TECHNICAL PROCEDURE

PARALIFT ULTRA
COMPOSILITE ST / STS
COMPOSILITE FBC

SUBJECT: Axle Maintenance
LIT NO: H667
DATE: November 2005

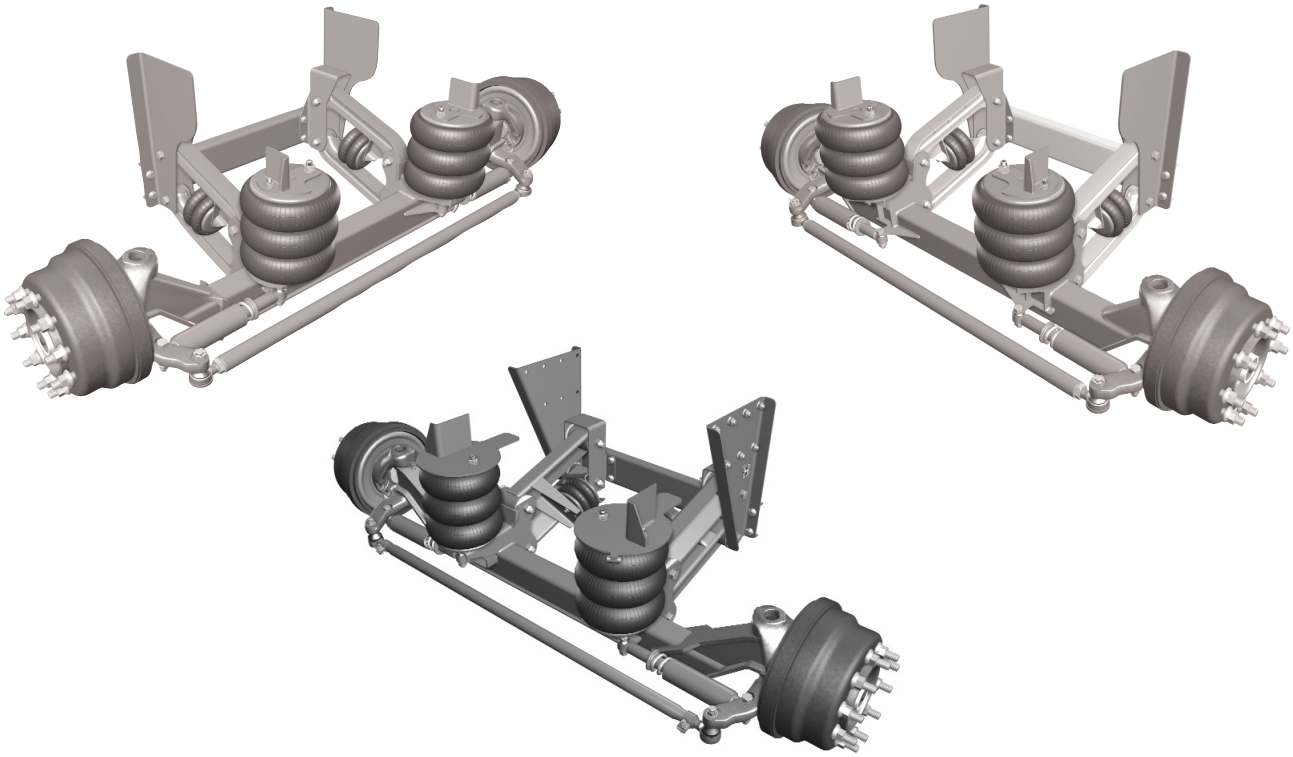


TABLE OF CONTENTS

For The Road Ahead™

HENDRICKSON

PREVENTATIVE MAINTENANCE

Regular lubricaton intervals should be followed to help prevent premature wear to the kingpin bushings.

GREASING AND LUBRICATION SPECIFICATIONS

COMPONENT	GREASING INTERVAL	GREASE
KINGPIN BREAK IN	5,000 miles or as needed	NLGI-1 or NLGI-2
KINGPIN BUSHINGS	10,000 miles or every 6 months	NLGI-1 or NLGI-2

KINGPIN LUBRICATION

On the Hendrickson PARALIFT ULTRA, COMPOSILITE ST / STS and COMPOSILITE FBC, the kingpin grease fittings are located on the top and bottom of the kingpin grease caps.

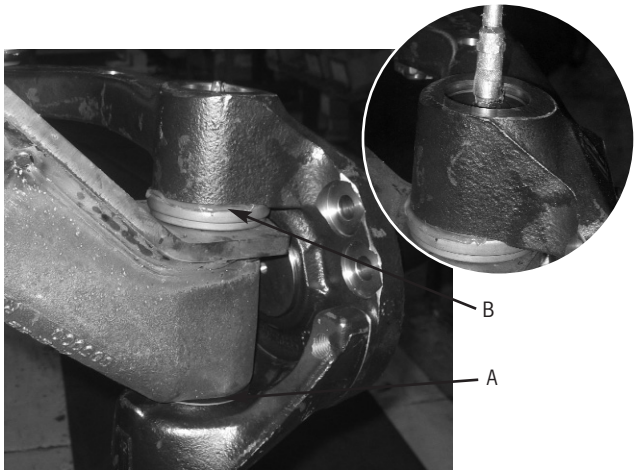
1. Prior to greasing the kingpins on the vehicle the suspension must be in a loaded condition.

2. Clean off all the grease fittings with a clean shop towel prior to lubrication.

3. Lubricate the kingpins through the grease fittings on the top and bottom of the steering knuckle.

4. Force the required lubricant into the upper and lower kingpin grease fittings until new lubricant flows from locations A and B. See Figure 1.

Note: Greasing at the lower zerk should purge grease from the thrust bearing shell.



A. Upper axle beam and knuckle
B. Lower axle beam and thrust bearing purge vents

Figure 1

KINGPIN BUSHING INSPECTION

INSPECTION PROCEDURE

1. Chock the wheels to help prevent the vehicle from moving. Set the parking brake.

2. Raise the lift axle off the ground.

CHECKING THE UPPER KINGPIN BUSHING

3. Affix a magnetic base dial indicator on the axle and place the tip of the dial indicator on the inside of the upper kingpin connection as shown in Figure 2.

Figure 2

4. Set the dial indicator to "0" zero.

5. Move the top of the tire in and out by applying reasonable, constant pressure and then releasing.

6. Check the reading on the dial indicator. If the dial indicator moves more than 0.025", the upper bushing is worn or damaged. Replace both bushings. Refer to the Kingpin Bushing Removal and Installation sections in this publication.

CHECKING THE LOWER KINGPIN BUSHING

7. Install a dial indicator so that the base is on the axle and the indicator tip is against the inside of the bottom of the knuckle.

8. Set the dial indicator to "0" zero.

IMPORTANT: If one bushing is worn or damaged, it is mandatory to replace both the top and bottom bushings on that knuckle assembly.

STEERING KNUCKLE INSPECTION AND ADJUSTMENT

CHECKING VERTICAL END PLAY (UP AND DOWN MOVEMENT)

1. Chock the tires to help prevent the vehicle from moving.
2. Set the parking brake.
3. Raise the lift axle off the ground.
4. If necessary, remove the wheels, hubs and drums.
5. Place a dial indicator on each side of the axle as follows:
   a. Ensure wheels are positioned straight ahead.
   b. Place the magnetic dial indicator base on the axle.
   c. Place the tip of the dial indicator on top of the upper kingpin connection.
6. Place a jack and a wood block (with a hole that allows clearance for the lower kingpin grease fitting) under the lower kingpin grease cap area. See Figure 3.
7. Set the dial indicator to "0" zero.

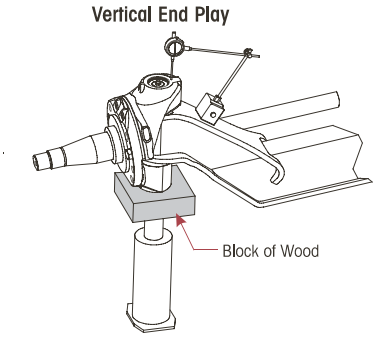


Figure 3

8. Raise the jack until the dial indicator shows the end of vertical travel. Measure and record the dial indicator reading. Vertical (up and down) inspection clearance must be between 0.008″ and 0.015″.

ADJUSTING VERTICAL END PLAY

1. If vertical clearance is greater than 0.015″, replace the thrust bearing.
2. After replacing the thrust bearing, if vertical clearance is greater than 0.011″, install shims (Hendrickson part no. 001764-1) between the top of the axle and the bottom of the upper kingpin connection to obtain the proper clearance specification. See the Steering Knuckle Disassembly section.
3. If vertical clearance is less than 0.008″, remove the shims from between the top of the axle and the bottom of the upper kingpin connection to obtain the proper clearance specification.
4. Repeat steps 2 or 3 until proper clearance is achieved.
5. Lower the jack.

STEERING KNUCKLE DISASSEMBLY

1. Remove the wheel and hub assembly.
2. Remove the brake components from the steering knuckle.
3. Remove the tie rod assembly.

Hint: Lightly tap the side of the tie rod arm with a mallet to separate the tie rod end from the tie rod arm. See Figure 4.

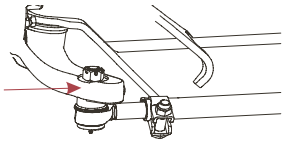


Figure 4

4. Remove the two socket head cap screws that connect upper kingpin connection to the backbone. See Figure 5.

⚠WARNING: REMOVAL OF THE CAP SCREWS WILL ALLOW THE BACKBONE TO SEPARATE FROM THE AXLE WHICH CAN RESULT IN COMPONENT DAMAGE AND/OR PERSONAL INJURY. BACKBONE MUST BE SUPPORTED BEFORE REMOVAL OF THE TWO CAP SCREWS.

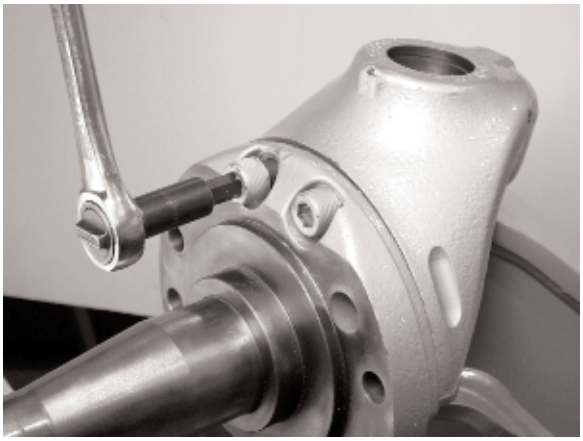


Figure 5

Hint: Remove the grease zerks from the knuckle assemblies. This will allow the knuckle assemblies to freely slide up and down the kingpins without creating back pressure.

6. Remove the backbone from the kingpin by sliding it down the kingpin.

7. Remove the upper kingpin connection from the axle by sliding it up and off the kingpin.

KINGPIN PREPARATION AND MEASUREMENT

CLEANING THE GROUND OR POLISHED PARTS

- Use a cleaning solvent to clean ground or polished parts and surfaces. DO NOT USE GASOLINE.

⚠CAUTION: DO NOT USE HOT SOLUTION TANKS OR WATER AND ALKALINE SOLUTIONS TO CLEAN GROUND OR POLISHED PARTS. DAMAGE TO THE PARTS WILL RESULT.

CLEANING THE ROUGH PARTS

- Rough parts can be cleaned with the ground or polished parts. Rough parts can also be cleaned in hot solution tanks with a weak alkaline solution. The parts must remain in the hot solution tanks until they are completely cleaned and heated.

DRYING THE CLEANED PARTS

- Parts must be dried immediately after cleaning. Dry the parts with clean paper towels, clean rags or compressed air. Do not dry bearings by spinning with compressed air. Damage to the bearings will result.

PREVENTING CORROSION ON CLEANED PARTS

- Apply a light coating of oil to all cleaned and dried parts that are going to be reused. Do not apply oil to the brake lining or the brake drums. If parts are to be stored, apply an effective rust inhibitor to all surfaces.

⚠WARNING: TO HELP PREVENT SERIOUS EYE INJURY, ALWAYS WEAR PROPER EYE PROTECTION WHEN YOU PERFORM VEHICLE MAINTENANCE OR SERVICE.

⚠WARNING: SOLVENT CLEANERS CAN BE FLAMMABLE, POISONOUS AND CAUSE BURNS. TO HELP AVOID SERIOUS PERSONAL INJURY, CAREFULLY FOLLOW THE MANUACTURER'S PRODUCT INSTRUCTIONS/GUIDELINES AND THE FOLLOWING PROCEDURES:
1. WEAR PROPER EYE PROTECTION.
2. WEAR PROTECTIVE CLOTHING.
3. WORK IN A WELL-VENTILATED AREA.
4. DO NOT USE GASOLINE, SOLVENTS OR OTHER MATERIALS THAT CONTAIN GASOLINE THAT CAN EXPLODE.
5. HOT SOLUTION TANKS OR ALKALINE SOLUTIONS MUST BE USED CORRECTLY. FOLLOW THE MANUFACTURER'S RECOMMENDED INSTRUCTIONS AND GUIDELINES CAREFULLY TO HELP PREVENT PERSONAL ACCIDENT OR INJURY.

1. Prepare and polish the kingpin by removing all grease and excess debris using a fine grit (220 grit or higher) emery cloth and parts solvent. See Figures 6 through 9.

Figure 6

Figure 7

Figure 8
Kingpin Before Cleaning

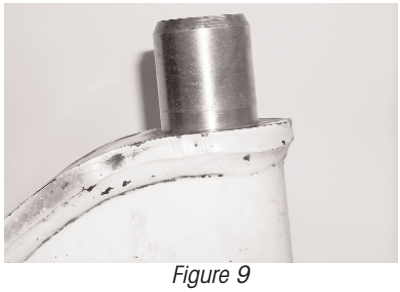


Figure 9
Kingpin After Cleaning

2. Inspect the kingpin for wear or damage. Use a micrometer and measure the upper and lower kingpin in two locations. Positions must be 90 degrees (perpendicular) from each other. See Figures 10 through 13. If the kingpin diameter is less than 1.802″, kingpin replacement may be necessary. Contact the Hendrickson Customer Service Department at 800-660-2843.

Figure 10

Figure 11

Figure 12

Figure 13

KINGPIN BUSHING REMOVAL

Note: A hydraulic press with a minimum forcing capacity of 2.5 tons (minimum press capacity of 5,000 psi or use an arbor press) is required.

⚠**WARNING: BEFORE APPLYING HYDRAULIC PRESSURE TO ANY TOOLING SETUP, ALWAYS CHECK TO BE SURE THE PRESS PLATE, ADAPTERS AND COMPONENTS BEING WORKED ON ARE POSITIONED PROPERLY, I.E. "IN LINE" WITH THE RAM. IMPROPER POSITIONING CAN CAUSE PERSONAL INJURY OR COMPONENT DAMAGE.**

1. Remove the grease cap retaining ring.

2. Install the backbone upside down in press. Be sure to support the backbone assembly so that it sits in-line with the press. See Figure 14.

3. Use the grease cap to press out the kingpin bushing and seal. Remove the grease zerk in the grease cap or use a hollow driver, to press out the kingpin bushing.

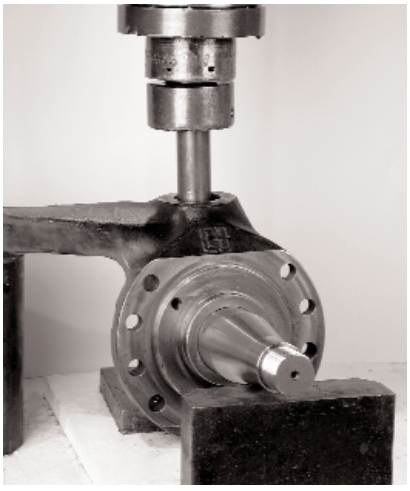


Figure 14

4. Use the same procedure to remove the kingpin bushing in the upper kingpin connection.

5. Clean the parts and then inspect before reassembling.

STEERING KNUCKLE BORE MEASUREMENT

Complete the following steering knuckle bore inspection and the measurement instructions prior to installing the kingpin bushing.

1. Measure the upper knuckle bore inside diameter at two locations. Always use an inside micrometer or a telescoping gauge when taking a knuckle bore measurement. Some out-of-roundness at the top and bottom of the bore edges is acceptable. The steering knuckle bore diameter is 1.938″ +/- 0.003″.

2. Measure the upper and lower bore in two positions and at two locations. The two positions must be 90 degrees opposed from each other. See Figures 15 through 17. If the average measurement is more than the knuckle bore maximum diameter specification, replace the knuckle.

Figure 15

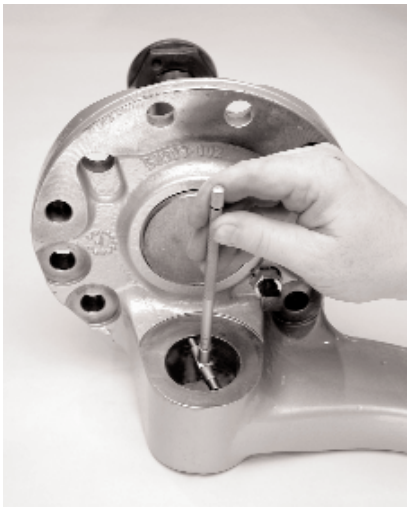


Figure 16

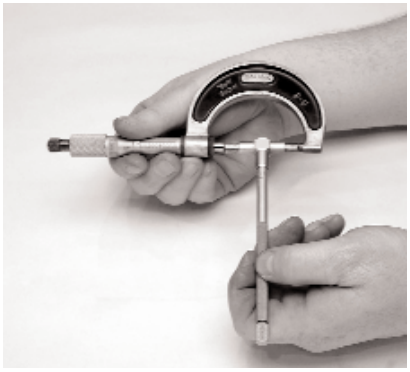


Figure 17

KINGPIN BUSHING INSTALLATION

1. A hydraulic press with a minimum forcing capacity of 5 tons will be required.

⚠**WARNING: BEFORE APPLYING HYDRAULIC PRESSURE TO ANY TOOLING SET-UP, ALWAYS CHECK TO BE SURE THE PRESS PLATE, ADAPTERS AND COMPONENTS BEING WORKED ON ARE POSITIONED PROPERLY, I.E. "IN LINE" WITH THE RAM. IMPROPER POSITIONING CAN CAUSE PERSONAL INJURY AND/OR COMPONENT DAMAGE.**

2. Install the backbone assembly or upper kingpin connection in the press.

3. Install the kingpin bushing from the machined side (axle side) of the backbone using a bushing driver. Press in the bushing to a depth of no less than 15/64″ (.236″) or 6 millimeters and no more than 5/16″ (.32″) or 8 millimeters. See Figures 18 and 19.

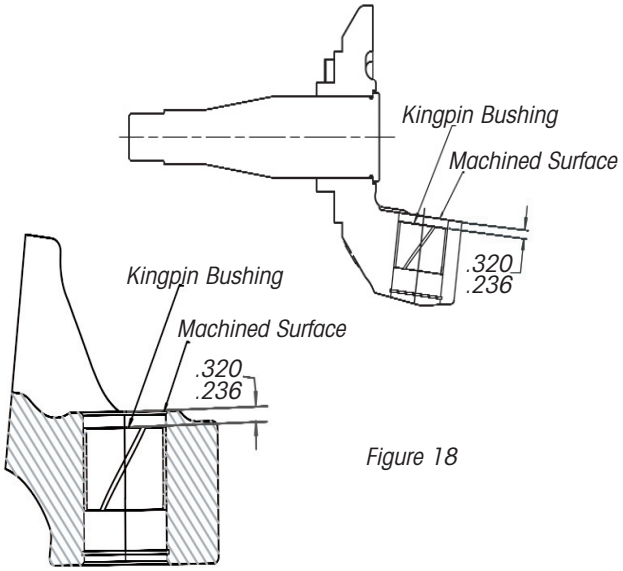


Figure 18

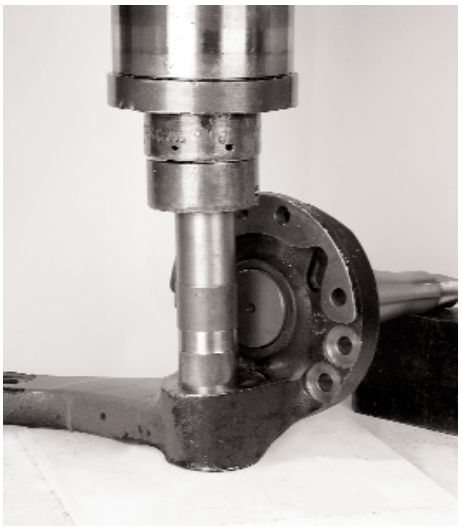


Figure 19

4. Following this procedure, it is necessary to ream the kingpin bushings to fit the kingpins. See the Kingpin Bushing Reaming Instructions section of this publication.

KINGPIN BUSHING REAMING

⚠CAUTION: REAM THE KINGPIN BUSHINGS WITH AN ADJUSTABLE STRAIGHT FLUTE REAMER. DO NOT HONE OR BURNISH THE KINGPIN BUSHINGS. HONING OR BURNISHING WILL DAMAGE THE BUSHINGS AND VOID THE WARRANTY.

⚠WARNING: WHEN INSTALLING STEERING KNUCKLE COMPONENTS IN A VICE, IT IS NECESSARY TO PROTECT THE MACHINED SURFACES FROM GOUGES AND/OR MARRING BY USING BRASS JAWS. FAILURE TO DO SO CAN CAUSE PREMATURE PART DAMAGE, DAMAGE TO THE STEERING KNUCKLE COMPONENTS, LOSS OF WARRANTY, LOSS OF VEHICLE CONTROL, PERSONAL INJURY OR PROPERTY DAMAGE.

1. Install the backbone assembly in a vise with brass jaws. It is acceptable to mount the knuckle components in a vise either vertically or horizontally when performing the reaming procedure.

2. Install the reamer into the backbone until the blades touch the kingpin bushing.

3. Rotate the reamer smoothly with light downward pressure. Do not apply too much pressure. See Figure 20.

4. Slide the reamer out of the bottom of the backbone assembly. If it is necessary to remove the reamer from the top, rotate the reamer opposite of the cutting rotation.

5. Clean and remove all bearing material from the knuckle assembly. Be sure to remove material from the grease channels and dimples.

6. Clean the 5/8″ brake backing plate bolts with a wire wheel and run a tap through the threads of the backbone / upper kingpin connection. Flush out with brake cleaner and dry with compressed air.

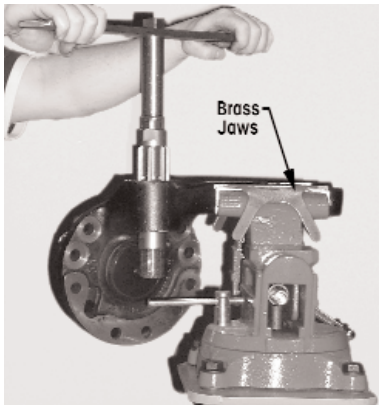


Figure 20

7. Repeat steps 1 through 6 to the upper kingpin connection.

⚠WARNING: PRIOR TO INSTALLATION ENSURE THAT ALL RESIDUAL LOCTITE MATERIAL IS REMOVED FROM THE MOUNTING BOLTS AND THE THREADED HOLES IN THE UPPER KINGPIN CONNECTION, AND NEW LOCTITE 277 OR EQUIVALENT IS APPLIED TO HELP ENSURE THAT THE BOLTS SUSTAIN THE PROPER TORQUE REQUIREMENT. FAILURE TO DO SO CAN CAUSE LOSS OF VEHICLE CONTROL RESULTING IN PERSONAL INJURY OR PROPERTY DAMAGE.

Note: The Hendrickson Genuine Part socket head cap screw (PN: 003405-1) comes with a pre-applied loctite compound.

8. Install the backbone and upper kingpin connection on the kingpin.

9. Check for the proper fit by rotating the knuckle assembly back and forth to verify there is no binding on the kingpin. See Figures 21 and 22.

10. If the bushing is too tight, repeat steps 1 though 9 until the proper clearance is achieved.

Note: The bushing bore diameter is to be 0.001 larger than the kingpin diameter.

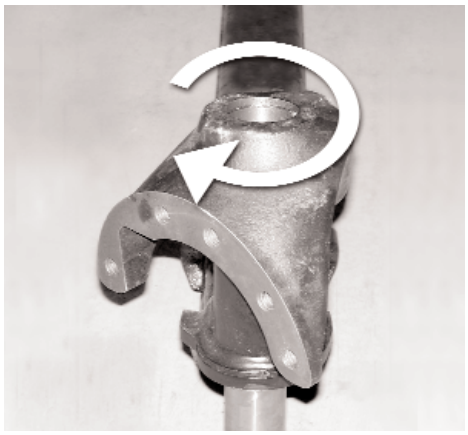


Figure 21

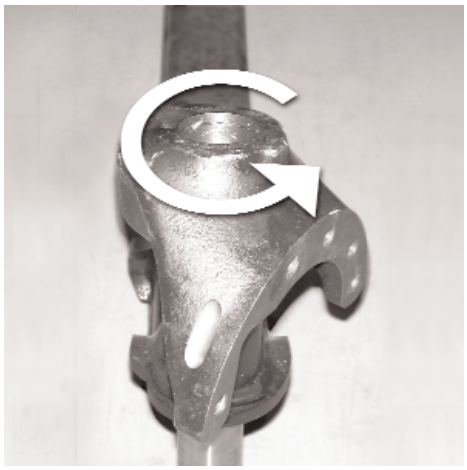


Figure 22

KINGPIN SEAL INSTALLATION

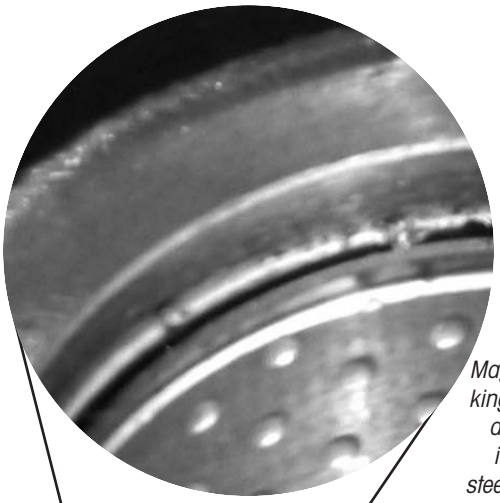
1. Place the backbone in a vise with brass jaws or place on a suitable workbench. The backbone will have the machined surface facing up (axle side up).

2. Lay the kingpin seal into the bore of the backbone. The seal lip should face outward (toward the axle).

3. Use a bushing driver tool to press the seal firmly into the backbone.

4. Install the kingpin seal until it makes contact with the kingpin bushing. See Figures 23 and 24.

5. Repeat steps 1 through 4 on the upper kingpin connection.



Magnification of kingpin bushing and lip seal installed in steering knuckle.

Figure 23

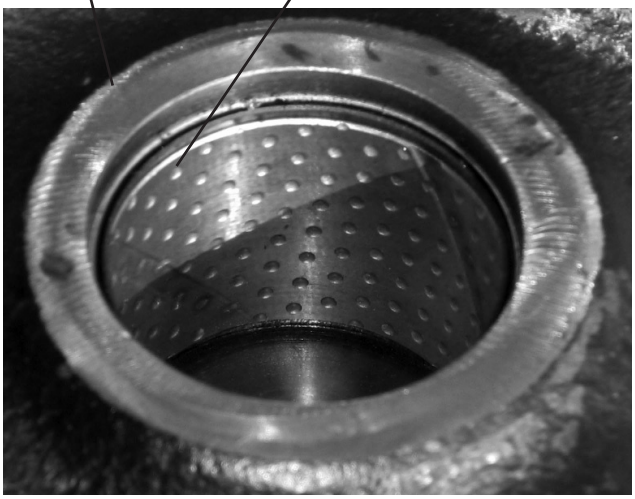


Figure 24

STEERING KNUCKLE ASSEMBLY

After replacing the kingpin bushings, it is necessary to reassemble the steering knuckle assemblies.

1. Install the thrust bearing on the lower kingpin, so the top side is up (the thrust bearing may be stamped "TOP" or the black seal will designate the top side), when the axle is in the operating position.

2. Pack the bearing dimples with multipurpose grease (NLGI Grade 2).

3. Install the backbone assembly on the kingpin. It will be necessary to support the backbone assembly with a bottle jack and a block of wood under the backbone assembly.

Hint: The easiest way to install the knuckle is with the grease cap not installed in the backbone assemblies. In this manner, it does not create back pressure. The assembly can then freely slide up and down on the kingpin.

4. Raise the bottle jack so that there is no free play between the backbone, thrust bearing and the bottom of the axle.

5. Install the the upper kingpin connection on the upper kingpin. See Figure 26.

6. Install the left and right brake backing plate bolts finger tight. These are for guide purposes only.

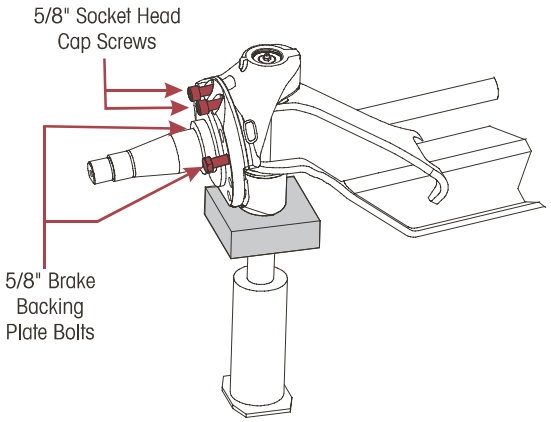


Figure 26

Note: Two guide studs may be substituted in place of the brake backing plate bolts.

7. Install the two new socket head cap screws until they are finger tight.

8. Apply slight upward pressure on the upper kingpin connection.

9. Insert feeler gauges between the upper kingpin connection and the top of the axle. Check the clearance between the upper kingpin connection and the top of the axle. See Figure 27.

10. Remove the brake backing plate bolts and socket head cap screws. See Figure 26.

11. Remove the upper kingpin connection.

Figure 27

12. Install the appropriate amount of shims to achieve 0.008″ to 0.011″ clearance between the upper kingpin connection and the top of the axle.

Example:

If 0.050″ clearance were measured, 0.040″ shims would be required to obtain the required 0.008″ to 0.011″ clearance.

13. Install the upper kingpin connection onto the kingpin.

14. Slide two 0.010″ feeler gauges on each side of the kingpin between the axle and the upper kingpin connection.

⚠WARNING: PRIOR TO INSTALLATION ENSURE THAT ALL RESIDUAL LOCTITE MATERIAL IS REMOVED FROM THE MOUNTING BOLTS AND THE THREADED HOLES IN THE UPPER KINGPIN CONNECTION, AND NEW LOCTITE 277 OR EQUIVALENT IS APPLIED TO HELP ENSURE THAT THE BOLTS SUSTAIN THE PROPER TORQUE REQUIREMENT. FAILURE TO DO SO CAN CAUSE LOSS OF VEHICLE CONTROL RESULTING IN PERSONAL INJURY OR PROPERTY DAMAGE.

15. Install the socket head cap screws and tighten to 175-200 foot pounds torque.

Note: The Hendrickson Genuine Part socket head cap screws (PN: 003405-1) comes with a pre-applied loctite compound.

16. Once the final torque of the socket cap screws has been obtained, remove the two 0.010″ feeler gauges and lower the bottle jack. Check the remaining bolt holes to ensure that the bolts will thread in.

17. Affix a magnetic base dial indicator on the axle and place the tip of the dial indicator on top of the upper kingpin connection. See Figure 27.

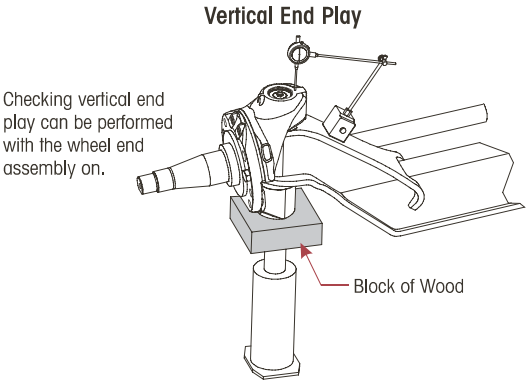


Figure 27

18. Zero the dial indicator.

19. Raise the bottle jack until there is no clearance between the backbone and the bottom of the axle.

20. Check the reading on the dial indicator. The specification for vertical travel on the steering knuckle assemblies is 0.008″ to 0.011″.

21. If the clearance is not within the required specification, repeat steps 3 through 9 until the proper clearance is obtained by adding or removing shims.

22. If the vertical travel is not within the specification, repeat steps 3 through 16 until the proper vertical travel is obtained.

23. Remove the bottle jack to remove the load off the knuckle assembly and continue assembling the wheel ends.

24. Install the tie rod cross tube into the tie rod arm.

25. Tighten the castle nuts to 185 foot pounds torque, then rotate the castle nut to the next castle slot and install the cotter pin.

26. Apply loctite to the three brake backing plate bolts prior to installation. Tighten bolts to 140-160 foot pounds torque.

Note: Loctite applied to the three brake backing plate bolts is a critical procedure to ensure that these bolts sustain the torque requirement of the kingpin connection.

27. Install new o-rings on the grease caps and lubricate the o-rings with grease.

28. Install grease caps and new retaining rings.

www.hendrickson-intl.com

HENDRICKSON

Auxiliary Axle Systems
277 North High Street
Hebron, OH 43025 USA
740.929.5600
Fax 740.929.5601

Auxiliary Axle Systems
250 Chrysler Drive, Unit #3
Brampton, ON L6S 6B6 Canada
905.789.1030
Fax 905.789.1033

H667 11-05

Printed in United States of America