TTLA-0520-LX

HITACHI

Training Text

LX70-7 LX80-7

Operational Principle

Hitachi Construction Machinery Co., Ltd.
Technical Training Center

		LX70-7	LX80-7
Rear overhang angle	°	32	33
Min. ground clearance, center hinge pin	mm [in.]	365 [14.4]	375 [14.8]
Bucket hinge pin height	mm [in.]	3515 [138.4]	3615 [142.3]
Dumping height, at 45° discharge angle	mm [in.]	2710 [106.7]	2750 [108.3]
Reach, at 45° discharge angle	mm [in.]	1020 [40.2]	1040 [40.9]
Bucket roll angle, in carry position	°	48	48
Bucket dumping angle, bucket fully raised	°	48	48
Towing pin height	mm [in.]	980 [38.6]	1070 [42.1]
Weight			
Weight of the loader	kg [lbs]	6625 [14610]	8215 [18110]

1.5 INTAKE AND EXHAUST SYSTEM

	LX70-7 (BB-4BG1T)	LX80-7 (DD-4BG1T)
Air cleaner	Cyclone filter paper type (8”)	←
Muffler	Porous separators	←
Turbocharger		
Name	TD04HL	TD04H
Turbocharging	Exhaust turbocharger	←
Lubrication	Forced circulation, oil cooled	←

1. General Description

The intake system of the engine is designed so that the outside open air is drawn through the air cleaner into the inlet manifold. The air cleaner is equipped with a dust indicator. The element needs to be cleaned when the warning light comes on.

The exhaust system is designed so that the exhaust gas from the exhaust manifold is passed through the muffler where the pressure and temperature of the exhaust gas are lowered, and discharged through the tail pipe into the atmosphere.

⚠ Be careful not to touch the muffler or exhaust manifold since they are hot when the engine is running or for a while after it is shut off; otherwise you might burn your hand.

Turbocharger

It is possible to attain high engine output by sending highly compressed air into the cylinders on the intake stroke to increase air supply, thus increasing the quantity of fuel to be injected. To achieve this purpose, the L13-2 and L16-2 are equipped with an exhaust-driven turbocharger.

The turbocharger’s exhaust gas inlet is connected to the exhaust manifold. The exhaust gas rotates the turbine wheel at a high speed, before being routed through the exhaust gas outlet into the muffler.

Therefore, the impeller, mounted on the opposite end of the same shaft as the turbine, also rotates at a high speed to compress the air drawn through the air cleaner and sends it to the intake manifold.

2. Hydrostatic Transmission (HST)

The operating principle of the general hydrostatic transmission (HST) which uses a variable capacity axial piston pump and motor for the HST pump and HST motor, respectively is given below.

(1) Operation of HST Pump

1. When the sliding surface of the swash plate is flat and positioned vertically, the system stands neutral and no oil is discharged. Even if the drive shaft rotates, the suction and discharge of oil is not performed, despite the rotation of the cylinder block.

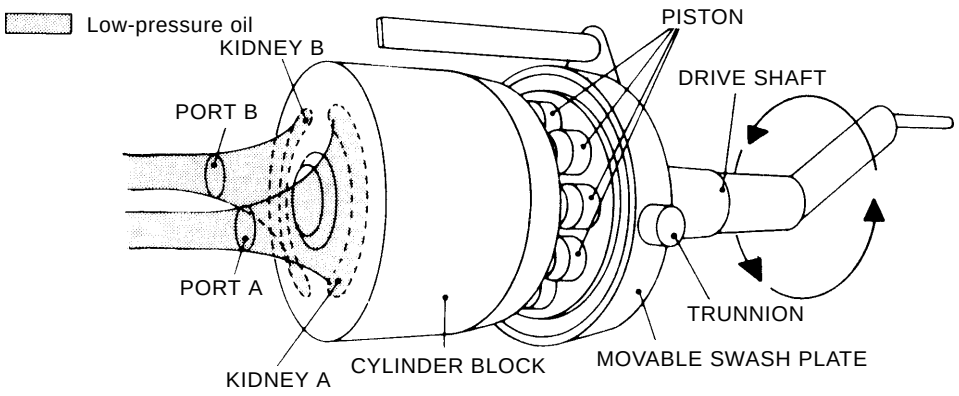


Fig. 2.4 Neutral

2. When the swash plate angle control lever is shifted to the left, the cylinder block turns enough to pass beyond the kidney B to draw oil into the piston holes. When the cylinder block turns to pass beyond the kidney A, pressure oil is discharged from the piston holes. When the cylinder block turns continuously, oil is sucked through port B leading to the kidneys, being discharged through port A.
3. The volume of oil to be sucked and discharged depends upon the piston stroke or the tilting angle of the swash plate. The discharge volume of oil is reduced by reducing the tilting angle of the swash plate and is increased by increasing the tilting angle.

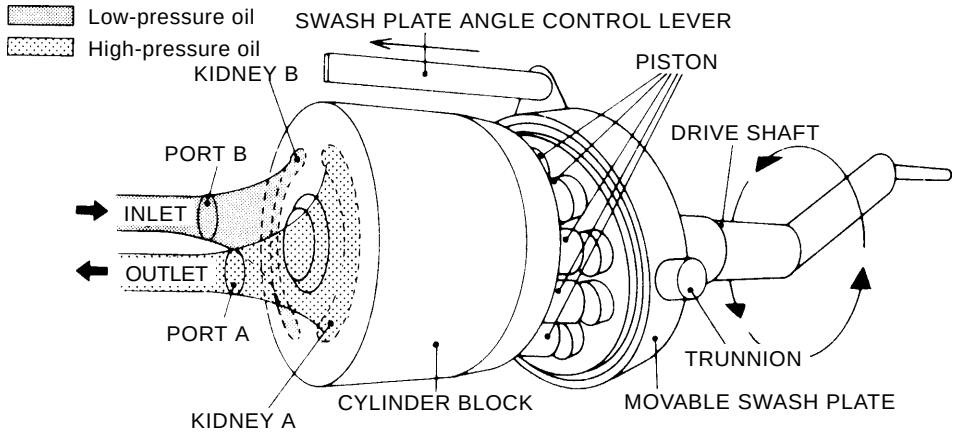
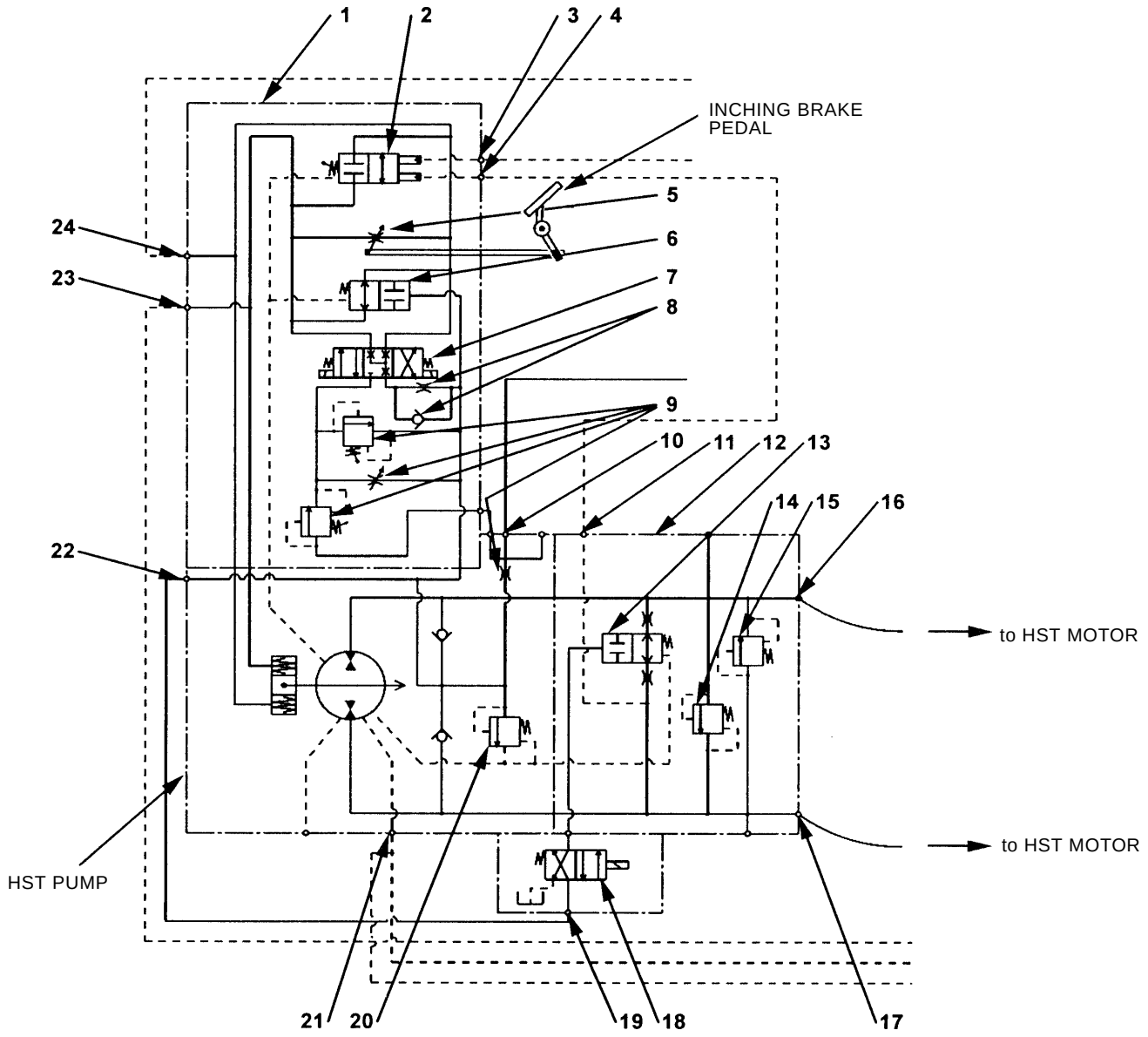


Fig. 2.5 Pump Operation (1)



1. PUMP COMBINATION VALVE 1
2. CUT-OFF VALVE
3. from MAIN STEERING CIRCUIT
4. PUMP SELF-DISCHARGE PRESSURE PORT (from PUMP COMBINATION VALVE 2)
5. INCHING VALVE
6. CONTROL PRESSURE BYPASS VALVE
7. FNR SOLENOID VALVE
8. PUMP TILT-ROLLING SPEED CONTROL VALVE
9. REGULATOR
10. from HST CHARGING PUMP
11. PUMP SELF-DISCHARGE PRESSURE PORT (to PUMP COMBINATION VALVE 1)
12. PUMP COMBINATION VALVE 2
13. NEUTRAL DAMP VALVE
14. RELIEF VALVE (FOR REV)
15. RELIEF VALVE (FOR FWD)
16. PORT B
17. PORT A
18. NEUTRAL DAMP SOLENOID VALVE
19. CHARGE PORT (from PUMP CASING)
20. CHARGE RELIEF VALVE
21. DRAIN PORT (to HST MOTOR)
22. CHARGE PORT (to NEUTRAL DAMP SOL VALVE)
23. PUMP TILT-ROLLING CONTROL PRESSURE PORT (FOR REV)
24. PUMP TILT-ROLLING CONTROL PRESSURE PORT (FOR FWD)

Fig. 2.16 HST Pump (Circuit Diagram)

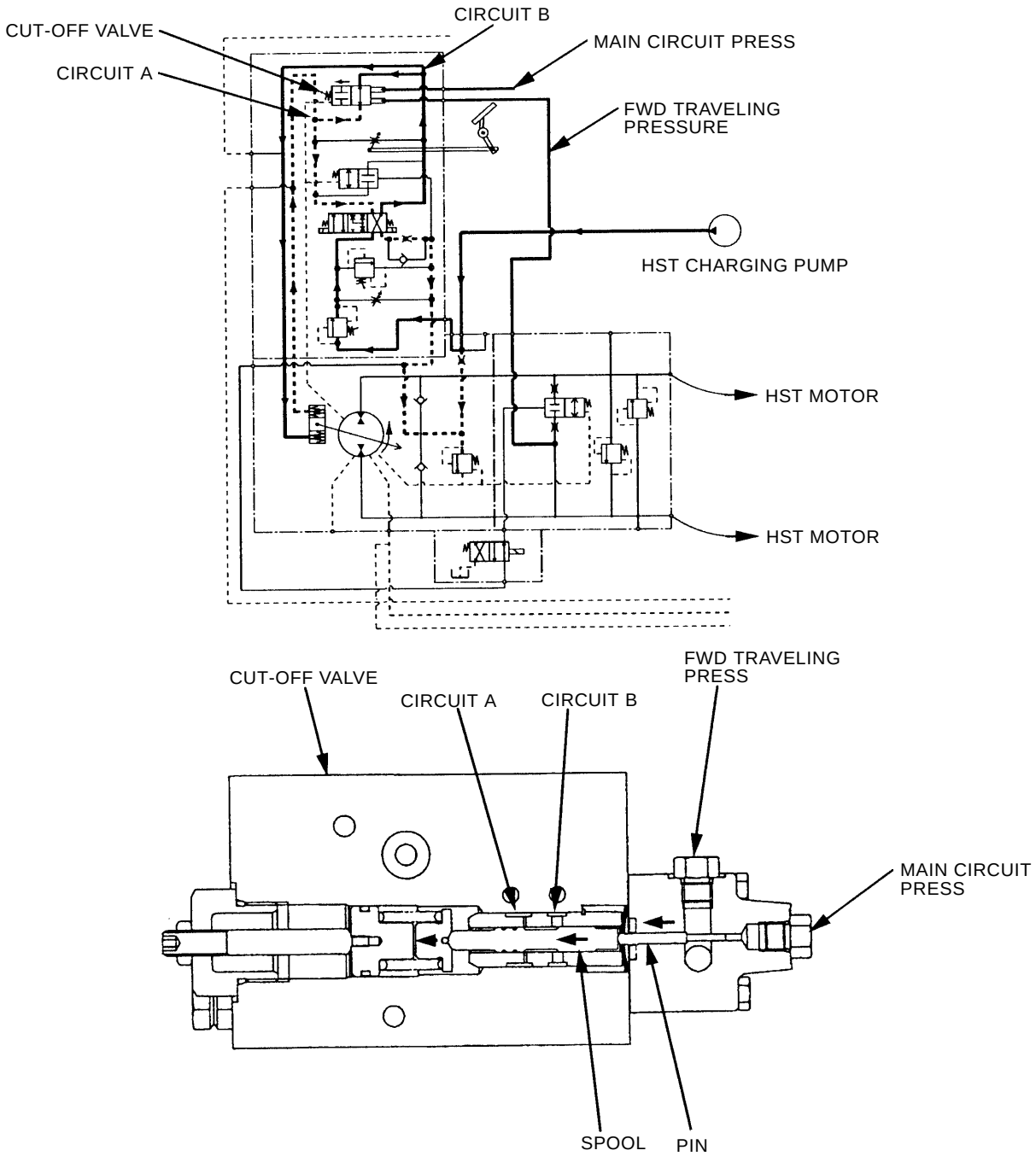
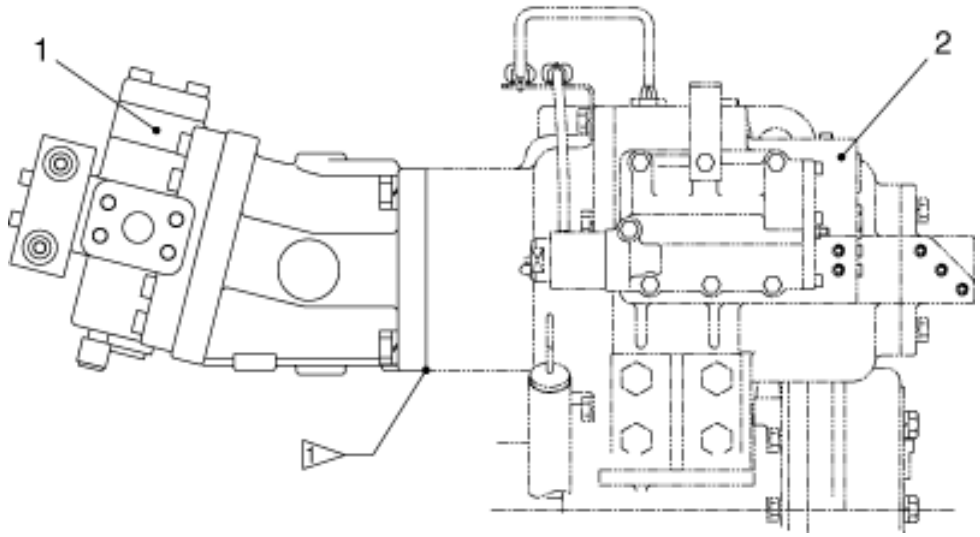


Fig. 2.29 Control by Cut-off Valve

2.3 HST MOTOR

	LX70-7	LX70-7
Model	A6V86HA	A6V115HA
Type	Variable delivery piston motor (inclined shaft type)	←
Discharge (suction)	33.5 – 86.3 cc/rev [0.00885 – 0.0228 gal/rev]	38.0 – 114.7 cc/rev [0.01004 – 0.0303 gal/rev]
Control	HA (high-pressure dependent, constant pressure control)	←
Weight	46 kg [101 lbs]	49 kg [108 lbs]



Note: ▷1 Mating surfaces: LOCTITE #5127 or 515

1. HST MOTOR
2. (TRANSMISSION)

Fig. 2.39 HST Motor

2.3.5 STOCK-PILE & SNOW (S&S) MODE (OPTION FOR LX80-7)

The fact that the engine output is constant means that the force available for lifting booms becomes smaller when a great traveling power is used. By contrast, the boom lifting force available becomes greater when the traveling power is small. The traveling power and the bucket break-out force are well matched. The S&S mode is activated by turning the S&S mode switch on with the Hi-Lo switch at the Lo position.

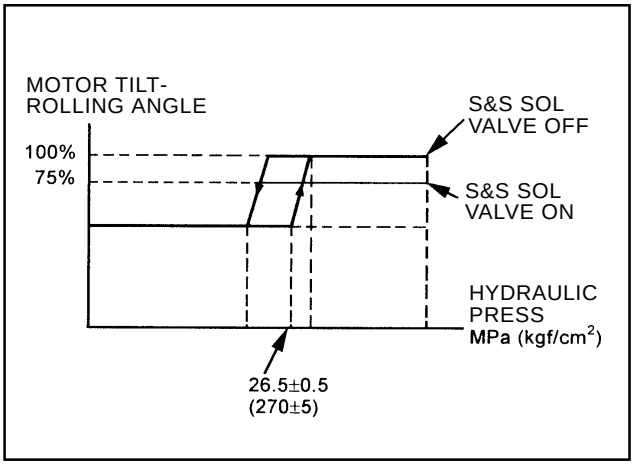


Fig. 2.49 Relationship of Tilt-rolling Angle and Hydraulic Pressure in S&S mode

When the S&S mode is turned on, the maximum traveling power is suppressed to 75% of that obtained when the S&S mode is OFF. Therefore, with the S&S mode turned on, the boom lifting force in digging operation (composite operation of scooping and traveling) becomes greater than that obtained when the S&S mode is off.

For this reason, the scooping is easier to do when the S&S mode is off. In addition, since the maximum traveling power is suppressed to 75%, snow removal operation can also be performed and easily and efficiently.

Operation

1. When the HST motor working pressure is more than 26.5 ± 0.5 MPa {270 ± 5 kgf/ cm^2} [3844 ± 73 psi], the hydraulic pressure overcomes the regulator spring force to push down the pilot piston. This allows the ports A and B to connect to each other so that the motor hydraulic oil flows, passing through the port B, into the large-diameter chamber of the servo piston. The HST motor hydraulic oil also flows, passing through the port C, to the small-diameter chambers of the servo piston and control piston. Since there is a difference in area between the large-diameter chamber and the small-diameter chamber of the servo pistons, the servo pistons move upward.
2. When the Hi-Lo switch is in the Lo position, the Hi-Lo solenoid valve relay is energized by the controller to energize the Hi-Lo solenoid valve, thus letting the loader traveling at low speed.
   When the S&S mode switch is turned on, the S&S mode relay is energized by the controller to energize the S&S mode solenoid valve.
3. As the S&S solenoid valve spool is moved, the port C is connected to the port D so that the working pressure of the motor acting on the regulator pilot piston flows, passing through the ports C and D, into the large-diameter chamber of the control piston.
   The area differential between the large-diameter chamber and the small-diameter chamber of the control piston forces the control piston downward.
4. When the control piston moves down, it serves as a stopper for the servo piston. When the servo piston moves upward, the tilt-rolling amount of the motor becomes larger. However, with the control piston down, the servo piston comes in contact with the control piston and stops there. Therefore, the traveling motor's maximum tilt-rolling angle is suppressed to 75% to suppress the traveling power.

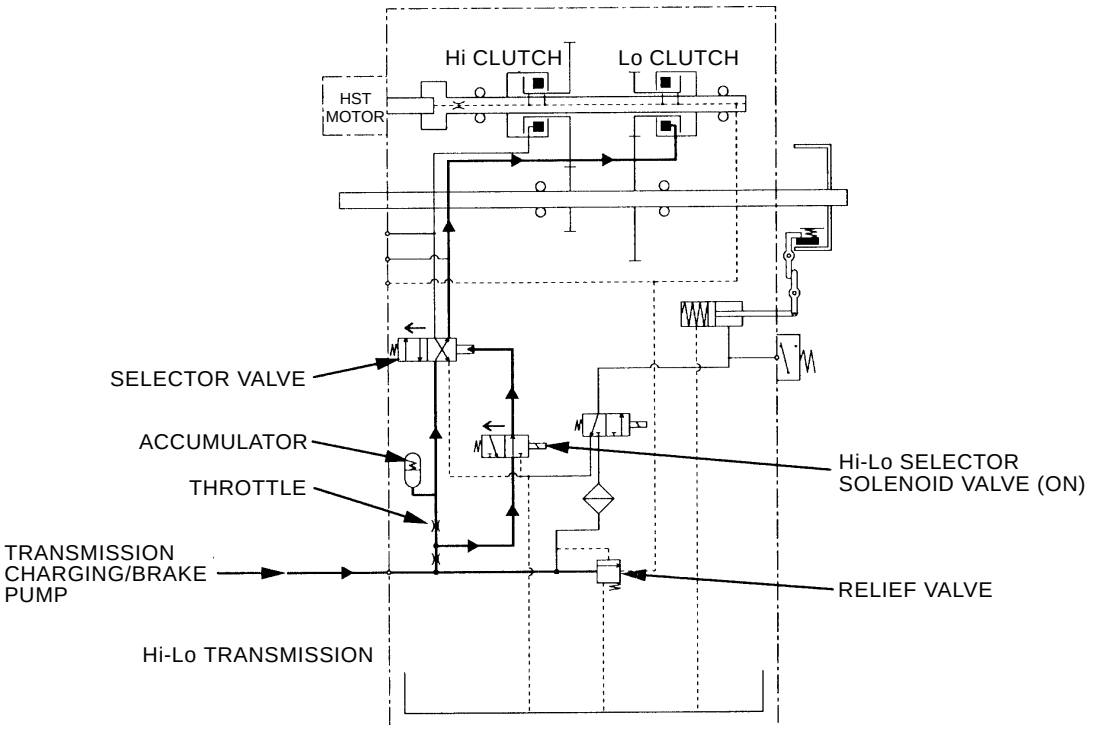


Fig. 2.60 Low Speed

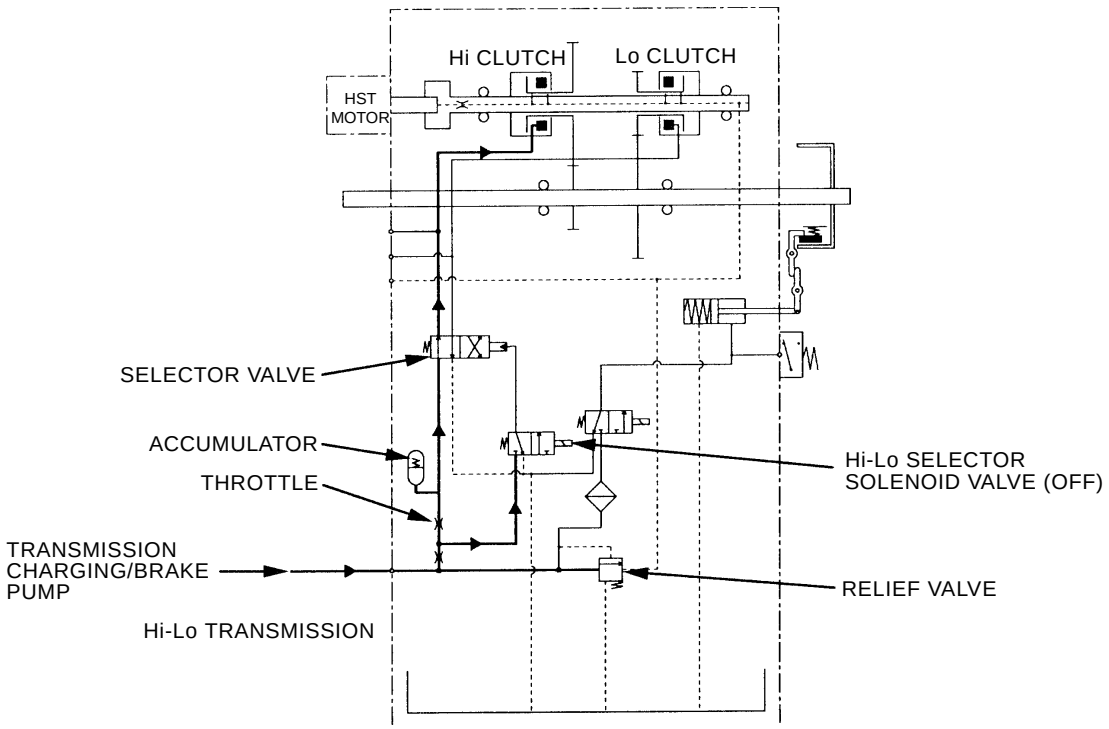
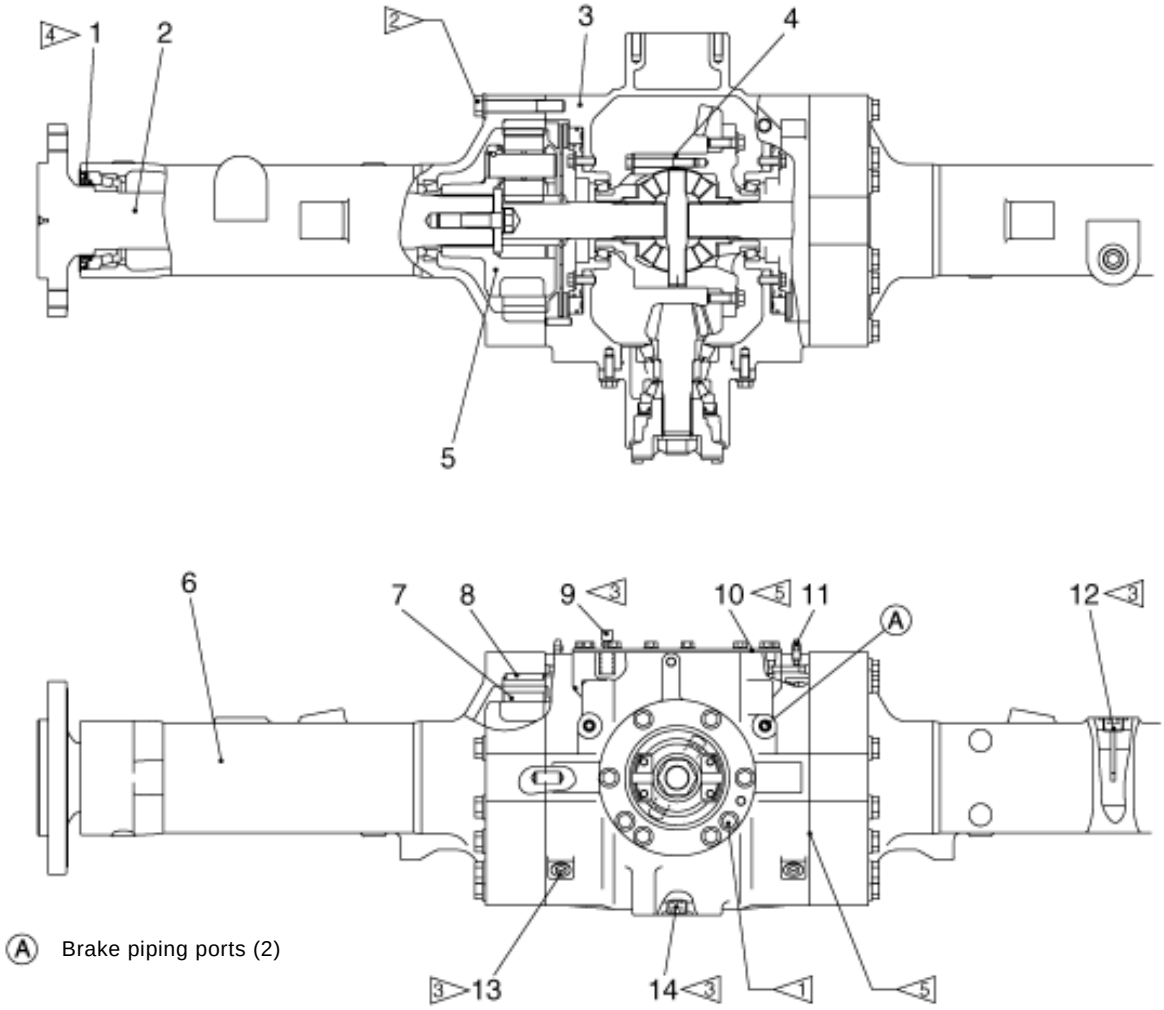


Fig. 2.61 High Speed

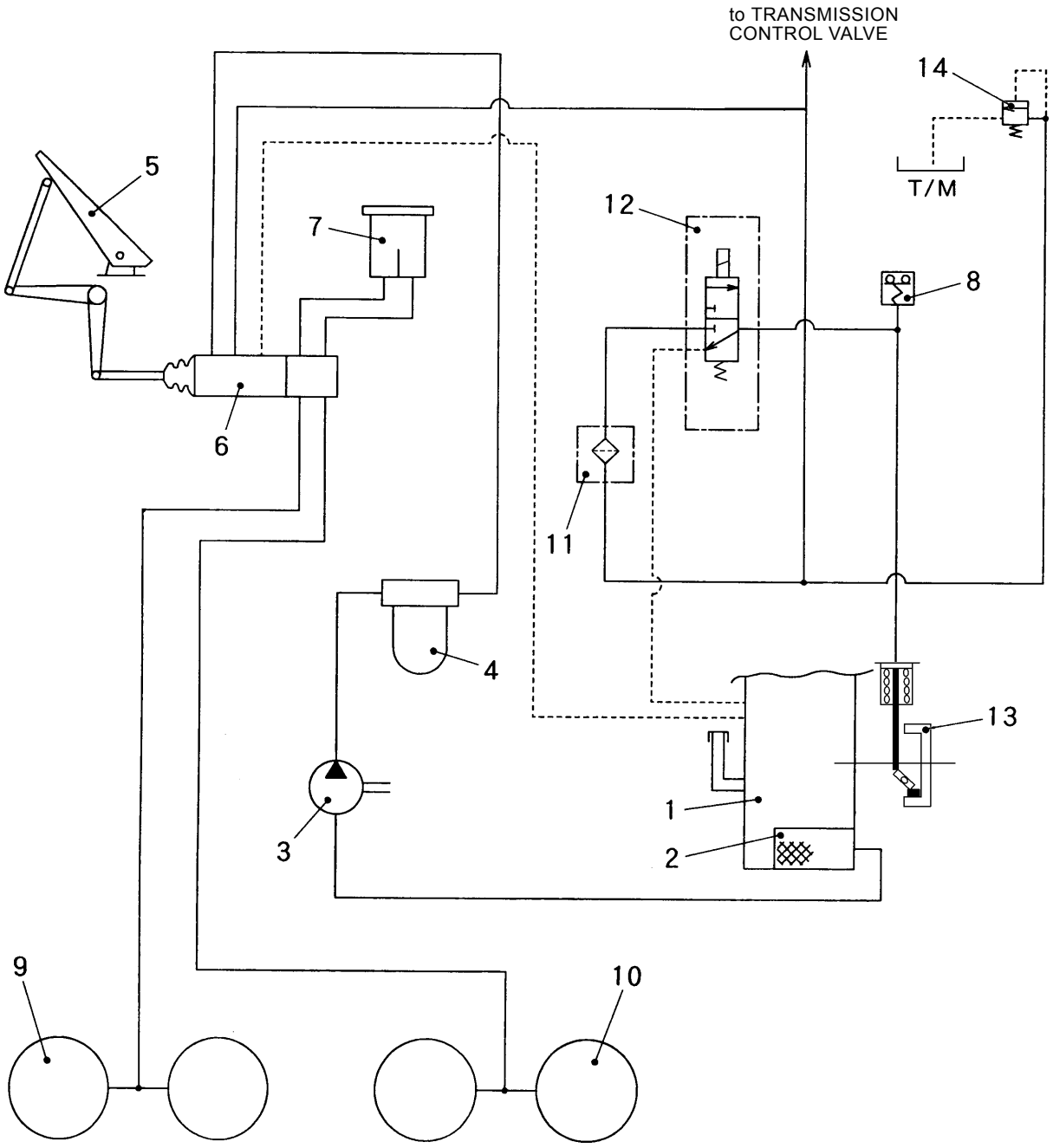


Note: 1 88 N-m {9 kgf-m} [64.9 lbf-ft], Threaded area: LOCTITE #262
2 225 N-m {23 kgf-m} [166.0 lbf-ft], Threaded area: LOCTITE #262
3 Threaded area: LOCTITE #572
4 Lip: Grease
5 Mating surfaces: LOCTITE FMD-127

1. OIL SEAL
2. AXLE SHAFT
3. DIFFERENTIAL BODY
4. DIFFERENTIAL
5. FINAL REDUCTION GEAR ASSEMBLY
6. AXLE TUBE
7. RING GEAR
8. PIN
9. BREATHER
10. COVER
11. BLEEDER
12. OIL DIPSTICK
13. PLUG (CHECK PORT)
14. DRAIN PLUG

Note: The sketches show the rear axle of the LX70-7. The rear axle of the LX80-7 has the same structure as that of the LX70-7.

Fig. 2.69 Rear Axle

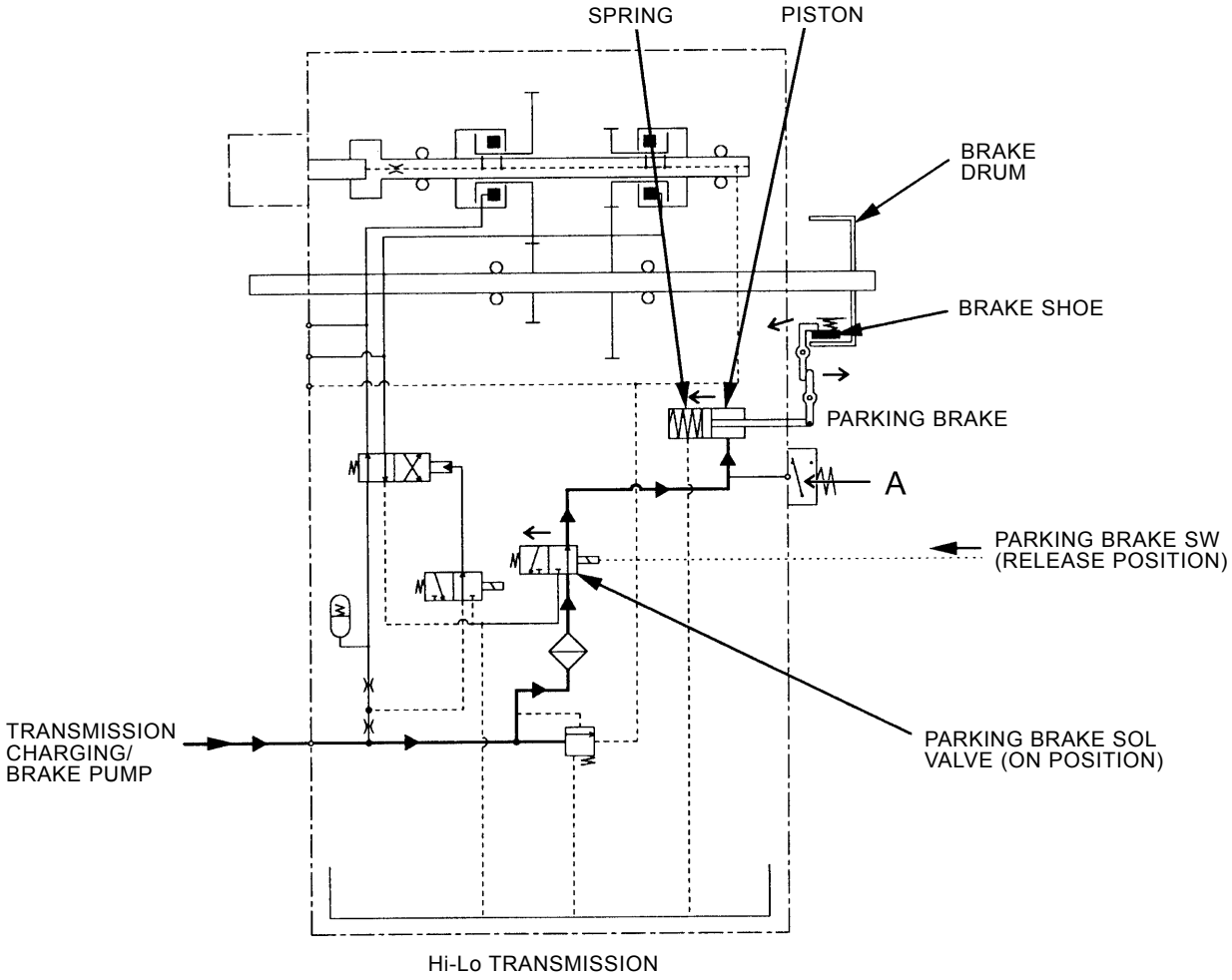


1. TRANSMISSION
2. STRAINER
3. TRANSMISSION CHARGING PUMP
4. TRANSMISSION INLINE FILTER
5. BRAKE PEDAL
6. BRAKE VALVE
7. BRAKE OIL TANK
8. PRESSURE SWITCH
9. DISK BRAKE (FRONT)
10. DISK BRAKE (REAR)
11. FILTER
12. PARKING BRAKE SOL VALVE
13. PARKING BRAKE
14. RELIEF VALVE

Fig. 3.2 Brake Oil Pressure Circuit Diagram

3.2.1 GENERAL DESCRIPTION (BRAKE LINE)

The parking brake is an internal expansion drum brake and installed on the transmission output shaft. The parking brake is operated with the parking brake switch in the operator's compartment.



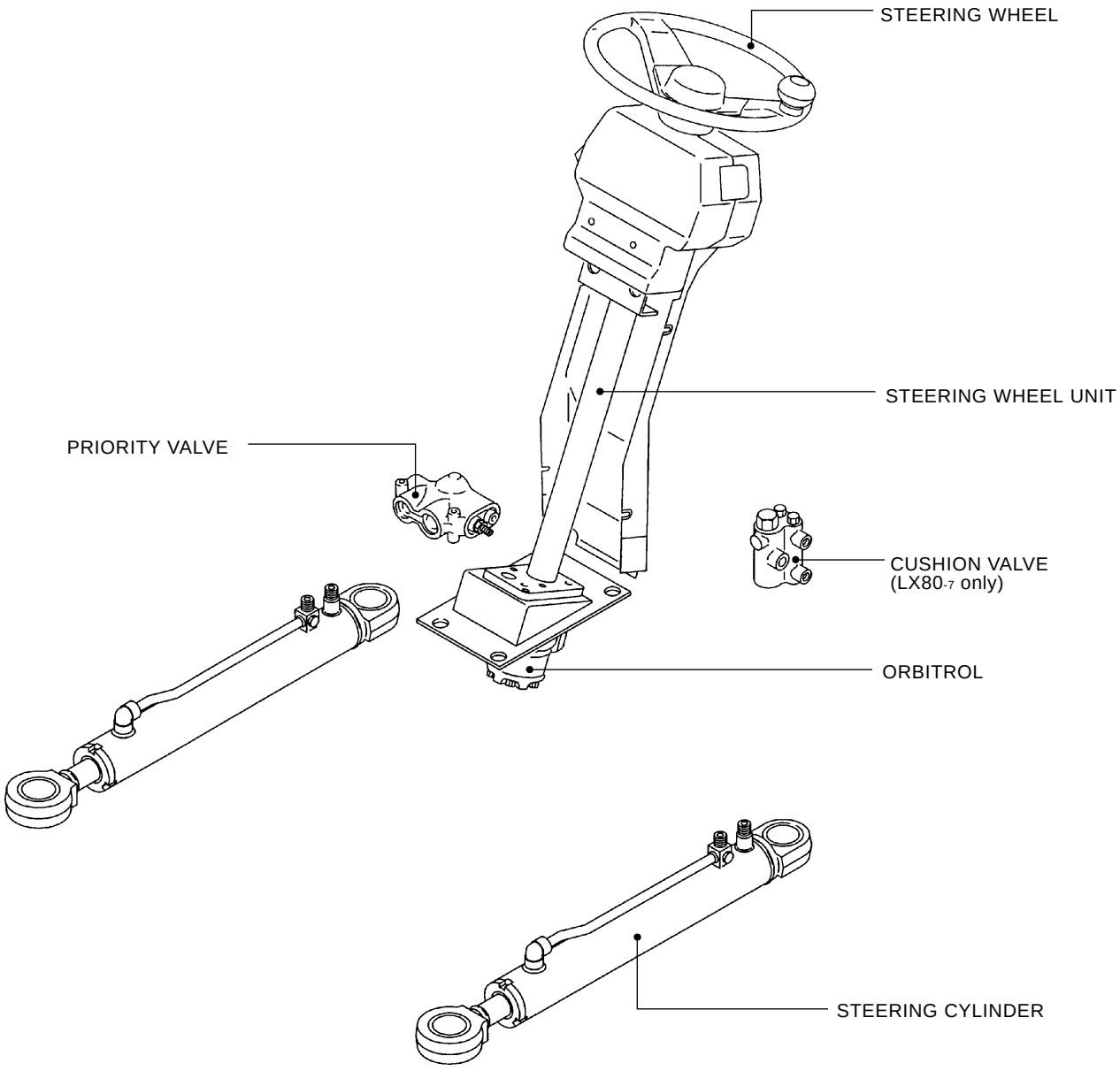
Position	Name	Use	Specification
Ⓐ	Pressure switch (parking brake switch)	Transmission clutch cut-off and "parking brake" indication light	OFF: 0.64 MPa {6.5 kgf/cm^2} [92.8 psi] ON: 0.27 MPa {2.8 kgf/cm^2} [39.2 psi] The switch is turned on at atmospheric pressure.

Fig. 3.13 Parking Brake Line

The steering mechanism is orbitrol type (full-hydraulic power steering) which does not use any linkage mechanism, but operates on hydraulic power alone.

The steering system consists of the steering wheel unit, orbitrol, priority valve, cushion valve (LX80-7 only), steering cylinders and hydraulic piping.

⚠ **If the pressure oil is not supplied from the pump for any reason such as when the engine stalls, the orbitrol acts as a manual steering system, thus making it possible to steer the loader. However, note that steering operation is considerably harder than usual.**



Note: The above sketch does not illustrate the hydraulic piping.
For the hydraulic piping, refer to "6. HYDRAULIC SYSTEM."

Fig. 4.2 Steering System

(2) Steering wheel in neutral (engine running)

1. The pressure oil from the main pump flows, passing through the priority valve P port, CF port, into the orbitrol. The oil then flows, passing through the internal throttle C0 and T port, back into the oil tank.
2. At this time, the pressure differential produced across the internal throttle C0 of the orbitrol is also transmitted to both the pressure chambers (A) and (B) so that the spool (1) moves to the right in the figure.
3. Therefore, the priority valve' EF port is fully closed while the CF port is slightly opened. This lets almost all portion of the oil discharged from the main pump flow to the control valve for operating the load handling system.

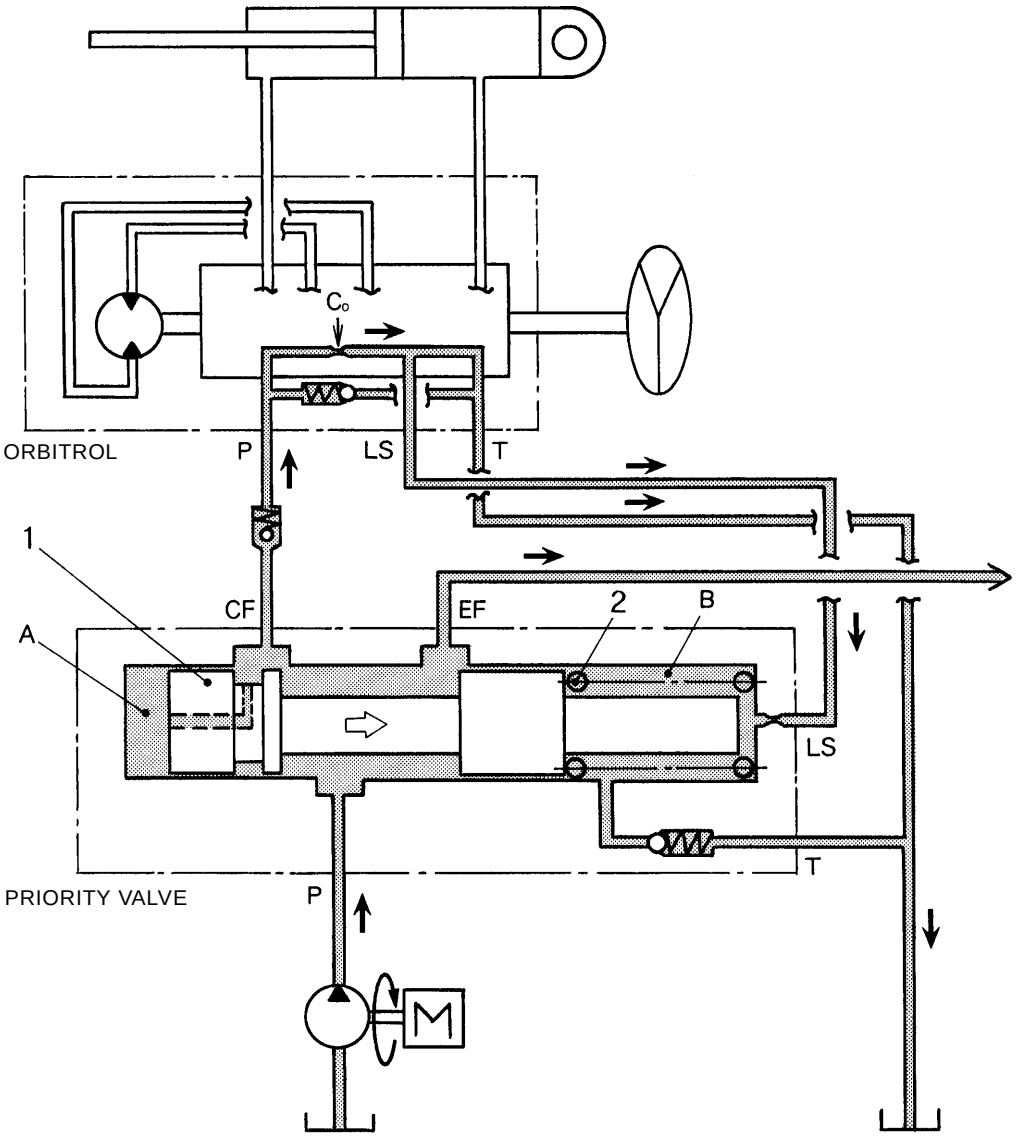
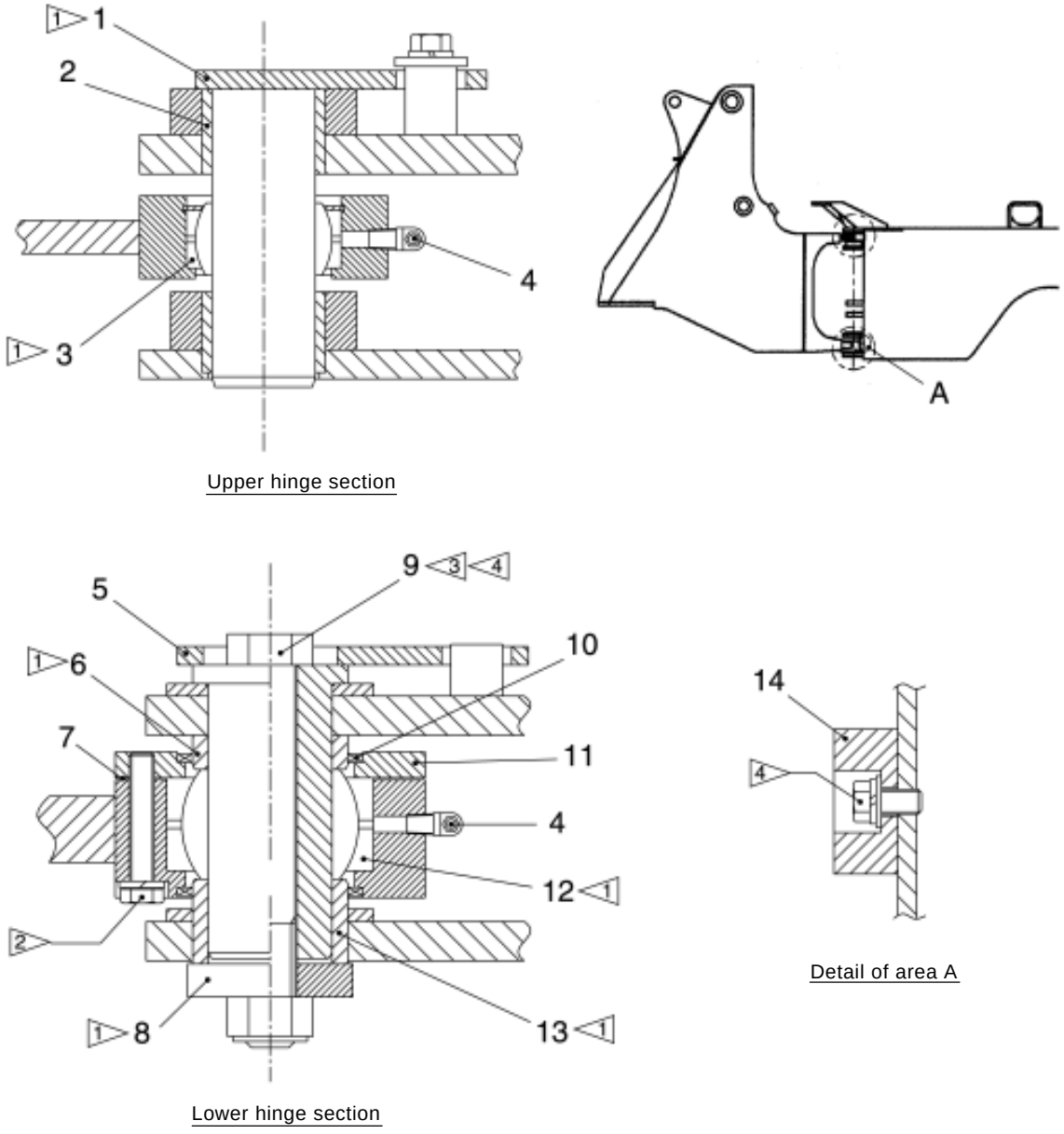


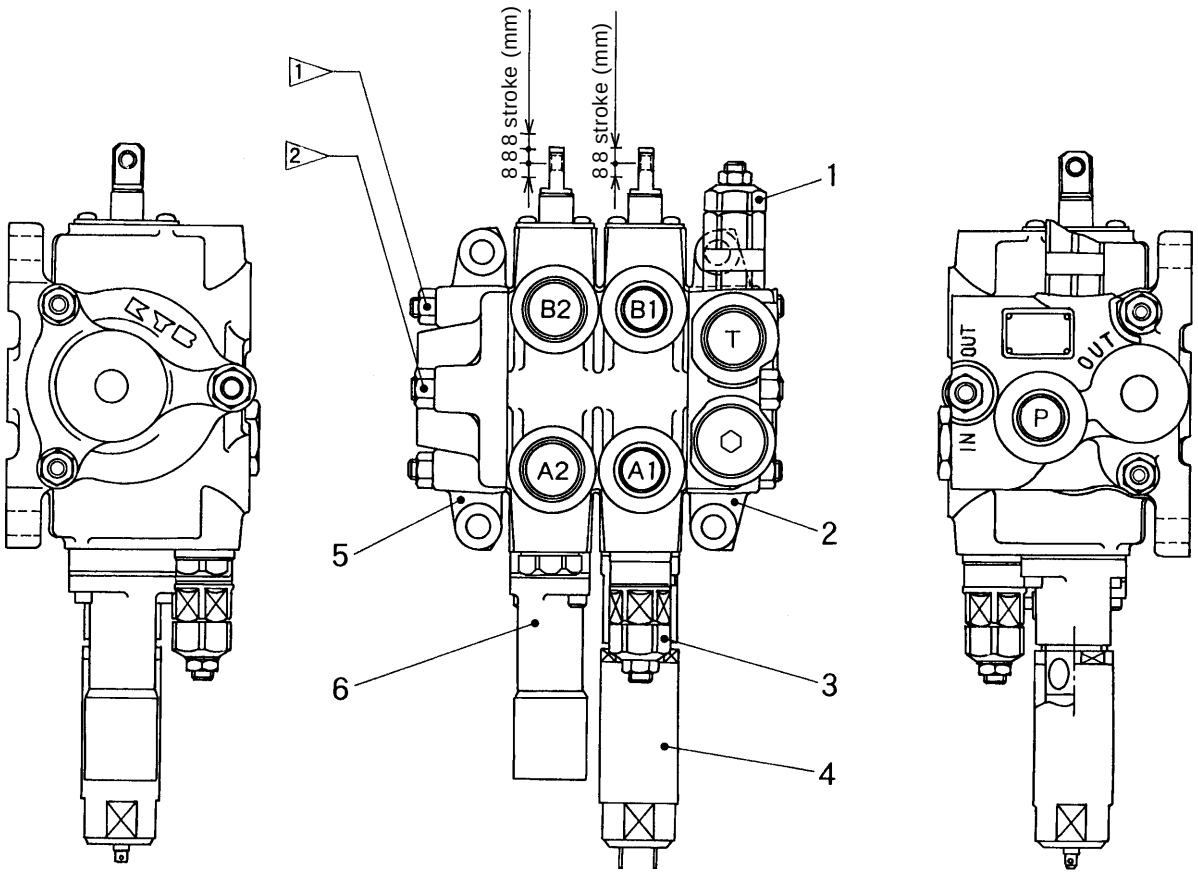
Fig. 4.14 Steering Wheel in Neutral (engine running)



Note: ▷1 Inner surface: Grease (before installing pin)
▷2 34.3 ± 2.9 N-m {3.5 ± 0.3 kgf-m} [25.3 ± 2.14 lbf-ft]
▷3 548.8 ± 39.2 N-m {56.0 ± 4.0 kgf-m} [404.8 ± 28.9 lbf-ft]
▷4 Threaded area: LOCTITE #262

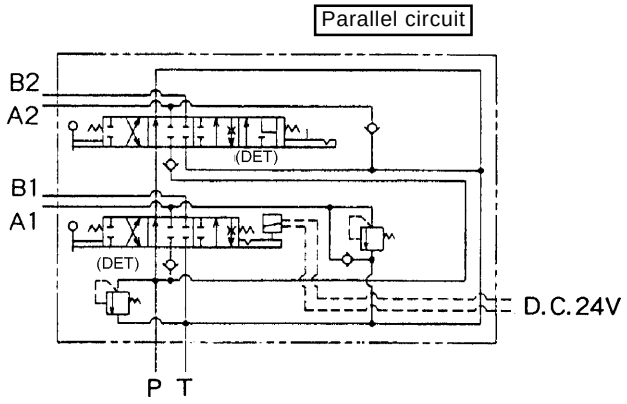
1. UPPER HINGE PIN
2. BUSHING
3. BUSHING
4. GREASE FITTING
5. LOWER HINGE PIN
6. COLLAR
7. SHIM
8. FLANGE
9. U-NUT
10. DUST SEAL
11. CAP
12. BUSHING
13. COLLAR
14. RUBBER

Fig. 5.3 Center Hinge Pin (LX70-7)



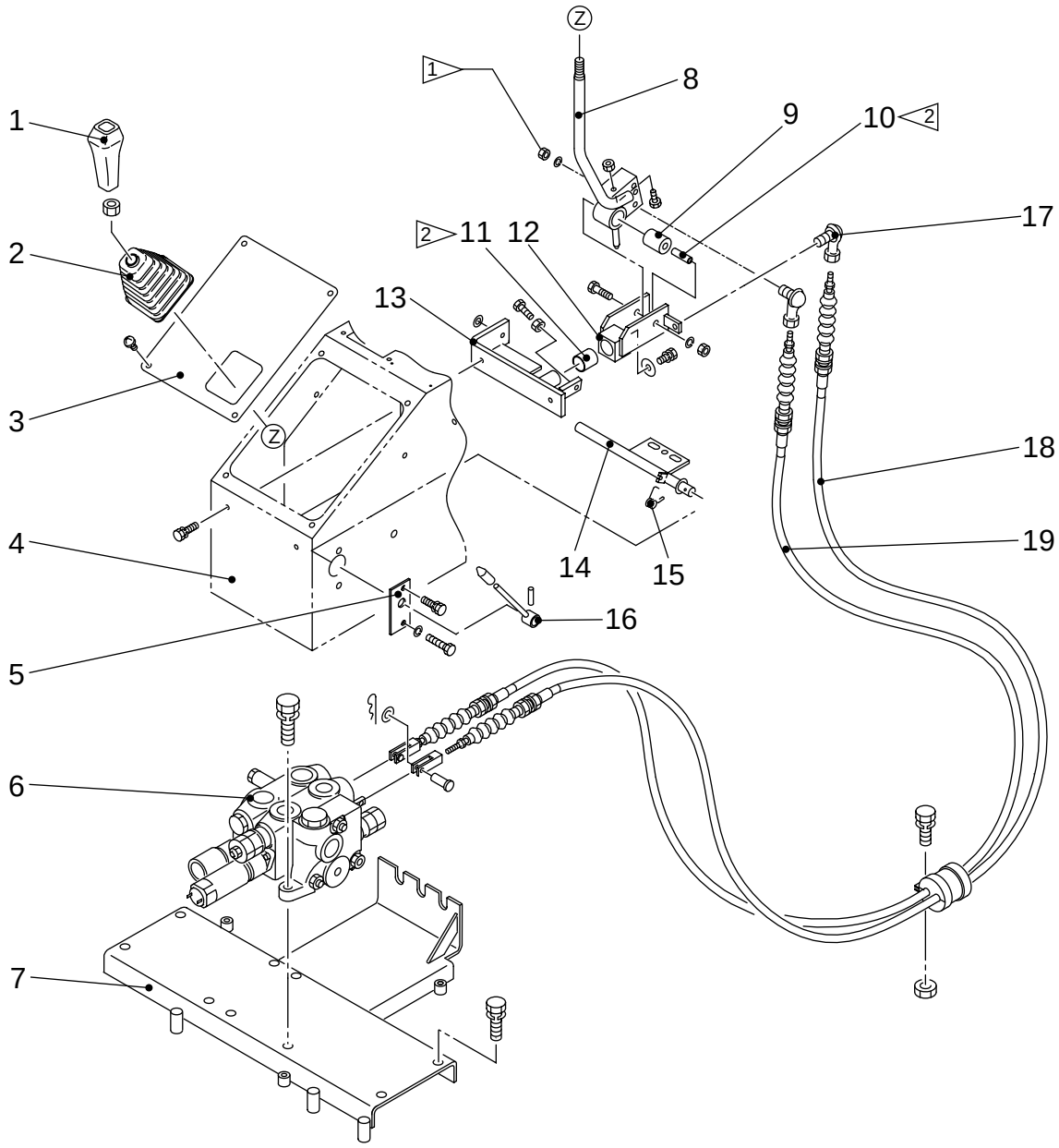
Note: ▷1 (2 points) 64.7 N-m {6.6 kgf-m} [47.7 lbf-ft]

▷2 101 N-m {10.3 kgf-m} [74.49 lbf-ft]



1. MAIN RELIEF VALVE
2. INLET SECTION
3. PORT RELIEF VALVE
4. SPOOL SECTION (BUCKET)
5. OUTLET SECTION
6. SPOOL SECTION (BOOM)

Fig. 6.5 Control Valve



Note: 1 Threaded area: LOCTITE #262

2 Before assembly, apply grease.

1. KNOB
2. BOOT
3. COVER
4. CONTROL BOX
5. PLATE
6. CONTROL VALVE
7. BRACKET
8. CONTROL LEVER
9. BUSHING
10. PIN
11. BUSHING
12. BOSS
13. BRACKET
14. STOPPER LINK
15. SPRING
16. HANDLE (LEVER STOPPER)
17. BALL LINK
18. CABLE (FOR BUCKET)
19. CABLE (FOR BOOM)

Fig. 6.21 Valve Controls

7.2 CYLINDERS

	LX70-7	LX80-7
Boom cylinder		
Type	Double-acting piston	←
Q'ty	2	←
Inner diameter	90 mm [3.54 in.]	110 mm [4.33 in.]
Cylinder rod diameter	55 mm [2.17 in.]	60 mm [2.36 in.]
Cylinder stroke	760 mm [29.9 in.]	681 mm [26.8 in.]
Weight (per cylinder)	53 kg [117 lbs]	75 kg [165 lbs]
Bucket cylinder		
Type	Double-acting piston	←
Q'ty	1	←
Inner diameter	110 mm [4.33 in.]	130 mm [5.12 in.]
Cylinder rod diameter	60 mm [2.36 in.]	70 mm [2.76 in.]
Cylinder stroke	421 mm [16.6 in.]	431 mm [17.0 in.]
Weight	56 kg [123 lbs]	88 kg [194 lbs]

7.2.1 BOOM CYLINDER

Two double-acting piston type boom cylinders are used. When the boom cylinders are extended or retracted, the booms are raised or lowered, rocking around the connecting pin at each cylinder tail.

The boom cylinder consists of a cylinder tube, cylinder head, piston rod, piston and packings.

7.2.2 BUCKET CYLINDER

The bucket cylinder is a double-acting piston type. As the bucket cylinder is extended or retracted, the bucket is dumped or rolled back through the bell crank and push rod.

The bucket cylinder consists of a cylinder tube, cylinder head, piston rod, piston and packings.