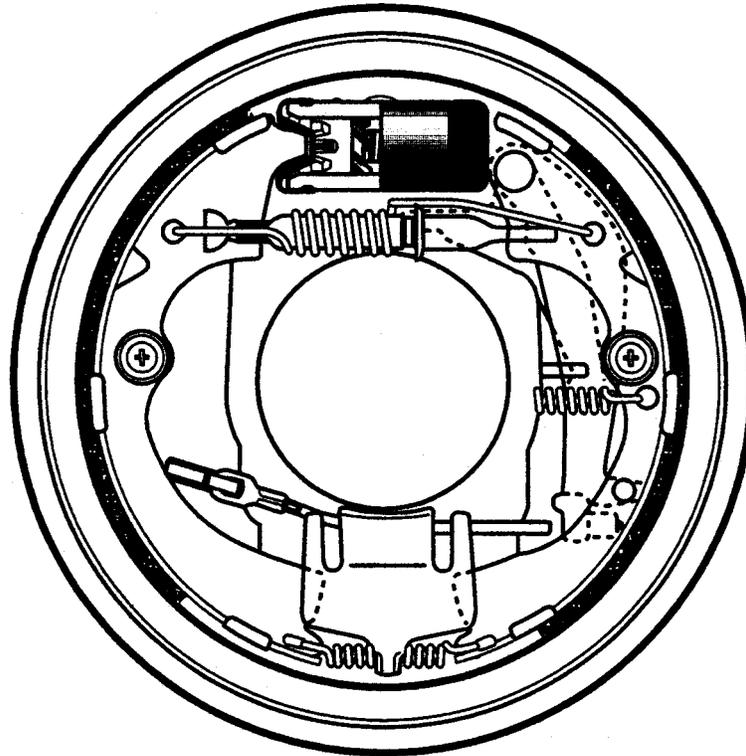


Section 3

# DRUM BRAKES

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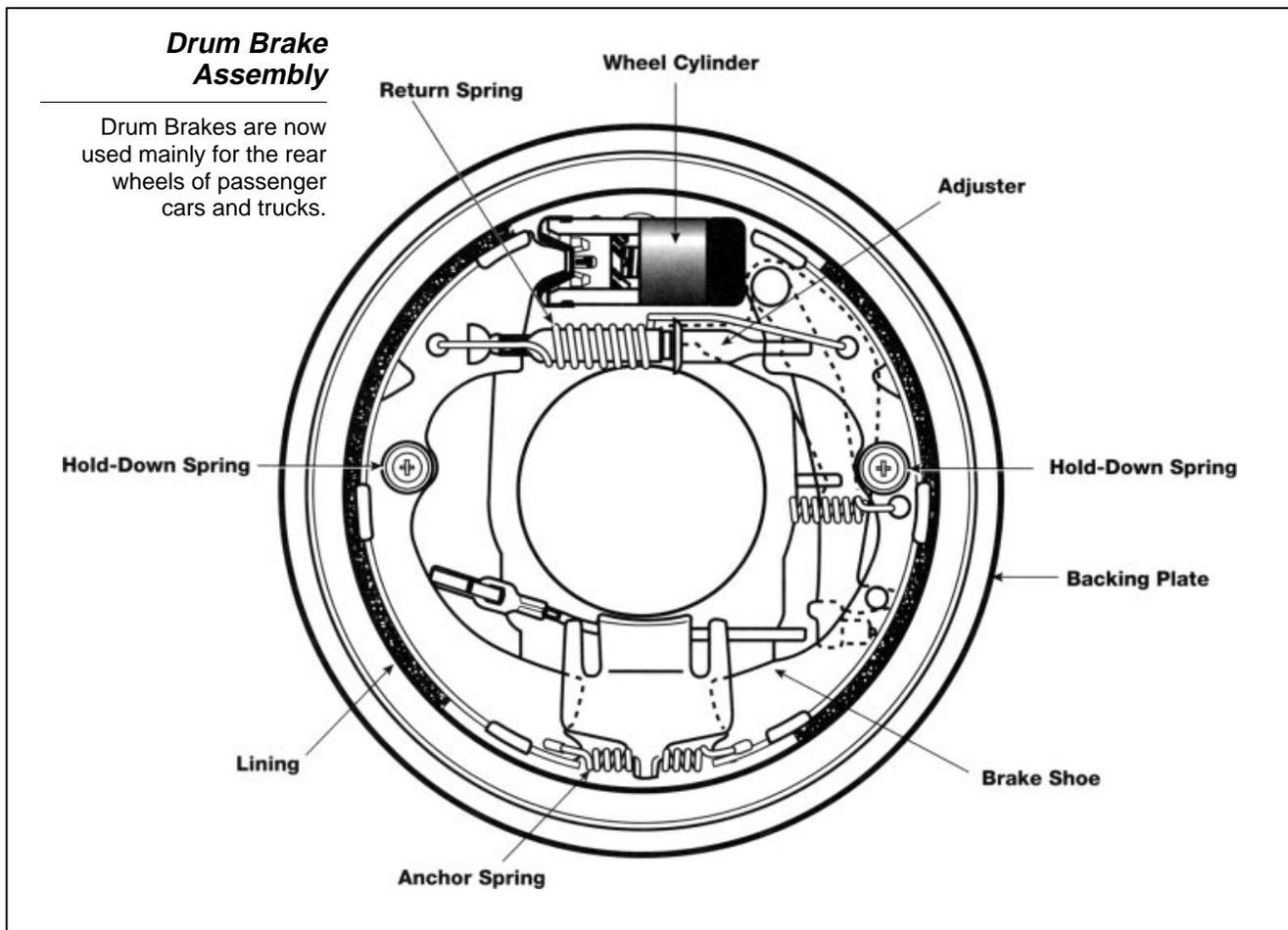
**Lesson Objectives**

1. Identify the components of the drum brake system.
2. Explain the operation of the drum brake system during brake application.
3. Explain brake fluid flow return from the wheel cylinder to the master cylinder.
4. Describe the function and operation of the self adjuster mechanism.
5. Demonstrate the operation of adjusting the brake shoe clearance using a vernier caliper or drum caliper.

**Drum Brakes** The drum brake has been more widely used than any other brake design. Braking power is obtained when the brake shoes are pushed against the inner surface of the drum which rotates together with the axle.

Drum brakes are used mainly for the rear wheels of passenger cars and trucks while disc brakes are used exclusively for front brakes because of their greater directional stability.

The backing plate is a pressed steel plate, bolted to the rear axle housing. Since the brake shoes are fitted to the backing plate, all of the braking force acts on the backing plate.

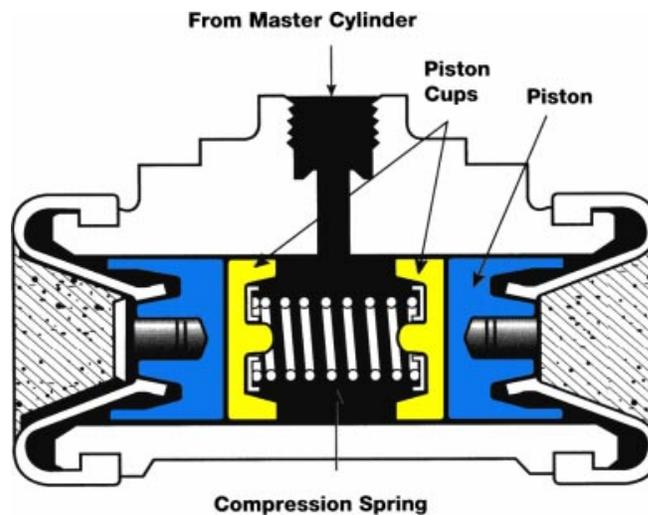


**Wheel Cylinder** The wheel cylinder consists of a number of components as illustrated on the next page. One wheel cylinder is used for each wheel. Two pistons operate the shoes, one at each end of the wheel cylinder. When hydraulic pressure from the master cylinder acts upon the piston cup, the pistons are pushed toward the shoes, forcing them against the drum.

When the brakes are not being applied, the piston is returned to its original position by the force of the brake shoe return springs.

### Wheel Cylinder

Hydraulic pressure acting upon the piston cup, forces the pistons outward toward the shoes.



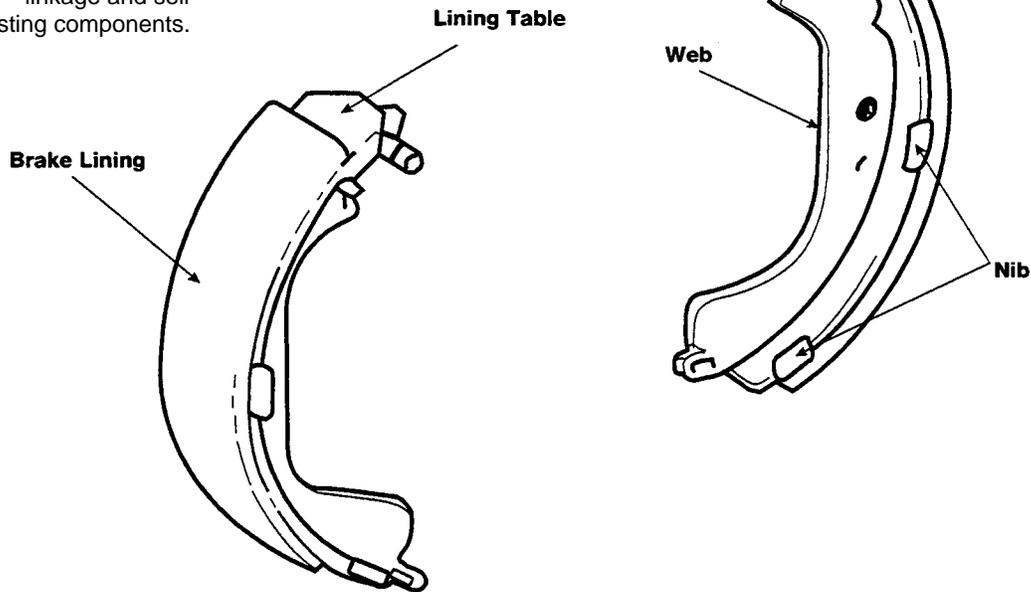
**Brake Shoes** Brake shoes are made of two pieces of sheet steel welded together. The friction material is attached to the lining table either by adhesive bonding or riveting. The crescent shaped piece is called the **web** and contains holes and slots in different shapes for return springs, hold-down hardware, parking brake linkage and self adjusting components. All the application force of the wheel cylinder is applied through the web to the lining table and brake lining. The edge of the lining table generally has three “V” shaped notches or tabs on each side called nibs. The nibs rest against the support pads of the backing plate to which the shoes are installed.

Each brake assembly has two shoes, a primary and secondary. The primary shoe is located toward the front of the vehicle and has the lining positioned differently than the secondary shoe. Quite often the two shoes are interchangeable, so close inspection for any variation is important.

Linings must be resistant against heat and wear and have a high friction coefficient. This coefficient must be as unaffected as possible by fluctuations in temperature and humidity. Materials which make up the brake shoe include friction modifiers, powdered metal, binders, fillers and curing agents. **Friction modifiers** such as graphite and cashew nut shells, alter the friction coefficient. **Powdered metals** such as lead, zinc, brass, aluminum and other metals increase a material's resistance to heat fade. **Binders** are the glues that hold the friction material together. **Fillers** are added to friction material in small quantities to accomplish specific purposes, such as rubber chips to reduce brake noise.

### **Brake Shoes and Lining**

The friction material is attached to the lining table. The crescent shaped web contains holes and slots in different shapes for return springs, hold-down hardware, parking brake linkage and self adjusting components.



**Brake Drum** The brake drum is generally made of a special type of cast iron. It is positioned very close to the brake shoe without actually touching it, and rotates with the wheel and axle. As the lining is pushed against the inner surface of the drum, friction heat can reach as high as 600 degrees F.

The brake drum must be:

1. Accurately balanced.
2. Sufficiently rigid.
3. Resistant against wear.
4. Highly heat-conductive.
5. Lightweight.

## Drum Type Brake Adjustment

It is very important that the specified drum-to-lining clearance be accurately maintained at all times. In some types of brake systems, this is done automatically. In others, this clearance must be periodically adjusted.

An excessively large clearance between the brake drum and lining will cause a low pedal and a delay in braking. If the drum to lining clearance is too small the brakes will drag, expand with increased heat, and seizure between the drum and brake lining may occur. Furthermore, if the clearance is not equal the rear-end of the vehicle may fishtail (oscillate from side to side) as one brake assembly locks-up.

### Automatic Brake Shoe Clearance Adjustment

Automatic clearance adjusting devices may be divided into two types:

- Reverse Travel Adjuster.
- Parking Brake Adjuster.

### Reverse Travel Adjuster

Adjustment effected by braking effort during reverse travel is used with duo-servo type brakes. Duo-servo brake shoes have a single anchor located above the wheel cylinder. When the leading shoe contacts the drum it transfers force to the trailing shoe which is wedged against the anchor. This system uses an:

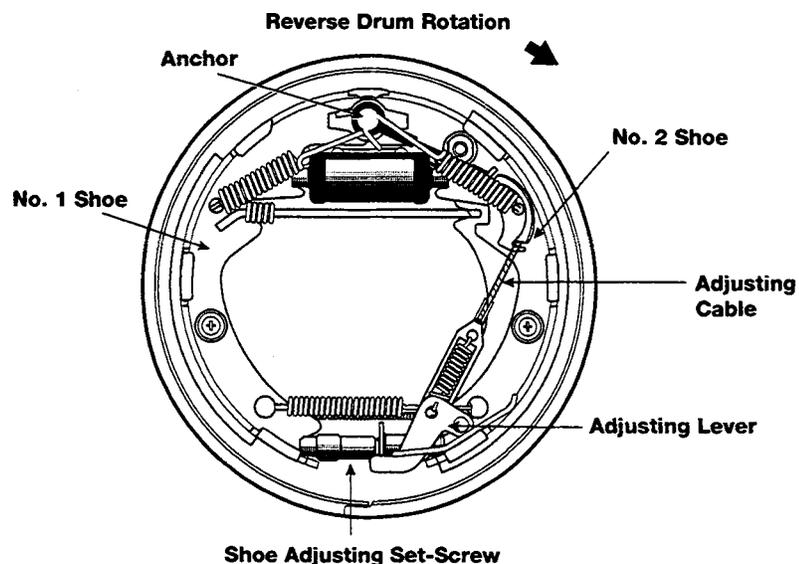
- adjusting cable assembly.
- adjusting lever.
- shoe adjusting setscrew (star wheel).
- cable guide.
- lever return spring.

The adjusting cable is fixed at one end to the anchor pin, while the other end is hooked to the adjusting lever via a spring.

The adjusting lever is fitted to the lower end of No. 2 brake shoe, and engages with the shoe adjusting setscrew.

### Reverse Travel Brake Shoe Adjustment

The adjusting cable is fixed to the anchor pin, the other end is hooked to the adjusting lever and engages with the shoe adjusting set screw.

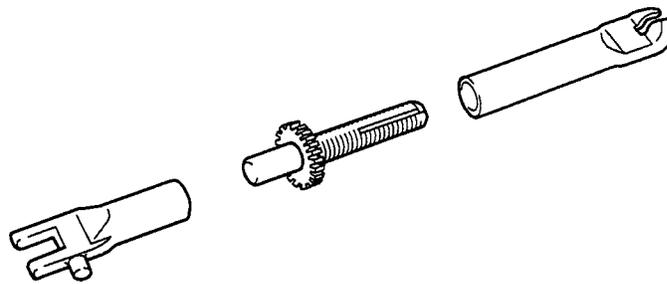


When the brake pedal is depressed while the vehicle is moving backward, the brake shoes expand and contact the drum. The shoes are forced by the drum to begin rotating; however, the upper end of No. 1 shoe is wedged against the anchor pin. Since No. 2 shoe is moving away from the anchor pin, it causes the adjusting lever to pivot and turn the shoe adjusting screw and reduce the clearance. If clearance is proper, the adjusting lever will not engage the tooth of the adjusting screw.

The shoe adjusting screw consists of a bolt and two nuts as shown below. The bolt end is marked with a "R" or "L" to indicate which side of the vehicle it is mounted on.

**Shoe Adjusting Set Screw**

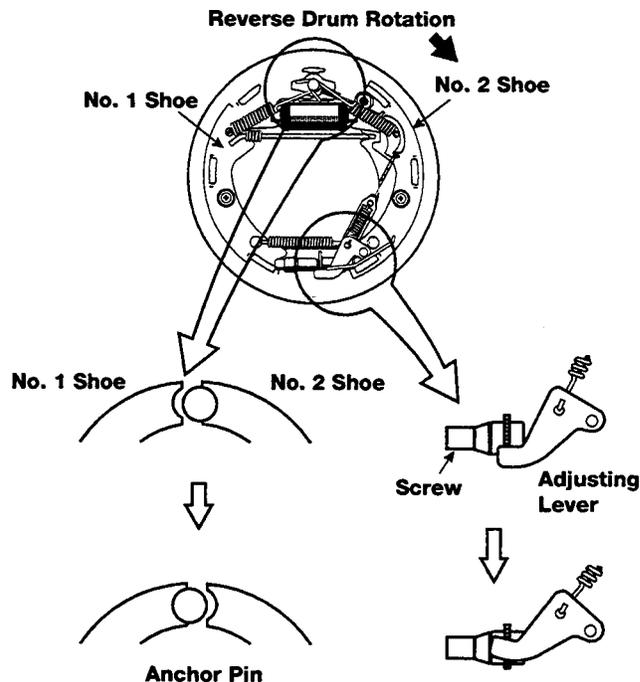
Each end of the screw is in contact with a brake shoe.  
Clearance decreases as the screw turns.



Since each end of the adjusting screw is in contact with a brake shoe, the brake shoe clearance decreases as the screw turns.

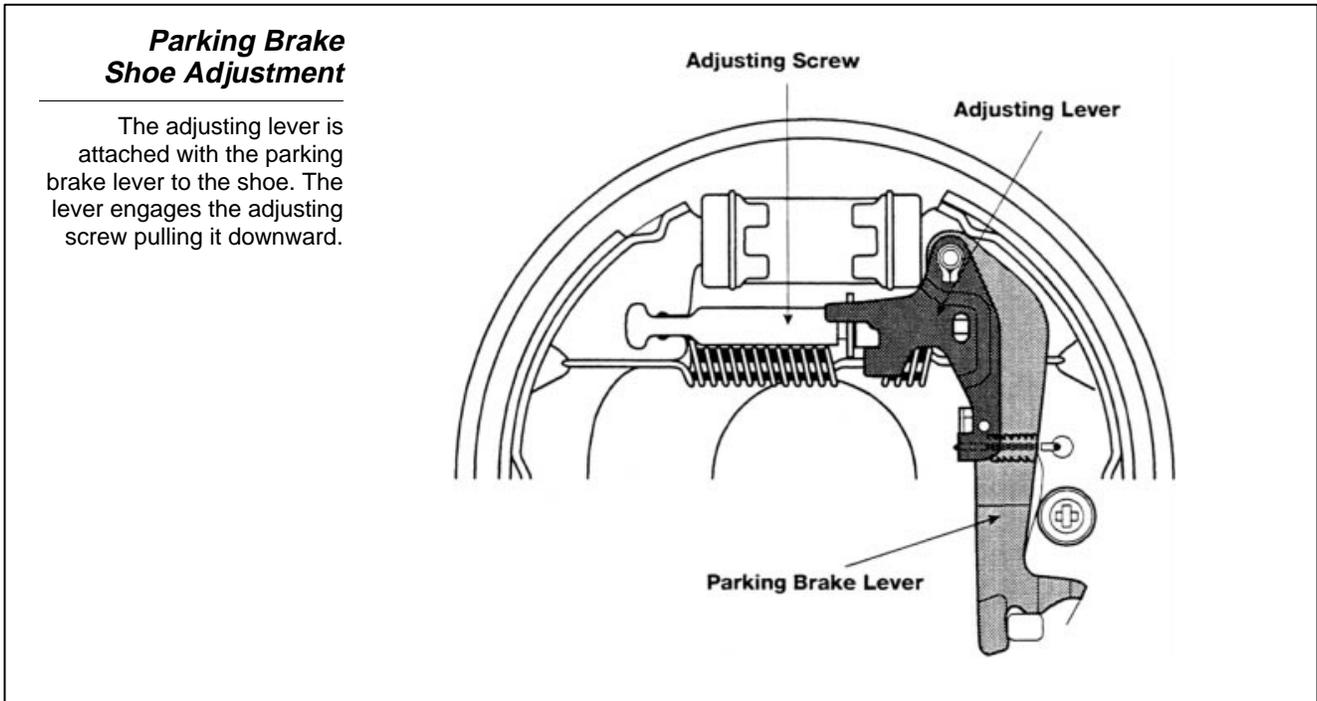
**Adjusting Lever Action**

As the No. 2 shoe moves away from the anchor pin, the adjusting lever pivots causing the adjusting screw to turn.



**Parking Brake Automatic Adjuster** The second type of automatic clearance adjustment operates by applying the parking brake. The adjusting lever is attached, together with the parking brake lever, to the shoe. The lower end of the adjusting lever is held to the brake shoe via a spring, and the other end of the lever engages the adjusting screw pulling it downward.

When the parking brake is released, the brake lever is pushed to the right. At the same time, the adjusting lever pivots, turning the adjusting screw.

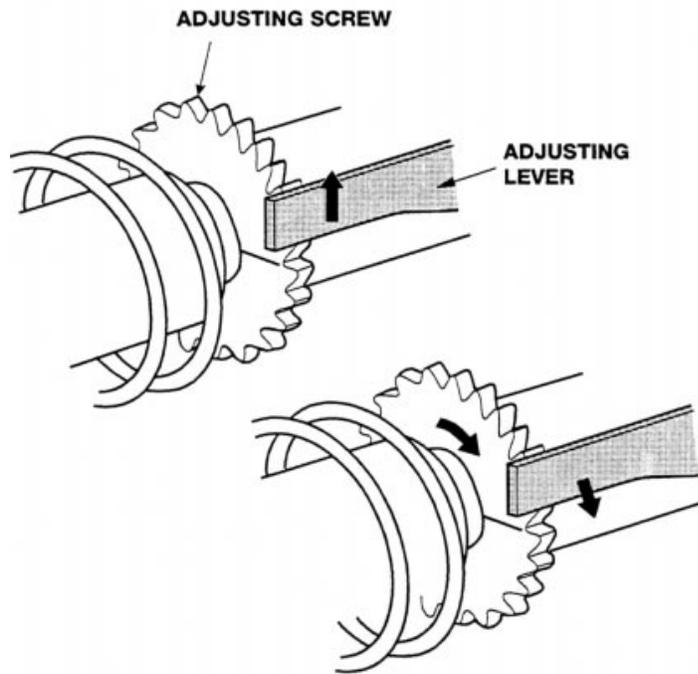


When brake shoe clearance is greater than standard and the parking brake lever is pulled, the adjusting lever moves over to the next tooth of the adjusting screw.

When the parking brake lever is released, the adjusting lever spring pulls the lever down. This causes the adjusting screw to rotate, reducing the brake shoe clearance.

### ***Adjusting Lever Rotates Adjusting Screw***

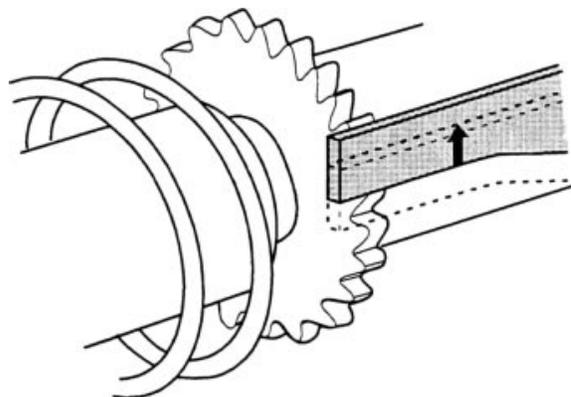
When the parking brake lever is pulled the adjusting lever engages the next tooth on the adjusting screw. When the parking brake lever is released, the adjusting lever rotates the adjusting screw.



When the brake shoe clearance is normal and the parking brake lever is pulled, the adjusting lever moves only a small distance. The adjusting lever does not move to the next tooth of the adjusting screw. Brake shoe clearance remains unchanged as a result.

### ***Normal Brake Shoe Clearance***

With proper clearance the adjusting lever does not engage the next tooth of the screw.



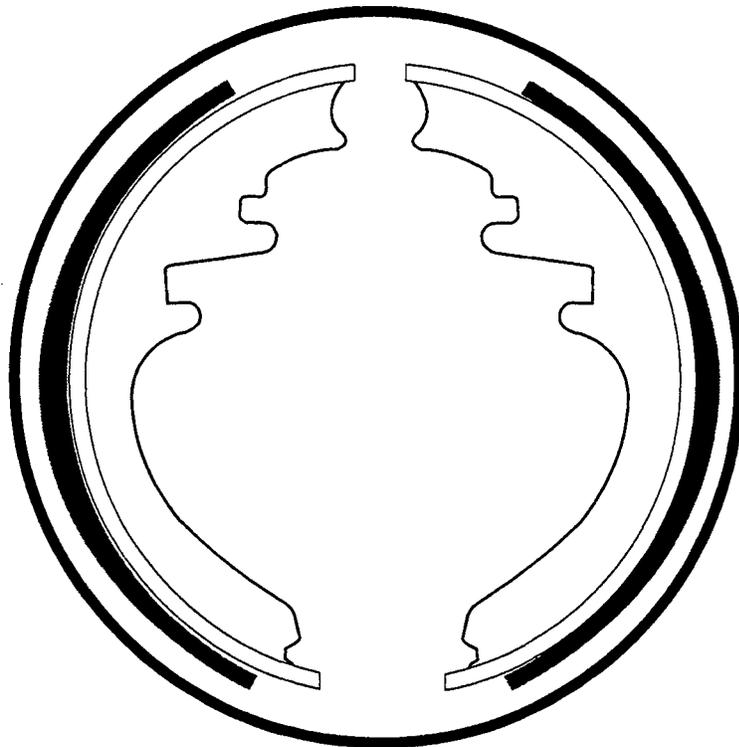
The adjusting lever is arranged in such a way as to engage with one adjusting screw tooth. Therefore, one operation of the parking brake lever only advances the adjusting screw by one tooth, reducing brake shoe clearance by approximately 0.012" (0.03mm), even when there is a large amount of brake shoe clearance.

Lining that is eccentrically ground, that is having clearance at the heel and toe when held against the drum face, can tolerate a closer drum to shoe clearance. As the brakes are applied, the center of the lining contacts the drum first. As hydraulic pressure increases, the shoe will stretch slightly and allow additional lining contact and ensures consistent pressure over a larger area of lining. As the shoes wear-in they will fit the contour of the drum more closely.

Place the lining inside the drum and press it against the contour of the drum to ensure heel and toe clearance. If the heel and toe have heavy contact it is likely that the brakes will grab and cause the wheels to lockup.

### ***Eccentrically Ground Brake Lining***

The center of the lining contacts the drum first. As pressure increases the shoe will stretch slightly and allow additional lining contact and ensures consistent pressure over a larger area of lining.



### **Initial Brake Shoe Adjustment**

Initial clearance between the shoe and the drum must be set when new brake shoes are installed. A specific clearance of 0.60 mm, (0.024") is stated in the Repair Manual for most models.

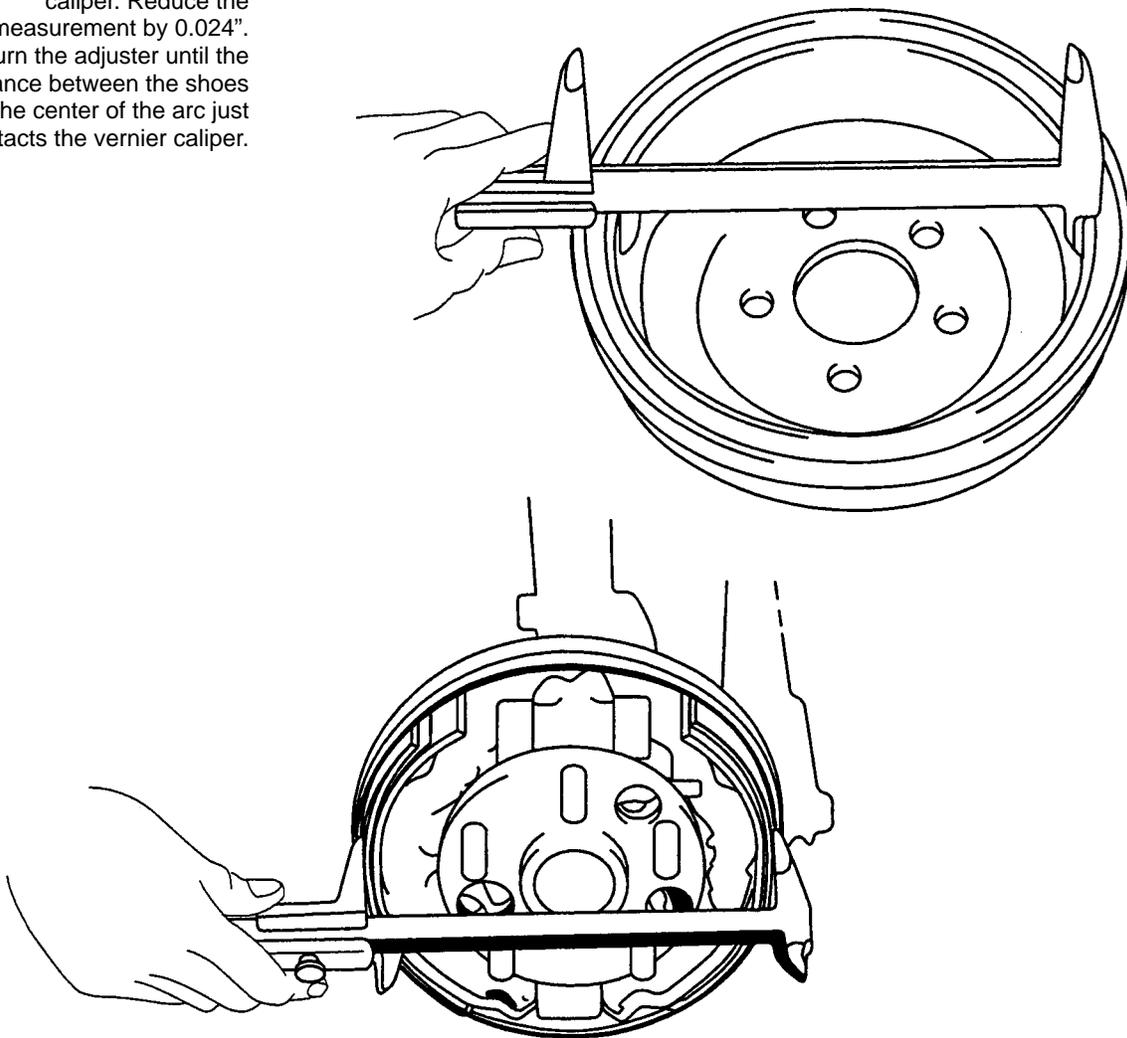
Use the following procedure to set the initial adjustment:

- Shoes must be centered on the backing plate.
- Measure the inside diameter of the drum with a vernier caliper.

- Reduce the measurement by 0.024" or (0.60 mm).
- Turn the adjuster until the distance between the shoes at the center of the arc just contacts the vernier caliper.
- When installing the drum, there should be no heavy drag of the drum and shoes as the drum is turned. Apply the parking brake several times to center the shoes and check for drag. Back-off adjustment if brakes continue to drag.

***Setting the  
Brake Shoe  
Initial Adjustment***

Measure the inside diameter of the drum with a vernier caliper. Reduce the measurement by 0.024". Turn the adjuster until the distance between the shoes at the center of the arc just contacts the vernier caliper.



**Brake Adjustment Caliper** A special gauge shown below is available from domestic tool sources which provides a built-in 0.030" clearance.

Using the narrow end of the gauge, place it in the drum and extend it the full diameter. Use the thumb screw to lock the position. Use the wide end of the gauge to set the brake shoe position. The shoe to drum clearance is preset in the tool design.

### ***Brake Adjustment Caliper***

Adjusting the caliper to the inside diameter of the drum establishes the correct shoe to drum clearance.

