

H TECHNICAL PROCEDURE

TRAILER SUSPENSION SYSTEMS STANDARD SERVICE WHEEL-END

SUBJECT: Hub Maintenance Procedures

LIT NO: L496

DATE: March 2018

REVISION: I

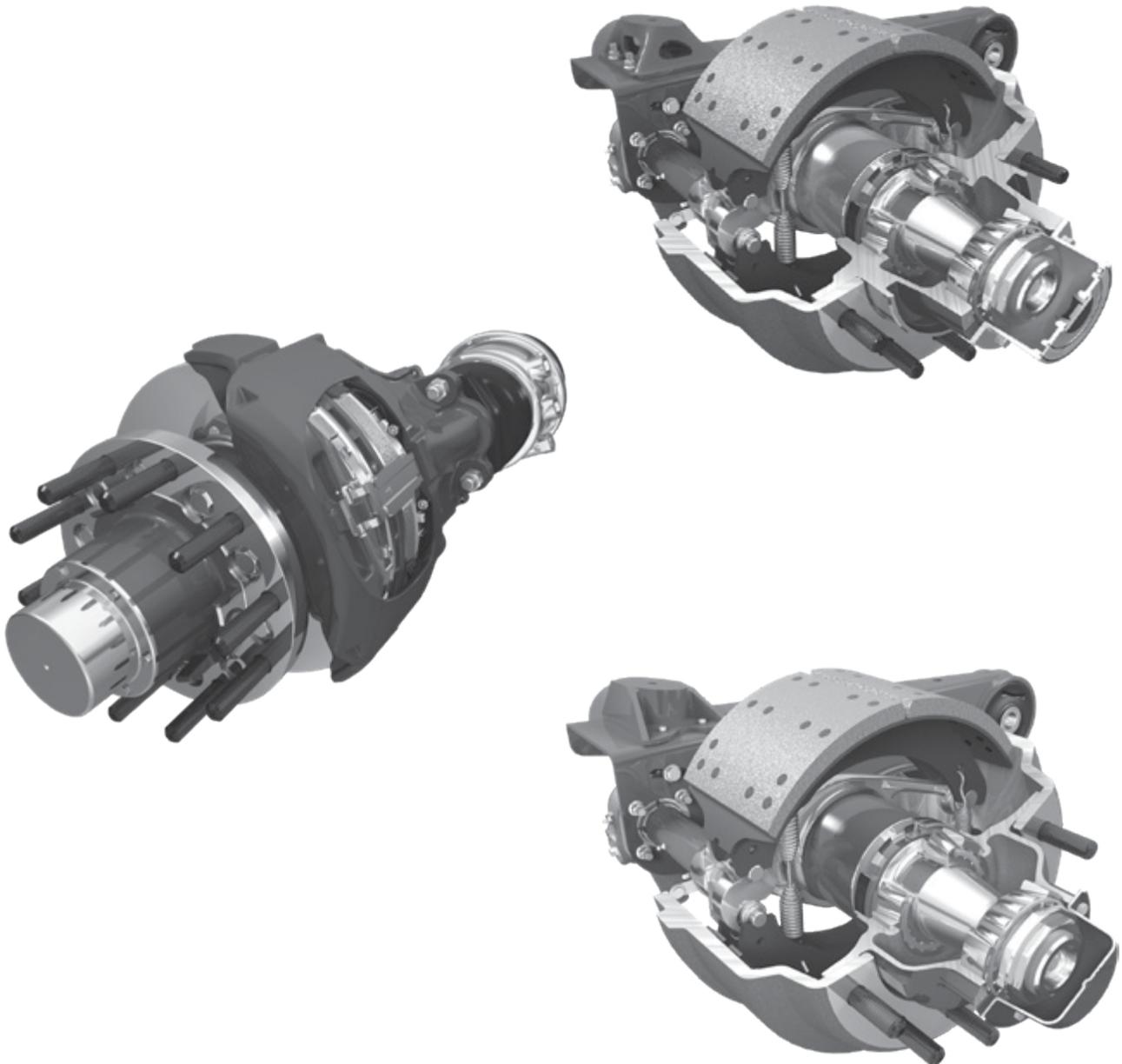




TABLE OF CONTENTS

Conventions Applied in this Document 3

 Explanation of Signal Words 3

 Important Safety Notices 3

General Service Notes..... 3

 During Service: 3

 Contacting Hendrickson..... 4

 Relative Literature 4

 Preparing Trailer for Service 5

Introduction 5

 HLS® Hendrickson Long-Life System™ and HVS® Hendrickson Value System™ 6

 HXL Hendrickson Extended-life 6

 HXL3® Hendrickson Extended-Life 3-year System™ 6

 HXL5® Hendrickson Extended-Life 5-year System™ 6

 HXL7® Hendrickson Extended-Life 7-year System™ 6

 Tools Required 6

 ADB Hub and Rotor..... 7

Inspection 7

 Checking for Seal Leaks..... 7

 Checking for Smooth and Quiet Rotation..... 8

 Checking End Play..... 8

Removing and Installing Hub 10

 Hub Removal 10

 Spindle Preparation..... 11

 Prepare Hub for Re-Installation..... 12

 Assemble Hub 12

 Spindle-mounted Seal Assembly..... 13

 Hub-mounted Seal Assembly 13

 Hub and Outer Bearing Assembly - SF Grease 14

 Hub and Outer Bearing Assembly - Oil Lubricant..... 14

 Hub and Outer Bearings Assembly - NLGI #2 Grease 14

 Standard Three- or Four-piece Spindle Nut Assembly 15

 Castle Spindle Nut Assembly 16

 Install Hubcap..... 18

 Hub Lubrication After Assembly, Oil Only 18

 Adding Oil Lubricant..... 18

 NLGI #2 Grease Lubricant 19

 Completing Installation..... 19

Additional Information..... 19

 Hub SF Grease Dam 19

 Making a Hub SF Grease Dam 19

 Torque Values..... 19

 Wheel Stud Removal and Installation Procedure 19w



CONVENTIONS APPLIED IN THIS DOCUMENT

This section explains the techniques used in this document to convey important information, safety issues, how to contact Hendrickson and how to apply hyperlinks.

EXPLANATION OF SIGNAL WORDS

Hazard signal words (such as DANGER, WARNING or CAUTION) appear in various locations throughout this publication. Information accented by one of these signal words must be observed at all times. Additional notes are utilized to emphasize areas of procedural importance and provide suggestions for ease of repair. The following definitions comply with ANSI Z535.4 and indicate the use of safety signal words as they appear throughout the publication.

⚠ DANGER: INDICATES IMMEDIATE HAZARDS WHICH WILL RESULT IN SEVERE PERSONAL INJURY OR DEATH.

⚠ WARNING: Indicates hazards or unsafe practices which could result in severe personal injury or death.

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

NOTICE: Indicates hazards or unsafe practices which could result in damage to machine or equipment.

IMPORTANT: An operating procedure, practice or condition that is essential to emphasize.

⚠ Safety alert symbol used to indicate a condition exists that may result in personal injury or harm to individuals. It must be applied to DANGER, WARNING and CAUTION statements, which emphasize severity.

IMPORTANT SAFETY NOTICES

Safety and precautionary statements are listed in Hendrickson literature number [T12007](#) and available at www.Hendrickson-intl.com/TrailerLit.

Warnings and cautions should be read carefully to help prevent personal injury and to assure that proper methods are used. Improper maintenance, service or repair can cause damage to the vehicle and other property, personal injury, an unsafe operating condition and potentially void the manufacturer's warranty.

LINKS

Links are identified by a dark grey line under the linked text. Internal links allow the reader to jump to a heading, step or page in this document. External links open the website or document referenced.

GENERAL SERVICE NOTES

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

Before you begin:

Read, understand and comply with:

- All instructions and procedures.
- All signal word (CAUTION, WARNING and DANGER) statements to help avoid personal injury or property damage.
- Company's maintenance, service, installation and diagnostic practices.
- Vehicle manufacturer's safety instructions when working on the vehicle.
- Vehicle manufacturer's instructions for recommended practices not described in this manual.
- Local safety regulations.

DURING SERVICE:

- Work must be carried out by trained personnel.
- Sudden release of parking springs (e.g. the spring brake part of the brake chamber or the brake return spring) may cause injury.
- Use recommended tools only.
- Before releasing trailer back into service, perform operational checks and test the trailer to ensure brakes are working correctly.

Hendrickson reserves the right to make changes and improvements to its products and publications at any time. Consult the Hendrickson website (www.hendrickson-intl.com) for the latest version of this manual.

NOTICE: Accessory-type hubcaps, such as the chrome "top hat" style hubcap, can potentially increase wheel-end temperatures during operation and are not recommended for use on Hendrickson extended-service wheel ends.



CONTACTING HENDRICKSON

Contact Hendrickson Trailer Technical Services for technical assistance as needed. To do so, several options are available. Technical Services must be contacted before performing any warranty related service.

Prior to contacting Technical Services, it is best to have the following information about the vehicle and Hendrickson suspension available (all that apply):

- Suspension ID Tag information (Refer to Hendrickson Literature Number L977 Trailer Suspension and Axle ID Guide, for ID tag location and details):
 - Suspension model number
 - Suspension serial number
 - Approximate number of suspension miles
- VIN plate data. Refer to trailer OEM manual for VIN plate location.
 - Trailer Type (van, reefer, flat bed, etc.)
 - Manufacturer
 - VIN (vehicle identification number)
 - In-service date¹
- If applicable, description of the system problem, part number and/or part description of the reported non-functioning part.
 - Date of problem
 - Where applicable: location of problem on suspension / trailer (e.g., road side, front axle, rear axle, curb side rear, etc.)
 - Symptoms-
 - » Systems, components or function affected by the problem.
 - » When does the problem occur?
 - » How often does the problem occur?
 - » Etc.

¹ If the in-service date is unknown or not available, the vehicle date of manufacture can be substituted.

- Any troubleshooting and/or measurements have been performed.
- Digital photos of suspension and damaged areas.
- Special application approval documentation (if applicable).

EMAIL

To contact Hendrickson Trailer Technical Services, use the following e-mail address:

HTTS@Hendrickson-intl.com

PHONE

Contact Hendrickson directly in the United States at **866-RIDEAIR (743-3247)**. From the menu, select:

- **Technical Services/Warranty** for technical information.
- Other selections include:
 - **Aftermarket Sales** for replacement parts information and ordering.
 - **Original Equipment Sales** for parts inquiries and ordering for trailer manufacturers.

RELATIVE LITERATURE

If you suspect your version of this or any other Hendrickson manual is not "Up-to-Date", the most current version is free online at:

www.hendrickson-intl.com/TrailerLit

Available Hendrickson documentation can be viewed or downloaded from this site.

All Hendrickson online documentation are PDF files that require Adobe Acrobat Reader to open. This is a free application downloadable from Adobe's home page (<http://get.adobe.com/reader/>).

Other relative literature may include:

LIT NO.	DESCRIPTION
<u>L583</u>	<i>Comprehensive Warranty Statement</i>
<u>L578</u>	<i>Suspension Preventive Maintenance Guide</i>
<u>L974</u>	<i>Drum Brake Maintenance Procedures, heading "RETRACTING THE BRAKE SHOES OR SLACK ADJUSTER CONTROL ARM(S)"</i>
<u>T71004</u>	<i>Hub and Rotor Assembly and Caliper Mounting Procedures</i>
<u>T82006</u>	<i>Stud Replacement Procedure</i>

Table 1: Relative wheel-end literature



STANDARD SERVICE WHEEL-END HUB MAINTENANCE PROCEDURES

PREPARING TRAILER FOR SERVICE

Information for trailer preparation, safety and precautionary statements, refer to Hendrickson literature number T12007, available at www.Hendrickson-intl.com/TrailerLit.

NOTE: DO NOT service a suspension or any components that is under warranty without first contacting Hendrickson Technical Services. Refer to CONTACTING HENDRICKSON for details.

WARNING: Do not work under a trailer supported only by jacks. Jacks can slip or fall over, resulting in serious personal injury. Always use safety stands to support a raised trailer.

INTRODUCTION

Hendrickson's **Standard Service Hub Assembly** (Figure 1) is a basic hub that applies conventional assembly processes defined in this document. For this process, components (hub, seal, inner and outer bearings) are specified and individually assembled,

one at a time, onto the spindle (or into the hub bore). The Standard Service wheel-end includes components available from Hendrickson, but specified by the customer. Whereas Hendrickson's Extended Life wheel-ends are Hendrickson specified by RTR (Ready-to-Roll) model and factory installed at Hendrickson. Each are delivered as complete subassemblies on a dressed axle.

The standard service hub (Figure 1) may be ductile iron, aluminum or Dura-Light Hub® and vendors include ConMet, Walther EMC, KIC or Webb. Spindle types include HN (tapered) or HP (parallel). In these procedures, all hubs are considered conventional hubs that are maintained and assembled similarly.

All components are field serviceable, however, no service of any kind should be attempted without first CONTACTING HENDRICKSON. Recommendations for preventative maintenance practices are listed in Hendrickson literature number L578 Suspension Preventive Maintenance Guide.

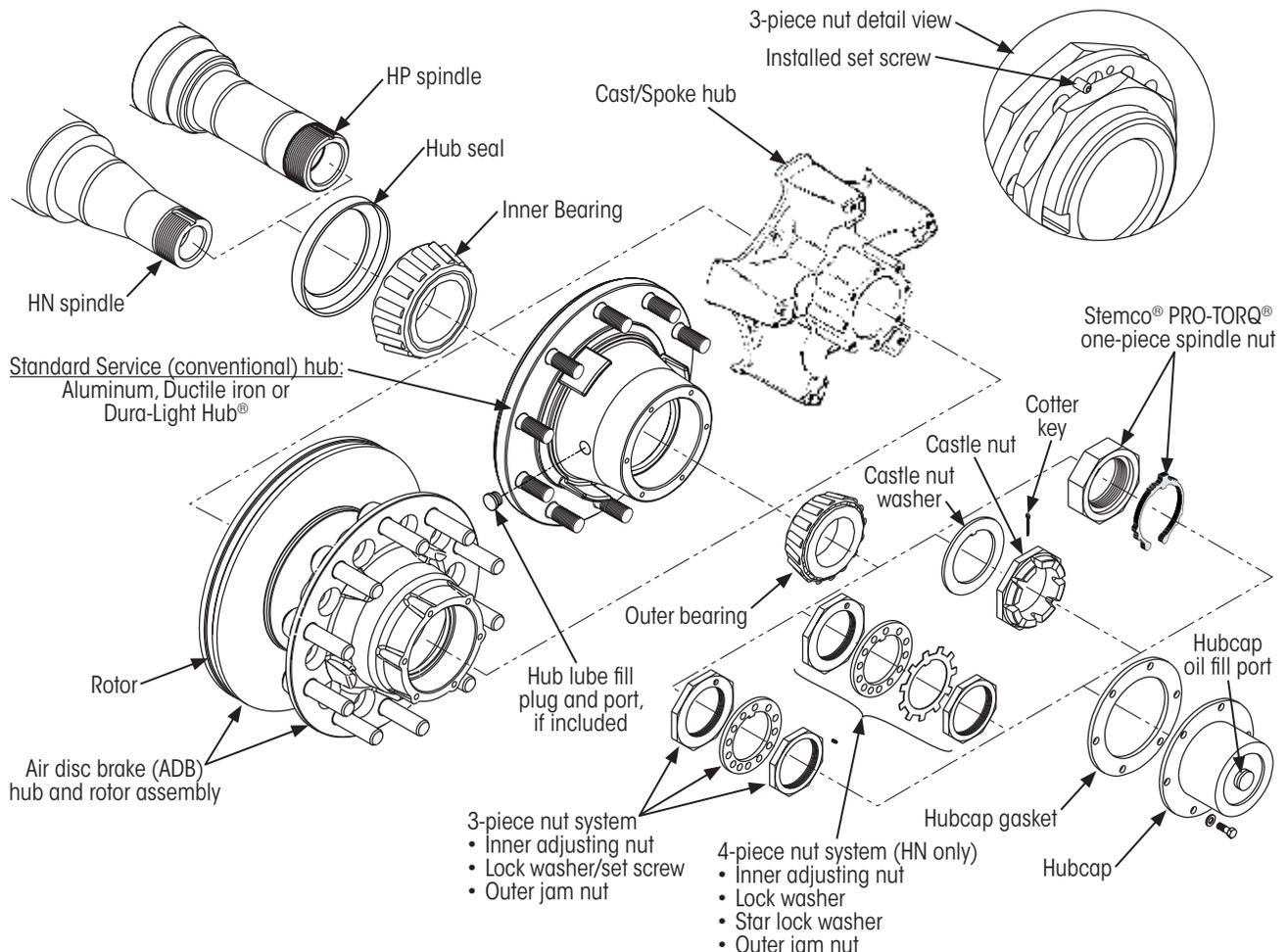


Figure 1: Hendrickson's Standard Service wheel-end parts identification



NOTICE: Accessory-type hubcaps, such as the chrome “top hat” style hubcap, increase wheel-end temperatures during operation and are not recommended for use on Hendrickson Standard or Extended Service wheel-ends.

NOTE: Hendrickson recommends HP spindle type for offset super single tire applications. Refer to Hendrickson literature number L846 Wide Base Tire Configurations for more details. The HN spindle design is not approved for use with any single offset wheel.

Other types of wheel-end assemblies can be found on Hendrickson suspensions for both drum and air disc brake (ADB) systems.

HLS® HENDRICKSON LONG-LIFE SYSTEM™ AND HVS® HENDRICKSON VALUE SYSTEM™

For service information on these wheel-end types, refer to Hendrickson literature number T72004 HLS® Wheel-end Maintenance Procedures or T72005 HVS® Wheel-end Maintenance Procedures.

HXL HENDRICKSON EXTENDED-LIFE

Hendrickson Extended-Life wheel-ends offer premium performance on Hendrickson dressed axles. Hendrickson selects premium components which are factory assembled in a controlled environment; allowing for an extended-service warranty beyond that of a standard service wheel-end.

HXL3® HENDRICKSON EXTENDED-LIFE 3-YEAR SYSTEM™

HXL3 wheel-ends come with oil bath lubrication (75W-90 synthetic gear lubricant or SAE 80W / 90W gear oil) and a three-year limited warranty. Spindle types include HN (tapered) or HP (parallel) with Hendrickson's PRECISION240® or PRECISION320® Nut System. Service and other applicable information can be found or is referenced in Hendrickson literature number T72006 Wheel-end Maintenance Procedures.

HXL5® HENDRICKSON EXTENDED-LIFE 5-YEAR SYSTEM™

HXL5 wheel-ends feature synthetic semi-fluid (SF) grease (Chevron Delo® Synthetic Grease SF). Spindle types include HN (tapered) or HP (parallel) with Hendrickson's PRECISION240 or PRECISION320 Nut System. Service and other applicable information can be found or is referenced in Hendrickson literature number T72007 Wheel-end Maintenance Procedures.

HXL7® HENDRICKSON EXTENDED-LIFE 7-YEAR SYSTEM™

HXL7 wheel-ends feature ductile iron, aluminum or Dura-Light Hub®, synthetic semi-fluid grease (Chevron Delo Synthetic Grease SF) and HP (parallel) spindle with Hendrickson's PRECISION320 Nut System. Service and other applicable information can be found or is referenced in Hendrickson literature number T72002 Wheel-end Maintenance Procedures.

TOOLS REQUIRED

The following tools may be required during the performance of some maintenance procedures:

TOOL		WHERE USED
Dial Indicator, with mounting stand (resolution to 0.0001", 0.0254 mm)		End-play measurement. Refer to <u>Figure 4 on page 9</u> .
Hub-mounted seal driver (<u>Figure 13</u>)		Available from seal manufacturer
Spindle-mounted seal driver (<u>Figure 12</u>)		Available from seal manufacturer
Torque Wrench (10 - 400 ft.lbs. or 13 - 542 Nm)		Used to tighten various plugs, screws and nuts, listed in this table, to the specified torque.
1/2 inch socket		Hubcap fasteners
1/4 or 5/16 inch hex key		Lube fill port plug, oil filled hub
<u>HUB SF GREASE DAM on page 19</u>		<u>HUB AND OUTER BEARING ASSEMBLY - SF GREASE on page 14</u>
HN spindle	For three- or four-piece nut system	
	37/8 inch socket	Inner Adjusting nut
	31/4 inch socket	Outer jam nut
	5/64 inch hex key	Set screw
HP spindle	For three-piece nut system	
	47/8 inch socket	Inner Adjusting nut
	43/8 inch socket	Outer jam nut
	5/64 inch hex key	Set screw

Table 2: List of required tools

IMPORTANT: Torque (Table 4 on page 19) cannot be properly applied with an ordinary wrench. **A calibrated torque wrench must be used to tighten fasteners** to specified values.

ADB HUB AND ROTOR

For air disc brake (ADB) systems, the caliper must be removed before removing the hub and rotor assembly. ADB rotor and caliper mounting is defined in Hendrickson literature number [T71004 *Hub and Rotor Assembly and Caliper Mounting Procedures*](#). Original mounting hardware must be discarded, once removed, and replaced with new hardware during reassembly.

Procedures for service and repair of Hendrickson's MAXX22T™ ADB can be found in Hendrickson literature number [T72009](#). For component replacement and repair of ADB systems and rotors manufactured by other vendors, links to Bendix, ConMet, Haldex and Wabco literature is available at

www.hendrickson-intl.com/TrailerLit.

INSPECTION

As a general practice, the hub assembly should be checked for seal leaks and smooth rotation.

⚠WARNING: Prior to performing inspection procedures, ensure conditions are safe by following steps in section **PREPARING TRAILER FOR SERVICE**.

NOTE: Recommended inspection intervals are based on an average trailer usage of 100,000 miles (160,000 km) per year. Higher usage would require more frequent inspections. Conversely, lower usage would require less inspection. Refer to Hendrickson literature number [L578 *Suspension Preventive Maintenance Guide*](#) for more details.

Inspections should be performed:

- Daily pre-operation check. This would include a general walk around to check for signs of obvious damage, wear or other abnormalities.
- Every month, visually inspect back of hub and hubcap gasket for leakage. Refer to the section titled [CHECKING FOR SEAL LEAKS](#) for complete inspection details.
- Every three to four months:
 - Perform monthly inspection.
 - Check for smooth rotation.
 - » Refer to the section titled [EXPLANATION OF SIGNAL WORDS](#) for details.
 - » If hub feels rough, sounds noisy or does not rotate freely; [CHECKING END PLAY](#) and/or make necessary repairs.

- During brake service and relining when the wheel-end will be dismantled enough to easily make these inspections. In addition to the inspection at brake service, always maintain current shop preventive maintenance and pre-trip inspection practices.

CHECKING FOR SEAL LEAKS

The hub assembly is filled with the specified lubricant at the factory during the assembly process. On the inboard side, lubricant is contained in the hub by the hub seal where leakage can occur ([Figure 1 on page 5](#)).

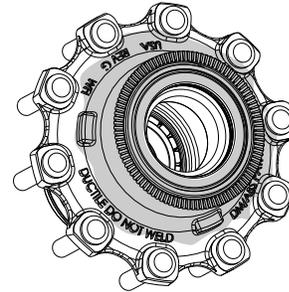


Figure 2: Check back side of hub for seal leak

To check for leaks, look at the inboard side of the hub, ([Figure 2](#)). A small amount of lubricant may be visible at the hub seal. **This is a normal occurrence and does not necessarily indicate a seal leak.**

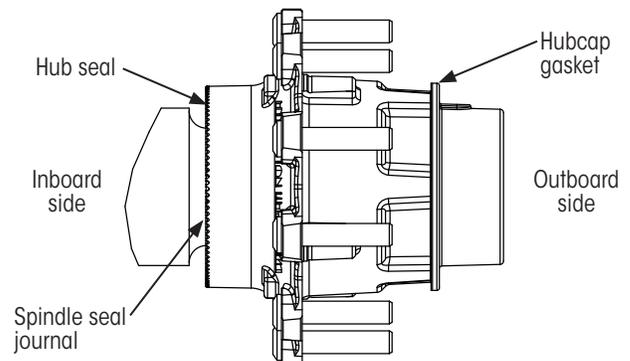


Figure 3: Areas where leaks may occur

A small amount of lubricant may also appear at the spindle bearing shoulder to hub joint ([Figure 3](#)) **This is also normal and does not necessarily indicate a seal leak.** It should be wiped clean to minimize any accumulation of dirt.

NOTICE: Pressure or steam washing should be avoided in this area as water could be forced past the seal and degrade lubricant performance and corrode bearings.



If the hub seal is leaking, a large quantity of lubricant will be present. Oil will be spattered on rim and tires. If this is the case, the seal and other components may need to be replaced. Take corrective action as needed.

CHECKING FOR SMOOTH AND QUIET ROTATION

Many factors can effect smoothness of rotation. Primary causes include:

- Bearing wear
- Damaged hub seal
- Moisture
- Unwanted debris

NOTE: A reasonable assessment can be performed without removing tires and rims. However, this procedure is best performed with hub only as shown in [Figure 5](#).

1. **Ensure** trailer is secure per [PREPARING TRAILER FOR SERVICE on page 5](#).
2. **Disengage** brakes and, if brake shoes, remove brake drum (recommended).
3. While maintaining physical contact, **slowly rotate** hub in both directions at least five revolutions.
4. **During rotation**, ensure smooth and quiet rotation. Bearings should move smoothly. Feel for any resistance in movement. Any debris in bearings should be felt as it moves over rollers in bearings.

IMPORTANT: Any mechanical system with moving parts is going to experience some wear between its parts. If rotation feels rough, sounds noisy or does not rotate freely. Take corrective action. **DO NOT** place the suspension back into service.

- A. If rotation feels normal, return to previous procedure or reassemble and restore trailer to normal operation.
- B. If rotation sounds noisy, check end play.
- C. If rotation feels rough or does not rotate freely, refer to [CONTACTING HENDRICKSON on page 4](#).

CHECKING END PLAY

NOTE: If extended service wheel-end (HXL), refer to applicable literature and [CONTACTING HENDRICKSON on page 4](#) before continuing.

This procedure should be performed:

- After [CONTACTING HENDRICKSON](#) Technical Services for guidance relative to suspected wheel end play movement, before removing the hubcap.
- **After** installing hub and when instructed by spindle nut installation procedure.

1. If not already done so:

- A. **Perform** [PREPARING TRAILER FOR SERVICE on page 5](#).
- B. **Remove** wheel (tires and rims).
- C. **Disengage** brakes.
- D. If drum brake, **remove** drum (recommended). If ADB, **remove** brake pads per manufacturer's recommended procedures.
- E. If oil lubricated, **drain** oil from wheel-end (do not reuse).
- F. **Remove** hubcap and discard gasket.

IMPORTANT: End play can be checked with brake drum installed or removed (preferred). If installed, **ensure all brake drum wheel fasteners are installed and tightened to manufacturers specifications** before checking end play.

2. **Ensure** hub hubcap mounting surface and end of spindle are **clean and totally free of any burrs or debris**.
3. **Rotate** hub **at least 5 revolutions** to ensure bearings are fully seated.

NOTE: The hub **MUST** be rotated before performing end play measurement. Rotation works the rollers into their fully seated positions against the bearing cone shoulder. **Failure to rotate hub could result in a false end play reading.**

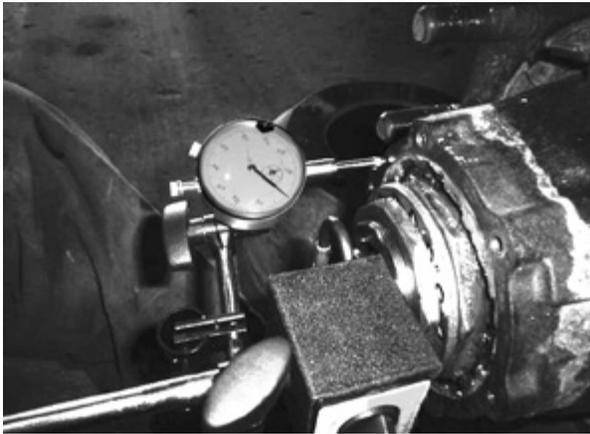


Figure 4: Checking end play

4. **Attach dial indicator** (Table 2) with magnetic base to flat surface at end of spindle (Figure 4).
5. **Position dial indicator** so its pointer line of action is parallel to spindle axis and touches the hubcap mounting surface on the hub. Ensure the plunger contacts the hub in an area that is smooth and fully machined. Any regions with scratches, gouges or non-cleanup should be avoided.
6. **Check indicator** for free movement in both directions. Lightly **push and pull** on indicator arm to verify plunger is free to move at least 0.005" in each direction. If indicator bottoms out, readjust until it is free to move 0.005" in both directions.

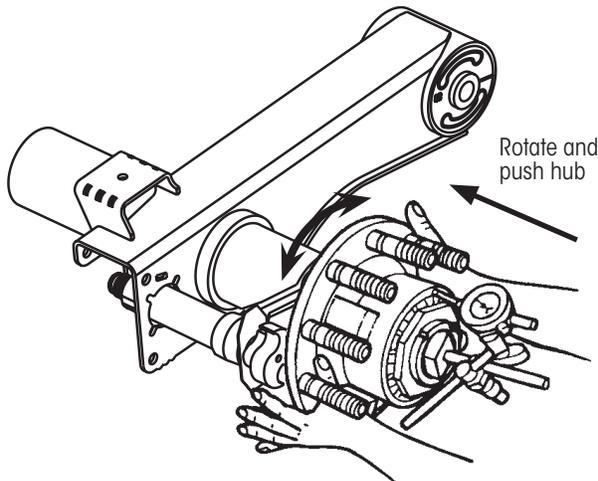


Figure 5: Checking inward end-play

7. **Zero indicator.**
8. **Grasp hub flange** as shown in Figure 5, and **push** the hub inward **while rotating** the hub slightly in both directions (15 - 30° between two holes) until the dial indicator reading remains constant. **Record** reading.

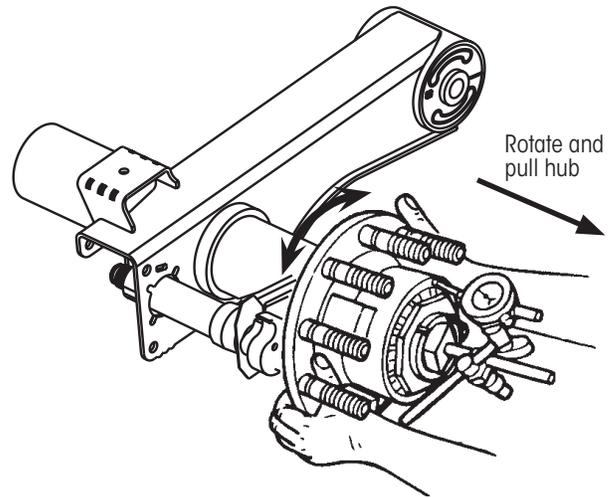


Figure 6: Checking outward end-play

9. While still grasping hub (Figure 6), **pull** hub outward **while rotating** hub slightly in both directions (15 - 30° between two holes) until dial indicator reading remains constant. **Record** reading.
10. End play is the total movement of the indicator. **Calculate** difference between recorded values of Step 8 and Step 9 to determine end play, **record** value.

IMPORTANT: End play should be between 0.001" (0.0254 mm) and 0.005" (0.127 mm). If subsequent readings are necessary, the hub must be rotated at least 5 revolutions to reseal the bearings (refer to Step 3).

- A. **If checking after spindle nut installation**, return to:

SPINDLE NUT SYSTEM	RETURN TO
STANDARD THREE- OR FOUR-PIECE SPINDLE NUT ASSEMBLY	Step 10 on page 15
CASTLE SPINDLE NUT ASSEMBLY	Step 7 on page 17
Stemco PRO-TORQ® nut	Refer to manufacturer's manual for installation procedures.

- B. If end play is **within specification**, no bearing adjustment is necessary. Continue to next step.
- C. If end play is **greater than 0.005"** (0.0254 mm), tighten spindle nut (**STANDARD THREE- OR FOUR-PIECE SPINDLE NUT ASSEMBLY** on page 15) or refer to **CONTACTING HENDRICKSON Technical Services**.

IMPORTANT: If end play is not within specifications, **DO NOT** place suspension back into service without correcting the problem.

11. Check to **ensure**, for 3-piece nut system (Figure 15 on page 15):
 - A. Inner adjusting nut is secure.
 - B. Lock washer and tang are properly seated.
 - C. Outer jam nut and retaining set screw are securely in place.
12. If not already done so, perform CHECKING FOR SEAL LEAKS on page 7.
13. Go to INSTALL HUBCAP on page 18.

REMOVING AND INSTALLING HUB

⚠WARNING: Prior to performing maintenance procedures, ensure conditions are safe. Refer to PREPARING TRAILER FOR SERVICE on page 5.

NOTE: In order to maintain warranty status, CONTACTING HENDRICKSON is recommended before removing the hubcap and disturbing the spindle nut.

Removal of hubcap hex head screws and/or hubcap is allowed when:

- Attaching hubometer bracket.
- During TIREMAAX® installation.

NOTICE: The old gasket must be discarded and replaced with new. Tighten fasteners to **15±3 ft. lbs. (21±3 Nm)** of torque.

HUB REMOVAL

Use the following procedure to remove hub assembly:

1. Remove tire / wheel assembly.
2. Disengage brakes and:
 - If drum brake, remove brake drum.
 - If ADB equipped, remove the caliper.
3. If oil, drain the oil from the hub.
4. Remove hubcap hex head screws and hubcap.
5. Remove and discard gasket.

REMOVE SPINDLE NUT

One of four spindle nut systems (Figure 7 through Figure 8) is used to secure a standard service hub to the spindle/axle:

- Standard three- or four-piece spindle nut
- Castle spindle nut (cross drilled HP spindles only)
- Stemco PRO-TORQ® nut system

Each of these spindle nut systems has a different locking mechanism which must be disengaged before spindle nut(s) can be removed.

1. **Disengage** spindle nut locking mechanism as follows:

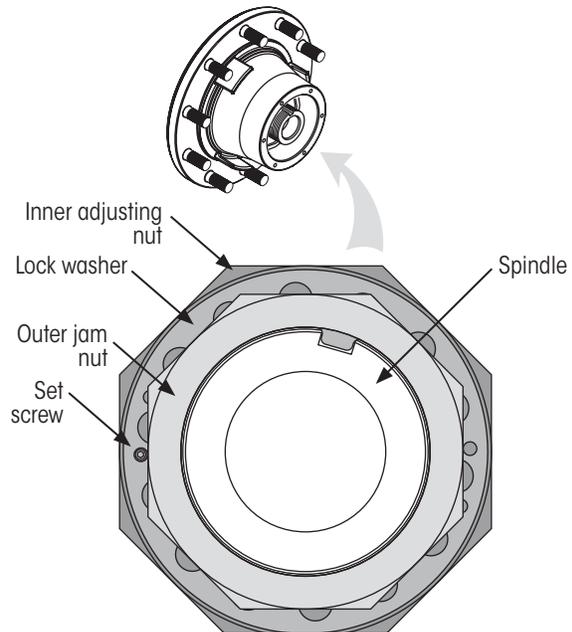


Figure 7: Three-piece nut system components

- A. **Standard** three-or four-piece nut (Figure 7) -
 - i. If three-piece, using a $\frac{5}{64}$ inch hex key, **remove** set screw from interlock washer.
 - ii. If four-piece, lift tabs from the flats on the outer nut. See Figure 18 on page 16.
 - iii. **Remove** spindle nuts and lock washer.

NOTICE: **DO NOT** attempt to rotate the outer nut without first unlocking the nut system. Doing so can damage spindle threads and compromise the axle. Remove the lock washer before rotating the inner nut.

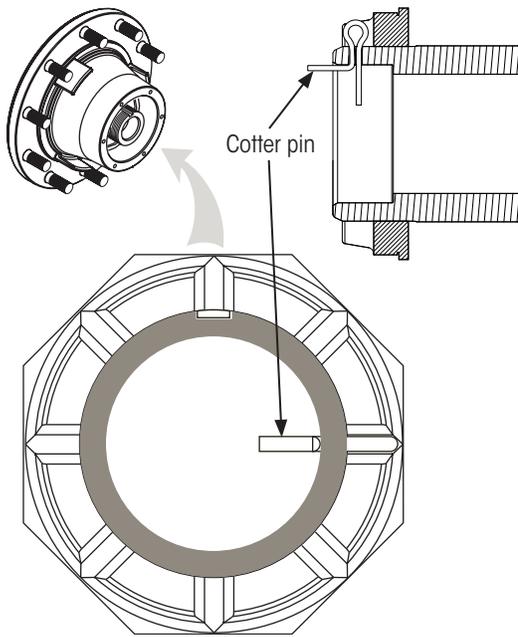


Figure 8: Castle spindle nut system (HP spindles only)

- B. **Castle** spindle nut system, applies to cross drilled HP spindle only (Figure 8) -
 - i. **Remove** and discard cotter pin.
 - ii. **Remove** spindle nut(s) and washer or lock washer (if equipped).

REMOVE HUB

After the spindle nut is removed, the hub is free to be gently removed from the spindle while avoiding damage to spindle and spindle threads.

⚠CAUTION: For safety reasons and to prevent damage to hub and spindle, lifting equipment may be required to lift and support the hub as it is being removed from the spindle.

NOTICE: Any damage to spindle or hub machined surfaces can affect wheel-end performance.

1. **Carefully pull** hub assembly slightly toward spindle end. A short quick motion should allow outer bearing to exit the hub. Be prepared to catch outer bearing if it slides off the end of the spindle. Otherwise, simply remove it.
2. **Remove** hub from spindle. The inner bearing is held in hub by the hub seal and should come off with hub.

3. **Remove and discard** hub seal:
 - A. **If the seal is in the hub** - a pry bar can be used to carefully remove seal from hub bore. Damage to hub and hub surfaces must be avoided.
 - B. **If the seal is on the spindle** - Using a brass, leather or other soft-faced mallet, drive seal off spindle by carefully striking seal from the back side.
4. **Remove, clean and inspect** inner bearing. Replace if needed.

SPINDLE PREPARATION

Before installing hub, follow this procedure to ensure spindle machined surfaces are clean and undamaged.

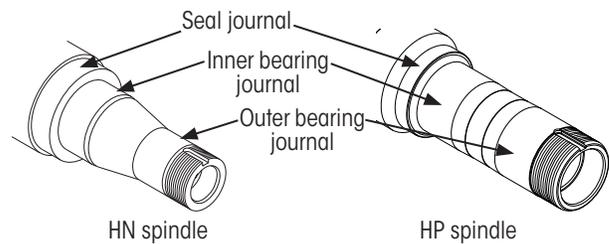


Figure 9: Spindle seal & bearing journals

1. **Remove** old lubricant and thoroughly clean spindle.
2. **Inspect** machined spindle journals (Figure 9) for nicks, scratches, burrs or marks. If needed, use crocus cloth or emery cloth to repair any damaged areas.
3. **Thoroughly clean** spindle threads and keyway with a wire brush to avoid false bearing adjustments and to avoid introduction of contaminants into the lubricant cavity.
4. **Thoroughly clean** spindle machined surfaces of rust, dirt, grease or any contaminants that could damage the hub seal and cause it to leak.
5. **Lubricate** spindle bearing surfaces with the same lubricant used to fill the hub.

NOTICE: To minimize fretting and damage to wheel-end, lubricate all components and applicable surfaces using the same lubricant.

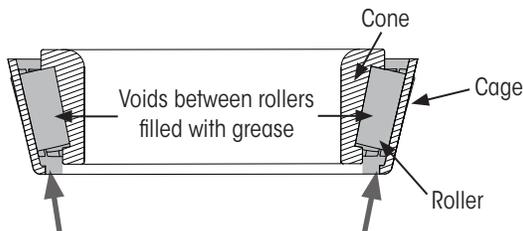
PREPARE HUB FOR RE-INSTALLATION

The hub and bearings should be cleaned and inspected prior to installation.

1. **Thoroughly clean** the hub bore of any dirt, grease, rust or any other substance that may be present.
2. **Inspect** hub seal bore for roughness. If needed, use emery cloth to remove any burrs or old bore sealant and wipe hub clean.
3. **Remove** all sharp edges, nicks and burrs from seal bore, hubcap bore and hubcap mounting surface of the hub.
4. **Ensure** hubcap mounting surface is smooth and free of debris.
5. Using the same lubricant used to fill the hub and **lubricate** hub seal and bearing journals.

IMPORTANT: DO NOT lubricate if Stemco seal.

6. If filling with **NLGI #2 grease**, prior to assembly:



Pack from small end until grease purges out the big end

Figure 10: If packing bearing with NLGI #2 grease

- A. **Pack** both inner and outer bearings with grease (Figure 10).

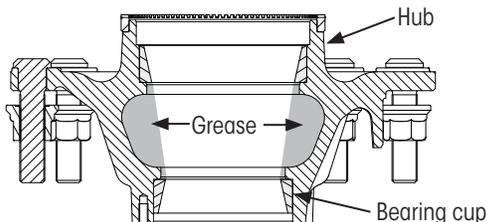


Figure 11: Pack hub inner cavity

- B. **Pack** hub inner chamber, full circle (Figure 11), with grease to slightly above the level of the bearing cup.

ASSEMBLE HUB

This procedure assumes field installation of the hub. Hub assembly includes:

- Hub Seal and inner bearing assembly:
 - SPINDLE-MOUNTED SEAL ASSEMBLY
 - HUB-MOUNTED SEAL ASSEMBLY
- HUB AND OUTER BEARING ASSEMBLY - SF GREASE on page 14
- HUB AND OUTER BEARING ASSEMBLY - OIL LUBRICANT on page 14
- HUB AND OUTER BEARINGS ASSEMBLY - NLGI #2 GREASE on page 14

NOTICE: The HUB SEAL CAN BE DAMAGED or prematurely fail if:

- **Hub seal is improperly installed.**
- **Hub seal is rammed into the spindle bearing shoulder.**
- **Hub is not kept supported and aligned with spindle until the outer bearing and axle nut are installed.**
- **Lubricant types are mixed during hub assembly.**

NOTICE: To minimize fretting and damage to wheel-end, lubricate all components and applicable surfaces using the same lubricant.

⚠CAUTION: For safety reasons, to prevent injury and damage to the hub and spindle, lifting equipment may be required to lift and support the hub as it is being installed onto the spindle.



SPINDLE-MOUNTED SEAL ASSEMBLY

This type of seal is mounted on the spindle before installing the hub. The replacement seal should be same brand and type as originally installed by the OEM. A recommended installation tool (Figure 12), with instructions, is available from the seal manufacturer.

1. **Lubricate seal** according to seal manufacturer's recommendations.
2. Following manufacturer's instructions, **place** the seal on the spindle (Figure 12). **Ensure** the seal is correctly oriented with "air side" facing inboard and "oil side" facing outboard.

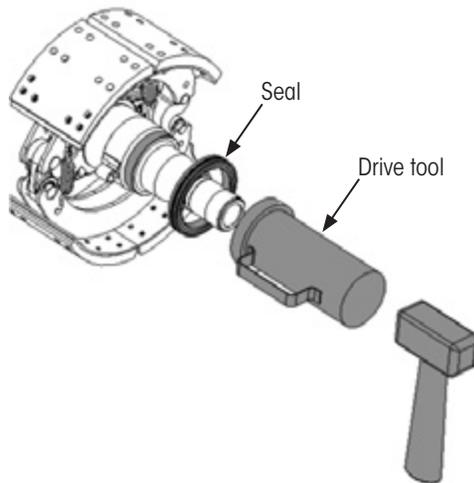


Figure 12: Spindle-mounted seal installation

3. **Place** installation tool over the spindle and drive seal until it is flush with the bearing shoulder.
4. **Rotate** installation tool and apply several light blows to ensure seal is properly seated against bearing shoulder.
5. Using the specified lubricant, **lubricate** inner bearing journal and cone.
6. **Install** the pre-lubricated inner bearing onto spindle. If it becomes misaligned, use a small hammer to tap lightly on the unmachined part of the axle tube. This will ease installation by creating vibrations which will help realign the bearing on the spindle.

NOTICE: NEVER hit a bearing with a hammer.

HUB-MOUNTED SEAL ASSEMBLY

This type of seal is mounted directly to the hub inner bore before installing hub. The replacement seal should be same brand and type as originally installed by the OEM. A hub-mount seal installation tool, with instructions, is available from seal manufacturer.

1. **Apply lubricant** to spindle, bearing journals.

NOTE: The hub was pre-lubricated during PREPARE HUB FOR RE-INSTALLATION on page 12.

2. **Install** pre-lubricated inner bearing into hub against inner bearing cup. **Ensure** it is properly seated in the cup.

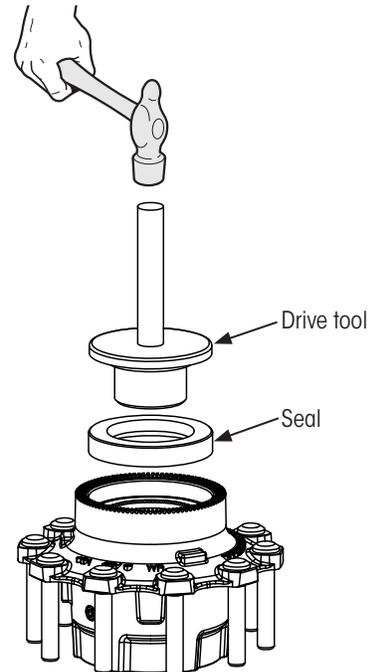


Figure 13: Hub-mounted seal installation

NOTE: A hub seal driver (Figure 13) is recommended and can be obtained from seal manufacturer.

3. **Lubricate seal** according to the seal manufacturer's recommendations.
4. **Place** seal onto the drive tool (Figure 13) for installation into the hub according to seal manufacturer's instructions.
 - A. **Align** seal tool with hub seal bore.
 - B. **Drive** seal until it bottoms out in the hub seal bore.
 - C. **Rotate** installation tool and apply several light blows to **ensure** seal is properly seated.
 - D. **Check** inner bearing to ensure it rotates freely.

HUB AND OUTER BEARING ASSEMBLY - SF GREASE

With seal and inner bearing in place; the hub, SF (Semi-Fluid) grease and the outer bearing can now be installed; in that order.

NOTE: Refer to MAKING A HUB SF GREASE DAM on page 19 for instructions on making the dam.

NOTICE: When completed, the hub should be filled to 50% of hub cavity (to 3 & 9 o'clock position when viewing from end of spindle). Any air bubbles or aeration of grease may result in insufficient grease quantity, bearing spalling and wheel-end damage.

1. Taking care not to damage the seal, gently slide the hub onto spindle until the seal is against the spindle seal journal (Figure 9).
2. **Support** and do not allow hub to move off center while completing the assembly.

NOTICE: If the hub is not properly supported, the seal could be damaged.

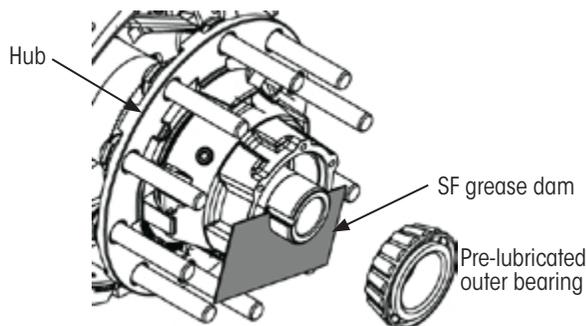


Figure 14: SF grease dam application

3. With the hub supported in position as shown in Figure 14, **place and hold** the SF grease dam so it covers the lower half the hub opening.
4. **Fill** hub cavity to the top of the dam (3 & 9 o'clock position when viewing from end of spindle) with SF grease.
5. **Pre-lube** outer bearing with a coating of SF grease.
6. **Place** grease coated outer bearing over the spindle and against the SF grease dam (Figure 14).
7. **Slide** the dam out as the bearing is inserted into the hub outer bearing cup.
8. **Clean** as needed to remove grease from unwanted areas.

NOTE: While sliding hub onto spindle, grease is collected at the spindle seal journal inboard of the hub (Figure 3 on page 7). This may be later interpreted as a grease leak and should be cleaned.

9. Continue with STANDARD THREE- OR FOUR-PIECE SPINDLE NUT ASSEMBLY on page 15.

HUB AND OUTER BEARING ASSEMBLY - OIL LUBRICANT

With seals in place, the hub and outer bearing can now be installed onto spindle.

1. **Gently slide** hub onto spindle, taking care not to damage the seal.
2. **Support** and do not allow hub to move off center while completing the assembly.
3. **Lubricate** outer bearing.
4. **Place** outer bearing over the spindle and into the hub outer bearing cup.

NOTE: While sliding hub onto spindle, oil is collected at the spindle bearing shoulder inboard of the hub (Figure 3 on page 7).

5. **Clean** spindle and hub area as needed.
6. Continue with STANDARD THREE- OR FOUR-PIECE SPINDLE NUT ASSEMBLY on page 15.

HUB AND OUTER BEARINGS ASSEMBLY - NLGI #2 GREASE

With seals in place, the hub, grease and outer bearing can now be assembled onto the spindle, in that order.

1. **Gently slide** the pre-lubricated hub (packed, Figure 11 on page 12) onto spindle, taking care not to damage the seal.
2. **Support** and do not allow hub to move off center while completing the assembly.
3. **Place** pre-lubricated (packed, Figure 10 on page 12) outer bearing over the spindle and into the hub outer bearing cup.
4. **Clean** spindle and hub area as needed.

NOTE: While sliding hub onto spindle, grease is collected at the spindle bearing shoulder inboard of the hub (Figure 3 on page 7). This may be later interpreted as a grease leak and should be cleaned.

5. Continue with STANDARD THREE- OR FOUR-PIECE SPINDLE NUT ASSEMBLY.



STANDARD THREE- OR FOUR-PIECE SPINDLE NUT ASSEMBLY

⚠WARNING: FAILURE TO FOLLOW THESE INSTRUCTIONS COULD CAUSE WHEEL TO COME OFF AND CAUSE BODILY INJURY.

OVER-TIGHTENING NUT COULD CAUSE BEARINGS TO RUN HOT AND BE DAMAGED.

NOTE: For other types of spindle nuts, refer to the manufacturer's literature for installation procedures.

The three-piece spindle nut system (Figure 15 on page 15) includes an inner adjusting nut, lock washer, inner jam nut and set screw.

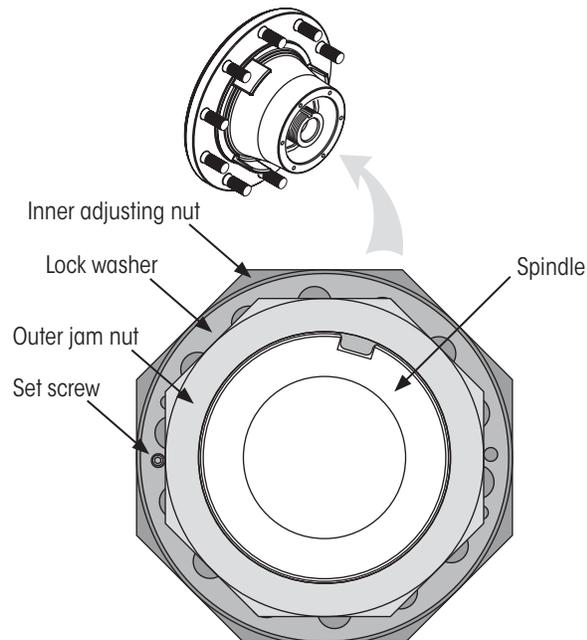


Figure 15: Three-piece nut system components

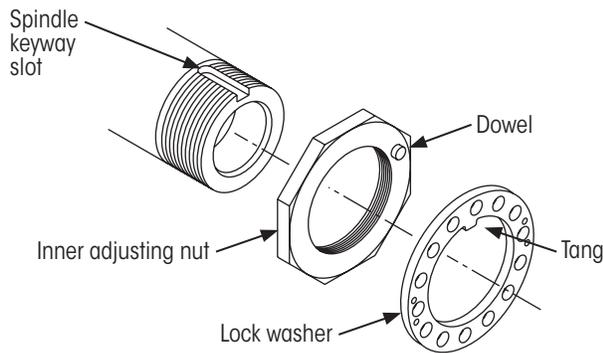


Figure 16: Adjusting nut and lock washer installation

1. Install inner adjusting nut (Figure 16) on spindle, dowel side out, and tighten to 200 ft. lbs. (271 Nm) of torque while rotating wheel.
2. Back off inner adjusting nut one full turn.
3. Rotate wheel at least 5 revolutions to seat bearings.
4. Tighten inner adjusting nut to 50 ft. lbs. (68 Nm) of torque while rotating hub.
5. Back off the inner adjusting nut ¼ turn.

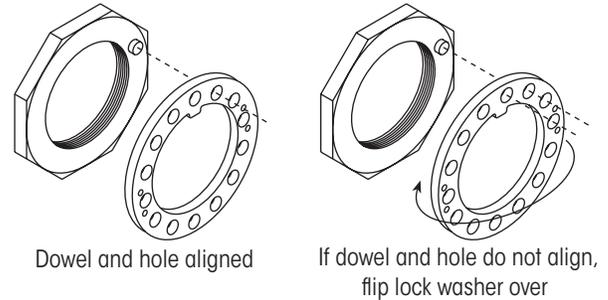


Figure 17: Align adjusting nut dowel with hole in lock washer

6. Install lock washer (Figure 16). Ensure lock washer tang fits in the spindle keyway slot and inner adjusting nut dowel fits in one of the holes in the lock washer. If this alignment cannot be achieved, remove the lock washer, flip it over and reinstall it on spindle (Figure 17).

NOTICE: DO NOT tighten inner adjusting nut for dowel pin alignment. This can excessively pre-load bearings, resulting in premature failure.

If the dowel and hole still don't line up, loosen the inner adjusting nut slightly until alignment occurs.

7. If 4-piece nut system, install star washer over lock washer as shown in Figure 1 on page 5.
8. Install outer jam nut (Figure 15).
9. Tighten outer jam nut to:

SPINDLE	TORQUE
HN	315 ft. lbs. (427 Nm)
HP	385 ft. lbs. (522 Nm)

Table 3: Outer jam nut torque values.

10. Perform CHECKING END PLAY on page 8. Return to next step when procedure is complete.

IMPORTANT: End play must be between 0.001" (0.0254 mm) and 0.005" (0.0127 mm).

- A. If end play is **within specifications**, go to next step to install set screw.
- B. **If excessive end play** (greater than 0.005").
 - i. **Remove** outer jam nut (Figure 15).
 - ii. **Pull** lock washer away from inner nut, but not entirely off the spindle.
 - iii. **Tighten** inner nut so its dowel aligns with the next alignment hole in the lock washer.

NOTE: If a smaller tightening increment is desired, remove lock washer from the spindle, flip it over, reinstall it on the spindle and tighten inner nut so its dowel aligns with the next alignment hole in the lock washer (Figure 17).

- iv. **Slide** lock washer up against inner nut and install outer jam nut.
- v. **Tighten** jam nut according to Table 3.
- vi. **Recheck** wheel bearing end play. Continue to adjust until end play is within the range specified, then go to [Step A](#)
- C. **If insufficient end play** (less than 0.001"):
 - i. Without rotating wheel, **remove** outer jam nut.
 - ii. **Pull** lock washer away from inner nut, but not entirely off spindle.
 - iii. **Loosen** inner adjusting nut so its dowel aligns with the previous alignment hole in lock washer.

NOTE: If a smaller loosening increment is desired, remove lock washer from spindle, flip it over, reinstall it on spindle and loosen inner adjusting nut so its dowel aligns with the previous alignment hole in lock washer (Figure 17).

- iv. **Slide** lock washer up against inner adjusting nut and install outer jam nut. Tighten nut according to [Table 3 on page 15](#).
- v. **Repeat** [CHECKING END PLAY](#) on [page 8](#), starting at [Step 3](#).

11. Secure outer nut position:

- A. **3-piece nut** - install set screw (Figure 1 on [page 5](#)) into an accessible threaded hole in lock washer (Figure 15). Set screw must contact inner adjusting nut. Tighten to 18±2 in. lbs. (2.0±0.0 Nm) of torque.

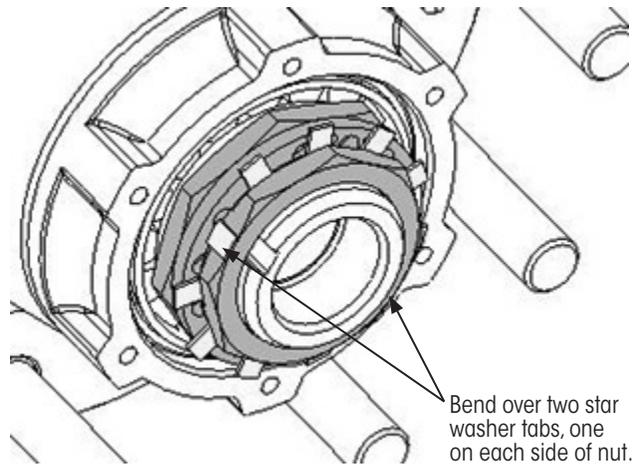


Figure 18: 4-piece nut system assembly (HN spindle only)

- B. **4-piece nut** - bend over two star washer tabs on opposite sides of the nut as shown in [Figure 18](#).

Inspecting Installation

To ensure correct installation, follow these procedures:

1. **Ensure** lock washer is properly positioned and flush with inner adjusting nut at dowel pin ([Figure 15](#) and [Figure 17](#)).
2. If three-piece, **ensure** set screw contacts nut face. When properly installed, the set screw will be approximately half the height of the outer jam nut.
3. If four-piece, ensure two tabs are folded over as shown in [Figure 18](#).
4. **Test** for free hub rotation, perform [CHECKING FOR SMOOTH AND QUIET ROTATION](#) on [page 8](#).

CASTLE SPINDLE NUT ASSEMBLY

A castle spindle nut is only applied to HP spindles that have been cross drilled to receive the cotter pin. Refer to [Figure 8 on page 11](#) for illustration.

1. **Install** castle nut washer and castle nut onto spindle.
2. **Tighten** to 200 ft. lbs. (271 Nm) of torque while rotating hub at least one full rotation.
3. **Back off** castle nut until it begins to feel loose. **Do not exceed ½ turn.**
4. **Tighten** castle nut to 50 ft. lbs. (68 Nm) of torque while rotating hub at least one full rotation.
5. **Back off** nut 1/8 turn.
6. **Insert** cotter key, but do not bend at this time.



7. Perform CHECKING END PLAY on page 8.

IMPORTANT: End play must be between 0.001" (0.0254 mm) and 0.005" (0.0127 mm).

- A. If end play is **within specifications**, go to Step 8.
- B. If end play is **out of tolerance**:
 - vi. **Remove** cotter key.
 - vii. If nut is too loose (greater than 0.005"), **tighten** nut by one alignment hole.

If nut is too tight (less than 0.001"), **loosen** nut one alignment hole.

- viii. **Reinstall** cotter key.
- ix. **Repeat** CHECKING END PLAY on page 8, starting at Step 3.

IMPORTANT: If the wheel-end includes **TIREMAAX®**, it is likely necessary to trim the cotter key (Figure 19) to avoid interference. Refer to T57001 TIREMAAX CP & PRO Wheel-end considerations for details. For more information on TIREMAAX, refer to www.Hendrickson-intl.com/TIREMAAX.

8. **Bend** the long leg of cotter pin to minimize castle nut movement.

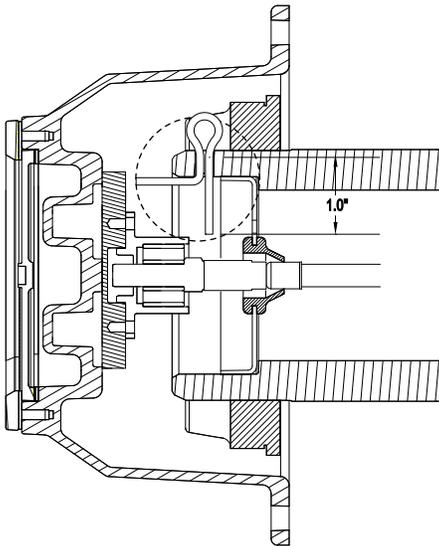


Figure 19: Cotter pin/TIREMAAX potential interference

NOTE: The cotter pin should extend into center of the spindle (Figure 19). If a hole in the spindle does not align with castle nut, loosen nut slightly until closest spindle hole aligns with a groove in castle nut.

9. Check to ensure:

- A. Spindle castle nut is secure
- B. Cotter key is properly installed and does not interfere with TIREMAAX® rotary union, if included.
- C. If not already done so, perform CHECKING FOR SEAL LEAKS on page 7.

INSTALL HUBCAP

After hub installation and inspection is complete, the hubcap can be installed.

IMPORTANT: Always install a new gasket when reinstalling hubcap.

NOTICE: Accessory-type hubcaps, such as the chrome “top hat” style hubcap, increase wheel-end temperatures during operation and are not recommended for use on Hendrickson Standard or Extended Service wheel-ends.

NOTICE: Interference between nut system and hubcap could occur if improper components are used. Use only genuine Hendrickson or Hendrickson approved replacement components. Refer to **RELATIVE LITERATURE on page 4** or **CONTACTING HENDRICKSON on page 4** as needed.

1. Visually inspect hubcap, hub mating surface, screw holes and new gasket for:
 - Signs of damage
 - Debris, such as silicon gasket sealer
 - Burrs or sharp edges
 - Cracks
2. Clean, repair or replace as needed. Protect any exposed grease during the process. Replace any quantity of grease lost during the process.
3. Align hubcap and new gasket onto hub and insert screws.
4. Hand-tighten hubcap screws.
5. Using a star pattern, tighten hubcap screws to 15 ± 3 ft. lbs. (21 ± 3 Nm) of torque.

NOTICE: Do not overtighten hubcap screws. Overtightening will distort metal hubcap mounting flange, which will prevent hubcap from achieving a leak-free seal.

HUB LUBRICATION AFTER ASSEMBLY, OIL ONLY

For complete lubrication details, refer to:

- Lubricant manufacturer for compatibility among types.
- Seal and bearing manufacturer’s recommendations for compatibility.
- Hub manufacturer for volumes.
- Fleet or OEM for lubricant type and other recommendations.

For adding lubricant, most hubs have a fill port and plug (Figure 1 on page 5) located on the side of the hub approximately halfway between the bearings. Standard service hubs will be filled with either oil or grease, as specified during original trailer build and fleet requirements.

IMPORTANT: If grease, DO NOT add grease through the hubcap fill port. Use of improper lubricants or maintenance procedures can void the wheel-end warranty.

NOTICE: To minimize fretting and damage to wheel-end, lubricate all components and applicable surfaces using the same lubricant.

ADDING OIL LUBRICANT

Oil lubricant must be added after hub assembly and as needed.

1. Remove hub or hubcap lube fill port plug (Figure 1 on page 5) on the side of the hub or at the hubcap window plug (if included).

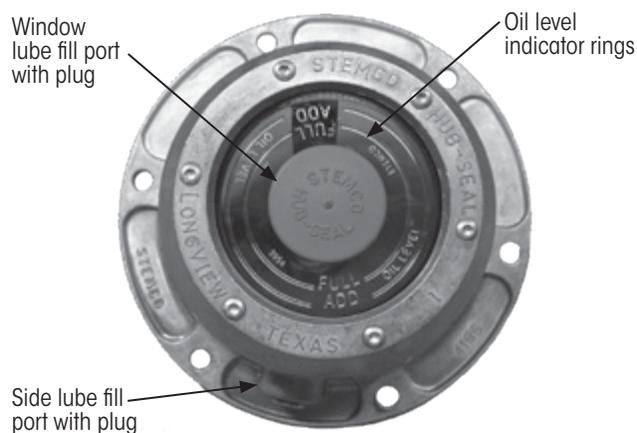


Figure 20: Sample oil hubcap with oil level indicator rings

NOTE: Not all hubs have a fill port. In this case, oil can only be added through the hubcap side or window lube fill port (Figure 20).



2. Fill wheel-end with oil until the oil level is above the "ADD" and to the "FULL" indicator ring of the hubcap window (Figure 20).

IMPORTANT: The oil level should be maintained to the hubcap full indicator ring (Figure 20). Adding oil above the hubcap full indicator ring should be avoided.

3. Check oil level at hubcap window.

NOTE: Allow sufficient time for oil to settle prior to final oil level check (it may be necessary to add oil more than once to adequately fill the wheel-end).

4. If oil was inserted through the fill port in the **hub**, install fill port plug and tighten to 22±2 ft. lbs. (30±2 Nm) of torque.

If oil was inserted through **hubcap** side fill port, install fill port plug and tighten to 7±2 ft. lbs. (10±2 Nm) of torque.

Otherwise, reinstall hubcap oil plug in window.

5. Spin hub more than three revolutions to distribute oil.

NLGI #2 GREASE LUBRICANT

Adequate NLGI #2 grease must be added during hub assembly (REMOVING AND INSTALLING HUB on page 10). Once assembled, additional grease will not serve to adequately lubricate bearings.

COMPLETING INSTALLATION

1. Spin hub more than three revolutions to distribute lubricant equally in hub bore.
2. If drum brake, install brake drum
3. If ADB, install brake caliper according to manufacturer's procedures. Refer to Hendrickson literature number T71004 *Hub and Rotor Assembly and Caliper Mounting* for information to reassemble ADB rotor and brake components. New caliper mounting hardware must be used.
4. Install wheel (tire and rim assembly) Refer to Brake DRUM AND WHEEL ASSEMBLY in Hendrickson literature number T82006 *Stud Replacement Procedures*.
5. If service is complete, restore trailer to normal operation.

ADDITIONAL INFORMATION

HUB SF GREASE DAM

Use of the hub SF grease dam, during assembly, is the recommended method of lubricating the hub with SF grease. Refer to HUB AND OUTER BEARING ASSEMBLY - SF GREASE on page 14 for instructions on how to use the Hub SF Grease Dam.

MAKING A HUB SF GREASE DAM

To make a grease dam, follow the instructions on the face of the template (Figure 21 on page 20). Use cardboard, plastic or other flat stiff material.

TORQUE VALUES

Table 4 lists torque values for wheel-end fasteners.

FASTENER	TORQUE	
	ft. lbs.	Nm
Hubcap Hex Head Screws	15±3	21±3
Hub fill port plug	22±2	30±2
Hubcap side fill port plug	7±2	10±2
Wheel Nuts ^{1,2}	475±25	645±30
STANDARD THREE- OR FOUR-PIECE SPINDLE NUT ASSEMBLY on page 15		
HN outer jam nut	315	427
HP outer jam nut	385	522
Set screw	18±2 in. lbs.	2.0±0.0
INSTALL HUBCAP		
Adjust nut according to procedure listed.		
¹ These fasteners are incrementally tightened according to procedures defined in this manual and superseded by OEM documentation, where applicable. Refer to decal T70013 <i>Wheel Assembly Procedure</i> . ² Re-torque all wheel nuts after 50 to 100 miles of service.		

Table 4: Standard Service Wheel-end fastener torque values

WHEEL STUD REMOVAL AND INSTALLATION PROCEDURE

Refer to Hendrickson literature number T82006 *Stud Replacement Procedures* for detailed instructions on wheel stud removal for both drum and disc applications

Hub SF Grease Dam

1. Print one template for each spindle type (HN & HP).
2. Make a HN or HP grease dam from cardboard, plastic or other flat stiff material.
3. Use this grease dam when filling hub with semi-fluid grease to 50% full level.
4. Slide outer bearing over spindle and slide grease dam out while inseting bearing into hub.

For more details, refer to TMC RP 631.

For assistance contact Hendrickson Technical Services
866-RIDEAIR (743-3247) or in Canada at 800-668-5360

HENDRICKSON
The World Rides On Us®

Figure 21: Hub SF Grease Dam template

Call Hendrickson at **866.RIDEAIR (743.3247)** for additional information.



TRAILER COMMERCIAL VEHICLE SYSTEMS
2070 Industrial Place SE
Canton, OH 44707-2641 USA
866.RIDEAIR (743.3247)
330.489.0045 • Fax 800.696.4416

Hendrickson Canada
250 Chrysler Drive, Unit #3
Brampton, ON Canada L6S 6B6
800.668.5360
905.789.1030 • Fax 905.789.1033

Hendrickson Mexicana
Circuito El Marqués Sur #29
Parque Industrial El Marqués
Pob. El Colorado, Municipio El Marqués,
Querétaro, México C.P. 76246
+52 (442) 296.3600 • Fax +52 (442) 296.3601