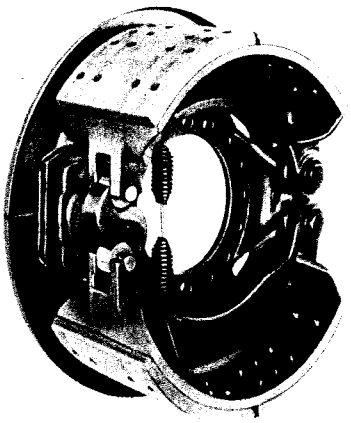
$2.00

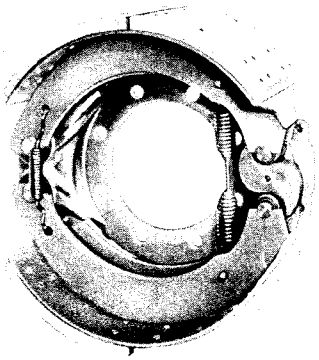
MAINTENANCE MANUAL NO. 4
REVISED 9-92

Cam Brakes

Rockwell

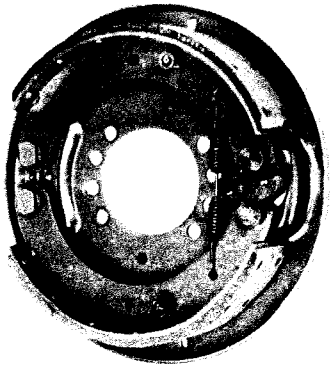


P-SERIES®

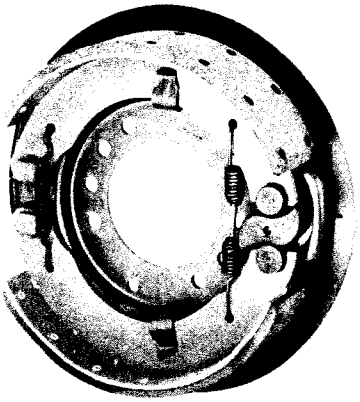


15" Q PLUS

16.5" Q-SERIES AND Q PLUS



T-SERIES



15" Q™-SERIES

Use Only Genuine Rockwell Parts.

Service Notes

This Maintenance Manual describes the correct service and repair procedures for Rockwell cam brakes.

The information contained in this manual was current at the time of printing and is subject to change without notice or liability.

You must follow your company safety procedures when you service or repair equipment. Be sure you understand all the procedures and instructions before you begin work on the unit.

Rockwell uses the following types of notes to give warning of possible safety problems and to give information that will prevent damage to equipment:

⚠ *WARNING*

A warning indicates procedures that must be followed exactly. Serious personal injury can occur if the procedure is not followed.

⚠ *CAUTION*

A caution indicates procedures that must be followed exactly. If the procedure is not followed, damage to equipment or components can occur. Serious personal injury can also occur in addition to damaged or malfunctioning equipment or components.

This symbol is used to indicate fasteners that must be tightened to a specific torque value.

NOTE

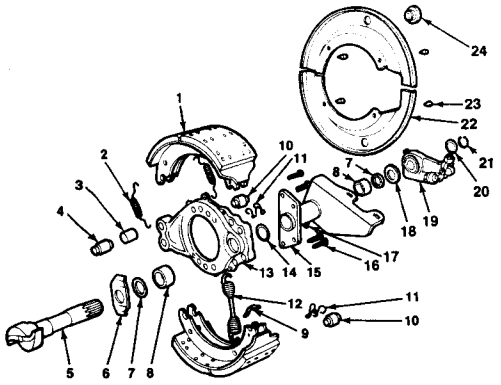
A note indicates an operation, procedure or instruction that is important for correct service. A note can also give information that will make service quicker and easier.

Some procedures require the use of special tools for safe and correct service. Failure to use these special tools when required, can cause injury to service personnel or damage to vehicle components.

⚠ *ASBESTOS AND NON-ASBESTOS FIBER WARNING*

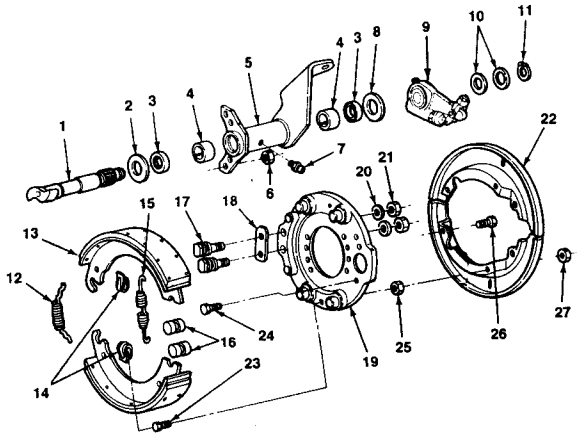
Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers whose long term effects are unknown.
Caution should be exercised in handling both asbestos and non-asbestos materials as described on page 2.

This manual is written in Rockwell Universal Language (RULS).



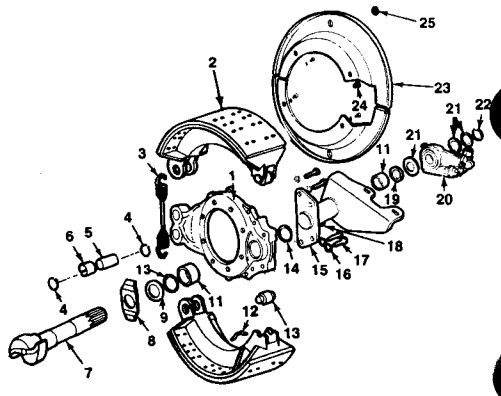
15" Q PLUS
16.5" Q-SERIES AND Q PLUS BRAKE

ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Shoe and lining assy.	13	Spider - brake
2	Spring - shoe retaining	14	Gasket - chamber bracket
3	Bushing - Anchor pin	15	Bracket - camshaft & chamber
4	Anchor pin - brake shoe	16	Capscrew - chamber bracket
5	Camshaft - "S" head	17	Fitting - grease
6	Washer - camhead (flat)	18	Washer - camshaft (thick)
7	Seal - camshaft (grease)	19	Slack Adj. - automatic
8	Bushing - camshaft	20	Washer - spacing
9	Pin - return spring	21	Lockring - camshaft
10	Roller - brake shoe	22	Dust Shield
11	Retainer - shoe roller	23	Capscrew - dust shield
12	Spring - brake shoe return	24	Plug



15" Q-SERIES BRAKE

ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Camshaft	15	Spring - shoe return
2	Washer - camhead	16	Rollers - brake shoe
3	Seal - camshaft	17	Anchor Pins - brake shoe
4	Bushing - camshaft	18	Plate - support
5	Bracket - camshaft	19	Backing Plate
6	Nut - camshaft bracket	20	Washer - anchor pin
7	Grease Fitting	21	Nut - anchor pin
8	Washer - spacing	22	Dust Shield
9	Slack Adjuster - automatic	23	Bolt - shoe clip
10	Spacers - camshaft	24	Bolt - camshaft bracket
11	Snap Ring - camshaft	25	Nut - clip to backing plate
12	Spring - shoe retaining	26	Capscrew - dust shield
13	Shoe & lining assembly	27	Nut - dust shield
14	Clips - anti-rattle		

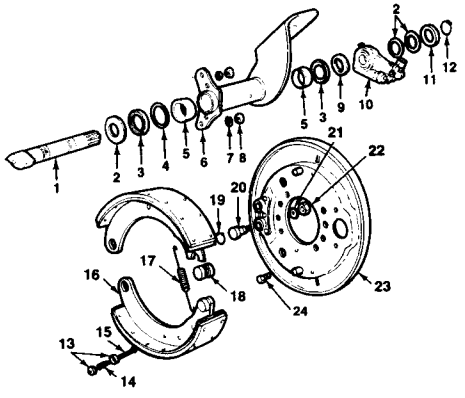


P-SERIES BRAKE

ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Spider - brake	14	Gasket - camshaft bracket
2	Shoe and lining assy.	15	Bracket - camshaft & chamber
3	Spring - brake shoe return	16	Washer - bracket capscrew
4	Lockring - anchor pin	17	Capscrew - camshaft bracket
5	Anchor Pin - brake shoe	18	Fitting - grease
6	Bushing - anchor pin	19	Seal - camshaft bracket
7	Camshaft - "S" head	20	Slack Adj. - automatic
8	Washer camshaft	21	Washer - spacing
9	Retainer - "O" ring	22	Lockring - camshaft
10	"O" Ring	23	Dust Shield
11	Bushing - camshaft	24	Capscrew - dust shield
12	Pin - return spring	25	Plug
13	Roller - brake shoe		

T-SERIES BRAKE

ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Camshaft	13	Retainer - anti-rattle spring
2	Washer - camhead	14	Spring - anti-rattle
3	Seal - camshaft	15	Rod - anti-rattle
4	Washer - spacer	16	Shoe & lining assy.
5	Bushing	17	Spring - shoe return
6	Bracket - camshaft & chamber	18	Roller - brake shoe
7	Lockwasher	19	Snap Ring - Anchor pin
8	Nut	20	Anchor Pin - brake shoe
9	Washer	21	Washer - anchor pin
10	Slack Adj - automatic	22	Nut - anchor pin
11	Washer - spacer	23	Backing Plate
12	Lockring - camshaft	24	Capscrew



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⚠ ASBESTOS WARNING

Recommended Procedures for Reducing Asbestos Dust, a Cancer and Lung Disease Hazard. For All Rockwell Brake Linings with Asbestos.

1. Because some brake linings contain asbestos, it is important that people who handle brake linings know the potential hazards of asbestos and the precautions to be taken. Exposure to airborne asbestos dust can cause serious and possibly fatal diseases; namely, asbestosis (a chronic lung disease) and cancer, principally lung cancer and mesothelioma (a cancer of the lining of the chest or abdominal cavities). The risk of lung cancer among asbestos workers who smoke is much greater than that among non-smokers. Symptoms of these diseases are not usually seen until 15 or 20, or more, years after the first exposure to asbestos.

2. OSHA has set the maximum allowable level for asbestos at 0.2 fibers of asbestos per cubic centimeter of air (0.2 f/cc) as an eight hour time weighted average and at 1.0 fiber per cubic centimeter (1.0 f/cc) averaged over a 30-minute sampling period. There is scientific debate whether even these levels will eliminate all risk of asbestos-related disease. Therefore, workers doing brake work should take steps to minimize exposure to asbestos to the extent possible.

3. Areas where brake work is done should be separate from other operations if possible. OSHA requires that the following sign be posted at the entrance to areas where exposures exceed either 0.2 f/cc (as an eight hour time weighted average) or 1.0 f/cc (averaged over a 30-minute sampling period.

DANGER: ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING
ARE REQUIRED IN THIS AREA

4. During brake servicing, the mechanic should wear an air purifying respirator with high-efficiency filters approved by NIOSH or MSHA for asbestos dust. (Disposable dust masks are no longer allowed by OSHA.) The respirator should be worn during all procedures, starting with the removal of wheels and including reassembly.

5. OSHA recommends that enclosed cylinders equipped with vacuums with high-efficiency (HEPA) filters be used in brake repairs. Under this system, the entire brake assembly is placed within the cylinder and the mechanic works on the brake through sleeves attached to the cylinder. Compressed air is blown into the cylinder to clean the assembly, and the dirty air is removed from the cylinder by the vacuum.

6. If such an enclosed system is not available, the mechanic must carefully clean the brake assembly in the open air. During disassembly, all parts should be carefully placed on the floor to minimize creation of airborne dust. Dust should first be cleaned from the brake drums, brake backing plates and brake assemblies using an industrial vacuum cleaner equipped with a HEPA filter system. After vacuum cleaning, any remaining dust should be removed using a rag soaked in water and wrung until nearly dry.

7. Compressed air or dry brushing should **never** be used for cleaning brake assemblies.

8. If grinding or other machining of brake linings is necessary, other precautions must be taken because exposure to asbestos dust is the highest during such operations. In addition to use of an approved respirator, there must be local exhaust ventilation such that worker exposures are kept as low as possible.

9. Work areas should be cleaned by industrial vacuums with HEPA filters or by wet wiping. Compressed air or dry sweeping should **never** be used for cleaning. Asbestos-containing waste, such as dirty rags, should be sealed, labeled and disposed of as required by EPA and OSHA regulations. Respirators should be used when emptying vacuum cleaners and handling asbestos waste products. Workers should wash before eating, drinking, or smoking, should shower after work, and should not wear work clothes home. Work clothes should be vacuumed after use and then laundered, without shaking, to prevent the release of asbestos fibers into the air.

⚠ NON-ASBESTOS FIBER WARNING

Most recently manufactured brake linings no longer contain asbestos fibers. In place of asbestos, these linings contain a variety of ingredients, including glass fibers, mineral wool, aramid fibers, ceramic fibers and carbon fibers. At present, OSHA does not specifically regulate these non-asbestos fibers, except as nuisance dust. Medical experts do not agree about the possible long-term risks from working with and inhaling non-asbestos fibers. Some experts nonetheless think that long term exposure to some non-asbestos fibers could cause diseases of the lung, including pneumoconiosis, fibrosis and cancer. Therefore, Rockwell recommends that workers use caution to avoid creating and breathing dust when working on brakes that contain non-asbestos fibers.

1. Whenever possible, work on brakes in a separate area away from other operations.

2. Always wear a respirator approved by NIOSH or MSHA during all brake service procedures. Wear the respirator from removal of the wheels through assembly.

3. **Never** use compressed air or dry brushing to clean brake parts or assemblies. OSHA recommends that you use cylinders that enclose the brake. These cylinders have vacuums with high efficiency (HEPA) filters and worker's arm sleeves. But, if such equipment is not available, carefully clean parts and assemblies in the open air.

4. Clean brake parts and assemblies in the open air. During disassembly, carefully place all parts on the floor to avoid getting dust into the air. Use an industrial vacuum cleaner with a HEPA filter system to clean dust from the brake drums, backing plates and other brake parts. After using the vacuum, remove any remaining dust with a rag soaked in water and wrung until nearly dry.

5. Grinding or machining brake linings. If you must grind or machine brake linings, take additional precautions because contact with fiber dust is higher during these operations. In addition to wearing an approved respirator, do such work in an area with exhaust ventilation.

6. Cleaning the work area. **Never** use compressed air or dry sweeping to clean the work area. Use an industrial vacuum with a HEPA filter and rags soaked in water and wrung until nearly dry. Dispose of used rags with care to avoid getting dust into the air. Use an approved respirator when emptying vacuum cleaners and handling used rags.

7. Worker clean-up. Workers should wash their hands before eating, drinking or smoking. Do not wear your work clothes home. Vacuum your work clothes after use and then launder them separately, without shaking, to prevent fiber dust from getting into the air.

8. Material safety data sheets on this product, as required by OSHA, are available from Rockwell.

Section 1
Introduction

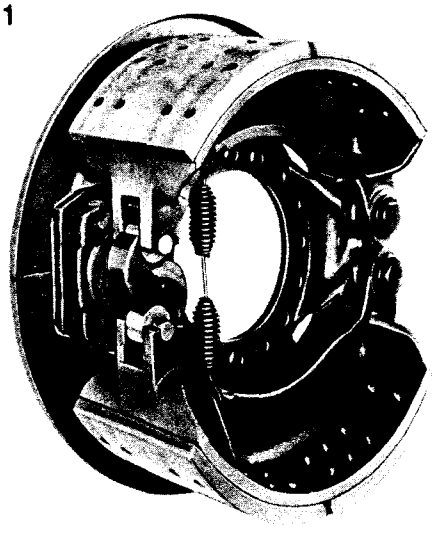
Rockwell Cam-Master® brakes are air actuated, cam operated, two shoe brakes with each shoe mounted on a separate anchor pin. The brakes are available with automatic or manual adjustment and can be assembled with spring brakes.

There are four types of Cam-Master brakes: P-Series®, Q™Series, Q Plus and T-Series.

P-Series Brakes

Rockwell P-Series brakes are available in 16.5 and 18 inch diameters with 7 inch wide cast shoes with 0.75 inch tapered brake lining. **Figure 1.**

Figure 1

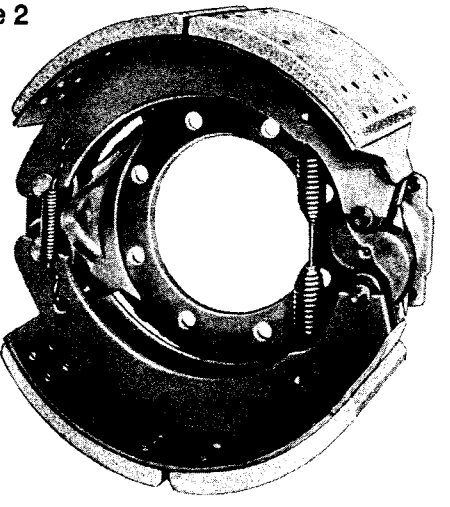


P-SERIES BRAKE WITH CAST SHOES

Q-Series and Q Plus Brakes

The Q-Series brake is similar to the P-Series brake, but has open anchor pin ends on the shoes to permit "Quick Change" service. The Q-Series brake also has two shoe retainer springs, in addition to the shoe return spring, and different design anchor pins. Q-Series brakes are available in 16.5 inch diameter with 5, 6, 7, 8, 8.625 and 10 inch widths with 0.75 inch tapered brake lining. **Figure 2.**

Figure 2



15" Q PLUS BRAKE
16.5" Q-SERIES and Q PLUS BRAKE

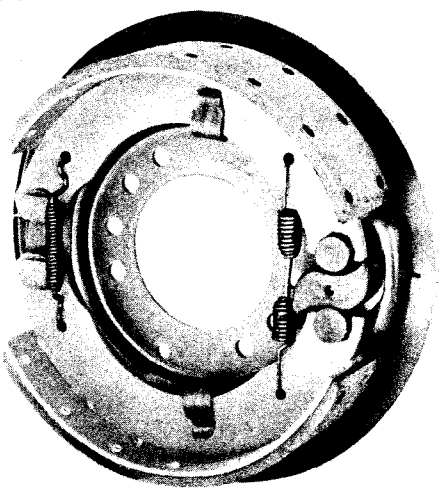
The Q Plus brake is the same as the Q-Series brake except for the following differences:

- New shoes
- Thicker linings
- Heavy-duty return spring
- New camshaft
- The trailer axle version of the 16.5" x 7" brake uses a heavy-duty, bolt-on camshaft bushing.

Section 1
Introduction

A 15 x 4 inch Q-Series brake is available for front, non-drive axle applications. **Figure 3.** The 15 x 4 inch Q-Series brake has one shoe return spring and one shoe retainer spring. The anchor pins are different from other Q-Series brakes, but the shoes still have the "Quick Change" feature. The shape of the rollers and the shape of the cam head are also different from other Q-Series brakes.

Figure 3



15" Q-SERIES BRAKE

The 15 inch Q Plus brake offers the same features as the 16.5 inch Q brake. Compared to the standard 15 inch Q Series brake, the 15 inch Q Plus is different due to the following features:

- Double web shoe
- Cast spider
- 1.5 inch-28 spline camshaft
- 1.75 inch offset
- 0.75 inch tapered brake lining.

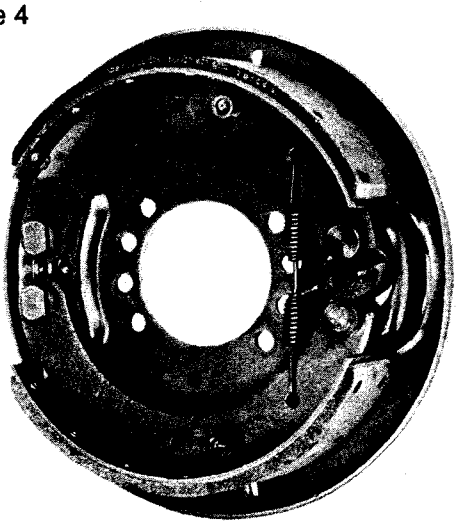
T-Series Brakes

The T-Series brake was for smaller capacity axles and was available in 15 inch diameter with 3.5 and 4 inch widths with 0.438 inch thick lining. **Figure 4.**

NOTE

The current 15 x 4 inch Q-Series and Q Plus brakes are designed to be used in applications where T-Series brakes were used. T-Series brake parts are NOT interchangeable with Q-Series or Q Plus brake parts.

Figure 4



T-SERIES BRAKE

Section 2
Disassemble Brakes

⚠ WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers whose long term effects are unknown. Caution should be exercised in handling both asbestos and non-asbestos materials as described on page 2.

Remove Wheel Components

⚠ WARNING

Do not work under a vehicle supported only by jacks. Jacks can slip or fall over and cause serious personal injury.

1. Jack up the vehicle under the axle being serviced.
2. Install jack stands under each corner of the vehicle to hold it in position.

⚠ WARNING

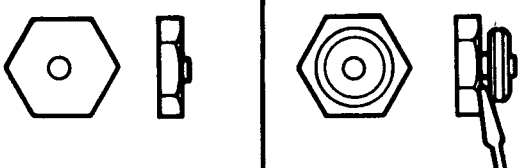
When you work on a spring chamber, carefully follow the service instructions of the chamber manufacturer. Sudden release of a compressed spring can cause serious personal injury.

3. If the brake has spring chambers, carefully cage and lock the spring so that the spring cannot actuate during disassembly.
4. Fully release the slack adjusters so that the shoes retract and the drums will clear the linings.

NOTE

Old style pawls on Rockwell automatic slack adjusters must be removed to prevent damage when adjusting the brake. New style "pull" pawls are spring loaded. They need only be pried out at least 1/32 inch to disengage the teeth and prevent damage. When you remove the pry bar the pawl will engage automatically. Figure 5.

Figure 5



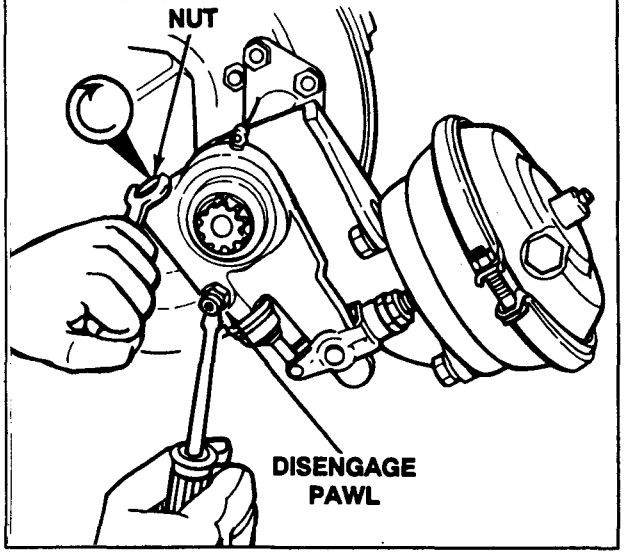
OLD STYLE (REMOVE) | NEW STYLE (PRY OUT)

⚠ CAUTION

Disengage or remove the pawl assembly before you turn the manual adjusting nut or you will damage the pawl teeth. Damaged teeth prevent automatic adjustment and require that you regularly adjust the brake manually.

A. Disengage or remove the pawl assembly as required. **Figure 6.**

Figure 6 **MANUAL ADJUSTING NUT**



DISENGAGE PAWL

B. Use a wrench to turn the manual adjusting nut until the brake shoes are fully retracted.

C. Remove the screwdriver so the pawl snaps back into engagement, or, install the pawl assembly.

NOTE

For complete maintenance instructions on the Rockwell automatic slack adjuster, see Rockwell Maintenance Manual No. 4B.

5. Remove the wheels and drums from the axle using standard procedures

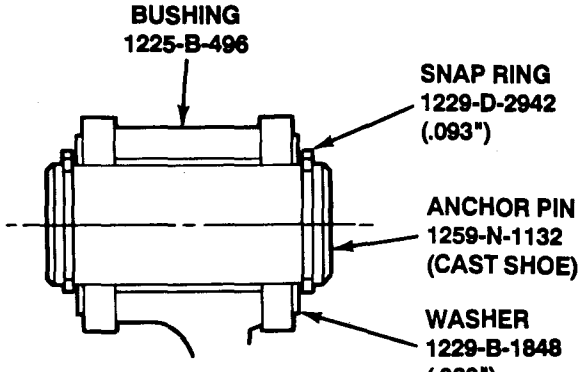
Section 2
Disassemble Brakes

Remove Brake Shoes

P-Series Brakes

Figure 7 shows the current anchor pin arrangement for P-series brakes. Older brakes may include additional parts.

Figure 7

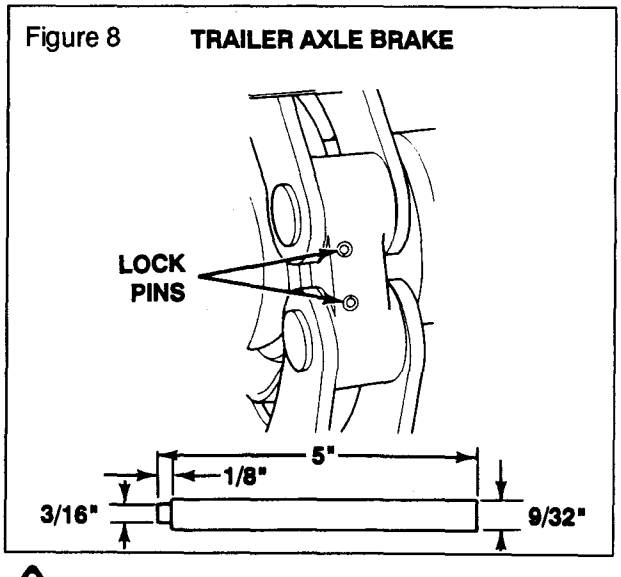


1. Remove any anchor pin snap rings, washers, retainers, felts, seals or set screws, as needed.

NOTE

Some trailer axle P-Series brakes have anchor pins that are held in place with lock pins. A tool to drive out the lock pins can be made from a steel rod, as shown in Figure 8.

Figure 8 **TRAILER AXLE BRAKE**

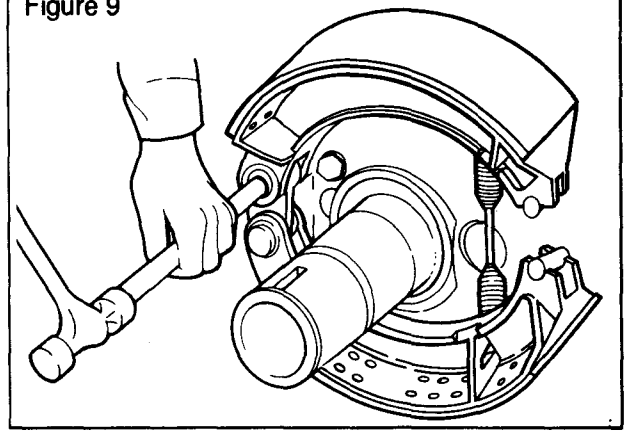


WARNING

Wear eye protection. Do not hit steel parts with a steel hammer. Pieces can break off and cause serious personal injury.

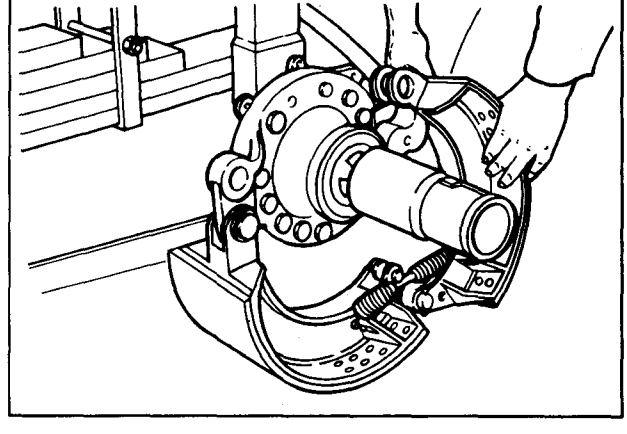
2. Remove the top anchor pin with a brass drift. **Figure 9.**

Figure 9



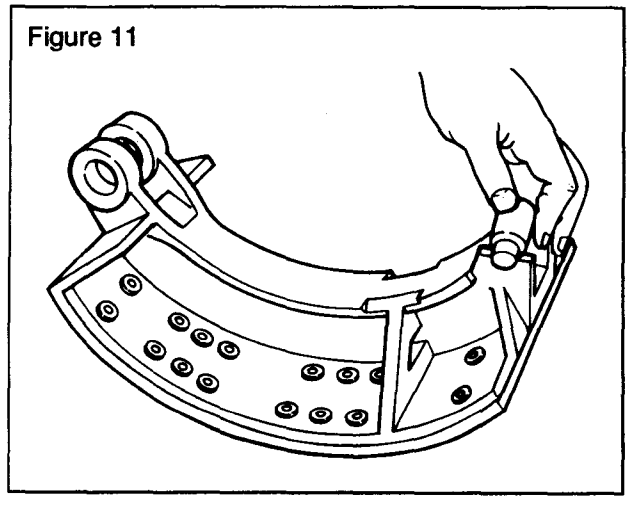
3. Rotate the top shoe to release the tension on the return spring and remove the shoe. **Figure 10.**

Figure 10



4. Remove the bottom anchor pin (see step 2) and remove the second shoe.
5. If necessary, remove the rollers. **Figure 11.**

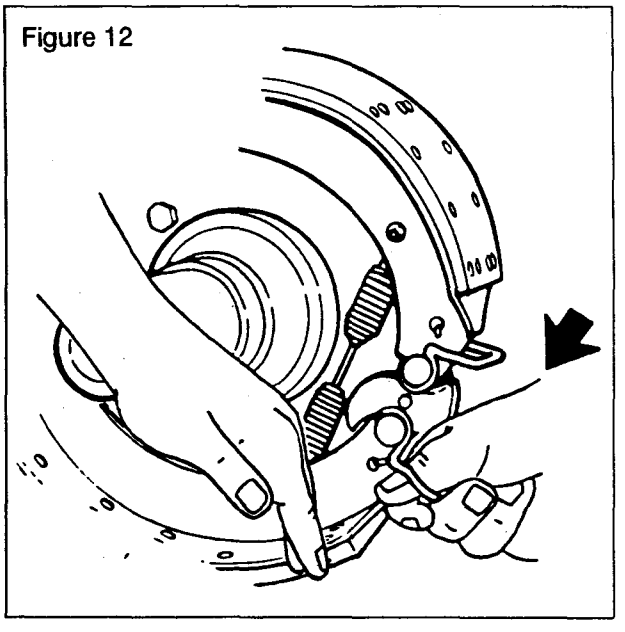
Figure 11



16.5 Inch Diameter Q-Series Brakes and All Q Plus Brakes

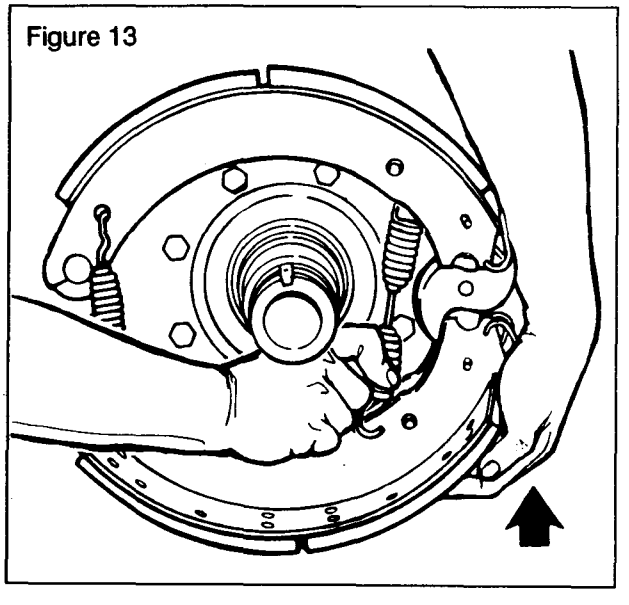
1. Push down on the bottom brake shoe and pull on the roller retaining clip to remove the bottom cam roller. **Figure 12.**

Figure 12



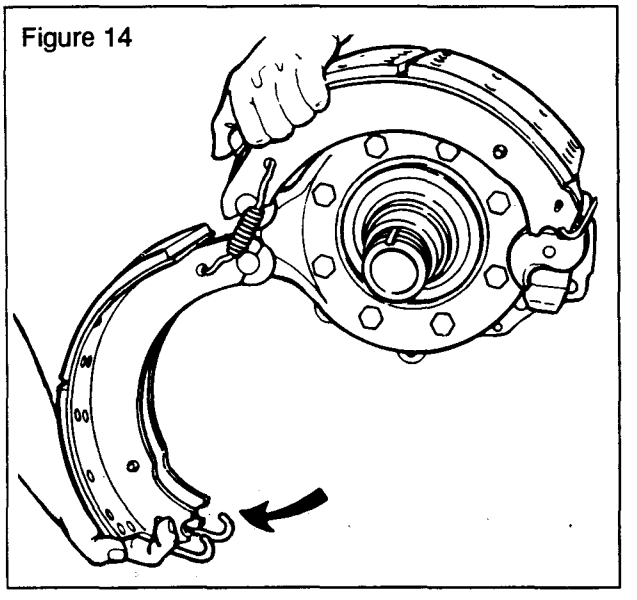
2. Lift the top brake shoe and pull on the roller retaining clip to remove the top cam roller.
3. Lift the bottom shoe to release the tension on the brake return spring and remove the spring. **Figure 13.**

Figure 13



4. Rotate the bottom shoe to release the tension on the two retaining springs. Remove the springs and brake shoes. **Figure 14.**

Figure 14



15 Inch Diameter Q-Series Brakes

1. Push down on the bottom brake shoe to give clearance and then remove the bottom cam roller.
2. Lift the top brake shoe and remove the top cam roller.
3. Remove the brake shoe return spring.
4. Rotate the bottom shoe to release the tension on the retaining spring. Remove the spring and brake shoes.

T-Series Brakes

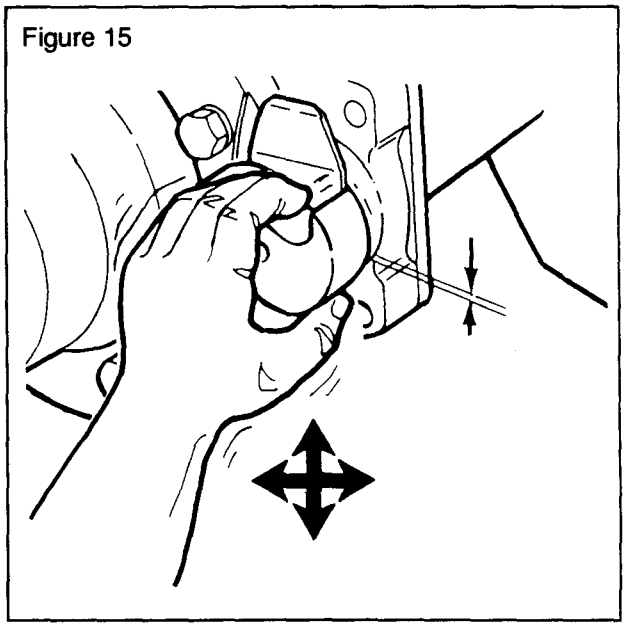
1. Disassemble the retainers and springs from the anti-rattle rods.
2. Push down on the bottom brake shoe to give clearance and then remove the bottom cam roller.
3. Lift the top brake shoe and remove the top cam roller.
4. Remove the anchor pin snap rings and the anchor pins.
5. Remove the brake shoes.

Section 2
Disassemble Brakes

Remove Camshaft and Slack Adjuster

1. Remove the two clevis pins from the clevis on the air chamber push rod.
2. Remove the slack adjuster from the camshaft.
3. Check to see if the camshaft bushings need replacement by checking the up and down and side to side end play of the camshaft. **Figure 15.** If this total movement is more than 0.030 inch (0.76 mm), remove the camshaft from the spider. Use the correct size driver to remove the bushings from the spider and the bracket.
4. Remove any snap rings, washers and spacers from the camshaft.
5. Pull the camshaft from the spider and bracket.

Figure 15



Section 3
Prepare Parts for Assembly

Clean Parts

⚠ WARNING

If you use cleaning solvents, hot solution tanks or alkaline solutions incorrectly, serious personal injury can occur. To prevent injury, follow the instructions supplied by the manufacturer of these products. Do NOT use gasoline to clean parts. Gasoline can explode.

Clean Ground or Polished Parts

Use a cleaning solvent, kerosene or diesel fuel to clean ground or polished parts and surfaces. DO NOT USE GASOLINE.

Do NOT clean ground or polished parts in a hot solution tank or with water, steam or alkaline solutions. These solutions will cause corrosion of the parts

Clean Rough Parts

Rough parts can be cleaned with solvents or in hot solution tanks with a weak alkaline solution. Parts must remain in the hot solution tanks until they are completely cleaned and heated. When the parts are removed from the hot solution tank, wash them with water until the hot solution is removed.

Dry Cleaned Parts

Dry the parts immediately after cleaning. Dry parts with clean paper or rags, or compressed air.

Prevent Corrosion on Cleaned Parts

Apply brake lubricant to cleaned and dried parts that are not damaged and are to be immediately assembled. Do NOT apply brake lubricant to the brake linings or the brake drums.

If parts are to be stored, apply a special material that prevents corrosion and rust to all surfaces. Do NOT apply the material to the brake linings or the brake drums. Store the parts inside special paper or other material that prevents corrosion and rust.

Inspect Parts

It is important that you carefully inspect all parts before assembly. Check all parts for wear or damage and repair or replace them as required.

1. Check the spider for expanded anchor pin holes and for cracks. Replace damaged spiders and anchor pin bushings.
2. Check the camshaft bracket for broken welds, cracks and correct alignment. Replace damaged brackets.
3. Check anchor pins for corrosion and wear. Replace damaged anchor pins.
4. Check brake shoes for rust, expanded rivet holes, broken welds, and correct alignment. Replace any shoe with any of the above conditions.

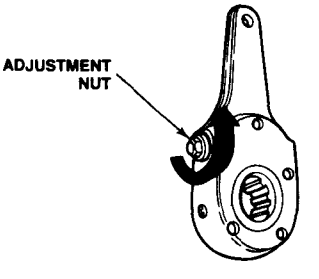
   On 16.5 Inch brake shoes only: anchor pin holes must not exceed 1.009 inches in diameter. The distance from the center of the anchor pin hole to the center of the roller hole must not exceed 12.779 inches. Replace any shoe whose measurements are not to specifications.
5. Check the camshaft for cracks, wear and corrosion. Check the cam head, bearing journals and splines. Replace damaged camshafts.
6. Check the slack adjusters:

   A. For slack adjusters with "quick connect" type clevis, check the gap between the clevis and the collar. If the gap exceeds 0.060 inch (1.52 mm) replace the clevis.

   B. Check the clevis pins and the bushing in the arm of the slack adjuster. Replace the pins if they are worn. Replace the bushing if its diameter exceeds 0.531 inch (13.5 mm).

   C. For manual slack adjusters, rotate the adjustment nut on the worm shaft to make sure that the worm drive is free. **Figure 16.** Replace the slack adjuster if the worm drive does not operate correctly. Do NOT repair a manual slack adjuster.

Figure 16



Section 3
Prepare Parts for Assembly

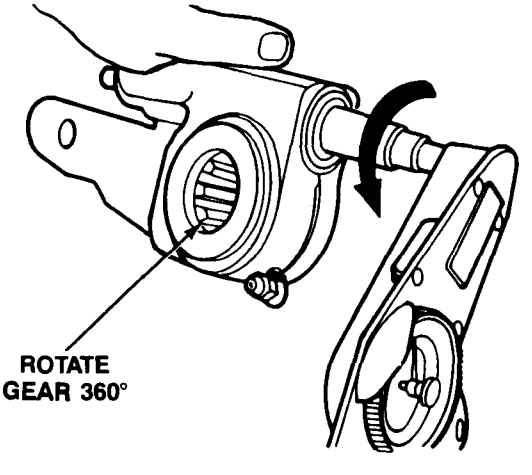
⚠ CAUTION

The pawl must be installed when you test the slack adjuster in step D. Turn the adjusting nut only in the direction shown in Figure 17. If you turn the adjusting nut in the opposite direction while the pawl is installed, you will damage the pawl teeth. Damaged teeth prevent automatic adjustment and require that you regularly adjust the brake manually.

D. Check Rockwell automatic slack adjusters by rotating the adjusting nut to the left with a pound inch torque wrench. **Figure 17.** Turn the gear 360 degrees (22 rotations of the adjusting nut).

- For a new or rebuilt slack adjuster, the torque MUST remain less than 25 lb-in for 360 degrees.
- For an in-service slack adjuster, the torque MUST remain less than 40 lb-in for 360 degrees.
- If the torque value exceeds the specifications, the slack adjuster is not working correctly. Disassemble, inspect and repair the slack adjuster. See Rockwell Maintenance Manual No. 4B for complete information.

Figure 17



7. Check the drums:

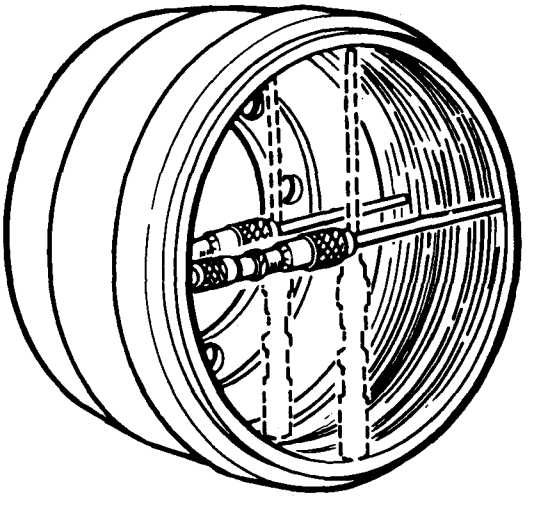
A. Check the brake drums for cracks, severe heat checking, heat spotting, scoring, pitting and distortion. Replace drums as required. Rockwell recommends that you do NOT turn or rebore brake drums because it decreases the strength and heat capacity of the drum.

B. Measure the inside diameter of the drum in several locations with a drum caliper or internal micrometer. **Figure 18.** Replace the drum if the diameter exceeds the specifications supplied by the drum manufacturer.

⚠ WARNING

Do not operate the vehicle with the brake drum worn or machined beyond the discard dimension indicated on the drum. The brake system may not operate correctly and this could result in damage or serious personal injury.

Figure 18



8. Check dust shields for rust and distortion. Repair or replace damaged shields as necessary.

⚠ WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers whose long term effects are unknown. Caution should be exercised in handling both asbestos and non-asbestos materials as described on page 2.

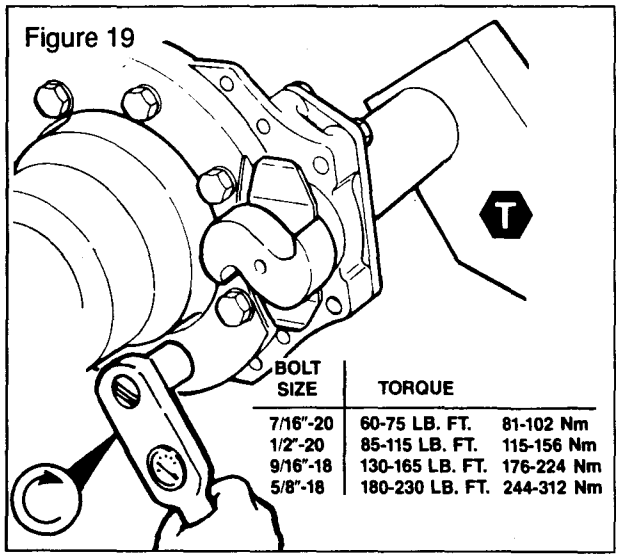
NOTE

To help avoid shorter lining life, Rockwell recommends that springs, rollers, and anchor pins be replaced at each reline.

Install Camshaft

1. Tighten all the spider bolts to the correct torque as shown in **Figure 19.** (T)

Figure 19



BOLT SIZE	TORQUE	
7/16"-20	60-75 LB. FT.	81-102 Nm
1/2"-20	85-115 LB. FT.	115-156 Nm
9/16"-18	130-165 LB. FT.	176-224 Nm
5/8"-18	180-230 LB. FT.	244-312 Nm

2. Use a seal driver to install new camshaft seals and new bushings in the spider and the camshaft bracket. **Figure 20.** Install the seals with their lips toward the slack adjuster. **Figure 21.**

Figure 20

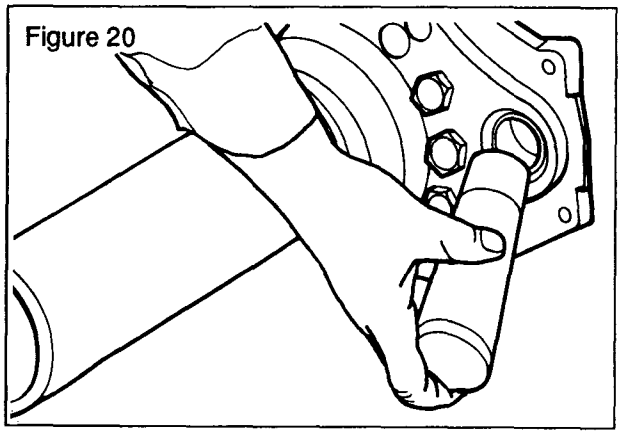
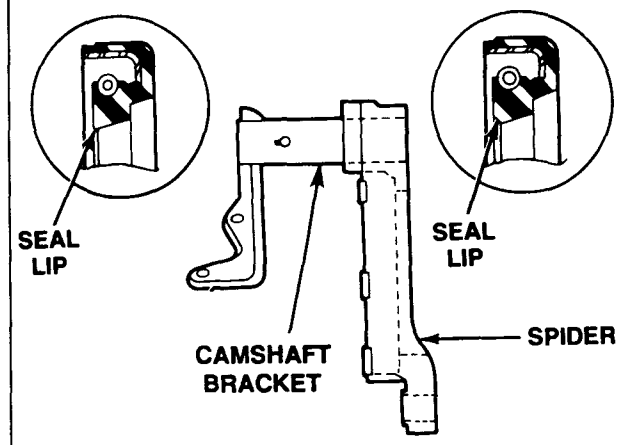
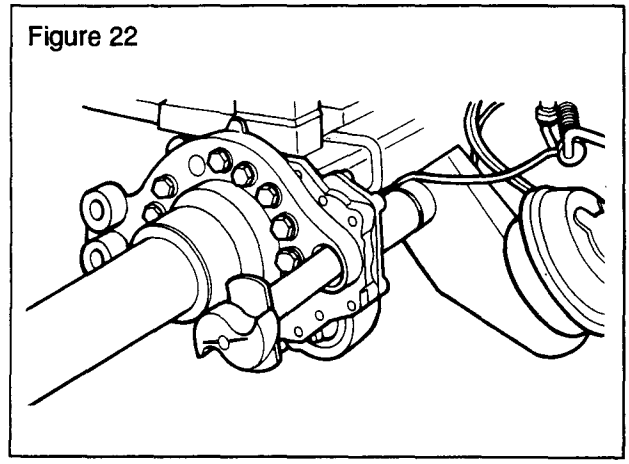


Figure 21



4. If the camshaft bracket was removed, install the gasket and bracket on the spider. Tighten the capscrews to the correct torque. See the Torque Chart on page 24.
5. Put the cam head thrust washer on the camshaft. Apply O-617-A or -B chassis grease to the camshaft bushings and journals. Install the camshaft through the spider and bracket so that the camshaft turns freely by hand. **Figure 22.**

Figure 22



Section 4
Assemble Brakes

Install Brake Shoes

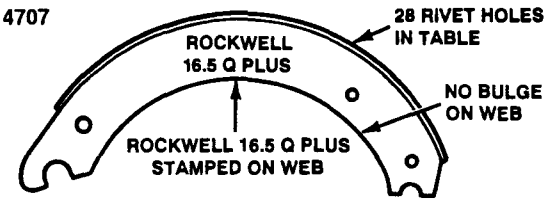
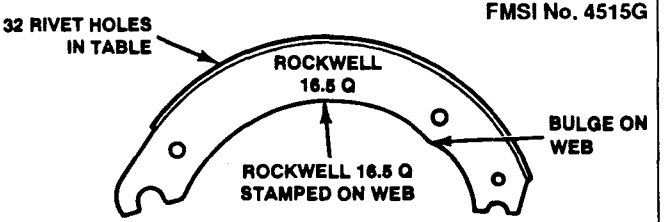
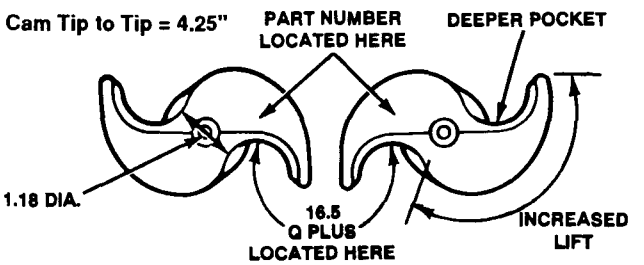
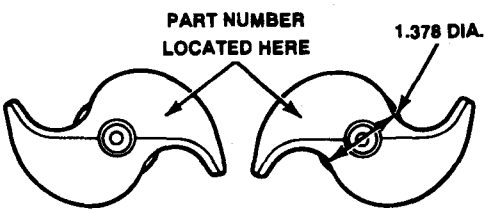
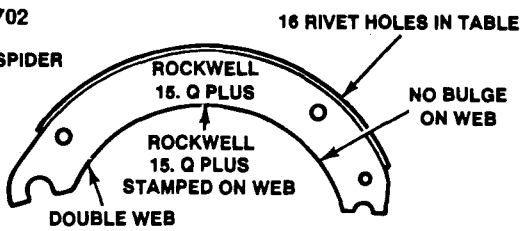
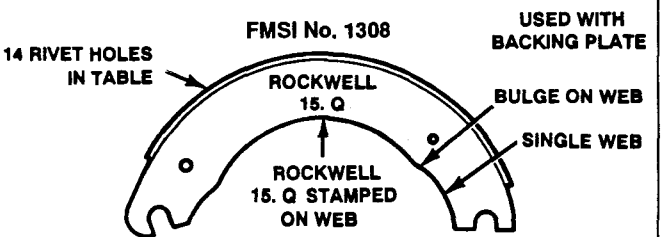
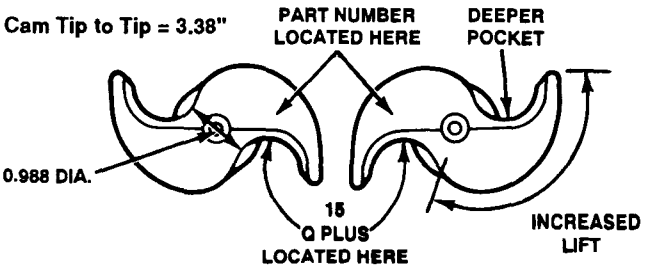
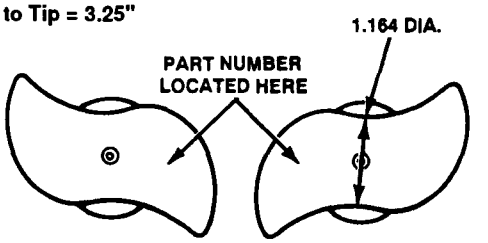
NOTE

When you install the brake shoes, lubricate the brake components as described in Section 6.

16.5 Inch Q-Series and All Q Plus Brakes

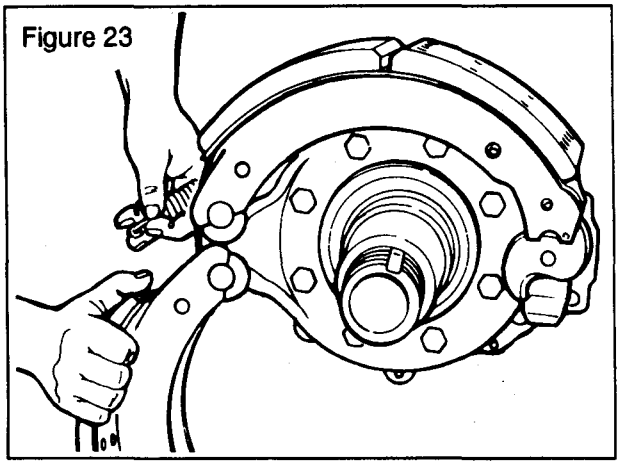
⚠ *WARNING*

Never use a standard Q brake camshaft with Q Plus brake shoes. Always use Q Plus camshafts with Q Plus brake shoes. All Q Plus shoes and camshafts are marked with "Q Plus" for easy identification. If Q Plus shoes are used with standard Q camshafts, there is a possibility that the camshaft will "roll over" during brake application under certain operating conditions. This results in a non-working brake which will increase stopping distances. Also, a new brake drum may not fit over the Q Plus brake shoes if the shoes are used with a standard Q brake camshaft. The chart below shows how to identify the differences between Q and Q Plus components.

Q Plus Components	Q Components
FMSI No. 4707  16.5" X 7" Q PLUS SHOE	FMSI No. 4515G  16.5" X 7" Q SHOE
Cam Tip to Tip = 4.25"  16.5" Q PLUS CAM (1.5" DIA. -28 SPLINES)	Cam Tip to Tip = 4.22"  16.5" Q CAM (1.5" DIA.-10 OR 28 SPLINES)
FMSI No. 4702 USED WITH SPIDER  15" X 4" Q PLUS SHOE	FMSI No. 1308 USED WITH BACKING PLATE  15" X 4" Q SHOE
Cam Tip to Tip = 3.38"  15" Q PLUS CAM (1.5" DIA.-28 SPLINES)	Cam Tip to Tip = 3.25"  15" Q CAM (1.25" DIA.-10 OR 24 SPLINES)

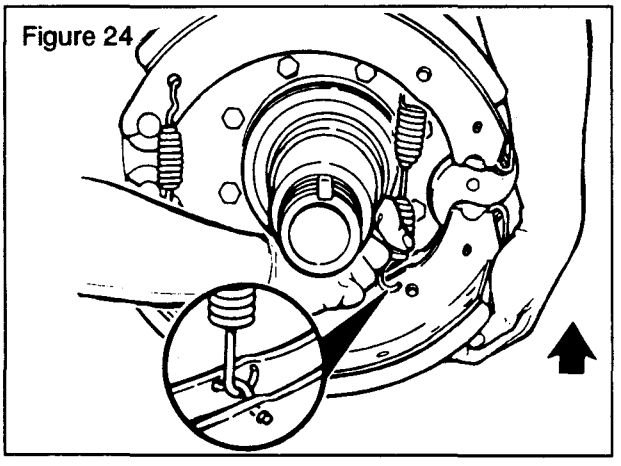
1. Put the upper brake shoe in position on the top anchor pin. Hold the lower brake shoe on the bottom anchor pin and install two new brake shoe retaining springs. **Figure 23.**

Figure 23



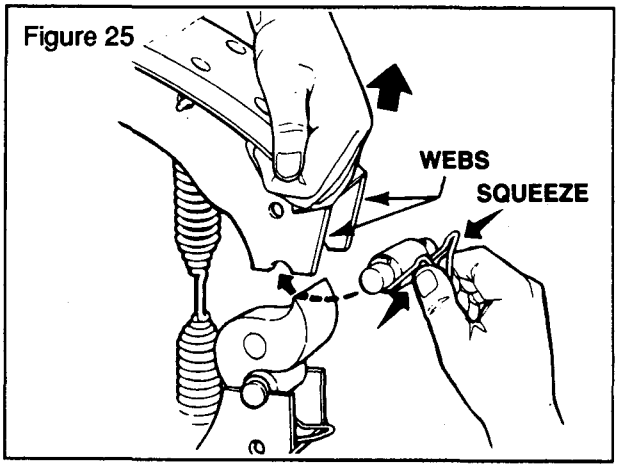
2. Rotate the lower brake shoe forward and install a new brake shoe return spring. **Figure 24.**

Figure 24



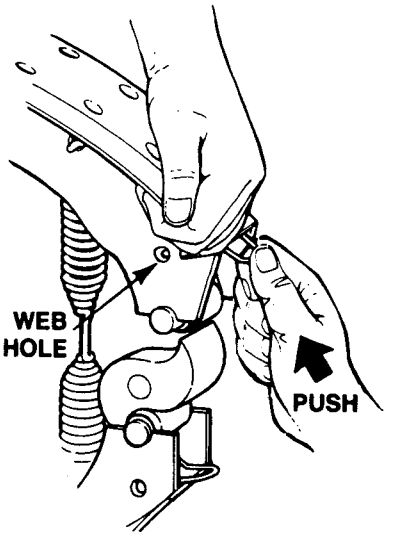
3. Pull each brake shoe away from the cam to permit enough space to install the cam rollers and retainers. Press the ears of the retainer together to permit the retainer to fit between the brake shoe webs. **Figure 25.**

Figure 25



4. Push the retainer into the brake shoe until its ears lock in the holes in the shoe webs. **Figure 26.**

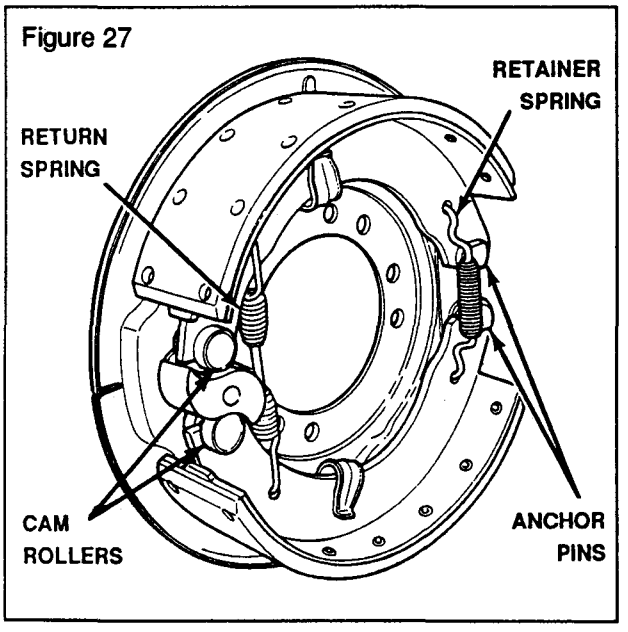
Figure 26



15 X 4 Inch Q-Series Brakes

1. If removed, assemble the anchor pins, washers and nuts to the spider. Tighten the anchor pin nuts to 325-375 lb-ft (441-509 N·m). (T)
2. Install the retainer spring on the shoes and install the shoes on the anchor pins. **Figure 27.** Hold the bottom shoe in position and install the return spring.

Figure 27



3. Pull each shoe away from the cam to permit enough space and then install the cam rollers.

Section 4
Assemble Brakes

P-Series Brakes

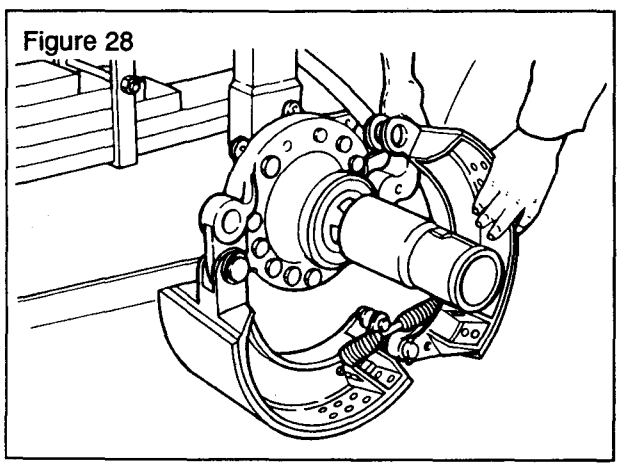
1. Install the anchor pin bushings. If necessary, align the holes in the bushings with the holes in the spider.
2. Install new cam rollers and roller retainers.
3. Put the lower brake shoe in position on the spider.

⚠ *WARNING*

Wear eye protection. Do not hit steel parts with a steel hammer. Pieces can break off and cause serious personal injury.

4. Use a brass drift to install the anchor pin. If necessary, align the flat or groove on the pin with the holes in the spider and bushing.
5. Install the anchor pin washers, felts, seals, retainers and snap rings as required: If required, install the lock pins or lock screws and tighten the screws to 10-15 lb-ft (13.6-20.3 N·m). T
6. Install a new shoe return spring on the brake shoes. **Figure 28.** Put the upper shoe in position over the spider and repeat steps 4 and 5 above.

Figure 28



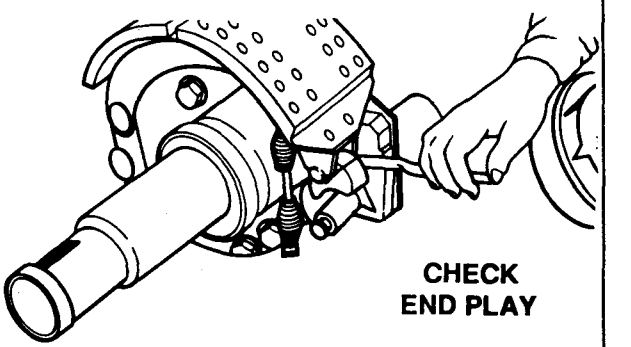
T-Series Brakes

1. If removed, assemble the anchor pins, washers and nuts to the backing plate. Tighten the anchor pin nuts to 185-350 lb-ft (251-475 N·m). T
2. Install the anti-rattle rods, then, install the brake shoes on the anchor pins and anti-rattle rods.
3. Install the anchor pin snap rings and the springs and retainers on the anti-rattle rods.
4. Pull each shoe away from the cam to permit enough space and then install the cam rollers.
5. Install a new shoe return spring on the brake shoes.

Install Slack Adjuster

1. Apply a rust preventive grease (Rockwell Specification O-637) to the camshaft splines.
2. Install the slack adjuster spacer washer on the splined end of the camshaft, followed by the slack adjuster.
3. Add spacer washers to limit the slack adjuster end play to 0.060 inch (1.5 mm) maximum. **Figure 29.**

Figure 29



4. Install a new camshaft lock ring.
5. Connect the slack adjuster to the air chamber push rod as follows:

Rockwell Automatic Slack Adjusters

A. If you install the slack adjuster that was removed, install the clevis on the push rod in the position you marked when you removed the clevis. Check the position of the clevis with the Rockwell Installation Template.

NOTE

There are three different Rockwell Automatic Slack Adjuster Installation Templates for Cam Brakes. Make sure you use the correct template. See the chart that follows.

Rockwell Automatic Slack Adjuster Templates		
Form Number	Brake Description	Color
TP-4781	Coach Cam Brake	White
TP-4786	Truck & Tractor Cam Brake	Brown
TP-4787	Trailer Cam Brake	Tan

The ASA Templates are available from:
Rockwell Literature Distribution Center
c/o Vispac, Inc.
35000 Industrial Road
Livonia, Michigan 48150

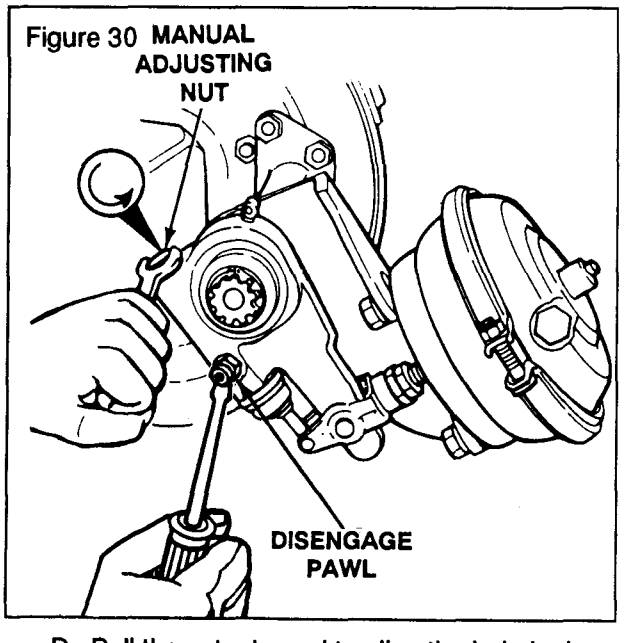
B. Apply a rust preventive grease (Rockwell specification O-637) to both clevis pins.

⚠ CAUTION

If you do not disengage or remove the pawl, you will damage the pawl teeth when you turn the manual adjusting nut in Step C. Damaged teeth prevent automatic adjustment and require that you regularly adjust the brake manually.

C. Disengage or remove the pawl as required. Turn the manual adjusting nut to the left to align the large holes in the slack adjuster arm and the clevis. Assemble with the large clevis pin and fasten with a cotter pin. **Figure 30.**

Figure 30



D. Pull the actuator rod to align the hole in the rod with the small hole in the clevis. Install the small clevis pin and fasten with a cotter pin.

E. Release or install the pawl assembly.

F. Apply the brakes so that the push rods extend completely. There must be clearance between the slack adjuster and all chassis components.

G. Release the brakes and observe that the manual adjusting nut rotates to the left as the push rods fully retract.

NOTE

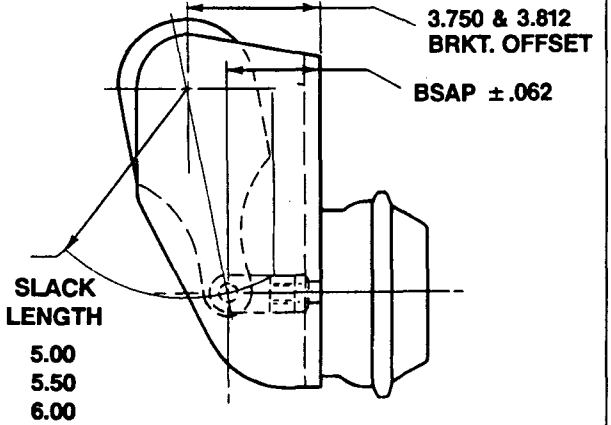
See Rockwell Automatic Slack Adjuster Maintenance Manual No. 4B for complete instructions to install new automatic slack adjusters.

Manual Slack Adjusters

A. If the clevis was not replaced, install new clevis pins. Apply rust preventive grease (Rockwell specification O-637) to the pins before installation.

B. When installed, the Brake Slack Adjuster Position (BSAP) must match the BSAP shown in **Figure 31.**

Figure 31



SLACK ADJ. SIZE	± .062 BSAP
5.00	2.84
5.50	2.75
6.00	2.67
6.50	2.59

CORRECT POSITION OF MANUAL SLACK ADJUSTER 3.750" AND 3.812" OFFSETS ONLY

(FOR OTHER BRACKET OFFSETS, REFER TO THE VEHICLE MANUFACTURER'S SPECIFICATIONS)

Section 4
Assemble Brakes

Adjust Brake

⚠ CAUTION

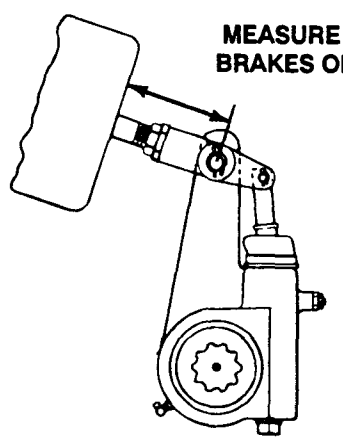
If you do not disengage or remove the pawl, you will damage the pawl teeth when you turn the manual adjusting nut in Step 1. Damaged teeth prevent automatic adjustment and require that you regularly adjust the brake manually.

1. **For Rockwell Automatic Slack Adjusters:** Disengage or remove the pawl as required. Turn the adjusting nut until the linings touch the drum, then, turn the adjusting nut 1/2 turn in the opposite direction.

   For Manual Slack Adjusters: Turn the adjusting nut until the linings touch the drum. Then, turn the nut in the opposite direction for one or two clicks so that the linings just clear the drum. Rotate the drum to check for clearance.

2. Measure the distance from the center of the large clevis pin to the bottom of the air chamber. **Figure 32.**

Figure 32



3. Use a pry bar to move the slack adjuster so that the linings are against the drum. Measure the same distance again. The difference between this measurement and the measurement in step 2 is the "free stroke".

4. Turn the adjusting nut until the "free stroke" is between 5/8 - 3/4 inch (15.9-19.1 mm).

5. Check the adjustment. Apply the brakes and hold the pressure. With the pressure at 85 psi, again measure the distance from the center of the large clevis pin to the bottom of the air chamber.

6. The difference between the measurements in step 2 and step 5 is the adjusted chamber stroke. Turn the adjusting nut so that the adjusted stroke is as short as possible, but not so short that the "free stroke" is too short and the linings drag. The adjusted stroke **MUST NOT** be greater than the dimensions shown in **Figure 33.**

Figure 33

MAXIMUM STROKE AT WHICH BRAKE MUST BE ADJUSTED*. 80-90 PSI (550-620 kPa) AIR PRESSURE IN THE AIR CHAMBER. CLAMP TYPE AIR CHAMBER.

CHAMBER TYPE (SIZE)	STROKE LENGTH NOT TO EXCEED:
9	1-3/8 inches (34.9 mm)
12	1-3/8 inches (34.9 mm)
16	1-3/4 inches (44.4 mm)
20	1-3/4 inches (44.4 mm)
24	1-3/4 inches (44.4 mm)
24 long stroke	2 inches (50.8 mm)
30	2 inches (50.8 mm)
36	2-1/4 inches (57.1 mm)

***NOTE: The U.S. Department of Transportation (DOT), Federal Highway Administration has issued the above specifications for cam brakes. Rockwell has requested the DOT to reconsider the disc brake recommended strokes. (The recommended stroke length for disc brakes is 1/4 inch (6.3 mm) longer than the recommended stroke length for cam brakes.) Currently the DOT recommends the same strokes as cam brakes.**

7. Release or install the pawl assembly and tighten the capscrew to 15-20 lb-ft (20-27 N·m). (T)

⚠ WARNING

When you work on a spring chamber, carefully follow the service instructions of the chamber manufacturer. Sudden release of a compressed spring can cause serious personal injury.

8. If the brake has spring chambers, carefully release the spring.

9. Test the vehicle to make sure that the brake system operates correctly before you put the vehicle into service.

⚠ WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers whose long term effects are unknown. Caution should be exercised in handling both asbestos and non-asbestos materials as described on page 2.

Vehicle brake systems require the correct lining material to perform as originally designed. The type of lining material that is specified is based on several technical considerations and DOT braking performance regulations. Always use the lining material specified by the vehicle manufacturer.

Always reline both wheels of a single axle and all four wheels of a tandem axle at the same time. Always install the same linings and drums on both wheels of a single axle and all four wheels of a tandem axle. It is not necessary that the front and rear axles have the same linings and drums.

Combination Linings

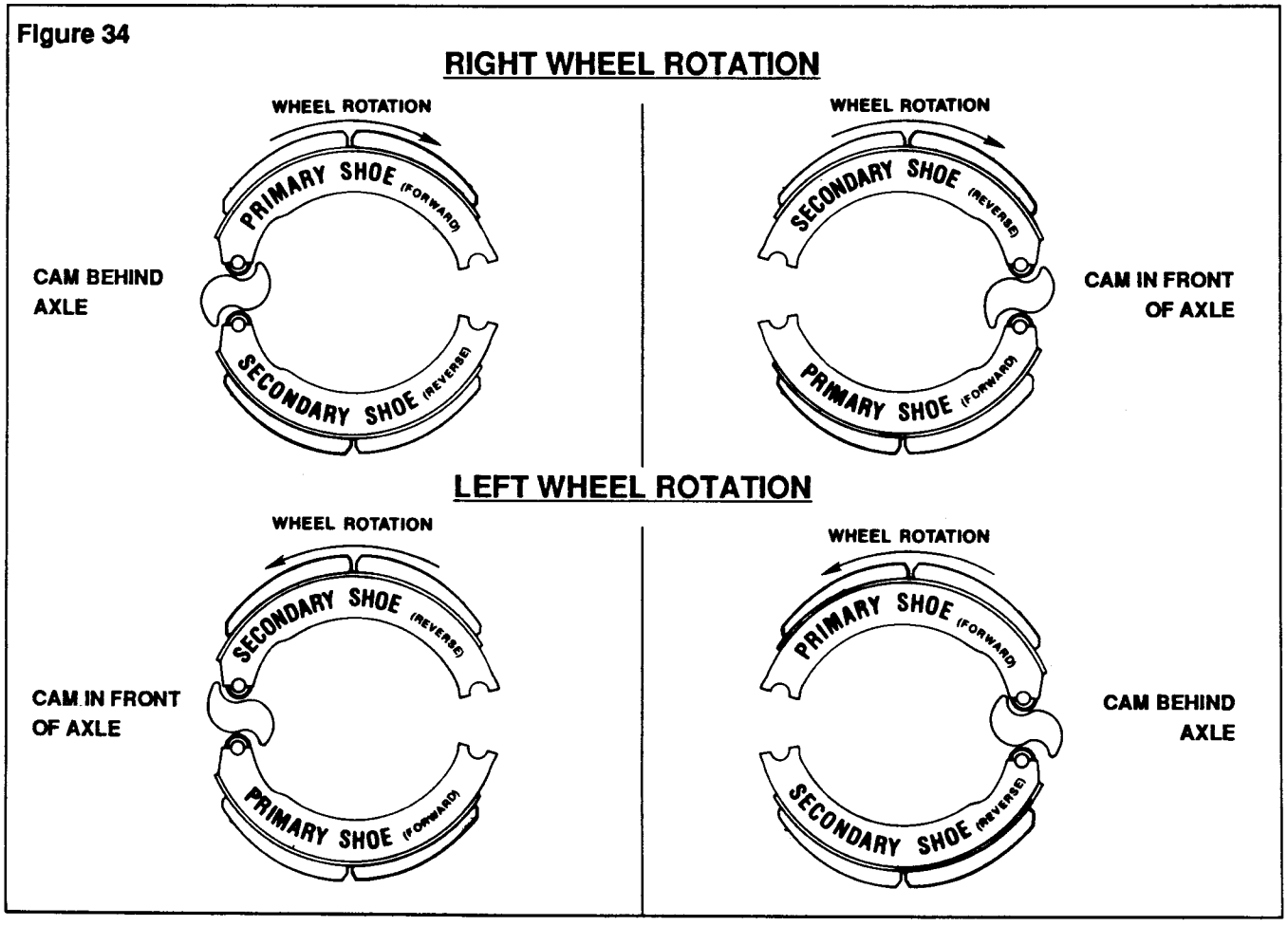
Combination lining sets with different friction ratings on the primary and secondary shoes are sometimes used. When combination friction lining sets are used, the lining blocks must be installed in the correct locations on the brake shoes.

NOTE

Always follow the instructions supplied with the replacement combination linings for correct installation.

The primary linings must be installed on the primary shoe. The first shoe past the cam in the direction of wheel rotation is the primary shoe. The primary shoe can be either at the top or the bottom position, depending on the location of the cam. If the cam is behind the axle, the top shoe is the primary shoe. If the cam is in front of the axle, the bottom shoe is the primary shoe. Figure 34.

Figure 34

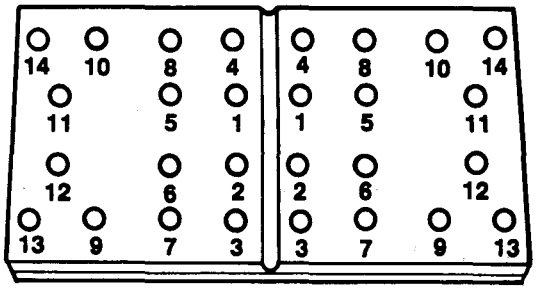


Section 5
Reline Brakes

Install Lining with Rivets

1. Check to make sure that the lining and shoe contact faces are clean.
2. Align the rivet holes in the lining with the rivet holes in the shoe.
3. Install the rivets into the rivet holes following the sequence shown in **Figure 35**.

Figure 35

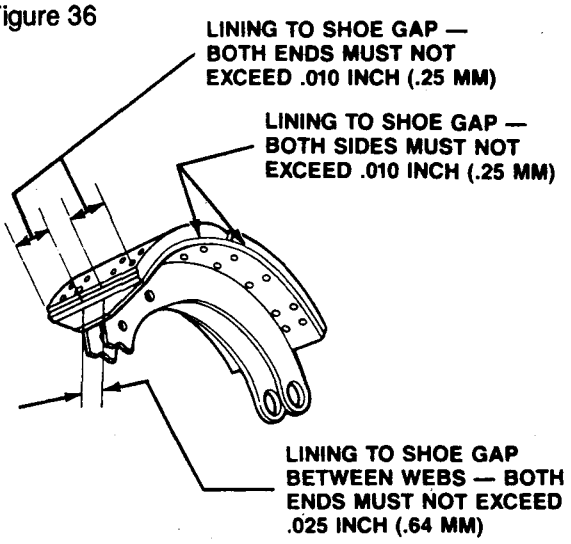


NOTE

Make sure the rivets are the correct body diameter, head size, shape, length and material or loose linings may result.

A gap of 0.010 inch (0.25 mm) maximum is acceptable between the shoe and linings along the sides and ends of the assembly, except between the double web. Between the webs a 0.025 inch (0.64 mm) gap is acceptable. **Figure 36.**

Figure 36



NOTE

For complete brake lining riveting procedures and specifications, see Rockwell publication TP-9239.

Install Lining with Bolts

The same procedures must be followed with bolted linings as with riveted linings. New lock washers must be used and the nuts tightened to the following torques:

- 3/8 inch diameter brass bolts at 220-280 lb-in or 18-23 lb-ft (24.9-31.6 N·m). T
- 1/4 inch diameter brass bolts at 80-100 lb-in or 7-8 lb-ft (9.0-11.3 N·m). T

Camshaft Bushings

1. Use O-617-A or O-617-B (multi-purpose chassis grease).
2. Use the following schedule:
   - Q or Q Plus brake - on-highway application: Every 100,000 miles (160,000 km).
   - P brake - on-highway application: Every 50,000 miles (80,000 km) or every six months.
   - Off-highway application: At least every four months, when the seals are replaced or when the brakes are relined. Lubricate more often for severe duty. Lubrication frequencies can be determined by inspecting the internal parts and lubricant every two weeks for the first four month period. At each inspection, look for hardened or contaminated grease or for the absence of grease.
3. Lubricate through the fitting on the bracket or the spider until new grease flows from the inboard seal.

⚠ CAUTION

If grease flows from the seal near the cam head, replace the seal. Remove any grease from the cam head, rollers and linings. Grease on the linings can increase stopping distances.

4. For the bushings at the slack adjuster end of trailer camshafts, lubricate until grease flows from around the bushing.

15 x 4 Inch Q-Brake Spider and Retainer Clips

1. Use O-617-A or O-617-B (multi-purpose chassis grease).
2. When the brake is disassembled, or when necessary, lubricate the clips and the spider where they touch the brake shoes.

Camshaft Splines and Clevis Pins

1. Use O-637 (rust preventive grease). Do NOT mix this grease with other greases. This compound is also available for the Southwest Petro-Chemical Division of Witco Chemical Corp., 1400 S. Harrison, Olathe, KS 66061 as "Corrosion Control", part number SA 8249496.
2. Lubricate when the brake is disassembled or when necessary.

Anchor Pins

1. Use O-616 (non-melting grease with bentone thickeners, NLGI grade No. 2).
2. When the brake is disassembled, or when necessary, lubricate the anchor pins where they touch the brake shoes.

Shoe Rollers

1. Use O-617-A or O-617-B (multi-purpose chassis grease).
2. When the brake is disassembled, or when necessary, lubricate the rollers where they touch the brake shoes. DO NOT get grease on the part of the roller that touches the cam head.

Automatic Slack Adjuster

1. The following chart shows the greases to use in Rockwell automatic slack adjusters. Use these greases or their equivalent.

OPERATING TEMPERATURE	
-40° F (-40° C) and Above	**Below -40° F (-40° C)**
Clay-Base Greases • Rockwell Spec O-616-A (Part Number A-1779-W-283) • Shell Darina EP-1 • Texaco Thermatex EP-1 • Texaco Hytherm EP-1 • Aralub 3837 • Tribolube-12 Grade 1 **Lithium-Base Greases** • Rockwell Spec O-692 • Amoco Super Permalube #2 • Citco Premium Lithium EP-2 • Exxon Ronex MP-2 • Kendall L-427 Super Blu #2 • Mobilith AW-1 • Sohio Factran EP-2	**Synthetic Greases** • Rockwell Spec O-645 (Part Number 2297-X-4574) • Mobilgrease 28 (Military) • Mobiltemp SHC 32 (Industrial)

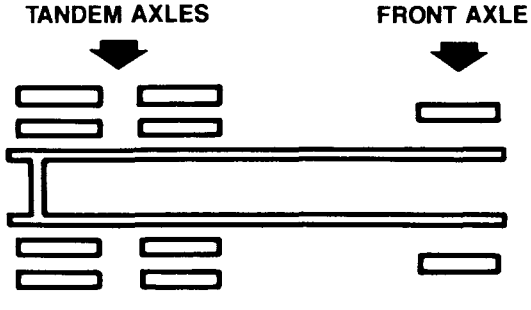
2. Use the following schedule that gives the most frequent lubrication:
   - Your fleet's chassis lubrication schedule.
   - The chassis manufacturer's chassis lubrication schedule.
   - A minimum of four times during the life of the linings.
3. Lubricate through the grease fitting until **new** grease flows from around the inboard splines, or, from the pawl assembly.

Section 7
Visual Inspection of the Brake System

For safe operating conditions and longer component life, make these visual inspections before the vehicle is put into service:

1. Check the complete air system for worn hoses and connectors. With air pressure at 100 psi, brakes released and engine off, loss of tractor air pressure must not exceed two psi a minute. Total tractor and trailer loss must not exceed three psi per minute.
2. Check to see that the air compressor drive belt is tight. Air system pressure must rise to approximately 100 psi in two minutes.
3. The governor must be checked and set to the specifications supplied by the vehicle manufacturer.
4. Both the tractor and trailer air systems must match the specifications supplied by the vehicle manufacturer.
5. Both wheel ends of each axle must have the same linings and drums. All four wheel ends of tandem axles also must have the same linings and drums. It is not necessary for the front axle brakes to be the same as the rear driving axle brakes. **Figure 37.**

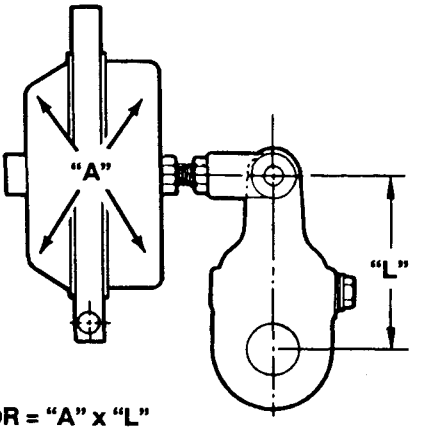
Figure 37



BOTH WHEEL ENDS OF EACH AXLE MUST HAVE IDENTICAL DRUMS AND LINING

6. Always follow the specifications supplied by the vehicle manufacturer for the correct lining to be used. Vehicle brake systems must have the correct friction material and these requirements can change from vehicle to vehicle.
7. Make sure that the return springs completely retract the shoes when the brakes are released. Replace the return springs each time the brakes are relined. Make sure that the spring brakes retract completely when they are released.
8. The "AL" factor is air chamber area multiplied by slack adjuster length. **Figure 38.** The "AL" factor must be equal for both ends of a single axle and all four ends of a tandem axle.

Figure 38



AL FACTOR = "A" x "L"
"A" = AIR CHAMBER AREA
"L" = LENGTH OF SLACK ADJUSTER

1. Brake Adjustment - when the air chamber stroke exceeds the limits shown in **Figure 39**.

Figure 39

MAXIMUM STROKE AT WHICH BRAKE MUST BE ADJUSTED*. 80-90 PSI (550-620 kPa) AIR PRESSURE IN THE AIR CHAMBER. CLAMP TYPE AIR CHAMBER.

CHAMBER TYPE (SIZE)	STROKE LENGTH NOT TO EXCEED:
9	1-3/8 inches (34.9 mm)
12	1-3/8 inches (34.9 mm)
16	1-3/4 inches (44.4 mm)
20	1-3/4 inches (44.4 mm)
24	1-3/4 inches (44.4 mm)
24 long stroke	2 inches (50.8 mm)
30	2 inches (50.8 mm)
36	2-1/4 inches (57.1 mm)

***NOTE: The U.S. Department of Transportation (DOT), Federal Highway Administration has issued the above specifications for cam brakes. Rockwell has requested the DOT to reconsider the disc brake recommended strokes. (The recommended stroke length for disc brakes is 1/4 inch (6.3 mm) longer than the recommended stroke length for cam brakes.) Currently the DOT recommends the same strokes as cam brakes.**

NOTE

The adjusting bolt on some manual slack adjusters can reach the limit of its adjustment before the linings are completely worn. To get additional adjustment, do the following:

A. Completely retract the brakes.
B. Remove the slack adjuster.
C. Turn the camshaft to force the brake shoes apart. Install the slack adjuster so that its arm is one spline closer to the clevis than before.
D. Adjust the brake.

2. Lubrication - lubricate the brake and slack adjuster according to the schedules on page 19.
3. Minor Inspection - at each lubrication.
4. Brake Reline - when the thickness of the lining is 1/4 inch (6.3 mm) at its thinnest point.
5. Drums - check at reline.
6. Major Inspection - at each reline.
7. Complete Overhaul - at every second reline or as required.

A schedule for the periodic adjustment, cleaning, inspection and lubrication of the brake equipment must be made according to experience and the type of operation.

Brakes must be adjusted as frequently as required for correct operation and safety. The adjustments must give correct clearance between the lining and drum, correct push rod travel and correct balance between the brakes.

NOTE

Wheel bearings must be correctly adjusted before brake adjustments are made.

Brakes must be cleaned, inspected, lubricated and adjusted every time the wheel hubs are removed.

During a major overhaul, the following parts must be carefully checked and replaced with Genuine Rockwell Replacement Parts if required:

1. Backing plates or spiders for distortion and loose bolts.
2. Anchor pins for wear and correct alignment.
3. Brake shoes for wear at anchor pin holes or roller slots.
4. Camshaft and camshaft bushings for wear.
5. Shoe return springs must be replaced.
6. Brake linings for grease on the lining, wear and loose rivets or bolts.

⚠ *CAUTION*

Do not let brake lining wear to the point that the rivets or bolts touch the drum or drum damage will occur.

7. Drums for cracks, deep scratches or other damage.

To help avoid shorter lining life, Rockwell recommends that springs, rollers, and anchor pins be replaced at each reline.

Section 9
Federal Road-Side Brake Adjustment Inspection

The following procedures are used to check the in-service adjustment (adjusted chamber stroke) of air brakes with slack adjusters. The procedures are divided into two groups:

1. Truck, tractor only, or tractor and trailer combination.
2. Trailer only.

NOTE:

The brake adjustment must be checked with 80-90 psi air pressure in the brake chambers when the brakes are fully applied. One hundred psi in the air tanks with the ENGINE OFF will supply 80-90 psi in the chambers when the brakes are fully applied.

- ***If necessary, run the engine to increase the pressure to 100 psi.***
- ***If necessary, turn off the engine and apply and release the brakes to decrease the pressure to 100 psi.***

Truck, Tractor, or Tractor and Trailer Combination

1. Check the gauges in the cab to make sure that the air pressure in the tanks is 100 psi with the engine off and the spring chambers released.
2. With the brakes NOT APPLIED, measure the distance from the bottom of the air chamber to the center of the large clevis pin on all the brakes. **Figure 40A.** Record each dimension.
3. Have another person apply and hold one full brake application. **Figure 40B.**
4. Repeat step 2 and measure WITH THE SERVICE BRAKES APPLIED. **Figure 40C.** Record each dimension.
5. Release the brakes.
6. Calculate the adjusted chamber stroke of each brake:
   A. Subtract the dimension that was measured in step 2 from the dimension measured in step 4.
   B. The difference between the two dimensions is the adjusted chamber stroke. The adjusted chamber stroke MUST NOT BE GREATER THAN THE STROKE LENGTH SHOWN IN FIGURE 41 for that size air chamber.
   C. If the adjusted chamber stroke you measured is greater than the maximum stroke shown in **Figure 41**, inspect the slack adjuster. See the manufacturer's instructions. If Rockwell automatic slack adjusters are used, see Rockwell Maintenance Manual No. 4B.

Figure 41

MAXIMUM STROKE AT WHICH BRAKE MUST BE ADJUSTED*. 80-90 PSI (550-620 kPa) AIR PRESSURE IN THE AIR CHAMBER. CLAMP TYPE AIR CHAMBER.

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24	1-3/4 inches (44.4 mm)
24 long stroke	2 inches (50.8 mm)
30	2 inches (50.8 mm)
36	2-1/4 inches (57.1 mm)

***NOTE: The U.S. Department of Transportation (DOT), Federal Highway Administration has issued the above specifications for cam brakes. Rockwell has requested the DOT to reconsider the disc brake recommended strokes. (The recommended stroke length for disc brakes is 1/4 inch (6.3 mm) longer than the recommended stroke length for cam brakes.) Currently the DOT recommends the same strokes as cam brakes.**

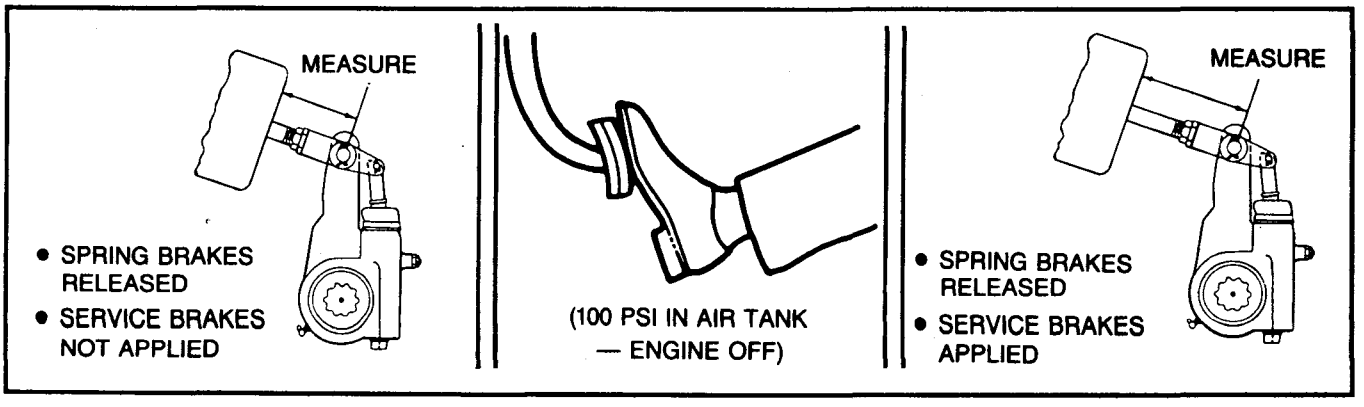


Figure 40A **Figure 40B** **Figure 40C**

Section 9
Federal Road-Side Brake Adjustment Inspection

Trailer Only

1. Connect an auxiliary air system to the SUPPLY or EMERGENCY port of the trailer air system.
2. Increase the air pressure to 100 psi MINIMUM to release the spring chambers.
3. With the brakes NOT APPLIED, measure the distance from the bottom of the air chamber to the center of the large clevis pin on all the brakes. **Figure 40A.** Record each dimension.
4. Connect a second auxiliary air system to the SERVICE port of the trailer air system.
5. Increase the air pressure of the second air system to 85 psi to apply the service brakes.
6. Repeat step 3 and measure WITH THE SERVICE BRAKES APPLIED. **Figure 40C.** Record each dimension.
7. Calculate the adjusted chamber stroke of each brake:
   A. Subtract the dimension that was measured in step 3 from the dimension measured in step 6.
   B. The difference between the two dimensions is the adjusted chamber stroke. The adjusted chamber stroke MUST NOT BE GREATER THAN THE STROKE LENGTH SHOWN IN FIGURE 41 for that size air chamber.
   C. If the adjusted chamber stroke you measured is greater than the maximum stroke shown in **Figure 41**, inspect the slack adjuster. See the manufacturer's instructions. If Rockwell automatic slack adjusters are used, see Rockwell Maintenance Manual No. 4B.

Section 10
Torque Chart

FASTENER TORQUE CHART FOR CAM-MASTER BRAKES

HOLD DOWN CLIP (2)
(SOME MODELS)
.250"-28 Thread
105-135 lb-in (12-15 N.m)

DUST SHIELD MOUNTING (4) or (6)
(SOME MODELS)
.312"-18 Thread
12-20 lb-ft (16-27 N.m)

.375"-16 Thread
Grade 8 = 30-50 lb-ft (41-68 N.m)
Grade 5 = 25-35 lb-ft (34-47 N.m)

ANCHOR PIN SET SCREW (2)
(SOME MODELS)
.375"-16 Thread
10 lb-ft (14 N.m) MINIMUM

ANCHOR PIN (2)
(T BRAKE ONLY)
.750"-16 Thread
185-350 lb-ft (250-474 N.m)

(15 X 4 Q-BRAKE ONLY)
325-375 lb-ft (441-509 N.m)

BRAKE MOUNTING BOLTS
Grade 8 bolts with lock nuts and two hardened washers on each bolt.

Bolt Size	Torque
7/16"-20	60-75 lb-ft (81-102 N·m)
1/2"-20	85-115 lb-ft (115-156 N·m)
9/16"-18	130-165 lb-ft (176-224 N·m)
5/8"-18	180-230 lb-ft (244-312 N·m)

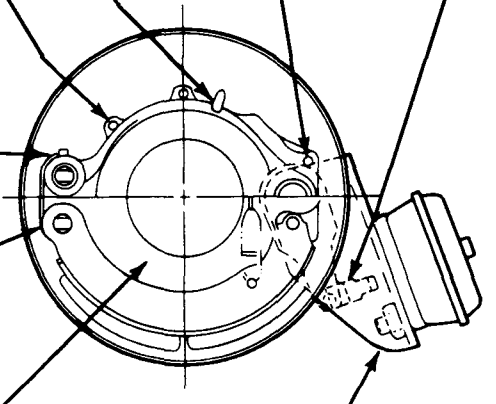
CAM BRACKET MOUNTING (4)
.500"-13 Thread
Grade 8 = 90-120 lb-ft. (122-163 N.m)
Grade 5 = 65-100 lb-ft (88-136 N.m)

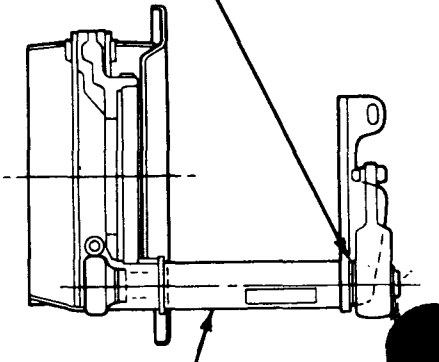
.625"-18 Thread
Plain Nut =150-190 lb-ft (203-258 N.m)
Lock Nut = 130-165 lb-ft (176-224 N.m)

PUSH ROD LOCK NUT (1)
.625"-18 Thread
25-50 lb-ft (34-68 N.m)

.500"-20 Thread
20-30 lb-ft (27-41 N.m)

ADD CAMSHAFT SPACING WASHERS SO THAT SLACK ADJUSTER IS ALIGNED WITH AIR CHAMBER CLEVIS





GREASE FITTING (1)
(SOME MODELS)
1/8" Dryseal
3-5 lb-ft (4-7 N.m)

ADD CAMSHAFT SPACING WASHERS TO PROVIDE 0.060" MAXIMUM END PLAY

AIR CHAMBER MOUNTING (2)

Chbr. Size	9	12	16	20	24	30	36	SPRING CHAMBER
Bendix	20-30 lb. ft. (27-41 N-m)		30-45 lb. ft (41-61 N-m)			45-65 lb. ft. (61-88 N-m)		65-85 lb. ft. (88-115 N-m)
Midland	37-50 lb. ft. (47-68 N-m)			70-100 lb. ft. (95-136 N-m)				
MGM								100-115 lb. ft. (136-156 N-m)
Anchorlok				110-115 lb. ft. with hex nut and washer (149-203 N-m)				
				85-95 lb. ft. with lock nut and washer (115-129 N-m)				

Section 11
Q-Series and Q Plus Brake Conversion Kits

"Q" Series Brake Conversion Kits are available to change "P" Series Cam-Master brakes (except models with cast shoes) into "Q" Series brakes with "Quick Change" brake shoes. **Figure 42.**

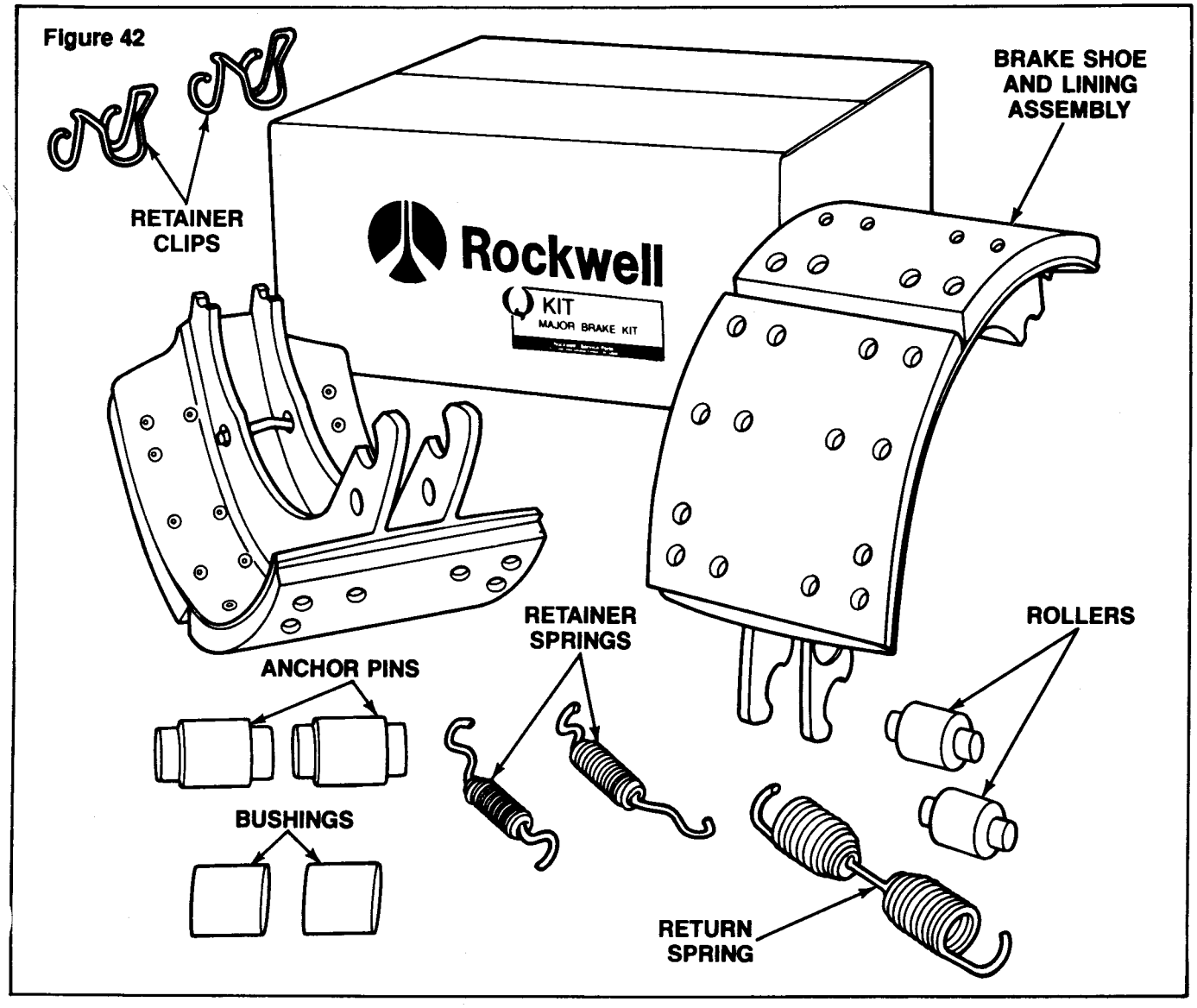
These kits contain all the parts needed to change one P-Series brake to a Q-Series brake. Each kit contains two shoe and lining assemblies, two anchor pins, two anchor pin bushings, two shoe retainer springs, two brake shoe rollers, two brake shoe roller retaining clips and one brake shoe return spring. Instructions are included in each kit.

Kits are also available to upgrade standard 16.5 inch Q Series brakes to Q Plus brakes. These kits include all the necessary hardware.

Q Series and Q Plus brake conversion kits are available from:

Rockwell International
Florence Distribution Center
7975 Dixie Highway
Florence, Kentucky 41042

Figure 42



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