INTRODUCTION

GENERAL

This section has a description and the service procedures for the parts of the brake system. The brake system includes the following parts: master cylinder, brake shoes, wheel cylinders, the parking brake system, and the seat brake system. A troubleshooting section is included at the end of this section.

DESCRIPTION AND OPERATION

Service Brakes (See FIGURE 1.)

A service brake assembly is installed on the mounts at each end of the drive axle. The parts of the service brake assembly are shown in FIGURE 3. and FIGURE 4. When the brake pedal is pushed, fluid pressure from the master cylinder causes the pistons in the wheel cylinders to extend. The pistons expand the brake shoes against the drums.

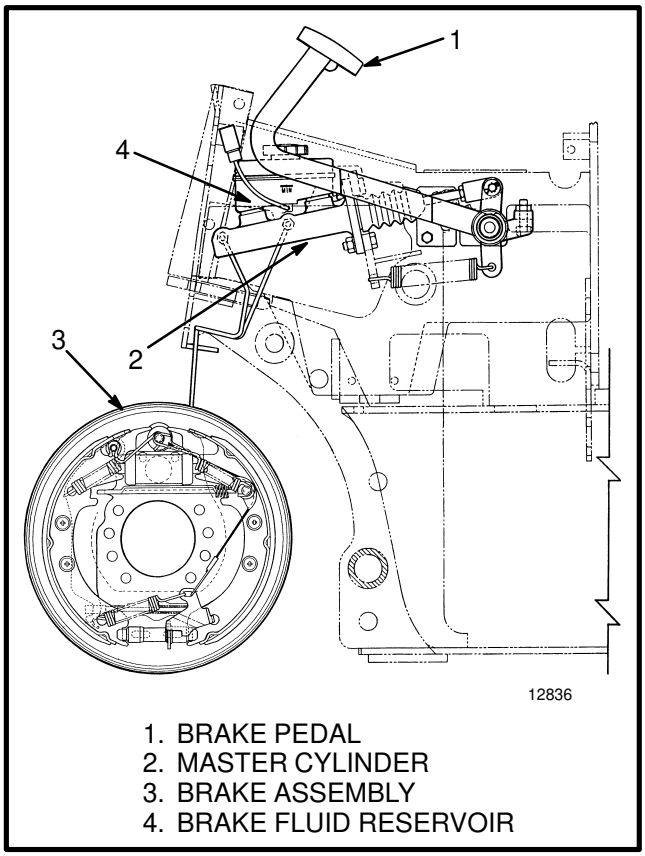
The clearance between the brake shoe and the brake drum is adjusted automatically. An adjuster linkage turns the adjuster wheel to adjust the clearance. When the lift truck moves in the REVERSE direction and the brakes are applied, the rear brake shoe and the adjuster links move with the drum. This linkage moves the adjuster lever to rotate the adjuster wheel. The adjuster wheel can turn only when there is clearance between the lining of the brake shoe and the brake drum. The adjuster wheel can also be turned with a tool. A slot in the back plate gives access to the adjuster wheel.

Master Cylinder

The master cylinder is designed for a dual circuit system. The master cylinder has two separate pistons that operate in the single bore of the master cylinder. The reservoir for the fluid is pressed into the two ports on top of the master cylinder and held in position by seals. When the brake pedal is pushed, the push rod moves the piston assemblies. The operation of the master cylinder is described in FIGURE 2.

If a failure occurs in one of the dual circuits, the other circuit will apply one of the service brakes. This failure will cause the brake pedal to travel farther when the brakes are applied, but the service brakes on one drive wheel will operate. This failure of one of the brake circuits can cause the lift truck to turn toward the drive wheel with the good brake when the brakes are applied. The operator must control the direction of the lift truck with the steering when the brakes are applied during this condition.

The reservoir is equipped with an indicator for low fluid level. A float in the reservoir moves up and down with the fluid level. When the fluid level is low, a magnet on the float activates a switch in the bottom of the reservoir. This switch energizes a warning light on the instrument cluster.



1. BRAKE PEDAL
2. MASTER CYLINDER
3. BRAKE ASSEMBLY
4. BRAKE FLUID RESERVOIR

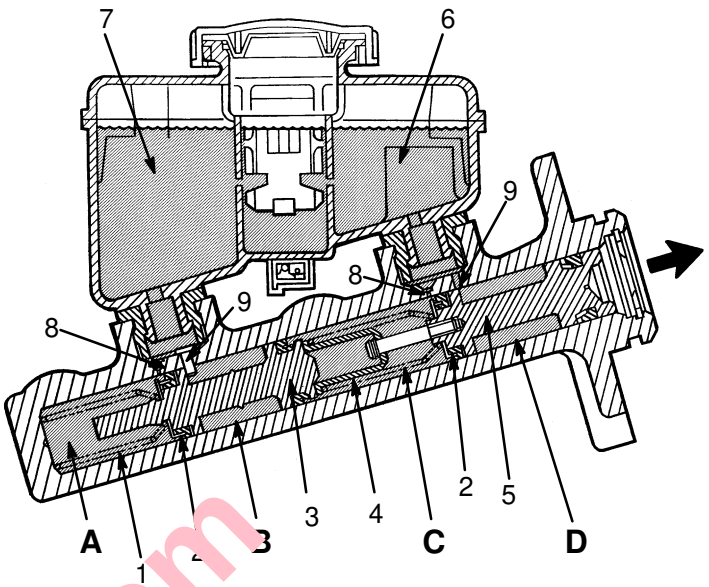
FIGURE 1. SERVICE BRAKE SYSTEM

BRAKE "OFF"

When the brakes are "OFF," the hydraulic fluid can move freely between the dual circuit system and the separate chambers of the fluid reservoir.

BRAKE "RELEASED"

When the brake pedal is released, the return springs cause the pistons to retract faster than the fluid. This action causes a vacuum between the fluid in chambers **A** and **C**. The vacuum causes the seals (2) to change shape. When the seals change shape, they permit the fluid in chambers **B** and **D** to flow through the holes in the pistons and past the seals into chambers **A** and **C**. The supply holes in the cylinder body supplies fluid as the flow moves from the one chamber to the other chamber. The fluid returns to the reservoir through the bypass holes when the pistons are fully retracted.



FLUID WITH NO PRESSURE
FLUID UNDER PRESSURE

1. SECONDARY SPRING
2. SEAL
3. SECONDARY PISTON
4. PRIMARY SPRING
5. PRIMARY PISTON
6. PRIMARY FLUID CHAMBER
7. SECONDARY FLUID CHAMBER
8. BYPASS HOLES
9. SUPPLY HOLES

BRAKE "APPLIED"

When the brake pedal is pressed, the primary piston moves in the cylinder bore. This movement creates hydraulic pressure that combines with the force of the primary spring. These combined forces overcome the secondary spring force and move the secondary piston in the bore with the primary piston. The first movement of both pistons pushes the seals (2) past the bypass holes in the chambers **A** and **C**. This action applies pressure to the fluid in those chambers and causes fluid to flow to the chambers of the two separate systems. The fluid in chambers **B** and **D** is not effected by movement of the pistons. This fluid can move freely between the piston chambers and the chambers of the fluid reservoir, before and during brake application.

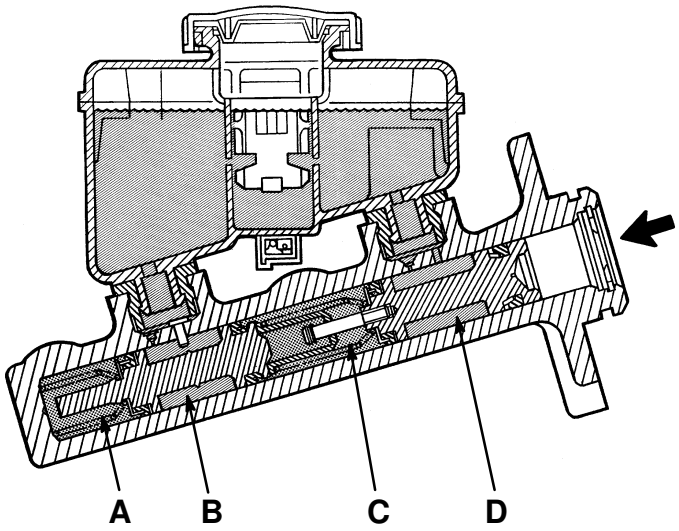


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FIGURE 2. OPERATION OF MASTER CYLINDER

Parking Brake

The parking brake system uses the service brake shoes. Additional linkage activates the parking brake system. When the lever is moved to apply the parking brake, the cables and linkage expand the brake shoes against the drums. The design of the parking brake linkage adjusts each cable so that the tension is the same when the lever is moved to apply parking brake.

SERVICE BRAKES

Removal And Disassembly

⚠ WARNING

Brake linings can contain dangerous fibers. Breathing the dust from these brake linings is a cancer or lung disease hazard. Do not create dust! Do not clean brake parts with compressed air or by brushing. Use vacuum equipment approved for brake dust or follow the cleaning procedure in this section. When the brake drums are removed, do not create dust.

Do not sand, grind, chisel, hammer or change linings in any way that will create dust. Any changes to brake linings must be done in a restricted area with special ventilation. Protective clothing and a respirator must be used.

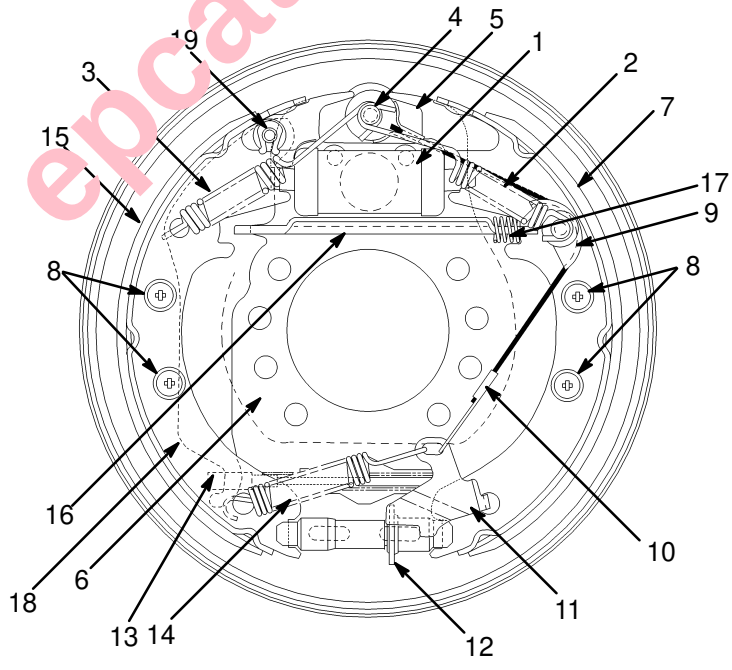
1. See the procedure "HOW TO PUT A LIFT TRUCK ON BLOCKS" in the PERIODIC MAINTENANCE section of the service manual or the **OPERATING MANUAL**. Tilt the mast fully backward. Put blocks under the mast. Tilt the mast forward until the wheels just touch the floor. Stop the motor. Put blocks under the frame of the lift truck.

2. If tilt does not function (**N30XMH**) use a hydraulic jack, crane or another lift truck to lift the drive wheels until they just touch the floor. Put blocks under the frame of the lift truck.

3. Remove the capscrews that hold the axle shaft to the hub. Remove the axle shaft.

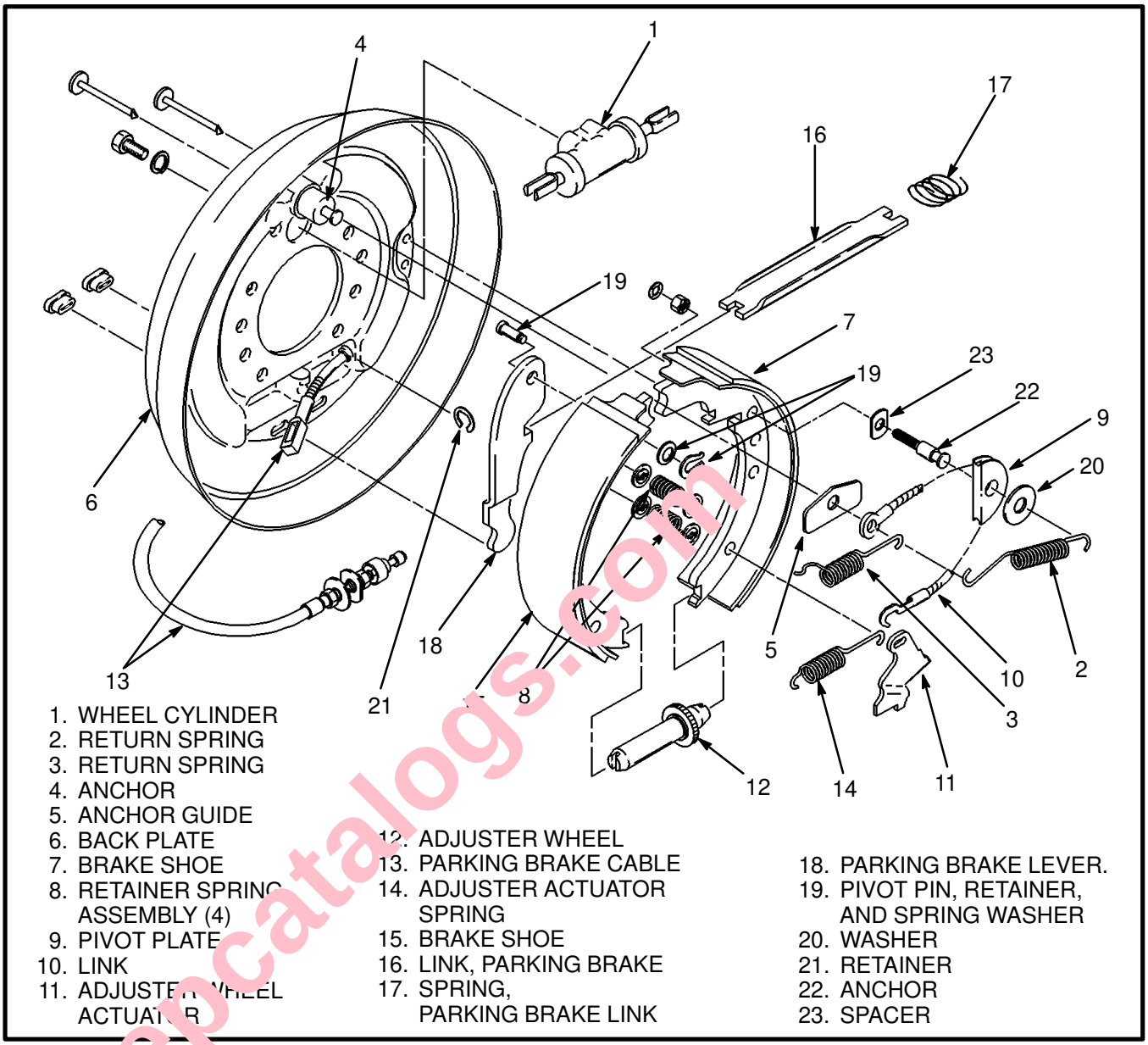
4. Release the park brake. Bend the lock plate and remove the nut that holds the axle bearing. Remove the washer and the bearing cone.

5. Put grease on the floor so that the wheel assembly will slide easily from the axle tube. Pull the wheel assembly from the lift truck. If the wheel assembly cannot be removed easily, use a small screwdriver to push the adjuster actuator away from the adjuster wheel. Use a brake adjustment tool or a screwdriver to turn the adjuster wheel to loosen the brake shoes. Remove the hub and drum assembly. Do not damage the grease seal when removing the hub.



1. WHEEL CYLINDER
2. RETURN SPRING
3. RETURN SPRING
4. ANCHOR
5. ANCHOR GUIDE
6. BACK PLATE
7. BRAKE SHOE
8. RETAINER SPRING ASSEMBLY (4)
9. PIVOT PLATE
10. LINK
11. ADJUSTER WHEEL ACTUATOR
12. ADJUSTER WHEEL
13. PARKING BRAKE CABLE
14. ADJUSTER ACTUATOR SPRING
15. BRAKE SHOE
16. LINK, PARKING BRAKE
17. SPRING, PARKING BRAKE LINK
18. PARKING BRAKE LEVER
19. PIVOT PIN, RETAINER, AND SPRING WASHER

FIGURE 3. BRAKE ASSEMBLY (LEFT BRAKE ASSEMBLY SHOWN)



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16. LINK, PARKING BRAKE
17. SPRING, PARKING BRAKE LINK
18. PARKING BRAKE LEVER.
19. PIVOT PIN, RETAINER, AND SPRING WASHER
20. WASHER
21. RETAINER
22. ANCHOR
23. SPACER

FIGURE 4. PARTS OF THE SERVICE BRAKE

⚠ WARNING

When the brake shoes are removed do not create dust in the air. See the cleaning procedure in this section.

6. Make a note of the arrangement of the parts. See FIGURE 3. and FIGURE 4. Remove the return springs (2) and (3) with spring pliers.

7. Remove the retainers, springs, and anchor pins (8) that hold the brake shoes to the back plate.

8. Disengage the link (10) from the adjuster wheel actuator (11). Remove the link (10), washer (20), and the pivot plate (9). Remove the anchor guide (5).

9. Move the brake shoes away from each other to disengage the brake shoes from the wheel cylinder. Disconnect the parking brake lever (18) from the parking brake cable (13) as the brake assembly is removed from the back plate. The parking brake lever has a hook that engages the parking brake cable.

NOTE: The adjuster wheel for the left brake is not the same as the adjuster wheel for the right brake. The adjuster wheel for the right brake has left–hand threads.

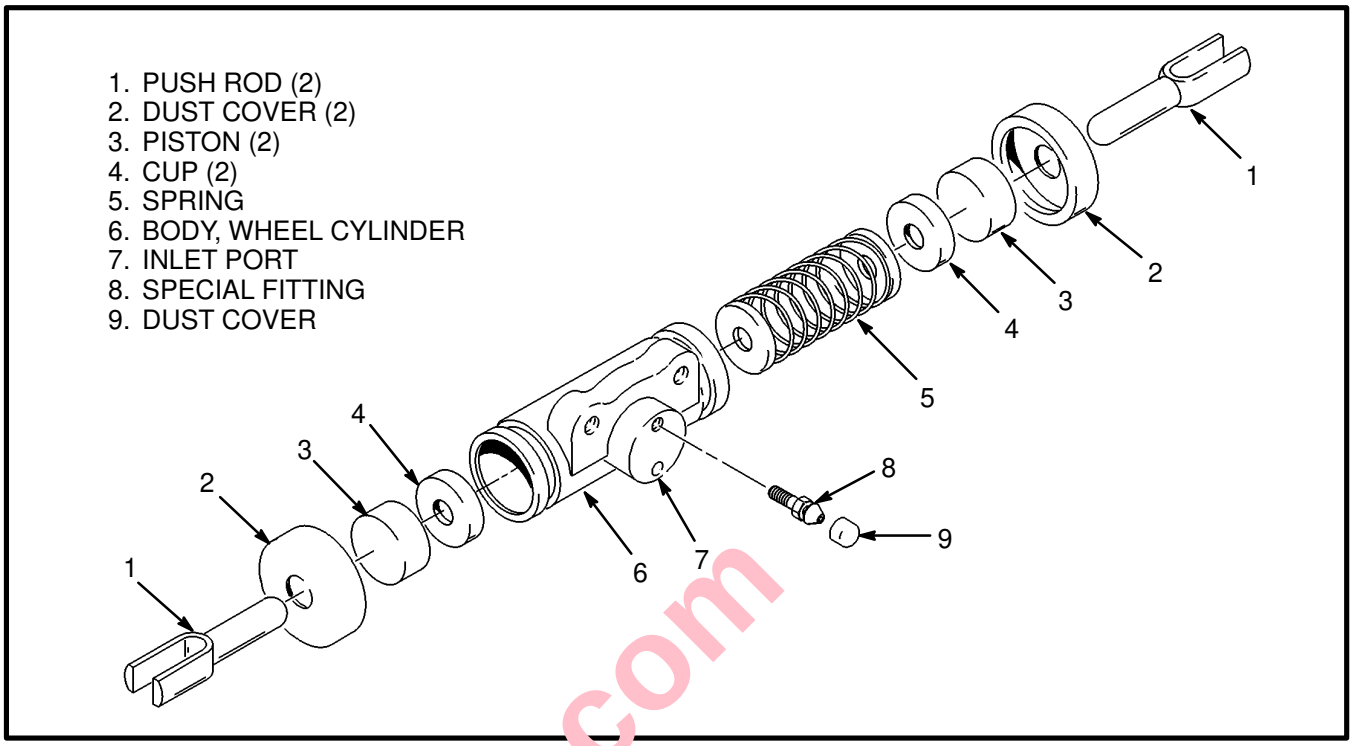

FIGURE 5. WHEEL CYLINDER

10. Make a note of the arrangement of parts and disassemble the brake assembly. Remove the parking brake link (16) and spring (17) if they are still engaged with brake shoes. The parking brake link and spring will often fall from the brake assembly when the brake assembly is removed from the back plate. The adjuster wheel (12) will also disengage from the brake shoes after the brake assembly is removed.

11. Remove the spring (14) for the adjuster wheel actuator (11). Remove the adjuster wheel actuator (11) from the brake shoe. Loosen the nut and remove the anchor (22) and spacer (23) from the brake shoe.

12. Use a screwdriver or small prybar to move apart the ends of the retainer (19). Remove the spring washer (19) and pivot pin (19) to remove the parking brake lever (18) from the brake shoe (15).

13. Disconnect the brake line from the wheel cylinder (1). Remove the capscrews that hold the wheel cylinder to the back plate and remove the wheel cylinder.

14. See FIGURE 5. Remove the push rods, dust covers, pistons, cups, and spring from the wheel cylinder.

NOTE: The back plate is not normally removed from the axle housing for brake repairs. Eight special capscrews are used to fasten the back plate to the axle mount and the locking function of the capscrews is reduced if they are removed. These capscrews are tightened to 255 N.m (188 lb_f ft).

Cleaning

⚠ WARNING

DO NOT use an oil solvent to clean the master cylinder, wheel cylinder, or the brake linings. Use a solvent approved for cleaning of brake parts. Do not permit oil or grease in the brake fluid or on the brake linings. Oil and grease will cause damage and leaks in the seals of a brake system. The brakes will not operate correctly if oil, grease, or brake fluid is on the brake linings.

Cleaning solvents can be flammable and toxic, and can cause skin irritation. When using cleaning solvents, always follow the safety instructions of the solvent manufacturer.

1. Do not release brake lining dust from the brake linings into the air when the brake drum is removed.

2. Use a solvent approved for cleaning of brake parts to wet the brake lining dust. Follow the instructions and cautions of the manufacturer for the use of the solvent. If a solvent spray is used, do not create brake lining dust with the spray.