SHOP MANUAL

KOMATSU

D65EX-12
D65PX-12

(EU SPEC.)

MACHINE MODEL	SERIAL NUMBER
D65EX-12	**65209 and up**
D65PX-12	**65275 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.
- D65EX/PX-12 mount the SA6D125E-3 engine.
  For details of the engine, see the SA6D125E Series Engine Shop Manual.

Printed in Japan 03-02 (03)

METHOD OF DISASSEMBLING, CONNECTING PUSH-PULL TYPE COUPLER

⚠ Before carrying out the following work, release the residual pressure from the hydraulic tank. For details, see TESTING AND ADJUSTING, Releasing residual pressure from hydraulic tank.

⚠ Even if the residual pressure is released from the hydraulic tank, some hydraulic oil flows out when the hose is disconnected. Accordingly, prepare an oil receiving container.

Disconnection

1) Release the residual pressure from the hydraulic tank. For details, see TESTING AND ADJUSTING, Releasing residual pressure from hydraulic tank.

2) Hold adapter (1) and push hose joint (2) into mating adapter (3). (Fig. 1)
   - ★ The adapter can be pushed in about 3.5 mm.
   - ★ Do not hold rubber cap (4).

3) After hose joint (2) is pushed into adapter (3), press rubber cap (4) against (3) until it clicks. (Fig. 2)

4) Hold hose adapter (1) or hose (5) and pull it out. (Fig. 3)
   - ★ Since some hydraulic oil flows out, prepare an oil receiving container.

Connection

1) Hold hose adapter (1) or hose (5) and insert it in mating adapter (3), aligning them with each other. (Fig. 4)
   - ★ Do not hold rubber cap (4).

2) After inserting the hose in the mating adapter perfectly, pull it back to check its connecting condition. (Fig. 5)
   - ★ When the hose is pulled back, the rubber cap moves toward the hose about 3.5 mm. This does not indicate abnormality, however.

Type 1

Fig. 1

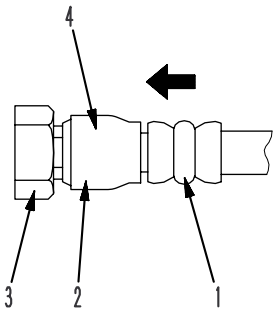


Fig. 2

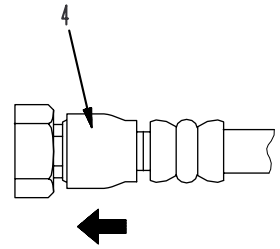


Fig. 3

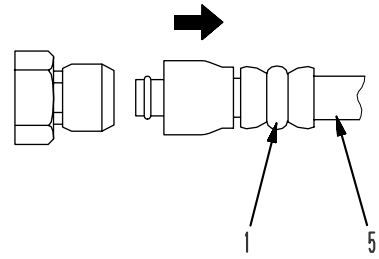


Fig. 4

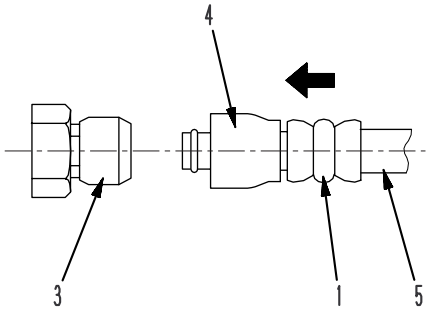
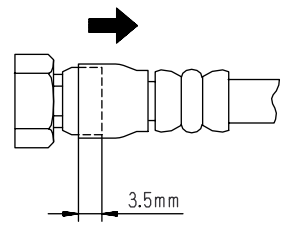


Fig. 5



CWP10701

Liter to U.S. Gallon

1ℓ = 0.2642 U.S. Gal

	0	1	2	3	4	5	6	7	8	9
0	0	0.264	0.528	0.793	1.057	1.321	1.585	1.849	2.113	2.378
10	2.642	2.906	3.170	3.434	3.698	3.963	4.227	4.491	4.755	5.019
20	5.283	5.548	5.812	6.076	6.340	6.604	6.869	7.133	7.397	7.661
30	7.925	8.189	8.454	8.718	8.982	9.246	9.510	9.774	10.039	10.303
40	10.567	10.831	11.095	11.359	11.624	11.888	12.152	12.416	12.680	12.944
50	13.209	13.473	13.737	14.001	14.265	14.529	14.795	15.058	15.322	15.586
60	15.850	16.115	16.379	16.643	16.907	17.171	17.435	17.700	17.964	18.228
70	18.492	18.756	19.020	19.285	19.549	19.813	20.077	20.341	20.605	20.870
80	21.134	21.398	21.662	21.926	22.190	22.455	22.719	22.983	23.247	23.511
90	23.775	24.040	24.304	24.568	24.832	25.096	25.361	25.625	25.889	26.153

Liter to U.K. Gallon

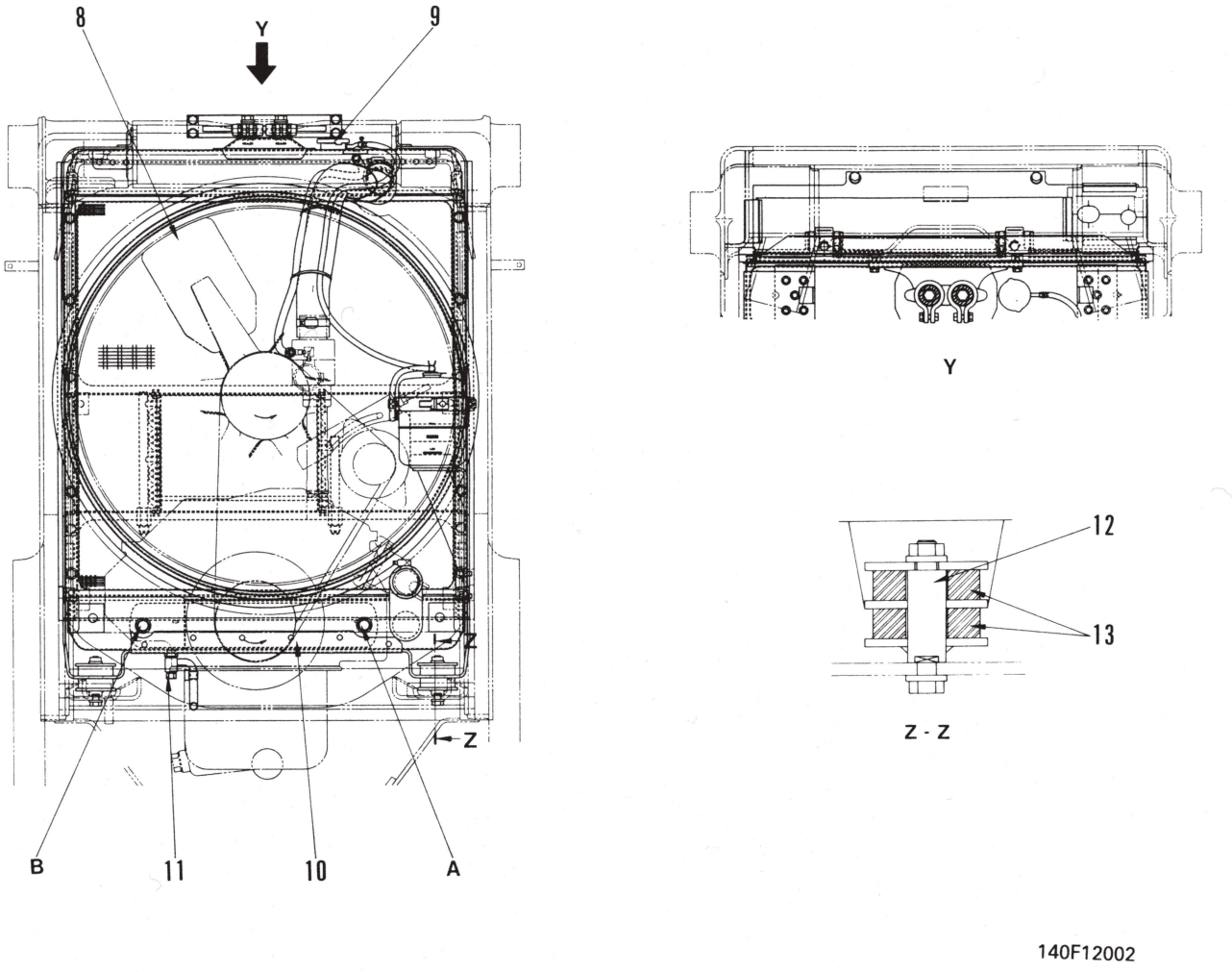
1ℓ = 0.21997 U.K. Gal

	0	1	2	3	4	5	6	7	8	9
0	0	0.220	0.440	0.660	0.880	1.100	1.320	1.540	1.760	1.980
10	2.200	2.420	2.640	2.860	3.080	3.300	3.520	3.740	3.950	4.179
20	4.399	4.619	4.839	5.059	5.279	5.499	5.719	5.939	6.159	6.379
30	6.599	6.819	7.039	7.259	7.479	7.969	7.919	8.139	8.359	8.579
40	8.799	9.019	9.239	9.459	9.679	9.899	10.119	10.339	10.559	10.778
50	10.998	11.281	11.438	11.658	11.878	12.098	12.318	12.528	12.758	12.978
60	13.198	13.418	13.638	13.858	14.078	14.298	14.518	14.738	14.958	15.178
70	15.398	15.618	15.838	16.058	16.278	16.498	16.718	16.938	17.158	17.378
80	17.598	17.818	18.037	18.257	18.477	18.697	18.917	19.137	19.357	19.577
90	19.797	20.017	20.237	20.457	20.677	20.897	21.117	21.337	21.557	21.777

SPECIFICATIONS

Machine model				D65EX-12	D65PX-12
Serial Numbers				65209 and up	65275 and up
Weight	Operating weight				
		• bare tracktor	kg	15,670	17,000
		• with straight tiltdozer + cab		18,900	20,250
		• with straight tilt + ripper + ROPS cab		[20,920]	[21,200]
		• with straight tilt + T/winch + ROPS cab		[20,750]	[21,200]
Performance	Min. truning radius		m	(Counterrotation turn)	(Counterrotation turn)
	Gradeability		deg	30	30
	Stability (front, rear, left, right)		deg	35	35
	Speed ranges	Forward 1st	km/h	3.9	3.9
		Forward 2nd		6.8	6.8
		Forward 3rd		10.6	10.6
		Reverse 1st	km/h	5.0	5.0
		Reverse 2nd		8.6	8.6
		Reverse 3rd		13.4	13.4
	Ground pressure	Bare tractor	kPa {kg/cm²}	52.96 {0.54}	25.50 {0.26}
		Straight tiltdozer		62.76 {0.64}	29.42 {0.30}
		E: Straight tilt + ripper + ROPS		[74.53 {0.76}]	–
		P: Straight tilt + ROPS		–	33.34 {0.34}
Dimensions	Overall length	Bare tractor	mm	4,365	4,425
		With straight tiltdozer		5,260	5,550
	Overall width	Bare tractor	mm	2,390	3,000
		With straight tiltdozer		3,415	3,970
	Overall heights	To tip of exhaust pipe	mm	2,990	3,025
		To top of operator's compartment		2,300	2,335

Note: The values for the weight and ground pressure in [ ] are reference values.

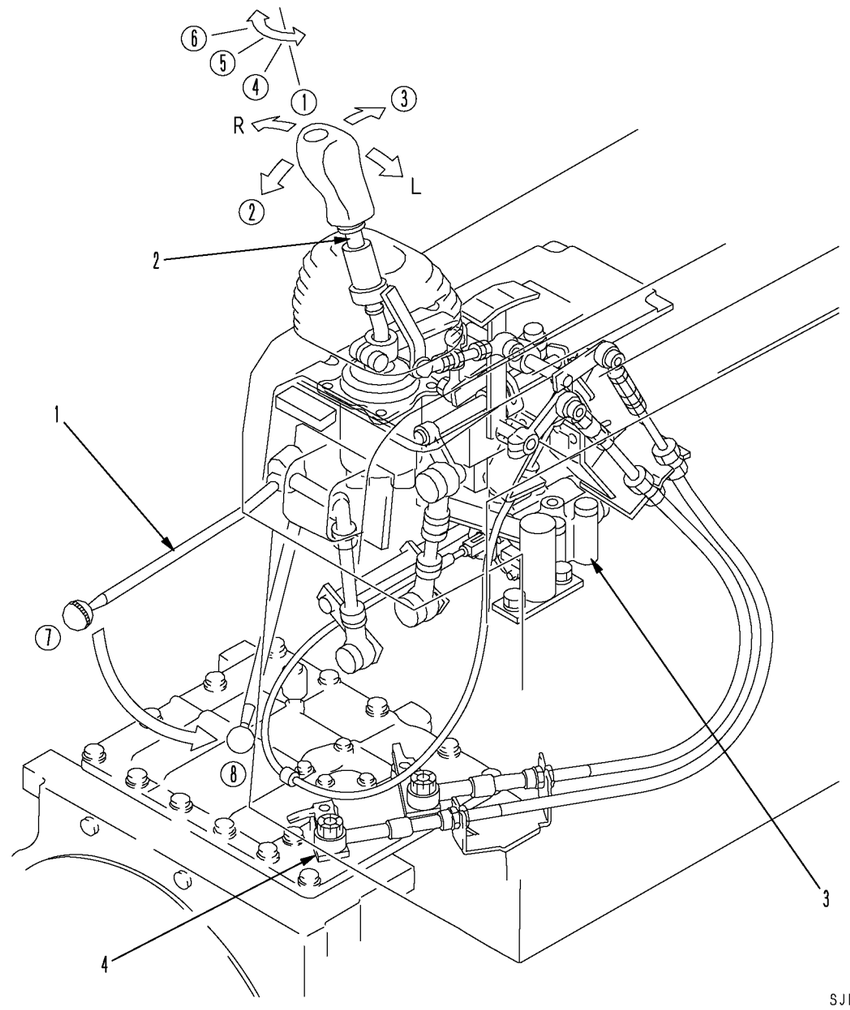


OUTLINE

- A reservoir tank has been installed for the radiator to make it possible to check the radiator water level.
- The power train oil cooler is built into the lower tank.

	Radiator	Power train oil cooler (built into lower tank)	Hydraulic oil cooler
Core type	D–6	PTO–LS	3A–CS
Fin pitch (mm)	3.0	—	3.5
Heat dissipation capacity (kca/h)	115,000	30,500	3,800
Heat dissipation area (m^2)	65.27	1.839	1.86

TRANSMISSION CONTROL



Lever positions
- ① NEUTRAL
- ② FORWARD
- ③ REVERSE
- ④ 1st
- ⑤ 2nd
- ⑥ 3rd
- ⑦ FREE
- ⑧ LOCK

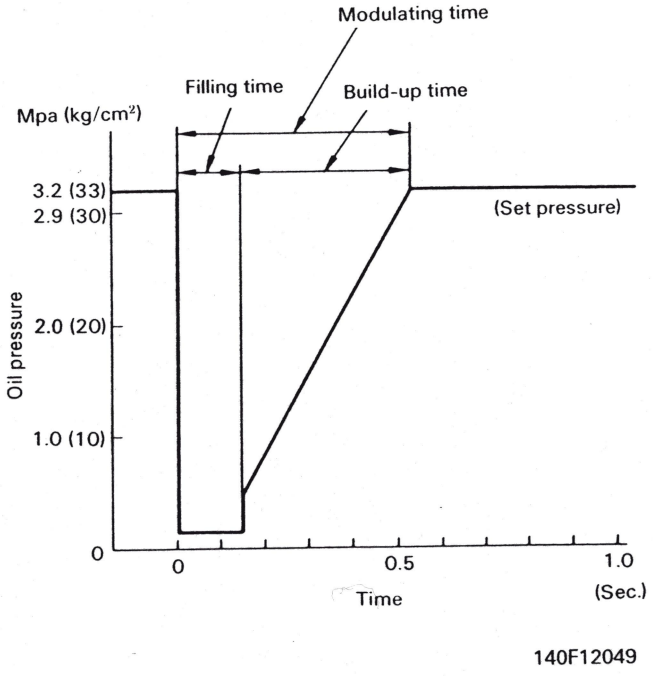
1. Safety lever
2. Joystick (directional change, gear shift)
3. Brake valve
4. Transmission control valve

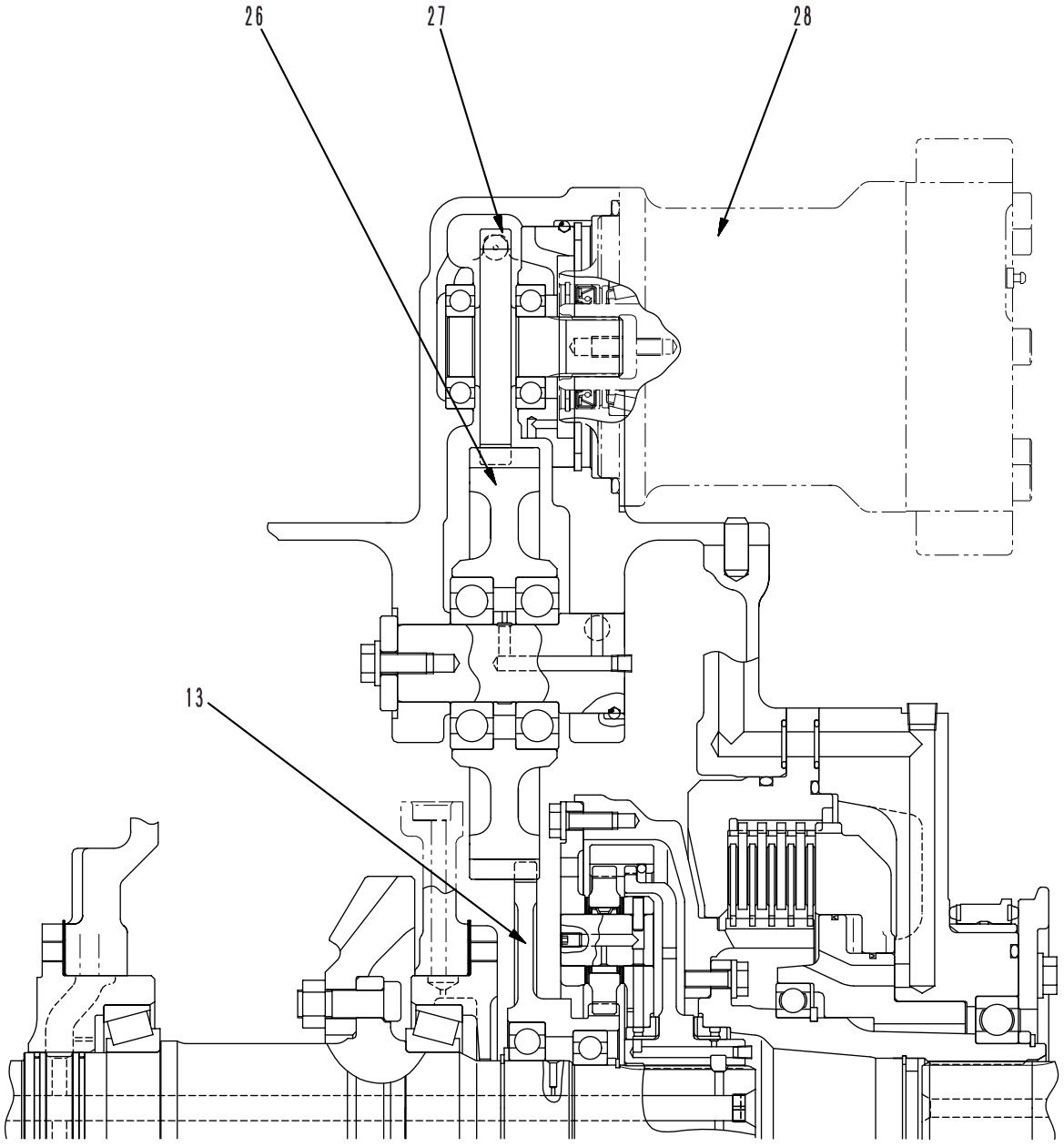
OUTLINE
- The transmission controlled by joystick (2), which changes the direction of travel, and selects the gear shift.

MODULATING VALVE

OUTLINE

- The modulating valve consists of a modulating relief valve and a quick return valve, and acts to modulates the pressure.
- When the gear shift lever is operated to shift gear the clutch is pushed into close contact by the piston. However, is high pressure is suddenly applied, the piston will suddenly engage the clutch. This will make the machine suddenly start, and it will receive an excessive shock.
- To prevent this, the modulating valve is installed. When the gear shift lever is operated to shift gear, the pressure on the piston gradually rises to the set pressure and the clutch is engaged smoothly. This allows the machine to start without any shock, thereby improving the durability of the power train and at the same time providing a comfortable ride for the operator.
- The figure shows the relationship between the time and the increase in the hydraulic pressure of the modulating valve.
  For example, when the gear is shifted from F1 and F2, the oil from the pump passes through the speed valve spool, flows to the second clutch and fills the circuit up to the clutch piston port.
  The time taken for the circuit to be filled up to the clutch piston port is called the “filling time”, and the oil pressure during this time is 0 - 0.5MPa (0 - 5kg/cm^2.)
  When the circuit up to the clutch piston port is filled with oil, the oil pressure starts to rise.
  The time taken for the pressure to rise to the set pressure is called the “built-up time”. The filling time and built-up time together are called the “modulating time”.





B – B

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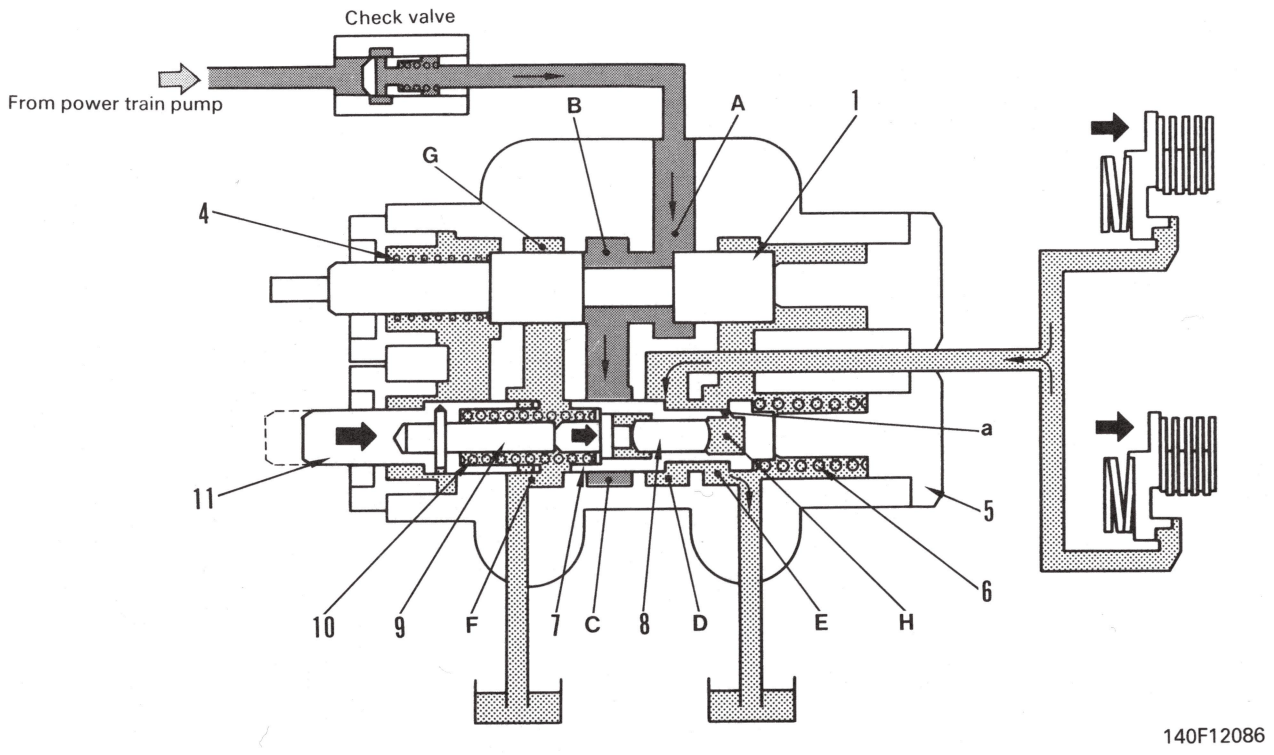
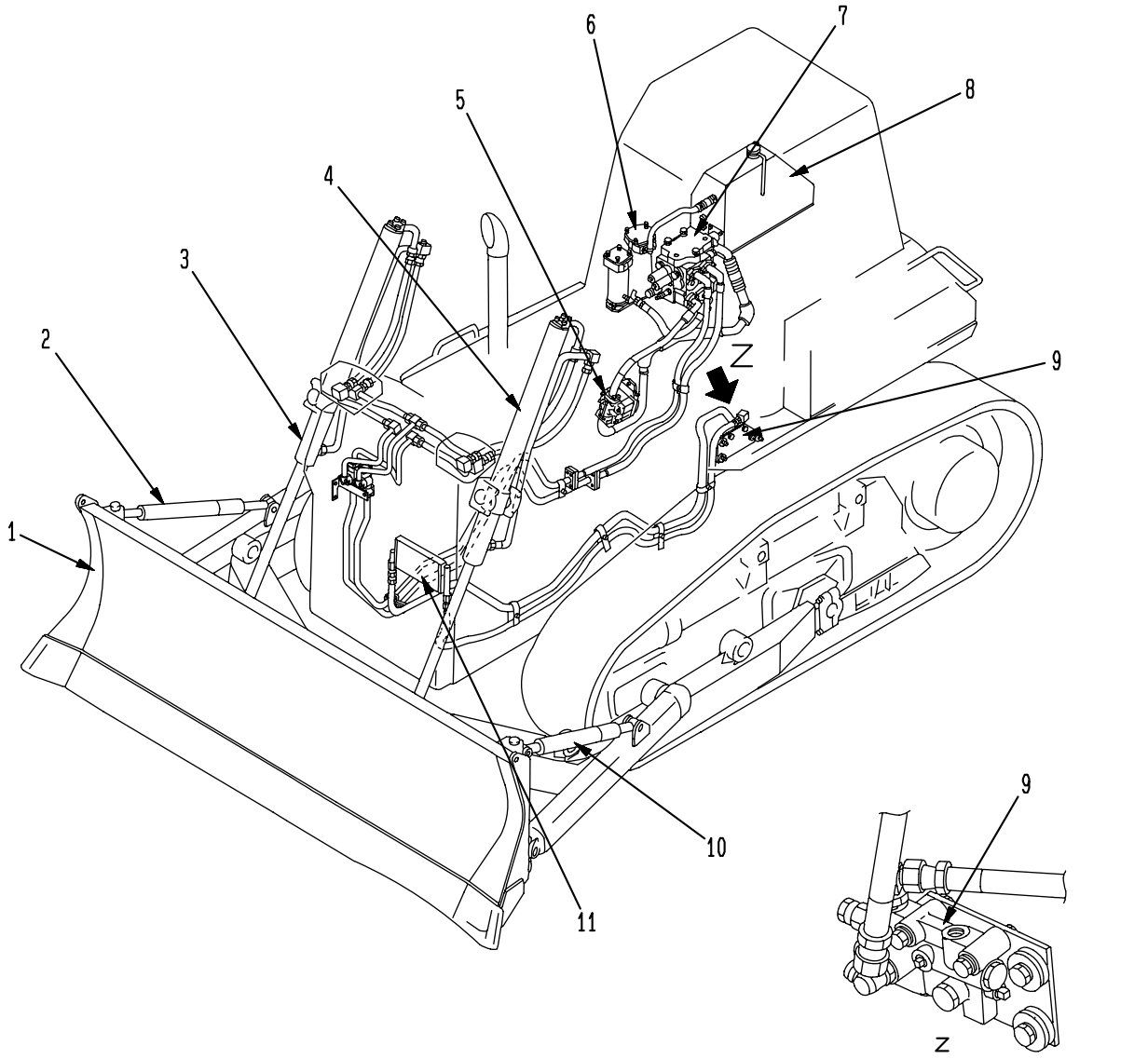
2. When brake is applied (parking brake OFF, brake pedal depressed)



- When the brake pedal is depressed, guide (11) and shaft (9) are pushed to the right in the direction of the arrow, and modulating spring (10) is compressed. The reaction force moves brake valve (7) to the right in the direction of the arrow. When this happens, ports **C** and **D** are closed, and port **D** and drain port **E** are opened, so the oil from the power train pump enters port **A** and stops at port **C**. Some of the oil flowing into the brake piston port and forming the back pressure is drained from port **D** and port **E**, and the rest of the oil passes from port **D** through orifice **a** and enters port **H**.
  However the oil beyond port **D** is drained to port **E**, so the oil pressure drops. The oil entering port **H** pushes piston (8) and the reaction force pushing brake valve (7) to the right in the direction of the arrow becomes smaller, so brake valve (7) is moved to the left in the direction of the arrow by the tension of return spring (6). This closes ports **D** and **E**, so the oil pressure beyond port **D** does not drop any further and is maintained at the same level.
- If the brake pedal is depressed further, the above operation is repeated, and when the valve reaches the end of its stroke, the brake is completely applied.
- The oil pressure beyond port **D** is determined by the tension of return spring (6), which changes the load according to the amount that the brake pedal is operated.
  Therefore, is the brake pedal is depressed only a short distance, the oil pressure beyond port **D** is set at a high level, and the brake is partially applied. If the brake pedal is depressed a large amount, the oil pressure is set at a low level and the brake is applied.

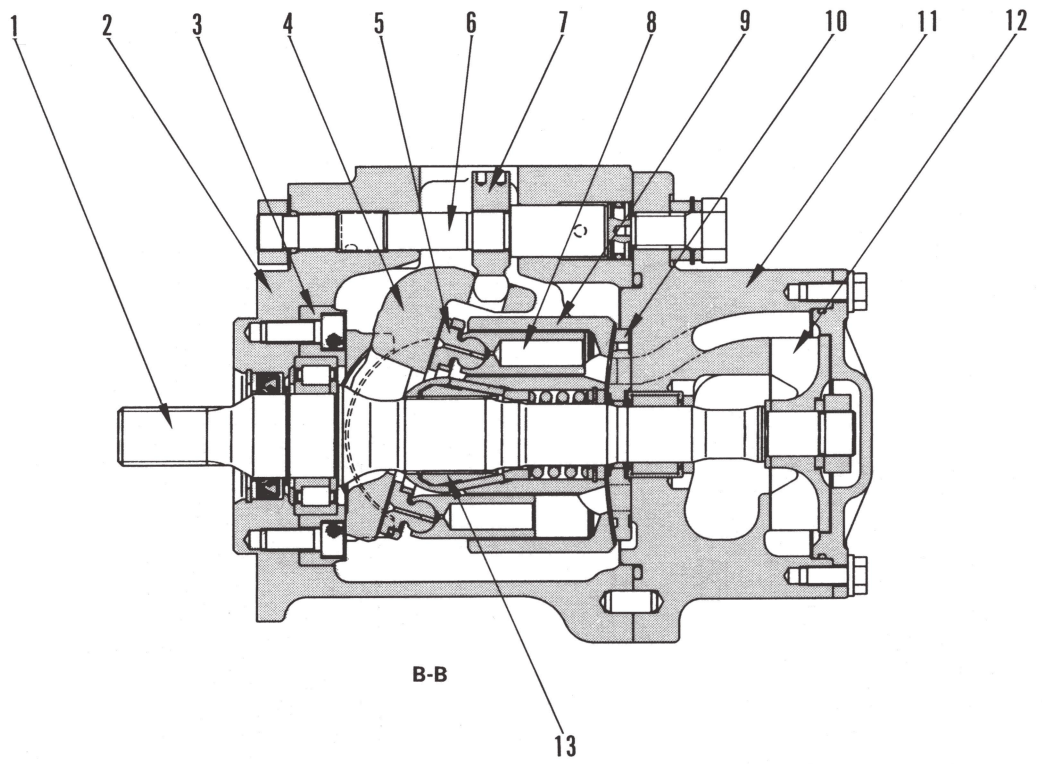
WORK EQUIPMENT HYDRAULIC PIPING DIAGRAM

ANGLEDOZER



SWD04750

1. Blade
2. Right brace
3. Right lift cylinder
4. Left lift cylinder
5. Hydraulic pump (SAL(1)-100)
6. Oil filter
7. Main control valve
8. Hydraulic tank
9. PPC charge valve
10. Left brace
11. Oil cooler



1. Shaft
2. Case
3. Cradle
4. Rocker cam
5. Shoe
6. Servo piston
7. Rod
8. Piston
9. Cylinder block
10. Valve plate
11. End cap
12. Impeller
13. Spline

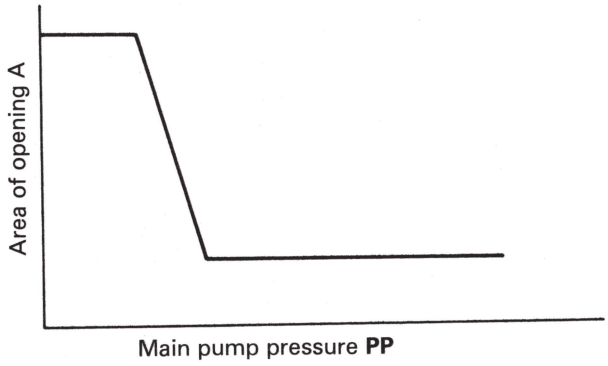
(2) Operation of variable throttle valve

1) Properties of variable throttle valve

- Because the main pump controls its own pressure, there is a tendency for the response speed of the swash plate to be quick at high pressure and slow at low pressure.
  The variable throttle valve has been installed between the **LS** valve and the port at the large diameter end of the servo piston for the following reasons.

  ① To reduce the swash plate speed between MIN and MAX at high pressure; to reduce the impact force on the rod and other parts of the main pump; and to prevent excessive response.
  ② To prevent cavitation at the suction port caused by the sudden increase in the suction volume when changing from MIN to MAX.

- The characteristics of the variable throttle valve are as shown in the diagram below.
  It has the function and property of maintaining the response during operations at low pressure by making the area of the opening smaller at high pressure and the area of the opening larger at low pressure, and by preventing the above problems ① and ② at high pressure.



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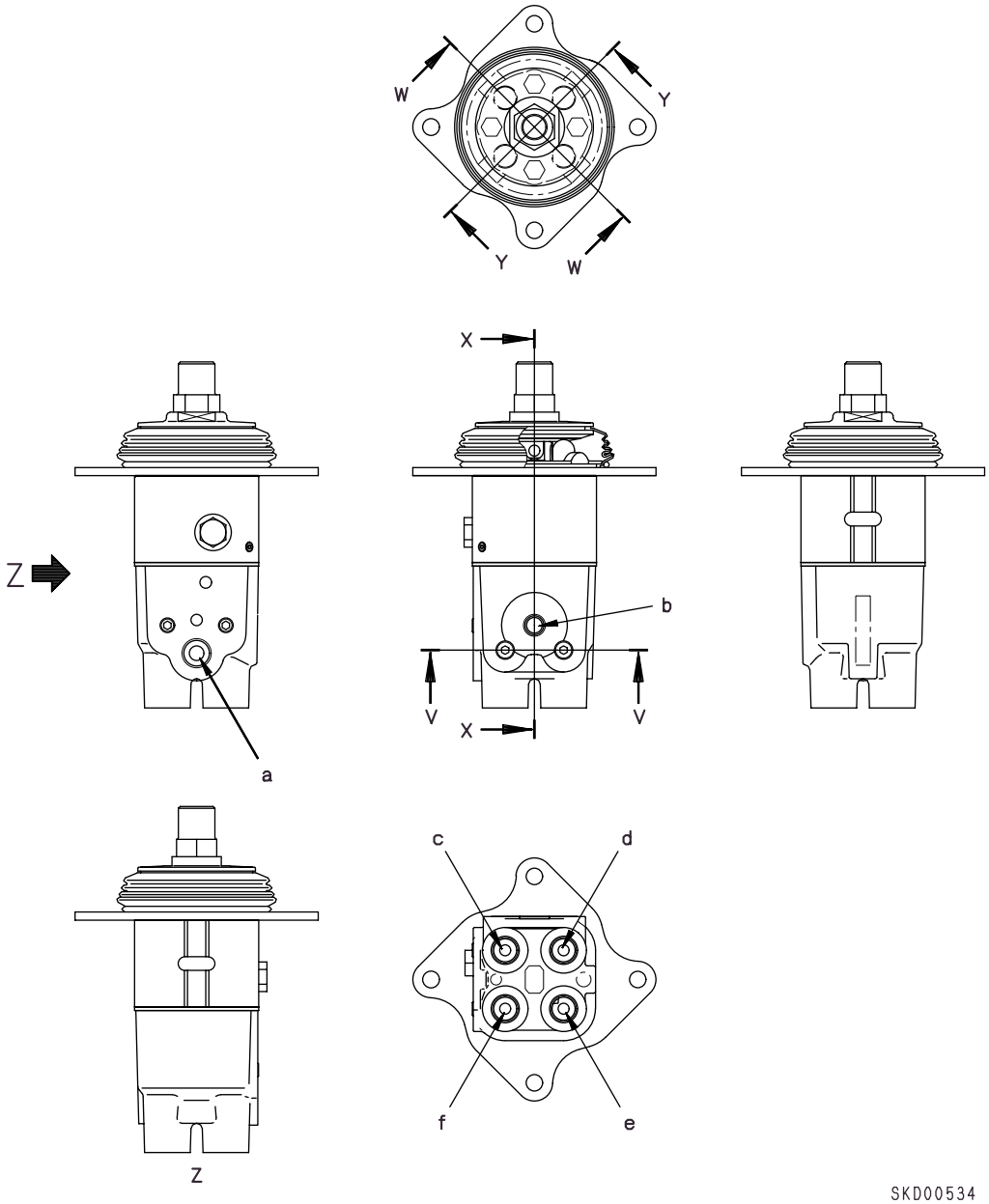
PPC VALVE

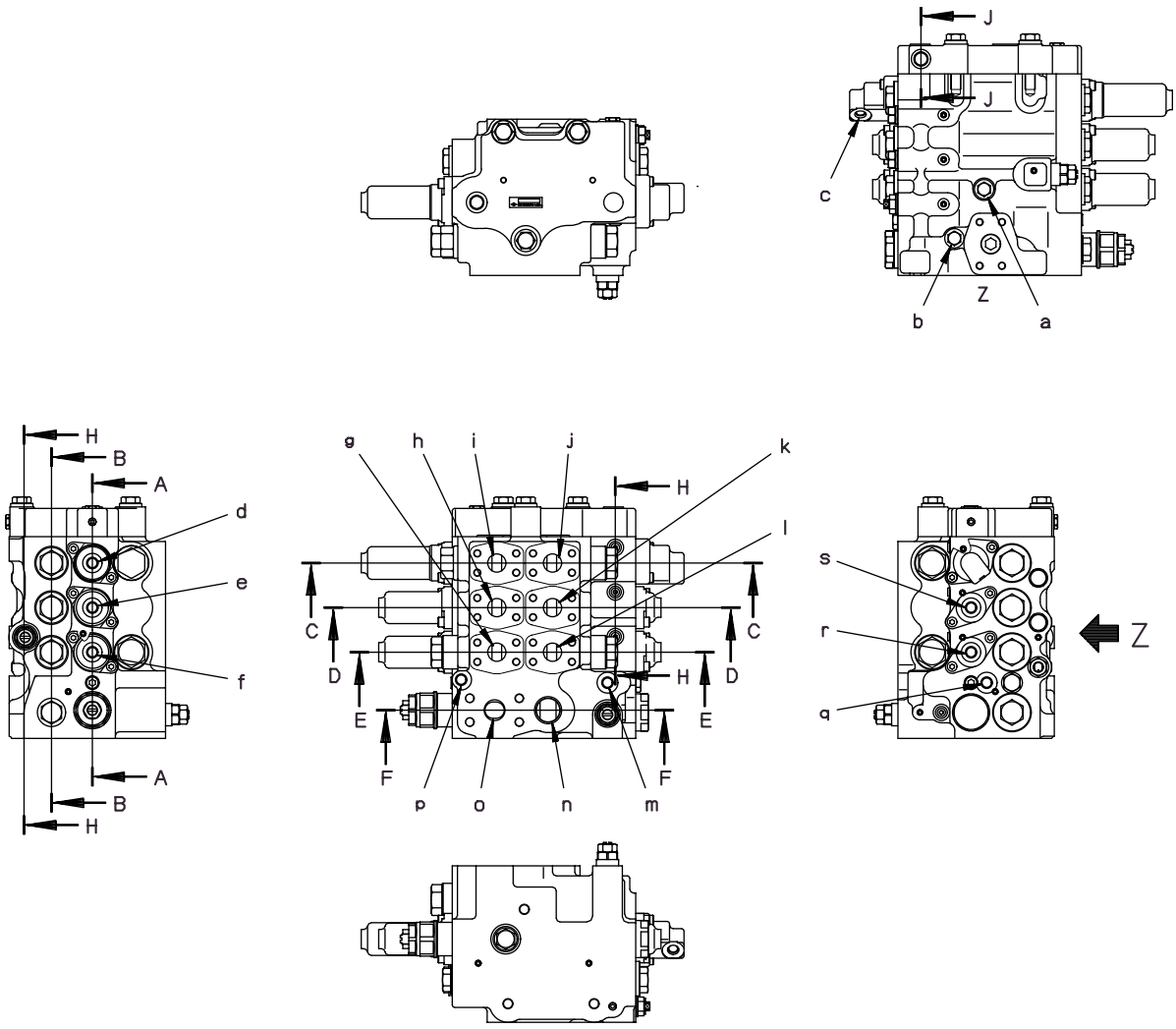
For blade lift, tilt



a. Port **P** (from port **P1** of PPC charge valve)
b. Port **T** (to tank)
c. Port **P2** (to port **PB3** of blade lilt valve)
d. Port **P4** (to port **PB2** of blade tift valve)
e. Port **P1** (to port **PA3** of blade lilt valve)
f. Port **P3** (to port **PA2** of blade tift valve)

MAIN CONTROL VALVE

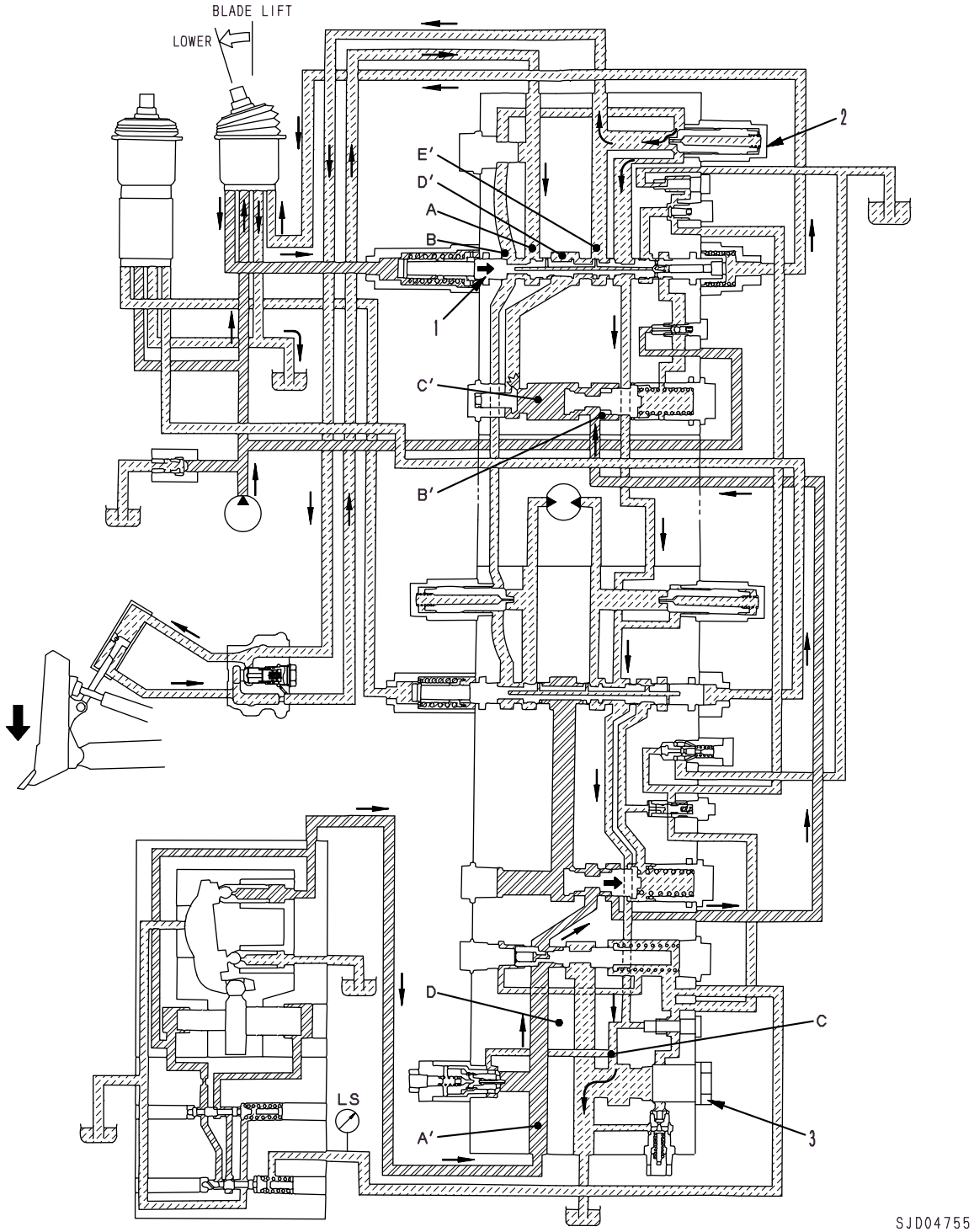
(3-SPOOL VALVE: BLADE LIFT + TILT + STEERING)



SKD00558

a. Port **PC** (pump pressure plug)
b. Port **PLSC** (LS pressure plug)
c. Port **PB3** (from PPC valve)
d. Port **PA3** (from PPC valve)
e. Port **PA2** (from PPC valve)
f. Port **PA1** (from PPC valve)
g. Port **A1** (to HSS motor)
h. Port **A2** (to tilt cylinder bottom)
i. Port **A3** (to lift cylinder head)
j. Port **B3** (to lift cylinder bottom)
k. Port **B2** (to tilt cylinder head)
l. Port **B1** (to HSS motor)
m. Port **LS** (to pump LS valve)
n. Port **T** (to tank)
o. Port **P** (from pump)
p. Port **TS** (to tank)
q. Port **Pi** (from PPC pump)
r. Port **PB1** (from PPC valve)
s. Port **PB2** (from PPC pump)

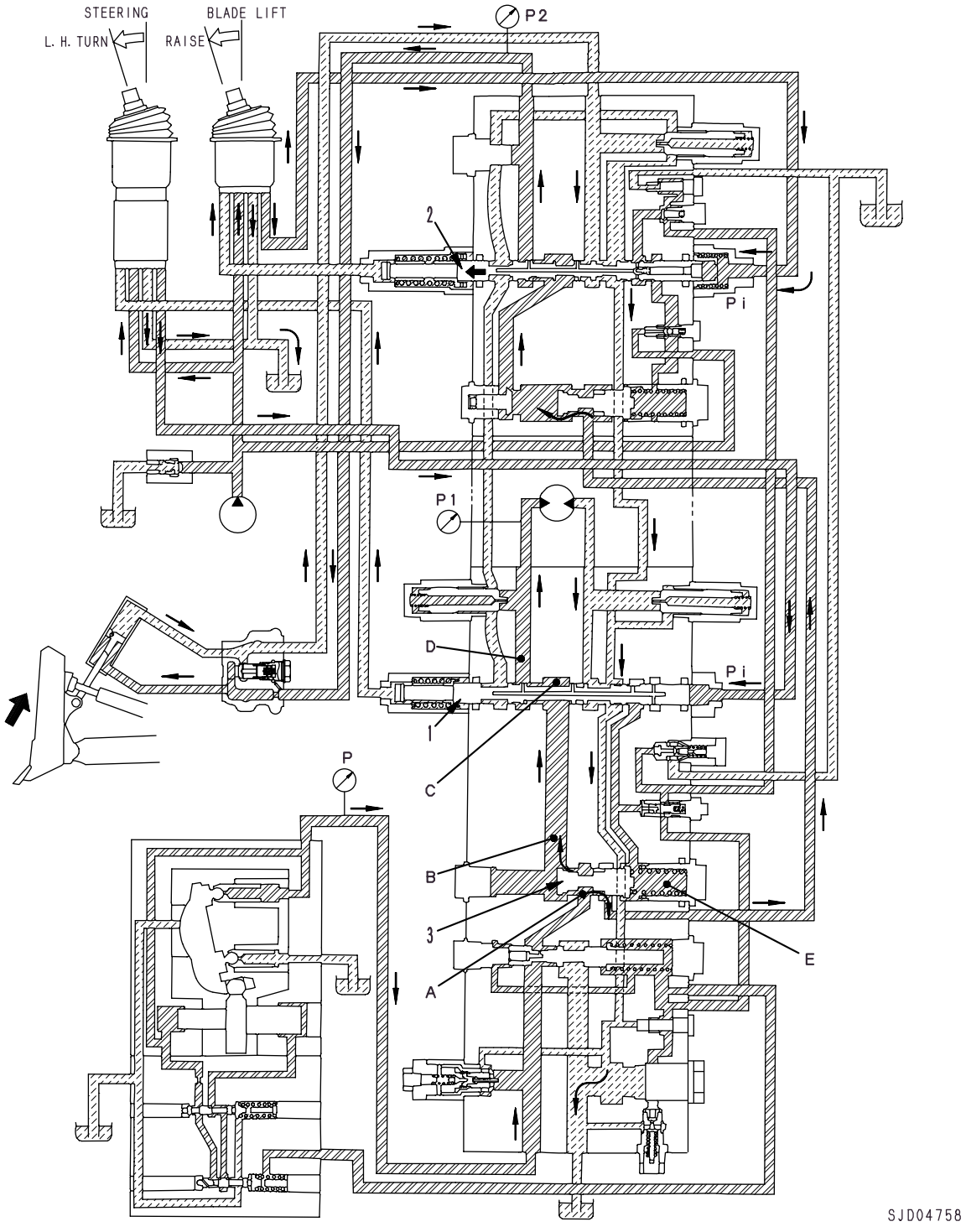
(3) Meter-out control when blade moves down under its own weight

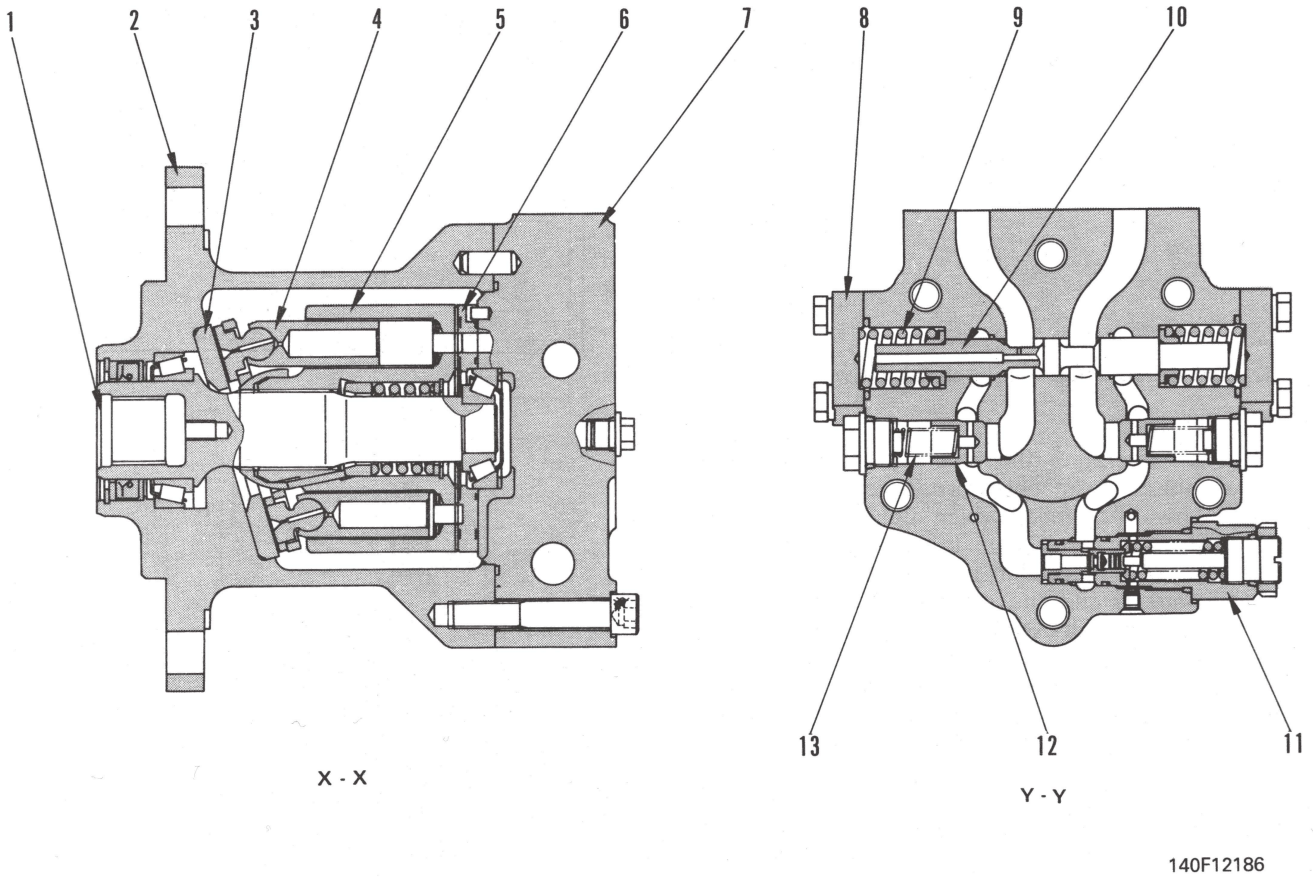


4. Compound operations

(1) Steering valve + work equipment valve

★ The diagram shows the condition when the steering and blade lift valve are operated at the same time.



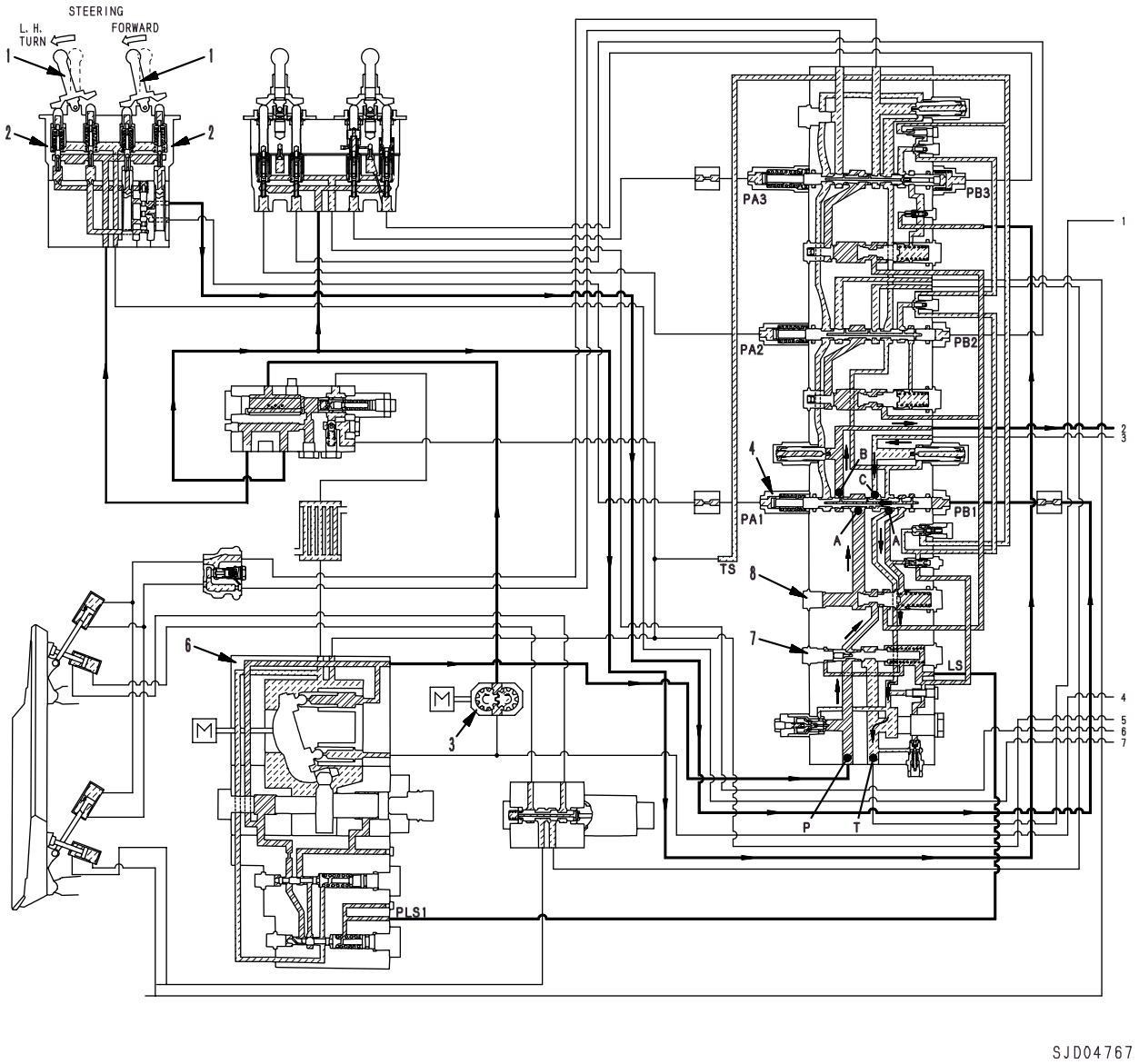


1. Output shaft
2. Motor case
3. Thrust plate
4. Piston
5. Cylinder
6. Valve plate
7. End cover
8. Brake valve assembly
9. Spool return spring
10. Counterbalance valve
11. Safety valve
12. Check valve
13. Check valve spring

STEERING

At FORWARD LEFT TURN

★ The diagram shows the D65PX-12.



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Input and output signals

DEUTSCH-24P [CN-EN1]

Pin No.	Signal name	Input/Output signal
1	Battery direct (+24V)	Input
2	Battery direct (+24V)	Input
3	Type select 1	Input
4	NC	—
5	NC	—
6	NC	—
7	GND (Power)	—
8	GND (Power)	—
9	NC	—
10	NC	—
11	NC	—
12	Pre-heater	Output

Pin No.	Signal name	Input/Output signal
13	Key switch (ACC)	Input
14	NC	—
15	Engine oil pressure (H)	Input
16	NC	—
17	NC	—
18	NC	—
19	Key switch (ACC)	Input
20	Key switch (C)	Input
21	Engine oil pressure (L)	Input
22	NC	—
23	NC	—
24	NC	—

DEUTSCH-40P [CN-EN2]

Pin No.	Signal name	Input/Output signal
1	NC	—
2	NC	—
3	NC	—
4	RS-232C 1 RX	Input
5	NC	—
6	NC	—
7	NC	—
8	NC	—
9	Sensor power surplly (+5V)	Output
10	Fuel dial	Input
11	NC	—
12	CAN shield	—
13	NC	—
14	RS-232C 1 TX	Output
15	G Shield	—
16	Ne Shield	—
17	Fuel temperature sensor	Input
18	NC	—
19	Sensor power surplly (+5V)	Output
20	Boost pressure sensor	Input

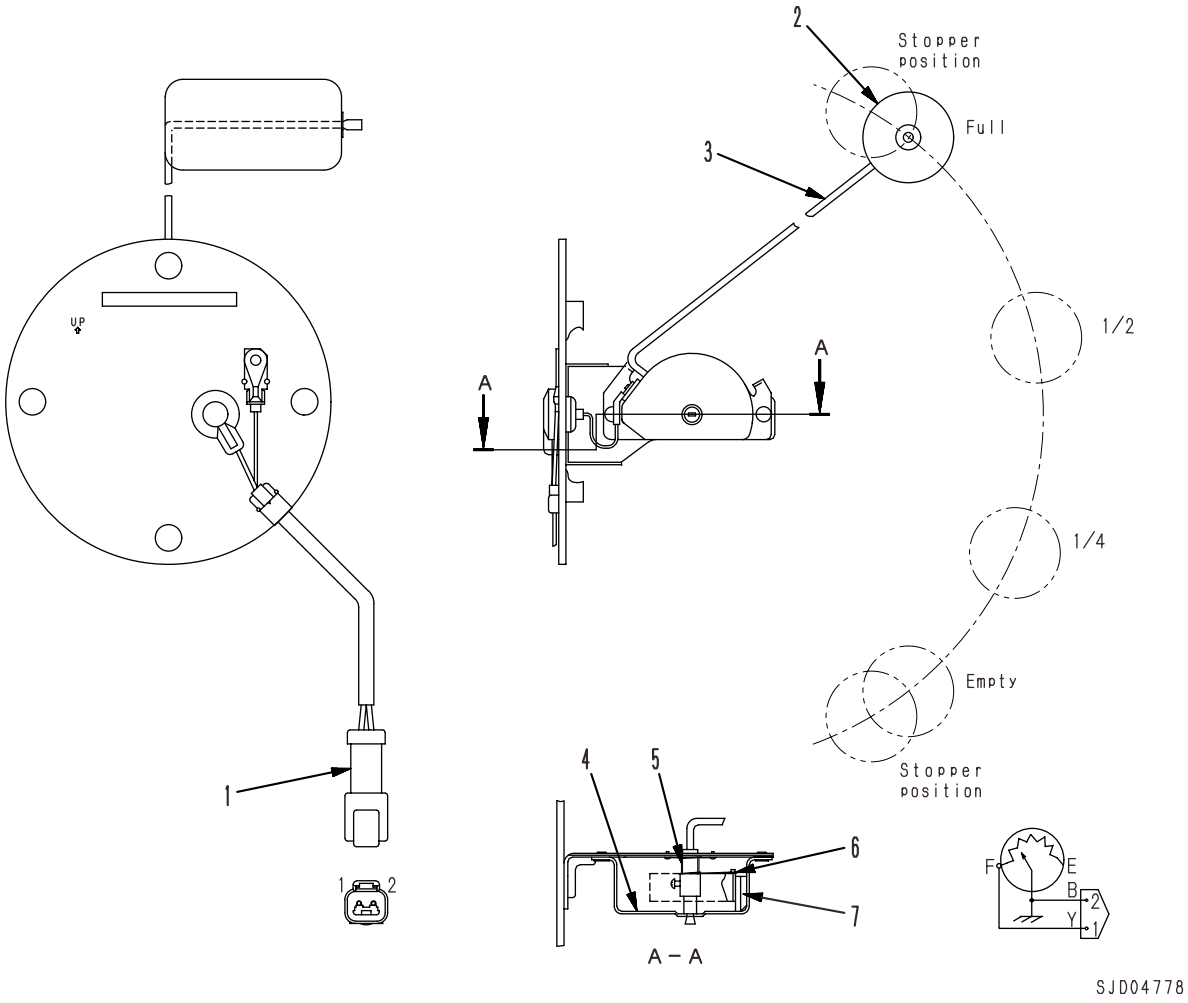
Pin No.	Signal name	Input/Output signal
21	NC	—
22	CANO L	Input/Output
23	NC	—
24	Trigger	Input
25	G puls (–)	Input
26	Ne puls (–)	Input
27	Cooland temperature (H)	Input
28	NC	—
29	GND (Analog)	—
30	NC	—
31	NC	—
32	CANO H	Input/Output
33	NC	—
34	GND (232C)	—
35	G puls (+)	Input
36	Ne puls (+)	Input
37	Cooland temperature (L)	Input
38	Decel signal	Input
39	GND (Analog)	—
40	Common rail pressure sensor	Input

DEUTSCH-40P [CN-EN3]

Pin No.	Signal name	Input/Output signal
1	Power surplly (Injector, Feed pump)	—
2	Power surplly (Injector, Feed pump)	—
3	NC	—
4	NC	—
5	Injector3 (+)	Output
6	Injector2 (+)	Output
7	Transmission Neutral signal 1	Input
8	NC	—
9	NC	—
10	NC	—
11	GND (Power)	—
12	Feed pump1 (+)	Output
13	Feed pump2 (+)	Output
14	Injector1 (+)	Output
15	Injector3 (–)	Output
16	Injector2 (–)	Output
17	Transmission Neutral signal 2	Input
18	NC	—
19	NC	—
20	NC	—

Pin No.	Signal name	Input/Output signal
21	Power surplly (Injector, Feed pump)	—
22	Feed pump1	Output
23	Feed pump2 (–)	Output
24	Injector1 (–)	Output
25	Injector6 (–)	Output
26	Injector4 (–)	Output
27	NC	—
28	NC	—
29	NC	—
30	NC	—
31	GND (Power)	—
32	GND (Power)	—
33	Injector5 (+)	Output
34	Injector5 (+)	Output
35	Injector6 (–)	Output
36	Injector4 (–)	Output
37	NC	—
38	NC	—
39	NC	—
40	NC	—

FUEL LEVEL SENSOR



1. Connector
2. Float
3. Arm
4. Body
5. Spring
6. Contact
7. Spacer

FUNCTION

- The fuel level sensor is installed to the center of front side of the fuel tank and its float (2) moves up and down according to the fuel level.
  The float operates the variable resistor through arm (3) and the signals are sent to the monitor panel to display the fuel level.

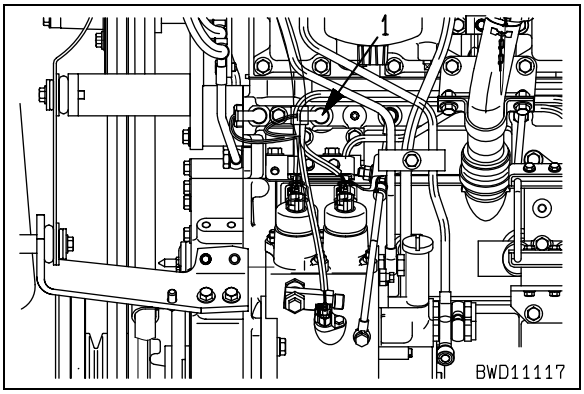
D65PX-12					
Standard value	Permissible value				
Max. 100	Max. 100				
Max. 200	Max. 200				
Max. 200	Max. 200				
—	—				
$2.4\ ^{+0.2}_{-0.5}$	2.9				
1.4 ± 0.2	1.7				

Test measurement item	Symbol	Part No.	Part Name	Remarks
Troubleshooting of wiring harness, sensor	L	799-601-8000	T-adapter kit	—
		799-601-9000	T-adapter kit	
		799-601-9410	Socket	
		799-601-9430	Socket	
		799-601-9420	Adapter	
		799-601-7100	T-adapter kit	
Troubleshooting of voltage, resistance value	M	Commercially available	Tester	—
Measuring wear of sprocket tooth	P	791-427-1220	Wear gauge	—

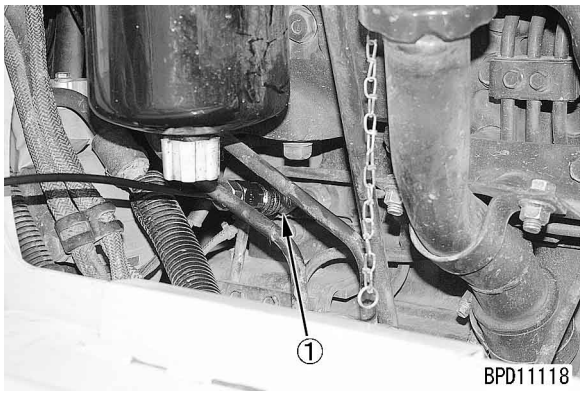
MEASURING ENGINE OIL PRESSURE

★ Measure the engine oil pressure under the following condition.
- Engine water temperature:
  Within operating range

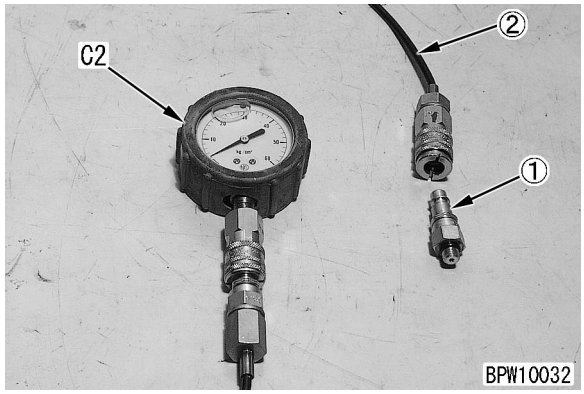
1. Remove low engine oil pressure switch (1).



2. Install nipple ① of hydraulic tester **C1** and connect them to hydraulic tester **C2**.



3. Run the engine at low idling and high idling and measure the engine oil pressure in each speed.



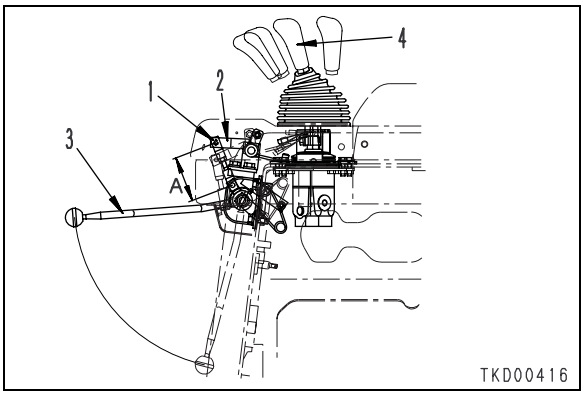
4. After finishing measurement, remove the measuring instruments and return the removed parts.

ADJUSTING WORK EQUIPMENT CONTROL LINKAGE

1. Set length of rod (1) to dimension **A**, and connect lever (2).
★ Dimension **A**: 83.5 mm

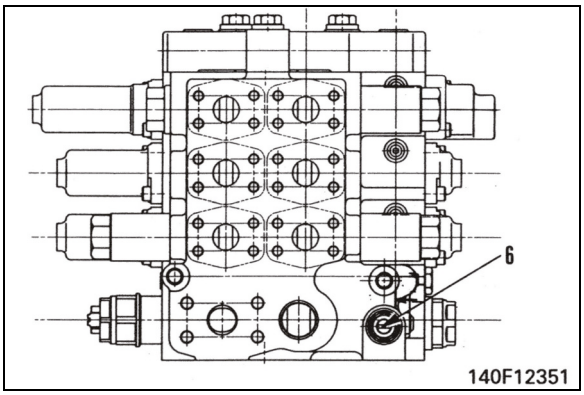
2. Move work equipment lock lever (3) from the FREE position to the LOCK position, and check that work equipment control lever (4) is returned from the FLOAT position to the HOLD position.

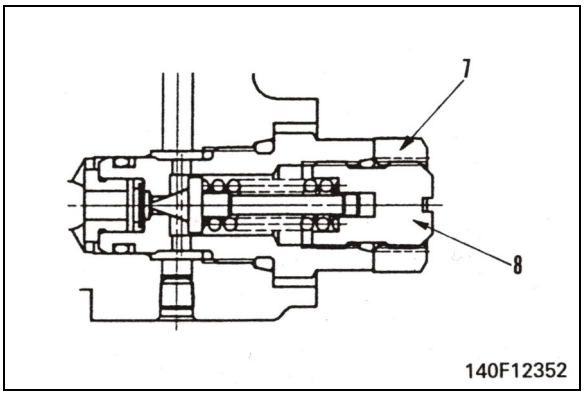
3. With work equipment lock lever (3) at the LOCK position, check that when work equipment control lever (4) is operated, work equipment lock lever (3) does not return to the FREE position.



3. Adjusting steering load sensing relief valve (6) pressure

- Lossen locknut (7), and turn adjustment screw (8) as follows to adjust.





★ TO RAISE pressure, turn CLOCKWISE TO LOWER pressure, turn COUNTER-CLOCKWISE

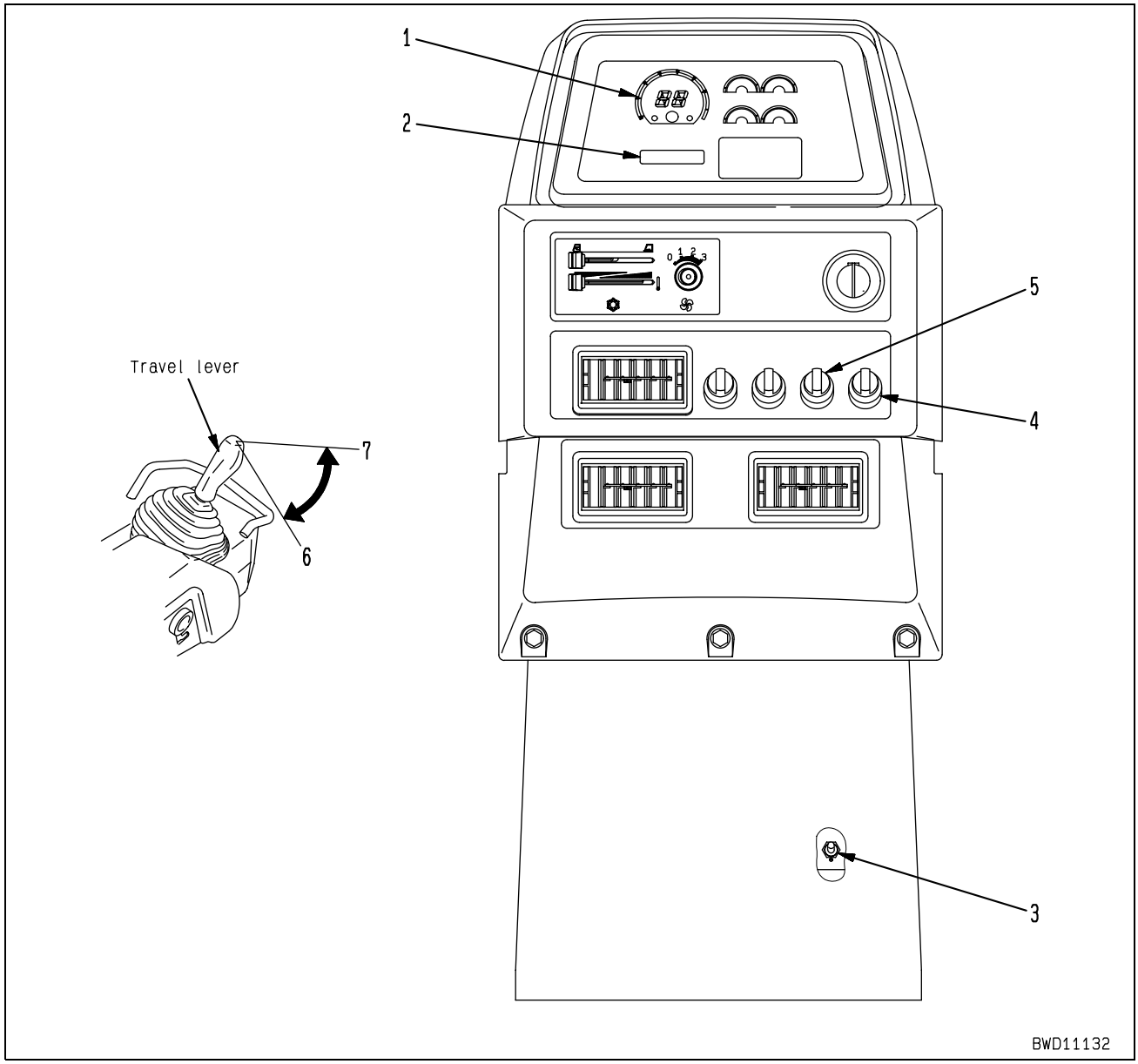
★ One turn of the adjustment screw adjusts the pressure by approx. 15.1 MPa (154kg/cm^2).

kgm Locknut: **73.6 ± 4.9 Nm**

(7.5 ± 0.5 kgm)

★ After adjusting, check the steering relief pressure and load sensing pressure again.

SPECIAL FUNCTIONS OF MONITOR PANEL (EMMS)



Display section of special functions

1. Upper display section (Gear speed display section)
2. Lower display section (Multi-information section)

Operation section 1 of special functions (Basic operation)

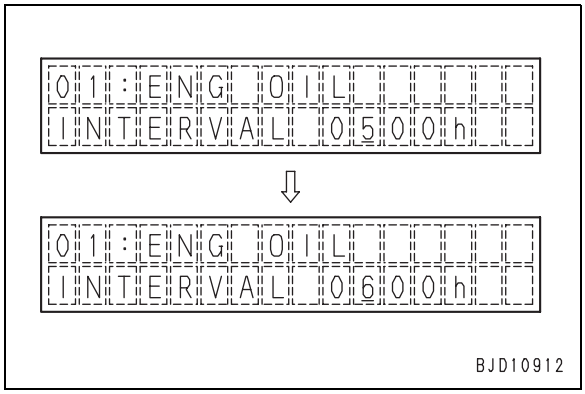
3. Service switch
4. Buzzer cancel switch

Operation section 2 of special functions (Change over operation)

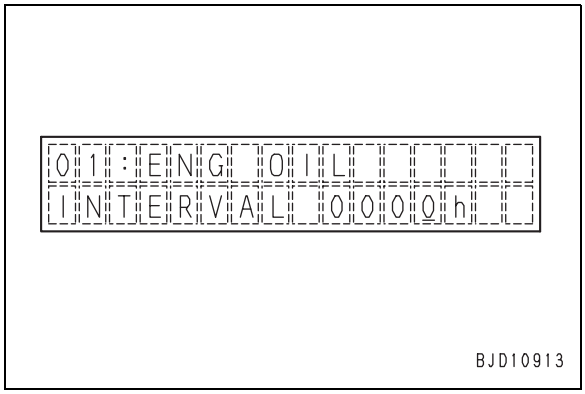
5. Cursor switch
6. Shift-up operation (2nd speed to 3rd speed)
7. Shift-down operation (2nd speed to 1st speed)

★ **EMMS**: Equipment Management Monitoring System

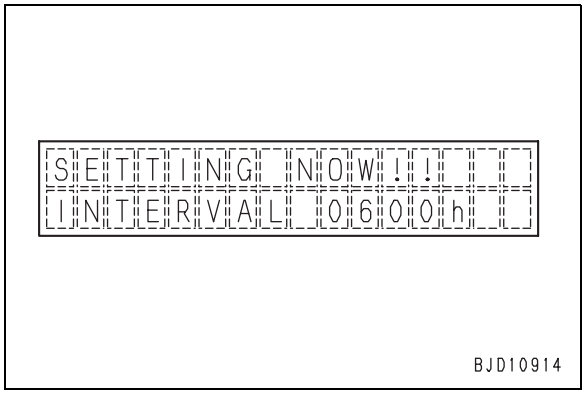
4) Changing replacement interval time
   i) Change the set time by operating information switch (5) and shift-up operation (6) (2nd to 3rd) or shift-down operation (7) (2nd to 1st).
      - [>]: Move cursor to right.
      - [<]: Move cursor to left.
      - [UP]: Increase number.
      - [DOWN]: Decrease number.



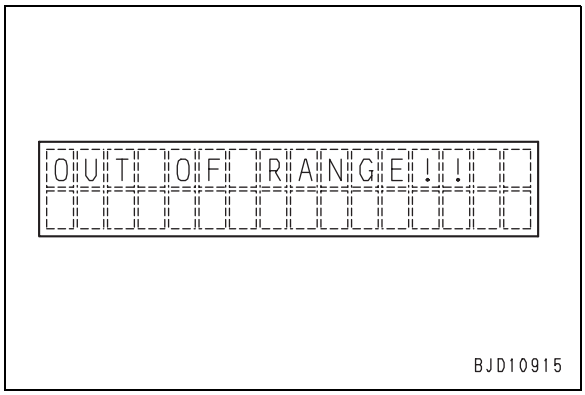
   ★ If you do not use the maintenance function, set the all times to 0.



   ii) If the input time is correct, enter the change of setting by operating buzzer cancel switch (4).
      - [◇]: Enter change.
      - ★ If the change is finished normally, the information display screen appears after the screen shown at right.



      - ★ If the change is not finished normally, the information display screen before the change appears after the screen shown at right. In this case, execute the above operation again.



⑪ 0008:Common rail reduced cylinder mode

★ When the engine common rail system seems to be faulty, this code is used to stop injecting fuel into 1 or more cylinders (reduce the number of effective cylinders) while the engine is running and find out a faulty cylinder from the change of the engine speed.

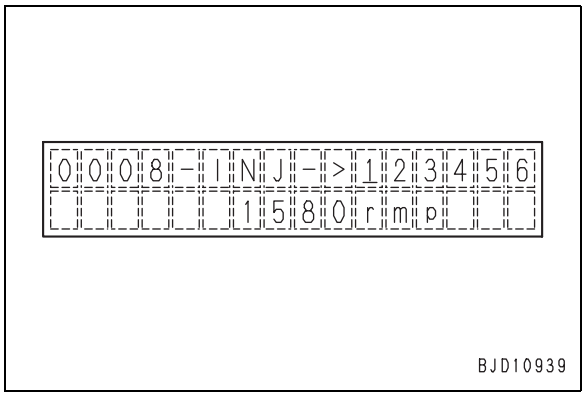
★ Since a fault is detected by the difference of the engine speed in the reduced cylinder mode operation from that in the normal mode operation, use this function while the engine is running.

- The engine speed is displayed on the lower line (Display range: 0 – 3000).
- Using method:
  Select the cylinders to be turned off for the reduced cylinder mode operation by operating information switch (5) and buzzer cancel switch (4).
  Use this method to turn on the selected cylinders again, too.
  - [>]: Move cursor to right.
  - [<]: Move cursor to left.
  - [◇]: Execute or stop reduced cylinder mode operation.

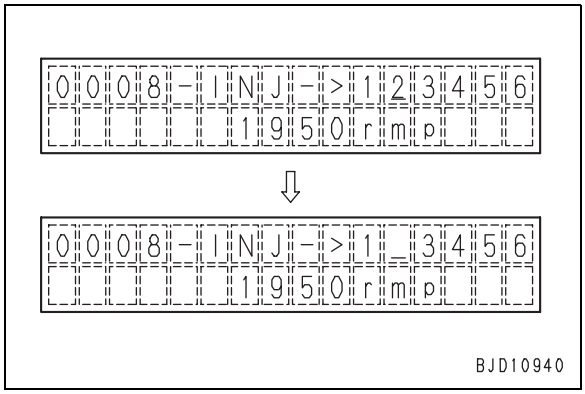
  ★ The figure at right is an example that No. 2 cylinder is turned off for reduced cylinder mode operation and turned on again (The cylinder No. lamp is turned off in the reduced cylinder mode operation and on in the normal mode operation).

  ★ Only one or more cylinders can be turned off for the reduced cylinder mode operation.

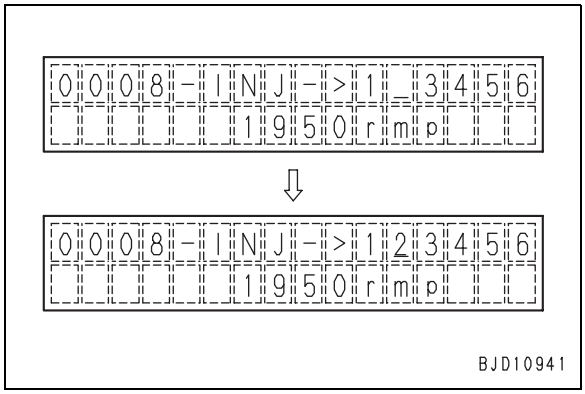
  ★ If this code is turned off, its function is turned off.



BJD10939



BJD10940



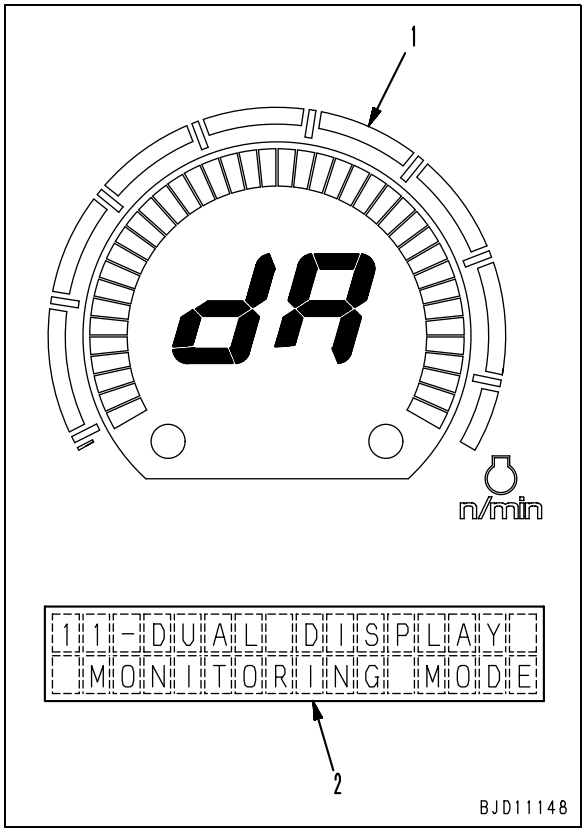
BJD10941

11. Dual display monitoring mode (11-DUAL DISPLAY MONITORING MODE)

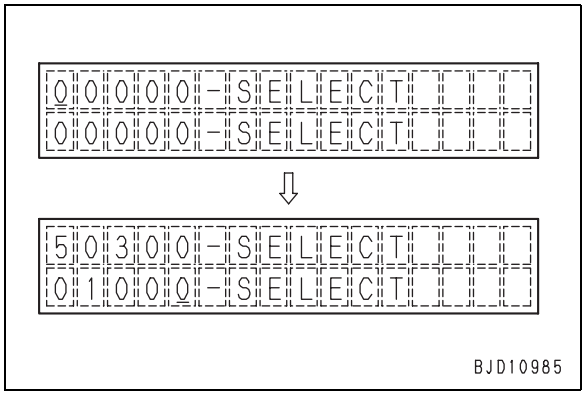
In this mode, 2 monitored items can be displayed simultaneously.

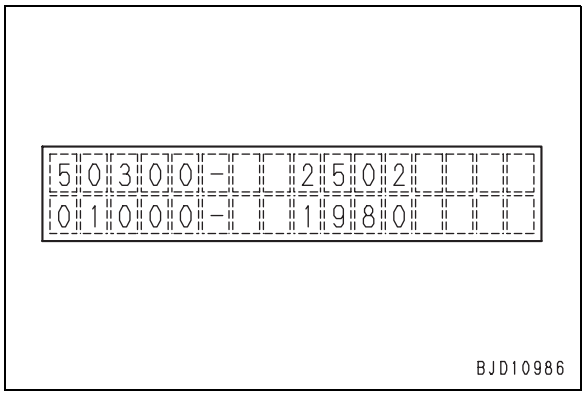
★ Note that only codes and monitoring information are displayed in this mode since the usable display columns are limited. (Item names and units cannot be displayed.)

1) Selecting and executing mode
   i) Select “Dual display monitoring mode” on the mode selection screen.
      ★ If the mode is selected, code (dR) is displayed on gear speed display section (1) and the title is displayed on multi-information section (2).
   ii) Display the monitoring code input screen by operating buzzer cancel switch (4).
      • [◇]: Execute mode.



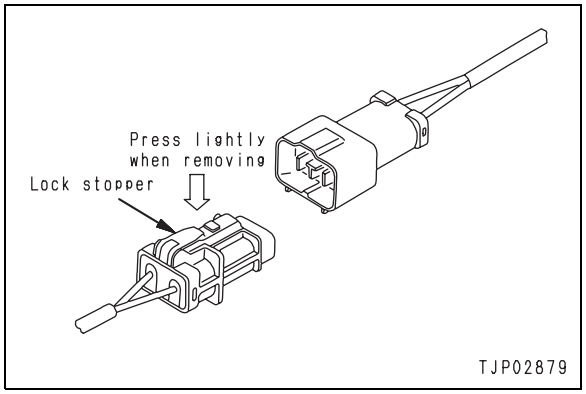
2) Selecting and entering monitored items
   i) On the code input screen, input the 5-digit codes of the items to be monitored to the upper and lower lines by operating information switch (5), shift-up operation (2nd to 3rd) (6), and shift-down operation (2nd to 1st) (7).
      • [>]: Move cursor to right.
      • [<]: Move cursor to left.
      • [UP]: Increase number.
      • [DOWN]: Decrease number.
   ii) After inputting the codes, display the monitoring screen by operating buzzer cancel switch (4).
      • [◇]: Enter input code.
      ★ If the input codes are normal, the monitoring screen shown at right appears.



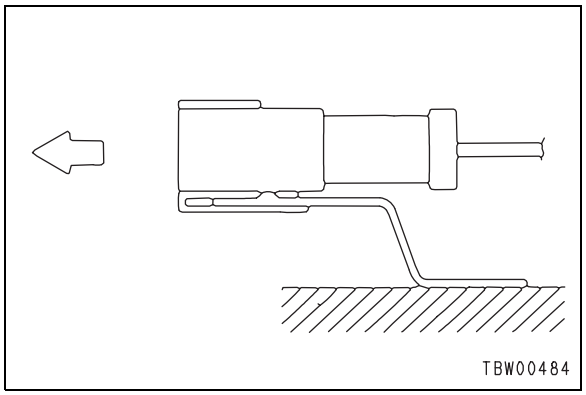


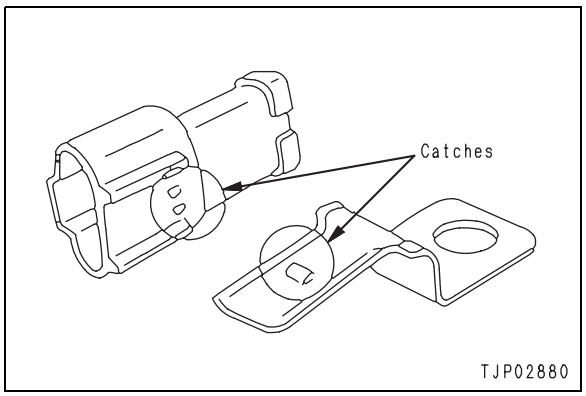
2) Removing, installing, and drying connectors and wiring harnesses

- **Disconnecting connectors**
  ① Hold the connectors when disconnecting. When disconnecting the connectors, hold the connectors and not the wires. For connectors held by a screw, loosen the screw fully, then hold the male and female connectors in each hand and pull apart. For connectors which have a lock stopper, press down the stopper with your thumb and pull the connectors apart.
  ★ Never pull with one hand.

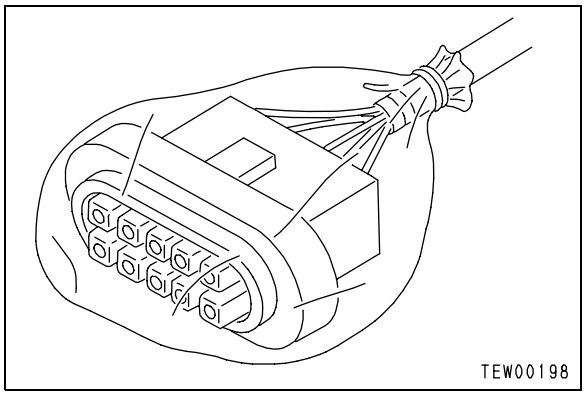


  ② When removing from clips
  When removing a connector from a clip, pull the connector in a parallel direction to the clip.
  ★ If the connector is twisted up and down or to the left or right, the housing may break.





  ③ Action to take after removing connectors.
  After removing any connector, cover it with a vinyl bag to prevent any dust, dirt, oil, or water from getting in the connector portion.
  ★ If the machine is left disassembled for a long time, it is particularly easy for improper contact to occur, so always cover the connector.



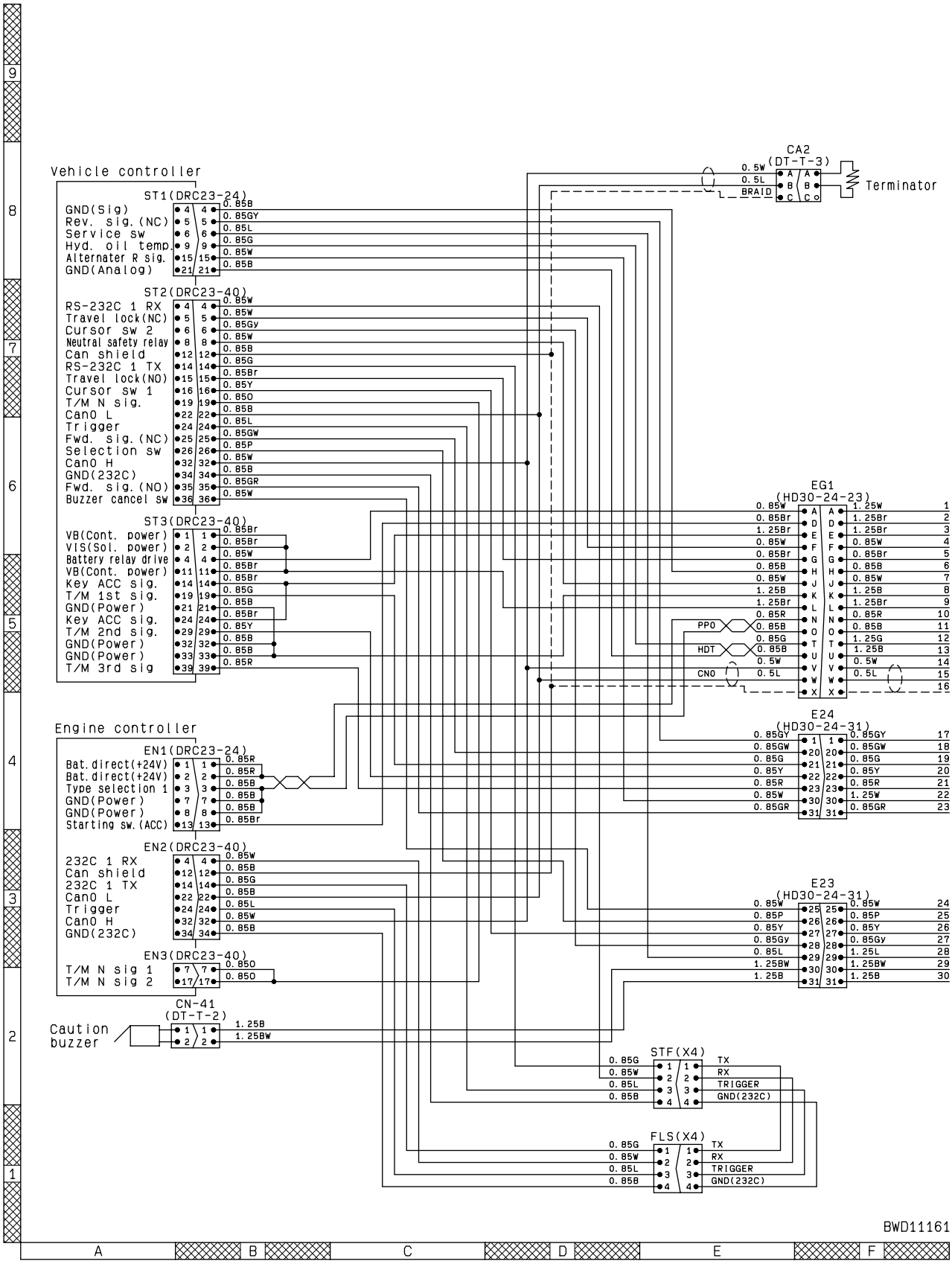
CONNECTOR ALLOCATION DRAWING AND ELECTRICAL CIRCUIT DIAGRAM FOR EACH SYSTEM

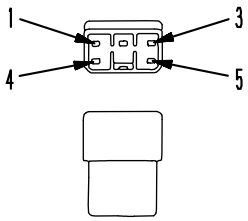
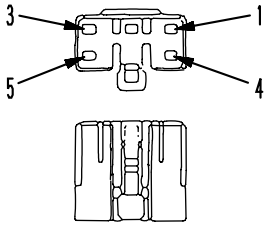
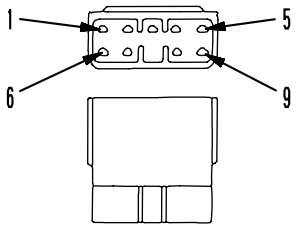
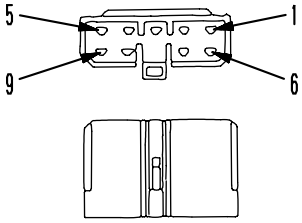
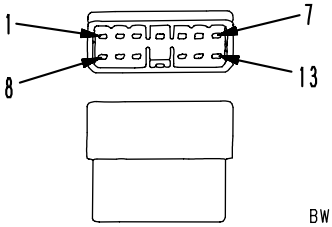
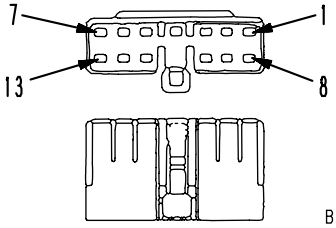
TABLE OF CONNECTORS

★ Addresses show approximate positions of these devices in single view layout drawings of connectors and electrical circuit diagrams of each system.

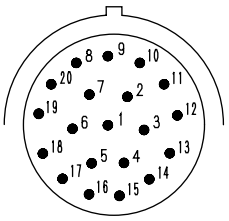
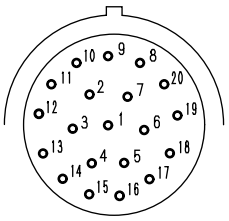
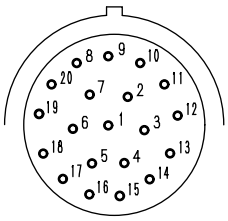
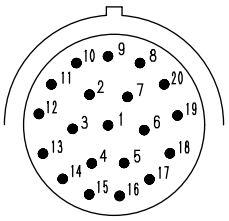
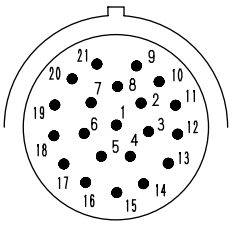
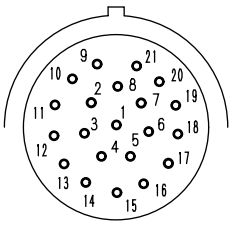
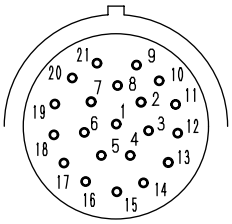
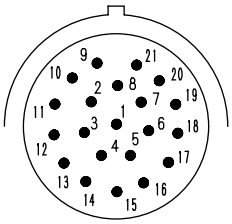
Connector No.	Type of connector	Number of pins	Device name	Address				
				3-dimensional drawing	Engine controller circuit	Machine controller circuit	Monitor panel circuit	Others circuit
BUZ	KES	3	Buzzer switch	D8			K8	
CN1	DT	2	Rear lamp	K8				K9
CN2	DT	2	Rear lamp (Additional)	K8				K8
CN3	DT	2	Fuel level sensor	L7	B2			
CN4	SWP	6	Intermediate connector (Rear lamp, sensor)	C2	C2		K6	J5
CN5	DT	2	Left headlamp	G8	B4			A6
CN6	DT	2	Right headlamp	E2	B5			A7
CN7	090 Ⅱ	2	Horn	E1				A7
CN8	DT	3	Intermediate connector (Headlamp, horn)	H1	C4			C6
CN9	KES	2	Left window washer	G8				A9
CN10	KES	2	Right window washer	G8				A9
CN11	KES	2	Front window washer	G9				A8
CN12	KES	2	Rear window washer	H9				A8
CN13	SWP	6	Intermediate connector (Window washer)	I2				C8
CN17	DT	4	Intermediate connector (Starting motor, heater)	Q8	I4	H6		J4
CN22	DT	2	Horn switch	H9				G8
CN23	DT	2	Travel lock switch	A3	F8	K1		I8
CN24	DTHD #12	1	Service power source	A2				
CN25	DTHD #12	1	Cab usual power source	A2				
CN26	DT	4	Intermediate connector (Window washer switch)	A1				C8
CN27	DT	3	Back-up alarm switch	K3			K3	I8
CN28	DT	2	Torque converter oil temperature switch	K3	B4			
CN29	DT	2	Pitch operation switch	H9				G8
CN30	DT	4	Intermediate connector (Monitor, switch)	A8	E6	J8	I6	
CN31	SWP	12	Intermediate connector (Monitor)	A8	E8	J9	H6	
CN32	SWP	12	Intermediate connector (Panel, switch)	A8	E6	J9	J6	F5
CN33	DT	4	Intermediate connector (Air conditioner)	A7	E5	J9	J6	F5
CN34	SWP	2	Diode (Air conditioner switch)	D7				B3
CN36	KES	4	Magnet relay (Air conditioner)	A7				B2
CN37	KES	4	Blower relay (Air conditioner)	A6				B5
CN39	KES	3	Blower resister (Air conditioner)	C6				B4
CN41	DT2	2	Caution buzzer	L6	K3		B2	
CN43	KES	4	Thermostat, dial pressure switch (Air conditioner)	D7				B1
CN44	KES	4	Blower switch (Air conditioner)	B9				B4
CN45	KES	3	Air conditioner switch	B9				B3
CN47	KES	4	Rear lamp switch	D7				F8
CN48	KES	4	Headlamp switch	D7				E8

CIRCUIT DRAWING FOR MONITOR PANEL SYSTEM



Number of Pins	MIC Type Connector		
	Male (Female housing)	Female (Male housing)	T-adapter Part Number
7	Body part number: 79A-222-2640 (Quantity: 5 pieces)	Body part number: 79A-222-2630 (Quantity: 5 pieces)	—
11	Body part number: 79A-222-2680 (Quantity: 5 pieces)	Body part number: 79A-222-2670 (Quantity: 5 pieces)	—
5	 BWP04741	 BWP04742	799-601-2710
	Body part number: 79A-222-2620 (Quantity: 5 pieces)	Body part number: 79A-222-2610 (Quantity: 5 pieces)	
9	 BWP04743	 BWP04744	799-601-2950
	Body part number: 79A-222-2660 (Quantity: 5 pieces)	Body part number: 79A-222-2650 (Quantity: 5 pieces)	
13	 BWP04745	 BWP04746	799-601-2720
	Body part number: 79A-222-2710 (Quantity: 2 pieces)	Body part number: 79A-222-2690 (Quantity: 2 pieces)	

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

Type (shell size code)	HD30 Series connector		
	Body (plug)	Body (receptacle)	T-adapter Part Number
18-20 (3)	Pin (male terminal)	Pin (female terminal)	799-601-9230
	 BWP05009	 BWP05010	
	Part number: 08191-31201, 08191-31202	Part number: 08191-34101, 08191-34102	
	Pin (female terminal)	Pin (male terminal)	799-601-9230
	 BWP05011	 BWP05012	
	Part number: 08191-32201, 08191-32202	Part number: 08191-33101, 08191-33102	
18-21 (4)	Pin (male terminal)	Pin (female terminal)	799-601-9240
	 BWP05013	 BWP05014	
	Part number: 08191-41201, 08191-42202	Part number: 08191-44101, 08191-44102	
	Pin (female terminal)	Pin (male terminal)	799-601-9240
	 BWP05015	 BWP05016	
	Part number: 08191-42201, 08191-42202	Part number: 08191-43101, 08191-43102	

Related circuit diagram

This is the excerpted circuit diagram related to trouble
- Connector No.: Indicates (Model-No. of pins) (Color).
- Arrow (⇔): Roughly indicates mounting place on machine.

TROUBLE CODE TABLE

★ Regarding trouble code provided with instruction “Refer to table”, check it against table below.

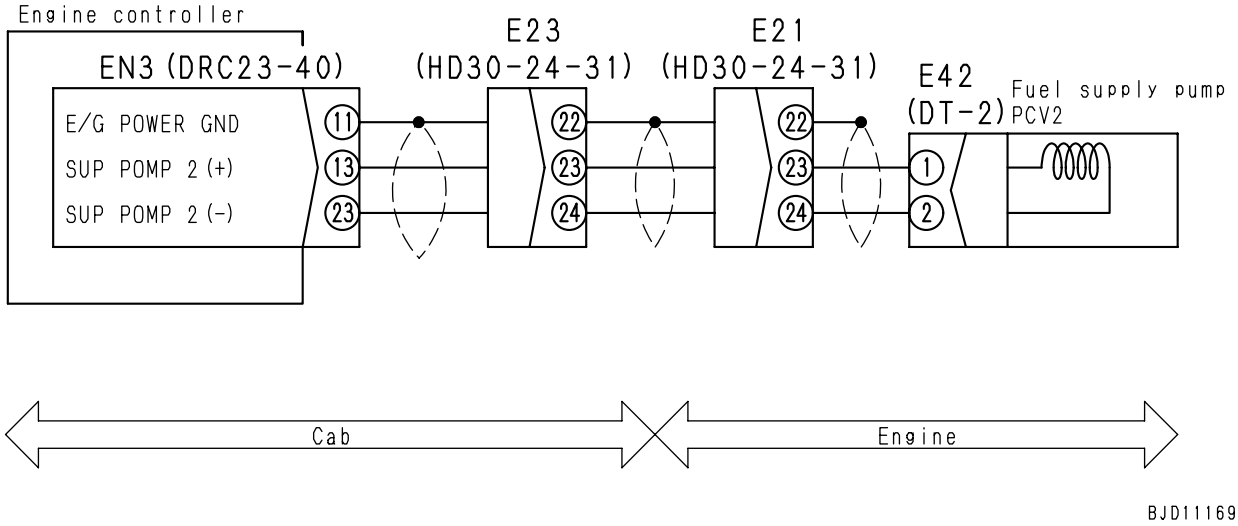
Trouble code	Contents of trouble	Trouble code	Contents of trouble
KA	Disconnection in wiring	L0	Fill signals at two or more channels which are not set as combination are turned ON at the same time.
KB	Short circuit	L1	Fill signal is ON when command current to ECMV is OFF.
KK	Source voltage reduction/ input	L2	Fuel pressure is above maxim specified value.
KQ	Type select signal inconsis-tency	L3	Object part is uncontrollable.
KR	Defective communication	L4	ON and OFF signals at two systems are inconsistent.
KT	Abnormality in controller	L6	Engine rotation signal, terminal C signal, oil pressure switch sig-nal, water temperature sensor signal, etc. are inconsistent with operation state or stop state.
KX	Outside input signal range	L8	Analog signals in two systems are inconsistent.
KZ	Disconnection or short cir-cuit	LC	rpm signals in two systems are inconsistent.
MA	Malfunction	LD	Switch is pressed for usually unthinkable long time.
MB	Performance reduction	LH	Fill signal is OFF when command current to ECMV is ON.
MW	Sliding		
NS	Overheat		
ZG	Oil pressure reduction		
ZK	Coolant level reduction		

ERROR CODE AD51KA (FUEL SUPPLY PUMP SOLENOID 2: DISCONNECTION IN WIRING (KA))

Action code	Error code	Trouble	Fuel supply pump solenoid 2: Disconnection in wiring (KA) (Engine controller system)
CALL E03	AD51KA		
Contents of trouble	• Disconnection in wiring occurred in fuel supply pump solenoid 2 (PCV2).		
Action of controller	• Flashes caution lamp and turns on caution buzzer. • Stops output to fuel supply pump solenoid 2 circuit.		
Problem that appears on machine	• If codes [AD11KA] and [AD11KB] are displayed at the same time, engine stops.		
Related information	• The special adapter (799-601-9430) is necessary for troubleshooting of fuel supply pump solenoid 1. • Method of reproducing error code: Engine start		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective fuel supply pump solenoid 2 (Internal disconnection in wiring)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			E42 (male)	Resistance	
			Between ① – ②	2.3 – 5.3Ω	
			Between ① – chassis ground	Min. 1MΩ	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between EN3 (female) ⑬ – E42 (female) ①	Resistance	Max. 1Ω
			Wiring harness between EN3 (female) ㉓ – E42 (female) ②	Resistance	Max. 1Ω
	3	Defective harness grounding (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between EN3 (female) ㉓ – E42 (female) ② with chassis ground	Resistance	Min. 1MΩ
	4	Defective engine controller	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			EN3 (male)	Resistance	
			Between ⑬ – ㉓	2.3 – 5.3Ω	
			Between ⑬ ㉓ – chassis ground	Min. 1MΩ	

Circuit diagram related to fuel supply pump solenoid 2

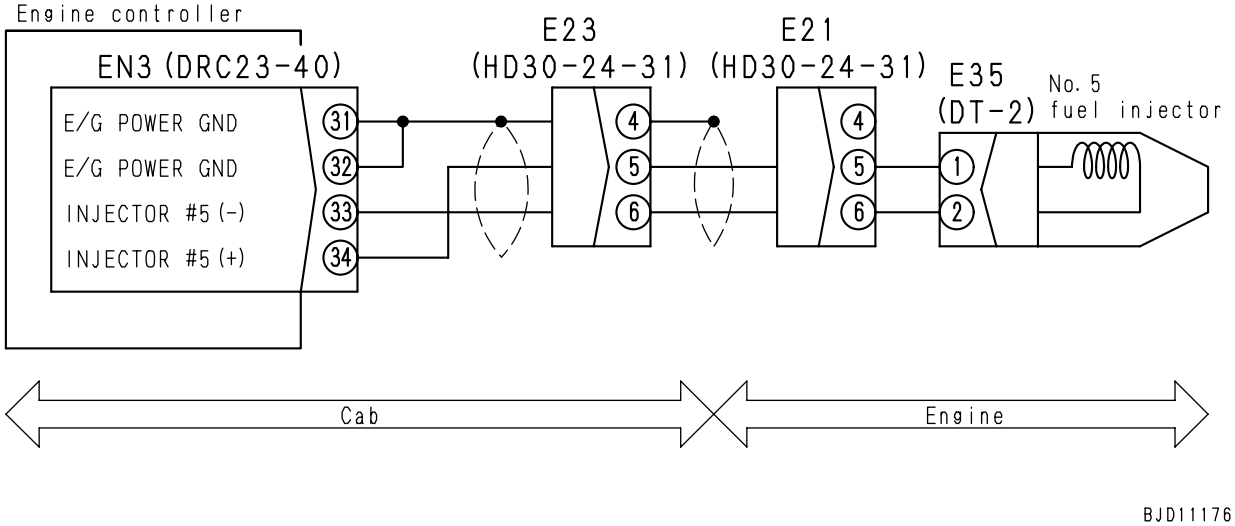


ERROR CODE ADE1KA (NO. 5 FUEL INJECTOR SOLENOID: DISCONNECTION (KA))

Action code	Error code	Trouble	No. 5 fuel injector solenoid: Disconnection (KA) (Engine controller system)
E02	ADE1KA		
Contents of trouble	• Disconnection occurred in No. 5 fuel injector solenoid (TWV#5) circuit.		
Action of controller	• Flashes caution lamp and turns on caution buzzer. • Stops output to No. 5 fuel injector solenoid circuit.		
Problem that appears on machine	• Engine output lowers.		
Related information	• Method of reproducing error code: Start engine.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective No. 5 fuel injector solenoid (Internal disconnection)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			E35 (male)	Resistance	
			Between ① – ②	0.4 – 1.1Ω	
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between EN3 (female) ㉞ – E35 (female) ①	Resistance	Max. 1Ω
			Wiring harness between EN3 (female) ㉝ – E35 (female) ②	Resistance	Max. 1Ω
	3	Defective engine controller	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			EN3 (male)	Resistance	
			Between ㉞ – ㉝	0.4 – 1.1Ω	

Circuit diagram related to No. 5 fuel injector solenoid



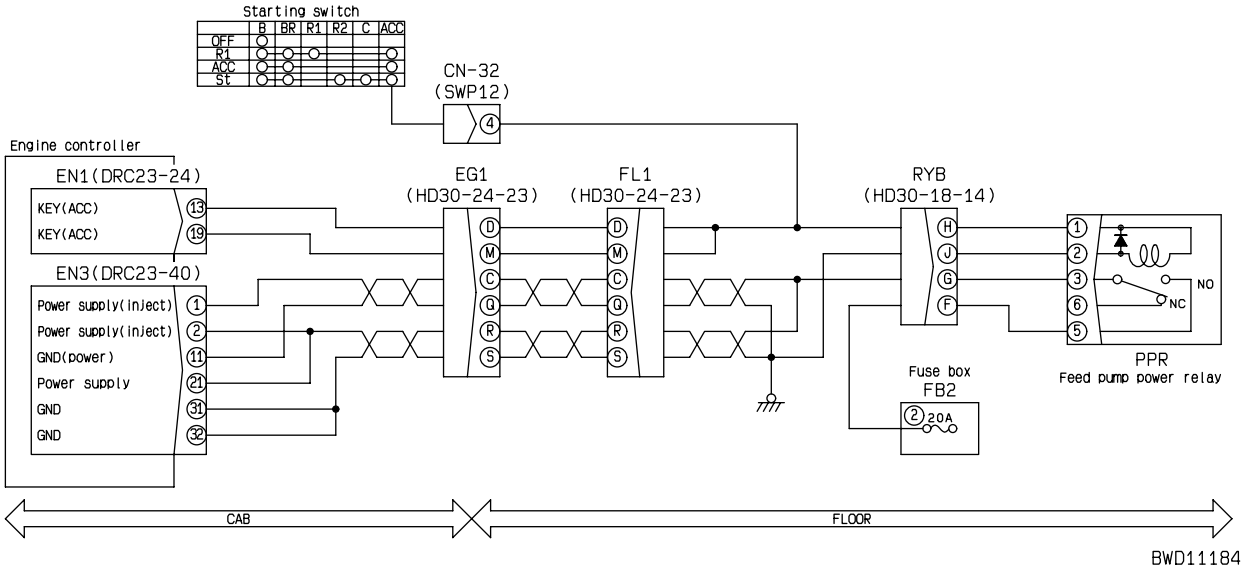
BJD11176

ERROR CODE D1D0KB (ENGINE CONTROLLER LOAD POWER SUPPLY: SHORT CIRCUIT (KB))

Action code	Error code	Trouble	Engine controller load power supply relay: Short circuit (KB) (Engine controller system)
E02	D1D0KB		
Contents of trouble	• Voltage is generated in controller load power supply circuit when starting switch is turned OFF.		
Action of controller	• Flashes caution lamp and turns on caution buzzer.		
Problem that appears on machine	• Does not take any particular action.		
Related information	• Method of reproducing error code: Turn starting switch OFF. ★ This error code detects abnormality in secondary side (contact side) of engine controller load power supply relay, but not in primary side (coil side)		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective engine controller load power supply relay (Internal short circuit)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			PPR (male)		Resistance	
			Between ③ – ⑤		Min. 1MΩ	
	2	Disconnection in wiring harness	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between starting switch terminal ACC – EN1 (female) ⑬, ⑲.		Resistance	Max. 1Ω
	3	Hot short circuit in wiring harness (Contact with 24V circuit)	★ Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
			Short circuit of wiring harness between EN3 (female) ①, ②, ㉑ – PPR (female) ③ with chassis ground		Voltage	Max. 1V
	4	Defective engine controller	★ Prepare with starting switch OFF, then carry out troubleshooting with starting switch OFF or ON.			
			EN3	Starting switch		Voltage
			Between ①, ②, ㉑ – chassis ground	OFF position		Max. 1V
				ON position		Max. 8V

Circuit diagram related to engine controller

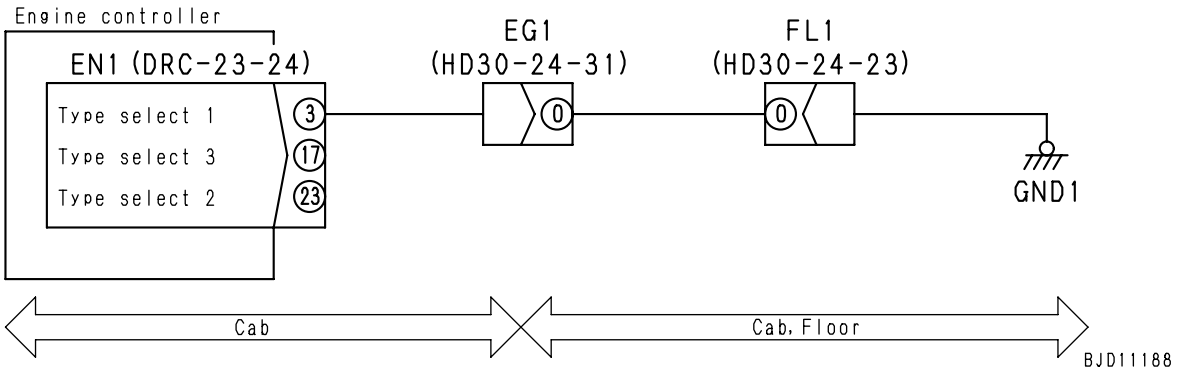


ERROR CODE DB29KQ (ENGINE CONTROLLER TYPE SELECT: TYPE SELECT SIGNAL INCONSISTENCY (KQ))

Action code	Error code	Trouble	Engine controller type select: Type select signal inconsistency (KQ) (Engine controller system)
CALL E03	DB29KQ		
Contents of trouble	• Type select signal directly acquired by engine controller is inconsistent with type select signal acquired via communication.		
Action of controller	• Flashes caution lamp and turns on caution buzzer. • Controls it as default-set type.		
Problem that appears on machine	• Machine does not provide normal output.		
Related information	• Method of reproducing error code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Unsuitable engine controller or wiring harness	Check part No. of engine controller and wiring harness again.		
	2	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	★ Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between EN1 (female) ③, ⑰, ㉓ – chassis ground	Resistance	Max. 1Ω
	3	Defective engine controller	★ Prepare with starting switch OFF, turn starting switch ON and carry out troubleshooting.		
			EN1	Voltage	
			Between ③ – chassis ground	Max. 1V	

Circuit diagram related to engine controller type select

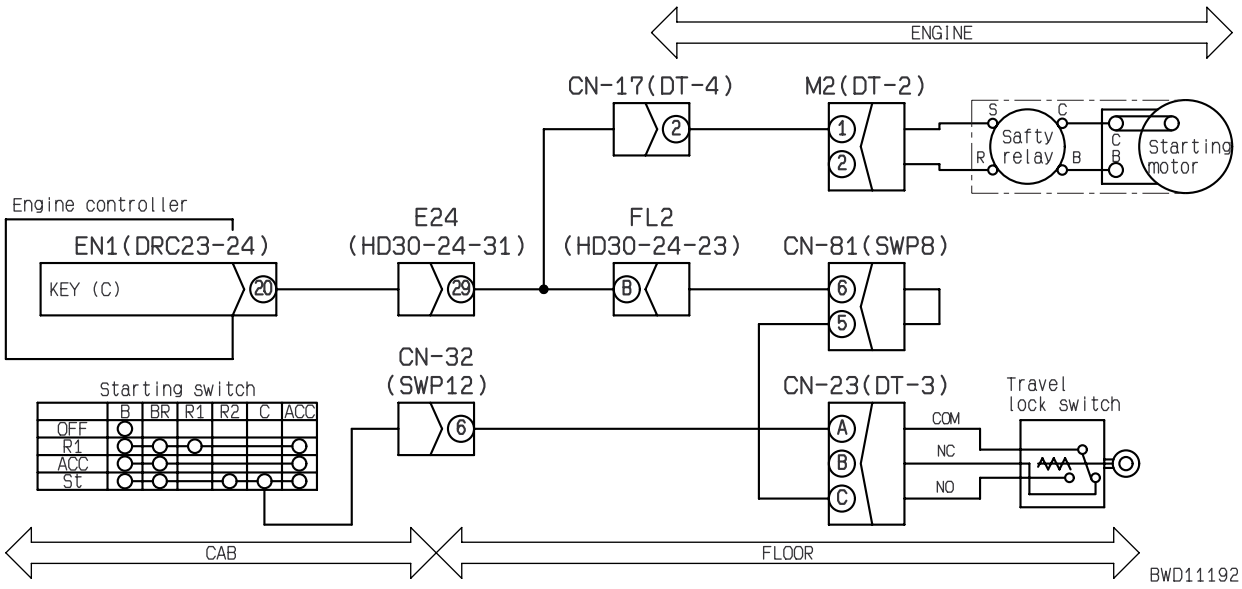


ERROR CODE DD11KB (STARTING SWITCH: SHORT CIRCUIT (KB))

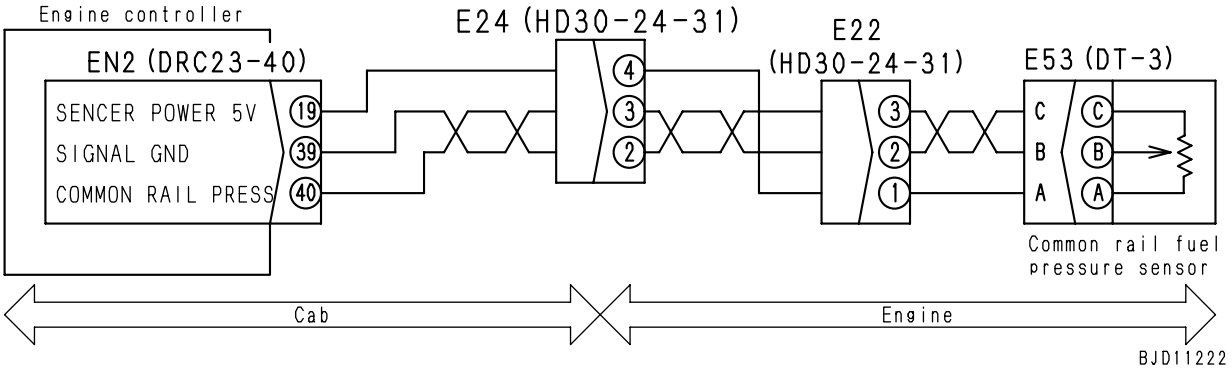
Action code	Error code	Trouble	Starting switch: Short circuit (KB) (Engine controller system)
CALL E04	DD11KB		
Contents of trouble	• Signal C of starting switch is input during running of engine.		
Action of controller	• Flashes caution lamp and turns on caution buzzer. • Operate with normal control.		
Problem that appears on machine	• Operate normally 10 seconds after engine starts		
Related information	• Method of reproducing error code: Start engine.		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective starting switch	★Prepare with starting switch OFF, then carry out troubleshooting with starting switch OFF or ON.		
			Starting switch terminal	Starting switch	Resistance
			Between Ⓑ – Ⓒ	When OFF/ON	Min. 1MΩ
	2	Hot short circuit in wiring harness (Contact with 24V circuit)	★Prepare with starting switch OFF, turn starting switch ON and carry out troubleshooting.		
			Short circuit of wiring harness between EN1 (female) ⑳ – CN23 (female) Ⓒ or M2 (female) ① with chassis ground	Voltage	Max. 1V
			Short circuit of wiring harness between CN23 (female) Ⓐ – starting switch terminal Ⓒ with chassis ground	Voltage	Max. 1V
	3	Defective engine controller	★Prepare with starting switch OFF, turn starting switch ON and carry out troubleshooting.		
			EN1	Voltage	
			Between ⑳ – chassis ground	Max. 1V	

Circuit diagram related to starting switch signal C



Circuit diagram related to common rail presure sensor



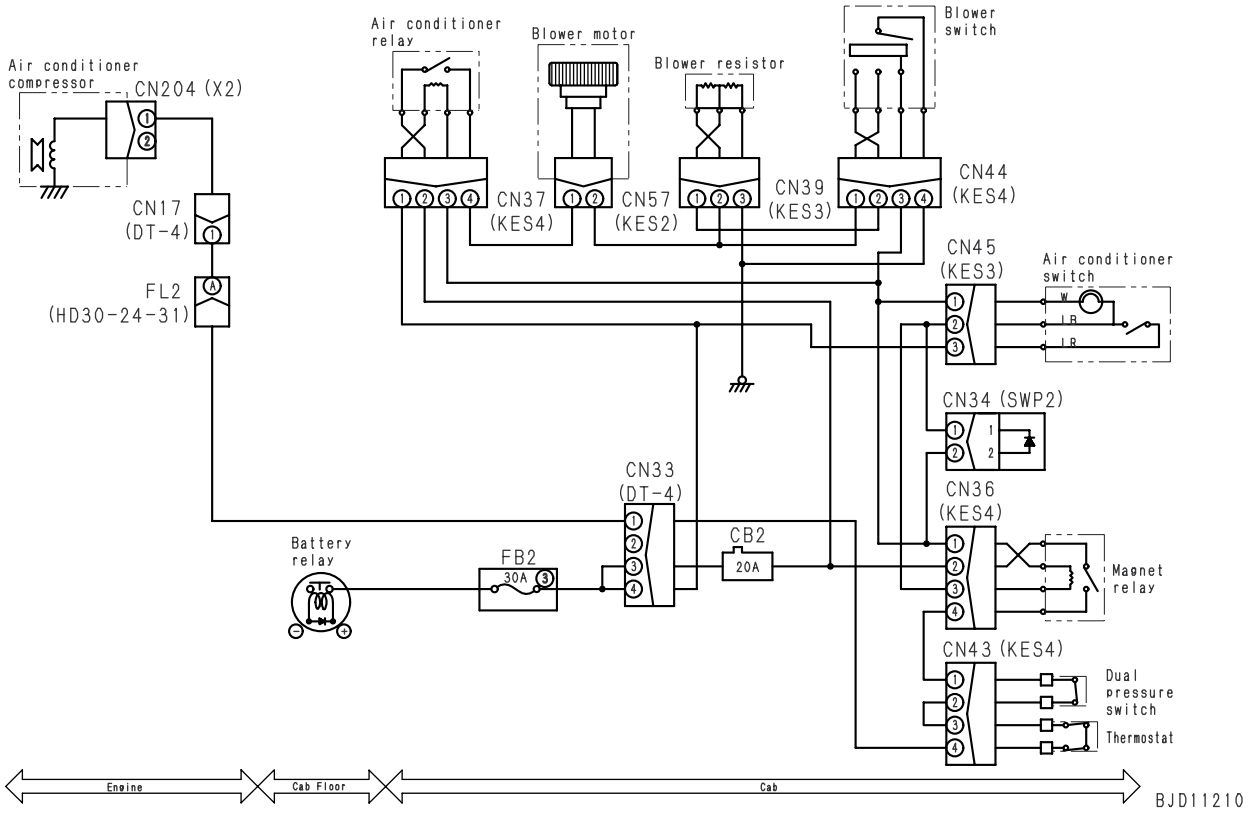
ERROR CODE DNCAKB (TRANSMISSION FNR DETECTION LIMIT SWITCH: SHORT CIRCUIT (KB))

Action code	Error code	Trouble	Transmission FNR detection limit switch: Short circuit (KB) (Machine controller system)
E01	DNCAKB		
Contents of trouble	• Multiple directional signals have been input to controller, so direction (F or R) cannot be displayed.		
Action of controller	• Monitor panel displays "--"		
Problem that appears on machine	• Gearshifting mechanism is mechanical, so gearshifting can be carried out. (The actual speed range can be checked by the lever angle.)		
Related information	• Method of reproduction error code: Turn starting switch ON.		

	Cause		Standard value in normal state/Remarks on troubleshooting			
Possible causes and standard value in normal state	1	Defective FNR detection limit switch(Defective point or internal short)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
					Resistance	
					Forward	Neutral	Reverse
			LMF (male)	Between A – B	Max. 1Ω	Min. 1MΩ	Min. 1MΩ
				Between A – C	Min. 1MΩ	Max. 1Ω	Max. 1Ω
			CN27 (male)	Between A – B	Max. 1Ω	Max. 1Ω	Min. 1MΩ
	2	Short circuit wiring harness(Contact with chassis ground)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.			
			Wiring harness between ST2 (female) ㉕ - LMF (female) B with chassis ground		Resistance	Min. 1MΩ
			Wiring harness between ST2 (female) ㉟ - LMF (female) C with chassis ground		Resistance	Min. 1MΩ
			Wiring harness between ST1 (female) ⑤ - CN27 (female) B with chassis ground		Resistance	Min. 1MΩ
			Between above wiring harnesses and chassis ground and other wiring harness		Resistance	Min. 1MΩ
	3	Defective machine controller	★Prepare with starting switch OFF, then turn starting switch ON and carry out troubleshooting.			
					Resistance	
					Forward	Neutral	Reverse
			Wiring harness between ST2 ㉕ - ST1 ④		Max. 1V	8V	8V
			Wiring harness between ST2 ㉟ - ST1 ④		8V	Max. 1V	Max. 1V
			Wiring harness between ST1 áD - ST1 ④		20 – 30V	20 – 30V	Max. 1V

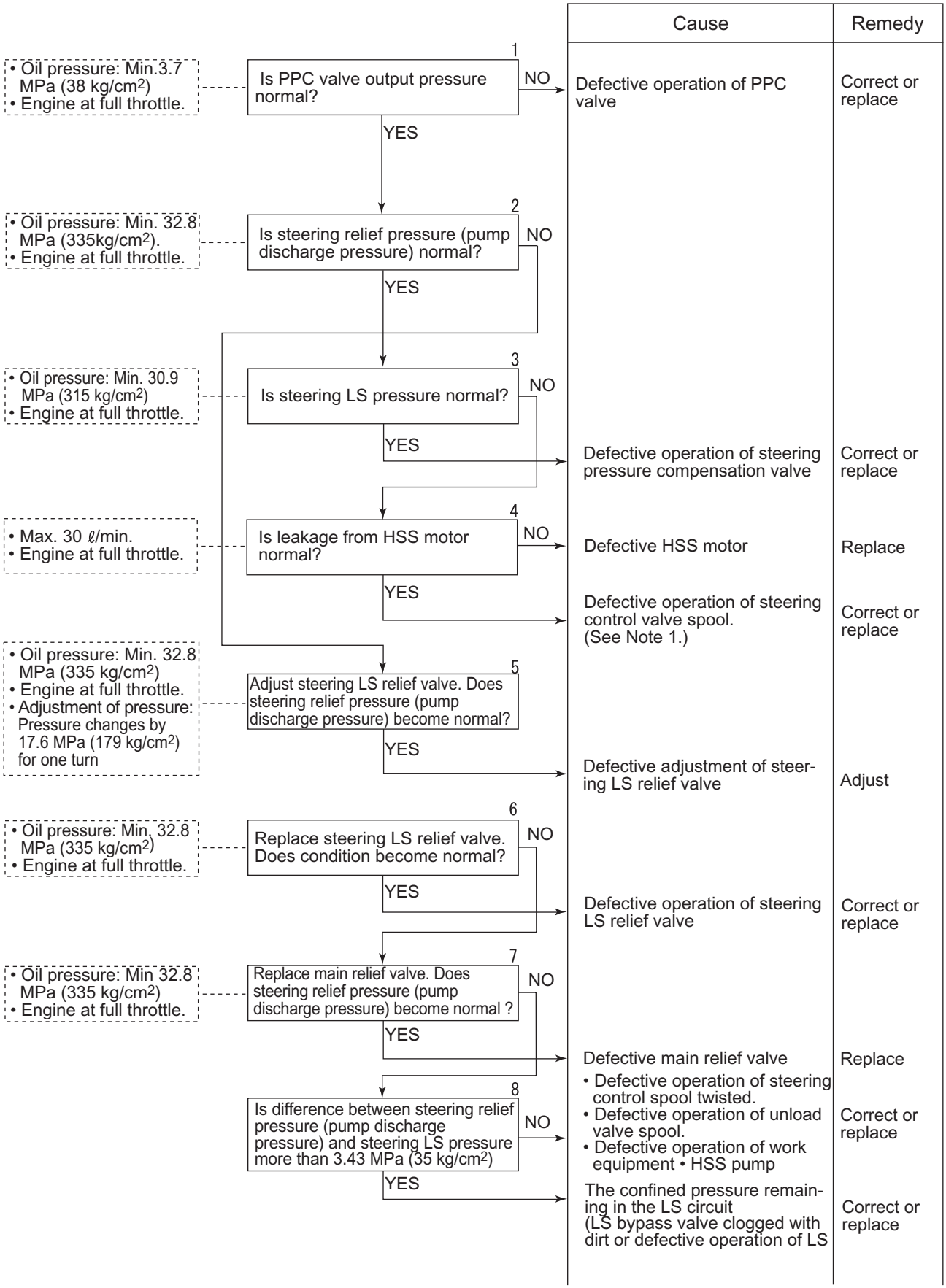
	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	5	Disconnection in wiring harness(Disconnection in wiring or defective contact in connector)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between heater relay terminal C and RHR (female) ③	Resistance	Max. 1Ω
			Wiring harness between RHR (female) ② and EN1 (female) ⑫	Resistance	Max. 1Ω
			Wiring harness between RHR (female) ① and starting switch terminal ACC	Resistance	Max. 1Ω
			Wiring harness between RHR (female) ⑤ and FB1 ②	Resistance	Max. 1Ω
			Wiring harness between starting switch terminal B and FB2 ⑤	Resistance	Max. 1Ω
			Wiring harness between heater relay terminal B and CN49 (female) ⑨	Resistance	Max. 1Ω
	6	Short circuit with ground in wiring harness (Contact with ground circuit)	★Prepare with starting switch OFF, then carry out troubleshooting without turning starting switch ON.		
			Wiring harness between heater relay terminal C and RHR (female) ③ with chassis ground	Resistance	Min. 1MΩ
			Wiring harness between RHR (female) ② and EN1 (female) ⑫ with chassis ground	Resistance	Min. 1MΩ
			Wiring harness between RHR (female) ① and starting switch terminal ACC with chassis ground	Resistance	Min. 1MΩ
			Wiring harness between RHR (female) ⑤ and FB1 ② with chassis ground	Resistance	Min. 1MΩ
			Wiring harness between starting switch terminal B and FB2 ⑤ with chassis ground	Resistance	Min. 1MΩ
			Wiring harness between heater relay terminal B and CN49 (female) ⑨ with chassis ground	Resistance	Min. 1MΩ
			Between above wiring harnesses	Resistance	Min. 1MΩ

Circuit diagram related to air conditioner



H-2 TURNING SPEED IS SLOW (CANNOT TURN) OR LACKS POWER WHEN TURNING.

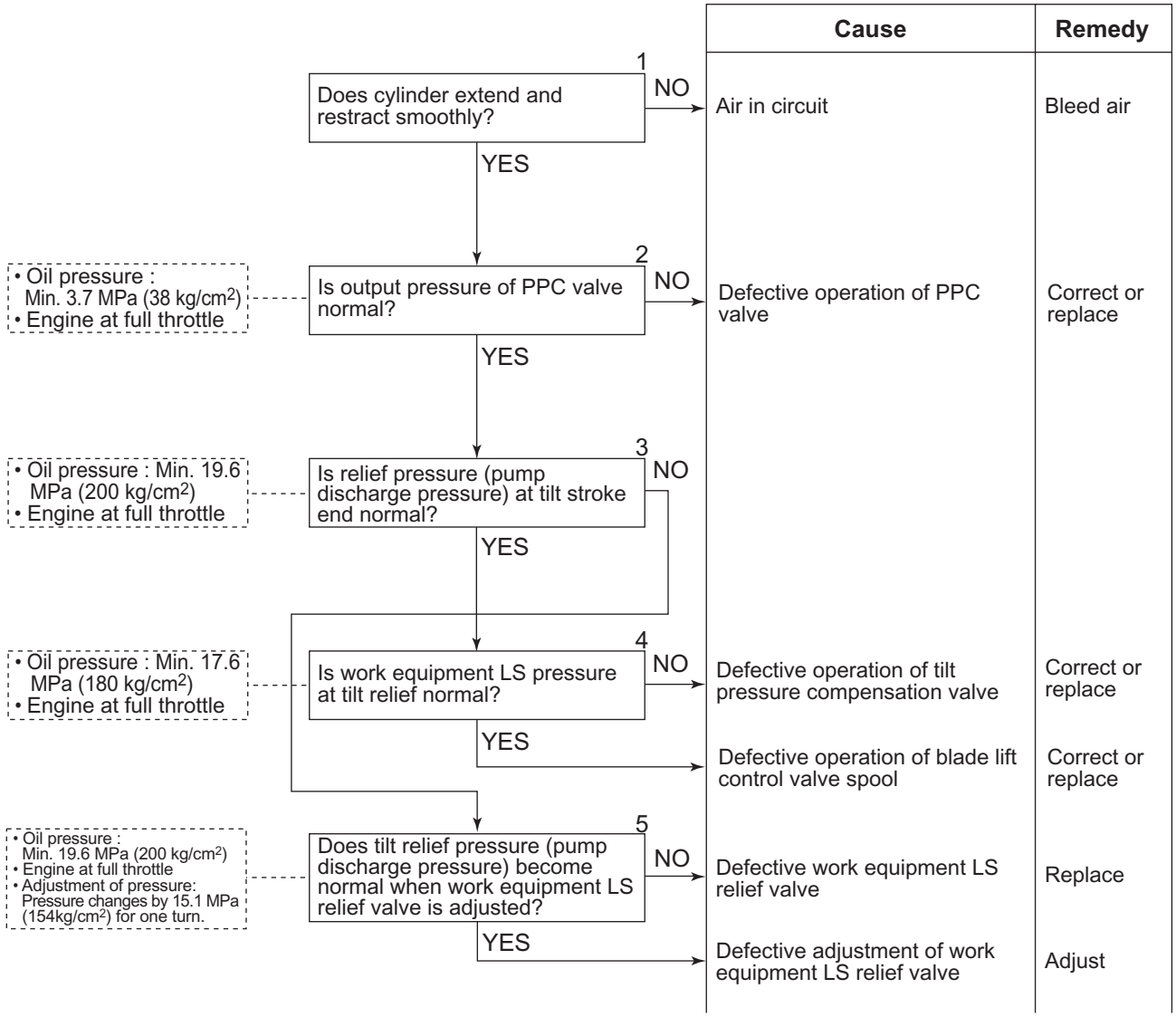
★ Check the oil level in the hydraulic tank before carrying out troubleshooting.



Note 1. Check that there is no clogging by dust or any deterioration of the spring, then move the spool by hand and judge if the spool moves smoothly.

H-13 BLADE LIFTING SPEED IS SLOW OR LACKS POWER

★ When hydraulic drift of blade is normal.
★ Check the oil level in the hydraulic tank before carrying out troubleshooting.
★ Check if the blade has been modified.



M-6 WARNING LAMP IS ABNORMAL

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

a) CAUTION ITEM LIGHT UP, BUT LAMP DOES NOT FLASH.

★ When a visual check shows that the bulb is not blown.
(If it is blown, replace the lamp)

Cause	Remedy
Defective monitor panel	Replace

b) MONITOR DISPLAY IS NORMAL BUT LAMP FLASHES.

Cause	Remedy
Defective monitor panel	Replace

PRECAUTIONS WHEN CARRYING OUT OPERATION

[When carrying out removal or installation (disassembly or assembly) of units, be sure to follow the general precautions given below when carrying out the operation.]

1. Precautions when carrying out removal work

- If the coolant contains antifreeze dispose of it correctly.
- After disconnecting hoses or tubes, cover them or fit blind plugs to prevent dirt or dust from entering.
- When draining oil, prepare a container of adequate size to catch the oil.
- Confirm the match marks showing the installation position, and make match marks in the necessary places before removal to prevent any mistake when assembling.
- To prevent any excessive force from being applied to the wiring, always hold the connectors when disconnecting the connectors.
- Fit wires and hoses with tags to show their installation position to prevent any mistake when installing.
- Check the number and thickness of the shims, and keep in a safe place.
- When raising components, be sure to use lifting equipment of ample strength.
- When using forcing screws to remove any components, tighten the forcing screws alternately.
- Before removing any unit, clean the surrounding area and fit a cover to prevent any dust or dirt from entering after removal.

★ **Precautions when handling piping during disassembling**

Fit the following blind plugs into the piping after disconnecting it during disassembly operations.

1) Hoses and tubes using sleeve nuts

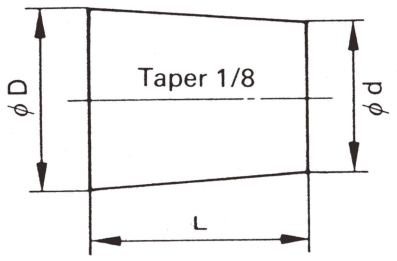
Nominal number	Plug (nut end)	Sleeve nut (elbow end) Use the two items below as a set
02	07376-50210	07221-20210 (Nut), 07222-00210 (Plug)
03	07376-50315	07221-20315 (Nut), 07222-00312 (Plug)
04	07376-50422	07221-20422 (Nut), 07222-00414 (Plug)
05	07376-50522	07221-20522 (Nut), 07222-00515 (Plug)
06	07376-50628	07221-20628 (Nut), 07222-00616 (Plug)
10	07376-51034	07221-21034 (Nut), 07222-01018 (Plug)
12	07376-51234	07221-21234 (Nut), 07222-01219 (Plug)

2) Split flange type hoses and tubes

Nominal number	Flange (hose end)	Sleeve head (tube end)	Split flange
04	07379-00400	07378-10400	07371-30400
05	07379-00500	07378-10500	07371-30500

3) If the part is not under hydraulic pressure, the following corks can b e used.

Nominal number	Part Number	Dimensions		
		D	d	L
06	07049-00608	6	5	8
08	07049-00811	8	6.5	11
10	07049-01012	10	8.5	12
12	07049-01215	12	10	15
14	07049-01418	14	11.5	18
16	07049-01620	16	13.5	20
18	07049-01822	18	15	22
20	07049-02025	20	17	25
22	07049-02228	22	18.5	28
24	07049-02430	24	20	30
27	07049-02734	27	22.5	34



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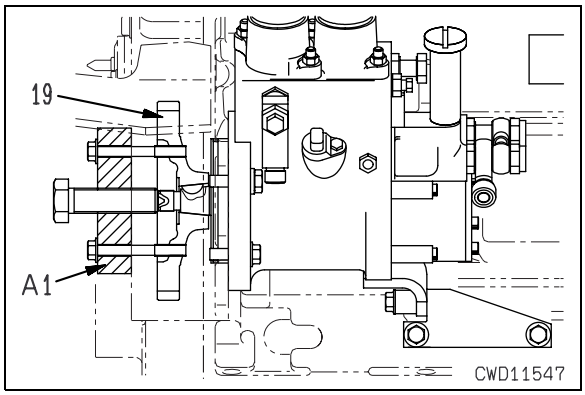
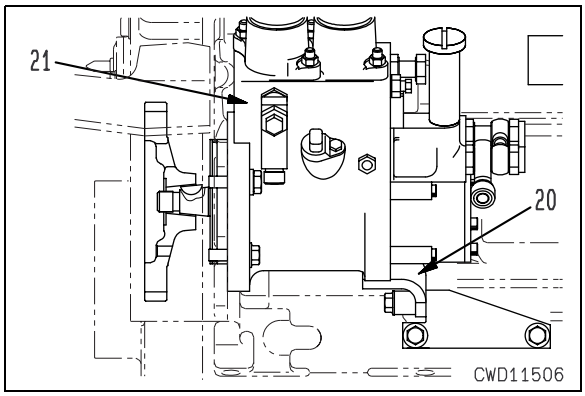
3) Remove the gear mounting nut and remove fuel supply pump drive gear (19) using tool **A1**.
   ★ Be careful so as not to allow the nuts, washers and woodruff key on the shaft to drop into the case. ※5



5. Fuel supply pump
Remove bracket (20) to remove fuel supply pump assembly (21).



INSTALLATION

- Carry out installation in the reverse order to removal.

※1

kgm Fuel hoses (4) and (5):
14.7 - 19.6 Nm {1.5 -2.0 kgm}

※2

kgm Fuel tubes (7) and (8) on filter side and the fuel supply pump side:
24.5 - 34.3 Nm {2.5 -3.5 kgm}

※3

★ Mounting cover (12) with its slit facing the cylinder block.
★ Mounting cover (13) with its slit facing down.

※4

kgm Lubrication tube (16)

On the fuel supply pump side:
7.9 - 12.7 Nm {0.8 - 1.3 kgm}

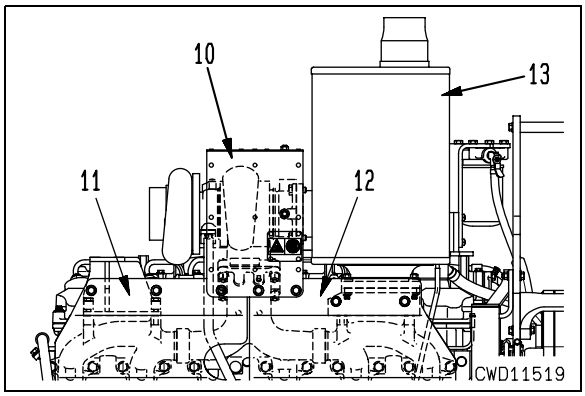
On the cylinder block side:
9.8 - 12.7 Nm {1.0 - 1.3 kgm}

4. Muffler assembly
1) Remove drain tube.

2) Remove heat insulation panels (10), (11), and (12).

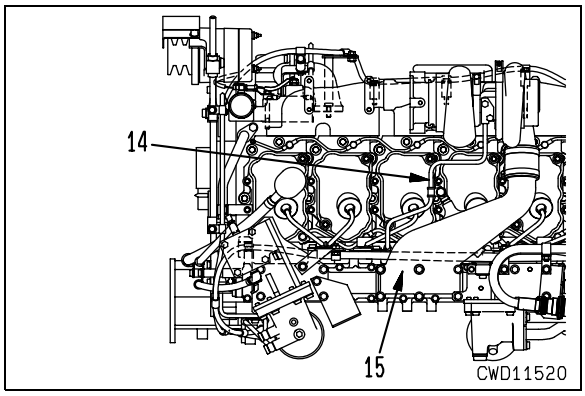
3) Remove the turbocharger connecting bolts.

4) Remove the mounting bolts and nuts and lift off muffler assembly (13).



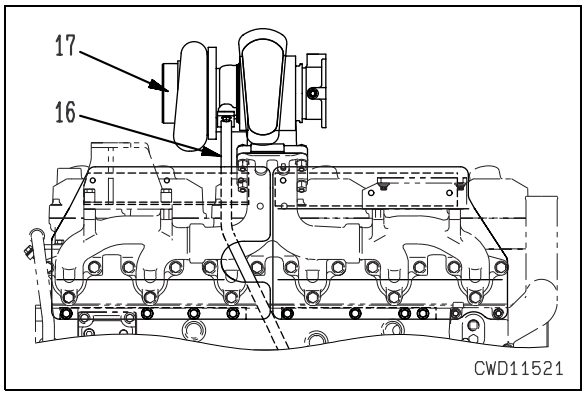
5. Remove turbocharger lubrication tube (14). ※ 4

6. Remove air intake connector (15). ※ 5

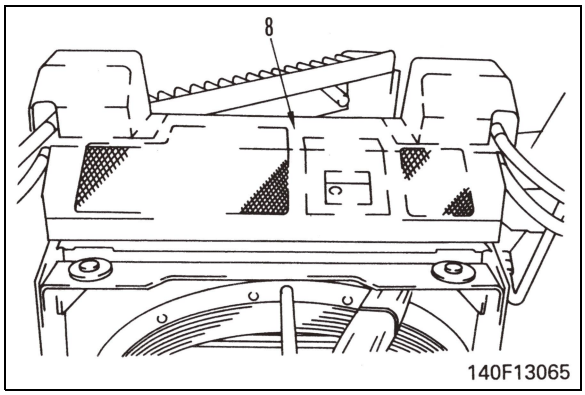


7. Turbocharger and exhaust manifold assembly
1) Remove drain tube (16). ※ 6
2) Sling turbocharger assembly (17) temporarily, then remove the exhaust manifold mounting bolts and turbocharger assembly. ※ 7

kg Turbocharger and exhaust manifold assembly: **45 kg**

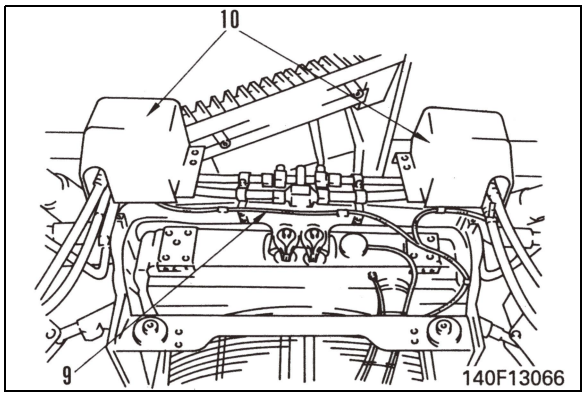


9. Remove radiator top cover (8).



10. Disconnect front lamp wiring (9) and horn wiring.

11. Remove front lamp assembly (10).

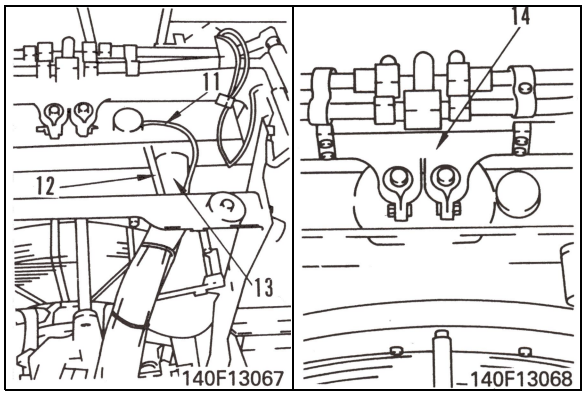


12. Disconnect hose (11) between radiator and reserve tank.

13. Disconnect aeration hose (12). ※ 3

14. Remove radiator inlet hose (13). ※ 4

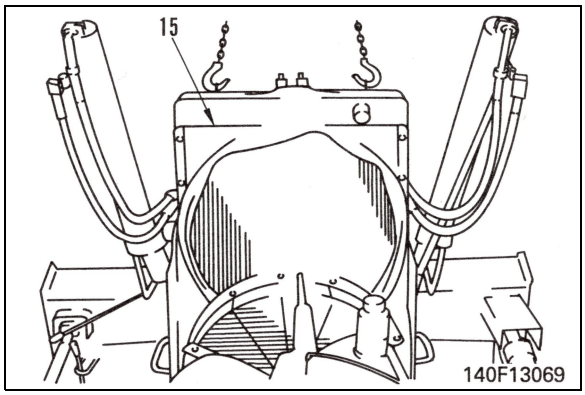
15. Remove bracket (14).



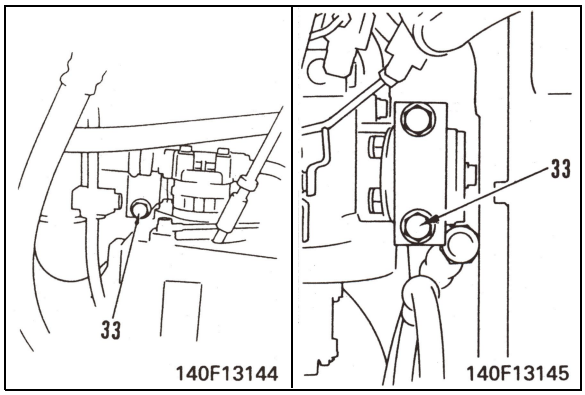
16. Remove 2 radiator bottom mount bolts, and raise radiator assembly (15) slowly, then remove.

★ When removing the radiator, be extremely careful not to damage the seal or radiator core.

kg Radiator assembly: **45 kg**



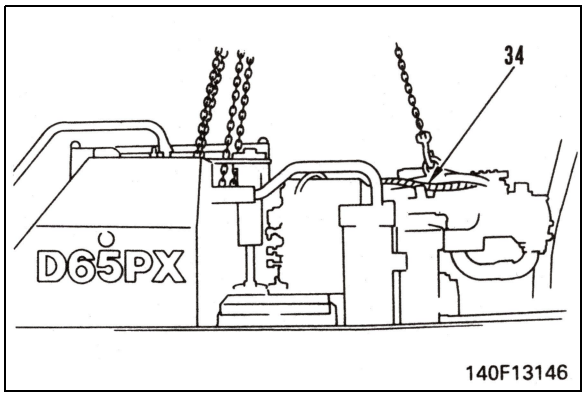
25. Remove front mount bolts (33).



26. Lift off power train unit assembly (34).

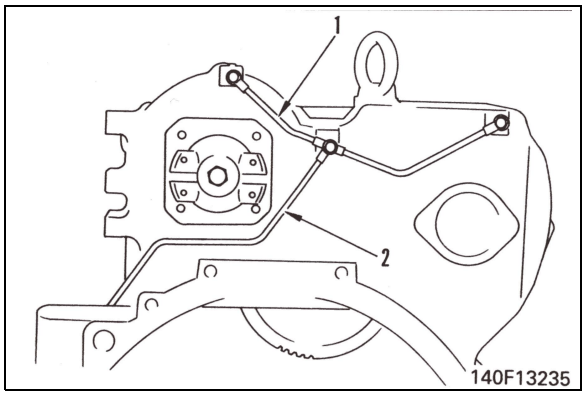
★ Check that all wiring and piping has been disconnected before removing the power train unit assembly.

kg Power train unit assembly: **1700 kg**

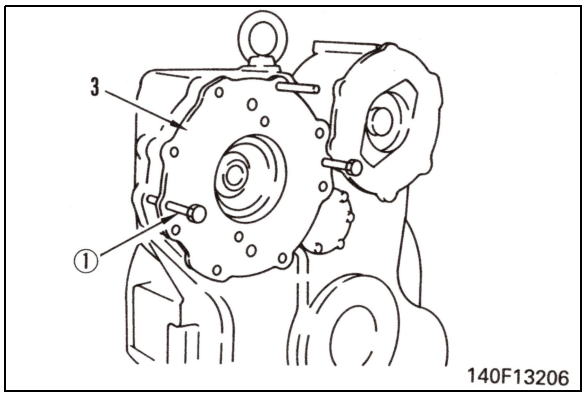


DISASSEMBLY OF PTO ASSEMBLY

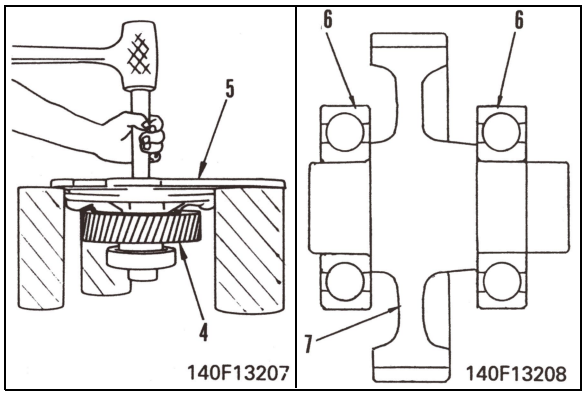
1. Lubrication tubes
Remove lubrication tubes (1) and (2).



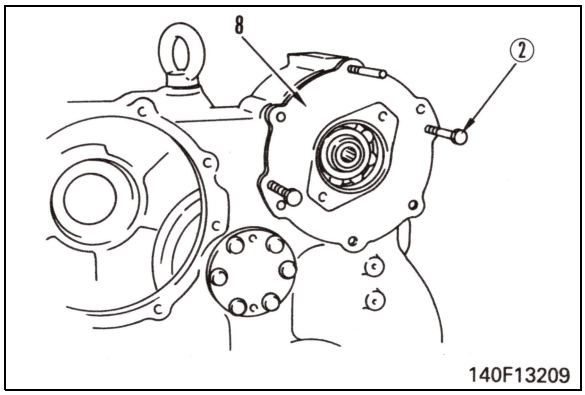
2. Cover assembly (right)
1) Remove mounting bolts, then using forcing screw ① , remove cover assembly (3).



2) Knock out gear assembly (4) from cover (5) and remove.
3) Remove bearings (6) from gear (7).

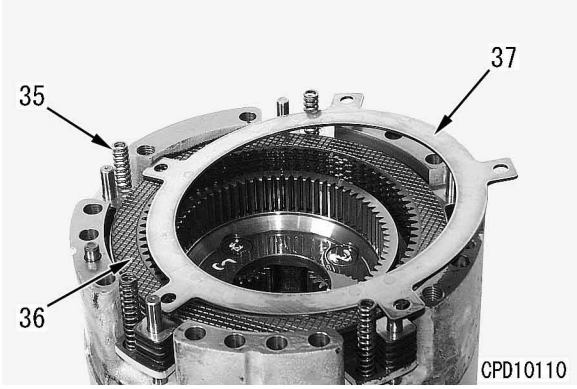


3. Cover assembly (left)
1) Remove mounting bolts, then using forcing screw ② , remove cover assembly (8).



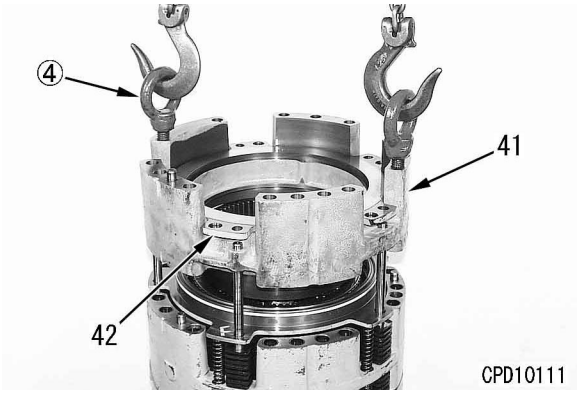
5. No. 1 discs, plates, and springs

1) Remove springs (35).
2) Remove discs (36) and plates (37).



6. No. 1 housing assembly

1) Using eyebolts ④ , remove No. 1 housing assembly (41).
2) Remove piston (42) from the housing.



7. No. 2 piston

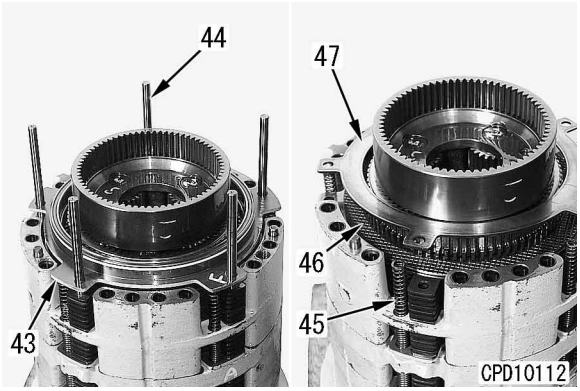
Remove No. 2 piston (43).

8. Guide pin

Remove guide pin (44).

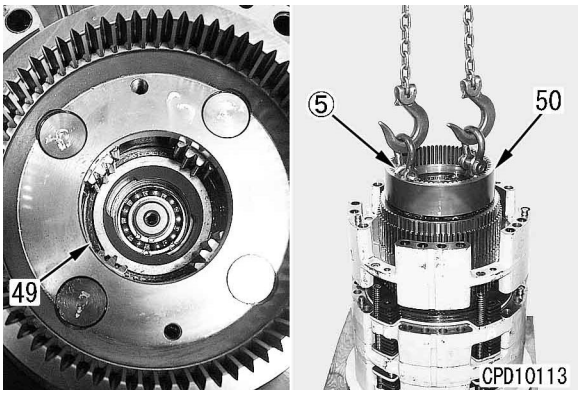
9. No. 2 discs, plates, and springs

1) Remove No. 2 clutch springs (45).
2) Remove discs (46) and plates (47).



10. No. 2 housing and No. 2 carrier assembly

1) Push up the output shaft lightly from underside.
2) Remove snap ring (49).
3) Using eyebolts ⑤ , remove No. 2 housing and No. 2 carrier assembly (50).

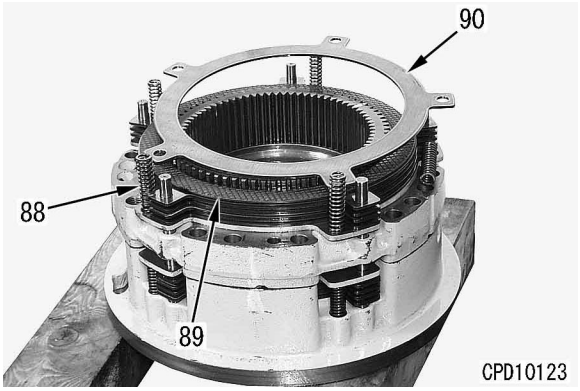


9. No. 4 discs, plates, and springs

Install No. 4 discs (89), plates (90), and springs (88).

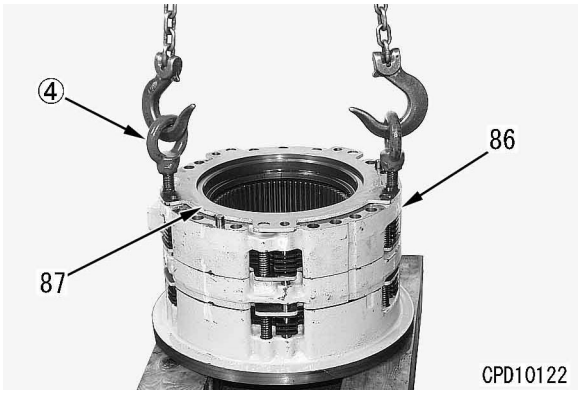
★ Discs: 4 pieces, Plates: 5 pieces

★ Free length of spring: 59 mm

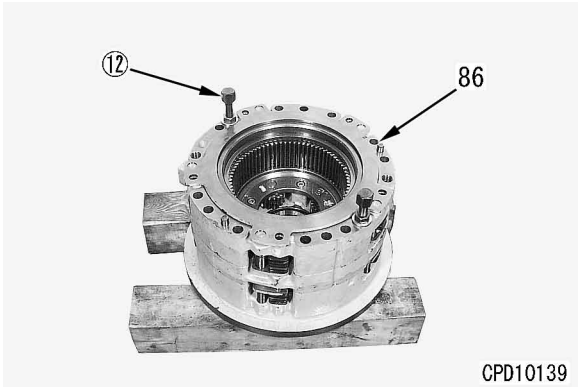


10. No. 3 housing assembly

1) Install the seal ring to No. 3 housing.
2) Install the seal ring and No. 3 piston (87).
   ★ For installation of the seal ring, see assembly step 7.
3) Using eyebolts ④ , install No. 3 housing (86).
   ★ Check that the springs are fitted securely in the grooves.

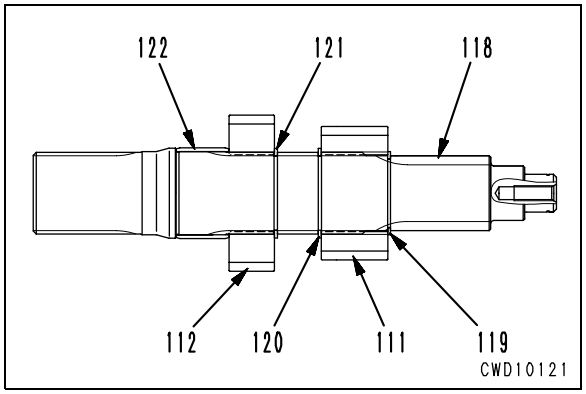


4) Using forcing screws ⑫ , tighten No. 3 housing (86) and insert dowel pin in the housing securely.

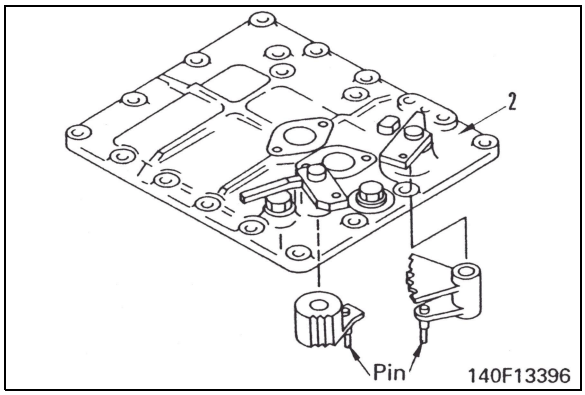


11. No. 3 carrier and output shaft assembly

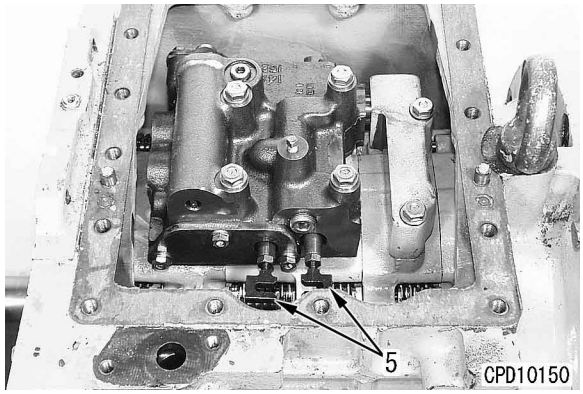
1) Assemble the output shaft according to the following procedure.
   i) Install inner race (122) to output shaft (118).
   ii) Install No. 5 sun gear (112) and snap rings (121) and (120).
   iii) Install No. 4 sun gear (111) and snap ring (119).

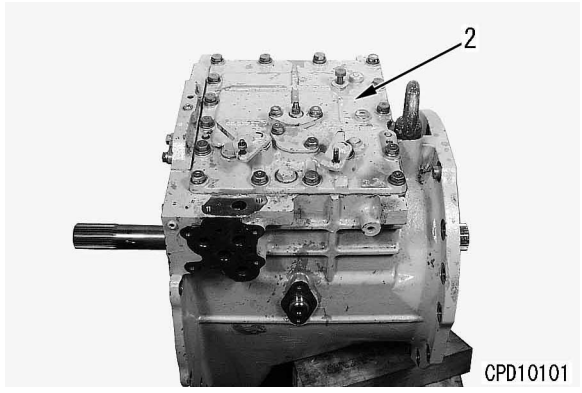


4) Set the yoke of spool (5) to the positions of the pins of the forward-reverse lever and gear shift lever of cover assembly (2).
   ★ Measure the distance from the holes for the cover assembly mounting bolts, then position the yoke.



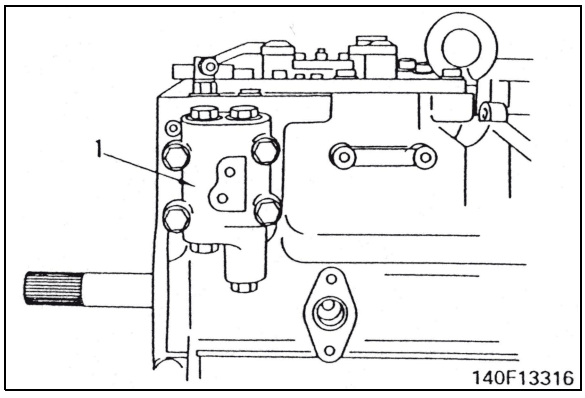
5) Fit the gasket and insert cover assembly (2) in the dowel pin lightly, checking the engagement of the pins and yoke through the clearance between the case and cover.
   ★ Move the forward-reverse lever and gear shift lever to check that the pins and yoke are engaged securely, then insert the cover in the dowel pin to the end and tighten the bolts.
   ★ If the pins are not engaged with the yoke, remove the cover and repeat the above procedure again.



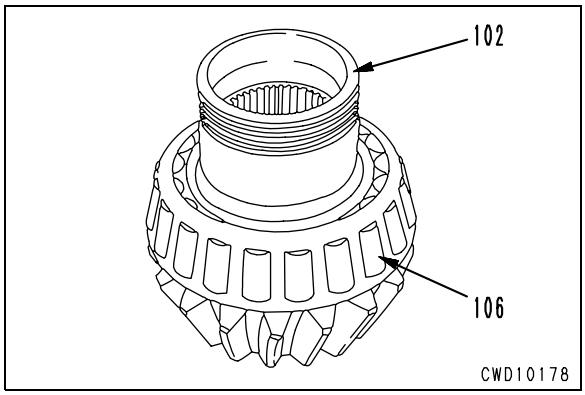


27. Relief valve assembly

Install relief valve assembly (1).

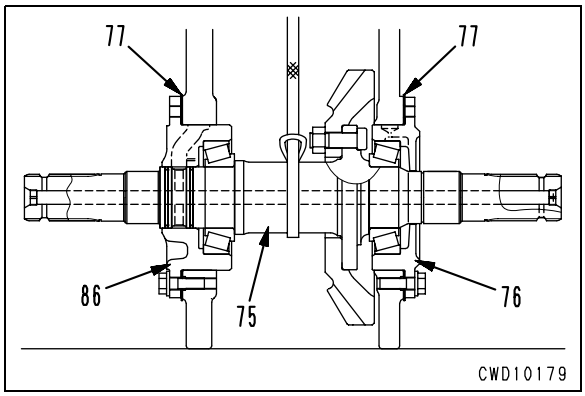


vi) Remove bearing (106) from bevel pinion (102).

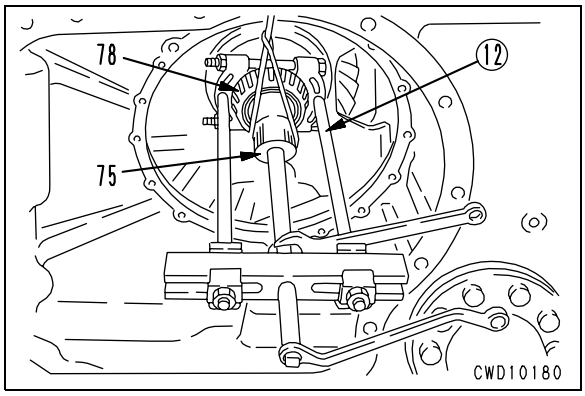


8. Bevel gear shaft and bevel gear

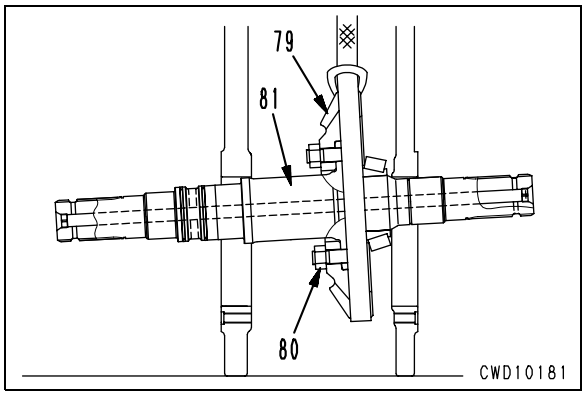
1) Sling bevel gear and shaft assembly (75) temporarily.
2) Remove cage assemblies (76) and (86).
   - ★ Check the thickness, quantity, and positions of shims (77).
   - ★ Since both cages are different from each other, make marks on them.



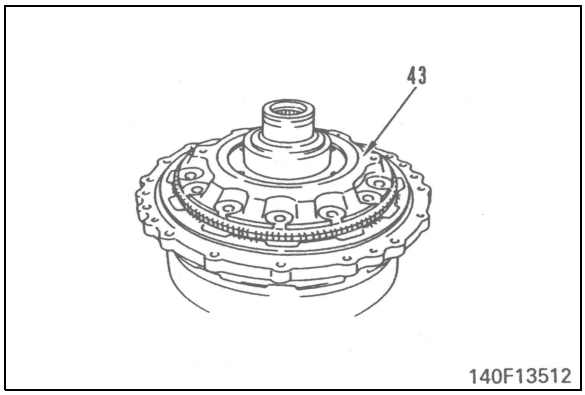
3) Move bevel gear and shaft assembly (75) to the left end and remove bearing (78) with puller ⑫ .
   - ★ Remove only the bearing on the left side of the machine.

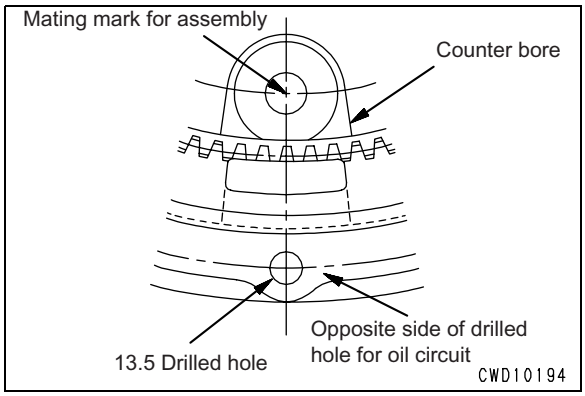


4) Sling bevel gear (79) and remove mounting nut (80) and pull out bevel gear shaft assembly (81) to the right side of the machine.

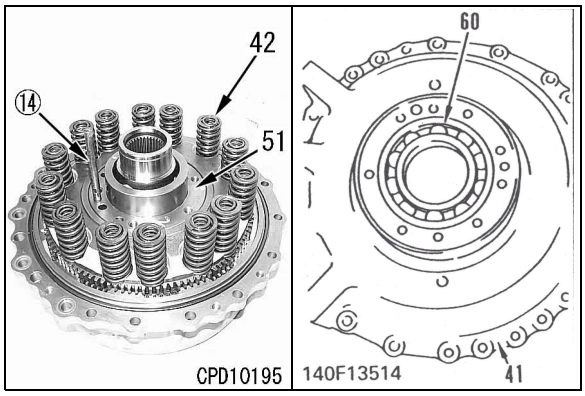


9) Install the seal ring to piston (43).
10) Install piston (43), matching the center of the spot-face having the match mark to the drilled hole "13.5 in diameter" (on the opposite side of the side hole).

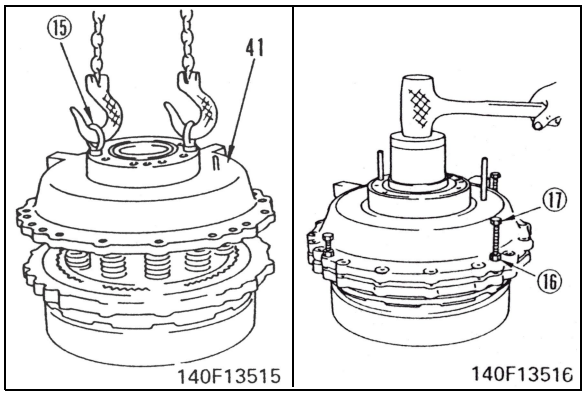




11) Install spring (42).
12) Install guide bolt ⑭ to age (51).
13) Install bearing (60) to cover (41).



14) Using eyebolts ⑮ and matching to the guide bolt, set cover (41).
★ Check that the spring is fitted securely to both of the piston and case.
15) Compressing the spring with forcing screws ⑰ and nuts ⑯ , press fit the inner race side of the bearing to the hub assembly.



DISASSEMBLY OF TRANSMISSION CONTROL VALVE ASSEMBLY

1. Disassembly of quick return valve
1) Remove snap ring (2) from valve body (1).
2) Pull out spacer (3), and remove snap ring (4).
3) Remove plug (5), pull out valve (6) and sleeve (7), then remove snap ring (8).

2. Disassembly of speed valve
1) Remove spool assembly (10) from valve body (9).
2) Loosen nut (11), and disconnect spool (12) and yoke (13).

3. Disassembly of directional valve, modulation valve
1) Remove snap ring (14), then remove stopper (15).
2) Loosen nut (16), and remove yoke (17).
3) Remove cover (18), shim (19), and spacer (20), then remove spring (21), washer (22), and springs (23) and (24).
4) Remove cover (25).
5) Remove collar (26) and spool (27).
6) Remove valve assembly (28).
7) Remove snap ring (29), stopper (30), valve (31), spring (32), valve (33), and valve (34) from valve assembly (28).

ASSEMBLY OF TRANSMISSION CONTROL 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 directional valve, modulation valve.
1) Assemble valves (34) and (33). Spring (32), and valve (31) to valve (28) fit stopper (30), then install snap ring (29).
2) Assemble valve assembly (28) to body (9), then assemble springs (24) and (23), washer (22), and spring (21) from opposite side, and install spacer (20).
3) Install shim (19) and cover (18).
★ Standard shim thickness: 2.5 mm
4) Install spool (27) and collar (26) to body (9), then install cover (25).
5) Assemble stopper (15), and install snap ring (14).
6) Assemble nut (16) to yoke (17), and install to valve (27).
kgm Locknut:
30.9 ± 3.4 nm {3.2 ± 0.35 kgm}
★ Dimension **a** for mounting yoke:
29.1 mm

2. Assembly pf speed valve
1) Assemble nut (11) to yoke (13), and install to spool (12).
kgm Locknut:
30.9 ± 3.4 nm {3.2 ± 0.35 kgm}
2) Assembly spool assembly (10) to body (9).

3. Assembly of quick return valve
1) Install plug (5) to body (1), assemble valve (6) and sleeve (7), then install snap ring (8).
2) Assemble spacer (3) to body (1), then fit snap rings (4) and (2).

ASSEMBLY OF HSS MOTOR ASSEMBLY

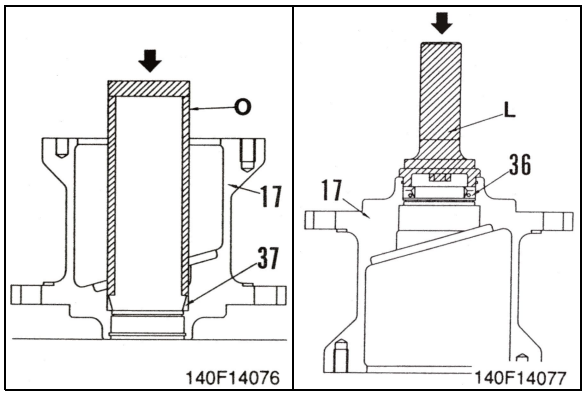
★ Clean all parts, and check for dirt or damage.
★ Coat the sliding surface of all parts with engine oil (EO10-CD) before installing.

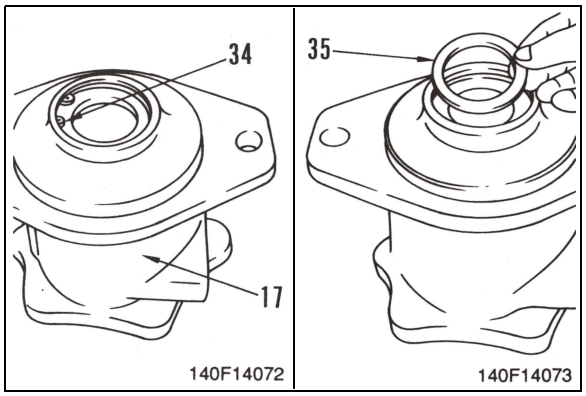
1. Motor case

1) Using tool **O**, press fit outer race (37) to motor case (17).
2) Using tool **L**, install oil seal (36) to motor case (17).

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

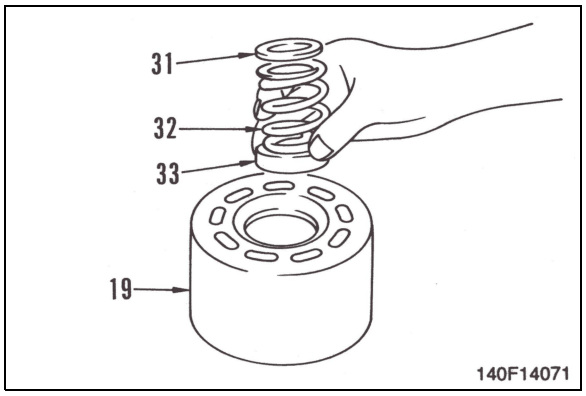
3) Fit spacer (35) and install snap ring (34).
   ★ Check that the snap ring is securely fitted into the groove.



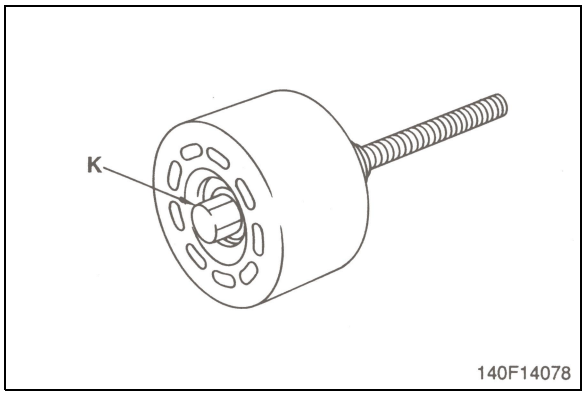


2. Cylinder block, piston assembly

1) Assembly of cylinder block
   i) Assemble spacer (33), spring (32), spacer (31) to cylinder block (19).
      ★ Assemble spacer (33) with the inside taper facing down.



   ii) Set tool **K** to cylinder block (19).
   iii) Hold bolt of tool **K** with wrench, tighten nut and compress spring (29), then install snap ring (30).
      ★ Check that the snap ring is securely fitted into the groove.
   iv) Remove tool **K**.



INSTALLATION OF FINAL DRIVE ASSEMBLY

- Carry out installation in the reverse order to removal.

※1

Thread of bracket mounting bolt:
Thread tightener (LT-2)

※2

★ Be careful not to damage the seal when installing.

kgm Cover mounting bolt:
110.3 ± 12.3 Nm {11.25 ± 1.25 kgm}

※3

kgm Final drive assembly mounting bolt:
549 ± 59 Nm {56 ± 6 kgm}

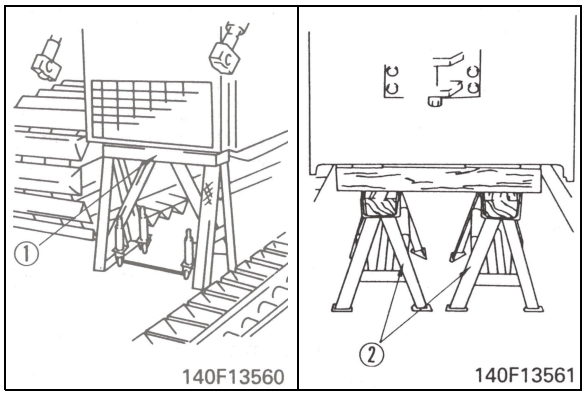
※4

kgm Cover mounting bolt:
277 ± 32 Nm {28.25 ± 3.25 kgm}

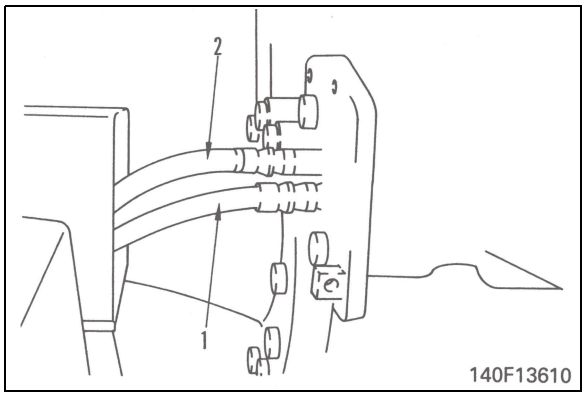
REMOVAL OF TRACK FRAME ASSEMBLY

1. Remove track shoe assembly.
For details, REMOVAL OF TRACK SHOE ASSEMBLY.

2. Using jack (50 ton), jack up chassis, then set stands ① and ② (height: Approx. 900 mm) under front frame and steering case.



3. Remove tilt cylinder hose protection cover, then disconnect hoses (1) and (2). (On inside of track frame on right side of chassis).



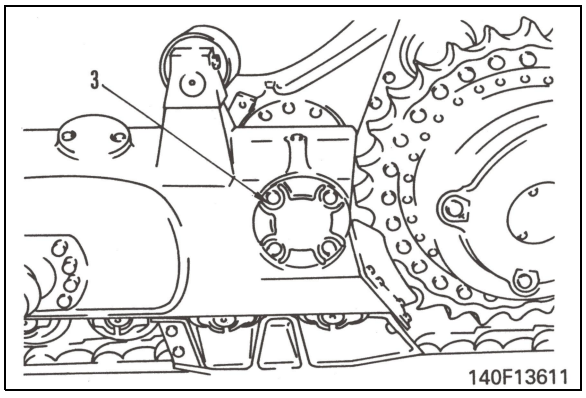
4. Remove pivot shaft cover (3). ※ 1

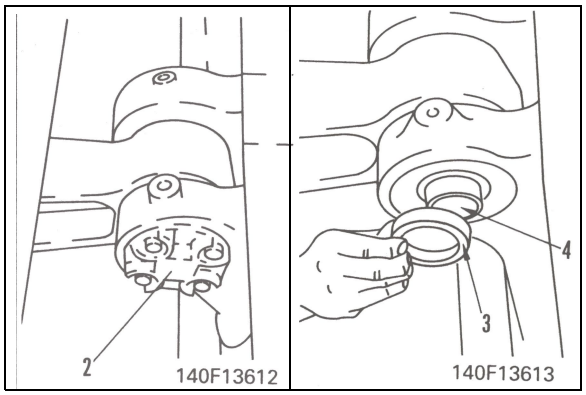
5. Remove equalizer bar side pin (4). ※ 2
- ★ Sling the track frame assembly, remove cover (5) and outside bushing (6), then knock out the pin and remove inside bushing (7).
- ★ When knocking out the pin, catch the inside bushing and be careful not to drop it.

6. Remove pivot shaft bolt (8) and plate (9), then lift off track frame assembly (10). ※ 3
- ★ Sling the carrier roller at its center. This makes it possible to balance it and raise it horizontally.
- ★ Oil will leak from the pivot chamber, so prepare a container to catch it.

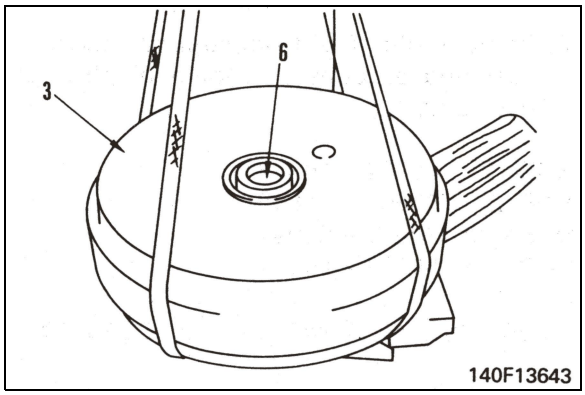
kg Track frame assembly:
1600 kg (D65EX)
1800 kg (D65PX)

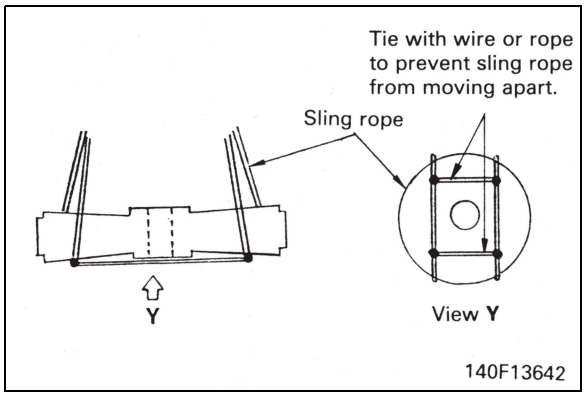
Pivot chamber: **Approx. 4.5 ℓ**





6. Raise idler (3) and assemble to shaft and support assembly (6).



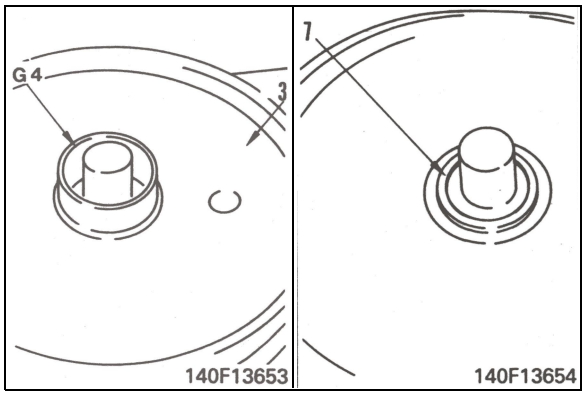


7. Using tool **G4**, assemble floating seal (7) to idler (3).

★ When assembling the floating seal, clean the thick line portion (O-ring and O-ring contact surface), remove all oil and grease, and dry it.

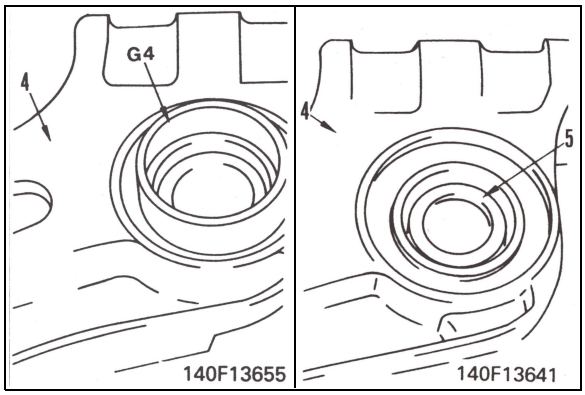
8. Refill idler with oil.

Idler: **150 cc (EO-30)**



9. Using tool **G4**, assemble floating seal (5) to support (4).

★ When assembling the floating seal, clean the thick line portion (O-ring and O-ring contact surface), remove all oil and grease, and dry it.

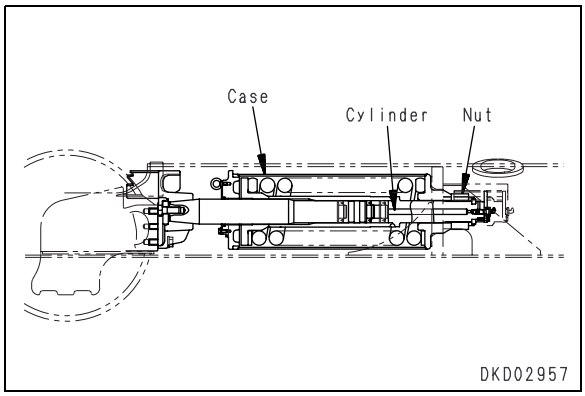


CHECKING BEFORE REMOVAL OF TRACK SHOE ASSEMBLY

⚠ In some cases, it may be extremely dangerous to remove the track shoe assembly. To prevent danger, carry out the following checks before removing the track shoe assembly.

- **Check before starting**
  1) Loosen the lubricator at the adjustment cylinder, remove the grease, move the machine backwards and forwards a short distance, and check that the track tension is relieved. If the track tension is not relieved and the track shoe assembly remains tense, there may be an abnormality inside the track frame (the recoil spring cylinder is broken, or the nut at the end of shaft has fallen off).

     ⚠ Never loosen the lubricator more than one turn.



REMOVAL OF TRACK SHOE ASSEMBLY (NORMAL)

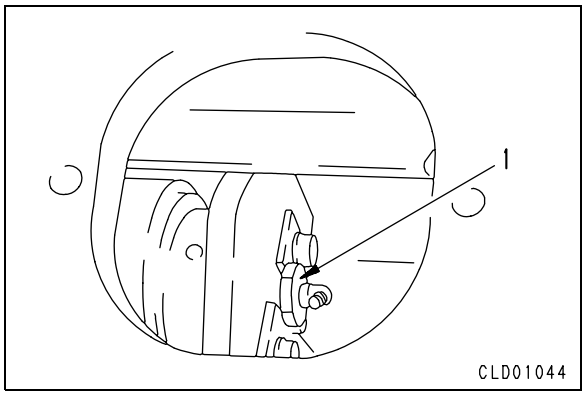
★ If CHECKING BEFORE REMOVAL OF TRACK SHOE ASSEMBLY shows that there is no abnormality, do as follows.

1. Set master link in position
   ★ Set a block (height: approx. 300 mm) so that the master link is approx. 500 mm from the ground at the front.

2. Relieve track shoe tension. ※1

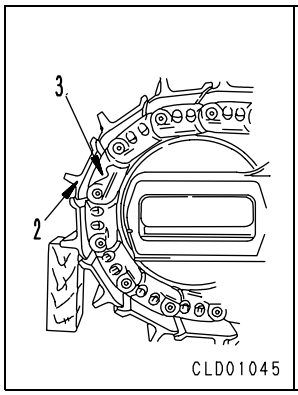
   ⚠ Never loosen lubricator (1) more than one turn.

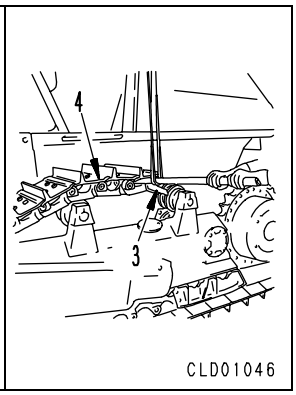
   ★ If the track is not relieved by loosening the lubricator, move the machine backwards and forwards.



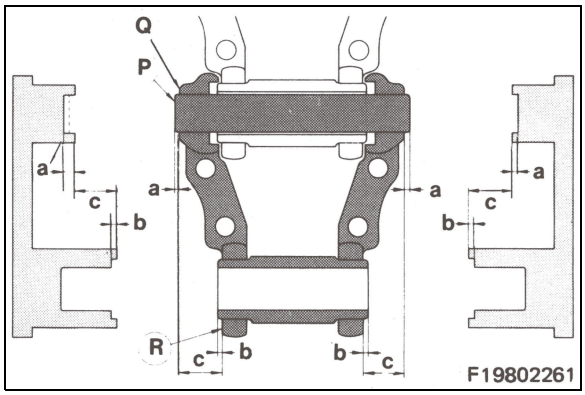
3. Remove mounting bolts of track shoe (2) and master link (3). ※2

4. Raise tip of master link, move machine forwards slowly, and lay out track shoe assembly (4).

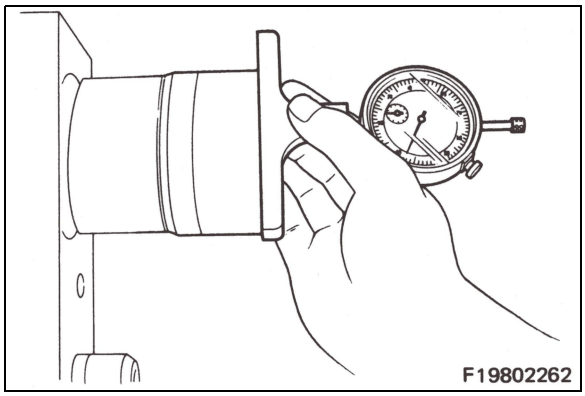




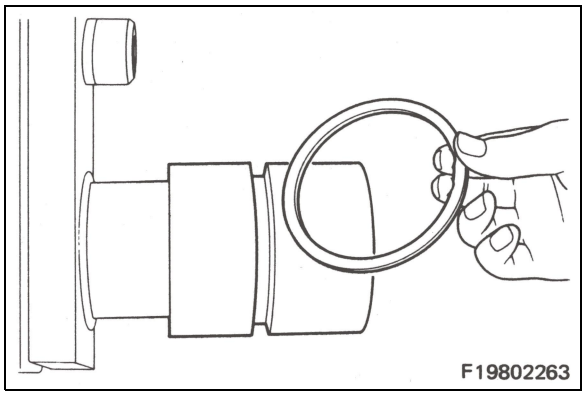
7) In order to keep the protrusion of the pin and bushing constant and the installation dimensions of the steel within the specified value during assembly, adjust the press-fitting jig dimensions of the link press.
   ★ For details of the standard dimensions, see PRESS-FITTING JIG DIMENSION TABLE FOR LINK PRESS.



   ★ To leave a small space for the pin when assembling, ensure that the dimension (dimension **a'**) is greater than dimension **"a"** at the pin pushing portion of the left press-fitting jig.
   When assembling in order ① left link press fitting, ② right link press fitting, provide the extra space for the pin on the right press-fitting jig.

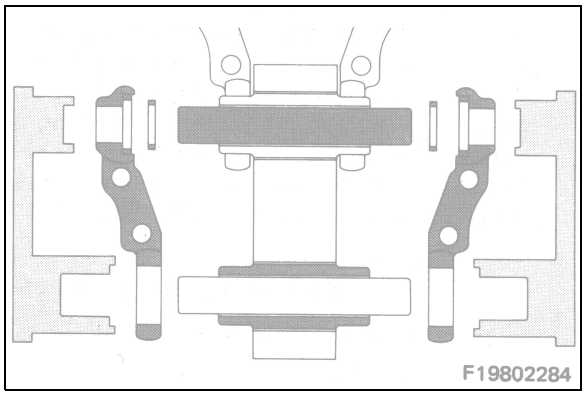


   ★ If the end face of the pin (portion **P**) or the end face of the link (portion **Q**, **R**) are worn, add the amount of wear to the standard dimension when adjusting the dimension of the press-fitting jig so that the amount of protrusion of the left and right pin and bushing is uniform.

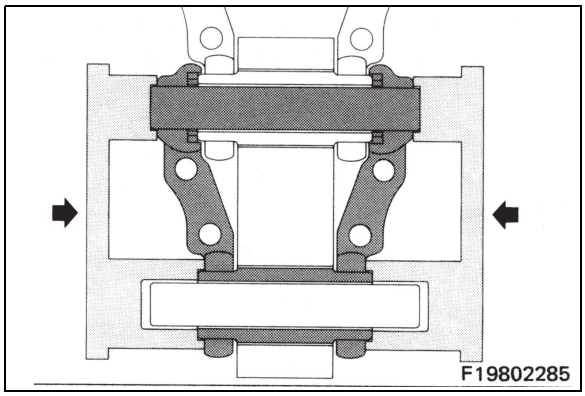


8) Adjust the relief pressure of the link press to make sure that the pushing force of the press does not exceed the specified value.
   ★ If the pushing force is too strong, excessive force will be brought to bear on the spacer, and it will be pushed against the bushing. This will cause the spacer to break or will cause abnormal wear between the spacer and bushing end face.
   ★ If the interference at the press-fitting portion is different from when the part is new, as when reusing a pin or bushing, measure several of the press-fitting portions, and use the value below to determine the set pushing force according to the average interference.
   ★ Set pushing force of pin and bushing:
   588 KN (60 ton)
   Set pushing force $\fallingdotseq 1.8 \times$ average pushing force
   (Adjust the relief pressure of link press to fix the set pushing force)

6) Feed the master link portion, then set the pin and bushing in position.
   ★ When reusing the pin, assemble so that the side hole is on the link tread side in the same way as when the part is new. If the parts are not assembled facing the specified direction, the strength may drop, so mark the direction of the side hole clearly on the end face to prevent any mistake during assembly.
   ★ If the outside diameter of the pin is worn, assemble so that the face that is not worn, assemble so that the face that is not worn is on the pulling side. However, in this case, also assemble so that the side hole faces the tread surface of the link.

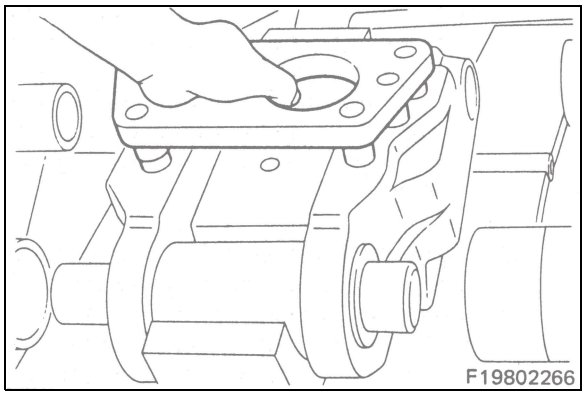


7) Set the left and right links in position, then operate the left and right bushing jigs to press fit the pin and bushing at the same time.
   ★ When press fitting, the seal my come off the link due to the play, so press fit smoothly. If the seal comes off the link, stop the press-fitting operation and fit the seal correctly on the link, then start the press-fitting operation again.
   ★ Set pushing force of pin and bushing:
   588 KN {60 ton}
   Set pushing force ≒ 1.8 × average pushing force
   (Adjusting the relief pressure of link press to fix the set pushing force)



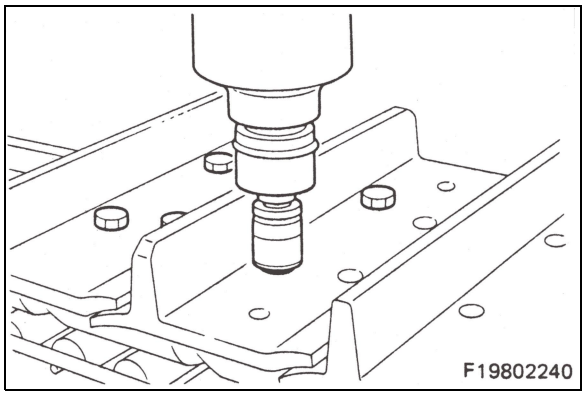
8) Using a shoe bolt hole pitch gauge, check that the distance between the shoe bolt holes is within the standard valve.

9) Assemble the pin end master link as the final link.
   ★ Check that the left and right master links are press fitted in parallel.



3. Shoe (regular link portion)
Set the link assembly on the bed, then use a shoe bolt impact wrench and torque wrench to install the shoe.

kgm Shoe bolt (regular link):
Initial tightening torque:
392.3 ± 39.2 Nm {40 ± 4 kgm}
Tightening angle: **120 ± 10°**



REMOVAL OF PIVOT SHAFT ASSEMBLY

1. Remove track frame assembly.
For details, see REMOVAL OF TRACK FRAME ASSEMBLY.

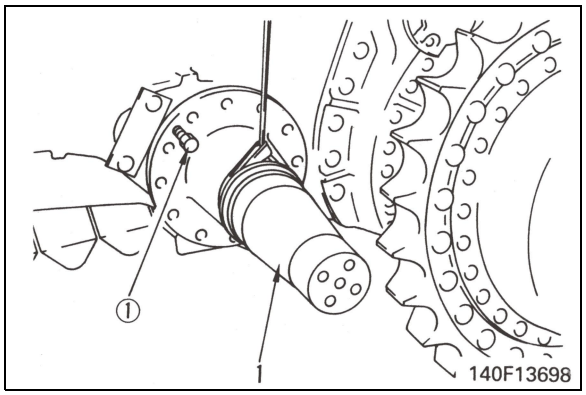
2. Sling pivot shaft assembly (1).

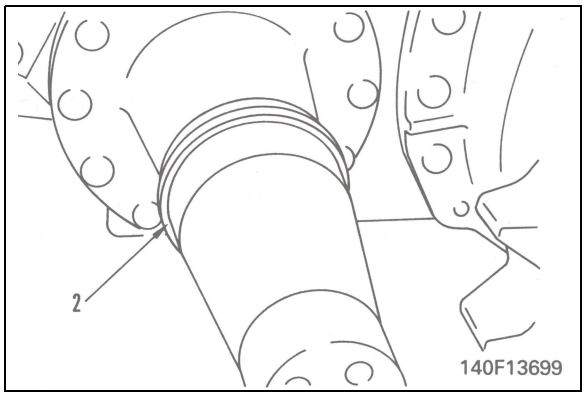
3. Remove mounting bolts, then forcing screws ①, raise pivot shaft assembly and pull out. ※1

kg Pivot shaft assembly:
90 kg (D65EX)
100 kg (D65PX)

4. Remove seal (2). ※2

5. Remove ring (3). ※3





INSTALLATION OF PIVOT SHAFT ASSEMBLY

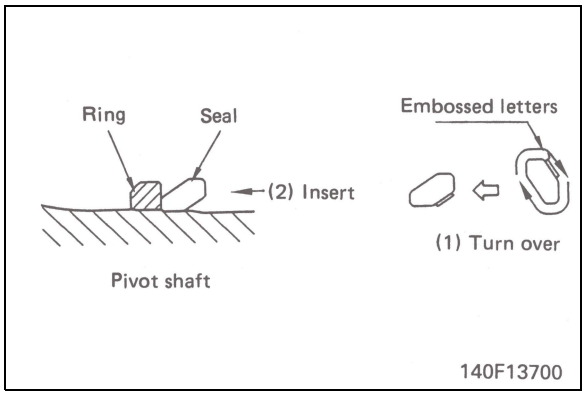
- Carry out installation in the reverse order to removal.

※1

kgm Pivot shaft mounting bolt:
594 ± 59 Nm {56 ± 6 kgm}

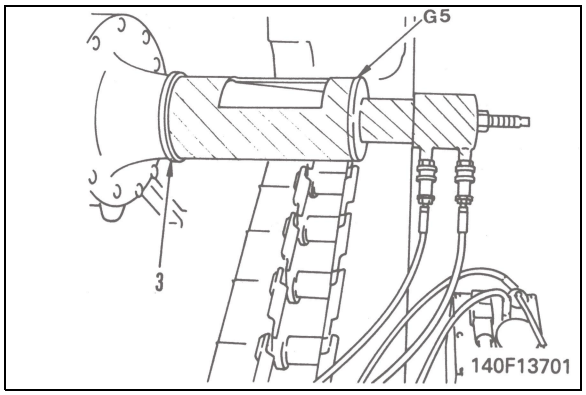
※2

★ Assemble the seal as follows (see diagram on right)
  1) Turn over the seal so that the embossed letters on the seal are on the inside.
  2) With the seal turned over, insert the seal on the shaft.
★ When inserting the seal, be careful not to damage the surface.



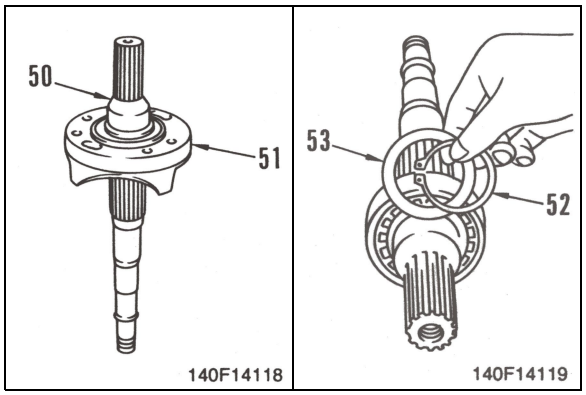
※3

★ Press fit ring (3) using tool **G5**.
★ Press fitting force: 1.9 ton

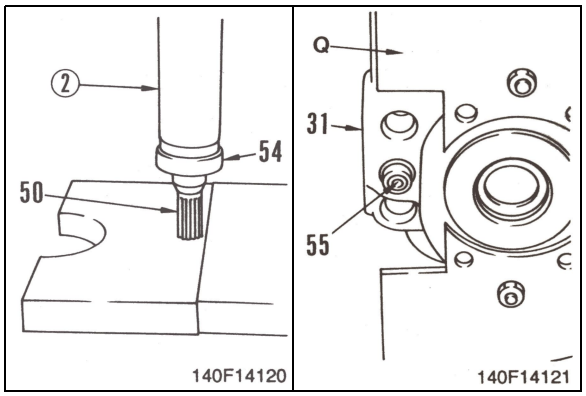


• Disassembly of shaft, cradle assembly

1) Push cradle (51) with a hydraulic press, taking care that it is not at an angle, and remove from shaft (50).
2) Remove snap ring (52), then remove washer (53).

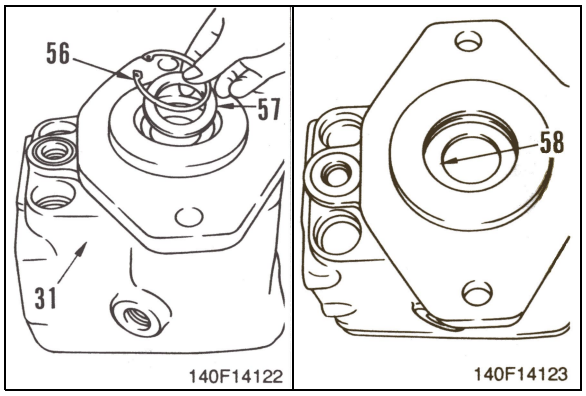


3) Using push tool ② , pull out bearing (54) from shaft (50).
   ★ Bearing (54) divides into two parts (flange and bearing), so be careful not to lose either part.
   ★ Check the direction of assembly of the bearing.



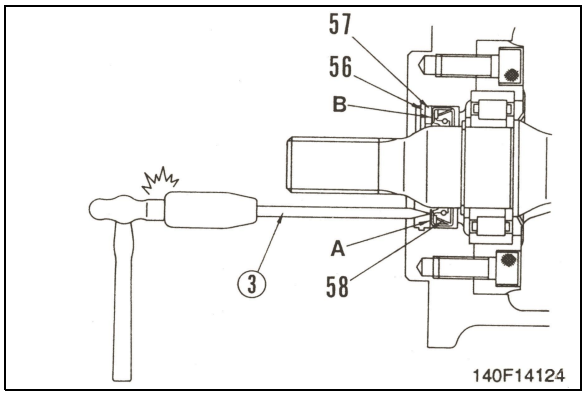
8. Disassembly of pump case

1) Loosen nut of swash plate adjustment screw (55), remove screw (55), then remove pump case (31) from tool **Q**.
   ★ Before loosening the nut, measure the dimension between the end face of the case and the end face of screws.
2) Remove snap ring (56) from pump case (31), then remove spacer (57).
3) Remove oil seal (58).



9. When replacing oil seal only (there is no need to disassemble), replace oil seal as follows.

1) Remove snap ring (56) and spacer (57).
2) Hit end of bar ③ with a hammer to pierce oil seal (58) to the core, then twist to remove.
   ★ Hit at a point close to the middle of the inside and outside diameter of the oil seal, and twist at two places on opposite sides as shown by **A** and **B** in the diagram. This marks it easier to remove.
   ★ Be careful not to damage the shaft.



REMOVAL OF PPC PUMP ASSEMBLY

1. Drain hydraulic oil.

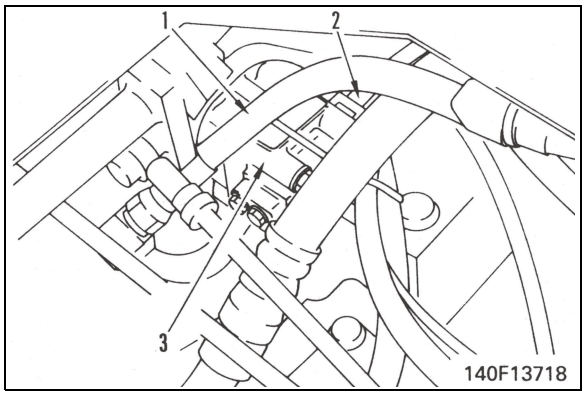
Hydraulic tank: **55 ℓ**

2. Remove operator's seat assembly, then remove right side cover.

Operator's seat assembly: **35 kg**

3. Disconnect hoses (1) and (2).

4. Remove PPC valve pump assembly (3).



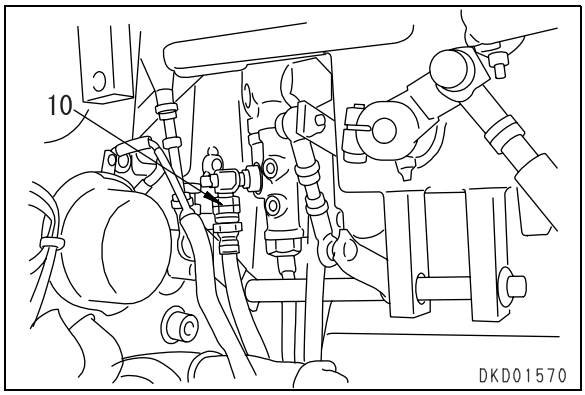
INSTALLATION OF PPC PUMP ASSEMBLY

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

10. Disconnect 4 PPC valve assembly mounting houses (10). ※2

★ Mark the hose with tabs to prevent any mistake when assembling the hoses.

11. Remove PPC valve assembly (11).



INSTALLATION OF PPC VALVE ASSEMBLY

FOR STEERING

- Carry out installation in the order to removal.

※1

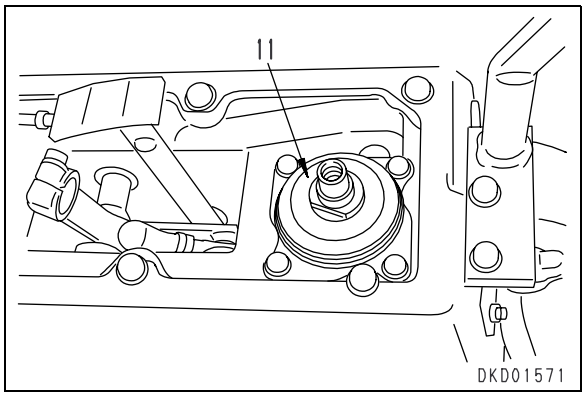
★ Adjust the cable.
For details, see TESTING AND ADJUSTING, Adjusting fuel control linkage.

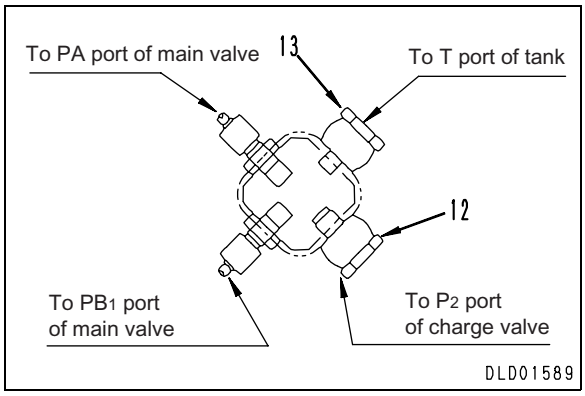
※2

★ Connect the PPC hoses as shown in the diagram.

kgm Hose mount joint bolt (12):
39.2 ± 4.9 Nm {4.0 ± 0.5 kgm}

kgm Hose mount joint bolt (13):
29.4 ± 4.9 Nm {3.0 ± 0.5 kgm}





DISASSEMBLY OF HYDRAULIC CYLINDER ASSEMBLY
(BLADE LIFT, BLADE TILT CYLINDER)

1. Remove tube from cylinder assembly.

2. Set cylinder assembly (1) to tool **H1**.

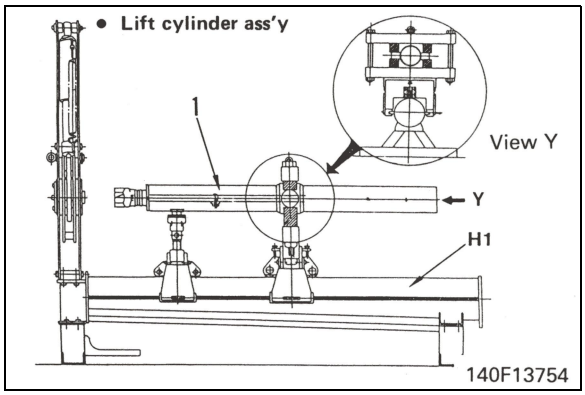
3. Piston rod assembly

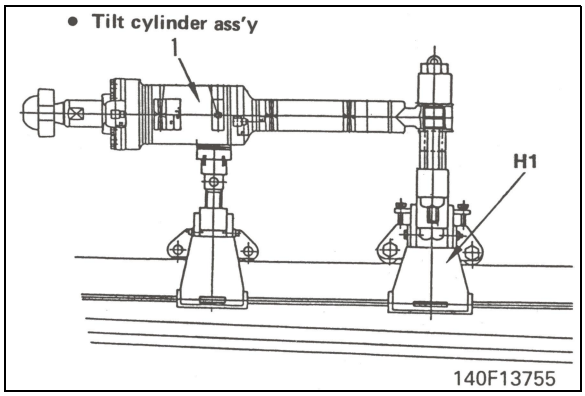
- Lift cylinder

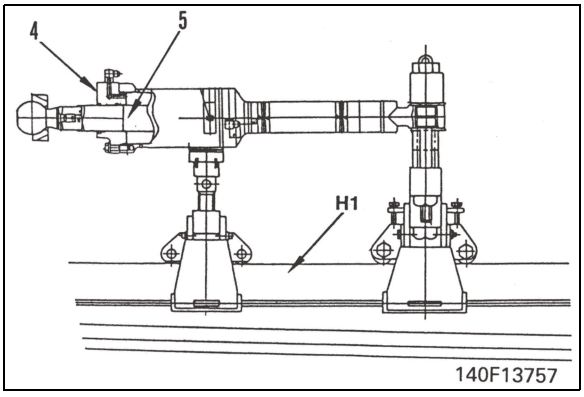
1) Using tool **H2**, disconnect cylinder head assembly (2).
2) Pull out piston rod assembly (3).
   ★ Place an oil container under the cylinder to catch the oil.

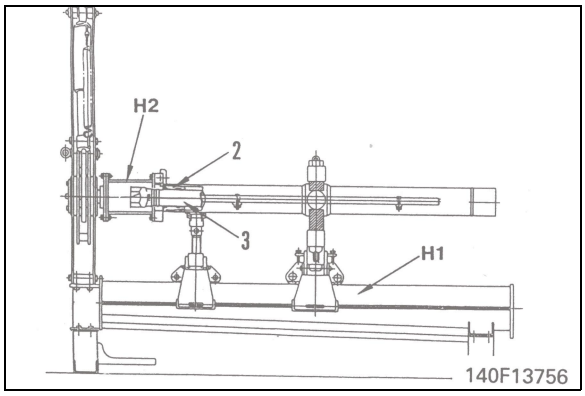
- Tilt cylinder

1) Remove mounting bolts, and disconnect cylinder head assembly (4).
2) Pull out piston rod assembly (5).
   ★ Place an oil container under the cylinder to catch the oil.







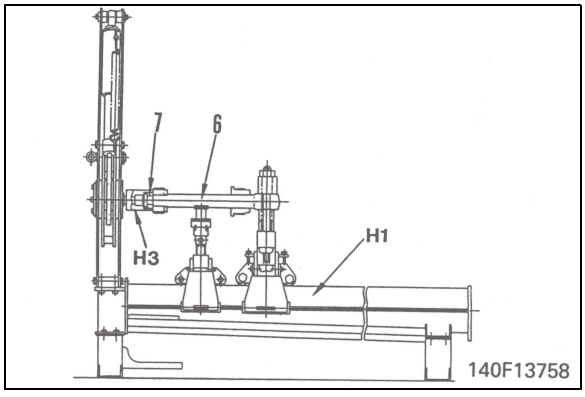


4. Piston, head assembly

- Lift, tilt cylinder

1) Set piston rod assembly (6) to tool **H1**.
2) Using tool **H3**, remove nut (7).

Cylinder	Width across flat of nut
Lift cylinder	50 mm
Tilt cylinder	80 mm



8. Sling right straight frame (9), assemble to blade, then install pin (10), and set block under straight frame.

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

Straight frame: **255 kg**

9. Sling right center brace (7), and assemble to straight frame, then install pin (8).

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

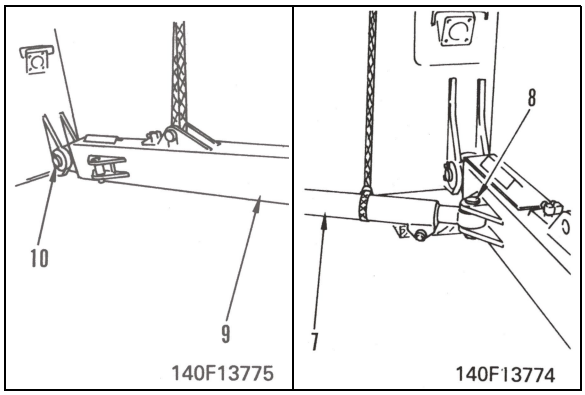
10. Sling tilt cylinder (3), and install pin (5), then assemble shim to spherical surface at cylinder rod end and tighten with bolt (6).

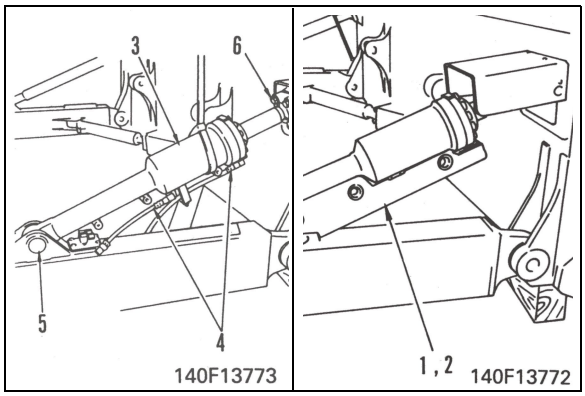
★ Check the thickness and number of shims that were removed, and assemble them in the same place.
Standard shim thickness: **5 mm**

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

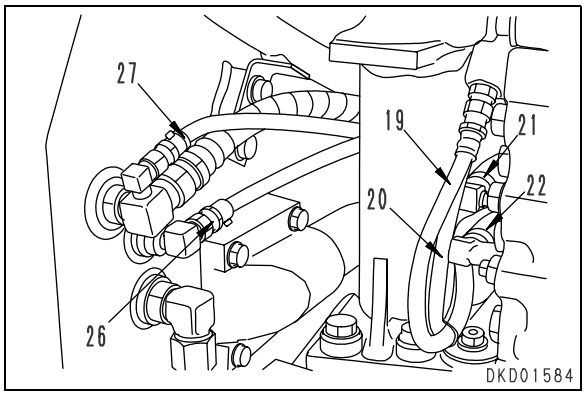
Tilt cylinder: **75 kg**

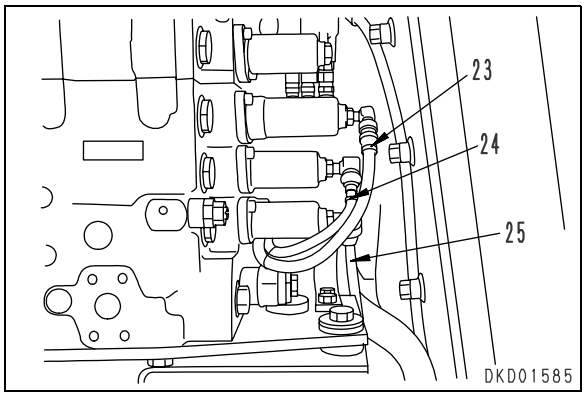
11. Connect hose (4) and install covers (2) and (1).

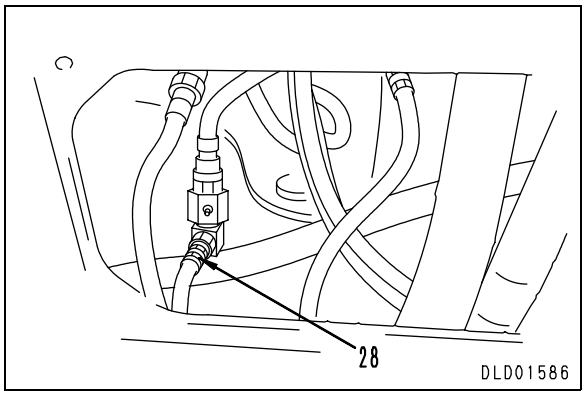


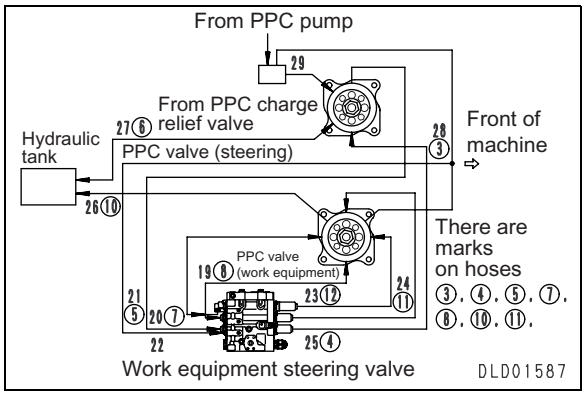


17. Disconnect pilot hoses (19), (20), (21), (22), (23), (24), (25), (26), (27) and (28).





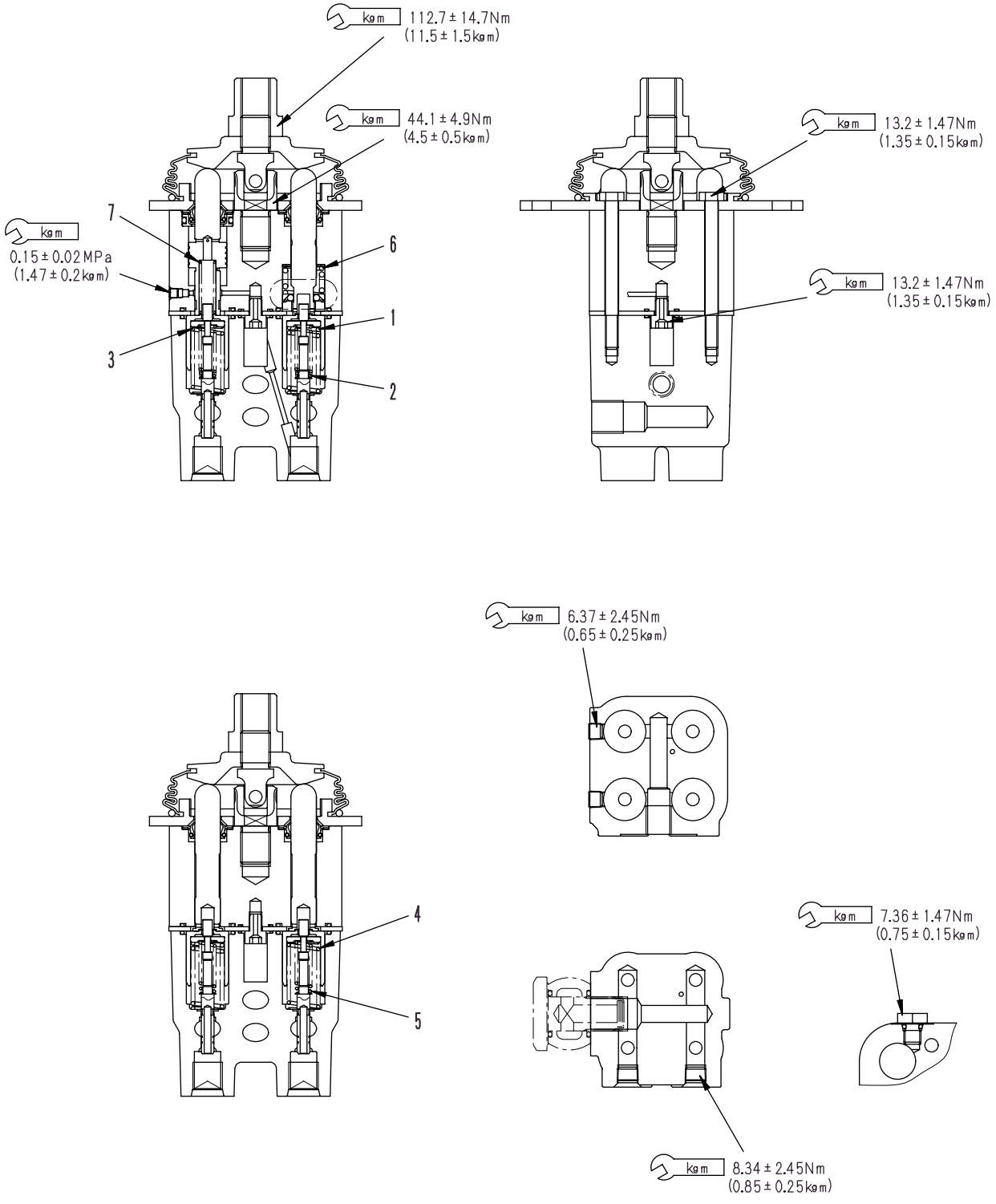




Unit: mm

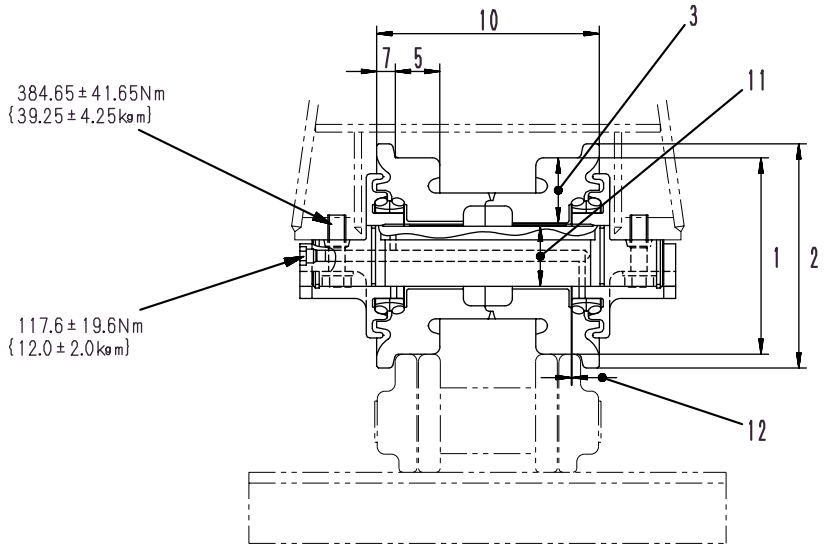
No.	Check item	Criteria					Remedy
1	No.1 clutch spring (X10)	Standard size			Repair limit		
		Free length	Installed length	Installed load	Free length	Installed load	
		69.5	58.7	233 N {23.8 kg}	65.3	198 N {20.2 kg}	
2	No. 2 clutch spring (X10)	69.5	63.6	127 N {13.0 kg}	65.3	109 N {11.1 kg}	
3	No. 3 clutch spring (X10)	59	44.1	146 N {14.9 kg}	55.5	125 N {12.7 kg}	
4	No. 4 clutch spring (X10))	59	44.5	142 N {14.5 kg}	55.5	121 N {12.3 kg}	
5	No. 5 clutch spring (X10)	59	44.3	144 N {14.7 kg}	55.5	123 N {12.5 kg}	
6	Total assembled thickness of No. 1 clutch	Standard size		Tolerance		Repair limit	Replace
		36.2		± 0.3		32.2	
7	Total assembled thickness of No. 2 clutch	49.4		± 0.4		43.8	
8	Total assembled thickness of No. 3 clutch	29.6		± 0.3		26.4	
9	Total assembled thickness of No. 4 clutch	29.6		± 0.3		26.4	
10	Total assembled thickness of No. 5 clutch	23.0		± 0.3		20.6	
11	Thickness of No. 1 – 5 clutch discs	3.4		± 0.1		2.6	
12	Thickness of No. 1 – 5 clutch plates	3.2		± 0.1		2.9	
13	Wear of seal ring on transmission input shaft	Width: 3.0 Thickness: 2.3		Width: –0.01 –0.03 Thickness: ± 0.10		Width: 2.7 Thickness: 2.2	

- **FOR BLADE LIFT, BLADE TILT**

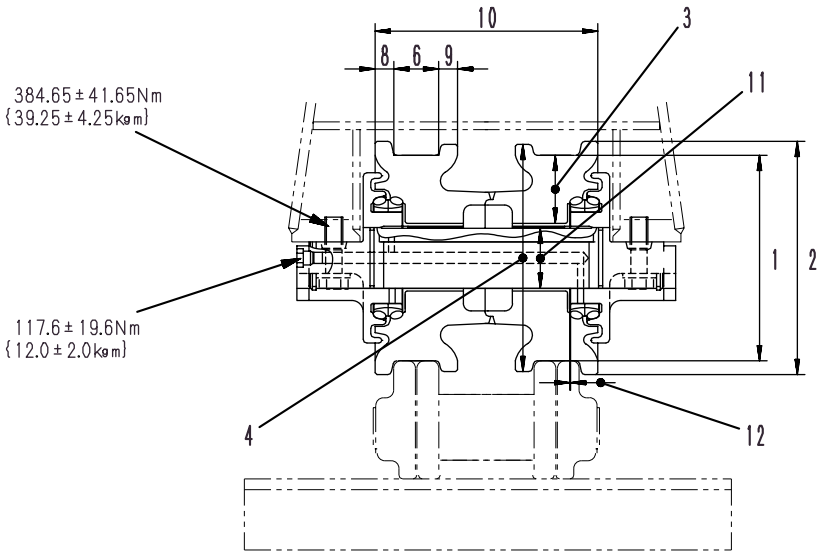


SKD00595

TRACK ROLLER



Single flange

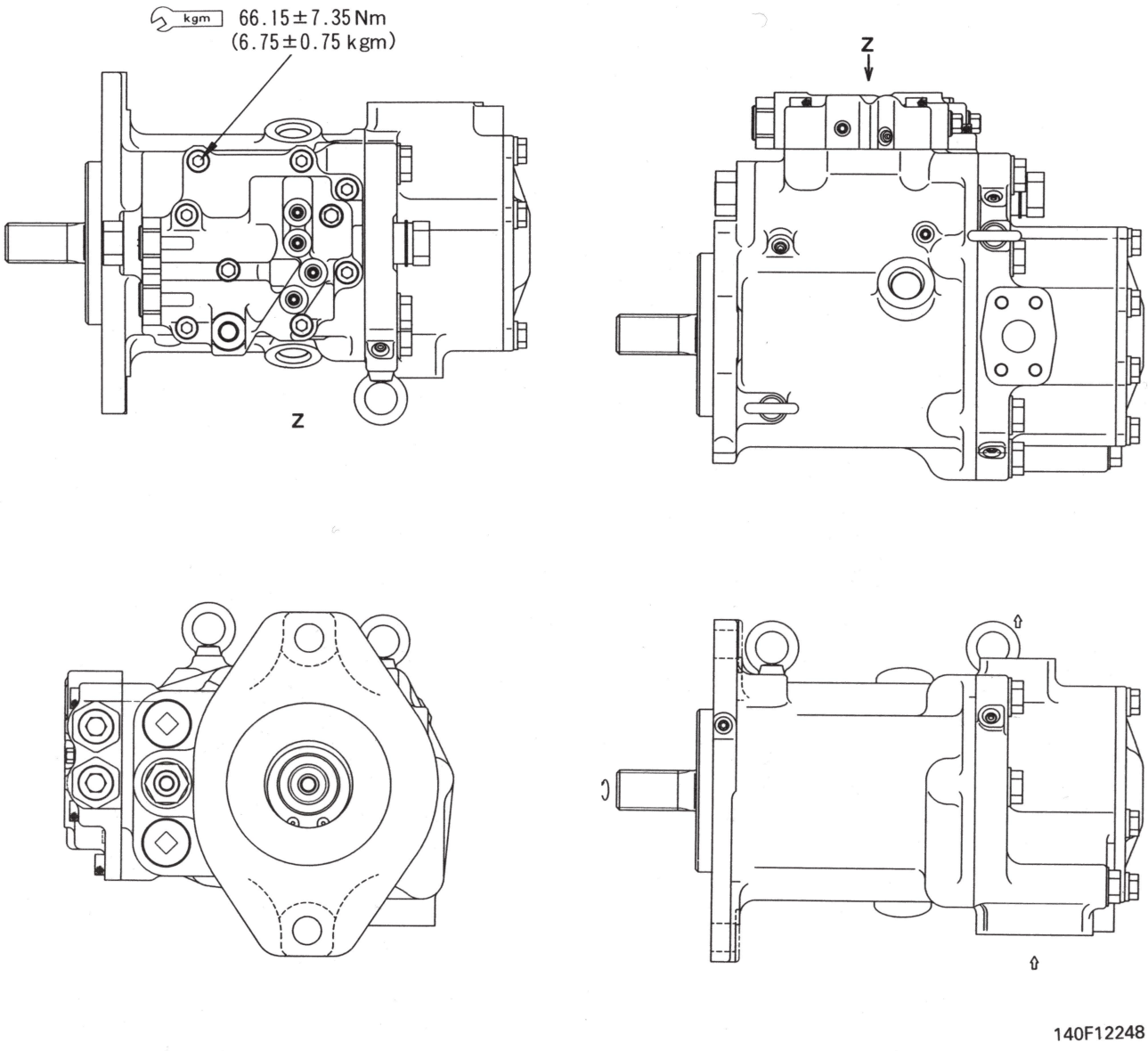


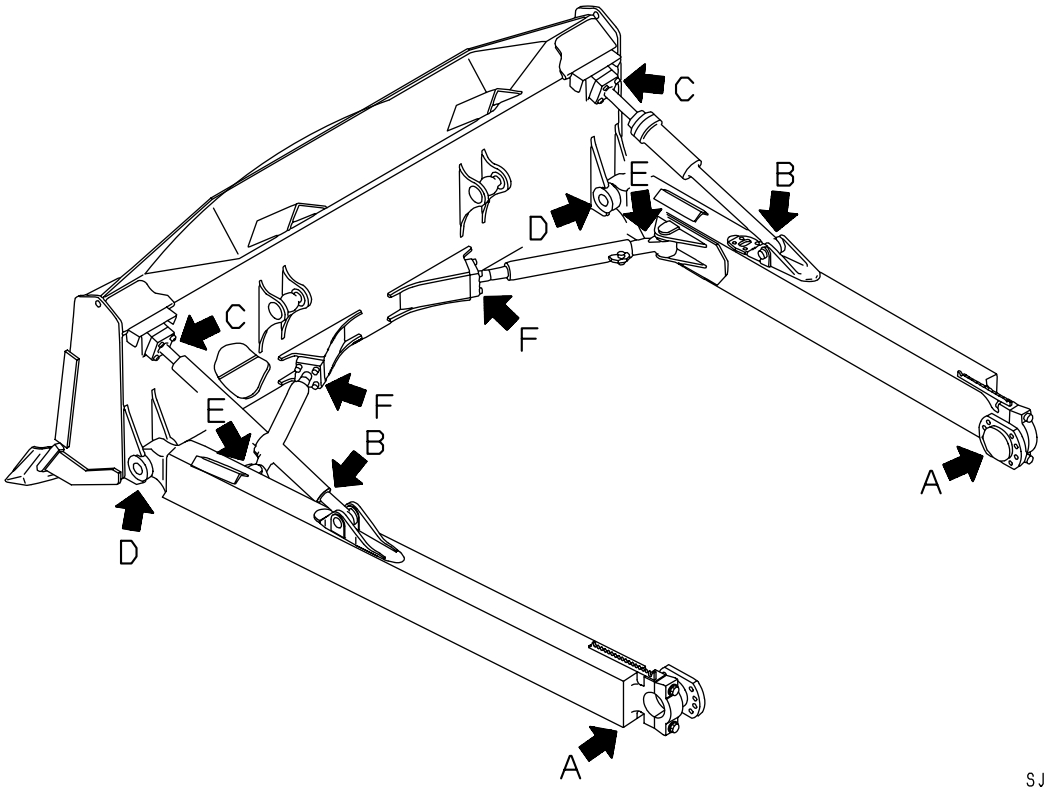
Double flange

SWD04055

HYDRAULIC, HSS PUMP

- **HPV 95**





SJD04785

Unit: mm

No.	Check item		Criteria					Remedy
			Standard size	Tolerance		Standard clearance	Clearance limit	
				Shaft	Hole			
1	Clearance between trunnion and spherical surface of cap		140	–0.1 –0.5	+1.5 0	0.1 — 2.0	3	Replace
2	Clearance between brace mounting pin and bracket		50	–0.2 –0.4	+0.2 0	0.2 — 0.6	2	
3	Clearance between brace mounting pin and brace		50	–0.2 –0.4	+0.2 0	0.2 — 0.6	2	
4	Clearance between bracket and spherical surface of brace		90 (Shaft) 91 (Hole)	–0.1 –0.3	+1 0	0.2 — 0.5	2	Adjust shim or replace
5	Clearance between bearing and spherical surface of bushing	Straight tiltdozer	90	–0.1 –0.5	+0.5 0	0.1 — 1.0	2	Replace
		Semi U-dozer	100	–0.1 –0.5	+0.5 0	0.1 — 1.0	2	
6	Clearance between brace mounting pin and bracket		55	0 –0.3	+0.6 –0.2	0.2 — 0.9	2	
7	Clearance between frame mounting pin and bearing		55	0 –0.3	+0.5 +0.2	0.2 — 0.8	2	
8	Clearance between brace mounting pin and bracket		50	–0.2 –0.4	+0.2 0	0.2 — 0.6	2	
9	Clearance between brace mounting pin and brace		50	–0.2 –0.4	+0.2 0	0.2 — 0.6	2	
10	Clearance between bracket and spherical surface of brace		90 (Shaft) 91 (Hole)	–0.1 –0.3	+1 0	0.2 — 0.5	2	Adjust shim or replace