

SHOP MANUAL

KOMATSU D375A-3

MACHINE MODEL SERIAL NUMBER

D375A-3 **17501 and up**

- This shop manual may contain attachments and optional equipment that are not available in your area. Please consult your local Komatsu distributor for those items you may require. Materials and specifications are subject to change without notice.
- D375A-3 mounts the SA6D170-2 engine.
For details of the engine, see the 6D170-2 Series Engine Shop Manual.

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


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HOISTING INSTRUCTIONS

HOISTING

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

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

WIRE ROPES

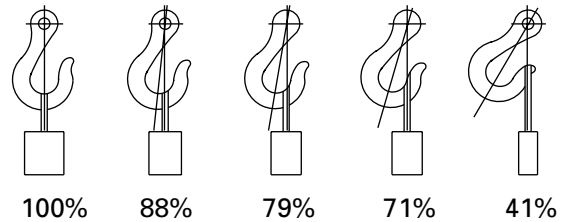
- 1) Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

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

Rope diameter mm	Allowable load	
	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.

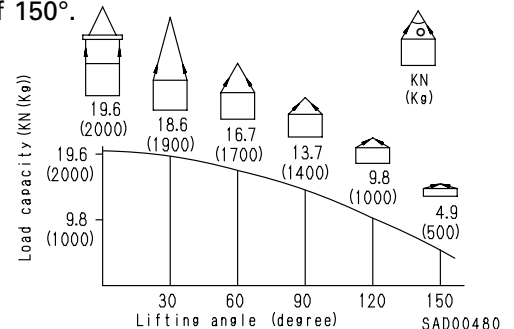
Slinging near the edge of the hook may cause the rope to slip off the hook during hoisting, and a serious accident can result. Hooks have maximum strength at the middle portion.



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°.



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

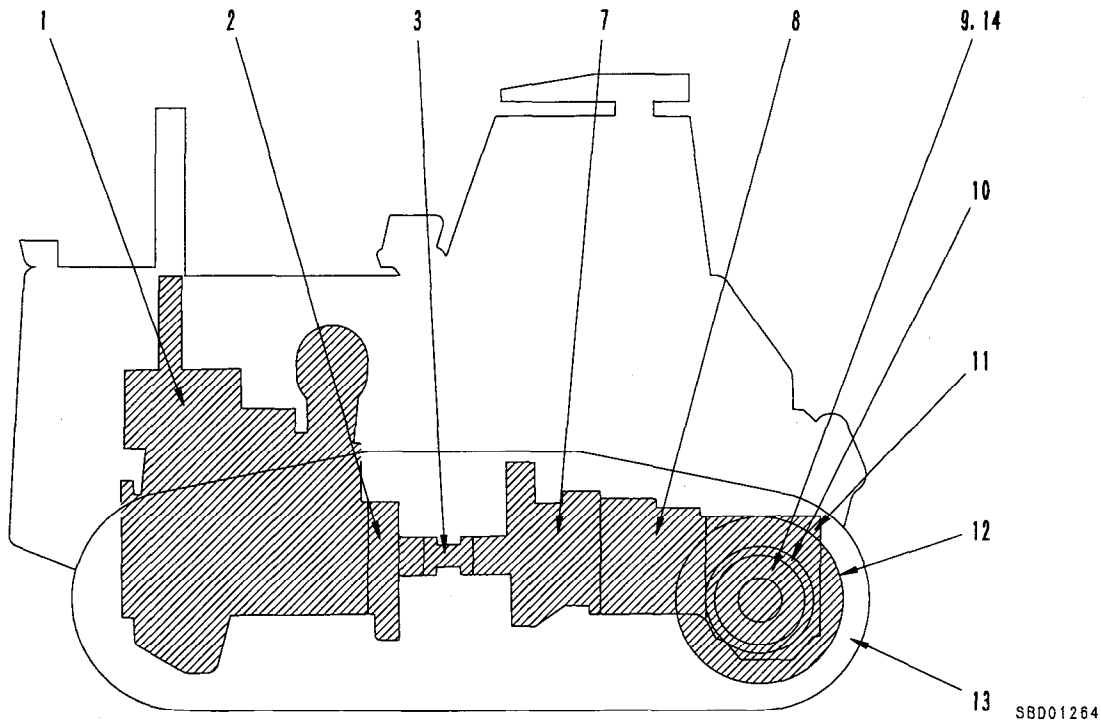
Kilogram to Pound

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		D375A-3		
Serial No.		17501 and up		
Dimensions	Track gauge	mm	2,500	
	Length of track on ground		3,840	
	Track shoe width		610	
	Min. ground clearance		610	
Engine	Name	mm	SA6D170E-2	
	Type		4-cycle, water-cooled, in-line, vertical type, direct injection, with turbocharger, aftercooler	
	No. of cylinders – bore x stroke		6 – 170 x 170	
	Piston displacement		23.15 {23,150}	
	Performance	Rated horsepower	KW/rpm {HP/rpm}	391/1,800 {525/1,800}
		Max. torque	Nm/rpm {kgm/rpm}	2,618/1,300 {267/1,300}
		Max. speed at no load	(rpm)	1,960
		Min. speed at no load	(rpm)	700
		Min. fuel consumption ratio	g/KW•h {g/HP•h}	213 {157}
	Starting motor		24V, 7.5 KW x 2	
Alternator		24V, 50A		
Battery		12V, 170Ah x 2		
Radiator core type		D type		
Power train system	Torque converter		3-element, single stage, single phase (with lock up clutch)	
	Transmission		Planetary gear type, multiple disc clutch, hydraulically actuated, force-feed lubrication gear pump, forward 3 speed, reverse 3 speed	
	Bevel gear shaft		Spiral bevel gear, splash type lubrication	
	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, manually operated), interconnected with clutch	
	Final drive		Spur gear 1-stage, planetary gear 1-stage reduction gear, splash type lubrication	

POWER TRAIN

**Outline**

- The power generated by engine (1) has its torsional vibration dampened by damper (2), and then passes through universal joint (3), and is transmitted to torque converter (7). The power from the engine is transmitted through oil by torque converter (7) to the input shaft (turbine shaft) of transmission (8) in accordance with the change in the load. There is a lock-up clutch assembled to the torque converter, and when the rotating speed beyond the torque converter becomes higher, the lock-up clutch is engaged. When this happens, the drive case and turbine form one unit, so the power from the engine is transmitted directly to the transmission input shaft. Transmission (8) uses a combination of a planetary gear system and hydraulic equipment to reduce the speed and shift the gears (forward: 3 gears, reverse: 3 gears). It connects two sets of clutches selected with the gear shift lever according to the change in the load, and transmits the power from the transmission to transfer (14) from the output shaft.

The power entering transfer (14) has its speed reduced. Its speed is further reduced by the bevel pinion and bevel gear of the bevel gear shaft, and it is then divided at right angles to the left and right and transmitted to the respective steering clutches (9). The power transmitted from the bevel gear shaft to the final drive is used to steer the machine by engaging or disengaging steering clutch (9).

The steering lever is operated to disengage the steering clutch on the side to which the machine is to be steered in order to change the direction of travel. The size of the turning radius is controlled by steering brake (10) installed to the outside of the steering clutch.

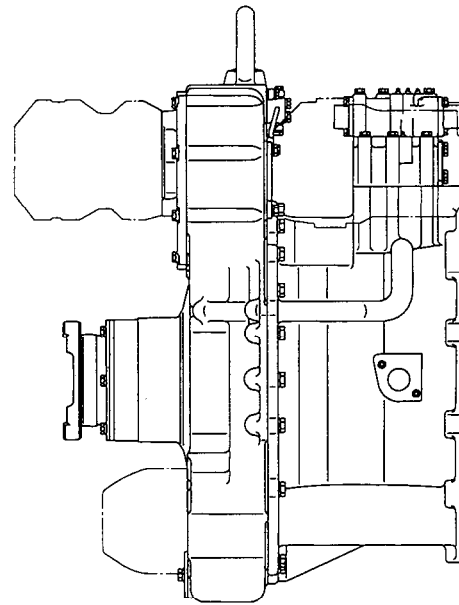
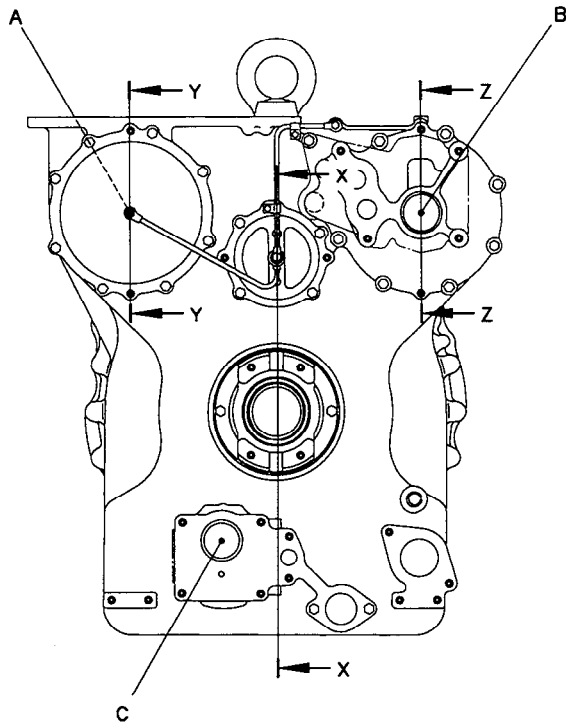
Steering brake (10) uses the same disc system that is used for the steering clutch.

The power output from the steering clutch enters final drive (11), where it is reduced, and rotates sprocket (12).

Final drive (15) is a double reduction type consisting of a single stage spur gear and single stage planetary gear system.

It rotates the sprocket to drive track shoe (13) and move the machine.

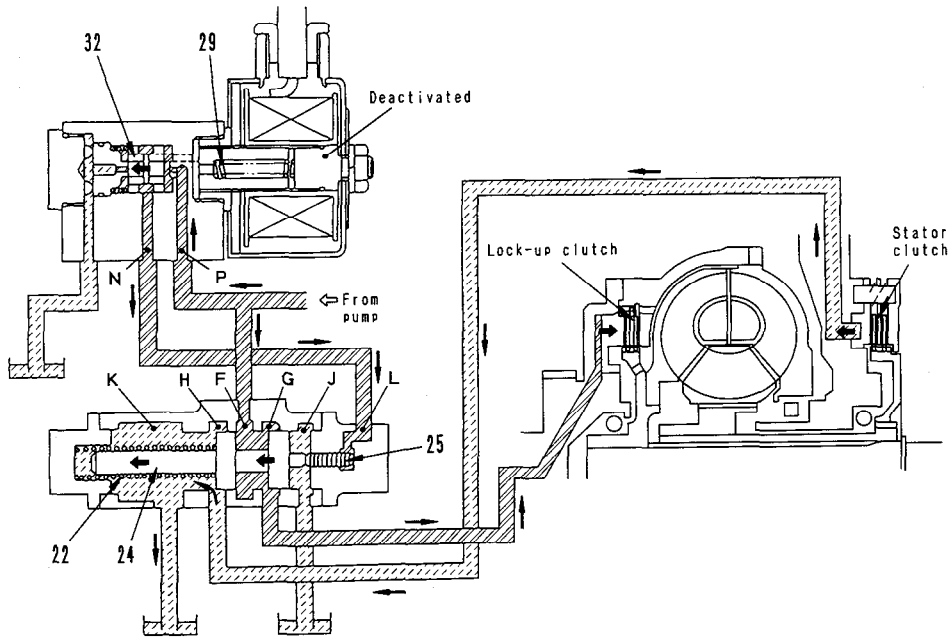
TORQUE CONVERTER, PTO



SBD01272

- | | | |
|--|------------------------------|--------------------------------------|
| 1. Coupling | 14. Bearing cage | 28. Scavenging pump gear (63 teeth) |
| 2. Seal cage | 15. Retainer | 29. Seal seat |
| 3. Input shaft [PTO drive gear (61 teeth)] | 16. Shaft | 30. Spacer |
| 4. Front housing | 17. Transmission input shaft | 31. Cover |
| 5. Idler gear (77 teeth) | 18. Stator shaft boss | 32. Hydraulic pump gear (57 teeth) |
| 6. Idler gear shaft | 19. Stator clutch housing | 33. Power train pump gear (57 teeth) |
| 7. Clutch housing | 20. Return spring | 34. Cover |
| 8. Drive case | 21. Stator clutch plate | 35. Cover |
| 9. Turbine | 22. Stator clutch disc | |
| 10. Rear housing | 23. Stator clutch piston | A. Hydraulic pump mount |
| 11. Stator | 24. Turbine boss | B. Power train pump mount |
| 12. Pump | 25. Lock-up clutch disc | C. Scavenging pump mount |
| 13. Stator shaft | 26. Lock-up clutch plate | |
| | 27. Lock-up clutch piston | |

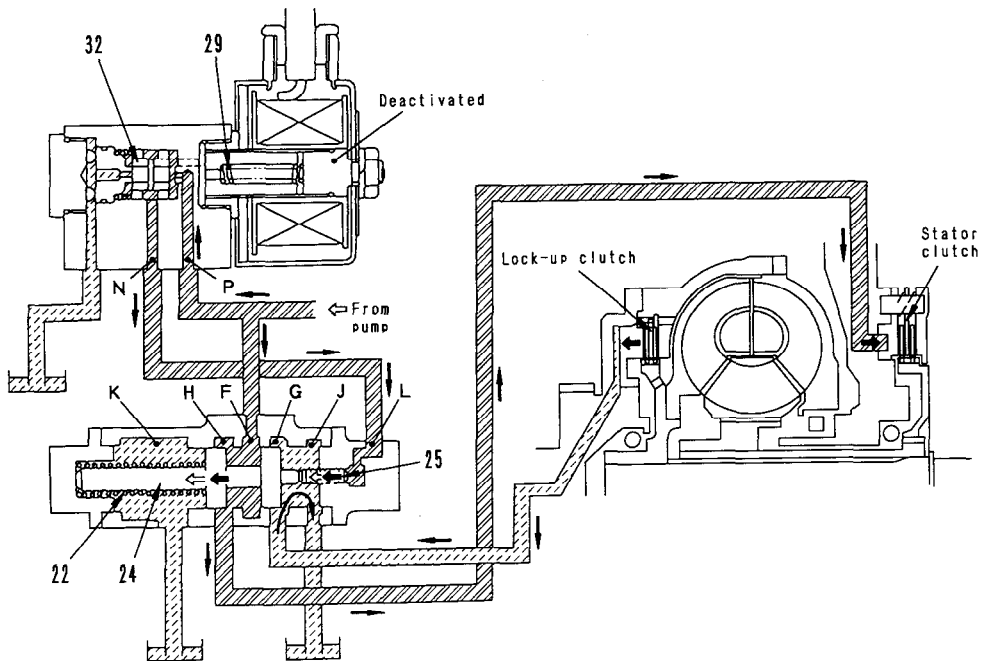
1. Travel in torque converter driv



SBD01285

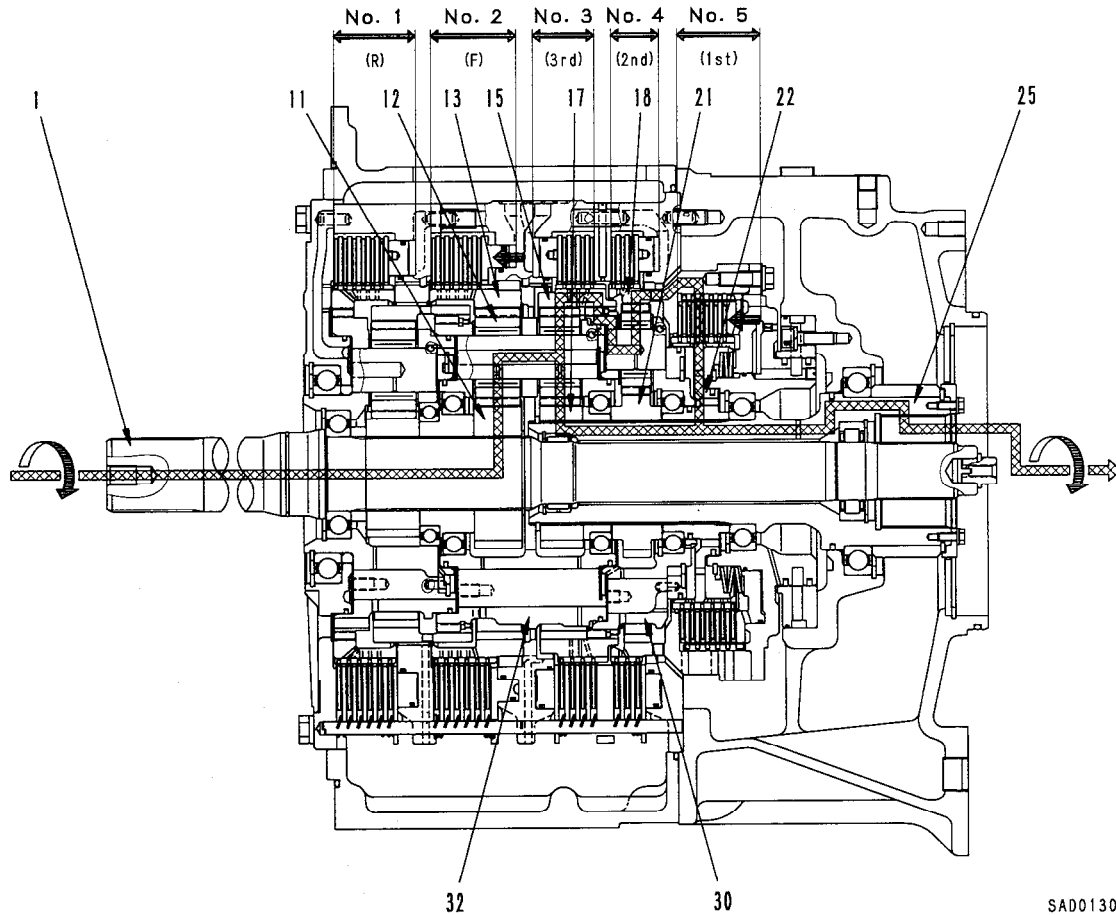
When the machine is in the torque converter range, the solenoid valve is DEACTIVATED, so valves (32) is pushed to the left in the direction of the arrow by the tension of spring (29). Ports N and P open.

The oil from the pump flows ports P and N into port L of the lock-up valve. When the pressure inside the circuit rises, piston (25) is pushed to the left in the direction of the arrow, and the piston pushes out lock-up selector valve (24) to the left.



SBD01287

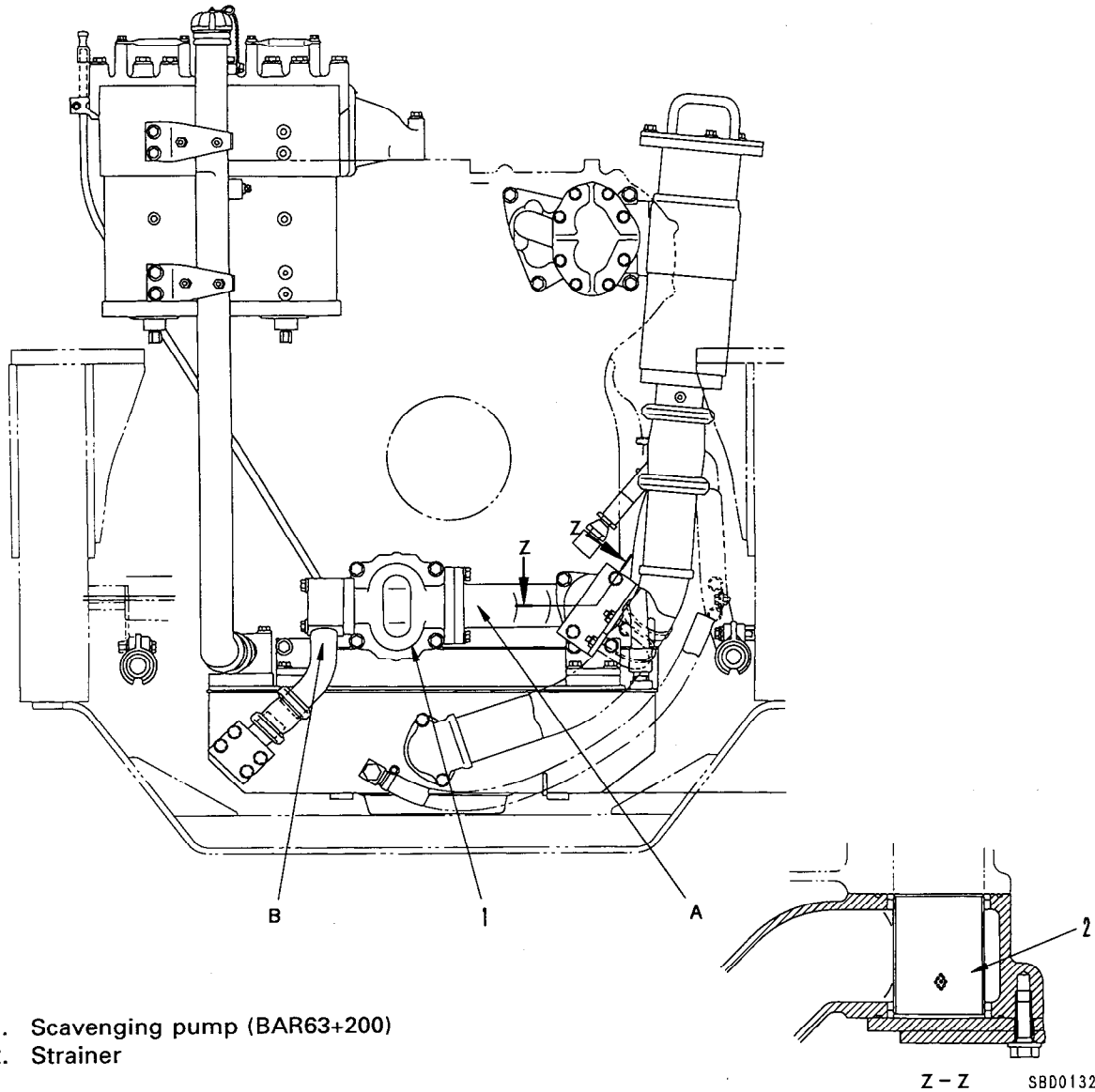
**OPERATION OF TRANSMISSION
FIRST FORWARD SPEED**



SAD01302

- For FORWARD 1st, No. 2 clutch and No. 5 clutch are engaged. The motive force transmitted from the torque converter to input shaft (1) is transmitted to output shaft (25).
- No. 2 clutch is actuated by the hydraulic pressure applied by the clutch piston and locks ring gear (13) in position. No. 5 clutch is actuated by hydraulic pressure applied by the clutch piston and engages No. 5 gear (22) and No. 4 ring gear (18).
- The motive force from the torque converter is transmitted to input shaft (1). The rotation of the input shaft is transmitted through sun gear (11) to planet pinion (12).
- Ring gear (13) is locked in position by No. 2 clutch, so planet gear (12) rotates carrier (32), which is on the inside of ring gear (13).
- No. 5 clutch is also engaged, so the No. 5 gear (22), sun gears (17) and (21), planet pinions, ring gears (15) and (18), and No. 4 carrier (30) form one unit. In addition, carrier (32) rotates as one unit with the gears of No. 3, 4 and 5 clutches to rotate output shaft (25). Output shaft (25) rotates at the same speed as carrier (32).

SCAVENGING PUMP STRAINER



- 1. Scavenging pump (BAR63+200)
- 2. Strainer

- A. Scavenging pump suction port
- B. Scavenging pump delivery port

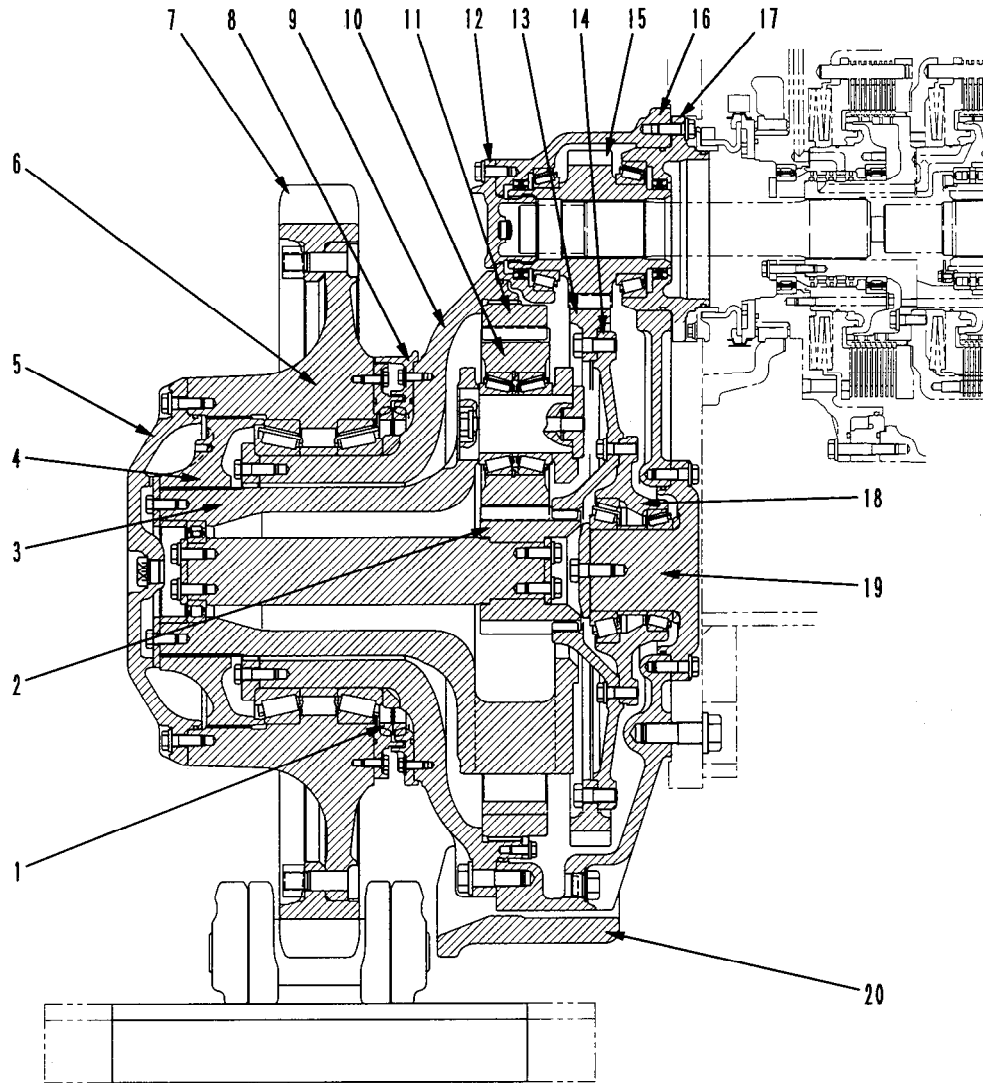
Outline

- The strainer is made of punched metal with 2-mm diameter holes.

1. Clutch cage
2. Clutch housing
3. Clutch spring
4. Clutch piston
5. Torque pin
6. Clutch disc (9 each)
7. Clutch plate (9 each)
8. Spacer
9. Clutch stopper
10. Clutch hub
11. Bearing cage
12. Bevel gear
13. Bevel gear shaft
14. Bevel shaft
15. Bearing cage
16. Pipe
17. Brake stopper
18. Brake hub
19. Brake disc (9 each)
20. Spacer
21. Brake plate (9 each)
22. Torque pin
23. Brake piston
24. Brake case
25. Brake spring
26. Brake cage
27. Sleeve
28. Output shaft

Outline

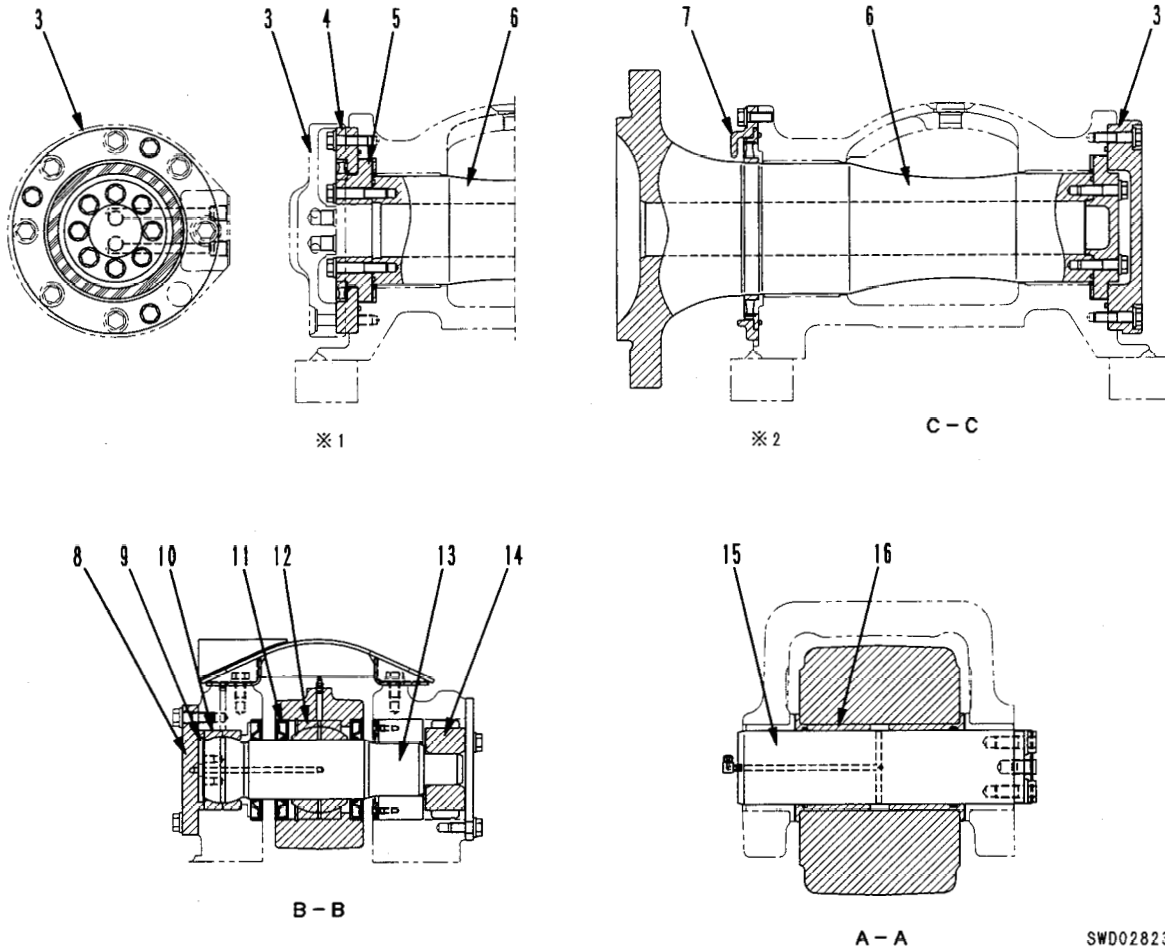
- The steering clutches are wet, multiple-disc clutches with a spring booster. They are interconnected with the brakes and are hydraulically actuated by a steering valve that is actuated when the joystick is operated. A forced lubrication system is employed in which the oil from the power train oil cooler passes through the passage inside the steering case, enters the housing and cage, and is then sent to the discs and plates.
- The steering brakes are wet, multiple-disc clutches with a spring booster. They are interconnected with the clutch and are hydraulically actuated by a steering valve that is actuated when the brake pedal and joystick are operated. A forced lubrication system is employed in which the oil from the power train oil cooler passes through the passage inside the steering case, enters the housing and cage, and is then sent to the discs and plates. The steering brakes are designed so that when the engine has stopped, the back pressure of the brake piston drops and the brakes are applied without the brake pedal being depressed. However, when the engine is started again, the brake is released as the hydraulic pressure inside the circuit rises, so the parking brake lever must always be locked.



A - A

SWD02576

- | | | |
|------------------------|---------------------------------|-----------------------------|
| 1. Floating seal | 8. Floating seal guard | 15. No. 1 pinion (20 teeth) |
| 2. Sun gear (16 teeth) | 9. Cover | 16. Final drive case |
| 3. Carrier | 10. Planetary pinion (26 teeth) | 17. Bearing cage |
| 4. Hub | 11. Ring gear (68 teeth) | 18. Boss |
| 5. Cover | 12. Cover | 19. Shaft |
| 6. Sprocket boss | 13. No. 1 gear (79 teeth) | 20. Wear guard |
| 7. Sprocket teeth | 14. No. 1 gear hub | 21. Pivot shaft |



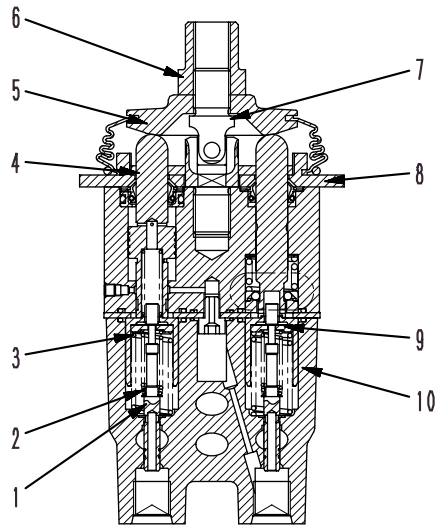
SWD02823

※1 With blade tilt
 ※2 Without blade tilt

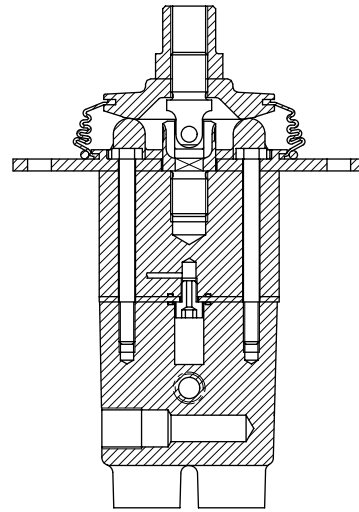
- 1. Equalizer bar
- 2. Pivot shaft assembly
- 3. Cover
- 4. Thrust plate
- 5. Thrust plate
- 6. Pivot shaft
- 7. Seal gauge
- 8. Cover

- 9. Seal rubber
- 10. Bushing
- 11. Seal
- 12. Bushing
- 13. Side pin
- 14. Stopper rubber
- 15. Center pin
- 16. Bushing

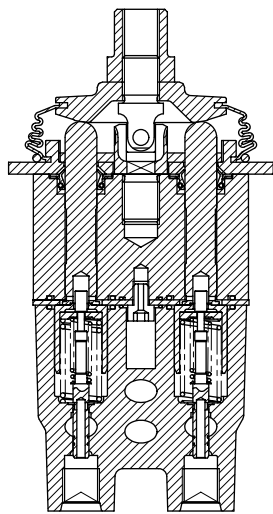
1. Hydraulic tank
 - 1A. Oil filler cap
2. Strainer
3. PPC charge pump (SAR(1)022)
4. PPC charge valve
Set pressure: 4.46 MPa {45.5 kg/cm²}
5. Accumulator
6. Oil cooler (for PPC)
7. PPC lock valve
8. Blade control PPC valve
 - 8A. For blade lift
 - 8B. For blade tilt
9. Ripper control PPC valve
 - 9A. For ripper lift
 - 9B. For ripper tilt
10. Hydraulic pump (SAR(4)140+(3)071)
11. Blade lift control valve
 - 11A. Demand valve
 - 11B. Main relief valve
Set pressure: 20.6 MPa {210 kg/cm²}
 - 11C. Shuttle valve
 - 11D. Check valve
 - 11E. Check valve
 - 11F. Blade lift valve
 - 11G. Suction valve (for blade lift)
 - 11H. Shuttle valve
12. Blade tilt, ripper Lo valve
 - 12A. Main relief valve
Set pressure: 20.6 MPa {210 kg/cm²}
 - 12B. Check valve
 - 12C. Blade tilt valve
 - 12D. Check valve
 - 12E. Ripper tilt valve
 - 12F. Check valve
 - 12G. Ripper lift valve
 - 12H. Shuttle valve
13. Ripper Hi valve
 - 13A. Check valve
 - 13B. Check valve
 - 13C. Ripper lift (Hi) valve
 - 13D. Ripper lift fixed differential pressure valve
 - 13E. Ripper lift fixed differential pressure valve
 - 13F. Shuttle valve
 - 13G. Shuttle valve
 - 13H. Suction valve (for ripper lift)
 - 13J. Ripper tilt (Hi) valve
 - 13K. Ripper tilt fixed differential pressure valve
 - 13L. Ripper tilt fixed differential pressure valve
 - 13M. Shuttle valve
 - 13N. Shuttle valve
14. Quick drop valve
15. R.H. blade lift cylinder
16. L.H. blade lift cylinder
17. Blade tilt cylinder
18. R.H. ripper tilt cylinder
19. R.H. ripper lift cylinder
20. L.H. ripper lift cylinder
21. L.H. ripper tilt cylinder
22. Hydraulic filter
Set pressure: 0.15 MPa {1.5 kg/cm²}



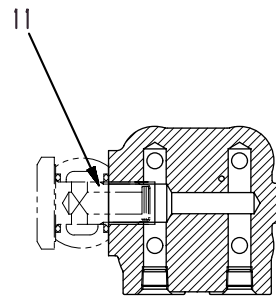
Y - Y



X - X



W - W



V - V

- 1. Spool
- 2. Metering spring
- 3. Centering spring
- 4. Pistion
- 5. Disc
- 6. Nut (for lever joint)

- 7. Joint
- 8. Plate
- 9. Retainer
- 10. Body
- 11. Filter

SJD03809

QUICK DROP VALVE

(BLADE LIFT CYLINDER)

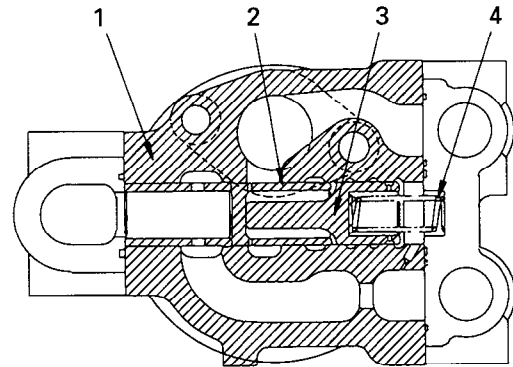
Structure

The quick drop valve consists of valve body (1), spool (2), check valve (3), and spring (4).

The quick drop valve serves to increase the blade lowering speed and to reduce the occurrence of vacuum when the blade is lowering, thereby shortening the time lag before digging is started.

The blade lowering speed, which is generally determined by the pump discharge, can be made faster with the quick drop valve.

1. Valve body
2. Spool
3. Check valve
4. Spring



SYD00333

Operation

1. Start of lowering

When the blade lever is operated to LOWER, the oil from the control valve enters the cylinder bottom through port **A** and pushes the piston. In the meantime, the oil in the cylinder head is pushed out into the piston, enters valve port **B**, and flows into the tank from port **C**.

2. While lowering

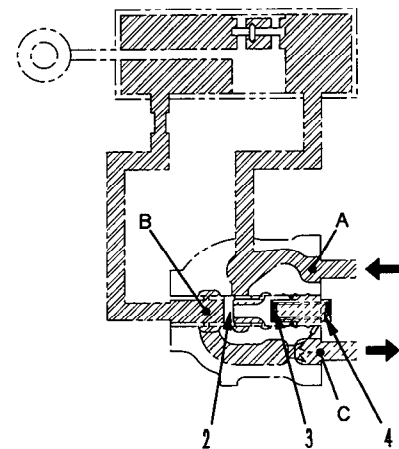
Pressurized oil from the cylinder head flows into port **C** through port **B**.

At this time, the oil flow is restricted by an orifice **a** provided along the way, causing a differential pressure between front and back of orifice.

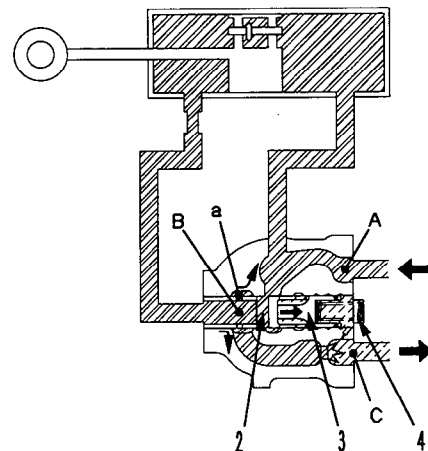
When the pressure of port **B** becomes greater than the force of spring (4), it compresses the spring and moves spool (2) and check valve (3) to the right.

When the spool and the check valve have moved, the circuit of port **B** and **A** is opened, part of the oil flowing from the cylinder head to port **C** enters the passage port **A**, and merged with the oil from the control valve, and flows to the cylinder bottom.

Thus, the blade lowering speed increases in accordance with the amount of oil that flows to the bottom of the cylinder and reduces the formation of vacuum at the bottom of the cylinder.



SV002588



SV002589

1. Valve body
2. Piston
3. Shuttle valve
4. Shuttle valve spring
5. Plug
6. Valve seat
7. Main relief valve poppet
8. Main relief valve spring
9. Sleeve
10. Main relief pressure adjustment screw

PL. From shuttle valve inside ripper valve
PB. From shuttle valve inside blade lift valve
PD. To demand valve pilot port
T. To hydraulic tank

Outline

- The main relief valve is in the circuit between the hydraulic tank and the ripper circuit and blade lift circuit through shuttle valve (3). The oil pressure in the blade lift circuit, that is, the large pump circuit, is set at 20.6 MPa {210 kg/cm²}.
- The shuttle valve is in the circuit between the demand valve through the main relief valve and the blade lift circuit and ripper circuit. It selects the two circuits to apply the pilot pressure to the demand valve. In other words, it selects either the blade lift circuit or the ripper circuit. When the work equipment is not being used (when the control lever is at neutral) the shuttle valve connects the blade lift circuit and the pilot port of the demand valve by the tension of spring (4).

- When the blade lever is operated slightly to the RAISE position the spool of the PPC valve directly connected to the control lever is actuated. When this happens, the pilot pressure entering the PPC valve from the PPC pump is sent to port **PB** of the blade lift valve. This pilot pressure moves spool (5) slightly to the left to a point where the pilot pressure and the force of the spring are in balance, and partially opens the circuit between ports **B** and **C**, ports **C** and **H**, and ports **D** and **F**.

When this happens, the oil from the two pumps passes from ports **A** and **B**, is throttled by spool (5), and enters port **C**. Some of the oil flows to the head end of cylinder (9), and the rest flows from ports **H** and **H'**, pushes shuttle valve (8) to the right and opens it, flows to port **K**, and enters ports **N**, **O**, and **P** of shuttle valve (10). It then enters port **Q** of demand valve (1) and becomes the pilot pressure.

At the same time, the oil from the pump passes through orifice **a** of demand valve (1), enters ports **L** and **M**, and becomes the pilot pressure.

The oil at the bottom end of cylinder (9) flows from port **D** to port **F**, and returns from port **G** to the hydraulic tank. When the hydraulic pressure in the circuit rises in this way the situation is different from in Item 2: spool (5) is throttling the circuit between ports **B** and **C**, so the flow of oil from port **B** to port **C** is restricted, and a pressure difference is generated between port **B** and port **C**. The hydraulic pressure in the circuit up to port **B** becomes higher.

Therefore, when the surface pressure acting on port **L** of the demand valve becomes greater than the combined force of the surface pressure acting on port **M**, the surface pressure (low pressure) acting on port **Q**, and the tension of spring (2), the demand valve is moved to the left.

When this happens, the circuits between ports **A** and **E'** and ports **R** and **F'** are opened, and the oil from both the large and small pumps is relieved to the hydraulic tank. This suppresses the rise in the hydraulic pressure at ports **A** and **B**, and the cylinder moves slowly.

As explained in the items above, the speed of movement of the cylinder is determined by the amount of opening of ports **B** and **C**,

which corresponds to the movement of the lever. If it is wide open, the flow of oil beyond port **C** increases, the hydraulic pressure rises, and the speed of movement becomes faster.

If it is opened only slightly, the flow of oil beyond port **C** is throttled, so the oil flow is reduced, the hydraulic pressure becomes low, and the speed of movement is slow. In other words, the hydraulic pressure and oil flow beyond port **C** is proportional, so this provides operation of the blade that follows the fine movements of the blade lever.

When cylinder is at stroke end

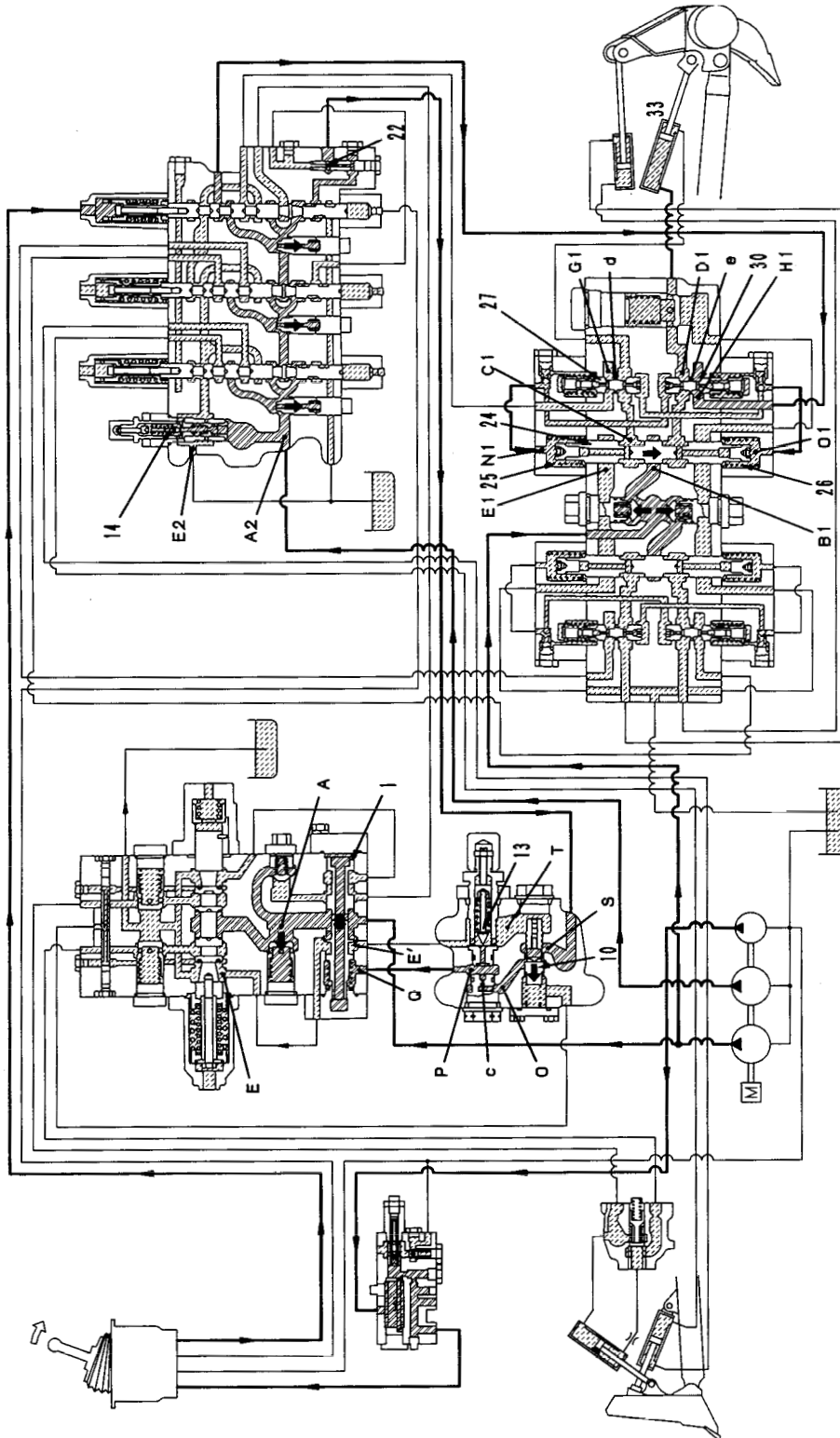
If cylinder (9) moves to the end of its stroke from the condition in Items 2 and 3, the hydraulic pressure in the whole circuit rises. Therefore, the hydraulic pressure beyond port **C** rises, and the oil entering the main relief valve through shuttle valves (8) and (10) (that is, the oil at port **P**) pushes open poppet (13) and is relieved to port **T**.

At this point, the circuit from port **O** to port **P** is throttled by orifice **c**, so the supply of oil to port **P** is delayed. As a result, the hydraulic pressure of pilot port **Q** of demand valve (1) drops, and the demand valve moves to the left.

When this happens, the circuit between ports **A** and **E'** and ports **R** and **F'** are opened, and the oil from the two pumps is relieved to prevent the hydraulic pressure from rising any further.

The hydraulic pressure at this point is 20.6 MPa {210 kg/cm²}.

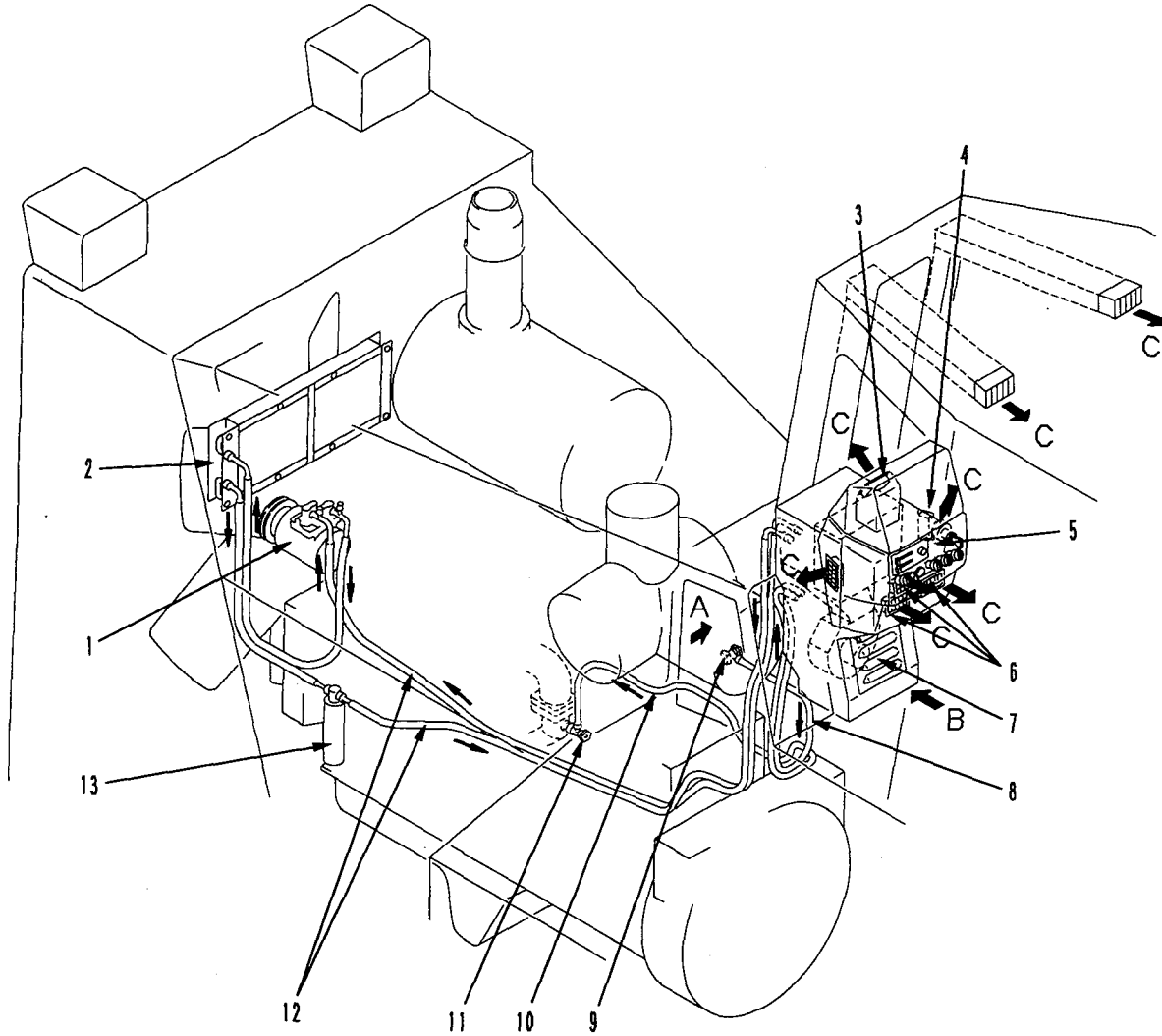
9. Ripper lever at LOWER (cylinder at stroke end)



SV002598

AIR CONDITIONER


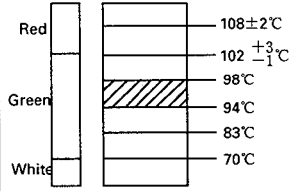

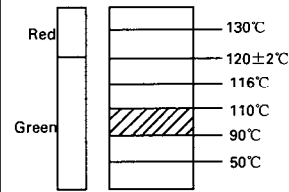

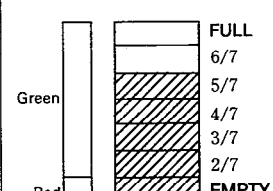
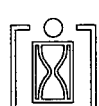

AIR CONDITIONER PIPING



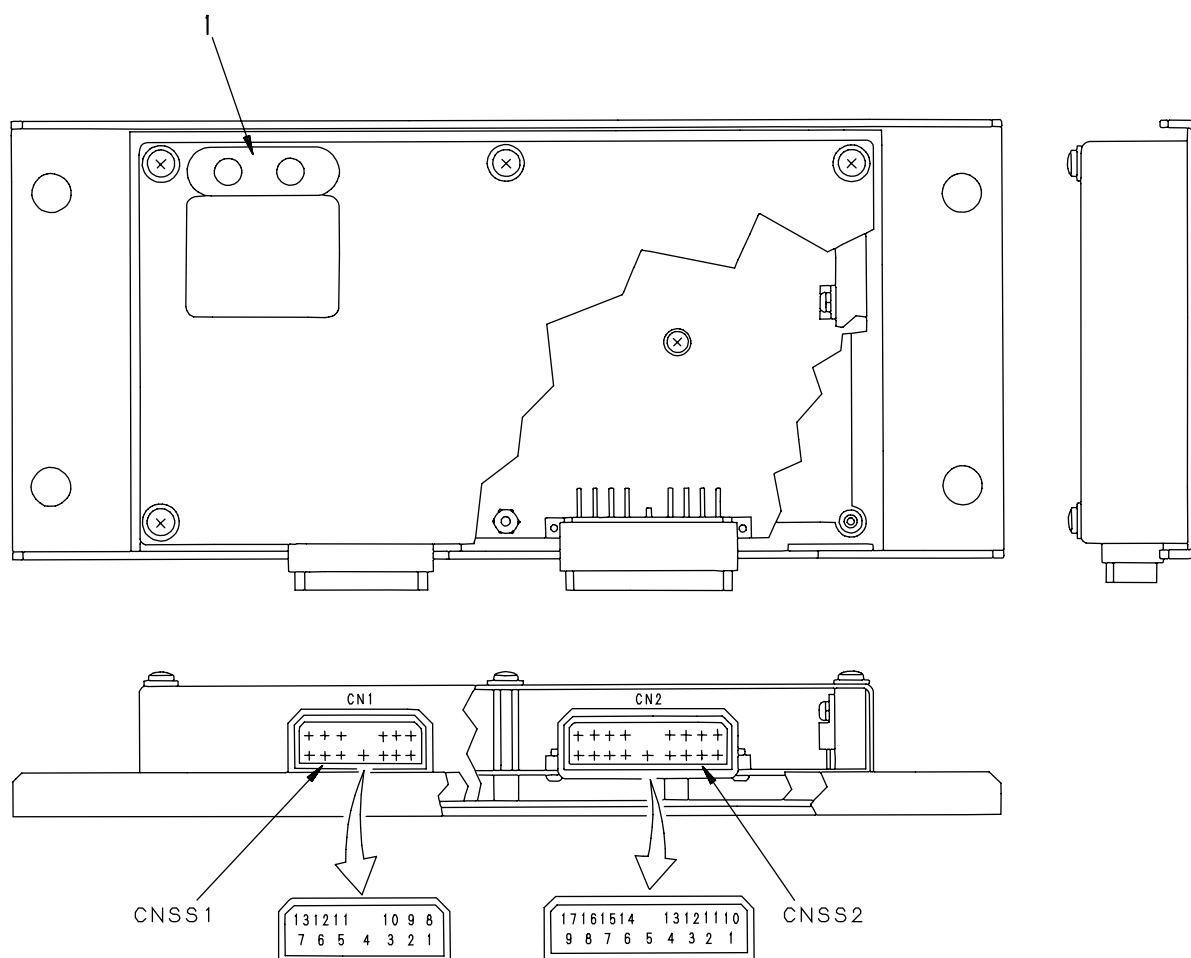
SV002602

- 1. Air conditioner compressor
- 2. Condenser
- 3. Window defroster
- 4. Side defroster
- 5. Air conditioner unit
- 6. Vent
- 7. Blower motor
- 8. Hot water pickup piping

- 9. Valve (hot water outlet)
- 10. Hot water return piping
- 11. Valve (hot water inlet)
- 12. Refrigerant piping
- 13. Receiver tank
- A. Fresh air
- B. Recirculated air
- C. Hot air/cold air

Display category	Symbol	Display item	Display range	Display method
Gauges	 <p>SAD01482</p>	Engine water temperature		One place lights up to show applicable level
	 <p>SAD01483</p>	Torque converter oil temperature		
	 <p>SAD01486</p>	Fuel level		
Service meter	 <p>SKD00631</p>	Hourmeter	From 0 to 99999	Actuated when alternator is charged. Advances by 1 hour for every hour.
	 <p>SKD00632</p>	Service meter indicator	Service meter	Lights up when service meter is running

SSC CONTROLLER



SED01409

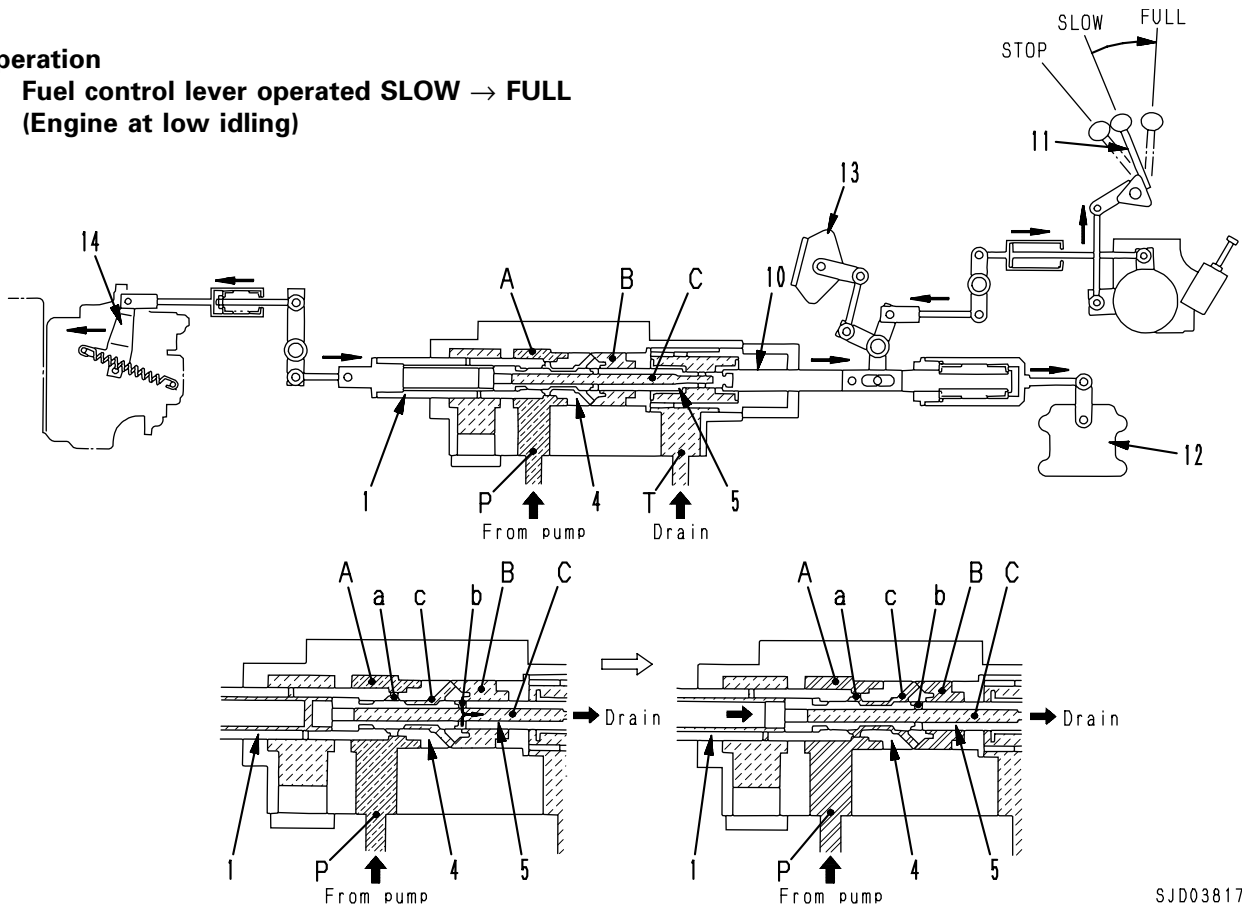
1. Self-diagnostic display LED

Function

1. The SSC controller uses the input signal from the acceleration sensor to calculate the travel speed of the machine in relation to the ground. In addition, it inputs the torque converter speed sensor signal and calculates the shoe speed. From these data, it detects the shoe slip ratio.
2. Next, it inputs the engine speed sensor signal and torque converter speed sensor signal, and calculates the drawbar pull.
3. It uses the results of the calculations in Steps 1 and 2 above together with the mode selection signal from the monitor panel and the transmission oil pressure sensor signal to calculate the optimum engine speed. It then sends a signal to the electric engine throttle controller as the SSC control command.
4. At the same time, it converts the throttle signal input from the fuel control lever potentiometer into a voltage and sends a signal to the electric engine throttle controller as the manual command.
5. When the mode selection panel lock-up mode signal is input, it sends the torque converter output shaft speed pulse (20 pulse/rev) as it is to the lock-up controller.
6. The SSC controller has a self-diagnostic function, and if there is any abnormality in the input or output system, the 2 LEDs flash to display the problem.

Operation

**1. Fuel control lever operated SLOW → FULL
(Engine at low idling)**



SJD03817

- When fuel control lever (11) is moved from SLOW to FULL, throttle potentiometer (13) in the control linkage moves to the FULL position and sends an electric signal to the governor controller. The governor controller adjusts the output to governor motor (12) according to this signal and moves the motor lever to the FULL position. When this happens, input spool (10) of the servo valve and pilot spool (5) move to the right, close the circuit between orifice **a** of piston (4) and passage **c**, and open the circuit between orifice **b** of the pilot spool and chamber **B**.

The oil from the power train pump always enters chamber **A** from port **P**. The circuit between orifice **a** and circuit **c** is closed, so the oil pressure rises.

The oil in chamber **B** passes through orifice **b** and flows to chamber **C**. It then flows from port **T** to the drain circuit, so the oil pressure in chamber **B** goes down.

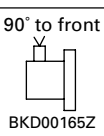
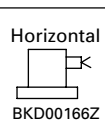
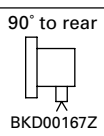
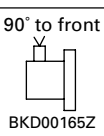
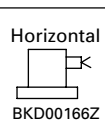
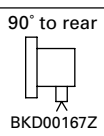
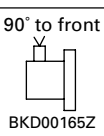
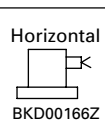
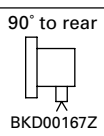
Therefore, piston (4) is pushed to the right by the oil pressure in chamber **A**, moves to the position where the circuit between orifice **a** and passage **c** opens (in other words, the point where the rod of joint (1) and the left end of spool (5) contact), and stops.

When piston (4) is pushed out to the right, joint (1), which forms one unit with the piston, is moved to the right, so the throttle lever of the fuel injection pump is moved to the FULL position.

If the fuel control lever is operated continuously, the above operation is repeated and the engine runs at full speed. In addition, the operating effort of the fuel control lever is also reduced by the action of the oil pressure in chamber **A**.

When the fuel control lever is stopped at a fixed point, piston (4) of the servo valve stops at a point where the circuit between orifice **a** of chamber **A** and passage **c** are open. At this point, the circuit in chamber **B** from orifice **b** to the circuit (in other words, the passage to the drain circuit) is closed, and at the same time, oil from passage **c** enters, so the oil pressure rises.

When this happens, the difference in pressure between chambers **A** and **B** (in other words, the pressure moving piston (4) to the left or right) disappears, so the piston is held in the same position. Therefore, the engine speed can be held constant to match the amount that the fuel control lever is moved.

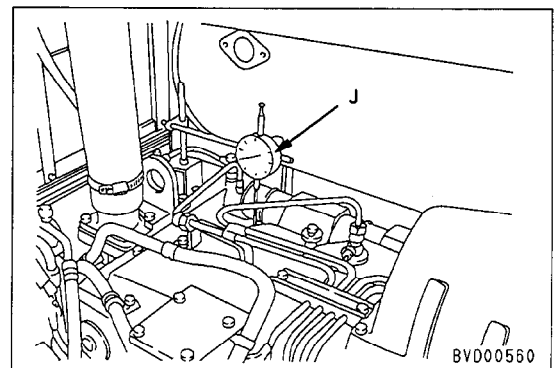
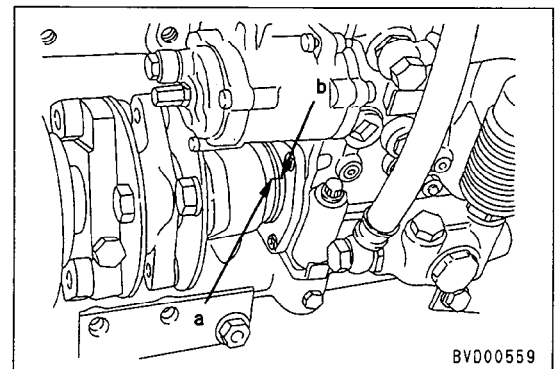
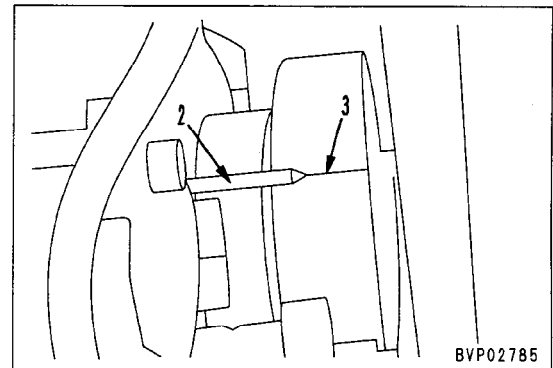
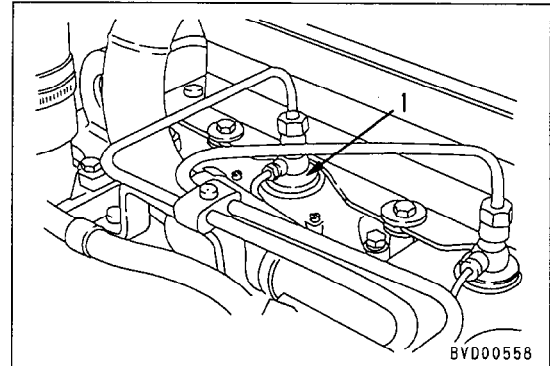
Classification	Component	Connector No.	Inspection method	Judgement table	Measurement condition												
Shoe slip controller system	Throttle potentiometer	CN-SS1 CN-SM1	Measure voltage	If the condition is as shown in the table below, it is normal	1) Turn starting switch ON. 2) Insert T-adapter.												
				<table border="1"> <tr> <td colspan="2">Between ⑥ - ⑯</td> <td>4.75 - 5.25 V</td> </tr> <tr> <td rowspan="2">Between SS1 ④ - Between SM1 ⑯ -</td> <td>High idling</td> <td>2.45 - 2.95 V</td> </tr> <tr> <td>Low idling</td> <td>1.00 - 1.50 V</td> </tr> </table>		Between ⑥ - ⑯		4.75 - 5.25 V	Between SS1 ④ - Between SM1 ⑯ -	High idling	2.45 - 2.95 V	Low idling	1.00 - 1.50 V				
	Between ⑥ - ⑯		4.75 - 5.25 V														
	Between SS1 ④ - Between SM1 ⑯ -	High idling	2.45 - 2.95 V														
		Low idling	1.00 - 1.50 V														
	Acceleration sensor	CN-SS1	Measure voltage	If the condition is as shown in the table below, it is normal	1) Turn starting switch ON. 2) Insert T-adapter.												
				<table border="1"> <tr> <td>Terminal</td> <td>  90° to front BKD00165Z </td> <td>  Horizontal BKD00166Z </td> <td>  90° to rear BKD00167Z </td> </tr> <tr> <td>Between ⑫ - ⑪</td> <td>0.75-1.75V</td> <td>2.0-3.0V</td> <td>3.25-4.25V</td> </tr> <tr> <td>Between ⑩ - ⑪</td> <td colspan="3">7.0-9.0V (power source)</td> </tr> </table>		Terminal	 90° to front BKD00165Z	 Horizontal BKD00166Z	 90° to rear BKD00167Z	Between ⑫ - ⑪	0.75-1.75V	2.0-3.0V	3.25-4.25V	Between ⑩ - ⑪	7.0-9.0V (power source)		
				Terminal		 90° to front BKD00165Z	 Horizontal BKD00166Z	 90° to rear BKD00167Z									
	Between ⑫ - ⑪	0.75-1.75V	2.0-3.0V	3.25-4.25V													
	Between ⑩ - ⑪	7.0-9.0V (power source)															
Engine speed sensor	CN-SS1	Measure resistance	If the condition is as shown in the table below, it is normal	1) Turn starting switch OFF. 2) Disconnect connector. 3) Measure at sensor end.													
		<table border="1"> <tr> <td>Between ⑨ - ② (female)</td> <td>500 - 1000 Ω</td> </tr> <tr> <td>Between ⑨ - chassis (female)</td> <td>Min. 1 MΩ</td> </tr> </table>	Between ⑨ - ② (female)		500 - 1000 Ω	Between ⑨ - chassis (female)	Min. 1 MΩ										
		Between ⑨ - ② (female)	500 - 1000 Ω														
		Between ⑨ - chassis (female)	Min. 1 MΩ														
Measure voltage	Measure with AC range	1) Start engine. 2) Insert T-adapter.															
<table border="1"> <tr> <td>Between ⑨ - ②</td> <td>0.5 - 3.0V</td> </tr> </table>	Between ⑨ - ②		0.5 - 3.0V														
Between ⑨ - ②	0.5 - 3.0V																
Adjust	1) Screw in until speed sensor contacts ring gear, then turn back 3/4 turns. 2) Sensor should work normally when adjusted as above.																
Torque converter speed sensor (Torque converter output shaft speed)	CN-SS1	Measure resistance	If the condition is as shown in the table below, it is normal	1) Turn starting switch OFF. 2) Disconnect connector. 3) Measure at sensor end.													
		<table border="1"> <tr> <td>Between ⑧ - ①</td> <td>480 - 1000Ω</td> </tr> </table>	Between ⑧ - ①		480 - 1000Ω												
Between ⑧ - ①	480 - 1000Ω																
Measure voltage	Measure with AC range	1) Start engine. 2) Insert T-adapter.															
<table border="1"> <tr> <td>Between ⑧ - ①</td> <td>0.5 - 6.0V</td> </tr> </table>	Between ⑧ - ①		0.5 - 6.0V														
Between ⑧ - ①	0.5 - 6.0V																
Transmission 1st oil pressure switch signal	CN-SS2	Measure voltage	If the condition is as shown in the table below, it is normal	1) Joystick (directional): Neutral 2) Joystick (speed): 1st 3) Insert T-adapter.													
			<table border="1"> <tr> <td rowspan="2">Between ⑯ - ⑭</td> <td>When starting engine</td> <td>20 - 30 V</td> </tr> <tr> <td>When starting switch is ON</td> <td>Max. 1 V</td> </tr> </table>		Between ⑯ - ⑭	When starting engine	20 - 30 V	When starting switch is ON	Max. 1 V								
Between ⑯ - ⑭	When starting engine	20 - 30 V															
	When starting switch is ON	Max. 1 V															
Transmission F (FORWARD) oil pressure switch signal	CN-SS2	Measure voltage	If the condition is as shown in the table below, it is normal	1) Turn starting switch ON. 2) Insert T-adapter.													
			<table border="1"> <tr> <td rowspan="2">Between ⑤ - ⑭</td> <td>Joystick (directional): F</td> <td>20 - 30 V</td> </tr> <tr> <td>Joystick (directional): N, R</td> <td>Max. 1 V</td> </tr> </table>		Between ⑤ - ⑭	Joystick (directional): F	20 - 30 V	Joystick (directional): N, R	Max. 1 V								
Between ⑤ - ⑭	Joystick (directional): F	20 - 30 V															
	Joystick (directional): N, R	Max. 1 V															

TESTING AND ADJUSTING

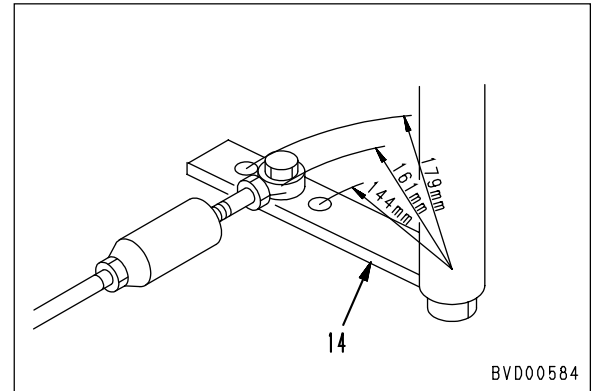
Table of tools for testing, adjusting, and troubleshooting	20-102	Simple procedure for testing brake performance	20-125
Measuring engine speed	20-103	Adjusting full monolever and parking lever	20-126
Measuring air supply pressure (Boost pressure)	20-104	Adjusting brake pedal linkage	20-131
Measuring exhaust temperature	20-105	Adjusting clearance of idler	20-133
Measuring exhaust color	20-106	Checking wear of sprocket	20-134
Adjusting valve clearance	20-107	Testing and adjusting track shoe tension	20-135
Measuring compression pressure	20-108	Measuring and adjusting work equipment hydraulic pressure	20-136
Measuring blow-by pressure	20-109	Testing and adjusting work equipment control circuit pressure	20-138
Measuring engine oil pressure	20-110	Measuring PPC valve output pressure	20-140
Testing and adjusting fuel injection timing	20-111	Adjusting PPC valve	20-142
Testing and adjusting alternator belt tension .	20-113	Measuring output pressure of ripper pin-puller solenoid valve	20-143
Testing and adjusting belt tension for air conditioner compressor	20-113	Checking location of cause of hydraulic drift of blade and ripper	20-144
Testing and replacing fan belt and adjusting auto tensioner	20-114	Measuring leakage inside hydraulic cylinder ..	20-145
Adjusting fuel control lever and decelerator pedal	20-115	Releasing remaining pressure in hydraulic circuit	20-146
Measuring torque converter stall speed	20-120	Bleeding air from hydraulic cylinders	20-146
Measuring torque converter stall + hydraulic pump relief (full stall) speed	20-121	Adjusting work equipment safety lever	20-147
Measuring power train oil pressure	20-122	Adjusting semi u-tiltdozer	20-148

TESTING AND ADJUSTING FUEL INJECTION TIMING

1. Remove No. 1 cylinder nozzle holder assembly (1).
 - ★ For details, see DISASSEMBLY AND ASSEMBLY, REMOVAL OF NOZZLE HOLDER ASSEMBLY.
2. Remove the coupling cover of the fuel injection pump.
3. Crank the engine to rotate the crankshaft in the normal direction and align 1.6TOP line (3) on the crankshaft pulley with pointer (2) to set the No. 1 cylinder to compression top dead center.
 - ★ Carry out cranking with the barring device on the flywheel housing.
 - ★ At compression top dead center, line a on the coupling is near line b on the fuel injection pump. If the lines are not near each other, the cylinder is not at compression top dead center, so rotate one more turn and align the lines again.
4. Set so that the tip of gauge assembly J contacts the head of the piston.
5. At near the top dead center, rotate the crankshaft in the normal direction and in the reverse direction to set the top dead center accurately with the scale of the dial gauge.
 - ★ Always rotate the crankshaft in the normal direction to align the position.
 - ★ Set the scale on the dial gauge to 0 when the piston is at top dead center.
6. Rotate the crankshaft in the normal direction until the scale on the dial gauge shows stroke c to align the fuel injection timing.
 - ★ Stroke c: 7.86 ± 0.20 mm (BTDC $22 \pm 0.5^\circ$)
7. When doing this, check that line a on the coupling is aligned with line b on the fuel injection pump.
 - ★ If the lines are not aligned, loosen 2 sets of mounting bolts and nuts (5) and lock bolt (4) in the oblong holes in the coupling, rotate the shaft of the fuel injection pump to align the lines, then tighten the nuts and bolts.



- 9) Set fuel control lever (2) to the high idling position and check that the engine speed becomes within the range of the speed given below after 10 seconds.
 - Engine speed: 660 - 900 rpm
 - ★ If the engine speed is not normal, adjust as follows.
 - If below 600 rpm: Move the pin hole of intermediate lever (14) to the 144 mm position.
 - If above 900 rpm: Move the pin hole of intermediate lever (14) to the 179 mm position.
 - If the engine speed does not become normal even when the pin hole is changed, carry out the adjustment again from Item 1. Connecting linkage.
- 10) Stop the engine and connect engine speed sensor connector CN-SM5.

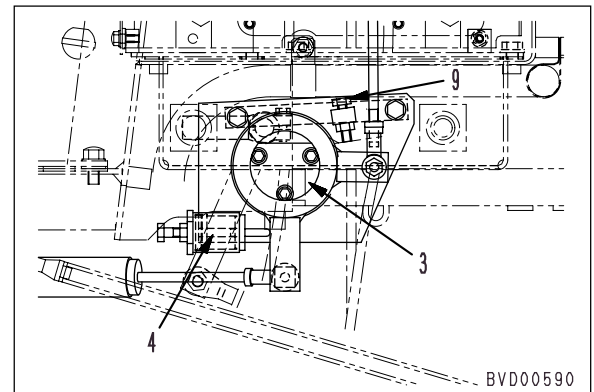


6. Connecting potentiometer

- 1) Set fuel control lever (2) to the high idling position.
- 2) Adjust dimension **k** between the pins of rod (24) and connect to intermediate lever (11) and potentiometer (25).
 - Dimension **k** between rod pins: 123 mm

7. Adjusting fuel control lever stopper

- 1) Set fuel control lever (2) to the high idling position.
- 2) Put stopper bolt (9) in contact with the lever at the top of clutch (3), then turn back 1.5 turns and lock in position.
- 3) Turn the starting switch OFF and disconnect intermediate connector CN-S08.
 - ★ Connector CN-S08 is installed to the front of the left ROPS frame (inside the inspection cover).
- 4) Start the engine, run at low idling, return fuel control lever (2) slowly to the STOP position, and stop the engine.
- 5) Put the stopper bolt of spring (4) in contact with the notch inside, then turn back one turn and lock in position.
- 6) Connect intermediate connector CN-S08.



5. Adjustment 3 of full monolever steering (full monolever portion)

- 1) Using pin ③, fix steering boss (19) and intermediate lever (20) in position, and set the steering of full monolever (4) to the neutral position.

★ For pin ③, use the part (Part No.:04205-10825) or a $\varnothing 8$ pin.

- 2) Adjust dimension **k** between the pins of rod (21), then connect to intermediate lever (20) and steering lever (22).

• Dimension **k** between pins: **490 mm**

- 3) Adjust dimension **m** between the pins of rod (23), then connect to steering lever (22) and intermediate lever (24).

• Dimension **m** between pins: **314 mm**

★ Connect so that there is no slack in the input spool of servo valve (17).

- 4) Remove pin ③.

6. Overall adjustment of full monolever

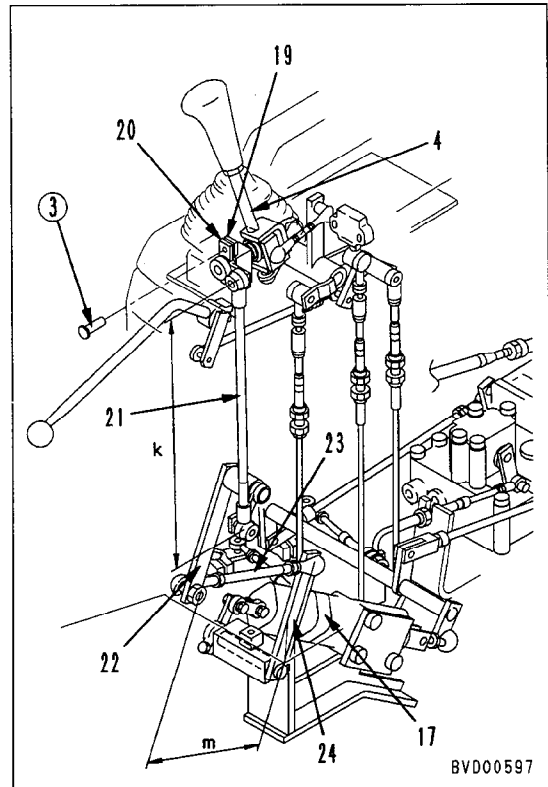
- 1) Turn full monolever (4) in the speed range direction and check that each speed range is correctly displayed on the speed range display cover.


★ If they are not displayed correctly, loosen the mounting bolt of the speed range display cover, then move the cover to the front or rear to adjust so that each speed range display is in the center of the cover.

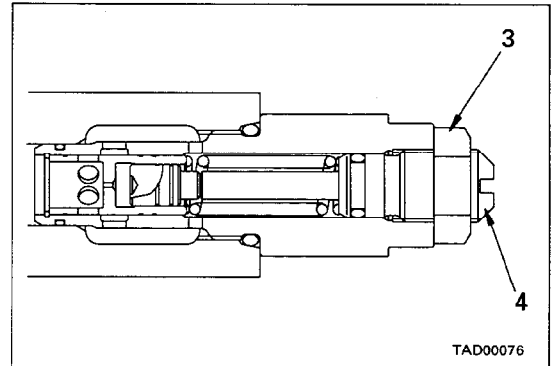
- 2) Check that the travel is correct when full monolever (4) is moved in the left and right steering direction.

• Lever movement for steering:

74 ± 25 mm

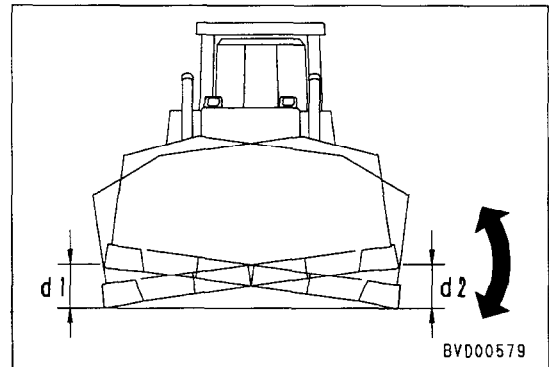


1. Loosen locknut (3).
 2. Turn adjustment screw (4) to adjust.
 - ★ Turn the adjustment screw as follows.
 - To INCREASE pressure, turn CLOCKWISE
 - To DECREASE pressure, turn COUNTER-CLOCKWISE
 - ★ Amount of adjustment for one turn of adjustment screw: **0.76 MPa (7.8 kg/cm²)**
-  Locknut: **63.7 ± 9.8 Nm (6.5 ± 1.0 kgm)**
- ★ After completion of the adjustment, repeat the above procedure to check the oil pressure again.



2. Adjusting blade tilt

- 1) Adjust installation dimension **c** of brace (3) with the handle.
 - Installation dimension **c** of brace (3):
1554 mm
- 2) Measure left and right tilt **d1** and **d2**.
 - Right tilt **d1**: **Approx. 700 mm**
 - Left tilt **d2**: **Approx. 700 mm**
- 3) If the tilt is not the same on the left and right sides, adjust installation dimension **c** of brace (3) as follows to give the same tilt on both sides.
 - **d1 > d2**: Carry out fine adjustment to make installation dimension **c** longer
 - **d1 < d2**: Carry out fine adjustment to make installation dimension **c** shorter



3. POINTS TO REMEMBER WHEN HANDLING HYDRAULIC EQUIPMENT

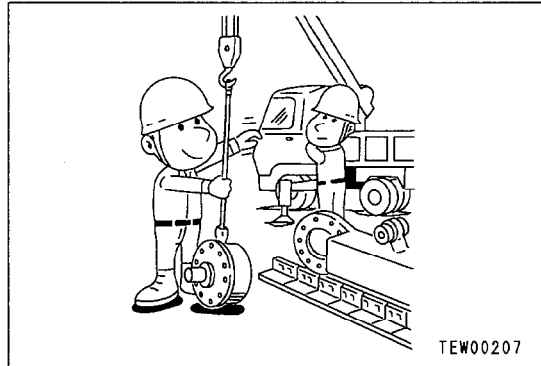
With the increase in pressure and precision of hydraulic equipment, the most common cause of failure is dirt (foreign material) in the hydraulic circuit. When adding hydraulic oil, or when disassembling or assembling hydraulic equipment, it is necessary to be particularly careful.

1) Be careful of the operating environment.

Avoid adding hydraulic oil, replacing filters, or repairing the machine in rain or high winds, or places where there is a lot of dust.

2) Disassembly and maintenance work in the field

If disassembly or maintenance work is carried out on hydraulic equipment in the field, there is danger of dust entering the equipment. It is also difficult to confirm the performance after repairs, so it is desirable to use unit exchange. Disassembly and maintenance of hydraulic equipment should be carried out in a specially prepared dustproof workshop, and the performance should be confirmed with special test equipment.

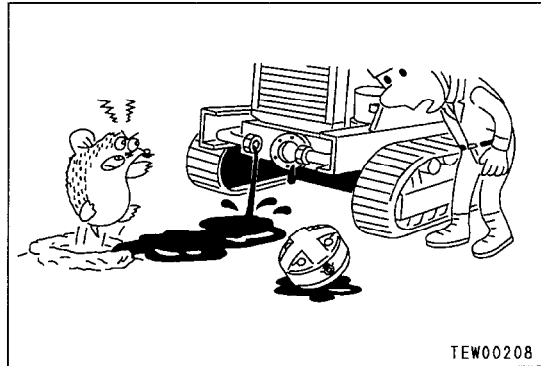


TEW00207

3) Sealing openings

After any piping or equipment is removed, the openings should be sealed with caps, tapes, or vinyl bags to prevent any dirt or dust from entering. If the opening is left open or is blocked with a rag, there is danger of dirt entering or of the surrounding area being made dirty by leaking oil so never do this.

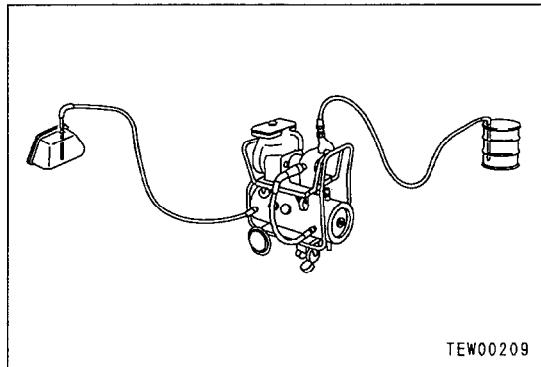
Do not simply drain oil out on to the ground, collect it and ask the customer to dispose of it, or take it back with you for disposal.



TEW00208

4) Do not let any dirt or dust get in during refilling operations.

Be careful not to let any dirt or dust get in when refilling with hydraulic oil. Always keep the oil filler and the area around it clean, and also use clean pumps and oil containers. If an oil cleaning device is used, it is possible to filter out the dirt that has collected during storage, so this is an even more effective method.



TEW00209

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

<Example>

① **M-5 Abnormality in buzzer**

② ★ 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.

★ Of the Caution items, the buzzer does not sound if there is an abnormality in the battery charge.

③ a) **Caution item flashes but buzzer does not sound**

		Cause	Remedy
Does buzzer sound when CNP2 (female) (7) is connected to chassis ground? • Connect CNP2 (female) (7) to chassis ground. • Turn starting switch ON.	1 YES	Defective monitor panel	Replace
	NO	Defective contact or disconnection in wiring harness between fuse 3 – CN215 (2) – CN217 (female) (1), or between CN217 (female) (2) – CNP2 (female) (7)	Repair or replace

S-2 Engine does not start

1) Engine does not turn

General causes why engine does not turn

- Internal parts of engine seized
 - ★ If internal parts of the engine are seized, carry out troubleshooting for "Engine stops during operations".
- Failure in power train
- Defective electrical system

Legend

- : Possible causes (judging from Questions and check items)
- ⊙ : Most probable causes (judging from Questions and Check items)
- △ : Possible causes due to length of use (used for a long period)
- : Items to confirm the cause.

Causes							
Defective wiring of starting circuit							
Defective or deteriorated battery							
Defective starting motor							
Broken ring gear							
Defective safety relay							
Defective battery relay							
Defective battery terminal connection							
Defective starting switch							

Questions	Confirm recent repair history										
	Degree of use of machine	Operated for long period		△		△					
Condition of horn when starting switch is turned ON	Horn sounds		⊙						○	○	
	Horn does not sound or volume is low		○								
When starting switch is turned to START, pinion moves out, but	Makes grating noise			○	○						
	Soon disengages again			○	○						
	Makes rattling noise and does not turn		○	○	○		○			○	
Check items	When starting switch is turned to START, pinion does not move out			○	○		○				
	When starting switch is turned to ON, there is no clicking sound			○					○		
	Battery terminal is loose									○	
	When battery is checked, battery electrolyte is found to be low			○							
Troubleshooting	Specific gravity of electrolyte, voltage of battery is low			●							
	For the following conditions 1) - 4), turn the starting switch OFF, connect the cord, and carry out troubleshooting at ON										●
	1) When terminal B and terminal C of starting switch are connected, engine starts										
	2) Even when terminal B and terminal C of starting motor (magnet switch) are connected, engine does not start				●						
	3) When terminal B and terminal C of starting motor (magnet switch) are connected, engine starts						●				
	4) There is no 24V between battery relay terminal M and terminal E								●		
When ring gear is inspected directly, tooth surface is found to be chipped					●						
Remedy											
				Replace		Replace		Replace		Replace	
				Replace		Replace		Replace		Replace	
				Replace		Replace		Replace		Replace	
				Replace		Replace		Replace		Replace	
				Replace		Replace		Replace		Replace	
				Replace		Replace		Replace		Replace	
				Replace		Replace		Replace		Replace	

S-10 Fuel consumption is excessive

General causes why fuel consumption is excessive

- Leakage of fuel
- Improper condition of fuel injection
- Excessive injection of fuel

- Legend
- : Possible causes (judging from Questions and check items)
 - ⊙: Most probable causes (judging from Questions and Check items)
 - △: Possible causes due to length of use (used for a long period)
 - : Items to confirm the cause.

Causes							
Defective injection pump (excessive injection)							
Defective nozzle holder spray							
Defective injection pump plunger							
External fuel injection timing							
Leakage of fuel from fuel piping, fuel filter							
Defective oil seal inside head cover							
Defective adjustment of fuel feed pump (piston)							
Defective adjustment of fuel control linkage							

Questions	Confirm recent repair history									
	Degree of use of machine	Operated for long period		△	△					
Condition of fuel consumption	More than for other machines of same model		⊙		○					
	Gradually increased			○	○					
	Suddenly increased						○	○		
Exhaust smoke color	Black		⊙	○	○					○
	White							○		
Check items	Seal on injection pump has come off		⊙							
	There is irregular combustion			⊙						
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low			⊙	○					
	Match mark on injection pump is misaligned					⊙				
	There is external leakage of fuel from engine						⊙			
	Engine oil level rises and smells of diesel fuel		○					⊙	⊙	
	Engine low idling speed is high		○							⊙

Troubleshooting	Injection pump measurement shows that injection amount is excessive		●							
	Speed does not change when operation of certain cylinders is stopped		●							
	When control rack is pushed, it is found to be heavy, or does not return			●						
	When check is made using dial gauge, injection timing is found to be incorrect				●					
	Remove head cover and inspect directly							●		
	Remove feed pump and inspect directly								●	
	When engine speed is measured, low idling speed is found to be high									●

Remedy	Adjust	Replace	Replace	Adjust	Correct	Correct	Correct	Adjust

ES-4 Reverse slow is not actuated when reverse slow switch is turned ON (switch LED is normal)

- ★ Check that there is no failure displayed on the shoe slip control. (If there is any failure displayed, carry out troubleshooting for G MODE first.)
- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on the next step.

	Cause	Remedy
<p>1 Is voltage between CNS01 (6) and (2) normal?</p> <ul style="list-style-type: none"> • Turn starting switch ON. • Turn reverse slow mode switch ON. • Max. 1 V <p>YES</p> <p>2 Is voltage between CNSS2 (17) and (14) normal?</p> <ul style="list-style-type: none"> • Turn starting switch ON. • Turn reverse slow mode switch ON. • Max. 1 V <p>YES</p> <p>3 Is joystick directional signal as shown in Table?</p> <ul style="list-style-type: none"> • Turn starting switch ON. 	<p>Defective shoe slip controller</p> <p>Go to ES-10</p> <p>Defective contact or disconnection in wiring harness between CNSS2 (female) (17) and CNS01 (female) (6)</p> <p>Go to M12</p>	<p>Replace</p> <p>—</p> <p>Repair or replace</p>

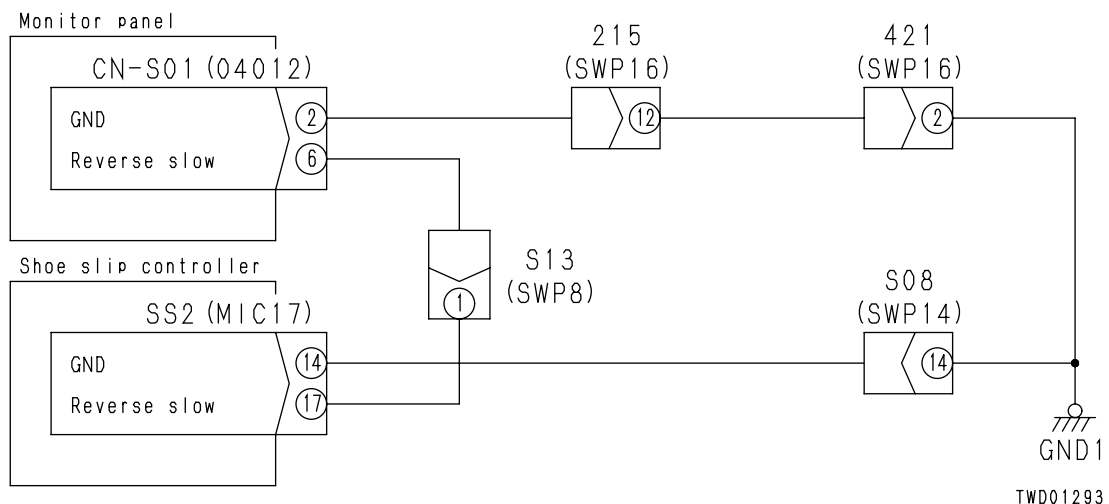
Table Check of shoe slip controller LED display

Operating condition (independent operation)		Controller LED display		Measurement conditions
		Green LED	Red LED	
Joystick	Operated to FORWARD	●	○	Starting switch ON
	Operated to REVERSE	○	● ^F	

- Lighted up
- OFF
- ^F Rapid flashing (5 times/sec)
- ^S Slow flashing (1 time/2 sec)

1. Turn starting switch ON or start engine.
2. Set Economy mode switch to 2.
3. Turn shoe slip control switch ON.
4. Set Rockbed selection mode switch to 1.
5. Operate joystick or ripper lever and check LED display.

ES-4. Related electrical circuit diagram



TWD01293

ES-9 Starting modulation does not work when shoe slip control is ON

ES-10 There is no up/down of drawbar pull by using ripper lever when shoe slip control is ON

- ★ Check that there is no failure displayed on the shoe slip control. (If there is any failure displayed, carry out troubleshooting for G MODE first.)
- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on the next step.

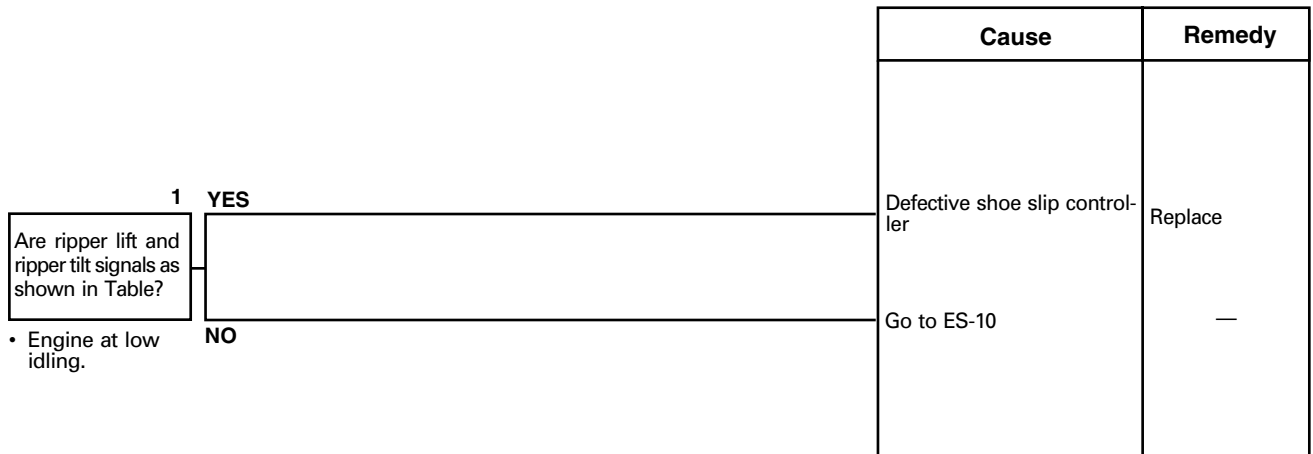


Table Check of shoe slip controller LED display



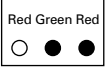


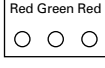
Operating condition (independent operation)		Controller LED display		Measurement conditions
		Green LED	Red LED	
Ripper lever	Operated to UP	● ^S	○	Engine at low idling
	Operated to DOWN	● ^F	○	
	Operated to TILT IN	○	● ^S	

- Lighted up
- ^F Rapid flashing (5 times/sec)
- OFF
- ^S Slow flashing (1 time/2 sec)

1. Turn starting switch ON or start engine.
 2. Set Economy mode switch to 2.
 3. Turn shoe slip control switch ON.
 4. Set Rockbed selection mode switch to 1.
 5. Operate joystick or ripper lever and check LED display.
- ★ Always carry out independent operation of one system only.
 - ★ It is enough to operate the ripper lever slightly so that the PPC oil pressure switch comes ON.

ACTION TAKEN BY CONTROLLER WHEN ABNORMALITY OCCURS AND PROBLEMS ON MACHINE

TROUBLESHOOTING

Content of display		Abnormality	Nature of abnormality
Shoe slip controller	Electric engine throttle controller		
—		Disconnection in governor motor system	<ol style="list-style-type: none"> 1. Disconnection in wiring harness between electric engine throttle controller CNSM1 (14) and governor motor CNSM3 (1) 2. Disconnection in wiring harness between electric engine throttle controller CNSM1 (3) and governor motor CNSM3 (2) 3. Disconnection in wiring harness between electric engine throttle controller CNSM1 (4) and governor motor CNSM3 (3) 4. Disconnection in wiring harness between electric engine throttle controller CNSM1 (15) and governor motor CNSM3 (4) 5. Defective governor 6. Defective electric engine throttle controller
—		Abnormality in feedback potentiometer system	<ol style="list-style-type: none"> 1. Short circuit in wiring harness between electric engine throttle controller CNSM1 (7) (shoe slip controller CNSS1 (3)) – CNSM1 (18), between CNSM1 (7) (CNSS1 (3)) – CNSM1 (8), and between CNSM1 (8) and (7) 2. Short circuit in wiring harness between feedback potentiometer CNSW2 (1) – (2), (1) – (3), (2) – (3) 3. Short circuit in wiring harness between CNSX4 (1) – (2), (1) – (3), (2) – (3) 4. Short circuit in wiring harness between CNSS1 (5) – CNSM1 (7), CNSS1 (5) – CNSM1 (18) 5. Disconnection in wiring harness between CNSM1 (6) – CNSSM2 (3) 6. Disconnection in wiring harness between CNSM1 (5) – CNSSM2 (2) 7. Disconnection in wiring harness between CNSM1 (16) – CNSSM2 (1) 8. Defective governor motor feedback potentiometer 9. Defective electric engine throttle controller 10. Defective shoe slip controller
—		Abnormality in shoe slip control command	<ol style="list-style-type: none"> 1. Defective contact, disconnection, or short circuit in wiring harness between shoe slip controller CNSS1 (13) - electric engine throttle controller CNSM1 (9) 2. Defective electric engine throttle controller 3. Defective shoe slip controller
	—	Abnormality in shoe slip controller	<ol style="list-style-type: none"> 1. Defective contact, disconnection, or short circuit in wiring harness between shoe slip controller CNSS1 (13) – electric engine throttle controller CNSM1 (9) 2. Defective contact or disconnection in wiring harness between fuse 4 – shoe slip controller CNSS2 (13) – electric engine throttle controller CNSM1 (1), (2) 3. Defective electric engine throttle controller 4. Defective shoe slip controller
		Abnormality in power source	<ol style="list-style-type: none"> 1. Defective contact or disconnection in wiring harness between shoe slip controller CNSS2 (14) – electric engine throttle controller CNSM1 (12) 2. Defective contact or disconnection in wiring harness between fuse 4 – shoe slip controller CNSS2 (13) – electric engine throttle controller CNSM1 (1), (2) 3. Defective electric engine throttle controller 4. Defective shoe slip controller

G-6

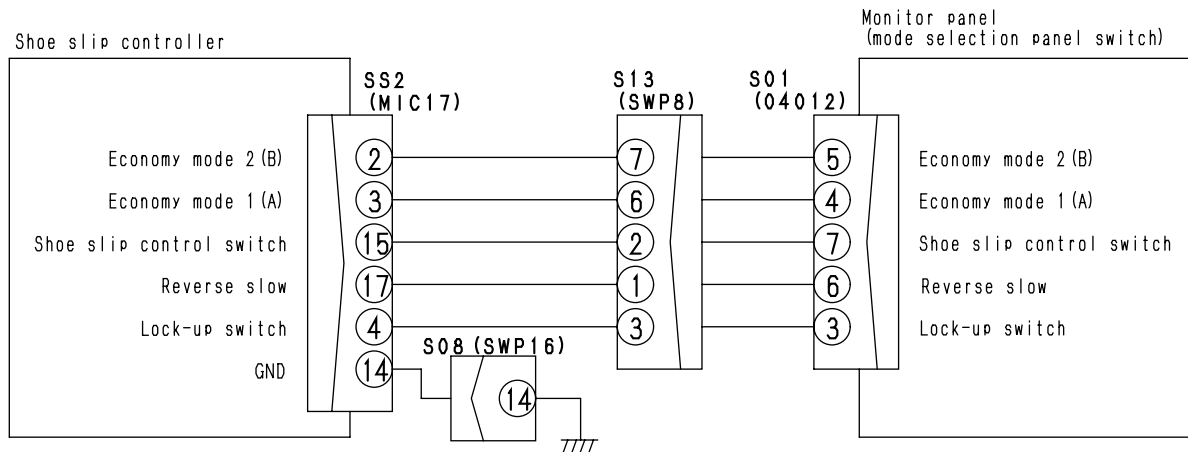


[Abnormality in control mode] is displayed

- ★ This troubleshooting is carried out when there is still an abnormality, so when disconnecting the connector and inserting the T-adaptor, or when removing the T-adaptor and returning the connector to its original position, if the abnormality display is not given, the problem has been removed.
- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on the next step.

		Cause	Remedy		
<p>1</p> <p>Is resistance between CNSS2 (female) (2), (3), (15), (17) – (14) normal?</p> <ul style="list-style-type: none"> • Min. 1 MΩ • Disconnect CNS01. • Turn starting switch OFF. 	YES	<p>2</p> <p>Is voltage between CNSS2 (2), (3), (15), (17) – (14) normal?</p> <ul style="list-style-type: none"> • 20 – 30 V • Turn starting switch ON. • Turn lock-up switch ON. 	<p>3 YES</p> <p>Keep in condition for measurement in Item 2. Is abnormality display given again?</p>	Defective shoe slip controller	Replace
	NO			NO	System has been reset
	NO	NO	NO	Defective monitor panel (shoe slip mode setting panel)	Replace
		<p>Short circuit with chassis in wiring harness between CNSS2 (female) (2) – CNS13 (7) – CNS01 (female) (5), CNSS2 (female) (3) – CNS13 (6) – CNS01 (female) (4), CNSS2 (female) (15) – CNS13 (2) – CNS01 (female) (7), CNSS2 (female) (17) – CNS13 (1) – CNS01 (female) (6), or CNSS2 (female) (4) – CNS13 (3) – CNS01 (female) (3) (wiring harness with defective resistance), or contact with other wiring harness</p>	Repair or replace		

G-6. Related electrical circuit diagram



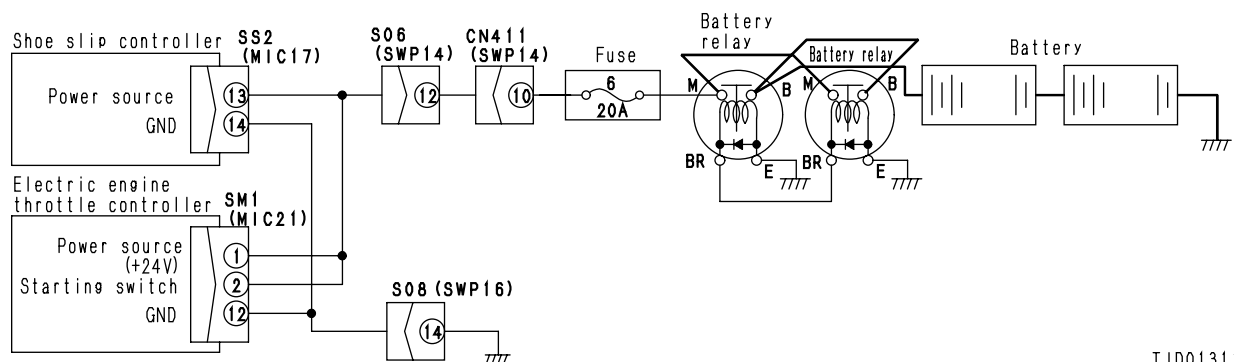
TJD01306

G-15  or  **[Abnormality in power source] is displayed**

- ★ This troubleshooting is carried out when there is still an abnormality, so when disconnecting the connector and inserting the T-adaptor, or when removing the T-adaptor and returning the connector to its original position, if the abnormality display is not given, the problem has been removed.
- ★ The battery voltage should be 20 – 30 V.
- ★ Check that fuse No. 4 is normal.
If it is blown, repair or replace the wiring harness between CNSS2 (13) – CNSM1 (1), (2) – CNS06 (12) – CN411 (10).
- ★ Always connect any disconnected connectors before going on the next step.

	Cause	Remedy
<p>1 YES</p> <p>Is voltage between CNSS2 (13), CNSM1 (1), (2) and chassis normal?</p> <ul style="list-style-type: none"> • 20 – 30 V • Turn starting switch ON. 		
<p>2 YES</p> <p>Is resistance between CNSS2 (female) (14), CNSM1 (female) (12) and chassis normal?</p> <ul style="list-style-type: none"> • Max. 1 Ω • Turn starting switch OFF. • Disconnect CNSS2 and CNSM1. 	<p>Defective shoe slip controller or electric engine throttle controller</p>	Repair
NO	<p>Defective contact or disconnection in wiring harness between CNSS2 (female) (14), CNSM1 (female) (12) – CNS08 (14) – chassis</p>	Repair or replace
NO	<p>Defective contact or disconnection in wiring harness between fuse 6 – CN411 (10) – CNS06 (12) – CNSS2 (female) (13) – CNSM1 (1), (2)</p>	Repair or replace

G-15. Related electrical circuit diagram



TJD01311

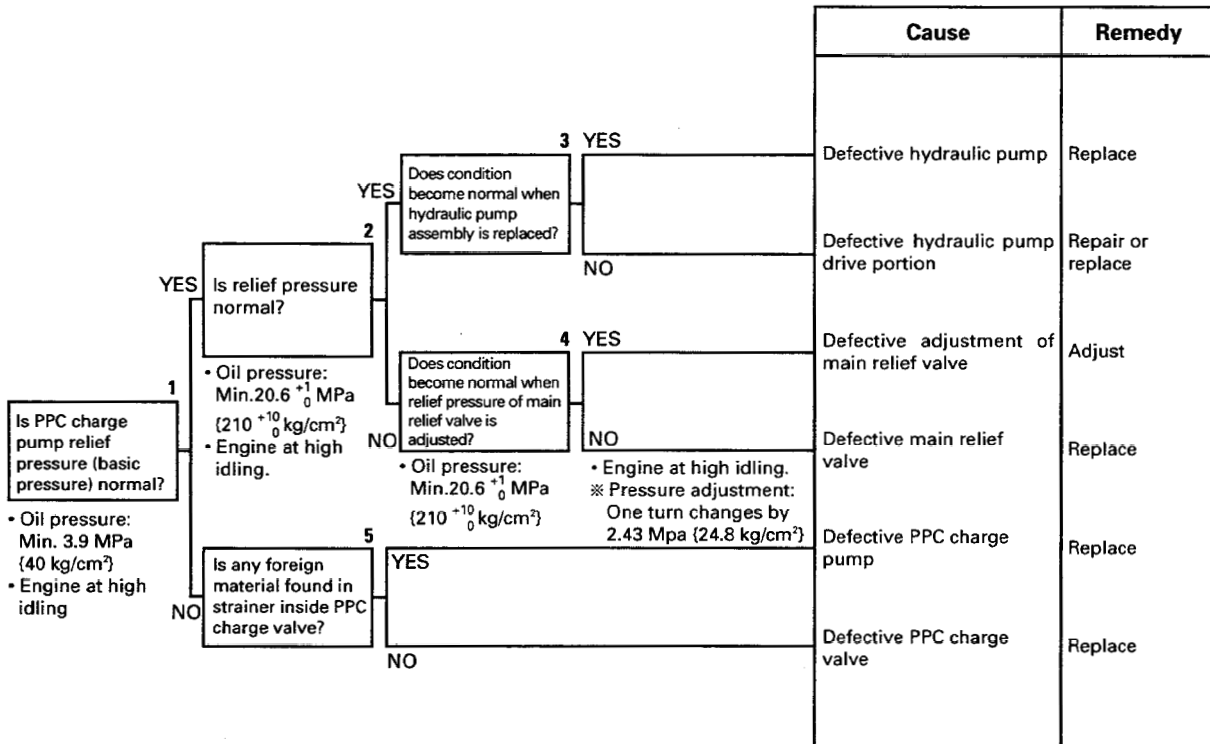
H-4 Machine travels only in one direction (forward or in reverse)

- ★ Conditions: Transmission main relief pressure normal (2.35 MPa {24 kg/cm²})
- ★ If the machine travels normally in 1st - 3rd in the direction where travel is normal (forward or reverse).

		Cause	Remedy
Is adjustment of speed lever linkage normal? ※ See TESTING AND ADJUSTING.	1 YES	Clutch slipping in direction where travel is not normal (F or R)	Repair or replace
	NO	Defective adjustment of speed lever linkage	Adjust

H-102 Work equipment does not move

★ Check oil level in power train before carrying out troubleshooting.



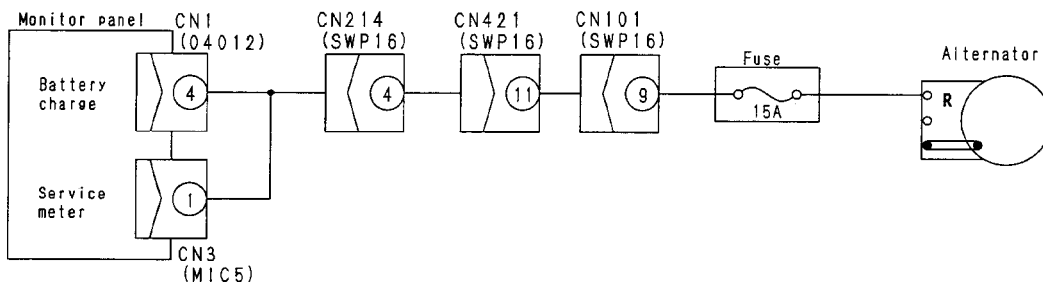
M-4 When starting switch is turned ON (engine started), CAUTION items flash (battery charge, engine oil pressure do not light up)

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.
- ★ Check both the alternator system and engine oil pressure system.
- ★ Check that fuse (15A) is normal before carrying out troubleshooting.

a) Alternator system

		Cause	Remedy	
<p>1</p> <p>Is voltage between alternator R and chassis normal?</p> <ul style="list-style-type: none"> • Disconnect terminal R. • Turn starting switch ON. • Max. 1 V 	YES	<p>2</p> <p>Is voltage between CN1 (4) and chassis normal?</p> <ul style="list-style-type: none"> • Disconnect CN1. • Turn starting switch ON. • Max. 1 V 	Defective monitor panel (monitor module)	Replace
	NO		Short circuit in wiring harness between CN1 (female) (4) - CN214 (4) - CN421 (11) - CN101 (9) - alternator R	Repair or replace
	NO		Defective alternator	Replace

M-4. a) Related electrical circuit diagram



BKD00684

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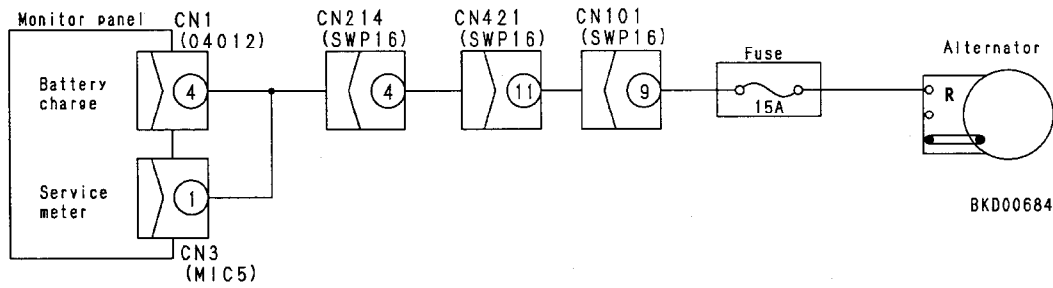
M-10 Service meter does not move after engine is started

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

		Cause	Remedy
Does charge abnormality display flash? 1 YES NO	YES	See M-5 a)	—
	NO	Defective monitor panel	Replace

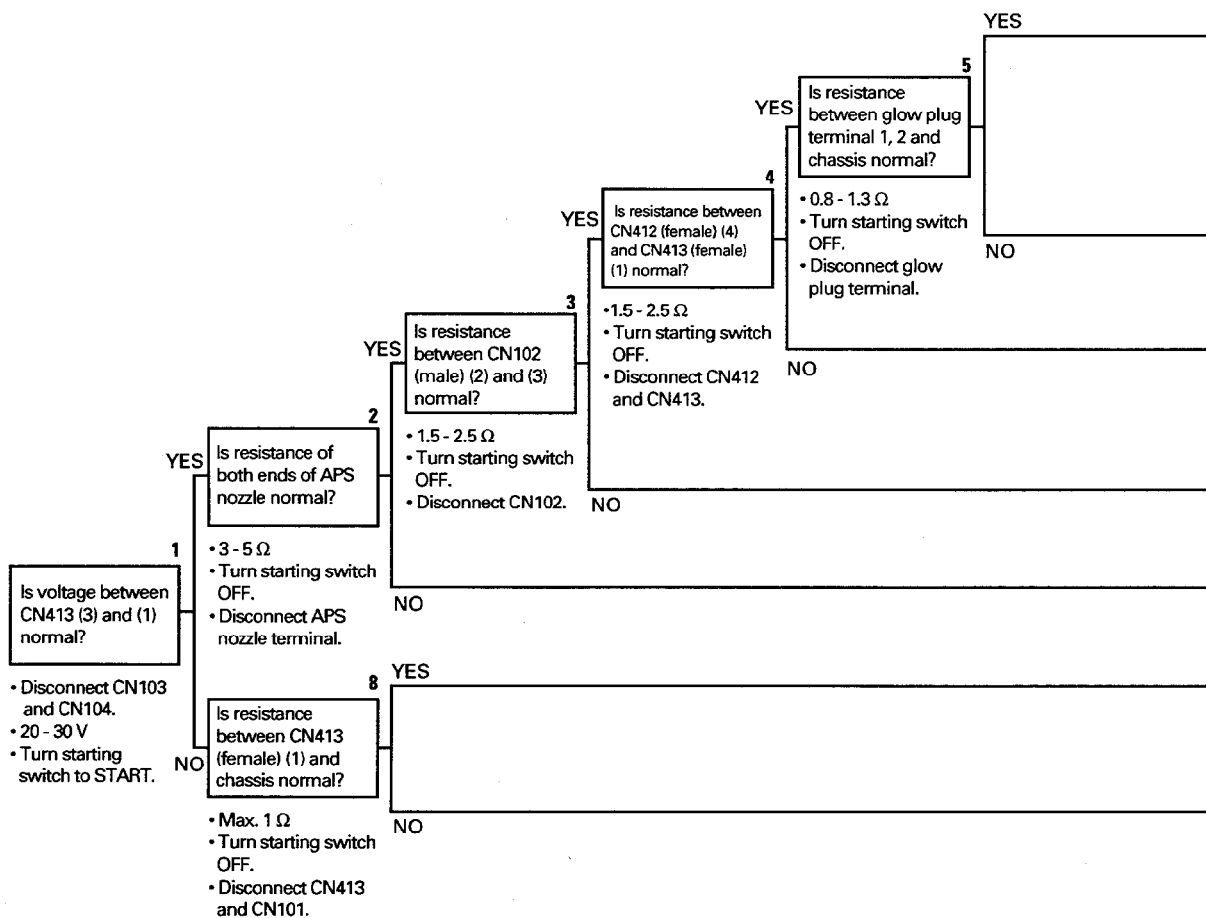
• Start engine.

M-10. Related electrical circuit diagram



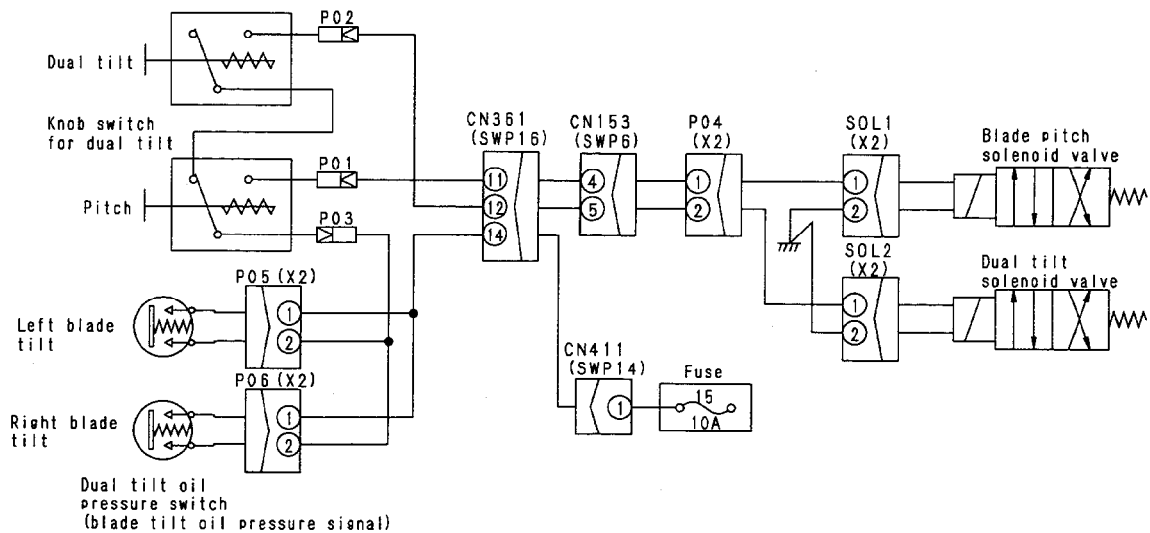
e) APS is not actuated when water temperature is below 20°C

- ★ When an abnormality occurs and the system returns to normal when the connector has been disconnected and a T-adapter inserted, or when the T-adapter has been disconnected and the connector connected, the system has been reset.
- ★ Always turn the starting switch OFF before disconnecting the connector or connecting the T-adapter (or socket).
- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on the next step.



	Cause	Remedy
	Defective knob switch for blade pitch	Replace
	Defective contact, or disconnection in wiring harness between CNSOL1 (female) (2) and chassis	Repair or replace
	Defective contact, or disconnection in wiring harness between CNP01 (male) (1) - CN361 (11) - CN153 (4) - CNP04 (1) - CNSOL1 (female) (1)	Repair or replace
	Defective contact, or disconnection in wiring harness between CNP05 (female) (1), CNP06 (female) (1) - CN361 (14) - CN411 (male) (1)	Repair or replace
	Defective contact, or disconnection in wiring harness between fuse 1 - CN411 (1) - CN361 (14) - CNP05 (1), CNP06 (1)	Repair or replace
	Defective solenoid valve for blade pitch	Replace

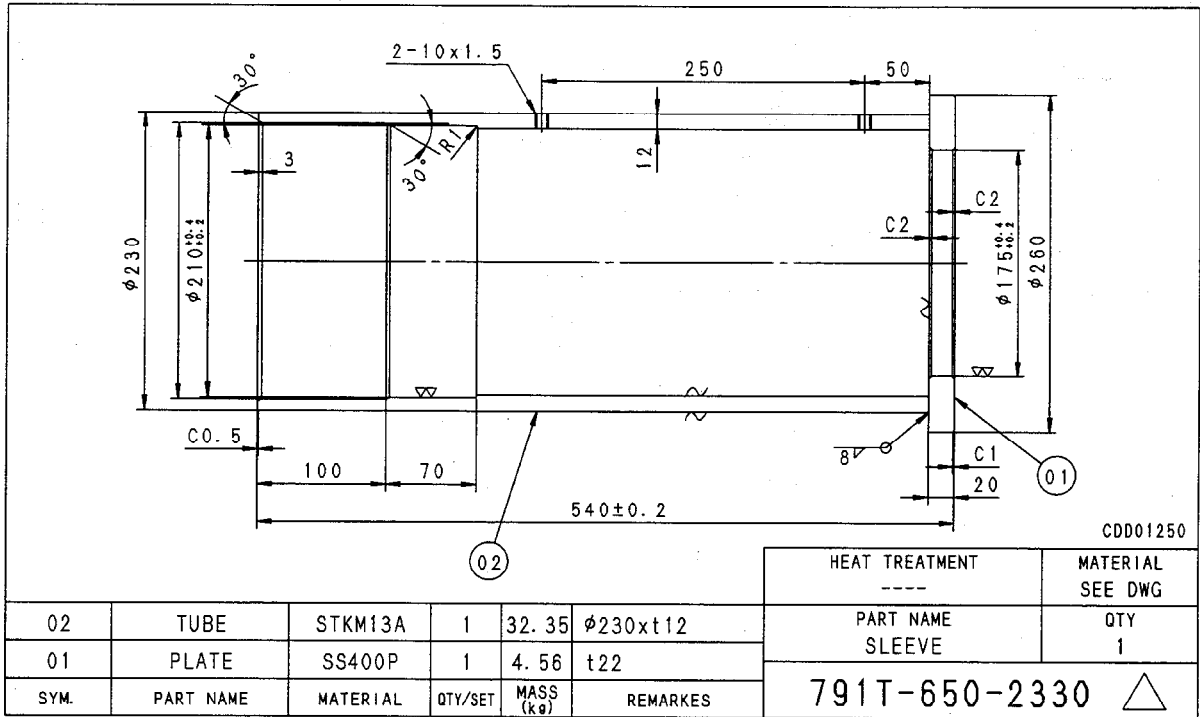
E-7. Related electrical circuit diagram



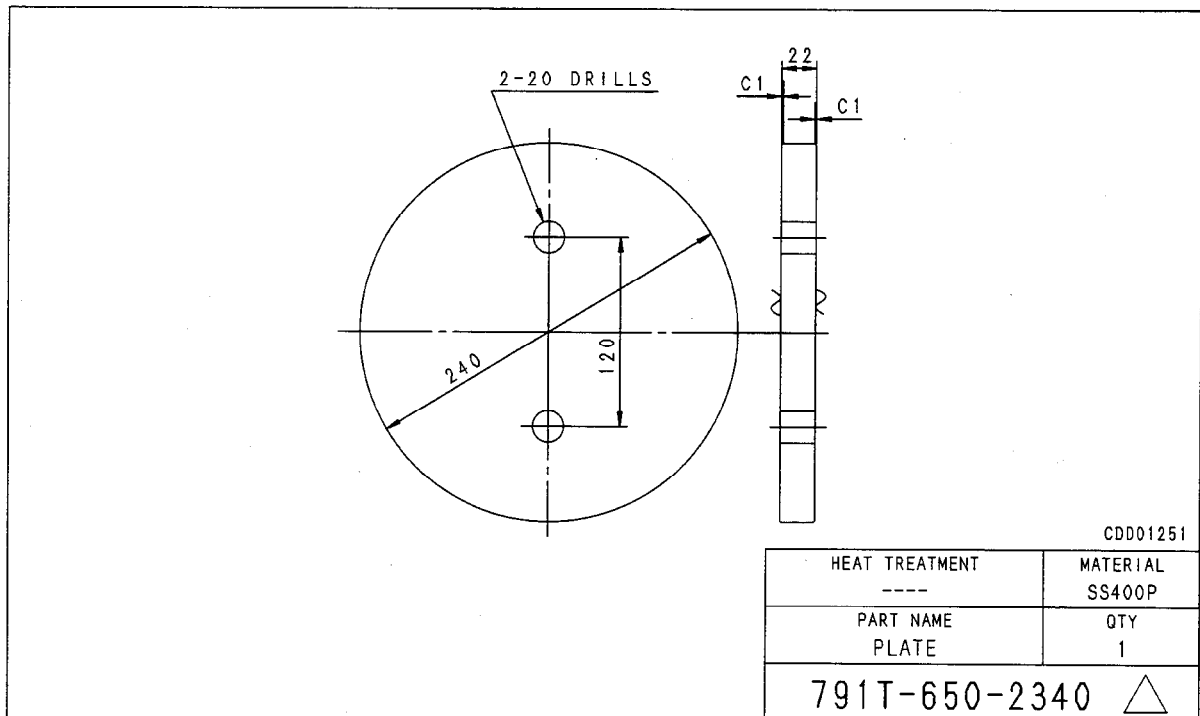
BKD00706

Component	Symbol	Part No.	Part Name	Neces- sity	Q'ty	New/ remodel	Sketch	Nature of work, remarks	
Disassembly, assembly of track roller	9	791-515-1520	Installer	■	1			Installation of floating seal	
	10	791-685-8320	Push tool	■	1			Press fitting of floating seal collar	
	11	791-601-1000	Oil pump		1			Filling with oil	
Disassembly, assembly of bogies	12	01017-31220	Bolt	■	3			Pulling out cage	
	L 13	1	791-630-1700	Remover & installer	■	1	N		Pulling out shaft assembly
		2	• 791-685-9510	• Frame		1			
		3	• 791-685-9520	• Frame		1			
		4	• 791-685-9530	• Rod		1			
		5	• 791-685-9540	• Rod		1			
		6	• 791-685-9550	• Nut		3			
		7	• 791-685-9560	• Bolt		4			
		8	• 791-630-1510	• Shaft		2			
		9	• 791-630-1520	• Nut		2			
		10	• 04530-12030	• Eyebolt		1			
		11	• 791-126-0150	• Adapter		1			
		12	• 791-685-9620	• Extension		1			
		13	• 791-630-1710	• Adapter		1	N		
		14	• 791-630-1720	• Spacer		1	N		
		15	• 04530-11018	• Eyebolt		2			
		16	• 791-630-1730	• Push tool		1	N		
		17	• 791-630-1770	• Fixture		4	N		
		18	• 01010-51025	• Bolt		9			
		19	• 01643-51032	• Washer		8			
		20	790-101-4300	Cylinder {1470 kN{150 ton}}	■	1			
		21	790-101-1102	Pump	■	1			
		22	791T-630-1580	Bracket	●	2		○	
		23	791T-630-1590	Stand	●	2		○	
		24	01017-52010	Bolt	●	4			
	14	790-201-2280	Plate	●	1			Pulling out collar	
	15	791-630-1730	Push tool	■	1			Press fitting of collar	
16	790-201-1930	Push tool	■	1			Press fitting of bushing of ring and cage		
	790-101-5021	Grip	■	1					
	01010-50830	Bolt	■	1					

P1 Sleeve



P2 Plate

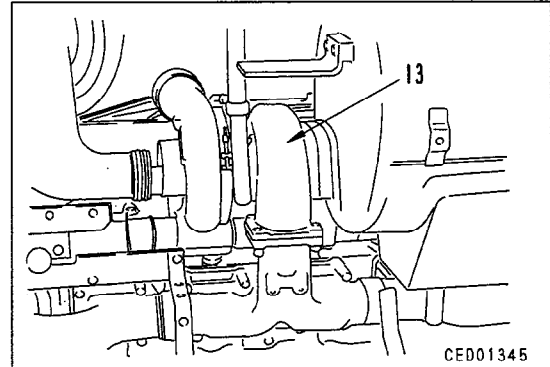


6. Lift off turbocharger assembly (13).

※ 1



Turbocharger assembly : 30 kg



INSTALLATION OF TURBOCHARGER ASSEMBLY

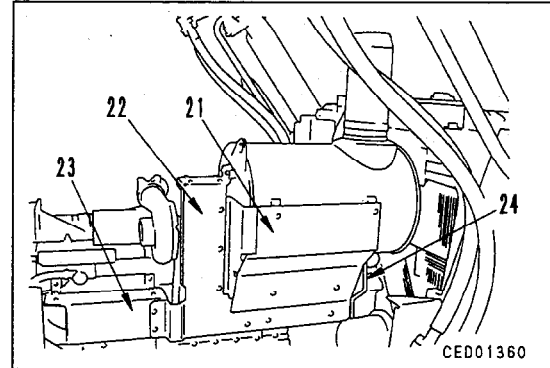
- Carry out installation in the reverse order to removal.

※ 1




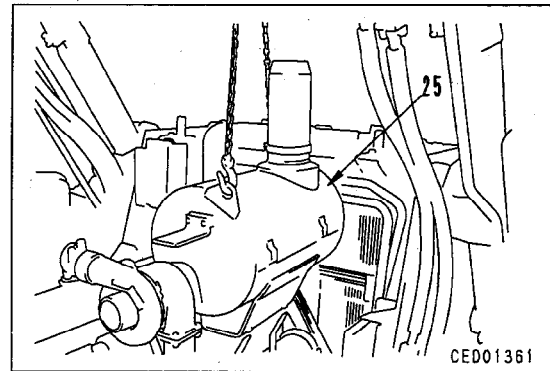
Turbocharger assembly mounting bolt:
 $66.15 \pm 7.35 \text{ Nm}$ { $6.75 \pm 0.75 \text{ kgm}$ }

16. Remove adiabatic covers (21), (22), and (23), and water drain tube (24).

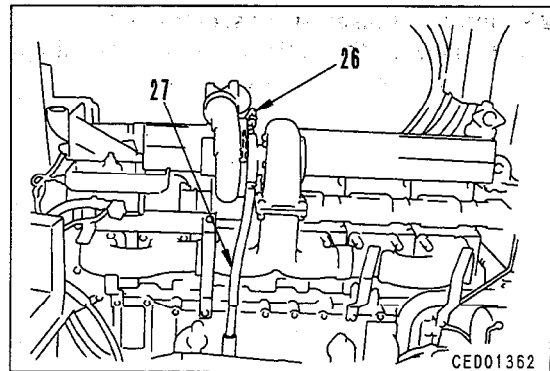



17. Lift off muffler assembly (25).


 Muffler assembly : 90 kg

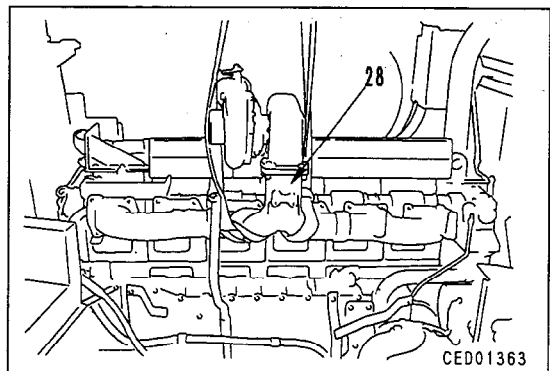


18. Disconnect turbocharger lubrication inlet hose (26) and outlet tube (27).



19. Lift off turbocharger and exhaust manifold assembly (28). 

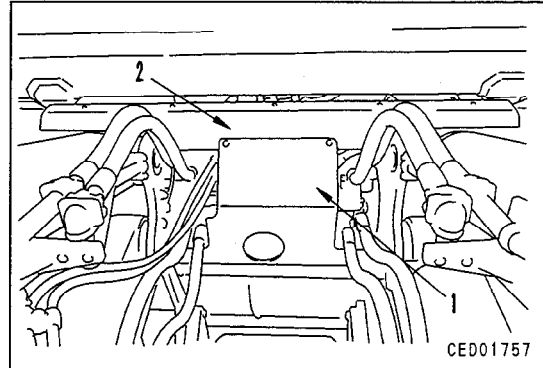
 Turbocharger, exhaust manifold assembly:
60 kg



REMOVAL OF FUEL TANK ASSEMBLY

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

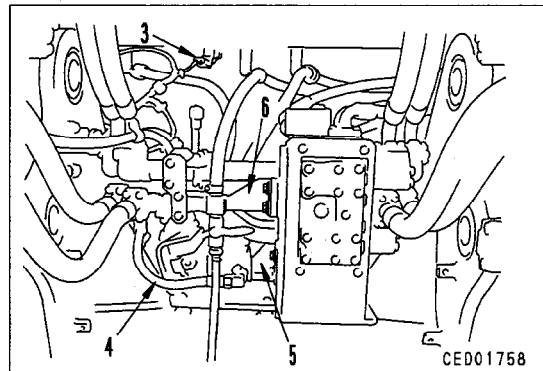
1. Remove covers (1) and (2).



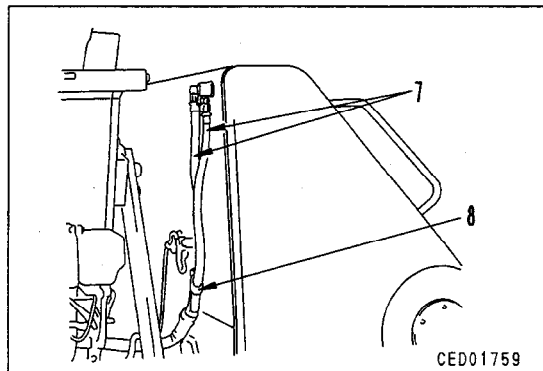
2. Disconnect wiring connector (CN-422) (3).

3. Close fuel supply valve and disconnect fuel supply hose (4).

4. Disconnect brackets (5) and (6).



5. Disconnect fuel return hose (7) and hose clamp (8).



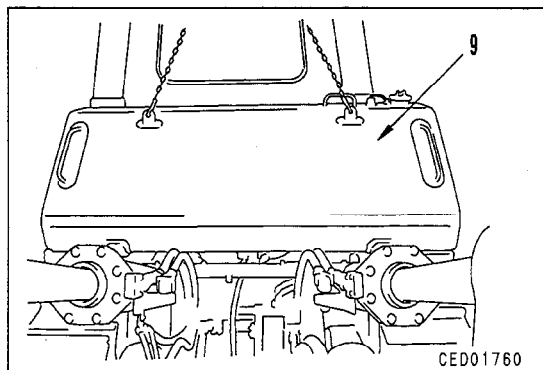
6. Lift off fuel tank assembly (9).



Fuel tank assembly :
Approx. 500 kg (when empty)
Approx. 1350 kg (when full)

INSTALLATION OF FUEL TANK ASSEMBLY

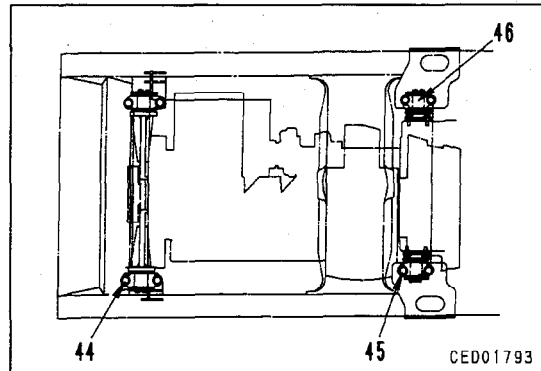
• Carry out installation in the reverse order to removal.



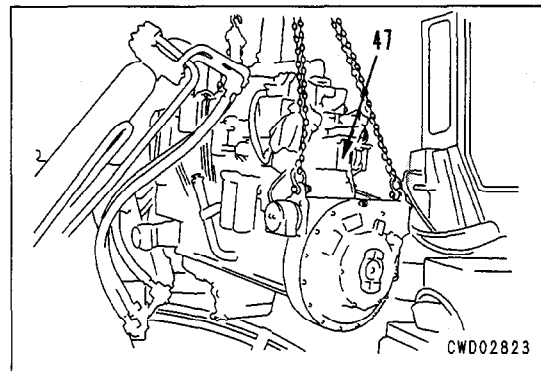
- 34. Remove front mount bolt (44) and rear mount bolt (45). ※ 5
- 35. Raise engine assembly (47) slowly and remove right rear mount cap (46).



Engine assembly : 3000 kg



- 36. Move engine assembly (47) towards front of chassis and operate chain block to raise front of engine and put engine assembly at an angle.
- 37. Move engine assembly (47) so that front and rear of engine do not interfere with chassis components, then turn at 90° to chassis and remove engine assembly (47).
 - ★ Be careful not to damage the wiring and the hoses when removing.



REMOVAL OF POWER TRAIN UNIT ASSEMBLY

1. Drain oil from hydraulic tank and power train case.

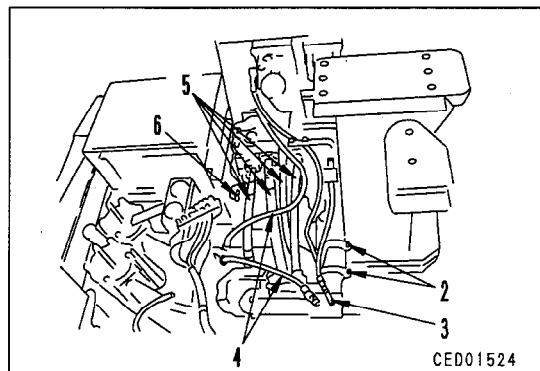
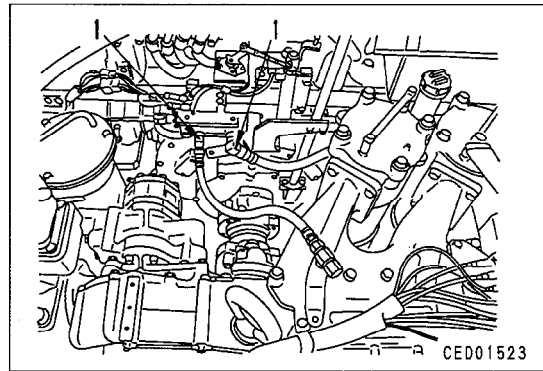


Hydraulic tank : **Approx. 120 ℓ**

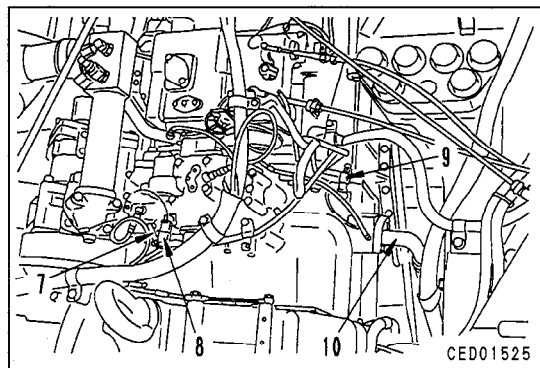


Power train case : **Approx. 150 ℓ**

2. Remove floor frame assembly.
For details, see REMOVAL OF FLOOR FRAME ASSEMBLY.
3. Remove fuel tank assembly.
For details, see REMOVAL OF FUEL TANK ASSEMBLY.
4. Disconnect 2 in-line servo valve hoses (1).
5. Remove 2 clamps (2) of work equipment and PPC pump inlet tube coupling.
★ Move the coupling towards the power line unit end, then disconnect the tube.
6. Disconnect PPC drain hose (3).
★ Disconnect at the pump inlet tube end and move towards right side of the chassis.
7. Disconnect 2 PPC oil cooler hoses (4), then disconnect clamps (2 places).
★ Keep the two hoses together, pass them around the outside of the oil level gauge, and move them towards the right side of the chassis.
8. Disconnect work equipment and PPC pump outlet hoses (5).
★ Disconnect at the pump end.
9. Disconnect wiring connector (CN-241) (6), then disconnect clamps (2 places).



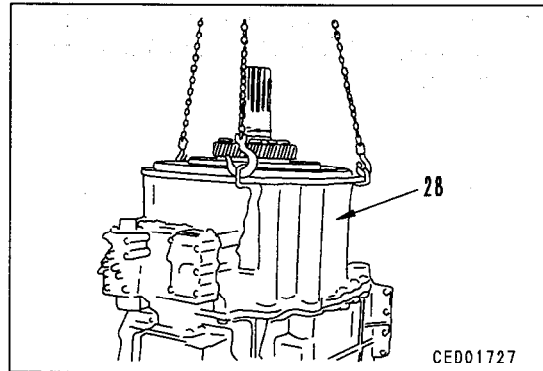
10. Disconnect hydraulic oil temperature sensor connector (CN-452) (7) and lock-up solenoid connector (CN-653) (8), then disconnect clamp (1 place).
11. Disconnect torque converter oil temperature sensor (CN-453) (9).
12. Disconnect torque converter oil cooler hose (10).



33. Lift off torque converter assembly (28).



Torque converter assembly : 550 kg



- 2) Using push tool ⑥, press fit gear assembly (3) to cover (4).

★ Install with the bearing end face and gear end face (which form a level surface) facing the cover.

 Gear spline portion : **Grease (G2-LI)**

- 3) Fit O-ring, then raise cover assembly (2) and install to case.

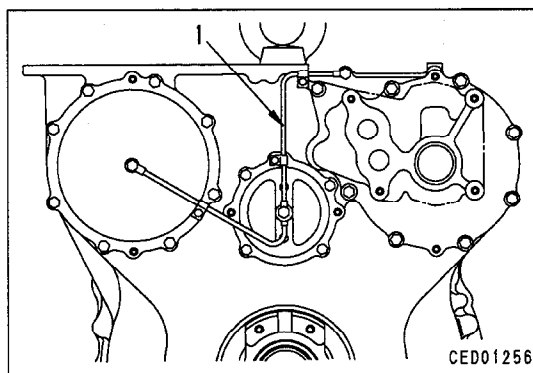
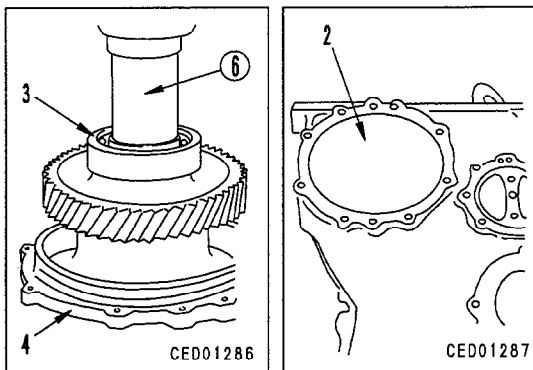
★ If the cover assembly is stiff and does not enter the case easily, tap the surrounding area uniformly with a plastic hammer to install.

★ Put drops (approx. 6 cc) of engine oil (SAE10W-CD or SAE30-CD) on the bearing and rotate about 10 times.


7. Lubrication tube

Sling PTO assembly and install lubrication tube (1).

★ Install the 3 lubrication tubes on the opposite side also.



v) Install piston (11) to housing (12).


 Contact surface of seal ring :
Grease (G2-LI)

★ When installing, be careful not to damage the seal ring.

vi) Using eyebolts ④, install housing and piston assembly (10).

★ Support the piston assembly by hand to prevent it from falling out when installing.

 Mounting bolt :
Thread tightener (LT-2)

 Mounting bolt :
110.35±12.25 Nm(11.25±1.25 kgm)


vii) Using push tool, press fit bearing (15).

★ Put drops (approx. 6 cc) of engine oil (SAE10W-CD or SAE30-CD) on the bearing and rotate about 10 times.

viii) Install plate (8), and secure with snap ring (7).

ix) Install input shaft (6).

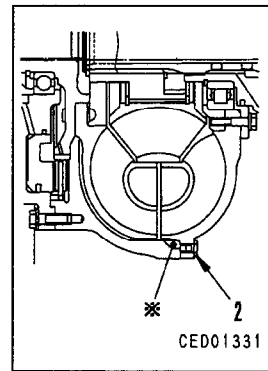
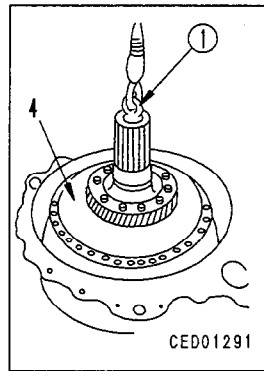
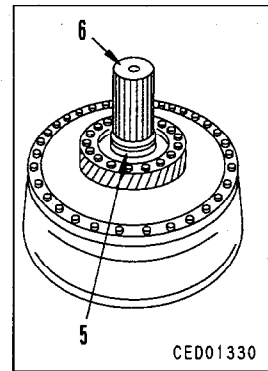
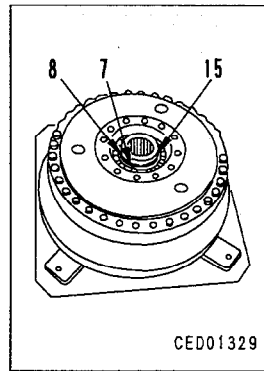
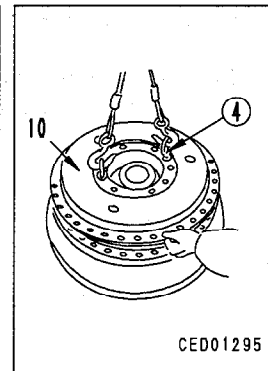
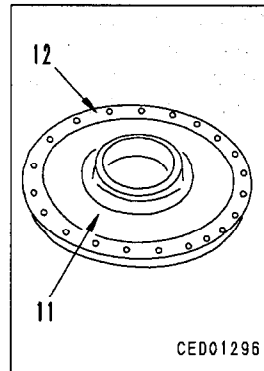
 Mounting bolt :
Thread tightener (LT-2)

 Mounting bolt :
277.0±31.9 Nm(28.25±3.25 kgm)

x) Install 2 seal rings (5).


2) Using eyebolt ①, install lock-up clutch and drive case assembly (4).


★ Align the positions of the turbine oil groove (※ mark) and drain plug (2) when installing.

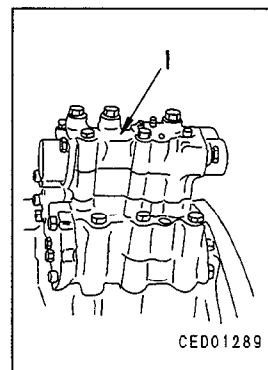
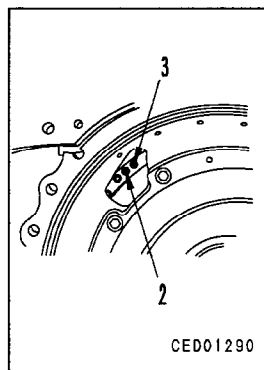


3) Tighten mounting bolts (3).

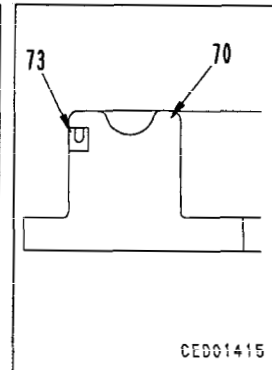
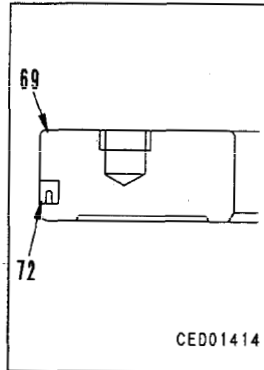
★ Check that drain plug (2) is tightened.

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

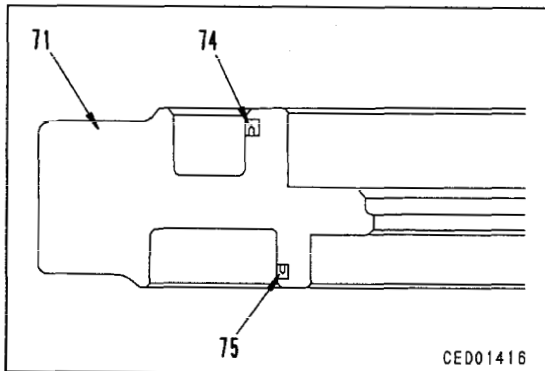
 Drain plug :
11.25 ± 1.45 Nm {1.15 ± 0.15 kgm}



- ii) Remove seal ring (72) from piston (69).
- iii) Remove seal ring (73) from piston (70).

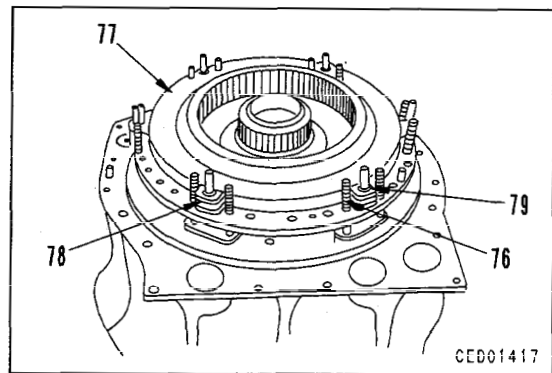


- iv) Remove seal rings (74) and (75) from housing (71).



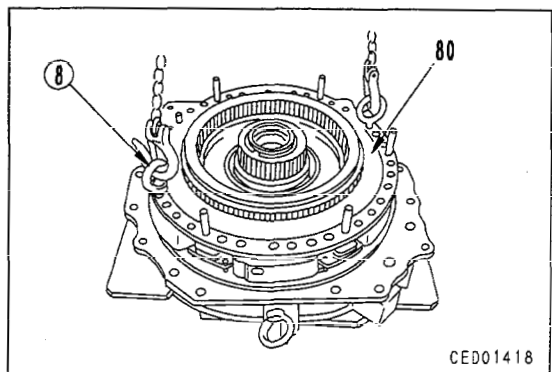
13. No. 3 discs, plates, springs

- 1) Remove guide plate, then remove 12 springs (76).
- 2) Remove 4 discs (77), 4 springs (79), and 3 plates (78) in turn.
- ★ After removing the discs and plates, keep them in a flat place to prevent them from becoming distorted.

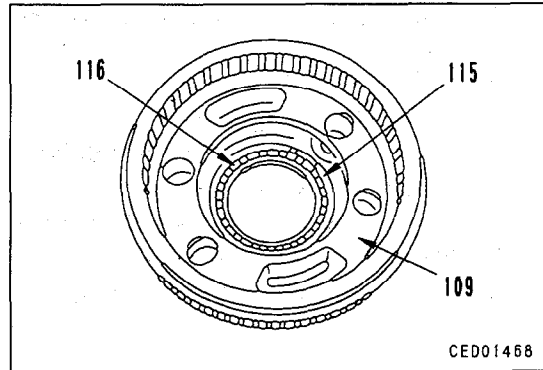


14. No. 3, No. 4 clutch plate

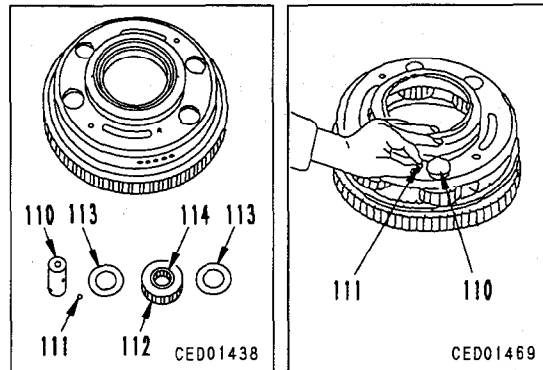
Using eyebolts ⑧, remove plate (80).



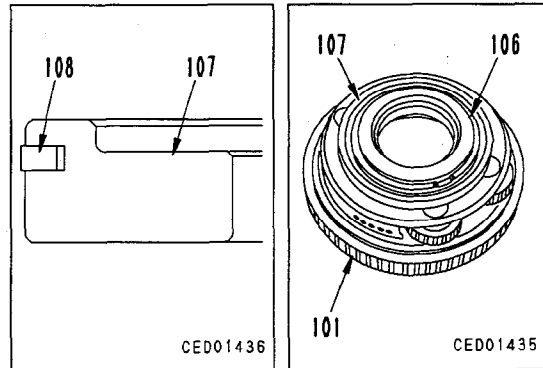
- i) Using push tool, press fit ball bearing (116) to carrier (109), then secure with snap ring (115).



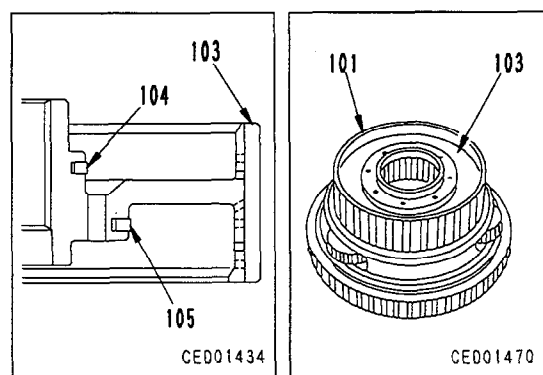
- ii) Turn over carrier.
 - iii) Assemble needle bearing (114) to gear (112), then fit thrust washers (113) to both ends and set to carrier.
 - iv) Fit ball (111) and install shaft (110) to carrier.
- ★ Check that the gear rotates smoothly.



- v) Install seal ring (108) to collar (107).
- Seal ring : Grease (G2-LI)
- vi) Align collar (107) with dowel pin and install to No. 3 ring gear and No. 4 carrier assembly (101), then secure with snap ring (106).
- * Knock in the dowel pin portion with a plastic hammer until there is no clearance at the mating surface.

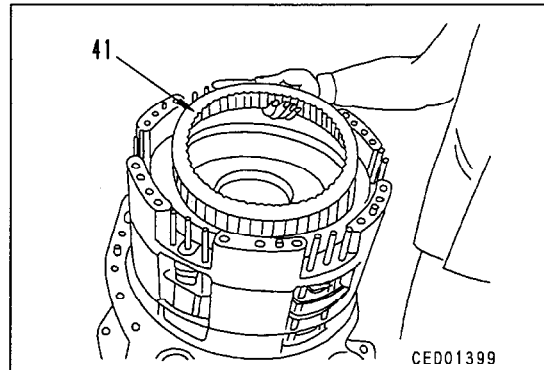


- vii) Install seal rings (105) and (104) to hub (103).
- Seal ring : Grease (G2-LI)
- viii) Install hub (103) to No. 3 ring gear and No. 4 carrier assembly (101).
- ★ Be careful not to get the seal ring caught.



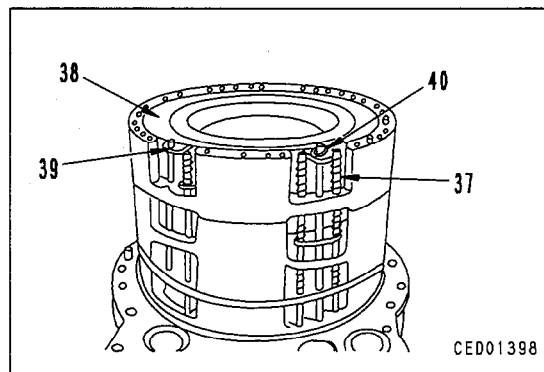
16. No. 1 clutch ring gear

Install No. 1 clutch ring gear (41).



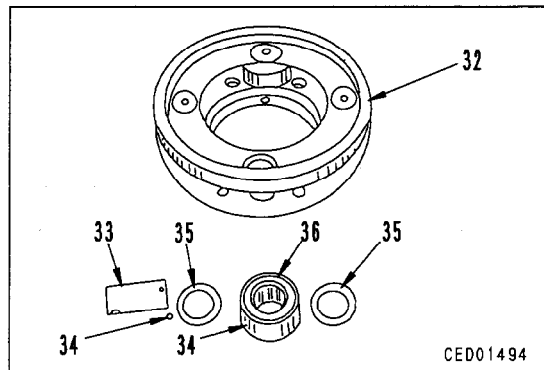
17. No. 1 discs, plates, springs

- 1) Fit guide plate and install 12 springs (37).
★ Free length of spring : 66 mm
- 2) Install 6 discs (38), 6 springs (40), and 5 plates (39) in turn.

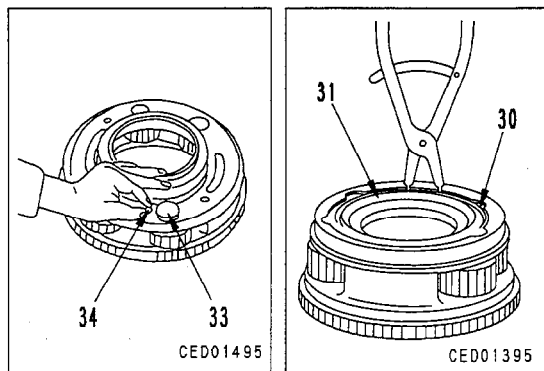


18. Input shaft, No. 1 carrier assembly

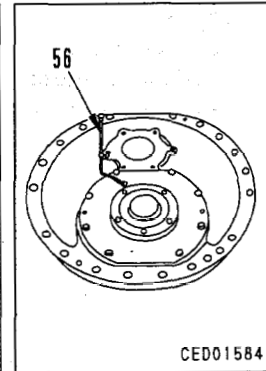
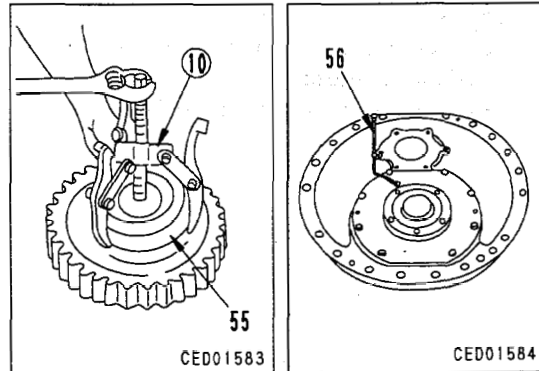
- 1) Assemble input shaft and No. 1 carrier assembly as follows.
 - i) Assemble needle bearing (36) to gear (34), then fit thrust washers (35) to both sides and set to carrier (32).



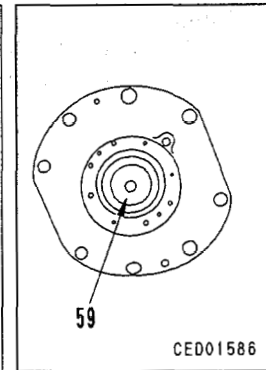
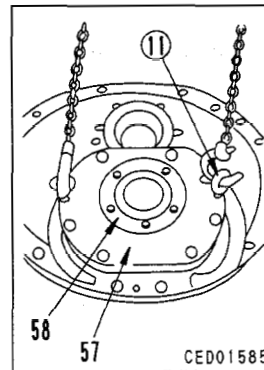
- ii) Fit ball (34) and install shaft (33) to carrier.
 - iii) Install collar (31) to carrier and secure with snap ring (30).



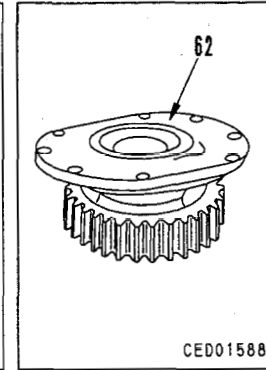
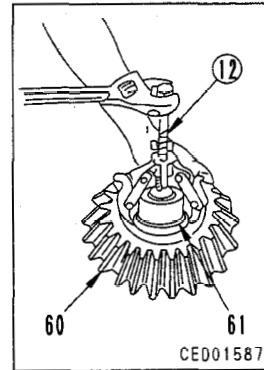
- vi) Using puller ⑩, remove bearing inner race (55) on both sides.
- vii) Remove lubrication tube (56).



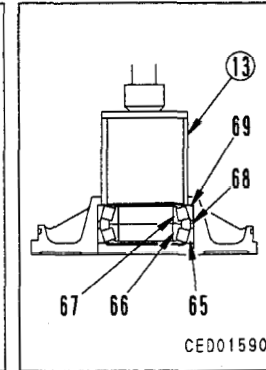
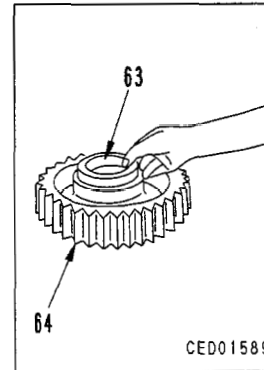
- viii) Using eyebolts ⑪, remove pinion housing assembly (57).
 - ★ Check the number and thickness of the shims, and keep in a safe place.
- ix) Using forcing screws, remove cover (58).
- x) Remove holder (59).



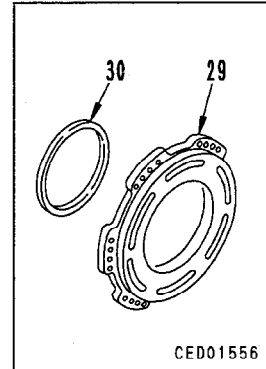
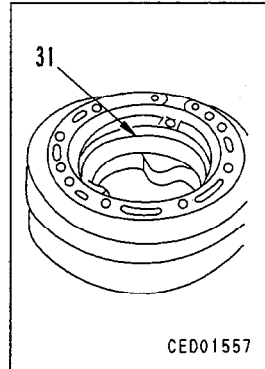
- xi) Push pinion shaft with press and remove pinion gear (60).
- xii) Remove holder, then using puller ⑫, remove bearing inner race (61) from pinion gear (60).
- xiii) Remove cage and bearing assembly (62).



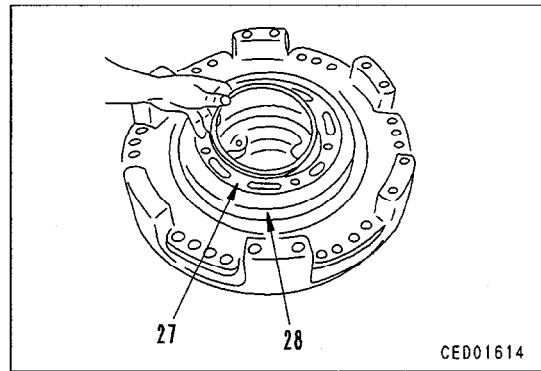
- xiv) Remove collar (63) from gear (64).
- xv) Using push tool ⑬, remove bearing outer races (65) and (69), bearing inner races (66) and (67), and collar (68).



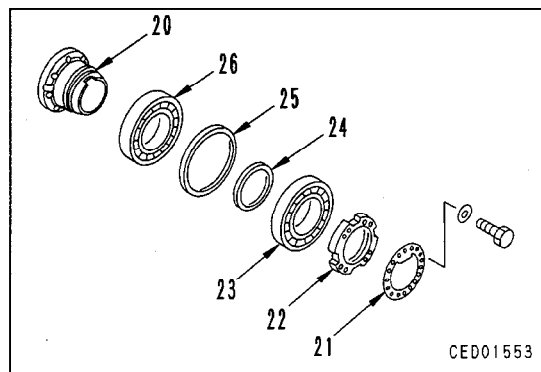
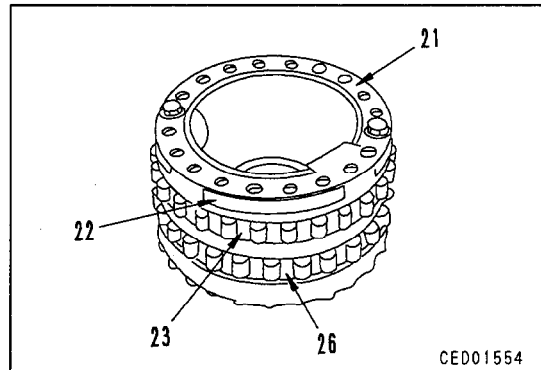
- iv) Install outer race (31) to clutch cage.
- v) Install seal ring (30) to piston.
- vi) Install piston (29).



- vii) Install seal ring (28) to clutch cage.
- viii) Using eyebolt, install clutch cage (27) to housing.



- ix) Install bearing inner race (26), spacers (25) and (24), and bearing inner race (23) to cage (20).
- x) Tighten nut (22) and install plate (21).
 - ★ Using a push tool, hold the cage down with a press, and use a hook wrench to tighten the nut.

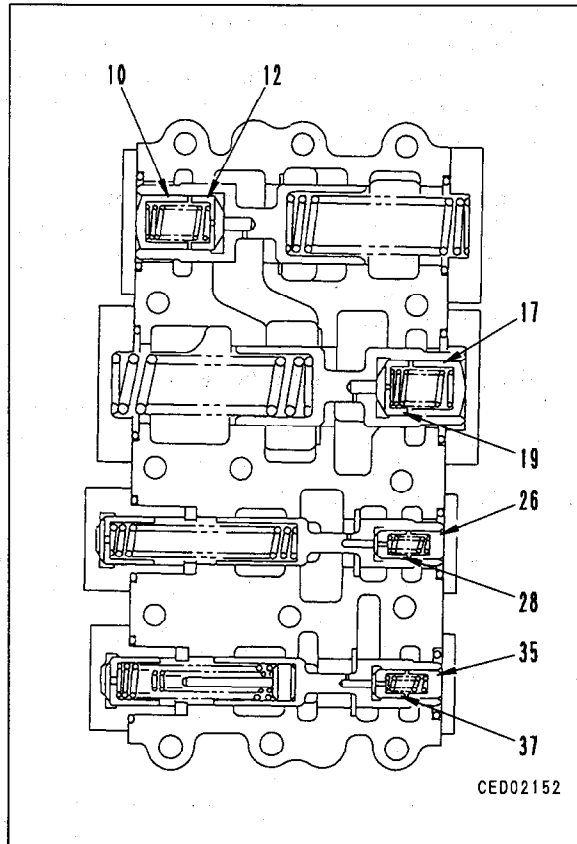


ASSEMBLY OF TORQUE CONVERTER VALVE ASSEMBLY

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

★ When assembling valves (37) and (35), (28) and (26), (19) and (17), and (12) and (10), assemble as shown in the diagram so that the end with the hole in the center of the valve is on the inside of the spool.

1. **Assembly of lock-up clutch modulating valve**
 - 1) Set shim (40) to spool (39) and assemble to spool (38).
 - ★ Standard shim thickness : 2.0 mm
 - 2) Assemble spool (38).
 - 3) Assemble valve (37), spring (36), and valve (35) to spool, then fit O-ring and install cover (34).
 - 4) Assemble ring (33) to body.
 - 5) Assemble spring (32).
 - 6) Assemble piston (31) to cover (30), then fit O-ring and install cover.
2. **Assembly of stator clutch modulating valve**
 - 1) Assemble spool (29).
 - 2) Assemble valve (28), spring (27), and valve (26) to spool, then fit O-ring and install cover (25).
 - 3) Assemble ring (24) to body.
 - 4) Assemble spring (23).
 - 5) Assemble piston (22) to cover (21), then fit O-ring and install cover.
3. **Assembly of main relief valve**
 - 1) Assemble spool (20).
 - 2) Assemble valve (19), spring (18), and valve (17) to spool, then fit O-ring and install cover (16).
 - 3) Assemble spring (15), then fit O-ring and install cover (14).
4. **Assembly of torque converter relief valve**
 - 1) Assemble spool (13).
 - 2) Assemble valve (12), spring (11), and valve (10) to spool, then fit O-ring and install cover (9).
 - 3) Assemble spring (8), then fit O-ring and install cover (7).
5. **Assembly of lock-up valve**
 - 1) Assemble spool (6).
 - 2) Assemble piston (5) to cover (4), then fit O-ring and install cover.
 - 3) Assemble spring (3), then fit O-ring and install cover (2).
 - 4) Fit O-ring and install solenoid valve (1).




3. Cage assembly

1) Assemble cage assembly as follows.

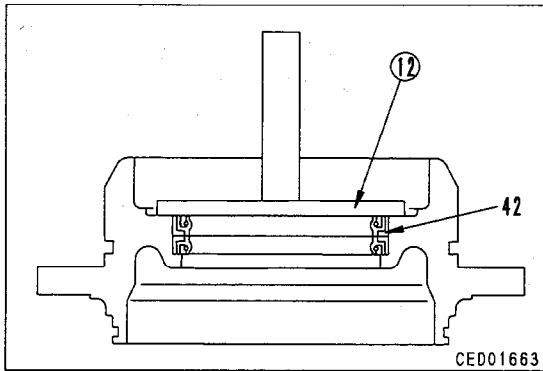
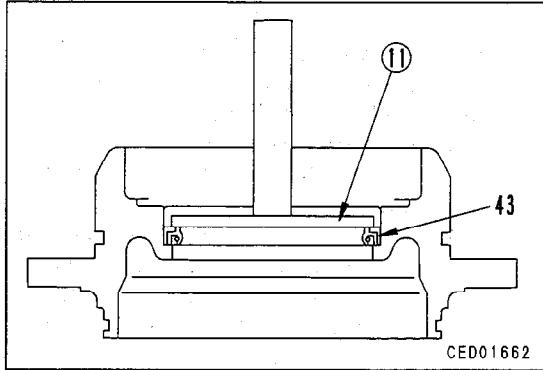
i) Using push tools ⑪ and ⑫, install oil seals (43) and (42).

★ Install the bottom oil seal with the side receiving the pressure at the bottom; install the top oil seal with the side receiving the pressure at the top.

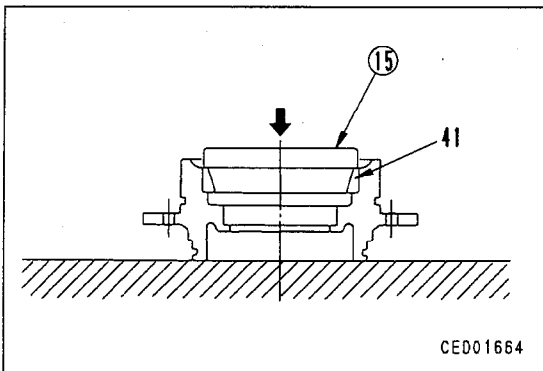
 Lip of oil seal : **Grease (G2-LI)**

 Oil seal press-fitting surface :
Gasket sealant (LG-1)

★ Coat the inside surface of the case thinly with gasket sealant and wipe off any sealant that is pushed out.

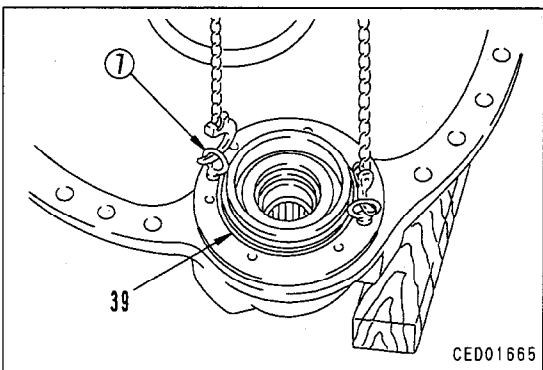


ii) Using push tool ⑮, press fit bearing outer race (41).



2) Using eyebolts ⑦, set cage assembly (39) to case and tighten C and D portions uniformly by cage mounting bolts.

 Mounting bolt : **14.7 Nm {1.5 kgm}**



INSTALLATION OF TRACK FRAME ASSEMBLY

- Carry out installation in the reverse order to removal.

※ 1

 Inside surface of bushing :

Grease (G2-LI)

- ★ Before installing the pin, adjust the height of the track frame and align the center of the equalizer bar hole and track frame hole.
- ★ Set the pin with the grease hole facing the outside of the machine.

※ 2

- ★ Fit pin (4) and bushing (3), install cover (2), then install the cover and cushion.

※ 3

- ★ After removing the grease from the press-fitting surface of the seal, coat with gasket sealant (LG-6).
- ★ Be careful not to install with the seal displaced in the direction of twisting.

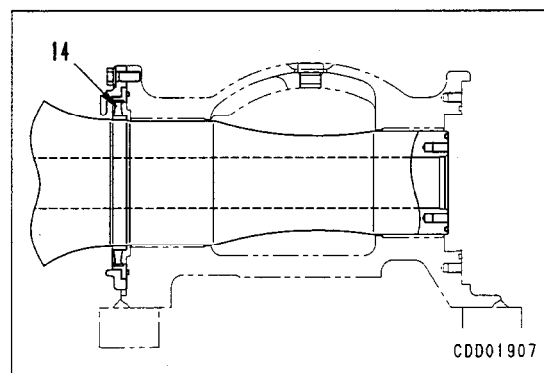
※ 4

- ★ Be careful not to install the track frame with seal (14) displaced in the direction of twisting.

- **Refilling with oil (pivot case)**
Add oil through oil filler to the specified level.

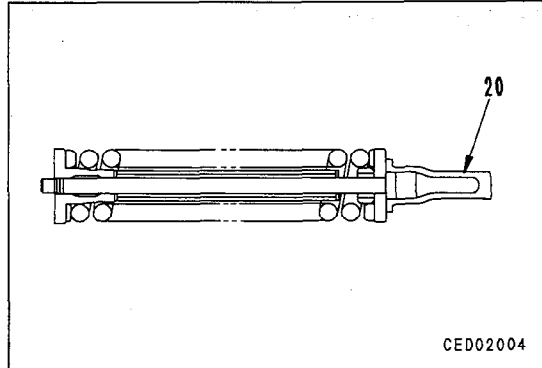


Pivot case : 16 ℓ (SAE30)




CDD01907

14. Remove holder (20) from recoil spring assembly.




INSTALLATION OF BOGIE ASSEMBLY

※ 1

 **kgm** Guard mounting bolt : $1325 \pm 145 \text{ Nm}$
($135 \pm 15 \text{ kgm}$)

※ 2

 Bogie assembly mounting bolt:
Thread tightener (LT-2)

★ Tightening order of bogie assembly mounting bolts:

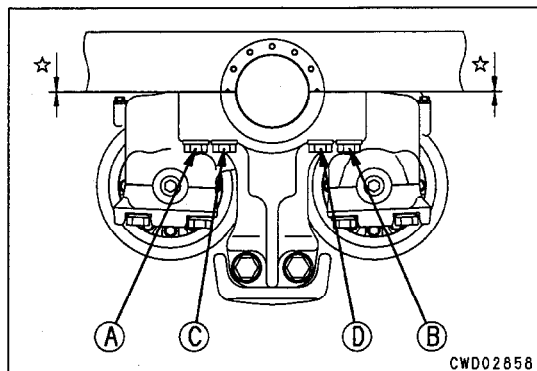
1. Tighten the bolts to about 294 Nm (30 kgm) in the following.

(A)→(B)→(C)→(D)

2. Tighten the bolts to the specified torque:
 $1,641.5 \pm 171.5 \text{ Nm}$ ($167.5 \pm 17.5 \text{ kgm}$)
in the following order.

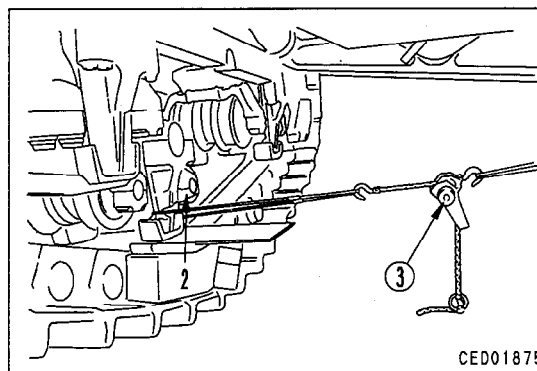
(B)→(D)→(C)→(A)

3. Roughly even the front and rear gaps marked with ☆.



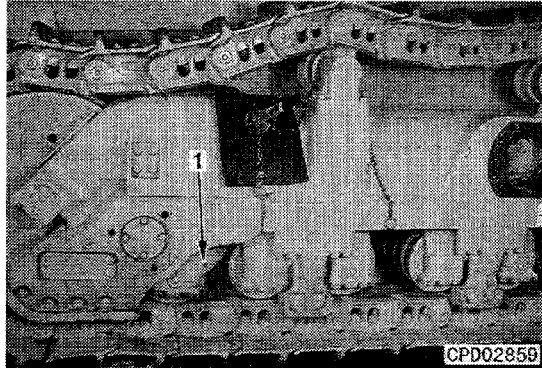
※ 3

★ Fit lever block ③ between the guard of bogie assembly (2) and the guard of the bogie assembly on the opposite side, then slide bogie assembly (2) on top of the steel plate to set it to the mounting position.

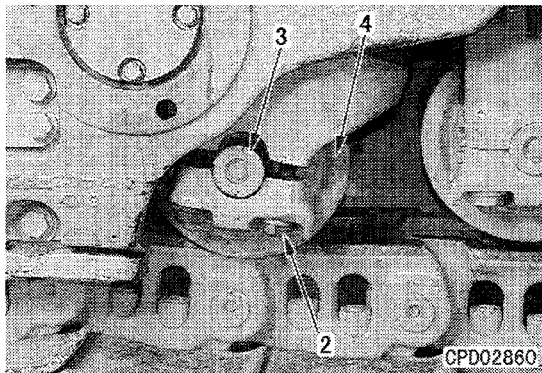


REMOVAL OF FIRST BOGIE ASSEMBLY

1. Loosen track shoe. For details, see SPREADING OF TRACK SHOE ASSEMBLY.
2. Lift up machine body by operating blade and ripper until track roller of second bogie assembly leaves track link.
 - ⚠ Set a block between the track roller and track link to keep the machine body raised.
3. Install eyebolts to pad mounting bolts (M10 x 2 pieces) at rear of first bogie assembly (1), and pull up first bogie assembly (1).

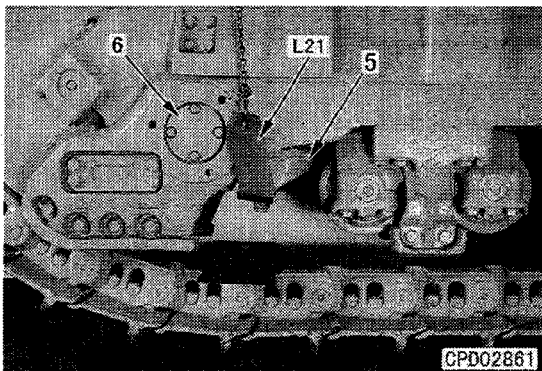


4. Insert a steel plate between track shoe and roller, then loosen roller cap bolts (2) by about 20mm (both inside and outside).
5. Hit end of shaft (3) with hammer to remove track roller assembly (4).
 - Take care not to break the dowel pin in front of the track roller assembly. (Inserting allowance: 5 - 6mm)
6. Remove roller cap bolts (2) and place track roller assembly (4) on the steel plate, then pull it out.

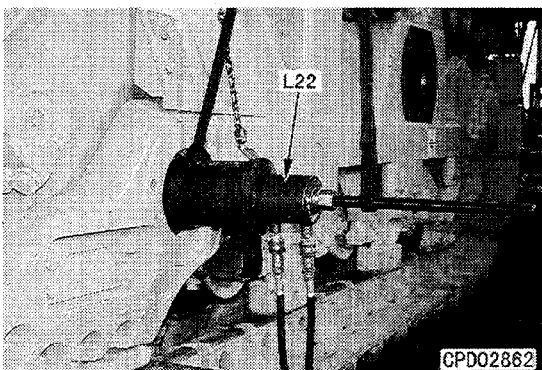


Track roller assembly: **130 kg**

7. Sling and hold first bogie (5) with tool L21.
8. Remove cover (6).



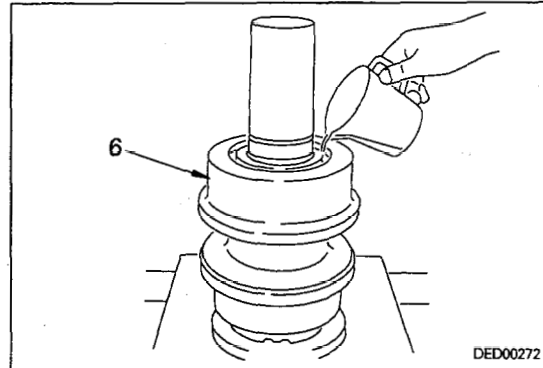
9. Pulling out pin and bushing
 - 1) Set tool L22.



8. Turn over roller (6), and add oil between shaft and roller.

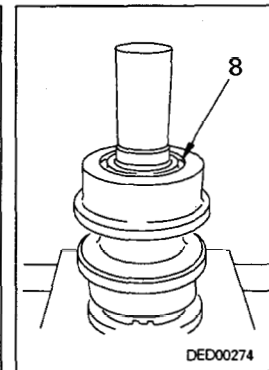
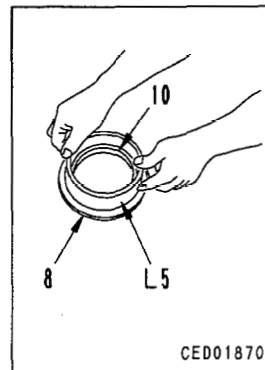


Carrier roller assembly : 700 – 800 cc (SAE140)

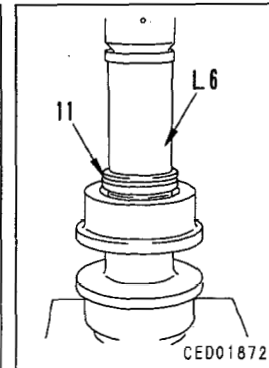
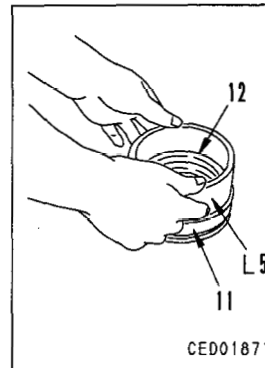


9. Using tool L5, install floating seal (10) to seal guide (8).

10. Fit O-ring, then align with dowel pin and install seal guide (8).

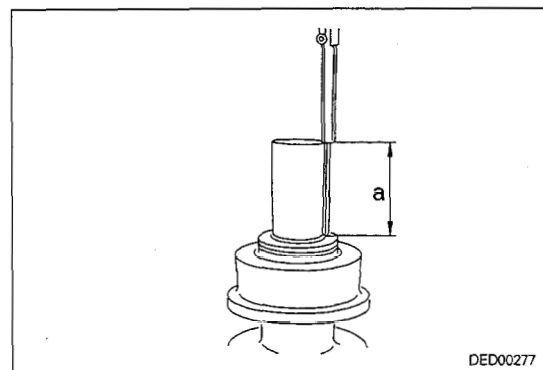


11. Using tool L5, install floating seal (12) to seal guide (11).



12. Using tool L6, press fit seal guide (11).

★ Press fit the seal guide to a point where dimension **a** from the end face of the shaft to the top surface of the seal guide is 158.75 ± 0.2 mm.



OVERALL ASSEMBLY

1. When rebuilding as lubricated track

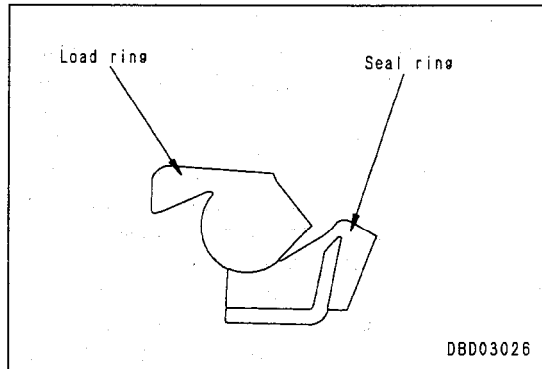
1. Preparatory work

- 1) Washing seal assembly
 - Machines fitted with F3 type seals

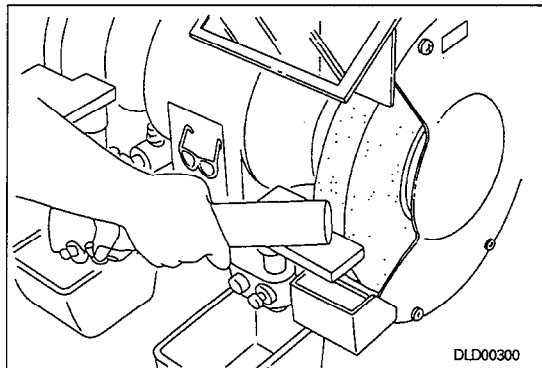
Remove the seal assembly from the link, then separate into the seal ring and load ring, and clean the parts.

★ The seal ring and load ring deteriorate easily when brought into contact with cleaning agent (trichlene, etc.), so wash the parts quickly. After cleaning, wipe the parts with a clean cloth to remove all the cleaning agent.
 - Machines fitted with W7 type seals

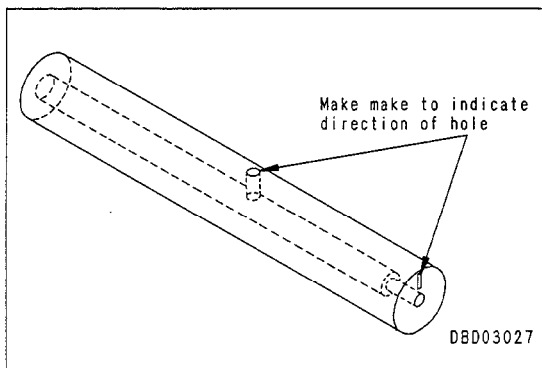
For seals that are to be reused, leave the seal installed to the link, and do not wash it.



- 2) When reusing the pin, chamfer the corner of the end face smooth with a grinder. Use a grinder to remove any protruding parts stuck to the press-fitting portion.
 - ★ If the corner of the end face has become sharp due to wear, there will be scuffing at the press-fitting portion and this will cause oil leakage.



- 3) Make a mark on the end face at the small plug end to show the direction of the side hole (hole in the radial direction) in the pin when assembling.
 - ★ When reusing the pin, assemble in the same direction as when the part is new (side hole on the link tread side).



- 4) Use tools **R3** and **R5** to knock the large plug and small plug into the pin.
- Insert the plug into the guide hole through the plug insertion window. (Coat the plug with oil.)
 - Push the bar by hand and insert the plug as far as possible.
 - Push the plug with the bar and push the guide itself against the pin.
 - Knock in the bar with a hammer.
 - ★ Dimension **a** to knock in from end face of pin:

Small pin: 7.5 ± 1 mm

Large pin: 11 ± 2 mm

- ★ If the plug was not removed from the pin during disassembly, it can be used again as it is.

- 5) Clean any part where outside diameter of the pin, front face of the spacer, or end face or inside diameter of the bushing are dirty.
- 6) Coat the outside diameter of the pin and the front face of the spacer with grease.

7) Installation of seal assembly

- Machines fitted with **F3** type seal
Clean the link counterbore, then use tool **R6** to push the seal in fully to the bottom.

- ★ If there is grease stuck to the link counterbore and seal assembly, the seal will rotate and its sealing performance will drop, so do not coat with grease.

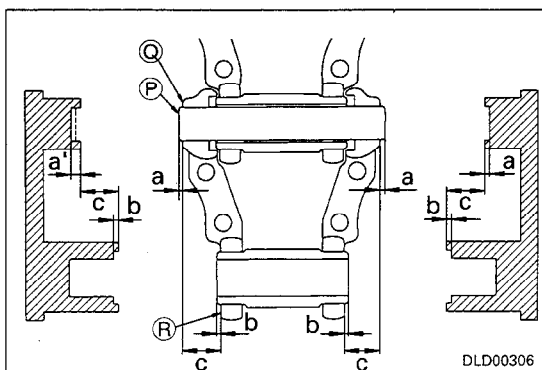
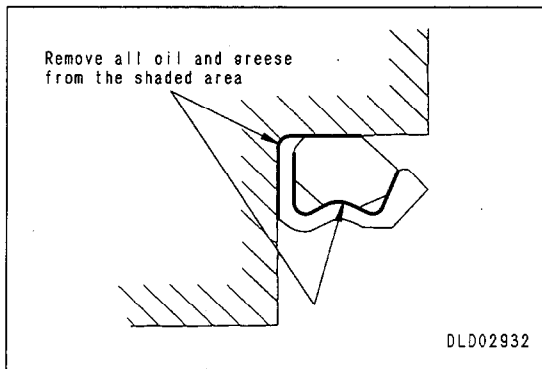
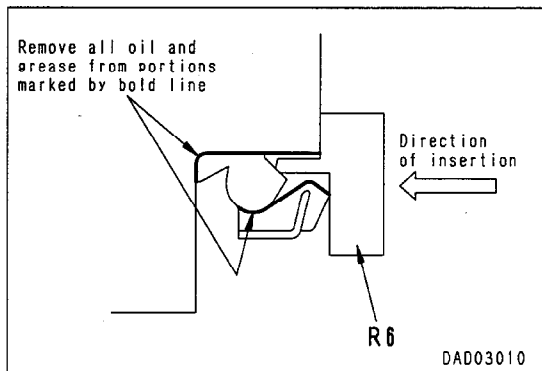
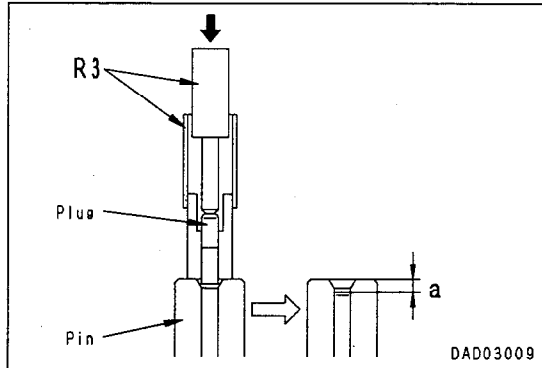
- Machines fitted with **W7** type seal
When reusing the link and replacing the seal with a new part, clean the link counterbore, then push the seal in fully to the bottom.


- ★ If there is grease stuck to the link counterbore and seal assembly, the seal will rotate and its sealing performance will drop, so do not coat with grease.

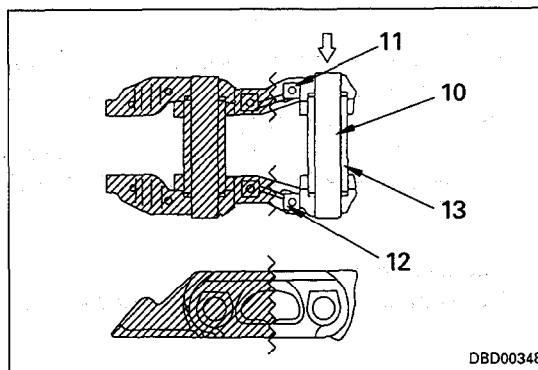
- 8) In order to keep the protrusion of the pin and bushing constant and the installation dimensions of the seal within the specified value during assembly, adjust the press-fitting jig dimensions of the link press.

- ★ For details of the standard dimensions, see PRESS-FITTING JIG DIMENSION TABLE FOR LINK PRESS.

- ★ If the end face of the pin (portion **P**) or the side face of the link (portions **Q**, **R**) are worn, add the amount of wear to the standard dimension when adjusting the dimension of the press-fitting jig so that the amount of protrusion of the left and right pin and bushing is uniform.



- 2) Removal of master link at pin end
Gas cut the portion marked WW, remove  , push pin (10) with a press in the direction of the arrow and remove from link (11), then remove pin (10) and link (12) at the same time from bushing (13).
- Special tool to use: 1. Gas cutter
2. Tool **R7**



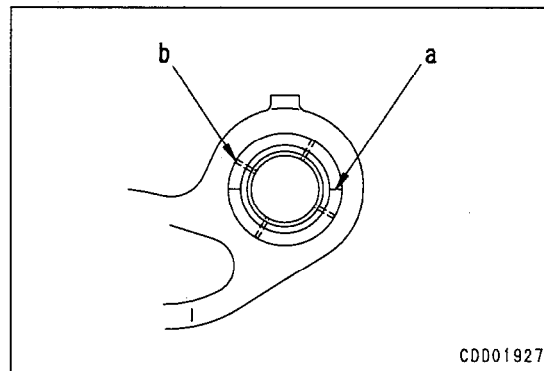
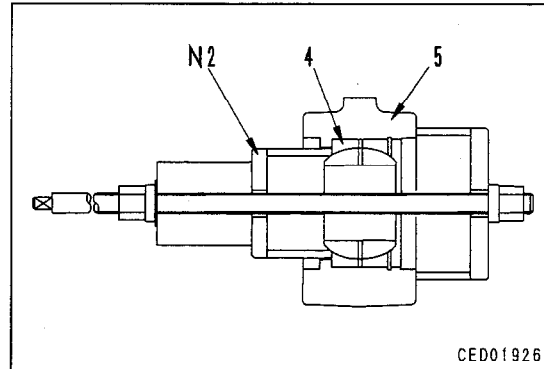
ASSEMBLY OF EQUALIZER BAR BUSHING

1. Side bushing

- 1) Set side bushing (4) and tool **N2** in position, then press fit side bushing (4) to equalizer bar (5).


 Outer circumference of bushing : **Anti-friction compound (LM-P)**

- ★ Align the direction of installation of the side bushing as shown in the diagram on the right.
 - i) Make split surface (mating surface) **a** of outer bushing horizontal.
 - ii) Set inner bushing and outer bushing grease hole **b** at an angle.
- ★ Side bushing press-fitting force : **34.3 - 73.5 kN {3.5 - 7.5 ton}**



- 2) Install snap ring (3).

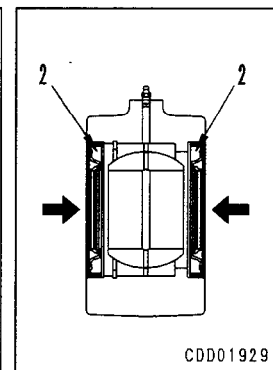
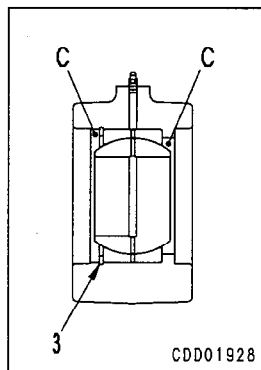
- ★ After installing the snap ring, fill front and rear portion **c** of side bushing with grease (G2-LI).

 Amount of grease to fill side bushing: **0.3 ℓ**

- 3) Using press, press fit seal (2).

- ★ Seal press-fitting force : **9.8 - 29.4 kN {1 - 3 ton}**
- ★ Press fit so that the mouthpiece of the seal does not extend from the end face of the equalizer bar.

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

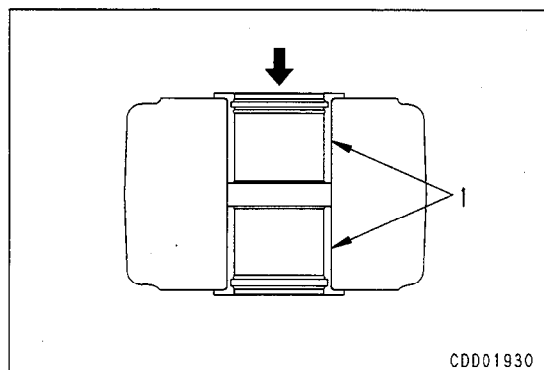


2. Center bushing

Using press, press fit bushing (1).

 Outer circumference of center bushing : **Anti-friction compound (LM-P)**

- ★ Center bushing press-fitting force : **49 - 186.2 kN {95 - 19 ton}**




ASSEMBLY OF BLADE LIFT VALVE ASSEMBLY

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


1. Assembly of shuttle valve assembly

Assemble ball (31), then fit O-ring and install plug (30).

 Plug : $34.3 \pm 4.9 \text{ Nm}$ $\{3.5 \pm 0.5 \text{ kgm}\}$


2. Assembly of check valve assembly

Assemble valve (29) and spring (28), then fit O-ring and install plug (27).

 Plug : $367.5 \pm 24.5 \text{ Nm}$ $\{37.5 \pm 2.5 \text{ kgm}\}$

3. Assembly of suction valve assembly

Assemble valve (26) and spring (25), then fit O-ring and install plug (24).

 Plug : $514.5 \pm 24.5 \text{ Nm}$ $\{52.5 \pm 2.5 \text{ kgm}\}$

4. Assembly of main relief, shuttle valve assembly

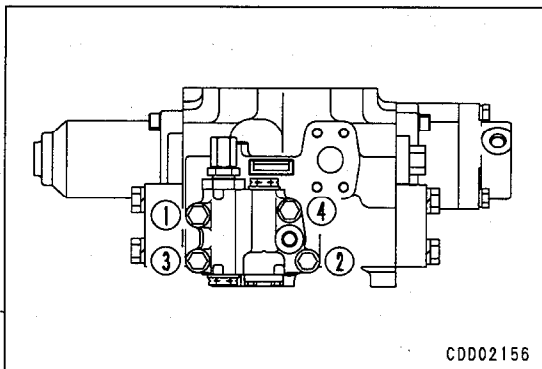
Fit O-ring and install main relief and shuttle valve assembly (18).

★ Tighten the mounting bolts in the order ① - ④.

 Mounting bolt :

1st step $34.3 \pm 4.9 \text{ Nm}$ $\{3.5 \pm 0.5 \text{ kgm}\}$


2nd step $66.15 \pm 7.35 \text{ Nm}$ $\{6.75 \pm 0.75 \text{ kgm}\}$




★ If the main relief valve was disassembled, carry out adjustments after installing the valve assembly to the chassis. For details, see TESTING AND ADJUSTING, Measuring and adjusting work equipment hydraulic pressure.

5. Assembly of demand valve assembly

1) Assemble seal (17) and spool (16), then fit O-ring and install case (15).

 Mounting bolt : $186.2 \pm 9.8 \text{ Nm}$ $\{19 \pm 1 \text{ kgm}\}$

2) Assemble spring (14) and install case (13).


 Mounting bolt : $186.2 \pm 9.8 \text{ Nm}$ $\{19 \pm 1 \text{ kgm}\}$

6. Assembly of main spool assembly

1) Assemble spool (12), then fit O-ring and install case (11).

2) Assemble retainer (10) and spring (9), then fit O-ring and install case (8).

3) Assemble retainer (7), spacer (6), spring (5), retainer (4), and washer (3), and install bolt (2).

 Mounting bolt : $110.25 \pm 12.25 \text{ Nm}$ $\{11.25 \pm 1.25 \text{ kgm}\}$

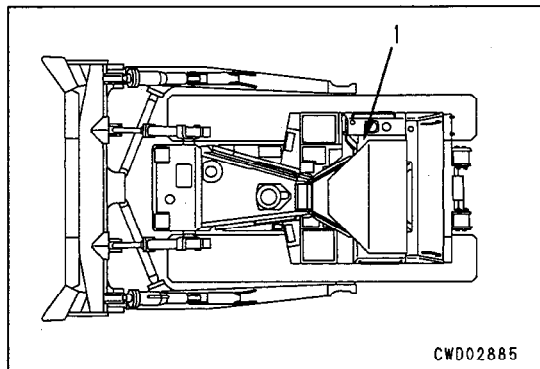
★ Tighten the bolt with the spool assembled inside the body.

4) Fit O-ring and install case (1).

REMOVAL OF BLADE PPC VALVE ASSEMBLY

⚠ Lower the work equipment to the ground and stop the engine. Release the remaining pressure in the hydraulic piping. For details, see TESTING AND ADJUSTING, Releasing remaining pressure from hydraulic circuit. Then loosen the oil filler cap slowly to release the pressure inside the hydraulic tank.

1. Remove operator's cab right cover (1).

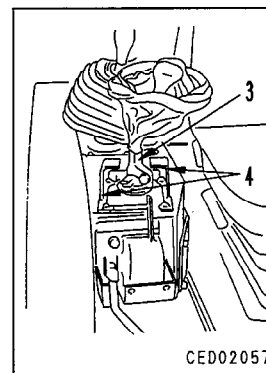
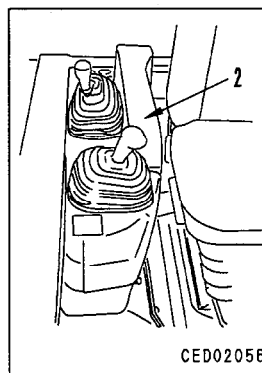


2. Remove right console (2).

★ Disconnect the wiring connectors (CN262 and CN263) inside the console.

3. Loosen lock bolt of lever (3), then pull out lever together with boot.

4. Remove brackets (4).



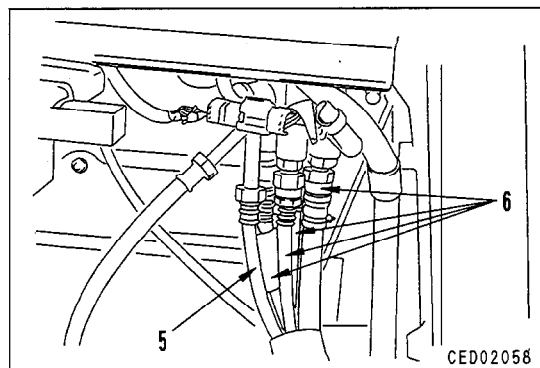
5. Disconnect hose (5).

6. Disconnect 4 PPC hoses (6).

★ The PPC hoses are distinguished by color bands.

※ 1

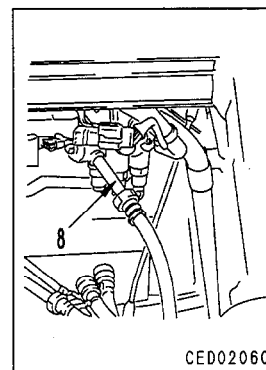
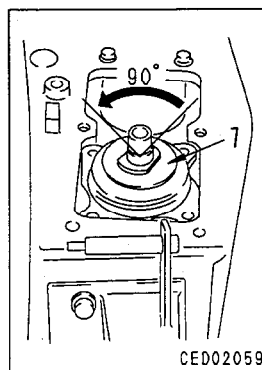
※ 2



7. Remove mounting bolts, rotate blade PPC valve assembly (7) 90° as shown in diagram, then tighten mounting bolts temporarily.

8. Disconnect hose (8).

※ 3



REMOVAL OF BLADE TILT CYLINDER ASSEMBLY

⚠ Lower the work equipment to the ground completely and stop the engine.

1. Remove mounting bolts and lower cover (1) on top of frame.

2. Sling cylinder assembly, and remove lock plate, then remove pin (2). ※ 1

⚠ Start the engine, retract the piston rod fully, then tie the piston rod with wire to prevent it from falling out.

3. Disconnect hoses (3).

⚠ Release the remaining pressure in the hydraulic circuit. For details, see TESTING AND ADJUSTING, Releasing remaining pressure in hydraulic circuit.

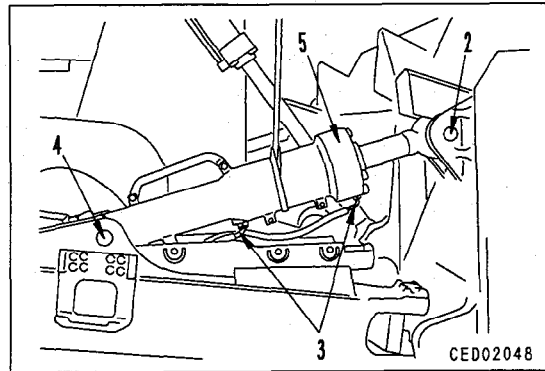
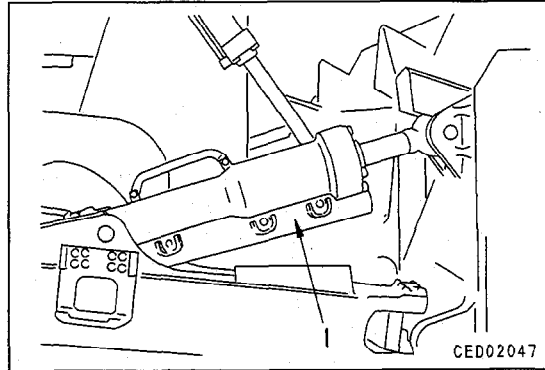
★ Fit blind plugs to prevent dirt or dust from entering the piping.

4. Remove lock plate, then remove pin (4), and lift off blade tilt cylinder assembly (5). ※ 2

★ When lifting off, be careful not to damage the hoses at the bottom end.



Blade tilt cylinder assembly : 310 kg



INSTALLATION OF BLADE TILT CYLINDER ASSEMBLY

• Carry out installation in the reverse order to removal.

※ 1 ※ 2



Pin : Grease (G2-LI)

• **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.

• **Bleeding air**

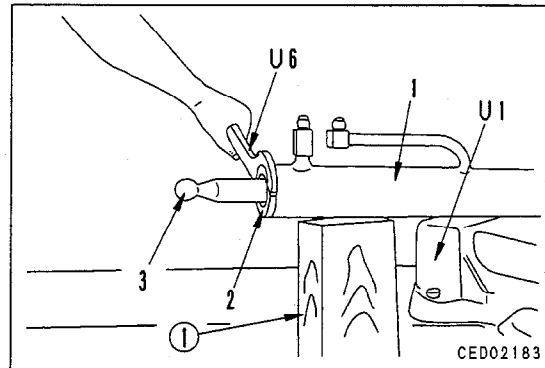
Bleed the air from the piping.

For details, see TESTING AND ADJUSTING, Bleeding air from hydraulic cylinder.

DISASSEMBLY OF RIPPER PIN-PULLER CYLINDER ASSEMBLY

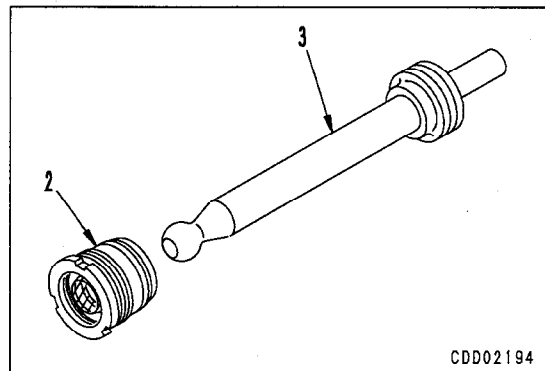
1. Cylinder assembly

- 1) Set pin-puller cylinder assembly (1) to tool U1.
- 2) Using tool U6, loosen cylinder head assembly (2).
- 3) Remove piston rod (3) together with cylinder head assembly (2).
 - ★ Put an oil container under the cylinder to catch the oil.

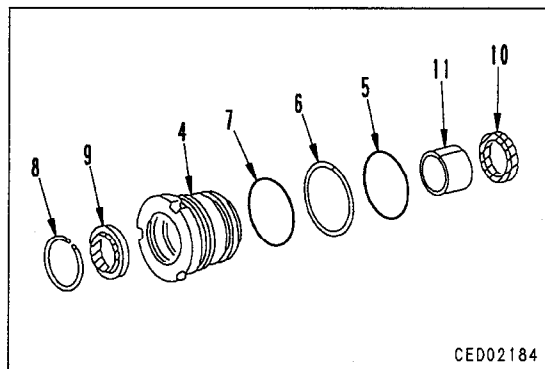


2. Cylinder head assembly

- 1) Remove cylinder head assembly (2) from piston rod (3).

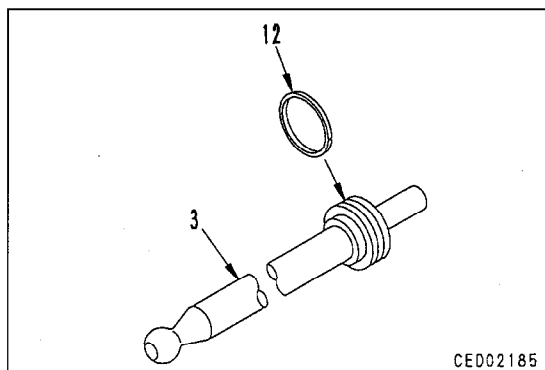


- 2) Remove O-ring (5) and backup ring (6).
- 3) Remove O-ring (7).
- 4) Remove snap ring (8), then remove dust seal (9).
- 5) Remove rod packing (10), then remove bushing (11).



3. Piston rod assembly

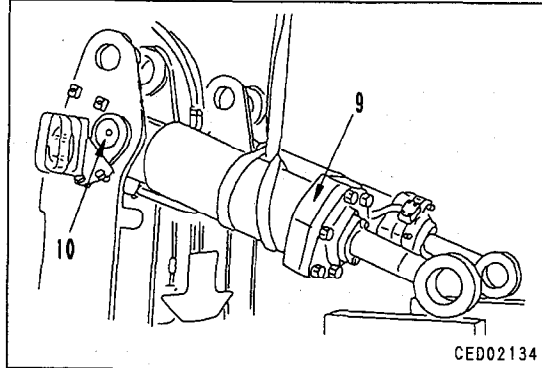
- Remove piston ring (12) from piston rod (3).



9. Sling lift cylinder assembly (9), then remove pin (10) and lift off lift cylinder assembly (9).



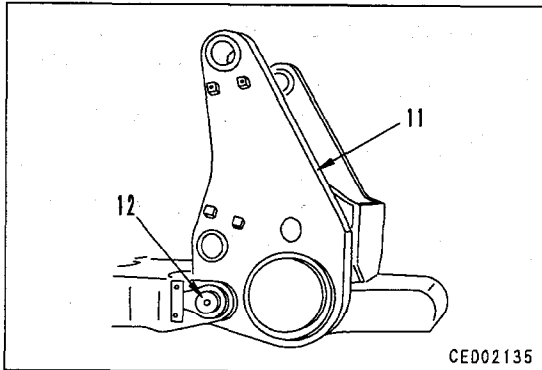
Lift cylinder assembly : 350 kg



10. Sling beam (11), then remove left and right pins (12) and lift off beam (11).



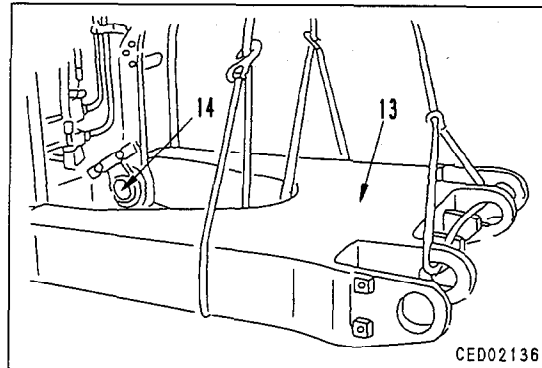
Beam : 2000 kg



11. Sling arm (13), then remove left and right pins (14) and lift off arm (13).



Arm : 1000 kg




INSTALLATION OF FLOOR FRAME ASSEMBLY

- Carry out installation in the reverse order to removal.

※ 1

- ★ Install the hoses without twisting or interference.
- ★ Install the air conditioner circuit hoses carefully to prevent dirt, dust, or water from getting inside the hoses.
- ★ Check that there are O-rings at the piping connection of the air conditioner hoses before installing.
Coat the O-rings thoroughly with compressor oil (Shell Suniso 4G or 5G).

 Tighten the air conditioner gas piping to the following tightening torques.

Thread size	Tightening torque Nm {kgm}
16 × 1.5	13.23±1.47 Nm {1.35±0.15 kgm}
22 × 1.5	22.05±2.45 Nm {2.25±0.25 kgm}
24 × 1.5	31.85±2.45 Nm {3.35±0.25 kgm}
M6 bolt (receiver portion)	5.39±1.47 Nm {0.55±0.15 kgm}
M6 bolt (compressor portion)	9.8±1.96 Nm {1.0±0.2 kgm}

※ 2 ※ 3


- ★ Adjust the directional, speed control, and parking brake linkage.

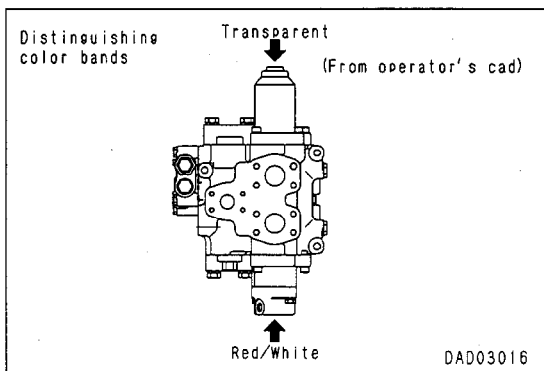
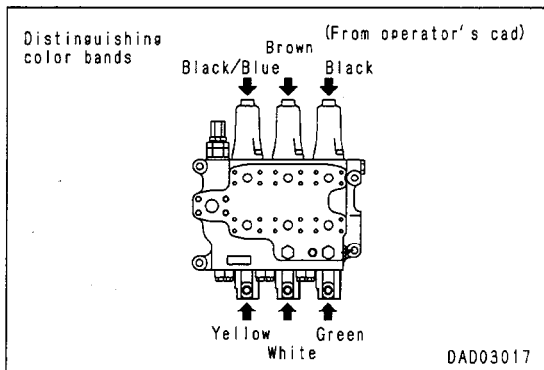
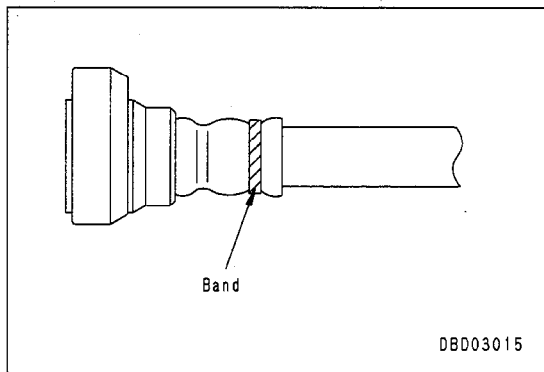
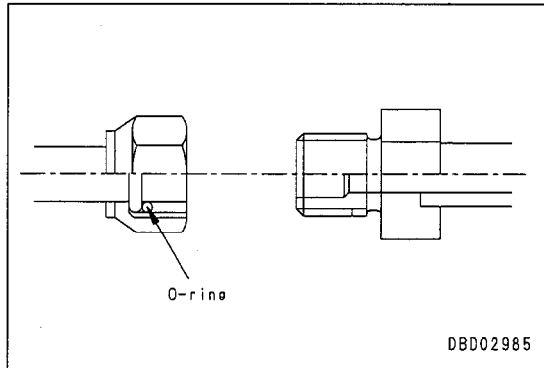
※ 4

- ★ For details, see TESTING AND ADJUSTING Adjusting joystick (steering, directional, gear shift lever) parking brake linkage.

※ 5

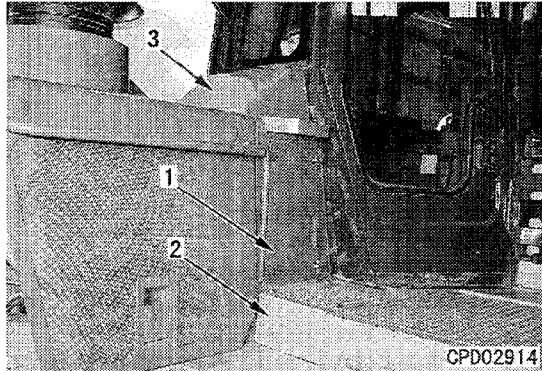
- ★ Adjust the brake pedal linkage.
For details, see TESTING AND ADJUSTING, Adjusting brake pedal linkage.

 Brake pedal linkage turnbuckle :
45.56 ± 12.25 Nm {4.76 ± 1.25 kgm}



REMOVAL OF AIR CONDITIONER UNIT

1. Remove covers (1), (2), and (3).



2. Remove cover (4).

3. Disconnect 2 air conditioner hoses (5).

★ Loosen the sleeve nut of each hose a little to release the all air conditioner gas (R134a), then disconnect the hose.

★ Disconnect the hoses on the air conditioner side, and keep them on the engine side.

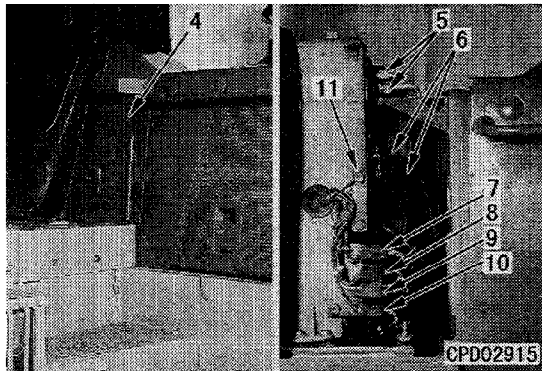
★ Plug the hoses to prevent dirt, water, etc. from entering.

★ Take care not to damage or miss the O-rings.

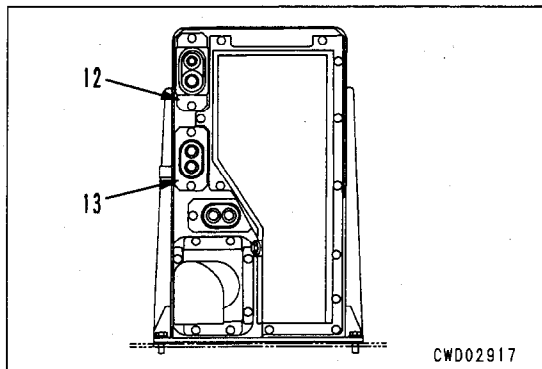
4. Disconnect 2 heater hoses (6).

★ Close the heater valve on the engine side.

5. Disconnect wiring connectors (CN-S13) (7), (CN-215) (8), (CN-214) (9), (CN-ADA) (10), and (CN-206) (11).

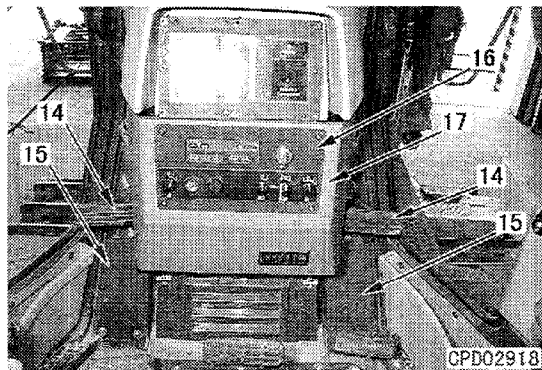


6. Remove covers (12) and (13).

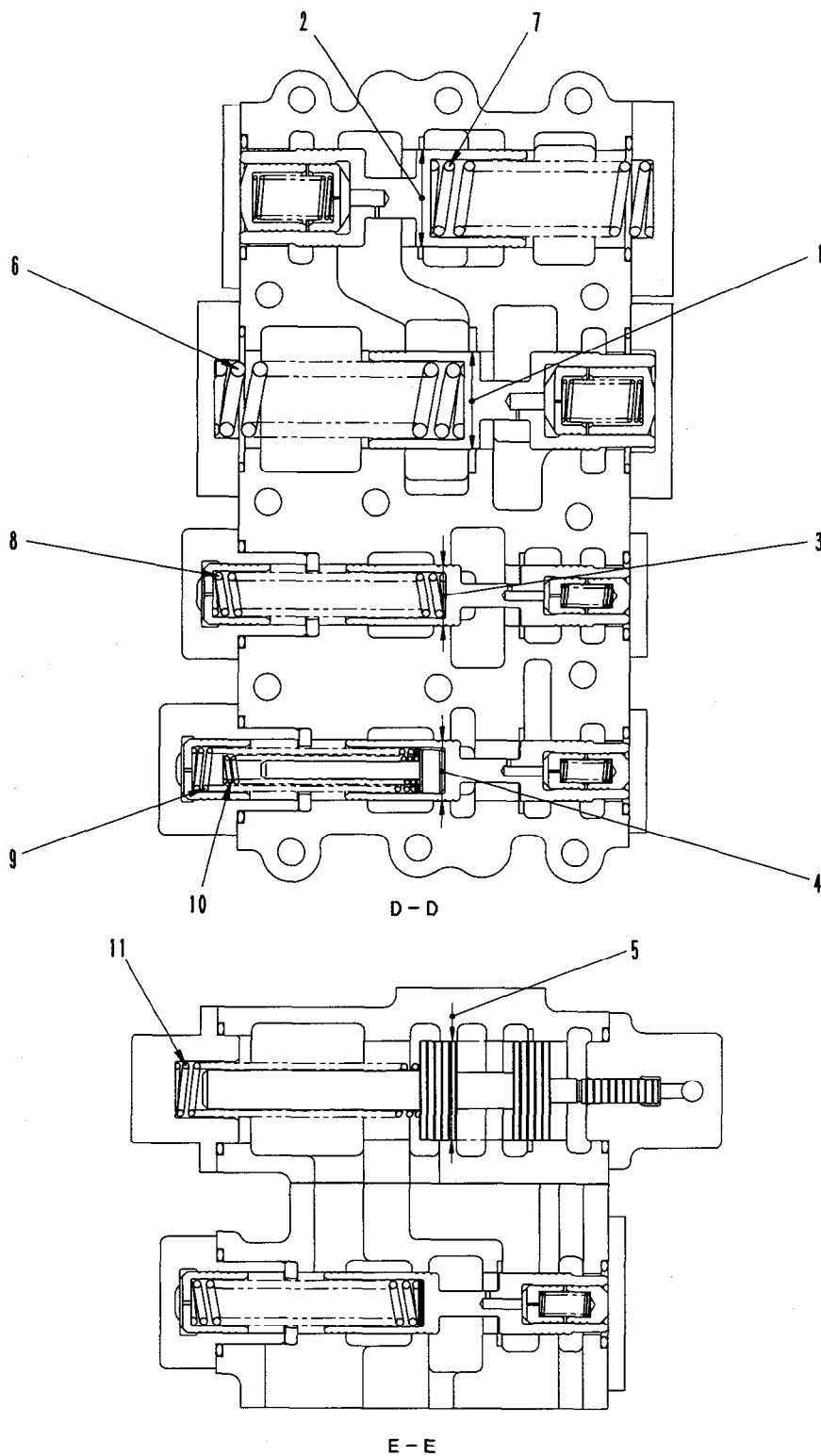


7. Remove step (14), then remove cover (15).

8. Remove panel (16), then remove cover (17).



TORQUE CONVERTER VALVE



SAD01225

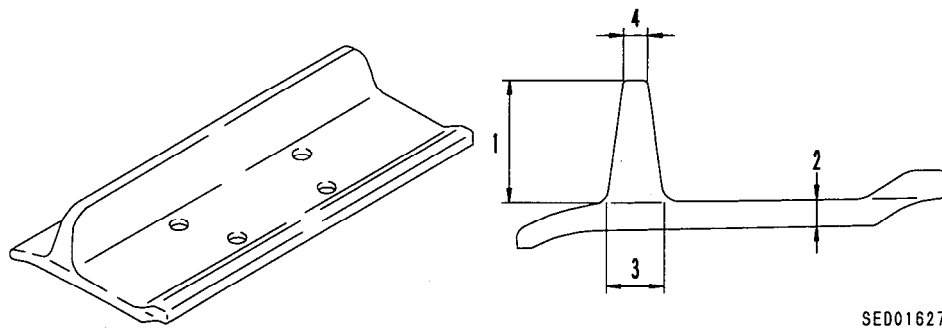
Unit: mm

No.	Check item	Criteria				Remedy	
1	Thickness of brake, clutch plate	Standard size		Repair limit		Replace	
		2.9		2.5			
	Distortion of brake, clutch plate	Tolerance		Repair limit		Repair or replace	
		less than 0.3		0.4			
2	Thickness of brake, clutch disc	Standard size		Repair limit		Replace	
		4.7		4.2			
	Distortion of brake, clutch	Tolerance		Repair limit		Repair or replace	
		less than 0.3		0.4			
3	Overall assembled thickness of brake plates and discs	Standard size		Repair limit		Replace	
		68.4		64.7			
4	Overall assembled thickness of clutch plates and discs	Standard size		Repair limit			
		68.4		65.4			
5	Backlash between brake, clutch disc and brake hub	Standard clearance		Repair limit			
		0.4 – 0.7		1.0			
6	Backlash between bevel gear and pinion	0.3 – 0.4		0.75		Adjust or replace	
7	Clearance between piston seal ring groove and seal ring	0.5 – 0.8		0.8		Replace	
8	Clearance between cage seal ring groove and seal ring	0.5 – 0.8		0.8			
9	Inside diameter of cage seal ring contact surface	Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
10	Inside diameter of piston seal ring contact surface	245	-0.5	+0.081	0.5 – 0.781		
			-0.7	0			
11	Brake belleville spring	Standard size			Repair limit		Replace
		Free length	Installed length	Installed load	Free length	Installed load	
		17.1	11.2	35.8 KN {3,650 kg}	16.5	33.9 KN {3,460 kg}	
12	Clutch belleville spring	17.6	11.35	37.9 KN {3,860 kg}	17.0	36.0 KN {3,670 kg}	
13	Interference between bevel gear and reamer bolt	Standard size	Tolerance		Standard interference	Interference limit	
			Shaft	Hole			
		16	+0.019 +0.001	+0.027 0	-0.026 – 0.019	0.02	
14	Runout of back face of bevel gear	Repair limit: 0.05 (measure after installing to bevel gear)				Repair or replace	
15	Preload of bevel gear shaft taper roller bearing	Standard rotating torque: 4.9 – 5.9 Nm {0.5 – 0.6 kgm} (At tip of bevel gear teeth with bevel pinion and gear not meshed: 23.5 – 28.4 N {2.4 – 2.9 kg})				Adjust	
16	Standard shim thickness for bearing cage	2.0				Adjust shim	

Unit: mm

No.	Check item	Criteria				Remedy
		Standard size		Repair limit		
1	Outside diameter of protruding part	927		—		Rebuild or replace
2	Outside diameter of tread surface	880		855		
3	Depth of tread	23.5		—		
4	Overall width	294.0		—		
5	Width of tread	79.0		—		
6	Clearance between shaft and bushing	Standard size	Tolerance		Standard clearance	Clearance limit
		155	Shaft	Hole		
7	Interference between idler and bushing	Standard size	Tolerance		Standard interference	Interference limit
		165	Shaft	Hole		
8	Width of shaft flange	Standard clearance		Clearance limit		Replace bushing
		242.0		—		

SHINGLE SHOE

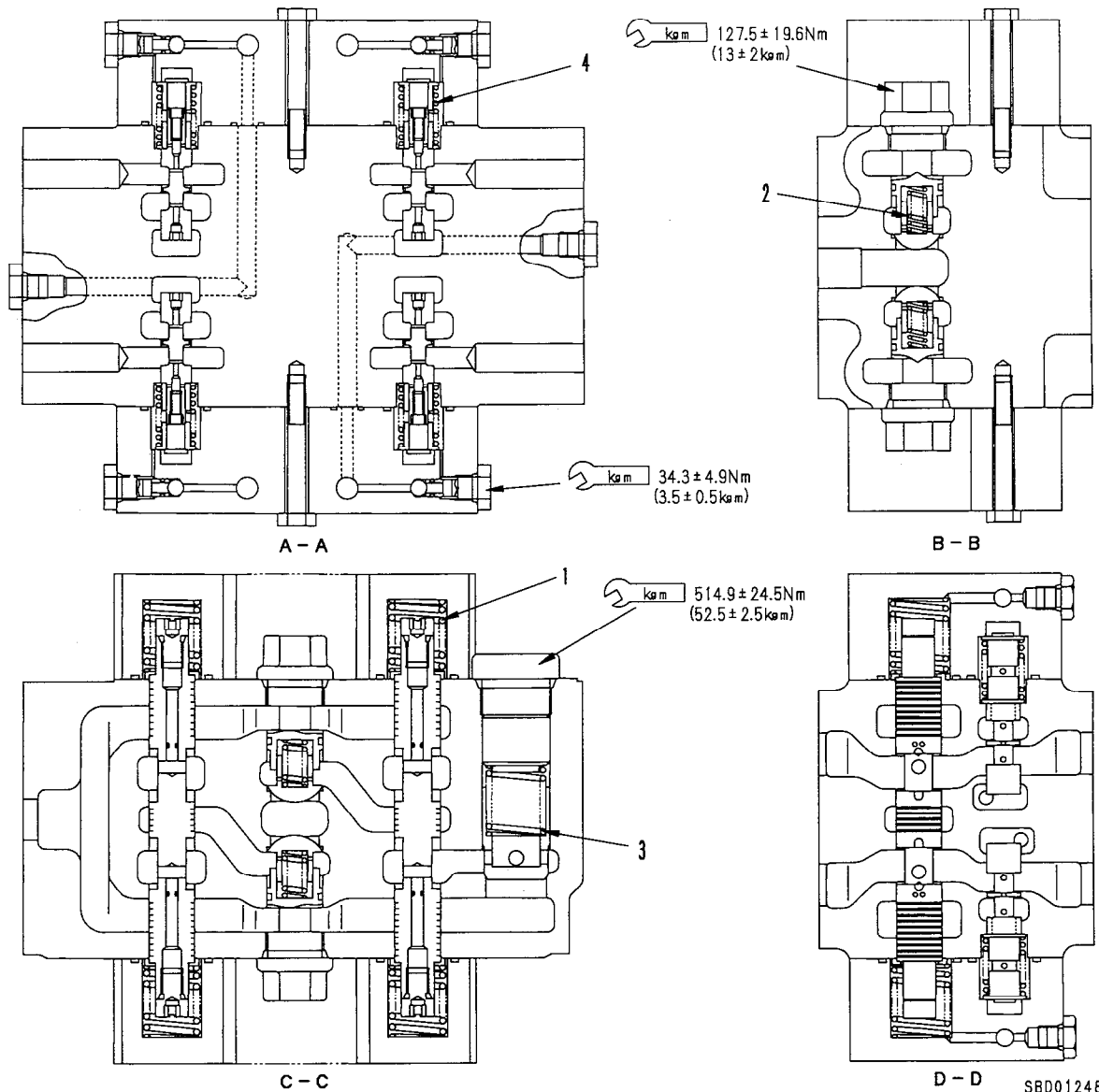


SED01627

Unit: mm

No.	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Height	93	30	Repair by build-up welding or replace
2	Thickness	23		
3	Length of base	45		
4	Length of tip	31		

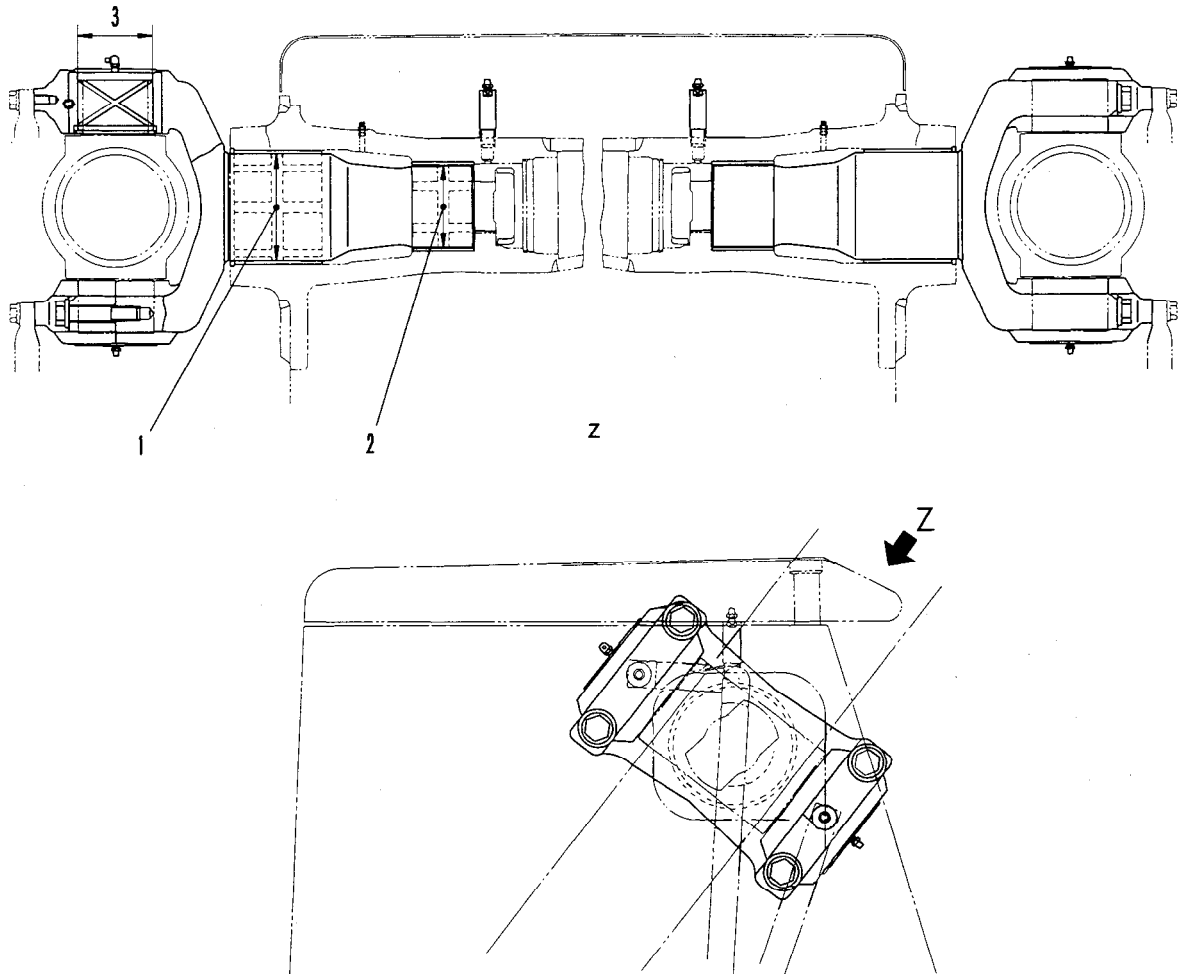
• RIPPER HIGH VALVE



S8D01248
Unit: mm

No.	Check item	Criteria				Remedy	
		Standard size		Repair limit			
		Free length	Installed length	Installed load	Free length	Installed load	
1	Hi valve return spring	79.5	42.0	152.0 N {15.5 kg}	72.0	121.6 N {12.4 kg}	Replace
2	Check valve spring	32.6	27.0	30.2 N {3.08 kg}	31.5	24.1 N {2.46 kg}	
3	Suction valve spring	75.7	43.5	9.8 N {1.0 kg}	69.3	7.9 N {0.8 kg}	
4	Constant differential pressure valve spring	57.4	33.5	169.7 N {17.3 kg}	52.6	135.3 N {13.8 kg}	

CYLINDER STAY



SBD01255

Unit: mm

No.	Check item	Criteria				Remedy	
		Standard size	Tolerance		Standard clearance		Clearance limit
Shaft	Hole						
1	Clearance between cylinder yoke and bushing	150	-0.085 -0.148	+0.063 0	0.085 - 0.211	0.5	Replace
2	Clearance between cylinder yoke and bushing	115	-0.072 -0.126	+0.054 0	0.072 - 0.180	0.5	
3	Clearance between lift cylinder support shaft and bushing	105	-0.120 -0.207	+0.035 0	0.120 - 0.242	0.5	

90 OTHERS

Electric circuit diagram

Chassis electric circuit diagram (1/2)..... 90-3

Chassis electric circuit diagram (2/2)..... 90-5

Electric circuit diagram inside cab..... 90-7

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