INTRODUCTION

GENERAL

This section has a description and the service procedures for the brake system. The parts of the brake system include the master cylinder, the brake shoes, wheel cylinders, pedals and linkage, and the parking brake system. Some electric lift trucks have an optional seat brake. The linkage and adjustments are shown at the end of this section.

DESCRIPTION AND OPERATION

The master cylinder has a housing and a piston assembly. The reservoir for the brake fluid is part of the housing for the master cylinder. When the brake pedal is pushed down, the push rod moves the piston assembly. The primary cup pushes the brake fluid through the check valve to the wheel cylinders. The secondary cup keeps the fluid that is above the primary cup in the master cylinder.

When the brake pedal is released, the return spring causes the piston assembly to return to the stop in the bore. The return springs for the brake shoes cause the pistons in the wheel cylinders to retract. The fluid in the wheel cylinders is pushed back through the lines to the check valve. The fluid pressure in the brake lines causes brake fluid to flow through the check valve to the master cylinder bore. The check valve keeps a low pressure in the brake lines so that the lips of the seals in the wheel cylinders are held in position against the bores.

When the brake pedal is released quickly, the return spring moves the piston faster than the brake fluid can flow through the check valve. Fluid from the inlet port flows from behind the piston through the holes drilled in the piston. The flow of fluid bends the lip of the primary cup and permits fluid to enter the pressure chamber. A port between the reservoir and the bore permits brake fluid to fill the volume in the reservoir and the bore. This compensator port has a very small diameter and is found near the primary cup on the pressure side of the piston. The compensator port permits brake fluid to move to and from the pressure side of the system when the temperature changes. The pedal linkage must be adjusted correctly. If the piston does not return to the stop, the primary cup will keep the compensator port closed.

A service brake assembly is installed at each end of the drive axle. The service brakes for the E/J1.25–1.75XL (E25–35XL) and E/J2.00–3.00XL (E/J40–60XL) are similar in operation, but are different in design. When the brake pedal is pushed, fluid pressure from the master cylinder causes the pistons in the wheel cylinder to move out of their bores. The pistons cause the brake shoes to expand against the drum.

The parking brake system uses the service brake shoes. A hand lever uses cables5 to apply the brakes. The clearance between the brake shoes and the brake drum is adjusted automatically. The adjuster linkage turns the adjuster wheel to adjust the clearance. The primary shoe and the adjuster links move a small amount with the brake drum when the brakes are applied when the lift truck is traveling in the REVERSE direction. The linkage causes the adjustor wheel actuator to rotate the adjuster wheel. The adjuster wheel can only turn when there is clearance between the lining and the brake drum. The adjuster wheel can also be turned manually. A slot in the back plate permits access for manual adjustment on the E/J1.25–1.75XL (E25–35XL) series. The drive wheel must be removed for access to the hole in the drum to manually adjust the adjuster wheel on the E/J2.00–3.00XL (E/J40–60XL) series.

REPAIRS

MASTER CYLINDER

This repair section describes the repair of the master cylinder that is used in the XL series of electric lift trucks. The repair of the brakes for the E/J1.25–1.75XL (E25–35XL) series and the E/J2.00–3.00XL (E/J40–60XL) series is described in separate parts of this repair section.

Removal And Disassembly

1. Remove the floor plate. Disconnect the clevis from the brake pedal and remove the push rod. Disconnect the hydraulic line from the master cylinder port. Install a plug in the master cylinder port to prevent leakage of the brake fluid.

2. Remove the mount plate for the master cylinder. Remove the bolts and the master cylinder from the frame. Drain the fluid from the reservoir.

3. Put the master cylinder in a vise with soft jaws as shown in FIGURE 2.

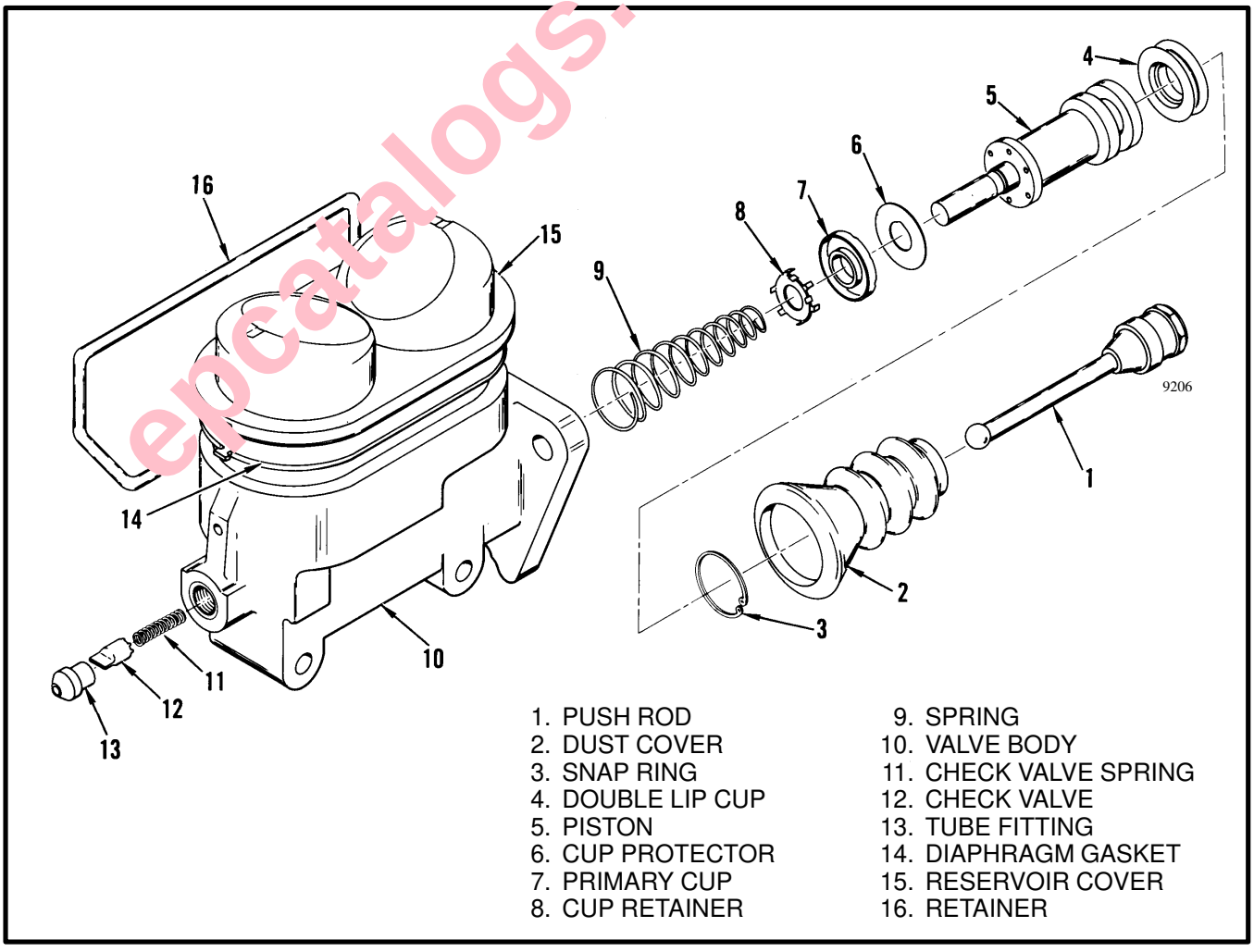
⚠ WARNING

There is a compressed spring behind the piston. Follow instructions in step 4. to avoid injury.

4. Hold the piston against the spring with a screwdriver. Remove the snap ring and carefully remove the piston assembly and spring.

5. Remove the check valve (12) and the spring (11). Use a thin r[illegible] as[illegible]driver to remove the check valve and tube fitting (13).

6. Clean all the parts with alcohol. DO NOT USE SOLVENT. Solvent will damage the rubber parts.



1. PUSH ROD
2. DUST COVER
3. SNAP RING
4. DOUBLE LIP CUP
5. PISTON
6. CUP PROTECTOR
7. PRIMARY CUP
8. CUP RETAINER
9. SPRING
10. VALVE BODY
11. CHECK VALVE SPRING
12. CHECK VALVE
13. TUBE FITTING
14. DIAPHRAGM GASKET
15. RESERVOIR COVER
16. RETAINER

FIGURE 1. MASTER CYLINDER

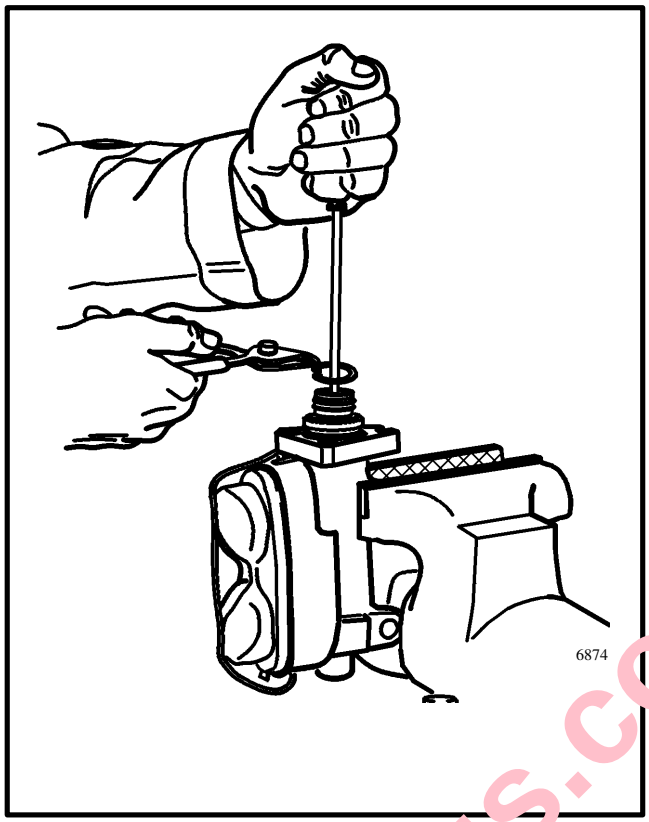


FIGURE 2. REMOVE THE PISTON

Inspection

Check the bore of the master cylinder for any damage. If any damage is found, replace the master cylinder.

Assembly

1. Use a repair kit. Install the parts in the order shown in FIGURE 1. Hold the piston in the cylinder with a screwdriver. Make sure the snap ring is in the correct position.

2. Install the check valve assembly. Install the diaphragm gasket and reservoir cover. Install the dust cover.

3. Fasten the master cylinder to the frame. Install the push rod and connect the clevis to the pedal. Install the mount plate for the brake switch and install the switch (if the lift truck is equipped with a brake switch).

4. Check the clearance between the push rod and the piston. Adjust the clearance so that the pedal can move approximately 1 to 4 mm (0.04 to 0.16 inch) before the piston begins to move. Loosen the jam nut and turn the push rod to adjust the clearance. If installed, adjust the brake switch so that the switch is closed when the brake pedal is in the up position.

5. Fill the reservoir with J1703 brake fluid. Operate the brake pedal to remove air from the master cylinder. Connect the hydraulic line to the master cylinder.

6. Remove the air from the system. Put the end of a small hose on the special fitting for removing the air from the wheel cylinder. Put the other end of the hose in a clean container. Loosen the special fitting one turn to permit brake fluid to flow from the wheel cylinder when the pedal is pushed. Slowly push the brake pedal and hold it at the end of its stroke. Close the special fitting. Repeat this procedure until air bubbles do not come from the hose. Make sure you do not completely drain the reservoir. Tighten the special fitting and remove the hose. Fill the reservoir. Repeat this procedure on the other wheel cylinder.

⚠ CAUTION

Do not permit brake fluid to flow from the special fitting on to any part of the axle. The brake fluid can cause damage to the oil and dust seals on the axle and cause a lubrication problem inside of the mast pivots. Brake fluid will also damage the paint on the lift truck.

BRAKES, E/J1.25–1.75XL(E25–35XL)

There are four configurations of tires available on the E/J1.25–1.75XL (E25–35XL) series of lift trucks:

E1.25–1.75XL (E25–35XL):

Standard Solid Tires
Wide Tread Solid Tires

J1.25–1.75XL (E25–35XL):

Pneumatic Tires (standard and wide tread)
Solid Tires that have a shape like pneumatic tires

The methods used to fasten the drive wheels to the hub are different for the standard and wide tread cushion tires and the rims used for the pneumatic tires. See FIGURE 3. When the drive tires are removed or installed, small changes in the procedure must be made for the differences in the axles. Do not mix types of tires or tread on the lift truck.

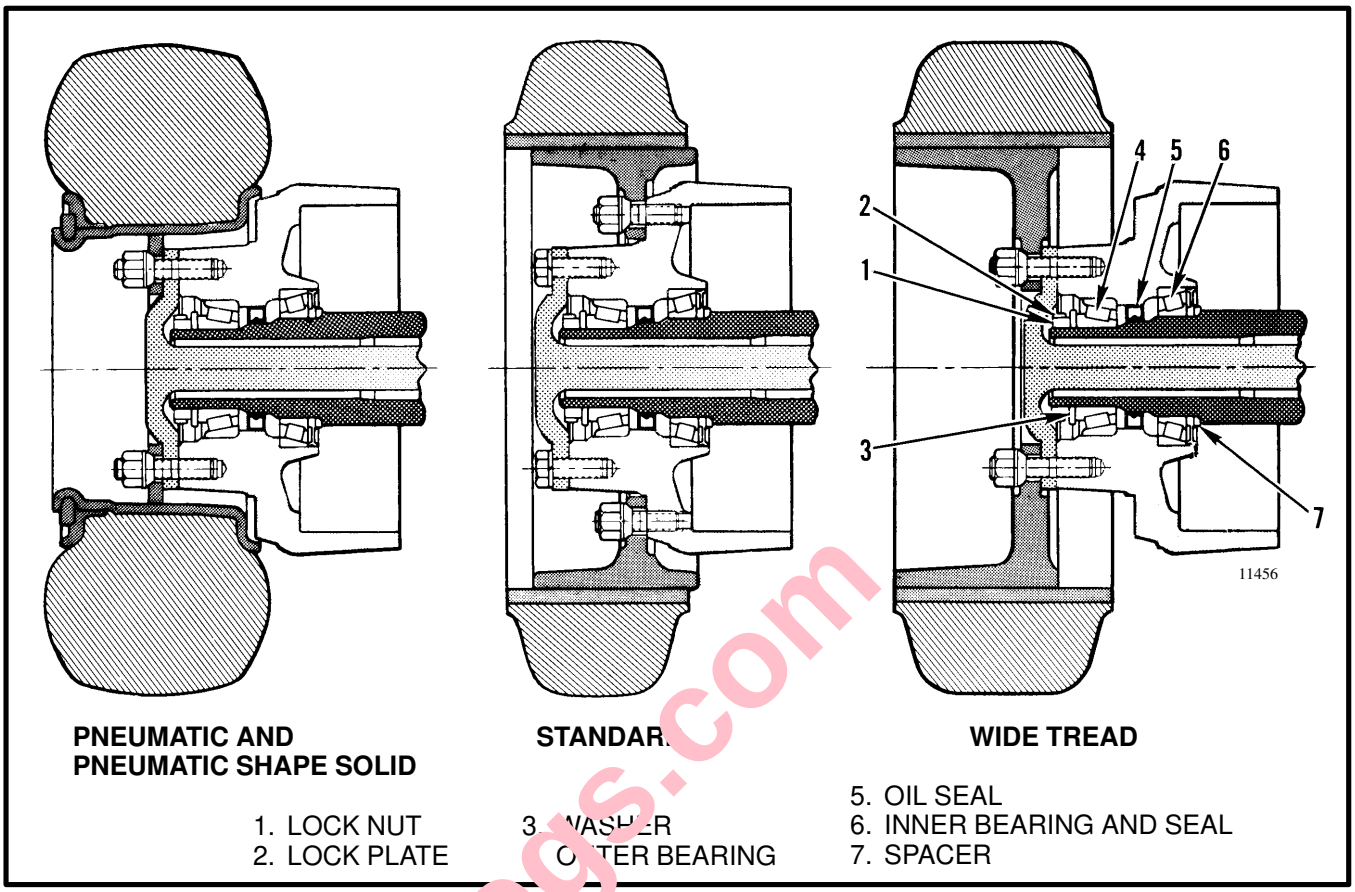


FIGURE 3. DRIVE WHEEL MOUNTS, E/J1.25–1.75XL (E25–35XL)

Removal And Disassembly

1. Tilt the mast fully backward and put blocks under the mast. Tilt the mast forward until the wheels are off of the floor. Put blocks under the frame.

2. Remove the drive wheels.

⚠ WARNING

If the lift truck has pneumatic tires, remove the air from the tires before the drive wheels are removed.

3. Remove the capscrews that hold the axle shaft to the hub. There are two holes with threads in the flange of the axle shaft. Put capscrews (M12 x 1.25) in these holes to loosen the axle shaft from the hub. The axle shaft can also be loosened from the hub by hitting the end of the axle shaft with a hammer. Remove the axle shaft.

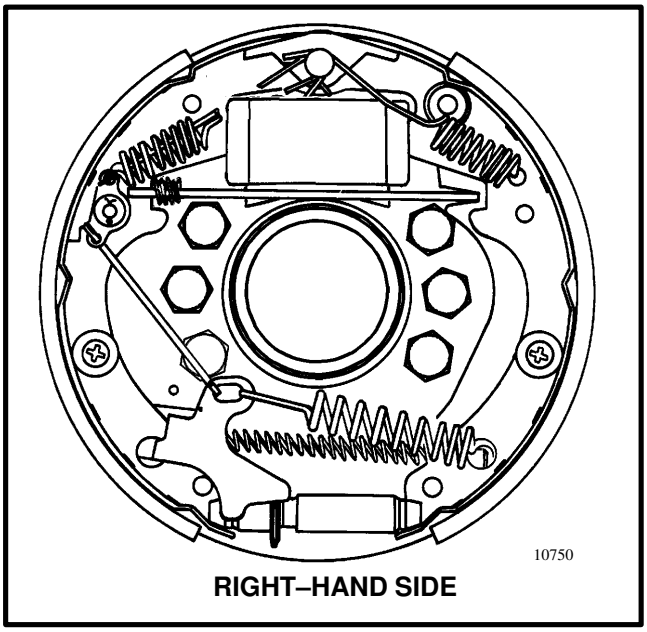


FIGURE 4. BRAKE ASSEMBLY

4. Raise the tabs on the lock plate, then remove the nut, lock plate and flat washer. Remove the brake drum and bearings. Be careful that you do not damage the oil seal. If the brake drum can not be easily

removed, turn the adjuster wheel to loosen the brake shoes. Use a second screwdriver to lift the adjuster wheel actuator away from the adjuster wheel so that the adjuster wheel can be turned.

5. Remove the spring and adjuster linkage from the brake shoes. Remove the spring assemblies that hold the brake shoes to the back plate. Remove the brake shoes. Disconnect the parking brake cable from the lever.

6. Disconnect the brake line at the wheel cylinder. Install a cap in the brake line. Remove the capscrews that hold the back plate to the axle mount. Remove the back plate.

7. Remove the wheel cylinder and the parking brake cable from the back plate.

8. If the parking brake cables need to be removed or replaced, remove the lever assembly from the lift truck. Remove the cables from the lever assembly.

Cleaning Procedures

⚠ WARNING

Brake linings can contain dangerous fibers. Inhaling the dust from these brake linings is a cancer or lung disease hazard. Do not make 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 make 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. 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, spray at a distance so that the dust is not released into the air.

⚠ CAUTION

Do not use an oil solvent to clean the wheel cylinder. Use a solvent approved for cleaning of brake parts. Do not permit oil or grease in the brake fluid or on the brake linings.

3. When the brake lining dust is wet, clean the parts. Put any rags or towels in a plastic bag or an airtight container while they are still wet. Put a "DANGEROUS FIBERS" warning label on the plastic bag or airtight container.

4. Any cleaning rags that will be washed must be cleaned so that fibres are not released into the air.

⚠ WARNING

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.

5. Clean the other parts of the brake system with with a brake cleaning fluid.

Inspection

1. Check the bore of the wheel cylinder for wear, damage and holes caused by corrosion. Install a new wheel cylinder if there is damage.

2. Check the return springs for damage. Inspect the back plate for wear where the brake shoes touch the back plate. Remove any grooves or install a new back plate.

3. Inspect the brake shoes for cracks or damage. If the linings or shoes are worn or damaged, new brake shoes must be installed. Maximum wear is to within 1 mm (0.025 in) of contact with the rivets, or the metal shoe on bonded linings. New brake shoes must be installed in complete sets.

⚠ WARNING

Install new brake shoes on both wheels if any shoe is damaged. The brake performance on both ends of an axle must be equal or the lift truck can be difficult to steer when the brakes are applied.

4. Inspect the brake drum for deep grooves or other damage. Use sandpaper on the surface for the brake shoes.

NOTE: If the brake drums require grinding, do not grind more than 1.5 mm (0.060 in) off the diameter. The maximum drum diameter, including the wear, is 231 mm (9.1 in). If the diameter is larger than this, install a new drum.

5. The teeth of the adjuster wheel must not be worn. The adjuster wheel must turn freely. Check the adjuster links for damage.

6. Make sure the parking brake levers move freely.