SHOP MANUAL

KOMATSU

WA250-5
WA250PT-5
(KA SPEC.)

MACHINE MODEL	SERIAL NUMBER
WA250-5	**70001 and up**
WA250PT-5	**70001 and up**

- This shop manual may contain attachments and optional equipment that are not available in your area. Please consult your local Komatsu distributor for those items you may require.
  Materials and specifications are subject to change without notice.
- WA250,250PT-5 mounts the SAA6D102E-2-A engine.
  For details of the engine, see the 102 Series Engine Shop Manual.

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HOISTING INSTRUCTIONS

HOISTING

> ⚠ Heavy parts (25 kg or more) must be lifted with a hoist, etc. In the **DISASSEMBLY AND ASSEMBLY** section, every part weighing 25 kg or more is indicated clearly with the symbol

- If a part cannot be smoothly removed from the machine by hoisting, the following checks should be made:
  1) Check for removal of all bolts fastening the part to the relative parts.
  2) Check for existence of another part causing interference with the part to be removed.

WIRE ROPES

1) Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

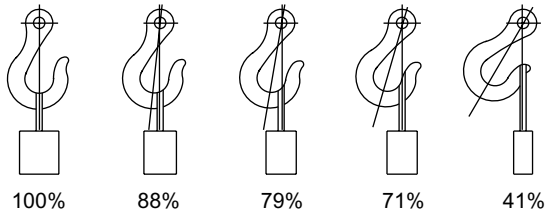
Wire ropes
(Standard "Z" or "S" twist ropes
without galvanizing)

Rope diameter	Allowable load	
mm	kN	tons
10	9.8	1.0
11.5	13.7	1.4
12.5	15.7	1.6
14	21.6	2.2
16	27.5	2.8
18	35.3	3.6
20	43.1	4.4
22.4	54.9	5.6
30	98.1	10.0
40	176.5	18.0
50	274.6	28.0
60	392.2	40.0

★ The allowable load value is estimated to be one-sixth or one-seventh of the breaking strength of the rope used.

2) Sling wire ropes from the middle portion of the hook.

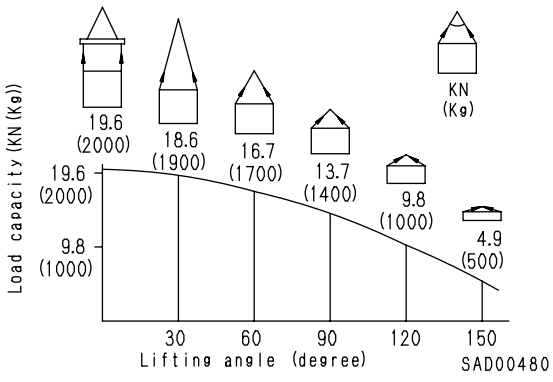
Slinging near the edge of the hook may cause the rope to slip off the hook during hoisting, and a serious accident can result. Hooks have maximum strength at the middle portion.



3) Do not sling a heavy load with one rope alone, but sling with two or more ropes symmetrically wound onto the load.

> ⚠ Slinging with one rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original winding position on the load, which can result in a dangerous accident.

4) Do not sling a heavy load with ropes forming a wide hanging angle from the hook.
When hoisting a load with two or more ropes, the force subjected to each rope will increase with the hanging angles. The table below shows the variation of allowable load kN {kg} when hoisting is made with two ropes, each of which is allowed to sling up to 9.8 kN {1000 kg} vertically, at various hanging angles.
When two ropes sling a load vertically, up to 19.6 kN {2000 kg} of total weight can be suspended. This weight becomes 9.8 kN {1000 kg} when two ropes make a 120° hanging angle. On the other hand, two ropes are subjected to an excessive force as large as 39.2 kN {4000 kg} if they sling a 19.6 kN {2000 kg} load at a lifting angle of 150°.



Millimeters to Inches

1 mm = 0.03937 in

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

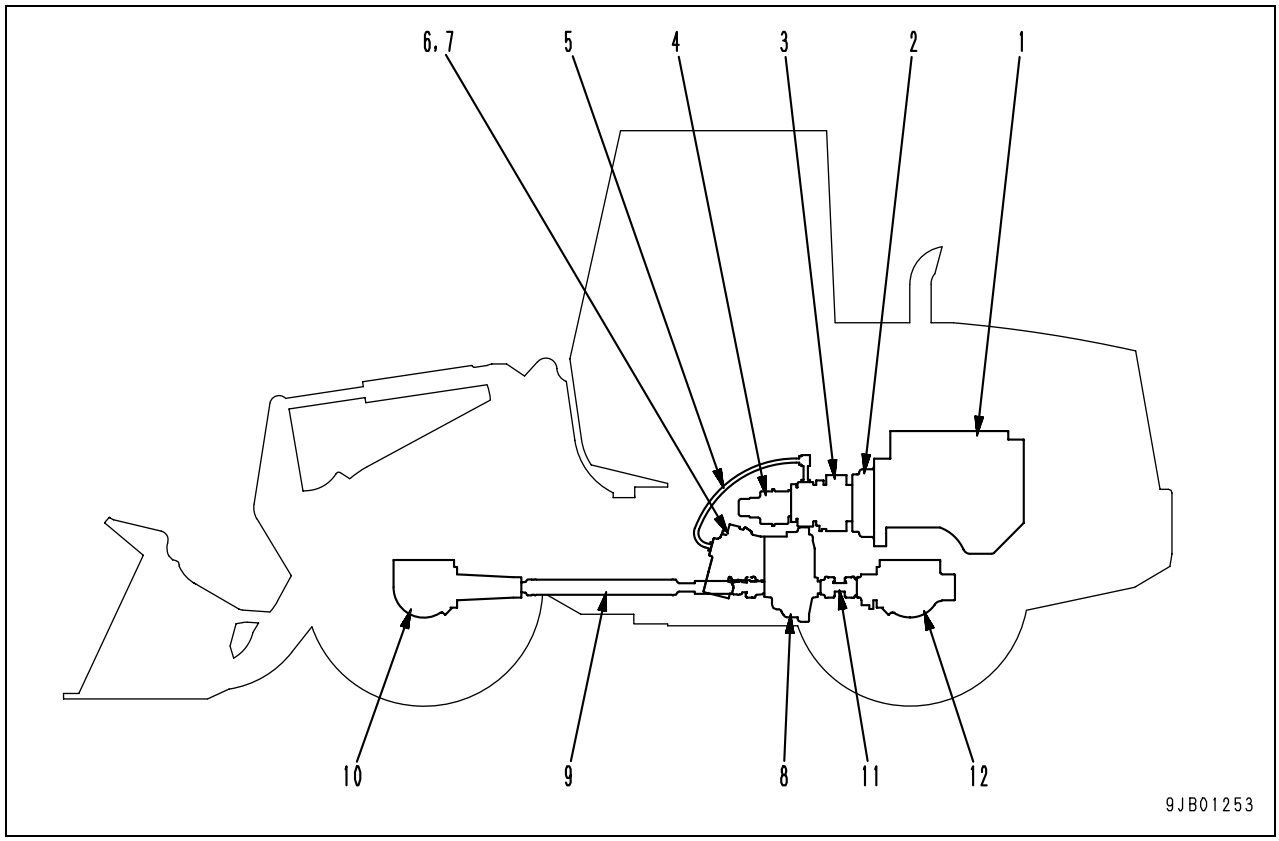
Kilogram to Pound

1 kg = 2.2046 lb

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

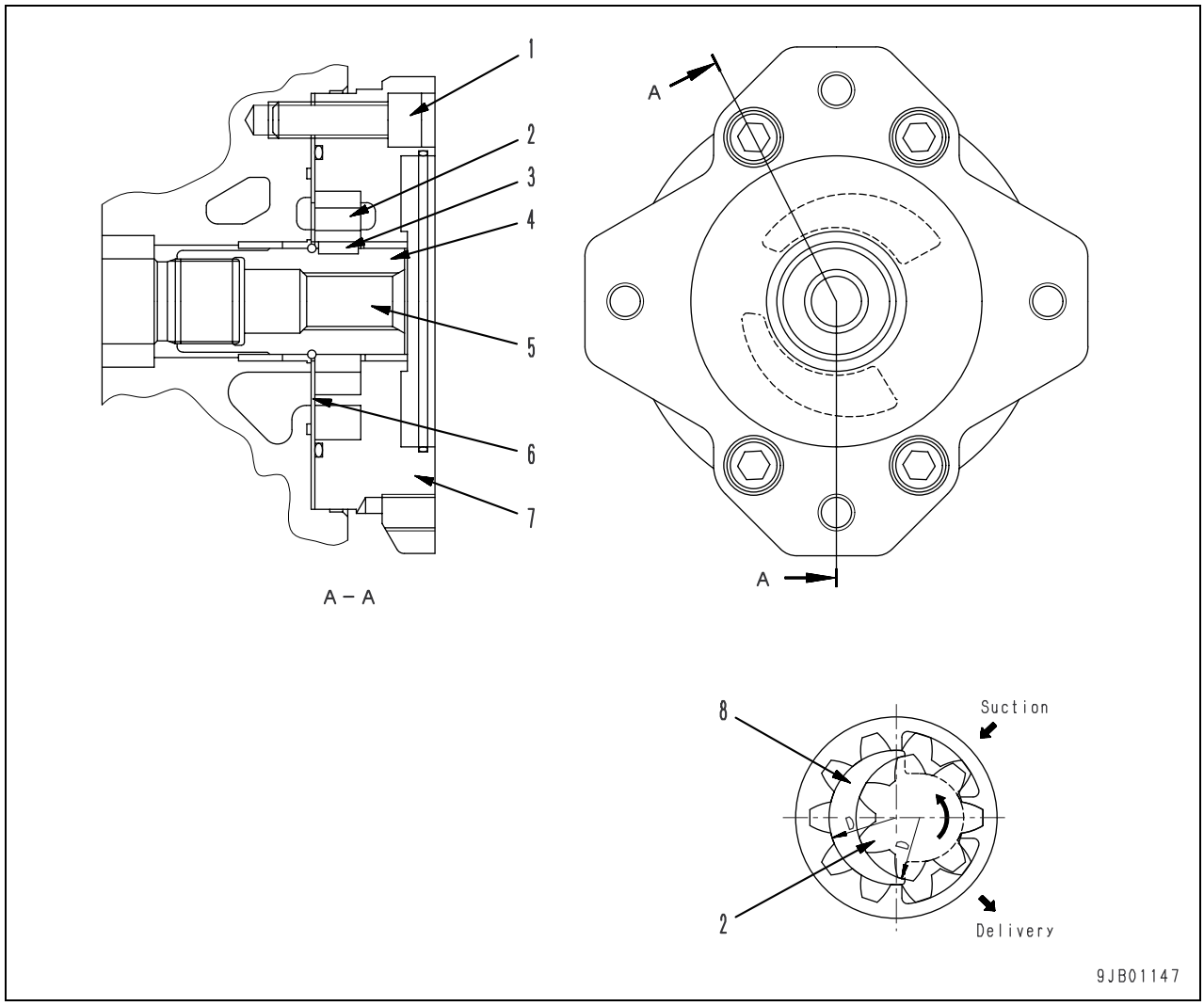
Machine model					WA250-5	WA250PT-5
Serial No.					70001 and up	
Steering control	Type				Articulated steering	
	Control				Hydraulic control	
Hydraulic system	Hydraulic pump	Steering pump	• Type		Gear type	
			• Delivery	ℓ / min	110	
		Work equipment pump	• Type		Gear type	
			• Delivery	ℓ / min	78	
		Brake and cooling fan pump	• Type		Gear type	
			• Delivery	ℓ / min	19	
		Transfer lubrication pump	• Type		Gear type	
			• Delivery	ℓ / min	22	
	Cylinder	Steering cylinder	Type		Reciprocating piston type	
			Cylinder inner diameter	mm	70	
			Piston rod diameter	mm	40	
			Stroke	mm	453	
			Max. length between pins	mm	1,271	
			Min. length between pins	mm	818	
		Lift cylinder	Type		Reciprocating piston type	
			Cylinder inner diameter	mm	130	
			Piston rod diameter	mm	70	
			Stroke	mm	717	
			Max. length between pins	mm	1,950.5	
			Min. length between pins	mm	1,233.5	
		Bucket cylinder	Type		Reciprocating piston type	Reciprocating piston type
			Cylinder inner diameter	mm	150	180
			Piston rod diameter	mm	75	90
			Stroke	mm	491	600
			Max. length between pins	mm	1,545	2,380
			Min. length between pins	mm	1,054	1,780
		Coupler plunger	Type		—	Reciprocating piston type
			Cylinder inner diameter	mm	—	35
			Piston rod diameter	mm	—	20
			Stroke	mm	—	214
			Max. length between pins	mm	—	586
			Min. length between pins	mm	—	372

POWER TRAIN



1. Engine
2. Damper
3. HST pump
4. 4-gear pump unit
5. High-pressure hose
6. HST motor 1
7. HST motor 2
8. Transfer
9. Front drive shaft
10. Front axle
11. Rear drive shaft
12. Rear axle

HST CHARGE PUMP



1. Cover bolt
2. Pump gear
3. Key
4. Coupling
5. Drive shaft
6. Plate
7. Charge pump cover
8. Crescent divider board

Outline

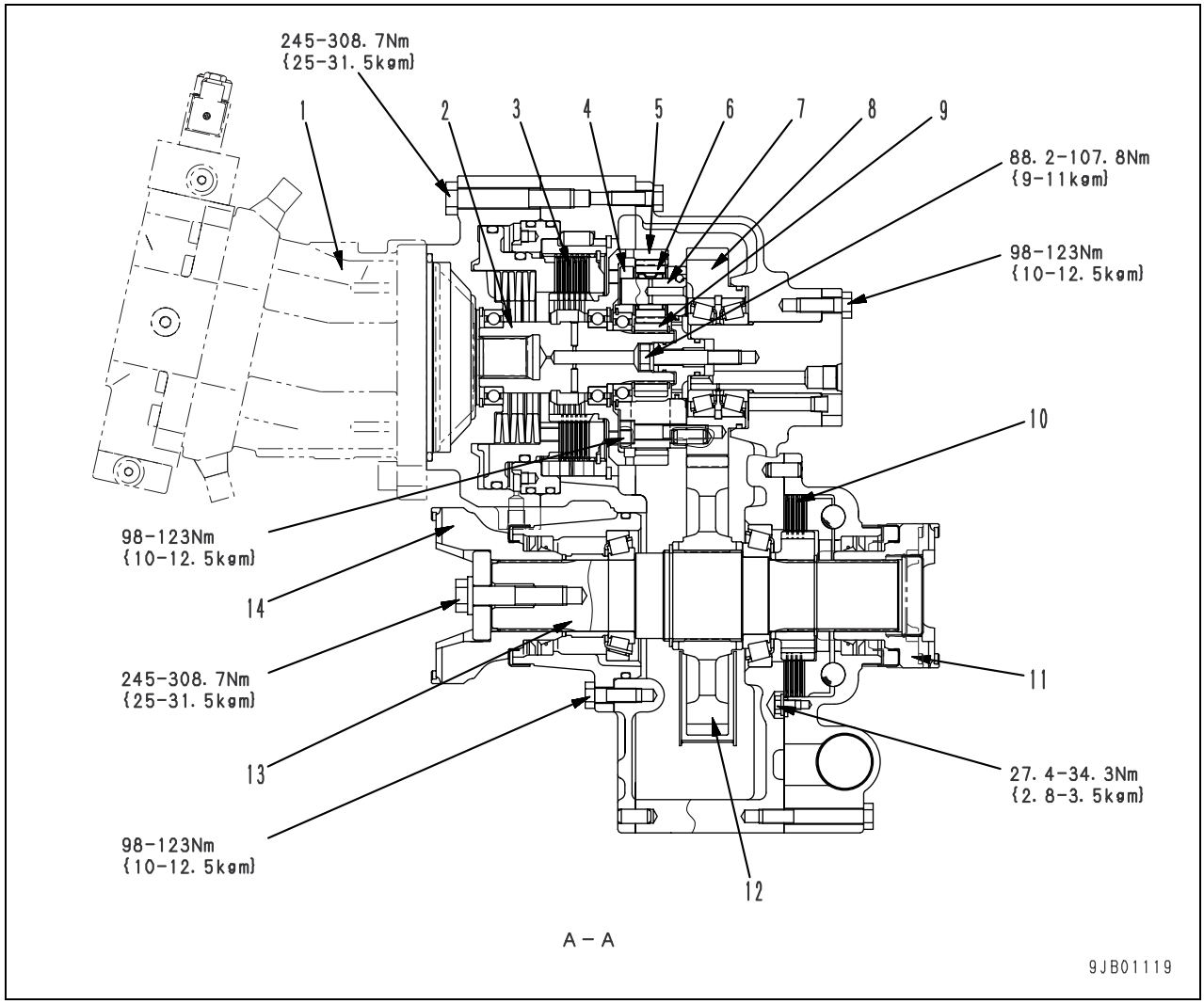
- The HST charge pump is built in the HST pump and driven together with the HST pump to supply oil to the HST speed-related valve and low-pressure relief valve of the HST pump.
- The HST charge pump sucks in oil from the hydraulic tank.

Specifications

Type	Gear pump (Inscribed type)
Theoretical capacity (cc/rev)	19.6

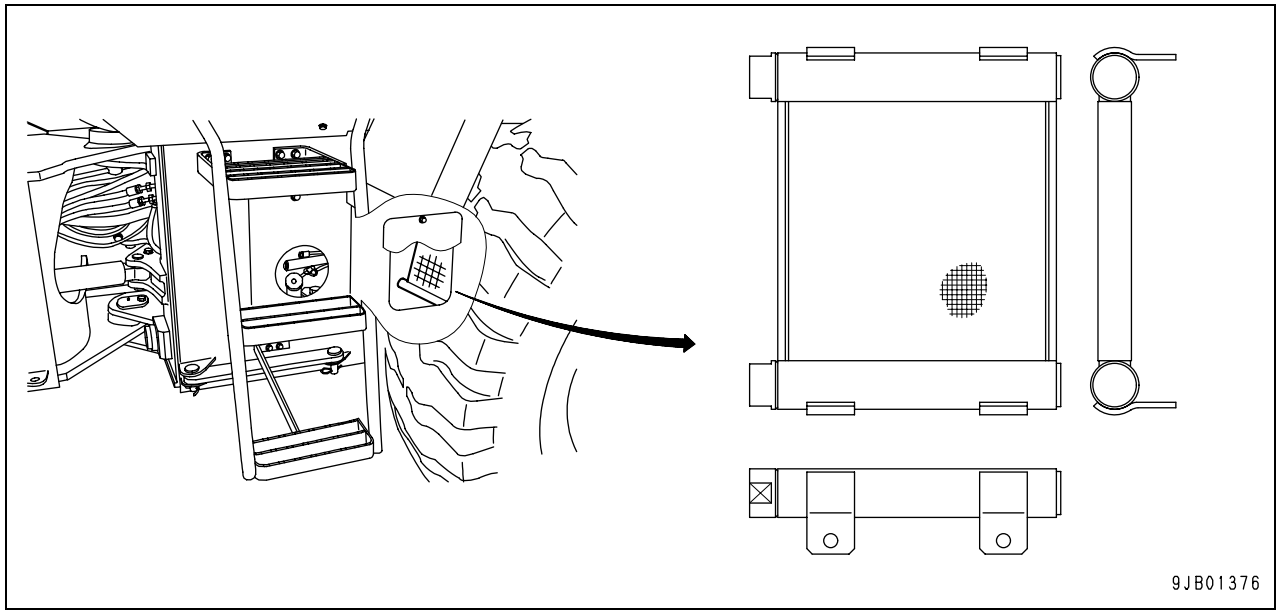
Function

- The HST charge pump is connected to drive shaft (5) of the HST pump and rotated by coupling (4).
- The HST charge pump has pump gear (2) and crescent divider board (8) in it and sucks and discharges the oil in the direction shown in the above figure.



1. HST motor 1
2. Input shaft
3. Transfer clutch
4. Carrier
5. Ring gear (Number of teeth: 80)
6. Planetary gear (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: 57)
13. Output shaft
14. Front coupling

TRANSFER OIL COOLER



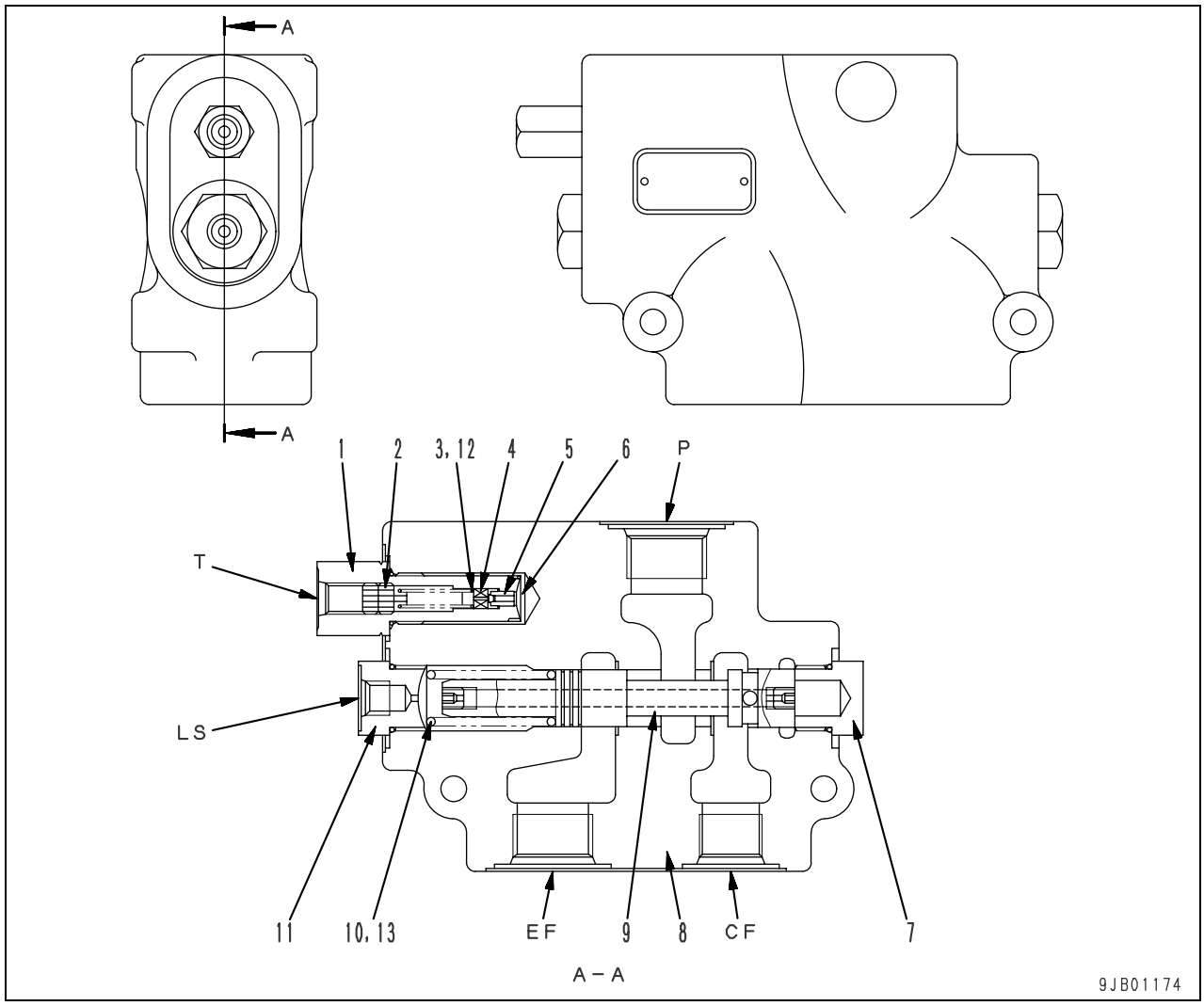
Specification

	Transfer oil cooler
Core type	CF40–1
Fin pitch (mm)	4.5 / 2
Total heat radiating area (m^2)	1.42

Unit: mm

No.	Check item		Criteria					Remedy
			Standard size	Tolerance		Standard Clearance	Clearance limit	
				Shaft	Hole			
6	Clearance between pinion gear bearing and shaft		ø 33.338	+0.025 +0.013	+0.013 0	-0.025 – 0	—	Replace
7	Clearance between axle housing and ring gear		ø 276	+0.100 +0.030	+0.100 0	-0.100 – +0.070	—	
8	Clearance between oil seal and housing		Max. 0.2					Adjust
9	Press-fitting portion of axle shaft seal	Housing	ø 140	+0.400 +0.200	+0.063 0	-0.400 – -0.137	—	Replace
		Shaft	ø 105	0 -0.054	-0.200 -0.400	-0.400 – -0.147	—	
10	Clearance at press-fitting portion of axle housing bearing	Outer race	ø 130	0 -0.025	-0.028 -0.068	-0.068 – -0.003	—	
		Inner race	ø 85	+0.045 +0.023	0 -0.020	-0.065 – -0.023	—	
11	Clearance at press-fitting portion of axle housing bearing	Outer race	ø 125	0 -0.018	-0.028 -0.068	-0.068 – -0.010	—	
		Inner race	ø 80	+0.030 +0.011	0 -0.016	-0.046 – -0.011	—	
12	End play of axle shaft		0 – 0.1					Adjust
13	Clearance of guide pin		ø 12	+0.025 +0.007	+0.207 +0.145	0.120 – 0.200	—	Replace

PRIORITY VALVE



P: From steering pump
CF: To orbit-roll valve
EF: To work equipment control valve
LS: From orbit-roll valve
T: To hydraulic tank

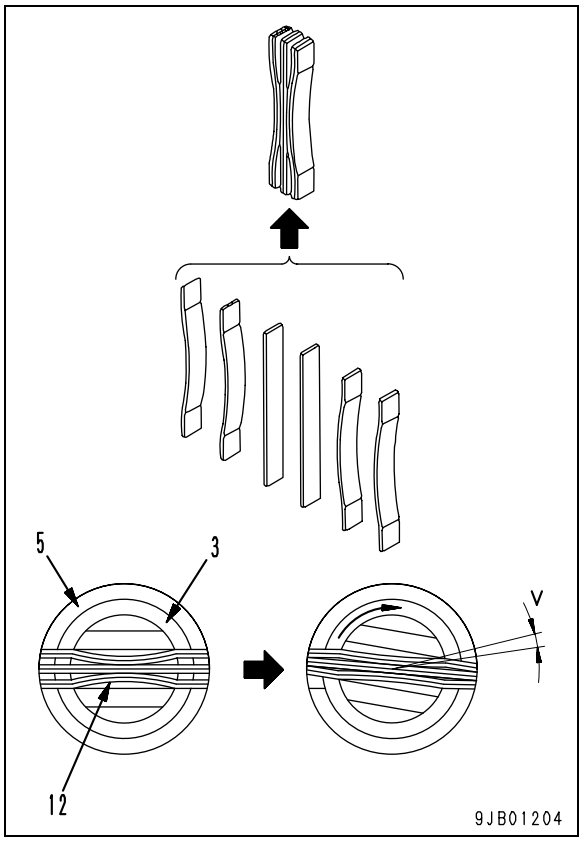
1. Relief valve body
2. Spring seat
3. Spring
4. Poppet
5. Seat
6. Screen
7. Plug
8. Valve body
9. Spool
10. Spring
11. Plug

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
12	Control spring	Free length	Installed length	Installed load	Free length	Installed load	Replace
		63.4	47.6	187 N {19.1 kg}	63.4 ± 1	187 ± 14.7 N {19.1 ± 1.5 kg}	
13	Relief spring	31	26.9	146 N {14.9 kg}	–	146 ± 14.7 N {14.9 ± 1.5 kg}	

Role of centering spring

- Center spring (12) is composed of 4 X-shaped leaf springs and 2 flat leaf springs and installed between spool (3) and sleeve (5) as shown in the figure.
- If the steering wheel is turned, spool (3) compresses centering spring (12) and an angular displacement is made between spool (3) and sleeve (5).
  As a result, the ports of spool (3) and sleeve (5) are connected and the oil is sent to the steering cylinder. When the steering wheel stops turning, the gerotor also stops turning. Then, the oil is not sent to the steering cylinder and its pressure rises. To prevent this, when the steering wheel stops turning, it is returned by the reaction force of centering spring (12) toward the neutral position by the angular displacement of spool (3) and sleeve (5).

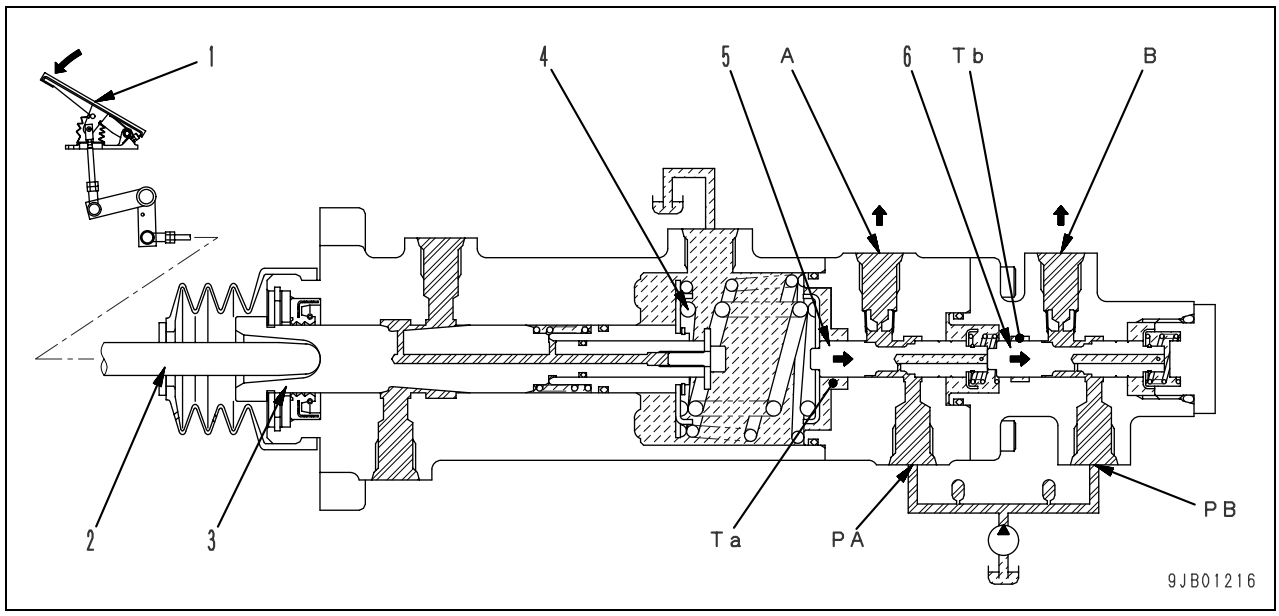


Outline

- The brake valve is installed under the front of the operator's seat. If either brake pedal is pressed, oil flows to the brake piston to operate the brake.
- Both brake pedals are connected mechanically to each other. If either of them is pressed, the other moves, too.
- The brake valve has an inching valve in it to control the control pressure of the HST pump.

Operation

1. When brake pedal is pressed

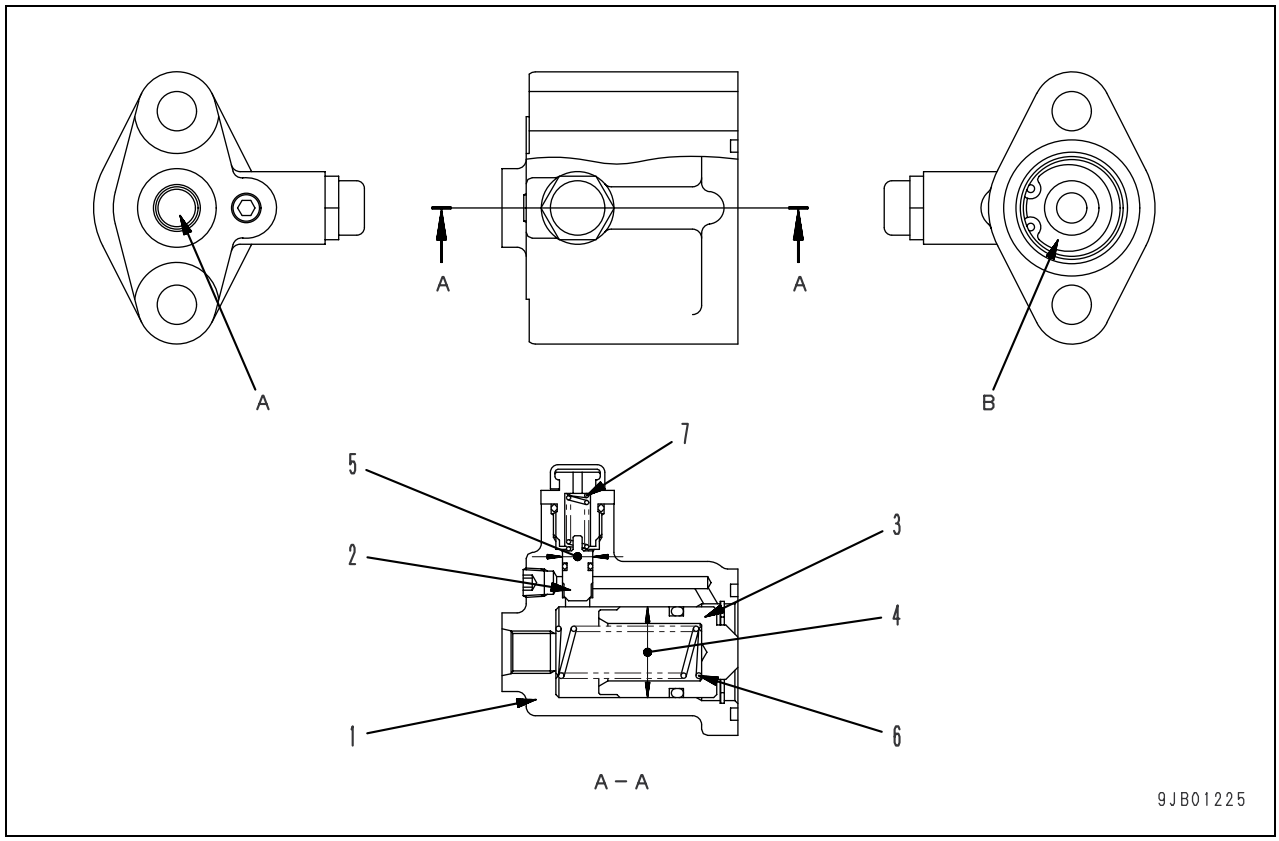


- If brake pedal (1) is pressed, the pressing force is transmitted through rod (2), spool (3), and spring (4) to spool (5).
- If spool (5) is pushed to the right, port **Ta** is closed and the oil from the pump flows through the accumulator, port **PA**, and port **A** to the rear brake piston to operate the rear brake.
- At the time when spool (5) is pushed to the right, spool (6) is also pushed to the right to close port **Pb**. As a result, the oil from the pump flows through the accumulator, port **PB**, and port **B** to the front brake piston to operate the front brake.

When only either brake operates (When either brake fails)

- Even if only either brake operates because of oil leakage, etc. in the front or rear brake system, the pressing force of brake pedal (1) moves spools (5) and (6) mechanically to the right. Accordingly, the oil from the pump flows normally to the brake piston of the normal system to operate the brake and stop the machine. With this mechanism, safety is heightened.

SLACK ADJUSTER



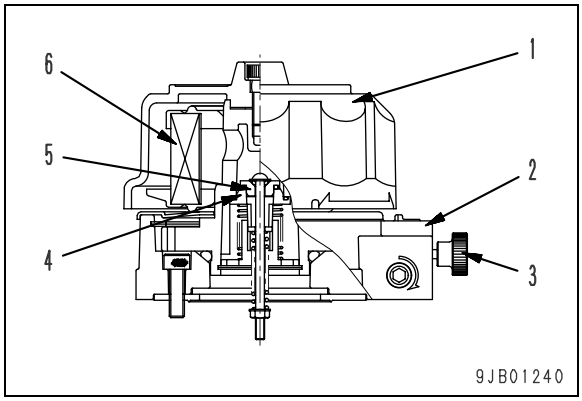
A: From brake valve
B: To brake piston

1. Body
2. Check valve
3. Piston

Unit: mm

No.	Check item	Criteria					Remedy
4	Clearance between piston and body	Standard size	Tolerance		Standard clearance	Clearance limit	Replace
			Shaft	Hole			
		ø 30	-0.065 -0.098	+0.052 0	0.065 – 0.150	0.163	
5	Clearance between check valve and body	ø 10	-0.013 -0.028	+0.015 0	0.013 – 0.043	0.048	
6	Piston return spring	Standard size			Repair limit		
		Free length	Installed length	Installed load	Free length	Installed load	
		87.5	48.2	11.8 N {1.2 kg}	–	9.8 N {1.0 kg}	
7	Check valve return spring	21.7	19.25	53.9 N {5.5 kg}	–	46.1 N {4.7 kg}	

Breather



1. Oil filler cap
2. Case
3. Unlocking knob
4. Sleeve
5. Poppet
6. Filter element

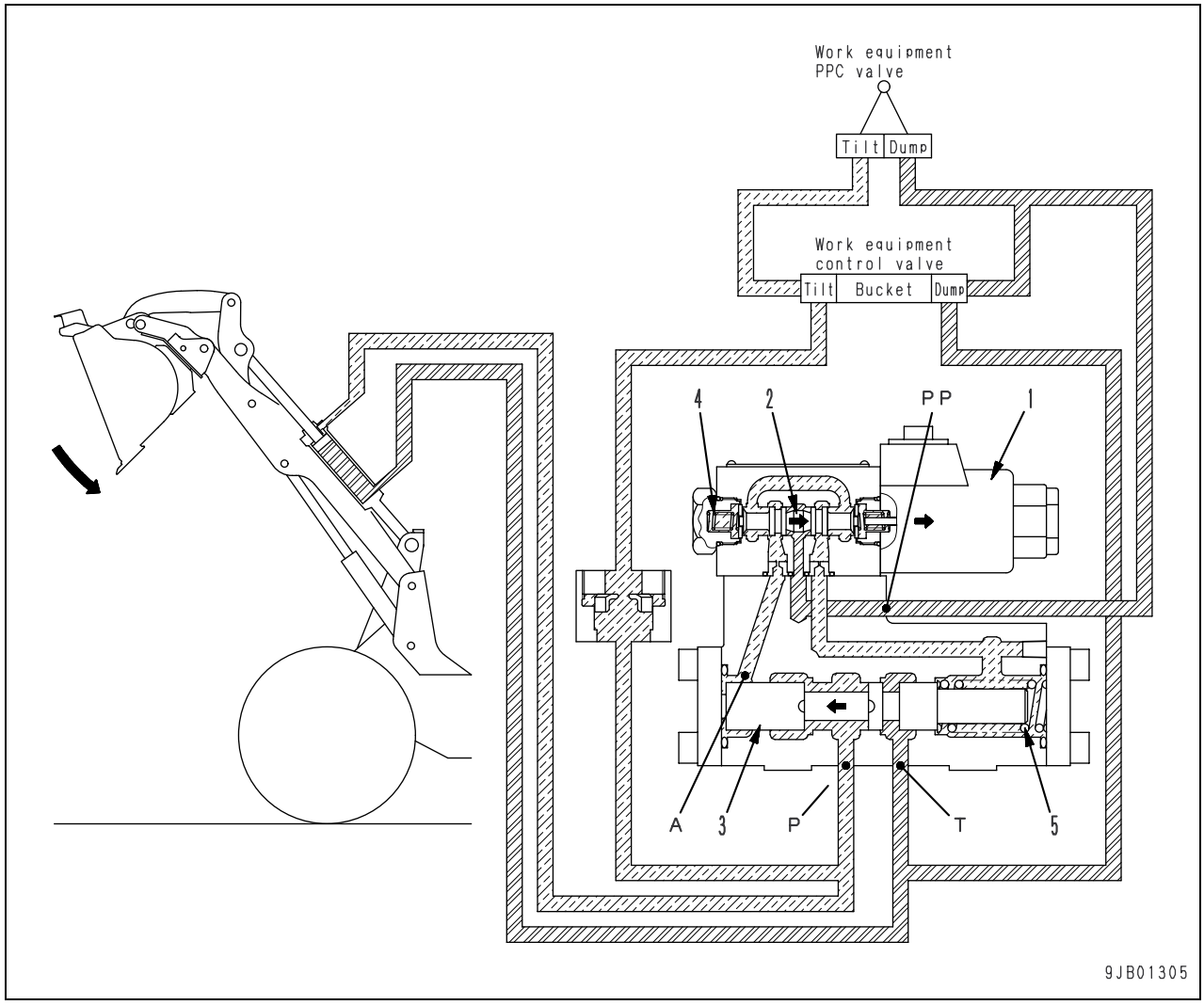
Prevention of negative pressure in tank

- Since the hydraulic tank is pressurized and enclosed, negative pressure can be generated when the oil level in the tank lowers. At this time, sleeve (4) is opened by the pressure difference from the atmospheric pressure and the atmosphere flows in the tank to prevent generation of negative pressure.
  (Set pressure of air intake valve:
  3.0 ± 0.3 kPa {0.03 ± 0.003 kg/cm^2})

Prevention of rise of pressure in tank

- While the hydraulic circuit is in operation, the pressure in the hydraulic tank rises when the oil level in the hydraulic tank rises according to the operation of the hydraulic cylinders and when the temperature rises. If the pressure in the tank rises above the set pressure, poppet (5) operates to release the pressure from the tank.
  (Set pressure of exhaust valve:
  0.1 ± 0.015 MPa {1.0 ± 0.15 kg/cm^2})

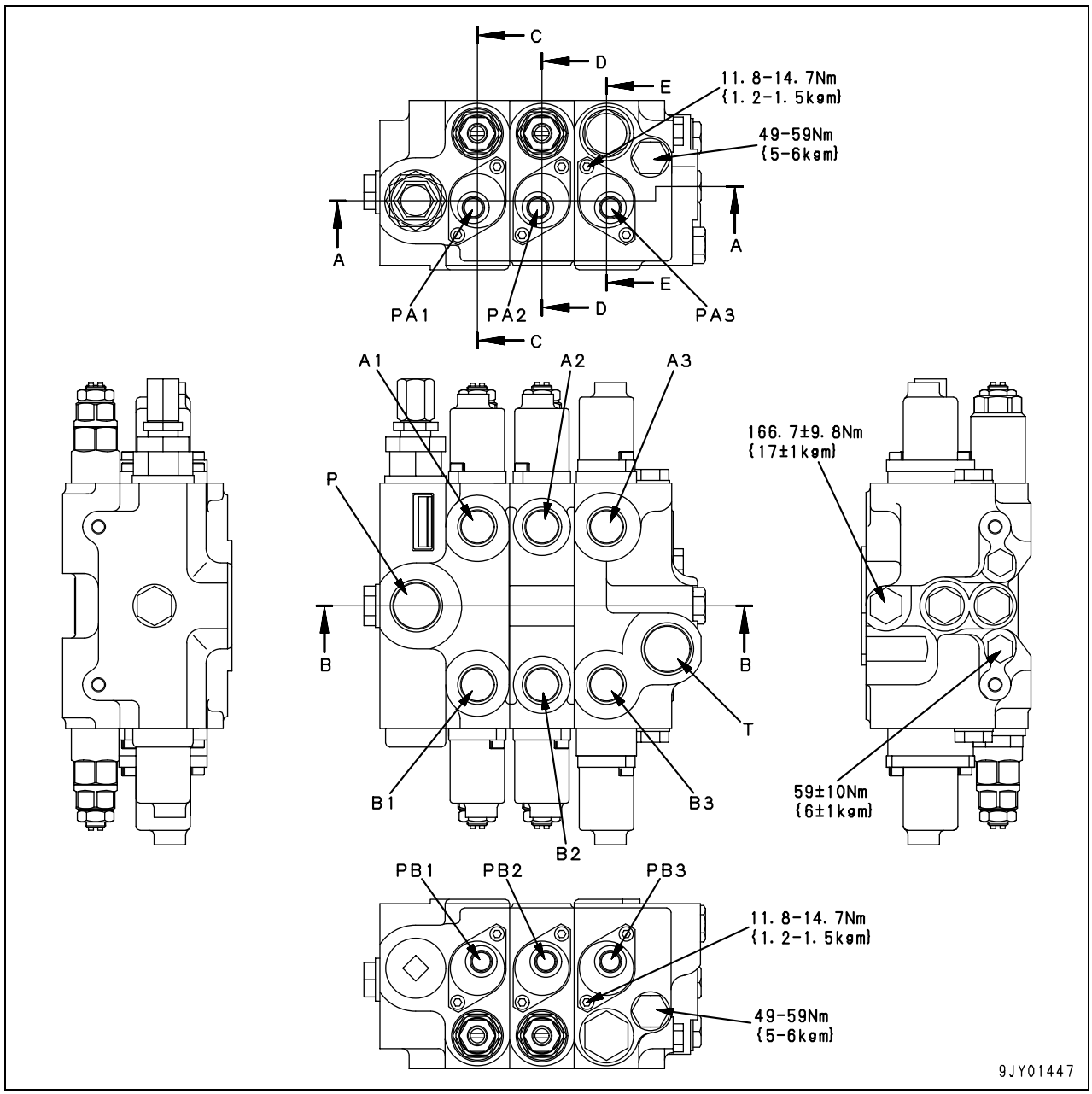
When bucket is "DUMP" in FAST mode (from just before dump end to dump end)



- If the bucket is "DUMP" continuously to just before the dump end with the dump speed switch in the FAST mode position, the tilt lever angle proximity switch operates.
- Bypass solenoid valve (1) is turned OFF and spool (2) is moved to the right and held in the neutral position by the reaction force of spring (4).
- At this time, port **PP** and chamber **A** are closed and spool (3) is pushed back to the left by the reaction force of spring (5) to close ports **P** and **T**.
- The oil on the bucket cylinder head side does not flow through the bypass valve but all of it flows through the work equipment control valve into the hydraulic tank.
- Since only the oil from the work equipment control valve flows to the bucket cylinder bottom side, the bucket dump speed is lowered.

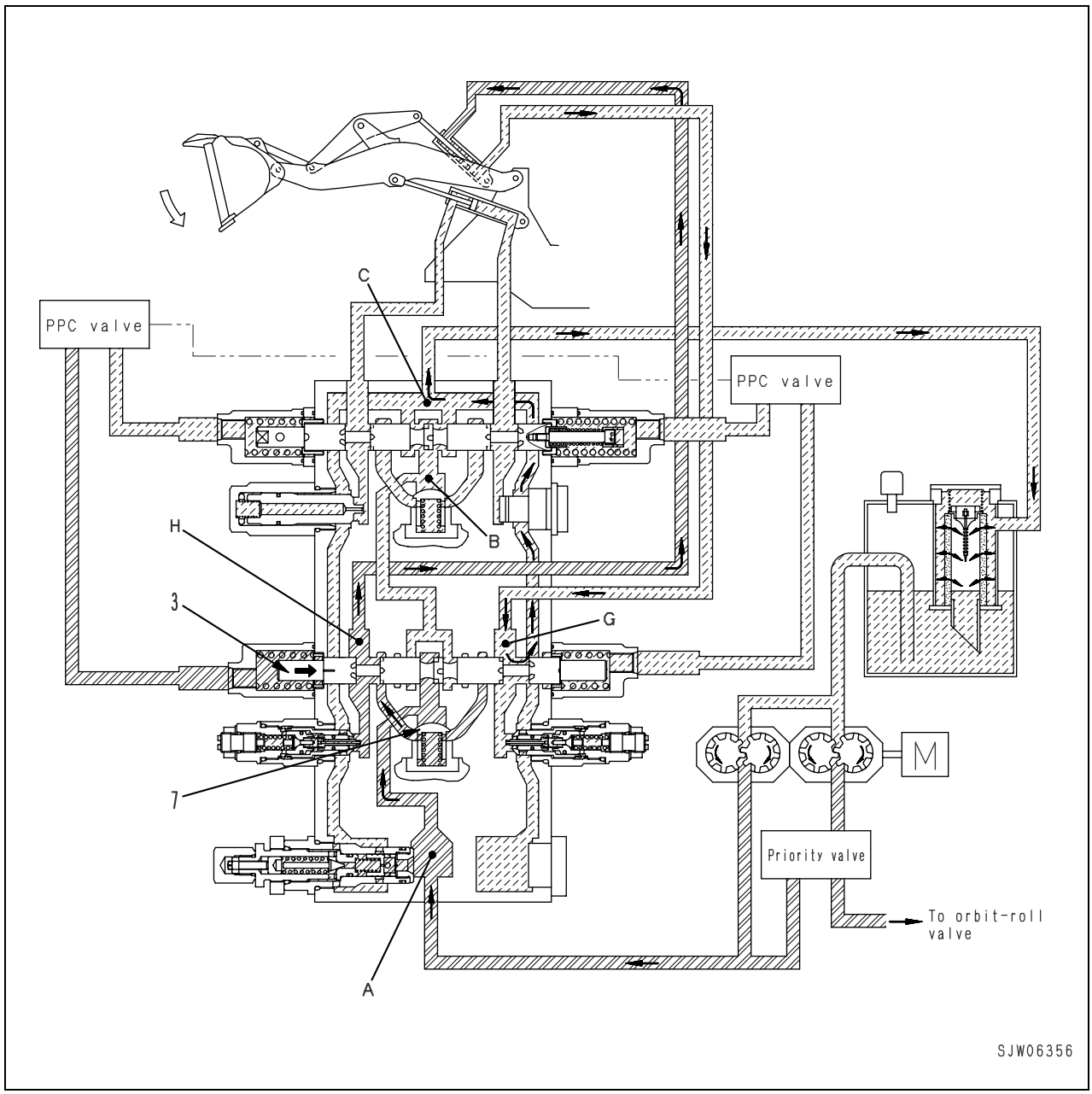
★ When the dump speed switch is set in the SLOW mode position, the bucket is operated as explained on this page regardless of the tilt lever angle.

2. 3-Spool valve



P: To pump
T: To drain
A1: To service cylinder
A2: To bucket cylinder head
A3: To lift cylinder head
B1: To service cylinder
B2: To bucket cylinder bottom
B3: To lift cylinder bottom
PA1: To service PPC valve P1
PA2: To work equipment PPC valve P2
PA3: To work equipment PPC valve P4
PB1: To service PPC valve P2
PB2: To work equipment PPC valve P1
PB3: To work equipment PPC valve P3

(6) DUMP position of the bucket spool

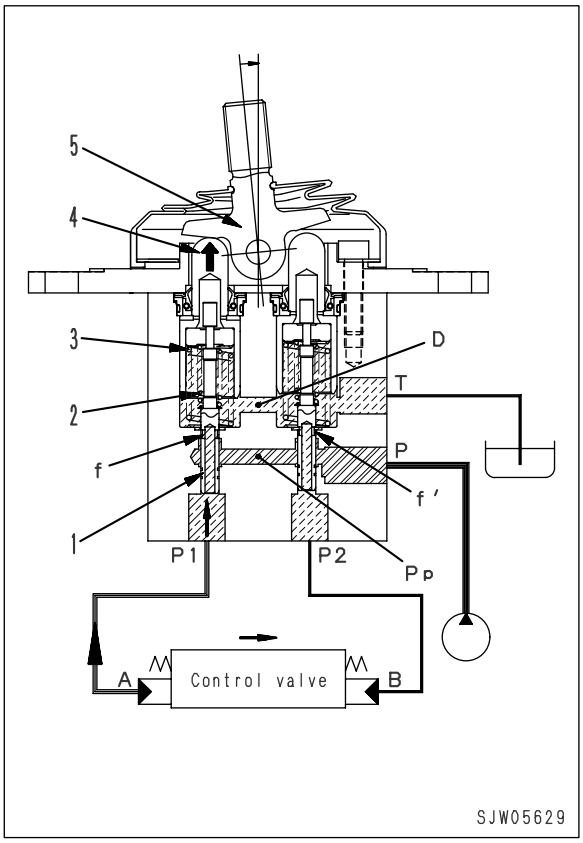


Operation

- If the work equipment control lever is pushed, bucket arm spool (3) is pushed in to the DUMP position.
- Since the bypass circuit is closed by the spool, the hydraulic oil from port **A** pushes check valve (7) open.
- The hydraulic oil from port **H** flows to the cylinder rod side.
- On the other hand, the hydraulic oil on the cylinder bottom side returns through port **G** and drain port **C** into the tank. Accordingly, the bucket dumps.

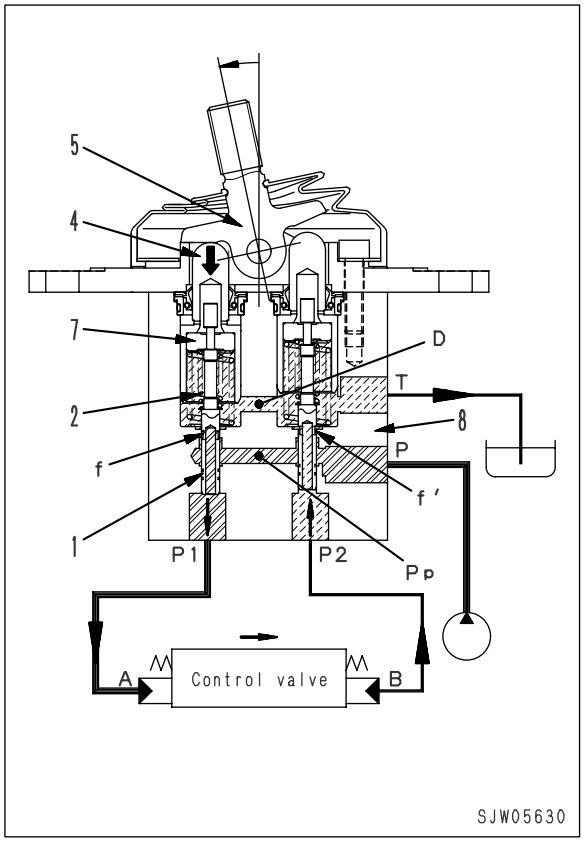
3. At the fine control position (When the control lever is returned)

- When the lever (5) is started to be returned, by the power of the centering spring (3) and by the pressure of the **P1** port, the spool (1) is pushed up. By the above, the fine control hole **f** connects to the drain chamber **D** to release the pressurized oil from the **P1** port.
- In case the pressure of the **P1** port drops excessively, the spool (1) is pushed down by the metering spring (2) and the fine control hole **f** is shut off from the drain chamber **D**, connecting to the drain chamber **D** almost simultaneously to supply the pump pressure **PP** until the pressure of the **P1** port returns to the pressure corresponding to the lever position.
- When the control valve spool returns, the oil in the drain chamber **D** flows through the fine control hole **f'** of the valve which is not moving to be led to the **B** chamber through the **P2** port to refill the oil.

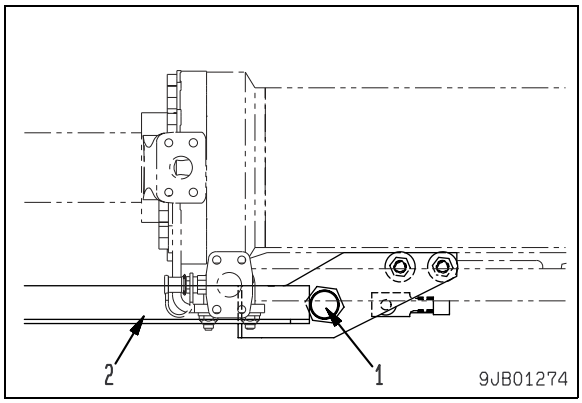


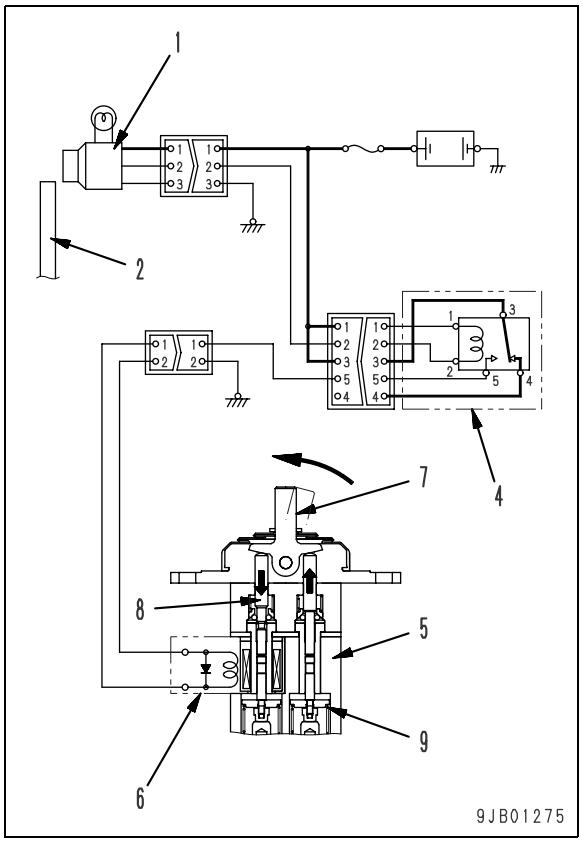
4. At full stroke

- When the lever (5) pushes down the piston (4) and when the retainer pushes down the spool (1), the fine control hole **f** is shut off from the drain chamber **D** and, then, it connects to the pressure chamber **PP** of the pump.
- Therefore, the pilot pressure oil coming from the main pump passes through the fine control hole **f** to be led to the **A** chamber through the **P1** port to push the control valve spool.
- The return oil from the **B** chamber passes through the **P2** port and the fine control hole **f'** to flow into the drain chamber **D**.



- If the bucket tilts and parts from the set position of the bucket positioner, or if plate (2) parts from over the sensing face of proximity switch (1), the lamp of proximity switch (1) goes off and bucket positioner relay (4) is turned off. Accordingly, the circuit of detent solenoid (6) of work equipment PPC valve (5) is turned off to demagnetize the coil.
  Bucket dump spool (8) held at the TILT position receives the reaction force of spring (9) and returns work equipment (bucket) control lever (7) to the HOLD position.





FUNCTION OF PROXIMITY SWITCH

When object of sensing is over sensing face of proximity switch

Lamp of proximity switch	ON
Bucket positioner relay switch circuit	Made
Work equipment PPC valve detent solenoid circuit	Made
Work equipment PPC valve detent solenoid	Magnetized

When object of sensing is apart from over sensing face of proximity switch

Lamp of proximity switch	OFF
Bucket positioner relay switch circuit	Broken
Work equipment PPC valve detent solenoid circuit	Broken
Work equipment PPC valve detent solenoid	Demagnetized

★ While the dump speed switch is in the SLOW mode position, the dump speed is kept low regardless of the bell crank angle.

FUNCTION OF PROXIMITY SWITCH

When object of sensing is over sensing face of proximity switch

Lamp of proximity switch	ON
Dump speed relay switch circuit	Made
Bypass solenoid valve circuit	Broken
Bypass solenoid	Demagnetized

When object of sensing is apart from over sensing face of proximity switch

Lamp of proximity switch	ON
Dump speed relay switch circuit	Broken
Bypass solenoid valve circuit	Made
Bypass solenoid	Magnetized

1. Starting switch
2. Alternator
3. Emergency flasher switch
4. Flasher unit
5. Turn signal lever
6. Turn signal lamp (Left)
7. Turn signal lamp (Right)
8. Head lamp relay
9. Lamp switch
10. Dimmer switch
11. Head lamp (Lo)
12. Head lamp (Hi)
13. Clearance lamp, tail lamp relay
14. Clearance lamp, tail lamp
15. License plate lamp
16. Working lamp relay
17. Tachograph lamp (If equipped)

Connection table of connector pins of machine monitor

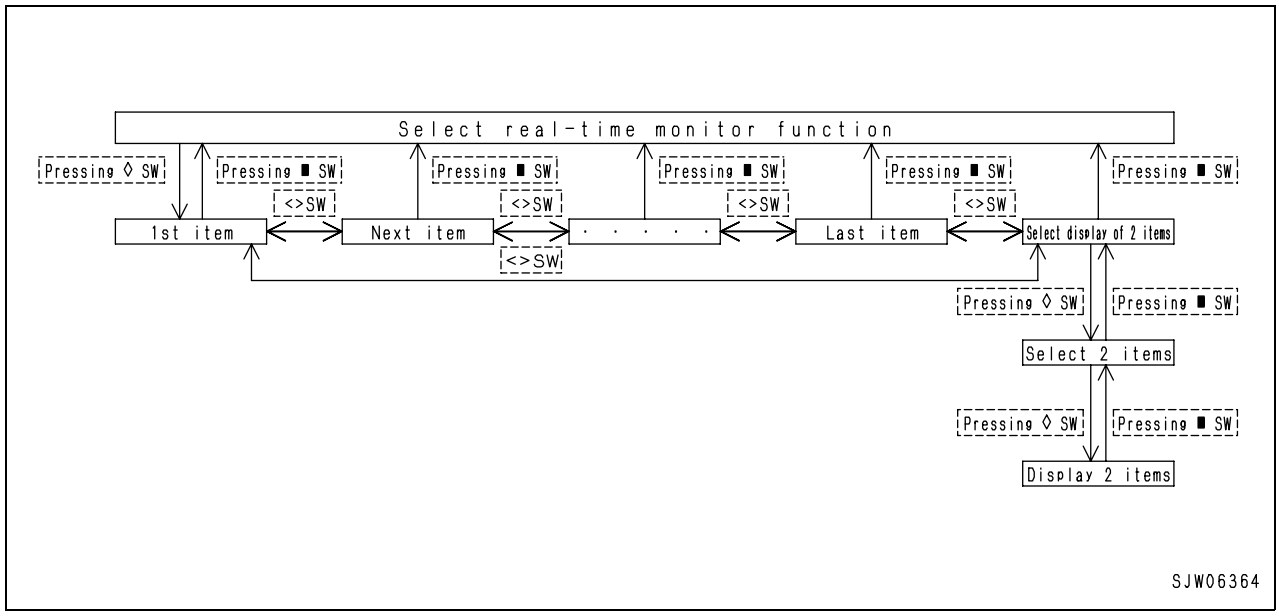
Symbol	Connector pin No.
a	CNL23-3
b	CNL23-1
c	CNL23-12
d	CNL22-11
e	CNL23-17
f	CNL21-12
g	CNL22-12
h	CNL23-9

Division	No.	Item		Device	Condition for operation	Operation								Indication color	Remarks
						Engine is stopped				Engine is running					
						Warning buzzer	Individual indication	Centralized warning	Indication of error code message	Warning buzzer	Individual indication	Centralized warning	Indication of error code message		
Pilot lamp	27	Automatic preheating		Bulb	Other than below	–	–	–	–	–	–	–	–	–	Lamp lights up when automatic preheater is turned ON. Output is turned OFF when IGN_C signal is turned ON. Postheater is turned ON after IGN_C signal is turned OFF.
					When engine is preheated (postheated)	–	○	–	–	–	○	–	–	Orange	
	29	Forward-reverse lever position	F	LED	When F is selected	–	○	–	–	–	○	–	–	Green	
			N		When N is selected	–	○	–	–	–	○	–	–	Orange	
			R		When R is selected	–	○	–	–	–	○	–	–	Green	
	28	Gear speed selector switch position	1	LED	When 1st gear speed is received	–	○	–	–	–	○	–	–	Green	Indicator lamp lights up when CAN signal is received from HST controller. Indicator lamp does not light up when CAN communication is defective (All lamps go off).
			2		When 2nd gear speed is received	–	○	–	–	–	○	–	–	Green	
			3		When 3rd gear speed is received	–	○	–	–	–	○	–	–	Green	
			4		When 4th gear speed is received	–	○	–	–	–	○	–	–	Green	

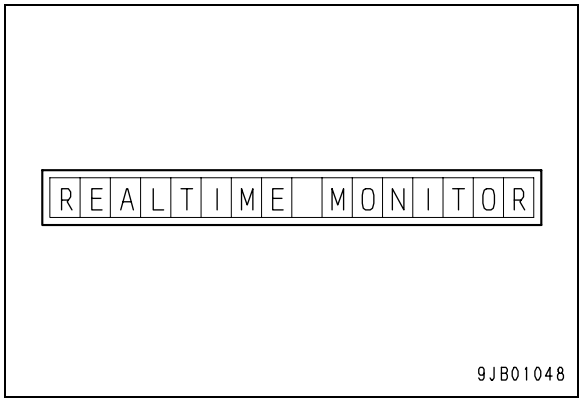
Real-time monitor function

The real-time monitor function displays the information saved in the HST controller and machine monitor mounted on the machine in real time.
This function is used for testing, adjusting, and troubleshooting in the normal display mode or 2-item display mode for displaying 2 data simultaneously.

1) Selection/Display of real-time monitor item
   Pressing the > SW changes the screen in the order of No. 1, No. 2, No. 3 --- Select display of 2 items.
   Pressing the < SW changes the screen in the order of Select of display of 2 items, No. 13, No. 12, No. 11 ---.
   Pressing the ■SW changes the screen to the [Select real-time monitor function] screen.
   In [Display of real-time monitor]: Pressing the ◇SW holds the displayed data. Pressing it again returns the displayed data into the active state.
   In [Select display of 2 items]: Pressing the ◇SW changes the screen to the [Select 2 items] screen.

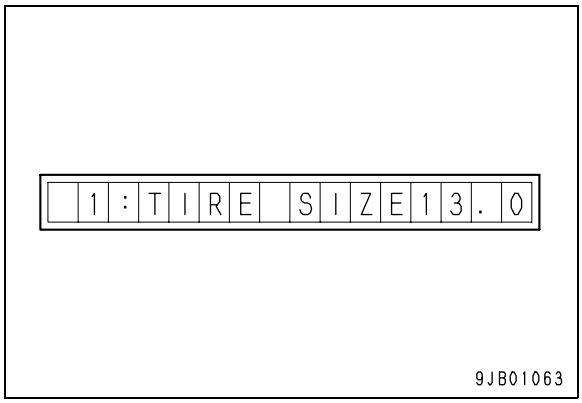


2) Selection of real-time monitor function (first layer)
   Pressing the > SW changes the screen to the [Select maintenance monitor function] screen.
   Pressing the < SW changes the screen to the [Select display of machine system failure history] screen.
   Pressing the ■SW change the screen to the normal screen or alarm screen.
   Pressing the ◇SW change the screen to the [Display of real-time monitor] screen.

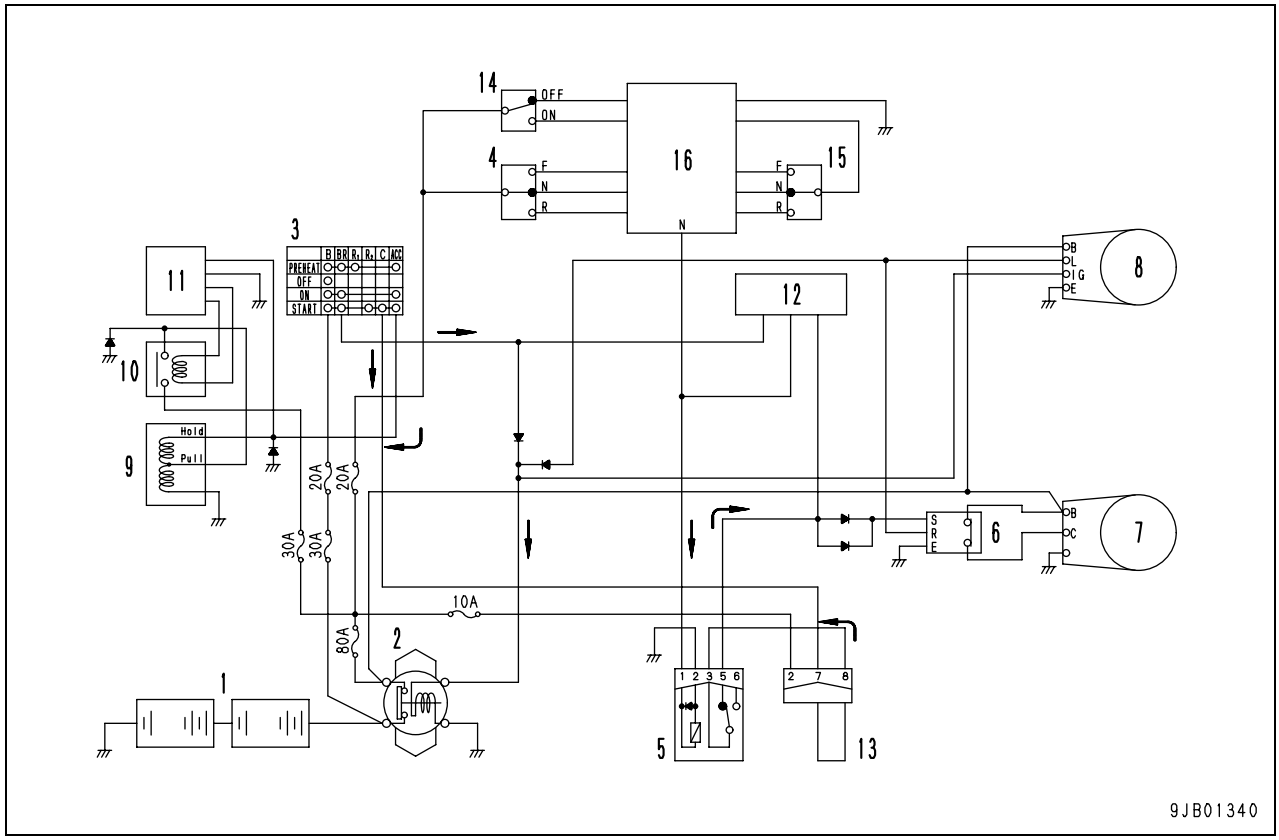


5) Selection of tire size (fourth layer)
Pressing the > SW or < SW selects a tire size.
(13.0/15.5/16.9/17.5/18.4/20.5)
If you press the ◇SW to finish selection, the operation acceptance peeps (on for 0.1 sec → off for 0.1 sec → on for 0.1 sec) are heard and the screen changes to the [Model selection item] screen.

★ Since "250" was selected on the "Select model" screen, "17.5" or "20.5" can be selected. (Other tire sizes are not displayed.)



ENGINE START CIRCUIT



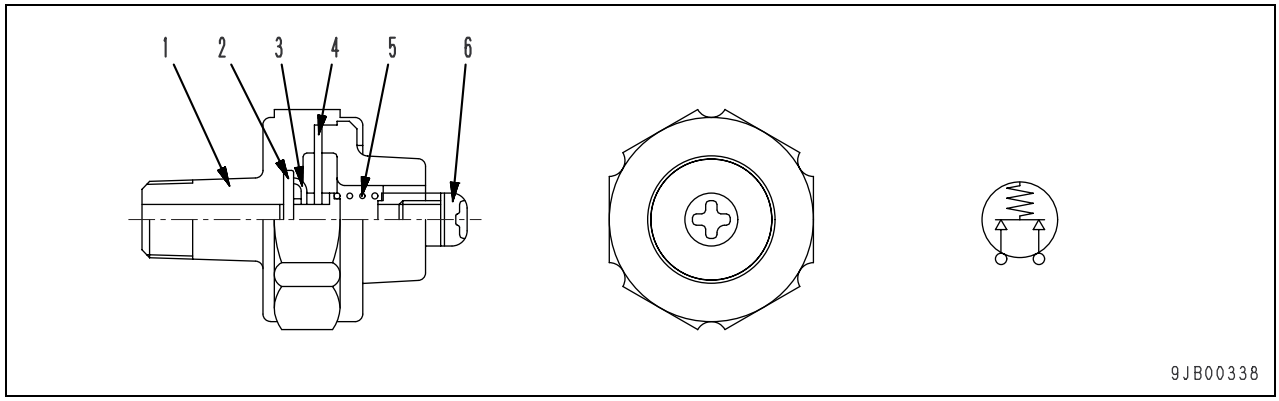
★ For details of the multi-function selector relay circuit, see Function of selecting forward-reverse selector switch.

1. Battery
2. Battery relay
3. Starting switch
4. Forward-reverse lever
5. Neutral safety relay
6. Starting motor safety relay
7. Starting motor
8. Alternator
9. Fuel cut-out solenoid
10. Fuel solenoid pull relay
11. Fuel cut-out solenoid timer
12. Machine monitor
13. Short connector
14. Forward-reverse selector switch drive switch
15. Forward-reverse selector switch
16. Multi-function selector relay circuit

Function

1. The neutral safety circuit is employed to secure the safety when the engine is started.
   - While the forward-reverse selector switch drive switch is OFF, the engine does not start if the forward-reverse lever is not in the N (Neutral) position.
   - While the forward-reverse selector switch drive switch is ON, the engine does not start if the forward-reverse selector switch is not in the N (Neutral) position.

Engine oil pressure sensor

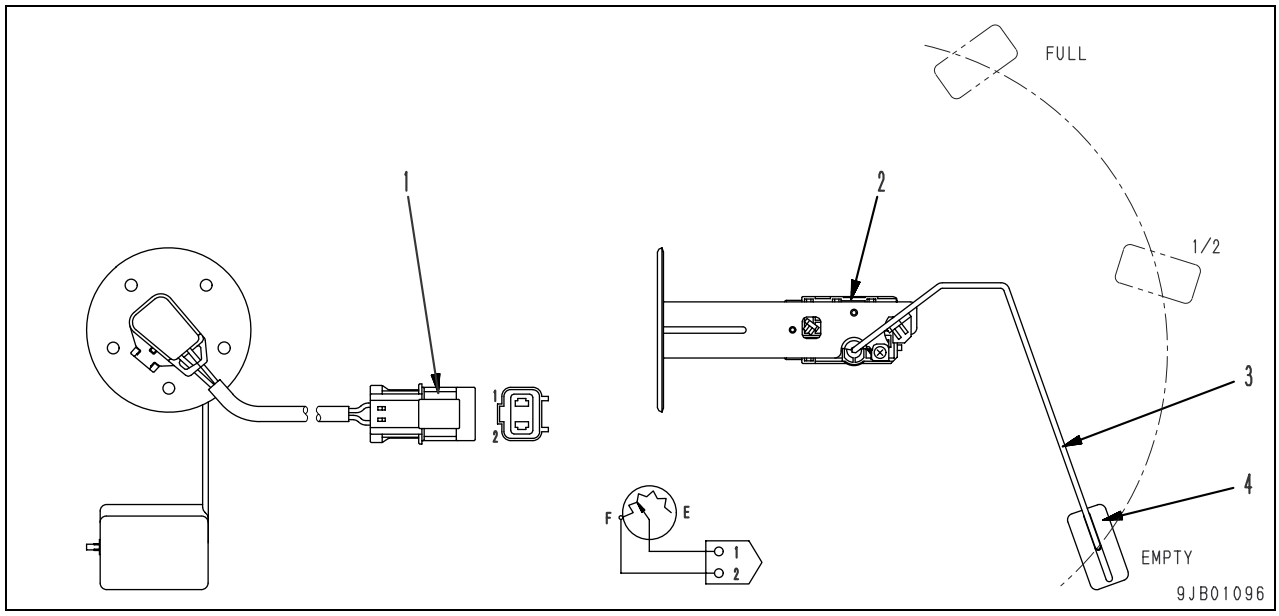


1. Plug
2. Contact ring
3. Contact
4. Diaphragm
5. Spring
6. Terminal

Function

- This sensor is mounted to the engine block. The diaphragm detects oil pressure, and when it reaches below the specified value, the switch is turned ON.

Fuel level sensor



1. Connector
2. Variable resistor
3. Arm
4. Froat

Function

- This sensor is mounted to the side surface of the fuel tank. The float moves vertically depending on the remaining quantity of the fuel.
  The movement of the float operates the variable resistor through the arm and sends a signal to the machine monitor to indicate the remaining quantity of the fuel.

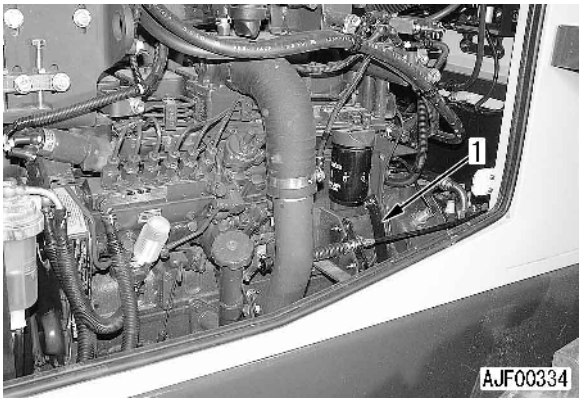
Machine model						WA250-5	
Category	Item		Measurement Conditions		Unit	Standard Value For New Machine	Service Limit Value
Power train (HST)	HST oil pressure	High pressure cut-off pressure	• Engine speed: Full speed • Hydraulic oil temperature: 45 -55°C • Directional lever: FORWARD • Speed switch: 3RD speed		MPa {kg/cm^2}	$44.1^{+1.47}_{0}$ {450^{+15}_{0}}	$44.1^{+1.96}_{0}$ {450^{+20}_{0}}
		Low pressure relief pressure (Work equipment PPC circuit pressure)	• Engine speed: Full speed • Hydraulic oil temperature: 45 -55°C • Directional lever: N			$2.46^{+0.2}_{0}$ {25^{+2}_{0}}	$2.46^{+0.2}_{0}$ {25^{+2}_{0}}
		Servo piston control oil pressure	• Engine speed: Full speed • Hydraulic oil temperature: 45 - 55°C • Directional lever: N	When brake pedal releasing		2.6 ± 0.1 {27 ± 1}	2.6+0.1/-0.2 {27+1/-2}
				When brake pedal depressing		0.59 ± 0.1 {6 ± 1}	0.59+0.1/-0.2 {6+1/-2}
	Transfer	Clutch control pressure	• Hydraulic oil temperature: 45 - 55°C • Directional lever: FORWARD • Speed switch: 3RD or 4TH speed • Travel at a speed of at least 10km/h			$2.46^{+0.2}_{0}$ {25^{+2}_{0}}	$2.46^{+0.2}_{0}$ {25^{+2}_{0}}
Steering	Steering relief pressure		• Engine speed: High idling • Hydraulic oil temperature: 45 - 55°C			18.6 ± 0.7 {190 ± 7}	18.6 ± 2.0 {190 ± 20}
Wheel brake	Performance		• Flat, horizontal, straight, dry paved road surface • Speed when applying brake: 32km/h, braking delay: Within 0.1sec • Brake pedal operating effort: 313.8N{32kg} • Tire inflation pressure: Specified pressure • Measure braking distance		m	Max.14	Max.14
	Disc wear		• Thickness of lining		mm	1 ± 0.1	Max.0.6
Parking brake	Performance		• Tire inflation pressure: Specified pressure • Flat paved road with 1/5 (11°20') grade • Machine at operating condition		-	Holds position	Holds position
Work equipment control valve	Relief pressure		• Engine speed: High idling • Hydraulic oil temperature: 45 - 55°C		MPa {kg/cm^2}	20.6 ± 0.4 {210 ± 4}	20.6 ± 2.0 {210 ± 20}

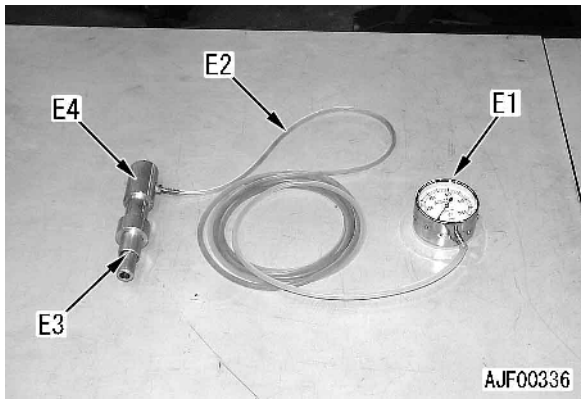
MEASURING BLOW-BY PRESSURE

Special tools required

Symbol		Part No.	Part Name
E		799-201-1504	Blow-by KIT
E	1	• 799-201-1541	Gauge
	2	• 795-201-1571	Tube
	3	• 799-201-1450	Adapter
	4	• 795-790-1950	Nozzle

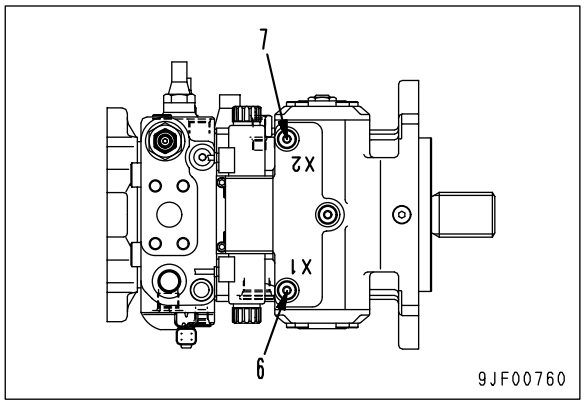
1. When measuring the blow-by, warm up the engine thoroughly so that the water temperature is at least 70°C.
2. Stop the engine, then install blow-by checker E to breather hose (1).



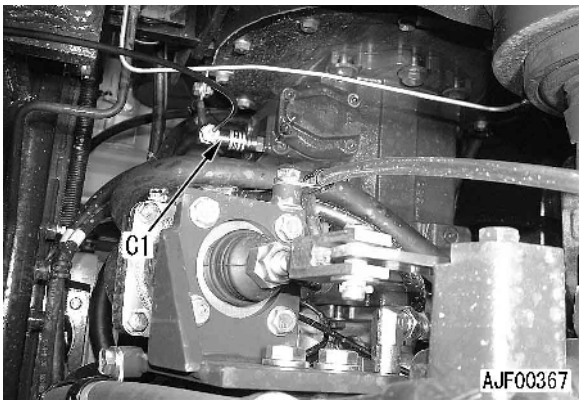


3. Run the engine at the rated output, and measure the blow-by pressure.
   - ★ The blow-by should be measured with the engine running at rated output.
   - • When measuring in the field, a similar value can be obtained at stall speed. In this case, the blow-by value will be about 80% of the value at rated output.
   - ★ Blow-by varies greatly according to the condition of the engine. Therefore, if the blow-by value is considered abnormal, check for problems connected with defective blow-by, such as excessive oil consumption, defective exhaust gas color, and prematurely dirty or deteriorated oil.

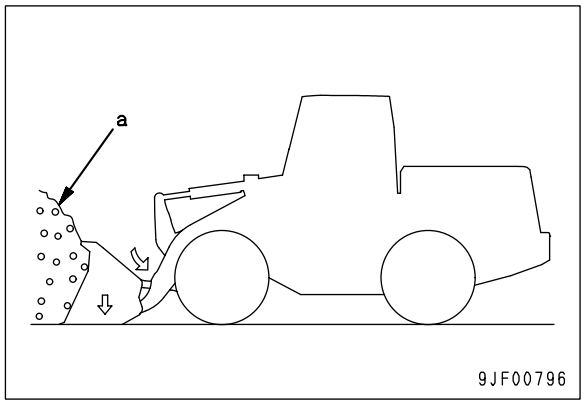
4. Measuring servo piston actuating pressure
   1) Remove servo piston actuation pressure measurement plug (6) or (7) (G 1/4) (width across flats for hexagonal head wrench: 8 mm).
      - Plug (6): For FORWARD circuit (port: X1)
      - Plug (7): For REVERSE circuit (port: X2)



   2) Install a nipple, then connect oil pressure gauge C1 (5.9 MPa {60 kg/cm2}).



   3) Measure the servo piston actuating pressure under the following conditions.
      i) 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 3rd.



      ii) Run the engine at full throttle and push in until the machine stops moving forward.

WARNING! Carry out the measurement on hard ground where it is difficult for the tires to slip.

      iii) Keep the engine running at full throttle, check that the tires are not turning, then measure the oil pressure.

TESTING AND ADJUSTING BRAKE PEDAL LINKAGE

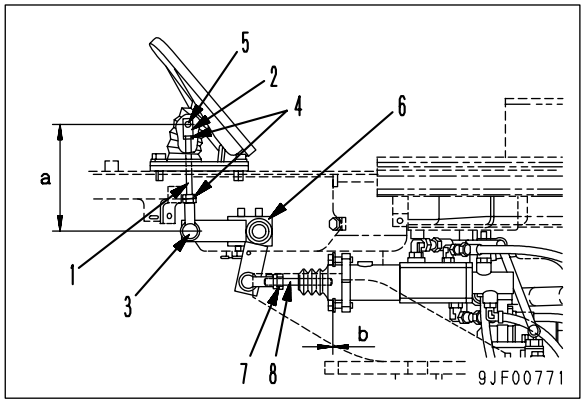
Testing

1. Check for play in linkage mounting pin (7), pin-hole of lever (6), and lever bushing.
2. Measure length of link (a = 184 mm), and check that it is within the standard value.
   ★ Measure the length from the center of pin (1) to the center of ball joint (3).
3. Measure the distance of movement of rod (8) and check that clearance b is within the standard value.
   ★ When doing this, check that the brake pedal is in contact with the stopper.

Adjusting

1. Adjusting link length (a)
   1) Remove pin (5) and ball joint (3), then remove rod (1).
   2) Loosen locknut (4), then turn yoke (2) and ball joint (3) to adjust the length.
   3) After adjusting the length of link (a), connect it to the brake pedal.
      ★ Standard values
      a = 184 mm
      b = 0 - 0.3 mm

2. Adjusting rod length (b)
   1) Loosen locknut (7), turn rod (8) so that the tip of the rod contacts the booster cylinder piston, then turn rod (8) back 1/4 turn.
      ★ Movement for 1/2 turn of rod: 0.75 mm
   2) Tighten locknut (7) to hold in position.
      ★ Standard values
      a = 184 mm
      b = 0 - 0.3 mm



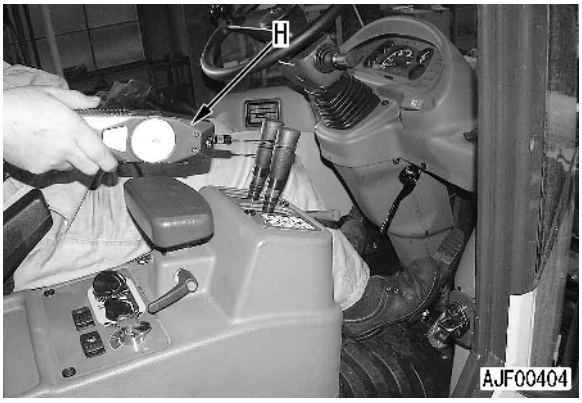
MEASURING AND ADJUSTING WORK EQUIPMENT CONTROL LEVER

★ Measuring condition
- Engine coolant temperature: Operating range of engine coolant thermometer
- Hydraulic oil temperature:60 - 80°C
- Engine speed: Low idling

WARNING! Install the safety bar to the frame.

Measurement

1. Operating effort of work equipment control lever
   1) Install tool **H** to the work equipment control lever and secure it in position.
      ★ Install tool **H** to the center of the knob.
      ★ Operate the control lever at the same speed as for normal operations, and measure the minimum value for the effort needed to operate the knob.



2. Travel of work equipment control lever
   1) Measure the travel at each position when operating the work equipment control lever.
      ★ Mark the lever knob and use a scale to measure.
      ★ If the stroke is not within the standard value, check for play in the linkage and wear of the bushing.

SPECIAL FUNCTIONS OF MACHINE MONITOR

Normal functions and special functions of machine monitor

The machine monitor is equipped with normal functions and special functions.

Various items of data are displayed on the character display in the middle of the machine monitor. Depending on the internal setting of the machine monitor, the display items are divided into automatic display items and items displayed when the machine monitor switches are operated.

1. Normal functions: Operator mode
   Functions for which the content is normally displayed or which can be used displayed and operated by the operator operating the switches.
2. Special functions 1: Service Mode 1
   Functions which the serviceman can display and operate with the special switches to carry out inspection, maintenance, and troubleshooting.
3. Special functions 2: Service Mode 2
   Special operations performed by the serviceman or at the factory.

Operator mode	
1	Service meter, time display (Load meter specification)
2	Odometer display function
3	Filter, oil replacement interval display function
4	Language selection function
5	HST selection function
6	Action code display function
7	Error code display function

→ ←

Service mode 1	
8	Electrical system trouble data display function
9	Mechanical system trouble data display function
10	Machine data monitoring function
11	Filter, oil replacement time setting function
12	Option selection function
13	Initialize function

→ ←

Service mode 2	
14	Service meter setting function
15	Odometer setting function

Failure Code	Location of Failure (Location, component with failure)	Nature of Failure (Problem, nature of failure)	Controller	Action code
DGR1KA	Brake oil temperature sensor system abnormal	Disconnection (KA)	MON	E01
DGR1KX	Brake oil temperature sensor system abnormal	Short circuit (KB)	MON	E01
DHE4L6	Engine oil pressure sensor disconnect	*See separate table (L6)	MON	E01

Separate table: Detailed phenomena of problem code (L)

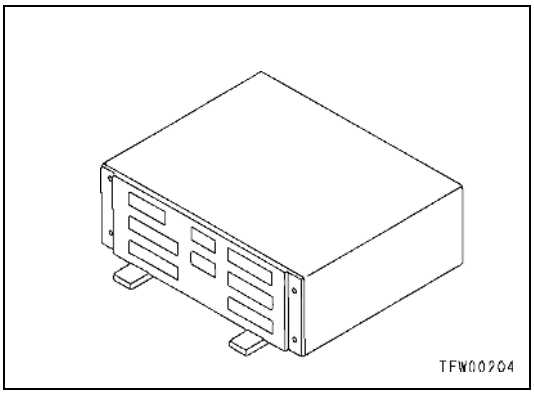
Problem code	Nature
L0	Fill signal ON 2 or more channels for clutches not forming a set are input at same time
L1	Fill signal is ON when command current to ECMV is OFF
L2	Fuel pressure is greater than maximum specified value
L3	Corresponding component cannot be controlled
L4	ON/OFF signals for 2 systems do not match
L5	Potentiometer signal and switch signal do not match
L6	Engine speed signal, terminal C signal, signals for oil pressure switch, water temperature, etc. do not match operating condition or stopped condition of machine
L8	Analog signals for 2 systems do not match
LC	Speed signals for 2 systems do not match
LD	Switch has been kept pressed for abnormally long time
LH	Fill signal is OFF when command current to ECMV is ON

<>: Reference value

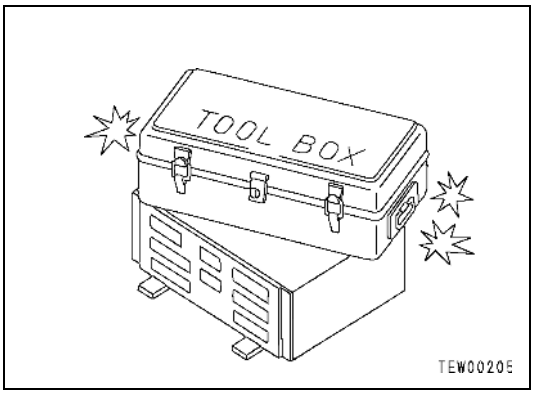
Item		Conditions		Unit	Standard value for new machine	Service limit value	Measure-ment results	Pass	Fail
Steering	Steering wheel operating time	Engine low idling		sec	3.3 - 4.1	Max. 4.8			
		Engine high idling			3.4 - 4.0	2.7 - 4.7			
	Lock frame with safety bar								
	Steering relief pressure	Engine high idling		MPa {kg/cm^2}	17.9 - 19.3 {183 - 197}	16.6 - 20.6 {170 - 210}			
Brake	Service brake	Lining thickness	Front right	mm	0.9 - 1.1	Max. 0.6			
			Front left		0.9 - 1.1	Max. 0.6			
			Rear right		0.9 - 1.1	Max. 0.6			
			Rear left		0.9 - 1.1	Max. 0.6			
Work equipment	Relief pressure	Engine high idling	Bucket relief	MPa {kg/cm^2}	20.2 - 21.0 {206 - 214}	18.6 - 22.6 {190 - 230}			
	Lift arm speed		Raising time	sec	5.4 - 6.4	Max. 8.2			
			Lowering time		2.9 - 3.9	Max. 4.7			
	Bucket speed		Dumping time		1.4 - 2.0	Max. 2.5			
			Tilting-back time		2.0 - 2.6	Max. 3.8			
	Hydraulic drift	Engine stopped	Bucket cylinder	mm/15 min	Max. 17	Max. 20			
			Lift cylinder		Max. 20	Max. 20			
Axle	Check differential drain plug visually		Front axle	-	Must be no excessive metal particles				
			Rear axle						

MEMO

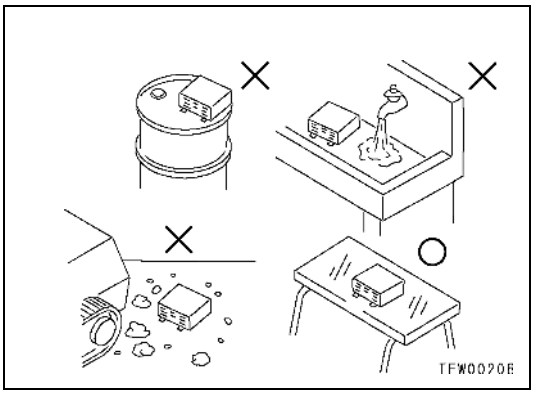
3) Handling control box
   (1) The control box contains a microcomputer and electronic control circuits.
   This controls all of the electronic circuits on the machine, so be extremely careful when handling the control box.
   (2) Do not open the cover of the control box unless necessary.



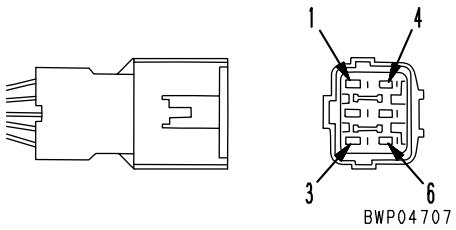
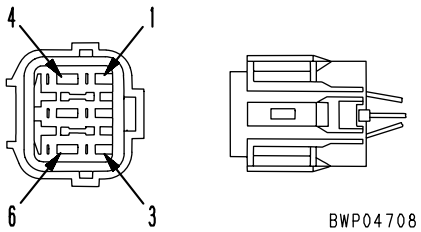
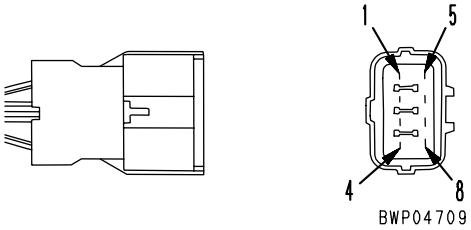
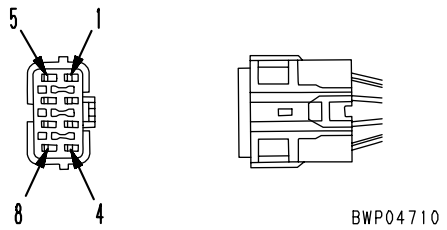
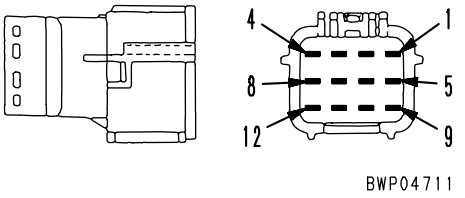
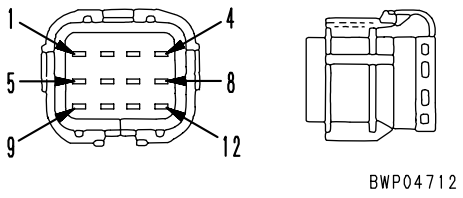
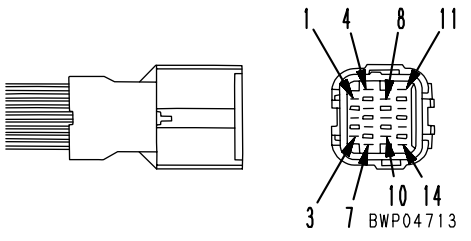
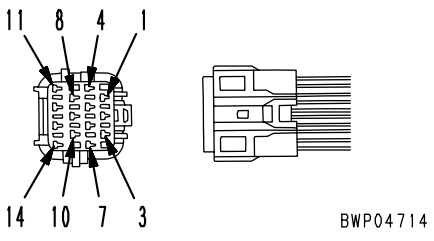
   (3) Do not place objects on top of the control box.
   (4) Cover the control connectors with tape or a vinyl bag.
   Never touch the connector contacts with your hand.
   (5) Do not leave the control box in a place where it is exposed to rain.

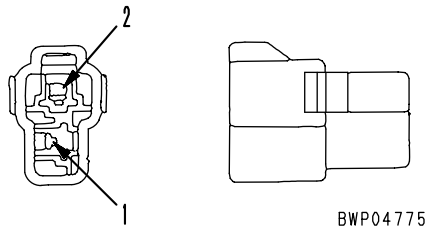
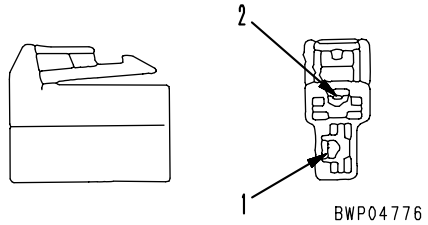
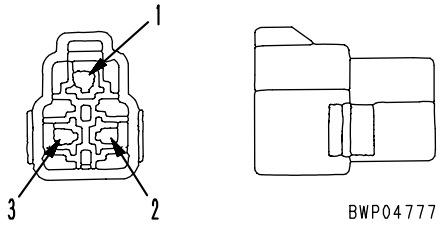
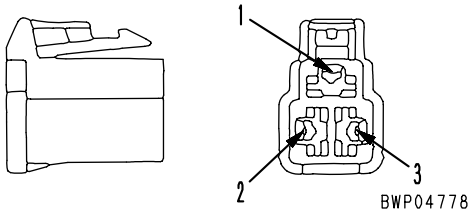
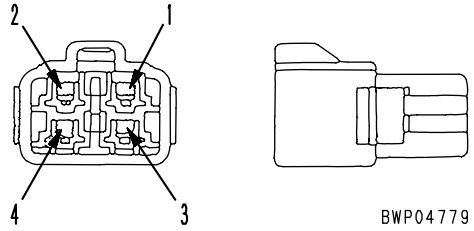
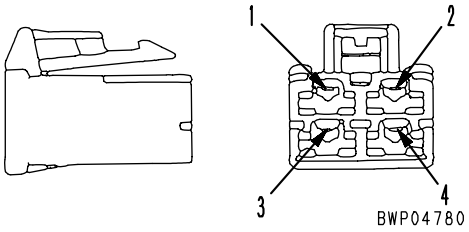
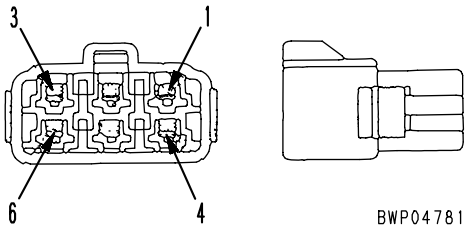
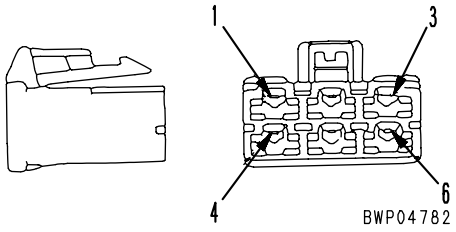


   (6) Do not place the control box on oil, water, or soil, or in any hot place, even for a short time. (Place it on a suitable dry stand)
   (7) Precautions when carrying out arc welding
   When carrying out arc welding on the body, disconnect all wiring harness connectors connected to the control box. Fit an arc welding ground close to the welding point.



2. Points to remember when troubleshooting electric circuits
   1) Always turn the power OFF before disconnecting or connecting connectors.
   2) Before carrying out troubleshooting, check that all the related connectors are properly inserted.
      ★ Disconnect and connect the related connectors several times to check.
   3) Always connect any disconnected connectors before going on to the next step.
      ★ If the power is turned ON with the connectors still disconnected, unnecessary abnormality displays will be generated.
   4) When carrying out troubleshooting of circuits (measuring the voltage, resistance, continuity, or current), move the related wiring and connectors several times and check that there is no change in the reading of the tester.
      ★ If there is any change, there is probably defective contact in the circuit.

Number of Pins	SWP Type Connector		
	Male (Female housing)	Female (Male housing)	T-adapter Part Number
6			799-601-7050
	Part number: 08055-10681	Part number: 08055-10691	
8			799-601-7060
	Part number: 08055-10881	Part number: 08055-10891	
12			799-601-7310
	Part number: 08055-11281	Part number: 08055-11291	
14			799-601-7070
	Part number: 08055-11481	Part number: 08055-11491	

Number of Pins	KES1 Automobile Type Connector		
	Male (Female housing)	Female (Male housing)	T-adapter Part Number
2			—
	Part number: 08027-10210 (Natural color) 08027-10220 (Black)	Part number: 08027-10260 (Natural color) 08027-10270 (Black)	
3			—
	Part number: 08027-10310	Part number: 08027-10360	
4			—
	Part number: 08027-10410 (Natural color) 08027-10420 (Black)	Part number: 08027-10460 (Natural color) 08027-10470 (Black)	
6			—
	Part number: 08027-10610 (Natural color) 08027-10620 (Black)	Part number: 08027-10660 (Natural color) 08027-10670 (Black)	

T-ADAPTER TABLE

★ The part Nos. of the T-adapter boxes and T-adapters are shown in the columns and those of the wiring harness checker assemblies are shown in the lines.

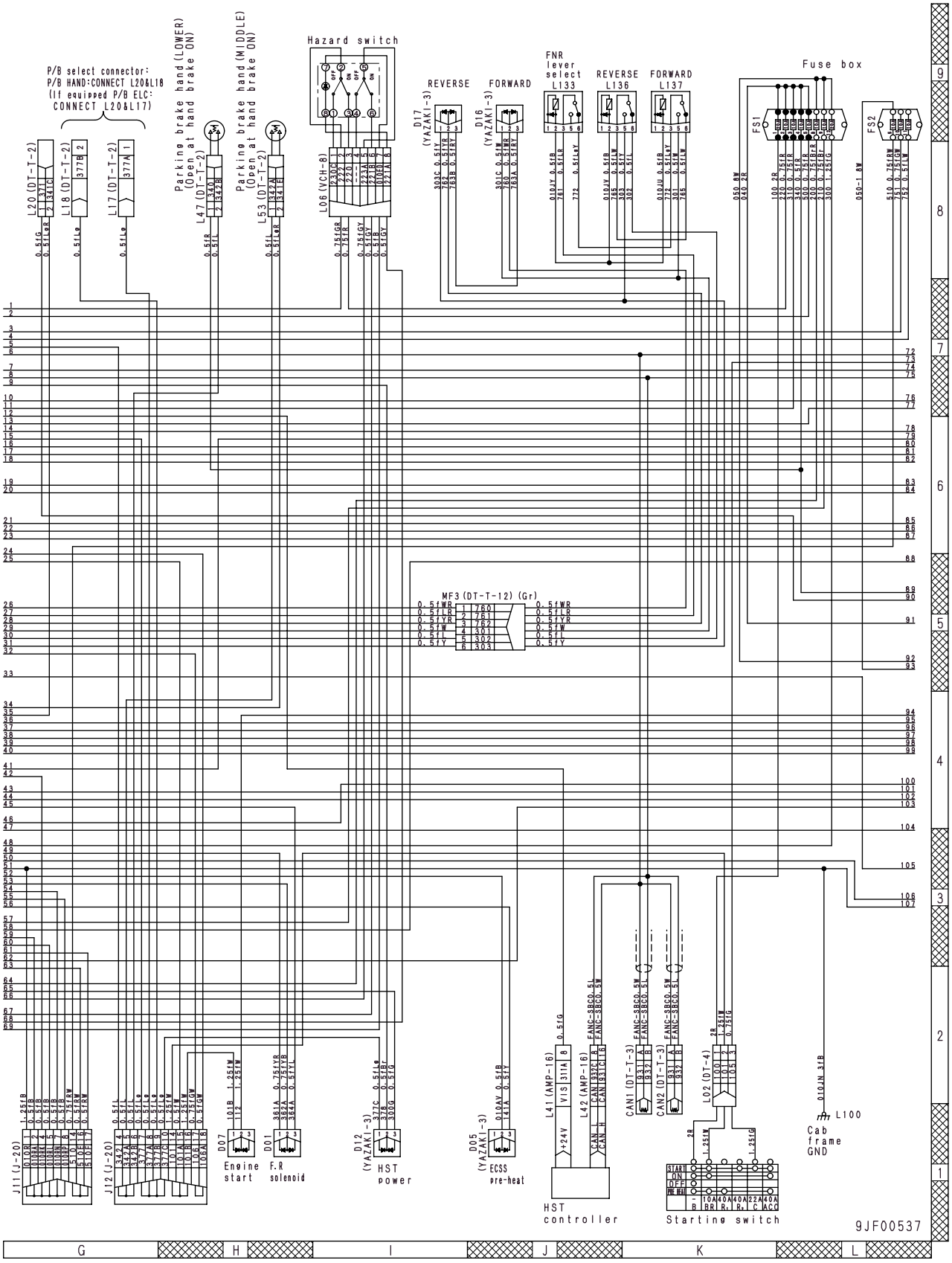
			KIT No.																	
Port No.	Connector type	Pin No.	799-601-2500	799-601-2700	799-601-2800	799-601-2900	799-601-3000	799-601-5500	799-601-6000	799-601-6500	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	|
799-601-2600	For measuring box	Econo-21P	○		○	○						○	○		○					
799-601-3100	For measuring box	MS-37P					○													
799-601-3200	For measuring box	MS-37P					○													
799-601-3300	For measuring box	Econo-24P							○											
799-601-3360	Plate	For MS box																		
799-601-3370	Plate	For MS box																		
799-601-3380	Plate	For MS box																		
799-601-3410	BENDIX(MS)	24P							○	○										
799-601-3420	BENDIX(MS)	24P							○	○										
799-601-3430	BENDIX(MS)	17P							○	○										
799-601-3440	BENDIX(MS)	17P							○	○										
799-601-3450	BENDIX(MS)	5P						○	○											
799-601-3460	BENDIX(MS)	10P							○	○										
799-601-3510	BENDIX(MS)	5P						○	○											
799-601-3520	BENDIX(MS)	14P						○	○											
799-601-3530	BENDIX(MS)	19P							○	○										
799-601-2910	BENDIX(MS)	14P						○	○											
799-601-3470	CASE								○											
799-601-2710	MIC	5P	○	○		○							○							
799-601-2720	MIC	13P	○	○		○							○							
799-601-2730	MIC	17P	○	○	○	○						○	○		○					
799-601-2740	MIC	21P	○	○	○	○						○	○		○					
799-601-2950	MIC	9P									○	○	○		○					
799-601-2750	ECONO	2P	○	○																
799-601-2760	ECONO	3P	○	○																
799-601-2770	ECONO	4P	○	○																
799-601-2780	ECONO	8P	○	○																
799-601-2790	ECONO	12P	○	○																
799-601-2810	DLI	8P	○	○																
799-601-2820	DLI	12P	○	○																
799-601-2830	DLI	16P	○	○																
799-601-2840	Extension cable		○	○									○							
799-601-2850	CASE		○																	
799-601-7010	X	1P											○		○					
799-601-7020	X	2P									○	○	○		○					
799-601-7030	X	3P									○	○	○		○					
799-601-7040	X	4P									○	○	○		○					
799-601-7050	SWP	6P									○	○	○							
799-601-7060	SWP	8P									○	○	○							
799-601-7310	SWP	12P																		○
799-601-7070	SWP	14P											○		○					

BEFORE TROUBLESHOOTING ELECTRICAL SYSTEM

FUSE BOX CONNECTION TABLE

★ This connection chart shows the equipment that each fuse box power source supplies power directly to ("switch power source" means the power supplied when the starting switch is ON; "permanent power source" means the power supplied when the starting switch is OFF).

Category	Fuse No.	Fuse capacity	Power supply destination
Permanent power source (Fuse box 1)	1	20A	Starting switch
	2	10A	Hazard lamp
	3	10A	HST control A
	4	10A	Parking brake 1
	5	10A	Meter, panel
	6	10A	Car radio A
	7	10A	Option (24V-1)
Switch power source (Fuse box 1)	8	10A	Head lamp (left side)
	9	10A	Head lamp (right side)
	10	10A	Turn signal lamp
	11	10A	Back lamp, stop lamp
	12	20A	HST control B
	13	10A	Work equipment positioner
	14	10A	Wiper
	15	10A	Car radio B
Switch power source (Fuse box 2)	1	20A	Air conditioner A
	2	20A	Air conditioner B
	3	10A	Beacon lamp
	4	10A	-
	5	10A	Load-meter
	6	20A	DC converter
	7	10A	Option (24V-2)
	8	10A	Parking brake 2
	9	10A	Horn
	10	10A	Side marker lamp (left side)
	11	10A	Side marker lamp (right side)
	12	20A	Front working lamp
	13	20A	Rear working lamp
	14	10A	(Spare 1)
	15	10A	(Spare 2)


P/B select connector:
P/B HAND:CONNECT L20&L18
(If equipped P/B ELC:
CONNECT L20&L17)
Parking brake hand (LOWER)
(Open at hand brake ON)
Parking brake hand (MIDDLE)
(Open at hand brake ON)
Hazard switch
REVERSE
FORWARD
FNR lever select L133
REVERSE L136
FORWARD L137
Fuse box
MF3 (DT-T-12) (Gr)
Engine start
F.R solenoid
HST power
ECSS pre-heat
HST controller
Starting switch
Cab frame GND
9JF00537

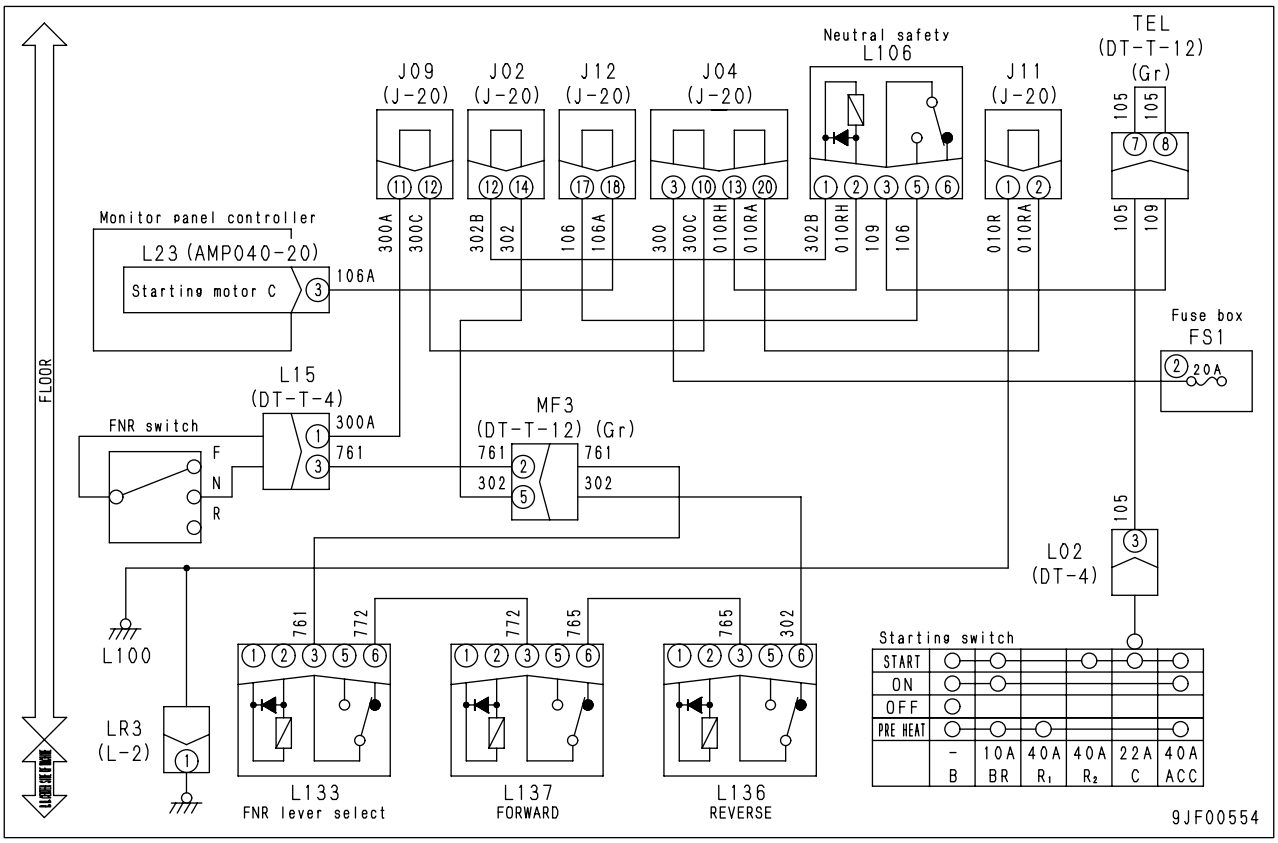
Error Code [989FN1] (HST overrunning (N1))

Action Code	Error Code	Controller Code	Trouble	HST overrunning (N1)
E02	989FN1	MON		
Description of Trouble	• Travel speed exceeds 45 km/h. • Automatic speed reduction when travel speed exceeds 40 km/h does not work.			
Machine monitor or controller Reaction	• Failure code is transmitted to HST controller, and when travel speed exceeds 40 km/h, HST controller automatically reduces speed			
Effect on Machine	• HST overrun alarm is given. • Automatically reduces speed.			
Related Information				

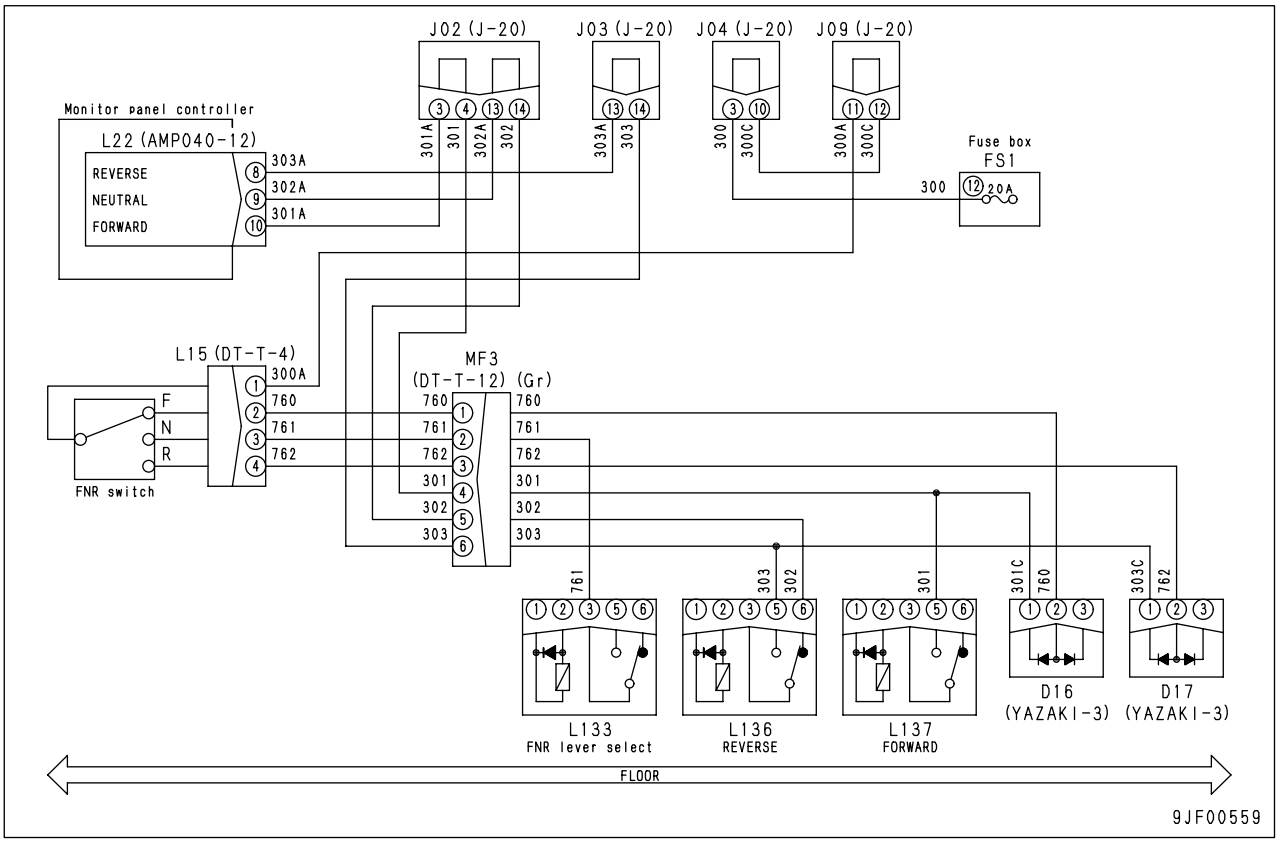
	Causes		Standard Value in Normal State and Remarks on Troubleshooting	
Possible Causes and Standard Values	1	- - -	1) Turn starting switch ON. 2) Operate machine monitor	
			Other code is displayed at same time	Carry out troubleshooting for applicable code displayed
	2	Overrunning HST	When machine was used in way that would cause HST to overrun	Inspect and repair cause of problem and damage to HST.
	3	Defective machine monitor	1) Start engine. 2) Operate machine monitor 3) Travel on flat ground.	
			Travel speed goes above 40 km/h.	Carry out troubleshooting for HST controller system failure codes DW26KZ and DX19KZ.
			Travel speed does not go above 40 km/h. (Less than 40 km/h)	Inspect and repair cause of problem and damage to HST.

Possible Causes and Standard Values	Causes		Standard Value in Normal State and Remarks on Troubleshooting			
	5	Hot short-circuiting between harnesses	1) Turn starting switch OFF. 2) Disconnect Connectors L23, L106. 3) Connect T-adapter.			
			Wiring harness between L23 (Female) (3) and L106 (Female) (5)	Voltage between L23 (Female) (3), L106 (Female) (5) and chassis ground		1V and below
	6	Defective machine monitor	1) Turn starting switch OFF. 2) Disconnect connector L23. 3) Insert T-adapter. 4) Connect connector. 5) Turn starting switch ON.			
			Between L23 (Female) (3) and Chassis ground	Starting switch START.	Voltage	20 - 30V
				Other than the above.	Voltage	1V and below

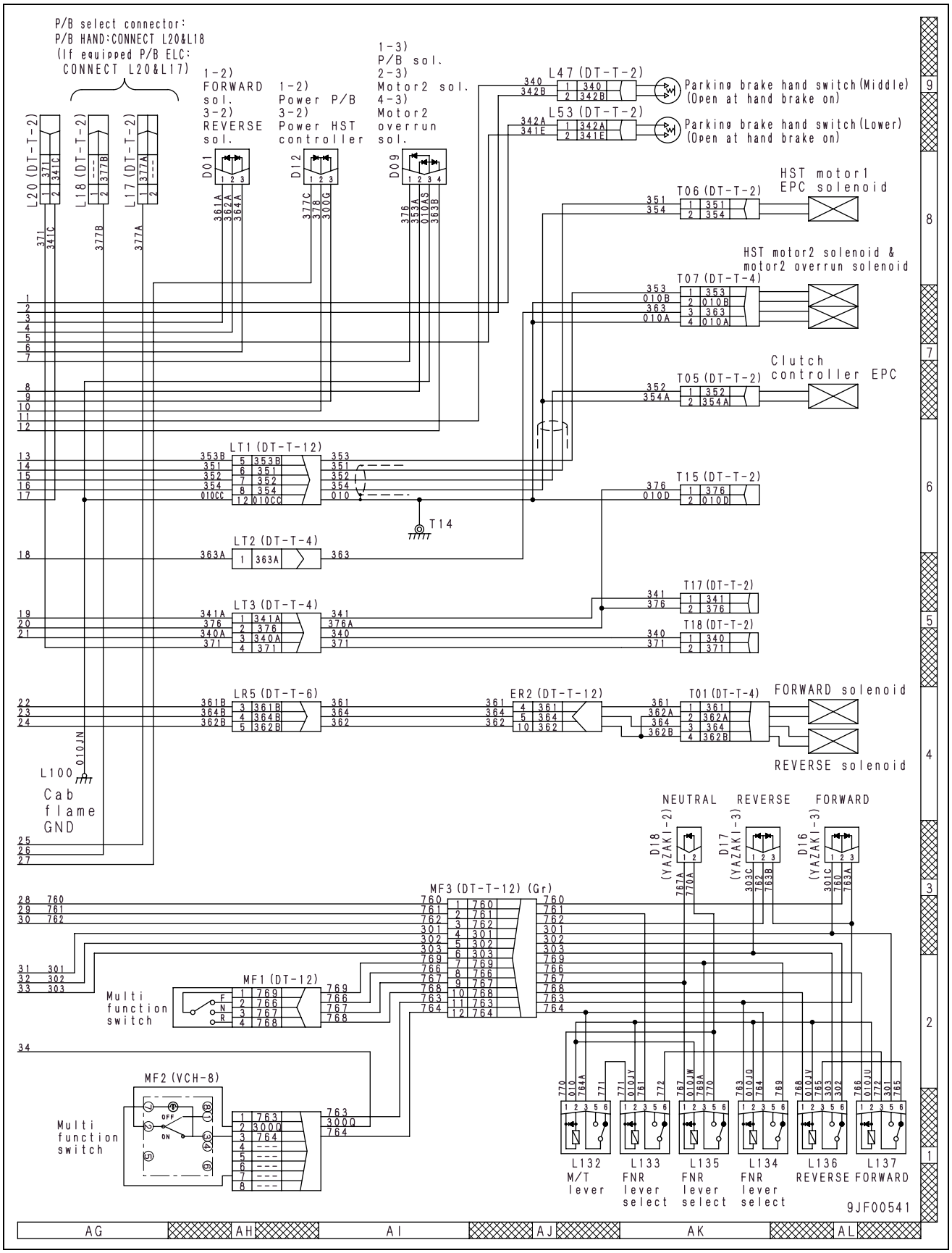
Related circuit diagram



Related circuit diagram



Related circuit diagram

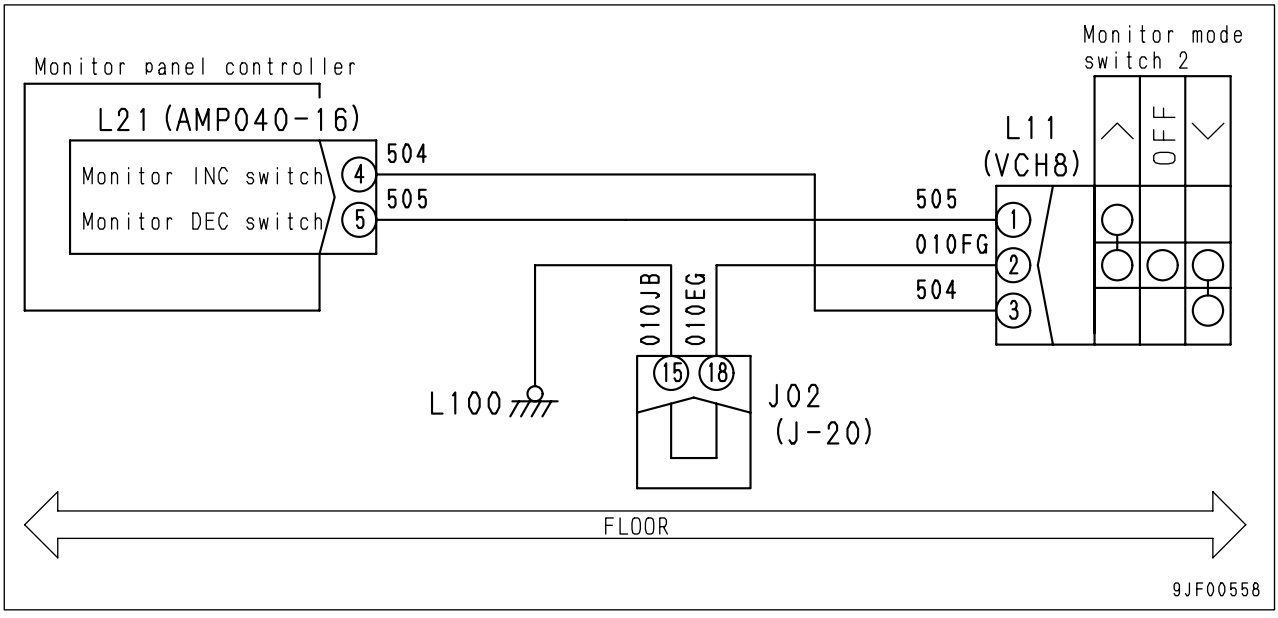


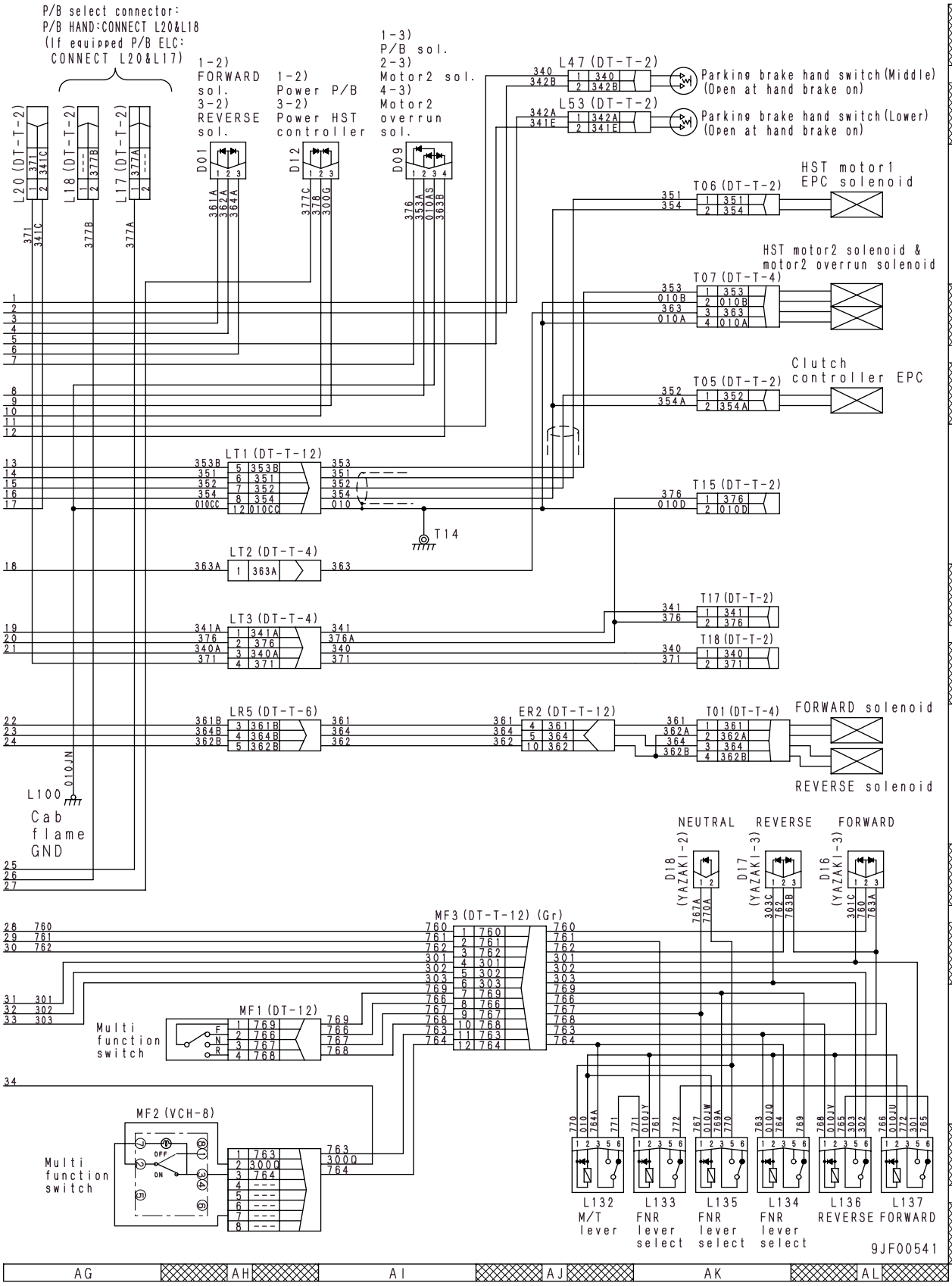
Troubleshooting Code [MON-11] (Input failure in monitor panel mode selector switch 2 [<] (Panel switch 3))

Action Code	Error Code	Controller Code	Trouble	Input failure in monitor panel mode selector switch 2 [<] (Panel switch 3)
-	-	-		
Description of Trouble	• The monitor panel mode selector switch 2 [<] (Panel switch 3) input circuit is always in the OPEN state.			
Machine monitor or controller Reaction	• Activates an alarm.			
Effect on Machine	• The monitor does not work.			
Related Information				

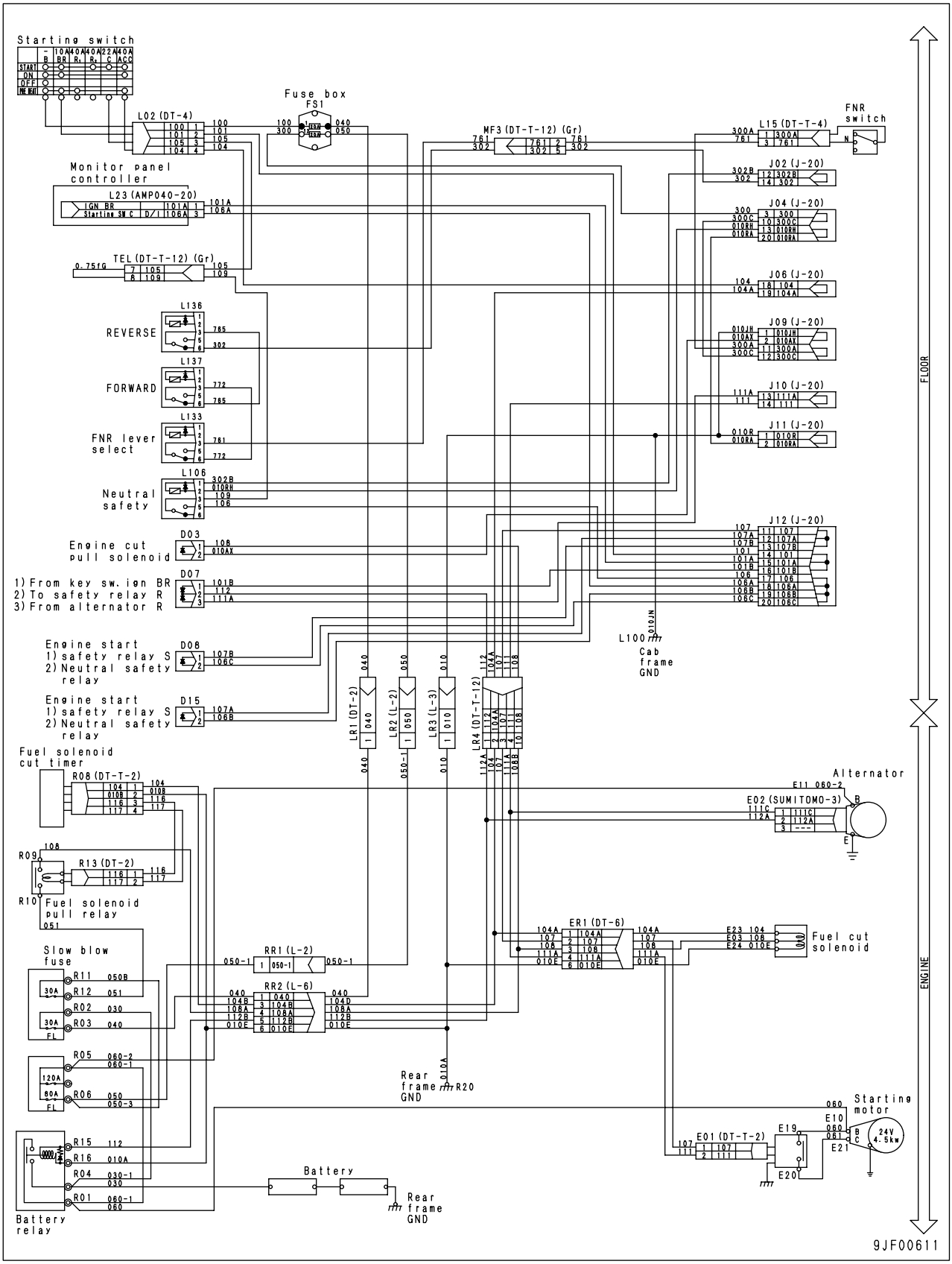
	Causes		Standard Value in Normal State and Remarks on Troubleshooting			
Possible Causes and Standard Values	1	Defective monitor panel mode selector switch 2 [<]	1) Turn starting switch OFF. 2) Disconnect connector L11. 3) Connect T-adapter.			
			Between L11 (Female) (2) and (3)	When monitor panel mode selector switch 2 [<] is turned ON.	Resistance	1Ω and below
				Other than above.	Resistance	1MΩ and above
	2	Wiring harness discontinuity (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect Connectors L21, L11. 3) Connect T-adapter.			
			Wiring harness between L21 (Female) (4) and L11 (Female) (3)		Resistance	1Ω and below
			Wiring harness between L11 (Female) (2) and chassis ground		Resistance	1Ω and below
	3	Hot short-circuiting between harnesses	1) Turn starting switch OFF. 2) Disconnect Connectors L21, L11. 3) Connect T-adapter. 4) Turn starting switch ON.			
			Wiring harness between L21 (Female) (4) and L11 (Female) (3)	Voltage between L21 (Female) (4), L11 (Female) (3) and chassis ground		1V and below
	4	Defective machine monitor	1) Turn starting switch OFF. 2) Disconnect connector L21. 3) Insert T-adapter. 4) Connect connector. 5) Turn starting switch ON.			
			Between L21 (Female) (4) and chassis ground	When monitor panel mode selector switch 2 [<] is turned ON.	Voltage	1V and below
				Other than above.	Voltage	20 - 30V

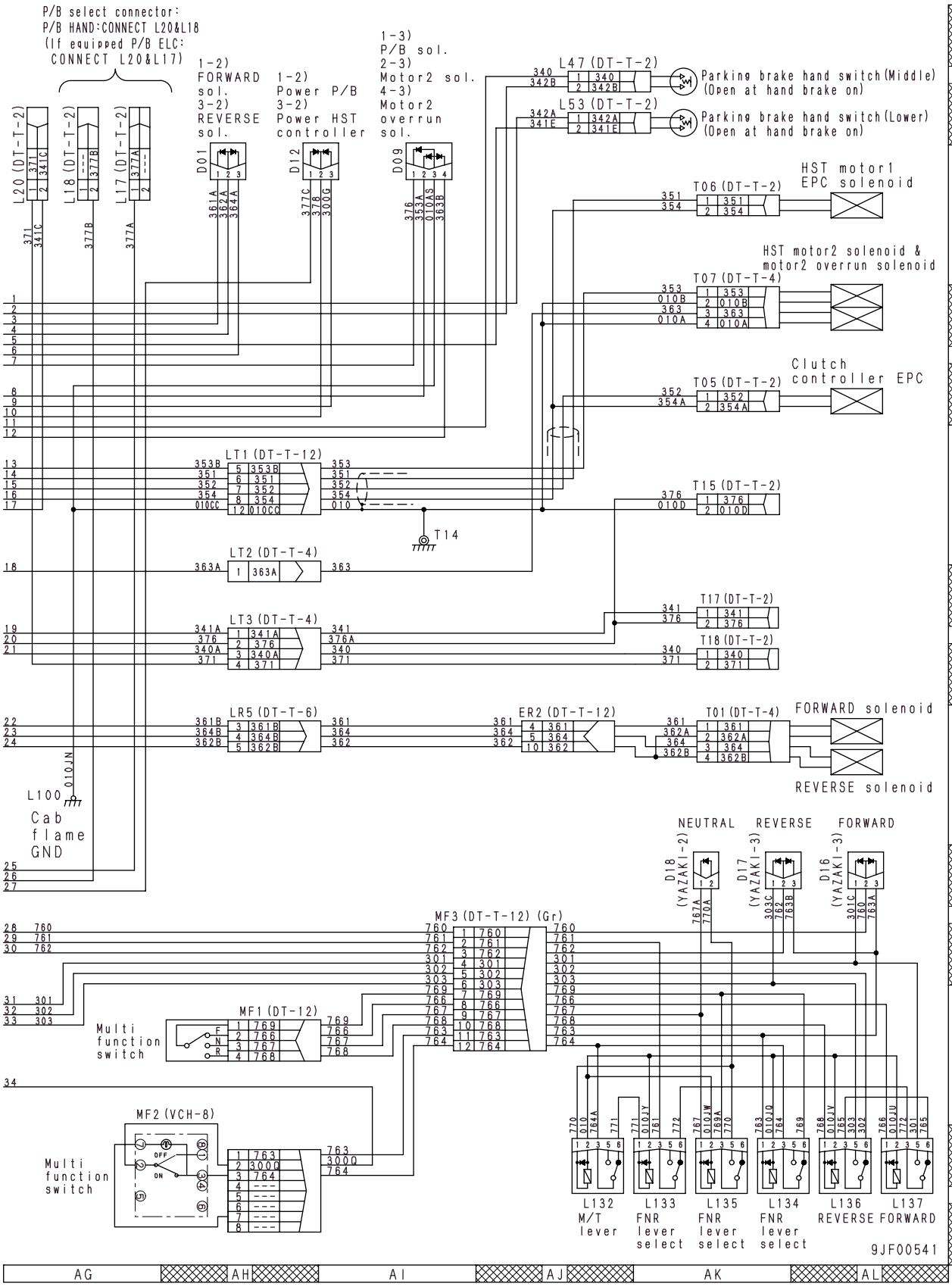
Related circuit diagram




P/B select connector:
P/B HAND:CONNECT L20&L18
(If equipped P/B ELC:
CONNECT L20&L17)
1-2) FORWARD sol.
3-2) REVERSE sol.
1-2) Power P/B
3-2) Power HST controller
1-3) P/B sol.
2-3) Motor2 sol.
4-3) Motor2 overrun sol.
L47 (DT-T-2)
Parking brake hand switch(Middle)
(Open at hand brake on)
L53 (DT-T-2)
Parking brake hand switch(Lower)
(Open at hand brake on)
HST motor1 EPC solenoid
T06 (DT-T-2)
HST motor2 solenoid & motor2 overrun solenoid
T07 (DT-T-4)
Clutch controller EPC
T05 (DT-T-2)
LT1 (DT-T-12)
T14
T15 (DT-T-2)
LT2 (DT-T-4)
T17 (DT-T-2)
LT3 (DT-T-4)
T18 (DT-T-2)
LR5 (DT-T-6)
ER2 (DT-T-12)
T01 (DT-T-4)
FORWARD solenoid
REVERSE solenoid
L100
Cab flame GND
NEUTRAL
REVERSE
FORWARD
MF3 (DT-T-12) (Gr)
MF1 (DT-12)
Multi function switch
MF2 (VCH-8)
Multi function switch
L132 M/T lever
L133 FNR lever select
L135 FNR lever select
L134 FNR lever select
L136 REVERSE
L137 FORWARD
9JF00541
AG
AH
AI
AJ
AK
AL

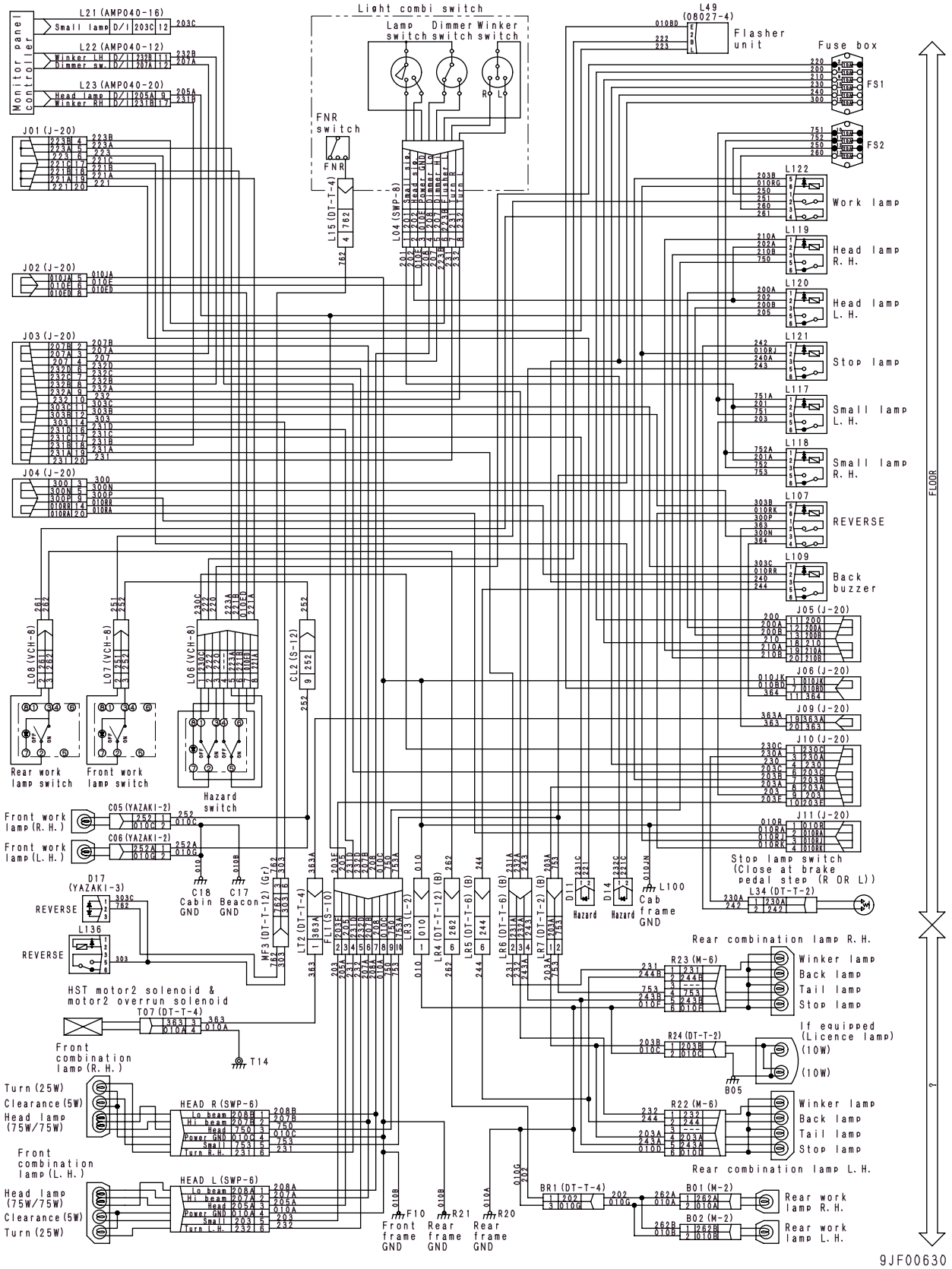
Related circuit diagram




P/B select connector:
P/B HAND:CONNECT L20&L18
(If equipped P/B ELC:
CONNECT L20&L17)
1-2) FORWARD sol.
3-2) REVERSE sol.
1-2) Power P/B
3-2) Power HST controller
1-3) P/B sol.
2-3) Motor2 sol.
4-3) Motor2 overrun sol.
L20 (DT-T-2)
L18 (DT-T-2)
L17 (DT-T-2)
D01
D12
D09
L47 (DT-T-2)
Parking brake hand switch(Middle)
(Open at hand brake on)
L53 (DT-T-2)
Parking brake hand switch(Lower)
(Open at hand brake on)
HST motor1 EPC solenoid
T06 (DT-T-2)
HST motor2 solenoid & motor2 overrun solenoid
T07 (DT-T-4)
Clutch controller EPC
T05 (DT-T-2)
LT1 (DT-T-12)
T15 (DT-T-2)
T14
LT2 (DT-T-4)
T17 (DT-T-2)
LT3 (DT-T-4)
T18 (DT-T-2)
LR5 (DT-T-6)
ER2 (DT-T-12)
T01 (DT-T-4)
FORWARD solenoid
REVERSE solenoid
L100
Cab flame GND
NEUTRAL
REVERSE
FORWARD
D18 (YAZAKI-2)
D17 (YAZAKI-3)
D16 (YAZAKI-3)
MF3 (DT-T-12) (Gr)
MF1 (DT-12)
Multi function switch
MF2 (VCH-8)
Multi function switch
L132 M/T lever
L133 FNR lever select
L135 FNR lever select
L134 FNR lever select
L136 REVERSE
L137 FORWARD
9JF00541
AG
AH
AI
AJ
AK
AL

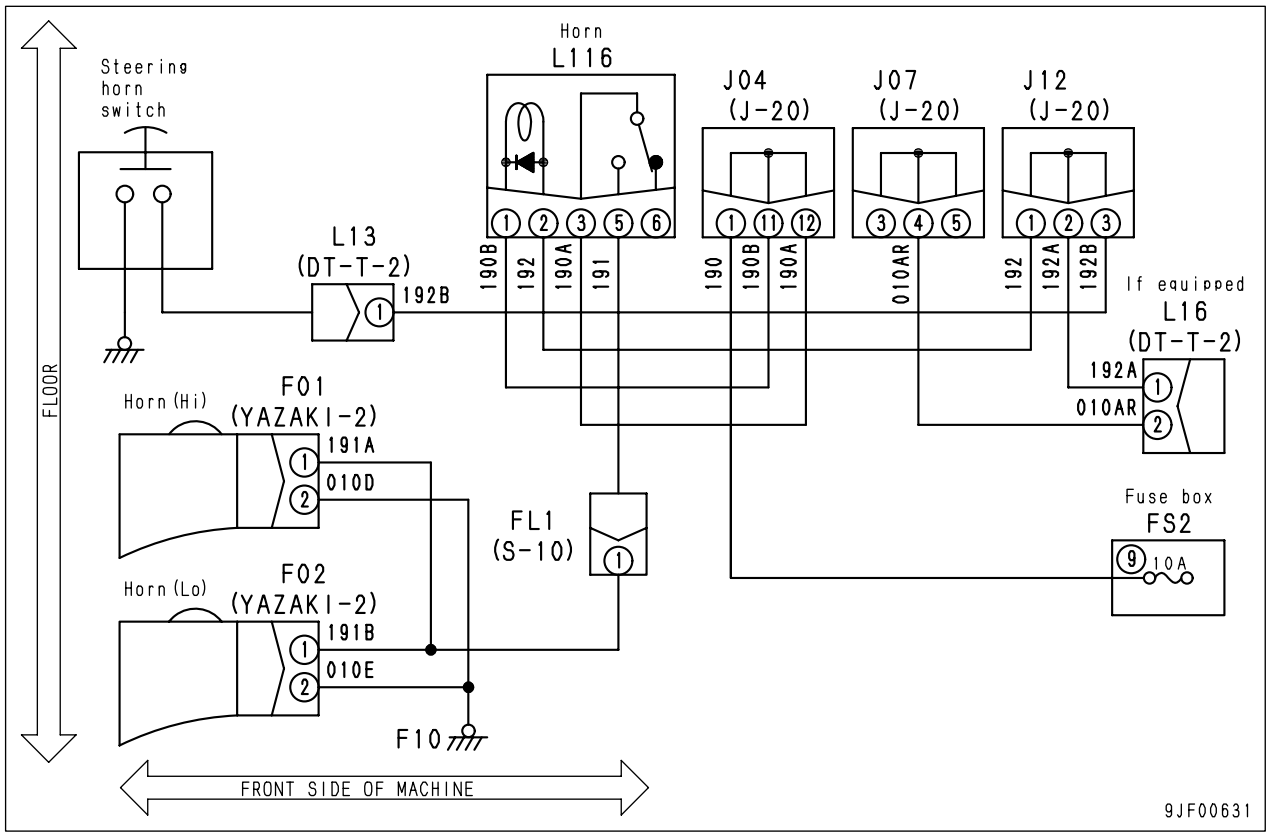
	Causes		Standard Value in Normal State and Remarks on Troubleshooting		
Possible Causes and Standard Values	4	Wiring harness discontinuity (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect connector L05, L48, L57 and fuse FS1 terminal. 3) Connect T-adapter.		
			Wiring harness between L05 (Female) (2) and L48 (Female) (4)	Resistance	1V and below
			Wiring harness between L05 (Female) (3) and L48 (Female) (5)	Resistance	1V and below
			Wiring harness between L05 (Female) (5) and L57 (Female) (2)	Resistance	1V and below
			Wiring harness between L05 (Female) (4) and L57 (Female) (1)	Resistance	1V and below
			Wiring harness between L48 (Female) (6) and L57 (Female) (5)	Resistance	1V and below
			Wiring harness between fuse FS1 (14) and L05 (Female) (7)	Resistance	1V and below
			Wiring harness between fuse FS1 (14) and L48 (Female) (3)	Resistance	1V and below
			Wiring harness between fuse FS1 (14) and L57 (Female) (6)	Resistance	1V and below
	5	Wiring harness ground fault	1) Turn starting switch OFF. 2) Disconnect connector L05, L48, L52, L57 and fuse FS1 terminal. 3) Connect T-adapter.		
			Wiring harness between L05 (Female) (2) and L48 (Female) (4)	Resistance between L05 (Female) (2), L48 (Female) (4) and chassis ground	1MΩ and above
			Wiring harness between L05 (Female) (3) and L48 (Female) (5)	Resistance between L05 (Female) (3), L48 (Female) (5) and chassis ground	1MΩ and above
			Wiring harness between L05 (Female) (5) and L57 (Female) (2)	Resistance between L05 (Female) (5), L57 (Female) (2) and chassis ground	1MΩ and above
			Wiring harness between L05 (Female) (4) and L57 (Female) (1)	Resistance between L05 (Female) (4), L57 (Female) (1) and chassis ground	1MΩ and above
			Wiring harness between L48 (Female) (6) and L57 (Female) (5)	Resistance between L48 (Female) (6), L57 (Female) (5) and chassis ground	1MΩ and above
			Wiring harness between fuse FS1 (14) and L05 (Female) (7)	Resistance between L05 (Female) (7) and chassis ground	1MΩ and above
			Wiring harness between fuse FS1 (14) and L48 (Female) (3)	Resistance between L48 (Female) (3) and chassis ground	1MΩ and above
			Wiring harness between fuse FS1 (14) and L57 (Female) (6)	Resistance between L57 (Female) (6) and chassis ground	1MΩ and above

Related circuit diagram



	Causes		Standard Value in Normal State and Remarks on Troubleshooting		
Possible Causes and Standard Values	4	Wiring harness discontinuity (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect connector L05, L152 and fuse FS1 terminal. 3) Connect T-adapter.		
			Wiring harness between fuse FS2 (8) and L116 (Female) (1), (3)	Resistance	1Ω and below
			Wiring harness between L116 (Female) (2) and L13 (Female) (1)	Resistance	1Ω and below
			Wiring harness between L116 (Female) (5) and F02 (Female) (1)	Resistance	1Ω and below
			Wiring harness between F01 (Female) (2), F02 (Female) (2) and chassis ground	Resistance	1Ω and below
	5	Wiring harness ground fault	1) Turn starting switch OFF. 2) Disconnect connector L05, L48, L52, L157 and fuse FS1 terminal. 3) Connect T-adapter.		
			Wiring harness between fuse FS2 (8) and L116 (Female) (1), (3) *1	Resistance between fuse FS2 (8), L116 (Female) (1), (3) and chassis ground	1MΩ and above
			Wiring harness between L116 (Female) (2) and L13 (Female) (1) *2	Resistance between L116 (Female) (2), L13 (Female) (1) and chassis ground	1MΩ and above
			Wiring harness between L116 (Female) (5) and F01 (Female) (1), F02 (Female) (1)	Resistance between L116 (Female) (4), F01 (Female) (1), F02 (Female) (1) and chassis ground	1MΩ and above
			★ In case of *1 above, fuse is blown ★ In case of *2 above, horn does not stop sounding		

Related circuit diagram



TROUBLESHOOTING OF HYDRAULIC, 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 safety bar been removed from frame?

No.	Diagnosis \ Remedy	Cause: Hydraulic pump a: Defective hydraulic pump or PTO Steering pump and switch pump: Steering △X	Others b: Priority valve: Spool	Others b: Priority valve: Relief valve	Others c: Obit-roll	Others d: Internal defective steering cylinder (Defective piston seal) △X	Others e: 2-way restrictor valve △X	Others f: Departer valve △X
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.

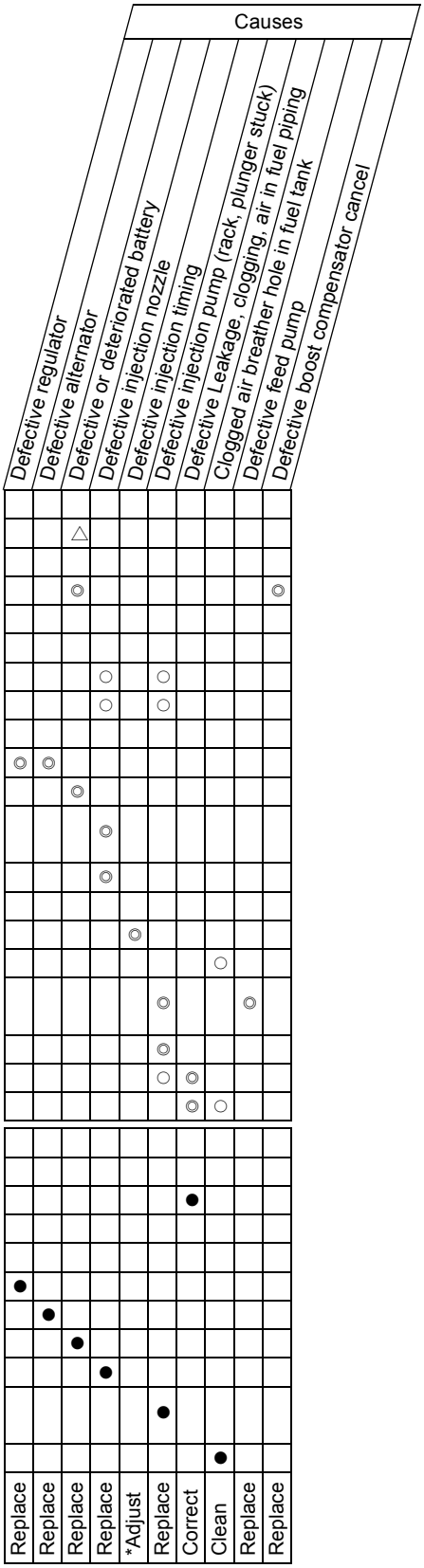
★ If the steering pump is abnormal (broken), check the priority valve at the same time.

H-19 The bucket does not tilt back

Ask the operator about the following:
- Has the bucket come not to work suddenly o Seizure or breakage of each equipment
- Did any abnormal noise occur at the time (And where)?
- Was there the phenomenon that the bucket worked slowly?
  → Wear of parts or deformation of spring

Inspection before diagnosis
- Is the stroke of the bucket control lever appropriate?

No.	Diagnosis \ Remedy	Cause: Tank to Pump a: Clogging of pump suction port or mixing of much air in oil	Tank to Pump b: The steering pump is defective	Tank to Pump c: The pump PTO does not drive	Tank to Pump d: The hydraulic pump and the switch pump are defective	Tank to Pump e: The PPC pump is defective	Priority Valve f: Defective operation of spool	PPC Valve g: The relief valve is defective	PPC Valve h: The spool is defective	Work Equipment Valve i: Defective operation of main relief valve	Work Equipment Valve j: Breakage inside valve body (Bucket spool)	Cylinder k: Damage of bucket cylinder piston seal
		C △		△ X	△ X	△ X	X	△ X	△ X	A X	X	X
1	The lift arm cannot operate and the bucket cannot tilt back	○		○	○	○	○	○		○	○	
2	The bucket can lift the machine but cannot tilt back, or the lift arm operates but the lift arm cannot tilt back								○		○	○
3	The bucket can tilt back without load but cannot in digging or scooping up	○			○					○		
4	The hydraulic pump causes an abnormal noise	○			○	○						
5	Large hydraulic drift of bucket cylinder										○	○
6	When the engine is at full throttle, the steering operation is heavy and slow	○	○	○								


Causes
Defective regulator
Defective alternator
Defective or deteriorated battery
Defective injection nozzle
Defective injection timing
Defective injection pump (rack, plunger stuck)
Clogged Leakage, clogging, air in fuel piping
Defective air breather hole in fuel tank
Defective feed pump
Defective boost compensator cancel
Replace
Replace
Replace
Replace
*Adjust
Replace
Correct
Clean
Replace
Replace

S-9 Oil becomes contaminated quickly

General causes why oil becomes contaminated quickly
- Entry of exhaust gas due to internal wear
- Clogging of lubrication passage
- Improper fuel
- Improper oil used
- Operation under excessive load

			Causes: Worm piston ring, cylinder liner	Clogged breather, breather hose	Clogged oil filter	Worm valve, valve guide	Clogged oil cooler	Clogged turbocharger oil drain tube	Defective seal at turbocharger turbine end	Exhaust smoke is black	
Questions / Check items	Confirm recent repair history										
	Degree of use of machine	Operated for long period	△			△			△		
	Engine oil must be added more frequently		◎								
	Non-specified fuel is being used				○						
	Color of exhaust gas	Black under light load	◎								
		Black								◎	
	Amount of blow-by gas	Excessive	◎			○		○	○		Carry out troubleshooting for "Exhaust smoke is black".
		None		◎							
	When oil filter is inspected, metal particles are found		○		◎	○					
	When exhaust pipe is removed, inside is found to be dirty with oil					◎					
	Engine oil temperature rises quickly						◎				
Troubleshooting	When compression pressure is measured, it is found to be low		●			●					
	When breather element is inspected directly, hose is broken or is found to be clogged with dirty oil			●							
	When oil filter is inspected directly, it is found to be clogged				●						
	When oil cooler is inspected directly, it is found to be clogged						●				
	Turbocharger oil drain tube is clogged							●			
	Excessive play of turbocharger shaft								●		
	When safety valve is directly inspected, spring is found to be catching or broken										
		Remedy	Replace	Clean	Replace	Replace	Clean	Clean	Replace	-	

HOW TO READ THIS MANUAL

REMOVAL AND INSTALLATION OF ASSEMBLIES

SPECIAL TOOLS

- Special tools that are deemed necessary for removal or installation of parts are listed.
- List of the special tools contains the following kind of information.
  1) Necessity
     ■: Special tools which cannot be substituted, should always be used.
     ●: Special tools which are very useful if available, can be substituted with commercially available tools.
  2) Distinction of new and existing special tools
     N: Tools with new part numbers, newly developed for this mode.
     R: Tools with upgraded part numbers, remodeled from already available tools for other models.
     Blank: Tools already available for other models, used without any modification.
  3) Circle mark (○) in sketch column:
     A circle mark means that a sketch of the special tool is presented in the section of Sketches for Special Tools.

★ Part No. of special tools starting with 79*T means that they are locally made parts and as such not interchangeable with those made by Komatsu in Japan e.g. 79*T--- xxx --- xxxx.

REMOVAL OF PARTS

- The REMOVAL Section contains procedures, precautions and the amount of oil or water to be drained.
- Various symbols used in the REMOVAL Section are explained and listed below.


This mark indicates safety-related precautions which must be followed when doing the work.

★ This mark gives guidance or precautions when doing the procedure.

[*1] This mark shows that there are instructions or precautions for installing parts.


This mark shows oil or water to be drained


This mark shows the weight of a part or a device.

INSTALLATION OF PARTS

- Except where otherwise instructed, install parts is the reverse order of removal.
- Instructions and precautions for installing parts are shown with [*1] mark in the INSTALLATION Section, identifying which step the instructions are intended for.
- Marks shown in the INSTALLATION Section stand for the following.


This mark indicates safety-related precautions which must be followed when doing the work.

★ This mark gives guidance or precautions when doing the procedure.


This mark stands for a specific coating agent to be used.

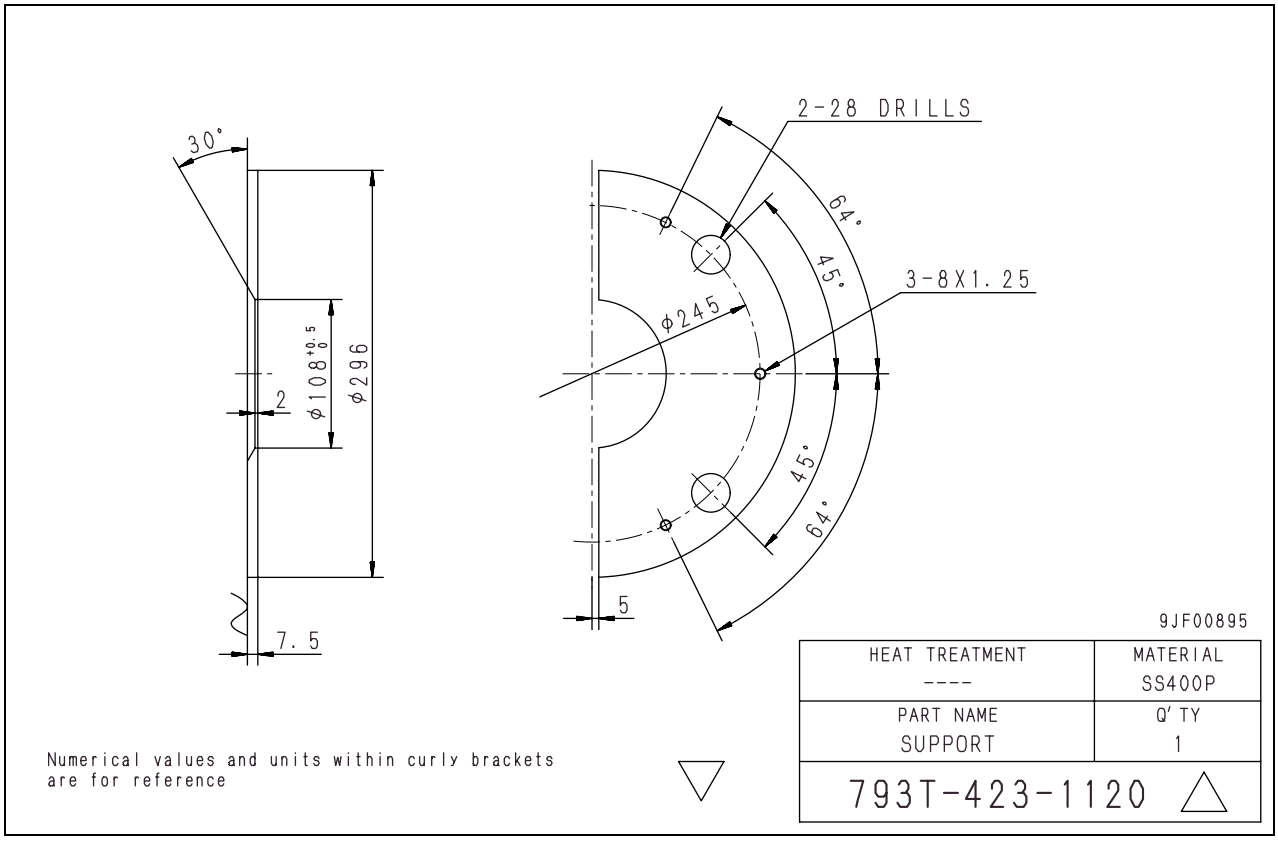

This mark indicates the specified torque.


This mark indicates an amount of oil or water to be added.

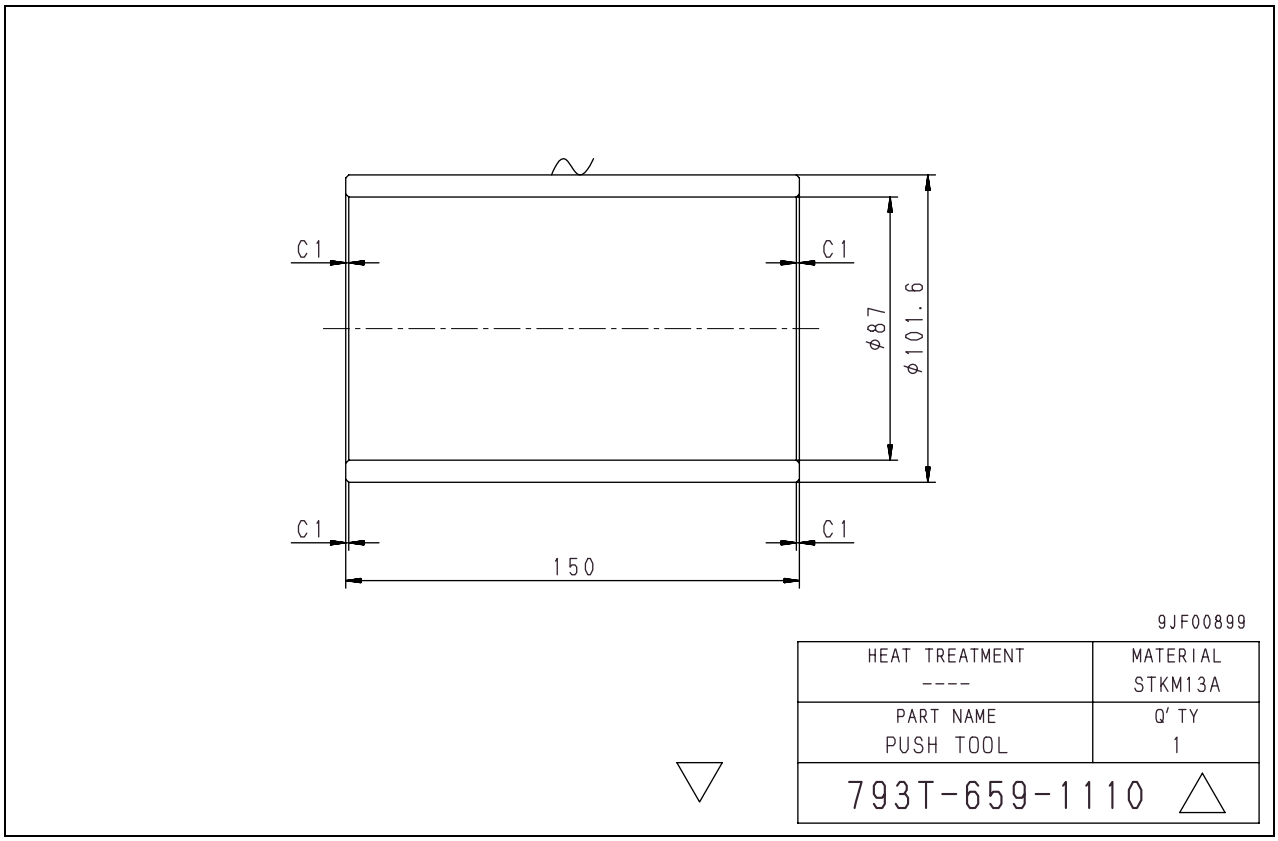
SKETCHES OF SPECIAL TOOLS

- Various special tools are illustrated for the convenience of local manufacture.

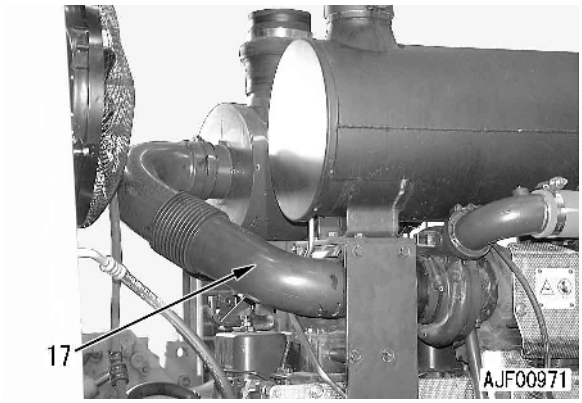
H2 SEAL SUPPORT



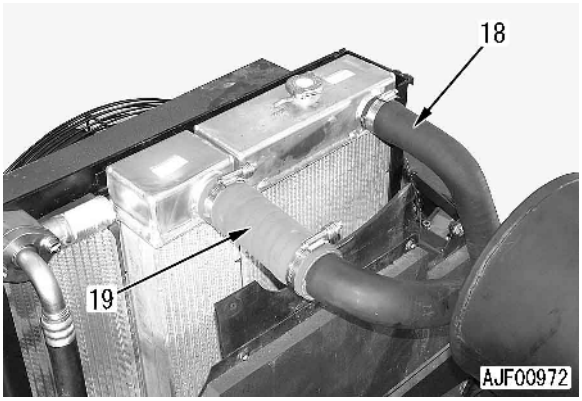
H3 PUSH TOOL



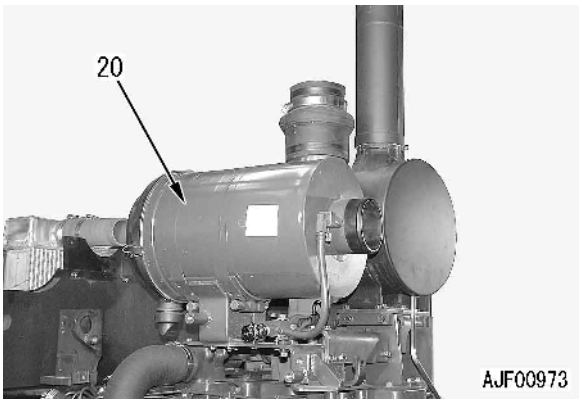
6. Remove air hose (17) between the air cleaner and turbocharger. [*2]



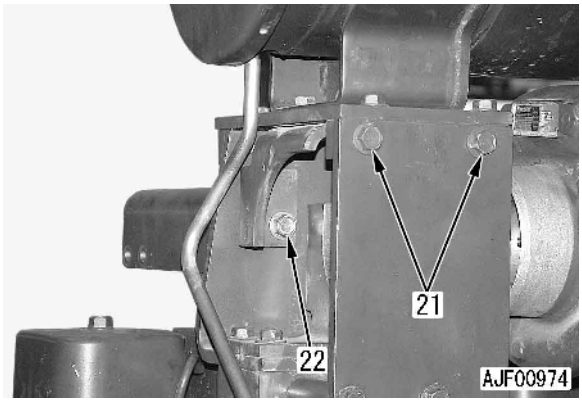
7. Disconnect radiator inlet hose (18). [*3]
8. Disconnect aftercooler upper hose (19). [*4]



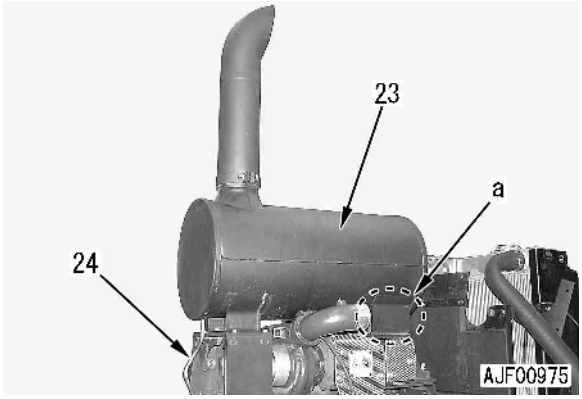
9. Remove air cleaner and bracket assembly (20).



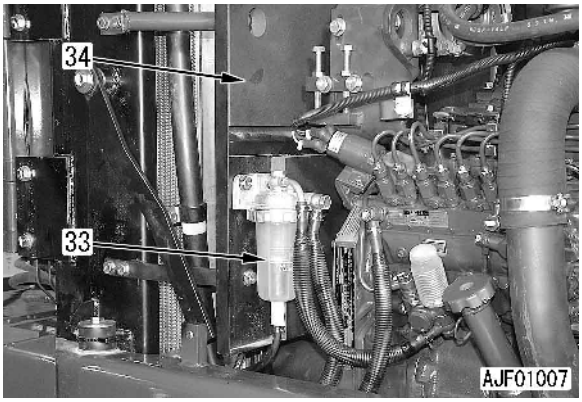
10. Remove the muffler according to the following procedure.
    1) Remove mounting bolts (21), 2 pieces on each side.
    2) Remove 1 mounting bolt (22).



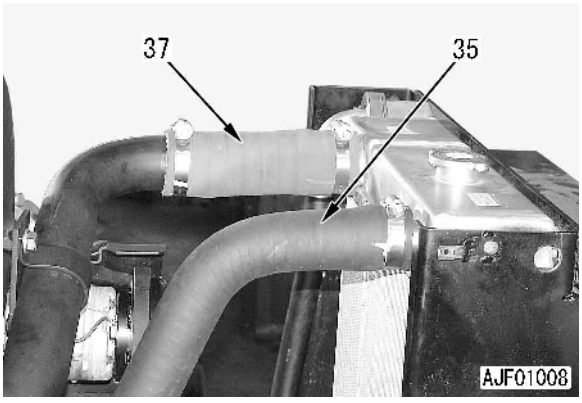
    3) Remove 4 mounting bolts from the inside of rear side (a).
    4) Raise muffler (23) and disconnect drain tube (24).

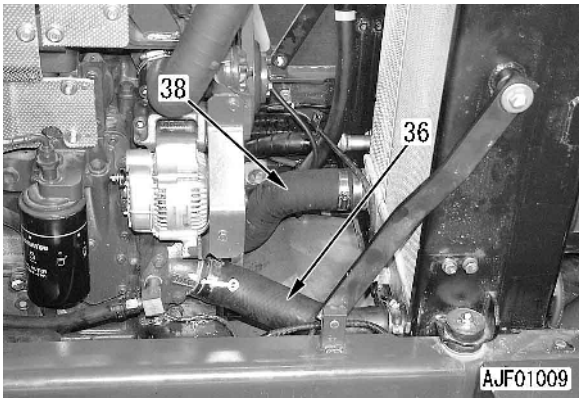


5. Remove the mounting bolts of fuel filter (33).
   ★ Bind the fuel filter to the engine with ropes, etc.
6. Remove cover (34).

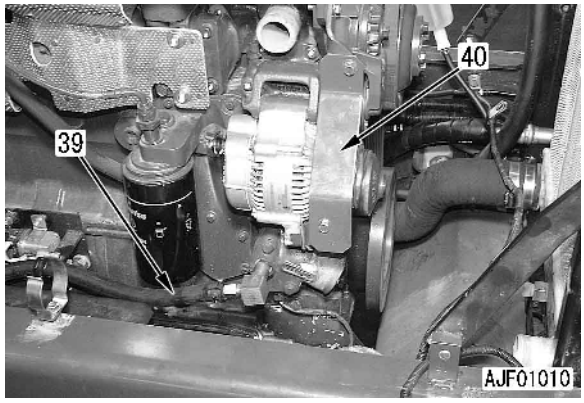


7. Disconnect radiator inlet hose (35) and radiator outlet hose (36). [*3]
8. Disconnect aftercooler upper hose (37) and aftercooler lower hose (38). [*4]

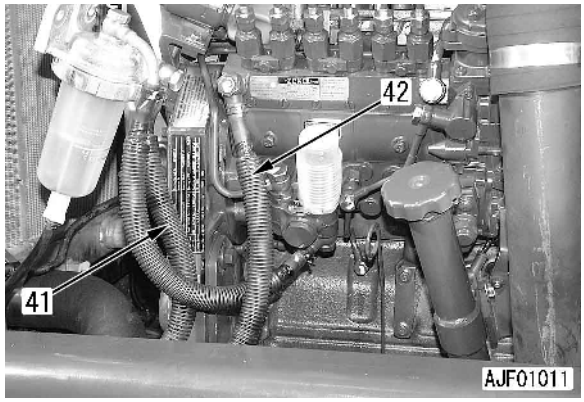




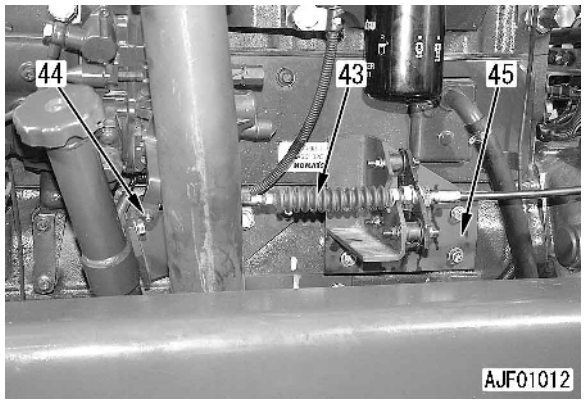
9. Disconnect heater hose (39).
   ★ Disconnect the 3 heater hose clamps.
10. Remove alternator belt cover (40).



11. Disconnect fuel supply hose (41) and fuel return hose (42).



12. Remove mounting nut (44) of fuel control cable (43), and then remove bracket (45) and fuel control cable together. [*5]
    ★ Move the fuel control cable and bracket assembly to the outside of the engine.



REMOVAL, INSTALLATION OF COOLING FAN AND FAN MOTOR ASSEMBLY

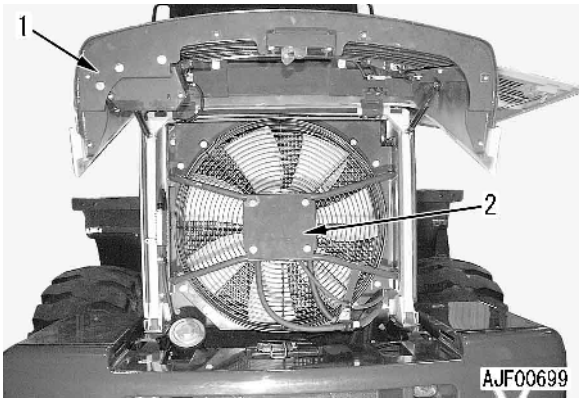
REMOVAL

Stop the vehicle on a level place and set the safety bar to the frame.

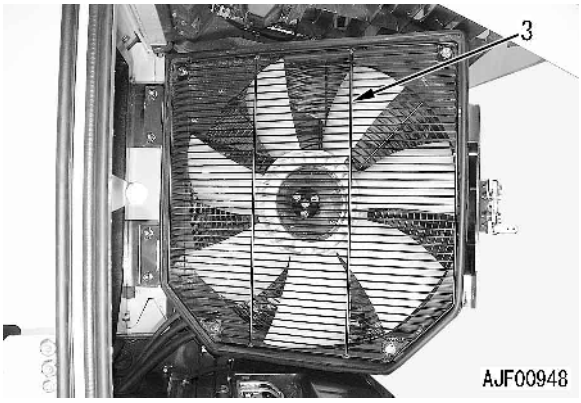
Lower the work equipment to the ground, stop the engine, apply the parking brake, and put chocks under the tires.

Slowly loosen the oil filler cap of the hydraulic tank to release the residual pressure in the hydraulic tank.

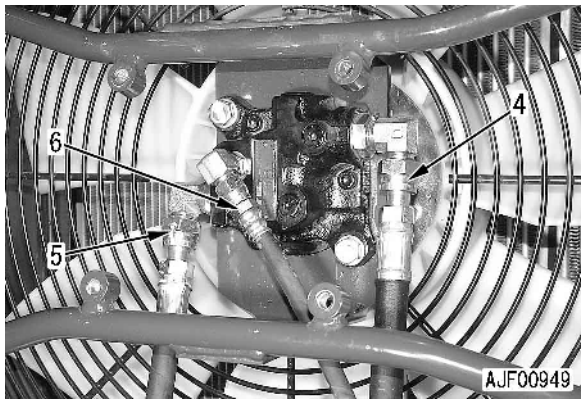
1. Open grille (1) and remove cover (2).



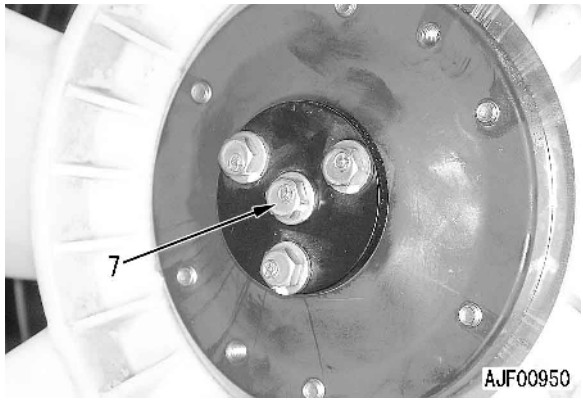
2. Open the fan guard assembly and remove guard (3).

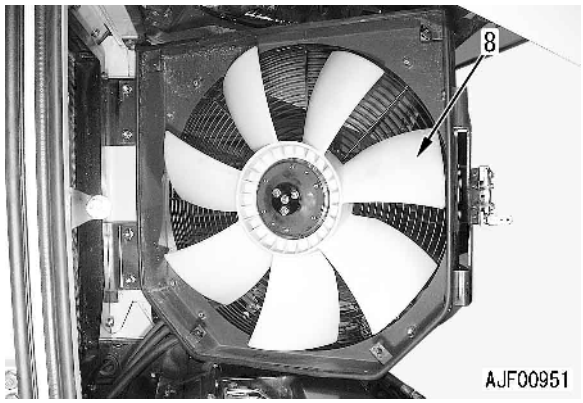


3. Disconnect P1-port hose (4), P2-port hose (5), and Dr-port hose (6).
   ★ Since oil will leak, prepare an oil receiver and an oil stop plug.

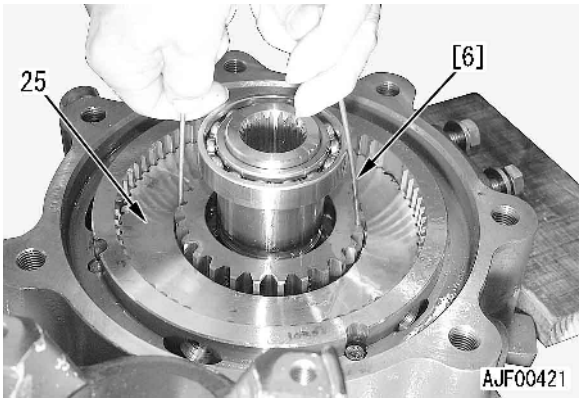


4. Remove 1 fan mounting bolt (7) and cooling fan (8). [*1]

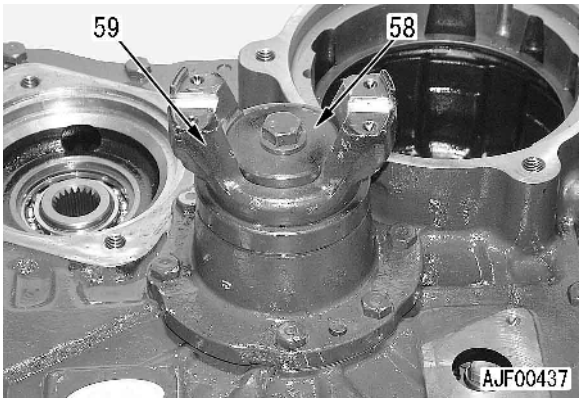




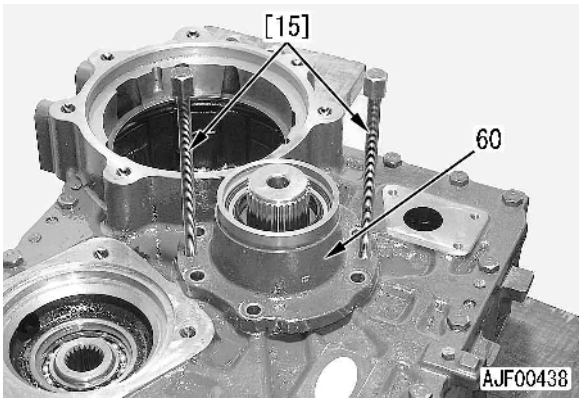
2) Using bar [6], remove end plate (25).



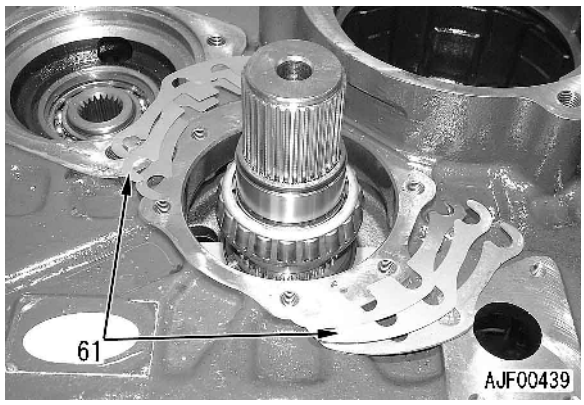
12. Coupling
    1) Remove the mounting bolts and holder (58).
    2) Remove coupling (59).



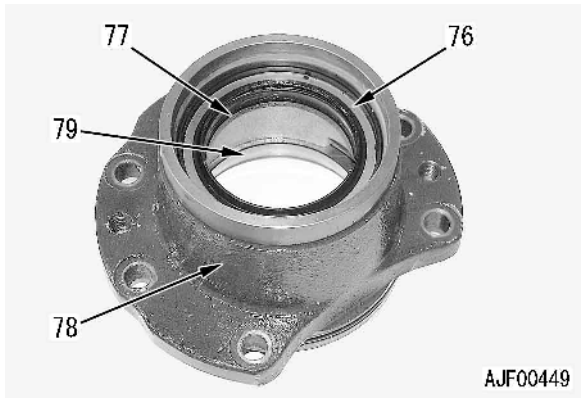
13. Cage assembly
    1) Remove the mounting bolts. Using forcing screws [15], remove cage assembly (60).



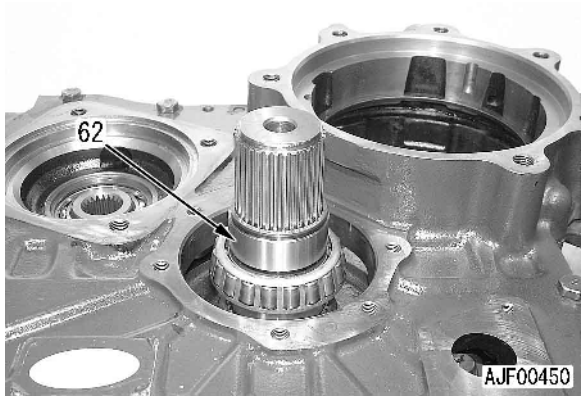
2) Remove shims (61).
   ★ Check the thickness and quantity of the shims.



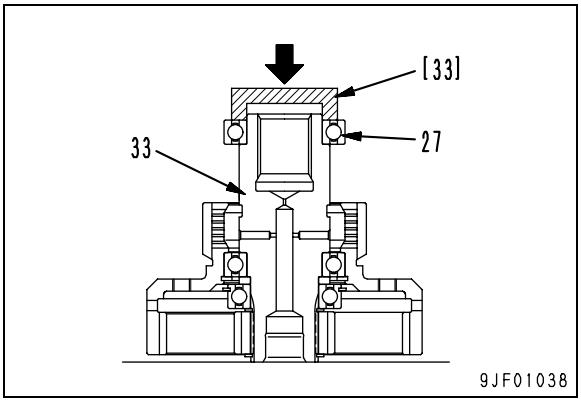
3) Remove dust seal (76) and oil seal (77) from cage (78).
4) Remove outer race (79).



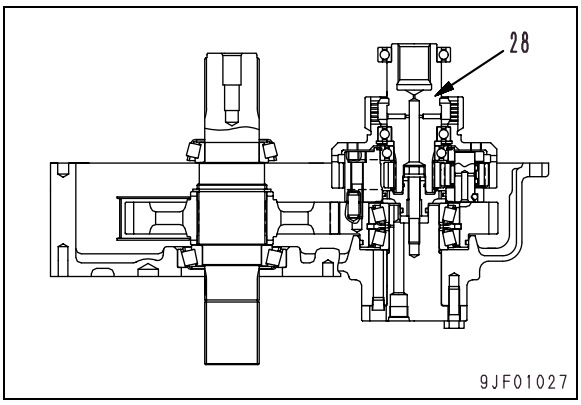
14. Spacer
    1) Remove spacer (62).



7) Using tool [33], press fit bearing (27) to HST motor 1 shaft (33).

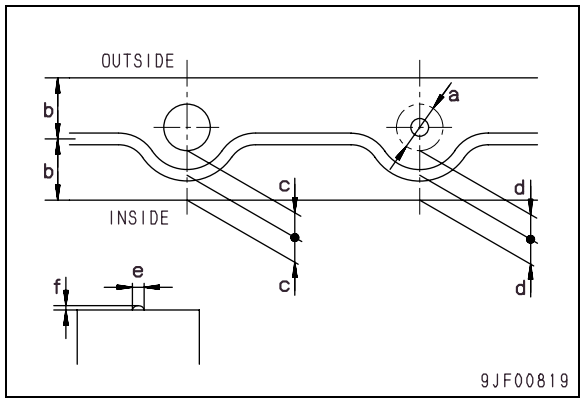


13. Installation of HST motor 1 shaft and ring gear
    1) Install HST motor 1 shaft and ring gear assembly (28).



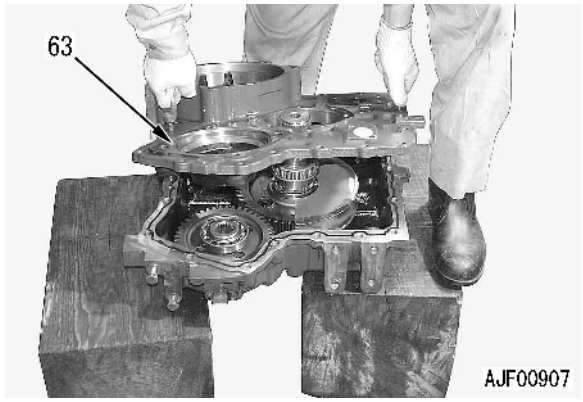
14. Front case
    ★ Use the front case and rear case as an assembly.
    ★ When installing the cases, match the match marks on their tops to each other.
    1) Apply gasket sealant to the rear case according to the following procedure.
       ★ Apply the gasket sealant to forcing screw contact part (a), similarly to the dimensions for a bolt hole.
       ★ Apply the gasket sealant so that dimensions (b) and (c) will be the same respectively.
       ★ Apply the gasket sealant so that dimension (e) x dimension (f) will be 2 - 5 mm.

       Gasket sealant:
       ThreeBond 1207B or equivalent

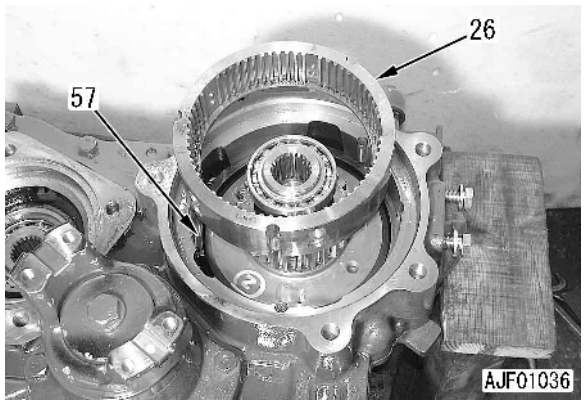


2) Install front case (63).

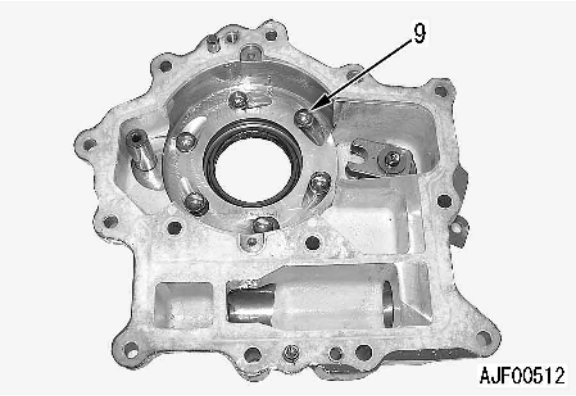
   Mounting bolt:
   98 - 123 Nm {10 - 12.5 kgm}



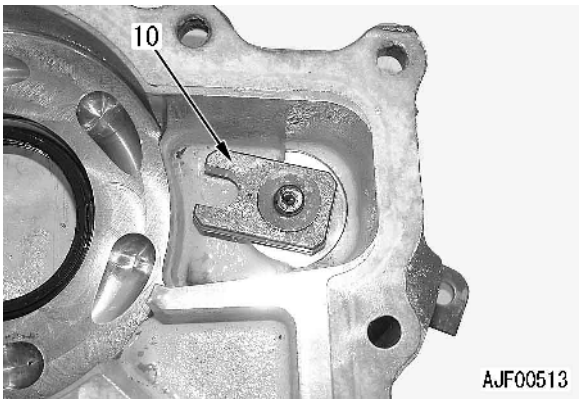
15. Clutch housing
    1) Install snap ring (57) to the front case.



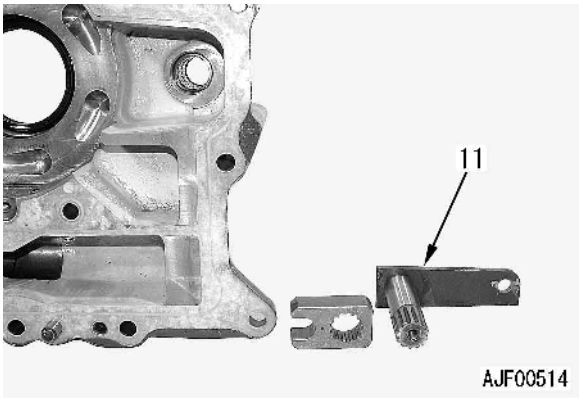
4. Ball
   1) Remove 6 balls (9).



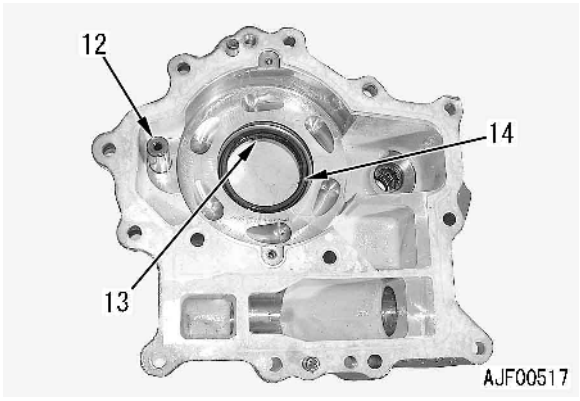
5. Lever
   1) Remove the mounting bolt and lever (10).



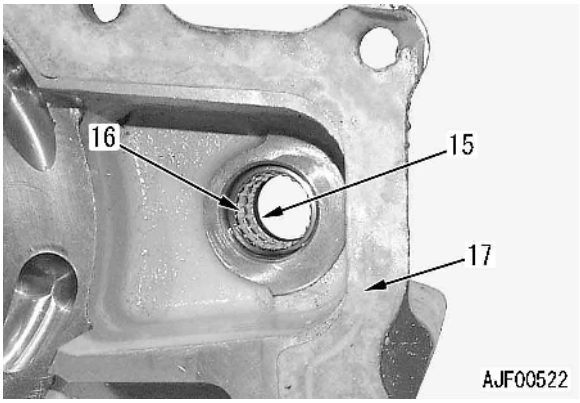
   2) Remove lever (11).



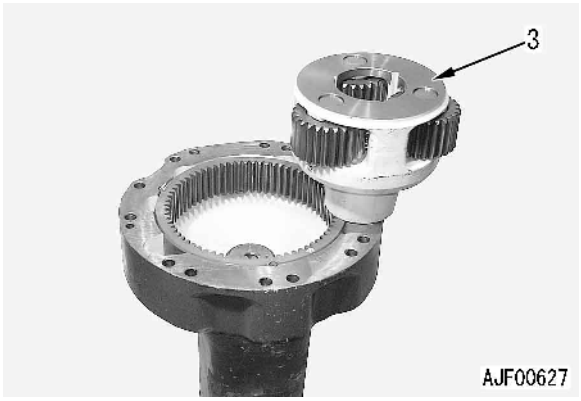
6. Pin
   1) Remove pin (12).
7. Dust seal and oil seal
   1) Remove dust seal (13) and oil seal (14).



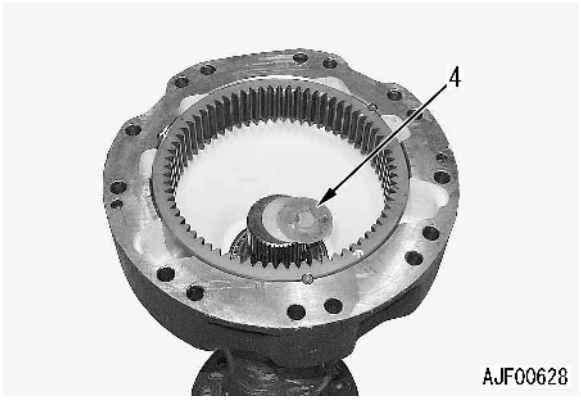
8. Oil seal and bearings
   1) Remove oil seal (15).
   2) Remove 2 bearings (16) from parking brake case (17).



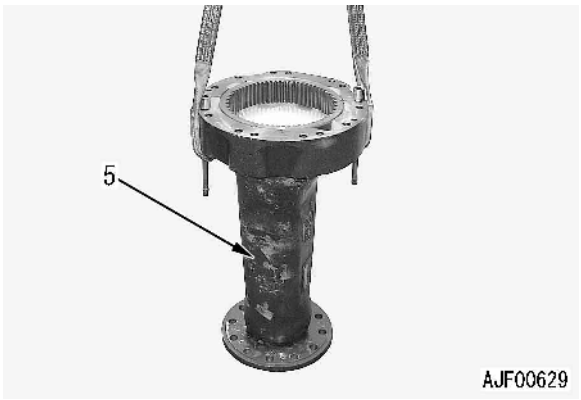
2) Remove planetary carrier assembly (3).



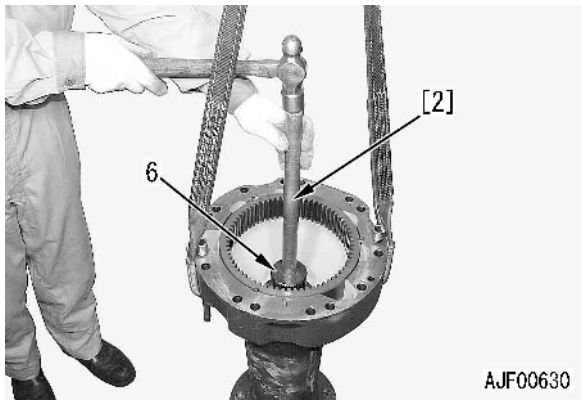
3) Remove shim (4).
★ Check the thickness and quantity of the shims.



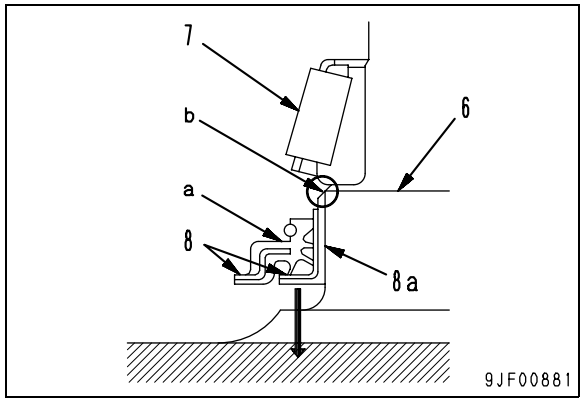
5. Axle shaft
1) Sling axle housing assembly (5) about 20 mm.



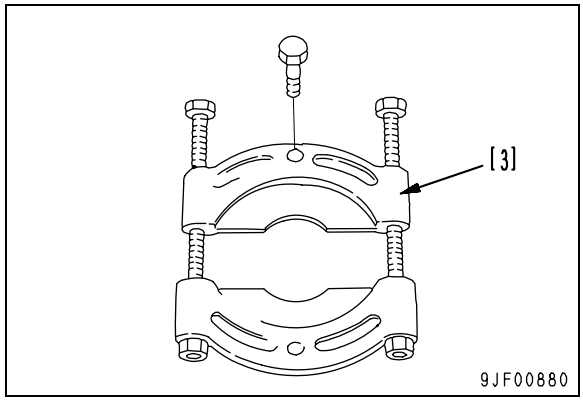
2) Hit the end of axle shaft (6) with copper hammer [2] to drive it out.



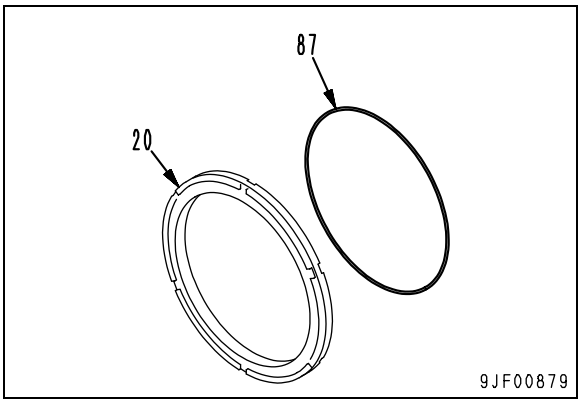
6. Axle shaft bearing
★ Do not heat the bearing to remove it or cut it with gas.
1) When removing bearing (7) from axle shaft (6), evenly push in part (a) around the oil seal and sleeve (8) with a screwdriver toward the flange.
2) Make clearance (b) at the contact part of bearing (7) and sleeve (8a) to hitch the claws of the puller.



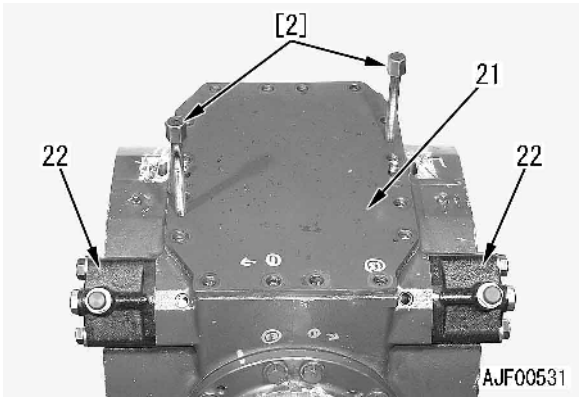
3) Install bearing puller [3] to the bottom of the bearing and it securely.
4) Install bearing puller [3] to clearance (b).
5) Tighten the bolts of bearing puller [3] to remove bearing (7).
6) Remove oil seal (8).



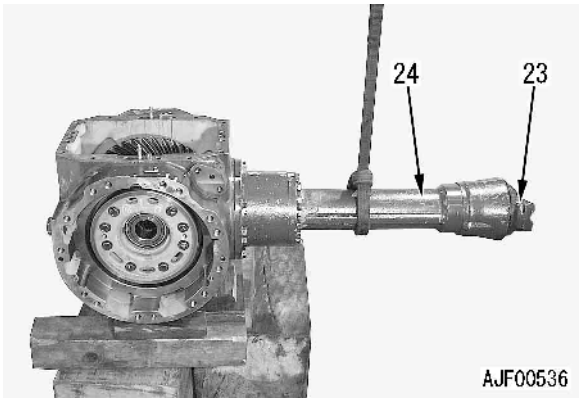
5) Remove seal (87) from piston (20).



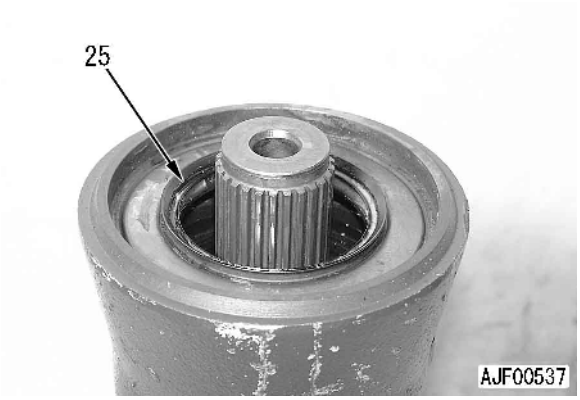
8. Top cover
   1) Remove the mounting bolts, and then remove top cover (21), using forcing screws [2].
9. Slack adjuster
   1) Remove 2 slack adjusters (22).



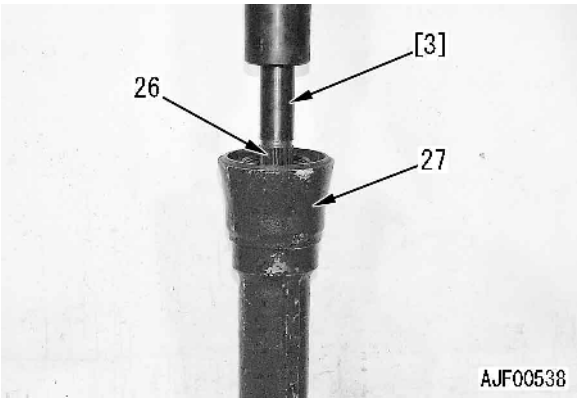
10. Removal of long cage assembly (Only front differential)
    1) Remove coupling (23).
       ★ Remove the coupling protector only when it needs to be removed.
    2) Remove long cage assembly (24).



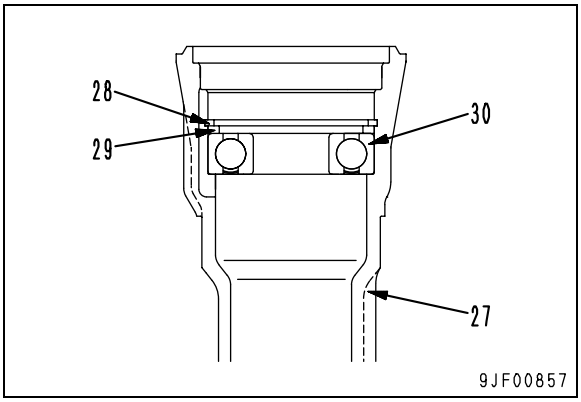
11. Disassembly of long cage assembly (Only front differential)
    1) Remove oil seal (25).



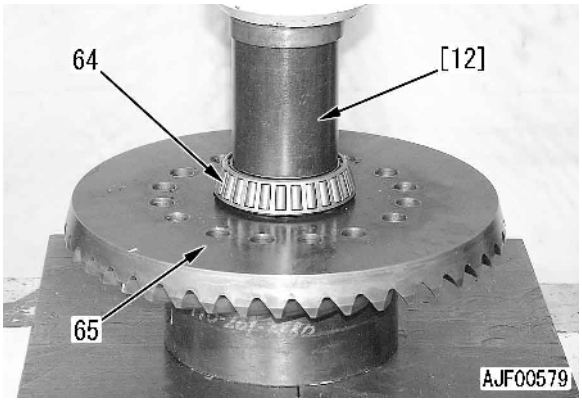
    2) Using push tool [3], push shaft (26) with a press to remove it from long cage (27).



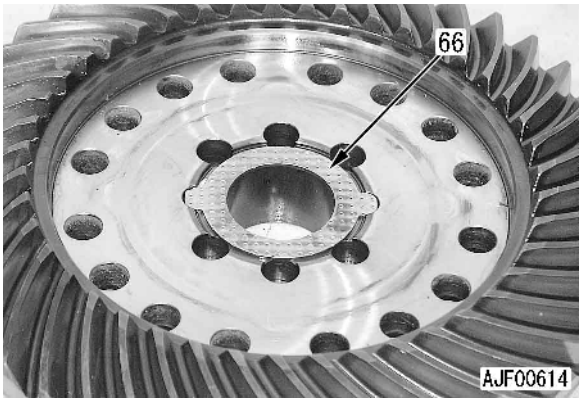
    3) Remove snap ring (28) and ring (29), and then remove bearing (30) from long cage (27).



12) Install bearing (64) to bevel gear (65).
★ Install the bearing by shrink fit at temperature below 100°C or by using push tool [12] and a press.



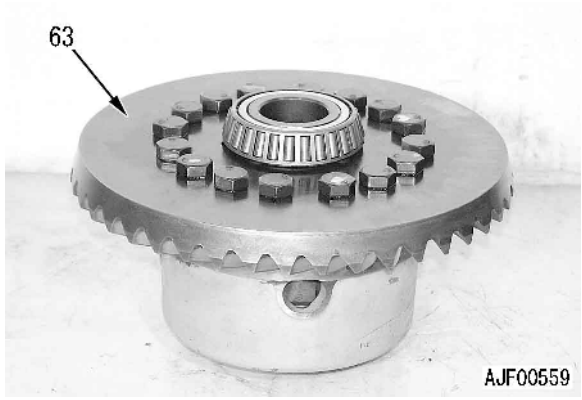
13) Install washer (66) to the back side of the bevel gear.
★ Install the washer with the dimpled side toward the side gear.
★ When installing the washer, apply grease thinly to it so that it will stuck to the bevel gear.



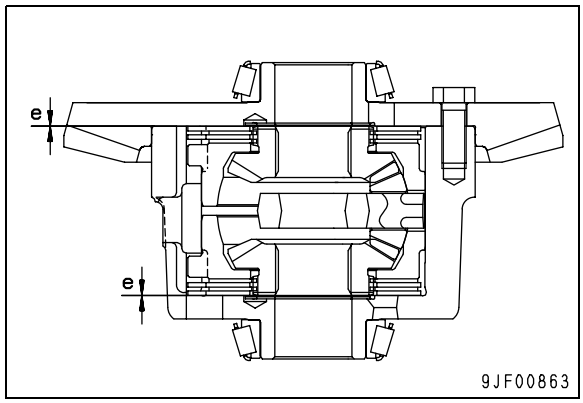
14) Install bevel gear and bearing assembly (63).
★ Match the match marks made when the assembly was removed.

Mounting bolt: **Adhesive (LT-2)**

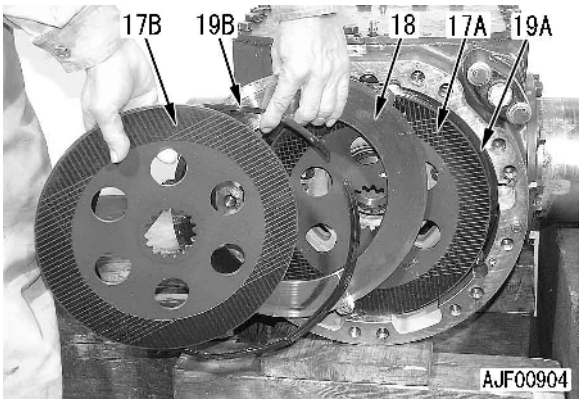
Mounting bolt:
245 - 309 Nm {25 - 31.5 kgm}



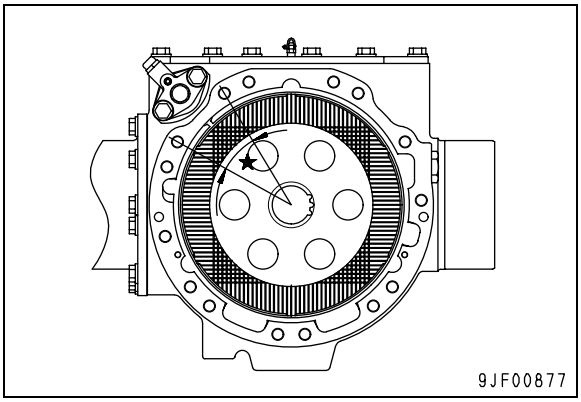
15) Adjust the clearance of the side gear in the axial direction.
i) Measure clearance (e) between the side gear and washer through the shaft holes on both sides of the limited-slip differential.
• Clearance (e):
0.13 - 0.36 mm (on both sides)
★ If the clearance is out of the standard range, replace the washer with new one.



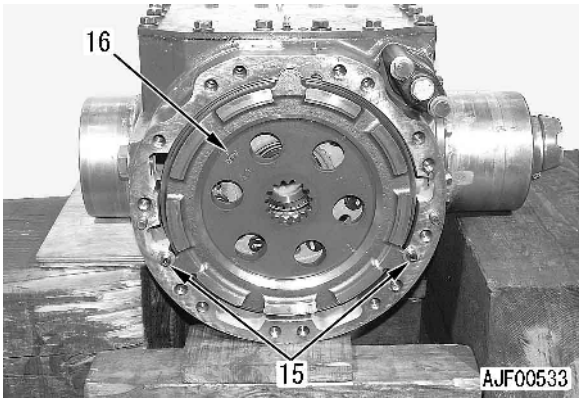
3) Install 1 disc (17A), 1 disc (17B), 1 plate (18), 2 wave springs (19A), and 2 wave springs (19B).
   ★ Install these parts in order of (19A), (17A), (18), (19B), and (17B).



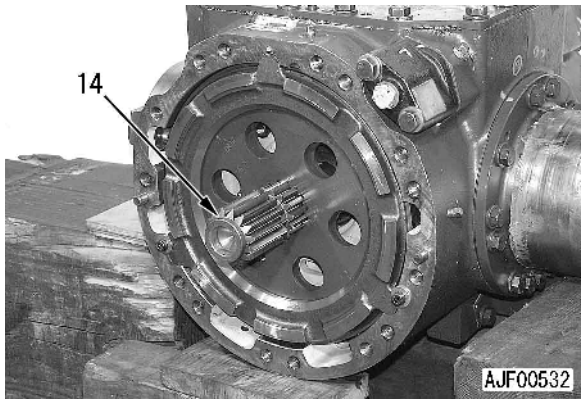
   ★ Pile up the 2 springs and match their cuts to each other, and then install them so that their cuts will be in the range marked with ★ in the brake oil port.



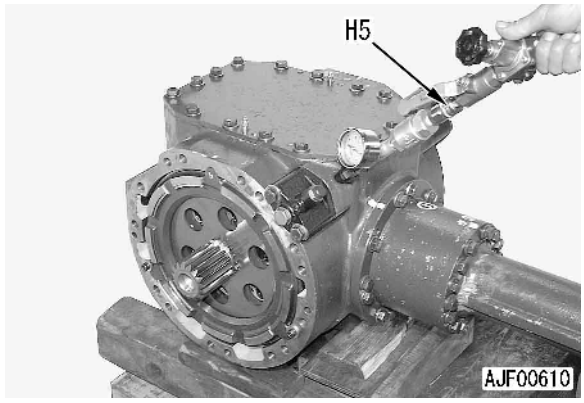
4) Install outer plate (16) and install 2 inside hexagon bolts (15).



5) Install sun gear shaft (14).

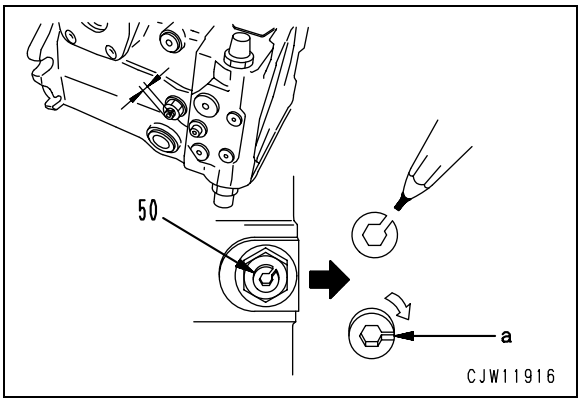


6) Using tool **H15**, supply air into the brake oil port to fit the piston.

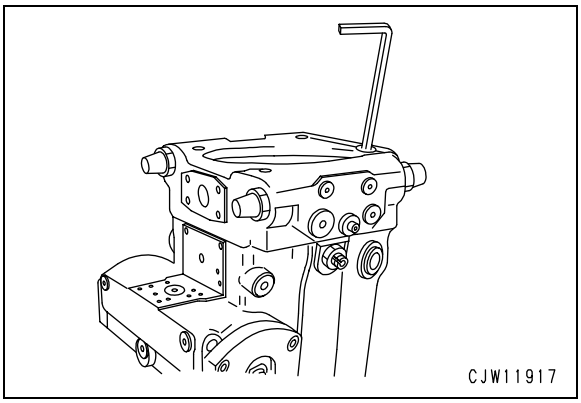


17. Brake oil leakage test
   1) Set outer plate fixing tool **H11**.
      ★ If you check for brake oil leakage without setting **H11**, the 2 hexagon socket head bolts for fixing the outer plate will be broken.
   2) Install nipple **H12** and pump **H13** to the brake port and bleed all air through the bleeder.
      ★ Bleed air by operating pump **H13**.
   3) Perform the low-pressure oil leakage test.
      ★ Operate tool **H13** to raise the pressure to 98 kPa {1 kg/cm^2}.
      ★ Leave the system for 5 minutes and check that the pressure does not lower at all.

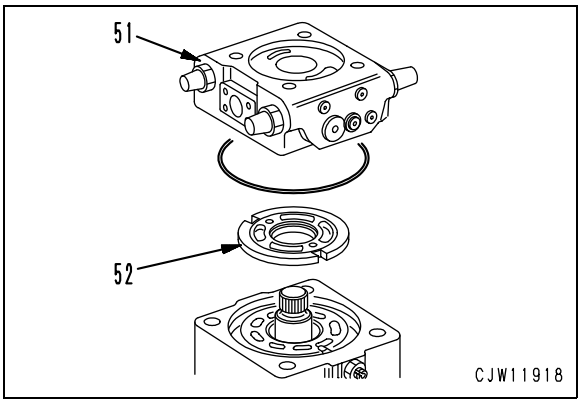
7. Port plate Ass'y
   1) Mark the position of the indexing screw (50).
   ★ Record setting measure.
   2) Set the indexing screw to disassembly position (a).



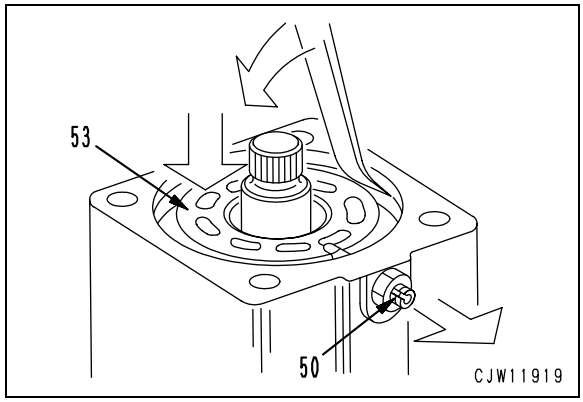
   3) Mark position of the connection plate.
   4) Loosen connection plate fixation.



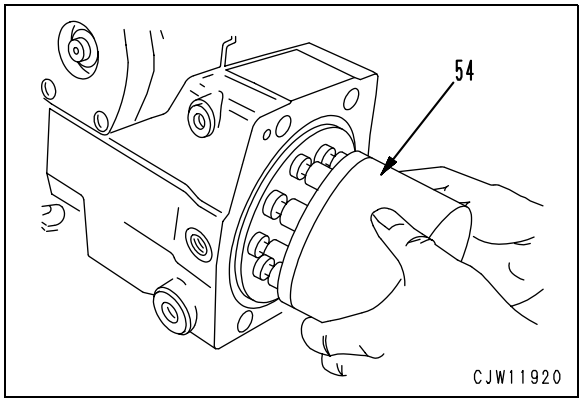
   5) Lift off port plate Assembly (51) and control plate (52).



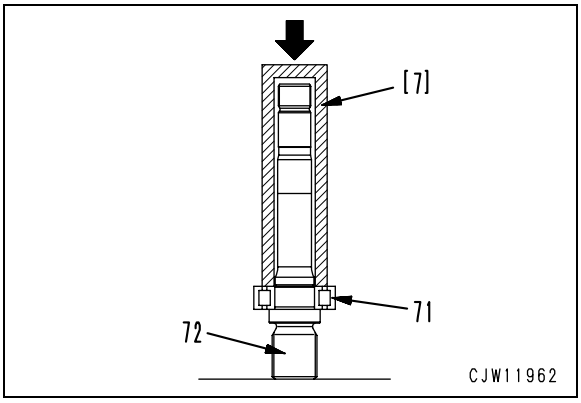
8. Cylinder block, Piston assembly
   1) Press the cylinder (53) to the bottom.
   2) Remove fixing indexing screw (50).



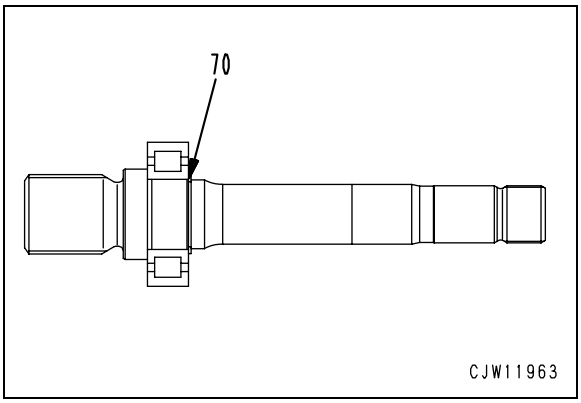
   3) Remove cylinder block and piston assembly (54).



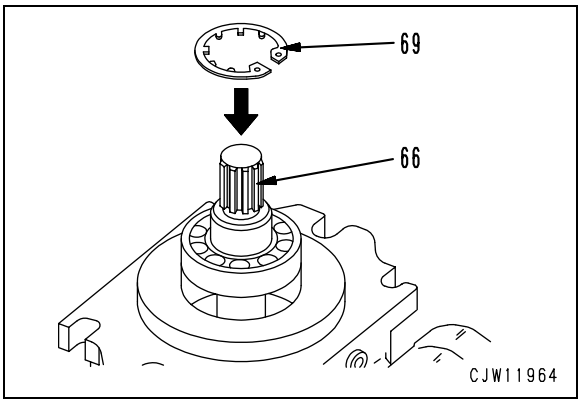
4. Drive shaft assembly
   1) Using tool [7], press fit bearing (71) to drive shaft (72).



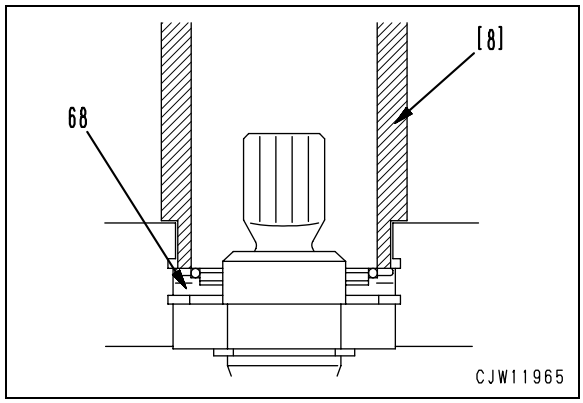
   2) Install snap ring (70).



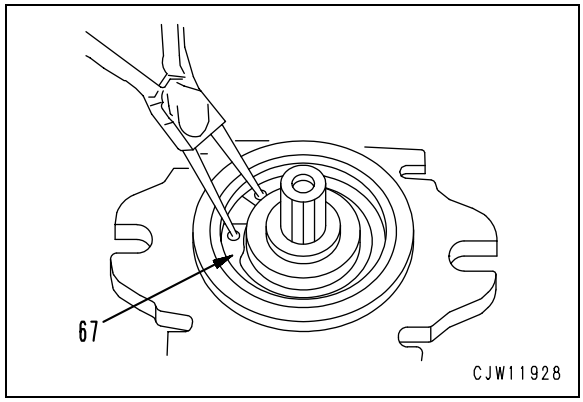
   3) Install drive shaft assembly (66).
   4) Install snap ring (69).



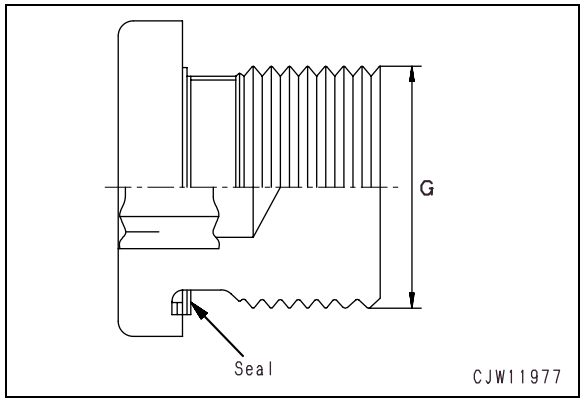
   5) Using tool [8], press fit seal (68).



   6) Install snap ring (67).

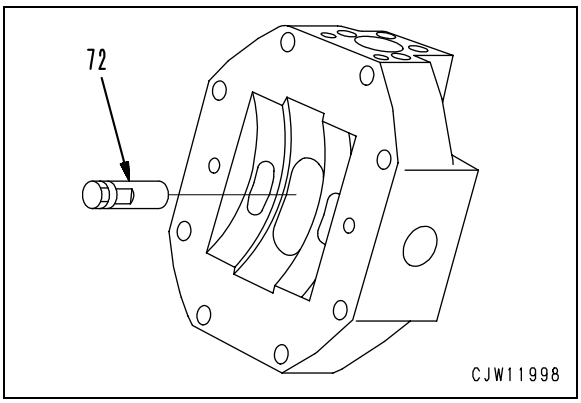


ii) Plugs with internal hexagon, O-ring and UNF-, UN- threads to SAE J 514

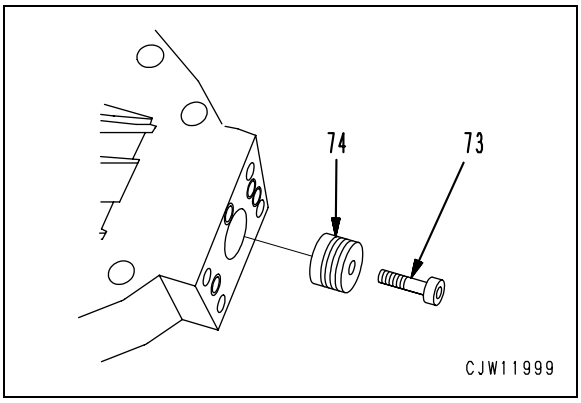


Thead	Tightening torque		Thead	Tightening torque	
	Nm	kgm		Nm	kgm
7/16-20UNF	15	1.53	M12 x 1.5	20	2.04
1/2-20UNF	20	2.04	M14 x 1.5	30	3.06
9/16-18UNF	25	2.55	M27 x 1.5	90	9.18
3/4-16UNF	72	7.34			
7/8-14UN	127	12.95			
11/16-12UN	147	14.99			
13/16-12UN	173	17.64			
15/16-12UN	198	20.19			
15/8-12UN	320	32.63			
17/8-12UN	390	39.77			

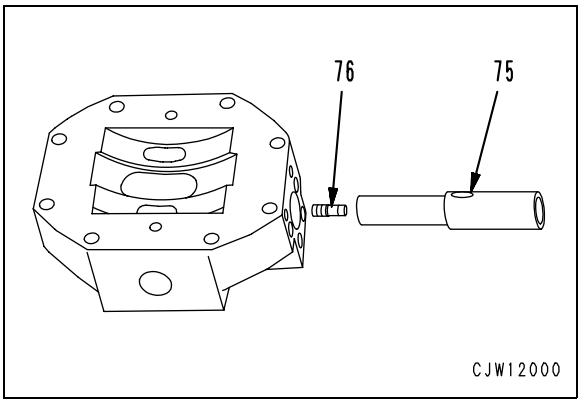
6) Disassemble the port plate assembly according to the following procedure.
   i) Remove rod (72).



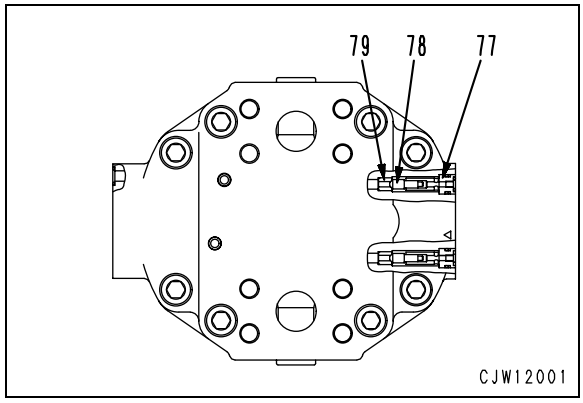
   ii) Remove bolt (73) and barrel (74).



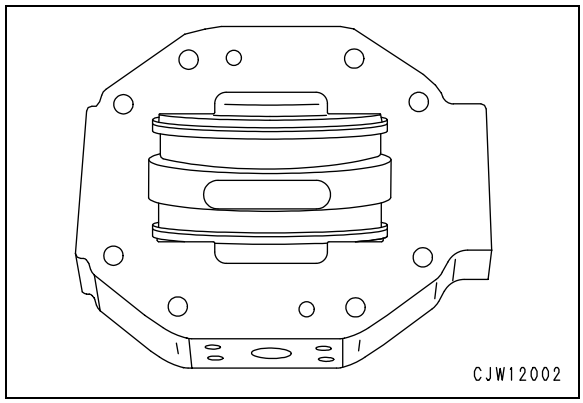
   iii) Remove piston (75).
   iv) Remove screw (76) from piston (75).



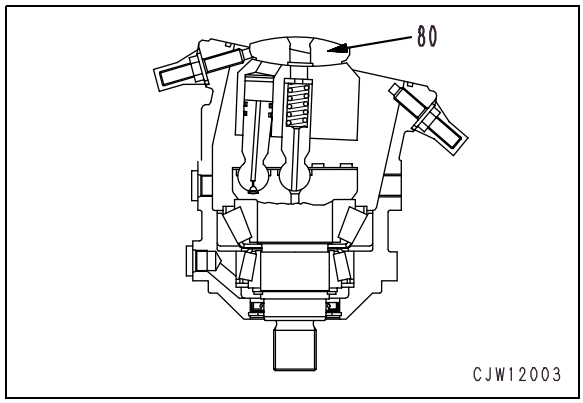
   v) Remove valve guide (77).
   vi) Remove poppet (78).
   vii) Remove valve seat (79).



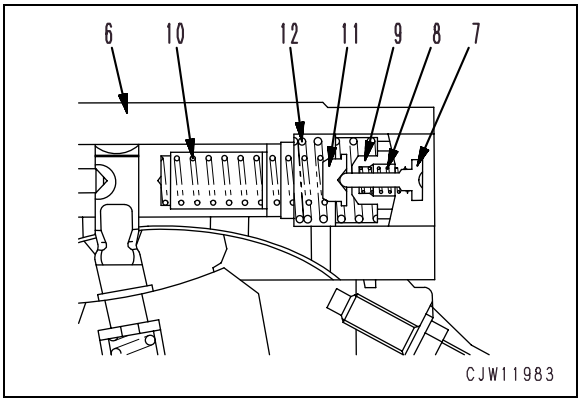
★ Check of port plate
- Sliding surface and side guides free of scoring and no wear.



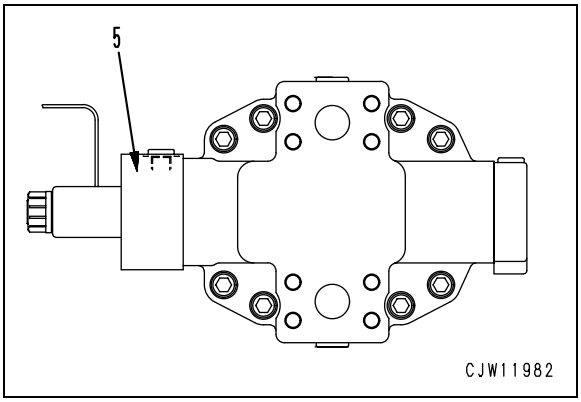
5. Control plate
   Remove control plate (80).



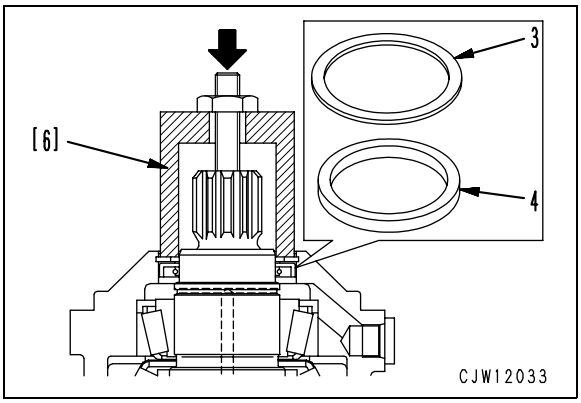
4) Install spring (12) and spring seat (11) to port plate assembly (6).
5) Install spring (10) and spring seat (9).
6) Install spring (8) and spring seat (7).



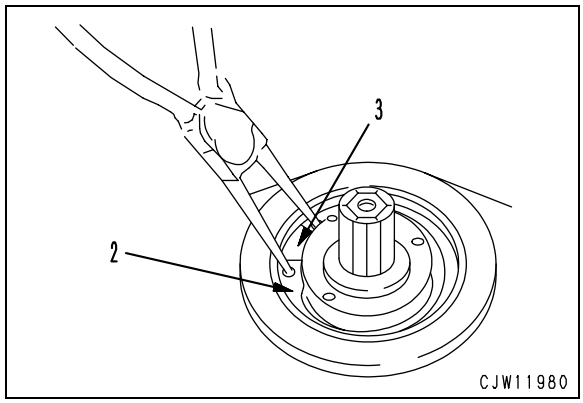
7) Install solenoid valve and housing assembly (5) with the 4 mounting bolts.



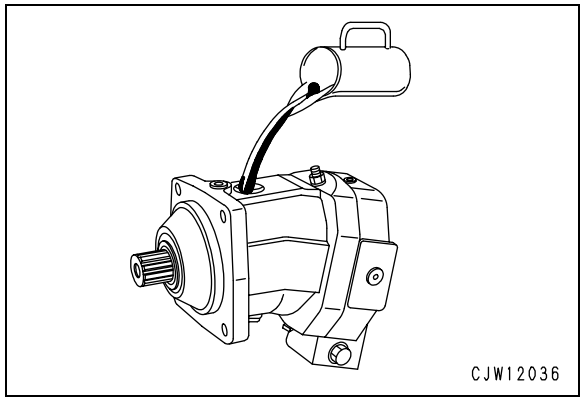
6. Seal
1) Using push tool [6], press fit seal (4).
2) Install shim (3).



3) Install snap ring (2).



7. Filling with oil
Fill up hydraulic aggregates with medium before start-up.



8. Tightening torque table
★ If the tightening torque of a mounting bolt, nut, or plug is not shown in this manual, see DISASSEMBLY, ASSEMBLY OF HST PUMP ASSEMBLY, Tightening torque table.

9. Before starting
- Observe the operating instructions before starting.
- Check the machine for remarkable faults.
- Do not operate the machine with defective instruments, warning lights or control elements.
- All safety devices must be in a secure position.
- Do not carry with you movable objects or secure them to the machine.
- Keep oily and inflammable material away from the machine.
- Before entering the driver's cabin, check if persons or obstacles are beside or beneath the machine.
- Be careful when entering the driver's cabin, use stairs and handles.
- Adjust your seat before starting.

INSTALLATION

- Carry out installation in the reverse order to removal.

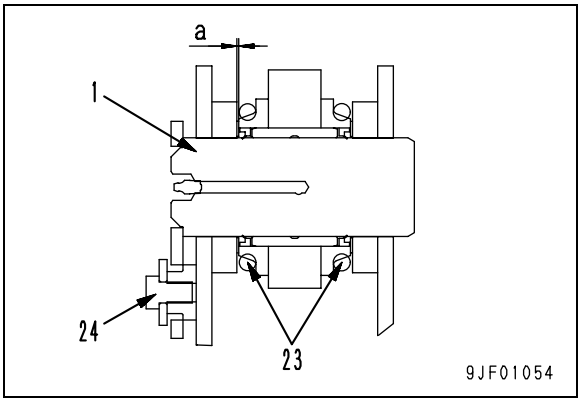
When aligning the pin holes, use a bar. Never insert your fingers in the pin holes.

[*1]
Procedure for installing bucket link pin

1. Sling the bucket link and install cord ring (23), aligning the holes for mounting pin (1).
2. Insert shims on both sides so that clearances (a) on both sides will be the same.
   - Clearance (a) (On each side): **Max. 1.5 mm**
   - Varieties of shim thickness: **Only 1.5 mm**
3. Install mounting pin (1) and lock it with bolt (24).

Never insert your fingers in the pin holes.

★ Take care that the cord ring will not be caught.



[*2]
Procedure for installing bucket hinge pin

1. Operate the control lever to align the holes for bucket mounting pin (2) and install cord ring (25).
2. Insert shims in clearance (b).
   - Clearance (b) (On each side): **Max. 1.5 mm**
   - Varieties of shim thickness: **1.5, 3.0 mm**
3. Install mounting pin (1) and lock it with bolt (26).

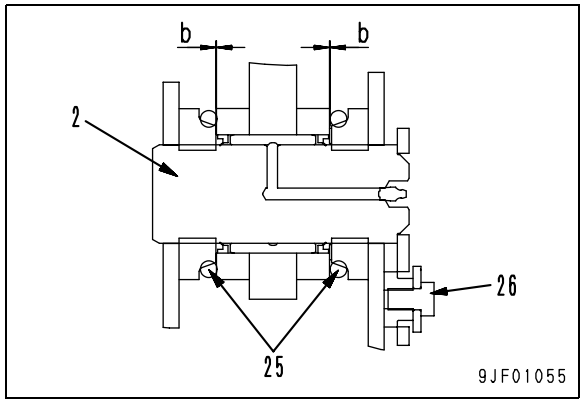
Never insert your fingers in the pin holes.

★ Take care that the cord ring will not be caught.
★ Take care not to damage the pin.
★ Before installing the pin, apply lubricant containing molybdenum disulfide to the inside of the bushing.

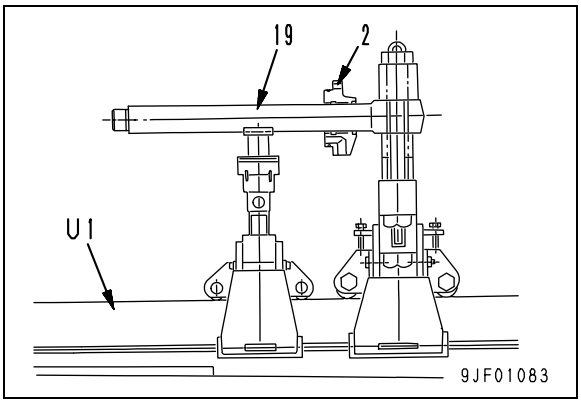
Inside of bushing:
Lubricant containing molybdenum disulfide (LM-P or equivalent)

★ After installing the pin, supply grease.

Grease:
Lubricant containing molybdenum disulfide (LM-G or Hyper White G1-T)



6. Assembly of cylinder head and piston rod assembly (WA250PT-5 bucket cylinder)
   1) Set piston rod (19) to tool **U1**.
   2) Install cylinder head assembly (2).



   - When reusing the rod and piston assembly, assemble them according to the following procedure.

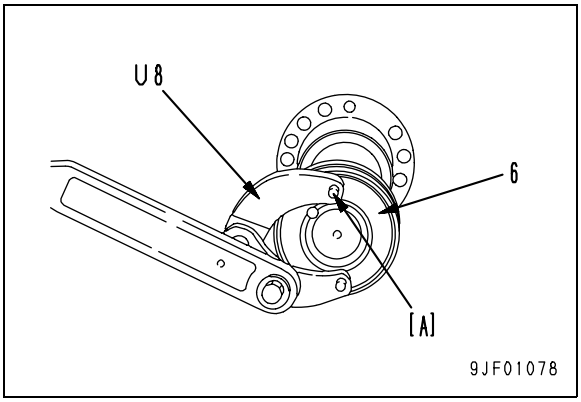
   ★ Clean the parts thoroughly and remove metal chips and dirt.

   3) Using tightening tool **U8**, tighten piston assembly (6) until the screw holes are aligned.

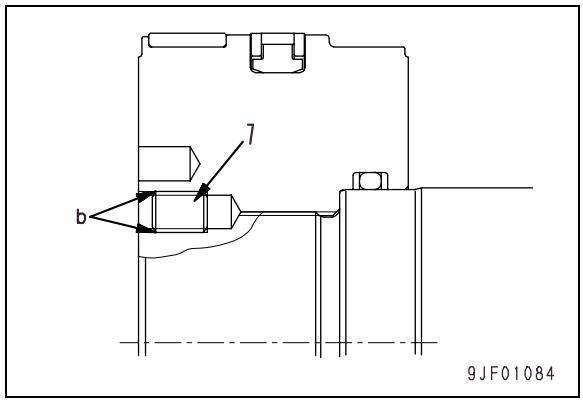
   ★ Remove burrs and fins from the threads with a file, etc.

   4) Tighten the screw (7).

Screw:
58.9 - 73.6 Nm {6 - 7.5 kgm}

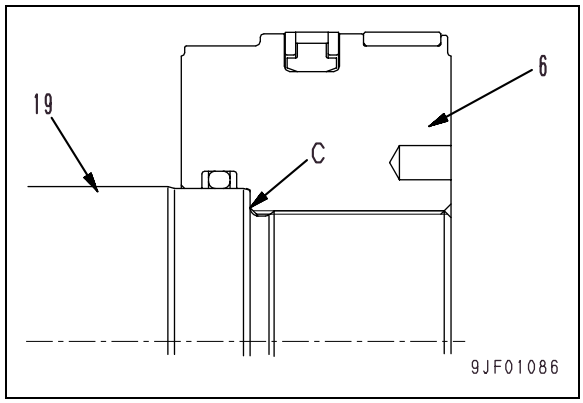


   5) Caulk 4 points of the threaded part (b) with a punch.



   - When replacing either or both of the rod and piston, assemble the new parts according to the following procedure.

   6) Using tool **U8**, screw in piston assembly (6) until it touches the end [part C] of rod (19), and then tighten it to the specified torque.



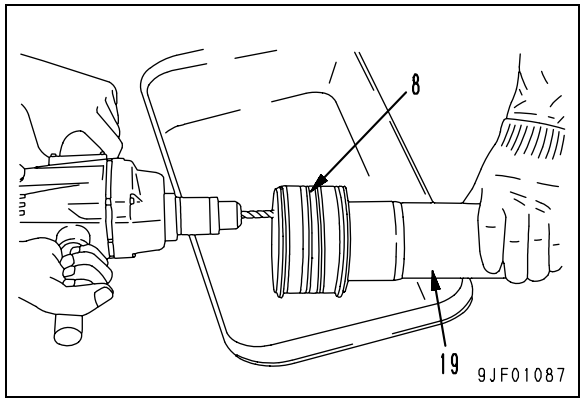
   7) Make 1 screw hole to install screw (7).

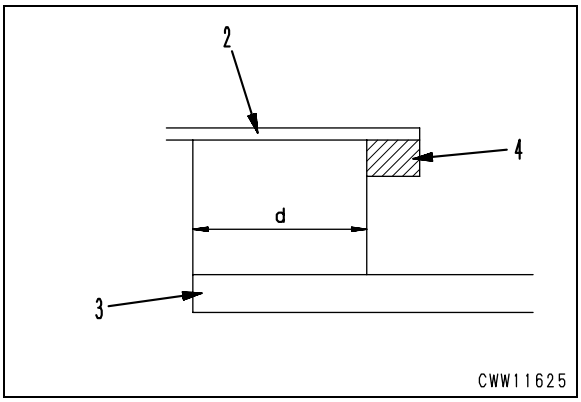
   ★ Make 1 hole horizontally with a drill at the V-groove of the threaded parts of piston (8) and rod (19).

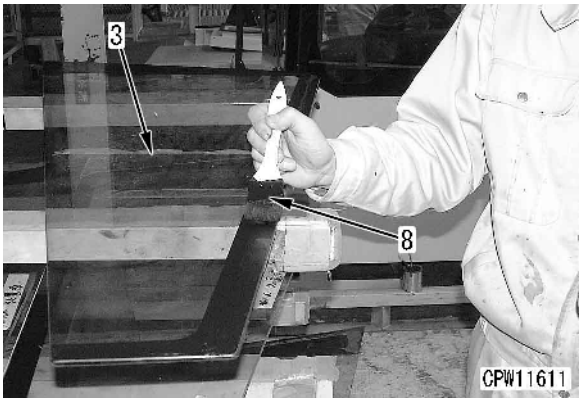
   - Threading dimensions (mm)

Diameter of tap drill hole	Depth of tap drill hole	Tap to be used	Tapping depth
10.3	27	12 X 1.75	20

   8) After making the hole, remove the all chips and dirt and clean thoroughly.







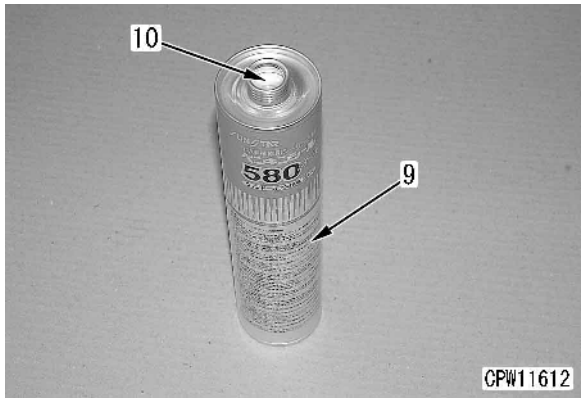
7. Apply adhesive.
   ★ Use either of the 2 types of the adhesive.

   Adhesive (Summer):
   SUNSTAR PENGUINE SEAL 580 SUPER "S"

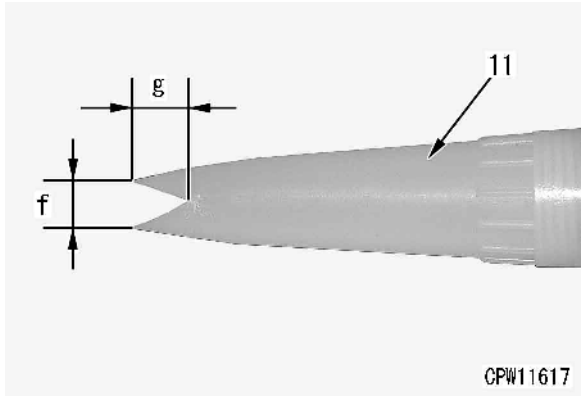
   Adhesive (Winter):
   SUNSTAR PENGUINE SEAL 580 SUPER "W"

   ★ The using limit of the adhesive is 4 months after the date of manufacture. Do not use the adhesive after this limit.
   ★ Keep the adhesive in a dark place where the temperature is below 25°C.
   ★ Never heat the adhesive higher than 30°C.
   ★ When reusing the adhesive, remove the all hardened part from the nozzle tip.

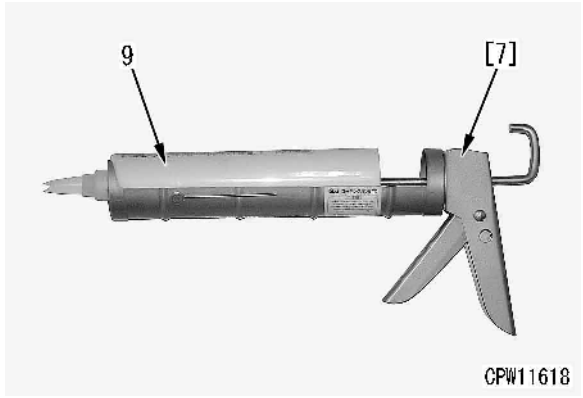
1) Break aluminum seal (10) of the outlet of adhesive cartridge (9) and install the nozzle.



2) Cut the tip of the adhesive nozzle (11) so that dimensions (f) and (g) will be as follows.
   - Dimension (f): 10 mm
   - Dimension (g): 12 mm

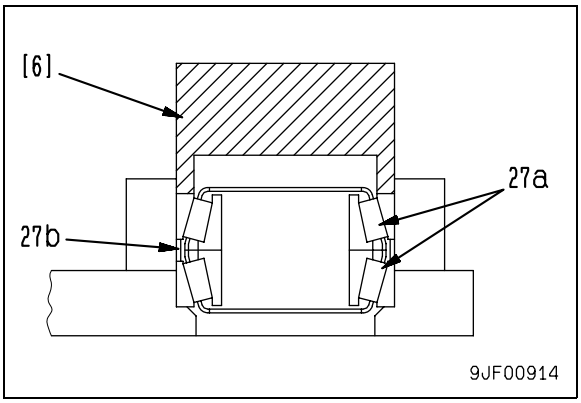


3) Set adhesive cartridge (9) to caulking gun [7].
   ★ An electric caulking gun is more efficient.



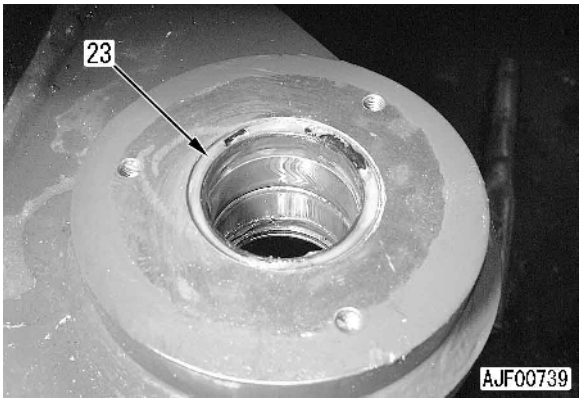
3. Assemble the lower hinge of the front frame.
   1) Using push tool [6], press fit bearing (27a) and spacer (27b) to the front frame.
      ★ Since the clearance of bearing (27a) and spacer (27b) is adjusted properly, do not change their combination.
      ★ Since bearing (27a) and spacer (27b) are an assembly, always replace them as a set.
      ★ Press fit bearing (27a) and spacer (27b) securely so that a clearance will not be made between the bearing and frame.

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



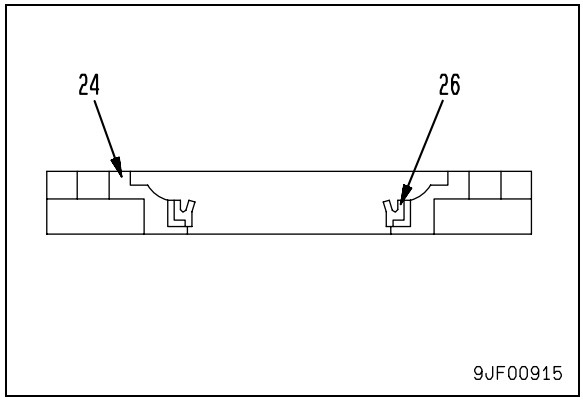
   2) Press fit dust seal (23) to the front frame.
      ★ Press fit the dust seal with the lip out.

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



   3) Press fit dust seal (26) to retainer (24).
      ★ Press fit the dust seal with the lip in.
      ★ Note that only this dust seal must be fitted with the lip in.

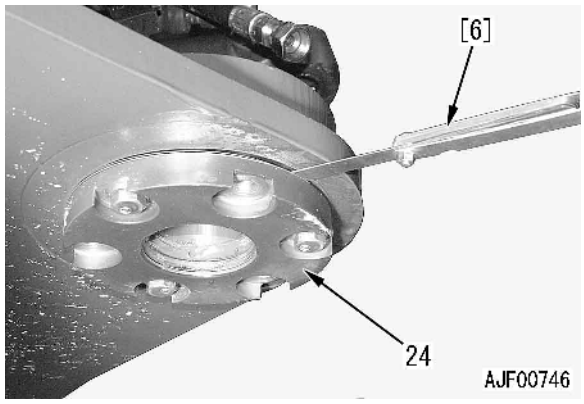
      Lip of dust seal: **Grease (G2-LI)**



   4) Tighten the 3 mounting bolts of retainer (24) evenly.

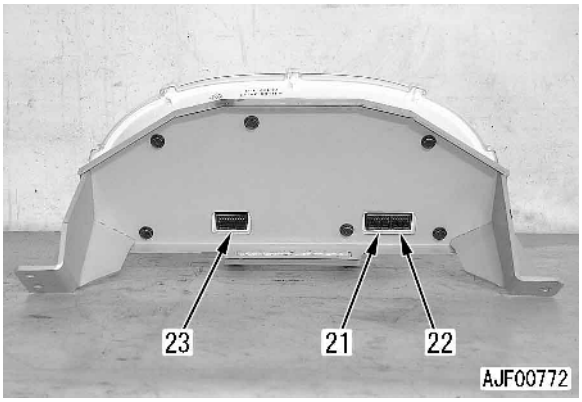
      Retainer mounting bolt: **14.7 Nm {1.5 kgm}**

   5) Measure the clearance between retainer (24) and front frame with feeler gauge [6], and then select shims so that the maximum clearance will be less than 0.1 mm when the shims are inserted.
      • Standard shim thickness: **0.85 mm**
      • Varieties of shim thickness: **0.1 mm, 0.2 mm, 0.5 mm**

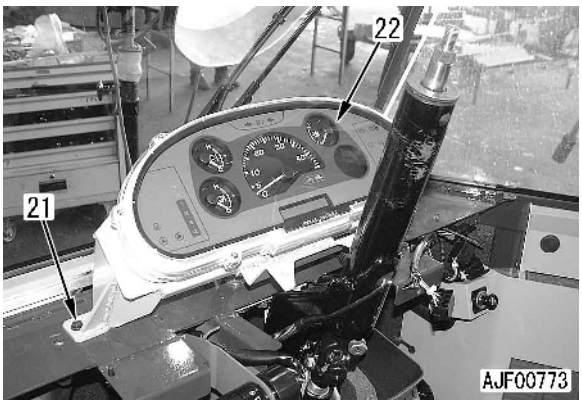


3) Remove front panel cover (17).
   ★ Take care not to damage the painted surface in the operator's cab.

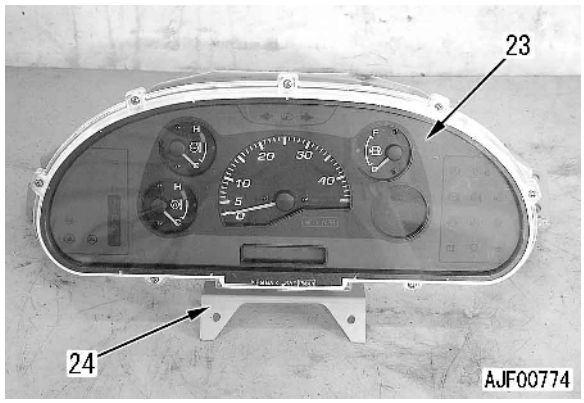
10. Disconnect monitor panel wiring connectors L21 (21), L22 (22), and L23 (23) from the points on the back side of the monitor panel shown in the figure.



11. Remove 4 bracket mounting bolts (21) and monitor panel and bracket assembly (22).



12. Remove monitor panel (23) from bracket (24). [*5]



INSTALLATION

- Carry out installation in the reverse order to removal.

[*1]

Steering wheel mounting nut:
29 ± 2.9 Nm {3.0 ± 0.3 kgm}

[*2]

Cover mounting bolt (Fine thread):
1.97 - 2.45 Nm {0.2 - 0.25 kgm}

Cover mounting bolt (Coarse thread):
5.88 Nm {0.6 kgm}

[*3]

Hexagon socket head bolt:
14.7 - 34 Nm {1.5 - 3.5 kgm}

[*4]

Front panel cover mounting bolt:
3.44 - 4.4 Nm {0.35 - 0.45 kgm}

[*5]

Monitor panel mounting bolt:
2.75 - 3.53 Nm {0.28 - 0.30 kgm}