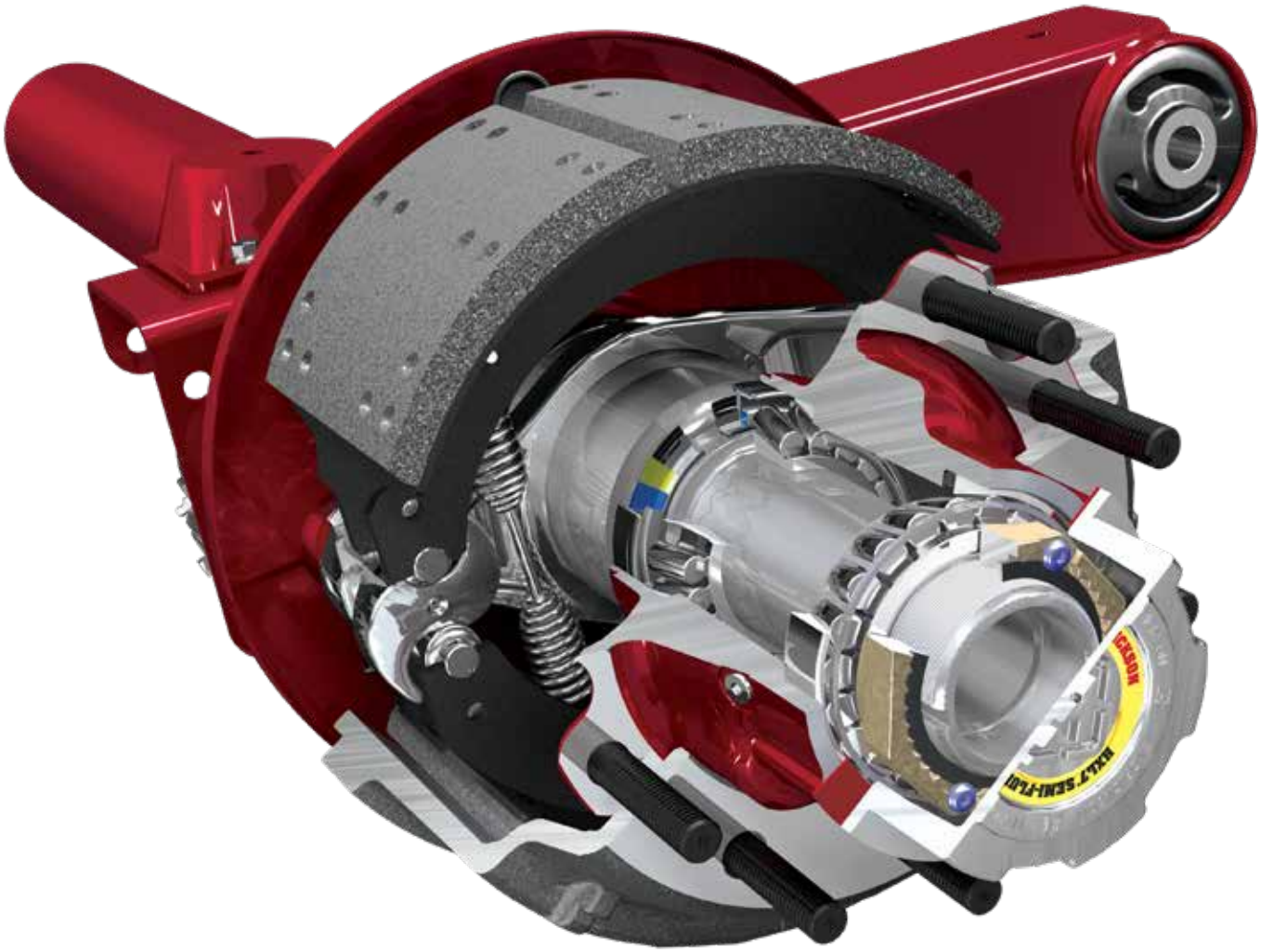
Asia Pacific Region Only

TECHNICAL MANUAL

WHEEL END MAINTENANCE MANUAL

LIT NO: 97117-250
DATE: January 2025 **REVISION:** D



HENDRICKSON
The World Rides On Us™

TABLE OF CONTENTS

NOTE: A detailed table of section contents can be found at the beginning of every section.

SECTION 1 – SERVICE NOTES

SECTION CONTENTS

CONVENTIONS APPLIED IN THIS DOCUMENT

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

EXPLANATION OF SIGNAL WORDS

Hazard signal words (such as 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 utilised to emphasise areas of procedural importance and provide suggestions for ease of repair.

The following definitions indicate the use of safety signal words as they appear throughout the publication.

⚠ **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 emphasise.

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

Document Links

This document includes links that can be utilised when viewed electronically. Links within the document are identified by black underlined text, whereas links to external websites are identified by blue underlined text.

GENERAL SERVICE NOTES

Before commencing work you must read, understand and comply with:

- All instructions and procedures.
- All signal word (CAUTION and WARNING) 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 precautionary and OH&S regulations.

During Service

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

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

Definitions

The following are definitions of words and abbreviations that may be used in this document:

- ADB – Air Disc Brake, using pneumatic air pressure rather than hydraulic or electric systems to function.
- ADI – Austempered Ductile Iron is a high strength specialty heat treated iron material.
- ADR – Australian Design Rule, these are national standards for vehicle safety, anti-theft and emissions.
- NLGI – National Lubricating Grease Institute standard of grease consistency.
- PCD – Pitch Circle Diameter, the diameter of the circle passing through the centre of all the wheel studs.
- SARN – Sub Assembly Registration Number verifies brake sub-assemblies comply with ADR 38/xx.
- SF – Semi Fluid grease.
- Vocation – The type of work performed by the truck or trailer.

IMPORTANT SAFETY NOTICES

NOTICE: The following safety notices are in general nature only. Please refer to the recommendations of the workplace safety authority in your country, state or territory for recommendations that are more thorough and advice on regulations that may also apply.

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

The 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 or void the manufacturer's warranty.

Carefully read, understand and follow all safety related information within this publication.

⚠ **WARNING**: Do not modify or rework parts. Use only Hendrickson authorised replacement parts. Use of substitute, modified or replacement parts not authorised by Hendrickson may not meet Hendrickson specifications and will void warranty. It can also result in failure of the part, loss of vehicle control and possible personal injury or property damage. Do not modify parts without written authorisation from Hendrickson.

⚠ **WARNING**: Always wear proper eye protection and other required PPE (personal protective equipment) when performing vehicle maintenance, repair or service.

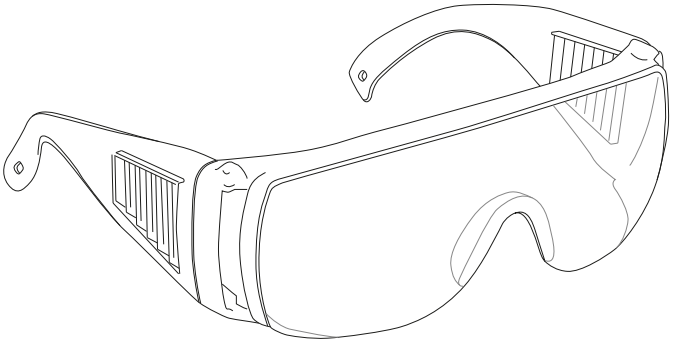


Figure 1: Wear safety glasses

⚠ **WARNING**: 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:

- Wear proper eye protection.
- Wear clothing that protects your skin.
- Work in a well ventilated area.
- Do not use petrol or any other highly flammable solvents to clean parts.

⚠ **WARNING**: 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.

⚠ **CAUTION**: A mechanic using a service procedure or tool which has not been recommended by Hendrickson must first satisfy himself that neither his safety nor the vehicle's safety will be jeopardised by the method or tool selected. Individuals deviating in any manner from the provided instructions assume all risks of consequential personal injury or damage to equipment.

NOTICE: When welding to or on the axle, take every caution to prevent bearing damage. When grounding welding equipment to the axle, take precautions to stop current from passing through the wheel bearings. A connection that places a wheel bearing between the ground cable connection and the weld area can damage the bearing by electric arcing.

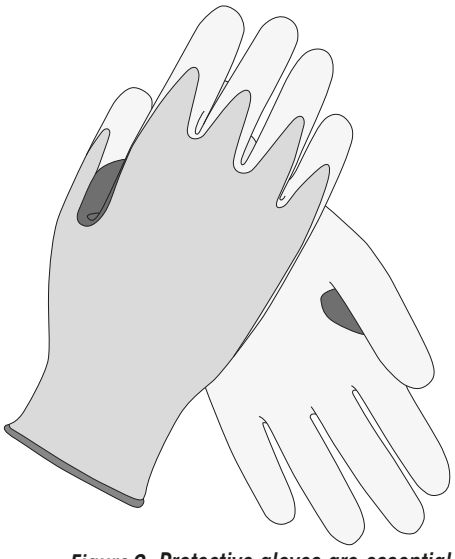


Figure 2: Protective gloves are essential

Brake Linings

⚠ **CAUTION**: Brake linings contain non-asbestos fibres. Wear approved eye protection and respirator when working on or near the brakes to prevent a possible health hazard.

⚠ **WARNING**: Avoid creating dust. Dust from brake pads and/or parts may be hazardous to the respiratory system.

The following precautions and considerations should be applied when handling these materials:

- Compressed air or dry brushing should never be used for cleaning brake assemblies or work area.
- Hendrickson recommends that workers doing brake work should take steps to minimise exposure to airborne brake lining particles. Proper procedures to reduce exposure include working in well ventilated area, segregation of areas where brake work is done, use of local filtered ventilation systems or use of enclosed cells with filtered vacuums.
- Workers should wash before eating, drinking or smoking; shower after working and should not wear work clothes home. Work clothes should be vacuumed and laundered separately without shaking.
- While Hendrickson does not offer asbestos brake linings, brake linings supplied by others may contain asbestos. Follow workshop, local, state and national safe practices as appropriate.

IMPORTANT: A significant design feature of Hendrickson INTRAAX® axles is that the hub assemblies do not require removal to access foundation drum brake components. This includes removal and replacement of camshafts and cam tubes.

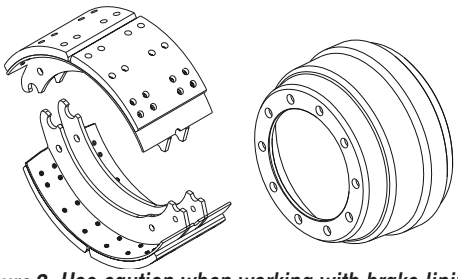


Figure 3: Use caution when working with brake linings

CONTACTING HENDRICKSON AND WARRANTY

Contact Hendrickson customer service before performing any warranty related repairs. Refer to the latest applicable warranty statements for more details regarding Hendrickson warranty, which are available on the www.hendrickson.com.au website.

Contact Hendrickson customer service for technical assistance as needed. To do so, several options are available. Prior to contacting Hendrickson, it will be best to have the following information about your Hendrickson suspension available (all that apply):

- Suspension ID Tag information. Get the suspension model number, suspension serial number and approximate number of suspension kilometres.
- Vehicle VIN number. (Refer to trailer OEM manual for VIN plate location.) Get the trailer type (van, refrigerated, flat bed, etc.…), manufacturer, VIN (vehicle identification number) and in-service or manufacture date.
- If applicable, description of the system problem, part number and/or part description of the reported non-functioning part.
- What troubleshooting and/or measurements have been performed?
- What service data literature do you have or need?
- Digital photos of suspension and damaged areas.

Detailed contacts for Hendrickson are available on the www.hendrickson.com.au website. Hendrickson Customer Service is best contacted via email customerservice@hendrickson.com.au or via phone 03 8792 3697.

PREPARING TRAILER FOR SERVICE

IMPORTANT: Do not repair a suspension or any component that is under warranty without first contacting Hendrickson Customer Service.

⚠ **WARNING**: To prevent serious eye injury, always wear safety glasses when performing trailer maintenance and service.

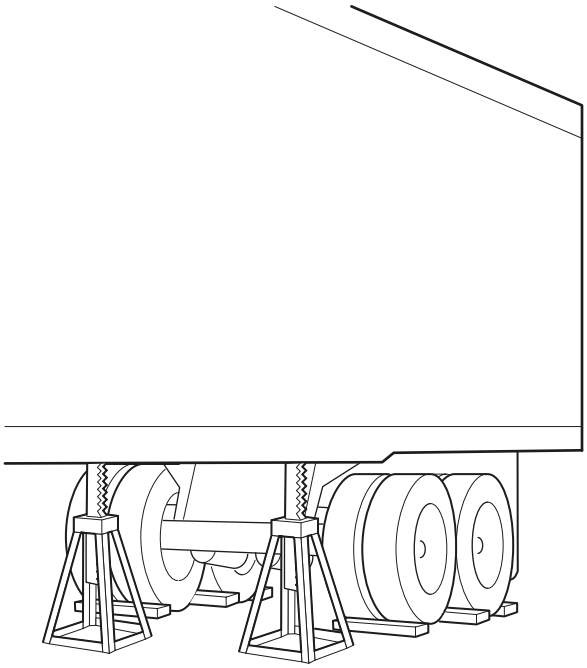


Figure 4: Trailer Preparation

Before beginning any work on a trailer suspension system, the following steps help to ensure conditions are safe. Refer to "General Service Notes" on page 4.

1. Park the trailer on a level, debris-free surface.
2. Set the trailer parking brakes.
3. To prevent the trailer from moving, chock the wheels of an axle not being raised.
4. Exhaust the air from the trailer suspension.
5. Release the trailer parking brakes.
6. Raise trailer with a jack until un-chocked wheels clear the work surface.
7. Support the raised trailer with suitable load-rated safety stands.

⚠ **WARNING**: Do not work under a trailer supported only by jacks. Jacks can slip or fall over, resulting in serious personal injury.

WHEEL END IDENTIFICATION

HUBCAP MARKING

Hubcaps on Hendrickson axles will usually be marked with the [H] logo coupled with an identifying label. The label will specify what type of wheel end is fitted to the axle, such as HXL5® or HXL7®. (Refer Figure 5.) For details on how to identify Hendrickson bearing packages refer to "Bearing Package Identification" on page 9.

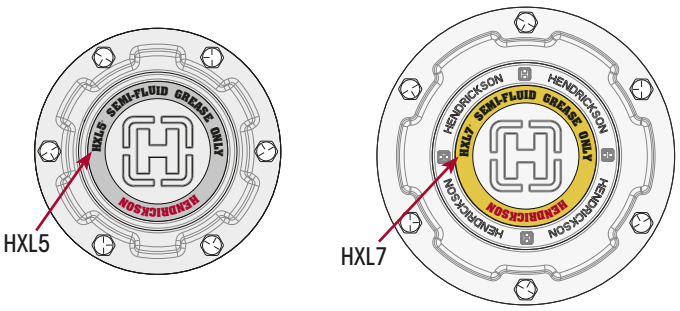


Figure 5: HXL5 and HXL7 Identifying Hubcap Label

SPINDLE IDENTIFICATION

Hendrickson suspensions and axles may be available with either HN (Tapered) or HP (Parallel) spindles. A relative comparison of spindle type can be made by examining hubcap size and end of spindle. HN spindle nut thread is around 67 mm, while the HP spindle nut thread is around 89 mm. Refer Figure 6 and Figure 7.
Tip: HXL7 is only available with HP parallel spindle.

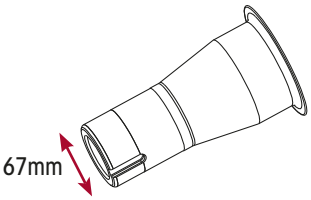


Figure 6: HN Tapered Spindle

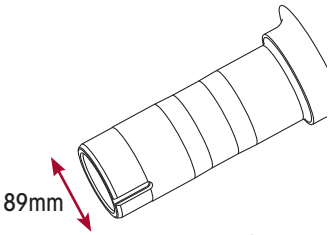


Figure 7: HP Parallel Spindle

PCD – PITCH CIRCLE DIAMETER

The Pitch Circle Diameter (PCD) is the diameter of the imaginary circle that passes through the centre of all the wheel studs. Truck and trailers usually have eight or ten wheel studs, which makes measuring PCD straightforward. Measure from the centre of one stud across to the centre of the stud diametrically opposite on the opposite side of the hub. Refer to Figure 8. Common PCD dimensions are 275mm for 8-Stud and 285mm (11.25") or 335mm for 10-stud wheel ends.

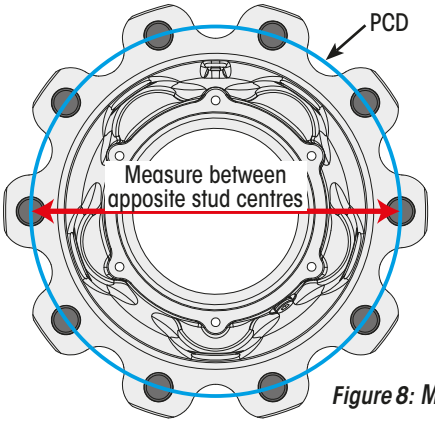


Figure 8: Measuring PCD

IRON OR ALUMINIUM?

It can be difficult to determine if a hub is iron or aluminium if it is covered in paint or dirt. One of the easiest checks is to use employ a magnet, which will be attracted to iron hubs.

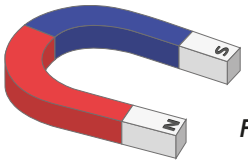


Figure 9: Magnets Attract Iron

DUCTILE IRON OR ADI?

Austempered Ductile Iron (ADI) is a specially treated ductile iron that gives it greatly increased tensile strength and toughness. Components especially designed to make use of this extra strength can be made lighter and stronger that aluminium. ADI hubs use a unique construction that removes excess metal and gains durability. They can most easily be identified by the scalloping around the wheel studs. Refer Figure 9 and Figure 10.

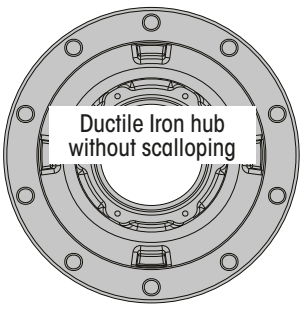


Figure 10: Ductile Iron Hub

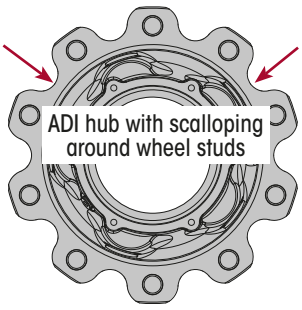


Figure 11: ADI Hub

WHEEL-END TYPES

NOTICE: Take into account the wheel end types prior to preparing trailer for service.

Five basic types of hub/wheel-end assemblies can be found on Hendrickson suspensions. Later model hubs can be identified by the label on the hubcap. Refer to the hub assembly component identification diagrams, if you are having difficulty identifying hubs. Suspension identification is set out in detail in Hendrickson Manual 97117-151.

Irrespective of the type of wheel end, Hendrickson recommend the use of a calibrated torque wrench to set the torque of all wheel end systems. This delivers consistent and repeatable wheel end settings across small and large workshops.

NOTICE: Accessory-type hubcaps, such as the chrome "top hat" style hubcap covers, increase wheel-end temperatures during operation and are not recommended for use on Hendrickson Extended Life HXL5 or HXL7 wheel ends.

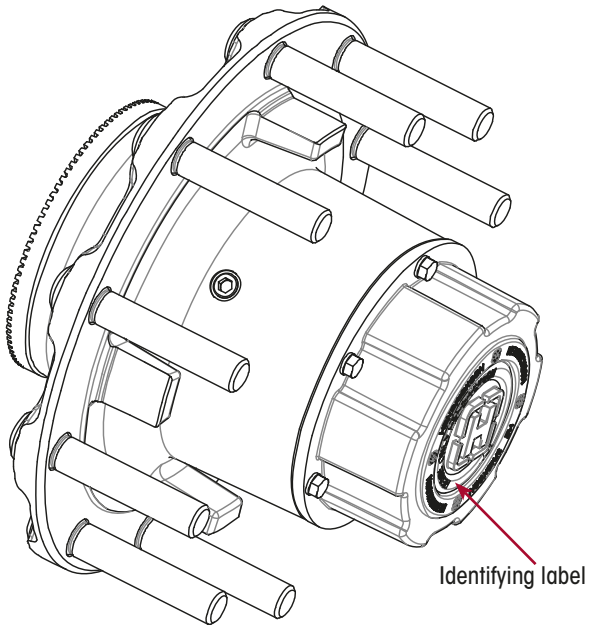


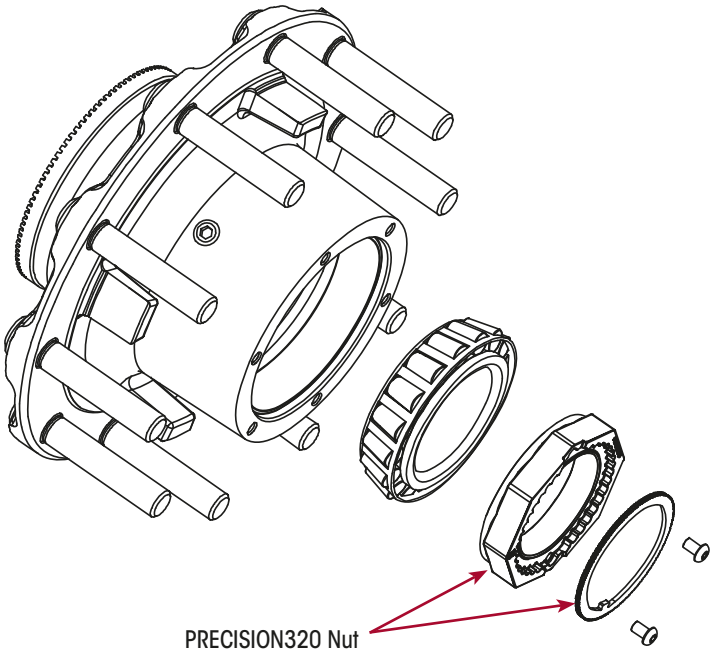
Figure 12: Hub Identification

BEARING PACKAGE IDENTIFICATION

The following is quick guide to wheel hub identification. More detailed information is available in the Introduction of each hub in "Section 3 – Hub Assemblies".

HXL7® Hendrickson Extended-Life

HXL7® systems features ductile iron, ADI or aluminium hub and synthetic semi-fluid grease. Spindle type includes HP (parallel) only. All components are field serviceable.



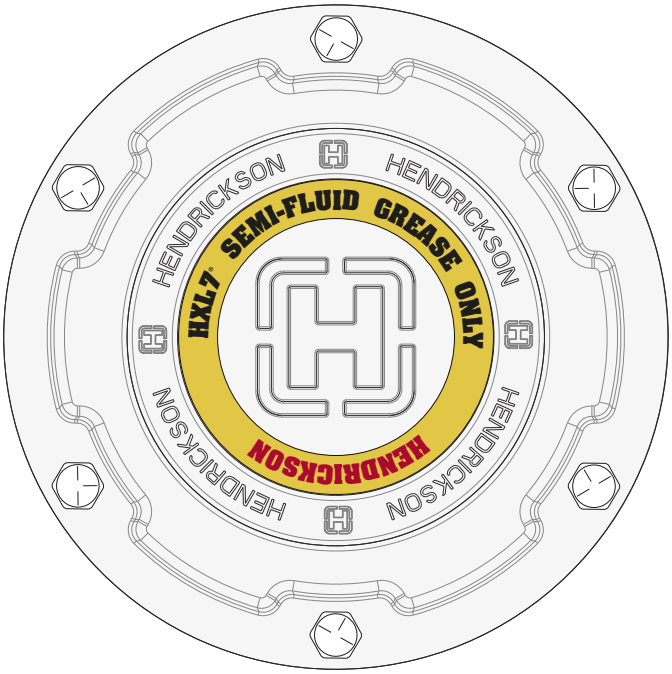
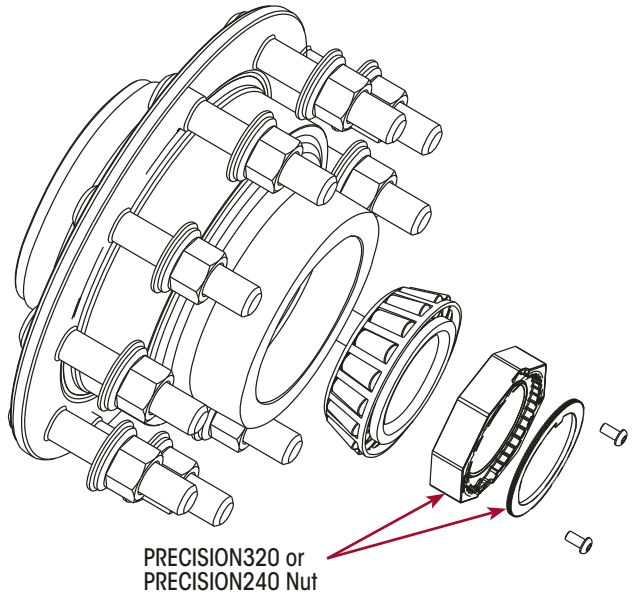


Figure 13: HXL7 HP Hubcap

The gold coloured hubcap label will show HXL7 and include the phrase Semi-Fluid Grease Only. If this is not visible, then removing the hubcap will reveal a HP spindle and the Hendrickson two-piece PRECISION320™ nut system with two locking screws.

HXL5® Hendrickson Extended-Life

HXL5® systems feature synthetic semi-fluid grease. Spindle type includes both HP (parallel) and HN (tapered). All components are field serviceable. They use either the PRECISION320™ nut system for HP spindles or the PRECISION240® nut system for HN spindles.



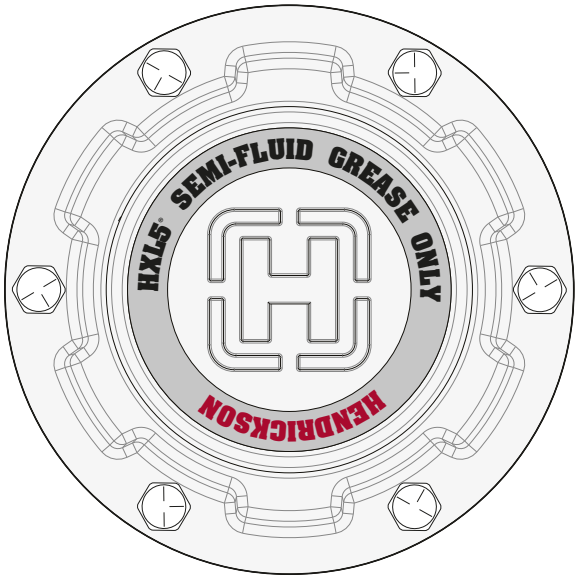
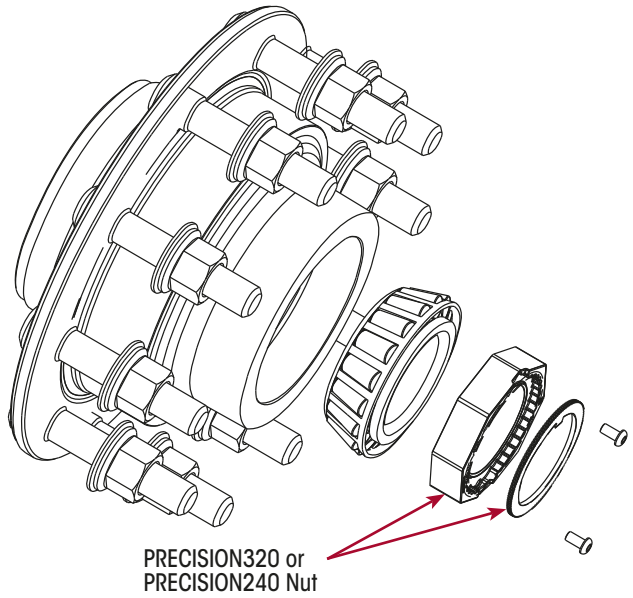


Figure 14: HXL5 HP or HN Hubcap

The silver coloured hubcap label will show HXL5 and include the phrase Semi-Fluid Grease Only. If this is not visible, then removing the hubcap will reveal a Hendrickson two-piece PRECISION nut system, with two locking screws, along with red semi-fluid grease.

HXL2™ Hendrickson Extended-Life

HXL2™ systems feature standard lithium wheel bearing grease. Spindle type includes both HP (parallel) and HN (tapered). All components are field serviceable. They use either the PRECISION320™ nut system for HP spindles or the PRECISION240® nut system for HN spindles.



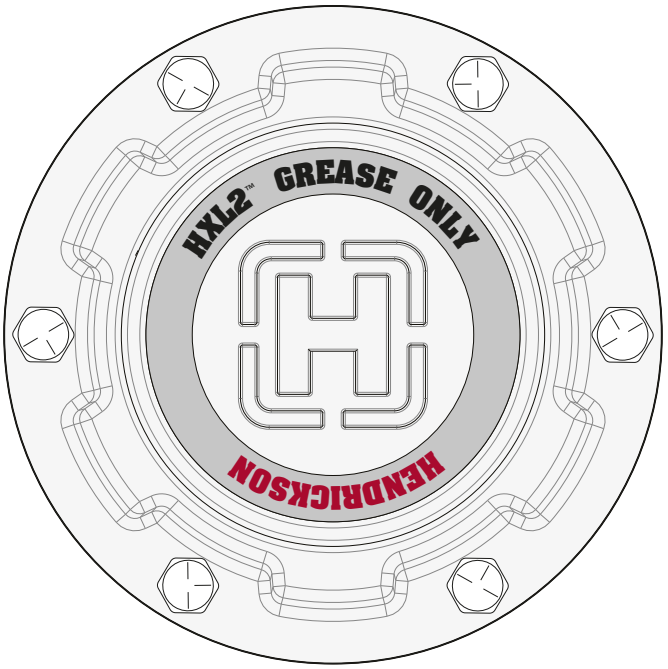
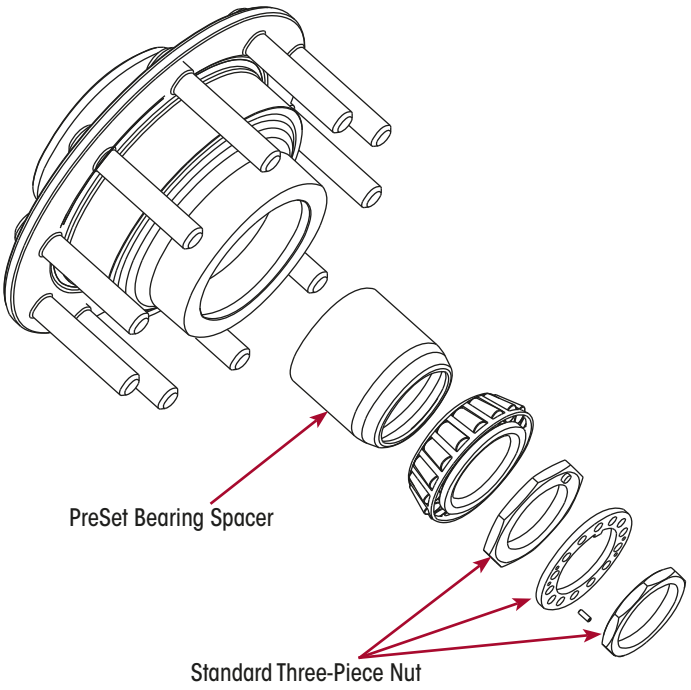


Figure 15: HXL2 HP or HN Hubcap

The silver coloured hubcap label will show HXL2 and include the phrase Grease Only. If this is not visible, then removing the hubcap will reveal a Hendrickson two-piece PRECISION nut system, with two locking screws, along with standard lithium grease.

PreSet

The hub, seal, spacer and bearings are factory assembled and installed as a complete sub-assembly, eliminating the need for individual seal and bearing installation and adjustment. All components are field serviceable. Spindle types include HN (tapered) or HP (parallel).



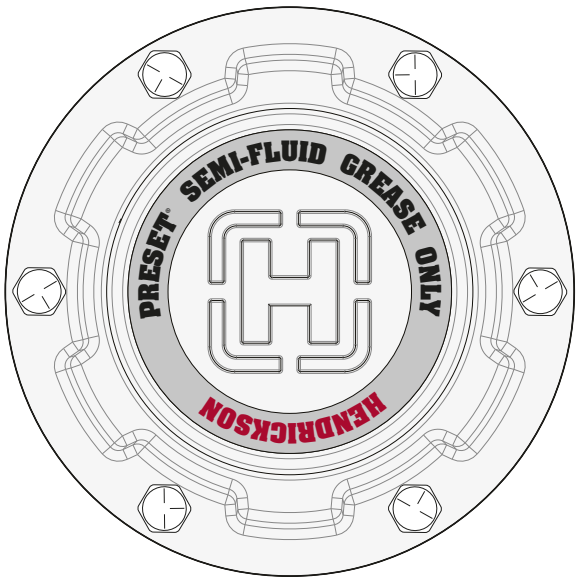
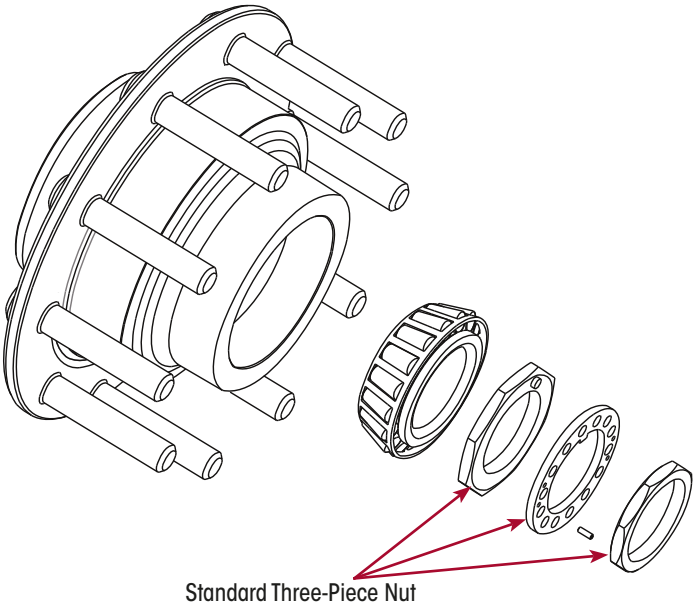


Figure 16: PreSet HP or HN Hubcap

The silver coloured hubcap label will show PreSet and include the phrase Semi-Fluid Grease Only. If this is not visible, then removing the hubcap will reveal either a HP or HN spindle and a basic three-piece nut system with one grub screw. The bearings are made to a higher tolerance than Standard Service bearings, but visually the only difference is the bearing PreSet spacer. Sometimes these will be fitted with different locking nut systems, but these are not standard Hendrickson supply.

Hendrickson Standard Service

The Standard Service wheel end is a conventional wheel end (with hub, seal, lubricant and bearings) that is factory installed by Hendrickson. Spindle types include HN (tapered) or HP (parallel).



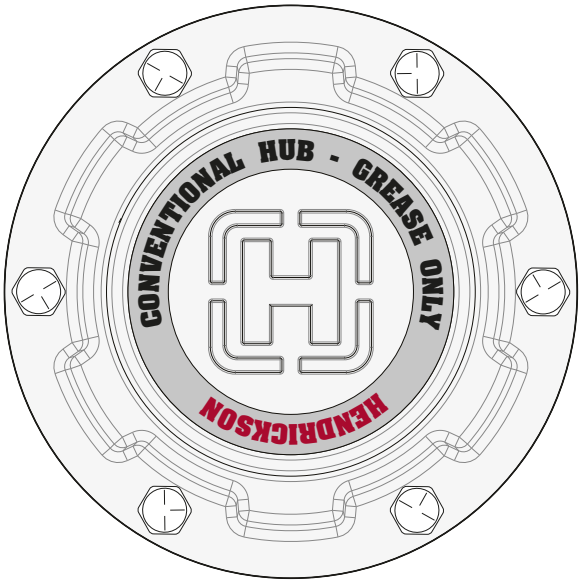
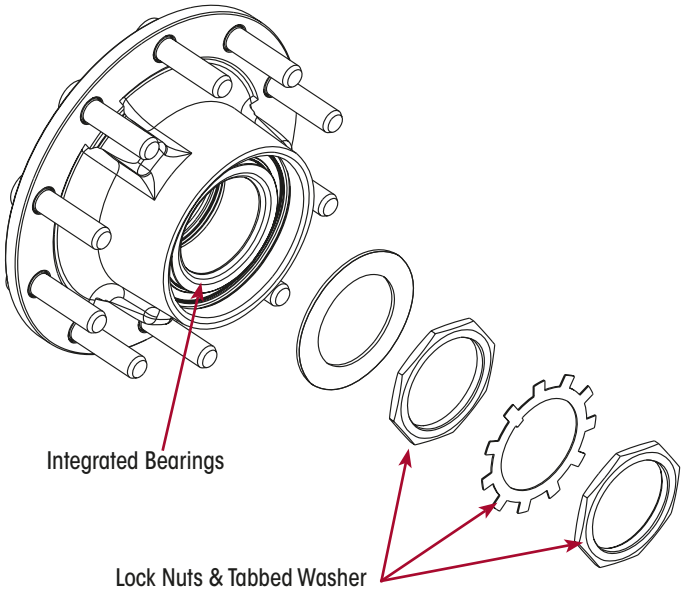


Figure 17: Standard Service HP or HN Hubcap

The silver coloured hubcap label will show Conventional Hub Grease Only. If this is not visible, then removing the hubcap will reveal either a HP or HN spindle and a basic three-piece nut system with one grub screw. Sometimes these will be fitted with different locking nut systems, but these are not standard Hendrickson supply.

Hendrickson Unitized System™ (HUS™)

HUS™ is a unitised hub system, which is fully integrated, pre-adjusted and permanently sealed and lubricated. Service parts are no longer available through Hendrickson. Please contact Hendrickson to learn about the options available to upgrade your axle to a newer spindle design. Alternatively, contact SKF directly to source service parts.



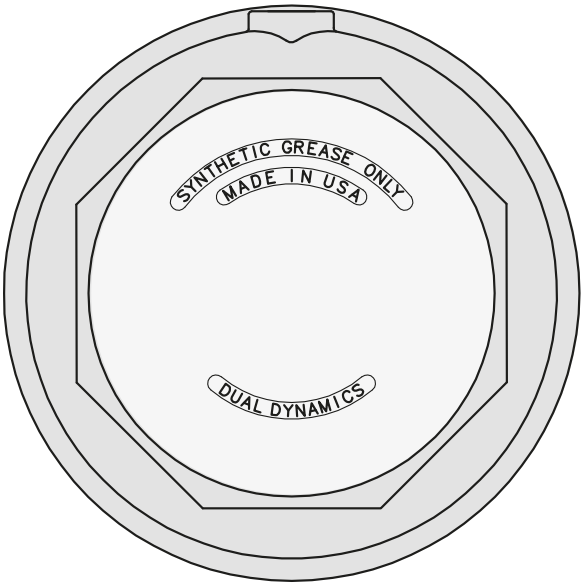


Figure 18: HUS Screw-On Hubcap

HUS hubs may be fitted with three distinct types of hubcaps and will not always have suitable identification. However, removing the hubcap will reveal a three-piece locknut and tabbed washer system.

SECTION 2 – INSPECTION

SECTION CONTENTS

HUB INSPECTION AND ROUTINE MAINTENANCE

The following inspections are a guide for driver checks and workshop maintenance. Trailer use and operating conditions vary greatly depending on vocation (type of work performed). Therefore, trailer wheel-end inspection and routine maintenance must be tailored for each vocational use. Off-road use, dirt, dust, grain, corrosive substances, temperature and humidity extremes will all have an impact on maintenance and inspection interval requirements.

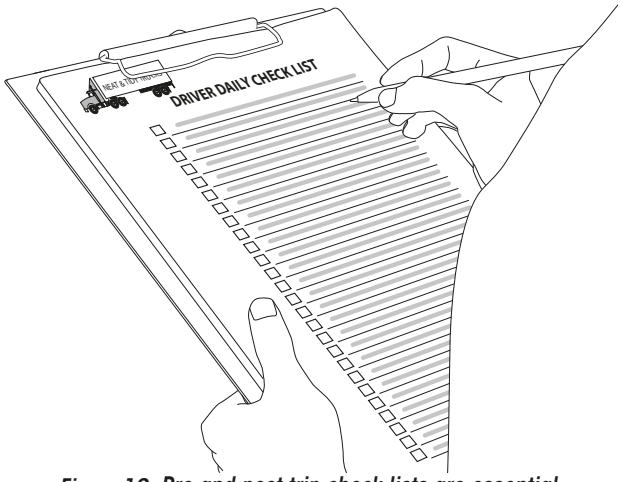


Figure 19: Pre and post trip check lists are essential

OPERATOR/DRIVER INSPECTION

Hendrickson recommends that the vehicle operator perform daily pre-trip and post-trip inspections of the wheel ends as an essential part of the routine preventative maintenance schedule.

Pre-Trip Inspection

With the vehicle parked on level ground and with the park brake applied, walk around the vehicle and visually inspect each wheel-end assembly for any evidence of the following defects:

1. The presence of lubricant around the brake components, hubcap or on the inside of the wheel.
2. Loose, damaged or missing hubcaps.
3. Loose, damaged or missing fasteners.
4. If hubs are oil filled, check for adequate oil level.
5. Check wheel end sensors/monitors for fault status (if fitted).

If any of the above conditions are found, take the trailer out of service until the item can be repaired.

Post-Trip Inspection

Post trip inspection should be performed immediately after parking the vehicle (i.e. with the vehicle on level ground and with the park brake applied), walk around the vehicle and visually inspect each wheel-end assembly for the following items:

1. The presence of lubricant around the brake components, hubcap or on the inside of the wheel.
2. Loose, damaged or missing hubcaps.
3. Loose, damaged or missing fasteners.
4. Excessive hub temperature. (Refer "Notice".)
5. If hubs are oil filled, check for adequate oil level.
6. If fitted, check wheel end monitor status.

If any of the above conditions are found, the vehicle should be placed out of service until the item can be repaired.

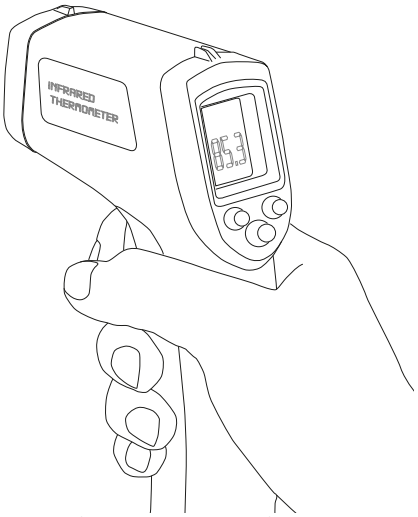


Figure 20: If possible use an infrared thermometer

NOTICE: The most effective and safest way to check hub temperatures is with an infrared thermometer. Exact temperatures will vary depending on conditions but should be consistent across all the axles. However, the relative temperatures can also be checked simply by carefully placing the back of the hand against each hubcap. Do not touch hub if significant radiant heat indicates that the temperature is likely to burn.

Temperatures should be reasonably consistent across all wheel ends. If an individual hub exhibits a significantly higher temperature in comparison to others on the trailer, a detailed inspection of the affected hub is required.

MAINTENANCE INSPECTION

HXL5® and HXL7® Hub

At regular intervals, the HXL5® and HXL7® hub assembly should be checked for seal leaks and smooth rotation. In addition to the intervals listed below, thorough inspections should be done at each brake reline, since the wheel end will be dismantled enough to easily make these inspections. Inspect wheel studs, clean hub/wheel mating surfaces and drum/wheel pilots whenever brake drums are removed. In addition to the inspection at brake service, always maintain current shop preventative maintenance as well as pre and post-trip inspection practices.

Every Month

Visually inspect the back of hub and hubcap for hub seal and gasket leakage. Refer to the section titled "Checking For Seal Leaks" on page 22 for complete inspection details. Use magnet to activate wheel end monitor (if fitted) and check that the status is okay (green light).

Every Three Months

Visually inspect the back of hub and hubcap for hub seal and gasket leakage. Refer to the section titled "Checking For Seal Leaks" on page 22 for complete inspection details. Use a magnet to activate the wheel end monitor (if fitted) and check that the status is okay (green light). Check hub for smooth rotation. Refer to the section titled "Checking For Smooth and Quiet Rotation" on page 23 for complete inspection details.

HXL5 & HXL7	Operator		Maintenance	
	Pre-Trip	Post-Trip	Monthly	Quarterly
Loose, damaged or missing hubcaps or fasteners	X	X	X	X
Excessive hub temperature		X		
Check hubcap and hub seal for leaks	X	X	X	X
Under vehicle inspection of hub for leaks or damage			X	X
Check Wheel End Sensor/Monitor status (if fitted)	X	X	X	X
Check for hub smooth rotation				X

NOTICE: There is no definite interval for bearing service or replacement on HXL5 or HXL7 wheel ends. They are designed to require only regular inspection maintenance during the warranty period. Further servicing, such as bearing replacement or cleaning and lubricant replacement, will vary depending on vehicle application and expected residual life.

There is no need for regular checking of end play during the warranty period, unless an issue with the wheel end has been found during the normal inspection procedure. After the hubs have been rebuilt, using the procedure detailed in this publication, they should be treated as Conventional hubs and free play should be checked annually.

HXL2™ Hub

At regular intervals, the HXL2™ hub assembly should be checked for seal leaks and smooth rotation. In addition to the intervals listed below, thorough inspections should be done at each brake reline, since the wheel end will be dismantled enough to easily make these inspections. Inspect wheel studs, clean hub/wheel mating surfaces and drum/wheel pilots whenever brake drums are removed. In addition to the inspection at brake service, always maintain current shop preventative maintenance as well as pre and post-trip inspection practices.

Every Month

Visually inspect the back of hub and hubcap for hub seal and gasket leakage. Refer to the section titled "Checking For Seal Leaks" on page 22 for complete inspection details.

Every Three Months

Visually inspect the back of hub and hubcap for hub seal and gasket leakage. Refer to the section titled "Checking For Seal Leaks" on page 22 for complete inspection details. Use a magnet to activate the wheel end monitor (if fitted) and check that the status is okay (green light). Check hub for smooth rotation. Refer to the section titled "Checking For Smooth and Quiet Rotation" on page 23 for complete inspection details.

Every Two Years or 300,000 km

Remove and disassemble the hub assemblies. Clean and inspect all components, replace as required. Replace seal and repack bearings with fresh lubricant.

HXL2	Operator		Maintenance		
	Pre-Trip	Post-Trip	Monthly	Quarterly	300,000 km
Loose, damaged or missing hubcaps or fasteners	X	X	X	X	X
Excessive hub temperature		X			
Check hubcap and hub seal for leaks	X	X	X	X	X
Under vehicle inspection of hub for leaks or damage			X	X	X
Check for hub smooth rotation				X	X
Clean and inspect hub and wheel bearings					X
Repack bearings with fresh grease					X
Replace hub seal					X

PreSet Hub

At regular intervals, PreSet hub assemblies should be checked for seal leaks and smooth rotation. In addition to the intervals listed below, thorough inspections should be done at each brake reline, since the wheel end will be dismantled enough to easily make these inspections. Inspect wheel studs, clean hub/wheel mating surfaces and drum/wheel pilots whenever brake drums are removed. In addition to the inspection at brake service, always maintain current shop preventative maintenance as well as pre and post-trip inspection practices.

Every Month

Visually inspect the back of hub and hubcap for hub seal and gasket leakage. Refer to the section titled "Checking For Seal Leaks" on page 22 for complete inspection details.

Every Three Months

Visually inspect the back of hub and hubcap for hub seal and gasket leakage. Refer to the section titled "Checking For Seal Leaks" on page 22 for complete inspection details. Check for hub for smooth rotation. Refer to the section titled "Checking For Smooth and Quiet Rotation" on page 23 for complete inspection details.

Every Five Years or 800,000 km

PreSet hubs have a recommended service interval of 800,000 km or five years for on-highway use. Vehicles in severe duty applications will need to be serviced more often. This service includes cleaning and inspecting hubs, as well as replacement of bearings, PreSet spacer, seals, spindle nuts and grease.

PreSet	Operator		Maintenance		
	Pre-Trip	Post-Trip	Monthly	Quarterly	800,000 km
Loose, damaged or missing hubcaps or fasteners	X	X	X	X	
Excessive hub temperature		X			
Check hubcap and hub seal for leaks	X	X	X	X	
Under vehicle inspection of hub for leaks or damage			X	X	
Check for hub smooth rotation				X	
Clean and inspect hub					X
Replace lubricant with fresh semi-fluid grease					X
Replace bearings, lock nuts, spacer and hub seal					X

Conventional Hub

At regular intervals, the conventional hub should be checked for seal leaks, smooth rotation and end play. In addition to the intervals listed below, thorough inspections should be done at each brake reline, since the wheel end will be dismantled enough to easily make these inspections. Inspect wheel studs, clean hub/wheel mating surfaces and drum/wheel pilots whenever brake drums are removed. In addition to the inspection at brake service, always maintain current shop preventative maintenance as well as pre and post-trip inspection practices.

Every Month

Visually inspect the back of hub and hubcap for hub seal and gasket leakage. Refer to the section titled "Checking For Seal Leaks" on page 22 for complete inspection details.

Every Three Months

Visually inspect the back of hub and hubcap for hub seal and gasket leakage, and check for smooth rotation. Refer to the sections "Checking For Seal Leaks" on page 22 and "Checking For Smooth and Quiet Rotation" on page 23 for complete inspection details.

Every Twelve Months

Remove and disassemble the hub assemblies. Clean and inspect all components, replace as required. Replace seal and repack bearings with fresh lubricant.

Conventional	Operator		Maintenance		
	Pre-Trip	Post-Trip	Monthly	Quarterly	Annually
Loose, damaged or missing hubcaps or fasteners	X	X	X	X	X
Oil level (If oil lube)	X	X	X	X	X
Excessive hub temperature		X			
Check hubcap and hub seal for leaks	X	X	X	X	X
Under vehicle inspection of hub for leaks or damage			X	X	X
Check for hub smooth rotation				X	X
Clean and inspect hub and wheel bearings					X
Repack bearings with fresh grease					X
Replace hub seal					X

HUS™ Hub

At regular intervals, the HUS™ hub should be checked for seal leaks, smooth rotation and end play. In addition to the intervals listed below, thorough inspections should be done at each brake reline, since the wheel end will be dismantled enough to easily make these inspections. Inspect wheel studs, clean hub/wheel mating surfaces and drum/wheel pilots whenever brake drums are removed. In addition to the inspection at brake service, always maintain current shop preventative maintenance as well as pre and post-trip inspection practices.

Every Month

Visually inspect the back of the hub and the hubcap for leakage. Refer to the section titled "Checking For Seal Leaks" on page 22 for complete inspection details. Use magnet to activate wheel end monitor (if fitted) and check that the status is okay (green light).

Every Three Months

Visually inspect the back of the hub and the hubcap for leakage and check the HUS hub for smooth rotation. Refer to the section titled "Checking For Smooth and Quiet Rotation" on page 23 for complete inspection details.

HUS	Operator		Maintenance	
	Pre-Trip	Post-Trip	Monthly	Quarterly
Loose, damaged or missing hubcaps or fasteners	X	X	X	X
Excessive hub temperature		X		
Check hubcap and hub seal for leaks	X	X	X	X
Under vehicle inspection of hub for leaks or damage			X	X
Check Wheel End Sensor/Monitor status (if fitted)	X	X	X	X
Check for hub smooth rotation				X

POST FLOOD MAINTENANCE

Axles that have been subjected to flood waters may need to be dismantled, cleaned, inspected and packed with fresh lubricant. Water does not need to get all the way into the centre of the hub to cause damage. Even a little water leaking past the hub seal could cause the inner bearing to fail over time.

If there is any evidence of moisture in the hub, it is recommended that the spindle end filter be replaced.

Flood water can contain bacterial and other contaminants that may be hazardous to your health. Wear protective equipment, such as gloves, if servicing a truck or trailer that has been subjected to flooding.

AXLE SPINDLE INSPECTION

Identification

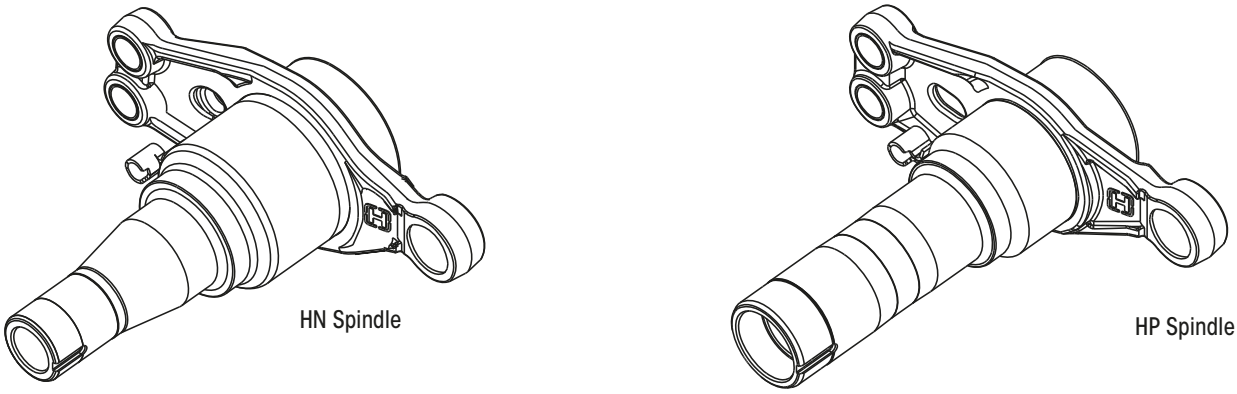


Figure 21: Spindle Identification

Two types of spindle design are currently in production on Hendrickson trailer suspensions. The spindles are referred to through-out this document as HN or HP.
Refer to Figure 21.

- HN is a tapered spindle design where the inner bearing is larger in diameter than the outer bearing.
- HP is a parallel design where both inner and outer bearings are the same diameter.

NOTICE: HUS® hubs have a parallel type spindle design but they are dimensionally unique and cannot be fitted with a HP type hub assembly. This type of spindle is no longer in production.

AXLE SPINDLE INSPECTION & SPECIFICATIONS

Before placing an axle back into service, it should be inspected for wear, fatigue, cracks and damage.

Hendrickson axle design uses induction hardening and friction-welded spindles to ensure that any wear is minimal, greatly increasing axle life and reducing service costs. However, it is still important to ensure that wheel ends and spindles are meticulously cleaned and inspected to avoid collapse or breakdown that could cause serious injury or death.

Spindle wear can be caused by high group axle loads, bearing spalling, axle journal fretting, prolonged off-road operation, high mileage, extended service life or a combination of any of these. Wheel end, axle and spindle inspection intervals therefore need to be adapted to the vocation, condition and application of the truck or trailer. Refer to the following procedure and Figure 22.

1. Using a lint free cloth, steel wire brush and suitable cleaning solvent, clean the spindle threads, bearing journals, spindle shoulder and hub seal journal.
2. Visually inspect the spindle thread, bearing journals, spindle shoulder and hub seal journal for nicks, roughness, spalling, corrosion, over heating discolouration, weld splatter, impact damage or wear.
3. Use fine emery cloth or wet/dry paper to completely prepare bearing journal and seal seating areas. Use a file to remove any ridge or burr.
4. Most journal wear will occur on the underside of the spindle. Check for wear and ridges in this area to ensure the bearing cones do not get caught or bind. File and/or linish to remove any lip present.
5. Clean spindle thread and keyway with a wire brush and inspect. Minor dents and deformation may be rectified with a thread file or die nut. Check by running the nut up and down thread and ensure it runs freely. However, the axle must be replaced if there is excessive wear or damage to the thread.

6. The axle tube, beams, brake spider and spindle should be closely inspected for any signs of cracking. If there is any doubt, then carry out detailed testing using ultrasonic, fluorescent dye or magnetic particle inspection. The axle must be replaced if any cracks are found in these critical areas. Any axle involved in heavy impacts should likewise be inspected to ensure that there are no microscopic cracks that could cause axle failure, especially near the brake spider.
7. A quick check of the spindle seal journal can be made by momentarily putting the seal onto the spindle and ensuring that it is a tight and even fit. A severely grooved spindle at the seal surface may be repaired with a sleeve.

⚠ **WARNING**: The axle must be replaced if there are any cracks found in the axle tube or spindle. Do not repair by welding. Placing it back into service after a weld repair can trigger a catastrophic failure which could result in serious injury or death.

Worn Bearing Journals

An axle that has worn bearing journals does not necessarily need replacing, depending on expected service life and operating conditions. In some applications, if the spindle has considerable, but not excessive, journal wear it may be returned to service with adjusted service intervals.

Worn journals will cause more radial movement of the hub on the spindle. This movement can cause misalignment of wheel bearings or place extra momentary load on the bearings, which may shorten their service life. Importantly it will create more relative movement within the hub seal and thus shorten its usable life.

This should be accommodated by using a premium synthetic grease and the best seal available. A shortened inspection and service interval, depending on usage, will then guard against possible component failure.

Wheel end inspection should include "Checking For Seal Leaks" on page 22, "Checking For Smooth and Quiet Rotation" on page 23 and "Checking End Play" on page 24.

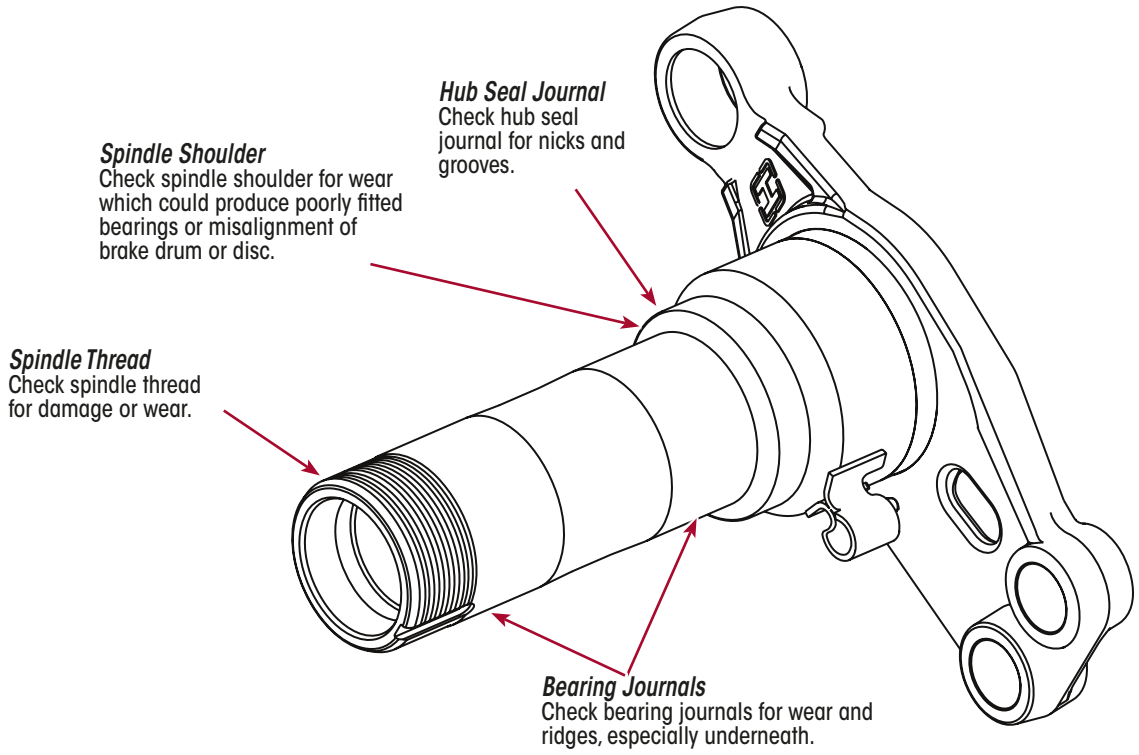


Figure 22: Spindle Inspection

CHECKING FOR SEAL LEAKS

The hub assembly is filled with grease or oil 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.

Major leaks can be obvious, as it will cause lubricant to coat brake surfaces and the inside of wheel assemblies. Temporarily remove dust shield inspection grommets (if fitted) to inspect brake linings for oil or grease. However, if a smaller leak is suspected, it will require complete removal of the brake dust shields for proper inspection.

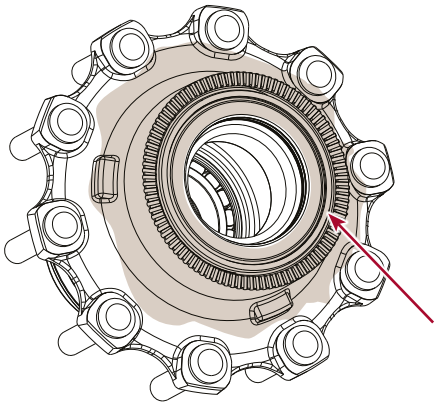


Figure 23: Check back side of hub for grease seal leak

To check for leaks, look at the inboard side of the hub. Refer to Figure 23. 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.

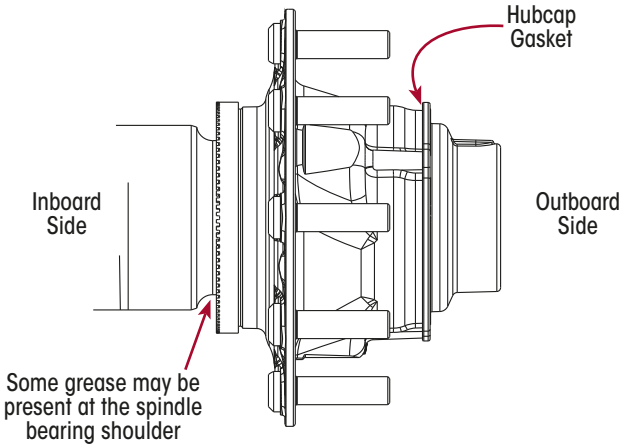


Figure 24: Wipe grease from spindle bearing shoulder

A small amount of lubricant may also appear at the spindle bearing shoulder to hub joint. Refer to Figure 24. This is also normal and does not necessarily indicate a seal leak. It should be wiped clean to minimise any accumulation of dirt.

IMPORTANT: Pressure or steam washing should be avoided around the hub seal because 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 or grease may be spattered on the dust shield, brake shoes or brake drum. If this is the case, the seal and other components will need to be replaced.

IMPORTANT: If the vehicle does not have dust shields or whenever dust shields are removed, clean excess dirt and dust from the seal area on the hub and spindle to ensure any build-up does not cause excessive seal wear.

CHECKING FOR SMOOTH AND QUIET ROTATION

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

- Bearing degradation
- Damaged hub seal
- Moisture ingress
- Unwanted debris

IMPORTANT: A reasonable assessment can be performed without removing tyres and rims. However, this procedure is best performed with hub only.

1. Ensure trailer is secure per "Preparing Trailer For Service" on page 7.
2. Back off brake adjustment to ensure there is no brake drag.

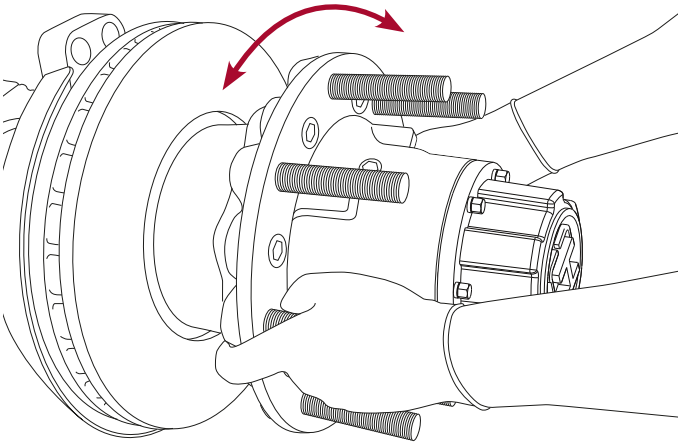


Figure 25: Check hub for smooth rotation

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. If rotation feels normal, return to previous procedure or reassemble and restore trailer to normal operation. If rotation sounds noisy, see "Checking End Play" on page 24.

⚠ **WARNING**: If rotation feels rough, sounds noisy, or does not rotate freely. Take corrective action. Do not place the vehicle back into service.

CHECKING END PLAY

IMPORTANT: Rocking the wheel with a lever or iron bar may be used to check relative wheel end movement, but it is not a good indicator of end play. Any movement detected this way will be a combination of end play and spindle wear, which is multiplied by the diameter of the wheel.

This procedure should be performed when:

- Issues are identified during "Checking For Smooth and Quiet Rotation" on page 23.
- After installing hub and when instructed as part of ***Inspecting Hub Installation*** procedure.

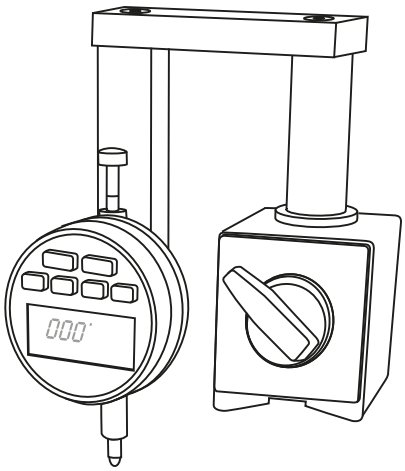


Figure 26: Digital Dial Gauge and Stand

IMPORTANT: The following instructions are general in nature. Actual measured end play will vary depending on the type of bearing system and whether it is a new installation or one that has been in service for some time. Wheel bearing end play may increase slowly with use.

1. If not already done so:
   A. Perform "Preparing Trailer For Service" on page 7.
   B. Remove wheel assembly.
   C. Disengage brakes. If drum brake, it is recommended that the drum be removed. If air disc brakes, remove brake pads per manufacturer's recommended procedures.

NOTICE: Ensure disc brake rotor does not contact the brake carrier when checking end play, which would prevent seeing a correct reading.

IMPORTANT: End play is best checked with the brake drum removed, but it can still be checked with drum installed. If installed, make sure all brake drum wheel fasteners are installed and tightened to manufacturers specifications and that the slack adjusters are backed right off before checking end play.

   D. Clean around hubcap to ensure that no dirt, grime or dust enters hub with cap removed. A wire brush may be necessary to effectively clean around hubcap. Also, clean around the mudguard spray suppressants to ensure particles do not drop down into the open hub during service.
   E. If oil lube, drain oil from wheel end. Do not reuse oil to avoid possible contamination or constituent degradation.
   F. Remove hubcap and discard gasket.
2. Ensure hub 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.

NOTICE: 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.

NOTICE: Repeated push-pull motions can dislodge the bearing rollers from their fully seated position and result in a false end play reading less than the actual end play in the wheel end. If subsequent readings are necessary, hub must be rotated at least 5 revolutions to reseat the bearings.

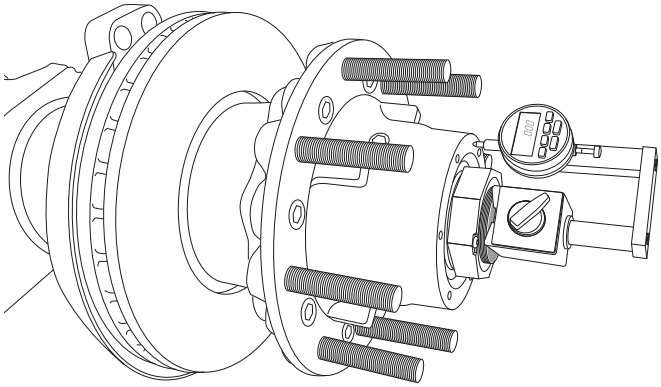


Figure 27: Attaching Dial Indicator

4. Attach dial indicator with magnetic base to flat surface at end of spindle. Ensure the base is securely mounted to the spindle end and does not rock or move. Refer to Figure 27.
5. Adjust dial indicator so its pointer line of action is parallel to spindle axis and touches the hubcap mounting surface on the hub. Make sure the plunger is centred between hubcap bolt mounting holes and contacts the hub in an area that is smooth and fully machined. Avoid any regions that have scratches, gouges or that are not cleaned up.
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 0.1524 mm (0.006") in each direction. If indicator bottoms out, readjust until it is free to move 0.1524 mm in both directions.
7. Zero indicator.

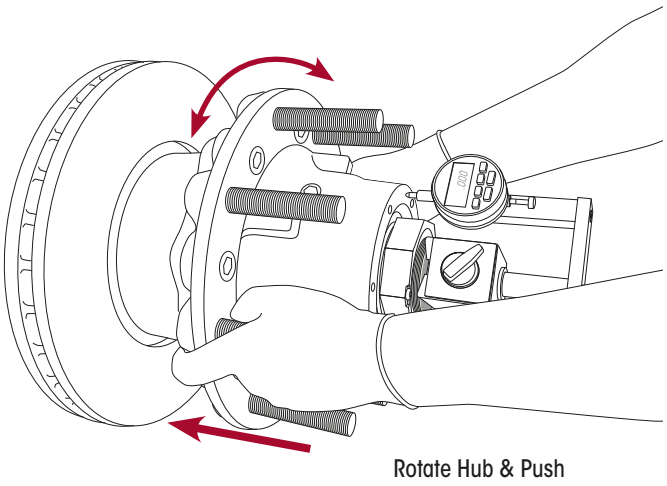


Figure 28: Checking inward end play

8. Hold the hub with hands at the 3 o'clock and 9 o'clock positions 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. Refer to Figure 28.

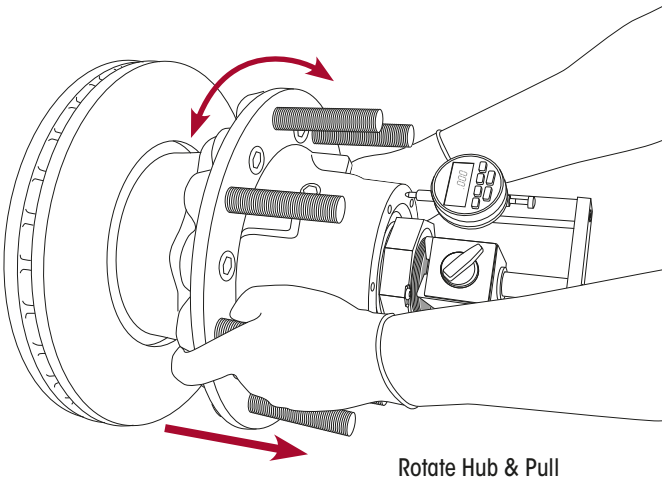


Figure 29: Checking outward end play

9. Hold the hub in a similar way and pull outward while rotating it slightly in both directions (15 - 30° between two holes) until dial indicator reading remains constant. Record reading. Refer to Figure 29.
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: If subsequent readings are necessary, the hub must be rotated at least 5 revolutions to reseat the bearings (refer to Step 3).

A. If end play is within specification (0.025 – 0.127 mm), no bearing adjustment is necessary. If checking end play after installation, return to the ***Inspecting Hub Installation*** for the relevant wheel-end. Otherwise, proceed to Step 11.

B. If end play is greater than 0.127 mm (0.005"), further inspection will be required to establish the cause. A course of action will need to be determined depending on whether it is a new installation or a hub that has been in service for a number of kilometres.

IMPORTANT: If end play is not within specifications, do not place axle assembly back into service without correcting the problem.

11. Check to ensure:

    A. Adjusting spindle nut is secure.

    B. Lock washer and tang are properly seated.

    C. Outer lock nut and retaining setscrews are securely in place.

    D. If not already done so, perform "Checking For Seal Leaks" on page 22.

12. Install hubcap with new gasket. If lubricated by oil, add required amount of lubricant through fill port.

SECTION 3 – HUB ASSEMBLIES

SECTION CONTENTS

HXL7® WHEEL-END MAINTENANCE PROCEDURES

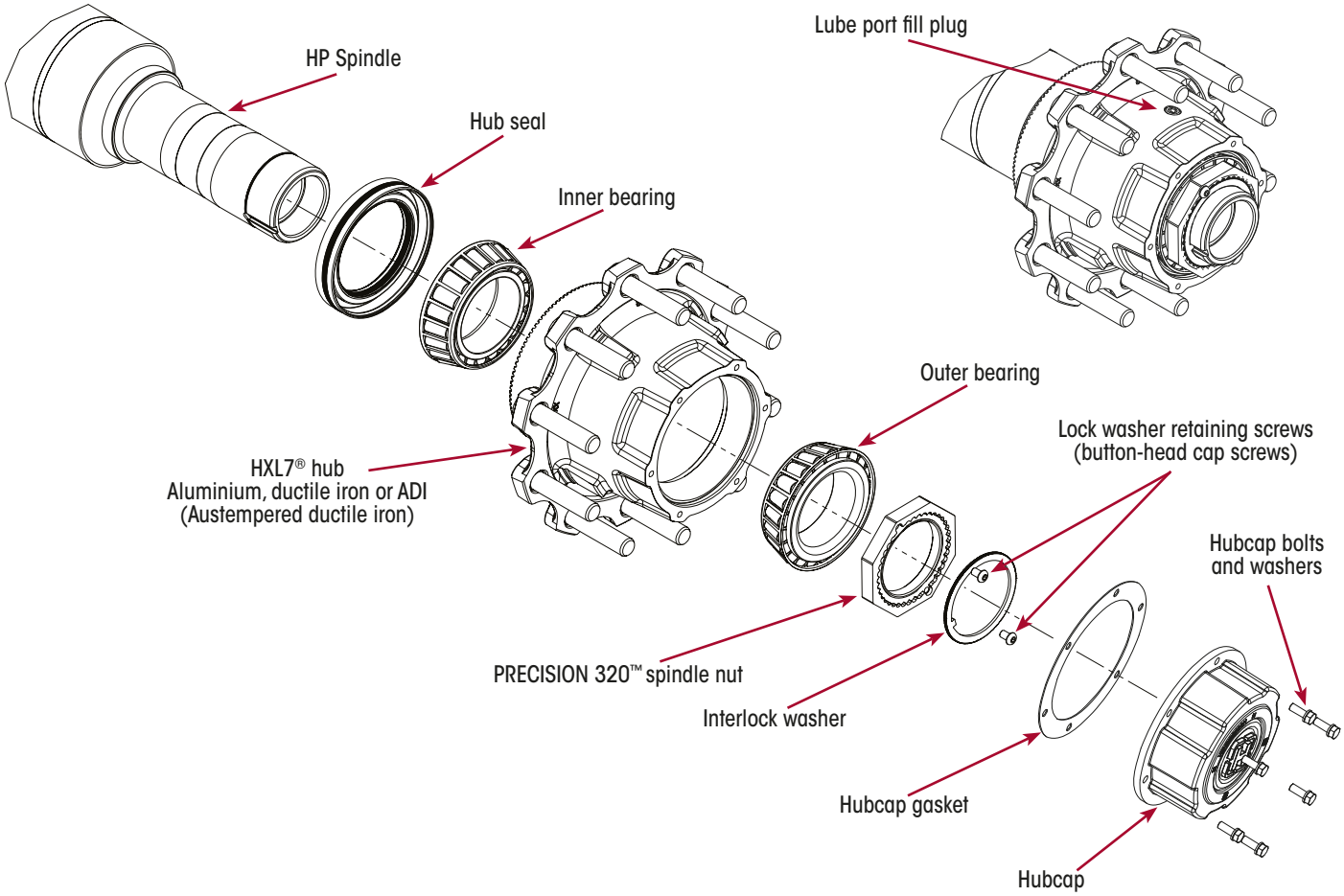


Figure 30: Hendrickson Extended-Life HXL7® wheel-end component identification

INTRODUCTION

The Hendrickson Extended Life HXL7® hub assembly comes pre-assembled, adjusted, sealed and lubricated on a Hendrickson dressed axle. Because Hendrickson controls the assembly, internal cleanliness, bearing adjustment and seal installation in our facilities, we can offer premium performance and an extended-service warranty on this hub assembly.

The HXL7® features a ductile iron, ADI or aluminium hub and is field serviceable with Hendrickson authorised components. However, to maintain warranty status, do not remove the HXL7® hubcap or attempt any kind of field service without first contacting Hendrickson technical services.

NOTICE: The HXL7 hubcap uses a tamper-evident screw, which is fitted on the assembly line. Contact Hendrickson customer service before removing this screw to maintain warranty status. On reassembly, it is best to replace this screw with a standard hubcap bolt.

TOOLS REQUIRED

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

Tool	Where Used
Calibrated torque wrenches (capable of 20, 30, 70 & 270 Nm)	To be used with sockets listed in this table.
Breaker bar	Disassembly and setup
4-7/8 inch socket	Installing PRECISION320™ HP Spindle Nut System
3/16 inch hex key	
1/2 inch socket	Hubcap Installation
1/4 or 5/16 inch hex key	Lube fill port plug
Dial Indicator and mounting stand with a resolution down to 0.01 mm (0.0005")	End play measurement
Hub Seal Driver Tool	(Available from Hendrickson)
Semi-Fluid Grease Measurement System	Hub Installation

IMPORTANT: Torque cannot be properly applied with an ordinary wrench. Calibrated torque wrenches must be used to apply specified torque with even distribution of applied forces. Refer to "Torque Wrenches" on page 96

INSPECTION

At regular intervals, the HXL7® hub assembly should be checked for seal leaks and smooth rotation.

⚠ **WARNING**: Prior to performing inspection procedures, help ensure conditions are safe by following directions in the section "Preparing Trailer For Service" on page 7.

Trailer axles should be inspected at regular intervals, ranging from a simple daily visual check by the driver all the way through to less frequent in-depth examinations. The frequency of thorough inspections will vary depending on driving conditions, vocation and kilometres travelled.

Refer to the section "Hub Inspection and Routine Maintenance" on page 14 for more information regarding daily, monthly, quarterly and service inspections.

REMOVING AND INSTALLING HUB

IMPORTANT: To ensure continued warranty, do not perform the following procedures without obtaining prior authorisation from Hendrickson.

Hub Removal

Use the following procedure to remove the HXL7® hub assembly:

1. Remove tyre and wheel assembly.
2. Disengage brakes and if drum brakes, remove drum. If air disc brakes, remove calliper and carrier according to manufacturer's procedures. New carrier mounting hardware must be used for re-installation.
3. Remove hubcap bolts, remove hubcap and discard gasket.

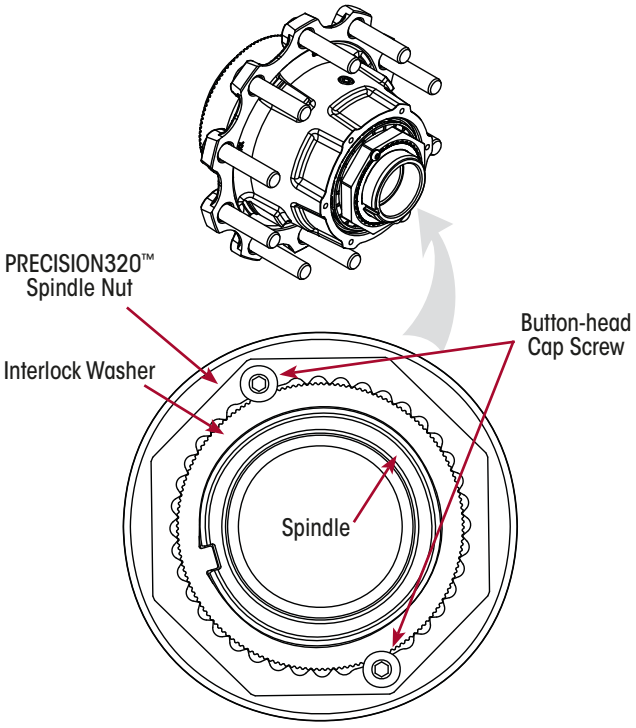


Figure 31: Button-head cap screw on PRECISION320™ nut system

4. Using a 3/16 inch hex key, remove button-head cap screws from interlock washer. ***Refer figure above.***
5. Remove interlock washer and spindle nut.

NOTICE: Pushing on edge of interlock washer near one of the screw holes will cause the opposite edge to tip away from the nut, allowing easy removal of interlock washer.

6. Carefully pull HXL7 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.

7. Remove hub from spindle. The inner bearing is held in the hub by the hub seal and should come off with the hub. If you are having difficulty removing the hub, refer to "Removing A Seized Hub" on page 93.

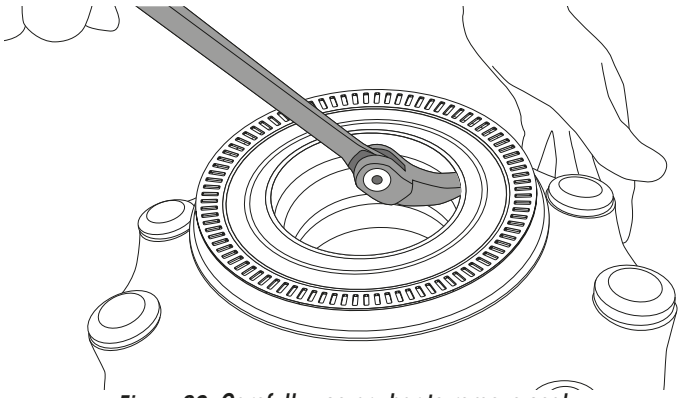


Figure 32: Carefully use pry bar to remove seal

8. Remove and discard hub seal. Use a pry bar to carefully remove the seal from the hub bore. Avoid any possible damage to hub and hub surfaces.

⚠ **WARNING**: It can take significant effort to remove a seal that has been in place for an extended period. Therefore, take extra care to ensure that you do not damage either the spindle or the hub. Any damage to the spindle's machined surfaces can affect wheel end performance.

Spindle and Hub Preparation

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

1. Remove old lubricant from spindle.

2. Thoroughly clean spindle machined surfaces of rust, dirt, grease or any other contaminants that could damage the hub seal and cause it to leak.

3. Clean spindle threads and keyway thoroughly with a wire brush to avoid false bearing adjustments and to avoid introduction of contaminants into the lubricant cavity.

4. Inspect machined spindle seal surface for nicks, scratches, burrs or marks. If needed, use wet and dry paper or fine emery cloth to repair any damaged areas.

5. Screw the spindle nut onto the spindle all the way by hand, remove it and then clean off any material or fine shards of thread that would otherwise contaminate the bearings.

6. Lubricate spindle with clean Mobil Mobilith SHC 007 Synthetic Grease.

NOTICE: Operating conditions may lead to spindle fretting. Under these conditions, lubricate the bearing journals on the axle spindle with a thin smear of molybdenum-based grease (such as Molykote G-n Metal Assembly paste or Molykote D Paste). Only apply a small amount of grease to ensure it does not contaminate bearing grease or get on the hub seal. Do not allow any of this lubricant to get on the spindle threads.

IMPORTANT: Do not mix different types of lubricants.

7. Thoroughly clean the hub bore of any dirt, grease, rust or any other substance that may be present.

8. Remove all sharp edges, nicks and burrs from seal bore, hubcap bore and hubcap mounting surface of the hub.

9. Inspect hub seal bore for roughness. If needed, use fine emery cloth to remove any burrs or old bore sealant, and wipe hub clean.

10. Ensure hubcap mounting surface is smooth and free of debris.

Hub Installation

IMPORTANT: Removing and refitting hubs and tyres as assemblies is generally not recommended due to the increased likelihood of damage to the hub seal. If a technician chooses to install the tyre and hub as an assembly, they will need to use sufficient support and precision to ensure the seal does not become damaged in any way during hub/wheel assembly installation.

NOTE: HXL7® requires Mobil Mobilith SHC 007 Synthetic Grease. Do not mix different types of lubricant.

1. Lubricate hub bearing cups.
2. Lubricate inner and outer bearings with the appropriate grease.
3. Install inner bearing into hub.

NOTICE: The correct hub seal installation tool must be used. Refer to "Special Tools" on page 97.

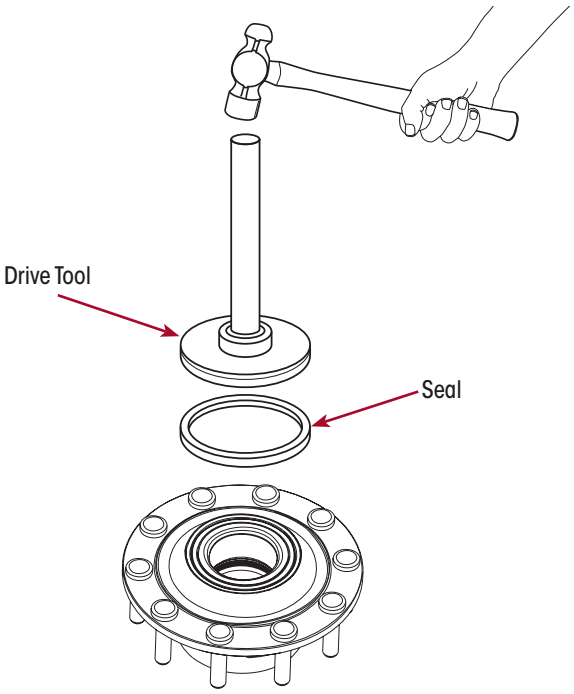


Figure 33: Using the correct tool for seal installation

4. Install hub seal.
   - A. Apply grease to the outer and inner edges of the seal and then place it on the installation tool.
   - B. Align tool with hub seal bore and drive seal until it bottoms out in the hub seal bore.
   - C. Check inner bearing to make sure it rotates freely.
5. Place outer bearing and PRECISION320™ nut in a convenient position on a clean rag close to axle.
6. Gently slide hub onto pre-lubricated spindle, taking care not to damage seal.

NOTICE: The hub seal can be damaged if:

- Hub seal is improperly installed.
- Hub seal is rammed into end of spindle or onto the spindle bearing shoulder.
- Hub is not kept supported and aligned with spindle until the outer bearing and axle nut are installed.
- Seal catches on spindle thread.

7. Hold hub in place on spindle, to avoid damaging the seal, install the outer bearing and then screw the PRECISION320 nut onto the spindle to prevent the bearing slipping off.

SETTING UP PRECISION320™ NUT SYSTEM

NOTICE: Failure to exactly follow the steps of this procedure could cause improper bearing seating, resulting in reduced bearing life.

The HXL7® wheel bearing system will provide long bearing service life if set correctly using the following complete procedure along with accurate equipment. This includes having a suitable correctly calibrated torque wrench and following the steps that describe turning the hub to settle the bearings.

⚠ **WARNING**: Failure to follow these instructions could cause a wheel to come off and cause bodily injury. Overtightening the nut could cause the bearings to run hot and be damaged.

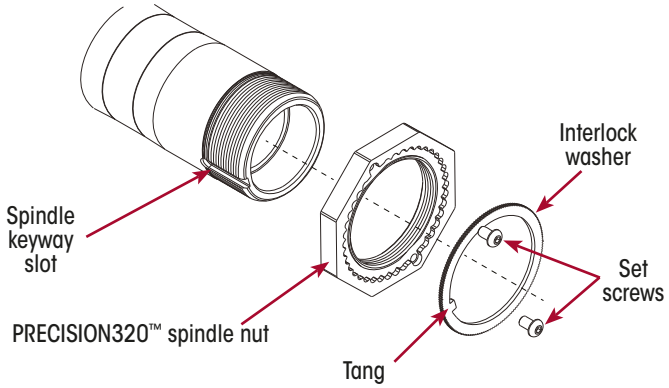


Figure 34: PRECISION320™ spindle nut system components

1. If not already done so, install PRECISION320™ spindle nut, (***refer figure above***) onto the spindle, toothed side out, and hand-tighten.

2. Simultaneously rotate hub clockwise at least three revolutions, while using a calibrated torque wrench to torque the PRECISION320 spindle nut to 270 Nm. This ensures that the seal and bearings are properly seated.
3. Back off PRECISION320 spindle nut one turn.
4. Rotate hub clockwise at least one full revolution.
5. Tighten PRECISION320 spindle nut to 70 Nm of torque. (1st)
6. Rotate hub clockwise three full revolutions.
7. Tighten PRECISION320 spindle nut to 70 Nm of torque. (2nd)
8. Rotate hub clockwise three full revolutions.
9. Tighten PRECISION320 spindle nut to 70 Nm of torque. (3rd)
10. Rotate hub clockwise three full revolutions.
11. Tighten PRECISION320 spindle nut to 70 Nm of torque. (4th)

IMPORTANT: Do not rotate the hub at this point. Rotating the hub before installing the interlock washer can dislodge the PRECISION320 spindle nut and cause improper bearing seating.

12. Back off the PRECISION320 nut exactly 1/8 turn (45° or one flat of the nut).

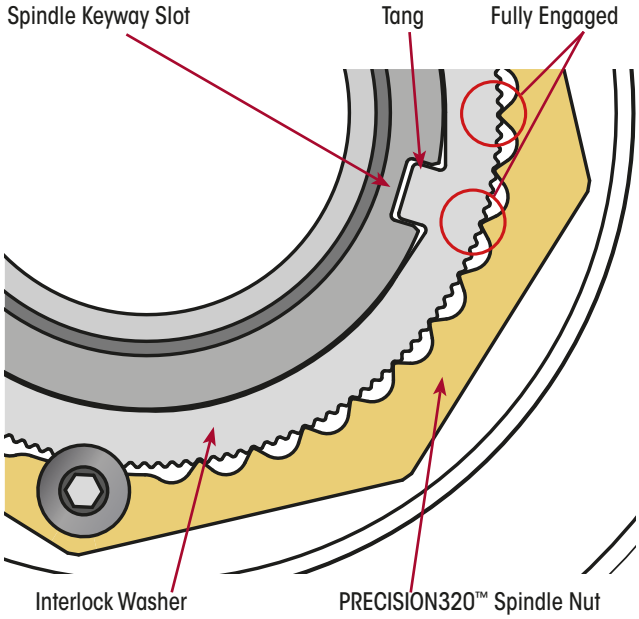


Figure 35: Interlock washer and spindle nut fully engaged

13. Install interlock washer into PRECISION320 spindle nut with the tang aligned and inserted in spindle keyway as shown in ***above figures***.
If washer and nut teeth do not align, do not rotate nut. Flip interlock washer over and install.

NOTICE: The PRECISION320 interlock washer and nut are designed so that one side of the washer will always engage the PRECISION320 spindle nut teeth without readjusting the nut.

IMPORTANT: Teeth between the interlock washer and PRECISION320 spindle nut must be fully engaged as shown in ***above figure***. Do not adjust nut to align interlock washer.

14. Install two button-head cap screws into PRECISION320 spindle nut until the heads of the screws just contact the face of the nut.

NOTICE: The button-head cap screws come new with pre-applied thread locking compound. Reapply medium strength locking compound (such as LOCTITE 243) to cleaned thread before installation if you are reusing the screws.

15. Tighten button-head cap screws to 20 Nm torque.

Inspecting Hub Installation

To ensure correct installation, follow these procedures:

1. Make sure interlock washer is fully seated in PRECISION320™ spindle nut. ***Refer previous figure.***
2. Ensure heads of both button-head cap screws contact nut face.
3. Turn hub five times to settle the bearings and check hub for free rotation. Ensure hub rotates smoothly and freely. If unsure refer to "Checking For Smooth and Quiet Rotation" on page 23. If the hub does not rotate freely, remove the button-head screws and interlock washer, and then repeat the Setting Up PRECISION320 Nut System procedure.
4. Check end play by referring to the section "Checking End Play" on page 24.
   It is important that there is at least 0.0254 mm (0.001") free play before returning wheel end into service. If necessary, move the adjusting nut slightly to achieve between 0.0254 and 0.0762 mm (0.001 – 0.003") free play. Moving the PRECISION320 nut one tooth on the inner washer will change end play approximately 0.013 mm (0.0005").
   If end play is out of specification, remove the button-head screws and interlock washer, move the nut slightly to tighten or loosen, and then refit interlock washer and screws before rechecking end play.
   Note that runout or scratches on the machined hub surface could cause the indicator to read up to 0.127 mm (0.005").
5. Inspect spindle shoulder and seal for excess lubricant. Wipe off any excess to ensure it is not mistaken for a leaking seal in service.

INSTALL HUBCAP AND ADD LUBRICANT

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

IMPORTANT: Always install a new gasket when reinstalling hubcap.

NOTICE: Interference between nut system and hubcap could occur if improper components are used. Use only genuine Hendrickson or Hendrickson approved replacement components.

1. Visually inspect hubcap, hub mating surface, bolt holes and new gasket for:
   - Signs of damage
   - Debris, such as silicon gasket sealer
   - Burrs or sharp edges
   - Cracks
2. Clean, repair or exchange as needed.
3. Align hubcap and new gasket onto hub and insert bolts.
4. Hand-tighten bolts.
5. Progressively tighten hubcap bolts, in a star pattern, to a torque of 20 Nm.

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

6. Remove fill port plug and fill hub cavity with the required amount of Mobil Mobilith SHC 007 Synthetic Semi-Fluid grease.

Spindle Type	Grease Weight	Grease Volume
HN Iron/Aluminium	460 g	560 ml
HN ADI	690 g	850 ml
HP	1000 g	1230 ml

This grease is available from Hendrickson. Refer to the "Hub Lubrication Guide" on page 80.

⚠ **WARNING**: Failure to correctly lubricate the hub will cause bearing failure along with subsequent hub, axle and possible trailer damage.

7. Refit fill port plug and torque to 30 Nm.

ASSEMBLE BRAKES AND WHEELS

Hub assembly is complete when the hubcap is installed and the hub is correctly lubricated. Follow these steps to complete the wheel-end assembly:

1. Turn hub so that pilot is at the 12 o'clock position and install brake drum and wheel (tyre and rim assembly). For more information refer to "Brake Drum and Wheel Assembly" on page 91. For air disc brake hubs refer to manufacturer's reference manual to install calliper, brake pads and brake chamber.
2. Restore trailer to normal operation.

TORQUE VALUES

Fastener	Torque (Nm)
Hub Fill Port Plug	30
Hubcap Screws	20
PRECISION320 Cap Screws	20
Wheel Nuts *	610

* Tighten wheel nuts incrementally. Re-torque all wheel nuts after 100 to 150 kilometres of service.

HXL7® WHEEL BEARING ADJUSTMENT SUMMARY

The following is a basic description of the detailed procedure shown in "Setting Up PRECISION320™ Nut System" on page 32. Refer to the complete article for further explanation and details.

Prior to commencement of this procedure, the axle journal and thread should be clean, bearing journals lubricated with Mobil Mobilith SHC 007 synthetic semi-fluid grease and the hub fitted to axle with the securing nut hand tight.

Step	Description	Resources
1	1. Torque the PRECISION320™ nut to ***270 Nm*** whilst rotating the hub a minimum of three rotations. **NOTE**: This ensures that the seal and bearings are properly seated. 2. Back off the PRECISION320 nut one turn. 3. Rotate hub one turn.	• Calibrated torque wrench set to 270 Nm • 4-7/8 inch socket • Breaker bar
2	1. Torque PRECISION320 nut to ***70 Nm***. (1st) 2. Rotate hub three times. 3. Torque PRECISION320 nut to ***70 Nm***. (2nd) 4. Rotate hub three times. 5. Torque PRECISION320 nut to ***70 Nm***. (3rd) 6. Rotate hub three times. 7. Torque PRECISION320 nut to ***70 Nm***. (4th) ⚠ **CAUTION**: Do not rotate the hub after final torque. 8. Back off the PRECISION320 nut exactly 1/8 turn (45°).	• Calibrated torque wrench set to 70 Nm • 4-7/8 inch socket • 3/8 or 1/2 inch to 3/4 drive adaptor to fit torque wrench and socket
3	1. Install precision interlock washer. **NOTE**: Do not move the PRECISION320 nut if the interlock washer teeth do not align, flip washer over and install. 2. Check that the interlock washer is sitting square and fully engaged with nut. 3. Insert button-head screws and tighten evenly until the head just contacts the interlock washer. 4. Torque button-head screws to ***20 Nm***.	• Calibrated torque wrench set to 20 Nm • 3/16 inch hex key socket
4	1. Turn hub five times to settle the bearing rollers and check that it turns freely. 2. Check that end play is between 0.0254 and 0.0762 mm (0.001 – 0.003"). 3. Install hubcap with new gasket and torque bolts to ***20 Nm***. 4. Add 1.23 litres (1.0 kg) of Mobil Mobilith SHC 007 synthetic semi-fluid grease through the fill port and torque fill plug to ***30 Nm.***	• Dial indicator • Calibrated torque wrench set to 20 and 30 Nm • 1/2 inch socket • 1/4 or 5/16 inch hex key socket • Grease measuring system

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HXL2™ & HXL5® WHEEL-END MAINTENANCE

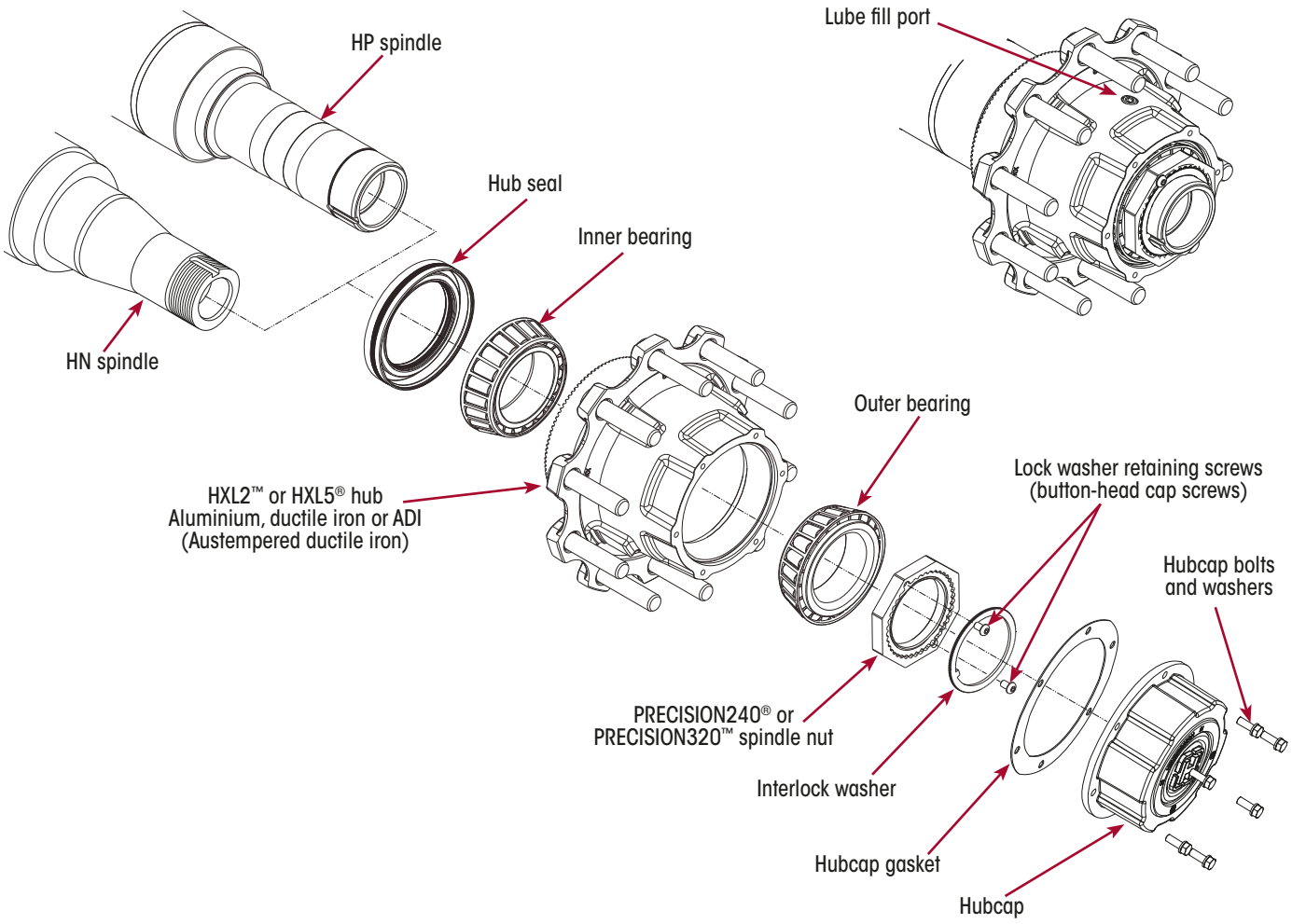

Figure 41: Hendrickson Extended-Life HXL2™ and HXL5® wheel-end component identification

PROCEDURES

INTRODUCTION

The Hendrickson Extended Life HXL2™ and HXL5® hub assemblies come pre-assembled, adjusted, sealed and lubricated on a Hendrickson dressed axle. Because Hendrickson controls the assembly, internal cleanliness, bearing adjustment and seal installation in our facilities, we can offer premium performance and an extended service warranty on these wheel-end assemblies.

These wheel end systems are available in either HP (parallel) or HN (tapered) spindles. The HP wheel end uses the PRECISION320™ precision nut and the HN wheel end uses the PRECISION240® precision nut system. The setting up for either HP or HN wheel ends are virtually identical. The differences are explained in the instructions, with the most notable being that the two different spindle nuts use different button head cap screws, which require distinct torque settings.

The HXL2™ and HXL5® wheel-end systems are available with ductile iron, austempered ductile iron (ADI) or aluminium hub and are field serviceable with Hendrickson authorised components. However, to maintain warranty status, do not remove the HXL2 or HXL5® hubcaps, or attempt any kind of field service without first contacting Hendrickson technical services.

TOOLS REQUIRED

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

Tool	Where Used
Calibrated torque wrenches (capable of 15, 20, 30, 70 and 270 Nm)	To be used with sockets listed in this table
Breaker bar	Disassembly and setup
3-13/16 inch socket	Installing PRECISION240® HN Spindle Nut System
5/32 inch hex key	
4-7/8 inch socket	Installing PRECISION320™ HP Spindle Nut System
3/16 inch hex key	
1/2 inch socket	Hubcap Installation
1/4 or 5/16 inch hex key	Lube fill port plug
Dial Indicator and mounting stand with resolution to 0.01 mm (0.0005")	End play measurement
Hub Seal Driver Tool	(Available from Hendrickson)
Semi-Fluid Grease Measurement System	Hub Installation

IMPORTANT: Torque cannot be properly applied with an ordinary wrench. Calibrated torque wrenches must be used to apply specified torque with even distribution of applied forces. Refer to "Torque Wrenches" on page 96

INSPECTION

At regular intervals, the hub assemblies should be checked for seal leaks and smooth rotation.

⚠ **WARNING**: Prior to performing inspection procedures, ensure conditions are safe by following directions in the section "Preparing Trailer For Service" on page 7.

Trailer axles should be inspected at regular intervals, ranging from a simple daily visual check by the driver all the way through to less frequent in-depth examinations. The frequency of thorough inspections will vary depending on driving conditions, vocation and kilometres travelled.

Refer to the section "Hub Inspection and Routine Maintenance" on page 14 for more information regarding daily, monthly, quarterly and service inspections.

REMOVING AND INSTALLING HUB

IMPORTANT: To ensure continued warranty, do not perform the following procedures without obtaining prior authorisation from Hendrickson.

Hub Removal

Use the following procedure to remove the HXL2™ or HXL5® hub assembly:

1. Remove tyre and wheel assembly.
2. Disengage brakes and if drum brakes, remove drum. If air disc brakes, remove calliper and carrier according to manufacturer's procedures. New carrier mounting hardware must be used for re-installation.
3. Remove hubcap bolts, remove hubcap and discard gasket.

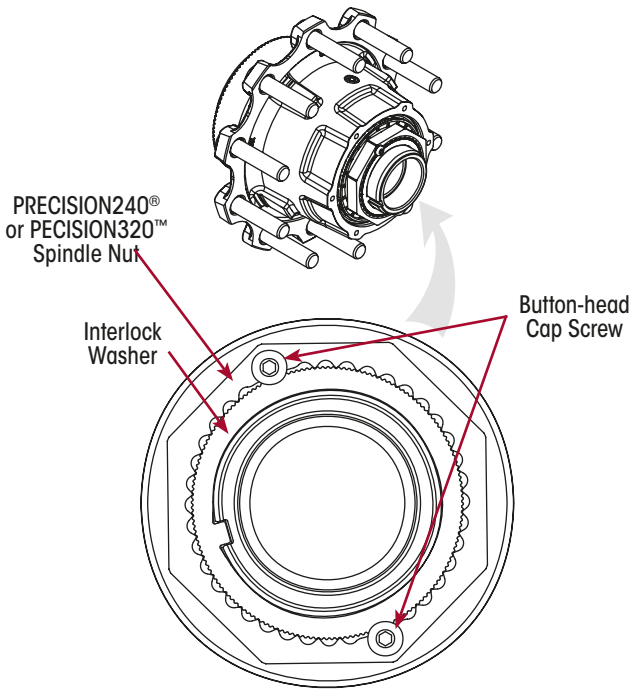

Figure 36: Button-head cap screws

4. Using a suitable hex key, remove button-head cap screws from interlock washer. ***Refer above figure.***
5. Remove interlock washer and spindle nut.

NOTICE: Pushing on edge of interlock washer near one of the screw holes will cause the opposite edge to tip away from the nut, allowing easy removal of interlock washer.

6. 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.

7. Remove hub from spindle. The inner bearing is held in the hub by the hub seal and should come off with the hub. If you are having difficulty removing the hub, refer to "Removing A Seized Hub" on page 93.

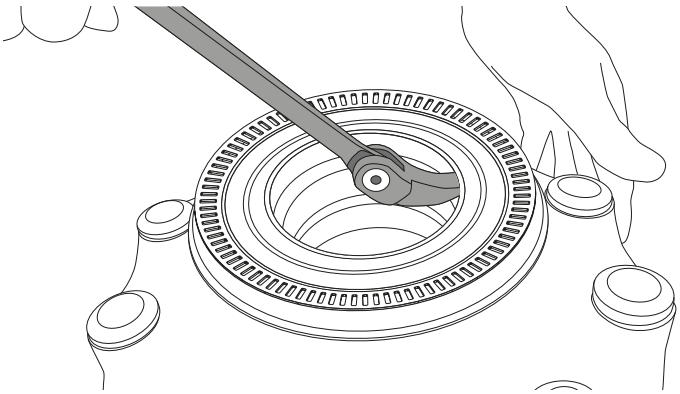

Figure 37: Carefully use pry bar to remove seal

8. Remove and discard hub seal. Use a pry bar to carefully remove the seal from the hub bore. Avoid any possible damage to hub and hub surfaces.

⚠ **WARNING**: It can take significant effort to remove a seal that has been in place for an extended period. Therefore, take extra care to ensure that you do not damage either the spindle or the hub. Any damage to the spindle's machined surfaces can affect wheel end performance.

Spindle and Hub Preparation

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

1. Remove old lubricant from spindle.
2. Thoroughly clean spindle machined surfaces of rust, dirt, grease or any other contaminants that could damage the hub seal and cause it to leak.
3. Clean spindle threads and keyway thoroughly with a wire brush to avoid false bearing adjustments and to avoid introduction of contaminants into the lubricant cavity.
4. Inspect machined spindle seal surface for nicks, scratches, burrs or marks. If needed, use wet and dry paper or fine emery cloth to repair any damaged areas.
5. Screw the spindle nut onto the spindle all the way by hand, remove it and then clean off any material or fine shards of thread that would otherwise contaminate the bearings.
6. Lubricate spindle with clean grease that is the same as use to lubricate the bearings.

NOTICE: Operating conditions may lead to spindle fretting. Under these conditions, lubricate the bearing journals on the axle spindle with a thin smear of molybdenum-based grease (such as Molykote G-n Metal Assembly paste or Molykote D Paste). Only apply a small amount of grease to ensure it does not contaminate bearing grease or get on the hub seal. Do not allow any of this lubricant to get on the spindle threads.

IMPORTANT: Do not mix different types of lubricants.

7. Thoroughly clean the hub bore of any dirt, grease, rust or any other substance that may be present.
8. Remove all sharp edges, nicks and burrs from seal bore, hubcap bore and hubcap mounting surface of the hub.
9. Inspect hub seal bore for roughness. If needed, use fine emery cloth to remove any burrs or old bore sealant, and wipe hub clean.
10. Ensure hubcap mounting surface is smooth and free of debris.

Hub Installation

IMPORTANT: Removing and refitting hubs and tyres as assemblies is generally not recommended due to the increased likelihood of damage to the hub seal. If a technician chooses to install the tyre and hub as an assembly, they will need to use sufficient support and precision to ensure the seal does not become damaged in any way during hub/wheel assembly installation.

NOTE: HXL2™ requires NLGI #2 wheel bearing grease. HXL5® requires Mobil Mobilith SHC 007 Synthetic Grease. Do not mix different types of lubricant.

1. Lubricate hub bearing cups. For HXL2 hubs, also fill hub cavity to the level of the bearing races as shown under "Standard Bearing Grease Application" on page 82.
2. Pack inner and outer bearings with the appropriate grease.
3. Install inner bearing into hub.

NOTICE: The correct hub seal installation tool must be used. Refer to "Special Tools" on page 97.

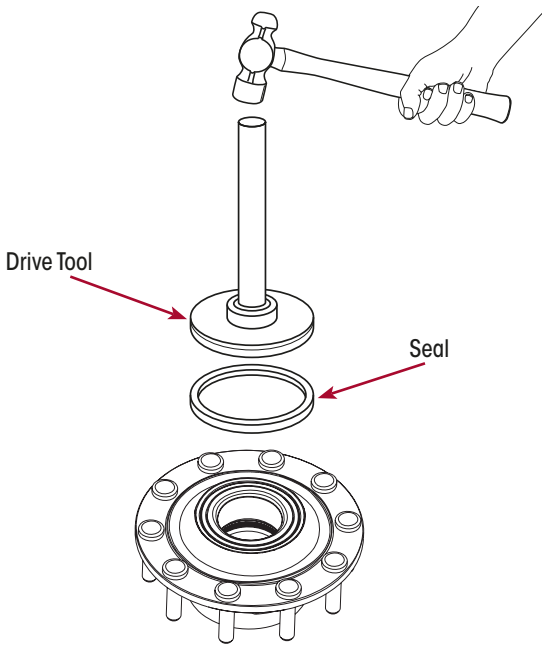

Figure 38: Using the correct tool for seal installation

4. Install hub seal.
   A. Apply grease to the outer and inner edges of the seal and then place it on the installation tool.
   B. Align tool with hub seal bore and drive seal until it bottoms out in the hub seal bore.
   C. Check inner bearing to make sure it rotates freely.
5. Place outer bearing and PRECISION240® or PRECISION320™ nut in a convenient position on a clean rag close to axle.
6. Gently slide hub onto pre-lubricated spindle, taking care not to damage seal.

NOTICE: The hub seal can be damaged if:

- Hub seal is improperly installed.
- Hub seal is rammed into end of spindle or onto the spindle bearing shoulder.
- Hub is not kept supported and aligned with spindle until the outer bearing and axle nut are installed.
- Seal catches on spindle thread.

7. Hold hub in place on spindle, to avoid damaging the seal, install the outer bearing and then screw the nut onto the spindle to prevent the bearing slipping off.

SETTING UP SPINDLE NUT SYSTEM

NOTICE: Failure to exactly follow the steps of this procedure could cause improper bearing seating, resulting in reduced bearing life.

The HXL2™ and HXL5® wheel bearing systems will provide long bearing service life if set correctly using the following complete procedure along with accurate equipment. This includes having a suitable correctly calibrated torque wrench and following the steps that describe turning the hub to settle the bearings.

⚠ **WARNING**: Failure to follow these instructions could cause a wheel to come off and cause bodily injury. Overtightening the nut could cause the bearings to run hot and be damaged.

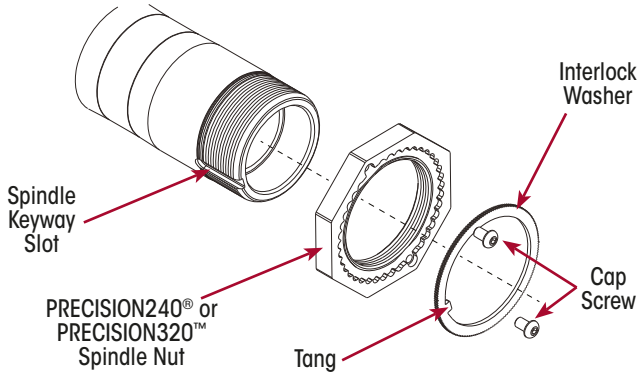

Figure 39: PRECISION240® or PRECISION320™ components

8. If not already done so, install spindle nut, (***refer above figure***) onto the spindle, toothed side out, and hand-tighten.
9. Simultaneously rotate hub clockwise at least three revolutions, while using a calibrated torque wrench to torque the PRECISION240® or PRECISION320™ spindle nut to **270 Nm**.
   This ensures that the seal and bearings are properly seated.
10. **Back off** spindle nut one turn.
11. Rotate hub **clockwise** at least **one full revolution**.
12. Tighten spindle nut to **70 Nm** of torque. (1st)
13. Rotate hub **clockwise three full revolutions**.
14. Tighten spindle nut to **70 Nm** of torque. (2nd)
15. Rotate hub **clockwise three full revolutions**.
16. Tighten spindle nut to **70 Nm** of torque. (3rd)

17. Rotate hub **clockwise three full revolutions**.

18. Tighten spindle nut to **70 Nm** of torque. (4th)

IMPORTANT: Do not rotate the hub at this point. Rotating the hub before installing the interlock washer can dislodge the spindle nut and cause improper bearing seating.

19. **Back off** the nut exactly **1/8 turn** (45° or one flat of the nut).

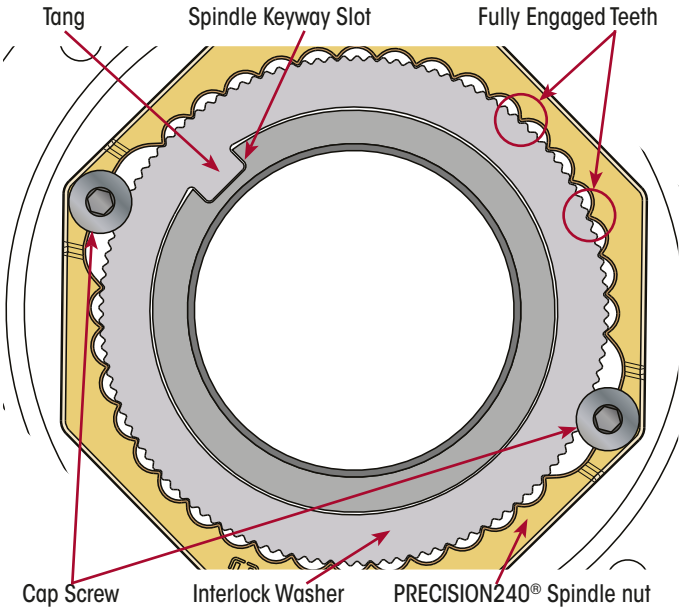

Figure 40: Interlock washer and spindle nut fully engaged

20. Install interlock washer into spindle nut with the tang aligned and inserted in spindle keyway as shown in ***above figure***.

21. If washer and nut teeth do not align, do not rotate nut. Flip interlock washer over and install.

NOTICE: The PRECISION240® and PRECISION320 interlock washer and nut are designed so that one side of the washer will always engage the spindle nut teeth without readjusting the nut.

IMPORTANT: Teeth between the interlock washer and spindle nut must be fully engaged as shown in ***above figure***. Do not adjust nut to align interlock washer.

22. Install two button-head cap screws into spindle nut until the heads of the screws just contact the face of the nut.

NOTICE: The button-head cap screws come new with pre-applied thread locking compound. Reapply medium strength locking compound (such as LOCTITE 243) to cleaned thread before installation if you are reusing the screws.

23. Tighten button-head cap screws for the HN PRECISION240® to 15 Nm torque and for the PRECISION320 to 20 Nm.

Inspecting Hub Installation

To ensure correct installation, follow these procedures:

1. Make sure interlock washer is fully seated in spindle nut. ***Refer previous figure.***

2. Ensure heads of both button-head cap screws contact nut face.

3. Rotate hub five times to settle bearing rollers and check hub for free rotation. Ensure hub rotates smoothly and freely. If unsure refer to "Checking For Smooth and Quiet Rotation" on page 23. If the hub does not rotate freely, remove the button-head screws and interlock washer, and then repeat the Setting Up Spindle Nut System procedure.

4. Check end play by referring to the section "Checking End Play" on page 24.
   It is important that there is at least 0.0254 mm (0.001") free play before returning wheel end into service. If necessary, move the adjusting nut slightly to achieve between 0.0254 and 0.0762 mm (0.001 – 0.003") free play. Moving the PRECISION240 nut one tooth on the inner washer will change end play approximately 0.013 mm (0.0005").
   If end play is out of specification, remove the button-head screws and interlock washer, move the nut slightly to tighten or loosen, and then refit interlock washer and screws before rechecking end play.
   Note that runout or scratches on the machined hub surface could cause the indicator to read up to 0.127 mm (0.005").

5. Inspect spindle shoulder and seal for excess lubricant. Wipe off any excess to ensure it is not mistaken for a leaking seal in service.

INSTALL HUBCAP AND ADD LUBRICANT

After the hub installation and inspection is complete, the hubcap can be installed. On HXL5 hubs, this is before adding lubricant.

IMPORTANT: Always install a new gasket when reinstalling hubcap.

NOTICE: Interference between nut system and hubcap could occur if improper components are used. Use only genuine Hendrickson or Hendrickson approved replacement components.

1. Visually inspect hubcap, hub mating surface, bolt holes and new gasket for:
   - Signs of damage
   - Debris, such as silicon gasket sealer
   - Burrs or sharp edges
   - Cracks
2. Clean, repair or exchange as needed.
3. On HXL2 hubs, apply a thin layer of grease on inside of hubcap to help prevent corrosion. Wipe off excess grease to ensure the sealing face is dry and clean.
4. Align hubcap and new gasket onto hub and insert bolts.
5. Hand-tighten bolts.
6. Progressively tighten hubcap bolts, in a star pattern, to a torque of 20 Nm.

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

7. On HXL5 hubs, remove fill port plug and fill hub cavity with the required amount of Mobil Mobilith SHC 007 Synthetic Semi-Fluid grease.

Spindle Type	Grease Weight	Grease Volume
HN Iron/Aluminium	460 g	560 ml
HN ADI	690 g	850 ml
HP	1000 g	1230 ml

Mobilith grease is available from your local Mobil distributor or through Hendrickson. For more information refer to the "Hub Lubrication Guide" on page 80.

NOTE: The quantities listed here for Semi-Fluid grease are similar to that required for standard NLGI#2.

⚠ **WARNING**: Failure to correctly lubricate the hub will cause bearing failure along with subsequent hub, axle and possible trailer damage.

8. For HXL5 hubs, refit fill port plug and torque to 30 Nm.

ASSEMBLE BRAKES AND WHEELS

Hub assembly is complete when the hubcap is installed and the hub is correctly lubricated. Follow these steps to complete the wheel-end assembly:

1. Turn hub so that pilot is at the 12 o'clock position and install brake drum and wheel (tyre and rim assembly). For more information refer to "Brake Drum and Wheel Assembly" on page 91. For air disc brake hubs refer to manufacturer's reference manual to install calliper, brake pads and brake chamber.
2. Restore trailer to normal operation.

TORQUE VALUES

The following table lists torque values for HXL2™ and HXL5® wheel-end fasteners.

Fastener	Torque (Nm)
Hub Fill Port Plug	30
Hubcap Screws	20
HN PRECISION240 Button-head Screws	15
HP PRECISION320 Button-head Screws	20
Wheel Nuts *	610

* Tighten wheel nuts incrementally. Re-torque all wheel nuts after 100 to 150 kilometres of service.

HXL2™ & HXL5® WHEEL BEARING ADJUSTMENT SUMMARY

The following is a basic description of the detailed procedure shown in "Setting Up Spindle Nut System" on page 40. Refer to the complete article for further explanation and details.

Prior to commencement of this procedure, the axle journal and thread should be clean, bearing journals lubricated with the appropriate grease (Lithium NGLI #2 for HXL2 and Mobil Mobilith SHC 007 synthetic semi-fluid for HXL5) and the hub fitted to axle with the securing nut hand tight.

Step	Description	Resources
1	1. Torque the PRECISION240® or PRECISION320™ nut to ***270 Nm*** whilst rotating the hub a minimum of three rotations. **NOTE**: This ensures that the seal and bearings are properly seated. 2. ***Back off*** the spindle nut one-half turn. 3. Rotate hub one turn.	• Calibrated torque wrench set to 270 Nm • 3-13/16 inch socket for HN spindles • 4-7/8 inch socket for HP spindles • Breaker bar
2	1. Torque spindle nut to ***70 Nm***. (1st) 2. Rotate hub three times. 3. Torque spindle nut to ***70 Nm***. (2nd) 4. Rotate hub three times. 5. Torque spindle nut to ***70 Nm.*** (3rd) 6. Rotate hub three times. 7. Torque spindle nut to ***70 Nm***. (4th) ⚠ **CAUTION**: Do not rotate the hub after final torque. 8. Back off the spindle nut exactly 1/8 turn (45°).	• Calibrated torque wrench set to 70 Nm • 3-13/16 inch socket for HN spindles • 4-7/8 inch socket for HP spindles • 3/8 or 1/2 inch to 3/4 drive adaptor to fit torque wrench and socket
3	1. Install precision interlock washer. **NOTE**: Do not move the spindle nut if the interlock washer teeth do not align, flip washer over and install. 2. Check that the interlock washer is sitting square and fully engaged with nut. 3. Insert button-head screws and tighten evenly until the head just contacts the interlock washer. 4. Torque button-head screws to ***15 Nm*** for HN spindles or ***20 Nm*** for HP spindles.	• For HN spindles a calibrated torque wrench set to 15 Nm and a 3/16 inch hex key or • For HP spindles a calibrated torque wrench set to 15 Nm and a 5/32 inch hex key
4	1. Turn hub five times to settle the bearing rollers and check that it turns freely. 2. Check that end play is between 0.0254 and 0.0762 mm (0.001 – 0.003"). 3. Install hubcap with new gasket and torque bolts to ***20 Nm***. 4. For HXL5®, add the correct amount of Mobil Mobilith SHC 007 synthetic semi-fluid grease through the fill port and torque fill plug to ***30 Nm***.	• Dial indicator • Calibrated torque wrench set to 20 and 30 Nm • 1/2 inch socket • 1/4 or 5/16 inch hex key socket • For HXL5®, a grease measuring system

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PRESET HUB PROCEDURES

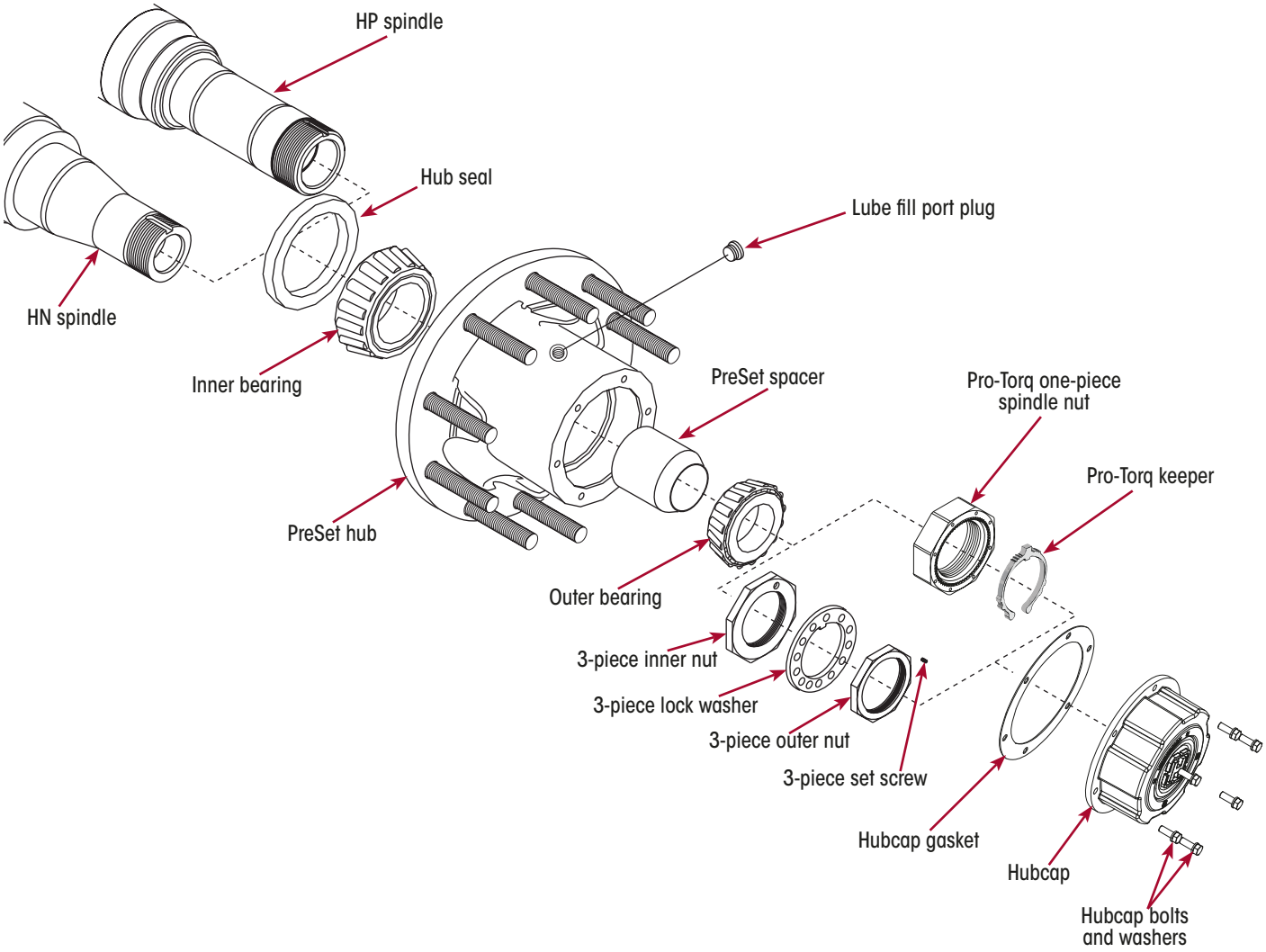

Figure 42: PreSet wheel end component identification

INTRODUCTION

The PreSet hub assembly comes complete with pre-installed bearing cups, bearing cones, bearing spacer and seal. These hubs are unique in that a precision tubular spacer is used between the bearings, eliminating the need for manual bearing adjustment.

⚠ **WARNING**: Replace the seal and spacer every time the hub is removed. This will ensure continued protection from contamination and correct bearing clearance.

⚠ **WARNING**: PreSet hubs rely on precision machined hub and spacers, along with bearings made to finer tolerances, to ensure correct end play. Using standard bearings or non-approved hubs will result in incorrect end play, which could cause accelerated component wear and subsequent wheel end collapse.

TOOLS REQUIRED

Tool	Where Used
Calibrated torque wrenches (capable of 2, 20, 305 & 430 Nm)	
Breaker bar	Disassembly and setup
1/2 inch socket	Hubcap Installation
1/4 or 5/16 inch hex key	Lube fill port plug
Dial Indicator & stand with a resolution of 0.01 mm (0.0005")	End play measurement
Hub Seal Driver Tool	(Available from Hendrickson)
HN Spindle Pro-Torq Nut	3-3/4 inch socket
HN Spindle Three-Piece Nut	3-13/16 inch socket
	3-1/4 inch socket
	5/64 inch hex key
HP Spindle Pro-Torq Nut	4-13/16 inch socket
HP Spindle Three-Piece Nut	4-7/8 inch socket
	4-3/8 inch socket
	5/64 inch hex key
Semi-Fluid Grease Measurement System	Hub Installation

IMPORTANT: Torque cannot be properly applied with an ordinary wrench. Calibrated torque wrenches must be used to apply specified torque with even distribution of applied forces. Refer to "Torque Wrenches" on page 96

INSPECTION

A complete inspection is recommended at each brake and/or tyre service interval.

NOTICE: The spacer and hub seal must also be replaced whenever replacing a disc brake rotor.

In addition to the complete inspection at brake and/or tyre service, maintain current shop preventive maintenance and pre-trip inspection practices.

At regular intervals, the PreSet hub assembly should be checked for seal leaks and smooth rotation.

⚠ **WARNING**: Prior to performing inspection procedures, ensure conditions are safe by following directions in the section "Preparing Trailer For Service" on page 7.

Trailer axles should be inspected at regular intervals, ranging from a simple daily visual check by the driver all the way through to less frequent in-depth examinations. The frequency of thorough inspections will vary depending on driving conditions, vocation and kilometres travelled.

Refer to the section "Hub Inspection and Routine Maintenance" on page 14 for more information regarding daily, monthly, quarterly and service inspections.

REMOVING AND INSTALLING THE HUB

IMPORTANT: To ensure continued warranty, do not perform the following procedures without obtaining prior authorisation from Hendrickson.

Hub Removal

1. Remove the tyre and wheel assembly.
2. Disengage brakes and if drum brakes, remove drum. If air disc brakes, remove calliper and carrier according to manufacturer's procedures. New carrier mounting hardware must be used for re-installation.
3. Remove hubcap bolts, remove hubcap and discard gasket.
4. Identify the spindle nut system. Two different spindle nut systems can be found securing the PreSet hub to the axle (***refer to the following figures***):
   - Standard Three-Piece Spindle Nut
   - Pro-Torq One-Piece Spindle Nut

   Each of these spindle nut systems has a different locking mechanism that must be disengaged before the spindle nut(s) can be removed.
5. Disengage the spindle nut locking mechanism as follows:

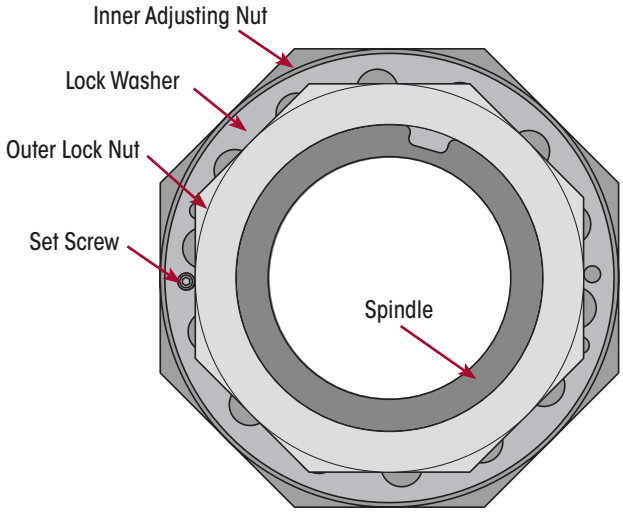

Figure 43: Three piece nut system

Standard Three-Piece - Using a 5/64-in. hex key, remove the setscrew from the lock washer.

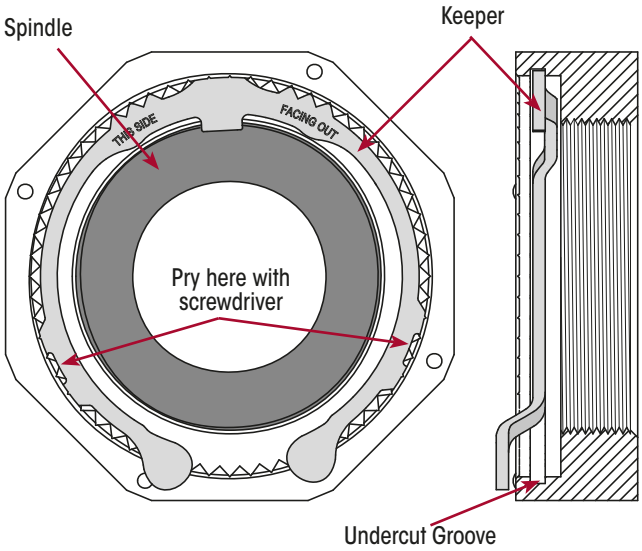

Figure 44: Pro-Torq System

Pro-Torq One-Piece - Remove the orange keeper from the nut. Using a flat-blade screwdriver, carefully pry both keeper arms from the undercut groove until the keeper releases. Slide the keeper off the spindle keyway.

NOTICE: Recommended practice is to replace the keeper each time the Pro-Torq spindle nut assembly is removed for maintenance purposes.

6. Remove the spindle nut(s) and lock washer (if fitted).
7. Protect the outer bearing from falling out of the hub and carefully slide the PreSet hub off the spindle.

⚠ **CAUTION**: Occasionally, the oil seal can become stuck on the spindle, making the hub difficult to remove. If mechanical assistance is required to remove the hub, take care to avoid damaging the hub and spindle. If you are having difficulty removing the hub, refer to "Removing A Seized Hub" on page 93

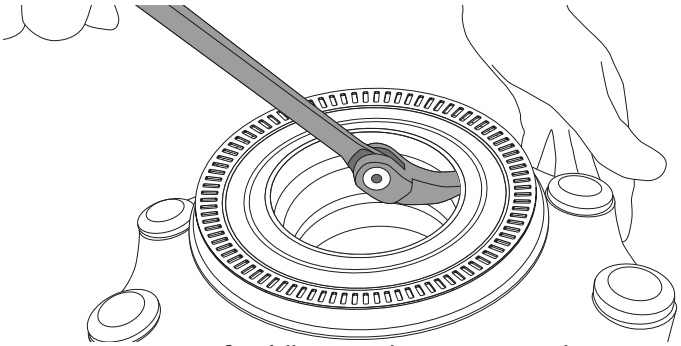

Figure 45: Carefully use pry bar to remove seal

8. Remove and discard hub seal. Use a pry bar to carefully remove seal from hub bore. Avoid damaging the hub or hub surfaces.

Spindle and Hub Preparation

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

1. Remove old lubricant and thoroughly clean spindle.
2. Inspect machined spindle seal surface for nicks, scratches, burrs or marks. If needed, use wet and dry paper or fine emery cloth to repair any damaged areas.
3. Clean spindle threads and keyway thoroughly 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 other contaminants that could damage the hub seal and cause it to leak.
5. Screw the spindle nut onto the spindle all the way by hand, remove it and then clean off any mate-rial or fine shards of thread that would otherwise contaminate the bearings
6. Lubricate spindle with clean Mobil Mobilith SHC 007 Synthetic Grease.

NOTICE: Operating conditions may lead to spindle fretting. Under these conditions, lubricate the bearing journals on the axle spindle with a thin smear of molybdenum-based grease (such as Molykote G-n Metal Assembly paste or Molykote D Paste). Only apply a small amount of grease to ensure it does not contaminate bearing grease or get on the hub seal. Do not allow any of this lubricant to get on the spindle threads.

IMPORTANT: Do not mix different types of lubricants.

7. Thoroughly clean the hub bore of any dirt, grease, rust or any other substance that may be present.
8. Remove all sharp edges, nicks and burrs from seal bore, hubcap bore and hubcap mounting surface of the hub.
9. Inspect hub seal bore for roughness. If needed, use fine emery cloth to remove any burrs or old bore sealant, and wipe hub clean.
10. Ensure hubcap mounting surface is smooth and free of debris.

⚠ **WARNING**: Replace the seal and spacer every time the hub is removed, such as when replacing a disc rotor. This will ensure correct bearing setting and continued protection from contamination.

Hub Installation

⚠ **WARNING**: PreSet hubs are designed with unique hubs and bearings. Do not install either standard or premium bearing cups or cones that are not identified as PreSet since this may result in rapid bearing failure.

IMPORTANT: Removing and refitting hubs and tyres as assemblies is generally not recommended due to the increased likelihood of damage to the hub seal. If a technician chooses to install the tyre and hub as an assembly, they will need to use sufficient support and precision to ensure the seal does not become damaged in any way during hub/wheel assembly installation.

NOTE: PreSet hubs require Mobil Mobilith SHC 007 Synthetic Grease. Do not mix different types of lubricant.

1. Lubricate inner and outer bearings and hub bearing cups with the appropriate grease.
2. Install inner bearing into hub.

NOTICE: The correct hub seal installation tool must be used. Refer to "Special Tools" on page 97.

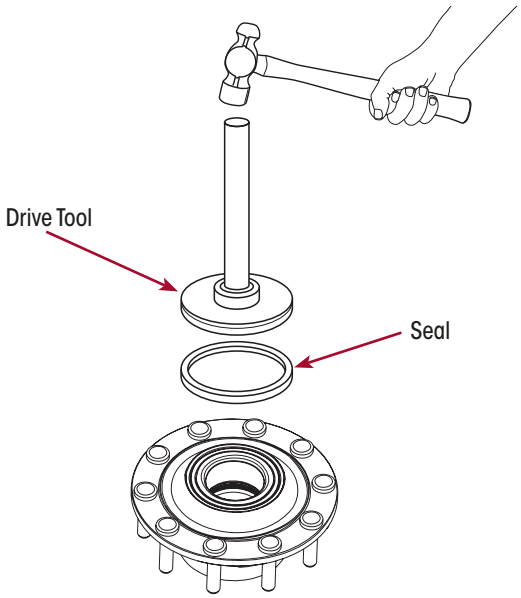

Figure 46: Using the correct tool for seal installation

3. Install hub seal.

A. Apply grease to the outer and inner edges of the seal and then place it on the installation tool.

B. Align tool with hub seal bore and drive seal until it bottoms out in the hub seal bore.

C. Check inner bearing to make sure it rotates freely and that there is a smear of grease on the inner edge of the hub seal.

4. Turn hub over so that the seal faces down.

5. Install the bearing spacer and outer bearing.

NOTICE: If it is a HN hub with a tapered spacer then the taper should be facing up.

6. Gently slide hub onto pre-lubricated spindle. Take care not to damage seal and to maintain alignment of bearings and spacer with the spindle.

NOTICE: The hub seal can be damaged if:

- Hub seal is improperly installed.
- Hub seal is rammed into end of spindle or onto the spindle bearing shoulder.
- Hub is not kept supported and aligned with spindle until the outer bearing and axle nut are installed.
- Seal catches on spindle thread.

NOTICE: Once the hub is on the spindle, never remove the outer bearing. Removing the outer bearing may cause the seal to become misaligned, resulting in premature seal failure.

SPINDLE NUT

On Hendrickson suspensions, one of two spindle nut systems can be used to secure the PreSet hub to the axle. (Refer to "Hub Removal" on page 47):

- Standard three-piece spindle nut
- Pro-Torq one-piece spindle nut

Each of these spindle nut systems has different installation requirements.

Standard Three-Piece

The three-piece spindle nut system includes an inner adjusting nut, lock washer and outer lock nut.

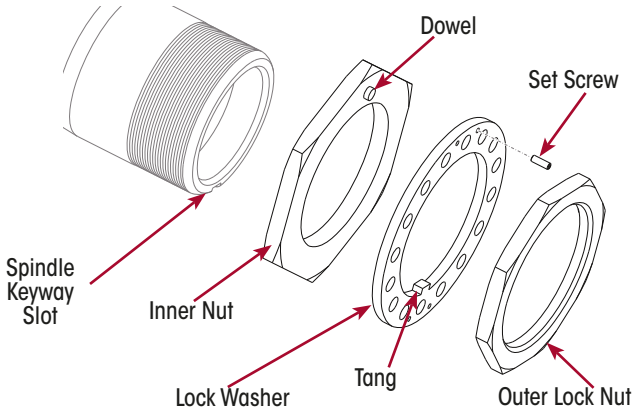

Figure 47: Three-Piece Nut System Installation

1. Install the inner nut (***refer to above figure***) on the spindle, dowel side out, and tighten to 430 Nm of torque while rotating the hub. ***Do not back off the inner nut***.

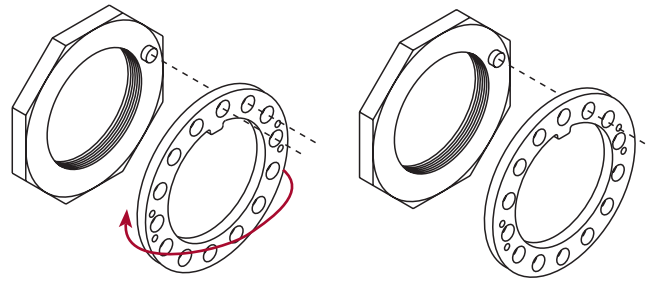

Figure 48: Adjusting Nut and Lock Washer Installation

2. Install the lock washer. Make sure the lock washer tang fits in the spindle keyway slot and the inner 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 the lock washer. Refer Figure 48.

⚠ **WARNING**: Do not loosen the inner nut for dowel pin alignment.

If necessary, tighten the inner nut slightly until alignment occurs with the closest hole in the lock washer.

3. Install the outer nut and tighten to 305 Nm of torque.

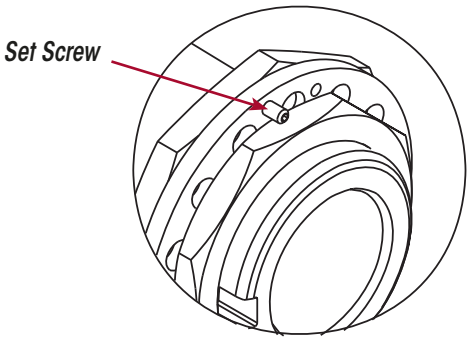

Figure 49: Installed set screw detail

4. Install the setscrew into an accessible threaded hole in the lock washer. Setscrew must contact the inner nut. Tighten to 2 Nm of torque. When properly installed, the setscrew will be approximately half the height of the outer lock nut. ***Refer above figure***.

Pro-Torq One-Piece

Follow this procedure to install Pro-Torq nut on Hendrickson wheel ends.

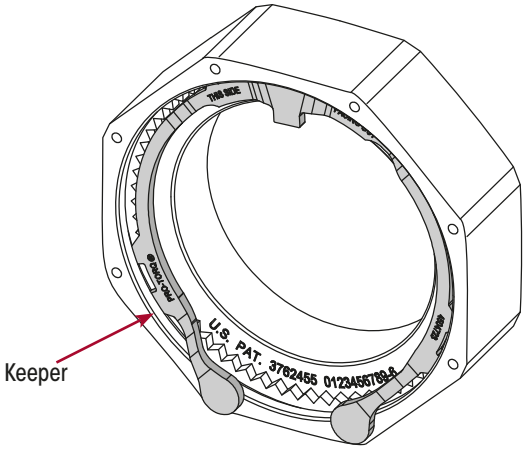

Figure 50: Pro-Torq nut

1. Check the condition of the keeper to ensure that it is in good condition. It is recommended that the keeper be replaced whenever the nut is removed for bearing maintenance.

2. Check spindle nut before assembly to ensure that it is in suitable condition. The side that faces the bearing must not have any noticeable wear and the locking ring groove and teeth must be in good condition. If there is any doubt about the condition of the nut, then this should be replaced as an assembly with the keeper.

3. If necessary, remove keeper from Pro-Torq nut. Using a screwdriver, carefully pry the keeper arm from the undercut groove on each side until the keeper releases.

4. Install the nut on the spindle until hand tight. While rotating the hub, tighten the nut to 430 Nm of torque. ***Do not back off the nut.***

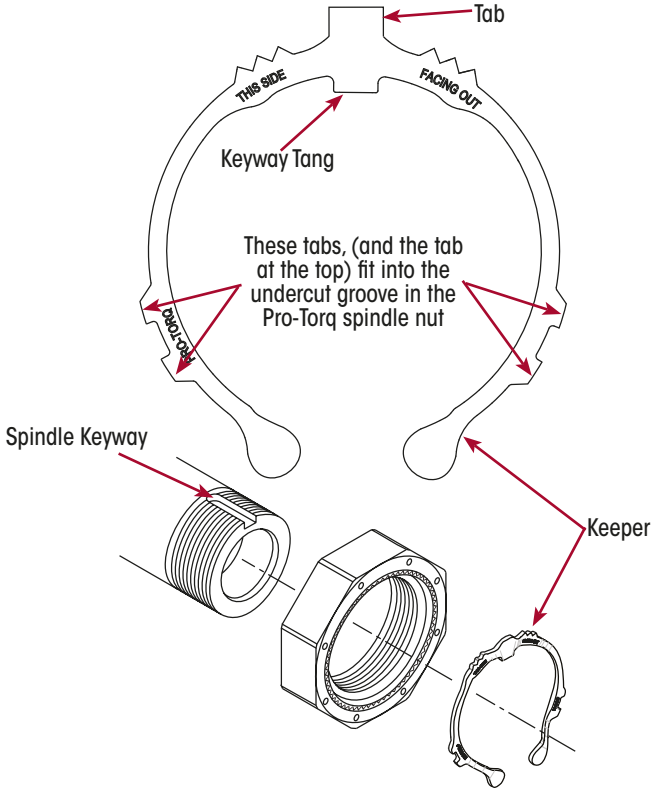

Figure 51: Keeper Installation for Pro-Torq Nut

5. Install keeper with bent legs and orange side facing out (***refer above figure***). Insert tab into undercut groove in nut and engage keeper keyway tang in spindle keyway.

NOTICE: Recommended practice is to replace the keeper each time the Pro-Torq spindle nut assembly is removed for maintenance purposes.

6. Engage mating teeth. If the teeth are out of alignment and the keeper will not engage, then tighten the nut slightly until they align. Do not tighten nut more than one tooth (six degrees).

7. Using a screwdriver, compress and insert the keeper arms, one at a time, into the undercut groove in the nut.

⚠ **WARNING**: Do not bend or manipulate the keyway tang in any way. Doing so may cause the tang to break, allowing the wheel to come off and cause bodily injury.

8. Inspect installation and ensure:
   - Keeper tab and keeper arms are fully seated in the undercut groove.
   - Keeper teeth engage fully with the nut.
   - Keyway tang does not contact the bottom of the keyway.

INSPECTING HUB INSTALLATION

The hub must now be inspected, before installing the hubcap and adding lubricant.

1. Test hub for free rotation. Ensure hub rotates smoothly and freely. If unsure refer to "Checking For Smooth and Quiet Rotation" on page 23. If the hub does not rotate freely, remove the hub and inspect to determine the cause. Do not place hub into service if it does not rotate freely.
2. Check end play by referring to the section "Checking End Play" on page 24. End play should be between 0.025 and 0.127 mm (0.001" and 0.005"). If end play is not correct, then dismantle hub, inspect, and repair before preceding to next step.
3. Inspect spindle shoulder and seal for excess lubricant. Wipe off any excess to ensure it is not mistaken for a leaking seal in service.

INSTALL HUBCAP AND ADD LUBRICANT

⚠ **IMPORTANT**: Always install a new gasket when reinstalling hubcap.

NOTICE: Interference between nut system and hubcap could occur if improper components are used. Use only genuine Hendrickson or Hendrickson approved replacement components.

4. Visually inspect hubcap, hub mating surface, bolt holes and new gasket for:
   - Signs of damage
   - Debris, such as silicon gasket sealer
   - Burrs or sharp edges
   - Cracks
5. Align hubcap and new gasket onto hub and insert bolts.
6. Hand-tighten bolts and progressively tighten hubcap bolts, in a star pattern, to a torque of 20 Nm.

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

7. Remove the fill hole plug from the fill hole on the side of the hub. Fill the hub with the specified amount of room temperature (16° C) semi-fluid grease. This grease is available from Hendrickson. For more information refer to the "Hub Lubrication Guide" on page 80.

Spindle Type	Grease Weight	Grease Volume
HN Iron/Aluminium	460 g	560 ml
HN ADI	690 g	850 ml
HP	1000 g	1230 ml

⚠ **WARNING**: Failure to correctly lubricate the hub will cause bearing failure along with subsequent hub, axle and possible trailer damage.

8. Refit fill port plug and torque to 30 Nm.

ASSEMBLE BRAKES AND WHEELS

Hub assembly is complete when the hubcap is installed and the hub is correctly lubricated. Follow these steps to complete the wheel-end assembly:

1. Turn hub so that pilot is at the 12 o'clock position and install brake drum and wheel (tyre and rim assembly). For more information refer to "Brake Drum and Wheel Assembly" on page 91. For air disc brake hubs refer to manufacturer's reference manual to install calliper, brake pads and brake chamber.
2. Restore trailer to normal operation.

TORQUE VALUES

The following table lists torque values for PreSet wheel-end fasteners.

Fastener	Torque (Nm)
Hub Fill Port Plug	30
Hubcap Screws	20
Pro-Torq Axle Nut	430
Three-Piece Inner Nut	430
Three-Piece Outer Lock Nut	305
Three-Piece Locking Setscrew	2
Wheel Nuts *	610

* Tighten wheel nuts incrementally. Re-torque all wheel nuts after 100 to 150 kilometres of service.

PRESET THREE-PIECE NUT ADJUSTMENT SUMMARY

The following is a basic description of the detailed procedure shown in "Standard Three-Piece" on page 49. Refer to the complete article for further explanation and details.

Prior to commencement of this procedure, the axle journal and thread should be clean, bearing journals lubricated with Mobil Mobilith SHC 007 synthetic semi-fluid grease and the hub fitted to axle with the securing nut hand tight.

⚠ **CAUTION**: Never loosen inner nut if the lock washer does not line up. Just tighten it a little until it does align.

Step	Description – Three-Piece Nut	Resources
1	Torque the inner nut to ***430 Nm*** whilst rotating the hub.	• Calibrated torque wrench set to 430 Nm • 3-13/16 inch socket – HN • 4-7/8 inch socket – HP • Breaker bar
2	1. Install lock washer. **NOTE**: Ensure lock washer tang fits in the keyway slot and the inner nut dowel fits into a lock washer hole. If it does not, then flip it over and reinstall. If necessary, ***tighten the inner nut*** slightly until alignment occurs with the closest hole in the lock washer. ***Do not loosen nut for alignment.*** 2. Install outer nut and torque to ***305 Nm***. 3. Install setscrew into lock washer and torque to ***2 Nm***. When properly installed, the setscrew will be approximately half the height of the outer nut.	• Calibrated torque wrench set to 305 Nm • Calibrated torque wrench set to 2 Nm • 3-1/4 inch socket – HN • 4-3/8 inch socket – HP • 5/64 inch hex key socket
3	1. Turn hub five times to settle the bearing rollers and check that it turns freely. 2. Measure hub end play. End play must be between 0.025 and 0.127 mm (0.001" and 0.005"). If not, remove outer lock nut, flip lock washer over and tighten or loosen inner nut until the dowel aligns, reinstall lock nut and recheck end play. 3. Install hubcap with new gasket and torque bolts to ***20 Nm***. 4. Add Mobil Mobilith SHC 007 synthetic semi-fluid grease through the fill port and torque fill plug to ***30 Nm***. 5. Use 0.56 litre (460 g) grease for HN hubs and 1.230 litres (1.0 kg) for HP hubs.	• Calibrated torque wrench set to 20 and 30 Nm • 1/2 inch socket • 1/4 or 5/16 inch hex key socket • Grease measuring system

PRESET PRO-TORQ NUT ADJUSTMENT SUMMARY

The following is a basic description of the detailed procedure shown in "Pro-Torq One-Piece" on page 50. Refer to the complete article for further explanation and details.

Prior to commencement of this procedure, the axle journal and thread should be clean, bearing journals lubricated with Mobil Mobilith SHC 007 synthetic semi-fluid grease and the hub fitted to axle with the securing nut hand tight.

NOTICE: Recommended practice is to replace the keeper each time the Pro-Torq spindle nut assembly is removed for maintenance purposes.

⚠ **CAUTION**: Never loosen inner nut if the locking keeper does not line up. Just tighten it a little until it does align.

Step	Description – Pro-Torq Nut	Resources
1	Torque the inner nut to ***430 Nm*** whilst rotating the hub.	• Calibrated Torque Wrench set to 430 Nm • 3-3/4 inch socket – HN • 4-13/16 inch socket – HP • Breaker bar
2	1. Install keeper, with bent legs facing outwards, into the undercut groove of the nut. **NOTE**: Ensure keeper keyway tang fits into the spindle keyway and mates with the teeth of the nut. If necessary, ***tighten nut*** slightly until they do align and then install keeper. ***Do not loosen nut for alignment.*** 2. Check that the keeper tabs, tang and teeth fit and mate properly.	
3	1. Turn hub five times to settle the bearing rollers and check that it turns freely. 2. Measure hub end play. End play must be between 0.025 and 0.127 mm (0.001" and 0.005"). If not, remove outer lock nut, flip lock washer over and tighten or loosen inner nut until the dowel aligns, reinstall lock nut and recheck end play. 3. Install hubcap with new gasket and torque bolts to ***20 Nm***. 4. Add Mobil Mobilith SHC 007 synthetic semi-fluid grease through the fill port and torque fill plug to ***30 Nm***. 5. Use 0.56 litre (460 g) grease for HN hubs and 1.230 litres (1.0 kg) for HP hubs.	• Calibrated torque wrench set to 20 and 30 Nm • 1/2 inch socket • 1/4 or 5/16 inch hex key socket • Grease measuring system

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STANDARD SERVICE WHEEL END MAINTENANCE PROCEDURES

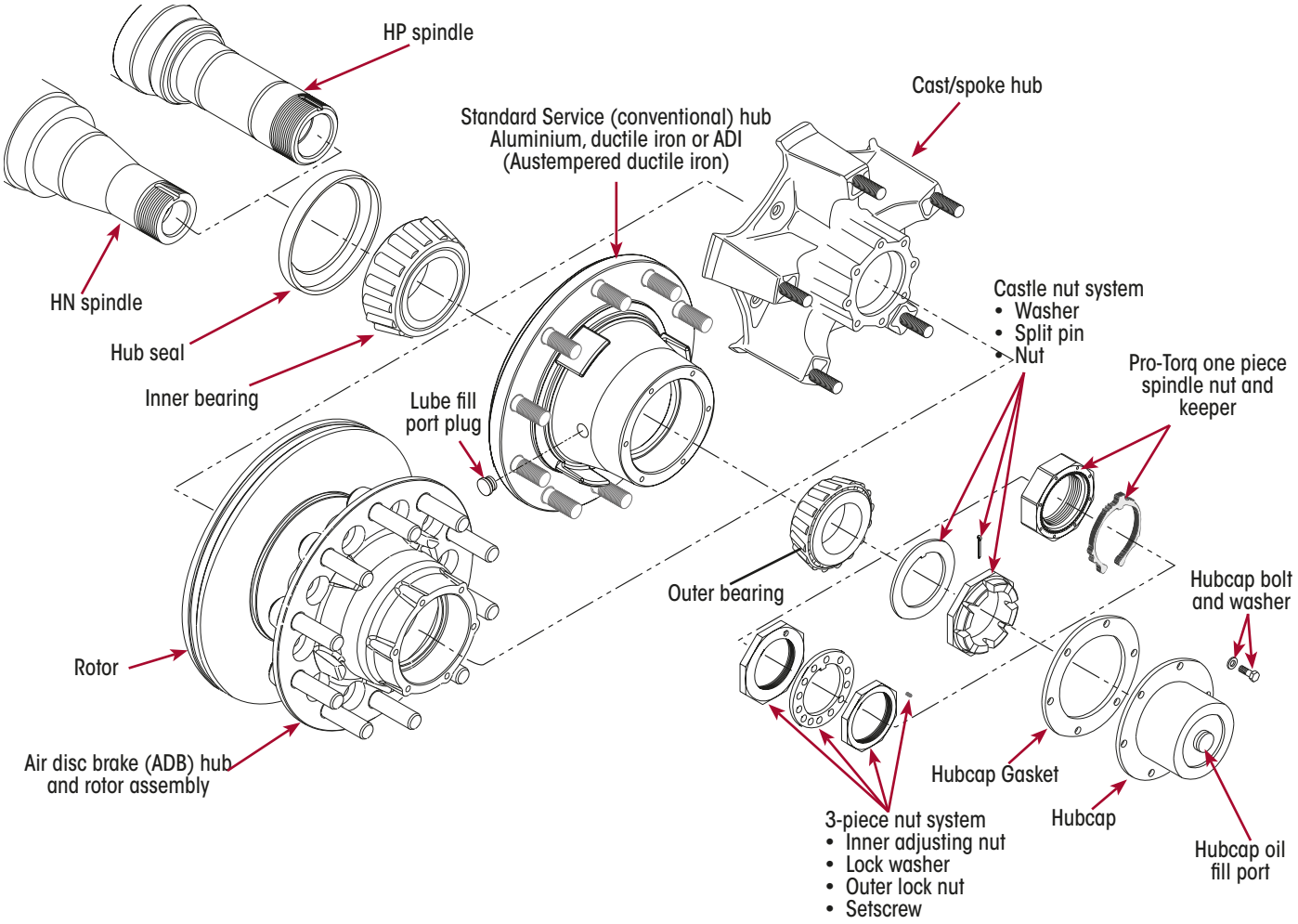


Figure 52: Hendrickson Standard Service wheel-end components identification

INTRODUCTION

Hendrickson Standard Service Hub Assembly 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 hub bore). The Standard Service wheel end includes components available from Hendrickson, but specified by the customer.

The Standard Service hub may be constructed of aluminium, austempered ductile iron (ADI) or ductile iron. Spindle types include HN (tapered) or HP (parallel). In these procedures, all similarly maintained and assembled hubs are considered conventional.

TOOLS REQUIRED

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

Tool	Where Used
Dial Indicator & stand with a resolution of 0.01 mm (0.0005")	End play measurement.
Breaker bar	Disassembly and setup
Hub-mounted seal driver	(Available from Hendrickson)
Spindle-mounted seal driver	
Calibrated torque wrenches (capable of 2, 20, 70, 135, 270 and 430 Nm)	
1/2 inch socket	Hubcap fasteners
1/4 or 5/16 inch hex key	Lube fill port plug
HN spindle Pro-Torq Nut	3-3/4 inch socket
HN spindle Three-Piece Nut	3-13/16 inch socket
	3-1/4 inch socket
	5/64 inch hex key
HP spindle Pro-Torq nut	4-13/16 inch socket
HP spindle Castle nut	4-3/4 inch socket
HP spindle Three-Piece Nut	4-7/8 inch socket
	4-3/8 inch socket
	5/64 inch hex key

IMPORTANT: Torque cannot be properly applied with an ordinary wrench. Calibrated torque wrenches must be used to tighten fasteners to specified values with even distribution of applied forces. Refer to "Torque Wrenches" on page 96

INSPECTION

At regular intervals, the standard hub assembly should be checked for seal leaks and smooth rotation.

⚠ **WARNING**: Prior to performing inspection procedures, ensure conditions are safe by following directions in the section "Preparing Trailer For Service" on page 7.

Trailer axles should be inspected at regular intervals, ranging from a simple daily visual check by the driver all the way through to less frequent in-depth examinations. The frequency of thorough inspections will vary depending on driving conditions, vocation and kilometres travelled.

Refer to the section "Hub Inspection and Routine Maintenance" on page 14 for more information regarding daily, monthly, quarterly and service inspections.

REMOVING AND INSTALLING HUB

IMPORTANT: To ensure continued warranty, do not perform the following procedures without obtaining prior authorisation from Hendrickson.

Hub Removal

Use the following procedure to remove hub assembly:

1. Remove tyre/wheel assembly.
2. Disengage brakes and if drum brakes, remove drum. If air disc brakes, remove calliper and carrier according to manufacturer's procedures. New carrier mounting hardware must be used for re-installation.
3. Remove hubcap bolts, remove hubcap and discard gasket.
4. One of three spindle nut systems will be used to secure a standard service hub to the spindle/axle:
   - Standard three-piece spindle nuts
   - Pro-Torq one-piece spindle nut
   - Castle spindle nut (HP spindles only)

   Each of these spindle nut systems has a different locking mechanism that must be disengaged before spindle nut(s) can be removed.
5. Disengage spindle nut locking mechanism as follows:

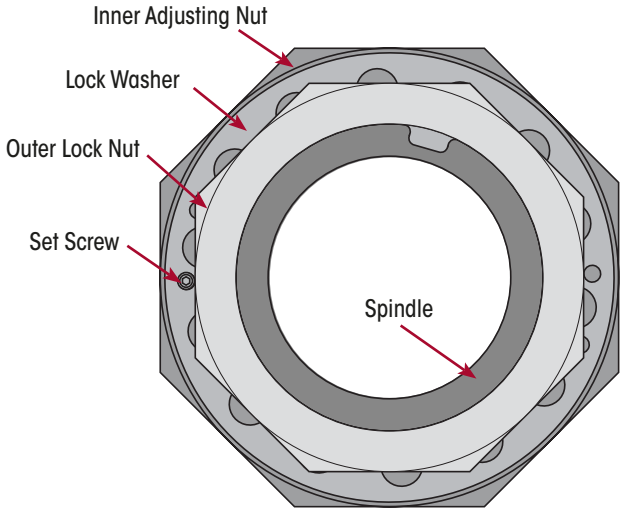


Figure 53: Three-Piece System Components

Standard Three-Piece – Remove setscrew from interlock washer using a 5/64 inch hex key.

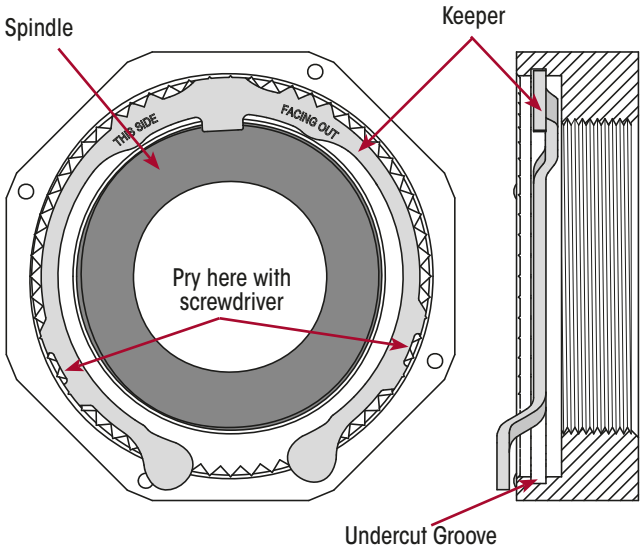


Figure 54: Pro-Torq System Components

Pro-Torq One-Piece – Using a flat-blade screwdriver, remove orange keeper from nut. Carefully pry both keeper arms from undercut groove in the nut until keeper releases. Slide keeper off spindle keyway.

NOTICE: Recommended practice is to replace the keeper each time the Pro-Torq spindle nut assembly is removed for maintenance purposes.

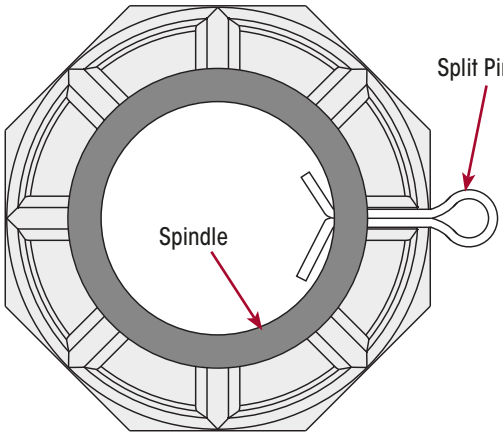


Figure 55: Castle Nut System Components

Castle Nut – Remove and discard split pin.

6. Remove spindle nut(s) and washer or lock washer (if fitted).

⚠ **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: Take care not to damage machined surfaces of spindle or hub.

7. Protect the outer bearing from falling out of the hub and carefully slide the hub off the spindle. If you are having difficulty removing the hub, refer to "Removing A Seized Hub" on page 93.

8. Remove and discard hub seal:

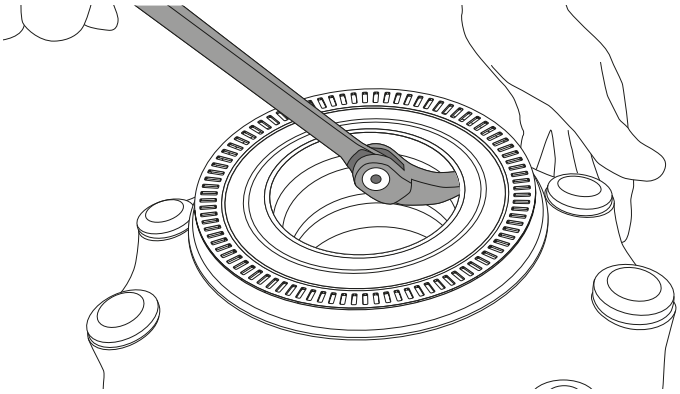


Figure 56: Carefully use pry bar to remove seal

A. If the seal is in the hub – use a pry bar to carefully remove seal from hub bore. Avoid damaging the hub or hub surfaces.

B. If the seal is on the spindle – drive the seal off the spindle by carefully striking it from the back side with a brass, leather or other soft-faced mallet.

If there is a seal wear ring on the axle spindle, lightly tap the ring with a ball peen hammer in one spot to enlarge it. The ring should slip off easily after a couple of taps.

⚠ **WARNING**: It can take significant effort to remove a seal that has been in place for an extended period. Therefore, take extra care to ensure that you do not damage either the spindle or the hub. Any damage to the spindle's machined surfaces can affect wheel end performance.

Spindle and Hub Preparation

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

1. Remove old lubricant and thoroughly clean spindle.
2. Inspect machined spindle seal surface for nicks, scratches, burrs or marks. If needed, use fine emery cloth or wet and dry paper to repair any damaged areas.
3. Clean spindle threads and keyway thoroughly 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. Screw the spindle nut onto the spindle all the way by hand, remove it and then clean off any mate-rial or fine shards of thread that would otherwise contaminate the bearings
6. Lubricate spindle with same lubricant used to fill hub.

IMPORTANT: Do not mix different types of lubricant.

7. Thoroughly clean the hub bore of any dirt, grease, rust or any other substance that may be present.
8. Inspect hub seal bore for roughness. If needed, use fine emery cloth to remove any burrs or old bore sealant, and wipe hub clean.
9. Remove all sharp edges, nicks and burrs from seal bore, hubcap bore and hubcap mounting surface of the hub.
10. Ensure hubcap mounting surface is smooth and free of debris.
11. Lubricate hub bearing surfaces with the same lubricant used to fill the hub.

Hub Installation

NOTICE: The hub seal can be damaged if:

- Hub seal is improperly installed.
- Hub seal is rammed into end of spindle or onto the spindle bearing shoulder.
- Hub is not kept supported and aligned with spindle until the outer bearing and axle nut are installed.
- Seal catches on spindle thread.

NOTICE: Do not mix lubricant types during hub assembly.

⚠ **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 installed on the spindle.

Spindle-Mounted Seal

This type of seal is mounted on the spindle before installing the hub. The replacement seal should be same brand and type as recommended by Hendrickson.

The correct hub seal installation tool must be used. Refer to "Special Tools" on page 97.

1. Lubricate seal and place it on the spindle.

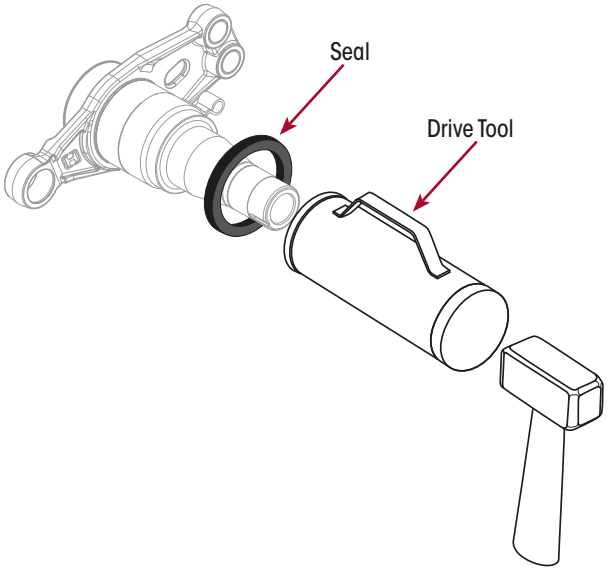


Figure 57: Using the correct tool for spindle mounted seal installation

2. Place installation tool over the spindle and drive seal until it is flush with the bearing shoulder.
3. Pack bearings with the appropriate lubricant and apply more lubricant to inner bearing journal and cone before installing. (Do not pack bearings with grease if using oil lubrication.)
4. Install inner bearing onto spindle. If it becomes misaligned, using a small hammer, tap lightly on the unmachined part of the axle tube. This will create vibration and help realign the bearing on the spindle and ease installation.

Hub-Mounted Seal

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 recommended by Hendrickson.

The correct hub seal installation tool must be used. Refer to "Special Tools" on page 97.

1. Lubricate hub.
2. Apply lubricant to spindle, bearing journal, hub cavity (between bearing cups), bearings cups within hub and pack bearing cones with grease. For more information refer to "Hub Lubrication Guide" on page 80. (Do not pack bearings with grease if using oil lubrication.)

NOTICE: To inhibit fretting, use the same lubricant used to fill the hub.

3. Install inner bearing into hub against inner bearing cup.

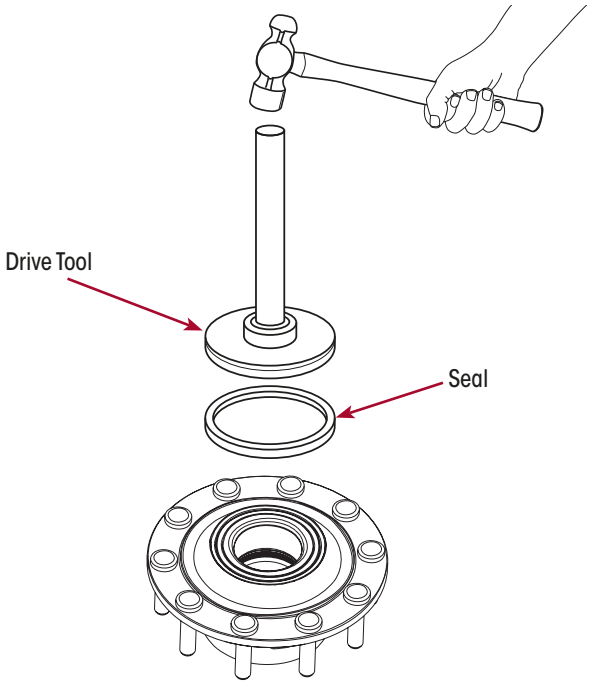


Figure 58: Using the correct tool for hub mounted seal installation

4. Lubricate inner and outer surfaces of the seal and place it on the installation tool.
   A. Align tool with hub seal bore.
   B. Drive seal until it bottoms out in the hub seal bore.
   C. Check inner bearing to make sure it rotates freely.

Hub and Outer Bearing

IMPORTANT: Removing and refitting hubs and tyres as

assemblies is generally not recommended due to the increased likelihood of damage to the hub seal. If a technician chooses to install the tyre and hub as an assembly, they will need to use sufficient support and precision to ensure the seal does not become damaged in any way during hub/wheel assembly installation.

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

1. If using NLGI #2 grease, ensure the hub cavity is packed with grease to the level of the bearing races. For more information refer to "Standard Bearing Grease Application" on page 82.
2. Pack outer bearing with grease or lube with oil and then place it on a clean rag within easy reach of the spindle end.
3. Gently slide hub onto spindle, taking care not to damage seal.
4. Hold hub in position and install outer bearing onto spindle.
5. Clean spindle and hub area of any excess lubricating grease or oil, especially from the spindle thread.
6. Fit primary spindle hub nut by hand to hold outer bearing and hub in place.

INSTALL SPINDLE NUT

Three types of spindle nut systems may be used to secure a conventional hub to the spindle/axle. Refer to the relevant section for appropriate instructions:

- "Standard Three-Piece Spindle Nut" on page 60.
- "Pro-Torq Spindle Nut" on page 62.
- "Castle Spindle Nut (HP Spindles Only)" on page 63.

Each of these spindle nut systems has different installation requirements.

⚠ **WARNING**: Failure to follow these instructions could cause wheel to come off and cause bodily injury. Over-tightening the spindle nut could cause the bearings to run hot and be damaged.

Standard Three-Piece Spindle Nut

The three-piece spindle nut system includes an inner adjusting nut, lock washer and outer lock nut.

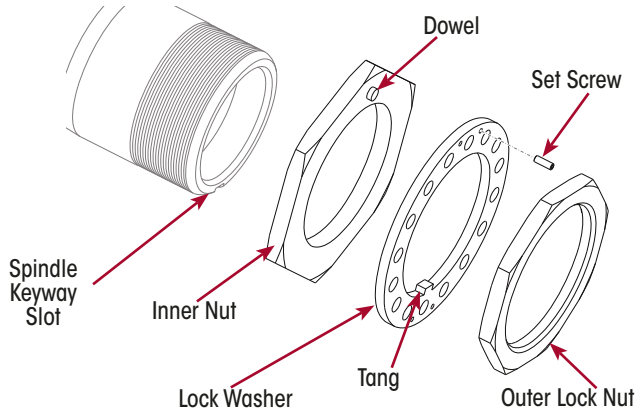


Figure 59: Three-Piece Nut System Installation

1. Install inner adjusting nut (***refer above figure***) on spindle, dowel side out, and tighten to 270 Nm of torque while rotating wheel to fully seat bearings and seal.
2. Back off inner adjusting nut one full turn.
3. Rotate wheel one full turn to relieve tension on bearings.
4. Tighten inner adjusting nut to 70 Nm of torque while rotating wheel.
5. Make a note of adjusting nut position and the back off the inner adjusting nut exactly 1/4 turn (90 degrees).

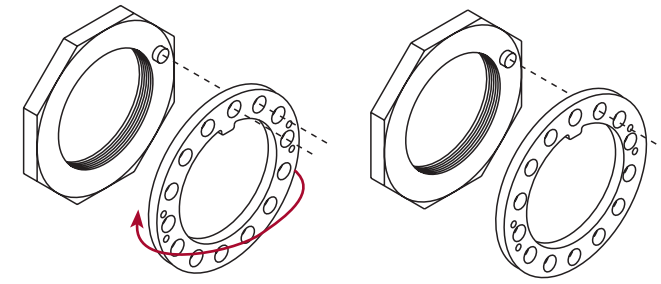


Figure 60: Adjusting Nut and Lock Washer Installation

6. Install lock washer (***refer above figure***). Make sure lock washer tang fits in the spindle keyway slot and inner adjusting nut dowel fits into 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.

NOTICE: Do not tighten inner adjusting nut for dowel pin alignment. This can excessively pre-load bearings, resulting in premature failure. If necessary, loosen the inner nut slightly until alignment occurs with the closest hole in the lock washer.

7. Install outer lock nut.
8. Tighten outer lock nut to 430 Nm.
9. Perform "Checking End Play" on page 24. Return to next step when procedure is complete.

IMPORTANT: End play must be between 0.025 mm (0.001") and 0.127 mm (0.005").

A. **If Excessive** – greater than 0.127 mm (0.005"):

i. Remove outer lock nut.

ii. 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.

iii. Slide lock washer up against inner nut and install outer lock nut.

iv. Tighten lock nut to specifications.

v. Recheck wheel bearing end play. If it is within specifications, proceed to "Install Setscrew, Step 10".

B. **If Insufficient** – less than 0.025 mm (0.001"):

i. Remove outer lock nut.

ii. 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.

iii. Slide lock washer up against inner adjusting nut and install outer lock nut.

iv. Tighten lock nut to specifications.

v. Recheck wheel bearing end play to see if it is now within specifications. If it is within specifications, proceed to "Install Setscrew, Step 10"

C. **Within Specifications** – proceed to "Install Setscrew, Step 10".

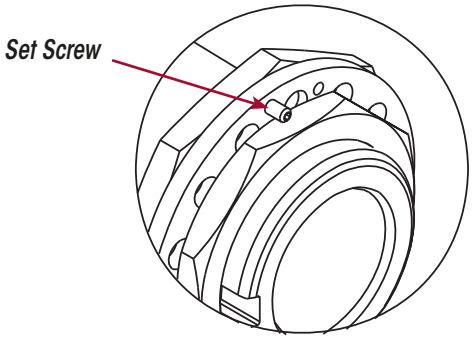


Figure 61: Installed set screw detail

10. Ensure lock washer is properly positioned over dowel pin and the install setscrew (***refer above figure***) into an accessible threaded hole in lock washer. Setscrew must contact inner adjusting nut. Tighten to 2 Nm of torque.

IMPORTANT: Ensure setscrew contacts nut face. When properly installed, the setscrew will be approximately half the height of the outer lock nut.

11. Test for free hub rotation and then proceed to "Install Hubcap and Add Lubricant" on page 64. (If there is any doubt, go to "Checking For Smooth and Quiet Rotation" on page 23.)

Pro-Torq Spindle Nut

Follow this procedure to install Pro-Torq nut on Hendrickson wheel ends.

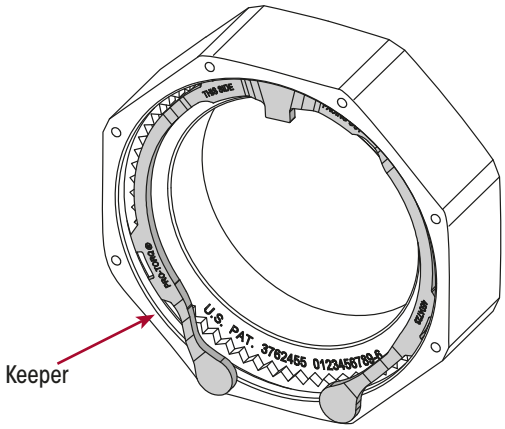


Figure 62: Pro-Torq nut

1. Check the condition of the keeper to ensure that it is in good condition. It is recommended that the keeper be replaced whenever the nut is removed for bearing maintenance.
2. Check spindle nut before assembly to ensure that it is in suitable condition. The side that faces the bearing must not have any noticeable wear and the locking ring groove and teeth must be in good condition. If there is any doubt about the condition of the nut, then this should be replaced as an assembly with the keeper.
3. If necessary, remove keeper from Pro-Torq nut. Using a screwdriver, carefully pry the keeper arm from the undercut groove on each side until the keeper releases.
4. Install Pro-Torq nut onto spindle and hand tighten.
5. Use a calibrated torque wrench to tighten nut to 270 Nm of torque. This ensures bearing cups are properly seated in the hub.
6. Rotate hub at least one full revolution.
7. Repeat Step 3 and Step 4 two more times, but do not rotate after final torque.
8. Back off nut until it is loose.
9. Use a calibrated torque wrench to tighten nut to 135 Nm of torque.
10. Rotate hub at least one full revolution.
11. Repeat Step 7 and Step 8 two more times, but ***do not rotate*** after final torque.

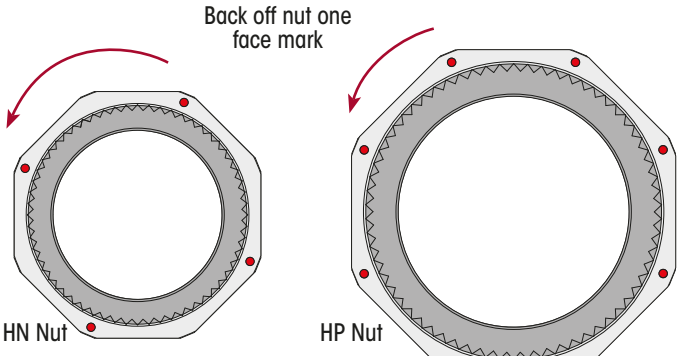


Figure 63: HN and HP spindle nut face marks

12. Back off nut one raised face mark (***refer above figure***):
    A. For HN spindle, 1/4 turn (90 degrees).
    B. For HP spindle, 1/8 turn (45 degrees).

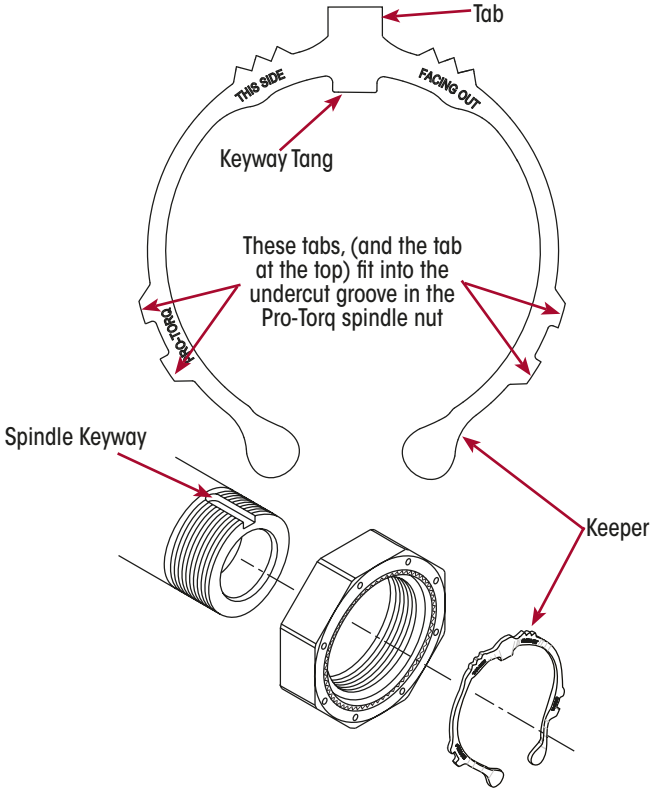


Figure 64: Keeper Installation for Pro-Torq Nut

13. Install keeper with bent legs and orange side facing out (***refer above figure***). Insert tab into undercut groove in nut and engage keeper keyway tang in spindle keyway.

NOTICE: Recommended practice is to replace the keeper each time the Pro-Torq spindle nut assembly is removed for maintenance purposes.

14. Engage mating teeth. If the teeth are out of alignment and the keeper will not engage, then loosen the nut slightly until they align. Do not loosen nut more than one tooth (six degrees).

15. Use a screwdriver to compress and insert keeper arms, one at a time, into undercut groove in the nut.

⚠ **WARNING**: Do not bend or manipulate keyway tang in any way. Doing so may cause tang to break, allowing wheel to come off and cause bodily injury.

16. Inspect installation and ensure:
    - Keeper tab and keeper arms are fully seated in the undercut groove.
    - Keeper teeth engage fully with the nut.
    - Keyway tang does not contact the bottom of the keyway.

17. Perform "Checking End Play" on page 24.

IMPORTANT: End play must be between 0.025 and 0.127 mm (0.001" and 0.005").

A. If end play is out of tolerance:

i. Remove keeper.

ii. If end play is insufficient (less than 0.025 mm), loosen nut one keeper tooth. If end play is excessive (greater than 0.127 mm), tighten nut by one keeper tooth.

iii. Reinstall keeper (Step 11 of this procedure).

iv. Repeat "Checking End Play" on page 24.

B. If end play is within specifications, go to next step.

18. Check to ensure the spindle nut is secure and the keeper is properly seated.

19. Test for free hub rotation and then proceed to "Install Hubcap and Add Lubricant" on page 64. (If unsure, go to "Checking For Smooth and Quiet Rotation" on page 23.)

Castle Spindle Nut (HP Spindles Only)

Follow this procedure to install castle style nuts on Hendrickson wheel ends.

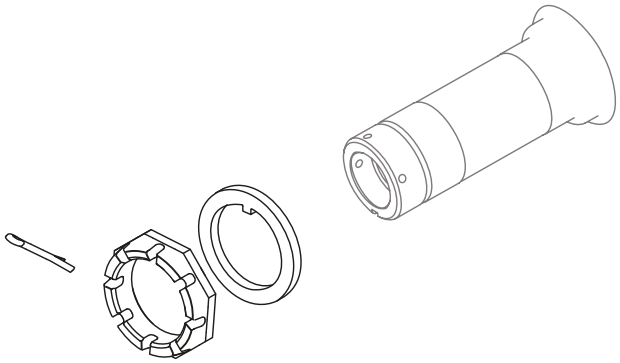


Figure 65: Installation of Castle Nut

1. Install castle nut washer and castle nut onto spindle.
2. Tighten to 270 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 1/2 turn.
4. Tighten castle nut to 70 Nm of torque while rotating hub at least one full rotation.
5. Back off nut 1/8 turn.
6. Insert split pin, but do not bend at this time.

NOTE: The split pin should extend into centre of the spindle. 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.

7. Perform "Checking End Play" on page 24.

IMPORTANT: End play must be between 0.025 and 0.127 mm (0.001" and 0.005").

A. If end play is out of tolerance:

i. Remove split pin.

ii. If end play is insufficient (less than 0.025 mm), loosen nut by one alignment hole. If end play is excessive (greater than 0.127 mm), tighten nut by one alignment hole.

iii. Reinstall split pin.

iv. Repeat "Checking End Play" on page 24.

B. If end play is within specifications, go to next step.

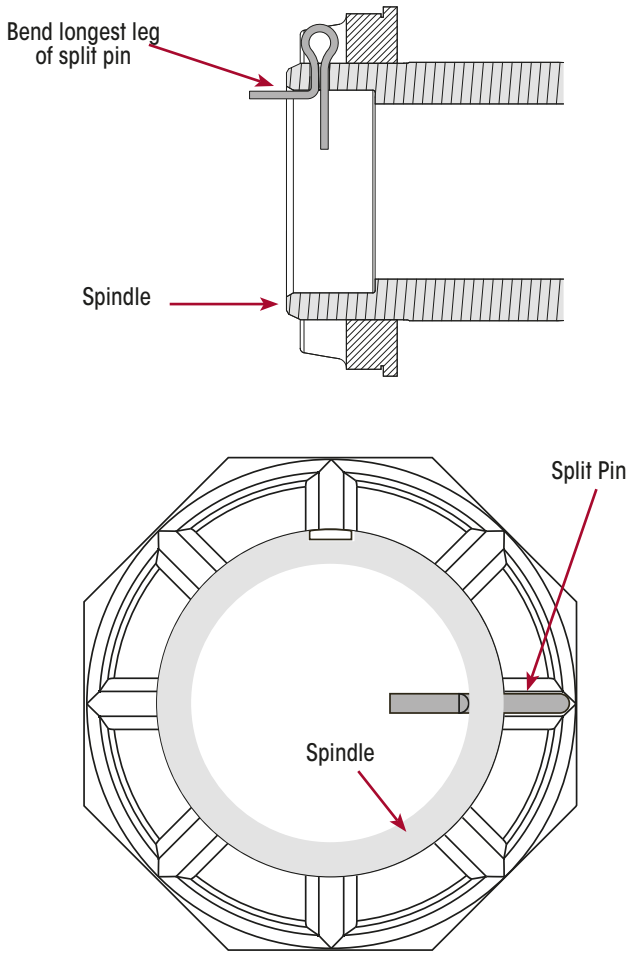


Figure 66: Split Pin Installation

8. Bend the long leg of split pin to minimise castle nut movement. Ensure split pin is bent sufficiently so that it will not contact the hubcap.

IMPORTANT: On axles fitted with TIREMAAX™ systems, extra care must be taken to ensure that the split pin is bent so that it does not interfere with the hose and fittings.

9. Check to ensure that the spindle castle nut is secure and the split pin is properly installed.

10. Test for free hub rotation and then proceed to "Install Hubcap and Add Lubricant" on page 64. (If unsure, go to "Checking For Smooth and Quiet Rotation" on page 23.)

INSTALL HUBCAP AND ADD LUBRICANT

The hub must now be inspected, before installing the hubcap and adding lubricant.

1. Test hub for free rotation. Ensure hub rotates smoothly and freely. If unsure refer to "Checking For Smooth and Quiet Rotation" on page 23. If the hub does not rotate freely, remove the hub and inspect to determine the cause. Do not place hub into service if it does not rotate freely.

2. Inspect spindle shoulder and seal for excess lubricant. Wipe off any excess to ensure it is not mistaken for a leaking seal in service.

IMPORTANT: Always install a new gasket when reinstalling hubcap.

NOTICE: Interference between nut system and hubcap could occur if improper components are used. Use only genuine Hendrickson or Hendrickson approved replacement components.

3. Visually inspect hubcap, hub mating surface, bolt holes and new gasket for:
   - Signs of damage
   - Debris, such as silicon gasket sealer
   - Burrs or sharp edges
   - Cracks

4. On grease filled hubs, apply a thin layer of grease on inside of hubcap to prevent corrosion. Wipe off excess grease to ensure the sealing face is dry and clean.

5. Align hubcap and new gasket onto hub and insert bolts.

6. Hand-tighten bolts and progressively tighten hubcap bolts, in a star pattern, to a torque of 20 Nm.

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

7. Two different kinds of lubricant are generally used in Hendrickson standard service hubs, oil or NLGI #2 grease. For more information refer to the "Hub Lubrication Guide" on page 80.

NLGI #2 Grease. This must be packed into bearings and fill the cavity between the bearing cups before assembly.

Oil Lubricant. Remove fill port plug on the side of the hub or at hubcap window plug (if included) and add oil until level is a maximum mark in hubcap window. Quantity of oil

required will be around 2/3 of that shown in the following Grease Capacity table.

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 wheel end).

Install fill port and tighten hub fill port plug to 30 Nm or hubcap side fill port to 10 Nm torque.

Approximate Grease Capacity

Spindle Type	Grease Weight	Grease Volume*
HN Iron/Aluminium	460 g	560 ml
HN ADI	690 g	850 ml
HP	1000 g	1230 ml

* Oil fill levels are generally only 2/3 of the volume specified for grease.

ASSEMBLE BRAKES AND WHEELS

Hub assembly is complete when the hubcap is installed and the hub is correctly lubricated. Follow these steps to complete the wheel-end assembly:

1. Turn hub so that pilot is at the 12 o'clock position and install brake drum and wheel (tyre and rim assembly). For more information refer to "Brake Drum and Wheel Assembly" on page 91. For air disc brake hubs refer to manufacturer's reference manual to install calliper, brake pads and brake chamber.
2. Restore trailer to normal operation.

TORQUE VALUES

The following table lists torque values for Standard Bearing wheel-end fasteners. Pro-Torq, castle and three-piece inner nuts must be set using procedures shown earlier in this section.

Fastener		Torque (Nm)
Hub Fill Port Plug	9/16"-18	30
	3/8"-18 Tapered Thread	30
Hubcap Side Fill Port		10
Hubcap Screws		20
Three-Piece Outer Lock Nut		430
Three-Piece Locking Setscrew		2
Wheel Nuts *		610

* Tighten wheel nuts incrementally. Re-torque all wheel nuts after 100 to 150 kilometres of service.

STANDARD BEARING THREE-PIECE NUT ADJUSTMENT SUMMARY

The following is a basic description of the detailed procedure shown in "Standard Three-Piece Spindle Nut" on page 60. Refer to the complete article for further explanation and details.

Prior to commencement of this procedure, the axle journal and thread should be clean, bearings and bearing journals lubricated with the same lubricant being used for hub and the hub fitted to axle with the securing nut hand tight.

⚠ **CAUTION**: Do not tighten inner nut to make the lock washer line up. Simply loosen it a little until it does align.

Step	Description – Three-Piece Nut	Resources
1	1. Torque the inner nut to ***270 Nm*** whilst rotating the hub. 2. ***Back off*** nut one full turn and then rotate hub one full turn.	• Calibrated torque wrench set to 270 Nm • 3-13/16 inch socket – HN • 4-7/8 inch socket – HP • Breaker bar
2	1. Torque the inner nut to ***70 Nm*** whilst rotating the hub. 2. Note position of inner nut and ***back off exactly 1/4 turn*** (90 degrees).	• Calibrated torque wrench set to 70 Nm • 3-13/16 inch socket – HN • 4-7/8 inch socket – HP
3	1. ***Install lock washer***. **NOTE**: Ensure lock washer tang fits in the keyway slot and the inner nut dowel fits into a lock washer hole. If it does not, then flip it over and reinstall. If necessary, loosen the inner nut slightly until alignment occurs with the closest hole in the lock washer. 2. Install outer nut and torque to ***430 Nm***.	• Calibrated torque wrench set to 430 Nm • 3-1/4 inch socket – HN • 4-3/8 inch socket – HP
4	1. Turn hub five times to settle the bearing rollers and check that it turns freely. 2. Measure hub end play. End play must be between 0.025 and 0.127 mm (0.001" and 0.005"). If not, remove outer lock nut, flip lock washer over and tighten or loosen inner nut until the dowel aligns, reinstall lock nut and recheck end play. 3. Install setscrew into lock washer and torque to ***2 Nm***. When properly installed, the setscrew will be approximately half the height of the outer nut. 4. Install hubcap with new gasket and torque bolts to ***20 Nm***. 5. If oil lubricated, fill hubs through fill port until it reaches the maximum mark on the hubcap indicator..	• Dial Indicator • Calibrated torque wrench set to 2 Nm • 5/64 inch hex key socket • Calibrated torque wrenches set to 2 Nm and 20 Nm • 1/2 inch socket

STANDARD BEARING PRO-TORQ NUT ADJUSTMENT SUMMARY

The following is a basic description of the detailed procedure shown in "Pro-Torq Spindle Nut" on page 62. Refer to the complete article for further explanation and details.

Prior to commencement of this procedure, the axle journal and thread should be clean, bearings and bearing journals lubricated with the same lubricant being used for hub and the hub fitted to axle with the securing nut hand tight.

NOTICE: Recommended practice is to replace the keeper each time the Pro-Torq spindle nut assembly is removed for maintenance purposes.

⚠ **CAUTION**: Never bend or manipulate the keeper keyway tang, which could allow the tang to break and the wheel to come off.

Step	Description – Pro-Torq Nut	Resources
1	1. Torque the nut to ***270 Nm***. 2. Rotate the hub one complete turn. 3. Torque the nut to ***270 Nm***. 4. Rotate the hub one complete turn. 5. Torque the nut to ***270 Nm***. 6. ***Back off nut*** one full turn.	• Calibrated torque wrench set to 270 Nm • 3-3/4 inch socket – HN • 4-13/16 inch socket – HP • Breaker bar
2	1. Torque the nut to ***135 Nm.*** 2. Rotate the hub one complete turn. 3. Torque the nut to ***135 Nm.*** 4. Rotate the hub one complete turn. 5. Torque the nut to ***135 Nm.*** 6. Note position of the raised face marks on the Pro-Torq nut and ***back off exactly one raised mark***. 1/4 turn (90 degrees) for HN and 1/8 turn (45 degrees) for HP.	• Calibrated torque wrench set to 135 Nm • 3-3/4 inch socket – HN • 4-13/16 inch socket – HP
3	1. Install keeper, with bent legs facing outwards, into the undercut groove of the nut. **NOTE**: Ensure keeper keyway tang fits into the spindle keyway and mates with the teeth of the nut. If necessary, loosen nut slightly (no more than 6 degrees) until they do align and then install keeper. 2. Check that the keeper tabs, tang and teeth fit and mate properly.	
4	1. Turn hub five times to settle the bearing rollers and check that it turns freely. 2. Measure hub end play. End play must be between 0.025 and 0.127 mm (0.001" and 0.005"). If not, remove keeper and tighten or loosen nut one tooth, reinstall keeper and recheck end play. 3. Install hubcap with new gasket and torque bolts to ***20 Nm***. 4. If oil lubricated, fill hubs through fill port until it reaches the maximum mark on the hubcap indicator.	• Dial Indicator • Calibrated torque wrench set to 20 Nm • 1/2 inch socket

STANDARD BEARING CASTLE NUT ADJUSTMENT SUMMARY

The following is a basic description of the detailed procedure shown in "Castle Spindle Nut (HP Spindles Only)" on page 63. Refer to the complete article for further explanation and details.

Prior to commencement of this procedure, the axle journal and thread should be clean, bearings and bearing journals lubricated with the same lubricant being used for hub and the hub fitted to axle with the securing nut hand tight.

Step	Description – Castle Nut	Resources
1	1. Torque the castle nut to ***270 Nm*** whilst rotating the hub. 2. ***Back off*** nut until it feels loose, but no more than half turn.	• Calibrated torque wrench set to 270 Nm • 4-3/4 inch socket
2	1. Torque the nut to ***70 Nm*** whilst rotating the hub. 2. Note position of nut and ***back off exactly 1/8 turn*** (45 degrees). 3. Insert split pin but do not bend yet. If hole does not align with nut, loosen sightly until it does align and then fit split pin.	• Calibrated torque wrench set to 70 Nm • 4-3/4 inch socket
3	1. Turn hub five times to settle the bearing rollers and check that it turns freely. 2. Measure hub end play. End play must be between 0.025 and 0.127 mm (0.001" and 0.005"). If not, remove split pin, tighten or loosen castle nut until the next hole aligns, reinstall split pin and recheck end play. 3. Bend split pin to minimise nut movement and to ensure there is no contact with hubcap. 4. Install hubcap with new gasket and torque bolts to ***20 Nm***. 5. If oil lubricated, fill hubs through fill port until it reaches the maximum mark on the hubcap indicator.	• Dial Indicator • Calibrated torque wrench set to 20 Nm • 1/2 inch socket

HENDRICKSON UNITIZED SYSTEM™ (HUS™) PROCEDURES

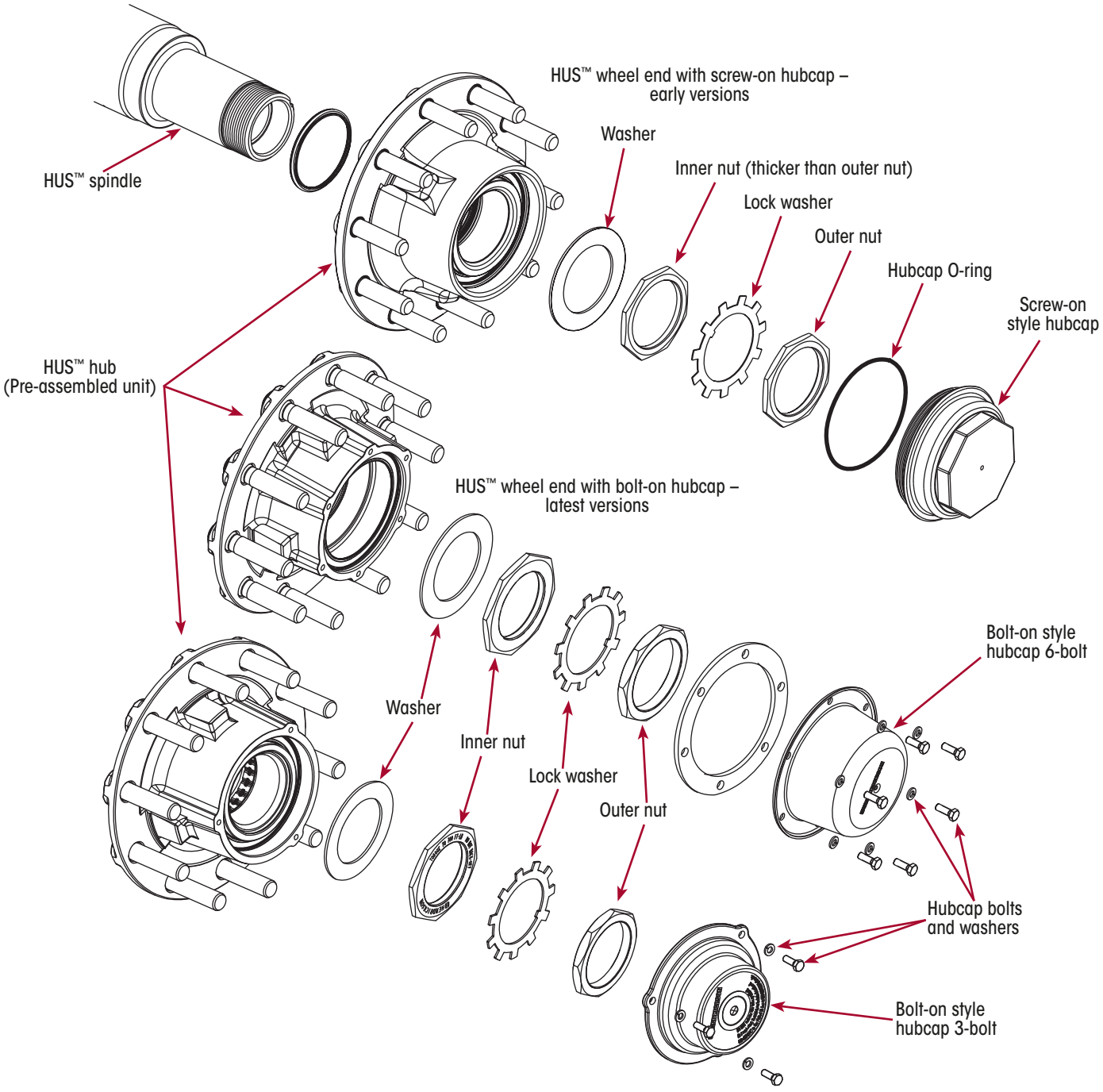


Figure 67: HUS™ wheel end component identification

INTRODUCTION

The HUS™ hub is manufactured by SKF. It is a permanently sealed and lubricated assembly designed to help reduce wheel-end maintenance.

Service parts are no longer available through Hendrickson. Please contact Hendrickson to learn about the options available to upgrade your axle to a newer spindle design. Alternatively, contact SKF directly to source service parts.

NOTICE: The HUS hub system uses a parallel spindle design that is dimensionally different to the standard HP design. It cannot be fitted with a HP type hub assembly.

The following features are unique to the HUS hub and help to distinguish it from the other hub assemblies found on Hendrickson suspensions:

- Warranty and service information is stamped on the hubcap.
- The hub and hubcap have no provision for adding lubricant.
- The four-piece axle spindle locking hardware consists of a washer, a thicker inner nut, a bendable tab lock washer and a thinner outer nut. The inner nut is also stamped with installation information.

Because the spindle locking hardware is unique to the HUS hub, it is not interchangeable with other Hendrickson suspension hub assemblies or other unitised hubs.

NOTICE: Replace both hub nuts, washers and hub shoulder seal every time the hub is removed. Replace the hubcap O-ring every time the hubcap is removed.

TOOLS REQUIRED

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

Tool	Where Used
Multi-Grips	Lock Washer
Calibrated torque wrenches and Torque Multiplier (capable of 20, 340 and 950 Nm)	
Breaker bar	Disassembly and setup
1/2 inch socket	Hubcap fasteners
4-7/8 inch socket	Inner Spindle Nut and Screw-On Hubcap
4-3/8 inch socket	Outer Spindle Nut

IMPORTANT: Torque cannot be properly applied with an ordinary wrench. Calibrated torque wrenches must be used to tighten fasteners to specified values with even distribution of applied forces. Refer to "Torque Wrenches" on page 96

INSPECTION

At regular intervals, the HUS hub should be checked for seal leaks, smooth rotation and end play.

⚠ **WARNING**: Prior to performing inspection procedures, ensure conditions are safe by following directions in the section "Preparing Trailer For Service" on page 7.

Trailer axles should be inspected at regular intervals, ranging from a simple daily visual check by the driver all the way through to less frequent in-depth examinations. The frequency of thorough inspections will vary depending on driving conditions, vocation and kilometres travelled.

Refer to the "Hub Inspection and Routine Maintenance" on page 14 for more information regarding daily, monthly, quarterly and service inspections.

REMOVING AND INSTALLING HUB

The HUS hub is a permanently sealed and lubricated assembly designed to help reduce wheel-end maintenance. Except for the hubcap and hubcap O-ring (or gasket), no individual component of the HUS hub assembly can be serviced. When necessary, the entire HUS hub must be replaced as an assembly.

IMPORTANT: Do not attempt to remove the hub bearings, seals or lubricant from the unitised assembly.

Under normal operating conditions, it is not necessary to remove the HUS hub assembly from the axle. The only exception is when the entire HUS hub is being replaced as an assembly. Whenever the HUS hub is removed from the spindle, the inner and outer nuts, both washers and the shoulder seal must be replaced, the entire spindle (except for the spindle threads) and hub bore must be wiped clean and lubricated with Molykote D, and the hubcap O-ring (or gasket) must be inspected and replaced.

Hub Removal

1. Remove the tyre/wheel assembly.

⚠ **CAUTION**: Remove the wheel nuts to remove the tyre/wheel assembly. Do not remove the inner and outer spindle nuts and then attempt to remove the tyre/wheel assembly, brake drum and hub as an entire assembly. The clip inside the hub bore can dislodge, causing the hub to disassemble. Damage to components can result.

2. Disengage the brake shoes and remove the brake drum.

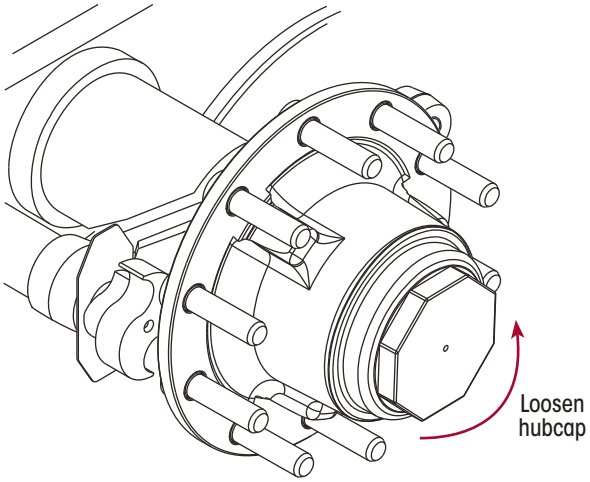


Figure 68: Removing screw-on hubcap

3. Remove the screw-on type hubcap by rotating it anticlockwise (***Refer figure above***). Remove the bolt-on type hubcap by removing the hubcap bolts.

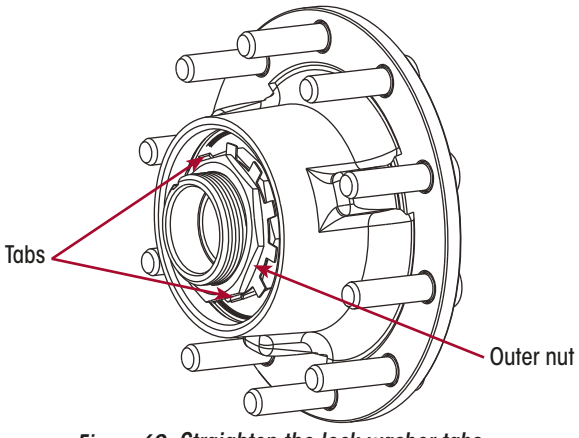


Figure 69: Straighten the lock-washer tabs

4. Using a screwdriver or other suitable tool, straighten the two opposing flattened lock-washer tabs until they clear the outer nut. ***Refer figure above***.

⚠ **CAUTION**: Keep the tool securely on the lock-washer tabs. If the tool slips off the tabs, damage to the hub outer seal can occur.

NOTICE: Because of the high installation torque 950 Nm, a torque multiplier may be useful when removing the inner and outer spindle nuts in the following step.

5. Remove the outer spindle nut, lock-washer, inner spindle nut and washer. Use care when removing the inner spindle nut to prevent damage to the hub outer seal.

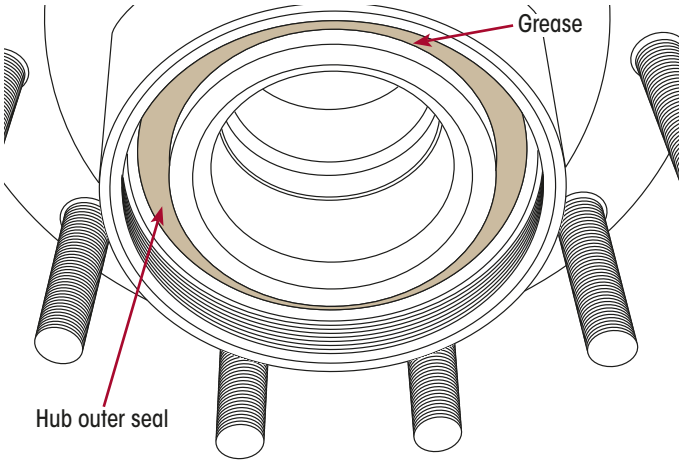


Figure 70: Normally present grease at hub outer seal

NOTICE: With the outer nut, lock-washer, inner nut and washer removed, it is possible to see most of the hub outer seal. Small amounts of grease may be visible at the hub outer seal (***Refer figure above***). This is a normal occurrence and does not indicate a seal leak. However if a large amount of grease is visible, the seal is leaking and the hub must be replaced.

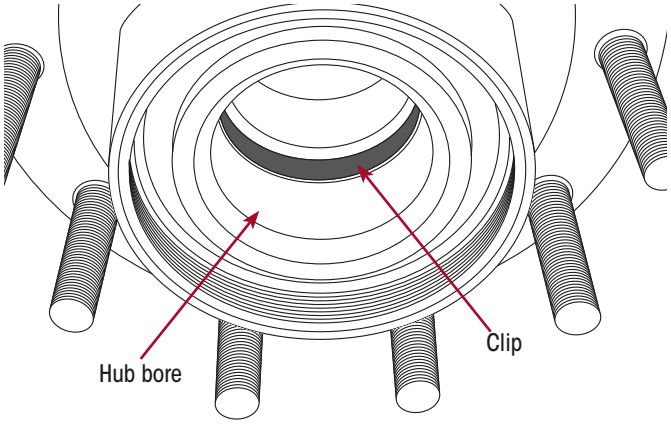


Figure 71: Avoid dislodging the clip inside the hub

⚠ **WARNING**: When removing the hub assembly from the axle spindle in the following step, taking care to avoid dislodging the clip inside the hub bore (***Refer figure above***).

If the clip becomes dislodged, the hub will disassemble, which can contaminate the lubricant. Damage to components may result.

⚠ **CAUTION**: To prevent damage to the hub outer seal, clear all contaminants away from the seal before removing the hub.

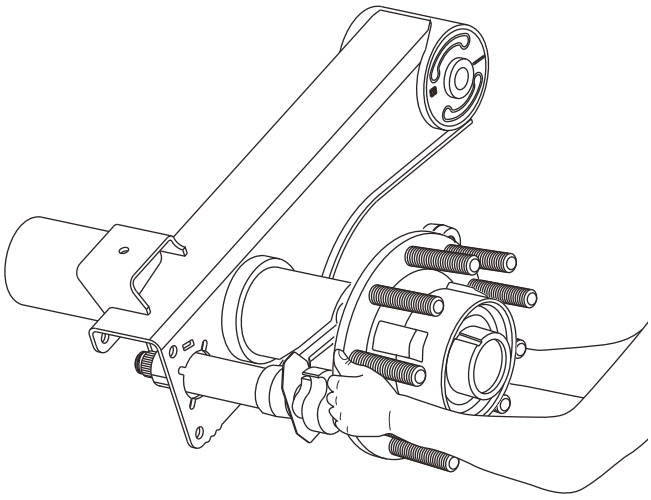


Figure 72: Removing the HUS™ hub

6. Grasp the hub assembly with both hands (***Refer figure above***). If the hub assembly is free on the axle spindle, pull the hub as straight as possible to avoid dislodging the clip inside the hub bore. If the hub assembly is seized on the axle spindle, use either one of the methods shown in "Removing A Seized Hub" on page 93 to remove the hub from the spindle.

IMPORTANT: If a puller is required to remove a stuck HUS hub, do not reinstall the same hub. Replace the hub.

IMPORTANT: Do not attempt to rebuild a disassembled hub. To avoid component damage, a new HUS hub must be installed.

Spindle and Hub Preparation

Whenever the HUS™ hub is removed from the spindle, the shoulder seal must be replaced before the hub is installed.

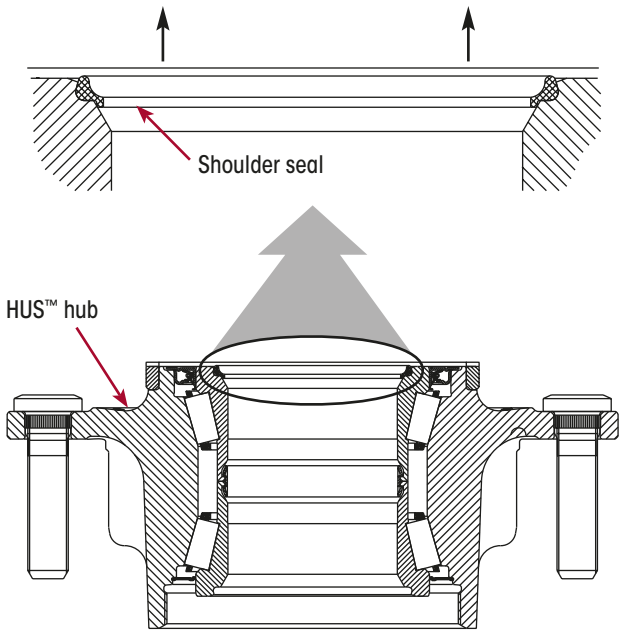


Figure 73: Shoulder seal location

1. Carefully remove the existing shoulder seal (***Refer figure above***). Take care not to scratch, nick or otherwise mark the hub bore when removing the seal.

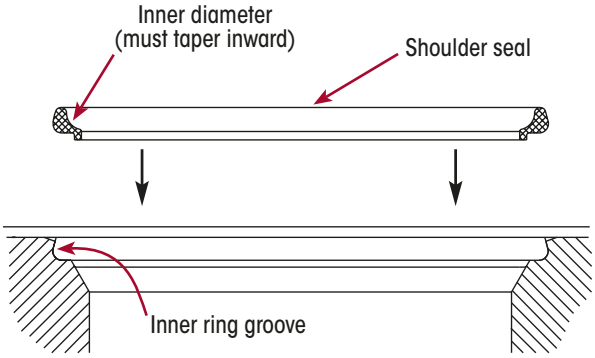


Figure 74: Shoulder seal installation details

2. Install the new shoulder seal into the inner ring groove (***Refer figure above***) in the hub. When properly oriented for installation, the shoulder seal inner diameter will taper inward. Do not force the shoulder seal into the inner ring groove.

⚠ **CAUTION**: To prevent damage to the hub outer seal, keep all contaminants away from the seal when installing the hub.

To prevent HUS hub component damage, do not use solvents to clean the hub bore. Solvents can enter the hub and contaminate the lubricant.

Do not attempt to install the hub, brake drum and tyre/wheel assembly as an entire assembly. The clip inside the hub bore can dislodge, causing the hub to disassemble. Damage to components may result.

3. Wipe the axle spindle, axle threads and hub bore with a clean rag to remove any old grease.
4. Check the axle spindle and hub bore for scratches, nicks or marks. If necessary, repair them with wet and dry paper or fine emery cloth.
5. Verify that the hub side of the axle bearing shoulder and the part of the hub that contacts this shoulder are completely free of debris (***refer figure below***).

⚠ **CAUTION**: Prevent debris from entering the joint between the hub and the axle bearing shoulder. If debris is trapped in this joint, it can create a gap that allows water to enter the axle spindle area and cause corrosion.

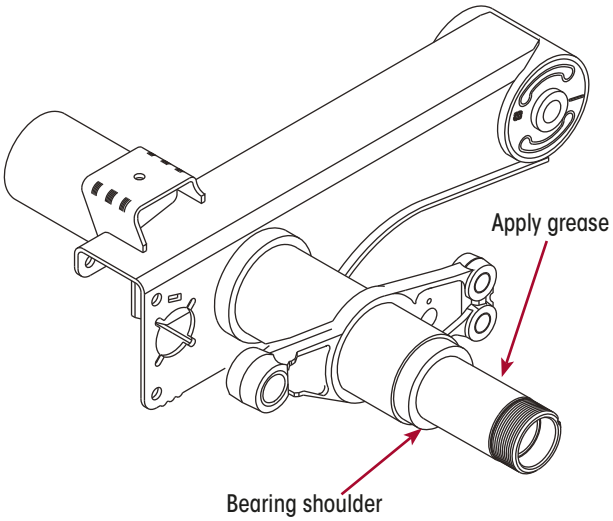


Figure 75: Check bearing shoulder and apply grease to spindle

6. Use a molybdenum-based grease (such as Molykote D Paste) to lubricate the entire axle spindle (except the threads), including the bearing journals and the hub side of the bearing shoulder. Do not allow any lubricant to get on the spindle threads; otherwise, it will result in excessive preload on the hub. If necessary, clean any excess lubricant from threads. ***Refer figure above.***

Hub Installation

⚠ **CAUTION**: When installing the hub assembly onto the spindle in the following step, align the hub bore straight onto the spindle to avoid dislodging the clip inside the hub bore. If the clip becomes dislodged, the hub will disassemble, which can contaminate the lubricant. Do not attempt to rebuild a disassembled hub. To avoid component damage, a new HUS® hub must be installed.

⚠ **CAUTION**: When installing the hub assembly onto the spindle in the following step, do not force the hub assembly onto the spindle. The hub can jam on the spindle resulting in component damage. Also, make sure the shoulder seal does not fall out of the inner ring groove. If the shoulder seal falls out of the groove, remove the hub and inspect the shoulder seal for tears before re-installing the shoulder seal and retrying the hub installation.

1. Carefully align the hub bore to the spindle and slide the hub straight onto the spindle. Tapping lightly on the unmachined part of the axle with a hammer may help ease hub installation. The hub is correctly installed when it contacts the spindle bearing shoulder.
2. Do not force the hub assembly onto the spindle. If the hub does not slide easily onto the spindle, carefully remove the hub so that you do not dislodge the clip inside the hub bore or damage the shoulder seal and then try to reinstall, ensuring the hub is correctly aligned.
3. After sliding the hub all the way onto the spindle, back hub off and wipe spindle shoulder face to remove any excess spindle grease. Check to verify that the shoulder seal has not become dislodged from hub during assembly. Carefully reseat the hub straight onto the spindle. The hub is seated correctly when it rests against the shoulder.

NOTICE: It is normal to see a small bead of grease at the spindle bearing shoulder when the hub is installed onto the spindle.

4. Install the inner washer.

NOTICE: When installing the spindle nuts in the following steps, rotate the hub while tightening the nuts to the specified torque.

5. Install the inner nut. While rotating the hub, use a calibrated torque wrench to tighten the inner nut to 950 Nm of torque. Be careful not to damage the hub outer seal when tightening the inner nut.
6. Install the lock-washer and verify that the tab is correctly inserted into the spindle keyway.
7. Install the outer nut. Use a calibrated torque wrench to tighten the outer nut to 340 Nm of torque.

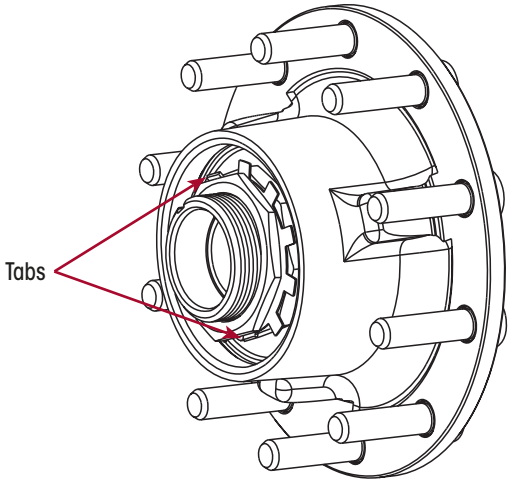


Figure 76: Bend opposing lock washer tabs over outer nut

8. Bend two lock-washer tabs over opposing flats of the outer nut. ***Refer figure above***.

⚠ **CAUTION**: When bending the lock-washer tabs, keep the tool securely on the tabs. If the tool slips off the tabs, damage to the hub outer seal can occur.

INSTALL HUBCAP

Screw-On Hubcaps.

NOTE: A new hubcap O-ring must be installed whenever the hubcap is removed.

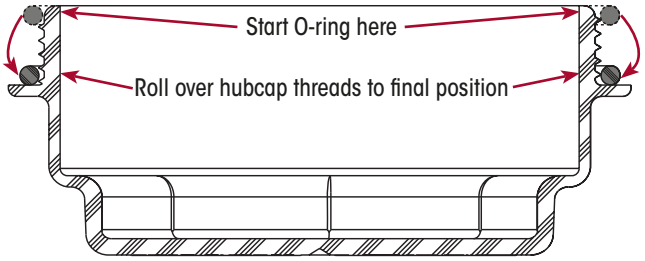


Figure 77: Rolling O-ring over the hubcap threads

Install the screw-on hubcap and tighten it to 85 Nm of torque.

Six-Bolt Hubcaps

1. Ensure that all surfaces are clean and free of dirt and grime.
2. Remove any burrs or sharp edges from the hubcap.
3. Install hubcap using a new gasket.
4. Using a star pattern, tighten the hubcap bolts to 20 Nm of torque.

NOTICE: The hubcap bolt holes must be free of debris, such as silicon gasket sealer, to ensure the bolts tighten properly and to avoid leaks.

⚠ **CAUTION**: Do not overtighten the hubcap bolts. Overtightening will distort the metal mounting flange, which will prevent the hubcap from achieving a leak-free seal.

Three-Bolt Hubcaps

1. Ensure that all surfaces are clean and free of dirt and grime.
2. Ensure that a new O-ring is installed correctly into the hubcap groove.
3. Place the hubcap on the hub and install only the first two threads of the bolts into the hub.
4. Position the hubcap against the hub so the entire O-ring is in contact with the hub.
5. Apply firm pressure against the face of the hubcap to seat the hubcap mating flange completely against the hub.

6. Check to make sure no gap exists between the hubcap mating flange and hub.
7. Tighten the three hubcap bolts to 20 Nm of torque.

ASSEMBLE BRAKES AND WHEELS

With hubcap installed, the hub assembly is complete.

Follow these steps to complete the wheel-end assembly:

1. Turn hub so that pilot is at the 12 o'clock position and install brake drum and wheel (tyre and rim assembly). For more information refer to "Brake Drum and Wheel Assembly" on page 91. For air disc brake hubs refer to manufacturer's reference manual to install calliper, brake pads and brake chamber.
2. Restore trailer to normal operation.

TORQUE VALUES

The following table lists torque values for HUS wheel-end fasteners.

HUS Wheel End Fastener	Torque (Nm)
Hubcap Screws	20
Inner Spindle Nut	950
Outer Spindle Nut	340
Screw-On Hubcap	85
Wheel Nuts *	610

* Tighten wheel nuts incrementally. Re-torque all wheel nuts after 100 to 150 kilometres of service.

HUS INSTALLATION SUMMARY

The following is a basic description of the detailed procedure shown in "Hub Installation" on page 73. Refer to the complete article for further explanation and details.

Prior to commencement of this procedure, the axle journal and thread should be clean, and the entire spindle end (except for the thread) lubricated with a molybdenum based grease.

Step	Description – HUS	Resources
1	1. Torque the inner nut to ***950 Nm*** whilst rotating the hub. 2. Install lock washer and ensure tab fits correctly into the spindle keyway. 1. Install outer nut and tighten to ***340 Nm***. 2. Bend two lock washer tabs over opposing outer nut flats. 3. Check that the hub spins freely. 4. Install hubcap. 1. Torque hubcap bots to ***20 Nm*** or for screw on hubcaps, torque to ***85 Nm.***	• Calibrated torque wrenches set to 950 Nm, 340 Nm, and 85 or 20 Nm • Breaker bar • 4-3/8 inch socket • 4-7/8 inch socket • 1/2 inch socket

SECTION 4 – SERVICE PROCEDURES

SECTION CONTENTS

BEARING CLEANING AND INSPECTION

⚠ **CAUTION**: Bearings must be handled with great care to avoid any damage that could reduce service life. Do not reuse a bearing that has been dropped.

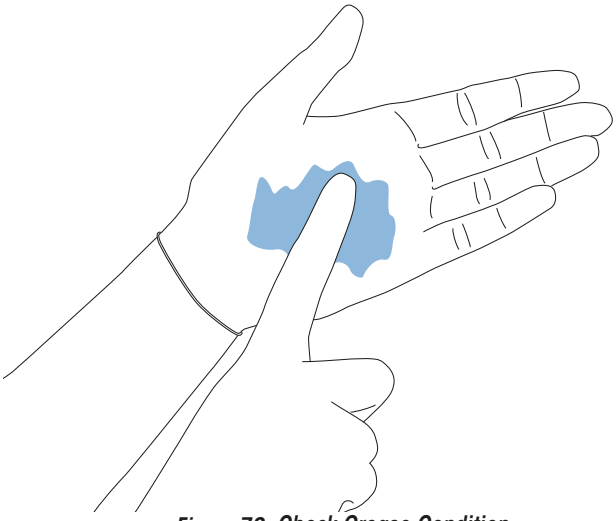


Figure 78: Check Grease Condition

1. Inspect condition of grease before you begin cleaning to get an early indication of any potential problems. White or foamy grease indicates that it has been contaminated with water. Gritty or dirty grease indicates that it has been contaminated due to a failed seal. Small metal particles or a metallic grey colour indicates that a component, such as a wheel bearing, has failed.
2. Wipe old grease out of hub and clean thoroughly.
3. Check the hub for serviceability. Clean and inspect the wheel bearing cups, wheel studs, wheel and hubcap mounting flanges and seal mounting area for damage, cracks, wear, fatigue or other damage.
4. Clean bearings in suitable solvent wash. Allow to dry thoroughly.

NOTICE: Bearings must not be mixed up. Ensure they are refitted back to the same cup they came from.

⚠ **CAUTION**: Do not spin bearings with compressed air. Rollers could be forced out of the cage at speed causing possible injury and the bearing surfaces may be damaged by high-speed contact without lubricant.

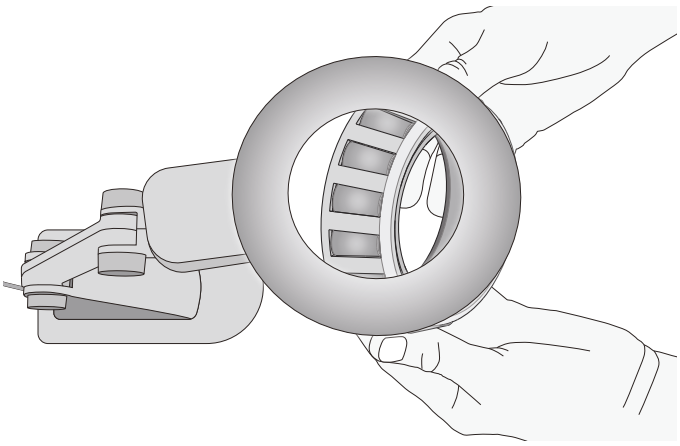


Figure 79: Thoroughly Inspect bearing

5. Thoroughly inspect the bearing rollers and inner race with a bright light, preferably with a magnifying glass.
6. Look for any wear, cracks, pitting discolouration or any other signs of damage. Replace any bearing that displays any of these faults. For more information refer to "Bearing Fault Descriptions" on page 79.

NOTICE: Always replace bearings as a set, inner and outer along with bearing cups.

7. If not immediately greasing the bearings after cleaning, give them a fine coating of spray lubricant to protect against corrosion. Remove any excess coating and wrap with a clean rag or place into a plastic bag. If you are storing the bearings for more than a day or so, then you should thoroughly pack with grease and rotate to coat internal surfaces, and store securely in plastic bags.

Bearing Fault Descriptions

The following descriptions will assist with bearing inspection and failure analysis. Although not comprehensive, they list the most common types of bearing failures.

NOTICE: Some of the problems shown here can cause similar symptoms. Therefore, you must consider trailer use, service frequency and surrounding issues when diagnosing the root cause of a problem.

Foreign Material

Foreign material is a common cause of bearing failure. It is frequently caused by inadequate cleaning methods, improper grease storage (allowing dust contamination), poor trailer maintenance and seal failure. Depending on particle size, it can cause accelerated bearing wear, grooving and pitting.

Water

Water within a hub can produce several different problems. All hubs have a small amount of moisture, which can cause corrosion if there is inadequate protection from the lubricant. It can cause etching corrosion of the bearing surfaces. Additionally, water contamination breaks down the lubricant film thickness and reduces the fatigue life of the bearing.

Inadequate Lubrication

Insufficient or unsuitable lubricant can cause a range of issues. They vary from discolouration, scoring and flaking, roller end scoring and excessive heat, through to complete bearing seizure.

Fatigue Spalling

Spalling refers to small flakes of material breaking off the bearing surface. High mileage, high loads, debris, misalignment or bearing damage can cause this stress related issue.

Excessive Load

Damage due to high bearing load is usually caused excessive preload. It will cause the bearing surfaces to fracture and peel.

Handling Damage

Improper or careless handling can cause nicks, dents and gouges in any of the bearing surfaces. Dropped or improperly installed bearings can cause cracked, twisted or bent cage damage.

Improper Fitting

A loose fit bearing cup or out of round spindle can cause cup spinning or localised spalling damage.

Brinelling

Brinelling is the indentation of the hardened bearing surface. Rough handling or shock loads often causes brinelling, as does transporting trailers on a flat bed. A common source of brinelling occurs when replacing wheels studs using a hammer, with the hub still in place.

HUB LUBRICATION GUIDE

GREASE NOTES

IMPORTANT: Greases should not be mixed because the thickeners, lubricating fluids and additives in different greases may be incompatible.

Lithium Grease

Standard wheel end hubs generally use NLGI #2 wheel bearing grease with a mineral base oil and lithium complex thickener. National Lubricating Grease Institute (NLGI) grade 2 refers to a grease of medium consistency that is suitable for wheel end roller bearings.

Semi-Fluid Grease

However, synthetic semi-fluid bearing grease (NLGI #00) has a number of advantages over standard lithium based grease. A few of these benefits are:

- Extended usable lubricant life
- Internal transfer of grease improves bearing reliability
- Increases seal life by lubricating moving parts of hub seal.

Hendrickson only recommend two semi-fluid grease specifications, ***Mobil Mobilith SHC 007*** and ***Chevron Delo Synthetic Semi-Fluid*** grease. Mobilith SHC 007 is available from a number of suppliers. Mobilith SHC is also available from Hendrickson, refer to Wheel End Parts List 97114-100 for more details.

LUBRICANT SPECIFICATIONS

Mobilith SHC 007 is a high performance NLGI 00 Grade grease with a synthetic base fluid. It has a recommended operating temperature range of -50° C to 150° C. It is used in all Hendrickson HXL5®/HXL7® extended life wheel ends.

Wheel end lubricant specifications that are approved by Hendrickson for use in service maintenance are listed in Table 3. Lubricants used in other areas of trailer maintenance are listed in the lubrication section of the Trailer Maintenance Procedures Manual 97117-161.

Grease Classification & NLGI Number

Group	Performance	Category
LA	Mild Duty	Chassis
LB	Severe Duty	Chassis
GA	Mild Duty	Wheel Bearing
GB	Moderate Duty	Wheel Bearing
GC	Severe Duty	Wheel Bearing
GC-LB	Severe Duty	Multi-purpose

Table 1: Grease Classification

The ASTM D4950 Standard is a standard classification and specification for automotive service greases. This specification defines the requirements used to describe the properties and performance characteristics of vehicle chassis greases and wheel bearing greases.

Category	Application	Type	Specifications
Wheel Bearing Grease	Conventional & HXL2 wheel bearings	Castrol Premium Heavy-Duty Wheel Bearing Grease, Shell Gadus S3 V220C Wheel Bearing Grease or similar	NGLI #2, GB or GC rated, high-temperature wheel bearing grease.
Semi-Fluid Grease	Hendrickson extra long-life HXL5 & HXL7 wheel bearings and PreSet	Mobil Mobilith SHC 007 or Chevron Delo Syn-Grease SFE EP	Synthetic base NLGI #00 **IMPORTANT**: Only these two greases meet Hendrickson standards for high performance wheel bearing semi-fluid grease. Use of any other grease will require adopting annual clean and repack service procedures.
Hub Oil	Oil filled wheel hubs	Mobilube HD Plus 85W-140, Castrol Syndrive 50E or similar	API MT-1 lubricant.

Table 3: Wheel End Lubricant Specifications

Chassis greases are grouped under the prefix letter L and wheel bearing lubricants are grouped under the prefix letter G. Higher suffix letters denote higher specifications. Any wheel bearing grease used on a trailer should be rated either GB or GC. Refer Table 1.

NLGI number	Appearance	ASTM Test Result"[1]"
000	Fluid	445-475
00	Semi-Fluid	400-430
0	Very Soft	355-385
1	Soft	310-340
2	Medium	265-295
3	Firm	220-250
4	Very Firm	175-205
5	Hard	130-160
6	Very Hard	85-115

Table 2: NLGI Consistency Standard

NLGI Consistency Standard was developed by the USA based National Lubricating Grease Institute. It is an evaluation of the relative hardness of lubricating grease. Refer Table 2.

The number does not refer to any other properties of the grease that would help you decide its suitability. Therefore, two greases could be identified as NLGI #2, one may be suitable for wheel ends and the other may be suitable for food manufacturing equipment. Just because it has the same NLGI number does not mean that it has the same properties or service life as the one you are replacing.

[1] ASTM (American Section of the International Association for Testing Materials) specification test ASTM D217 is a two-part test that compares the hardness of a grease at 25 degrees Celsius.

Storing Grease

To minimise the separation of oil from the grease during storage, smooth the grease surface and then gently tap container on a hard surface, to remove any trapped bubbles of air.

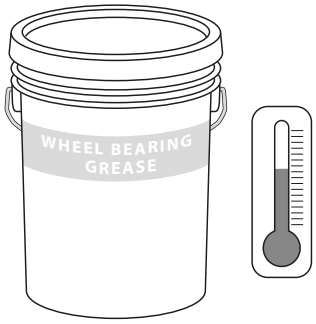


Figure 80: Store Grease in a Cool Area

Securely refit the lid and store out of direct sunlight and away from any heat sources. Replace any grease that is contaminated, past its use-by date or has been poorly stored. Refer to the grease manufacturer for more details and information regarding grease care and storage requirements.

STANDARD BEARING GREASE APPLICATION

Standard NLGI #2 grease should be packed into the bearing so that it coats all surfaces and fills the space between the rollers and cage. Smear excess grease around the outside of the bearing.

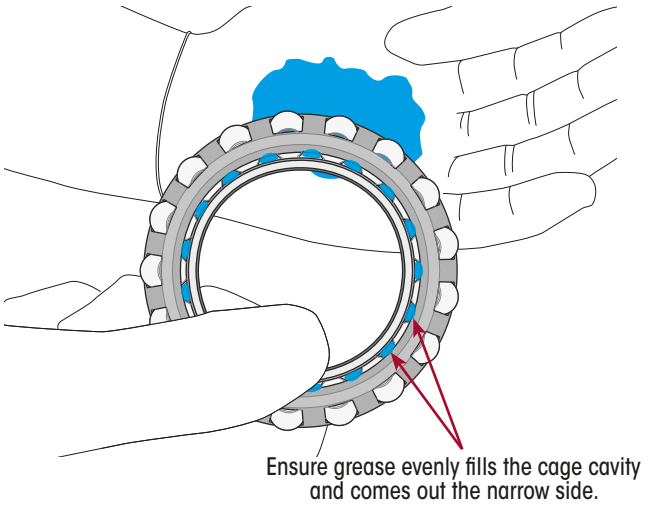


Figure 81: Packing Grease By Hand

Force the grease, with the palm of your hand, through the bearing from the wide side to the narrow side to ensure proper distribution.

Make sure that the grease comes through evenly to ensure maximum bearing life. Coat outside of bearing with grease and place under a clean rag or plastic bag to avoid contamination before use.

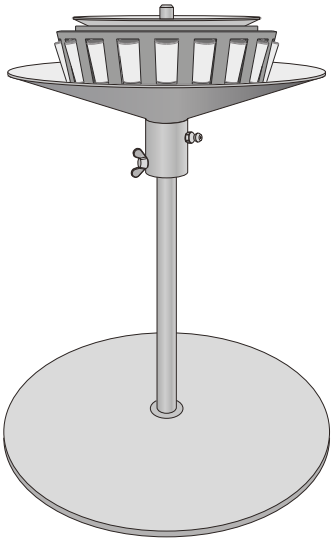


Figure 82: Use Bearing packer for Reliable Results

A grease packing tool is better than packing by hand because it provides a more consistent application of grease. Packing tools are usually designed to force grease from the narrow side through to the wider side of the bearing.

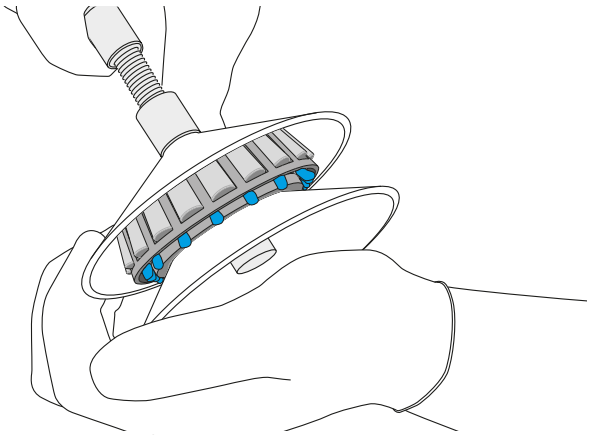


Figure 83: Ensure Grease is Forced Evenly Past Bearing Rollers

Force grease through bearing until it comes out evenly past the rollers, ensuring the bearing is properly packed.

Coat the outside of the bearing rollers evenly with excess grease.

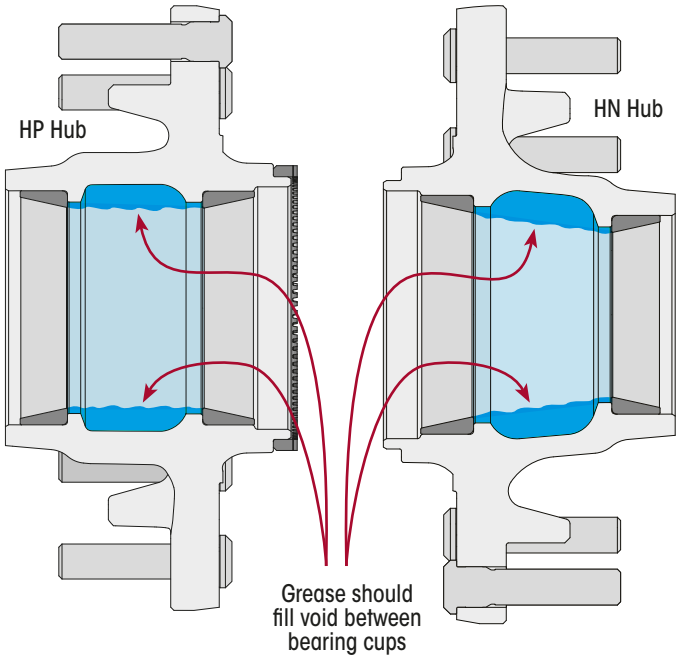


Figure 84: Fill Hub with Grease to the Level Shown

Standard (NLGI #2) grease should be applied to fill the hollow space all the way around the inner cavity of the hub up to the level between the bearing cups.

Be sure to eliminate any air pockets that would reduce the grease level in the hub.

IMPORTANT: The hub should be approximately half-filled with grease. A hub overly packed with grease may cause churning within the hub, which could create excessive temperatures. This will eventually cause seal failure or breakdown of the lubricant.

SEMI-FLUID GREASE MEASUREMENT

The semi fluid grease quantity for Hendrickson wheel ends needs to be measured to ensure reliable bearing operation. The required quantity has a practical tolerance, from the minimum amount specified in Table 4 or up to the maximum at the half level of the hub, which is about 20% more.

Spindle Type	Grease Weight	Grease Volume
HN Iron/Aluminium	460 g	560 ml
HN ADI	690 g	850 ml
HP	1000 g	1230 ml

Table 4: Semi-Fluid Grease Minimum Volume

Here is a quick run-down of the differing methods that have been tried and tested by Hendrickson. More complete explanations of each method follow.

- **Pneumatic Grease Gun** – The easiest, most efficient, and accurate way to measure grease quality is with a measuring "Pneumatic Grease Measurement Pump". For time required, accuracy and efficiency this is the best method, which will soon pay for the initial investment if the workshop regularly services HXL5® or HXL7® wheel ends.
- **Grease Dam** – If a pneumatic grease gun is available without a measuring gauge, then the "Semi Fluid Grease Dam" method is the simplest method. This method can also be used by cupping grease until the correct level is achieved
- **Grease Pouches** – For HN (excluding ADI) and HP hubs Hendrickson have made measured "Semi Fluid Grease Pouch" that can be convenient depending on local availability.
- **Suction Gun** – Lastly, it is also possible to use a "Measured Suction Gun", although it is more awkward to use than the previously mentioned methods.

Pneumatic Grease Measurement Pump

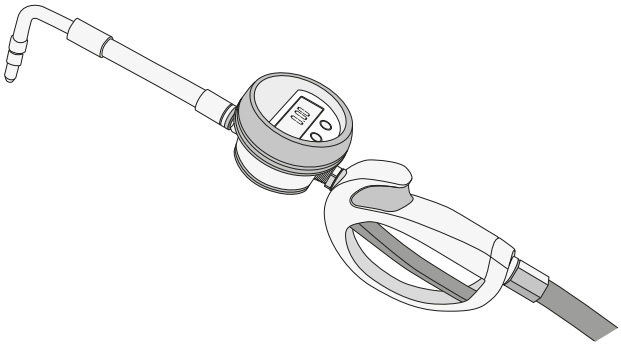


Figure 85: If Possible, Use a Pneumatic Measuring Pump

A measured amount of semi-fluid grease should be pumped into the hub through the fill port to the level shown in Table 4. The easiest way to do this is with a pneumatic pump that has an accurate measuring gauge.

Semi Fluid Grease Pouch

Semi fluid grease pouches are effective and convenient to use for HN (excluding ADI) and HP hubs. However, availability of these pouches will vary depending on country and local supplier. If the correct pouch is not available, using weight scales is the best way to ensure correct grease levels.

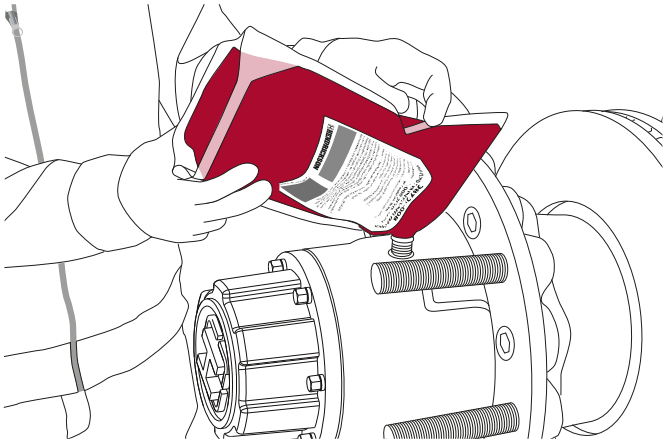


Figure 86: Using a Semi Fluid Grease Pouch

Insert pouch spout into the hub grease fill port and empty into hub.

Semi Fluid Grease Dam

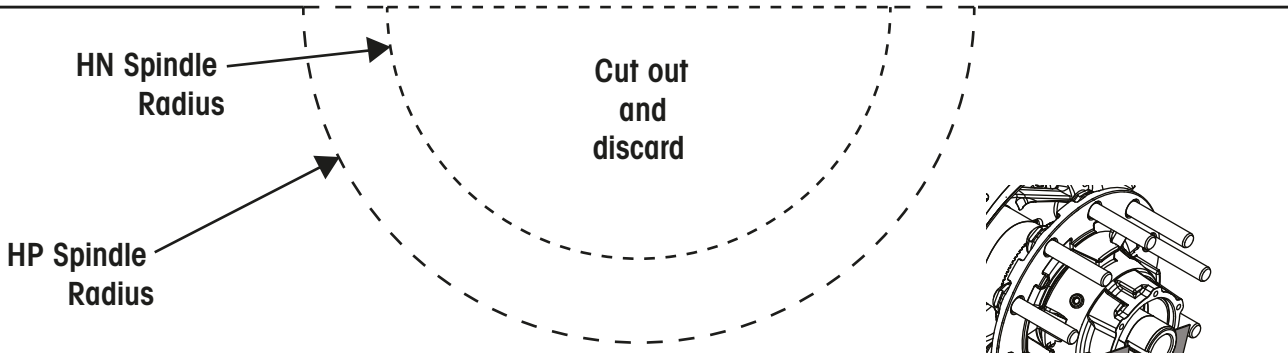
Grease dams are an alternative method of measuring the correct amount of semi-fluid grease if a grease pump is available without a gauge. It is also possible to use a cup to add grease into he hub until the required grease level is reached. A grease dam is easy to use and is appropriate for all hub and spindle types, including ADI hubs.

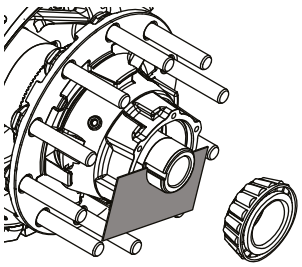
NOTE: This method of filling requires around twenty percent more grease than the published minimum volume as shown in Table 4.

1. Install hub, without outer bearing, and support with an axle stand or similar to ensure the hub seal does not become dislodged.
2. Make a semi fluid grease dam by printing the pattern Figure 90 on page 84. Select "***Actual Size***" from the printing options to ensure the pattern is the right size.
3. Cut pieces of cardboard or plastic to match the printed pattern.

TIP: Plastic dams are handy because they can be cleaned and stored for later reuse.

4. Hold the dam up to the spindle and pump the semi fluid grease into the hub up to the level of the dam.
5. The grease should fill the hub up to the 9 o'clock and 3 o`clock points.
6. Slide the pre-greased outer bearing onto the spindle as you pull the semi fluid grease dam out of the way, so that minimal grease is lost.





Hub Semi Fluid Grease Dam

1. Print one template at 'Actual Size' 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 inserting bearing into hub.

Figure 90: Semi Fluid Grease Dam Pattern

HENDRICKSON
The World Rides On Us®

Measured Suction Gun

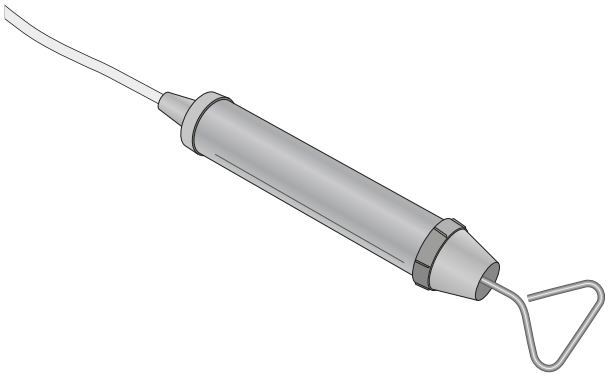


Figure 87: C16 Suction Gun

If it is not possible to use the previously mentioned methods, the grease can be metered and injected into the hub with a syringe, such as the Macnaught C16 500 ml Suction Gun. The following instructions apply to the C16 Suction Gun.

1. Unscrew the nozzle end of the tube and pull the plunger all the way back.

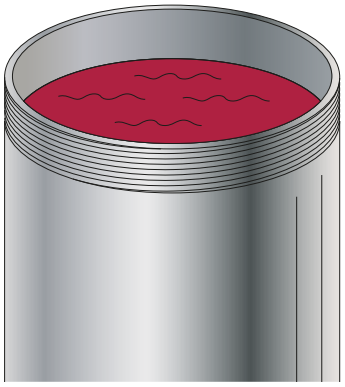


Figure 88: Semi-fluid Grease within 3 cm from Top - 560 ml

2a. For ***HN hubs***, (excluding ADI) fill the tube to within 3 cm from the top, without any air pockets. This will provide ***560 ml*** (460 g) of semi-fluid grease, which is ideal for HN spindle hubs.

NOTE: HN ADI hubs are best filled with either a semi-fluid grease dam or pneumatic measuring pump.

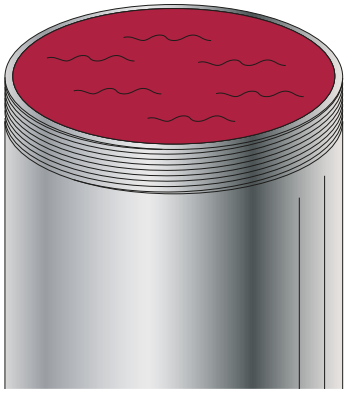


Figure 89: Semi-fluid Grease to Top – 615 ml

2b. For ***HP hubs***, fill the tube all the way to the top, without any air pockets. This will provide 615 ml of semi-fluid grease. You need ***two complete tubes***, which is a total of ***1230 ml*** (1000 g), to get the right quantity of semi-fluid grease for a HP spindle hub.

WHEEL BEARING CUP REPLACEMENT

Inspection

Check to see if the cups can be removed or rotated by hand inside the hub. If bearing cups can be moved by hand, replace hub.

NOTICE: To ensure long-term reliability bearings must be replaced as a complete set.

Bearing cups may be replaced in both iron and aluminium hubs, however the replacement methods vary.
Refer to the appropriate section:

- "Iron Hubs" on page 86
- "Aluminium Hubs" on page 88.

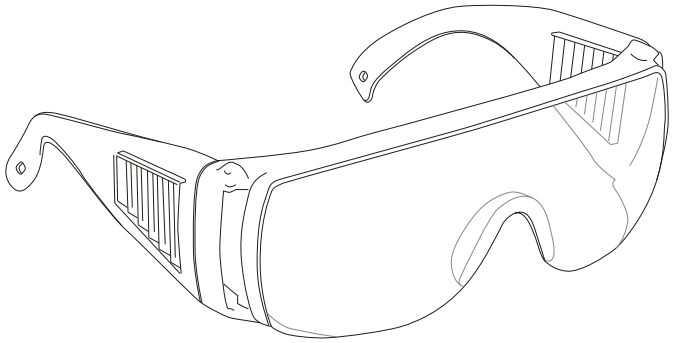


Figure 91: Wear Safety Glasses

⚠ **CAUTION**: Proper personal protective equipment is essential when carrying out the following procedures. In particular, safety glasses should be worn for most of these steps. Gloves and face shields should also be worn if welding or handling hot components.

IRON HUBS

Bearing cups are best removed with a press using correct bearing removal tools. If these are not available, the next best option is to run a bead of weld around the bearing cups as shown in "Aluminium Hubs" on page 88. However, with patience and care it is possible to tap the cups out of the hub with a mild steel drift punch as shown below.

⚠ **CAUTION**: To avoid injury, do not use hardened steel punches and always wear safety glasses.

1. Thoroughly clean hub assembly.
2. Check to see if the cups can be removed or rotated by hand inside the hub. If bearing cups can be moved by hand, replace hub.

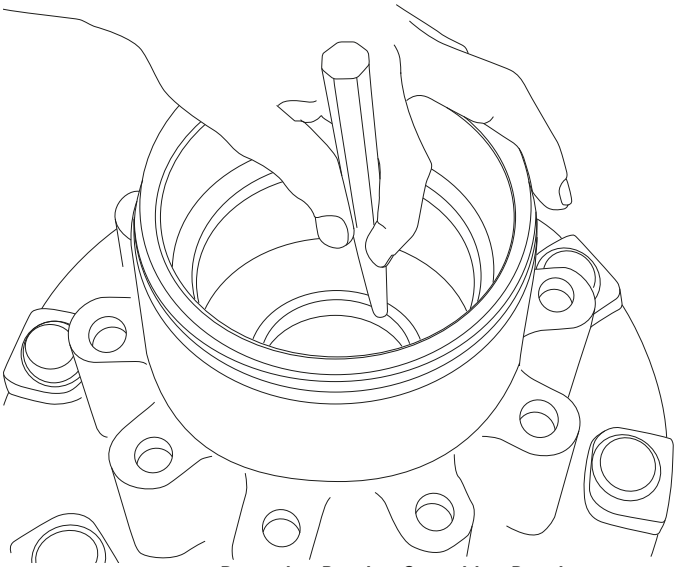


Figure 92: Removing Bearing Cup with a Punch

3. Drive the bearing cup out of the hub from the other side of the hub with the mild steel drift punch. Alternate the point of impact around the cup to ensure that comes out evenly. Refer Figure 92.
4. Inspect bearing bore in hub for damage. Replace the hub if there are any signs of the cup spinning or surface damage.
5. Clean bore with fine emery cloth to remove fine burrs or marks.

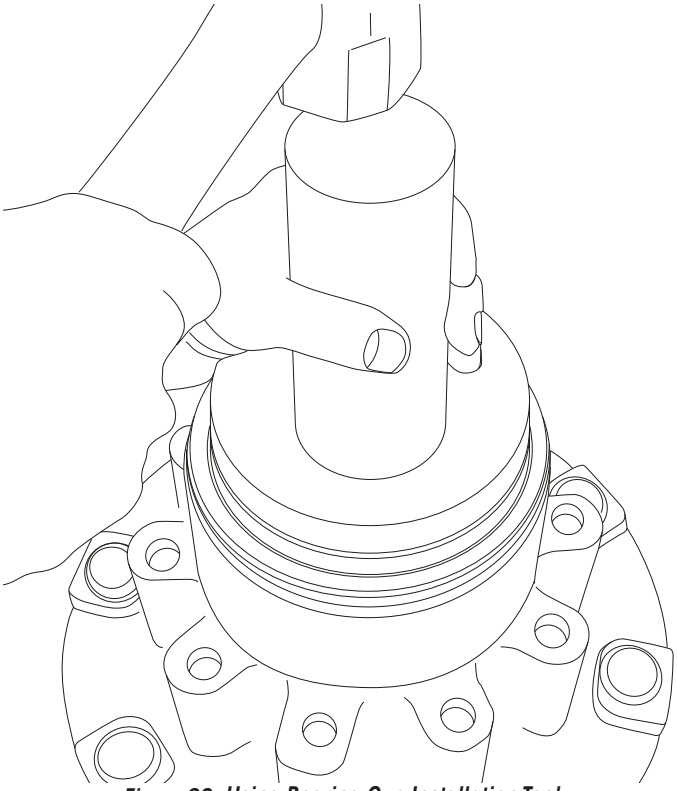


Figure 93: Using Bearing Cup Installation Tool

6. Install the bearing cup with a cup driver tool in a press to ensure the cup moves into the hub evenly. If this is not possible, use a hammer with the cup driver tool, but ensure the cup enters the hub vertically to avoid hub damage. Refer Figure 93.

⚠ **CAUTION**: It is essential to use a suitable cup driver when installing the bearings. Driving the bearing cups into the hub with a punch may cause burrs on the edge of the cup, which will cause the bearing to fail in service.

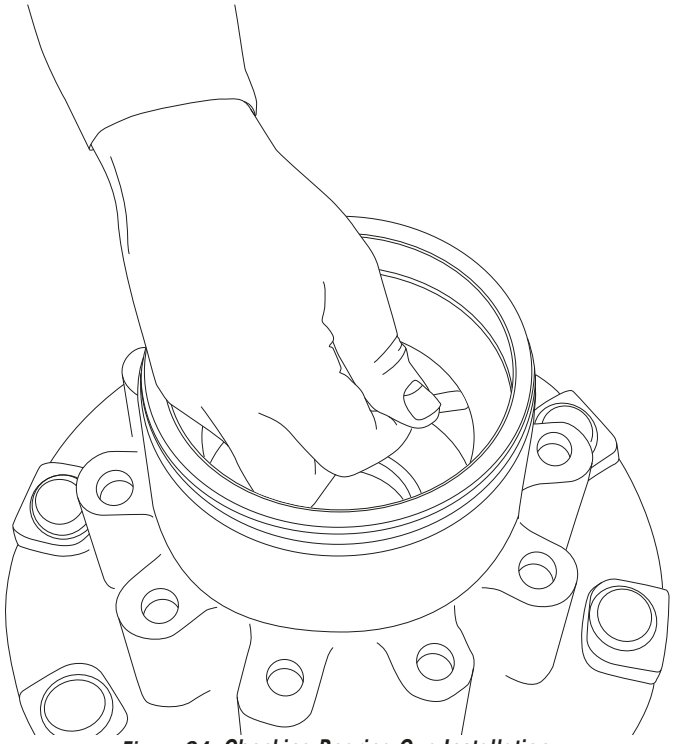


Figure 94: Checking Bearing Cup Installation

7. Check the cup is completely home in the hub by attempting to insert a 0.05 mm (0.002 inch) feeler gauge between the cup and the hub bearing-stop. If the cup is correctly installed, the feeler gauge will not fit. Refer Figure 94.
8. Repeat procedure for the other bearing cup.
9. Clean hub and inspect bearing cups to ensure that they have not been damaged in the process.

ALUMINIUM HUBS

Bearing cups are more difficult to replace in aluminium hubs. The cups are pressed into relatively soft aluminium hub, which must not be damaged in the removal process.

⚠ **CAUTION**: Never use oxyacetylene torches to heat aluminium hubs. This type of localized heat can weaken and damage the aluminium. If suitable equipment to weld and heat the hub is not available, you must replace the complete hub and bearing assembly.

1. Thoroughly clean the hub of all grease and oil.

⚠ **CAUTION**: Failure to clean all flammable material from hub could cause a fire when welding or heating.

2. Check to see if the cups can be removed or rotated by hand inside the hub. If bearing cups can be moved by hand, replace hub.

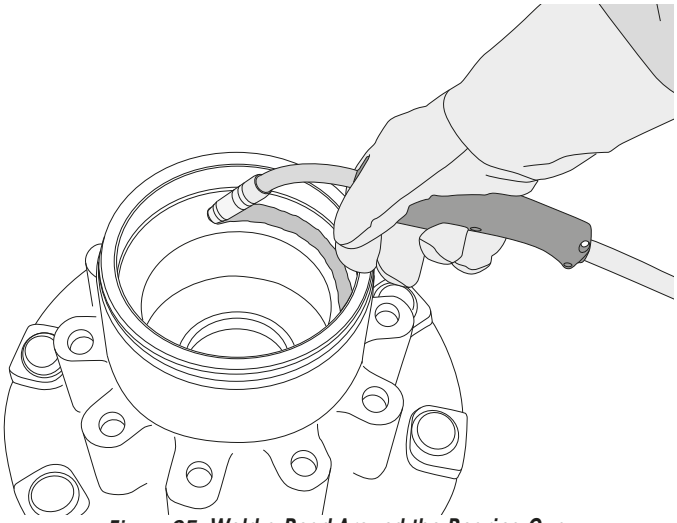


Figure 95: Weld a Bead Around the Bearing Cup

3. Using a suitable welder, weld a large bead around the centre of the bearing cup. Refer Figure 95.

IMPORTANT: Take care not to allow weld to blow a hole through the bearing cup, which would permanently damage the hub.

4. Allow to cool for at least 15 minutes. This will allow the weld to shrink, which will cause the bearing cup to contract.

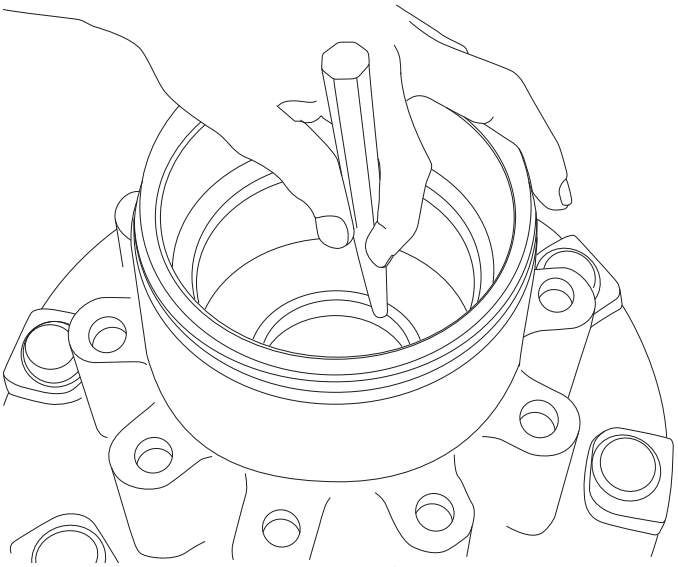


Figure 96: Remove Bearing Cups with a Punch

5. Drive the bearing cup out of the hub from the other side of the hub with the punch. Refer Figure 96.

6. Inspect bearing bore in hub for damage. Replace the hub if there are any signs of the cup spinning or surface damage.

7. Clean bore with fine emery cloth to remove fine burrs or marks.

8. To prepare hub for cup installation, heat hub in an oven set to 140 degrees C. Place the hub in boiling water if an oven is not available.

⚠ **CAUTION**: Do not allow the hub temperature to exceed 150 degrees C as this would allow for the structure of the metal to change and soften. A softened hub could cause component failure and resultant injury.

9. Place bearing cup into a plastic bag to protect it from moisture and then chill with dry ice (if available) or place into freezer.

10. Prepare tools and equipment to install bearing cup. Use gloves to protect your hands.

NOTICE: Bearing cups must be installed quickly to avoid heat transferring to the bearing cup, which would make it more difficult to install.

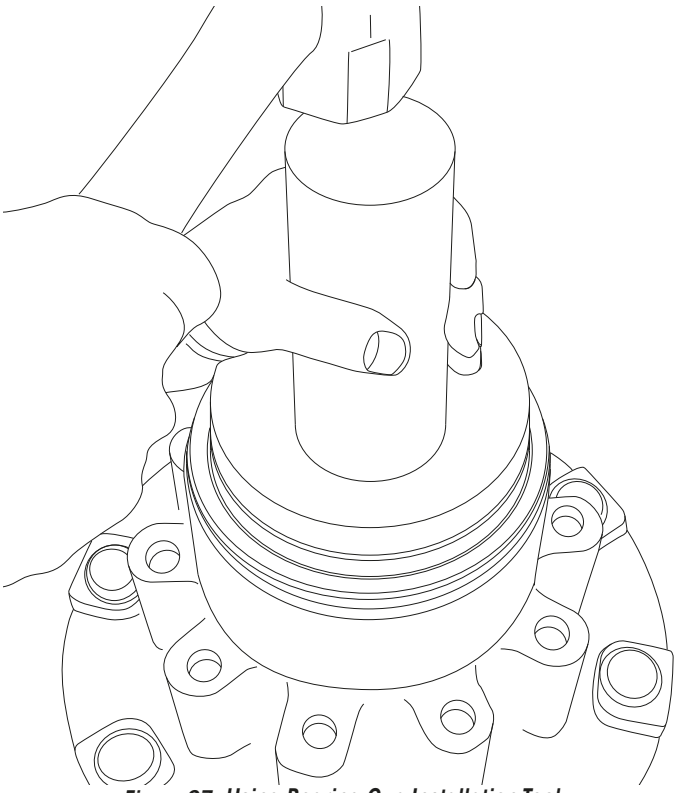


Figure 97: Using Bearing Cup Installation Tool

11. Install the bearing cup with a cup driver tool in a press to ensure the cup moves into the hub evenly. If this is not possible, use a hammer with the cup driver tool, but ensure the cup enters the hub vertically to avoid hub damage. Ensure the cup moves into the hub quickly and evenly. Refer Figure 97.

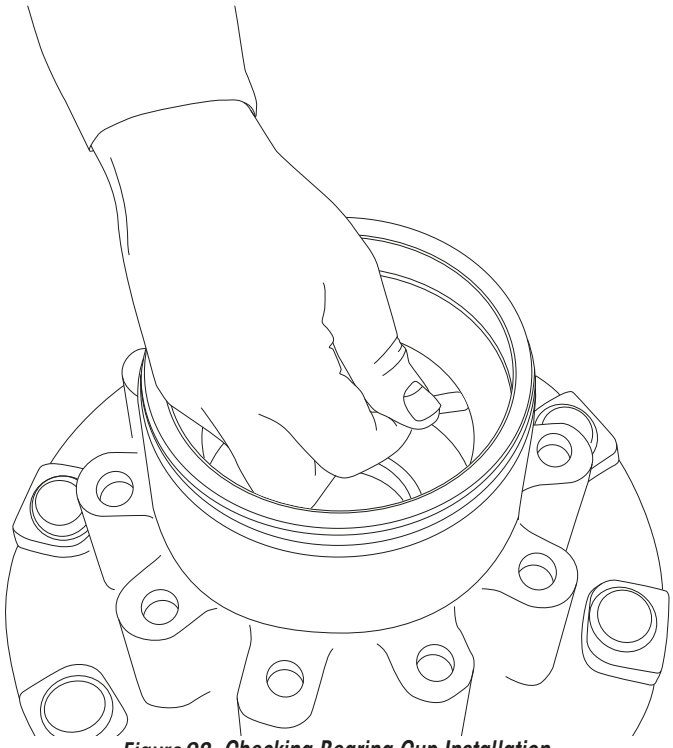


Figure 98: Checking Bearing Cup Installation

12. Check the cup is completely home in the hub by attempting to insert a 0.05 mm (0.002 inch) feeler gauge between the cup and the hub bearing-stop. If the cup is correctly installed, the feeler gauge will not fit. Refer Figure 98.
13. Repeat procedure for the other bearing cup.
14. Clean hub and inspect bearing cups to ensure that they have not been damaged in the process.

Figure 99: Protective Gloves are Essential When Welding

WHEEL STUD REPLACEMENT

STUD REMOVAL

NOTICE: Do not use a hammer to remove wheel studs if the hub is attached to the spindle. The hammer will cause impact damage (brinelling) to the bearing raceway, which will greatly reduce bearing life.

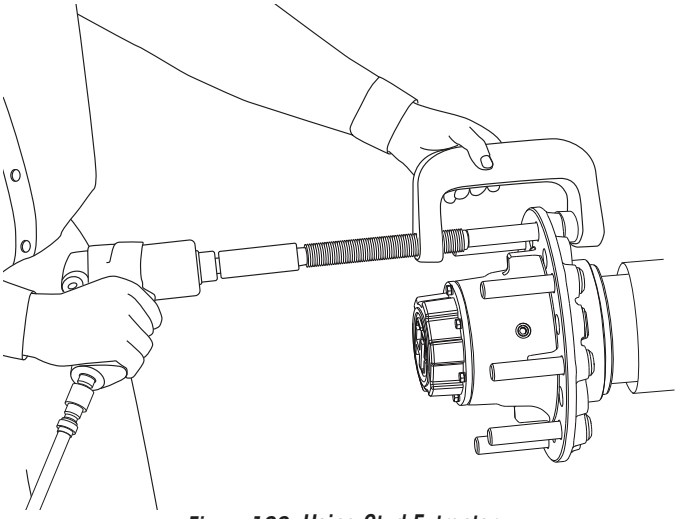


Figure 100: Using Stud Extractor

1. Use a stud remover to extract stud(s). Refer Figure 100.
2. Discard all removed studs.

STUD INSTALLATION

This procedure is for installation of one stud. If more than one stud is to be installed, repeat each step as needed.

1. Clean all related flat surfaces on hub with buffer or emery cloth.
2. Install new stud into hub. If possible, line up knurls on the replacement stud with imprints (grooves) in the hub stud hole.
3. Apply no more than two drops of oil to original wheel nut to ensure nut spins freely (Do not use more than 2 drops of oil), and place nut on newly installed stud.

NOTICE: Some studs have threads that do not go the full length of the stud. For these studs, a spacer must be used when installing the stud, such as hardened washers or temporarily fitting the brake drum.

4. Use a 1/2 inch drive impact wrench to tighten nut and draw replacement studs tight to hub inner surface.
5. Complete stud draw-in process using a torque wrench set to 410 Nm. To prevent the hub from turning, protect the threads of another stud with a nut and then hold protected stud with a jack stand.

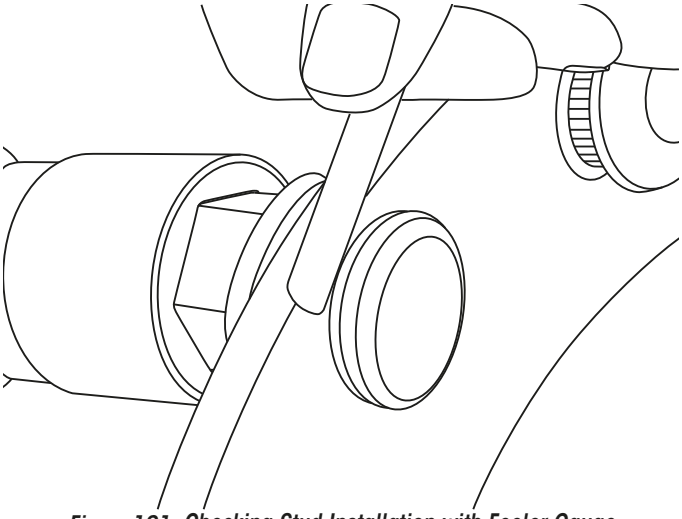


Figure 101: Checking Stud Installation with Feeler Gauge

6. Check stud installation with a 0.04 mm (0.0015 inch) feeler gauge to make sure the bolt is seated. Refer Figure 101.
7. Remove and discard the installation nut when completed. Do not place trailer into service with this nut.

BRAKE DRUM AND WHEEL ASSEMBLY

Both hub pilot (Figure 102) and stud pilot (Figure 103) wheel mounting systems are available on Hendrickson suspensions. However, the hub pilot system is standard fitment in the Asia Pacific region.

Hub Pilot

With the hub pilot system, pilot bosses (which are machined into the hub) centre the brake drum and tyre/wheel assembly on the hub. A single flange nut on each wheel stud for both single and dual wheel applications fastens the entire wheel assembly together.

Stud Pilot

With the stud pilot system (this is also known as the ball seat, ball seat cap nut or double cap nut system), the brake drum is centred on a pilot boss just like the hub pilot system, but a spherical radius contact area between the mounting nut and the wheel centres the wheel on the hub.

A single cap nut on each wheel stud (for single wheel applications) fastens the entire wheel assembly together or by inner and outer cap nuts on each wheel stud (for dual wheel applications).

NOTE: Before reusing flange nuts that have already been used in service, apply two drops of oil at one point between the flange and the hex.

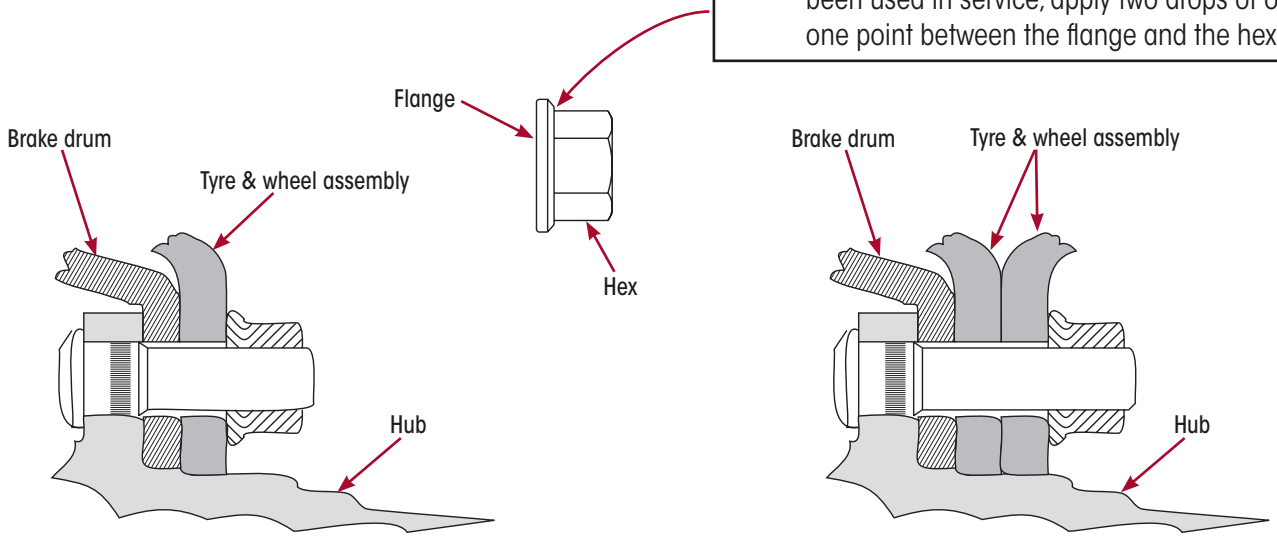


Figure 102: Hub Pilot Wheel Mounting System

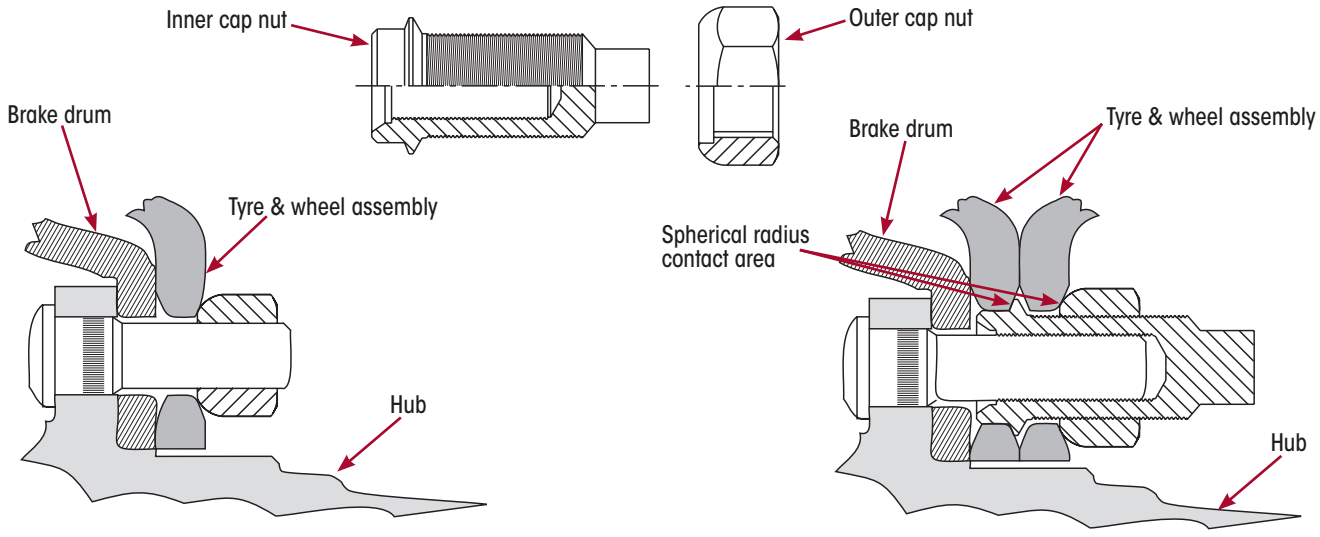


Figure 103: Stud Pilot Wheel Mounting System

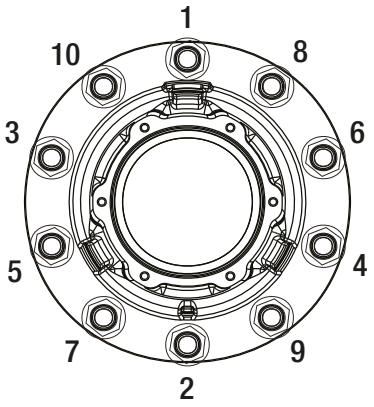
Assembly Procedures

The following information is intended to provide basic brake drum and wheel installation instructions. Finer details such as whether or not to use a corrosion inhibitor, use a wheel dolly or sling, etc., will vary depending on application and your workplace practices. Refer to hub and/or wheel manufacturer's installation instructions and your company's maintenance, service and installation practices for complete installation details.

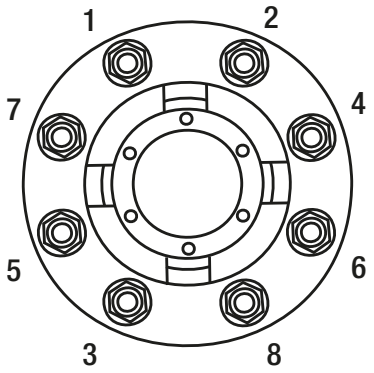
⚠ **WARNING**: Read and follow the outlined instructions when installing or servicing the hub, improper installation could result in property damage, injury or death.

This information applies to Hendrickson equipped vehicles equipped with hub-piloted disc wheels, flange nuts and M22 x 1.5 studs.

1. Clean all mating surfaces on hub, drum, wheels and nuts.
2. Rotate hub so a pilot boss is at the top (12 o'clock) position.
3. Mount brake drum on hub so it seats on drum pilot and against hub face.
4. Mount wheels on hub. Start wheel nuts to hold wheel and drum into position.
5. Snug top (12 o'clock) and bottom (6 o'clock) wheel nuts and apply 70 Nm of torque to draw wheel and brake drum fully against the hub.
6. Inspect to ensure proper assembly with wheel and brake drum positioned on pilot bosses before Installing remaining wheel nuts.



10 stud tightening sequence



8 stud tightening sequence

Figure 104: Wheel Nut Tightening Sequence

7. Using sequence shown, tighten all wheel nuts to 70 Nm of torque. Refer Figure 104.
8. Repeating sequence shown, re-tighten all wheel nuts to a final torque of 610 Nm.
9. Check seating of wheel and brake drum at the pilot bosses. Rotate wheel and check for any rotational irregularity.

⚠ **CAUTION**: Re-torque all wheel nuts after 100 to 150 kilometres of initial service following any installation of wheels to hub assembly.

10. Repeat installation procedure for remaining wheel sets..

REMOVING A SEIZED HUB

It may be possible to remove a seized hub with either of the following methods. The most important consideration is to avoid causing any damage to the axle spindle.

Method A.

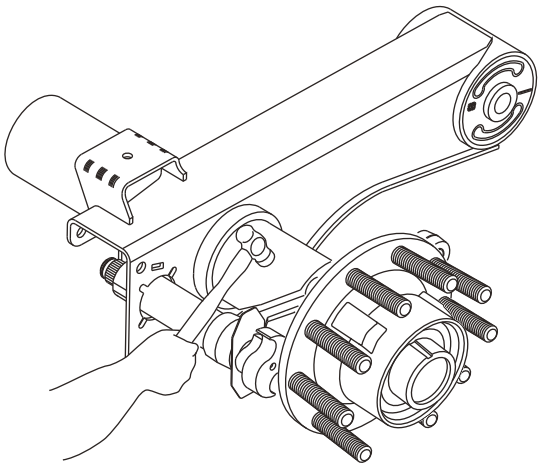


Figure 105: Tap Lightly on Axle to Loosen Hub

Tap lightly on the unmachined part of the axle with a hammer (***refer above figure***). Tapping may loosen the hub assembly for easier removal.

⚠ **CAUTION**: Use caution when tapping the axle to ensure that the axle does not become damaged.

Method B.

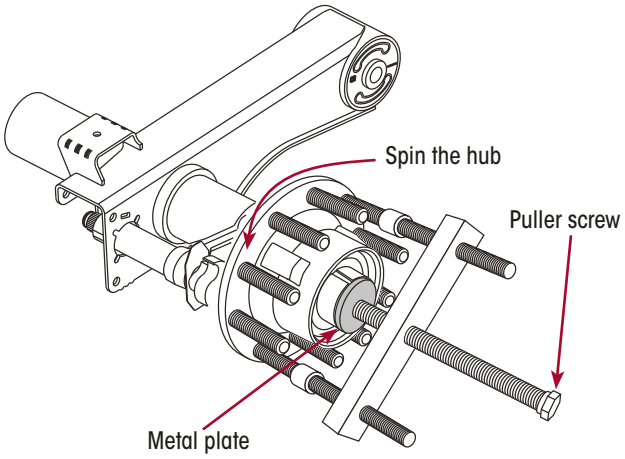


Figure 106: Removing Hub with Heavy-duty Puller

a. Attach a suitable puller to the hub. Install a metal plate between the puller screw and the end of the spindle (***refer above figure***).

⚠ **CAUTION**: To prevent damage to the end of the spindle, always use a metal plate between the puller screw and the end of the spindle.

b. While holding the puller screw stationary, spin the hub to remove it from the axle.

c. For HUS™ hubs, when the hub reaches the end of the spindle, remove the puller, and pull the hub off the spindle as straight as possible to prevent dislodging the clip inside the hub bore.

If you are unable to remove the hub using either of the above methods, then you may need to use a hydraulic porta-power unit.

⚠ **CAUTION**: Only employ extraction methods that will prevent any damage to the spindle or axle, such as using a solid metal plate to protect the end of the spindle.

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REPLACING SPINDLE END FILTERS

If the axles have been submerged in flood waters, the wheel ends must be removed, cleaned, inspected and repacked with fresh, clean grease along with new gaskets and seals. If there is any evidence of water in any of the wheels ends, then the spindle end filters must be replaced along with cleaning up of any moisture and debris.

Spindle Filter Disassembly

1. Chock wheels to keep trailer from moving.
2. If the wheel-end is oil lubricated, drain oil from the hubcap and discard oil.
3. Remove hubcap bolts and hubcap.
4. Tap spindle plug on one side with a suitable punch. Do this near the edge taking care to prevent damage to the spindle. The plug should begin to pivot which will allow removal with pliers or similar.
5. Remove spindle filter with long-nose pliers.
6. Check inside of axle for evidence of moisture or contamination.
7. Dry and clean out the axle tube.
8. Inspect spindle plug bore and remove any burrs or sealant.

Spindle Filter Assembly

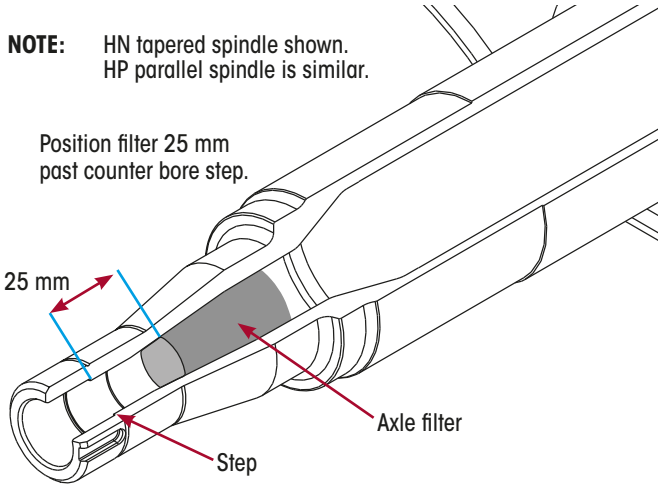
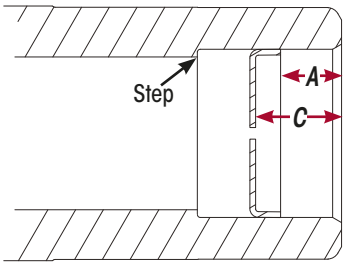


Figure 107: Spindle Filter Position

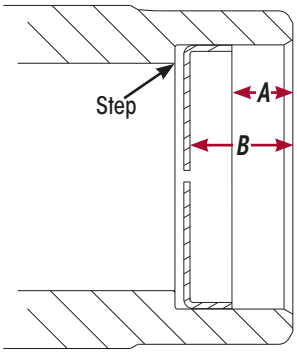
1. Install spindle filter until the end face is about 25 mm past the counter bore step in the bore. Refer Figure 107.

A = 16 mm
B = 27 mm
C = 23 mm



HN Spindle

Set plug depth **'A'** to 16 mm from end of spindle. Refer Text.



HP Spindle

Figure 108: Spindle Plug Position

2. Using a suitable tool "[2]", such as a tube or socket, evenly install spindle plug into spindle until the outside edge of the plug is about 16 mm from spindle end. Refer Figure 108.

NOTE: Set plug depth to 16 mm (± 2 mm), dimension A, from end of spindle. Dimensions B and C can be used as a check. Do not set plug too close to the step on the HP spindle or it may be harder to remove if it ever needs to be replaced again.

3. Verify the plug is evenly installed and is a tight fit in the spindle bore.
4. Clean up and inspect hubs and bearings. Replace bearings if they were exposed to water for any extended periods or if there are any signs of pitting.
5. Rebuild wheel ends as shown in the relevant section of this manual, depending on wheel end type.

[2] NOTE: Special tools are available for plug installation. However, they are not needed providing care is taken to install the plugs evenly and at the right depth. Nevertheless, the tools may be useful in assisting with spindle plug installation if a large number of axles require filter replacement. Refer to "Special Tools" on page 97.

TORQUE – METRIC & IMPERIAL

CONVERSION OF UNITS

This Manual refers purely to metric Newton Metres. The tables presented here provide a guide to unit conversion. If necessary, convert units of torque by using one of the formula shown below.

Units	Formula
Nm to Foot Pound	Multiply by 0.738
Nm to Inch Pound	Multiply by 0.113
Foot Pound to Nm	Multiply by 1.356
Inch Pound to Nm	Multiply by 8.85

TORQUE WRENCHES

To maintain accuracy, Torque Wrenches must be calibrated regularly.

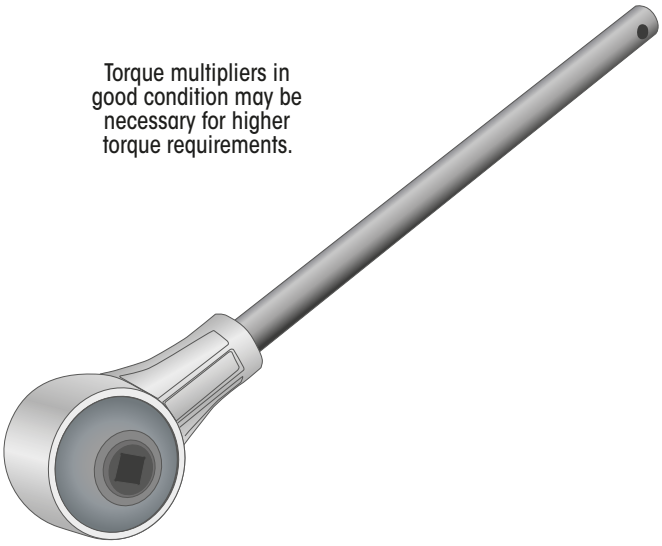
According to ISO 6789 this should be every 5,000 cycles or every 12 months, whichever occurs first. However, if deemed necessary, they may be calibrated more often.

Calibrated torque wrenches are essential to maintain axle reliability

Torque Conversion Table

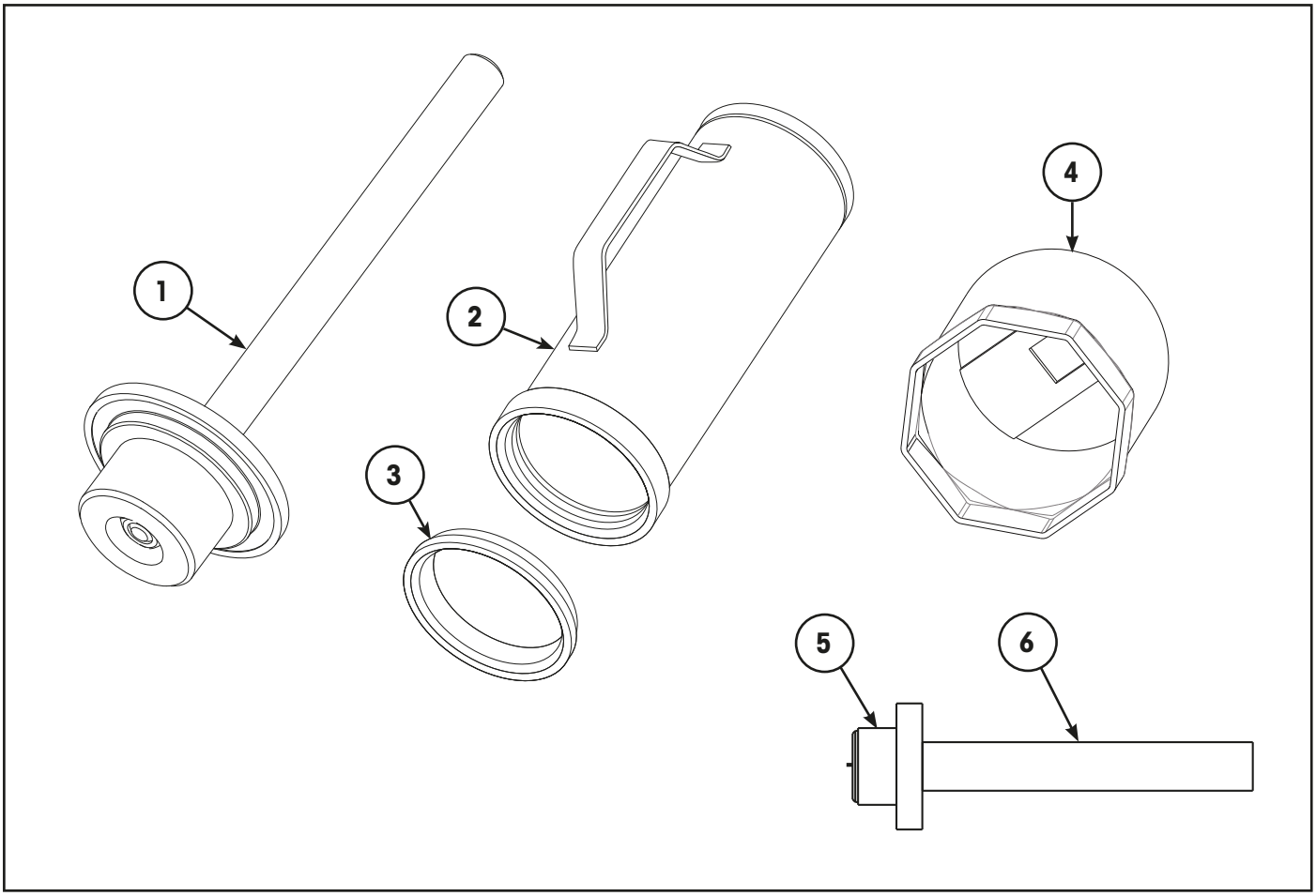
The following table lists common torque values found throughout this document.

Torque Figures Referred To In This Manual		
Nm	**Foot lb**	**Inch lb**
2	1	18
10	7	88
15	11	133
20	15	177
25	18	
30	22	
70	52	
85	63	
135	100	
270	199	
305	225	
340	250	
410	302	
430	317	
610	450	
950	701	



Torque multipliers in good condition may be necessary for higher torque requirements.

SPECIAL TOOLS



Item	Part Number	Description	Notes
1	S-32121-1	HN Hub Mounted Seal Insertion Tool	Suits hub mounted HN seal.
	S-32121-2	HP Hub Mounted Seal Insertion Tool	Suits hub mounted HP seal.
2	97781-003	Universal Spindle Mounted Seal Insertion Tool Tube	Use with adapter ring – item 3.
3	97781-001	HN Spindle Mounted Seal Insertion Tool Adapter Ring	Use with universal tool tube – item 2.
	97781-002	HP Spindle Mounted Seal Insertion Tool Adapter Ring	
4	S-32120-1	Socket, HN 8-Point Spindle Nut 3/4" Drive – 3-13/16"	Suits PRECISION240® & HN 3-piece inner nut.
	S-32120-2	Socket, HN 8-Point Spindle Nut 3/4" Drive – 3-1/4"	Suits HN 3-piece outer nut.
	S-32120-4	Socket, HP 8-Point Spindle Nut 3/4" Drive – 4-3/8"	Suits HP 3-piece outer nut.
	S-32120-6	Socket, HP 8-Point Spindle Nut 3/4" Drive – 4-13/16"	Suit HP Pro-Torq nut.
	S-32120-3	Socket, HP 8-Point Spindle Nut 3/4" Drive – 4-7/8"	Suits PRECISION320™ & HP 3-piece inner nut.
5	S-28146-1	Spindle Plug Driver – HN Tapered Spindle	Use with plug driver handle, item 6.
	S-28146-3	Spindle Plug Driver – HP Parallel Spindle	Use with plug driver handle, item 6.
6	S-27399	Spindle Plug Driver Handle	Use with plug driver, item 5.

Revisions Table

DATE	REV	PAGE	DESCRIPTION
Apr-2019	B	44, 53, 67	Add ADI hub fill quantity, ECN 10949, 11002 & 1119.
Apr-2019	B	11, 17, 18 & 39-46	Add HXL5 HP and HXL2 HP & HN hub information, ECN 11219 & 11241.
Apr-2019	B	48, 55, 58, 69 & 95	Correct Pro-Torq recommended socket size & add socket, ECN 11525.
Jun-2023	C	21, 95, 97	Amend post flood procedure. Add spindle filter replacement & tools.
Jun-2023	C	22, 23	Amend spindle inspection criteria.
Jan-2025	D	42, 64, 65	Add note to apply grease to inside of hubcap. Add Assemble Brake & Wheels part.

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