SEBM022904

SHOP MANUAL

KOMATSU

WD600-3

MACHINE MODEL	SERIAL NO.
WD600-3	**50001 and up**

- This shop manual may contain attachments and optional equipment that are not available in your area. Please consult your local Komatsu distributor for those items you may require. Materials and specifications are subject to change without notice.
- WD600-3 mounts the SAA6D170E-3 engine.
  For details of the engine, see the 6D170-3 Series Engine Shop Manual.

Printed in Japan 03-13(01)

HOISTING INSTRUCTIONS

HOISTING

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

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

WIRE ROPES

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

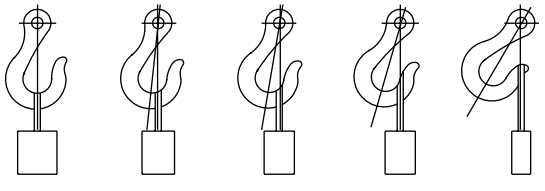
Wire ropes
(Standard "Z" or "S" twist ropes
without galvanizing)

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

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

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

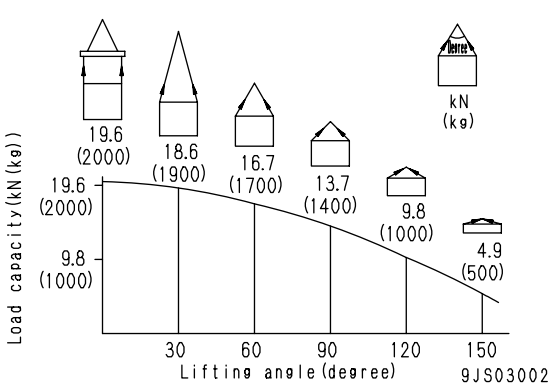
Slinging near the edge of the hook may cause the rope to slip off the hook during hoisting, and a serious accident can result. Hooks have maximum strength at the middle portion.



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

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

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



Millimeters to Inches

1 mm = 0.03937 in

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

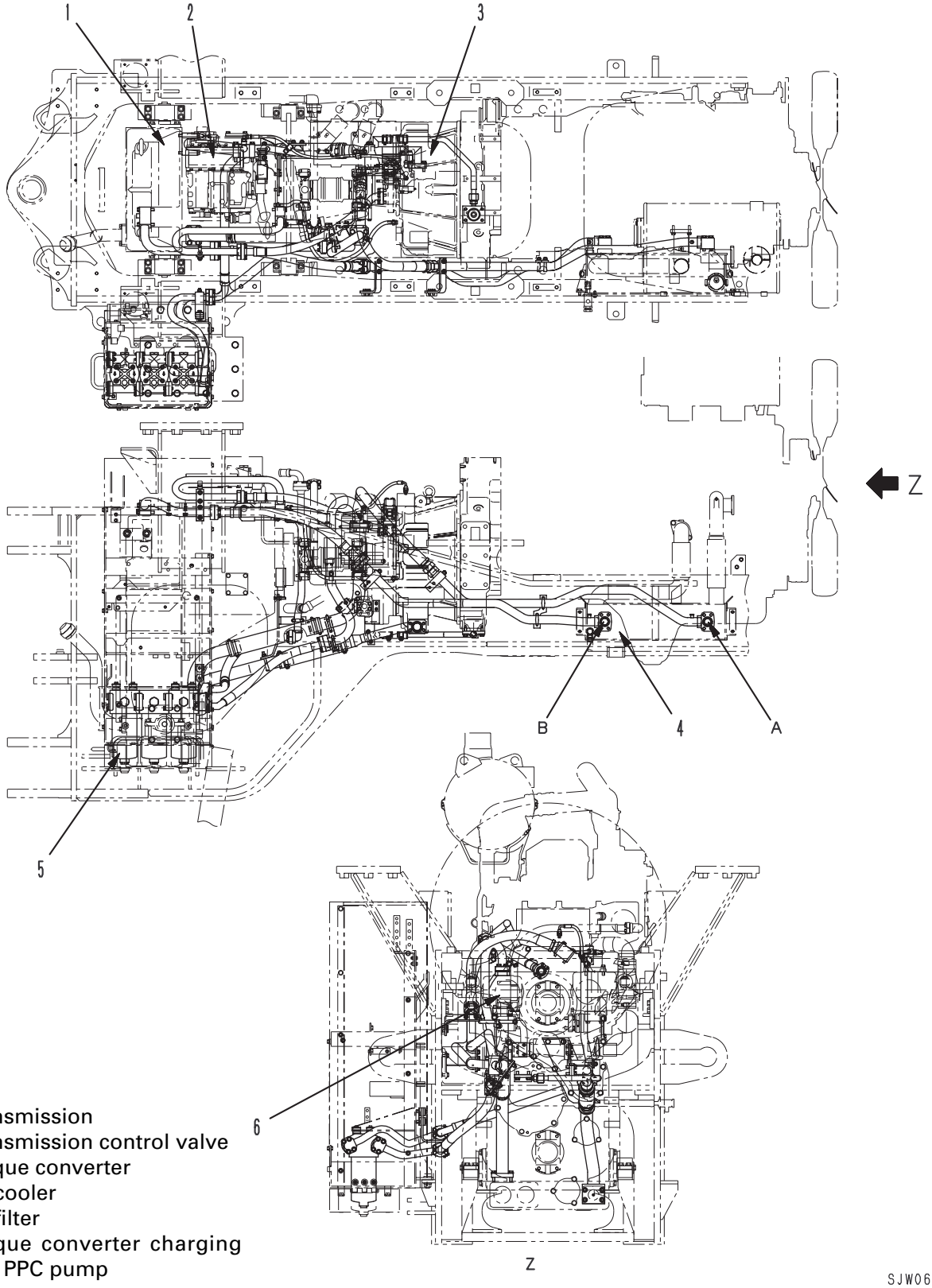
Kilogram to Pound

1 kg = 2.2046 lb

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

Machine model				WD600-3
Serial Number				50001 and up
Steering system	Type Structure			Articulated steering Hydraulic power steering
Hydraulic system	Delivery of hydraulic pump	Work equipment pump Switch pump Steering pump PPC pump Transmission and PTO lubrication pump	ℓ /min	152 (Gear pump: SAL (3)-80) 204 (Gear pump: SAL (4)-100) 246 (Gear pump: SAL (4)-125) 63 (Gear pump: SAL (1)- 32) 247 (Gear pump: SAL (3)-125)
	Control valve	For work equipment, set pressure For steering system, set pressure	MPa {kg/cm^2}	2-spool type 20.6 {210} Orbit roll + spool valve type 20.6 {210}
	Cylinder	Lift cylinder No. - bore x stroke Pitch and tilt cylinder No. - bore x stroke Steering cylinder No. - bore x stroke	mm	Double acting piston type 1 – 160 x 1,080 Double acting piston type 2 – 180 x 236.5 Double acting piston type 2 – 140 x 495
Dozer system	Blade width		mm	5,100
	Blade height		mm	1,470
	Max. lifting height		mm	1,500
	Max. tilting distance		mm	1,430
	Pitch angle		deg	23
	Max. digging depth		mm	450

TORQUE CONVERTER AND TRANSMISSION PIPING

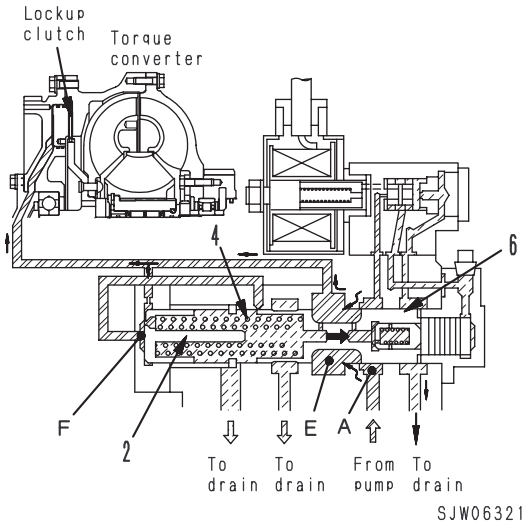


SJW06246

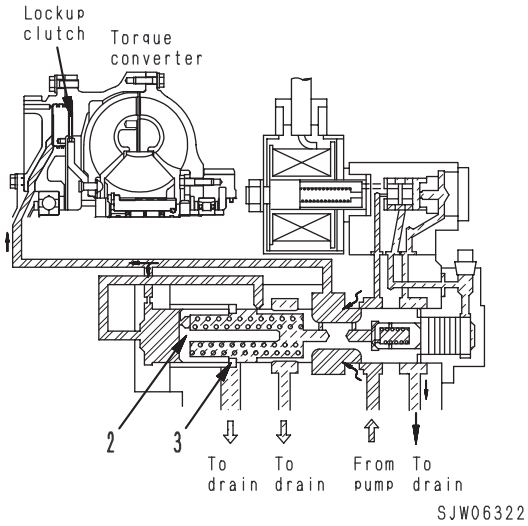
1. Transmission
2. Transmission control valve
3. Torque converter
4. Oil cooler
5. Oil filter
6. Torque converter charging and PPC pump

A. Oil inlet
B. Oil outlet

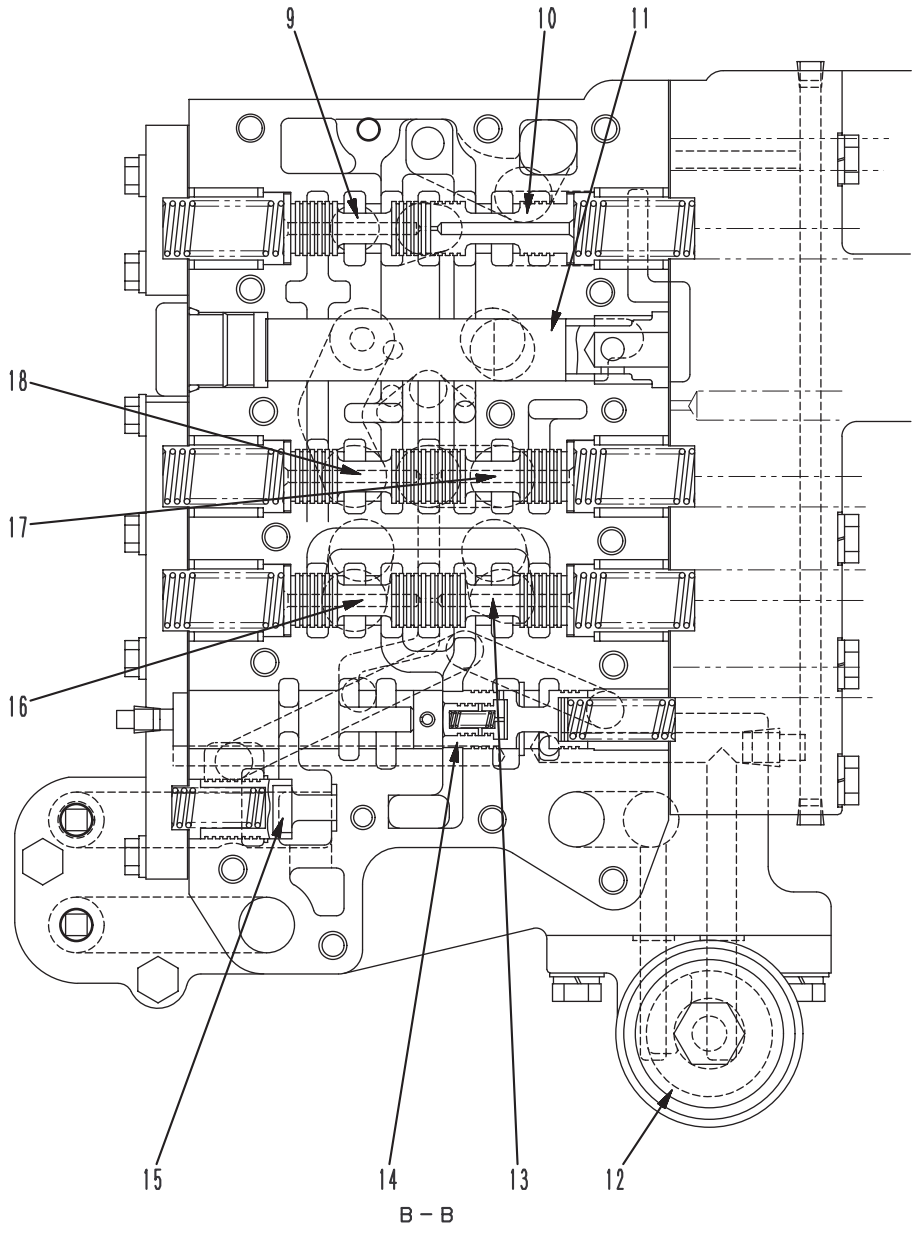
4) The oil from port **E** to port **F** applies pressure to load piston (2), and pushes piston (2) to the right in the direction of the arrow to compress spring (4).
Compressed spring (4) pushes lock up valve (6) to the right in the direction of the arrow, and opens port **A** and port **E**. When this happens, the increase in hydraulic pressure to the lockup clutch starts again.



5) By repeating the actions in Steps 3) and 4), the load on spring (4) is increased, and the hydraulic pressure gradually rises.
Finally, when load piston (2) contacts stopper (3), the rise in hydraulic pressure stops. The pressure at this point is the set pressure of the lockup valve.
   - Set pressure: 1.86 MPa {19 kg/cm^2}



LOWER VALVE



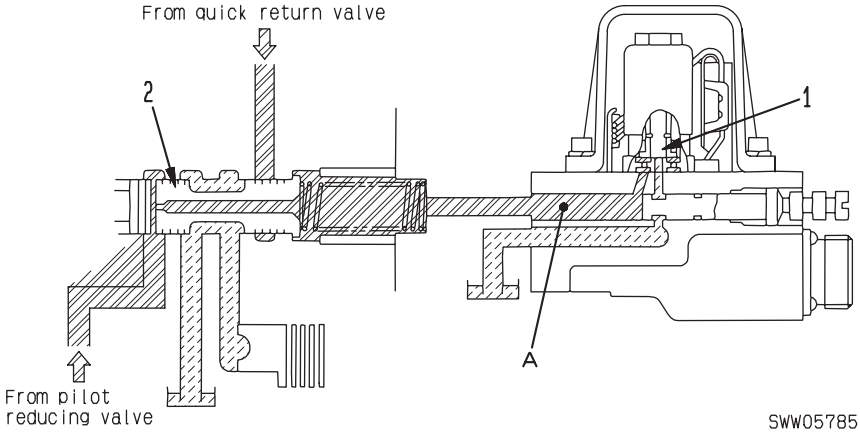
9. 1st spool
10. 2nd spool
11. Spacer
12. Pilot filter
13. FORWARD spool
14. Reducing valve
15. Lubrication valve
16. REVERSE spool
17. 4th spool
18. 3rd spool

FUNCTION

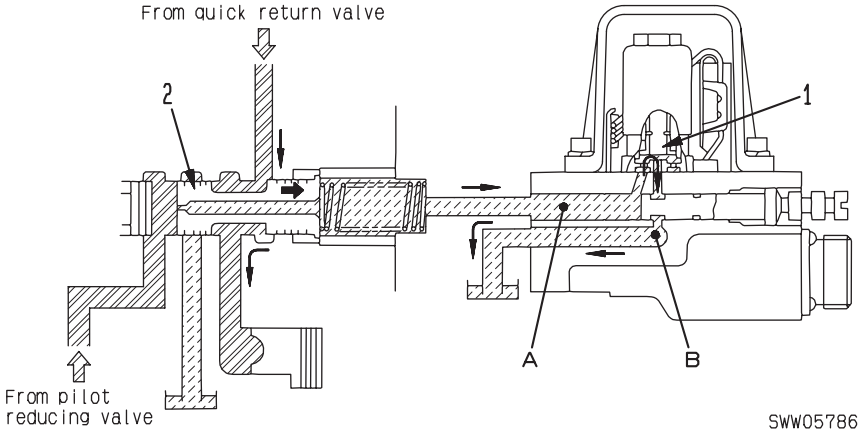
- There is one solenoid valve installed for each directional and speed spool in the transmission valve.
  When the directional lever and speed control levers in the operator's compartment are operated, the solenoid valve is actuated, and oil is drained to actuate the directional and speed spools.

OPERATION

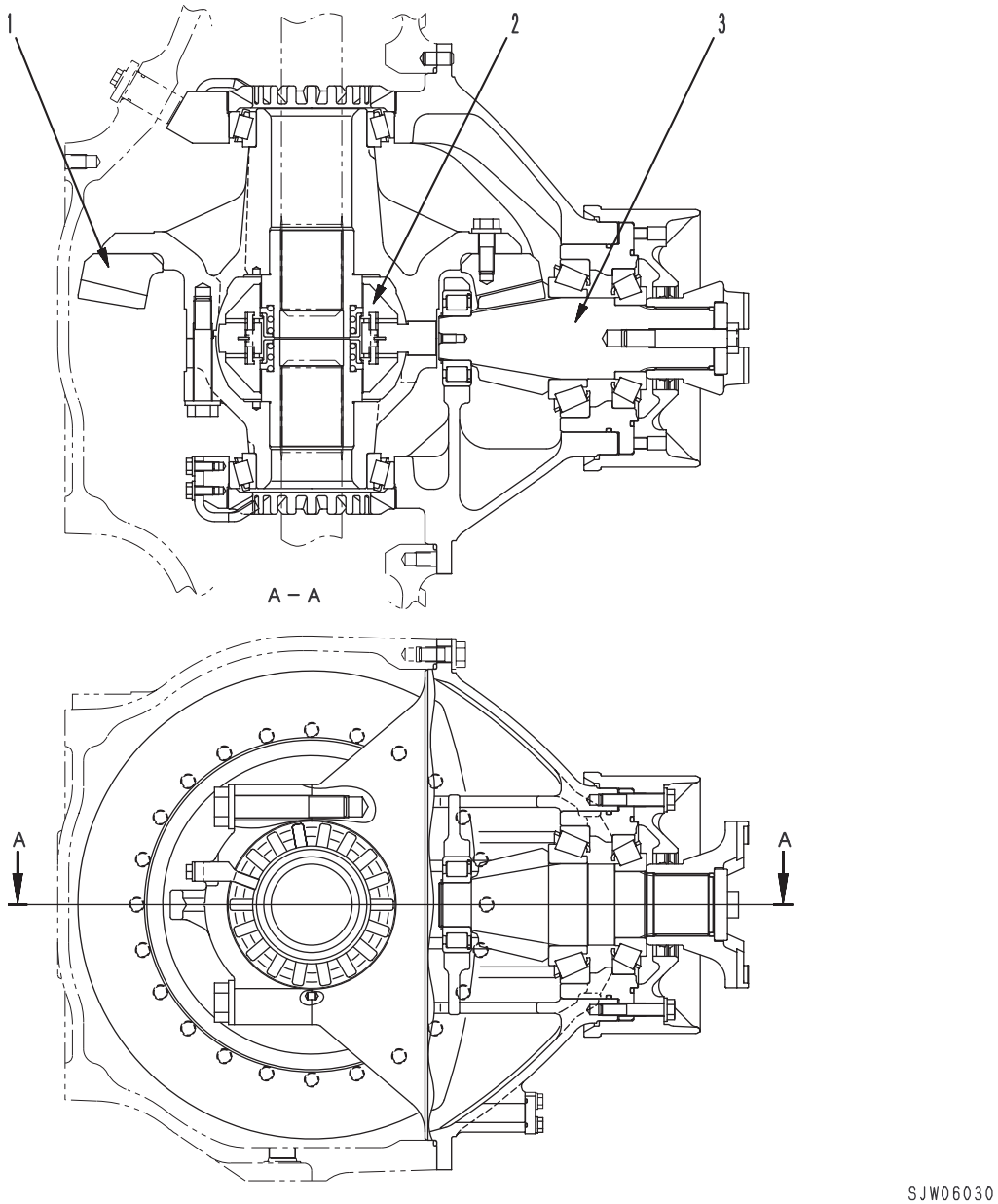
1) Solenoid valve **OFF**
   The oil of spool (2) enters port **A**. However, solenoid valve (1) shuts off the oil, so directional and speed spool (2) does not move.



2) Solenoid valve **ON**
   When the directional and gear shift lever are operated, the solenoid valve (1) is pulled up. The oil from directional and speed spool (2) enters port **A** and flows from port **B** to the drain circuit. Therefore, port **A** becomes the low pressure circuit, and directional and speed spool (2) is actuated.

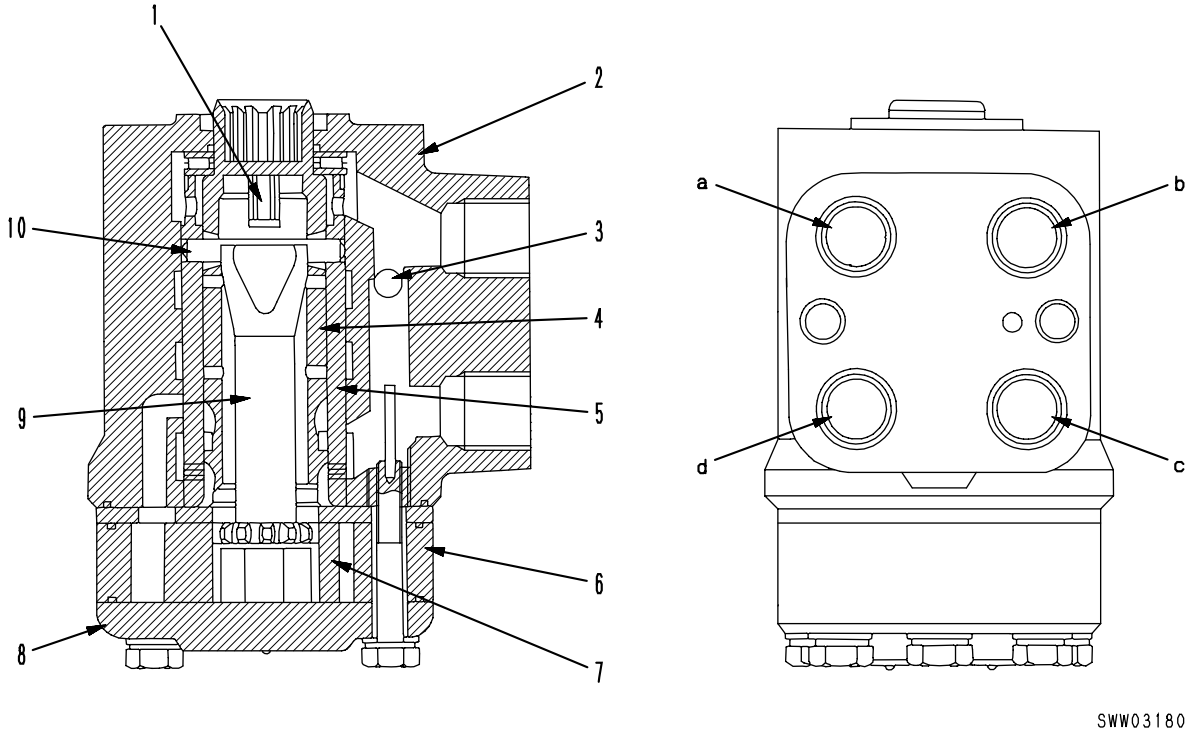


REAR DIFFERENTIAL
(NON-SPIN DIFFERENTIAL)



1. Bevel gear (Number of teeth: 43)
2. Non-spin differential assembly
3. Bevel pinion (Number of teeth: 8)

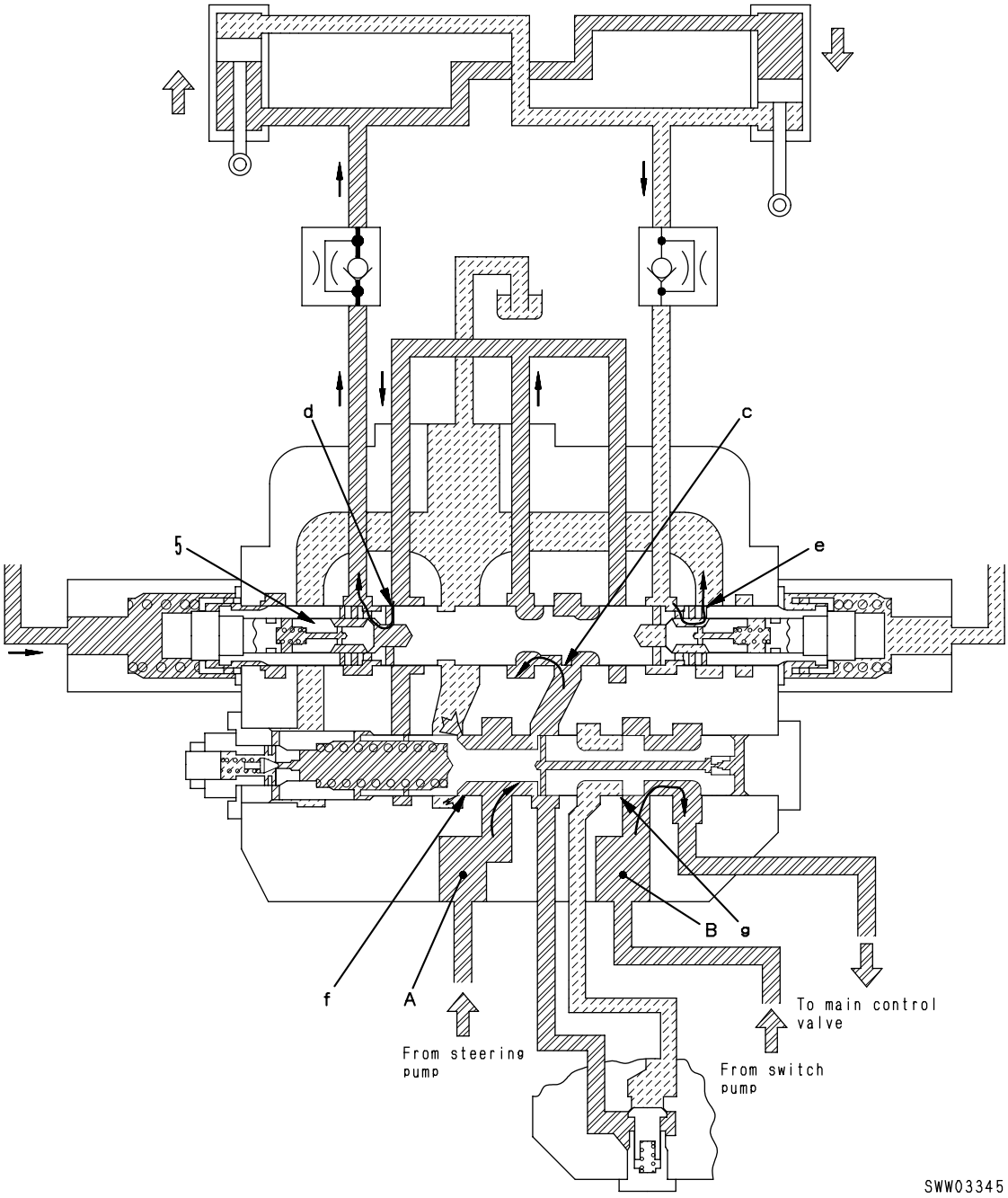
STEERING UNIT (ORBIT-ROLL VALVE)



1. Neutral position spring
2. Valve body
3. Check valve
4. Spool
5. Sleeve
6. Gear rim
7. Gear
8. Cover
9. Drive shaft
10. Center pin

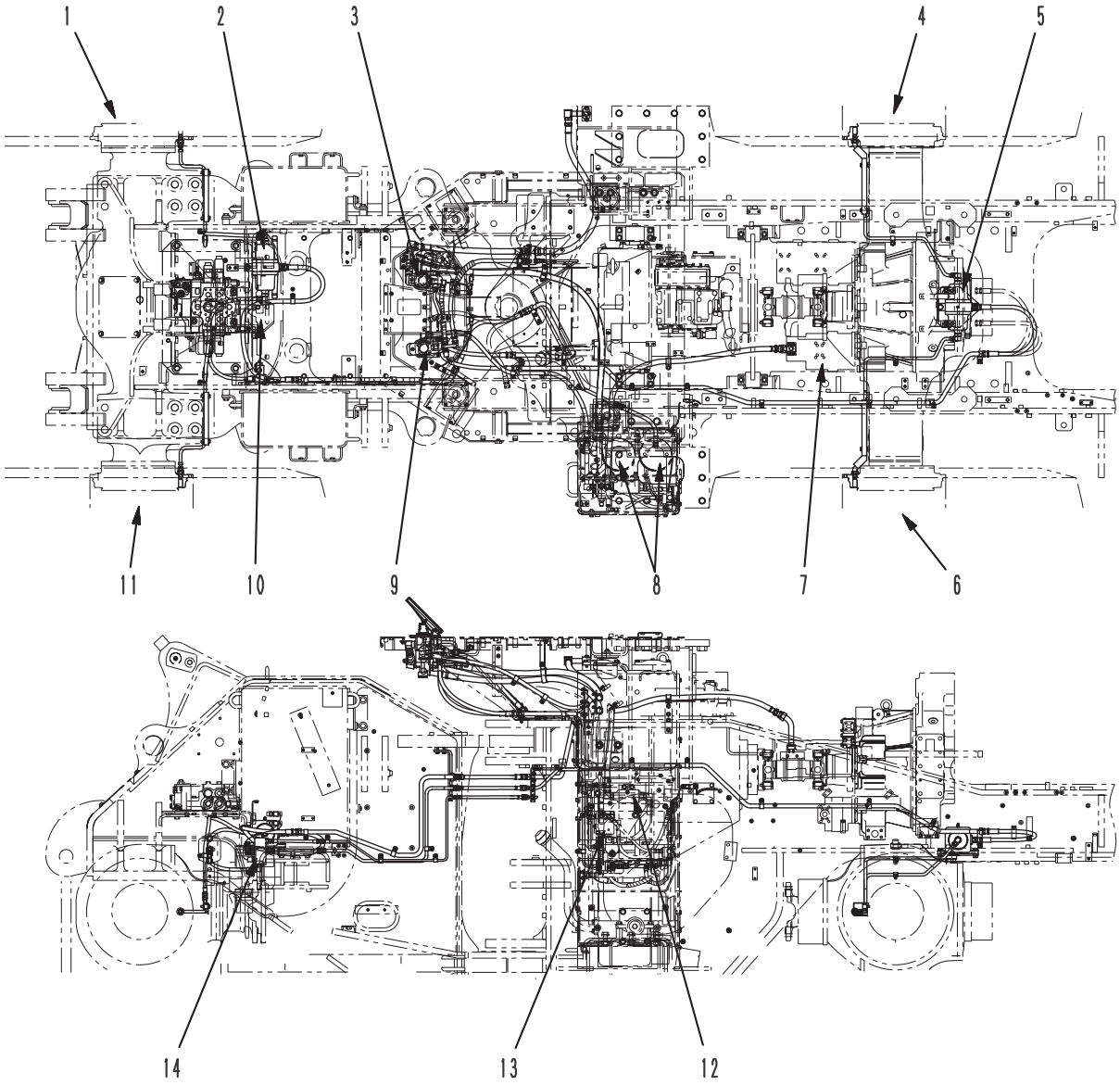
a: To hydraulic tank
b: To steering valve port **Pb**
c: To steering valve port **Pa**
d: From PPC pump

Engine running at high speed



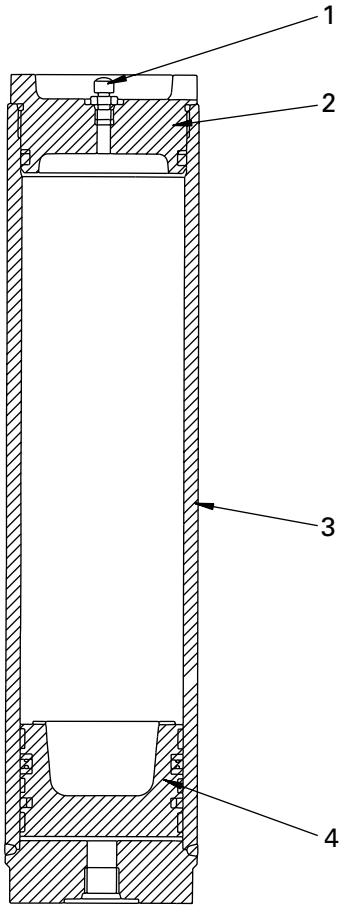
- There is no need for supply of extra oil from the switch pump, so the steering pump pressure rises until notch **g** closes and shuts off the merge passage from port **B**.
- The pressure difference on both sides of notch **c** is controlled only by notch **f**, and the excess oil from the steering pump is drained from notch **f** to the drain circuit. (At this point, notch **g** is completely closed.)
- The oil from the steering pump passes through notches **c** and **d**, pushes load check valve (5), and flows to the cylinder. The return oil from the cylinder passes through notch **e** and flows to the drain circuit.
- Notch **g** is closed, so the oil from the switch pump all flows from port **B** and is sent to the main control valve.

BRAKE PIPING



1. Front brake (Right)
2. Slack adjuster (Front)
3. Brake valve (Right)
4. Rear brake (Right)
5. Slack adjuster (Rear)
6. Rear brake (Left)
7. Torque converter charging and PPC (used as brake, too) pump
8. Accumulator
9. Brake valve (Left)
10. Parking brake
11. Front brake (Left)
12. Strainer
13. Charging valve
14. Parking brake valve

ACCUMULATOR (FOR BRAKE)



SEW00120

1. Valve
2. Top cover
3. Cylinder
4. Piston

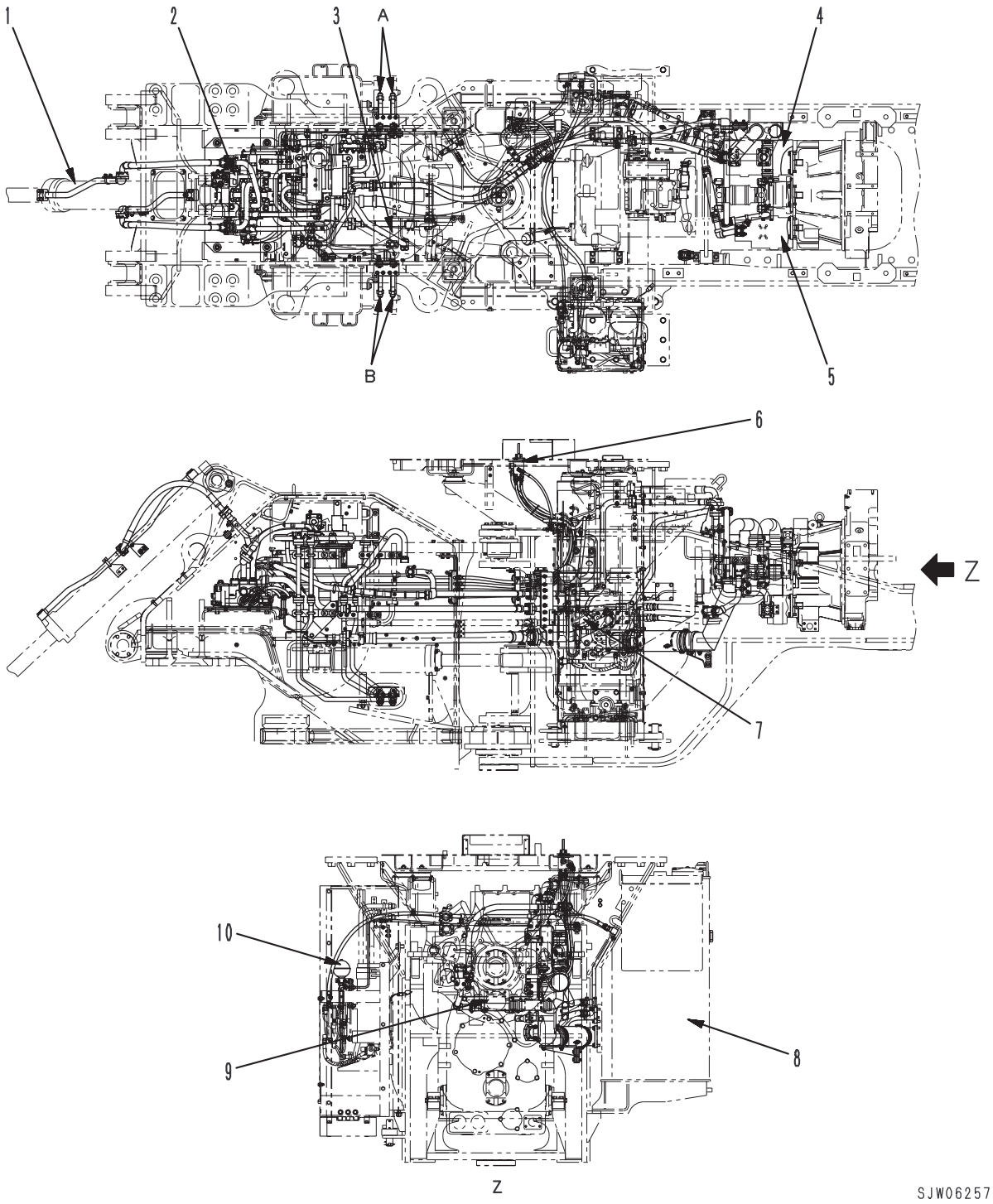
FUNCTION

- The accumulator is installed between the charge valve and the brake valve. It is charged with nitrogen gas between cylinder (3) and free piston (4), and uses the compressibility of the gas to absorb the pulse of the hydraulic pump or to maintain the braking force and to make it possible to operate the machine if the engine should stop.

SPECIFICATIONS

Gas used:	Nitrogen gas
Charge amount:	6,000 cc
Charging pressure:	3.4 MPa {35 kg/cm^2} (at 50°C)

HYDRAULIC PIPING



1. Lift cylinder
2. Work equipment valve
3. Steering valve
4. Steering + switching pump
5. Torque converter charging + PPC pump
6. PPC valve
7. Accumulator charging valve
8. Hydraulic tank
9. Work equipment pump
10. Accumulator

A. To pitch cylinder (Right)
B. To pitch and tilt cylinder (Left)

3. Control lever moved back from slightly operated position to hold (Fine control) (Fig. 3):
When plate (10) starts to be pushed back, piston (2) is pushed up by a force corresponding to the force of centering spring (6) and the pressure at port **P4**.
At the same time, fine control hole (f) of valve (8) is connected to drain chamber **D**, so the oil at port **P4** escapes.
If the pressure at port **P4** drops too far, valve (8) is pushed down by spring (7). Fine control hole (**f**) is shut off from drain chamber **D**, and at almost the same time it is connected to pump pressure chamber **PP**. The pump pressure is supplied until the pressure at port **P1B** returns to a pressure equivalent to the position of the lever.
When the spool of the control valve returns, the oil in drain chamber **D** flows in from fine control hole (**f'**) of the valve which has not moved. The extra oil then flows through port **P1** to chamber **P1A**.

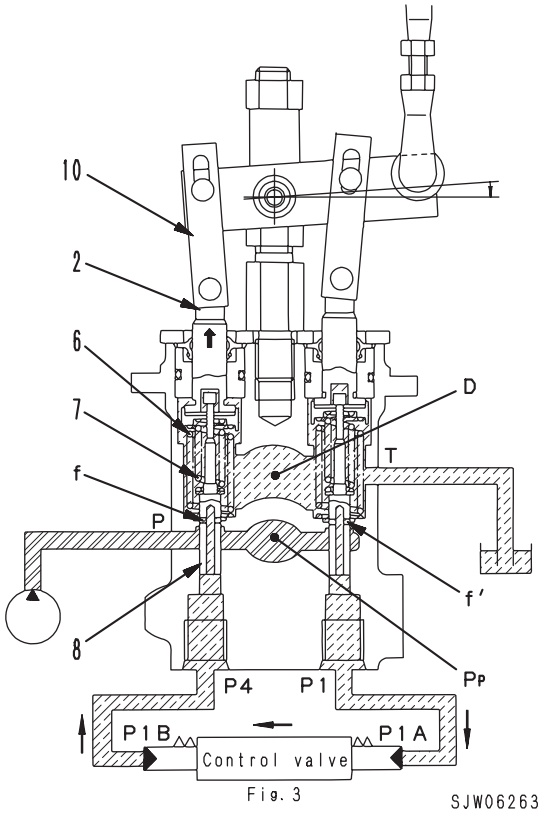


Fig. 3 SJW06263

4. Control lever operated to end of travel (Fig. 4):
Plate (10) pushes piston (2) down, and piston (2) forcibly pushes in valve (8).
Fine control hole (**f**) is shut off from drain chamber **D**, and is connected to pump pressure chamber **PP**.
Therefore, pressure oil from the charging pump passes through fine control hole (**f**), and flows from port **P4** to chamber **P1B** to push the spool of the control valve.
The oil returning from chamber **P1A** flows from port **P1** through fine control hole (**f'**) to drain chamber **D**.

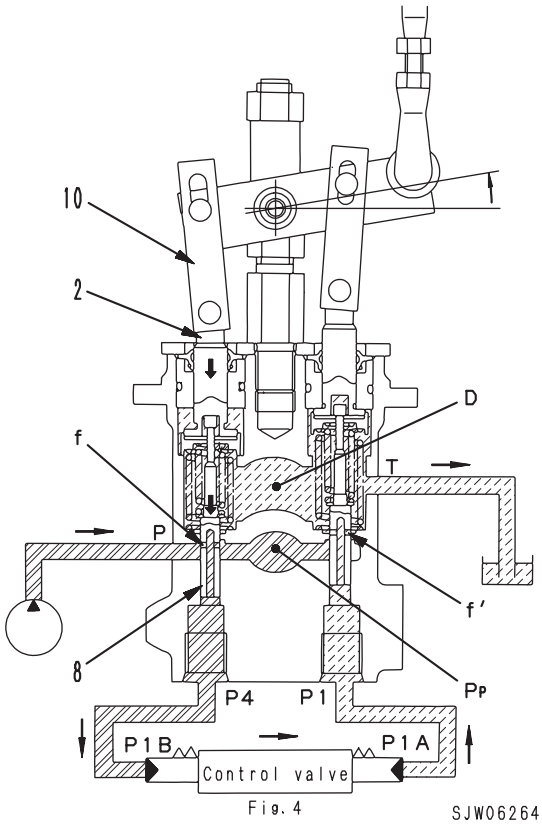
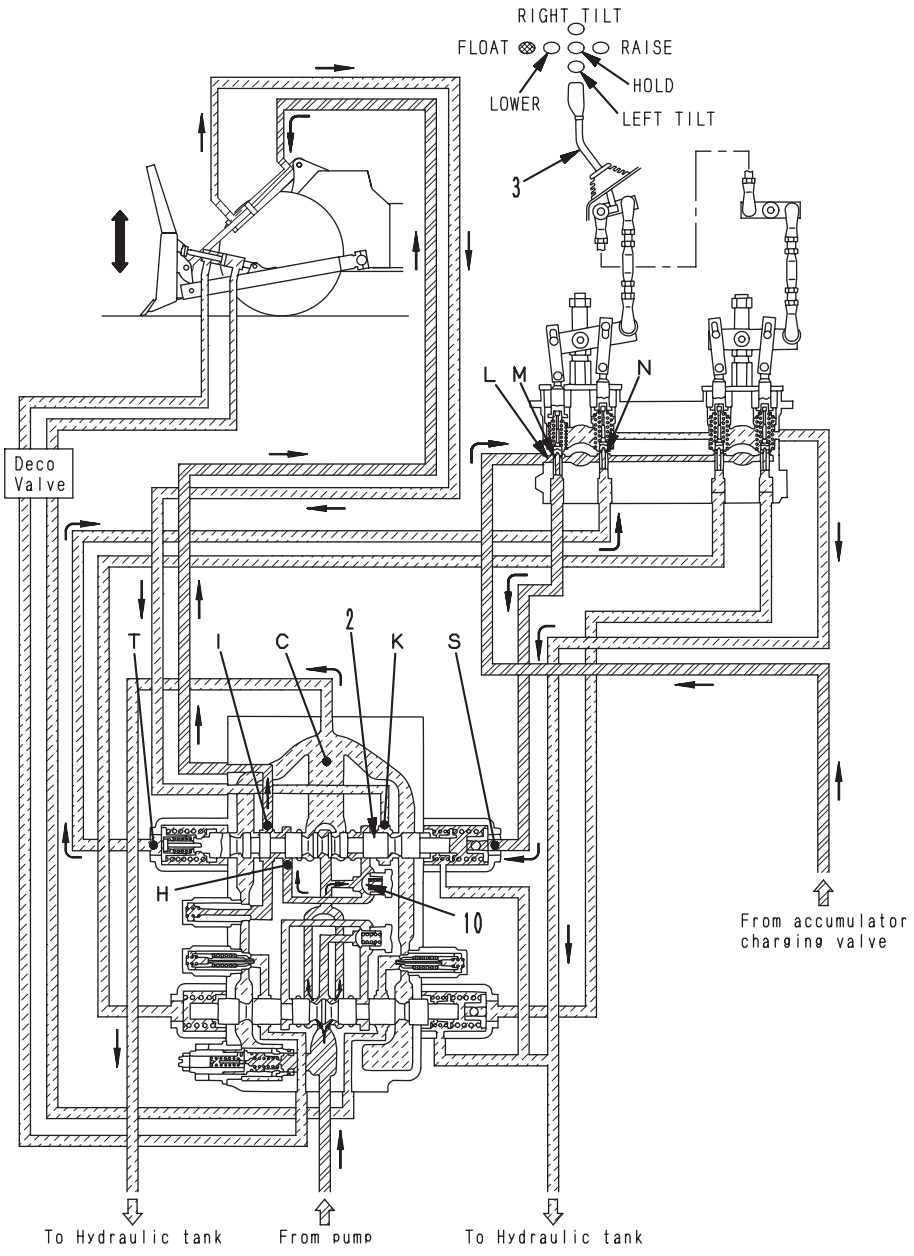


Fig. 4 SJW06264

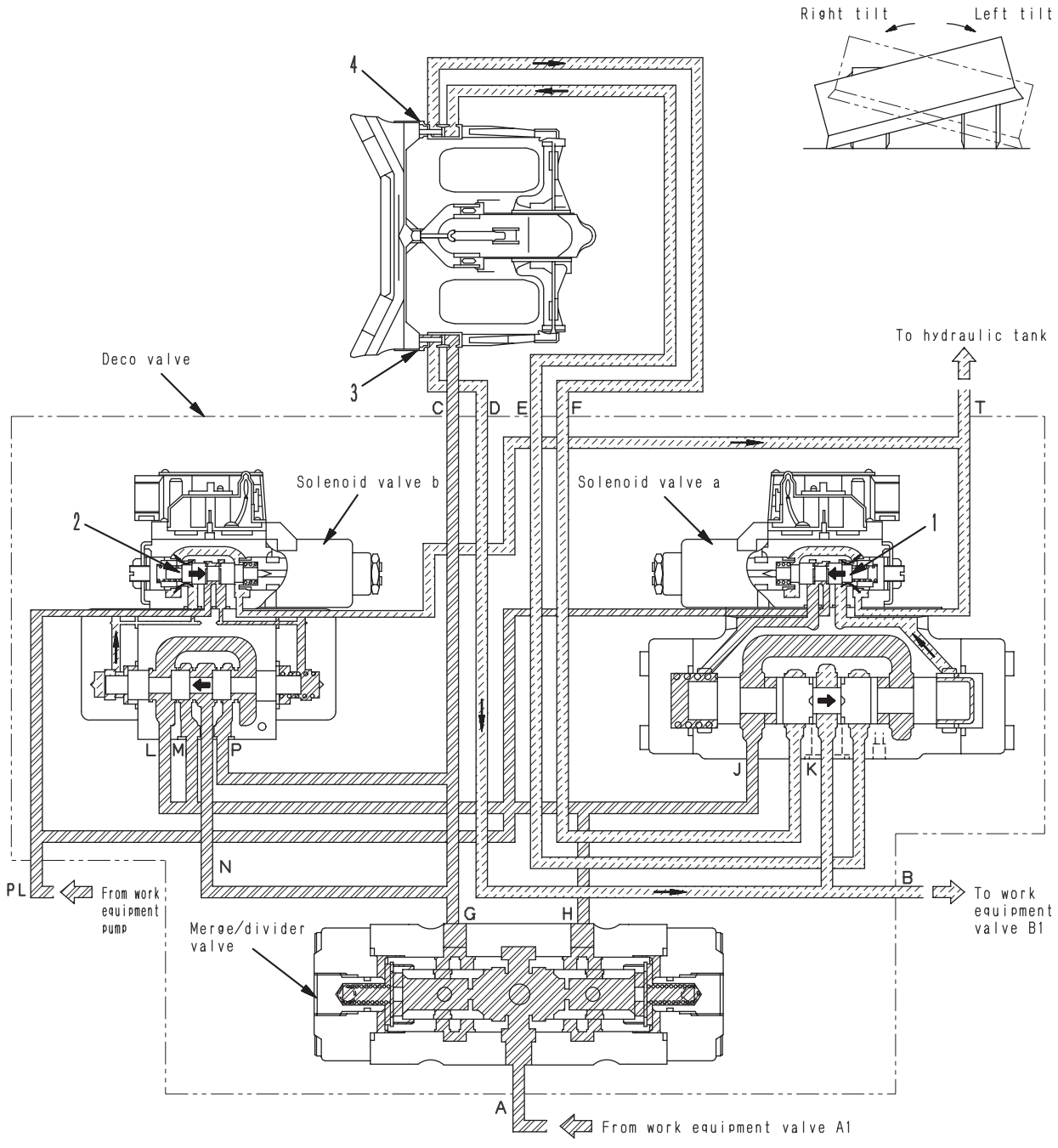
LIFT SPOOL FLOAT POSITION



OPERATION

- Placing the work equipment control lever (3) at the FLOAT position moves the spool of the PPC valve beyond the LOWER position to the FLOAT position. The pressure oil at the port **L** flows to the port **M** and port **S**. The pressure oil at the port **T** flows to the port **N**.
- The pressure oil at the port **S** pushes the lift spool (2) to the FLOAT position.
- The oil at the cylinder bottom side goes through the port **H** and the port **C** to the drain circuit, and the oil at the cylinder rod side goes through the port **K** and the port **C** to the drain circuit. Accordingly, the blade floats.

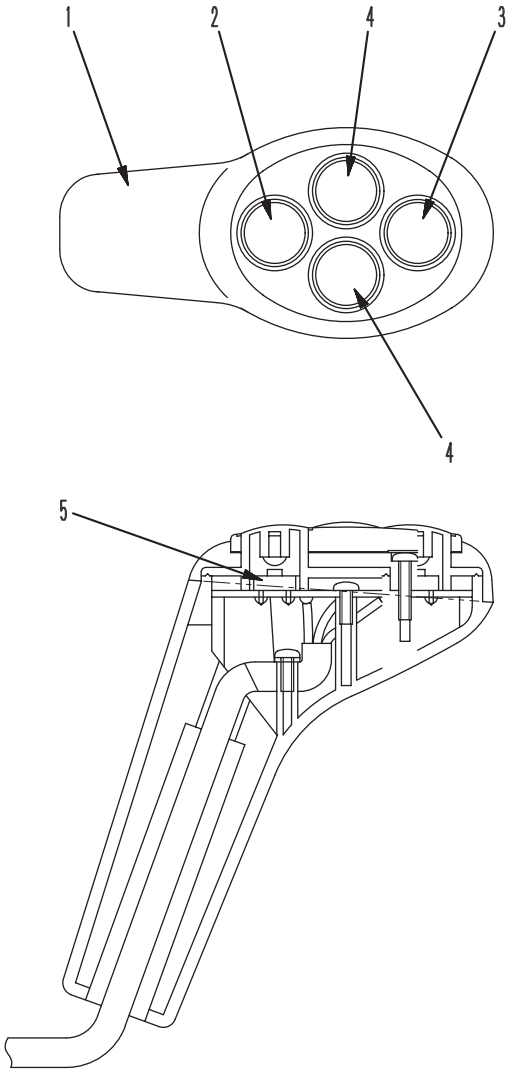
1. Operation of right tilt



MAIN MONITOR SWITCH FUNCTION

Item	Function	Display	Actuation
Working lamp (front)	Front working lamp lights up or goes out each time switch is pressed when side lamps are lighted up	Lights up	Front working lamp lights up
		Goes out	Front working lamp goes out
Working lamp (rear)	Rear working lamp lights up or goes out each time switch is pressed when side lamps are lighted up	Lights up	Rear working lamp lights up
		Goes out	Rear working lamp goes out
Transmission cut-off	Transmission cut-off function is actuated or stopped each time switch is pressed	Lights up	Cut-off function actuated
		Goes out	Cut-off function stopped
Manual	Auto shift mode switches to manual mode when switch is pressed	Lights up	Manual mode
		Goes out	Auto shift mode

KICK-DOWN, HOLD SWITCH



SJW06286

1. Work equipment control lever
2. Hold switch
3. Kick-down switch
4. Tilt or pitch switch
5. Switch

KICK-DOWN SWITCH

OPERATION

- The kick-down (shifting down from 2nd → 1st) is actuated only when traveling in F2.
- When traveling in F2, if it is desired to shift down to 1st without operating the speed lever, operate the kick-down switch on the boom lever to ON to shift down to F1.
- After this, even if the kick-down switch is pressed, the transmission is kept at F1.

CANCELLATION (or not actuated)

- When directional lever is at **N**
- When directional lever is at **R**
- When speed lever is not at 2nd
- When starting switch is OFF

HOLD SWITCH

With auto shift transmission

- The hold switch is installed to the work equipment control lever, and when the hold switch is pressed, the speed range displayed on the main monitor transmission indicator is held.
- Press the hold switch again to cancel.

10. Change of travel mode of transmission controller

1) Specifications for change over "steering wheel and joystick" modes to each other and over "auto and manual" modes to each other
   a) Neutral interlock function
      When the mode is changed, the neutral condition is held until the "N" signal is received normally.
   b) Gear speed
      The output of the gear speed changes according to change of the mode.

Table 2 Output gear speed at change of mode

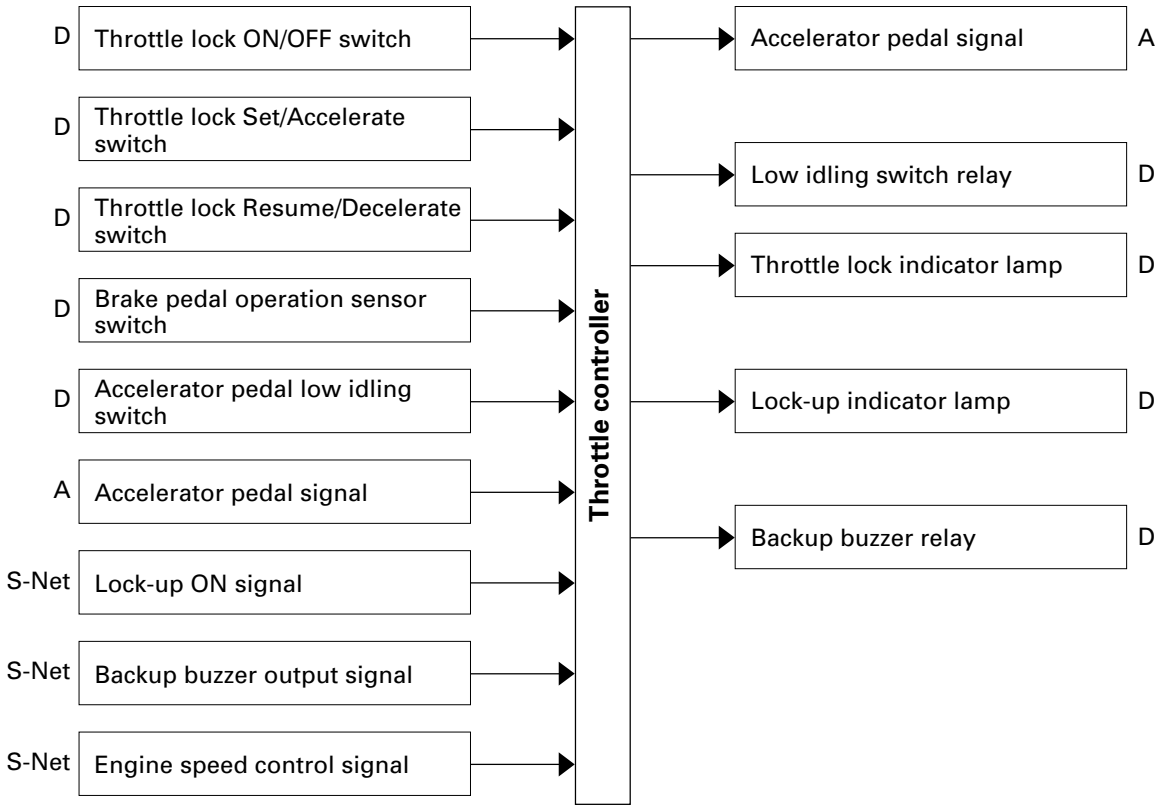
			Condition after change of mode			
			Steering wheel		Joystick	
			Auto	Manual	Auto	Manual
Condition before change of mode	Steering wheel	Auto		Position of range lever (*2 (1))	2nd speed (*1) (Changed at N)	
		Manual	2nd speed (*2(2))			Gear speed is held. (Changed at N)
	Joystick	Auto	2nd speed (*1) (Changed at N)			Previous gear speed is held. (*2 (2))
		Manual		Position of range lever (Changed at N)	2nd speed (*2 (3))	

(*1) Usually, the steering wheel mode and joystick mode are change over to each other while the vehicle is stopped and the transmission is at the neutral, the gear is shifted to 2nd speed. If the vehicle is traveling, the "restart data" of the Automatic shift function is used and the gear speed matched to the current travel speed is set. If the gear shift lever is at "1", 1st speed is set.

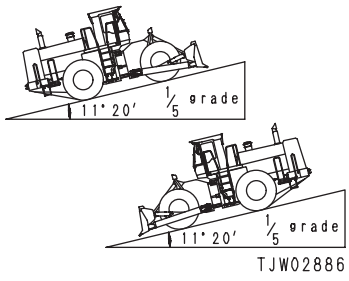
(*2) Auto and manual can be changed to each other in the same mode, even while the vehicle is traveling.

(1) Steering wheel mode: When auto is changed to manual, the gear speed of the position of the gear shift lever is set.
(2) Joystick mode: When auto is changed to manual, the gear speed is not changed.
(3) When manual is changed to auto, the gear speed matched to the current travel speed is set according to the data of "Table 1 Automatic shift change points table - 8. Changeover of F and R to each other". If the gear shift lever is at "1", however, 1st speed is set.

SYSTEM CONFIGURATION



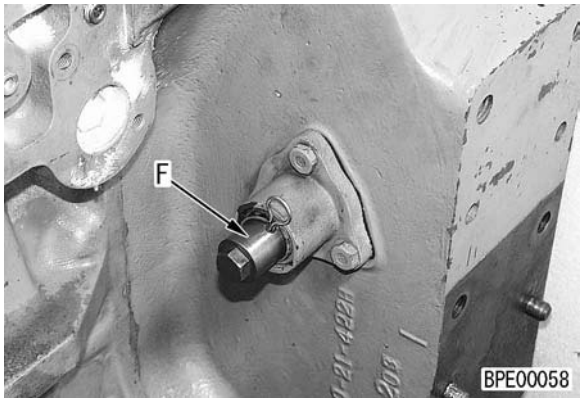
A: Analog signal
D: Digital signal

Machine model					WD600-3	
Category	Item		Measurement conditions	Unit	Standard value for new machine	Service limit value
Wheel brake	Brake oil pressure		• Hydraulic oil temperature: 45 – 55°C	MPa {kg/cm²}	4.9 ± 0.49 {50 ± 5}	4.9 ± 0.69 {50 ± 7}
	Drop in brake pressure		• Engine stopped • Keep brake pedal depressed at 4.9 MPa {50 kg/cm²} and measure drop in oil pressure after 5 min.		Max. 0.49 {5}	0.49 {5}
	Performance		• Tire inflation pressure: Specified pressure • Flat, horizontal, straight, dry paved road surface • Speed when applying brake: 20 km/h, braking delay: 0.1 sec • Brake pedal operating effort: Specified operating effort (294±29.4 N {30±3 kg}) • Measure stopping distance	m	Max. 5	5
	Disc wear		• Measure piston stroke	mm	7.5 ± 0.6	13.4
Parking brake	Parking brake inlet port pressure	Brake released	• Torque converter oil temperature: 60 – 80°C • Engine at high idling	MPa {kg/cm²}	5.9 – 9.8 {60 – 100}	5.9 – 9.8 {60 – 100}
		Brake operated			Max. 0.14 {Max. 1.4}	0.14 {1.4}
	Performance		• Tire inflation pressure: Specified pressure • Flat dry paved road with 1/5 (11°20') grade • Machine at operating condition  TJW02886	—	Stopped	Stopped
	Pad thickness		Including pack metal	mm	31.7 ± 0.3	12.7
	Clearance		Total of each end		1.06 ± 0.18	2.1
PPC	PPC valve source pressure (Orbit-roll source pressure)		• Hydraulic oil temperature: 45 – 55°C • Engine speed: High idling	MPa {kg/cm²}	$3.72^{+0.2}_{0}\{38^{+2}_{0}\}$	$3.72^{+0.2}_{-0.2}\{38^{+2}_{-2}\}$
	PPC valve output pressure		• Hydraulic oil temperature: 45 – 55°C • Engine speed: High idling • Work equipment control lever: Operated fully		$3.72^{+0.2}_{0}\{38^{+2}_{0}\}$	$3.72^{+0.2}_{-0.2}\{38^{+2}_{-2}\}$

System	Name of component	Connector No.	Inpsection method	Judgement table	Measurement conditions
Maintenance monitor	Brake accumulator low pressure switch	C03 (male) C04 (male)	Measure resistance	If the condition is as shown in the table below, it is normal Accumlator pressure: Min 5.39 ± 0.49 MPa {5.39 ± 0.49 kg/cm²} — Between (1) – (2) — Max. 1 Ω Depress brake pedal and lower accumlator pressure to below 4.41 ± 0.49 MPa {45 ± 5 kg/cm²} — Between (1) – (2) — Min. 1 MΩ	1) Turn starting switch OFF. 2) Disconnect connector. 3) Connect T-adapter.
	Engine water temperature sensor	E04 (male)	Measure resistance	If the condition is as shown in the table below, it is normal Normal temperature (25˚C) — Between (1) – (2) — Approx. 40 kΩ 100 ˚C — Between (1) – (2) — Approx. 3.7 kΩ	1) Turn starting switch OFF. 2) Disconnect connector. 3) Connect T-adapter.
	Torque converter oil temperature sensor	E07 (male)	Measure resistance	If the condition is as shown in the table below, it is normal Normal temperature (25˚C) — Between (1) – (2) — Approx. 40 kΩ 100 ˚C — Between (1) – (2) — Approx. 3.7 kΩ	1) Turn starting switch OFF. 2) Disconnect connector. 3) Connect T-adapter.
	Engine oil lever switch	E10	Measure resistance	If the condition is as shown in the table below, it is normal Oil level normal — Between (1) – (2) — Max. 1 Ω Oil level abnormal — Between (1) – (2) — Min. 1 MΩ	1) Turn starting switch OFF. 2) Disconnect terminal.
	Dust indicator	E13 (male) E14 (male)	Measure continuity	If the condition is as shown in the table below, it is normal Air cleaner normal — Between E13 (1) – E14 (1) — Continuity Air cleaner clogged or engine stopped — Between E13 (1) – E14 (1) — No Continuity	1) Turn starting switch OFF. 2) Disconnect connector. 3) Start engine. 4) Measure continuity.

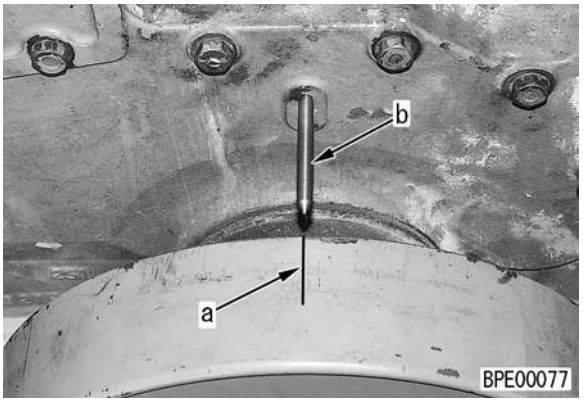
ADJUSTING VALVE CLEARANCE

1. Remove the cover of the flywheel housing, then install barring device **F1**.



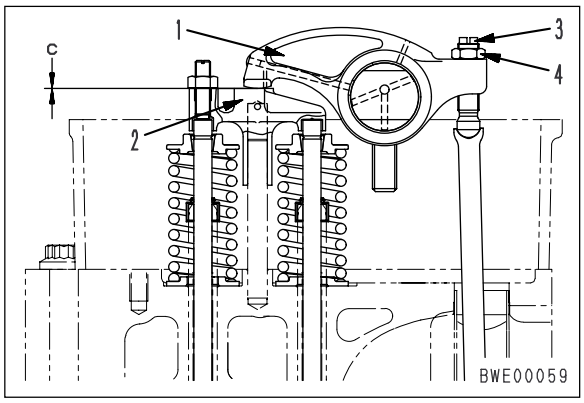
2. Remove the cylinder head cover.

3. Using barring device **F1**, rotate the crankshaft in the normal direction to set No. 1 cylinder at compression top dead center, and align pointer **b** with the [1.6TOP] line **a** on the crankshaft pulley.
   ★ At compression top dead center, the valve rocker arm can be moved by hand by the amount of the valve clearance. If the rocker arm does not move, the crankshaft is not at compression dead center, so rotate it one more turn.



5. To adjust the valve clearance, insert feeler gauge **F2** into clearance c between rocker arm (1) and crosshead (2), and adjust the valve clearance with adjustment screw (3).
   ★ Insert the feeler gauge and turn the adjustment screw until the clearance is a sliding fit.
   ★ Valve clearance
   Intake valve: 0.32 mm
   Exhaust valve: 0.62 mm

5. Tighten locknut (4) to hold adjustment screw (3) in position.
   Locknut :
   57.8 – 77.4 Nm {5.9 – 7.9 kgm}
   After tightening the locknut, check the clearance again.



6. Turn the crankshaft 120° each time in the normal direction and repeat the procedure in Steps 3 to 5 to adjust the valves of each cylinder according to the firing order.
   ★ Firing order : 1 – 5 – 3 – 6 – 2 – 4

7. After completing the measurement, set to the original condition.
   Cylinder head cover mounting bolt:
   9.8 ± 1.0 Nm {1 ± 0.1 kgm}

HANDLING EQUIPMENT IN FUEL CIRCUIT

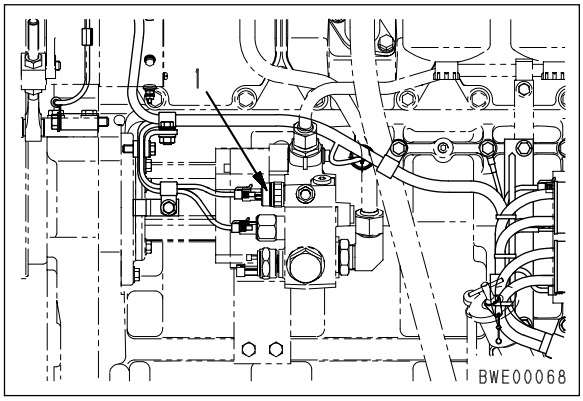
★ Precautions when carrying out inspection and maintenance of fuel system.
With the HPI type fuel injection system, more precise equipment is used than on the conventional fuel injection pump and nozzle. Problems may occur if dirt or dust get in, so always be careful of the following points.
When carrying out inspection or maintenance of the fuel line, pay more attention than usual to prevent dirt or dust from getting in. If there is any dirt stuck to any part, use clean fuel to wash it off completely.

★ Precautions when replacing fuel filter cartridge
Always use a genuine Komatsu part for the fuel filter cartridge.
With the HPI type fuel injection system, more precise equipment is used than on the conventional fuel injection pump and nozzle. Problems may occur if dirt or dust get in, so a special filter with highly efficient filtering performance is used.
For this reason, do not use imitation filters. If they are used, there is danger of problems occurring in the fuel line.

MEASURING FUEL PUMP OUTLET PORT PRESSURE

★ Measure the outlet port pressure of the fuel pump with the signal voltage of the fuel pump pressure sensor.

1. Insert a T-adapter into the connector of fuel pump pressure sensor (1), then connect to T-adapter box **Q**.



2. Start the engine and measure the power source voltage of the fuel pump pressure sensor.
   ★ Check that the power source voltage is within the following range.
   ★ Sensor power source voltage (between (A) and (B)): 4.75 – 5.25 V
3. Run the engine at each speed and measure the signal voltage of the fuel pump pressure sensor.
   ★ Check that the power source voltage is within the following range.
   ★ Sensor power source voltage (between (C) and (B)):

Engine speed (rpm)	Signal voltage (V)	Fuel pump outlet port pressure (reference) (MPa{kg/cm²})
600	1.78±0.21	0.83±0.14 {8.45±1.41}
700	1.94±0.21	0.93±0.1 {9.50±1.41}
800	2.10±0.21	1.03±0.14 {10.53±1.41}
900	2.26±0.21	1.14±0.14 {11.60±1.41}
1,000	2.42±0.21	1.25±0.14 {12.70±1.41}
1,100	2.59±0.21	1.34±0.14 {13.70±1.41}
1,200	2.76±0.21	1.46±0.14 {14.90±1.41}

4. After completing the measurement, remove the measuring equipment and set to the original condition.

METHOD FOR OPERATION OF EMERGENCY MANUAL SPOOL

★ If the machine cannot be moved because of a failure in any part of the transmission valve system (electrical system, solenoid valves, spools, etc.), it is possible to move the machine by operating the emergency manual spool.

⚠ The emergency manual spool is only for emergency use when there has been a failure and it is necessary to move the machine from a dangerous working area to a safe place for repairs. Do not operate the spool except in emergencies.

⚠ When carrying out this operation, keep strictly to the procedure and pay careful attention to safety when moving the machine .

⚠ To prevent the machine from moving, lower the work equipment completely to the ground, apply the parking brake, and put blocks securely under the tires.

⚠ Carry out the operation with the engine stopped.

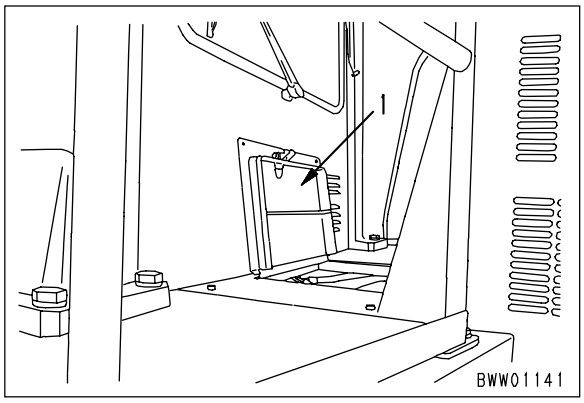
1. Remove inspection cover (1) at the rear of the cab.

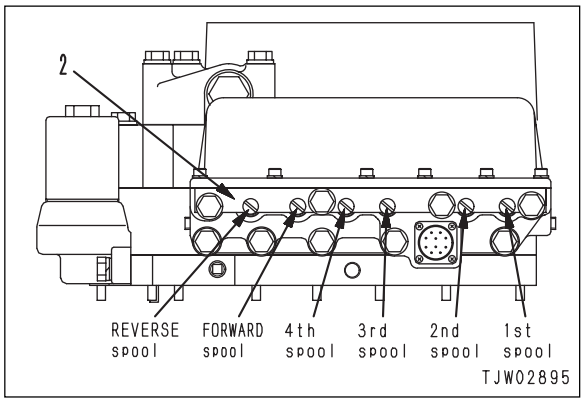
2. Remove lock plate (2) of the emergency manual spool of the transmission valve.
   ★ Simply loosen the mounting bolts to remove the lock plate.

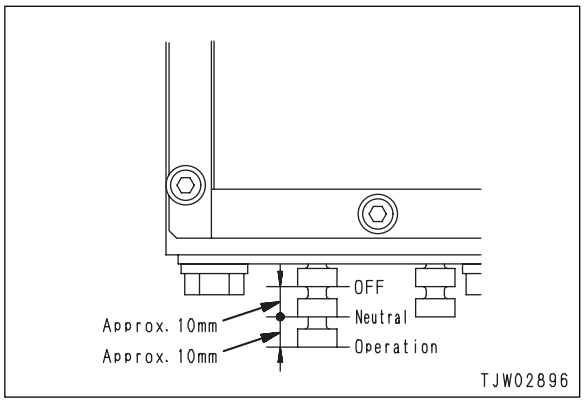
3. Decide the direction to move the machine (forward or in reverse) then move the emergency manual spool to the operating position.

   FORWARD: Rotate FORWARD clutch spool and 1st spool counterclockwise, and pull out approx. 10 mm to the operating position.

   REVERSE: Rotate REVERSE clutch spool and 1st spool counterclockwise, and pull out approx. 10 mm to the operating position.







TESTING AND ADJUSTING ACCUMULATOR CHARGE CUT-IN AND CUT-OUT PRESSURE

Measuring

★Hydraulic oil temperature: 45 – 55°C

⚠ Put blocks securely under the tires.

⚠ Depress the brake pedal at least 100 times with the engine stopped to release the pressure inside the accumulat or circuit.

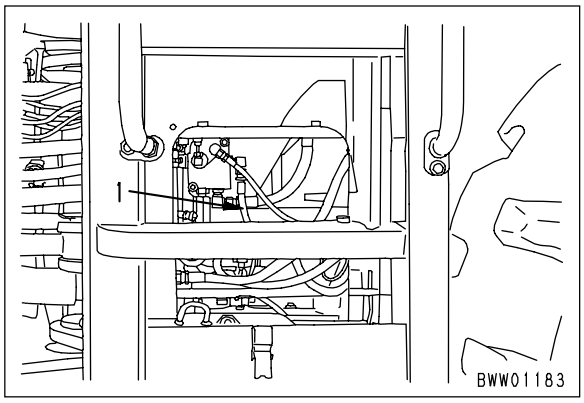
1. Remove the cover and disconnect accumulator inlet hose (1).
2. Install the adapter (M18 x 1.5) to elbow (2) at the charge valve end, then assemble hose (1) again.
3. Install oil pressure gauge **C1** (39 MPa {400 kg/cm²}) to adapter **C3**.
4. Measure the accumulator charge cut-in pressure. Start the engine, run the engine at low idling, and measure the oil pressure when the accumulator pressure warning" pilot lampon the maintenance meter goes out.
5. Measure the accumulator charge cut-out pressure.
   After the accumulator charge cut-in is actuated, measure the oil pressure when the indicator of the oil pressure gauge has risen and suddenly starts to drop.

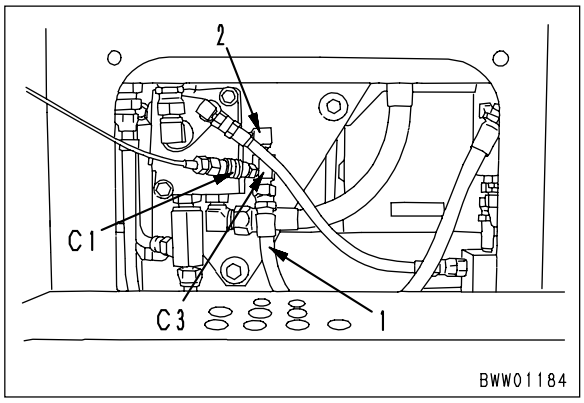
Adjusting

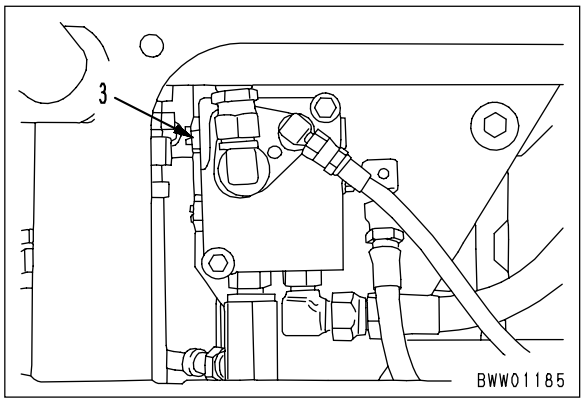
★ When the accumulator charge cut-out pressure is adjusted, the cut-in pressure also changes in proportion to the ratio of the valve area. For this reason, there is no adjustment nut for the cut-in pressure.

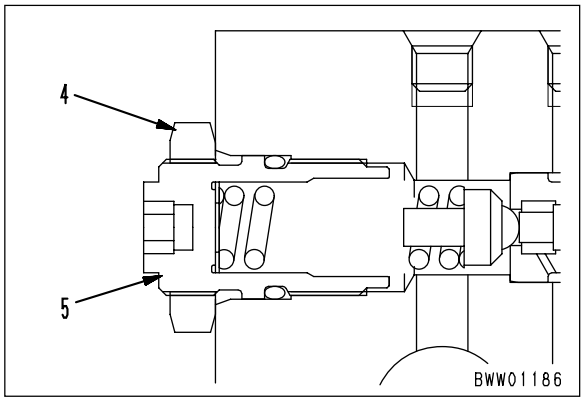
1. Loosen locknut (4) of accumulator charge cut-out valve (3), then turn adjustment screw (5) to adjust.
   - ★ Turn the adjustment screw to adjust the pressure as follows.
     - To RAISE pressure, turn CLOCKWISE
     - To LOWER pressure, turn COUNTER-CLOCKWISE
   - ★ Pressure adjustment for 1 turn of adjustment screw: 5.59 MPa {57 kg/cm²}

     Locknut : **9.8 – 11.8 Nm {1 – 1.2 kgm}**
   - ★ After completion of adjustment, repeat the measurement procedure given above to check the accumulator cut-in pressure and cut-out pressure again.









POINTS TO REMEMBER WHEN TROUBLESHOOTING

⚠ Stop the machine in a level place, and check that the safety pin, blocks, and parking brake are securely fitted.

⚠ When carrying out the operation with two or more workers, keep strictly to the agreed signals, and do not allow any unauthorized person to come near.

⚠ If the radiator cap is removed when the engine is hot, hot water may spurt out and cause burns, so wait for the engine to cool down before starting troubleshooting.

⚠ Be extremely careful not to touch any hot parts or to get caught in any rotating parts.

⚠ When disconnecting wiring, always disconnect the negative (–) terminal of the battery first.

⚠ When removing the plug or cap from a location which is under pressure from oil, water, or air, always release the internal pressure first. When installing measuring equipment, be sure to connect it properly.

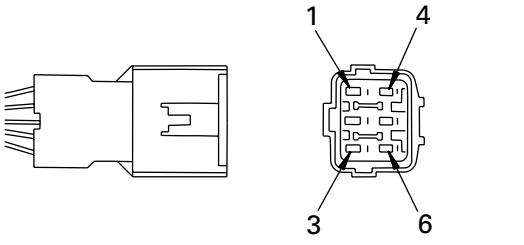
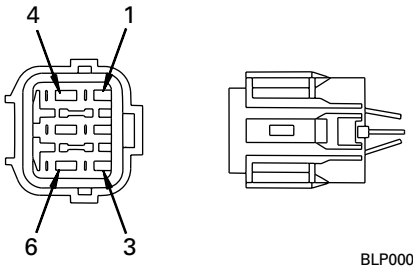
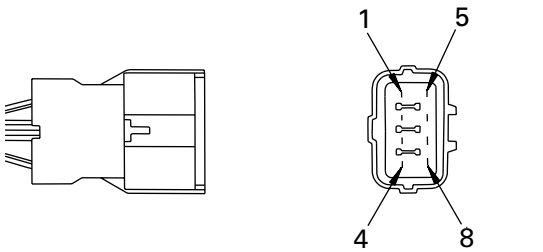
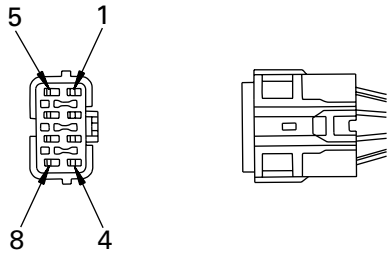
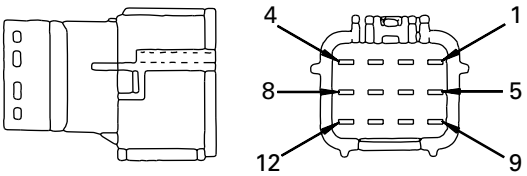
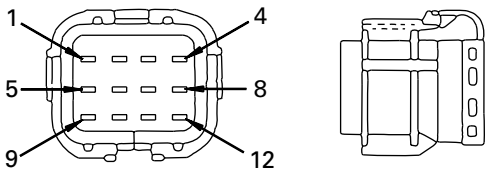
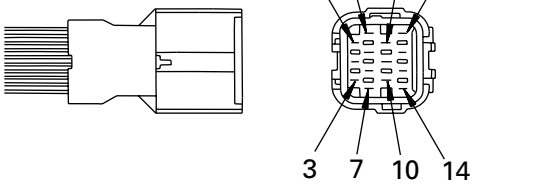
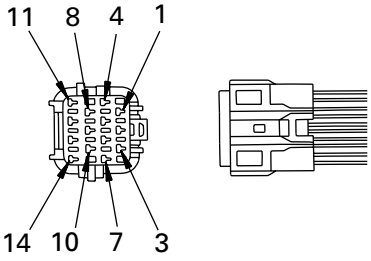
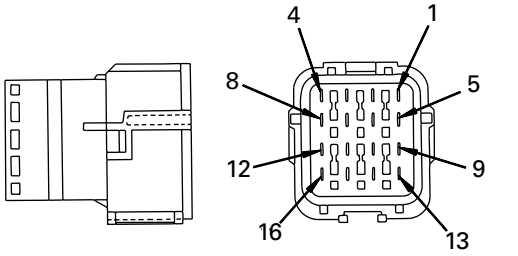
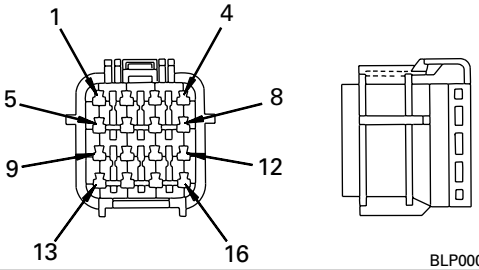
The aim of troubleshooting is to pinpoint the basic cause of the failure, to carry out repairs swiftly, and to prevent reoccurrence of the failure.
When carrying out troubleshooting, and important point is of course to understand the structure and function. However, a short cut to effective troubleshooting is to ask the operator various questions to form some idea of possible causes of the failure that would produce the reported symptoms.

1. When carrying out troubleshooting, do not hurry to disassemble the components.
   If components are disassembled immediately any failure occurs:
   - Parts that have no connection with the failure or other unnecessary parts will be disassembled.
   - It will become impossible to find the cause of the failure.

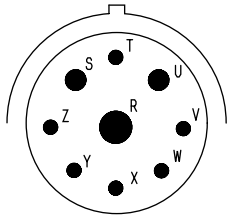
   It will also cause a waste of manhours, parts, or oil or grease, and at the same time, will also lose the confidence of the user or operator.
   For this reason, when carrying out troubleshooting, it is necessary to carry out thorough prior investigation and to carry out troubleshooting in accordance with the fixed procedure.
2. Points to ask user or operator
   1) Have any other problems occurred apart from the problem that has been reported?
   2) Was there anything strange about the machine before the failure occurred?
   3) Did the failure occur suddenly, or were there problems with the machine condition before this?
   4) Under what conditions did the failure occur?
   5) Had any repairs been carried out before the failure?
      When were these repairs carried out?
   6) Has the same kind of failure occurred before?
3. Check before troubleshooting
   1) Check for symptoms of any abnormality in the machine.
   2) Check the CHECKS BEFORE STARTING items.
   3) Other inspection items.
   4) Other maintenance items can be checked externally, so check any item that is considered to be necessary.
4. Confirming failure
   Confirm the extent of the failure yourself, and judge whether to handle it as a real failure or as a problem with the method of operation, etc.
   ★ When operating the machine to reenact the troubleshooting symptoms, do not carry out any investigation or measurement that may make the problem worse.
5. Troubleshooting
   Use the results of the investigation and inspection in Items 2 – 4 to narrow down the causes of failure, then use the troubleshooting flowchart to locate the position of the failure exactly.
   ★ The basic procedure for troubleshooting is as follows.
      1) Start from the simple points.
      2) Start from the most likely points.
      3) Investigate other related parts or information.
6. Measures to remove root cause of failure
   Even if the failure is repaired, if the root cause of the failure is not repaired, the same failure will occur again.
   To prevent this, always investigate why the problem occurred. Then, remove the root cause.

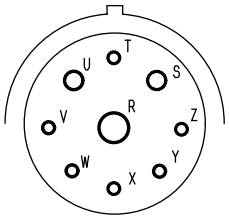
CHECKS BEFORE TROUBLESHOOTING

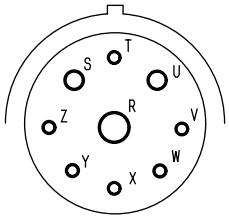
	Item	Judgement standard	Remedy
Lubricating oil, cooling water	1. Check fuel level, type of fuel	—	Add fuel
	2. Check for impurities in fuel	—	Clean, drain
	3. Check hydraulic oil level	—	Add oil
	4. Check hydraulic filter · (Torque converte, Transmission hydraulic oil)	—	Clean, drain
	5. Check brake oil level	—	Add oil
	6. Check engine oil level	—	Add oil
	7. Check coolant level	—	Add water
	8. Check dust indicator for clogging	—	Clean or replace
Electrical equipments	9. Check for looseness, corrosion of battery terminal, wiring	—	Tighten or replace
	10. Check for looseness, corrosion of alternater terminal, wiring	—	Tighten or replace
	11. Check for looseness, corrosion of starting motor terminal, wiring	—	Tighten or replace
	12. Check operation of instruments	—	Repair or replace
Hydtaulic, mechanical equipments	13. Check for abnormal noise,smell	—	Repair
	14. Check for oil leakage	—	Repair
	15. Carry out air bleeding	—	Bleed air
	16. Check effect of parking brake, wheel brake	—	Repair or replace
Electrics, eiectrical equipment	17. Check battery voltage (engine stopped)	24 – 26 V	Replace
	18. Check battery electrolyte level	—	Add or replace
	19. Check for discolored, burnt, exposed wiring	—	Replace
	20. Check for missing wiring clamps, hanging wiring	—	Repair
	21. Check for water leaking on wiring (be particularly careful attention to water leaking on connectors or terminals)	—	Disconnect connector and dry
	22. Check for blown, corroded fuses	—	Replace
	23. Check alternator voltage (engine runing at 1/2 throttle or above) (If the battery charge is low, the voltage may be approx. 25V immediately after starting.)	28.5 – 29.5 V	Replace
	24. Sound of actuation of battery relay (when starting switch is turned ON, OFF)	—	—

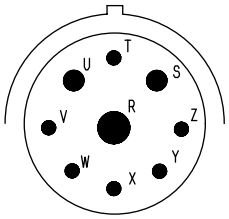
No. of pins	SWP type connector	
	Male (female housing)	Female (male housing)
6	 TEW00235	 BLP00033
8	 TEW00237	 TEW00238
12	 BLP00034	 BLP00035
14	 TEW00239	 TEW00240
16	 BLP00036	 BLP00037

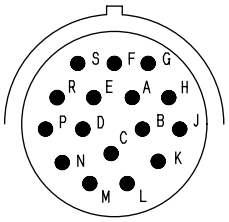
(Pin No. is printed on connector (wire insertion side), too.)

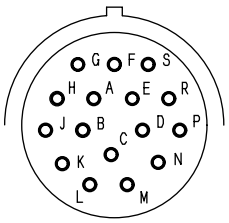
<table>
<tr><td rowspan="2">Type (Shell size code)</td><td colspan="2">HD30 series connector</td><td rowspan="2">Part No. of T-adapter</td></tr>
<tr><td>Body (Plug)</td><td>Body (Receptacle)</td></tr>
<tr><td rowspan="4">24-9 (5)</td><td>Pin (male terminal)</td><td>Pin (female terminal)</td><td rowspan="2">799-601-9250</td></tr>
<tr><td> 

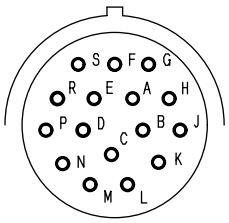
BWP05017</td><td> 

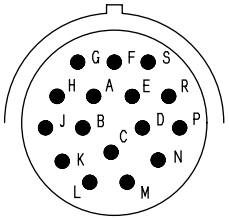
BWP05018</td></tr>
<tr><td>Part No.: 08191-51201, 08191-51202</td><td>Part No.: 08191-54101, 08191-54102</td></tr>
<tr><td>Pin (female terminal)</td><td>Pin (male terminal)</td><td rowspan="2">799-601-9250</td></tr>
<tr><td> 

BWP05019</td><td> 

BWP05020</td></tr>
<tr><td>Part No.: 08191-52201, 08191-52202</td><td>Part No.: 08191-53101, 08191-53102</td></tr>
<tr><td rowspan="4">24-16 (6)</td><td>Pin (male terminal)</td><td>Pin (female terminal)</td><td rowspan="2">799-601-9260</td></tr>
<tr><td> 

BWP05021</td><td> 

BWP05022</td></tr>
<tr><td>Part No.: 08191-61201, 08191-62202, 08191-61205, 08191-62206</td><td>Part No.: 08191-64101, 08191-64102, 08191-64105, 08191-64106</td></tr>
<tr><td>Pin (female terminal)</td><td>Pin (male terminal)</td><td rowspan="2">799-601-9260</td></tr>
<tr><td> 

BWP05023</td><td> 

BWP05024</td></tr>
<tr><td>Part No.: 08191-62201, 08191-62202, 08191-62205, 08191-62206</td><td>Part No.: 08191-63101, 08191-63102, 08191-63105, 08191-63106</td></tr>
</table>

TROUBLESHOOTING OF ENGINE SYSTEM (S MODE)

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

General causes why engine does not pick up smoothly

- Insufficient intake of air
- Insufficient supply of fuel
- Improper condition of fuel injection
- Use of improper fuel
- Defective fuel injection pump

			Causes: Clogged air cleaner element	Clogged fuel filter, strainer	Clogged feed pump strainer	Clogged injection nozzle, defective spray	Defective feed pump	Worn piston ring, cylinder	Seized turbocharger, interference	Improper valve clearance	Clogged fuel tank air breather hole	Defective, leaking fuel piping	Improper contact of valve, valve seat	Broken injection pump boost compensator diaphragm, broken air pump	Broken injection pump stop lever
Questions	Confirm recent repair history														
	Degree of use	Operated for long period	△	△	△			△					△		
	Replacement of filters has not been carried out according to operation manual		◎	◎	◎										
	Non-specified fuel has been used			◎	◎	◎	◎								
	Engine oil must be added more frequently						◎								◎
	Rust and water are found when fuel is drained			◎	◎										
	Dust indicator is red		◎												
	Noise of interference is heard from around turbocharger							◎							
	Engine pick-up suddenly became poor					○		◎		○	○				
	Color of exhaust gas	Blue under light load					◎								
		Black	◎			◎		◎					○		◎
Check items	Clanging sound is heard from around cylinder head								◎						
	Mud is stuck to fuel tank cap									◎					
	There is leakage from fuel piping										◎				
	High idling speed under no load is normal, but speed suddenly drops when load is applied			◎	◎		○			○			◎		◎
	There is hunting from engine (rotation is irregular)			○	◎	○	○			○					
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low					◎									
	Blow-by gas is excessive							◎							
Troubleshooting	When air cleaner element is inspected directly, it is found to be clogged		●												
	When fuel filter, strainer are inspected directly, they are found to be clogged			●											
	When feed pump strainer is inspected directly, it is found to be clogged				●										
	Some cylinders does not change engine speed when operating on reduced cylinders					●									
	Inspect feed pump						●								
	When compression pressure is measured, it is found to be low							●					●		
	When turbocharger is rotated by hand, it is found to be heavy								●						
	When valve clearance is checked directly, it is found to be outside standard value									●					
	When fuel cap is inspected directly, it is found to be clogged										●				
	When feed pump is operated, operation is too light or too heavy											●			
	When starting switch is turned ON, there is a clearance between stop lever and stopper bolt													●	
	When boost compensator diaphragm is inspected it is found to be broken, or pipe is crushed														●
		Remedy	Clean	Clean	Clean	Repair	Replace	Replace	Replace	Adjust	Clean	Repair	Replace	Adjust	Replace

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

S-13 Oil level rises

★ If there is oil in the cooling water, carry out troubleshooting for "Oil is in cooling water".

General causes why oil level rises

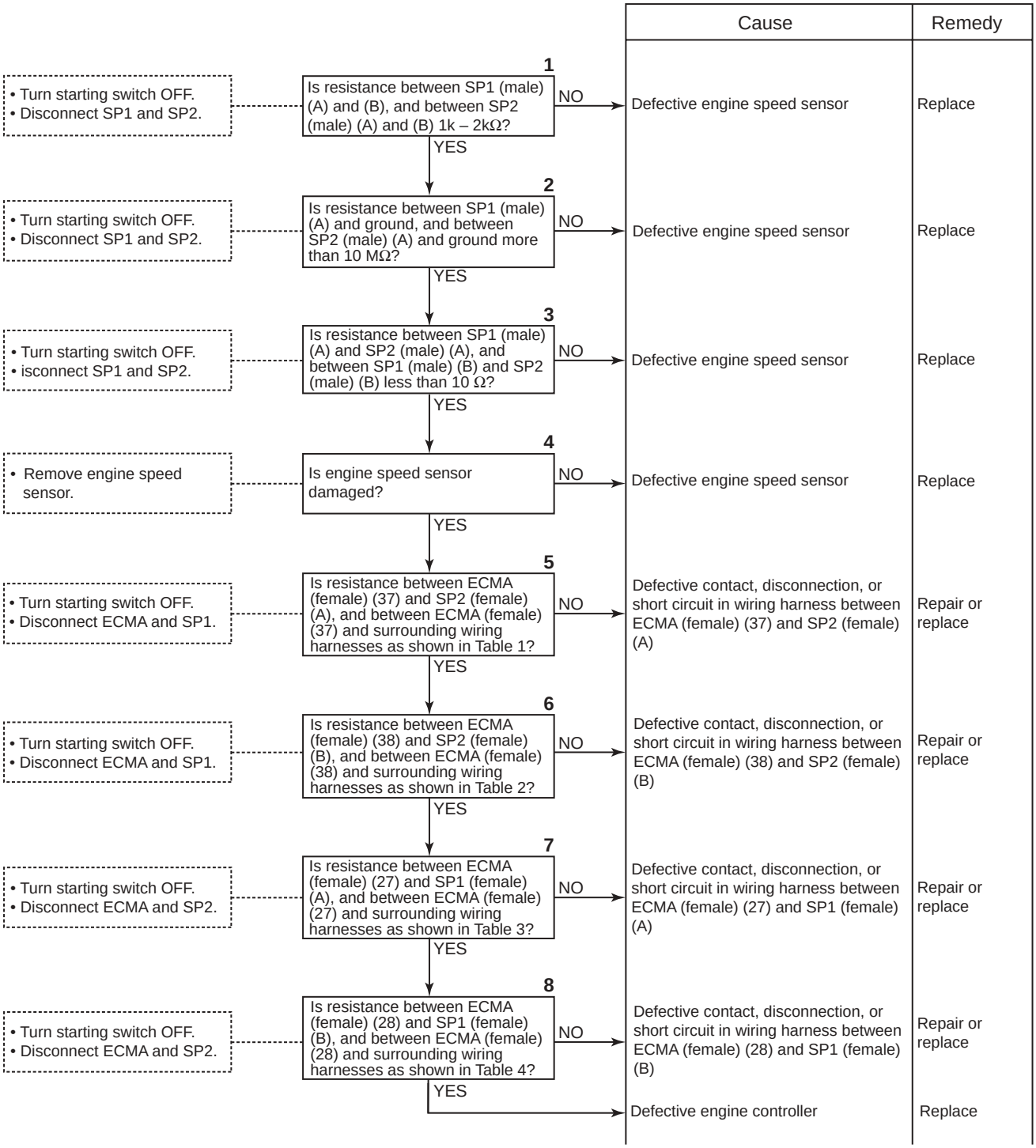
- Water in oil (cloudy white)
- Fuel in oil (diluted, and smells of diesel fuel)
- Entry of oil from other component

			Causes: Broken oil cooler core, O-ring	Defective nozzle holder sleeve	Broken cylinder head, head gasket (including precombustion chamber)	Clogged water pump breather hole, defective seal	Worn, damaged rear seal surface	Defective seal of pump or auxiliary equipment	Leakage of fuel from nozzle holder retaining cap	Defect inside injection pump	Defective thermostat seat	Damaged cylinder liner O-ring, holes made by pitting	Cracks inside cylinder block	Broken after-cooler core
Questions	Confirm recent repair history													
	Degree of use	Operated for long period		△		△	△	△				△		
	There is oil in radiator cooling water		◎	○	○							○	○	
	Exhaust gas is white			◎					○		○			
	When engine is first started, drops of water come from muffler			◎										○
Check items	Leave radiator cap open. When engine is run at idling, an abnormal number of bubbles appear, or water spurts back				◎							○		
	Water pump breather hole is clogged with mud					◎								
	When water pump breather hole is cleaned, water comes out					◎								
	Oil level does down in TORQFLOW transmission, or damper case						◎							
	Oil level does down in hydraulic tank							◎						
	Engine oil smells of diesel fuel								◎	◎	◎			
	Fuel is added more frequently								◎	◎	◎			
Troubleshooting	Pressure-tightness test of oil cooler shows there is leakage		●											
	Pressure-tightness test of cylinder head shows there is leakage			●										
	When compression pressure is measured, it is found to be low				●									
	Remove water pump and inspect directly					●								
	Inspect rear seal directly						●							
	When pump auxiliary equipment is removed, seal is found to be broken							●						
	Remove nozzle holder and inspect directly								●					
	Remove injection pump and inspect directly									●				
	There is improper contact of thermostat seat valve										●			
	Remove oil pan and inspect directly											●	●	
	Pressure-tightness test of after-cooler core shows there is leakage													●
	Remedy		Replace	Replace	Replace	Replace	Repair	Replace	Repair	Replace	Repair	Replace	Replace	Replace	Replace

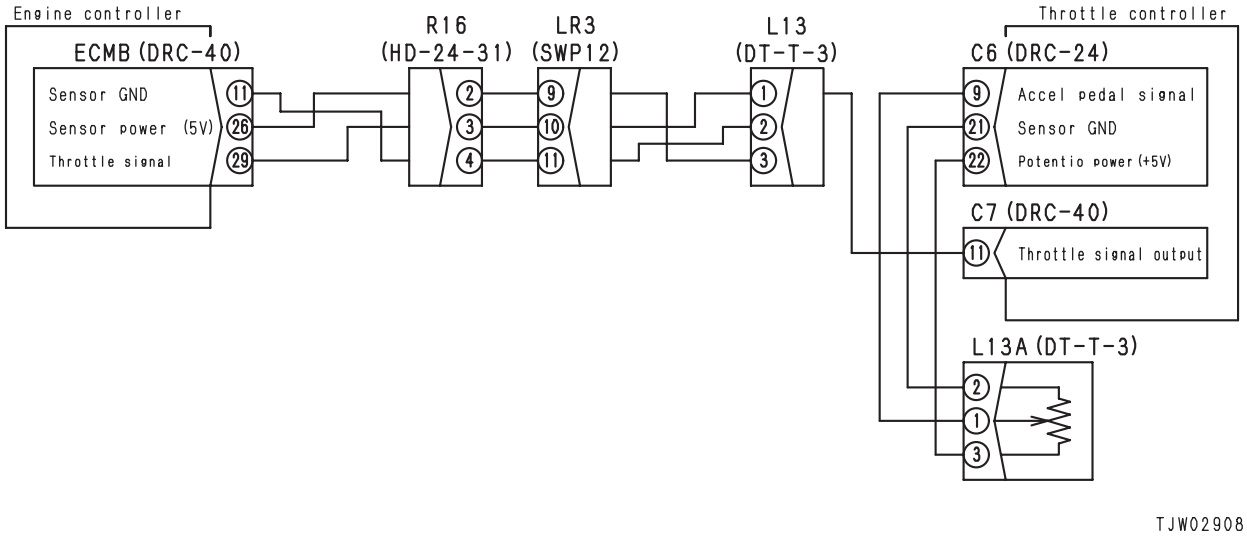
Legend
○ : Possible cause (jugding from Questions and Check items)
◎ : Most probable causes (judging from Questions and Check items)
△ : Possible causes due to length of use (used for a long period)
● : Items confirm the cause

User code	System with abnormality	Nature of abnormality	Condition when normal
131	Abnormality in throttle sensor system high level	• Abnormality has occurred in throttle sensor circuit ECMB (29): 4.80 V or more detected	—
132	Abnormality in throttle sensor system low level	• Abnormality has occurred in throttle sensor circuit ECMB (29): 0.30 V or less detected	—
135	Abnormality in oil pressure sensor system high level	• Abnormality has occurred in oil pressure sensor circuit ECMB (24): 4.88 V or more detected	• Voltage of oil pressure sensor Between ECMA (6) and (17) (power source): 4.75 – 5.25 V Between ECMA (24) and (17) (signal): 0.42 – 0.58 V (engine stopped)
141	Abnormality in oil pressure sensor system low level	• Abnormality has occurred in oil pressure sensor circuit ECMA (24): 0.31 V or less detected	• 14. Voltage of oil pressure sensor Between ECMA (6) and (17) (power source): 4.75 – 5.25 V Between ECMA (24) and (17) (signal): 0.42 – 0.58 V (engine stopped)
143	Abnormal drop in oil pressure (level 1)	• Oil pressure sensor detected pressure lower than set oil pressure (level 1) Level 1 judgment value (reference) At 600 rpm Max. 0.05 MPa { 0.5 kg/cm^2} At 1000 rpm Max. 0.09 MPa { 0.9 kg/cm^2} At 1500 rpm Max. 0.15 MPa { 1.5 kg/cm^2} At 1800 rpm Max. 0.18 MPa {1.85 kg/cm^2} At 2000 rpm Max. 0.21 MPa { 21 kg/cm^2}	—
144	Abnormality in water temperature sensor system high level	• Abnormality has occurred in water temperature sensor circuit ECMA (22): 4.95 V or more detected	• Resistance of water temperature sensor Between CLTP (A) and (B): 600 – 36k Ω
145	Abnormality in water temperature sensor system low level	• Abnormality has occurred in water temperature sensor circuit ECMA (22): 0.21 V or less detected	• Resistance of water temperature sensor Between CLTP (A) and (B): 600 – 36k Ω
151	Abnormal rise in water temperature	• Water temperature sensor has detected temperature higher than set temperature Judgment value (reference): Min. 105°C	
153	Abnormality in intake air temperature sensor system high level	• Abnormality has occurred in intake air temperature sensor circuit ECMA (23): 4.88 V or more detected	• Resistance of intake air temperature sensor Between IMTP (A) and (B): 36 – 600 Ω
154	Abnormality in intake air temperature sensor system low level	• Abnormality has occurred in intake air temperature sensor circuit ECMA (23): 0.08 V or less detected	• Resistance of intake air temperature sensor Between IMTS (A) and (B): 36 – 600 Ω
221	Abnormality in atmospheric pressure sensor system high level	• Abnormality has occurred in atmospheric pressure sensor circuit ECMA (34): 4.78 V or more detected	• Voltage of atmospheric temperature sensor Between ECMA (6) and (17) (power source): 4.75 – 5.25 V Between ECMA (34) and (17) (signal): 0.42 – 0.58 V (engine stopped)
222	Abnormality in atmospheric pressure sensor system low level	• Abnormality has occurred in atmospheric pressure sensor circuit ECMA (34): 0.20 V or less detected	• Voltage of atmospheric pressure sensor Between ECMA (6) and (17) (power source): 4.75 – 5.25 V Between ECMA (34) and (17) (signal): 0.42 – 0.58 V (engine stopped)
234	Overspeed	• Engine speed sensor has detected speed higher than set speed Judgment value (reference): D375A :2,400 rpm or more WA600 :2,500 rpm or more PC1100 :2,400 rpm or more Morita :2,550 rpm or more	—

EA-4 Error code [115] (Abnormality in engine speed sensor 2 system)



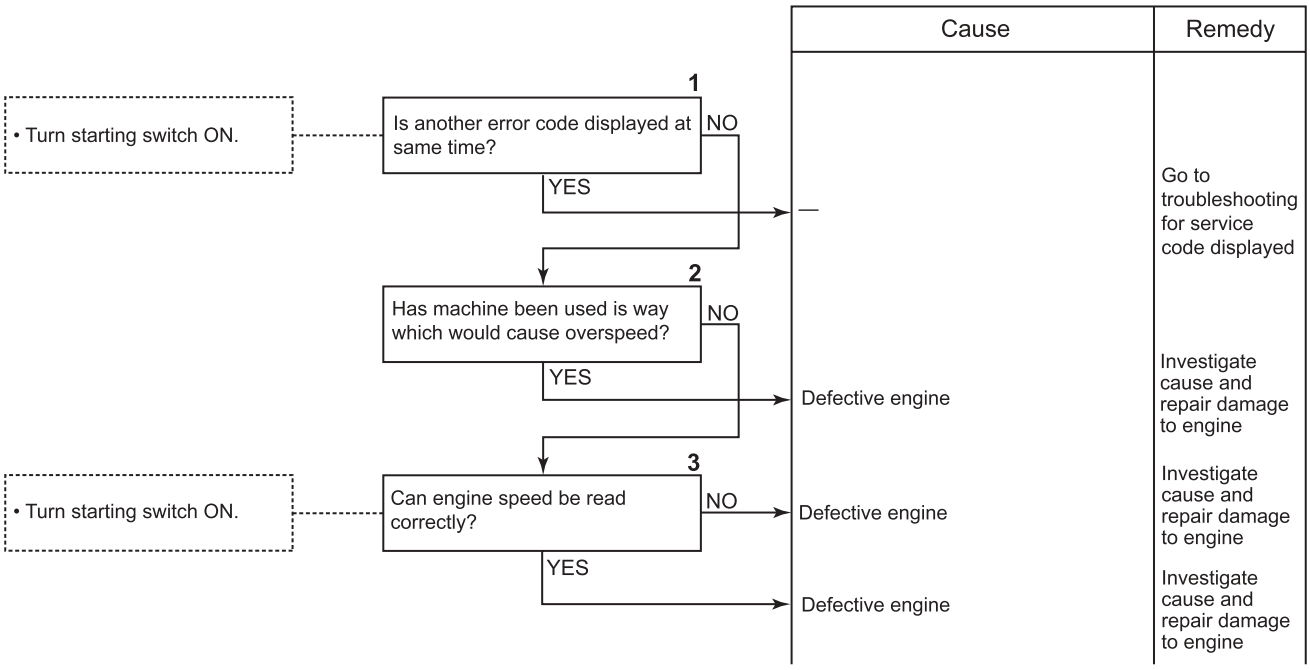
EA-12 Related electrical circuit diagram



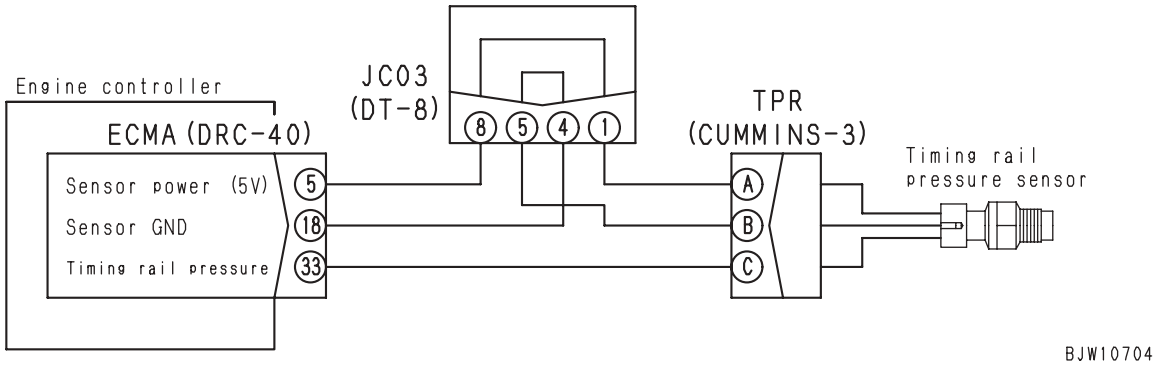
EA-13 Error code [132] (Abnormality in accelerator sensor system low level)

★ Carry out troubleshooting for error code [131].

EA-24 Error code [234] (Overspeed)



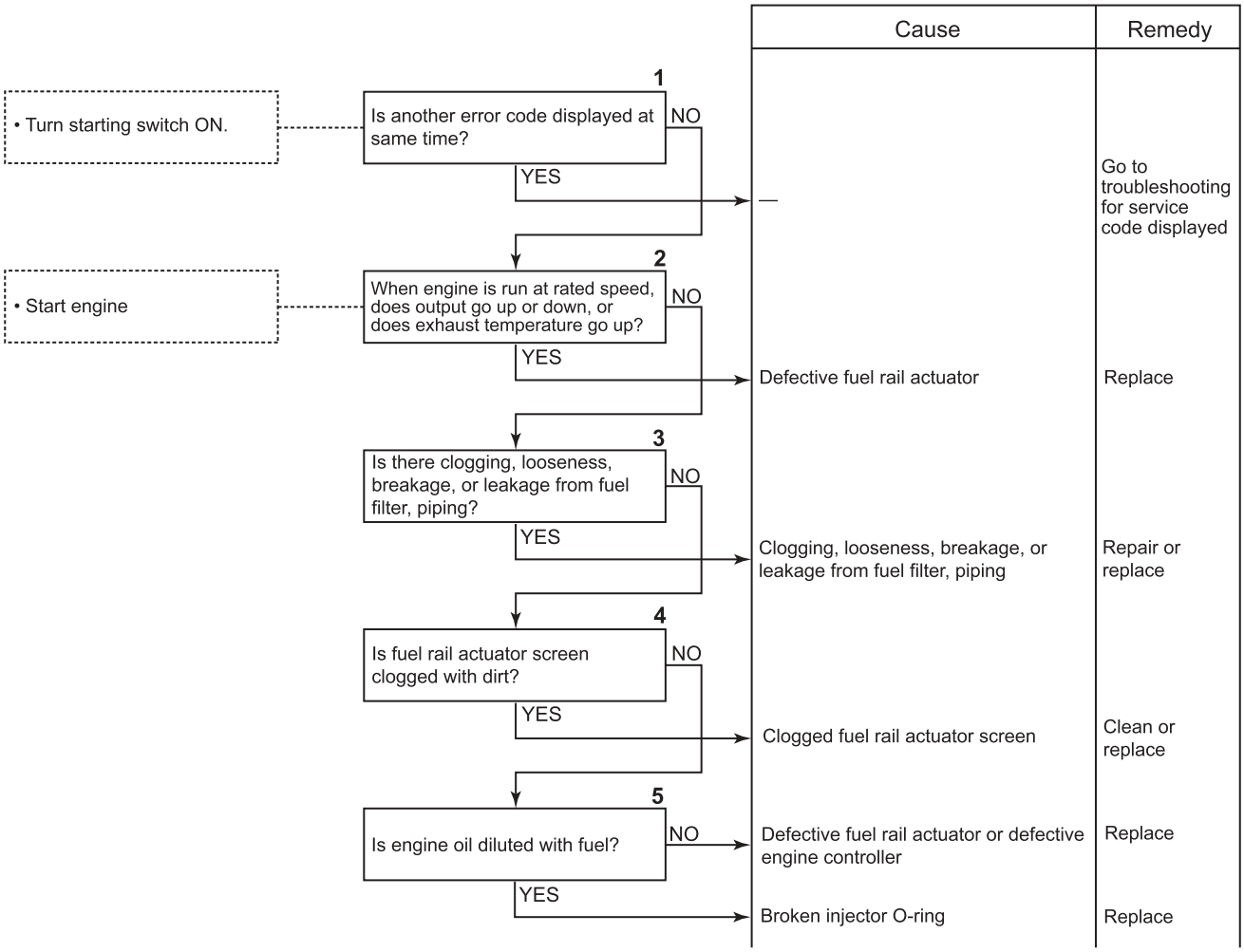
EA-36 Related electrical circuit diagram



EA-44 Error code [467] (Abnormality in timing rail actuator control)

★ Carry out troubleshooting for error code [112].

EA-45 Error code [468] (Abnormality in fuel rail actuator control)



EA-46 Error code [514] (Abnormality in fuel rail actuator)

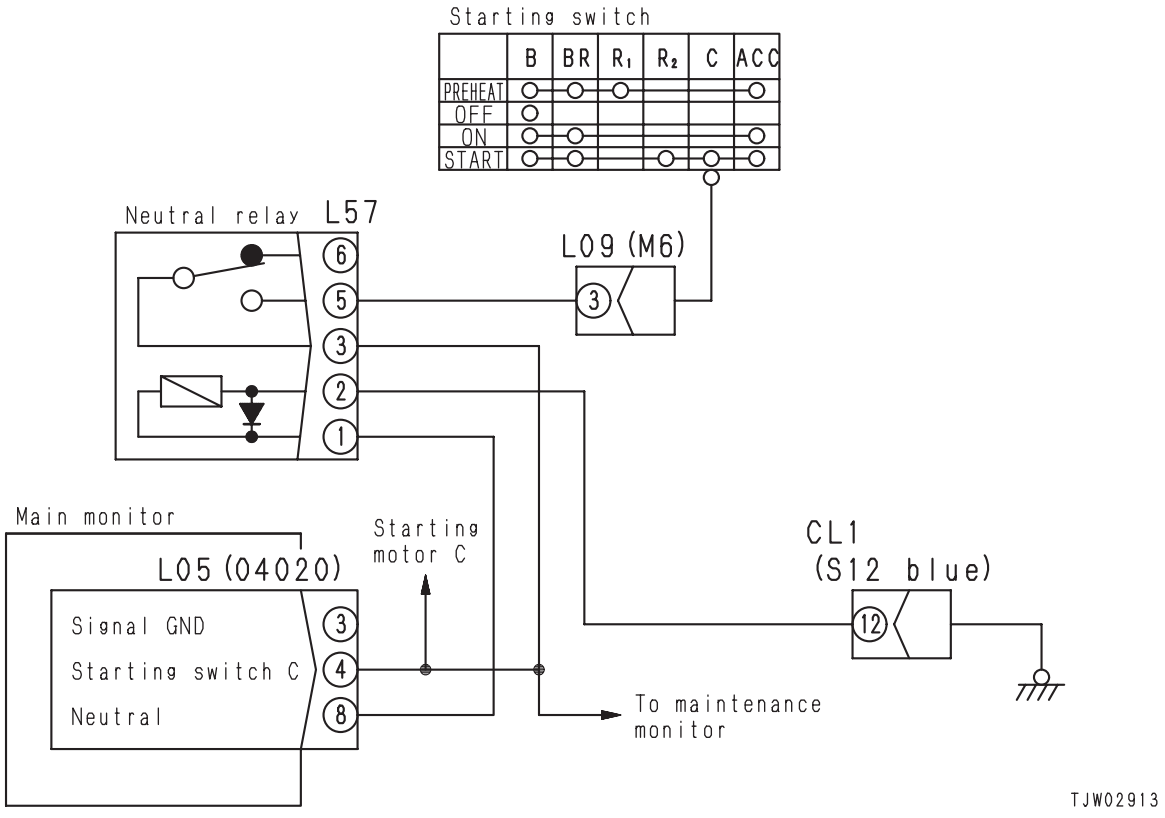
★ Carry out troubleshooting for error code [468].

M-2 When starting switch is turned ON and engine is started immediately, all lamps stay lighted up

★ Before disconnecting or connecting connectors, always turn starting switch OFF.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

	Cause	Remedy
1 Is voltage between L05 (4) and chassis ground normal? • 20 – 30 V • Turn starting switch to START. — YES	Defective main monitor	Replace
NO	Defective contact or disconnection in wiring harness between L05 (female) (4) and L57 (female) (3)	Repair or replace

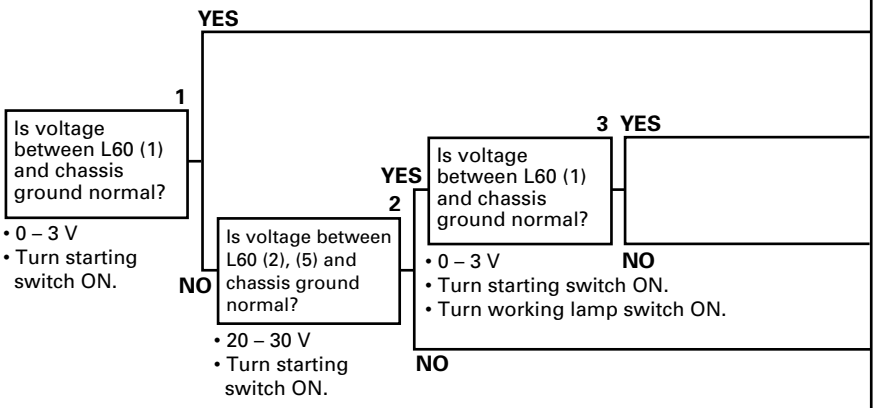
M-2 Related electrical circuit diagram



M-10 Abnormality in front working lamp

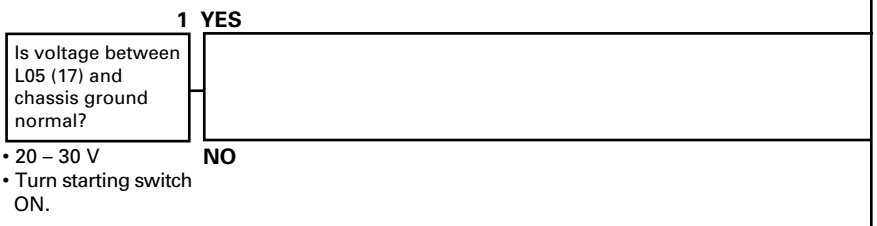
★ Before disconnecting or connecting connectors, always turn starting switch OFF.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.
★ Before starting troubleshooting, check that the monitor lighting is lighted up.

a) Neither monitor display nor front working lamp light up



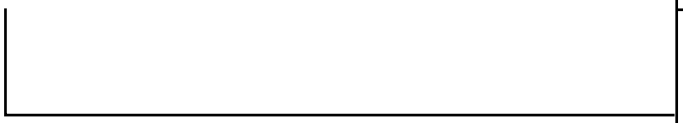
Cause	Remedy
Defective contact or disconnection in wiring harness between L60 (female) (1), L05 (female) (17) and CL1 (female) (7)	Repair or replace
Defective front working lamp relay	Replace
Defective main monitor or defective contact or discon-nection in wiring harness between L60 (female) (6) and L06 (female) (1)	Repair or replace
Defective contact or discon-nection in wiring harness between L60 (female) (2), (5) and FS5 (female) (1)	Repair or replace

b) Working lamp lights up but monitor display does not light up



Cause	Remedy
Defective main monitor	Replace
Defective contact or discon-nection in wiring harness between L05 (female) (17) and L60 (female) (1)	Repair or replace

c) Monitor display lights up but working lamp does not light up

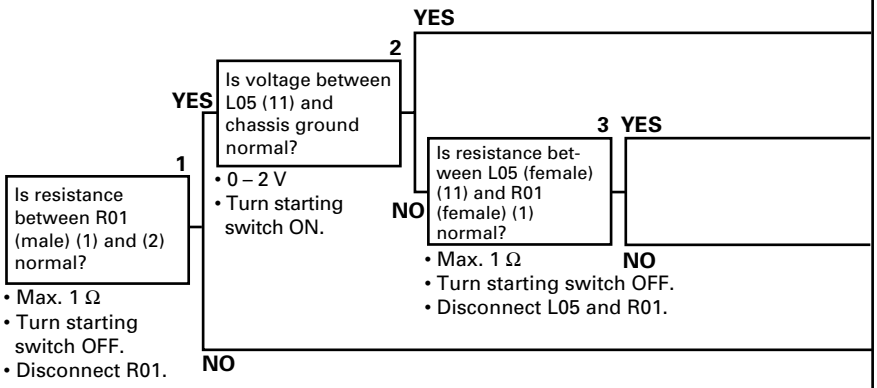


Cause	Remedy
Defective contact or discon-nection in wiring harness between L60 (1) – CL1 (7) – C03 (female) (1), C04 (female) (1), or blown working lamp bulb	Repair or replace

M-18 Abnormality in emergency steering display

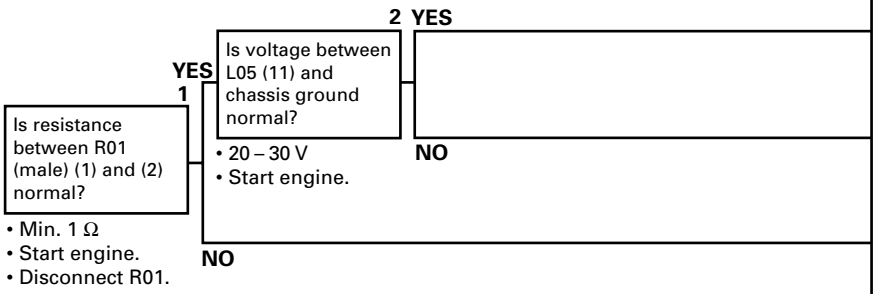
★ Before disconnecting or connecting connectors, always turn starting switch OFF.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

a) Emergency steering display does not flash



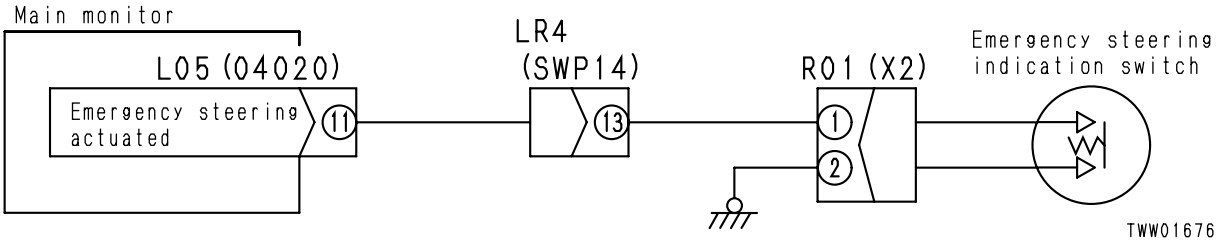
Cause	Remedy
Defective main monitor	Replace
Defective contact or discon -nection in wiring harness between R01 (female) (2) and chassis ground	Repair or replace
Defective contact or discon -nection in wiring harness between L05 (female) (11) and R01 (female) (1)	Repair or replace
Defective emergency steering lamp switch	Replace

b) Emergency steering display stays flashed



Cause	Remedy
Defective main monitor	Replace
Short circuit with chassis ground in harness between L05 (female) (11) and R01 (female) (1)	Repair or replace
Defective emergency steering lamp switch	Replace

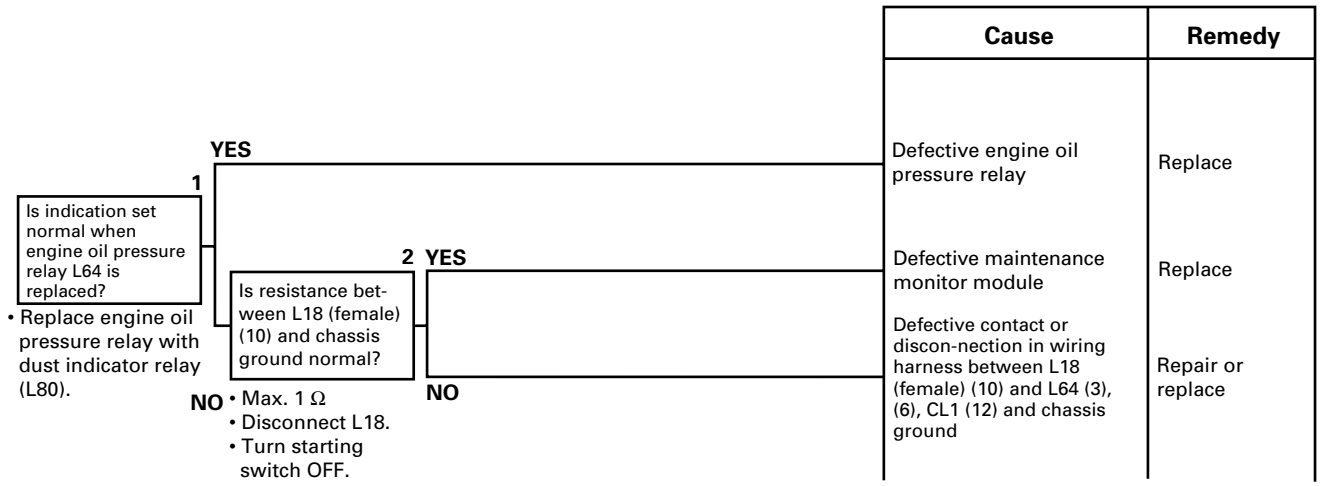
M-18 Related electrical circuit diagram



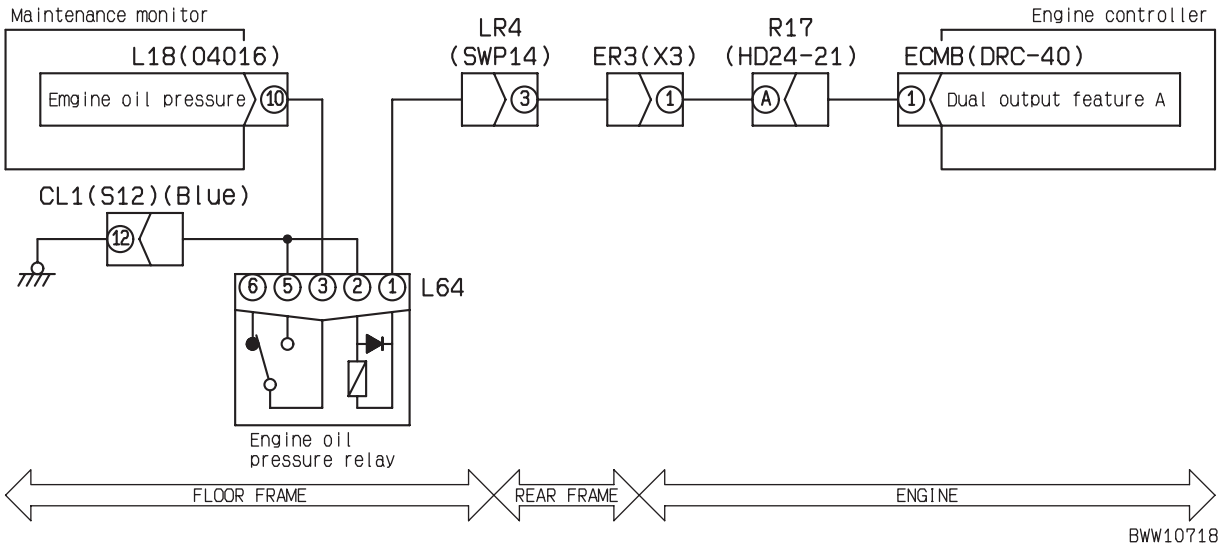
K-5 When engine is stopped and starting switch is turned ON, CAUTION item display flashes

★ Before disconnecting or connecting connectors, always turn starting switch OFF.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.
★ Check that Error Code [527] is not displayed in the engine controller.

a) Engine oil pressure display flashes
(Check that the engine oil pressure is correct.)

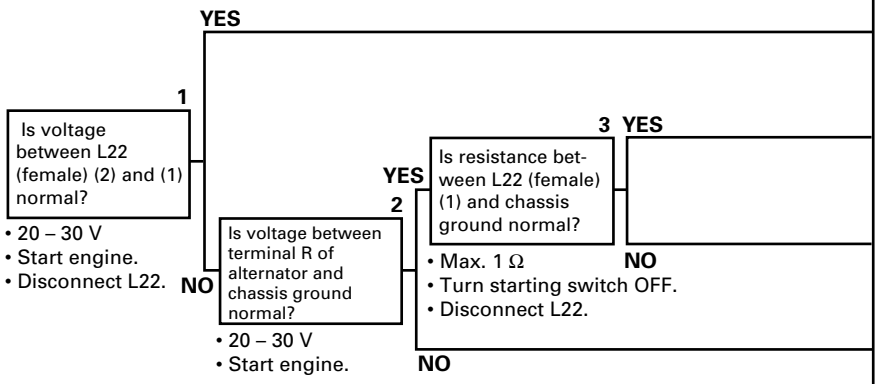


K-5 a) Related electrical circuit diagram



K-12 Service meter does not work

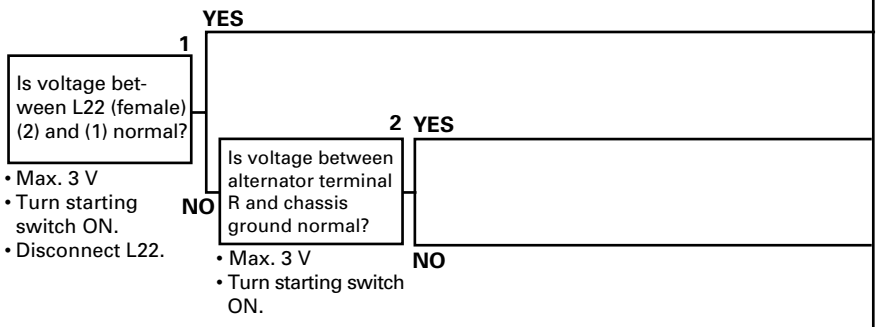
★ Before disconnecting or connecting connectors, always turn starting switch OFF.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.



Cause	Remedy
Defective service meter	Replace
Defective contact or disconnection in wiring harness between L22 (female) (2), LR4 (6), ER1 (9) and terminal R of alternator	Repair or replace
Defective contact or disconnection in wiring harness between L22 (female) (1), CL1 (12) and chassis ground	Repair or replace
Defective alternator	Replace

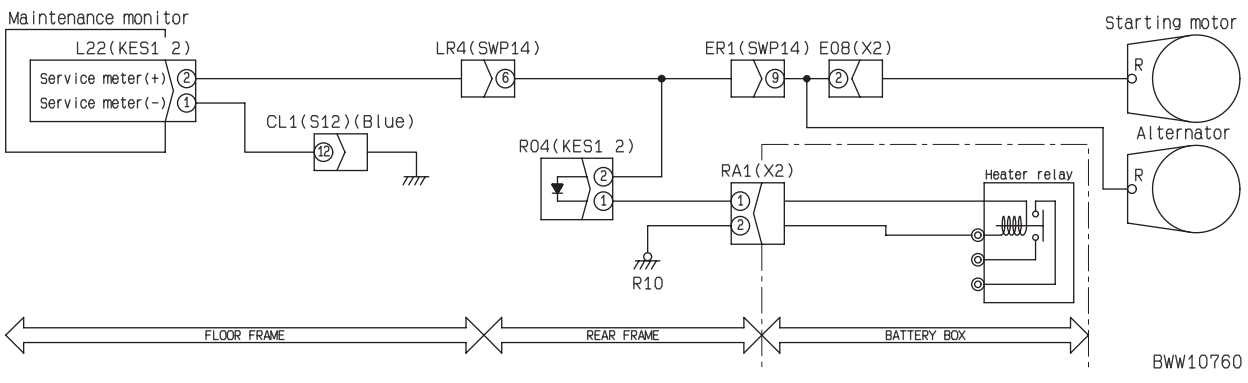
K-13 Service meter is running even when engine is stopped

★ Before disconnecting or connecting connectors, always turn starting switch OFF.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.



Cause	Remedy
Defective service meter	Replace
Contact of +24V with wiring harness between L22 (female) (2) – LR4 (6) – ER1 (9) – alternator terminal R	Repair or replace
Defective alternator	Replace

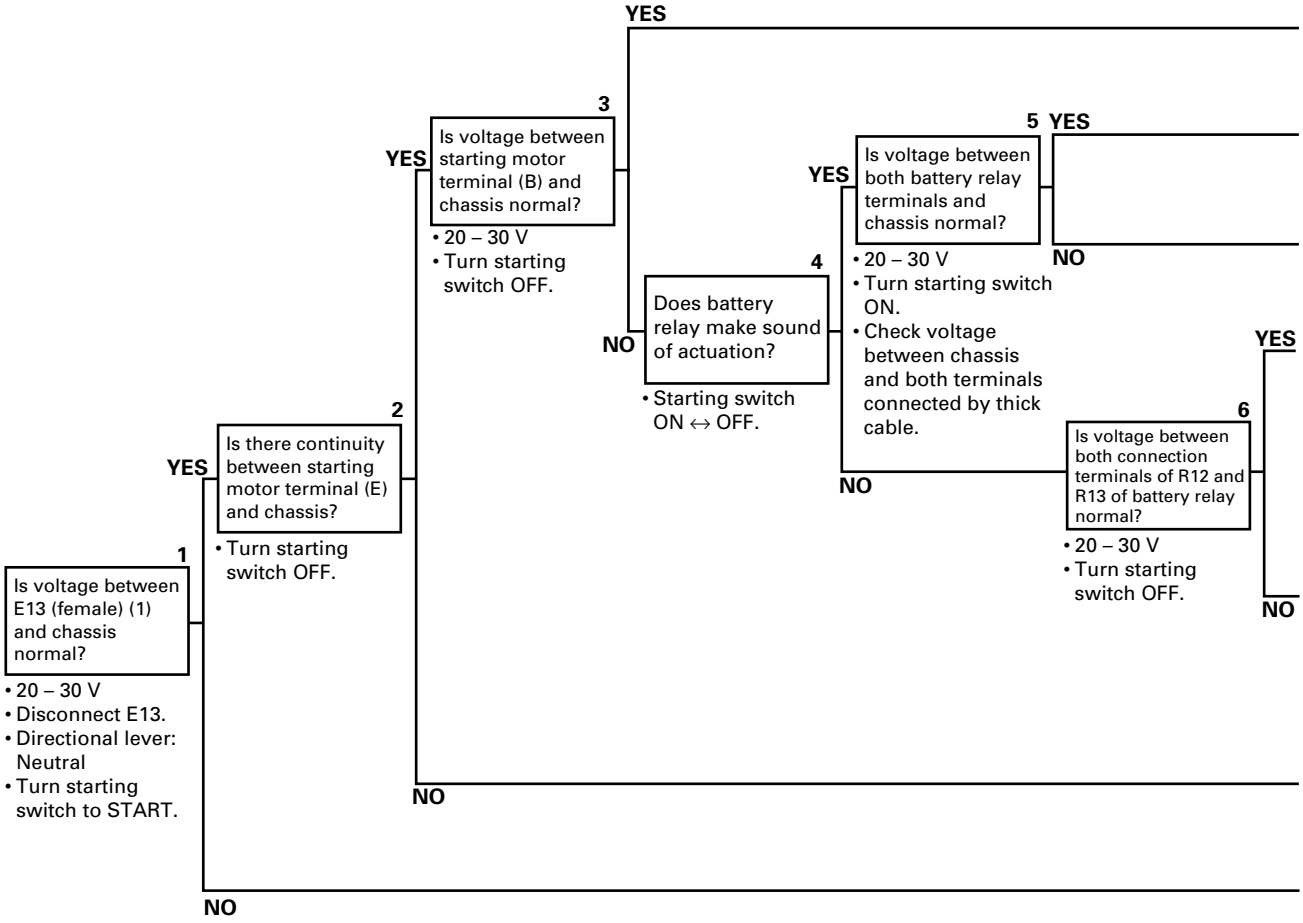
K-12,13 Related electrical circuit diagram



E-1 Engine does not start

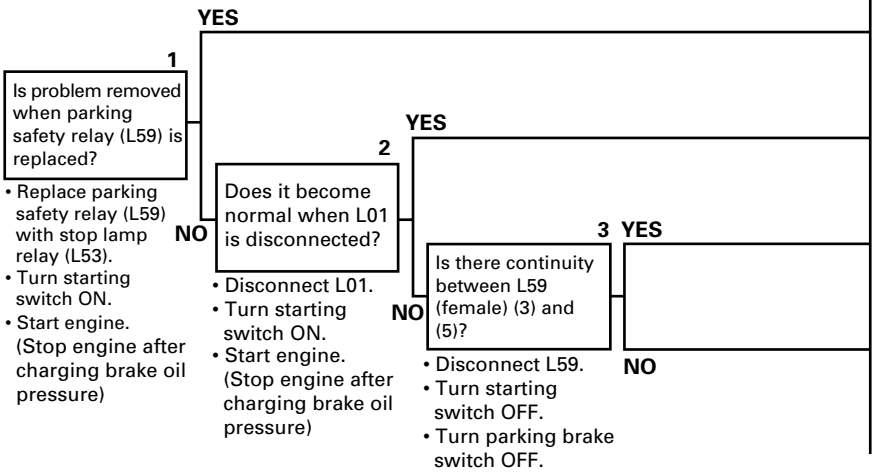
★ When connecting or disconnecting the T-adapter (or socket adapter) or short connector to carry out checks, always turn the starting switch OFF before starting.
★ When connecting the T-adapter (or socket adapter), connect to the connector specified as CN○△( ).
★ After checking, connect the disconnected connectors and disconnect the T-adapter immediately to return to the original condition before going on to the next check.

Starting motor does not turn



E-5 Parking brake is released when starting switch is turned ON

★ When connecting or disconnecting the T-adapter (or socket adapter) or short connector to carry out checks, always turn the starting switch OFF before starting.
★ When connecting the T-adapter (or socket adapter), connect to the connector specified as CN○△( ).
★ After checking, connect the disconnected connectors and disconnect the T-adapter immediately to return to the original condition before going on to the next check.



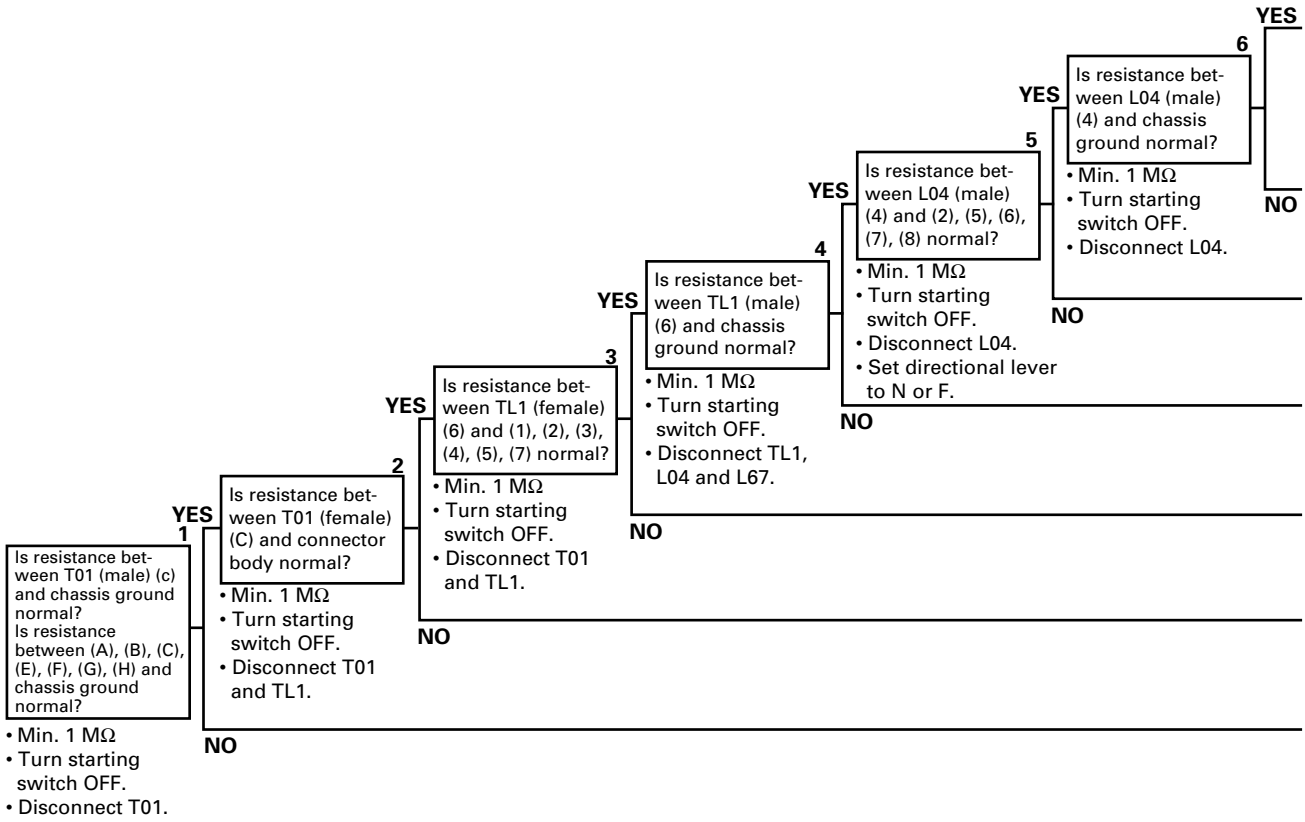
Cause	Remedy
Defective parking safety relay	Replace
Defective parking brake switch	Replace
Contact of wiring harness between L59 (5) and (female)(3)(1)	Repair or replace
Contact of wiring harness between L01 (female) (1) and (2)	Repair or replace

E-6 Transmission does not change to neutral when parking brake is applied, but parking brake works normally

★ Carry out T-16 of TROUBLESHOOTING OF TRANSMISSION CONTROL SYSTEM.

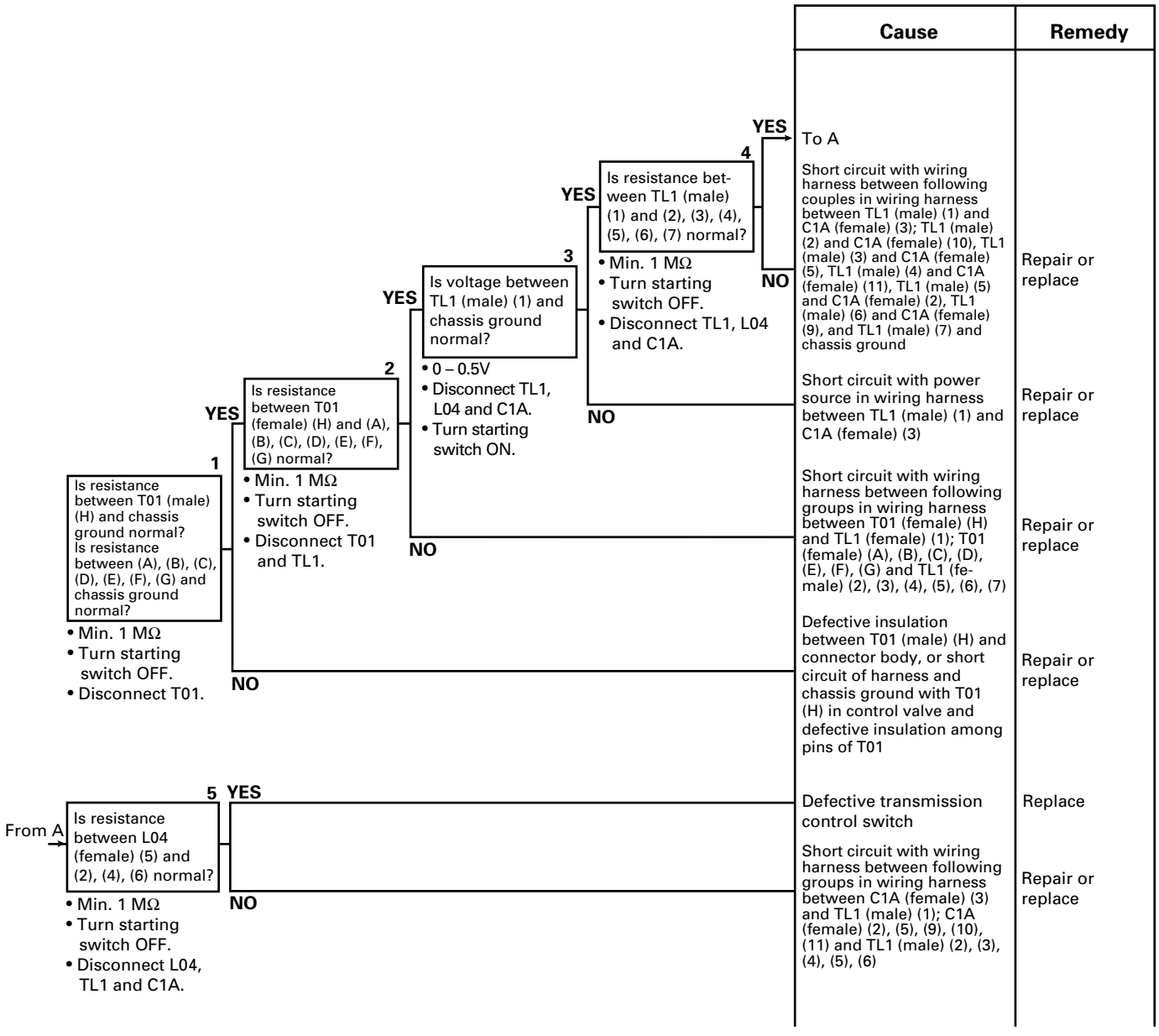
d) Short circuit to chassis ground in directional solenoid circuit

1) Short circuit to chassis ground in travel FORWARD circuit



f) Short circuit to chassis ground in shift solenoid circuit

1) Short circuit to chassis ground in 1st solenoid circuit



TROUBLESHOOTING OF HYDRAULIC AND MECHANICAL SYSTEM (H MODE)

H-10 Turning, response of steering is poor [machine with joystick]

Ask the operator the following questions.
- Did the problem suddenly start?
  Yes = Related equipment broken
- Was there any abnormal noise when this happened? Where did the noise come from?
- Was there previously any symptom, such as difficulty in steering?
  Yes = Wear of related equipment, defective seal

Checks before troubleshooting
- Is the oil level in the hydraulic tank correct? Is the type of oil correct?

No.	Problems		Remedy	Causes: Defective PTO	Air sucked in at suction end of pump	Defective PPC pump	Defective steering pump	Defective switch pump	Defective charge valve	Defective Orbit-roll	Clogged filter	Defective actuation of joystick solenoid valve	Defective actuation of stop valve	Defective actuation of demand spool	Defective main relief valve
				Hydraulic pump					Charge valve	Orbit-roll	Joystick		Stop valve	Steering valve	
				a	b	c	d	e	f	g	h	i	j	k	l
			△ ×	△	△	×	×	×	△ ×	△ ×	C ×	×	△ ×	△ ×	△ ×
1	When steering mode switch is switched	Abnormality only in steering wheel mode							○						
2		Abnormality only in joystick mode								○	○				
3		Abnormality in both modes	○	○	○	○	○	○	○			○	○	○	
4	Turning, response of steering is poor in both directions (left and right)		○	○	○	○	○	○	○	○	○		○	○	
5	Turning, response of steering is poor in one direction (left or right)											○			
6	Steering wheel is heavy in both directions (left and right)								○						
7	Steering wheel is heavy in one direction (left or right)											○			
8	Work equipment moves								○	○	○	○	○		
9	Work equipment does not move		○	○	○	○	○	○							
10	Abnormal noise comes from around PTO		○												
11	Abnormal noise comes from around steering pump or hydraulic tank			○		○									
12	Abnormal noise comes from around switch pump or hydraulic tank			○			○								
13	When steering relief pressure is measured	Oil pressure is low in both directions (left and right)	○	○	○	○	○	○	○	○	○		○	○	
14		Oil pressure is low in one direction (left or right)										○			
15	When Orbit-roll output pressure is measured, oil pressure is found to be low				○		○	○							
16	When joystick solenoid valve output pressure is measured, oil pressure is found to be low				○		○		○	○					
17	When PPC valve (Orbit-roll) basic pressure is measured, oil pressure is found to be low				○		○								

★ There is a close connection between the steering circuit and the work equipment circuit, so if any abnormality is felt in the steering, check the operation of the work equipment also.

H-20 Blade does not rise

Ask the operator the following points.
- Did the problem suddenly fail to rise?
  Yes = Seizure or damage to various units
- Was unusual noise produced?
  (Where did it emanate from?)
- Were there previous signs of blade slowing down ?
  Yes = Wear of parts of flattening of spring

Checks before troubleshooting
- Is oil level in hydraulic tank correct?
- Is travel of work equipment lever correct?

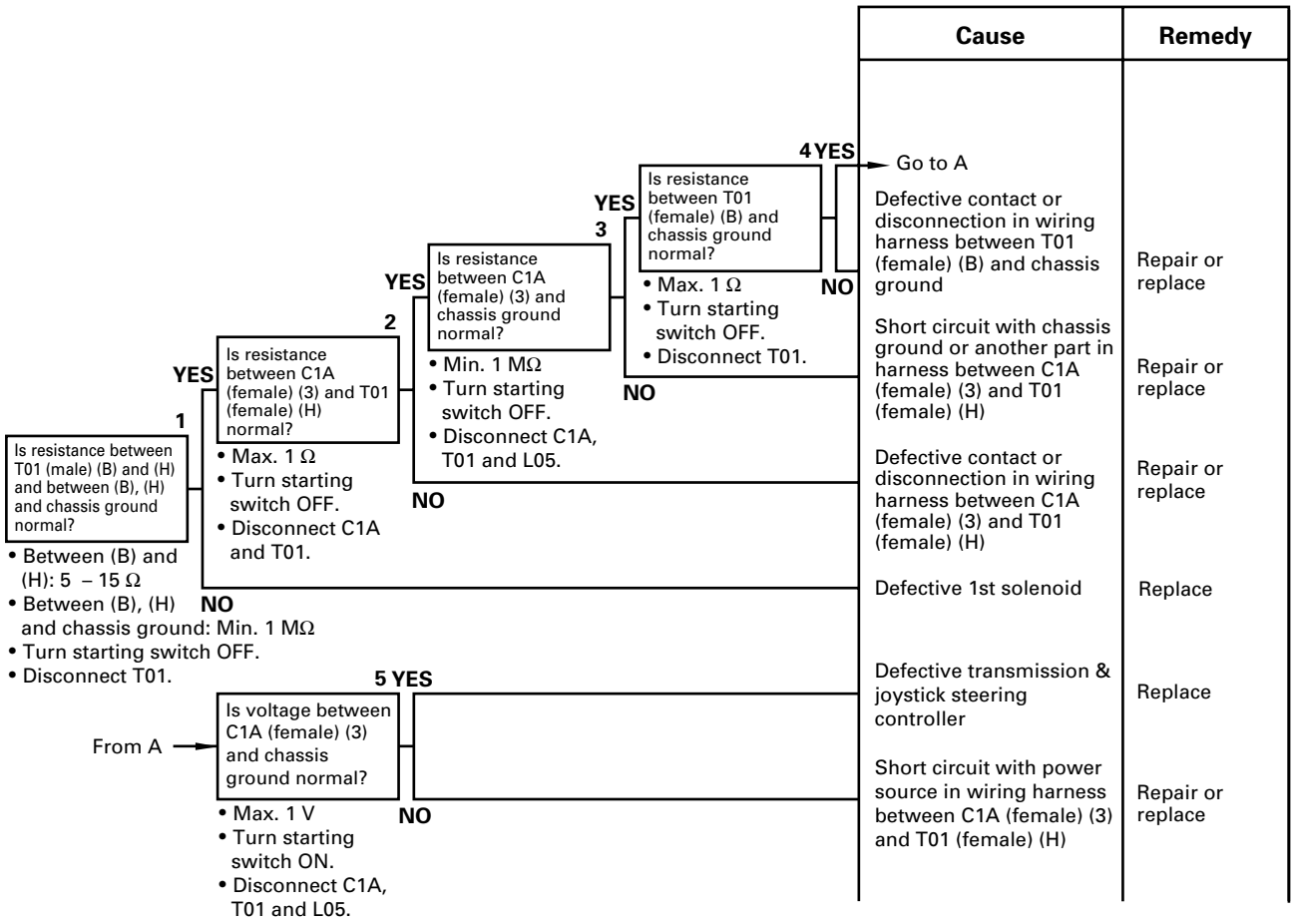
No.	Problems \ Remedy / Causes	Tank-pump a: Blockage in suction port of pump or excessive amount of air contained in oil	Tank-pump b: Pump PTO is not being driven	Tank-pump c: Faulty hydraulic and switch pump	Tank-pump d: Faulty PPC pump	Steering valve e: Defective actuation of demand spool	PPC valve f: Defective actuation of relief valve	PPC valve g: Defective actuation of spool	Work equipment control valve h: Defective actuation of main relief valve	Work equipment control valve i: Internal damage valve body (lift spool)	Cylinder j: Damaged lift cylinder piston seal
	Remedy	C △	△ ×	△ ×	△ ×	×	△ ×	△ ×	△ ×	×	×
1	The blade is unable to pitch, tilt, or rise	○	○	○	○	○	○		○	○	
2	The machine body can be lifted up by the blade however the blade is unable to rise. Or the blade can tilt however the blade is unable to rise.							○		○	○
3	The blade can rise under no load but cannot rise under load	○		○					○		
4	The hydraulic pump produces an abnormal noise	○		○	○						
5	Lift cylinder has large amount of hydraulic drift									○	○
6	When the engine is at full, steering action is light and excessively fast					○					
7	When the engine is at full, steering action is heavy and slow	○		○							

JUDGEMENT TABLE FOR TRANSMISSION CONTROL SYSTEM

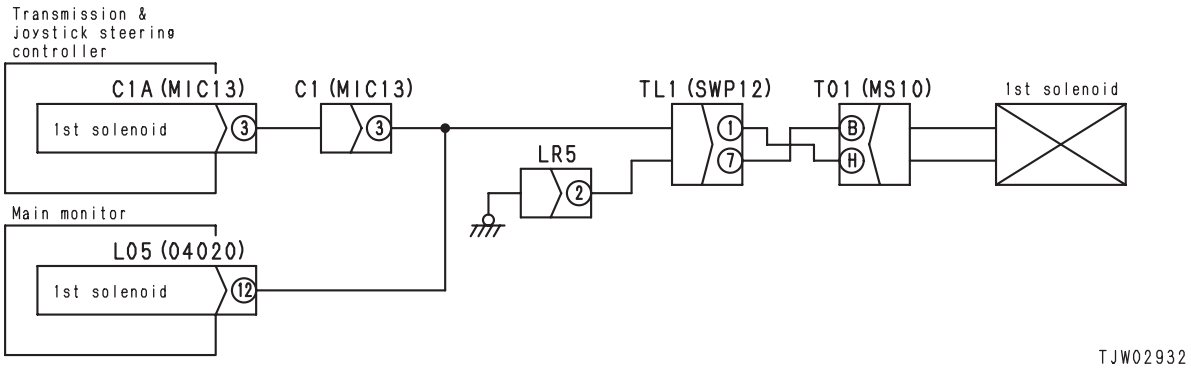
Location of failure / Failure code / Failure mode		Self-diagnostic display (abnormality display)																		Trouble-shooting code when no abnormality display is given
		Short circuit, disconnection in lock-up solenoid	Short circuit, disconnection in F solenoid	Short circuit, disconnection in R solenoid	Short circuit, disconnection in 1st solenoid	Short circuit, disconnection in 2nd solenoid	Short circuit, disconnection in 3rd solenoid	Short circuit, disconnection in 4th solenoid	Short circuit, disconnection in joystick directional switch system	Short circuit, disconnection in directional switch system	Short circuit, disconnection in shift switch system	Disconnection in travel speed sensor system	Short circuit, disconnection in engine speed sensor system	Abnormality in kickdown switch signal system	Abnormality in transmission cut-off signal system	Abnormality in neutralizer signal system	Abnormality in alarm buzzer signal system	Abnormality in network signal system	Abnormality in network signal system or main monitor	
		10	12	13	14	15	16	17	19	20	21	22	23	—	—	—	—	—	—	
1	Travel is impossible		○	○	○	○	○	○	△	△	△									E-1, H-1
2	Directional lever and direction of travel are different									○										
3	Machine travels forward when directional lever is not at F		○							○										
4	Machine travels in reverse when directional lever is not at R.			○						○										
5	There is excessive gearshifting shock											○	○							H-2, H-3
6	There is shift hunting when traveling										○									
7	There is shift hunting when shifting gear												○							
8	Speed range cannot be controlled with speed control lever										○									
9	Kickdown does not work													○						T-14, E-7
10	Transmission is not cut off with left brake														○					T-15
11	It is possible to travel even when parking brake is applied															○				T-16, E-3
12	If F-R lever is operated when traveling at high speed, alarm buzzer does not sound																○			T-17
13	Alarm buzzer continues to sound																○			T-17, J-1
14	Main monitor does not display transmission controller information (alarm buzzer, failure code, etc.)																	○		T-18
Troubleshooting code when failure code is displayed		T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8	T-9	T-10	T-11	T-12	–	–	–	–	–	–	

T-4 Failure code [14] (Short circuit, disconnection, or short circuit with power supply in 1st solenoid) is displayed

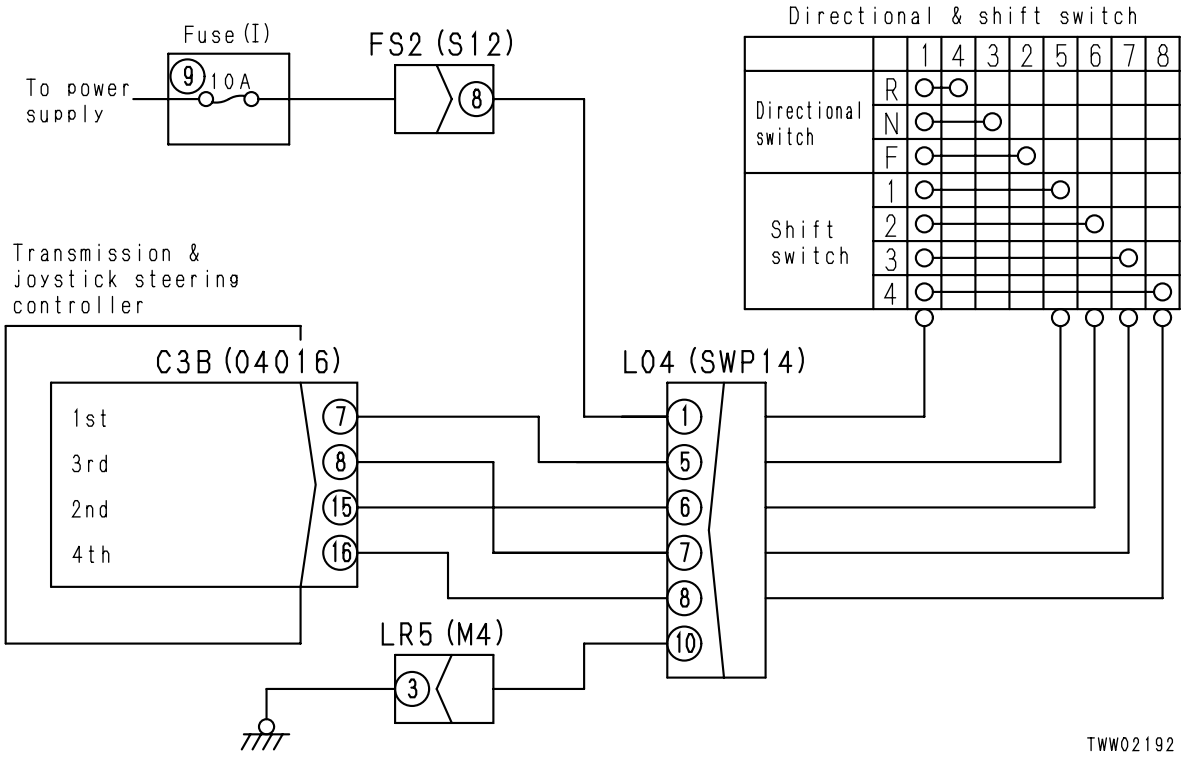
★ **This troubleshooting is carried out when there is still an abnormality, so when disconnecting the connector and inserting the T-adapter, or when removing the T-adapter and returning the connector to its original position, if the failure code is no longer displayed on the monitor display, the problem has been removed.**
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.



T-4 Related electrical circuit diagram

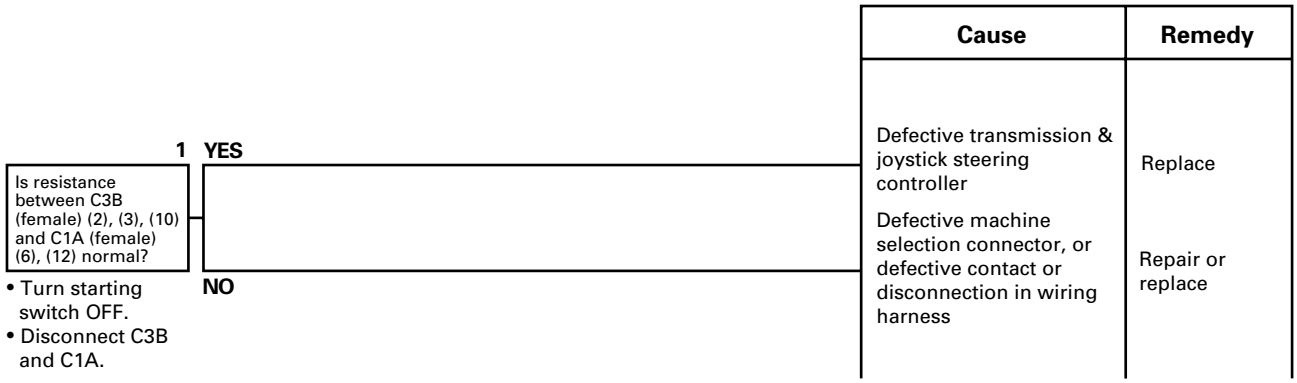


T-10 Related electrical circuit diagram



T-21 Abnormality in machine selection wiring harness

★ Check that machine selection connector is properly selected.
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

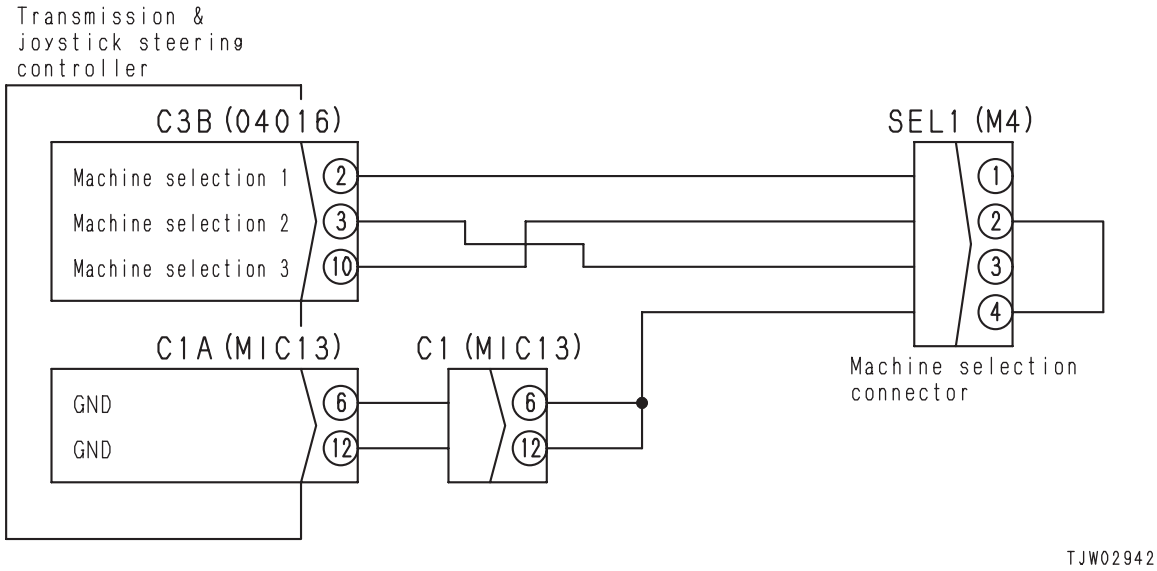


Cause	Remedy
Defective transmission & joystick steering controller	Replace
Defective machine selection connector, or defective contact or disconnection in wiring harness	Repair or replace

Table 1

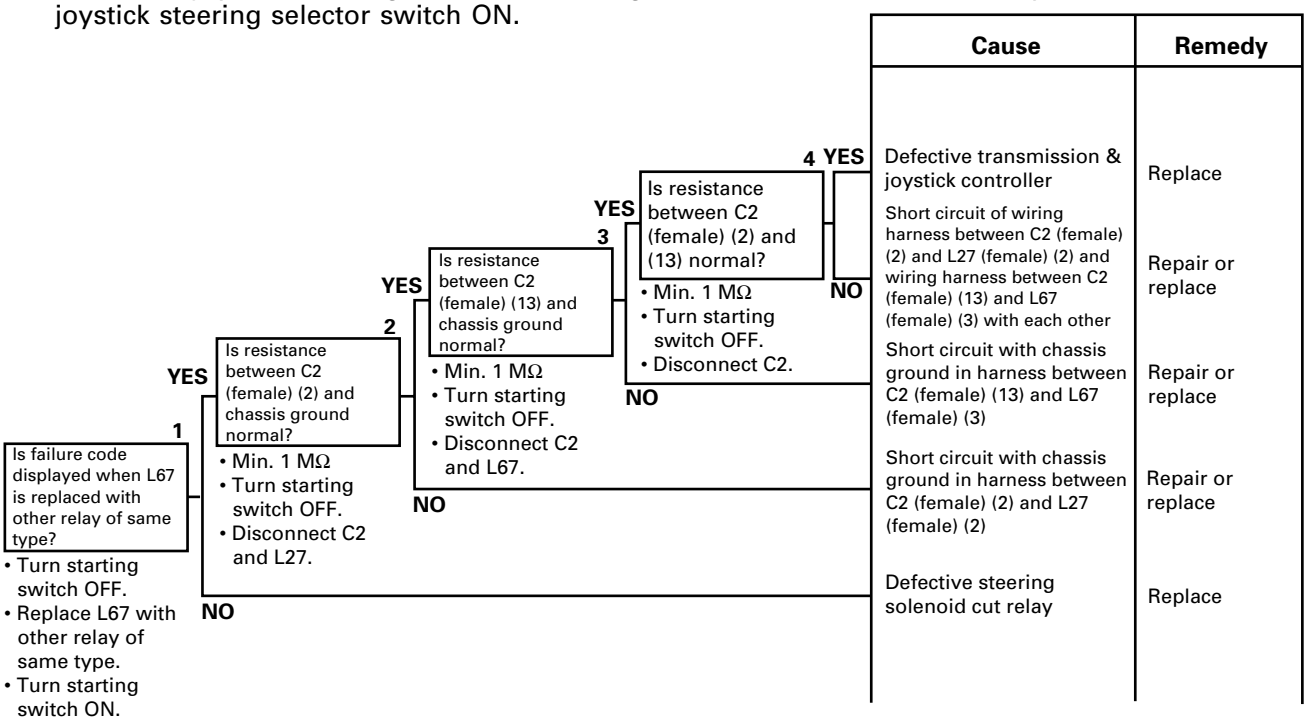
Connector \ Machine model	WA600-3
Between C3B (female) (2) and C1A (female) (6), (12)	Min. 1 MΩ
Between C3B (female) (3) and C1A (female) (6), (12)	Max. 1 Ω
Between C3B (female) (10) and C1A (female) (6), (12)	Min. 1 MΩ

T-21 Related electrical circuit diagram

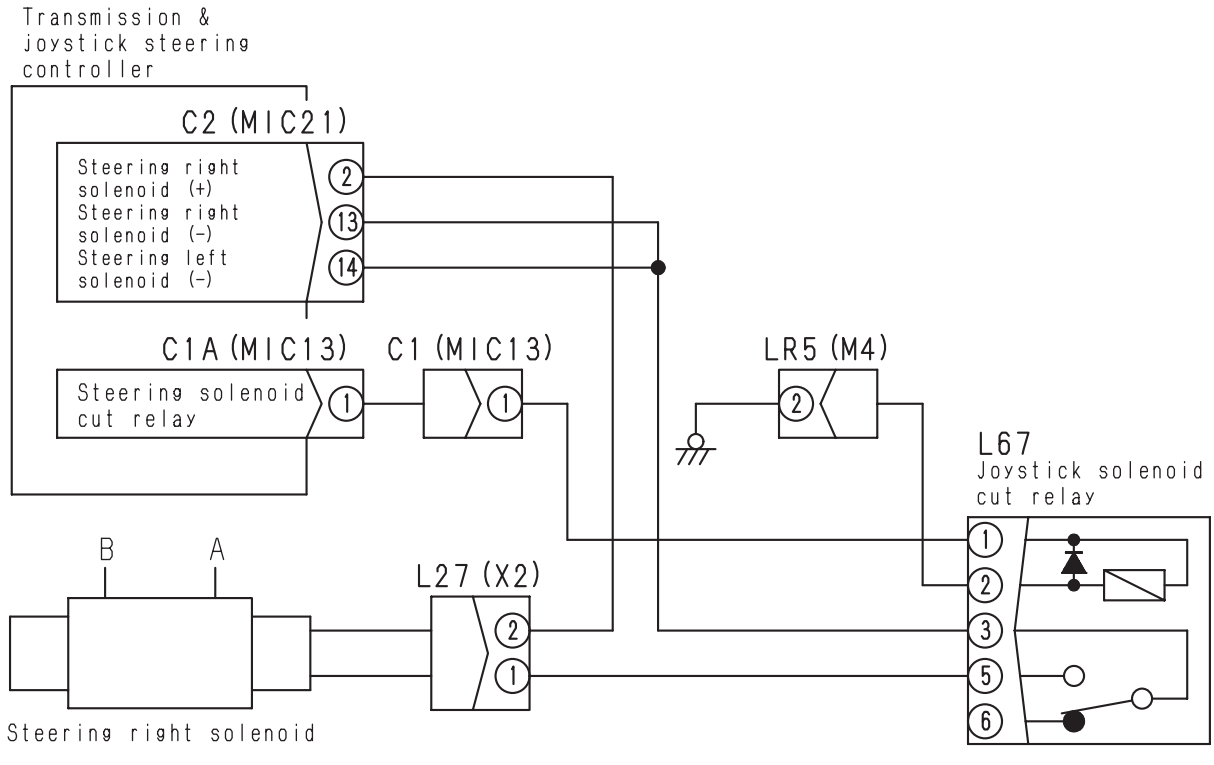


J-2 Failure code [57] (Short circuit in steering right solenoid (detected when signal is output)) is displayed

★ **This troubleshooting is carried out when there is still an abnormality, so when disconnecting the connector and inserting the T-adapter, or when removing the T-adapter and returning the connector to its original position, if the failure code is no longer displayed on the monitor display, the problem has been removed.**
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.
★ When the joystick steering lever is not being used, leave it at the neutral position and turn the joystick steering selector switch ON.



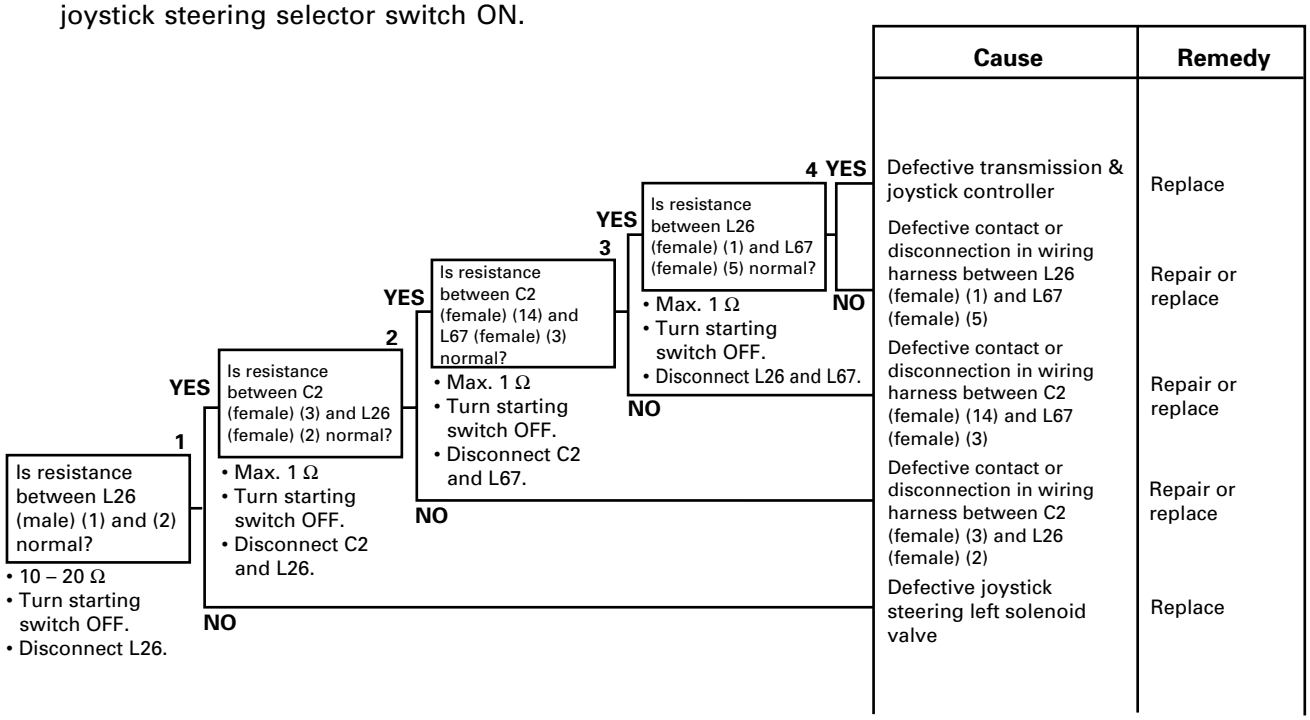
J-2 Related electrical circuit diagram



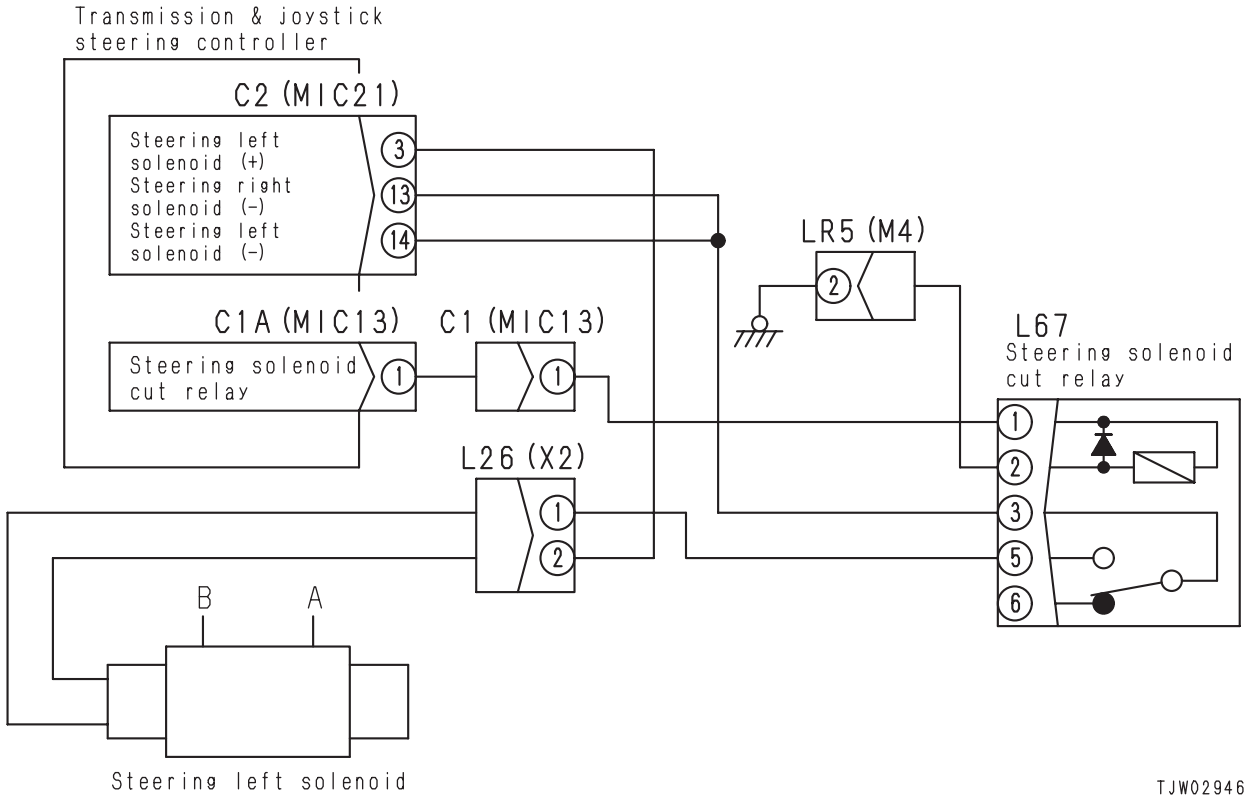
TJW02945

J-12 Disconnection in steering left solenoid

★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.
★ When the joystick steering lever is not being used, leave it at the neutral position and turn the joystick steering selector switch ON.

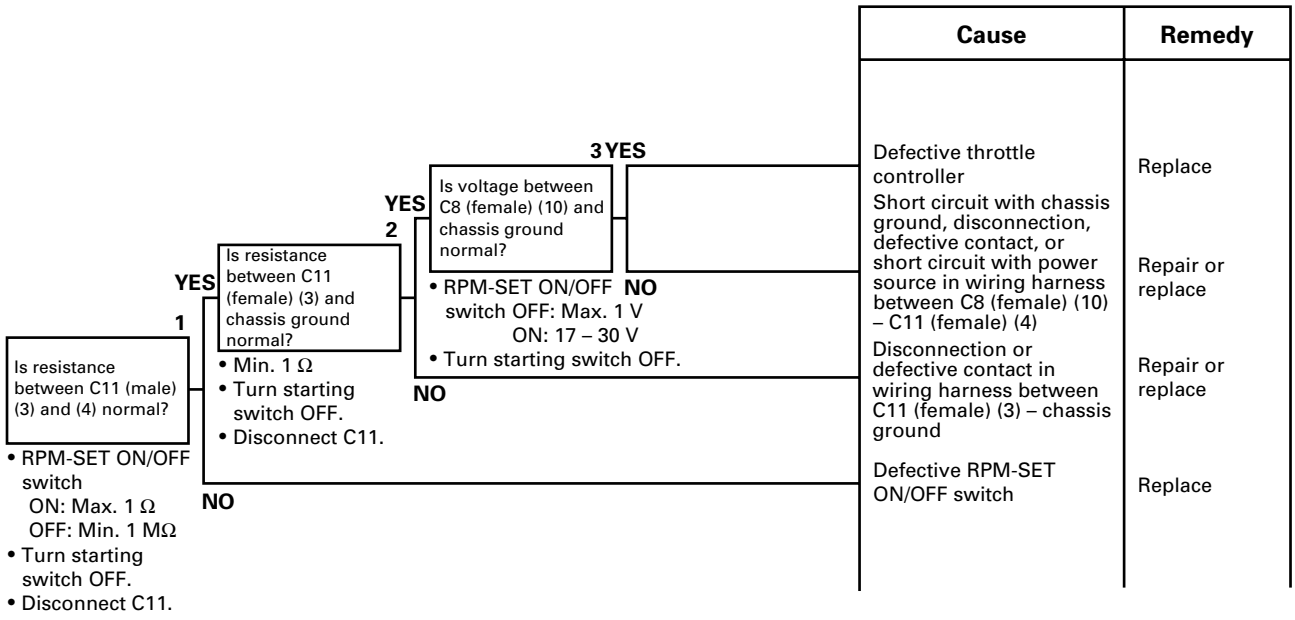


J-12 Related electrical circuit diagram

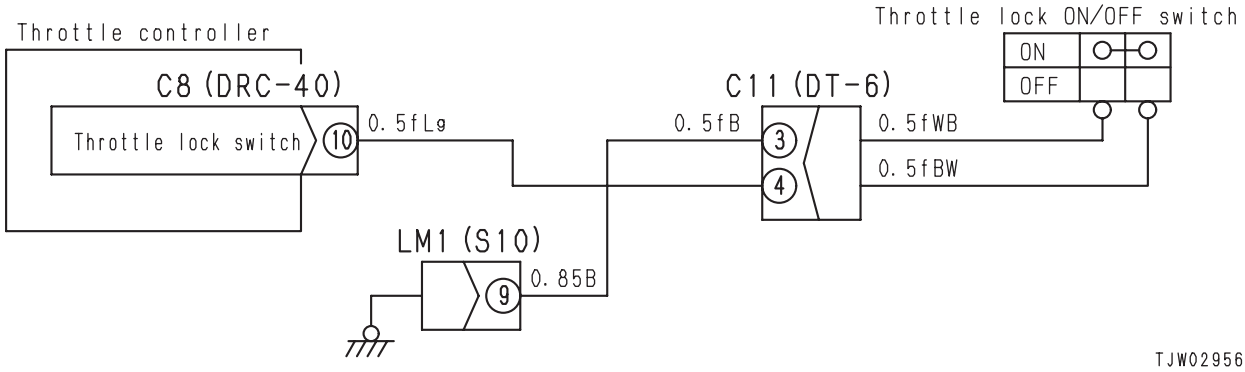


TH-6 Abnormality in RPM-SET ON/OFF switch system

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



TH-6 Related electrical circuit diagram

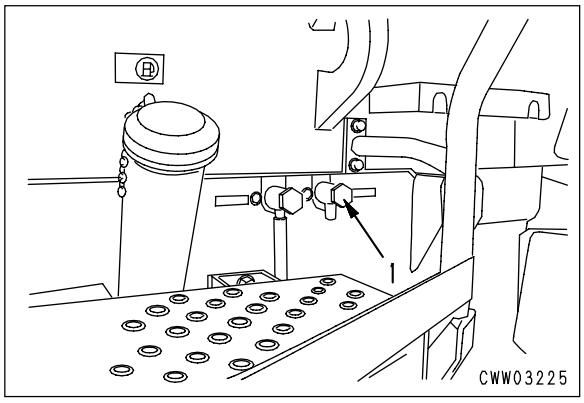


Component	Symbol		Part No.	Part Name	Necessity	Q'ty	New/ remodel	Sketch	Nature of work, remarks
Charging air conditioner with gas	X	1	799-703-1200	Service tool kit	■	1			Charging air conditioner with gas
			799-703-1110	Vacuum pump (220V)		1			
			790-703-1120	Vacuum pump (240V)		1			
			799-703-1400	Gas leak detector	■	1			

REMOVAL OF ENGINE AND TORQUE CONVERTER ASSEMBLY

⚠ Stop the machine on level ground and lower the work equipment completely to the ground, then put blocks under the wheels to prevent the machine from moving.

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



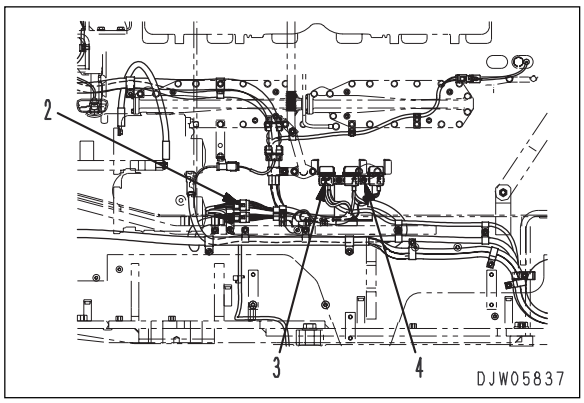
1. Remove the radiator . For details, see REMOVAL OF RADIATOR.

2. Disconnect engine oil drain valve (1) from the fitting portion.

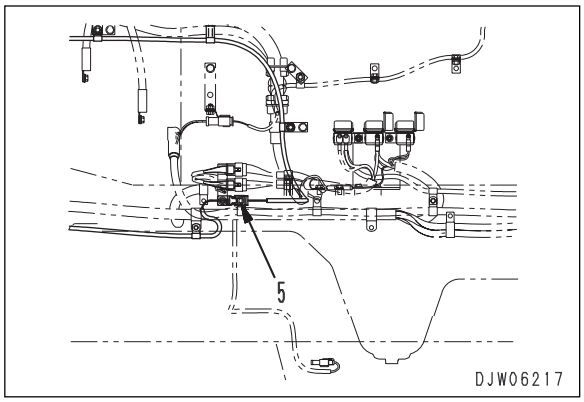
3. Disconnect connectors (2) (ER1, ER2, ER3).

4. Disconnect body grounding terminals (3) (E18, R10).

5. Disconnect wire (4) (E01) between the alternator and slow blow fuse on the slow blow fuse side.



6. Disconnect torque converter lockup wiring harness connector (5) (T08).

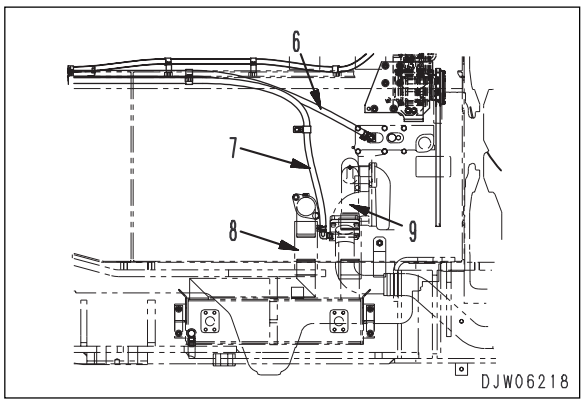


7. Disconnect heater hot water supply hose (6).

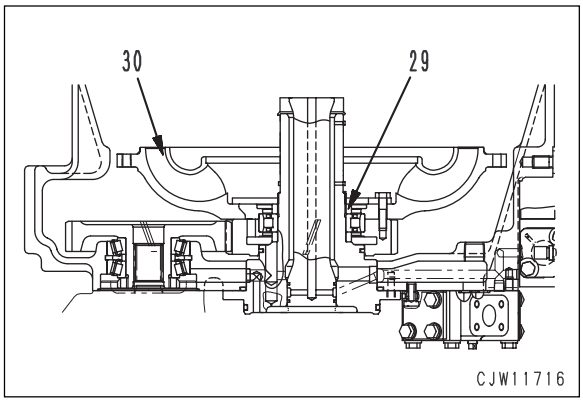
8. Disconnect heater hot water return hose (7).

9. Disconnect tube (8) between engine oil cooler and torque converter oil cooler.

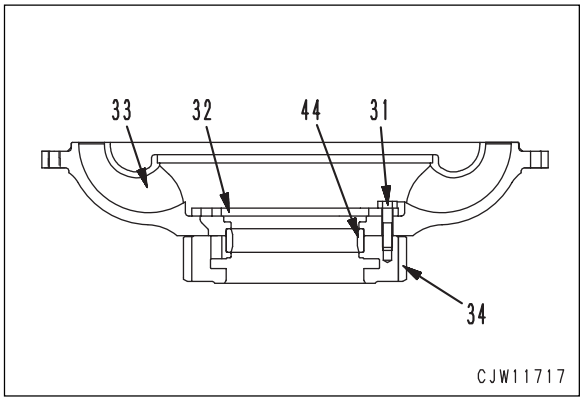
10. Disconnect hose (9) between water pump and torque converter oil cooler.



2) Remove spacer (29).
3) Remove pump assembly (30).

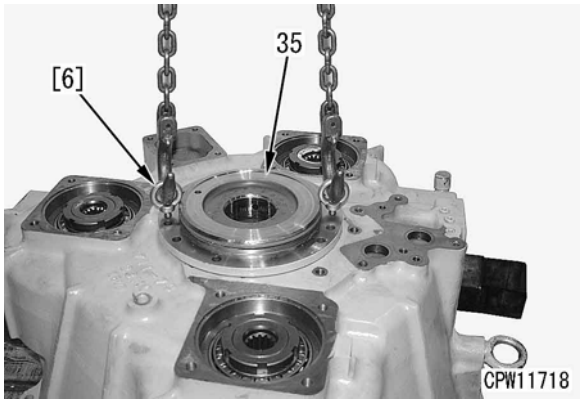


4) Remove bolt (31) and plate (32), and then remove gear (34) and outer race (44) from pump (33).



14. Stator shaft

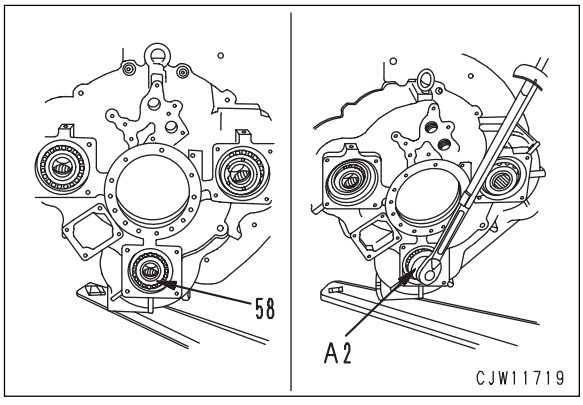
1) Remove the bolts tightened temporarily.
2) Using hanging bolt [6], remove stator shaft assembly (35).



15. Pump drive gear assembly

★ Since all of the 3 assemblies have the same structure, the procedure for disassembling only 1 assembly is described below.

1) Using tool **A2**, remove nut (58).
   ★ When loosening the nut, prevent the pump drive gear from turning with a bar.

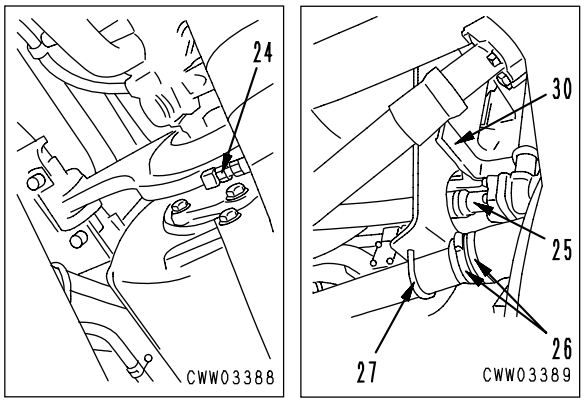


18. Disconnect trunnion greasing hose (24).

19. Disconnect hose (25).

20. Loosen bands (26).

21. Remove clamp (27) from bracket (30).

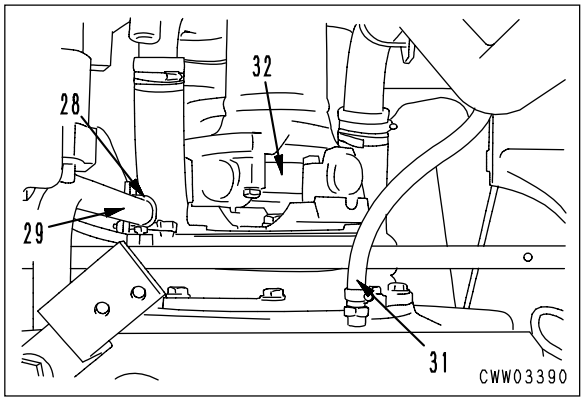


22. Remove clamp (28), then disconnect tube (29) from the transmission valve.

23. Disconnect hose (31) between the torque converter and transmission.

24. Disconnect upper drive shaft (32). ※ 2

kg Upper drive shaft: **27kg**

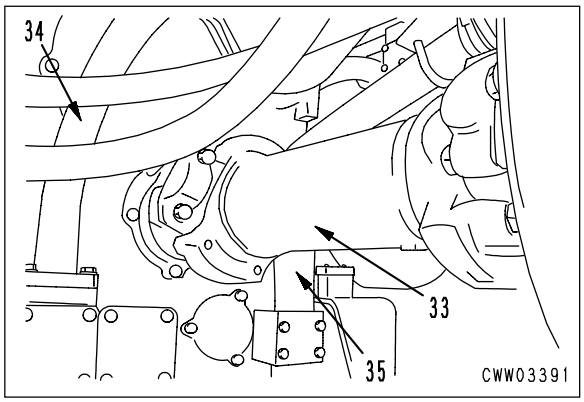


25. Disconnect rear drive shaft (33). ※ 3

kg Rear drive shaft: **57kg**

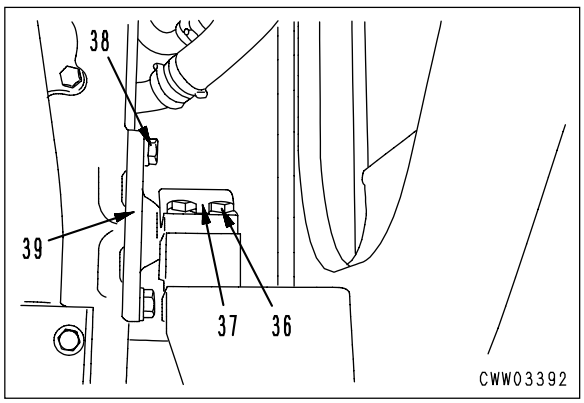
26. Remove suction tube (34) connected to the transmission pump.
★ Disconnect this tube from the intermediate clamp.

27. Disconnect drain tube (35).
★ Remove bracket (30).

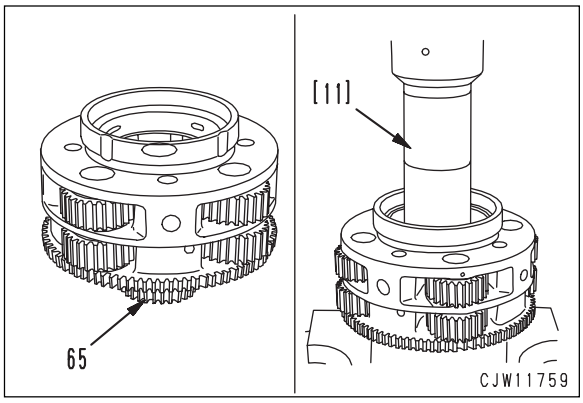


28. Remove transmission mounting bolts (36), then remove cap (37).

29. Remove mounting bolt (38), then remove bracket (39). ※ 4
★ Sling the transmission temporarily.

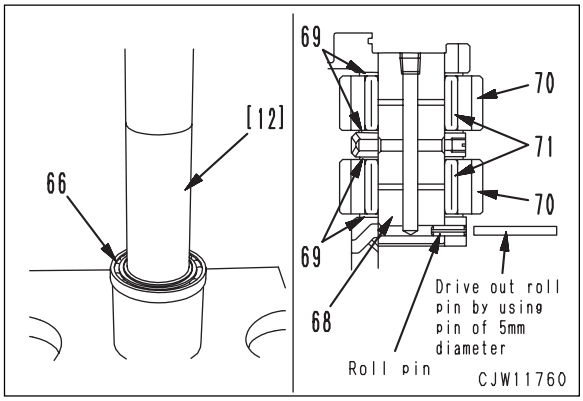


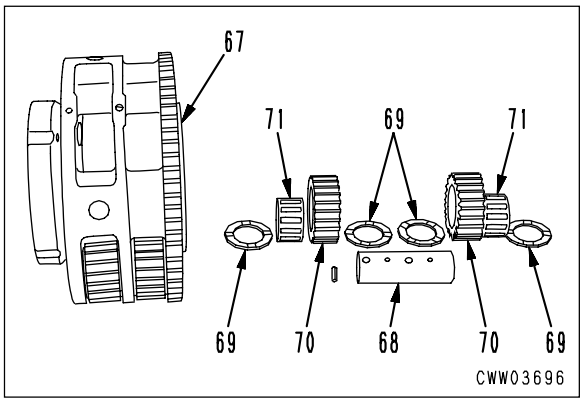
v) Set the assembly to the press, then remove sun gear (65) by using push tool [11] (Outside diameter: 100mm).



vi) Set the assembly to the press, then remove bearing (66) by using push tool [12] (Outside diameter: 85mm).

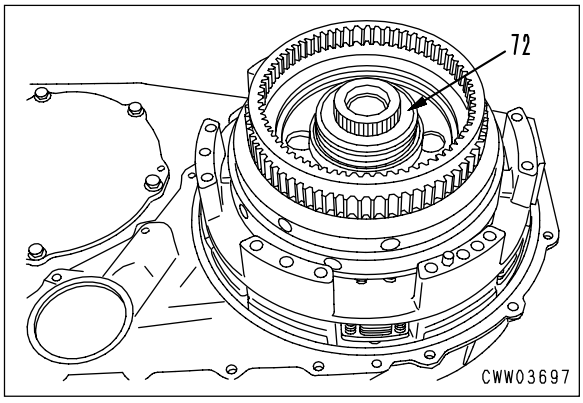
vii) Pull the roll pin out of carrier (67) and remove pin (68), then remove thrust washers (69), planetary gear (70) and needle bearings (71).



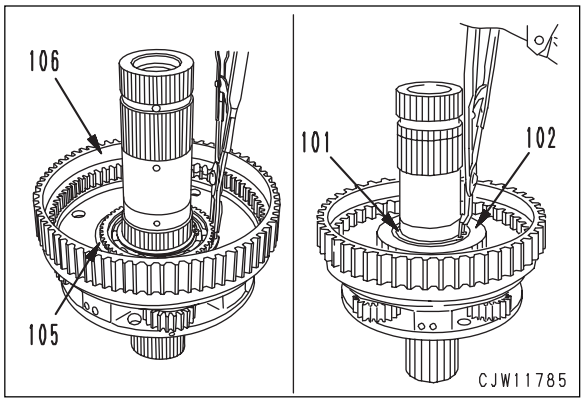


22. Collar

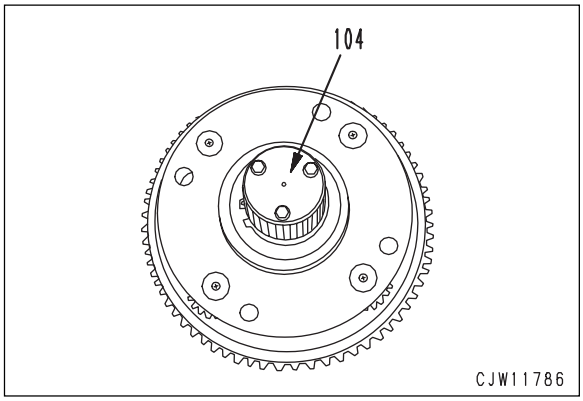
Remove collar (72).



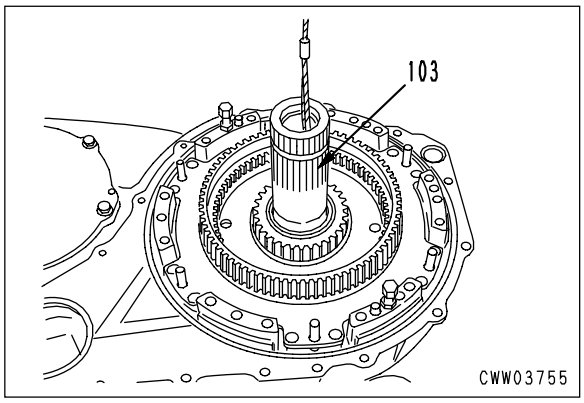
ix) Install ring gear (106), then install snap ring (105).
x) Install sun gear (102), then install snap ring (101).



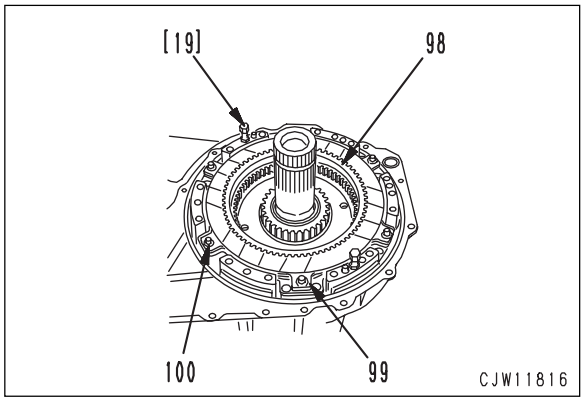
xi) Install plate (104).



2) Inserting a pin in the hole of the shaft, sling and install shaft and carrier assembly (103).
★ Fit the tooth surfaces of the planetary gear and ring gear to each other.



8. Disc, plate and spring
Install disc (98), plate (99) and spring (100), then remove bolt [19].



31. Check of operating condition of piston

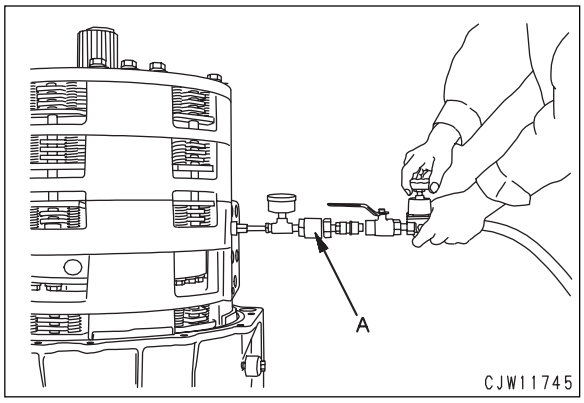
Using tool **A**, check the operation and stroke of the piston.

★ Air pressure: 0.3 – 0.5MPa {3 – 5kg/cm²}

★ Piston stroke

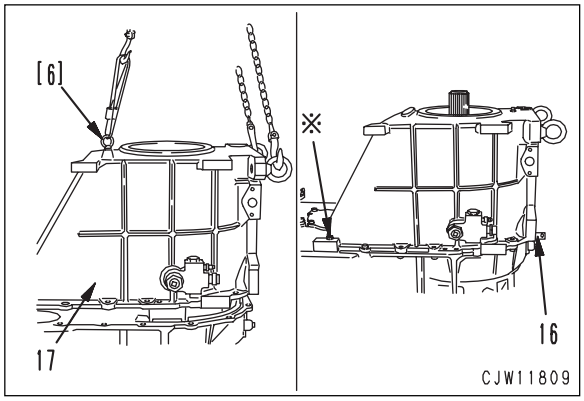
mm

Piston	Stroke
No.1	4.0
No.2	4.0
No.3	3.2
No.5	3.2



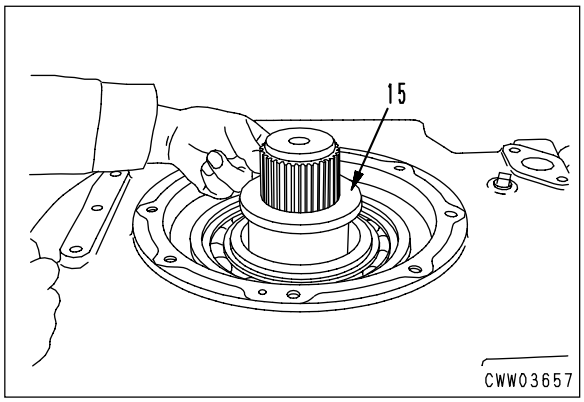
32. Transmission case

1) Install the O-ring to the transfer case, then sling transmission case (17) temporarily, using eyebolts [6] (12mm, P = 1.75).
2) Matching the dowel pin, install transmission case (17).
   ★ When installing, confirm that the bolt for plate (16) is 5mm longer than the other bolts.
   ★ Install the bolt 60mm long to the portion marked with ※.



33. Collar

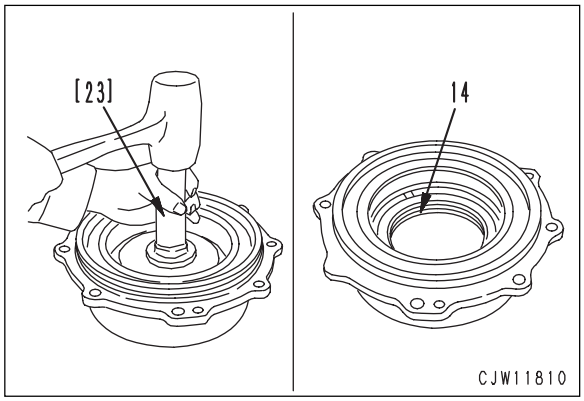
Install collar (15).



34. Coupling and cage assembly

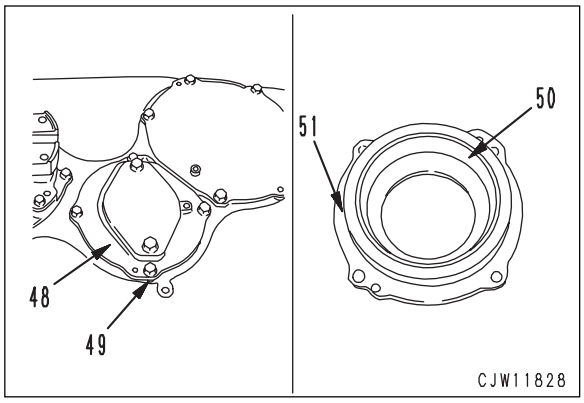
1) Assemble the coupling and cage assembly according to the following procedure.
   i) Using push tool [23] (Outside diameter: 145mm), install oil seal (14).

   Oil seal lip surface: **Grease (G2-LI)**



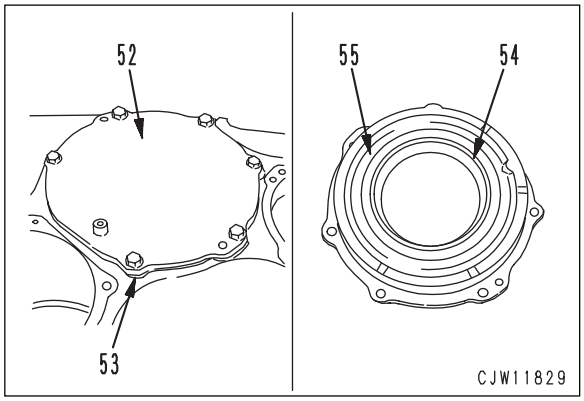
21. Cage

1) Remove the mounting bolts, then remove cage (48), using forcing screws.
   ★ Check the thickness and number of the shims (49), then store them.
2) Remove outer race (50) from cage (51).



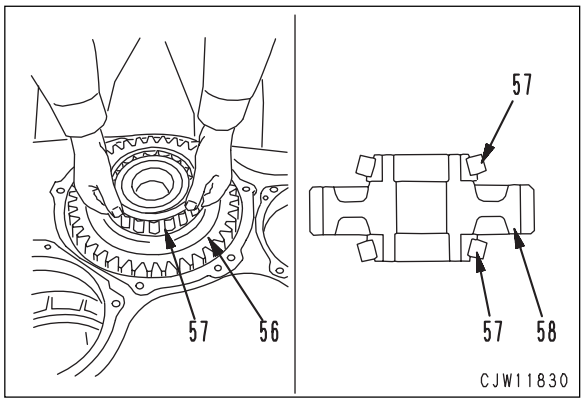
22. Cage

1) Remove the mounting bolts, then remove cage (52) and shims (53), using forcing screws.
   ★ Check the thickness and number of the shims, then store them.
2) Remove outer race (54) from cage (55).



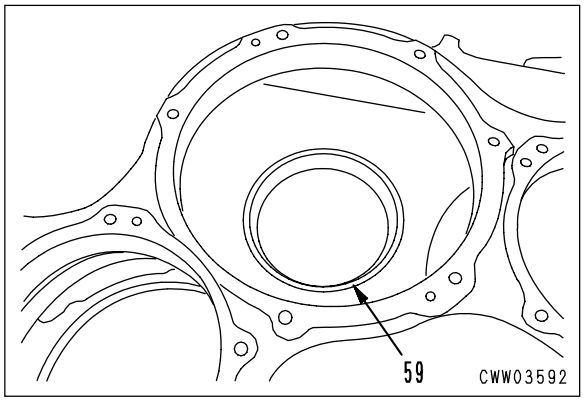
23. No. 2 gear

1) Remove No. 2 gear (56).
2) Using a puller, remove bearing (57) from gear (58).



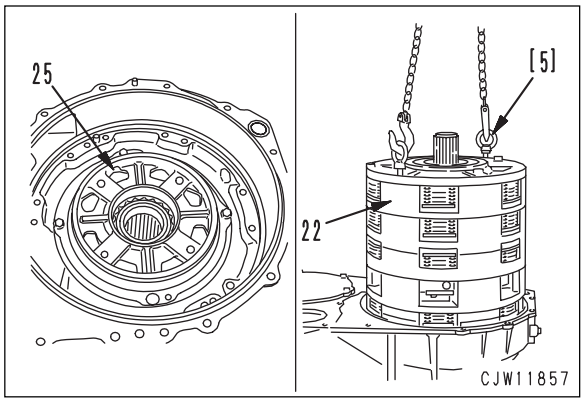
24. Outer race

Remove outer race (59) from the transfer case.



20. Transmission

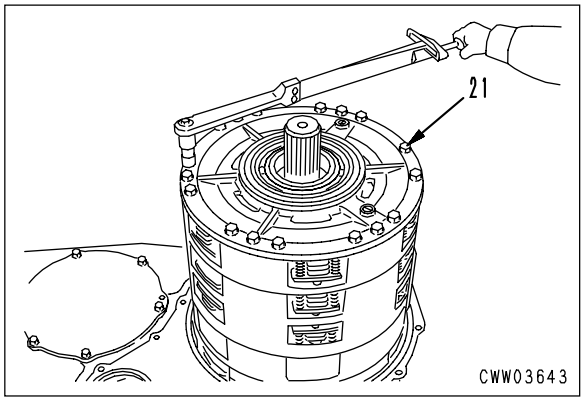
1) Install the O-ring to cage (25).
2) Install the seal ring, then sling and install transmission (22), using eyebolt [5] (14mm, P = 2.0) and matching the dowel pin.
   ★ Install the seal ring evenly.



21. Tie bolts

Install 15 tie bolts (21).

Tie bolt: **166.7 ± 9.8Nm {17 ± 1kgm}**



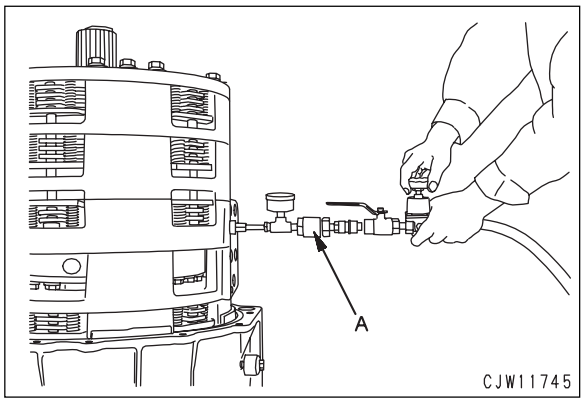
22. Check of operating condition of piston

Using tool **A**, check the operation and stroke of the piston.

★ Air pressure: 0.3 – 0.5MPa {3 – 5kg/cm²}
★ Piston stroke

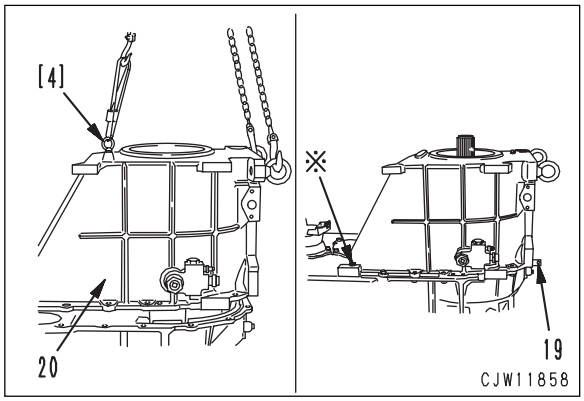
mm

Piston	Stroke
No.1	4.0
No.2	4.0
No.3	3.2
No.4	3.2



23. Transmission case

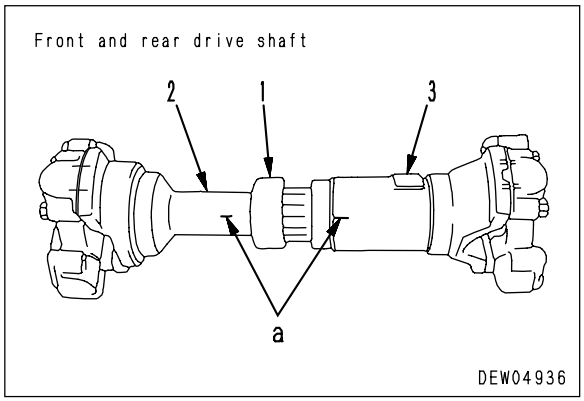
1) Install the O-ring to the transfer case, then sling transmission case (20) temporarily, using eyebolts [4] (12mm, P = 1.75).
2) Matching the dowel pin, install transmission case (20).
   ★ When installing, confirm that the bolt for plate (19) is 5mm longer than the other bolts.
   ★ Install the bolt 60mm long to the portion marked with ※.



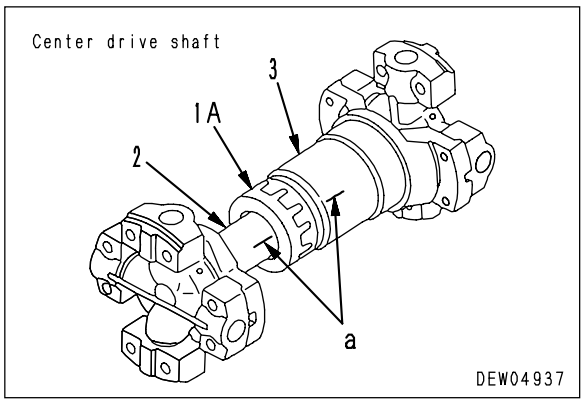
DISASSEMBLY OF DRIVE SHAFT

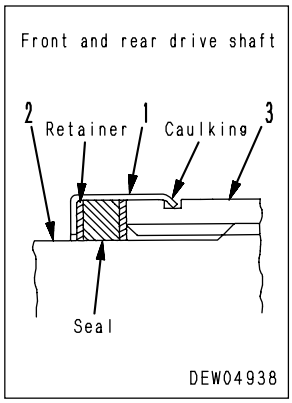
1. Shaft

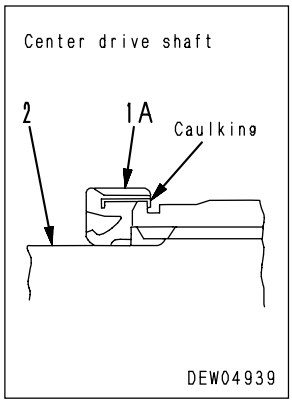
1) Remove shaft (2)
   ★ Make match makes **a** before removing to ensure that the position does not change.



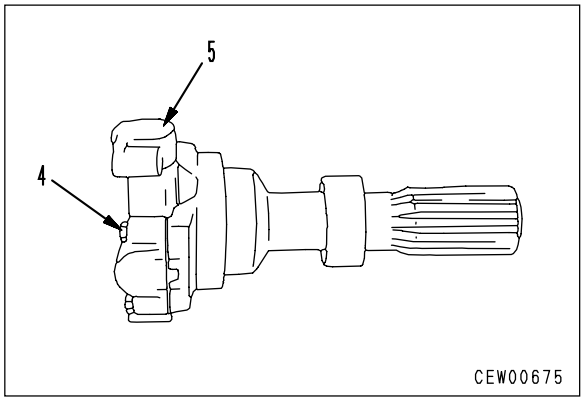
   ★ Cover (1) and (1A) is caulked with punch at four places, so it must not be removed unless necessary.
   ★ When removing cover (1) and (1A) be extremely careful not to damage cover (1), (1A) and yoke (3).
   ★ When removing the caulking, raise the caulking with a screwdriver.







2) Remove mounting bolts (4), then remove spider assembly (5).
   ★ Make match marks on yoke and spider.

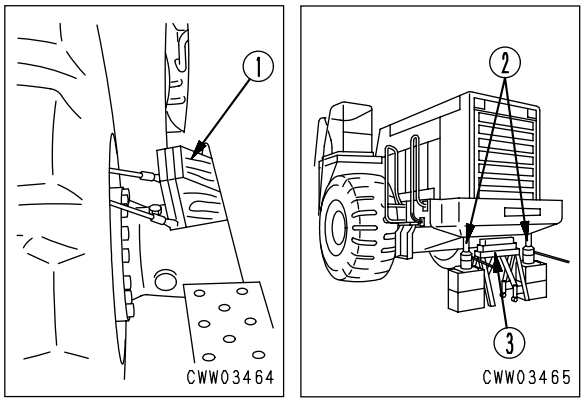


REMOVAL OF REAR AXLE

⚠ Stop the machine on level ground and install the safety bar on the frame and put blocks under the wheels.

1. Set blocks [1] on right and left sides of the rear axle.
★ Set these block to prevent the tires from jumping up when removed.

2. Raise the machine body with jacks (5ton) [2], then set support stand [3] under the counter weight.

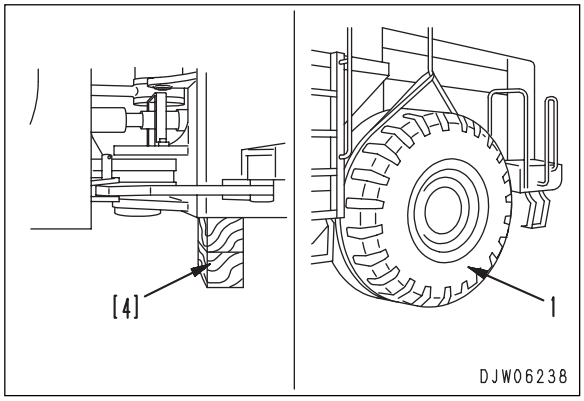


3. Adjusting jack [2], set blocks [4].

4. Sling tire (1) temporarily, then remove the hub nuts.

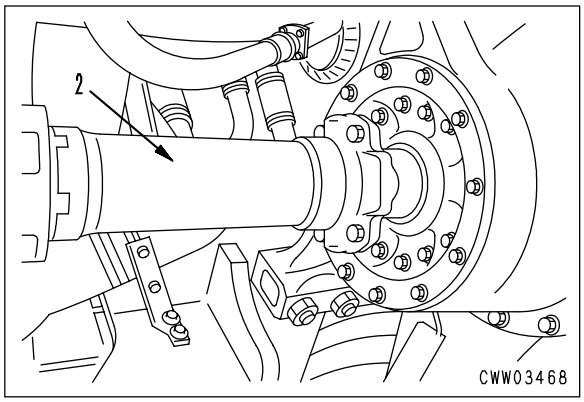
5. Sling and remove tires (1). ※ 1

kg Tires: **1,450kg**



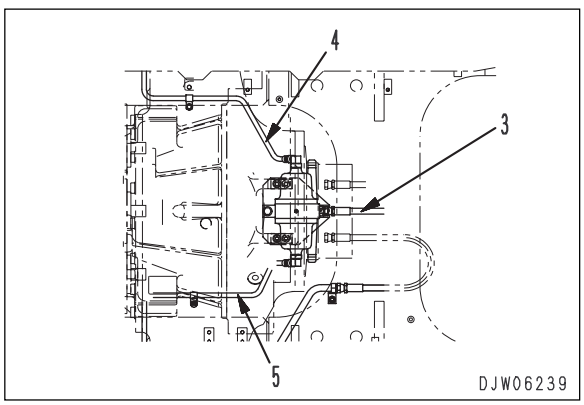
6. Disconnect rear drive shaft (2). ※ 2
★ When disconnecting the drive shaft, sling it with a rope, etc. to prevent it from falling.

kg Drive shaft: **57kg**



7. Disconnect hose (3) from the brake valve.

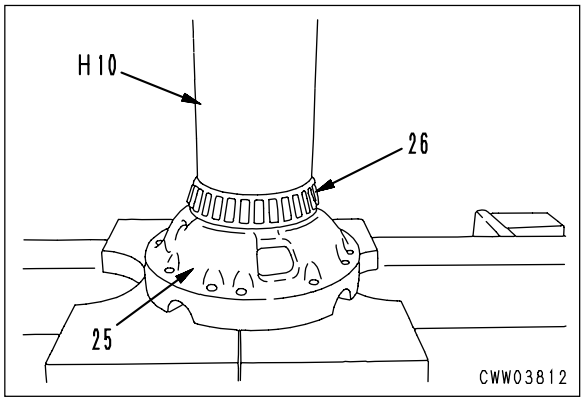
8. Disconnect tubes (4) and (5) connected to right and left brakes from the slack adjuster. ※ 3



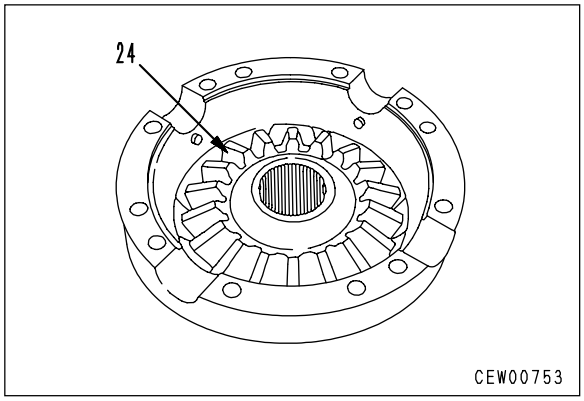
ASSEMBLY OF DIFFERENTIAL GEAR

FINE ASSEMBLY OF DIFFERENTIAL GEAR CASE

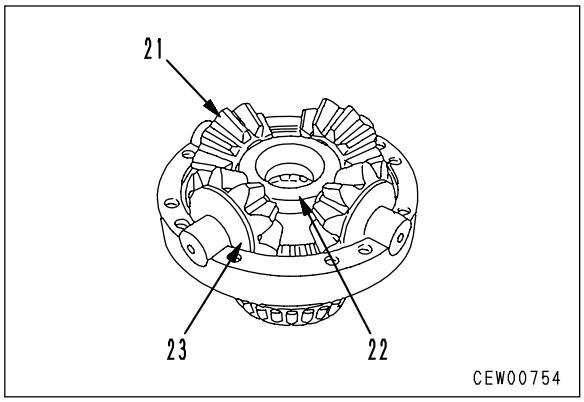
1. **Bearing**
   Using press fit kit **H10** (Inner diameter: 120 mm), press fit bearing (26) to case (25).



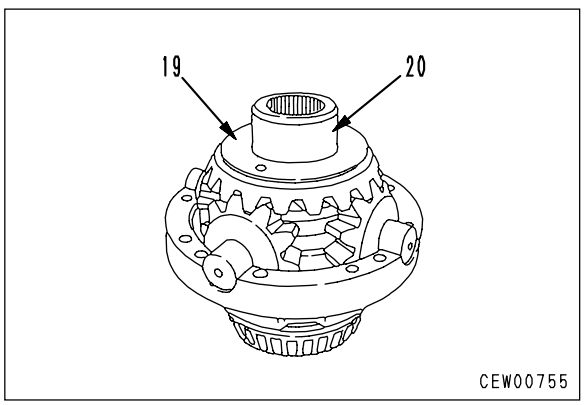
2. **Bevel gear (small)**
   Install thrust and small bevel gear (24) to case.
   ★ Align thrust with dowel pin and install.



3. **Pinion gear, cross shaft**
   Assemble pinion gears (21) and washers (23) with cross shaft (22).
   ★ Align washer groove with dowel pin of case and install.



4. **Bevel gear (small)**
   Install bevel gear (20) and thrust plate (19).



ASSEMBLY OF FINAL DRIVE

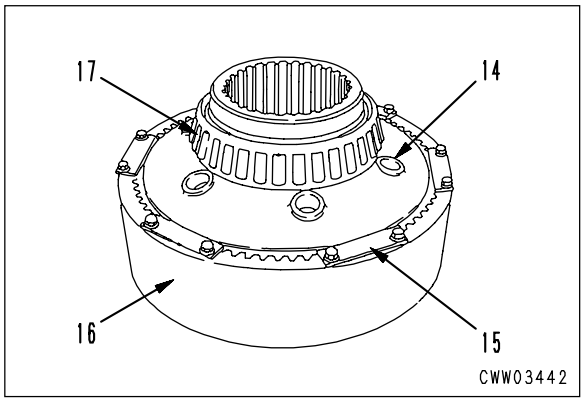
1. Assembly of ring gear

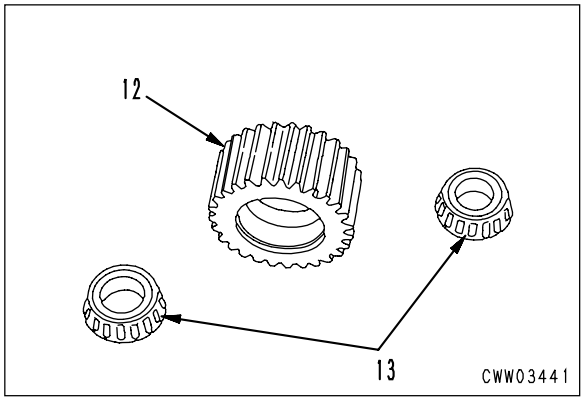
1) Press fit bearing (17) to ring gear hub (14).
   - ★ After press fitting the bearing, check that there is not any gap between bearing and hub.
2) Fit ring gear hub (14) to ring gear (16), then install lock plate (15).
   - ★ Install the lock plate with the wider side in.
   - ★ Degrease the screw holes sufficiently.

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

Mounting bolt:

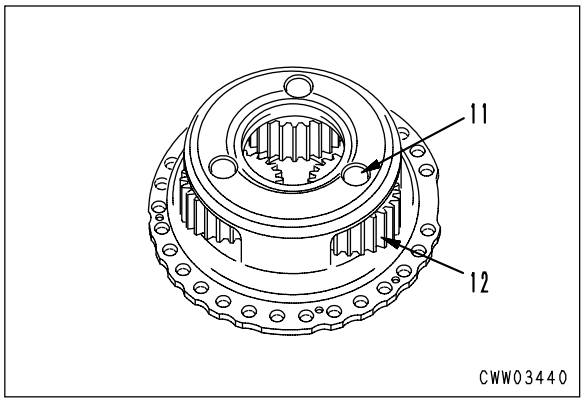
27.0 – 34.0Nm {2.8 – 3.5kgm}





2. Assembly of planetary carrier

1) Install bearings (13) to pinion gear (12), then set them to the carrier case.
2) Matching the hole of the pinion to that of the carrier case, press fit shaft (11).
   - ★ Press fit the shaft with the lock ball hole outward. Stop before the hole, then adjust the holes to each other.



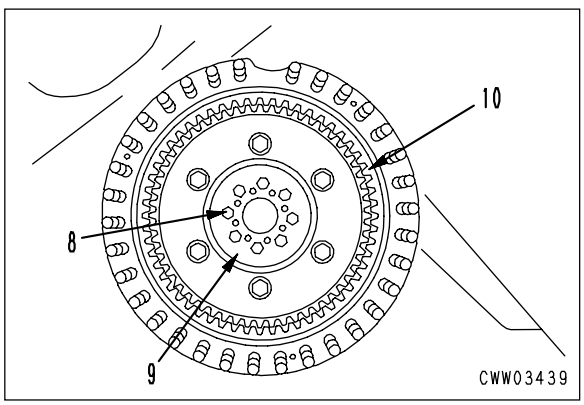
3. Adjustment procedure of wheel bearing

1) Insert ring gear (10) in the axle housing, then secure retainer (9) with mounting bolts (8) without inserting any shim.

Mounting bolt:

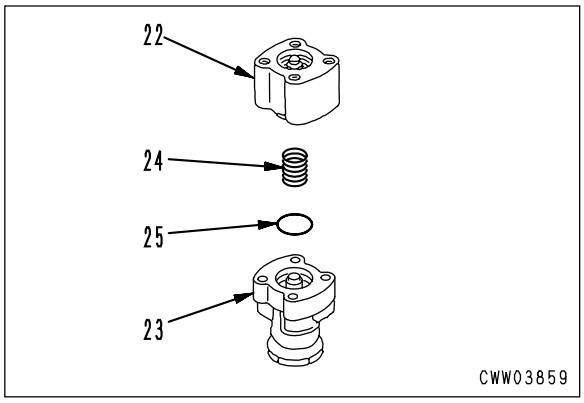
57.9 – 67.7Nm {5.9 – 6.9kgm}

- ★ Turn the hub by 5 – 6 turns and tighten the bolts alternately and evenly.



11. Disconnect cylinders (22) and (23).

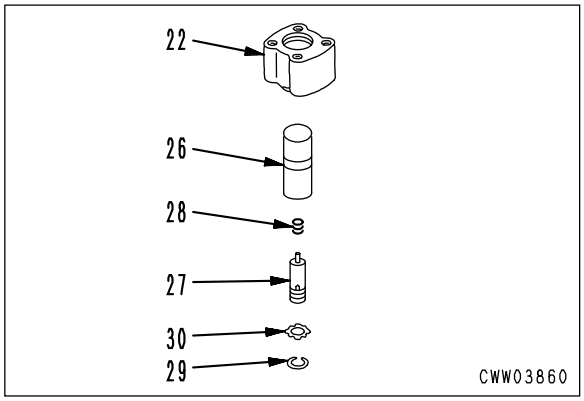
12. Remove return spring (24) and O-ring (25).



13. Pull spool (26) out of cylinder (22).

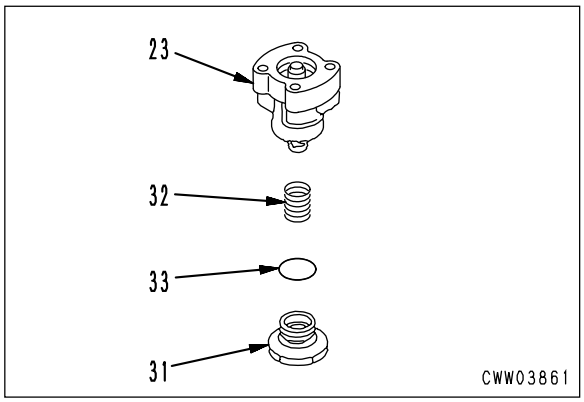
14. Remove piston (27) and spring (28) from spool (26).

15. Remove snap ring (29) from spool (26), then remove retainer (30).



16. Remove nut end (31) from cylinder (23), then remove spring (32).

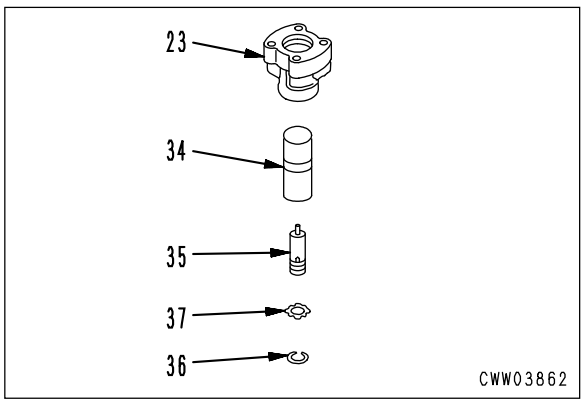
17. Remove O-ring (33) from nut end (31).



18. Pull spool (34) out of cylinder (23).

19. Pull piston (35) out of spool (34).

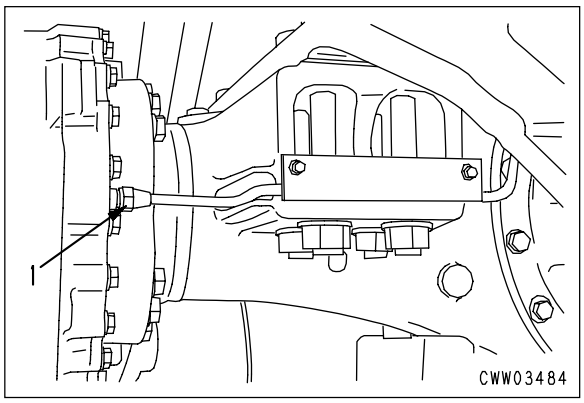
20. Remove snap ring (36) from spool (34), then remove retainer (37).



REMOVAL OF BRAKE

⚠ Stop the machine on level ground and lower the work equipment completely to the ground, then put the safety bar on the frame and set blocks under the wheels to prevent the machine from moving.

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



1. Remove the final drive. For details, see REMOVAL OF FINAL DRIVE

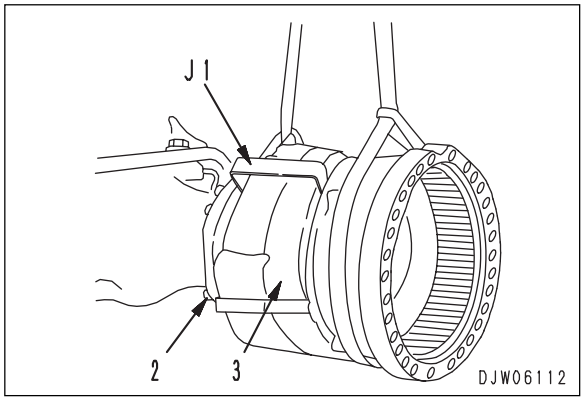
2. Disconnect brake tube (1). ※ 1

3. Sets tools **J1**.

4. Sling the brake and wheel hub temporarily, then remove mounting bolts (2). ※ 2

5. Sling and remove brake and wheel hub (3).

kg Brake and wheel hub: **195kg**



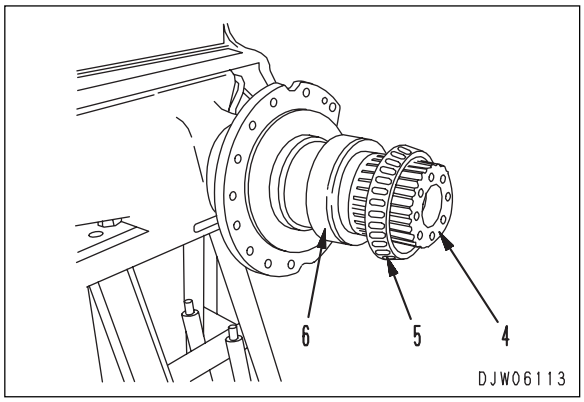
6. Remove bearing (5) and retainer (6) from axle (4).

INSTALLATION OF BRAKE

- Carry out installation in the reverse order to removal.

※ 1

★ Bleed air from the brake. For details, see BLEDING AIR FROM EACH PORTION, of TESTING AND ADJUSTING,.



※ 2

Brake and wheel hub mounting bolt:

824.0 – 1030.0Nm {84.0 – 105.0kgm}

※ 3

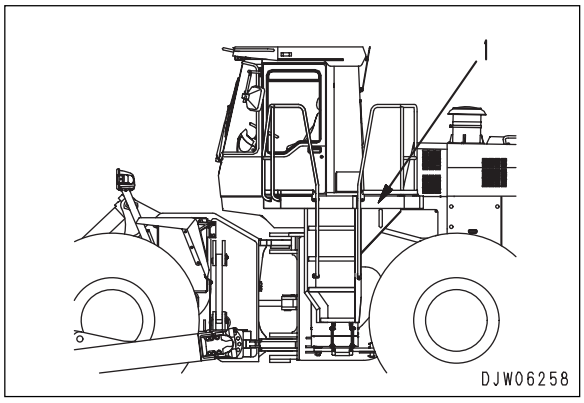
★ Adjust the preload of the bearing. For details, see ASSEMBLY OF FINAL DRIVE.

REMOVAL OF HYDRAULIC TANK

⚠ Stop the machine on level ground and lower the work equipment completely to the ground, then put blocks under the wheels to prevent the machine from moving.

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

⚠ Loosen the filler cap to release the pressure from the hydraulic tank.



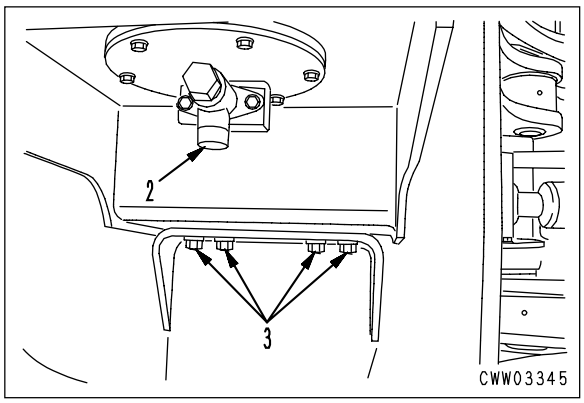
1. Sling and remove ladder floor (1).

kg Ladder floor: **120kg**

2. Loosen hydraulic tank drain valve (2), and drain oil.

Hydraulic oil: **200** ℓ

3. Remove mounting bolts (3) from the bottom of the hydraulic tank. ※ 1

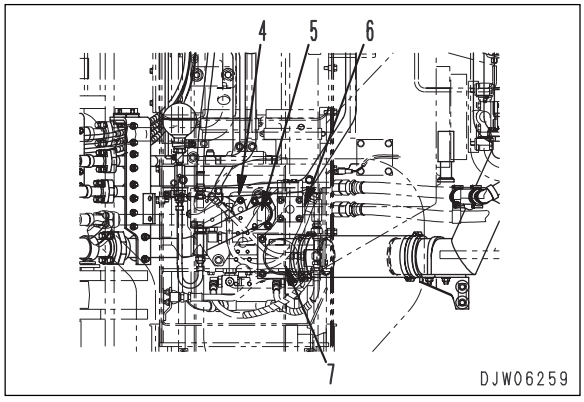


4. Disconnect return tube (4) coming from the charge valve.

5. Disconnect return tube (5) coming from work equipment valve.

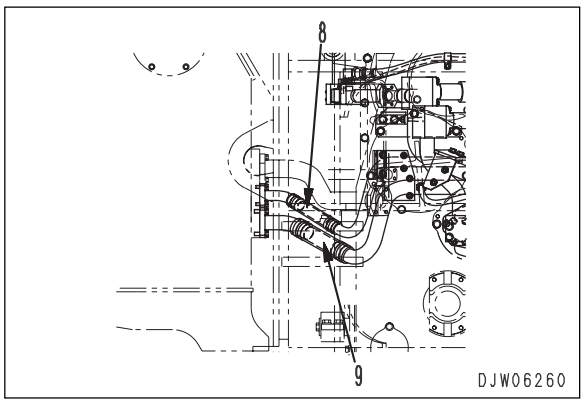
6. Disconnect tube (6) going to the hydraulic oil cooler.

7. Disconnect hydraulic pump tube (7).



8. Disconnect emergency steering suction tube (8).

9. Disconnect emergency steering return tube (9).



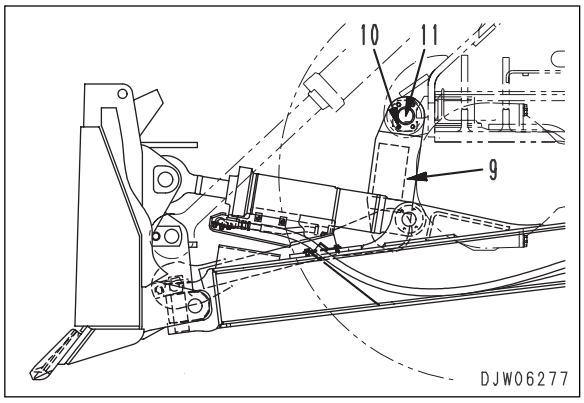
INSTALLATION OF LIFT CYLINDER ASSEMBLY

- Carry out installation in the reverse order to removal.

⚠ Use stick, bar or similar tool to align the holes for the pin and never put a finger into the hole.

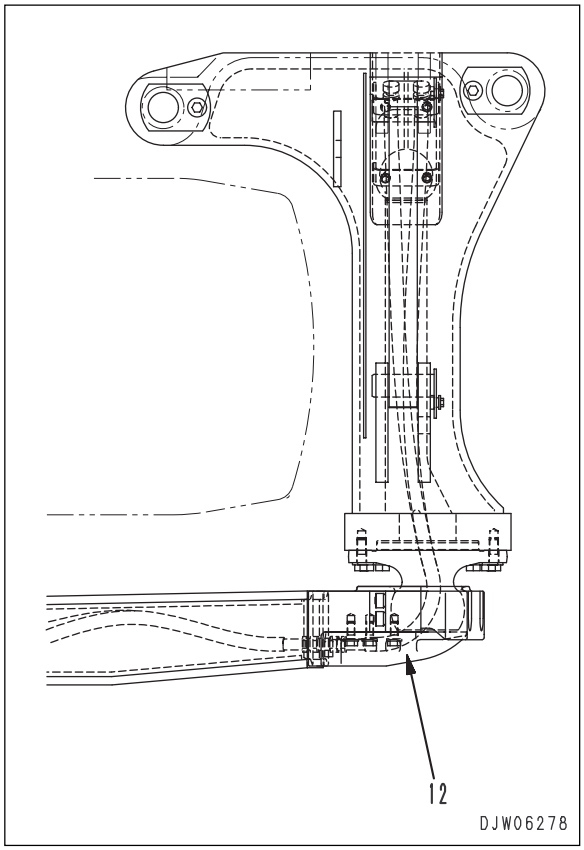
6. Sling H-link (9), remove lock bolt (10), and pull out the cord ring and pin (11). ※ 4
★ If shims are inserted, record its quantity.

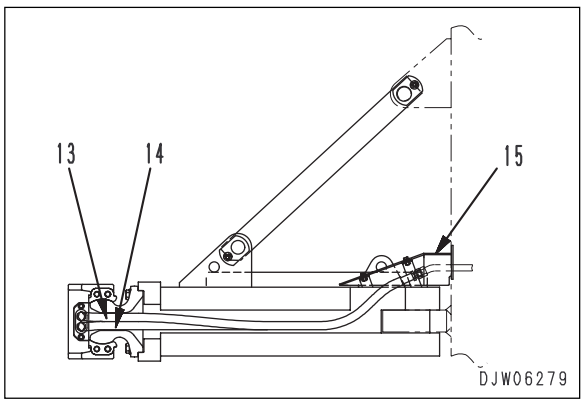
7. Lift off the H-link.
kg H-link: **486kg**



8. Remove cover (12) and (15).

9. Disconect hoses (13) and (14) from connector.

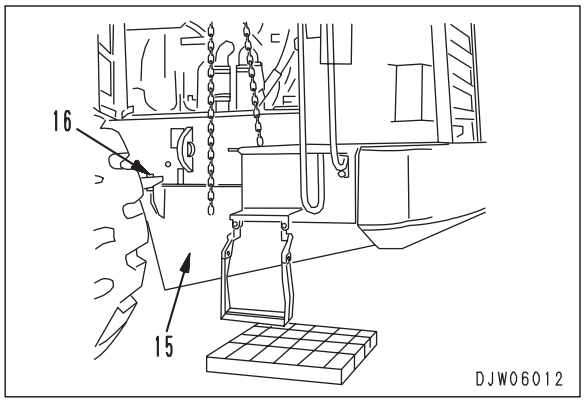




12. Sling fuel tank (15) temporarily, then remove mounting bolt (16). ※ 1

★ Place a pallet under the fuel tank, then lower the tank slowly, balancing it.

kg Fuel tank: **420kg**



INSTALLATION OF FUEL TANK

- Carry out installation in the reverse order to removal.

※ 1

Mounting bolt:

824.0 – 1030.0Nm {84.0 – 105.0kgm}

REMOVAL OF PARKING BRAKE

⚠ Stop the machine on level ground and lower the work equipment completely to the ground, then put blocks under the wheels to prevent the machine from moving.

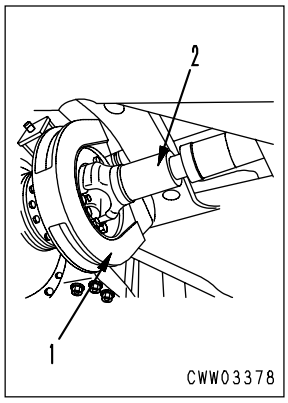
⚠ Disconnect the cable from the negative (–) terminal of the battery.

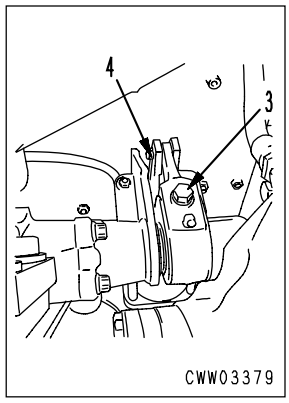
1. Remove disc plate cover (1).
2. Disconnect drive shaft (2). ※ 1

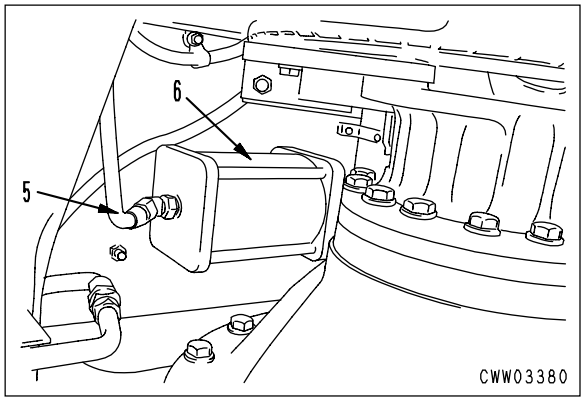
   kg Drive shaft: **20kg**
3. Turn adjustment bolt (3) clockwise to increase the clearance between the pad and disc. ※ 2
4. Pull out connecting pin (4).
5. Disconnect hose (5).
6. Remove spring cylinder (6).
7. Disconnect plate (7). ※ 3
   - ★ Secure the calipers.
   - ★ Since 2 dowel pins are installed, raise the calipers a little, then remove the plate.
8. Remove pad (8).
9. Remove calipers (9).

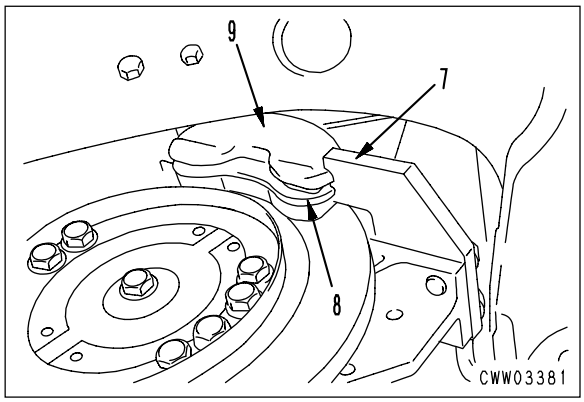
   kg Calipers: **32kg**
10. Remove mounting bolts (10), then remove disc (11).

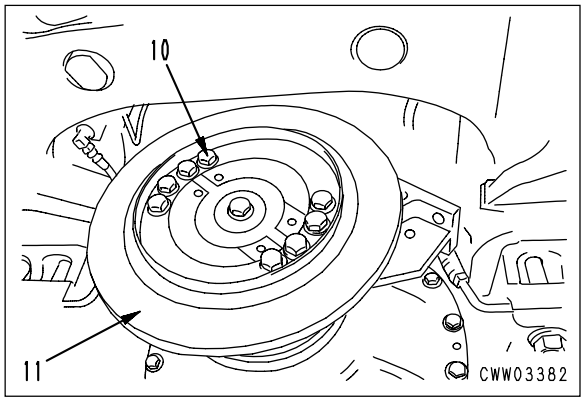
    kg Disc: **31kg** ※ 4











INSTALLATION OF PARKING BRAKE

- Carry out installation in the reverse order to removal.

※ 1

Mounting bolt: **157 – 196Nm {16 – 20kgm}**

※ 2

★ Adjust the parking brake. For details, see TESTING AND ADJUSTING PARKING BRAKE of TESTING AND ADJUSTING,.

※ 3

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

Mounting bolt:
824.0 – 1030.0Nm {84.0 – 105.0kgm}

※ 4

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

Mounting bolt:
490.0 – 608.0Nm {50.0 – 62.0kgm}

REMOVAL OF MONITOR

⚠ Stop the machine on level ground and lower the work equipment completely to the ground, then put blocks under the wheels to prevent the machine from moving.

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

1. Remove cover (1).

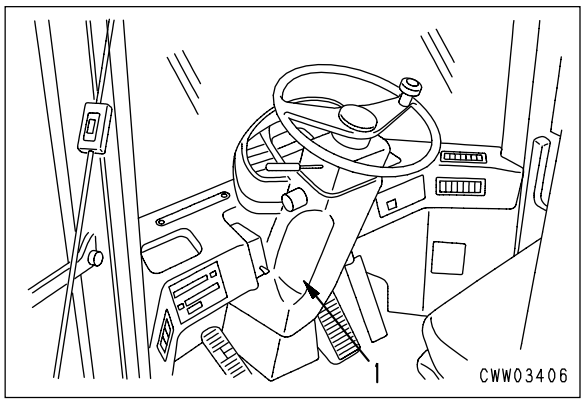
2. Remove screw (2).

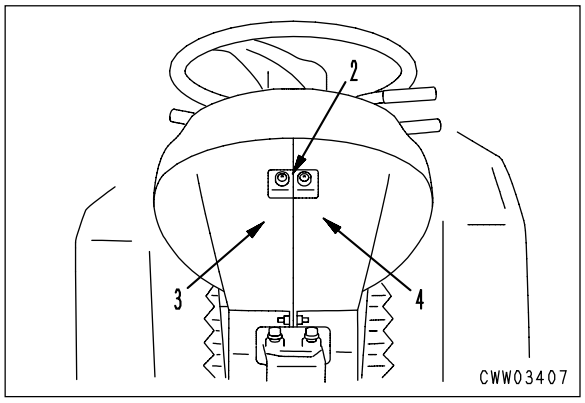
3. Remove covers (3) and (4) on both sides.

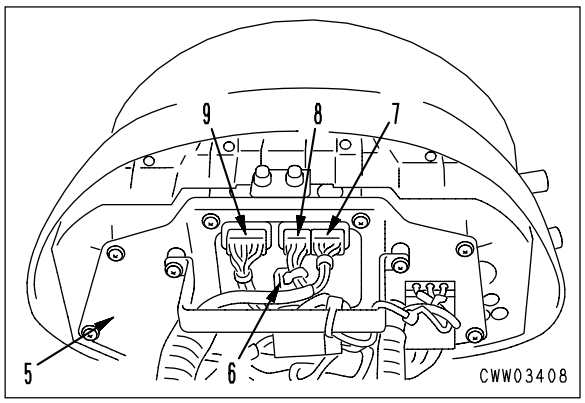
4. Remove bracket (5).

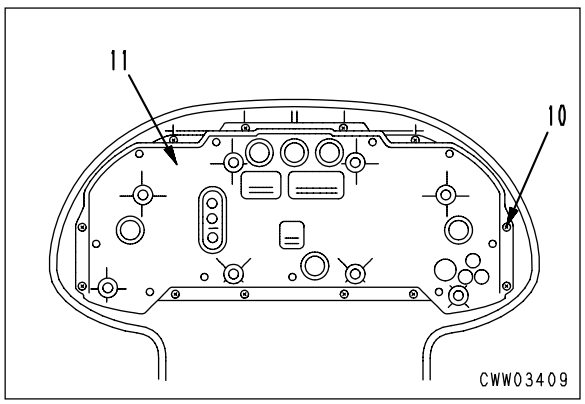
5. Disconnect connectors (6) (L08), (7) (L06), (8) (L07) and (9) (L05).

6. Remove 12 screws (10), then remove monitor (11).





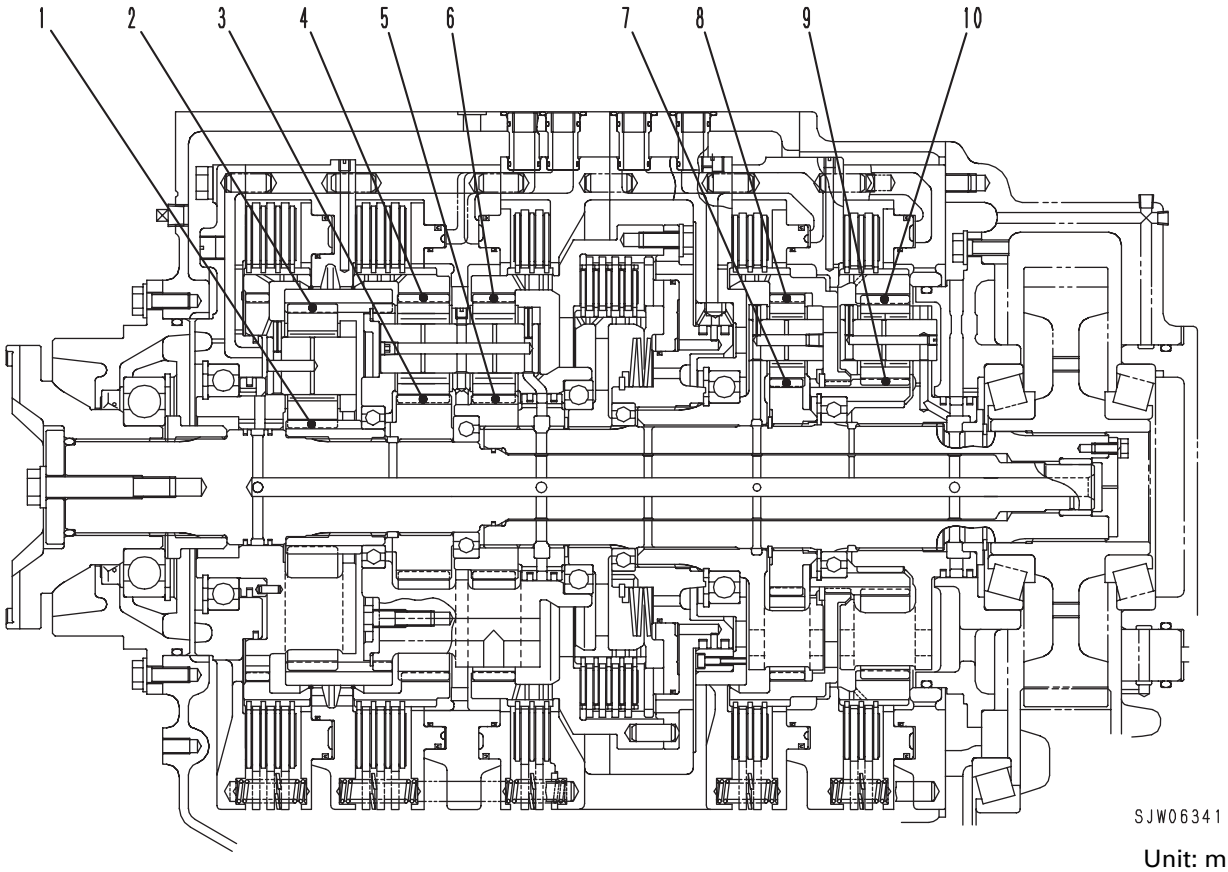




INSTALLATION OF MONITOR

- Carry out installation in the reverse order to removal.

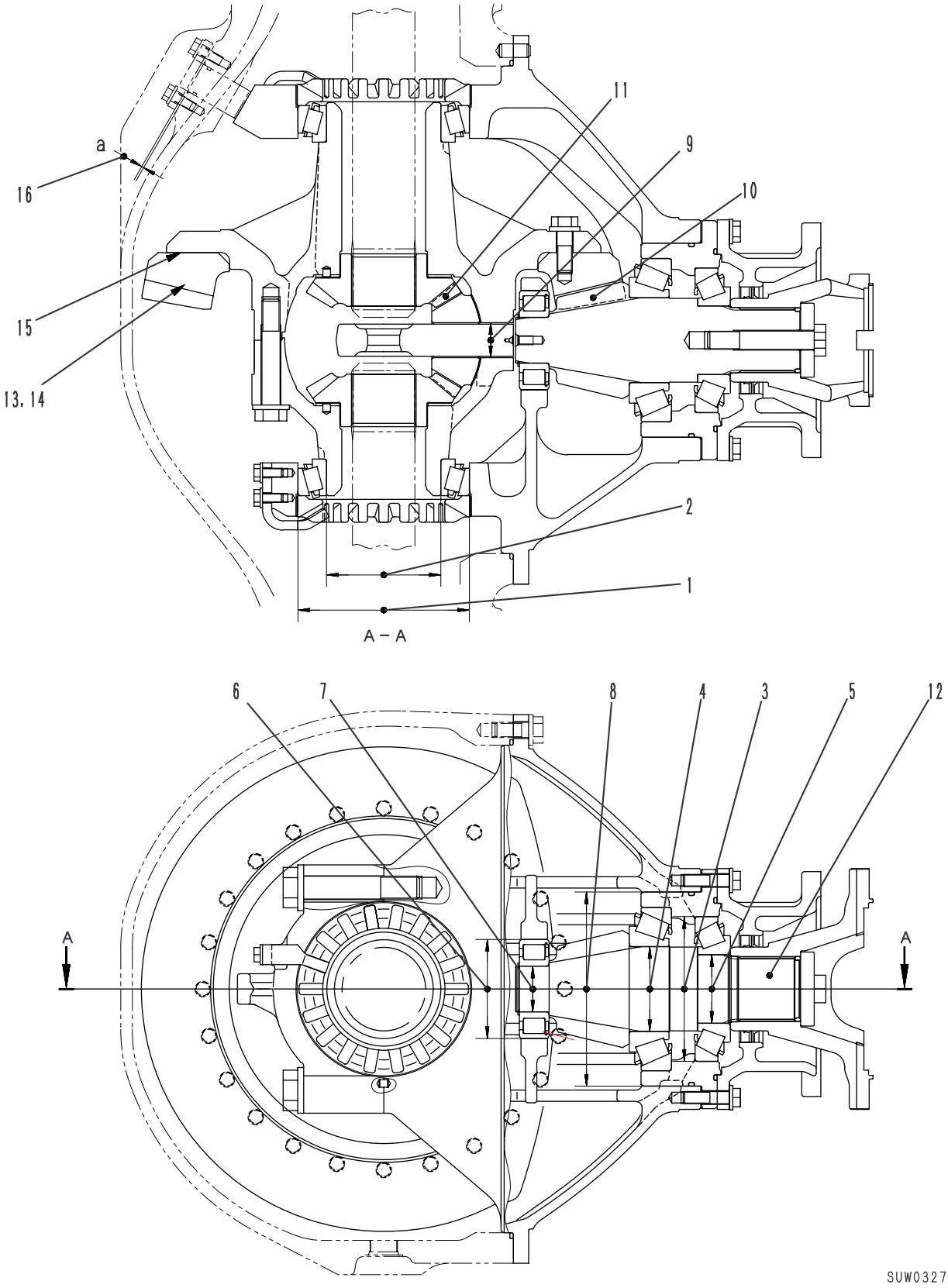
TRANSMISSION (2/2)



Unit: mm

No.	Check item	Criteria	Remedy
1	Backlash between reverse sun gear and planetary gear	0.13 – 0.32	Replace
2	Backlash between reverse planetary gear and ring gear	0.15 – 0.38	
3	Backlash between forward sun gear and planetary gear	0.13 – 0.36	
4	Backlash between forward planetary gear and ring gear	0.14 – 0.39	
5	Backlash between 4th sun gear and planetary gear	0.13 – 0.36	
6	Backlash between 4th planetary gear and ring gear	0.14 – 0.39	
7	Backlash between 3rd sun gear and planetary gear	0.13 – 0.36	
8	Backlash between 3rd planetary gear and ring gear	0.14 – 0.39	
9	Backlash between 1st sun gear and planetary gear	0.13 – 0.36	
10	Backlash between 1st planetary gear and ring gear	0.14 – 0.39	

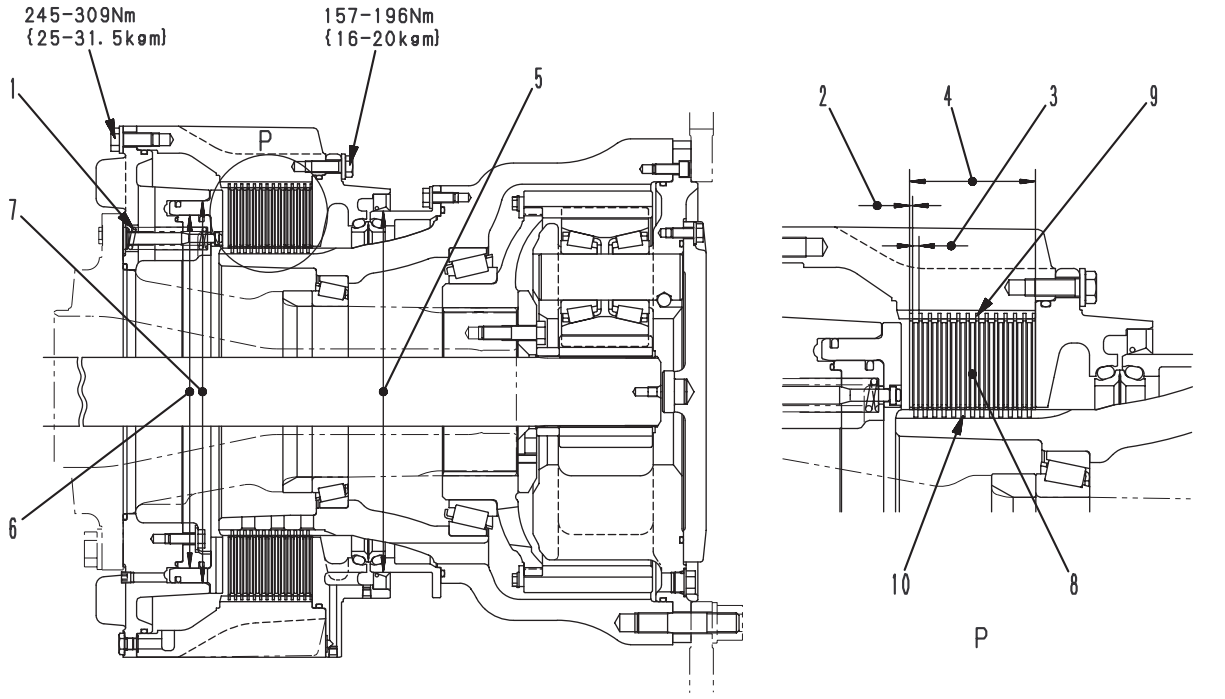
DIFFERENTIAL (1/2)



Unit: mm

No.	Check item	Criteria					Remedy
		Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
1	Clearance between lower hinge pin and rear frame	108	−0.101 −0.152	0 −0.050	0.051 – 0.152	–	Replace
2	Clearance between lower hinge pin and spacer (small)	108	−0.101 −0.152	0 −0.050	0.051 – 0.152	1.0	
3	Clearance between lower hinge pin and bearing	107.95	−0.051 −0.102	+0.025 0	0.051 – 0.127	1.0	
4	Clearance between lower hinge pin and spacer (large)	108	−0.101 −0.152	0 −0.05	0.051 – 0.152	1.0	
5	Clearance between rear frame and spacer (large)	140	−0.250 −0.300	−0.150 −0.200	0.050 – 0.150	–	
6	Clearance between front frame and upper hinge bearing	160	0 −0.025	−0.077 −0.127	–0.127 – –0.052	–	
7	Clearance between upper hinge pin and rear frame	100	−0.076 −0.127	+0.025 −0.020	0.056 – 0.152	–	
8	Clearance between upper hinge pin and bearing	100	−0.076 −0.127	0 −0.020	0.056 – 0.127	1.0	
9	Clearance between front frame and lower hinge bearing	212.725	+0.025 0	−0.051 −0.102	–0.127 – –0.051	–	
10	Clearance between rear frame and bushing	132	+0.131 −0.021	+0.166 +0.110	–0.021 – 0.181	–	
11	Clearance at press-fitted part of seal of upper hinge pin	117.45	+0.280 +0.180	+0.025 −0.030	–0.310 – –0.155	–	
12	Clearance at press-fitted part of seal of lower hinge pin	158.75	+0.310 +0.210	+0.025 −0.025	–0.335 – –0.185	–	
		Standard size		Tolerance		Repair limit	
13	Height of lower hinge spacer (small)	45.2		±0.1		–	
14	Height of lower hinge spacer (large)	88.5		±0.1		–	
15	Shim thickness for lower hinge and retainer	2.55					Adjust
16	Shim thickness for lower hinge and retainer	1.65					
17	Shim thickness for upper hinge and retainer	1.50					
18	Tightening torque of lower hinge retainer mounting bolt	When adjusting with shim: 68.6 Nm (7 kgm)					
		Final value: 279.0±29.4 Nm {28.5±3 kgm}					
19	Tightening torque of lower hinge retainer mounting bolt	When adjusting with shim: 279.0±29.4 Nm {28.5±3 kgm}					
		Final valuue: 279.0±29.4 Nm {28.5±3 kgm}					
20	Tightening torque of upper hinge pin mounting bolt	When adjusting with shim: 34.3 Nm {3.5 kgm}					
		Final value: 279.0±29.4 Nm {28.5±3 kgm}					

BRAKE

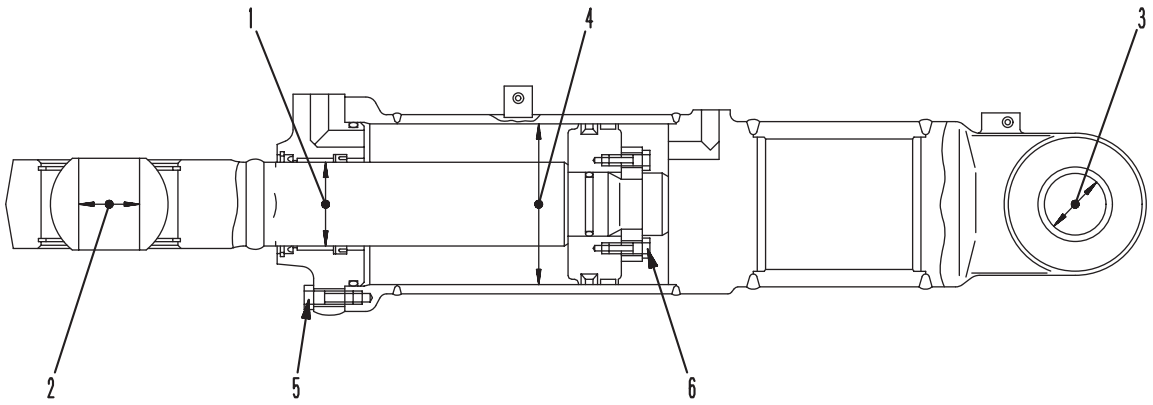


SJW06296

Unit: mm

No.	Check item	Criteria					Remedy
1	Return spring	Standard size			Repair limit		Replace
		Free length	Installation length	Installation load	Free length	Installation load	
		104.8	92.4	677 N {69 kg}	102.7	642 N {65.5 kg}	
2	Thickness of plate	Standard size			Repair limit		
		2.4			2.15		
3	Thickness of disc	5.1			4.6		
4	Total thickness of plate and disc	99.9			89.9		
5	Wear of contact surface of seal	Standard size		Tolerance		Repair limit	
		430		0 −0.155		–	
6	Wear of surface in contact with piston seal	420		+0.097 0		–	
7	Wear of surface in contact with piston seal	455		+0.097 0		–	
8	Deformation of friction surface of plate and disc	Standard size			Repair limit		
		Max. 0.4			0.7		
9	Backlash between outer gear and plate	0.29 – 0.62					
10	Backlash between inner gear and disc	0.17 – 0.52					

TILT, PITCH CYLINDER

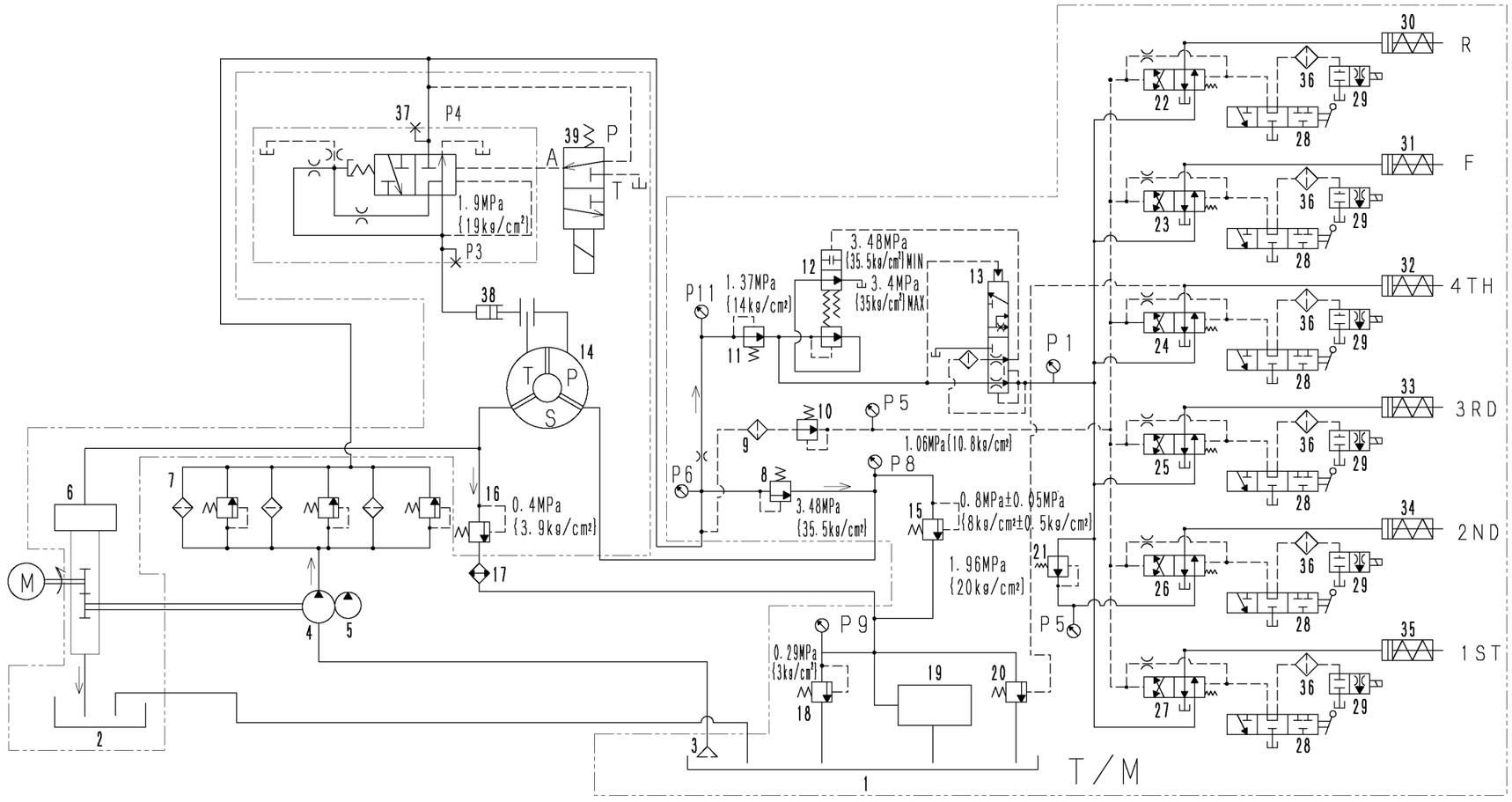


SJW06300

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
1	Clearance between rod and bushing	90	–0.036 –0.090	+0.257 +0.048	0.084 – 0.347	–	Replace bushing
2	Clearance between piston rod mounting pin and bushing	75	–0.30 –0.40	+0.20 0	0.30 – 0.60	–	
3	Clearance between cylinder bottom mounting pin and bushing	70	–0.30 –0.50	+0.174 0.100	0.40 – 0.674	–	
4	Cylinder bore	180	–	+0.30 0	–	–	Replace
5	Tightening torque of cylinder head mounting bolt	343 ± 34.3 Nm{35 ± 3.5 kgm}					Retighten
6	Tightening torque of piston mounting bolt	98 – 123 Nm{10 – 12.5 kgm }(with LT-2)					

HYDRAULIC CIRCUIT DIAGRAM FOR POWER TRAIN



SJW06344

1. Transmission case
2. PTO case
3. Strainer
4. Torque converter charging pump (SAL(3)-125)
5. PTO pump (SAL(1)-32)
6. PTO lubrication
7. Oil filter (3 pcs)
8. Transmission main relief valve
9. Pilot oil filter
10. Pilot reducing valve
11. Priority valve
12. Modulating valve
13. Quick return valve
14. Torque converter
15. Torque converter relief valve
16. Torque converter regulator valve
17. Oil cooler
18. Lubrication valve
19. Transmission lubrication
20. Lubrication bypass valve
21. Reducing valve
22. Reverse spool
23. Forward spool
24. 4th spool
25. 3rd spool
26. 2nd spool
27. 1st spool
28. Emergency manual spool
29. Solenoid valve
30. Reverse clutch
31. Forward clutch
32. 4th clutch
33. 3rd clutch
34. 2nd clutch
35. 1st clutch
36. Last chance filter
37. Lock-up valve
38. Lock-up clutch
39. Solenoid valve