



H TECHNICAL PROCEDURE

SOTTEK® Front Suspension System for Lion Bus

SUBJECT: Service Instructions

LIT NO: 17730-312

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SECTION 1

Introduction

This technical publication is intended to acquaint and assist maintenance personnel in the preventive maintenance, service, repair and rebuild of the following Hendrickson equipment as installed on applicable Lion Bus:

- **SOFTEK®** — An integrated steel spring mechanical suspension with the STEERTEK axle
- **STEERTEK** — A durable, lightweight, fabricated steer axle assembly

See Parts List Section of this publication 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.

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 Suspensions and the STEERTEK axle.

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

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

SECTION 2

Product Description

FIGURE 2-1 SOFTEK with Drum Brakes

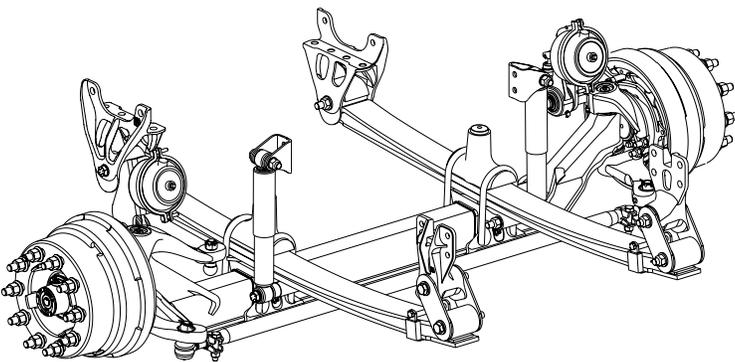
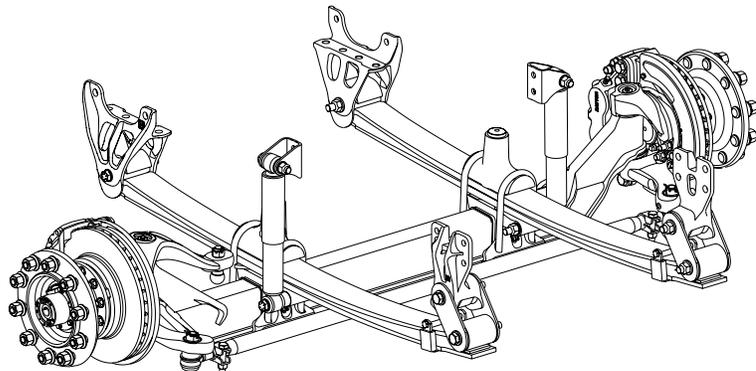


FIGURE 2-2 SOFTEK with Disc Brakes



SOFTEK — is an integrated front mechanical suspension and robotically welded steer axle that work together to form an integrated torsion system. Utilizing a system approach, Hendrickson has engineered and optimized components to form a system delivering ride, stability and handling characteristics with reduced weight and maintenance.

- **Front and Rear Frame Brackets** — SOFTEK brackets with optimized designs deliver weight reduction and proven durability.
- **Leaf spring assembly** — SOFTEK leaf spring, with its innovative design, provides superior stability, performance and a soft ride. Durable rubber front and patented rear bushings are greaseless and only require periodic inspections.
- **Shock absorbers** — SOFTEK utilizes premium shock absorbers that have been tested and tuned specifically for the suspension system.

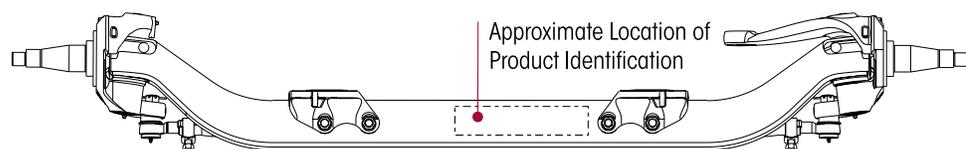
STEERTEK — Integrated into the SOFTEK system, the box-shaped design provides a stiffer axle and resists torsional, longitudinal and vertical loads more effectively than traditional I-Beam axles. Together with the front limbs of the leaf springs, the fabricated axle beam forms a torsion system, enhancing 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
 - Bottom Axle Wrap
 - Top Axle Wrap Liner
 - Bottom Axle Wrap Liner
 - Top pad
 - ¾" U-bolts / Hex Bolts, Washers and Nylon Locknuts
- **Adjustable Tie Rod** — To help maximize tire life, the tie rod easily adjusts 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 50° wheel cut. The two piece knuckle design makes replacing the kingpin bushings easier by eliminating the need to remove the kingpins.

TECHNICAL NOTES

1. SOFTEK is approved for 100% on-highway use with up to 10% off-highway uses; other applications that exceed 10% off-highway use must be pre-approved by Hendrickson and the vehicle manufacturer. The SOFTEK systems for Lion bus is 10,500 pound capacity.
2. The STEERTEK axle is available with 70.87" Kingpin Intersections (KPI).
3. The STEERTEK axle offers 4.25" axle beam drop height. Axle beam drop is measured from the kingpin intersection to the top of the axle.
4. SOFTEK is integral to and available exclusively with the STEERTEK axle. This system is anti-lock braking system (ABS) ready. STEERTEK is compatible with industry standard wheel ends and brakes.
5. 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. The steering knuckles and clamp group are part of the axle assembly

FIGURE 2-3 Front view of STEERTEK axle showing approximate location of product identification.



SECTION 3

Important Safety Notice

Proper maintenance, service and repair is important to 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.

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

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

■ EXPLANATION OF SIGNAL WORDS

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



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

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

DANGER

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

WARNING

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

CAUTION

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

NOTE

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

SERVICE HINT

A helpful suggestion, which 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.



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



■ SAFETY PRECAUTIONS

WARNING

FASTENERS

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

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, USING A REGULARLY CALIBRATED TORQUE WRENCH. TORQUE VALUES SPECIFIED IN THIS TECHNICAL PUBLICATION ARE FOR HENDRICKSON SUPPLIED FASTENERS ONLY. IF NON HENDRICKSON FASTENERS ARE USED, FOLLOW TORQUE SPECIFICATION LISTED IN THE VEHICLE MANUFACTURER'S SERVICE MANUAL.

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

PERSONNEL PROTECTIVE EQUIPMENT

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

CAUTION

PROCEDURES AND TOOLS

A MECHANIC 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

SUPPORT THE VEHICLE PRIOR TO SERVICING

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

WARNING

SHOCK ABSORBERS

THE SHOCK ABSORBERS ARE THE REBOUND TRAVEL STOPS FOR THE SPRINGS. ANYTIME THE FRONT AXLE ON AN 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.

WARNING

KINGPINS

STEERTEK IS A UNIQUE AXLE, IN THAT 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 TECHNICAL SERVICES DEPARTMENT.

WARNING

MODIFYING COMPONENTS

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

 **WARNING****TORCH / WELDING**

DO NOT USE A CUTTING TORCH TO REMOVE ANY ATTACHING FASTENERS. THE USE OF HEAT ON SUSPENSION AND AXLE 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 LEAF SPRING ASSEMBLY AND AXLE. DO NOT CONNECT ARC WELDING GROUND LINE TO THE LEAF SPRING ASSEMBLY OR AXLE. DO NOT STRIKE AN ARC WITH THE ELECTRODE ON THE LEAF SPRING ASSEMBLY OR AXLE. DO NOT USE HEAT NEAR THE LEAF SPRING ASSEMBLY OR AXLE. DO NOT NICK OR GOUGE THE LEAF SPRING ASSEMBLY OR AXLE. SUCH IMPROPER ACTIONS CAN CAUSE DAMAGE TO THE LEAF SPRING ASSEMBLY OR THE AXLE COULD FAIL, AND CAN CAUSE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

 **WARNING****AXLE CAMBER**

UNAUTHORIZED WELDING OR MODIFICATIONS CAN CAUSE CRACKS OR OTHER AXLE STRUCTURAL DAMAGE AND RESULT IN LOSS OF VEHICLE CONTROL, SEVERE PERSONAL INJURY OR DEATH. DO NOT BEND, WELD OR MODIFY AXLE WITHOUT AUTHORIZATION FROM HENDRICKSON.

AXLE CAMBER IS NOT ADJUSTABLE. DO NOT CHANGE THE AXLE CAMBER ANGLE OR BEND THE AXLE BEAM, SEE FIGURE 3-2. BENDING THE AXLE BEAM TO CHANGE THE CAMBER ANGLE CAN DAMAGE THE AXLE AND REDUCE AXLE STRENGTH, WILL VOID HENDRICKSON'S WARRANTY AND CAN CAUSE LOSS OF VEHICLE CONTROL, POSSIBLY CAUSING PERSONAL INJURY OR PROPERTY DAMAGE.

 **WARNING****DAMAGED COMPONENTS**

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

IN ADDITION, IN THE EVENT A CRASH RESULTS IN EXCESSIVE SIDE LOAD DAMAGE TO ADJACENT PARTS, SUCH AS A BENT WHEEL, HUB, OR SPINDLE, IT IS STRONGLY RECOMMENDED TO REPLACE 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 ANY APPLICABLE WARRANTIES.

 **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 PROCEDURE:

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

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 OR AXLE WHEN TOWING THE VEHICLE. THE USE OF TOW STRAPS ARE NECESSARY TO TOW A DISABLED VEHICLE FROM A REPAIR FACILITY PARKING LOT INTO THE SHOP BAY. THE TOW STRAPS SHOULD BE CONNECTED TO THE TOW HOOKS PROVIDED BY THE VEHICLE MANUFACTURER AT THE FRONT OF THE BUMPER. IF THE USE OF TOW HOOKS IS NOT AN OPTION, THEN TOW STRAPS MAY BE WRAPPED AROUND THE FRONT STEERTEK AXLE, SEE FIGURE 3-1, IN A MANNER THAT IS ACCEPTABLE FOR TOWING THE VEHICLE FROM A REPAIR FACILITY PARKING LOT INTO THE SHOP BAY. DO NOT USE A TOW CHAIN AROUND THE FRONT STEERTEK AXLE TO TOW THE VEHICLE, DOING SO WILL DAMAGE THE AXLE AND VOID ANY APPLICABLE WARRANTY, SEE FIGURE 3-1. FOR DETAILED INSTRUCTIONS FOR ON-HIGHWAY TOWING, SEE TOWING PROCEDURE SECTION OF THIS PUBLICATION.

FIGURE 3-1



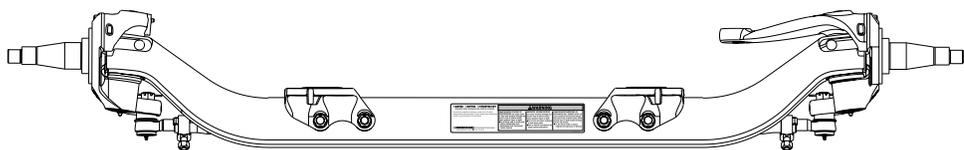
WARNING

REPAIR AND RECONDITIONING

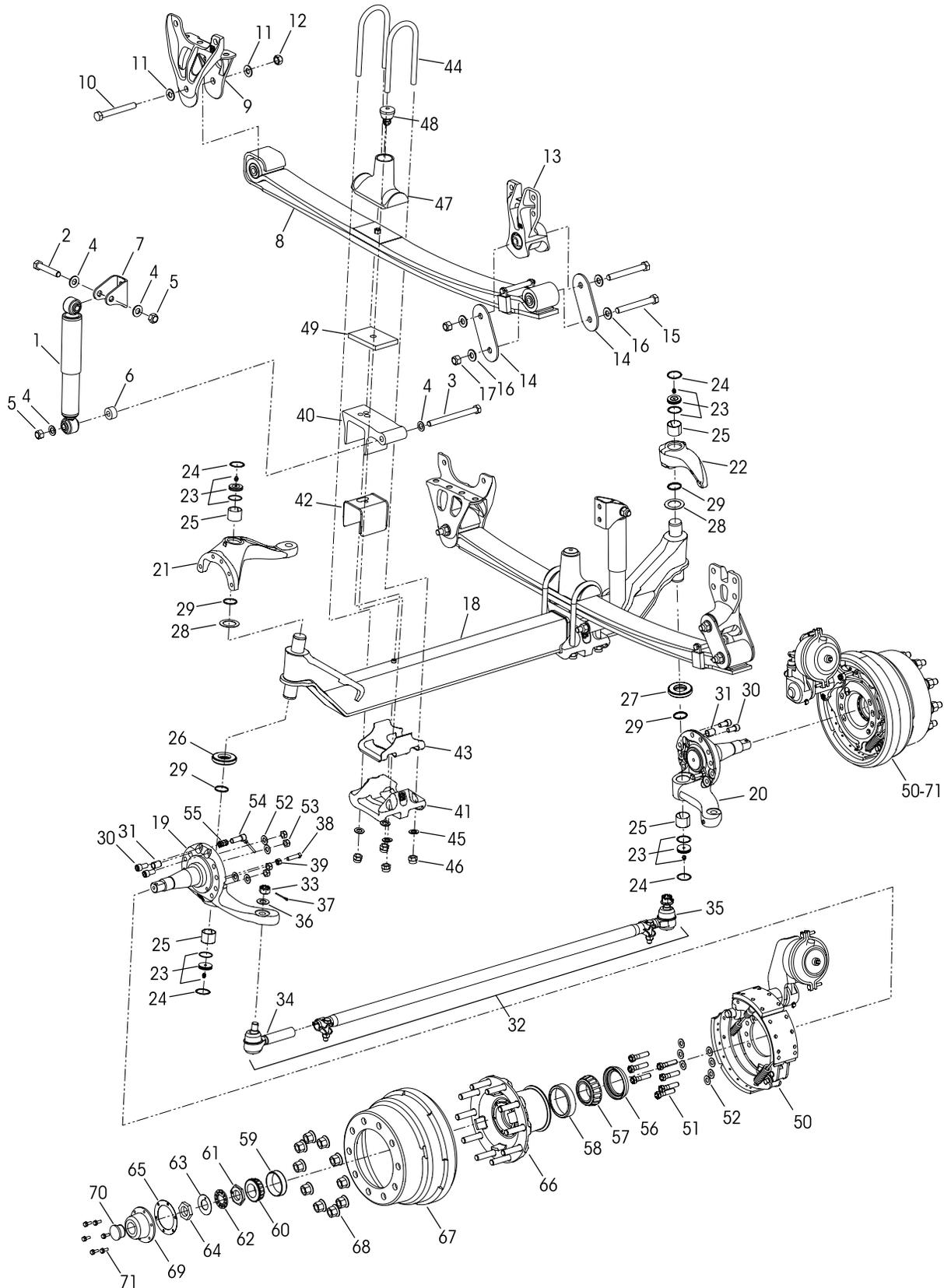
THE REPAIR OR RECONDITIONING OF SUSPENSION OR AXLE COMPONENTS IS NOT ALLOWED, SEE LABEL IN FIGURE 3-2. ANY AXLE COMPONENTS FOUND TO BE DAMAGED OR OUT OF SPECIFICATIONS MUST BE REPLACED. ALL MAJOR HENDRICKSON COMPONENTS ARE HEAT TREATED AND TEMPERED. SOFTEK COMPONENTS CANNOT BE BENT, WELDED, HEATED, OR 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.

FIGURE 3-2 REPLACE ANY SAFETY DECALS THAT ARE FADED, TORN, MISSING, ILLEGIBLE, OR OTHERWISE DAMAGED. CONTACT HENDRICKSON TO ORDER REPLACEMENT LABELS.

<p>HAIRTEK® SOFTEK® STEERTEK NXT INTEGRATED FRONT SUSPENSION AND STEER AXLE SYSTEMS</p>	<p>WARNING</p>	
<p><small>This article is covered by at least one or more of the U.S. and/or foreign patents and/or pending U.S. and/or foreign patent applications posted at: www.hendrickson-intl.com/patents</small></p>	<p>UNAUTHORIZED WELDING OR MODIFICATIONS can cause cracks or other axle structural damage and result in loss of vehicle control, severe personal injury or death.</p> <ul style="list-style-type: none"> ■ Do not bend, weld or modify axle without authorization from Hendrickson Truck Commercial Vehicle Systems. 	<p>IMPROPER JACKING METHOD can cause structural damage and result in loss of vehicle control, severe personal injury or death.</p> <ul style="list-style-type: none"> ■ Do not use axle beam outboard of axle spring seats. ■ Refer to vehicle manufacturer for proper jacking instructions.
<p>HENDRICKSON Truck Commercial Vehicle Systems <small>www.hendrickson-intl.com 1.866.755.5968</small></p>	<p>UNAUTHORIZED TAMPERING OF INTEGRATED AXLE SPRING SEATS can cause component and structural damage and result in loss of vehicle control, severe personal injury or death, property damage, and will void warranty.</p> <ul style="list-style-type: none"> ■ Do not remove, modify or replace integrated axle spring seat or fasteners 	
<p><small>NO. 60906-0210</small></p>		



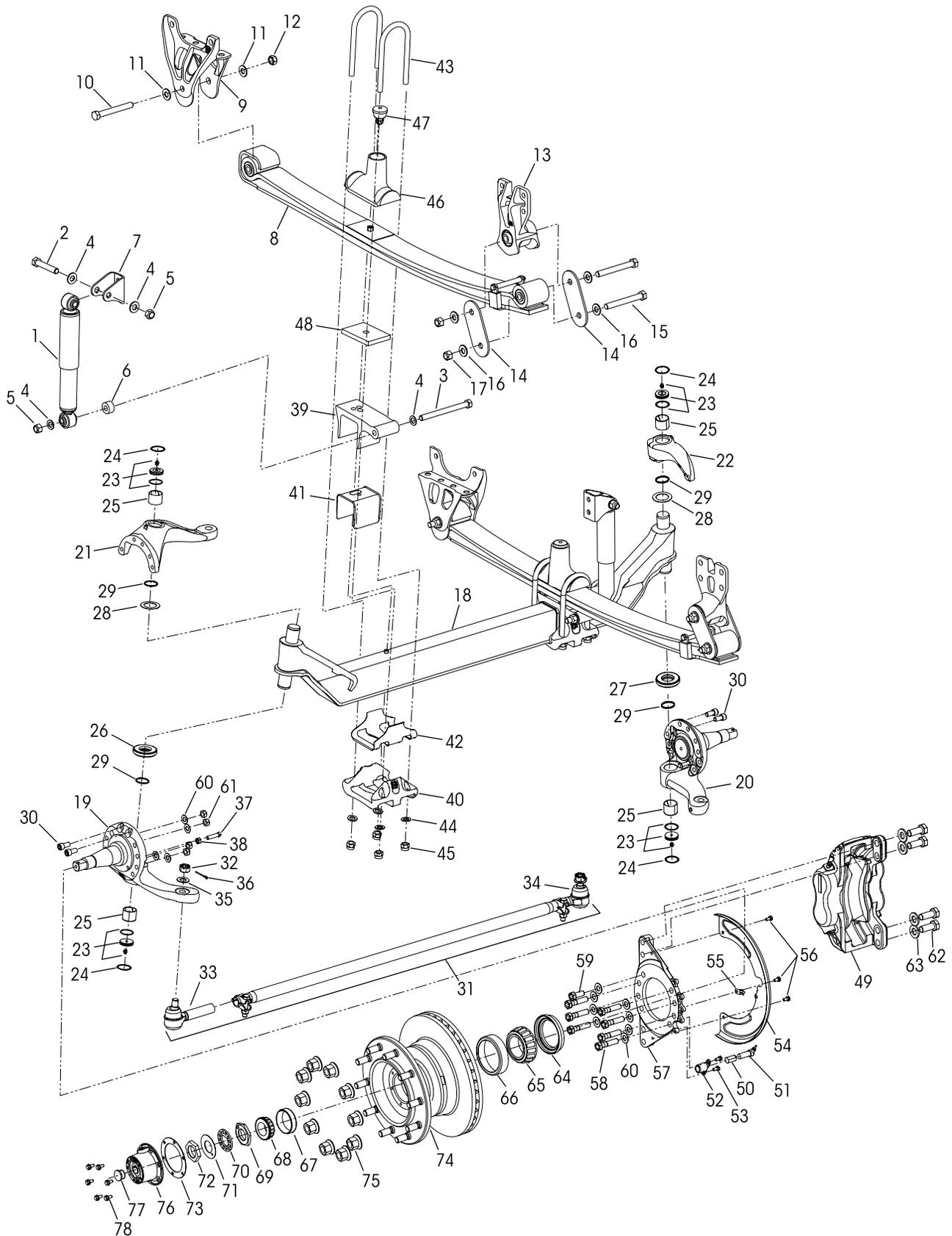
SECTION 4 Parts Lists





SOFTEK® for Lion Bus equipped with Drum Brakes

VEHICLE				VEHICLE			
KEY NO.	PART NO.	DESCRIPTION	QTY.	KEY NO.	PART NO.	DESCRIPTION	QTY.
1	58913-009L	Shock Absorber	2			Tie Rod Ends, 1 1/8" Threads	
2	58917-001	3/4"-10 UNC x 4 1/4" Upper Shock Bolt	2	34	70995-001	Left Hand	1
3	58917-016	3/4"-10 UNC x 8 1/2" Lower Shock Bolt	2	35	70995-002	Right Hand	1
4	22962-001	3/4" Hardened Washer	8	36	22962-007	7/8" Flat Washer	2
5	49842-000	3/4"-10 UNC Hex Locknut	4	37	17800-004	Tie Rod Nut Cotter Pin	2
6	59946-001	Shock Spacer	2		60961-069	Stop Bolt Service Kit, One Side, Includes Key Nos. 38-39	
7	59423-002	Shock Bracket	2	38	60238-001	1/2"-13 UNC x 2" Square Head Bolt	2
	60961-162	Leaf Spring Assembly Service Kit, Includes Key Nos. 8, 13-14		39	60240-000	1/2"-13 UNC Hex Jam Nut	2
8	53624-000	Leaf Spring Assembly	2	40	59952-003	Top Axle Wrap	2
9	64488-002	Front Hanger	2	41	64722-003	Bottom Axle Wrap	2
10	58258-008	M20 x 160 mm Hex Bolt	2	42	60508-000	Top Axle Wrap Liner	2
11	58246-004	M20 Hardened Washer	4	43	59845-000	Bottom Axle Wrap Liner	2
12	58259-000	M20 Locknut	2		60961-140	Clamp Group Service Kit, One side, Includes Key Nos. 44-46	
13	66510-001	Rear Shackle Bracket Assembly	2	44	64804-110	3/4"-16 UNF x 1 1/2" U-bolt	4
14	64314-000	Rear Shackle Plate	4	45	22962-001	3/4" Flat Washer	8
15	58258-008	M20 x 160 mm Hex Bolt	4	46	17700-035	3/4"-16 UNF 2B Nylon Locknut	8
16	58246-004	M20 Hardened Washer	8		64506-000	Top Pad/Axle Stop Assembly Includes Key Nos. 47-48	
17	58259-000	M20 Locknut	4	47	64519-000	Top Pad	2
	64502-048	STEERTEK Axle Assembly with Brake Assembly, Includes Key Nos. 18-43, 50-71		48	64080-000	Rubber Axle Stop	2
18	64905-001	Axle & Kingpin Assembly	1	49	70105-010	Front Axle Spacer - 10 mm	2
		Lower Steering Knuckle Assembly, Includes Key Nos. 25, 29, 31		50		**Meritor Drum Brake Assembly, 15" x 4" Left Hand Part No. QP4-1540-3085 Right Hand Part No. QP4-1540-3086	1 1
19	58900-027	Left Hand	1	51	32043-002	5/8"-11 UNC x 2 3/4" Hex Bolt	14
20	58900-028	Right Hand	1	52	22962-036	5/8" Hardened Washer	22
		Upper Steering Knuckle Assembly, Includes Key Nos. 25, 29		53	47764-000	5/8"- UNC Locknut	8
21	60903-034	Left Hand, <i>Replaces 60903-004</i>	1	54	64547-000	ABS Sensor	2
22	60904-002	Right Hand	1	55	64550-000	ABS Sensor Clip	2
		Kingpin Bushing and Bearing Service Kits		56		**Federal Mogul Wheel Seal Kit No. M380001TXO	2
	60961-040	Axle Set, Includes Kit Nos. 60961-009 & -039				**Timken Inner Bearing One side, Set No. 413, Includes Key Nos. 57-58	
	60961-009	Left Hand with Composite Thrust Bearing, Includes Key Nos. 23-26, 28-30 and Loctite		57		Inner Bearing Cone	2
	60961-039	Right Hand with Roller Thrust Bearing, Includes Key Nos. 23-25, 27-30 and Loctite		58		Inner Bearing Cup	2
23	59156-000	Grease Cap Assembly	4			**Timken Outer Bearing One Side, Set No. 406, Includes Key Nos. 59-60	
24	58937-000	Retaining Ring	4	59		Outer Bearing Cup	2
25	58909-000	Kingpin Bushing	4	60		Outer Bearing Cone	2
		Thrust Bearing Service Kits		61		**Meritor 1 1/2"-12 UNF Inner Wheel Bearing Adj. Nut Part No. 1227-U-541	2
	60961-043	Axle Set, Includes Kit Nos. 60961-041 & -042		62		**Meritor 3/16" Wheel End Lock Ring Part No. 1229-G-475	2
	60961-041	Left Hand Composite Thrust Bearing, Includes Key Nos. 26, 28-30 and Loctite		63		**Meritor 0.05" Wheel End Lock Washer Part No. 1229-F-474	2
	60961-042	Right Hand Roller Thrust Bearing, Includes Key Nos. 27-30 and Loctite		64		**Meritor Wheel End Outer Nut No. 1227-B-106	2
26	59828-000	Left Hand Composite Thrust Bearing	1	65		**Stemco Hubcap Gasket Part No. 330-3024	2
27	64256-000	Right Hand Roller Thrust Bearing	1	66		**Webb Hub Part No. 25201-1T	2
28		Kingpin Shim	As Req.	67		**Webb Drum Part No. 65545B	2
	60259-001X	0.005" Thickness (Pack of 4)		68		***M22 x 1.5 Two-piece Wheel Nut	20
	60259-002	0.047" Thickness		69		**Stemco Hubcap Assembly - 6", Kit No. 343-4346, Includes Key No. 70	2
29	58910-001	Kingpin Seal	4	70		*Rubber Plug	2
30	60236-001	5/8"-11 UNC Socket Head Cap Screw	4	71	64545-002	5/8"-18 UNC x 3/4" Hex Bolt with Retainer Washer (Hubcap Bolts)	12
	60937-000	Loctite (Red) Compound Tube (Not Shown)	1				
31	64246-000	ABS Sensor Sleeve	2				
32	76877-003	Tie Rod Assembly, Includes Key Nos. 33-35	1				
33		*5/8" Castle Nut	2				
		Tie Rod End Service Kits					
	60961-734	Axle Set, Kit Nos. 60961-736 and 60961-741					
	60961-736	Left Hand, Includes Key Nos. 34, 36-37					
	60961-741	Right Hand, Includes Key Nos. 35-37					





SOFTEK® for Lion Bus equipped with Disc Brakes

KEY NO.	PART NO.	DESCRIPTION	VEHICLE QTY.	KEY NO.	PART NO.	DESCRIPTION	VEHICLE QTY.
1	58913-009L	Shock Absorber	2	35	22962-007	7/8" Flat Washer	2
2	58917-001	3/4"-10 UNC x 4 1/4" Upper Shock Bolt	2	36	17800-004	Tie Rod Nut Cotter Pin	2
3	58917-016	3/4"-10 UNC x 8 1/2" Lower Shock Bolt	2		60961-069	Stop Bolt Service Kit, One Side, Includes Key Nos. 37-38	
4	22962-001	3/4" Hardened Washer	8	37	60238-001	1/2"-13 UNC x 2" Square Head Bolt	2
5	49842-000	3/4"-10 UNC Hex Locknut	4	38	60240-000	1/2"-13 UNC Hex Jam Nut	2
6	59946-001	Shock Spacer	2	39	59952-003	Top Axle Wrap	2
7	59423-002	Shock Bracket	2	40	64722-003	Bottom Axle Wrap	2
	60961-162	Leaf Spring Assembly Service Kit, Includes Key Nos. 8, 13-14		41	60508-000	Top Axle Wrap Liner	2
8	53624-000	Leaf Spring Assembly	2	42	59845-000	Bottom Axle Wrap Liner	2
9	64488-002	Front Hanger	2		60961-140	Clamp Group Service Kit, One side, Includes Key Nos. 43-45	
10	58258-008	M20 x 160 mm Hex Bolt	2	43	64804-110	3/4"-16 UNF x 11" U-bolt	4
11	58246-004	M20 Hardened Washer	4	44	22962-001	3/4" Flat Washer	8
12	58259-000	M20 Locknut	2	45	17700-035	3/4"-16 UNF 2B Nylon Locknut	8
13	66510-001	Rear Shackle Bracket Assembly	2		64506-000	Top Pad/Axle Stop Assembly Includes Key Nos. 46-47	
14	64314-000	Rear Shackle Plate	4	46	64519-000	Top Pad	2
15	58258-008	M20 x 160 mm Hex Bolt	4	47	64080-000	Rubber Axle Stop	2
16	58246-004	M20 Hardened Washer	8	48	70105-010	Front Axle Spacer - 10 mm	2
17	58259-000	M20 Locknut	4	49		**Meritor Brake Caliper Assembly Left Hand Part No. 60450482007 Right Hand Part No. 60450483007	2
		STEERTEK Axle Assembly with Brake Assembly, Includes Key Nos. 18-42, 49-65, 68-78		50		**Wabco ABS Sensor Clip Part No. 300088	2
	64502-050	Vehicles built AFTER July 20, 2017		51		**Wabco ABS Sensor Part No. 441 032 814 0	2
	64502-049	Vehicles built PRIOR TO July 20, 2017		52		**Meritor ABS Bracket Part No. 69180466	2
18	64905-001	Axle & Kingpin Assembly	1	53	18160-012	5/8"-18 UNC x 1/2" Bolt (ABS Bracket)	4
		Steering Knuckle Assembly, Includes Key Nos. 25, 29		54		**Meritor Dust Shield Part No. 3264W1453	2
19		Left Hand Lower	1	55		**Meritor Dust Shield Clip Part No. 2257V1270	2
	58900-053	Vehicles built AFTER July 20, 2017		56	64201-001	M8 x 1 1/4"-6G Cap Screw (Dust Shield)	6
	58900-061	Vehicles built PRIOR TO July 20, 2017		57		**Meritor Torque Plate Left Hand Part No. 69120952 Right Hand Part No. 69120951	2
20		Right Hand Lower	1	58	32043-002	5/8"-11 UNC x 2 3/4" Hex Bolt (Torque Plate)	14
	58900-054	Vehicles built AFTER July 20, 2017		59	32043-021	5/8"-11 UNC x 1 1/2" Hex Bolt (Torque Plate)	2
	58900-062	Vehicles built PRIOR TO July 20, 2017		60	22962-036	3/8" Hardened Washer (Torque Plate)	24
21	60903-034	Left Hand Upper, <i>Replaces 60903-004</i>	1	61	47764-000	5/8"-11 UNC Locknut (Torque Plate)	8
22	60904-002	Right Hand Upper	1	62	58258-017	M20 x 2.5-6G Hex Bolt (Caliper)	8
		Kingpin Bushing and Bearing Service Kits		63	58246-018	M20 Hardened Washer (Caliper) <i>Replaces 58246-009</i>	8
	60961-040	Axle Set, Includes Kit Nos. 60961-009 & -039		64		**Federal Mogul Wheel Seal Kit No. M380001TX0 **Timken Inner Bearing One side, Set No. 413, Includes Key Nos. 65-66	2
	60961-009	Left Hand with Composite Thrust Bearing, Includes Key Nos. 23-26, 28-30 and Loctite		65		Inner Bearing Cone	2
	60961-039	Right Hand with Roller Thrust Bearing, Includes Key Nos. 23-25, 27-30 and Loctite		66		Inner Bearing Cup **Timken Outer Bearing One Side, Set No. 406, Includes Key Nos. 67-68	2
23	59156-000	Grease Cap Assembly	4	67		Outer Bearing Cup	2
24	58937-000	Retaining Ring	4	68		Outer Bearing Cone	2
25	58909-000	Kingpin Bushing	4	69		**Meritor 1 1/2"-12 UNF Inner Wheel Bearing Adj. Nut Part No. 1227-U-541	2
		Thrust Bearing Service Kits		70		**Meritor 3/4" Wheel End Lock Ring Part No. 1229-G-475	2
	60961-043	Axle Set, Includes Kit Nos. 60961-041 & -042		71		**Meritor 0.05" Wheel End Lock Washer Part No. 1229-F-474	2
	60961-041	Left Hand Composite Thrust Bearing, Includes Key Nos. 26, 28-30 and Loctite		72		**Meritor Wheel End Outer Nut No. 1227-B-106	2
	60961-042	Right Hand Roller Thrust Bearing, Includes Key Nos. 27-30 and Loctite		73		**Stemco Hubcap Gasket Part No. 330-3024	2
26	59828-000	Left Hand Composite Thrust Bearing	1	74		**Meritor Hub & Rotor Assembly, Steel Hub 15.38 x 1.54 Rotor Part No. 17160671003	2
27	64256-000	Right Hand Roller Thrust Bearing	1	75		***M22 x 1.5 Two-piece Wheel Nut	20
28		Kingpin Shim	As Req.	76		**Stemco Hubcap Assembly - 6", Kit No. 343-4346, Includes Key No. 77	2
	60259-001X	0.005" Thickness (Pack of 4)		77		*Rubber Plug	2
	60259-002	0.047" Thickness		78	64545-002	5/8"-18 UNC x 3/4" Hex Bolt with Retainer Washer (Hubcap Bolts)	12
29	58910-001	Kingpin Seal	4				
30	60236-001	5/8"-11 UNC Socket Head Cap Screw	4				
	60937-000	Loctite (Red) Compound Tube (Not Shown)	1				
31		Tie Rod Assembly, 1 1/8" Threads, Includes Key Nos. 32-34	1				
	76877-002	Vehicles built AFTER July 20, 2017					
	76877-003	Vehicles built PRIOR TO July 20, 2017					
32		*5/8" Castle Nut	2				
		Tie Rod End Service Kits					
	60961-734	Axle Set, Includes 60961-736 and 60961-741					
	60961-736	Left Hand, Includes Key Nos. 33, 35-36					
	60961-741	Right Hand, Includes Key Nos. 34-36					
		Tie Rod End, 1 1/8" Threads					
33	70995-001	Left Hand	1				
34	70995-002	Right Hand	1				

SECTION 5 Special Tools

KINGPIN BUSHING TOOL – ADJUSTABLE STRAIGHT FLUTE REAMER

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

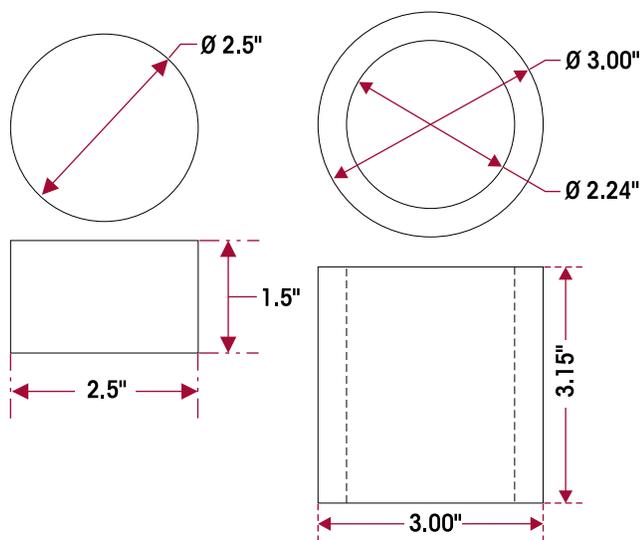


KINGPIN TOOLS

SHOP MADE TOOLS: The 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.

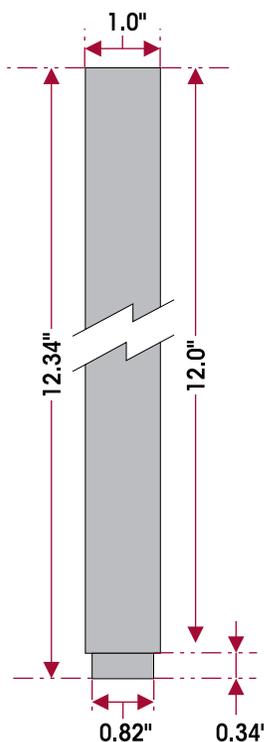
Bushing Driver

Bushing Receiving Tool (for press bushing replacement)

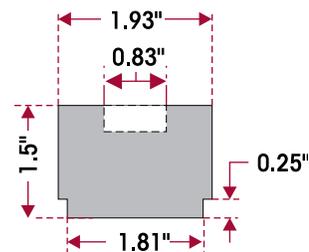


NOTE: Kingpin Handle is used for both Bushing Driver and Seal Tools

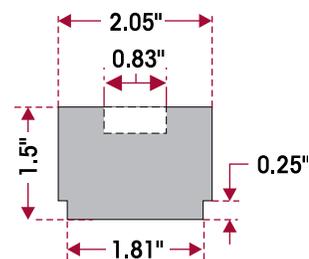
Kingpin Handle



Bushing Driver Installer / Remover Tool (to seat bushing)



Seal Driver Installer Tool (to seat seal)



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

** Not supplied by Hendrickson for aftermarket service purposes. Description and part number listed for reference only. For more information and assistance with service, maintenance and rebuild instructions on these components see below component manufacturers:

- Federal Mogul technical and parts support 800.325.8886 or go to www.fme-cat.com
- Meritor technical and parts support 888.725.9355 or online, parts (www.meritorpartsexpress.com), technical support (www.meritorbullpen.com)
- Stemco technical and part support 800.527.8492 or go to www.stemco.com
- Timken at technical and part support 866.984.6536 or online at www.timken.com/resources or Timken YouTube series, Timken Tricks of the Trade (Installing a Timken® Set-Right® Bearing)
- WABCO technical and parts support 855.228.3203 or online at www.wabco-auto.com/aftermarket-services/inform-product-catalog
- Webb technical and part support 800.633.3256 or go to www.webbwheel.com

*** Not supplied by Hendrickson, used for reference only. Contact the vehicle manufacturer for more information.

SECTION 6

Towing Procedure

ON-HIGHWAY AND ON-ROADWAY

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.

- **METHOD 1** — Wheel lift, the ideal towing procedure
- **METHOD 2** — Conventional axle fork

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 toll-free at 1-866-755-5968 (U.S. and Canada) or send e-mail to: techservices@hendrickson-intl.com with any questions regarding proper towing procedures for vehicles equipped with a STEERTEK axle.

METHOD 1 — WHEEL LIFT

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.

FIGURE 6-1 Wheel lift method



METHOD 2 — AXLE FORK LIFT

This is an alternative method for towing the vehicle, which requires standard 5" forks, see Figures 6-2 and 6-3, and designated lift points between the two (2) 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 (2) axle clamp groups as shown in Figure 6-2.

- Proper tow fork location on inside clamp group on the STEERTEK Axle, see Figures 6-2 and 6-3.

FIGURE 6-2



FIGURE 6-3



- 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 Figures 6-4 and 6-5.

FIGURE 6-4



FIGURE 6-5



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

⚠ WARNING

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 TOW STRAPS ARE NECESSARY TO TOW A DISABLED VEHICLE FROM A REPAIR FACILITY PARKING LOT INTO THE SHOP BAY. THE TOW STRAPS SHOULD BE CONNECTED TO THE TOW HOOKS PROVIDED BY THE VEHICLE MANUFACTURER AT THE FRONT OF THE BUMPER. IF THE USE OF TOW HOOKS IS NOT AN OPTION, THEN TOW STRAPS MAY BE WRAPPED AROUND THE FRONT STEERTEK AXLE, SEE FIGURE 6-6, IN A MANNER THAT IS ACCEPTABLE FOR TOWING THE VEHICLE FROM A REPAIR FACILITY PARKING LOT INTO THE SHOP BAY. DO NOT USE A TOW CHAIN AROUND THE FRONT STEERTEK AXLE TO TOW THE VEHICLE, DOING SO WILL DAMAGE THE AXLE AND VOID ANY APPLICABLE WARRANTY, SEE FIGURE 6-6.

- NYLON TOW STRAPS OR CHAINS ARE NOT RECOMMENDED FOR ON-HIGHWAY OR ON-ROADWAY TOWING.

FIGURE 6-6



SECTION 7

Preventive Maintenance

The SOFTEK systems installed on STEERTEK axle are low maintenance systems. Following appropriate inspection procedures is important to help ensure the proper maintenance and operation of the SOFTEK suspension system and component parts function to their highest efficiency. Look and replace any bent, cracked, worn or damaged parts.

HENDRICKSON RECOMMENDED PREVENTIVE MAINTENANCE INTERVALS

- **The first 1,000 miles**
- **On-highway** – every 25,000 miles (40,000 km) or 6 months, whichever comes first

COMPONENT INSPECTION

- **Clamp group** — Check torque on clamp group mounting hardware. Refer to the Clamp Group Re-Torque Interval 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.
- **Top pad** — Look for cracks. Replace if necessary, see Component Replacement Section of this publication for replacement procedure.
- **Fasteners** — Look for any loose or damaged fasteners on the entire suspension. Make sure all fasteners are tightened to the specified torque. See Torque Specification Section of this publication for recommended torque requirements. Use a calibrated torque wrench to check torque in a tightening direction. As soon as the fastener starts to move, record the torque. Correct the torque if necessary. Replace any worn or damaged fasteners.
- **Front and rear leaf spring hangers** — Check for cracks or loose mounting hardware. Replace if necessary, see 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, refer to the vehicle manufacturer for proper preventive maintenance and rebuild instructions.
- **Shock absorber** — Look for any signs of dents or leakage. Refer to the Shock Absorber Inspection in this section.
- **Steel leaf spring** — Look for cracks. Replace if cracked or broken. Check the front and rear bushings for any wear or deterioration. Replace leaf spring assembly if any of the previous conditions are observed. 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.
- **Steering pivot points** — Check for looseness at all pivot points. Inspect and lubricate all pivot points, maximum service interval is 25,000 miles. Refer to the STEERTEK Greasing and Lubrication Specifications Table 7-1, in this section.
- **STEERTEK axle and Tie Rod** — Inspect for any cracks or dents on the axle, and also refer to the Tie Rod Ends Inspection and Lubrication Section in this publication. Replace as necessary.
- **Tire wear** — Inspect tires for wear patterns that may indicate suspension damage or misalignment. See Tire 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.

See the vehicle manufacturer's applicable publications for other preventive 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 service lubrication interval is a guideline, the vehicle may require increased lubrication interval depending on severity of operation.

TABLE 7-1

STEERTEK Greasing and Lubrication Specifications				
COMPONENT	GREASING INTERVAL	GREASE	NLGI GRADE	OUTSIDE TEMPERATURE
KINGPIN BUSHINGS	Maximum of 25,000 miles (40,000 kilometers) 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			

NOTE: Lubrication greases acceptable for use on the STEERTEK axle will carry a designation of NLGI #2 EP and rated GC-LB or equivalent.

STEERING KNUCKLE

CHECKING VERTICAL END PLAY (UP AND DOWN MOVEMENT)

The operating spec for vertical end play 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. Support the vehicle with jack stands.
4. Place a dial indicator on each side of the axle as follows:
 - a. Index the wheels slightly (left or right).
 - b. Place the magnetic dial indicator base on the axle, see Figure 7-1.
 - 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 end play is greater than 0.030" or below 0.008", an adjustment of the upper knuckle is necessary.

FIGURE 7-1

Ensure the tip of the dial indicator is on the top of the upper steering knuckle and not on the grease cap



ADJUSTMENT

1. If the vertical end play is:
 - **Greater than 0.030"**, loosen the socket head cap screws and **push down** on the knuckle assembly until the proper vertical end play is achieved. If adjustment does not achieve end play specification, **install shims**, Hendrickson Part No. 60259-001X (0.005" thickness) or Part No. 60259-002 (0.047" thickness) between the top of the axle and the bottom of the upper steering knuckle to obtain the proper end play specification. See Steering Knuckle Assembly in Component Replacement Section of this publication for proper shim installation.

- **Less than 0.008"**, loosen the socket head cap screws and **pull up** on the knuckle assembly until the proper vertical end play is achieved. If adjustment does not achieve end play specification, **remove shims**. See Steering Knuckle Assembly in Component Replacement Section of this publication for proper shim removal.

KINGPIN BUSHING WEAR

CHECKING STEERING KNUCKLE LATERAL MOVEMENT

NOTE

If one (1) bushing is worn or damaged, it is mandatory to replace both the upper and lower bushings on that knuckle assembly.

FIGURE 7-2
CHECKING UPPER KINGPIN BUSHING

FIGURE 7-3
CHECKING LOWER KINGPIN BUSHING

FIGURE 7-4

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 jack stands.
3. **CHECKING THE UPPER KINGPIN BUSHING.** Install the base of a dial indicator onto the axle beam and face the tip against the steering knuckle, see Figure 7-2.
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 7-4.
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 upper and lower bushings. Refer to the Kingpin Bushing replacement procedure in the Component Replacement Section of this publication.
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 7-3.
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 upper and lower kingpin bushings. Refer to the Component Replacement Section of this publication.

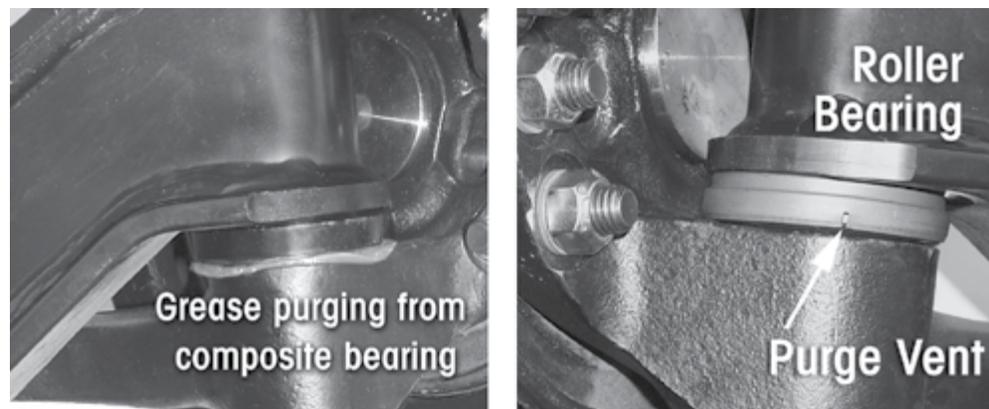


KINGPIN LUBRICATION

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 STEERTEK Greasing and Lubrication Specifications Table 7-1.
5. Force the required lubricant into the upper and lower kingpin grease fittings, until new lubricant flows from upper axle beam and knuckle locations, see grease purging from composite bearing in Figure 7-5.

FIGURE 7-5



NOTE

Greasing at the lower zerck should purge grease from the thrust bearing shell. The left side of the axle has a composite style thrust bearing and the right side of the axle has a steel roller thrust bearing, see Figure 7-6. Both purge in the same area.

FIGURE 7-6



TIE ROD ENDS

INSPECTION

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 jack 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 COTTER PIN MUST BE INSTALLED CORRECTLY 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.

⚠ WARNING

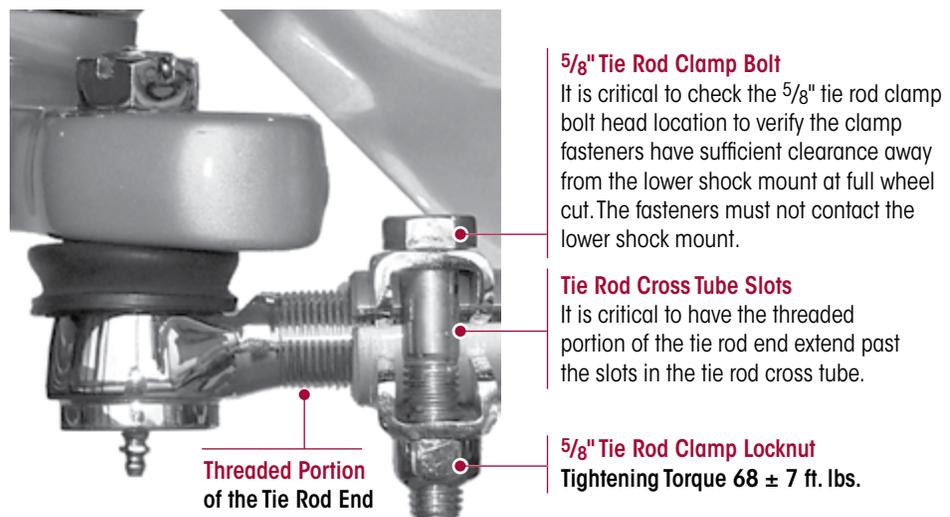
IT IS CRITICAL TO CHECK THE $\frac{5}{8}$ " TIE ROD CLAMP BOLT HEAD LOCATION TO VERIFY THE CLAMP FASTENERS HAVE SUFFICIENT CLEARANCE AWAY FROM THE LOWER SHOCK ABSORBER MOUNT AT FULL WHEEL CUT. THE FASTENERS MUST NOT CONTACT THE LOWER SHOCK ABSORBER MOUNT. FAILURE TO DO SO CAN CAUSE ONE OR MORE COMPONENTS TO FAIL CAUSING LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

6. Verify the $\frac{5}{8}$ " tie rod clamp bolt head does not contact the lower shock absorber mount at full wheel cut, see Figure 7-7.

⚠ WARNING

THE THREADED PORTION OF THE TIE ROD END MUST EXTEND PAST THE SLOTS INTO THE TIE ROD CROSS TUBE, SEE FIGURE 7-7. FAILURE TO DO SO CAN CAUSE COMPONENT DAMAGE, LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

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

FIGURE 7-7

 $\frac{5}{8}$ " Tie Rod Clamp Bolt

It is critical to check the $\frac{5}{8}$ " tie rod clamp bolt head location to verify the clamp fasteners have sufficient clearance away from the lower shock mount at full wheel cut. The fasteners must not contact the lower shock mount.

Tie Rod Cross Tube Slots

It is critical to have the threaded portion of the tie rod end extend past the slots in the tie rod cross tube.

 $\frac{5}{8}$ " Tie Rod Clamp Locknut

Tightening Torque 68 ± 7 ft. lbs.

⚠ CAUTION

DO NOT USE THE FOLLOWING ITEMS OR METHODS TO CHECK FOR MOVEMENT OF THE TIE ROD ASSEMBLY, WHICH CAN CAUSE DAMAGE TO COMPONENTS:

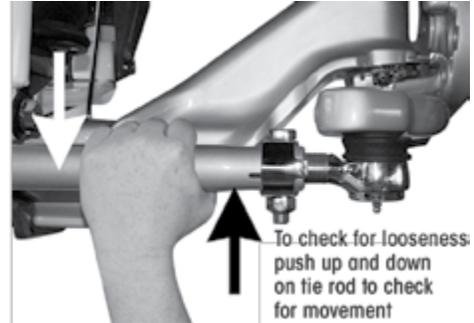
- A CROW BAR, PICKLE FORK OR 2 X 4
- ANYTHING OTHER THAN HANDS USED TO GRASP AND ROTATE THE CROSS TUBE ASSEMBLY (CAN RESULT IN DAMAGE TO THE CROSS TUBE).
- EXCESSIVE PRESSURE OR FORCE IS APPLIED TO THE TIE ROD ENDS OR THE JOINTS OF THE ASSEMBLY.

9. By hand or using a pipe wrench, with jaw protectors to avoid gouging the tie rod 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 7-8.
10. 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 6" or 152.4 mm). Apply hand pressure with reasonable human effort vertically up and down in a push-pull motion several times (using approximately 50-100 pounds of force). Check for any vertical movement or looseness at both tie rod end locations, see Figure 7-9.

FIGURE 7-8



FIGURE 7-9



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

FIGURE 7-10

**NOTE**

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

TIE ROD END LUBRICATION

LUBRICATION PROCEDURE

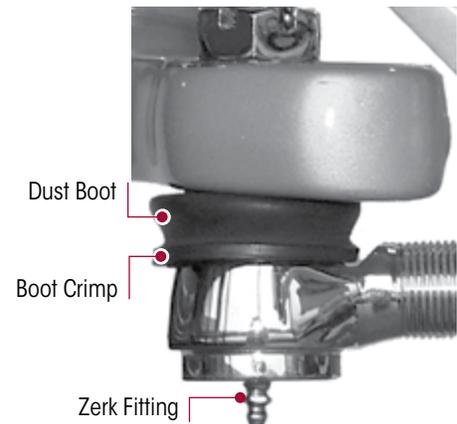
1. Turn the vehicle wheels straight ahead.
2. Wipe the zerk fitting and grease gun tip with clean shop towels.
3. Wipe the seal / boot clean with shop towels.
4. Attach a grease gun to the zerk fitting. Either a hand or pneumatic grease gun is acceptable. If air operated grease gun is used, system air 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 7-11. Continue to purge grease until fresh grease flows from the purge area.
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.

FIGURE 7-11



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 / 25,000 mile inspection and annual re-torque interval.
4. Ensure that the clamp group is properly aligned and the hex bolts / U-bolts are seated in the top pad, and the bottom axle wrap is centered on the top axle wrap, see Figure 7-12.
5. Tighten the clamp group locknuts evenly in 50 foot pounds increments to 293 ± 12 foot pounds torque in the proper pattern to achieve uniform bolt tension, see Figure 7-13.
6. After tightening the clamp group, check for the signs of component or bolt movement.
7. If signs of movement are present, disassemble the clamp group fasteners, check for component wear or damage and replace as necessary, then install new clamp group fasteners and repeat Steps 4 through 5.

FIGURE 7-13

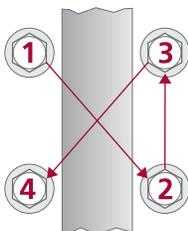
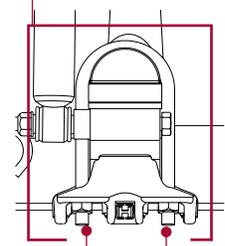


FIGURE 7-12

IMPORTANT
Ensure that the Axle Clamp Group is properly aligned



$\frac{3}{4}$ " Clamp Group Locknuts
Tightening Torque
293 ± 12 ft. lbs.

TIRE INSPECTION

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

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

The following tire Inspection guidelines are based upon Technology & Maintenance Council (TMC) recommended practices. Any issues regarding irregular tire wear where Hendrickson is asked for assistance will require tire and alignment maintenance records, reference TMC's literature numbers RP 219A, RP 230, or RP 642.

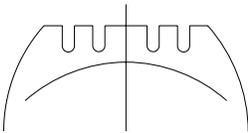
Tire wear is normally the best indicator of vehicle alignment condition. If tires are wearing too rapidly or irregularly, alignment corrections may be needed. The tire wear patterns described below can help isolate specific alignment problems.

The most common conditions of concern are:

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

FIGURE 7-14

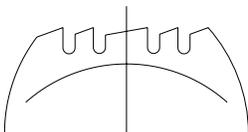
OVERALL FAST WEAR (Miles per 32nd)



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 219A publication, page 11. For information on how to accurately measure and record tire rates, see TMC RP 230 publication.

FIGURE 7-15

FEATHER WEAR

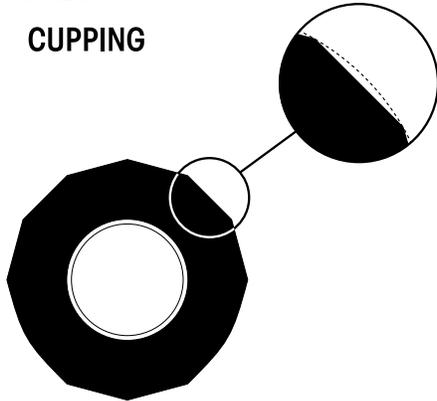


Feather wear — Tread ribs or blocks worn so that one side is higher than the other resulting in step-offs across the tread face. Generally, ribs or blocks exhibit this wear. To spot this problem, do the following:

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 7-16
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.

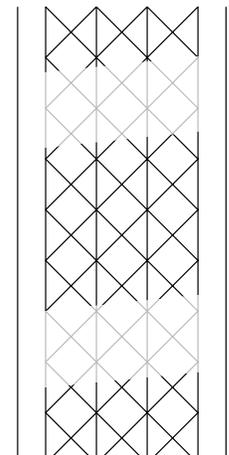
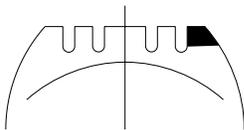
To solve cupping problems:

- *Tires* – Correct mismatch 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.

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, mis-mounting of tire and wheel assembly to axle, and mismatched duals 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 tire. If the source of trouble is the vehicle, diagnose cause and correct as needed.

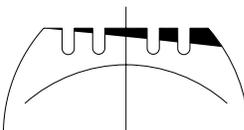
FIGURE 7-17
DIAGONAL WEAR

FIGURE 7-18
**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 7-19
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.

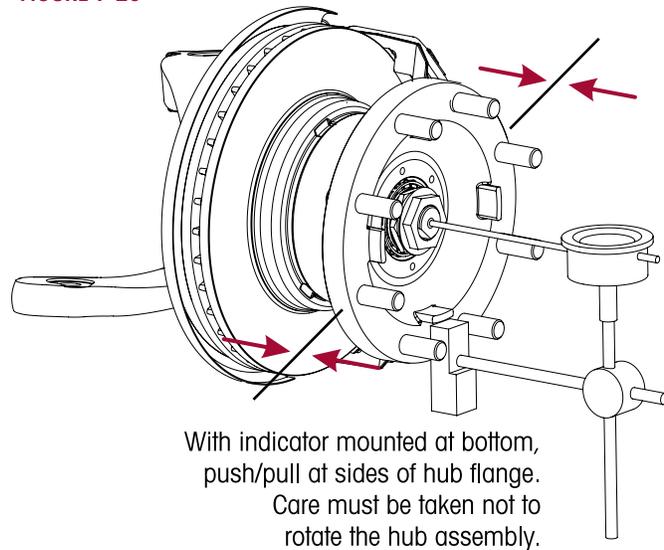
WHEEL BEARING END PLAY

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

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

FIGURE 7-20

1. Verify end play with a dial indicator, see Figure 7-20. 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.



NOTE If end play is not within specification, a wheel bearing adjustment is required, refer to the vehicle manufacturer for proper preventive maintenance and rebuild instructions.

SHOCK ABSORBERS

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

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

Inspection of the shock absorber can be performed by doing a heat test, and a visual inspection. Replace as necessary, refer to the Component Replacement Section of this publication.

FIGURE 7-21

HEAT TEST

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

⚠ WARNING

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



2. Use an infrared thermometer to check the temperature of the shock absorber. This can also be performed by carefully touching the shock absorber body below the dust cover. Touch the frame to get an ambient reference, see Figure 7-21. A warm shock absorber is acceptable, a cold shock absorber should be replaced.
3. To inspect for an internal failure, remove and shake the suspected shock absorber. Listen for the sound of metal parts rattling inside. Rattling of metal parts can indicate that the shock absorber has an internal failure and the shock absorber should be replaced.

VISUAL INSPECTION

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

FIGURE 7-22

SHOCK ABSORBER VISUAL INSPECTION - UNACCEPTABLE CONDITIONS



LEAKING VS. MISTING SHOCK ABSORBER VISUAL INSPECTION

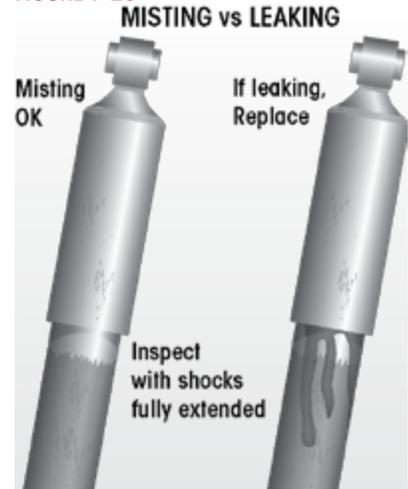
The inspection must not be conducted after driving in wet weather or a vehicle wash. The shock absorber needs to be free from water. Many shock absorbers are often misdiagnosed as failures. Misting is the process whereby very small amounts of shock absorber fluid evaporate at a high operating temperature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

NOTE

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

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

FIGURE 7-23



AXLE WRAP LINER

NOTE

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.

INSPECTION

It is possible for the axle wrap liner to crack while in operation. If during a visual inspection a cracked liner is:

- Identified and all the pieces are intact it is not necessary to replace the liner.
- Broken out and there are pieces missing, the liner must be replaced immediately, see Figure 7-24.

See Top Axle Wrap in Component Replacement Section of this publication.

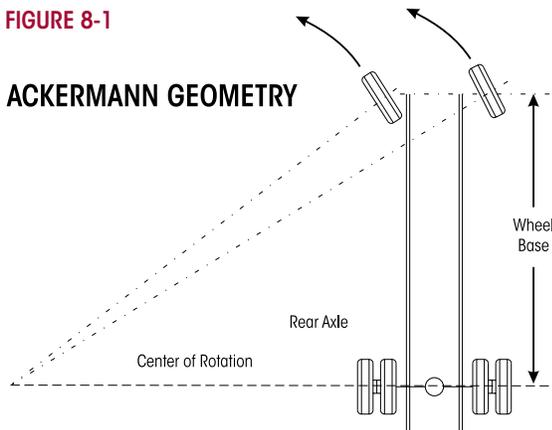
FIGURE 7-24

Axle Wrap Liners Unacceptable Cracks



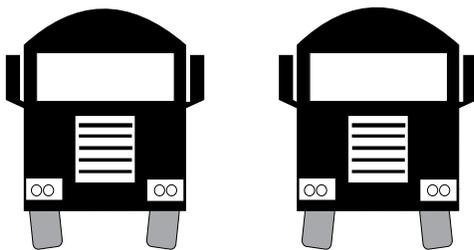
SECTION 8 Alignment & Adjustments

ALIGNMENT DEFINITIONS

FIGURE 8-1
ACKERMANN GEOMETRY


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.

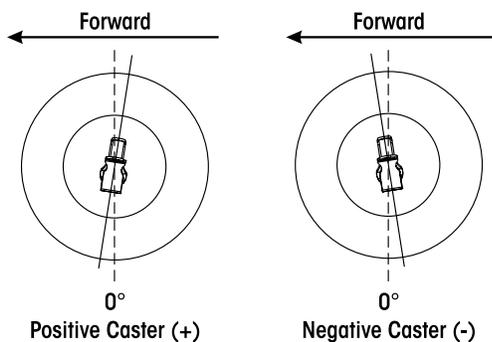
Bump Steer (Feedback) — The feedback felt through the steering linkage to the steering wheel when a steer axle tire hits a bump in the road. This occurs because the axle-end of the drag link and the axle attachment point of the spring do not travel in parallel circular arcs as the suspension moves up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

FIGURE 8-2
CAMBER

Positive Camber
Negative Camber

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.

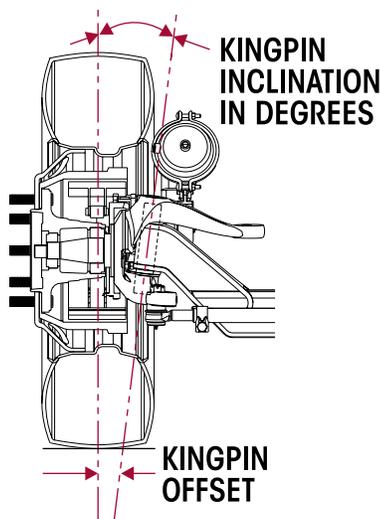
Excessive positive camber may cause smooth wear on the outer half of the tire tread. Excessive negative camber may cause wear on the inner half of the tread. Static-unloaded camber angles are built into the axle to put the loaded tire perpendicular to the road.

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.

FIGURE 8-3
CASTER

Positive Caster (+)
Negative Caster (-)

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.

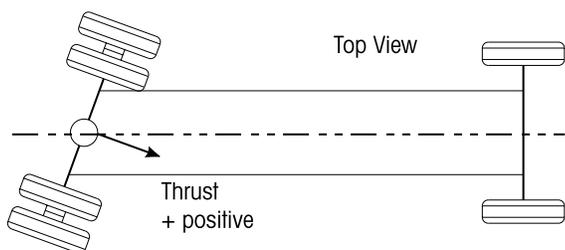
Kingpin Offset — The distance between the center of the tire patch and intersection of the kingpin axis with the ground. This parameter of front end geometry is important in vehicles without power steering and has a major effect on static steering. If there is no kingpin offset, the tires must scrub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

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 8-5

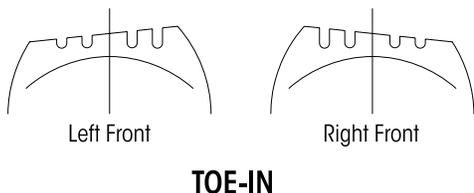
THRUST ANGLE



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.

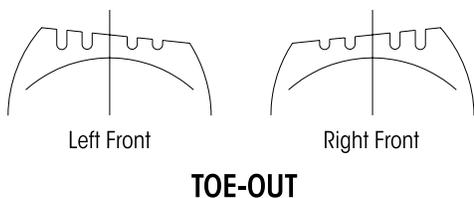
A steering correction is required to offset the effect of the thrust angles and keeps the vehicle traveling in a straight line. It results in a lateral offset between the steer and drive axle tires commonly referred to as “dog tracking.”

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.

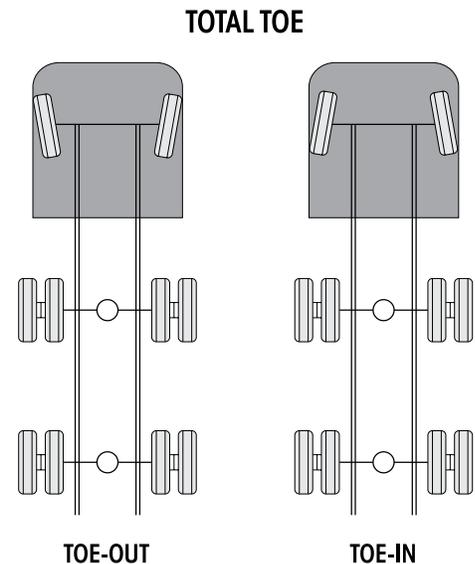
FIGURE 8-7



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.

Toe-Out on Turns — (See Ackermann Geometry). Excessive turning angles such as those encountered in pickup and delivery operations may contribute to premature tire wear. Be advised that the greater the 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 OEM, tire OEM 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.

FIGURE 8-8


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
- The wheels and tires are free of excessive wear and damage
- Wheel bearing end play is within OEM specification

FRONT SUSPENSION

Inspect the following:

- All fasteners are installed and tightened to the specified torque. See Tightening Torque Specification Section of this publication.
- Leaf springs are free of wear or damage
- Shock absorbers are free of wear and damage
- Vehicle ride height is within specification. Follow manufacturer's guidelines (if equipped).
- Front and rear spring mounts are free of wear or damage

INSPECT TIE ROD ENDS

Perform Tie Rod Inspection procedure; refer to the Preventive Maintenance Section in this publication.

REAR AXLE AND REAR SUSPENSION

The rear axle can cause front tire wear. If the outer edge of one (1) 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. Refer to the procedure dictated by the vehicle or suspension manufacturer.
- 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 Technology & Maintenance Council (TMC) Guidelines for Total Vehicle Alignment.

FRONT WHEEL ALIGNMENT

Hendrickson recommends technicians review The Technology & Maintenance Council's publication (TMC) "Guidelines for Total Vehicle Alignment" (TMC RP 642).

Check total (front and rear) vehicle wheel alignment when any of the following occurs:

- Every 80,000 to 100,000 miles, or 12-18 months (normal maintenance)
- When the vehicle does not steer correctly
- To correct a tire wear condition

For rear wheel alignment specifications and adjustments refer to the vehicle manufacturer.

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 the Inspection Prior to Alignment in this section.
2. Check the wheel bearing end play.
3. Check and adjust toe.
4. Check and adjust the vehicle ride height as specified in the Preventive Maintenance Section of this publication.

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, refer to the Steering Stop Adjustment Procedure in this section, see Figure 8-9.

FIGURE 8-9

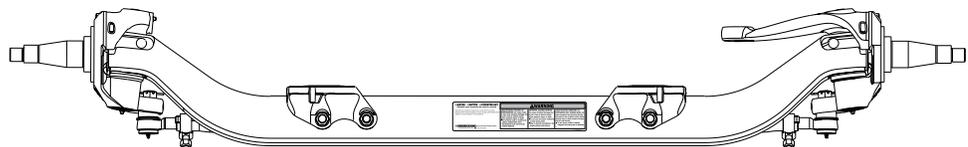

3. If the vehicle is equipped with power steering, check the pressure relief in the power steering system and reset if necessary. Refer to the vehicle manufacturer regarding the subject: Adjusting the Pressure Relief in the Power Steering System.
4. Check the turning angle. Refer to the original equipment manufacturer specifications.
5. Check the kingpin (or steering axis) inclination, refer to Kingpin Inclination under Alignment Definitions in this section.

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 8-10.

FIGURE 8-10

<p>HAIRTEK® SOFTEK® STEERTEK NXT INTEGRATED FRONT SUSPENSION AND STEER AXLE SYSTEMS</p> <p><small>This article is covered by at least one or more of the U.S. and/or foreign patents and/or pending U.S. and/or foreign patent applications posted at: www.hendrickson-intl.com/patents</small></p> <p>HENDRICKSON Truck Commercial Vehicle Systems <small>www.hendrickson-intl.com 1.866.755.5968</small></p>	<p style="text-align: center;">WARNING</p> <table border="0"> <tr> <td data-bbox="820 1045 1015 1186"> <p>UNAUTHORIZED WELDING OR MODIFICATIONS can cause cracks or other axle structural damage and result in loss of vehicle control, severe personal injury or death.</p> <ul style="list-style-type: none"> ■ Do not bend, weld or modify axle without authorization from Hendrickson Truck Commercial Vehicle Systems. </td> <td data-bbox="1015 1045 1209 1186"> <p>IMPROPER JACKING METHOD can cause structural damage and result in loss of vehicle control, severe personal injury or death.</p> <ul style="list-style-type: none"> ■ Do not use axle beam outboard of axle spring seats. ■ Refer to vehicle manufacturer for proper jacking instructions. </td> <td data-bbox="1209 1045 1421 1186"> <p>UNAUTHORIZED TAMPERING OF INTEGRATED AXLE SPRING SEATS can cause component and structural damage and result in loss of vehicle control, severe personal injury or death, property damage, and will void warranty.</p> <ul style="list-style-type: none"> ■ Do not remove, modify or replace integrated axle spring seat or fasteners </td> </tr> </table> <p style="text-align: right; font-size: small;">TRC 40905-0210</p>	<p>UNAUTHORIZED WELDING OR MODIFICATIONS can cause cracks or other axle structural damage and result in loss of vehicle control, severe personal injury or death.</p> <ul style="list-style-type: none"> ■ Do not bend, weld or modify axle without authorization from Hendrickson Truck Commercial Vehicle Systems. 	<p>IMPROPER JACKING METHOD can cause structural damage and result in loss of vehicle control, severe personal injury or death.</p> <ul style="list-style-type: none"> ■ Do not use axle beam outboard of axle spring seats. ■ Refer to vehicle manufacturer for proper jacking instructions. 	<p>UNAUTHORIZED TAMPERING OF INTEGRATED AXLE SPRING SEATS can cause component and structural damage and result in loss of vehicle control, severe personal injury or death, property damage, and will void warranty.</p> <ul style="list-style-type: none"> ■ Do not remove, modify or replace integrated axle spring seat or fasteners
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6. Check camber angle. **DO NOT** attempt to adjust camber. Refer to "Camber" under the Alignment Definitions in this section.
7. It is necessary to verify that all ride heights (front and rear) are within specifications prior to checking caster to get an accurate caster reading.
8. Check and adjust caster angle. Refer to Caster Angle under Alignment Definitions in this section.

NOTE

The use of two (2) 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.

9. Check and adjust toe-in. Refer to Adjusting the Toe-In under Alignment Definitions in this section.

STEERING STOP

ADJUSTMENT

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 truck 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.
5. Decrease the wheel cut by loosening the jam nuts and screw the axle stops out counter-clockwise.

WARNING

ALWAYS CHECK / RESET THE STEERING GEAR BOX POPPETS 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.

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 8-11.

6. Tighten the jam nuts to 50 ± 10 foot pounds torque.
7. Measure the wheel cut and check for any interference with related steering components.

FIGURE 8-11



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.

NOTE

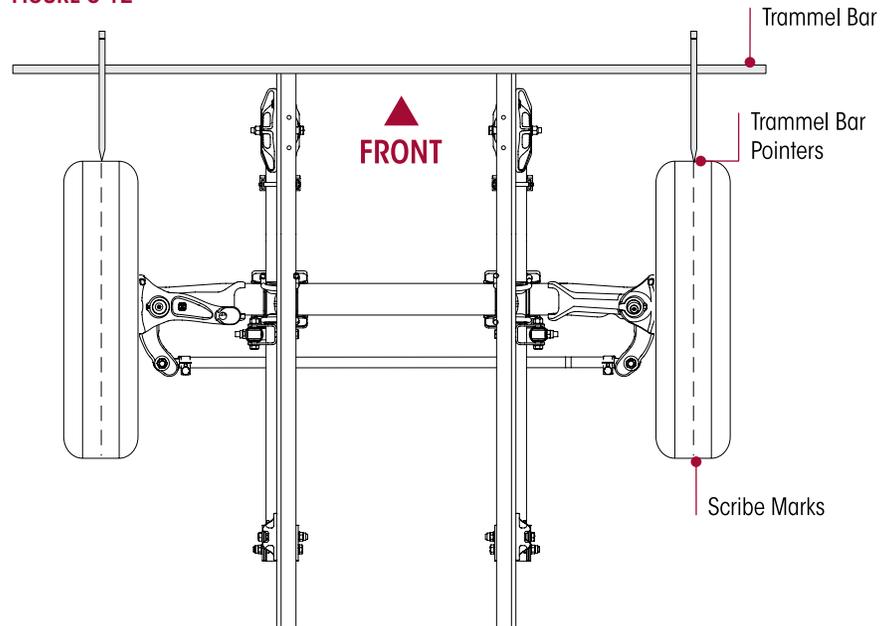
DO NOT measure toe-in with the front axle off the ground. The weight of the vehicle must be on the front axle when toe-in is measured.

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 8-12.

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.

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.

FIGURE 8-12


10. If the toe measurement is not within the specifications of $\frac{1}{16}'' \pm \frac{1}{32}'' (0.06'' \pm 0.03'')$, it will be necessary to adjust the toe setting. Refer to the following procedure.

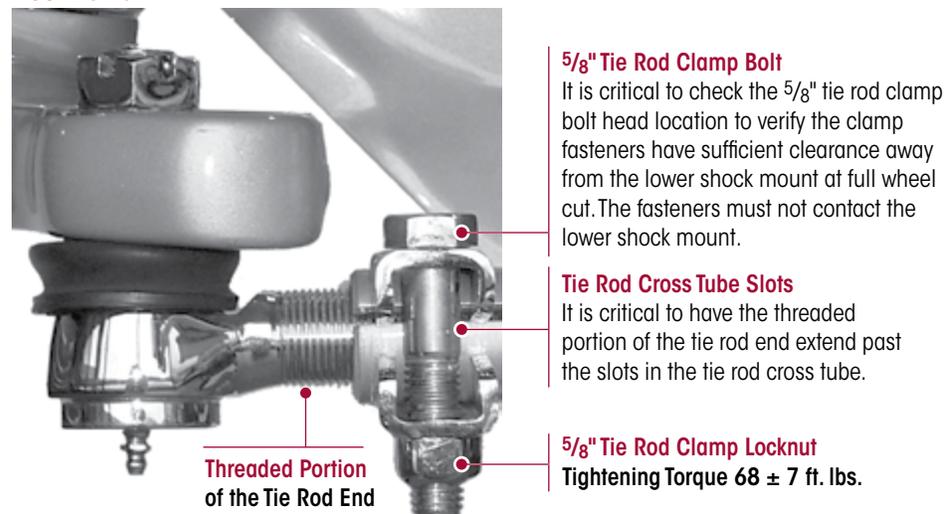
- a. Loosen the tie rod cross tube clamp bolts and locknuts.
- b. Turn the tie rod cross tube until the specified toe-in distance is achieved.

WARNING

THE THREADED PORTION OF THE TIE ROD END MUST EXTEND PAST THE SLOTS INTO THE TIE ROD CROSS TUBE, SEE FIGURE 8-13. FAILURE TO DO SO CAN CAUSE COMPONENT TO FAIL CAUSING LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

- c. Tighten the bolt and locknut on the tie rod cross tube to $\boxed{68} \pm 7$ foot pounds torque.

11. Repeat Steps 1 through 9 until the correct toe setting is achieved.

FIGURE 8-13


SPRING EYE RE-TORQUE

This procedure to re-torque is necessary when replacing

- Front hanger
- Rear hanger
- Steel leaf spring

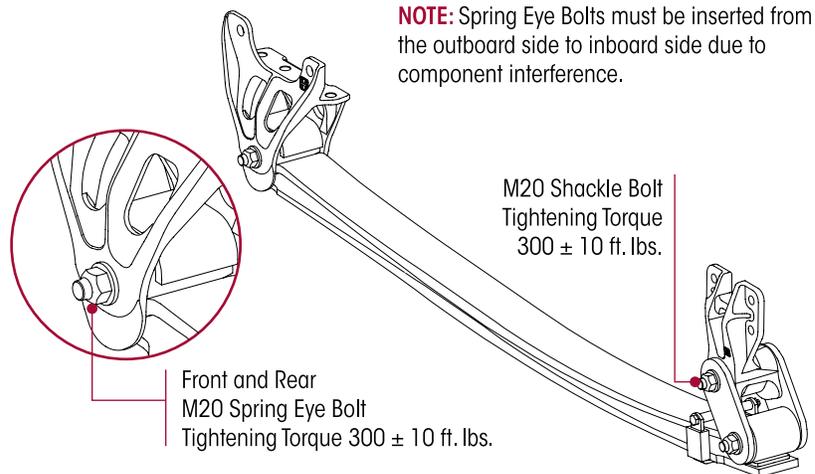
SOFTEK RE-TORQUE

1. Chock the wheels.
2. Loosen all six (6) front and rear spring eye bolts, see Figure 8-14.

NOTE

DO NOT remove the spring eye bolts.

FIGURE 8-14



3. Let the suspension settle.
4. Tighten the front M20 spring eye bolt locknuts to 300 ± 10 foot pounds torque.
5. Tighten the rear M20 spring eye bolt and shackle bolt locknuts to 300 ± 10 foot pounds torque.
6. Affix a straight edge to the bottom of the frame rail behind frame hanger, see Figure 8-15.
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 less than 3/8" the vehicle is level. If measurement is more than 3/8" contact Hendrickson Tech Services.

FIGURE 8-15



SECTION 9

Component Replacement

FASTENERS

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

SHOCK ABSORBER

NOTE

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

WARNING

THE SHOCK ABSORBERS ARE THE REBOUND TRAVEL STOPS FOR THE SPRINGS. ANYTIME THE FRONT AXLE ON AN 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.

DISASSEMBLY

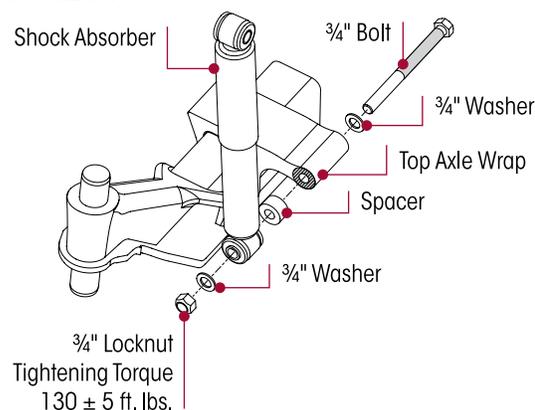
1. Place the vehicle on a level floor.
2. Chock the wheels.
3. Remove and discard the lower shock absorber mounting bolts and fasteners.
4. Remove and discard the upper shock absorber mounting bolts and fasteners.

WARNING

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

5. Slide out the shock absorber.
6. Remove the lower shock absorber spacer.
7. Inspect the shock absorber mounting brackets and hardware for damage or wear, replace as necessary.

FIGURE 9-1



Apply a thin coating of anti-seize compound to:

- the lower shock absorber
- mounting bolt shank
- mating face of the axle wrap
- mating face of the spacer
- the inside bore of the aluminum top axle wrap

ASSEMBLY

1. Install the shock absorber into the upper mounting bracket.
2. Install the upper shock absorber 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 shock absorber eye locknuts to \mathbb{N} 130 \pm 5 foot pounds torque.
6. Remove wheel chocks.

FRONT LEAF SPRING FRAME HANGER

DISASSEMBLY

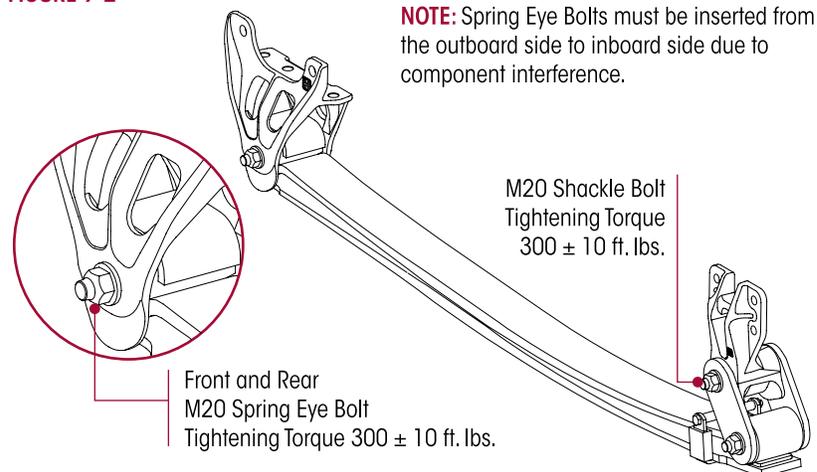
1. Place the vehicle on level floor.
2. Chock the wheels.
3. Raise the frame.
4. Support the vehicle with frame stands.
5. Suspend the front axle from the shock absorbers.
6. Remove the M20 spring eye bolt, washers and locknut.

SERVICE HINT

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

7. Remove the frame mounting fasteners from the hanger. See manufacturer's guidelines.
8. Remove the hanger from the vehicle, see Figure 9-2.

FIGURE 9-2



ASSEMBLY

1. Install the new hanger on the frame.
2. Install new frame fasteners. Follow manufacturer's guidelines.
3. Install the new M20 spring eye bolt from the outboard side of the hanger, see Figure 9-2, washers and locknut.
4. Remove the frame stands and lower frame.
5. Tighten M20 shackle locknut to \mathbb{N} 300 \pm 10 foot pounds torque.
6. Remove the wheel chocks.

REAR SHACKLE BRACKET

DISASSEMBLY

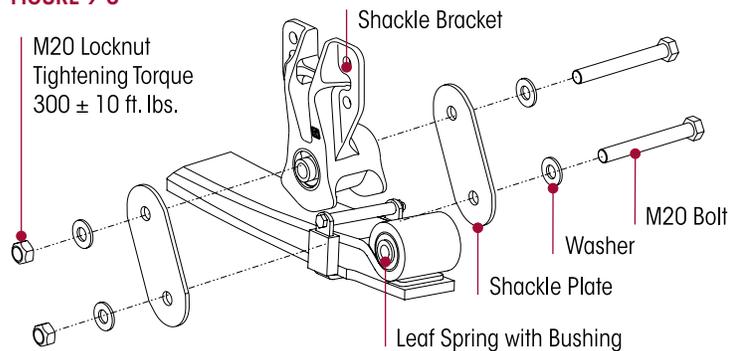
1. Place the vehicle on level floor.
2. Chock the wheels.
3. Raise the frame.

4. Support the vehicle with frame stands.
5. Suspend the front axle from the shock absorbers.

SERVICE HINT

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

6. Remove the rear M20 spring eye and shackle pivot bolts, washers and locknuts.
7. Remove the frame fasteners from the shackle bracket. See manufacturer's guidelines.
8. Remove the shackle bracket from the vehicle, see Figure 9-3.
9. Inspect the shackle assembly and both thrust washers (if equipped) for excessive wear or damage. See Thrust Washer Inspection in the Preventive Maintenance Section of this publication. Hendrickson recommends the thrust washers be replaced when this assembly is serviced.
10. If damaged or worn excessively, replace with Genuine Hendrickson Parts as detailed in the Component Replacement Section of this publication.

FIGURE 9-3

ASSEMBLY

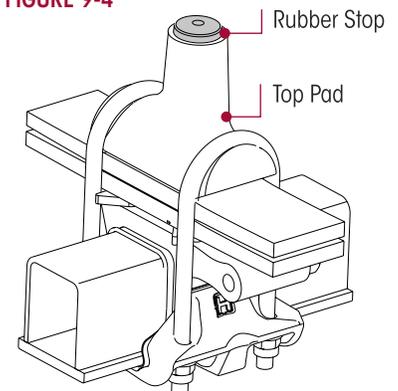
1. Install the shackle bracket on the frame.
2. Install new frame fasteners. Follow manufacturer's guidelines.
3. Install the thrust washers (if equipped) and shackle plates with the M20 bolts, washers and locknuts, see Figure 9-3.
4. Remove the frame stands and lower frame.
5. Tighten M20 locknuts to 300 ± 10 foot pounds torque.
6. Remove the wheel chocks.

RUBBER AXLE STOP
REMOVAL

1. Insert a small pry bar between the rubber stop and the inside of the top pad.
2. Apply downward force on the pry bar and pull the rubber stop out of the top pad, see Figure 9-4.
3. Inspect the top pad and frame rail flange for any contact damage.
4. Clean any debris from inside the top pad.

INSTALLATION

1. Lubricate the new rubber axle stop with soapy water.
2. Install the rubber axle stop in the top pad.
3. Apply downward force on the rubber axle stop until it is seated firmly in the top pad.

FIGURE 9-4


LEAF SPRING ASSEMBLY

DISASSEMBLY

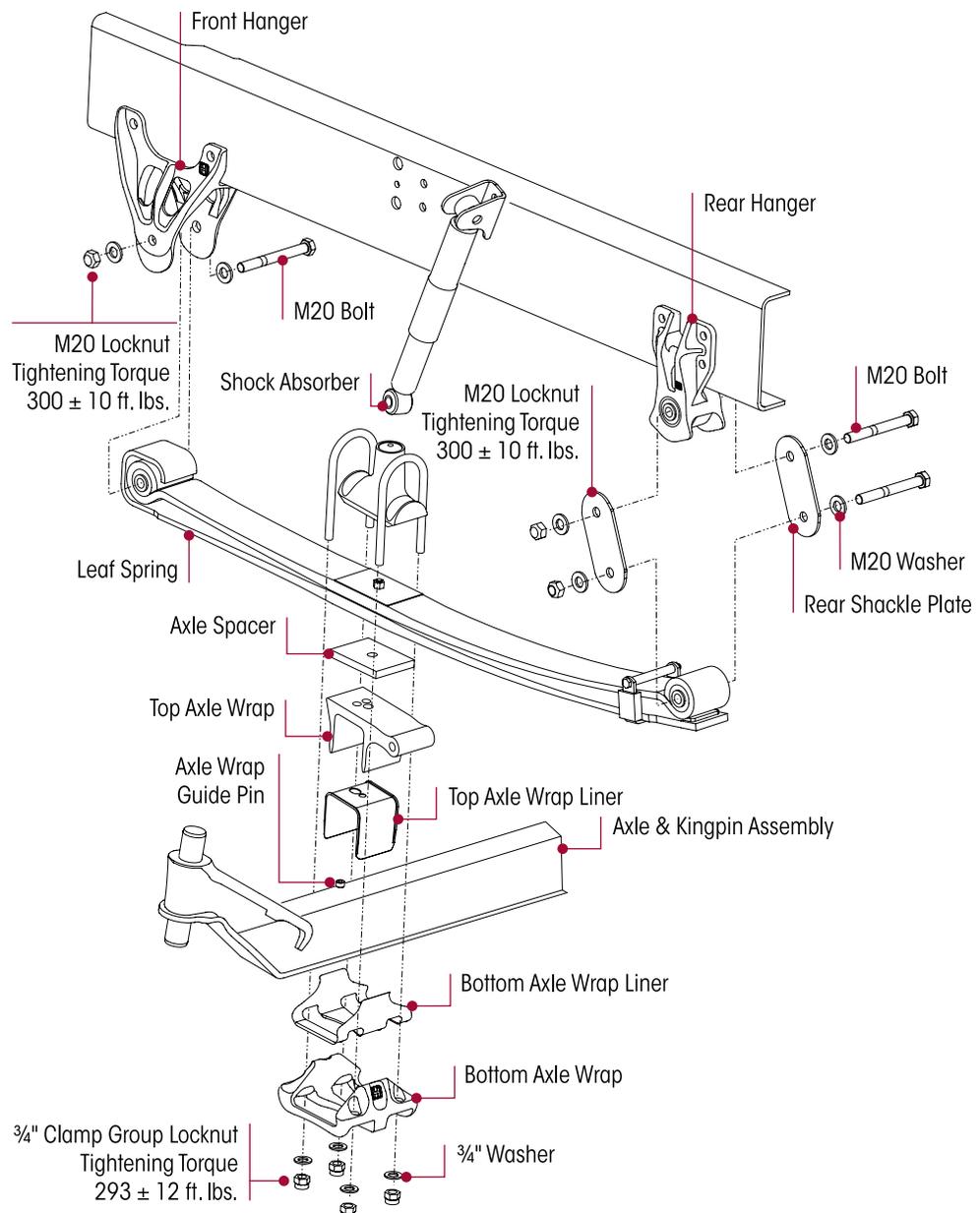
1. Place the vehicle on a level floor.
2. Chock the wheels.
3. Raise the vehicle.
4. Support the vehicle with frame stands.
5. Suspend the front axle to remove the load from leaf spring assembly.
6. Remove the front and rear M20 spring eye bolts washer and locknuts. Loosen the M20 shackle pivot bolt.

SERVICE HINT

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

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

FIGURE 9-5



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.

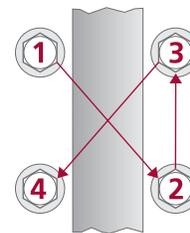
8. Remove the top pad, galvanized liner and the bottom axle wrap, see Figure 9-5.
9. Remove the spring assembly.

ASSEMBLY

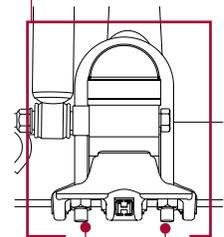
1. Install the new spring and wrap leaf assembly on the axle. Verify that the center bolt is located properly in the top axle wrap and spacer (if equipped), see Figure 9-5.
2. Install the new galvanized liner and the top pad onto the spring.
3. Remove and replace the bottom axle wrap liner located in bottom axle wrap.
4. Install the bottom axle wrap.
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 spring and wrap leaf assembly into the front hanger and rear shackle assembly.

8. Install the M20 spring eye bolts, washers and locknuts. Snug bolts. **DO NOT** tighten at this time.
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 9-6.

10. Tighten the clamp group locknuts evenly in 50 foot pounds increments to 293 ± 12 foot pounds torque in the proper pattern to achieve uniform bolt tension, see Figure 9-7.
11. Remove the frame supports and load the front axle with the vehicle weight.
12. Tighten the M20 spring eye bolt locknuts to 300 ± 10 foot pounds torque.

FIGURE 9-7

FIGURE 9-6

IMPORTANT
Ensure that the Axle Clamp Group is properly aligned



$\frac{3}{4}$ " Clamp Group Locknuts
Tightening Torque
 293 ± 12 ft. lbs.

FRONT LEAF SPRING EYE BUSHING

The spring eye bushings for the SOFTEK spring and wrap leaf 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 spring and wrap leaf assembly must be replaced. Follow the procedure for the Front Leaf Spring removal in the Component Replacement Section of this publication.

BOTTOM AXLE WRAP

DISASSEMBLY

1. Place the vehicle on level floor.
2. Chock the wheels.
3. Raise the frame.
4. Support the vehicle 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.

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

ASSEMBLY

1. Install new bottom axle wrap liner into bottom axle wrap.
2. Install 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 9-8.
4. Tighten locknuts evenly to 293 ± 12 foot pounds torque, see Figure 9-8 for proper torque sequence.
5. Remove the wheel chocks.

TOP AXLE WRAP (In Chassis)

DISASSEMBLY

1. Place the vehicle on level floor.
2. Chock the wheels.
3. Raise the frame.
4. Support the vehicle with frame stands.
5. Suspend the front axle to remove the load from the spring and wrap leaf assembly.
6. Remove the front and rear M20 spring eye bolts, washers and locknuts. Loosen the M20 shackle pivot bolt.
7. Support the axle with a jack.

SERVICE HINT

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

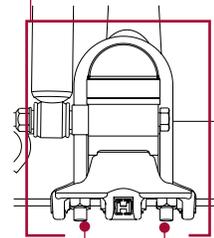
WARNING

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.

FIGURE 9-8

IMPORTANT

Ensure that the Axle Clamp Group is properly aligned

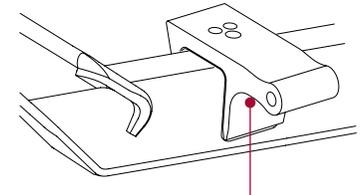


$\frac{3}{4}$ " Clamp Group Locknuts
Tightening Torque
293 ± 12 ft. lbs.

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.

8. Remove the 3/4" clamp group U-bolts, washers and locknuts. Discard fasteners.
9. Remove the top pad and the bottom axle wrap.
10. Remove the lower shock absorber mounting bolt.
11. Remove the spring and wrap leaf assembly.
12. 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 9-9.
13. Clean and inspect the axle wrap and axle wrap liners for cracks or damage, replace each if cracks or damage are present.

FIGURE 9-9


Carefully strike upward with a dead blow mallet on both ends

ASSEMBLY
WARNING

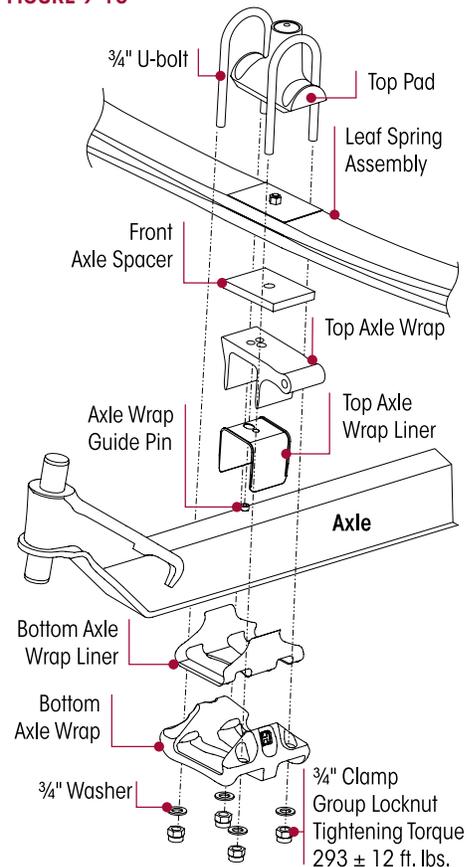
DO NOT ASSEMBLE CLAMP GROUP WITHOUT AXLE WRAP LINERS. FAILURE TO DO SO CAN CAUSE LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE OR PERSONAL INJURY.

1. Install the new top axle wrap liner on the axle. Index the liner with the axle's guide pin, see Figure 9-10.
2. Spray the top axle wrap liner and the top axle wrap with a silicon lubricant.
3. Position the top axle wrap on the axle over the top axle wrap liner, see Figure 9-10.
4. Protect the top surface of the top axle wrap with a block of wood, cardboard, or shop towels.

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.

5. Using a dead blow mallet drive the top axle wrap onto the axle indexing the axle guide pin until the axle wrap is firmly seated on the axle.
6. Place the front axle spacer onto the top axle wrap. Ensure the spacer is indexing the locating hole, see Figure 9-10.
7. Install the leaf spring assembly onto the axle wrap indexing the center bolt in the locating hole.
8. Install the top pad on the leaf spring assembly.
9. Remove and replace the bottom axle wrap liner.
10. Install the bottom axle wrap.
11. Install the new 3/4" clamp group U-bolts, washers, and locknuts.
12. Snug the clamp group, **DO NOT** torque at this time.

FIGURE 9-10


- Use a jack and raise the axle and spring assembly into the front spring hanger and shackle assembly.

SERVICE HINT

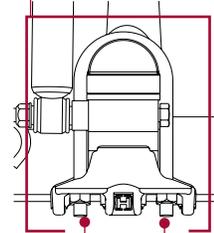
A bottle jack may be required to raise the axle slightly in order to install the spring eye bolts.

- Install the M20 spring eye bolts, washer and locknuts in the front spring hanger and rear shackle assembly.

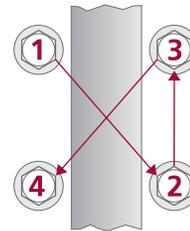
- Ensure that the clamp group is properly aligned and the U-bolts are seated in the top pad, and the bottom axle wrap is centered with the top axle wrap, see Figure 9-11.

FIGURE 9-11**IMPORTANT**

Ensure that the Axle Clamp Group is properly aligned



$\frac{3}{4}$ " Clamp Group Locknuts
Tightening Torque
293 ± 12 ft. lbs.

FIGURE 9-12

- Tighten the $\frac{3}{4}$ " clamp group locknuts evenly to \square 293 ± 12 foot pounds torque in the proper sequence, see Figure 9-12.

- Apply a thin coating of anti-seize to the lower shock absorber mounting bolt.

- Install shock absorbers (See shock absorber assembly in this section).

- Remove the jack from the axle.

- Remove the frame stands.

- Tighten the M20 spring eye bolt locknuts to \square 300 ± 10 foot pounds torque.

- Remove the wheel chocks.

FRONT AXLE ASSEMBLY**STEERTEK AXLE CLAMP GROUP CONSIST OF THE FOLLOWING COMPONENTS:**

- Top axle wrap
- Bottom axle wrap
- Top axle wrap liner
- Bottom axle wrap liner
- Top pad
- $\frac{3}{4}$ " U-bolts, washers and nylon locknuts

STEERTEK AXLE REMOVAL**AXLE DISASSEMBLY**

Refer to Figure 9-13 when replacing the components of the STEERTEK axle.

! 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.

- Place the vehicle on level floor.
- Chock the wheels.
- Raise the frame.
- Support the vehicle with frame stands.
- Suspend the front axle with the shock absorbers attached.
- Remove the front wheels, hubs, brake shoes and torque plate assembly.
- Disconnect the drag link from the steering arm.
- Support the axle with a floor jack.

9. If the vehicle is equipped with the shock absorbers attached to the top axle wrap, it will be necessary to remove the lower shock absorber mounting locknuts and washers. Remove the shock absorbers from the lower mounting bolts and push clear of spring assembly.

WARNING

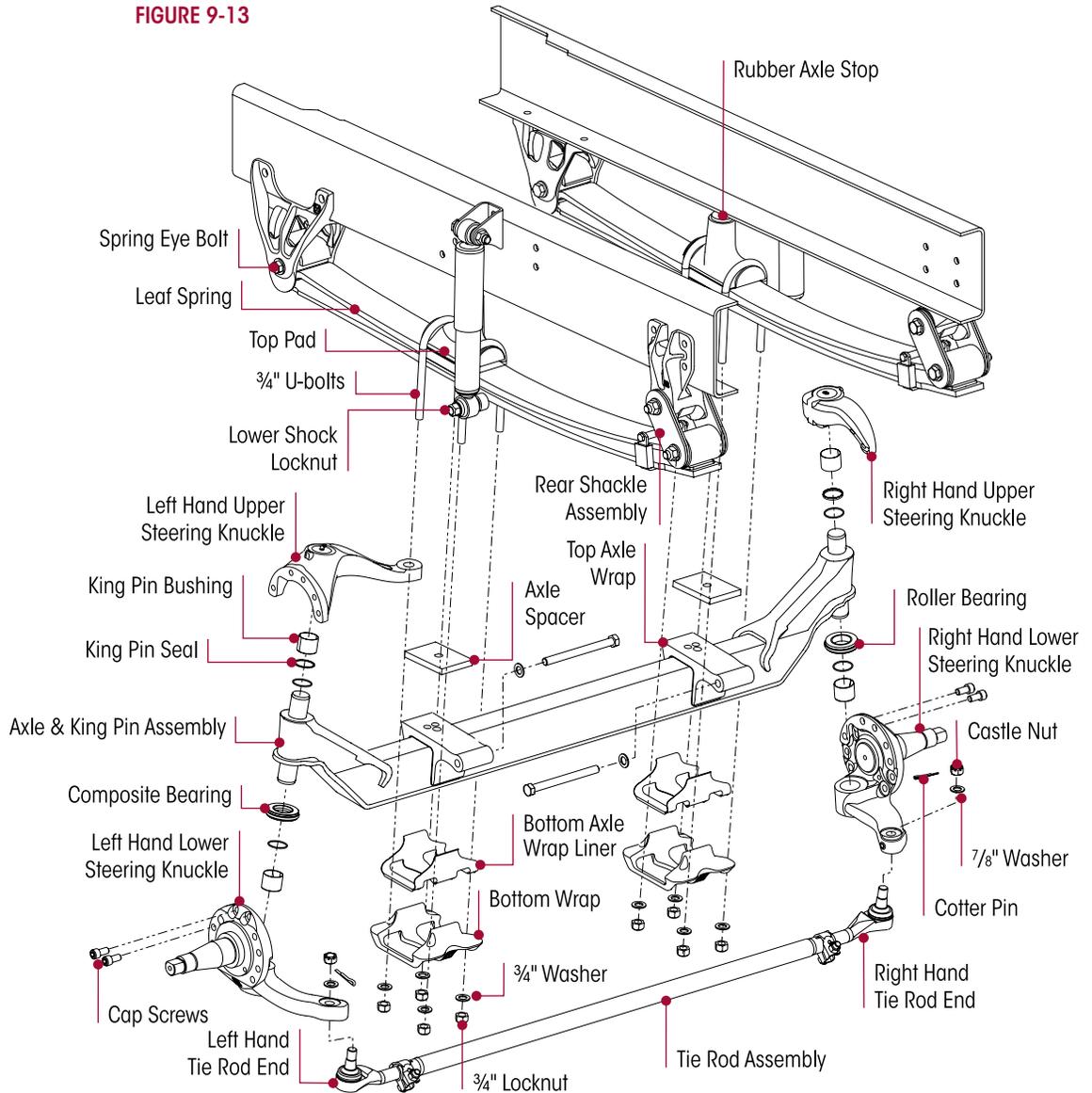
THE REPAIR OR RECONDITIONING OF SUSPENSION OR AXLE COMPONENTS IS NOT ALLOWED. HENDRICKSON ADVISES REPLACING ALL COMPONENTS FOUND TO BE DAMAGED OR OUT OF SPECIFICATIONS. ALL MAJOR HENDRICKSON COMPONENTS ARE HEAT TREATED AND TEMPERED. SOFTEK COMPONENTS CANNOT BE BENT, WELDED, HEATED, OR REPAIRED WITHOUT 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.

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.

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

11. Lower the axle and remove from the vehicle.

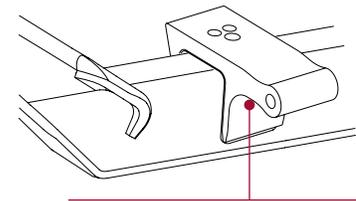
FIGURE 9-13

STEERTEK AXLE (REMOVED FROM CHASSIS)

CLAMP GROUP DISASSEMBLY

1. Remove the bottom axle wrap and liner from the axle.
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 9-14.
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.

FIGURE 9-14



Carefully strike upward with a dead blow mallet on both ends

WARNING

REMOVAL OF THE CAP SCREWS WILL ALLOW THE STEERING KNUCKLE TO SEPARATE FROM THE AXLE. THE BACKBONE 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 (2) $\frac{5}{8}$ " socket head cap screws from the steering knuckle assembly.
6. Remove the steering knuckle, thrust bearing, and shims (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.

CLAMP GROUP ASSEMBLY

1. Install the new top axle wrap liner on the axle. Index the liner with the axle's guide pin, see Figure 9-15.

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

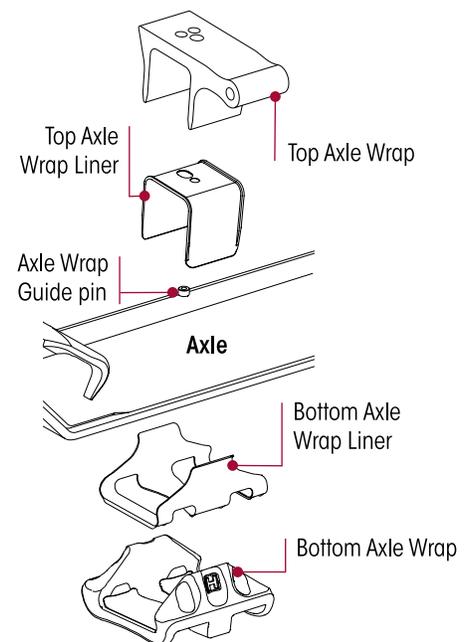
SECURELY INSTALL THE TOP WRAP TO THE AXLE. FAILURE TO DO SO CAN CAUSE LOSS OF VEHICLE CONTROL, PERSONAL INJURY OR PROPERTY DAMAGE.

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, see Axle Wrap Assembly instructions located in this section. 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.

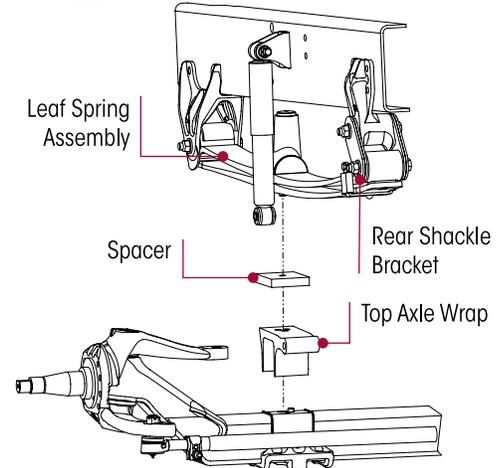
FIGURE 9-15



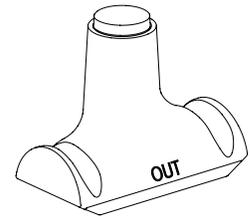
AXLE INSTALLATION

1. Place the new axle on the floor jack and position the axle under the vehicle.
2. Install the axle spacer on the top axle wrap prior to raising the axle into position.
3. Raise the axle into position, see Figure 9-16. Care must be taken at this point to ensure that the front leaf spring assemblies' center bolt is aligned correctly in the top axle wrap.
4. Verify that the galvanized liner is between the leaf springs and the top pad.
5. Install the new bottom axle wrap liners on the bottom axle wraps.

6. Install the bottom axle wraps on the axle.
7. Install the top pad with the directional identification facing correctly on the vehicle, see Figure 9-17.
8. Install the new 3/4" clamp group U-bolts / hex bolts, washers and locknuts. Snug the bolts, **DO NOT** tighten to the specified torque at this time.
9. Ensure that the clamp groups are properly aligned and the bolts are seated in the top pad, and the bottom axle wraps are centered on the top axle wraps, see Figure 9-18.
10. Install the lower shock absorber connection (if removed) from the inboard side to the outboard side. Install the lower shock absorber fasteners and tighten to \mathbb{N} 130 ± 5 foot pounds torque.

FIGURE 9-16


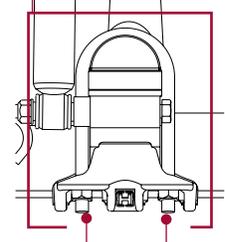
11. Install the steering knuckles as per the Steering Knuckle replacement instructions in this section.
12. Install the tie rod assembly as per the Tie Rod replacement instructions in this section.
13. Install the 7/8" hardened washers on the lower steering knuckles (Ackermann arms) and the castle nuts. Tighten the castle nuts to \mathbb{N} 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 the nut for cotter pin installation.

FIGURE 9-17


14. Install the tie rod end cotter pins.
15. Connect the drag link. Install the castle nut. Tighten the castle nut to \mathbb{N} 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 the nut for cotter pin installation.
16. Install the drag link cotter pin.
17. Install the brake backing plate assemblies.
18. Install the brakes, hubs, and wheels as per manufacturer's guidelines.
19. Fill the hubs with the proper lubricant (see manufacturer's guidelines for recommended lubrication specifications).
20. Raise the vehicle and remove the frame stands.
21. Lower the vehicle.

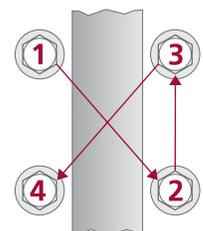
FIGURE 9-18

IMPORTANT
Ensure that the Axle Clamp Group is properly aligned



3/4" Clamp Group Locknuts
Tightening Torque
293 ± 12 ft. lbs.

22. Tighten the 3/4" clamp group locknuts evenly in 50 foot pounds increments to \mathbb{N} 293 ± 12 foot pounds torque in the proper sequence to achieve uniform bolt tension, see Figure 9-19.
23. Grease the front steering components as per lubrication guidelines in the Preventive Maintenance Section of this publication.
24. Remove the wheel chocks.

FIGURE 9-19


STEERING KNUCKLE

STEERING KNUCKLE DISASSEMBLY

NOTE See tools needed to remove and install kingpin bushing under 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 level floor.
2. Chock the wheels.
3. Support the vehicle with jack stands on the axle.
4. Remove the wheel and hub assembly.
5. Remove the brake components from steering knuckle.
6. Remove the tie rod assembly.
7. Remove the drag link from the knuckle if necessary.

SERVICE HINT

Lightly tap the side of the lower steering knuckle (Ackermann arm) with a mallet to separate the tie rod end from the Ackermann arm, see Figure 9-20.

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.

8. Remove the two (2) socket head cap screws that connect upper kingpin connection to the steering knuckle, see Figure 9-21.
9. Remove the lower steering knuckle from the kingpin by sliding it down the kingpin.
10. Remove the upper steering knuckle by sliding it up off the kingpin.

KINGPIN PREPARATION AND MEASUREMENT

WARNING

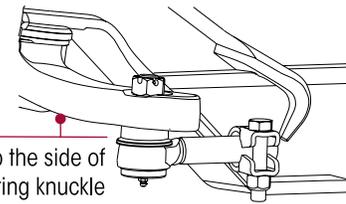
TO HELP PREVENT SERIOUS EYE INJURY, ALWAYS WEAR PROPER EYE PROTECTION WHEN YOU PERFORM VEHICLE MAINTENANCE OR SERVICE.

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:

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

FIGURE 9-20



Lightly tap the side of lower steering knuckle (Ackermann arm) to loosen the tie rod end

FIGURE 9-21



CAUTION

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

- Cleaning Ground and 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

STEERTEK IS A UNIQUE AXLE, IN THAT 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 TECHNICAL SERVICES DEPARTMENT.

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 9-22 through 9-25.

FIGURE 9-22



FIGURE 9-23



FIGURE 9-24



FIGURE 9-25



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 9-26 through 9-29.

Kingpin minimum dimension is 1.802"

FIGURE 9-26



FIGURE 9-27



FIGURE 9-28



FIGURE 9-29



KINGPIN BUSHING

You will need:

- A hydraulic shop press with a minimum forcing capacity of 2.5 tons (or an arbor press) or optional method - use hand tools.
- Adjustable Straight Flute Reamer with a cutting diameter must facilitate a range of 1.802" - 1.812"

Refer to the Special Tools Section of this publication for the following shop made tools:

- Kingpin Bushing Driver Tool
- Kingpin Bushing Receiving Tool (for shop press method)
- Kingpin Handle, Bushing Driver Installer / Remover and Seal Driver Installer Tool

FIGURE 9-30



FIGURE 9-31



FIGURE 9-32



REMOVAL

1. Remove the retaining ring for the grease cap.

NOTE

If a shop press is not available to remove and install the kingpin bushings, an acceptable optional method is to use a hammer along with the shop made tools (Kingpin Bushing Drivers and Seal Driver Tools) on a work bench.

WARNING

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

2. Ensure that each part of the steering knuckle assembly is squarely supported on the Receiving Tool before applying hydraulic pressure to press out the kingpin bushings (see Special Tools Section of this publication), see Figures 9-31 and 9-32.
3. Remove the grease zerk in the grease cap.
4. Place the upper steering knuckle in the press with the grease cap side (non machined side) facing up. Use the Kingpin Bushing Installer / Remover Tool and Kingpin Handle to press out the grease cap, kingpin bushing and seal, see Figure 9-31.

CAUTION

BEFORE APPLYING HYDRAULIC PRESSURE TO REMOVE OR INSTALL THE KINGPIN BUSHING, SUPPORT THE LOWER STEERING KNUCKLE AS SHOWN IN FIGURE 9-32. IMPROPER SUPPORT TO THE STEERING KNUCKLES CAN CAUSE COMPONENT DAMAGE.

5. Use the same procedure to remove the kingpin bushing in the the lower steering knuckle. Place 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 9-32.

FIGURE 9-33

6. Clean the parts and inspect for reassembly, see Figure 9-33.


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° opposed from each other, see Figures 9-34 through 9-36. If the average measurement is more than the knuckle bore maximum diameter specification, replace the knuckle.

FIGURE 9-34

FIGURE 9-35

FIGURE 9-36


INSTALLATION

WARNING

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

1. Install the lower or upper steering knuckle in the press. Ensure that each part of the steering knuckle assembly is squarely supported on the Receiving Tool before applying hydraulic pressure to press in the kingpin bushings.
2. Always install the kingpin bushing from the machined side (axle side) of the lower steering knuckle using the Kingpin Bushing Driver to install kingpin bushing (see tool specifications in the Special Tools Section of this publication), see Figures 9-37 and 9-39.
3. Press in the kingpin bushing using the Kingpin Bushing Installer / Remover Tool and Kingpin Handle, (see Special Tools Section of this publication), to a depth of no less than $\frac{15}{64}$ " (0.236") or 6 millimeters and no more than $\frac{5}{16}$ " (0.32") or 8 millimeters past the kingpin bore.
4. Following this procedure it is necessary to ream the kingpin bushings to fit the kingpins, see Kingpin Bushing Reaming in this section.

FIGURE 9-37



FIGURE 9-38



FIGURE 9-39



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.

FIGURE 9-40

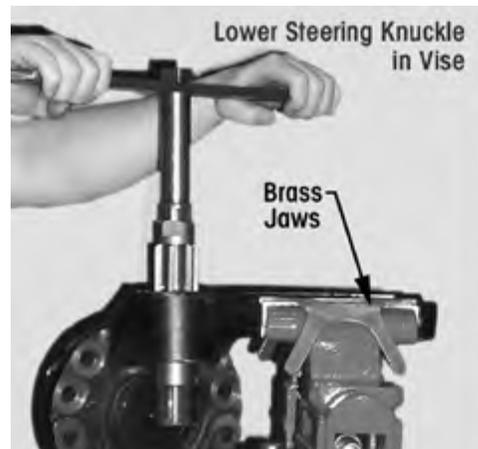
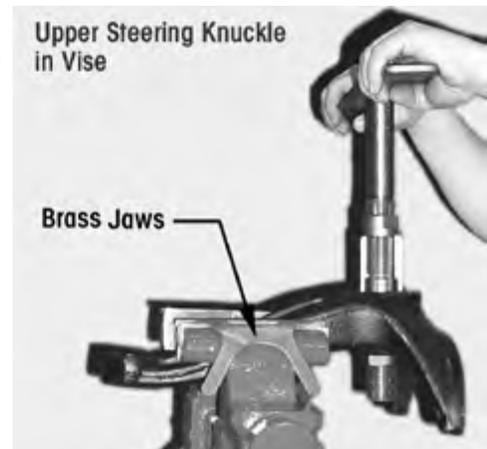
2. Install the reamer into the lower steering knuckle until the blades touch the kingpin bushing.
3. Rotate the reamer with light downward pressure. Rotate the reamer smoothly. **DO NOT** apply too much pressure, see Figures 9-41 and 9-42.
4. Slide the reamer out of the bottom of the steering knuckle assembly. If it is necessary to remove the reamer from the top, rotate the reamer opposite of cutting rotation, see Figure 9-40.



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 5/8" brake spider / torque 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.

FIGURE 9-41

FIGURE 9-42

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 Figure 9-42.
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.

KINGPIN SEAL INSTALLATION
FIGURE 9-43

MAGNIFICATION OF LIP SEAL
Lip seal faces toward axle.


FIGURE 9-44

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



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 Kingpin 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 9-43 and 9-44.

STEERING KNUCKLE ASSEMBLY

After replacement of the kingpin bushings it is necessary to re-assemble the steering knuckle assemblies. The STEERTEK axle is equipped with two (2) different thrust bearings installed. **DO NOT** substitute aftermarket components when servicing.

FIGURE 9-45



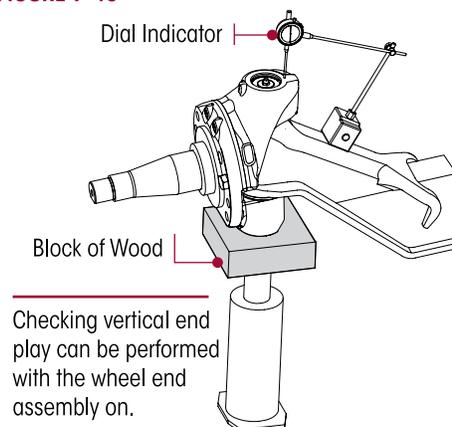
1. Install the thrust bearing on the lower kingpin with the seal facing up toward axle (the black seal will designate the top side, see Figure 9-45). The composite thrust bearing is installed on the left side of the axle. The roller bearing is installed on the right side of the axle.
2. Install the shim 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.

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 three (3) brake backing plate bolts by hand. These are for guide purposes only.
7. Snug the two (2) socket head cap screws.
8. Lower the bottle jack so that all the vertical clearance is on the underside of the axle.

FIGURE 9-46



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 9-46.
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.
14. If the clearance is **below the 0.008"**, loosen the two (2) 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.

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.

NOTE

The steering knuckle socket head cap screws come with a pre-applied loctite compound.

15. Remove one (1) old socket head cap screw and replace with a new socket head cap screw.
16. Remove second socket head cap screw and replace with new socket head cap screw. Tighten both socket head cap screws to 188 ± 12 foot pounds torque.
17. Recheck the vertical clearance with the dial indicator or a 0.010" feeler gauge, see Figure 9-46.
18. Remove the brake spider bolts, they should thread out freely.
19. Remove the bottle jack and continue assembling the wheel ends.

IMPORTANT NOTE

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

20. Apply loctite to the three (3) brake spider bolts prior to installation into the brake spider. Tighten bolts to 188 ± 12 foot pounds torque.

WARNING

DO NOT GREASE KNUCKLES WITHOUT THE BRAKE SPIDER 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 ends into the lower steering knuckles (Ackermann arms).
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 the 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. Install brakes, drums, wheels and tires.
27. Remove jack and safety stands.
28. Grease steering knuckles with the vehicle on the floor.
29. Remove wheel chocks.

TIE ROD END AND CROSS TUBE

DISASSEMBLY

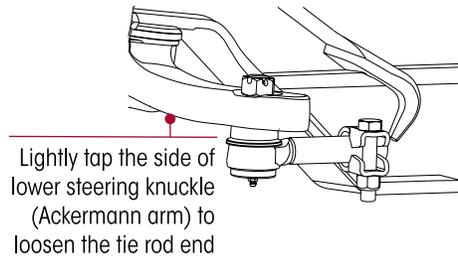
1. Chock the wheels.
2. Position the steer axle tires straight ahead.
3. Remove the cotter pin and castle nut.

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 LOSS OF VEHICLE CONTROL, AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

4. Lightly tap the side of the lower steering knuckle (Ackermann arm) to loosen the tie rod end from the Ackermann arm, see Figure 9-47.
5. Repeat 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.
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.

FIGURE 9-47



ASSEMBLY

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

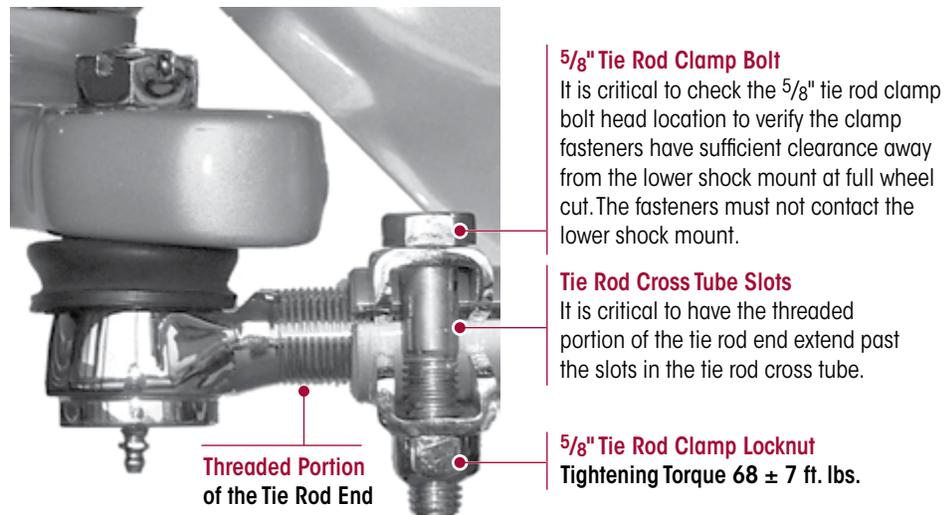
NOTE

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 lower steering knuckle.
- A left hand threaded tie rod end will be installed into the left side lower steering knuckle.

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.

FIGURE 9-48



WARNING

THE THREADED PORTION OF THE TIE ROD END MUST EXTEND PAST THE SLOTS INTO THE TIE ROD CROSS TUBE, SEE FIGURE 9-48. FAILURE TO DO SO CAN CAUSE COMPONENT DAMAGE, LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

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 PERSONAL INJURY OR PROPERTY DAMAGE.

3. Replace the opposing tie rod end if necessary by repeating Steps 2 and 3.
4. If replacing opposing tie rod end, it is critical that the cross tube will rotate in the opposing tie rod end.

5. Install the cross tube into the lower steering knuckles (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 Preventive Maintenance Section of this publication.
8. Set the toe, see the Toe Adjustment Procedure in Alignment & Adjustments Section of this publication.

AIR DISC BRAKE • DRUM BRAKE ASSEMBLY

SERVICE HINT

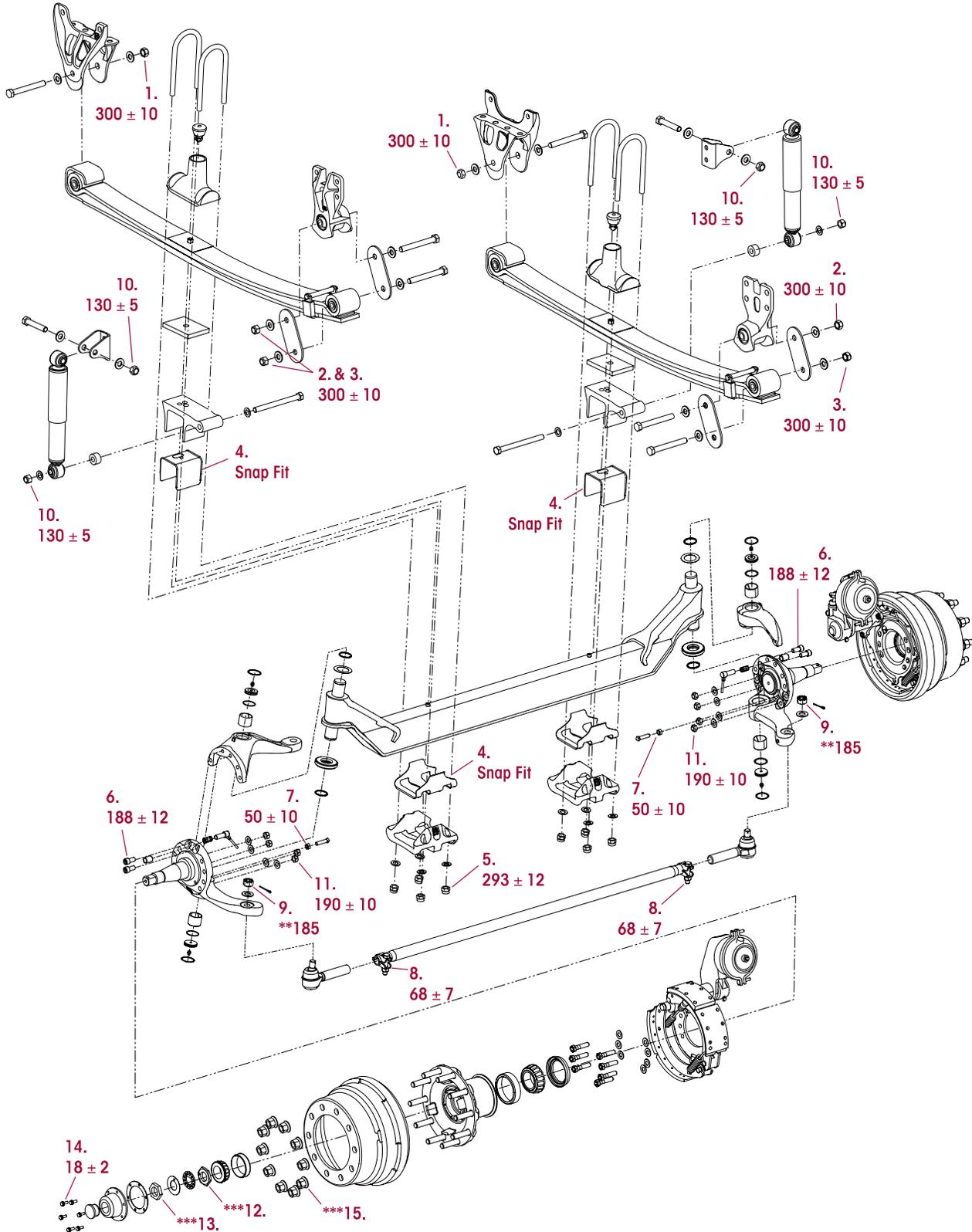
Brake components are not supplied by Hendrickson for aftermarket service purposes. For more information and assistance with service, maintenance and rebuild instructions on these components, refer to the following component manufacturers.

- **Federal Mogul** technical and parts support 800.325.8886 or www.fme-cat.com
- **Meritor** technical and parts support 888.725.9355 or parts (www.meritorpartsexpress.com), technical support (www.meritorbullpen.com)
- **Stemco** technical and part support 800.527.8492 or go to www.stemco.com
- **Timken** technical and part support 866.984.6536 or online at www.timken.com/resources or Timken YouTube series, Timken Tricks of the Trade (Installing a Timken® Set-Right® Bearing)
- **WABCO** technical and parts support 855.228.3203 or www.wabco-auto.com/aftermarket-services/inform-product-catalog
- **Webb** technical and part support 800.633.3256 or go to www.webbwheel.com

SECTION 10 Torque Specifications

HENDRICKSON RECOMMENDED TORQUE VALUES
PROVIDED IN FOOT POUNDS

SOFTEK for Lion Bus with Drum Brakes





SOFTEK with STEERTEK Axle for Lion Bus with Drum Brakes

Hendrickson Recommended Torque Specifications

NO.	COMPONENT	FASTENER		TORQUE VALUE	
		*QTY.	SIZE	FOOT POUNDS	NEWTON METERS
Frame fasteners are furnished and installed by the vehicle manufacturer. Vehicle manufacturer may use an equivalent HUCK fastener at frame mount.					
1	Front Frame Hanger to Front Leaf Spring Eye	2	M20	300 ± 10	407 ± 14
2	Rear Shackle Bracket to Shackle Plate	2	M20	300 ± 10	407 ± 14
3	Rear Shackle Bracket to Leaf Spring Eye	2	M20	300 ± 10	407 ± 14
4	Axle Wrap Liners for Clamp Group	4	Formed	Snap Fit	
	⚠ WARNING DO NOT ASSEMBLE CLAMP GROUP WITHOUT AXLE WRAP LINERS. FAILURE TO DO SO CAN CAUSE LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE OR PERSONAL INJURY.				
5	Clamp Group Hardware	8	¾"	293 ± 12	397 ± 16
	⚠ WARNING 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	⅝"	188 ± 12	255 ± 16
7	Knuckle / Steering Stop Bolt	2	½" Jam Nut	50 ± 10	68 ± 14
8	Tie Rod Tube to Tie Rod Ends	2	⅝"	68 ± 7	92 ± 9
9	Tie Rod Ends / Drag Link to Steering Knuckle	2	⅞" Castle Nut	**185	**251
10	Upper and Lower Shock absorber Eye Fasteners	4	¾"	130 ± 5	176 ± 8
11	Lower Steering Knuckle Assembly to Brake Assembly	8	⅝"	190 ± 10	258 ± 14
12	Inner Wheel Bearing Adjusting Nut	2	1½"	***	
13	Wheel Bearing Outer Nut	2	1½"	***	
14	Hubcap	12	⅝"	18 ± 2	24 ± 3
15	Wheel Flange Nut	20	M22	***	

• All hardware ¼" and greater is Grade 8 with no additional lubrication.

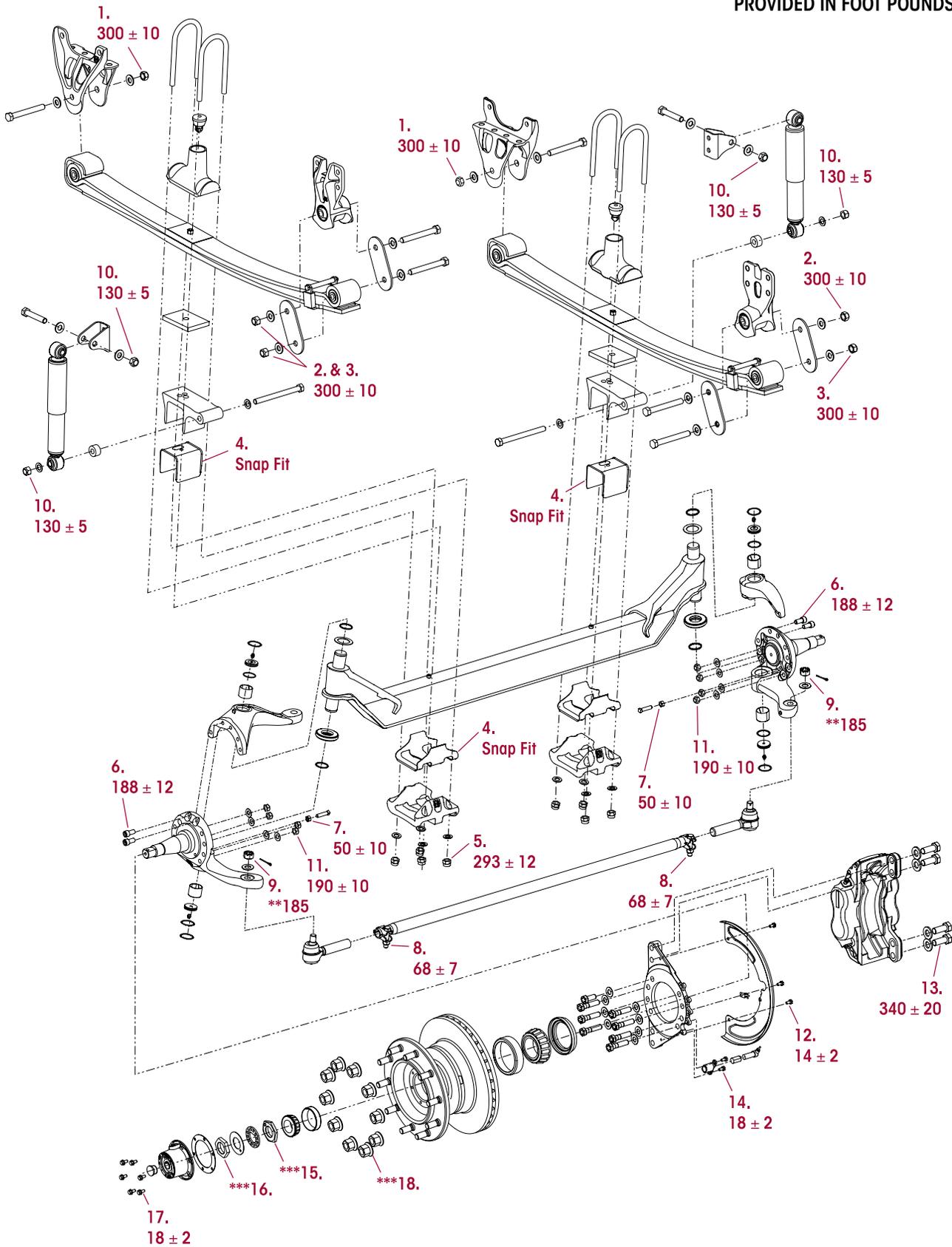
NOTE: * Quantities shown as per front suspension and axle system.

** Torque to 185 foot pounds (251 Nm), advance nut to next hex face to install cotter pin. **DO NOT** back off nut for cotter pin installation.

*** Not supplied by Hendrickson, used for reference only. Follow the torque specification listed in the vehicle manufacturer's service manual.

SOFTEK for Lion Bus with Disc Brakes

HENDRICKSON RECOMMENDED TORQUE VALUES
PROVIDED IN FOOT POUNDS





SOFTEK with STEERTEK Axle for Lion Bus with Disc Brakes

Hendrickson Recommended Torque Specifications

NO.	COMPONENT	FASTENER		TORQUE VALUE	
		*QTY.	SIZE	FOOT POUNDS	NEWTON METERS
Frame fasteners are furnished and installed by the vehicle manufacturer. Vehicle manufacturer may use an equivalent HUCK fastener at frame mount.					
1	Front Frame Hanger to Front Leaf Spring Eye	2	M20	300 ± 10	407 ± 14
2	Rear Shackle Bracket to Shackle Plate	2	M20	300 ± 10	407 ± 14
3	Rear Shackle Bracket to Leaf Spring Eye	2	M20	300 ± 10	407 ± 14
4	Axle Wrap Liners for Clamp Group	4	Formed	Snap Fit	
	⚠ WARNING DO NOT ASSEMBLE CLAMP GROUP WITHOUT AXLE WRAP LINERS. FAILURE TO DO SO CAN CAUSE LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE OR PERSONAL INJURY.				
5	Clamp Group Hardware	8	¾"	293 ± 12	397 ± 16
	⚠ WARNING 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	⅝"	188 ± 12	255 ± 16
7	Knuckle / Steering Stop Bolt	2	½" Jam Nut	50 ± 10	68 ± 14
8	Tie Rod Tube to Tie Rod Ends	2	⅝"	68 ± 7	92 ± 9
9	Tie Rod Ends / Drag Link to Steering Knuckle	2	⅞" Castle Nut	**185	**251
10	Upper and Lower Shock absorber Eye Fasteners	4	¾"	130 ± 5	176 ± 8
11	Lower Steering Knuckle Assembly to Torque Plate	8	⅝"	190 ± 10	258 ± 14
12	Torque Plate to Dust Shield	6	M8	14 ± 2	19 ± 3
13	Torque Plate to Caliper	8	M20	340 ± 20	461 ± 27
14	Torque Plate to ABS Bracket	4	⅝"	18 ± 2	24 ± 3
15	Inner Wheel Bearing Adjusting Nut	2	1½"	***	
16	Wheel Bearing Outer Nut	2	1½"	***	
17	Hubcap	12	⅝"	18 ± 2	24 ± 3
18	Wheel Flange Nut	20	M22	***	
NOTE: * Quantities shown as per front suspension and axle system.					
** Torque to 185 foot lbs., advance nut to next hex face to install cotter pin. DO NOT back off nut for cotter pin installation.					
*** Not supplied by Hendrickson, used for reference only. Follow the torque specification listed in the vehicle manufacturer's service manual.					

SECTION 11

Troubleshooting Guide

SOFTEK with STEERTEK Axle for Lion Bus

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	Lubricate axle at scheduled frequency
	Incorrect lubrication procedures	Use correct lubrication procedures
	Lubrication interval not compatible with operating conditions	Change lubrication interval to match operating condition
	Worn or missing seals	Replace worn or missing seals
Vibration or shimmy of front axle during operation	Caster out of specification	Verify ride height is within specification, then adjust caster to specification
	Wheels and / or tires out of balance	Balance or replace wheels and / or tires
	Worn shock absorbers	Replace shock absorbers
	Worn thrust washers and rear hanger clamps	Replace thrust washers and rear hanger clamps
	Broken engine mount	Replace engine mount
	Wheel bearing adjustment	Adjust wheel bearing to the vehicle manufacturers specifications
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 toe setting	Adjust toe-in to manufacturer's specification
	Incorrect steering arm geometry	Repair steering system as necessary
	Worn kingpin bushings	Replace kingpin bushings
	Excessive wheel bearing end play	Check specified wheel nut torque, replace worn or damaged wheel bearings
	Wheel bearing adjustment	Adjust wheel bearing to the vehicle manufacturers 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 specification	Verify ride height is within specification, then adjust caster to specification
	Tie rod ends hard to move	Replace tie rod ends
	Worn thrust bearing	Replace thrust bearing
	Steering gear box internal problem	Perform steering gear troubleshooting procedures per steering gear manufacturing guidelines.



SOFTEK with STEERTEK Axle for Lion Bus

Troubleshooting Guide

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	Pump / gear relief valve pressure setting exceeds system specifications	Adjust power steering system to manufacturer's specified pressure
	Steering gear poppets improperly set or malfunctioning	Check for proper operation or adjust poppets to OEM specifications
	Axle stops improperly set	Set axle stops to OEM specifications
NOTE: Damaged components require replacement	Severe duty cycle service	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
Restricted steering radius	Steering stops not adjusted correctly	Adjust steering stops to achieve correct wheel cut
Vehicle leans	Ride height incorrect	Adjust ride height to specification
	Suspension is not torqued correctly at installation	Perform spring hanger re-torque procedure. See Torque Specification Section of this publication
	Leaf spring broken	Replace leaf spring
	Excessive weight bias	Contact the vehicle manufacturer or Hendrickson Tech Services
Vehicle wanders	Caster out of specifications	Verify ride height is within specification, then 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	Adjust ride height to specification
	Front ride height out of adjustment	Adjust ride height to specification

SECTION 12

Front Alignment Specifications

SOFTEK with STEERTEK Axle for Lion Bus

Front Suspension Alignment Specification

CAMBER ¹	DESIGN SPECIFICATION	RANGE	
		MINIMUM	MAXIMUM
LEFT	0.0° ± 1.0°	-1.0°	+1.0°
RIGHT	0.0° ± 1.0°	-1.0°	+1.0°
CROSS	0.0°	—	+2.0°

CAMBER NOTES:

¹ 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 ^{1,2}	DESIGN SPECIFICATION	RANGE	
		MINIMUM	MAXIMUM
LEFT	5.0° ± 1.0°	+4.0°	+6.0°
RIGHT	5.0° ± 1.0°	+4.0°	+6.0°
CROSS ³	0.0°	—	+2.0°

CASTER NOTES:

¹ Caster is determined with the vehicle at specified ride height 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.

² 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.

³ **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 (2) different angle caster shims will not correct cross caster.**

⁴ **Example of caster adjustment:** 2.50° Right Hand / 3.00° Left Hand, would require two (2), 1.0 shim on each side to increase caster and achieve 4.50° Right Hand / 5.00° Left Hand, which is in specification. **DO NOT** attempt to use uneven shims.

Hendrickson recommends following tmc² practices:

	DESIGN SPECIFICATION ¹	RANGE	
		MINIMUM	MAXIMUM
TOTAL TOE²	1/16" ± 1/32" (0.06" ± 0.03")	1/32" (0.03")	3/32" (0.09")

TOE-IN NOTES:

¹ 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.

² In most instances total toe is set by the vehicle manufacturer or body builder. Consult the vehicle manufacturer for specifications.



SECTION 13

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, videos, or charts, contact TMC at:

TMC / ATA	Phone: 703-838-1763
2200 Mill Road	website: tmc.truckline.com
Alexandria, VA 22314	online ordering: 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

Videos

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

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



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