



# Service Data

SD-22-3250

## Bendix® BEPA (Ford) 15" x 4" Cam Brake

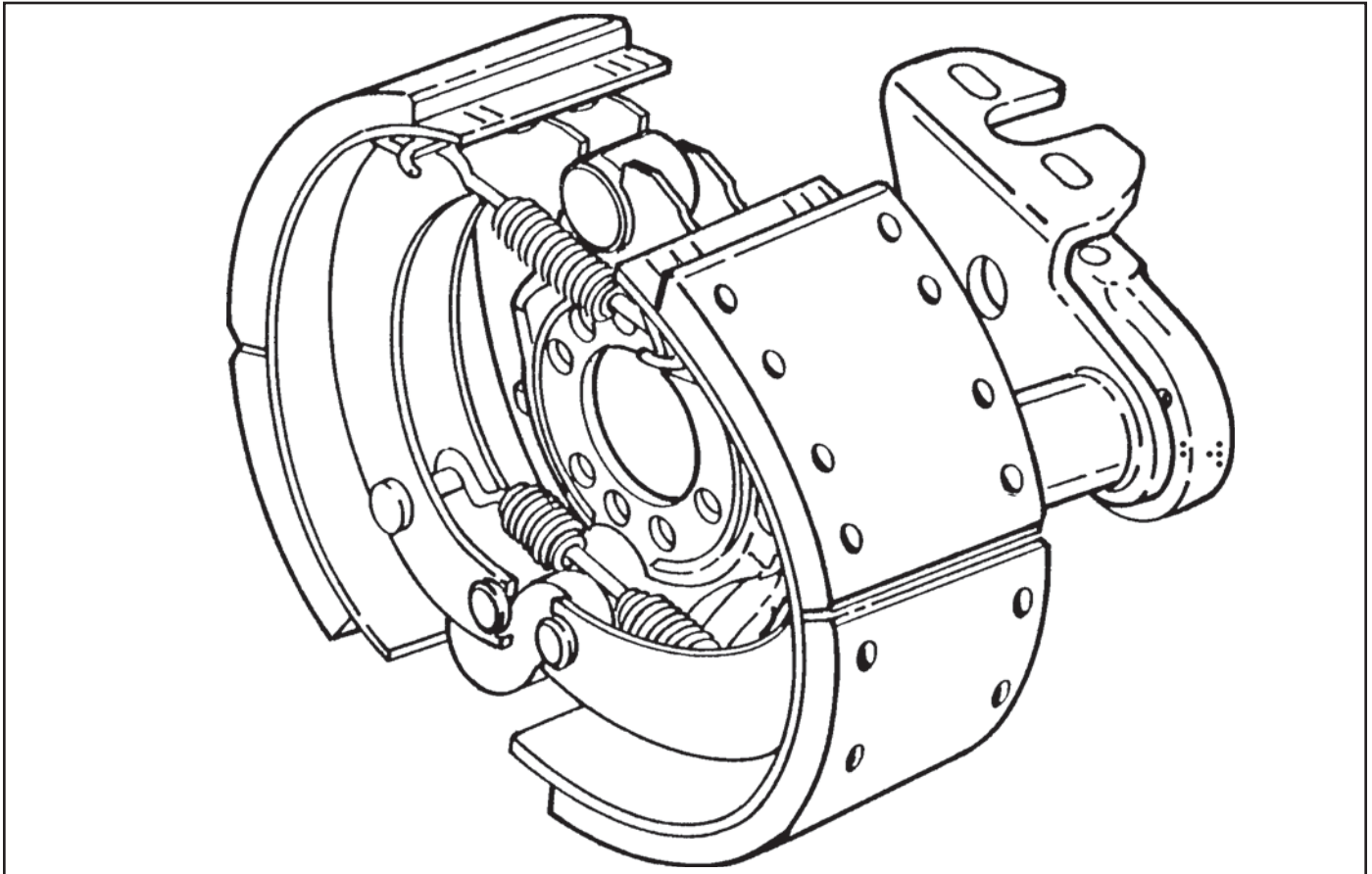


FIGURE 1

### GENERAL DESCRIPTION

The Bendix® BEPA (Ford) 15" x 4" cam brake is designed for use on heavy duty highway vehicles. It is a mechanically actuated, leading/trailing shoe brake with a fixed position cam and anchor.

The brake consists of two fabricated steel shoe assemblies anchored to a cast iron torque spider and actuated by a single forged S-cam shaft. Two retaining springs secure the shoe assemblies to the anchor pin. The twin webs of each shoe assembly are keyed to the anchor pin on one end and the cam roller on the other. A single shoe to shoe return spring is used to maintain constant contact between the shoe, cam roller and cam.

### OPERATION

The Bendix® cam brake operates in the following manner during a braking application. The force of the push rod of the actuator is converted from a linear force to a rotary torque. This is accomplished by use of the slack adjuster. This torque is transferred to the cam shaft of the foundation brake due to the spline of the cam shaft being connected to the gear of the slack adjuster. On the opposite end of the cam shaft is the S-cam which when rotated lifts the cam rollers. This spreads the brake shoe ends apart equally and pivots the shoes about the anchor pin so the brake lining comes in contact with the rotating brake drum. The friction created by the lining pressure against the drum generates the torque necessary to provide a retarding force to slow down the vehicle. The energy of the vehicle in motion is converted to heat at the surface of the drum and lining. This heat raises the temperature of the drum. The heat is stored in the drum, and finally dissipated to the air.

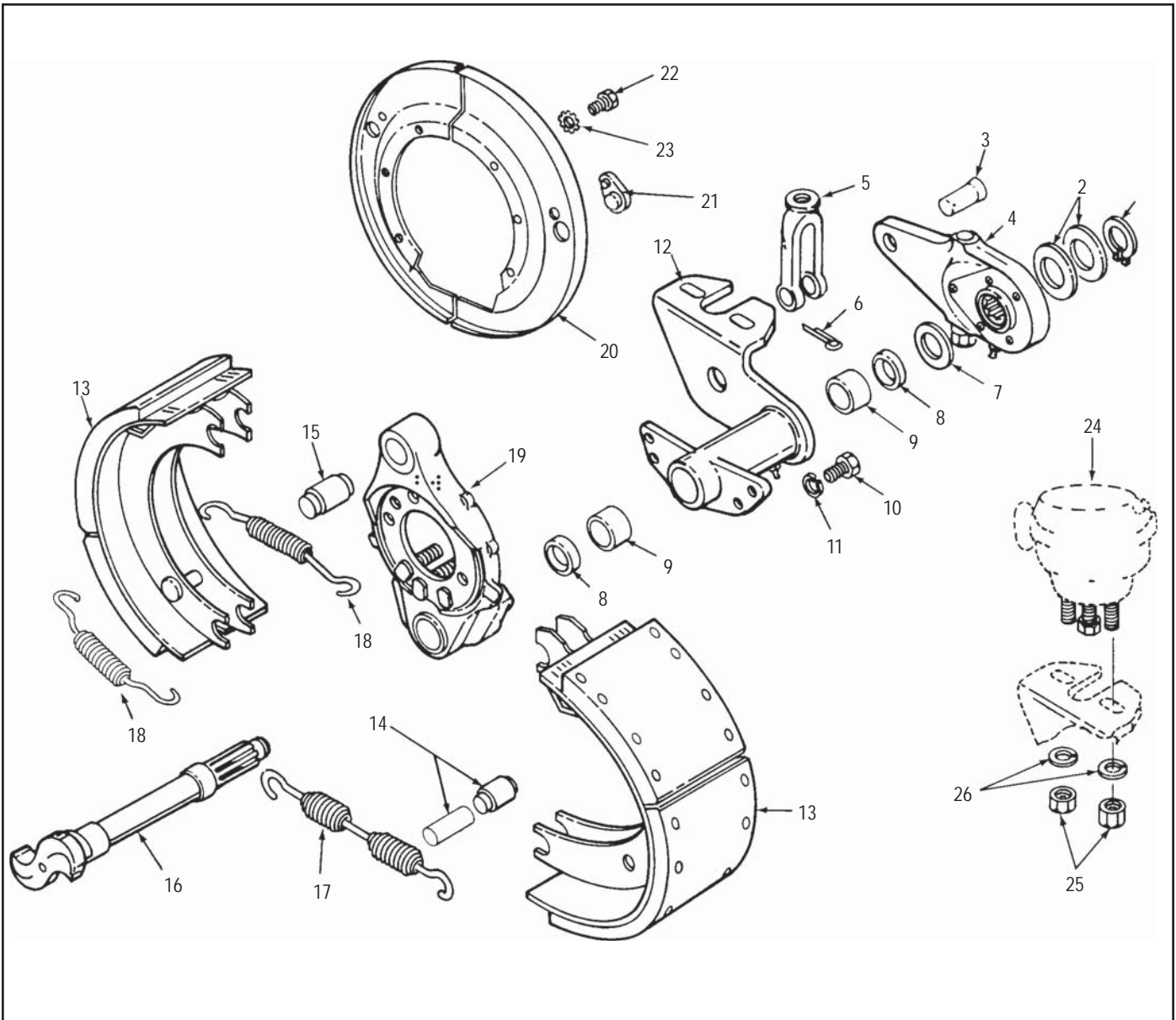


FIGURE 2 - BENDIX® BEPA (FORD) 15" X 4" CAM BRAKE

Key No.	Description	Qty.	Key No.	Description	Qty.
1	Snap ring	1	14	Cam roller assembly	2
2	Spacer washers	# +reqd.	15	Anchor pin	1
3	Yoke pin	1	16	S-Cam shaft	1
4	Slack adjuster	1	17	Shoe return spring	1
5	Yoke	1	18	Anchor spring	2
6	Cotter pin	1	19	Spider	1
7	Washer	1	20	Dust shield	2
8	Grease seal	2	21	Rubber inspection plug	2
9	Bushing	2	22	Cap Nut	6
10	Cap screw	4	23	Star Washer	6
11	Lock washer	4	24	Actuator	1
12	Chamber bracket and cam tube	1	25	Mounting Nuts	2
13	Brake shoe assembly	2	26	Washers	2

## PREVENTIVE MAINTENANCE

**Important:** Review the warranty policy before performing any intrusive maintenance procedures. An extended warranty may be voided if intrusive maintenance is performed during this period.

Because no two vehicles operate under identical conditions, maintenance intervals will vary. Experience is a valuable guide in determining the best maintenance interval for a vehicle.

### 1. BRAKE LUBRICATION

Grease camshaft bracket with vehicle manufacturer's recommended chassis lube. Lube once every six months or at each chassis lubrication.

### 2. BRAKE RELINE

The life of the brake lining is dependent on many factors such as the material of the lining, type of operation the vehicle is used for, and the driver of the vehicle. If driving conditions require frequent braking, lining replacement will be required more often. Reline when lining thickness at center of shoe is 5/16". Refer to section "Reline Procedure".

## **WARNING! PLEASE READ AND FOLLOW THESE INSTRUCTIONS TO AVOID PERSONAL INJURY OR DEATH:**

When working on or around a vehicle, the following general precautions should be observed **at all times**.

1. Park the vehicle on a level surface, apply the parking brakes, and always block the wheels. Always wear safety glasses.
2. Stop the engine and remove ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. Where circumstances require that the engine be in operation, **EXTREME CAUTION** should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated or electrically charged components.
3. Do not attempt to install, remove, disassemble or assemble a component until you have read and thoroughly understand the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.
4. If the work is being performed on the vehicle's air brake system, or any auxiliary pressurized air systems, make certain to drain the air pressure from all reservoirs before beginning **ANY** work on the vehicle. If the vehicle is equipped with an AD-IS® air dryer system or a dryer reservoir module, be sure to drain the purge reservoir.
5. Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.

6. Never exceed manufacturer's recommended pressures.
7. Never connect or disconnect a hose or line containing pressure; it may whip. Never remove a component or plug unless you are certain all system pressure has been depleted.
8. Use only genuine Bendix® replacement parts, components and kits. Replacement hardware, tubing, hose, fittings, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems.
9. Components with stripped threads or damaged parts should be replaced rather than repaired. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.
10. Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.
11. For vehicles with Antilock Traction Control (ATC), the ATC function must be disabled (ATC indicator lamp should be ON) prior to performing any vehicle maintenance where one or more wheels on a drive axle are lifted off the ground and moving.

## PREPARATION

1. Park vehicle on a level surface and prevent movement by means other than the brakes.
2. If equipped with spring brakes, cage the spring on all axles to be worked on.
3. Drain air from all reservoirs.
4. Raise the axle, to be worked on until the tires clear the ground.
5. Turn the slack adjuster adjusting screw in the opposite direction used to adjust the brakes until the cam rollers return to the start position on the S-cam.
6. Remove wheels and drums using the procedures specified in the vehicle maintenance manual.

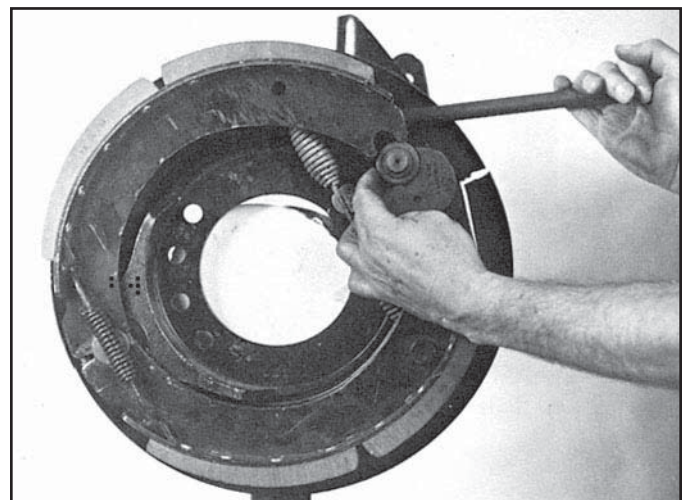


FIGURE 3 - REMOVING CAM ROLLERS

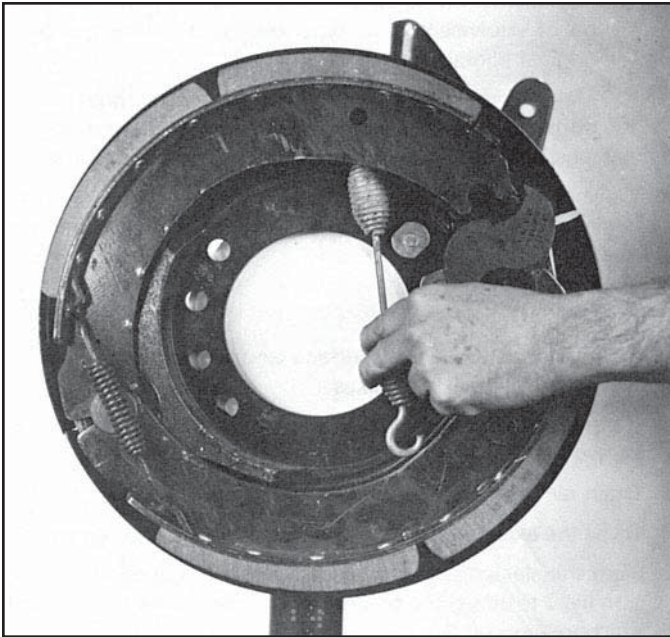


FIGURE 4 - REMOVING SHOE RETURN SPRING

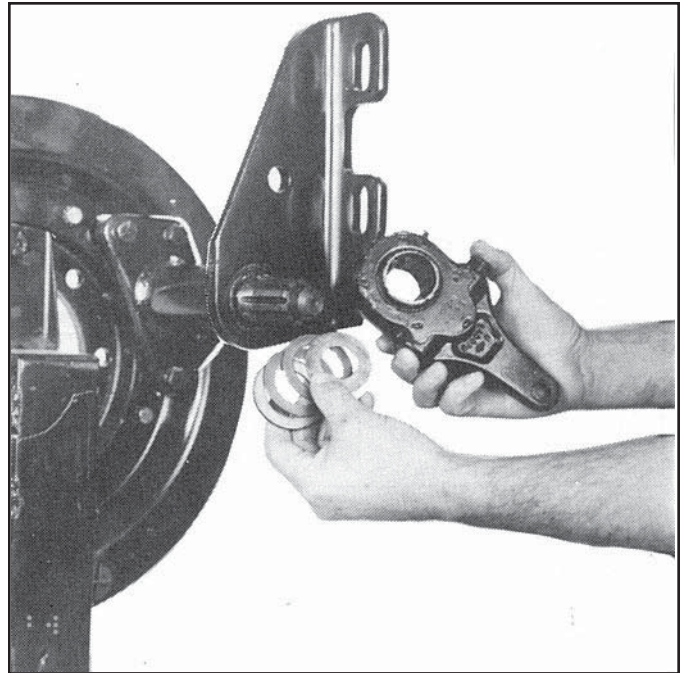


FIGURE 6 - REMOVING SLACK ADJUSTER

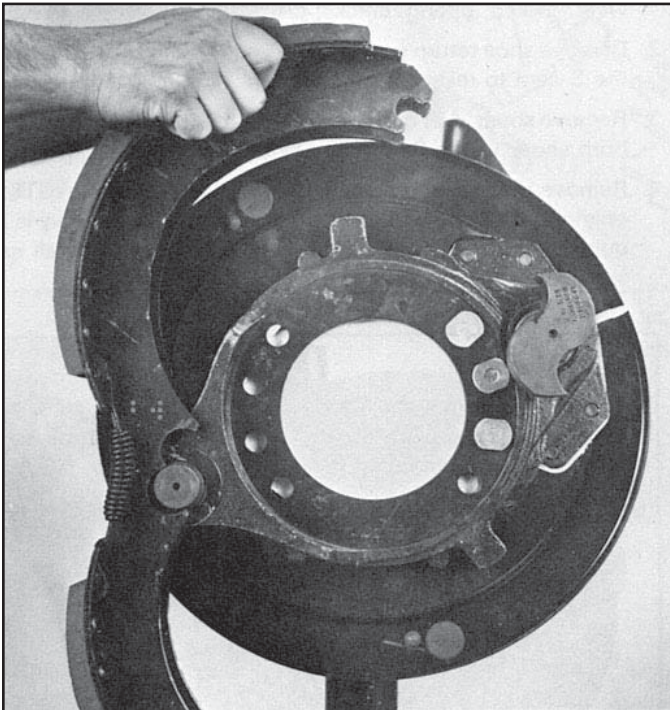


FIGURE 5 - REMOVING SHOES

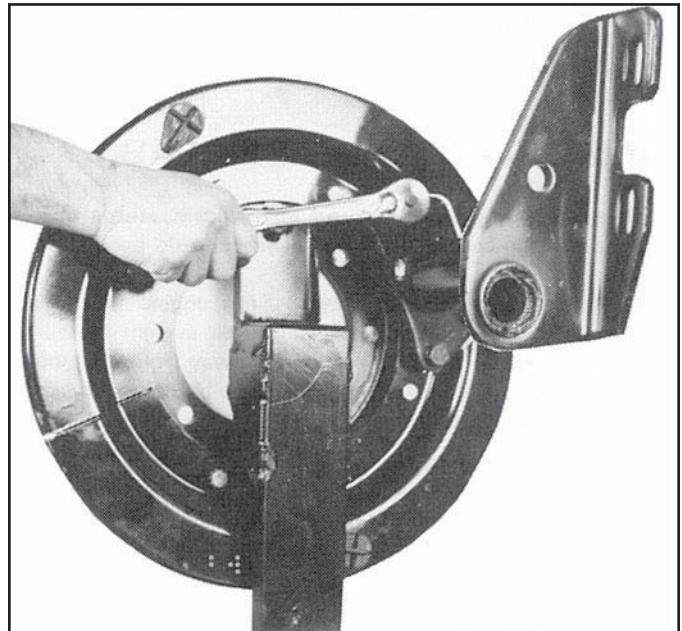


FIGURE 7 - REMOVING ACTUATOR BRACKET

### DISASSEMBLY (See Figure 2)

1. Insert a sturdy lever between one of the shoes and the cam shaft housing. Pry shoe away from cam roller until pin and roller assembly can be removed. Repeat on opposite shoe. (See Figure 3) (If cam rollers or pins show signs of wear, galling, pitting, cracks; discard and replace with new.)
2. Remove shoe return spring and discard. Force shoes towards the S-cam to relieve spring tension. (Figure 4)

3. Remove shoes. Lift one of the shoes off anchor pin and lower both shoes to the floor. (See Figure 5)
4. Remove the two shoe retainer springs and discard. NOTE: If only replacing the brake shoes, no further disassembly is required. Reverse Steps 1 thru 4. NOTE: Always install new springs.
5. Remove the anchor pin by sliding it out of the spider.
6. Remove the cotter pin from the yoke of the actuator. Remove yoke pin so the slack arm is free of the yoke. Remove the two nuts and washers that secure the actuator to the bracket and remove the actuator.

7. Remove snap ring and washer from splined end of cam shaft. Remove slack adjuster from cam shaft. (A puller may be required.) Remove spacers and the thick washer from cam shaft. (See Figure 6)
8. Remove cam shaft from actuator bracket and cam tube.
9. Mark and remove the dust shields from the spider by removing the six cap screws using a 3/8" socket. Do not remove unless there is apparent damage (See Figure 7).
10. Remove the actuator bracket and cam tube from the spider by removing the four cap screws and lockwashers using a 3/4" socket.
11. Remove and discard the two cam shaft grease seals. One at each end of the cam tube.
12. Remove and discard the two cam shaft bushings located in the same area as the seals in Step 11. Use a tool of proper diameter and length to drive the bushings out from the backside. NOTE: Prior to removal see the "Inspection of Parts" section, Step 1B.
13. To facilitate assembly, note or mark the relationship of the spider to the axle (driver or curb side) and the orientation on the axle flange. Remove the spider from the axle flange by removing the five bolts, nuts, and lockwashers and the nuts and lockwashers from the three studs. NOTE: If the spider is to be reused and there is damage to any of the three studs, they may be pressed out of the spider and replaced with grade 8, 5/8" bolts.

### **CLEANING OF PARTS**

After disassembling the foundation brake, wash the metallic components in mineral spirits and wipe dry. Be careful not to get any foreign material, especially grease on the brake shoes or interior of the brake drum. Use a wire brush to remove heavy contamination from the spider and outside of the brake drum.

### **INSPECTION OF PARTS**

1. ACTUATOR BRACKET AND CAM TUBE
  - A. Check assembly for bent actuator bracket and broken or cracked cam tube welds.
  - B. Inspect cam shaft bushing for signs of wear. Bearing surfaces should be smooth and free of any pitting or fractures. Insert cam shaft and measure looseness at both ends with a dial indicator. If more than .020" movement is noted, replace bushings and/or cam shaft. NOTE: If it is determined that a bushing requires replacement, both cam shaft bushings should be replaced.

2. CAM SHAFT
  - A. Inspect cam shaft spline for cracks and excessive deformation. Replace as necessary.
  - B. Inspect the cam shaft bearing journals for wear or corrosion. If the shaft shows wear or roughness that is visible or roughness that can be detected by feel, it must be replaced.
  - C. Inspect cam head for cracks, and its roller surfaces for flat spots, brinelling, or ridges. Note unusual wear patterns which may indicate an out-of-square condition. Replace if any of these conditions exist.
3. SPIDER
  - A. Inspect for cracked or broken surfaces on the spider at the cam, anchor pin, and mounting bolt holes. Replace any spider with visible damage. Do not attempt to weld or repair. Check fit of anchor pin in torque spider. Radial clearance in excess of .010" indicates excessive wear. Replace anchor pin and/or torque spider.
4. ROLLERS AND PINS
  - A. Inspect rollers and pins for flat spots, galling, broken or cracked surfaces. Replace as necessary.
5. ANCHOR PIN
  - A. Inspect anchor pin for worn, broken or cracked surfaces. Replace as necessary.
6. SHOES AND LINING
  - A. Check shoes for bent shoe webs, cracks in shoe table welds or webs, and elongated rivet holes. Replace shoes if any of these conditions exist.
  - B. Measure the shoe span by loosely installing the anchor pin and cam roller in the appropriate ends of the shoe web. If the distance from center of anchor pin to center of cam roller exceeds 11.78" replace shoe.
  - C. Check linings. Replace when any of the following conditions exist:
    1. Lining thickness at thinnest point is 1/4" or less.
    2. Linings are cracked or worn in an unusual or odd pattern, i.e., lining wear tapered from side to side across shoe table. Unusual wear patterns can indicate damage to foundation brake parts.
    3. Rivet holes are elongated in lining or shoes.
    4. Lining is oil soaked.
    5. Linings can be moved by hand, i.e.; loose rivets.

## 7. BRAKE DRUMS

- A. Inspect drums for cracks, heat checking, glazing, grooving, severe out-of-round condition or bell mousing (must not exceed .025 T.I.R.). Replace any cracked drums. It is recommended that drums be turned at reline to prevent hot spotting and achieve quicker, more complete burnishing of the new lining.
- B. Measure the drum I.D. to be sure the maximum limit allowed (stamped on drum) has not been exceeded, due to wear or machining.

## 8. MANUAL SLACK ADJUSTER

- A. Check for cracks in the body and arm of the slack adjuster.
- B. Check for spline wear. The amount of backlash in the slack adjuster to camshaft should be no more than .094" measured 6" from centerline of the cam shaft (See Figure 8).

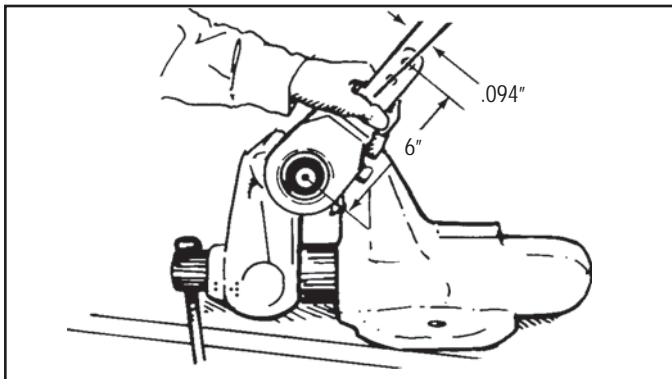


FIGURE 8 - CHECKING SLACK ADJUSTER BACKLASH

- C. Check ability to rotate the adjusting nut at least one complete revolution in each direction. Force required to rotate the adjusting nut should not exceed 15 ft. lbs. NOTE: If any of the above conditions are found, replace the slack adjuster. Do not attempt to repair.

## 9. AUTOMATIC SLACK ADJUSTERS

- A. Consult manufacturer's service information. (For information on Bendix Automatic Slack Adjusters, see Service Data sheet SD-05-1200, formerly SD-05-1).

## 10. ACTUATORS

- A. Check for cracked housing, loose mounting studs.
- B. Check for damage to the push rod, and push rod boot (if so equipped).
- C. Check for broken push rod return spring.
- D. Check for excessive wear on yoke, yoke pin, and slack adjuster yoke pin hole or bushing. There should be no more than .031 combined free play in these components.

**CAUTION:** If the vehicle is equipped with spring brakes, refer to manufacturer's instructions. High spring load, if not handled properly, may result in serious injury or death may result.

## ASSEMBLY (SEE FIGURE 2)

1. Install the spider onto the axle flange using the five bolts, three 5/8" studs, lockwashers and nuts. Be sure spider is properly oriented as noted during disassembly. Tighten mounting bolts to vehicle manufacturer's specifications.
2. If cam shaft bushings were removed, replace with new bushings. Drive into place using Owatonna 630-7 piloted driver or similar tool, taking care not to damage or distort the I.D. of the bushings. NOTE: Bushings are located at each end of cam shaft tube.
3. Install new cam shaft grease seals in the end of the cam tube and chamber bracket. Use Owatonna 630-7 piloted driver or similar tool to install grease seals.

**CAUTION:** The lip of the grease seals must be installed correctly to prevent possible damage. The lip of the seal that is installed in the cam end must enter the opening first. The lip of the seal that is installed in the opposite end of the cam tube must enter last (See Figure 9).

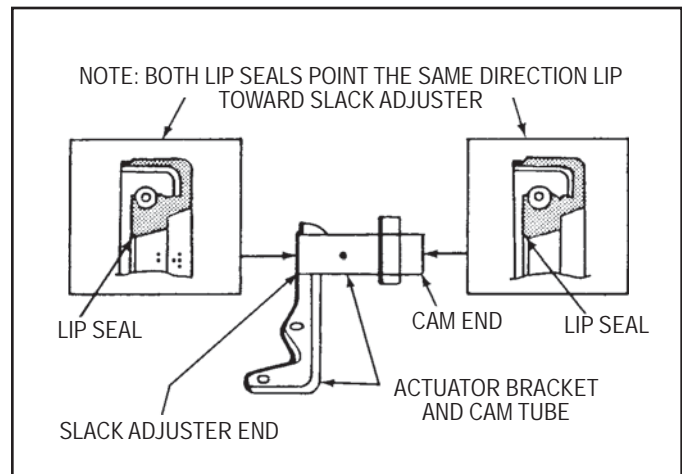


FIGURE 9 - SEAL INSTALLATION

4. Install the actuator bracket and cam tube onto the spider using four cap screws and lockwashers. Torque to 70-80 ft. lbs. Secure the actuator to the bracket using the two nuts and washers. Torque to vehicle manufacturer's specification.
5. If removed, reinstall the dust shields. Tighten the six cap screws and lockwashers to 90-110 in. lbs. torque.
6. Coat cam shaft journals with light film of chassis lube. Do not coat "S"-cam head. Install the cam shaft into the cam tube. Be careful not to damage the grease seals.

7. Install the thick cam shaft flat washer, the slack adjuster, spacers, washer, and a new snap ring in that sequence onto the splined end of the cam shaft. Adjust end play of the cam shaft to between .005" and .045" by using the appropriate number of spacer washers. Make sure the snap ring is seated into the groove at the end of the splined camshaft.
8. Install the anchor pin into the spider. Center the anchor pin in the spider so it protrudes equally from each side.
9. Install new brake shoe retaining springs. Engage hook ends of the two springs into each of the tabs of the two brake shoes.
10. Place the top shoe onto the spider by engaging the open slots on the end with the retaining springs onto the anchor pin. Place opposite end of the shoe against the S-cam. Swing the opposite shoe, with springs attached, back until slots in the shoe engage the anchor pin, then swing shoe toward the S-cam. Spring tension will hold the shoes in this position.
11. Place the hook of the brake shoe return spring onto the return spring pins on one shoe. Hold shoes against the S-cam and connect the other hook of the brake shoe return spring over the return spring pin of the other shoe.
12. Insert a sturdy bar between the end of one of the brake shoes and the spider housing at the S-cam end of the shoe. Pry down until the brake shoe roller and pin can be installed between the S-cam and the slots in the end of the brake shoe. Repeat the same procedure on the other shoe.
13. Adjust the slack adjuster until the yoke pin can be installed through the proper hole in the arm. Install a new cotter pin to retain. Make sure the cam rollers are in the lowest position on the cam.
14. Lubricate the cam shaft bushings by filling the cam shaft tube with chassis lube through the zerk fitting provided. Fill until grease is forced out in the area of the slack adjuster. Grease should not appear at the cam head end. If it does, the new seal has not been properly installed, or the old seals should be replaced.
15. Reinstall brake drums and wheels. Torque and adjust to manufacturer's specifications.
16. Spin the wheel slowly and adjust the slack adjuster until wheel will no longer turn. Back off slack adjuster just enough for wheel to spin freely. Be sure to adjust brakes equally on each axle.
17. Apply and release brakes and observe slack adjusters. Both slacks on each axle should respond rapidly and in unison during application and release.
18. Drive vehicle at a low speed in a safe area and check for brake effectiveness prior to putting back into service.

