

Shop Manual

GALEO

WA150-5

WHEEL LOADER

SERIAL NUMBERS WA150-5 H50051 and up

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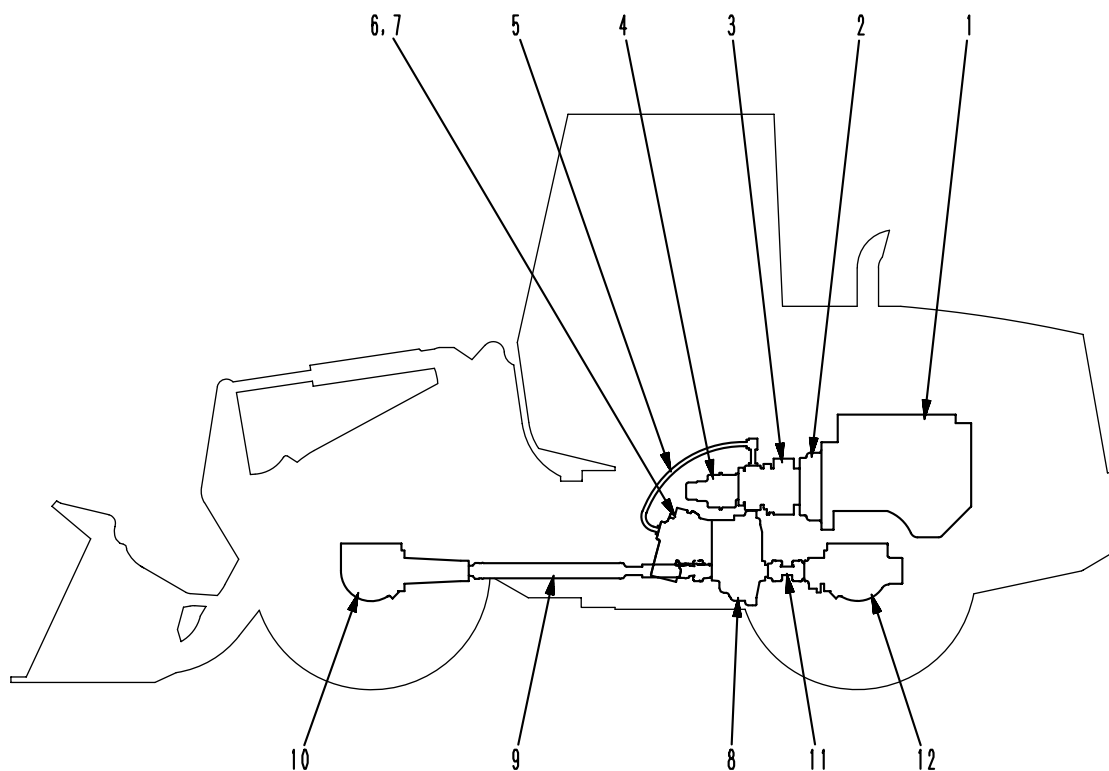


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		Machine model	WA150-5H	
		Serial No.	H50051 and up	
Steering control	Type		Articulated steering	
	Control		Hydraulic control	
Hydraulic system	Hydraulic pump	Work equipment and Steering pump <ul style="list-style-type: none"> Type Theoretical capacity 	cm ³ /rev 63.1	
		Brake and cooling fan pump <ul style="list-style-type: none"> Type Theoretical capacity 	cm ³ /rev 10.5	
		Transfer lubrication pump <ul style="list-style-type: none"> Type Theoretical capacity 	cm ³ /rev 6.4	
	Steering cylinder	Type		Reciprocating piston type
		Cylinder inner diameter	mm	55
		Piston rod diameter	mm	30
		Stroke	mm	375
		Max. length between pins	mm	1,020
	Lift cylinder	Type		Reciprocating piston type
		Cylinder inner diameter	mm	110
		Piston rod diameter	mm	60
		Stroke	mm	628
Max. length between pins		mm	1,659	
Bucket cylinder	Type		Reciprocating piston type	
	Cylinder inner diameter	mm	110	
	Piston rod diameter	mm	55	
	Stroke	mm	452	
	Max. length between pins	mm	1,367	
	Min. length between pins	mm	915	

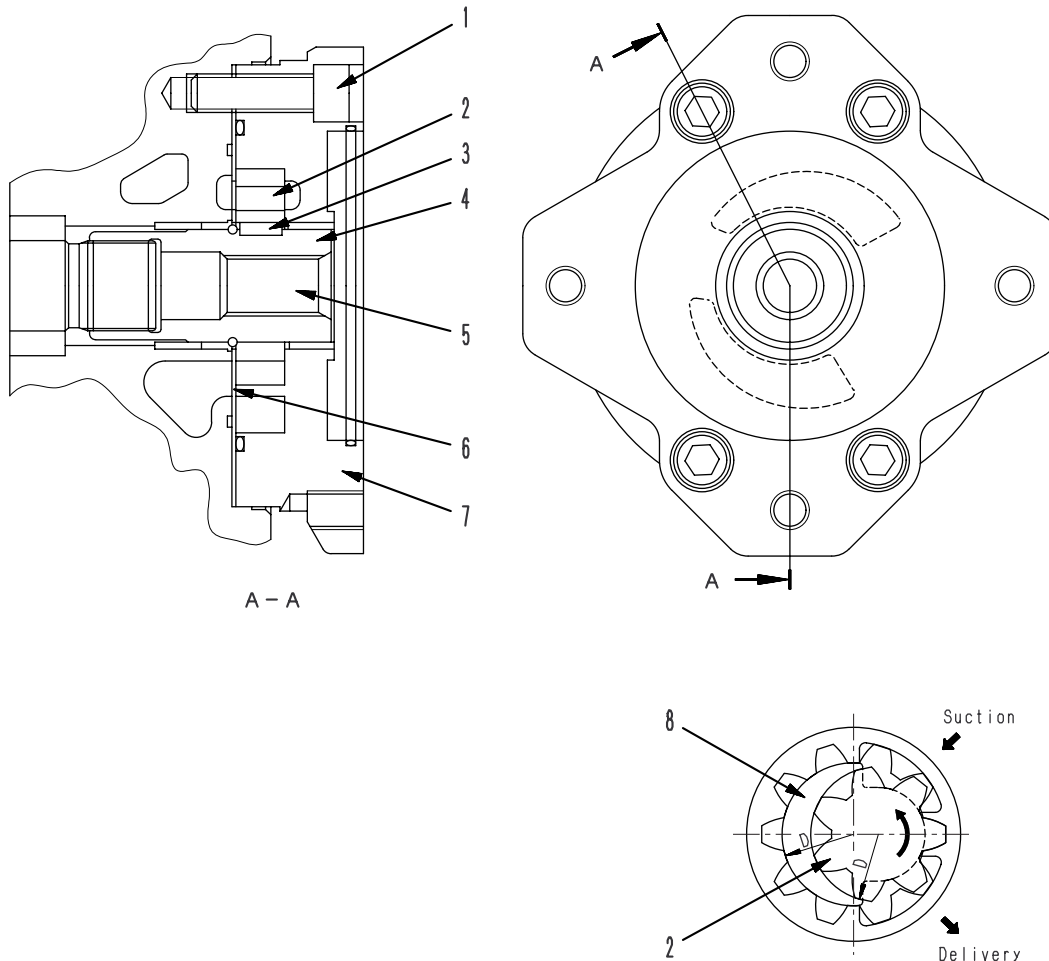
POWER TRAIN



9JB01253

1. Engine
2. Damper
3. HST pump
4. 3-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



9JB01147

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

Outline

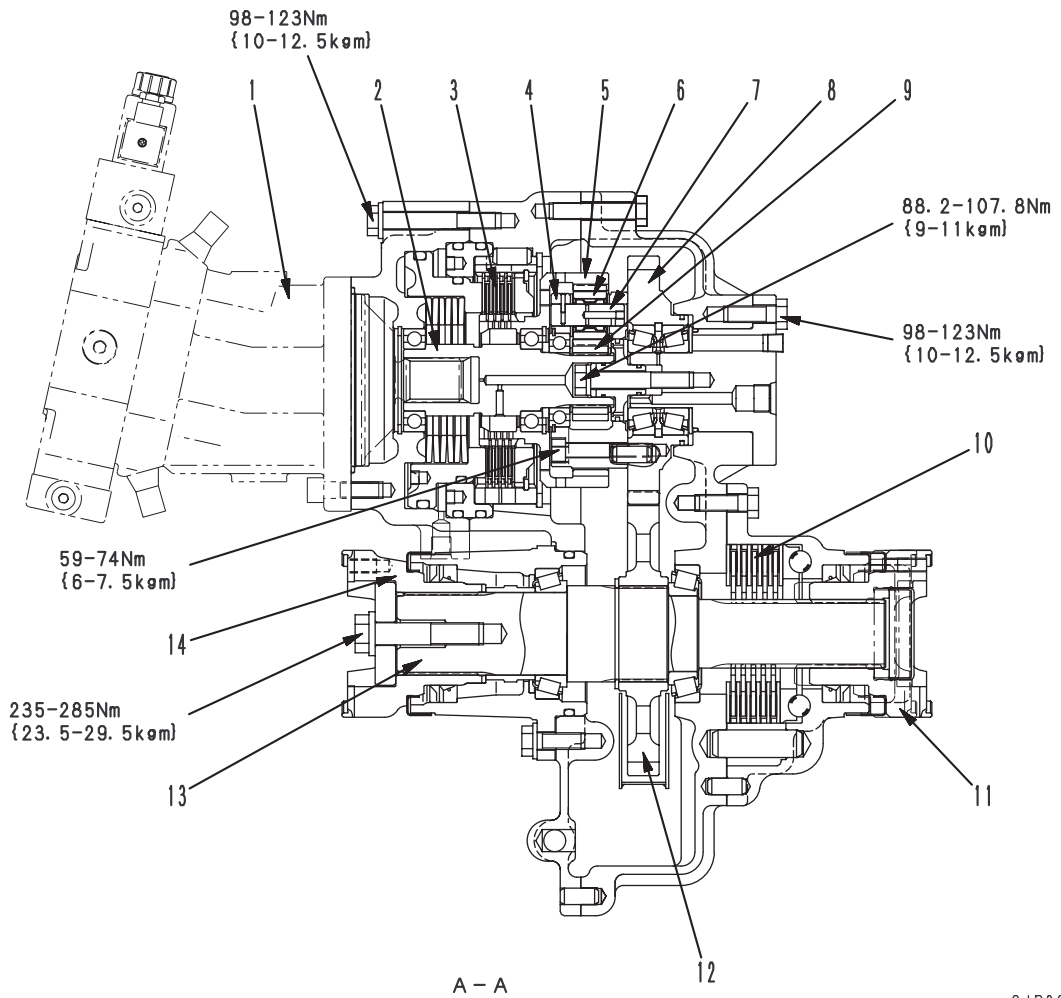
- The HST charge pump is built in the HST pump and driven together with the HST pump to supply oil to the HST speed-related valve and low-pressure relief valve of the HST pump.
- The HST charge pump sucks in oil from the hydraulic tank.

Specifications

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

Function

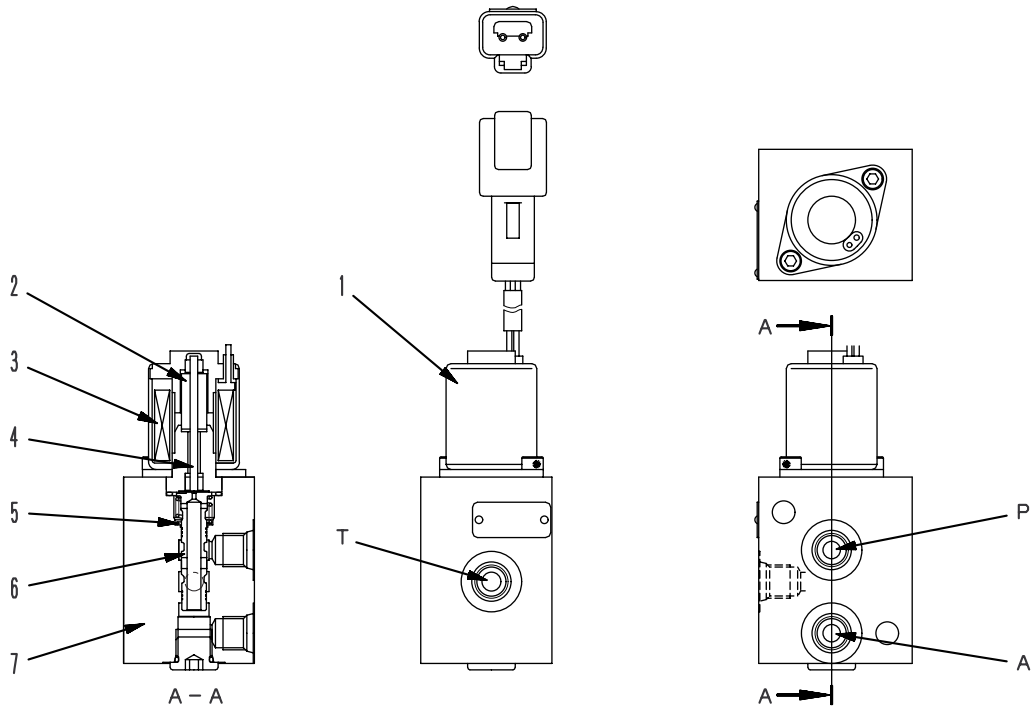
- The HST charge pump is connected to drive shaft (5) of the HST pump and rotated by coupling (4).
- The HST charge pump has pump gear (2) and crescent divider board (8) in it and sucks and discharges the oil in the direction shown in the above figure.



9JB02172

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. HST motor 1 2. Input shaft 3. Transfer clutch 4. Carrier 5. Ring gear (Number of teeth: 66) 6. Planetary gear (Number of teeth: 19) 7. Planetary shaft | <ul style="list-style-type: none"> 8. Motor 1 gear (Number of teeth: 43) 9. Sun gear (Number of teeth: 27) 10. Parking brake 11. Rear coupling 12. Output gear (Number of teeth: 50) 13. Output shaft 14. Front coupling |
|---|---|

CLUTCH SOLENOID VALVE



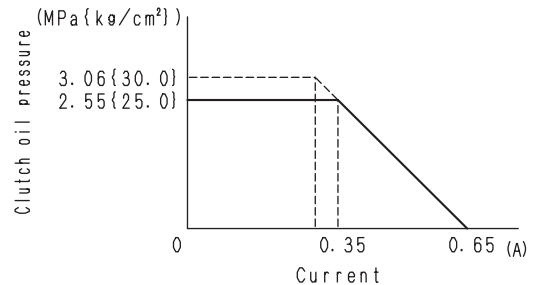
9JB01169

P: From HST charge pump
 A: To transfer clutch
 T: To drain port

- 1. Clutch solenoid valve
- 2. Plunger
- 3. Coil
- 4. Push pin
- 5. Spring
- 6. Spool
- 7. Body

Operation

- When the current of the input signal is large, the hydraulic oil of the transfer clutch is drained.
- As the current of the input signal is reduced, the hydraulic pressure of the transfer clutch is heightened.
- After the current of the input signal is reduced until the hydraulic pressure of the transfer clutch reaches the hydraulic pressure sent from the HST charge pump, the hydraulic pressure of the transfer clutch is kept at the hydraulic pressure sent from the HST charge pump even if the current of the input signal is reduced further.

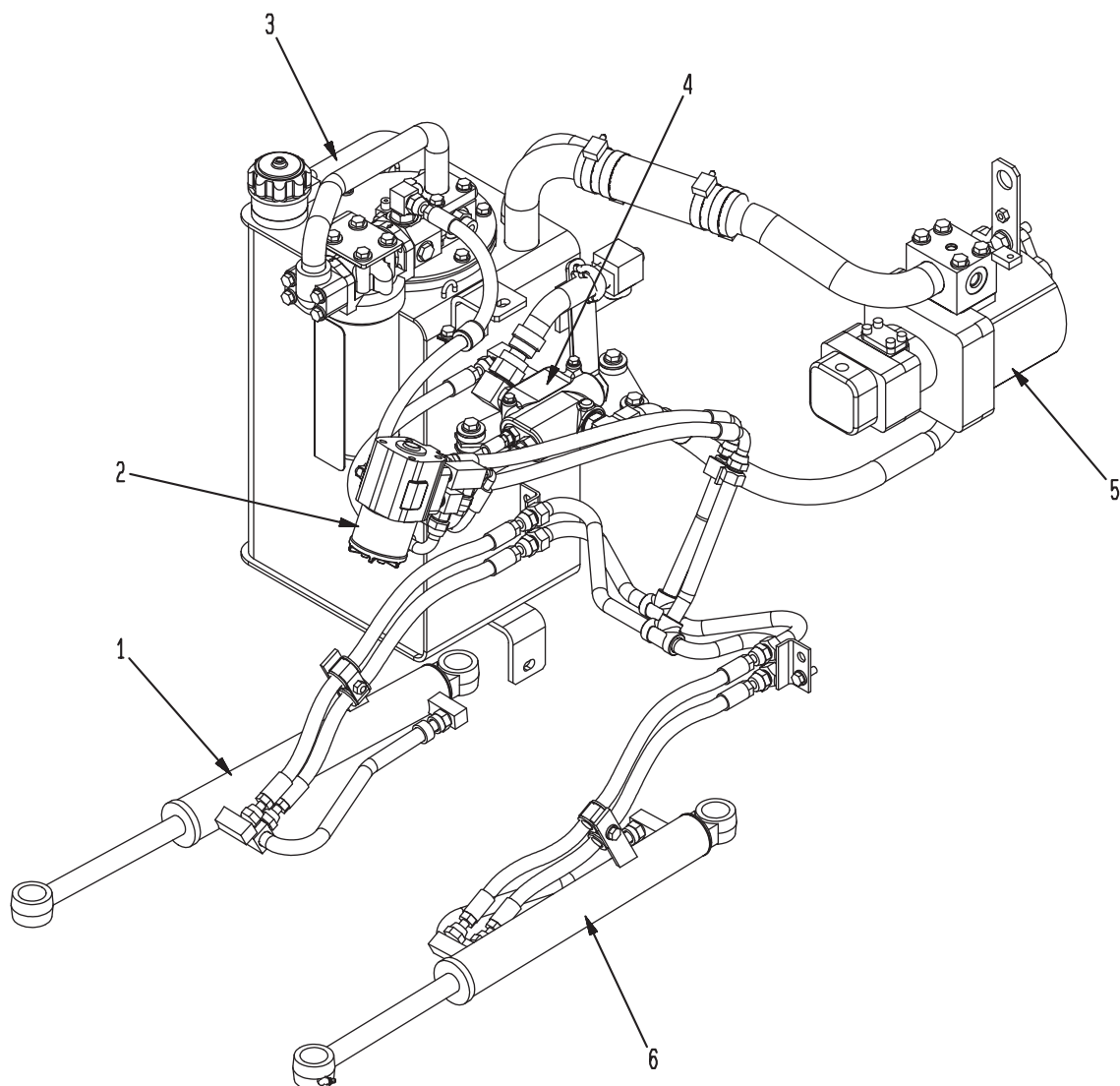


9JB01822

Unit: mm

No.	Check item	Criteria				Remedy	
		Standard size	Tolerance	Repair limit			
11	Plate thickness	3	± 0.02	2.9	Replace		
		3.1					
12	Disc thickness	2.5	+0.04 -0.03	2.45			
13	Washer thickness	2	± 0.05	1.8			
14	Clearance between disc and plate (Total of both sides)	0.20 – 0.6					
15	End play (one end) of side gear in axial direction	0.13 – 0.36					
16	Backlash between case and plate	0 – 0.5					
17	Backlash between side gear and disc	0.13 – 0.32					
18	Clearance between spider and differential pinion gear	Standard size	Tolerance			Standard clearance	Clearance limit
		22	Shaft	Hole			
			-0.110 -0.160	+0.05 0	0.110 – 0.210	—	

STEERING PIPING



9JB01915

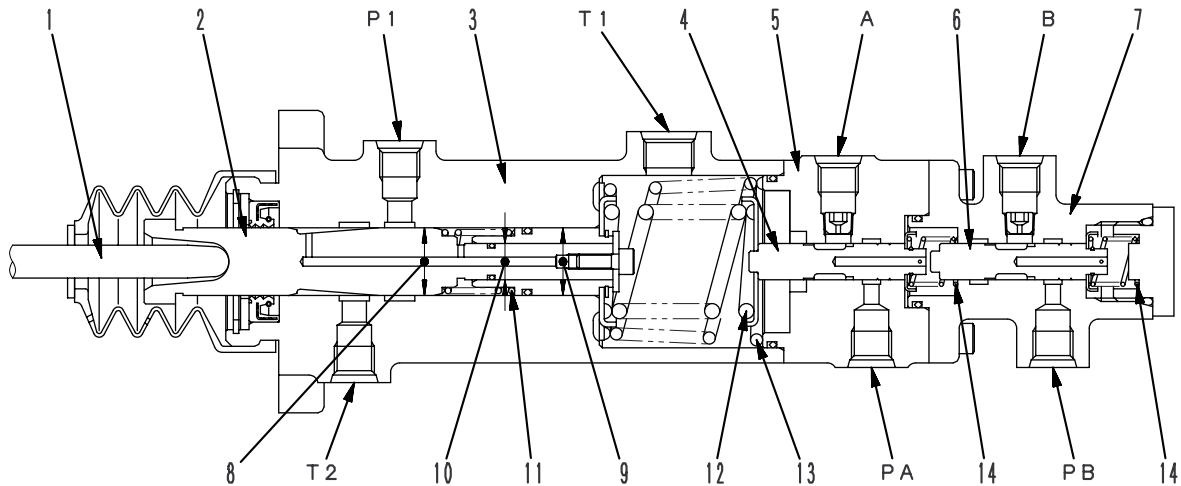
1. Steering cylinder (right)
2. Orbit-roll valve
3. Hydraulic oil tank
4. Priority valve
5. Work equipment and steering pump
6. Steering cylinder (left)

- If the steering wheel is turned to the left, spool (3) connected by the drive shaft of the steering column turns to the left.
At this time, since spool (3) and sleeve (5) are connected by centering spring (12), spool (3) compresses centering spring.
Accordingly, an angular displacement is made between spool (3) and sleeve (5) by the compression of centering spring (12).
Then, port **A** is connected to vertical groove **B** first. Next, vertical groove **B** is connected to port **E**, and then port **E** is connected to vertical groove **C**, and vertical groove **C** is connected to port **G** of the left steering circuit at last.
Orifice **b** of port **J** to vertical **B** and priority valve is kept connected, but port **K** of sleeve (5) disconnects vertical groove **M** and port **L** gradually.
When port **A** is connected to vertical groove **B**, port **F** of the right steering circuit is connected to vertical groove **D**.
- As a result of above connection and disconnection of the ports and vertical grooves, the oil from the pump flows through port **A** to the vertical groove **B**, and then flows to port **E** to rotate the gerotor. The oil discharged from the gerotor flows through port **E**, vertical groove **C**, and port **G** to the head side of the left steering cylinder.
The hydraulic pressure in vertical groove **M** is transmitted through orifice **b** to port **J** and used as the pilot pressure of the priority valve.
The oil from the head side of the right steering cylinder is drained through port **F**, vertical groove **D**, and port **H** into the hydraulic tank.

3. Steering wheel stopped

When the operation of steering wheel is stopped, the difference in rotation between the spool (3) and sleeve (5) is returned to the neutral condition by the reaction of centering spring (12).

BRAKE VALVE



9JB01215

P1: From HST pump
 T1: To hydraulic tank
 T2: To steering pump (Suction side)
 PA: From accumulator (Rear side)

A: To rear brake
 PB: From accumulator (Front side)
 B: To front brake

1. Rod
 2. Inching valve spool
 3. Inching valve body
 4. Brake valve spool (for rear)

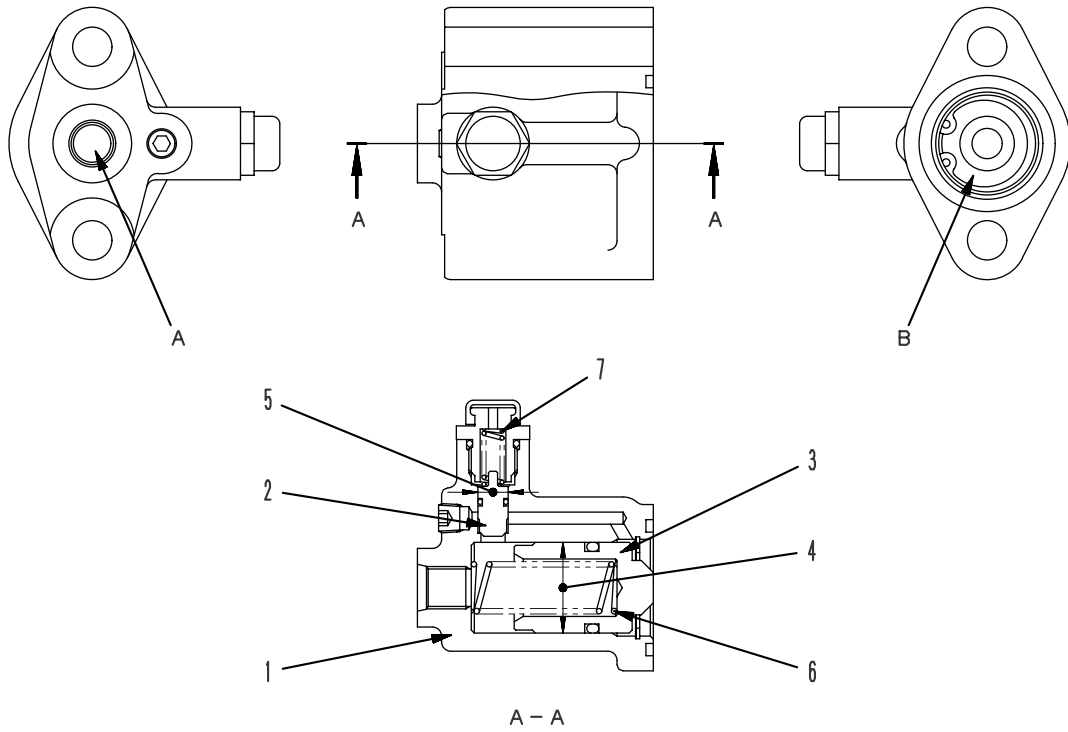
5. Brake valve body (for rear)
 6. Brake valve spool (for front)
 7. Brake valve body (for front)

Unit: mm

No.	Check item	Criteria				Remedy
		Standard size	Tolerance		Standard clearance	
8	Clearance between inching valve spool and body	22.4	-0.022 -0.053	+0.033 0	0.020 – 0.086	0.096
9	Clearance between inching valve guide and body	22.4	-0.022 -0.053	+0.033 0	0.020 – 0.086	0.096
10	Clearance between inching valve spool and guide	12	-0.050 -0.093	+0.050 0	0.050 – 0.143	0.157
11	Inching valve control spring	Standard size			Repair limit	
		Free length	Installed length	Installed load	Free length	Installed load
		34.7	16.7	24.5 N {2.5 kg}	–	20.8 N {2.1 kg}
12	Brake valve control spring	35.6	24.0	113 N {11.5 kg}	–	96 N {9.8 kg}
13	Inching valve return spring	50.0	49.5	19.6 N {2.0 kg}	–	16.7 N {1.7 kg}
14	Brake valve return spring	114.9	52.4	147 N {15.0 kg}	–	125 N {12.7 kg}

Replace

SLACK ADJUSTER



9JB01225

A: From brake valve
 B: To brake piston

- 1. Body
- 2. Check valve
- 3. Piston

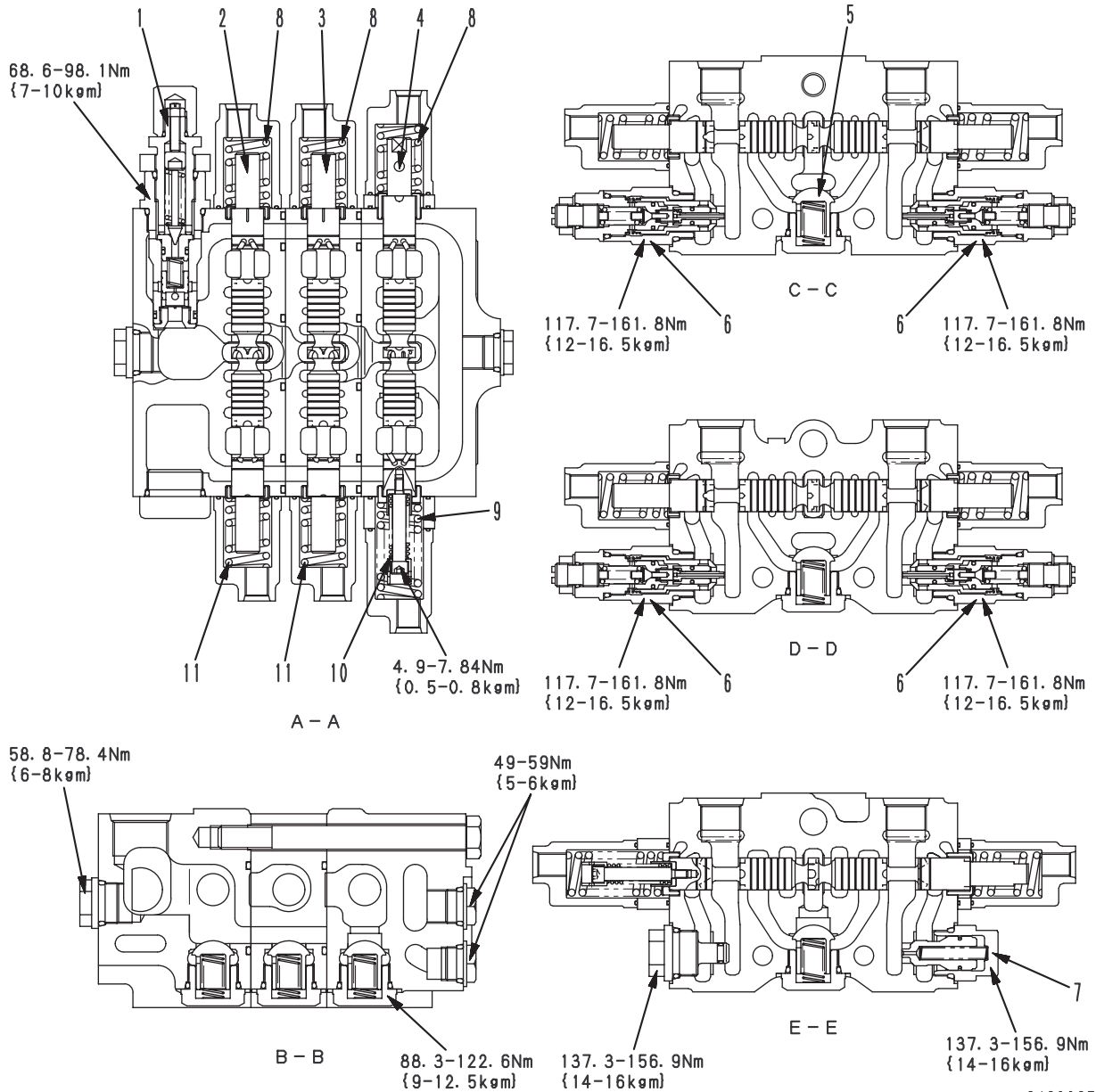
Unit: mm

No.	Check item	Criteria				Remedy	
		Standard size	Tolerance		Standard clearance		Clearance limit
			Shaft	Hole			
4	Clearance between piston and body	30	-0.065 -0.098	+0.052 0	0.065 – 0.150	0.163	
5	Clearance between check valve and body	10	-0.013 -0.028	+0.015 0	0.013 – 0.043	0.048	
6	Piston return spring	Standard size			Repair limit		Replace
		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}	

1. Work equipment control valve
2. Bucket cylinder
3. Hydraulic tank
4. Work equipment PPC valve
5. Lock valve
6. Oil cooler
7. Cold relief valve
8. 3-gear pump unit
 - Work equipment and steering pump
 - Brake and cooling fan pump
 - Transfer lubricating oil pump
9. Accumulator (for PPC circuit)
10. Accumulator (for E.C.S.S.) (If equipped)
11. Lift cylinder
12. E.C.S.S. valve (If equipped)

Outline

- The hydraulic system consists of the HST, steering, work equipment, brake, cooling fan, and transfer lubricating circuit. Work equipment circuit controls the operation of the lift arm and bucket.
- The oil in hydraulic tank (3) is sent by the work equipment pump of 3-gear pump unit (8) to work equipment control valve (1). If both spools of the lift arm and bucket of work equipment control valve (1) are held, the oil flows through the drain circuit of work equipment control valve (1) and is filtrated by the return filter installed to hydraulic tank (3) and returns to hydraulic tank (3).
- If the work equipment control lever is operated, the spool of the lift arm or bucket of work equipment PPC valve (4) operates.
- The oil from the PPC valve hydraulically operates each spool of work equipment control valve (1) and flows to lift cylinder (11) or bucket cylinder (2) to move the lift arm or bucket.
- The maximum pressure in the hydraulic circuit is controlled by the relief valve in work equipment control valve (1). The bucket cylinder circuit has a safety valve (safety-suction valve) to protect itself.
- Accumulator (for PPC circuit) (9) is installed to the PPC pilot circuit so that the work equipment can be lowered to the ground even if the engine stops.
- Hydraulic tank (3) is pressurized, enclosed, and equipped with a breather which has a relief valve and which is also used as an oil filler cap. The breather pressurizes the tank and prevents generation of negative pressure and cavitation.



9JS00975

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

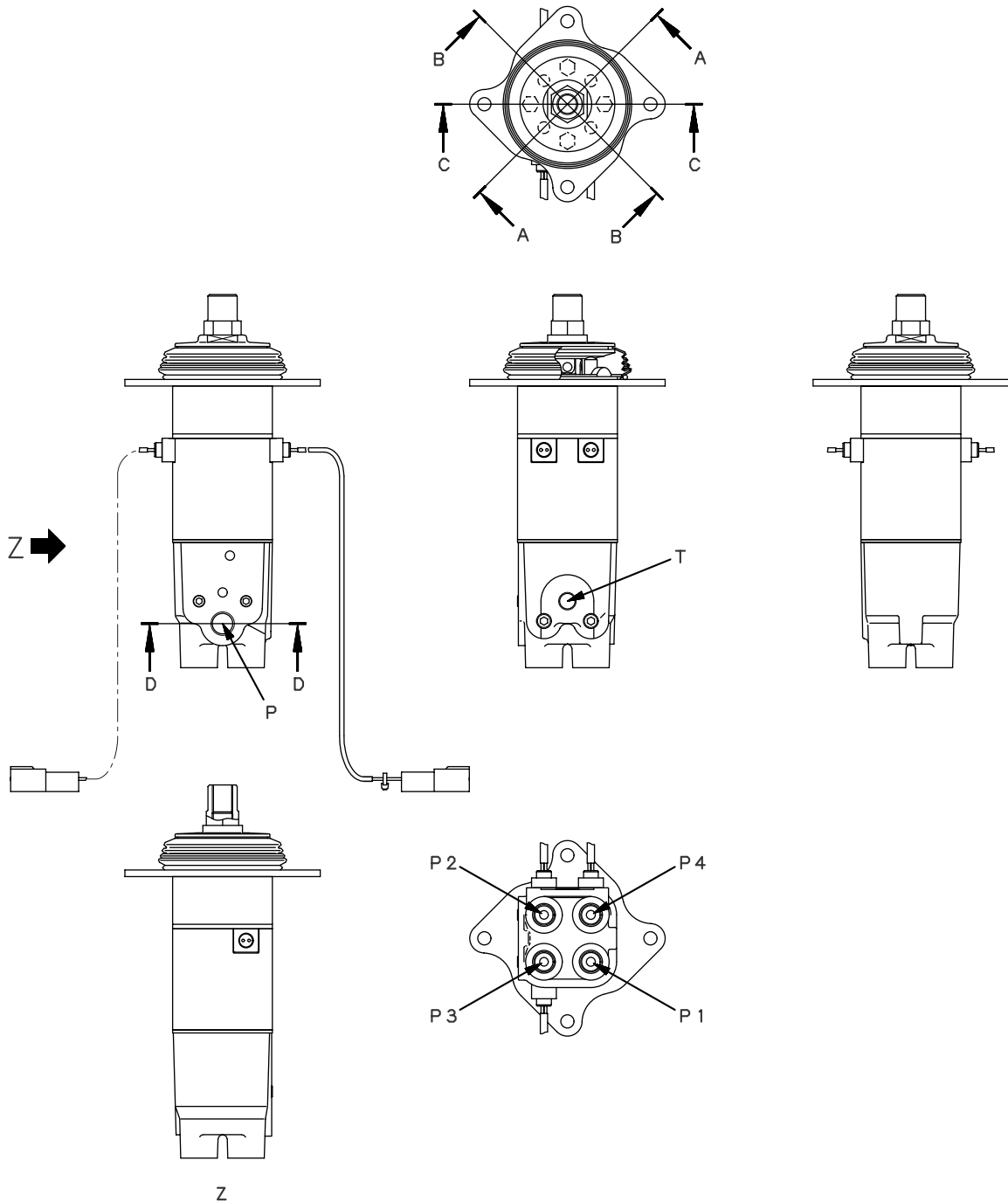
Unit: mm

No.	Check item	Criteria				Remedy	
		Standard size		Repair limit			
		Free length x Outside diameter	Installed length	Installed load	Free length		
8	Lift arm raise and bucket tilt spool return spring	42.5 x 27.5	41	92.2 N {9.4 kg}	40.4	87.3 N {8.9 kg}	Replace spring if damaged or deformed
9	Lift arm lower spool return spring	58.9 x 26.3	57.3	55.9 N {5.7 kg}	56	53 N {5.4 kg}	
10	Lift arm float spool return spring	53.4 x 12	38.5	110.8 N {11.3 kg}	50.7	105 N {10.7 kg}	
11	Bucket dump spool return spring	42 x 27.5	41	72.5 N {7.4 kg}	39.9	68.6 N {7 kg}	

WORK EQUIPMENT PPC VALVE

Mono-lever type

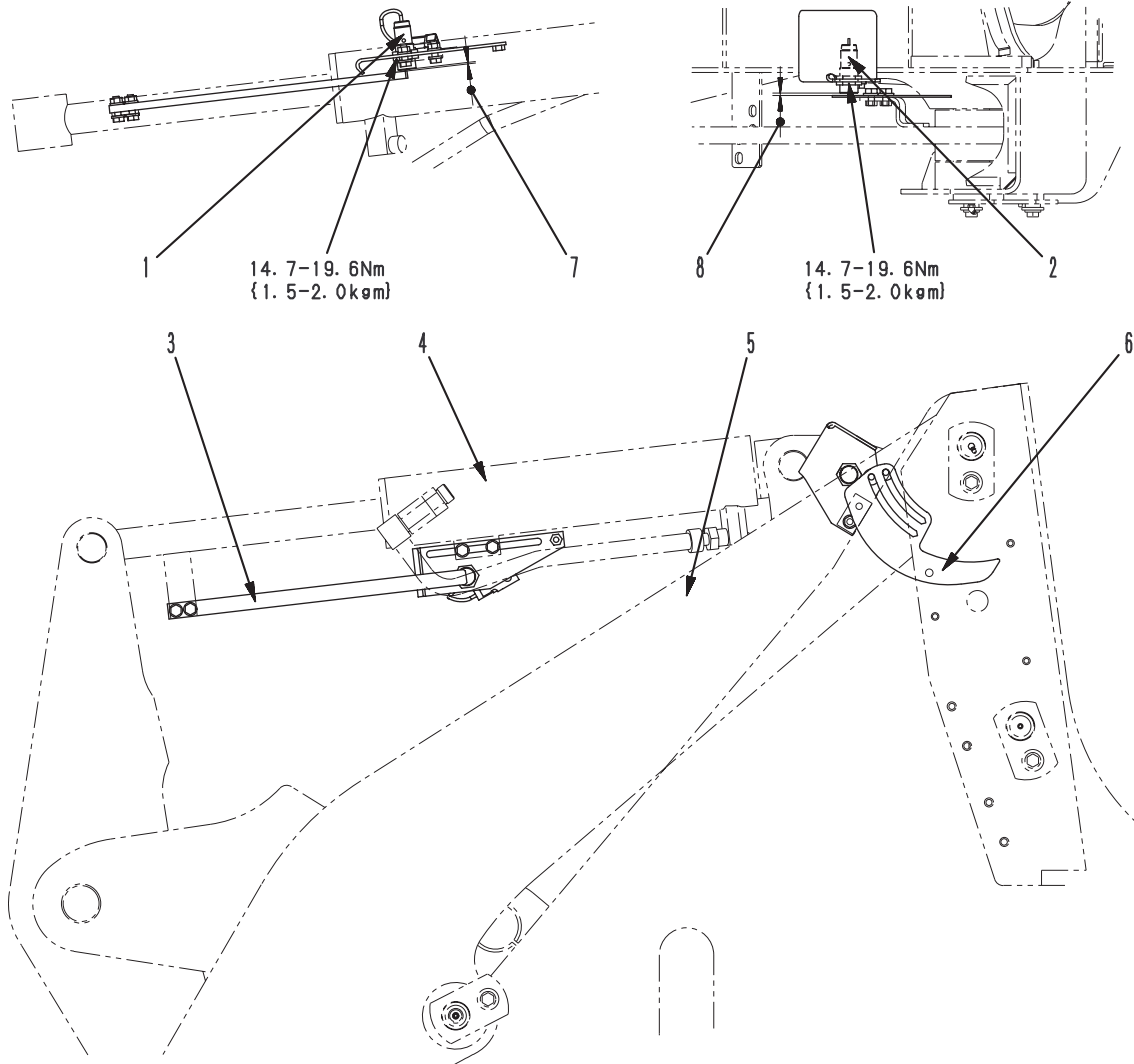
★ Do not disassemble. If it is disassembled, its set pressure must be adjusted.



9JY01467

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

BUCKET POSITIONER AND BOOM KICK-OUT



9JB01810

- | | |
|--|---|
| <ul style="list-style-type: none"> 1. Bucket positioner proximity switch 2. Boom kick-out proximity switch (If equipped) 3. Plate | <ul style="list-style-type: none"> 4. Bucket cylinder 5. Boom 6. Plate (If equipped) |
|--|---|

Unit: mm

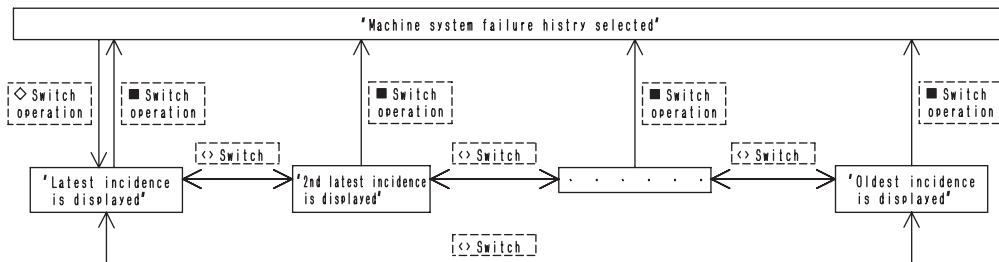
No.	Check item	Criteria	Remedy
7	Clearance of bucket positioner proximity switch	3 - 5	Adjust
8	Clearance of boom kick-out proximity switch	3 - 5	

STRUCTURE, FUNCTION AND MAINTENANCE STANDARD LIST OF ITEMS DISPLAYED ON MONITOR

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 failure code message	Warning buzzer	Individual indication	Centralized warning	Indication of failure code message			
Backup lamp	-	Backup lamp	Bulb for night light	When clearance lamp is ON	-	-	-	-	-	-	-	-	Orange		
Unit	9	Indication of meter	LED		-	O	-	-	-	O	-	-	Green	km/h or MPH (Selected by setting monitor)	
Gauge/Meter	5	Travel speed	Pointer: Movement	Conversion of travel speed pulse into travel speed	-	-	-	-	-	-	-	-	-	If there is error in communication, condition is held until key is turned OFF.	
	1 2	HST oil temperature/HST oil temperature caution	Pointer: Movement Indicator: LED	Other than below	-	-	-	-	-	-	-	-	-	White range: 50 - 110°C Red range: 110 - 135°C	
				Alarm: Above 110°C	●	O	O	B@CRNS	●	O	O	B@CRNS	Red		
				HST oil temperature: Above 150°C	-	-	-	DGH1KX	-	-	-	DGH1KX	-		
	3 4	Engine water temperature/Engine water temperature caution	Pointer: Movement Indicator: LED	Other than below	-	-	-	-	-	-	-	-	-	White range: 50 - 102°C Red range: 102 - 135°C	
				Alarm: Above 102°C	-	O	-	-	-	O	-	-	Red		
				Alarm: Above 105°C	●	O	O	B@BCNS	●	O	O	B@BCNS	Red		
				Engine water temperature: Above 150°C	-	-	-	DGE2KX	-	-	-	DGE2KX	-		
	10 11	Fuel level / Fuel level caution	Pointer: Movement Indicator: LED	Other than below	-	-	-	-	-	-	-	-	-	Red	
				Above 110% (Below 5%)	-	O	-	-	-	O	-	-	-		
	24	Odometer	LCD	Conversion of travel speed pulse into travel distance	-	-	-	-	-	-	-	-	-		
		Service meter		Operates when charge is normal. Corresponds to clock time in 1:1.	-	-	-	-	-	-	-	-	-		
Caution lamp	12	Centralized warning lamp	Bulb	Other than below	-	-	-	-	-	-	-	-	Lamp is turned ON by each controller and message is indicated on character display. Lamp is turned ON by caution.		
				When error is made	△	△	△	△	△	△	△	△		Red	
	14	Brake oil pressure (Accumulator oil pressure)	Bulb	Oil pressure is normal (GND)	-	-	-	-	-	-	-	-	-	*1: For 30 sec just after key is turned ON and engine is started *2: 30 sec after engine is started (after *1)	
				Oil pressure is abnormal (OPEN) (*1)	-	O	-	-	-	●	O	O	-		Red
				Oil pressure is abnormal (OPEN) (*2)	-	-	-	-	-	●	O	O	2G42ZG		Red
	15	Prevention of omitting to apply parking brake	Bulb	Other than below	-	-	-	-	-	-	-	-	-	Lamp lights up and warning buzzer sounds when engine is stopped and parking brake is released (or when key is turned OFF).	
When application of parking brake is omitted (24 V)				☆	O	O	-	-	-	-	-	Red			
16	Axle oil temperature	Bulb	Oil temperature is normal	-	-	-	-	-	-	-	-	-	*3: oil temperature above 120°C is detected for continuous 5 seconds or oil temperature above 115°C is detected for continuous 5 seconds and the travel speed is above 35 km/h		
			Oil temperature is abnormal (*3)	●	O	O	B@C7NS	●	O	O	B@C7NS	Red			
			Brake oil temperature: Above 150°C	-	-	-	DGR1KX	-	-	-	DGR1KX	-			
			Detection of error	-	-	-	DGR1KB	-	-	-	DGR1KB	-			

Items Related to the Fault History of Machine System

- 1) Display of the fault history of vehicle system
 A current fault is displayed prior to the restored ones.
 Pressing the > SW displays the next older fault.
 Pressing the < SW displays the next newer fault.
 After the oldest fault in memory was displayed, a screen is displayed allowing to select clearing the entire fault history of electric system of the relevant controller.
 Pressing the ■SW changes the screen to the [Select displaying abnormalities in machine system] screen on the first layer.



SJW05363

- 2) Selection of displaying the fault history of machine system (first layer)
 Pressing the > SW changes the screen to the [Select the real-time monitor functions] screen.
 Pressing the < SW changes the screen to the [Select displaying the fault history of machine system] screen.
 Pressing the ■SW changes the screen to the ordinary or alert screen.
 Pressing the ◇SW changes the screen to the [Display abnormalities in electric system] screen.

M	A	C	H	I	N	E	F	A	U	L		
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9JB01332

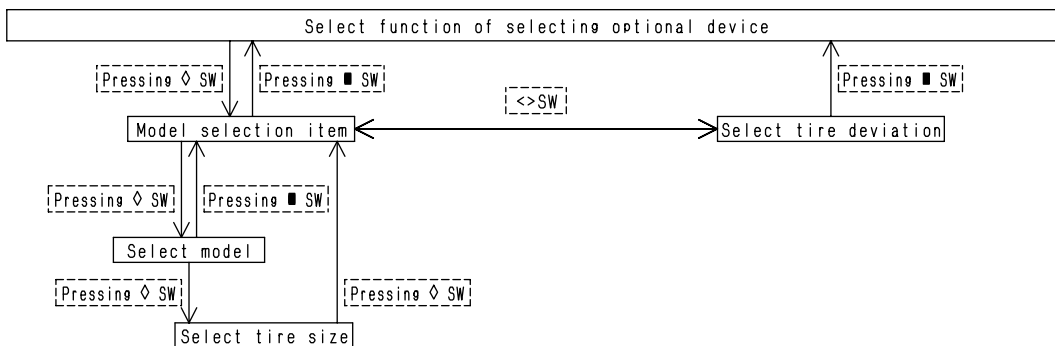
Setting required when optional device is installed

When any of the following optional devices is added or replaced, adjust the sensors, etc. to the initial values with the machine monitor.

Added or replaced optional device	Adjustment item
Tire size, machine monitor	Model selection, tire size selection, tire deviation selection

Function of selecting optional device

- 1) Selection and display of optional item
 Pressing the > SW or < SW changes the selected optional items in order.
 Pressing the ■SW changes the screen to the [Select function of selecting optional device]
 In [Model selection item]: Pressing the ◇SW changes the screen to the [Select model] screen.
 In [Select each optional device]: Pressing the ◇SW updates the items of each optional device.



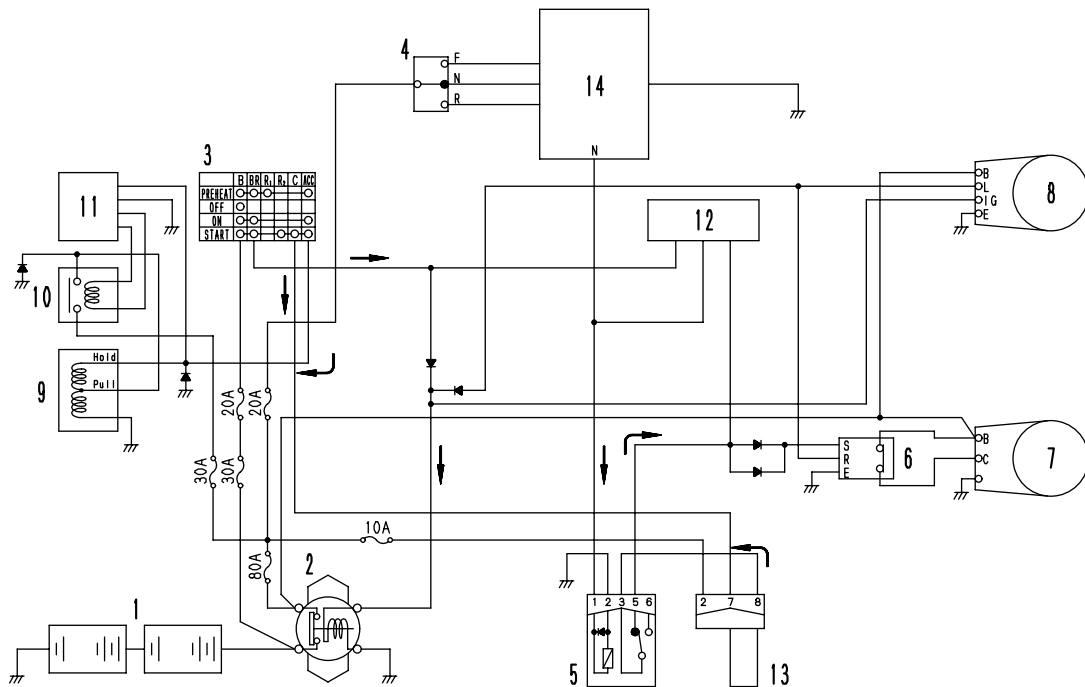
SJW06365

- 2) Selection of function of selecting optional device (fourth layer)
 Pressing the > SW changes the screen to the [Select initializing function] screen.
 Pressing the < SW changes the screen to the [Select maintenance monitor function] screen
 Pressing the ■SW changes the screen to the normal screen or alarm screen.
 Pressing the ◇SW changes the screen to the [Model selection item] screen.

O P T I O N A L S E L E C T

9JB01060

ENGINE START CIRCUIT



9JB01824

★ For details of the directional lever relay, see Electrical circuit diagram.

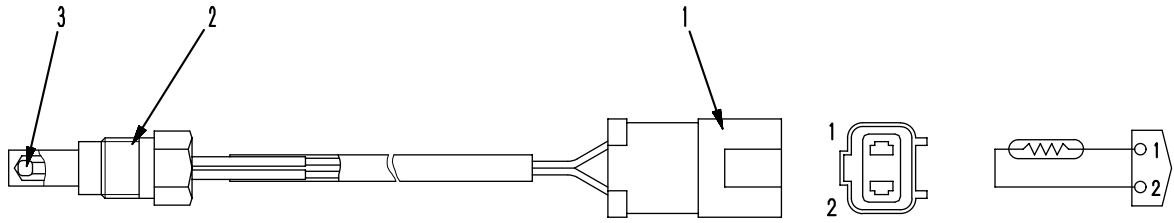
1. Battery
2. Battery relay
3. Starting switch
4. Directional lever
5. Neutral safety relay
6. Starting motor safety relay
7. Starting motor
8. Alternator
9. Fuel cut-out solenoid
10. Fuel solenoid pull relay
11. Fuel cut-out solenoid timer
12. Machine monitor
13. Short connector
14. Directional lever relay

Function

1. The neutral safety circuit is employed to secure the safety when the engine is started.
 - The engine does not start if the directional lever is not in the N (Neutral) position.

Coolant temperature sensor (For monitor)

HST oil temperature sensor



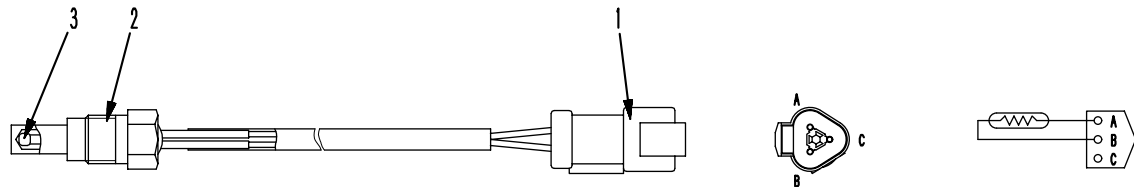
9JB01344

- 1. Connector
- 2. Plug
- 3. Thermistor

Function

- The coolant temperature sensor (for monitor) is installed to the engine cylinder block and the HST oil temperature sensor is installed to the hydraulic piping of motor 2. They generate thermistor resistance change signals as temperature change signals.

Coolant temperature sensor (For preheating)



9JB00782

- 1. Connector
- 2. Plug
- 3. Thermistor

Function

- The coolant temperature sensor (for preheating) is installed to the engine coolant piping. It generates thermistor resistance change signals as temperature change signals.

Machine model				WA150-5		
Category	Item		Measurement Conditions	Unit	Standard Value For New Machine	Service Limit Value
Work equipment	Hydraulic drift	Lift arm cylinder	<ul style="list-style-type: none"> • Bucket no load • Position of work equipment: Lift arm and bucket in level position • Engine stopped • Hydraulic oil temperature: 45 – 55°C • Stop engine and leave for 5 minutes, then measure for 15 minutes. 	mm	Max. 17	Max. 20
		Bucket cylinder			Max. 17	Max. 20
Proximity switch	Clearance between bucket positioner switch		<ul style="list-style-type: none"> • Hydraulic oil temperature: 45 – 55°C 		3 – 5	—
	Clearance between lift arm positioner switch				3 – 5	—
Oil pressure drive fan	Max. fan speed		<ul style="list-style-type: none"> • Engine speed: High idling • Hydraulic oil temperature: 45 – 55°C 	rpm	1,350 ± 40	—
	Fan driving pressure		<ul style="list-style-type: none"> • Hydraulic oil temperature: 45 – 55°C 	MPa {kg/cm ² }	15.7 ± 1.6 {160 ± 16}	15.7 ± 2.5 {160 ± 25}

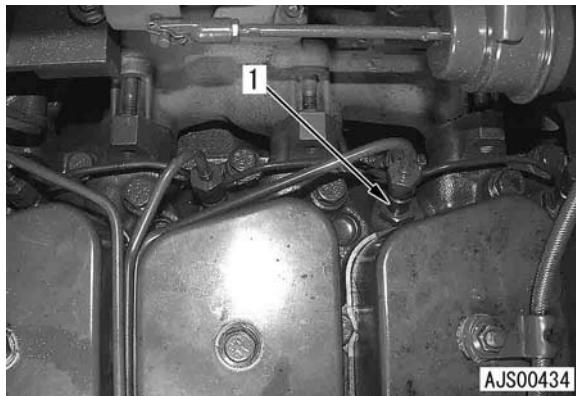
MEASURING COMPRESSION PRESSURE

Special tools required

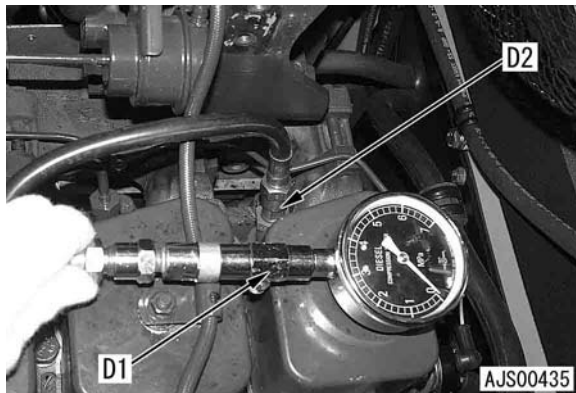
Symbol	Part No.	Part Name	
A	1	799-205-1200	Tachometer KIT
D	1	795-502-1590	Compression gauge
	2	795-502-1700	Adapter

! When measuring the compression pressure, be careful not to burn yourself on the exhaust manifold or muffler, or to get your clothes caught in the fan, fan belt or other rotating parts.

- Adjust the valve clearance.
For details, see ADJUSTING VALVE CLEARANCE.
- Warm up the engine to make the oil temperature 40 - 60°C.
- Remove nozzle holder assembly (1) from the cylinder to be measured.
For details, see REMOVAL AND INSTALLATION OF NOZZLE HOLDER ASSEMBLY



- Install adapter **D2** in the mount of the nozzle holder, then connect compression gauge **D1**.

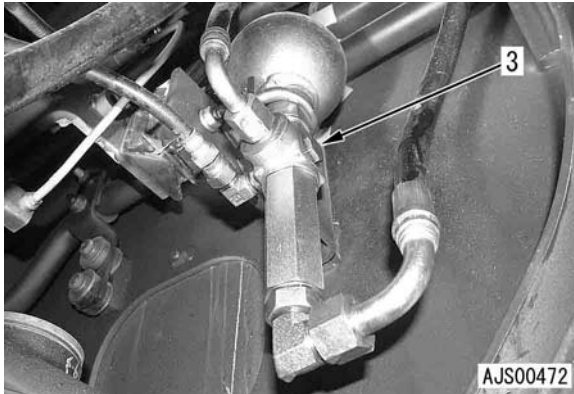


- Set multi-tachometer **A1** in position.
★ For details, see MEASUREMENT OF ENGINE SPEED.
- Disconnect fuel cut solenoid connectors (CN-E23, E03, E24).
- Disconnect the fuel control linkage, secure the governor lever of the fuel pump at the NO INJECTION position, then crank the engine with the starting motor and measure the compression pressure.
★ Measure the compression pressure at the point where the pressure gauge indicator remains steady.
★ When measuring the compression pressure, measure the engine speed to confirm that it is within the specified range.
★ After measuring the compression pressure, install the nozzle holder assembly.

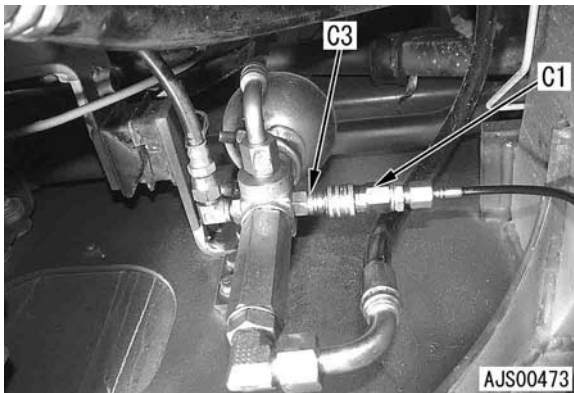
2. Measuring low-pressure relief pressure (basic pressure of work equipment PPC circuit)

- 1) Remove low-pressure relief pressure measurement plug (3) (10mm, P=1.25mm) from under the machine.

★ The oil pressure measurement plug is installed near the bottom right of the transfer on the right side of the rear frame.



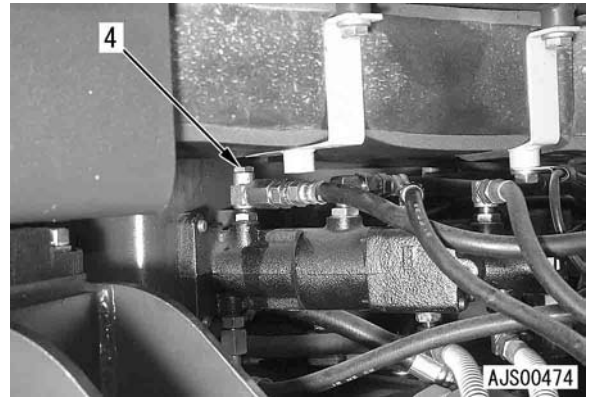
- 2) Install a nipple **C3**, then connect oil pressure gauge **C1** (5.9 MPa {60 kg/cm²}).



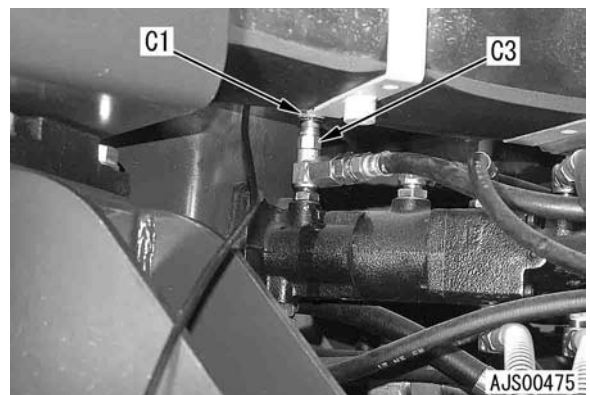
- 3) Place the directional lever at N (neutral), run the engine at high idling, and measure the low-pressure relief pressure.

3. Measuring servo piston control pressure (DA pressure)

- 1) Remove the bottom left cover of operator's cab.
- 2) Remove servo piston control pressure measurement plug (4) (DA pressure) (10mm, P=1.25mm).



- 3) Install a nipple **C3**, then connect oil pressure gauge **C1** (5.9 MPa {60 kg/cm²}).



- 4) Place the directional lever at N (neutral), run the engine at high idling, and measure the control pressure when the wheel brake pedal is depressed and when it is released.
 - ★ The brake pedal is connected to the inching valve and controls the control pressure.

TESTING HYDRAULIC FAN

Special tools required

Symbol	Part No.	Part Name
A	1	799-205-1100 Tachometer KIT
C	1	799-101-5002 Hydraulic tester
		790-261-1203 Digital type hydraulic tester
	6	799-401-3300 Adapter

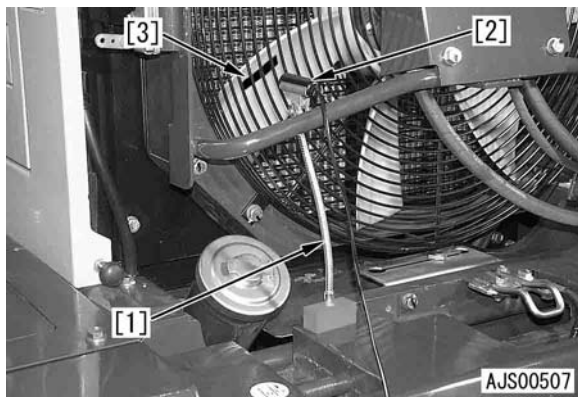
⚠ Set the bottom face of the bucket horizontal, lower the bucket completely to the ground, and put blocks under the tires.

⚠ When removing the measurement plug and disconnecting the hose, loosen the oil filler cap slowly to release the pressure inside the hydraulic tank.

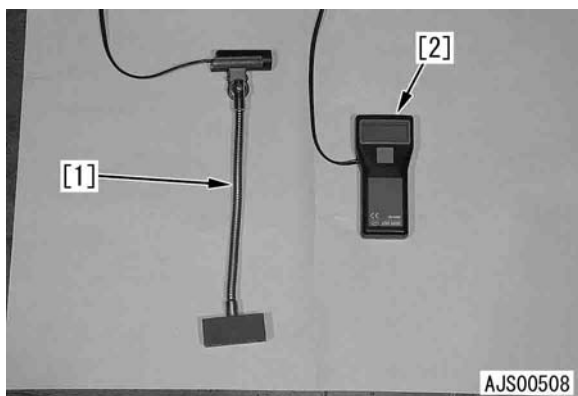
- ★ Measurement conditions
 - Hydraulic oil temperature: 45 - 55°C

Measuring fan speed

1. Open the radiator grill.
2. Install stand [1], probe [2], and reflecting tape [3] in the tachometer KIT **A1**, then connect the meter itself.



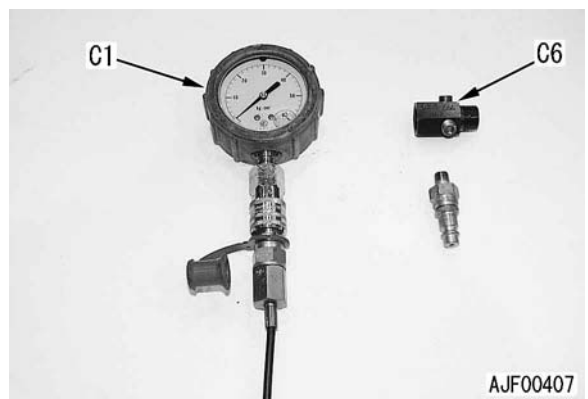
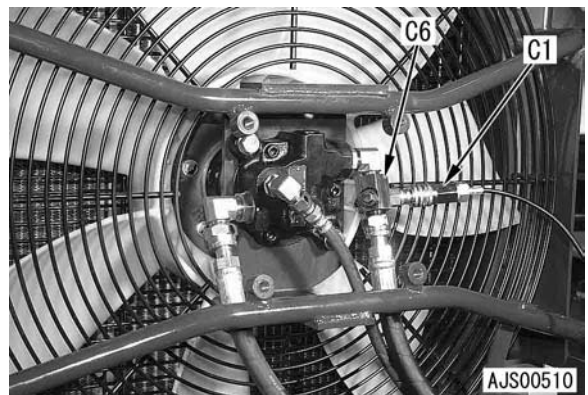
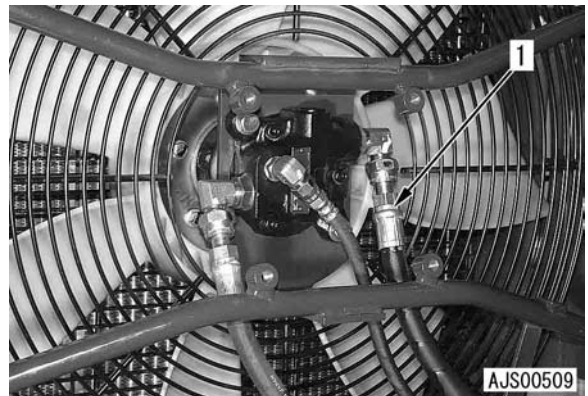
Tachometer KIT **A1**



3. Start the engine, run at high idling, and measure the fan speed.

Measuring oil pressure

1. Open the radiator grill.
2. Remove the fan motor cover.
3. Disconnect hose (1), then connect oil pressure gauge **C1** (39.2 MPa {400 kg/cm²}) and adapter **C6** (hose size: for # 04).



4. Run the engine at high idling and measure the fan drive oil pressure.

TESTING AND ADJUSTING PARKING BRAKE CONTROL CABLE

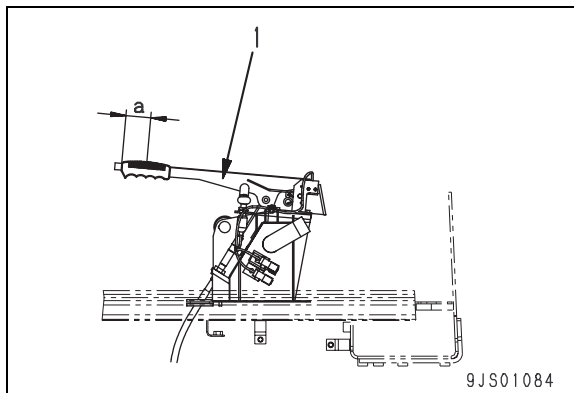
Special tool required

Symbol	Part No.	Part Name
H	79A-264-0021	Push-pull scale


Testing

! Apply the parking brake and lock the tires with chocks.

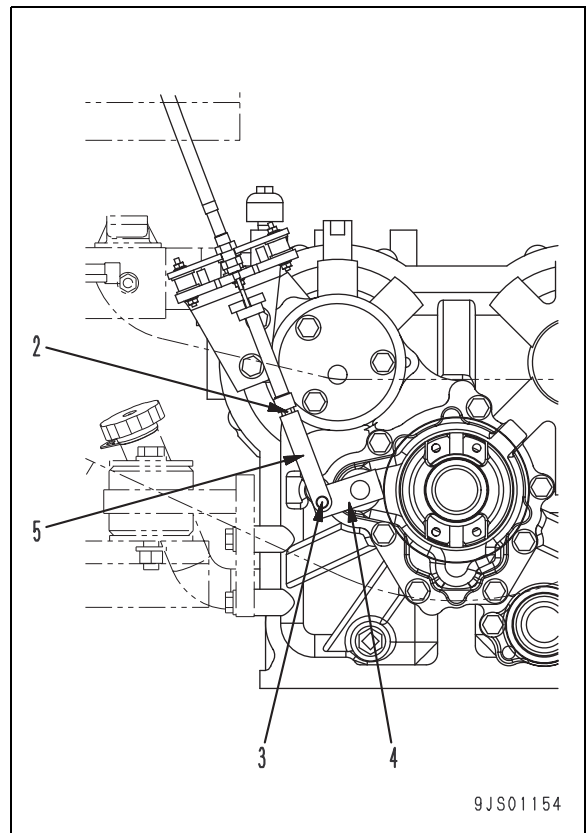
1. Install push-pull scale H in the range of (a) from the end of parking brake lever (1) (excluding the button) and pull the parking brake lever with the force of Approx. 294 N {Approx. 30 kg}.
 - (a): 55 mm
2. If the parking brake lever is pulled by 9 teeth or more, check the fixing parts of the parking brake control cable (on both lever side and brake side) for looseness. If the fixing parts are loosened, tighten them, and then perform the following adjustment.



5. Install clevis pin (3) and tighten locknut (2).

 Locknut: **5.9 - 9.8 Nm {0.6 - 1.0 kgm}**

- ★ After finishing the adjustment, pull the parking brake lever with the force of about 294 N {about 30 kg} again and check that it is pulled by less than 6 teeth.

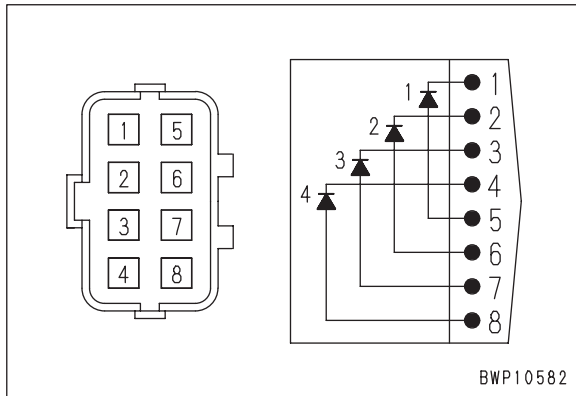


Adjusting

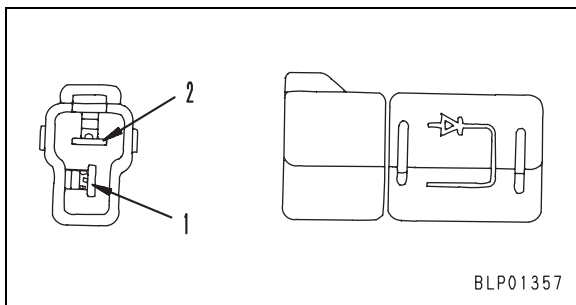
1. Release the parking brake.
 - ★ Check that the pawl of the parking brake lever is at the lowest position.
2. Loosen locknut (2) and remove clevis pin (3).
3. Pull parking brake lever (4) on the transfer side in the release direction. (Add the play of the parking brake lever to the upper side, however.)
4. Under the above condition, tighten clevis (5) to match its hole to the hole of parking brake lever (4).

PROCEDURE FOR CHECKING DIODE

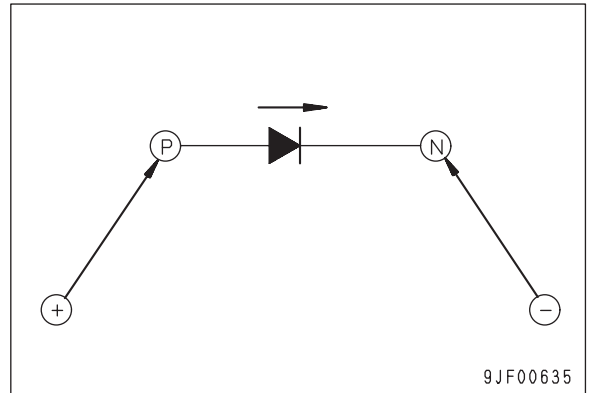
- ★ Use the following procedure to check the centralized diode (8-pin) and the individual diode (2-pin).
- ★ The direction of continuity of the individual diode is marked on the surface of the diode as shown in the diagram below.



- ★ The direction of continuity of the individual diode is marked on the surface of the diode as shown in the diagram below.



1. When using digital tester
 - 1) Switch to the diode range and check the display value.
 - ★ With a normal tester, the internal battery voltage is displayed.
 - 2) Put the red (+) end of the test pin in contact with the anode (P) of the diode, and the black (-) end in contact with the cathode (N), and check the display.
 - 3) Judge the condition of the diode from the display value.
 - Display value does not change: No continuity (defective)
 - Display value of changes: There is continuity (normal) (see ★)
 - ★ In the case of silicon diodes, a value between 460 and 600 is displayed.



2. When using analog tester
 - 1) Set to the resistance range.
 - 2) When doing the following, check the deflection of the indicator.
 - i) Put the red (+) end of the test pin in contact with the anode (P) of the diode, and the black (-) end in contact with the cathode (N).
 - ii) Put the red (+) end in contact with the cathode (N) and the black (-) end of the test pin in contact with the anode (P) of the diode.
 - 3) Judge the condition of the diode from the deflection of the indicator.
 - If the indicator does not deflect in Step i), but it deflects in Step ii): Normal (note that the amount of the deflection (resistance value) differs according to the type of tester and the selection of the measurement range.)
 - If the indicator deflects in both Step i) and Step ii): Defective (internal short circuit)
 - If the indicator does not deflect in either Step i) or Step ii): Defective (internal disconnection)

12. Option selection function

Select the display function for option selection function on the menu screen of Service Mode 1.

- When adding or removing optional equipment, change the setting on the machine monitor.
- When the machine monitor has been replaced, set the status of optional equipment installed on the machine.

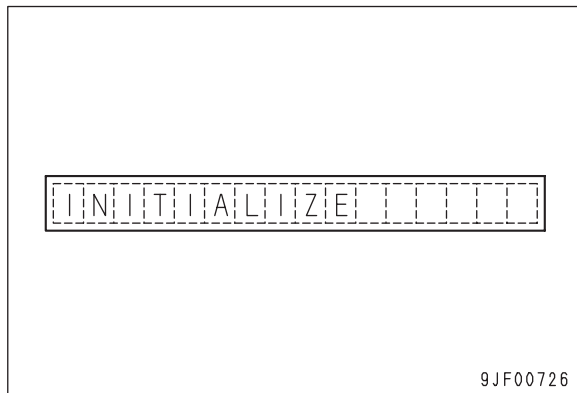
★ For details, see STRUCTURE AND FUNCTION, Option selection function.

Option set items

Adding and changing option	Adjustment item
Tire size, Machine monitor	Model selection, Tire size selection, Tire deflection selection

13. Initialize function

★ This function is a special function used only at the factory, so it cannot be used when servicing the machine.



Service mode 2

This has the following functions to allow settings to be made when the machine monitor is replaced.

1. Setting service monitor

This sets the values for the service meter recorded in the machine monitor.

★ It is only possible to set to a higher value than the present value.

2. Setting odometer reading

This sets the value for the odometer reading recorded in the machine monitor.

★ It is only possible to set to a higher value than the present value.

★ For details, see STRUCTURE AND FUNCTION, Necessary settings for machine.

- Connecting connectors

- Check the connector visually.

- 1) Check that there is no oil, dirt, or water stuck to the connector pins (mating portion).
 - 2) Check that there is no deformation, faulty contact, corrosion, or damage to the connector pins.
 - 3) Check that there is no damage or breakage to the outside of the connector.
- ★ If there is any oil, water, or dirt stuck to the connector, wipe it off with a dry cloth. If any water has gotten inside the connector, warm the inside of the wiring with a dryer, but be careful not to make it too hot as this will cause short circuits.
 - ★ If there is any damage or breakage, replace the connector.

- Assemble the connector securely.

Align the position of the connector correctly, then insert it securely.
 For connectors with a lock stopper:
 Push in the connector until the stopper clicks into position.

- Correct any protrusion of the boot and any misalignment of the wiring harness.

For connectors fitted with boots, correct any protrusion or the boot. In addition, if the wiring harness is misaligned, or the clamp is out of position, adjust it to its correct position.

- ★ When blowing with dry air, there is danger that the oil in the air may cause improper contact, so clean with properly filtered air.

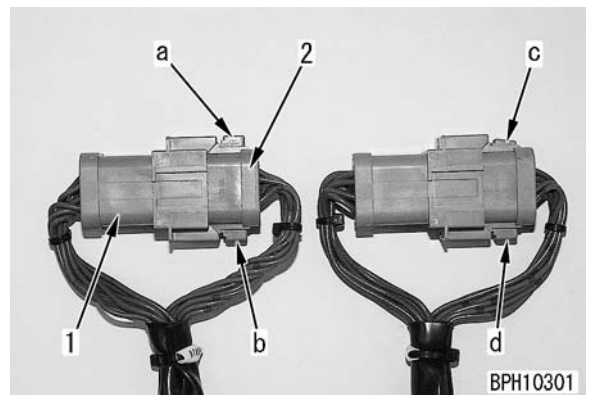
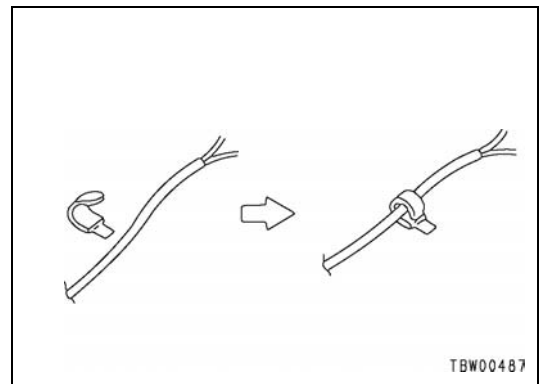
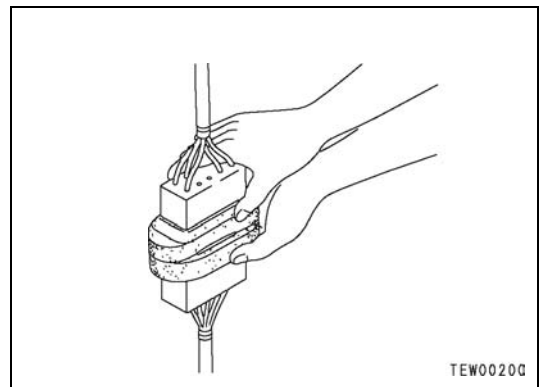
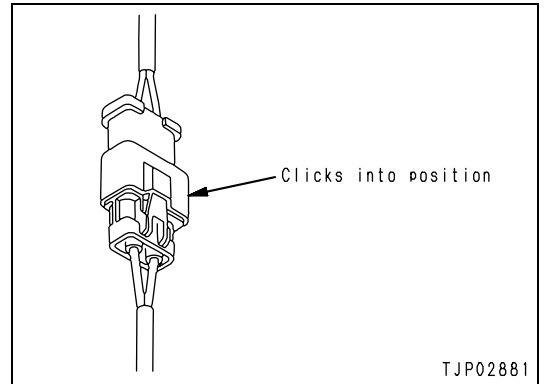
- When the wiring harness clamp of the connector has been removed, always return it to its original condition and check that there is no looseness of the clamp.

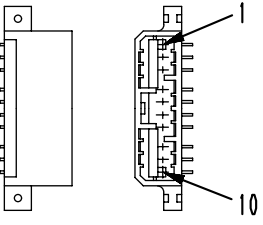
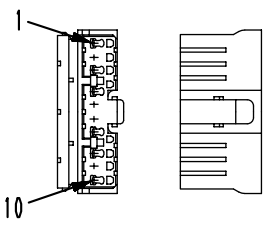
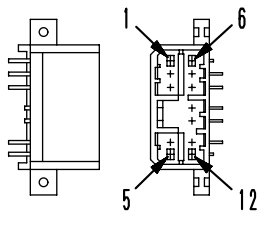
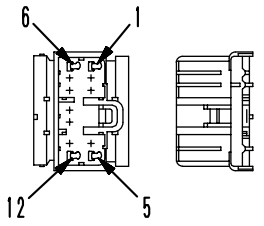
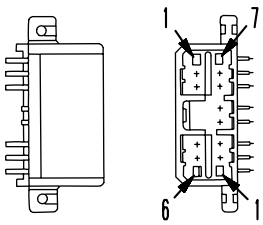
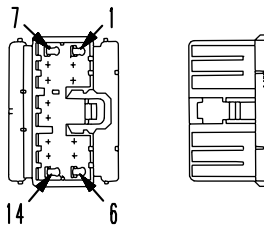
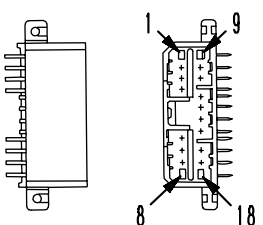
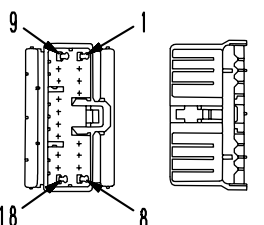
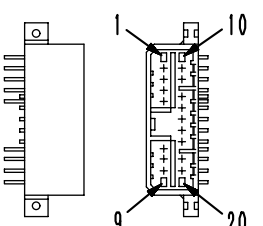
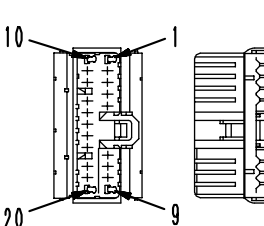
- Connecting connectors (DT type connector)

Since the DT 8-pole and 12-pole DT type connectors have 2 latches respectively, push them in until they click 2 times.

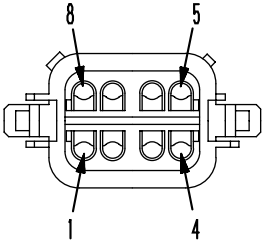
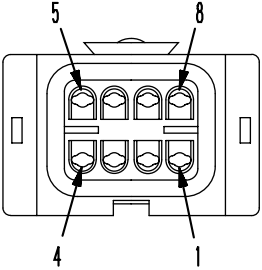
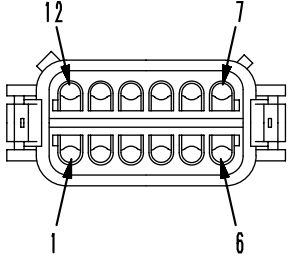
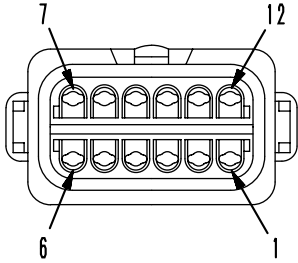
- Male connector, 2. Female connector

- Normal locking state (Horizontal) : a, b, d
- Incomplete locking state (Diagonal) : c



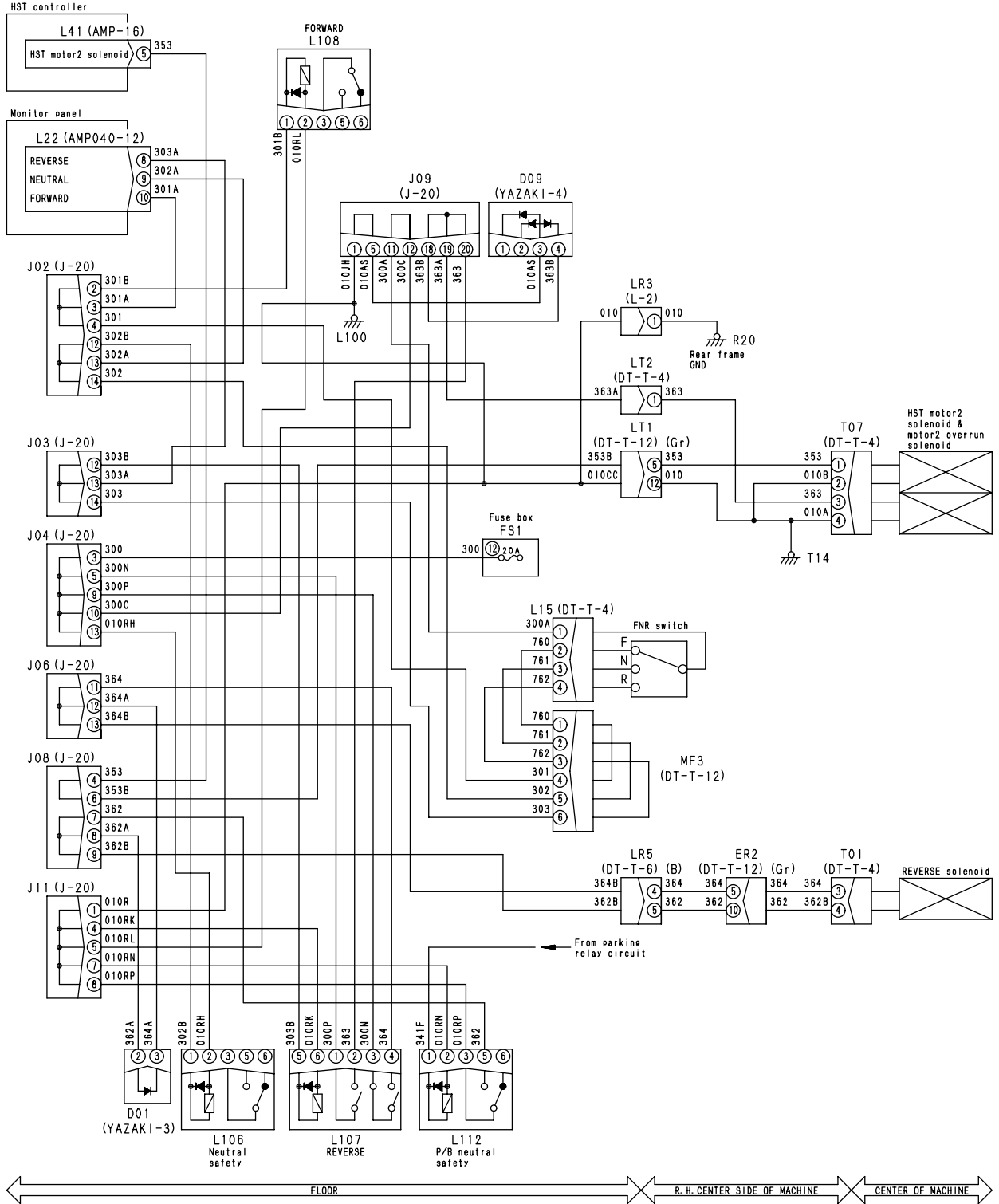
Number of Pins	AMP070 Type Connector		
	Male (Female housing)	Female (Male housing)	T-adapter Part Number
10	 <p>BWP04759</p>	 <p>BWP04760</p>	799-601-7510
	—	Part number: 08195-10210	
12	 <p>BWP04761</p>	 <p>BWP04762</p>	799-601-7520
	—	Part number: 08195-12210	
14	 <p>BWP04763</p>	 <p>BWP04764</p>	799-601-7530
	—	Part number: 08195-14210	
18	 <p>BWP04765</p>	 <p>BWP04766</p>	799-601-7540
	—	Part number: 08195-18210	
20	 <p>BWP04767</p>	 <p>BWP04768</p>	799-601-7550
	—	Part number: 08195-20210	

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

Number of Pins	DT Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part Number
8	 <p style="text-align: center;">BWP05045</p>	 <p style="text-align: center;">BWP05046</p>	8GR: 799-601-9060 8B: 799-601-9070 8G: 799-601-9080 8BR: 799-601-9080
	Part number:08192-1820 □ (normal type) 08192-2820 □ (fine wire type)	Part number:08192-1810 □ (normal type) 08192-2810 □ (fine wire type)	
12	 <p style="text-align: center;">BWP05047</p>	 <p style="text-align: center;">BWP05048</p>	12GR: 799-601-9110 12B: 799-601-9120 12G: 799-601-9130 12BR: 799-601-9140
	Part number:08192-1920 □ (normal type) 08192-2920 □ (fine wire type)	Part number:08192-1910 □ (normal type) 08192-2910 □ (fine wire type)	

Connector No.	Connector Type	Number of pins	Installation Name	Address			
				Layout Drawing	System Drawing		
					HST	MON	E
L104	R	5	Parking brake indicator relay (Electrical type)	N-9		A-6	
L105	R	5	Parking brake safety relay	N-8			
L106	R	5	Neutral safety relay	M-8		A-4	I-9
L107	R	6	Reverse relay	M-8	A-5	A-4	K-9
L108	R	5	Forward relay	N-7	A-5	A-4	
L109	R	5	Back buzzer relay	M-9			I-9
L110	R	5	ECSS relay	N-9			L-9
L111	R	5	HST solenoid safety relay	M-9	A-4		
L112	R	5	Parking brake neutral safety relay	M-9		A-3	
L113	R	5	Boom kick-out relay	N-9			H-9
L114	R	5	Bucket positioner relay	N-8			H-9
L115	R	5	Auto preheating relay	M-9		A-3	I-9
L116	R	5	Horn relay	N-9			I-9
L117	R	5	Small lamp relay (Left side)	U-9		A-6	J-9
L118	R	5	Small lamp relay (Right side)	X-5		A-6	J-9
L119	R	5	Head lamp relay (Right side)	W-4		A-5	K-9
L120	R	5	Head lamp relay (Left side)	T-9		A-5	K-9
L121	R	5	Stop lamp relay	U-8			K-9
L122	R	6	Working lamp relay	U-8			J-9
LR1	DT	2	Intermediate connector (Rear harness)	I-3, X-2	H-4	M-5	M-6
LR2	L	2	Intermediate connector (Rear harness)	I-3, X-3	H-4	M-5	M-6
LR3	L	2	Intermediate connector (Rear harness)	I-3, X-2	H-4	M-5	M-6
LR4	DT-T	12	Intermediate connector (Rear harness)	I-3, W-3	H-3	M-4	M-6
LR5	DT-T	6	Intermediate connector (Rear harness)	H-3, W-2	H-3	M-4	M-5
LR6	DT-T	6	Intermediate connector (Rear harness)	I-3, W-2		M-4	M-5
LR7	DT-T	2	Intermediate connector (Rear harness)	H-3, W-2		M-3	M-4
LT1	DT-T	12	Intermediate connector (HST harness)	I-2, X-2	G-6	M-6	M-3
LT2	DT-T	4	Intermediate connector (HST harness)	I-2, X-1	H-5	M-6	M-3
LT3	DT-T	4	Intermediate connector (HST harness)	I-2, X-1		M-5	
MF1	DT	12	Multi-function	N-6			D-8
MF2		8	Multi-function	Q-8			E-8
MF3	DT-T	12	Multi-function	X-4	H-6	I-5	B-4
MF4	DT-T	2	Multi-function	X-4			
R00	Terminal	1	Ground (Battery)	J-9		X-5	
R01	Terminal	1	Battery relay	J-3, AD-2	L-2	X-6	R-7
R02	Terminal	1	Slow blow fuse (30A)	L-2	L-4	X-7	R-8
R03	Terminal	1	Slow blow fuse (30A)	L-2	L-4	X-7	R-8
R04	Terminal	1	Battery relay	J-3	L-2	X-6	R-7
R05	Terminal	1	Slow blow fuse (120A)	L-2	L-3	X-7	R-8
R06	Terminal	1	Slow blow fuse (80A)	L-3	L-3	X-7	R-7
R07	Terminal	1	Slow blow fuse (120A)	L-3		X-7	R-7
R08	DT-T	4	Fuel solenoid cut timer	K-2			P-8
R09	Terminal	1	Fuel solenoid pull relay	K-1			Q-9

Related circuit diagram



BJW11431

Troubleshooting Code [HST-3] HST Output Control (Traction control) cannot be controlled

Action Code	Error Code	Controller Code	Trouble	HST output control (Traction control) cannot be controlled
-	-	-		
Description of Trouble	<ul style="list-style-type: none"> The traction control switch system is defective, so the HST output control cannot be controlled. 			
Machine monitor or controller Reaction	<ul style="list-style-type: none"> No action. 			
Effect on Machine	<ul style="list-style-type: none"> The HST output control (Traction control) cannot be controlled. 			
Related Information	<ul style="list-style-type: none"> Traction control ON-OFF output signal can be checked in the monitoring function (Code: 80200). 			

Possible Causes and Standard Values	Causes		Standard Value in Normal State and Remarks on Troubleshooting			
		1	Defective traction control switch	1) Turn starting switch OFF. 2) Disconnect connector L56. 3) Connect T-adapter.		
Between L56 (Female) (3) and (2)				Traction control switch ON	Resistance	Max. 1M \times
				Traction control switch OFF	Resistance	Min. 1M \times
2		Wiring harness discontinuity (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect Connectors L42, L56 and fuse FS1 terminal. 3) Connect T-adapter.			
			Wiring harness between L42 (Female) (3) and L56 (Female) (2)		Resistance	Max. 1M \times
			Wiring harness between fuse FS1 (12) and L56 (Female) (3)		Resistance	Max. 1M \times
3		Wiring harness ground fault	1) Turn starting switch OFF. 2) Disconnect Connectors L42, L56 and fuse FS1 terminal. 3) Connect T-adapter.			
			Wiring harness between L42 (Female) (3) and L56 (Female) (3)		Resistance between L42 (Female) (3), L56 (Female) (2) and chassis ground	Min. 1M \times
			Wiring harness between fuse FS1 (12) and L56 (Female) (3)		Resistance between fuse FS1 (12), L56 (Female) (3) and chassis ground	Min. 1M \times
			★ In the above case, the all fuses are blown.			
4		Hot short-circuiting between harnesses	1) Turn starting switch OFF. 2) Disconnect connectors L41 and L56. 3) Connect T-adapter. 4) Turn starting switch ON.			
			Wiring harness between L42 (Female) (3) and L56 (Female) (2)		Voltage between L42 (Female) (3), L56 (Female) (2) and chassis ground	Max. 1V
5		Defective HST controller	1) Turn starting switch OFF. 2) Disconnect Connector L42. 3) Insert T-adapter. 4) Connect connector. 5) Turn starting switch ON.			
			Between L42 (3) and chassis ground	Traction control switch ON	Voltage	20 - 30V
	Traction control switch OFF			Voltage	Max. 1V	

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ECSS-1 MALFUNCTION OF TRAVEL DAMPER

★ For how to read the troubleshooting table, see HST-mode, MON-mode, E-mode, etc. Before carrying out the troubleshooting, understand the contents of the troubleshooting table.

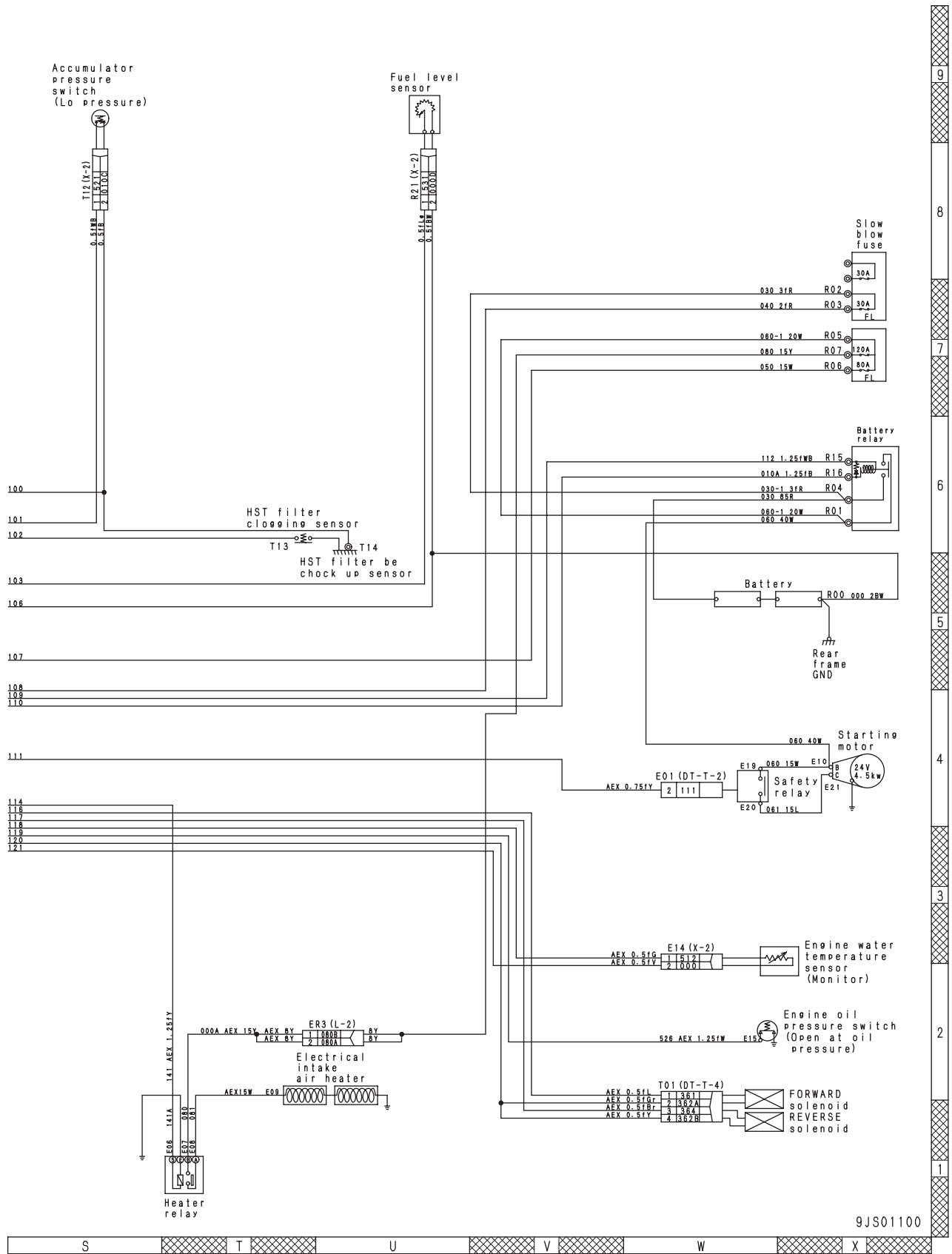
Specification of load meter (STD)

Malfunction of travel damper

a) Travel damper does not operate

Action Code	Error Code	Controller Code	Trouble	Malfunction of travel damper a) Travel damper does not operate
-	-	-		
Description of Trouble	<ul style="list-style-type: none"> The travel damper does not operate. 			
Machine monitor or controller Reaction	<ul style="list-style-type: none"> None in particular. 			
Effect on Machine	<ul style="list-style-type: none"> The travel damper does not operate. 			
Related information	<ul style="list-style-type: none"> If the fuse is broken, check for grounding fault. 			

Possible Causes and Standard Values	Causes		Standard Value in Normal State and Remarks on Troubleshooting			
	Possible Causes and Standard Values	1	Defective travel damper switch	1) Turn starting switch OFF. 2) Disconnect connector L09. 3) Connect T-adapter.		
Between L09 (male) (2) and (3)				Travel damper switch: ON	Resistance	Max. 1 \times
				Travel damper switch: OFF	Resistance	Min. 1M \times
2		Defective travel damper relay (L110)	1) Turn starting switch OFF. 2) Relay: Replace L110 with normal relay. 3) Turn starting switch ON. 4) Operate travel damper switch.			
			When relay L110 is replaced, does condition become normal?	No	Relay L110 is normal.	
				Yes	Relay L110 is defective.	
			1) Turn starting switch OFF. 2) Disconnect relay L110. 3) Check relay unit.			
			Between relay L110 (male) (1) and (2)	Resistance	200 - 400 \times	
			1) Turn starting switch OFF. 2) Disconnect relay L110. 3) Check relay unit. 4) Apply normal voltage between relay L110 (male) (1) and (2).			
3		Defective travel damper solenoid (F07)	When 24 V is applied between and (1) and (2)	Resistance	Max. 1 \times	
				Resistance	Min. 1M \times	
			When solenoid (F07) is replaced, does condition become normal?	No	Travel damper solenoid is normal.	
	Yes			Travel damper solenoid is defective.		
1) Turn starting switch OFF. 2) Disconnect connector F07. 3) Connect T-adapter.						
Between F07 (male) (1) and (2)	Resistance	21 - 24 \times				

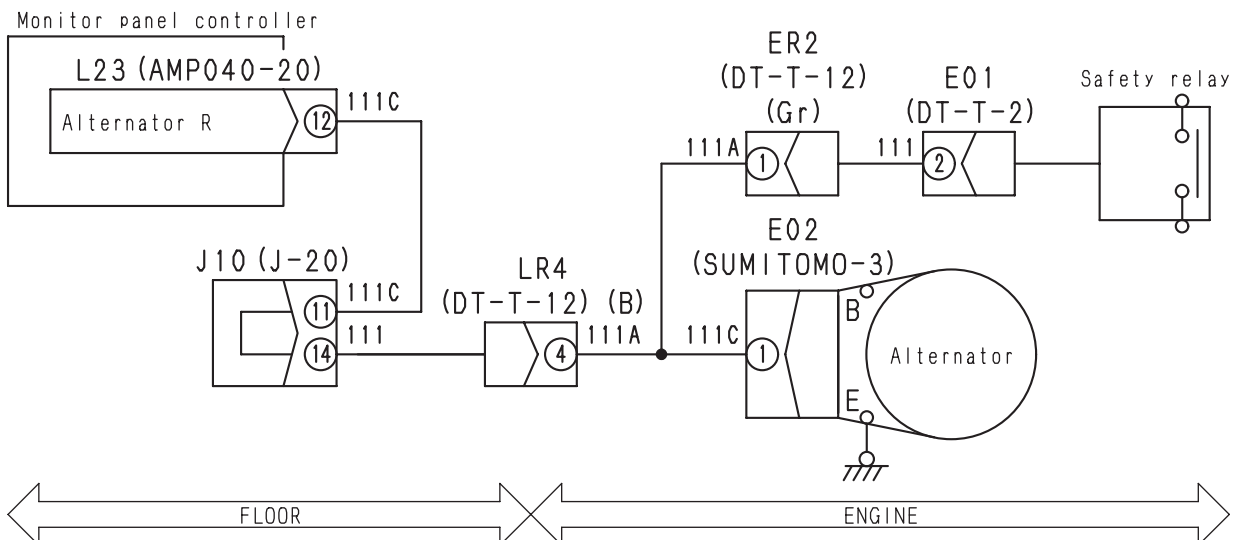


Error Code [AB00MA] (Defective battery charging circuit (MA))

Action Code	Error Code	Controller Code	Trouble	Defective battery charging circuit (MA) (No signal from alternator terminal R when engine stopped, Abnormal detection)
E03	AB00MA	MON		
Description of Trouble	<ul style="list-style-type: none"> During engine operation, the input voltage to the alternator terminal R signal is below 5V. 			
Machine monitor or controller Reaction	<ul style="list-style-type: none"> Activates an alarm. 			
Effect on Machine	<ul style="list-style-type: none"> The battery is deteriorated. The engine cannot be started. The service meter does not work. 			
Related Information				

Possible Causes and Standard Values	Causes		Standard Value in Normal State and Remarks on Troubleshooting		
	1	Battery is deteriorated.	---		
2	Defective alternator	Between alternator terminal R [E02 (1)] and chassis ground	Engine started (Throttle 1/2 or more).	Voltage	28 - 29V
			Engine stopped.	Voltage	Max. 1.5V
3	Wiring harness discontinuity (Disconnection or defective contact)	Wiring harness between L23 (Female) (12) and E02 (Female) (1)	1) Turn starting switch OFF. 2) Disconnect Connectors L23, E02. 3) Connect T-adapter.		
			Resistance	Max. 1M \times	
4	Wiring harness ground fault	Wiring harness between L23 (Female) (12) and E02 (Female) (1)	1) Turn starting switch OFF. 2) Disconnect Connectors L23, E02. 3) Connect T-adapter.		
			Resistance between L23 (Female) (12), E02 (Female) (1) and chassis ground	Min. 1M \times	
5	Defective machine monitor	Between L23 (Female) (12) and chassis ground	1) Turn starting switch OFF. 2) Disconnect connector L23. 3) Insert T-adapter. 4) Connect connector. 5) Turn starting switch ON.		
			Engine started (Throttle 1/2 or more).	Voltage	28 - 29V
			Engine stopped.	Voltage	Max. 1.5V

Related circuit diagram



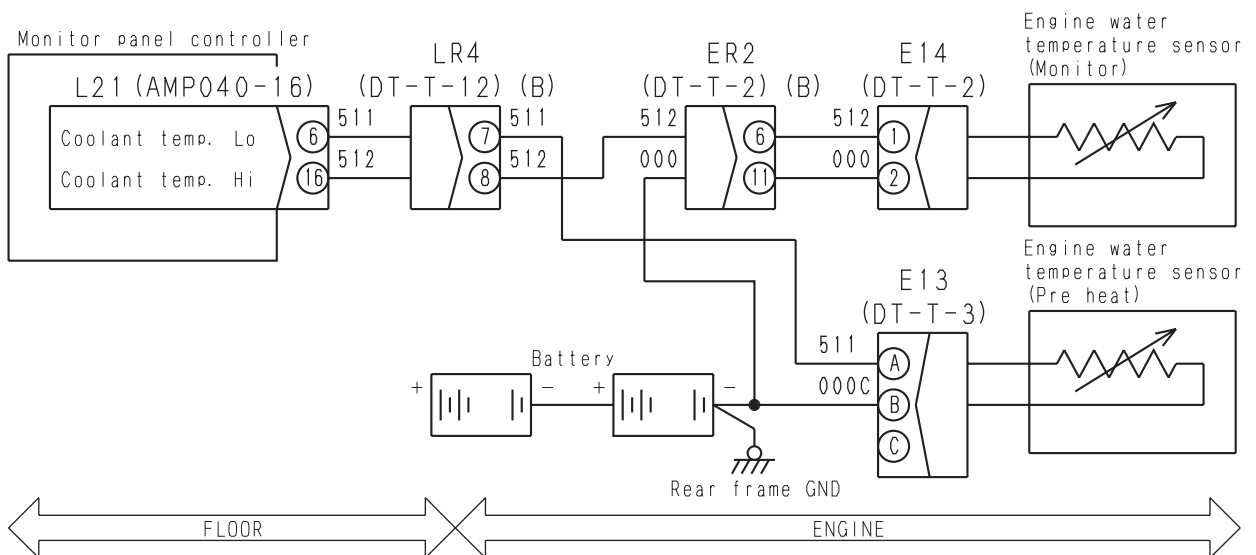
9JS01165

Error Code [DGE2KX] (Engine coolant temperature (High temperature) sensor system failure (KX))

Action Code	Error Code	Controller Code	Trouble	Engine coolant temperature (High temperature) sensor system failure (KX)
E01	DGE2KX	MON		
Description of Trouble	<ul style="list-style-type: none"> The engine coolant temperature sensor input voltage is less 0.98V. 			
Machine monitor or controller Reaction	<ul style="list-style-type: none"> Activates an alarm. 			
Effect on Machine	<ul style="list-style-type: none"> The engine coolant temperature gauge is in the MAX position. 			
Related Information	<ul style="list-style-type: none"> The engine coolant temperature is displayed by real-time monitoring code 04101. 			

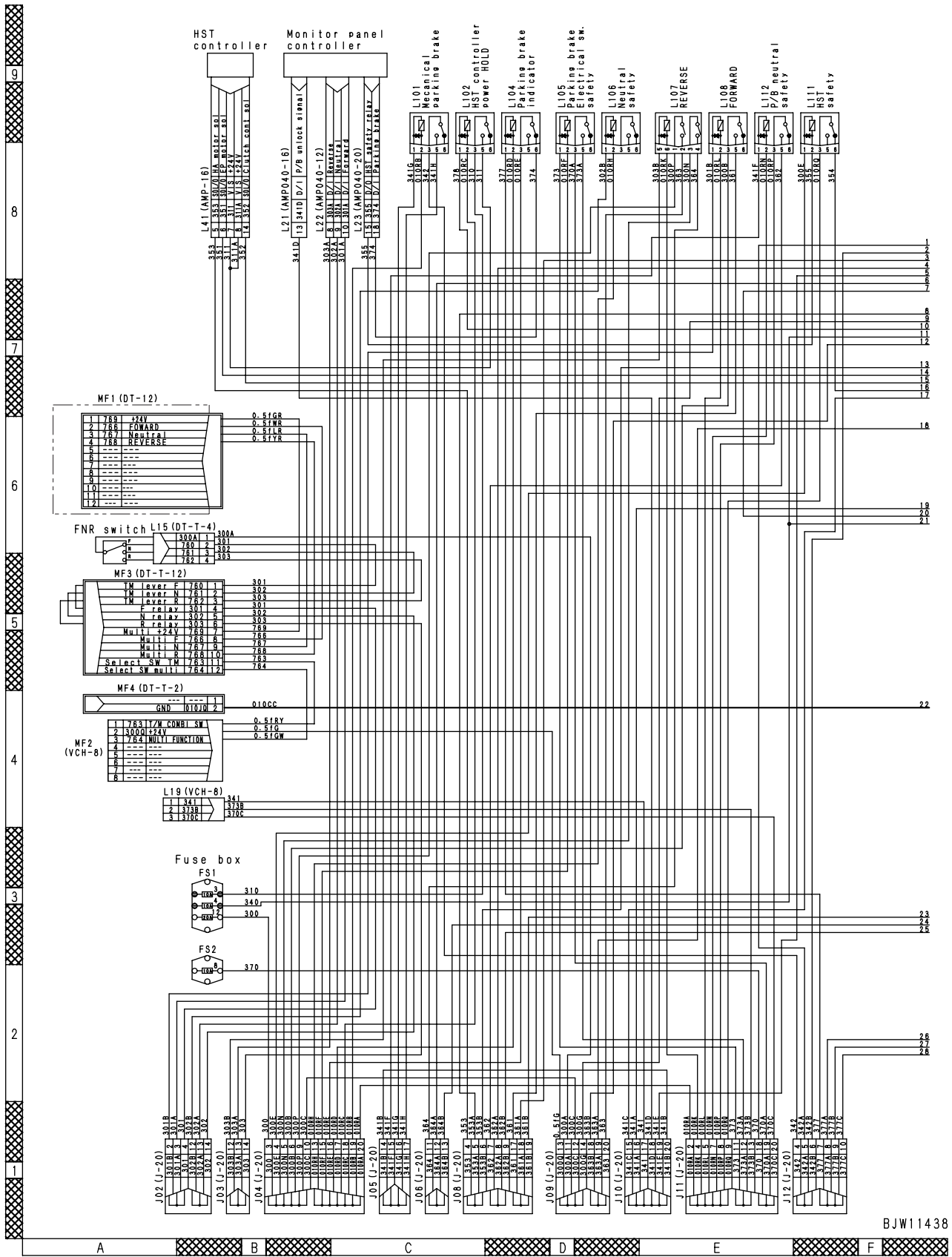
Possible Causes and Standard Values	Causes		Standard Value in Normal State and Remarks on Troubleshooting			
		1	Defective engine coolant temperature (High temperature) sensor	1) Turn starting switch OFF. 2) Disconnect connector E14. 3) Connect T-adaptor.		
Between E14 (Male) (1) and (2)				Normal temperature (25°C).	Resistance	35 - 50k X
				When 100°C	Resistance	3.1 - 4.5k X
2		Wiring harness ground fault	1) Turn starting switch OFF. 2) Disconnect Connectors L21, E14. 3) Connect T-adaptor.			
			Wiring harness between L21 (Female) (16) and E14 (Female) (1)	Resistance between L21 (Female) (16), E14 (Female) (1) and chassis ground		Min. 1M X
3		Defective machine monitor	1) Turn starting switch OFF. 2) Disconnect connector L21. 3) Insert T-adaptor. 4) Connect connector. 5) Turn starting switch ON.			
	Between L21 (Female) (16) and chassis ground		Normal temperature (25°C).	Resistance	35 - 50k X	
			When 100°C	Resistance	3.1 - 4.5k X	

Related circuit diagram

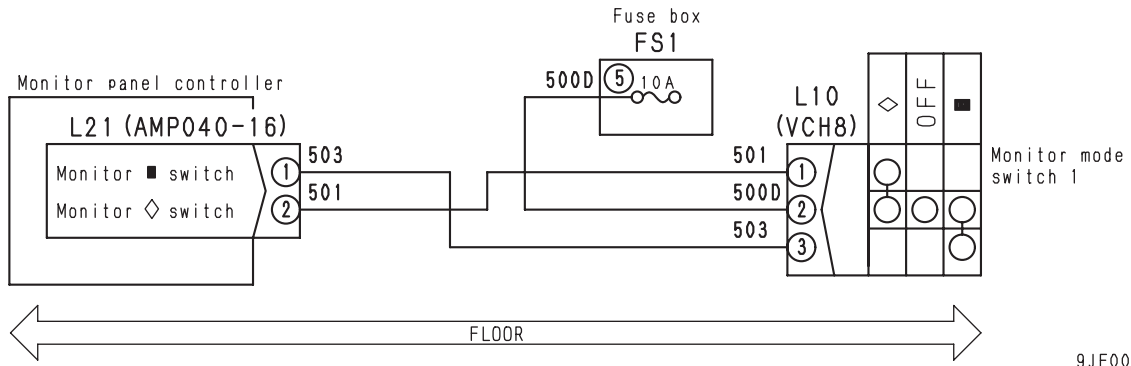


9JF01112

Related circuit diagram



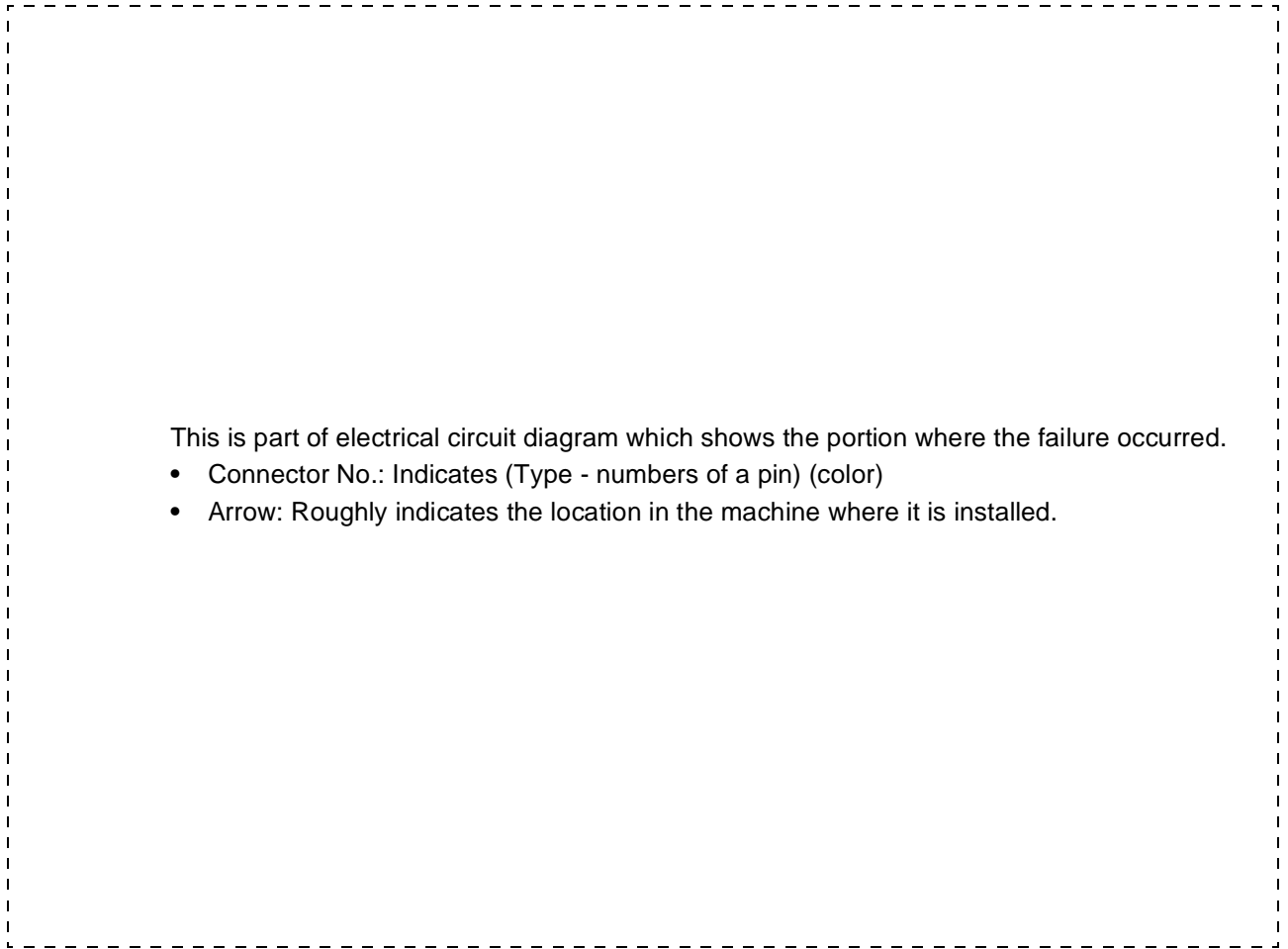
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9JF00557

TROUBLESHOOTING OF ELECTRICAL SYSTEM (E MODE)

Electrical system diagram	20-602
Parking brake related diagram	20-606
Before troubleshooting electrical system	20-608
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Troubleshooting Code [E-11] (The horn does not sound)	20-664
Troubleshooting Code [E-13] (Defective the air conditioner)	20-666

Related circuit diagram

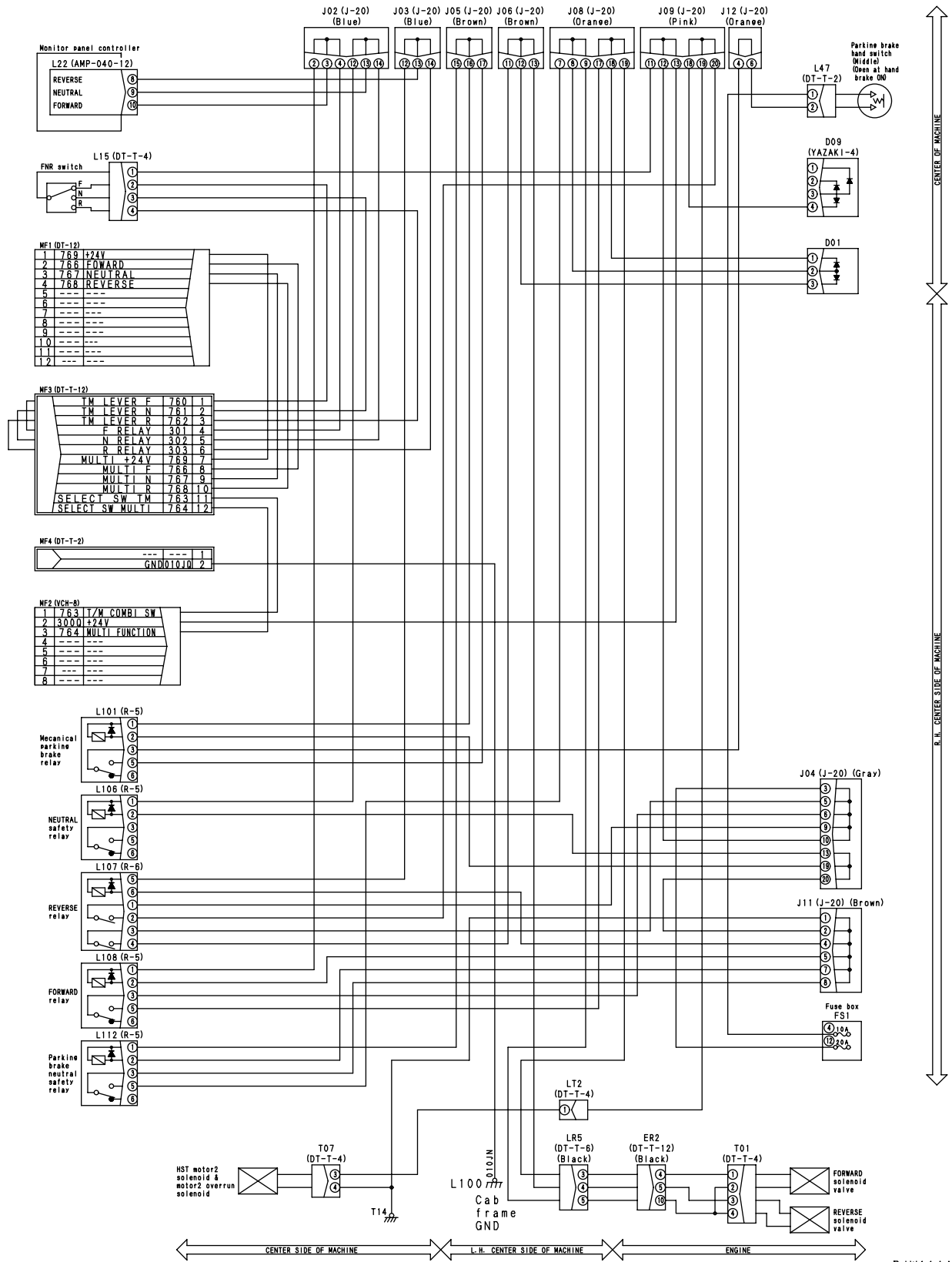
		Causes	Standard Value in Normal State and Remarks on Troubleshooting			
Possible Causes and Standard Values	1	Defective intake air heater relay	1) Turn starting switch OFF. 2) Disconnect heater relay terminal E06, E07, E08. 3) Solid part check.			
			Between E06 and chassis ground		Resistance 19 - 25✕	
			Between E07 and E08	When relay is ON (impressed voltage 24V between E08 - chassis ground).	Resistance	Max. 1✕
	When the relay OFF (Other than above).	Resistance		Min. 1M✕		
	2	Defective intake air heater (Ribbon heater)	1) Turn starting switch OFF. 2) Disconnect heater terminal E09. 3) Solid part check.			
			Between heater terminal E09 and chassis ground	Resistance	0.17 - 0.27✕	
	3	Defective auto-preheating relay (L115)	1) Turn starting switch OFF. 2) Replace relay L115 with normal relay 3) Turn starting switch ON.			
			Does condition become normal when automatic preheating relay L115 is replaced with normal relay?	Condition is abnormal.	Relay L115 is normal.	
				Condition is normal.	Defective relay L115.	
			1) Turn starting switch OFF. 2) Disconnect connector L115. 3) Solid part check.			
			Between L115 (Male) (1) and (2)		Resistance	200 - 400✕
			1) Turn starting switch OFF. 2) Disconnect connector L115. 3) Solid part check. 4) Applies impressed voltage between L115 (Male) (1) - (2)			
			Between L115 (Male) (3) and (5)	Applies 24V impressed voltage between L115 (Male) (1) - (2)	Resistance	Max. 1✕
				Does not apply voltage between L115 (Male) (1) - (2)	Resistance	Min. 1M✕
	4	Defective diode (D05)	1) Turn starting switch OFF. 2) Replace diode (D05) with normal diode. 3) Turn starting switch ON.			
			Condition is abnormal.		Diode (D05) is normal.	
			Condition is normal.		Defective diode (D05)	
			Measure between (2) ✕ (1) with diode range		Continuity	
			Measure between (2) ✕ (3) with diode range		Continuity	
			Measure between (1) ✕ (2) with diode range		No continuity	
Measure between (1) ✕ (3) with diode range			No continuity			
Measure between (3) ✕ (2) with diode range			No continuity			
Measure between (3) ✕ (1) with diode range			No continuity			
★ Put (+) pole of tester in contact with left side.						

		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 L47, L53, fuse FS1 terminal. 3) Connect T-adapter.			
			Wiring harness between fuse FS1 (4) and L47 (Female) (1)	Resistance	Max. 1 \times	
			Wiring harness between L47 (Female) (2) and J12 (6), (7) and L53 (Female) (1)	Resistance	Max. 1 \times	
			Wiring harness between L53 (Female) (2) and J10 (19), (18) and L21 (Female) (13)	Resistance	Max. 1 \times	
			Wiring harness between L53 (Female) (2) and J10 (Female) (19), (20) and J05 (14), (16) and L101 (Female) (1)	Resistance	Max. 1 \times	
			Wiring harness between L53 (Female) (2) and J10 (Female) (19), (20) and J05 (14), (17) and L101 (Female) (5)	Resistance	Max. 1 \times	
			Wiring harness between L101 (Female) (2) and chassis ground	Resistance	Max. 1 \times	
			Wiring harness between L47 (Female) (2) and J12 (Female) (6), (4) and L101 (Female) (3)	Resistance	Max. 1 \times	
	5	Wiring harness ground fault	1) Turn starting switch OFF. 2) Disconnect connector L101, L47, L53, both ends of fuse FS1 terminal. 3) Connect T-adapter.			
			Wiring harness between fuse FS1 (4) and L47 (Female) (1)	Resistance between L47 (Female) (1) and chassis ground	Min. 1M \times	
			Wiring harness between L47 (Female) (2) and J12 (6), (5) and L53 (Female) (1)	Resistance between L47 (Female) (2), L53 (Female) (1) and chassis ground	Min. 1M \times	
			Wiring harness between L47 (Female) (2) and J12 (6), (4) and L101 (Female) (3)	Resistance between L47 (Female) (2), L101 (Female) (3) and chassis ground	Min. 1M \times	
			★ In the above case, the fuse is blown.			
	6	Defective junction connector (J05), (J10) and (J12)	• Carry out inspection, and if any abnormality is found, repair or replace.			
	7	Defective machine monitor	1) Turn starting switch OFF. 2) Disconnect connector L21. 3) Insert T-adapter. 4) Connect connector. 5) Turn starting switch			
			Between L21 (13) and chassis ground	Place parking brake lever LOCK to MIDDLE.	Voltage	Max. 1V
				Place parking brake lever FREE.	Voltage	20 - 30V

Related circuit diagram

★ See "TROUBLESHOOTING CODE [E-4 (a)]"

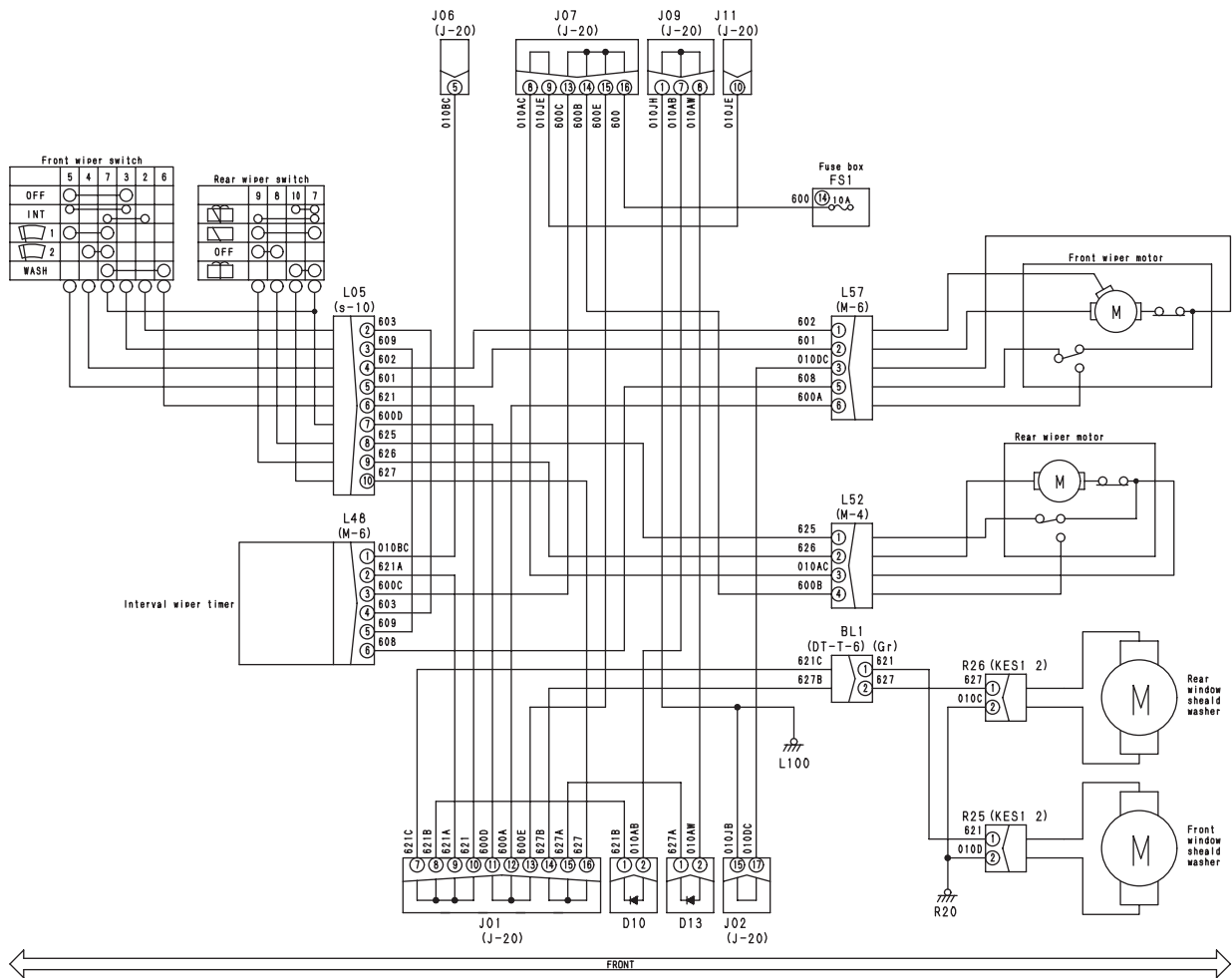
Related circuit diagram



BJW11444

Possible Causes and Standard Values	Causes		Standard Value in Normal State and Remarks on Troubleshooting		
	4	Wiring harness ground fault	1) Turn starting switch OFF. 2) Disconnect connector L05, L48, L52, L57 and fuse FS1 terminal. 3) Connect T-adaptor.		
			Wiring harness between L05 (Female) (8) and L52 (Female) (1)	Resistance between L05 (Female) (8), L52 (Female) (1) and chassis ground	Min. 1M \times
			Wiring harness between L05 (Female) (9) and L52 (Female) (2)	Resistance between L05 (Female) (9), L52 (Female) (2) and chassis ground	Min. 1M \times
			Wiring harness between fuse FS1 (14) and L05 (Female) (7)	Resistance between L05 (Female) (7) and chassis ground	Min. 1M \times
Wiring harness between fuse FS1 (14) and L52 (Female) (6)	Resistance between L52 (Female) (6) and chassis ground	Min. 1M \times			
★ In the all above cases, the fuse is blown.					

Related circuit diagram



9JS01178

		Causes	Standard Value in Normal State and Remarks on Troubleshooting		
Possible Causes and Standard Values	4	Defective small lamp relay (Right side) (L118) ★ When right side is defective	1) Turn starting switch OFF. 2) Replace relay L118 with normal relay. 3) Turn starting switch ON.		
			Does condition become normal when small lamp relay (right) L118 is replaced with normal relay?	Condition is abnormal.	Relay L118 is normal.
				Condition is normal.	Defective relay L118.
			1) Turn starting switch OFF. 2) Disconnect connector L118. 3) Solid part check.		
			Between L118 (Male) (1) and (2)	Resistance	200 - 400 \times
			1) Turn starting switch OFF. 2) Disconnect connector L118. 3) Solid part check. 4) Applies impressed voltage between L118 (Male) (1) - (2)		
			Between L118 (Male) (3) and (5)	Applies 24V impressed voltage between L118 (Male) (1) - (2)	Resistance
	Does not apply voltage between L118 (Male) (1) - (2)	Resistance		Min. 1M \times	
	5	Wiring harness discontinuity (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect connector L04, L117, L118, HEAD L, and fuse FS2 terminal (10), (11). 3) Connect T-adapter.		
			Wiring harness between L04 (Female) (3) and chassis ground	Resistance	Max. 1 \times
			Wiring harness between L117 (Female) (5) and J10 (9), (10) and HEAD L (Female) (5)	Resistance	Max. 1 \times
			Wiring harness between fuse FS2 (10) and L117 (Female) (1), (3)	Resistance	Max. 1 \times
			Wiring harness between L117 (Female) (2) and L04 (Female) (1)	Resistance	Max. 1 \times
			Wiring harness between HEAD L (Female) (4) and chassis ground	Resistance	Max. 1 \times
			1) Turn starting switch OFF. 2) Disconnect connector L04, L118, HEAD R and fuse FS2 terminal (11). 3) Connect T-adapter.		
			Wiring harness between L04 (Female) (3) and chassis ground	Resistance	Max. 1 \times
			Wiring harness between L118 (Female) (5) and HEAD R (Female) (5)	Resistance	Max. 1 \times
			Wiring harness between fuse FS2 (11) and L118 (Female) (1), (3)	Resistance	Max. 1 \times
Wiring harness between L118 (Female) (2) and L04 (Female) (1)			Resistance	Max. 1 \times	
Wiring harness between HEAD R (Female) (4) and chassis ground	Resistance	Max. 1 \times			

Related circuit diagram

★ See "TROUBLESHOOTING CODE [E-10.(a)]".

Troubleshooting Code [E-13] (Defective of the air conditioner)**a) The air conditioner does not work**

Action Code	Error Code	Controller Code	Trouble	Defective the air conditioner a) The air conditioner does not work
-	-	-		
Description of Trouble	<ul style="list-style-type: none"> The air conditioner does not work. 			
Machine monitor or controller Reaction	<ul style="list-style-type: none"> No reaction. 			
Effect on Machine	<ul style="list-style-type: none"> The air conditioner does not work. 			
Related Information	<ul style="list-style-type: none"> If fuse FS2 (2) is blown, check wiring harness between fuse FS2 (2) - C03 (Female) (8) for short circuit with ground. 			

Possible Causes and Standard Values	Causes		Standard Value in Normal State and Remarks on Troubleshooting		
	1	Wiring harness discontinuity (Disconnection or defective contact)	1) Turn starting switch OFF. 2) Disconnect connector C03, fuse FS2 terminal. 3) Connect T-adapter.		
Wiring harness between fuse FS2 (2) and C03 (Female) (8)			Resistance	Max. 1 \times	
Wiring harness between C03 (Female) (11) and chassis ground			Resistance	Max. 1 \times	
2	Defective air conditioner control panel	★ Check the control panel, and if any abnormality is found, repair or replace.			

TROUBLESHOOTING OF HYDRAULIC, MECHANICAL SYSTEM (H MODE)

Method of using troubleshooting chart	20-702
Error code and cause table	20-704
H-1 The machine does not start	20-706
H-2 The travel speed is slow	20-707
H-3 The thrusting force is weak	20-708
H-4 Engine stalls when traveling or engine speed drops excessively	20-709
H-5 The gear is not shifted	20-710
H-6 The steering wheel does not turn	20-711
H-7 The steering wheel is heavy	20-712
H-8 Steering wheel shakes or jerks	20-713
H-9 Machine deviates naturally to one side when traveling	20-713
H-10 The brake does not work or does not work well	20-714
H-11 The brake is not released or is dragged	20-715
H-12 The lift arm does not rise or lower	20-716
H-13 The lift arm moves slowly or the lift arm rising force is insufficient	20-717
H-14 When rising, the lift arm comes to move slowly at specific height	20-718
H-15 The lift arm cylinder cannot hold down the bucket (The bucket rises in the air)	20-718
H-16 Hydraulic drifts of the lift arm occur often	20-718
H-17 The lift arm wobbles during operation	20-718
H-18 When the control lever is switched from "HOLD" to "RAISE," the lift arm falls temporarily	20-719
H-19 The bucket does not tilt back	20-720
H-20 The bucket moves slowly or the tilting-back force is insufficient	20-721
H-21 The bucket comes to operate slowly in the midst of tilting-back	20-722
H-22 The bucket cylinder cannot hold down the bucket	20-722
H-23 Hydraulic drifts of the bucket occur often	20-722
H-24 The bucket wobbles during travel with cargo (The work equipment valve is set to "HOLD")	20-723
H-25 When the control lever is switched from "HOLD" to "TILT," the bucket falls temporarily	20-723
H-26 The control levers of the lift arm and bucket do not move smoothly and heavy	20-723
H-27 The travel damper does not operate and machine pitches and bounces	20-724

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?

		Cause						
		Hydraulic pump	Others					
		a	b	c	d	e	f	
	Defective hydraulic pump or PTO Steering pump and switch pump	Priority valve	Obit-roll		Internal defective steering cylinder (Defective piston seal)	2-way restrictor valve	Emergency steering valve (*1)	
	Steering	Spool	Relief valve					
No.	Diagnosis	△ X	X	X	X	△ X	△ X	△ 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.
- *1. This warning is given only when the emergency steering is installed.

H-20 The bucket moves slowly or the tilting-back force is insufficient

Inspection before diagnosis

- Is the stroke of the bucket control lever appropriate?
- Seizure of work equipment linkage bushing (Does any abnormal noise occur?)

Check of Abnormality

- Make sure in an actual operation that the tilting-back force is insufficient.
- Measure the operating speed of the bucket, and make sure referring to the criterion value table that the speed is abnormal

		Cause								
		Tank to Pump	Priority valve	HST pump	PPC valve	Work equipment valve			Cylinder	
		a	b	c	d	e	f	g	h	i
		Clogging of pump suction port or mixing of much air in oil	The hydraulic pump and the switch pump are defective	Defective operation of spool	Defective operation of low-pressure relief valve	Defective operation of spool	Defective operation or improper adjustment of main relief valve	Defective operation of safety valve (With suction valve) on bucket cylinder bottom side	Wear or breakage inside valve body (Bucket spool)	Damage of bucket cylinder piston seal
No.	Diagnosis	△	△	△	△	△	△	△	X	X
1	The lift arm rising force and speed are abnormal, and the bucket tilting force and speed are abnormal	○	○	○	○		○			
2	The lift arm rising force and speed are normal, and the bucket tilting force and speed are abnormal					○		○	○	○
3	When the oil temperature rises in No. 1, the bucket speed becomes worse		○						○	
4	The hydraulic pump is causing an abnormal noise	○	○							
5	Large hydraulic drift of bucket cylinder							○	○	○
6	The relief oil pressure from the relief valve of the work equipment valves is low		○				○	○		
7	The relief oil pressure from the relief valve of the work equipment valves is too high						○			

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							
		Worn piston ring, cylinder liner	Clogged breather, breather hose	Clogged oil filter	Worn valve, valve guide	Clogged oil cooler	Clogged turbocharger oil drain tube	Defective seal at turbocharger turbine end	
Check items	Questions	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	◎		○		○	○	
		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	
								Carry out troubleshooting for "Exhaust smoke is black".	

2. DISASSEMBLY AND ASSEMBLY OF ASSEMBLIES

SPECIAL TOOLS

- Special tools which are deemed necessary for disassembly and assembly 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) New/remodel

N: Tools with new part numbers, newly developed for this model.

R: Tools with upgraded part numbers, remodeled from already available tools for other models.

Blank: Tools already available for other models, used without any modification.
 - 3) Mark ○ in sketch column:
This mark means that a sketch of the special tool is presented in the section of Sketches of 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.

DISASSEMBLY

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



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



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



: This mark shows oil or water to be drained

ASSEMBLY

- Section titled ASSEMBLY contain procedures, precautions and the know-how for the work, as well as the amount of oil or water to be added.
- Various symbols used in ASSEMBLY Section are explained and listed below.



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



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



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



: This mark indicates the specified torque.



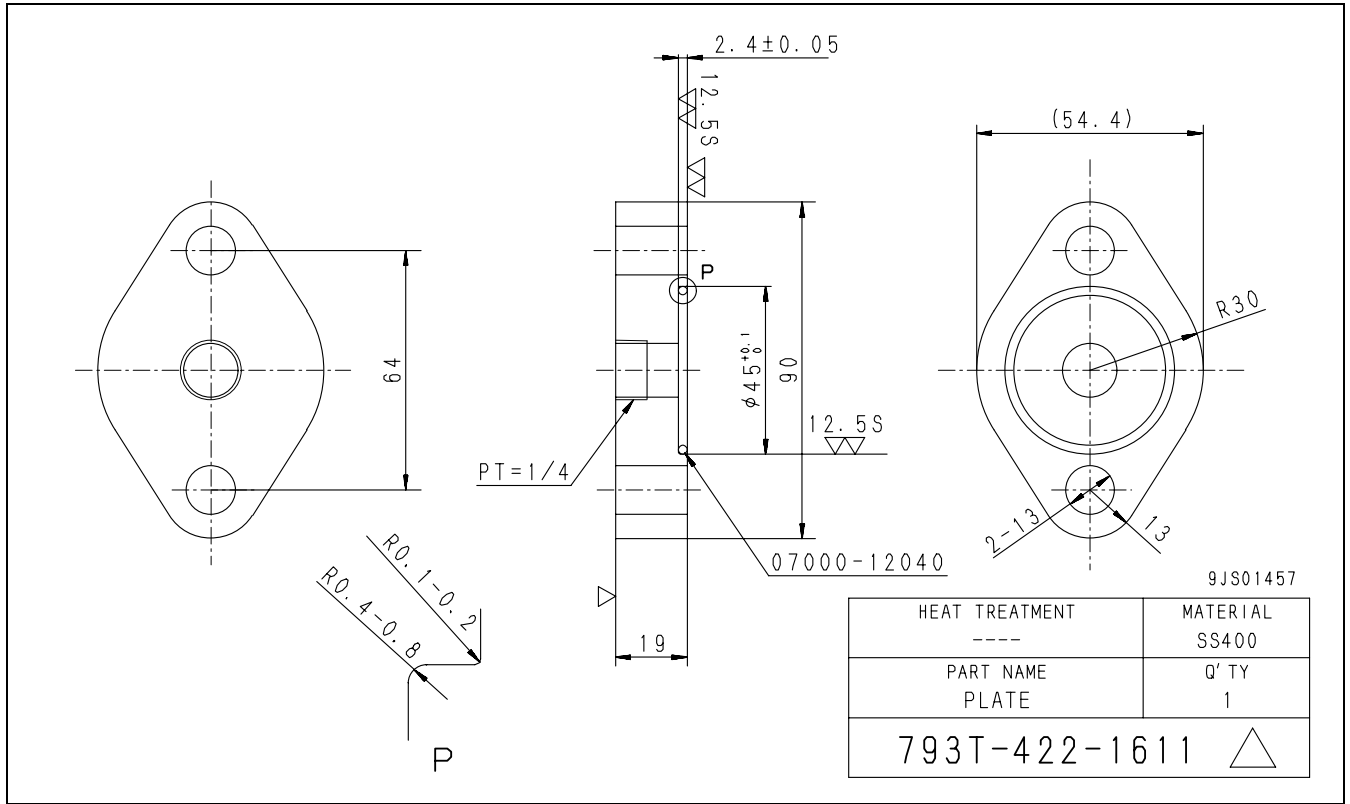
: This mark indicates an amount of oil or water to be added.

SKETCHES OF SPECIAL TOOLS

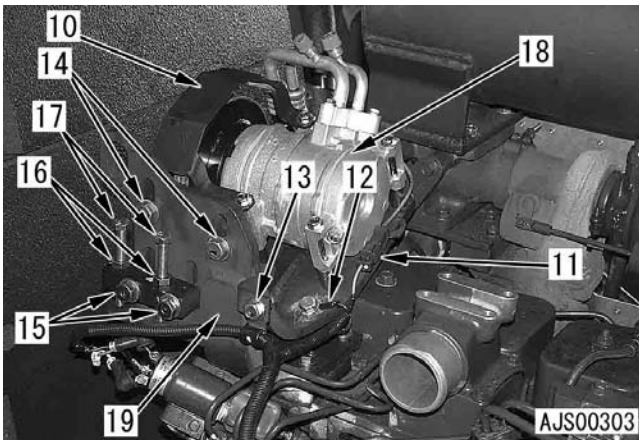
- Various special tools are illustrated for the convenience of local manufacture.

Note: Komatsu will not be held responsible for special tools manufactured according to these sketches.

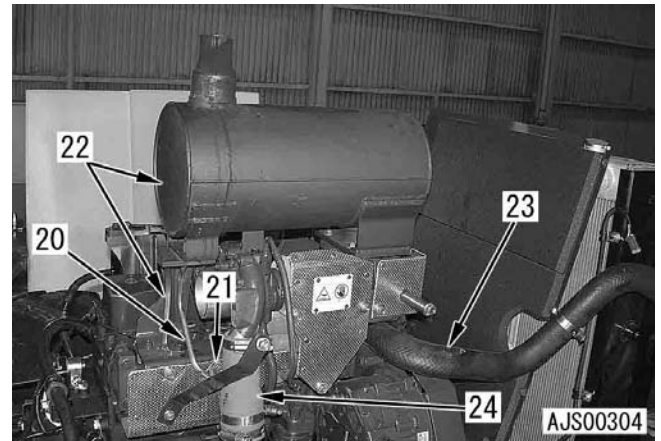
H15 PLATE



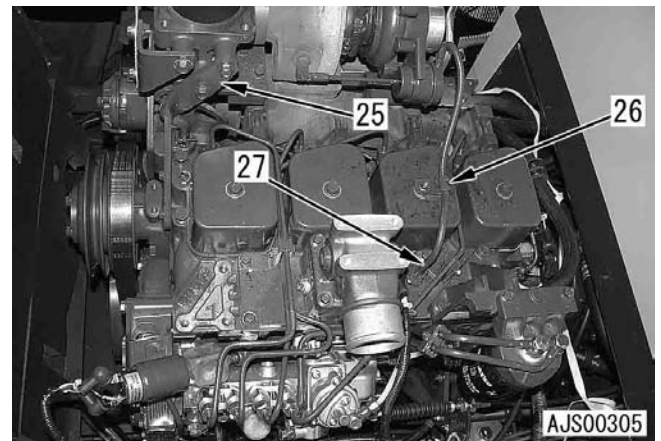
11. Remove the air conditioner compressor according to the following procedure.
 - 1) Remove cover (10).
 - 2) Disconnect wiring connector E16 (11) and ground terminal E22 (12).
[*2]
 - 3) Remove clamp (13).
 - 4) Loosen 2 mounting bolts (14) and 2 mounting bolts (15).
 - 5) Loosen 2 locknuts (16) and 2 adjustment bolts (17).
 - 6) Remove the air conditioner compressor belt.
[*3]
 - 7) Remove 2 mounting bolts (14), 2 mounting bolts (15), and air conditioner compressor assembly (18).
 - ★ Place the air conditioner piping by the side of the engine without disconnecting it.
 - 8) Remove air conditioner compressor bracket assembly (19).
 - ★ Also, remove the plate hiding under the assembly.



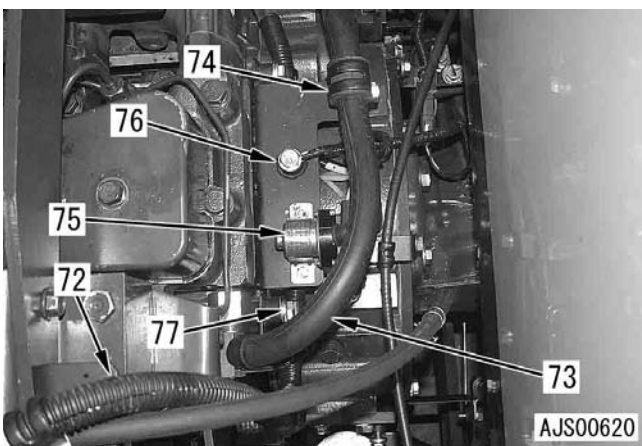
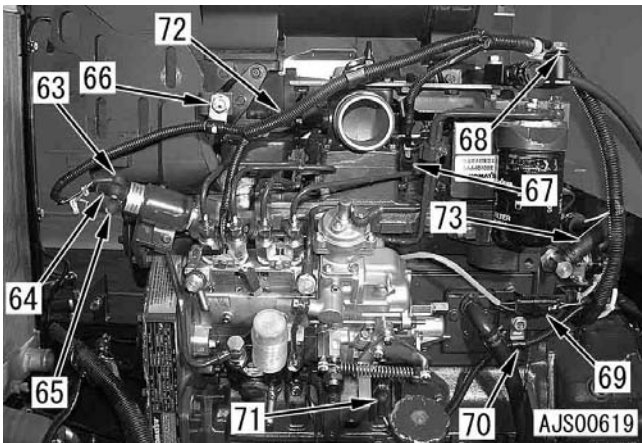
12. Remove the muffler according to the following procedure.
 - 1) Remove 3 drain tube mounting bolts (21) to release drain tube (20).
 - 2) Remove 4 muffler mounting bolts and 4 bracket mounting bolts and remove muffler and bracket assembly (22).
13. Remove radiator inlet hose (23).
[*1]
14. Remove air hose (24).
[*4]



15. Remove bracket (25).
16. Disconnect hose clamp (26) and hose (27).

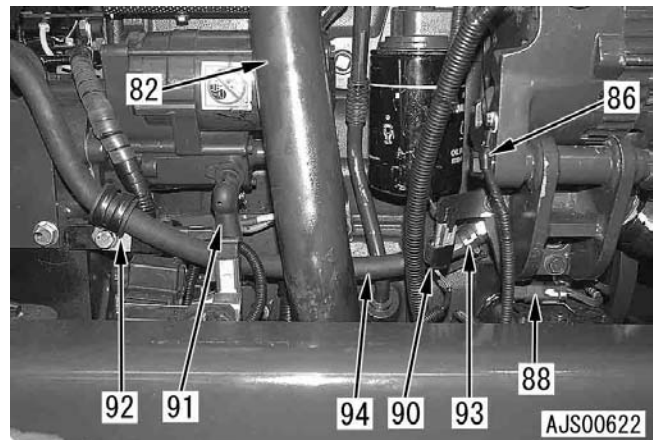
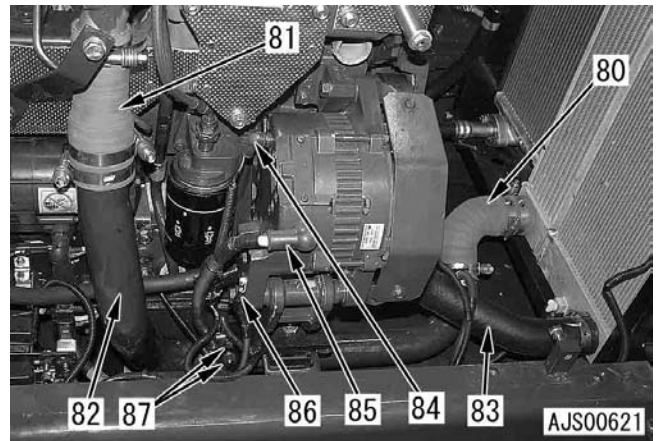


11. Disconnect the following wiring connectors and terminals.
 - (67): E06 Heater terminal [*9]
 - (69): E14 Engine coolant temperature sensor
 - (71): E15 Engine oil pressure sensor
12. Disconnect clamps (66), (68), and (70) and remove harness (72) from the engine.
13. Disconnect heater hose (73) and heater hose clamp (74).
14. Remove heater relay bracket (75), earth terminal (76), and clamp (77) and disconnect harness (72) from the engine.



15. Disconnect aftercooler lower hose (80), hose (81), and radiator lower hose (83). [*1], [*5]
16. Disconnect alternator terminals (84) and (85) and earth terminal (86). [*10]
17. Disconnect 2 clamps (87).

18. Disconnect the following wiring connectors and terminals.
 - (88): E13 Engine coolant temperature sensor
 - (90): Connector
 - (91): E10 starting motor terminal [*11]
19. Remove heater hose clamps (92) and (93) and disconnect heater hose (94).
20. Remove tube (82).




21. Disconnect E01 starting motor connector (95).
22. Disconnect harness clamp (96).
23. Remove plate (97).
 - ★ This is due to the engine cannot be lifted off with engine mounting bracket (104) installed since electric part A is located just behind engine mounting bracket (104).

REMOVAL AND INSTALLATION OF FUEL TANK ASSEMBLY

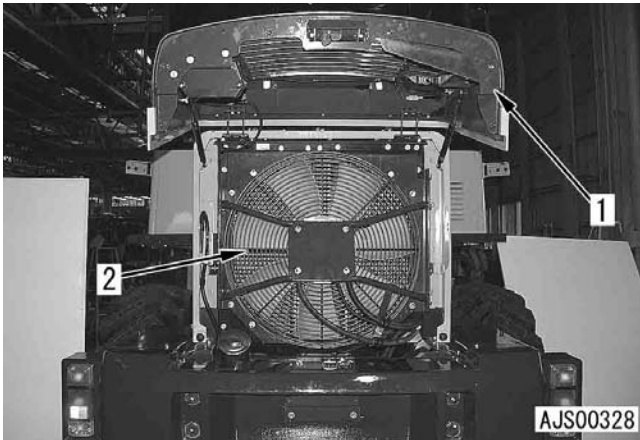
REMOVAL

- ⚠ Stop the machine 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.
- ⚠ Disconnect the cable from the negative (-) terminal of the battery.

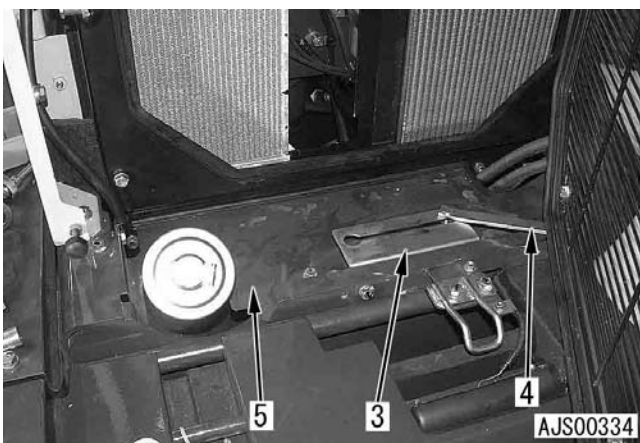
1. Drain the fuel.

 Fuel tank: **133 ℓ (at fill-up)**

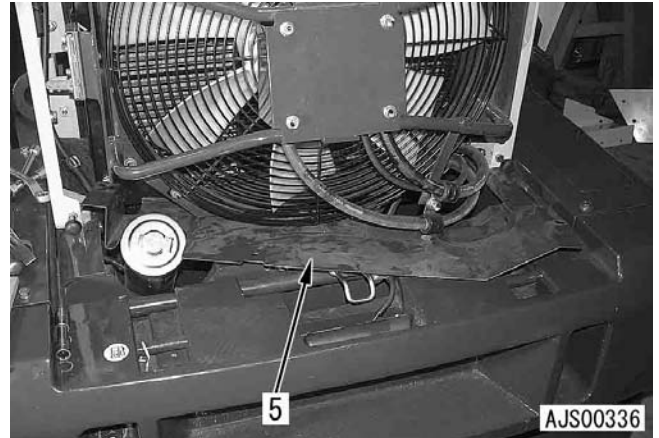
2. Remove grille (1) and remove fan guard (2).



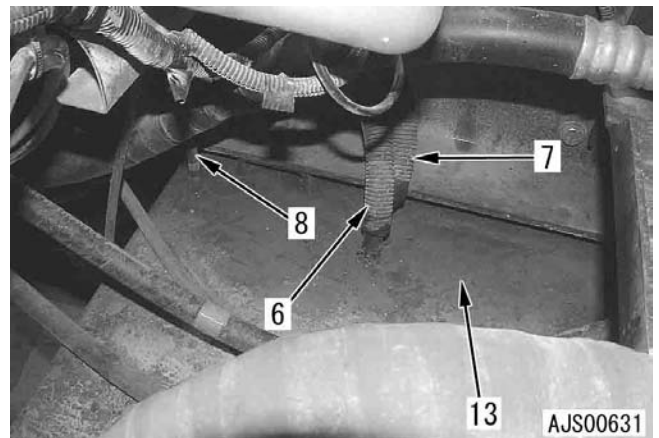
3. Remove hinges (3) and (4) and plate (5).



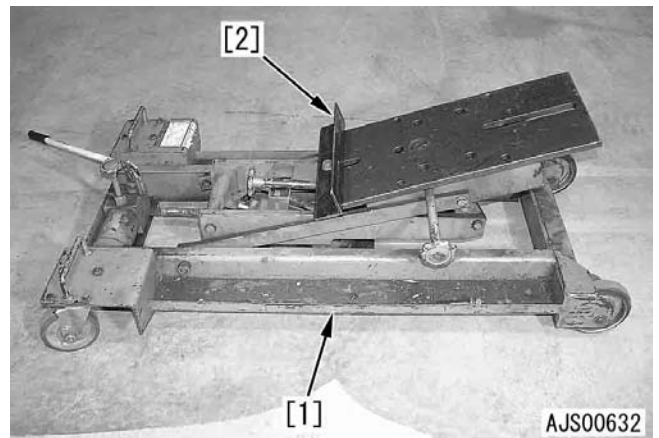
- ★ Close the fan guard temporarily and remove plate (5).



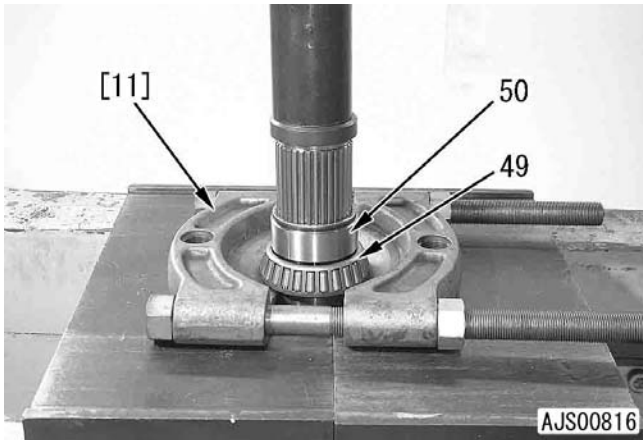
4. Disconnect fuel supply hose (6), fuel return hose (7), and spill hose (8) from the top of fuel tank (13).
 - ★ Label all hoses for their mounting positions at disconnection.
 - ★ Disconnect the hose clamp from the top of the fuel tank.



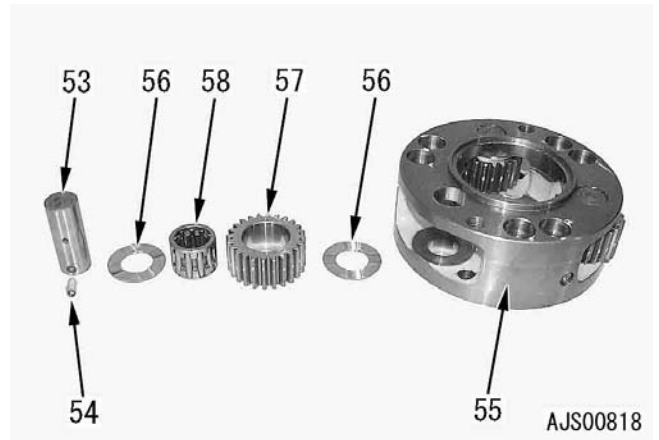
5. Install angle [2] on transmission jack [1].



- Using puller [11], remove front bearing (49) and spacer (50).

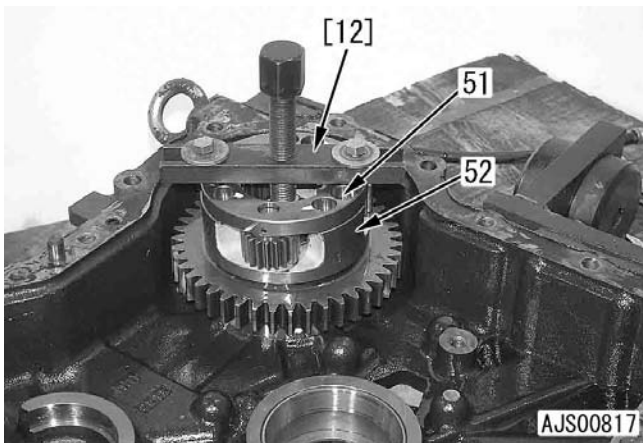


- Remove 2 thrust washers (56), planetary gear (57), and bearing (58) (at 3 places).



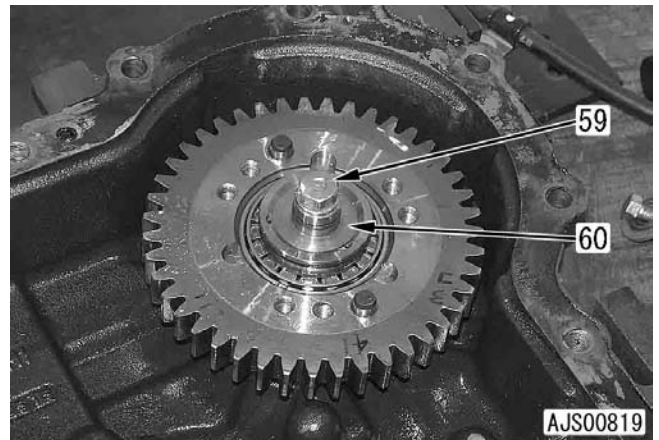
20. Removal of carrier assembly

- Remove 6 bolts (51).
- Using tool [12], remove carrier assembly (52).



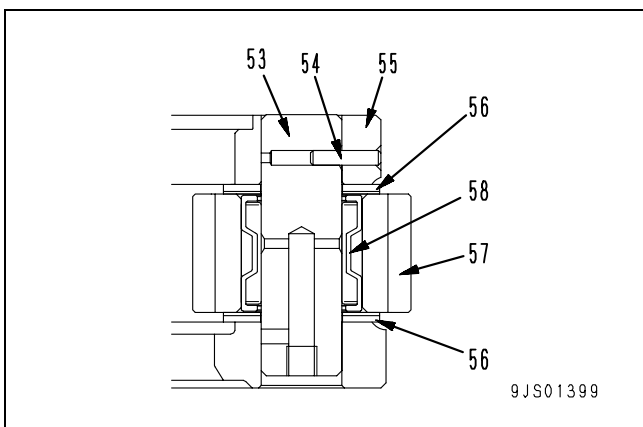
22. Holder

- Remove mounting bolt (59) and holder (60).

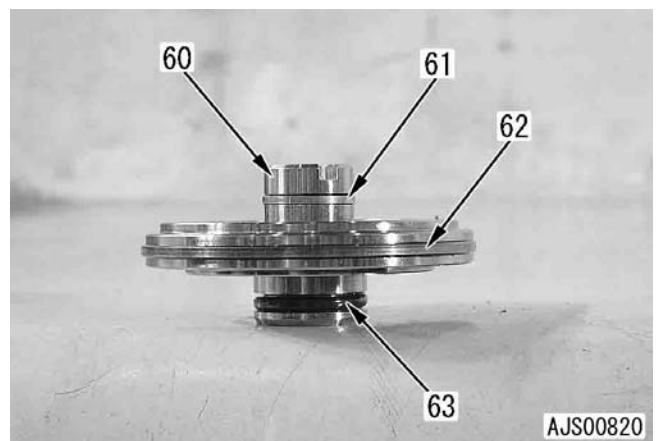


21. Disassembly of carrier assembly

- Drive in pin (54) toward shaft (53) to remove shaft (53) from carrier (55).
 ★ After removing the shaft, remove the pin from the shaft.



- Remove seal rings (61) and (62) and O-ring (63) from holder (60).



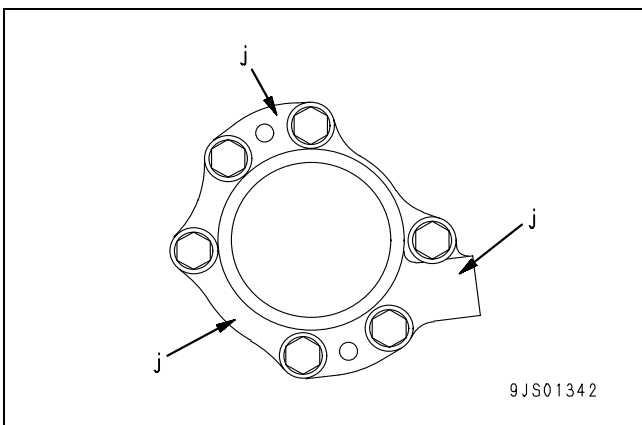
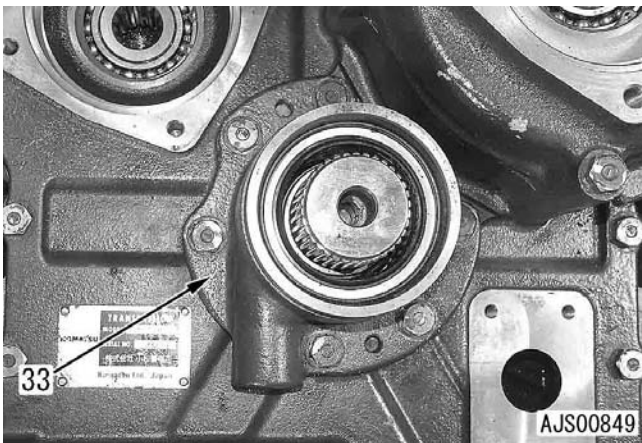
21. Pre-load adjustment on output shaft taper roller bearing

- 1) Install cage assembly (33) without inserting any shim.


 Mounting bolt:
4.80 ± 0.98 Nm {0.5 ± 0.1 kgm}

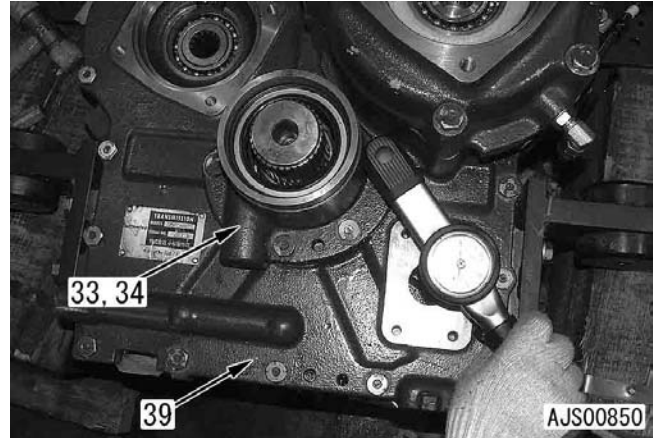
- 2) Rotate the output shaft 20 times and check the tightening torque for the mounting bolts tightened at step 1).
- 3) If the tightening torque has changed, repeat steps 1) and 2), and then check again.
- 4) If the tightening torque has not changed, measure the clearances for cage (33) at 3 places (j) and calculate average (k) of 3 values.

★ To confirm that the bearing is not leaning, check that the dispersion of clearances at 3 places (j) is 0.15 mm or less. If the dispersion is larger than 0.15 mm, the bearing may not be installed adequately or there is another cause. In this case, eliminate the cause and reduce the dispersion to 0.15 mm or less.

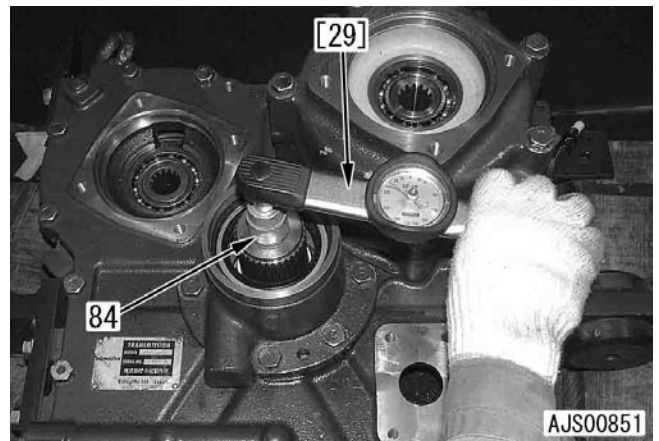


- 5) Calculate the shim thickness (t).
 - Shim thickness (t) = Average of clearance (k) + 0.15mm to 0.20 mm
- 6) Insert selected shims (34) between cage assembly (33) and front case (39).
- 7) Tighten the cage mounting bolts.

 Mounting bolt:
98 – 122.5 Nm {10 – 12.5 kgm}



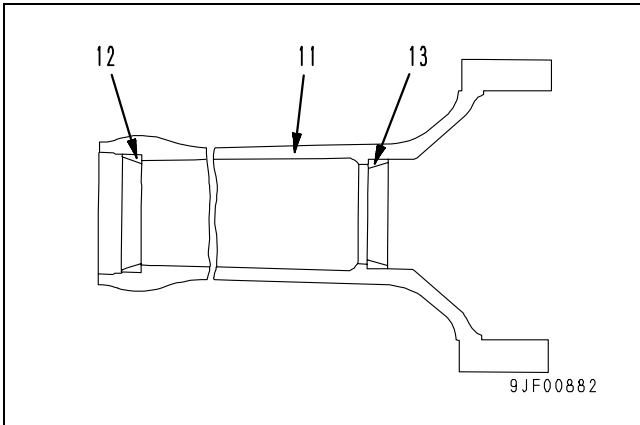
- 8) Install holder mounting bolt (84) on the output shaft.
- 9) Set the torque wrench [29] on the holder mounting bolt and measure the rotating torque for the output shaft.
 - ★ Measure the rotating torque without installing the front and rear couplings.
 - Rotating torque for the output shaft:
2.9 – 4.9 Nm {0.3 – 0.5 kgm}



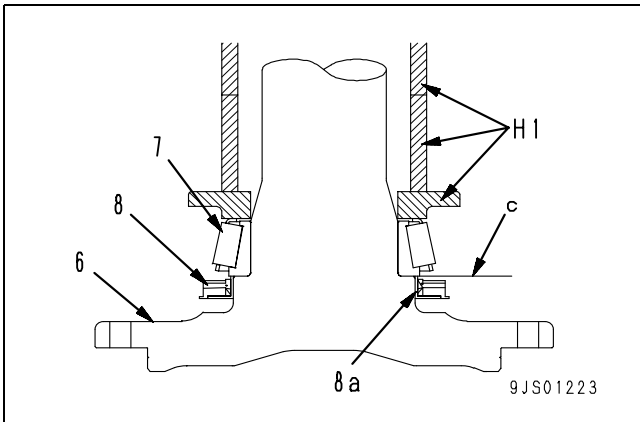
ASSEMBLY

1. Axle housing and axle shaft

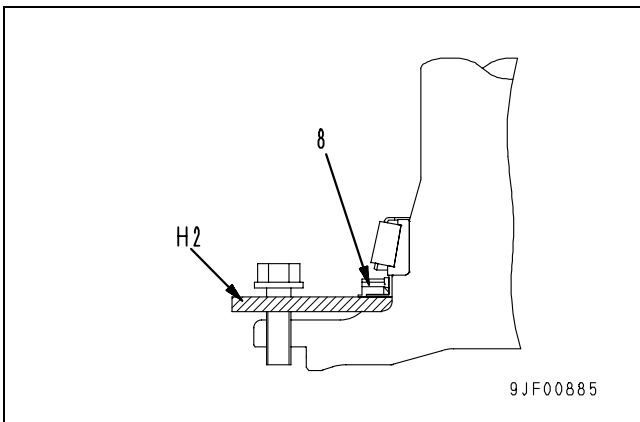
- 1) Press fit bearing outer races (12) and (13) into axle housing (11).



- 2) Use tool **H1** to press fit seal (8) and bearing (7) into axle shaft (6) simultaneously.
 - ★ Press fit bearing (7) and oil seal sleeve (8a) until they are flush with axle shaft end (c), and then check that there is not clearance between bearing (7) and oil seal sleeve (8a).




- 3) Install tool **H2** under oil seal (8).
 - ★ Adjust tool **H2** so that the top of tool **H2** will contact with oil seal (8) lightly and the clearance will be even.




2. Axle shaft bearing

- 1) Stand up axle shaft (6) on the block and fix it securely.
- 2) Sling axle housing (11) vertically, and then lower it slowly.
 - ★ Insert the axle housing by utilizing its weight.

 Oil seal fitting part and bearing:

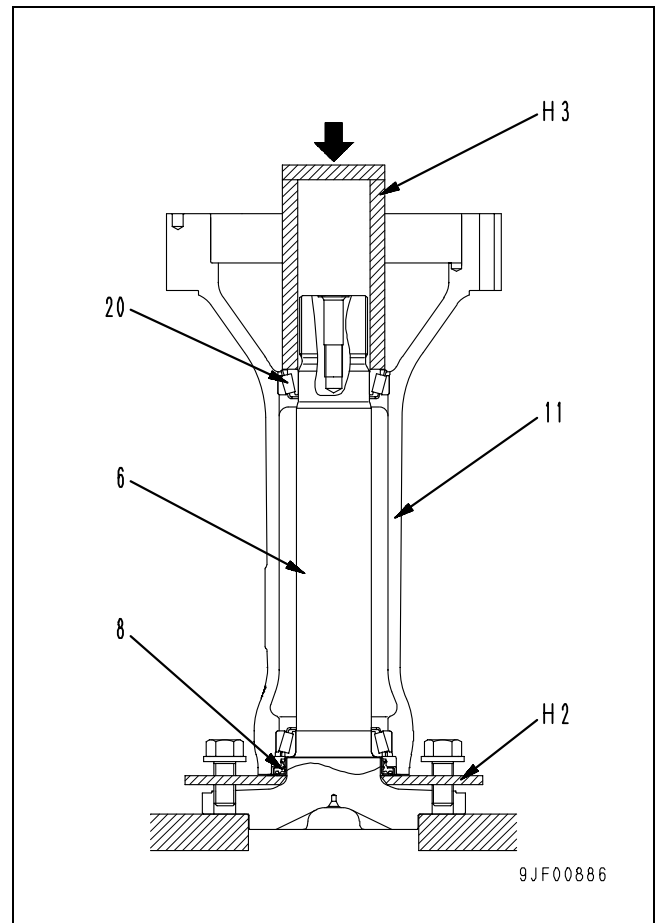
Axle oil

- ★ After installing the housing, leave tool **H2** installed until step 4).
- 3) Use tool **H3** to press fit bearing (20) into axle shaft (6).
 - ★ Press fit the bearing by turning the axle housing with hands.

 Outside circumference of bearing:

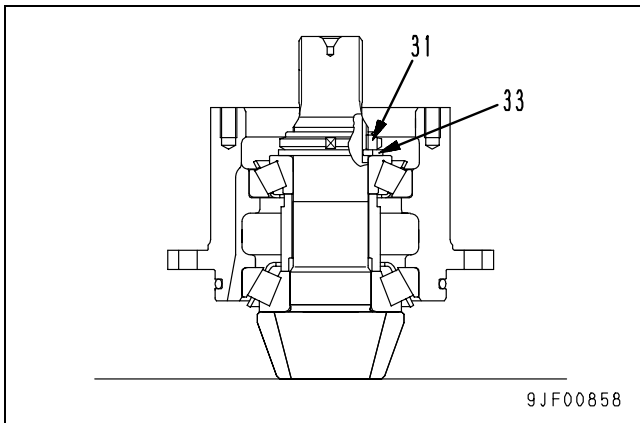
Axle oil

- 4) Remove tool **H2** in horizontal direction.
 - ★ Check that oil seal (8) is not leaning.
 - ★ Bring the end surface of axle housing (11) into intimate contact (the clearance should be less than 0.2 mm) with the flange for oil seal (8).



8. Disassembly of front cage assembly (for front differential)

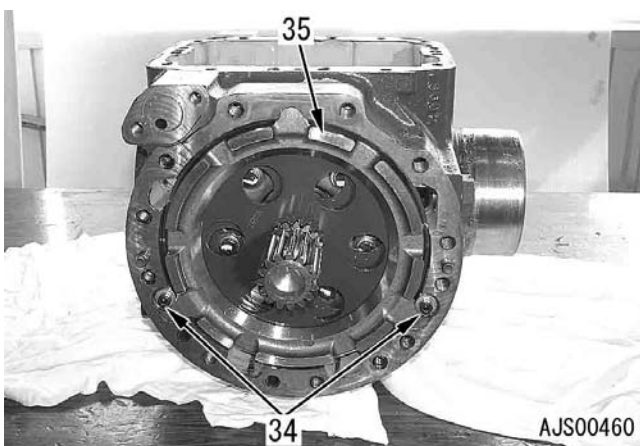
- 1) Remove nut (31) and holder (33).



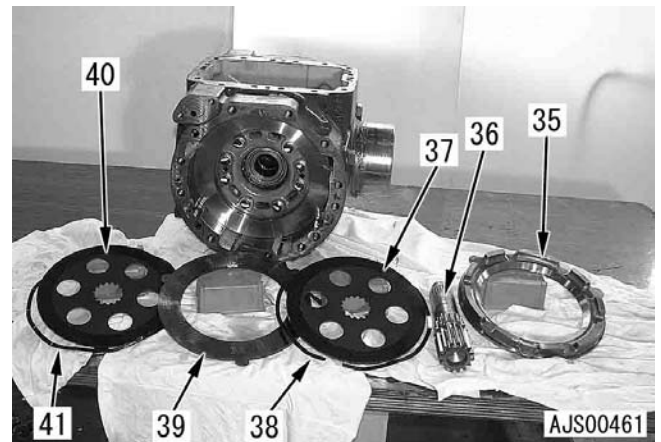
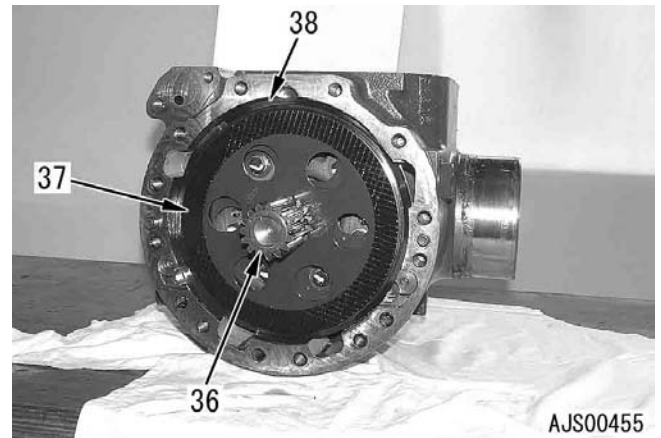
- 2) For the further disassembly procedure for the front cage assembly, see steps 2)–5) in 7. Disassembly of rear cage assembly shown above.

9. Brake

- 1) Place and stabilize the differential assembly on blocks.
 - ★ The photo shows the rear differential.
 - ★ Remove both brakes according to the following procedure.
- 2) Remove 2 hexagon socket head bolts (34).
- 3) Remove outer plate (35).

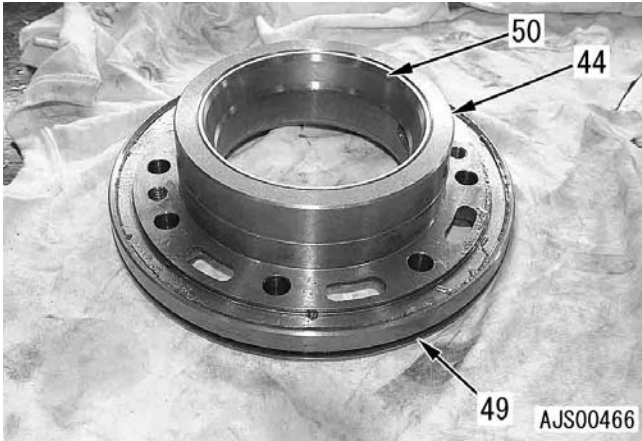


- 4) Remove sun gear shaft (36).
- 5) Remove disc (37), wave spring (38), plate (39), disc (40), and wave spring (41) in order.




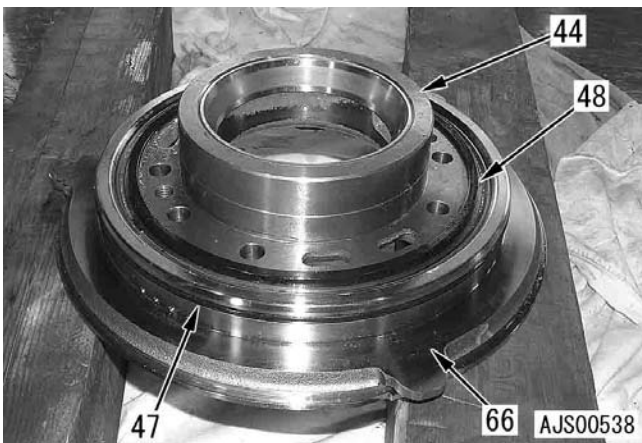
4. Bearing carrier

- 1) Install outer race (50) and seal (49) to bearing carrier (44).



- 2) Install bearing carrier (44), ring (48) and seal (47) to piston (66).


 Apply axle oil thinly to the piston and piston mounting section.




- 3) Apply axle oil to the bearing, and then use guide bolt [16] to install shim (67) and bearing carrier and piston assembly (46).

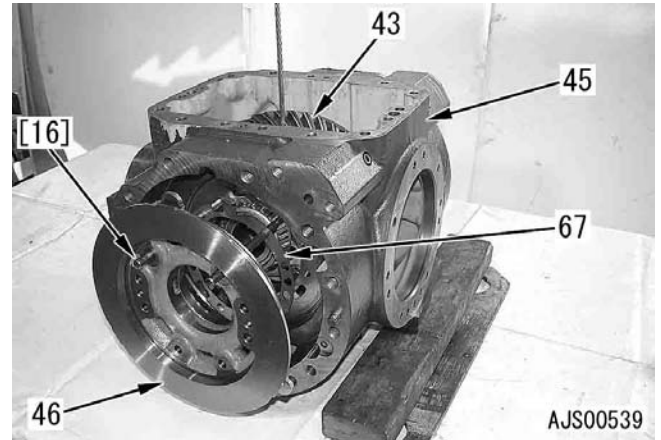
★ Install the shims of the thickness and quantity checked when disassembled to each bearing carrier. Install the bearing carriers on both sides.

★ Turning the bevel gear, tighten the mounting bolts.

 Bearing: **Axle oil**

 Mounting bolt for bearing carrier and piston assembly (46):

59 – 74 Nm {6.0 – 7.5 kgm}



★ Rotate piston several turns to smooth the axle oil on the bearing.

- 4) Use push-pull gauge [17] to measure the starting torque in the tangential direction to the bevel gear.

• Starting torque:

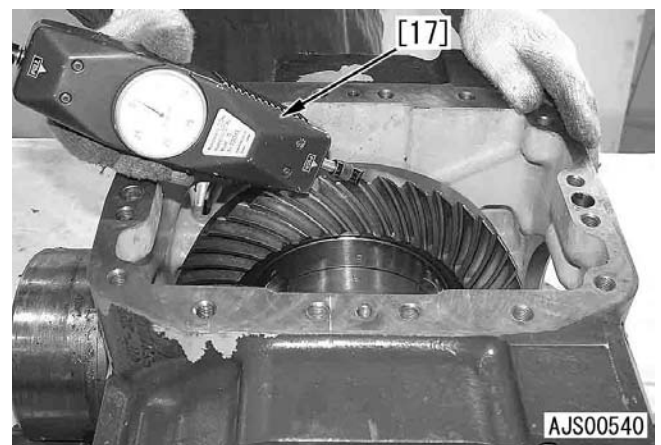
8.8 – 27.5 N {0.9 – 2.8 kg}

★ If the starting torque is out of the standard range, adjust it by increasing or decreasing the shim thickness.

• Varieties of shim thickness:

0.05 mm, 0.2 mm, 0.3 mm, 0.8 mm

★ After the adjustment, the shim thickness should be between 0.5 – 1.35 mm on each side.



REMOVAL AND INSTALLATION OF HST PUMP AND 3-GEAR PUMP ASSEMBLY

REMOVAL


⚠ Stop the machine 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 for the hydraulic tank to release the residual pressure in the hydraulic tank.

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

1. Drain the hydraulic oil.

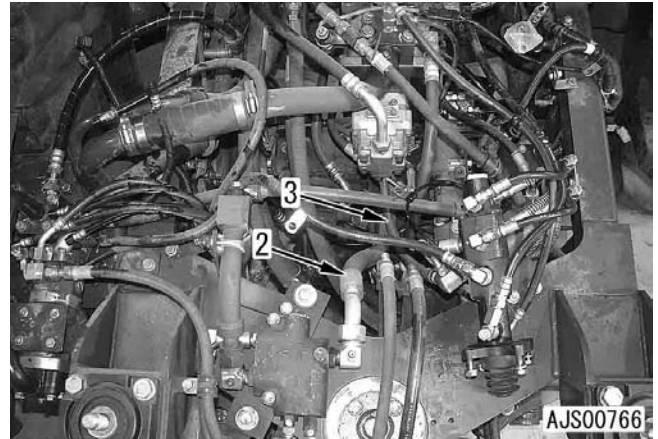
 Hydraulic tank: 47 ℓ

2. Remove the operator's cab assembly. For details, see Removal and installation of operator's cab assembly.

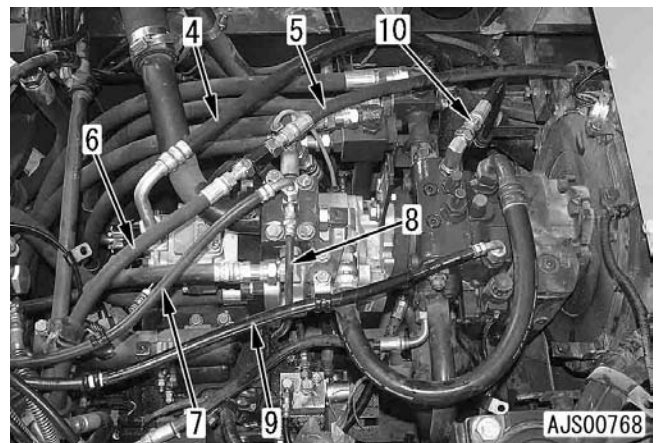
3. Disconnect wiring connector T07 (1).



4. Disconnect the following tubes and hoses.
 - (2) : Hose between steering pump and priority port P
 - (3) : Hose between brake pump and charge valve port P



- (4) : Transfer suction hose
- (5) and (6) : Hose between accumulator charge valve port A and fan motor
- (7) : Brake valve inching return hose
- (8) : Transfer clutch valve return hose
- (9) : Brake valve inching port P hose
- (10) : Hose between HST pump port G and accumulator

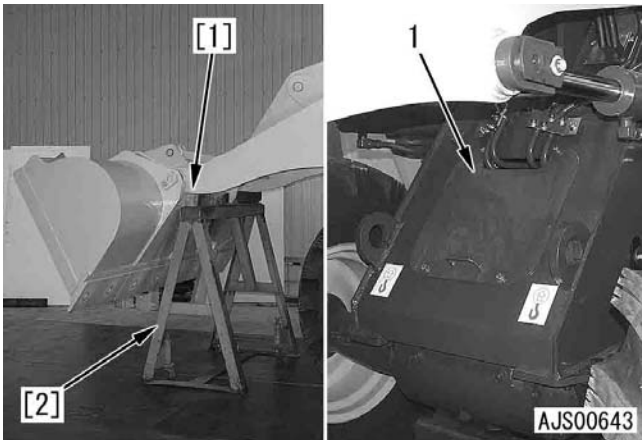


REMOVAL AND INSTALLATION OF TRAVEL DAMPER VALVE ASSEMBLY


REMOVAL

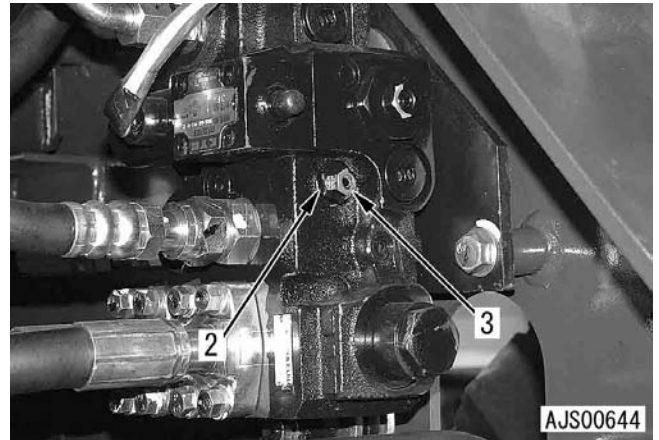
- ⚠ Stop the machine on a level place and, apply the parking brake, and put chocks under the tires.
- ⚠ Disconnect the cable from the negative (-) terminal of the battery.
- ⚠ Stop the engine, and then slowly loosen the oil filler cap of the hydraulic tank to release the residual pressure in the hydraulic tank.
- ⚠ Operate the work equipment control lever 2 – 3 times to release the residual pressure in the work equipment circuit.

1. Raise the lift arm and dump the bucket, and then support the lift arm with block [1] and stand [2].
2. Remove work equipment valve upper cover (1).




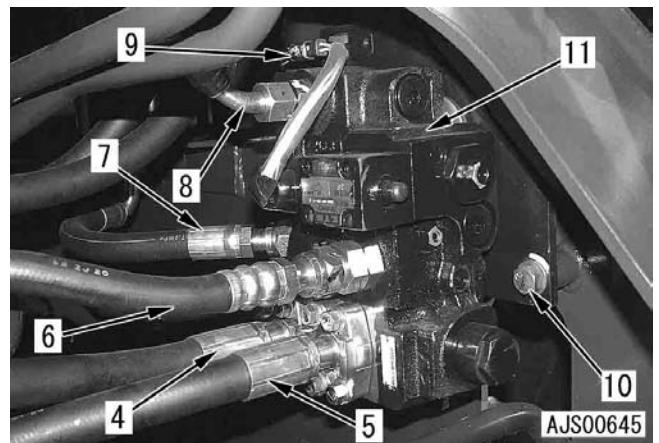
3. Release the residual pressure in the travel damper circuit.
 - 1) Loosen locknut (2).
 - 2) Loosen adjustment screw (3) by 1/2 – 1 turn to release the pressure in the accumulator circuit for the travel damper.
 - ★ Adjustment screw (3) is painted red.
 - 3) After releasing the residual pressure, replace adjustment screw (3) and tighten locknut (2) securely.

 Mounting bolt:
 $13 \pm 0.6 \text{ Nm } \{1.3 \pm 0.06 \text{ kgm}\}$



4. Disconnect the following hoses and tubes. [*1]
 - ★ Label all hoses and tubes for their mounting positions at disconnection.
 - ★ Since oil will leak through the disconnected hoses and tubes, prepare oil receivers.
 - (4) : Port A hose
 - (5) : Port B hose
 - (6) : Port T hose
 - (7) : Port SP hose
 - (8) : Port P hose
5. Disconnect wiring connector F07 (9).
6. Remove 3 bracket mounting bolts (10) and lift off travel damper valve assembly (11).

 Travel damper valve assembly: **25 kg**

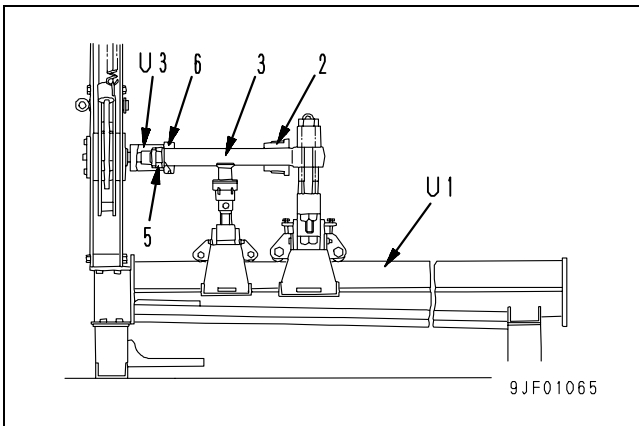


INSTALLATION

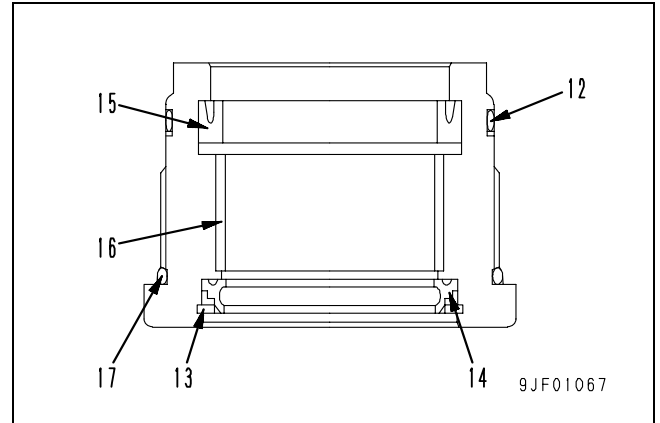
- Carry out installation in the reverse order to removal.
- **Refilling with oil (Hydraulic tank)**
 Add oil to the specified level through the oil filler and start the engine to circulate the oil through the system. Then, check the oil level again.

3. Piston and cylinder head

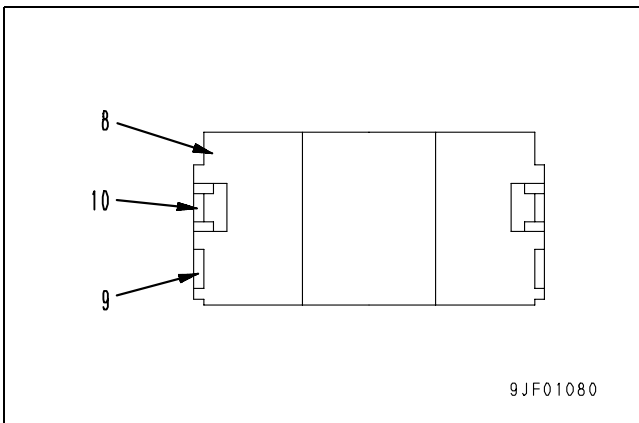
- 1) Set cylinder head and piston rod assembly (3) to tool **U1**.
- 2) Use tool **U3** to remove nut (5).
 - Width across flats of nut (steering): **32 mm**
 - Width across flats of nut (bucket and lift arm): **60 mm**
- 3) Remove piston assembly (6) and cylinder head assembly (2).

**5. Disassembly of cylinder head assembly**

- 1) Remove O-ring and backup ring (12).
- 2) Remove snap ring (13) and dust seal (14).
- 3) Remove rod packing (15).
- 4) Remove bushing (16).
- 5) Remove O-ring (17).

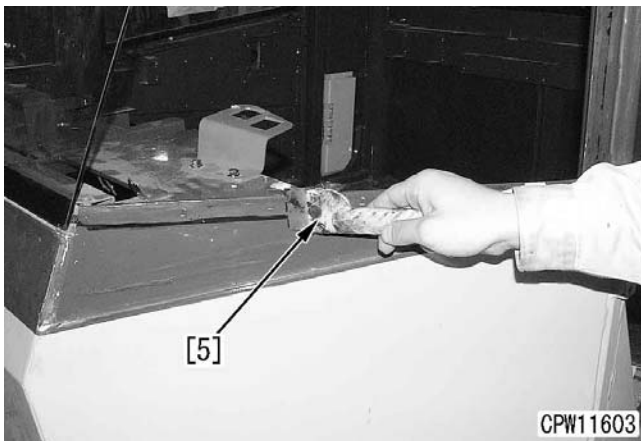
**4. Disassembly of piston assembly**

- 1) Remove wear ring (9) and piston ring (10) from piston (8).



INSTALLATION

1. Use scraper [5] to remove the remaining adhesive.
 - ★ Do not scratch the paint.



2. Remove oil, dust, dirt, etc. from the sticking surfaces on cab (2) and window glass (3) with white gasoline.
 - ★ If the sticking surfaces are not cleaned well, the glass may not be stuck properly.
 - ★ Clean the all black part on the back side of the window glass.
 - ★ After cleaning the sticking surfaces, leave them for at least 5 minutes to dry.



3. If any paint was flaked off when the adhesive was removed with the scraper, coat the bare part with paint.
 - ★ If the glass is installed without repairing the bare part, that part will be rusted.
 - ★ Do not apply paint to a part which will be coated with primer.



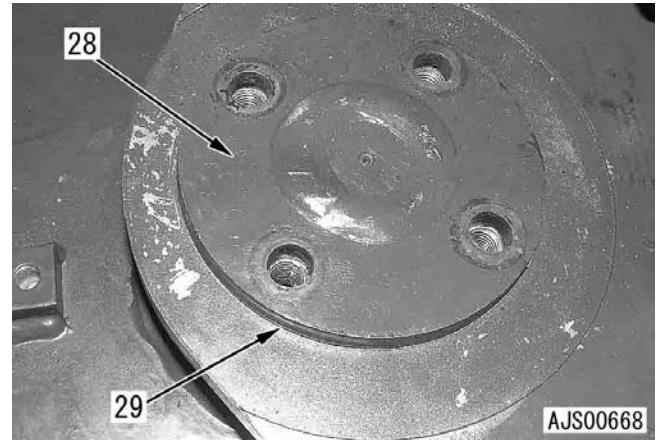
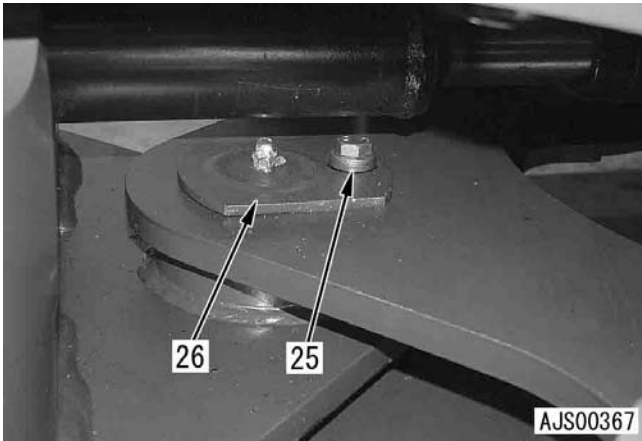
4. Stick both-sided adhesive tape (4) along the inside edge of the glass sticking section.
 - Dimension of both-sided adhesive tape: **7 x 4.8 mm**
 - ★ Sticking the both-sided adhesive tape, do not touch the cleaned surface as much as possible.
 - ★ Do not remove the release tape of the both-sided adhesive tape on the glass sticking side before sticking the glass.



13. Remove lower hinge pin (26).

[*5]

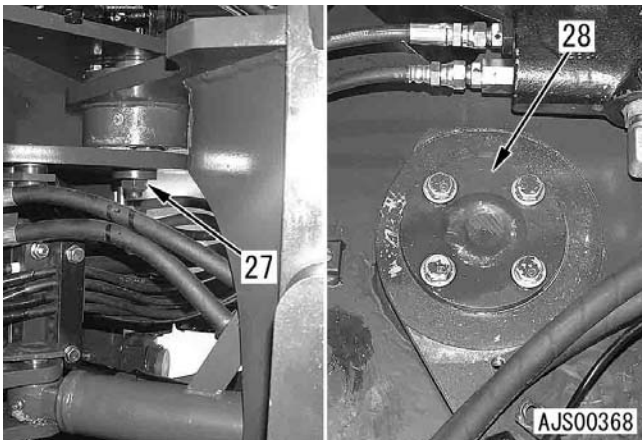
- 1) Remove lock bolt (25).
- 2) Remove lower hinge pin (26).



14. Remove upper hinge pin (28).

[*6]

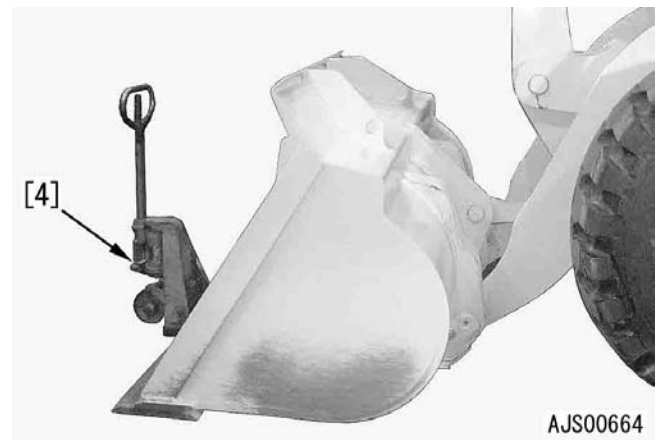
- 1) Remove mounting nut (27).
- 2) Remove the mounting bolts.



15. Disconnect the front frame and the rear frame.

[*8]

- 1) Set hand lift truck [4] under the bucket.



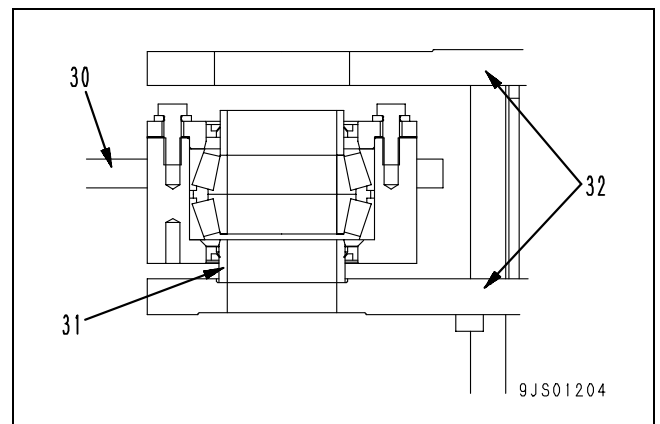
- 2) Use a tool such as a bar to lift up front frame assembly (30) by 2 – 3 mm, and then move lower spacer (31) from rear frame assembly (32).

★ The front frame assembly may be lifted up by 2 – 3 mm with a large-sized crane, if available.

- 3) Adjust the heights of the front frame and the rear frame with the hydraulic jack so that the pin can be pulled out easily, and then remove upper hinge pin (28).

[*7]

- 4) Remove shims (29).
 - ★ Check the thickness and quantity of the shims.

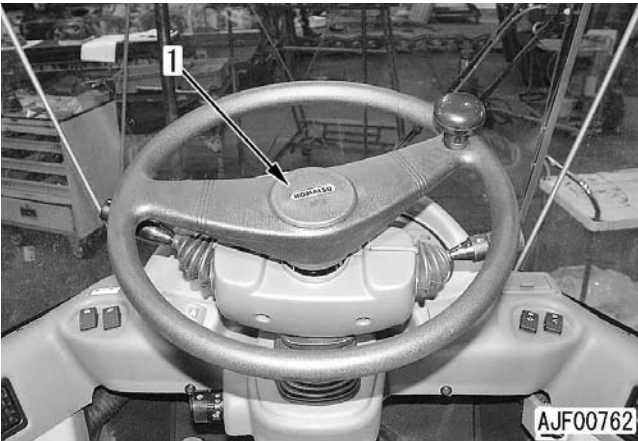


REMOVAL AND INSTALLATION OF MONITOR PANEL

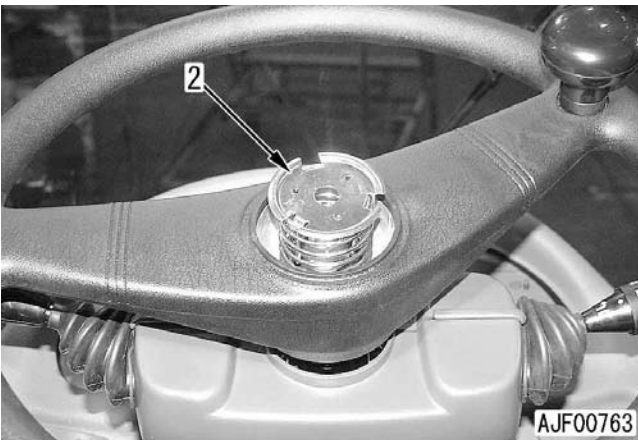
REMOVAL

! Disconnect the cable from the negative (-) terminal of the battery.

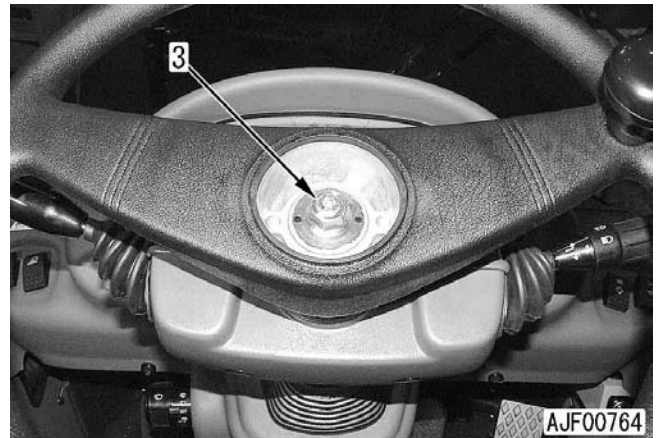
1. Remove pad (1) from the steering wheel.



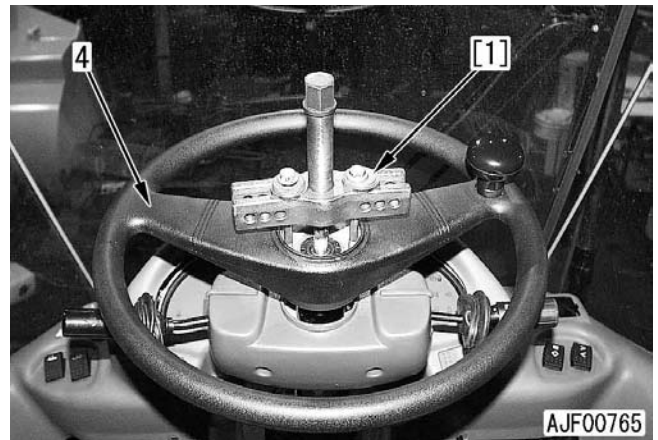
2. Remove contact assembly (2).



3. Remove steering wheel mounting nut (3).
[*1]



4. Use puller [1] to remove steering wheel (4) from the steering column.



5. Remove cover (5).
[*2]



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