

SECTION 4 BRAKE SYSTEM

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SECTION 4 BRAKE SYSTEM

GROUP 1 STRUCTURE AND FUNCTION

1. OUTLINE

There are two brake systems, the foot brake system and the hand brake system.

In the foot brake system, oil pressure is generated in the master cylinder by treading on the brake pedal. This pressure causes the wheel cylinder pistons to extend, expanding the brake shoes and pressing them against the brake drums to attain braking force.

In the hand brake system, the brake shoes are expanded by operating the brake lever.

Force from the lever is transmitted to the brake shoes through the hand brake cables and a lever arm in each wheel brake assembly.

The wheel brake is the duo-servo type. With force applied to both the primary and secondary shoes, this type provides a large amount of brake force.

In addition, the brake is equipped with automatic adjusters which constantly adjust the clearance between the shoe and the drum, compensation for wear due to the shoe friction and thus keeping the clearance constant.

2. SPECIFICATION

1) BRAKE

Item		Specification
Type		Front wheel, duo-servo & auto adjustment type
Brake shoe size		310 × 60 mm
Wheel cylinder bore diameter		28.57 mm
Master cylinder diameter		19.05 mm
Pedal adjustment	Free height	140~145 mm
	Pedal play	8~12 mm
Brake drum diameter	Normal	310 mm
Wheel cylinder installation torque		0.7~1.3 kgf · m
Backing plate installation torque		15~20 kgf · m
Brake oil		Only use for brake fluid DOT3

2) PARKING BRAKE

Item		Specification
Type		Ratchet, internal expanding mechanical type
Parking lever stroke		40 mm
Parking cable stroke		18.1 mm

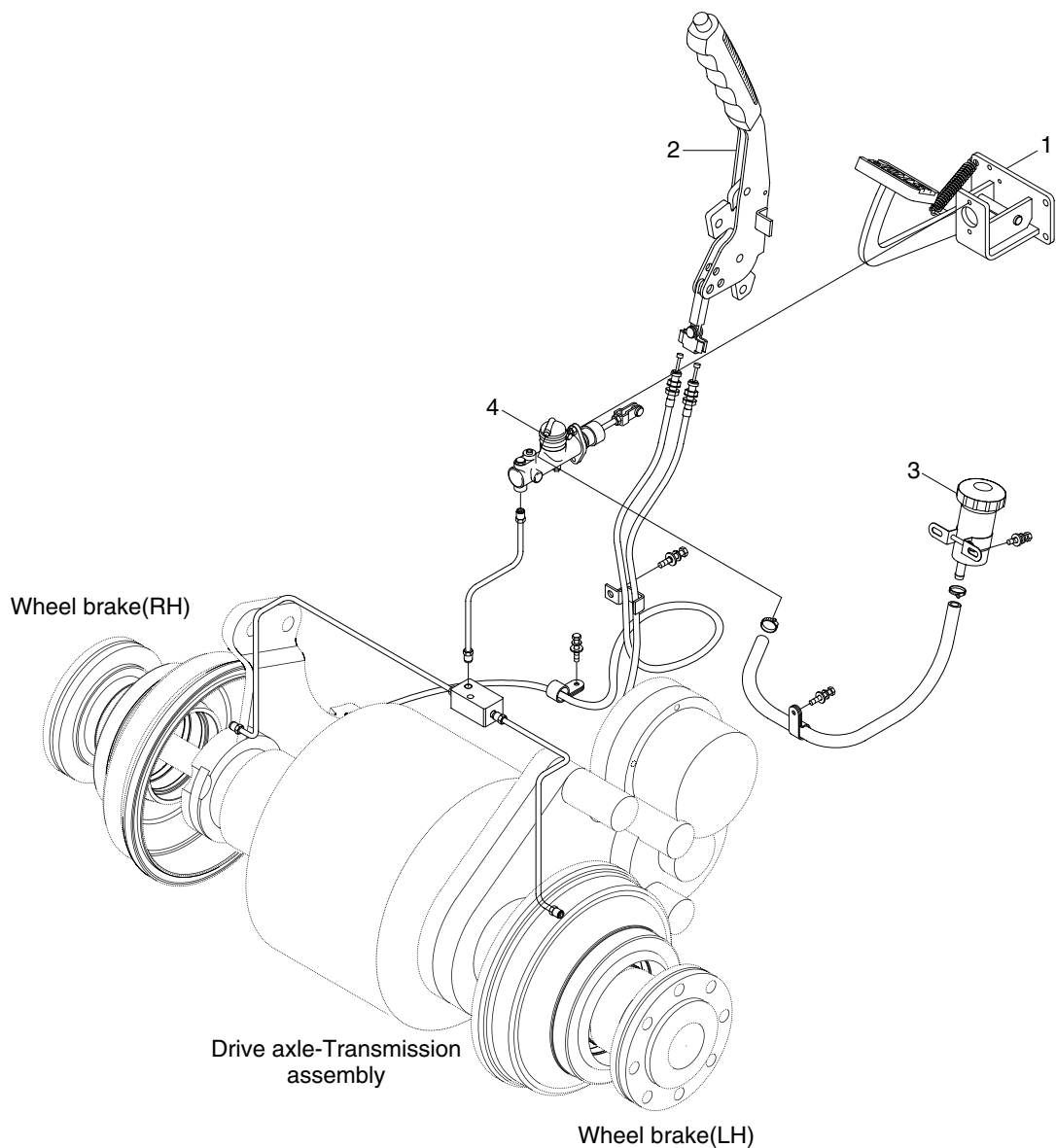
3. BRAKE PEDAL AND PIPING

The brake system provides two systems, a foot brake and a parking brake.

In the foot brake system, the oil pressure which is generated in the master cylinder when the brake pedal is depressed is transmitted to the wheel cylinders. The piston of the wheel cylinder presses the brake shoes and then moves outward causing contact with the drums and braking force is obtained. In the parking brake system, the force is transmitted to move the brake shoe through a brake cable to activate the brake when the brake lever is operated.

The wheel brake is a dual servo type in which the actuating force is applied to both the primary and secondary shoes. Even if the applied force is small, a large braking force will be obtained.

These brakes are equipped with self adjusters which continuously adjusts the brakes in small increments in direct proportion to the wear of the linings.



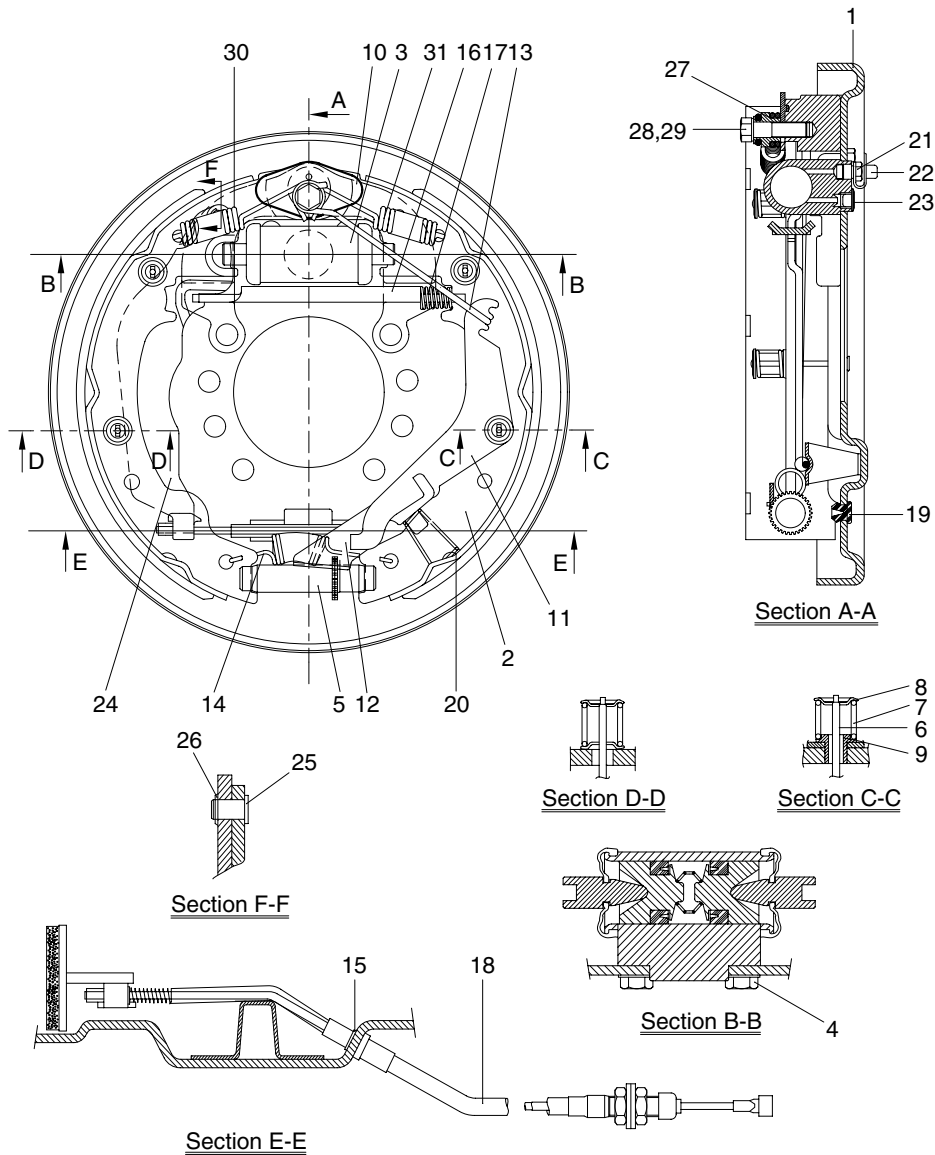
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4. WHEEL BRAKE

1) STRUCTURE

The wheel brake assembly mounts to the flange on the drive axle housing casting and is basically contained within the hub assembly.

The inside of the hub is machined and acts as the brake drum.

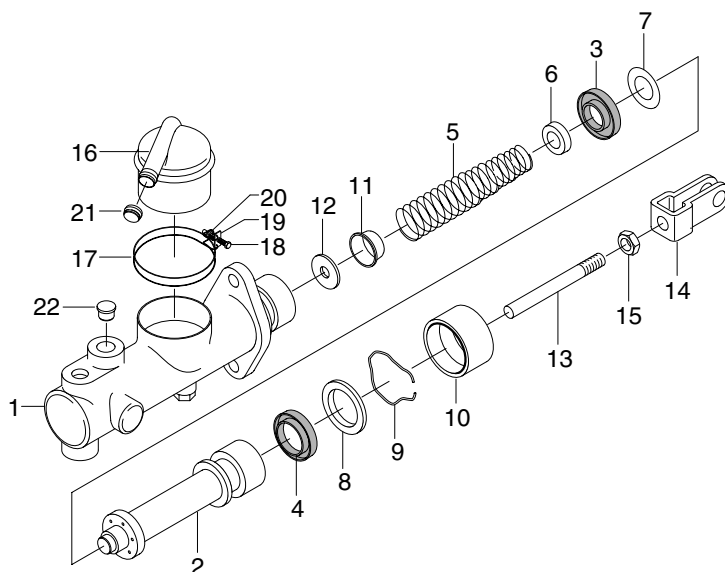


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1 Back plate assy(LH/RH)	12 Lever pawl(LH/RH)	22 Bleed screw-cap
2 Lined shoe assy	13 Stopper	23 Plug
3 Wheel cylinder assy	14 Spring	24 Lever(LH/RH)
4 Bolt-set	15 Retaining-ring	25 Pin
5 Adjuster assy(LH/RH)	16 Strut	26 Retaining-ring
6 Pin	17 Spring	27 Sleeve
7 Spring	18 Parking cable assy(LH/RH)	28 Bolt
8 Washer	19 Plug	29 Spring-washer
9 Bush	20 Spring	30 Shoe A
10 Plate	21 Bleed-screw	31 Shoe B
11 Lever actuator(LH/RH)		

5. BRAKE MASTER CYLINDER

1) STRUCTURE



D255BS04

1	Body	7	Spacer	13	Rod	18	Band bolt
2	Piston	8	Plate	14	Yoke	19	Band plate
3	Primary cup	9	Key wire	15	Nut	20	Band washer
4	Secondary cup	10	Boot	16	Nipple	21	Cap
5	Spring	11	Check valve	17	Band	22	Cap
6	Spring seat	12	Valve seat				

2) DISASSEMBLY

- (1) Remove the master cylinder boot (10) and remove the rod (13).
- (2) Remove the key wire (9) and take out the plate (8), the piston (2), the piston primary cup (3), and piston spring (5).
- (3) Specification of master cylinder.
 - Cylinder bore diameter : 19.05 mm
 - Piston stroke : 23.0 mm

3) INSPECTION

- (1) Clean and check these components.
 - ※ Use isopropyl alcohol or brake fluid for washing the components. Do not use gasoline, kerosene or any other mineral oils. When using alcohol, do not leave rubber parts in the liquid for more than 30 seconds.
- (2) Inspect the inside wall of the master cylinder, and if any faults are found, replace the cylinder assembly.
- (3) Replace the boot (10), the primary cup (3), piston (2), if deformation or any other defect is found.

4) ASSEMBLY

- ※ Prior to assembly make sure again of no contaminant of the components. Apply a thin coat of brake oil to the components.
 - Assembly is in opposite order to disassembly.

GROUP 2 OPERATIONAL CHECKS AND TROUBLESHOOTING

1. OPERATIONAL CHECKS

1) BRAKE PIPING

- (1) Check pipes, hoses and joints for damage, oil leakage or interference.
- (2) Operate brake pedal and check operating force when pedal is depressed. Check also change in operating force, and change in position of pedal when pedal is kept depressed.

2) WHEEL BRAKE

Compact wheel base chassis

- (1) Measure lining at point with most wear, and check that lining thickness is at least 2.0 mm (0.08 in).
- (2) Hold lining surface with screw driver to prevent piston from coming out, depress brake pedal and check movement of shoe.
- (3) Remove brake shoe from anchor pin, and check for rust or wear.
When assembling, coat sliding parts with special brake grease.

3) BRAKE DRUM

- (1) Measure inside diameter of drum, and check that it is within 254 mm (10 in).
- (2) Tighten mounting bolt of drum.

4) BACKING PLATE

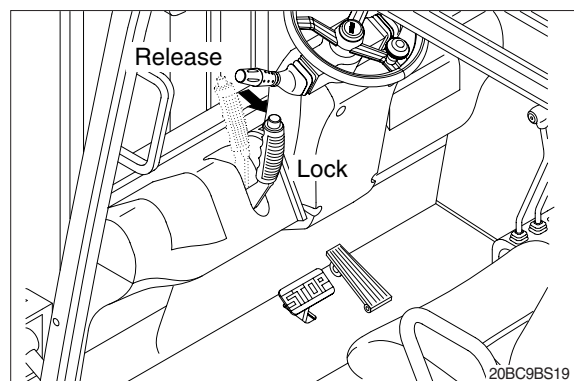
- (1) Check visually for deformation or cracks.
Check particularly for deformation at outside circumference of plate and at mounting bolt.
- (2) Coat mounting bolt with loctite and tighten.

5) BRAKING FORCE

- (1) Select a dry, flat, paved surface and drive truck at maximum speed. When signal is given, stop truck immediately and measure distance from point where signal was given to point where truck stopped. (unloaded)
· Stopping distance : Within 5 m (197 in)
- (2) Check that there is no pulling of steering wheel, pulling by brakes to one side or abnormal noise when making emergency stops.

6) PARKING BRAKE

- (1) Operating force of parking lever is 20 - 30 kgf · m (144 - 217 lbf · ft).
- (2) Check that parking brake can hold machine in position when loaded on 15% slope. If there is no slope available, travel at low speed and check braking effect of parking brake.



2. TROUBLESHOOTING

Problem	Cause	Remedy
Insufficient braking force	<ul style="list-style-type: none"> Hydraulic system leaks oil. Hydraulic system leaks air. Lining surface soiled with water or oil. Lining surface roughened or in poor contact with drum. Lining worn. Brake valve or wheel cylinder malfunctioning. Hydraulic system clogged. 	<ul style="list-style-type: none"> Repair and add oil. Bleed air. Clean or replace. Repair by polishing or replace. Replace. Repair or replace. Clean.
Brake acting unevenly. (Machine is turned to one side during braking.)	<ul style="list-style-type: none"> Tires unequally inflated. Brake out of adjustment. Lining surface soiled with water or oil. Earth intruding into brake drum. Lining surface roughened. Lining in poor contact with drum. Lining worn. Brake drum worn or damaged (distortion or rusting). Wheel cylinder malfunctioning. Brake shoe poorly sliding. Back plate mounting bolt loose. Back plate deformed. Wheel bearing out of adjustment. Hydraulic system clogged. 	<ul style="list-style-type: none"> Adjust tire pressure. Adjust. Clean or replace. Clean. Repair by polishing or replace. Repair by polishing. Replace. Repair or replace. Repair or replace. Adjust. Retighten or replace. Replace. Adjust or replace. Clean.
Brake trailing.	<ul style="list-style-type: none"> Pedal has no play. Brake shoe poorly sliding. Wheel cylinder malfunctioning. Piston cup faulty. Return spring fatigued or bent. Parking brake fails to return or out of adjustment. Brake valve return port clogged. Hydraulic system clogged. Wheel bearing out of adjustment. 	<ul style="list-style-type: none"> Adjust. Adjust. Repair or replace. Replace. Replace. Repair or adjust. Clean. Clean. Adjust or replace.
Brake chirps	<ul style="list-style-type: none"> Brake trailing. Piston fails to return. Lining worn. Lining surface roughened. 	<ul style="list-style-type: none"> See above. Brake trailing. Replace. Replace. Repair by polishing or replace.

Problem	Cause	Remedy
Brake squeaks	<ul style="list-style-type: none"> • Lining surface roughened. • Lining worn. • Poor shoe to lining contact. • Excessively large friction between shoe and back plate. • Foreign matter on drum sliding surface. • Drum sliding surface damaged or distorted. • Brake shoe deformed or poorly installed. • Back plate mounting bolt loosening. • Worn anchor or other contact portion. • Lining poor contact with drum. • Anti-rattle spring poorly installed. 	<ul style="list-style-type: none"> • Repair by polishing or replace. • Replace. • Replace. • Clean and apply brake grease. • Clean • Replace. • Replace or repair. • Retighten. • Replace. • Repair or replace. • Repair or replace.
Brake rapping	<ul style="list-style-type: none"> • Drum sliding surface roughened. • Drum eccentric or excessively distorted. • Lining surface roughened. 	<ul style="list-style-type: none"> • Repair by polishing or replace. • Replace. • Repair by polishing or replace.
Large pedal stroke	<ul style="list-style-type: none"> • Brake out of adjustment. • Hydraulic line sucking air. • Oil leaks from hydraulic line, or lack of oil. • Lining worn. • Shoe tilting or does not return completely. • Lining in poor contact with brake drum. 	<ul style="list-style-type: none"> • Adjust. • Bleed air. • Check and repair or add oil. • Replace. • Repair. • Repair.
Pedal dragging.	<ul style="list-style-type: none"> • Twisted push rod caused by improperly fitted brake valve. • Brake valve seal faulty. • Flow control valve orifice clogged. 	<ul style="list-style-type: none"> • Adjust. • Replace. • Clean or replace.

GROUP 3 TESTS AND ADJUSTMENTS

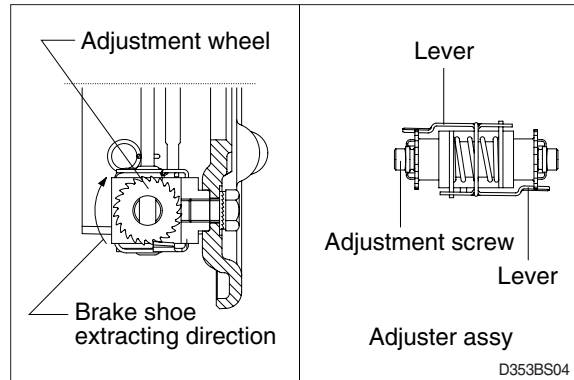
1. ADJUSTMENT OF WHEEL BRAKE

⚠ Adjust with engine stopped.

- 1) Jack up truck. Extend adjustment screw by clicking adjustment wheel teeth with a screwdriver until wheel (mounted on brake drum being adjusted) offers a light resistance when turned by hand. Back adjustment wheel by 25~30 teeth to shorten length of adjustment screw.

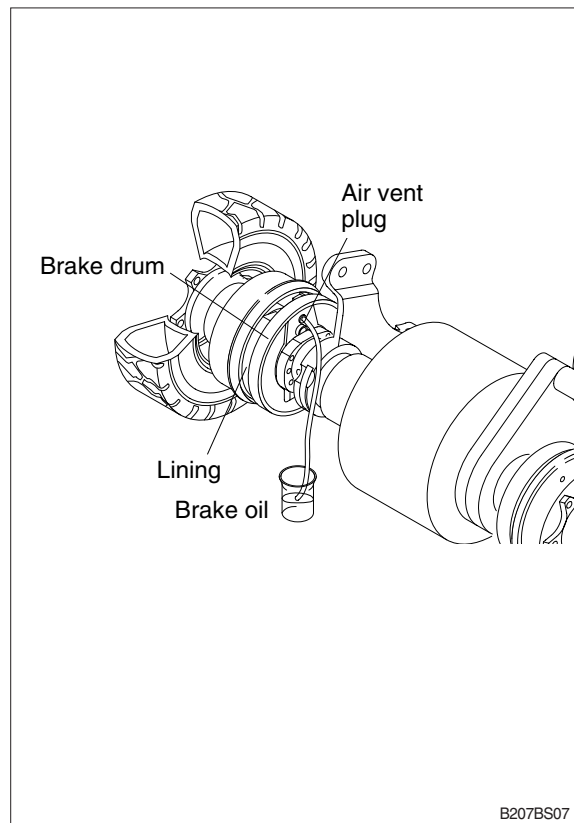
※ When backing adjustment wheel, be sure to adequately raise adjustment lever to keep it free from interference with adjustment wheel. If lever is bent by mistake, it loses proper function.

- 2) After adjusting brake, drive machine for about 500 m, then check heat of brake drum at 4 points to confirm that brakes are not dragging.
- 3) After adjusting, confirm that brake stopping distance is within standard range.



2. AIR BLEEDING OF BRAKE SYSTEM

- 1) Air bleeding should be performed by two persons :
One rides on truck for depressing and releasing brake pedal : the other person is on the ground and removes cap from air vent plug on wheel cylinder.
- 2) Block the front wheel securely and apply parking brake.
- 3) Start the machine.
- 4) Attach a vinyl tube to air vent plug and immerse other end of tube into a vessel filled with hydraulic oil.
- 5) Loosen air vent plug by turning it 3/4 with a wrench. Depress brake pedal to drain oil mixed with air bubbles from plug hole.
- 6) Depress brake pedal until no air bubbles come out of air vent plug hole.
- 7) After completion of air bleeding, securely tighten air vent plug. Install cap on plug.



3. ADJUSTMENT OF PEDAL

1) BRAKE PEDAL

(1) Pedal height from floor plate

Adjust with stopper bolt.

- Pedal height : 130~135 mm (5.1~5.3 in)

(2) Play

Adjust with rod of master cylinder

- Play : 4~6 mm (0.15~0.24 in)

