

# **TECHNICAL PROCEDURE**

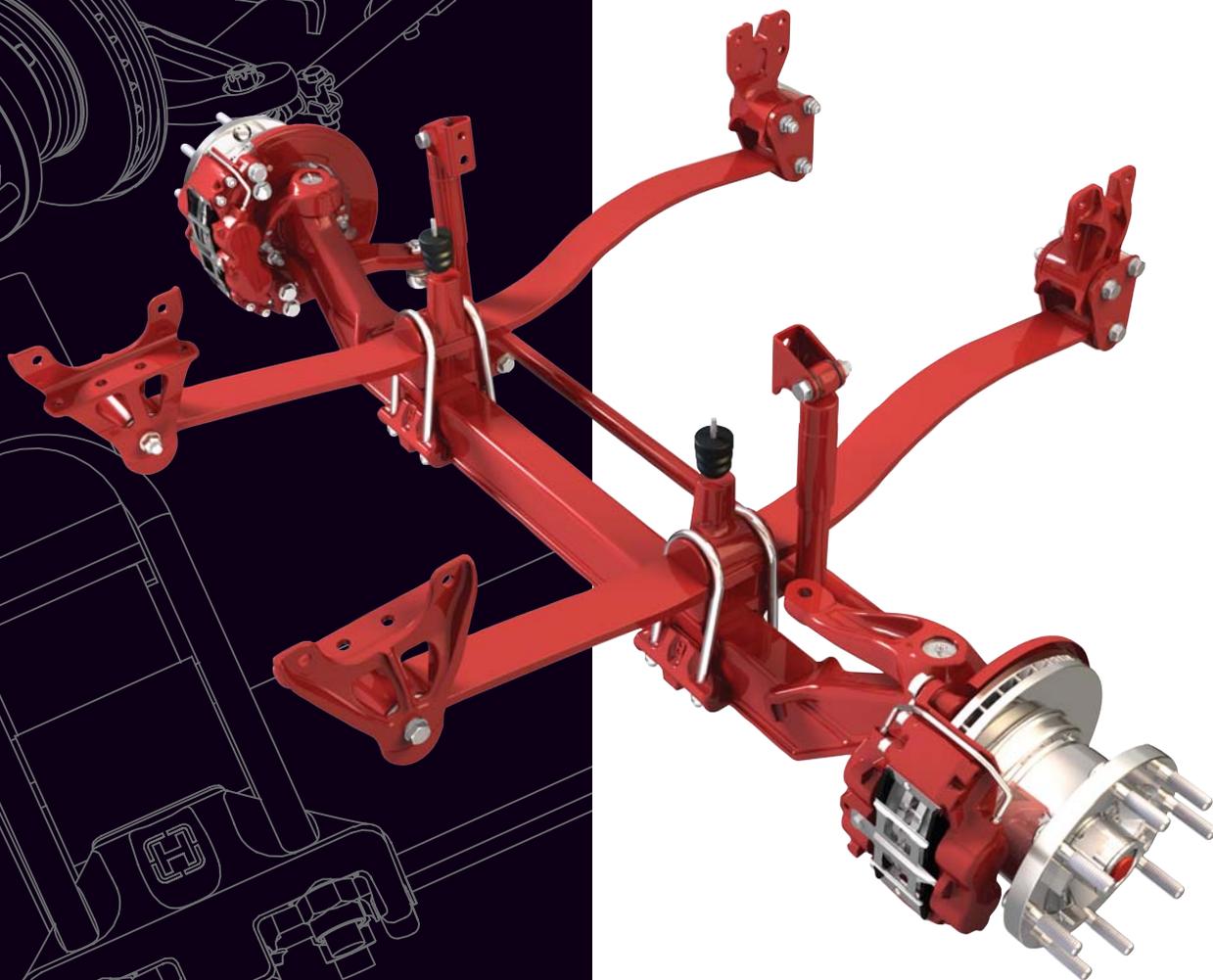
**SUBJECT:** SOFTEK® Service Instructions for  
Workhorse UFO Motorhome  
Chassis

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 **SOFTTEK®**



*For The Road Ahead™*

 **HENDRICKSON**





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 November 2007  
 Rev. B

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## SECTION 1

# Introduction

This publication is intended to acquaint and assist maintenance personnel in the preventive maintenance, service, repair, and rebuild for the following as installed on applicable Workhorse UFO Motorhome Chassis:

- **SOFTEK®** — Integrated steel spring mechanical suspension utilizing the STEERTEK axle.
- **STEERTEK** — A lightweight, formed and robotically welded steer axle assembly.
- See parts lists to determine the components that are manufactured by Hendrickson. For components not manufactured or supplied by Hendrickson contact the vehicle manufacturer for proper preventive maintenance and rebuild instructions.

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**NOTE**

Use only  Hendrickson Genuine parts for servicing this suspension system.

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

A Technical Procedure Quiz has been included at the back of this publication. Hendrickson will provide a personalized SOFTEK Technical Procedure Quiz Achievement Certificate to candidates scoring 80% or higher on the test. Simply complete the test and fill in the enclosed answer sheet or write your answers on a separate sheet with the return address, name, phone number, and company name as it will appear on the award and mail to:

Hendrickson  
ATTN: Truck Marketing Quiz Assessment  
800 S. Frontage Road  
Woodridge, Illinois 60517

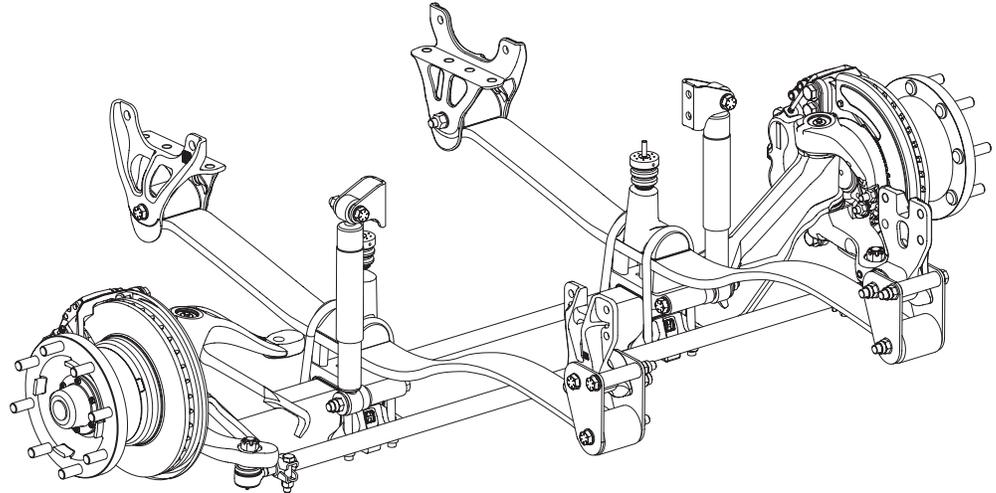
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**The latest revision of this publication is also available online at [www.hendrickson-intl.com](http://www.hendrickson-intl.com).**

## SECTION 2

# Product Description

**FIGURE 2-1 SOFTEK MECHANICAL SUSPENSION**  
SPRING: MONOLEAF; CAPACITY: 9,500 POUNDS; SUSPENSION WEIGHT: 240 POUNDS.



**Leaf spring assembly** — With its innovative design, the leaf spring provides superior stability, performance and a soft ride. Durable composite front and patented rear bushings are greaseless and only require periodic inspections.

**Shock absorbers** — SOFTEK utilizes premium shocks that have been tested and tuned specifically for the UFO Motorhome Chassis system.

**Front and rear frame brackets** — Optimized designs deliver weight reduction and proven durability.

**Axle beam** — The box-shaped design provides a stiffer axle and resists torsional, longitudinal and vertical loads more effectively than traditional axle beams. Together with the front limbs of the leaf springs, the robotically welded axle beam forms a torsion system, enhancing roll stability characteristics and improving handling.

**Axle clamp group** — The axle-friendly clamp group provides four-sided clamping pressure. The Clamp Group consists of the following:

- Top axle wrap
- Top axle wrap liner
- Top pad
- Bottom axle wrap
- Bottom axle wrap liner
- ¾" U-bolts, washers and nylon locknuts

**Adjustable tie rod** — To help maximize tire life, the tie rod easily adjusts for toe-in/out.

**Steering knuckles** — The steering and tie rod arms are integrated for increased strength and reduced weight. The unique steering knuckle packaging delivers a maximum of up to 55° wheel cut. The two piece knuckle design makes replacing the kingpin bushings easier by eliminating the need to remove the kingpins.

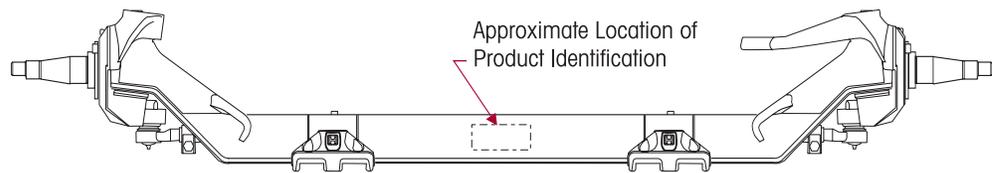
**Hub and rotor assembly** — SOFTEK hub and rotor assembly provides consistent performance and durability.

## TECHNICAL NOTES

1. SOFTEK is approved for 100% on-highway uses; other applications must be pre-approved by Hendrickson Sales Engineering. This system has a 9,500 pound capacity. System capacity represents maximum loads on tires at ground level.
2. The STEERTEK axle has a 71.0" Kingpin Intersection (KPI).
3. The STEERTEK axle is a 5.36" axle beam drop height. Axle beam drop is measured from the kingpin intersection to the top of the axle.
4. SOFTEK suspension weight includes frame hangers, main springs, bushings, shocks, upper shock brackets and axle attachment hardware.
5. SOFTEK is integral to and available exclusively with the STEERTEK axle. This system is anti-lock braking system (ABS) ready. STEERTEK is compatible with most industry standard wheel ends and brakes, contact the vehicle or chassis and body manufacturer for more information.
6. The STEERTEK axle product identification is etched on the center front of the axle beam providing the following information:
  - Axle part number: Identifies the features of the axle beam.
  - Axle assembly number: Identifies the complete assembly, which includes the steering knuckles and bracket assemblies.

**FIGURE 2-2**

Front view of STEERTEK axle showing approximate location of product identification.



**SECTION 3****Important Safety Notice**

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

All safety related information should be read carefully to help prevent personal injury and to assure that proper methods are used. Improper servicing 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 decal and that 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.



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



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



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 of this publication.

## SAFETY PRECAUTIONS

 **WARNING**

### FASTENERS

LOOSE OR OVER TORQUED FASTENERS CAN CAUSE COMPONENT DAMAGE, LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR SEVERE PERSONAL INJURY. MAINTAIN CORRECT TORQUE VALUE AT ALL TIMES. CHECK TORQUE VALUES ON A REGULAR BASIS AS SPECIFIED.

 **WARNING**

### LOAD CAPACITY

ADHERE TO THE PUBLISHED CAPACITY RATINGS FOR THE SUSPENSIONS. ADD-ON AXLE ATTACHMENTS AND OTHER LOAD TRANSFERRING DEVICES CAN INCREASE THE SUSPENSION LOAD ABOVE THE RATED AND APPROVED CAPACITIES WHICH COULD RESULT IN FAILURE AND LOSS OF VEHICLE CONTROL, POSSIBLY CAUSING PERSONAL INJURY OR PROPERTY DAMAGE.

 **WARNING**

### MODIFYING COMPONENTS

DO NOT MODIFY OR REWORK PARTS. DO NOT SUBSTITUTE PARTS OF THE SUSPENSION OR AXLE COMPONENTS, USE OF A MODIFIED OR REPLACEMENT PARTS NOT AUTHORIZED BY HENDRICKSON MAY NOT MEET HENDRICKSON'S SPECIFICATIONS, AND CAN RESULT IN FAILURE OF THE PART, LOSS OF VEHICLE CONTROL, AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE. USE ONLY HENDRICKSON AUTHORIZED REPLACEMENT PARTS DO NOT MODIFY PARTS WITHOUT AUTHORIZATION FROM HENDRICKSON.

 **WARNING**

### TORCH/WELDING

DO NOT USE A CUTTING TORCH TO REMOVE ANY ATTACHING 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 LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

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

 **CAUTION**

### PROCEDURES AND TOOLS

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 JEOPARDIZED BY THE METHOD OR TOOL SELECTED. INDIVIDUALS DEVIATING IN ANY MANNER FROM THE INSTRUCTIONS PROVIDED ASSUME ALL RISKS OF CONSEQUENTIAL PERSONAL INJURY OR DAMAGE TO EQUIPMENT INVOLVED.

 **WARNING**

### PERSONNEL PROTECTIVE EQUIPMENT

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



**WARNING**

**AXLE**

**AXLE CAMBER IS NOT ADJUSTABLE.** DO NOT CHANGE THE AXLE CAMBER ANGLE OR BEND THE AXLE BEAM. BENDING THE AXLE BEAM (SEE FIGURE 3-1) TO CHANGE THE CAMBER ANGLE WILL DAMAGE THE AXLE AND REDUCE AXLE STRENGTH, **AND WILL VOID HENDRICKSON'S WARRANTY.** A BENT AXLE BEAM CAN CAUSE LOSS OF VEHICLE CONTROL, POSSIBLY CAUSING PERSONAL INJURY OR PROPERTY DAMAGE.

**FIGURE 3-1**

REPLACE ANY SAFETY DECALS THAT ARE FADED, TORN, MISSING, ILLEGIBLE, OR OTHERWISE DAMAGED. CONTACT HENDRICKSON TO ORDER REPLACEMENT LABELS.



THE STEERTEK HAS A UNIQUE AXLE. THE KINGPIN IS CRYOGENICALLY INSTALLED IN THE AXLE. THE KINGPIN IS A NON-REPLACEABLE COMPONENT OF THE AXLE ASSEMBLY. DO NOT TRY TO REMOVE THE KINGPIN. IF THE KINGPIN SHOWS SIGNS OF MOVEMENT, CONTACT THE HENDRICKSON TECH SERVICE DEPARTMENT.

THE REPAIR OR RECONDITIONING OF SUSPENSION OR AXLE COMPONENTS IS NOT ALLOWED AS SHOWN ON LABEL IN FIGURE 3-1. HENDRICKSON ADVISES REPLACING ALL COMPONENTS FOUND TO BE DAMAGED OR OUT OF SPECIFICATIONS. ALL MAJOR HENDRICKSON COMPONENTS ARE HEAT TREATED AND TEMPERED. SOFTEK COMPONENTS CANNOT BE BENT, WELDED, HEATED, OR REPAIRED WITHOUT REDUCING THE STRENGTH OR LIFE OF THE COMPONENT. FAILURE TO FOLLOW THESE GUIDELINES CAN CAUSE LOSS OF VEHICLE CONTROL, POSSIBLE PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE AND WILL VOID APPLICABLE WARRANTIES.

IF A VEHICLE EQUIPPED WITH A STEERTEK AXLE IS INVOLVED IN A CRASH, A THOROUGH INSPECTION OF THE AXLE SHOULD BE PERFORMED NOTING THE CONDITION OF THE AXLE BEAM, KINGPINS, AND KNUCKLE ASSEMBLIES. IF ANY COMPONENT APPEARS DAMAGED THE AXLE SHOULD BE REPLACED. IN THE EVENT THE CRASH RESULTED IN EXCESSIVE SIDE LOAD SUCH AS A BENT WHEEL, HUB, OR SPINDLE, IT IS STRONGLY RECOMMENDED TO REPLACE THE COMPLETE AXLE ASSEMBLY, CONTACT HENDRICKSON TECHNICAL SERVICES WITH ANY QUESTIONS. FAILURE TO REPLACE ANY DAMAGED COMPONENTS CAN CAUSE LOSS OF VEHICLE CONTROL, POSSIBLE PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE AND WILL VOID APPLICABLE WARRANTIES.

**WARNING**

**SUPPORT THE VEHICLE PRIOR TO SERVICING**

PLACE THE VEHICLE ON A LEVEL FLOOR AND CHOCK THE WHEELS TO HELP PREVENT THE VEHICLE FROM MOVING. SUPPORT A RAISED VEHICLE WITH SAFETY STANDS. DO NOT WORK UNDER A RAISED VEHICLE SUPPORTED ONLY BY A FLOOR JACK. A JACK CAN SLIP OR FALL OVER. SERIOUS PERSONAL INJURY CAN RESULT.

 **WARNING****OFF ROADWAY TOWING**

WHEN A VEHICLE IS DISABLED AND EQUIPPED WITH A STEERTEK AXLE, CARE MUST BE TAKEN TO ENSURE THERE IS NO DAMAGE TO THE SUSPENSION WHEN TOWING THE VEHICLE. THE USE OF A TOW STRAP IS NECESSARY TO TOW A DISABLED VEHICLE INTO A REPAIR FACILITY. A TOW STRAP MAY BE WRAPPED AROUND THE FRONT AXLE (SEE FIGURE 3-2) IN A MANNER THAT IS ACCEPTABLE FOR TOWING THE VEHICLE INTO THE SHOP. DO NOT USE A TOW CHAIN AROUND THE FRONT AXLE OR WITH A SINGLE POINT LOCATION TO TOW THE VEHICLE, DOING SO WILL DAMAGE THE AXLE. SEE FIGURE 3-3. FOR DETAILED TOWING INSTRUCTIONS FOR ON-HIGHWAY TOWING SEE SECTION 6.

**FIGURE 3-2 ACCEPTABLE****FIGURE 3-3 NOT ACCEPTABLE** **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.

 **WARNING****CALIPER, HUB ASSEMBLY AND BRAKE TORQUE PLATE**

PLACE THE VEHICLE ON A LEVEL FLOOR AND CHOCK THE WHEELS TO HELP PREVENT THE VEHICLE FROM MOVING. ALWAYS SUPPORT A RAISED VEHICLE WITH SAFETY STANDS. DO NOT WORK UNDER A RAISED VEHICLE SUPPORTED ONLY BY A FLOOR JACK. A JACK CAN SLIP OR FALL OVER. ALWAYS WEAR EYE PROTECTION. FAILURE TO DO SO CAN CAUSE POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.



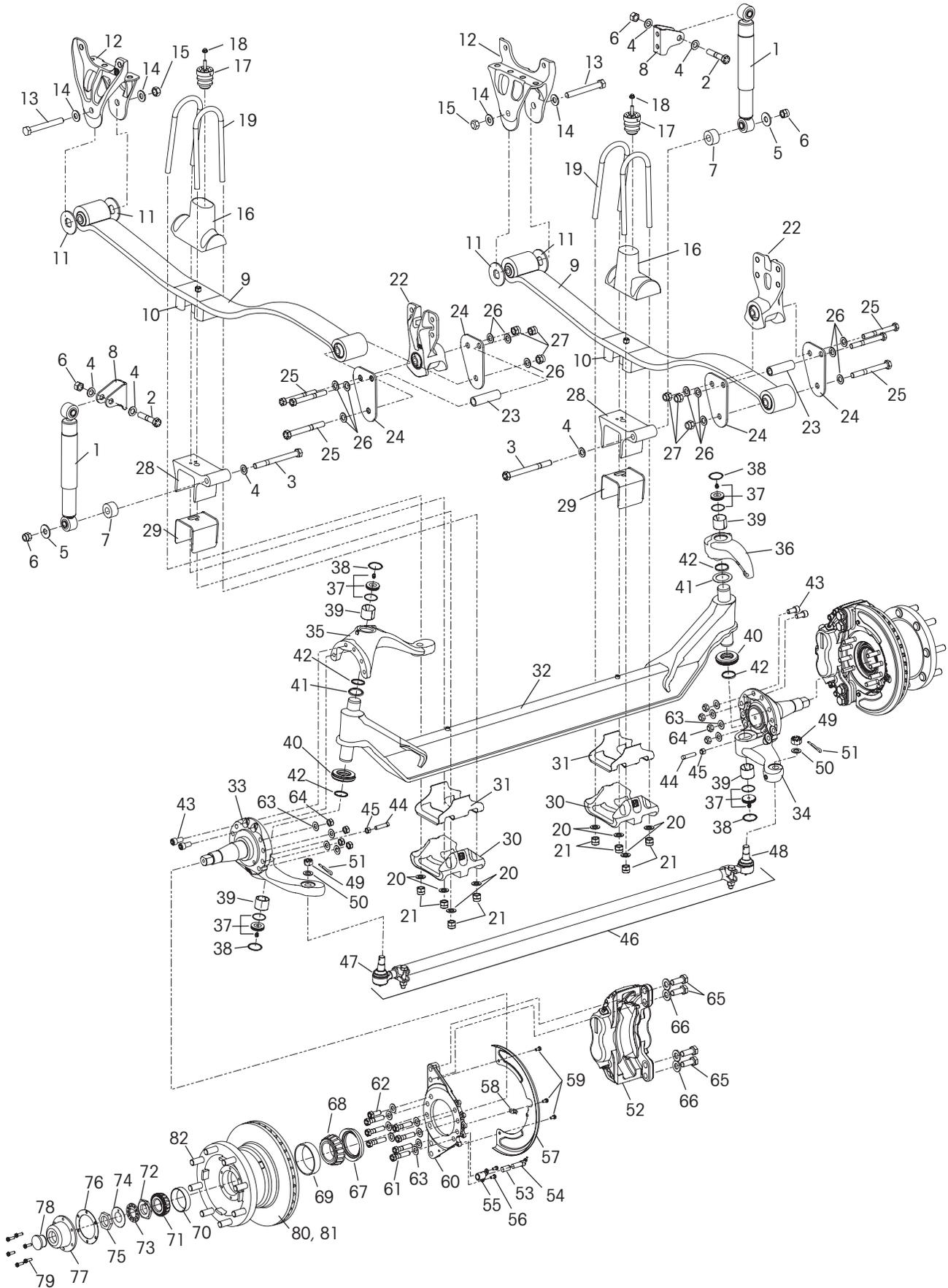
## WARNING

### SHOCK ABSORBERS

THE SHOCK ABSORBERS ARE THE REBOUND TRAVEL STOPS FOR THE LEAF SPRINGS. ANYTIME THE FRONT AXLE ON SOFTEK SUSPENSION IS SUSPENDED IT IS MANDATORY THAT THE SHOCK ABSORBERS REMAIN CONNECTED. FAILURE TO DO SO COULD CAUSE A REVERSE ARCH IN THE STEEL LEAF SPRINGS, POSSIBLY RESULTING IN PREMATURE STEEL LEAF SPRING FAILURE.

THE OUTBOARD SHOCK RETAINING WASHER MUST BE USED ON THE OUTBOARD SIDE OF THE LOWER SHOCK BUSHING. AND MUST NOT SUBSTITUTED WITH A REGULAR WASHER. FAILURE TO USE THE PROPER WASHER CAN CAUSE PREMATURE COMPONENT FAILURE WHICH CAN CAUSE A REVERSE ARCH IN THE STEEL LEAF SPRINGS, POSSIBLY RESULTING IN PREMATURE STEEL LEAF SPRING FAILURE.

# SECTION 4 Parts List





KEY NO.	PART NO.	DESCRIPTION	NO.REQ.
	60961-148	<b>Shock Absorber Service Kit</b> , One Wheel End (Includes Key Nos. 1-7)	
1	66153-002	Shock Absorber	2
2	21867-017	¾"-16 UNF Upper Shock Bolt - 4.0"	2
3	21867-005	¾"-16 UNF Lower Shock Bolt - 8.25"	2
4	22962-001	¾" Flat Washer	6
5	59946-004	Shock Retaining Washer	2
6	17700-035	¾"-16 UNF Locknut	4
7	59946-003	Shock Spacer	2
8	66589-001	Shock Bracket	2
9	66441-002	Leaf Spring Assembly, (Includes Spring Eye Bushing and Z Spacer)	2
10		**Z Spacer (Attached to leaf spring)	2
11	67493-000	Thrust Washer - Front Hanger (Replaces 65869-000)	4
12	66297-000	Front Hanger	2
13	21867-006	¾"-16 UNF Bolt - 7.0" (Replaces 58917-009)	2
14	22962-001	¾" Flat Washer	4
15	17700-035	¾"-16 UNF Nylocknut (Replaces 17700-033)	2
16	65925-000	Top Pad / Axle Stop	2
17	66308-001	Auxiliary Bumper	2
18		*M10 x 1.5 Flanged Locknut	2
	60961-151	<b>U-bolt Axle Clamp Kit</b> , One Side (Includes Key Nos. 19-21)	
19	64804-115	¾"-16 UNF U-bolt	4
20	22962-001	¾" Flat Washer	8
21	17700-035	¾"-16 UNF Nylocknut	8
		Rear Shackle Bracket Assembly (Includes Key Nos. 22-27)	
	66511-001	LH	1
	66511-002	RH	1
22	66510-001	Rear Shackle Bracket/Bushing Assembly	2
23	60631-002	Spacer Shackle Stop	2
24	66413-000	Rear Shackle Plate	4
25	58917-021	¾"-10 UNC Bolt - 6.5"	6
26	22962-001	¾" Flat Washer	12
27	17700-033	¾"-10 UNC Nylocknut	6
	64502-043	Axle Wheel End Brake Assembly (Includes Key Nos. 28-78)	1
	63252-521	STEERTEK Axle Assembly (Includes Key Nos. 28-51)	1
	64628-003	<b>Axle Wrap and Liner Service Kit</b> , Axle Set (Includes Key Nos. 28-31)	
28	59952-018	Top Axle Wrap	2
29	60508-000	Top Axle Wrap Liner	2
30	64723-002	Bottom Axle Wrap	2
31	59845-000	Bottom Axle Wrap Liner	2
32	64905-003	Axle & Kingpin Assembly	1
33	58900-061	LH Lower Steering Knuckle Assembly	1
34	58900-062	RH Lower Steering Knuckle Assembly	1
35	60903-052	LH Upper Steering Knuckle Assembly	1
36	60904-002	RH Upper Steering Knuckle Assembly	1
	60961-039	<b>Kingpin Bushing w/Roller Thrust Bearing Service Kit</b> , One Wheel End (Includes Key Nos. 37-43 and Loctite)	
37	59156-000	Grease Cap Assembly	4
38	58937-000	Retaining Ring	4
39	58909-000	Kingpin Bushing	4
	60961-042	<b>Roller Thrust Bearing Service Kit</b> , One Wheel End (Includes Key Nos. 40-43 and Loctite)	
40	64256-000	Thrust Bearing - Roller	2
41	60259-002	Kingpin Shim 0.047"	2
Not Shown	60259-001	Kingpin Shim 0.005" (As Needed for Service)	
42	58910-000	Kingpin Seal	4
43	60236-001	5/8"-11 UNC Socket Head Cap Screw	4
Not Shown	60937-000	Loctite® (Red) Compound Tube	1

KEY NO.	PART NO.	DESCRIPTION	NO.REQ.
	60961-069	<b>Stop Bolt Service Kit</b> , One Wheel End (Includes Key Nos. 44-45)	
44	60238-001	½"-13 UNC Square Head Bolt	2
45	60240-000	½"-13 UNC Jam Nut	2
46	60239-008	***Tie Rod Assembly (Includes Key Nos. 47-51)	1
	60961-010	*** <b>Tie Rod End Service Kit</b> , Axle Set (Includes Kit Nos. 60961-025 & -026)	
	60961-025	*** <b>LH Tie Rod End Service Kit</b> (Includes Key Nos. 47, 49-51)	1
	60961-026	*** <b>RH Tie Rod End Service Kit</b> (Includes Key Nos. 48-51)	1
47	64000-001	***LH Tie Rod End	1
48	64000-002	***RH Tie Rod End	1
49		**7/8" Castle Nut (Included in Tie Rod Assembly)	2
50	22962-007	7/8" Hardened Washer	2
51	17800-004	Cotter Pin	2
52		*Caliper Assembly	2
53		*ABS Sensor Clip	2
54		*ABS Sensor	2
55		*ABS Bracket	2
56	18160-012	5/16"-18 UNC Bolt - 0.5" (ABS Bracket)	4
57		*Dust Shield	2
58		*Dust Shield Clip	2
59	64201-001	M8 x 1.25"-6G Cap Screw (Dust Shield)	6
60		*Torque Plate	2
	64625-011	<b>Brake Fastener Kit</b> , One Wheel End (Includes Key Nos. 61-66)	
61	32043-002	5/8"-11 UNC Hex Bolt - 2.75" (Torque Plate)	14
62	32043-021	5/8"-11 UNC Hex Bolt - 1.5" (Torque Plate)	2
63	22962-036	5/8" Hardened Washer (Torque Plate)	24
64	47764-000	5/8"-11 UNC Locknut (Torque Plate)	8
65	58258-017	M20 x 2.5"-6G Hex Bolt (Caliper)	8
66	58246-009	M20 Hardened Washer (Caliper)	8
	64626-008	<b>Front Bearing Wheel End Service Kit</b> One Wheel End (Includes Key Nos. 67-76)	
67	64531-000	Wheel Seal	2
68	64529-000	Inner Bearing Cone	2
69	66810-001	Inner Bearing Cup	2
70	66811-001	Outer Bearing Cup	2
71	64530-000	Outer Bearing Cone	2
72	64671-000	1½"-12 UNF Adj. Inner Nut	2
73	64672-000	1½"-12 UNF Pierced Lock Ring	2
74	64673-000	1½" Lock Washer	2
75	64674-000	1½"-12 UNF Outer Nut	2
76	64546-000	Hubcap Gasket	2
77	64532-000	Hubcap Assembly (Includes Key No. 78)	2
78		** Rubber Plug	
79	64545-002	5/16"-18 UNC Bolt - 0.75", for Hubcap (Replaces 64545-001)	12
80	66352-001	Hub & Rotor Assembly Steel Hub 15.38 x 1.54 Rotor	2
	60961-152	<b>Hub Service Kit</b> , One Wheel End (Includes Key Nos. 69-70, 81-82)	
81	67086-000	Hub	2
82	66812-000	Wheel Stud M22 x 1.25"	16

**NOTE:**

\* Not supplied by Hendrickson, used for reference only. Refer to vehicle manufacturer for more information.  
Hendrickson is not responsible for components supplied by vehicle manufacturer. For assistance with maintenance and rebuild instructions on these components see vehicle manufacturer.

\*\* Item included in assembly only, part not sold separately.

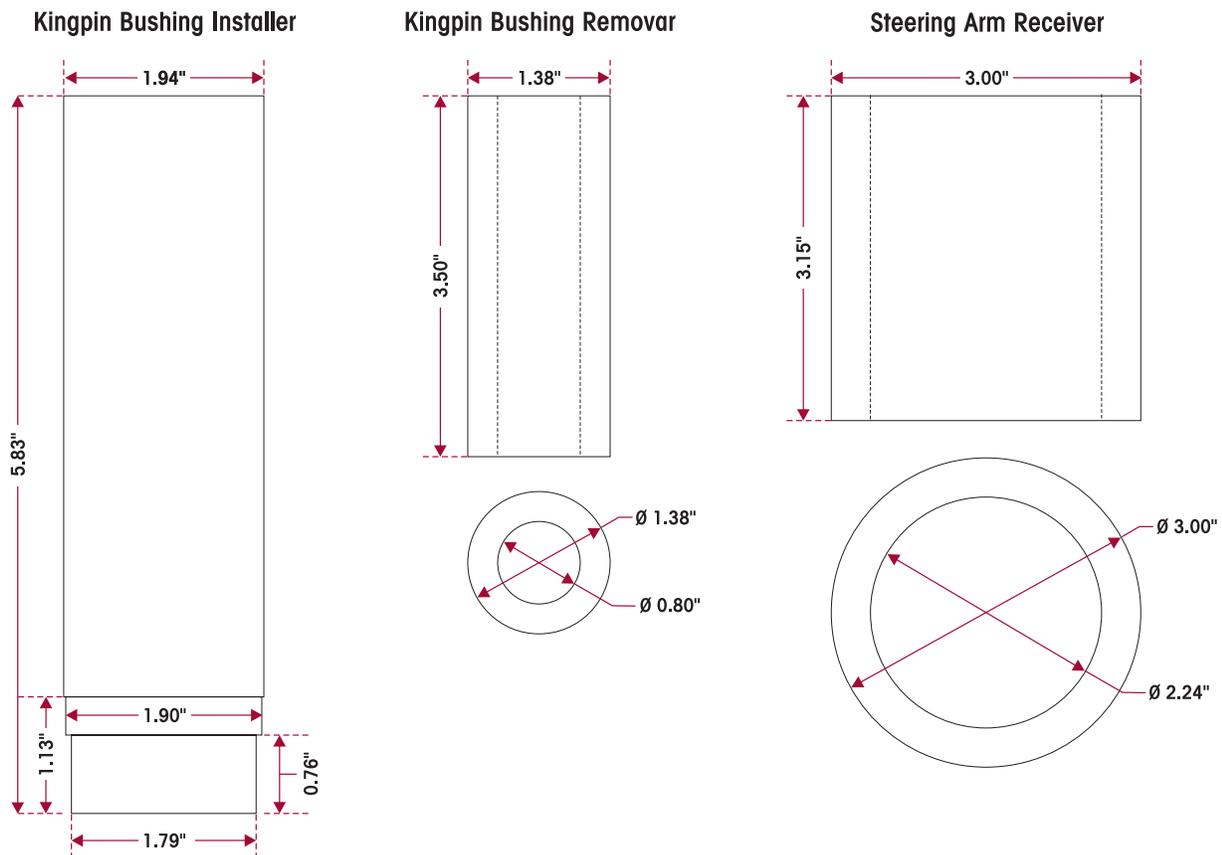
\*\*\* The tie rod assembly is designed for use on a mechanical suspension with hydraulic brakes, it is not designed for vehicles with air brakes.

## SECTION 5

# Special Tools

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

### KINGPIN BUSHING TOOLS



### ADJUSTABLE STRAIGHT FLUTE REAMER

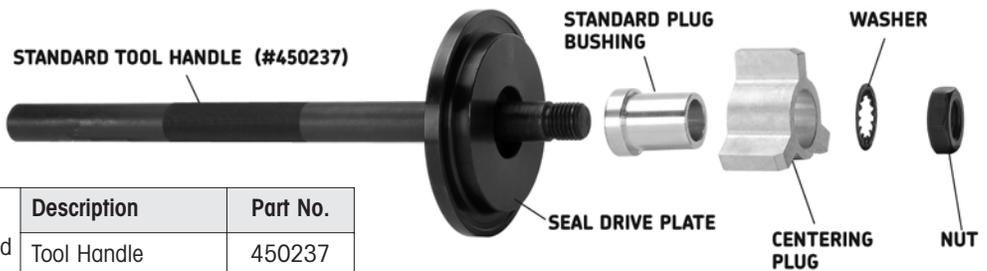
The dimension of cutting diameter must facilitate a range of 1.802" – 1.812"



## HUB WHEEL SEAL TOOLS

**FIGURE 5-5**
**Hub Wheel Seal Removal Tool**
**SKF SRT-1**

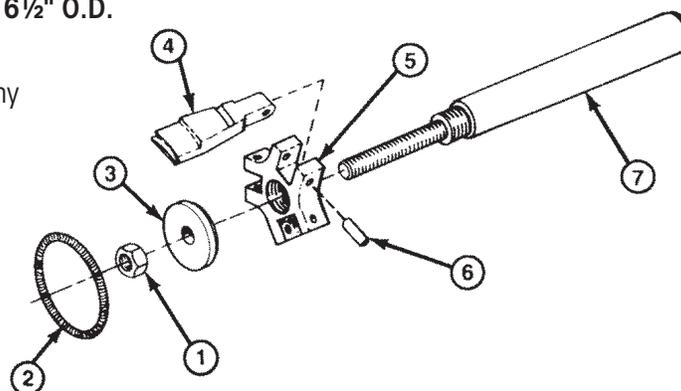
To order contact your local distributor or call SKF customer service 1-800-882-0008 for a local distributor in your area.


**FIGURE 5-6**
**Hub Wheel Seal Installation Tool**
**SKF Scotseal® Classic / Scotseal® Longlife**


The seal drive plates and centering plug that fit on the end of the tool handle come in different sizes. Refer to these part nos. while ordering.	Description	Part No.
	Tool Handle	450237
	Seal Drive Plate	436
	Centering Plug	706

**FIGURE 5-7**
**Bearing Cup Installation Tool**
**OTC Tool No. 7180**
**Capacity: 3<sup>5</sup>/<sub>8</sub>" O.D. – 6<sup>1</sup>/<sub>2</sub>" O.D.**

To order contact OTC,  
Owatanna Tool Company  
800-533-6127  
www.otctools.com



No.	Description
1	Hex Nut (5/8"-18)
2	Extension Spring
3	Expander
4	Jaw
5	3 way Head
6	Pin
7	Handle

## SECTION 6

# On Highway and On Roadway Recommended Towing Procedure

Hendrickson recommends that a vehicle equipped with a STEERTEK axle be towed by the following methods (listed in order of preference) for ON HIGHWAY or ON ROADWAY applications.

1. Wheel lift method, the ideal towing procedure
2. Conventional axle fork method

Please read, understand and comply with any additional towing instructions and safety precautions that may be provided by the vehicle manufacturer.

Hendrickson will not be responsible for any damage to the axle, suspension or other vehicle components resulting from any towing method or fixture not authorized by Hendrickson.

Please contact Hendrickson Tech Services at 630.910.2800 or send email to: [techservices@hendrickson-intl.com](mailto:techservices@hendrickson-intl.com) with any questions regarding proper towing procedures for motorhomes equipped with a STEERTEK axle.

## WHEEL LIFT METHOD—IDEAL

This method provides the greatest ease for towing the vehicle. Lifting at the tires helps reduce the risk of possible damage to the axle, suspension, and engine components during towing operations, see Figure 6-1.

It may be necessary to raise the vehicle and place a block of wood under the tires to provide adequate clearance below the axle to locate the wheel lift equipment for towing, see Figure 6-2.

**FIGURES 6-1** WHEEL LIFT METHOD



**FIGURE 6-2** BLOCK UNDER TIRES



## AXLE FORK LIFT METHOD

This is an alternative method for towing the vehicle, but requires standard 5" forks, (see Figures 6-3 and 6-4) and designated lift points between the two axle clamp groups. The following procedure must be used:

- Place a spacer on the boom, to provide adequate clearance between the oil pan and the boom, if necessary. Lift the vehicle in order to place spacer under tires. This will provide sufficient room under the axle to locate forks in the proper position.
- Install the fork in the boom properly.
- Position the tow forks directly under the axle, between the two axle clamp groups as shown in Figure 6-3.

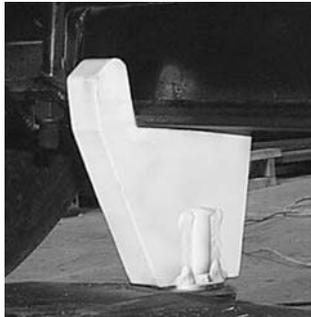
### FIGURES 6-3 AND 6-4

Proper tow fork location on inside clamp group on the STEERTEK Axle

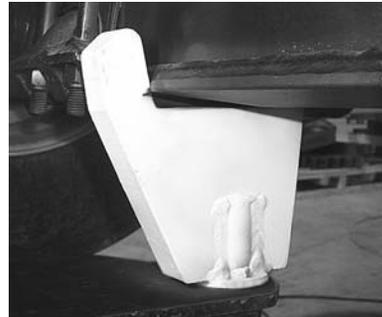


- Prior to lifting the vehicle, ensure that the bottom axle plate is flat in the tow fork to minimize any gap between the bottom axle plate and the tow fork. See Figure 6-5 and 6-6.

**FIGURE 6-5 – WITHOUT GAP**



**FIGURE 6-6 – WITH GAP**



### NOTE

When lifting a vehicle with an under lift boom, care must be taken not to damage the engine's oil pan. Vehicles equipped with a front fairing may require removal of the front fairing prior to towing to prevent component damage.

- Lift vehicle and secure the vehicle to the boom.
- Install safety straps, it is preferred to use nylon safety straps. Chains have a tendency to bind and may cause damage to the axle.

## OFF ROADWAY TOWING METHOD

WHEN A VEHICLE IS DISABLED AND EQUIPPED WITH A STEERTEK AXLE, CARE MUST BE TAKEN TO ENSURE THERE IS NO DAMAGE TO THE SUSPENSION OR AXLE WHEN TOWING THE VEHICLE. THE USE OF A TOW STRAP IS NECESSARY TO TOW A DISABLED VEHICLE INTO A REPAIR FACILITY. A TOW STRAP MAY BE WRAPPED AROUND THE FRONT AXLE (SEE FIGURE 6-7) IN A MANNER THAT IS ACCEPTABLE FOR TOWING THE VEHICLE INTO THE SHOP. DO NOT USE A TOW CHAIN AROUND THE FRONT AXLE TO TOW THE VEHICLE, DOING SO WILL DAMAGE THE AXLE AND VOID WARRANTY. SEE FIGURE 6-8.

**THE FOLLOWING METHODS ARE NOT RECOMMENDED FOR ON HIGHWAY OR ON ROADWAY TOWING**

**FIGURE 6-7**  
NYLON STRAPS ARE  
**ACCEPTABLE** FOR  
OFF ROADWAY TOWING



**FIGURE 6-8**  
CHAINS ARE  
**NOT ACCEPTABLE** FOR  
OFF ROADWAY TOWING



## SECTION 7

# Preventive Maintenance

The SOFTEK® is low maintenance suspension. However following appropriate inspection procedure is important to help ensure the proper maintenance and operation of the SOFTEK suspension system and component parts function to their highest efficiency. Look for bent or cracked parts. Replace all worn or damaged parts.

## HENDRICKSON RECOMMENDED PREVENTIVE MAINTENANCE INTERVALS

- The first 1,000 miles (for clamp group re-torque only)
- Every 10,000 miles or six months, whichever comes first.

## COMPONENT INSPECTION

- **Auxiliary bumper** — Inspect for cracks or missing auxiliary bumper. Check fasteners for proper torque. Replace if necessary, see Component Replacement Section of this publication for replacement procedure.
- **Clamp group** — Check torque on clamp group mounting hardware. Refer to Torque Specifications in the appendix.
- **Fasteners** — Look for any loose or damaged fasteners on the entire suspension. Make sure all fasteners are tightened to the specified torque. Refer to  Torque Specifications in the appendix. Use a calibrated torque wrench to check torque in a tightening direction. As soon as the fastener starts to move, record the torque. Correct the torque if necessary. Replace any worn or damaged fasteners.
- **Front and rear spring hangers** — Check for cracks or loose mounting hardware. Replace if necessary, see the Component Replacement Section of this publication for replacement procedure.
- **Hub** — Visually inspect the hubcap and any signs of leakage and proper fluid level. Visually inspect the wheel seal for any signs of leakage. Replace if necessary, see Component Replacement Section of this publication for replacement procedure.
- **Operation** — All steering components must move freely through the full range of motion from axle stop to axle stop.
- **Shock absorber** — Look for any signs of dents or leakage, misting is not considered a leak. See Shock Absorber Inspection in this section.
- **Steel leaf spring** — Look for cracks. Replace if cracked or broken. Check the front and rear bushing for any wear or deterioration. Replace if necessary, see the Component Replacement Section of this publication for replacement procedure.
- **Steering pivot points** — Check for looseness at all pivot points. Inspect and lubricate all pivot points. Refer to the Troubleshooting Guide Section in the Appendix of this publication.
- **STEERTEK Axle** — The axle should be free of any nicks or gouges. Inspect for any cracks or dents on axle.
- **Thrust washers** — Look for any signs of excessive wear to the thrust washers. See Front Thrust Washer Inspection detailed in this section.
- **Tire wear** — Inspect tires for wear patterns that may indicate suspension damage or misalignment. See Tire Inspection in this section.
- **Top and bottom axle wrap liners** — Look for any cracking or broken pieces on liner in load bearing areas. See Axle Wrap Liner Inspection in this section.



- **Wear and damage** — Inspect all parts of suspension for wear and damage. Look for bent or cracked parts. Replace all worn or damaged parts.
- **Wheel bearing** — Verify wheel bearing end play is within specification, see Wheel Bearing Inspection in this section.

See vehicle manufacturer’s applicable publications for other preventative maintenance requirements.

### LUBRICATION INTERVALS

For vehicles equipped with the STEERTEK axle, regular lubrication intervals should be followed to help prevent premature wear to the kingpin bushings and tie rod ends. See lubrication chart below.

**NOTE** The recommended specification for lubrication interval is a guideline, the vehicle may require increased lubrication interval depending on severity of operation.

STEERTEK GREASING AND LUBRICATION SPECIFICATIONS				
Component	Greasing Interval	Grease	NLGI Grade	Outside Temperature
Kingpin Bushings	3,000 miles or 90 days whichever comes first	Multipurpose Grease	2	Refer to the lubricant manufacturer’s specifications for the temperature service limits applicable to your area.
Tie Rod Ends				
Drag Link	See Vehicle Manufacturer			
Front Wheel Bearing	15,000 Miles	SAE 90W GL-5	2	Refer to the lubricant manufacturer’s specifications for the temperature service limits applicable to your area.
<b>NOTE:</b> Lubrication greases acceptable for use on the STEERTEK axle will carry a designation of NLGI #2 EP and rated GC-LB or equivalent.				

### KINGPIN LUBRICATION

On the Hendrickson STEERTEK front axle the kingpin grease fittings are located on the top and bottom of the kingpin grease caps.

1. Place vehicle on the ground.
2. Prior to greasing the kingpins on the vehicle, the suspension must be in a loaded condition.
3. Clean off all the grease fittings and grease gun tip with a clean shop towel prior to lubrication.
4. Lubricate the kingpins through the grease fittings on the top and bottom of the steering knuckle, see Lubrication Specification chart above.
5. Force the required lubricant into the upper and lower kingpin grease fittings, until new lubricant flows from the upper axle beam and knuckle and the thrust bearing purge location, See Figure 7-1.

**FIGURE 7-1**



**NOTE** Greasing at the lower zerk should purge grease from the thrust bearing shell.

## TIE ROD END LUBRICATION

### LUBRICATION PROCEDURE

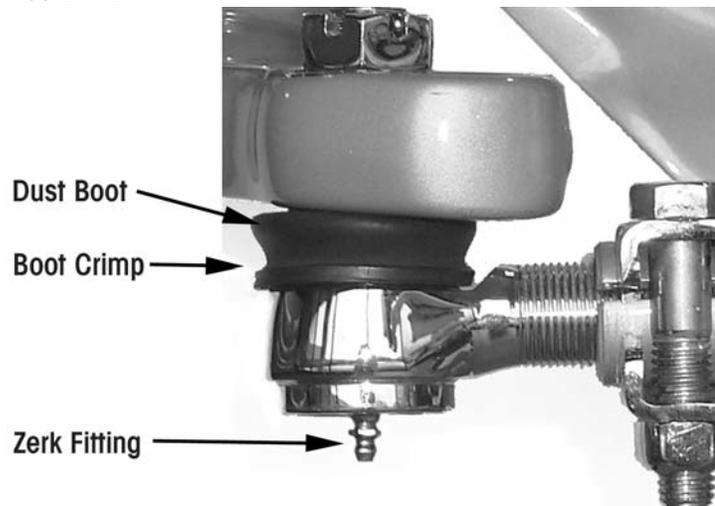
1. Turn the vehicle wheels straight ahead.
2. Wipe the zerk fitting and grease gun tip with clean shop towels.
3. Wipe the seal/boot clean with shop towels.
4. Attach a grease gun to the zerk fitting. Either a hand or pneumatic grease gun is acceptable. If air operated grease gun is used, system air pressure should not exceed 150 psi (1035 kPa).

 **CAUTION**

EXCEEDING THE MAXIMUM AIR PRESSURE TO THE ZERK FITTING CAN CAUSE DAMAGE TO THE DUST BOOT AND COMPONENT FAILURE.

5. Dirt, water, and discolored old grease should flow from the relief vents or purge holes near the boot crimp or bellows area. See Figure 7-2.

**FIGURE 7-2**



6. If the tie rod end is designed for lube service and it will not accept grease proceed as follows:
  - a. Remove the zerk fitting.
  - b. Inspect the threaded zerk fitting hole in the tie rod end and remove any obstructions.
  - c. Install a new zerk fitting.
  - d. Continue the lubrication procedure.
  - e. If the tie rod end will not accept grease following this procedure it will be necessary to replace the tie rod end, (see Tie Rod End replacement in the Component Replacement Section of this publication).
7. Apply grease until all the old grease is purged from the boot and fresh grease is coming out.

## TIE ROD END INSPECTION

### INSPECTION PROCEDURE

Before beginning this inspection procedure, the entire system must be unloaded (i.e., the front end of the vehicle must be raised and supported with safety stands).

#### CAUTION

DO NOT GREASE THE TIE ROD ASSEMBLY BEFORE PERFORMING THE INSPECTION. DOING SO CAN INHIBIT EFFORTS TO DETERMINE ACTUAL WEAR.

#### CAUTION

REPLACE THE ENTIRE TIE ROD END IF THE BOOT IS TORN OR MISSING, FAILURE TO DO SO CAN CAUSE PREMATURE WEAR OF THE TIE ROD END.

1. Block rear wheels of vehicle. Using the bottom of the axle beam or the frame rails, raise the front end off the ground and support with stands.
2. With the engine off, turn the wheels from full left to full right and then return to the straight-ahead position.
3. Check that the boots are in place and completely installed over the tie rod ends.
4. Check for cracking or tears in the boots. Also check the boot seals for damage. Replace the entire tie rod end if the boot is damaged.

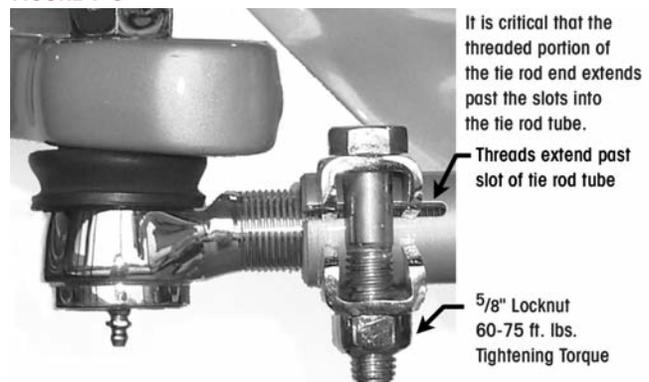
#### WARNING

THE CORRECT COTTER PIN MUST BE INSTALLED THROUGH THE TIE ROD END WITH THE CASTLE NUT TIGHTENED TO THE PROPER TORQUE SPECIFICATION IN ORDER TO SECURELY ATTACH THE TIE ROD. LOSS OF THE COTTER PIN CAN CAUSE THE TIE ROD END NUT TO BECOME LOOSE AND ADVERSELY AFFECT VEHICLE STEERING AND POSSIBLY RESULT IN TOTAL LOSS OF STEERING CONTROL.

5. Check that the tie rod end nut is installed and secured with a cotter pin. If the cotter pin is missing, check the nut torque specification and then install a new cotter pin. Always tighten the castle nut to specified torque when setting the cotter pin. Do not back off the nut to insert cotter pin.

6. Check that the tie rod end is threaded correctly into the cross tube and is engaged deeper than the end of the cross tube slot. The tie rod end must be visible the entire length of the cross tube slot. See Figure 7-3.

**FIGURE 7-3**



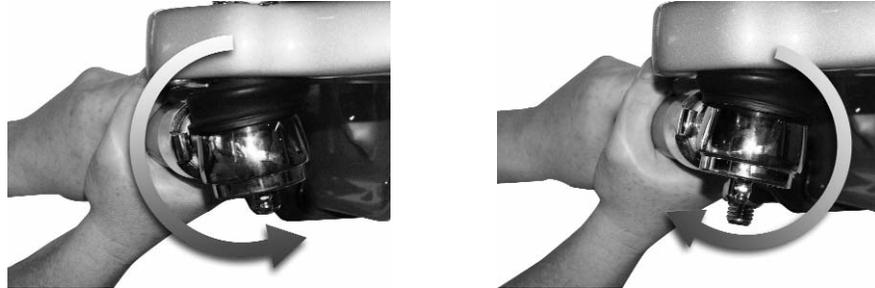
7. Check that zerk fittings are installed. Replace a damaged zerk fitting with a new one.

#### CAUTION

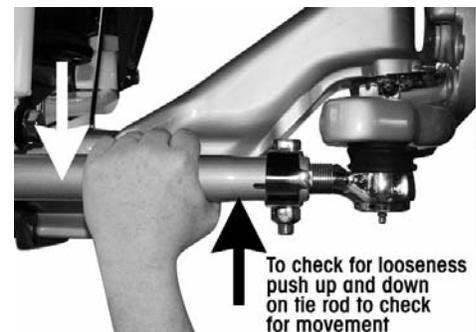
DO NOT USE THE FOLLOWING ITEMS OR METHODS TO CHECK FOR MOVEMENT OF THE TIE ROD ASSEMBLY. DAMAGE TO COMPONENTS CAN RESULT IF:

- A CROW BAR, PICKLE FORK OR 2 x 4 ARE USED.
- ANYTHING OTHER THAN HANDS ARE USED TO GRASP THE CROSS TUBE ASSEMBLY (CAN RESULT IN DAMAGE TO THE CROSS TUBE).
- EXCESSIVE PRESSURE OR FORCE IS APPLIED TO THE TIE ROD ENDS OR THE JOINTS OF THE ASSEMBLY.

8. By hand or using a pipe wrench, with jaw protectors to avoid gouging the cross tube, rotate the cross tube toward the front of the vehicle and then toward the rear. After rotating, center the cross tube. If the cross tube will not rotate in either direction, replace both tie rod ends. See Figure 7-4.

**FIGURE 7-4**


9. Position yourself directly below the tie rod end. Using both hands, grab the assembly end as close to the tie rod end as possible (no more than six inches or 152.4mm). Apply hand pressure with reasonable human effort vertically up and down in a push-pull motion several times (using approximately 50-100 pounds of pressure). Check for any movement or looseness at both tie rod end locations. See Figure 7-5.

**FIGURE 7-5**


10. If there is any movement in the tie rod assembly, install a magnetic based dial indicator on the Ackermann arm. See Figure 7-6.
11. Set the dial indicator to zero.
12. Apply hand pressure with reasonable human effort vertically up and down in a push-pull motion several times (using approximately 50-100 pounds of pressure). Observe the reading on the dial indicator.
13. If the reading is more than 0.060", replace both tie rod ends at the next service interval.
14. If a tie rod end exhibits 0.125" of movement by hand, the vehicle should be removed immediately from use and the tie rod end be replaced.

**FIGURE 7-6**

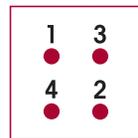
**NOTE**

According to the Commercial Vehicle Safety Alliance (CVSA), the vehicle "out of service" criteria is: Any motion other than rotational between any linkage member and its attachment point of more than  $\frac{1}{8}$ " (3mm) measured with hand pressure only. (393.209(d)), (published in the North American Standard Out-of-Service Criteria Handbook, April 1, 2006.)

## CLAMP GROUP RE-TORQUE INTERVAL

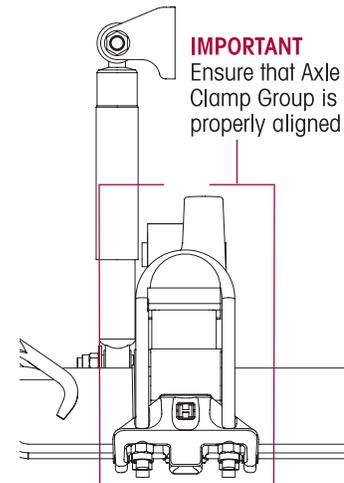
1. Clamp group locknuts must be torqued to specification at preparation for delivery.
2. Clamp group locknuts must be re-torqued at 1,000 miles.
3. Thereafter follow the 6 month inspection and annual re-torque interval.
4. Ensure that the clamp group is properly aligned and the U-bolts are seated in the top pad, and the bottom axle wrap is centered on the top axle wrap. See Figures 7-7.

FIGURE 7-8



5. Tighten the clamp group locknuts evenly in 50 foot pound increments to  285-305 foot pounds torque in the proper pattern to achieve uniform bolt tension, see Figure 7-8.

FIGURE 7-7



## TIRE INSPECTION

The leading causes of tire wear are the following in order of importance:

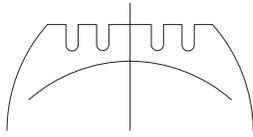
1. Tire Pressure
2. Toe Setting
3. Thrust Angle
4. Camber

The following tire inspection guidelines are based upon TMC (Technology & Maintenance Council) recommended practices. Any issues regarding irregular tire wear where Hendrickson is asked for assistance, will require tire and alignment maintenance records as described in the TMC literature number RP642 or TMC "Guidelines for Total Vehicle Alignment" publication.

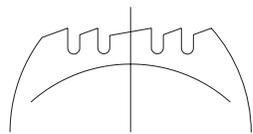
Tire wear is normally the best indicator of vehicle alignment condition. If tires are wearing too rapidly or irregularly, alignment corrections may be needed. The tire wear patterns described below can help isolate specific alignment problems.

The most common conditions of concern are:

- Overall Fast Wear (Miles per 32nd)
- Feather Wear
- Rapid Shoulder Wear (One Shoulder Only)
- One-Sided Wear
- Diagonal Wear
- Cupping

**FIGURE 7-9**
**OVERALL FAST WEAR  
(Miles per 32nd)**


**Overall Fast Wear** — Fast wear can be described as exhibiting a good, but accelerated wear pattern. It is typically caused by operating conditions, such as mountainous terrain, frequency and severity of turning, abrasive road surfaces in combination with vehicle configurations and their attributes—such as power steering, heavy axle loads, high wheel cuts, setback axles, short wheel base tractors, long wheel base straight trucks. To correct this problem, consult with vehicle and tire manufacturers when specifying equipment or replacing tires. For more information, see TMC RP 219 publication, page 11. For information on how to accurately measure and record tire rates, see TMC RP 230 publication.

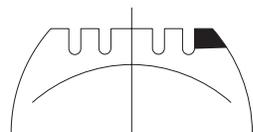
**FIGURE 7-10**
**FEATHER WEAR**


**Feather Wear** — Tread ribs or blocks worn so that one side is higher than the other resulting in step-offs across the tread face. Generally, ribs or blocks exhibit this wear. To spot this problem, do the following:

With one hand flat on the tread of the tire and a firm down pressure, slide your hand across the tread of the tire. In one direction, the tire will feel smooth and in the opposite direction there will be a sharp edge to the tread. Typical causes of feather wear include: excessive side force scrubbing, resulting from conditions of misalignment such as excessive toe, drive axle misalignment, worn, missing or damaged suspension components, bent tie rods or other chassis misalignment.

To correct this problem, tires can be rotated to another axle for maximum utilization of remaining tread. Additionally, diagnose the vehicle itself and correct misalignment condition as required. If steer tire feathers are in opposite directions, an improper toe condition is most likely the cause. For more information, see TMC RP 219A publication, page 5.

If feather wear on both steer tires is in the same direction, drive axle or other chassis misalignment is indicated. If one steer tire shows feather wear and the other steer tire has normal wear, a combination of toe and drive axle or chassis misalignment is indicated.

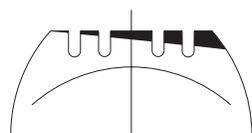
**FIGURE 7-11**
**RAPID SHOULDER WEAR  
(One Shoulder Only)**


**Rapid Shoulder Wear (One Shoulder Only)** — Is defined as a tire worn on the edge of one shoulder, sometimes extending to inner ribs. It can progress to diagonal wipeout. For more information, see TMC RP 219A publication, page 22.

This wear condition is usually caused by excessive toe or excessive camber. These conditions can be created by a misaligned or bent axle and can also be caused by loose or worn wheel bearings.

To correct this type of rapid shoulder wear:

- *Tires*— Change direction of rotation of tire. If shoulder wear is severe, remove and retread.
- *Vehicle* – Diagnose misalignment and/or mechanical condition and correct.

**FIGURE 7-12**
**ONE-SIDED WEAR**


**One-sided wear** — Is excessive wear on one side of tire extending from the shoulder towards the center of the tread. For more information, see TMC RP 219A, page 26.

One-sided wear is usually caused by improper alignment, worn kingpins, loose wheel bearings, excessive camber, excessive axle loads, non-parallel axles, or non-uniform tire and wheel assembly caused by improper bead seating or bent wheel.

To correct one-sided wear:

- *Tires* – Depending on severity, rotate tires to another axle position or, if worn to minimum tread depths, submit for possible retreading.
- *Vehicle* – Diagnose mechanical problem and correct.

**Diagonal Wear** — Can be described as localized flat spots worn diagonally across the tread at approximately 25-35° angles, often repeating around the tread circumference. For more information, see TMC RP 219A publication, page 20.

Diagonal wear is usually caused by bad wheel bearings, toe out, mismounting of tire and wheel assembly to axle, and mismatched duels for size and/or inflation pressures. It may start as brake skid. Diagonal wear is aggravated by high speed empty or light load hauls.

To correct diagonal wear, reverse direction of rotation of the tire. If wear is excessive, true or retread. If the source of trouble is the vehicle, diagnose cause and correct as needed.

FIGURE 7-13

### DIAGONAL WEAR

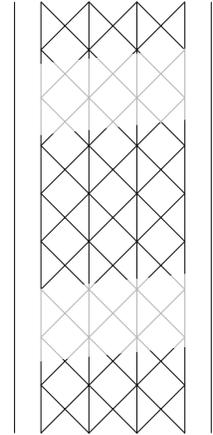
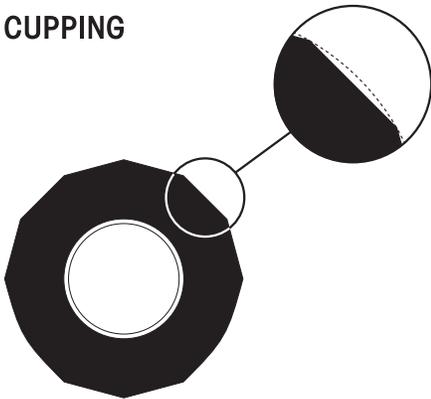


FIGURE 7-14

### CUPPING



**Cupping** — Localized, dished out areas of fast wear creating a scalloped appearance around the tire. Cupping, which appears around the tire on the shoulder ribs, may also progress to adjoining ribs. See TMC RP 219A publication, page 7.

Cupping is usually a result of moderate-to-severe imbalance, improper rim/wheel mounting, excessive wheel end play or other assembly non-uniformity. It can also be due to lack of shock absorber control on some suspension types.

To solve cupping problems:

- *Tires* – Correct mismount or balance problem. If ride complaints arise, steer tires may be rotated to drive or trailer axle.
- *Vehicle* – Diagnose component imbalance condition, i.e., wheel, rim, hub, brake, drum. Correct as necessary.

## SHOCK ABSORBER INSPECTION

**NOTE**

This component is not supplied by Hendrickson. Hendrickson is not responsible for components supplied by the vehicle manufacturer. For assistance with maintenance and rebuild instructions on this component, see the vehicle manufacturer.

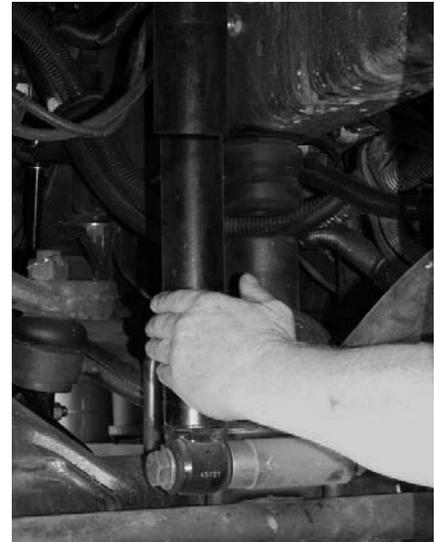
Inspection of the shock absorber can be performed by doing a heat test, and a visual inspection. For instructions on shock absorber replacement see the Component Replacement Section of this publication. It is not necessary to replace shock absorbers in pairs if one shock absorber requires replacement.


**WARNING**
**HEAT TEST**

1. Drive the vehicle at moderate speeds on rough road for minimum of fifteen minutes.

DO NOT GRAB THE SHOCK AS IT COULD POSSIBLY CAUSE PERSONAL INJURY.

2. Lightly touch the shock body carefully below the dust cover. See Figure 7-15.
3. Touch the frame to get an ambient reference. A warm shock absorber is acceptable, a cold shock absorber should be replaced.
4. To inspect for an internal failure, remove and shake the suspected shock. Listen for the sound of metal parts rattling inside. Rattling of metal parts can indicate that the shock has an internal failure.

**FIGURE 7-15**

**VISUAL INSPECTION**

Look for these potential problems when doing a visual inspection. Inspect the shock absorbers fully extended. Replace as necessary.

**FIGURE 7-16**


Damaged upper or lower mount



Damaged upper or lower bushing



Damaged dust cover and/or shock body



Bent or dented shock



Improper installation example: washers (if equipped) installed backwards.

**LEAKING VS. MISTING SHOCK VISUAL INSPECTION**

The inspection must not be conducted after driving in wet weather or a vehicle wash; shocks need to be free from water. Many shocks are often mis-diagnosed as failures. Misting is the process whereby very small amounts of shock fluid evaporate at a high operating temperature through the upper seal of the shock. When the "mist" reaches the cooler outside air, it condenses and forms a film on the outside of the shock body. Misting is perfectly normal and necessary function of the shock. The fluid which evaporates through the seal area helps to lubricate and prolong the life of the seal.

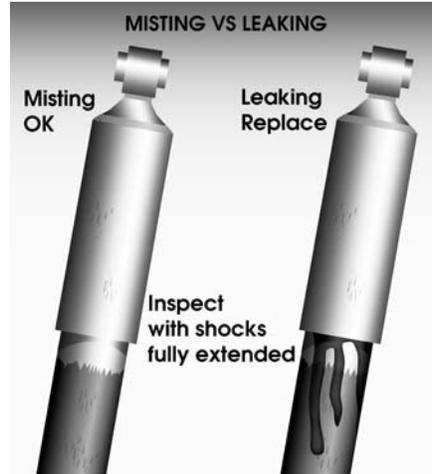
A shock that is truly leaking and needs to be replaced will show signs of fluid leaking in streams from the upper seal. These streams can easily be seen when the shock is fully extended, underneath the main body (dust cover) of the shock. Look for these potential problems when doing a visual inspection. Inspect the shock absorbers fully extended. Replace as necessary.

#### NOTE

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

If the shock is damaged, install a new shock absorber as detailed in the Component Replacement Section of this publication.

FIGURE 7-17



## FRONT THRUST WASHER INSPECTION

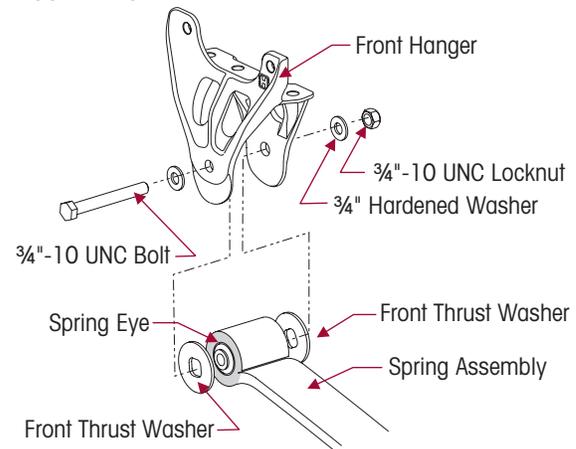
In normal use these components will function satisfactorily, even though the components may show some wear.

An indication that the shackle thrust washers are worn, or need replacement is when the suspension exhibits one or more of the following conditions:

1. Excessive lateral movement of the spring.
2. Thrust washers are worn and cause the front spring eye to rub against the inside of the front hanger, see Figure 7-18.
3. Normal and unacceptable thickness of the thrust washers can be measured with a micrometer or a ruler.

- The minimum thickness allowable for a thrust washer is  $\frac{1}{8}$ " (0.125").
- If one or more of these conditions is experienced, disassembly of the front hanger assembly is required to replace the thrust washers.
- If one thrust washer is worn out, Hendrickson recommends both thrust washers on that side of the suspension be replaced. Inspect the thrust washers on the other side of the vehicle and replace if necessary. See Thrust Washer replacement procedure in the Component Replacement Section of this publication.

FIGURE 7-18



## AXLE WRAP LINER INSPECTION

### INSPECTION PROCEDURE

- Axle wrap liners are installed on the STEERTEK axle to help prevent any type of abrasion on the axle at the clamp group area. Any time an axle wrap is removed it is mandatory that the axle wrap liner be replaced.

- Liner Crack Criteria:

It is possible for the axle wrap liner to crack during service. If the liner is cracked and all the pieces are intact it is not necessary to replace the liner. If the liner is broken out and there are pieces missing the liner must be replaced immediately. See Figure 7-19. See Axle Wrap replacement in the Component Replacement Section of this publication.

**FIGURE 7-19**

**Axle Wrap Liners  
Unacceptable Cracks**



## KINGPIN BUSHING INSPECTION

### INSPECTION PROCEDURE

1. Chock the wheels to help prevent the vehicle from moving. Set the parking brake.
2. Use a jack to raise the vehicle until the wheels are off the ground. Support the vehicle with safety stands.
3. **CHECKING THE UPPER KINGPIN BUSHING.** Install the base of a dial indicator onto the axle beam. See Figure 7-20.
4. Set the dial indicator to "0" zero.
5. Move the top of the tire in and out by applying reasonable constant pressure and then release, see Figure 7-22.
6. Check the reading on the dial indicator. If the dial indicator moves more than 0.015", the upper bushing is worn or damaged. Replace both bushings. Refer to the Kingpin Bushing replacement procedure in the Component Replacement Section of this publication.

**FIGURE 7-20**



**FIGURE 7-21**



7. **CHECKING THE LOWER KINGPIN BUSHING.** Install a dial indicator so that the base is on the axle and the indicator tip is against the inside of the bottom of the knuckle. See Figure 7-21.
8. Set the dial indicator to "0" zero.
9. Move the bottom of the tire in and out. If the dial indicator moves more than 0.015", the lower bushing is worn or damaged. Replace both kingpin bushings. Refer to the Component Replacement Section of this publication.

**NOTE**

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

**FIGURE 7-22****STEERING KNUCKLE INSPECTION****CHECKING VERTICAL END PLAY (UP AND DOWN MOVEMENT)**

The operating spec for vertical clearance on the steering knuckle is 0.008" to 0.030".

1. Chock the rear tires to help prevent the vehicle from moving.
2. Set the parking brakes.
3. Use a jack to raise the vehicle until both tires are 1" off the ground.
4. Place a dial indicator on each side of the axle as follows:
  - a. Index the wheels slightly (left or right) if necessary.
  - b. Place the magnetic dial indicator base on the axle. See Figure 7-23.
  - c. Place the tip of the dial indicator on the top of the upper steering knuckle (not on the grease cap).
5. Set the dial indicator to "0" (zero).
6. Lower the jack.
7. If vertical clearance is greater than 0.030" adjust the upper knuckle to obtain specification, if adjustment does not achieve specification, install shims (Hendrickson part no. 60259-002) between the top of the axle and the bottom of the upper steering knuckle to obtain the proper clearance specification. See Steering Knuckle Assembly in the Component Replacement Section of this publication for proper shim installation.
8. If vertical clearance is below 0.008", adjust the upper steering knuckle to obtain the proper clearance specification, if adjustment does not achieve specification, remove shims. See Steering Knuckle Assembly in the Component Replacement Section of this publication for proper shim removal.

**FIGURE 7-23**

## WHEEL BEARING END PLAY INSPECTION

FIGURE 7-24

This inspection can be made with or without the wheel assembly on the vehicle.

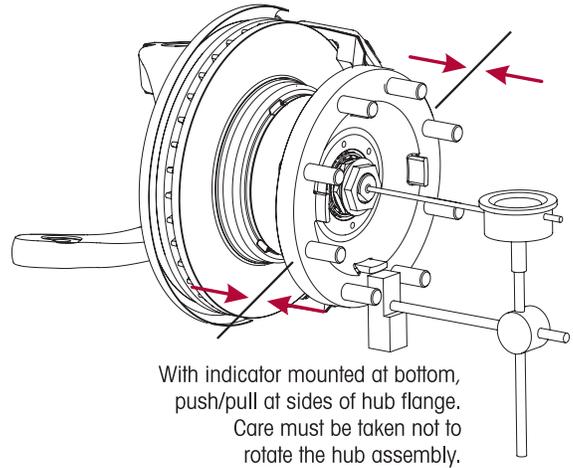
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**NOTE**

The correct specification to allow the wheel to rotate freely is 0.001" to 0.005" end play.

---

1. Verify end play with a dial indicator. See Figure 7-24. Wheel end play is the free movement of the wheel assembly along the spindle axis.
  - a) Attach a dial indicator with its magnetic base to the hub.
  - b) Adjust the dial indicator so that its plunger or pointer is against the end of the spindle with its line of action parallel to the axis of the spindle.
  - c) Grasp the hub assembly at the 3 o'clock and 9 o'clock positions. Push the hub in and out while oscillating it to seat the bearings. Read bearing end play as the total indicator movement.



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**NOTE**

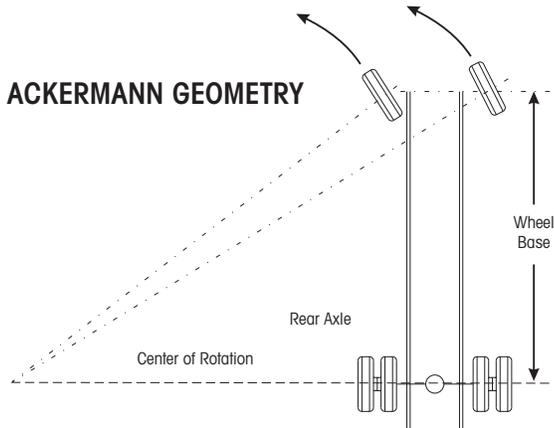
If end play is not within specification, a wheel bearing adjustment is required, see Wheel Bearing Adjustment in the Alignment & Adjustments Section of this publication.

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## SECTION 8 Alignment & Adjustments

### ALIGNMENT DEFINITIONS

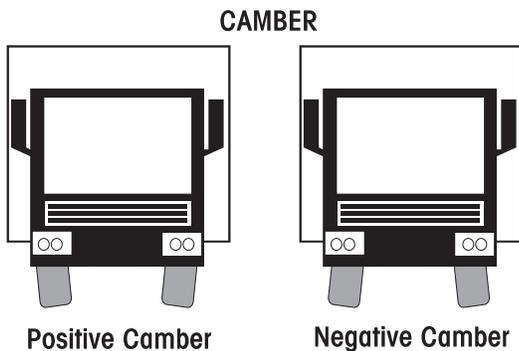
FIGURE 8-1



**Ackermann Steering Geometry** — The geometry of the four bar linkage consisting of the front axle beam pivot points, tie rod arms, and cross tube and attempts to provide free rolling of front tires in a turn. Ackermann geometry is dependent upon the steering axle track-width and wheelbase of the vehicle. Improper geometry results in wheel scrub in turns which generally appears as toe wear on the tire. Usually more wear is present on one side of the vehicle than the other due to the operational route of the vehicle.

**Bump Steer (Feedback)** — The feedback felt through the steering linkage to the steering wheel when a steer axle tire hits a bump in the road. This occurs because the axle-end of the drag link and the axle attachment point of the spring do not travel in parallel circular arcs as the suspension moves up and down. This condition can also be caused by trapped air in the power steering system.

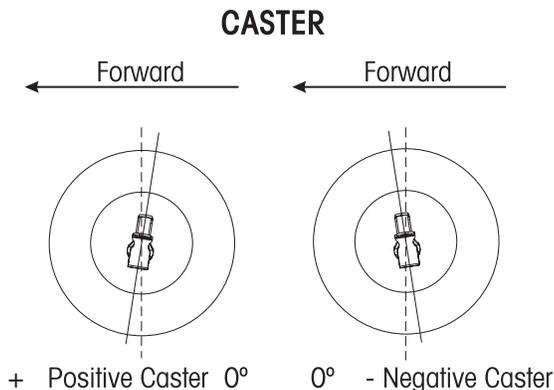
FIGURE 8-2



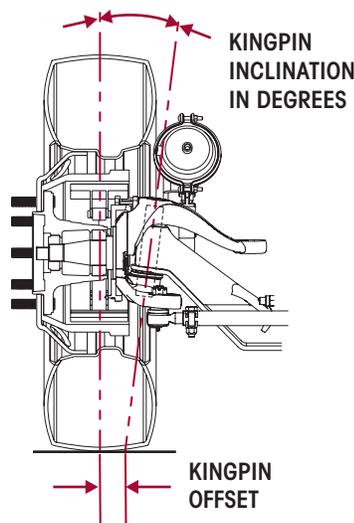
**Camber** — The angle formed by the inward or outward tilt of the wheel reference to a vertical line. Camber is positive when the wheel is tilted outward at the top and is negative when the wheel is tilted inward at the top.

Excessive positive camber may cause smooth wear on the outer half of the tire tread. Excessive negative camber may cause wear on the inner half of the tread. Static-unloaded camber angles are built into the axle to put the loaded tire perpendicular to the road.

FIGURE 8-3



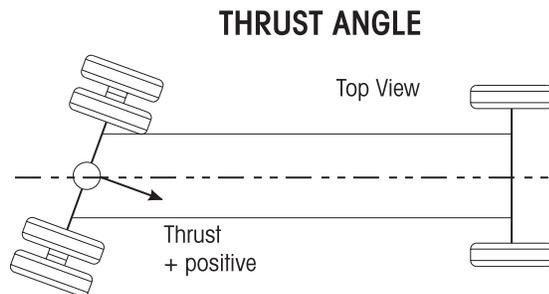
**Caster** — The forward or rearward tilt of the steering axle kingpin in reference to a vertical line. The angle is measured in degrees. Caster is positive when the top of the steering axis is tilted rearward and is negative when the tilt is forward. Proper caster is important for directional stability and returnability. Too much positive caster can cause shimmy, excessive steering effort and is normally a vehicle performance and handling consideration. Uneven positive caster may create a steering pull toward the side with the lower caster. This attribute may be used to compensate for crowned roads.

**FIGURE 8-4**


**Kingpin Inclination (KPI)** — The inward tilt of the kingpin from the vertical. This front suspension parameter has a pronounced effect on steering effort and returnability. As the front wheels are turned around an inclined kingpin, the front of the truck is lifted. This lifting of the vehicle is experienced as steering effort when the turn is executed and exhibits itself as recovery force when the steering wheel is released.

**Kingpin Offset** — The distance between the center of the tire patch and intersection of the kingpin axis with the ground. This parameter of front end geometry is important in vehicles without power steering and has a major effect on static steering. If there is no kingpin offset, the tires must scrub around the center of the pin patch when turned in a static condition, resulting in higher static steering efforts.

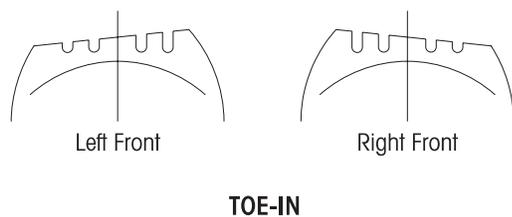
**Steering Arm** — The component that connects the drag link to the axle knuckle assembly.

**FIGURE 8-5**


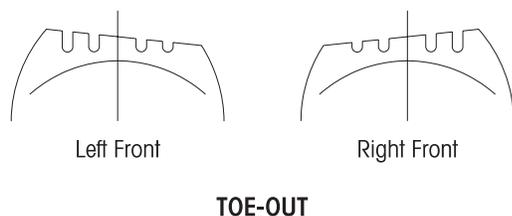
**Thrust Angle, Tracking, or Square** — The angle formed by the centerline of the vehicle frame (geometric centerline) and the direction that an axle points. As indicated by the term “square”, the ideal value for the angle is 0° or when the axle centerline is at 90° or perpendicular to the geometric centerline. Thrust or tracking to the right is positive, and to the left is negative.

A steering correction is required to offset the effect of the thrust angles and keeps the vehicle traveling in a straight line. It results in a lateral offset between the steer and drive axle tires commonly referred to as “dog tracking.”

**Tie Rod Arm (Ackermann-Arm, Cross Tube Arm)** — The component that transmits steering forces between left and right axle knuckle assemblies through the cross tube assembly.

**FIGURE 8-6**


**Toe-in** — is when the horizontal line intersects in front of the wheels, or the wheels are closer together in front than in the back. Toe-in is commonly designated as positive, toe-out as negative. Excessive toe-in wears the outside edge of the tires. Steer axle toe is adjustable to reduce wear to the leading edge of the tire and also to avoid road wander. Toe is adjusted in a static, unloaded condition so that the tires will run in a straight line under a dynamic, loaded condition.

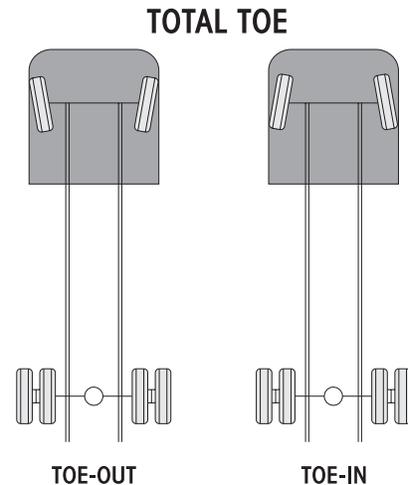
**FIGURE 8-7**


**Toe-out** — Is when the horizontal lines intersect behind the wheels, or the wheels are closer together in back than in front. Toe-in is commonly designated as positive, toe-out as negative. Excessive toe-out wears the inside edge of the tires. Steer axle toe is adjustable to reduce wear to the leading edge of the tire and also to avoid road wander. Toe is adjusted in a static, unloaded condition so that the tires will run in a straight line under a dynamic, loaded condition.

FIGURE 8-8

**Toe-Out on Turns** — (See Ackermann Geometry). Excessive turning angles may contribute to premature tire wear. Be advised that the greater turning angles, the more that toe and camber change. If you have any doubt regarding the optimum turning angles for your operation, contact the vehicle's manufacturer, axle manufacturer, tire manufacturer and alignment equipment manufacturer for advice.

**Total Toe** — The angle formed by two horizontal lines through the planes of two wheels. Steer axle toe is adjustable to reduce wear to the leading edge of the tire and also to avoid road wander. Toe is adjusted in a static, unloaded condition so that the tires will run in a straight line under a dynamic, loaded condition.



## INSPECTION PRIOR TO ALIGNMENT

### WHEELS AND TIRES

Examine the following items:

- The tires are inflated to the manufacturer's specified tire pressure.
- The steer axle tires are the same size and type.
- The lug nuts are tightened to manufacturer's specified torque.
- The wheels are balanced and check for tire to rim runout.
- The wheels and tires are free of excessive wear and damage.
- Wheel bearing end play is within the vehicle manufacturer or chassis and body manufacturer specification.

### FRONT SUSPENSION

Inspect the following:

- All fasteners are installed and tightened to the specified torque. See Torque Specifications Section in the appendix of this publication.
- Leaf springs are free of wear or damage.
- Shock absorbers are free of wear and damage.
- Front and rear spring mounts for wear or damage.

### INSPECT TIE ROD ENDS

Perform "Tie Rod Inspection" procedure refer to the Preventive Maintenance Section of this publication.



## REAR AXLE AND REAR SUSPENSION

Rear axle misalignment can cause front tire wear. If the outer edge of one front tire is worn and the inner edge of the other front tire is worn, check the following:

- Make sure the rear axle (especially a tandem axle) is correctly aligned and the ride height is within specifications (if equipped). Refer to the procedure from the manufacturer of the vehicle or the suspension.
- All fasteners including U-bolts (if applicable) are installed and tightened to the specified torque.
- The leaf springs are not worn or damaged.
- The bushings in the leaf springs are not worn or damaged.
- The torque rods (if used) are correctly adjusted (if adjustable).
- The frame is not bent or twisted.
- Refer to any additional recommendations and specifications from the manufacturer of vehicle on rear axles and suspensions. Reference the TMC (The Technology & Maintenance Council) Guidelines for Total Vehicle Alignment.

## FRONT WHEEL ALIGNMENT

Hendrickson recommends technicians review TMC's publication TMC (Technology & Maintenance Council) "Guidelines for Total Vehicle Alignment."

The SOFTEK front wheel alignment specifications can be found in the Appendix of this technical publication.

Check the total vehicle wheel alignment when the following occur:

- Every 12-18 months (normal maintenance).
- When the vehicle does not steer correctly.
- To correct a tire wear condition.
- There are two types of front wheel alignment:
  1. *Minor alignment* – a minor front wheel alignment is done **for all** normal maintenance conditions, see below.
  2. *Major alignment* – a major alignment is done when uneven or excessive tire wear is evident, or response at the steering wheel is sluggish, or the need for major wheel alignment check and adjustment is required, see below.

## MINOR FRONT WHEEL ALIGNMENT

Perform the minor front wheel alignment in the following sequence:

1. Inspect all systems that affect wheel alignment. Refer to "Inspection Prior to Alignment" in this section.
2. Check the wheel bearing end play.
3. Check toe-in and adjust if necessary.

## MAJOR FRONT WHEEL ALIGNMENT

Be certain to follow wheel alignment inspection intervals as specified by the original equipment manufacturer. Before performing a major front wheel alignment it is recommended that alignment equipment calibration be checked to ensure proper vehicle alignment.

Major wheel alignment is accomplished in the following sequence of operation:

1. Inspect all the systems that influence the wheel alignment. Refer to the "Inspection Prior to Alignment" in this section.
2. Check and adjust the maximum turn angle (see "Steering Stop Procedure" in this section). See Figures 8-9 and 8-10.

FIGURE 8-9



FIGURE 8-10



3. If the vehicle has power steering, check and adjust, if necessary, the pressure relief in the power steering system. Refer to vehicle manufacturer's specifications. See Steer Stops in the Alignment & Adjustments Section of this publication.
4. Check the turning angle (toe-out during vehicle turns or the Ackermann angle). Refer to vehicle manufacturer or chassis and body manufacturer for specifications.
5. Check the kingpin (or steering axis) inclination. Refer to "Kingpin Inclination" in the Definitions under the Alignment & Adjustments Section of this publication.
6. Check the camber angle. Do not attempt to adjust. Refer to "Camber" in the Definitions under the Alignment & Adjustments Section of this publication.

**WARNING**

AXLE CAMBER IS NOT ADJUSTABLE. DO NOT CHANGE THE AXLE CAMBER ANGLE OR BEND THE AXLE BEAM. BENDING THE AXLE BEAM TO CHANGE THE CAMBER ANGLE CAN DAMAGE THE AXLE AND REDUCE AXLE STRENGTH, AND WILL VOID HENDRICKSON'S WARRANTY. A BENT AXLE BEAM CAN CAUSE LOSS OF VEHICLE CONTROL, POSSIBLY CAUSING PERSONAL INJURY OR PROPERTY DAMAGE. SEE FIGURE 8-11.

FIGURE 8-11



7. Check and adjust caster angle. Refer to "Caster" in the Definitions under the Alignment & Adjustments Section of this publication. **The use of two different angle caster shims will not change cross caster.** Cross caster is the difference between the caster readings for left and right side of the vehicle.

**SERVICE HINT**

Prior to checking caster confirm that the vehicle is at its proper ride height on the rear suspension (if applicable). The rear ride height must be correct to achieve proper caster.

8. Check and adjust toe-in, refer to adjusting the Toe-In under "Definitions" under the Alignment & Adjustments Section of this publication.

## STEERING STOP

### ADJUSTMENT PROCEDURE

When the axle or lower steering knuckle is replaced, the steering stop adjustment must be checked.

The steering stop adjustment procedure is as follows:

1. Drive vehicle onto turntables and chock the rear wheels.
2. Measure the wheel cut. The wheel cut is determined by steering the tires. Wheel cut is measured at the inside wheel only, therefore the tires must be turned to the full lock position for each right hand and left hand direction. Refer to the vehicle manufacturer for exact specifications.
3. Increase the wheel cut by loosening the jam nuts and screw the axle stops in clockwise.
4. Tighten the jam nuts.

#### NOTE

It is very important that the sides of the square head axle stops are set parallel to the axle beam to ensure a good contact point on the axle, see Figure 8-12.

**FIGURE 8-12**



5. Decrease the wheel cut by loosening the jam nuts and screw the axle stops out counter-clockwise.
6. Tighten the jam nuts to 40-60 foot pounds.
7. Measure the wheel cut and check for any interference with related steering components.



#### WARNING

ALWAYS CHECK/RESET THE STEERING GEAR BOX PUPPET WHEN THE WHEEL CUT IS DECREASED. FOLLOW MANUFACTURER'S GUIDELINES FOR THE GEAR BOX POPPET RESETTING PROCEDURE. FAILURE TO DO SO CAN RESULT IN PREMATURE FAILURE OF THE AXLE OR STEERING KNUCKLE. THIS CONDITION CAN CAUSE LOSS OF VEHICLE CONTROL, PERSONAL INJURY OR PROPERTY DAMAGE AND VOID WARRANTY.

## WHEEL BEARING ADJUSTMENT

This procedure follows the guidelines of TMC RP 618.

1. Lubricate the bearing with clean axle lubricant of the same type used in the hub assembly.
2. After the wheel hub and bearings are assembled on the spindle, tighten the inner (adjusting) nut to 200 foot pounds torque while rotating the wheel hub assembly.
3. Back off the inner (adjusting) nut one full turn. Rotate the wheel.
4. Re-tighten the inner (adjusting) nut to 50 foot pounds torque while rotating the wheel hub assembly.
5. Back off the inner (adjusting) nut one third turn.

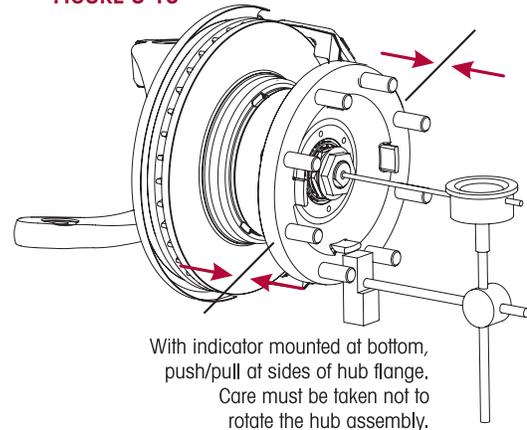
6. Install the locking washer. If dowel pin and washer are not aligned, remove the washer and turn it over and reinstall. If required, loosen the inner (adjusting) nut just enough for alignment.

**CAUTION**

NEVER TIGHTEN THE INNER (ADJUSTING) NUT FOR ALIGNMENT AT THIS POINT OF THE PROCEDURE. THIS CAN PRE-LOAD THE BEARING AND CAUSE PREMATURE FAILURE.

7. Install and tighten the outer (jam) nut to 240-260 foot pounds torque.

**FIGURE 8-13**



With indicator mounted at bottom, push/pull at sides of hub flange. Care must be taken not to rotate the hub assembly.

8. Verify end play with a dial indicator. See Figure 8-13. Wheel end play is the free movement of the wheel assembly along the spindle axis.
  - a) Attach a dial indicator with its magnetic base to the hub.
  - b) Adjust the dial indicator so that its plunger or pointer is against the end of the spindle with its line of action parallel to the axis of the spindle.
  - c) Grasp the hub assembly at the 3 o'clock and 9 o'clock positions. Push the hub in and pull out while oscillating it to seat the bearings. Care must be taken not to rotate the hub assembly. Read bearing end play as the total indicator movement.

**NOTE**

If end play is not within specification of 0.001" to 0.005", a readjustment is required.

9. Re-adjustment Procedure

- **Excessive End Play** — If the end play is too loose, remove the outer (jam) nut and pull the washer away from the inner (adjusting) nut, but not off the spindle. Tighten the inner (adjusting) nut to the next alignment hole of the washer. Reassemble the washer and re-tighten the outer (jam) nut to 240-260 foot pounds torque. Verify end play with a dial indicator.
- **Insufficient End Play** — If end play is not present, remove the outer (jam) nut and pull the washer away from the inner (adjusting) nut, but not off the spindle. Loosen the inner (adjusting) nut to the next alignment hole of the washer. Reassemble the washer and re-tighten the outer (jam) nut to 240-260 foot pounds torque. Verify end play with a dial indicator.
- **Fine Tuning Adjustment** — If after performing the readjustment procedures, end play is 0.001"-0.005" range, if less play is desired, repeat the appropriate procedures, removing the washer from the spindle, tighten or loosen the inner (adjusting) nut the equivalent of 1/2 of an alignment hole, or reversing the alignment washer, and re-installing it onto the spindle. Reassemble and re-tighten the outer (jam) nut to 240-260 foot pounds torque. Verify end play with a dial indicator.

**Secure outer nut by bending one washer tang over the outer nut.**

**CAUTION**

BEFORE OPERATING THE VEHICLE, THE WHEEL HUB CAVITIES AND BEARINGS MUST BE LUBRICATED TO HELP PREVENT FAILURE.

## TOE SETTING

1. Place the vehicle on a level floor with the wheels in a straight ahead position.
2. Raise the vehicle and support the front axle with jack stands.
3. Use paint and mark the center area of tread on both steer axle tires around the complete outer diameter of the tires.
4. Scribe a line through both steer axle tires in the painted area around the complete outer diameter of the tires.
5. Raise the vehicle and remove the jack stands.
6. Set the vehicle on the ground.

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**NOTE**

Do not measure toe-in with the front axle off the ground. The weight of the vehicle must be on the front axle when toe-in is measured.

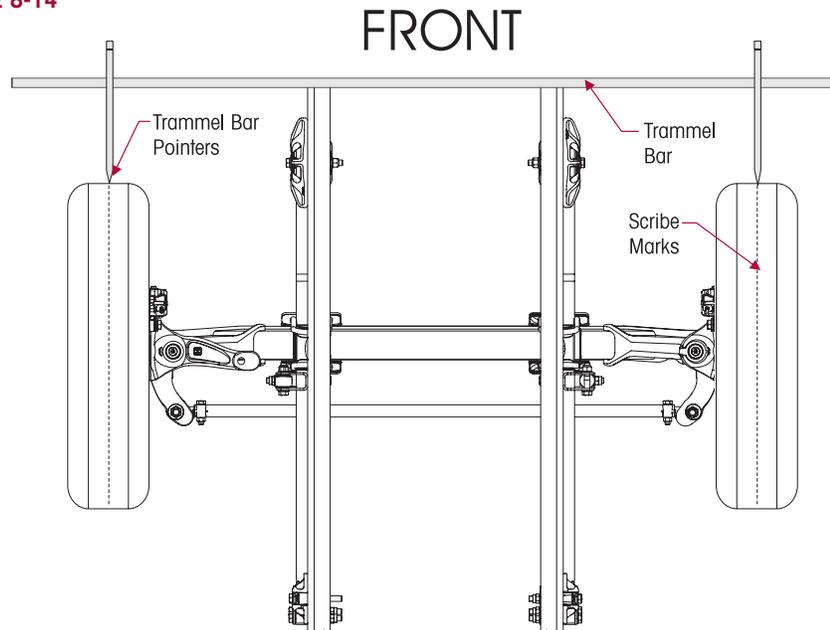
7. Use a trammel bar and measure the distance between the scribe marks at the rear of the steer axle tires. Record the measurement.
8. Install the trammel bar and measure the distance between the scribe marks at the front of the steer axle tires. Record the measurement. See Figure 8-14.

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**NOTE**

When setting up the trammel bar the pointers should be level with the spindles at the front and rear of the steer axle tires.

**FIGURE 8-14**



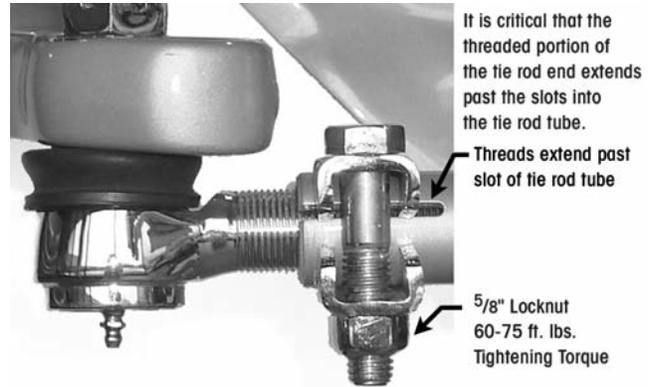
9. To calculate the toe setting subtract the front measurement from the rear measurement, the difference between the two will equal the toe-in/toe-out measurement.
10. If the toe measurement is not within the specifications of  $\frac{1}{16}'' \pm \frac{1}{32}''$  ( $0.060 \pm 0.030$ ), it will be necessary to adjust the toe setting. Refer to the following procedure.
  - a. Loosen the tie rod cross tube clamp bolts and locknuts.
  - b. Turn the tie rod cross tube until the specified toe-in distance is achieved.

**WARNING**

THE THREADED PORTION OF THE TIE ROD END MUST EXTEND PAST THE SLOTS INTO THE TIE ROD CROSS TUBE, SEE FIGURE 8-15. FAILURE TO DO SO CAN CAUSE COMPONENT TO FAIL CAUSING LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

**FIGURE 8-15**

- c. Tighten the bolt and locknut on the tie rod cross tube to 60-75 foot pounds torque.
11. Repeat steps 1-9 until the correct toe setting is achieved.

**SPRING EYE RE-TORQUE**

This procedure to re-torque is necessary when replacing

- Front hanger
- Shackle assembly
- Steel leaf spring assembly

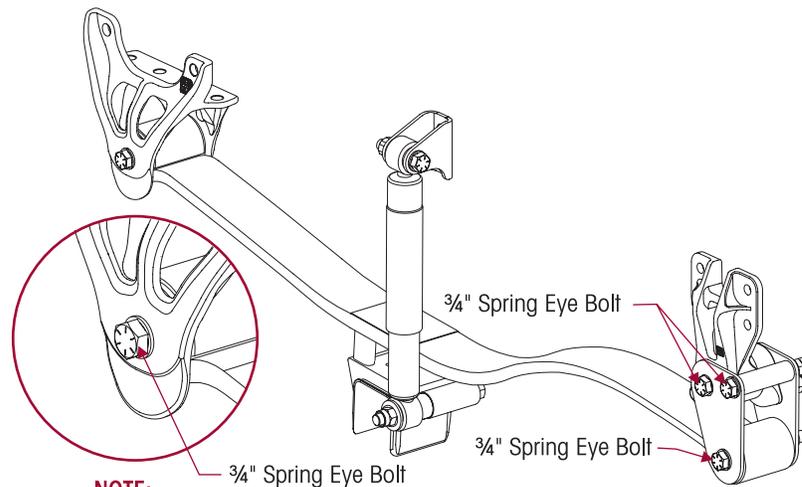
**RE-TORQUE PROCEDURE**

1. Chock the wheels.
2. Loosen all six (6) front and rear spring eye bolts, see Figure 8-16.

**NOTE**

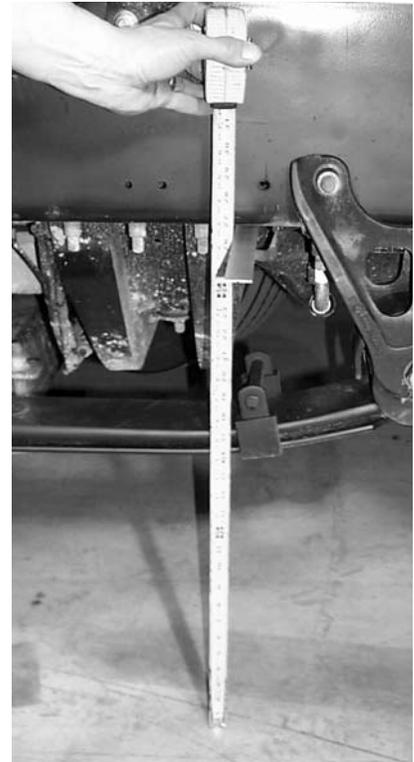
**DO NOT** remove the spring eye bolts.

3. Let the suspension settle.
4. Tighten the front  $\frac{3}{4}$ " spring eye bolt locknuts to 320-340 foot pounds torque.

**FIGURE 8-16****NOTE:**

Front spring eye bolts must be inserted from the outboard side to inboard side to avoid component interference. Tightening Torque 320-340 ft. lbs.

5. Tighten the rear  $\frac{3}{4}$ " spring eye bolt and shackle bolt locknuts to  320-340 foot pounds torque.
6. Affix a straight edge to the bottom of the frame rail behind frame hanger , see Figure 8-17.
7. With the vehicle on a level surface measure the distance from the top of the straight edge to the ground on both sides of the vehicle and record the measurements.
8. Measure the difference from one side to the other.
9. Do a road test and repeat measurement steps 7 to 9.
10. If the measurement is acceptable if less than  $\frac{1}{2}$ " and the vehicle is level. If measurement is more than  $\frac{1}{2}$ " contact the vehicle manufacturer.
11. Remove the wheel chocks.

**FIGURE 8-17**

## SECTION 9

# Component Replacement

### FASTENERS

Hendrickson recommends that when servicing the vehicle to replace the removed fasteners with new equivalent fasteners. Maintain correct torque values at all times. Check torque values as specified. See Hendrickson's Recommended Torque Specifications in the Appendix of this publication. If non-Hendrickson fasteners are used follow torque specifications listed in the vehicle manufacturer's service manual.

### SHOCK ABSORBER

#### NOTE

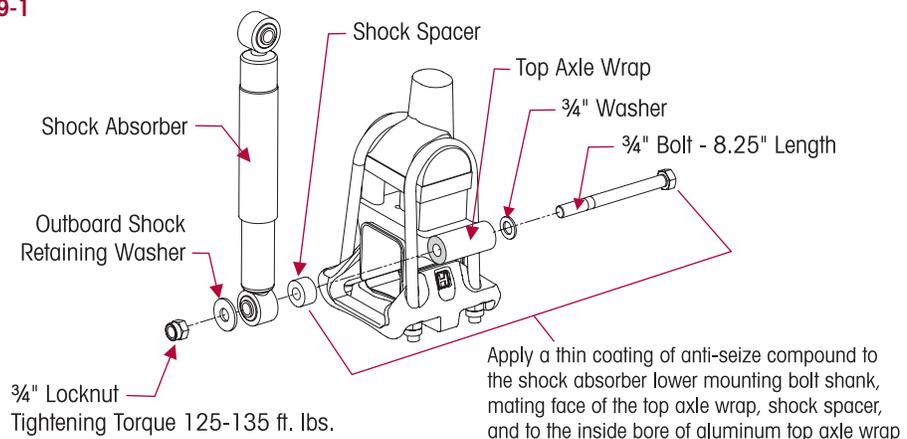
This component is not supplied by Hendrickson. Hendrickson is not responsible for components supplied by the vehicle manufacturer. For assistance with maintenance and rebuild instructions on this component, see the vehicle manufacturer.

It is not necessary to replace the shock absorber in pairs if only one shock requires replacement.

#### DISASSEMBLY

1. Remove the lower mounting bolts, fasteners, and spacer.
2. Remove the upper mounting bolts and fasteners.
3. Slide out the shock absorber.
4. Inspect the shock absorber mounting brackets and hardware for damage or wear, replace as necessary.

**FIGURE 9-1**



#### ASSEMBLY

1. Install the shock absorber into the upper mounting bracket.
2. Install the upper shock mounting bolt, washers and locknut.
3. Apply a thin coating of anti-seize compound to the shock absorber lower mounting bolt shank, to the mating face of the axle wrap and spacer, and to the inside bore of the aluminum axle wrap. This is necessary to help prevent seizing of the bolt to the aluminum axle wrap.

4. Install the lower bolt from the inboard side to the outboard side of the top axle wrap and attach the spacer, washer, and locknut. See Figure 9-1.
5. Tighten both of the shock eye locknuts to 125-135 foot pounds torque.

## AUXILIARY BUMPER

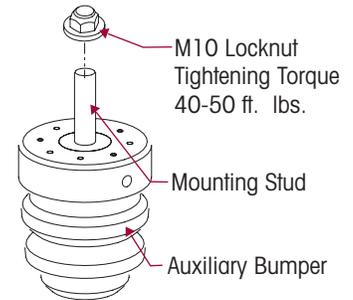
### DISASSEMBLY

1. Remove auxiliary bumper mounting fasteners from auxiliary bumper stud. See Figure 9-2.
2. Remove auxiliary bumper from the bottom of the frame rail.

### ASSEMBLY

1. Install new auxiliary bumper into position on the bottom of the frame rail.
2. Install fasteners on auxiliary bumper mounting stud. See Figure 9-2.
3. Tighten mounting locknut to 40-50 foot pounds torque.

**FIGURE 9-2**



## FRONT LEAF SPRING FRAME HANGER

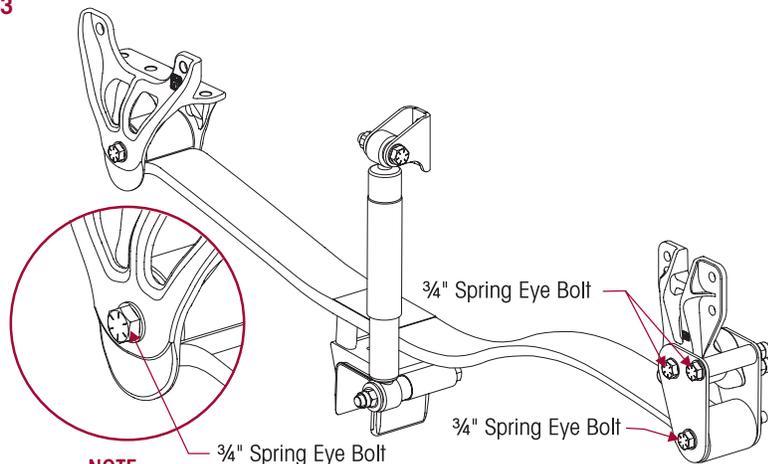
### DISASSEMBLY

1. Place the vehicle on a level floor.
2. Chock the wheels.
3. Raise the frame.
4. Support the frame with frame stands.
5. Suspend the front axle from the shocks.
6. Remove the  $\frac{3}{4}$ " spring eye bolt, washers and locknut.

### SERVICE HINT

A bottle jack may be required to raise the axle slightly to facilitate removal of the spring eye bolt.

**FIGURE 9-3**



**NOTE:**

Front spring eye bolts must be inserted from the outboard side to inboard side to avoid component interference. Tightening Torque 320-340 ft. lbs.

7. Remove the frame mounting fasteners from the hanger. See manufacturer's guidelines.
8. Remove the hanger from the vehicle, see Figure 9-3.

### ASSEMBLY

1. Install the new hanger on the frame.
2. Install new frame fasteners. Follow manufacturer's guidelines.
3. Install the new  $\frac{3}{4}$ " spring eye bolt from the outboard side of the hanger (see Figure 9-3), washers and locknut.
4. Remove the frame stands and lower frame.
5. Tighten  $\frac{3}{4}$ " locknut to 320-340 foot pounds torque.

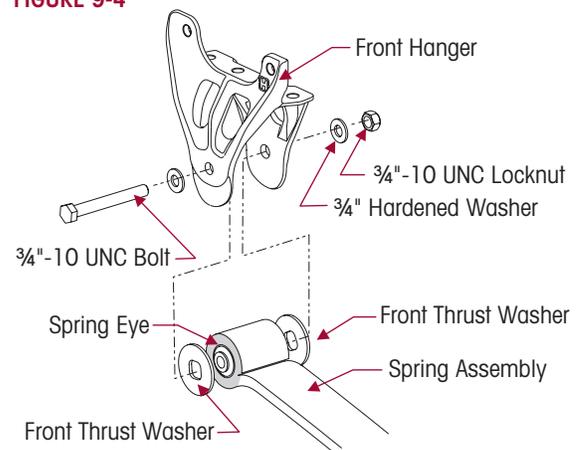
## THRUST WASHERS – FRONT HANGER

### DISASSEMBLY

1. Place the vehicle on a level floor.
2. Chock the wheels.
3. Raise the vehicle.
4. Support the vehicle with frame stands.
5. Suspend the front axle to remove the load from the leaf spring assemblies.
6. Install a floor jack at the center of the axle for support.

**FIGURE 9-4**

7. Remove the front  $\frac{3}{4}$ " spring eye bolts from both leaf springs. See Figure 9-4.
8. Loosen the rear spring eye shackle bolts, but **DO NOT** remove.
9. Remove the lower shock mounting bolts.
10. Lower the floor jack, allowing the front spring eyes to drop out of the front spring hangers.
11. Remove the thrust washers.
12. Inspect the front spring hanger for any damage or wear, replace component as necessary.



### ASSEMBLY

1. Install the new thrust washers on the front springs.
2. Raise the floor jack and install the spring eyes and thrust washers into the front spring hangers. See Figure 9-4.
3. Install the  $\frac{3}{4}$ " front spring eye bolt into the hanger.
4. Install the lower shock mounting bolts.
5. Raise the vehicle and remove the frame stands.
6. Lower the vehicle.
7. Tighten the front and rear spring eye bolts to the required torque specification.

8. Tighten the lower shock mounting bolts to the required specification.
9. Remove wheel chocks.

## REAR SHACKLE FRAME BRACKET

### DISASSEMBLY

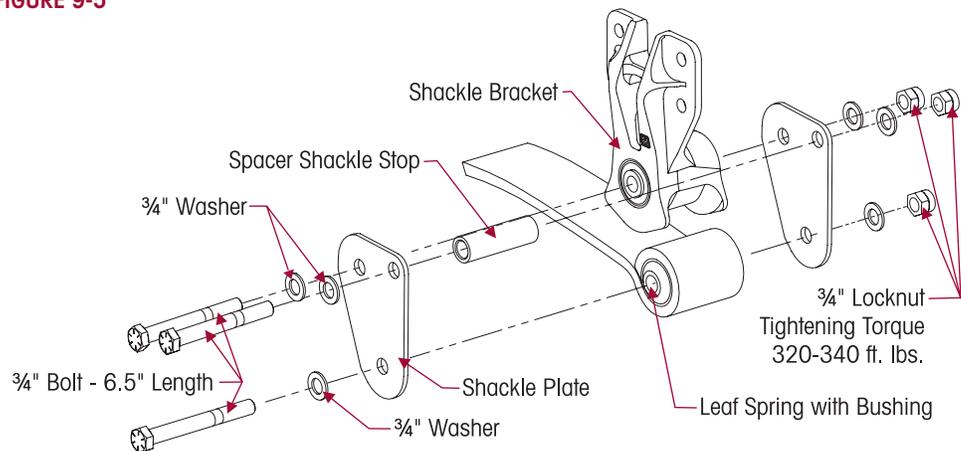
1. Place the vehicle on a level floor.
2. Chock the wheels.
3. Raise the frame.
4. Support the frame with frame stands.
5. Suspend the front axle from the shocks.
6. Remove the rear  $\frac{3}{4}$ " spring eye and shackle pivot bolts, shackle plates, washers and locknuts.

### SERVICE HINT

A bottle jack may be required to raise the axle slightly to facilitate removal of the rear spring eye bolt.

7. Remove the frame fasteners from the shackle bracket. See manufacturer's guidelines.
8. Remove the shackle bracket from the vehicle, see Figure 9-5.
9. Inspect the shackle assembly for excessive wear or damage.
10. If damaged or worn excessively, replace with Genuine Hendrickson Parts as detailed in the Component Replacement Section of this publication.

**FIGURE 9-5**



### ASSEMBLY

1. Install the shackle bracket on the frame.
2. Install new frame fasteners. Follow manufacturer's guidelines.
3. Install the shackle plates with the  $\frac{3}{4}$ " bolts, washers and locknuts. See Figure 9-5.
4. Remove the frame stands and lower frame.
5. Tighten  $\frac{3}{4}$ " locknuts to 320-340 foot pounds torque.

## LEAF SPRING

### DISASSEMBLY

1. Place the vehicle on a level floor.
2. Chock the wheels.
3. Raise the vehicle.
4. Support the frame with frame stands.
5. Suspend the front axle to remove the load from leaf spring assembly.
6. Remove the front and rear  $\frac{3}{4}$ " spring eye bolts washer and locknuts.
7. Remove the  $\frac{3}{4}$ " shackle pivot bolt.

### SERVICE HINT

To ease in the removal of the spring eye bolts, it may be necessary to raise the axle slightly.

8. Remove the  $\frac{3}{4}$ " clamp group U-bolts, washers and locknuts. Discard the fasteners.



### WARNING

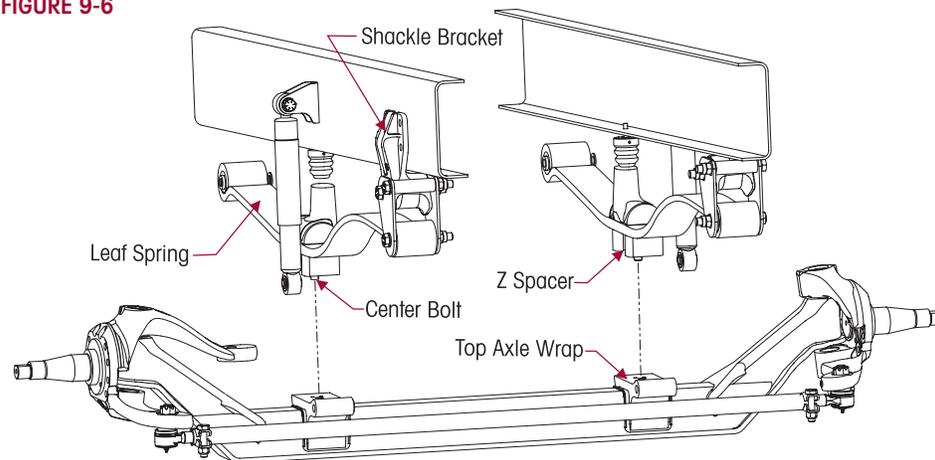
DO NOT USE A CUTTING TORCH TO REMOVE CLAMP GROUP BOLTS OR ATTACHING FASTENERS. THE USE OF SUCH HEAT ON SUSPENSION COMPONENTS CAN ADVERSELY AFFECT THE STRENGTH OF THESE PARTS. A COMPONENT DAMAGED IN THIS MANNER CAN RESULT IN THE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

### SERVICE HINT

If a clamp group nut fails to come off bolt, cut half way through the bolt with an abrasive cut off wheel, taking care not to contact axle beam or other components. Using an impact wrench, spin the locknut to fracture the bolt and remove.

9. Remove the top pad and the bottom axle wrap. See Figure 9-6.
10. Remove the leaf spring assembly.

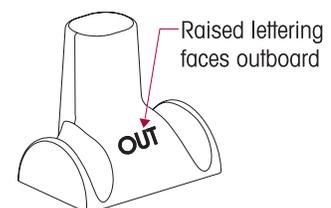
**FIGURE 9-6**



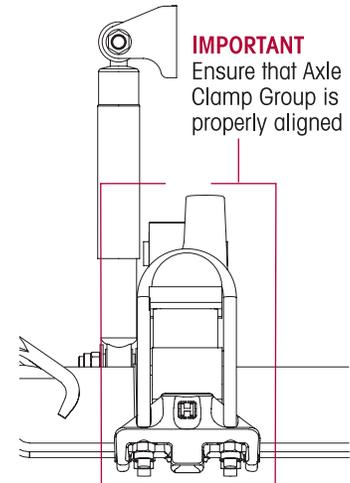
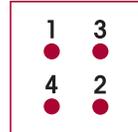
### ASSEMBLY

1. Install the new leaf spring assembly on the axle. Verify that the center bolt is located properly in the top axle wrap. See Figure 9-6.
2. Install the top pad with the raised lettering "OUT" facing the outboard side on the spring, see Figure 9-7.
3. Remove and replace the bottom axle wrap liner located in bottom axle wrap.
4. Install the bottom axle wrap.

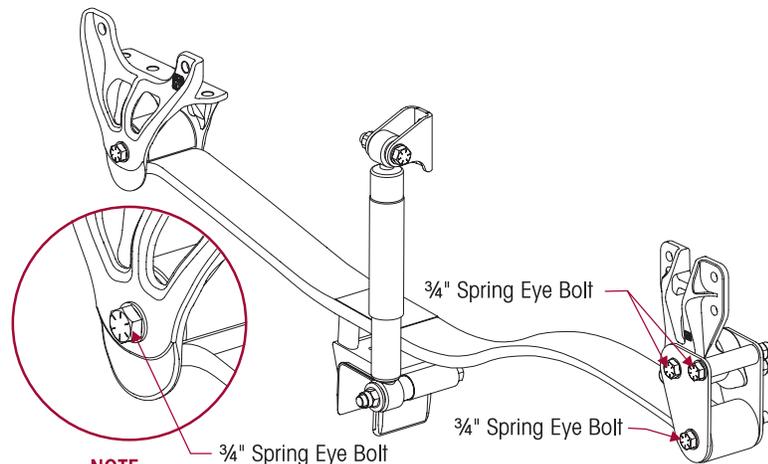
**FIGURE 9-7**



5. Install the new  $\frac{3}{4}$ " clamp group U-bolts, washers, and locknuts. The locknuts must be replaced when the clamp group is removed, to prevent premature bolt fatigue.
6. Snug the clamp group, **DO NOT** torque at this time.
7. Raise the axle and the leaf spring assembly into the front hanger and rear shackle assembly.
8. Install the  $\frac{3}{4}$ " spring eye bolts, washers and locknuts. Snug bolts. **DO NOT** tighten.
9. Ensure that the clamp group is properly aligned and the U-bolts are seated in the top pad, and the bottom axle wrap is centered with the top axle wrap. See Figure 9-8.

**FIGURE 9-8**

**FIGURE 9-9**


10. Tighten the clamp group locknuts evenly in 50 foot pounds increments to 285-305 foot pounds torque in the proper pattern to achieve uniform bolt tension, see Figure 9-9.
11. Remove the frame supports and load the front axle with the vehicle weight.
12. Tighten the  $\frac{3}{4}$ " spring eye bolt locknuts to 320-340 foot pounds torque. See Figure 9-10.

**FIGURE 9-10**

**NOTE:**

Front spring eye bolts must be inserted from the outboard side to inboard side to avoid component interference. Tightening Torque 320-340 ft. lbs.

## SPRING EYE BUSHINGS

The spring eye bushings for the SOFTEK leaf spring assemblies are designed to provide extended service life. If premature wear occurs careful consideration must be given to the contributing factor that caused the wear. This must be corrected in order to prevent the new bushing from wearing in the same manner. The front and rear bushings are permanently installed in the spring leaf and are not serviceable. If a bushing wears prematurely, the leaf spring assembly must be replaced. Follow the procedure for the Front Leaf Spring removal in the Component Replacement Section of this manual.

## BOTTOM AXLE WRAP

### DISASSEMBLY

1. Place the vehicle on a level floor.
2. Chock the wheels.
3. Support the frame with frame stands.

### WARNING

DO NOT USE A CUTTING TORCH TO REMOVE CLAMP GROUP BOLTS OR ATTACHING FASTENERS. THE USE OF SUCH HEAT ON SUSPENSION COMPONENTS CAN ADVERSELY AFFECT THE STRENGTH OF THESE PARTS. A COMPONENT DAMAGED IN THIS MANNER CAN RESULT IN THE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

### SERVICE HINT

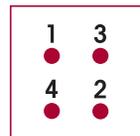
If a clamp group nut fails to come off bolt, cut half way through the bolt with an abrasive cut off wheel, taking care not to contact axle beam or other components. Using an impact wrench, spin the locknut to fracture the bolt and remove.

4. Remove  $\frac{3}{4}$ " U-bolts, washers and locknuts. Discard fasteners.
5. Remove bottom axle wrap. It may be necessary to use a dead blow mallet to dislodge axle wrap.
6. Once removed inspect axle wrap for damage. Replace if necessary.
7. Discard the used bottom axle wrap liner.

### ASSEMBLY

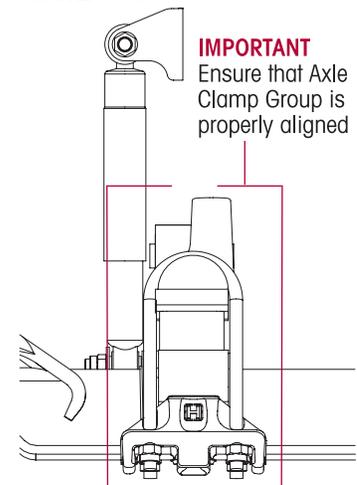
1. Install the new bottom axle wrap liner into bottom axle wrap.
2. Install the bottom axle wrap on axle.
3. Install new  $\frac{3}{4}$ " U-bolts, washers and locknuts. Ensure that the clamp group is properly aligned and the U-bolts are seated in the top pad, and the bottom axle wrap is centered with the top axle wrap. See Figure 9-11.

FIGURE 9-12



4. Tighten the clamp group locknuts evenly in 50 foot pounds increments to  285-305 foot pounds torque in the proper pattern to achieve uniform bolt tension, See Figure 9-12 for proper torque pattern to achieve uniform bolt tension.

FIGURE 9-11



## TOP AXLE WRAP (In Chassis)

### DISASSEMBLY

1. Place the vehicle on a level floor.
2. Chock the wheels.
3. Raise the vehicle and suspend the front axle to remove the load from the leaf spring assembly.
4. Support the frame with frame stands.
5. Remove the front and rear  $\frac{3}{4}$ " spring eye bolts, washers and locknuts. Loosen the  $\frac{3}{4}$ " shackle pivot bolt.

**SERVICE HINT**

A bottle jack may be required to raise the axle slightly in order to remove spring eye bolts.

6. Support the axle with a jack.

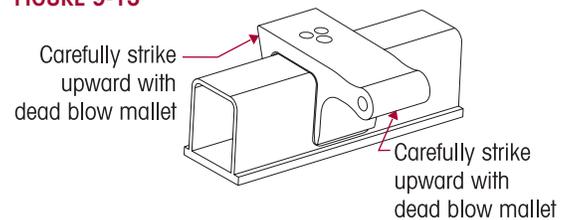

**WARNING**

DO NOT USE A CUTTING TORCH TO REMOVE CLAMP GROUP BOLTS OR ATTACHING FASTENERS. THE USE OF SUCH HEAT ON SUSPENSION COMPONENTS CAN ADVERSELY AFFECT THE STRENGTH OF THESE PARTS. A COMPONENT DAMAGED IN THIS MANNER CAN RESULT IN THE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

**SERVICE HINT**

If a clamp group nut fails to come off bolt, cut half way through the bolt with an abrasive cut off wheel, taking care not to contact axle beam or other components. Using an impact wrench, spin the locknut to fracture the bolt and remove.

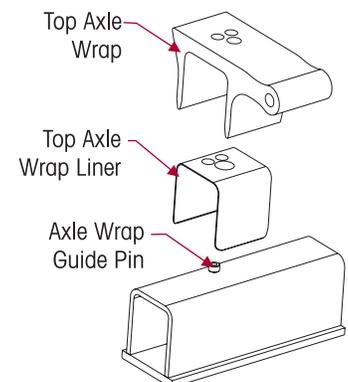
7. Remove the 3/4" clamp group U-bolts, washers and locknuts. Discard fasteners.
8. Remove the top pad and the bottom axle wrap.
9. Remove the lower shock mounting bolt.
10. Remove the leaf spring assembly.

**FIGURE 9-13**


11. Strike the axle wrap with a dead blow mallet at the front and rear on the underside of the axle wrap to dislodge it from the axle. See Figure 9-13.
12. Clean and inspect the axle wrap and axle wrap liners for cracks or damage, replace each if cracks or damage are present.

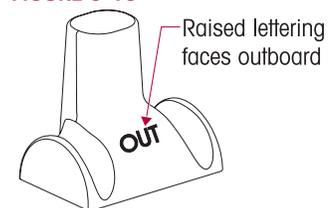
**ASSEMBLY**

1. Install the new axle wrap liner on the axle.
2. Spray the axle wrap liner and the axle wrap with a silicon lubricant.
3. Position the axle wrap on the axle, see Figure 9-14.

**FIGURE 9-14**

**CAUTION**

DO NOT STRIKE THE TOP AXLE WRAP WITH A HAMMER. HENDRICKSON RECOMMENDS USING A PLASTIC DEAD BLOW MALLET WITH CARE WHEN INSTALLING THE AXLE WRAP.

4. Protect the top surface of the axle wrap with a block of wood, cardboard, or shop towels.
5. Make sure the axle wrap bore indexes the locating axle wrap guide pin on the axle.
6. Install the leaf spring assembly on the axle wrap indexing the center bolt in to the locating hole.

**FIGURE 9-15**


7. Install the top pad with the raised lettering "OUT" facing outboard side on the leaf spring assembly. See Figure 9-15.
8. Remove and replace the bottom axle wrap liner.
9. Install the bottom axle wrap.
10. Install the new 3/4" clamp group U-bolts, washers, and locknuts.

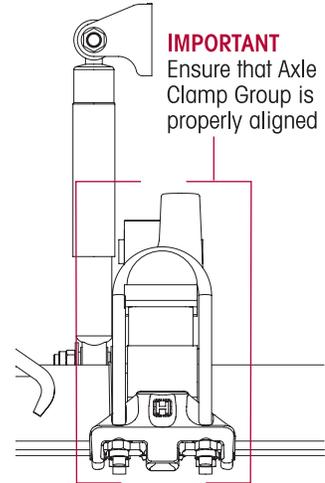
11. Snug the clamp group, **DO NOT** torque at this time.
12. Use a jack and raise the axle and leaf spring assembly into the front spring hanger and shackle assembly.

**SERVICE HINT**

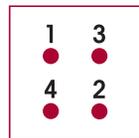
A bottle jack may be required to raise the axle slightly in order to install the spring eye bolts.

13. Install the 3/4" spring eye bolts, washer and locknuts in the front spring hanger and rear shackle assembly.
14. Ensure that the clamp group is properly aligned and the U-bolts are seated in the top pad, and the bottom axle wrap is centered with the top axle wrap. See Figure 9-16.

**FIGURE 9-16**



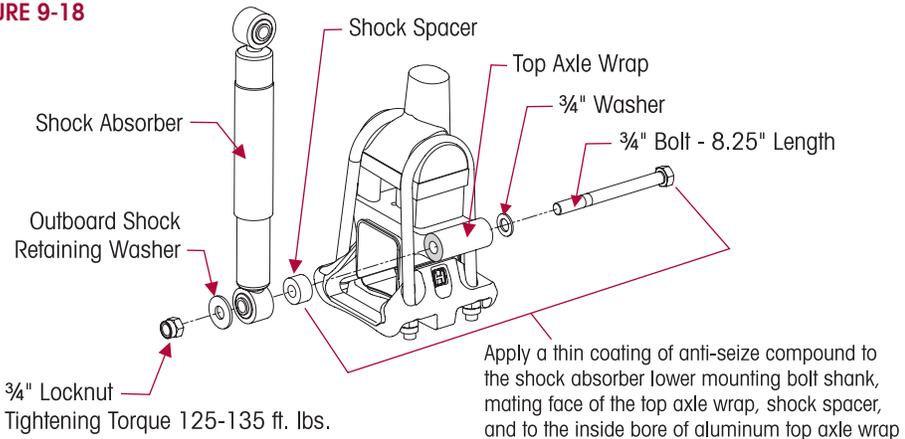
**FIGURE 9-17**



15. Tighten the 3/4" clamp group locknuts evenly in 50 foot pounds increments to 285-305 foot pounds torque in the proper pattern to achieve uniform bolt tension, see Figure 9-17.

16. Apply a thin coating of anti-seize to the lower shock mounting bolt.
17. Install the 3/4" lower shock bolt to the top axle wrap (oriented from the inboard side to the outboard side), washer, and locknut. See Figure 9-18.
18. Tighten the 3/4" locknut per vehicle manufacturer's torque specifications.
19. Remove the jack from the axle.
20. Remove the frame stands.
21. Tighten the 3/4" spring eye bolt locknuts to 320-340 foot pounds torque.

**FIGURE 9-18**



**CALIPER ASSEMBLY**

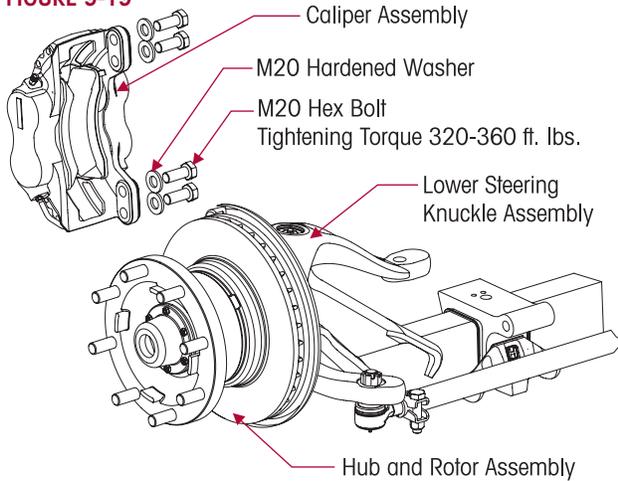
**WARNING**

NEVER WORK UNDER A RAISED VEHICLE SUPPORTED BY ONLY A JACK. ALWAYS SUPPORT A RAISED VEHICLE WITH STANDS. BLOCK THE WHEELS AND MAKE SURE THE UNIT WILL NOT ROLL BEFORE RELEASING BRAKES. ALWAYS WEAR EYE PROTECTION. FAILURE TO DO SO CAN CAUSE POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

**DISASSEMBLY**

1. Place the vehicle on a level floor.
2. Chock the wheels.

3. Raise the vehicle and install safety stands.
4. Remove the tire and wheel.
5. Remove the four caliper mounting bolts. See Figure 9-19.
6. Remove the caliper and brake pads, secure with suitable strap. **DO NOT** let the caliper hang by brake line.

**FIGURE 9-19**

**INSPECTION**

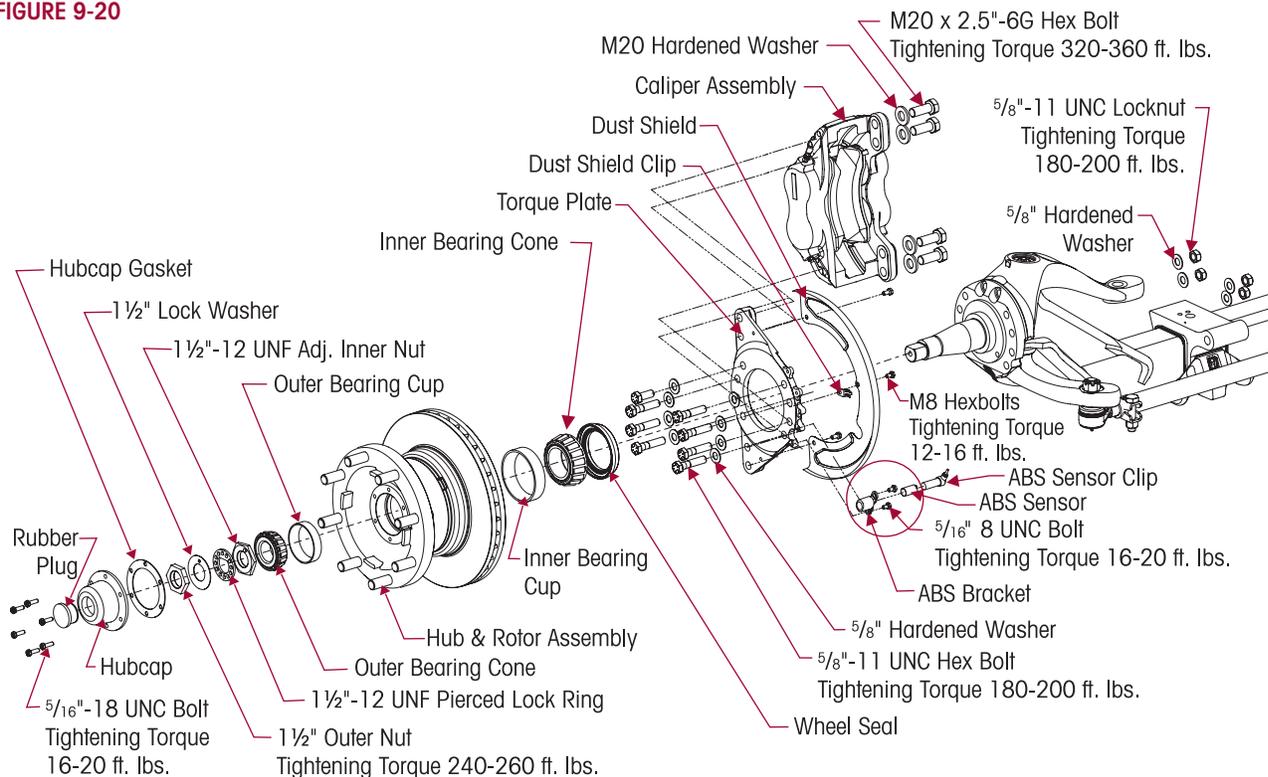
1. Inspect brake torque plate and mounting holes for cracks or damage. Replace as necessary.

**ASSEMBLY**

1. Install the caliper assembly on brake rotor.
2. Install the caliper bolts and tighten to 320-360 foot pounds torque.
3. Install tire and wheel.
4. Remove wheel chocks and safety stands.

**HUB ASSEMBLY AND BRAKE TORQUE PLATE**
**WARNING**

NEVER WORK UNDER A RAISED VEHICLE SUPPORTED BY ONLY A JACK. ALWAYS SUPPORT A RAISED VEHICLE WITH STANDS. BLOCK THE WHEELS AND MAKE SURE THE UNIT WILL NOT ROLL BEFORE RELEASING BRAKES. ALWAYS WEAR EYE PROTECTION. FAILURE TO DO SO CAN CAUSE POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

**FIGURE 9-20**


**DISASSEMBLY**

1. Place the vehicle on a level floor.
2. Chock the wheels.
3. Raise the vehicle and install safety stands.
4. Remove the tire and wheel.
5. Remove the four caliper mounting bolts. See Figure 9-19.
6. Remove the caliper and brake pads, secure with suitable strap. DO NOT let the caliper hang by brake line.
7. Install a suitable drain pan under hubcap.
8. Remove the hubcap and drain the lube oil.
9. Remove the outer wheel bearing nut, lock washers, inner wheel bearing nut, and outer wheel bearing. See Figure 9-20.
10. Slide the hub and rotor assembly off the spindle.
11. Remove the eight (8) torque plate mounting fasteners.
12. Remove the brake torque plate.

**HUB WHEEL SEAL REMOVAL AND INSPECTION OF THE HUB****You will need:**

- SKF part number – SRT-1 Seal Removal Tool, see Special Tool Section of this publication.
1. Remove wheel seal. Wheel seal removal is best done with a specifically designed tool. Hendrickson recommends the use of SKF tooling and instructions to remove the wheel seal from the hub.

**CAUTION**

HAMMERS, CHISELS AND IMPROPER PRYING TOOLS CAUSE DAMAGE TO BEARINGS AND HUBS AND CAN LEAD TO COMPONENT DAMAGE. USE ONLY SPECIFIED TOOLS.

2. After removal of the wheel seal, remove the inner wheel bearing.
3. Clean and inspect wheel bearings, replace if damaged.
4. Clean residual oil from hub and any remaining hubcap gasket material.
5. Inspect the hub for broken fasteners, cracks in the hub, and damage to the hub and bore.
6. If a bearing cup is loose in the hub, this indicates a serious condition and the hub must be replaced.

**BEARING CUP REMOVAL**

1. Use a mild steel drift or cup driver to drive out the bearing cup. Alternate the location of impact on the cup by 180° and/or 90°.
2. Inspect the bearing bores and bearing cup stop for damage. If there is evidence of cup spinning, the hub must be replaced.
3. Use an emery cloth to remove any minor burrs or raised areas.

**BEARING CUP INSTALLATION****You will need:**

- OTC part number – OTC 7180 installation tool, see Special Tool Section of this publication.
1. Install bearing cup. Bearing cup installation is best done with a specifically designed tool. Hendrickson recommends the use of OTC tooling and instructions to install the bearing cup in the hub.

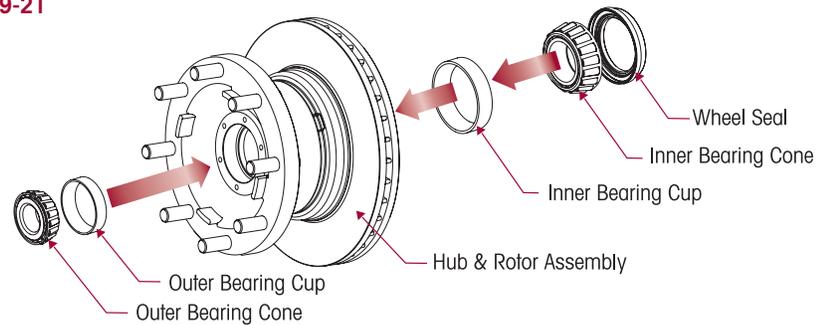
2. Use a .004" feeler gauge to check for a gap between the cup and the bearing cup stop. The feeler gauge should not fit between the cup and the bearing cup stop.
3. Inspect the bearing surface for any damage, which might have occurred during installation. There should be no scoring of the new bearing cup surface.

### HUB WHEEL SEAL INSTALLATION

#### You will need:

- SKF Scotseal® Classic and Scotseal® Longlife Installation Tools, see Special Tool Section of this publication.
1. Install the wheel seal. Seal installation is best done with specifically designed tools. - Hendrickson recommends the use of SKF tooling and instructions to install the wheel seal in the hub.
  2. Position hub on the wheel studs facing down.
  3. Pre-lube the inner wheel bearing and install in the hub.
  4. Position a new wheel seal into the hub bore and insert the tool assembly with centering plug into the seal.
  5. Hold the tool handle firmly and straight, drive the seal with firm hammer strokes until the seal is squarely seated. Continue driving the seal the hub until the sound of impact changes.
  6. After the seal is bottomed in the bore, check for freedom of movement by manually moving the packing of the seal up and down. Ensure that the inner bearing rotates freely.

**FIGURE 9-21**



### CLEANING AND INSPECTION

1. Clean the face of the steering knuckle and spindle.
2. Inspect the spindle for any damage or fretting. Remove any light fretting with a fine grit emery cloth (220 and higher).
3. Check the spindle threads for any damage.
4. Clean steering knuckle threads with a 5/8" tap.
5. Clean and install the brake torque plate.

### ASSEMBLY

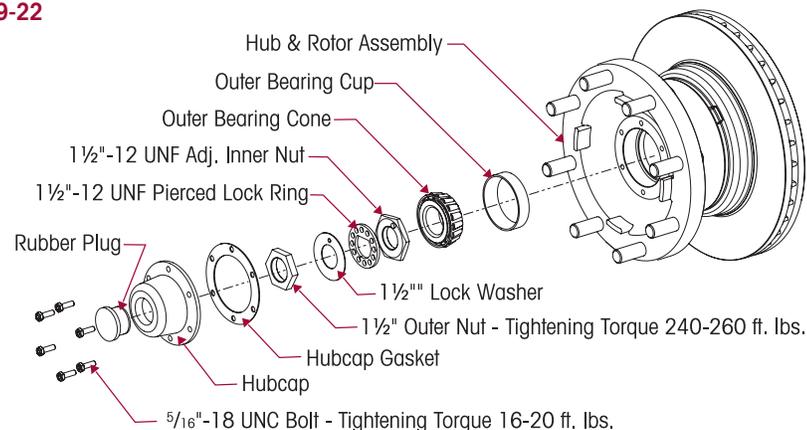
1. Install Loctite on the threaded bolts that do not have nuts.
2. Tighten the brake torque plate fasteners in a crisscross pattern to 180-200 foot pounds torque.
3. Carefully slide the hub and rotor assembly onto the spindle.
4. Pre-lube the lube oil reservoir in the hub, see Lubrication Specifications in the Preventive Maintenance Section of this publication.
5. Pre-lube and install the outer wheel bearing.

- Adjust the wheel bearing end play to specification, see Wheel Bearing instructions in the Alignment & Adjustments Section of this publication.

**NOTE**

Always install and re-install a hubcap with a **NEW** gasket.

- Install the **NEW** hubcap gasket.
- Loosely install hubcap bolts. See Figure 9-22.
- Uniformly tighten hubcap bolts in a star pattern to 16-20 foot pounds torque.
- Fill wheel end assembly through the center fill port with the Grade 2 oil (SAE-90 weight, GL-5). Allow the oil to seep through the outer bearing and fill the hub cavity. Continue to add oil until the oil reaches the oil level fill line as indicated on the hubcap.
- Install the caliper assembly on brake rotor. See Figure 9-19.
- Install the caliper bolts and tighten to 320-360 foot pounds torque.
- Install the wheel and tighten lug nuts to the required torque specification per the vehicle manufacturer.
- Remove wheel chocks and safety stands.

**HUBCAP****FIGURE 9-22****DISASSEMBLY**

- Install suitable drain pan under hubcap.
- Remove hubcap mounting fasteners. See Figure 9-22.
- Remove hubcap.
- Remove hubcap gasket from hub assembly.
- Clean any residual gasket material from hub.

**ASSEMBLY****NOTE**

Always install and re-install a hubcap with a **NEW** gasket.

- Install hubcap and **NEW** gasket.
- Loosely install hubcap bolts.
- Uniformly tighten hubcap bolts in a star pattern to 16-20 foot pounds torque.
- Fill wheel end assembly through the center fill port with the Grade 2 oil (SAE-90 weight, GL-5). Allow the oil to seep through the outer bearing and fill the hub cavity. Continue to add oil until the oil reaches the oil level fill line as indicated on the hubcap.
- Install center fill hubcap plug.

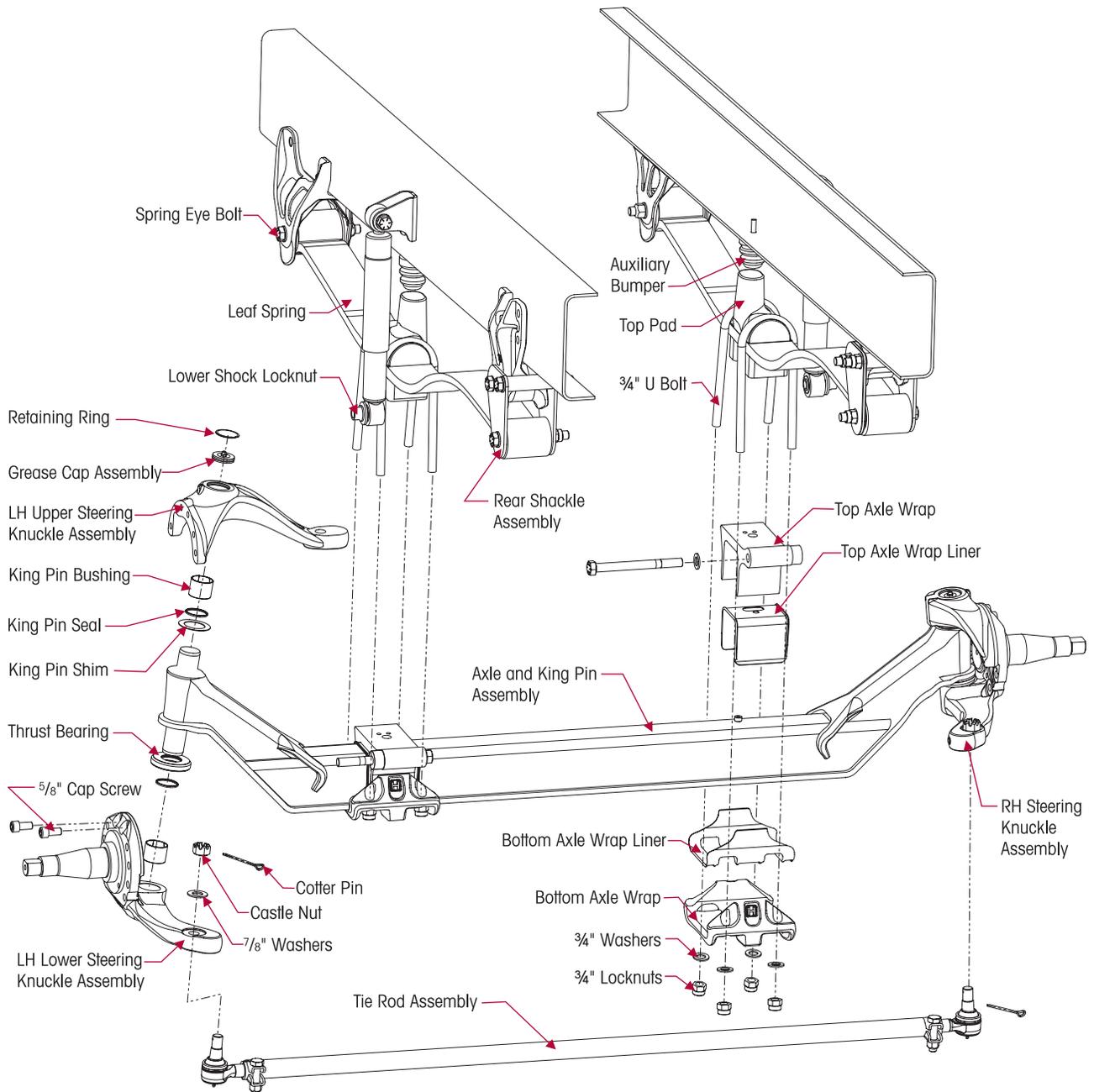
## FRONT AXLE ASSEMBLY

### AXLE CLAMP GROUP

The axle clamp group consist of the following components:

- Top Axle Wrap
- Top Axle Wrap Liner
- Top pad
- Bottom Axle Wrap
- Bottom Axle Wrap Liner
- ¾" Bolts, Washers and Nylon Locknuts

**FIGURE 9-23**



## DISASSEMBLY

Refer to Figure 9-23 when replacing the components of the STEERTEK axle as shown.

### WARNING

DO NOT USE A TORCH ON CLAMP GROUP BOLTS OR ANY OTHER PART OF THE SOFTEK SUSPENSION. IF THE CLAMP GROUP BOLTS WILL NOT COME LOOSE WITH AN IMPACT WRENCH, USE A CUT OFF WHEEL AND CUT THE SHANK OF THE BOLT. THE USE OF A TORCH CAN CAUSE DAMAGE TO CERTAIN SOFTEK COMPONENTS THAT CAN RESULT IN THE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

1. Place the vehicle on a level floor.
2. Chock the wheels.
3. Raise the vehicle.
4. Support the frame and suspend the front axle with the shocks attached.
5. Remove the front wheels, calipers, hubs, brake shoes, ABS sensors, and backing plate assembly.
6. Disconnect the drag link from the steering arm.
7. Support the axle.

### WARNING

THE REPAIR OR RECONDITIONING OF SUSPENSION OR AXLE COMPONENTS IS NOT ALLOWED. HENDRICKSON ADVISES REPLACING ALL COMPONENTS FOUND TO BE DAMAGED OR OUT OF SPECIFICATIONS. ALL MAJOR HENDRICKSON COMPONENTS ARE HEAT TREATED AND TEMPERED. SOFTEK COMPONENTS CANNOT BE BENT, WELDED, HEATED, OR REPAIRED WITHOUT REDUCING THE STRENGTH OR LIFE OF THE COMPONENT. FAILURE TO FOLLOW THESE GUIDELINES CAN CAUSE LOSS OF VEHICLE CONTROL, AND POSSIBLE PERSONAL INJURY OR DEATH OR PROPERTY DAMAGE AND WILL VOID APPLICABLE WARRANTIES.

8. Disconnect and remove the lower shock mounting bolts.
9. Remove the  $\frac{3}{4}$ " clamp group bolts and fasteners.
10. Lower the axle and remove from the vehicle.

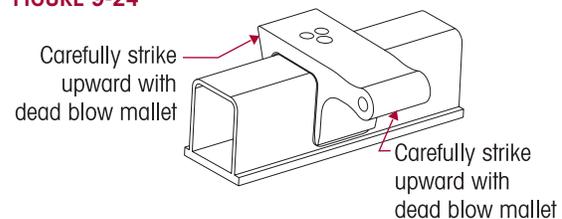
## FRONT AXLE (Removed from Chassis)

### DISASSEMBLY

1. Remove the bottom axle wrap and liner from the axle.

**FIGURE 9-24**

2. Strike the top axle wrap with a dead blow mallet at the front and rear on the underside of the axle wrap to dislodge it from the axle. See Figure 9-24.



3. After removal of the top axle wrap from the axle inspect for cracks or fretting.
4. Remove the tie rod assembly. See Tie Rod disassembly in this section.

### WARNING

REMOVAL OF THE CAP SCREWS WILL ALLOW THE STEERING KNUCKLE TO SEPARATE FROM THE AXLE. THE STEERING KNUCKLE MUST BE SUPPORTED BEFORE REMOVAL OF THESE TWO (2) CAP SCREWS. FAILURE TO DO SO CAN CAUSE COMPONENT DAMAGE OR PERSONAL INJURY.

5. Remove the two  $\frac{5}{8}$ " socket head cap screws from the steering knuckle assembly.
6. Remove the steering knuckle, thrust bearing, and shim pack if equipped.

7. After complete removal of the one side, repeat steps 1-6 for the opposite side of the axle.
8. Inspect the steering kingpin bushings for excessive wear. If worn, replace the kingpin bushings and seals. See the Kingpin Bushing replacement instructions in this section.

**PRE-ASSEMBLY**

1. Install the new upper axle wrap liner on the axle. Index the liner with the axle's guide pin, see Figure 9-25.

**CAUTION**

DO NOT STRIKE THE TOP AXLE WRAP WITH A HAMMER. DAMAGE TO THE ALUMINUM AXLE WRAP WILL OCCUR. USE A PLASTIC DEAD BLOW Mallet WITH CARE WHEN INSTALLING THE AXLE WRAP.

**WARNING**

SECURELY INSTALL THE TOP WRAP TO THE AXLE. FAILURE TO DO SO CAN CAUSE LOSS OF CONTROL OF THE VEHICLE, PERSONAL INJURY OR PROPERTY DAMAGE.

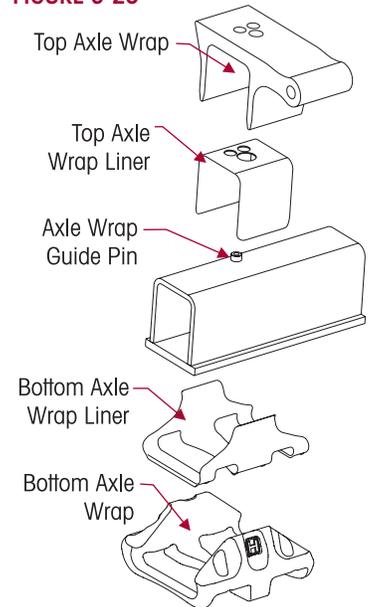
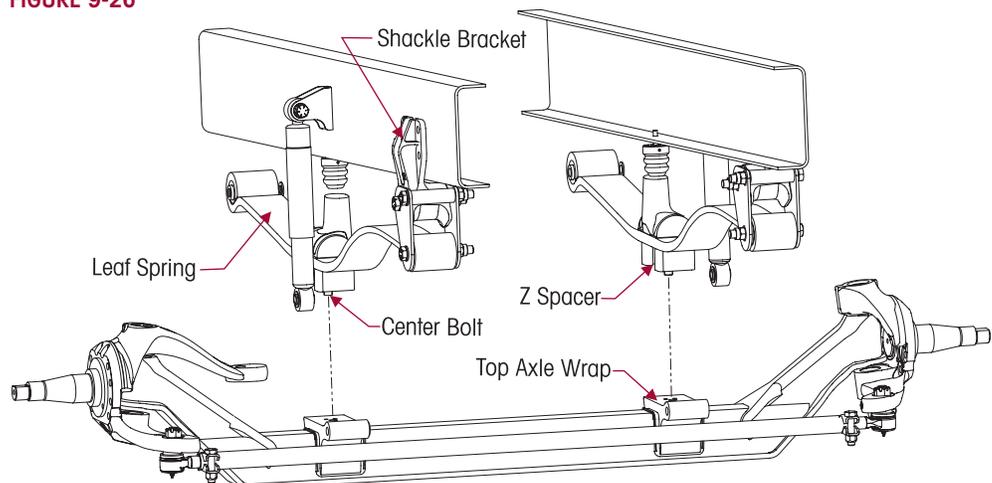
**SERVICE HINT**

Apply a lubricant (such as an aerosol silicone) to the outer surface of the plastic liner to aid in assembly of the top axle wrap.

2. Install the top axle wrap, the axle wrap must be aligned with the guide pin on the axle.
3. At this point in the assembly do not install anything further on the axle.

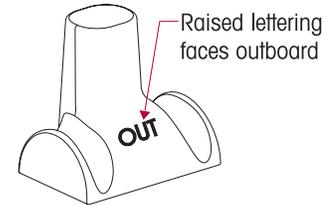
**ASSEMBLY**

1. Place the new axle on the floor jack and position the axle under the vehicle.
2. Raise the axle into position. Care must be taken at this point to ensure that the leaf spring bolt aligns with the axle top wrap. see Figure 9-26.
3. Verify that the leaf spring center bolt engages in the top axle wrap bore.

**FIGURE 9-25**

**FIGURE 9-26**


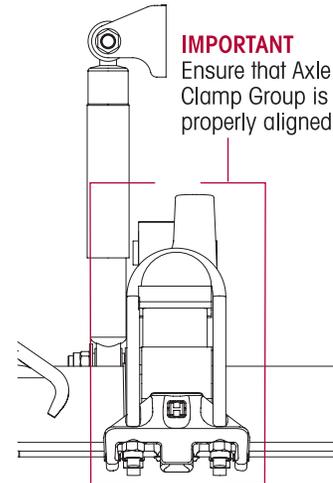
4. Completely raise the axle, engaging the leaf spring assembly into the axle wrap.
5. Install the top pad with the raised lettering "OUT" facing outboard side on the leaf spring assembly. See Figure 9-27.

FIGURE 9-27



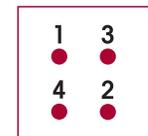
6. Install the new bottom axle wrap liners on the bottom axle wraps.
7. Install the bottom axle wraps on the axle.
8. Install the new  $\frac{3}{4}$ " clamp group U-bolts, washers and locknuts. Snug the bolts, **DO NOT** tighten to torque at this time.
9. Install the shock absorbers on  $\frac{3}{4}$ " lower shock mounting bolts. Install the washers and locknuts and tighten per vehicle manufacturer's torque specifications.
10. Ensure that the clamp groups are properly aligned and the U-bolts are seated in the top pad, and the bottom axle wraps are centered with the top axle wraps. See Figure 9-28.

FIGURE 9-28



11. Tighten the  $\frac{3}{4}$ " clamp group locknuts evenly in 50 foot pounds increments to 285-305 foot pounds torque in the proper pattern to achieve uniform bolt tension, see Figure 9-29.
12. Install the steering knuckles as per the Steering Knuckle replacement instructions in this section.
13. Install the tie rod tube.
14. Install the  $\frac{7}{8}$ " hardened washers on the Ackermann arm and the castle nuts. Tighten the castle nuts to 185 foot pounds, then rotate until the first castle slot lines up with the cotter pin bore in the tie rod end. Do not back off nut for cotter pin installation.
15. Install the cotter pins.
16. Connect the drag link. Install the castle nut. Tighten the castle nut to 185 foot pounds, then rotate until the first castle slot lines up with the cotter pin bore in the drag link. Do not back off nut for cotter pin installation.
17. Install cotter pin.
18. Install the brake backing plate assemblies.
19. Install the brakes, hubs, and wheels as per manufacturer's guidelines.
20. Fill the hubs with the proper lube (see manufacturer's guidelines for recommended lubrication).
21. Grease the front steering components as per lubrication guidelines in the Preventive Maintenance Section of this publication.

FIGURE 9-29



## STEERING KNUCKLE

### DISASSEMBLY

See tools needed to remove and install kingpin bushing under the Special Tools Section of this publication.

The steering knuckle disassembly and assembly includes the 'Kingpin Preparation' and Measurement' and Kingpin Bushing Removal process.

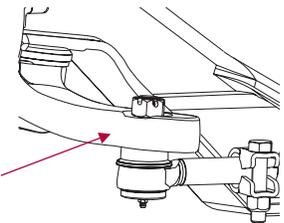
1. Place the vehicle on a level floor.
2. Chock the wheels.
3. Remove the wheel and hub assembly.
4. Remove the brake components from steering knuckle.
5. Remove the tie rod assembly.

#### Service Hint

Lightly tap the side of the Ackermann arm with a mallet to separate the tie rod end from the Ackermann arm, see Figure 9-30.

**FIGURE 9-30**

Lightly tap the side of Ackermann arm to loosen the tie end rod.



6. Remove the drag link from the knuckle.

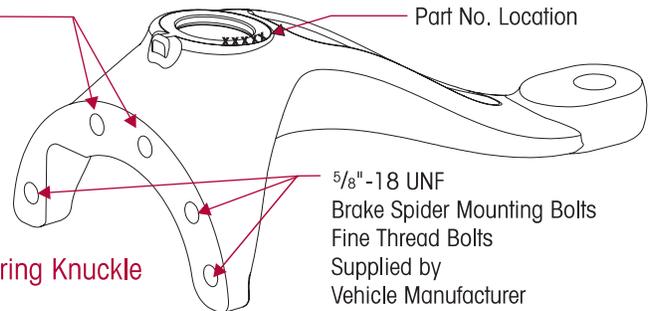
#### **WARNING**

REMOVAL OF THE CAP SCREWS (SEE FIGURE 9-31) WILL ALLOW THE STEERING KNUCKLE TO SEPARATE FROM THE AXLE. THE STEERING KNUCKLE MUST BE SUPPORTED BEFORE REMOVAL OF THESE TWO (2) CAP SCREWS. FAILURE TO DO SO CAN CAUSE COMPONENT DAMAGE OR PERSONAL INJURY.

7. Remove the 2 socket head cap screws that connect upper kingpin connection to the steering knuckle, see Figure 9-31 and 9-32.

**FIGURE 9-31**

$\frac{5}{8}$ "-11 UNC  
Socket Head Cap Screws  
Coarse Thread Bolts  
Supplied by Hendrickson



Left Hand Upper Steering Knuckle

$\frac{5}{8}$ "-18 UNF  
Brake Spider Mounting Bolts  
Fine Thread Bolts  
Supplied by  
Vehicle Manufacturer

#### SERVICE HINT

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

**FIGURE 9-32**

8. Remove the lower steering knuckle from the kingpin by sliding it down the kingpin.
9. Remove the upper steering knuckle by sliding it up off the kingpin.



**SERVICE HINT**

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

10. Remove the lower steering knuckle from the kingpin by sliding it down the kingpin.
- 11 Remove the upper steering knuckle by sliding it up off the kingpin.

**KINGPIN PREPARATION AND MEASUREMENT****CLEANING THE GROUND OR POLISHED PARTS**

- Use a cleaning solvent to clean ground or polished parts and surfaces. **DO NOT USE GASOLINE.**
- Do not clean ground or polished parts in a hot solution tank or with water, steam, or alkaline solutions. These solutions will cause corrosion of the parts.

**DRYING THE CLEANED PARTS**

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

**PREVENTING CORROSION ON CLEANED PARTS**

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

**WARNING**

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

**WARNING**

SOLVENT CLEANERS CAN BE FLAMMABLE, POISONOUS AND CAUSE BURNS. TO HELP AVOID SERIOUS PERSONAL INJURY, CAREFULLY FOLLOW THE 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, SOLVENTS OR OTHER MATERIALS THAT CONTAIN GASOLINE THAT CAN EXPLODE.
5. HOT SOLUTION TANKS OR ALKALINE SOLUTIONS MUST BE USED CORRECTLY. FOLLOW THE MANUFACTURER'S RECOMMENDED INSTRUCTIONS AND GUIDELINES CAREFULLY TO HELP PREVENT PERSONAL ACCIDENT OR INJURY.

**CAUTION**

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

**WARNING**

THE STEERTEK HAS A UNIQUE AXLE. THE KINGPIN IS CRYOGENICALLY INSTALLED IN THE AXLE. THE KINGPIN IS A NON-REPLACEABLE COMPONENT OF THE AXLE ASSEMBLY. DO NOT TRY TO REMOVE THE KINGPIN. IF THE KINGPIN SHOWS SIGNS OF MOVEMENT, CONTACT HENDRICKSON PRODUCT ENGINEERING – TECH SERVICES.

1. Prepare and polish the kingpin by removing all grease and excess debris using a fine grit (220 grit or higher) emery cloth and parts solvent. See Figures 9-33 through 9-36.

**FIGURE 9-33****FIGURE 9-34****FIGURE 9-35 KINGPIN BEFORE CLEANING****FIGURE 9-36 KINGPIN AFTER CLEANING**

2. Inspect the kingpin for wear or damage. Use a micrometer and measure the upper and lower kingpin in two locations. Positions must be 90° opposed from each other. If the kingpin has less than 1.802" diameter, replacement of the axle is necessary, see Figures 9-37 through 9-40.

**Kingpin minimum dimension is 1.802"**

**FIGURE 9-37****FIGURE 9-38****FIGURE 9-39****FIGURE 9-40**

## KINGPIN BUSHING REMOVAL

1. Remove the retaining ring for the grease cap.
2. A hydraulic shop press with a minimum forcing capacity of 2.5 tons (minimum press capacity of 5,000 psi or use an arbor press) will be required.

### WARNING

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

### CAUTION

BEFORE APPLYING HYDRAULIC PRESSURE TO REMOVE OR INSTALL THE KINGPIN BUSHING, SUPPORT THE LOWER STEERING KNUCKLE AS SHOWN IN FIGURES 9-41 AND 9-42. IMPROPER SUPPORT TO THE STEERING KNUCKLES CAN CAUSE COMPONENT DAMAGE.

3. Use the grease cap to press out the kingpin bushing and seal. Remove the grease zerk in the grease cap or use a hollow driver, (see Figure 9-41) to press out the kingpin bushing.
4. Install the lower steering knuckle upside down in press. Be sure to support the lower steering knuckle assembly so that it sits in-line with the press, see Figure 9-42.
5. Use the same procedure to remove the kingpin bushing in the upper kingpin connection or the steering arm, see Figures 9-43 through 9-44.
6. Clean the parts and inspect for reassembly.

FIGURE 9-41



FIGURE 9-42



FIGURE 9-43



FIGURE 9-44



## STEERING KNUCKLE BORE MEASUREMENT

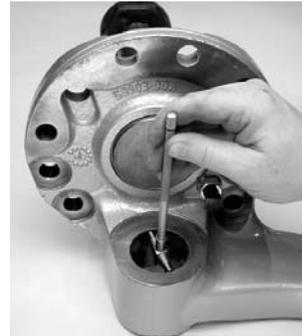
Complete the following steering knuckle bore inspection and the measurement instructions prior to installing the kingpin bushing.

1. Measure the upper knuckle bore inside diameter at two locations. Always use an inside micrometer or a telescoping gauge when taking a knuckle bore measurement. Some out-of-roundness at the top and bottom of the bore edges is acceptable. Steering knuckle bore diameter is  $1.938" \pm 0.003"$
2. Measure the upper and lower bore in two positions and at two locations. The two positions must be  $90^\circ$  opposed from each other. See Figures 9-45 through 9-47. If the average measurement is more than the knuckle bore maximum diameter specification, replace the knuckle.

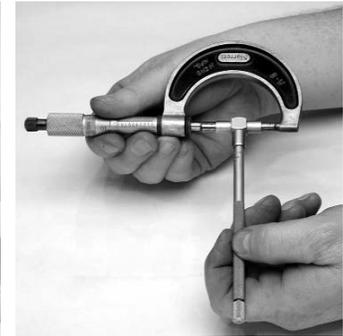
**FIGURE 9-45**



**FIGURE 9-46**



**FIGURE 9-47**



## KINGPIN BUSHING INSTALLATION

1. A hydraulic shop press with a minimum forcing capacity of 10 tons and a kingpin bushing driver will be required.

**WARNING**

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

2. Install the lower or upper steering knuckle in the press.
3. Install the kingpin bushing from the machined side (axle side) of the lower or upper steering knuckle using a bushing driver, (see driver specifications in the Special Tools Section of this publication). Press in bushing to a depth of no less than  $1\frac{5}{64}"$  (0.236") or 6 millimeters and no more than  $\frac{5}{16}"$  (0.32") or 8 millimeters, see Figures 9-48 and 9-49.
4. Following this procedure it is necessary to ream the kingpin bushings to fit the kingpins, (see Kingpin Bushing Reaming Instructions).

**FIGURE 9-48**



**FIGURE 9-49**



**FIGURE 9-50**



## KINGPIN BUSHING REAMING

### CAUTION

REAM THE KINGPIN BUSHINGS WITH AN ADJUSTABLE STRAIGHT FLUTE REAMER. (SEE SPECIAL TOOLS SECTION OF THIS PUBLICATION) DO NOT HONE OR BURNISH THE KINGPIN BUSHINGS. HONING OR BURNISHING WILL DAMAGE THE BUSHINGS AND VOID WARRANTY.

### WARNING

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

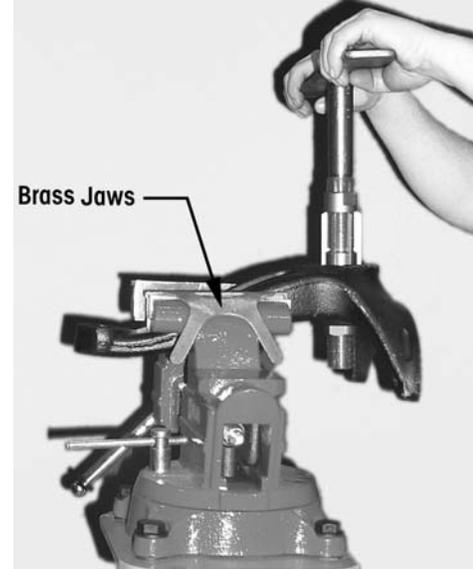
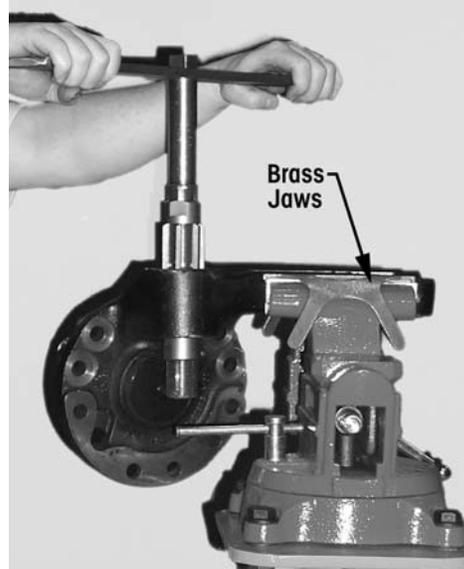
1. Install the lower steering knuckle assembly in a vise with brass jaws.

### SERVICE HINT

It is acceptable to mount the knuckle components in a vise either vertically or horizontally when performing the reaming procedure.

2. Install the reamer into the lower steering knuckle until the blades touch the kingpin bushing.
3. Rotate the reamer with light downward pressure. Rotate the reamer smoothly. DO NOT apply too much pressure, see Figures 9-51 and 9-52.

**FIGURE 9-51** LOWER STEERING KNUCKLE IN VISE    **FIGURE 9-52** UPPER STEERING KNUCKLE IN VISE



4. Slide the reamer out of the bottom of the steering knuckle assembly. If it is necessary to remove the reamer from the top, rotate the reamer opposite of cutting rotation.
5. Clean and remove all Kingpin bushing material from the steering knuckle assembly. Take special attention to remove material from the grease channels and dimples.
6. Clean the  $\frac{5}{8}$ " brake backing plate bolts with a wire wheel and run a tap through the threads of the lower steering knuckle assembly and then flush out with brake cleaner and dry with compressed air.

### WARNING

PRIOR TO INSTALLATION ENSURE THAT ALL RESIDUAL LOCTITE® MATERIAL IS REMOVED FROM THE MOUNTING BOLTS AND THE THREAD BORES IN THE UPPER STEERING KNUCKLES, AND NEW LOCTITE 277 OR EQUIVALENT IS APPLIED TO HELP ENSURE THAT THE BOLTS SUSTAIN THE PROPER TORQUE REQUIREMENT. FAILURE TO DO SO CAN CAUSE LOSS OF VEHICLE CONTROL RESULTING IN PERSONAL INJURY OR PROPERTY DAMAGE.

**NOTE**

The Hendrickson Genuine part, socket head cap screw comes with a pre-applied loctite compound.

7. Install the upper and lower steering knuckle on the kingpin.
8. Check for the proper fit by rotating the knuckle assembly back and forth to verify there is no binding on the kingpin, see Figures 9-53 and 9-54.
9. If the bushing is too tight repeat steps 1 through 8 until the proper clearance is achieved.

**NOTE**

Bushing size is to be 0.001" larger than the kingpin size.

**FIGURE 9-53****FIGURE 9-54****KINGPIN SEAL INSTALLATION**

1. Place the steering knuckle assembly in a vise with brass jaws or place on a suitable workbench. The steering knuckle will have the machined surface facing up (axle side up).
2. Lay the kingpin seal into the bore of the steering knuckle. The seal lip should face outward or toward the axle.
3. Use a bushing driver tool and press seal firmly into the steering knuckle assembly.
4. Install the kingpin seal until it makes contact with the kingpin bushing, see Figures 9-55 and 9-56.

**FIGURE 9-55****MAGNIFICATION OF LIP SEAL**

Lip seal faces toward axle.

**FIGURE 9-56**

Magnification of King Pin Bushing and Lip seal installed in steering knuckle.



## STEERING KNUCKLE ASSEMBLY

### ASSEMBLY

After replacement of the kingpin bushings it is necessary to reassemble the steering knuckle assemblies. Do not substitute aftermarket components when servicing.

1. Install the thrust bearing on the lower kingpin with the seal facing up toward axle (the black seal will designate the top side).
2. Install the shim on the upper kingpin.
3. Pack the bushing dimples on the upper and lower steering knuckles with multi purpose Lithium based grease (NLGI Grade 2) before installation.
4. Install the upper steering knuckle on the upper arm kingpin.
5. Install the lower steering knuckle on the lower kingpin and install the old socket head cap screws loose into the top two threaded holes.

**FIGURE 9-57**

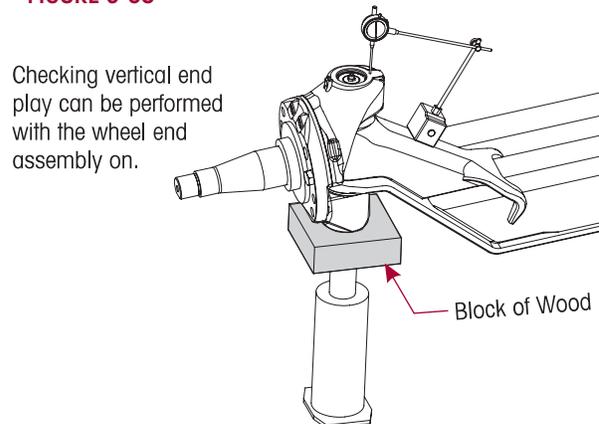


### SERVICE HINT

The easiest way to achieve this is with the grease caps not installed in the knuckle assemblies. This eliminates back pressure. The assembly can then freely slide up and down on the kingpin. If the grease caps are still installed, remove the grease zerks to avoid creating back pressure. Grease zerks will be re-installed at the end of the procedure.

6. Install a bottle jack under the lower knuckle and slightly raise the knuckle until it is possible to thread in the (3) brake torque plate mounting bolts by hand. These are for guide purposes only.
7. Snug the two socket head cap screws.
8. Lower the bottle jack so that all the vertical clearance is on the underside of the axle.
9. Affix a magnetic base dial indicator on the axle and place the tip of the dial indicator on top of the knuckle assembly. See Figure 9-58.
10. Zero the dial indicator.
11. Raise the bottle jack until there is no clearance between the knuckle assembly and the bottom of the axle, slightly lifting the axle.
12. Check the reading on the dial indicator. The specification for vertical travel on the steering knuckle during assembly is 0.008" to 0.011".
13. If the clearance is above 0.011", loosen the socket head cap screws and push down on the knuckle assembly until the proper vertical clearance is achieved. Add (0.005") shim if necessary.

**FIGURE 9-58**



Checking vertical end play can be performed with the wheel end assembly on.



14. If the clearance is below the 0.008", loosen the two socket head cap screws and pull up on the knuckle assembly until the proper vertical clearance is achieved. If the 0.008" minimum clearance is unattainable it may be necessary to remove a 0.005" shim.

**NOTE**

The  Hendrickson Genuine part, socket head cap screw comes with a pre-applied loctite compound.

**WARNING**

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

15. Remove one old socket head cap screw and replace with new socket head cap screw and tighten to  175-200 foot pounds torque.
16. Remove second socket head cap screw and replace with new socket head cap screw. Tighten socket head cap screw to  175-200 foot pounds torque.
17. Recheck the vertical clearance with the dial indicator or a 0.010" feeler gauge. See Figure 9-58.
18. Remove the three (3) brake torque plate mounting bolts, they should thread out freely.
19. Remove the bottle jack and continue assembling the wheel ends.
20. Install the brake torque plate.

**WARNING**

DO NOT GREASE KNUCKLES WITHOUT THE BRAKE TORQUE PLATE INSTALLED AND TIGHTENED TO PROPER TORQUE. FAILURE TO DO SO CAN CAUSE COMPONENT DAMAGE RESULTING IN FAILURE AND LOSS OF VEHICLE CONTROL, POSSIBLY CAUSING PERSONAL INJURY OR PROPERTY DAMAGE.

21. Install the tie rod end into the lower steering knuckle arm.
22. Tighten the castle nuts to  185 foot pounds torque then rotate the castle nut to the next castle slot and install cotter pin.
23. Install the drag link into the steering arm and tighten to vehicle manufacturer's specifications.
24. Install new o-rings on the grease caps and lubricate o-rings with grease.
25. Install grease caps and new retaining rings.
26. Apply loctite to the three (3) brake torque plate mounting bolts prior to installation into the brake torque plate. Tighten bolts to  180-200 foot pounds torque.

**IMPORTANT NOTE**

Loctite applied to the three (3) brake backing plate mounting bolts is a critical procedure to ensure that these bolts sustain the torque requirement of Steering knuckle assembly.

27. Install the hub, brake caliper assembly, wheels and tires.
28. Remove jack and safety stands.
29. Grease the steering knuckles with the vehicle on the floor.

## TIE ROD END AND CROSS TUBE

### NOTE

The tie rod assembly is designed for use on a mechanical suspension with hydraulic brakes, it is not designed for vehicles with air brakes.

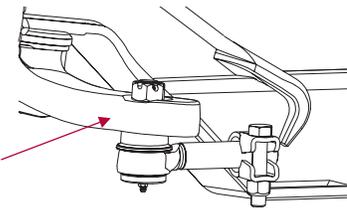
Hendrickson supplies different tie rod assemblies and each type may take a different replacement tie rod end kit to service. Prior to ordering find the part number on the tie rod tube, see Hendrickson publication no. SEU-0223 or contact Hendrickson Sales Engineering for corresponding kit numbers.

### DISASSEMBLY

1. Chock the wheels.
2. Position the steer axle tires straight ahead.
3. Remove the cotter pin and castle nut.
4. Lightly tap the side of the Ackermann arm to loosen the tie rod end from the Ackermann arm, see Figure 9-59.
5. Repeat to steps 3 and 4 to remove the other tie rod end.
6. Remove the cross tube and tie rod ends from the vehicle.
7. Mount the cross tube in a soft jaw vice.
8. Remove the hardware from the clamp on the cross tube.
9. Count the exposed threads on the tie rod end being replaced.
10. Remove the tie rod end from the cross tube.

**FIGURE 9-59**

Lightly tap the side of Ackermann arm to loosen the tie end rod.



### WARNING

DO NOT HEAT THE CROSS TUBE WITH A TORCH TO FACILITATE THE REMOVAL OF THE TIE ROD END. THE USE OF SUCH HEAT CAN ADVERSELY AFFECT THE STRENGTH OF THE CROSS TUBE. A COMPONENT DAMAGED IN THIS MANNER WILL RESULT IN LOSS OF WARRANTY, AND CAN RESULT IN THE AND LOSS OF VEHICLE CONTROL, AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

11. If the opposing tie rod end is being replaced repeat steps 8 through 10.
12. Inspect the cross tube for dents, cracks, or thread damage. Replace the cross tube if needed.

### ASSEMBLY

1. Lubricate the new tie rod end threads with Anti-Seize.

### NOTE

When installing the cross tube the thread direction of the tie rod ends are as follows:

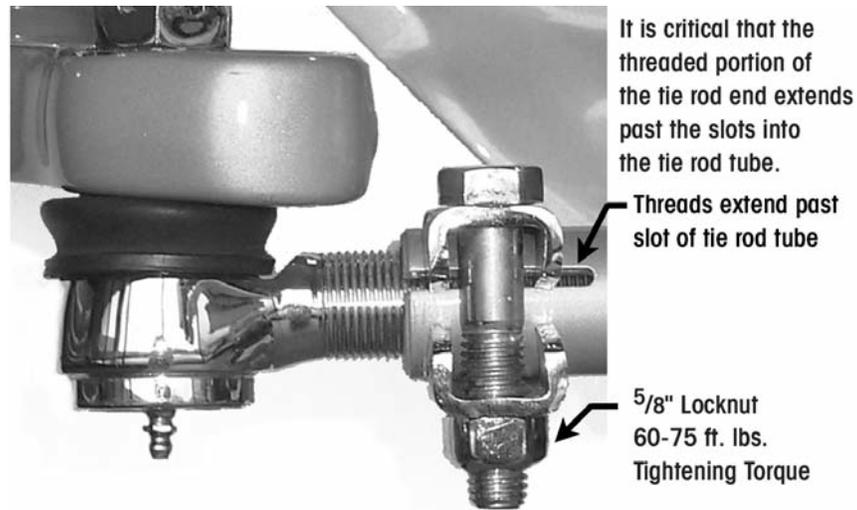
- A right hand threaded tie rod end will be installed into the right side Ackermann arm.
- A left hand threaded tie rod end will be installed into the left side Ackermann arm.

2. Install the new tie rod end into the cross tube, leaving the same amount of threads exposed that were counted on the failed tie rod end prior to removal.



### WARNING

THE THREADED PORTION OF THE TIE ROD END MUST EXTEND PAST THE SLOTS INTO THE TIE ROD CROSS TUBE, SEE FIGURE 9-60. FAILURE TO DO SO CAN CAUSE COMPONENT DAMAGE, LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

**FIGURE 9-60**


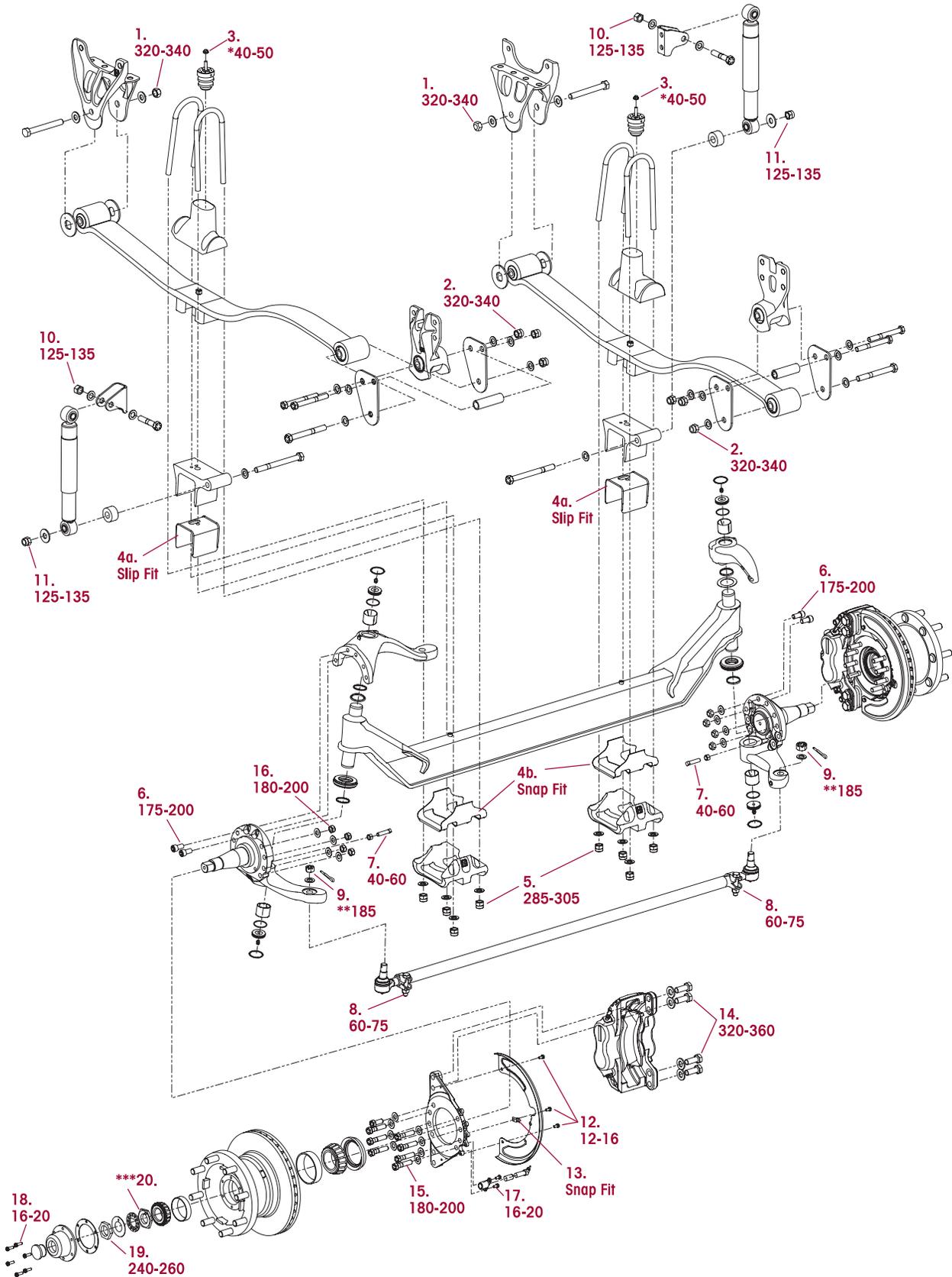
3. Replace the opposing tie rod end if necessary by repeating steps 2 and 3.
4. If replacing opposing tie rod end is not necessary it is critical that the cross tube will rotate in the opposing tie rod end.

**WARNING**

DO NOT HEAT THE CROSS TUBE WITH A TORCH TO ROTATE THE CROSS TUBE IN THE TIE ROD END. THE USE OF SUCH HEAT CAN ADVERSELY AFFECT THE STRENGTH OF THE CROSS TUBE. A COMPONENT DAMAGED IN THIS MANNER WILL RESULT IN LOSS OF WARRANTY, AND CAN RESULT IN THE LOSS OF VEHICLE CONTROL, AND POSSIBLE LOWER STEERING KNUCKLE PERSONAL INJURY OR PROPERTY DAMAGE.

5. Install the cross tube into the Ackermann arms.
6. Tighten the castle nuts to 185 foot pounds torque then rotate the castle nut to the next castle slot and install cotter pin.
7. Grease tie rod ends. See Lubrication Chart for required lubricant in the Preventive Maintenance Section of this publication.
8. Set the toe, (see the Toe Adjustment Procedure in the Alignment & Adjustments Section of this publication).

## Recommended torque values provided in foot pounds



# SOFTEK for Workhorse UFO Motorhome Chassis

HENDRICKSON RECOMMENDED TORQUE SPECIFICATIONS					
NO.	COMPONENT	QUANTITY	SIZE	TORQUE VALUE (in foot pounds)	
1	Front Frame Hanger to Spring Eye	2	3/4"	320-340	
2	Rear Shackle Bracket to Leaf Spring	6	3/4"	320-340	
3	Auxiliary Bumper	2	*M10	*40-50	
4	Axle Clamp Group Liners	A. Upper	2	Formed	Slip Fit
		B. Lower	2	Formed	Snap Fit
 <b>WARNING</b> DO NOT ASSEMBLE CLAMP GROUP WITHOUT AXLE WRAP DELRIN LINERS. FAILURE TO DO SO CAN CAUSE LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE OR PERSONAL INJURY.					
5	Clamp Group Hardware	4	3/4"	285-305	
	 <b>WARNING</b> ENSURE CLAMP GROUP IS ALIGNED PROPERLY PRIOR TO TIGHTENING HARDWARE. FAILURE TO DO SO CAN CAUSE LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE OR PERSONAL INJURY.				
6	Knuckle Attachment Bolt (Socket Head Cap Screw)	4	5/8"	175-200	
7	Knuckle / Axle Wheel Stop Bolt	2	5/8"	40-60	
8	Tie Rod Tube to Tie Rod End	2	5/8"	60-75	
9	Tie Rod End to Lower Steering Knuckle (Castle Nut)	2	7/8"	**185	
10	Upper Shocks Eye to Shock Bracket	2	3/4"	125-135	
11	Lower Shock Eye to Top Wrap	2	3/4"	125-135	
12	Torque Plate to Dust Shield	6	M8	12-16	
13	Clip to Dust Shield	2		Snap Fit	
14	Torque Plate to Caliper (at the Bolt head)	8	M20	320-360	
15	Torque Plate to Lower Steering Knuckle Assembly (at Bolt head)	16	5/8"	180-200	
16	Torque Plate to Lower Steering Knuckle Assembly (at Locknut)	8	5/8"	180-200	
17	Torque Plate to ABS Bracket (at the Bolt Head)	4	5/16"	16-20	
18	Hubcap	12	5/16"	16-20	
19	Outer Nut to Hubcap	2	1 1/2"	240-260	
20	Inner (adjusting) Nut to Hubcap	2	1 1/2"	***	
21	Rotor Capscrew (not shown)	10	9/16"	100-125	
<ul style="list-style-type: none"> <li>• All hardware 1/4" and greater is Grade 8 with no additional lubrication.</li> <li>• Frame mount hardware in most cases huck style fasteners supplied by the vehicle or chassis and body manufacturer.</li> </ul>					
<b>NOTES:</b> <ul style="list-style-type: none"> <li>* All hardware highlighted in gray in the matrix denotes items are not supplied by Hendrickson. For torque requirements see vehicle manufacturer. Torque values listed above apply only to fasteners supplied by Hendrickson. If non Hendrickson fasteners are used, follow torque specification listed in vehicle manufacturer's service manual.</li> <li>** Torque to 185 foot pounds, advance nut to next hex face to install cotter pin. Do not back off nut for cotter pin installation.</li> <li>*** See Wheel Bearing Adjustment in the Alignment &amp; Adjustments Section of this publication for proper torque procedure.</li> </ul>					

## SOFTEK for Workhorse UFO Motorhome Chassis

## TROUBLESHOOTING GUIDE

CONDITION	POSSIBLE CAUSE	CORRECTION
Worn or damaged kingpins and kingpin bushings	Dirt in system– contaminated lubricant	Polish and inspect kingpin, replace bushing and seals, then follow specified lubrication procedures
	Incorrect lubricant	Lubricate axle with specified lubricant
	Axle not lubricated at scheduled frequency	Lubricant axle at scheduled frequency
	Incorrect lubrication procedures	Use correct lubrication procedures
	Lubrication interval not compatible with operating conditions	Change lubrication interval to match operating conditions
	Worn or missing seals	Replace worn or missing seals
Vibration or shimmy of front axle during operation	Caster out of specification	Adjust caster
	Wheels and/or tires out of balance	Balance or replace wheels and/or tires
	Worn shock absorbers	Replace shock absorbers
	Wheel bearing adjustment	Adjust wheel bearing to vehicle manufacturers specifications
	Brake rotor is warped	See Vehicle manufacturer for brake support component
Excessive wear on tires or uneven tire tread wear	Tires have incorrect air pressure	Adjust tire pressure to manufacturer's specification
	Tires out of balance	Balance or replace tires
	Incorrect axle alignment	Align axles
	Incorrect toe setting	Adjust toe-in to manufacturer's specification
	Incorrect steering arm geometry	Repair steering system as necessary
	Excessive wheel bearing end play	Check specified wheel nut torque, replace worn or damaged wheel bearings
	Wheel bearing adjustment	Adjust wheel bearing to vehicle manufacturer's specifications
Vehicle is hard to steer	Low pressure in the power steering system	Repair power steering system
	Steering linkage needs lubrication	Lubricate steering linkage
	Steering knuckles are binding	Check vertical clearance
	Incorrect steering arm geometry	Repair steering system as necessary
	Caster out of adjustment	Adjust caster as necessary
	Tie rod ends hard to move	Grease or if problem persists replace tie rod ends
	Worn thrust bearing	Replace thrust bearing

## SOFTEK for Workhorse UFO Motorhome Chassis

## TROUBLESHOOTING GUIDE (CONTINUED)

CONDITION	POSSIBLE CAUSE	CORRECTION
Tie rod ends are worn and require replacement	Tie rod ends need lubrication	Lubricate tie rod end. Make sure lubrication schedule is followed.
	Severe operating conditions	Increase frequency of inspection and lubrication intervals
	Damaged boot on tie rod end	Replace tie rod end
Bent or broken cross tube, tie rod end ball stud or tie rod end  NOTE: Damaged components require replacement	Pump/gear relief valve pressure setting exceeds system specifications	Adjust power steering system to manufacturer's specified pressure
	Steering gear poppet improperly set or malfunctioning	Check for proper operation or adjust poppet to OEM specifications
	Axle stops improperly set	Set axle stops to OEM specifications
	Axle stops improperly set	Increase frequency of inspection and lubrication intervals
Worn or broken steering ball stud	Drag link fasteners tightened past specified torque	Tighten drag link fasteners to the specified torque
	Lack of lubrication or incorrect lubricant	Lubricate linkage with specified lubricant
	Power steering stops out of adjustment	Adjust steering stops to OEM specifications
Suspension has harsh or bumpy ride	Broken or worn leaf spring	Replace leaf spring
	Front suspension overloaded	Redistribute steer axle load
	Cracked or missing auxiliary bumper	Inspect and replace auxiliary bumper if necessary
Restricted steering radius	Steering stops not adjusted correctly	Adjust steering stops to achieve correct wheel cut
Vehicle leans	Leaf spring broken	Replace leaf spring
	Excessive weight bias	Contact vehicle manufacturer
	Cracked or missing auxiliary bumper	Inspect and replace auxiliary bumper if necessary
Vehicle wanders	Caster out of specification	Adjust caster to specification
	Incorrect toe setting	Adjust toe to specification
	Air in the power steering system	Remove air from the power steering systems
	Rear ride height out of adjustment (if applicable)	Adjust ride height to specification (if applicable)

# SOFTEK for Workhorse UFO Motorhome Chassis

## MECHANICAL MODULE SUSPENSION ALIGNMENT SPECIFICATION

CAMBER <sup>1</sup>	DESIGN SPECIFICATION	RANGE	
		MINIMUM	MAXIMUM
LEFT	0.00° ± 1°	-1°	+1°
RIGHT	- 0.25° ± 1°	-1.25°	+0.75°
CROSS	0.00 Max 2°	—	—

### CAMBER NOTES:

- <sup>1</sup> The camber angle is not adjustable. Do not bend axle or otherwise try to adjust camber. If found out of specification, notify Hendrickson Tech Services for further information.

CASTER <sup>1,2</sup>	DESIGN SPECIFICATION	RANGE	
		MINIMUM	MAXIMUM
LEFT	3.9° ± 1°	+2.9°	+4.9°
RIGHT	3.9° ± 1°	+2.9°	+4.9°
CROSS <sup>3</sup>	0.00 Max 2°	—	—

### CASTER NOTES:

- <sup>1</sup> Caster is determined with the vehicle at specified ride height for air suspension or at rated load for mechanical suspension systems. It is critical that the vehicle front and rear ride height is within specifications prior to performing a caster measurement or adjustment. See Hendrickson ride height specifications and procedure.
- <sup>2</sup> In most cases actual vehicle caster is defined with the frame rails at zero slope. Refer to the vehicle manufacturer's specifications for correct frame rail slope. (Both the alignment surface and the vehicle's frame rails should be level during execution of alignment procedures). For vehicles with a positive frame rake (higher in rear) add the frame slope (in degrees) to the caster reading to determine true vehicle caster.
- <sup>3</sup> **The cross caster angle is not adjustable** – Do not bend axle or otherwise try to adjust cross caster. If found out of specifications notify Hendrickson Tech Services for further information. Changes to caster can be attained by using caster shims as provided by the vehicle manufacturer or chassis and body manufacturer. Caster shims must match, side to side, to reduce uneven loading to the suspension components. **The use of two different angle caster shims will not correct cross caster.**
- <sup>4</sup> **Example of caster alignment** – 2.5° RH/3° LH, would require one, 1.000 shim on each side to increase caster and achieve 3.50° RH/4.00° LH, which is in specification. Do not attempt to use uneven shims.

### Hendrickson recommends the following TMC practices<sup>2</sup> for Total Toe:

	DESIGN SPECIFICATION*	RANGE	
		MINIMUM	MAXIMUM
TOTAL TOE <sup>2</sup>	1/16" ± 1/32" (0.06" ± 0.03")	1/32" (0.03")	3/32" (0.09")

### TOE-IN NOTES:

- <sup>1</sup> In most instances total toe is set by the vehicle manufacturer or body builder. Consult the vehicle manufacturer for specifications.
- <sup>2</sup> Toe-in is to be set and adjusted in the normal vehicle unladed configuration. Actual vehicle curb weight on the ground. Toe should be checked at the tires front and rear tread center, at a distance above ground equal to the tire's rolling radius.

# Reference Material

This technical publication covers Hendrickson Truck Suspension's recommended procedures for our parts/products. Other components play a major role in overall performance and Hendrickson recommends you follow the specific vehicle manufacturer's recommendation for care and maintenance. Some recommended procedures have been developed by The Technology & Maintenance Council (TMC) and Hendrickson supports these recommendations. We have compiled a list of these below.

## TMC

To obtain copies of the following RP's, video's, or charts, contact TMC at:

TMC/ATA  
2200 Mill Road  
Alexandria, VA 22314

Phone: 703-838-1763  
website: [tmc.truckline.com](http://tmc.truckline.com)  
online ordering: [www.truckline.com/store](http://www.truckline.com/store)

### Important References

TMC RP 214B	Tire/Wheel End Balance and Runout
TMC RP 216	Radial Tire Conditions Analysis Guide
TMC RP 219A	Radial Tire Wear Conditions and Causes
TMC RP 222A	User's Guide To Wheels and Rims
TMC RP 230	Tire Test Procedures for Tread wear, Serviceability, and Fuel Economy
TMC RP 514	Pre-Alignment Inspection
TMC RP 618	Wheel Bearing Adjustment Procedure
TMC RP 620B	Front End Alignment Steering Geometry
TMC RP 708A	Trailer Axle Alignment
TMC RP 642	Guidelines For Total Vehicle Alignment
TMC RP 644	Wheel End Conditions Analysis Guide
TMC RP 645	Tie Rod End Inspection and Maintenance Procedure

### Video's

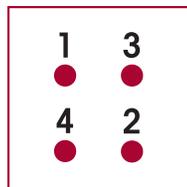
TMC T0326	Wheel End Maintenance
TMC T0372	Tire Pre-Trip Inspection Guidelines

### Other

TMC T0400	Wheel bearing Adjustment Procedure Wall Chart
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# Technical Procedure Publication Quiz

- 1) What three items have the greatest influence on tire wear?
  - a) Toe
  - b) Air Pressure
  - c) Camber
  - d) Thrust Angle
- 2) Caster may be increased or decreased using shims or wedges.  
True or False
- 3) Cross caster may be changed using shims or wedges.  
True or False
- 4) You may bend a STEERTEK axle to correct for improper camber settings.  
True or False
- 5) In an unladen vehicle the correct toe setting for the STEERTEK axle is?
  - a) 0 to negative  $\frac{1}{16}$ "
  - b) 0 to positive  $\frac{1}{32}$ "
  - c) Positive  $\frac{1}{32}$ " to positive  $\frac{3}{32}$ "
  - d) Positive  $\frac{1}{32}$ " to positive  $\frac{1}{8}$ "
- 6) When reducing wheel cut on the STEERTEK axle it is necessary to check the steering gear box poppet.  
True or False
- 7) The torque requirement for the  $\frac{3}{4}$ " front and rear spring hanger eye bolts are the same.  
True or False
- 8) The rear spring hangers are interchangeable from right to left.  
True or False
- 9) When servicing the clamp group a technician should always replace the following items.
  - a)  $\frac{3}{4}$ " U-bolts and nylon locknuts (Grade 8)
  - b) Bottom axle wrap liner
  - c) Upper axle wrap liner, if removed
  - d) All of the above
- 10) What is the clamp group final torque?
  - a)  500-550 foot pounds
  - b)  285-305 foot pounds
  - c)  290-310 foot pounds
  - d) Vehicle Manufacturer Specified
- 11) What is the  torque pattern for the clamp group? See Figure below.



- a) 1,3,2,4
- b) 1,4,2,3
- c) 1,2,3,4
- d) The torque pattern does not matter

- 12) For a vehicle equipped with a STEERTEK axle it is an acceptable practice to tow using a tow chain wrapped around the axle.  
True or False

- 13) When re-bushing the front spring eye it is necessary to:
- Heat the spring eye
  - Press the bushing in and out
  - Remove the front spring hanger
  - None of the above
- 14) To remove the STEERTEK knuckle you must.
- Drive the kingpin out of the axle bore
  - Remove the locking pins before driving the kingpin out
  - Remove the two  $\frac{5}{8}$ " socket head cap screws and separate the knuckle assembly
  - None of the above
- 15) What is the maximum allowable specification for lateral movement of the steering knuckle?
- 0.001"
  - 0.075"
  - 0.011"
  - 0.015"
- 16) Worn kingpins are easily removed and replaced.  
True or False
- 17) The lower shock eye bolt mounting torque is:
-  125-135 foot pounds
  -  225-255 foot pounds
  - Not critical
  - None of the above
- 18) Although the SOFTEK is low maintenance, it is recommended to do a visual inspection on the axle and suspension every \_\_\_\_\_ months.
- 12 months
  - 6 months
  - Never
- 19) When replacing the rear spring  $\frac{3}{4}$ " length hanger bolts the new bolts should be installed.
- From the outside facing in
  - It does not matter what direction the bolts are facing
  - From the inside facing out
  - None of the above
- 20) The STEERTEK axle combined with the clamp group and stiff front spring limb help to make the SOFTEK torsionally rigid and reduce body roll.  
True or False
- 21) How many grease points are there on the STEERTEK axle?
- 2
  - 6
  - 8
  - None
- 22) It is acceptable to replace a failed shock absorber with any brand that will fit.  
True or False
- 23) A shock that is misting is classified as a leaking shock and should be replaced immediately.  
True or False
- 24) Wheel bearing adjustment has no impact on tire wear.  
True or False
- 25) To heat test a shock absorber you should drive a vehicle at moderate speeds for fifteen minutes.  
True or False

- 26) Prior to performing a total vehicle alignment the following components must be inspected.
- a) Front and rear spring mounts
  - b) Steer axle tires
  - c) Tie rod ends
  - d) All of the above
- 27) When the clamp group is disassembled the use of a cutting torch is acceptable to help remove seized bolts and nuts.  
True or False
- 28) Prior to steering knuckle re-assembly it is critical that residual Loctite be removed from the upper kingpin connection.  
True or False
- 29) Are the thrust bearings different on each side of the axle?
- a) Yes
  - b) No
- 30) If the kingpin bushing is worn, then both bushings on that knuckle need to be replaced.  
True or False
- 31) The unique packaging of the steering knuckle will allow up to \_\_\_\_\_ degrees of wheel cut on the STEERTEK axle.
- a) 55°
  - b) 32°
  - c) 87°
  - d) None of the above
- 32) A pre-alignment inspection reveals a tie rod end is worn out of specification. What is the correct action needed to complete the alignment.
- a) Fill the tie rod with grease to absorb excessive play
  - b) Replace the tie rod and reset toe before alignment
  - c) Perform alignment and then replace tie rod end and reset toe
  - d) Align vehicle and do not repair tie rod end
- 33) The seal on the thrust bearings are installed facing down.
- a) True
  - b) False
  - c) Doesn't matter
- 34) When servicing tie rod ends it is not necessary to have the part number located on the tie rod tube to order tie rod service kits.  
True or False
- 35) When checking the wheel bearing end play the required specification is:
- a) 1.0" to 5.0"
  - b) 0.003" to 0.007"
  - c) 0.001" to 0.005"
  - d) no adjustment required

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**CERTIFICATE**

Hendrickson will provide a personalized SOFTEK Technical Procedure Quiz Achievement Certificate to candidates scoring 80% or higher on the test. Simply complete the test and fill in the enclosed answer sheet or write your answers on a separate sheet with the return address, name, phone number, and company name as it will appear on the award and mail to:

Hendrickson  
ATTN: Truck Marketing Quiz Assessment  
800 S. Frontage Road  
Woodridge, Illinois 60517



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