SHOP MANUAL

KOMATSU

D65E,P-12
D65EX,PX-12

MACHINE MODEL	SERIAL NUMBER
D65E-12	**60001 and up**
D65P-12	**60001 and up**
D65EX-12	**60001 and up**
D65PX-12	**60001 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.
- D65-12 mount the 6D125-1, S6D125-1, 6D125E-2 and S6D125E-2 engine.
  For details of the engine, see the 125 Series and 125-2 Series Engine Shop Manual.

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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). (See Fig. 1)
   - ★ The adapter can be pushed in about 3.5 mm.
   - ★ Do not hold rubber cap portion (4).

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

4) Hold hose adapter (1) or hose (5) and pull it out. (See 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. (See Fig. 4)
   - ★ Do not hold rubber cap portion (4).

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

Type 1

Fig. 1

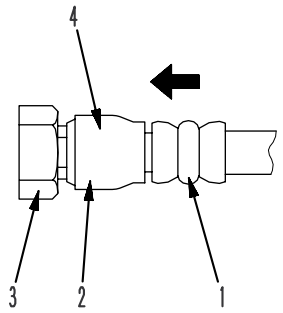


Fig. 2

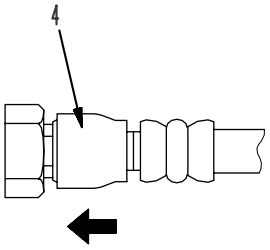


Fig. 3

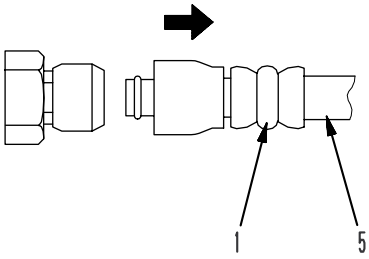


Fig. 4

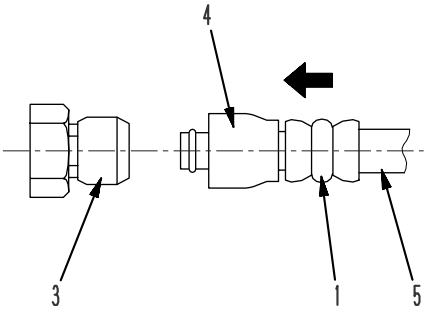
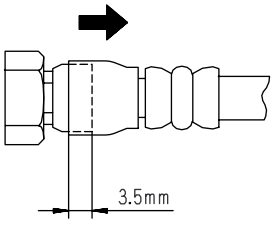


Fig. 5



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kg/cm² to lb/in²

1kg/cm² = 14.2233 lb/in²

	0	1	2	3	4	5	6	7	8	9
0	0	14.2	28.4	42.7	56.9	71.1	85.3	99.6	113.8	128.0
10	142.2	156.5	170.7	184.9	199.1	213.4	227.6	241.8	256.0	270.2
20	284.5	298.7	312.9	327.1	341.4	355.6	369.8	384.0	398.3	412.5
30	426.7	440.9	455.1	469.4	483.6	497.8	512.0	526.3	540.5	554.7
40	568.9	583.2	597.4	611.6	625.8	640.1	654.3	668.5	682.7	696.9
50	711.2	725.4	739.6	753.8	768.1	782.3	796.5	810.7	825.0	839.2
60	853.4	867.6	881.8	896.1	910.3	924.5	938.7	953.0	967.2	981.4
70	995.6	1010	1024	1038	1053	1067	1081	1095	1109	1124
80	1138	1152	1166	1181	1195	1209	1223	1237	1252	1266
90	1280	1294	1309	1323	1337	1351	1365	1380	1394	1408
100	1422	1437	1451	1465	1479	1493	1508	1522	1536	1550
110	1565	1579	1593	1607	1621	1636	1650	1664	1678	1693
120	1707	1721	1735	1749	1764	1778	1792	1806	1821	1835
130	1849	1863	1877	1892	1906	1920	1934	1949	1963	1977
140	1991	2005	2020	2034	2048	2062	2077	2091	2105	2119
150	2134	2148	2162	2176	2190	2205	2219	2233	2247	2262
160	2276	2290	2304	2318	2333	2347	2361	2375	2389	2404
170	2418	2432	2446	2460	2475	2489	2503	2518	2532	2546
180	2560	2574	2589	2603	2617	2631	2646	2660	2674	2688
190	2702	2717	2731	2745	2759	2773	2788	2802	2816	2830
200	2845	2859	2873	2887	2901	2916	2930	2944	2958	2973
210	2987	3001	3015	3030	3044	3058	3072	3086	3101	3115
220	3129	3143	3158	3172	3186	3200	3214	3229	3243	3257
230	3271	3286	3300	3314	3328	3343	3357	3371	3385	3399
240	3414	3428	3442	3456	3470	3485	3499	3513	3527	3542

Machine model				D65E-12	D65P-12	D65EX-12	D65PX-12
Serial Numbers				60001 – 60947	60001 – 60890	60001 – 60941	60001 – 60914
Work equipment (angle, power pitch)	Type			Hydraulic angle dozer	Hydraulic power pitch dozer	Hydraulic angle dozer	Hydraulic power pitch dozer
	Blade support method			Brace type	Hydraulic cylinder type	Brace type	Hydraulic cylinder type
	Performance	Max. lifting height (from ground)	mm	1,180	1,200	1,180	1,200
		Max. lowering depth (from ground)	mm	460	445	460	445
		Max. tilt	mm	400	890	400	890
		Max. angle	deg	25	–	25	–
		Range for blade cutting angle	deg	–	+9, –7	–	+9, –7
	Dimensions	Blade width	mm	3,970	3,970	3,970	3,970
		Blade height	mm	1,120	1,110	1,120	1,110
		Blade cutting angle	deg	55	57	55	57
Work equipment (semi-U)	Type			Hydraulic semi-U dozer	–	Hydraulic semi-U dozer	–
	Blade support method			Brace type (tilt cylinder on right)	–	Brace type (tilt cylinder on right)	–
	Performance	Max. lifting height (from ground)	mm	1,095	–	1,095	–
		Max. lowering depth (from ground)	mm	450	–	450	–
		Max. tilt	mm	855	–	855	–
		Range for blade cutting angle	deg	±7	–	±7	–
	Dimensions	Blade width	mm	3,360	–	3,360	–
		Blade height	mm	1,425	–	1,425	–
		Blade cutting angle	deg	55	–	55	–

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WEIGHT TABLE

⚠ This weight table is a guide for use when transporting or handling components.

Unit: kg

Machine Model	D65E-12	D65P-12	D65EX-12	D65PX-12
Serial Numbers	60001 — 60947	60001 — 60890	60001 — 60941	60001 — 60914
Engine, damper assembly	1,080	1,200	1,200	1,200
• Engine assembly	1,030	1,150	1,150	1,150
• Damper assembly	45	45	45	45
• Parts mounted to engine (wiring)	1.5	1.5	1.5	1.5
Radiator assembly (including oil cooler)	165	165	165	165
• Oil cooler assembly (for hydraulic oil)	6	6	6	6
Fuel tank assembly	120	120	120	120
Power train unit assembly	1,570	1,570	1,580	1,580
• Steering clutch, brake assembly	700	700	—	—
• Steering valve assembly	25	25	—	—
• Transmission assembly	485	485	485	485
• Torque converter, PTO assembly	290	290	290	290
• Transmission valve assembly	17	17	17	17
• Main relief valve assembly	6	6	6	6
• HSS assembly	—	—	735	735
• Brake valve assembly	—	—	6	6
Final drive assembly (each side)	790	815	790	815
Sprocket assembly (each side)	8.3 × 9	8.3 × 9	8.3 × 9	8.3 × 9
Hull frame assembly	2,040	2,040	2,040	2,040
Track group assembly (each side)	1,545	1,745	1,545	1,745
• Track frame	640	750	640	750
• Idler assembly (each side)	200	200	200	200
• Track roller assembly (single :1)	54 × 5	54 × 6	54 × 5	54 × 6
• Track roller assembly (double: 1)	61 × 2	61 × 2	61 × 2	61 × 2
• Carrier roller assembly (1)	30 × 2	30 × 2	30 × 2	30 × 2

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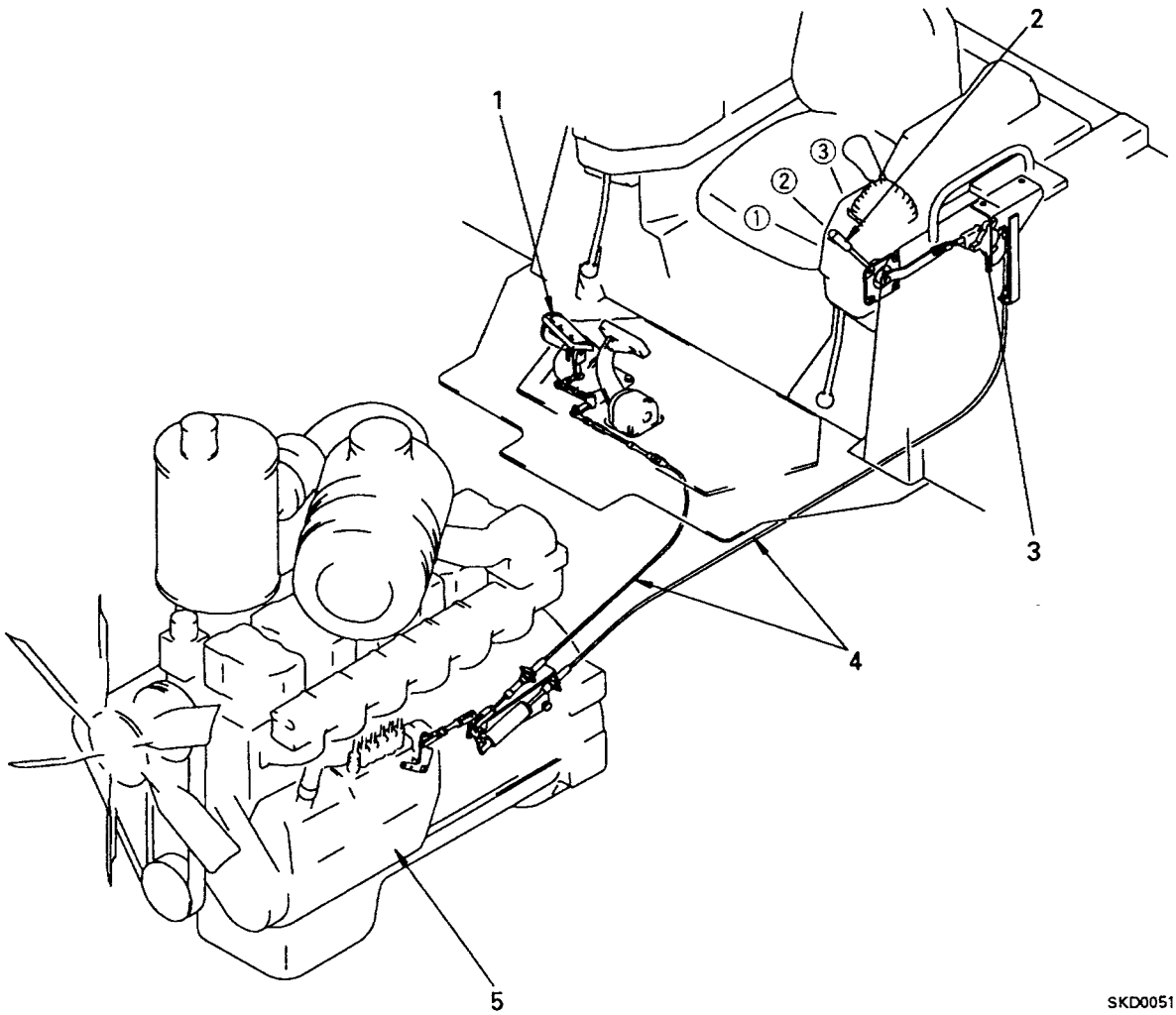
D65E-12 **60948 – 65000**
D65P-12 **60891 – 65000**
D65EX-12 **60942 – 65000**
D65PX-12 **60915 – 65000**



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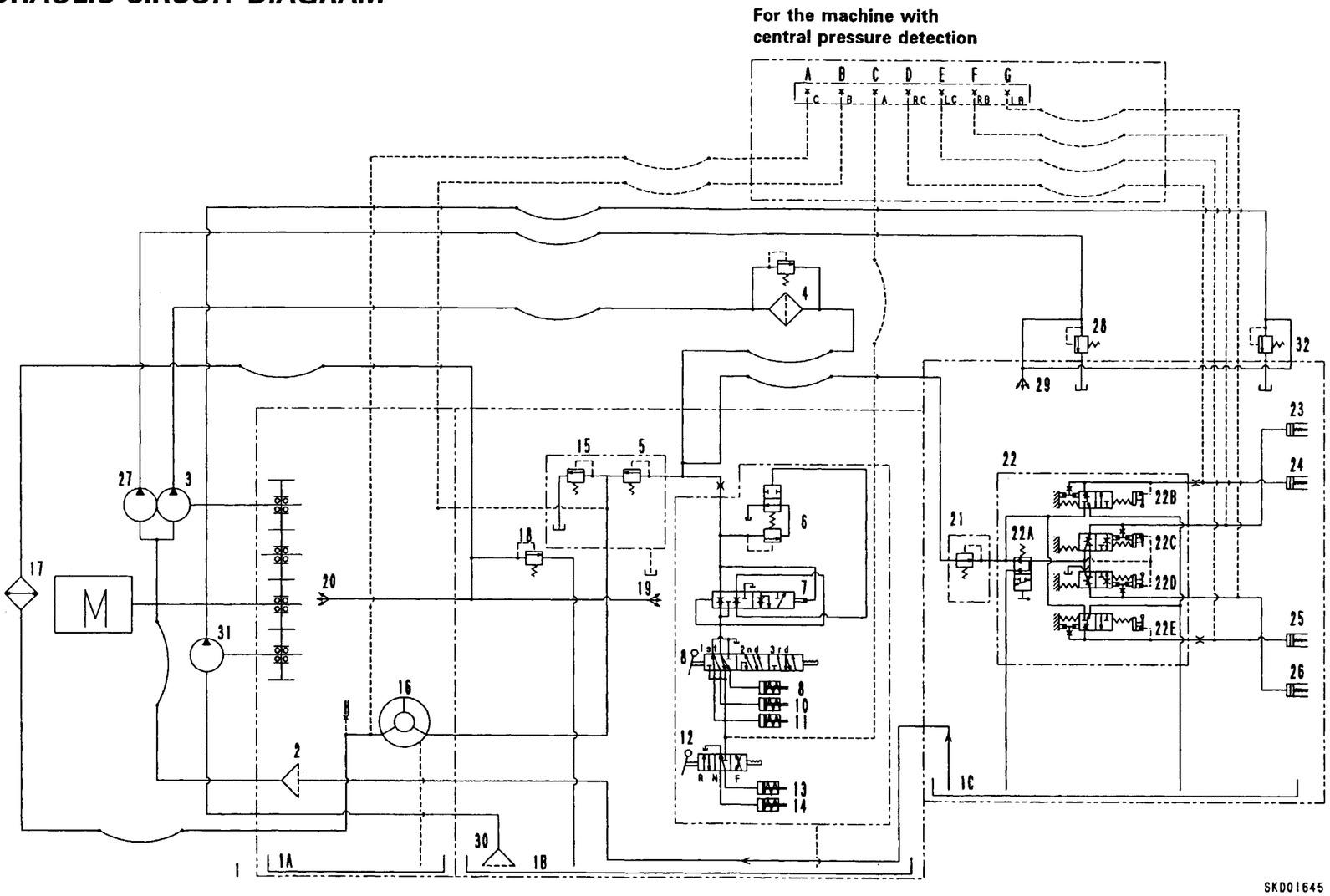
1. Decelerator pedal
2. Throttle lever
3. Clutch
4. Cable
5. Fuel injection pump

Lever positions
① STOP
② Low idling
③ High idling

OUTLINE
- The engine speed is controlled by throttle lever (2) or decelerator pedal (1).

POWER TRAIN HYDRAULIC CIRCUIT DIAGRAM

D65E-12 60001 – 65000
D65P-12 60001 – 65000



SKD01645

1. Power train oil pan
   1A. Torque converter case
   1B. Transmission case
   1C. Steering case
2. Oil strainer
3. Power train pump (SAL(2)-045)
4. Power train oil filter
   Set pressure: 0.15 MPa {1.5kg/cm²}
5. Main relief valve
   Set pressure:
   3.33 ± 0.1 MPa {34 ± 1 kg/cm²}
6. Modulating valve
7. Quick return valve
8. Speed valve
9. 1st clutch
10. 3rd clutch
11. 2nd clutch
12. Directional valve
13. Reverse clutch
14. Forward clutch
15. Torque converter relief valve
    Set pressure: 0.83 MPa {8.5 kg/cm²}
16. Torque converter
17. Oil cooler
18. Transmission lubrication valve
    Set pressure: 0.29 MPa
    {25 ± 1 kg/cm²}
19. Transmission lubrication
20. PTO lubrication
21. Reducing valve
    Set pressure:
    2.45 ± 0.1 MPa {25 ± 1 kg/cm²}
22. Steering control valve
    22A. Parking brake valve
    22B. Right clutch valve
    22C. Right brake valve
    22D. Left brake valve
    22E. Left clutch valve
23. Right brake
24. Right clutch
25. Left clutch
26. Left brake
27. Power train lubrication pump (SAL(2)-045)
28. Lubrication valve
    Set pressure: 0.33 MPa {3.4 kg/cm²}
29. Clutch, brake lubrication
30. Strainer
31. Scavenging pump
32. Lubrication valve
    Set pressure: 0.33 MPa {3.4 kg/cm²}

A.(C): Pressure detection port for torque converter outlet port
B.(B): Pressure detection port for torque converter inlet port
C.(A): Transmission modulating pressure detection port
D.(RC): Right clutch pressure detection port
E.(LC): Left clutch pressure detection port
F.(RB): Right brake pressure detection port
G.(LB): Left brake pressure detection port
H. : Power train oil temperature sensor mount

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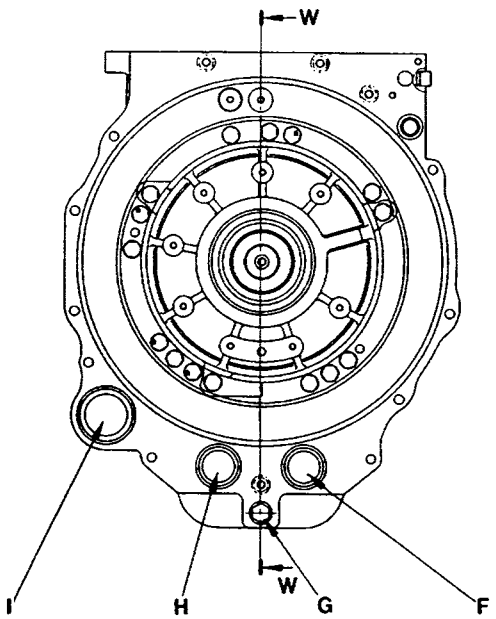
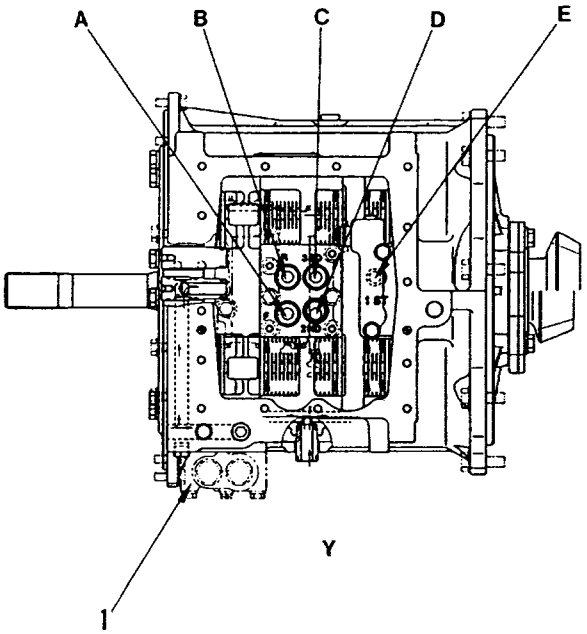
TRANSMISSION

D65E, P-12 60001 – 65000
D65EX, PX-12 60001 – 65000



X



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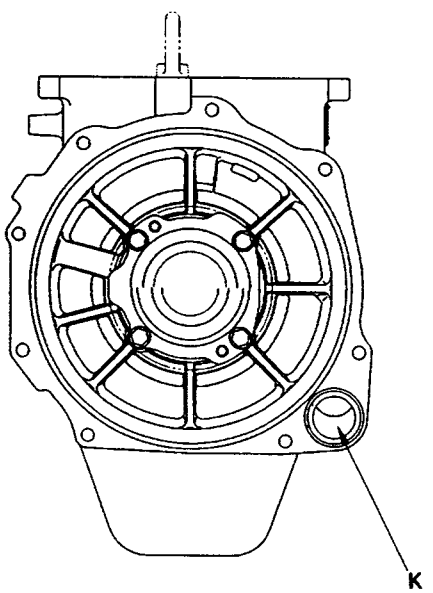

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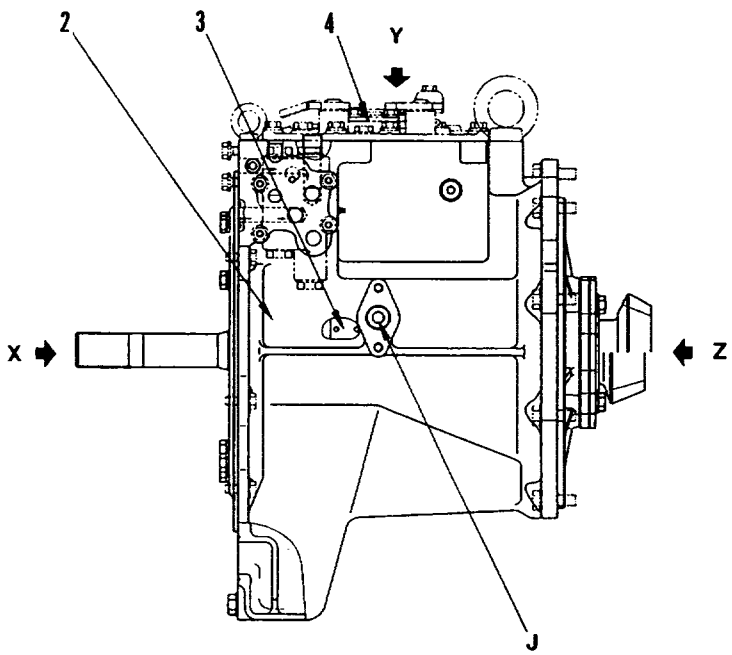

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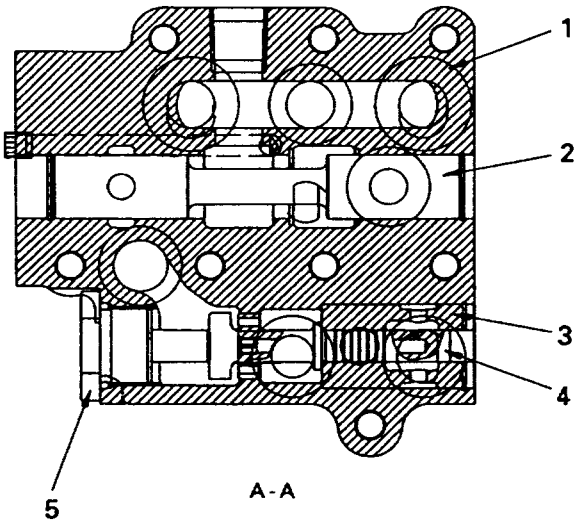

A-A

1. Valve body
2. Spacer
3. Quick return valve sleeve
4. Quick return valve
5. Plug
6. Valve body
7. Stopper
8. Speed valve spool
9. Directional valve spool
10. Collar
11. Cover
12. Stopper
13. Piston
14. Piston spring
15. Modulating valve spool
16. Modulating valve sleeve
17. Modulating valve spring (Large)
18. Modulating valve spring (Small)
19. Modulating valve spring
20. Stopper
21. Cover

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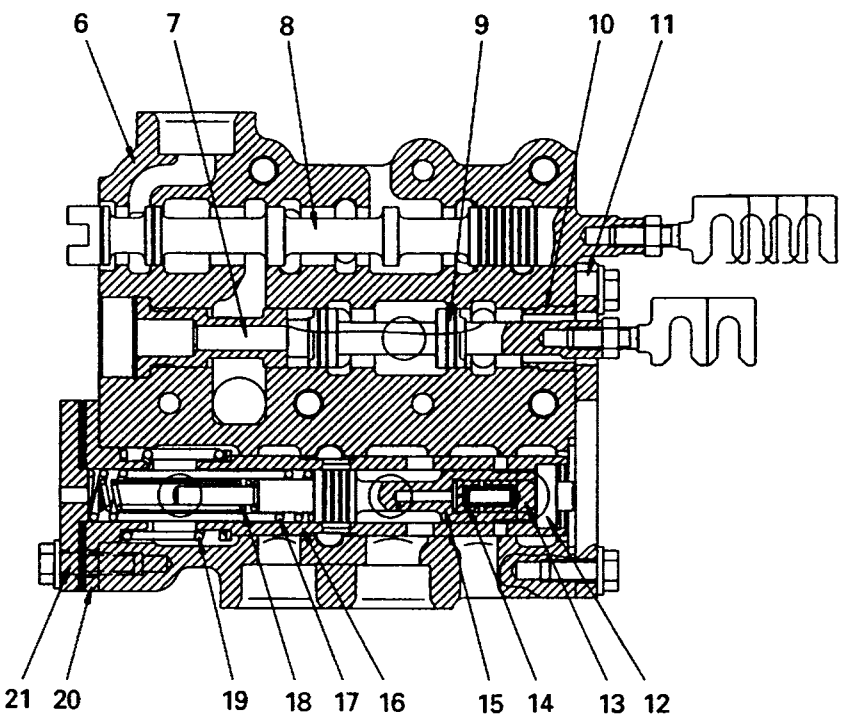

B-B

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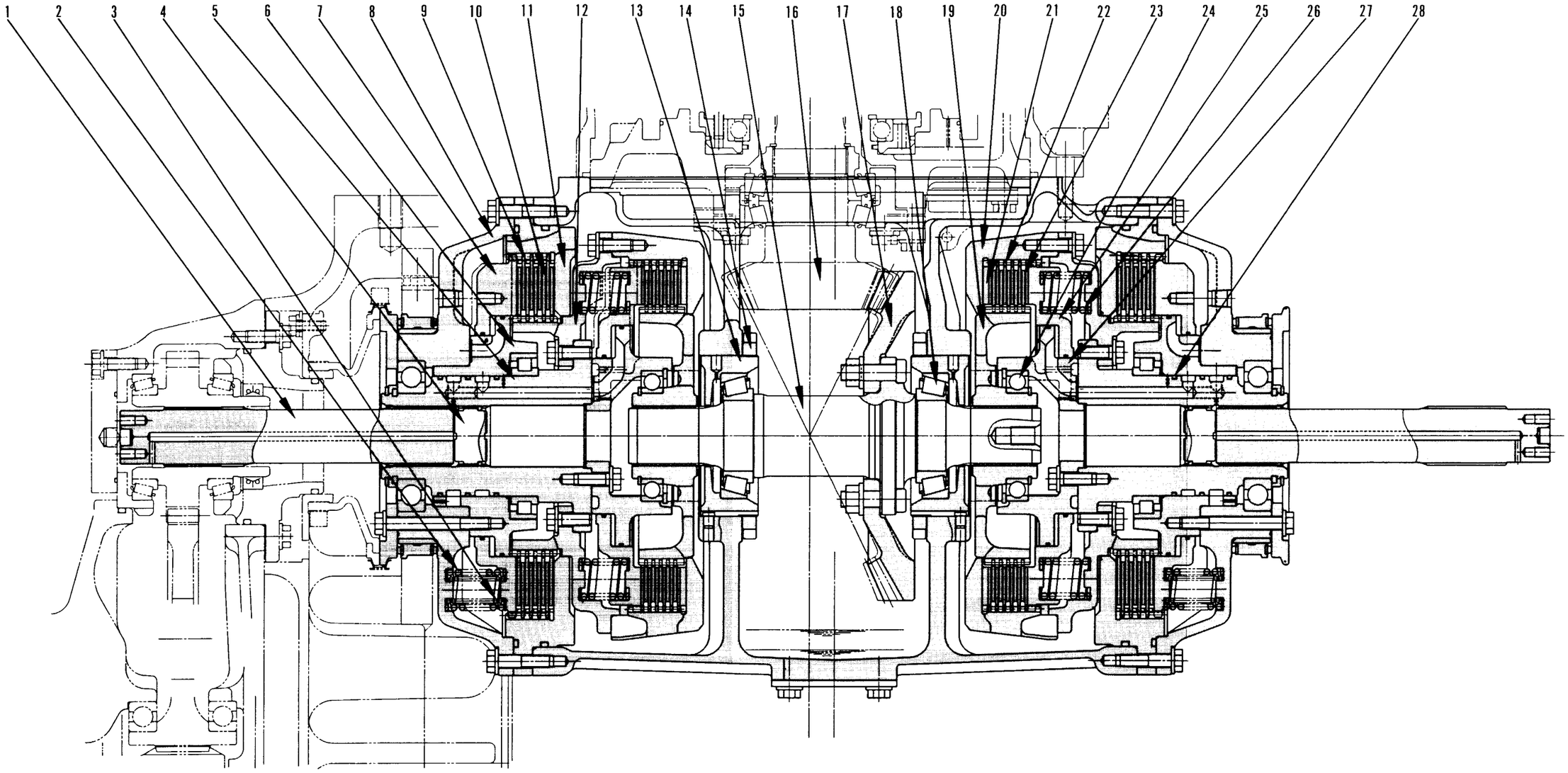

A - A

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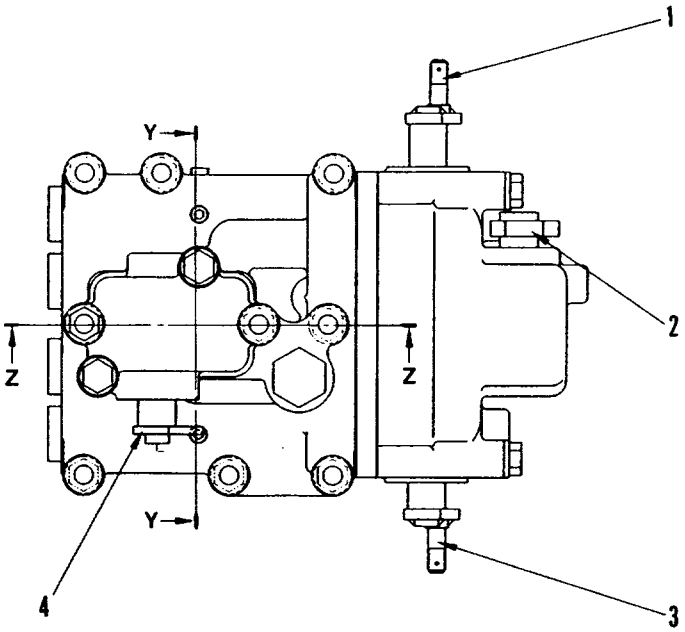
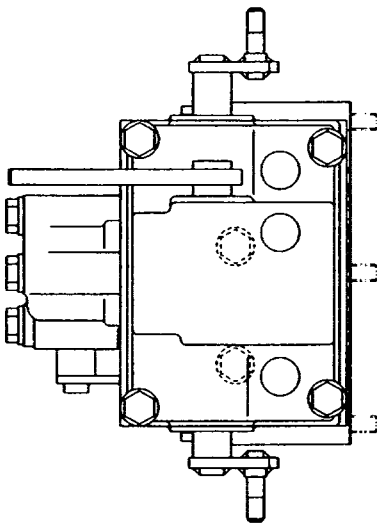
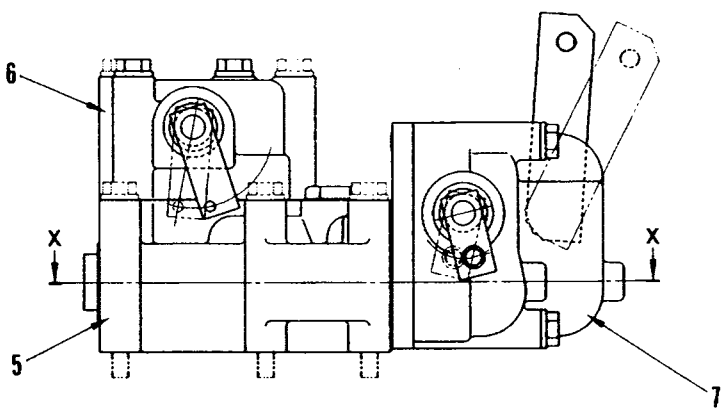
1. Output shaft
2. Brake spring (large)
3. Brake spring (small)
4. Stopper
5. Brake hub
6. Brake cage
7. Brake cylinder
8. Brake cover
9. Brake plate (each side: 4)
10. Brake disc (each side: 5)
11. Brake drum
12. Brake inner drum
13. Bevel gear shaft cage
14. Bevel gear shaft nut
15. Bevel gear shaft
16. Bevel pinion
17. Bevel gear
18. Bevel gear shaft bearing
19. Clutch inner drum
20. Clutch outer drum
21. Spacer
22. Clutch plate (each side: 6)
23. Clutch disc (each side: 5)
24. Clutch support bearing
25. Clutch piston
26. Clutch spring
27. Clutch cage
28. Seal ring

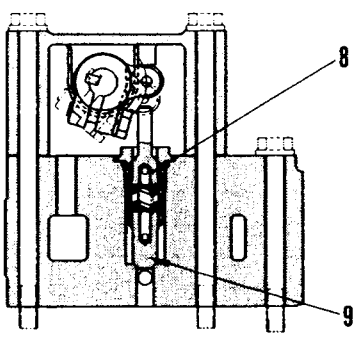
STEERING CONTROL VALVE

D65E, P-12 60001 – 65000

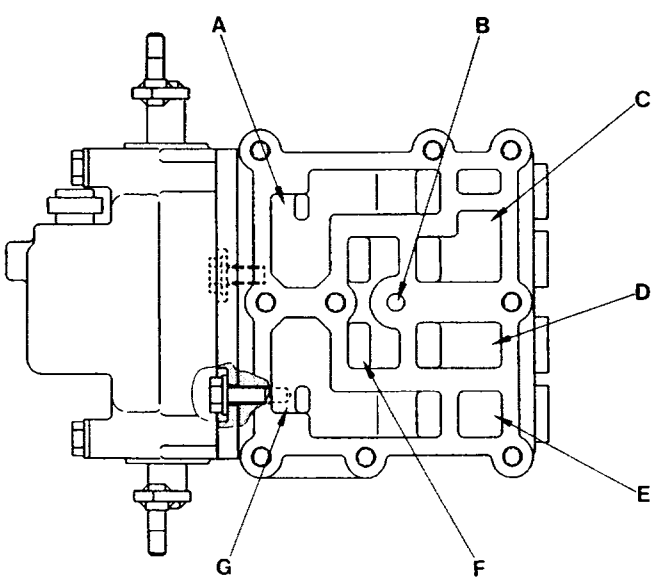


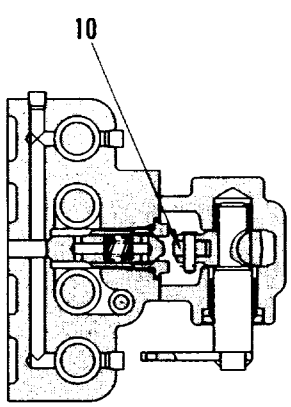






Z - Z





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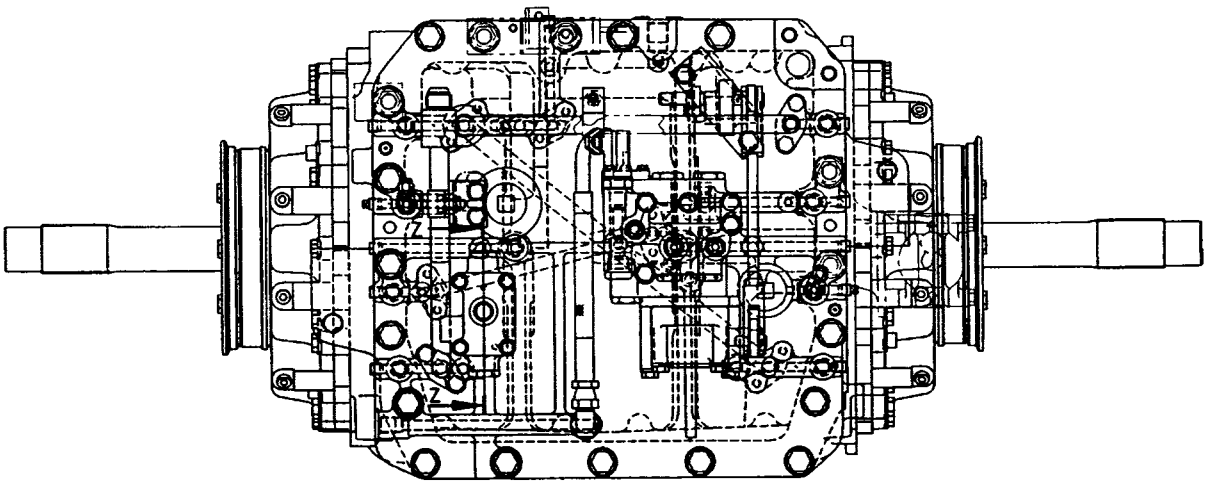

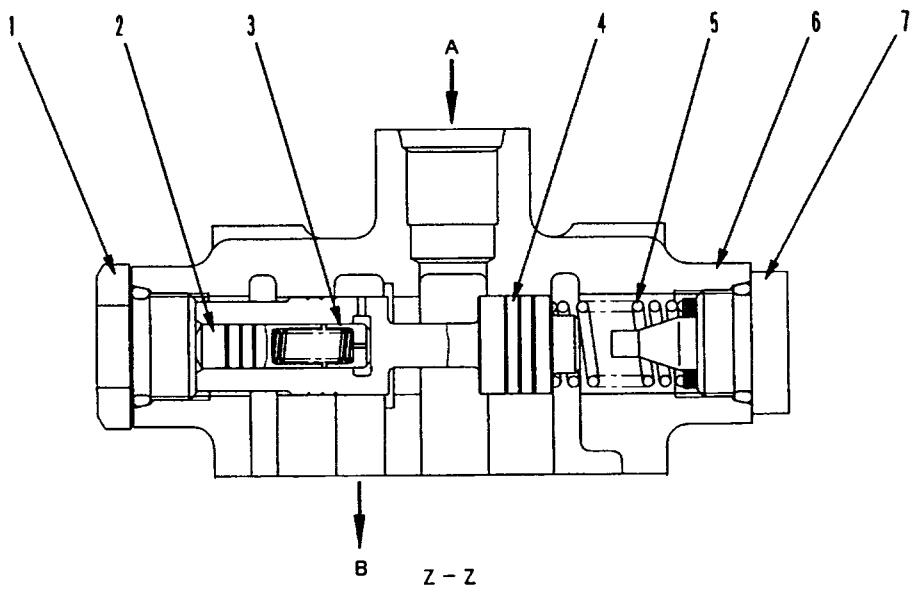

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1. Orifice
2. Plug
3. Body
4. Spring
5. Spool
6. Spring
7. Spool
8. Plug

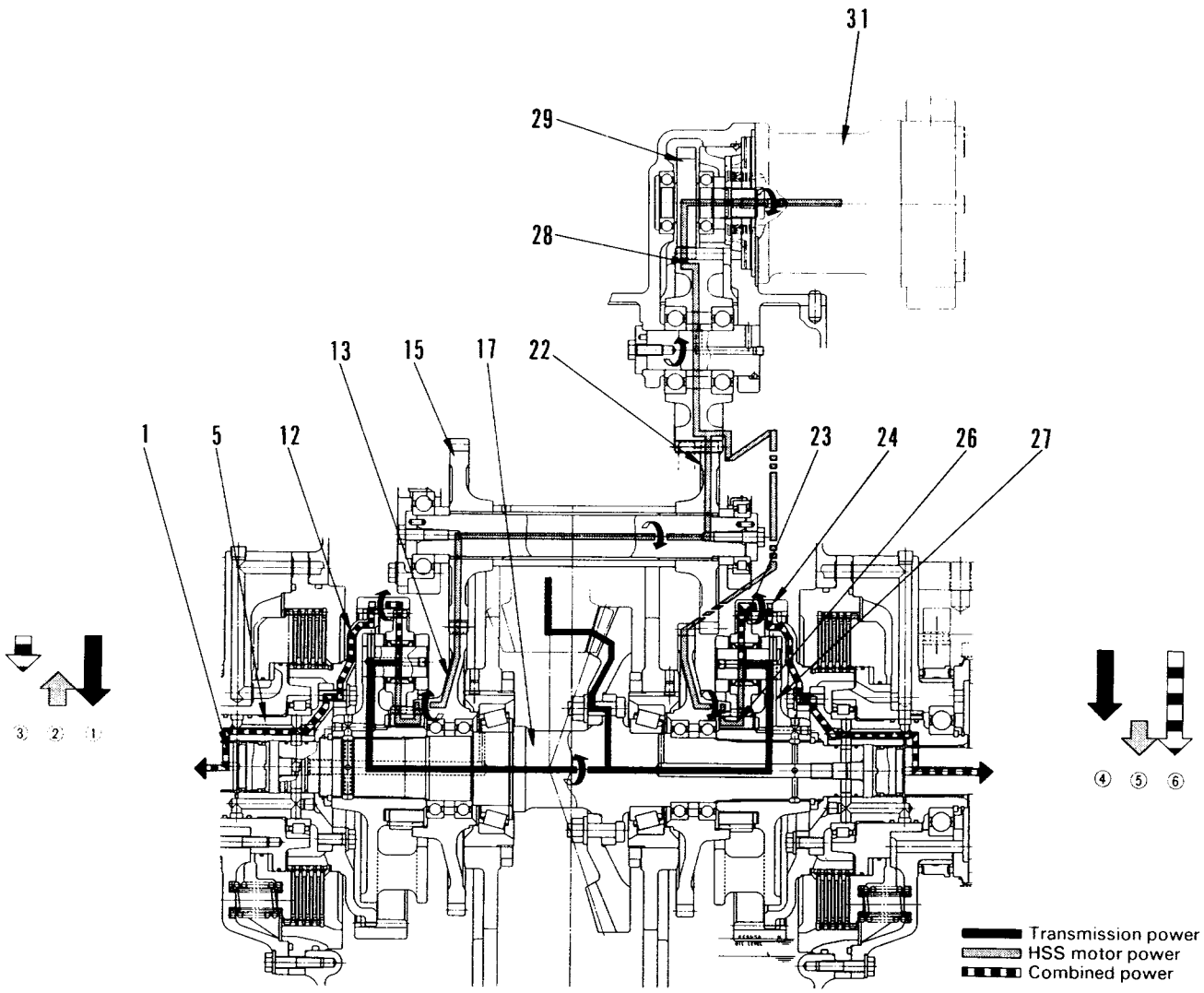
A. From main relief valve
B. To PPC valve

OUTLINE

- The reducing valve is installed between the main relief valve and the steering control valve. The set pressure of the main relief valve is a high 3.24 to 3.43 MPa (33 to 35 kg/cm²) at rated, so the reducing valve lowers the oil pressure to the set pressure for the steering to protect the steering.

Unit: MPa (kg/cm²)

	Set pressure
Cracking pressure	2.45 (25)



① Transmission output speed
② Decrease in speed from HSS motor
③ Left bevel gear shaft output speed (① — ②)
④ Transmission output speed
⑤ Increase in speed from HSS motor
⑥ Right bevel gear shaft output speed (④ + ⑤)

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Reverse

If the steering lever is operated to the left when the machine is traveling in reverse, the action of the selector valve makes HSS motor (31) rotate in the opposite direction from the traveling forward. That is, the HSS motor rotates counterclockwise as seen from the left side of the machine.

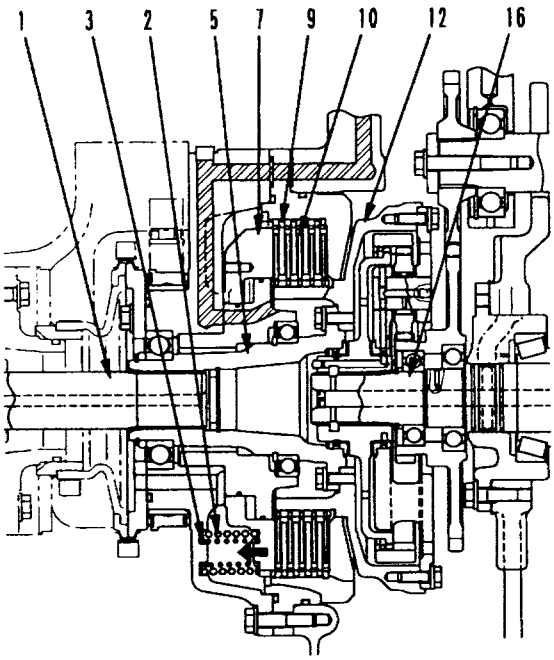
At the same time, gear **A** (13) on the left side of the machine rotates counterclockwise as seen from the left side of the machine while gear **A** (13) on the right side of the machine rotates clockwise as seen from the left side of the machine.

When the machine is traveling in reverse, bevel gear shaft (17) and carrier (27) which is interconnected with the bevel gear shaft rotate counterclockwise as seen from the left side of the machine.

Therefore, considering the relationship of the rotating speed of the elements in the pairs of planetary gears, the rotating speed of ring gear (24) on the right side is faster (in the reverse direction) than when traveling in a straight line by the amount of the power of HSS motor; on the other hand, the rotating speed of ring gear (24) on the left side is slower than when traveling in a straight line, so the machine turns in reverse to the left, where the output speed is slower.

Operation of brakes

1. **Brake released**
   When the brake is in the neutral position, the brake valve is also in the neutral position and oil enters the back-pressure port of brake piston (7).
   When the oil pressure rises, the oil pushes the piston to the left in the direction of the arrow, compresses springs (2) and (3), and releases the pressure pushing discs (10) and plates (9) together. When this happens, the power transmitted from bevel gear shaft (16) through the HSS steering to brake inner drum (12) is transmitted from hub (5) to output shaft (1), and goes to the final drive.



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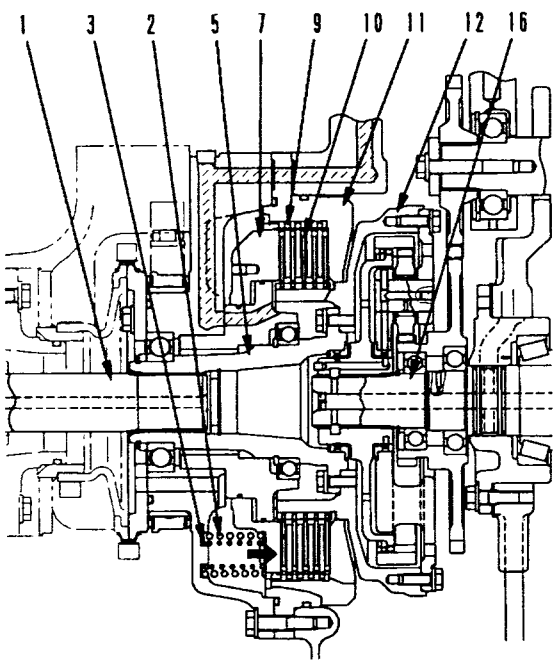
2. **Brake applied (brake pedal depressed)**
   If the brake pedal is depressed, the brake valve switches and the oil applying back pressure to piston (7) is connected to the drain circuit.
   In this condition, piston (7) is pushed out to the right in the direction of the arrow by the tension of springs (2) and (3), so discs (10) and plates (9) are pressed against the stopper portion of brake outer drum (11). The brake outer drum is joined to the steering case and is fixed in position.
   Therefore, the rotation of brake inner drum (12), that is the rotation of output shaft (1), is stopped because the discs and plates are pushed into contact together.
   The hydraulic force applied to piston (7) cab be controlled by the amount that the brake pedal is depressed, and the braking force can be adjusted.

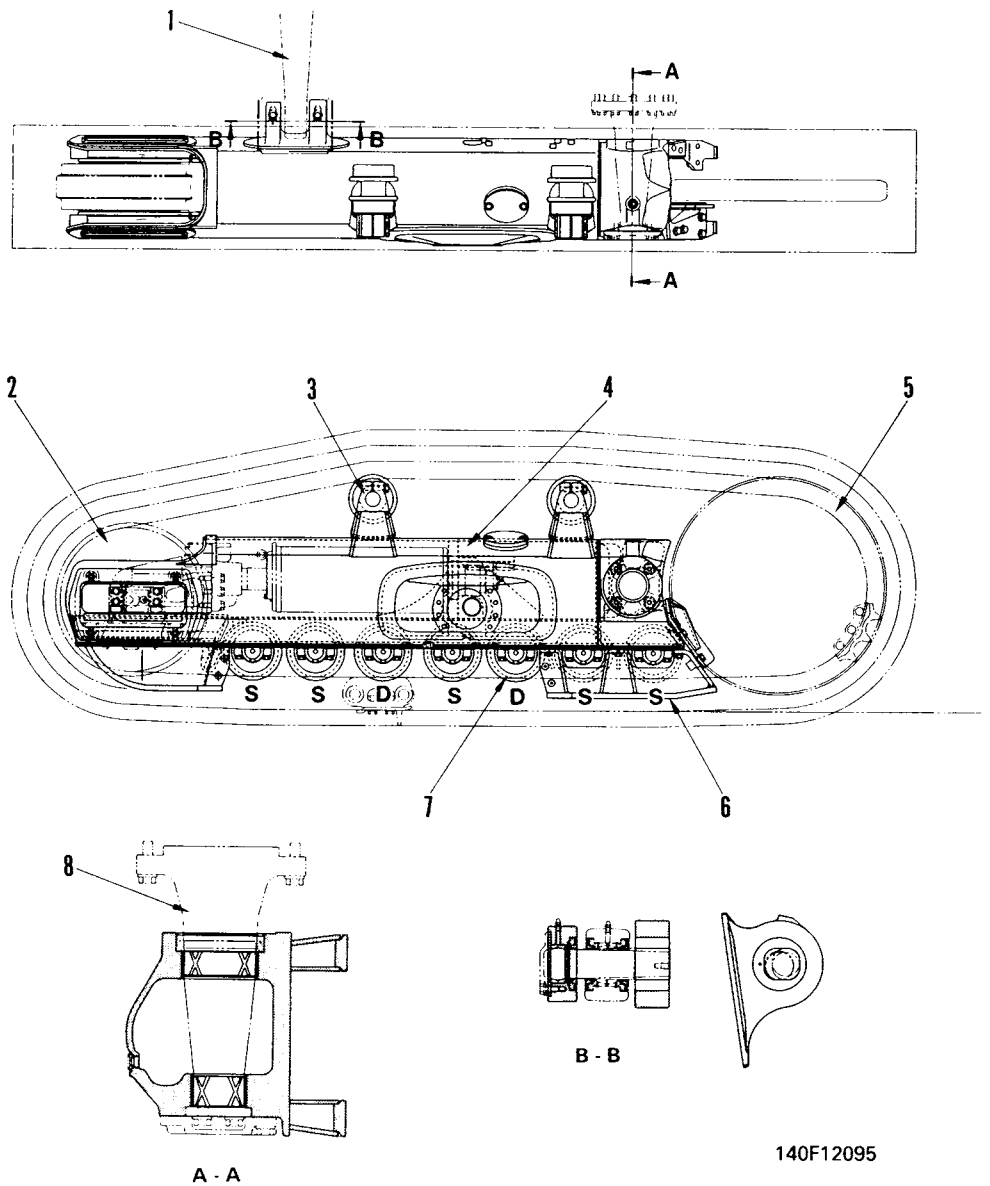


SWD04042

TRACK FRAME

D65E-12 60001 – 60947
D65P-12 60001 – 60890
D65EX-12 60001 – 60941
D65PX-12 60001 – 60914

★ The diagram shows the D65E-12, D65EX-12.



014012

1. Equalizer bar
2. Idler
3. Carrier roller
4. Track frame
5. Sprocket
6. Track roller guard
7. Track roller
8. Pivot shaft

• Track roller

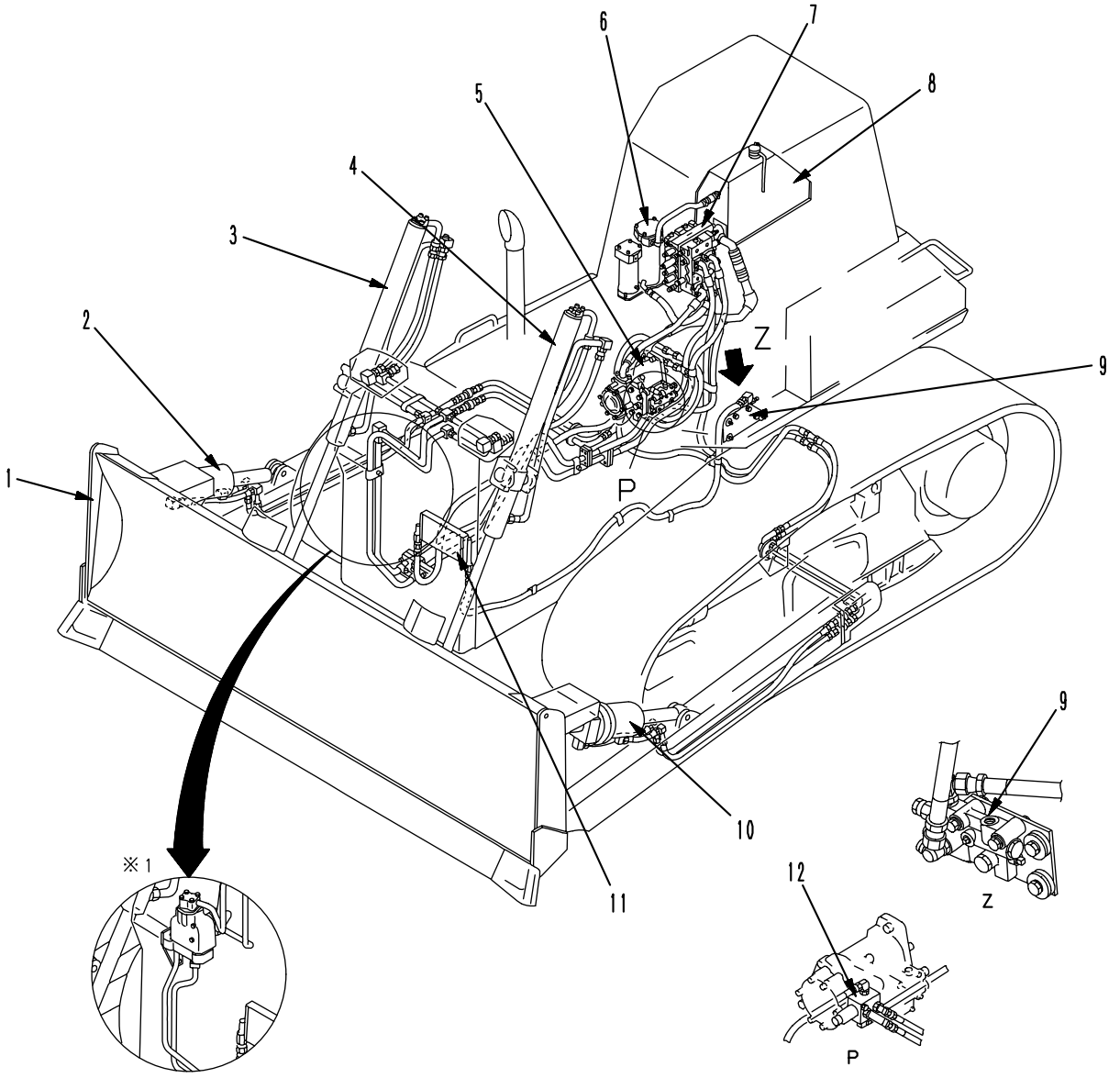
	Q'ty	Flange type and arrangement
D65E, D65EX	7	S,S,D,S,D,S,S
D65P, D65PX	8	S,S,D,S,S,D,S,S

POWER PITCH DOZER

D65P-12 60001-60890
D65PX-12 60001-60914

※1. Serial Numbers
D65P-12 60516 – 60890
D65PX-12 60516 – 60914

★ The diagram shows the D65PX-12.



SWD05024

014012

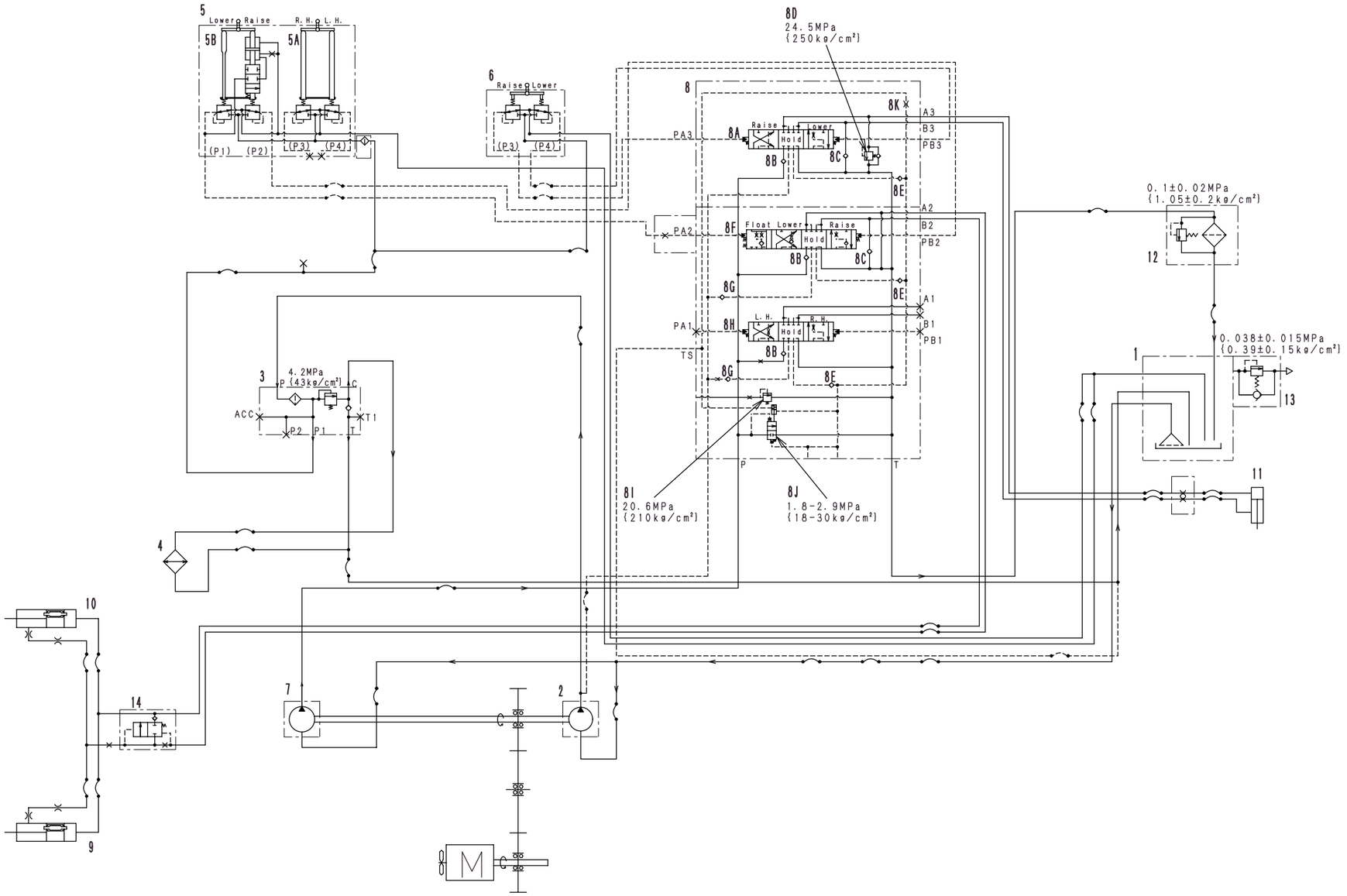
1. Blade
2. Pitch cylinder
3. Right lift cylinder
4. Left lift cylinder
5. Hydraulic HSS pump (HPV95)
6. Oil filter
7. Main control valve
8. Hydraulic tank
9. PPC charge valve
10. Tilt cylinder
11. Oil cooler
12. Tilt/pitch selector valve

WORK EQUIPMENT HYDRAULIC CIRCUIT DIAGRAM

ANGLEDOZER (WITH RIPPER)

D65E-12 60948 and up
D65P-12 60891 and up

★ The diagram shows the D65E-12.



1. Hydraulic tank
2. PPC pump (SBR(1)-010)
3. PPC charge valve
4. Oil cooler
5. Blade control PPC valve
   5A. Blade tilt
   5B. Blade lift
6. Ripper control PPC valve (D65E only)
7. Hydraulic pump (SAL(3)-080)
8. Main control valve
   8A. Ripper valve (D65E only)
   8B. Load check valve
   8C. Suction valve
   8D. Suction safety valve
   8E. LS check valve
   8F. Blade lift valve
   8G. Preset check valve
   8H. Blade tilt valve
   8I. Main relief valve
   8J. Variable unload valve
   8K. Back pressure check valva
   8L. Back pressure valve
   8M. LS bypass valve
9. Left blade lift cylinder
10. Right blade lift cylinder
11. Ripper lift cylinder (D65E only)
12. Hydraulic filter
13. Breather
14. Suction valve

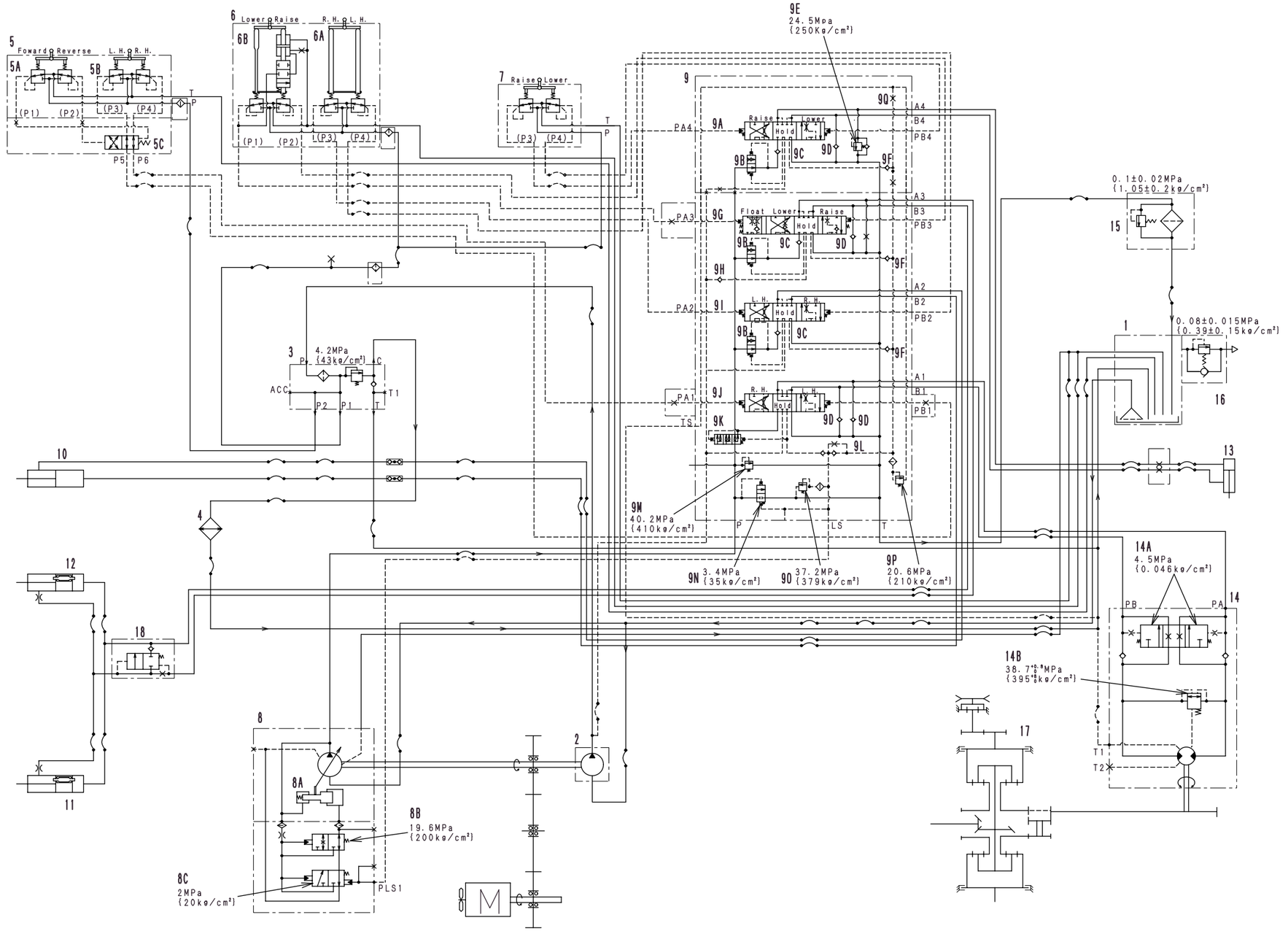
014012

SWD05027

STEERING AND WORK EQUIPMENT HYDRAULIC SYSTEM DIAGRAM

STRAIGHT TILT DOZER (WITH RIPPER)

D65EX-12 60942 and up

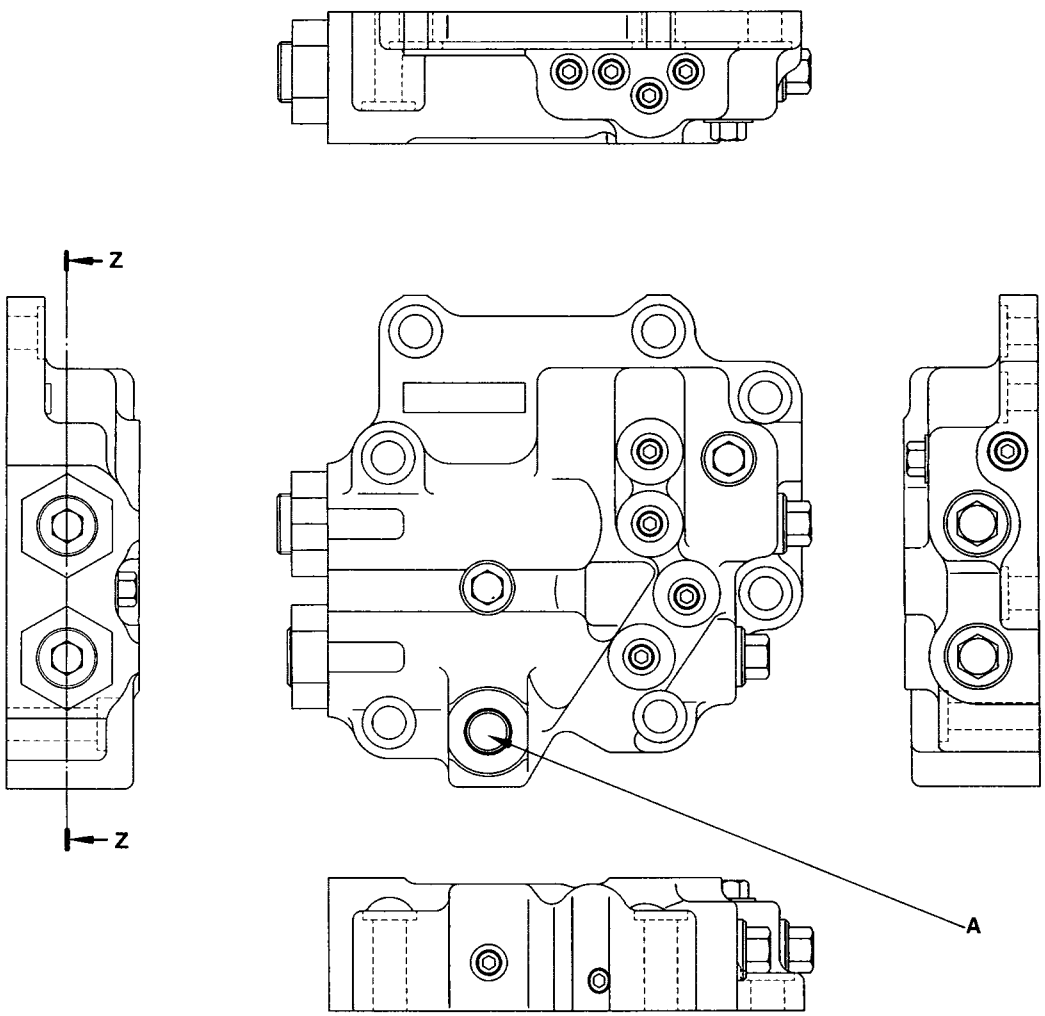


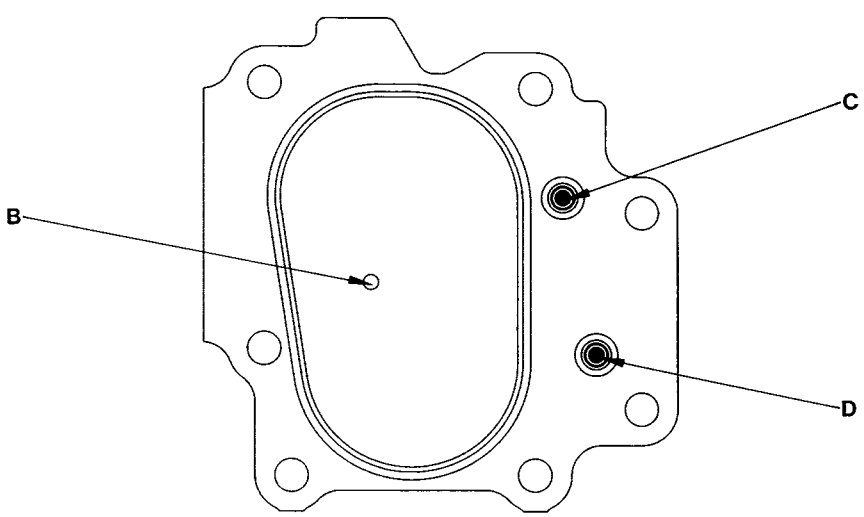
SWD05039

1. Hydraulic tank
2. PPC pump (SBR(1)-010)
3. PPC charge valve
4. Oil cooler
5. Steering control PPC valve
   - 5A. Direction (for HSS)
   - 5B. Steering
   - 5C. Steering circuit selector valve
6. Blade control PPC valve
   - 6A. Blade tilt
   - 6B. Blade lift
7. Ripper control PPC valve
8. Hydraulic, HSS pump (HPV95)
   - 8A. Servo cylinder
   - 8B. Variable throttle valve
   - 8C. LS valve
9. Main control valve
   - 9A. Ripper valve
   - 9B. Pressure compensation valve
   - 9C. Load check valve
   - 9D. Suction valve
   - 9E. Suction safety valve
   - 9F. LS check valve (for work equipment)
   - 9G. Blade lift valve
   - 9H. Preset check valve
   - 9I. Blade tilt valve
   - 9J. Steering valve
   - 9K. Steering priority valve
   - 9L. LS check valve (for steering valve)
   - 9M. Main relief valve
   - 9N. Unload valve
   - 9O. LS relief valve (for steering valve)
   - 9P. LS relief valve (for work equipment valve)
   - 9Q. LS bypass valve
10. Blade tilt cylinder
11. Left blade lift cylinder
12. Right blade lift cylinder
13. Ripper lift cylinder
14. HSS motor (HMF95)
    - 14A. Counterbalance valve
    - 14B. Safety valve
15. Hydraulic filter
16. Breather
17. HSS unit
18. Suction valve

01401-2

2. LS VALVE





A. Port **PLS**
B. Port **PT**
C. Port **PP**
D. Port **PNC**

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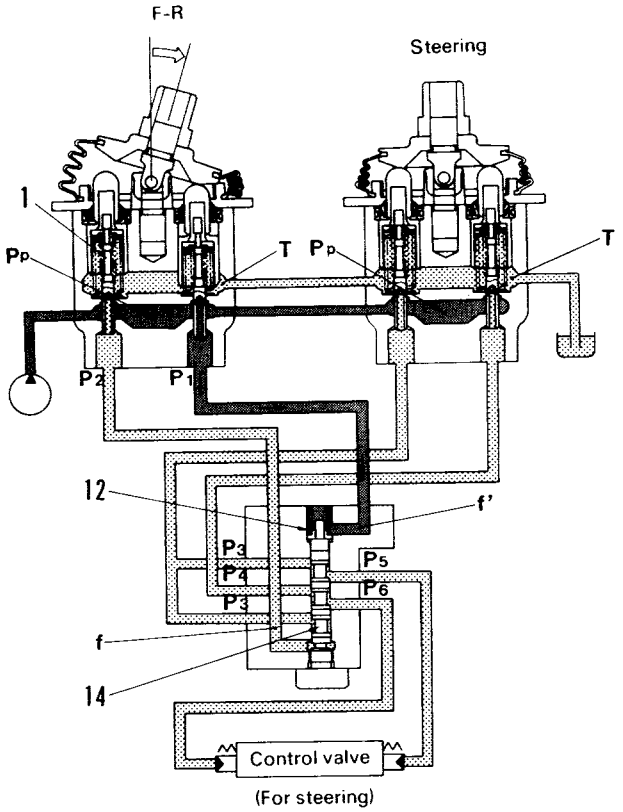
014012

2) When directional lever is operated fully to port P1

Spool (1) is pushed down, and chamber **f'** is connected with pump pressure chamber **PP**.
The pressure in chamber **f'** rises, but spool (14) is pushed down by spring (12) so it does not change its position.
For this reason, the connections of each port of the selector valve remain the same as in Item 1).

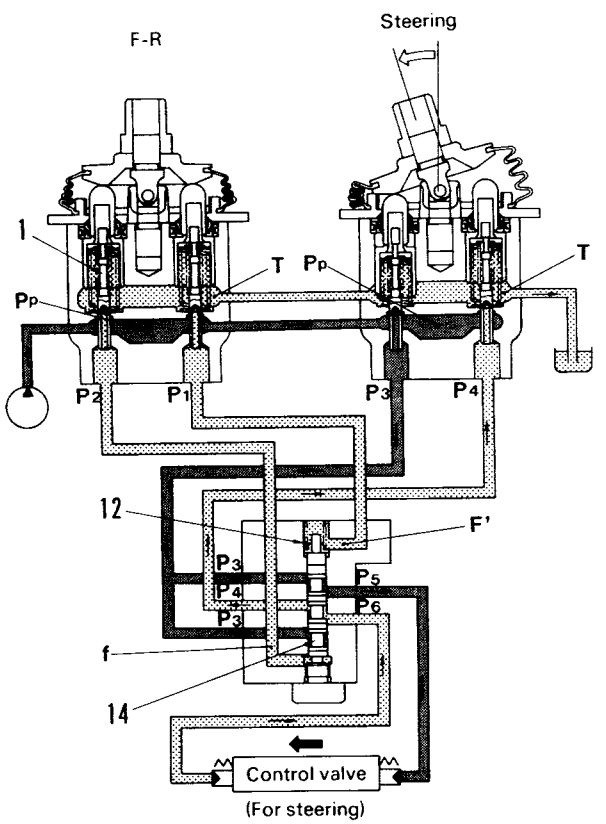


140F12136

014012

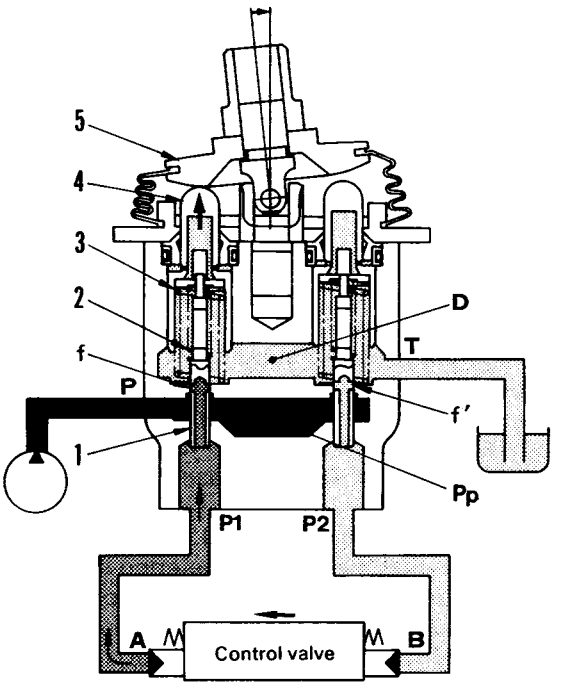
3) When directional lever is at neutral or is operated fully to port P1, and steering lever is operated

If the steering lever is operated to port **P3**, spool (14) is at the bottom, so the oil at port **P3** flows to port **P5** and moves the control valve to the left. The oil at port **P6** passes through port **P4** and is drained to port **T**.



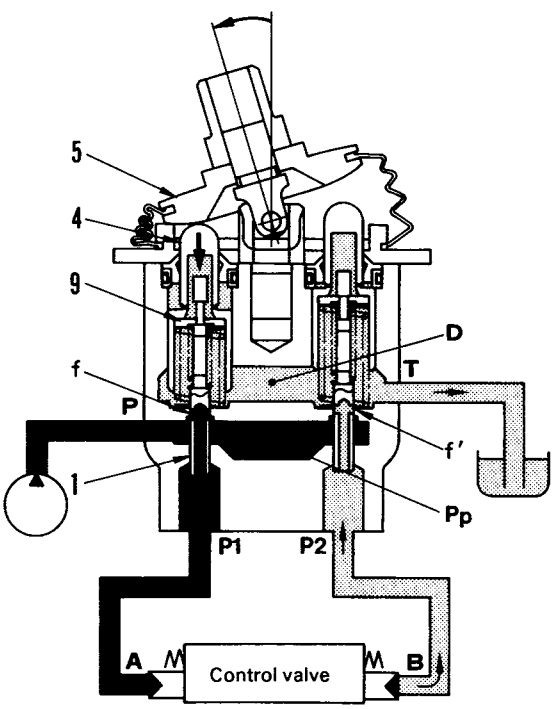
140F12137

3) During fine control
(when control lever is returned)
When disc (5) starts to be returned, spool (1) is pushed up by the force of centering spring (3) and the pressure at port **P1**.
When this happens, fine control hole **f** is connected to drain chamber **D** and the pressure oil at port **P1** is released.
If the pressure at port **P1** drops too far, spool (1) is pushed down by metering spring (2), and fine control hole **f** is shut off from drain chamber **D**. At almost the same time, it is connected to pump pressure chamber **PP**, and the pump pressure is supplied until the pressure at port **P1** recovers to a pressure that corresponds to the lever position.
When the spool of the control valve returns, oil in drain chamber **D** flows in from fine control hole **f'** in the valve on the side that is not working.
The oil passes through port **P2** and enters chamber **B** to fill the chamber with oil.



20TF01046

4) At full stroke
When disc (5) pushes down piston (4), and retainer (9) pushes down spool (1), fine control hole **f** is shut off from drain chamber **D**, and is connected with pump pressure chamber **PP**.
Therefore, the pilot pressure oil from the charging pump passes through fine control hole **f** and flows to chamber **A** from port **P1**, and pushes the control valve spool.
The oil returning from chamber **B** passes from port **P2** through fine control hole **f'** and flows to drain chamber **D**.



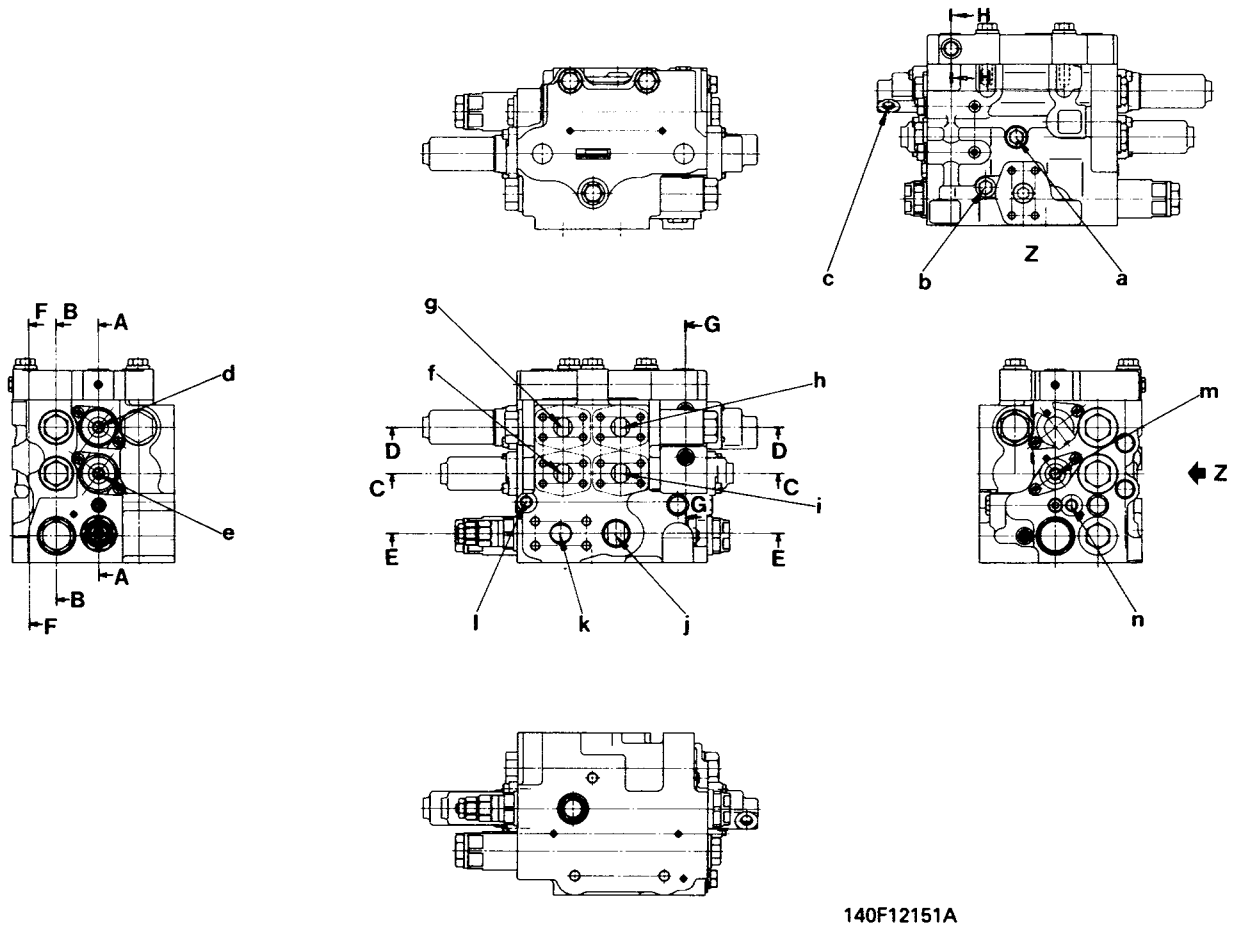
20TF01047

014012

MAIN CONTROL VALVE

(2-SPOOL VALVE: BLADE LIFT + TILT)

D65E-12 60001 – 60947
D65P-12 60001 – 60890



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014012

a. Port **PC** (pump pressure plug)
b. Port **PLSC** (LS pressure plug)
c. Port **PB2** (from PPC valve)
d. Port **PA2** (from PPC valve)
e. Port **PA1** (from PPC valve)
f. Port **A1** (to tilt cylinder bottom)
g. Port **A2** (to lilt cylinder head)
h. Port **B2** (to lilt cylinder bottom)
i. Port **B1** (to tilt cylinder head)
j. Port **T** (to tank).
k. Port **P** (from pump)
l. Port **TS** (to tank)
m.Port **PB1** (from PPC valve)
n. Port **Pi** (from PPC pump)

(1) If spool (1) moves to the right because of PPC output pressure **Pi**, the oil discharged from the pump flows through ports **A**, **B**, **C**, **D**, **E**, and **F**, and flows to the bottom end of the tilt cylinder.
When this happens, the pressure in chamber **F** is sent through **LS** sensing hole **G** through ports **H**, **I**, **J**, **K**, and **L**, and goes to ports **M** and **N** of unload spool (2).

(2) If the cylinder reaches the end of its stroke and it stops, the condition becomes **P** ≒ **P1** ≒ **PLS**, and unload spool (2) is pushed completely to the left by the load of spring (3), so the unload oil flow becomes 0.

(3) In this condition, all the oil discharged by the pump tries to flow to the cylinder, but the cylinder piston is stopped, so the pressure in the pump circuit rises.

(4) If the pump pressure reaches the cracking pressure, relief valve (4) is actuated, so the maximum pressure in the pump circuit is set.

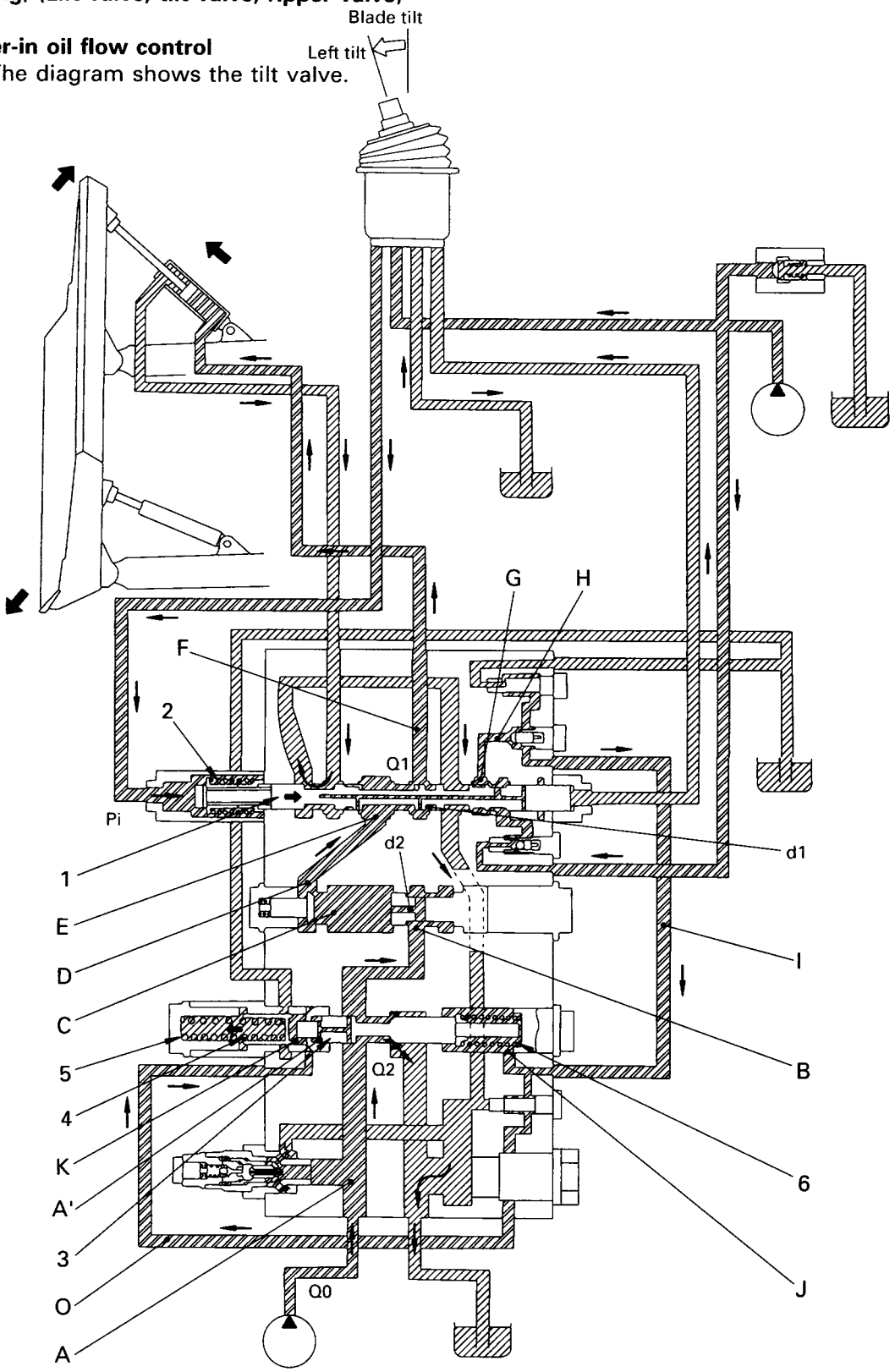
(5) Throttle **Q** of relief valve (4) is used to keep the peak pressure to the minimum.

014012

2. Control of oil flow (unload valve at high setting) (Lift valve, tilt valve, ripper valve)

(1) Meter-in oil flow control

★ The diagram shows the tilt valve.

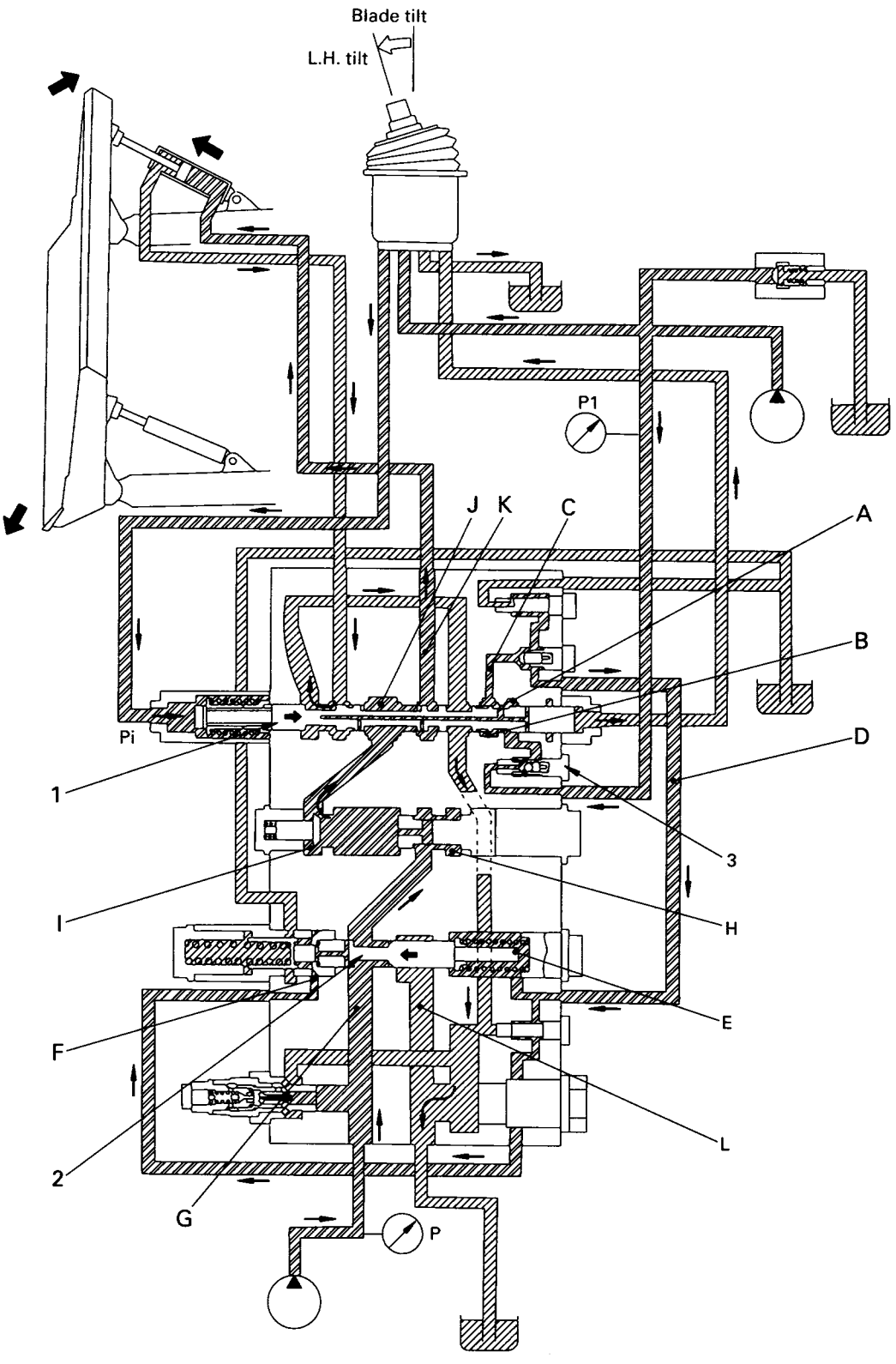


014012

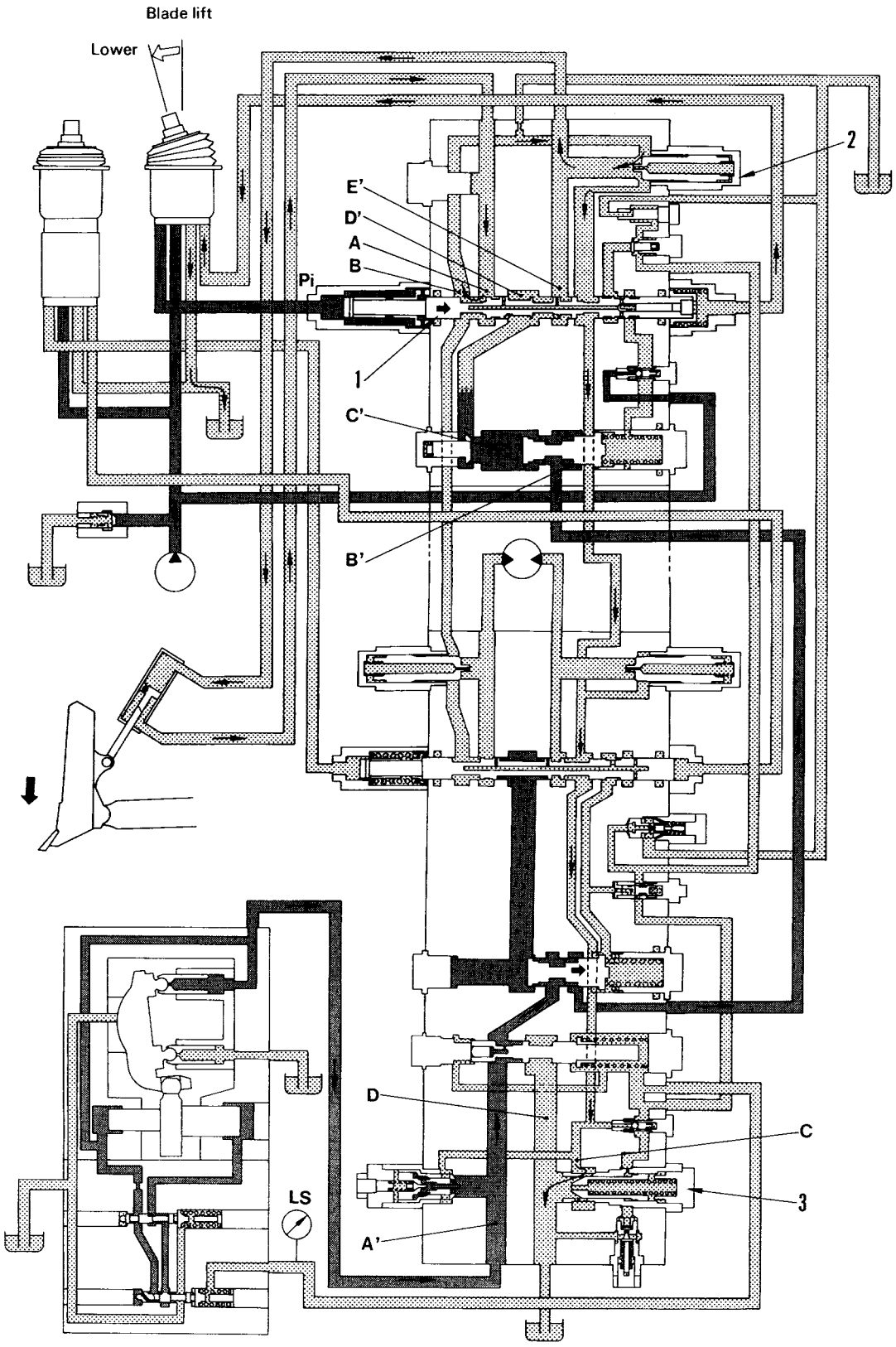
SLD00551

- △**PLS** = Differential pressure between ports **A** and **J** = 1.8 – 2.9 MPa (18 – 30 kg/cm²)
- △**PLS'** = Differential pressure between ports **A** and **F**
- △**PLS** ≒ △ **PLS'**

(2) Tilt valve



(3) Meter-out control when blade moves down under its own weight, and suction function using back-pressure valve (work equipment lever at LOWER)

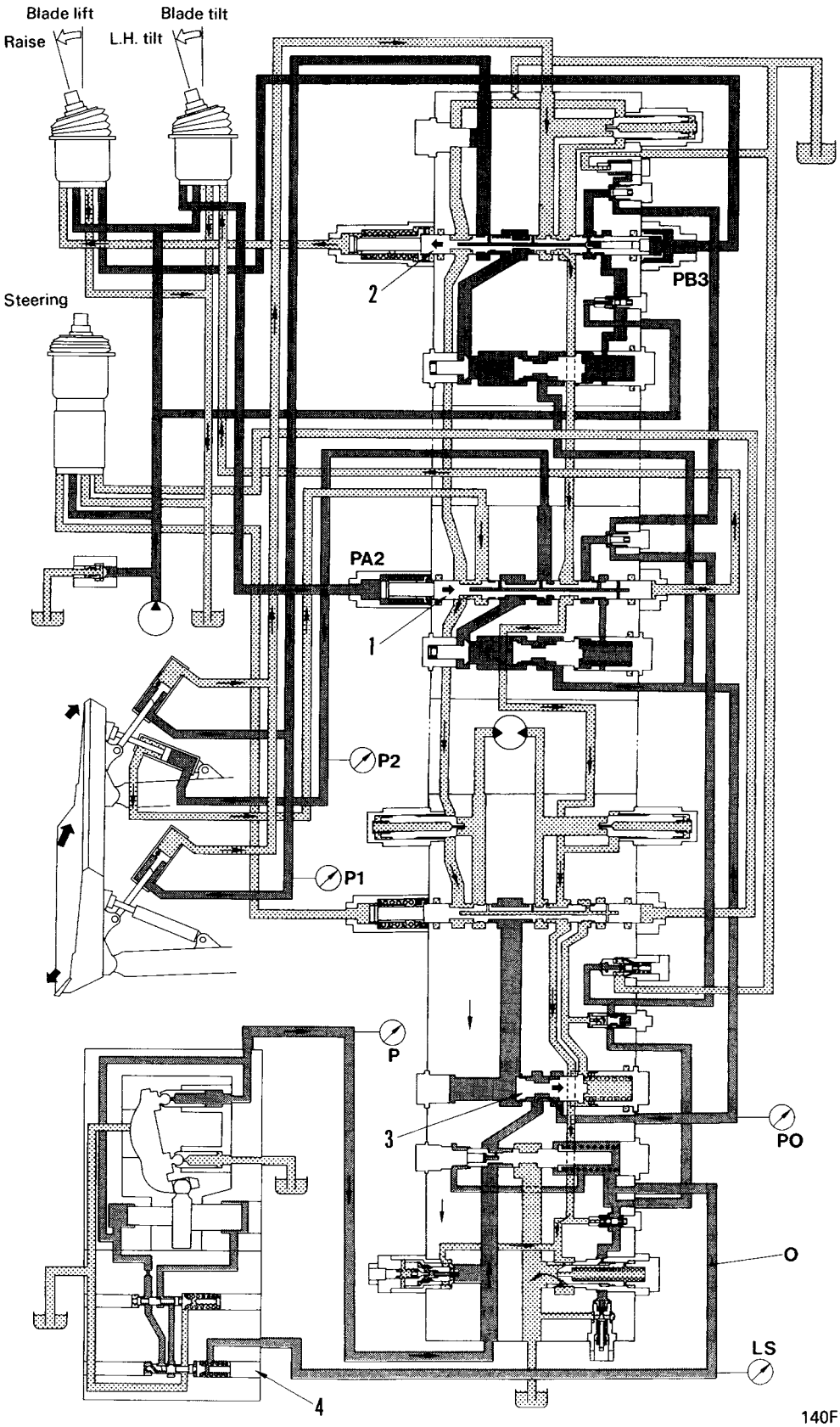


014012

140F12174A

(2) Compound operation of work equipment valve

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



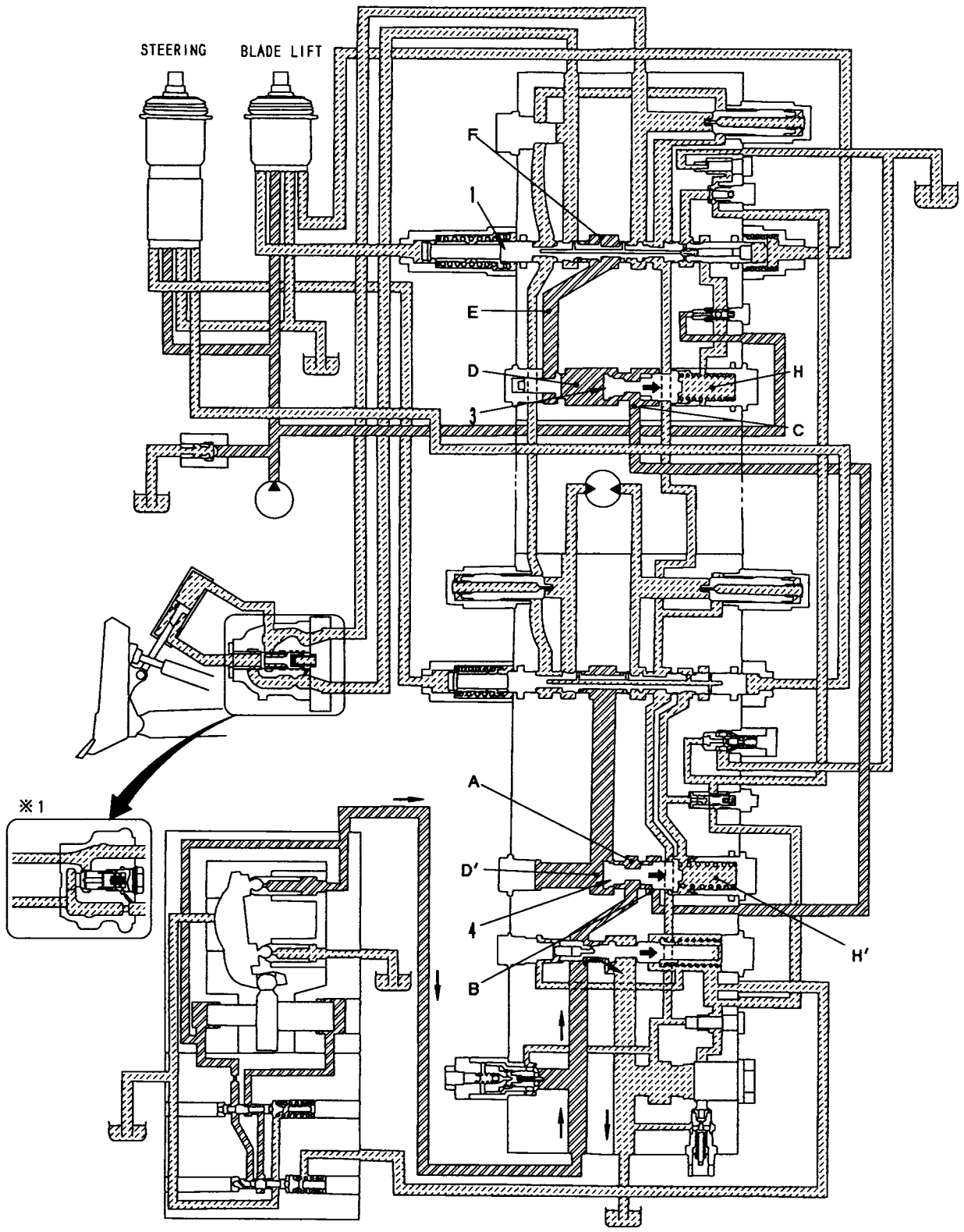
014012

140F12181A

(2) Work equipment valve
(tilt valve, lift valve, ripper valve)

※1. Serial Numbers
D65EX-12 61446 and up
D65PX-12 61369 and up

★ The diagram shows the blade lift valve.



014012

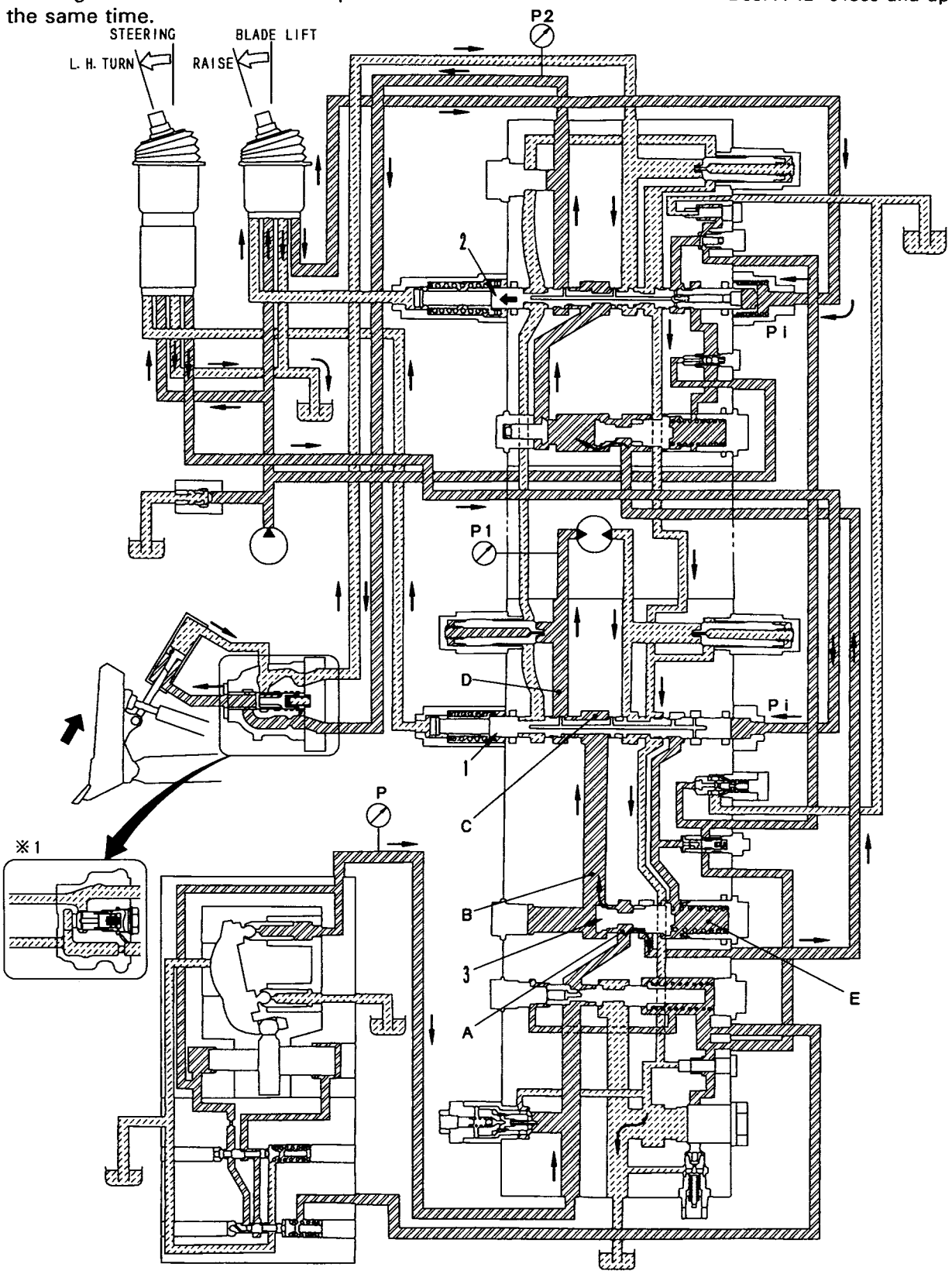
SLD01663

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. Serial Numbers
D65EX-12 61446 and up
D65PX-12 61369 and up

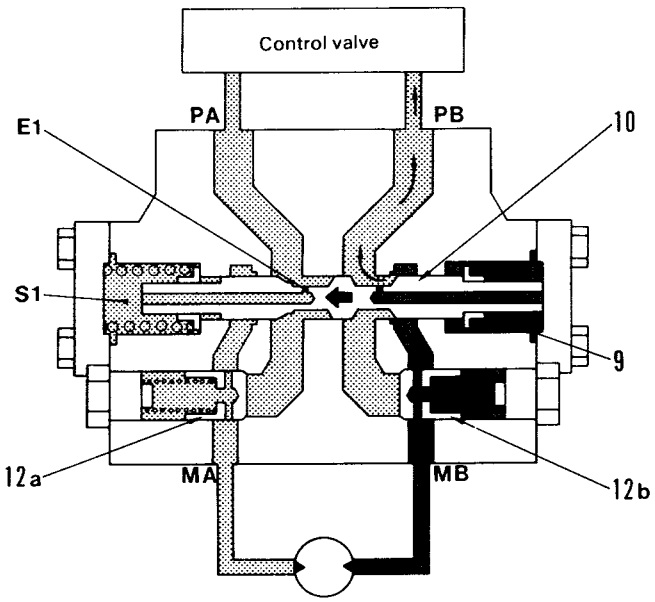


014012

SLD01667

Action of brakes when operating steering on downhill slopes

- When the steering is operated on a downhill slopes, if the machine attempts to run away, the HSS motor will rotate under no load, and the oil pressure at the inlet port of the HSS motor will drop. This drop in pressure will pass through orifice **E1**, so the pressure in chamber **S1** will also drop.
  If the pressure in chamber **S1** drops below the spool switching pressure, spool (10) is pushed to the left in the direction of the arrow by spring (9), and outlet port **MB** is throttled.
  As a result, the pressure at the outlet port rises, and this creates a resistance to the rotation of the HSS motor which prevents the motor from overrunning.
  In other words, the spool moves to a position where it balances the pressure at outlet port **MB** with the force resulting from the weight of the machine and the pressure at the inlet port. In this way, it throttles the outlet port circuit and controls the motor to a speed that matches the amount of oil discharged from the pump.



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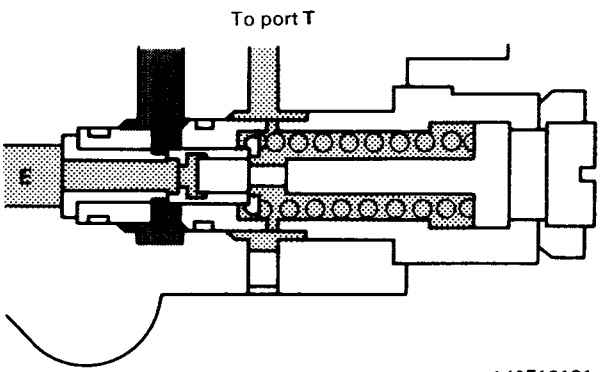
014012

2. Safety valve

FUNCTION

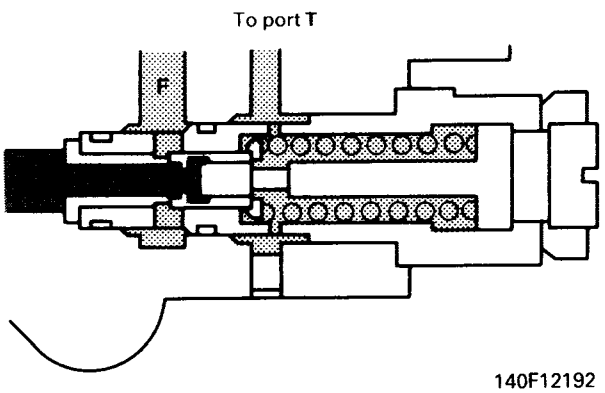
- When the operation of the steering stops, counterbalance valve (10) closes the circuit at the inlet and outlet ports of the HSS motor, but the HSS motor continues to turn because of inertia. As a result, the pressure at the outlet port of the HSS motor becomes extremely high, and this will damage the HSS motor and the piping. The safety valve acts to release this abnormal pressure to the inlet port of the HSS motor to protect the equipment from damage.



140F12191

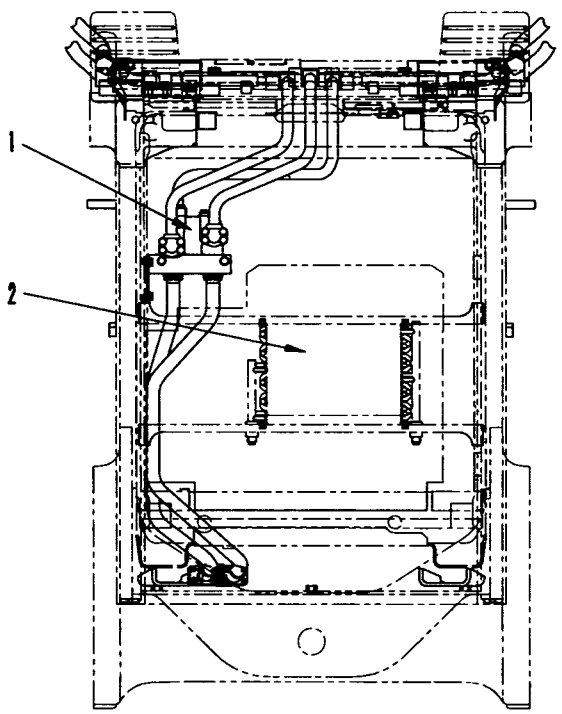
OPERATION

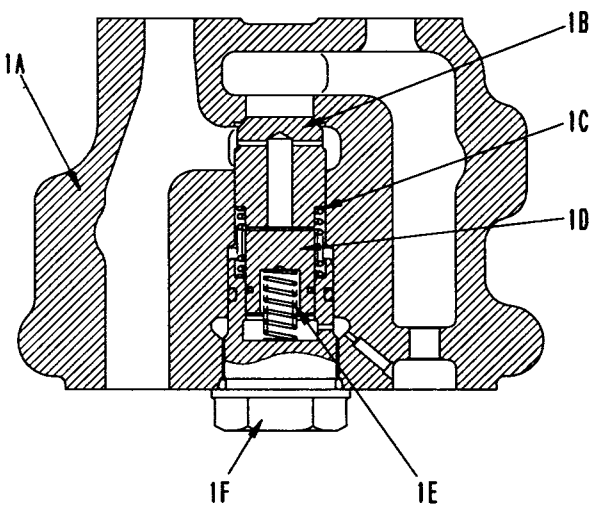
- When the operation of the steering is stopped, the check valve of the counterbalance valve closes chamber **E** (or chamber **F**) in the outlet port circuit, but the pressure at the outlet port side continues to rise because of inertia.



140F12192

D65E-12 61441 and up
D65P-12 61365 and up
D65EX-12 61446 and up
D65PX-12 61369 and up





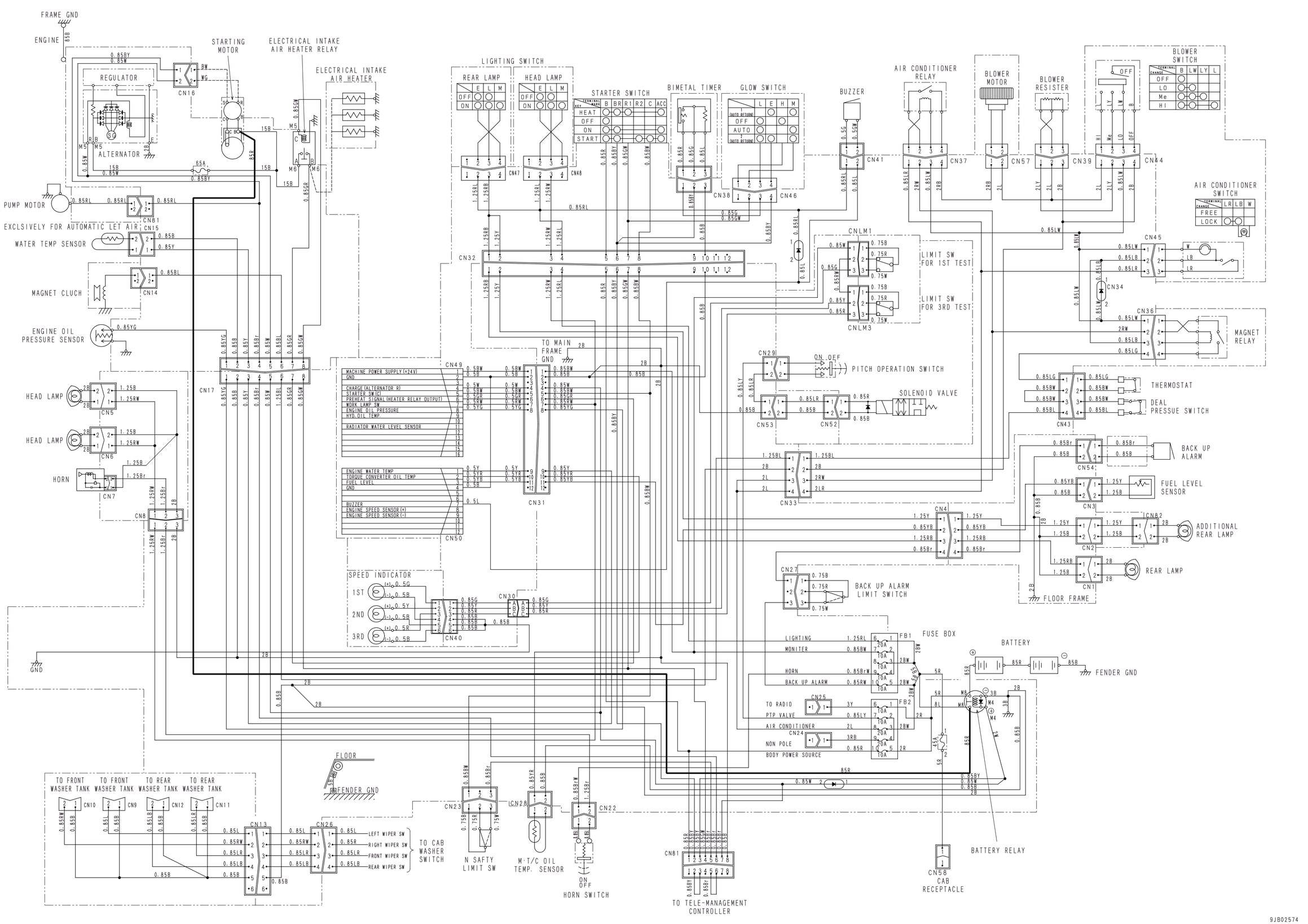
SKL01653

014012

OUTLINE

- Suction valve (1) is between the control valve and the blade lift cylinder. It acts to reduce the formation of any vacuum at the cylinder bottom when the blade is lowered, and also reduces the time lag before starting to dig. The lowering speed of the blade is more or less determined by the discharge amount from the pump, but the installation of a suction valve enables an even greater lowering speed.

1. Suction valve assembly
   1A. Body
   1B. Valve
   1C. Spring
   1D. Piston
   1E. Spring
   1F. Plug
2. Hydraulic oil cooler


FRAME GND
ENGINE
STARTING MOTOR
ELECTRICAL INTAKE AIR HEATER RELAY
ELECTRICAL INTAKE AIR HEATER
REGULATOR
ALTERNATOR
PUMP MOTOR
EXCLSIVELY FOR AUTOMATIC LET AIR
WATER TEMP SENSOR
MAGNET CLUCH
ENGINE OIL PRESSURE SENSOR
HEAD LAMP
HORN
LIGHTING SWITCH
REAR LAMP
HEAD LAMP
STARTER SWITCH
BIMETAL TIMER
GLOW SWITCH
BUZZER
AIR CONDITIONER RELAY
BLOWER MOTOR
BLOWER RESISTER
BLOWER SWITCH
AIR CONDITIONER SWITCH
LIMIT SW FOR 1ST TEST
LIMIT SW FOR 3RD TEST
PITCH OPERATION SWITCH
SOLENOID VALVE
THERMOSTAT
DEAL PRESSUE SWITCH
MAGNET RELAY
BACK UP ALARM
FUEL LEVEL SENSOR
ADDITIONAL REAR LAMP
REAR LAMP
FLOOR FRAME
BACK UP ALARM LIMIT SWITCH
FUSE BOX
BATTERY
FENDER GND
BATTERY RELAY
CN58 CAB RECEPTACLE
TO MAIN FRAME GND
MACHINE POWER SUPPLY (+24V)
GND
CHARGE (ALTERNATOR R)
STARTER SW (C)
PREHEAT SIGNAL (HEATER RELAY OUTPUT)
WORK LAMP SW
ENGINE OIL PRESSURE
HYD. OIL TEMP
RADIATOR WATER LEVEL SENSOR
ENGINE WATER TEMP
TORQUE CONVERTER OIL TEMP
FUEL LEVEL
GND
BUZZER
ENGINE SPEED SENSOR (+)
ENGINE SPEED SENSOR (–)
SPEED INDICATOR
1ST
2ND
3RD
TO RADIO
PTP VALVE
AIR CONDITIONER
NON POLE
BODY POWER SOURCE
TO FRONT WASHER TANK
TO FRONT WASHER TANK
TO REAR WASHER TANK
TO REAR WASHER TANK
LEFT WIPER SW
RIGHT WIPER SW
FRONT WIPER SW
REAR WIPER SW
TO CAB WASHER SWITCH
N SAFTY LIMIT SW
M-T/C OIL TEMP. SENSOR
HORN SWITCH
TO TELE-MANAGEMENT CONTROLLER
9JB02574

SENSORS

- The signal from the sensor is input directly to the machine monitor panel.
- The engine oil pressure sensor signal is judged to be normal when the contacts are open and the signal wire is separated from the chassis ground.

Display category	Type of sensor	Sensor method	When normal	When abnormal
Caution	Engine oil pressure	Contact	OFF (open)	ON (closed)
	Engine coolant temperature	Resistance	—	—
	Power train oil temperature	Resistance	—	—
Gauge	Fuel level	Resistance	—	—

014012

STANDARD VALUE TABLE FOR CHASSIS

D65E-12 60001 – 60947
D65P-12 60001 – 60890
D65EX-12 60001 – 60941
D65PX-12 60001 – 60914

Classification	Check item	Measurement conditions		Unit	D65E-12 Standard value	D65E-12 Permissible value
Engine stall	Torque converter stall speed	• Engine oil pressure: within operating range • Engine oil temperature: within operating range • Power train oil temperature: 70 — 80°C • Hydraulic oil temperature: 45 — 55°C • No of speed range: F3		rpm	1,690 ± 100	1,570
Travel of control levers, pedals	Fuel control lever	• Center of lever knob	Engine: low idling → full throttle	mm	93 ± 20	93^{+40}_{-20}
			Engine: low idling → stop		43 ± 20	43^{+40}_{-20}
	Decelerator pedal	• Center of pedal			57 ± 10	57 ± 10
	Gear shift lever	• Engine stopped • Center of lever knob	Between each speed range		39 ± 6	39 ± 6
	Steering. F-R lever	• Engine stopped	N → F		73 ± 10	73 ± 10
		• Center of lever knob	N → R		65 ± 10	65 ± 10
		• Engine low idling • Center of lever knob	Full stroke LEFT turn		82 ± 15	82 ± 15
			RIGHT turn		83 ± 15	83 ± 15
			Until steering clutch is fully disengaged		40	40
	Brake pedal	• Engine low idling • Center of pedal	Full stroke		79 ± 12	79 ± 12
	Blade control lever	• Engine low idling	HOLD → RAISE		81 ± 12	81 ± 12
		• Center of lever knob	HOLD → LOWER		58 ± 9	58 ± 9
		• Hydraulic oil temperature: 45 — 55°C	HOLD → LEFT TILT HOLD → RIGHT TILT		62 ± 10	62 ± 10
	Ripper control lever	• Engine low idling • Center of lever knob	HOLD → RAISE		77 ± 12	77 ± 12
		• Hydraulic oil temperature: 45 — 55°C	HOLD → LOWER		65 ± 10	65 ± 10
Operating force of control levers, pedals	Fuel control lever	• Center of lever knob	Engine: low idling → full throttle	N (kg)	75.5 ± 29.4 (7.7 ± 3.0)	117.7 (12.0)
			Engine: full throttle → low idling		21.6 ± 9.8 (2.2 ± 1.0)	39.2 (4.0)
			Engine: low idling → stop		72.6 ± 19.6 (7.4 ± 2.0)	117.7 (12.0)
	Decelerator pedal	• Engine speed: low idling (825 ± 25 rpm) • Center of pedal			98.1 ± 29.4 (10 ± 3)	147.1 (15)
	Gear shift lever	• Engine stopped	1st → 2nd		32.4 ± 19.6 (3.3 ± 2.0)	58.8 (6.0)
		• Center of lever knob	2nd → 3rd		39.2 ± 19.6 (4.0 ± 2.0)	58.8 (6.0)

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Classification	Check Item	Measurement conditions		Unit	D65E-12	
					Standard value	Permissible value
Operating force of control levers, pedals	Steering F-R lever	• Engine stopped • Center of lever knob	N → F	N (kg)	32.4 ± 19.6 (3.3 ± 2.0)	49.0 (5.0)
			N → R		34.3 ± 19.6 (3.5 ± 2.0)	49.0 (5.0)
		• Engine low idling • Center of lever knob	Untill steering clutch is fully disengaged		12.7 ± 9.8 (1.3 ± 1.0)	24.5 (2.5)
			Until machine turns when brake is applied		29.4 ± 9.8 (3.0 ± 1.0)	49.0 (5.0)
	Brake pedal	• Engine low idling • Center of pedal			451.0 ± 78.5 (46.0 ± 8.0)	588.4 (60.0)
	Brake control lever	• Engine low idling • Hydraulic oil temperature: 45 – 55°C • Center of lever knob	HOLD → RAISE		26.5 ± 9.8 (2.7 ± 1.0)	39.2 (4.0)
			HOLD → LOWER		23.5 ± 9.8 (2.4 ± 1.0)	39.2 (4.0)
			HOLD → LEFT TILT HOLD → RIGHT TILT		22.5 ± 9.8 (2.3 ± 1.0)	39.2 (4.0)
	Ripper control lever	• Engine low idling • Hydraulic oil temperature: 45 – 55°C • Center of lever knob	HOLD → RAISE		25.5 ± 9.8 (2.6 ± 1.0)	39.2 (4.0)
			HOLD → LOWER		20.6 ± 9.8 (2.1 ± 1.0)	39.2 (4.0)
Hydraulic oil pressure	Torque converter relief pressure (inlet)	• Power train oil temperature: 70 – 80°C	Engine: low idling	MPa (kg/cm²)	$0.2^{+0.15}_{-0.1}$ $(2.0^{+1.5}_{-1.0})$	$0.2^{+0.15}_{-0.1}$ $(2.0^{+1.5}_{-1.0})$
			Engine: full throttle		0.75 ± 0.15 (7.5 ± 1.5)	0.75 ± 0.15 (7.5 ± 1.5)
	Torque converter outlet pressure		Engine: low idling		0.2 ± 0.1 (2.0 ± 1.0)	0.2 ± 0.1 (2.0 ± 1.0)
			Engine: full throttle		0.45 ± 0.15 (4.5 ± 1.5)	0.45 ± 0.15 (4.5 ± 1.5)
	Transmission main relief pressure		Engine: full throttle		3.3 ± 0.1 (34.0 ± 1.0)	3.0 (31.0)
	Transmission modulating pressure		Engine: full throttle		3.3 ± 0.1 (34.0 ± 1.0)	3.0 (31.0)
	Transmission lubrication pressure		Engine: full throttle		0.1 ± 0.05 (1.0 ± 0.5)	0.1 ± 0.05 (1.0 ± 0.5)
	Steering clutch operating pressure		Engine: low idling		2.5 ± 0.1 (25.0 ± 1.0)	2.2 (22.0)
			Engine: full throttle		2.5 ± 0.1 (25.0 ± 1.0)	2.2 (22.0)

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Classification	Check Item	Measurement conditions		Unit	D65E-12	
					Standard value	Permissible value
Hydraulic oil pressure	Load sensing pressure	• Hydraulic oil temperature: 45 – 55°C • Engine speed: full throttle	Steering	MPa (kg/cm²)	—	—
			Work equipment		—	—
	Brake operating pressure	• Power train oil temperature: 70 – 80°C	Engine: low idling		2.5 ± 0.1 (25.0 ± 1.0)	2.2 (22.0)
			Engine: full throttle		2.5 + 0.1 (25.0 ± 1.0)	2.2 (22.0)
	PPC valve relief pressure	• Hydraulic oil temperature: 45 – 55°C	Engine: full throttle		4.2 ± 0.3 (43.0 ± 3.0)	3.7 (38.0)
	Steering relief pressure		Engine: full throttle		—	—
	Blade lift relief pressure		Engine: low idling		Min. 15.7 (Min. 160)	Min. 15.7 (Min. 160)
			Engine: full throttle		20.6 ± 1.0 (210 ± 10)	17.6 (180)
	Blade tilt relief pressure		Engine: low idling		Min. 15.7 (Min. 160)	Min. 15.7 (Min. 160)
			Engine: full throttle		20.6 ± 1.0 (210 ± 10)	17.6 (180)
	Ripper lift relief pressure		Engine: low idling		Min. 15.7 (Min. 160)	Min. 15.7 (Min. 160)
			Engine: full throttle		20.6 ± 1.0 (210 ± 10)	17.6 (180)
HSS motor	Leakage from HSS motor	• Hydraulic oil temperature: 45 – 55°C • Steering lever: full • Gear shift lever: N • Brake pedal: depress • Engine: full throttle		ℓ/min.	—	—
Performance	Travel speed	• On level surface • Engine at full throttle • Engine water temperature: Inside operating range • Run up distance: 10 – 30 m • Measurement distance: 20 m	F 1st	km/h	3.4 ± 0.2	3.4 ± 0.2
			F 2nd		6.1 ± 0.3	6.1 ± 0.3
			F 3rd		9.6 ± 0.5	9.6 ± 0.5
			R 1st		4.6 ± 0.3	4.6 ± 0.3
			R 2nd		7.7 ± 0.4	7.7 ± 0.4
			R 3rd		11.7 ± 0.6	11.7 ± 0.6

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MEASURING BLOWBY

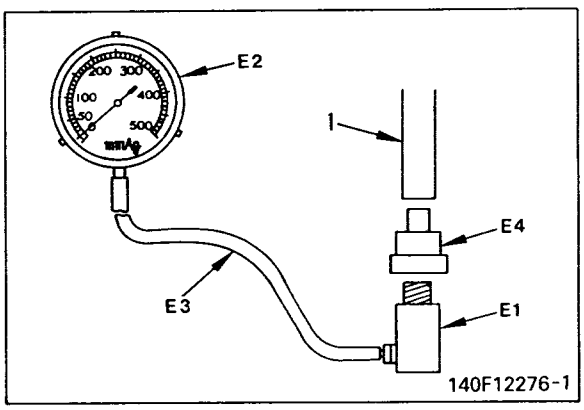
★ Raise the coolant temperature to the operating range before measuring.

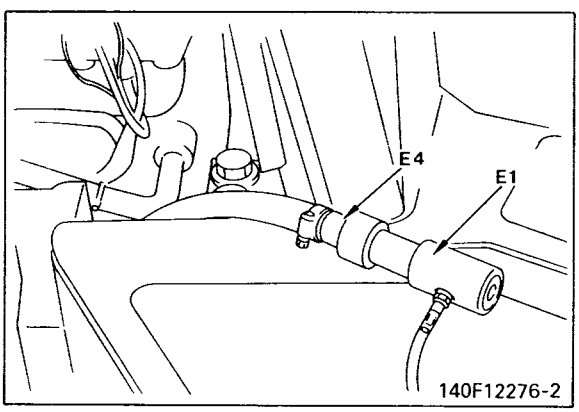
1. Install tools **E4**, **E1** to the tip of engine breather hose (1), then connect it to tools **E3**, **E2**.

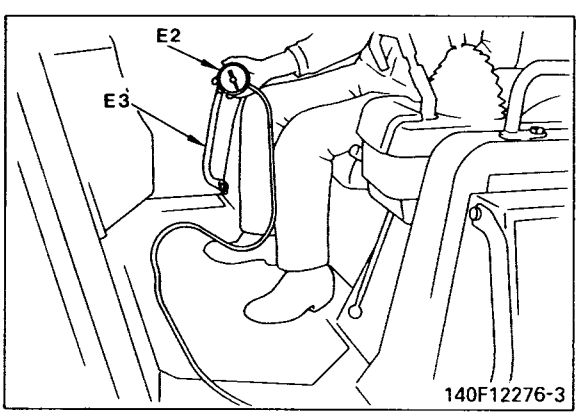
2. Run the engine at rated output, and measure the blow-by pressure.

   ⚠ When measuring, be careful not to touch any hot parts or rotating parts.
   ★ The blow-by should be measured with the engine running at rated output.
   - When measuring in the field, a similar value can be obtained at stall speed.
   - If it is possible to check at rated output or stall speed, measure at high idling.
     In this case, the blow-by value will be about 80% of the value at rated output.

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







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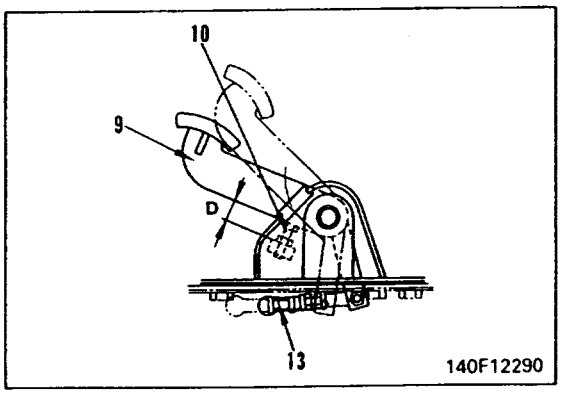
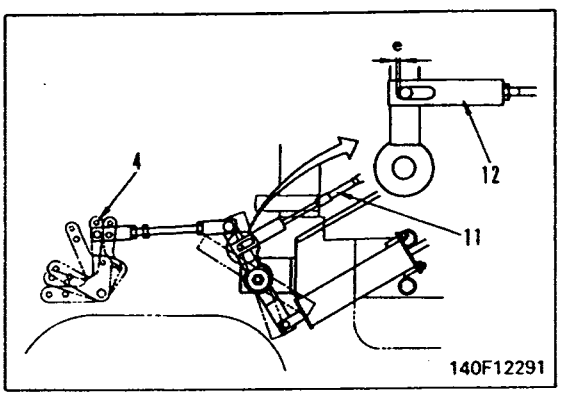
5. Adjust the height of stopper bolt (10) of decelerator pedal (9) to dimension **D**.
   ★ Stopper bolt height dimension **D**: 21 mm

6. Set governor lever (4) of the fuel injection pump to the LOW IDLING position, depress decelerator pedal (9) until it contacts stopper bolt (10), then connect cable (11), yoke (12), and rod (13).
   ★ Standard installed length of rod (13): 88.1 mm

7. In the condition in Step 5, adjust with cable (11) and yoke (12) so that clearance **e** at the oblong hole of yoke (12) is 0.
   ★ When doing this, check that governor lever (4) of the fuel injection pump does not move from the low idling position.

8. Start the engine, move throttle lever (2) to the FULL position, then depress decelerator pedal (9) until it contacts stopper bolt (10), and adjust the height of stopper bolt (10) so that the engine speed is 900 rpm.





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D65EX-12 60942 – 65000
D65PX-12 60915 – 65000

★ Tighten the locknut of the cable and rod securely, then bend the cotter pin securely.

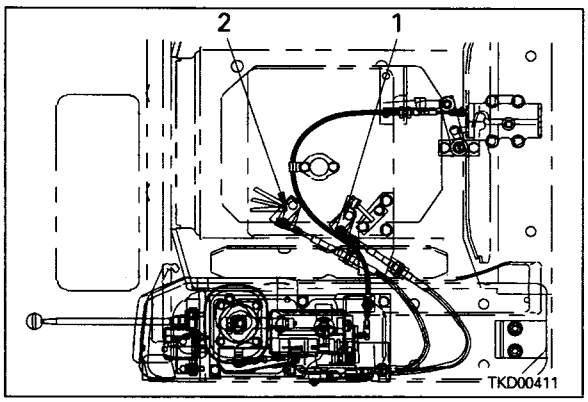
★ Speed range selector lever (1) and directional selector lever (2) are installed to the transmission control valve, and the speed position and directional position are set by the detent inside the valve.

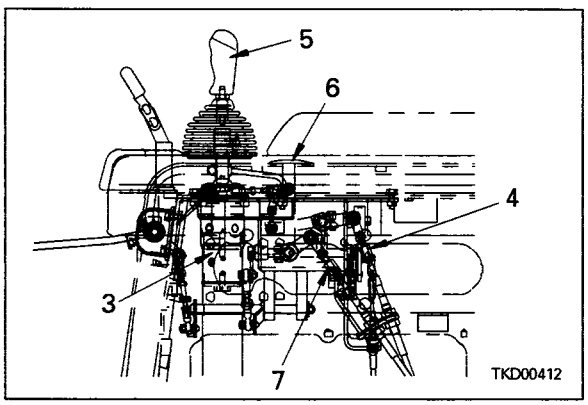
1. Adjusting directional linkage

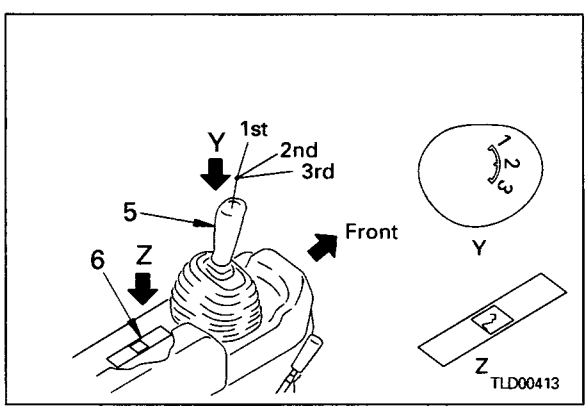
1) Connect the directional lever linkages.
2) Set directional selector lever (2) at the N position, and turn turnbuckle (4) to adjust so that the lever of PPC valve (3) moves to the neutral position.
3) In the above condition, turn turnbuckle (4) one turn in the direction to shorten the distance.
   ★ The directional lever moves towards the front.
4) After adjusting, set directional lever (5) within the range of play of the N position and hold it fully at the R side to carry out a counter-rotation turn. Check that the direction of the turn is the same as when traveling forward.

2. Adjusting speed lever linkage

1) Connect all the speed lever linkages, and adjust turnbuckle (7) so that the "2" display of display plate (6) is in the center of the hole in the "2nd" position.
2) Keep in the same condition as in Step 1) and install the knob so that the "2" display of knob (5) is at the front.







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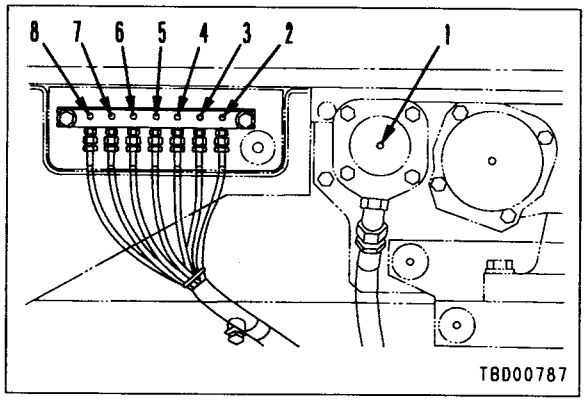
MEASURING POWER TRAIN OIL PRESSURE

D65E, P-12 (With central pressure detection)

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

★ When measuring the hydraulic pressure, remove all the sand and dirt from around the nipple and plug.

★ Raise the power train oil temperature to 70 – 80 °C before measuring.



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

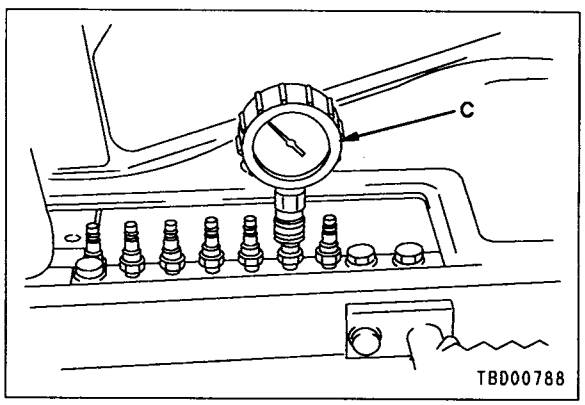


Table of centralized pressure pick-up port positions and gauges to use when measuring hydraulic pressure

No.	Measurement location	Gauge MPa{kg/cm²}
1	Transmission main relief pressure	5.9 {60}
2	Left brake actuating pressure	5.9 {60}
3	Right brake actuating pressure	5.9 {60}
4	Left clutch actuating pressure	5.9 {60}
5	Right clutch actuating pressure	5.9 {60}
6	Transmission modulating pressure	5.9 {60}
7	Torque converter inlet pressure	2.45 {25}
8	Torque converter outlet pressure	0.98 {10}

1. Measuring torque converter oil pressure

Measuring torque converter inlet and outlet port pressure

i) Install oil pressure gauge **C** to torque converter inlet pressure measurement nipple (7) and outlet pressure measurement nipple (8).

ii) Set the gearshift lever at neutral, and measure the torque converter inlet port pressure and outlet port pressure with the engine at low idling and high idling.

2. Measuring transmission oil pressure

1) Measuring main relief pressure

i) Install oil pressure gauge **C** to main relief pressure measurement nipple (1).

ii) Set the F-R lever to the N position, and measure the main refief pressure with the engine at low idling and high idling.

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vii) • With the engine at low idling, place the F-R lever at the R position, and measure the modulating pressure.
• Run the engine at high idling and stall the torque converter, then measure the modulating pressure.

⚠ Precautions when stalling the torque converter

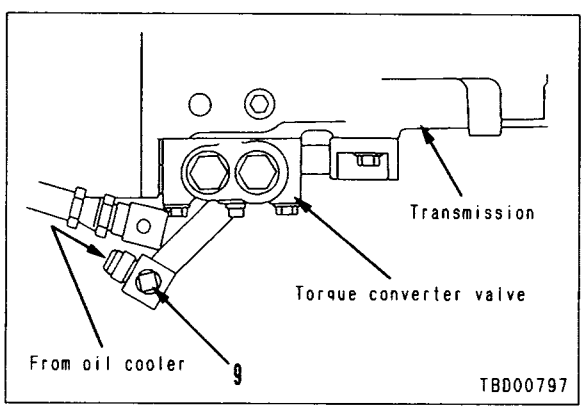
- Depress the decelerator pedal before pulling the fuel control lever to the FULL position.
- Release the decelerator pedal to run the engine at high idling. However, for safety reasons, always keep your right foot on the decelerator pedal until the completion of the measurement operation.

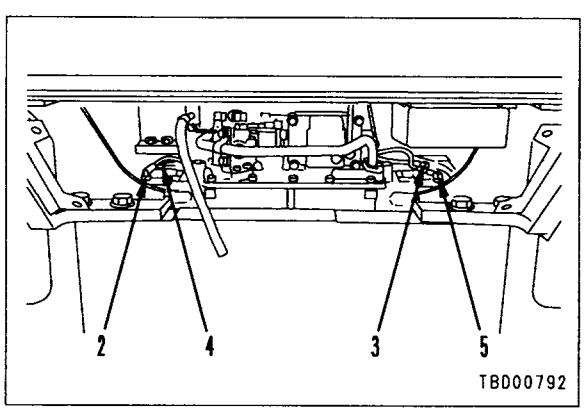
3) Measuring transmission lubricating oil pressure (※1)
   i) Remove lubricating oil pressure measurement plug (6) (PT1/8), and install oil pressure gauge **C** [0.98 MPa {10 kg/cm²}].
   ii) Place the steering and directional lever at neutral, and measure the lubricating oil pressure with the engine at low idling and high idling.

Note: The oil pressure differs greatly between high temperature and low temperature, so warm up the oil throughly before measuring.
For details, see MEASURING ENGINE SPEED AT TORQUE CONVERTER STALL.

3. Measuring brake oil pressure (※3)
   1) Remove the plug (2) for measuring the brake oil pressure, and install the oil pressure gauge **C**.
   2) Place the steering and directional lever at the N position for steering and direction, and measure the oil pressure with the engine at low idling and high idling.

★ Check at the same time that the hydraulic pressure is 0 MPa {0 kg/cm²} when the brake pedal is depressed, or the parking brake is placed at the LOCK position.





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PROCEDURE FOR TESTING SENSORS

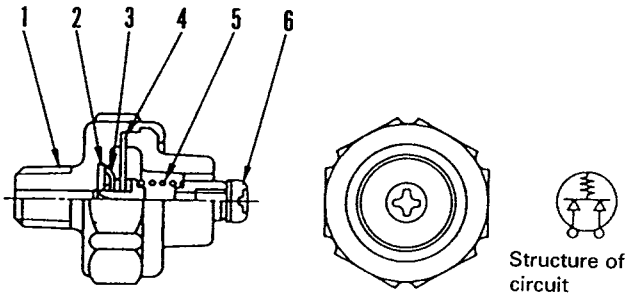
1. Engine oil pressure sensor

1) Stop the engine and turn the starting switch OFF.
2) With the sensor still installed to the engine, disconnect the wiring harness from the sensor.
3) Measure the resistance between the terminal and the chassis with the engine stopped and with the engine running.

★ Judgement

The following results show that the sensor is normal

Engine oil pressure over 0.5 kg/cm^2	No continuity
Engine oil pressure under 0.5 kg/cm^2	Continuity



1. Plug
2. Contact ring
3. Contact
4. Diaphragm
5. Spring
6. Terminal

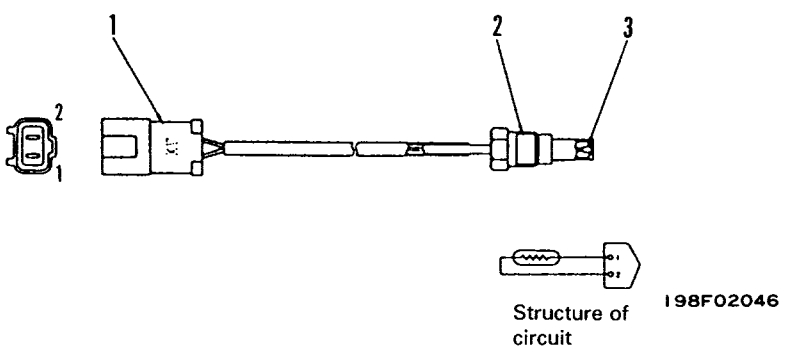
2. Coolant temperature, Power train oil temperature sensor

1) Stop the engine, turn the starting switch OFF, and remove the sensor from the engine or torque converter.
2) Measure the resistance between terminals 1 and 2 with the sensor at about the same temperature as the ambient temperature.

★ Judgement

The following results show that the sensor is normal

Ambient temperature	When normal
100°C	Approx. 3.8 KΩ
I	I
90°C	Approx. 5 KΩ
I	I
35°C	Approx. 29 KΩ
I	I
20°C	Approx. 52 KΩ
I	I
10°C	Approx. 80 KΩ



1. Connector
2. Plug
3. Thermistor

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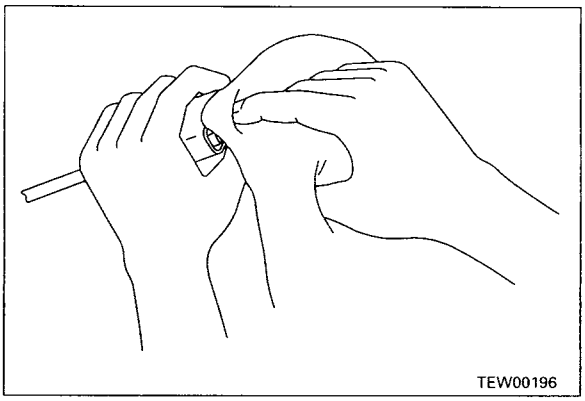
- **Drying wiring harness**
  If there is any oil or dirt on the wiring harness, wipe it off with a dry cloth. Avoid washing it in water or using steam. If the connector must be washed in water, do not use high-pressure water or steam directly on the wiring harness.

  If water gets directly on the connector, do as follows.

  ① Disconnect the connector and wipe off the water with a dry cloth.
  ★ If the connector is blown dry with compressed air, there is the risk that oil in the air may cause defective contact, so remove all oil and water from the compressed air before blowing with air.



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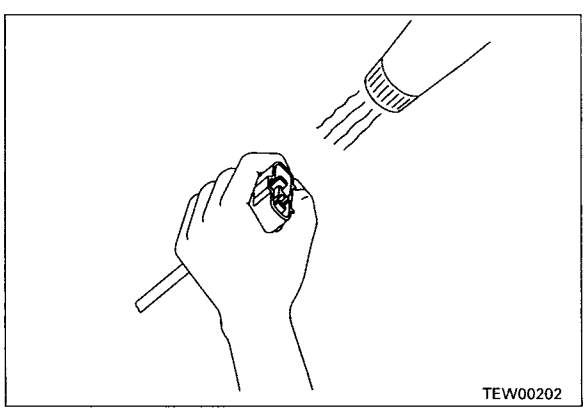
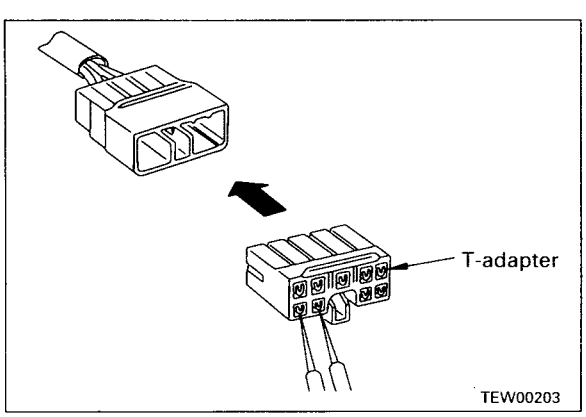
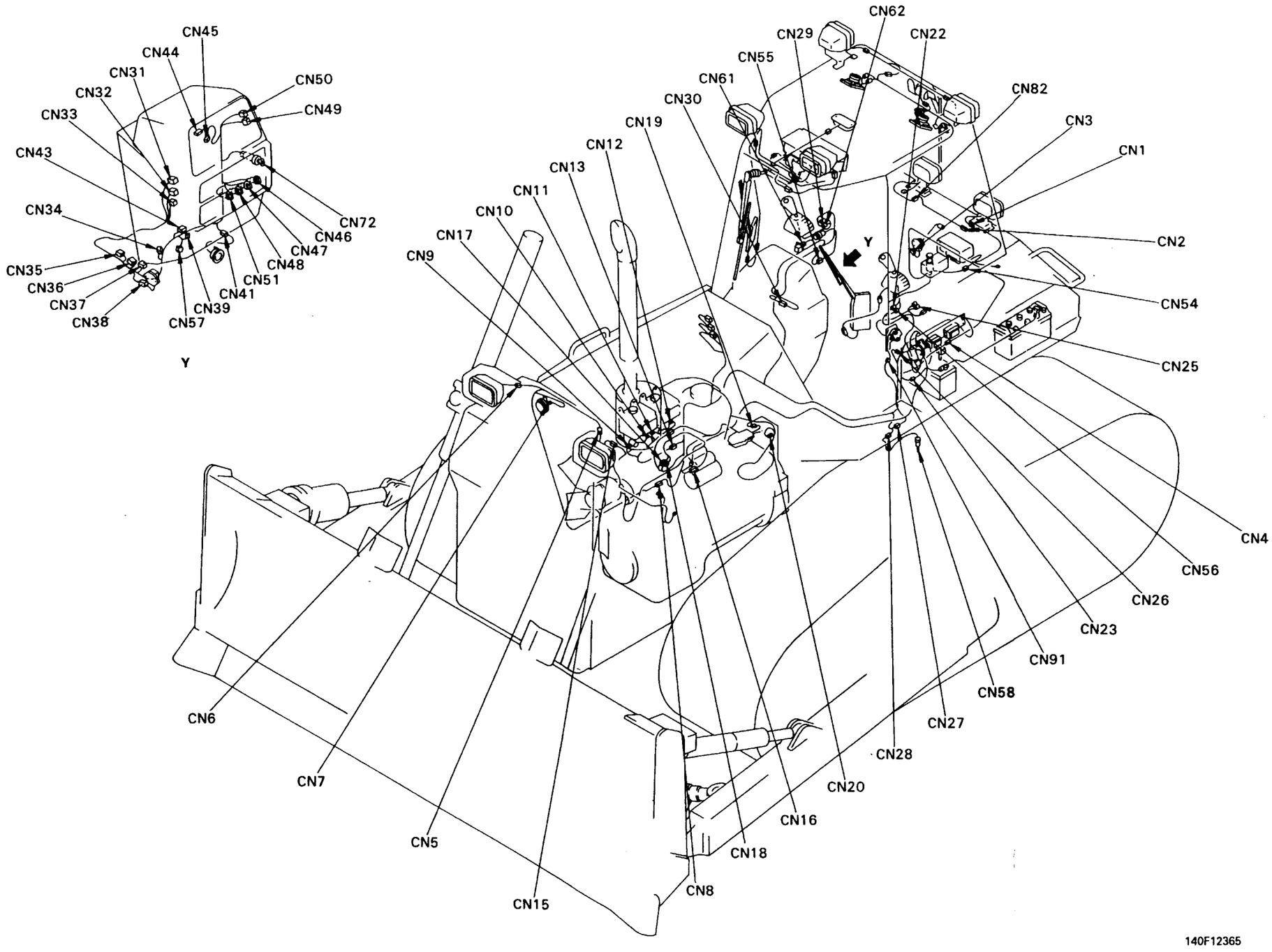
② Dry the inside of the connector with a dryer. If water gets inside the connector, use a dryer to dry the connector.
★ Hot air from the dryer can be used, but regulate the time that the hot air is used in order not to make the connector or related parts too hot, as this will cause deformation or damage to the connector.

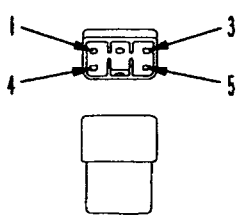
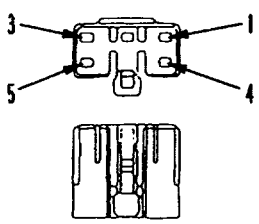
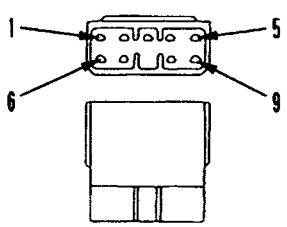
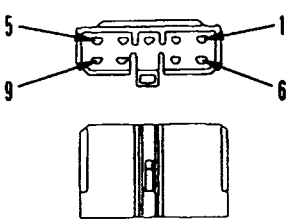
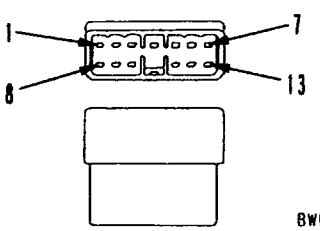
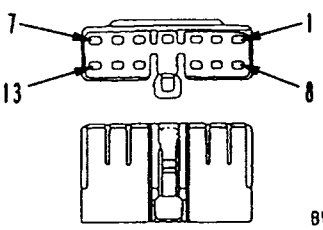


③ Carry out a continuity test on the connector. After drying, leave the wiring harness disconnected and carry out a continuity test to check for any short circuits between pins caused by water.
★ After completely drying the connector, blow it with contact restorer and reassemble.



CONNECTOR POSITION DRAWING



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

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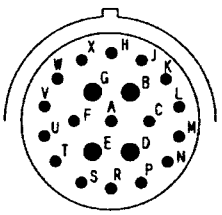
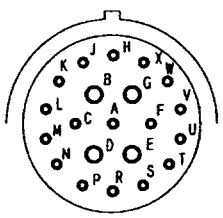
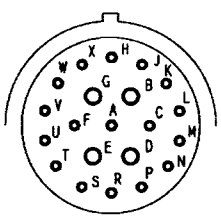
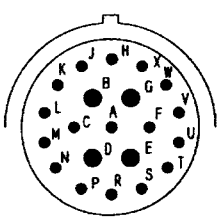
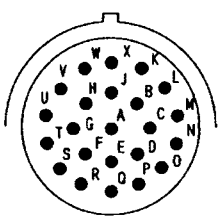
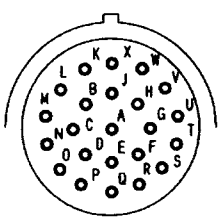
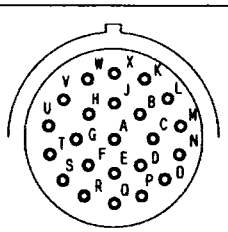
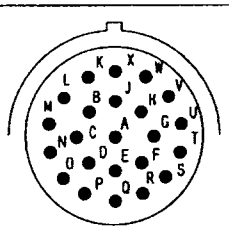
[The pin No. is also marked on the connector (electric wire insertion end)]

Type (shell size code)	HD30 Series connector		
	Body (Plug)	Body (receptacle)	T-adapter Part No.
24-21 (7)	Pin (male terminal)	Pin (female terminal)	799-601-9270
	 BWP05025	 BWP05026	
	Part No.: 08191-71201, 08191-71202, 08191-17205, 08191-71206	Part No.: 08191-74101, 08191-74102, 08191-74105, 08191-74106	
	Pin (female terminal)	Pin (male terminal)	799-601-9270
	 BWP05027	 BWP05028	
	Part No.: 08191-72201, 08191-72202, 08191-72205, 08191-72206	Part No.: 08191-73101, 08191-73102, 08191-73105, 08191-73106	
24-22 (8)	Pin (male terminal)	Pin (female terminal)	799-601-9280
	 BWP05029	 BWP05030	
	Part No.: 08191-81201, 08191-81202, 08191-81203, 08191-81204, 08191-81205, 08191-81206	Part No.: 08191-84101, 08191-84102, 08191-84103, 08191-84104, 08191-84105, 08191-84106	
	Pin (female terminal)	Pin (male terminal)	799-601-9280
	 BWP05031	 BWP05032	
	Part No.: 08191-82201, 08191-82202, 08191-82203, 08191-82204, 08191-82205, 08191-82206	Part No.: 08191-83101, 08191-83102, 08191-83103, 08191-83104, 08191-83105, 08191-83106	

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② Engine turns but no exhaust gas comes out (Fuel is not being injected)

General causes why engine turns but no exhaust gas comes out

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

Standards for use of fuel

KIND OF FLUID	AMBIENT TEMPERATURE
	−22 −4 14 32 50 68 86 104°F −30 −20 −10 0 10 20 30 40°C
Diesel fuel	ASTM D975 No. 2

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

		Causes: Broken injection pump drive shaft, key	Defective injection pump (rack, plunger seized)	Seized, broken feed pump piston	Clogged fuel filter, strainer	Clogged feed pump strainer	Lack of fuel	Clogged, leaking fuel piping	Clogged fuel tank air breather hole	Defective fuel cut solenoid	Defective engine stop motor	Improper fuel used
Questions	Confirm recent repair history											
	Degree of use — Operated for long period				△	△			△			
	Exhaust gas suddenly stops coming out (when starting again)	◎	◎	◎								
	Replacement of filters has not been carried out according to operation manual				◎	◎						
	Fuel tank is found to be empty						◎					
	There is leakage from fuel piping							◎				
	Mud is stuck to fuel tank cap								◎			
Check items	When starting switch is turned ON, linkage does not move									◎	◎	
	When fuel filter is drained, fuel does not come out											◎
	When engine is cranked with starting motor, 1) Injection pump coupling does not rotate	◎										
	2) No fuel comes out even when fuel filter air bleed plug is loosened	◎			○	○						○
	3) No fuel spurts out even when injection pipe sleeve nut is loosened	◎	◎	◎								
	Rust and water are found when fuel is drained				○	○						
Troubleshooting	Check injection pump directly	●										
	When control rack is pushed, it is found to be heavy, or does not return		●									
	Check feed pump directly			●								
	When fuel filter, strainer are inspected directly, they are found to be clogged				●							●
	When feed pump strainer is inspected directly, it is found to be clogged					●						
	When fuel cap is inspected directly, it is found to be clogged								●			
	Does not move even when fuel cut solenoid linkage is disconnected									●		
	Does not move even when engine stop motor linkage is disconnected										●	
	Remedy	Replace	Replace	Replace	Clean	Clean	Add	Repair	Repair	Replace	Replace	Replace

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S-13 Oil level rises

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

General causes why oil level rises

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

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

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

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H-5 Can turn in only one direction (when steering lever is operated)

D65E-12 60001 – 65000
D65P-12 60001 – 65000

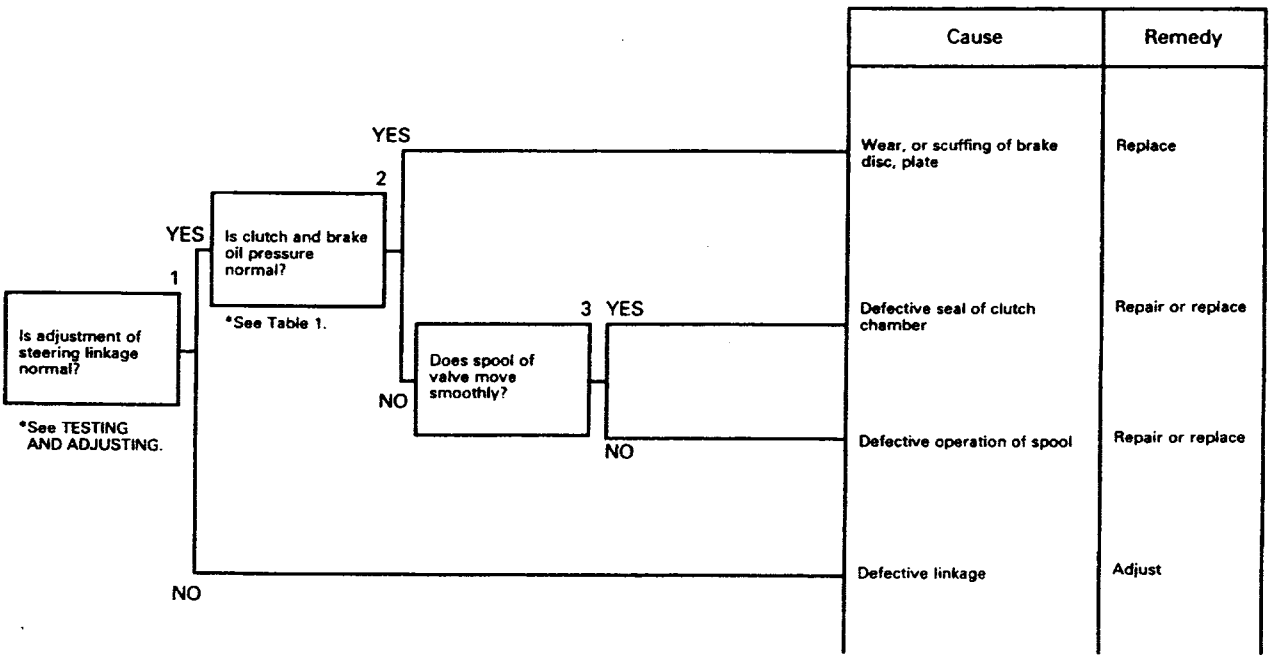

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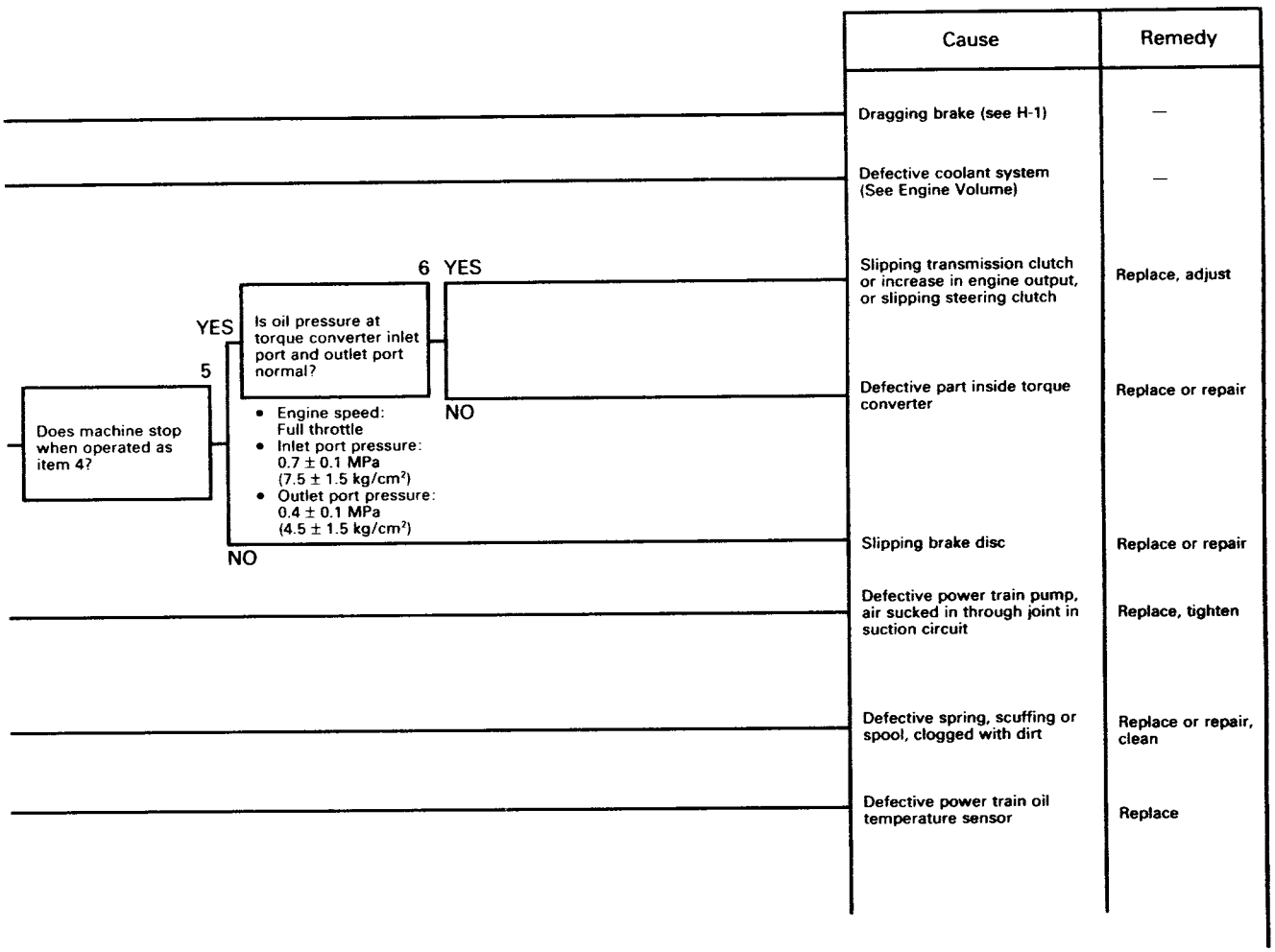
Table 1

Unit: MPa (kg/cm²)

Conditions				D65E, P	
				Hydraulic pressure	
				Clutch	Brake
Steering and directional lever not operated		Engine speed:	Full	0 (left, right)	Min. 2.2 (22) (left, right)
			Low idling	0 (left, right)	Min. 2.2 (22) (left, right)
Steering and directional lever operated	Operated to left	Engine speed:	Full	Right: 0 Left: Min. 2.2 (22)	Right: Min. 2.2 (22) Left: 0
			Low idling	Right: 0 Left: Min. 2.2 (22)	Right: Min. 2.2 (22) Left: 0
	Operated to right	Engine speed:	Full	Right: Min. 2.2 (22) Left: 0	Right: 0 Left: Min. 2.2 (22)
			Low idling	Right: Min. 2.2 (22) Left: 0	Right: 0 Left: Min. 2.2 (22)


Does machine stop when operated as item 4?
5
YES
NO
Is oil pressure at torque converter inlet port and outlet port normal?
• Engine speed: Full throttle
• Inlet port pressure: 0.7 ± 0.1 MPa (7.5 ± 1.5 kg/cm²)
• Outlet port pressure: 0.4 ± 0.1 MPa (4.5 ± 1.5 kg/cm²)
6
YES
NO
Cause
Remedy
Dragging brake (see H-1)
—
Defective coolant system (See Engine Volume)
—
Slipping transmission clutch or increase in engine output, or slipping steering clutch
Replace, adjust
Defective part inside torque converter
Replace or repair
Slipping brake disc
Replace or repair
Defective power train pump, air sucked in through joint in suction circuit
Replace, tighten
Defective spring, scuffing or spool, clogged with dirt
Replace or repair, clean
Defective power train oil temperature sensor
Replace

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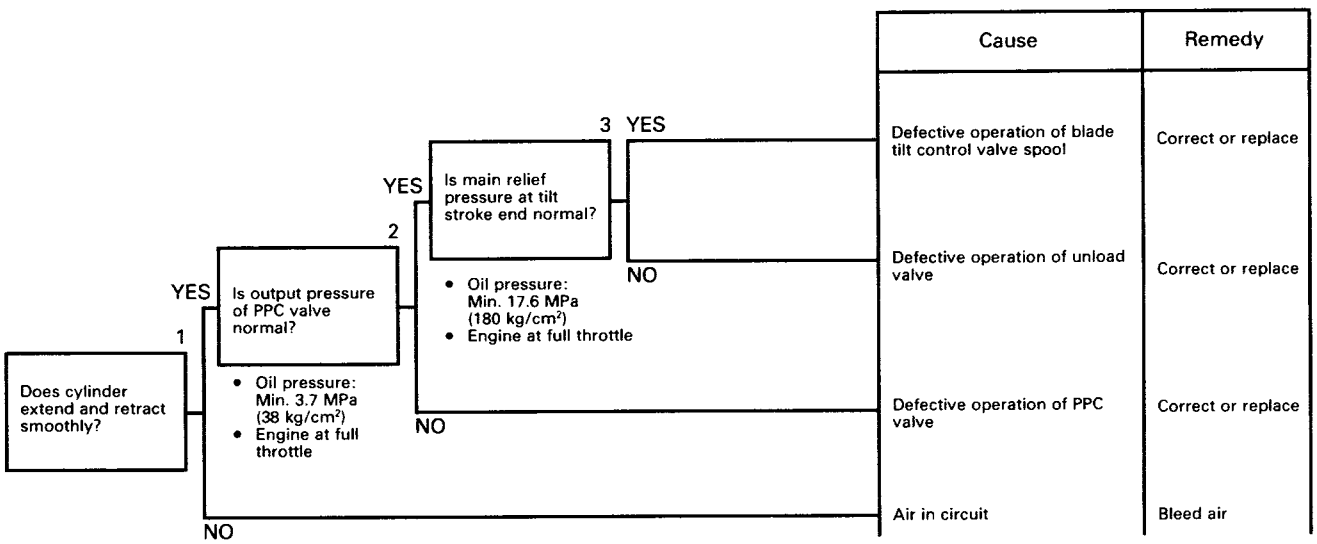
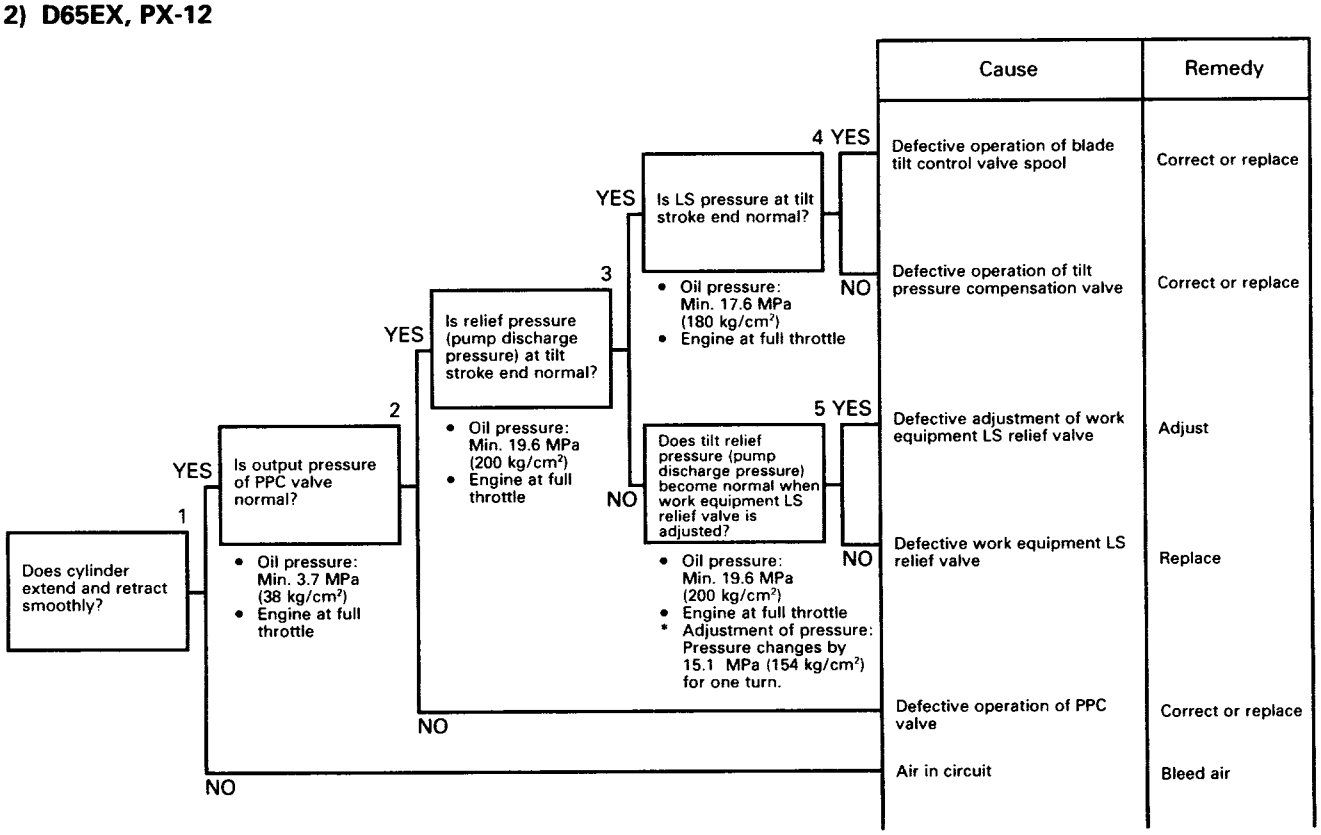
H-21 Blade tilt speed is slow or lacks power

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

1) D65E, P-12



2) D65EX, PX-12



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D65E-12 65001 and up
D65P-12 65001 and up
D65EX-12 65001 and up
D65PX-12 65001 and up

★ If the battery is normal
★ Before carrying out troubleshooting, check that fuse FB1 No. 6 is normal.
★ 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) Front lamps

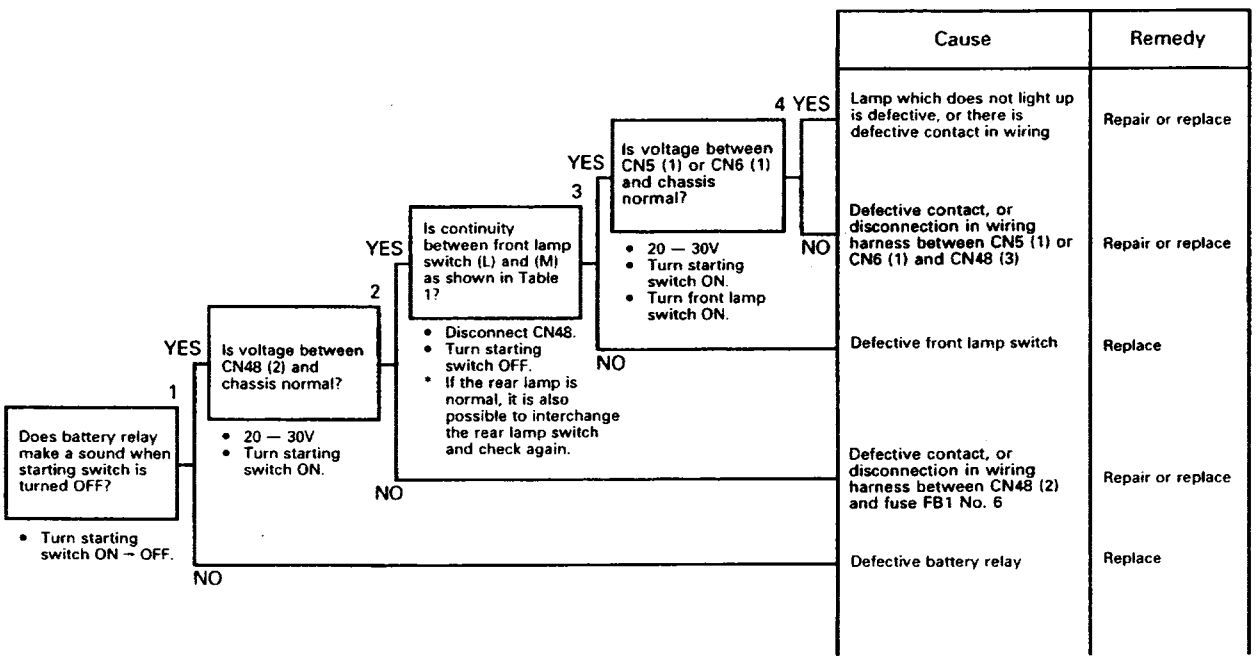

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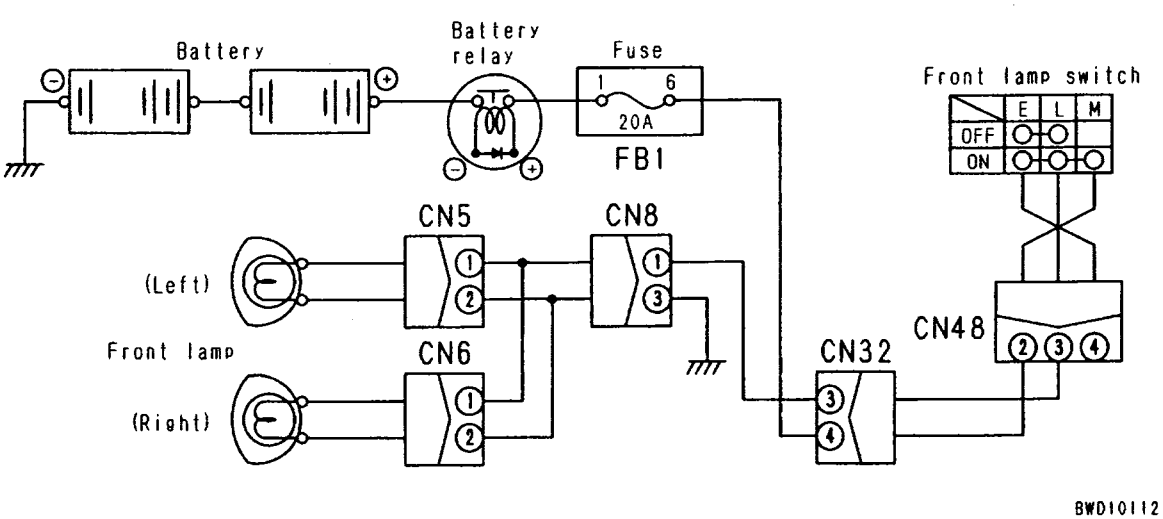
Table 1

	E	L	M
OFF	○	○	
ON	○	○	○

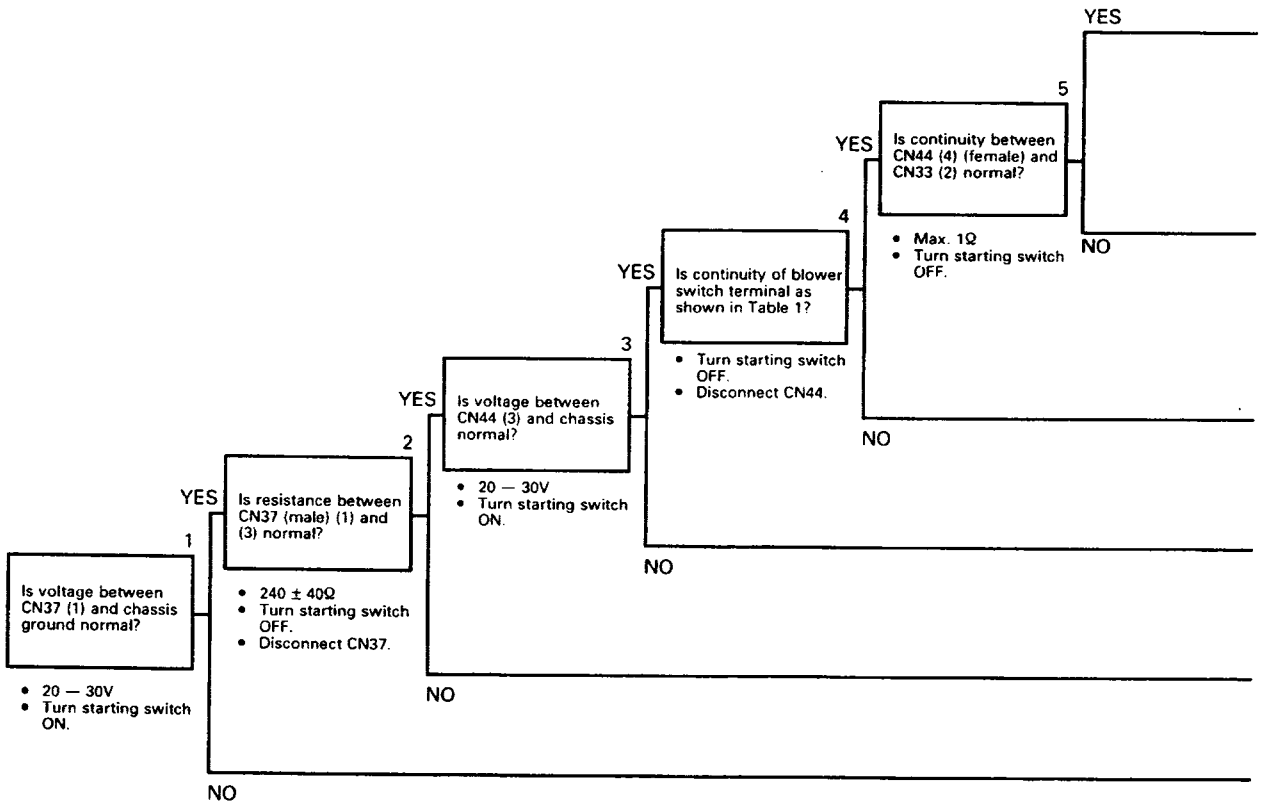
E-2 a) Related electrical circuit diagram



E-7 Air conditioner has no effect

★ If the battery and battery relay are normal.
★ Before carrying out troubleshooting, check that fuse FB2 No. 3 is normal.
★ 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) No air comes out



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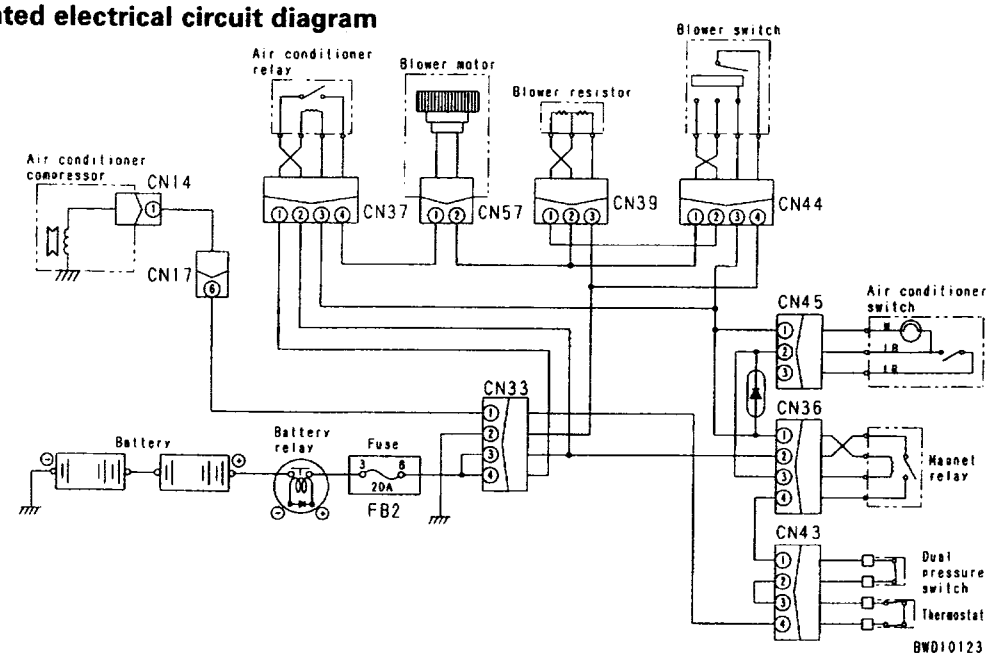
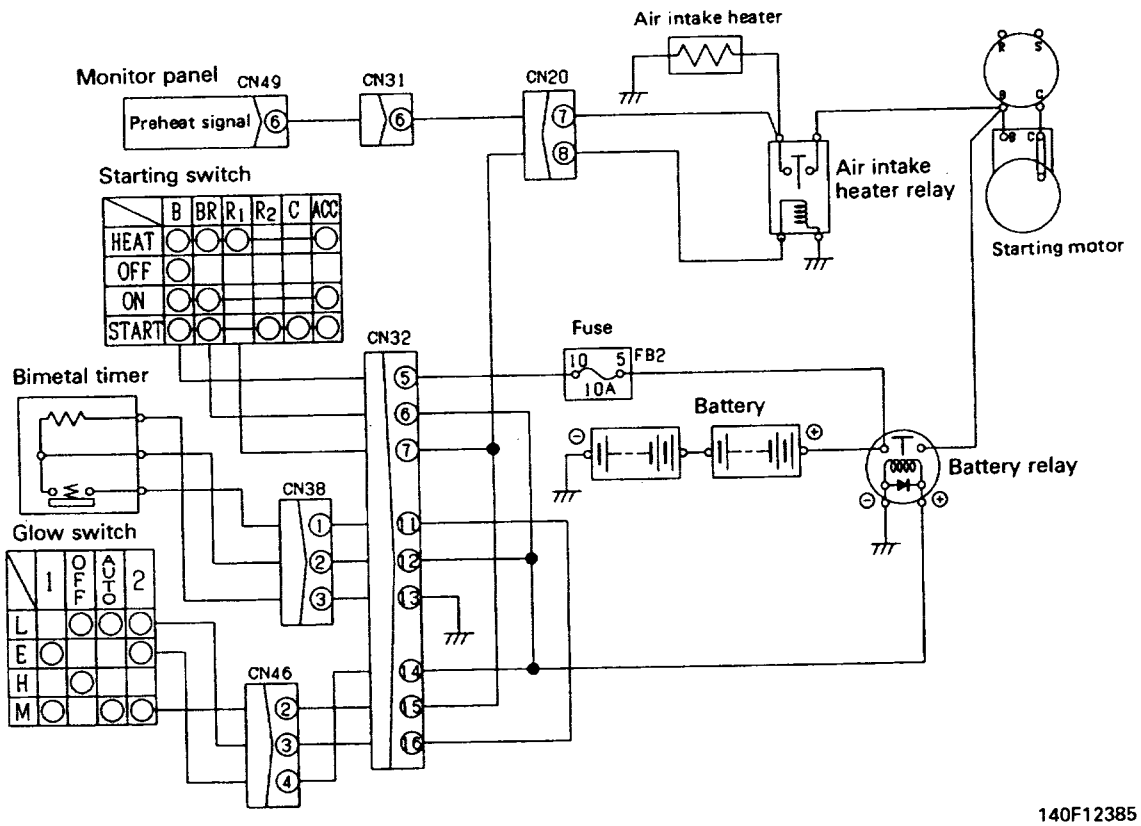
E-7 Related electrical circuit diagram



M-3 a), b) Related electrical circuit diagram



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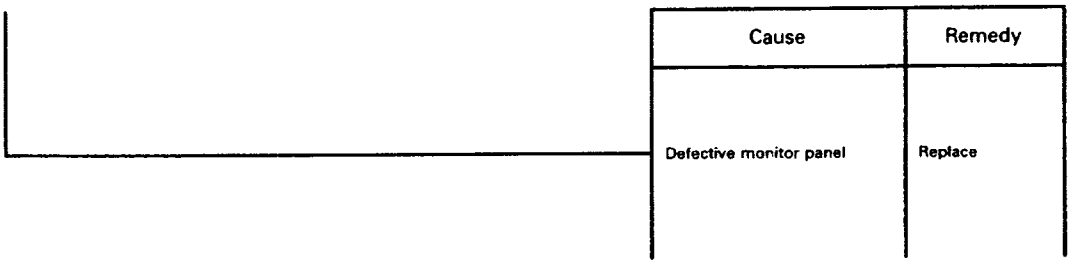
M-6 Warning lamp is abnormal

★ 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 flashing 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

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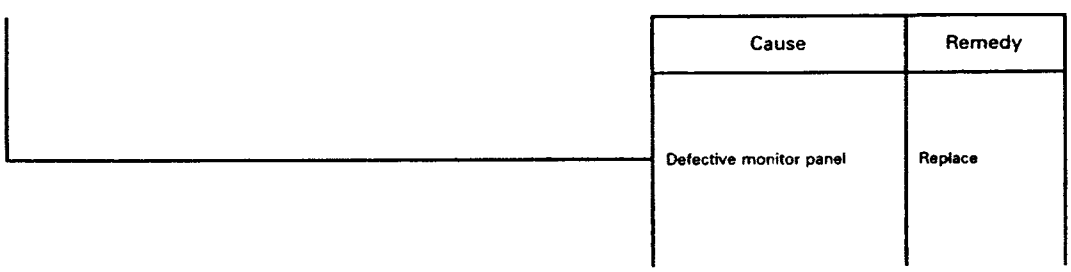
b) Monitor display is normal but lamp flashes



Cause	Remedy
Defective monitor panel	Replace

PPC PUMP ASSEMBLY
Removal 30-213
Installation 30-213
MAIN CONTROL VALVE ASSEMBLY
Removal 30-214
Installation 30-214
Disaseembly (3-spool valve) 30-216
Assembly 30-218
MAIN RELIEF VALVE
Removal 30-220
Installation 30-220
PPC VALVE ASSEMBLY
Removal (for work equipment) 30-221
Installation (for work equipment) 30-221
Removal (D65EX, PX, for steering) 30-222
Installation (D65EX, PX, for steering) . 30-223
Disassembly (for work equipment) 30-224
Assembly (for work equipment) 30-225
Disassembly (D65EX, PX, for steering) . 30-226
Assembly (D65EX, PX, for steering) 30-227
PPC CHARGE RELIEF VALVE ASSEMBLY
Removal 30-228
Installation 30-228
Disassembly 30-229
Assembly 30-229
SUCTION VALVE
Removal 30-229-1
Installation 30-229-1
BLADE LIFT CYLINDER ASSEMBLY
Removal 30-230
Installation 30-230
BLADE TILT CYLINDER ASSEMBLY
Removal 30-231
Installation 30-231
HYDRAULIC CYLINDER ASSEMBLY
(BLADE LIFT, BLADE TILT CYLINDER)
Removal 30-232
Installation 30-234
WORK EQUIPMENT ASSEMBLY
Removal 30-237
Installation 30-238
Disassembly 30-239
Assembly 30-241
RIPPER VALVE ASSEMBLY (OPT.)
Disassembly 30-243
Assembly 30-244
ROPS GUARD
Removal 30-245
Installation 30-245
OPERATOR'S CAB ASSEMBLY
Removal 30-246
Installation 30-247
CANOPY ASSEMBLY
Removal 30-247-1
Installation 30-247-1
DASHBOARD ASSEMBLY
Removal 30-248
Installation 30-248
MONITOR ASSEMBLY
Removal 30-249
Installation 30-249
FLOOR FRAME ASSEMBLY (D65E, P)
Removal 30-250
Installation 30-253
FLOOR FRAME ASSEMBLY (D65EX, PX)
Removal 30-254
Installation 30-257

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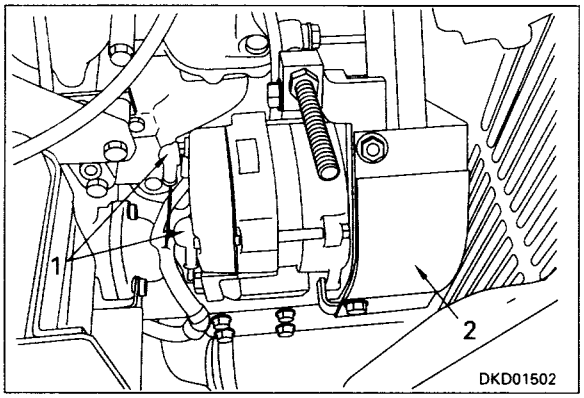
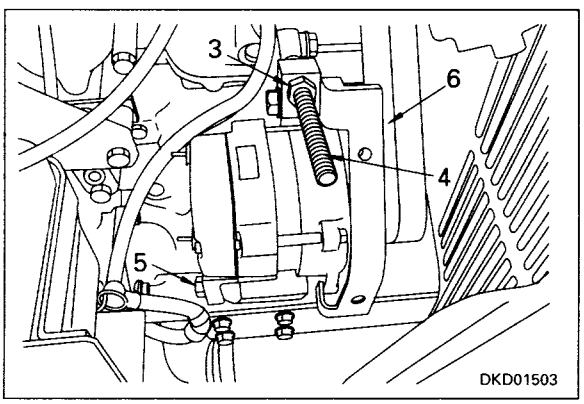
REMOVAL OF ALTERNATOR ASSEMBLY

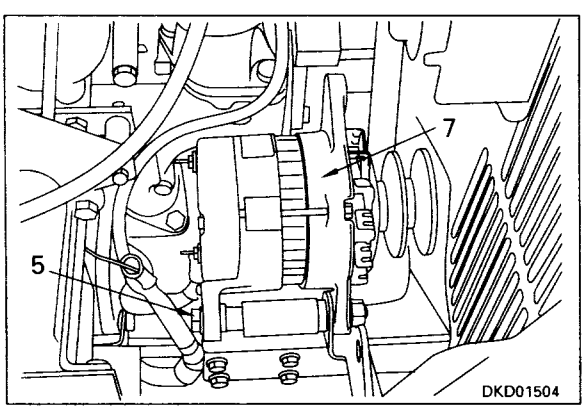
D65E-12 60948 and up
D65P-12 60891 and up
D65EX-12 60942 and up
D65PX-12 60915 and up

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

1. Open top right side cover and remove bottom side cover.
   - On machines with cab specification, the washer tank is installed inside the bottom right side cover, so disconnect the hose and connector, then remove the bottom side cover.
2. Disconnect wiring (1).
3. Remove cover (2).
4. Remove locknut (3), then remove rod (4).
5. Loosen mounting bolt and nut (5), and remove 2 fan belts (6). ※ 1
6. Remove mounting bolt and nut, then remove alternator assembly (7).







INSTALLATION OF ALTERNATOR ASSEMBLY

D65E-12 60948 and up
D65P-12 60891 and up
D65EX-12 60942 and up
D65PX-12 60915 and up

- Carry out installation in the reverse order to removal.

※ 1
Adjusting tension of alternator belt
★ Adjust the tension of the alternator belt. For details, see TESTING AND ADJUSTING.

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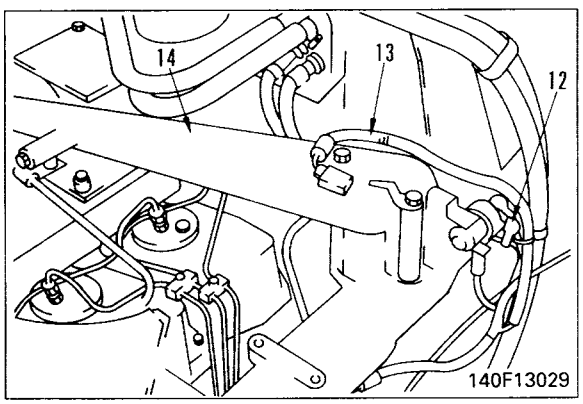
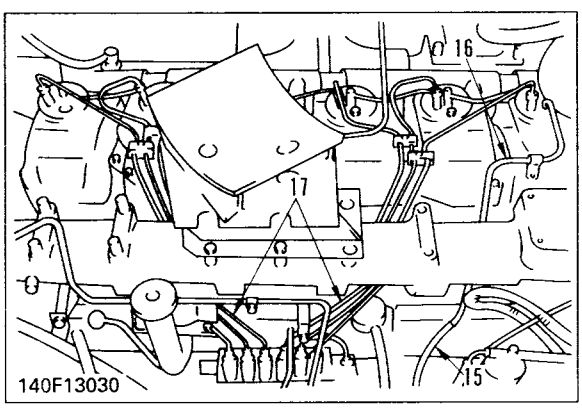
8. Disconnect electrical intake air heater wiring (12).

9. Remove wiring (13), then remove connector (14).



10. Disconnect hose (15), then remove fuel return tube (16).

11. Remove 6 fuel injection pipes (17). ※2



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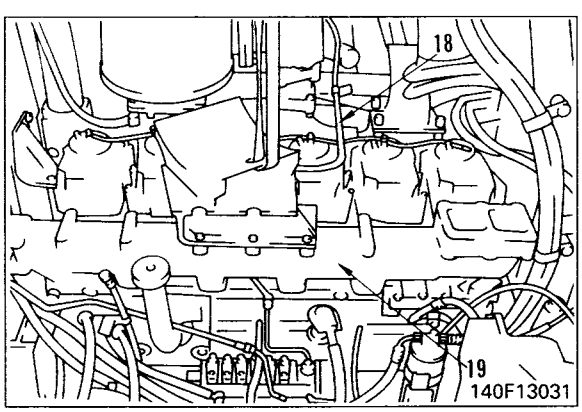
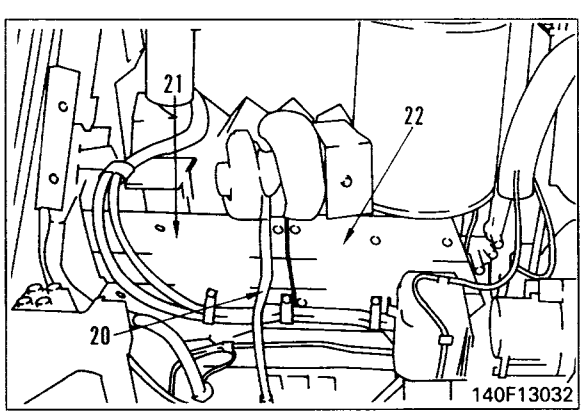
12. Disconnect turbocharger inlet tube (18).

13. Sling intake manifold (19), and remove mounting bolts, then remove together with tube (18).
★ Mark the mounting position of each spacer and tube clamp before removing.



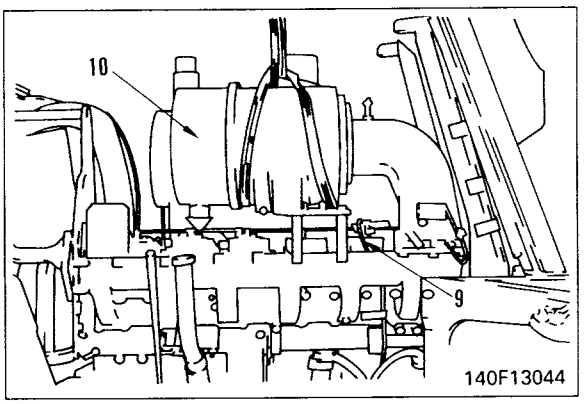
14. Remove turbocharger outlet tube (20).

15. Remove safety covers (21) and (22).



9. Disconnect tube (9).

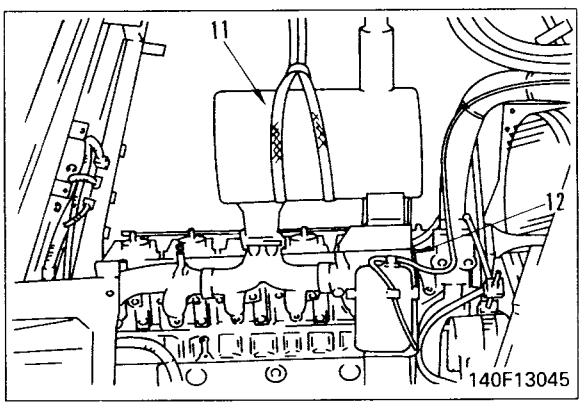
10. Sling air cleaner and intake manifold (10), and remove mounting bolts, then remove together with tube (9).
    ★ Mark the mounting position of each spacer and tube clamp before removing.



11. Remove safety covers.

12. Sling muffler and exhaust manifold assembly (11), and remove mounting bolts, then remove assembly. ※3

13. Remove muffler drain pipe (12).



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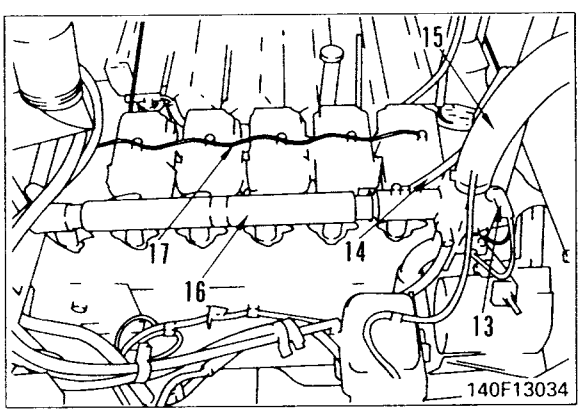
14. Disconnect wiring connector (13) of water temperature sensor from clip.

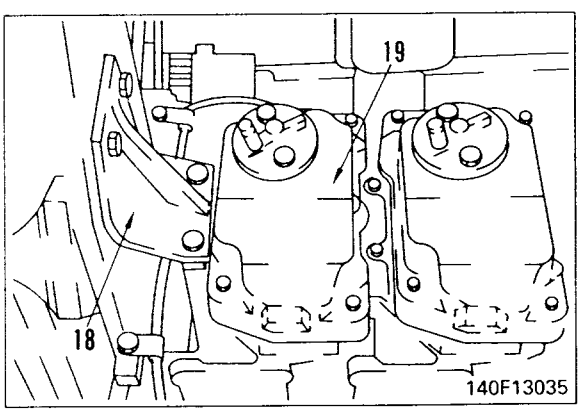
15. Disconnect aeration hose (14) and radiator inlet hose (15).

16. Remove water manifold assembly (16).

17. Remove spill pipe (17). ※4



18. Remove bracket (18), then remove cylinder head cover (19). ※5
    • Remove bracket (18) only for No. 1 cylinder head.



INSTALLATION OF ENGINE REAR SEAL

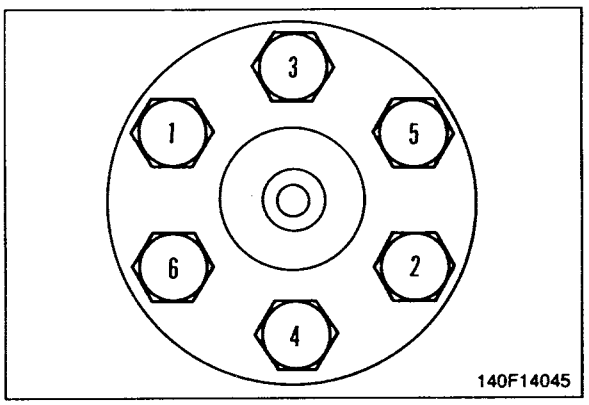
- Carry out installation in the reverse order to removal.

※1

★ When tightening the flywheel mounting bolts, follow the order on the diagram and use the procedure below.

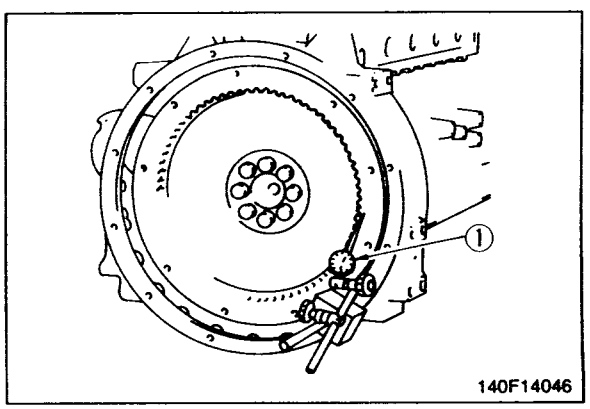
Flywheel mounting bolt thread:
Lubricating oil (EO30)

kgm Flywheel mounting bolt:
1st step: **147 ± 19.6 Nm (15 ± 2.0 kgm)**
2nd step: **289.1 ± 19.6 Nm (29.5 ± 2.0 kgm)**



- Using dial gauge ①, measure radial and face runout of flywheel.

Face runout: 0.2 mm
Radial runout: 0.15 mm



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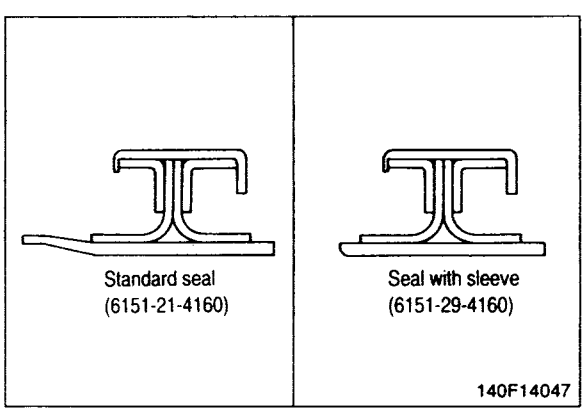
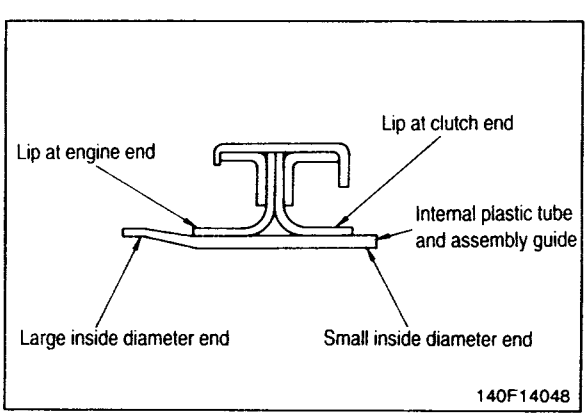
※2

★ With the Teflon seal (lay down lip seal), check the condition of the wear of the shaft, select either a standard seal or a seal with a sleeve, then assemble the seal.

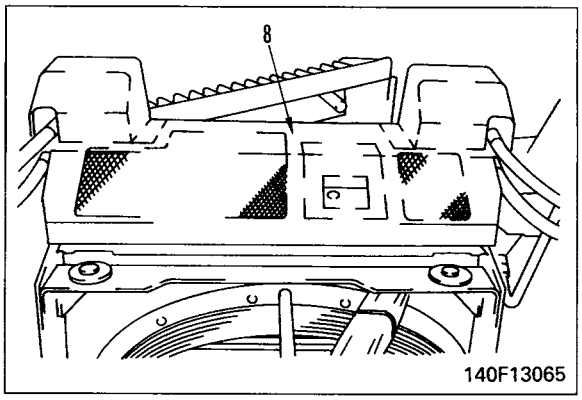
The condition of wear is judged by the smoothness (no deformation can be felt when touched with the flat of a finger, depth of wear less than 10 μm). If there are no scratches, assemble a standard seal; in all other cases, assemble a seal with a sleeve.



- **Procedure for assembling standard seal**
  - ★ Before assembling the seal, check that there are no scratches, burrs, flashes, or rust on the housing, lip sliding surface, or at the corner of the end face of the crankshaft.
  - ★ When assembling the seal, do not coat the shaft and seal lip with oil or grease, and wipe off all the oil from the shaft.
  - ★ Do not remove the internal plastic tube from the standard seal until assembling the seal.

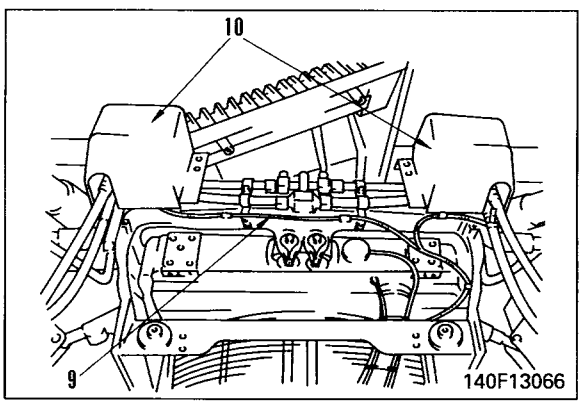


9. Remove radiator top cover (8).



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

11. Remove front lamp assembly (10).



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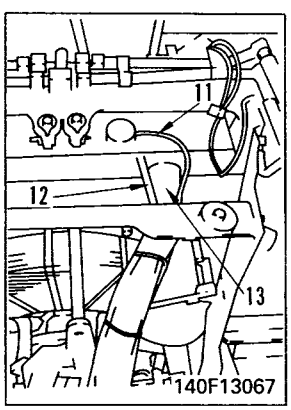
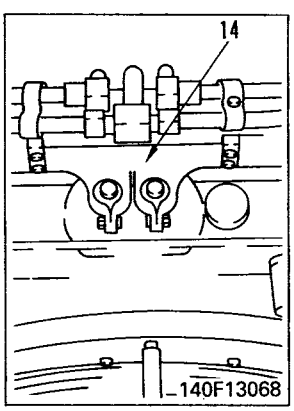
12. Disconnect hose (11) between radiator and reserve tank.

13. Disconnect aeration hose (12). ※3

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

15. Remove bracket (14).

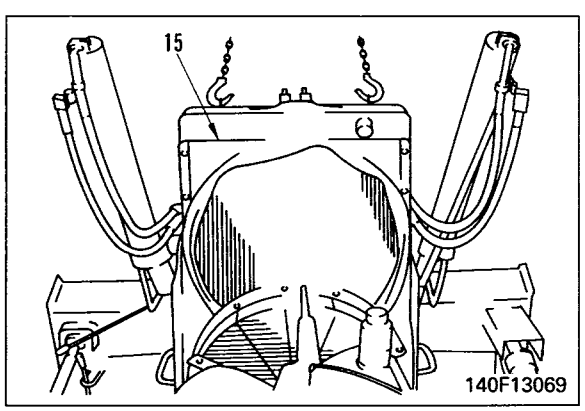




16. Remove 2 radiator bottom mount bolts, and raise radiator assembly (15) slowly, then remove.

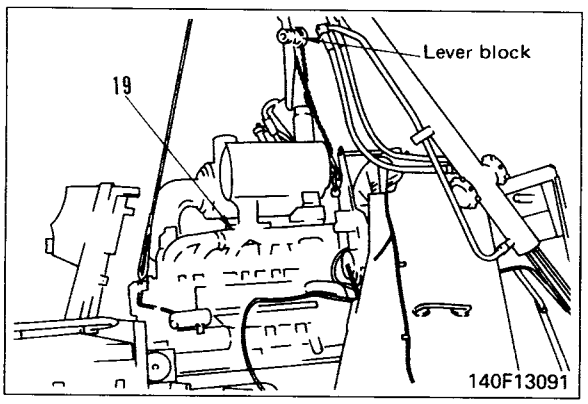
★ When removing the radiator, be extremely careful not to damage the seal or radiator core.

kg Radiator assembly: **45 kg**



13. Move engine assembly (19) towards front of machine, and gradually lift it off.
    ★ When removing the engine assembly, be extremely careful not to damage the wiring or hoses.

    kg Engine assembly: **1300 kg**



INSTALLATION OF ENGINE ASSEMBLY (Canopy specification)

D65E-12 60001 – 60947
D65P-12 60001 – 60890
D65EX-12 60001 – 60941
D65PX-12 60001 – 60914

- Carry out installation in the reverse order to removal.

※ 1
★ Adjust the rod and cable. For details, see TESTING AND ADJUSTING, Adjusting fuel control linkage.

※ 2
Universal joint mounting bolt thread:
Thread tightener (LT-2)
kgm Universal joint mounting bolt:
110.5 ± 12.3 Nm (11.25 ± 1.25 kgm)

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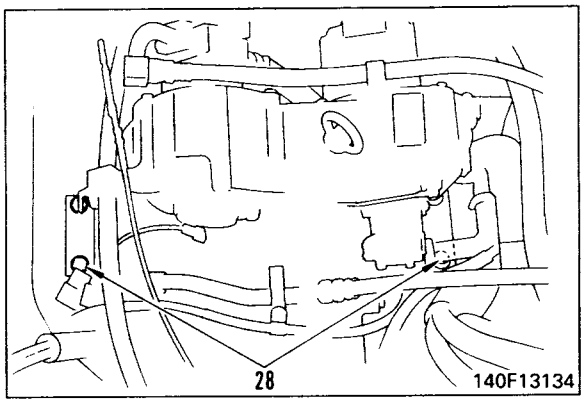
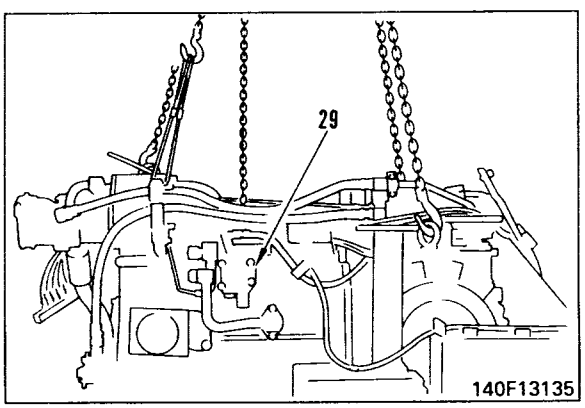
22. Remove front mount bolts (28).



23. Lift off power train unit assembly (29).

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

kg Power train unit assembly: **1600 kg**



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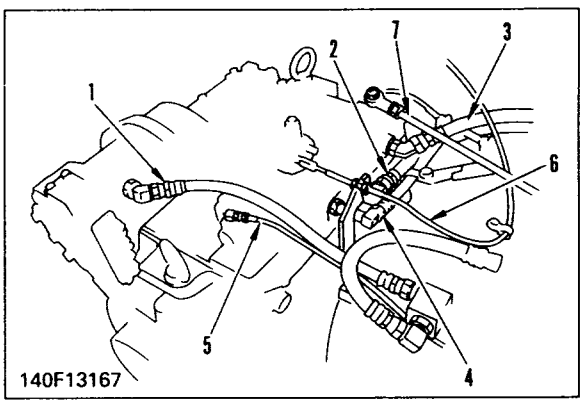
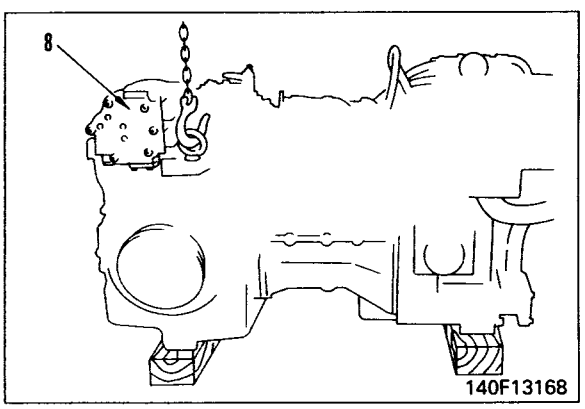
SEPARATION OF POWER TRAIN UNIT

D65EX, PX

1. Remove drain plugs of HSS case and transmission case, and drain oil from case.
   Power train case: **Approx. 50 ℓ**



2. Remove hoses (1), (2), (3), (4), and (5).
3. Remove brake cables (6). ※1
4. Remove brake rod (7). ※2
5. Sling HSS assembly (8), then remove mounting bolts, and disconnect from transmission case. ※3
   kg HSS assembly: **75 kg**



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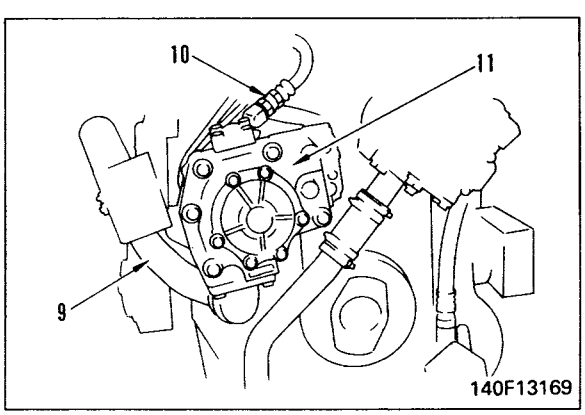
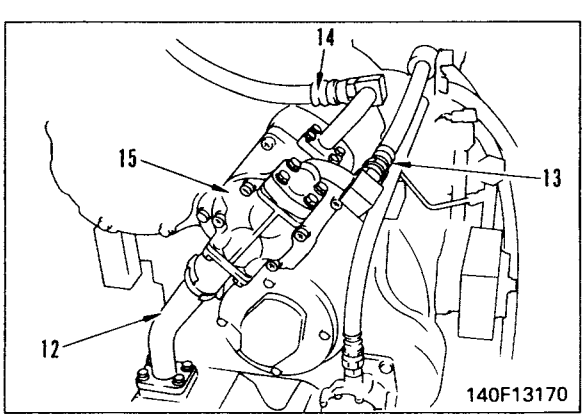
6. Remove suction tube (9) and drain hose (10), then remove piston pump assembly (11).
   kg Piston pump assembly: **65 kg**



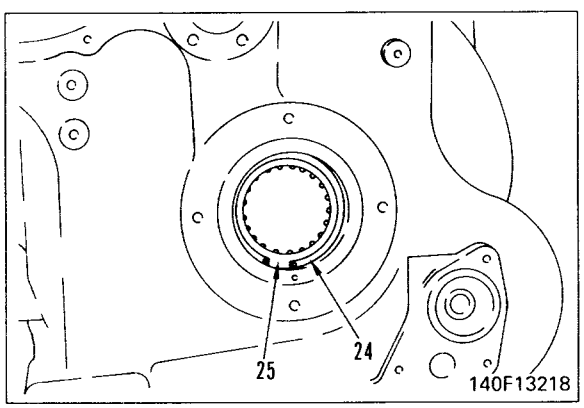
7. Remove suction tube (12) and outlet hoses (13) and (14), then remove tandem pump assembly (15).



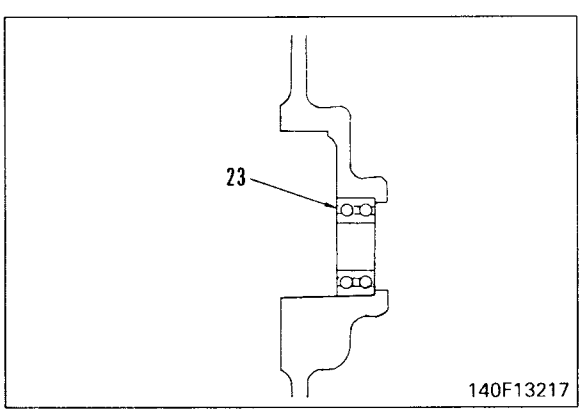
ASSEMBLY OF PTO ASSEMBLY

★ Clean all parts, and check for dirt or damage before installing.
★ Put a drop of engine oil on the rotating portion of the bearing, then rotate it several times.
★ Check that the snap ring is fitted securely in the groove.

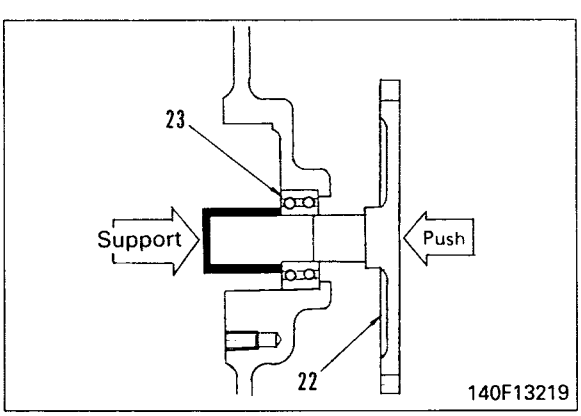
1. Input shaft bearing
Press fit bearing (25), and install snap ring (24).



2. Scavenging pump drive gear
1) Install bearing (23).



2) Support inner race end of bearing (23), and install gear (22) to bearing.



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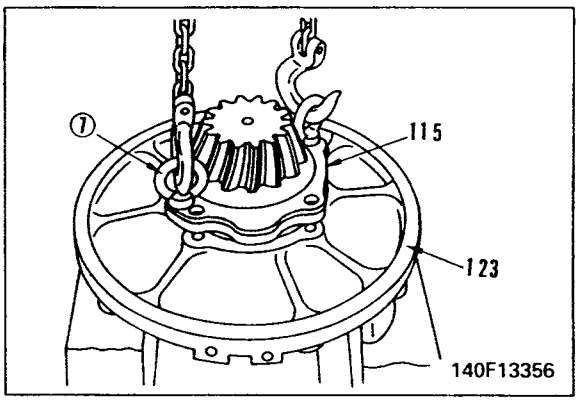
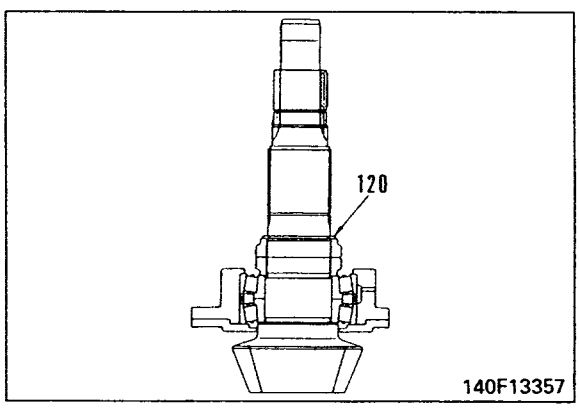
27. Bevel pinion assembly

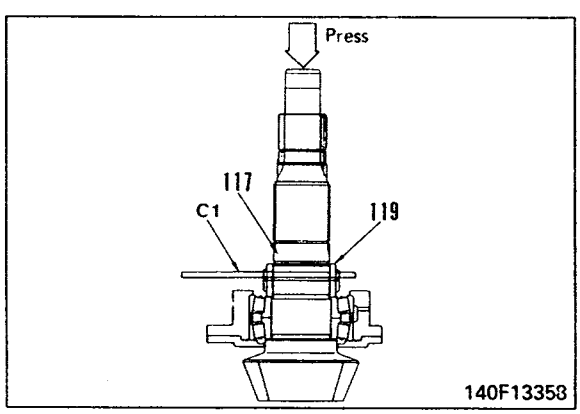
1) Using eyebolts ⑦, remove bevel pinion assembly (115) from case (123).
   ★ Check the number and thickness of the shims, and keep in a safe place.



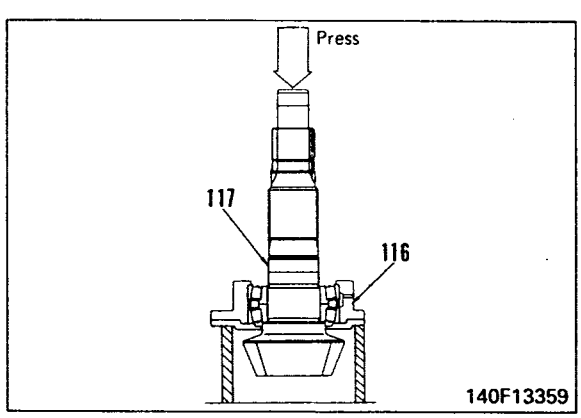
2) Remove snap ring (120).



3) Press bevel pinion (117) with press, then using tool **C1**, remove nut (119).



4) Support cage (116), and push end face of shaft, then remove bevel pinion (117) from cage.



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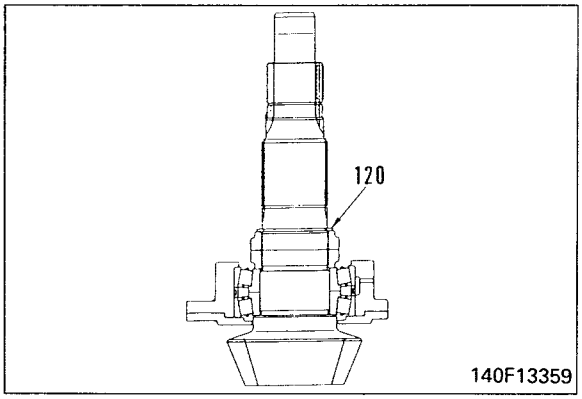
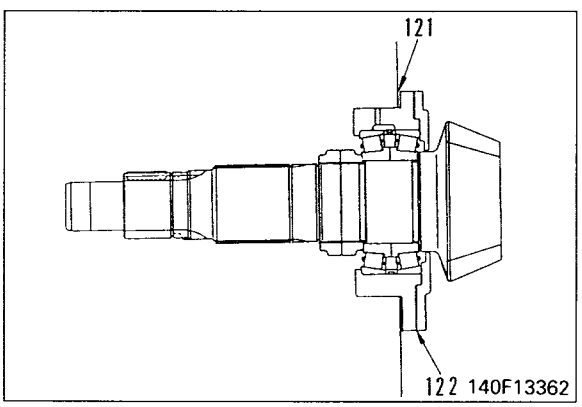
iv) Install snap ring (120).



2) Assemble removed shims (121) and (122), then using eyebolts ⑦, install bevel pinion assembly (115) to case (123).

Mounting bolt:
Thread tightener (LT-2)



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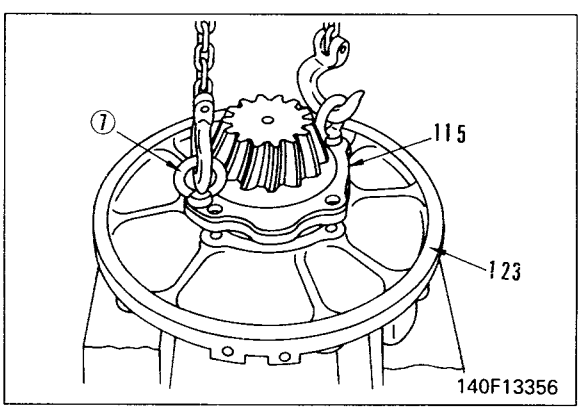
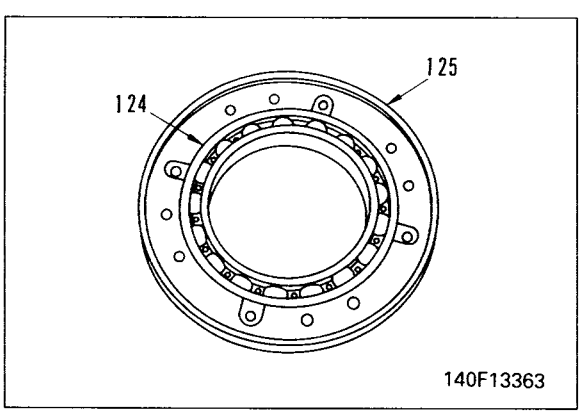
★ Adjust the thickness of shim (122) as follows.
- i) With the shim at the cover side removed, push the cover towards the case, and rotate the shaft several times to settle the bearing.
- ii) Keep the cover pushed, and tap the cover several times with a plastic hammer.
- iii) Measure the clearance between the cover and cage at two places around the circumference.
- iv) Select a shim so that the thickness is clearance − 0.05 — 0.15 mm.



2. Cage (for securing No. 5 carrier)

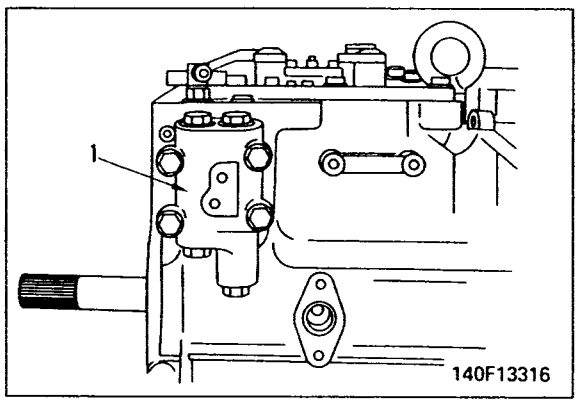
1) Press fit bearing (124) to cage (125).



29. Relief valve

Install relief valve assembly (1).

kgm Mounting bolt:
49 ± 4.9 Nm (5 ± 0.5 kgm)



30. Adjusting tooth contact and backlash

★ See ASSEMBLY OF HSS ASSEMBLY, Step 4, Adjusting backlash and tooth contact.

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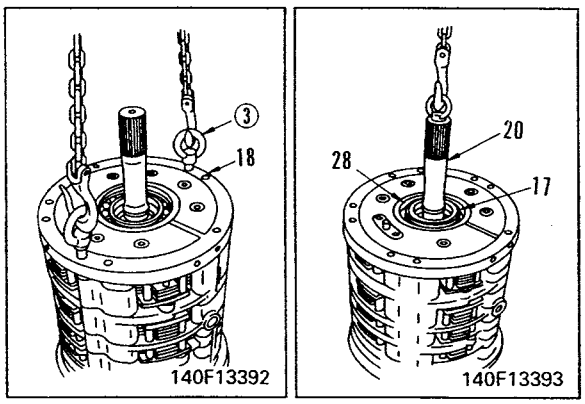
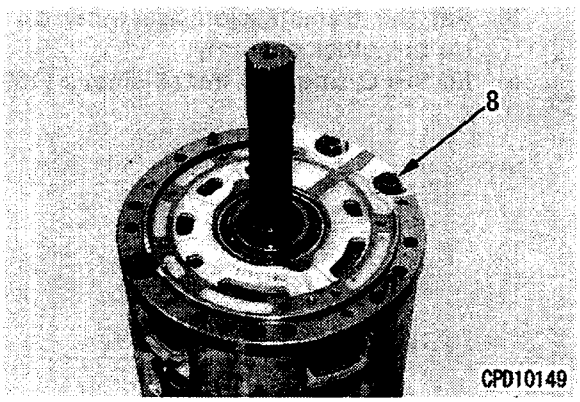
3) Using eyebolts ③, install front plate (18), matching it to the guide pin and spring.
4) Press fit the inner race side of bearing (28) to input shaft (20) and install snap ring (17).
★ Check that the spring is fitted to the cover securely.

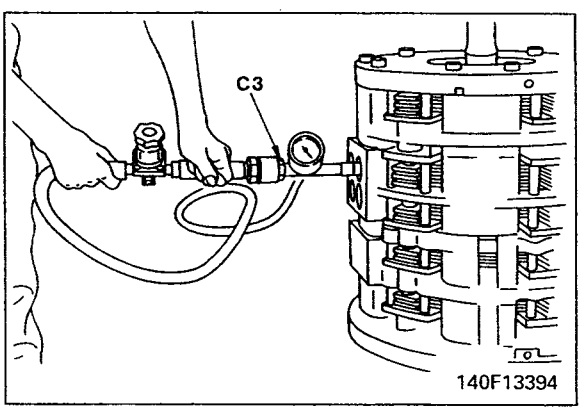


23. Tie bolts
Install tie bolts (8).
kgm Tie bolt: **17 +_ 1 kgm**

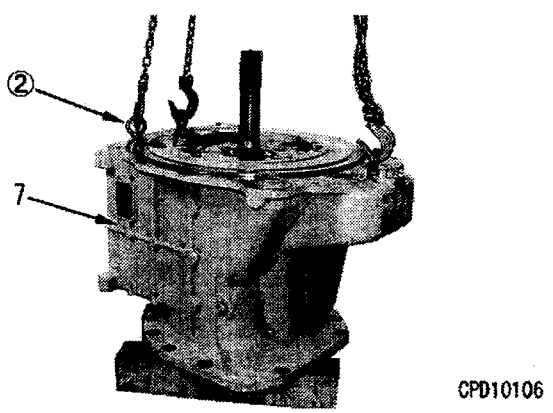


24. Operation check of piston
Using tool **C3**, check the operating condition and stroke of each piston.

Piston	Standard stroke (mm)
No1	5
No2	7
No3	4
No4	4
No5	3



25. Transmission case
1) Fit the O-ring and install transmission case (7), using eyebolts ②.



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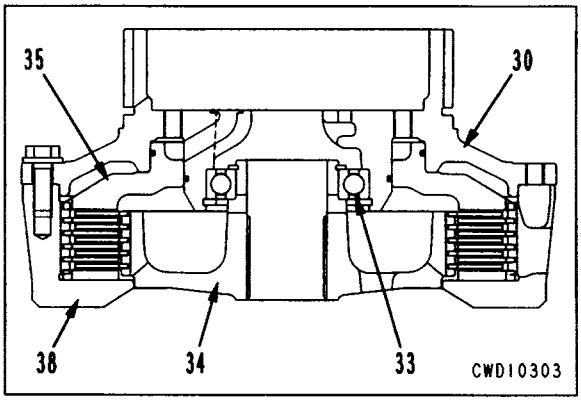
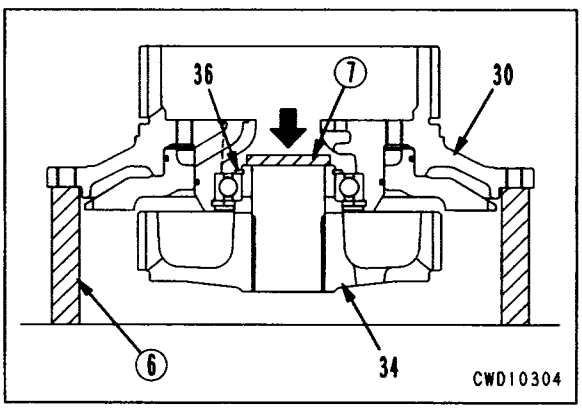
3) Disassembly of clutch assembly

i) Remove the mounting bolts, hub (30), bearing (33), hub (34), and piston (35).



ii) Set hub (30) on block ⑥ and remove snap ring (36).

iii) Remove hub (34) from hub (30) by pushing it with push tool⑦.



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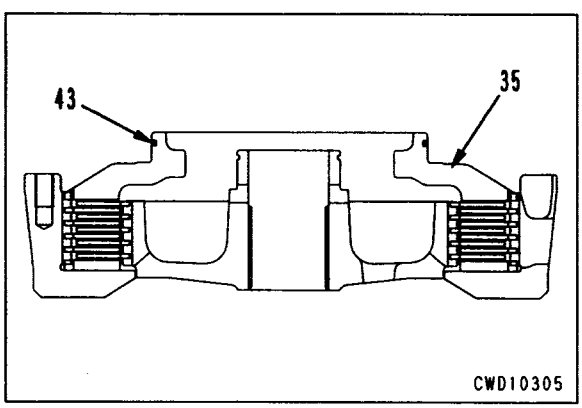
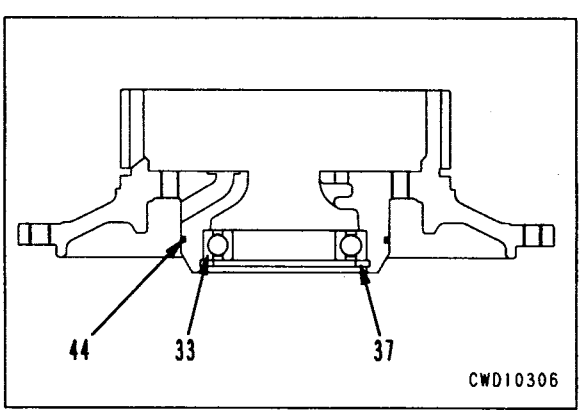
iv) Remove piston (35) and seal ring (43).



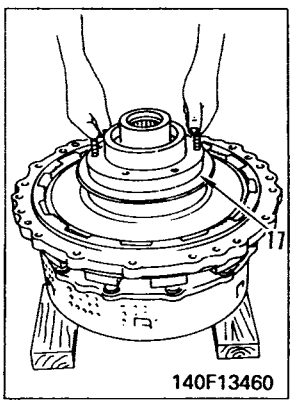
v) Remove snap ring (37) and bearing (33).

vi) Remove seal ring (44).

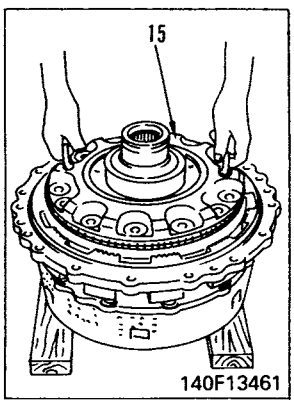


v) Fit seal ring and install cage (17) to hub.
★ Align the oil holes in the cage visually with the oil holes in the drum at 4 places.

vi) Install seal ring to piston (15).



140F13460



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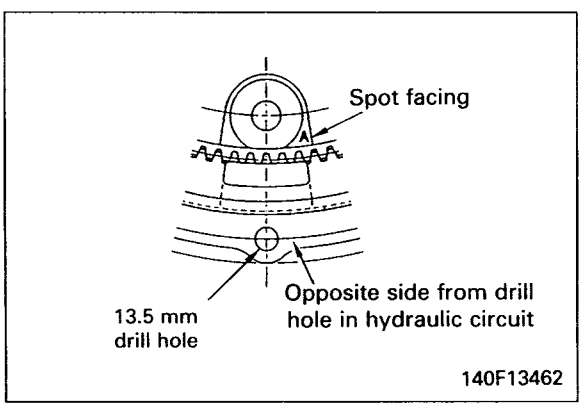
vii) Align center of spot facing stamped with **A** mark on piston (15) with "13.5 mm drill hole" on drum (opposite side from oil hole), and set in position.



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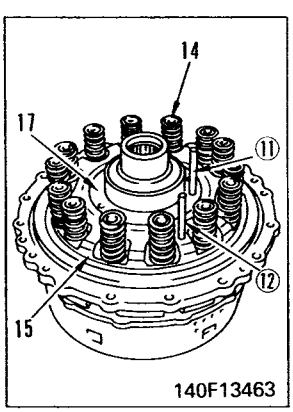
viii) Install spring (14).
ix) Install guide bolts ⑪ and ⑫ to piston (15) and cage (17).
★ Guide bolt ⑫ is for aligning the brake release bolt hole.
x) Install bearing (13) to cover (12).



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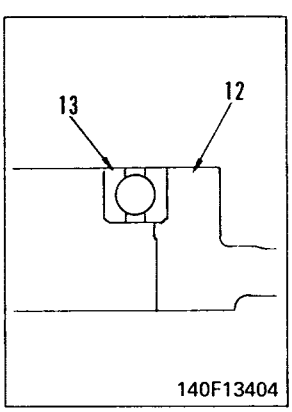
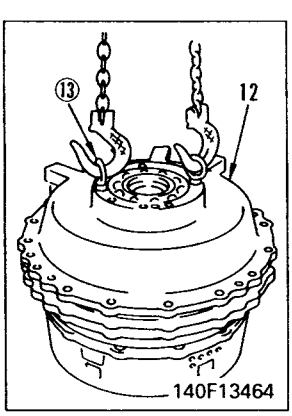


140F13404

xi) Using eyebolts ⑬, align with guide bolt, then set cover (12) in position.
★ Check that the spring is fitted securely into both the piston and cover.
xii) Compress spring with bolt ⑭ and nut ⑮, and at the same time press fit inner race of bearing to hub (16).



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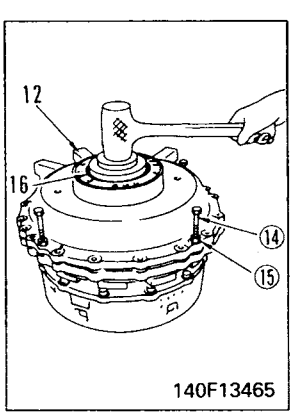

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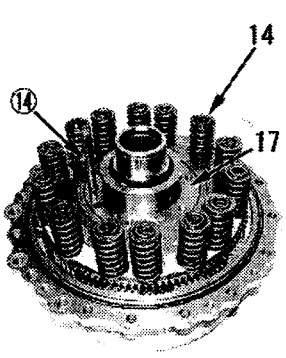
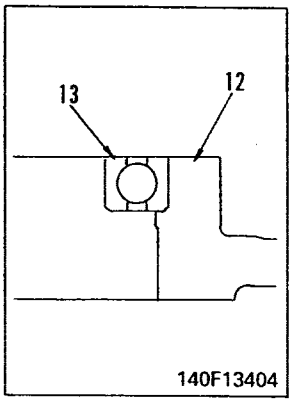
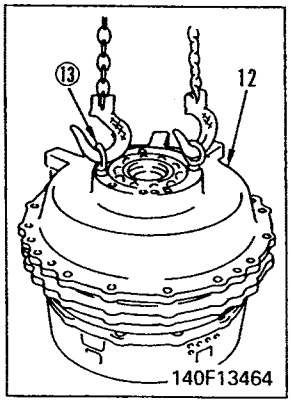
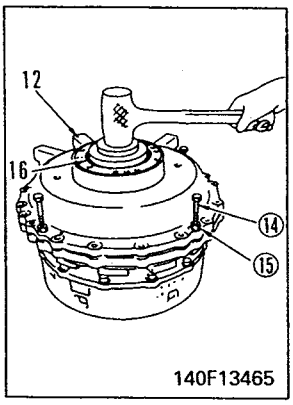
viii) Install spring (14).
ix) Install guide bolt ⑭ to cage (17).
x) Install bearing (13) to cover (12).





xi) Using eyebolts ⑬ and matching to the guide bolt, set cover (12).
★ Check that the spring is fitted securely to both of the piston and cover.
xii) Compressing the spring with forcing screws ⑭ and nuts ⑮, press fit the inner race side of the bearing to hub (16).





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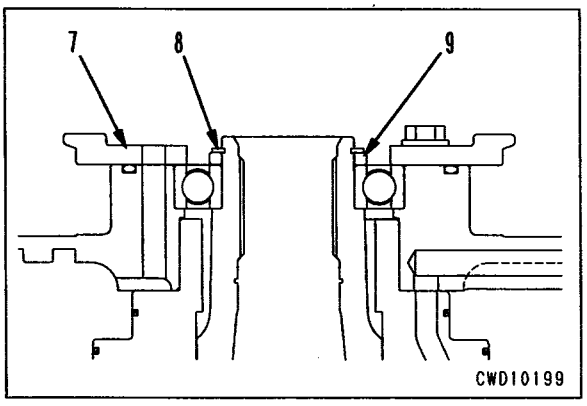
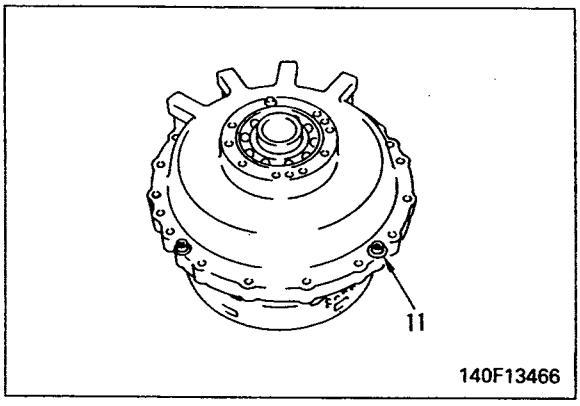
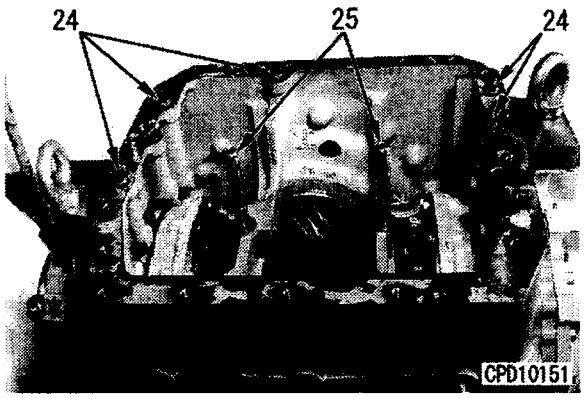
xiii) Install spacer (9) and snap ring (8).
xiv) Install flange (7).



xv) Remove the bolts and nuts used to compress the spring, then install 4 bolts (11).



2) Remove 5 sleeves (24) and 2 sleeves (25) from the HSS case.



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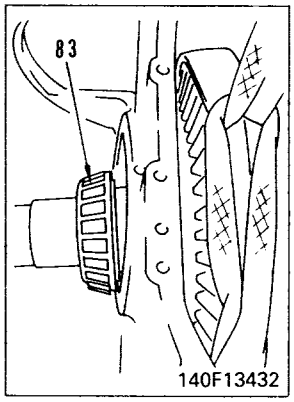
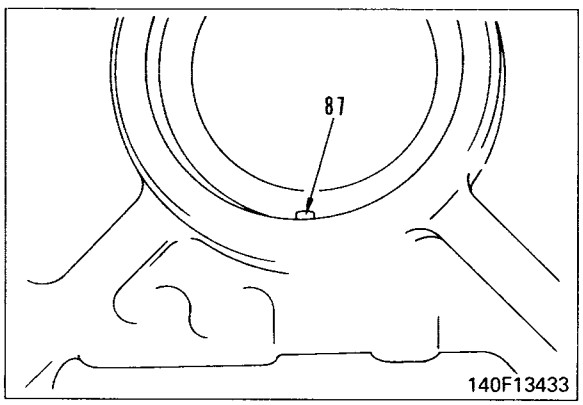
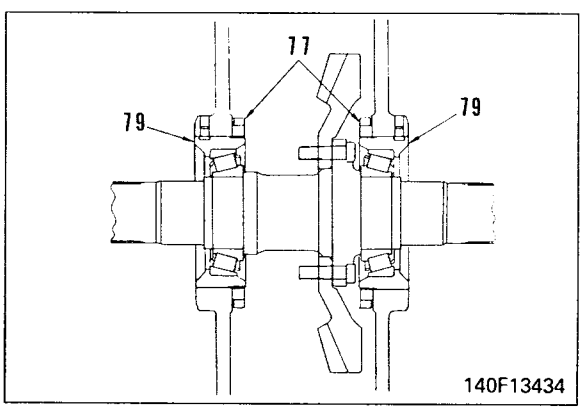
6) Shrink fit bearing (83).



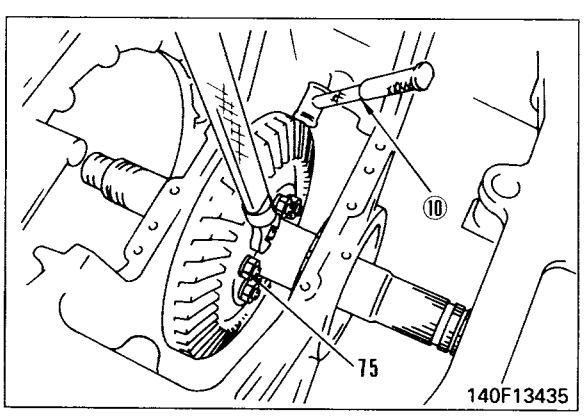
7) Align with pin (87) of cage, install cage (79), then tighten ring nut (77) temporarily.





8) Tighten bevel gear mounting nut (75).
★ Stop the gear from turning with plastic hammer ⑩ or some soft object.

kgm Nut:
245.2 ± 29.4 Nm (25 ± 3 kgm)



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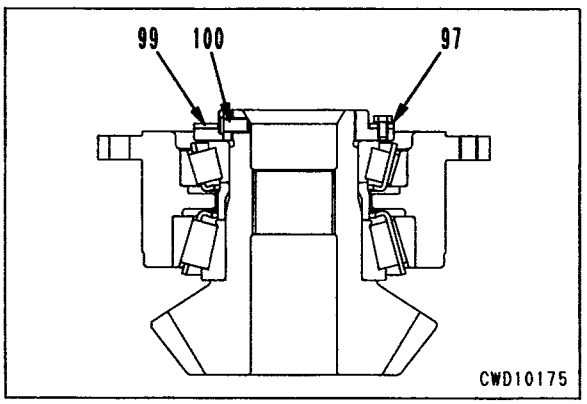
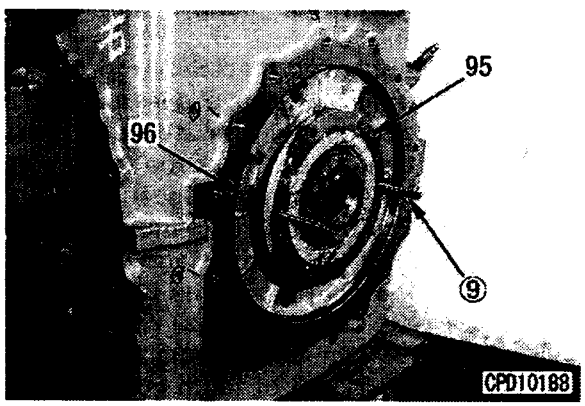
vii) Install pin (100), plate (99), and lock (97), then tighten the bolt.
viii) Bend lock (97) securely.



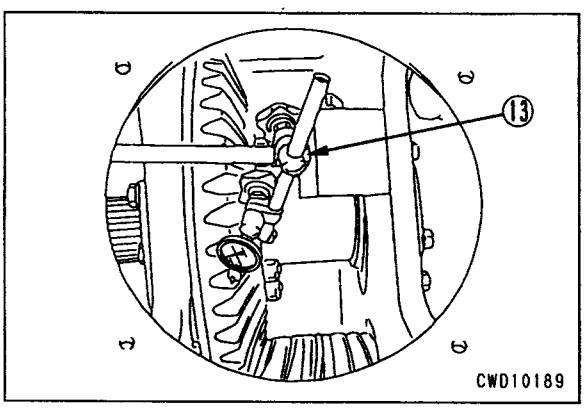
4) Using guide bolt ⑨, install shims (96) and bevel pinion assembly (95).
★ Install shims of the thickness and quantity recorded when removed.
- Standard shim thickness: 2 mm
- Varieties of shim thickness: 0.2 mm, 0.3 mm, 1.0 mm

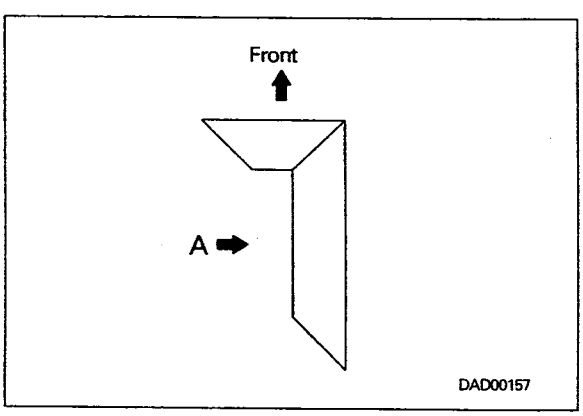


4. Adjusting backlash and tooth contact

1) Adjusting backlash
Apply the probe of dial gauge ⑬ to the tooth tip at the end of the bevel gear at right angles. Fix the bevel pinion and move the bevel gear forward and backward, and read the value at this time.
★ Standard backlash: 0.2 - 0.28 mm
★ Measure the backlash diagonally at 3 or more places.
- If the measured backlash is out of the standard range, adjust it according to the following procedure.

★ Adjust the backlash by increasing or decreasing the thickness of both shims (77). Do not change the total thickness of both shims so that the pre-load will not change. (If the thickness of the shim on one side is increased, decrease the thickness of the other side, and vice versa.)
- When backlash is insufficient
Decrease the thickness of the shim on the right side of the machine body and increase the thickness on the left side by the same quantity. (Move the bevel gear in direction A.)





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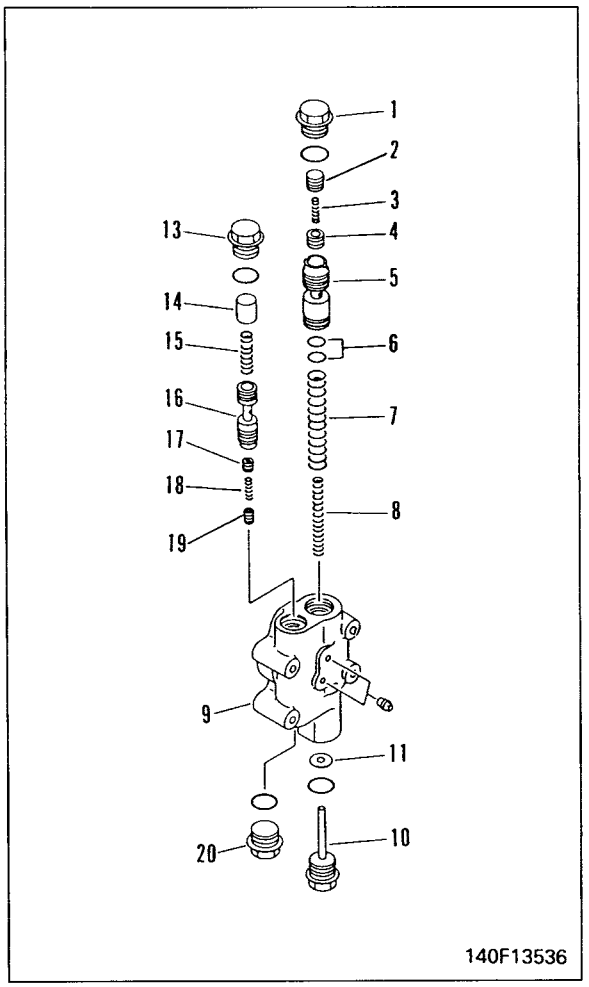
DISASSEMBLY OF TORQUE CONVERTER VALVE ASSEMBLY

1. Remove plug (1), then remove valve (2), spring (3), valve (4), valve (5), shim (6), and springs (7) and (8) from valve body (9).
   ★ Check the number and thickness of the shims, and keep in a safe place.
2. Remove plug (10), then remove washer (11).
3. Remove plug (13), then remove guide (14), spring (15), spool (16), valve (17), spring (18), and valve (19).
4. Remove plug (20).



ASSEMBLY OF TORQUE CONVERTER VALVE ASSEMBLY

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

1. Assemble spring (15) and guide (14) to spool (16).
2. Assemble valve (19), spring (18), and valve (17), then assemble in valve body (9), and install plugs (20) and (13).
3. Assemble washer (11) and springs (8) and (7) to plug (10), and install to valve body (9).
4. Assemble valve (2), spring (3), and valve (4), the assemble in valve (5), and assemble shim (6) on opposite side.
   ★ Check the thickness and number of shims, then assemble them.
   Standard shim thickness: 3 mm
5. Assemble valve (5) to valve body (9), then install plug (1).
6. Tighten plugs (10) and (1).

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REMOVAL OF BRAKE VALVE ASSEMBLY

D65EX, PX

1. Remove operator's seat, then remove chassis rear cover.

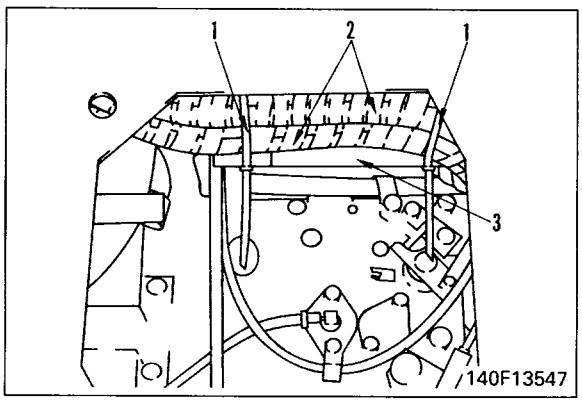
   kg Operator's seat: **35 kg**

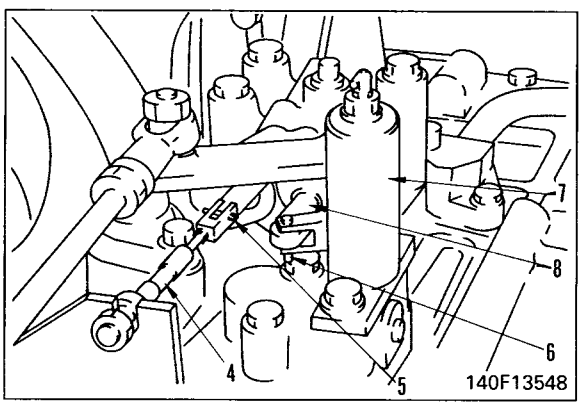
2. Cut band (1), then move 2 PPC hoses (2) towards engine, and remove bracket (3).

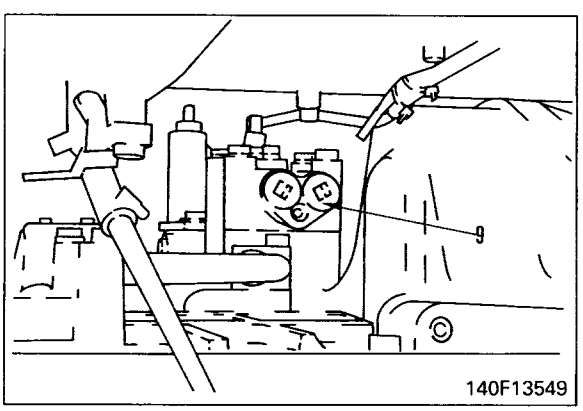
3. Loosen locknut of cable (4), then pull out pin (5) and disconnect cable (4). ※1
   ★ Measure installed dimension **a** of the cable before disconnecting the cable.

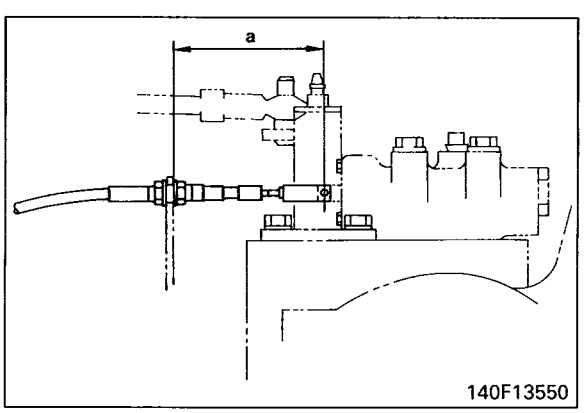
4. Pull out pin (6), and disconnect lever (7) and spool (8). ※2

5. Remove brake valve (9). ※3









INSTALLATION OF BRAKE VALVE ASSEMBLY

D65EX, PX

- Carry out installation in the reverse order to removal.

※1

★ Bend the cotter pin securely after installing.
★ After installing, afjust the parking brake lever. For details, see ADJUSTING PARKING BRAKE LEVER.

※2

★ Bend the cotter pin securely after installing.

※3

kgm Mounting bolt:
49 ± 4.9 Nm (5 ± 0.5 kgm)

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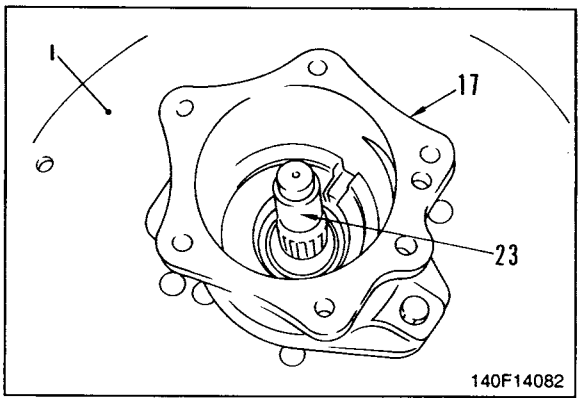
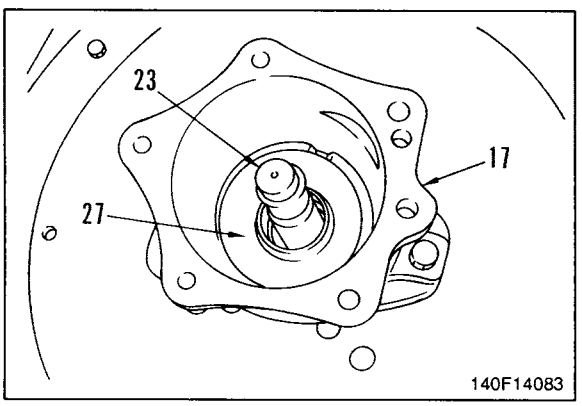
2) Set motor case (17) to tool **I**, and install shaft (23).



4. Cylinder block, piston, bearing, end cover

1) Assemble plate (27) to shaft (23) installed to motor case (17).



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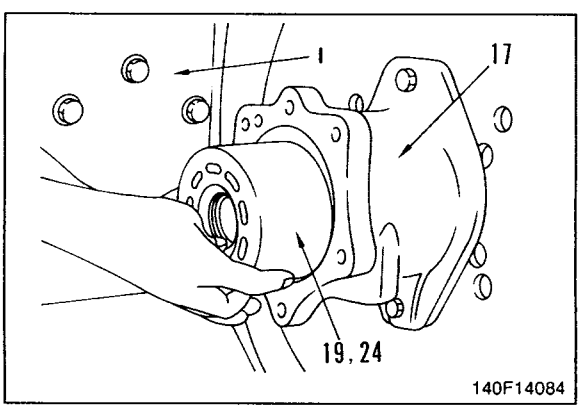
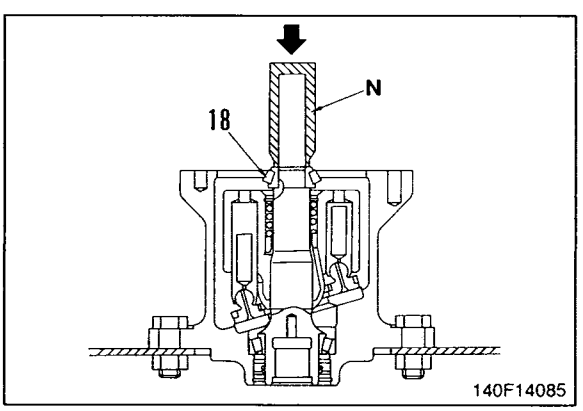
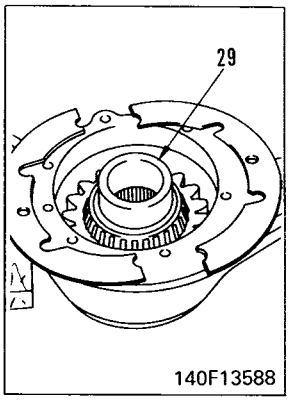
2) Turn over tool **I** 90°, and assemble cylinder block (19) and piston assembly (24) to motor case (17).

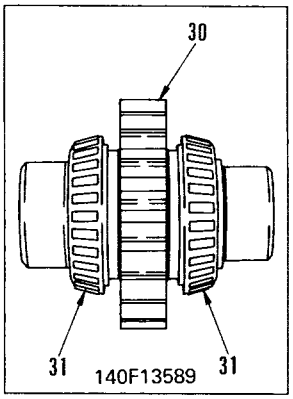


3) Turn over tool **I** 90°, then use tool **N** to press fit sub bearing (18).

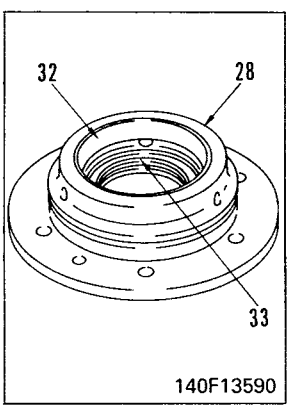


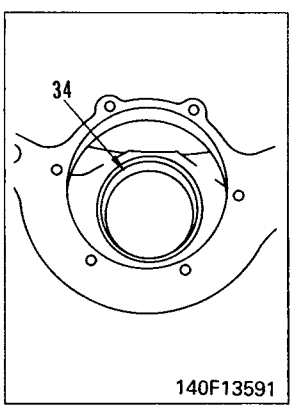
2) Remove pinion assembly (29).
3) Remove bearing (31) from pinion (30).





4) Remove outer race (32) and oil seal (33) from cage (28).
5) Remove outer race (34) from case.





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ASSEMBLY OF RECOIL SPRING ASSEMBLY

D65E-12 60001 – 60947
D65P-12 60001 – 60890
D65EX-12 60001 – 60941
D65PX-12 60001 – 60914

1. Press fit bushing (21) to cylinder (20), and assemble case (12), spring (19), and cylinder (20) temporarily, then set to tool **G1**.

   ⚠ The spring is under a high installed load, so be careful to set all parts correctly.

2. Apply hydraulic pressure slowly, compress spring, and set so that installed length of the spring is the standard value.
   - ★ When compressing the spring, be careful not to damage the thread. Use lever block ② and carry out centering before compressing the spring.
   - ★ Installed length of spring: **634 mm**

3. Install nut (16), then install spacers (18) and (17).

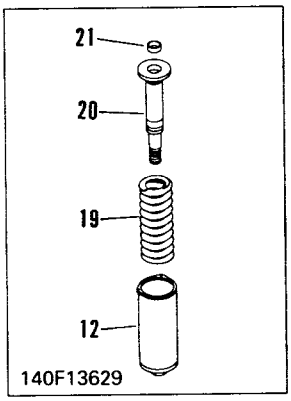
4. Gradually release hydraulic pressure to completely remove tension of spring, then remove recoil spring assembly (1) from tool **G1**.

5. **Assembly of holder**
   Assemble seal (15) to holder (13), then install cover (14).
   Lip of seal: **Grease (G2-LI)**

6. Install holder (13) to case (12) of recoil spring.

7. **Assembly of yoke, piston assembly**
   1) Using push tool ①, press fit piston (11) to yoke (10).
   2) Assemble washer (9) and plate (8), and tighten bolt (7).
      - ★ Bend the plate securely.
   3) Fit ring (6), packing (5), and ring (4), and install snap ring (3).

8. Assemble yoke and piston assembly (2) to recoil spring assembly (1).



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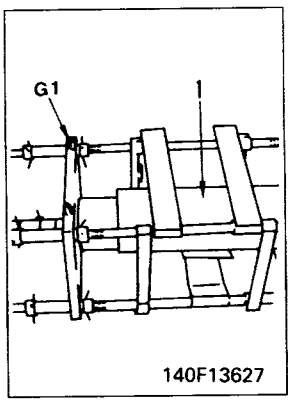

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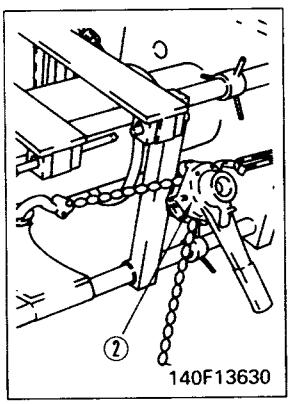

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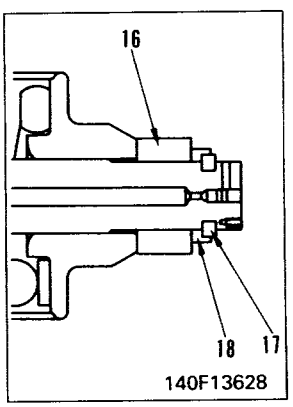

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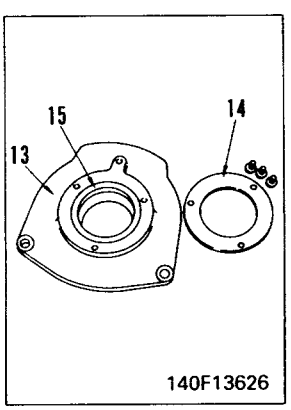

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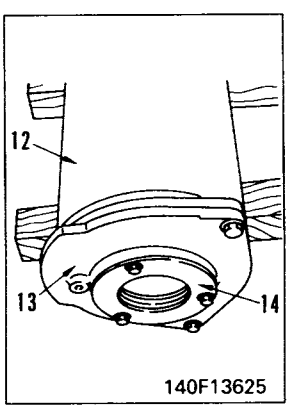

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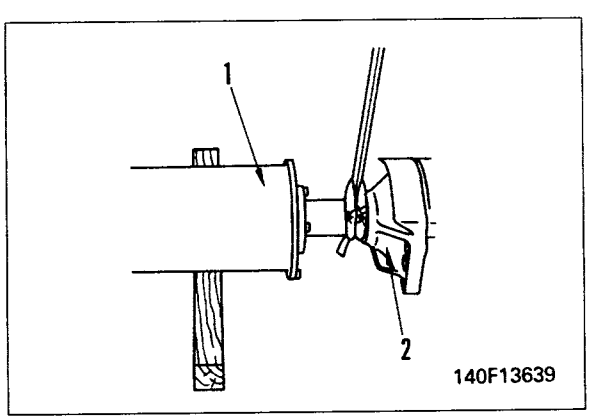

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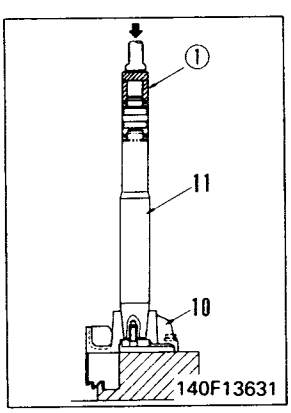

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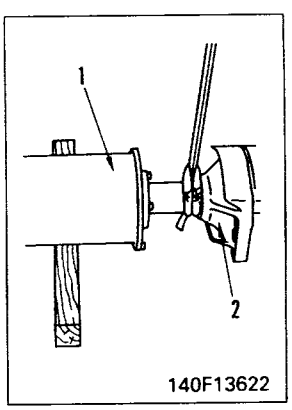

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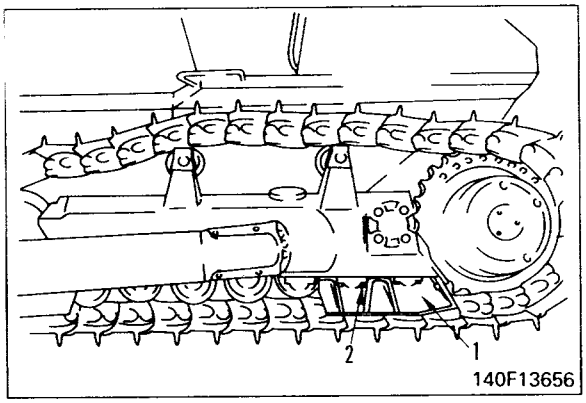
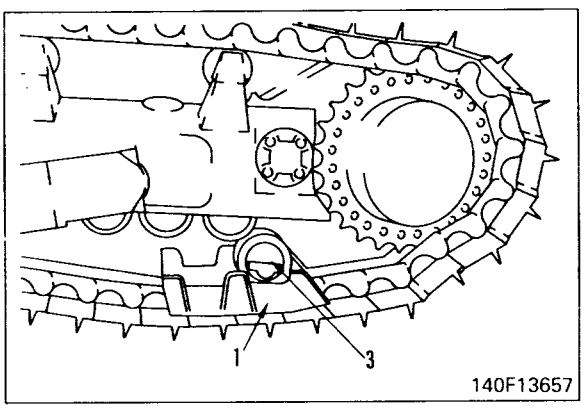
REMOVAL OF TRACK ROLLER ASSEMBLY

1. Loosen track shoe tension.
   For details, see REMOVAL OF TRACK SHOE ASSEMBLY.
2. Remove mounting bolts of track roller guard (1). ※1
3. Remove track roller mounting bolts (2).
4. Start engine, and operate blade, ripper, and hydraulic jack to jack up machine.

   ⚠ After jacking up the machine, set blocks on top of the track shoes and lock the work equipment control levers and brake lock lever.
5. Remove track roller assembly (3). ※2

   kg Track roller assembly: (W) **60 kg**
   (S) **55 kg**





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INSTALLATION OF TRACK ROLLER ASSEMBLY

- Carry out installation in the reverse order to removal.

※1

Thread of roller guard mounting bolt:
Thread tightener (LT-2)

※2

Thread of track roller mounting bolt:
Thread tightener (LT-2)

kgm Track roller mounting bolt:
385 ± 42 Nm
(39.3 ± 9.3 kgm)

★ Install so that the oil plug is on the outside of the chassis.

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

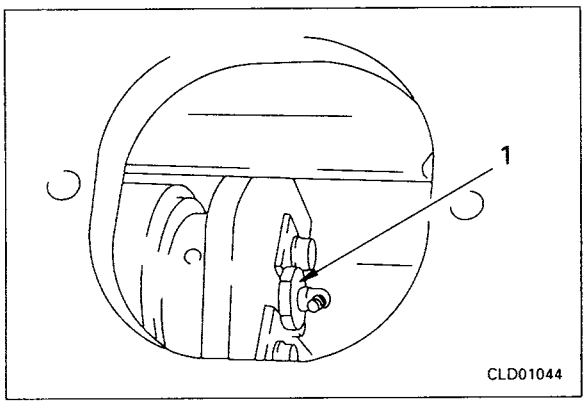
D65E-12 60948 and up
D65P-12 60891 and up
D65EX-12 60942 and up
D65PX-12 60915 and up

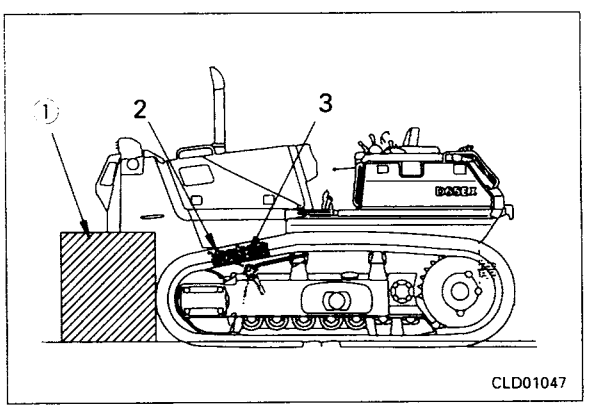
★ When CHECKING BEFORE REMOVAL OF TRACK SHOE ASSEMBLY shows any abnormality, do as follows.

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

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

1. Remove work equipment assembly.
   For details, see REMOVAL OF WORK EQUIPMENT ASSEMBLY.
2. Loosen lubricator (1) of adjustment cylinder, then move machine backwards and forwards to release grease. ※ 1
   ⚠ Never loosen the lubricator more than one turn.
   ★ Check that all the grease has been removed.
3. Drive slowly forward to put track shoe at idler end in contact with large block ① or a wall (if another large bulldozer of the same capacity as the machine being repaired is available, put in contact with the blade). Stop machine when recoil spring bends and track shoe also bends, then apply brake. When doing this, set so that master link is between idler and front carrier roller. For safety reasons, fit a lever block between carrier roller support and link.
   • Remove shoe (2), then disconnect master link (3). ※ 2
   ⚠ Be extremely careful to ensure safety when disconnecting the track shoe.
   • Move machine towards rear slowly, and lay out track shoe assembly.





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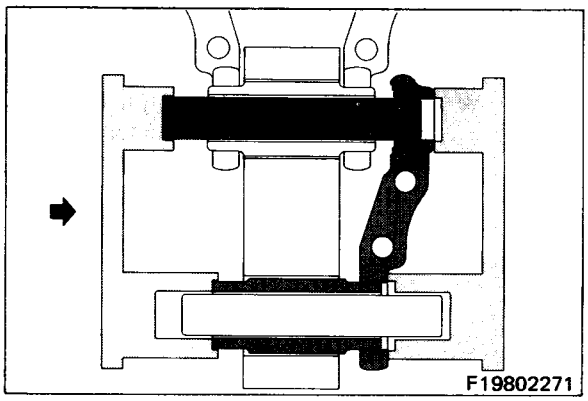
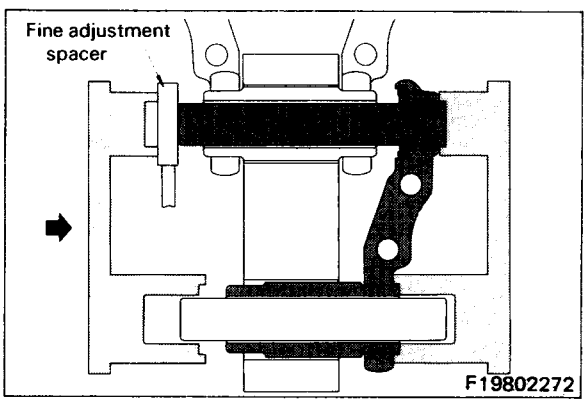
9) Using the right jig as the receiving end and the left jig as the pushing end, press fit the pin and bushing at the same time.
★ When press fitting, the seal may come off the link due to the play, so press fit smoothly. If the seal comes off the link, stop the press-fitting operation and fit the seal correctly on the link, then start the press-fitting operation again.
★ Pin and bushing press fitting force:
196 — 392 KN (20 — 40 ton)



10) Using a fine adjustment spacer, press fit so that the end face of the pin is in tight contact with the bottom of the receiving jig.
★ Adjust the depth of lthe hole in the receiving jig so that the protrusion of the left and right pins is uniform.



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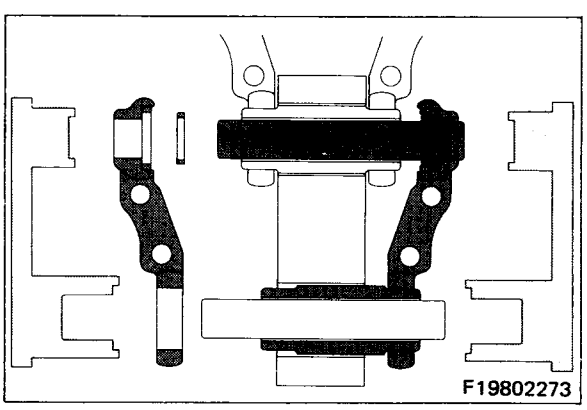
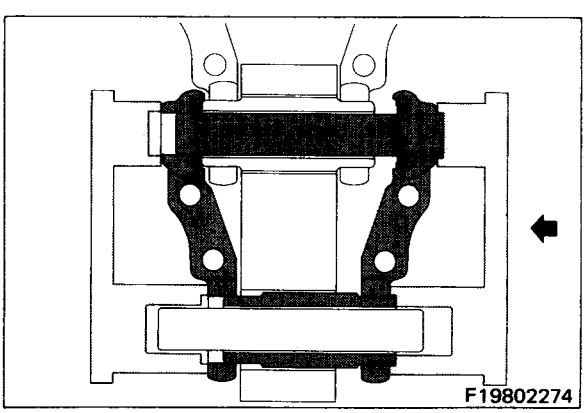
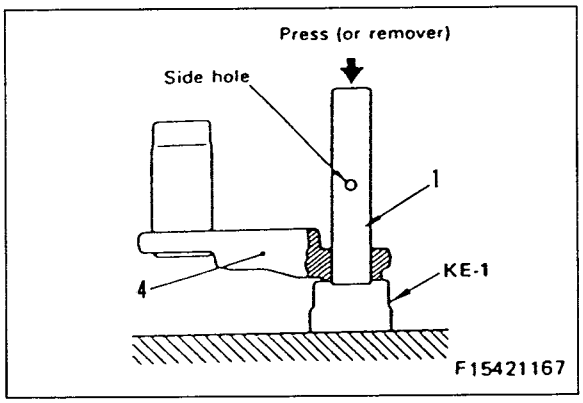
11) Set the left link in position and install the spacer to the pin.
★ Coat with oil in the same way as when installing the right link.



12) Using the left jig as the receiving end and the right jig as the pushing end, press fit the left link.
★ When press fitting, be careful that the left and right seal and spacer do not come out of position.
★ Provide enough space on the left jig so that the end face of the pin does not contact the bottom of the jig.
★ Link press fitting force:
196 — 392 KN (20 — 40 ton)

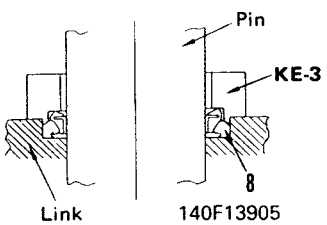


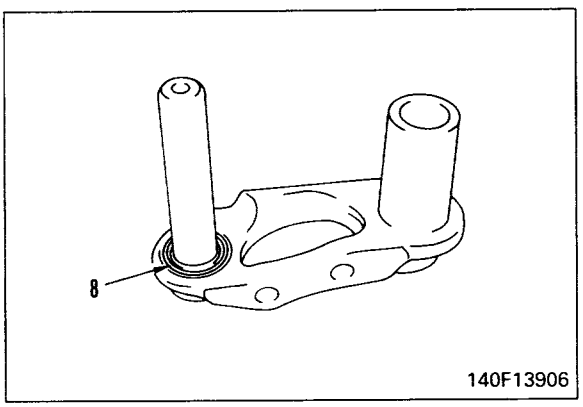
4) Put tool **KE-1** in contact with the end face of link (4), and press fit pin (1).
   - ★ Press fit so that the side hole in the pin is on the same side as the link tread.
   - ★ Pin press fitting force:
     147 — 245 KN (15 — 25 ton)
   - ★ Always use a new pin.



3. Seal

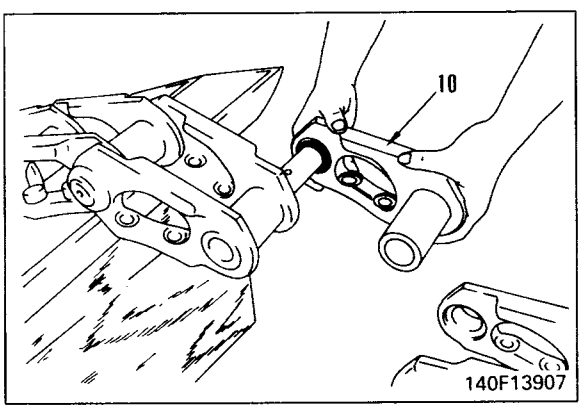
Install seal (8) with tool **KE-3**.
- ★ Check that there is no oil on the contact surface of the link and seal.
- ★ Carry out steps 1 ~ 3 in the repair shop beforehand.



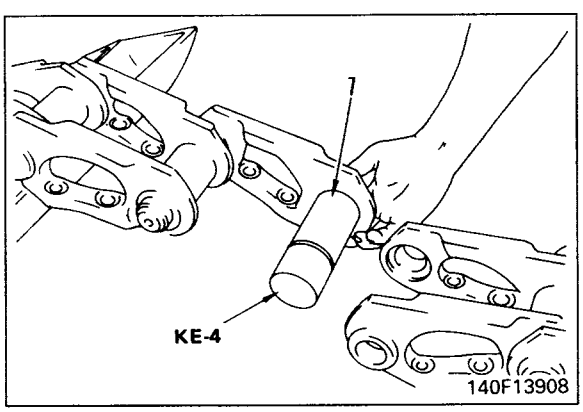


4. Link sub-assembly

1) Install link sub-assembly (10).
   - ★ Check that there is no dirt or dust stuck to the surface of the seal or the end face of the bushing, then coat with oil (GO140B) using a clean cloth or small brush.



2) Install tool **KE-4** (guide used when press fitting link) to bushing (7).

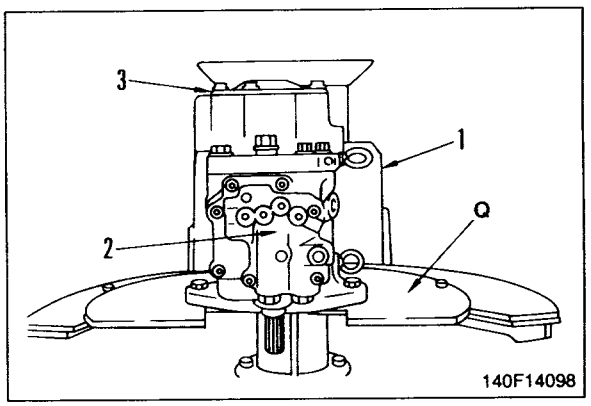


014012

DISASSEMBLY OF HSS, WORK EQUIPMENT PUMP ASSEMBLY

D65EX, PX

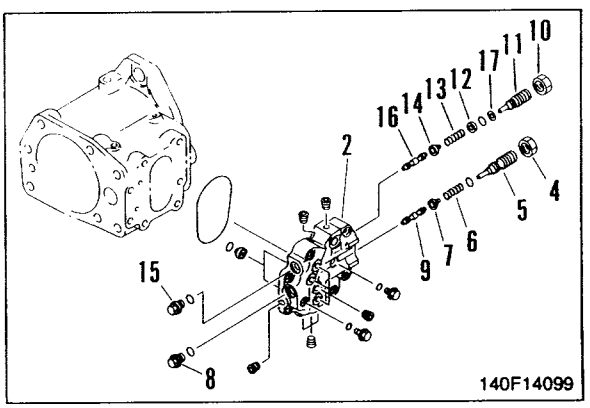
1. Set pump assembly to tool **Q**.



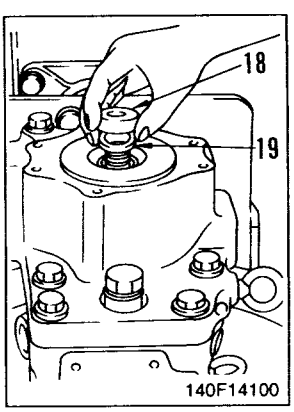
2. **Valve assembly, cover**
   1) Remove valve (2) and cover (3) from pump assembly (1).
   2) Disassembly of valve assembly

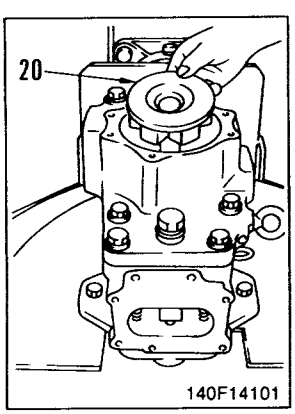
   - Variable throttle valve
     i) Loosen nut (4), remove plug (5), then remove spring (6) and seat (7), and pull out spool (9).
     ii) Remove plug (8).
     iii) Remove nut (4) and O-ring from plug (5).

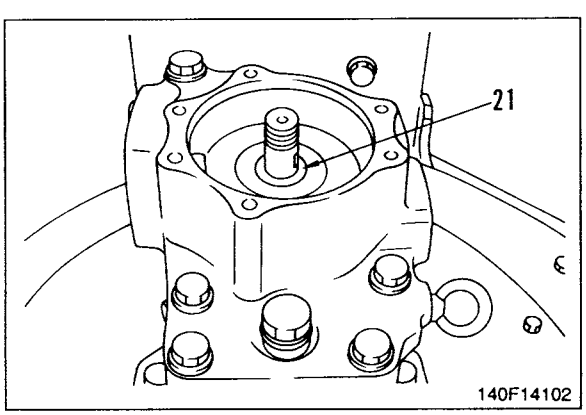
   - LS valve
     i) Loosen nut (10), remove plug (11), then remove seat (12), spring (13), and seat (14).
     ii) Remove plug (15), and pull out spool (16).
     iii) Remove backup ring (17) and O-ring from plug (11).



3. **Impeller, washer**
   1) Remove nut (18), then remove spacer (19).
   2) Remove impeller (20), then remove key and washer (21).
      ★ Be careful not to lose the key.



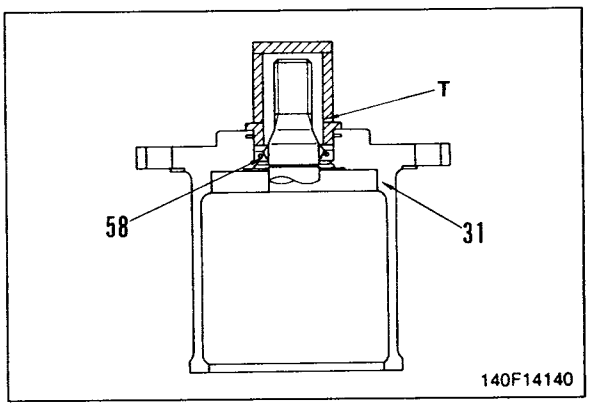


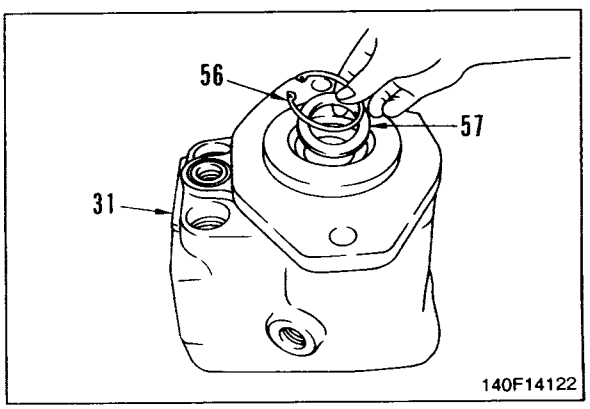


014012

12. When replacing oil seal only (there is no need to carry out assembly operation), replace oil seal as follows.

1) Using tool **T**, press fit oil seal (58).
   ★ Check that there are no burrs or flashes on the corner of the shaft.
2) Assemble spacer (57), and install snap ring (56).



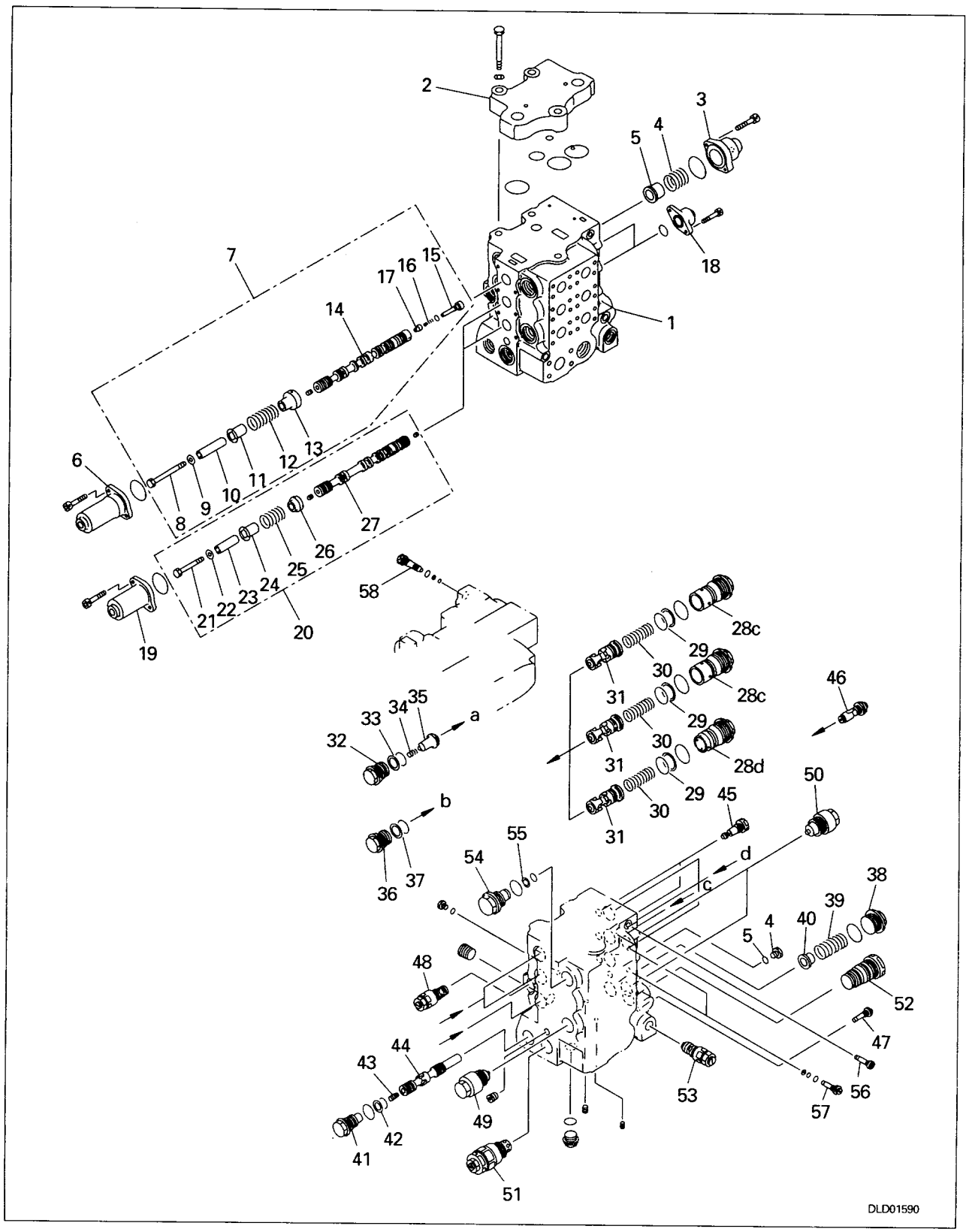


014012

ASSEMBLY OF MAIN CONTROL VALVE ASSEMBLY

(3-SPOOL VALVE) **D65E-12 60948 and up** **D65EX-12 60942 and up**
D65P-12 60891 and up **D65PX-12 60915 and up**

★ The diagram shows 3-spool valve for D65EX, PX-12.



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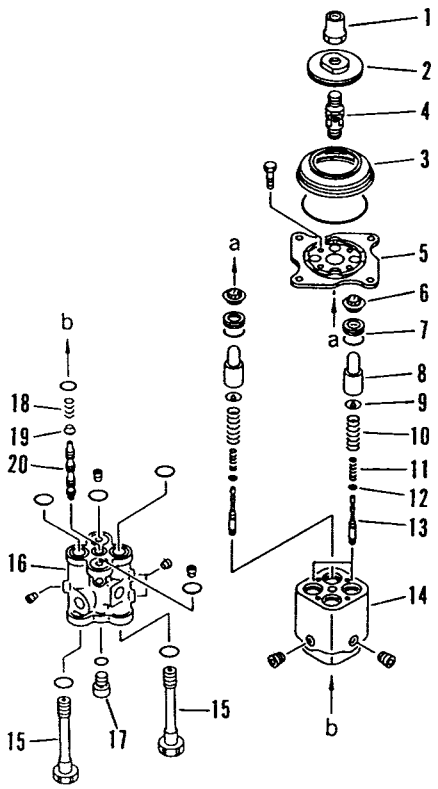
ASSEMBLY OF PPC VALVE ASSEMBLY

D65EX, PX FOR STEERING

1. Assemble spool (20), spacer (19), and spring (18) to block (16), and fit O-ring.
2. Fit O-ring to block (16) and install to body (14) with bolt (15).
   - Block mating surface: **Gasket (LG-6)**
   - kgm Bolt: **66.2 ± 7.4 Nm (6.8 ± 0.8 kgm)**
3. Fit O-ring to plug (17) and install to block.
   - kgm Plug: **17.2 ± 2.5 Nm (1.8 ± 0.3 kgm)**
4. Assemble valve (13) to body (14).
5. Assemble shim (12) and spring (11) to valve (13).
6. Assemble spring (10), retainer (9), and piston (8).
   - ★ Spring (10) consists of spring with a different number of coils for each hydraulic port. The number of coils and position of use are as follows.

Port	Number of coils on spring
P1, P2	11
P3, P4	9

   - ★ The position of each port is stamped on the bottom of the valve body.
   - Piston: **Grease (LG-2)**
   - ★ When assembling piston (8), coat the outer circumference of the piston and the inner circumference of the body hole with grease.
7. Fit O-ring to collar (7), then assemble in body (14), and install seal (6).
8. Install plate (5).
   - kgm Mounting bolt: **13.3 ± 1.5 Nm (2.7 ± 0.5 kgm)**
9. Install joint (4).
   - Sliding portion of joint: **Grease (LG-2)**
   - Joint: **Thread tightener (LT-2)**
   - kgm Joint: **44.1 ± 4.9 Nm (4.5 ± 0.5 kgm)**
   - ★ Keep strictly to the standard value for the tightening torque of the joint.
10. Assemble disc (2), with boot (3), and tighten with nut (1).
    - kgm Nut: **112.8 ± 14.7 Nm (11.5 ± 1.5 kgm)**
    - ★ After assembling the disc, adjust the assembled height of the disc. For details, see TESTING AND ADJUSTING, Adjusting PPC valve.



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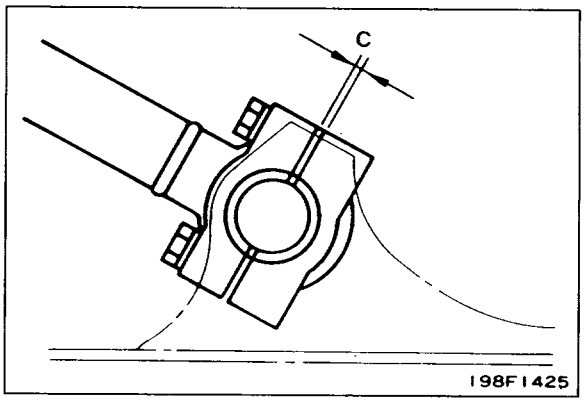
014012

INSTALLATION OF WORK EQUIPMENT ASSEMBLY

- Carry out installation in the reverse order to removal.

※1

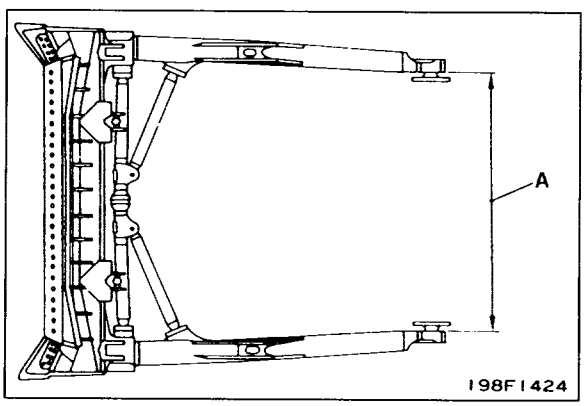
★ Adjust so that play **C** of the spherical portion in the axial direction is within 0.5 mm, but can still rotate smoothly.
★ Standard shim thickness: **5 mm**



※2

★ Adjust with a block ① so that the height and width of the left and right straight frames are dimensions **A** and **B** as shown below.

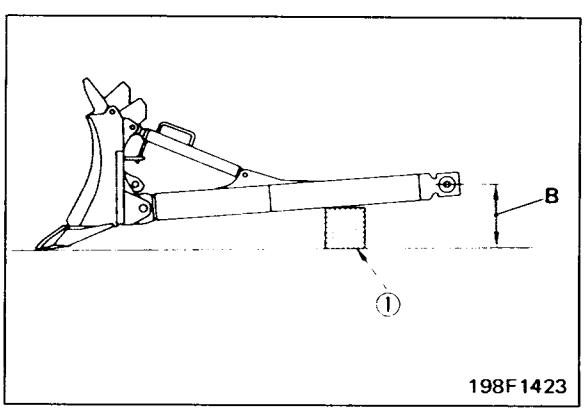
D65E D65EX	Dimensions **A**: Approx. 2600 mm Dimensions **B**: Approx. 422 mm
D65P D65PX	Dimensions **A**: Approx. 3136 mm Dimensions **B**: Approx. 522.5 mm

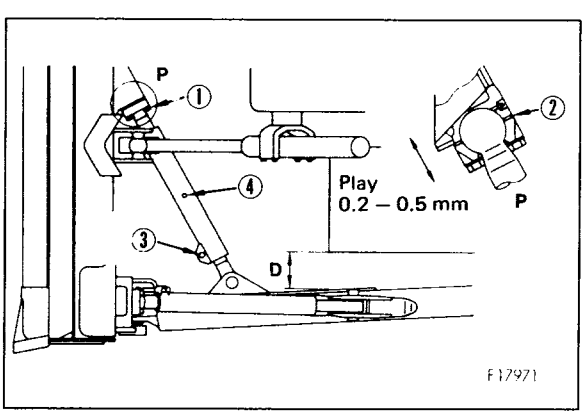


★ Adjust the tension of the center brace as follows.
1) Adjust with shim ② so that play of ball joint ① is 0.2 — 0.5 mm.
2) Loosen bolt ③.
3) Operate blade control lever, and raise blade slightly.

⚠ After completing the operation, lock the blade control lever securely with the safety lever.

4) Insert bar in hole ④ of center brace, and turn in direction of thrust.
★ Adjust so that clearance **D** between the track and frame is uniform on the left and right sides.



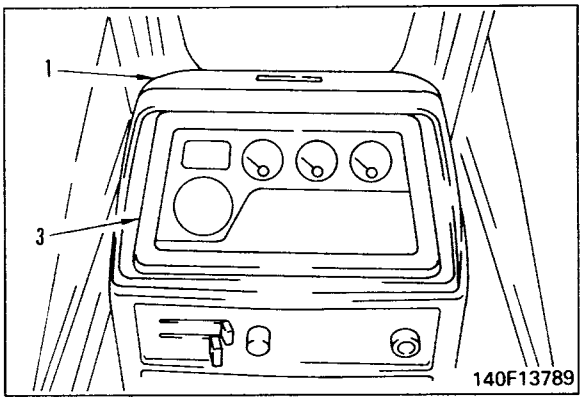


014012

REMOVAL OF MONITOR ASSEMBLY

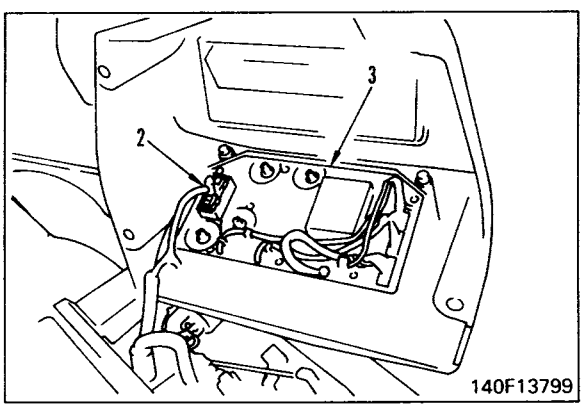
⚠ Disconnect the cable from the negative (–) terminal of the battery.

1. Open cover (1), and disconnect connector (2), then remove monitor assembly (3).



INSTALLATION OF MONITOR ASSEMBLY

- Carry out installation in the reverse order to removal.

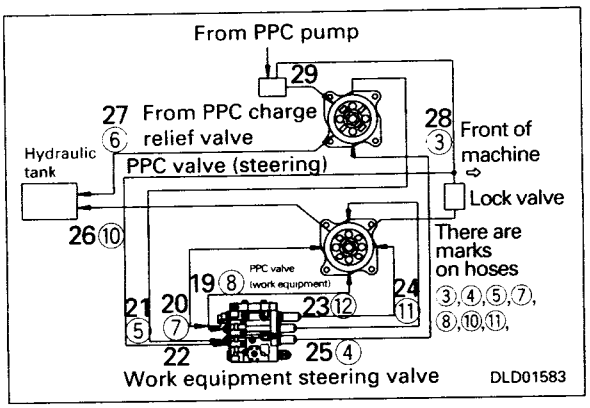


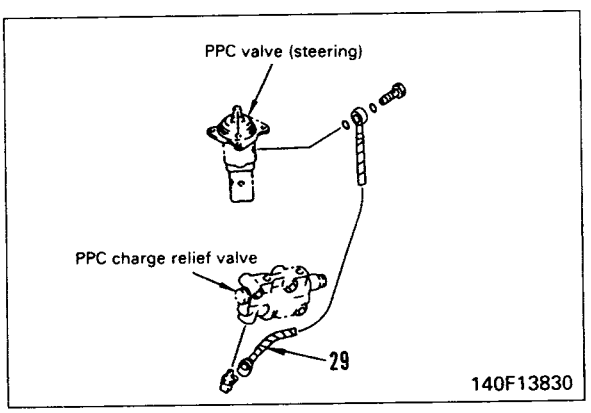
014012

19. Disconnect steering pilot hose (29).

20. Lift off floor frame assembly (27). ※ 6
    - ★ For the rear right suspension, remove 4 bolts at the top, and for the rear left suspension, remove 4 bolts at the bottom.
    - ★ Be careful not to damage the control cable or rod and wiring when removing.

kg Floor frame assembly: **350 kg**





INSTALLATION OF FLOOR FRAME ASSEMBLY

D65EX-12 60001 – 60941
D65PX-12 60001 – 60914

014012

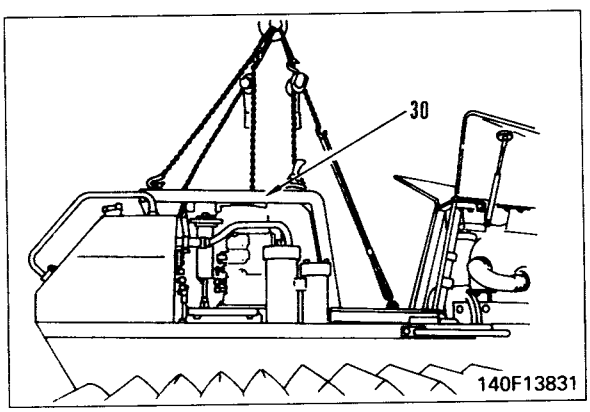
- Carry out installation in the reverse order to removal.

※ 1
- ★ Adjust the rod when connecting it.
  For details, see TESTING AND ADJUSTING, Adjusting brake pedal linkage.

※ 2
- ★ Insert the stopper for the yoke connecting pin securely.
- ★ Adjust the cable when connecting the rod.
  For details, see TESTING AND ADJUSTING, Adjusting fuel control linkage.

※ 3
- ★ Insert the stopper for the yoke connecting pin securely.
- ★ Adjust the cable when connecting it.
  For details, see TESTING AND ADJUSTING, Adjusting directional linkage and Adjusting speed linkage.

※ 4
- ★ Insert the stopper for the yoke connecting pin securely.
- ★ Adjust the cable when connecting it.
  For details, see TESTING AND ADJUSTING, Adjusting fuel control linkage.



※ 5
- ★ Insert the stopper for the yoke connecting pin securely.
- ★ Adjust the cable when connecting the rod.
  For details, see TESTING AND ADJUSTING, Adjusting parking brake lever.

※ 6

kgm Front mount bolt: **548.8 ± 58.8 Nm (56 ± 6 kgm)**

kgm Suspension bolt: **110.3 ± 12.3 Nm (11.25 ± 1.25 kgm)**

014012

Unit: mm

No.	Check item	Criteria					Remedy
1	No. 1 clutch spring (×10)	Standard size			Repair limit		
		Free length	Installed length	Installed load	Free length	Installed load	
		59.0	47.5	112.8 N (11.5 kg)	55.5	96.1 N (9.8 kg)	
2	No. 2 clutch spring (×10)	69.5	58	248.1 N (25.3 kg)	65.3	210.8 N (21.5 kg)	
3	No. 3 clutch spring (×10)	54	40	98.1 N (10.0 kg)	50.8	83.4 N (8.5 kg)	
4	No. 4 clutch spring (×10)	54	40.5	93.2 N (9.5 kg)	50.8	79.4 N (8.1 kg)	
5	No. 5 clutch spring (×10)	54	45	65.7 N (6.7 kg)	50.8	55.9 N (5.7 kg)	
6	Total assembled thickness of No. 1 clutch	Standard size		Tolerance		Repair limit	Replace
		40		± 0.3		37.9	
7	Total assembled thickness of No. 2 clutch	50		± 0.3		47.3	
8	Total assembled thickness of No. 3 clutch	30.5		± 0.2		28.9	
9	Total assembled thickness of No. 4 clutch	29.5		± 0.2		27.9	
10	Total assembled thickness of No. 5 clutch	29.5		± 0.2		27.9	
11	Thickness of No. 1 — 5 clutch discs	5.0		± 0.1		4.5	
12	Thickness of No. 1 — 5 clutch plates	5.0		± 0.1		4.5	
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	

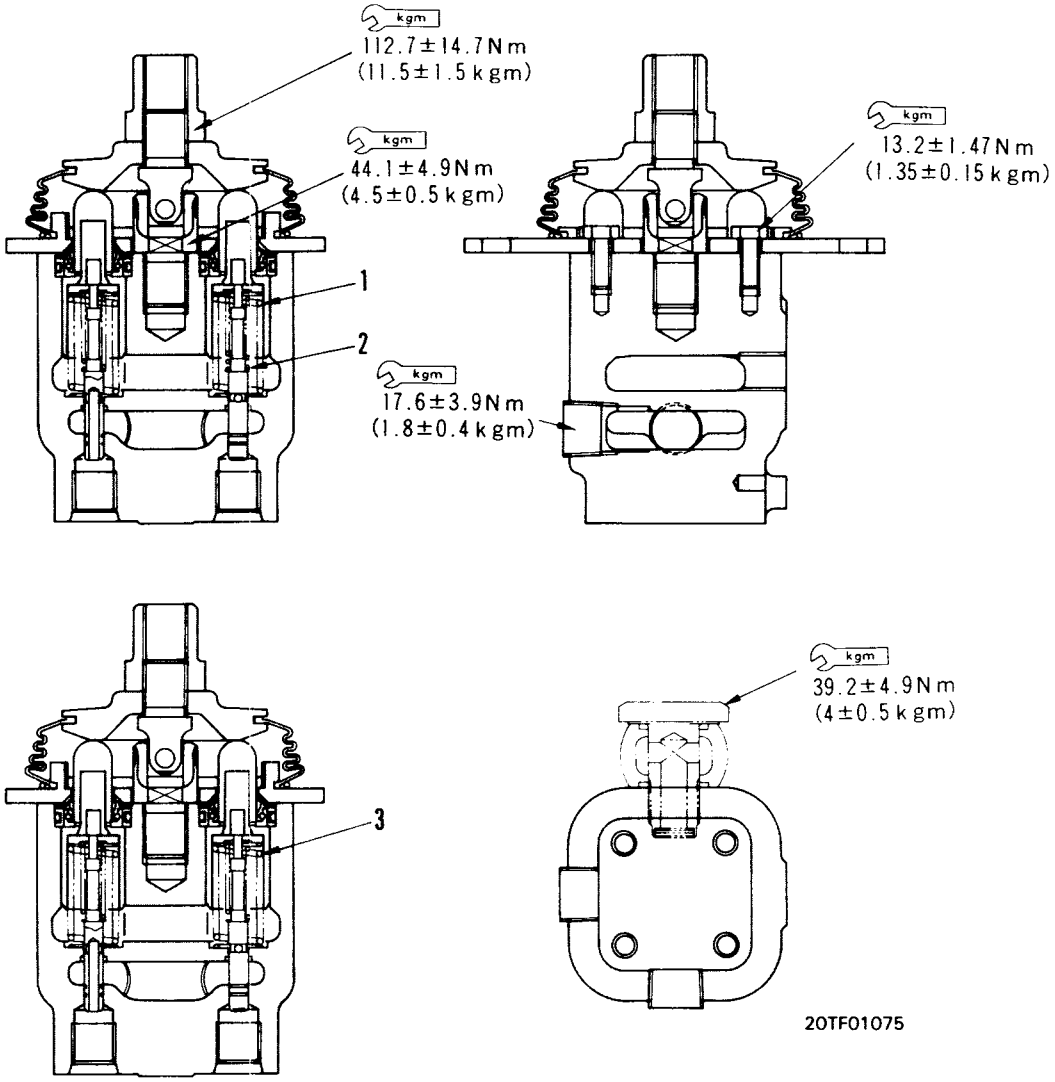
Unit: mm

No.	Check item	Criteria				Remedy
1	Thickness of brake plate	Standard size		Repair limit		Replace
		2.9		2.6		
	Distortion of brake plate	Tolerance		Repair limit		Correct or replace
		less than 0.15		0.3		
2	Thickness of brake disc	Standard size		Repair limit		Replace
		5.2		4.9		
	Distortion of brake disc	Tolerance		Repair limit		Correct or replace
		less than 0.25		0.4		
3	Total assembled thickness of brake plates and discs	Standard size		Repair limit		Replace
		37.6		34.9		
4	Backlash of brake disc and brake inner drum	Standard clearance		Clearance limit		
		0.3 — 0.7		1.0		
5	Backlash between gear A and gear B	0.26 — 0.64		0.80		
6	Backlash between gear A and gear D	0.21 — 0.51		0.70		
7	Backlash between gear C and gear D	0.25 — 0.63		0.80		
8	Backlash between gear D and pinion	0.19 — 0.48		0.70		
9	Backlash between sun gear and planet pinion	0.12 — 0.39		0.60		
10	Backlash between planet pinion and ring gear	0.17 — 0.52		0.70		
11	Backlash between bevel gear and pinion	0.25 — 0.33		0.50		Adjust or replace
12	Seal ring contact surface of small diameter portion of brake piston	Standard size	Tolerance		Standard clearance	Clearance limit	Replace
			Shaft	Hole		
		200	−0.100 −0.172	+0.072 0	0.100 — 0.244	—	
13	Preload of taper roller bearing for bevel gear shaft	Tighten bevel gear shaft nut 5 notches. Reference when assembling new bearing: Starting torque: 14.7 — 19.6 Nm (1.5 — 2.0 kgm) Load at tip of bevel gear teeth: 78.5 — 107.9 N (8.0 — 11.0 kg)				Adjust

014012

- **FOR BLADE LIFT, BLADE TILT, RIPPER LIFT**

D65E-12 60001 — 60947 **D65EX-12 60001 — 60941**
D65P-12 60001 — 60890 **D65PX-12 60001 — 60914**



014012

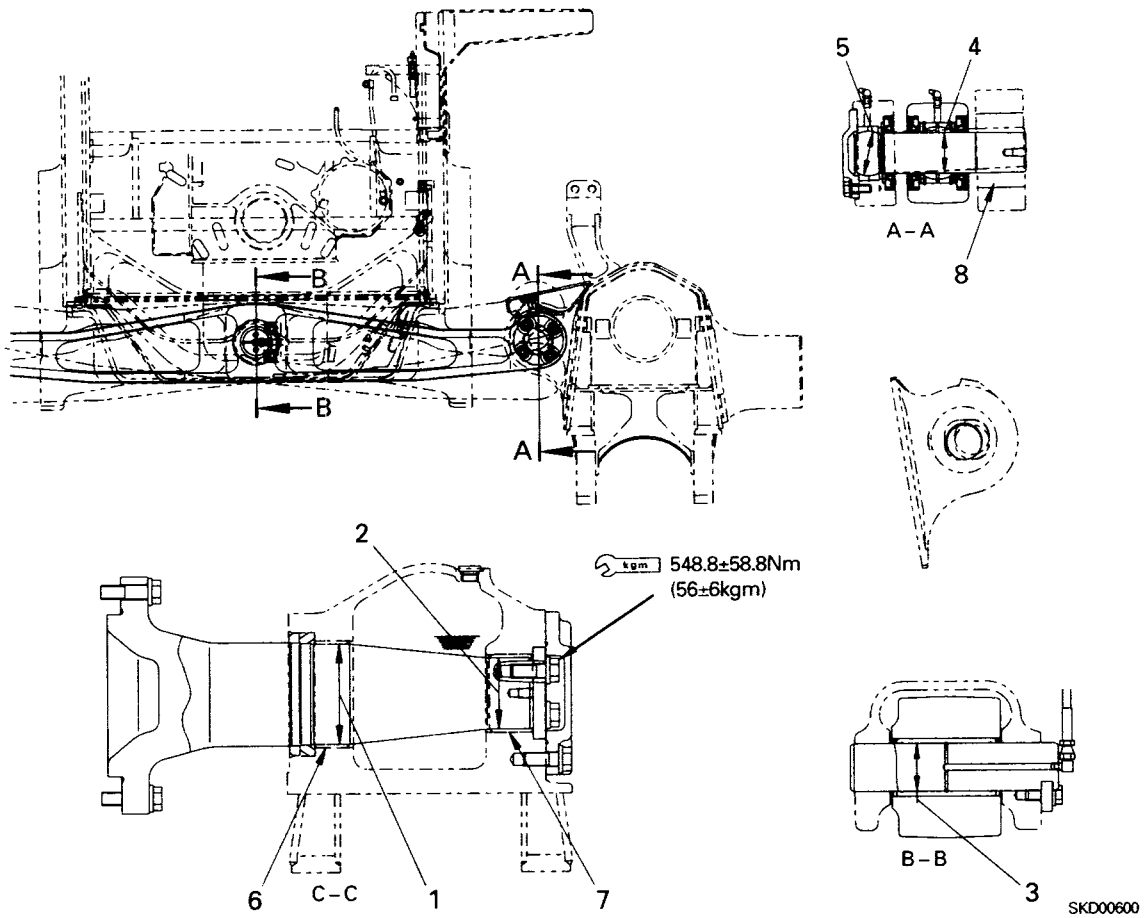
Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Centering spring (for P3, P4)	Free length X O.D.	Installed length	Installed load	Free length	Installed load	If there is any damage or deformation, replace spring
		50.4 X 15.5	34	55.9 N (5.7 kg)	—	45.1 N (4.6 kg)	
2	Metering spring	26.6 X 7.5	24.9	16.7 N (1.7 kg)	—	13.7 N (1.4 kg)	
3	Centering spring (for P1, P2)	50.1 X 15.5	34	71.6 N (7.3 kg)	—	56.9 N (5.8 kg)	

014012

Unit: mm

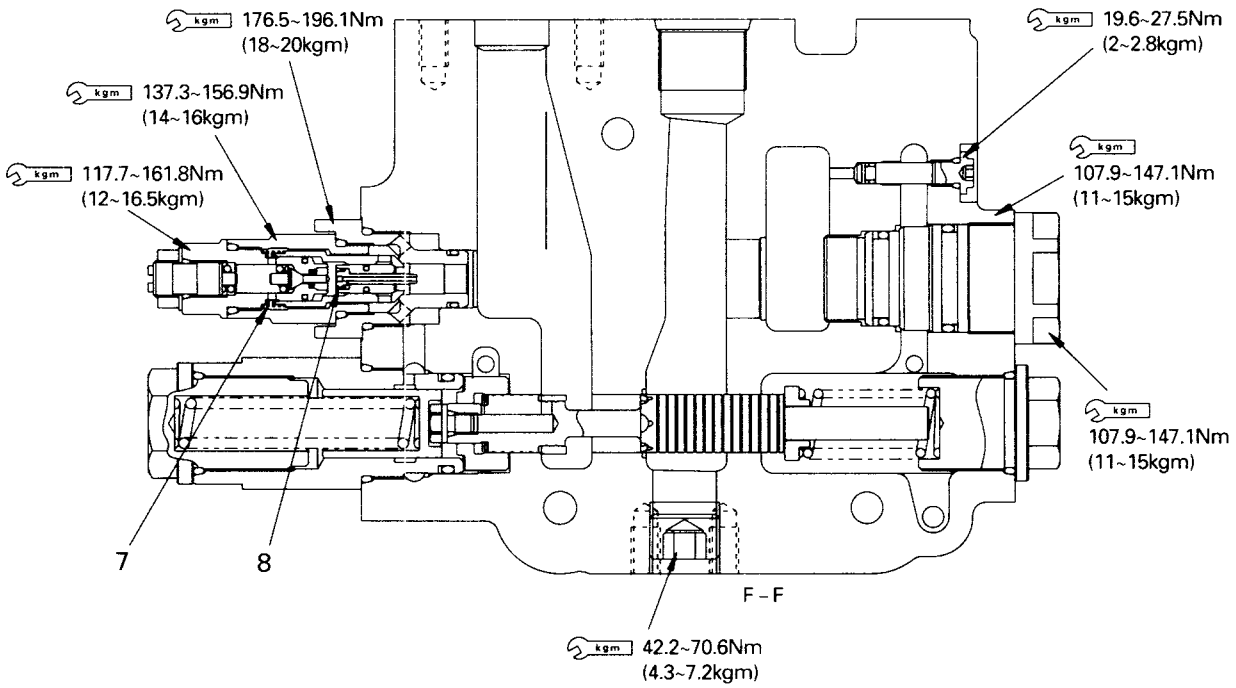
No.	Check item	Criteria					Remedy
1	Outside diameter of protruding portion of idler	Standard clearance: 630		Repair limit: —			Add metal or replace
2	Outside diameter of idler tread	590		570			
3	Depth of tread	20		30			
4	Thickness of tread	15		5			
5	Width of idler tread	44.5		48.5			
6	Overall width of idler	190		186			
7	Clearance between shaft and bushing	Standard size: 65	Tolerance: Shaft −0.250 −0.350	Tolerance: Hole +0.142 −0.008	Standard clearance: 0.242 — 0.492	Clearance limit: 1.5	Replace bushing
8	Play in axial direction	Standard clearance: 0.26 — 0.66		Clearance limit: —			Replace
9	Clearance between guide plate and frame plate	1.0		—			Adjust shim or replace
10	Clearance between support and frame plate	2.0		—			Replace
11	Standard thickness of side plate shim	4.0					Adjust



014012

Unit: mm

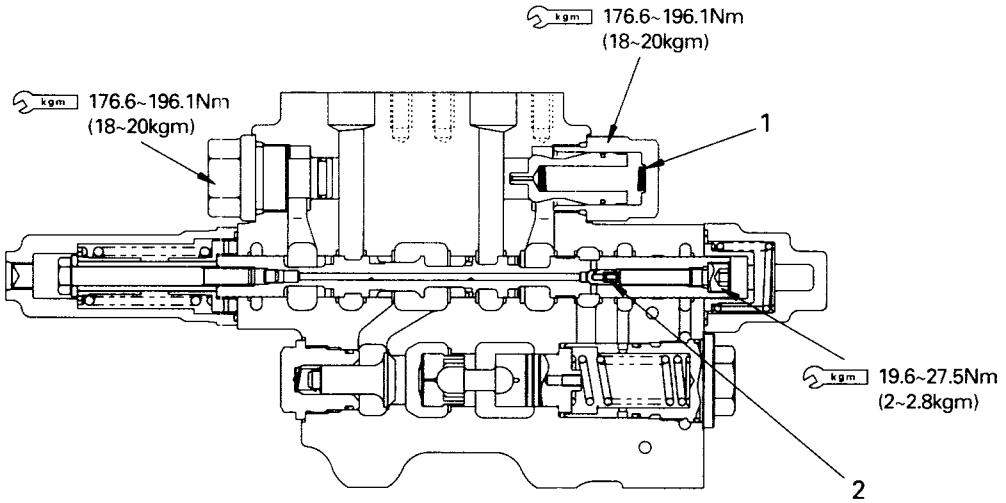
No.	Check item	Criteria					Remedy
		Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
1	Clearance between pivot shaft and bushing (inside)	148	−0.145 −0.208	+0.125 +0.085	0.230 — 0.333	1.0	Replace bushing
2	Clearance between pivot shaft and bushing (outside)	105	−0.120 −0.174	+0.107 +0.072	0.192 — 0.281	1.0	
3	Clearance between center pin and bushing	70	−0.100 −0.146	+0.25 +0.19	0.290 — 0.396	0.5	
4	Clearance between side pin and bushing	60	−0.048 −0.078	−0.002 −0.033	0.015 — 0.076	0.5	
5	Clearance between side pin and spherical surface of bushing	66	−0.1 −0.3	+0.3 +0.1	0.2 — 0.6	1.0	
6	Press fitting force of pivot shaft bushing (inside)	0.9 — 22.6 KN { 0.1 — 2.3 ton }					—
7	Press fitting force of pivot shaft bushing (outside)	0.9 — 36.3 KN { 0.1 — 3.7 ton }					
8	Press fitting force of side pin bushing	68.6 — 235.4 KN { 7 — 24 ton }					



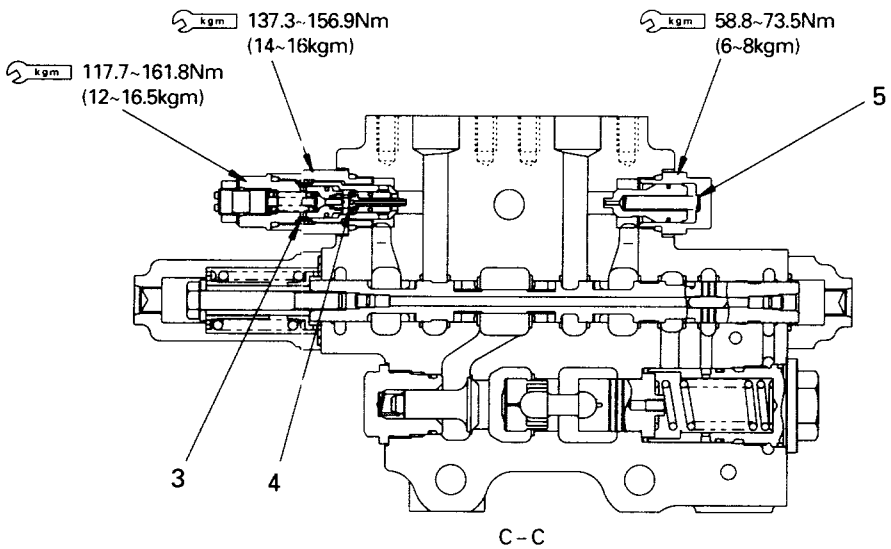
014012

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
		Free length X O.D.	Installed length	Installed load	Free length	Installed load	
1	Spool return spring	73.4 X 3.1	68.5	223.6 N (22.8 kg)	—	178.9 N (18.2 kg)	If there is any damage or deformation, replace spring
2	Spool return spring (lift valve only)	51.7 X 31.3	50	140.2 N (14.3 kg)	—	112.2 N (11.4 kg)	
3	Spool return spring (for lift FLOAT)	65.3 X 36.5	33.5	335.4 N (34.2 kg)	—	268.3 N (27.4 kg)	
4	Load check valve spring	20.8 X 10.2	13.5	12.7 N (1.3 kg)	—	10.2 N (1.0 kg)	
5	Unload spring	87.2 X 26	53.1	442.3 N (45.1 kg)	—	353.8 N (36.1 kg)	
6	Cancel spring	118.4 X 19.5	92.5	443.3 N (45.2 kg)	—	354.6 N (36.2 kg)	
7	Relief valve spring	16.3 X 21.3	9	2.16 N (0.22 kg)	—	1.01 N (0.10 kg)	
8	Relief valve spring	20 X 7	13.7	1.27 N (0.13 kg)	—	19.0 N (1.94 kg)	



D-D



C-C

SKD00615

014012

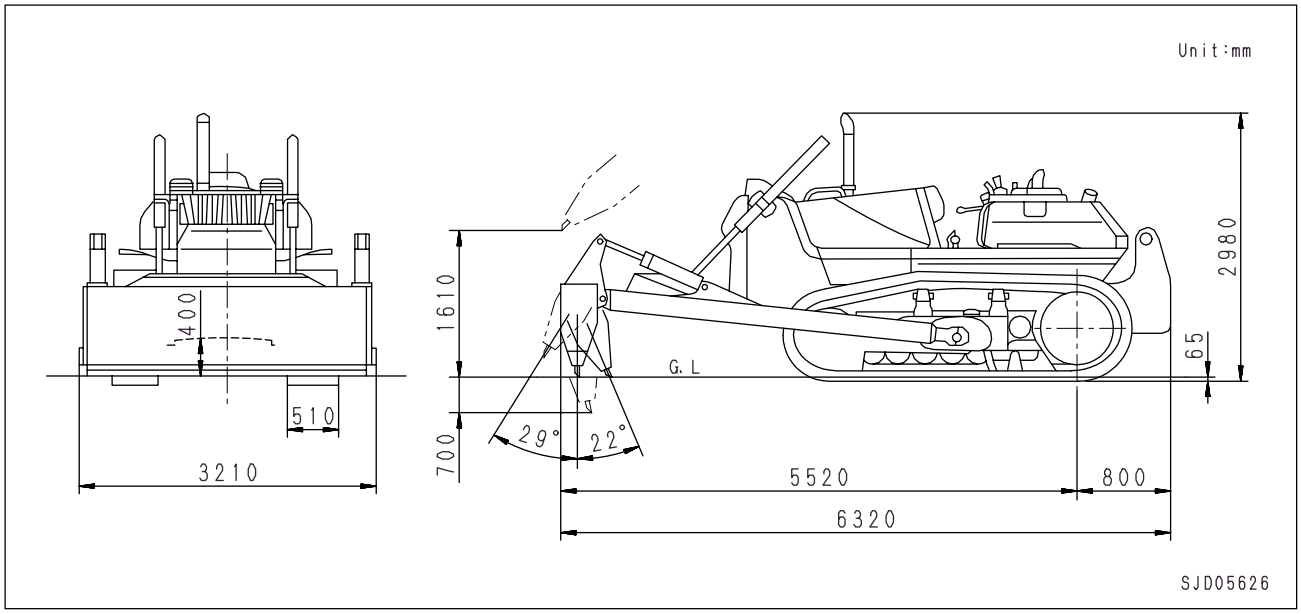
Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Suction valve spring	Free length X O.D.	Installed length	Installed load	Free length	Installed load	If there is any damage or deformation, replace spring
		64.9 X 12.5	56	6.4 N (0.65 kg)	—	5.1 N (0.52 kg)	
2	Check valve spring inside spool	9.4 X 4.6	8.5	0.3 N (0.03 kg)	—	0.24 N (0.02 kg)	
3	Suction safety valve spring	16.3 X 21.3	9	2.16 N (0.22 kg)	—	1.73 N (0.18 kg)	
4	Suction safety valve spring	20 X 7	13.7	1.27 N (0.13 kg)	—	1.01 N (0.10 kg)	
5	Suction valve spring	46.8 X 7.5	40.6	5.5 N (0.56 kg)	—	4.4 N (0.45 kg)	

SPECIFICATIONS

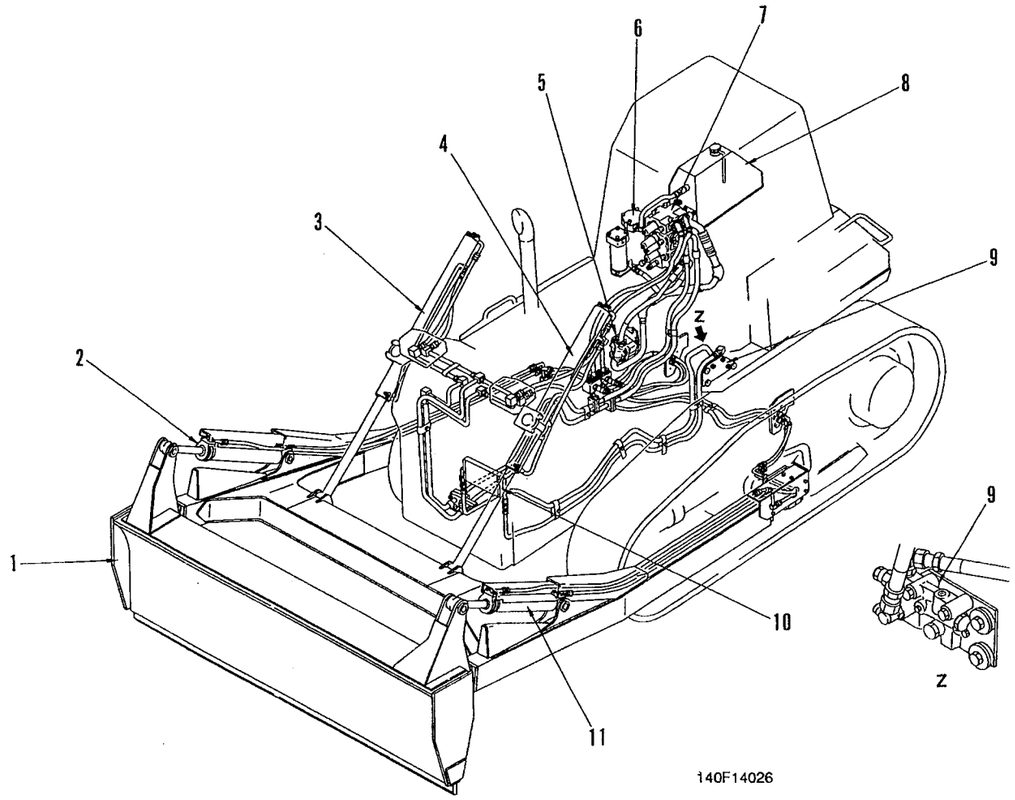
SPECIFICATION DRAWING

- D65E, D65EX-12 Trimming dozer



WORK EQUIPMENT HYDRAULIC PIPING DIAGRAM

TRIMMING DOZER



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1. Blade
2. Right trimming cylinder
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. Oil cooler
11. Left trimming cylinder

014012