SHOP MANUAL

KOMATSU

D575A-3

Super Dozer

MACHINE MODEL	SERIAL NUMBER
D575A-3 SUPER DOZER	**10101 and up**

- This shop manual may contain attachiments 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.
- D575A-3 Super Dozer mount the SA12V170E-2 engine.
  For details of the engine, see the 12V170-2 Series Engine Shop Manual.

Printed in Japan 05-08(02)

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 kg

- 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:

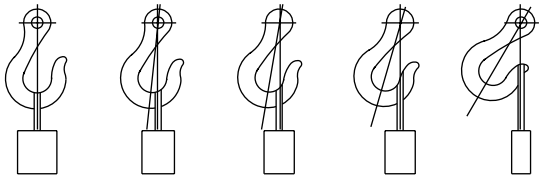
Wire ropes
(Standard "Z" or "S" twist ropes without galvanizing)

Rope diameter	Allowable load	
mm	kN	tons
10	9.8	1.0
11.2	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.

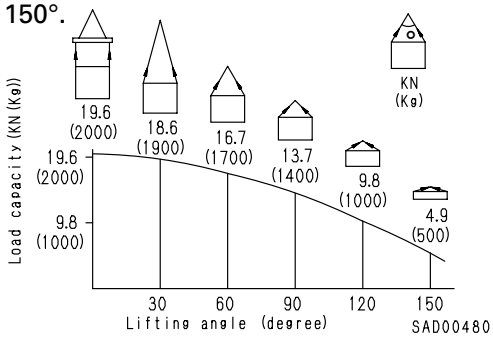


SAD00479

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°.



SAD00480

Millimeters to Inches

1 mm = 0.03937 in

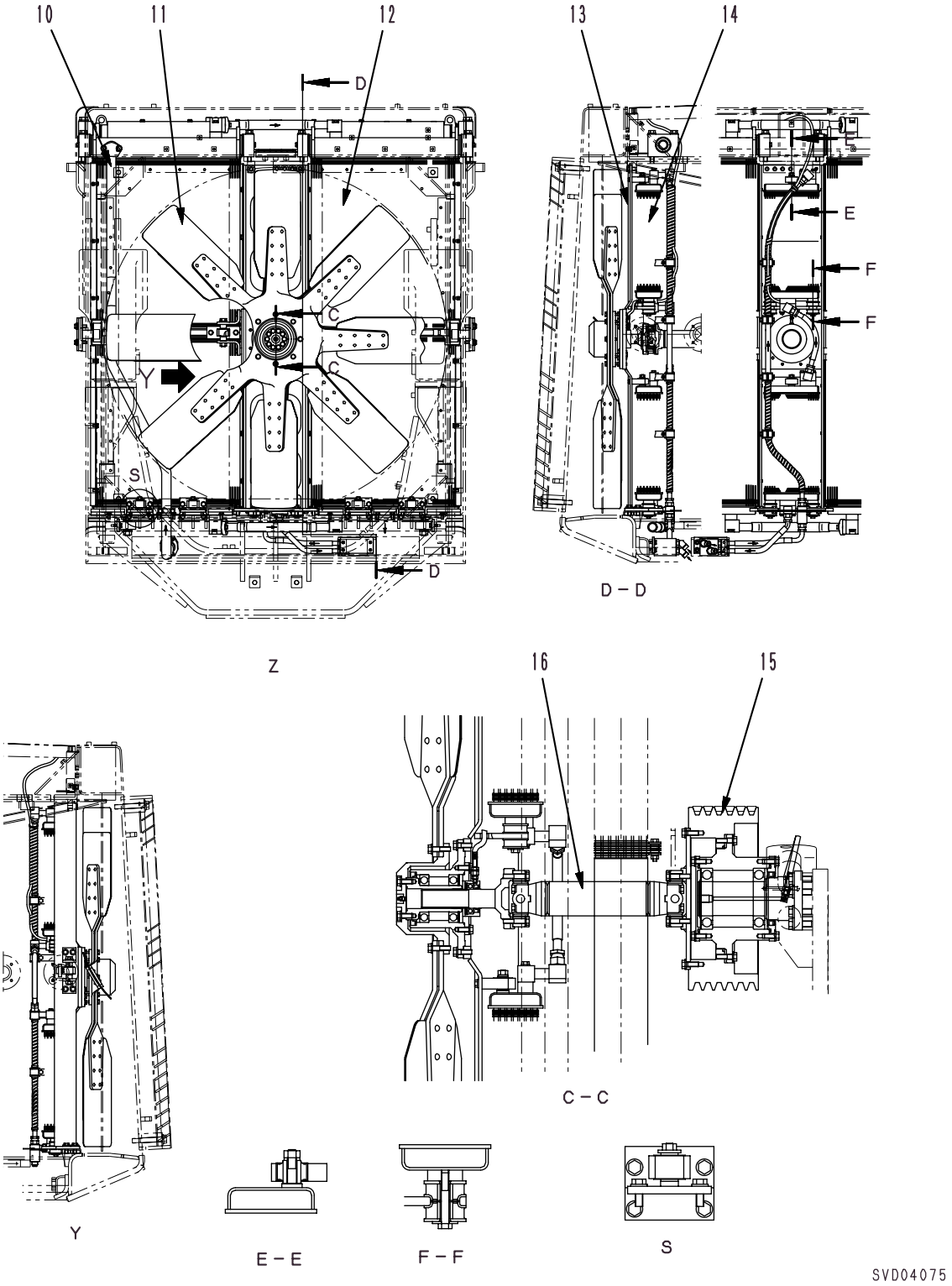
	0	1	2	3	4	5	6	7	8	9
0	0	0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	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

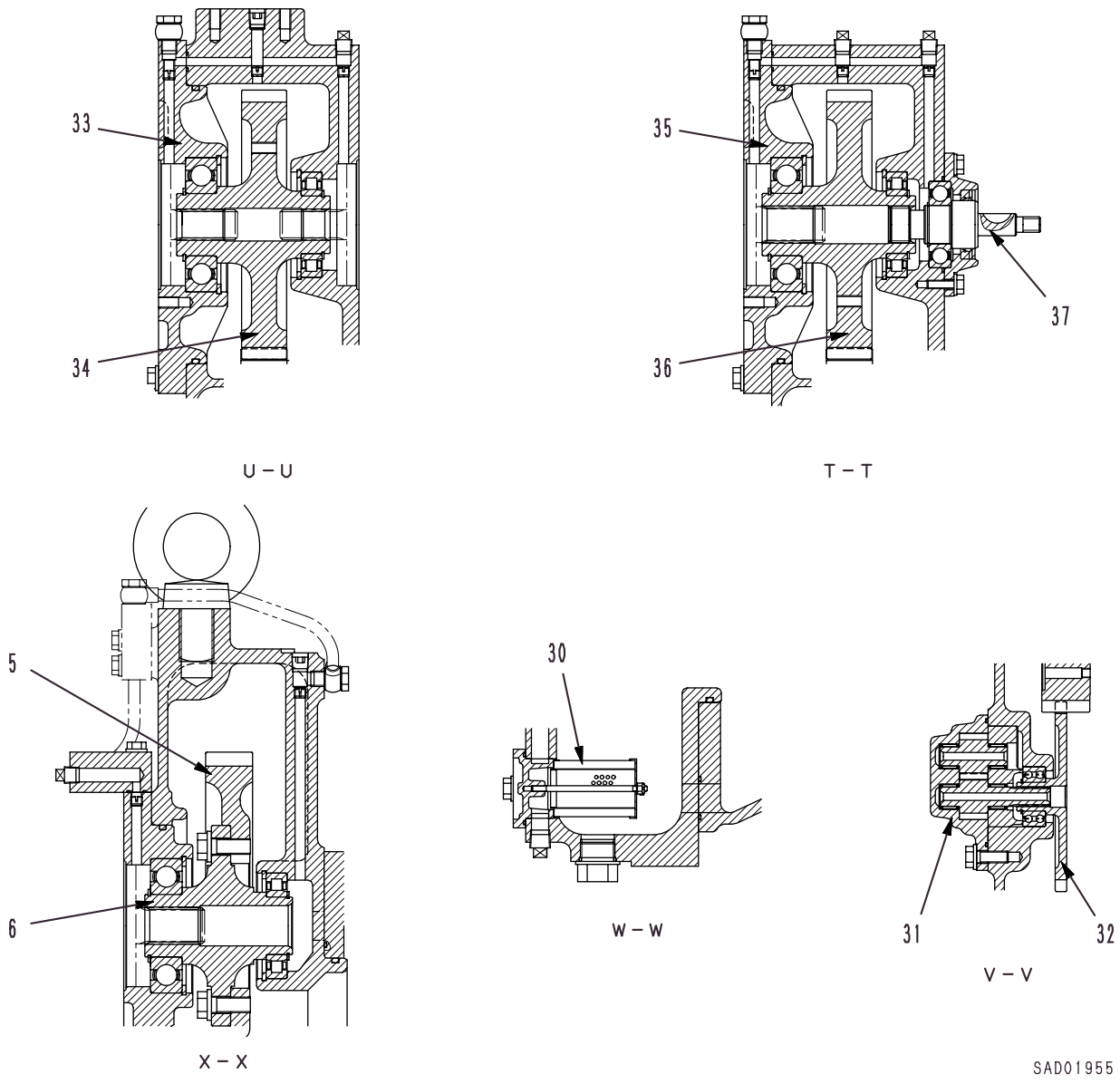
1 kg = 2.2046 lb

	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			D575A-3 Super dozer
Serial Number			10101 and up
Engine	Name		SA12V170E-2
	Type of engine		4-cycle, water-cooled, V-type, direct injection, with turbocharger and aftercooler
	No. of cylinders – Bore × Stroke	mm	12 – 170 × 170
	Piston displacement	ℓ {cc}	46,3 {46,300}
	Performance: Flywheel horsepower	kW {HP}/rpm	858 {1,150} /1,800
	Performance: Max. torque	Nm {kgm}/rpm	5,658 {577} /1,300
	Performance: Max. speed at no load	rpm	2,000 ± 50
	Performance: Min. speed at no load	rpm	650 ± 50
	Performance: Min. fuel consumption ratio	g/kWh {g/HPh}	216 {160}
	Starting motor		24V, 11 kW × 2
	Alternator		24V, 75A
	Battery		12V, 200Ah × 4
	Radiator core type		D type
Power train system	Power train pump		Gear type: SAL(4) – 140 + 125
	Power train lubrication pump		Gear type: SAR(4) – 250
	Final drive lubrication pump		Gear type: Left and right (1 each)
	Torque converter		3-element, 1-stage, single phase
	Transmission		Planetary gear, multiple disc clutch, hydraulically actuated, force-feed lubrication pump, forward 3-speed, reverse 3-speed
	Bevel gear		Spiral bevel gear, force-feed lubrication pump
	Steering clutch		Wet type, multiple clutch disc, spring boosted, hydraulically actuated (manual type), interconnected with brake
	Steering brake		Wet type, multiple clutch disc, spring boosted, hydraulically actuated (pedal operated, manual type), interconnected with clutch
	Final drive		Spur gear 2-stage, planetary gear 1-stage reduction, force-feed lubrication pump


10
11
12
D
C
C
Y
S
D
Z
13
14
E
F
F
D – D
16
15
C – C
Y
E – E
F – F
S
SVD04075

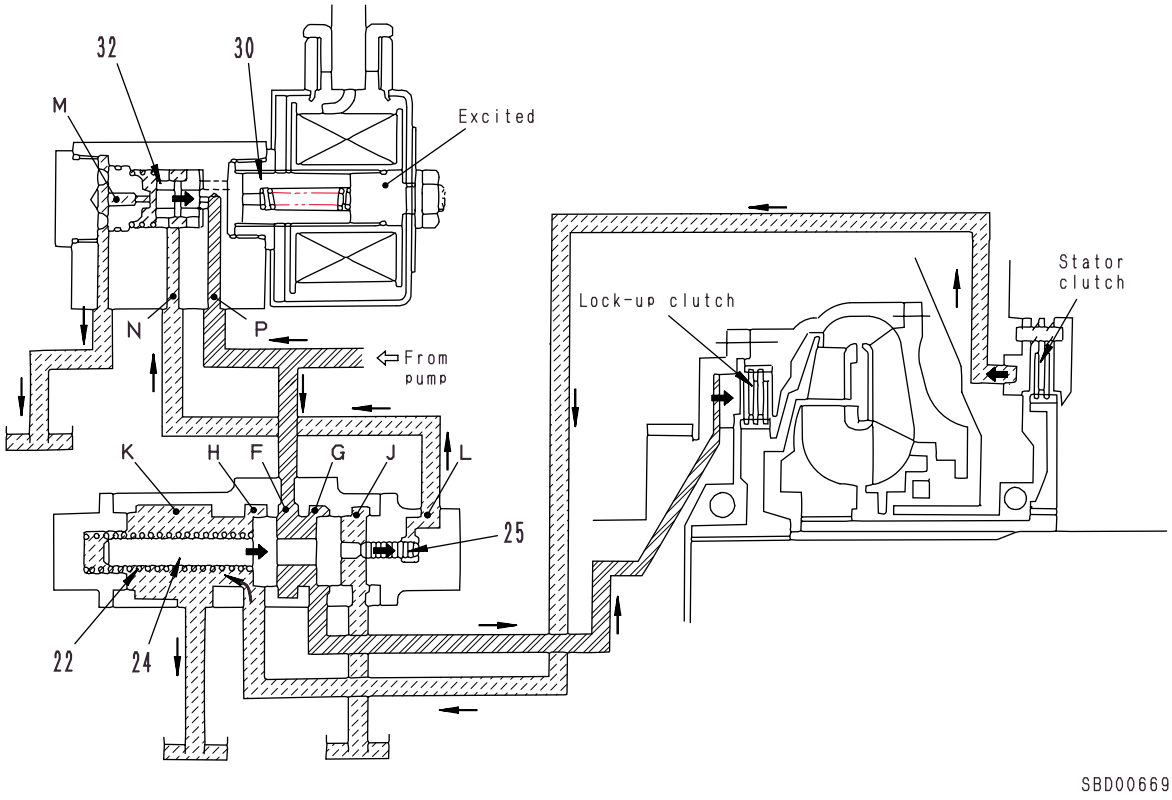
(3/3)



25. Lock-up clutch disc
26. Lock-up clutch plate
27. Lock-up clutch piston
28. Seal seat
29. Spacer
30. Strainer
31. Scavenging pump
32. Scavenging pump gear (No. of teeth: 34)
33. Cover
34. Hydraulic pump gear (No. of teeth: 49)
35. Cover
36. Power train pump gear (No. of teeth: 49)
37. Shaft

When lock-up selector valve (24) moves to the left in the direction of the arrow, ports **F** and **G** and ports **H** and **K** close, and ports **F** and **H** and ports **G** and **J** open.
When this happens, the oil from the pump flows from port F to port **H**, and becomes the back pressure of the stator clutch piston. When the pressure in the circuit rises, the stator clutch is engaged.
At the same time, the oil that is the back pressure of the lock-up clutch piston is drained from port **G** to port **J**, and the lock-up clutch is disengaged.

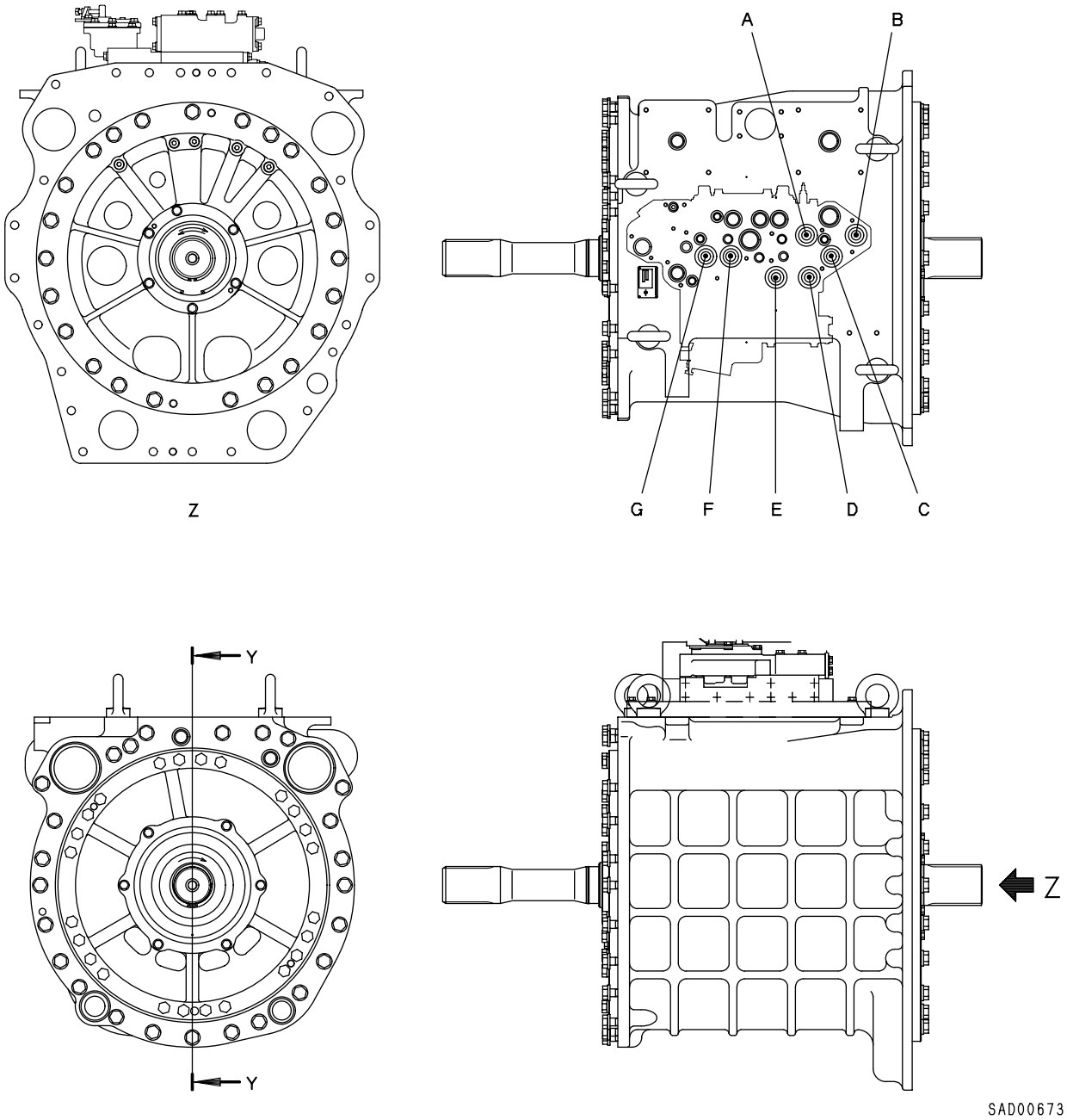
2. Travel in direct drive



When the machine is in the direct drive range, the solenoid valve is excited, so plunger (30) is pushed to the right in the direction of the arrow and valve (32) is moved. Port **P** close and ports **N** and **M** open.
When this happens, oil from the pump stops at **P**. The high-pressure oil at port L is drained from port **N** to port **M**.
When the pilot pressure at port **L** is lost, piston (25) and lock-up selector valve (24) are returned to the right in the direction of the arrow by the tension of spring (22).

Ports **F** and **H** and ports **G** and **J** close, and ports **F** and **G** and ports **H** and **K** open.
When this happens, the oil from the pump flows from port **F** to port **G**, and becomes the back pressure of the lock-up clutch piston. When the pressure in the circuit rises, the lock-up clutch is engaged.
At the same time, the oil that is the back pressure of the stator clutch piston is drained from port **H** to port **K**, and the stator clutch is disengaged.

TRANSMISSION

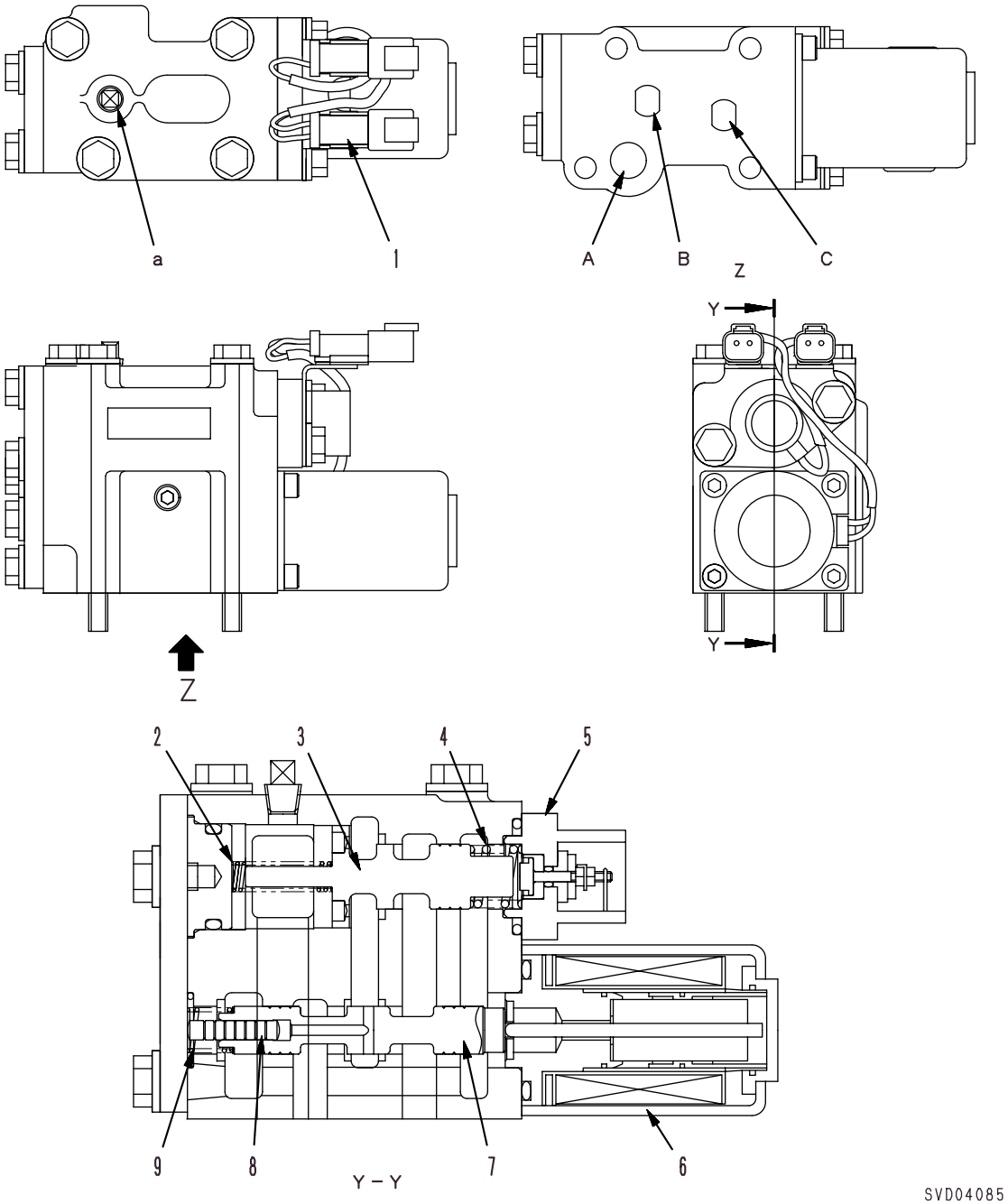


A. Lubrication port
B. Lubrication port
C. 1st clutch port
D. 2nd clutch port
E. 3rd clutch port
F. Forward clutch port
G. Reverse clutch port

ECMV

★ ECMV stands for Electronic Control Modulation Valve.

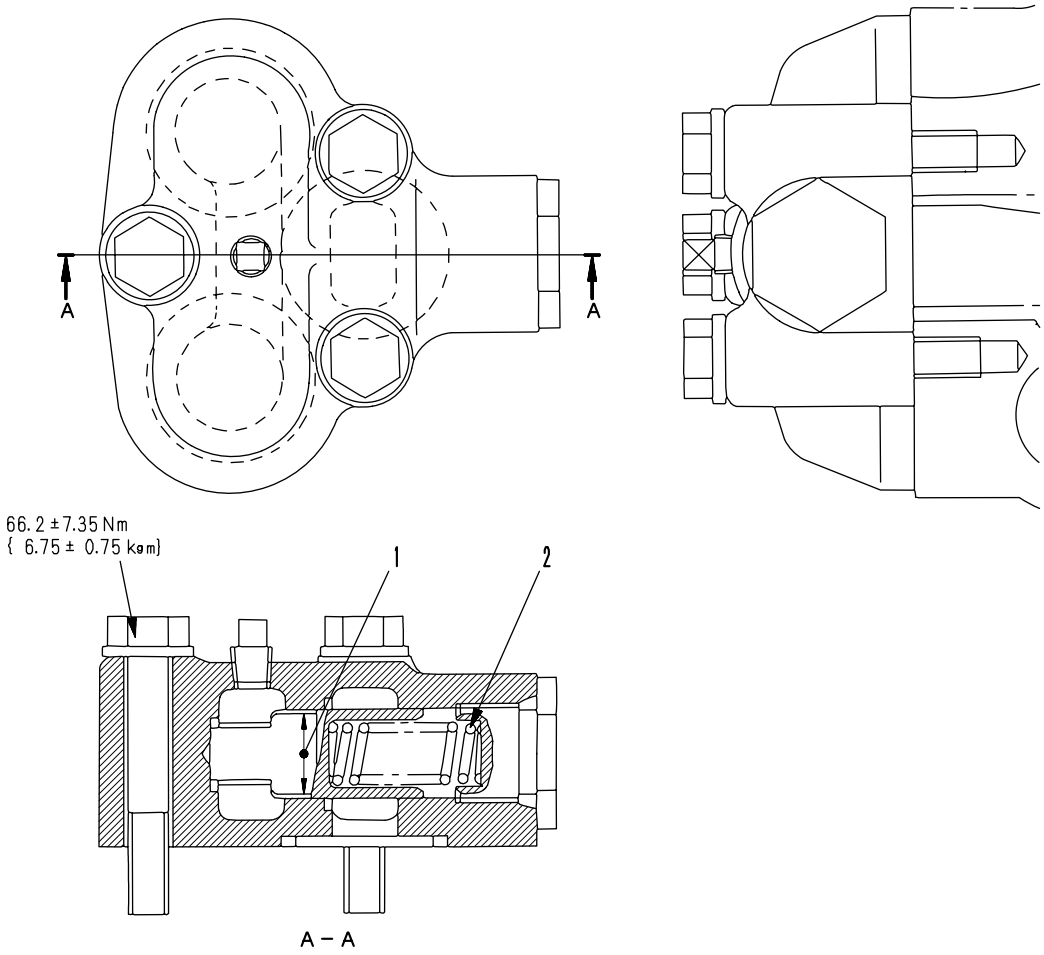
For Forward, 2nd, 3rd clutch



1. Connector
2. Spring
3. Flow sensor valve spool
4. Spring
5. Fill switch
6. Proportional solenoid
7. Pressure control valve spool
8. Load piston
9. Spring

A. To clutch
B. Drain
C. From pump

a. Clutch pressure measurement port

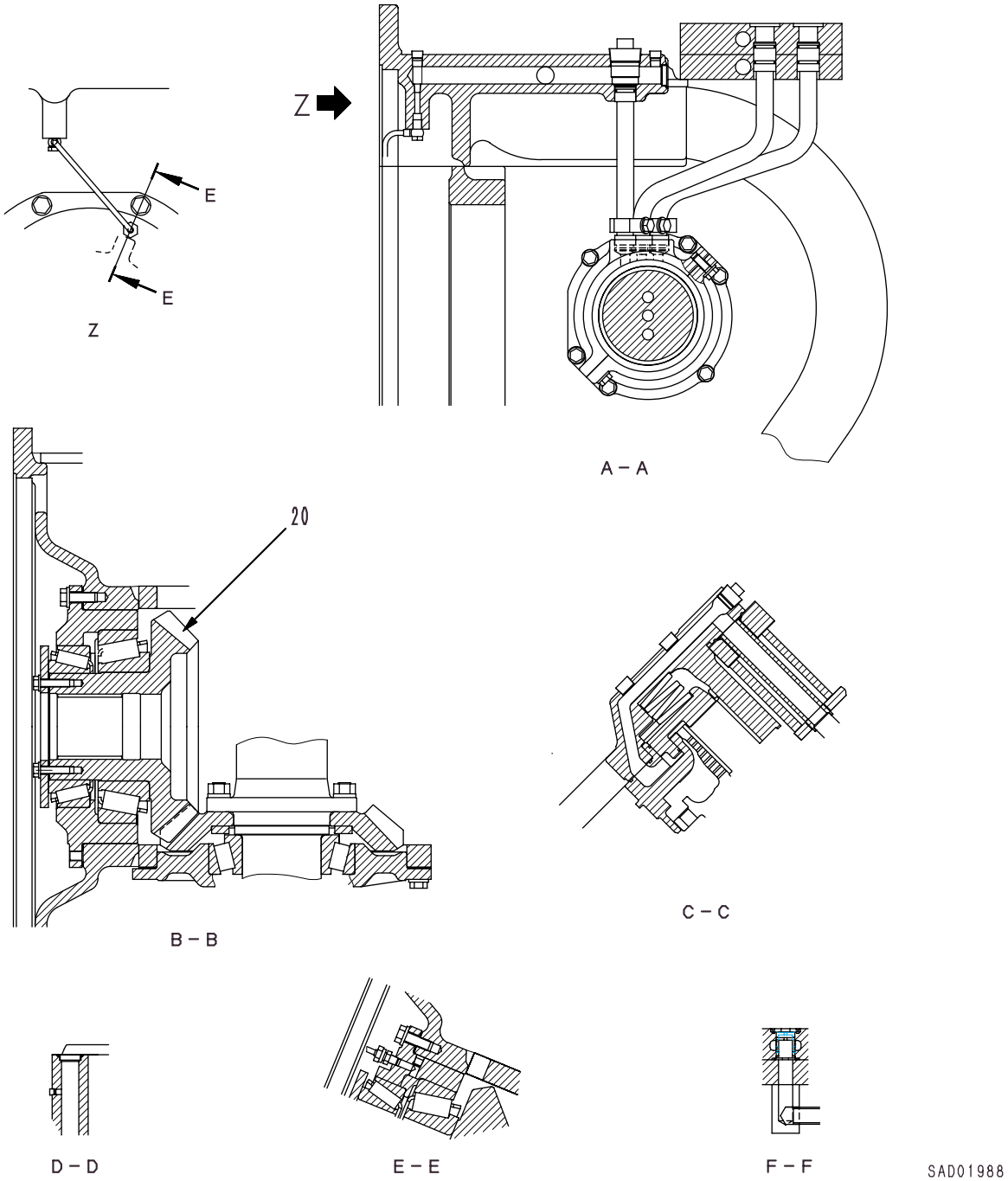


9JB00121

Unit: mm

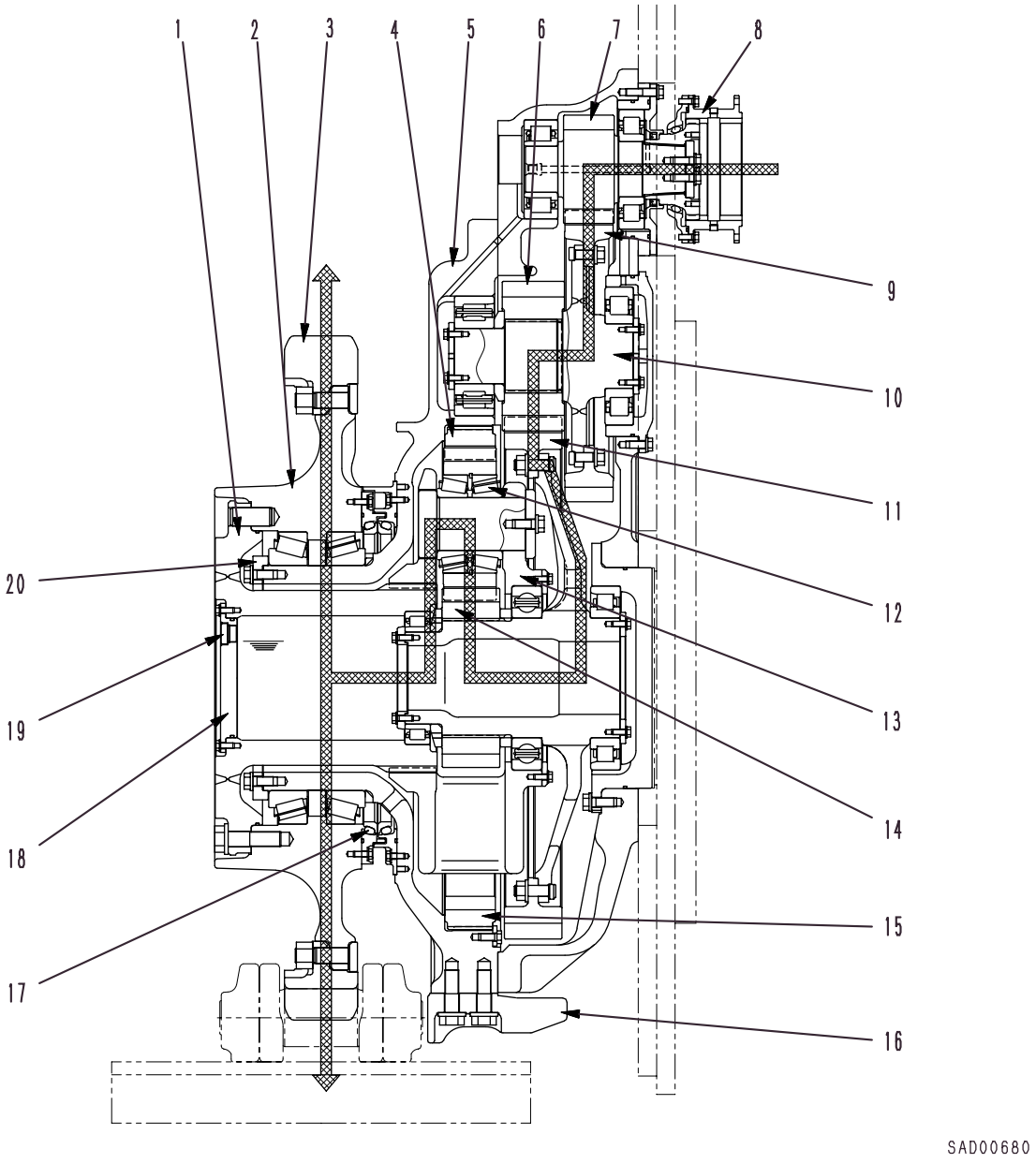
No.	Check item	Criteria					Remedy
1	Clearance between lubricating oil relief valve spool and valve body	Standard size	Tolerance		Standard clearance	Clearance limit	Replace
			Shaft	Hole			
		Ø 22	–0.035 –0.045	+0.013 0	0.035 – 0.058	0.078	
2	Valve spring of lubricating oil relief valve	Standard size			Repair limit		
		Free length	Installed length	Installed load	Free length	Installed load	
		68.5	37	91.9 N {9.37 kg}	66.4	87.3 N {8.9 kg}	

(3/3)



1. Brake output shaft
2. Brake flange
3. Piston spring (Belleville spring)
4. Brake piston
5. Piston housing
6. Wave spring
7. Brake disc
8. Brake plate
9. Stopper
10. Bevel gear
11. Steering shaft
12. Clutch flange
13. Clutch disc
14. Clutch plate
15. Clutch piston
16. Piston spring (Belleville spring)
17. Drum
18. Oil filler
19. Dipstick
20. Bevel pinion

POWER TRAIN

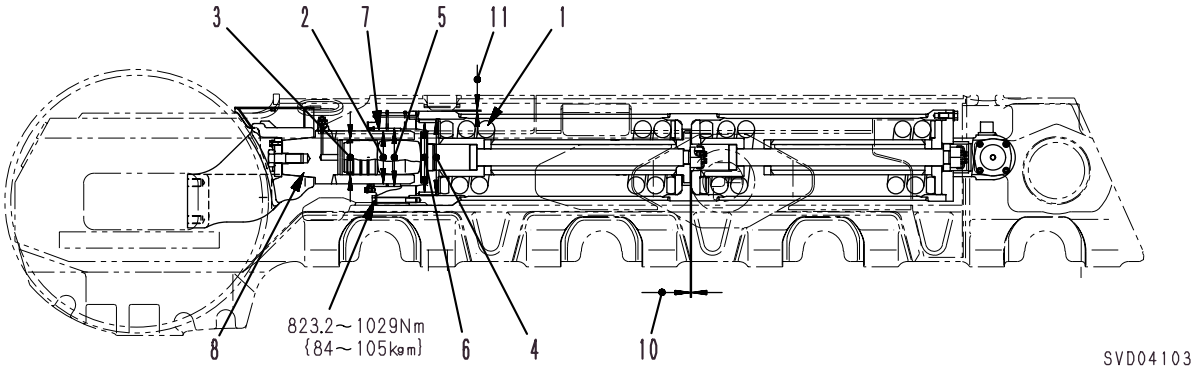


OPERATION

- The motive power form the bevel gear shaft and steering clutch is transmitted to No. 1 pinion (7) through gear coupling (8). From No. 1 pinion (7), it passes through No. 1 gear (9) and No. 1 hub (10), and rotates No. 2 pinion (6).
- From No. 2 pinion (6), it passes through No. 2 gear (11) and No. 2 hub (12), and rotates sun gear (14).
- The rotation of sun gear (14) is transmitted to planetary gear (4), but ring gear (15), which is meshed with the planetary gear, is locked by cover (5), so the planetary gear rotates around the sun gear along the ring gear. Therefore, the rotation of the sun gear rotates carrier (13).
- The rotation of carrier (13) passes through shaft (1) and is transmitted to sprocket hub (2). The sprocket hub rotates in the same direction as sun gear (14).
- The power transmitted to sprocket teeth (3) through sprocket hub (2).

Unit: mm

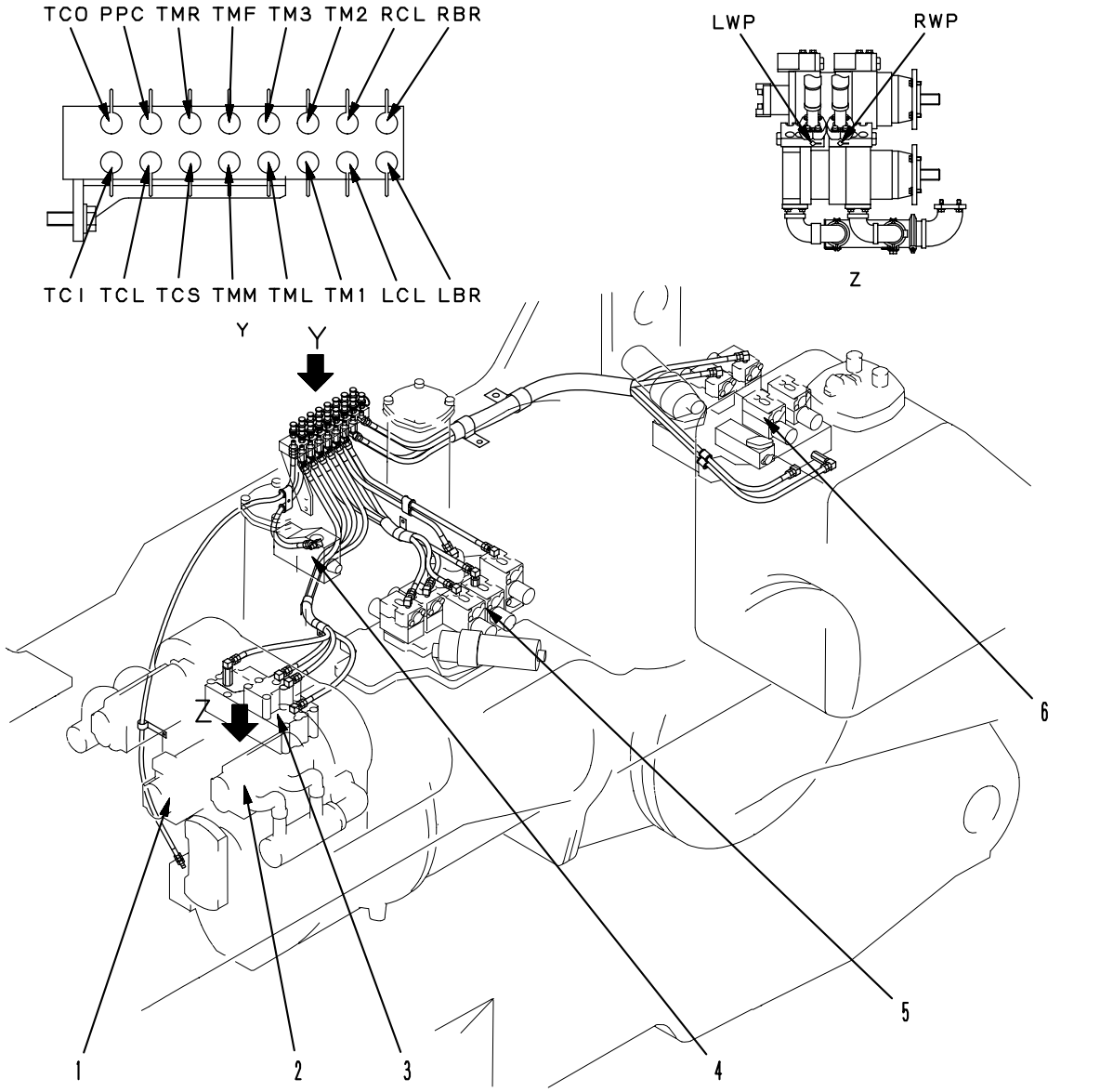
No.	Check item	Criteria				Remedy
1	Outside diameter of protrusion	1,246				Rebuild or replace
2	Outside diametr of tread	Standard size		Repair limit		
		1,190		1,165		
3	Tread step	28		40.5		
4	Tread thickness	37.5		25		
5	Overall width	358				
6	Tread width	92				
7	Clearance between bushing and shaft	Standard size	Tolerance		Standard clearance	Replace bushing
			Shaft	Hole		
		205	–0.350 –0.440	+0.178 +0.005	0.345 – 0.591	
8	Interference between bushing and idler	Standard size	Tolerance		Standard interference	
			Shaft	Hole		
		215	–0.143 –0.104	+0.046 +0.044	0.058 – 0.187	
9	Width of shaft flange	342				Replace
10	Tightening torque for oil filler plug	205.9 ± 49 Nm {21 ± 5 kgm}				Retighten



Unit: mm

No.	Check item	Criteria					Remedy
1	Recoil spring (each)	Standard size			Repair limit		Replace
		Free length	Installed length	Installed load	Free length	Installed load	
		1,375	1.110	529.2 N {54,000 kg}			
2	Clearance between bushing and cylinder	Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
		250	0 –0.072	+0.240 +0.190	– 0.190 – – 0.312	—	
3	Clearance between adjustment cylinder and bushing	165	–0.1 –0.56	+0.063 0	0.1 – 0.623	—	
4	Clearance between bushing and recoil spring case	361	–0.6 –0.943	+0.057 0	– 0.6 – 1.0	—	
5	Inter-ference between bushing and flange	Standard size	Tolerance		Standard interference	Interference limit	
			Shaft	Hole			
		274	+0.240 +0.190	+0.72 0	– 0.53 – 0.24	—	
6	Inter-ference between bushing and pilot flange	329	0 –0.057	–0.244 –0.319	– 0.187 – – 0.319	—	
7	Press-fitting force for inside cylinder bushing	—					Adjustment
8	Press-fitting force for idler yoke	784 ± 78.4 kN {80 ± 8 ton}					
9	Press-fitting force for pilot flange bushing	—					
10	Clearance between recoil spring bearing plate and nut	5.0					
11	Clearance between recoil spring case and stopper	Standard size			Repair limit		Repair
		5					

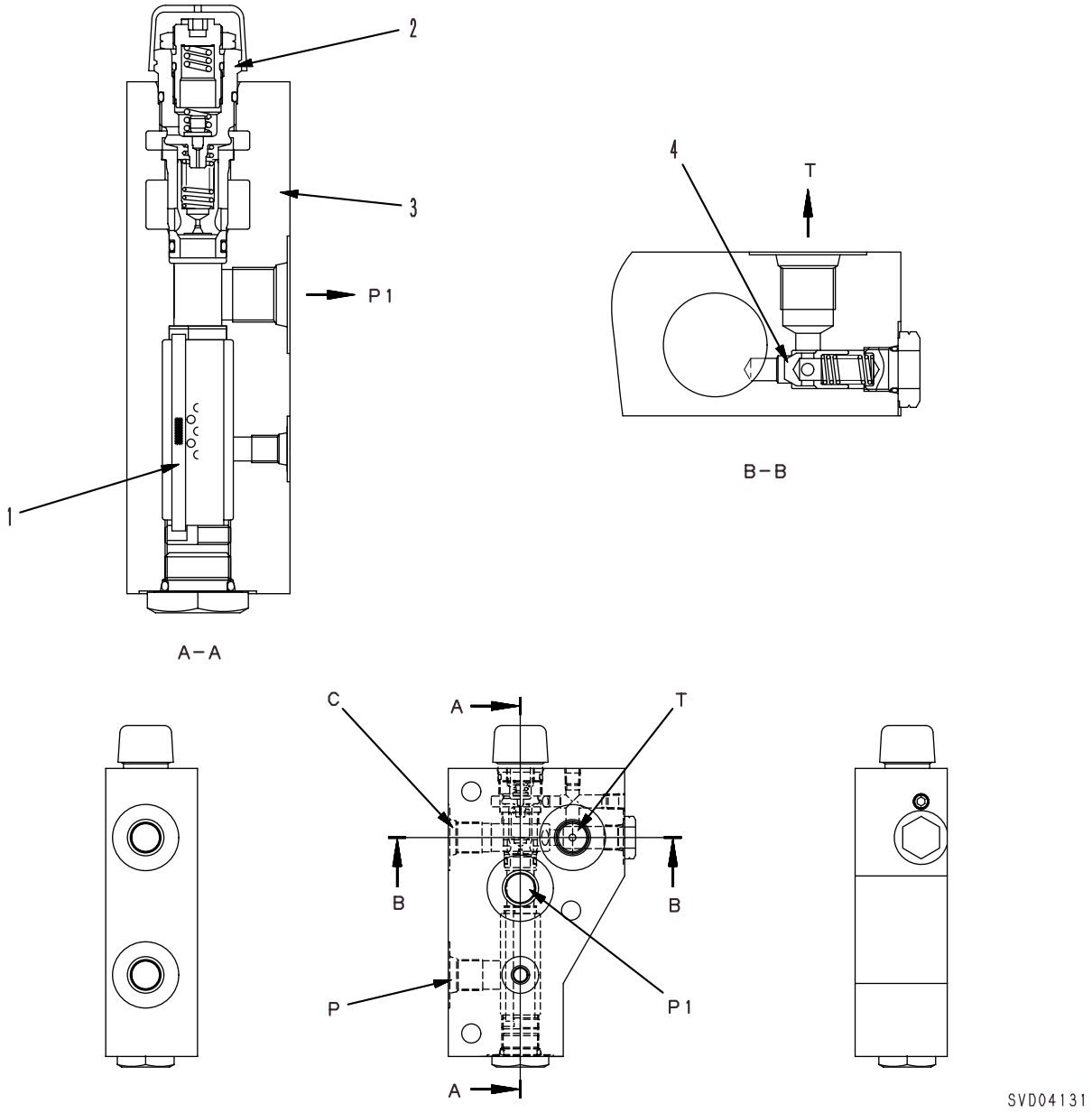
CENTRALIZED OIL PRESSURE DETECTION PIPING DIAGRAM



1. Hydraulic pump (SAR(4)-125+125+(1)-32) (for pitch assist and pilot)
2. Hydraulic pump (SAL(4)-200+200) (for work equipment)
3. Torque converter valve
4. PPC relief valve
5. Transmission control valve
6. Steering control valve

LBR. Pick-up port for steering brake pressure (L.H.)
LCL. Pick-up port for steering clutch pressure (L.H.)
LWP. Pick-up port for work equipment pump (For L.H.)
PPC. Pick-up port for PPC pilot pressure
RBR. Pick-up port for steering brake pressure (R.H.)
RCL. Pick-up port for steering clutch pressure (R.H.)
RWP. Pick-up port for work equipment pump (For R.H.)
TCI. Pick-up port for torque converter inlet pressure
TCL. Pick-up port for torque converter lock-up pressure
TCO. Pick-up port for torque converter outlet pressure
TCS. Pick-up port for torque converter stator clutch pressure
TM1. Pick-up port for 1st clutch pressure
TM2. Pick-up port for 2nd clutch pressure
TM3. Pick-up port for 3rd clutch pressure
TMF. Pick-up port for forward clutch pressure
TML. Pick-up port for transmission lubrication pressure
TMM. Pick-up port for transmission main pressure
TMR. Pick-up port for reverse clutch pressure

PPC RELIEF VALVE



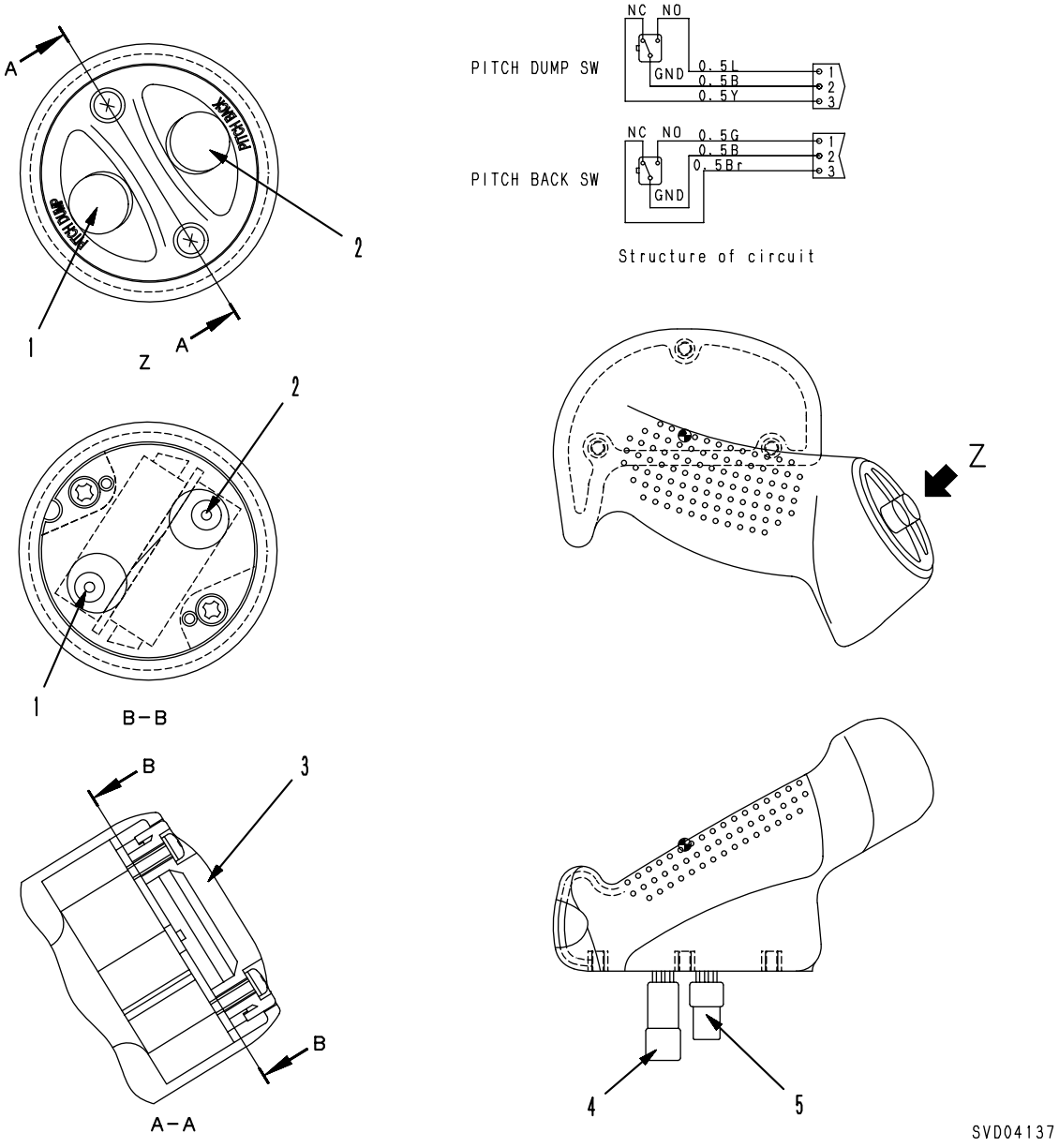
1. Strainer
2. Relife valve
3. Body
4. Oil cooler by-pass valve

C. To oil cooler
P. From PPC pump
P1. To pressure PPC
T. To tank

OUTLINE

- This valve adjusts the pressure in the PPC circuit to a constant 3.14 MPa {32 kg/cm^2}.

BLADE CONTROL KNOB

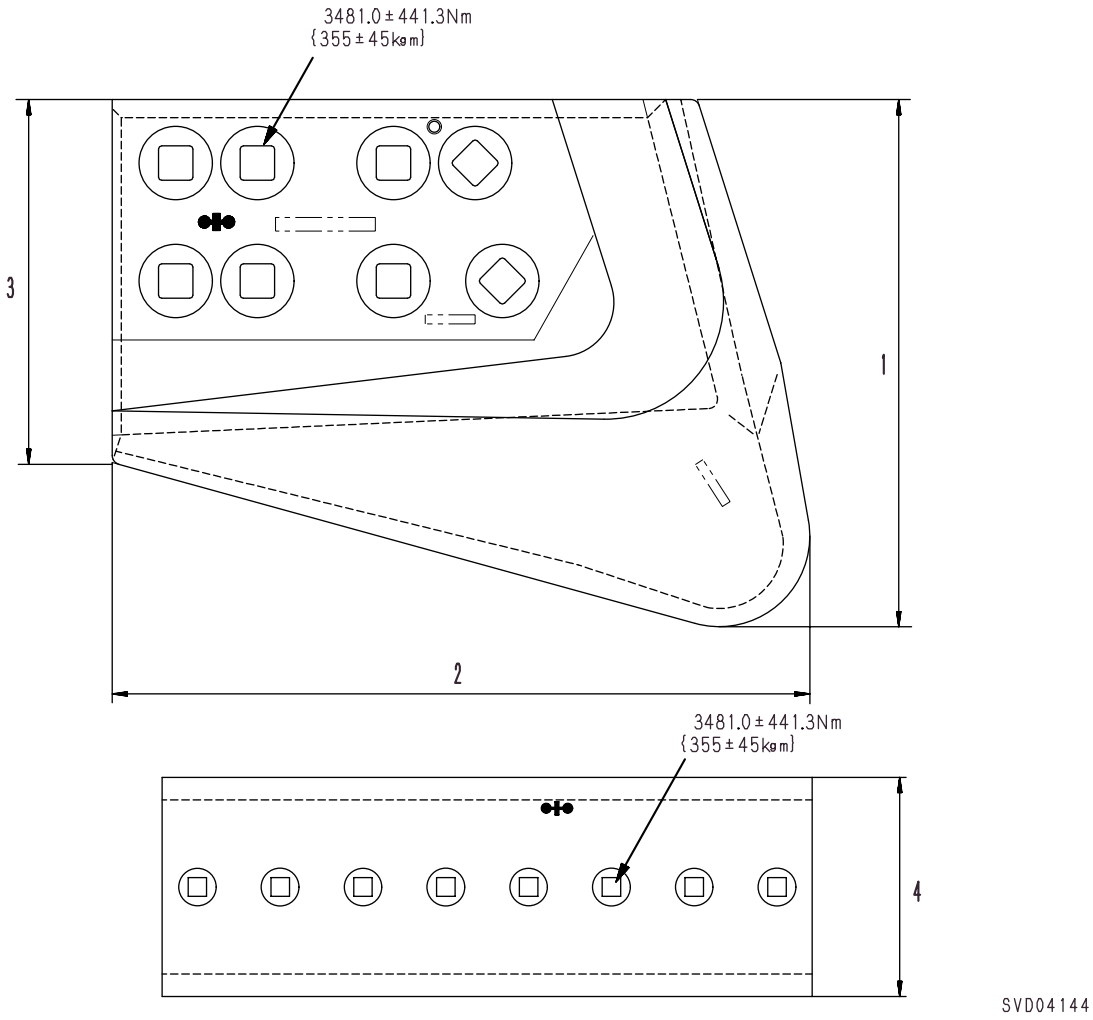


1. Switch (pitch dump)
2. Switch (pitch back)
3. Cover
4. Connector (male)
5. Connector (female)

OUTLINE

- The blade raise, lower, left tilt, and right tilt operations are carried out by operating the blade control knob to the front, rear, left, and right.
- While switch (1) is being pressed, the blade pitch dump operation is carried out. (It is given priority over the blade tilt operation.)
- While switch (2) is being pressed, the blade pitch back operation is carried out. (It is given priority over the blade tilt operation.)
- If switches (1) and (2) are pressed at the same time, the blade pitch dump operation is carried out. (The pitch dump operation is given priority.)

CUTTING EDGES AND END BITS

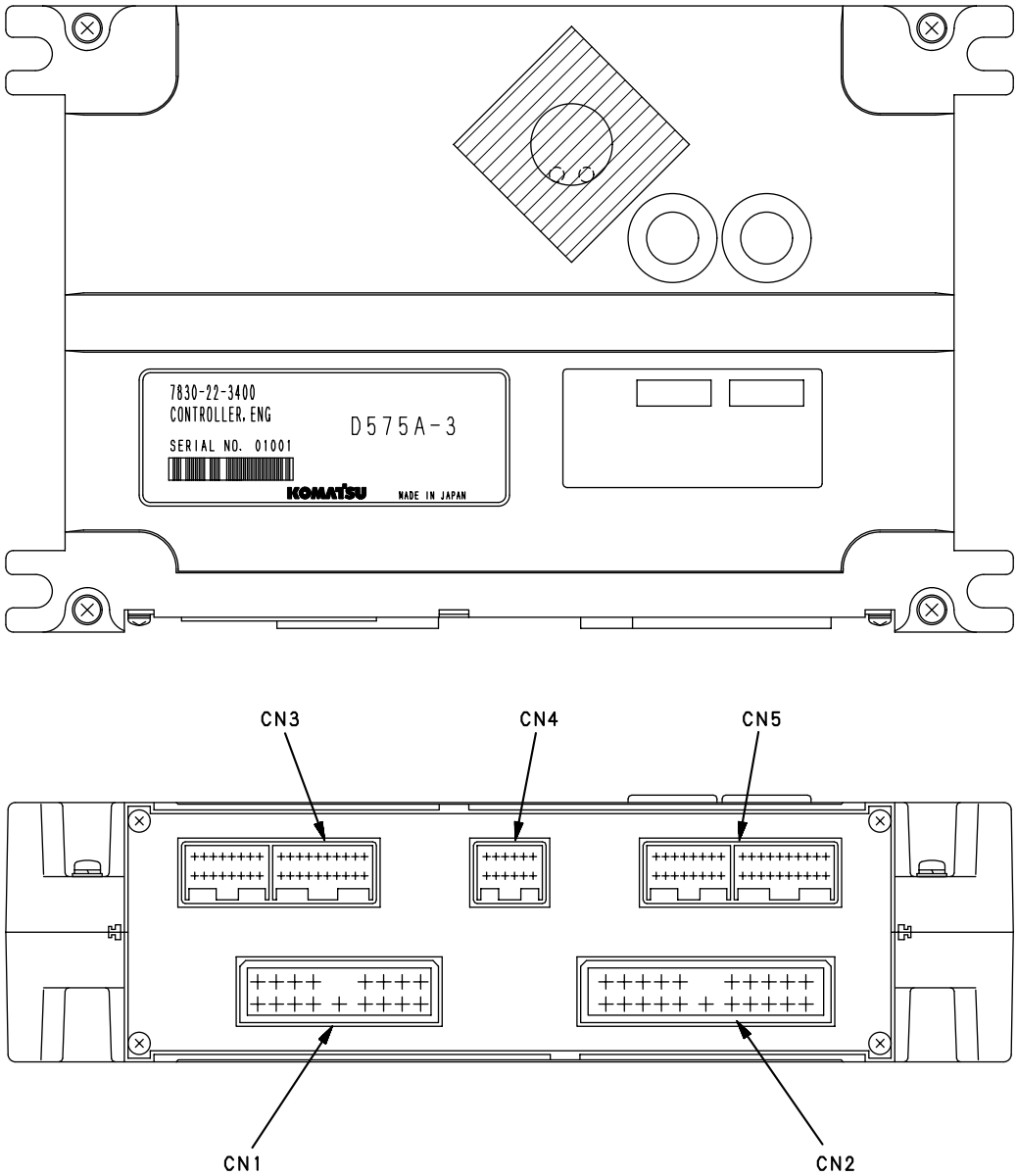


Unit: mm

No.	Check item	Criteria		Remedy
1	Height of the outside of end bit	Standard size	Repair limit	Replace
		580 (585)	350 (410)	
2	Width of end bit	770 (785)	620 (680)	
3	Height of the inside of end bit	400 (450)	340 (345)	
4	Height of cutting edge	406	346 (up to 286 when turned)	Turn or Replace

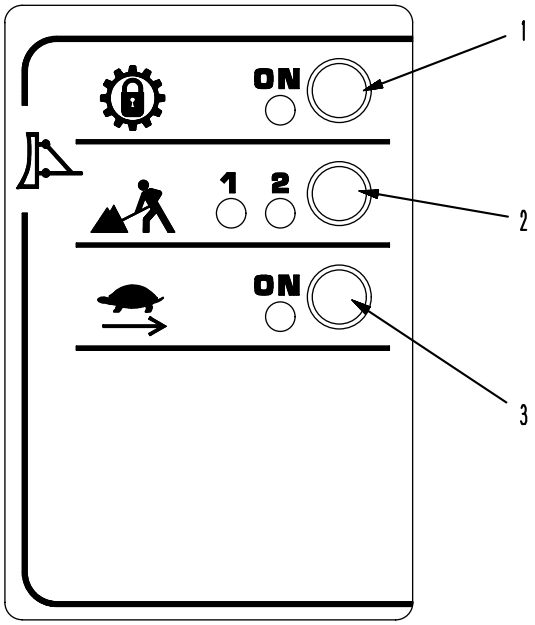
★ The valves in ( ) are for heavy duty type end bits.

ENGINE CONTROLLER



SVD04177

SWITCHES



SVD04182

1. Lock-up mode switch
2. Economy mode switch
3. Reverse slow mode switch

OUTLINE

- The mode selection panel has 3 mode selection switches. The selection mode changes each time the switches are pressed.
  The LED lights up to display the existing condition.

Switch actuation table

Item	Actuation
Lock-up mode	**ON** ↔ OFF
Economy mode	**OFF** ↔ 1 ↔ 2
Reverse slow mode	**OFF** ↔ ON

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

OUTLINE

Blade pitch control

- When the pitch back switch on the blade control lever is pressed, the pitch solenoid, right tilt limit solenoid, and pitch priority solenoid are turned ON.
  After 50 msec, the pitch back solenoid is turned ON and PPC pressure acts on the pitch back end of the blade valve spool.
- When the pitch dump switch on the blade control lever is pressed, the pitch selector solenoid, left tilt limit solenoid, and pitch priority solenoid are turned ON.
  After 50 m.sec, the pitch dump solenoid is turned ON and PPC pressure acts on the pitch dump end of the right and left blade pitch spool.

Pitch assist pump control

- The pitch assist solenoid is driven by the following logic.

  OFF conditions (when any of the following conditions are fulfilled)
  1) When the pitch selector solenoid is OFF
  2) When the engine speed is below 700 rpm
  3) When driving in F1 torque converter drive, with the travel speed below 1 km/h and the drawbar pull value more than 0.75 W
  4) When driving in F2 with the travel speed less than 1.5 km/h

  ON conditions (when all the following conditions are fulfilled)
  1) When none of the OFF conditions are fulfilled (OFF conditions are given priority)
  2) When the engine speed is more than 800 rpm
  3) When more than 2 sec. has passed after either 3) or 4) of the OFF conditions have been canceled.
     ★ If any of the above conditions are not fulfilled, the existing condition is maintained.

Blade tilt limit control

- The difference from the average of the blade yoke angles is calculated according to the left and right cylinder yoke angle sensor signals.
- The blade yoke angle average is used as the parameter, and the blade yoke angle difference limit is calculated and the tilt limit is actuated according to the following conditions.
  1) When the yoke angle difference is greater than the (+) limit value, the left tilt limit solenoid is turned ON.
  2) When the yoke angle difference is smaller than the (–) limit value, the right tilt limit solenoid is turned ON.
  3) If the above conditions are fulfilled when operating the pitch, the tilt limit is actuated to stop the pitch direction.
     ★ When the tilt limit is actuated, the tilt limit lamp lights up.
     (When the night lighting is ON, the lock-up lamp becomes dim.)

Auto pitch back control

- If the following condition is fulfilled, the blade can be reset automatically.
  1) When a traction force larger than 0.3 W is generated while traveling forward in F1 or F2
- If any of the following conditions is fulfilled, the blade cannot be reset automatically.
  1) When the neutral state continues for more than 30 seconds
  2) When the transmission gear is shifted into neutral, then into a forward travel position
- If any of the following conditions is fulfilled while the blade can be reset automatically and the machine is traveling in reverse, the blade is pitched back automatically.
  1) When the lift raise PPC oil pressure switch is turned ON
  2) When the pitch back knob switch is turned ON
- If any of the following conditions is fulfilled while the blade is pitched back automatically, the blade pitch back function is reset.
  1) When time passes more than 0.5 seconds after the reverse oil pressure switch is turned off
  2) When the pitch dump switch is turned ON
  3) When the pitch back switch is kept turned ON for more than 2 seconds
  4) When the average yoke angle is reduced to below 27 degrees.

Cate-gory	Item		Measurement conditions			Unit	Standard value	Permissible value
Operating effort of control lever, pedal	joystick	Steering	• Engine at low idling • Center of pedal	Left	Until clutch is completely disengaged	N {kg}	98± 1 {1.0 ± 0.1}	98± 1 {1.0 ± 0.1}
					Until machine turns when brake is applied		19.6 ± 4.9 {2.0 ± 0.5}	19.6 ± 4.9 {2.0 ± 0.5}
				Right	Until clutch is completely disengaged		11.8 ± 1 {1.2 ± 0.1}	11.8 ± 1 {1.2 ± 0.1}
					Until machine turns when brake is applied		24.5 ± 4.9 {2.5 ± 0.5}	24.5 ± 4.9 {2.5 ± 0.5}
	Brake pedal		• Engine at low idling • Center of pedal			N {kg}	372.7 ± 52 {38 ± 5.3}	Max. 490 {Max. 5.0}
	Blade lever		• Engine at low idling • Hydraulic oil temperature: 45-55°C • Center of lever knob		HOLD - RAISE	N {kg}	25.5 ± 4.9 {2.6 ± 0.5}	25.5 ± 4.9 {2.6 ± 0.5}
					HOLD - Left, right tilt		25.5 ± 9.8 {2.6 ± 1.0}	25.5 ± 9.8 {2.6 ± 1.0}

<table>
<tr><th>System</th><th colspan="2">Name of component</th><th>Connector No.</th><th>Inspection methd</th><th>Judgment table</th><th>Measurement conditions</th></tr>
<tr><td rowspan="2">Controller</td><td rowspan="2">Controller</td><td>Alarm buzzer
Buzzer selector relay</td><td>SE4</td><td>Measure voltage</td><td>If the condition is as shown in the table below, it is normal<table><tr><td>Caution buzzer between(9) – (21)</td><td>2.5 – 3 sec. after switch ON</td><td>Max. 1 V</td></tr><tr><td>Buzzer selector relay between (20) – (21)</td><td>Other than above</td><td>20 – 30 V</td></tr></table></td><td>1) Turn starting switch ON.
2) Insert T-adapter.</td></tr>
<tr><td>Caution lamp
Torque converter lock-up lamp</td><td>SE4</td><td>Measure voltage</td><td>If the condition is as shown in the table below, it is normal<table><tr><td>Caution betwee (3) – (21)</td><td>When lamp is ON</td><td>Max. 1 V</td></tr><tr><td>Lock-up between (2) – (21)</td><td>When lamp is OFF</td><td>10 – 30 V</td></tr></table></td><td>1) Turn starting switch ON.
2) Insert T-adapter.</td></tr>
</table>

MEASURING BLOW-BY PRESSURE

★ Blow-by pressure measurement tools

Symbol		Part No.	Part Name
E	1	799-201-1504	Blow-by checker
	2	799-201-1590	Gauge
	3	799-201-1511	Nozzle
		799-201-1450	Adapter

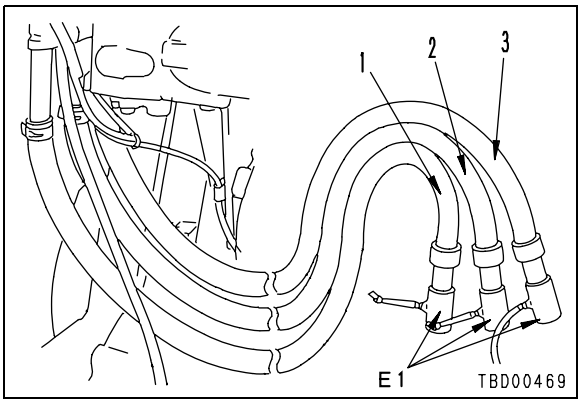
⚠ The measuring equipment is installed at a position that cannot be seen from the operator's seat, so take steps to ensure that no one starts the engine during the operation.

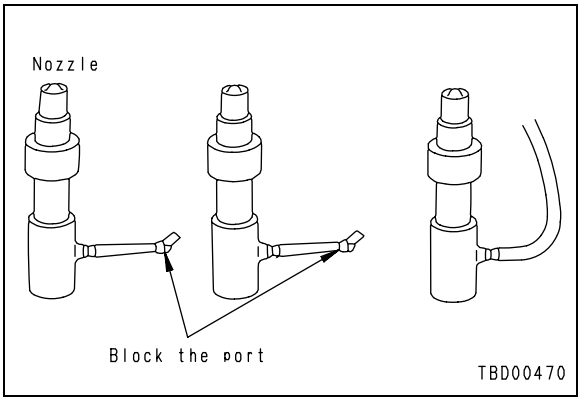
★ Raise the coolant temperature to the operating range before measuring.

1. Install the nozzle **E3** of blow-by checker **E1** to the tip of breather hose (3), then connect it to the gauge with the hose.

2. Install nozzle **E3** to the tip of the remaining breather hoses (1) and (2).
   ★ Block the port used to connect the gauge.

   ⚠ When measuring, be careful not to touch any hot parts or rotating parts.





3. Run the engine at high idling with the torque converter continuously stalled, and measure the pressure indicated by the gauge **E2**.
   ★ Be careful not to overheat the torque converter (the red range of the oil temperature gauge lights up).

Reference:
Blow-by varies greatly according to the condition of the engine. Therefore, if the blow-by value is considered abnormal, check for problems connected with defective blow-by, such as excessive oil consumption, defective exhaust gas color, and prematurely dirty or deteriorated oil.

MEASURING POWER TRAIN OIL PRESSURE

★ Power train oil pressure measurement tools

Symbol		Part No.	Part Name
C	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	799-401-2320	Hydraulic tester

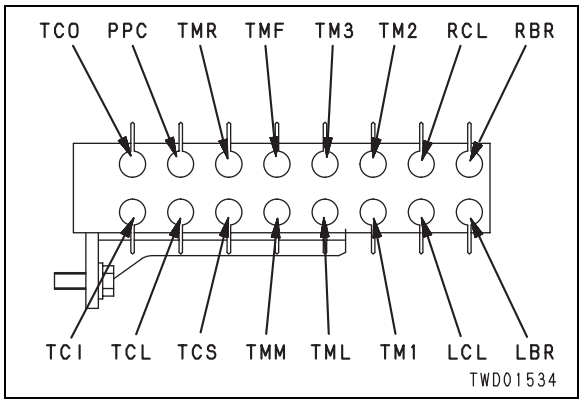
⚠ Stop the machine on level ground, lower the work equipment to the ground and apply the parking brake.

★ When measuring the hydraulic pressure, remove all the sand and dirt from around the nipple and plug.
★ Raise the power train oil temperature to at least 70°C before measuring.

• Refer to the diagram and table below to install oil pressure gauge **C** to the nipple for the circuit to be measured.

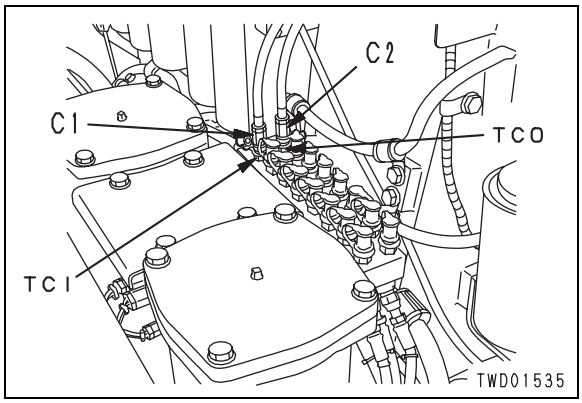
Table of centralized pressure pick-up port positions and gauges to use when measuring hydraulic pressure

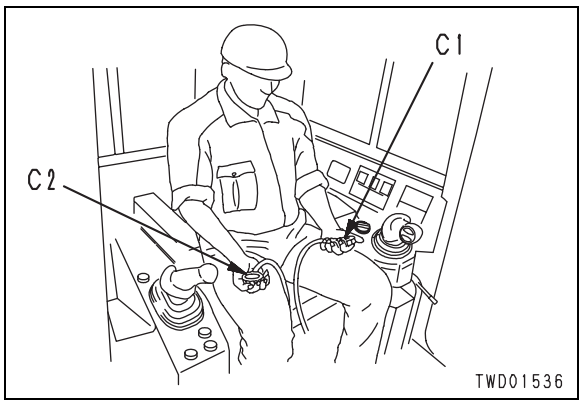
No.	Measurement location	Gauge (MPa {kg/cm^2})
LBR.	Steering brake pressure (L.H.)	6 {60}
LCL.	Steering clutch pressure (L.H.)	6 {60}
PPC.	PPC pilot pressure	6 {60}
RBR.	Steering brake pressure (R.H.)	6 {60}
RCL.	Steering clutch pressure (R.H.)	6 {60}
TCI.	Torque convertr inlet pressure	2.5 {25}
TCL.	Torque convertr lock-up pressure	6 {60}
TCO.	Torque convertr outlet pressure	1.0 {10}
TCS.	Torque converter stator clutch pressure	6 {60}
TM1.	1st clutch pressure	6 {60}
TM2.	2nd clutch pressure	6 {60}
TM3.	3rd clutch pressure	6 {60}
TMF.	Forward clutch pressure	6 {60}
TML.	Transmission lubrication pressure	1.0 {10}
TMM.	Transmission main pressure	6 {60}
TMR.	Reverse clutch pressure	6 {60}



1. Measuring torque converter oil pressure

1) Measuring torque converter inlet port and outlet pressure
   i) Install oil pressure gauges **C1** and **C2** to torque converter inlet pressure measurement nipple **TCI** and outlet pressure measurement nipple **TCO**.
   ii) Set the gearshift lever at neutral, and measure the torque converter inlet port pressure and outlet port pressure with the engine at low idling and high idling.





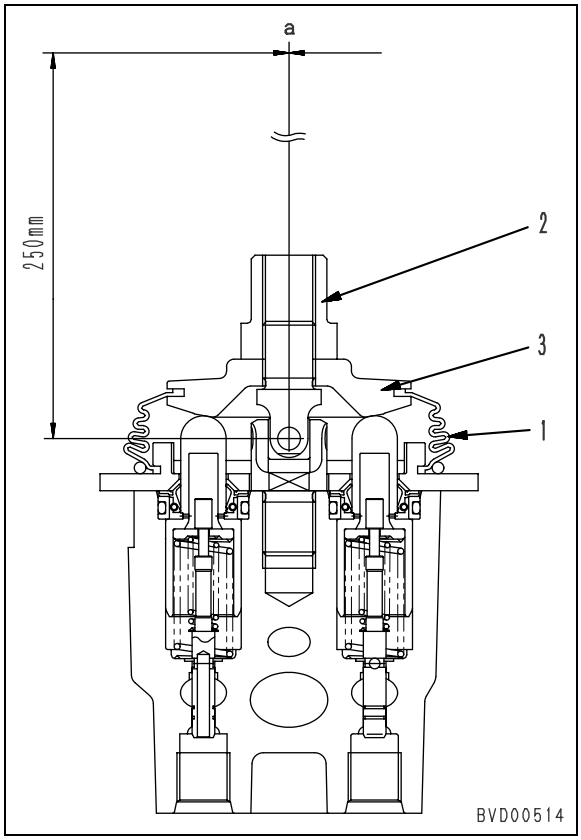
ADJUSTING PPC VALVE

★ If there is excessive play at the tip of the blade lever and ripper lever, adjust the PPC valve as follows.
- Standard play dimension **a**:
  1 – 5 mm at point 250 mm from center of lever (both front-to-rear and left-right)

★ The diagram shows the ripper PPC valve.

1. Remove boot (1).
2. Loosen locknut (2), then turn disc (3) to adjust the play.
   ★ When doing this, do not move the piston.
3. Secure disc (3) in position and tighten locknut (2).

   kgm Locknut:
   98.07 – 127.49 Nm {10 – 13 kgm}
4. Install boot (1).



CHECKING LOCATION OF CAUSE OF HYDRAULIC DRIFT OF BLADE

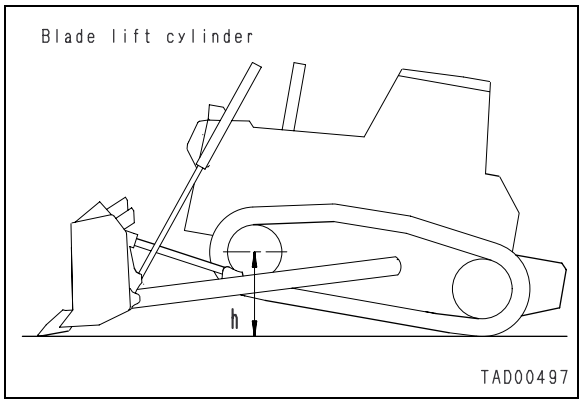
★ Stroke, hydraulic drift measurement tool

Symbol	Part No.	Part Name
J	Commercially available	Scale

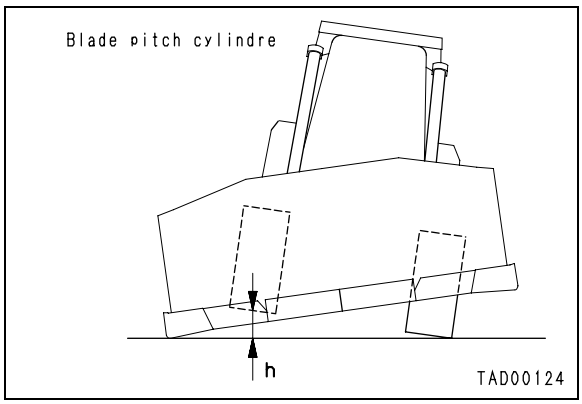
★ If hydraulic drift occurs in the blade and ripper (cylinder), check as follows to see if the cause is in the cylinder packing or in the control valve.

1. Inspection posture

1) Blade lift cylinder
   - Push the blade against the ground to raise the chassis.
   ★ The piston has a valve so do not operate to the end of the stroke.



2) Blade pitch cylinder
   - Extend the pitch cylinder rod fully (maximum tilt), then push the blade against the ground to raise the chassis.



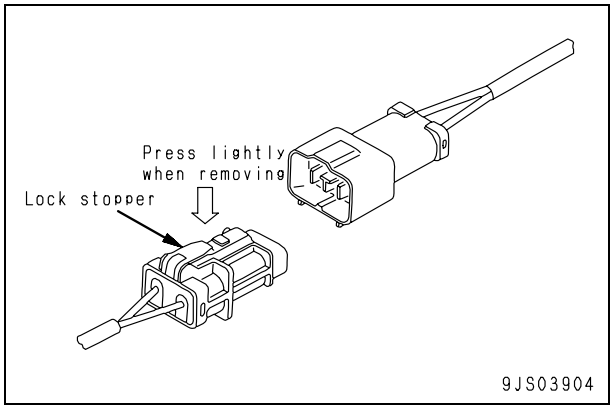
3. Removing, installing, and drying connectors and wiring harnesses

1) Disconnecting connectors

1] Hold the connectors when disconnecting.

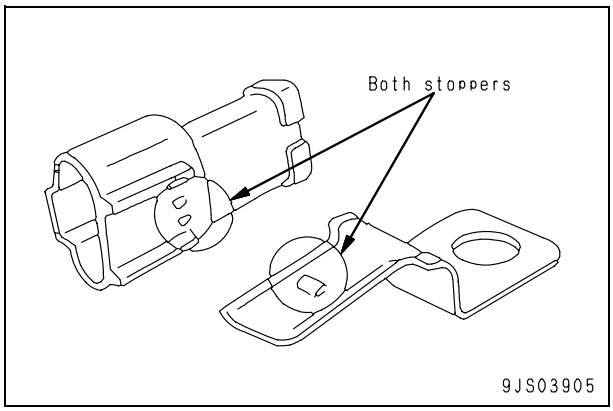
When disconnecting the connectors, hold the connectors. For connectors held by a screw, loosen the screw fully, then hold the male and female connectors in each hand and pull apart. For connectors which have a lock stopper, press down the stopper with your thumb and pull the connectors apart.

★ Never pull with one hand.



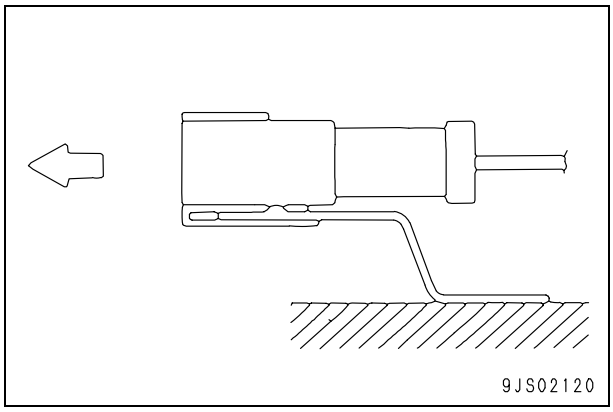
2] When removing from clips

- Both of the connector and clip have stoppers, which are engaged with each other when the connector is installed.



- When removing a connector from a clip, pull the connector in a parallel direction to the clip for removing stoppers.

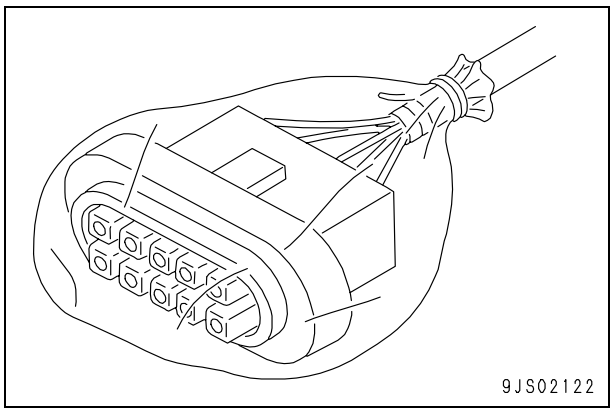
★ If the connector is twisted up and down or to the left or right, the housing may break.



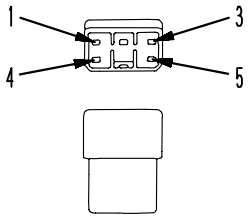
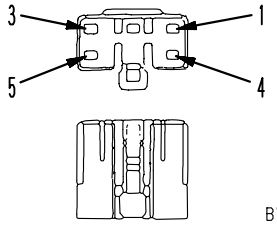
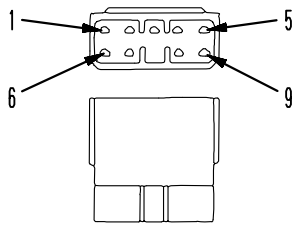
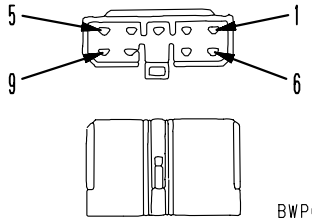
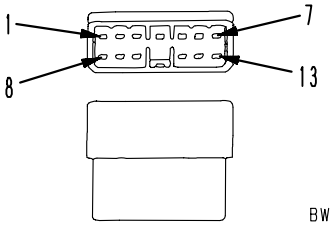
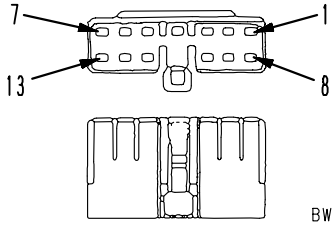
3] Action to take after removing connectors

After removing any connector, cover it with a vinyl bag to prevent any dust, dirt, oil, or water from getting in the connector portion.

★ If the machine is left disassembled for a long time, it is particularly easy for improper contact to occur, so always cover the connector.

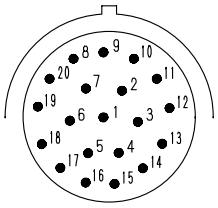
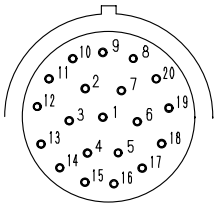
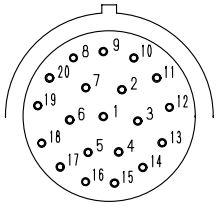
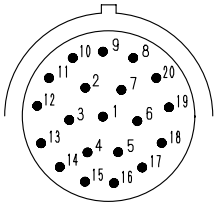
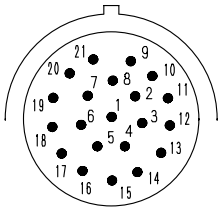
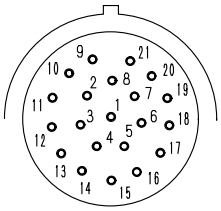
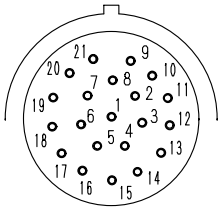
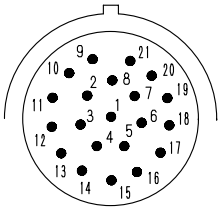


Connector	Model	Number of pins	Component name	Address of stereogram
SRT, FRT	DT	2	Transmission R clutch ECMV	J3
S1T, F1T	DT	2	Transmission 1st clutch ECMV	K5
S2T, F2T	DT	2	Transmission 2nd clutch ECMV	K4, K5
S3T, F3T	DT	2	Transmission 3rd clutch ECMV	K4, K5
TMCN1	—	24	Transmission controller	Q2
TMCN2	—	40	Transmission controller	Q2
TMCN3	—	40	Transmission controller	Q2
NGICN1	—	24	Steering controller	P9
NGICN2	—	40	Steering controller	Q9
NGICN3	—	40	Steering controller	Q8
SLC, FLC	DT	2	Left clutch ECMV	J7
SLB, FLB	DT	2	Left brake ECMV	K7
SRC, FRC	DT	2	Right clutch ECMV	J8
SRB, FRB	DT	2	Right brake ECMV	J7

No. of pins	MIC type connector		
	Male (female housing)	Female (male housing)	T-adapter Part No.
7	Body part No. : 79A-222-2640 (Q'ty:5)	Body part No. : 79A-222-2630 (Q'ty:5)	—
11	Body part No. : 79A-222-2680 (Q'ty:5)	Body part No. : 79A-222-2670 (Q'ty:5)	—
5	 BWP04741	 BWP04742	799-601-2710
	Body part No. : 79A-222-2620 (Q'ty:5)	Body part No. : 79A-222-2610 (Q'ty:5)	
9	 BWP04743	 BWP04744	799-601-2950
	Body part No. : 79A-222-2660 (Q'ty:5)	Body part No. : 79A-222-2650 (Q'ty:5)	
13	 BWP04745	 BWP04746	799-601-2720
	Body part No. : 79A-222-2710 (Q'ty:2)	Body part No. : 79A-222-2690 (Q'ty:2)	

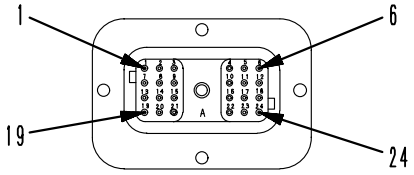
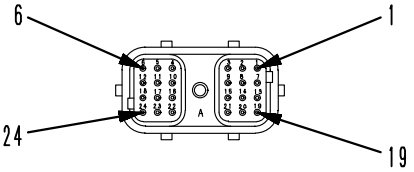
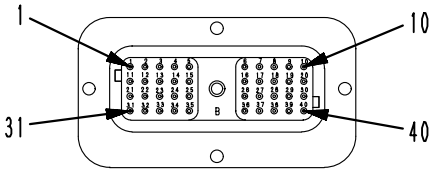
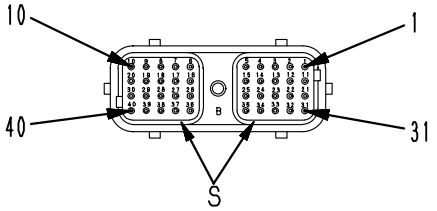
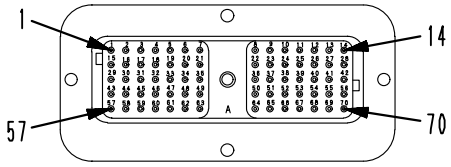
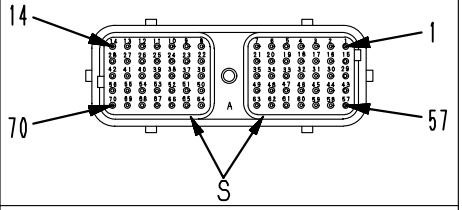
9JS04896

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

Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part No.
18-20 (3)	Pin (male terminal)	Socket (female terminal)	799-601-9230
	 BWP05009	 BWP05010	
	Part No. :08191-31201, 08191-31202	Part No. :08191-34101, 08191-34102	
	Socket (female terminal)	Pin (male termial)	799-601-9230
	 BWP05011	 BWP05012	
	Part No. :08191-32201, 08191-32202	Part No. :08191-33101, 08191-33102	
18-21 (4)	Pin (male terminal)	Socket (female terminal)	799-601-9240
	 BWP05013	 BWP05014	
	Part No. :08191-41201, 08191-42202	Part No. :08191-44101, 08191-44102	
	Socket (female terminal)	Pin (male termial)	799-601-9240
	 BWP05015	 BWP05016	
	Part No. :08191-42201, 08191-42202	Part No. :08191-43101, 08191-43102	

9JS04905

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

No. of pins	DRC12,16 Series connector		
	DRC12:Male pin (female housing)	DRC16:Female pin (male housing)	T-adapter Part No.
24 (A)※ (B) (C)			–
	–	–	
40 (A)※ (B) (C)			–
	–	Seal(S) Part No. : 17A-06-41830	
70 (A)※ (B) (C)			–
	–	Seal(S) Part No. : 17A-06-41840	

※ (A)、(B)、(C):Key position

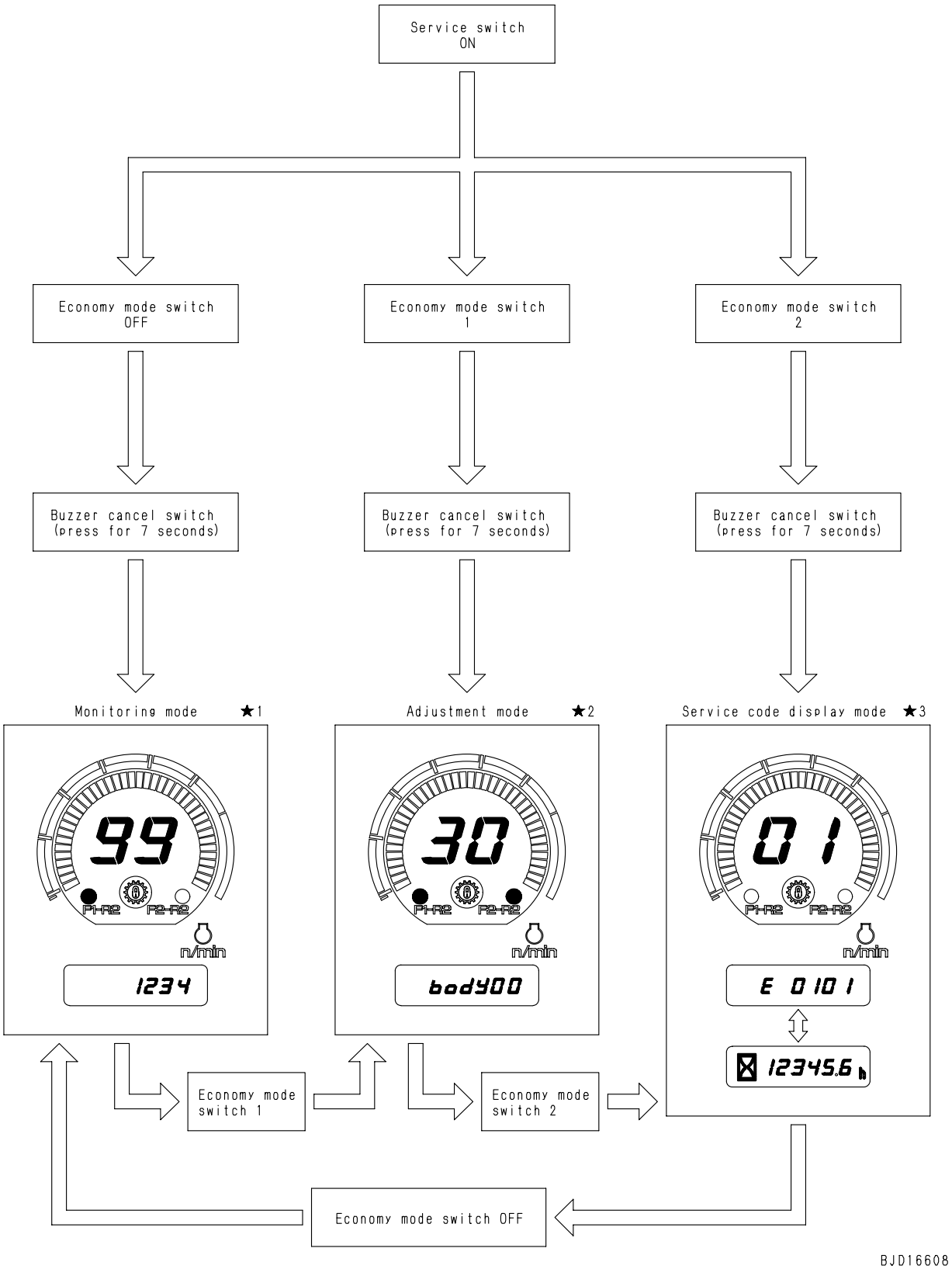
BJW12753

T-BRANCH BOX AND T-BRANCH ADAPTER TABLE (Rev. 2008.02)

★ The vertical column indicates a part number of T-branch box or T-branch adapter while the horizontal column indicates a part number of harness checker assembly.

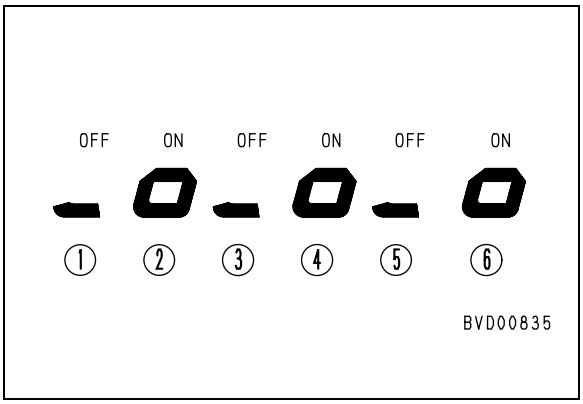
Part No.	Part name	Number of pins	Identification symbol	T-adapter kit														Out of kit
				799-601-2500	799-601-2700	799-601-2800	799-601-7000	799-601-7100	799-601-7400	799-601-7500	799-601-8000	799-601-9000	799-601-9100	799-601-9200	799-601-9300	799-601-4101	799-601-4201	
799-601-2600	T-box (for ECONO)	21		●		●		●	●		●							
799-601-3100	T-box (for MS)	37																●
799-601-3200	T-box (for MS)	37																●
799-601-3380	Plate for MS (14-pin)																	●
799-601-3410	Adapter for BENDIX (MS)	24	MS-24P															●
799-601-3420	Adapter for BENDIX (MS)	24	MS-24P															●
799-601-3430	Adapter for BENDIX (MS)	17	MS-17P															●
799-601-3440	Adapter for BENDIX (MS)	17	MS-17P															●
799-601-3450	Adapter for BENDIX (MS)	5	MS-5P															●
799-601-3460	Adapter for BENDIX (MS)	10	MS-10P															●
799-601-3510	Adapter for BENDIX (MS)	5	MS-5S															●
799-601-3520	Adapter for BENDIX (MS)	17	MS-17P															●
799-601-3530	Adapter for BENDIX (MS)	19	MS-19P															●
799-601-2910	Adapter for BENDIX (MS)	14	MS-14P															●
799-601-3470	Case																	●
799-601-2710	Adapter for MIC	5	MIC-5P	●	●				●									
799-601-2720	Adapter for MIC	13	MIC-13P	●	●				●									
799-601-2730	Adapter for MIC	17	MIC-17P	●	●	●		●	●		●							
799-601-2740	Adapter for MIC	21	MIC-21P	●	●	●		●	●		●							
799-601-2950	Adapter for MIC	9	MIC-9P				●	●	●		●							
799-601-2750	Adapter for ECONO	2	ECONO2P	●	●													
799-601-2760	Adapter for ECONO	3	ECONO3P	●	●													
799-601-2770	Adapter for ECONO	4	ECONO4P	●	●													
799-601-2780	Adapter for ECONO	8	ECONO8P	●	●													
799-601-2790	Adapter for ECONO	12	ECONO12P	●	●													
799-601-2810	Adapter for DLI	8	DLI-8P	●	●													
799-601-2820	Adapter for DLI	12	DLI-12P	●	●													
799-601-2830	Adapter for DLI	16	DLI-16P	●	●													
799-601-2840	Extension cable (ECONO type)	12	ECONO12P	●	●				●									
799-601-2850	Case			●														
799-601-4350	T-box (for DRC60, ECONO)	60														●		
799-601-4360	Case															●		
799-601-7010	Adapter for X (T-adapter)	1							●		●							
799-601-7020	Adapter for X	2	X2P				●	●	●		●							
799-601-7030	Adapter for X	3	X3P				●	●	●		●							
799-601-7040	Adapter for X	4	X4P				●	●	●		●							
799-601-7050	Adapter for SWP	6	SW6P				●	●	●									
799-601-7060	Adapter for SWP	8	SW8P				●	●	●									
799-601-7310	Adapter for SWP	12	SW12P															●
799-601-7070	Adapter for SWP	14	SW14P						●		●							
799-601-7320	Adapter for SWP	16	SW16P															●
799-601-7080	Adapter for M (T-adapter)	1	—						●		●							
799-601-7090	Adapter for M	2	M2P				●	●	●		●							
799-601-7110	Adapter for M	3	M3P				●	●	●		●							

Procedure for switching to each mode

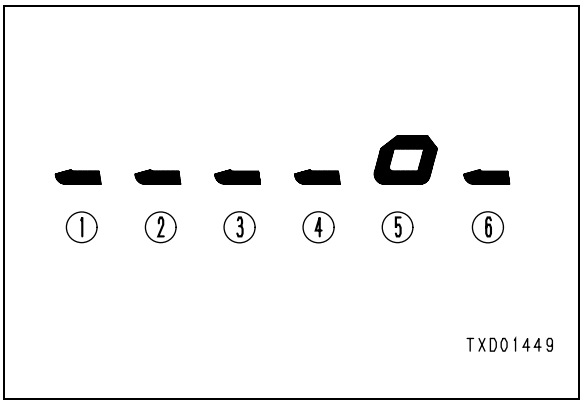


Details of bit display items

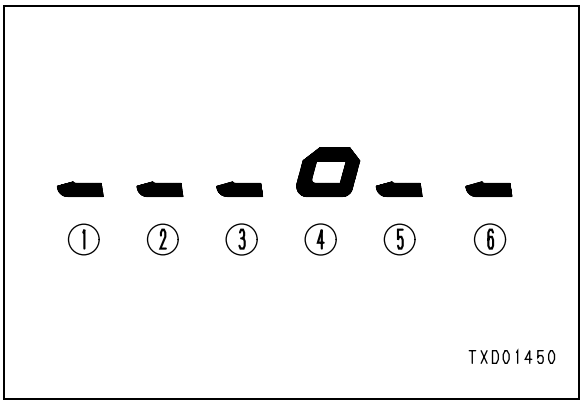
★ The diagram on the right is an example of the bit display
①, ③, and ⑤ display OFF condition
②, ④, and ⑥ display ON condition



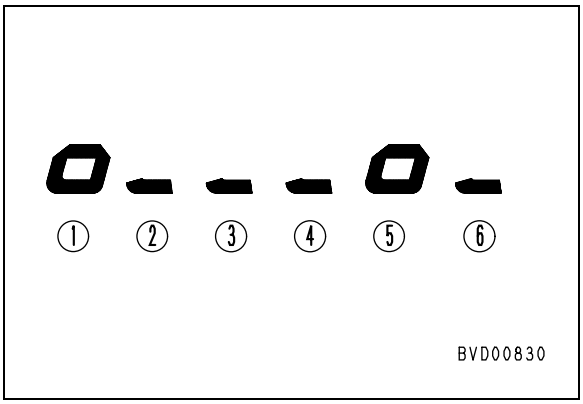
L9: Actuation status of parking lever switch
①: (Not used)
②: (Not used)
③: (Not used)
④: (Not used)
⑤: Parking lever switch (N.C.)
⑥: Parking lever switch (N.O.)
The figure at right shows that the parking lever switch (N.C.) is turned on and the parking lever switch (N.O.) is turned off.
In the normal state,
When the parking lever is at the LOCK position:
_ _ _ _ 0 _
When the parking lever is at the FREE position:
_ _ _ _ _ _ _ 0



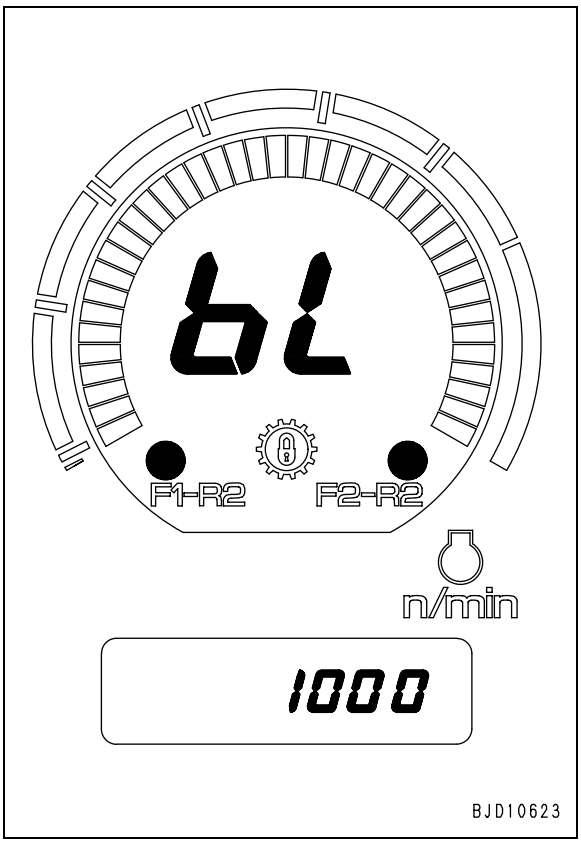
LJ: Actuation status of lamp signal
①: (Not used)
②: (Not used)
③: (Not used)
④: Lighting signal
⑤: (Not used)
⑥: (Not used)
The figure at right shows that the lighting signal is turned on.



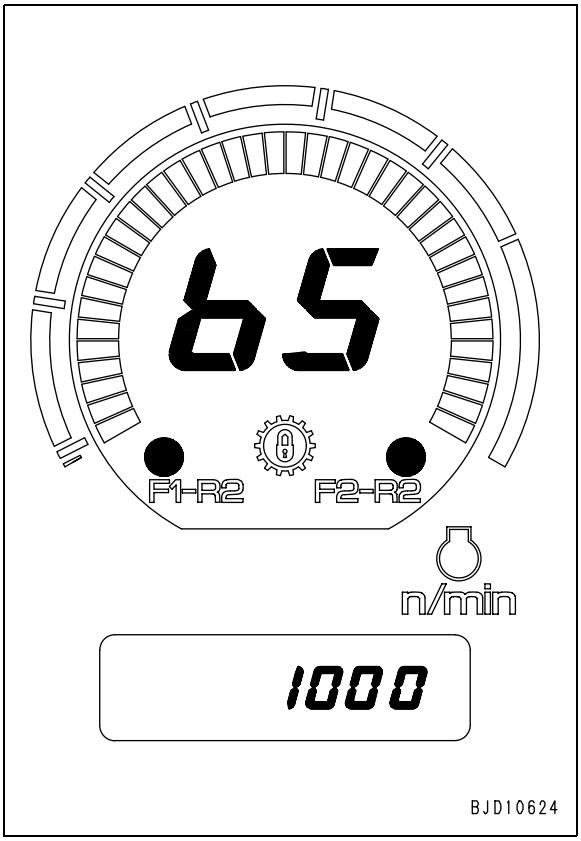
7b: Actuation status of steering fill switch
①: Left steering brake fill switch
②: Left steering clutch fill switch
③: (Not used)
④: (Not used)
⑤: Right steering clutch fill switch
⑥: Right steering brake fill switch
This display shows the state of the steering ECMV fill switch.
"_" shows that ECMV is draining (the clutch is engaged completely = oil pressure is 0 kg/cm^2), and "0" shows that ECMV is applying pressure.
The figure at right shows that the left steering clutch and right steering brake are engaged (Oil pressure is 0 kg/cm^2).



(9) bL: Brake release mode
- This code is the function to assist the adjustment of the parking lever cable or brake pedal rod when the brake is released with the brake ECMV.
- If the brake oil pressure is measured in this condition, it is possible to check the actuation status of the brake valve.
- The service meter display shows the voltage value (unit: mV) of the brake pedal potentiometer.
- Method of use
  When this code is displayed, the function becomes effective. The brake ECMV releases the brake, so measure the brake oil pressure as necessary (the brake oil pressure cannot be checked on the monitor panel).
  ★ When this code is finished, the function becomes ineffective.



(10) b5: Sudden stop prevention valve actuation mode
- This code is the function to check the actuation of the sudden stop prevention valve when the output to the clutch ECMV, brake ECMV, and sudden stop prevention solenoid valve is set to 0.
  If the brake oil pressure is measured in this condition, it is possible to check the actuation status of the sudden stop prevention valve.
- The service meter display shows the voltage value (unit: mV) of the brake pedal potentiometer.
- Method of use
  When this code is displayed, the function becomes effective. The clutch ECMV, brake ECMV, and sudden stop prevention solenoid valve output become 0, so measure the brake oil pressure as necessary (the brake oil pressure cannot be checked on the monitor panel).
  ★ When this code is finished, the function becomes ineffective.

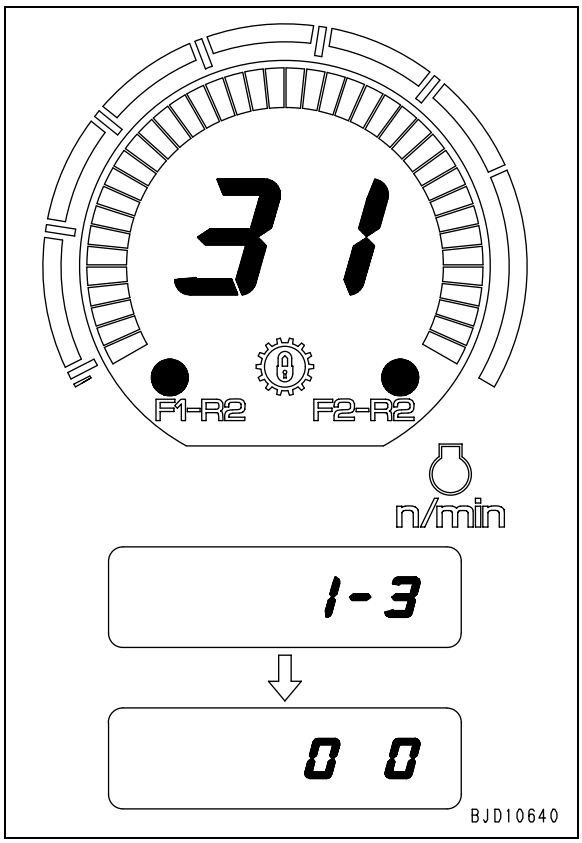


(25) 3x: Transmission 3rd clutch trigger compensation value

- This code is the function to check the transmission 3rd clutch learning control value and to format the learning control value (all clutches).
- The service meter display section displays the control value – control value (Unit: 10 ms) in each state of the engine speed and torque converter oil temperature.
- Method of checking
  When the code is selected, the following data is displayed for 2 seconds.

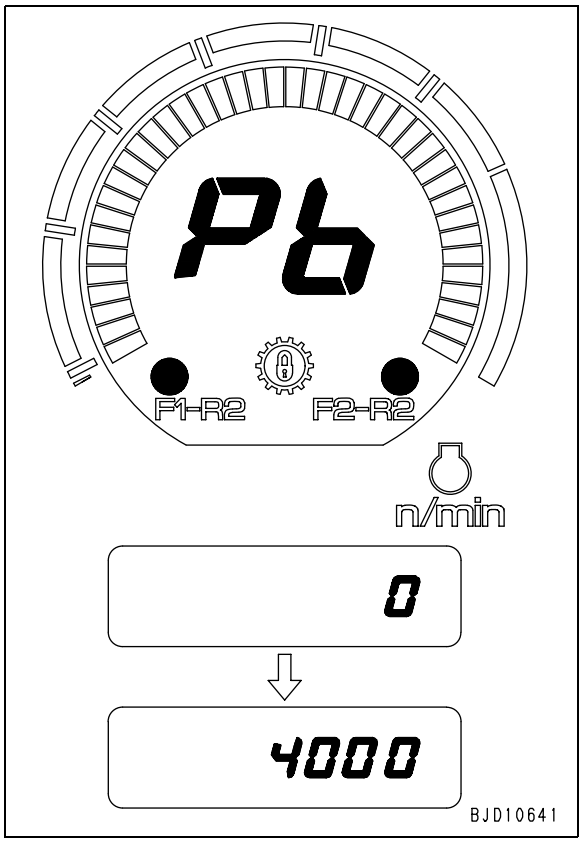
Speed range display	Service meter display	(Engine condition)
31	Control value H1 – control value L1	Low
32	Control value H2 – control value L2	Medium (low speed)
33	Control value H3 – control value L3	Medium (high speed)
34	Control value H4 – control value L4	High speed

  - Control value Hx: Control value (unit: 10 ms) when torque converter oil temperature is high
  - Control value Lx: Control value (unit: 10 ms) when torque converter oil temperature is low
- Method of formatting
  1) Turn the starting switch ON and then select this code.
  2) Hold the buzzer cancel switch for at least 1 sec. at the ON position and check that the alarm buzzer sounds.
  3) Check that the display for the control value has returned to [00].
  ★ Even when this code is finished, the initial setting remains effective.



(26) Pb: Steering brake I-P

- This code is the function to measure the I-P characteristic value of the left and right steering brake ECMV s.
- The service meter display shows the I-P measurement time (unit: 10 ms).
- Method of measurement 1 (preparatory work)
- Start the engine and select this code.
- Method of measurement 2 (measuring left brake)
  1) Operate the PCCS lever steering to the left and check that the displayed value for the I-P measurement time increases continuously from [0].
     ★ Hold the lever at the left position until the displayed value reaches [4000].
  2) After checking that the displayed value has reached [4000], return the lever to the neutral position.
     ★ The displayed value changes from [4000] to [0].
- Method of measurement 3 (measuring right brake)
  1) Operate the PCCS lever steering to the right and check that the displayed value for the I-P measurement time increases continuously from [0].



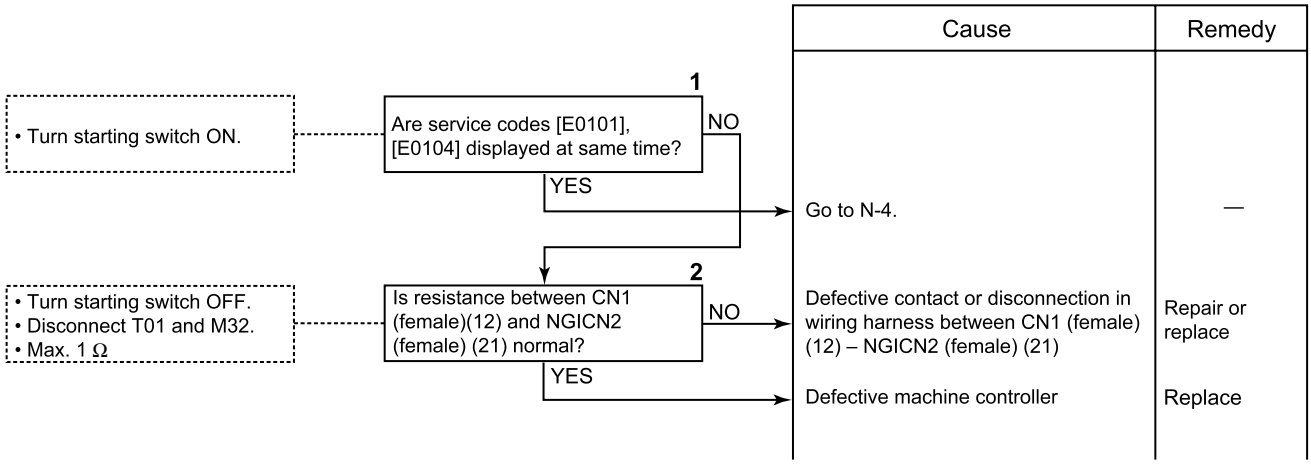
★ **Method of re-enaction**
S: Service code that can be re-enacted when starting switch is turned ON
S+: Service code that can be re-enacted when starting switch is turned ON and applicable switch or lever is operated
E: Service code that can be re-enacted when engine is started
E+: Service code that can be re-enacted when engine is started and applicable switch or lever is operated

★ **Troubleshooting mode**
N mode: Troubleshooting of network system
E mode: Troubleshooting of engine controller system
ST mode: Troubleshooting of steering controller system
T mode: Troubleshooting of transmission controller system
M mode: Troubleshooting of monitor panel and electrical equipment system

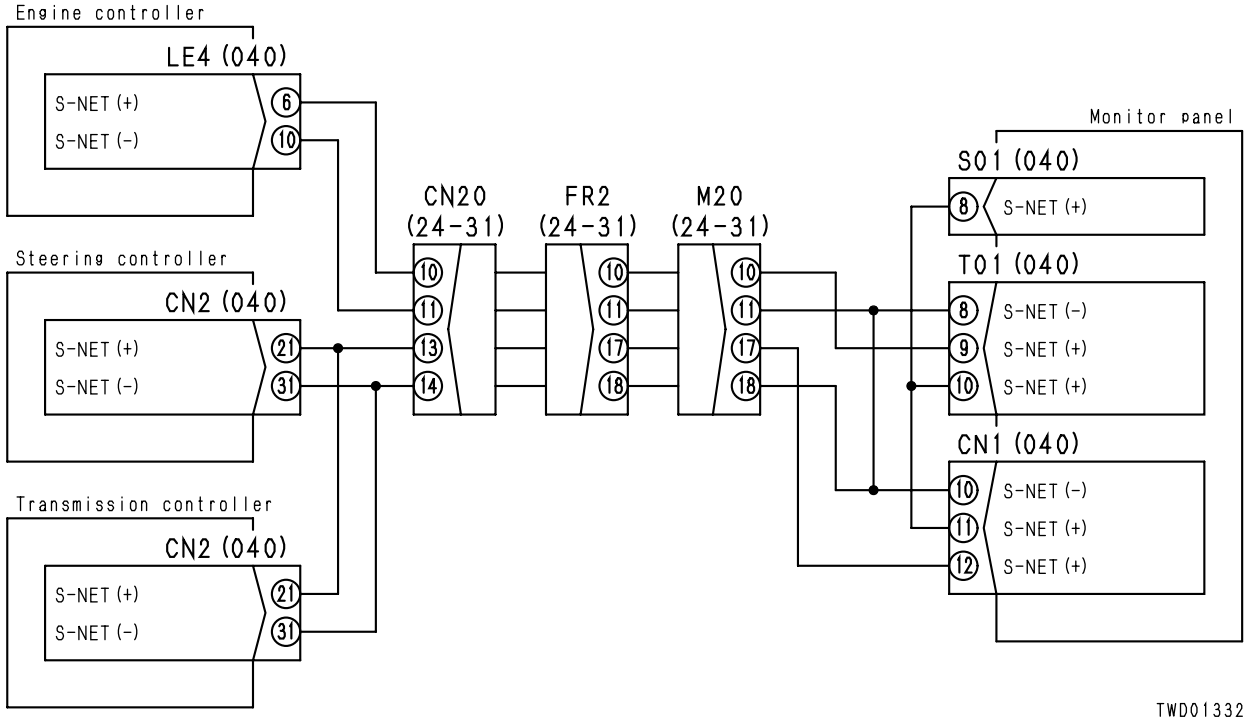
★ **Re-enaction of service code and method of confirming return to normal**
The procedure for re-enacting the service code and checking that the condition has returned to normal after repair is as follows.
1) Switch to the service code display mode and check the service code that is displayed.
   ★ Make a note of all the service codes.
2) Delete the service codes.
3) Carry out the re-enaction of all the service codes that were displayed.
   ★ For details of the method of re-enaction, see the above table or the section on troubleshooting.
4) Check if the service codes on the service code display are displayed or not displayed.

N-3 [E0105] Abnormality in network system (steering controller system) is displayed

★ If the starting switch was turned off after the abnormality occurred, turn the starting switch on and check that the service code displays "**E**" at the head. (If "**P**" is displayed, the condition has returned to normal.)
★ 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.



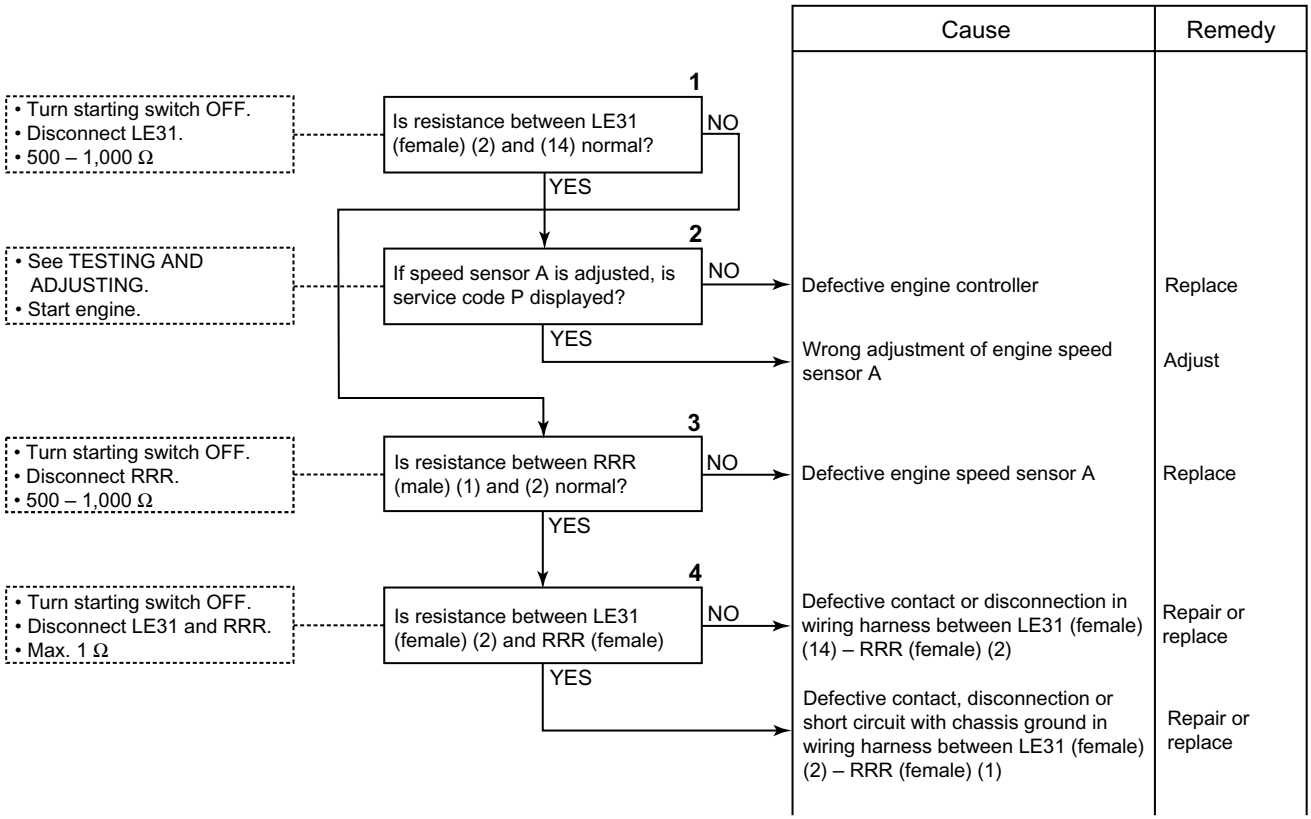
N-3 Related electrical circuit diagram



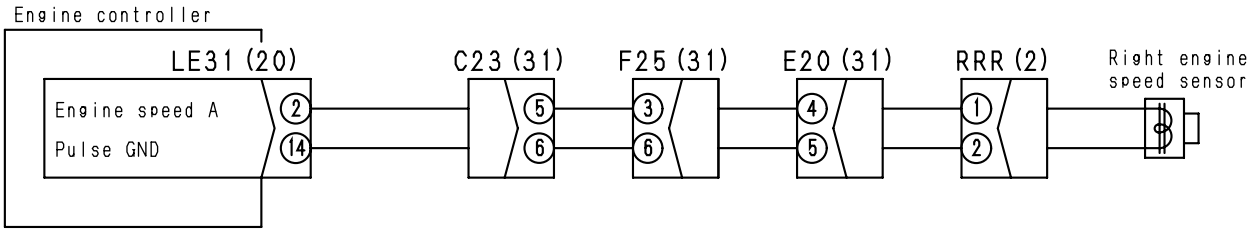
Condition when normal (voltage, current, resistance)	Action by controller when abnormality is detected	Problem that appears onmachine when there is abnormality
• Resistance of relay: 200 – 900 Ω • Voltage between E11 (5) and (14): 20 – 30 V		
• Resistance of solenoid: 10 – 21 Ω	1. Lights up caution lamp, sounds alarm buzzer 2. Reduces engine output by 20%	1. Lacks power
• Resistance of solenoid: 10 – 21 Ω	1. Lights up caution lamp, sounds alarm buzzer 2. Reduces engine output by 20%	1. Lacks power
• Resistance of sensor: 3.8 – 80 k Ω	1. Lights up caution lamp, sounds alarm buzzer 2. Controls with with engine water temperature taken as 90°C	
	1. Lights up caution lamp, sounds alarm buzzer 2. Sets right fuel injection pump to NO INJECTION condition	1. Engine runs on one bank
	1. Lights up caution lamp, sounds alarm buzzer 2. Sets left fuel injection pump to NO INJECTION condition	1. Engine runs on one bank
• Voltage between E21 (1) and (21): 20 – 30 V	1. Lights up caution lamp, sounds alarm buzzer	1. Engine runs on one bank
• Voltage between E21 (12) and (21): 20 – 30 V	1. Lights up caution lamp, sounds alarm buzzer	1. Engine runs on one bank
• Voltage between E11 (7) and (8)(16): 20 – 30 V	1. Lights up caution lamp, sounds alarm buzzer 2. Drives with switch power source	
• Voltage between E11 (9)(17) and (8)(16) : 20 – 30 V	1. Lights up caution lamp, sounds alarm buzzer 2. Drives with backup power source	

E-7 [E0409] Abnormality in engine speed sensor A system is displayed

★ If the starting switch was turned off after the abnormality occurred, start engine and check that the service code displays "**E**" at the head. (If "**P**" is displayed, the condition has returned to normal.)
★ 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.

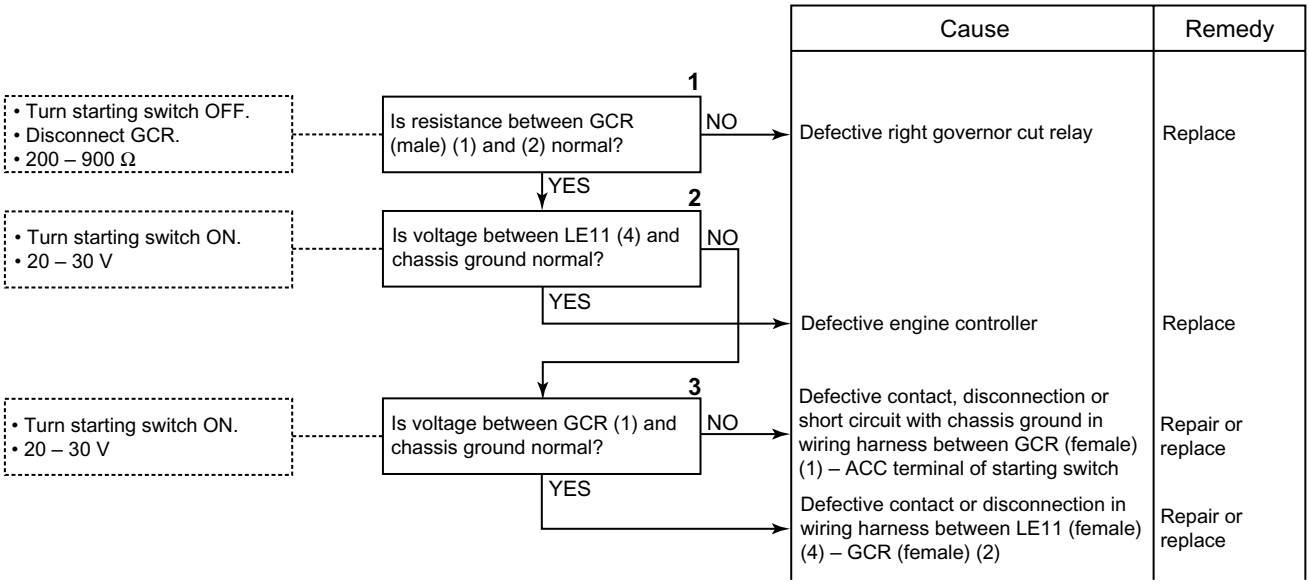


E-7 Related electrical circuit diagram

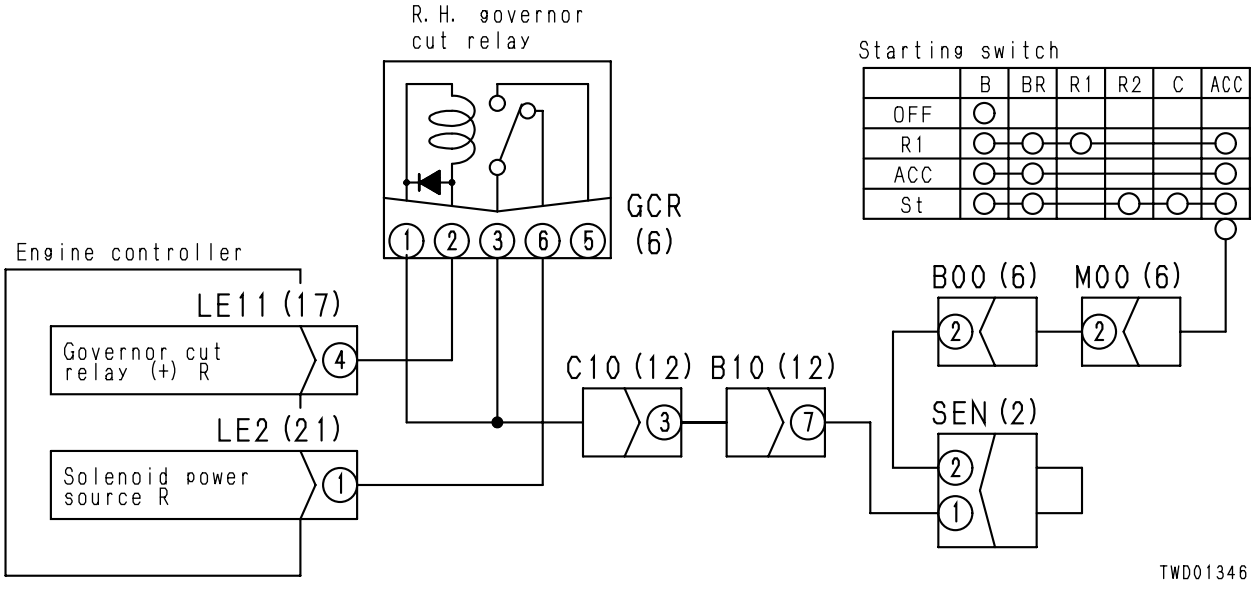


E-17 [E0426] Disconnection in left governor cut relay system is displayed

★ If the starting switch was turned off after the abnormality occurred, turn the starting switch on and check that the service code displays "**E**" at the head. (If "**P**" is displayed, the condition has returned to normal.)
★ 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.

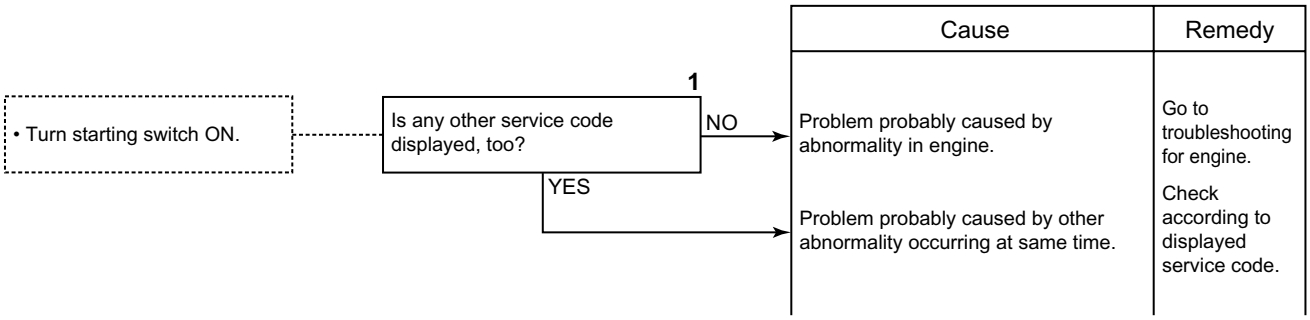


E-17 Related electrical circuit diagram



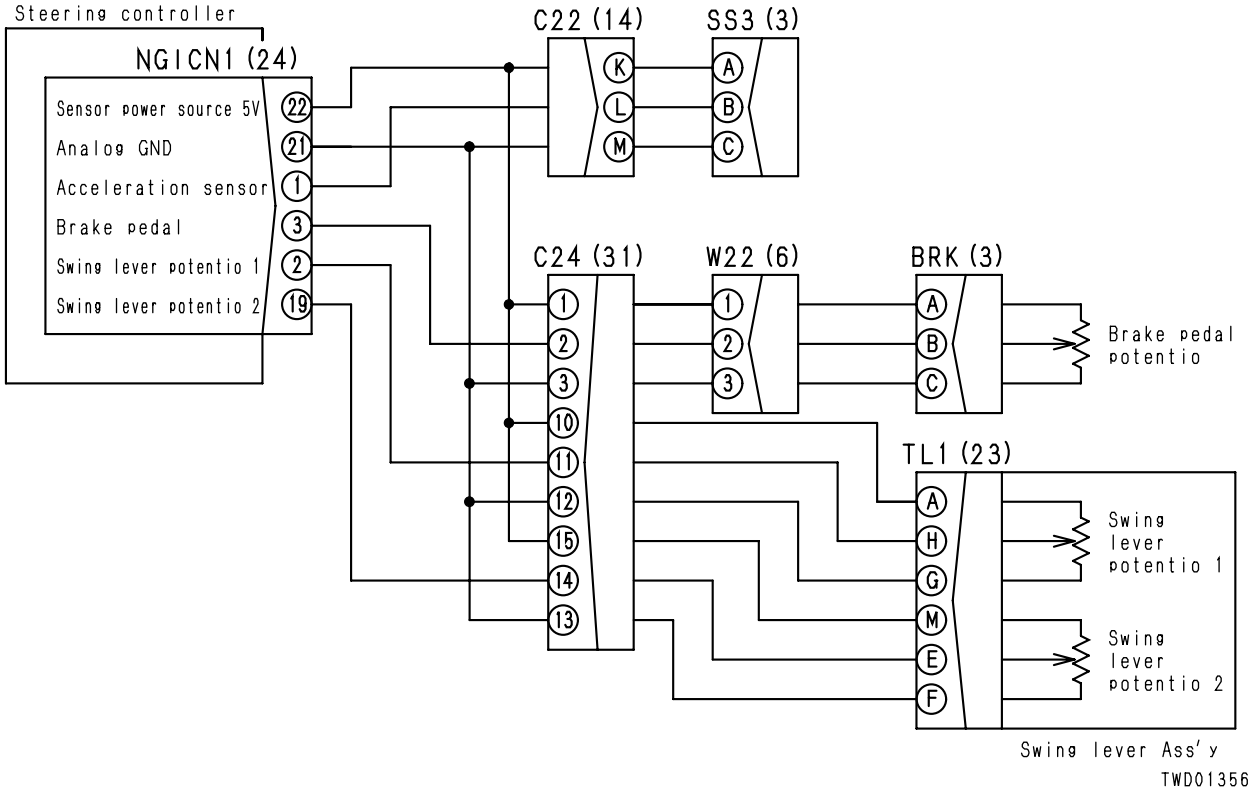
E-29 [E0455] Engine overheating is displayed

★ If the starting switch was turned off after the abnormality occurred, turn the starting switch on and check that the service code displays "**E**" at the head. (If "**P**" is displayed, the condition has returned to normal.)



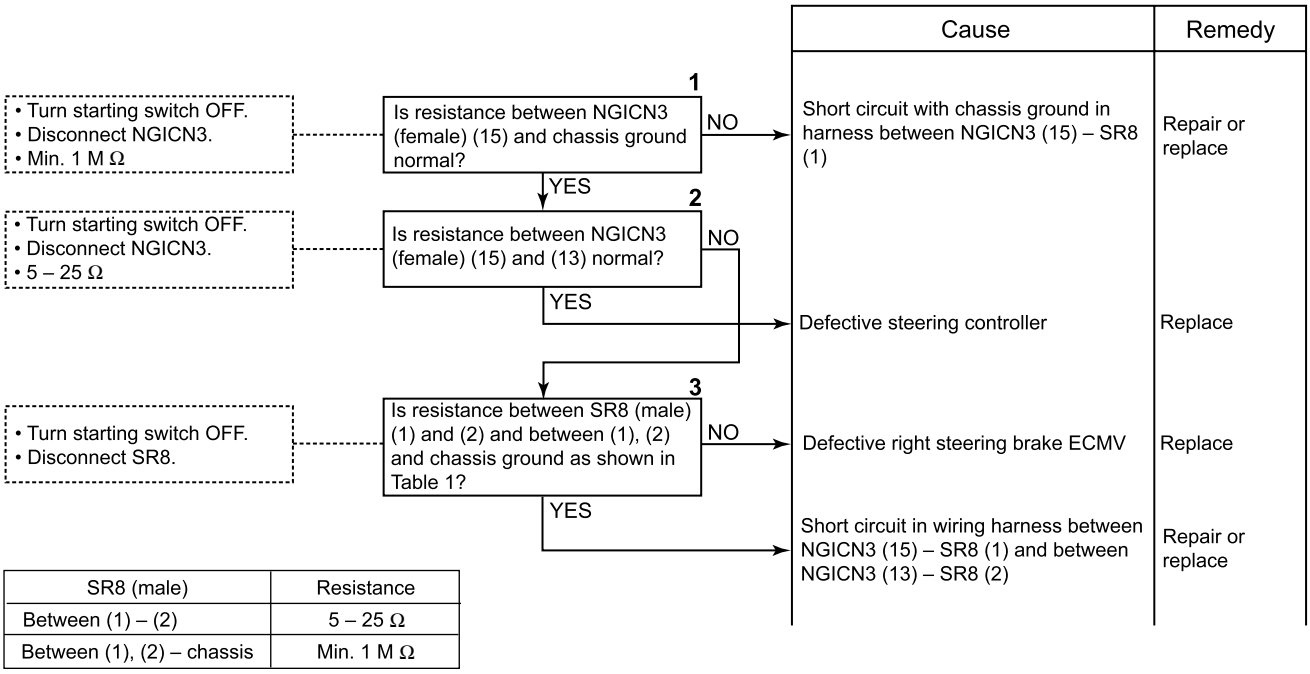
Service code	Abnormal system	Criterion
E0757	Short circuit in left brake ECMV system	Detection of OS short circuit (A_Out_Check)
E0760	Abnormality in right steering clutch oil pressure system (Clutch is not engaged)	Engine speed > 600 rpm, Output > 0.5 A, Fill switch OFF (Fill_Sw_Check)
E0761	Abnormality in right steering clutch oil pressure system (Clutch is not disengaged)	Engine speed > 600 rpm, Output = 0 A, Fill switch ON (Fill_Sw_Check)
E0762	Abnormality in left steering clutch oil pressure system (Clutch is not engaged)	Engine speed > 600 rpm, Output > 0.5 A, Fill switch OFF (Fill_Sw_Check)
E0763	Abnormality in left steering clutch oil pressure system (Clutch is not disengaged)	Engine speed > 600 rpm, Output = 0 A, Fill switch ON (Fill_Sw_Check)
E0764	Abnormality in right brake oil pressure system (Brake is not engaged)	Engine speed > 600 rpm, Output > 0.5 A, Fill switch OFF (Fill_Sw_Check)
E0765	Abnormality in right brake oil pressure system (Brake is not disengaged)	Engine speed > 600 rpm, Output = 0 A, Fill switch ON (Fill_Sw_Check)
E0766	Abnormality in left brake oil pressure system (Brake is not engaged)	Engine speed > 600 rpm, Output > 0.5 A, Fill switch OFF (Fill_Sw_Check)
E0767	Abnormality in left brake oil pressure system (Brake is not disengaged)	Engine speed > 600 rpm, Output = 0 A, Fill switch ON (Fill_Sw_Check)
E0779	Disconnection in emergency stop prevention solenoid system	Output current > 0 mA, Current signal [1A = 1V] + 0.05V < Output voltage (Fill_Sw_Check)
E0780	Short circuit in emergency stop prevention solenoid system	Detection of OS short circuit (A_Out_Check)
E0781	Abnormality in travel lock switch system	Both NO and NC are NO or NC (No_nc_Check)
E0782	Disagreement in travel lock	Transmission controller travel lock (Snet) and steering controller travel lock are different.
E0930	Disconnection in engine speed sensor system	No pulses are input when terminal voltage is above specification level (2.2 V). (P_In_Check)
E0933	Disconnection in transmission speed sensor system	No pulses are input when terminal voltage is above specification level (2.2 V). (P_In_Check)

ST-10 Related electrical circuit diagram



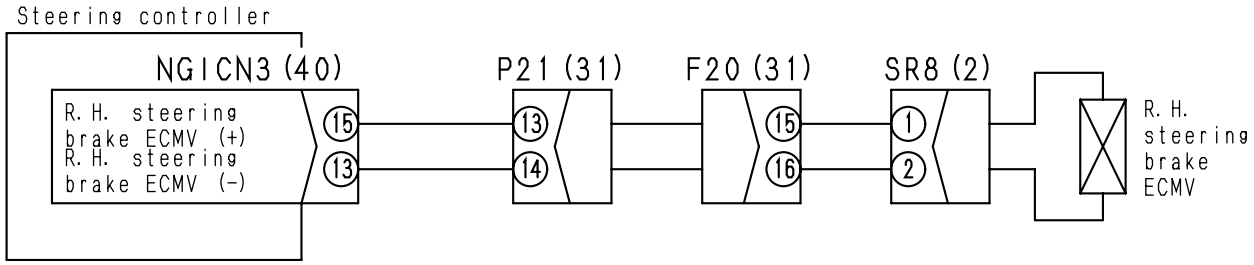
ST-19 [E0755] Short circuit in right steering brake ECMV system

★ f the starting switch was turned off after the abnormality occurred, turn the starting switch on and set the joystick in the right steering position and check that the service code displays "E" at the head. (If "P" is displayed, the condition has returned to normal.)
★ 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.

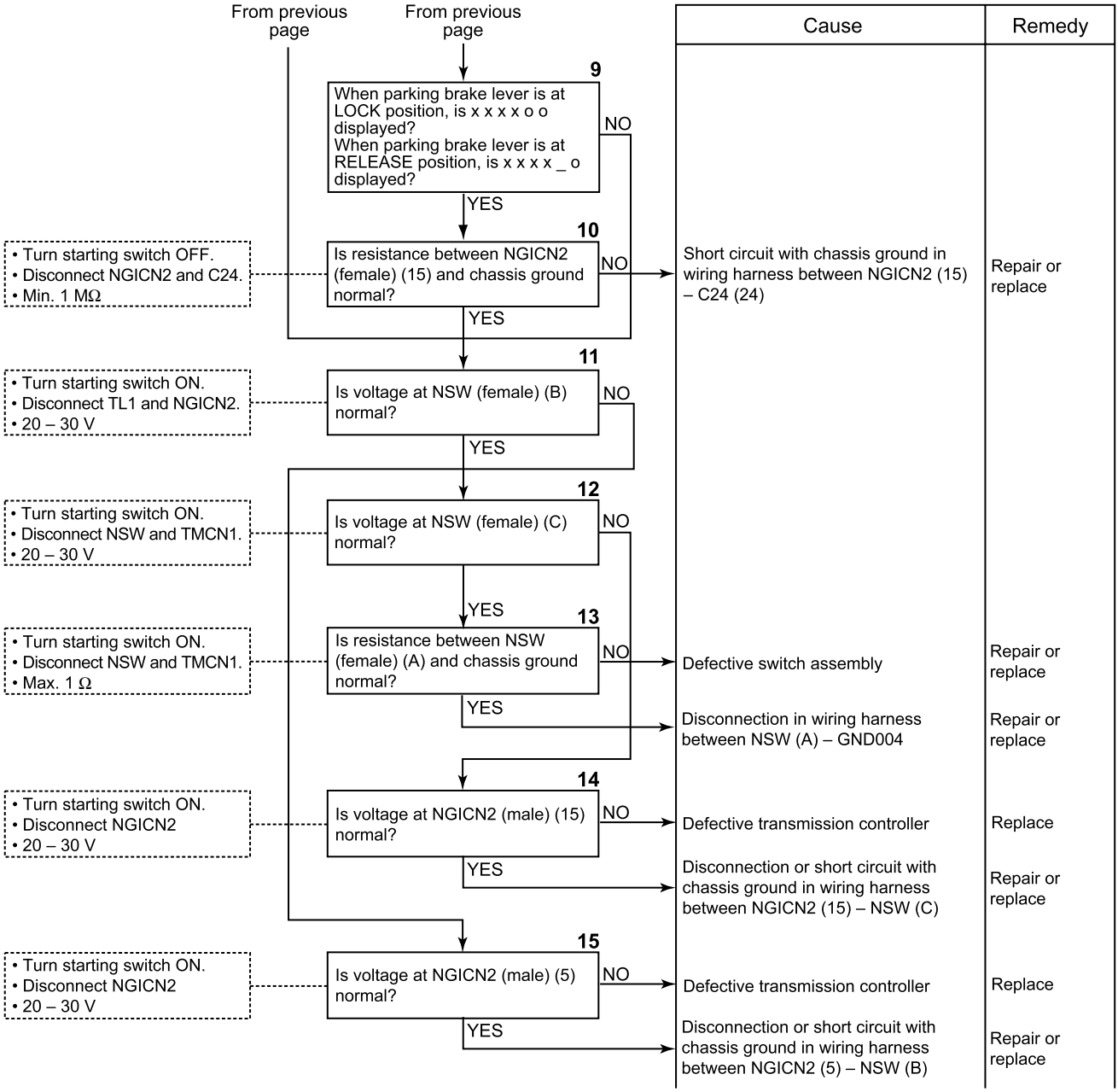


SR8 (male)	Resistance
Between (1) – (2)	5 – 25 Ω
Between (1), (2) – chassis	Min. 1 MΩ

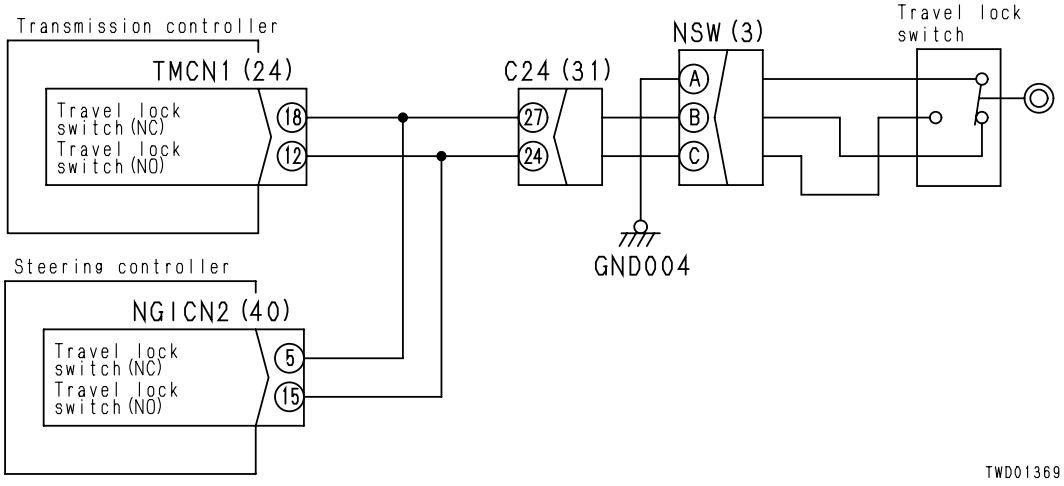
ST-19 Related electrical circuit diagram



TWD01362



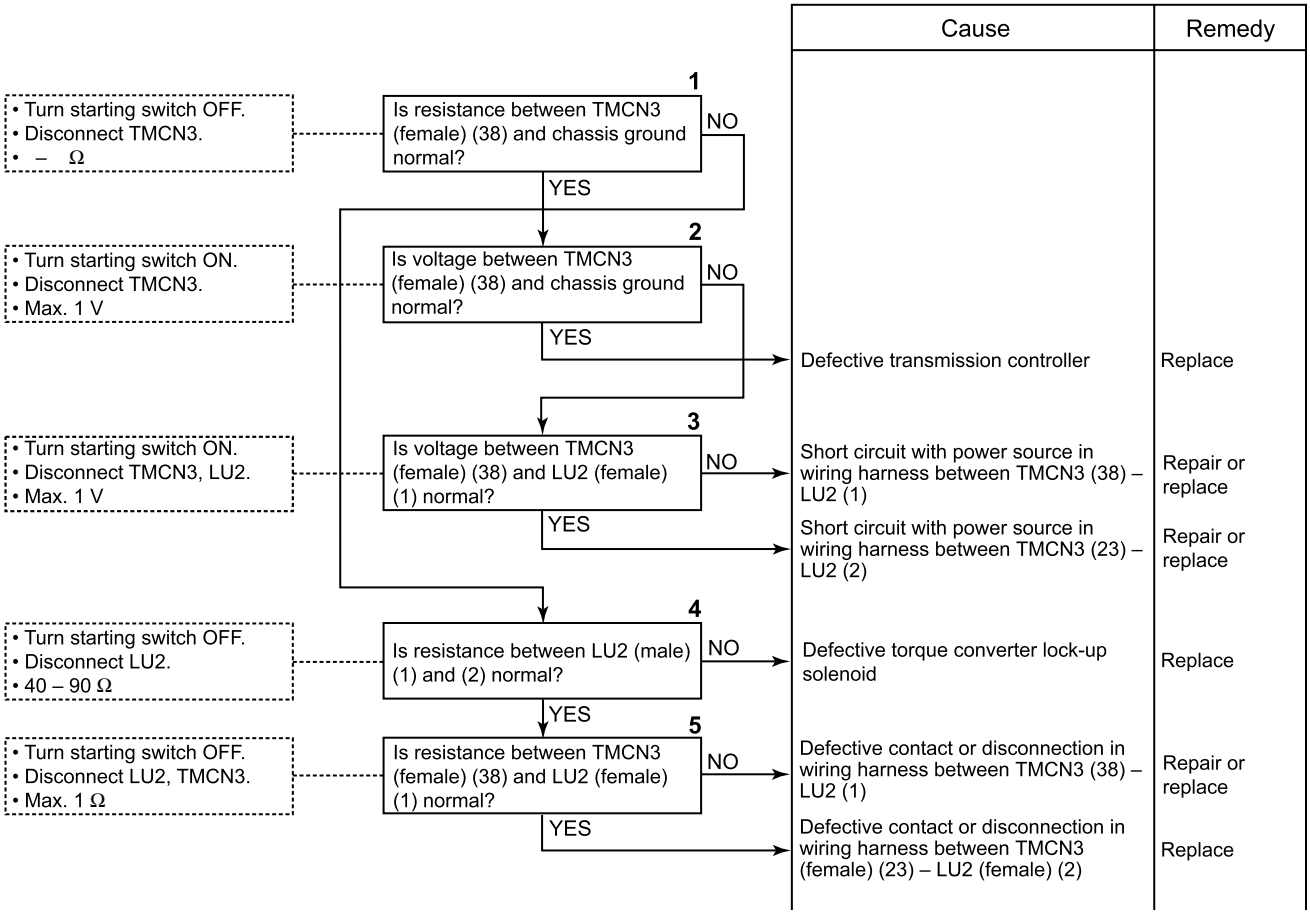
ST-32 a) Related electrical circuit diagram



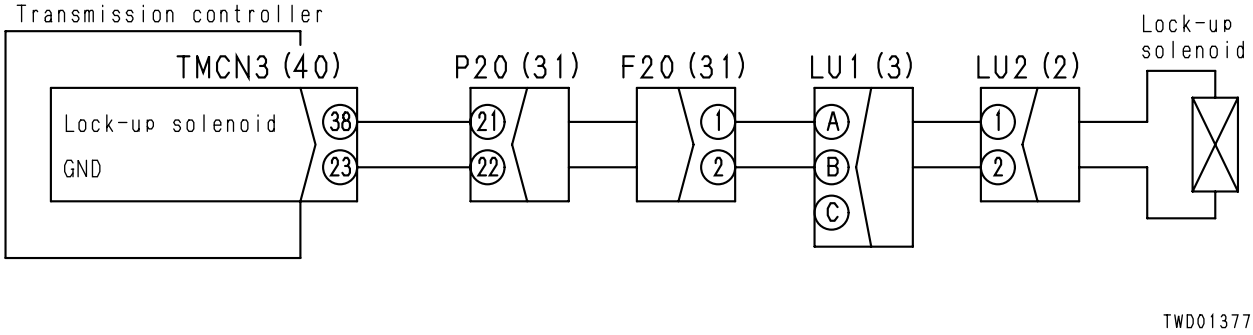
Action by controller	Problem that appears on machine when there is abnormality
Lights up caution lamp and sounds alarm buzzer. Stops outputting to reverse clutch ECMV.	Machine can travel at only F1. Engine output is reduced to half.
Lights up caution lamp and sounds alarm buzzer. Stops outputting to reverse clutch ECMV.	Machine can travel at only F1. Engine output is reduced to half.
Lights up caution lamp and sounds alarm buzzer. Stops outputting to 1st clutch ECMV.	Machine can travel at only 2nd gear. Engine output is reduced to half.
Lights up caution lamp and sounds alarm buzzer. Stops outputting to 1st clutch ECMV.	Machine can travel at only 2nd gear. Engine output is reduced to half.
Lights up caution lamp and sounds alarm buzzer. Stops outputting to 2nd clutch ECMV.	Engine output is reduced to half. Only 1st gear speed is available.
Lights up caution lamp and sounds alarm buzzer. Stops outputting to 2nd clutch ECMV.	Engine output is reduced to half. Only 1st gear speed is available.
Lights up caution lamp and sounds alarm buzzer. Stops outputting to 3rd clutch ECMV.	Engine output is reduced to half. Only 1st gear speed is available.
Lights up caution lamp and sounds alarm buzzer. Stops outputting to 3rd clutch ECMV.	Engine output is reduced to half. Only 1st gear speed is available.
Lights up caution lamp and sounds alarm buzzer. Judges forward travel operation as N.	Machine can travel at only R1 gear. Engine output is reduced to half.
Lights up caution lamp and sounds alarm buzzer. Judges reverse travel operation as N.reverse.	Machine cannot travel in reverse. Engine output is reduced to half. Only 1st gear speed is available.
Lights up caution lamp and sounds alarm buzzer. Judges reverse travel operation as N.reverse.	Machine can travel at only F1. Engine output is reduced to half.
Lights up caution lamp and sounds alarm buzzer. Judges forward travel operation as N.	Machine cannot travel forward. Engine output is reduced to half. Only 1st gear speed is available.
Lights up caution lamp and sounds alarm buzzer. Allows use of only 2nd gear.	Machine can travel at only 2nd gear. Engine output is reduced to half.
Lights up caution lamp and sounds alarm buzzer. Allows use of only 1st gear.	Engine output is reduced to half. Only 1st gear speed is available.
Lights up caution lamp and sounds alarm buzzer. Allows use of only 1st gear.	Engine output is reduced to half. Only 1st gear speed is available.
Lights up caution lamp and sounds alarm buzzer. Allows use of only 2nd gear.s	Engine output is reduced to half. Only 2nd gear speed is available.
Lights up caution lamp and sounds alarm buzzer. Allows use of only 1st gear.	Engine output is reduced to half. Only 1st gear speed is available.
Lights up caution lamp and sounds alarm buzzer. Allows use of only 3rd gear.	Engine output is reduced to half. Only 3rd gear speed is available.
Lights up caution lamp and sounds alarm buzzer. Allows use of only 3rd gear.	Engine output is reduced to half. Only 3rd gear speed is available.
Lights up caution lamp and sounds alarm buzzer. Sets transmission in N.	Machine cannot move.
Lights up caution lamp and sounds alarm buzzer.	Tilt limit function does not work.
Lights up caution lamp and sounds alarm buzzer.	Tilt limit function does not work.

T-7 [E0213] Disconnection in torque converter lock-up solenoid system is displayed

★ If the starting switch was turned off after the abnormality occurred, turn the starting switch on and check that the service code displays "**E**" at the head. (If "**P**" is displayed, the condition has returned to normal.)
★ 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.



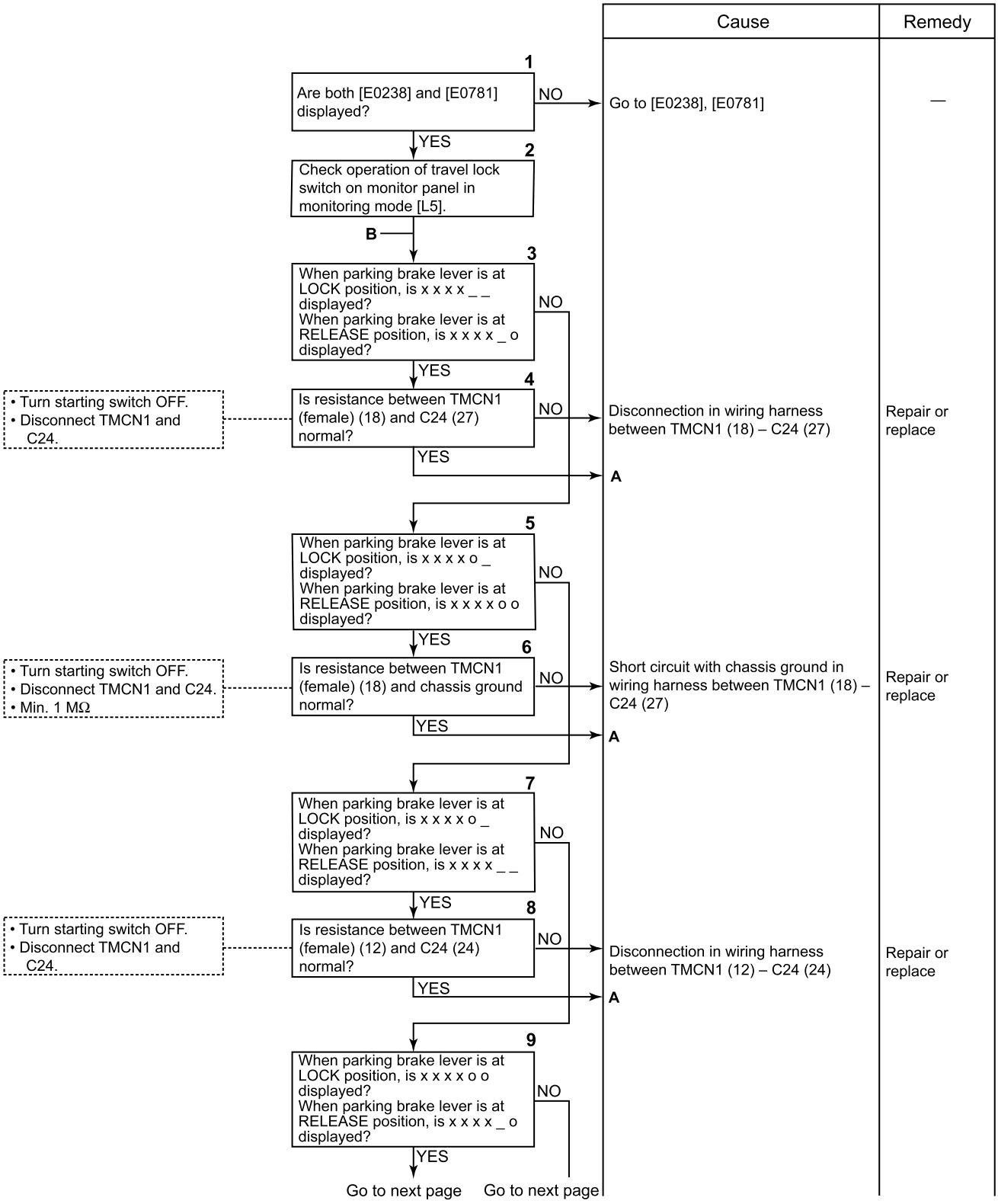
T-7 Related electrical circuit diagram



T-17 [E0238] Abnormality in travel lock switch system

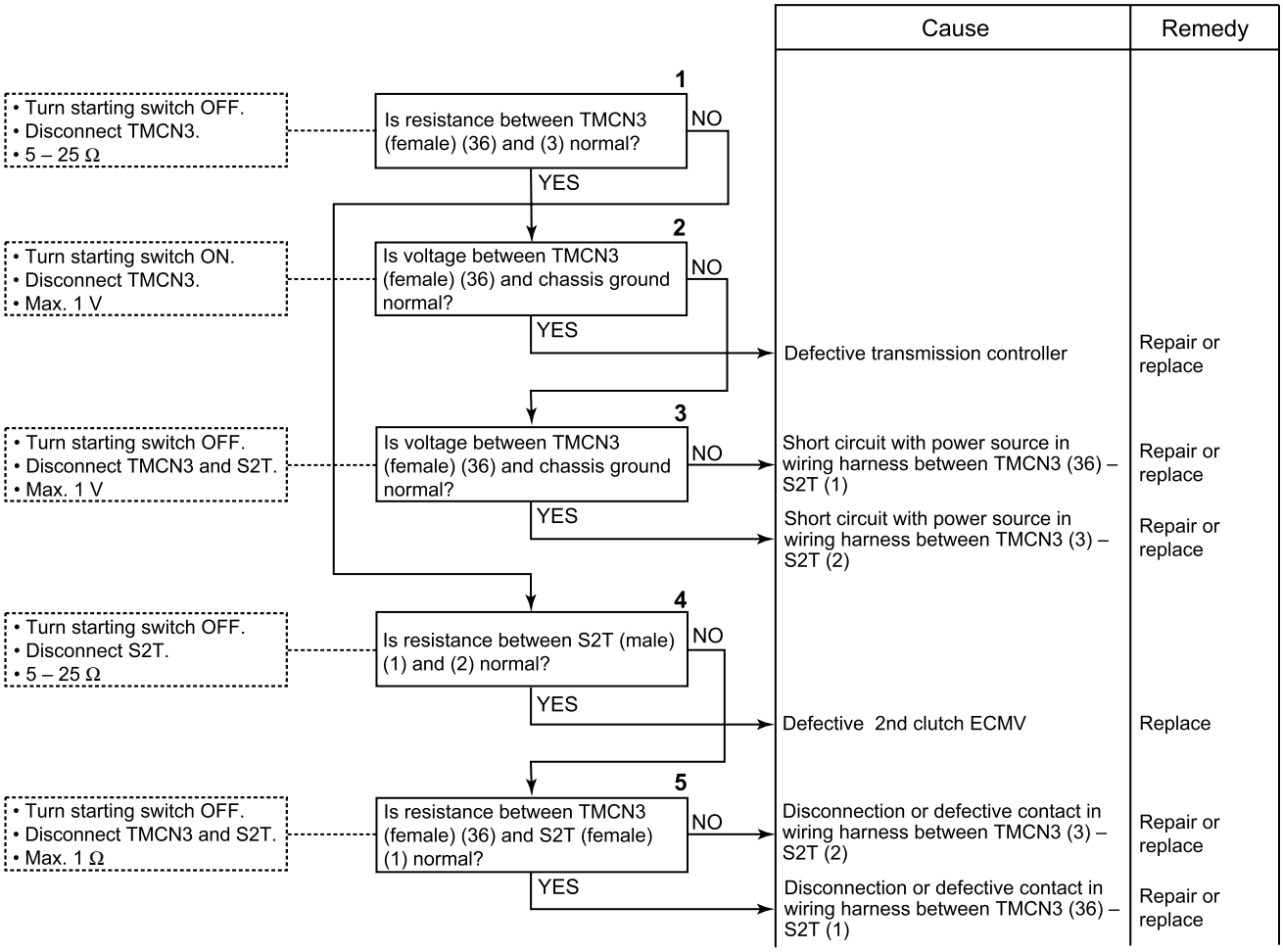
★ If the starting switch was turned off after the abnormality occurred, turn the starting switch on, turn on and off the parking brake lever, and check that the service code displays "**E**" at the head. (If "**P**" is displayed, the condition has returned to normal.)
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.

a) When only E0238 is displayed

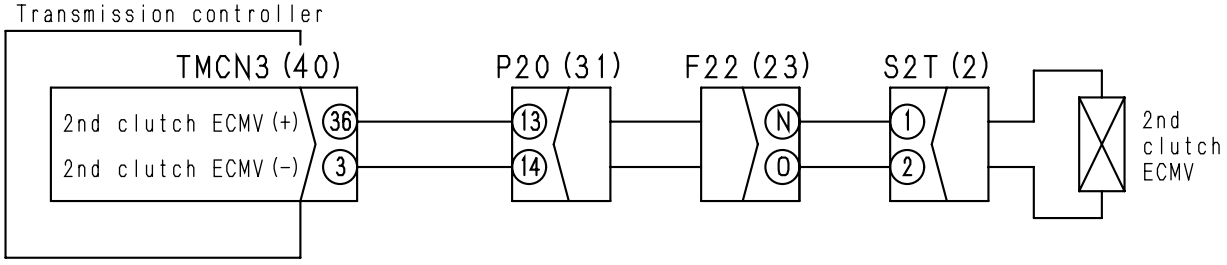


T-25 [E0256] Disconnection in 2nd clutch ECMV system

★ If the starting switch was turned off after the abnormality occurred, set the joystick in the 2nd gear speed position and turn the starting switch on and check that the service code displays "**E**" at the head. (If "**P**" is displayed, the condition has returned to normal.)
★ 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.



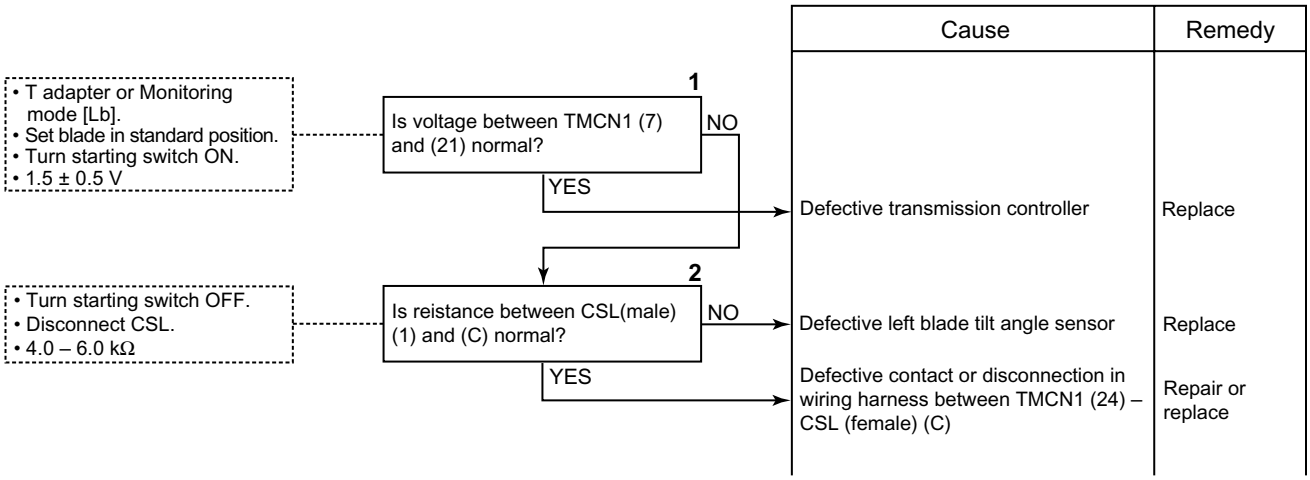
T-25 Related electrical circuit diagram



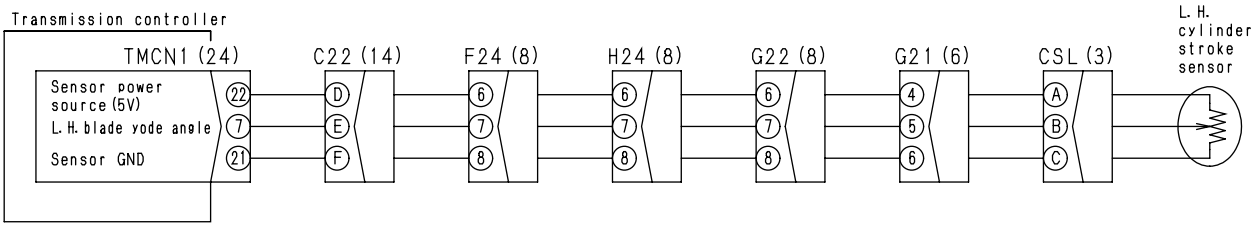
TWD01388

T-42 [E0301] Abnormality in left blade tilt angle sensor system is displayed

★ If the starting switch was turned off after the abnormality occurred, turn the starting switch on and check that the service code displays "**E**" at the head. (If "**P**" is displayed, the condition has returned to normal.)
★ Check that the left blade tilt angle sensor is installed normally. (If not, adjust.)
★ 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.



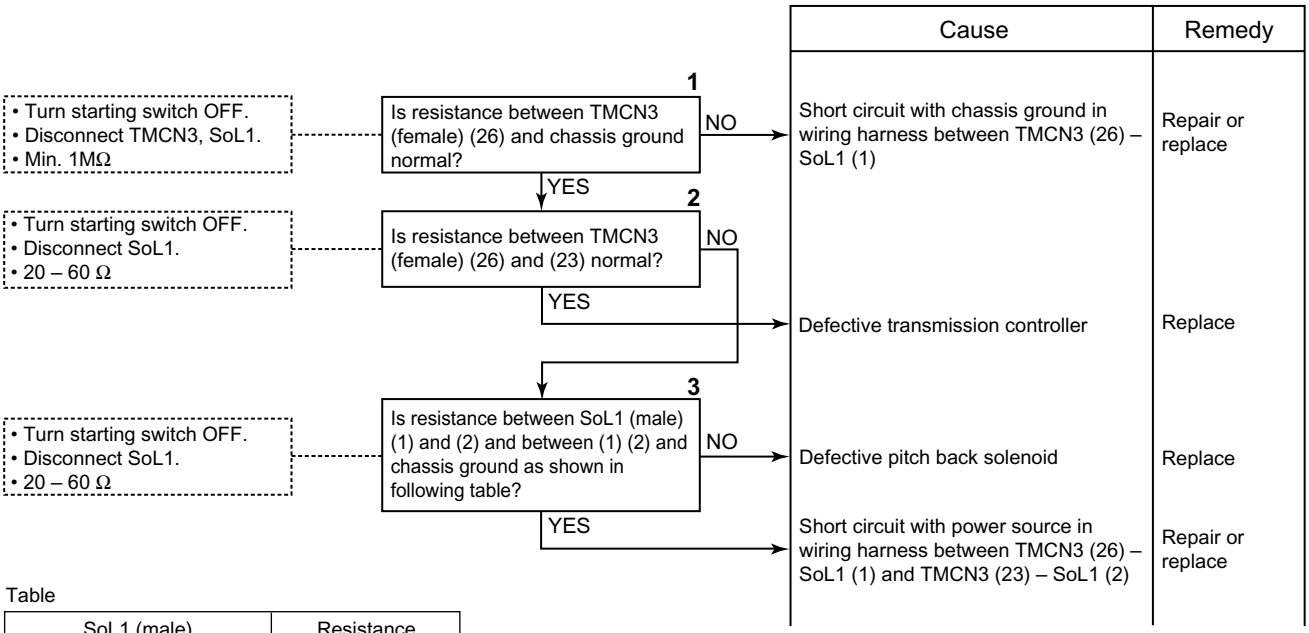
T-42 Related electrical circuit diagram



TWD01396

T-50 [E0314] Short circuit in pitch back solenoid system is displayed

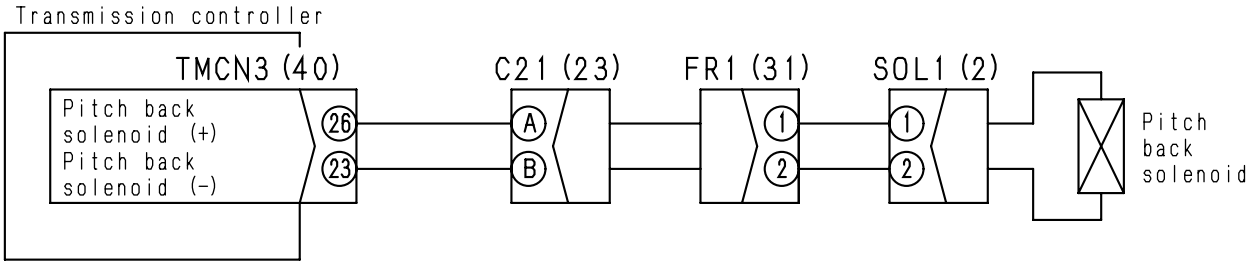
★ If the starting switch was turned off after the abnormality occurred, turn the starting switch on and perform pitch back operation, and check that the service code displays "**E**" at the head. (If "**P**" is displayed, the condition has returned to normal.)
★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
★ Always connect any disconnected connectors before going on to the next step.



Table

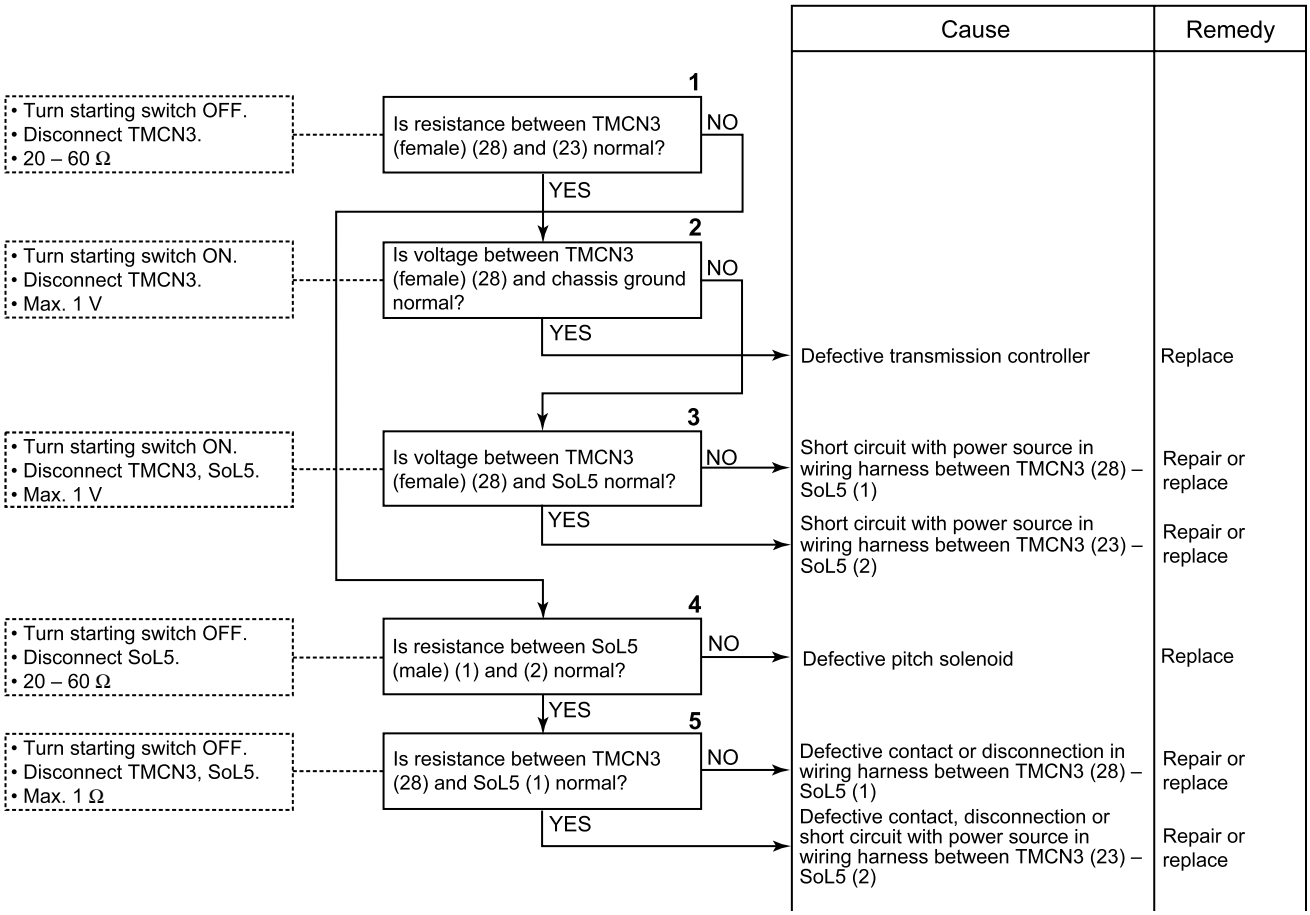
SoL1 (male)	Resistance
Between (1) – (2)	20 – 60 Ω
Between (1), (2) – chassis	Min. 1 MΩ

T-50 Related electrical circuit diagram

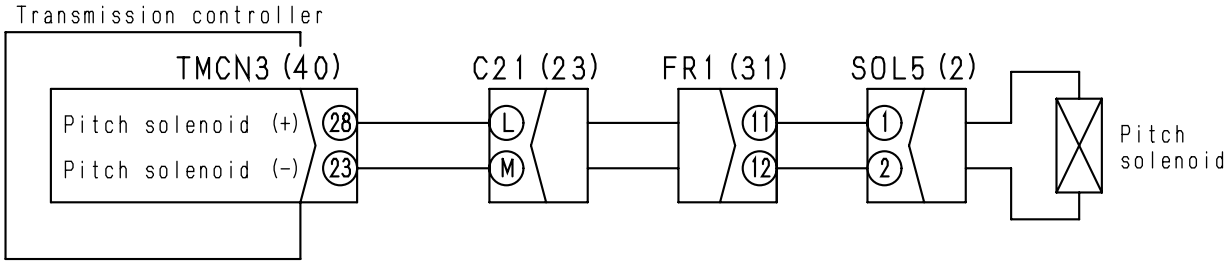


T-61 [E0345] Disconnection in pitch solenoid system is displayed

★ If the starting switch was turned off after the abnormality occurred, turn the starting switch on and perform pitch operation, check that the service code displays "**E**" at the head. (If "**P**" is displayed, the condition has returned to normal.)
★ 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.



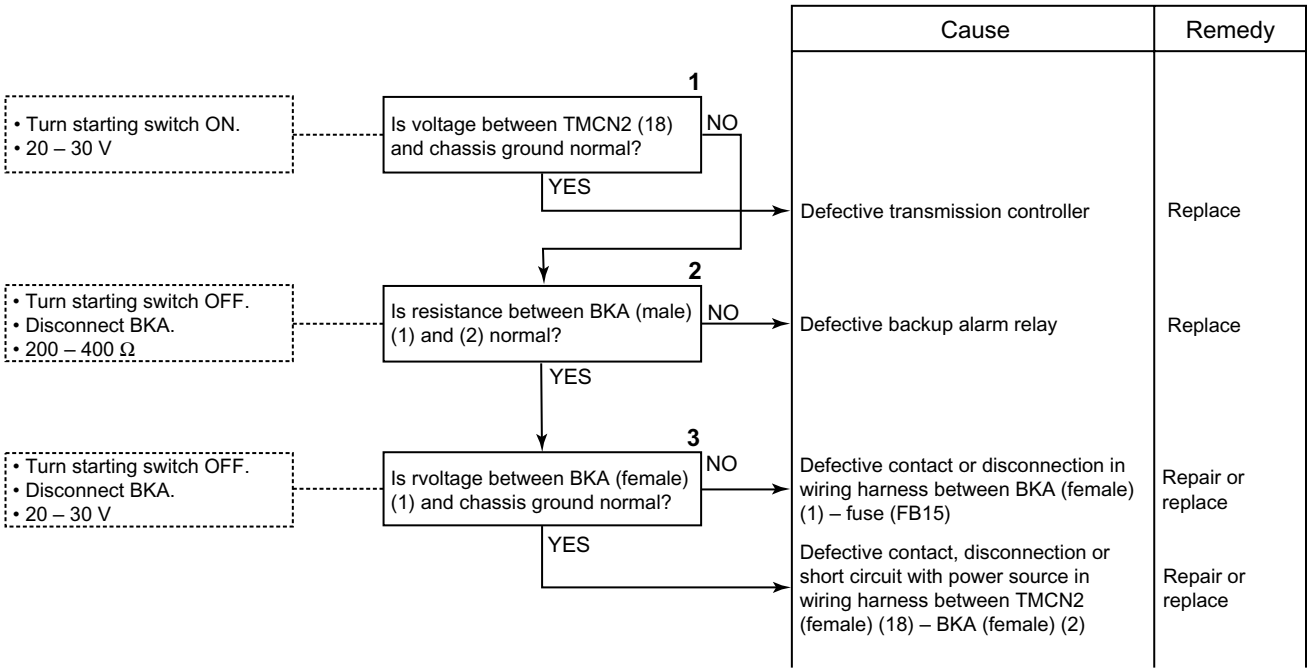
T-61 Related electrical circuit diagram



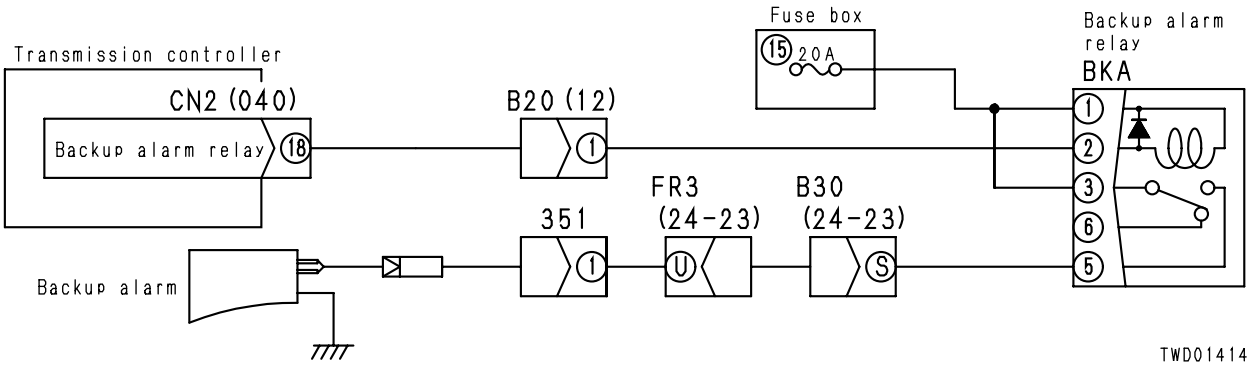
TWD01407

T-71 [E0610], [E0611] Disconnection in backup alarm relay system is displayed

★ If the starting switch was turned off after the abnormality occurred, turn the starting switch on and operate the joystick to the REVERSE position, and check that the service code displays "**E**" at the head. (If "**P**" is displayed, the condition has returned to normal.)
★ 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-71 Related electrical circuit diagram



H-4 Machine turns only in one direction (Lever operated)

★ Check the power train oil level before starting troubleshooting.
★ When power train main oil pressure is normal.

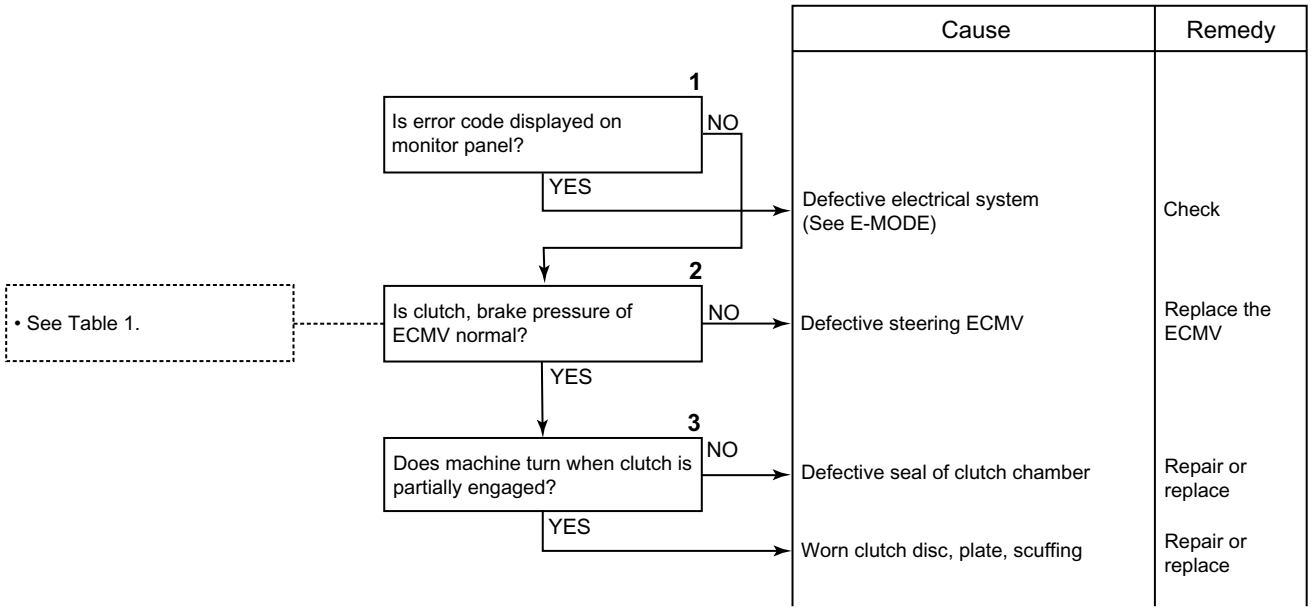


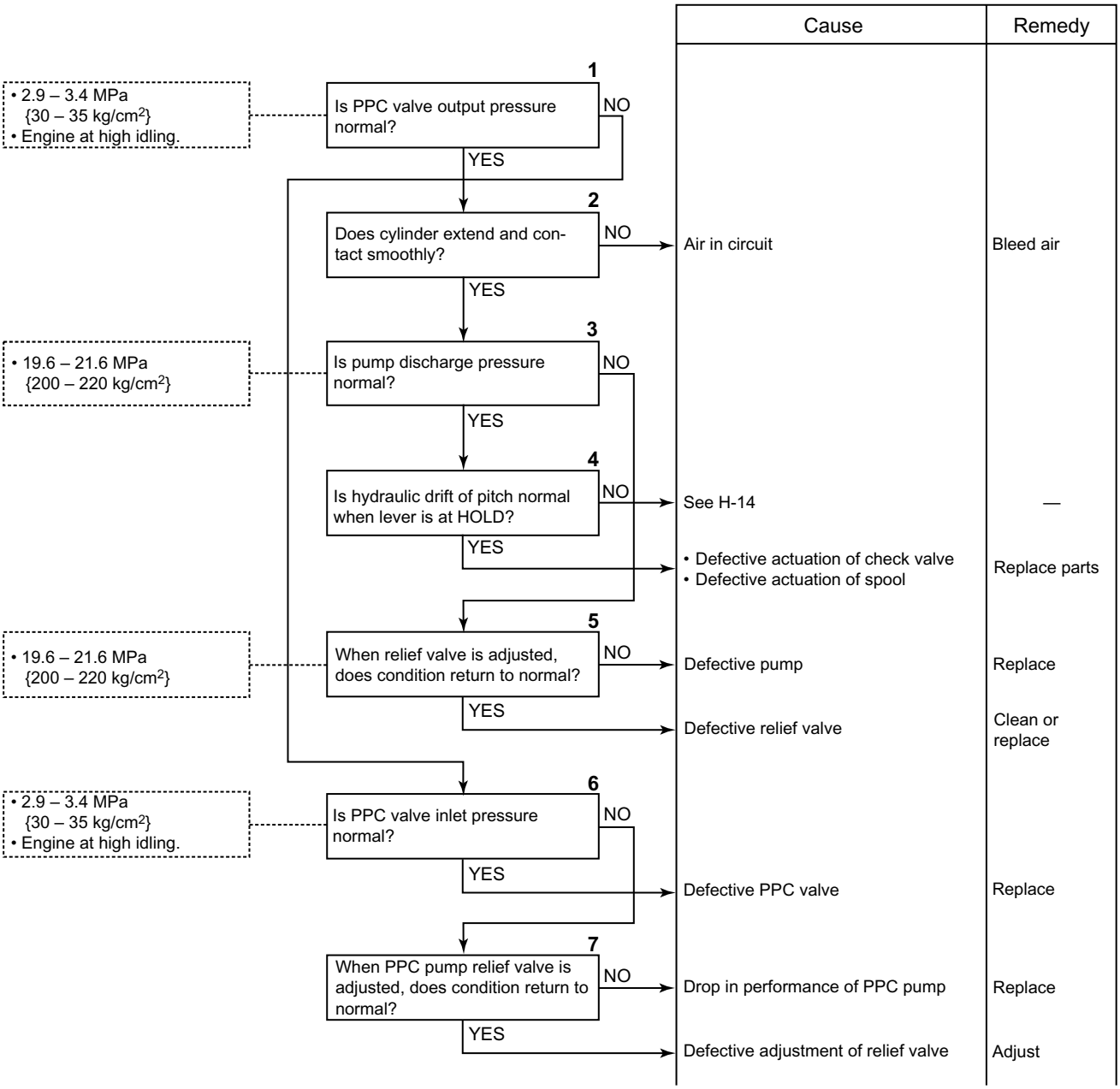
Table 1

Conditions	Steering lever not operated		Steering lever operated		
	Engine speed: High idling	Engine speed: Low idling	Engine speed:High idling		Engine speed: Low idling
Oil pressure (MPa {kg/cm^2})	• Clutch pressure: 0 {0} (left and right) • Brake pressure: 2.3 – 2.7 {23 – 28} (left and right)	• Clutch pressure: 0 {0} (left and right) • Brake pressure: 2.0 – 2.6 {20 – 27} (left and right)	Right lever	• Clutch pressure: (right 2.3 – 2.7 {23 – 28}, left 0{0}) • Clutch pressure: (right 0{0}, left 2.3 – 2.7 {23 – 28})	• Clutch pressure: (right 2.0 – 2.6 {20 – 27}, left 0{0}) • Clutch pressure: (right 0{0}, left 2.0 – 2.6 {20 – 27})
			Left lever	• Clutch pressure: (right 0{0}, left 2.3 – 2.7 {23 – 28}) • Clutch pressure: (right 2.3 – 2.7 {23 – 28}, left 0{0})	• Clutch pressure: (right 0{0}, left 2.0 – 2.6 {20 – 27}) • Clutch pressure: (right 2.0 – 2.6 {20 – 27}, left 0{0})

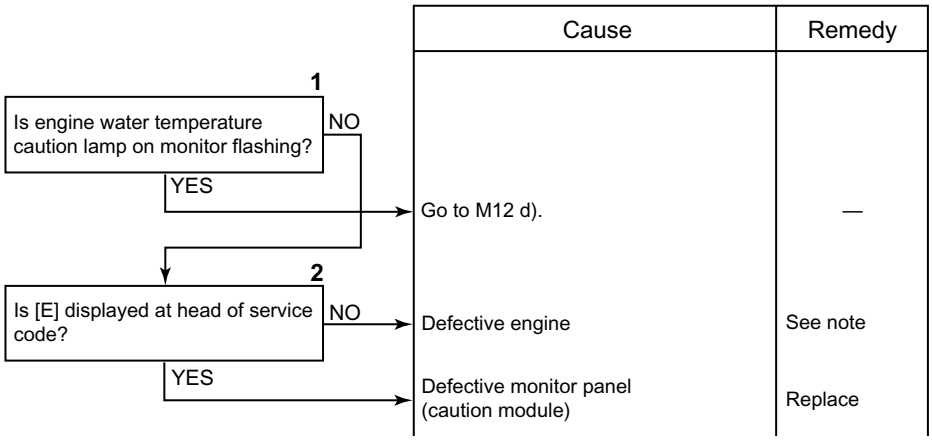
H-12 Blade pitch speed slow or blade pitch lacks power

★ Check the hydraulic oil level before starting troubleshooting.

Note: Check for any modification of the blade.



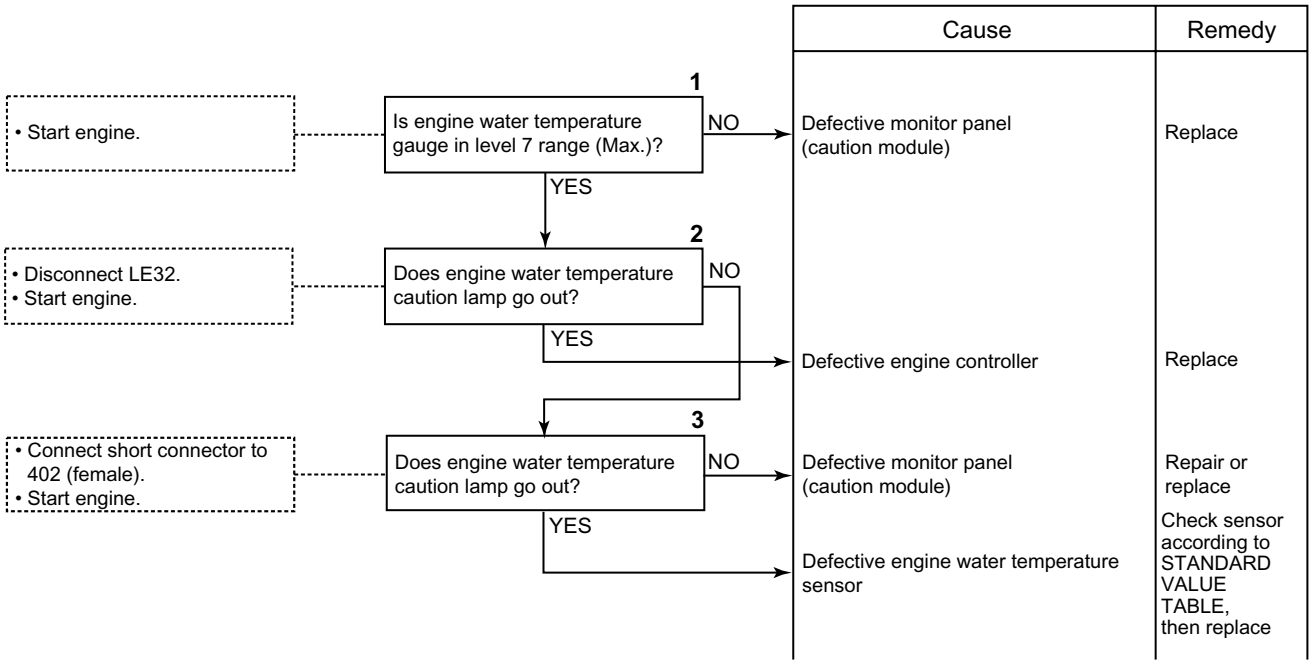
M-7 [E0432] Abnormality in engine water temperature is displayed



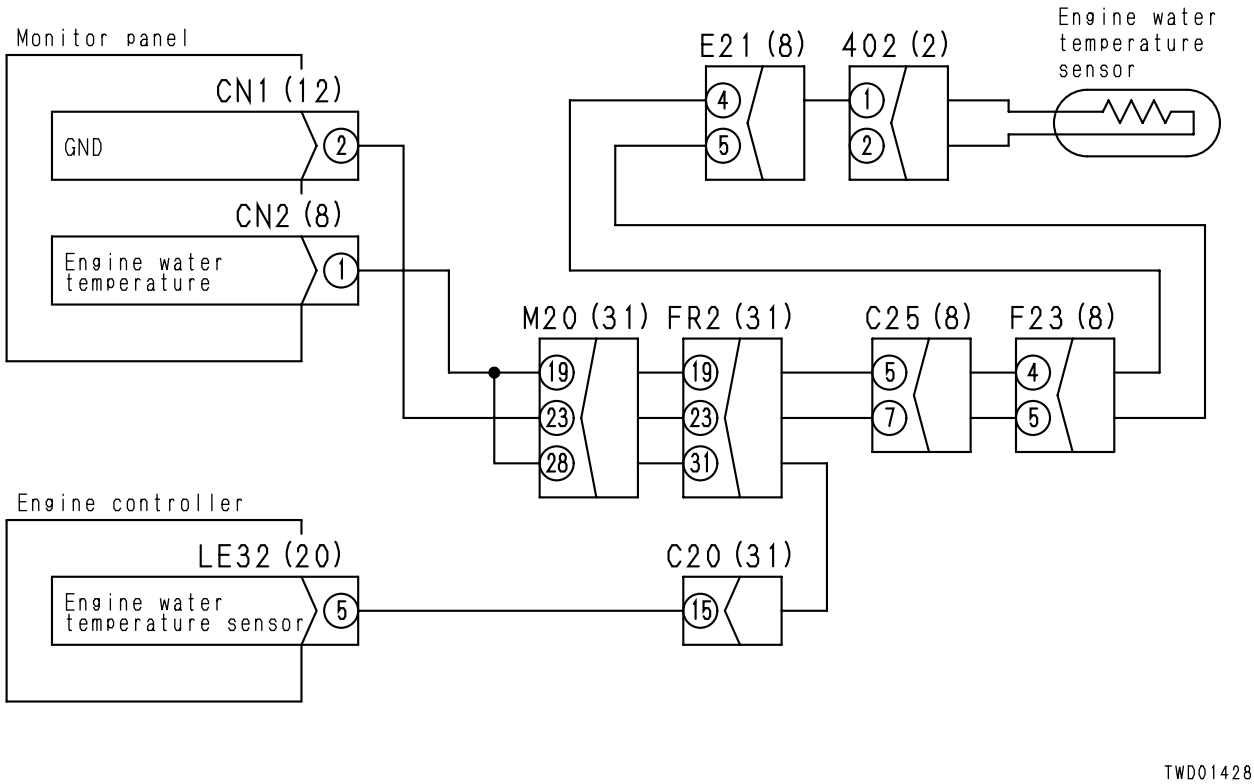
NOTE: The display on the monitor panel has returned to normal, but it shows that the engine water temperature sensor has detected abnormal oil temperature in the past. Check the engine and remove the cause of the abnormality.

d) [Engine water temperature] flashes

★ Check that the engine water temperature is normal before starting troubleshooting.



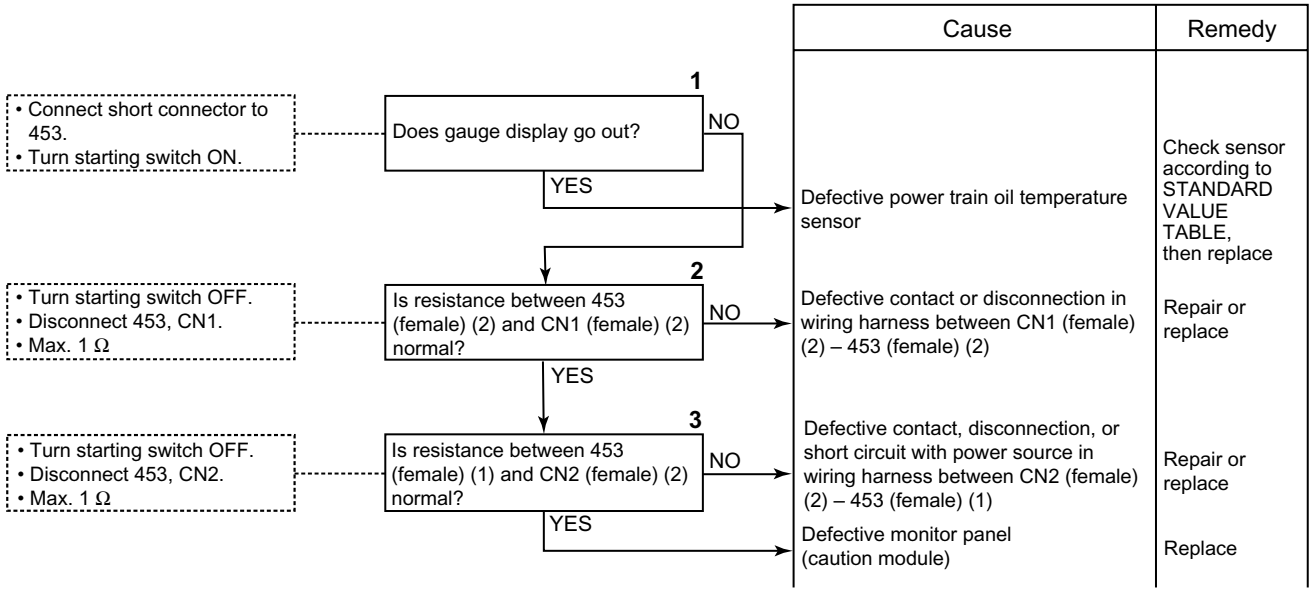
M-12 d) Related electrical circuit diagram



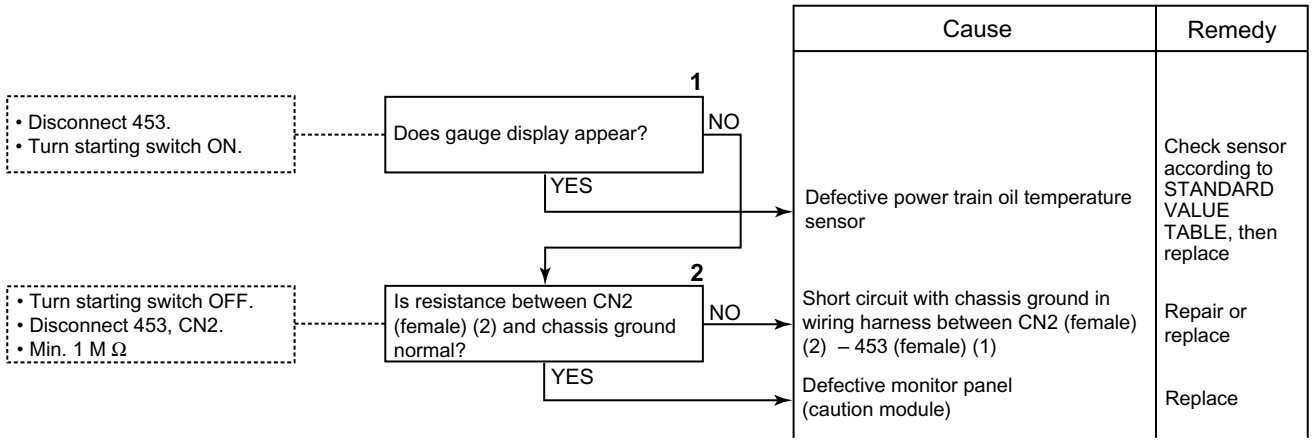
M-16 Abnormality in power train (torque converter) oil temperature gauge

★ Check that the power train (torque converter) oil temperature is normal before starting troubleshooting. (If not check the power line.)
★ Before carrying out troubleshooting, check that all the related connectors are properly connected.
★ Always connect any disconnected connectors before going on to the next step.

a) Power train oil temperature gauge shows abnormally low temperature



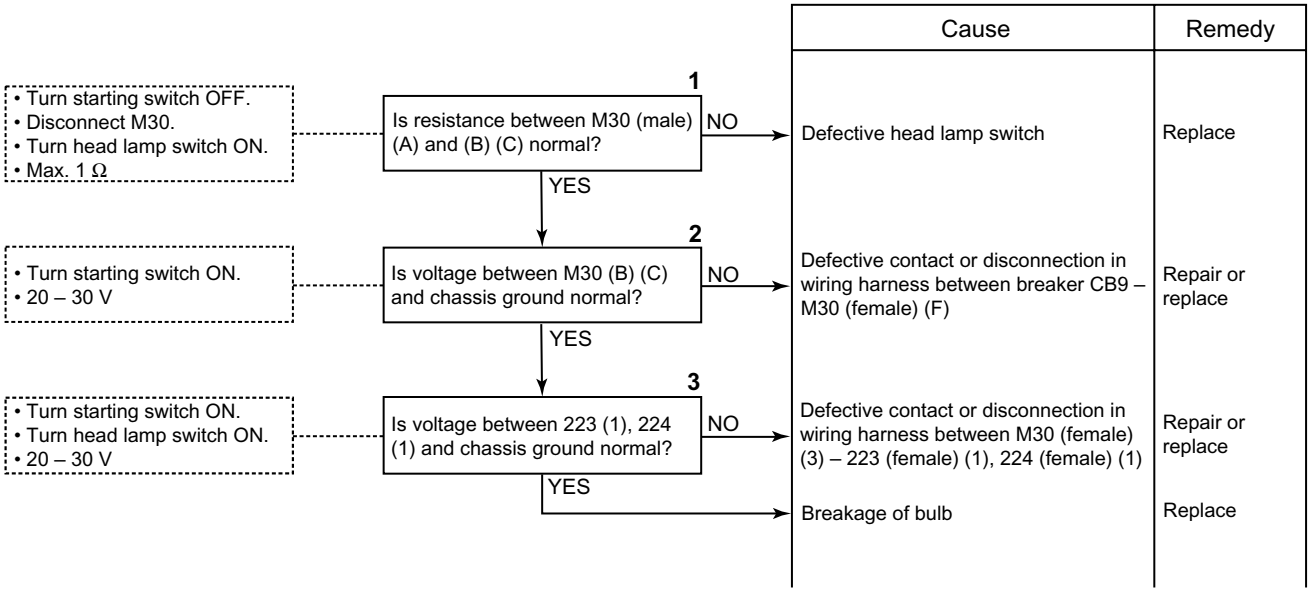
b) Power train (torque converter) oil temperature gauge gives no display (gauge does not even display one level)



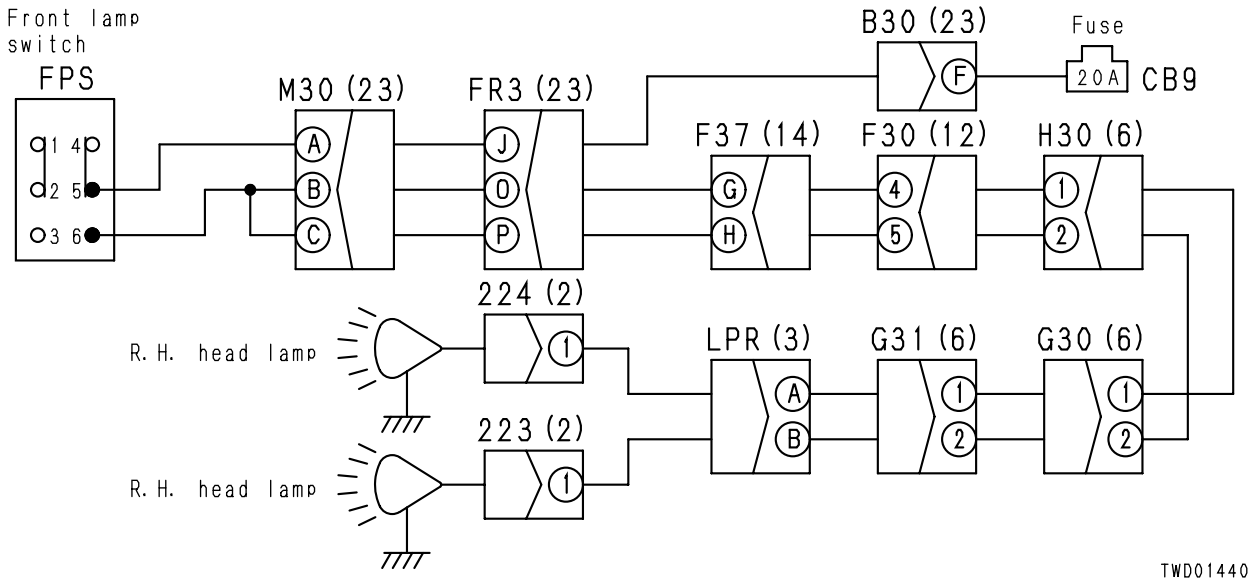
M-23 R.H. front lamp do not light up

★ Check that all bulbs are normal. (If any one is broken, replace it.)
★ Check that breaker CB9 are normal. (If breaker is broken, check the circuit related to it for short circuit with chassis ground.)
★ 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) Any one of front lamps and working lamps does not light up



M-23 Related electrical circuit diagram



(2) Engine turns but no exhaust gas comes out (Fuel is not being injected) (with electronical governor) (including cases with V-type engine where there is fuel injection for the bank on only one side)

General causes why engine turns but no exhaust gas comes out

- Supply of fuel impossible
- Supply of fuel is extremely small
- Improper selection of fuel (particularly in winter)

Standards for use of fuel

Type of fuel	AMBIENT TEMPRATURE
	-22 -4 14 32 50 68 86 104°F -30 -20 -10 0 10 20 30 40°C
Diesel fuel	ASTM D975 No.1 / ASTM D975 No.2

		Causes															
		Broken fuel injection pump drive shaft, key	Defective fuel injection pump (seized plunger, rack)	Seized, broken feed pump (gear, shaft)	Clogged fuel filter, strainer	Clogged priming pump strainer	Lack of fuel	Clogged, leaking fuel piping	Clogged fuel tank air breather hole	Defective fuel cut solenoid (valve stuck)	Improper fuel used	Seized governor oil pump gear, shaft (*1)	Defective operation of governor oil pump relief valve (*1)	Governor spool valve struck (*1)	Clogged governor oil supply pipe (*1)	Clogged governor oil strainer (*1)
Questions	Confirm recent repair history					△			△							
	Degree of use / Operated for long period				△	△			△							
	Exhaust gas suddenly (when starting again) stopped coming out	◎	◎	◎								◎	◎		○	○
	Replacement of filters has not been carried out according to operation manual				◎	◎										
	Fuel tank is found to be empty						◎									
	There is leakage from fuel piping							◎								
	Mud is stuck to fuel tank cap								◎							
	When fuel filter is drained, fuel does not come out										◎					
Check items	When engine is cranked with starting motor, 1) Fuel injection pump coupling does not turn	◎														
	2) No fuel comes out even when fuel filter air bleed plug is loosened	◎			○	○					○					
	3) No fuel comes out even when fuel injection pump air bleed plug is loosened									◎						
	4) No fuel spurts out even when fuel injection pipe sleeve nut is loosened	◎	◎	◎								◎	◎	◎	○	○
	Rust and water are found when fuel tank is drained				○	○										
Troubleshooting	Inspect fuel injection pump directly	●														
	Conrol rack does not move		●													
	Inspect feed pump directly			●												
	When fuel filter, strainer are inspected directly, they are found to be clogged				●						●					
	When priming pump strainer is inspected directly, it is found to be clogged					●										
	When fuel cap is inspected directly, it is found to be clogged								●							
	Inspect fuel cut solenoid directly									●						
	Inspect governor oil pump directly											●	●			
	Inspect governor spool valve directly													●		
	When governor oil supply pipe is inspected directly, it is found to be clogged														●	
	When governor oil strainer (Inlet and inside of gear pump) is inspected directly, it is found to be clogged															●
	Remedy	Replace	Replace	Replace	Clean	Clean	Add	Correct	Correct	Replace	Replace	Replace	Clean	Replace	Clean	Clean

*1 : See "S-17 Abnormality in governor servo system is displayed is troubleshooting for engine controller".

S-11 Oil is in cooling water, or water spurts back, or water level goes down

General causes why oil is in cooling water
- Internal leakage in lubrication system
- Internal leakage in cooling system

			Causes					
			Broken oil cooler core, O-ring	Broken cylinder head, head gasket	Insufficient protrusion of cylinder liner	Broken cylinder liner O-ring, holes caused by pitting	Internal cracks in cylinder block	Clogged breather of water pump, defective seal
Questions / Check items	Confirm recent repair history							
	Degree of use of machine	Operated for long period	△			△		
	Oil level	Gradually increased	○	○				
		Suddenly increased				○	○	
	Hard water is being used as cooling water (corrosion resisteor valve is closed)		○			○		
	Engine oil level has risen, oil is cloudy white		◎			○	○	○
	Excessive air bubbles inside radiator, spurts back			◎	◎			
Troubleshooting	Pressure-tightness test of oil cooler shows there is leakage		●					
	Pressure-tightness test of cylinder head shows there is leakage			●				
	When cylinder head is removed, and cylinder liner is inspected directly, it is found to be abnormal				●	●		
	When oil pan is removed, and liner and cylinder block are inspected directly, they are found to be abnormal					●	●	
	When water pump is inspected, it is found to be abnormal							●
		Remedy	Replace	Replace	Replace	Replace	Replace	Replace

METHOD OF USING MANUAL

1. When removing or installing unit assemblies

① When removing or installing a unit assembly, the order of work and techniques used are given for the removal operation; the order of work for the installation operation is not given.

② Any special techniques applying only to the installation procedure are marked [※1], and the same mark is placed after the relevant step in the removal procedure to indicate which step in the installation procedure it applies to.

(Example)

REMOVAL OF ○○○○ ASSEMBLY.....Title of operation

.....Precautions related to safety when carrying out the operation

1. X X X X (1).....Step in operation

★.....Technique or important point to remember when removing XXXX (1).

2. △△△△ (2): ..... [※1].....Indicates that a technique is listed for use during installation

3. □□□□ assembly (3)

 .....Quantity of oil or water drained

INSTALLATION OF ○○○○ ASSEMBLY .....Title of operation

- Carry out installation in the reverse order to removal.

[※1] .....Technique used during installation

★.....Technique or important point to remember when installing △△△△ (2).

- Adding water, oil .....Step in operation

★ .....Point to remember when adding water or oil

 .....Quantity when filling with oil and water

2. General precautions when carrying out installation or removal (disassembly or assembly) of units are given together as PRECAUTIONS WHEN CARRYING OUT OPERATION, so be sure to follow these precautions when carrying out the operation.

3. Listing of special tools

① For details of the description, part number, and quantity of any tools (A1, etc.) that appear in the operation procedure, see the SPECIAL TOOLS LIST given in this manual.

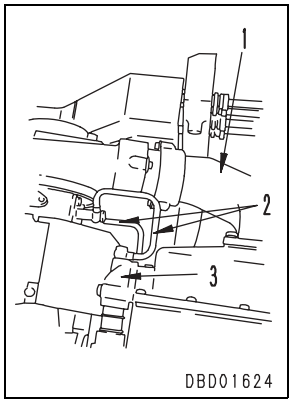
Nature of work	Symbol		Part No.	Part Name	Q'ty	Remarks
Disassembly, assembly of recoil spring, tube assembly	I	3	791-830-1231	Push tool	1	Assembly of dust seal
			790-101-5421	Grip	1	
			01010-51240	Bolt	1	
Disassembly, assembly of idler yoke	J	1	791-830-1201	Push tool	1	Press fitting of idler yoke
			• 791-822-1270	• Screw	1	
			• 790-210-2880	• Spacer	1	
			• 01580-04536	• Nut	1	
			• 01643-34512	• Washer	1	
			790-101-4100	Puller (980KN (100 ton))	1	
			790-101-1102	Pump	1	
		2	791-830-1261	Spacer	1	Removal of idler yoke
Replacement of equalizer bar	K	1	791-850-1100	Remover & Installer	1	Removal, press fitting of center pin bushing
			• 791-850-1110	• Bracket	1	
			• 791-850-1120	• Plate	1	
			• 790-438-1110	• Screw	1	
			• 791-112-1180	• Nut	2	
			• 790-101-3300	• Bearing puller	1	
			• 790-101-2510	• Block	1	
			• 01643-32780	• Washer	1	
			• 04530-01018	• Eyebolt	2	
			790-101-4000	Puller (490KN (50 ton))	1	
			790-101-1102	Pump	1	
		2	791-850-1200	Remover	1	Removal of side pin spherical bushing
			• 791-850-1130	• Sleeve	1	
			• 791-850-1140	• Sleeve	1	
			• 792-900-1530	• Screw	1	
			• 791-650-1240	• Spacer	2	
			• 01582-13024	• Nut	2	
			• 01643-33080	• Washer	2	
			790-101-4000	Puller (490KN (50 ton))	1	
			790-101-1102	Pump	1	
		3	791-850-1300	Installer	1	Press fitting of side pin spherical bushing
			• 791-850-1310	• Plate	1	
			• 791-850-1140	• Sleeve	1	
			• 791-775-1140	• Screw	1	

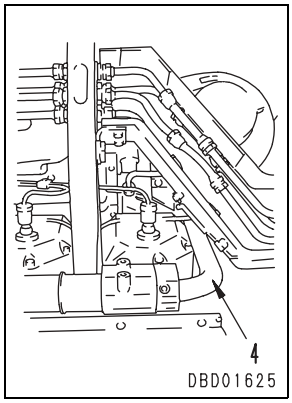
REMOVAL OF AFTER-COOLER CORE ASSEMBLY

1. Remove air cleaner assembly and muffler assembly.
   For details, see REMOVAL OF CYLINDER HEAD ASSEMBLY.

2. Remove connector (1), tubes (2), and connectors (3).
   Remove 2 connectors (3), one each at the top and bottom.

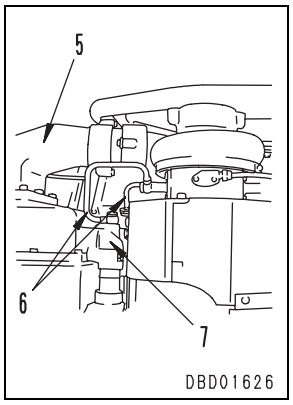
3. Remove tube (4).

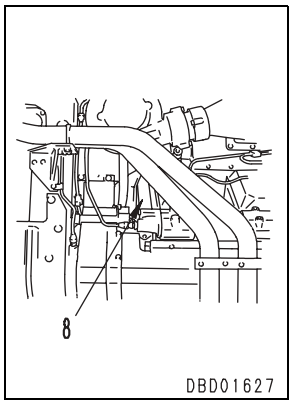




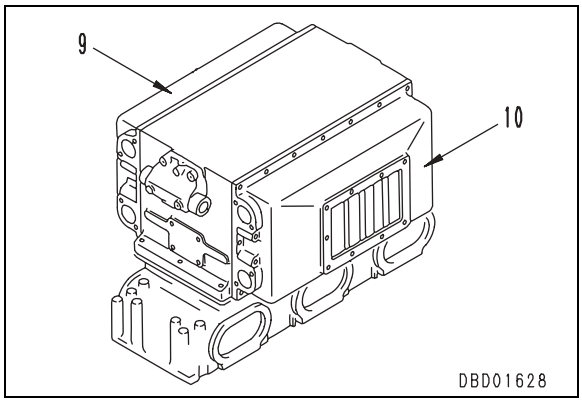
4. Remove connector (5), tubes (6), and connectors (7).
   ★ Remove 2 connectors (7), one each at the top and bottom.

5. Remove tube (8).

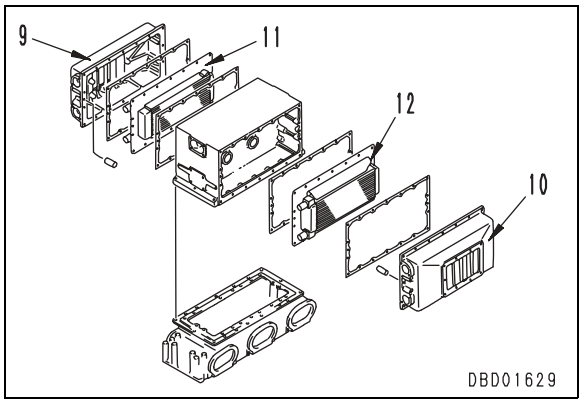




6. Remove cover assemblies (9) and (10).



7. Remove cores (11) and (12) from cover assemblies (9) and (10).



INSTALLATION OF AFTER-COOLER CORE ASSEMBLY

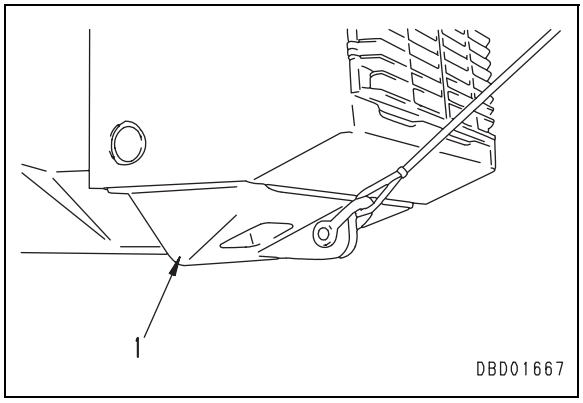
- Carry out installation in the reverse order to removal.

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

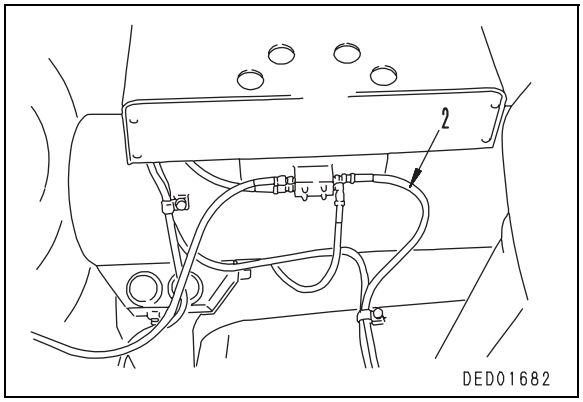
- **Refilling with water**
  Add water through water filler to the specified level.
  ★ Run the engine to circulate the water through the system. Then check the water level again.

REMOVAL OF FAN DRIVE SUPPORT ASSEMBLY

1. Drain hydraulic oil.
   Hydraulic tank : **Approx. 300 ℓ**
2. Open undercover (1).
   ★ Raise the drawbar from the front of the radiator and remove the mounting bolts.
   ★ Put protective material at the corner under the radiator.
   kg Undercover (under radiator) : **540 kg**

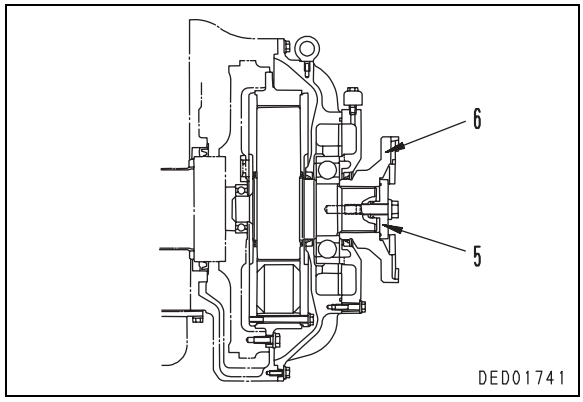


3. Remove engine hood and top cover.
   For detail, see REMOVAL OF RADIATOR ASSEMBLY.
4. Disconnect fan pulley grease hose (2).
   Remove the hose clamp tightened together with the wiring.



5. Remove holder (5). ※3

6. Remove coupling (6).

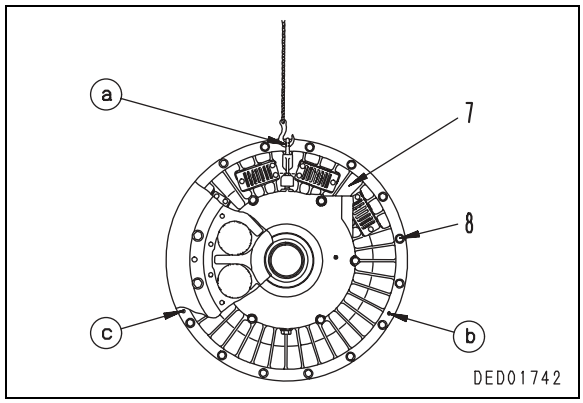


7. Cover assembly ※4 ※5

1) Sling cover assembly (7).
2) Remove mounting bolts (8), take out forcing screws, screw into tap holes ⓐ, ⓑ, and ⓒ, and remove cover assembly.

★ Use guide bolts and nuts and be careful not to let the cover assembly fly off.

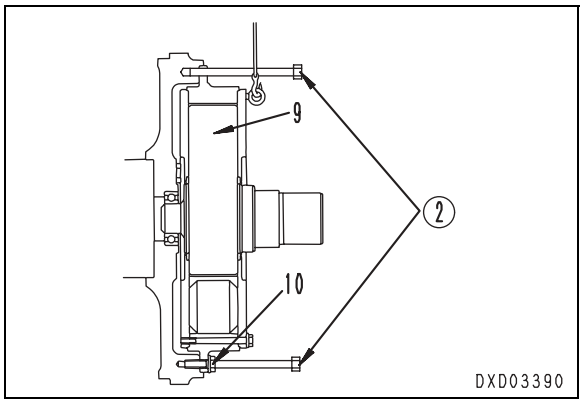
kg Cover assembly : **90 kg**

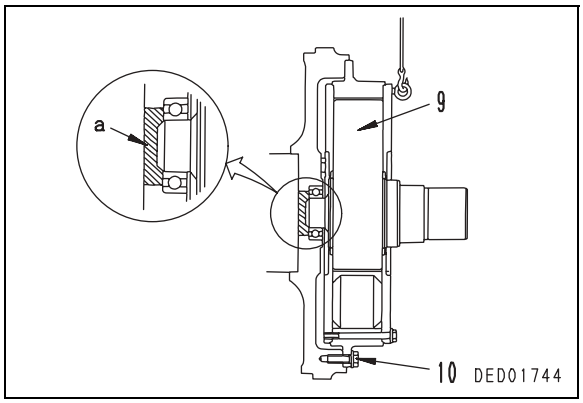


8. Damper assembly

1) Sling damper assembly (9) and set guide bolts ② in position.
   ★ Use the mounting bolt holes to install the guide bolts.
2) Remove mounting bolts (10) and lift off damper assembly.
   ★ When removing the damper assembly, install nuts to the guide bolts, and be careful not to let the damper assembly fly off.

kg Damper assembly : **80 kg**





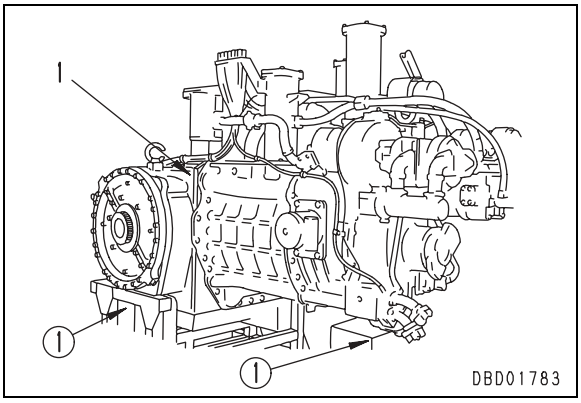
REMOVAL OF PTO, TORQUE CONVERTER ASSEMBLY

1. Remove power train assembly.
   For details, see REMOVAL OF POWER TRAIN ASSEMBLY.

2. Set power train assembly (1) on block ① horizontally.

3. Remove step (2).

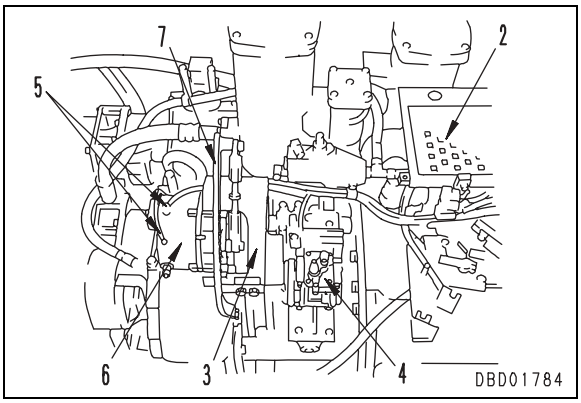
4. Remove V-belt cover (3).



5. Remove belt, then remove air conditioner compressor assembly (4) together with bracket.

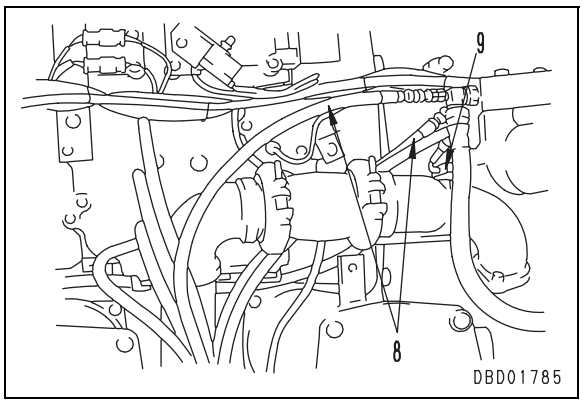
6. Disconnect wiring (5).

7. Remove belt, then remove alternator assembly (6).
8. Remove bracket (7).



9. Disconnect central pressure detection hose (8) and solenoid connector.
   ★ Fit tags to distinguish the mounting position of the hoses.

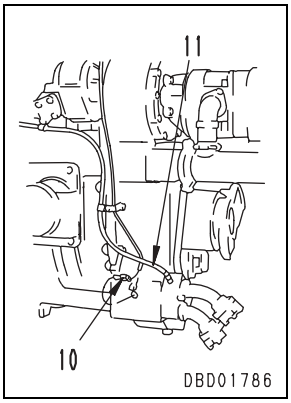
10. Disconnect solenoid connector (9).

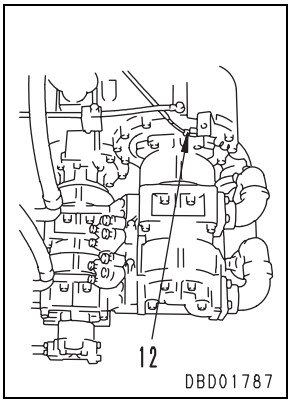


11. Disconnect torque converter oil temperature sensor connector (10), and remove wiring clamp.

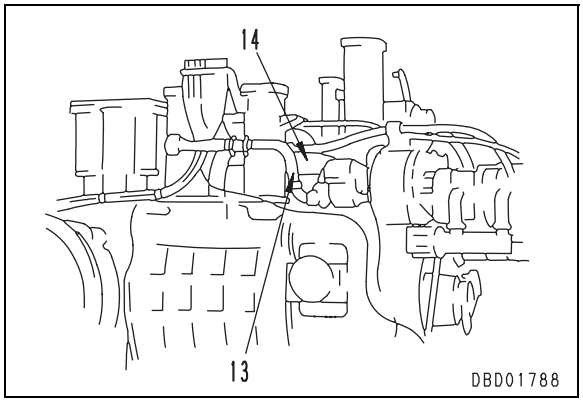
12. Disconnect central pressure detection hose (11) and remove hose clamp.

13. Disconnect hydraulic oil temperature sensor connector (12) and remove wiring clamp.





14. Remove transmission lubrication pump outlet tube (13) and inlet tube (14).

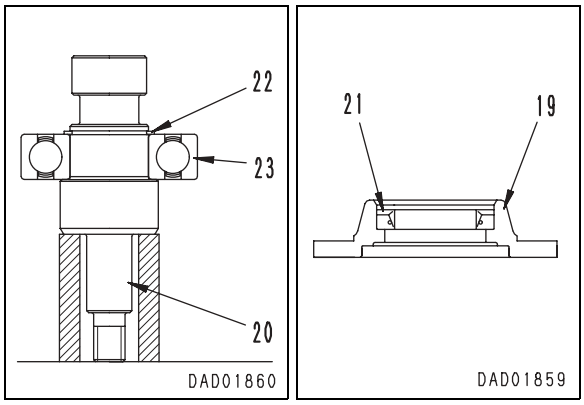


3. Alternator drive shaft

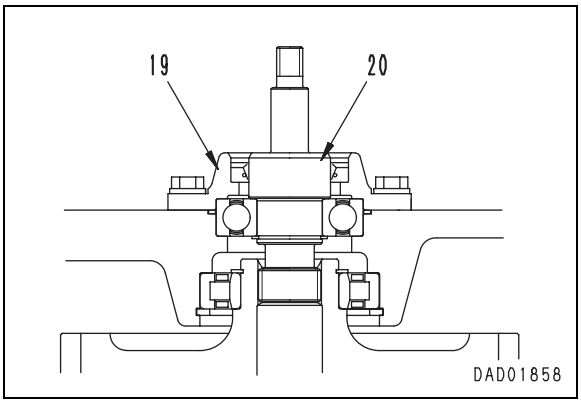
1) Using push tool, press fit bearing (23) to shaft (20), and install snap ring (22).
2) Using push tool, press fit oil seal (21) to housing (19).

Press-fitting portion of oil seal (at housing end) : **Gasket sealant (LG-5)**

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

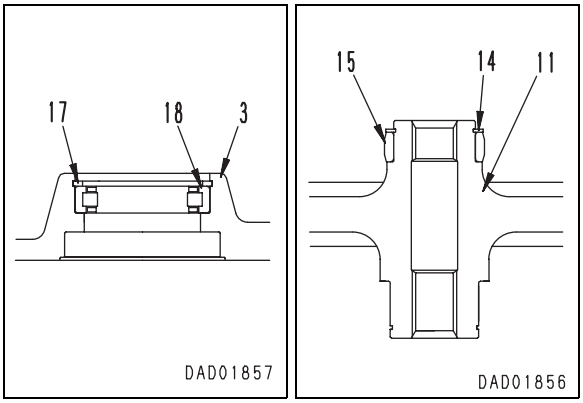


3) Install alternator drive shaft (20).
   ★ Align the spline with the hydraulic pump drive shaft, and press fit the bearing to the case.
4) Fit O-ring and install housing (19).
   ★ Be careful not to damage the oil seal lip.
   ★ Drop a small amount of engine oil on the bearing and rotate at least 10 times.

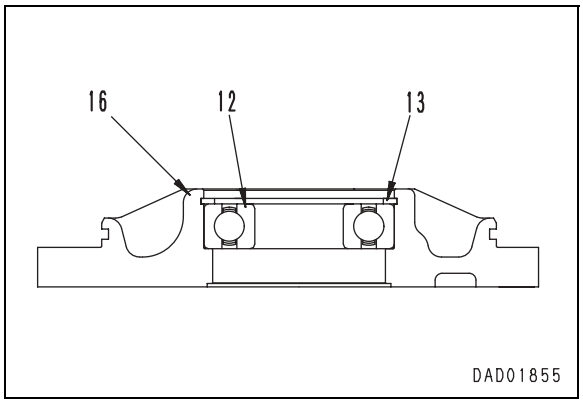


4. Drive shaft assembly (for power train pump)

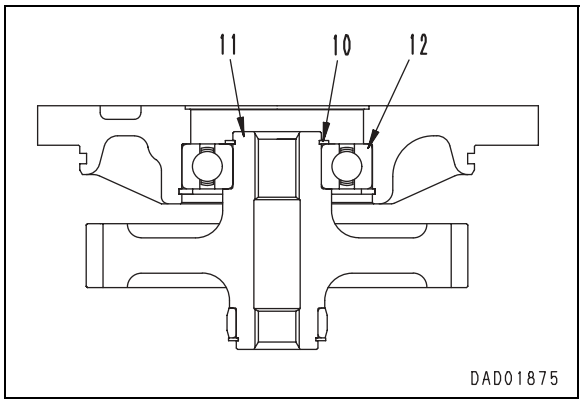
1) Using push-puller, install bearing (18) to case (3), then install snap ring (17).
2) Assemble drive shaft assembly.
   i) Using push tool, press fit inner race (15) to shaft (11).
   ii) nstall snap ring (14).



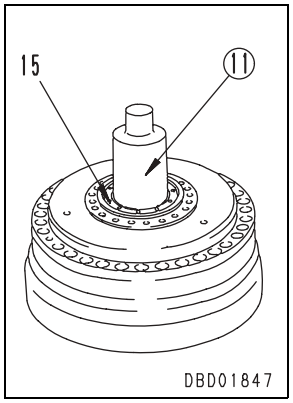
   iii) Using push tool, press fit bearing (12) to cage (16).
   iv) Install snap ring (13).

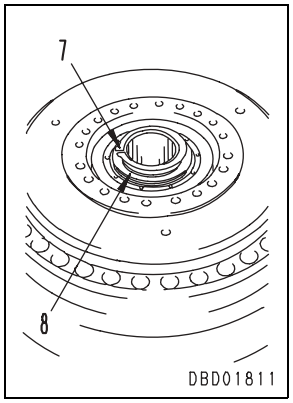


   v) Using push tool, press fit shaft (11) to inner race of bearing (12) installed to cage.
   vi) Install snap ring (10).
      ★ Drop a small amount of engine oil on the bearing and rotate at least 10 times.



vii) Using push tool ⑪, press fit bearing (15).
viii) Fit plate (8) and secure with snap ring (7).



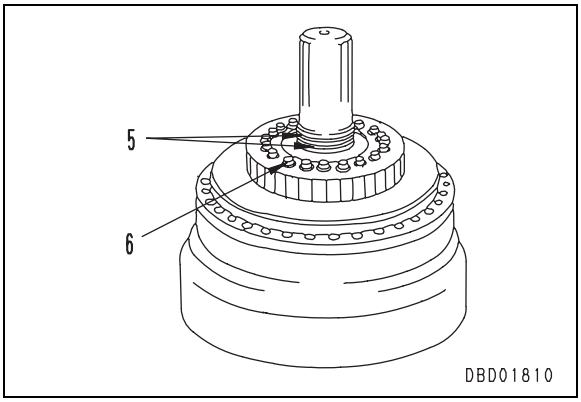


viii) Using eyebolts, fit input shaft (6) and tighten with mounting bolts.

Mounting bolt :
Thread tightener (LT-2)

kgm Mounting bolt :
277.04 ± 31.87 Nm {28.25 ± 3.25 kgm}

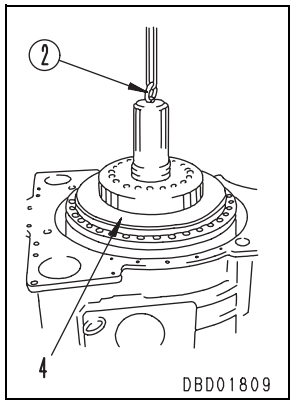
ix) Install seal ring (5) to input shaft.

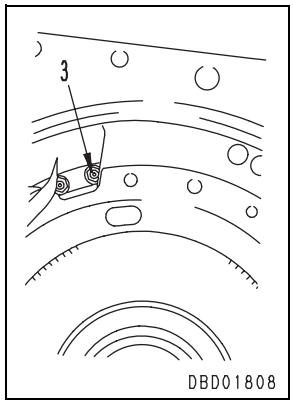


2) Using eyebolts ②, set lock-up clutch and drive case assembly (4) to pump.
★ Fit guide bolts (Thread dia.=10mm, Pitch=1.5mm, Length=60mm) to the drive case, and set to the pump.
3) Tighten mounting bolts (3).

Mounting bolt :
Thread tightener (LT-2)

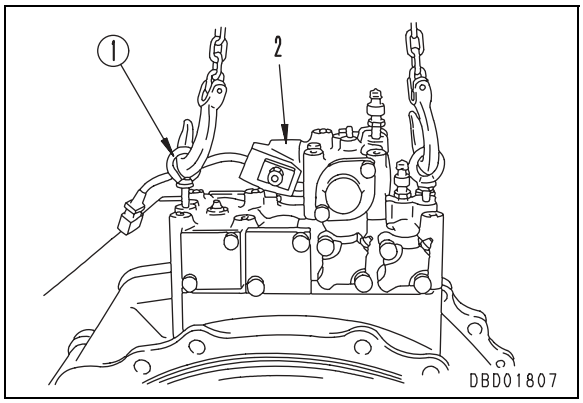
kgm Mounting bolt :
53.9 ± 4.9 Nm {5.5 ± 0.5 kgm}



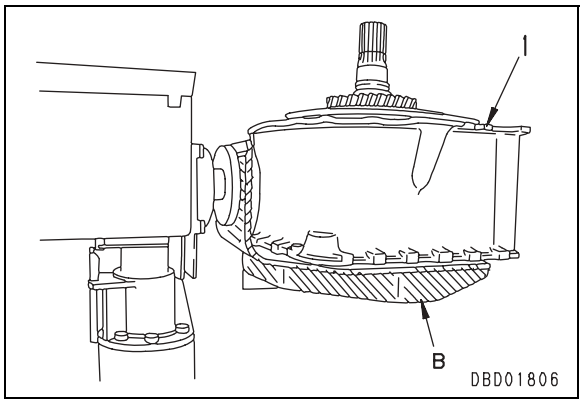


13. Torque converter valve assembly
Fit gasket, and using eyebolts ①, install valve assembly (2).
★ Tighten the mounting bolts uniformly in turn.

kgm Mounting bolt :
49.0 ± 4.9 Nm {5.0 ± 0.5 kgm}

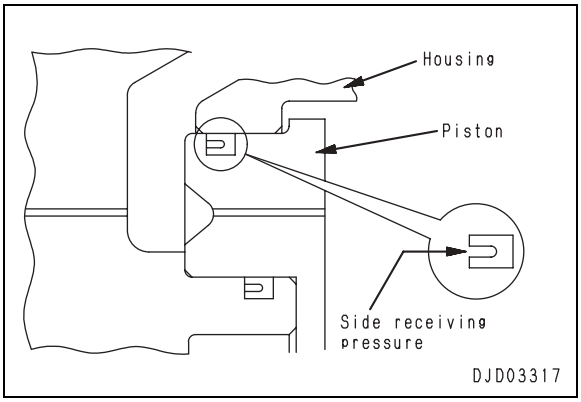


14. Torque converter assembly
Remove torque converter assembly (1) from tool **B**.



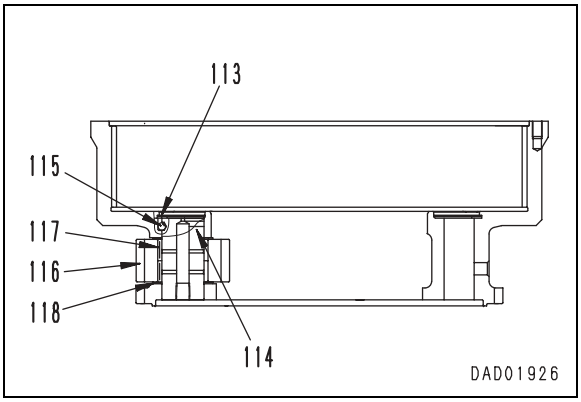
ASSEMBLY OF TORQFLOW TRANSMISSION ASSEMBLY

★ Clean all parts thoroughly (especially the oil holes), and check for dents, dirt or damage. Coat the sliding surfaces of all parts with engine oil before installing.
★ Install the seal ring with the side receiving the pressure facing the housing. Coat with grease (G2-LI) and be careful to install uniformly.



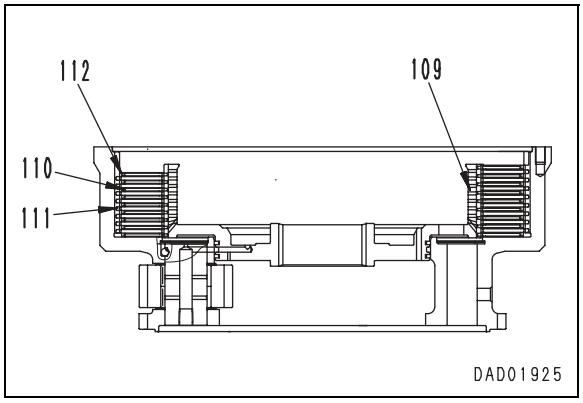
ASSEMBLY OF NO. 5 CLUTCH ASSEMBLY

1. Drum, No. 4 carrier assembly
Assemble No. 4 carrier assembly as follows.
1) Assemble bearing (117) to gear (116).
2) Put thrust washers (118) in contact on both sides, and set in carrier.
3) Fit ball (115), then push shaft (114) from drum end and install.
4) Install snap ring (113).

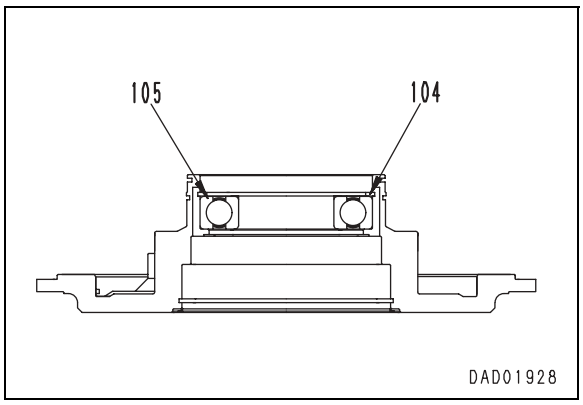


2. Hub
Fit seal ring and set hub (109) to drum and No. 4 carrier assembly.

3. Discs, plates, springs
Install discs (110), plates (111), and springs (112).
★ No. of discs: 9
★ No. of plates: 8
★ No. of springs: 9



4. Housing, piston assembly
1) Assemble housing and piston assembly as follows.
   i) Using push tool, press fit bearing (105) to housing.
   ii) Install snap ring (104).

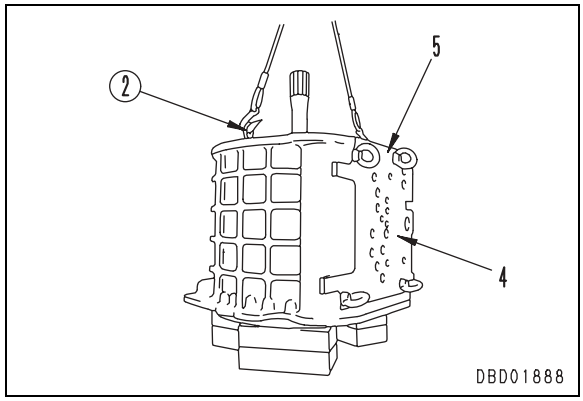


27. Case

Fit O-ring, and using eyebolts ②, install case (5).

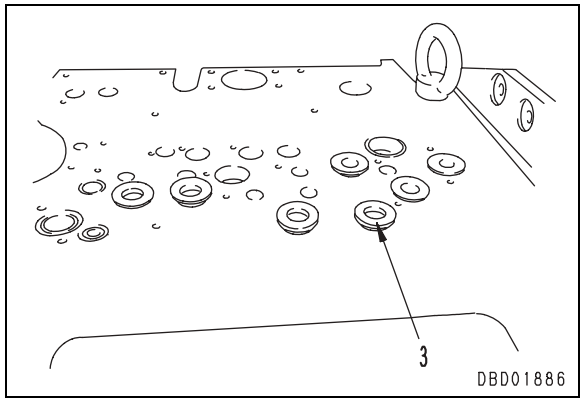
★ Tighten the bolts from below.

kgm Mounting bolt :
549.2 ± 58.8 Nm {56 ± 6 kgm}



28. Control valve

1) Set transmission assembly (4) facing side.
2) Fit O-ring and install sleeve (3).



3) Install control valve assembly.
For detail, see INSTALLATION OF TRANSMISSION CONTROL VALVE ASSEMBLY. (ECMV ASSEMBLY)

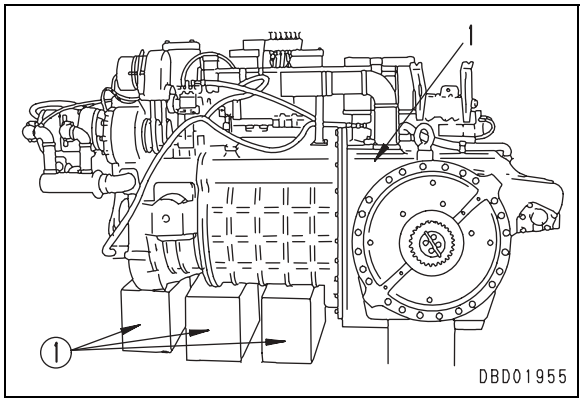
29. Cover

Install cover.

REMOVAL OF STEERING CASE ASSEMBLY

1. Remove power train assembly.
For details, see REMOVAL OF POWER TRAIN ASSEMBLY.

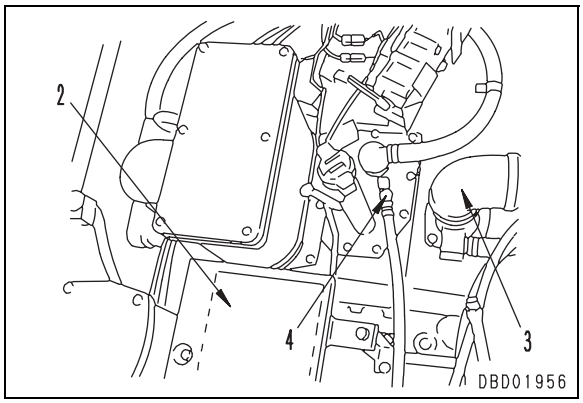
2. Set power train assembly (1) horizontally on block ①.



3. Remove step (2).

4. Remove suction tube (3).

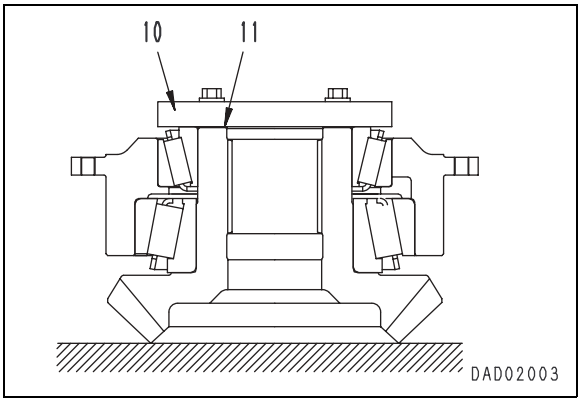
5. Disconnect hose (4).



ix) Calculate thickness of shim (11) as follows, then insert shim and install plate (10).

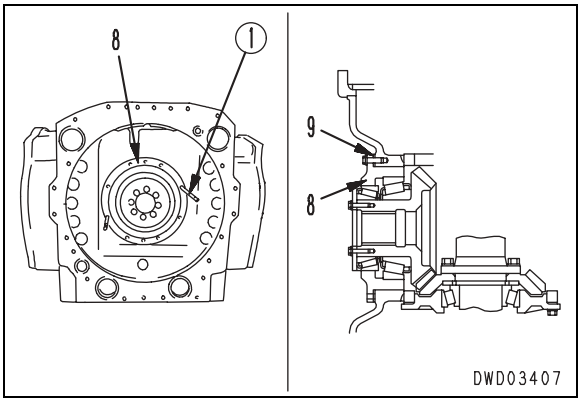
Shim thickness = 1.5 mm (thickness of shim assembled in Step v)) – Clearance Ⓒ ± 0.025 mm

★ After adjusting the preload, check that the rotating torque at the tip of the bevel pinion teeth is less than 38.64 N {3.94 kg}.



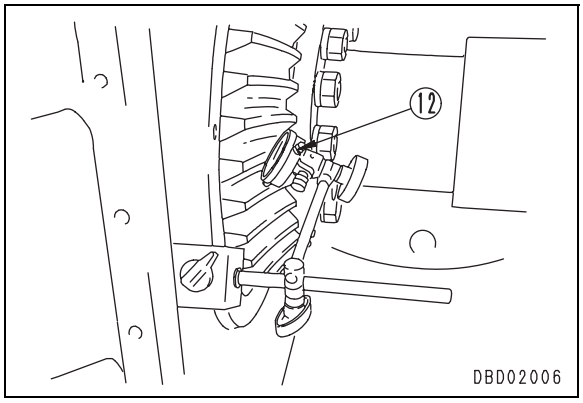
2) Using guide bolt ①, assemble bevel pinion assembly (8).
   ★ When assembling the bevel pinion assembly, leave a clearance to assemble the shim.
3) Remove guide bolt, assemble shim (9) (removed during disassembly), then install bevel pinion assembly (8).
   ★ Standard shim thickness : **1.55 mm**

   kgm Mounting bolt :
   277.04 ± 31.87 Nm {28.25 ± 3.25 kgm}

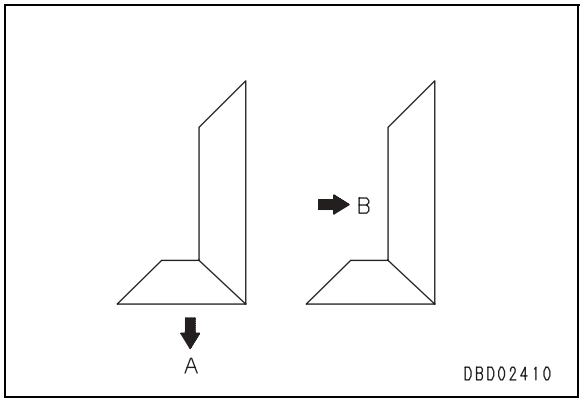


5. Adjusting tooth contact, backlash

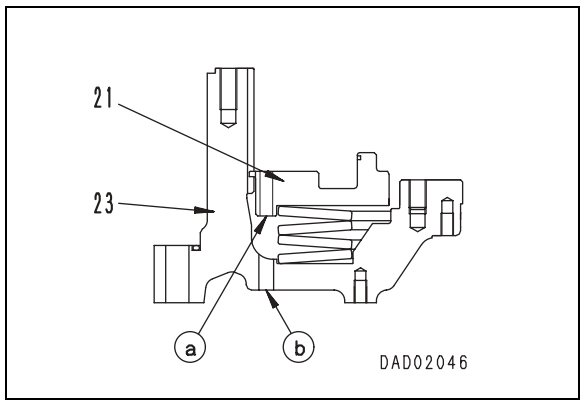
1) Adjusting backlash
   Put the probe of dial gaugee ⑫ at right angles in contact with the tip of the bevel gear teeth. Hold the bevel pinion in position, and read the measurement when the bevel gear is moved forward and backward.
   ★ Standard value for backlash :
   0.36 – 0.46 mm
   ★ Measure at a minimum of three points on opposite sides.



- If the result of the inspection shows that the correct backlash is not being obtained, adjust as follows.
- If backlash is too small
  Adjust the shim thickness at the bevel pinion end to move the bevel pinion in direction **A**, or adjust the shim thickness at the bearing cage of the bevel gear shaft to move the bevel gear in direction **B**.

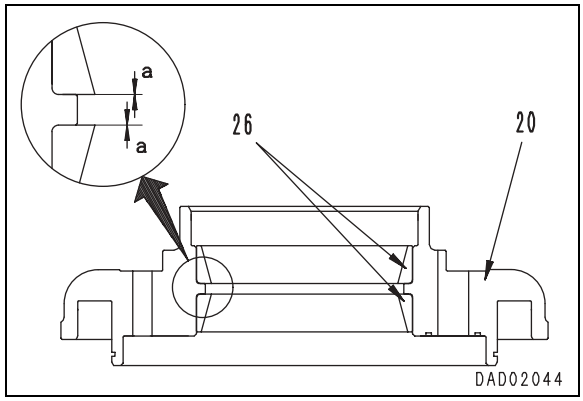


★ Align the position of piston tap hole ⓐ and brake release tap hole ⓑ in brake flange when assembling the piston.
There is also danger that the 3rd belleville spring from the bottom may come out of position, so be careful when assembling.



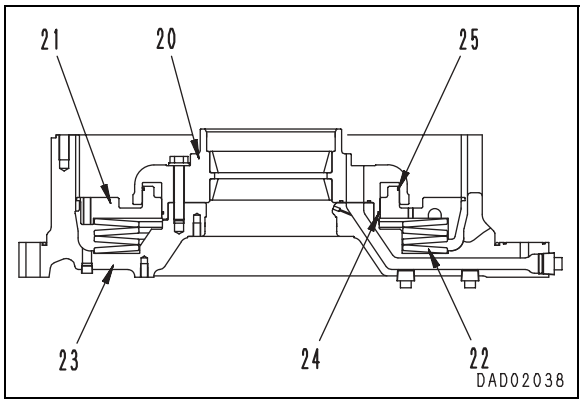
★ Be careful of the direction of the lip when installing the seal ring. Be careful not to damage the seal ring when assembling, and coat the sliding surface with grease after installing.
★ Be careful not to damage the seal ring when assembling, and after installing the seal ring, coat the sliding surface with grease.

3. Press fit bearing outer races (26) to cage (20).
★ After press fitting, check that there is no clearance at portion "**a**".

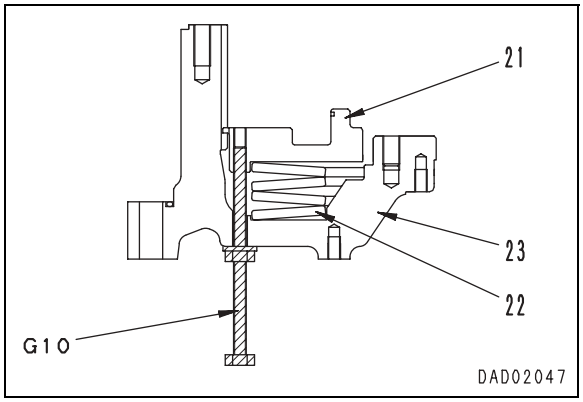


4. Assemble piston ring (24) to cage (20), and install to brake flange (23).
★ Coat the sliding surface of the seal ring with grease. (G2-LI)
★ When installing cage (20), be careful not to damage piston rings (24) and (25).

kgm Mounting bolt :
277.04 ± 31.87 Nm {28.25 ± 3.25 kgm}



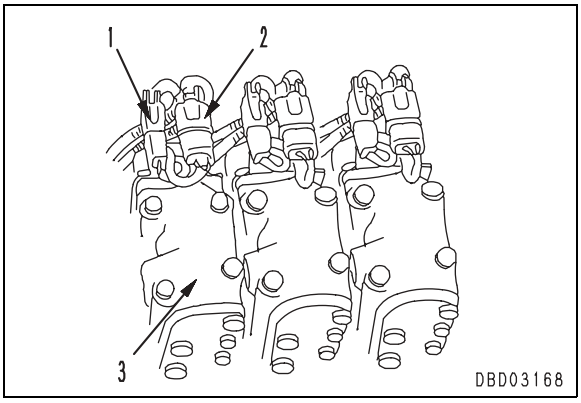
5. Using tool **G10** through brake release tap hole in brake flange (23), tighten piston (21) and compress belleville spring (22).
★ Install 4 brake release bolts **G10** on diagonally opposite sides.



REMOVAL OF TRANSMISSION CONTROL VALVE ASSEMBLY (ECMV ASSEMBLY)

⚠ Stop the machine on level ground, lower the work equipment completely to the ground, then apply the parking brake.

1. Remove cover.
2. Disconnect wiring connectors (1) and (2).
3. Remove ECMV assembly (3). ※1 ※2



INSTALLATION OF TRANSMISSION CONTROL VALVE ASSEMBLY (ECMV ASSEMBLY)

- Carry out installation in the reverse order to removal.

※1

★ Before removing the ECMV assembly, clean the area around the valve thoroughly and be careful not to let any dirt get in.

※2

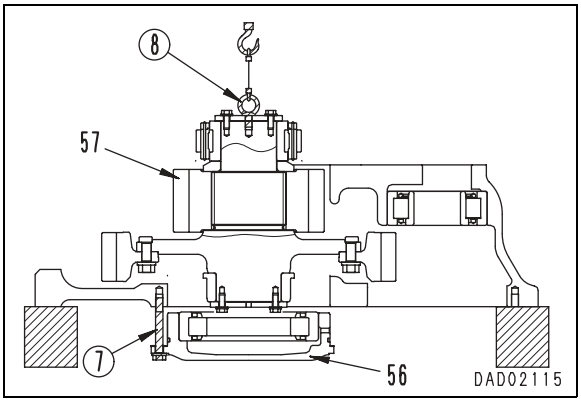
kgm ECMV assembly mounting bolt :
30.89 ± 3.43 Nm {3.15 ± 0.35 kgm}

13. No. 2 shaft assembly

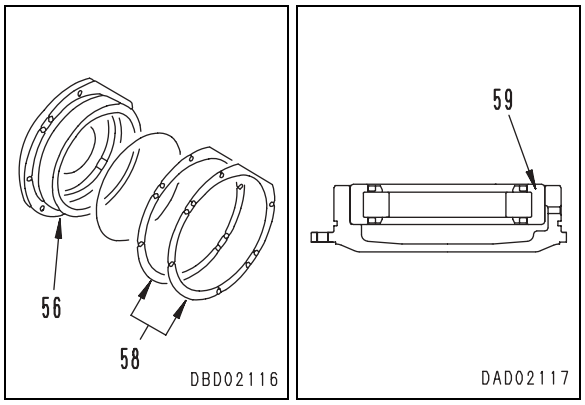
1) Remove mounting bolts, then using forcing screws, remove cover (56).

⚠ Removal of the cover requires work under the assembly, so set 2 bolts ⑦ (L = Approx. 100 mm) in position to prevent the cover from falling off.

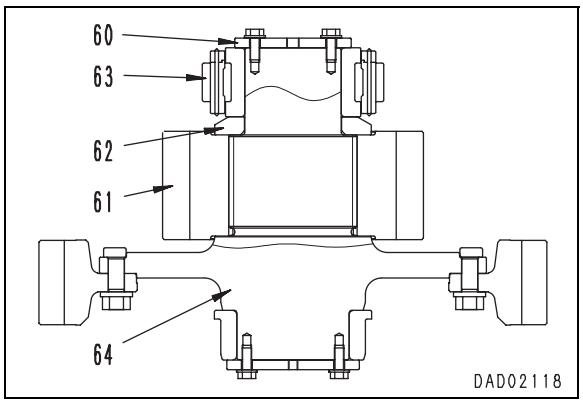
2) Using eyebolt ⑧, remove No.2 shaft assembly (57).



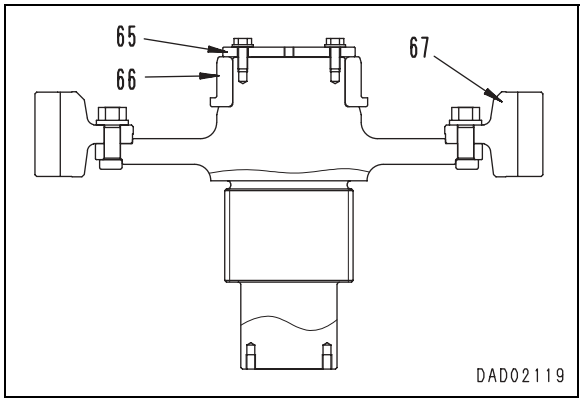
3) Remove cover (56), then remove shim (58).
4) Remove bearing (59) from cover.



5) No. 2 shaft assembly.
   i) Remove mounting bolts, then remove plate (60).
   ii) Set gear puller to gear (61), and remove spacer (62) together with bearing (63) from shaft (64).

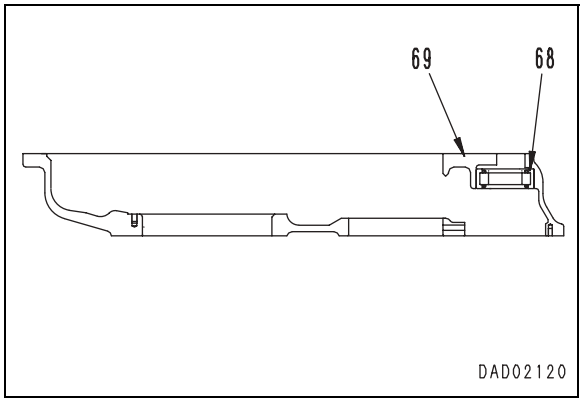


   iii) Remove mounting bolts, then remove plate (65).
   iv) Using gear puller, remove inner race (66) from shaft.
   v) Remove mounting nut, then remove gear (67).



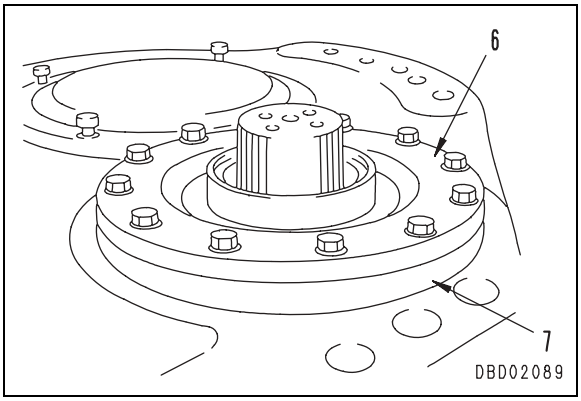
14. Bearing

Remove bearing (68) from case (69).



4) Install oil seal cage (6).

Lip of oil seal :
Grease (G2-LI) (fill 40 – 60%)



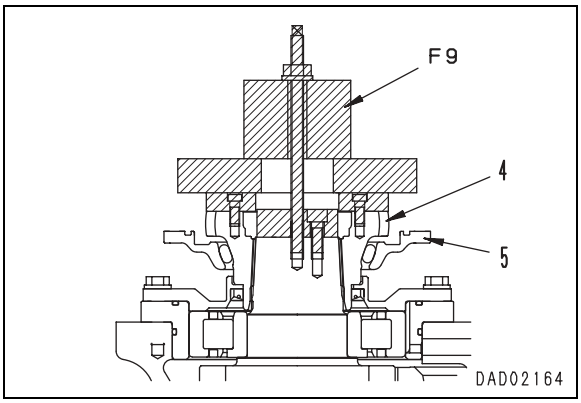
14. Cover

Fit O-ring and assemble cover (5).

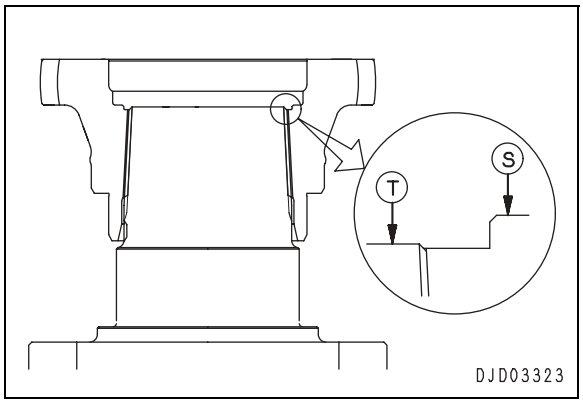
15.Gear

1) Using tool **F9**, press fit gear (4).

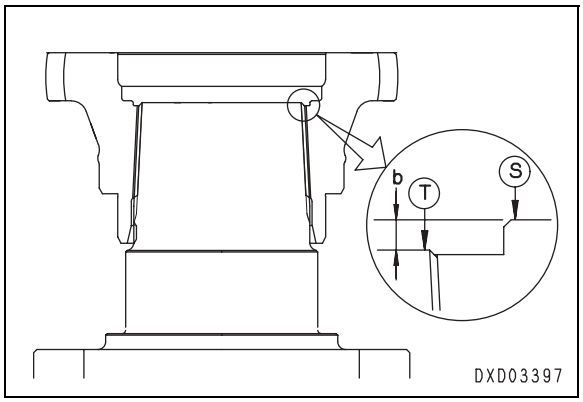
Taper serration portion :
Anti-friction compound (LM-P)



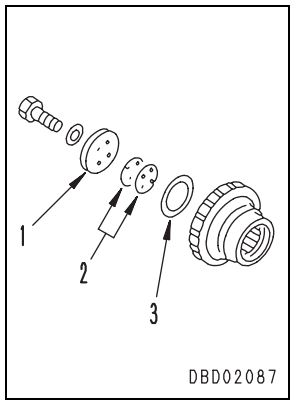
★ Press fit the gear with an initial force of 294KN (30 ton), then check that there is a stepped difference of 3 ± 0.5 mm between gear end face Ⓢ and shaft end face Ⓣ. If it is not within the standard value, press fit further (up to a maximum of 392 kN (40 ton), and check that the value is within the standard range.

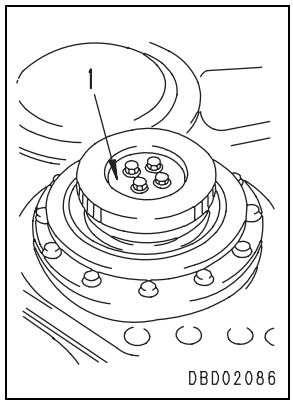


2) Adjusting shim thickness
Using calipers, measure dimension **b** between gear end face Ⓢ and shaft end face Ⓣ.
Shim thickness = **b** – (0.1 – 0.2)mm.
★ Types of shim : 0.1 mm, 0.2 mm, 0.5 mm
★ Standard shim thickness : 3 mm



3) Fit specified shim (2) and packing (3), then install holder (1).

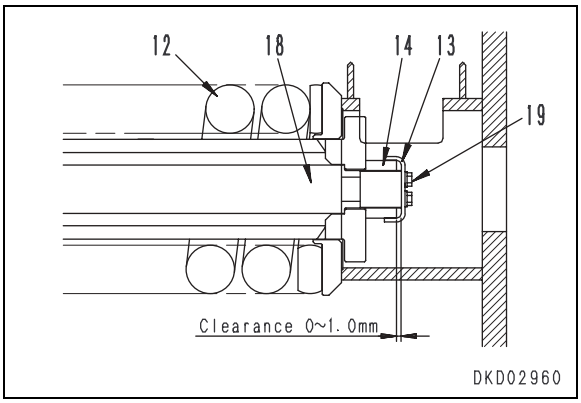




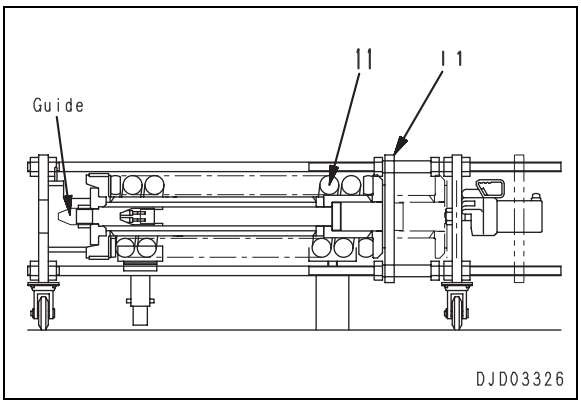
iv) Fit nut (14), then install lock plate (13).
★ When securing the recoil spring mounting nut, make a clearance of 8 – 9 mm between lock plate (13) and Nut (14), then bring lock plate (13) and bolt (18) into tight contact, and secure in position.

Lock mounting bolt (19) :
Thread tightener (LT-2)

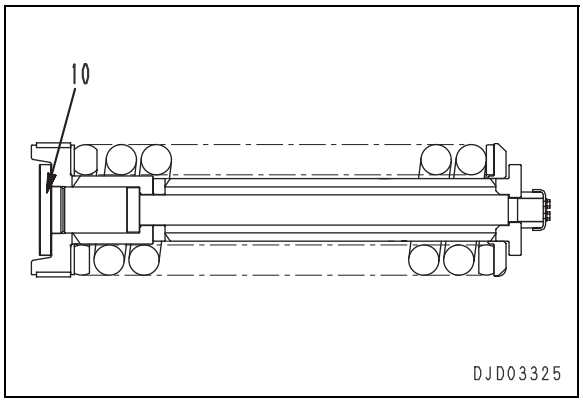
★ Purpose of making clearance
1) If the nut is screwed in a small amount and nut (14) protrudes beyond bolt (18), lock plate (13) may bend and lock bolt (19) may fall off.
2) If the nut is screwed in too far, the load of the spring will always be applied to the set bolt, and the set bolt will break.



v) Release hydraulic pressure slowly to remove spring tension completely, then remove recoil spring assembly (11) from tool **I1**.

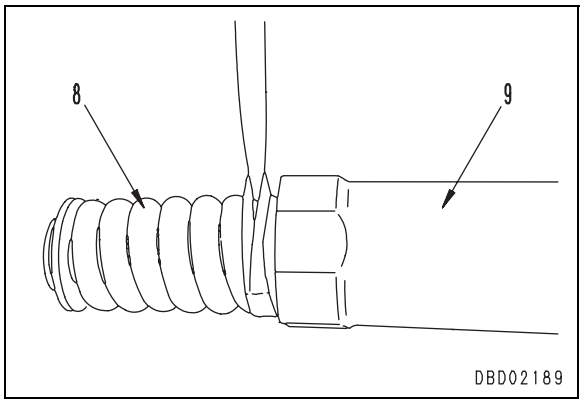


vi) Install holder (10).



2) Raise recoil spring assembly (8) and assemble to tube (9).

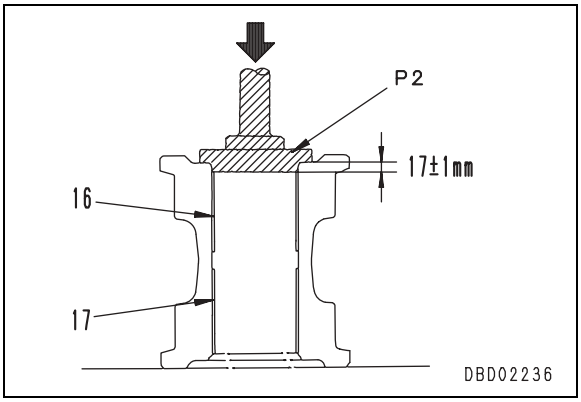
Coat all of the recoil spring with grease (G2-LI), then assemble to the tube.



ASSEMBLY OF TRACK ROLLER ASSEMBLY

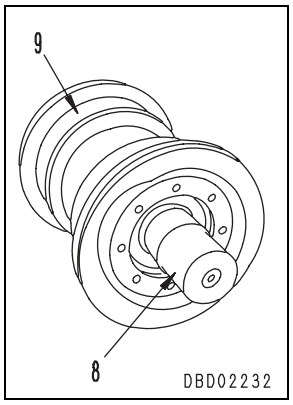
★ Clean all parts, and check for dirt or damage.

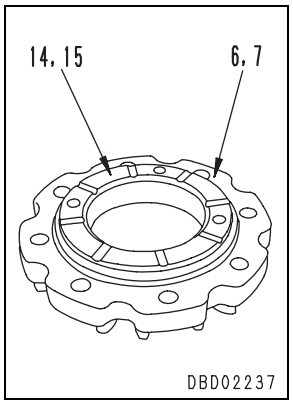
1. Set roller (9) to press, then using tool **P2**, press fit bushings (17) and (16).
   ★ Use a plastic hammer to carry out centering before press fitting the bushing with a press.
   ★ Press fit the bushing to a point where the dimension from the end face of the roller to the top face of the bushing is 17 – 1 mm.
   ★ Bushing press fitting force :
   137 – 226 kN {14 – 23 ton}



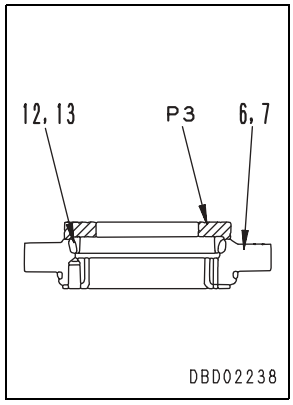
2. Set shaft (8) to roller (9).

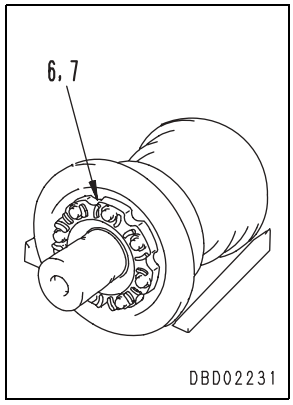
3. Press fit bushings (14) and (15) to retainers (6) and (7), and assemble O-rings.



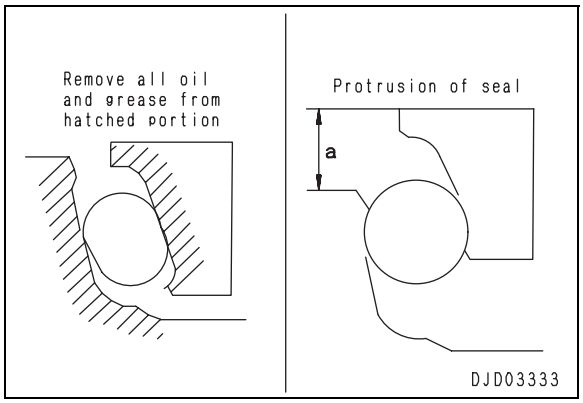


4. Using tool **P3**, assemble floating seals (13) and (12) to retainers (7) and (6).



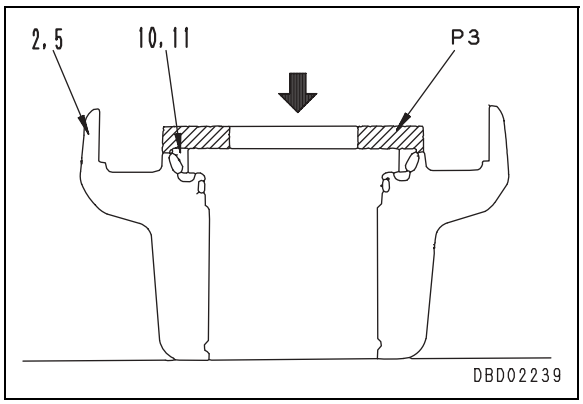


★ Remove all oil and grease from the O-ring and O-ring contact surface, and dry before assembling the floating seal.
★ After inserting the floating seal, check that the angle is as follows.
★ Angle of floating seal : **Within 1 mm**
★ Protrusion **a** of floating seal : 7 – 11 mm



5. Install retainer (7) and (6) to roller (9).

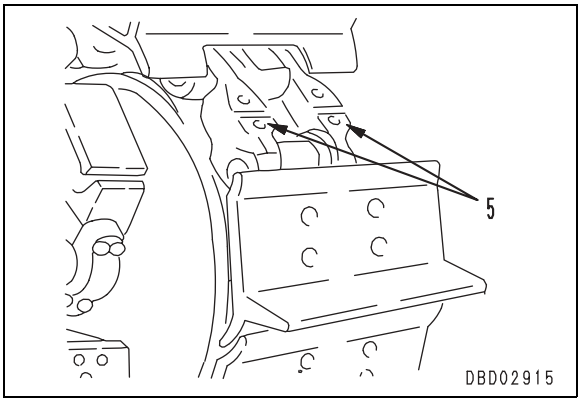
6. Using tool **P3**, assemble floating seals (11) and (10) to collars (2) and (5), then install O-rings.



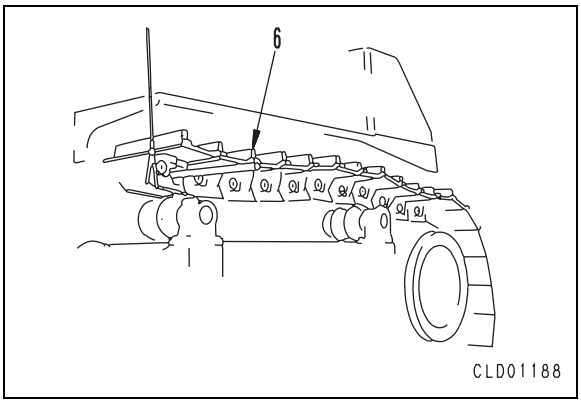
8. Disconnect master link (5).

9. Raise tip of master link at front, and open track shoe assembly to front.

   ⚠ To prevent the track shoe assembly from opening suddenly, use a chain block and remove carefully.



10. Raise tip of master link, move machine towards rear slowly, and lay out track shoe assembly (6).
    ★ Track shoe length : Approx. 13.7 m



11. Remove master bolt.
    (It can be removed easily by hand or with a wrench.)

REMOVAL OF TRACK SHOE ASSEMBLY (WHEN THERE IS ABNORMALITY INSIDE TRACK FRAME)

★ When CHECKING BEFORE REMOVAL OF TRACK SHOE ASSEMBLY shows any abnormality, do as follows.

⚠ If there is any abnormality inside the track frame, there is danger that the track shoe assembly may spring back when it is removed or that the idler may spring out when the track shoe assembly is removed. This may lead to serious injury, so remove the track shoe assembly as follows.

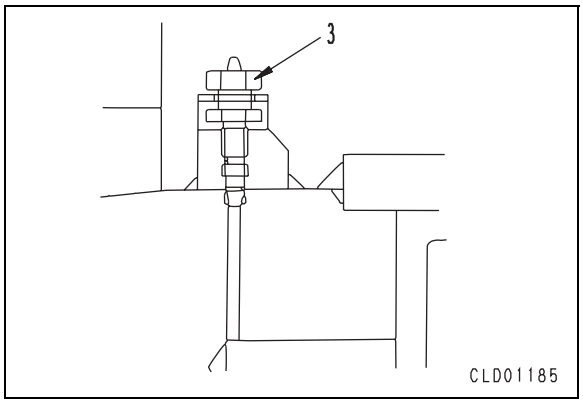
⚠ If there is any interference or abnormal catching around the idler assembly, examine carefully and remove the problem before starting.

1. Remove work equipment assembly.
   For details, see REMOVAL OF BLADE ASSEMBLY.

2. Loosen lubricator (3) of adjustment cylinder, then move machine backwards and forwards to release grease. ※1 ※3

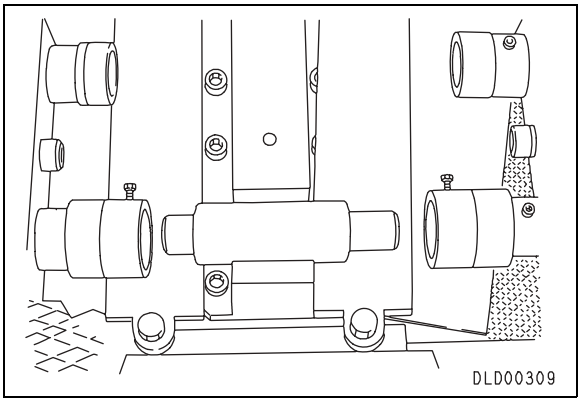
   ⚠ Never loosen the lubricator more than one turn.

   ★ Check that all the grease has been removed.

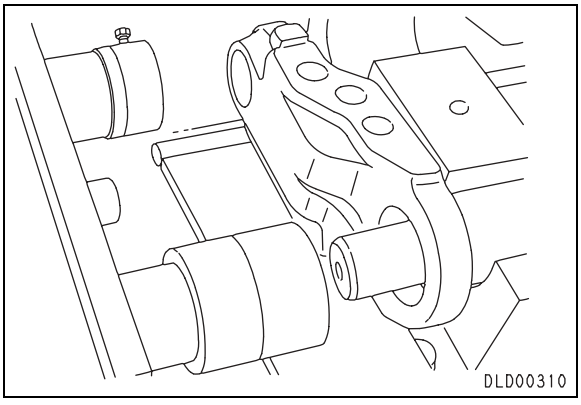


2. Assembly of link

1) Use a clean brush to coat the area between the pin and bushing with oil (GO140B), set in position, then set in front of the jaw of the link press.
   ★ When reusing (turning) the bushing, set the worn surface on the outside circumference of the bushing facing the shoe mounting surface of the link (facing up on the link press).

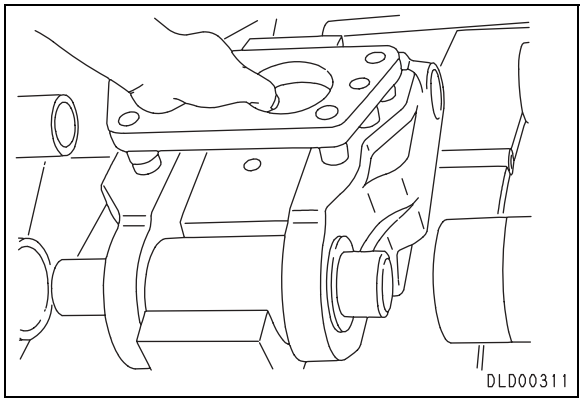


2) Set the left and right bushing end master link with the shoe mounting surface facing up, then press fit to the bushing.
   ★ When doing this, use the pin end master link as a support.
   ★ Press-fitting force for bushing:
   245 – 441 KN {25 – 45 ton}

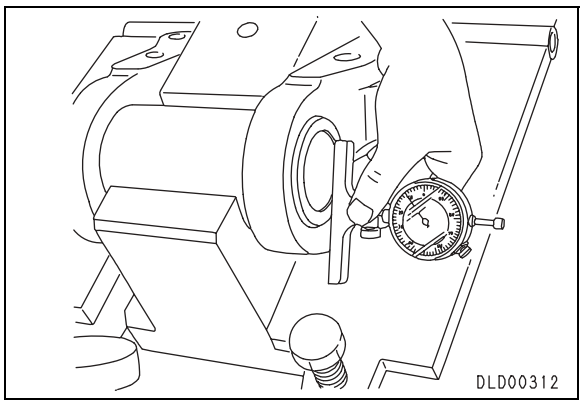


3) Using a shoe bolt hole pitch gauge, press fit until the distance between the shoe bolt holes of the left and right link is the specified value.
   ★ Use compressed air to remove all metal particles from burrs caused by press fitting the bushing.

4) Turn over the master link, and check that the left and right master links have been press fitted in parallel.

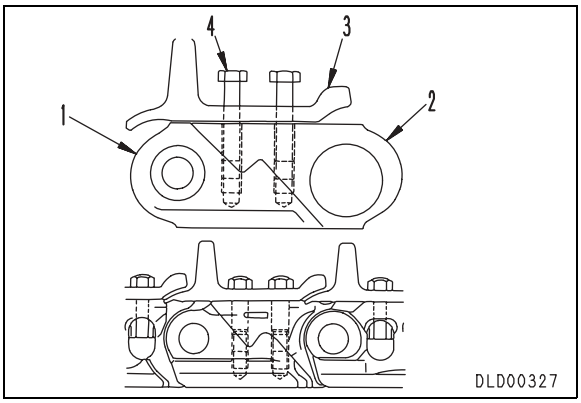


5) Measure the amount of protrusion of the left and right bushings with a depth gauge.
   ★ Adjust the press-fitting jig for the link press so that the protrusion of the left and right bushings is uniform.



4. Connecting to make 1/2 assembly

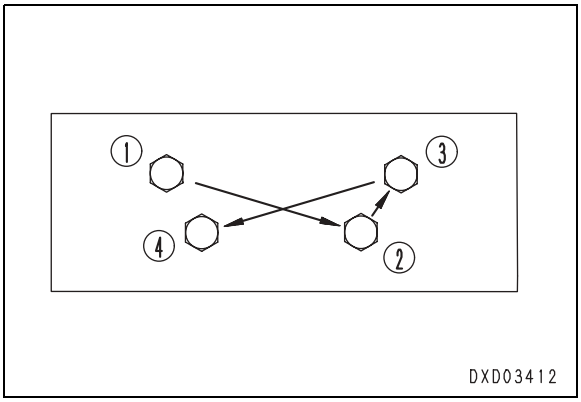
Set two completely assembled portions of track on a flat surface in a straight line with the shoes facing up. Pull master link (1) at the pin end to master link (2) at the bushing end, and set at the mating surfaces. Then put shoe (3) on top, check that shoe bolt (4) goes in easily by hand, and connect the two parts with the master bolt.



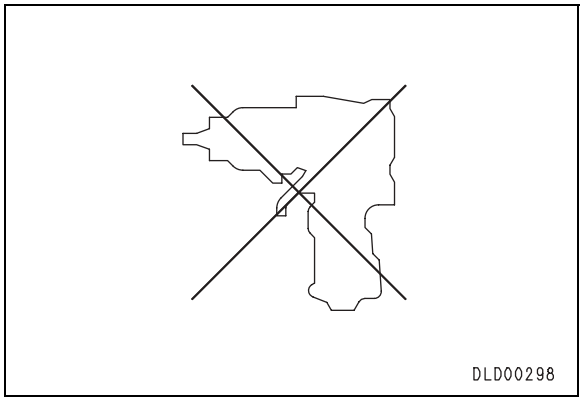
Shoe bolt: **Anti-friction compound (LM-P)**

kgm Shoe bolt (master link):
Initial torque:
1,960 ± 210 Nm {200 ± 20 kgm}
Tightening angle: **120** $^{+20}_{0}$°

★ When tightening, tighten in the order ① – ④.



★ Do not use an impact wrench for the master link.

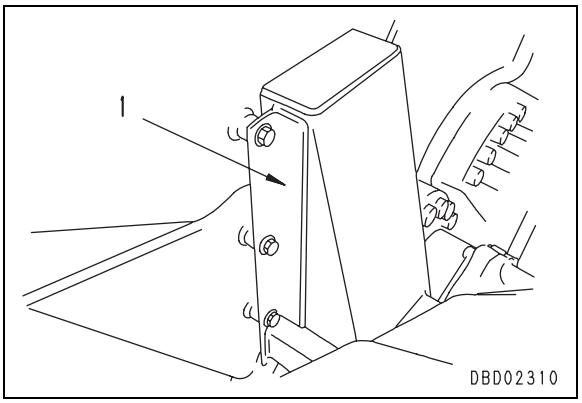


REMOVAL OF EQUALIZER BAR ASSEMBLY

1. Drain oil from pivot chamber.

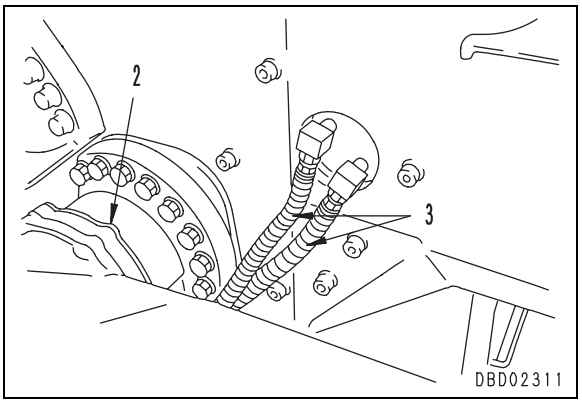
   Pivot chamber : **Approx. 18** ℓ

2. Remove cover (1).

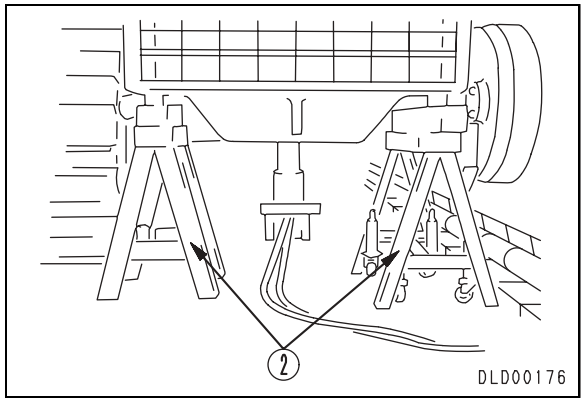


3. Remove mounting bolts of torsion seal (2). ※1
   ★ Oil will leak from the pivot chamber, so put a container under the pivot chamber to catch the oil.

4. Disconnect hose (3).
   ★ Oil will flow out, so use a container to catch the oil, and after disconnecting, install a blind plug.

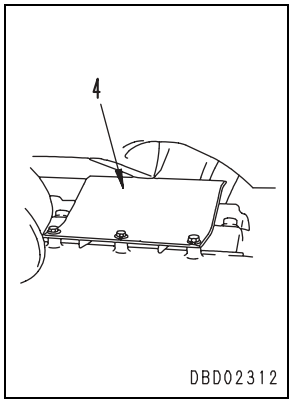


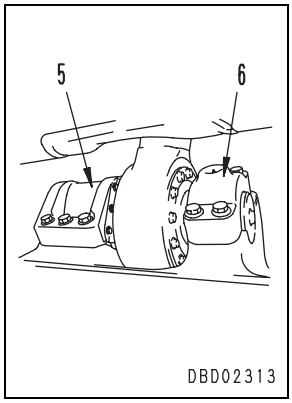
5. Set stand ② securely under radiator guard.
   ★ Do not jack up the front of the machine at this point.



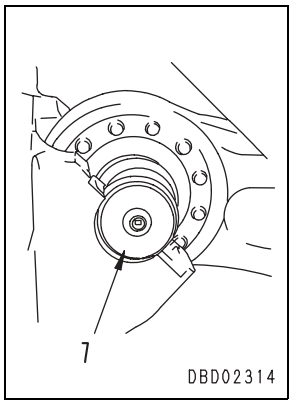
6. Remove cover (4).

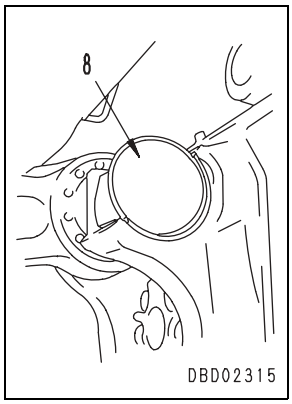
7. Remove caps (5) and (6). ※2





8. Remove equalizer bars (7) and (8).





ASSEMBLY OF BLADE VALVE ASSEMBLY

★ Clean all parts, dry them, and check for dirt or damage. Coat the sliding surfaces of all parts with engine oil before installing.

1. Assemble suction valve assembly.
   1) Install seal (23) to valve (22).
   2) Assemble spring (24) to valve, then assemble to sleeve (21).
   3) Install O-ring to spool.

2. Install plugs (19) and (20).

   kgm Plug (19) :
   152.0 ± 24.5 Nm {15.5 ± 2.5 kgm}

   kgm Plug (20) : **68.6 ± 9.8 Nm {7 ± 1 kgm}**

3. Assemble valve (18) and spring (17), then install plate (17).

   kgm Mounting bolt :
   88.3 ± 9.8 Nm {9 ± 1 kgm}

4. Fit O-ring to flange (15), then assemble to body.

5. nstall relief valve assembly (14).

   kgm Relief valve assembly:
   321.17 ± 46.58 Nm {32.75 ± 4.75 kgm}

6. Install suction and safety valve assembly (13).

   kgm Suction, safety valve assembly :
   225.6 ± 9.8 Nm {23 ± 1 kgm}

7. Install suction valve assemblies (12) and (11).

   kgm Suction valve assembly :
   225.6 ± 9.8 Nm {23 ± 1 kgm}

8. Assemble spool (tilt, lift).
   1) Assemble spool (6) to body (1).
   2) Install springs (9) and (8) to retainer (10), assemble to case (7), then install to body.
   3) Assemble springs (4) and (3) to retainer (5), assemble to case (2), then install to body (1).

INSTALLATION OF BLADE PPC VALVE ASSEMBLY

- Carry out installation in the reverse order to removal.

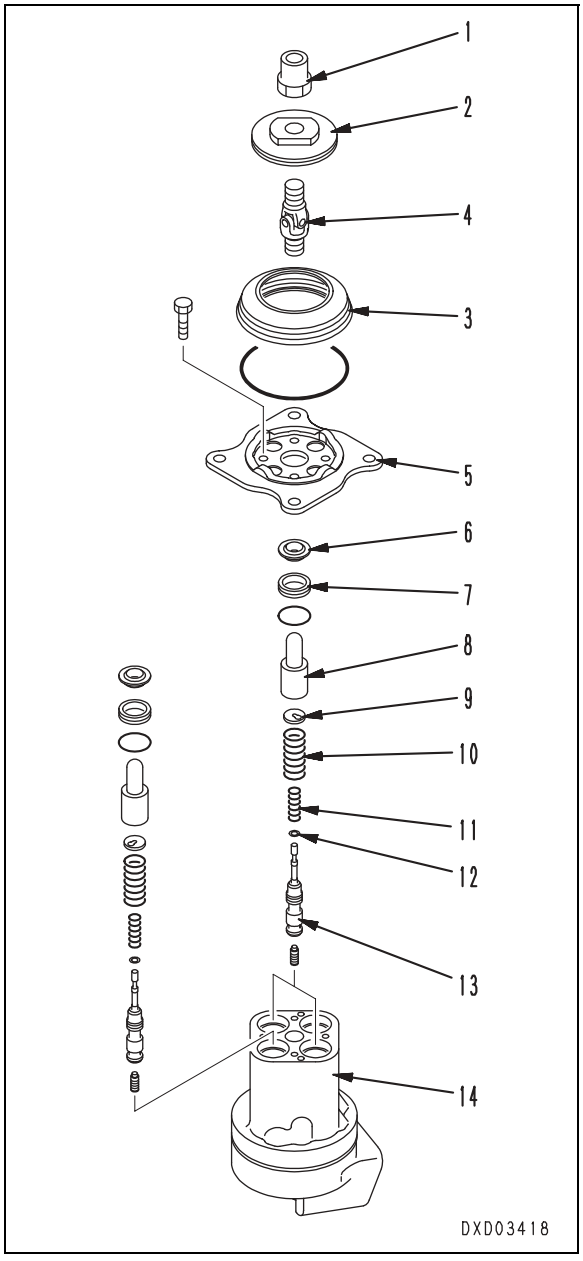
- **Refilling with oil (hydraulic tank)**
  Add oil through oil filler to the specified level.
  ★ Run the engine to circulate the oil through the system. Then check the oil level again.

DISASSEMBLY OF WORK EQUIPMENT PPC VALVE ASSEMBLY

1. Remove nut (1), then remove disc (2) and boot (3).
2. Remove bolts, then remove plate (5).
   ★ Do not remove joint (4) unless it is to be replaced.
3. Remove seal (6) and collar (7).
4. Pull out piston (8), then remove retainer (9), springs (10) and (11), and shim (12).

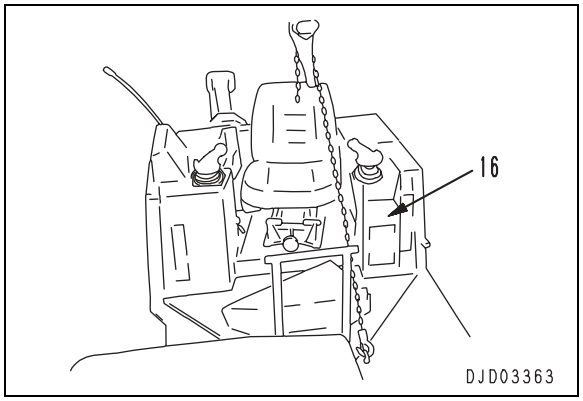
★ Spring (10) consists of two each of two types of springs with different installed loads, so check the mounting position (oil pressure port) and mark with tags to prevent mistakes when installing.

5. Pull out valve (13) from body (14).



16. Remove operatorís compartment frame assembly (16).
    ★ Sling the operatorís compartment frame assembly, and remove the mounting bolts.

    kg Operatorís compartment frame assembly: **670 kg**



INSTALLATION OF OPERATOR'S COMPARTMENT FRAME ASSEMBLY

- Carry out installation in the reverse order to removal.

※1
★ Bend the cotter pin securely.