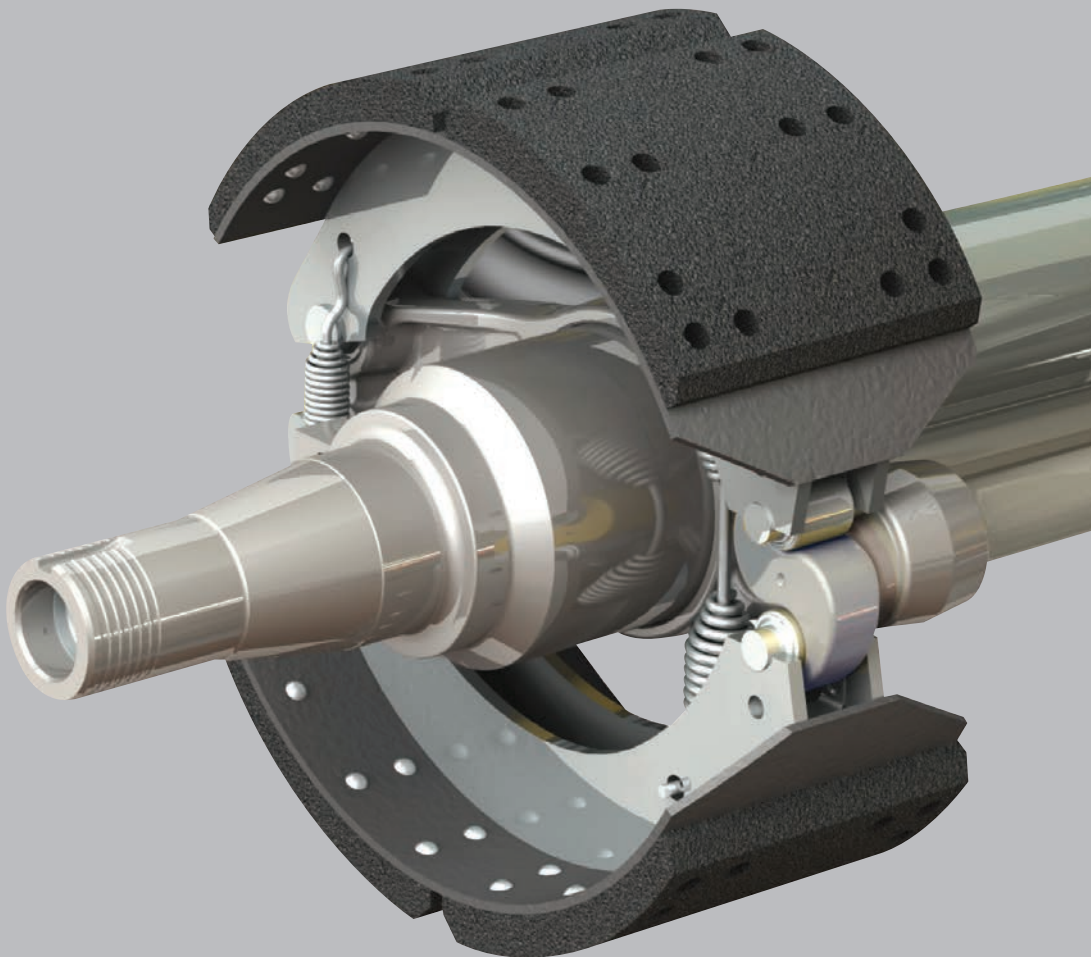


## Service Manual for Drum Brake Axles

### Tapered and Parallel Spindle Axles



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## Introduction

This manual provides the necessary information for the maintenance, inspection, and safe operation of the SAF® axle/brake system.

Read this manual before using or servicing this product and keep it in a safe location for future reference. Updates to this manual, which are published as necessary, are available on the internet at [www.safholland.us](http://www.safholland.us).

Use only SAF-HOLLAND® Original Parts to service the SAF-HOLLAND INTEGRAL™ drum brake axle. A list of technical support locations that supply SAF-HOLLAND Original Parts and an Aftermarket Parts Catalog are available on the internet at [www.safholland.us](http://www.safholland.us) or contact Customer Service at 888-396-6501.

## Warranty

Refer to the complete warranty for the country in which the product will be used. A copy of the written warranty is included with the product or available on the internet at [www.safholland.com](http://www.safholland.com).

## Notes, Cautions, and Warnings

Before starting any work on the unit, read and understand all the safety procedures presented in this manual. This manual contains the terms “NOTE”, “IMPORTANT”, “CAUTION”, and “WARNING” followed by important product information. These terms are defined as follows:

**NOTE:** Includes additional information to enable accurate and easy performance of procedures.

**IMPORTANT:** Includes additional information that if not followed could lead to hindered product performance.

**CAUTION** Used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, could result in property damage.

**⚠ CAUTION** Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

**⚠ WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

## 1. Safety Instructions

### General and Servicing Safety Instructions

- Read and observe all Warning and Caution hazard alert messages. The alerts provide information that can help prevent serious personal injury, damage to components, or both.

**⚠ WARNING** Failure to follow the instructions and safety precautions in this manual could result in improper servicing or operation leading to component failure which, if not avoided, could result in death or serious injury.

- All installation should be performed by a properly trained technician using proper/special tools, and safe procedures.

**NOTE:** In the United States, workshop safety requirements are defined by federal and/or state Occupational Safety and Health Act (OSHA). Equivalent laws could exist in other countries. This manual is written based on the assumption that OSHA or other applicable employee safety regulations are followed by the location where work is performed.

**IMPORTANT:** Use only SAF-HOLLAND Original Parts to service your SAF-HOLLAND INTEGRAL drum brake axle.

**⚠ WARNING** Failure to maintain the SAF-HOLLAND INTEGRAL drum brake with SAF-HOLLAND Original Parts can result in brake or wheel bearing failure which, if not avoided, could result in death or serious injury.

- Properly support and secure the vehicle and axles from unexpected movement when servicing the unit.

**⚠ WARNING** Failure to properly support the vehicle and axles prior to commencing work could create a crush hazard which, if not avoided, could result in death or serious injury.

- If possible, unload the trailer before performing any service procedures.
- After re-positioning the brake chamber, brake adjuster and/or ABS system as instructed in this manual, ALWAYS consult the manufacturer's manual for proper operation.

**IMPORTANT:** Key components on each axle system including but not limited to suspension, brake adjuster, brake chambers, bearings, hubs, and drums require information supplied by the original manufacturer of the components to ensure proper and safe operation of the axle system.

**⚠ WARNING** Failure to follow the original manufacturer's instructions regarding spring brake or air pressure control could allow an uncontrolled release of energy which could result in death or serious injury.

- Service both roadside and curbside of an axle. Worn parts should be replaced in sets. Key components on each axle's braking system, such as friction material, rotors and drums will normally wear over time.

### Operational and Road Safety Instructions

- The wheel contact surfaces between the wheel and hub MUST NOT receive additional paint.

**IMPORTANT:** The wheel contact surfaces MUST be clean, smooth and free from grease.

**⚠ WARNING** Failure to keep wheel and hub contact surfaces clean and clear of foreign material could allow wheel/hub separations which, if not avoided, could result in death or serious injury.

- Only the wheel and tire sizes approved by the trailer builder can be used.
- Before operating the vehicle, ensure that the maximum permissible axle load is not exceeded and that the load is distributed equally and uniformly.

- Make sure that the brakes are not overheated from continuous operation.

**⚠ WARNING** Failure to minimize the use of brakes during overheating conditions could result in deterioration of brake efficiency which, if not avoided, could result in death or serious injury.

- The parking brake **MUST NOT** be immediately applied when the brakes are overheated.

**CAUTION** If the parking brake is immediately applied to the brakes when overheated, the brake drums could be damaged by different stress fields during cooling.

- Observe the operating recommendation of the trailer manufacturer for off-road operation of the installed axles.

**IMPORTANT:** The definition of OFF-ROAD means driving on non-asphalt/non-concrete routes, such as gravel roads, agricultural and forestry tracks, on construction sites and in gravel pits.

**IMPORTANT:** Off-road operation of axles beyond the approved application design could result in damage and impair suspension system performance.

- SAF axles require routine service, inspection and maintenance to maintain optimum performance, operational and road safety, and to recognize natural wear and defects before they become serious. Please refer to the Service Manual for Drum Brake Axles XL-TA1000060M-en-US which can be found at [www.safholland.us](http://www.safholland.us) or contact our customer service group at 888-396-6501.

## 2. Model Identification

The Drum Brake Axle Serial Tag is located near the center of the axle tube (**Figure 1**).

## 3. Identification Tag

The sample tag illustrated will help interpret the information on the SAF-HOLLAND USA®, Inc. serial number tag. The model number, axle body part number, axle beam rating, and serial number are listed on the tag (**Figure 2**).

Record the tag numbers below for future quick reference.

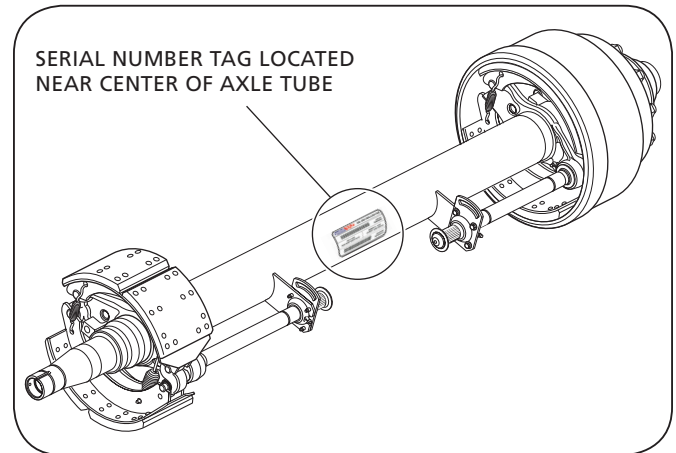
**Axle Body Part Number** \_\_\_\_\_

**Model Number** \_\_\_\_\_

**Axle Beam Rating** \_\_\_\_\_

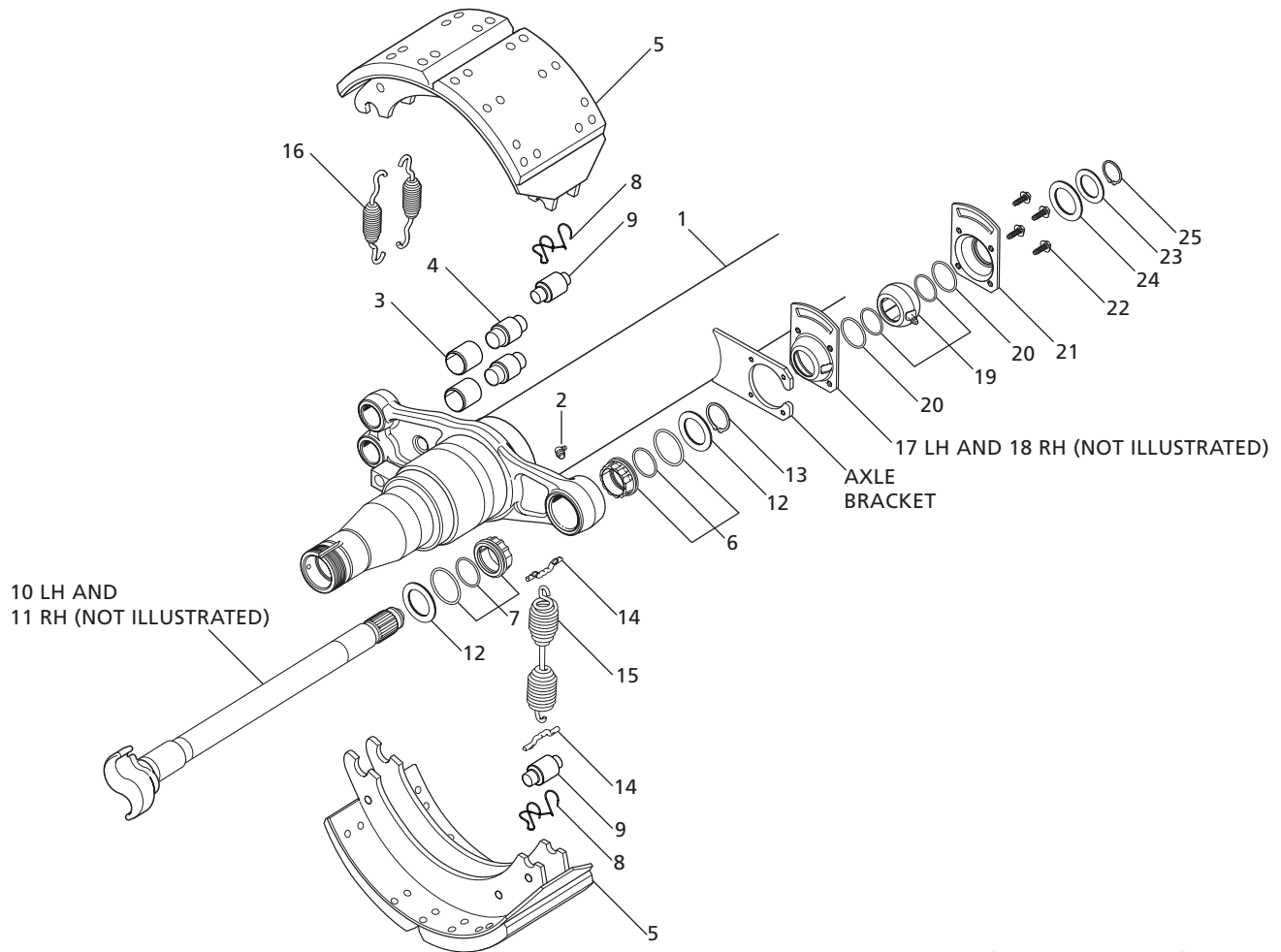
**Serial Number** \_\_\_\_\_

**Figure 1**



**Figure 2**



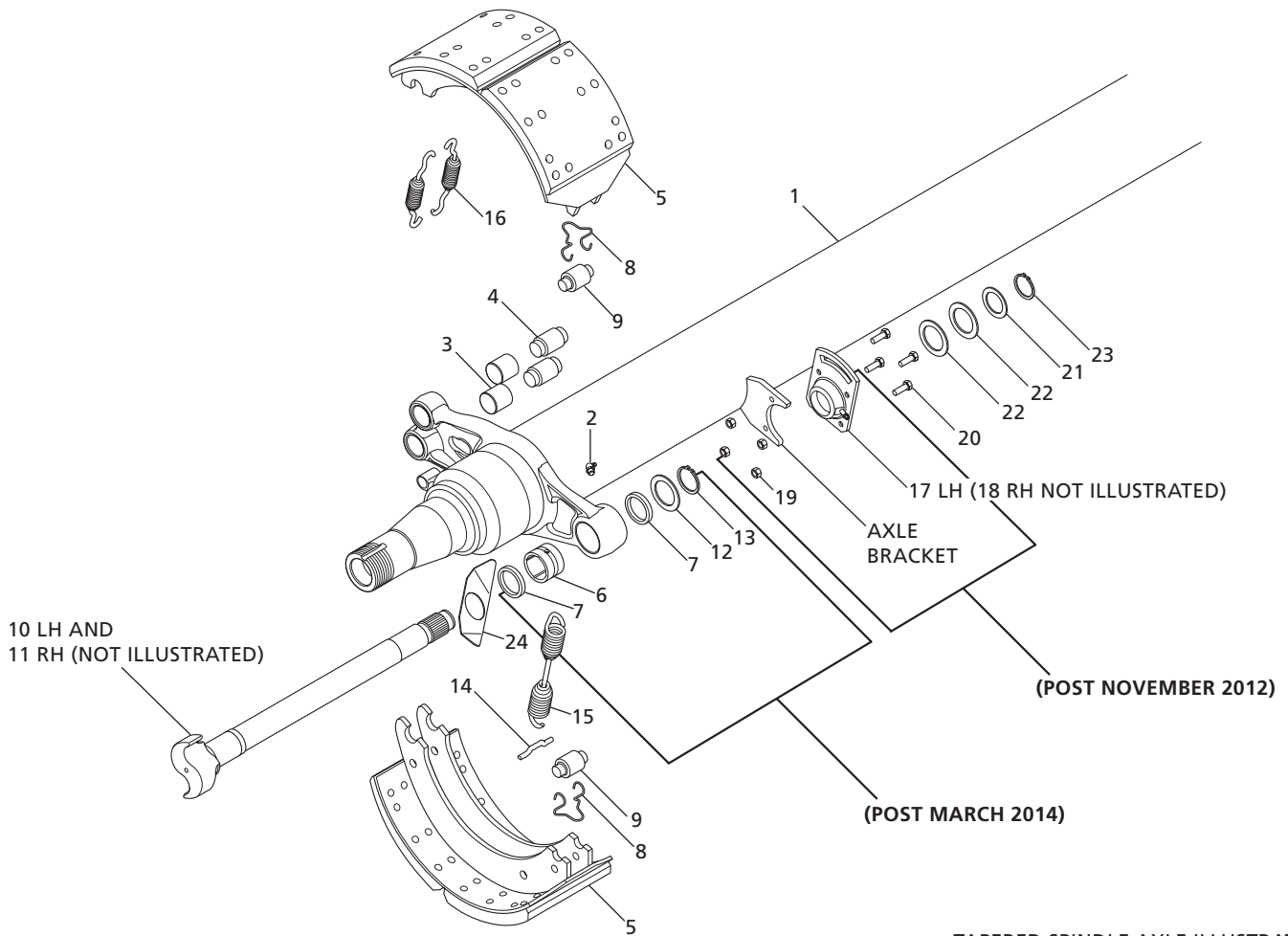


TAPERED SPINDLE AXLE ILLUSTRATED

BRAKE COMPONENTS		
ITEM	DESCRIPTION	QTY
1	Axle Body Assembly	1
2	Fitting, Lubrication	2
3	Bushing, Anchor Pin	4
4	Pin, Anchor	4
5	Brake Shoe Assembly	4
6	Bearing Assembly, S-Cam-Spider Inboard	2
7	Bearing Assembly, S-Cam-Spider Outboard	2
8	Retainer, Roller	4
9	Roller, Brake Shoe	4
10	S-Camshaft, Left-Hand	1
11	S-Camshaft, Right-Hand (not shown)	1
12	Washer, S-Cam Bearing-Outboard	4
13	Retainer Ring	2

BRAKE COMPONENTS		
ITEM	DESCRIPTION	QTY
14	Return Spring Pin	4
15	Spring, Return-Hub/Drum	2
16	Spring, Anchor Pin	4
17	Housing, S-Cam Bearing, Left-Hand Slotted	1
18	Housing, S-Cam Bearing, Right-Hand Slotted	1
19	Bearing Assembly S-Camshaft	2
20	O-Ring, S-Camshaft Bearing Seal-Inboard	4
21	Housing, S-Cam Bearing	2
22	Screw, Thread Rolling Tapping	8
23	Washer, Shaft End	2
24	Washer, Shaft End	2
25	Retaining Ring	2

**NOTE:** Refer to Drum Brake Axle Parts Manual XL-TA10058PM-en-US for axle component and service kit part numbers.



TAPERED SPINDLE AXLE ILLUSTRATED

BRAKE COMPONENTS		
ITEM	DESCRIPTION	QTY
1	Axle Body Assembly	1
2	Fitting, Lubrication	2
3	Bushing, Anchor Pin	4
4	Pin, Anchor	4
5	Brake Shoe Assembly	4
6	Bushing, Cam Bearing	2
7	Cam Seal, Spider	4
8	Retainer, Cam Roller	4
9	Roller, Brake Shoe	4
10	S-Camshaft, Left-Hand	1
11	S-Camshaft, Right-Hand (not shown)	1
12	Washer, S-Cam Bearing-Outboard	2

BRAKE COMPONENTS		
ITEM	DESCRIPTION	QTY
13	Retainer Ring	2
14	Return Spring Pin	4
15	Spring, Return-Hub/Drum	2
16	Spring, Anchor Pin	4
17	Cam Bearing Kit - Left-Hand	1
18	Cam Bearing Kit - Right-Hand (not shown)	1
19	Nut, Lock	8
20	Bolt, Hex Head Cap	8
21	Washer, Shaft End	2
22	Washer, Shaft End	4
23	Retaining Ring	2
24	Guide PLate, Brake Roller Shoe	2

**NOTE:** Refer to Drum Brake Axle Parts Manual XL-TA10058PM-en-US for axle component and service kit part numbers.



## 4. Hubs, Bearings and Seal Removal

**NOTE:** Before starting any axle/brake service procedures, park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle and axle(s) with safety stands. DO NOT work under a vehicle supported only by jacks. Jacks can slip or fall over. Serious personal injury and damage to components can result.

**⚠ WARNING** Failure to properly support the vehicle and axles prior to commencing work could create a crush hazard which, if not avoided, could result in death or serious injury.

1. Release the trailer brakes and cage the spring brakes according to the spring brake manufacturer's instructions. Remove the tire and wheel assembly to access the hub and drum.
2. Remove the drum from the hub using a support device such as a drum dolly (**Figure 3**).

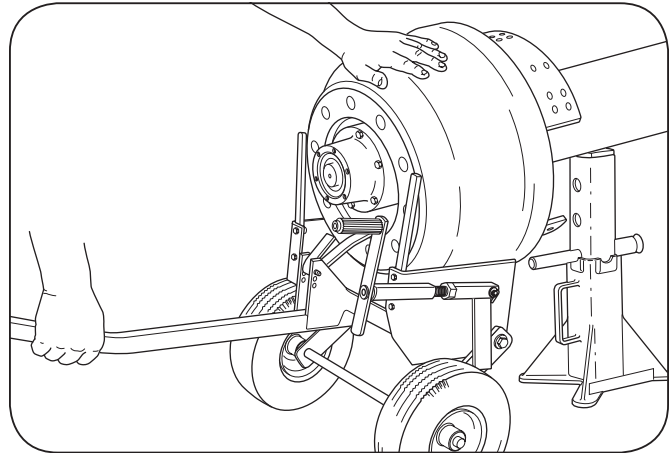
**⚠ CAUTION** Failure to support weight during installation or removal of the brake drum could create a crush hazard which, if not avoided, could result in minor to moderate injury.

**NOTE:** It is necessary to retract the brake shoes in accordance with the brake adjuster's manufacturer manual to allow the brake drum to clear the brake shoes during brake drum removal.

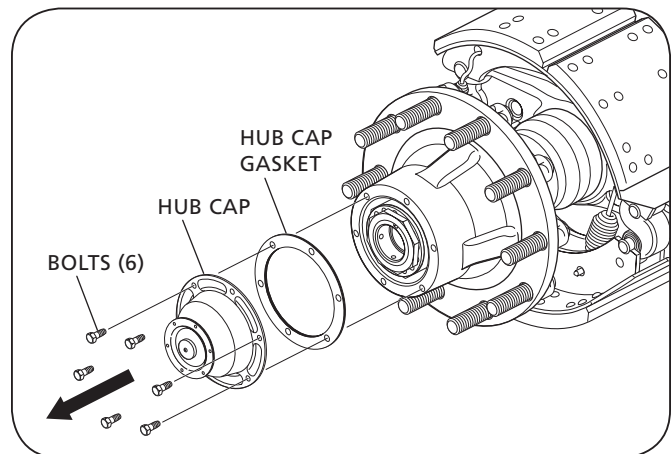
3. Remove the hub cap and gasket by removing six (6) bolts (**Figure 4**).

**NOTE:** Be prepared to collect lubrication fluid when removing the hub cap.

**Figure 3**



**Figure 4**





4. Remove the set screws (**Figure 5**).
5. Remove the axle nut from the spindle using a wrench with the axle nut socket. If the unit is equipped with a Pro-Torq® spindle nut, remove the nut and skip Step 5 (**Figure 6**).
6. Release the axle washer and the inner axle nut from the spindle (**Figure 6**).
7. Remove the outer hub bearing from the spindle (**Figure 6**).

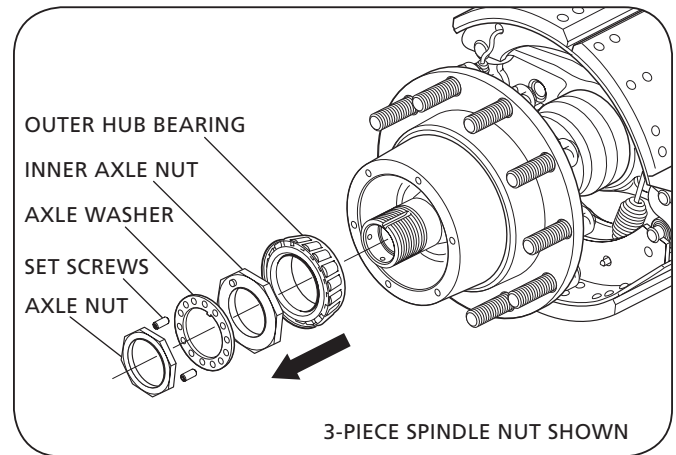
**NOTE:** With the axle nut, washer, and inner nut removed, it is possible to access the outer bearing.

**CAUTION** DO NOT hit steel parts with a steel hammer as parts could break, sending flying steel fragments in any direction creating a hazard which, if not avoided, could result in minor to moderate injury.

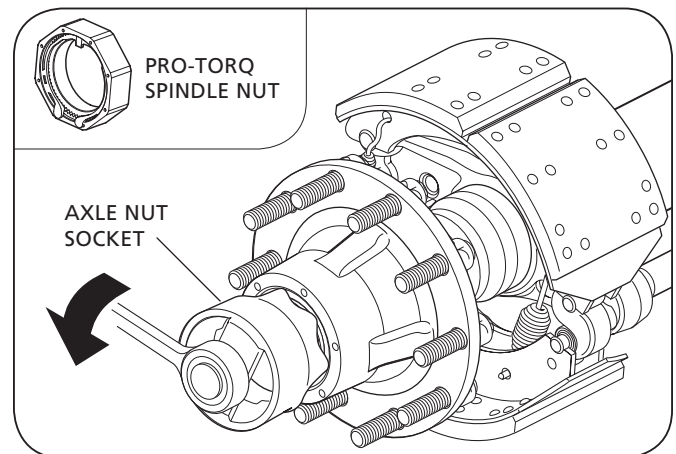
8. Grasp the hub assembly with both hands and pull the hub assembly off the axle spindle (**Figure 7**).

**NOTE:** Depending on the type of hub seal, the hub seal and inner bearing could remain on spindle or come off with hub assembly.

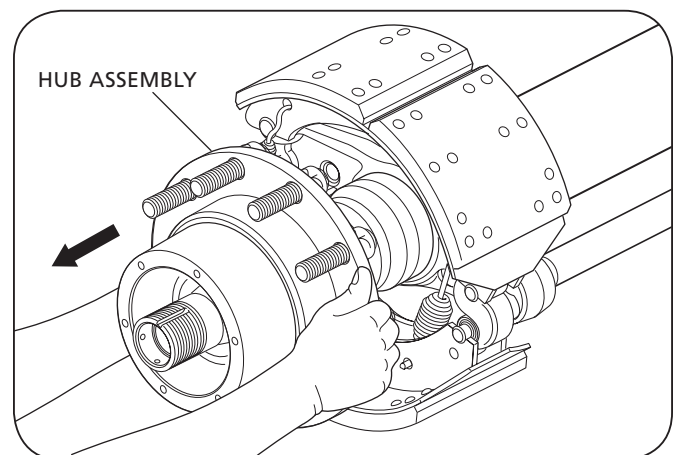
**Figure 5**



**Figure 6**



**Figure 7**



9. Remove the inner hub bearing from the spindle or from the inside of the hub (**Figure 8**).
10. Remove the hub seal from the hub bore using a pry bar. A spindle mount hub seal can be driven off the spindle by striking the ring from the back side or prying off with a crow's foot bar. Discard the used hub seal and use a new hub seal during re-assembly being careful not to gouge the spindle shoulder (**Figure 8**).

**CAUTION** DO NOT use a chisel to cut the seal. The shoulder can be damaged, resulting in a leak which could lead to wheel end and/or brake failure.

## 5. Bearing Inspection

**CAUTION** Thoroughly clean the bearings. DO NOT mix a synthetic base grease or oil with an organic/mineral base lubricant.

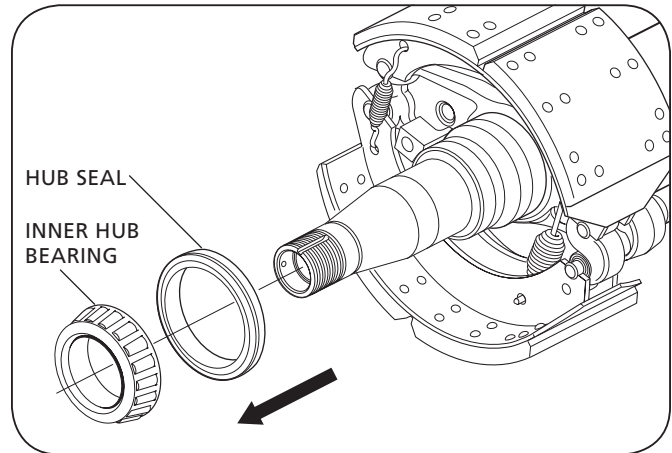
**CAUTION** DO NOT spin dry the hub bearings with compressed air. Bearing damage could result.

1. After removing the hub assembly, clean excess grease from the bearings.

**IMPORTANT:** A bearing which has been removed from a vehicle should be cleaned with solvent. When cleaning DO NOT use steam or water which will cause the bearings to rust.

**IMPORTANT:** Bearings that are rusted, flaked, pitted, or have damaged cages should be replaced. It is recommended to replace all questionable bearings and ALWAYS replace the cup and cone as a matched set. NEVER re-assemble a tapered roller bearing in a damaged or worn housing or on damaged or worn spindles. Housings or spindles should be replaced and NOT re-machined if the bearing journal is worn.

**Figure 8**



## 6. Hubs, Bearings and Seal Installation

### 6.1 Spindle mounted Hub Seal Installation instructions (Refer to 6.2 for hub mounted Hub Seal instructions)

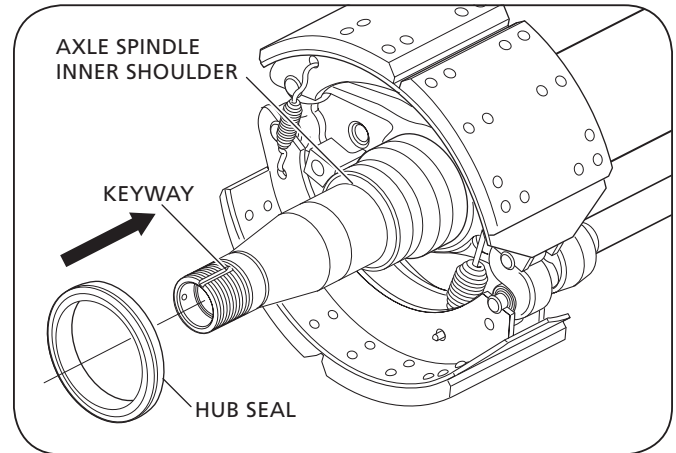
1. Before installing the hub seal on the axle spindle, inspect the machined spindle seal surface for nicks, scratches, burrs or marks. If needed, use crocus cloth or emery cloth to repair any damaged areas.
2. Clean the threads and the keyway thoroughly with a wire brush to avoid false bearing adjustments and to avoid introduction of contaminants into the lubricant cavity.
3. Thoroughly clean the spindle and spindle threads of rust, dirt, grease or any other contaminants that could damage the hub seal and cause it to leak.

**CAUTION**

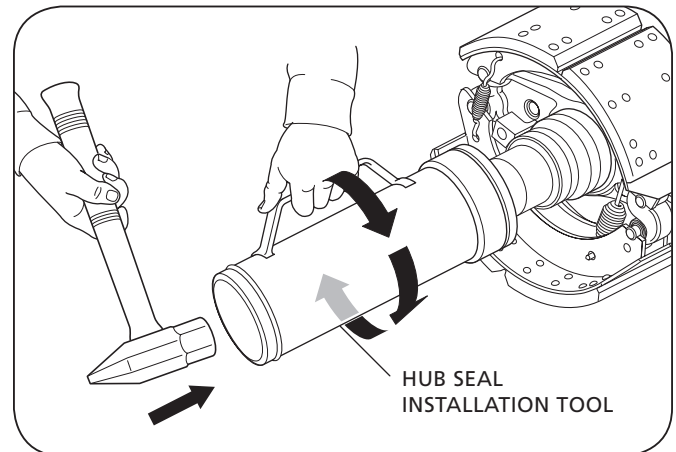
NEVER install a spindle mounted hub seal in the hub and then force it onto the axle spindle by tightening the axle nut. Damage to the seal will result.

4. The seal assembly should be placed on the spindle so the words "Oil Bearing Side" are exposed to the oil (**Figure 9**).
5. Drive the hub seal into place using the seal installation tool and hammer. Rotate the hub seal installation tool in 1/4-turn intervals with every hammer tap until the seal is properly seated with the metal face of the seal flush with the inner shoulder of the axle spindle (**Figure 10**).
6. Apply a thin coat of oil to the O.D. of the seal.
7. Prepare the hub. Remove the old lube and thoroughly clean the hub cavity and hub bore. Inspect the inner hub bore for roughness. If needed, use an emery cloth to remove any burrs or old bore sealant.

**Figure 9**



**Figure 10**



8. Install the inner and outer bearing cups into hub (**Figure 11**).
9. Pre-lube the inner bearing with the lubricant that is being retained and place it into the hub.

**CAUTION** Failure to lubricate the bearing correctly and maintain proper lubrication could result in bearing damage.

**NOTE:** If using grease and not oil for hub lubrication, the inner and outer bearing, and the hub cavity **MUST** be pre-packed with grease before installation. Lubricate the wheel end components with grease specified in the lubrication table in Section 22.

10. Push the hub onto the spindle until it contacts the seal. Pre-lube the outer bearing with the lubricant that is being retained and place it into the hub.

**CAUTION** Support the hub against the spindle inner shoulder until the outer bearing and adjusting nut are installed. **DO NOT** ram the hub into the bearing shoulder, which, if not avoided, could damage the hub seal.

## 6.2 Hub Mounted Hub Seal Installation Instructions

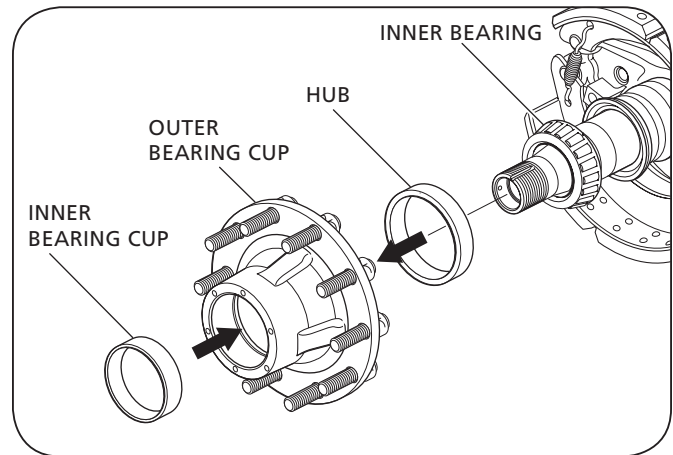
1. Remove all the burrs from the hub bore and the spindle. Thoroughly clean the hub cavity and spindle.
2. Place the hub on a smooth, hard surface in a horizontal position. Pre-lube the inner bearing with the lubricant that is being retained and place it into the hub bearing cup (**Figure 12**).

**NOTE:** When using grease, pre-pack the inner bearing before placement into the hub.

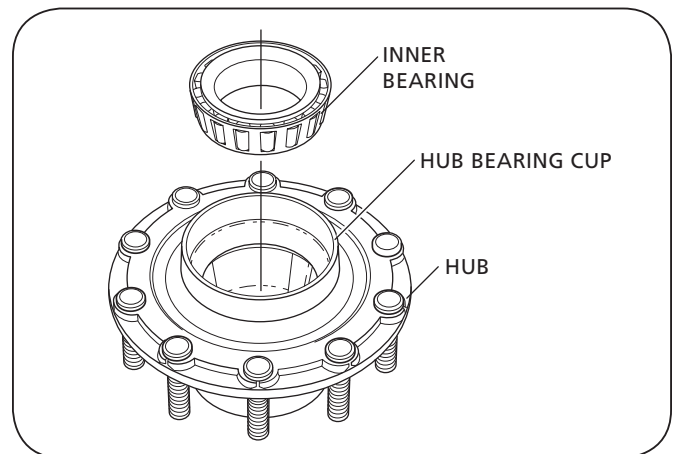
3. With the correct head on the hub seal installation tool, place the hub seal on the installation tool, so that the words "Lube Side" face the inner bearing. Place the tool (with the seal correctly mounted in the tool head) into the hub bore. Use a three to five pound hammer to drive against the end of the tool. Drive the seal into the bore until complete bottoming is assured (**Figure 13**). Remove the Installation Tool and apply a thin layer of lubricant on the I.D. surface of the seal. Ensure the inner bearing rotates freely. Install a new seal if the seal is crooked or damaged or after installation.

**NOTE:** **DO NOT** apply lubricant to the O.D. of the seal.

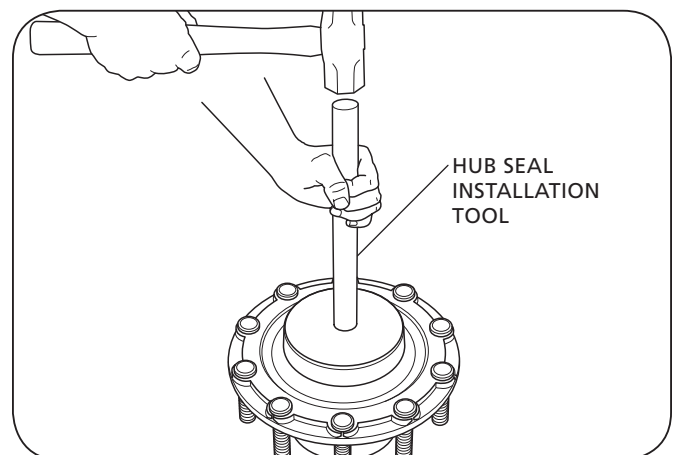
**Figure 11**



**Figure 12**



**Figure 13**



4. Align the hub bore to the center of spindle with mechanical supports. Gently push the hub assembly onto the spindle until the seal is seated against the bearing shoulder. Rotate the hub and lightly strike to ensure that the seal is properly seated against the bearing shoulder.
5. Pre-lube the outer bearing with the lubricant that is being retained and place into the hub.

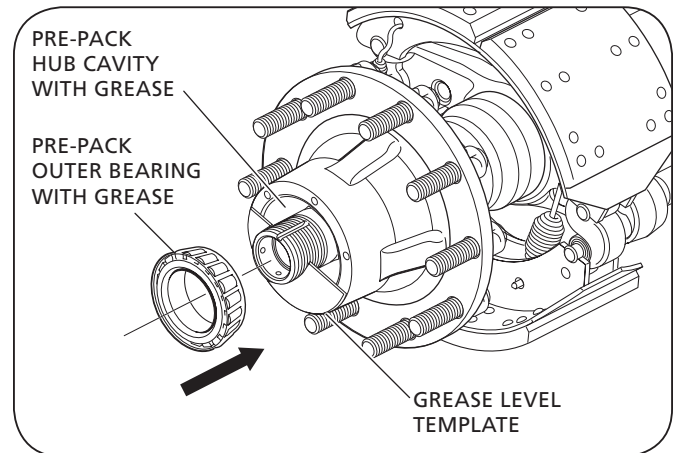
**NOTE:** When using grease, pre-pack the hub cavity. The grease fill amount should be to a three (3) o'clock and nine (9) o'clock level. This is to ensure a 50% hub cavity fill. Use a template to hold the grease in place while filling the hub cavity (**Figure 14**).

## 7. Hub Bearing Adjustment

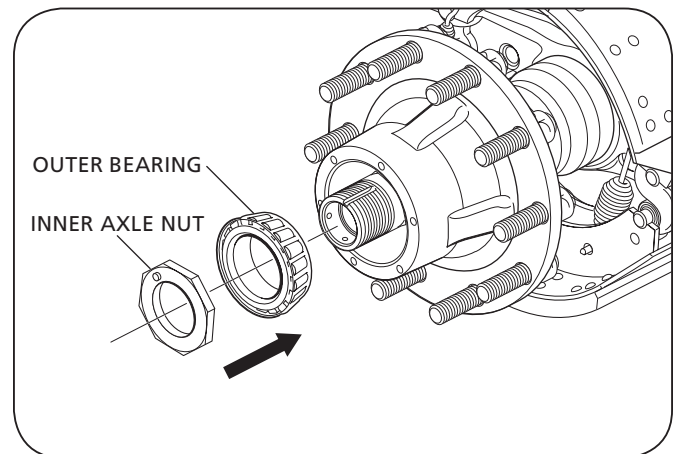
### 7.1 Hub Bearing Adjustment Using 3-Piece Axle Nut

1. Install the bearing inner-axle adjustment nut finger tight against the outer bearing (**Figure 15**).
2. While rotating the hub assembly, tighten the inner axle adjustment nut to 200 ft.-lbs. (271 N•m).
3. Back off the inner axle adjustment nut one full turn and then re-torque the nut to 50 ft.-lbs. (68 N•m) while rotating the hub assembly.
4. Back off the inner axle nut approximately 1/4 turn and install the axle lock washer (**Figure 16**). DO NOT include socket backlash in the 1/4 turn.
5. Install the lock washer. If the hole in the washer is NOT aligned with the pin on the inner nut, turn the washer around and re-install. If the pin and hole are still NOT aligned, slightly adjust parts as needed.
6. Install the outer axle nut finger tight against the axle lock washer (**Figure 16**).
7. Tighten the outer axle nut to 200-300 ft.-lbs. (271-407 N•m).

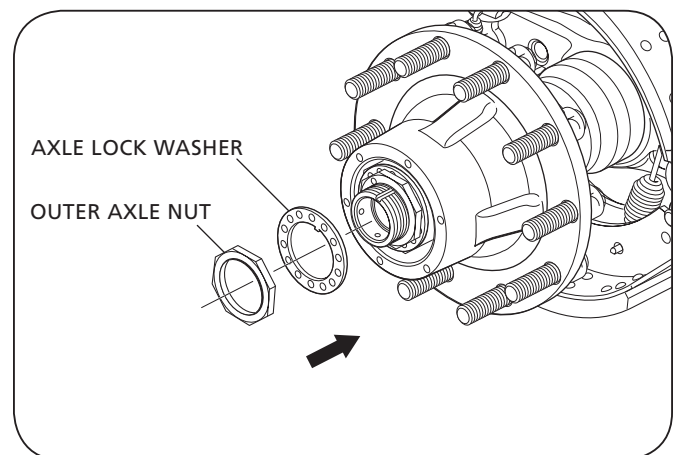
**Figure 14**



**Figure 15**



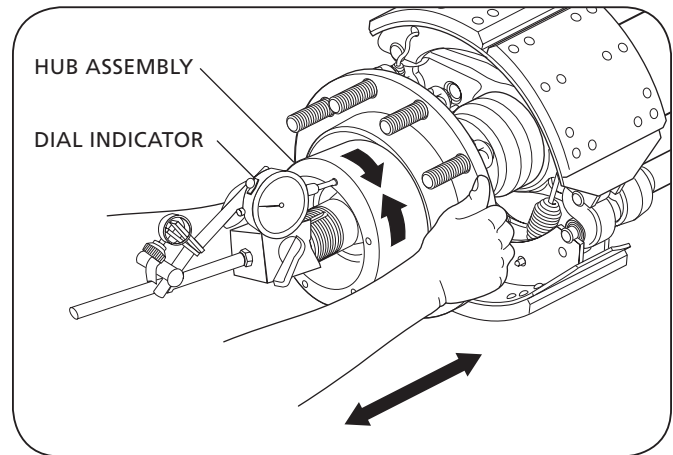
**Figure 16**





8. Check the wheel bearing end play as follows:
  - a. Attach the magnetic base of a dial indicator to the spindle. Touch the dial indicator stem to the hubcap gasket face (**Figure 17**).
  - b. Reading Number One – Slightly rotate the wheel-end in both directions while pushing inward until the dial indicator does not change. Set the dial indicator to zero (**Figure 17**).
  - c. Reading Number Two – Slightly rotate the hub in both directions while pulling outward until the dial indicator does not change (**Figure 17**).
  - d. End play is the difference between reading number one and reading number two.

**Figure 17**



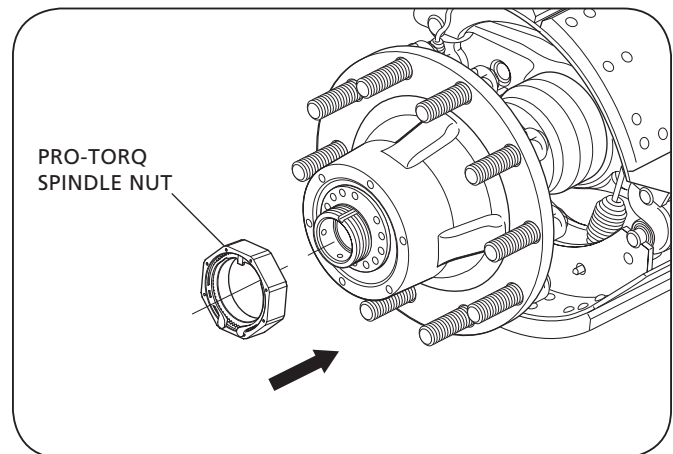
**IMPORTANT:** Final adjustment should allow the wheel to rotate freely with 0.001" to 0.005" (0.025 mm to 0.0127 mm) end play. If the end play is NOT within specification, re-adjustment is required.

**⚠ WARNING** Failure to maintain proper hub bearing adjustment could allow bearing failure and wheel-end separation which, if not avoided, could result in death or serious injury.

**NOTE:** If the wheel bearing end play needs adjustment, remove the outer nut and the lock washer. Tighten or loosen the inner nut as needed. Return to Step 6.

9. Install the set screw into an accessible threaded hole in the lock washer. Set screw **MUST** contact the inner adjusting nut. Tighten to 16-20 in.-lbs. (1.8-2.2 N•m) (**Figure 19**).

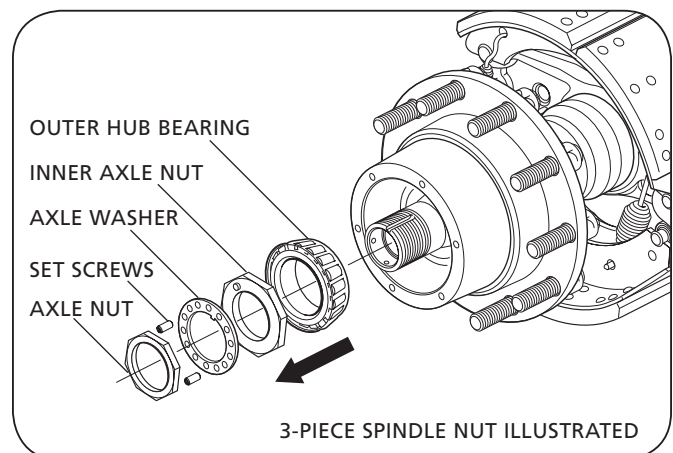
**Figure 18**



## 7.2. Hub Bearing Adjustment Using Pro-Torq Axle Nut

The unit could be equipped with a Pro-Torq spindle nut (**Figure 18**). Refer to Stemco® "Pro-Torq Installation Instructions" (Part No. 09-571-006) which can be found at [www.stemco.com](http://www.stemco.com) for more information.

**Figure 19**



## 8. Hub Cap Installation

1. Install the hub cap assembly, making sure the hub cap gasket is in place (**Figure 20**).

**CAUTION**

When installing the hub cap, make sure the hub cap gasket is not bent or damaged.

**CAUTION**

DO NOT over torque. This can crush the hub cap gasket and cause a leak.

2. Install the six (6) bolts to secure the hub cap assembly (**Figure 18**, page 14). Tighten the bolts to 12-16 ft.-lbs. (16-21 N•m).

## 9. Filling Hub With Lubricant (Oil Based)

**IMPORTANT:** DO NOT mix oil lubricant with grease lubricant. If the bearing assembly has been lubricated with grease DO NOT add oil.

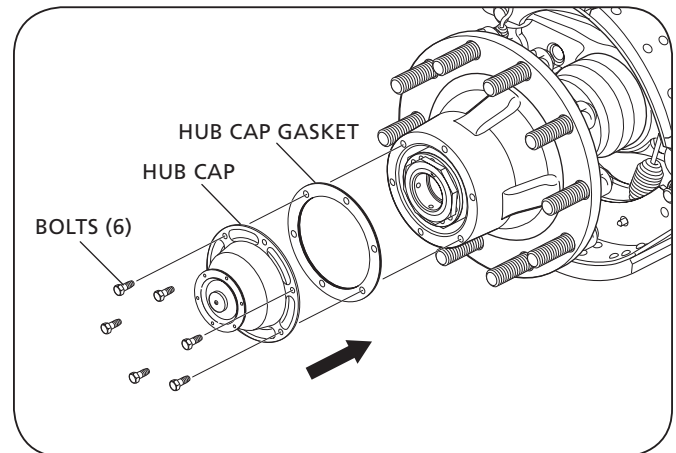
**WARNING**

Failure to correctly lubricate the bearings could damage the bearings which, if not avoided, could result in death or serious injury.

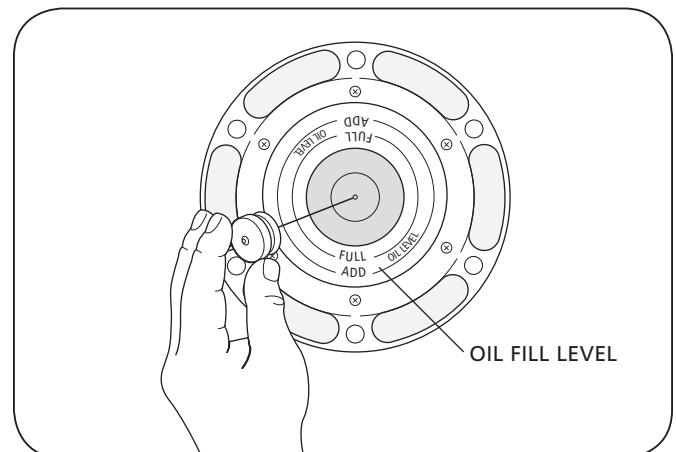
1. Remove the plug and fill the hub to the FULL mark with the specified lubricant (oil), through the hole in the hub cap (**Figure 21**).
2. Allow the oil to flow through the bearings and level off.
3. Insert the plug into the hole in the hub cap (**Figure 22**).

**IMPORTANT:** Axles equipped with a centralized tire inflation system MUST use a vented hub cap.

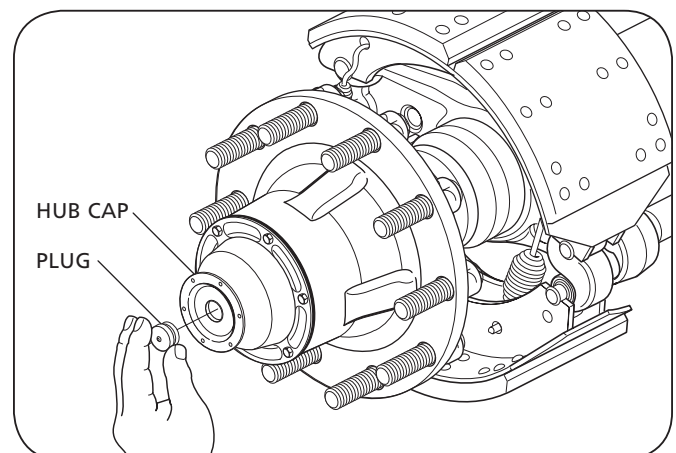
**Figure 20**



**Figure 21**



**Figure 22**





4. Re-install the drum on the hub using a support device such as a drum dolly jack (**Figure 23**).

**CAUTION** Failure to support weight during installation or removal of the brake drum could create a crush hazard which, if not avoided, could result in minor to moderate injury.

**CAUTION** Failure to uncage the spring brakes in accordance with manufacturer's instructions after servicing is complete will prohibit proper brake function, which, could result in uneven brake system component wear.

### 10. Retracting the Brake Shoes or Brake Adjuster Control Arm(s)

**IMPORTANT:** Refer to the brake adjuster's manufacturer's procedures for proper adjustment of the brake adjusters.

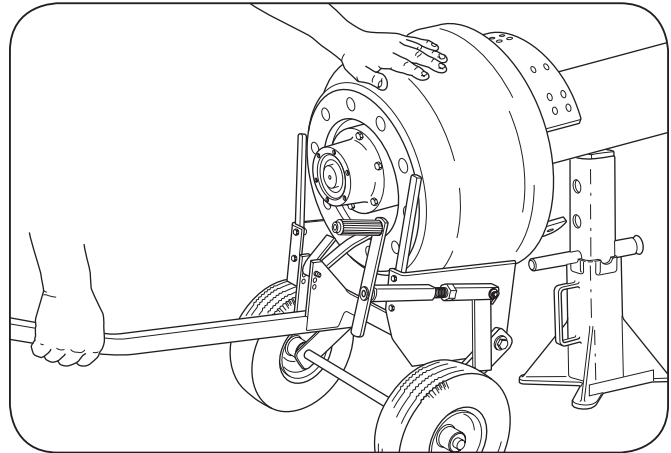
**WARNING** Failure to operate with proper brake adjuster position could render brakes inoperable which, if not avoided, could result in death or serious injury.

**NOTE:** When servicing the brakes, in some instances it could be necessary to fully retract the brake shoes in order to remove the brake drum.

**NOTE:** When removing the S-Camshaft, it is necessary to retract the brake adjuster control arm(s) from the clevis so the brake adjuster can be removed from the S-Cam shaft.

In both of the notes above, the brake shoes or the brake adjuster control arm(s) are retracted by turning the adjusting nut manually on the automatic brake adjuster.

**Figure 23**



## 11. Brake Shoe Removal

**NOTE:** Before starting any axle/brake service procedures, park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle and axle(s) with safety stands. DO NOT work under a vehicle supported only by jacks. Jacks can slip or fall over. Serious personal injury and damage to components can result.

**⚠ WARNING** Failure to properly support the vehicle and axles prior to commencing work could create a crush hazard which, if not avoided, could result in death or serious injury.

1. Release the trailer brakes and cage the spring brakes according to the spring brake manufacturer's instructions. Remove the tire and wheel assembly to access the hub and drum.
2. Remove the drum from the hub using a support device such as a drum dolly (**Figure 24**).

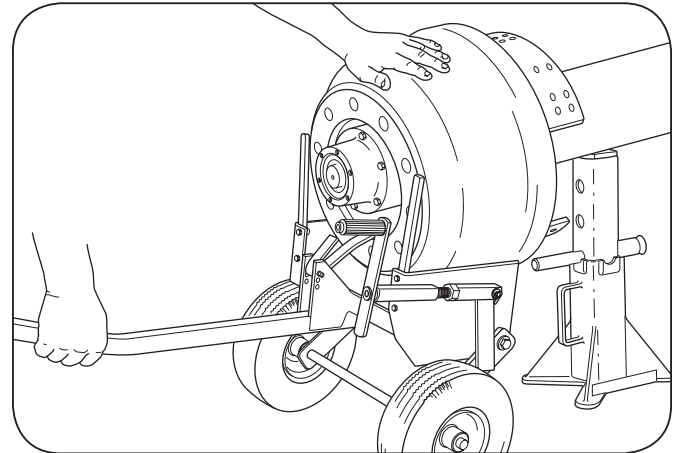
**⚠ CAUTION** Failure to support weight during installation or removal of brake drum could create a crush hazard which, if not avoided, could result in minor to moderate injury.

**NOTE:** It is necessary to retract the brake shoes in accordance with the brake adjuster's manufacturer's manual to allow the brake drum to clear the brake shoes during the brake drum removal.

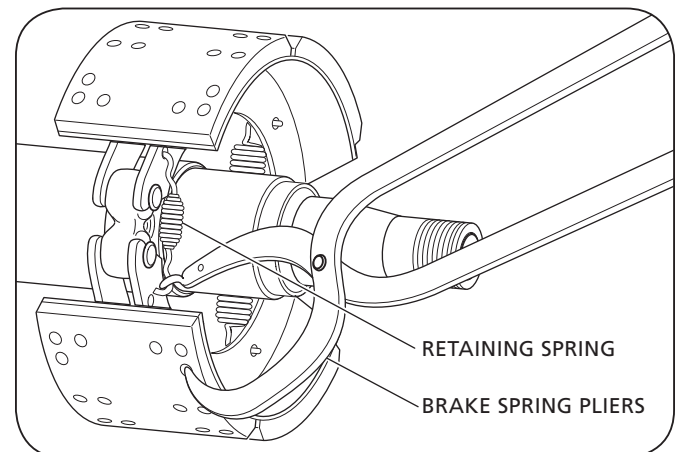
3. Using the brake spring pliers, unhook both the brake retaining springs from the brake shoes (**Figure 25**).
4. Press down on the lower brake shoe to disengage it from the anchor pin. Move the lower shoe to the side of the anchor bracket and lift the upper and lower shoes (still connected by brake return spring) from the anchor pins (**Figure 26**).

**IMPORTANT:** The brake return spring, brake shoe rollers and roller retaining clips will remain on the brake shoes during this procedure.

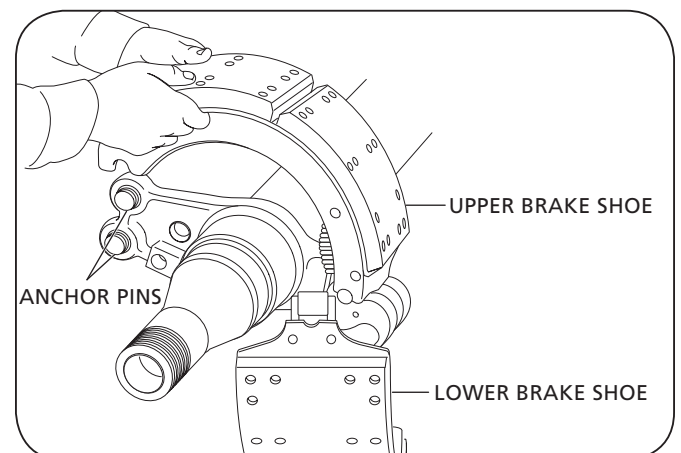
**Figure 24**



**Figure 25**



**Figure 26**



5. Discard the used brake hardware.

**IMPORTANT:** Brake hardware such as brake rollers, roller retaining clips and brake return springs experience fatigue during their normal lifespan and could not have the same performance characteristics as new components. Since most of these brake components are supplied new with the brake overhaul kit, the existing components should NOT be re-used.

6. With the brake shoes off, inspect the S-Camshaft and S-Camshaft bushings for wear. Verify that the S-Cam-to-bushing radial free play is within specification by using a dial indicator and moving the S-Camshaft back and forth (**Figure 27**). Rotate the S-Camshaft in all directions when checking for radial free play.

**NOTE:** Use a dial indicator to verify that S-Cam-to-bushing free play is 0.030" (0.76 mm) or less.

- If radial free play is less than 0.030" (0.76 mm): DO NOT replace the bushings and the seals.
- If radial free play is more than 0.030" (0.76 mm): Replace the bushings and the seals.

7. Inspect the brake shoes and components for wear:

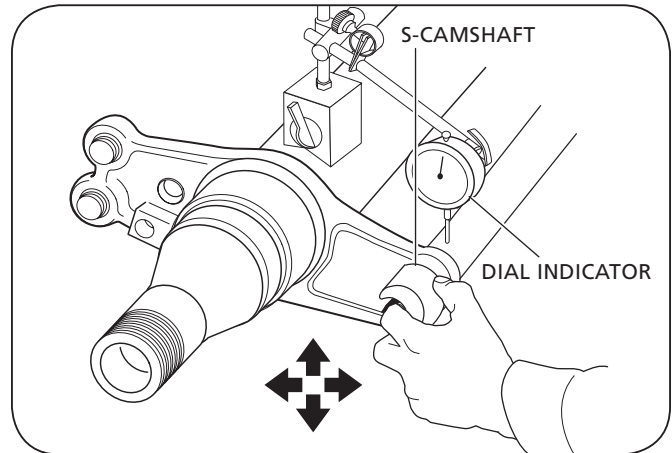
- h. Inspect the spider for expanded anchor pin holes and for cracks. Brake spiders cannot be repaired and **MUST** be replaced with new axle assembly.
- i. Inspect the S-Camshaft bracket for broken welds, cracks and correct alignment. Replace the damaged brackets.
- j. Inspect the anchor pins for corrosion and wear. Replace worn or damaged anchor pins.

**NOTE:** Follow the brake shoe manufacturer specifications for minimum brake shoe thickness and maximum brake drum inner diameter. A general guideline for replacing brake shoes is when the lining thickness is 1/4" (6 mm) or less, or when the lining rivets have begun to contact the drum (**Figure 28**).

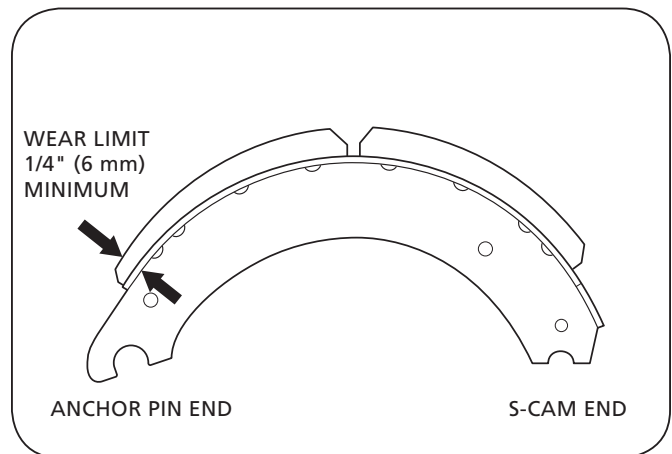
**CAUTION** Failure to replace the brake shoes that are excessively worn could result in damage to brake drum or other components.

- k. Inspect the brake shoes for wear, expanded rivet holes, broken welds and correct alignment. Replace the shoes as a set with any of the above conditions.

**Figure 27**



**Figure 28**



8. Inspect the brake drums for wear.

**WARNING** DO NOT operate the vehicle with the brake drum worn or machined beyond the discard dimension indicated by the drum manufacturer. The brake system may not operate correctly. Damage to components, death or serious injury, could result.

**CAUTION** Replace the brake drum if it is out-of-round. DO NOT turn or re-bore a brake drum beyond manufacturers recommendations. Doing so could decrease the strength and capacity of the drum which, if not avoided, could result in brake component damage.

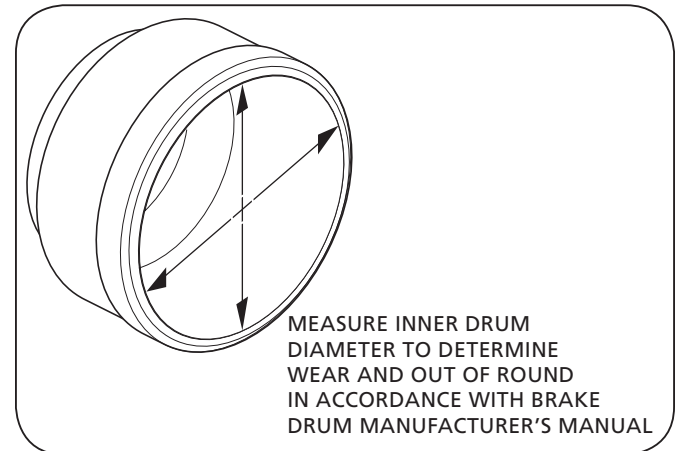
- a. Inspect the brake drums for cracks, severe heat checking, heat spotting, scoring, pitting and distortion. Replace the drums as required.
- b. Measure the inside diameter of the drum in several locations with a drum caliper or internal micrometer (*Figure 29*).
- c. If brake drum is excessively worn or out of round replace the brake drum.

**CAUTION** Failure to replace an out of round brake drum could result in damage to the brake drum or other components.

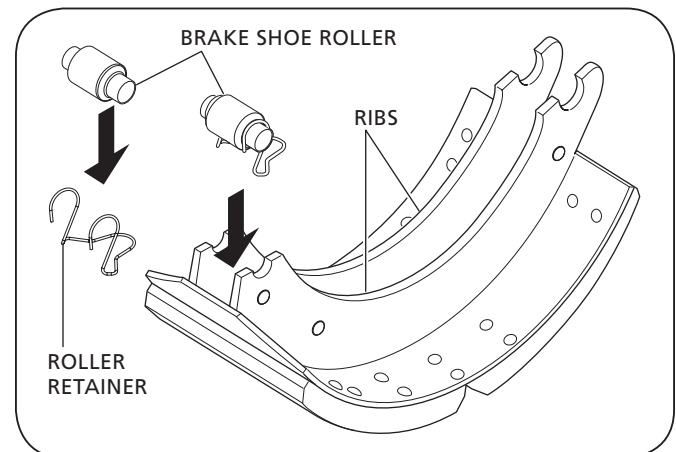
## 12. Brake Shoe Installation

1. Install the brake shoe roller into the roller retainer (*Figure 30*).
2. Install the roller and roller retainer into the brake shoe ribs (*Figure 30*).
3. Coat anchor pins (ends only) completely with lubricant (Never-Seez®) and install (if removed) in the brake spider (*Figure 31*).

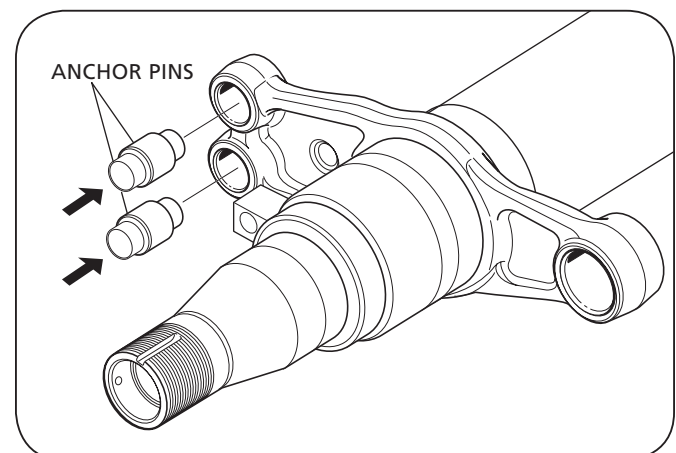
**Figure 29**



**Figure 30**



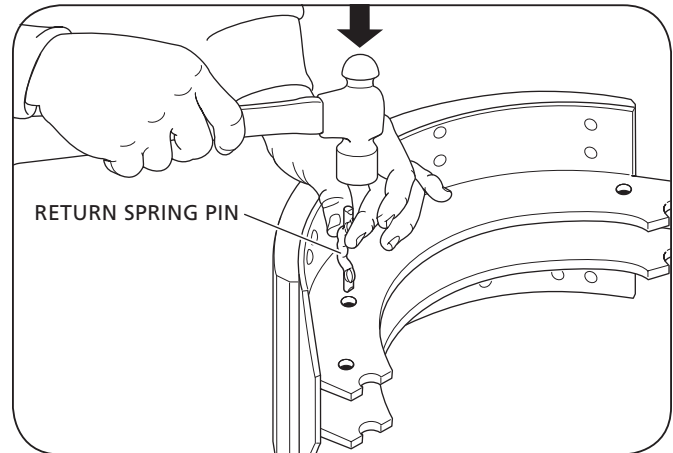
**Figure 31**



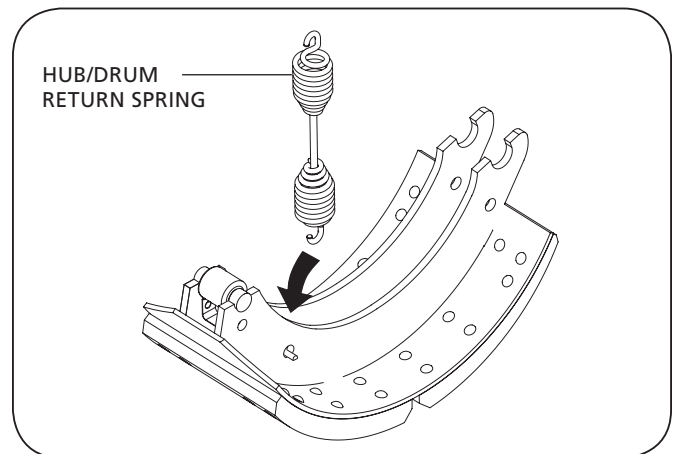
4. Install the return spring pin into the brake shoe ribs (**Figure 32**).
5. Connect the hub/drum return spring to the upper and lower brake shoes (**Figure 33**).
6. Position the roller of the upper brake shoe up against the S-Cam, then place the other end of the shoe against the anchor pin (**Figure 34**).

**CAUTION** Failure to control spring pressure during the brake shoe installation could create a pinch hazard which, if not avoided, could result in minor to moderate injury.

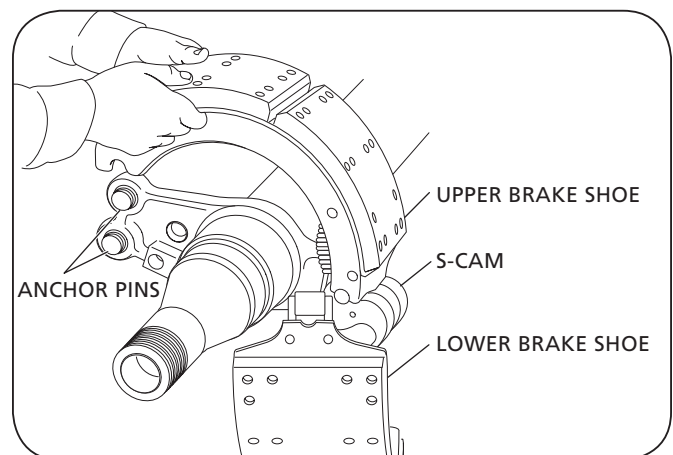
**Figure 32**



**Figure 33**



**Figure 34**

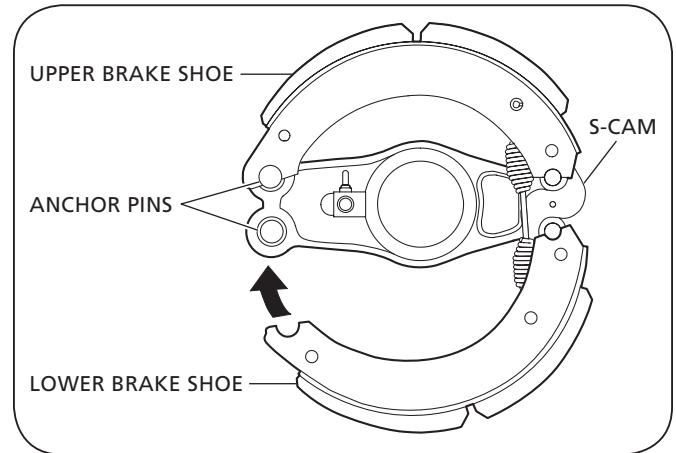


7. Position the roller of the lower brake shoe up against the S-Cam, then place the other end of the shoe against the anchor pin (**Figure 35**).
8. Install the two (2) brake anchor pin springs using the anchor pin pliers (**Figure 36**).
9. Make sure the brake linings are clean.
10. Re-install the drum using a support device such as a drum dolly jack (**Figure 37**).

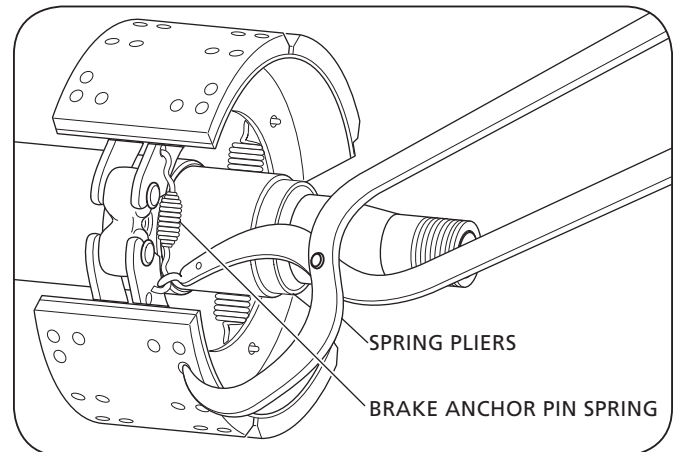
**CAUTION** Failure to support weight during the installation or removal of the brake drum could create a crush hazard which, if not avoided, could result in minor to moderate injury.

11. Adjust the brakes as described in Section 17.

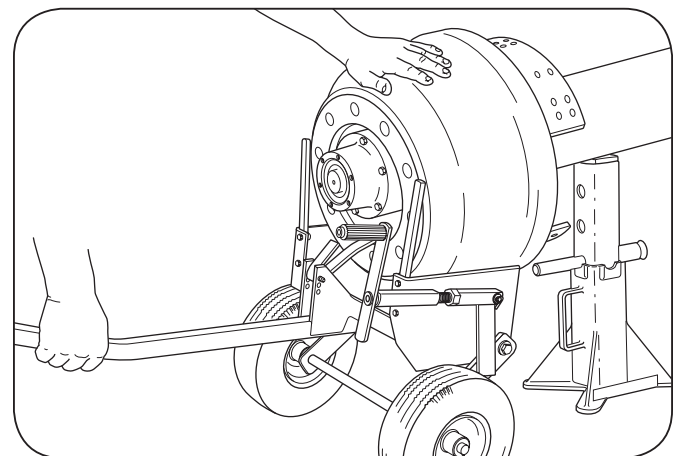
**Figure 35**



**Figure 36**



**Figure 37**



## 13. Brake Adjuster Removal

**NOTE:** Maintenance procedures in this section require re-positioning of the brake adjuster. Consult the manufacturer's manual for procedures to properly operate the brake adjusters.

1. Remove the cotter pins that secure the brake adjuster/ brake chamber clevis pins (**Figure 38**). Remove the clevis pins.
2. Remove the retaining ring and washer that secure the brake adjuster to the S-Camshaft (**Figure 39**).
3. Remove the self-adjusting brake adjuster from the spline end of the brake S-Camshaft.
4. Rotate the adjusting mechanism to back the brake adjuster out of the clevis in accordance with the brake adjusters manual.

## 14. Brake Adjuster Installation

1. Apply an even coat of anti-seize compound to splined surface of the S-Camshaft.
2. Position the spacing washers on both sides of the brake adjuster, then install the brake adjuster onto the S-Camshaft spline and secure the brake adjuster on the S-Camshaft by assembling the retaining ring (**Figure 40**).
3. Align the brake adjuster to the clevis and pin together using the clevis pins and the cotter pins (**Figure 38**).
4. Apply service and the spring brake several times. Final brake adjustment is required to ensure proper initial brake operation. The brake adjuster will then seek the proper working stroke during normal operating conditions. Refer to the brake adjuster and brake chamber manufacturers' procedures for proper adjustment.

Figure 38

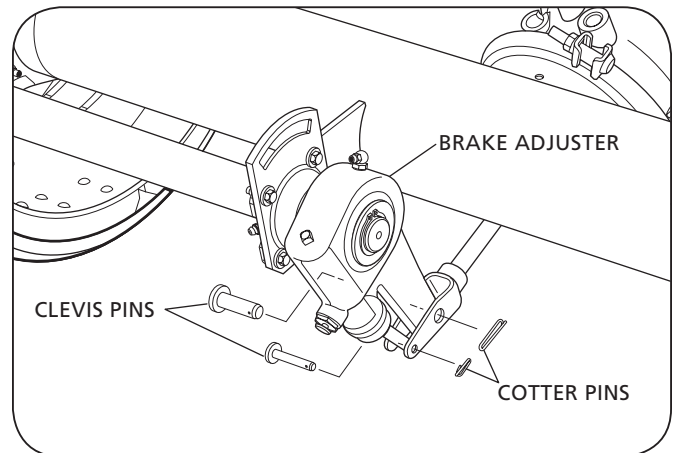


Figure 39

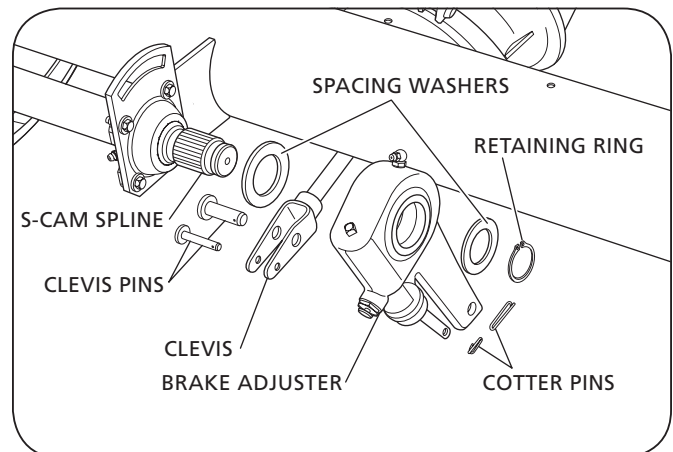
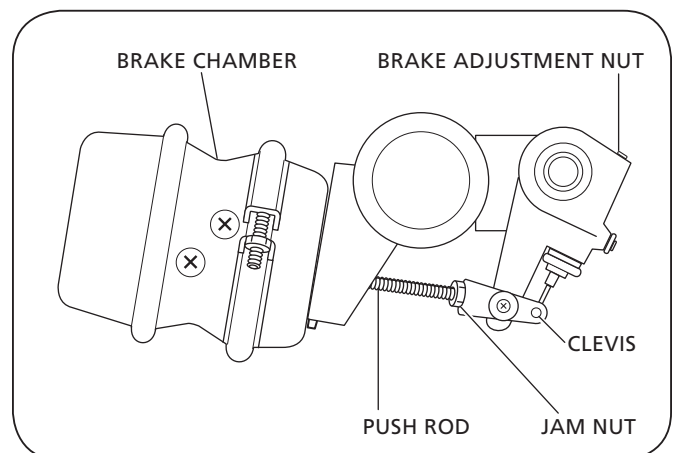


Figure 40

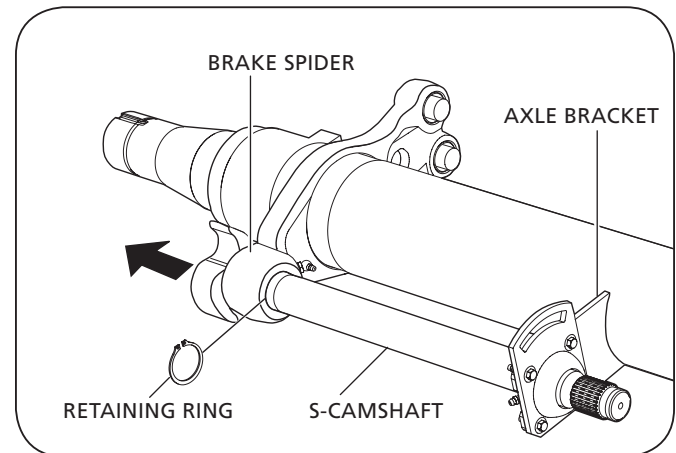




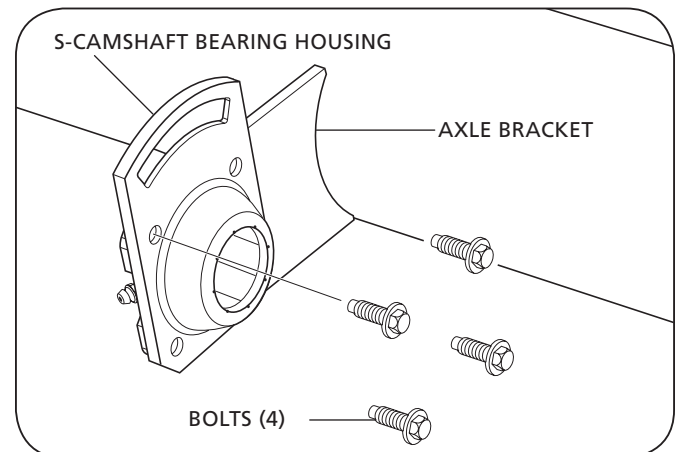
## 15. S-Camshaft and Bearing Removal Procedure

1. Remove the brake shoes and the brake adjuster as described in Section 11 and 13, respectively.
2. Remove the retaining ring from the spider end of the S-Camshaft (**Figure 41**).
3. Remove the S-Camshaft by sliding it out of the S-Camshaft bearing housing and bearings. It could be necessary to tap the end of the shaft with a soft mallet to release it from the bearings (**Figure 41**).
4. Remove the existing bolts securing the S-Camshaft bearing housing to the axle bracket (**Figure 42**).
5. Inspect the bearings assembly for wear and deterioration. Replace as necessary.

**Figure 41**



**Figure 42**



## 16. S-Camshaft and Bearing Installation

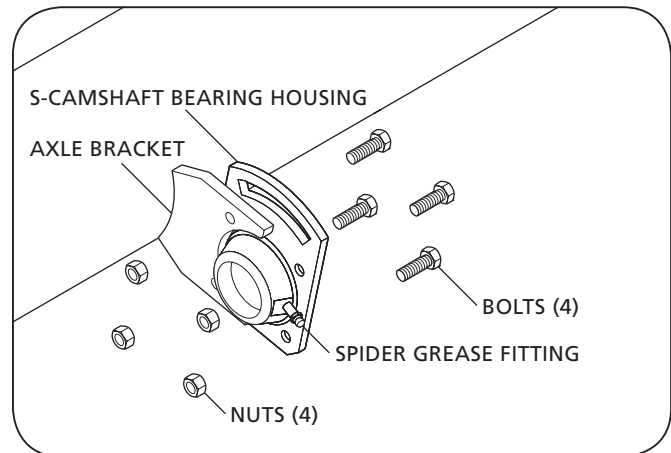
1. Attach the S-Cam bearing housing bracket to the axle bracket, securing it with the four (4) nuts and bolts (**Figure 43**). Tighten the nuts to 15-22 ft.-lbs. (20-30 N•m).
2. Install the S-Camshaft bearing into the brake spider, ensuring that the bearing is centered (**Figure 44**).
3. Install the guide plate, and cam seals on the S-Camshaft and slide the S-Camshaft and the washer assembly through the S-Camshaft bearing in the brake spider (**Figure 44**).

**NOTE:** Cam seals, refer to **Figure 44**, **MUST** be installed with the metal shoulder oriented toward the wheel, and the open end oriented toward the center of the vehicle. This facilitates complete lubrication of the s-cam bearing while allowing air to purge from the s-cam bearing away from the brake shoes.

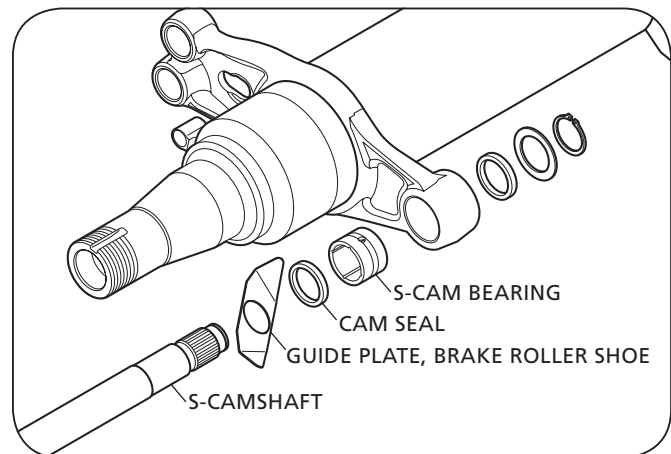
### CAUTION

Failure to center S-Camshaft bearing into the brake spider, and to properly orient cam seals, could not allow grease flow to bearing which, if not avoided, could result in premature bearing failure (**Figure 45**).

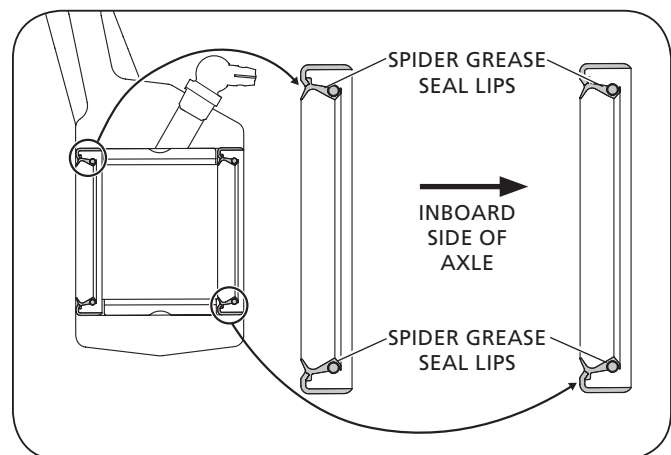
**Figure 43**



**Figure 44**

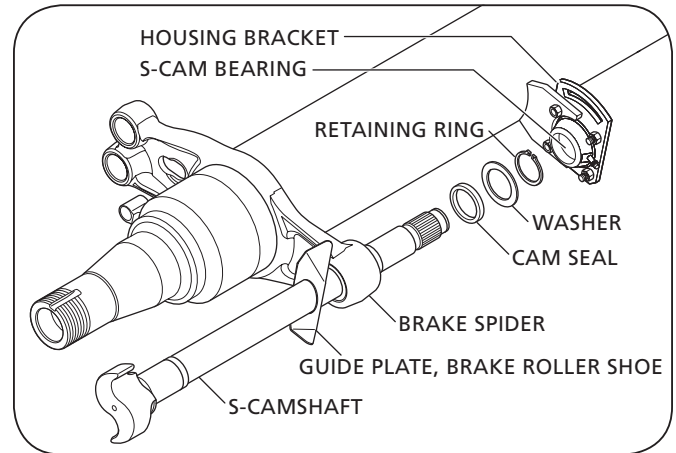


**Figure 45**

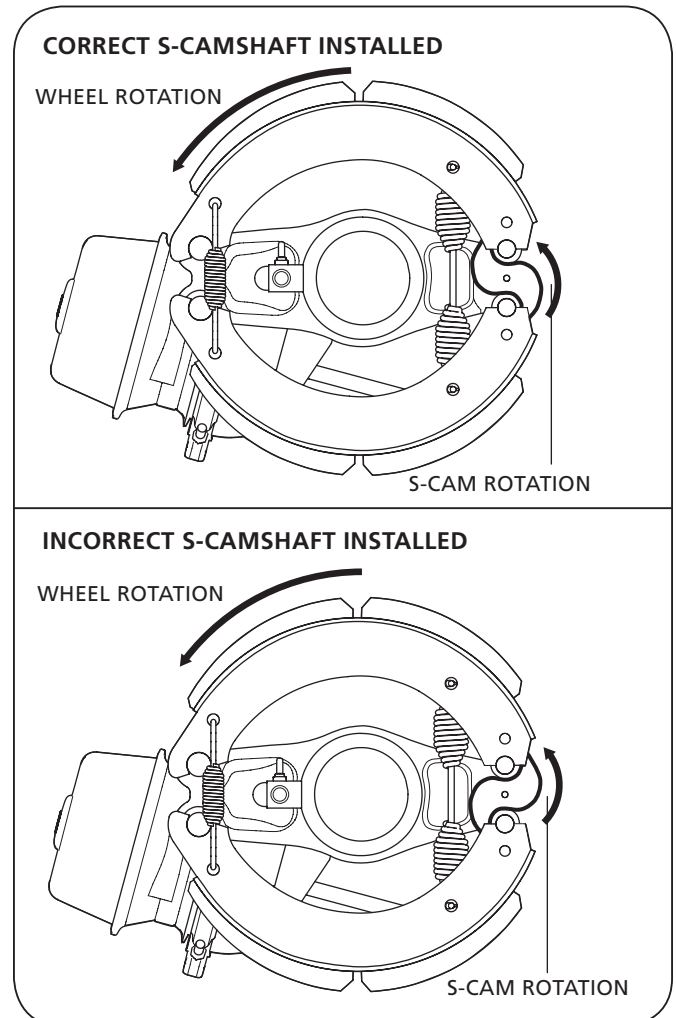


4. Install the cam seal washer and the retaining ring onto the S-Camshaft and slide the S-Camshaft into the S-Camshaft bearing housing bracket (**Figure 46**).
5. Install the brake shoes and the brake adjusters as described in Section 12 and 14, respectively.
6. Inspect the S-Camshaft installation to ensure that the correct S-Camshaft has been installed on the required side of the axle for proper operation (**Figure 47**).
7. Lubricate the S-Camshaft bearings with grease specified in the Lubrication Table in Section 22 (**Figure 48**, page 26).

**Figure 46**



**Figure 47**



## 17. Brake Adjustment Procedure

1. Verify that the spring brakes are caged prior to beginning the adjustment procedure.
2. Adjust the brake adjuster until the brake lining contacts the brake drum, then back off 1/2 turn.
3. Apply the service brakes using normal operating pressure (average line pressure should be 90 psi, but not less than 80 psi). Check the following while brake pressure is applied.
  - The optimum distance of the push rod travel should be approximately 1.5" -1.75" (38-44 mm) (**Figure 49**).
  - Angle between the push rod and the brake adjuster with the brake applied, should be 95°-100° (**Figure 50**).
  - Brake lining to drum contact. A 0.010" feeler gauge should not fit between the lining and the drum contact area.
4. Release the air pressure from the service brake system and check to see that all brakes release to the normal relaxed position. If all the brakes do not properly release, Refer to Troubleshooting Chart in Section 23.

**CAUTION** Failure to adjust the brakes in accordance with manufacturer's instructions prior to placing the trailer back in service will prohibit proper brake function which, if not avoided, could result in uneven brake system component wear.

5. Uncage the spring brakes.

**WARNING** Failure to uncage the spring brakes in accordance with manufacturers' instructions after servicing is complete will prohibit proper brake function which, if not avoided, could result in death or serious injury.

Figure 48

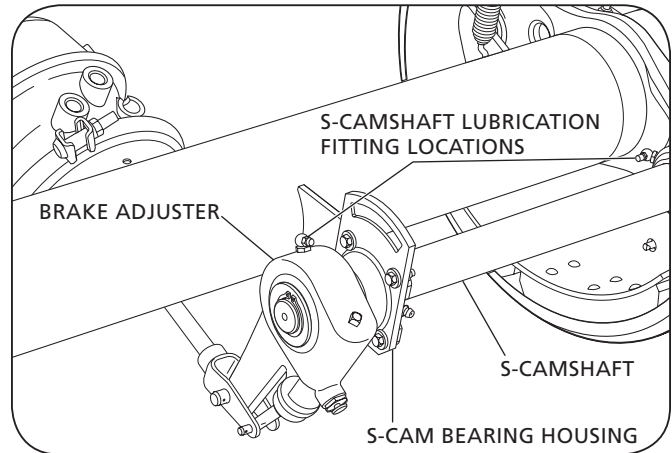


Figure 49

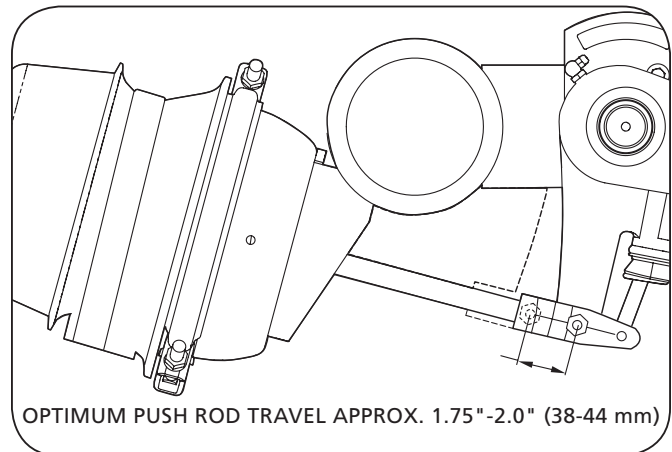
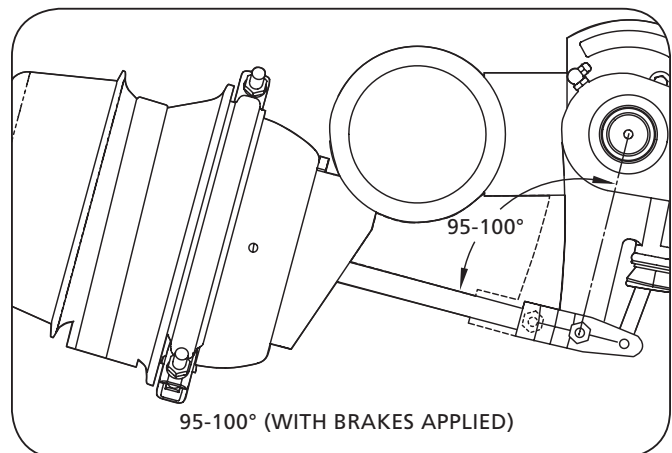


Figure 50



## 18. ABS Sensor Replacement Procedure

### 18.1 Sensor Removal

**NOTE:** ABS sensors **MUST** match the system. **DO NOT** mix sensors from different manufacturers.

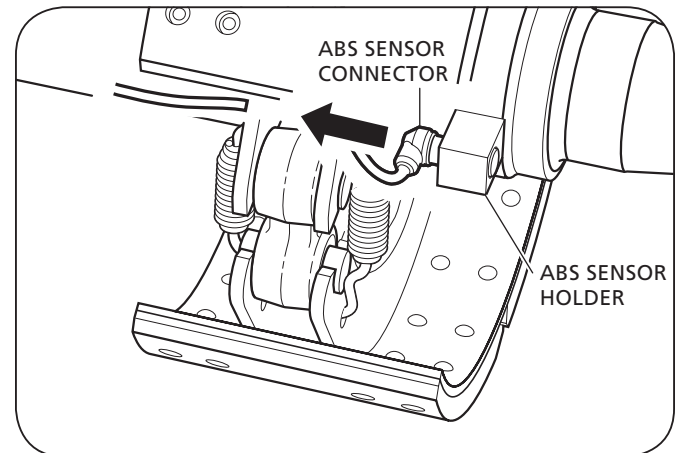
1. Manually release the brakes.
2. Remove the brake drum assembly as described in Section 4.
3. Disconnect the ABS sensor connector and remove the sensor from the sensor holder by pulling straight out (**Figure 51**).
4. Remove the sensor retaining spring clip, if necessary.

### 18.2 Sensor Installation

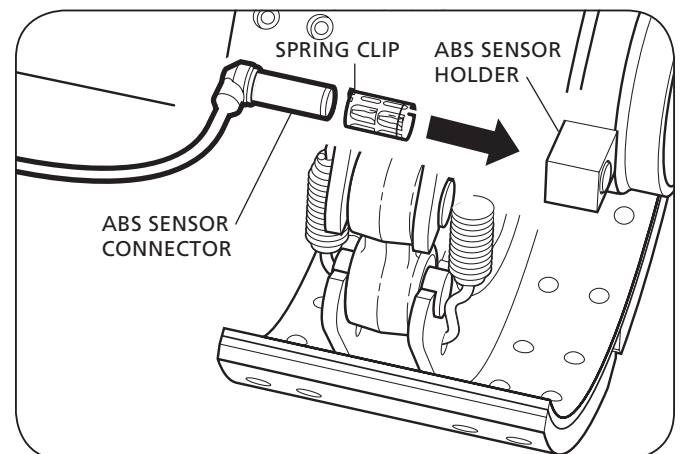
**NOTE:** Be sure to use the correct spring clip for the sensor being installed.

1. Install the sensor retaining spring clip, if removed, into the sensor holder.
2. Install the ABS sensor into the spring clip and the sensor holder. Push the sensor in until it contacts the tone ring (**Figure 52**).
3. Connect the ABS sensor connector.
4. Re-install the drum using support device such as a drum dolly jack (**Figure 37**, page 21).
5. Adjust the brakes as described in Section 17.

**Figure 51**



**Figure 52**



## 19. Wheel Installation Procedure

The following information is intended to provide basic wheel installation instructions. Refer to TMC RP222C for complete installation details.

1. Clean all mating surfaces on hub, wheels and nuts.
2. Rotate the hub so a pilot boss is at the top (12 o'clock) position.
3. Mount wheel(s) on hub. One or more of the wheel nuts can be started in order to hold wheel in position.
4. Tighten the top wheel nut first. Apply 50 ft.-lbs. (68 N•m) of torque to draw the wheel up fully against the hub.
5. Install remaining wheel nuts. Using sequence illustrated in **(Figure 53)**, tighten all wheel nuts to 50 ft.-lbs. (68 N•m) of torque.
6. Repeating sequence illustrated in **(Figure 53)**, retighten all wheel nuts to 475 ± 25 ft. lbs. ( 644 ± 34 N•m) of torque.
7. Check seating of wheel at the pilot bosses. Rotate wheel and check for any rotational irregularity.

**⚠ WARNING** Retorque all wheel nuts after 5 to 100 miles of service on the initial "in-service" following any installation of wheel to hub assembly.

## 20. Axle Alignment Inspection

**NOTE:** Alignment can be achieved using an optical device designed specifically for this purpose. Follow the instructions in the optical device operating instructions to align the axles.

1. To manually align the axles attached to the trailer, first pull the trailer in a straight line for a sufficient distance to release/clear any binds in the suspension.

**NOTE:** A straight, unbound suspension is the position of a suspension during normal operations.

Using the alignment procedures per the suspension manufacturer's recommendations, align the axles to the following specifications.

2. Measure the distance from the king pin to the centerline of the spindles on each side of the front axle. Dimensions A and B **MUST** be equal to within 1/8" (4 mm) **(Figure 54, A and B)**.
3. Measure the distance from the centerline of the spindles of the front axle to the centerline of the spindles of each additional axle. Dimension C and D **MUST** be equal to within 1/16" (1 mm) **(Figure 54, C and D)**.

Figure 53

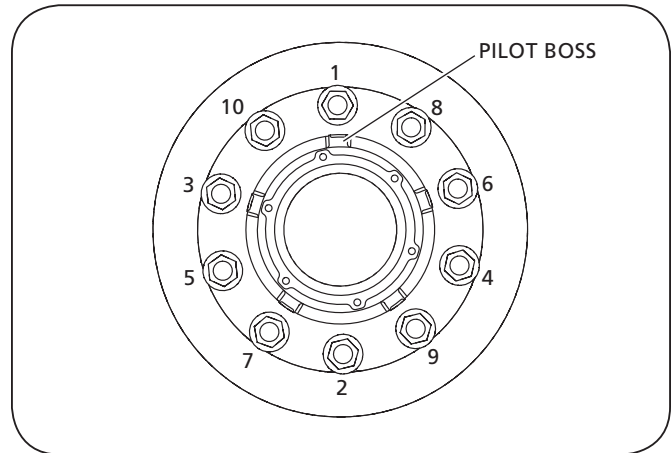
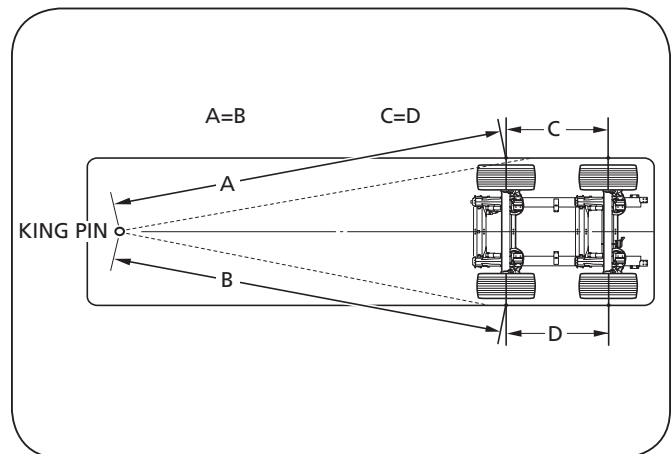


Figure 54



## 21. Routine Service Schedule

WHICHEVER OCCURS FIRST		PERIODIC CHECKS		
MILEAGE INTERVALS	AFTER FIRST 3,000 MILES	EVERY 10,000 MILES	EVERY 50,000 MILES	EVERY 100,000 MILES
TIME INTERVALS	AFTER FIRST MONTH	EVERY MONTH	EVERY 6 MONTHS	EVERY 12 MONTHS
<b>VISUAL INSPECTION FOR WEAR/DAMAGE</b>				
Check brake linings for wear.	■	■		
Check S-Camshaft for proper operation.	■	■		
Check brake adjusters for correct function.	■	■		
Check air brake system for leaks (brake applied).	■	■		
Check axle structural components for cracks or damage.	■	■		
Check hub lubrication level for excessive leakage.	■	■		
<b>MECHANICAL CHECK</b>				
Attention: Torque check wheel nuts after the first 5-100 miles (8-160 km) from date vehicle was placed into service and after every wheel removal. Continually check wheel torque every 10,000 miles (16,000 km), or at the intervals indicated in your vehicle owner's manual, whichever occurs first.	■			
Torque check all nuts and bolts to recommended setting.	■		■	
Check and adjust wheel bearing end play.	■			■
Pack hub bearings with fresh lubricant (also after every brake lining replacement, check hub bearing wear).				■
Lubricate S-Camshaft bearing bushings.	■	■		
<b>SAFETY INSPECTION</b>				
Check brake lining to drum clearance for correct adjustment – re-adjust clearance if necessary. Check service brake and parking brake for performance.	■	■		
<b>SPECIAL SERVICE CONDITIONS</b>				
Vehicles with long standing periods.	Service at specified time intervals, e.g. trailer used for storage or frequently left standing for several days at a time.			
Vehicles used under extreme conditions.	Service at suitably reduced intervals, e.g. trailer operating in continuous multi-shifts or in off-road construction sites.			

Warranty claims will only be accepted as long as the operation and maintenance instructions have been complied with and if SAF-HOLLAND approved spare parts have been fitted.



## 22. Torque and Lubrication Specifications

TORQUE SPECIFICATIONS	
COMPONENT	TORQUE VALUE
Grease Fitting, Spider	20-50 in-lbs (2-6 N•m)
Axle, Inner Nut	Refer to Section 7
Axle, Outer Nut	200-300 ft.-lbs. (271-407 N•m)
Air Chamber Nuts	80-125 ft.-lbs. (108-169 N•m)
Hubcap Bolts	12-16 ft.-lbs. (16-21 N•m)
Self-Threading Screw	15-22 ft.-lbs. (20-30 N•m)

LUBRICATION SPECIFICATION		
COMPONENT	SURFACE TO BE LUBRICATED	LUBRICANT
S-Camshafts	S-Camshaft Bearings (Four (4) Grease Fittings per Axle)	Lithium Complex Grease
S-Camshafts	S-Camshaft Spline	Never-Seez
Brakes	Brake Shoe Rollers anchor Pins	Never-Seez
Brakes – Brake Adjuster	Brake Adjuster Grease Fitting	Lithium Complex Grease
Axle	Bearings and Hubs	NLGI 00 Semi-Fluid Grease (Standard) 75W-90 Synthetic Oil (Optional)*

\* Oil lubed bearings and hubs should remain lubricated with oil, grease lubed bearings and hubs should remain lubricated with grease.

**NOTE:** Intervals are based upon normal operations. Reduce intervals to compensate for abnormal operations or severe conditions. During inactive periods, sufficient lubrication must be performed for equipment preservation.

### 23. Troubleshooting Chart

PROBLEM	POSSIBLE CAUSE	RESOLUTION
Brakes will not release	Brake shoes bound up at anchor pins	Lubricate brake operating parts
	Brake hoses Restricted	Replace hoses
	Brakes out of adjustment	Adjust brakes
	Damaged brake assembly	Replace or repair as required
No brakes or insufficient brakes <b>NOTE:</b> All of the possible causes would result in brake lockup.	Source of air supply shut off at tractor	Open cutout cocks at rear of tractor cab or push control valve "IN"
	Low brake line pressure	Check air pressure gauge on tractor - inoperative
	Brake lines between tractor and trailer not properly coupled	Properly couple brake lines
	Reservoir drain cock open	Close drain cock
Dog tracking	Leaf spring broken	Replace complete spring
	Bent Axle	Replace or straighten axle
	Frame or suspension out of alignment	Straighten frame or align axles
Uneven tire wear	Over or under inflation	Inflate to proper pressure
	Loose wheel stud nuts or clamps	Tighten wheel stud nuts or clamps
	Loose or tight wheel bearing adjustment	Adjust bearings
	Axle bent or out of alignment	Straighten, align or replace axle
	Tires not properly matched	Match tires
	Improper acting brakes	Correct brakes as required
	Rapid Stopping	Apply brakes slowly when approaching stop
	High-speed driving on turns	Reduce speed
Grabbing brakes	Oil, grease or foreign material on brake lining	Reline brakes
	Brakes out of alignment	Adjust brakes
	Brake drum out-of-round	Replace brake drum
	Damaged brake chamber or internal assembly	Replace brake chamber/internal assembly
	Leaky or broken hose between relay valve and brake chamber	Replace or Repair as required
Excessive heat cracks on drum	Rapid stopping or poor air flow to brakes	Replace drum
	Out of adjustment	Adjust brakes
	Binding S-Cam, anchor pins or chamber rod end pin	Lubricate and free up
	Damaged brake assembly/brake drum out-of-round	Replace or repair as required
ABS inoperable		Refer to ABS manufacturer's service literature
Slow brake application or release	Lack of lubrication	Lubricate brake operating parts
	Excessive travel in brake chamber push rod	Adjust brakes
	Restriction in hose or lines	Replace hoses
	Defective brake valve	Replace brake valve



From fifth wheel rebuild kits to suspension bushing repair kits, SAF-HOLLAND Original Parts are the same quality components used in the original component assembly.

SAF-HOLLAND Original Parts are tested and designed to provide maximum performance and durability. Will-fits, look-alikes or, worse yet, counterfeit parts will only limit the performance potential and could possibly void SAF-HOLLAND's warranty. Always be sure to spec SAF-HOLLAND Original Parts when servicing your SAF-HOLLAND product.

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