TECHNICAL PROCEDURE

HTS™ 21K Rear Mechanical Suspension for Lion Type C School Bus

SUBJECT: Service Instructions
LIT NO: 17730-278
DATE: February 2023 **REVISION:** C

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HENDRICKSON
The World Rides On Us®

SECTION 1
Introduction

This publication is intended to acquaint and assist maintenance personnel in the preventive maintenance, service, repair, and rebuild of the HTS™ 21K rear suspension system as installed on applicable Lion Type C School Buses.

NOTE Use only Genuine Hendrickson parts for servicing this suspension system.

It is important to read and understand this entire Technical Procedure publication prior to performing any maintenance, service, repair, or rebuild of this product. The information in this publication contains parts lists, safety information, product specifications, features, proper maintenance, service, repair and rebuild instructions for the HTS suspension.

Hendrickson reserves the right to make changes and improvements to its products and publications at any time. Contact Hendrickson Tech Services for information on the latest version of this manual at 1-866-755-5968 (toll-free U.S. and Canada), 630-910-2800 (outside U.S. and Canada) or email: techservices@hendrickson-intl.com.

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

SECTION 2
Product Description

Hendrickson's HTS 21K suspension for Lion Type C School Bus application, is a mechanical suspension designed to achieve enhanced durability with limited maintenance requirements. The system utilizes advanced spring technology to achieve extended service life with excellent ride characteristics.

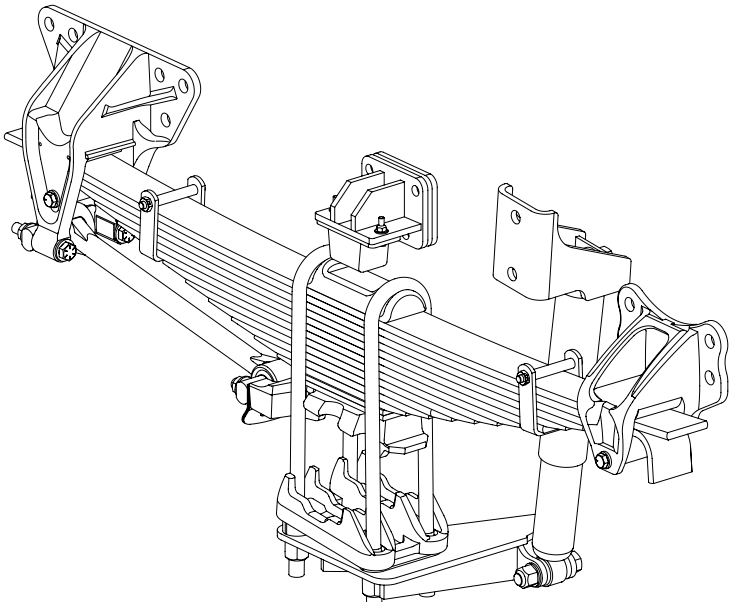
HTS for Lion for Type C School Bus applications, is available in 21,000 pound capacity, designated as HTS 21K. This suspension configuration is intended primarily for over-the highway applications where the axle load does not exceed 21,000 pounds. The HTS 21K suspension is approved for the school bus applications, any other applications require approval from Hendrickson Engineering.

The HTS 21K suspension for Lion Bus for this Type C School Bus Applications, is intended for installation on vehicles with overall frame widths of 33.94" to 34.19".

The HTS 21K suspension design features include:

- **Axle Connection** — Wide seats with heavy-duty U-bolts for secure connection
- **Axle Stop** — Limits spring deflection
- **Leaf spring Assembly** — Hendrickson quality springs are made from high-strength steel. Heat treated and shot peened for exceptional fatigue life
- **Shims** — Drop-in shims used for ease of alignment
- **Shock Absorbers** — Positioned and tuned for optimum damping characteristics
- **Spring Hanger** — Designed for lightweight and maximum durability

FIGURE 2-1



HTS 21K* Specifications for Lion Type C School Bus

Suspension Installed Weight[1]	679 lbs. (308 kg)
Suspension Rating	21,000 lbs. (9,525 kg)
Gross Vehicle Weight (GVW) Approval	33,000 lbs. (14,969 kg)
Ride Height (loaded)[2]	216 mm (8.5")

* All applications require approval from Hendrickson Engineering.

1. Installed weight includes complete suspension, axle brackets, shock absorbers, shock absorber brackets, and frame brackets.
2. Suspension ride height measurements are taken from the centerline of the axle to the bottom of the vehicle frame.

SECTION 3
Important Safety Notice

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

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

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

EXPLANATION OF SIGNAL WORDS

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

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

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

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

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

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

NOTE — An operating procedure, practice condition, etc. which is essential to emphasize.

SERVICE HINT — A helpful suggestion that will make the servicing being performed a little easier and/or faster.

Also note that particular service operations may require the use of special tools designed for specific purposes. These special tools can be found in the Special Tools section in this publication.

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

SAFETY PRECAUTIONS

WARNING

FASTENERS

DISCARD USED FASTENERS. ALWAYS USE NEW FASTENERS TO COMPLETE A REPAIR. FAILURE TO DO SO COULD RESULT IN FAILURE OF THE PART, OR MATING COMPONENTS, ADVERSE VEHICLE HANDLING, PERSONAL INJURY, OR PROPERTY DAMAGE.

LOOSE OR OVER TORQUED FASTENERS CAN CAUSE COMPONENT DAMAGE, ADVERSE VEHICLE HANDLING, PROPERTY DAMAGE, OR SEVERE PERSONAL INJURY. MAINTAIN CORRECT TORQUE VALUE AT ALL TIMES. CHECK TORQUE VALUES ON A REGULAR BASIS AS SPECIFIED, USING A REGULARLY CALIBRATED TORQUE WRENCH. TORQUE VALUES SPECIFIED IN THIS TECHNICAL PUBLICATION ARE FOR HENDRICKSON SUPPLIED FASTENERS ONLY. IF NON HENDRICKSON FASTENERS ARE USED, FOLLOW TORQUE SPECIFICATIONS LISTED IN THE VEHICLE MANUFACTURER'S SERVICE MANUAL.

WARNING

U-BOLT FASTENERS

U-BOLTS THAT ARE FOUND TO BE LOOSE REQUIRE THAT MATING COMPONENTS BE INSPECTED FOR SIGNS OF WEAR. ANY WORN COMPONENTS MUST BE REPLACED. FAILURE TO DO SO CAN CAUSE PREMATURE CLAMP GROUP FAILURE, COMPONENT DAMAGE, ADVERSE VEHICLE HANDLING, PROPERTY DAMAGE, OR SEVERE PERSONAL INJURY. MAINTAIN CORRECT TORQUE VALUES AT ALL TIMES. CHECK TORQUE VALUES ON A REGULAR BASIS AS SPECIFIED.

WARNING

LOAD CAPACITY

ADHERE TO THE PUBLISHED CAPACITY RATINGS FOR THE SUSPENSION. ADD-ON AXLE ATTACHMENTS AND OTHER LOAD TRANSFERRING DEVICES, SUCH AS LIFTABLE AXLES, CAN INCREASE THE SUSPENSION LOAD ABOVE ITS RATED AND APPROVED CAPACITIES, WHICH CAN RESULT IN COMPONENT DAMAGE AND ADVERSE VEHICLE HANDLING, POSSIBLY CAUSING PERSONAL INJURY OR PROPERTY DAMAGE.

WARNING

SUPPORT THE VEHICLE PRIOR TO SERVICING

PLACE THE VEHICLE ON A LEVEL FLOOR AND CHOCK THE WHEELS TO PREVENT THE VEHICLE FROM MOVING OR ROLLING. DO NOT WORK AROUND OR UNDER A RAISED VEHICLE SUPPORTED BY ONLY A FLOOR JACK. ALWAYS SUPPORT A RAISED VEHICLE WITH RIGID SAFETY STANDS. FAILURE TO DO SO CAN CAUSE SERIOUS PERSONAL INJURY OR DAMAGE TO EQUIPMENT.

CAUTION

PROCEDURES AND TOOLS

A TECHNICIAN USING A SERVICE PROCEDURE OR TOOL WHICH HAS NOT BEEN RECOMMENDED BY HENDRICKSON MUST FIRST SATISFY THEMSELVES THAT NEITHER THEIR SAFETY NOR THE VEHICLE'S SAFETY WILL BE JEOPARDIZED BY THE METHOD OR TOOL SELECTED. INDIVIDUALS DEVIATING IN ANY MANNER FROM THE INSTRUCTIONS PROVIDED WILL ASSUME ALL RISKS OF CONSEQUENTIAL PERSONAL INJURY, OR DAMAGE TO THE EQUIPMENT INVOLVED.

WARNING

PERSONAL PROTECTIVE EQUIPMENT

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

WARNING

MODIFYING COMPONENTS

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

⚠ WARNING

TORCH/WELDING

DO NOT USE A CUTTING TORCH TO REMOVE ANY FASTENERS. THE USE OF HEAT ON SUSPENSION COMPONENTS WILL ADVERSELY AFFECT THE STRENGTH OF THESE PARTS. A COMPONENT DAMAGED IN THIS MANNER CAN RESULT IN THE ADVERSE VEHICLE HANDLING AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

EXERCISE EXTREME CARE WHEN HANDLING OR PERFORMING MAINTENANCE IN THE AREA OF THE LEAF SPRING ASSEMBLY. DO NOT CONNECT ARC WELDING GROUND LINE TO THE LEAF SPRING ASSEMBLY. DO NOT STRIKE AN ARC WITH THE ELECTRODE ON THE LEAF SPRING ASSEMBLY. DO NOT USE HEAT NEAR THE LEAF SPRING ASSEMBLY. DO NOT NICK OR GOUGE THE LEAF SPRING ASSEMBLY. SUCH IMPROPER ACTIONS CAN DAMAGE THE LEAF SPRING ASSEMBLY AND CAUSE ADVERSE VEHICLE HANDLING AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

⚠ WARNING

LEAF SPRING ASSEMBLY

A LEAF SPRING ASSEMBLY THAT HAS A MISSING, CRACKED OR DAMAGED LEAF OR SPRING CLIP WILL REQUIRE COMPLETE LEAF SPRING ASSEMBLY REPLACEMENT AND A THOROUGH INSPECTION OF THE ENTIRE SUSPENSION. IF ANY SUSPENSION COMPONENT APPEARS DAMAGED, REPLACEMENT IS REQUIRED. FAILURE TO REPLACE ANY DAMAGED COMPONENTS CAN CAUSE ADVERSE VEHICLE HANDLING, POSSIBLE PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE AND WILL VOID ANY APPLICABLE WARRANTIES.

⚠ CAUTION

SHOCK ABSORBERS

THE SHOCK ABSORBERS ARE THE REBOUND TRAVEL STOPS FOR THE SUSPENSION. ANYTIME THE AXLE INSTALLED ON THE SUSPENSION IS SUSPENDED IT IS MANDATORY THAT THE SHOCK ABSORBERS REMAIN CONNECTED. REPLACEMENT OF SHOCK ABSORBERS WITH NON-HENDRICKSON PARTS CAN ALTER THE REBOUND TRAVEL OF THE SUSPENSION.

⚠ CAUTION

LEAF SPRING ASSEMBLY SHIMS

FAILURE TO INSTALL THE HTS LEAF SPRING ASSEMBLY SHIMS IN THE SAME ORIENTATION AND LOCATION WILL REQUIRE A VEHICLE ALIGNMENT. IMPROPER VEHICLE ALIGNMENT CAN INCREASE TIRE WEAR.

⚠ WARNING

PARTS CLEANING

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

1. WEAR PROPER EYE PROTECTION
2. WEAR CLOTHING THAT PROTECTS YOUR SKIN
3. WORK IN A WELL VENTILATED AREA
4. DO NOT USE GASOLINE, OR SOLVENTS THAT CONTAIN GASOLINE. GASOLINE CAN EXPLODE
5. HOT SOLUTION TANKS OR ALKALINE SOLUTIONS MUST BE USED CORRECTLY. FOLLOW THE MANUFACTURER'S RECOMMENDED INSTRUCTIONS AND GUIDELINES CAREFULLY TO HELP PREVENT PERSONAL ACCIDENT OR INJURY

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

SECTION 4
Special Tools

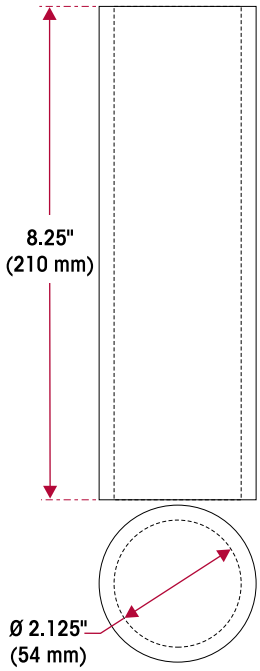
ULTRA ROD TORQUE ROD BUSHING TOOLS

FUNNEL TOOL

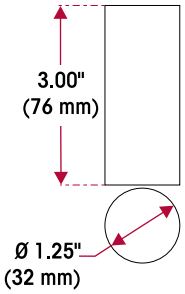
Hendrickson Part No. 66086-001L

These shop made tools are designed to install and remove ULTRA ROD torque rod bushings. Bushing tools are made from cold rolled steel or equivalent. Drawings are for reference only. Hendrickson does not supply these tools.

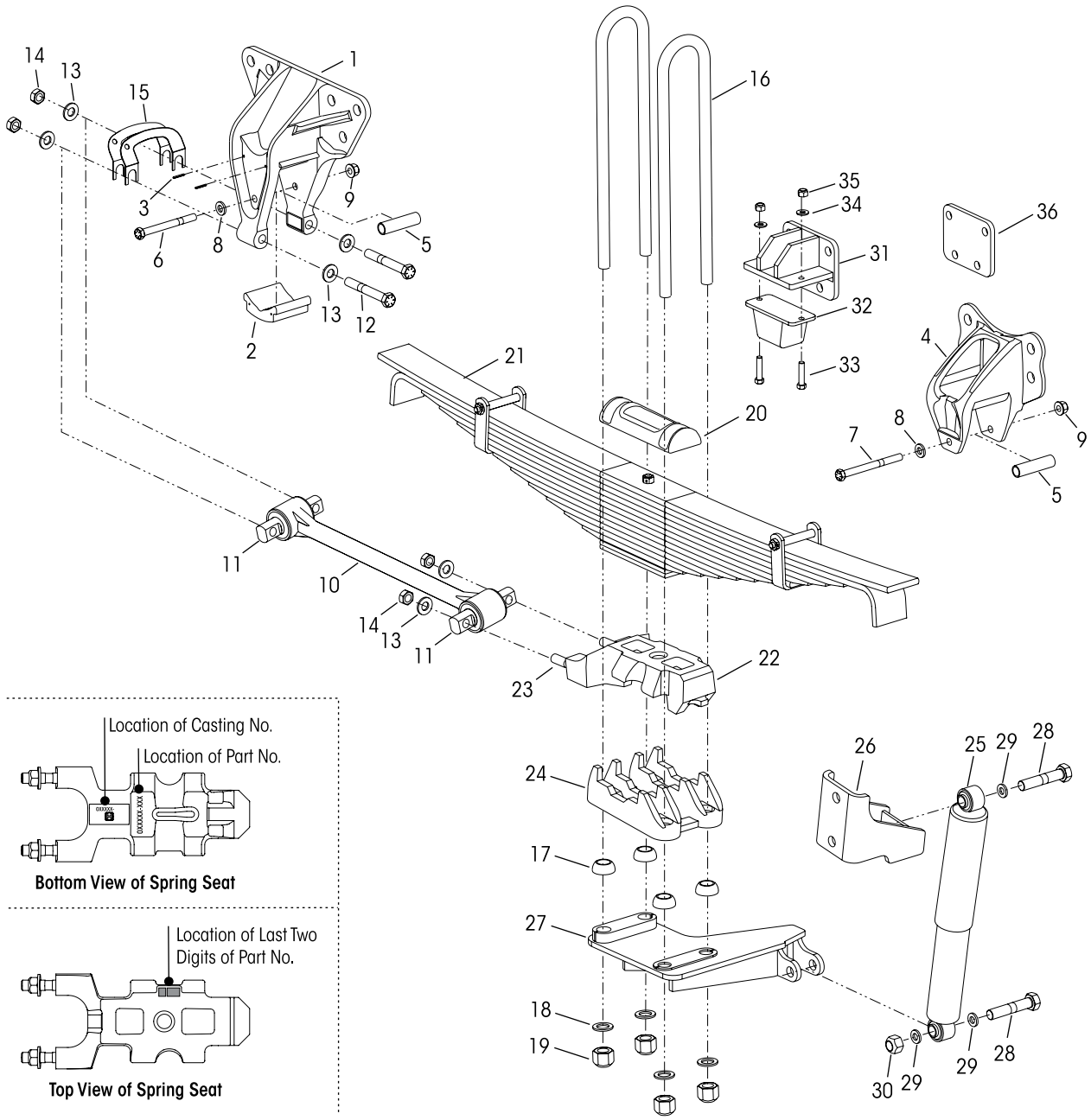
Receiving Tool



Installation / Removal Tool



SECTION 5
Parts Lists



KEY NO.	PART NO.	DESCRIPTION	VEHICLE QTY.
1	58425-001	Front Spring Hanger Assembly, Includes Key Nos. 2-3	2
2	56929-000	Slipper Pad	2
3	58287-001	Retainer Lock Pin	4
4	50028-001	Rear Spring Hanger	2
	49175-032	**Rebound Roller Kit, Axle Set,** Includes Key Nos. 5-9	
5	58631-000	Rebound Roller	4
6	24531-015	½"-13 UNC-2B x 5½" Hex Bolt	2
7	24531-014	½"-13 UNC-2B x 5" Hex Bolt	2
8	22962-014	½" Flat Washer	4
9	60819-000	½"-13 UNC-2B Flange Nut	4
10	62001-495	ULTRA ROD® Longitudinal Torque Rod Assembly, Includes Key No. 11	2
11	47691-000L	ULTRA ROD Torque Rod Bushing	4
		Longitudinal Torque Rod Fastener Service Kit	
	49176-007	**Axle Set,** Includes Key Nos. 12-14, 23	
	50754-023	**Single,** Includes Key Nos. 12-14	
12		*⅝"-11 UNC x 4½" Hex Bolt	4
13		*⅝" Flat Washer	12
14		*⅝"-11 UNC Locknut	8
15	34013-234	**Torque Rod Shim Kit** (4 x 1.5 mm)	As Req.
	91430-021	**U-bolt Service Kit, One Wheel End,** Includes Key No. 16 and Kit No. 48718-157	
16	47417-010	⅞"-14 UNF- 2A x 19" U-bolt	4
	48718-157	**U-bolt Fastener Service Kit, One Wheel End,** Includes Key Nos. 17-19	
17		*⅞" Spherical Washer	8
18		*⅞" Flat Washer	8
19		*⅞"-14 UNF-2B Nut	8
20	48797-000	Top Pad	2
21	53933-000	Leaf Spring Assembly, *Replaces 53192-000*	2
22		**Spring Seat Assembly, Includes Key Nos. 13-14, 23	2
	50970-031	2.5° for Diesel, ID No. A31	
	50970-055	5.5° for Electric, ID No. A55	
	50973-030	8.0°, ID No. B30	
23	50918-000	⅝"-11 UNC Stud	4
24	93302-000	Axle Bottom Cap, *Replaces 50216-000*	2
25	60665-025L	Shock Absorber	2
26	67530-000	Upper Shock Absorber Bracket	2
27		Lower Shock Absorber Bracket	
	67556-003	Left Hand	1
	67556-004	Right Hand	1
28	50764-004	¾"-10 UNC x 3¾" Hex Bolt	4
29	22962-001	¾" Washer	6
30	49842-000	¾"-10 UNC Nut	2
	69883-000	Axle Stop Assembly, Includes Key Nos. 31-36	
31	69877-000	Axle Stop Bracket	2
	34013-481	**Axle Stop Service Kit, Axle Set,** Includes Key Nos. 32-35	
32	49395-000	Axle Stop	2
33		*5⁄16" x 1.5" Hex Cap Screw Bolt	4
34		*5⁄16" Flat Washer	4
35		*5⁄16"-24 UNF Locknut	4
36	69877-001	Backing Plate	2

NOTES: * Item included in kit / assembly only, part not sold separately.

** Refer to Page 8 for the ID number location.

SECTION 6
Preventive Maintenance

Following appropriate inspection procedures are important to help ensure the proper maintenance and operation of the HTS 21K rear suspension systems and component parts. Hendrickson recommends the HTS rear suspension be inspected at vehicle pre-delivery, the first 1,000 miles or 100 hours, and at the regular preventive maintenance intervals, every 50,000 miles or twelve (12) months, whichever comes first, with the exception of the clamp group fasteners, see U-bolt Connection in this section.

NOTE Torque values shown in this publication apply only if Hendrickson supplied fasteners are used. If non-Hendrickson fasteners are used, follow the torque specification listed in the vehicle manufacturer's service manual.

HENDRICKSON RECOMMENDED INSPECTION INTERVALS

	PRE-DELIVERY INSPECTION	FIRST IN-SERVICE INSPECTION	PREVENTIVE MAINTENANCE
Visually inspect for proper assembly and function. Check for all of the following and replace components as necessary: • Signs of unusual movement, loose, or missing components • Signs of abrasive or adverse contact with other components • Damaged, bent or cracked parts • Proper suspension function, alignment • Front spring hanger to longitudinal torque rod • Rear spring hanger to leaf spring assembly	Within the first **100 Miles /** (150 km)	Within the first **1,000 Miles** (1,600 km) or 100 Hours	Every 12 Months or **50,000 Miles**
Inspect fasteners for proper torque as recommended in the Torque Specifications section in this publication with special attention to the following suspension connection: • Clamp group (U-bolts)			*Not to exceed **25,000 Miles**
Verify the lateral alignment of axles are within the vehicle manufacturer's tolerances			Every 12 Months or 50,000 Miles
Inspect the leaf spring assembly for missing, cracked or damaged spring leaf(s)			

* Maintaining the correct U-bolt torque is important to help ensure proper suspension component performance after the first 1,000 mile inspection or U-bolt service. A fleet may determine its own torque inspection intervals by inspecting the U-bolt torque on a more frequent basis (for example at 5,000 miles, or 10,000 miles). If during the torque inspection the U-bolt torque is found below torque specifications, correct the U-bolt torque and decrease the interval between torque inspections. If the U-bolt torque is found within torque specifications, inspection intervals may be increased. **DO NOT exceed 25,000 miles between U-bolt torque inspection intervals.**

COMPONENT INSPECTION

- **Clamp group** — Visually inspect for any loose or damaged fasteners. Verify the U-bolt locknuts have the proper torque values maintained, see the U-bolt Connection in this section.
- **Fasteners** — Visually inspect for any loose or damaged fasteners on the entire suspension. Make sure all fasteners are tightened to a torque value within the specified torque range. See Torque Specification section in this publication for recommended torque requirements. Use a calibrated torque wrench to check torque in a tightening direction. As soon as the fastener starts to move, record the torque and correct the torque if necessary.
- **Leaf spring assembly** — See Leaf Spring Assembly in this section.
- **Longitudinal torque rods** — See Longitudinal Torque Rods in this section.
- **Shock absorbers** — Look for any signs of dents or leakage, see Shock Absorbers in this section.

- **Spring hangers** — Visually inspect for any signs of loose fasteners, movement, damage or excessive wear on the inside of hanger legs. Verify the frame attaching fasteners have the proper torque values maintained, refer to the vehicle manufacturer for proper torque specifications. Inspect front spring hanger slipper pads for wear and replace as necessary, see inspection in this section.
- **Tire wear** — Visually inspect the tires for wear patterns that may indicate suspension damage or misalignment.
- **Wear and damage** — Visually inspect all parts of the suspension for wear and damage. Look for bent or cracked parts.

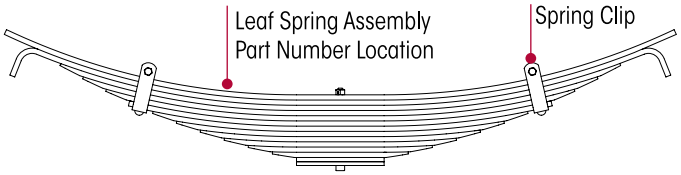
See vehicle manufacturer's applicable publications for other preventive maintenance requirements.

LEAF SPRING ASSEMBLY

⚠ WARNING

A LEAF SPRING ASSEMBLY THAT HAS A MISSING, CRACKED OR DAMAGED LEAF OR SPRING CLIP WILL REQUIRE COMPLETE LEAF SPRING ASSEMBLY REPLACEMENT AND A THOROUGH INSPECTION OF THE ENTIRE SUSPENSION. IF ANY SUSPENSION COMPONENT APPEARS DAMAGED, REPLACEMENT IS REQUIRED. FAILURE TO REPLACE ANY DAMAGED COMPONENTS CAN CAUSE ADVERSE VEHICLE HANDLING, POSSIBLE PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE AND WILL VOID ANY APPLICABLE WARRANTIES.

FIGURE 6-1



The leaf spring assembly part number is stamped on the top leaf of the assembly, see Figure 6-1. Hendrickson recommends that in the event of replacement of high mileage springs that both leaf spring assemblies on the suspension be replaced to ensure even spring deflection. All Hendrickson leaf springs are made to rigid specifications and each leaf is shot peened for long life. To assure compatibility and functionality as a suspension system, Hendrickson recommends genuine leaf springs be specified.

Inspect the entire leaf spring assembly (Figure 6-1), replacement is required for the following:

- If any leaf spring or spring clip is damaged, cracked, or missing.
- If in the unloaded condition, if more than 50% of the first leaf is worn at the spring hanger contact area, regardless of mileage.

U-BOLT CONNECTION

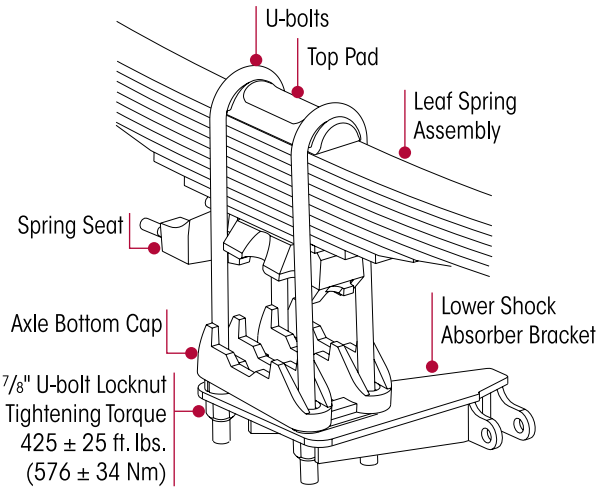
NOTE

Hendrickson recommends the use of phosphate and oil coated Grade 8 bolts, hardened washers and Grade C locknuts for the U-bolt connection. All threads should be lubricated with SAE 20 oil before assembly to obtain the correct relationship of torque and fastener tension.

Maintaining correct U-bolt torque is important to help ensure proper suspension component performance.

1. Inspect the U-bolts for proper seating of components, i.e. no gaps, see Figure 6-2.

FIGURE 6-2



2. **DO NOT** exceed the specified torque on U-bolt locknuts, refer to the Torque Specifications section of this publication. U-bolt locknuts **MUST** be torqued as specified:
   - At predelivery and at any U-bolt service
   - First 1,000 miles, thereafter, follow the inspection and re-torque intervals, every 25,000 miles

WARNING

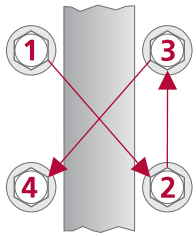
IT IS IMPORTANT THAT THE U-BOLT CONNECTION BE PROPERLY ALIGNED AND HAVE THE PROPER TORQUE VALUES MAINTAINED. METAL SURFACES CAN WORK AND WEAR THE SPRING SEATS, AXLE BOTTOM CAPS AND POSSIBLY OTHER COMPONENTS RELATED IN THE TOTAL ASSEMBLY. MAINTAIN CORRECT TORQUE VALUE AT ALL TIMES FOR U-BOLT LOCKNUTS TO HELP PREVENT EXCESSIVE REPAIRS, DOWNTIME AND POSSIBLE SEPARATION OF COMPONENTS AND ADVERSE VEHICLE HANDLING, PROPERTY DAMAGE OR PERSONAL INJURY.

EXAMPLE

A fleet may determine its own torque inspection interval by inspecting the U-bolt torque on a more frequent basis (for example at 5,000 miles, or 10,000 miles). If during the torque inspection the U-bolt torque is found to be below torque specifications, correct the U-bolt torque and decrease the interval between torque inspections. If the U-bolt torque is found within torque specifications, inspection intervals may be increased. **DO NOT exceed 25,000 miles between U-bolt torque inspection intervals.**

3. Tighten the U-bolt locknuts evenly in 50 foot pounds increments to 425 ± 25 foot pounds torque in the proper pattern to achieve uniform bolt tension, see Figure 6-3.

FIGURE 6-3



AXLE STOP

INSPECTION

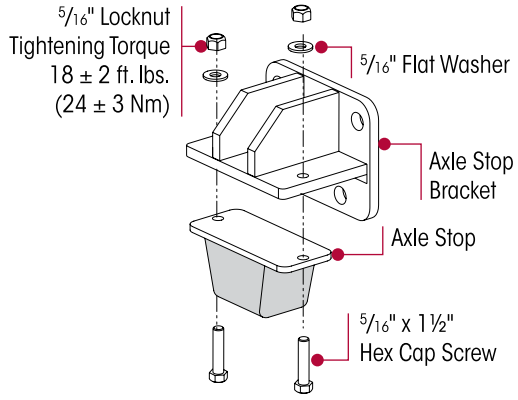
NOTE

Follow the vehicle manufacturer's specifications for axle stop to frame fastener tightening torque values.

In the event one axle stop shows signs of damage or excessive wear, Hendrickson recommends that both axle stops be replaced.

- Check the axle stop bracket to frame fasteners for proper torque per the vehicle manufacturer's specifications.
- Check axle stop to axle stop bracket fasteners for proper torque, see Figure 6-6.

FIGURE 6-6

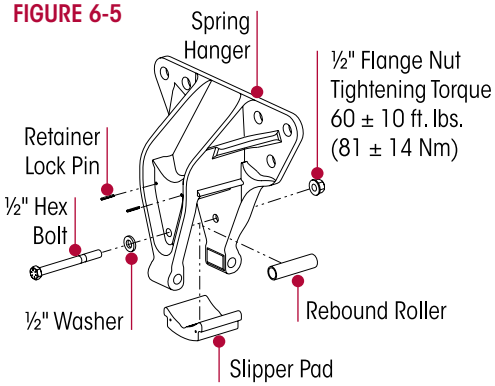


- Visually inspect the axle stop and mating components for damage or excessive wear and replace as necessary, see Figure 6-6. Refer to Axle Stop in the Component Replacement section of this publication.

SLIPPER PADS

The operation of the HTS suspension will result in some wear between the spring assembly and the spring hanger slipper pads, see Figure 6-5. In normal use the slipper pads will function satisfactorily even though they may show some wear. If the slipper pads require replacement, follow instructions in the Component Replacement section in this publication.

FIGURE 6-5



LONGITUDINAL TORQUE RODS

WARNING

THIS HENDRICKSON SUSPENSION REQUIRES TORQUE RODS FOR SUSPENSION PERFORMANCE AND VEHICLE STABILITY. IF THESE TORQUE RODS ARE DISCONNECTED OR ARE NON-FUNCTIONAL, DO NOT OPERATE THE VEHICLE. OPERATING A VEHICLE WITH DISCONNECTED OR NON-FUNCTIONAL TORQUE RODS CAN RESULT IN ADVERSE VEHICLE HANDLING, COMPONENT DAMAGE, SUSPENSION/VEHICLE DAMAGE, AND/OR SEVERE PERSONAL INJURY.

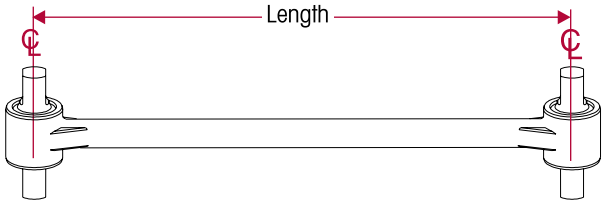
Longitudinal torque rod length, see Figure 6-4, is determined by the original vehicle manufacturer. The longitudinal torque rods along with the spring seat maintain the control of acceleration and brake forces.

ULTRA ROD Bushings — ULTRA ROD torque rod bushings can be replaced by pressing out the worn end, and installing a replacement bushing. See Component Replacement section of this publication.

NOTE

Hendrickson recommends the use of Grade 8 bolts and Grade C locknuts for all straddle mount torque rod attachments.

FIGURE 6-4



VISUAL INSPECTION

Visually inspect **(1) torque rod bushings** for any torn or shredded rubber material interfaces or elongated oval shapes and **(2) torque rods** for any metal-to-metal contact, bent, cracked, or broken components. The torque rod and/or the torque rod bushings will require replacement if any of these conditions are encountered.

PHYSICAL INSPECTION

Inspect the torque rod bushings for signs of looseness per the following method:

1. With the vehicle shut down perform a lever check.
2. Place a long pry bar under each torque rod end and apply pressure to check for loosness.

SHOCK ABSORBERS

NOTE It is not necessary to replace shock absorbers in pairs if only one (1) shock absorber requires replacement.

Hendrickson uses a long service life, premium shock absorber on all HTS suspensions. If shock absorber replacement is necessary, Hendrickson recommends shock absorbers be replaced with identical Hendrickson Genuine parts for servicing. Failure to do so will affect the suspension performance, durability, and will void any applicable warranty. See vehicle manufacturer's applicable publications for other shock absorber inspection requirements.

Inspection of the shock absorber can be performed by doing a heat test, see Figure 6-7, and a visual inspection. Replace as necessary, refer to the Component Replacement section of this publication.

FIGURE 6-7

HEAT TEST AND PHYSICAL INSPECTION

1. **Heat Test:** Drive the vehicle at moderate speeds on a rough road for a minimum of fifteen minutes.

⚠ WARNING

DO NOT GRAB THE SHOCK ABSORBER AS IT COULD POSSIBLY BE HOT AND CAUSE PERSONAL INJURY.

   a. Perform a heat test by carefully touching or placing a hand near the shock absorber body below the dust cover. Touch the frame to get an ambient reference, see Figure 6-7. A shock absorber that is warm to the touch is acceptable, a cold shock absorber should be replaced.

2. **Physical Inspection:** To inspect for an internal failure, remove and shake the suspected shock absorber. Listen for the sound of metal parts rattling inside. The rattling of metal parts can indicate that the shock absorber has an internal failure and the shock absorber should be replaced.

VISUAL INSPECTION

Look for these potential problems when doing a visual inspection, see Figure 6-8. Inspect the shock absorbers fully extended. Replace as necessary.

FIGURE 6-8

SHOCK ABSORBER VISUAL INSPECTION – UNACCEPTABLE CONDITIONS

Damaged upper or lower mount

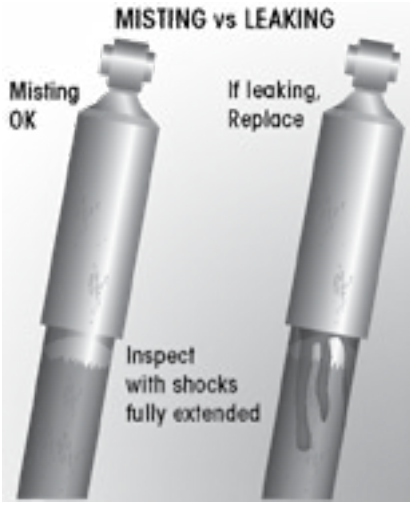
Damaged upper or lower bushing

Damaged dust cover and / or shock body

Bent or dented shock absorber

Improper installation Example: washer (if equipped installed backwards

FIGURE 6-9



LEAKING VS. MISTING SHOCK ABSORBER VISUAL INSPECTION

The inspection must not be conducted after driving in wet weather or a vehicle wash. The shock absorber needs to be free from water.

Many shock absorbers are often misdiagnosed as failures. Misting is the process whereby very small amounts of shock absorber fluid evaporate at a high operating temperature through the upper seal of the shock absorber. When the "mist" reaches the cooler outside air, it condenses and forms a film on the outside of the shock absorber body. Misting is perfectly normal and a necessary function of the shock absorber. The fluid which evaporates through the seal area helps to lubricate and prolong the life of the seal.

NOTE

The HTS system is equipped with a premium seal on the shock absorber, however, this seal will allow for misting to appear on the shock absorber body (misting is not a leak and is considered acceptable).

Inspect the shock absorber fully extended. **A shock absorber that is truly leaking** will show signs of fluid **leaking in streams from the upper seal**, see Figure 6-9. These streams can easily be seen, underneath the main body (dust cover) of the shock absorber. Replace as necessary.

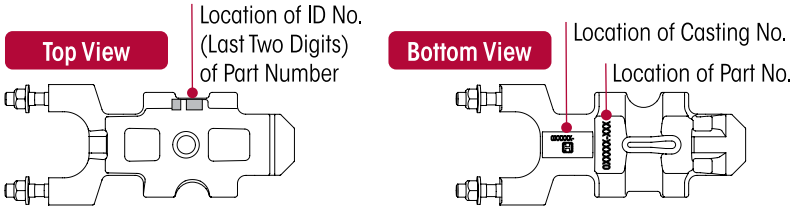
SECTION 7
Alignment & Adjustments

AXLE PINION ANGLE

The axle pinion angle is set by the spring seat assembly. The pinion angle should be checked in the loaded condition and is set by the vehicle manufacturer.

If a new spring seat is required, see the location of the ID No. (Last Two Digits of the Part Number) as shown in Figure 7-1 bottom view, also refer to the Parts Lists section in this publication.

FIGURE 7-1



DRIVE AXLE ALIGNMENT INSPECTION

Proper alignment is essential for maximum ride quality, performance, and tire service life. The following recommended alignment procedure should be performed if excessive or irregular tire wear is observed.

NOTE Computerized alignment equipment is the preferred method of measuring alignment. Laser alignment equipment may be used, however, to calculate the shim thickness required the target offset must be converted to thrust angle, see alignment equipment manufacturer for procedures.

1. Use a work bay with a level, flat surface.
2. Relax the suspension by slowly moving the vehicle back and forth several times in a straight line without using the brakes. This will slacken or loosen the suspension as the vehicle is positioned. End with all wheels positioned straight ahead.
3. **DO NOT** set the parking brake. Chock the front wheels of the vehicle.
4. Verify all suspension components are in good condition. Repair or replace any worn or damaged suspension components before proceeding with the alignment process.
5. Ensure all drive axle tires are the same size, and inflated to the correct tire pressure.
6. Use an alignment machine to calculate the drive axle readings.

NOTE Depending on your alignment equipment, enter the vehicle year, make, model and design into the system's computer to determine the OEM's alignment specifications per the alignment equipment instructions. That data will be compared to the vehicle's actual alignment status to determine necessary corrections. Some systems allow you to simply scan the VIN to recall specs. Vehicle manufacturers have set specific alignment specifications.

7. If the measurements are within the vehicle manufacturer's specifications, then the rear drive axle alignment is acceptable. Proceed to check the pinion angles of the drive axles (Step 9).
   a. If the alignment of the rear drive axle **IS NOT** within the vehicle manufacturer's specifications, then the alignment of this axle **MUST** be corrected **BEFORE** checking the drive axle pinion angles. Correct the alignment of this axle by following the Alignment Adjustment Instructions as shown in this section.
8. After all drive axles are aligned, check the pinion angle of each drive axle with a digital protractor. Refer to the vehicle manufacturer specifications for the required pinion angles.
   a. If all pinion angles are within the vehicle manufacturer's specifications then proceed to Step 11.

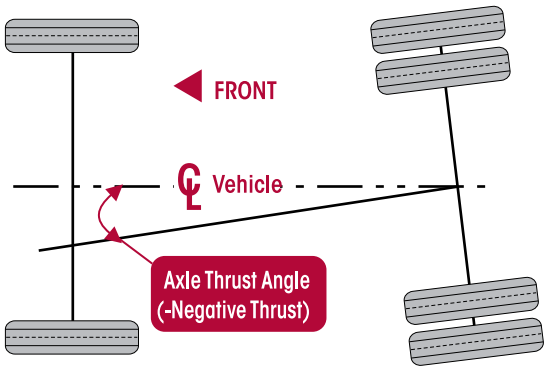
b. If any pinion angle is out of the vehicle manufacturer's specifications it must be corrected. Follow the Alignment Adjustment procedure in this section.

9. Recheck measurements to confirm adjustments until the correct alignment and pinion angles are achieved.
10. When all drive axle alignments and pinion angles are within the vehicle manufacturer's specifications then the alignment procedure is complete.
11. Remove the wheel chocks.

ALIGNMENT ADJUSTMENT

If alignment of the drive axle is required, as determined by the alignment inspection procedure, perform the following steps.

FIGURE 7-2



1. Determine the direction of axle thrust angle. Figure 7-2 illustrates the drive axle with a thrust angle to the left (-negative thrust).
2. Chock the wheels of the front axles to prevent vehicle movement during service.
3. Loosen but **DO NOT REMOVE** the longitudinal torque rod fasteners from the front hanger.

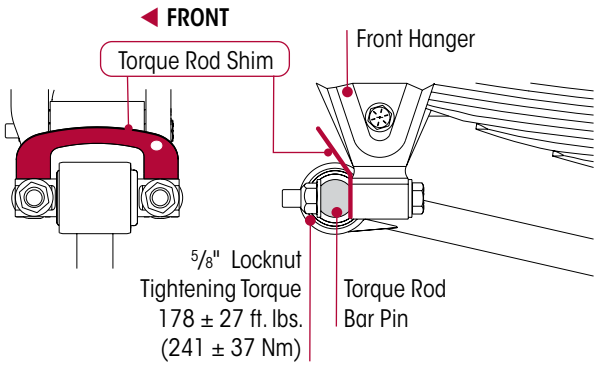
SERVICE HINT

Axle thrust angle may be adjusted at either wheel end on an axle. If insufficient adjustment is available at one wheel end, the opposing wheel end will also need to be adjusted, but in the opposite direction.

EXAMPLE:

The alignment equipment shows the front drive axle to have a 0.40° thrust angle to the left. This will require a ¼" shim thickness increase to the front side of the left front longitudinal torque rod. If there is less then ¼" of adjustment available at this location then some of the adjustment will have to be made at the rear of the right front end bushing. In this case a ⅛" shim thickness increase at the front side of the left front bar pin AND a ⅛" shim thickness increase at the rear side of the right front bar pin will correct the 0.40° thrust angle.

FIGURE 7-3



4. Adjust shim thickness to move the axle in the desired direction, see Figure 7-3.
5. If more adjustment is needed, up to 4 shims may be installed at the longitudinal torque rod ends.
6. Once the vehicle is aligned, tighten the longitudinal torque rod fasteners to 178 ± 27 foot pounds torque.
7. Remove wheel chocks.

SECTION 8
Component Replacement

FASTENERS

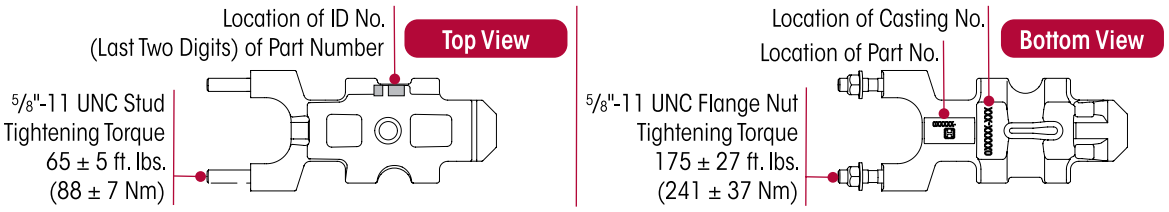
When servicing the HTS suspension, Hendrickson recommends replacing all removed fasteners with new equivalent fasteners. Maintain the correct torque values at all times. Check the torque values as specified, see Hendrickson's Torque Specifications section of this publication. If non-Hendrickson fasteners are used, follow the torque specifications listed in the vehicle manufacturer's service manual.

SPRING SEATS

The following instructions apply if the spring seat or mounting bolts to the longitudinal torque rod attachment require replacement. Figure 8-1 shows a view of the spring seat and studs that are used to connect the torque rod to the spring seat.

NOTE If a new spring seat is required, see the location of the ID No. (Last Two Digits) of the Part Number as shown in Figure 8-1 bottom view, also refer to the Parts Lists section in this publication.

FIGURE 8-1



DISASSEMBLY

1. Chock the wheels.
2. Raise and support the axle with safety stands.
3. Remove the tires per the vehicle manufacturer's instructions.
4. Raise the frame to remove the load from the suspension.
5. Support the frame with safety stands.
6. Loosen the rebound bolt flange nut in the front spring hanger.

NOTE It might be necessary to raise or lower the frame in order to remove the torque rod fasteners.

SERVICE HINT Prior to disassembly of the HTS longitudinal torque rod fasteners, note the orientation and quantity of torque rod shim(s). It is required that the longitudinal torque rod shims be installed in the same orientation and location as removed to preserve the existing alignment.

7. Remove and discard the longitudinal torque rod fasteners connected to the front spring hanger. Remove the alignment shim(s).
8. Remove and discard the longitudinal torque rod fasteners connected to the spring seat stud.
9. Remove the longitudinal torque rod, see Figure 8-2.
10. Remove and discard the lower shock absorber fastener.
11. Remove and discard the U-bolt fasteners, spherical washers, and U-bolts, see Figure 8-3.
12. Remove the bottom cap, spherical washers, and the lower shock bracket.
13. Lower the axle or raise the frame enough to allow clearance to remove the spring seat.

INSPECTION

WARNING

FAILURE OF THE LEAF SPRING ASSEMBLY BETWEEN THE U-BOLTS WILL REQUIRE THE REPLACEMENT OF ALL CLAMP GROUP COMPONENTS. FAILURE TO DO SO CAN RESULT IN PREMATURE LEAF SPRING ASSEMBLY OR CLAMP GROUP FAILURE, WHICH MAY RESULT IN ADVERSE VEHICLE HANDLING, PROPERTY DAMAGE AND/OR PERSONAL INJURY.

1. Inspect the leaf spring assembly for cracks, broken or missing leafs, or damage, see Preventive Maintenance section in this publication. Replace as necessary.
2. Inspect the spring seat and axle bottom cap for excessive wear and cracks. Replace as necessary.
3. Inspect the axle housing for any cracks or wear. Repair or replace as necessary per vehicle manufacturer's specifications.

WARNING

U-BOLTS THAT ARE FOUND TO BE LOOSE WILL REQUIRE THAT THE MATING COMPONENTS BE INSPECTED FOR SIGNS OF WEAR. ANY COMPONENTS WORN MUST BE REPLACED. FAILURE TO DO SO CAN CAUSE PREMATURE CLAMP GROUP FAILURE, COMPONENT DAMAGE, ADVERSE VEHICLE HANDLING, PROPERTY DAMAGE, OR SEVERE PERSONAL INJURY. MAINTAIN CORRECT TORQUE VALUE AT ALL TIMES. CHECK TORQUE VALUES ON A REGULAR BASIS AS SPECIFIED.

FIGURE 8-2

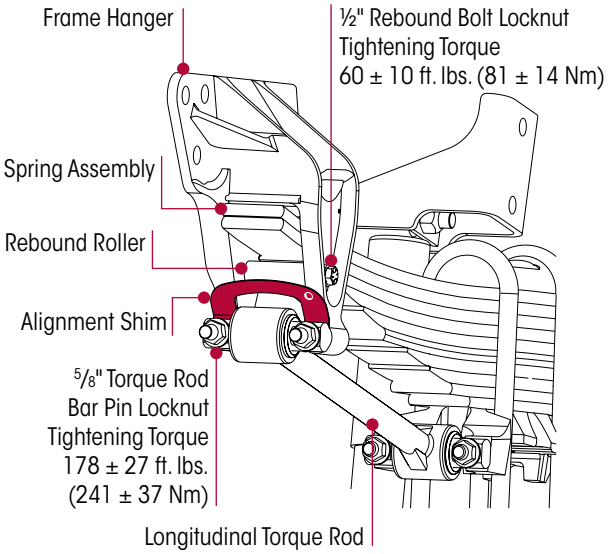
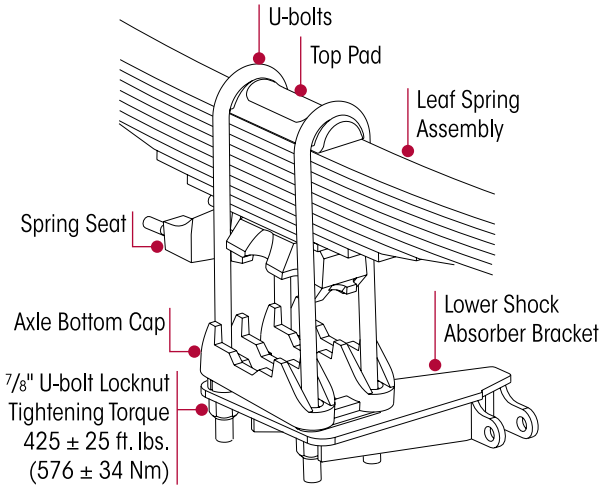


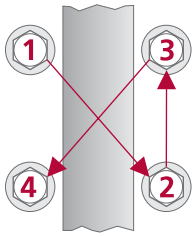
FIGURE 8-3



ASSEMBLY

1. Install the spring seat with the studs mounted forward. Ensure the spring seat is engaged on the axle dowel pin.
2. Raise the axle or lower the frame until the spring center bolt engages into the spring seat alignment hole.
3. Install the U-bolts, top pad, spring seat, axle bottom cap, lower shock absorber bracket, washers, and locknuts as shown in Figure 8-3. **DO NOT** tighten the U-bolt locknuts at this time.

FIGURE 8-4



4. Tighten the U-bolt locknuts evenly in 50 foot pounds increments in the proper pattern, see Figure 8-4, to achieve uniform bolt tension to 425 ± 25 foot pounds.
5. Tap the top of the U-bolts with a dead blow mallet, and retighten to 425 ± 25 foot pounds. **DO NOT** exceed specified torque on U-bolt locknuts.
6. Install the longitudinal torque rod.

NOTE U-bolt locknuts must be retightened to 425 ± 25 foot pounds torque after the first 1,000 miles of service and at regular intervals thereafter as experience dictates, not to exceed 25,000 miles. **DO NOT** exceed specified torque on U-bolt locknuts.

⚠ CAUTION FAILURE TO INSTALL THE HTS LONGITUDINAL TORQUE ROD SHIMS IN THE SAME ORIENTATION AND LOCATION WILL REQUIRE A VEHICLE ALIGNMENT. IMPROPER VEHICLE ALIGNMENT CAN INCREASE TIRE WEAR.

NOTE Prior to assembly of the HTS longitudinal torque rod fasteners, note the location, orientation and quantity of torque rod shim(s). It is required that the longitudinal torque rod shims be installed in the same orientation and location as removed to preserve the existing alignment.

7. Install the longitudinal torque rod fasteners and alignment shim(s) that were removed, see Figure 8-2.
8. Tighten the torque rod fasteners to 178 ± 27 foot pounds torque, see Figure 8-2.
9. Install the lower shock absorber into lower shock bracket and tighten the lower shock fasteners to 60 ± 10 foot pounds torque, see Figure 8-3.
10. Tighten rebound roller flange nut to 60 ± 10 foot pounds torque, see Figure 8-2.
11. Remove axle safety stands and lower the axle.
12. Install the tires per the vehicle manufacturer's instructions.
13. Lower the frame and remove safety stands.

NOTE Axle alignment is necessary anytime the leaf spring assembly is serviced, which includes removal of the U-bolts.

14. Verify axle alignment, see the Alignment & Adjustments section in this publication.
15. Remove wheel chocks.

SPRING SEAT STUDS

SERVICE HINT It is not necessary to disassemble the clamp group to replace the spring seat studs.

DISASSEMBLY

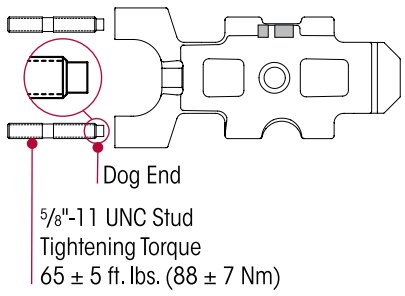
1. Chock the front wheels of the vehicle.
2. Support the frame with safety stands.
3. Loosen the rebound bolt flange nut in the front hanger.

SERVICE HINT It may be necessary to raise or lower the frame to remove the torque rod fasteners.

NOTE Prior to removal, note the location, orientation and quantity of the torque rod shim(s) **prior** to disassembly. It is required that the torque rod shims be installed in the same orientation and location as removed to preserve the existing alignment.

4. Remove the torque rod to front hanger fasteners and torque rod shims, see Figure 8-2.
5. Remove and discard the longitudinal torque rod to spring seat stud fasteners.
6. Remove the longitudinal torque rod.
7. Remove the spring seat mounting studs.

FIGURE 8-5



ASSEMBLY

1. Screw in the new studs with the dog end first (see Figure 8-5) into the spring seat until they bottom out in the spring seat. Tighten the studs to 65 ± 5 foot pounds torque.

CAUTION

FAILURE TO INSTALL THE LONGITUDINAL TORQUE ROD SHIMS IN THE SAME ORIENTATION AND LOCATION WILL REQUIRE A VEHICLE ALIGNMENT. IMPROPER VEHICLE ALIGNMENT CAN INCREASE TIRE WEAR.

NOTE

It is required that the longitudinal torque rod shim(s) be installed in the same location, orientation and quantity as removed to preserve the existing alignment.

2. Install the longitudinal torque rod.
3. Install the mounting fasteners and any alignment shims that were removed, see Figure 8-2.
4. Tighten the torque rod fasteners to 178 ± 27 foot pounds torque, see Figure 8-2.
5. Tighten rebound roller flange nut to 60 ± 10 foot pounds torque.
6. Remove the frame safety stands and wheel chocks.

LEAF SPRING ASSEMBLY

WARNING

A LEAF SPRING ASSEMBLY THAT HAS A MISSING, CRACKED OR DAMAGED LEAF OR SPRING CLIP WILL REQUIRE COMPLETE LEAF SPRING ASSEMBLY REPLACEMENT AND A THOROUGH INSPECTION OF THE ENTIRE SUSPENSION MUST BE PERFORMED. IF ANY COMPONENT APPEARS DAMAGED, REPLACEMENT IS REQUIRED. FAILURE TO REPLACE ANY DAMAGED COMPONENTS CAN CAUSE ADVERSE VEHICLE HANDLING, POSSIBLE PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE AND WILL VOID ANY APPLICABLE WARRANTIES.

DISASSEMBLY

1. Chock the wheels.
2. Raise and support the axle with safety stands.
3. Remove the tires per the vehicle manufacturer's instructions.
4. Raise the frame to remove the load from the suspension.
5. Support the frame with safety stands.
6. Remove the rebound bolt fasteners, and roller from both front and rear spring hangers.

NOTE

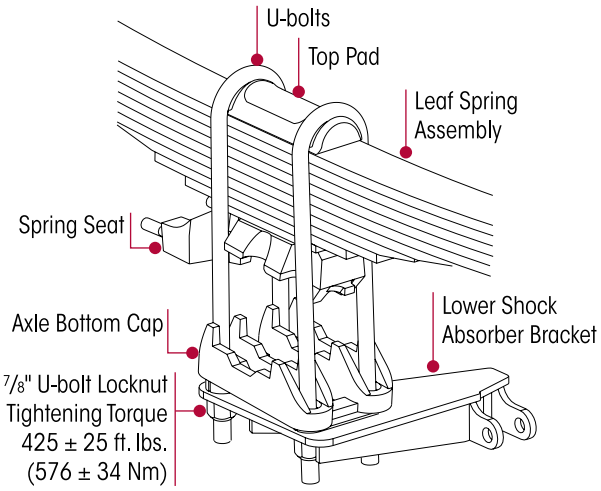
It might be necessary to raise or lower the frame in order to remove the torque rod fasteners.

SERVICE HINT

Prior to disassembly of the HTS longitudinal torque rod fasteners, note the orientation and quantity of torque rod shim(s). It is required that the longitudinal torque rod shims be installed in the same orientation and location as removed to preserve the existing alignment.

7. Remove and discard the longitudinal torque rod to spring hanger fasteners and alignment shim(s).
8. Remove and discard the longitudinal torque rod to spring seat stud fasteners.
9. Remove the longitudinal torque rod.
10. Remove and discard the lower shock absorber fasteners.
11. Remove and discard the U-bolt fasteners, see Figure 8-6.
12. Remove the bottom cap, spherical washers, and lower shock bracket.

FIGURE 8-6



⚠ WARNING

U-BOLTS THAT ARE FOUND TO BE LOOSE WILL REQUIRE THAT THE MATING COMPONENTS BE INSPECTED FOR SIGNS OF WEAR. ANY COMPONENTS WORN MUST BE REPLACED. FAILURE TO DO SO CAN CAUSE PREMATURE CLAMP GROUP FAILURE, COMPONENT DAMAGE, ADVERSE VEHICLE HANDLING, PROPERTY DAMAGE, OR SEVERE PERSONAL INJURY. MAINTAIN CORRECT TORQUE VALUE AT ALL TIMES. CHECK TORQUE VALUES ON A REGULAR BASIS AS SPECIFIED.

13. Remove and discard U-bolts.
14. Lower axle or raise the frame enough to allow clearance to remove the leaf spring.
15. Remove the leaf spring assembly.

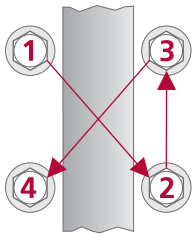
ASSEMBLY

1. Install the leaf spring assembly onto the spring seat.
2. Raise the axle or lower the frame to center the leaf spring through the legs of the spring hanger.
3. Pilot the spring center bolt into the hole in the spring seat.
4. Install the U-bolts, top pad, bottom cap, spherical washers, lower shock bracket, washers, and locknuts as shown in Figure 8-6. Snug **DO NOT** tighten the U-bolt locknuts at this time.
5. Continue to raise the axle or lower the frame to alow the front and rear spring hangers to engage the leaf spring assembly.

⚠ WARNING

IT IS IMPORTANT THAT THE U-BOLT CONNECTION BE PROPERLY ALIGNED AND HAVE THE PROPER TORQUE VALUES MAINTAINED. METAL SURFACES CAN WORK AND WEAR THE SPRING SEATS, AXLE BOTTOM CAPS AND POSSIBLY OTHER COMPONENTS RELATED IN THE TOTAL ASSEMBLY. PROPERLY TIGHTENED U-BOLT LOCKNUTS WILL ELIMINATE COSTLY REPAIR, DOWNTIME AND POSSIBLE SEPARATION OF COMPONENTS AND ADVERSE VEHICLE HANDLING, PROPERTY DAMAGE OR PERSONAL INJURY.

FIGURE 8-7



6. Tighten the U-bolt locknuts evenly in 50 foot pounds increments in the proper pattern, see Figure 8-7, to achieve uniform bolt tension to 425 ± 25 foot pounds.
7. Tap the top of the U-bolts with a dead blow mallet, and retighten to 425 ± 25 foot pounds. **DO NOT** exceed specified torque on U-bolt locknuts.

NOTE

U-bolt locknuts must be retightened to 425 ± 25 foot pounds torque after the first 1,000 miles of service and at regular intervals thereafter as experience dictates, not to exceed 25,000 miles. **DO NOT** exceed specified torque on U-bolt locknuts, see Preventive Maintenance section for more information.

8. Install the longitudinal torque rod.

⚠ CAUTION

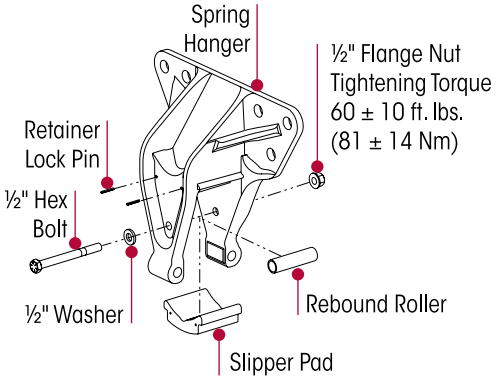
FAILURE TO INSTALL THE HTS LONGITUDINAL TORQUE ROD SHIMS IN THE SAME ORIENTATION AND LOCATION WILL REQUIRE A VEHICLE ALIGNMENT. IMPROPER VEHICLE ALIGNMENT CAN INCREASE TIRE WEAR.

NOTE

It is required that the HTS longitudinal torque rod shims be installed in the same orientation and location as removed to preserve the existing alignment.

9. Install the torque rod fasteners and any alignment shims that were removed.
10. Tighten the torque rod fasteners to 178 ± 27 foot pounds torque.
11. Install the lower shock absorber into lower shock bracket and tighten to 60 ± 10 foot pounds torque.

FIGURE 8-8



12. Install the rebound bolt, rebound roller, washer and flange nut on the spring hangers shown in Figure 8-8 and tighten to 60 ± 10 foot pounds torque.
13. Install the tires per the vehicle manufacturer's instructions.

NOTE Alignment is necessary anytime the spring assembly is serviced, which includes removal of the U-bolts.

14. Remove the frame safety stands.
15. Verify the axle alignment, see Alignment & Adjustments section in this publication.
16. Remove the wheel chocks.

ULTRA ROD LONGITUDINAL TORQUE ROD

DISASSEMBLY

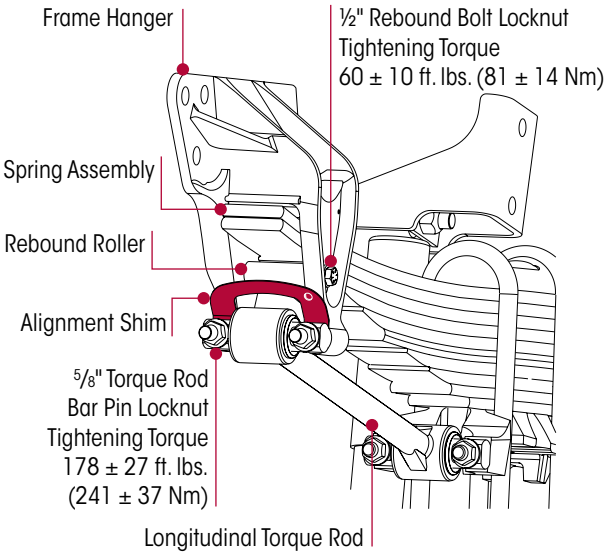
1. Chock wheels of drive axle.
2. Loosen rebound bolt flange nut in the front spring hanger.

NOTE It might be necessary to raise or lower the frame in order to remove the torque rod fasteners.

SERVICE HINT Prior to disassembly of the longitudinal torque rod fasteners, note the orientation and quantity of torque rod shim(s). It is required that the longitudinal torque rod shims be installed in the same orientation and location as removed to preserve the existing alignment.

3. Remove and discard the fasteners and alignment shims that connect the longitudinal torque rod to spring hanger.
4. Remove and discard the fasteners that connect the longitudinal torque rod to spring seat stud.
5. Remove the longitudinal torque rod.
6. Inspect the mounting surfaces for any wear or damage, replace if necessary.
7. To replace bushings, refer to Torque Rod Bushing in this section.

FIGURE 8-9



ASSEMBLY

1. Position the new or re-bushed torque rod on the spring seat and install fasteners. Hand tighten locknuts. **DO NOT** tighten at this time.
2. Position the longitudinal torque rod on the forward face of the spring hanger legs.

⚠ CAUTION FAILURE TO INSTALL THE HTS LONGITUDINAL TORQUE ROD SHIMS IN THE SAME ORIENTATION AND LOCATION WILL REQUIRE A VEHICLE ALIGNMENT. IMPROPER VEHICLE ALIGNMENT CAN INCREASE TIRE WEAR.

NOTE It is required that the HTS longitudinal torque rod shims be installed in the same orientation and location as removed to preserve the existing alignment.

3. Install torque rod to spring hanger fasteners, and any alignment shims that were removed.
4. Tighten torque rod locknuts to 178 ± 27 foot pounds torque as shown in Figure 8-9.
5. Tighten the rebound bolt flange nuts to 60 ± 10 foot pounds torque as shown in Figure 8-9.
6. Verify the axle alignment, see Alignment & Adjustments section in this publication.
7. Remove the wheel chocks.

ULTRA ROD TORQUE ROD BUSHINGS

You will need:

- A vertical press with a capacity of at least 10 tons
- A receiving, installation, and funnel tool, see the Special Tools section of this publication for shop made tool specifications

REMOVAL

1. Remove the longitudinal torque rod(s) as detailed in the Longitudinal Torque Rod in this section.

CAUTION

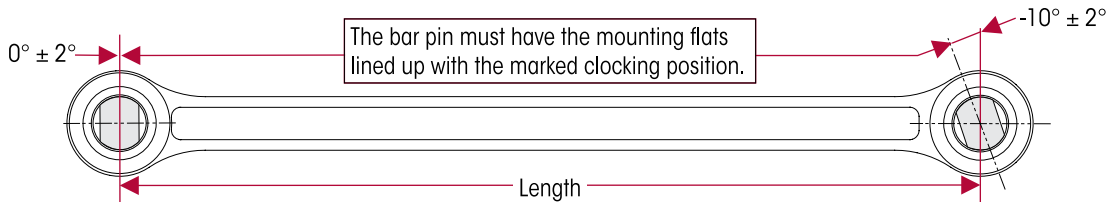
DO NOT USE HEAT OR USE A CUTTING TORCH TO REMOVE THE BUSHINGS FROM THE TORQUE ROD. THE USE OF HEAT WILL ADVERSELY AFFECT THE STRENGTH OF THE TORQUE ROD; HEAT CAN CHANGE THE MATERIAL PROPERTIES. A COMPONENT DAMAGED IN THIS MANNER CAN RESULT IN THE ADVERSE VEHICLE HANDLING, POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE AND VOID WARRANTY.

CAUTION

BE SURE THE TORQUE ROD IS SQUARELY SUPPORTED ON THE PRESS BED FOR SAFETY.

2. Prior to removal of the straddle mount bar pin bushings, mark the clocking position (0 degree and -10 degree), see Figure 8-10, of the bushing assembly's bar pin flats with a paint stick on the torque rod end hub prior to disassembly.
3. Install the torque rod in the press. Support the torque rod end on the receiving tool with the end of the torque rod centered on the tool. Be sure the torque rod is squarely supported on the press bed.
4. Push directly on the inner metal of the bushing assembly until the bushing assembly clears the torque rod end tube.
5. Clean and inspect the inner diameter of the torque rod ends.

FIGURE 8-10



INSTALLATION

NOTE **DO NOT** use a petroleum or soap based lubricant. Such lubricants can cause adverse reactions with the bushing, such as deterioration of the rubber, causing premature failure.

1. Lubricate the inner diameter of the torque rod end hub and the new rubber bushing with light Naphthenic Base Oil, such as 60 SUS at 100°F, see Figure 8-11.
2. Support the torque rod end tube on the receiving tool with the end tube of the torque rod centered on the receiving tool.

NOTE When replacing a straddle mount bar pin type bushing assembly, verify the correct clocking position of the straddle mount bar pin flats, see Figure 8-10, prior to installing the bushing assembly in the torque rod end hub.

3. Center the new bushing assembly on the torque rod end hub. When installing a straddle mount type bushing assembly, verify the bushing assembly's bar pin flats are clocked correctly.
4. Press directly on the inner metal of the bushing assembly. The rubber bushings of the bar pin must be centered within the torque rod end tubes.
5. When pressing in the new bushings overshoot the desired final position by approximately 3⁄16", see Figure 8-12.
6. Press the inner metal of the bushing assembly again from the opposite side to center the bushing and inner metal within the torque rod end tube, see Figure 8-13.

FIGURE 8-11

FIGURE 8-12

FIGURE 8-13

CAUTION

IF THE TORQUE ROD ASSEMBLY IS NOT ALLOWED THE ALLOTTED TIME FOR THE LUBRICANT TO DISSIPATE, THE BUSHING MAY SLIDE FROM THE TORQUE ROD END TUBE. THE BUSHING WILL THEN NEED TO BE REMOVED AND A NEW BUSHING RE-INSTALLED.

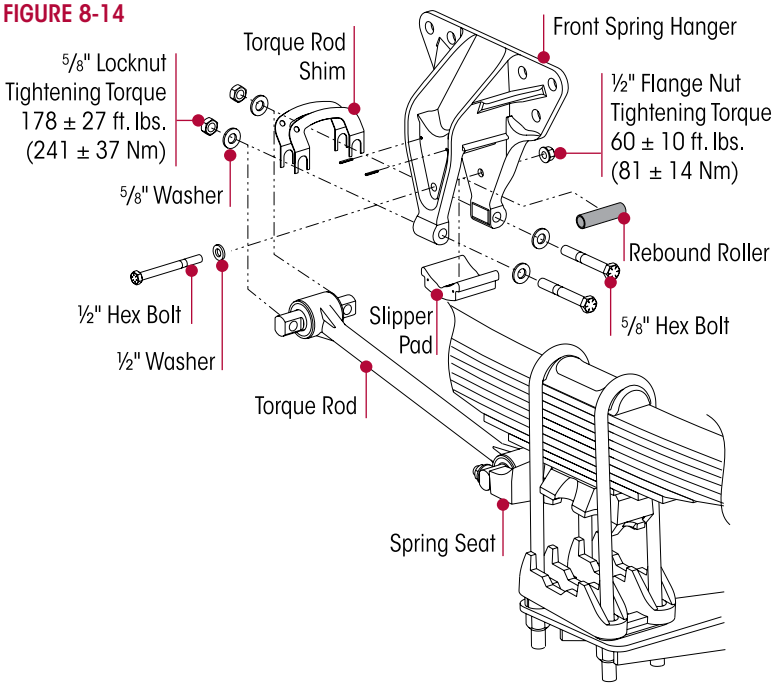
7. Wipe off excess lubricant. Allow the lubricant **four hours** to dissipate before operating the vehicle.
8. Install the torque rod assembly as detailed in the Longitudinal Torque Rod in this section.

FRONT SPRING HANGERS

DISASSEMBLY

1. Place the vehicle on a level floor.
2. Chock the front wheels.
3. If necessary, remove the wheel assemblies per the vehicle manufacturer's instructions to allow additional access to service the front spring hanger.
4. Raise the frame and support with safety stands to remove the load from the suspension.
5. Remove and discard the rebound roller fasteners
6. Remove the rebound roller from the hanger, see Figure 8-14.
7. Remove and discard the longitudinal torque rod fasteners that connect the to spring hanger. It is not necessary to remove the spring seat torque rod fasteners.

FIGURE 8-14



SERVICE HINT

Prior to disassembly of the longitudinal torque rod fasteners, note the orientation and quantity of the torque rod shim(s). It is required that the longitudinal torque rod shims be installed in the same orientation and location as removed to preserve the existing alignment.

8. Remove the torque rod alignment shim(s).
9. Remove and discard the front spring hanger to frame fasteners per vehicle manufacturer's instructions.
10. Remove the front spring hanger.

ASSEMBLY

1. Position the front spring hanger over the leaf spring assembly.
2. Install the front spring hanger to frame fasteners and tighten to torque per the vehicle manufacturer's instructions.
3. Lower the frame and remove safety stands.
4. Install the longitudinal torque rod on the forward face of the spring hanger legs.

NOTE

It is required that the longitudinal torque rod shims be installed in the same orientation and location as removed to preserve the existing alignment.

5. Install the new longitudinal torque rod mounting fasteners and any alignment shim(s) as per prior to removal.
6. Tighten the torque rod fasteners to 178 ± 27 foot pounds torque.
7. Install the rebound roller and fasteners in the spring hanger and tighten to 60 ± 10 foot pounds torque, see Figure 8-14.
8. Install the wheel assemblies if removed per the vehicle manufacturer's instructions.
9. Verify axle alignment, see Alignment & Adjustments section in this publication.
10. Remove wheel chocks.

SLIPPER PAD

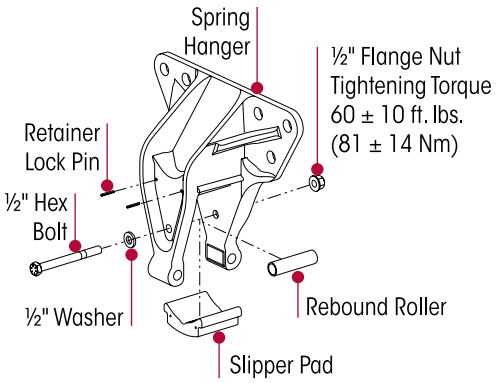
You will need:

- Blunt end ⅛" punch drive

DISASSEMBLY

1. Place the vehicle on a level floor.
2. Chock the wheels.
3. If necessary, remove the wheel assemblies per the vehicle manufacturer's instructions to allow additional access to service the slipper pad.
4. Remove and discard the rebound roller and fasteners.
5. Remove and discard lock pins with a blunt end ⅛" punch drive until the current lock pins pass through the hanger.

FIGURE 8-15



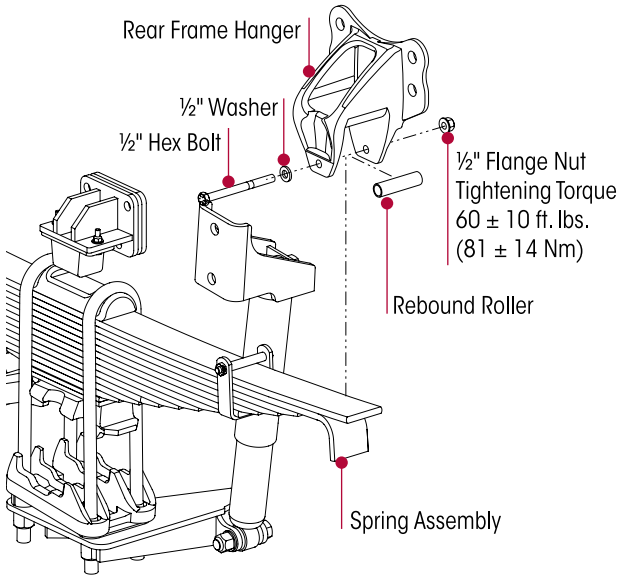
6. Raise and support the frame with safety stands to allow access to the slipper pad and to remove the load from the suspension.
7. Remove and discard slipper pad with a screwdriver.

ASSEMBLY

1. Insert the new slipper pad.
2. Lower the frame to secure the slipper pad in place between the front spring hanger and the leaf spring assembly.
3. Drive new retainer lock pins into place with punch until it is flush with front spring hanger, see Figure 8-15.
4. Install the rebound fasteners and rebound roller and tighten to 60 ± 10 foot pounds torque, see Figure 8-15.
5. Install the wheel assemblies if removed per the vehicle manufacturer's instructions.
6. Remove frame safety stands.
7. Remove the wheel chocks.

REAR SPRING HANGERS

FIGURE 8-16



DISASSEMBLY

1. Chock the wheels.
2. Remove the rebound fasteners and roller from the hanger, see Figure 8-16.
3. Remove the wheel assemblies per the vehicle manufacturer's instructions if necessary to allow additional access to service the rear spring hanger.
4. Raise and support the frame of the vehicle high enough to remove the load from the spring assembly.
5. Support the frame with safety stands.
6. Remove the rear spring hanger to frame fasteners per vehicle manufacturer's specifications.
7. Remove the rear spring hanger.

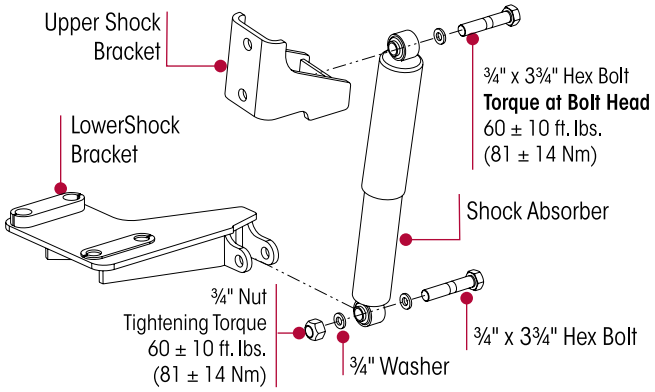
ASSEMBLY

1. Position the rear spring hanger over the leaf spring assembly, see Figure 8-16.
2. Install the frame fasteners in the rear spring hanger and tighten to the vehicle manufacturer's specifications.
3. Remove the frame safety stands and lower the frame.
4. Install the rebound roller and fasteners in spring hanger and tighten to 60 ± 10 foot pounds torque, see Figure 8-16.
5. Remove wheel chocks.

SHOCK ABSORBER

NOTE It is not necessary to replace shock absorbers in pairs if only one (1) shock absorber requires replacement.

FIGURE 8-17



DISASSEMBLY

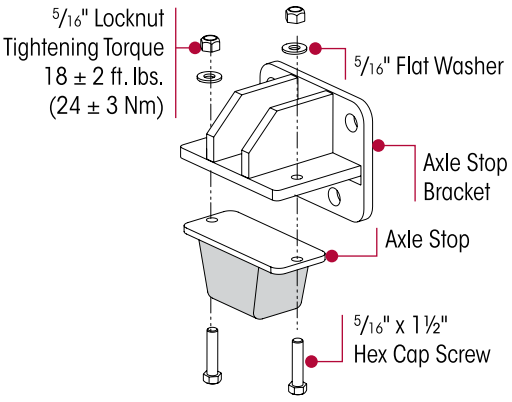
1. Chock the wheels of the vehicle.
2. Remove and discard the lower shock absorber mounting fasteners, see Figure 8-17.
3. Remove and discard the upper shock absorber mounting fasteners, see Figure 8-17.
4. Slide the shock absorber out of the upper and lower mounting brackets.
5. Inspect the shock absorber mounting brackets and fasteners for damage or wear. Replace if necessary.

ASSEMBLY

1. Slide the lower shock absorber mount into the lower shock bracket and install lower fasteners.
2. Tighten the upper shock absorber fasteners at the bolt head to 60 ± 10 foot pounds torque, see Figure 8-17.
3. Tighten the lower shock absorber fasteners to 60 ± 10 foot pounds torque, see Figure 8-17.
4. Remove the wheel chocks.

AXLE STOP

FIGURE 8-18



DISASSEMBLY

1. Chock the wheels.
2. Remove the axle stop assembly fasteners from the frame.
3. Remove the axle stop and axle stop spacer, see Figure 8-18.
4. Remove the 5/16" fasteners that connect axle stop to the axle stop bracket.
5. Inspect for any damage or worn surfaces.

ASSEMBLY

1. Install the 5/16" fasteners that connect axle stop to the axle stop bracket.
2. Tighten the fasteners to 18 ± 2 foot pounds torque.
3. Install the axle stop assembly to the frame and tighten fasteners to vehicle manufacturer's torque specifications.
4. Remove the wheel chocks.

SECTION 9

Troubleshooting Guide

HTS 21K for Lion Bus

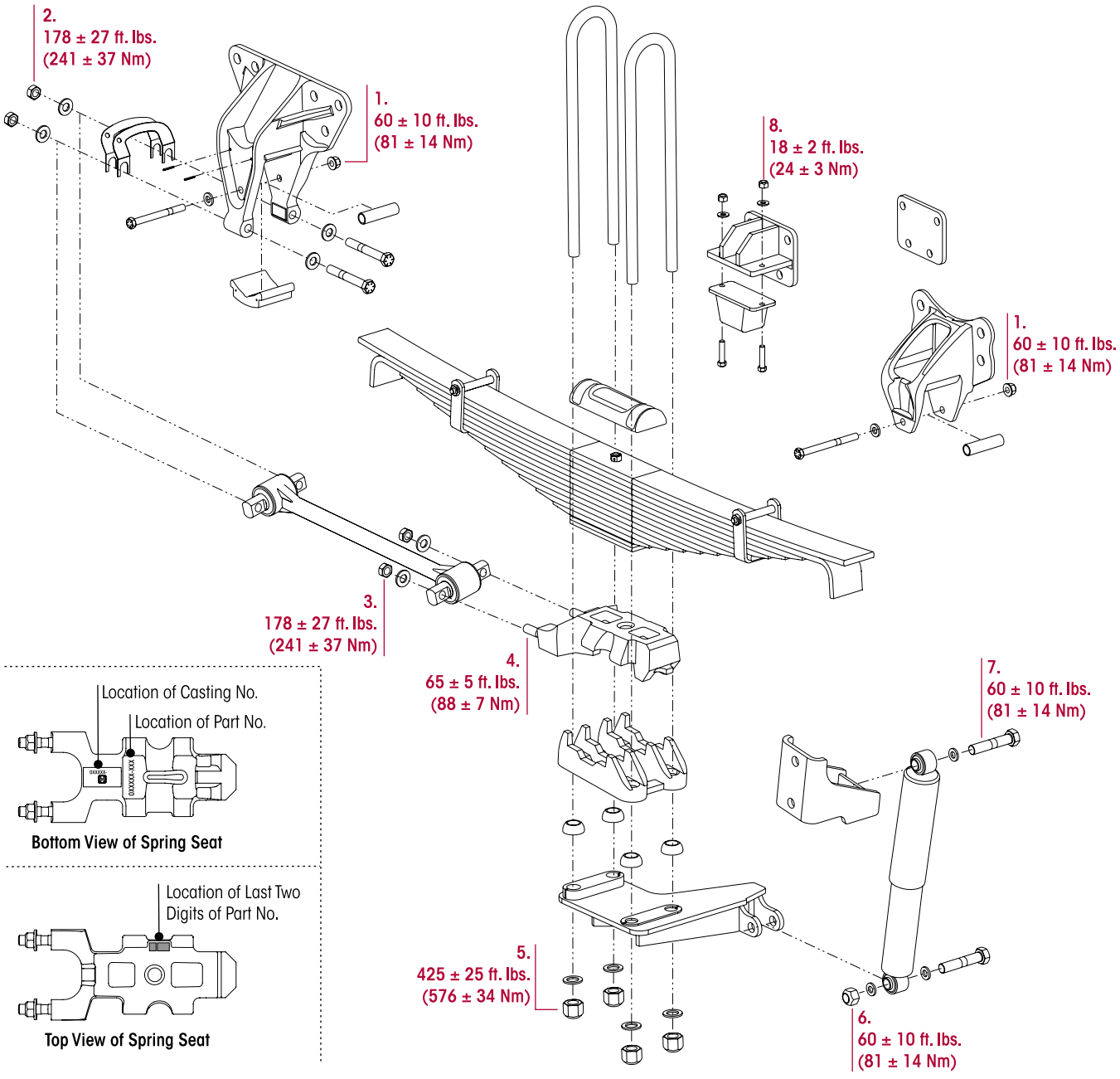
TROUBLESHOOTING GUIDE		
CONDITION	**POSSIBLE CAUSE**	**CORRECTION**
Suspension has harsh or bumpy ride	Suspension is overloaded	Redistribute the load to correct weight.
	Damaged or leaking shock absorber	Replace the shock absorber.
Irregular tire wear	Incorrect tire inflation pressure	Correct the tire pressure per vehicle manufacturer and tire manufacturer specifications.
	Incorrect alignment	Adjust the alignment, see Alignment & Adjustments section.
	Worn torque rod bushings	Replace the torque rod bushings as necessary.
Excessive driveline vibration	Incorrect pinion angle(s)	Adjust the pinion angle(s), refer to the vehicle manufacturer for specifications.
Suspension is noisy	Loose U-bolts	Tighten the U-bolts to specifications, see the Preventive Maintenance section.
	Worn torque rod bushings	Replace torque rod bushings as necessary.
Vehicle leaning	Load not centered	Redistribute the load.
	Frame twisted	Straighten the frame per vehicle manufacturer's guidelines.
	Axle housing bent or broken	Replace the axle housing per the vehicle manufacturer's guidelines and align vehicle.
	Loose U-bolts	Tighten the U-bolts to specifications, see the Preventive Maintenance section.
	Front suspension	Inspect and repair the front suspension.
	Broken leaf in spring assembly	Replace the leaf spring assembly.
Vehicle bouncing excessively	Damaged or leaking shock absorbers	Replace the shock absorbers.
	Incorrect ride height or broken leaf in spring assembly	Replace the leaf spring assembly.
Excessive frame slope	Incorrect ride height or broken leaf in spring assembly	Replace the leaf spring assembly.
	Suspension overloaded	Redistribute the load or reduce the load to the correct weight.

SECTION 10

Torque Specifications

Hendrickson recommended torque values provided in Foot Pounds and in Newton Meters

HTS 21K for Lion Bus



HTS 21K for Lion Bus

HENDRICKSON RECOMMENDED TORQUE SPECIFICATIONS					
NO.	COMPONENT	QUANTITY	***SIZE	*TORQUE VALUE	
				FOOT POUNDS	NEWTON METERS
Frame fasteners are furnished and installed by the vehicle manufacturer. Vehicle manufacturer May use an equivalent HUCK fastener for frame mount.					
1	Rebound Roller Fastener	4	½"-11 UNC	60 ± 10	81 ± 14
2	Torque Rod Bar Pin to Spring hanger	4	⅝"-11 UNC	178 ± 27	241 ± 37
3	Torque Rod Bar Pin to Spring Seat	4	⅝"-11 UNC	178 ± 27	241 ± 37
4	Spring Seat Stud	4	⅝"-11 UNC	65 ± 5	88 ± 7
5	U-bolt Locknut	8	⅞"-14 UNF	**425 ± 25	576 ± 34
6	Shock Absorber to Lower Shock Absorber Bracket	2	¾"-10 UNC	60 ± 10	81 ± 14
7	Shock Absorber to Upper Shock Absorber Bracket (at the bolt head)	2	¾"-10 UNC	60 ± 10	81 ± 14
8	Axle Stop Locknut	4	5/16"-24 UNF	18 ± 2	24 ± 3

NOTE * Torque values listed above apply only if Hendrickson supplied fasteners are used. If non-hendrickson fasteners are used, follow the torque specification listed in vehicle manufacturer's service manual.

** **DO NOT** exceed torque on U-bolt locknuts.

*** All threads must be clean and lubricated with SAE 20 oil before assembly to obtain the correct relationship of torque and fastener tension.

NOTE After the initial break-in period (up to 1,000 miles) all bolts and nuts should be checked to ensure recommended tightening torque is maintained. To obtain the maximum service life from the suspension system, mounting fasteners should be checked at least once a year and tightened to the specified torque.

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

*Call Hendrickson at **1.866.755.5968** (toll-free) or **1.630.910.2800** for additional information.*

HENDRICKSON

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