

H TECHNICAL PROCEDURE

KINGPIN BUSHING KITS: FABRICATED AND CAST TWO-PIECE KNUCKLES

SUBJECT: Preventive Maintenance & Installation

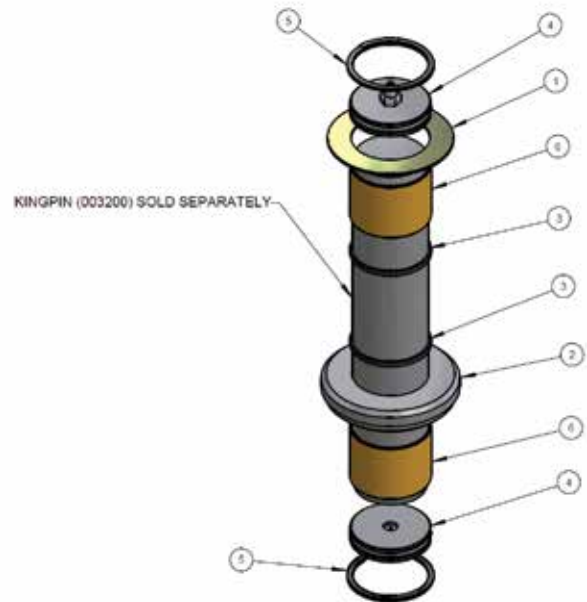
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Kingpin Bushing Kit R-003270



Hendrickson provides a number of resources on its Hendrickson Academy website, including instructional videos on the topics covered in this document. Set up an account today to gain access to these valuable training materials.

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SECTION 1

Introduction

This publication is intended to assist maintenance personnel with the procedures for the installation of **Kingpin Kits** and associated preventive maintenance procedures for Hendrickson Steerable Auxiliary Axle Suspension Systems.

NOTE

USE ONLY HENDRICKSON GENUINE PARTS FOR SERVICING YOUR SUSPENSION SYSTEM.

It is important to read and understand this entire publication prior to performing any installation, service or maintenance of the product. The information in this publication contains product images, safety information, product specifications, features and proper installation, service and maintenance instructions for Hendrickson **Kingpin Kits and Loose Kingpins**.

Hendrickson reserves the right to make changes and improvements to its products and publications at any time. Contact Hendrickson Tech Services for information on the latest version of this manual at 1-800-660-2829 (toll-free U.S. and Canada), 1-740-929-5600 (Outside U.S. and Canada), or e-mail: liftaxle@hendrickson-intl.com.

The latest revision of this publication is available online at www.hendrickson-intl.com.



SECTION 2

Important Safety Notice

Proper installation, maintenance, service, and repair is important for the reliable operation of the suspension. The procedures recommended by Hendrickson and described in this technical publication are methods of performing such maintenance, service and repair.

All safety related information should be read carefully to help prevent personal injury and to assure that proper methods are used. Improper installation, maintenance, service or repair may damage the vehicle, cause personal injury, render it unsafe in operation, or void manufacturer’s warranty.

Failure to follow the safety precautions in this manual can result in personal injury and/or property damage. Carefully read and understand all safety related information within this publication, on all decals and in all such materials provided by the vehicle manufacturer before conducting any installation, maintenance, service or repair.

■ EXPLANATION OF SIGNAL WORDS



Hazard “Signal Words” (Danger-Warning-Caution) appear in various locations throughout this publication. Information accented by one of these signal words must be observed to help minimize the risk of personal injury to service personnel, or possibility of improper service methods which may damage the vehicle or render it unsafe.

To the left is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

Additional Notes or Service Hints are utilized to emphasize areas of procedural importance and provide suggestions for ease of repair. The following definitions indicate the use of these signal words as they appear throughout the publication.



INDICATES AN IMMINENTLY HAZARDOUS SITUATION, WHICH, IF NOT AVOIDED, WILL RESULT IN SERIOUS INJURY OR DEATH.



INDICATES A POTENTIAL HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, CAN RESULT IN SERIOUS INJURY OR DEATH.



INDICATES A POTENTIAL HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, MAY RESULT IN MINOR OR MODERATE INJURY.

NOTE

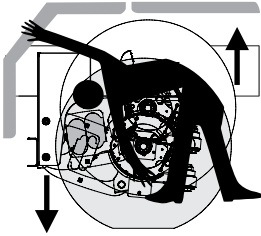
AN OPERATING PROCEDURE, PRACTICE CONDITION, ETC. WHICH IS ESSENTIAL TO EMPHASIZE.

SERVICE HINT

A HELPFUL SUGGESTION THAT WILL MAKE THE SERVICING BEING PERFORMED A LITTLE EASIER AND/OR FASTER.



The torque symbol alerts you to tighten fasteners to a specified torque value. Refer to Torque Specifications Section of this publication.

SAFETY PRECAUTIONS:**WARNING****LIFT AXLE RAPID MOVEMENT**

LIFT AXLE RAPID MOVEMENT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

IF LIFT AXLE IS OPERATED BY AN AUTOMATIC OR SEMI-AUTOMATIC LIFT AXLE CONTROL SYSTEM, SUCH SYSTEM MAY CAUSE LIFT AXLE TO RAISE OR LOWER AUTOMATICALLY UNDER DIFFERENT CONDITIONS. LIFT AXLE ACTIVATION AND MOVEMENT MAY VARY DEPENDING ON THE BRAND, CONFIGURATION, AND OPERATING CONDITION OF THE LIFT AXLE CONTROL SYSTEM AND/OR OTHER FACTORS. READ, UNDERSTAND, AND COMPLY WITH ALL APPLICABLE OPERATING INSTRUCTIONS AND SAFETY INFORMATION PROVIDED BY THE LIFT AXLE CONTROL SYSTEM MANUFACTURER AND VEHICLE MANUFACTURER. ENSURE ALL PERSONNEL ARE CLEAR OF LIFT AXLE BEFORE AND DURING VEHICLE LOADING AND LIFT AXLE ACTIVATION UP OR DOWN.

CAUTION**LIFT AXLE ACTIVATION**

DO NOT LOWER THE LIFT AXLE WHILE THE VEHICLE IS MOVING IN REVERSE OR TRAVELING FORWARD AT MORE THAN 15 MPH. FAILURE TO COMPLY WITH THIS RULE CAN CAUSE COMPONENT DAMAGE.

CAUTION**NAVIGATING A 90 DEGREE CURVE OR TURN**

TO MINIMIZE PREMATURE TIRE WEAR OR POSSIBLE DAMAGE TO NON-STEERABLE LIFT AXLE COMPONENTS (IF APPLICABLE), THE LIFT AXLE MAY BE RAISED TO THE UP POSITION PRIOR TO NAVIGATING A 90 DEGREE OR TIGHTER CURVE OR TURN. COMPLY WITH ALL FEDERAL, STATE / PROVINCIAL AND / OR LOCAL WEIGHT, DIMENSION AND CONFIGURATION REGULATIONS UNDER LOADED AND UNLOADED CONDITIONS.

WARNING**LOAD CAPACITY**

ADHERE TO THE PUBLISHED CAPACITY RATINGS FOR THE AUXILIARY LIFT AXLE. ADD-ON AXLE ATTACHMENTS (I.E. SLIDING FIFTH WHEELS) AND OTHER LOAD TRANSFERRING DEVICES CAN INCREASE THE AUXILIARY AXLE LOAD ABOVE THE RATED AND APPROVED CAPACITIES WHICH CAN RESULT IN FAILURE AND ADVERSE VEHICLE HANDLING, POSSIBLY CAUSING PERSONAL INJURY OR PROPERTY DAMAGE.

CAUTION**DAILY/PRE-TRIP OPERATOR INSPECTION**

DAILY (AND BEFORE EACH TRIP) INSPECT ALL LIFT AXLE COMPONENTS FOR PROPER OPERATING CONDITION AND PROPER INSTALLATION TO THE TRUCK / TRAILER FRAME. THIS ESSENTIAL DAILY / PRE -TRIP OPERATOR INSPECTION MUST ALSO INCLUDE A VISUAL INSPECTION OF ALL WHEEL SEALS AND GASKETS FOR LEAKS, A VERIFICATION OF PROPER OIL LEVEL IN THE HUBS (IF APPLICABLE), INSPECTION OF ALL LIFT AND RIDE AIR SPRINGS FOR WEAR, AND INSPECTION OF ALL TIRES FOR PROPER INFLATION AND ABNORMAL WEAR PATTERNS. IDENTIFY AND REPAIR / REPLACE ANY LOOSE, DAMAGED OR IMPROPERLY INSTALLED COMPONENTS. FOR ADDITIONAL SERVICE, REPAIR, AND REBUILD INSTRUCTIONS, REFER TO THE CURRENT VERSION OF OTHER HENDRICKSON PUBLICATIONS THAT APPLY TO THE PARTICULAR LIFT AXLE SUSPENSION. SUCH PUBLICATION NUMBERS MAY INCLUDE, BUT ARE NOT LIMITED TO, OM-H754, OM-H757, TP-H633, AND H621, ALL OF WHICH ARE AVAILABLE ONLINE AT WWW.HENDRICKSON-INTL.COM

WARNING**REPAIR AND RECONDITIONING**

THE REPAIR OR RECONDITIONING OF LIFT AXLE COMPONENTS THAT ARE BENT, DAMAGED OR OUT OF SPECIFICATION IS NOT ALLOWED. ANY LIFT AXLE COMPONENTS FOUND TO BE DAMAGED OR OUT OF SPECIFICATION MUST BE REPLACED. LIFT AXLE COMPONENTS CANNOT BE BENT, WELDED, HEATED, OR REPAIRED WITHOUT REDUCING THE STRENGTH OR LIFE OF THE COMPONENT. FAILURE TO FOLLOW THESE GUIDELINES CAN CAUSE ADVERSE VEHICLE HANDLING, POSSIBLE PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE AND WILL VOID APPLICABLE WARRANTIES.



WARNING

PERSONNEL PROTECTIVE EQUIPMENT

ALWAYS WEAR PROPER EYE PROTECTION AND OTHER REQUIRED PERSONAL PROTECTIVE EQUIPMENT TO HELP PREVENT PERSONAL INJURY WHEN YOU PERFORM VEHICLE MAINTENANCE, REPAIR OR SERVICE.

CAUTION

PROCEDURES AND TOOLS

A MECHANIC PERFORMING A SERVICE PROCEDURE OR USING A TOOL THAT HAS NOT BEEN RECOMMENDED BY HENDRICKSON MUST FIRST ASSURE HIMSELF THAT NEITHER HIS SAFETY NOR THE VEHICLE'S SAFETY WILL BE JEOPARDIZED BY THE METHOD OR TOOL SELECTED. INDIVIDUALS DEVIATING IN ANY MANNER FROM THE INSTRUCTIONS PROVIDED ASSUME ALL RISKS OF POTENTIAL PERSONAL INJURY OR DAMAGE TO EQUIPMENT INVOLVED.

WARNING

FASTENERS

DISCARD USED FASTENERS. ALWAYS USE NEW FASTENERS TO COMPLETE A REPAIR. FAILURE TO DO SO COULD RESULT IN FAILURE OF THE PART OR MATING COMPONENTS, Adverse vehicle handling, PERSONAL INJURY, OR PROPERTY DAMAGE. LOOSE OR OVER-TORQUED FASTENERS CAN CAUSE COMPONENT DAMAGE, Adverse vehicle handling, PROPERTY DAMAGE, OR SEVERE PERSONAL INJURY. MAINTAIN CORRECT TORQUE VALUE AT ALL TIMES. CHECK TORQUE VALUES ON A REGULAR BASIS AS SPECIFIED, USING A REGULARLY CALIBRATED TORQUE WRENCH. TORQUE VALUES SPECIFIED IN THIS TECHNICAL PUBLICATION ARE FOR HENDRICKSON-SUPPLIED FASTENERS ONLY. IF NON-HENDRICKSON FASTENERS ARE USED, FOLLOW TORQUE SPECIFICATIONS FROM THE FASTENER MANUFACTURER.

WARNING

MODIFYING COMPONENTS

DO NOT MODIFY OR REWORK PARTS WITHOUT AUTHORIZATION FROM HENDRICKSON. DO NOT SUBSTITUTE REPLACEMENT COMPONENTS NOT AUTHORIZED BY HENDRICKSON. USE OF MODIFIED, REWORKED, SUBSTITUTE OR REPLACEMENT PARTS NOT AUTHORIZED BY HENDRICKSON MAY NOT MEET HENDRICKSON'S SPECIFICATIONS AND CAN RESULT IN FAILURE OF THE PART, ADVERSE VEHICLE HANDLING, POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE, AND WILL VOID APPLICABLE WARRANTIES. USE ONLY HENDRICKSON-AUTHORIZED REPLACEMENT PARTS.

THE VEHICLE MANUFACTURER SHOULD BE CONSULTED BEFORE MAKING ANY CHANGES TO THE VEHICLE'S FRAME. TYPICALLY, CUTTING OR ALTERING THE VEHICLE'S FRAME OR SIDE RAIL IS NOT PERMITTED AND MAY AFFECT THE MANUFACTURER'S WARRANTY COVERAGE.

ANY INSTALLATION DEVIATIONS MUST BE APPROVED IN WRITING BY HENDRICKSON'S PRODUCT ENGINEERING DEPARTMENT. FAILURE TO COMPLY WITH ANY OF THE ABOVE WILL VOID APPLICABLE WARRANTIES.

WARNING

DAMAGED AXLE COMPONENTS

IF A VEHICLE EQUIPPED WITH A HENDRICKSON LIFT AXLE IS INVOLVED IN A CRASH, A THOROUGH INSPECTION OF THE LIFT AXLE MUST BE PERFORMED NOTING THE CONDITION OF THE AXLE BEAM, KINGPINS, AND KNUCKLE ASSEMBLIES, INCLUDING THE AREAS OF AXLE-TO-KINGPIN INTERFACE, FOR ANY DAMAGE, GAPS, KINGPIN MOVEMENT OR PLAY. IF ANY COMPONENT APPEARS DAMAGED, OR THE KINGPINS APPEAR TO CONTAIN ANY DAMAGE, GAPS, MOVEMENT OR PLAY, THE COMPLETE AXLE ASSEMBLY MUST BE REPLACED.

IN ADDITION, IN THE EVENT A CRASH RESULTS IN EXCESSIVE SIDE LOAD DAMAGE TO ADJACENT PARTS, SUCH AS A BENT WHEEL, HUB, OR SPINDLE, IT IS STRONGLY RECOMMENDED TO REPLACE SUCH ADJACENT PARTS AND THE COMPLETE LIFT AXLE ASSEMBLY.

CONTACT HENDRICKSON TECHNICAL SERVICES DEPARTMENT WITH ANY QUESTIONS. FAILURE TO REPLACE ANY DAMAGED COMPONENTS CAN CAUSE ADVERSE VEHICLE HANDLING, POSSIBLE PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE AND WILL VOID ANY APPLICABLE WARRANTIES.

WARNING**LIFT AXLE CAMBER**

UNAUTHORIZED WELDING OR MODIFICATIONS CAN CAUSE CRACKS OR OTHER LIFT AXLE STRUCTURAL DAMAGE AND RESULT IN ADVERSE VEHICLE HANDLING, SEVERE PERSONAL INJURY OR DEATH. DO NOT BEND, WELD OR MODIFY AXLE WITHOUT AUTHORIZATION FROM HENDRICKSON. AXLE CAMBER IS NOT ADJUSTABLE. DO NOT CHANGE THE AXLE CAMBER ANGLE OR BEND THE AXLE BEAM. BENDING THE AXLE BEAM TO CHANGE THE CAMBER ANGLE CAN DAMAGE THE AXLE AND REDUCE AXLE STRENGTH, CAN CAUSE ADVERSE VEHICLE HANDLING, POSSIBLY CAUSING PERSONAL INJURY OR PROPERTY DAMAGE AND WILL VOID APPLICABLE WARRANTIES.

WARNING**IMPROPER JACKING METHOD**

IMPROPER JACKING METHOD CAN CAUSE STRUCTURAL DAMAGE AND RESULT IN ADVERSE VEHICLE HANDLING, SEVERE PERSONAL INJURY OR DEATH. DO NOT USE AXLE BEAM OUTBOARD OF AXLE SPRING SEATS. REFER TO VEHICLE MANUFACTURER FOR PROPER JACKING INSTRUCTIONS.

WARNING**SUPPORT THE LIFT AXLE PRIOR TO SERVICING**

PLACE THE VEHICLE/TRAILER ON A LEVEL FLOOR AND CHOCK THE WHEELS TO HELP PREVENT THE VEHICLE/TRAILER FROM MOVING. PRIOR TO SERVICING A LIFT AXLE IN THE RAISED POSITION, (1) PROPERLY SUPPORT THE LIFT AXLE WITH SAFETY STANDS, AND (2) RELEASE ALL AIR PRESSURE IN LIFT AXLE'S AIR SPRINGS AND RIDE SPRINGS. DO NOT WORK AROUND OR UNDER A RAISED LIFT AXLE SUPPORTED ONLY WITH FLOOR JACKS OR OTHER LIFTING DEVICES. FAILURE TO DO SO CAN CAUSE DEATH, PERSONAL INJURY OR DAMAGE TO COMPONENTS.

WARNING**AIR SPRINGS**

AIR SPRING ASSEMBLIES MUST BE DEFLATED PRIOR TO LOOSENING ANY ADJACENT HARDWARE. UNRESTRICTED AIR SPRING ASSEMBLIES CAN VIOLENTLY SHIFT. DO NOT INFLATE AIR SPRING ASSEMBLIES WHEN THEY ARE UNRESTRICTED. AIR SPRING ASSEMBLIES MUST BE RESTRICTED BY SUSPENSION OR OTHER ADEQUATE STRUCTURE. DO NOT INFLATE BEYOND PRESSURES RECOMMENDED BY AIR SPRING MANUFACTURER. CONTACT HENDRICKSON TECHNICAL SERVICES FOR DETAILS. IMPROPER USE OR OVER INFLATION MAY CAUSE AIR SPRING ASSEMBLIES TO BURST, CAUSING PROPERTY DAMAGE AND/OR SEVERE PERSONAL INJURY.

WARNING**AIR SPRINGS**

EXHAUST ALL PRESSURE IN THE LIFT AXLE'S AIR SPRINGS AND VEHICLE AIR SYSTEM BEFORE WORKING ON OR AROUND THE LIFT AXLE. FAILURE TO DO SO CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

WARNING**AIR SPRINGS**

PRIOR TO AND DURING DEFLATION AND INFLATION OF THE AIR SUSPENSION SYSTEM, ENSURE THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR FROM UNDER THE VEHICLE AND AROUND THE SERVICE AREA. FAILURE TO DO SO CAN CAUSE SEVERE PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

CAUTION**AIR SPRINGS**

INFLATE THE SUSPENSION'S AIR SPRINGS SLOWLY AND MAKE SURE THE RUBBER BLADDER OF THE AIR SPRING INFLATES UNIFORMLY AND IS NOT BINDING. FAILURE TO DO SO CAN CAUSE DAMAGE TO THE AIR SPRING AND / OR MOUNTING BRACKETS AND WILL VOID APPLICABLE WARRANTIES.

WARNING**OFF ROADWAY TOWING**

HENDRICKSON DOES NOT RECOMMEND TOWING A VEHICLE BY THE LIFT AXLE. DOING SO WILL DAMAGE THE AXLE AND WILL VOID APPLICABLE WARRANTIES.



 **WARNING**

PARTS CLEANING

SOLVENT CLEANERS CAN BE FLAMMABLE, POISONOUS, AND CAN CAUSE BURNS. TO HELP AVOID SERIOUS PERSONAL INJURY, CAREFULLY FOLLOW THE MANUFACTURER'S PRODUCT INSTRUCTIONS AND GUIDELINES AND THE FOLLOWING PROCEDURES:

1. WEAR PROPER EYE PROTECTION.
2. WEAR CLOTHING THAT PROTECTS YOUR SKIN.
3. WORK IN A WELL VENTILATED AREA.
4. DO NOT USE GASOLINE OR SOLVENTS THAT CONTAIN GASOLINE. GASOLINE 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.

DO NOT USE HOT SOLUTION TANKS OR WATER AND ALKALINE SOLUTIONS TO CLEAN GROUND OR POLISHED PARTS. DOING SO WILL CAUSE DAMAGE TO THE PARTS AND VOID APPLICABLE WARRANTIES.



SECTION 3

Special Tools

The following tools / materials are needed when installing and servicing Hendrickson steerable lift axle suspension systems, including **King Pin Inspection and Replacement and assemblies associated with these procedures:**

Bushing Inspection

- Two jack stands
- Small bottle jack
- Block of wood
- Magnetic base dial indicator

Steering Knuckle Disassembly

- ½" Impact
- Wrench or socket: 7/16" and 1 5/16"
- 1 5/16" Box wrench
- Deep well socket: 1 5/16" and 1 1/8"
- Brake spring tool or notched screw driver
- Needle nose pliers

Kingpin Inspection and Replacement

- Cleaning solvent and emery cloth (220 grit or higher)
- 1"-2" Micrometer measuring device
- 1 1/8" Socket and impact gun
- 3/8" Punch
- Hammer
- Portable hydraulic (5-10 ton) press

Bushing Housing Replacement

- Hydraulic shop press with a minimum force capacity of 5 tons
- Bushing driver
- Magnetic base dial indicator

Steering Knuckle Assembly

- 1 5/16" Box wrench and deep well socket
- Brake spring tool or notched screw driver
- Wrench or socket: 7/16", 1 5/16"
- Two 0.010" feeler gauges
- Magnetic base dial indicator
- Needle nose pliers
- Torque wrench capable of 500 foot pounds

Kingpin Lubrication

- Multipurpose NLGI-2 grease
- Grease gun

Integrated Brake Replacement

- Brake spring tool or notched screw driver

Steering Stabilizer Inspection and Replacement

- 1 1/8" Wrench and socket
- Torque wrench
- Digital protractor or equivalent device

Steer Ahead and Toe Setting

- 1 5/16" Wrench and socket
- ½" Impact
- Can of white spray paint
- Torque wrench capable of 60 foot pounds and 500 foot pounds
- Straight blade screwdriver for scribing line in tire
- Linear measuring instrument (tape measure or scales)
- Jack stand

Lubrication

- Hand or pneumatic grease gun
- NLGI-1 or NLGI-2 grease

Miscellaneous

- Wheel chocks



SECTION 4 Preventive Maintenance

Following appropriate inspection procedures is important to help ensure the proper maintenance and operation of the steerable suspension and component parts. Hendrickson recommends the suspension be inspected at pre-delivery, the first in-service inspection, and regular preventive maintenance intervals. Inspection must include the following items and other components referenced in this section.

NOTE: SECTION 4 PERTAINS TO BOTH CAST AND FABRICATED TWO-PIECE KNUCKLES; ACCOMPANYING PHOTOS ARE INSTRUCTIONAL IN NATURE AND MAY NOT REPRESENT YOUR ACTUAL SUSPENSION'S COMPONENTS.

HENDRICKSON INSPECTION INTERVALS	FIRST IN-SERVICE INSPECTION	PREVENTIVE MAINTENANCE
Wheel Bearings – Verify end play is between 0.001" and 0.005". Adjust and lubricate as required	Within the first 3,000 Miles	8,000 Miles or every 3 months, whichever comes first
Tie Rod Ends – Inspect for leaking and lubricate as required		10,000 Miles or every 6 month, whichever comes first
Kingpin Bushings – Check for wear and grease as required		10,000 Miles or every 6 months, whichever comes first
Pivot Connections – Verify Torque		5,000 Miles or as needed
Stabilizers – Check for leaking and adequate return		
Brake Assembly Components – Inspect for leaking and component wear	3,000 Miles	20,000 Miles or every 10 months, whichever comes first

LUBRICATION INTERVALS

Regular lubrication 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 Bushing	10,000 miles or every 6 months	

KINGPIN LUBRICATION

On the Hendrickson suspensions, the kingpin grease fittings are located on the top and bottom of the kingpin grease caps.

1. Prior to greasing the kingpins, the axle must be on the ground in a loaded condition.
2. Clean off all the grease fittings with a clean shop towel prior to lubrication.

FIGURE 4-1

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 4-1.



NOTE: GREASING AT THE LOWER ZERK SHOULD PURGE GREASE FROM THE THRUST BEARING SHELL.

KINGPIN BUSHING INSPECTION

INSPECTION PROCEDURE

1. Chock the rear wheels to help prevent the vehicle from moving.
2. Set the parking brake.
3. Raise the lift axle and support with jack stands.
4. **CHECKING THE UPPER KINGPIN BUSHING.**
 - a. 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 4-2.
 - b. Set the dial indicator to "0" zero.
 - c. Move the top of the tire in and out by applying reasonable, constant pressure and then releasing.
 - d. 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.
5. **CHECKING THE LOWER KINGPIN BUSHING**
 - a. 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.
 - b. Set the dial indicator to "0" zero.

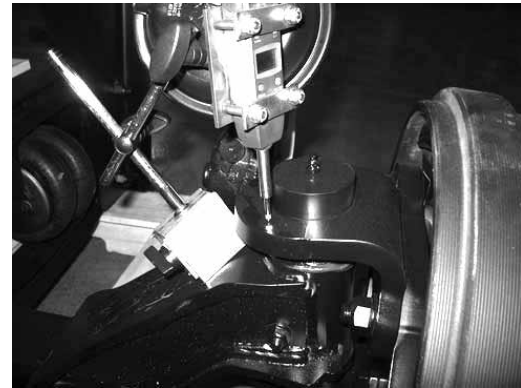
IMPORTANT:

IF ONE BUSHING IS WORN OR DAMAGED, IT IS MANDATORY TO REPLACE BOTH THE TOP AND BOTTOM BUSHINGS ON THAT KNUCKLE ASSEMBLY.

FIGURE 4-2



FIGURE 4-3



6. Remove jack stands and lower the lift axle.
7. Remove wheel chocks.

STEERING KNUCKLE INSPECTION/ADJUSTMENT

CHECKING VERTICAL END PLAY (UP AND DOWN MOVEMENT)

1. Chock the rear wheels of the vehicle.
2. Set the parking brake.
3. Raise the lift axle and support with jack stands.
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 4-3).
7. Set the dial indicator to "0" zero.
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 0.030".

ADJUSTING VERTICAL END PLAY

1. If vertical clearance is greater than 0.030", replace the thrust bearing.
2. After replacing the thrust bearing, if vertical clearance is greater than 0.018", install shims (Hendrickson Part No. R-001764-1Q12) 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. Remove jack stands and lower the lift axle.
6. Remove wheel chocks.

SECTION 5

Component Replacement

STEERING KNUCKLE DISASSEMBLY

NOTE:

THE FOLLOWING TOPICS PERTAIN TO BOTH **CAST** AND **FABRICATED TWO-PIECE KNUCKLES**; ACCOMPANYING PHOTOS ARE INSTRUCTIONAL IN NATURE AND MAY NOT REPRESENT YOUR ACTUAL SUSPENSION'S COMPONENTS.

1. Chock the rear wheels of the vehicle.
2. Set the parking brake.
3. Raise the lift axle and support with jack stands.
4. Remove the wheel and hub assembly.
5. Remove the brake components from the steering knuckle.
6. Remove the tie rod assembly (See Figure 5-1).

FIGURE 5-1



7. Remove the bolts that connect upper kingpin assembly to the steering knuckle.

WARNING

REMOVAL OF THE BOLTS WILL ALLOW THE STEERING KNUCKLE TO SEPARATE FROM THE AXLE WHICH CAN RESULT IN COMPONENT DAMAGE AND/OR PERSONAL INJURY. STEERING KNUCKLE MUST BE SUPPORTED BEFORE REMOVAL OF THE TWO BOLTS.

SERVICE 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.

8. Remove the steering knuckle from the kingpin by sliding it down the kingpin.
9. Remove the upper kingpin assembly 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.



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

SOLVENT CLEANERS CAN BE FLAMMABLE, POISONOUS AND CAUSE BURNS. TO HELP AVOID SERIOUS PERSONAL INJURY, CAREFULLY FOLLOW THE MANUFACTURER'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.

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 5-2 through 5-5.

FIGURE 5-2



FIGURE 5-3



FIGURE 5-4



FIGURE 5-5



2. Inspect the kingpin for wear or damage. Use a micrometer, measure the upper and lower kingpin in two locations. Positions must be 90 degrees (perpendicular) from each other, see Figures 5-6 through 5-9.
3. If the kingpin diameter is **less than 1.802"**, kingpin replacement may be necessary.



FIGURE 5-6



FIGURE 5-7



FIGURE 5-8



FIGURE 5-9



FABRICATED KNUCKLE KINGPIN BUSHING

NOTE:

THE FOLLOWING TOPIC PERTAINS TO FABRICATED TWO-PIECE KNUCKLES; ACCOMPANYING PHOTOS ARE INSTRUCTIONAL IN NATURE AND MAY NOT REPRESENT YOUR ACTUAL SUSPENSION'S COMPONENTS.

YOU WILL NEED:

- A hydraulic shop press with a minimum forcing capacity of 5 tons



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

NOTE:

THE KINGPIN BUSHING HOUSING ON A FABRICATED KNUCKLE INCLUDES PRE-REAMED BUSHINGS AND SEALS.

KINGPIN BUSHING REMOVAL & INSTALLATION

1. Install the steering knuckle assembly or upper kingpin connection in the press. Ensure is securely supported on the prior to applying hydraulic pressure to press out the bushing.
2. Remove worn kingpin bushing housing.
3. Install the new kingpin bushing housing (refer to Figure 5-10) from the machined side (axle side) of the steering knuckle and upper kingpin connection. Ensure that the kingpin bushing housing is tight against the machined surface, see Figures 5-11 through 5-13.

FIGURE 5-10



FIGURE 5-11

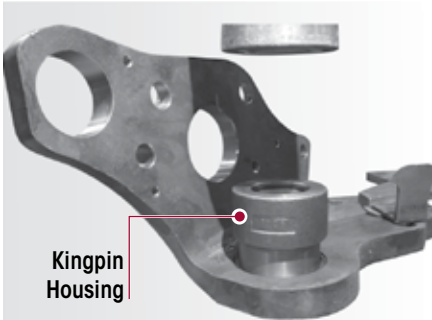


FIGURE 5-12

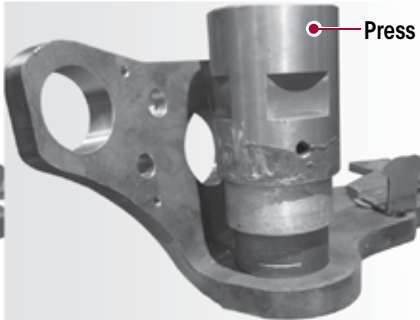
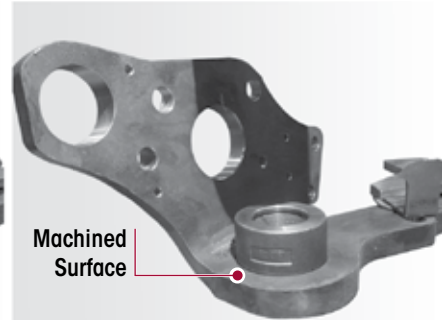


FIGURE 5-13





CAST KNUCKLE KINGPIN BUSHING REMOVAL

NOTE:

THE FOLLOWING TOPIC PERTAINS TO CAST TWO-PIECE KNUCKLES; ACCOMPANYING PHOTOS ARE INSTRUCTIONAL IN NATURE AND MAY NOT REPRESENT YOUR ACTUAL SUSPENSION'S COMPONENTS.

YOU WILL NEED:

- A hydraulic shop press with a minimum forcing capacity of 2.5 tons (minimum press capacity of 5,000 psi or use an arbor press).



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.

1. Remove the grease cap retaining ring.
2. Install the steering knuckle upside down in press. Be sure to support the steering knuckle assembly so that it sits in-line with the press (See Figure 5-14).
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.
4. Use the same procedure to remove the kingpin bushing in the upper kingpin connection.
5. Clean the parts and then inspect before reassembling.

FIGURE 5-14



CAST KNUCKLE BORE MEASUREMENT

NOTE:

THE FOLLOWING TOPIC PERTAINS TO CAST TWO-PIECE KNUCKLES; ACCOMPANYING PHOTOS ARE INSTRUCTIONAL IN NATURE AND MAY NOT REPRESENT YOUR ACTUAL SUSPENSION'S COMPONENTS.

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 $1.938" \pm 0.003"$.
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 5-15 through 5-17. If the average measurement is more than the knuckle bore maximum diameter specification, replace the knuckle.

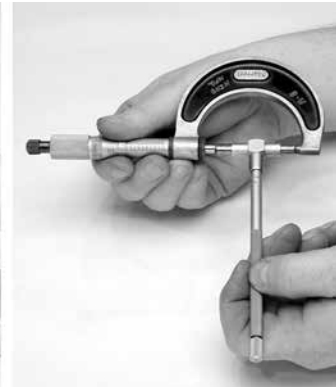
FIGURE 5-15



FIGURE 5-16



FIGURE 5-17



CAST KNUCKLE KINGPIN BUSHING REAMING

NOTE:

THE FOLLOWING TOPIC PERTAINS TO CAST TWO-PIECE KNUCKLES; ACCOMPANYING PHOTOS ARE INSTRUCTIONAL IN NATURE AND MAY NOT REPRESENT YOUR ACTUAL SUSPENSION'S COMPONENTS.

YOU WILL NEED:

- A hydraulic shop press with a minimum forcing capacity of 5 tons



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.

1. Install the steering knuckle assembly, steering arm or upper kingpin connection in the press.
2. Always install the kingpin bushing from the machined side (axle side) of the steering knuckle using a bushing driver. Press in bushing to a depth of no less than 1¹/₄" (0.236") or 6 millimeters and no more than 5¹/₈" (0.32") or 8 millimeters, see Figures 5-18 and 5-19.
3. Following this procedure it is necessary to ream the kingpin bushings to fit the kingpins, see Kingpin Bushing Reaming Instructions in this section.

FIGURE 5-18

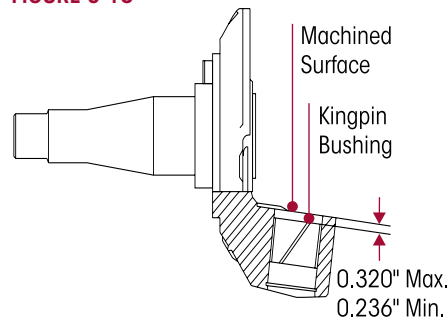


FIGURE 5-19



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 WILL VOID APPLICABLE WARRANTIES.



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, ADVERSE VEHICLE HANDLING, PERSONAL INJURY OR PROPERTY DAMAGE AND WILL VOID APPLICABLE WARRANTIES.

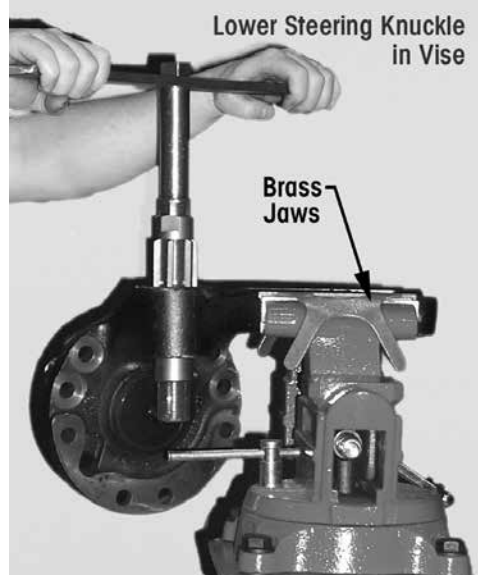
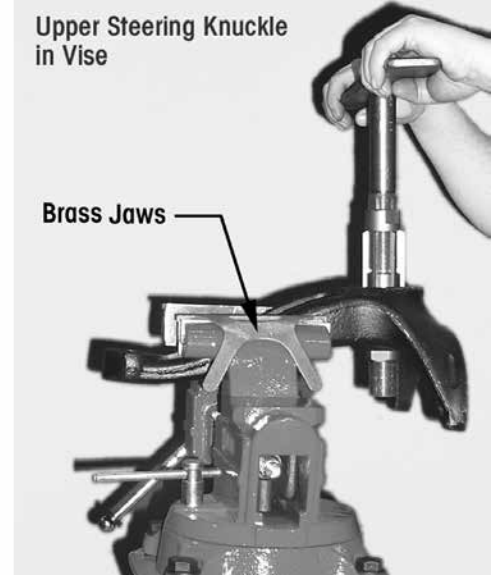


1. Install the steering knuckle assembly in a vise with brass jaws.

SERVICE HINT:

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 steering knuckle until the blades touch the kingpin bushing.
3. Rotate the reamer smoothly with light downward pressure. **DO NOT** apply too much pressure (See Figure 5-20 and 5-21).

FIGURE 5-20**FIGURE 5-21**

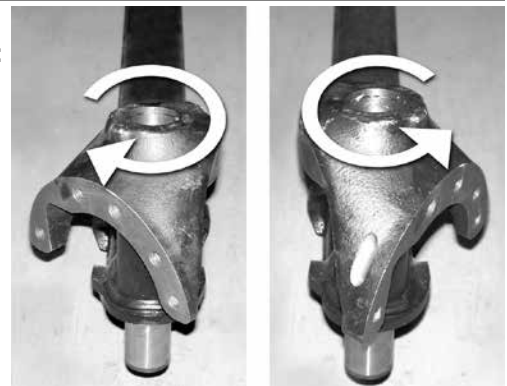
4. Slide the reamer out of the bottom of the steering knuckle assembly. If it is necessary to remove the reamer from the top, rotate the reamer opposite of the cutting rotation.
5. Clean and remove all bearing material from the knuckle assembly. Be sure to remove material from the grease channels and dimples.
6. Clean the 5/8" brake backing plate bolts with a wire wheel and run a tap through the threads of the steering knuckle / upper kingpin connection. Flush out with brake cleaner and dry with compressed air.
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 ADVERSE VEHICLE HANDLING RESULTING IN PERSONAL INJURY OR PROPERTY DAMAGE.

FIGURE 5-22**FIGURE 5-23****NOTE:**

THE HENDRICKSON GENUINE PART SOCKET HEAD CAP SCREW (PART NUMBER: 6110C125H4A8) COMES WITH A PRE-APPLIED LOCTITE COMPOUND.



8. Install the steering knuckle 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 5-22 and 5-23.
10. If the bushing is too tight, repeat Steps 1 through 9 until the proper clearance is achieved.

KINGPIN SEAL INSTALLATION

NOTE:

THE FOLLOWING TOPIC PERTAINS TO CAST TWO-PIECE KNUCKLES; ACCOMPANYING PHOTOS ARE INSTRUCTIONAL IN NATURE AND MAY NOT REPRESENT YOUR ACTUAL SUSPENSION'S COMPONENTS.

1. Place the steering knuckle in a vise with brass jaws or place on a suitable workbench. The steering knuckle will have the machined surface facing up (axle side up) (See Figure 5-24).
2. Lay the kingpin seal into the bore of the steering knuckle. The seal lip should face outward (toward the axle) (See Figure 5-25).
3. Use a bushing driver tool to press the seal firmly into the steering knuckle.
4. Install the kingpin seal until it makes contact with the kingpin bushing.
5. Repeat Steps 1 through 4 on the upper kingpin connection.

FIGURE 5-24

STEERING KNUCKLE

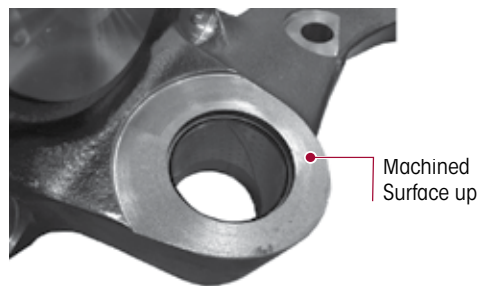
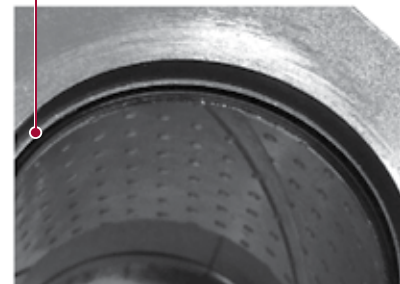


FIGURE 5-25

Lay the kingpin seal into the bore of the steering knuckle. The lip should face outward, toward the axle.



STEERING KNUCKLE ASSEMBLY

NOTE:

THE FOLLOWING TOPIC PERTAINS TO CAST AND FABRICATED TWO-PIECE KNUCKLES; ACCOMPANYING PHOTOS ARE INSTRUCTIONAL IN NATURE AND MAY NOT REPRESENT YOUR ACTUAL SUSPENSION'S COMPONENTS.

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

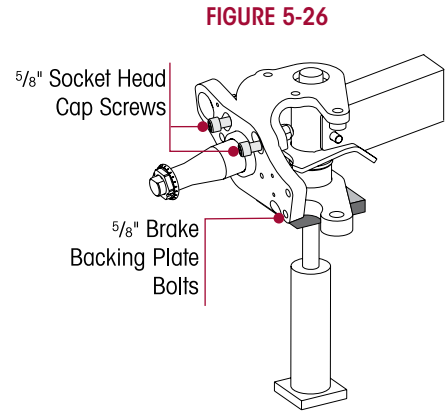
1. Install the thrust bearing on the lower kingpin, so the top side is up (the thrust bearing may be stamped **TOP** or the black seal will designate the top side), when the axle is in the operating position.
2. Pack the bearing dimples with multipurpose grease (NLGI Grade 2).
3. Install the steering knuckle assembly on the kingpin. It will be necessary to support the steering knuckle assembly with a bottle jack and a block of wood under the steering knuckle assembly.



SERVICE HINT:

THE EASIEST WAY TO INSTALL THE KNUCKLE IS WITH THE GREASE CAP NOT INSTALLED IN THE STEERING KNUCKLE 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 steering knuckle, thrust bearing and the bottom of the axle.
5. Install the upper kingpin connection on the upper kingpin (See Figure 5-26).
6. Install the left and right brake backing plate bolts finger tight. These are for guide purposes only.



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 5-27).
10. Remove the brake backing plate bolts and socket head cap screws (See Figure 5-26).
11. Remove the upper kingpin connection.
12. Install the appropriate number 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.



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 ADVERSE VEHICLE HANDLING RESULTING IN PERSONAL INJURY OR PROPERTY DAMAGE.

15. Install the socket head cap screws and tighten. Refer to torque specifications section in this publication.

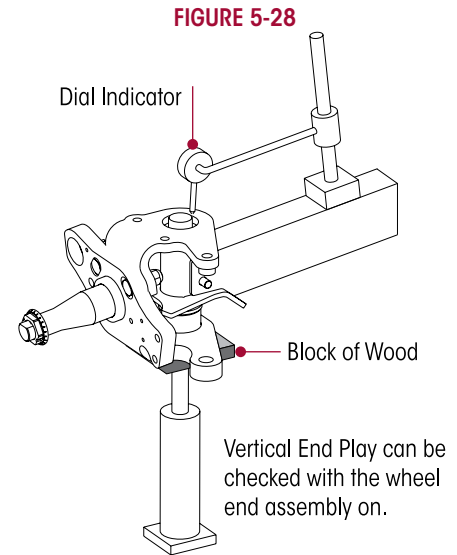
NOTE

APPLY LOCKTITE TO THE HENDRICKSON GENUINE PART SOCKET HEAD CAP SCREWS (PART NUMBER: R-6110C125H4H8).



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 5-28).
18. Zero the dial indicator.
19. Raise the bottle jack until there is no clearance between the steering knuckle 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. **Compliant Tie Rod** – Tighten the mounting bolts. Refer to torque specifications section in this publication.

Rigid Tie Rod – Tighten the castle nuts to 185 foot pounds torque, then rotate the castle nut to the next castle slot and install the cotter pin. Tighten bolts. Refer to torque specifications section in this publication.

NOTE: **LOCTITE APPLIED TO KNUCKLE ASSEMBLY BOLTS IS A CRITICAL PROCEDURE TO ENSURE THAT THESE BOLTS SUSTAIN THE TORQUE REQUIREMENT OF THE KINGPIN CONNECTION.**

26. Install new O-rings on the grease caps and lubricate the O-rings with grease.
27. Install grease caps and new retaining rings.
28. ng (See Figure 5-30).
29. Support the lower brake shoe assembly and remove the return spring (See Figure 5-31). Set parts aside and remove the upper brake shoe.
30. Remove the brake bolts and brake anchor pin. If lock straight target is present, note the position for proper reassembly location (See Figure 5-32.)
31. Hendrickson replacement brake kits for each specific axle will have the necessary parts to be replaced. Discard worn or damaged parts.
32. Install brake bolts through the anchor pin. Tightened to 160 foot pounds torque.
33. Install new parts in reverse order from Step 5.



SECTION 6 Available Kingpin Kits

NOTE: THE FOLLOWING KITS ARE FOR TWO-PIECE KNUCKLES ONLY. FOR ONE-PIECE KNUCKLE LEGACY SUSPENSIONS, PLEASE CONTACT HENDRICKSON CUSTOMER SERVICE:

- Liff Axle Customer Service: liffaxle@hendrickson-intl.com
- Technical Support & Warranty: liffaxletech@hendrickson-intl.com

Knuckle Classification	Bushing Kit Only	Bushing Kit & Kingpins	Kingpins Only
Truck: Cast Backbone: PRESS FIT KP	R-003270		R-003200
Truck: Cast Backbone: DRAWKEY KP	R-003270	R-006648	
Truck, Fab. Backbone: PRESS FIT KP		R-010300-2	
Truck, Fab. Backbone: DRAWKEY KP	R-010300-1	R-010300	
Trailer: Cast Backbone: PRESS FIT KP	R-003270		R-003200
Trailer: Cast Backbone: DRAWKEY KP		R-006648	R-003200
Trailer: Fabricated Backbone		R-015919	
Truck: Leading Kingpin, Fab. Backbone		R-013483	R-0011600

*Actual product performance may vary depending upon vehicle configuration, operation, service and other factors.
All applications must comply with applicable Hendrickson specifications and must be approved by the respective vehicle manufacturer with the vehicle in its original, as-built configuration.
Contact Hendrickson for additional details regarding specifications, applications, capacities, and operation, service and maintenance instructions.*

Call Hendrickson at 800.660.2829 or 800.668.5360 in Canada for additional information.



www.hendrickson-intl.com

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