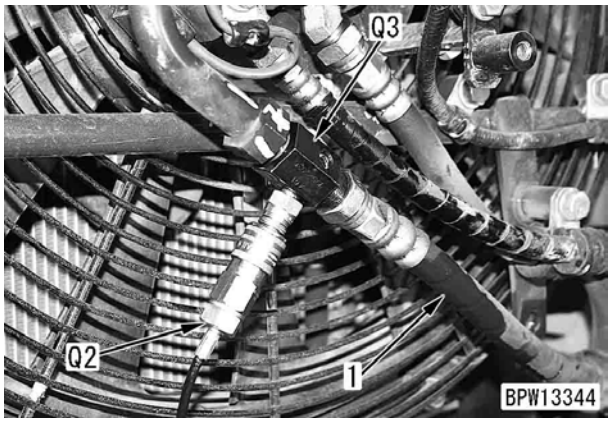
5. Measure the high-pressure cut-off oil pressure under the following conditions.
   1) Lower the bucket to near the ground, then drive the machine forward and thrust the bucket into the stockpile of soil or rock (portion a).
      ★ Set the directional lever to FORWARD and the speed selector switch to 2nd and traction control switch to ON.

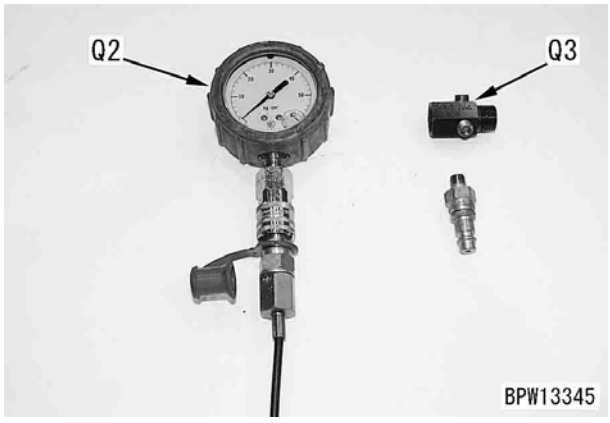


Testing fan drive oil pressure

1. Open the radiator grille.
2. Disconnect hose (1), install oil pressure gauge **Q2** (40 MPa {400 kg/cm^2}) and adapter **Q3** (Hose size: For #04), and connect hose (1) again.







3. Start the engine and measure the fan drive oil pressure.

4. After finishing the work, remove the measuring instruments and return the removed parts.

Testing parking brake performance

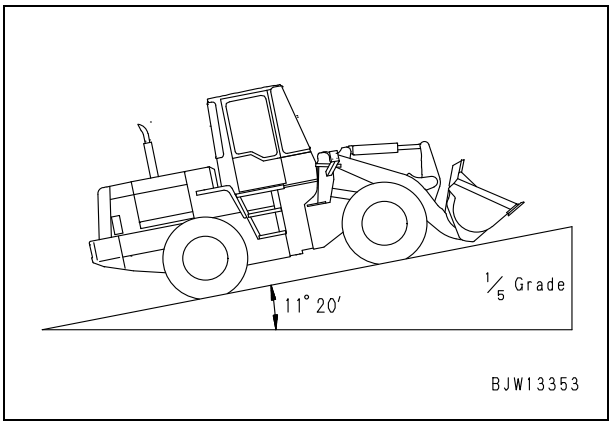
★ Measurement condition
- Tire inflation pressure: Specified pressure
- Road: 1/5 gradient (11° 20'), flat, and dry road
- Machine: Ready for operation

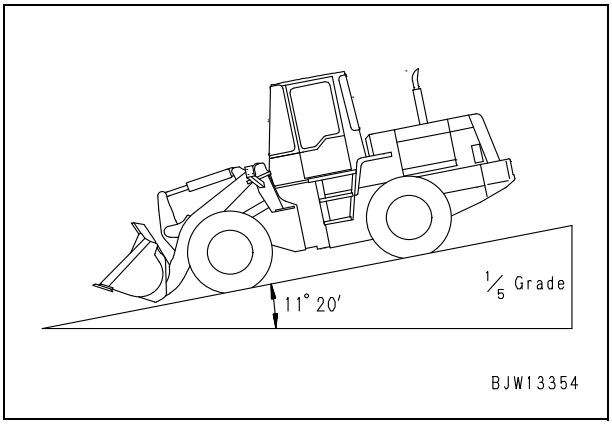
Measuring method

1. Start the engine and set the machine in the straight travel position, and then drive up a slope of 1/5 gradient with no load in the bucket.

2. Press the brake pedal to stop the machine, set the directional lever in the N position, and stop the engine.

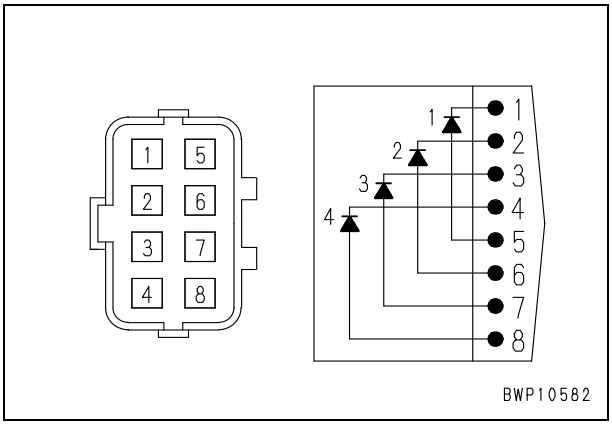
3. Pull the parking brake lever fully, release the brake pedal gradually, and check that the machine is kept stopped.
   ★ Measure the parking brake performance on an uphill and a downhill.



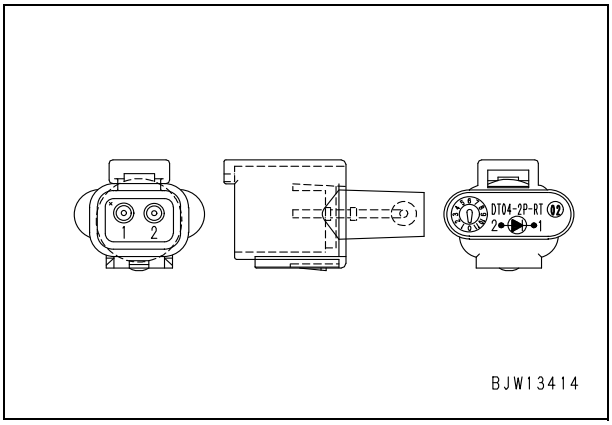


Procedure for testing diodes

★ Check an assembled-type diode (8 pins) and independent diode (2 pins) in the following manner.
★ The conductive directions of the assembled-type diode are indicated on the surface of the diode as shown in the following figure.

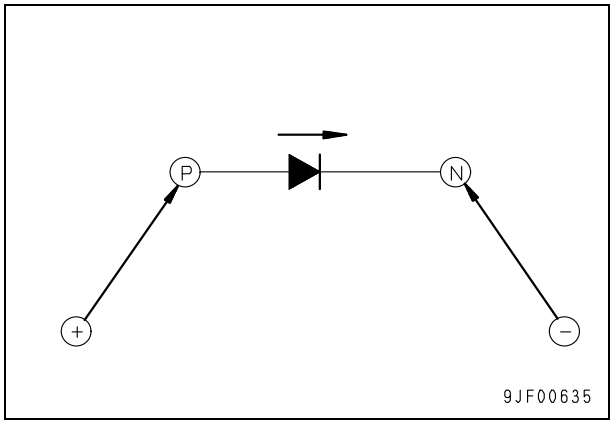


★ The conductive directions of the single diode is indicated on the surface of the diode as shown in the following figure.



1. When using digital type circuit tester

1) Switch the testing mode to diode range and confirm the indicated value.
   ★ Voltage of the battery inside is displayed with conventional circuit testers.
2) Put the red probe (+) of the test lead to the anode (P) and the black probe (–) to the cathode (N) of diode, and confirm the indicated value.
3) Determine acceptability of the diode from the indicated value.
   - Indicated value remains unchanged: Conduction is absent (Failure)
   - The indicated value changes: The diode has conductivity (Normal) (See ★ below.)
   ★ A value between 460 to 600 is indicated for silicon diodes.



2. Contents of 7-segment and dot displays for CPU

★ The LED display should be checked with the starting switch turned ON.

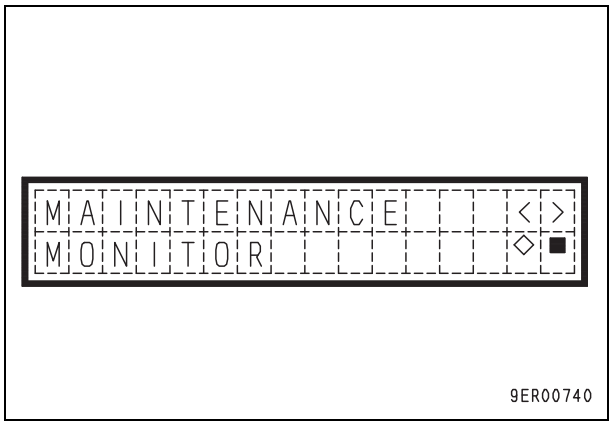
No.	LED	Name/function	Display (*2)	Description
7	7 segments	Number of unsent mails, satellite capture state	0 to 9 displayed	The number indicates the number of unsent mails. (10 or more unsent mails are indicated by “9”.) Light-on indicates that the machine is in process of capturing the satellite.
			0 to 9 fast blink	The number indicates the number of unsent mails. (10 or more unsent mails are indicated by “9”.) Fast blink indicates that the satellite is not captured.
8	Dot	GPS positioning status	ON	GPS positioning was completed. (The position can be confirmed. *3)
			OFF	GPS positioning was not completed. (The position cannot be confirmed. *3)

*2: Blink types and blink times
Fast blink: Blinks in about 0.5-second cycle
Slow blink: Blinks in about 2.0-second cycle

*3: Supplementary explanation of GPS positioning status
One or more minute may be taken until GPS positioning is completed after the starting switch was turned ON even in an outdoor service area.
GPS positioning will fail in a weak signal or non-service area.

5. Maintenance monitoring function

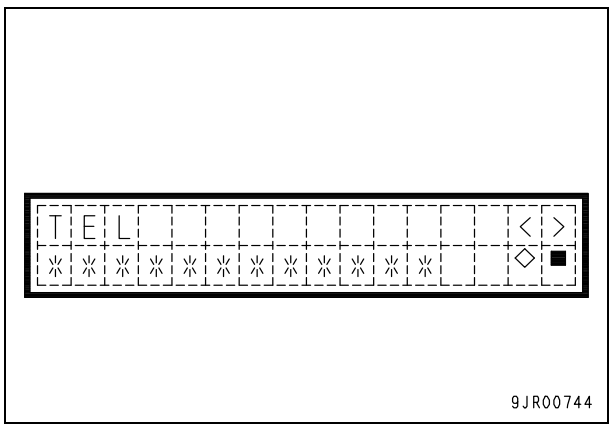
1) Filter, oil replacement time display (automatic display)
   As the filter or oil replacement time draws close, the machine monitor automatically displays its information to alert operator's attention.
2) Resetting replacement time (selection menu)
   As maintenance operation for a filter or oil is completed, the machine monitor allows resetting the time interval through the switch operation.
   ★ For details, see the “Other functions of machine monitor” of the “Operation” section in the Operation and maintenance manual.



6. Telephone number input function

Telephone numbers are entered through the switch operation. And modification or cancellation of the phone numbers in the machine monitor is also available through the switch operation.

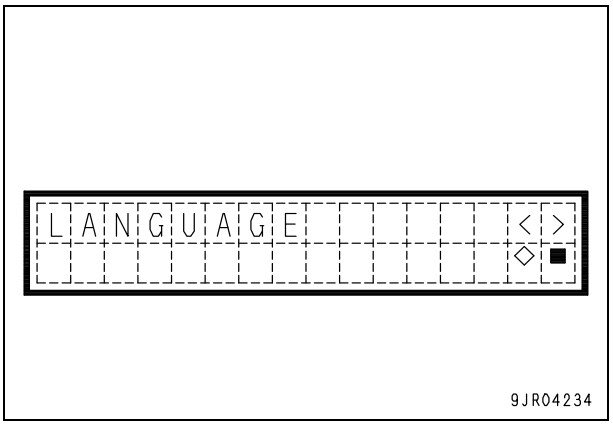
★ When action code [E03] is displayed, a phone number is displayed along with [CALL].
★ For details, see the “Other functions of machine monitor” of the Operation section in the Operation and maintenance manual.



7. Language selection function

Switch operation allows selecting a display language of the machine monitor.

★ Functions of the service mode are constantly displayed in English since they are exempted from the display selection function.
★ A desired language is selectable from English, Japanese, German, French, Italian, Spanish and Swedish.
★ For details, see the “Other functions of machine monitor” of the Operation section in the Operation and maintenance manual.



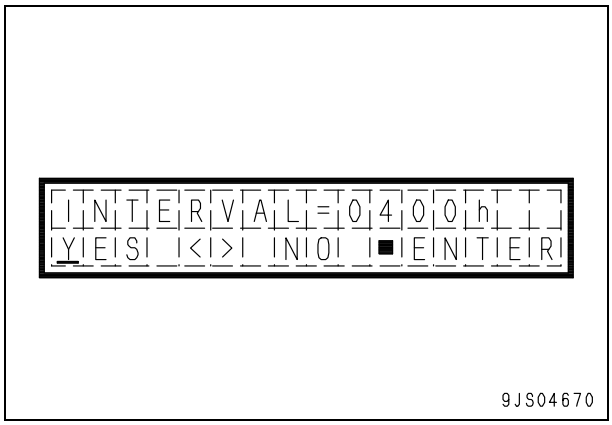
Failure code	Troubled part/item	Trouble	Controller	Action code	Category of record
DHH1KX	HST oil pressure sensor	Disconnection/Ground fault	HST	E03	Electrical system
DHH1KY	HST oil pressure sensor	Hot short	HST	E03	Electrical system
DHTCL6	HST filter clogging sensor	Functional defect	MON	E01	Electrical system
DJF1KA	Fuel level sensor	Disconnection/Hot short	MON	E01	Electrical system
DLT3KX	Travel speed sensor B	Abnormality	HST	E03	Electrical system
DLT4KX	Travel speed sensor A	Abnormality	HST	E03	Electrical system
DLT4LC	Travel speed sensor A & B	Abnormality	HST	E03	Electrical system
DV00KY	Alarm buzzer	Hot short	MON	E01	Electrical system
DW26KA	Motor 2 solenoid	Disconnection/Ground fault	HST	E01	Electrical system
DW26KY	Motor 2 solenoid	Hot short	HST	E01	Electrical system
DW7BKY	Fan reverse solenoid circuit	Hot short	HST	E01	Electrical system
DW7BKZ	Fan reverse solenoid circuit	Disconnection/Ground fault	HST	E01	Electrical system
DX16KA	Fan EPC solenoid	Disconnection	HST	E01	Electrical system
DX16KB	Fan EPC solenoid	Ground fault	HST	E01	Electrical system
DX16KY	Fan EPC solenoid	Hot short	HST	E01	Electrical system
DX19KA	Motor 1 solenoid	Disconnection	HST	E03	Electrical system
DX19KB	Motor 1 solenoid	Ground fault	HST	E03	Electrical system
DX19KY	Motor 1 solenoid	Hot short	HST	E03	Electrical system
DX20KA	Clutch EPC solenoid	Disconnection	HST	E03	Electrical system
DX20KB	Clutch EPC solenoid	Ground fault	HST	E03	Electrical system
DX20KY	Clutch EPC solenoid	Hot short	HST	E03	Electrical system
DXH7KB	Reverse solenoid	Ground fault	HST	E03	Electrical system
DXH7KZ	Reverse solenoid	Disconnection/Hot short	HST	E03	Electrical system
DXH8KB	Forward solenoid	Ground fault	HST	E03	Electrical system
DXH8KZ	Forward solenoid	Disconnection/Hot short	HST	E03	Electrical system

★ Use this page in front page and spread.

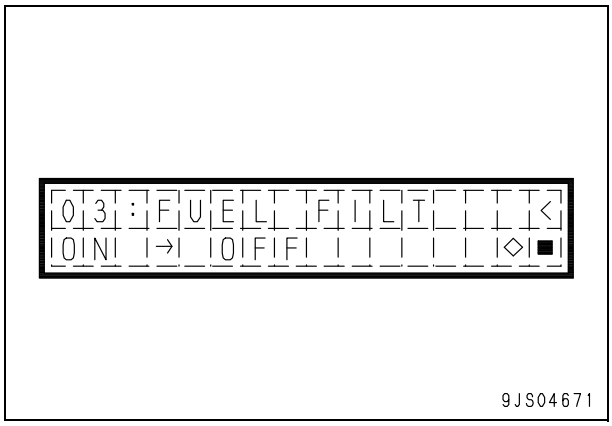
HST [HST controller system]

Contents of display in normal state	Unit (*4)	Remarks
As per software No.	Condition display	
As per software application version No.	Condition display	
As per software data version	Condition display	
	Condition display	
	Condition display	
	Condition display	
	Condition display	
0	Condition display	“0” is always displayed.
Low-pressure relief pressure: 2.4 – 2.7 High-pressure cutoff pressure: 43.1 – 46.6	MPa	
Low-pressure relief pressure: 0.660 – 0.680 High-pressure cutoff pressure: 3.373 – 3.607	V	
Above 10.5 km/h in 3rd or 4th gear speed: 0 mA Other than above: 100 – 600 mA (Depends on control)	mA	
When clutch is engaged: 670 mA When clutch is disengaged Above 10.5 km/h in 3rd or 4th gear speed): 0 mA	mA	
0 – 1000 mA • Fan rotation direction is being reversed: 800 mA • Fan is rotating in reverse: 0 mA	mA	
Switch position, forward: 0 Switch position, automatic reverse: 2 Manual reverse switch is being operated: 1	Condition display	
Depends on travel speed.	km/h	Not used
0 km/h = 0 min^{-1} 10 km/h = 838 min^{-1} 20 km/h = 1676 min^{-1} 30 km/h = 2514 min^{-1} 40 km/h = 3352 min^{-1}	min^{-1}	When tires of size 17.5 are installed. “min^{-1}” is SI unit of rotation speed. (1 min^{-1} = 1 rpm)
0%	%	“0%” is always displayed.
Ordinary: 100% Forward travel in S mode: 50 – 100%	%	
0 – 20%	%	
Directional lever in N, stopped: 0 (OFF) Other than above: 1 (ON)	Condition display	

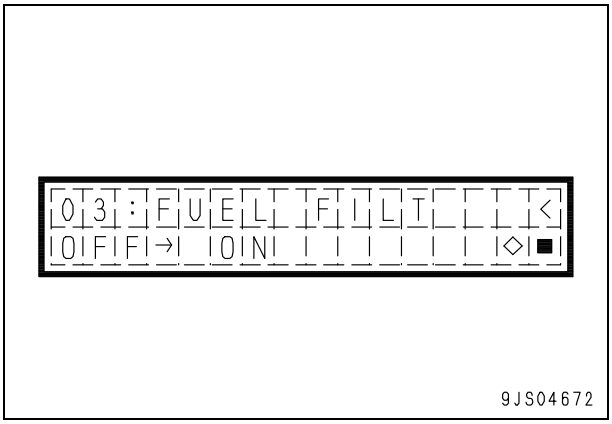
6) Select “YES” or “NO” using [<] or [>] switch.
★ The selected cursor will start flashing. If “YES” is selected and [■] switch is pressed, the information will be deleted. If “NO” is selected and [■] switch is pressed, deletion is cancelled and the maintenance interval change item screen is restored.
★ By default, the cursor is set to NO (cancel) to prevent resetting error.
★ When an interval time is changed, the timer remaining time is changed as shown below.
● Timer remaining time = Interval time being set – Elapsed time from the last replacement



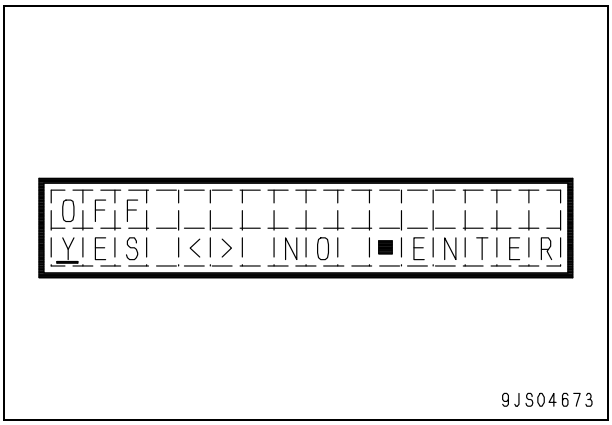
8-2. Selection between enabling or disabling timer by item
1) Pressing [<] or [>] switch from 8-1-3) Interval time change screen displays the “Selection between enabling or disabling timer by item” screen.
★ When “Timer by item” is enabled, the order of display is ON → OFF.



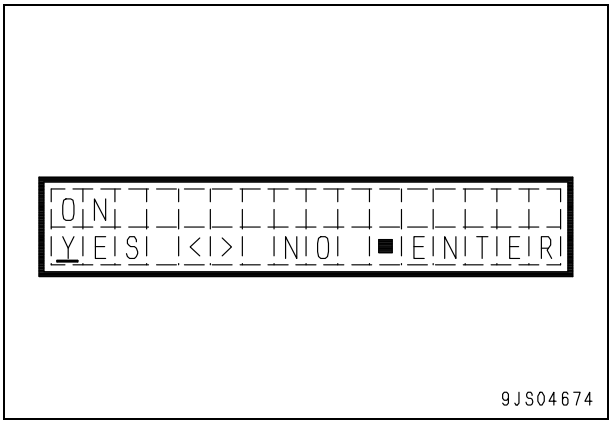
★ When “Timer by item” is disabled, the order of display becomes OFF → ON.
★ The default display is ON.



2) Press [◇] switch from this state.
★ If “Timer by item” is disabled, OFF will be displayed in the upper column.



★ If “Timer by item” is enabled, ON will be displayed in the upper column.



Pm clinic inspection chart

WA200-6 Serial No. 70001 and up

Machine serial No.	
Engine serial No.	SAA4D107E-1 #

	Hours inspection

Work order No.	Date of execution	Service Meter	Serviceman
	Year: Month: Day:	h	

Questions asked to operator, walk around inspection

Was there any abnormality before inspection started?	Ambient temperature Max. °C
	Min. °C
	Altitude m

Max. coolant temp. (During operation)		Max. HST oil temp. (During operation)	
Segment color	W G G G G R R 1 2 3 4 5 6 7	Segment color	G G G G G R R 1 2 3 4 5 6 7

★ If the machine is cold, warm it up fully. <>: Reference value

	Item	Conditions		Unit	Standard value for new machine	Service limit value	Measurement results	Pass	Fail
Engine	Engine speed	Low idle		rpm	775 – 850	775 – 850			
		High idle			2,175 – 2,295	2,175 – 2,295			
		HST stall			2,080 – 2,280	1,980 – 2,295			
		Hydraulic stall			1,970 – 2,170	1,870 – 2,270			
		Full stall (HST stall + hydraulic stall)			1,860 – 2,170	1,760 – 2,270			
	Blow-by pressure	At rated output		kPa {mmH_2O}	Max. 0.98 {Max. 100}	1.96 {200}			
	Oil pressure	SAE15W-40	High idle	MPa {kg/cm^2}	Min. 0.29 {Min. 3.0}	0.25 {2.5}			
			Low idle		Min. 0.10 {Min. 1.0}	0.07 {0.7}			

★ Before starting the inspection, check that the machine does not move when the directional lever is placed in position.
⚠ When measuring the transfer clutch control pressure, carry out the measurement at a place where the machine can travel safety at a speed of more than 10 km/h.

HST	High-pressure cut-off pressure	• Engine: Full throttle • Hydraulic oil temp.: 45 – 55°C	Directional lever: F Speed selector switch: 2nd Traction control switch: ON	MPa {kg/cm^2}	44.6 – 46.6 {455 – 475}	43.1 – 46.6 {440 – 475}			
	Low-pressure relief pressure (work equipment PPC circuit basic pressure)		Directional lever: N		2.5 – 2.7 {25.5 – 27.5}	2.4 – 2.7 {24.5 – 27.5}			
	Servo piston control pressure		Directional lever: N Brake: released		2.5 – 2.7 {25.5 – 27.5}	2.4 – 2.7 {24.5 – 27.5}			
			Directional lever: N Brake: pressed		Max. 0.6 {Max. 6}	Max. 0.6 {Max. 6}			
	Servo piston actuation pressure		Directional lever: Forward and reverse Gear speed selector switch: 1st Travel speed control dial: Min. side Measure while driving at full throttle (Approx. 5 km/h).		2.5 – 2.7 {25.5 – 27.5}	2.3 – 2.7 {23.5 – 27.5}			
	Transfer clutch control pressure	Hydraulic oil temp.: 45 – 55°C	Directional lever: F Speed selector switch: 3rd or 4th		2.5 – 2.7 {25.5 – 27.5}	2.4 – 2.7 {24.5 – 27.5}			

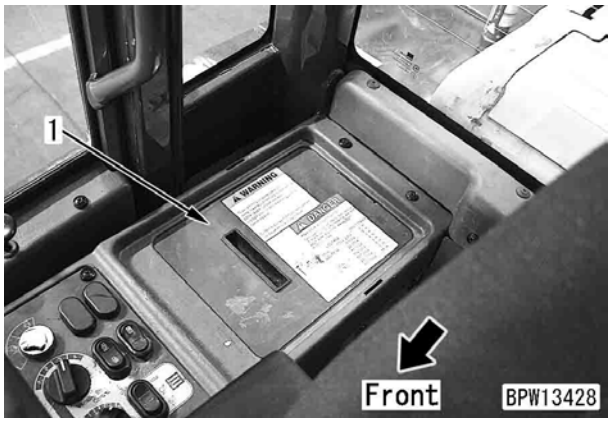
Fuse box: FS2

Type of power supply (Power source)	Fuse No.	Fuse capacity	Destination of power (*)
Accessory power supply (Slow blow fuse [80A])	1	20 A	Air conditioner blower
	2	5 A	Air conditioner compressor
	3	20 A	Beacon Working lamp (Front: For addition) Rotary lamp
	4	20 A	Glass heater
	5	10 A	Load meter, air cleaner clogging relay
	6	20 A	Key ON power for optional device
	7	10 A	DC converter
	8	10 A	Parking brake Horn
	9	10 A	Air suspension seat
	10	10 A	Small lamp (right)
	11	10 A	Small lamp (left)
	12	10 A	Working lamp (front)
	13	10 A	Working lamp (rear)
ACC signal (ACC switch)	14	10 A	Machine monitor (Starting switch ACC signal) Backup lamp Backup alarm
	15	5 A	Engine controller (Starting switch ACC signal)

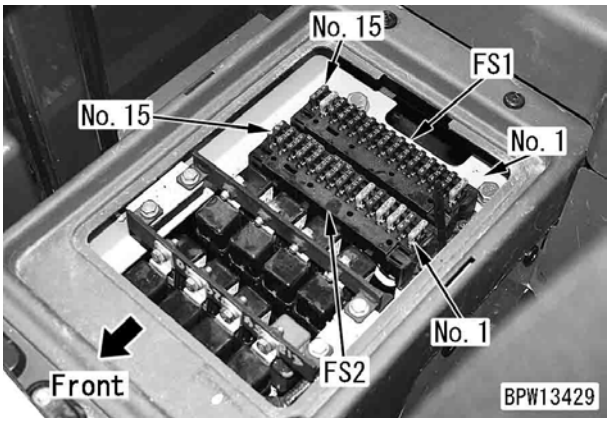
*: Optional devices are included.
Devices which are not set may be included.

Location

- Inside of cover (1) at rear of console in cab



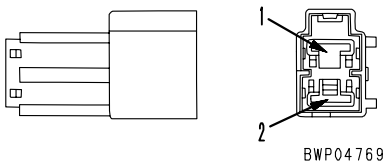
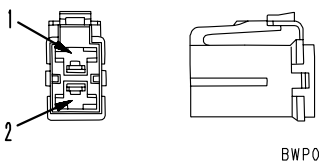
Fuse No.

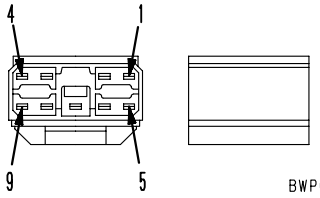
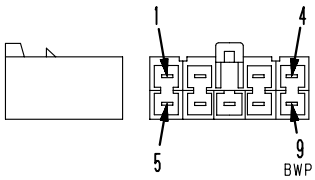


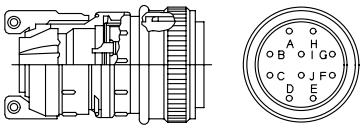
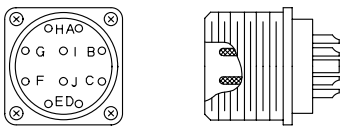
Related circuit diagram

This is the excerpted circuit diagram related to trouble

- **Connector No.: Indicates (Model – No. of pins) (Color)**
- **"Connector No. and pin No." from each branching/ merging point: Shows the ends of branch or source of merging within the parts of the same wiring harness.**
- **Arrow (⟷): Roughly shows the location on the machine.**

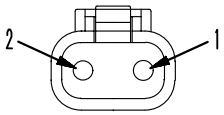
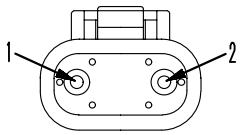
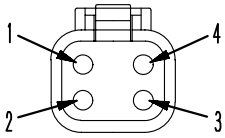
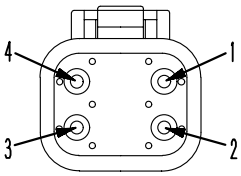
No. of pins	L type connector		
	Male (female housing)	Female (male housing)	Testing connection use special tool Part No.
2	 BWP04769	 BWP04770	—
	—	—	

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

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

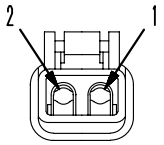
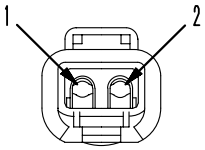
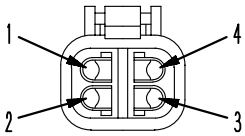
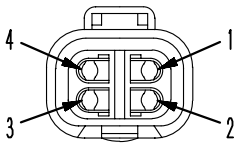
B4D18401

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

No. of pins	DTP Series connector		
	Body (plug)	Body (receptacle)	Testing connection use special tool Part No.
	Pin(female terminal)	Socket(male terminal)	
2			–
	–	–	
4			799-601-4260 (T-adapter)
	Part No. :6261-81-2810	–	

B4D18413

DT series connector for engine

No. of pins	WIF (water in fuel) sensor (107, 114 engine)		
	Body (plug)	Body (receptacle)	Testing connection use special tool Part No.
2	 BWP05037	 BWP05038	799-601-9020 (T-adapter) (kit:799-601-4101) (kit:799-601-4201)
	Part No. :08192-12200 (normal type) 08192-22200 (fine wire type)	Part No. :08192-12100 (normal type) 08192-22100 (fine wire type)	
No. of pins	EGR (by pass) valve stroke sensor (125, 140, 170 engine)		
	Body (plug)	Body (receptacle)	
4	 BWP05041	 BWP05042	799-601-9040 (T-adapter) (kit:799-601-4101) (kit:799-601-4201)
	Part No. :08192-14200 (normal type) 08192-24200 (fine wire type)	Part No. :08192-14100 (normal type) 08192-24100 (fine wire type)	

B4D18425

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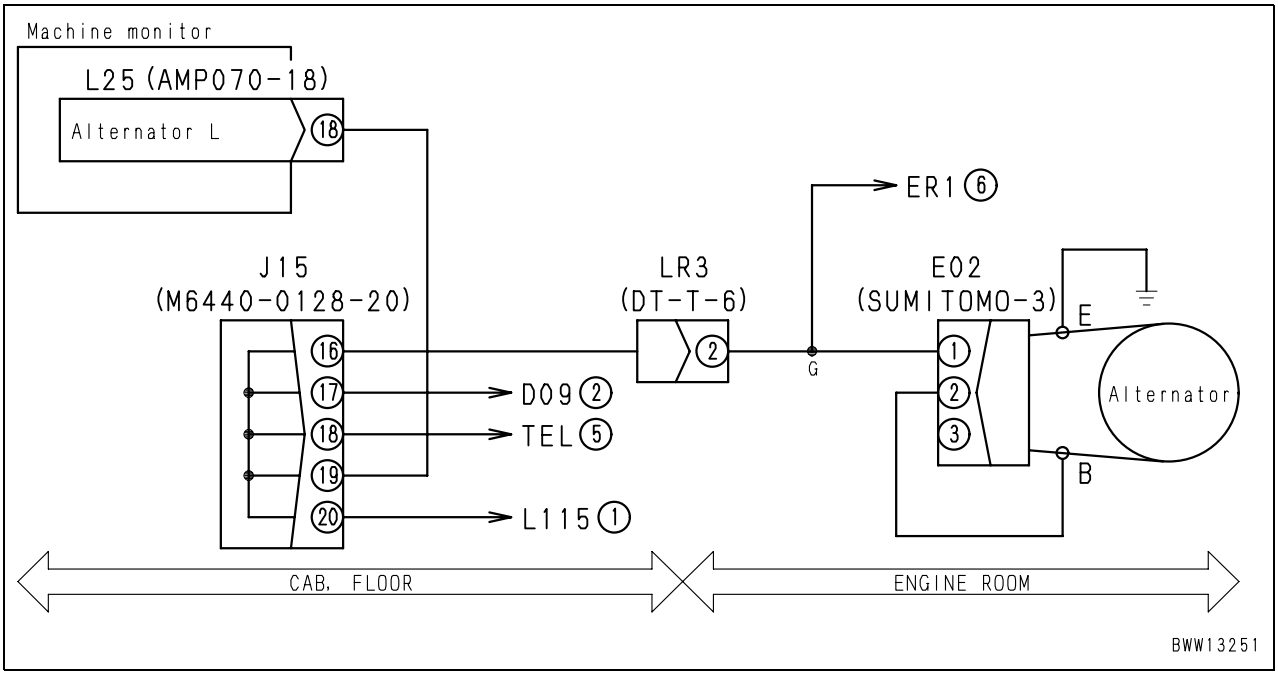
Related circuit diagram

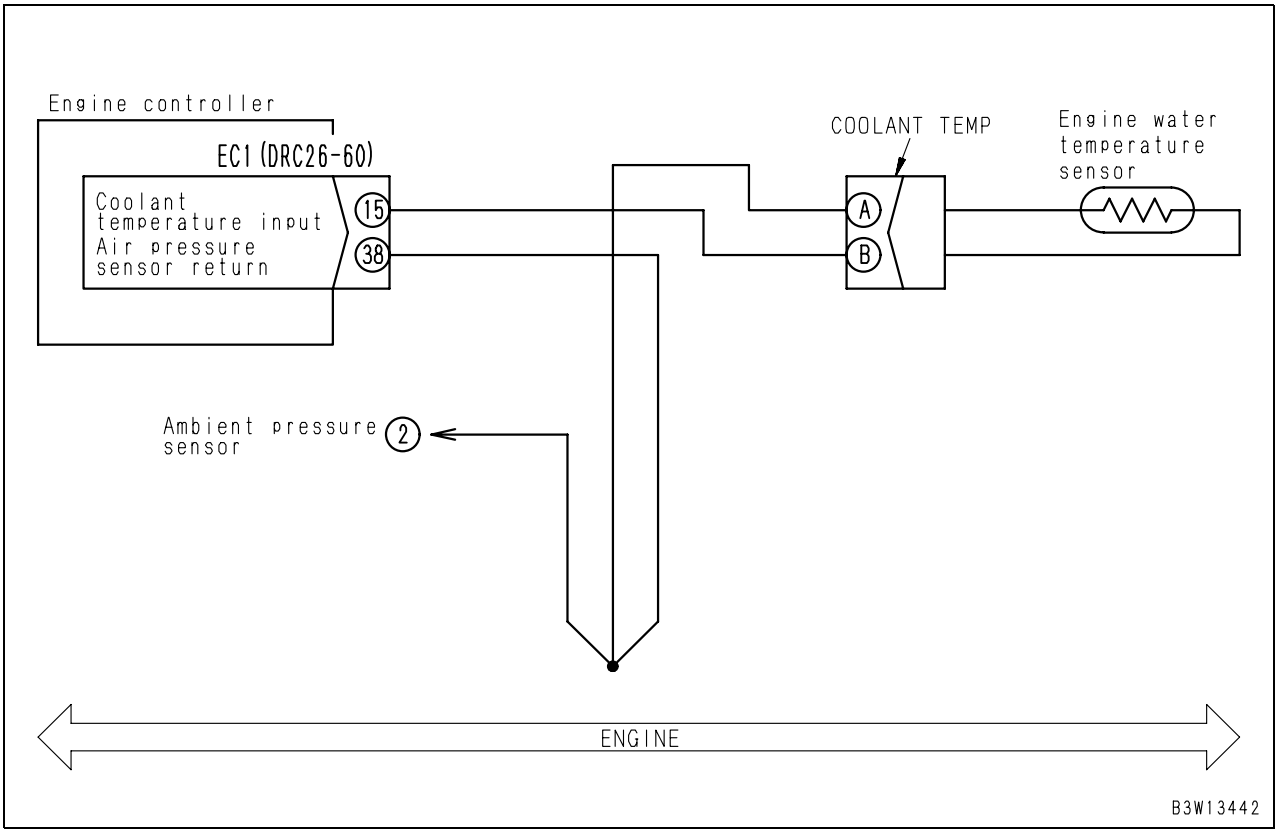


Failure code [CA111] Abnormality in engine controller

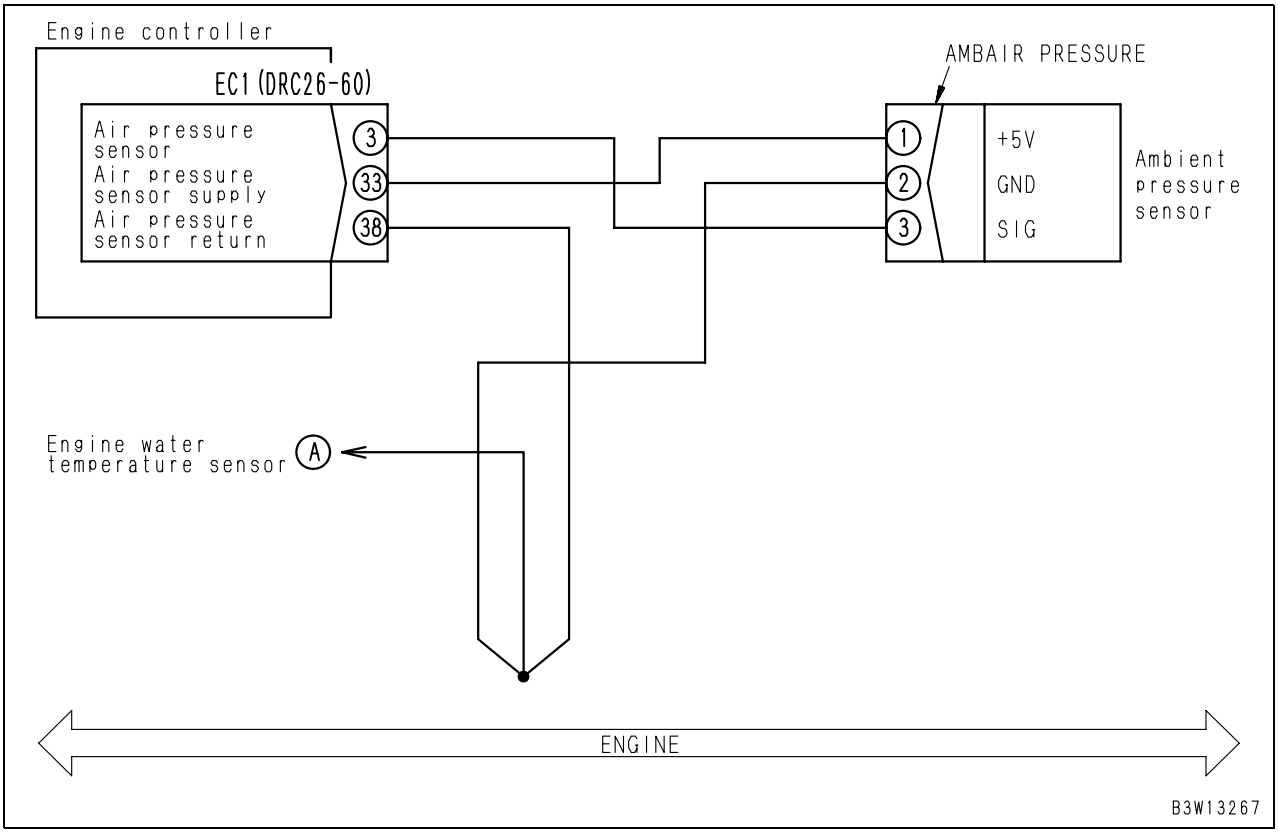
Action code	Failure code	Trouble	Abnormality in engine controller (Engine controller system)
E03	**CA111**		
Contents of trouble	• Abnormality occurred in memory of engine controller or power supply circuit.		
Action of controller	• Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine	• The engine does not start.		
Related information	• Method of reproducing failure code: Start engine		

Possible causes and standard value in normal state	Causes		Standard value in normal state/Remarks on troubleshooting
	1	Defective engine controller	Possible defect in engine controller (Troubleshooting cannot be carried out.)

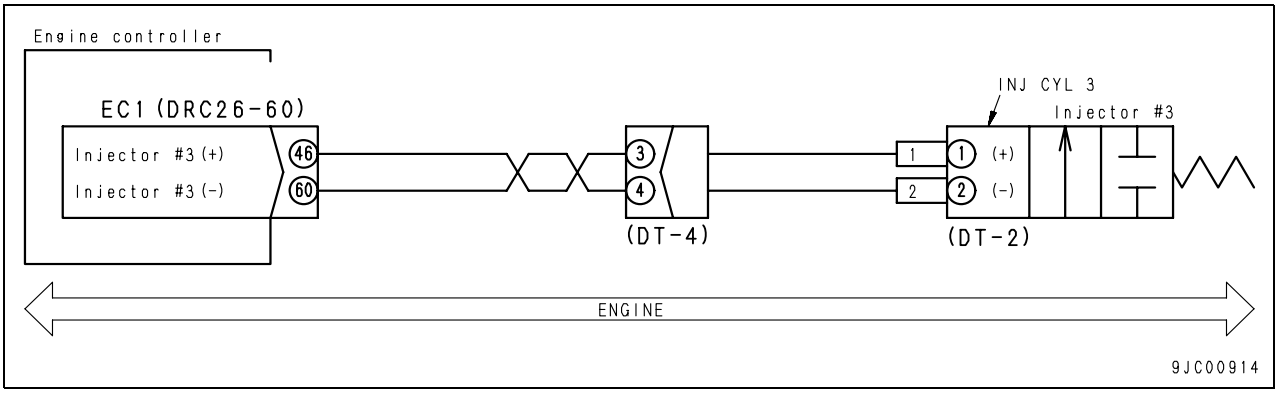
Related circuit diagram



Related circuit diagram



Related circuit diagram

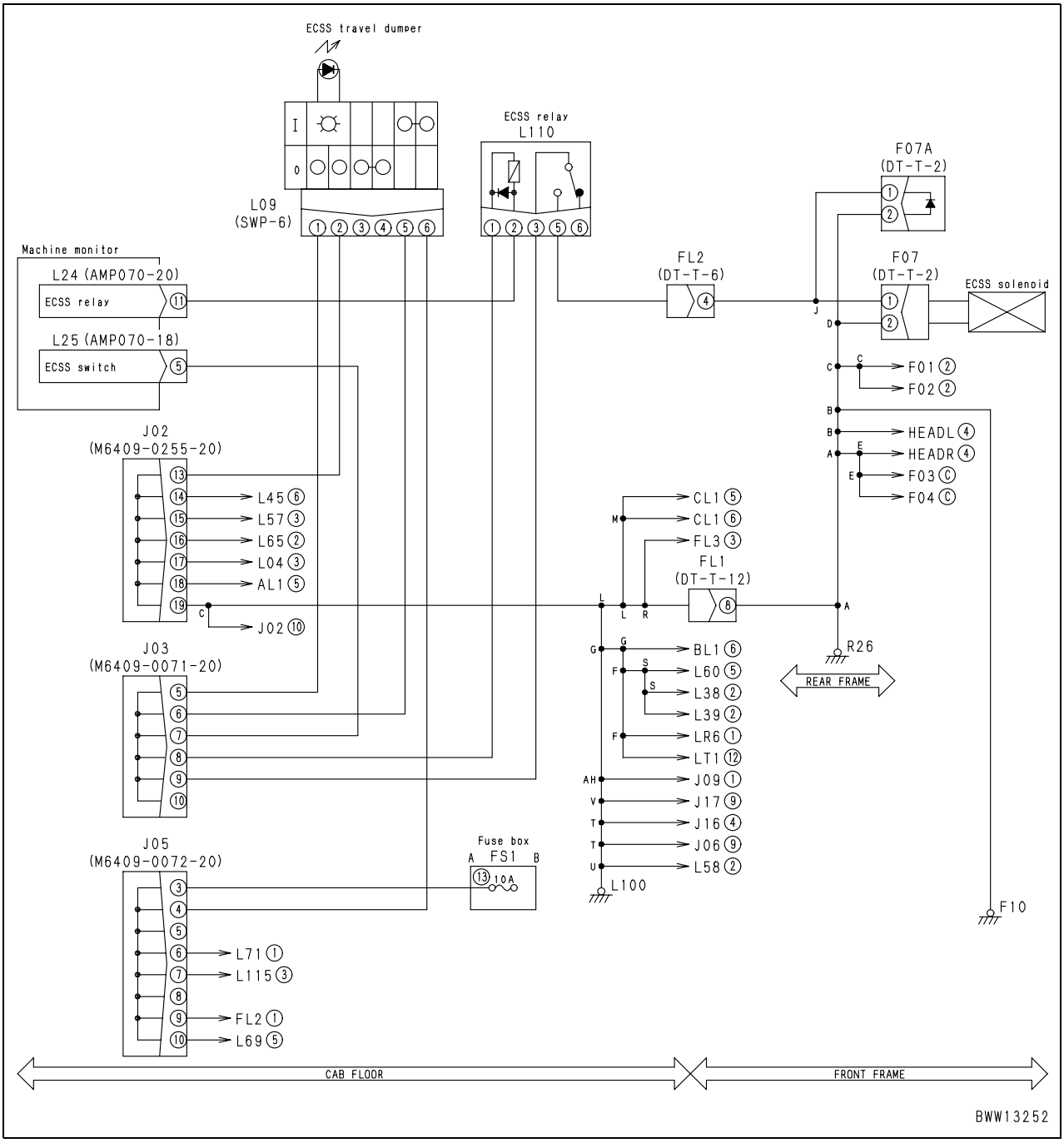


Failure code [CA757] All continuous data lost error

Action code	Failure code	Trouble	All continuous data lost error (Engine controller system)
E03	**CA757**		
Contents of trouble	• All data in engine controller are lost.		
Action of controller	• Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine	• Engine stops and sometimes cannot be started. • The monitoring function of the machine monitor (engine controller system) sometimes fail to work normally.		
Related information	• Method of reproducing failure code: Turn the starting switch ON.		

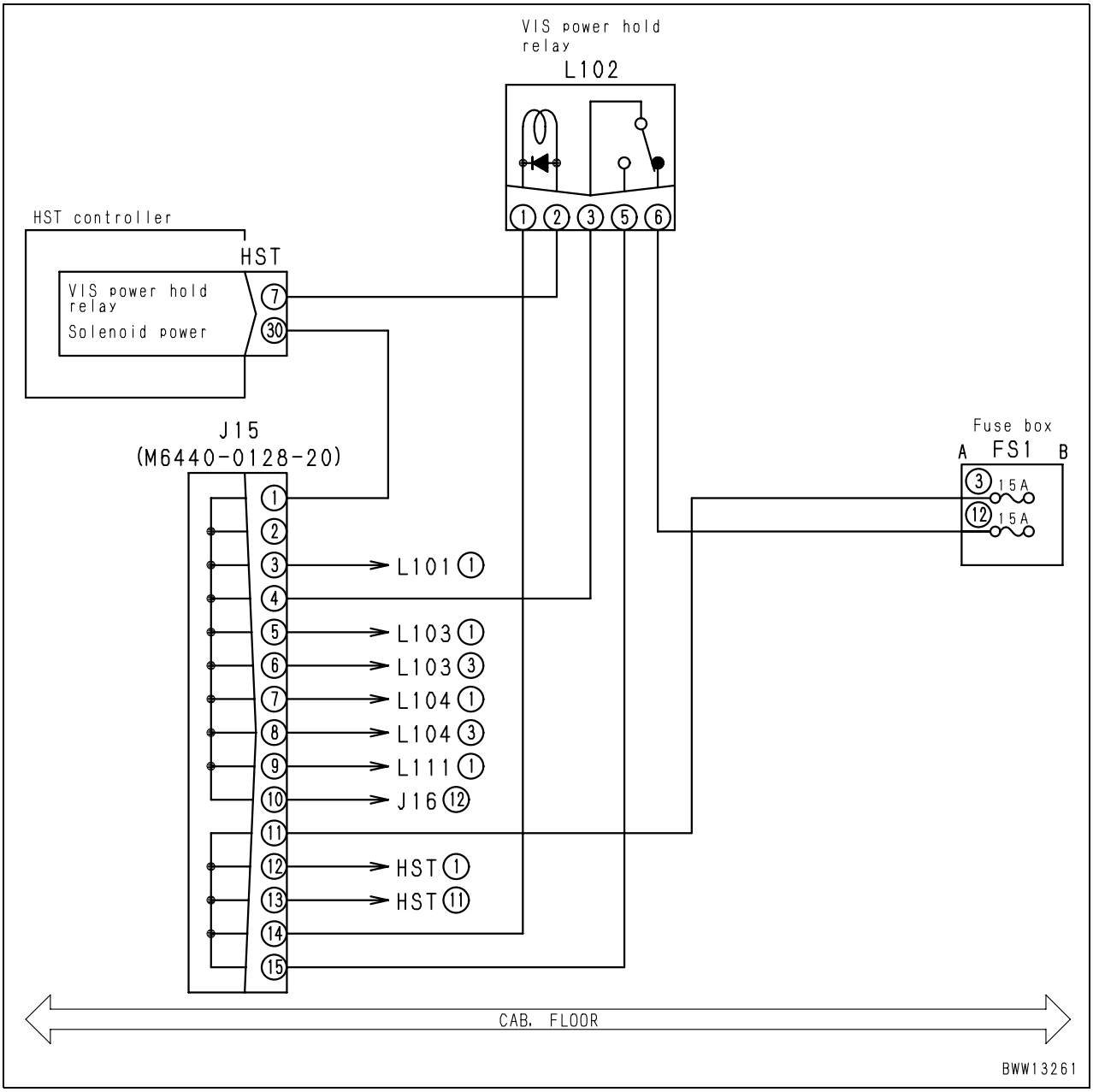
	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defect in related system	If another code is displayed, carry out troubleshooting for it.			
	2	Loose, corroded battery terminal	Inspect battery terminal directly for loose and corrosion.			
	3	Defective battery voltage	★ Prepare with starting switch OFF, then carry out troubleshooting with starting switch OFF and START.			
			Battery (1 piece)	Starting switch	Voltage	
			Between (+) – (–) terminals	OFF	Min. 12 V	
				START	Min. 6.2 V	
	4	Defective fuse No. 4 of fuse box FS1	If the fuse is broken, the circuit probably has a grounding fault, etc.			
	5	Defective engine control cut-out relay (L107) (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			L107 (male)	Resistance		
			Between (1) and (2)	200 – 400 Ω		
			★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			When engine control cut-out relay (L107) is replaced with a relay of the same type, if the condition becomes normal, the engine control cut-out relay (L107) is defective.			
	6	Defective engine control cut-out relay (L108) (Internal disconnection or short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			L108 (male)	Resistance		
			Between (1) and (2)	200 – 400 Ω		
			★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			When engine control cut-out relay (L108) is replaced with a relay of the same type, if the condition becomes normal, the engine control cut-out relay (L108) is defective.			
	7	Disconnection in wiring harness (Disconnection or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between fuse No. 4 of fuse box FS1 – L107, L108 (female) (3)	Resistance	Max. 10Ω	
			Wiring harness between L107 (female) (5), L108 (female) (5) – EC3 (female) (3), (4)	Resistance	Max. 10Ω	
			Wiring harness between EC3 (female) (1), (2) – ground	Resistance	Max. 10Ω	

Related circuit diagram



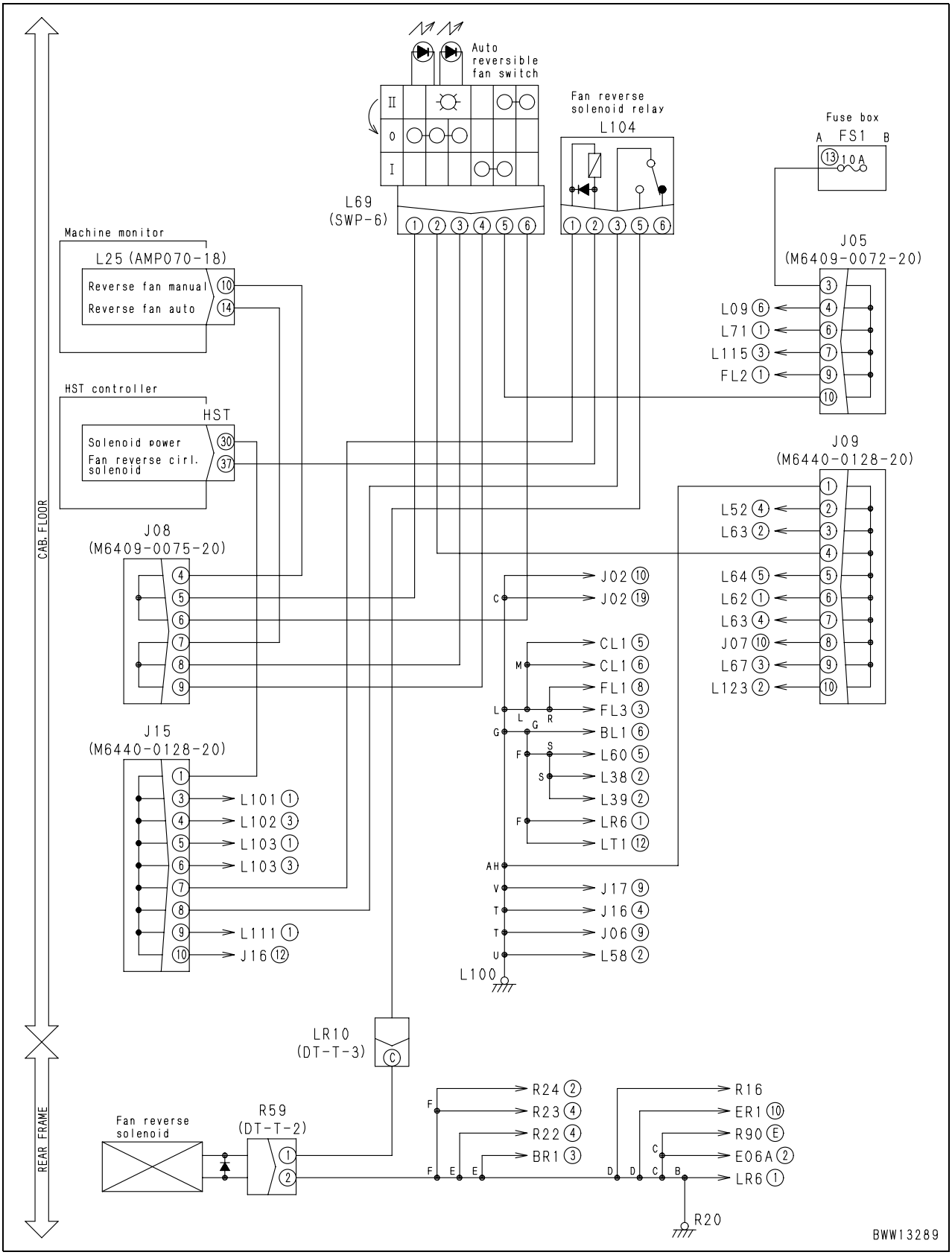
	Causes		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	3	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between HST (female) (28), (38) – L80 (female) (7), (8) and ground	Resistance	Min. 1 MΩ
			Wiring harness between HST (female) (28), (38) – L29 (female) (3), (8) and ground	Resistance	Min. 1 MΩ
			Wiring harness between HST (female) (28), (38) – EC2 (female) (46), (47) and ground	Resistance	Min. 1 MΩ
			Wiring harness between HST (female) (28), (38) – C140 (female) (28), (38) and ground	Resistance	Min. 1 MΩ
			Wiring harness between HST (female) (28), (38) – CAN1 (female) (A), (B) and ground	Resistance	Min. 1 MΩ
			Wiring harness between HST (female) (28), (38) – CAN2 (female) (A), (B) and ground	Resistance	Min. 1 MΩ
	4	Defective power supply circuit of machine monitor	★ Power supply circuit or grounding circuit may be defective. Confirm that there is no disconnection of the circuit or defective mating of the connector.		
	5	Defective machine monitor, HST controller, engine controller or KOMTRAX terminal	★ If above troubleshootings 1 – 4 have not identified the cause of the trouble, failure on the machine monitor, HST controller, engine controller or KOMTRAX terminal should be suspected. (Since trouble is in system, troubleshooting cannot be carried out.)		

Related circuit diagram

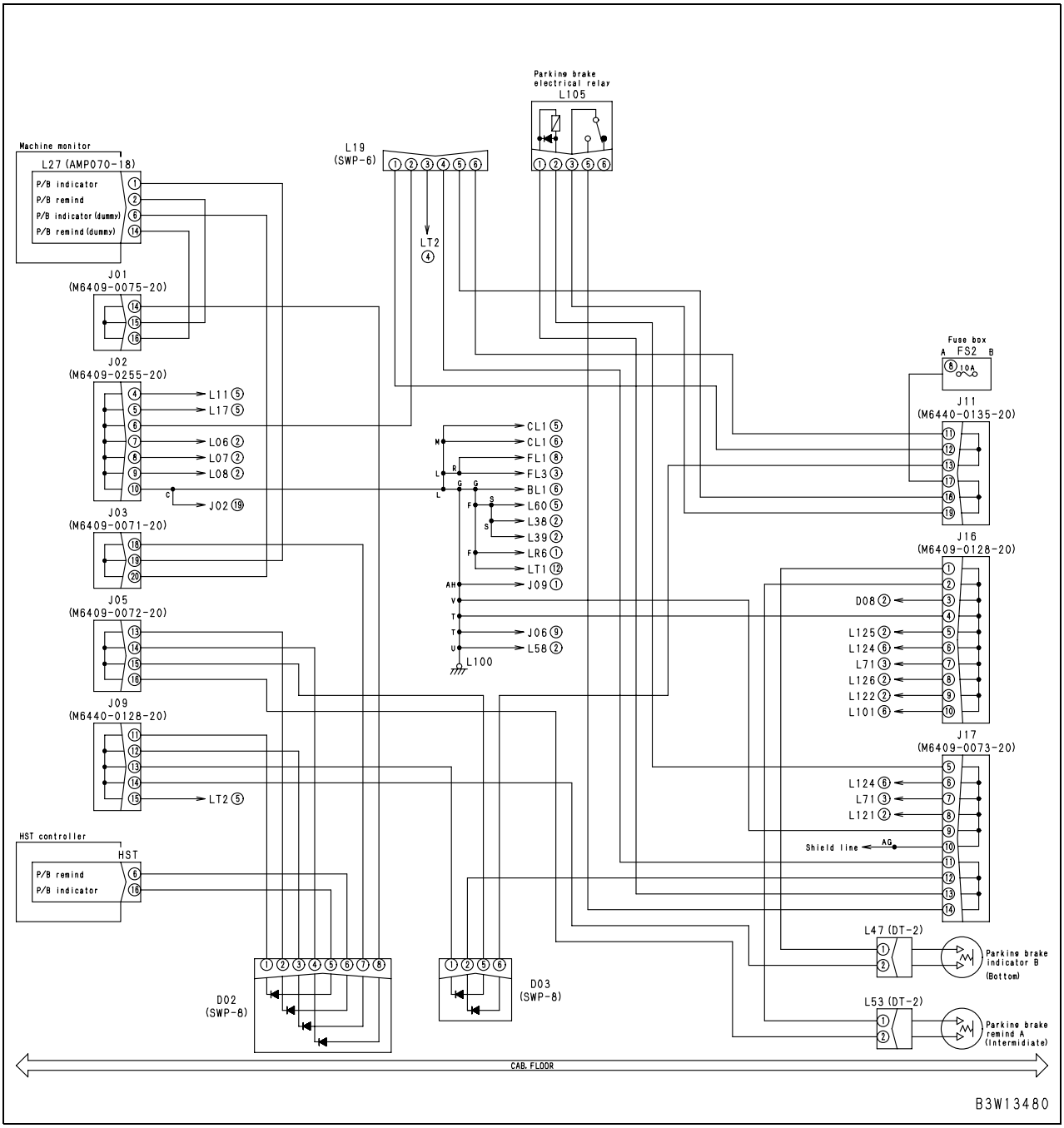


<table>
<tr><td rowspan="13">Possible causes and standard value in normal state</td><td colspan="2">Causes</td><td colspan="5">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="7">e</td><td rowspan="7">Defective backup alarm/lamp relay (L126) (Internal short circuit)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">L126 (male)</td><td colspan="2">Resistance</td></tr>
<tr><td colspan="3">Between (1) – (2)</td><td colspan="2">200 – 400 Ω</td></tr>
<tr><td colspan="5">★ Prepare with starting switch OFF.
★ Test relay unit.</td></tr>
<tr><td>Backup alarm/lamp relay (L126)</td><td colspan="2">(1) – (2)</td><td colspan="2">Resistance</td></tr>
<tr><td rowspan="2">Between (3) – (5)</td><td>When 24 V is applied (relay is "ON")</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td>Other than above (relay is "OFF")</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td colspan="5">★ Prepare with starting switch OFF, then turn starting switch to START and carry out troubleshooting.</td></tr>
<tr><td colspan="5">Replace backup alarm/lamp relay (L126) with another relay. If condition becomes normal, backup alarm/lamp relay is defective.</td></tr>
<tr><td rowspan="2">f</td><td rowspan="2">Defective directional pressure selector solenoid (Internal short circuit)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Between T07 (male) (3) – T07 (male) (4)</td><td>Resistance</td><td>20 – 30 Ω</td></tr>
<tr><td rowspan="2">g</td><td rowspan="2">Defective motor 2 solenoid (Internal short circuit)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Between T07 (male) (1) – T07 (male) (2)</td><td>Resistance</td><td>20 – 30 Ω</td></tr>
<tr><td rowspan="2">h</td><td rowspan="2">Defective fan reverse solenoid (Internal short circuit)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Between R59 (male) (1) – R59 (male) (2)</td><td>Resistance</td><td>35 – 45 Ω</td></tr>
<tr><td rowspan="3">i</td><td rowspan="3">Defective HST controller</td><td colspan="5">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td colspan="3">HST</td><td colspan="2">Voltage</td></tr>
<tr><td colspan="3">Between (1), (11) – ground</td><td colspan="2">20 – 30 V</td></tr>
</table>

Related circuit diagram

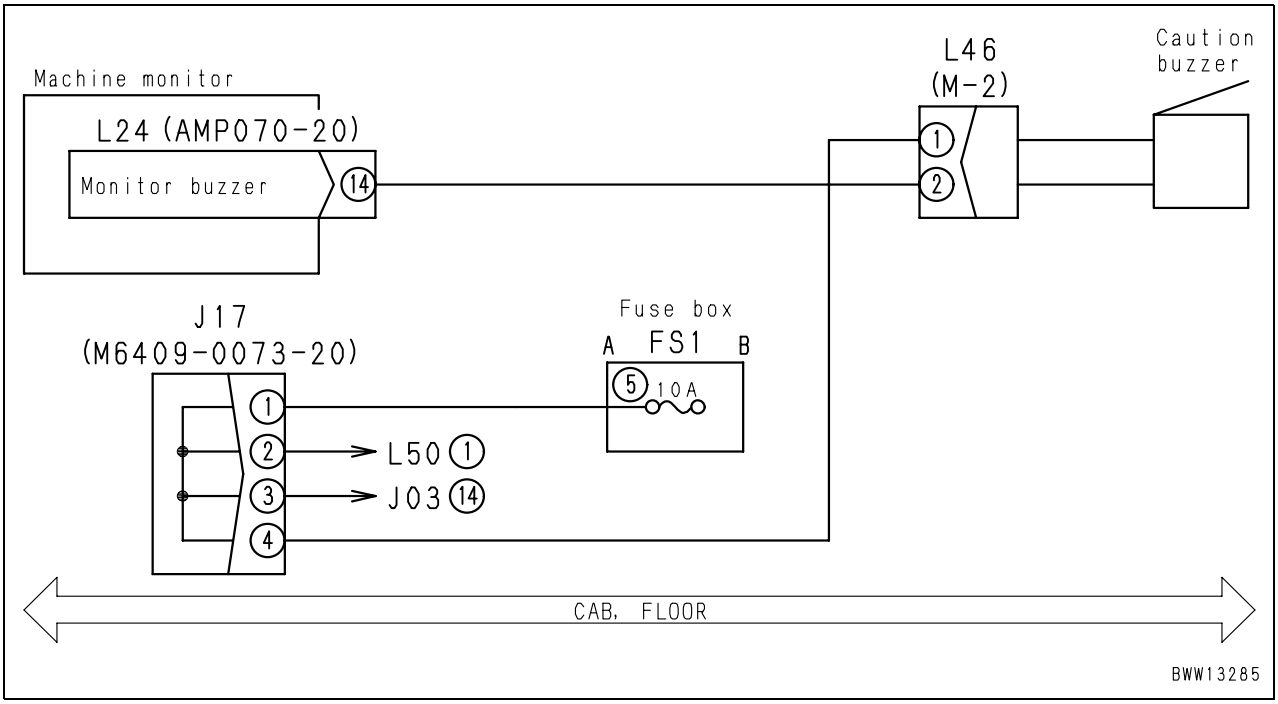


Related circuit diagram



<table>
<tr><td rowspan="17">Possible causes and standard value in normal state</td><td colspan="2">Causes</td><td colspan="4">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td rowspan="6">4</td><td rowspan="6">Disconnection in wiring harness
(Disconnection or defective contact in connector)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">Wiring harness between fuse No. 3 of fuse box (FS1) – L102 (female) (5) and ground</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Wiring harness between L102 (female) (3) – L15 (female) (1)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Wiring harness between HST (female) (15) – L15 (female) (4)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Wiring harness between HST (female) (5) – L15 (female) (3)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="2">Wiring harness between HST (female) (34) – L15 (female) (2)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="6">5</td><td rowspan="6">Grounding fault in wiring harness
(Contact with ground circuit)</td><td colspan="4">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="2">Wiring harness between fuse No. 3 of fuse box (FS1) – L102 (female) (5) and ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="2">Wiring harness between L102 (female) (3) – L15 (female) (1), circuit branch end and ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="2">Wiring harness between HST (female) (15) – L15 (female) (4), L126 (female) (13) and ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="2">Wiring harness between HST (female) (5) – L15 (female) (3), D01 (female) (5) and ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="2">Wiring harness between HST (female) (34) – L15 (female) (2) and ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="7">6</td><td rowspan="7">Defective HST controller</td><td colspan="4">★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.</td></tr>
<tr><td>HST</td><td>FNR (directional) lever</td><td colspan="2">Voltage</td></tr>
<tr><td rowspan="2">Between (5) and ground</td><td>N (Neutral)</td><td colspan="2">20 – 30 V</td></tr>
<tr><td>Other than above</td><td colspan="2">Max. 1 V</td></tr>
<tr><td rowspan="2">Between (34) and ground</td><td>F (Forward)</td><td colspan="2">20 – 30 V</td></tr>
<tr><td>Other than above</td><td colspan="2">Max. 1 V</td></tr>
<tr><td rowspan="2">Between (15) and ground</td><td>R (Reverse)</td><td colspan="2">20 – 30 V</td></tr>
<tr><td>Other than above</td><td colspan="2">Max. 1 V</td></tr>
</table>

Related circuit diagram

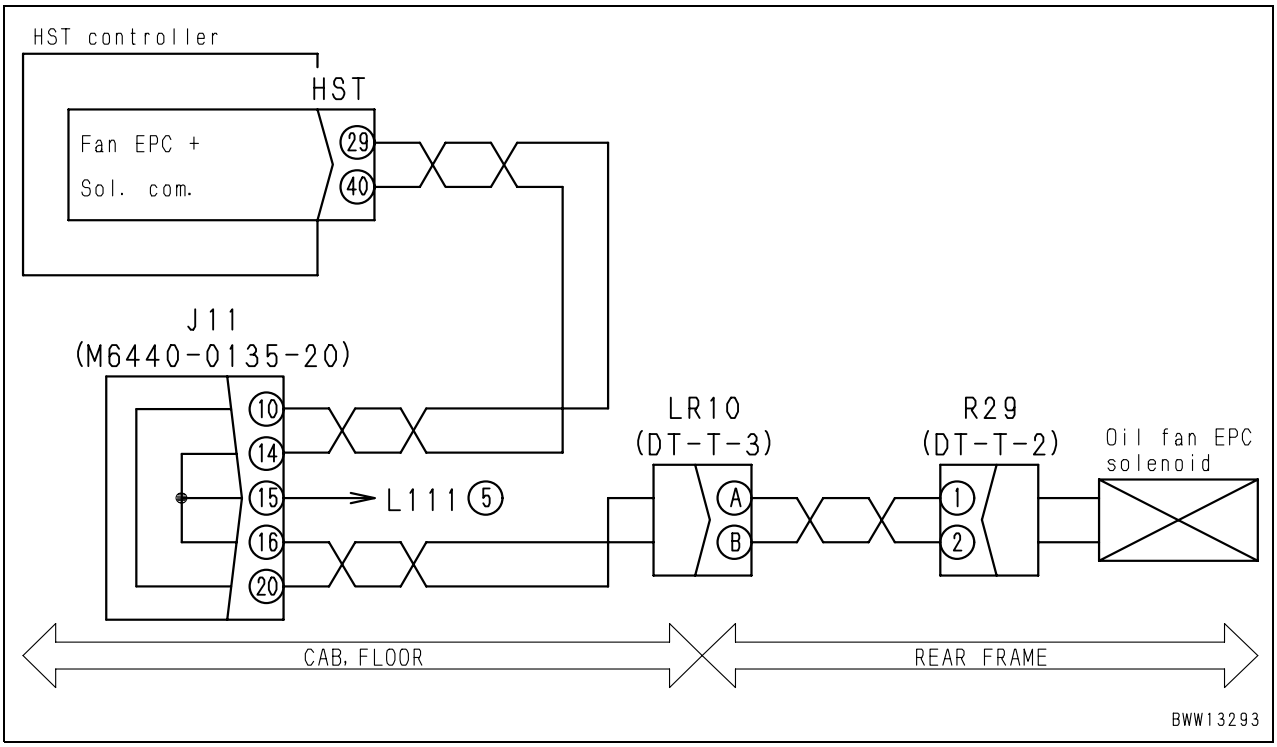


Failure code [DX16KB] Fan EPC solenoid: Ground fault

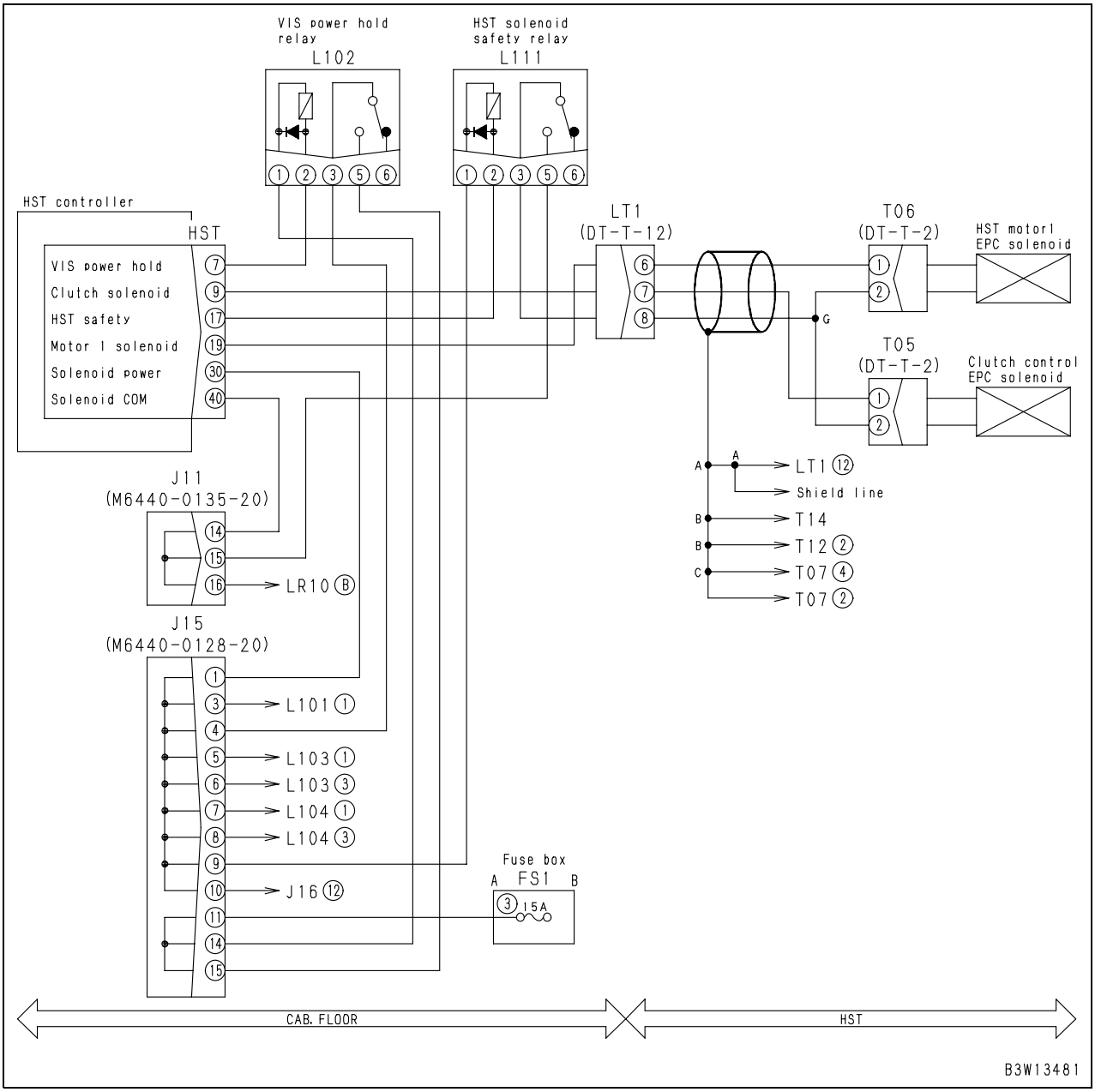
Action code	Failure code	Trouble	Fan EPC solenoid: Ground fault (HST controller system)
E01	**DX16KB**		
Contents of trouble	• Since the fan EPC solenoid system is shorted, abnormal current flows when the fan EPC solenoid output is ON.		
Action of controller	• Turns the output to the fan EPC solenoid OFF. • Even if cause of failure disappears, system does not reset itself until starting switch is turned OFF.		
Problem that appears on machine	• The fan speed is set to the maximum.		
Related information	• The output state (current) to the fan EPC solenoid can be checked with the monitoring function (Code: HST – 41400 – FAN EPC DIR). • Method of reproducing failure code: Turn the starting switch ON.		

	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective fan EPC solenoid (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			R29 (male)	Resistance		
			Between (1) – (2)	5 – 10 Ω		
			Between (1), (2) and ground	Min. 1 MΩ		
	2	Grounding fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between HST (female) (29) – R29 (female) (1) and ground	Resistance	Min. 1 MΩ	
	3	Defective HST controller	• If causes 1 – 2 are not detected, HST controller may be defective. (Since trouble is in system, troubleshooting cannot be carried out.)			

Related circuit diagram



Related circuit diagram

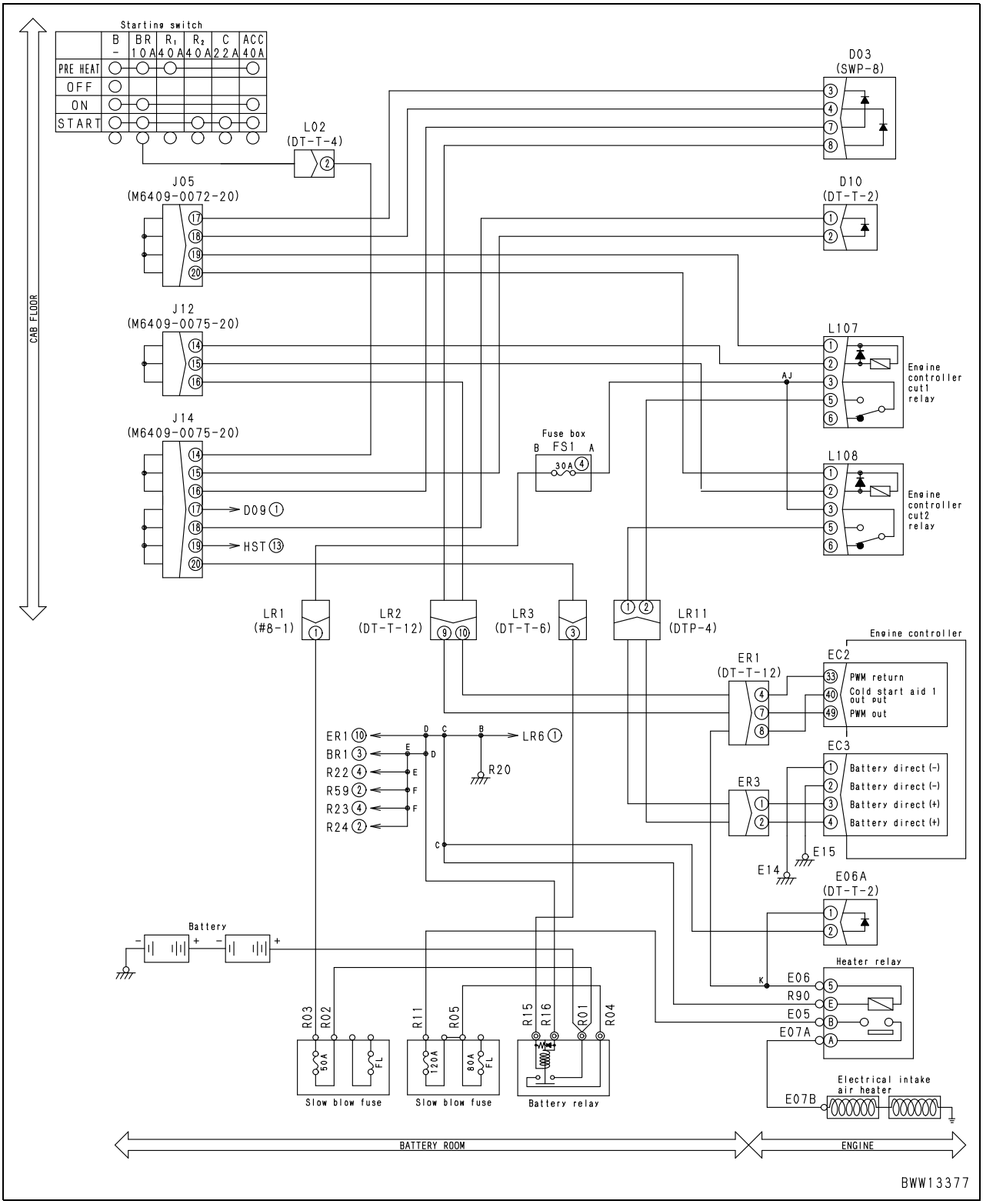


Failure code [M400N1] Motor 1: Overrun alarm

Action code	Failure code	Trouble	Motor 1: Overrun alarm (HST controller system)
E02	**M400N1**		
Contents of trouble	• HST motor 1 speed exceeded alarm operation set value.		
Action of controller	• Turns the centralized warning lamp and alarm buzzer ON.		
Problem that appears on machine	• HST motor 1 may be broken (If it is broken, machine cannot travel).		
Related information	• Advance alarm is turned ON before this code is displayed. • If HST motor 1 speed decreases below alarm reset value, system resets itself.		

Possible causes and standard value in normal state	Causes		Standard value in normal state/Remarks on troubleshooting
	1	HST motor 1 overrun	★ Give operator instructions to use engine in range where alarm is not turned ON.

Related circuit diagram



E-5 ECSS keeps operating

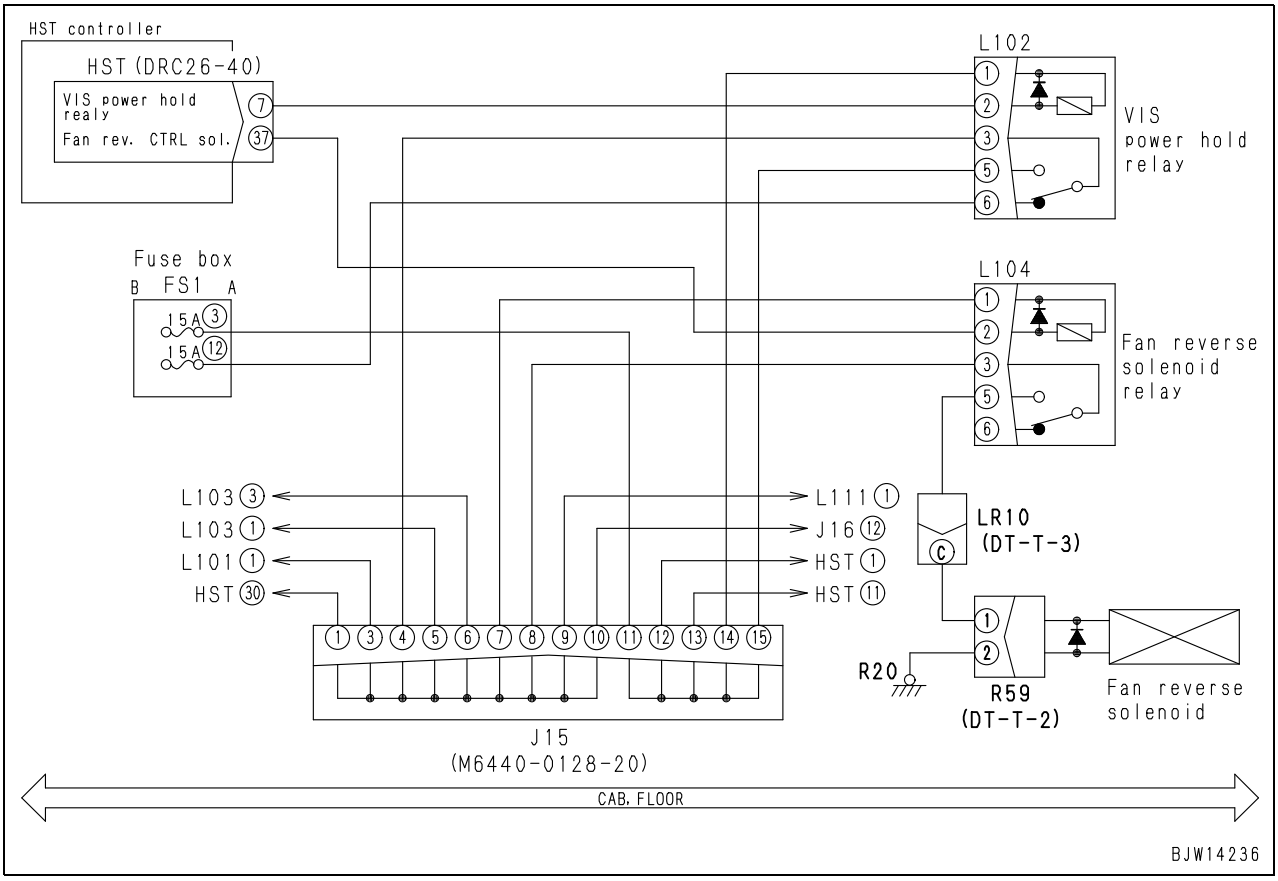
Contents of trouble	• When ECSS switch is turned OFF, ECSS keeps operating. • When ECSS switch is turned ON, ECSS operates even at low travel speed (4 km/h or below).
Related information	• Output state (ON/OFF) to ECSS solenoid relay can be checked with monitoring function. (Monitoring code: MONITOR PANEL – 40952 – D-OUT-3) • Input state (ON/OFF) from ECSS switch can be checked with monitoring function. (Monitoring code: MONITOR PANEL – 40901 – D-IN-8)

	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective ECSS switch (Internal defect)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			L09 (male)	Switch position	Resistance	
			Between (5) – (6)	ON	Max. 1 Ω	
				OFF	Min. 1 MΩ	
			Between (5), (6) – another terminal	– (Always)	Min. 1 MΩ	
			★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between L110 (male) (1) – (2)		Resistance	200 – 400 Ω
	2	Defective ECSS solenoid relay (L110) (Internal defect)	★ Prepare with starting switch OFF, then start engine and carry out troubleshooting.			
			Replace ECSS solenoid relay (L110) with another relay.	Condition becomes normal.	Relay (L110) is defective.	
				Condition does not become normal.	Relay (L110) is normal.	
			★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between L110 (male) (1) – (2)		Resistance	200 – 400 Ω
	3	Defective ECSS solenoid (Internal defect)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between F07 (male) (5) – (6)		Resistance	15 – 30 Ω
	4	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between fuse box FS-2, No. 9 – L09 (female) (6)		Resistance	Max. 1 Ω
			Wiring harness between L09 (female) (5) – L25 (female) (5), L110 (female) (1), (3)		Resistance	Max. 1 Ω
			Wiring harness between L24 (female) (11) – L110 (female) (2)		Resistance	Max. 1 Ω
			Wiring harness between L110 (female) (5) – F07 (female) (1)		Resistance	Max. 1 Ω
			Wiring harness between F07 (female) (2) – ground		Resistance	Max. 1 Ω
	5	Ground fault in wiring harness (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Between wiring harness L24 (female) (11) – L110 (female) (2) and ground		Resistance	Min. 1 MΩ
			Reference: If above is defective, ECSS operates when ECSS switch is turned ON even at low travel speed (4 km/h or below).			

	Causes		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	5	Wiring harness discontinuity (Disconnection or defective contact)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between F04 (female) (A) and fuse (FS1) (13)	Resistance	Max. 1 Ω
			Wiring harness between F04 (female) (B) and L113 (female) (2)	Resistance	Max. 1 Ω
			Wiring harness between F04 (female) (C) and ground	Resistance	Max. 1 Ω
			Wiring harness between L113 (female) (1), (3) and L115 (female) (5)	Resistance	Max. 1 Ω
			Wiring harness between L115 (female) (3) and fuse FS1 (13)	Resistance	Max. 1 Ω
			Wiring harness between L113 (female) (5) and L35 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between L35 (female) (2) and ground	Resistance	Max. 1 Ω
			Wiring harness between E02 (female) (1) – L115 (female) (1)	Resistance	Max. 1 Ω
			Wiring harness between L115 (female) (2) – ground	Resistance	Max. 1 Ω
			★ With all the above items, the boom kick-out does not function		
	6	Wiring harness ground fault (Contact with GND circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between F04 (female) (B) and L113 (female) (2) and ground	Resistance	Min. 1 MΩ
			Wiring harness between L113 (female) (5) and L35 (female) (1) and ground	Resistance	Min. 1 MΩ
			★ In this case, the boom kick-out detent does not function (lever returns to neutral)		
			Wiring harness between F04 (female) (A) and fuse (FS1) (13) and ground	Resistance	Min. 1 MΩ
			Wiring harness between L113 (female) (1) (3) and L115 (female) (5) and ground	Resistance	Min. 1 MΩ
			Wiring harness between L115 (female) (3) and fuse FS1 (13) and ground	Resistance	Min. 1 MΩ
			Wiring between harness E02 (female) (1) – L115 (female) (1) and ground	Resistance	Min. 1 MΩ
			★ In this case, the fuse is blown and no detents function (lever returns to neutral)		
	7	Hot short-circuiting between harnesses (Contact with 24V circuit)	★ Prepare with starting switch OFF, turn starting switch ON and carry out troubleshooting.		
			Wiring harness between L113 (female) (5) and L35 (female) (1) and ground	Voltage	Max. 1 V
			★ In this case, the boom kick-out does not function (lever does not return to neutral)		
			Wiring between harness L113 (female) (1), (3) – L115 (female) (5) and ground	Voltage	Max. 1 V
			★ In this case, lift arm detent operates even if engine is stopped.		

Possible causes and standard value in normal state	Causes		Standard value in normal state/Remarks on troubleshooting		
	4	Defective machine monitor or HST controller	★ Prepare with starting switch OFF, then start engine, operate cooling fan reverse switch, and carry out troubleshooting.		
			HST	Indicator	Voltage
			Between (37) – ground	OFF	20 – 30 V
				ON	Max. 1 V

Related circuit diagram



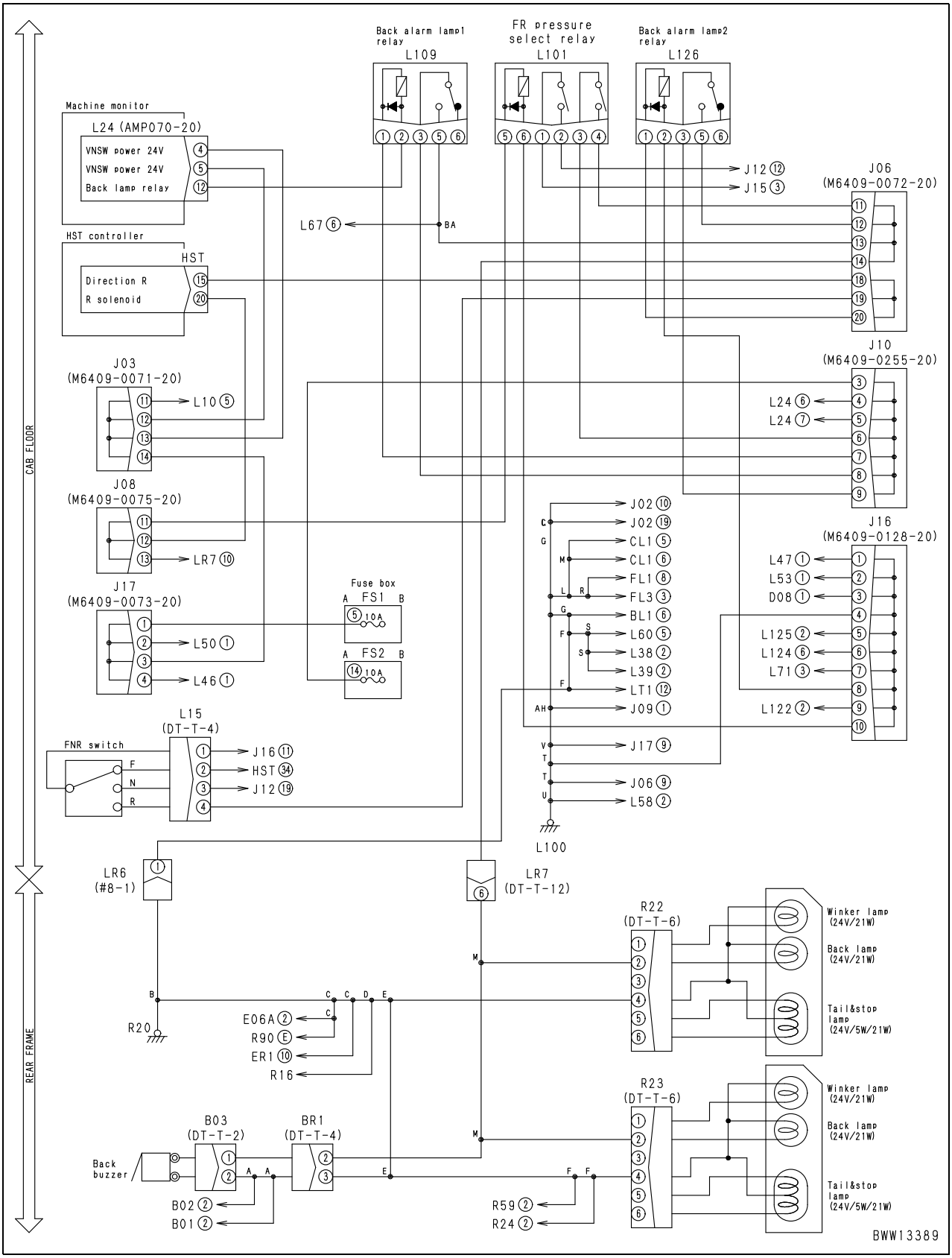
Contents of trouble	(3) Headlamp (low beam) does not light up or go off.
Related information	• The switch, lamp, or wiring harness of the headlamp (low beam) is disconnected or shorted with the ground. • Carry out the following troubleshooting when the high beam lights up (goes off) normally. • The input state (ON/OFF) to the machine monitor from the lamp switch (head lamp) can be checked with the monitoring function (Code: MONITOR PANEL 40900, D-IN-0). • The input state (ON/OFF) to the machine monitor from the dimmer switch (high beam) can be checked with the monitoring function (Code: MONITOR PANEL 40904, D-IN-34).

<table>
<tr><td rowspan="12">Possible causes and standard value in normal state</td><td colspan="2">Causes</td><td colspan="5">Standard value in normal state/Remarks on troubleshooting</td></tr>
<tr><td>1</td><td>Broken bulb</td><td colspan="5">If a specific headlamp does not light up, its bulb may be broken or may have a defective contact. Check the bulb directly.</td></tr>
<tr><td rowspan="5">2</td><td rowspan="5">Defective dimmer switch (Internal defect)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td>L04 (male)</td><td colspan="2">Dimmer switch</td><td colspan="2">Resistance</td></tr>
<tr><td rowspan="2">Between (5) and (3)</td><td colspan="2">Low</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td colspan="2">High</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td rowspan="2">Between (4) and (3)</td><td colspan="2">Low</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td colspan="2">High</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Disconnection in wiring harness (Disconnection or defective contact in connector)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Wiring harness between FLH (female) (A) – L04 (female) (5)</td><td>Resistance</td><td>Max. 1 Ω</td></tr>
<tr><td colspan="5">Reference: Connector "FLH" is installed to both right and left sides.</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Ground fault in wiring harness (Contact with ground circuit)</td><td colspan="5">★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.</td></tr>
<tr><td colspan="3">Wiring harness between FLH (female) (A) – L04 (female) (4) and ground</td><td>Resistance</td><td>Min. 1 MΩ</td></tr>
<tr><td colspan="5">Reference: Connector "FLH" is installed to both right and left sides.</td></tr>
</table>

Contents of trouble	(2) Turn signal lamp does not light up or go off.
Related information	• The switch, lamp, or wiring harness of the turn signal lamp system is defective. • When the hazard lamp lights up. • The input state (ON/OFF) to the machine monitor from the turn signal lamp and hazard lamp switch (right turn signal lamp) can be checked with the monitoring function (Code: MONITOR PANEL 40901, D-IN-12). • The input state (ON/OFF) to the machine monitor from the turn signal lamp and hazard lamp switch (left turn signal lamp) can be checked with the monitoring function (Code: MONITOR PANEL 40901, D-IN-13).

	Causes		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Broken bulb	If a specific turn signal lamp does not light up, its bulb may be broken or may have a defective contact. Check the bulb directly.			
	2	Defective turn signal lamp switch (Internal defect)	L04 (male)	Turn signal lamp switch	Resistance	
			Between (6) and (7)	Left	Min. 1 MΩ	
				Right	Max. 1 Ω	
			Between (6) and (8)	Left	Max. 1 Ω	
				Right	Min. 1 MΩ	
	3	Defective hazard relay (L125)	★ Prepare with starting switch OFF, then check relay unit.			
			Between L125 (female) (3) – (6)		Resistance	Max. 1 Ω
	4	Disconnection in wiring harness (Disconnection or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between fuse box FS1 No. 10 – L125 (female) (6)		Resistance	Max. 1 Ω
			Wiring harness between L49 (female) (4) – L04 (female) (6)		Resistance	Max. 1 Ω
			Wiring harness between L04 (female) (7) – R23 (female) (1), – FLC (female) (C)		Resistance	Max. 1 Ω
			Wiring harness between L04 (female) (8) – R22 (female) (1), – FLC1 (female) (C)		Resistance	Max. 1 Ω
			Wiring harness between R22 (female) (4) – ground		Resistance	Max. 1 Ω
			Wiring harness between R22 (female) (4) – ground		Resistance	Max. 1 Ω
			Wiring harness between FLC (female) (B) – ground		Resistance	Max. 1 Ω
			Wiring harness between FLC1 (female) (B) – ground		Resistance	Max. 1 Ω
	5	Ground fault in wiring harness (Contact with ground circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between fuse box FS1 No. 10 – L125 (female) (6) and ground		Resistance	Min. 1 MΩ

Related circuit diagram



WHEEL LOADER

WA200-6
WA200PZ-6

Machine model	Serial number
WA200-6	70001 and up
WA200PZ-6	70001 and up

40 Troubleshooting

500 Troubleshooting of hydraulic and mechanical system (H-mode)

H-6 The steering wheel does not turn

Ask the operator about the following:

- Did the problem suddenly start?
  → **Breakage of steering related equipment**
- Was there previously any symptom, such as heavy steering?
  → **Internal wear of steering related equipment, defective seal**

Inspection before diagnosis

- Are the oil level in the hydraulic tank and the oil type appropriate?
- Has the lock bar been removed from frame?

No.	Diagnosis \ Remedy	Cause: Hydraulic pump a: Defective hydraulic pump or PTO Steering pump and switch pump	Cause: Hydraulic pump a: Steering	Cause: Others b: Priority valve: Spool	Cause: Others b: Priority valve: Relief valve	Cause: Others c: Orbit-roll	Cause: Others d: Internal defective steering cylinder (Defective piston seal)	Cause: Others e: 2-way restrictor valve	Cause: Others f: Emergency steering valve (*1)
		a	△ X	b	b	c	d	e	f
1	Steering wheel does not turn in both directions (left and right)		○	○	○	○	○	○	
2	In condition in Item 1, movement of work equipment is abnormal		○						
3	In condition in Item 1, movement of work equipment is normal			○					
4	Steering wheel turns only in one direction (left or right)					○	○	○	
5	Steering wheel is heavy and does not turn		○	○	○	○			
6	Oil pressure of steering circuit is low or there is no pressure					○			
7	Emergency steering does not function in both directions (left and right)								○

★ There is a close connection between the steering circuit and work equipment circuit, so if any abnormality is felt in the steering, check the operation of the work equipment also.
★ If the steering pump is abnormal (broken), check the priority valve at the same time.
*1. This warning is given only when the emergency steering is installed.

H-25 When the control lever is switched from “HOLD” to “TILT,” the bucket falls temporarily

Check of Phenomenon

- When the control lever is switched from “HOLD” to “TILT” gradually at low idle of the engine, the bucket falls temporarily due to its own weight. When the control lever is completely set to “TILT,” the bucket returns to normal.

Cause

- Improper adhesion of bucket spool check valve of the work equipment valve

H-26 The control levers of the lift arm and bucket do not move smoothly and heavy

Check of Abnormality

- Refer to the criterion value table and check if the lever operating efforts are large practically.

		Cause
		PPC valve
		a
		C Defective operation of spool
No.	**Remedy** / **Diagnosis**	△
1	Becomes heavy in some places during operation regardless of oil pressure and oil temperature	○
2	Becomes heavy overall during operation regardless of oil pressure and oil temperature	○

c) Exhaust smoke comes out but engine does not start (fuel is being injected)

General causes why exhaust smoke comes out but engine does not start

- Lack of rotating force due to defective electrical system
- Insufficient supply of fuel
- Insufficient intake of air
- Improper selection of fuel

			Causes												
			Clogged air cleaner element	Worn dynamic valve system (Valve, rocker lever, etc.)	Worn piston ring, cylinder	Use of improper fuel	Clogged air breather hole of fuel tank cap	Leaking or clogged fuel system, entry of air	Clogging of fuel filter	Stuck, seized supply pump plunger	Clogged injector, defective spray	Defective, deteriorated battery	Defective coolant temperature sensor, wiring harness	Defective intake air heater system
Questions / Check items	Confirm recent repair history														
	Degree of use of machine	Operated for long period			△				△		△				
	Suddenly failed to start			◎						◎			○		
	Non-specified fuel is being used									○	○				
	Replacement of filters has not been carried out according to Operation and Maintenance Manual		◎						◎						
	Oil must be added more frequently				◎										
	When engine is preheated or when temperature is low, preheating monitor does not indicate normally														◎
	Dust indicator is red		◎												
	Air breather hole of fuel tank cap is clogged						○								
	Rust and water are found when fuel tank is drained								◎						
	Fuel is leaking from fuel piping							◎							
	When priming pump is operated, it makes no reaction or it is heavy							◎	○						
	Starting motor cranks engine slowly											◎			
	When engine is cranked, abnormal sound is generated around cylinder head			◎											
	While engine is cranked with starting motor,	If air bleeding plug of fuel filter is removed, fuel does not flow out				○			◎						
		If spill hose from injector is disconnected, little fuel spills								◎					
Troubleshooting	Inspect air cleaner directly		●												
	Inspect dynamic valve system directly			●											
	When compression pressure is measured, it is found to be low				●										
	When air is bled from fuel system, air comes out							●							
	Inspect fuel filter directly								●						
	Carry out troubleshooting according to “No-pressure feed by supply pump (*1)” in display of code									●					
	When specific gravity of electrolyte and voltage of battery are measured, they are low											●			
	Coolant temperature gauge does not indicate normally												●		
	When starting switch is turned to HEAT, intake air heater mount does not become warm														●
		Remedy	Clean	Replace	Replace	Replace	Clean	Correct	Replace	Replace	Replace	Replace	Replace	Replace	Replace

*1: Failure code [CA559] and [CA2249] in the display of code

S-14 Coolant temperature becomes too high (overheating)

General causes why coolant temperature becomes too high

- Lack of cooling air (deformation, damage of fin)
- Drop in heat dissipation efficiency
- Problem in coolant circulation system
- Rise in oil temperature in power train
  → Carry out troubleshooting on applicable machine

			Causes													
			Broken cylinder head, head gasket	Cracks inside cylinder block	Holes caused by pitting	Clogged, broken oil cooler	Lack of coolant	Broken fan pulley bearing	Defective operation of thermostat	Clogged, crushed radiator fins	Clogged radiator core	Defective radiator cap (pressure valve)	Slipping fan belt, worn fan pulley	Defective coolant temperature gauge	Rise in power train oil temperature
Questions	Confirm recent repair history														
	Degree of use of machine	Operated for long period	△		△					△	△				
	Condition overheating	Sudden overheated					○	◎					○		
		Always tends to overheat		○					○	◎	◎		○		
	Coolant temperature gauge	Rises quickly		○			○		◎						
		Does not go down from red range												◎	
Check items	Radiator coolant level monitor indicates drop of coolant level			○			◎								
	Engine oil level has risen, oil is milky			◎	◎	○									
	Fan belt tension is low												◎		
	When fan pulley is turned, it has play							◎							
	Milky oil is floating on coolant			○	○	◎									
	There are excessive air bubbles in radiator, coolant spurts back		◎												
	When light bulb is held behind radiator core, no light passes through									◎					
	Radiator shroud, inside of underguard are clogged with dirt or mud									◎			◎		
	Coolant is leaking because of cracks in hose or loose clamps						◎								
	Coolant flows out from radiator overflow hose											◎			
	Fan belt whines under sudden acceleration												◎		
	Power train oil temperature enters red range faster than engine coolant temperature														◎

Troubleshooting	When compression pressure is measured, it is found to be low	●												Check directly
	Inspect cylinder block directly		●	●										
	Inspect oil cooler directly				●									
	Temperature difference between upper and lower tanks of radiator is large						●							
	When operation of thermostat is carried out, it does not open at cracking temperature							●						
	Temperature difference between upper and lower tanks of radiator is slight								●					
	Inspect radiator core directly									●				
	When operation of radiator cap is carried out, its cracking pressure is low										●			
	Inspect fan belt, pulley directly											●		
	When coolant temperature is measured, it is found to be normal												●	
Remedy		Replace	Replace	Replace	Replace	Add	Replace	Replace	Correct	Correct	Replace	Correct	Replace	—

Component	Symbol		Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch	Nature of work, remarks
Differential assembly	H	23	791T-465-1210	Push tool	■	1		○	Removal of shaft
		24	790-201-3260	Bolt (12 x 1.75 mm)	●	2			Removal and installation of upper cover and bearing carrier
		25	791-615-2130	Sleeve	■	1			Removal of pinion gear assembly
		26	Commercially available	Puller	●	1			Removal of carrier bearing
		27	79G-05V-1400	Bar	■	1			Removal of differential case bearing outer race
		28	792T-413-1120	Push tool	■	1		○	Assembly of limited slip differential assembly
		29	Commercially available	Depth gauge	●	1			Selection of plate thickness
		30	Commercially available	Torque wrench	●	1			Measurement of no-load operation torque of sun gear shaft
		31	Commercially available	Dial gauge	●	1			Measurement of backlash of bevel gear
		32	790-201-2830	Spacer	■	1			Installation of long cage shaft bearing
		33	791-126-0211	Adapter	■	1			Installation of long cage shaft assembly
		34	Commercially available	Depth micrometer	●	1			Adjustment of trunnion cap shim
Center hinge pin	J	1	791-830-1410	Push tool	■	1			Press fitting of bearing to front frame and upper hinge
		2	791-630-1260	Push tool	■	1			Press fitting of bearing to front frame and lower hinge
		3	Commercially available	Thickness gauge	●	1			Measurement of clearance between front frame and retainer
Piston pump and motor assembly	S	1	790-201-2720	Push tool	●	1			Disassembly, assembly of piston pump and motor
		2	790-201-2150	Push tool	■	1			
			790-201-2830	Push tool	■	1			
		3	790-201-2740	Push tool	●	1			
		4	02010-20783	Bolt	●	1			
		5	790-201-2740	Push tool	■	1			
			793T-417-1120	Push tool	●	1			
			02010-20783	Bolt	●	1			
Hydraulic cylinder assembly	U	1	790-502-1003	Repair stand	■	1			Disassembly, assembly of hydraulic cylinder
			790-101-1102	Hydraulic pump	■	1			
		2	790-102-3802	Wrench assembly	■	1			Removal, installation of cylinder head
		3	790-102-1320	Socket (Lift)	■	1			Removal, installation of piston nut
			790-102-1330 or Commercially available	Socket (Bucket) (Width across flats: 46 mm)	■	1			
			790-302-1280	Socket (Steering)	■	1			
		4	790-201-1702	Push tool kit	■	1			Press fitting of cylinder head bushing
			790-101-5021	• Grip		1			
			01010-50816	• Bolt		1			
			790-201-1791	• Push tool (Lift, bucket)		1			
			790-201-1811	• Push tool (Steering)		1			

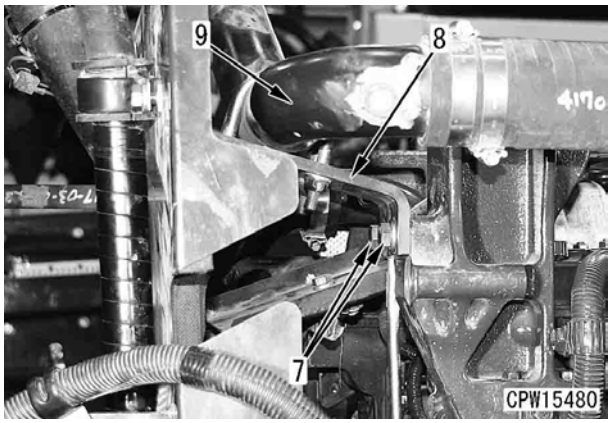
WHEEL LOADER

WA200-6
WA200PZ-6

Machine model	Serial number
WA200-6	70001 and up
WA200PZ-6	70001 and up

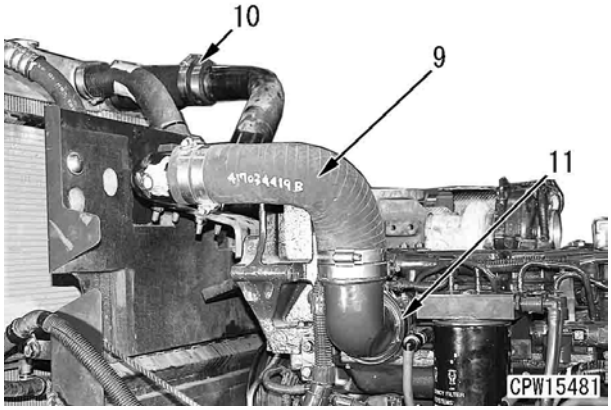
50 Disassembly and assembly
200 Engine and cooling system

8. Remove 2 bracket mounting bolts (7).
   ★ Remove bracket (8) and air tube and hose assembly (9) together.

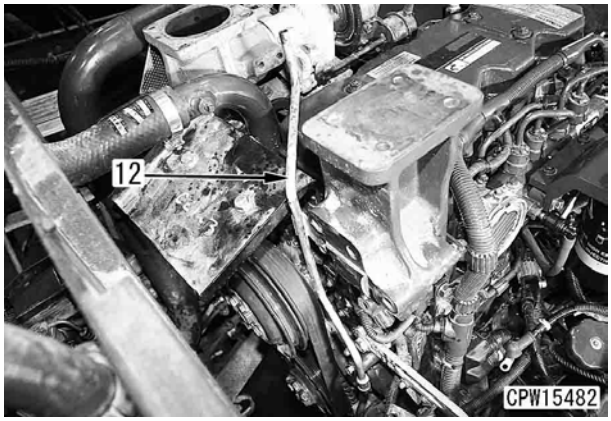


9. Remove hose clamp (10) and tube clamp (11). [*3]

10. Disconnect air tube and hose assembly (9) between the air aftercooler and intake manifold.



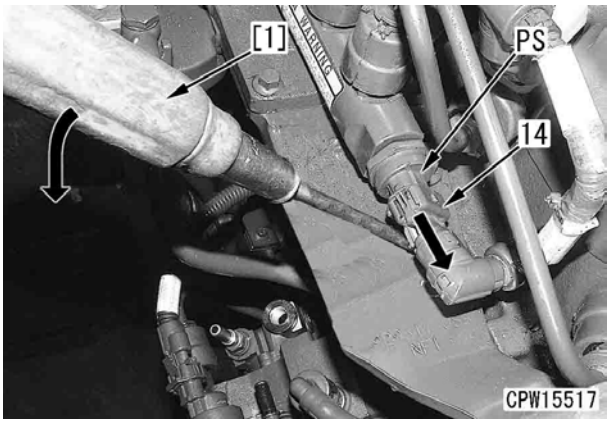
11. Remove water drain tube (12).

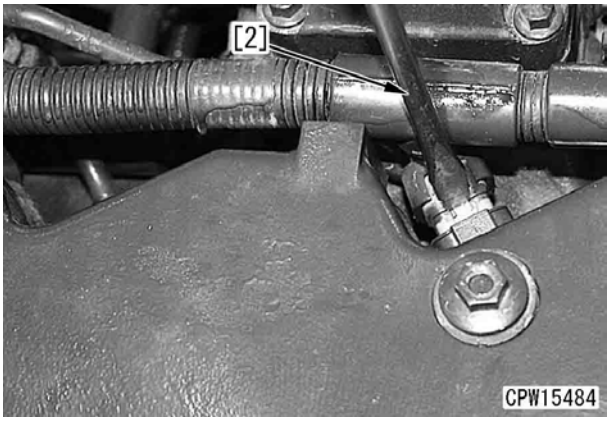


12. Remove 2 wiring harness clamps (13).

13. Disconnect wiring harness connector (14).
   ★ While pressing up the lock of wiring harness connector (14) with flat-head screwdriver [1], pull the connector in the direction of the arrow.
   ★ Do not remove fuel pressure sensor (PS) if it does not need to be replaced.

14. Disconnect wiring harness connectors CN-INJ1 (15) and CN-INJ2 (16). [*4]
   ★ While pressing the lock of the wiring harness connector with flat-head screwdriver [2], pull the connector.
   ★ Move wiring harness (17) toward the intake manifold.





Removal and installation of engine hood assembly

Removal

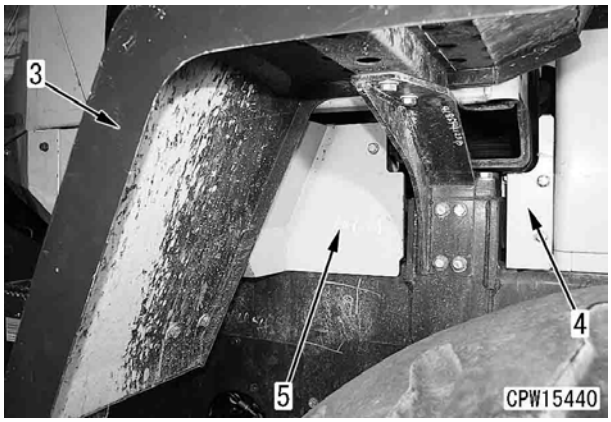
- **Stop the machine on a level ground and install the lock bar to the frame to fix the front and rear frames.**
- **Lower the work equipment to the ground, stop the engine, apply the parking brake, and put chocks under the tires.**
- **Disconnect the cable from the negative (–) terminal of the battery.**

1. Open and fix right and left engine side covers (1).
   ★ Check that the covers are locked securely.

2. Open radiator grille (2).

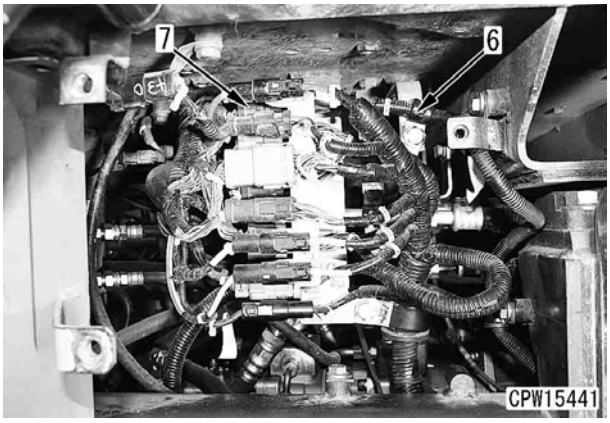
3. Remove right and left fenders (3).

4. Remove right and left covers (4) and (5).

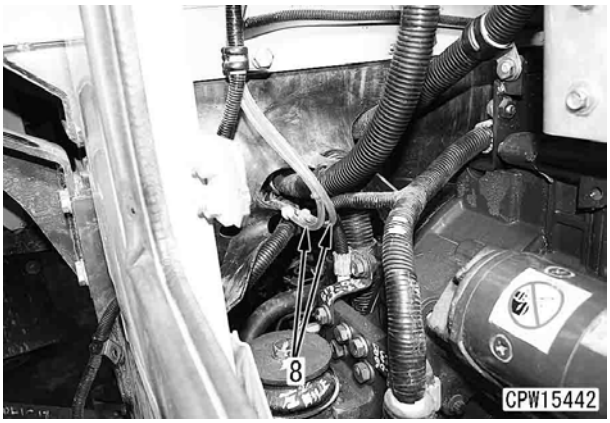


5. Remove 4 wiring harness clamps (6) under the left of the cab floor.

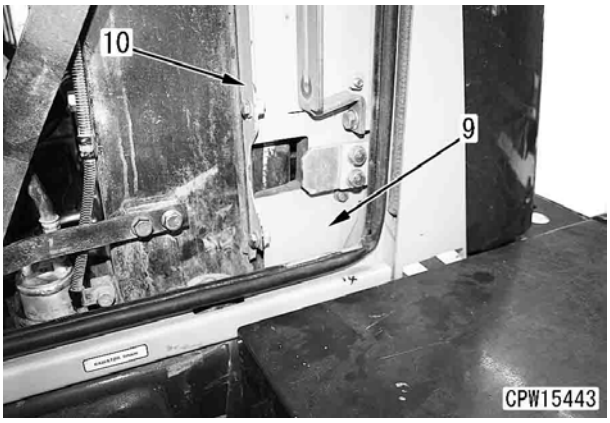
6. Disconnect washer motor wiring harness connector (7).



7. Disconnect 2 washer hoses (8) from the left side of the engine compartment.



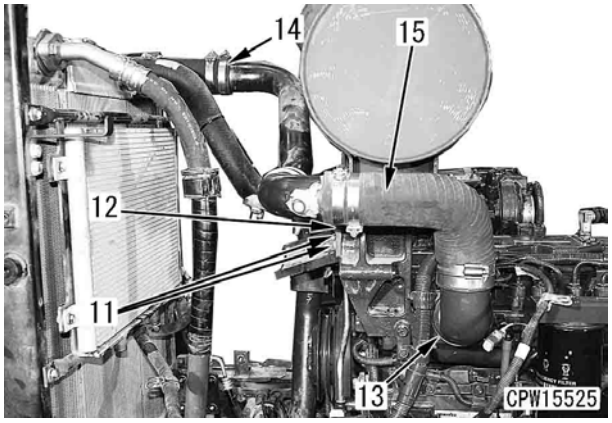
8. Remove right and left plates (9) and (10).



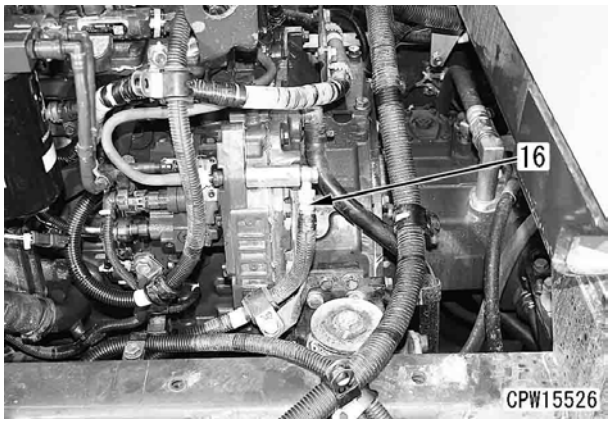
12. Remove 2 bracket mounting bolts (11).

13. Remove tube clamp (13) and hose clamp (14). [*2]

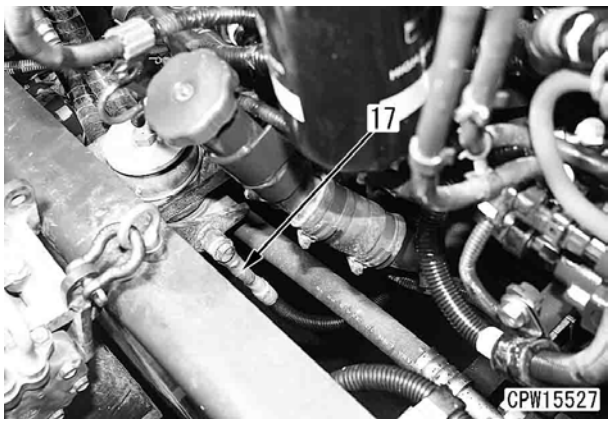
14. Disconnect air tube and hose assembly (15) between the air aftercooler and intake manifold.
    ★ Remove bracket (12) and air tube and hose assembly (15) together.



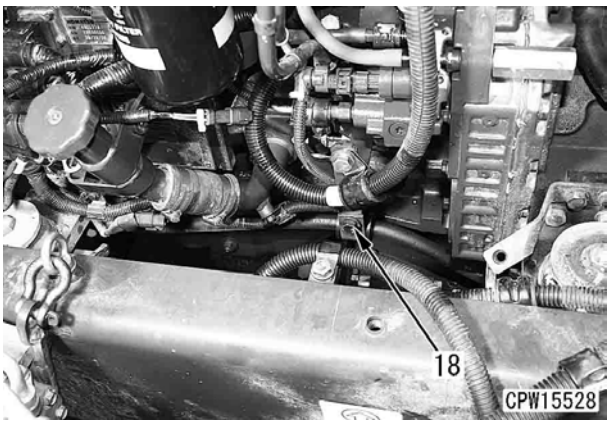
15. Disconnect fuel hose (16).



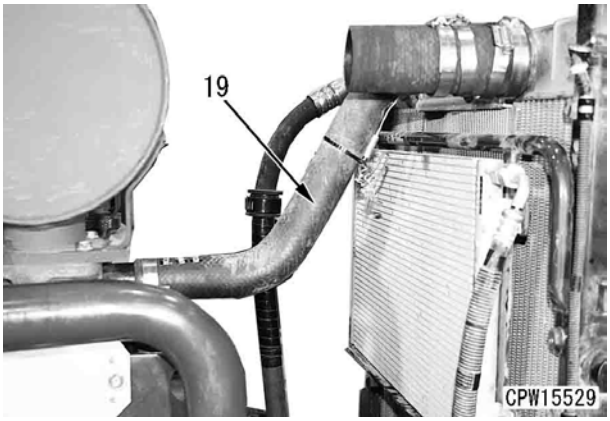
16. Disconnect engine ground cable (17) on the left side of the engine compartment. [*3]



17. Remove 3 cooling fan motor hose clamps (18).



18. Disconnect radiator upper hose (19). [*4]



Removal and installation of cooling fan and fan motor assembly

Special tools

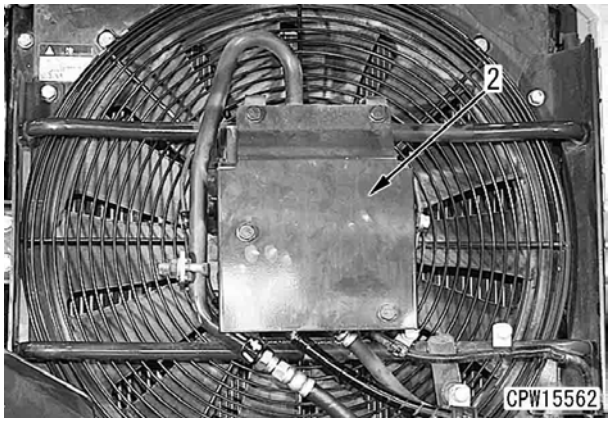
Symbol		Part No.	Part name	Necessity	Q'ty	New/Remodel	Sketch
A	**8**	791-415-2002	Remover	■	1		

Removal

- ⚠ **Stop the machine on a level ground and install the lock bar to the frame to fix the front and rear frames.**
- ⚠ **Lower the work equipment to the ground, stop the engine, apply the parking brake, and put chocks under the tires.**
- ⚠ **Disconnect the cable from the negative (–) terminal of the battery.**

1. Open radiator grille (1).

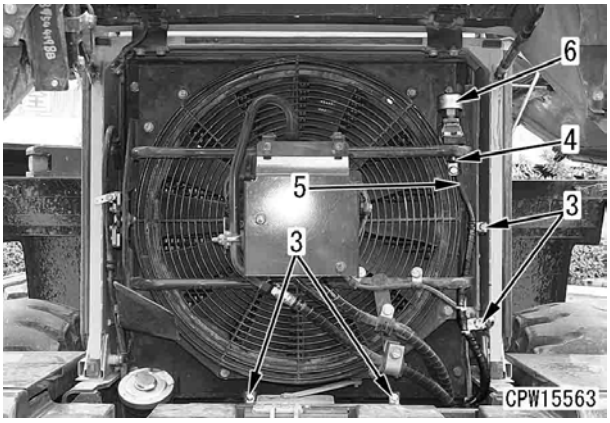
2. Remove cover (2).



3. Remove 4 fuel tank breather hose clamps (3).

4. Remove clip (4) and disconnect hose (5) from breather (6).

5. Remove breather (6).



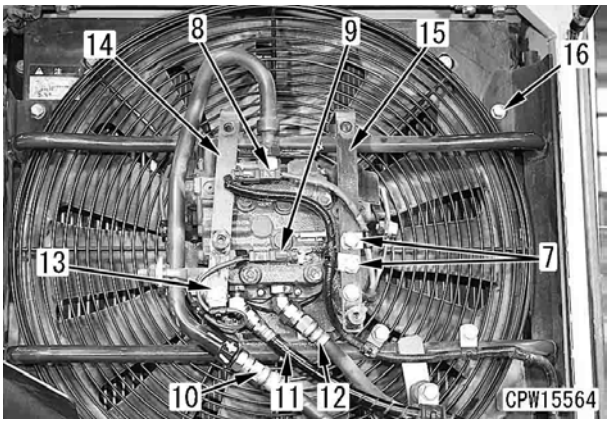
6. Remove 2 wiring harness clamps (7).

7. Disconnect wiring harness connectors CN-R59 (8) and CN-R29 (9).

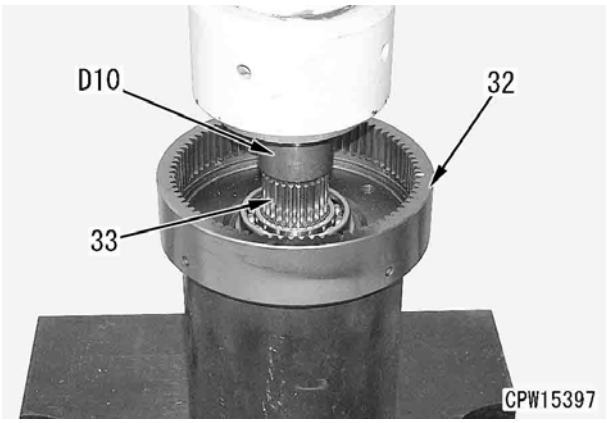
8. Disconnect P port hose (10), TC port hose (11) and T port hose (12).
   ★ Plug the disconnected hoses and ports to prevent oil leakage.

9. Remove wiring harness clamp (13) and brackets (14) and (15).

10. Remove 4 shroud mounting bolts (16). [*1]

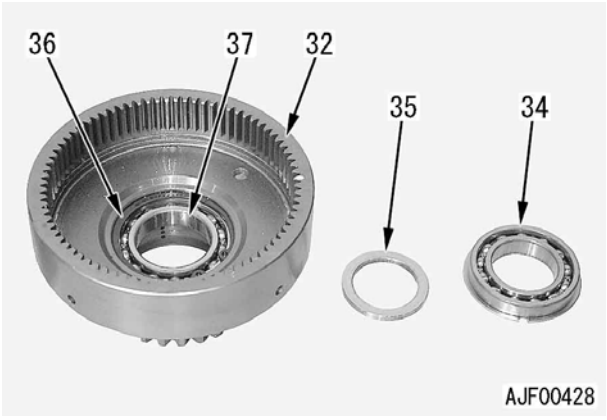


4) Supporting ring gear (32) and using tool **D10** and a press, push out HST motor 1 shaft (33).



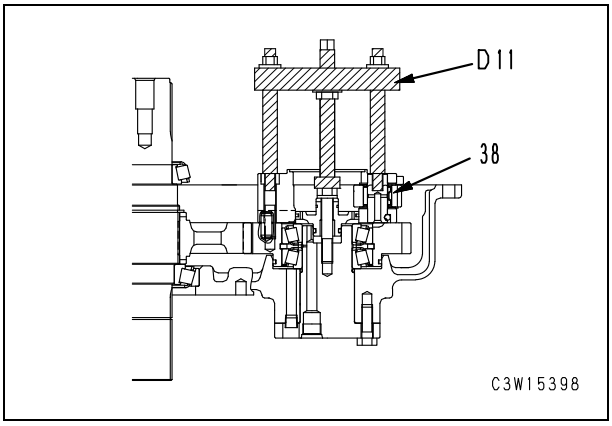
5) Remove bearing (34) and spacer (35) from ring gear (32).

6) Remove snap ring (36) and bearing (37).



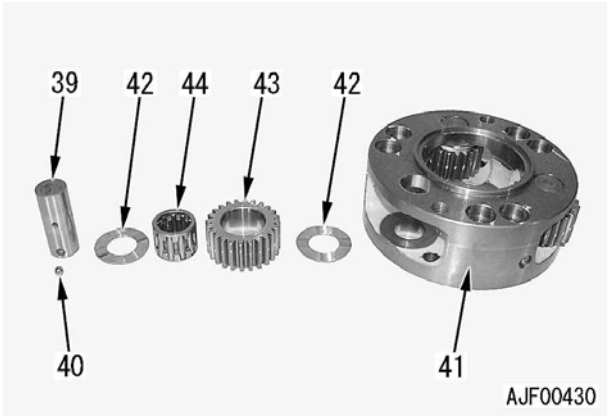
18. Removal of carrier assembly

1) Using tool **D11**, remove carrier assembly (38) from the dowel pin of the HST motor 1 gear.



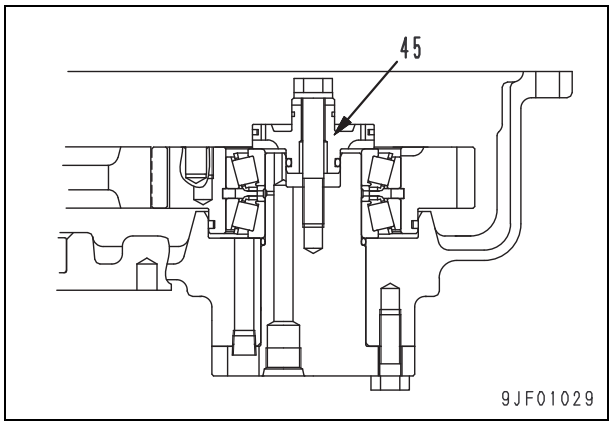
19. Disassembly of carrier assembly

1) Press shaft (39) and remove ball (40) and pinion shaft (39) from carrier (41).
   ★ Keep the ball carefully.
2) Remove 2 thrust washers (42), planetary gear (43), and bearing (44) (at 3 places).

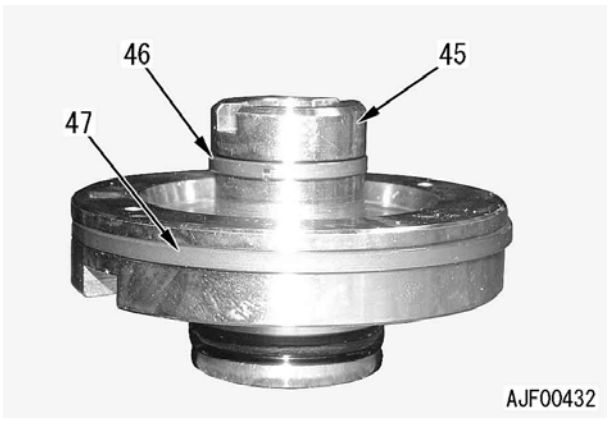


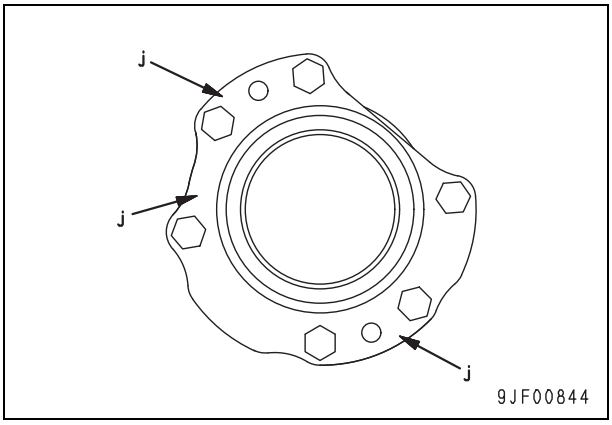
20. Holder

1) Remove the mounting bolts and holder (45).

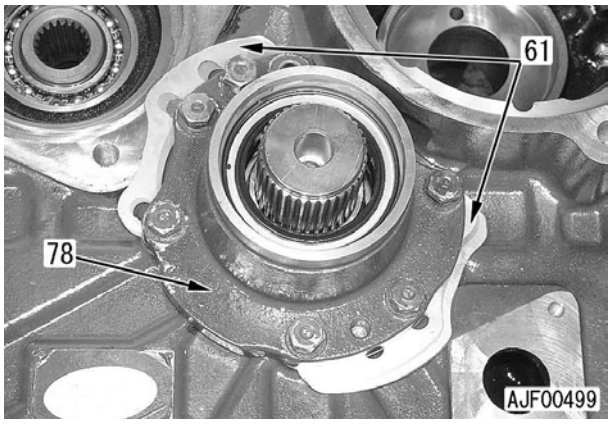


2) Remove seal rings (46) and (47) from holder (45).

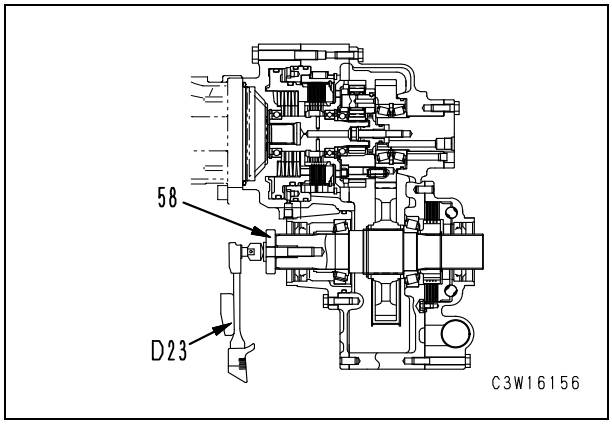




4) Calculate shim thickness (t).
   - Shim thickness (t) = Average of clearance (k) + (0.15 mm to 0.20 mm)
5) Insert selected shims (61) between cage (78) and the front case.
6) Tighten the cage mounting bolts.
   Mounting bolt:
   98 – 123 Nm {10.0 – 12.5 kgm}

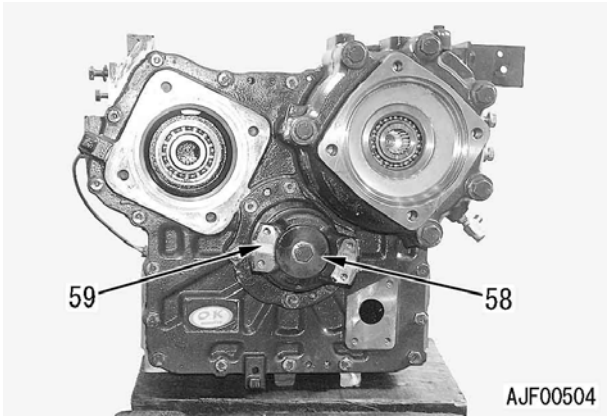


7) Install holder (58) and the holder mounting bolt to the output shaft.
8) Set tool **D23** to the holder mounting bolt and measure the rotating torque of the output shaft.
   ★ Measure the rotating torque without installing the front and rear couplings.
   - Rotating torque of output shaft:
   3.9 – 5.9 Nm {0.4 – 0.6 kgm}

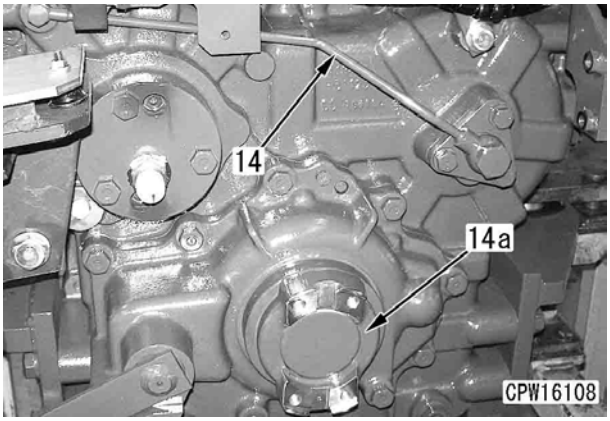


25. Coupling

1) Install coupling (59) on the cage side.
   Spline of coupling:
   Molybdenum disulfide grease (LM-G)
2) Install holder (58) and tighten the mounting bolt.



3) Install coupling (14a) on the parking brake side.
   Spline of coupling:
   Molybdenum disulfide grease (LM-G)
4) Install breather tube (14).



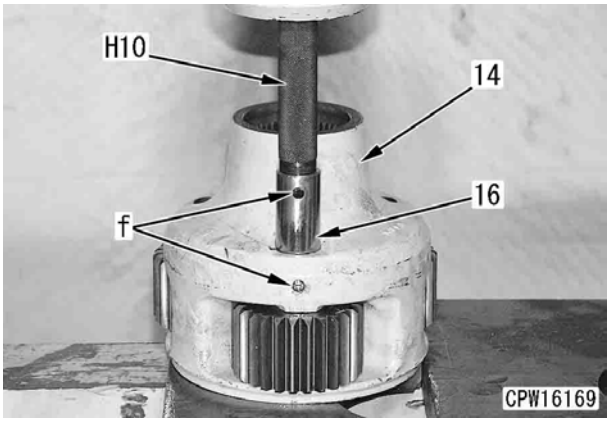
WHEEL LOADER

WA200-6
WA200PZ-6

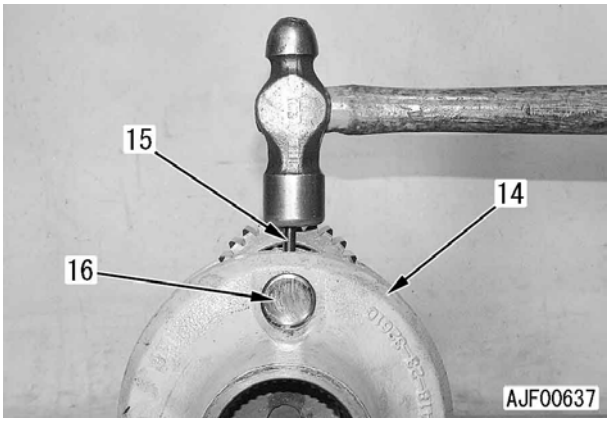
Machine model	Serial number
WA200-6	70001 and up
WA200PZ-6	70001 and up

50 Disassembly and assembly
320 Power train, Part 2

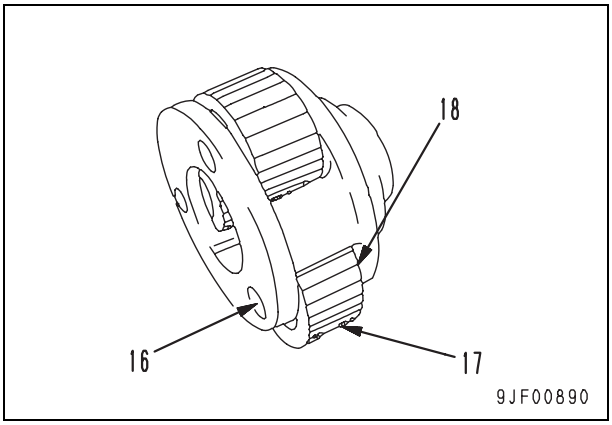
3) Using tool **H10**, press fit shaft (16) to planetary carrier (14).
★ When press fitting, match pin holes (f).
Shaft: **Axle oil (AXO80)**



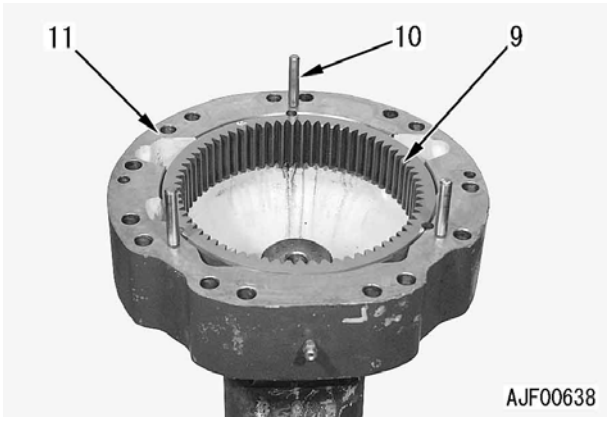
★ Matching the holes of shaft (16) and roll pin (15), drive roll pin (15) so that it will be flush with planetary carrier (14).



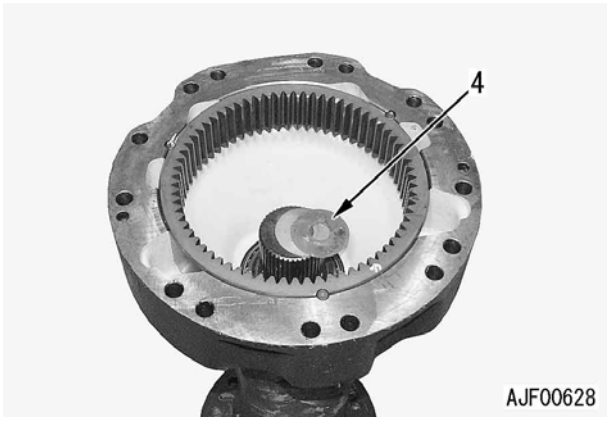
4) Hit the end of shaft (16) and the differential side of gear (17) lightly to push back the bearing and check that the gear rotates smoothly.



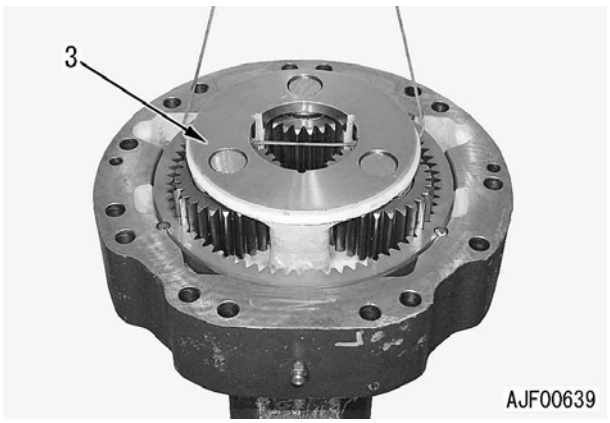
5. Ring gear
1) Install ring gear (9) to axle housing (11) and insert 3 pins (10).
★ Match the pin holes of the housing and ring gear.



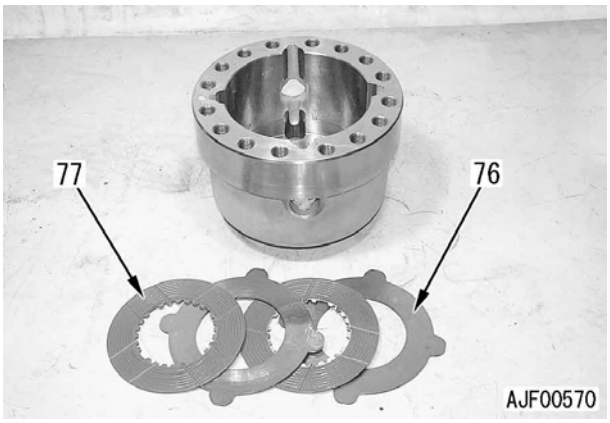
6. Planetary carrier assembly
1) Install shim (4) selected in step 3 to the end of the axle shaft.



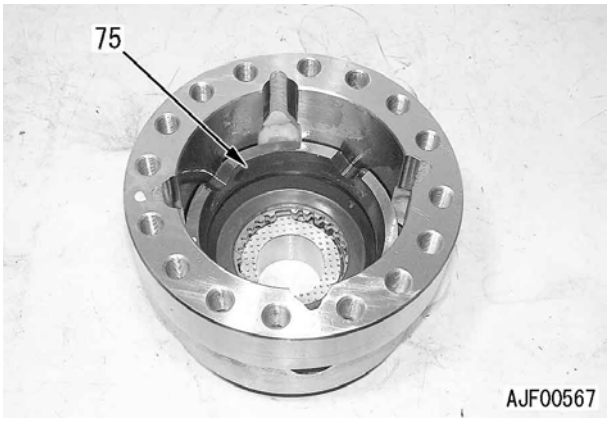
2) Sling and install planetary carrier assembly (3).
⚠ **When installing the planetary carrier, take care not to catch your fingers in the gear.**



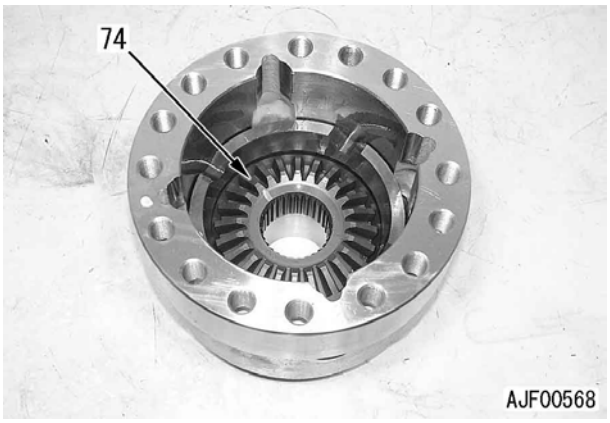
3) Install 2 discs (77) and 2 plates (76).
Before installing the discs and plates, soak them in the axle oil (AXO80).



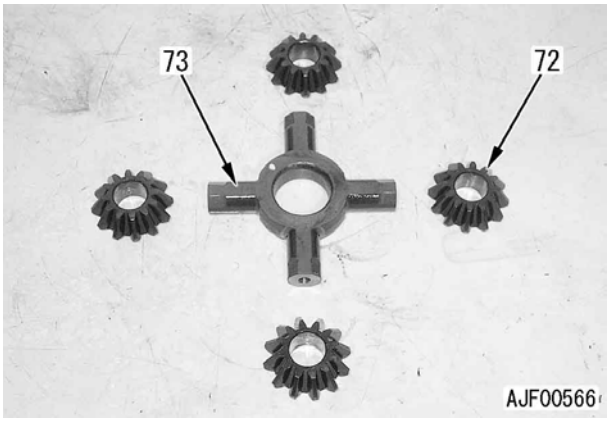
4) Install pressure ring (75).



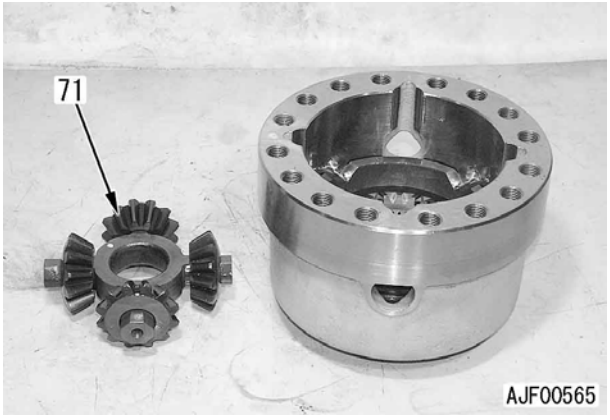
5) Install side gear (74).
★ Referring to step 10) below, match the cut of the inside of the disc to the oil groove of the side gear.



6) Install 4 pinion gears (72) to spider shaft (73).



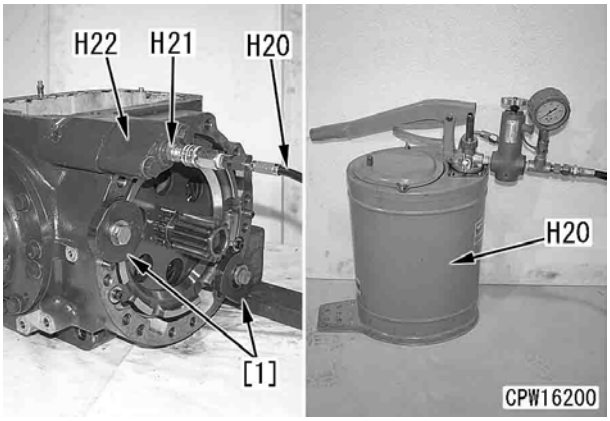
7) Install pinion gear assembly (71).



13. Brake oil leakage test

★ Action of the piston of the slack adjuster lowers pressure during the low-pressure leakage test. To prevent this, use tool **H19**.

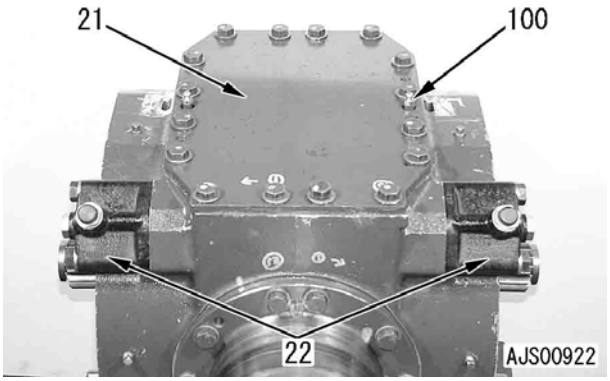
1) Keep plate [1] (equivalent to tool **H19**) set.
   ⚠ **If the brake oil leakage test is performed without setting plate [1], the piston will jump out, and that is dangerous.**
2) Install tools **H22**, **H21** and **H20** to the brake port and bleed all air from the brake system through the bleeder.
   ★ Be sure to fit the O-ring to tool **H22**.
   Mounting bolt of tool **H22**:
   98 – 123 Nm {10.0 – 12.5 kgm}
   ★ Bleed air by operating pump **H20**.



3) Perform the low-pressure oil leakage test.
   ★ Operate pump **H20** to raise the pressure to 98 kPa {1 kg/cm²}.
   ★ Leave the system at 98 kPa {1 kg/cm²} for 5 minutes and check that the pressure does not lower at all.
   ★ If the oil leaks (If the pressure drops more than the standard), remove the brake piston and check the seals for damage.
   ★ If the hose is moved while the pressure is measured, the pressure fluctuates. Accordingly, do not move the hose.
4) Perform the high-pressure brake oil leakage test.
   ★ If oil leakage is not detected by the low-pressure brake oil leakage test, operate pump **H20** to raise the pressure to 4,410 kPa {45 kg/cm²}.
   ★ Leave the system at 4,410 kPa {45 kg/cm²} for 5 minutes and check that the pressure does not drop more than 98 kPa {1 kg/cm²}.
   ★ If the oil leaks (If the pressure drops more than the standard), remove the brake piston and check the seals for damage.
   ★ If the hose is moved while the pressure is measured, the pressure fluctuates. Accordingly, do not move the hose.
5) Remove tools **H20**, **H21**, and **H22** and plate [1] (equivalent to tool **H19**), and then perform the test on the opposite side.

14. Top cover

1) Remove bleeder screw (100) temporarily and install top cover (21).
   Mating face of cover: **Adhesive (LOCTITE 515 or equivalent)**
   Mounting bolt:
   98 – 123 Nm {10.0 – 12.5 kgm}
2) Install slack adjusters (22) to the right and left.
   ★ Take care that the O-rings will not come off.
   Mounting bolt:
   98 – 123 Nm {10.0 – 12.5 kgm}

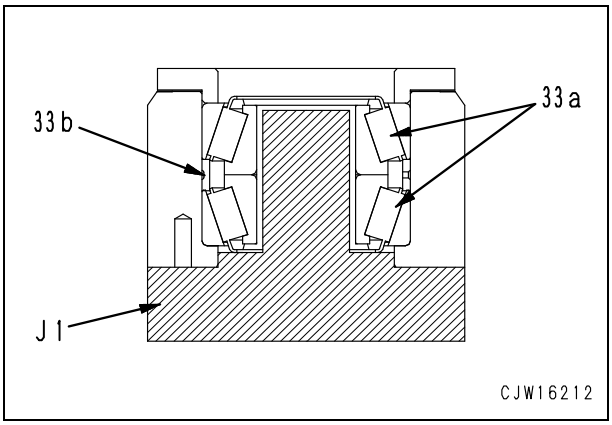


★ For the rear differential, perform "19. Rear axle support" and after steps.
★ Perform steps 15 – 18 for the front differential.

2. Assemble the upper hinge of the front frame.

1) Using tool **J1**, press fit bearing (33a) and spacer (33b) to the front frame.
   - ★ Since the clearance of bearing (33a) and spacer (33b) is adjusted properly, do not change their combination.
   - ★ Since bearing (33a) and spacer (33b) are an assembly, always replace them as a set.
   - ★ Press fit bearing (33a) and spacer (33b) securely so that a clearance will not be made between the bearing and frame.

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

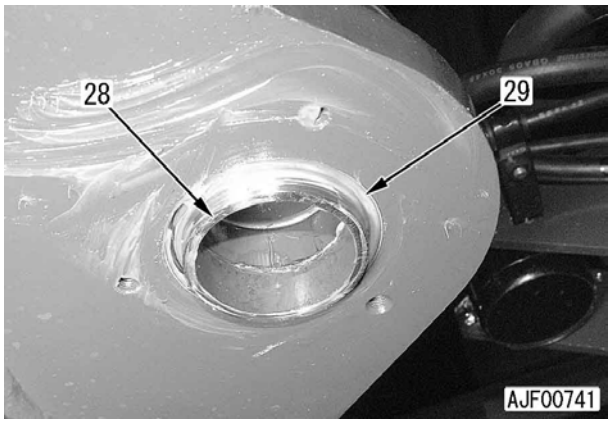


2) Press fit dust seal (29) to the front frame.
   - ★ Press fit the dust seal with the lip out.

   Lip of dust seal: **Grease (G2-LI)**

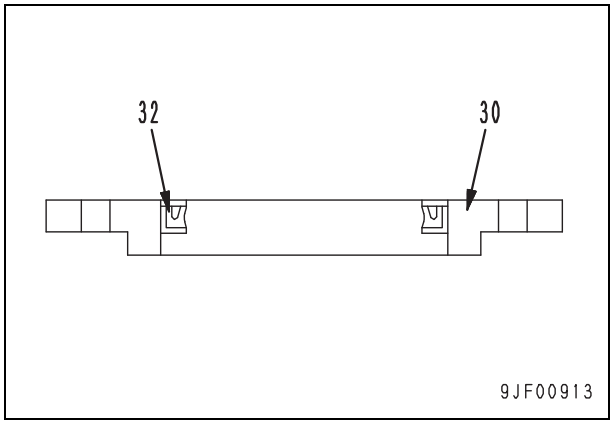
3) Install lower spacer (28).
   - ★ Install the spacer with the chamfered part on the bearing side.

   Lower spacer:
   Lubricant containing molybdenum disulfide (LM-P)



4) Press fit dust seal (32) to retainer (30).
   - ★ Press fit the dust seal with the lip out.

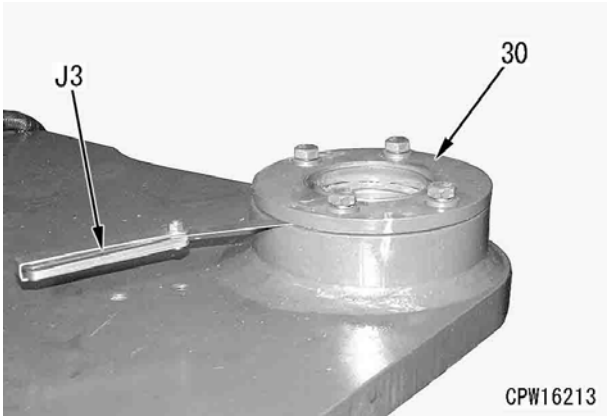
   Lip of dust seal: **Grease (G2-LI)**



5) Tighten the mounting bolts of retainer (30) evenly.

   Retainer mounting bolt:
   3.92 – 5.88 Nm {0.4 – 0.6 kgm}

6) Measure the clearance between retainer (30) and front frame with tool **J3**, and then select shims so that the maximum clearance will be 0.1 – 0.2 mm when the shims are inserted.
   - Standard shim thickness: **1.3 mm**
   - Varieties of shim thickness:
     0.1 mm, 0.5 mm



[*4]

Mating face of HST pump and 4-gear pump assembly: **Gasket sealant (LG-6)**

HST pump and 4-gear pump assembly mounting bolts:

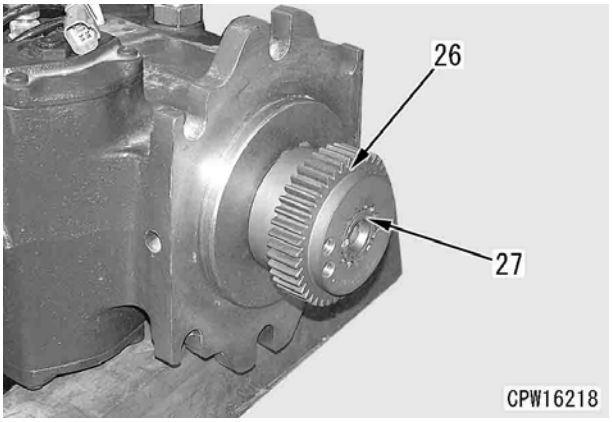
M12 (24) (4 pieces):
98 – 123 Nm {10.0 – 12.5 kgm}

M16 (25) (2 pieces):
245 – 309 Nm {25.0 – 31.5 kgm}

1. If boss (26) was removed from the HST pump assembly, install it according to the following procedure.

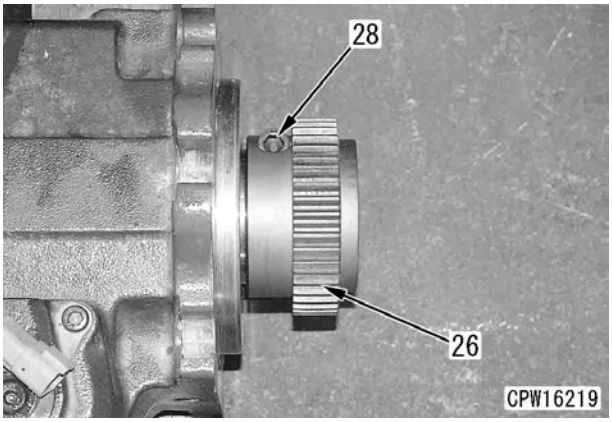
★ Install boss (26) so that it will be flush with the shaft end face of pump shaft (27).

- Level difference between boss and pump shaft end face: **Max. 0.5 mm**



2. Tighten hexagon socket head bolt (28) of boss (26).

Mounting bolt (28): **86 Nm {8.8 kgm}**



- **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.

  Hydraulic oil (For details, see "Table of fuel, coolant and lubricants"):
  Only necessary quantity

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

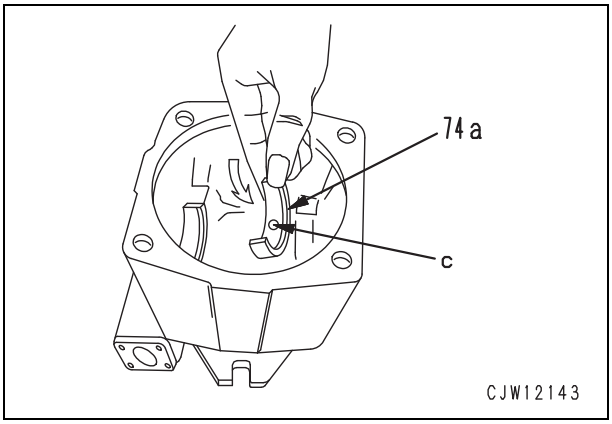
  Total amount of coolant: **Approx. 17 ℓ**
  (For details, see "Table of fuel, coolant and lubricants")

★ When any of rod (91), collar (83), snap ring (85), piston (90), and ring (84) needs to be replaced, replace all of the servo piston assembly (82) since a dimension of ring (84) must be adjusted.

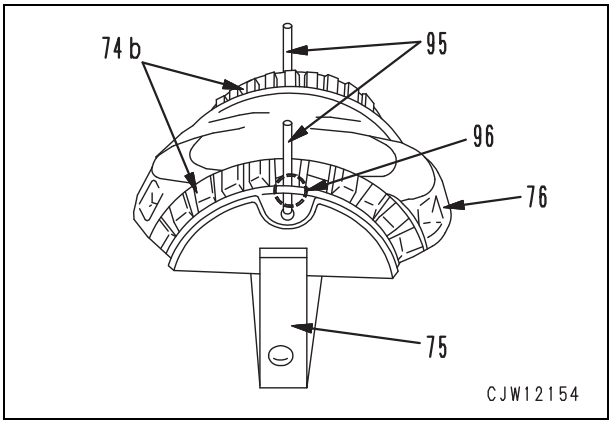
3. Cradle and bearing cups

1) Insert bearing cup set (74a).

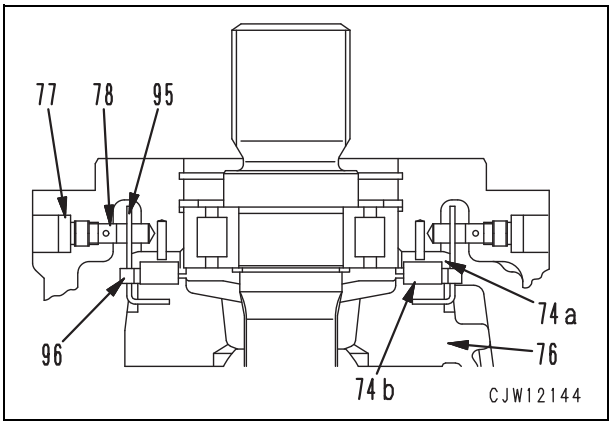
★ Fit hole (c) of cup set (74a) to the pin in the case.



2) Swivel cradle (73)
Assemble bearing (74b), wire (95), lever (75) and articulating pin (96) to cradle (76).



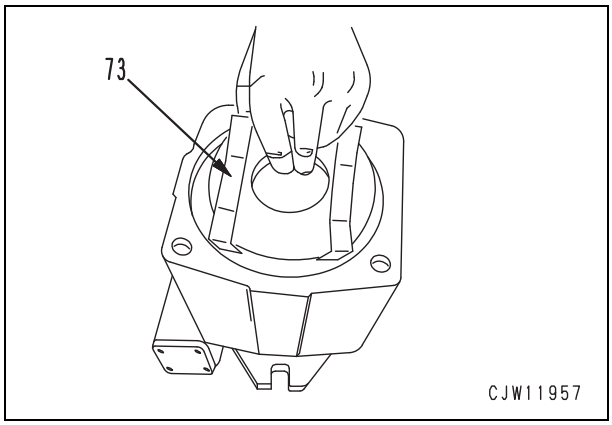
★ Completed cradle holding device



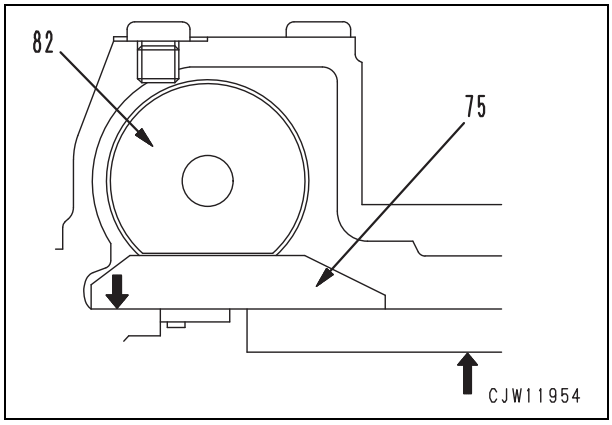
3) Insert completely swivel cradle (73) into housing.

★ Assistance: Devices, e.g. clamp, rubber rings, grease and string.

★ Pay attention for correct seat of the swivel cradle (73) in the housing.



★ Install so that servo piston (82) and lever (75) will be as shown below.



⚠ **Remove auxiliary device.**

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