



H TECHNICAL PROCEDURE

AIRTEK® for International IC Bus Vehicles

SUBJECT: Service Instructions

LIT NO: 17730-268

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SECTION 1

Introduction

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

- **AIRTEK®** — An integrated front air suspension with the STEERTEK axle.

See parts list 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 AIRTEK Suspension and the STEERTEK axle.

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

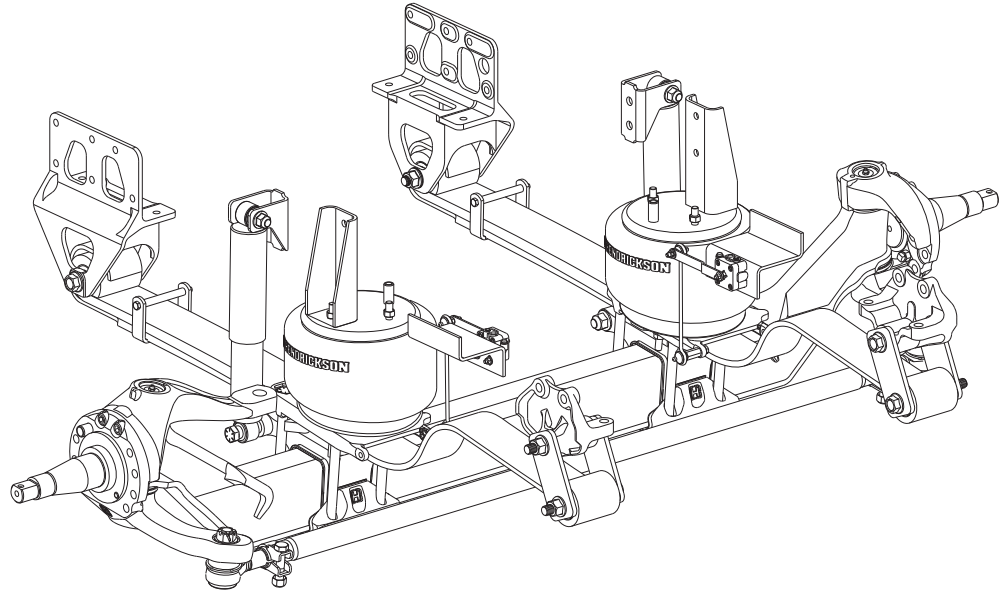
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The latest revision of this publication is also available online at www.hendrickson-intl.com.

SECTION 2 Product Description

FIGURE 2-1 AIRTEK Air Suspension and Axle System for International IC Bus Vehicles
Capacity: 12,000 and 14,000 LBS.
STEERTEK — Axle Drop: 4.25"



AIRTEK — Winner of the 2001 Automotive News and Cap Gemini Ernst & Young PACE Award for Product Innovation, AIRTEK is an integrated front air suspension and robotically welded steer axle that work together to form an integrated torsion system. This lightweight system provides driver comfort and is ideal for bus applications. Utilizing a system approach, Hendrickson has engineered and optimized the following components to form a system delivering enhanced ride, stability and handling characteristics with reduced weight and maintenance.

Air Springs — Exclusive to Hendrickson, the lightweight air springs deliver an extremely soft ride. The air springs are engineered to support 80% of the vertical load while providing very low spring rate.

AIRTEK Leaf Spring Assembly — With its innovative design, the leaf spring provides superior stability, performance and a soft ride. The leaf spring shares loads with the air spring. Durable rubber front and rear bushings are greaseless and only require periodic inspections.

Shock Absorbers — AIRTEK utilizes premium shocks that have been tested and tuned specifically for the AIRTEK system.

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

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

- Top axle wrap
- Top axle wrap Liner
- Top pad
- Bottom axle wrap
- Bottom axle wrap liner
- ¾" Bolts and flange locknuts

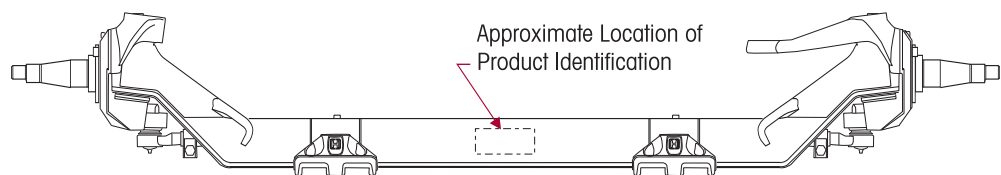
Adjustable Tie Rod — To help maximize tire life, the tie rod easily adjusts toe-in/out.

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. AIRTEK is approved for on-highway usage with up to 15 percent operation on unpaved secondary roads. Other applications must be pre-approved by both Hendrickson and vehicle manufacturer. This system has a 12K and 14K pound capacity. System capacity represents maximum loads on tires at ground level.
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. AIRTEK suspension weight includes main springs, bushings, air springs, height control system and shocks.
5. STEERTEK axle system weight is based on a 4.25" drop height and a 70.87" KPI axle. Weight includes, the axle beam, knuckle/steering arm assemblies and tie rod assemblies.
6. AIRTEK is integral to and available exclusively with the STEERTEK axle. Contact Hendrickson for approval and guidelines on any application that exceeds 15 percent off road usage. This system is anti-lock braking system (ABS) ready. STEERTEK is compatible with industry standard wheel ends and brakes. STEERTEK is also available with mechanical suspension options. Contact Hendrickson or vehicle manufacturer for availability.
7. The STEERTEK axle product identification is etched on the center front of the axle beam providing the following information:
 - Axle part number: Identifies the features of the axle beam.
 - Axle assembly number: Identifies the complete assembly, which includes the steering knuckles and bracket assemblies.

FIGURE 2-2 Front view of STEERTEK axle showing approximate location of etched 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.

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

Failure to follow the safety precautions in this manual can result in personal injury and/or property damage. Carefully read and understand all safety related information within this publication, on all decals and 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.



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



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



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.

SAFETY PRECAUTIONS

WARNING

FASTENERS

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

DANGER

AIR SPRINGS

AIR SPRING ASSEMBLIES MUST BE DEFLATED PRIOR TO LOOSENING ANY CLAMP GROUP HARDWARE. UNRESTRICTED AIR SPRING ASSEMBLIES CAN VIOLENTLY SHIFT. DO NOT INFLATE AIR SPRING ASSEMBLIES WHEN THEY ARE UNRESTRICTED. AIR SPRING ASSEMBLIES MUST BE RESTRICTED BY SUSPENSION OR OTHER ADEQUATE STRUCTURE. DO NOT INFLATE BEYOND PRESSURES RECOMMENDED BY AIR SPRING MANUFACTURER, CONTACT HENDRICKSON TECHNICAL SERVICES FOR DETAILS. IMPROPER USE OR OVER INFLATION MAY CAUSE AIR SPRING ASSEMBLIES TO BURST, CAUSING PROPERTY DAMAGE AND/OR SEVERE PERSONAL INJURY.

WARNING

WHEN SERVICING THE VEHICLE OR ATTACHING AN AIR SPRING AND THE VEHICLE IS ON THE GROUND, PRIOR TO AIRING THE SUSPENSION SYSTEM MAKE CERTAIN THE AIR SPRING LOCATOR IS INDEXED INTO THE UPPER AIR SPRING BRACKET PROPERLY, AND THE AIR SPRING IS FULLY SEATED ON THE SPRING TOP PAD. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN PREMATURE AIR SPRING FAILURE, CAUSE PERSONAL INJURY, OR PROPERTY DAMAGE.

WARNING

PRIOR TO AND DURING DEFLATION AND INFLATION OF THE FRONT AIR SUSPENSION SYSTEM, ENSURE THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR FROM UNDER THE VEHICLE AND AROUND THE SERVICE AREA, FAILURE TO DO SO CAN CAUSE SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

WARNING

LOAD CAPACITY

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

WARNING

MODIFYING COMPONENTS

DO NOT MODIFY OR REWORK PARTS WITHOUT AUTHORIZATION FROM HENDRICKSON. DO NOT SUBSTITUTE OR 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, AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE. USE ONLY HENDRICKSON AUTHORIZED REPLACEMENT PARTS.

WARNING

TORCH/WELDING

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

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



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 INTO 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 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 AXLE TO TOW THE VEHICLE, DOING SO WILL DAMAGE THE AXLE AND VOID WARRANTY, (SEE FIGURE 3-2). FOR DETAILED TOWING INSTRUCTIONS FOR ON-HIGHWAY TOWING, SEE SECTION 6.

FIGURE 3-1 ACCEPTABLE



FIGURE 3-2 NOT ACCEPTABLE



WARNING

PARTS CLEANING

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

SHOCK ABSORBERS

THE SHOCK ABSORBERS ARE THE REBOUND TRAVEL STOPS FOR THE SPRINGS. ANYTIME THE FRONT AXLE ON AN AIRTEK SUSPENSION IS SUSPENDED IT IS MANDATORY THAT THE SHOCK ABSORBERS REMAIN CONNECTED. FAILURE TO DO SO COULD CAUSE THE AIR SPRINGS TO EXCEED THEIR MAXIMUM LENGTH, POSSIBLY CAUSING THE AIR SPRINGS TO SEPARATE FROM THE PISTON, OR CAUSE A REVERSE ARCH IN THE STEEL LEAF SPRINGS, POSSIBLY RESULTING IN PREMATURE STEEL LEAF SPRING FAILURE.

CAUTION

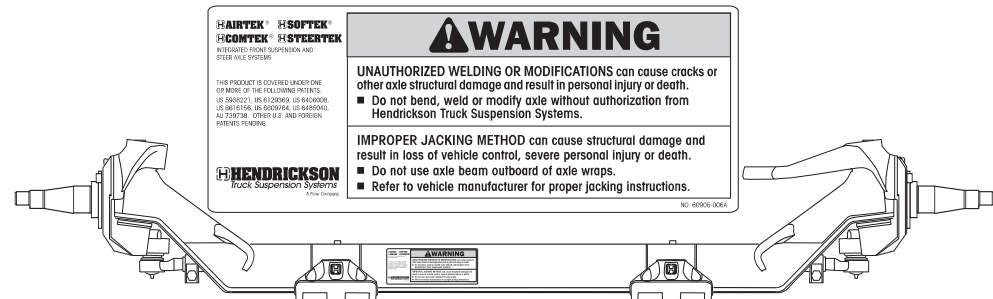
PROCEDURES AND TOOLS

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
AXLE CAMBER

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

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


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 TECH SERVICES DEPARTMENT.

WARNING
REPAIR AND RECONDITIONING

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

WARNING
DAMAGED COMPONENTS

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

WARNING
PERSONNEL PROTECTIVE EQUIPMENT

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

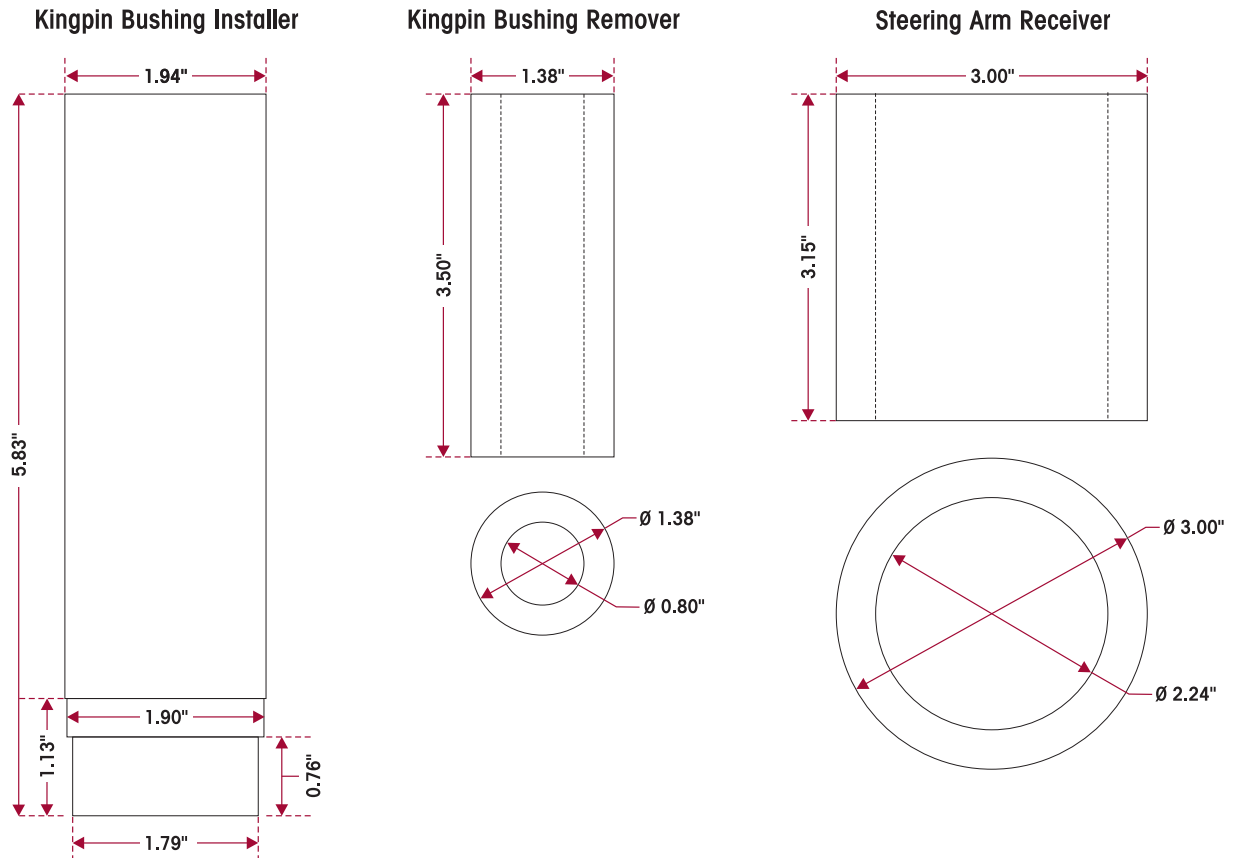
WARNING
SUPPORT THE VEHICLE PRIOR TO SERVICING

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

SECTION 4 Special Tools

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

KINGPIN BUSHING TOOLS

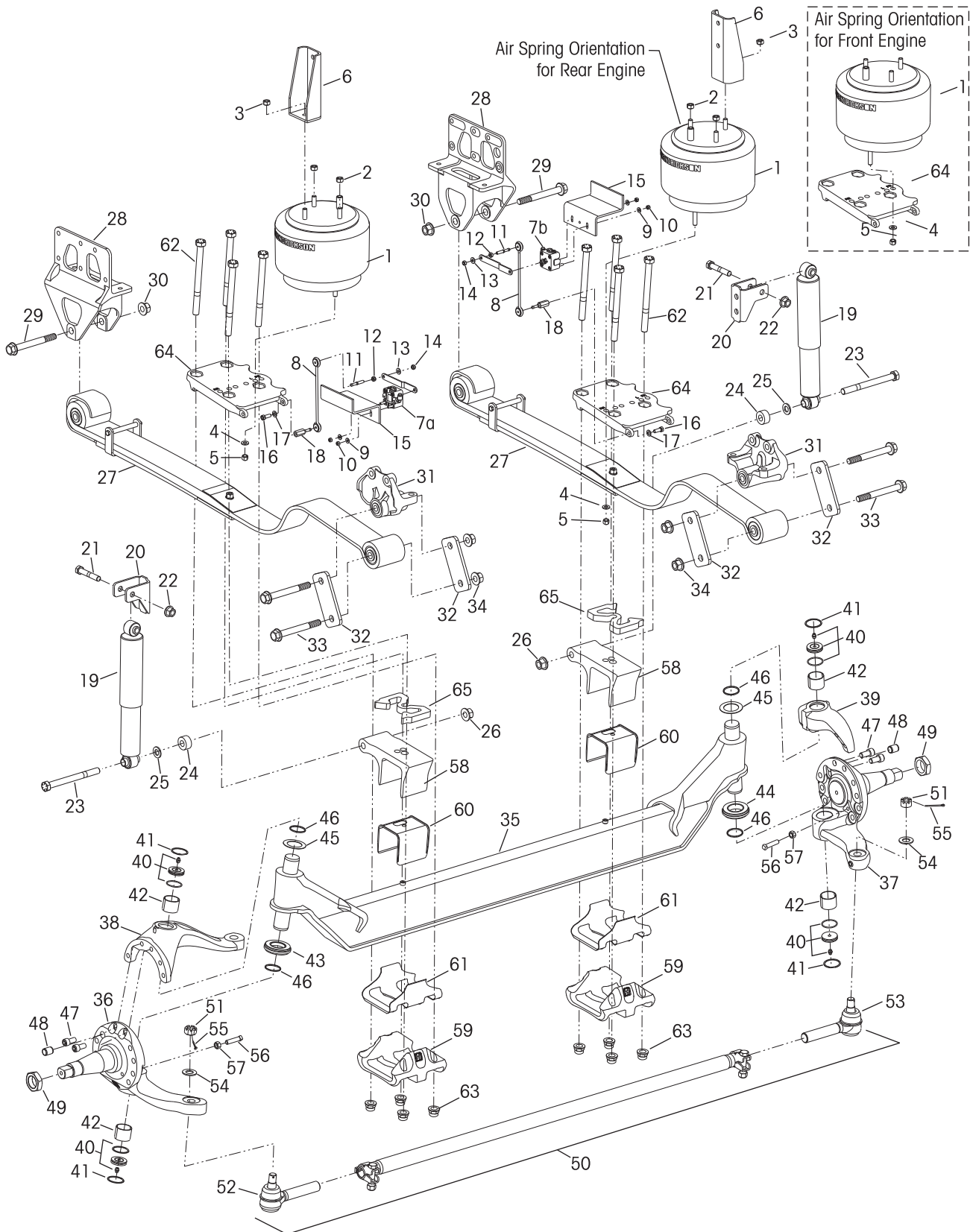


ADJUSTABLE STRAIGHT FLUTE REAMER

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



SECTION 5 Parts List





KEY NO.	PART NO.	DESCRIPTION	NO.REQ.	KEY NO.	PART NO.	DESCRIPTION	NO.REQ.
1	67568-002	Air Spring Assembly	2		60961-040	Kingpin Bushing and Bearing Service Kit, Axle Set , Includes Kit Nos. 60961-009 & 60961-039	
2		**1/2"-13 UNC Upper Air Spring Locknut	4		60961-009	LH Kingpin Bushing w/Composite Thrust Bearing Service Kit , Includes Key Nos. 40-43, 45-47 & Loctite	
3		**3/4"-16 UNF Upper Air Spring Locknut	2		60961-039	RH Kingpin Bushing w/Roller Thrust Bearing Service Kit , Includes Key Nos. 40-42, 44-47 & Loctite	
4		**1/2" Lower Air Spring Washer	2	40	59156-000	Grease Cap Assembly	4
5		**1/2"-13 UNC Lower Air Spring Locknut	2	41	58937-000	Retaining Ring	4
6		**Air Spring Bracket	2	42	58909-000	Kingpin Bushing	4
		Height Control Valve Assembly		60961-043		Thrust Bearing Service Kit, Axle Set , Includes Kit Nos. 60961-041 & 60961-042	
	59427-013	LH, Includes Key Nos. 7a, 8-14	1	60961-041		LH Composite Thrust Bearing Service Kit , Includes Key Nos. 43, 45-47, Loctite	
	59427-014	RH, Includes Key Nos. 7b-14	1	60961-042		RH Roller Thrust Bearing Service Kit , Includes Key Nos. 44-47, Loctite	
		Height Control Valve		43	59828-000	LH Composite Thrust Bearing	1
7a	59935-011	*LH	1	44	64256-000	RH Roller Thrust Bearing	1
7b	59935-018	*RH	1	45	60259-002	Kingpin Shim - 0.047"	2
8	59428-004	*Height Control Valve Linkage	2	Not Shown	60259-001	Kingpin Shim - 0.005" (As needed for service)	
9		*1/4" Washer	4	46	58910-000	Kingpin Seal	4
10		*1/4" Locknut	4	47	60236-001	5/8"-11 UNC Socket Head Cap Screw	4
11		*5/16" Stud	2	Not Shown	60937-000	Loctite (Red) Compound Tube	1
12		*5/16" Hex Nut	2	48	64246-000	ABS Sensor Sleeve	2
13		*5/16" Washer	2	49	64578-000	1 1/2"-12 UNF Spindle Nut	2
14		*5/16" Locknut	2	50	64006-002	Tie Rod Assembly, Includes Key No. 51	1
15		**Height Control Valve Bracket	2	51		*7/8" Castle Nut	2
16		3/8"-16 UNC 1.0" Hex Head Bolt	2	60961-010		Tie Rod End Service Kit, Axle Set , Includes Kit Nos. 60961-025, -026	
17		3/8" Washer	2	60961-025		LH Tie Rod End Service Kit , Includes Key Nos. 52, 54-55	
18		Link Mount	2	60961-026		RH Tie Rod End Service Kit , Includes Key Nos. 53-55	
	59429-003	RE	2	52	64002-001	LH Tie Rod End	1
	64742-002	FE Right Hand	1	53	64002-002	RH Tie Rod End	1
	59429-003	FE Left Hand	1	54	22962-007	7/8" Flat Washer	2
19	65992-001	Shock Absorber	2	55	17800-004	Tie Rod Nut Cotter Pin	2
20		**Shock Absorber Bracket	2	60961-069		Stop Bolt Service Kit, One Side , Includes Key Nos. 56-57	
21		**M16 x 90 Upper Shock Bolt	2	56	60238-001	1/2"-13 UNC Square Head Bolt	2
22		**M16 Upper Shock Flange Locknut	2	57	60240-000	1/2"-13 UNC Hex Jam Nut	2
23		**3/4"-10 UNC 8.0" Lower Shock Bolt	2	58	59952-030	Top Axle Wrap	2
24		**3/4" Shock Spacer	2	59	64722-003	Bottom Axle Wrap	2
25		**3/4" Lower Shock Washer	2	60961-015		Top/Bottom Axle Wrap Liner Service Kit, One Side , Includes Key Nos. 60-61	
26		**3/4"-10 UNC Lower Shock Flange Locknut	2	60	60508-000	Top Axle Wrap Liner	2
27	67420-000	Leaf Spring Assembly	2	61	59845-000	Bottom Axle Wrap Liner	2
28		**Front Hanger	2	62		**3/4"-16 UNF 9.0" Hex bolt	8
29		**3/4"-16 UNF 6.5" Flange Hex Head Bolt	2	63		**3/4"-16 UNF Flange Locknut	8
30		**3/4"-16 UNF Flange Hex Locknut	2	64	67719-000	Top Pad	2
31		**Rear Hanger	2	65	64536-020	Z Spacer - 20mm	2
32		**Shackle Bracket	4				
33		**3/4"-16 UNF 6.5" Flange Hex Head Bolt	2				
34		**3/4"-16 UNF Flange Hex Locknut	2				
		STEERTEK Axle Assembly, Includes Key Nos. 32-65	1				
	70952-318	14.6K, 200" Wheelbase					
	70952-328	12K, 200" Wheelbase					
		Axle Assembly	1				
		Includes Key Nos. 35-59					
	63284-462	200" Wheelbase					
	63284-463	150" Wheelbase					
35	64905-005	Axle & Kingpin Assembly	1				
36	58900-073	LH Lower Steering Knuckle Assembly	1				
37	58900-074	RH Lower Steering Knuckle Assembly	1				
38	60903-046	LH Upper Steering Knuckle Assembly	1				
39	60904-034	RH Upper Steering Knuckle Assembly	1				

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

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

HENDRICKSON AIRTEK RIDE HEIGHT GAUGE FOR INTERNATIONAL VEHICLES — Literature number 45745-252, can be obtained on-line at www.hendrickson-intl.com/literature/liiform.asp

SECTION 6

Recommended 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.

1. Wheel lift method, the ideal towing procedure
2. Towing the vehicle from the rear method
3. Conventional axle fork method

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

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

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

WHEEL LIFT METHOD—IDEAL

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

FIGURE 6-1 Wheel Lift Method



TOWING VEHICLE FROM THE REAR METHOD

This method is preferred when the proper equipment is not available to perform the wheel lift method and is necessary for wreckers not equipped with an under lift system.

AXLE FORK LIFT METHOD

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

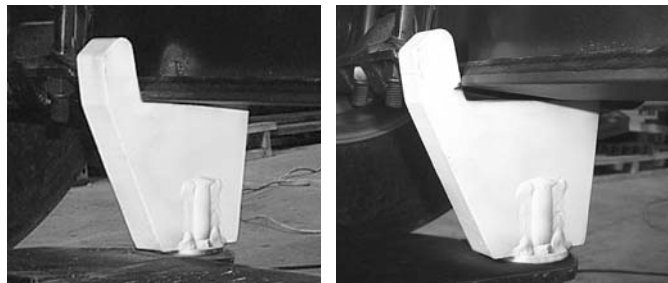
FIGURES 6-2 AND 6-3 Proper tow fork location on inside clamp group on the STEERTEK axle



- Prior to lifting the vehicle, ensure that the bottom axle plate is flat in the tow fork to minimize any gap between the bottom axle plate and the tow fork, see Figures 6-4 and 6-5. It may be necessary to deflate the air in the steer axle suspension, and/or release the tractor brakes. Deflate the steer axle air springs by disconnecting the height control valve linkage and lowering the height control valve linkage arm. This will exhaust the air pressure in the steer axle air springs.

FIGURE 6-4 Without Gap

FIGURE 6-5 With Gap

**NOTE**

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

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

OFF ROADWAY TOWING

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 INTO 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 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 AXLE TO TOW THE VEHICLE, DOING SO WILL DAMAGE THE AXLE AND VOID WARRANTY, SEE FIGURE 6-7.

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

FIGURE 6-6

NYLON STRAPS ARE
ACCEPTABLE FOR
OFF ROADWAY TOWING



FIGURE 6-7

CHAINS ARE NOT
ACCEPTABLE FOR
OFF ROADWAY TOWING



SECTION 7


Preventive Maintenance

Following appropriate inspection procedure is important to help ensure the proper maintenance and operation of the AIRTEK® suspension system and component parts function to their highest efficiency.

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

- **Air Spring** — Look for chaffing or any signs of spring or component damage.
- **Clamp group** — Check torque on clamp group mounting hardware. Refer to  Torque Specifications section of this publication.
- **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 Chart in this publication for recommended torque requirements. Use a calibrated torque wrench to check torque in a tightening direction. As soon as the fastener starts to move, record the torque. Correct the torque if necessary. Replace any worn or damaged fasteners.
- **Front hangers** — Check for cracks or loose mounting hardware. Replace if necessary, see the Component Replacement Section in this publication for replacement procedure.
- **Operation** — All steering components must move freely through the full range of motion from axle stop to axle stop.
- **Shock absorber** — Look for any signs of dents or leakage, misting is not considered a leak. See Shock Absorber Inspection in this section.
- **Steel leaf spring and wrap leaf assembly** — Look for cracks. Replace if cracked or broken. Check the front and rear bushings for any wear or deterioration. Replace spring assembly if any of the previous conditions are observed. See the Component Replacement Section in this publication for replacement procedure.
- **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 Lubrication matrix in this section.
- **STEERTEK Axle** — The axle should be free of any nicks or gouges. Inspect for any cracks or dents on axle.
- **Rear hanger** — Look for any signs of excessive wear to the rear hanger and shackle bracket.
- **Tire wear** — Inspect tires for wear patterns that may indicate suspension damage or misalignment. See Tire Inspection in this section.
- **Top and bottom axle wrap liners** — Look for any cracking or broken pieces on liner in load bearing areas. See Axle Wrap Liner Inspection in this section.
- **Top pad** — Look for cracks. Replace if necessary, see the Component Replacement Section in this publication for replacement procedure.
- **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 vehicle manufacturer's applicable publications for other preventative maintenance requirements.

LUBRICATION INTERVALS

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

STEERTEK GREASING AND LUBRICATION SPECIFICATIONS				
Component	Greasing Interval	Grease	NLGI Grade	Outside Temperature
Kinpin 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.				

KINGPIN LUBRICATION

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

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

NOTE

Greasing at the lower zerk should purge grease from the thrust bearing shell. The left side of the axle has a composite style thrust bearing, as shown in Figure 7-1 and the right side of the axle has a steel roller thrust bearing, see Figure 7-2. Both purge in the same area.

FIGURE 7-1



FIGURE 7-2



TIE ROD END LUBRICATION

LUBRICATION PROCEDURE

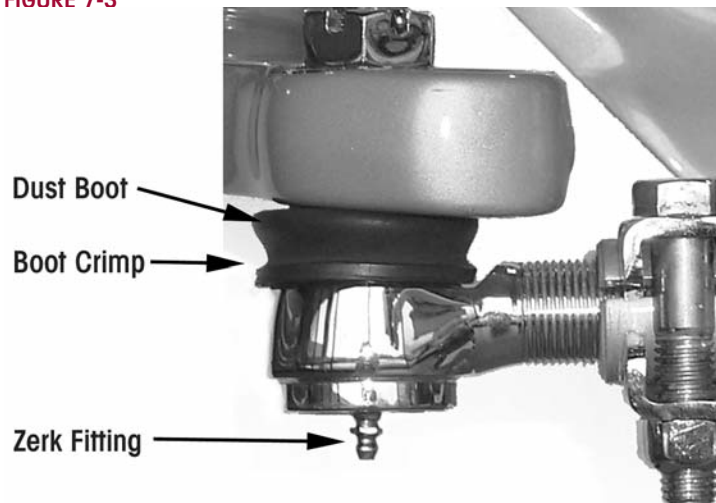
1. Turn the vehicle wheels straight ahead.
2. Wipe the zerk fitting and grease gun tip with clean shop towels.
3. Wipe the seal/boot clean with shop towels.
4. Attach a grease gun to the zerk fitting. Either a hand or pneumatic grease gun is acceptable. If air operated grease gun is used, system air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

FIGURE 7-3



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.

TIE ROD END INSPECTION

INSPECTION PROCEDURE

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

CAUTION

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

CAUTION

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

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

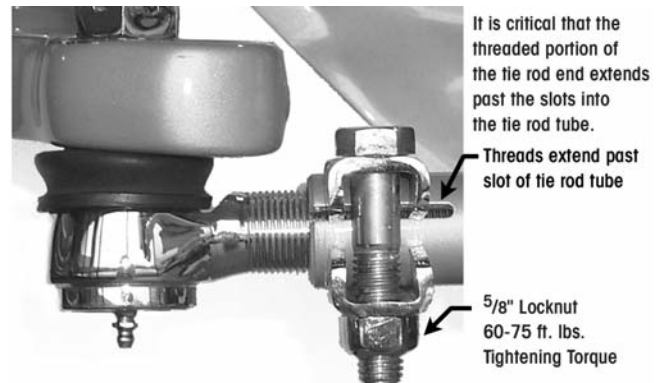
WARNING

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

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

FIGURE 7-4

6. Check that the tie rod end is threaded correctly into the cross tube and is engaged deeper than the end of the cross tube slot. The tie rod end must be visible the entire length of the cross tube slot, see Figure 7-4.
7. Check that zerk fittings are installed. Replace a damaged zerk fitting with a new one.



CAUTION

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

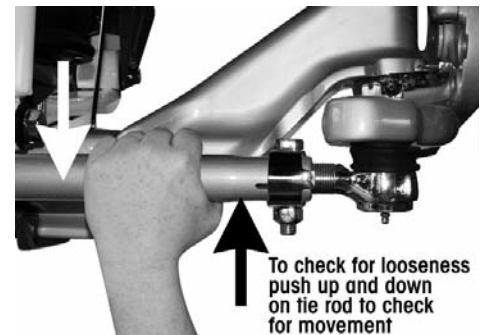
- A CROW BAR, PICKLE FORK OR 2 x 4 ARE USED.
- ANYTHING OTHER THAN HANDS ARE USED TO GRASP THE CROSS TUBE ASSEMBLY (CAN RESULT IN DAMAGE TO THE CROSS TUBE).
- EXCESSIVE PRESSURE OR FORCE IS APPLIED TO THE TIE ROD ENDS OR THE JOINTS OF THE ASSEMBLY.

8. By hand or using a pipe wrench, with jaw protectors to avoid gouging the cross tube, rotate the cross tube toward the front of the vehicle and then toward the rear. After rotating, center the cross tube. If the cross tube will not rotate in either direction, replace both tie rod ends, see Figure 7-5.

FIGURE 7-5

FIGURE 7-6

9. Position yourself directly below the tie rod end. Using both hands, grab the assembly end as close to the tie rod end as possible (no more than 6" or 152.4mm). Apply hand pressure with reasonable human effort vertically up and down in a push-pull motion several times (using approx. 50-100 pounds of force). Check for any movement or looseness at both tie rod end locations, see Figure 7-6.


FIGURE 7-7

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


NOTE

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

CLAMP GROUP RE-TORQUE INTERVAL

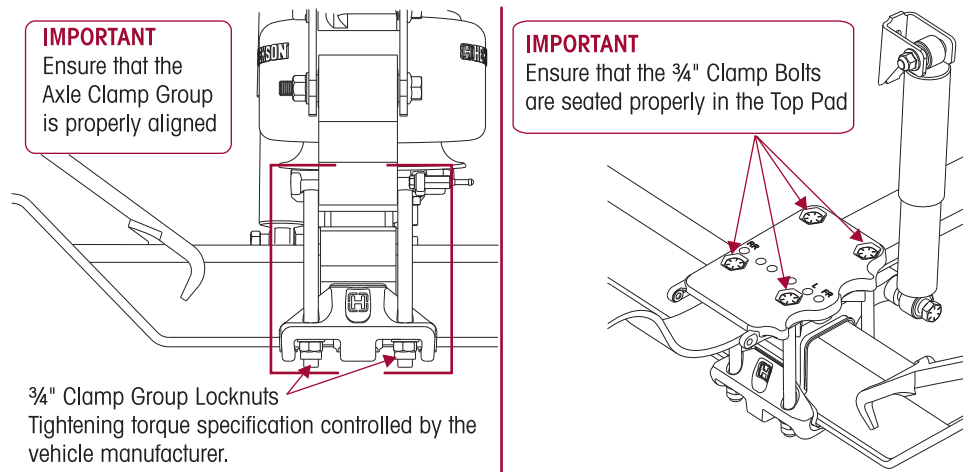
1. Clamp group locknuts must be torqued to specification at preparation for delivery.
2. Clamp group locknuts must be re-torqued at 1,000 miles.
3. Thereafter follow the 6 month/ 50,000 mile inspection and annual re-torque interval.

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.

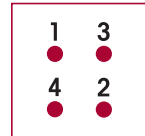
4. Ensure that the clamp group is properly aligned and the hex bolts are seated in the top pad, and the bottom axle wrap is centered on the top axle wrap, see Figure 7-8.

FIGURE 7-8



5. Check for the signs of component or bolt movement.
6. 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 1 through 5.
7. Tighten the clamp group locknuts evenly in 50 foot pounds increments to vehicle manufacturer's torque specification in the proper pattern to achieve uniform bolt tension, see Figure 7-9.

FIGURE 7-9

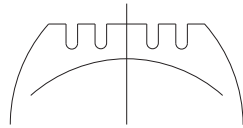


TIRE INSPECTION

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

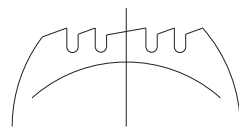
1. Tire Pressure
 2. Toe Setting
 3. Thrust Angle
 4. Camber
- The following tire Inspection guidelines are based upon TMC (The Technology & Maintenance Council) recommended practices. Any issues regarding irregular tire wear where Hendrickson is asked for assistance, will require tire and alignment maintenance records as described in the TMC literature number RP642 or TMC "Guidelines for Total Vehicle Alignment" publication.

- Tire wear is normally the best indicator of vehicle alignment condition. If tires are wearing too rapidly or irregularly, alignment corrections may be needed. The tire wear patterns described below can help isolate specific alignment problems.
- The most common conditions of concern are:
 - Overall Fast Wear (Miles per 32nd)
 - Cupping
 - Rapid Shoulder Wear (One shoulder only)
 - Feather Wear
 - Diagonal Wear
 - One-Sided Wear

FIGURE 7-10
**OVERALL FAST WEAR
(Miles per 32nd)**


Overall Fast Wear — Fast wear can be described as exhibiting a good, but accelerated wear pattern. It is typically caused by operating conditions, such as mountainous terrain, frequency and severity of turning, abrasive road surfaces in combination with vehicle configurations and their attributes—such as power steering, heavy axle loads, high wheel cuts, setback axles, short wheel base tractors, long wheel base straight trucks. To correct

this problem, consult with vehicle and tire manufacturers when specifying equipment or replacing tires. For more information, see TMC RP 219 publication, page 11. For information on how to accurately measure and record tire rates, see TMC RP 230 publication.

FIGURE 7-11
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.

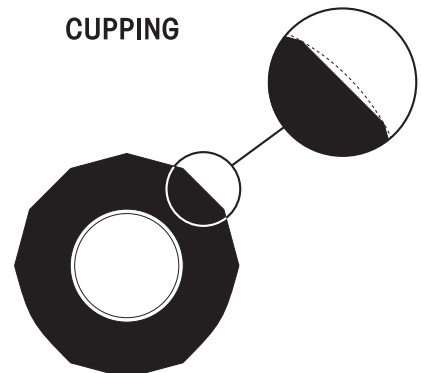
To correct this problem, tires can be rotated to another axle for maximum utilization of remaining tread. Additionally, diagnose the vehicle itself and correct misalignment condition as required. If steer tire feathers are in opposite directions, an improper toe condition is most likely the cause. For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

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 endplay or other assembly non-uniformity. It can also be due to lack of shock absorber control on some suspension types.

To solve cupping problems:

FIGURE 7-12
CUPPING


- *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 or retread. If the source of trouble is the vehicle, diagnose cause and correct as needed.

FIGURE 7-13
DIAGONAL WEAR

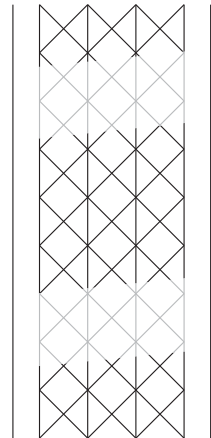
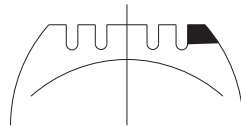


FIGURE 7-14

**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.

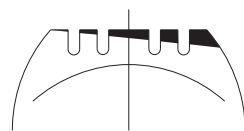
This wear condition is usually caused by excessive toe or excessive camber. These conditions can be created by a misaligned or bent axle and can also be caused by loose or worn wheel bearings.

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 7-15

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.

SHOCK ABSORBER INSPECTION

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

WARNING

HEAT TEST

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

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

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

FIGURE 7-16



VISUAL INSPECTION

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

FIGURE 7-17



LEAKING VS. MISTING SHOCK VISUAL INSPECTION

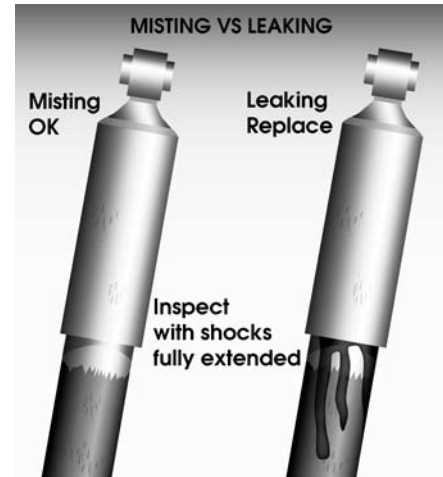
The inspection must not be conducted after driving in wet weather or a vehicle wash. Shocks needs to be free from water. Many shocks are often mis-diagnosed as failures. Misting is the process whereby very small amounts of shock fluid evaporate at a high operating temperature through the upper seal of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

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

NOTE

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

FIGURE 7-18



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

AXLE WRAP LINER INSPECTION

INSPECTION PROCEDURE

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

- Liner Crack Criteria:

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

FIGURE 7-19



KINGPIN BUSHING INSPECTION

INSPECTION PROCEDURE (STEERING KNUCKLE LATERAL MOVEMENT)

1. Chock the wheels to help prevent the vehicle from moving. Set the parking brake.
2. Use a jack to raise the vehicle until the wheels are off the ground. Support the vehicle with safety stands.
3. **CHECKING THE UPPER KINGPIN BUSHING.** Install the base of a dial indicator onto the axle beam and place the tip against the steering knuckle, see Figure 7-20.
4. Set the dial indicator to "0" zero.

FIGURE 7-20



FIGURE 7-21



FIGURE 7-22

5. Move the top of the tire in and out by applying reasonable constant pressure and then release, see Figure 7-22.
6. Check the reading on the dial indicator. If the dial indicator moves more than 0.015", the upper bushing is worn or damaged. Replace both bushings. Refer to the Kingpin Bushing replacement procedure in the Component Replacement Section of this publication.
7. **CHECKING THE LOWER KINGPIN BUSHING.** Install a dial indicator so that the base is on the axle and the indicator tip is against the inside of the bottom of the knuckle, see Figure 7-21.
8. Set the dial indicator to "0" zero.


NOTE

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

9. Move the bottom of the tire in and out. If the dial indicator moves more than 0.015", the lower bushing is worn or damaged. Replace both kingpin bushings. Refer to the Component Replacement Section of this publication.

STEERING KNUCKLE INSPECTION

CHECKING VERTICAL END PLAY (UP AND DOWN MOVEMENT)

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

1. Chock the rear tires to help prevent the vehicle from moving.
2. Set the parking brakes.
3. Use a jack to raise the vehicle until both tires are 1" off the ground.

FIGURE 7-23

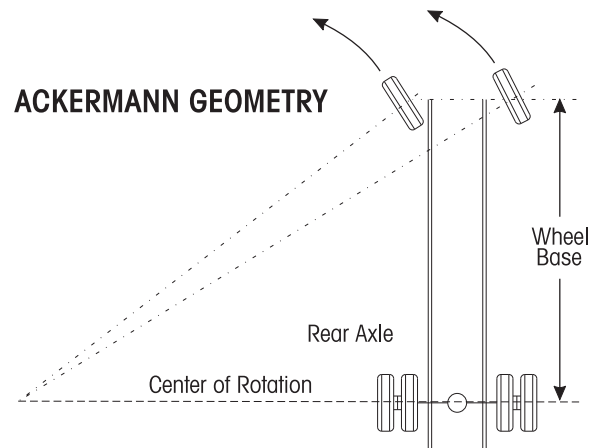
4. Place a dial indicator on each side of the axle as follows:
 - a. Index the wheels slightly (left or right).
 - b. Place the magnetic dial indicator base on the axle, see Figure 7-23.
 - c. Place the tip of the dial indicator on the top of the upper steering knuckle (not on the grease cap).



5. Set the dial indicator to "0" (zero).
6. Lower the jack.
7. If vertical clearance is greater than 0.030", adjust the upper knuckle to obtain clearance specifications, if adjustment does not achieve clearance specification, install shims (Hendrickson part no. 60259-002) between the top of the axle and the bottom of the upper steering knuckle to obtain the proper clearance specification. See Steering Knuckle Assembly in the Component Replacement Section of this publication for proper shim installation.
8. If vertical clearance is below 0.008", adjust the upper steering knuckle to obtain the proper clearance specification, if adjustment does not achieve clearance specification, remove shims. See Steering Knuckle Assembly in the Component Replacement Section of this publication for proper shim removal.

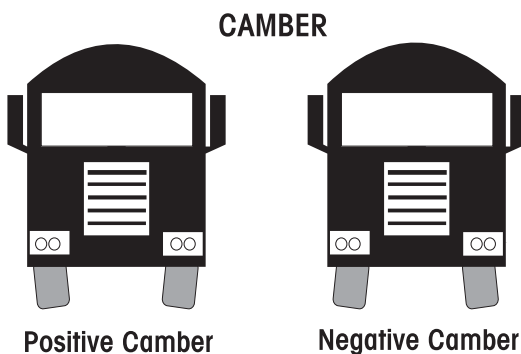
SECTION 8 Alignment & Adjustments

ALIGNMENT DEFINITIONS

FIGURE 8-1


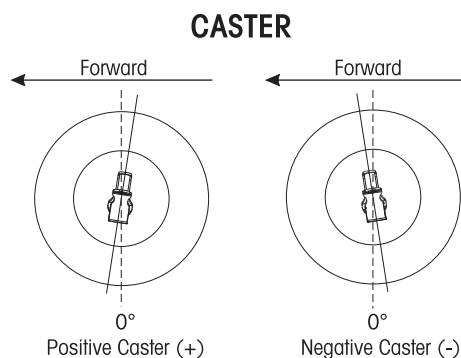
Ackermann Steering Geometry — The geometry of the four bar linkage consisting of the front axle, two knuckle assemblies, and tie rod assembly is designed to provide free rolling of front tire in a turn. Ackermann geometry is dependent upon the steering axle track-width and wheelbase of the vehicle. Improper geometry results in wheel scrub in turns which generally appears as toe wear on the tire, usually more wear on one side of the vehicle than the other due to the operational route of the vehicle.

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

FIGURE 8-2


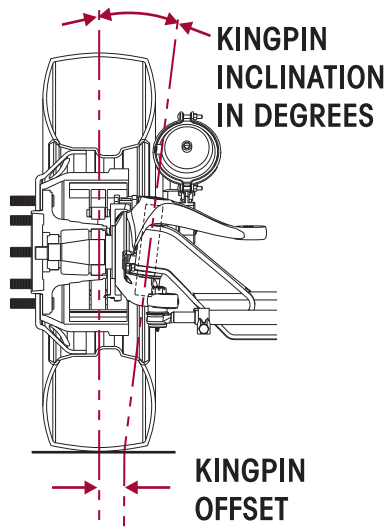
Camber — The angle formed by the inward or outward tilt of the wheel reference to a vertical line. Camber is positive when the wheel is tilted outward at the top and is negative when the wheel is tilted inward at the top.

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

FIGURE 8-3


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

FIGURE 8-4

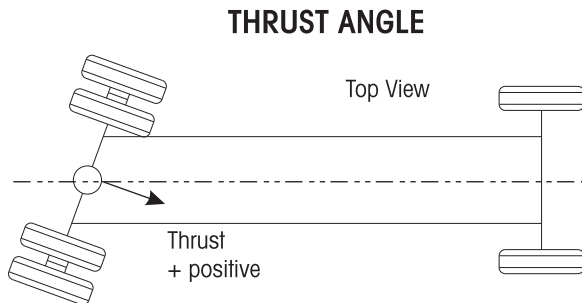


Kingpin Inclination (KPI) — The inward tilt of the kingpin from the vertical. This front suspension parameter has a pronounced effect on steering effort and returnability. As the front wheels are turned around an inclined kingpin, the front of the truck is lifted. This lifting of the vehicle is experienced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

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

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

FIGURE 8-5

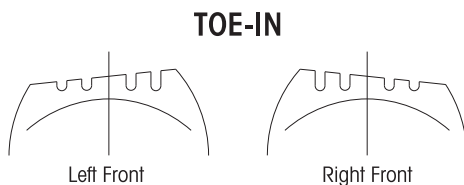


Thrust Angle, Tracking, or Square — The angle formed by the centerline of the vehicle frame (geometric centerline) and the direction that an axle points. As indicated by the term "square", the ideal value for the angle is 0° or when the axle centerline is at 90° or perpendicular to the geometric centerline.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

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

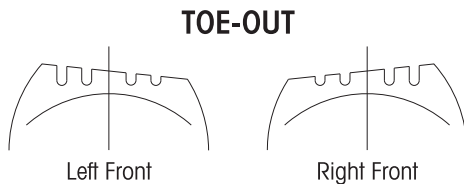
Tie Rod Arm (Ackermann-Arm, Cross Tube Arm) — The component that transmits steering forces between left and right axle knuckle assemblies through the cross tube assembly.

FIGURE 8-6

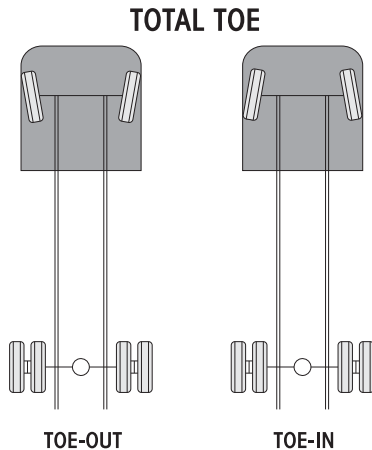


Toe-in — Is when the horizontal line intersects in front of the wheels, or the wheels are closer together in front than in the back. Toe-in is commonly designated as positive, toe-out as negative. Excessive toe-in wears the outside edge of the tires. Steer axle toe is adjustable to reduce wear to the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

FIGURE 8-7



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

FIGURE 8-8


Toe-out on Turns — (See Ackermann Geometry). Excessive turning angles such as those encountered in pickup and delivery operations may contribute to premature tire wear. Be advised that the greater turning angles, the more that toe and camber change. If you have any doubt regarding the optimum turning angles for your operation, contact the vehicle's manufacturer, axle 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.

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 Torque Specification Section of this publication.
- Leaf springs are free of wear or damage.
- Air springs are free of wear or damage.
- Shock absorbers are free of wear and damage.
- Vehicle ride height for both the front and rear are 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 of this publication.

REAR AXLE AND REAR SUSPENSION

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

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

FRONT WHEEL ALIGNMENT

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

The AIRTEK front wheel alignment specifications can be found in the Front Alignment Specifications Section of this publication.

Check total 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.
- There are two types of front wheel alignment:
 1. *Minor alignment* – a minor front wheel alignment is done **for all** normal maintenance conditions, see below.
 2. *Major alignment* – a major alignment is done when uneven or excessive tire wear is evident, or response at the steering wheel is sluggish, or the need for major wheel alignment check and adjustment is required, see below.

MINOR FRONT WHEEL ALIGNMENT

Perform the minor front wheel alignment in the following sequence:

1. Inspect all systems that affect wheel alignment. Refer to "Inspection Prior to Alignment" in this section.
2. Check the wheel bearing endplay.
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 Figures 8-9 and 8-10.
3. If the vehicle is equipped with power steering, check the pressure relief in the power steering system and reset if necessary. Refer to vehicle manufacturer regarding the subject: Adjusting the Pressure Relief in the Power Steering System.

FIGURE 8-9



FIGURE 8-10

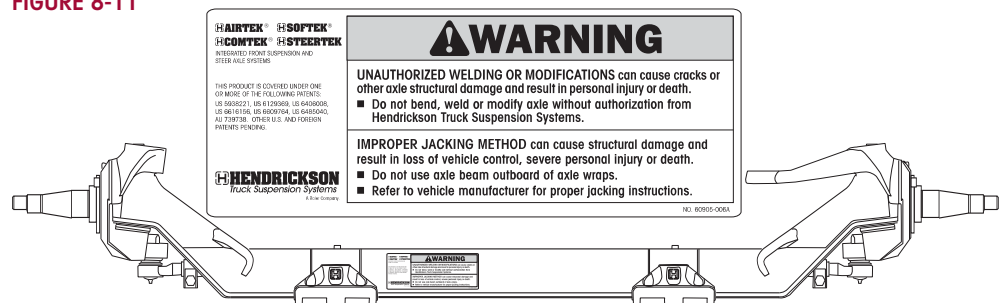


4. Check the turning angle. Refer to OEM specifications.
5. Check the kingpin (or steering axis) inclination. Refer to Kingpin Inclination under the Alignment Definitions in this section.

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 8-11.

FIGURE 8-11



6. Check camber angle. **DO NOT** attempt to adjust camber. Refer to the Wheel Alignment Specifications section of this publication.
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 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.

RIDE HEIGHT ADJUSTMENTS

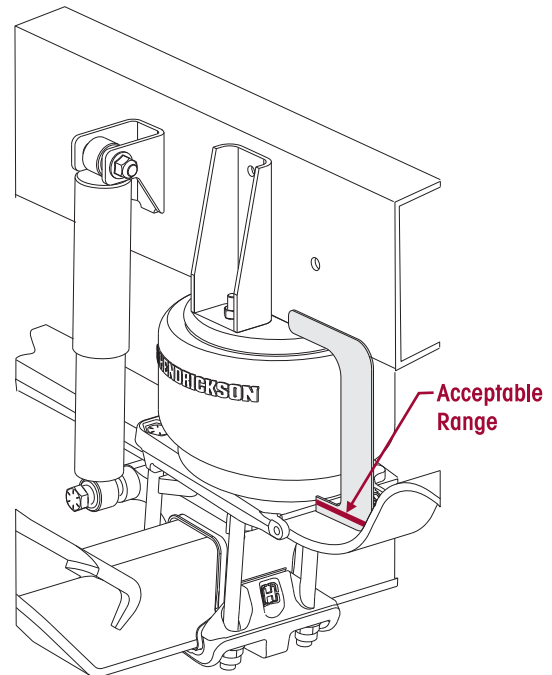
The recommendation of the vehicle manufacturer is that dual height control valves are only to be installed on the front suspension when the rear suspension is equipped with a single height control valve system. This arrangement is best suited to keep the vehicle level versus having dual height control systems on both the front and rear suspensions.

1. Drive the vehicle onto a level surface.
2. Free and center all suspension joints by slowly moving vehicle back and forth several times without using the brakes. It is **IMPORTANT** when coming to a complete stop to verify the brakes are released.
3. Chock drive wheels.
4. Verify that the air system is at full operating pressure.
5. Detach the lower rubber grommet of the height control valve linkage from the lower stud and exhaust the suspension system air by lowering the height control valve linkage arms.

6. Re-attach the lower grommet of the height control valve linkages onto the lower studs to fill the suspension system with air. Wait until the airflow to the front air springs has stopped.

7. The ride is measured at the front of the air spring. Place the gauge so the flat surface of the gauge is against the side of the frame rail, the horizontal flat is sitting on top of the air spring bead plate. Align the bottom of the height gauge to the air spring piston flange as shown in Figure 8-12. Verify that the air spring height is within the "ACCEPTABLE" tolerance indicated on the gauge, the suspension reference ride height is $8\frac{7}{16}$ " (214.8 mm) $\pm \frac{3}{16}$ ".

FIGURE 8-12



8. If the air spring piston flange edge contacts the "BELOW SPEC" region, the ride height is set too low. If the air spring piston flange contacts to the "ABOVE SPEC" region, the ride height is set too high. If the ride height is out of specification it will be necessary to adjust the ride height, see Adjustment Procedure in this section.
9. If a gauge is not available, measure the suspension reference ride height on the front axle (top front of the air spring to the bottom of the air spring flange height $8\frac{7}{16}$ " (214.8 mm) $\pm \frac{3}{16}$ ", see Figure 8-13. If reference ride height is out of specification, it will be necessary to adjust the ride height.

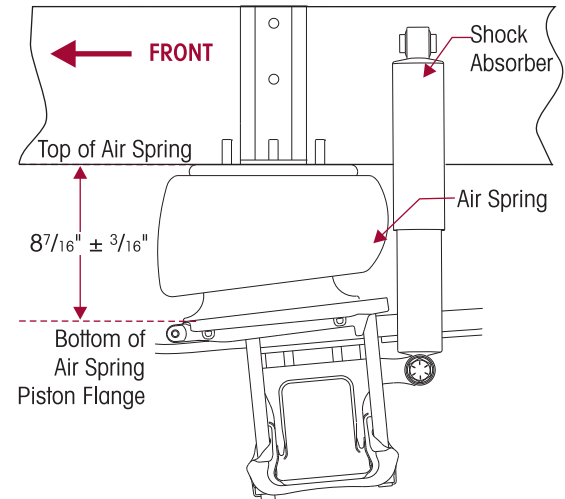
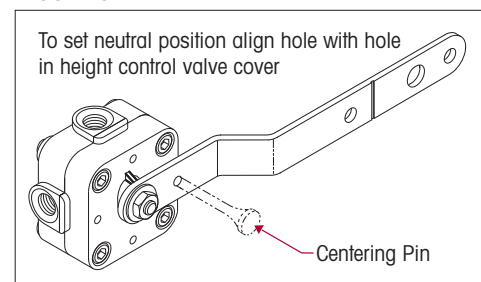
ADJUSTMENT PROCEDURE

1. Verify that the air system is at full operating pressure.

SERVICE HINT

It is very important that the leveling valve be cycled completely before and after any ride height adjustments. Cycling of the leveling valve will help make the adjustment more accurate.

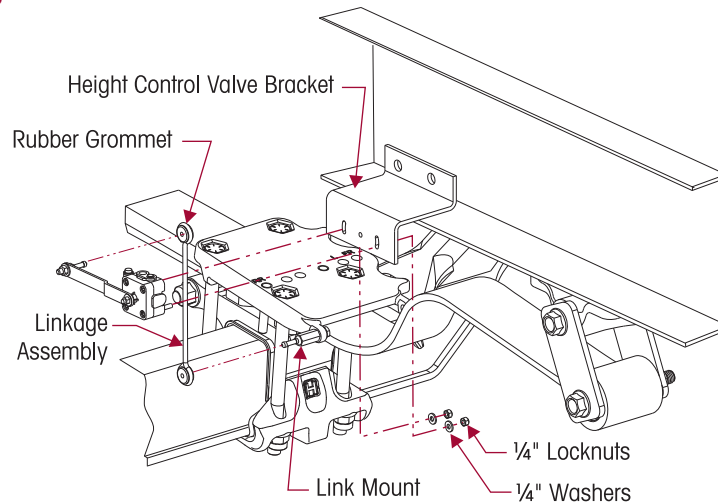
2. See Air Spring Safety Notice in the Important Safety Notice section of this publication prior to deflating or inflating the suspension system. Cycle the air system. Detach the lower rubber grommet(s) of the height control valve linkage(s) from the lower stud and exhaust the suspension system air by lowering the height control valve linkage arm.
3. Refill the suspension by raising the height control valve arm(s) by hand, so that the air springs are above the proper ride height.
4. Lower the leveling valve arm(s) to exhaust the air system until the suspension is at the proper ride height.
5. Use a $\frac{1}{8}$ " wooden dowel rod (golf tee) to set the neutral position for the height control valve(s) by aligning the hole in the leveling arm(s) with the hole in the height control valve cover, as shown in Figure 8-14. **DO NOT** use a metal rod or nail as this may cause damage to the height control valve.

FIGURE 8-13

FIGURE 8-14

NOTE

Hendrickson recommends the following be performed during any type of ride height adjustment to help prevent socket head cap screws from loosening from the height control valve housing, potentially causing subsequent air leaks from the height control valve.

6. Prior to adjusting the height control valves, clean the threads of the mounting fasteners of any debris and corrosion.
7. To adjust the height control valve, loosen the mounting locknuts.
8. Adjust the height control valves by loosening the mounting locknuts and pivoting the valve body about the mounting bolt so the link mount stud inserts directly into the center hole of the rubber grommet at the proper height. Check the rubber grommet for any tearing or damage, replace as necessary.
9. Facing the air spring from the outboard side for the left side of the vehicle, pivot the valve body clockwise to increase the ride height and counter clockwise to decrease the ride height. For the right side of the vehicle, pivot the valve body counter clockwise to increase the ride height and clockwise to decrease the ride height.

FIGURE 8-15



10. Tighten the mounting locknuts to 7-10 foot pounds torque after the adjustment is made, see Figure 8-15. Install a (5 mm) allen wrench in the bottom socket head cap screws to prevent the screws from turning while re-tightening the locknuts. Remove the dowel from the height control valves.
11. Cycle the air from the system by lowering the height control valve arm.
12. Reconnect the height control valve linkage rubber grommet to the link mounts. Allow the air suspension system to completely fill with air.
13. Recheck the ride height after adjustment.
14. Repeat Steps 2 through 11 until the ride height is within specification.

HEIGHT CONTROL VALVE TEST

The height control valve test can be done with Barksdale Test Kit (Model 55521).

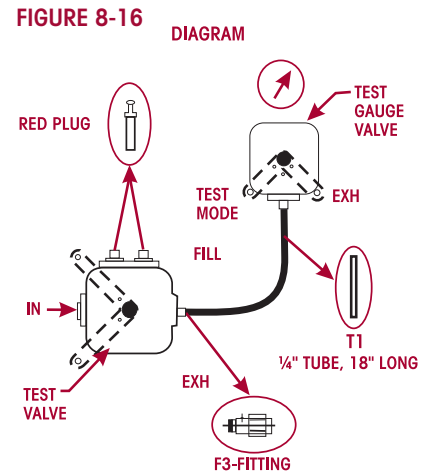
KIT CONTENTS

QTY.	DESCRIPTION	QTY.	DESCRIPTION	QTY.	DESCRIPTION
1	Gauge	1	Valve	2	Plug
1	(F3) Fitting	1	(T1) Tubing 1/4"	1	Fitting
1	Flush Plug	1	Tool	1	O-Ring

HEIGHT CONTROL VALVE TEST INSTRUCTIONS

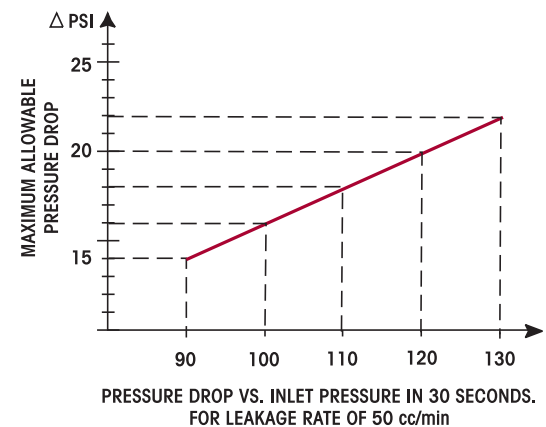
1. Disconnect linkage from valve handle.
2. Lower height control valve linkage arm down to exhaust air from the suspension system.
3. Remove the tubing from both air spring ports, see Figure 8-16. Place supplied tool around the tubing, press down to pull out tubing. **DO NOT CUT THE TUBING.**
4. Install the red plugs supplied into the air spring ports.
5. Use needle nose pliers to remove the "flapper" from the valve exhaust port.

6. Install hex fitting F3 (the one with a small pin protruding) into the exhaust port. To install hex fitting into exhaust port align pin on fitting with slot on exhaust port, push in and rotate clockwise to stop.
7. Connect one end of the tubing (T1) to this port and one end into the test gauge valve.
8. Rotate the test gauge valve handle to test mode, see diagram in Figure 8-16.
9. Rotate handle on valve being tested to fill mode.



10. Observe pressure reading for a period of 30 seconds.
11. Refer to chart for maximum allowable pressure drop vs. inlet pressure in 30 seconds, see Figure 8-17. The valve is good if the pressure drop does not exceed the maximum allowable.
12. Rotate truck valve handle to exhaust mode.
13. Rotate test gauge valve handle to test mode. Repeat Steps 10, 11.
14. Replace valve if maximum allowable drop is exceeded.

FIGURE 8-17



This test is complete. Remove test gauge valve and fitting from the exhaust port. Remove the red plugs from the air spring ports. Reconnect the air spring tubing to the valve, ensuring that the air lines are pushed fully into the PTC fittings. Reconnect the linkage to the valve handle. Front suspension ride height will automatically return to the correct position.

STEERING STOP

ADJUSTMENT PROCEDURE

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

The steering stop adjustment procedure is as follows:


1. Drive 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.

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 8-18.

FIGURE 8-18

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

**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.

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

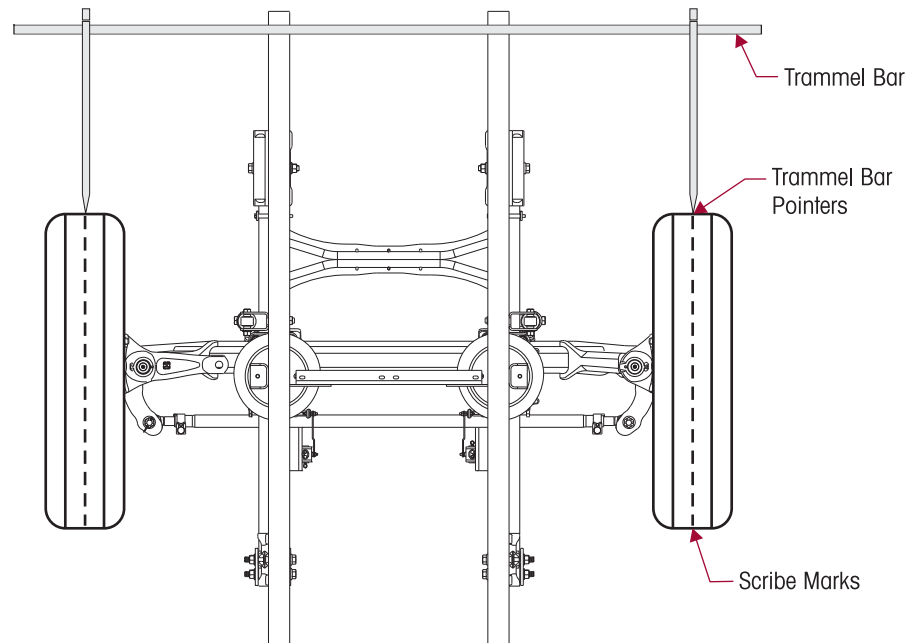
DO NOT measure toe-in with the front axle off the ground. The weight of the vehicle must be on the front axle when toe-in is measured.

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 8-19.

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 8-19
FRONT


10. If the toe measurement is not within the specifications of $\frac{1}{16}'' \pm \frac{1}{32}''$ ($0.060'' \pm 0.030''$), it will be necessary to adjust the toe setting. Refer to the following procedure.

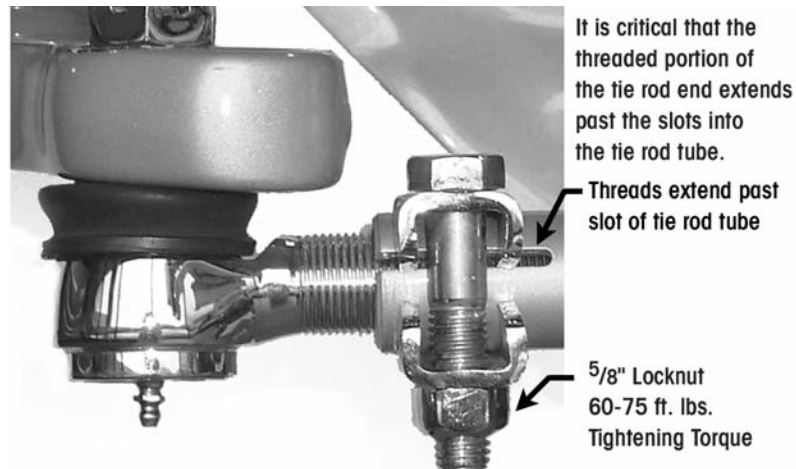
- a. Loosen the tie rod cross tube clamp bolts and locknuts.
- b. Turn the tie rod cross tube until the specified toe-in distance is achieved.

WARNING

THE THREADED PORTION OF THE TIE ROD END MUST EXTEND PAST THE SLOTS INTO THE TIE ROD CROSS TUBE, SEE FIGURE 8-20. 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 60-75 foot pounds torque.

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

FIGURE 8-20


SECTION 9

Component Replacement

FASTENERS

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

HEIGHT CONTROL VALVE

The recommendation of the vehicle manufacturer is that dual height control valves are only to be installed on the front suspension when the rear suspension is equipped with a single height control valve system. This arrangement is best suited to keep the vehicle level versus having dual height control systems on both the front and rear suspensions.

DISASSEMBLY

1. Drain the air from the secondary air tank.
2. Deflate the air spring(s) by removing the height control valve linkage(s) at the rubber grommet(s) and lowering the height control linkage arm. This will exhaust the air pressure in the air springs.

CAUTION

THE HEIGHT CONTROL VALVE FITTINGS ARE NON-SERVICEABLE. IF THE HEIGHT CONTROL VALVE IS TO BE RE-INSTALLED; CARE MUST BE TAKEN TO REMOVE DIRT AND DEBRIS FROM THE PUSH-TO-CONNECT FITTINGS. FAILURE TO DO SO CAN RESULT IN THE PUSH-TO-CONNECT FITTINGS FAILING TO SEAL PROPERLY WITH THE AIR LINE.

3. Disconnect the air line(s) from the height control valve(s), see Figure 9-1.
4. Remove the mounting locknuts and washers.
5. Remove the height control valve .

ASSEMBLY

1. Attach the height control valve(s) on the mounting bracket as shown in Figure 9-2.
2. Attach the 1/4" washers and the locknuts. **DO NOT** tighten the locknuts to specified torque until after the proper ride height is attained.

FIGURE 9-1

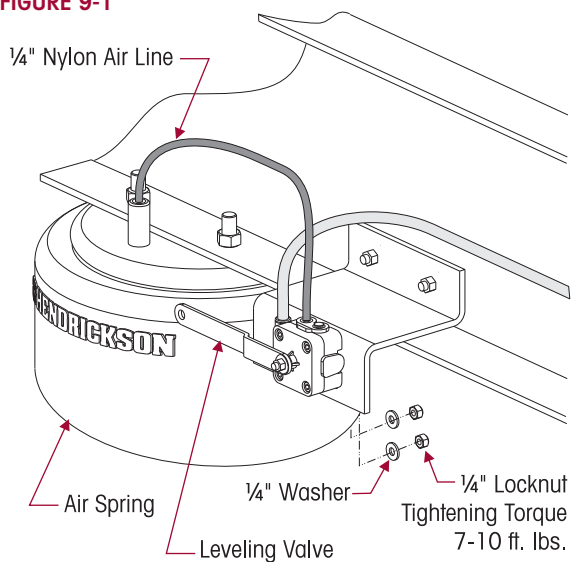
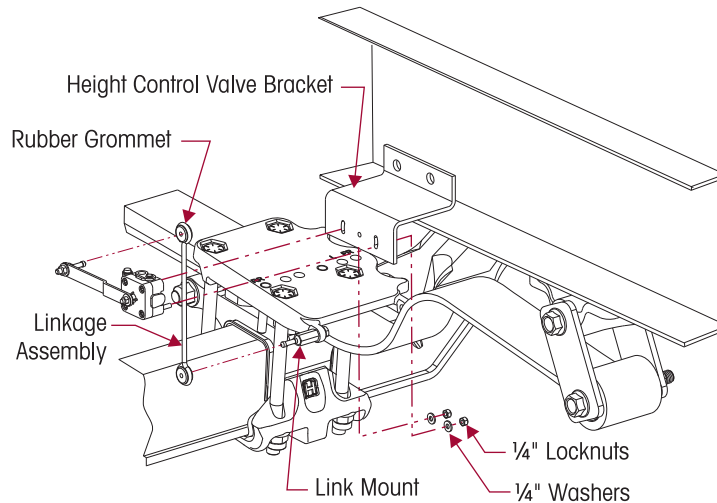
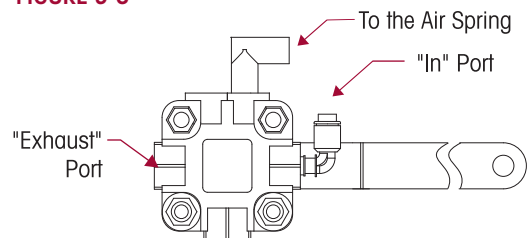


FIGURE 9-2

SERVICE HINT

When replacing or installing nylon air line tubing into quick-connect fittings it is critical that the end of the air line is cut square. Improper cut of the end of the air line tubing can cause the air line to seat improperly in the quick connect fitting causing air leakage.

FIGURE 9-3

3. Attach the air lines to the height control valve(s), see Figure 9-3.
4. Install the height control valve linkage assembly(s).
5. Adjust the height control valve(s) to proper specifications. See the Alignment & Adjustments Section of this publication for proper ride height adjustment.
6. After the adjustment is made, install a $\frac{3}{16}$ " allen wrench in the bottom socket head cap screws to prevent the screws from turning while tightening to torque the $\frac{1}{4}$ " in locknuts.
7. Tighten the $\frac{1}{4}$ " locknuts to 7-10 foot pounds torque.



AIR SPRING

DISASSEMBLY

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

WARNING

WHEN SERVICING THE VEHICLE OR ATTACHING AN AIR SPRING AND THE VEHICLE IS ON THE GROUND, PRIOR TO AIRING THE SUSPENSION SYSTEM MAKE CERTAIN THE AIR SPRING LOCATOR IS INDEXED INTO THE UPPER AIR SPRING BRACKET PROPERLY, AND THE AIR SPRING IS FULLY SEATED ON THE SPRING TOP PAD. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN PREMATURE AIR SPRING FAILURE, CAUSE PERSONAL INJURY, OR PROPERTY DAMAGE.

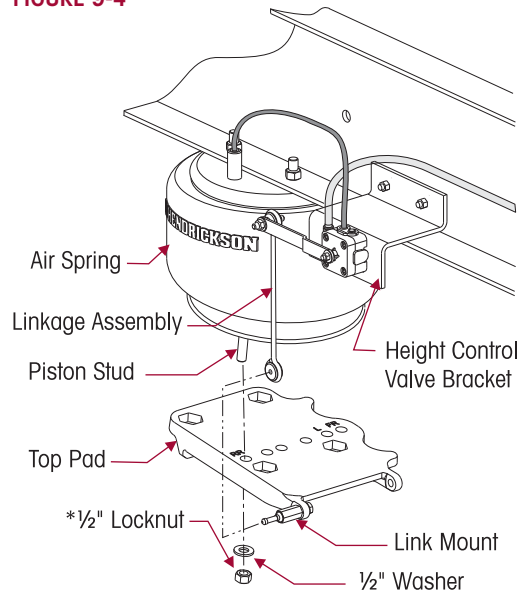
WARNING

PRIOR TO AND DURING DEFLATION AND INFLATION OF THE FRONT AIR SUSPENSION SYSTEM, ENSURE THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR FROM UNDER THE VEHICLE AND AROUND THE SERVICE AREA, FAILURE TO DO SO CAN CAUSE SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

- See Air Spring Warnings and instructions in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.

FIGURE 9-4

- Remove the air from the air system by disconnecting the height control valve linkage(s) at the rubber grommet(s) and allowing the lever(s) to drop. This will exhaust air from the system.
- If the air spring is damaged and the suspension is deflated, it will be necessary to raise the frame and support the vehicle with frame stands to obtain adequate clearance for air spring removal.
- Disconnect the $\frac{1}{4}$ " NPT air fitting from the air spring.
- Remove the lower $\frac{1}{2}$ " air spring locknut from the piston stud to remove the air spring from the top pad, see Figure 9-4.



*Tightening Torque Specifications controlled by the vehicle manufacturer.

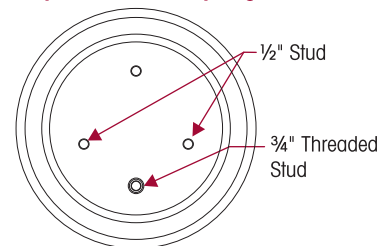
- Remove the $\frac{3}{4}$ " upper air spring locknut from the air spring bracket.
- Remove the air spring.

FIGURE 9-5

Top View of Air Spring

ASSEMBLY

- Compress the air spring and slide into vertical position.
- There is a locating $\frac{1}{2}$ " stud and $\frac{3}{4}$ " threaded stud on top of the air spring, see Figure 9-5.
- There are two studs on the bottom of the air spring. Guide studs through the air spring bracket and properly seat the lower air spring piston into the top axle pad. Secure the $\frac{1}{2}$ " locknut to the piston.
- Tighten the $\frac{3}{4}$ " upper air spring locknuts and the $\frac{1}{2}$ " lower air spring locknuts to vehicle manufacturer's torque specifications.


 **WARNING**

WHEN SERVICING THE VEHICLE OR ATTACHING AN AIR SPRING AND THE VEHICLE IS ON THE GROUND, PRIOR TO AIRING THE SUSPENSION SYSTEM MAKE CERTAIN THE AIR SPRING LOCATOR IS INDEXED INTO THE UPPER AIR SPRING BRACKET PROPERLY, AND THE AIR SPRING IS FULLY SEATED ON THE SPRING TOP PAD. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN PREMATURE AIR SPRING FAILURE, CAUSE PERSONAL INJURY, OR PROPERTY DAMAGE.

 **WARNING**

PRIOR TO AND DURING DEFLATION AND INFLATION OF THE FRONT AIR SUSPENSION SYSTEM, ENSURE THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR FROM UNDER THE VEHICLE AND AROUND THE SERVICE AREA, FAILURE TO DO SO CAN CAUSE SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

5. See Air Spring Warnings and instructions in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
6. Install the air line into the air spring.
7. Air up the suspension.
8. Check the air spring for leaks.
9. Check the ride height and adjust if necessary. See the Alignment & Adjustments Section of this publication for the proper ride height adjustment.
10. Remove the wheel chocks.

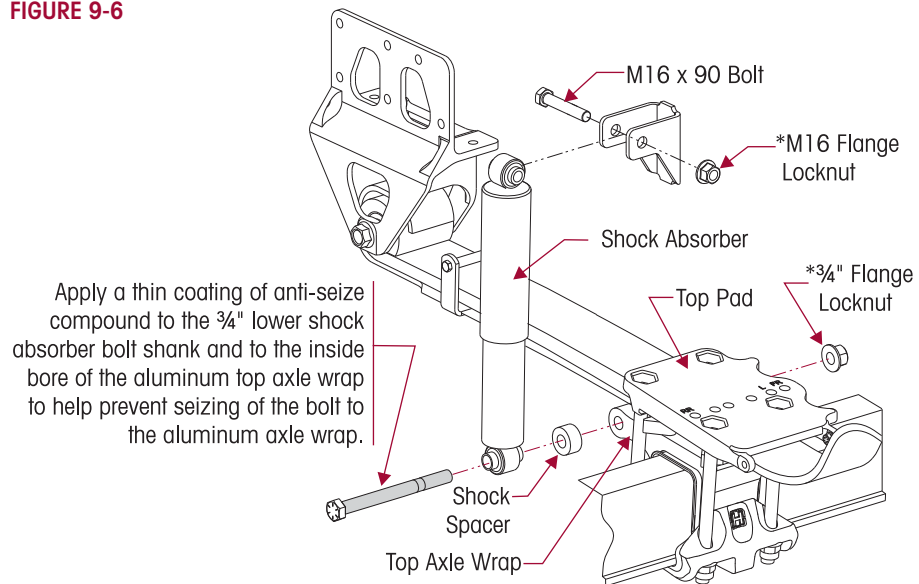
SHOCK ABSORBER

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

WARNING

THE SHOCK ABSORBERS ARE THE REBOUND TRAVEL STOPS FOR THE SPRINGS. ANYTIME THE FRONT AXLE ON AN AIRTEK SUSPENSION IS SUSPENDED IT IS MANDATORY THAT THE SHOCK ABSORBERS REMAIN CONNECTED. FAILURE TO DO SO COULD CAUSE THE AIR SPRINGS TO EXCEED THEIR MAXIMUM LENGTH, POSSIBLY CAUSING THE AIR SPRINGS TO SEPARATE FROM THE PISTON, OR CAUSE A REVERSE ARCH IN THE STEEL LEAF SPRINGS, POSSIBLY RESULTING IN PREMATURE STEEL LEAF SPRING FAILURE.

FIGURE 9-6



DISASSEMBLY

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

ASSEMBLY

1. Install the shock absorber into the upper mounting bracket.

2. Install the upper shock mounting bolts and locknuts.
3. Apply a thin coating of anti-seize compound to the shock absorber lower mounting bolt shank 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.
3. Install the lower bolt from the outboard side to the inboard side of the top axle wrap and attach the spacer and locknut, see Figure 9-6.
4. Tighten the M16 upper and 3/4" lower locknuts to vehicle manufacturer's torque specifications.

REAR SPRING HANGER AND SHACKLE BRACKET

DISASSEMBLY

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



WARNING

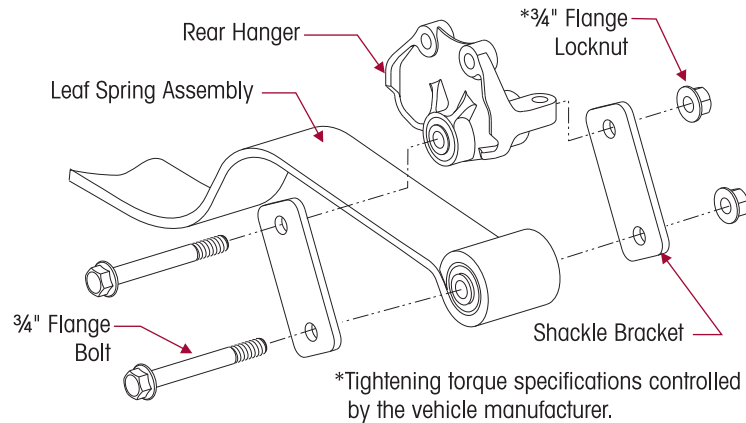
PRIOR TO AND DURING DEFLATION AND INFLATION OF THE FRONT AIR SUSPENSION SYSTEM, ENSURE THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR FROM UNDER THE VEHICLE AND AROUND THE SERVICE AREA, FAILURE TO DO SO CAN CAUSE SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

3. See Air Spring Warnings and instructions in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
4. Deflate the air springs by detaching the upper rubber grommet of the height control valve linkage from the upper stud and exhaust the suspension system air by lowering the height control valve linkage arm.
5. Remove the air lines from air springs.
6. Raise the frame.
7. Support the vehicle with frame stands.
8. Suspend the front axle from the shock absorbers.
9. Remove the rear spring eye bolt and fastener.

SERVICE HINT

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

10. Remove the hardware from the rear spring hanger. See manufacturer's guidelines.
11. Remove the rear hanger from the vehicle, see Figure 9-7.
12. Remove the two shackle brackets from the rear spring hanger.
13. Inspect the rear spring hanger and both shackle brackets for excessive wear or damage.
14. If damaged or worn excessively, replace with Genuine Hendrickson Parts as detailed in the Component Replacement Section of this publication.

FIGURE 9-7

ASSEMBLY

1. Install the shackle brackets on the rear spring hanger and leaf spring assembly, see Figure 9-7.
2. Install 3/4" rear hanger fasteners.
3. Tighten the rear hanger flange locknuts to vehicle manufacturer's torque specifications.
4. Install the rear spring hanger on the frame.
5. Install new frame mounting hardware per the vehicle manufacturer's guidelines.
6. Remove the wheel chocks.

LEAF SPRING AND WRAP LEAF ASSEMBLY
DISASSEMBLY

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

WARNING

DEFLATE AND DISCONNECT THE AIR SYSTEM PRIOR TO RAISING THE FRONT OF THE VEHICLE. PRIOR TO AND DURING DEFLATION AND INFLATION OF THE FRONT AIR SUSPENSION SYSTEM, ENSURE THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR FROM UNDER THE VEHICLE AND AROUND THE SERVICE AREA, FAILURE TO DO SO CAN CAUSE SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

3. See Air Spring Warnings and instructions in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
4. Deflate the air springs by detaching the upper rubber grommets of the height control valve linkage from the upper studs and exhaust the suspension system air by lowering the height control valve linkage arm.
5. Disconnect the air lines from the air springs.
6. Raise the truck.
7. Support the vehicle with frame stands.
8. Suspend the front axle to remove the load from the leaf spring assembly.
9. Remove the air spring (see Air Spring Disassembly in this section).

10. Support the axle with a jack.
11. Remove the front and rear spring eye bolts and fasteners.

WARNING

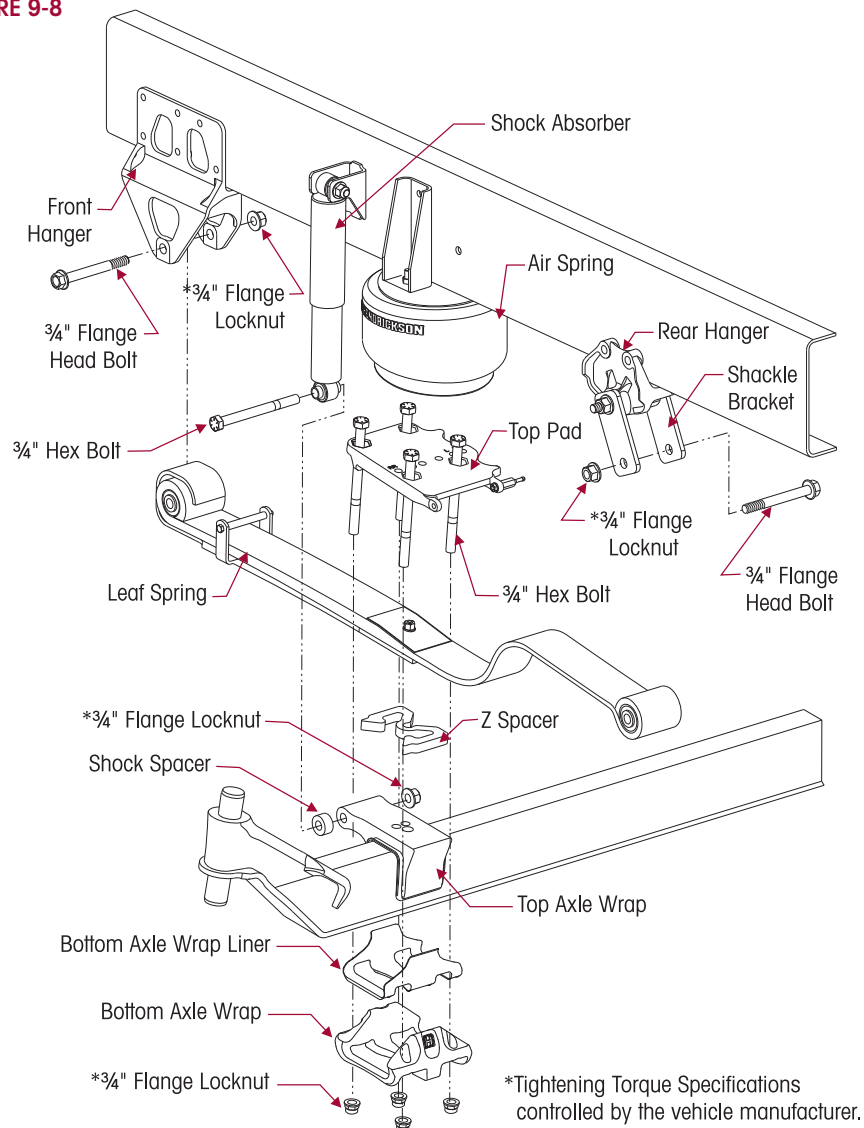
DO NOT USE A CUTTING TORCH TO REMOVE CLAMP GROUP BOLTS OR ATTACHING FASTENERS. THE USE OF SUCH HEAT ON SUSPENSION COMPONENTS CAN ADVERSELY AFFECT THE STRENGTH OF THESE PARTS. A COMPONENT DAMAGED IN THIS MANNER CAN RESULT IN THE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

12. Remove and discard the $\frac{3}{4}$ " clamp group fasteners.
13. Remove the top pad, bottom axle wrap and liner from the leaf spring being serviced, see Figure 9-8.

SERVICE HINT

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

14. Disconnect the lower air spring mounting fasteners from the top pad and discard.
15. Remove the spring and wrap leaf assemblies.

FIGURE 9-8


ASSEMBLY

1. Install the spring and wrap leaf assemblies over the axle and into the front spring hanger.
2. Install the ¾" front spring eye bolt and fastener, but **DO NOT** tighten.
3. Engage the leaf spring to the axle with the leaf spring locating stud into the aligning hole of the top axle wrap.
4. Install the top pad on top of the leaf spring.

CAUTION

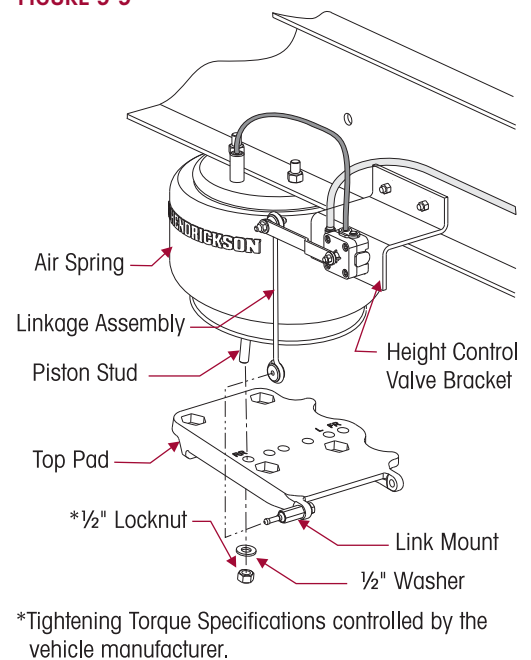
DO NOT ASSEMBLE CLAMP GROUP WITHOUT AXLE WRAP LINERS. FAILURE TO DO SO CAN CAUSE LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE OR PERSONAL INJURY.

5. Install a new bottom axle wrap liner in the bottom axle wrap.
6. Install the bottom axle wrap.
7. Install the new clamp group bolts (Grade 8), and the new nylon flange locknuts (Grade C). The nylon locknuts must be replaced when the clamp group is removed.
8. Snug the clamp group fasteners to 100 foot pounds pre-torque.
9. Raise the axle and the rear spring assembly into the rear spring shackle brackets.
10. Install the ¾" rear spring assembly fasteners in the rear spring shackle brackets. Snug fasteners, **DO NOT** tighten at this time.
11. Lower the floor jack

IMPORTANT NOTE

Only the weight of the axle should be on the spring at the time of the front and rear spring eye fasteners are tighten to torque.

12. Install the air spring into the top pad. Make sure the air spring piston seats into the top pad correctly, see Figure 9-9.
13. Install the ½" lower air spring fasteners and tighten to vehicle manufacturer's torque specifications.
14. Raise the vehicle and remove the frame stands.
15. Lower the vehicle.
16. Remove the floor jack.
17. See Air Spring Warnings and instructions in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
18. Install air lines to the air springs.
19. Install the height control valve linkage and inflate the suspension to normal operating pressure.
20. Tighten the front and rear spring eye ¾" flange locknuts to vehicle manufacturer's torque specifications.

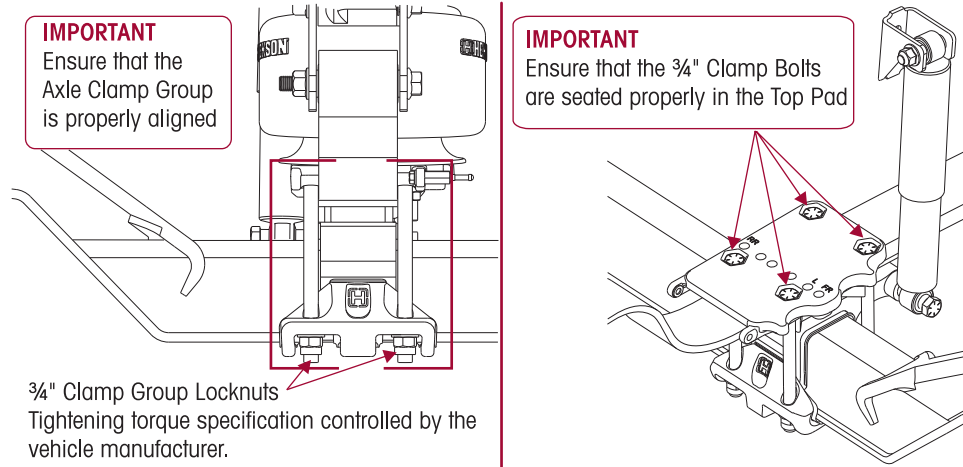
FIGURE 9-9


*Tightening Torque Specifications controlled by the vehicle manufacturer.

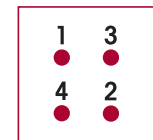
**WARNING**

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.

21. Ensure that the clamp group is properly aligned and the hex bolts are seated in the top pad, and the bottom axle wrap is centered on the top axle wrap, see Figures 9-10.

FIGURE 9-10

22. Tighten the clamp group locknuts evenly in 50 foot pounds increments in the proper pattern to achieve uniform bolt tension, see Figure 9-11. Tighten to the vehicle manufacturer's torque specifications.
23. Verify proper ride height. See Alignment & Adjustments Section of this publication.
24. Remove the wheel chocks.

FIGURE 9-11**FRONT LEAF SPRING EYE BUSHING**

The spring eye bushings for the AIRTEK spring are designed for extended service life. In the event of premature/excessive wear or damage, careful consideration must be given to the contributing factors. This must be corrected in order to help prevent the new bushings from sustaining wear or damage in the same manner. The front bushings are not replaceable components, therefore Hendrickson requires in the event of premature/excessive wear or damage, that the front spring and wrap leaf assemblies be replaced.

BOTTOM AXLE WRAP**DISASSEMBLY**

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

**WARNING**

PRIOR TO AND DURING DEFLATION AND INFLATION OF THE FRONT AIR SUSPENSION SYSTEM, ENSURE THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR FROM UNDER THE VEHICLE AND AROUND THE SERVICE AREA, FAILURE TO DO SO CAN CAUSE SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

4. See Air Spring Warnings and instructions in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
5. Deflate the air springs by disconnecting the height control valve linkage and lowering the height control valve linkage arm. This will exhaust the air pressure in the air springs.
6. Remove air spring on side being replaced, see Air Spring replacement instructions in this section.

 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.

7. Remove $\frac{3}{4}$ " clamp group hex bolts and Grade 8 nylon flange locknuts on the side being replaced, see Figure 9-10.
8. Remove bottom axle wrap. It may be necessary to use a dead blow mallet to dislodge axle wrap.
9. Once removed inspect axle wrap for damage. Replace if necessary.
10. Discard used bottom axle wrap liner.

ASSEMBLY** CAUTION**

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

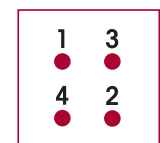
1. Install new bottom axle wrap liner into bottom axle wrap.
2. Install bottom axle wrap on axle.
3. Install new $\frac{3}{4}$ " hex bolts (if removed) and grade 8 nylon flange locknuts.

 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.

4. Ensure that the clamp group is properly aligned and the hex bolts are seated in the top pad, and the bottom axle wrap is centered on the top axle wrap, see Figure 9-10.

5. Tighten the clamp group locknuts evenly in 50 foot pounds increments in the proper pattern to achieve uniform bolt tension, see Figure 9-12. Tighten to the vehicle manufacturer's torque specifications.

FIGURE 9-12

6. Install air spring, see Air Spring Assembly in this section.
7. Install the height control valve linkage and inflate the suspension to normal operating pressure.
8. Remove the frame stands and wheel chocks.

TOP AXLE WRAP (In Chassis)**DISASSEMBLY**

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

WARNING

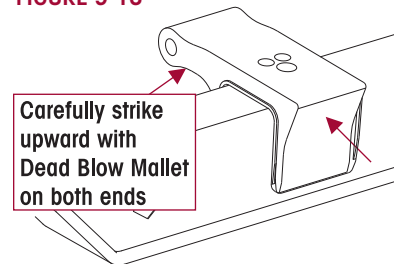
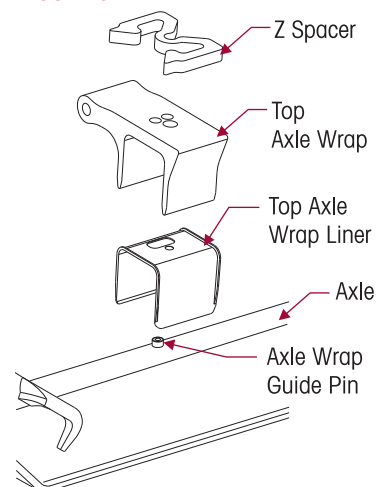
PRIOR TO AND DURING DEFLATION AND INFLATION OF THE FRONT AIR SUSPENSION SYSTEM, ENSURE THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR FROM UNDER THE VEHICLE AND AROUND THE SERVICE AREA, FAILURE TO DO SO CAN CAUSE SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

3. See Air Spring Warnings and instructions in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
4. Deflate the air springs by disconnecting the height control valve linkage and lowering the height control valve linkage arm. This will exhaust the air pressure in the air springs.
5. Disconnect the air lines at the air springs.
6. Support the vehicle with frame stands.
7. Lower the floor jack and suspend the front axle to remove the load from the leaf springs.
8. Remove the air spring (see Air Spring Disassembly in the Component Replacement Section of this publication).

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.

9. Remove the $\frac{3}{4}$ " clamp group hex bolts and fasteners from the side being serviced.
10. Remove the lower shock mounting bolt from the side being serviced.
11. Remove the top pad casting, the bottom axle wrap and liner (discard liner).
12. Remove the front and rear leaf spring eye bolts.
13. Remove the spring and wrap leaf assemblies.
14. Strike the axle wrap with a dead blow mallet at the front and rear on the underside of the axle wrap to dislodge it from the axle, see Figure 9-13.
15. Clean and inspect the axle wrap and axle for cracks or damage, replace if cracks or damage are present.

FIGURE 9-13

FIGURE 9-14

ASSEMBLY

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 axle wrap liner on the axle.
2. Spray the top of the axle wrap liner and the inside of the axle wrap with a silicon lubricant.
3. Position the axle wrap on the axle over the axle wrap liner, see Figure 9-14.

CAUTION

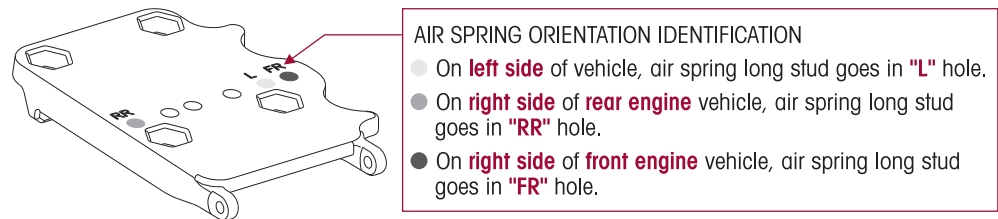
CAUTION

4. Protect the top surface of the axle wrap with a block of wood, cardboard, or shop towels.

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

5. Using a dead blow mallet drive the axle wrap onto the axle indexing the axle guide pin until the axle wrap is firmly seated on the axle.
6. Install the leaf spring and wrap leaf spring assemblies into the front hanger and the rear shackle brackets.
7. Install the 3/4" spring eye bolts in the front hanger and rear shackle brackets, see Figure 9-8.
8. Install the top pad on the leaf spring with the directional identification facing the front of the vehicle, see Figure 9-15.

FIGURE 9-15



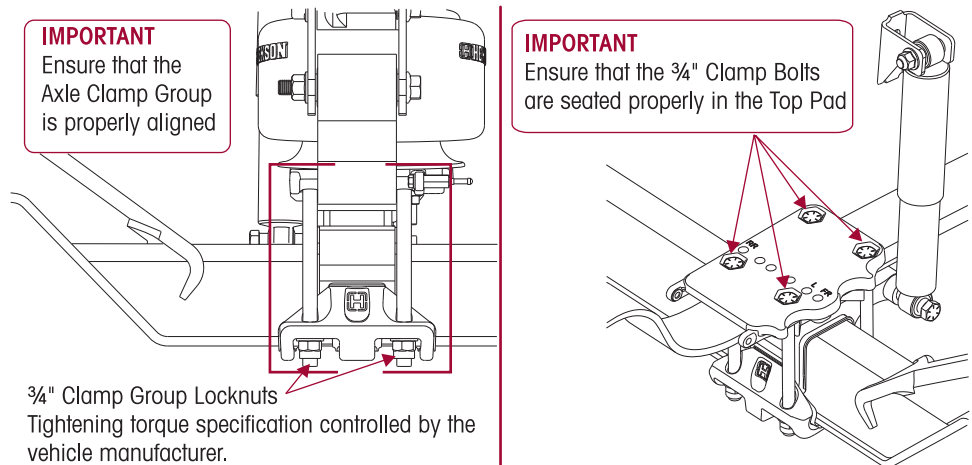
9. Install new clamp group hex bolts into the top pad.
10. Remove and replace the bottom axle wrap liner.
11. Install the bottom axle wrap.
12. Install the new clamp group washers and nylon locknuts (Grade C).

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.

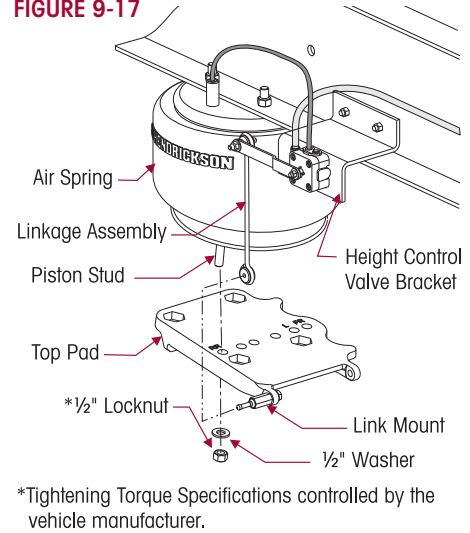
13. Ensure that the clamp group is properly aligned and the hex bolts are seated in the top pad, and the bottom axle wrap is centered on the top axle wrap, see Figures 9-16.
14. Snug the clamp group fasteners to 100 foot pounds pre-torque.
15. Install the lower shock mounting bolts from the outboard side to the inboard side.

FIGURE 9-16



16. Install the air spring into upper air spring mounting bracket and the top pad. Make sure the air spring piston seats into the top pad correctly, see Figure 9-17.
17. Attach new air spring mounting fasteners. Tighten upper and lower air spring mounting fasteners to vehicle manufacturer's torque specifications.
18. Raise the vehicle and remove the frame supports.
19. Lower the floor jack and load the front axle with the truck's weight. Remove the floor jack.

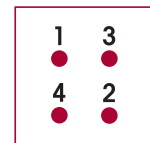
FIGURE 9-17



20. See Air Spring Warnings and instructions in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
21. Install air lines to the air spring.
22. Install the height control valve linkage and inflate the suspension to normal operating pressure.

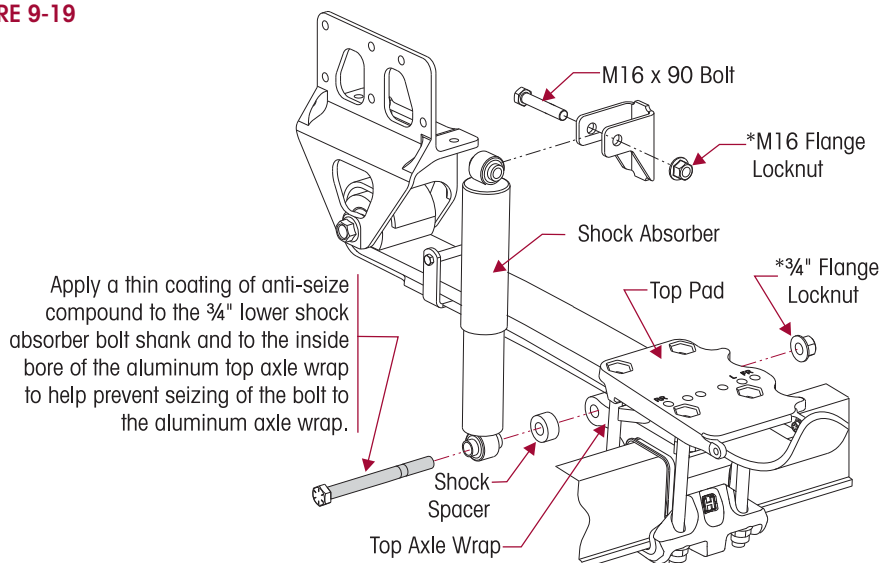
23. Tighten the clamp group locknuts evenly in 50 foot pounds increments in the proper pattern to achieve uniform bolt tension, see Figure 9-18. Tighten to the vehicle manufacturer's torque specifications.

FIGURE 9-18



24. Tighten the lower shock mounting bolts to vehicle manufacturer's torque specifications, see Figure 9-19.
25. Verify proper ride height, refer to the Alignment & Adjustments Section of this publication.
26. Tighten the front and rear spring eye 3/4" locknuts to vehicle manufacturer's torque specifications.
27. Remove the wheel chocks.

FIGURE 9-19



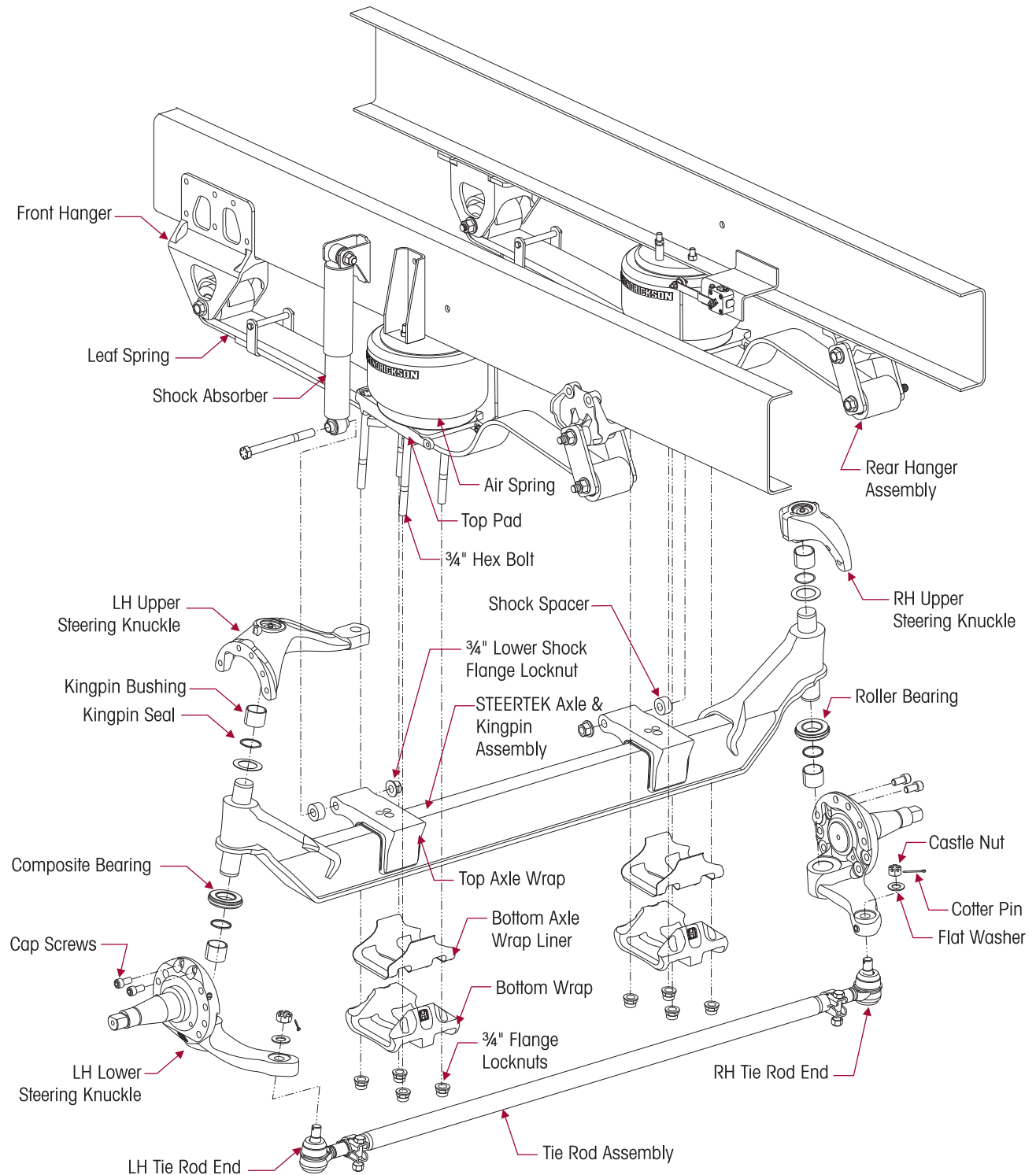
*Tightening torque specifications controlled by the vehicle manufacturer.

FRONT AXLE ASSEMBLY

STEERTEK AXLE CLAMP GROUP consist of the following components:

- Top axle wrap
- Top axle wrap liner
- Top pad
- Bottom axle wrap
- Bottom axle wrap liner
- ¾" Bolts and Flange locknuts

FIGURE 9-20



STEERTEK AXLE REMOVAL

Refer to Figure 9-20 when replacing the components of the STEERTEK axle as shown.

WARNING

DO NOT USE A TORCH ON CLAMP GROUP BOLTS OR ANY OTHER PART OF THE AIRTEK 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 AIRTEK COMPONENTS THAT CAN RESULT IN THE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

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

WARNING

PRIOR TO AND DURING DEFLATION AND INFLATION OF THE FRONT AIR SUSPENSION SYSTEM, ENSURE THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR FROM UNDER THE VEHICLE AND AROUND THE SERVICE AREA, FAILURE TO DO SO CAN CAUSE SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

4. See Air Spring Warnings and instructions in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
5. Deflate the air springs by disconnecting the height control valve linkage and lowering the height control valve linkage arm. This will exhaust the air pressure in the air springs.
6. Raise the frame.
7. Support the vehicle with frame stands.
8. Suspend the front axle with the shocks attached.
9. Remove the front wheels, hubs, brake shoes, ABS sensors, and backing plate assembly.
10. Disconnect the drag link from the steering arm.
12. Remove lower air spring mounting fasteners for both air springs at the axle top pad and unseat from the top pad.
13. Support the axle with a floor jack.

WARNING

DO NOT REPAIR OR RECONDITION SUSPENSION OR AXLE COMPONENTS FOUND TO BE DAMAGED OR OUT OF SPECIFICATIONS. ALL SUCH DAMAGED OR OUT OF SPECIFICATION COMPONENTS MUST BE REPLACED. ALL MAJOR HENDRICKSON COMPONENTS ARE HEAT TREATED AND TEMPERED. AIRTEK 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

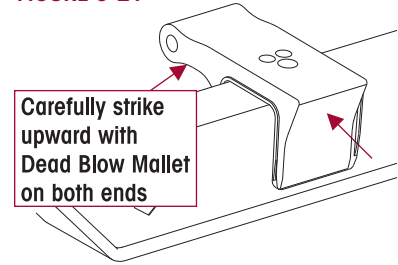
If a clamp group nut fails to come off bolt, cut half way through the bolt with an abrasive cut off wheel, taking care not to contact axle beam or other components. Using an impact wrench, spin the locknut to fracture the bolt and remove.

14. Remove the 3/4" clamp group bolts and fasteners.
15. Lower the axle and remove from the vehicle.

STEERTEK AXLE (Removed from Chassis)

STEERTEK AXLE 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 9-21.
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 9-21


WARNING

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

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

AXLE PRE-ASSEMBLY

CAUTION

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

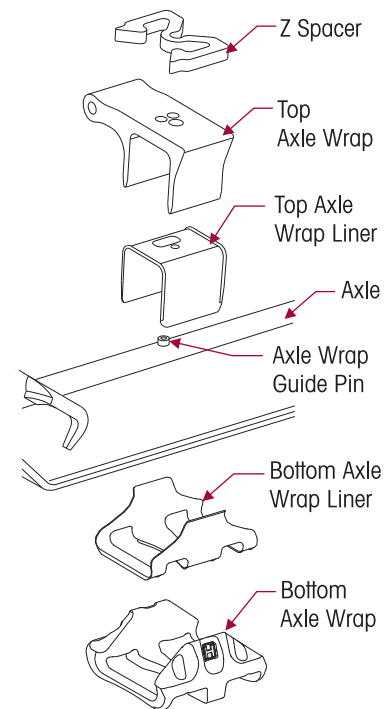
1. Install the new upper axle wrap liner on the axle. Index the liner with the axle's guide pin, see Figure 9-22.

CAUTION

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

WARNING

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

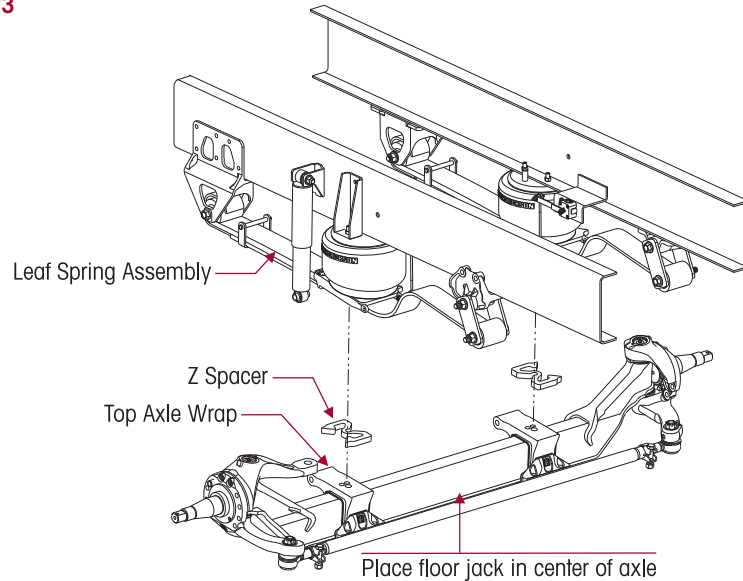
FIGURE 9-22


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 9-23



AXLE INSTALLATION

1. Place the new axle on the floor jack and position the axle under the vehicle.
2. Raise the axle into position. Care must be taken at this point to ensure that the front spring and wrap leaf assembly's center bolt is aligned correctly in the top axle wrap, see Figure 9-23.

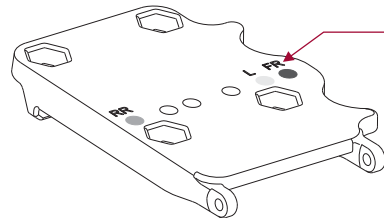


CAUTION

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

3. Install the new bottom axle wrap liners and front axle spacers on the bottom axle wraps.
4. Install the bottom axle wrap on the axle.
5. Install the top pad with the directional identification facing the front of the vehicle, see Figure 9-24.
 - On left side of vehicle, air spring long stud goes in **"L"** hole.
 - On right side of rear engine vehicle, air spring long stud goes in **"RR"** hole.
 - On right side of front engine vehicle, air spring long stud goes in **"FR"** hole.

FIGURE 9-24



AIR SPRING ORIENTATION IDENTIFICATION

- On **left side** of vehicle, air spring long stud goes in **"L"** hole.
- On **right side** of **rear engine** vehicle, air spring long stud goes in **"RR"** hole.
- On **right side** of **front engine** vehicle, air spring long stud goes in **"FR"** hole.

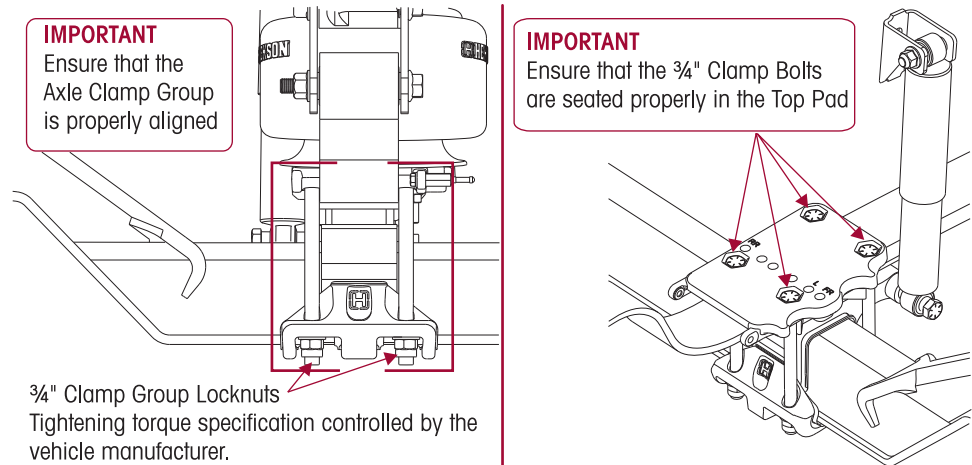
6. Install the new clamp group $\frac{3}{4}$ " hex bolts (Grade 8) and the new $\frac{3}{4}$ " nylon locknuts (Grade C).



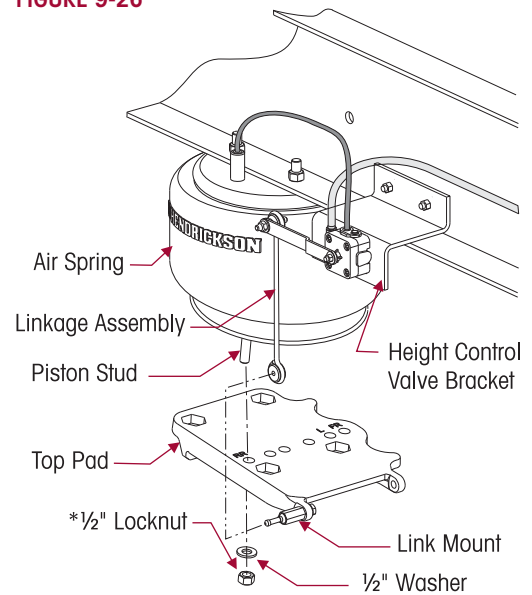
WARNING

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.

7. Ensure the clamp group is properly aligned and the hex bolts are seated in the top pad, and the bottom axle wrap is centered on the top axle wrap, see Figure 9-25.

FIGURE 9-25


8. Snug the clamp group fasteners to 100 foot pounds pre-torque.
9. See Air Spring Warnings and instructions in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.

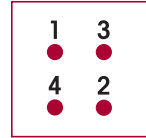
FIGURE 9-26


10. Engage the air springs into the top pad and install new lower air spring mounting fasteners. Tighten the lower air spring mounting fastener to vehicle manufacturer's torque specifications, see Figure 9-26.
11. Install the lower shock mounting bolts from the inboard side to the outboard side.
12. Install the steering knuckles as per the Steering Knuckle replacement instructions in this section.
13. Install the tie rod assembly.
14. Install the 7/8" hardened washers on the Ackermann arm and the castle nuts. Tighten the castle nuts to 185 foot pounds, then rotate until the first castle slot lines up with the cotter pin bore in the tie rod end. **DO NOT** back off nut for cotter pin installation.
15. Install the tie rod end cotter pin.
16. Connect the drag link. Install the castle nut to install the steering arm. Tighten the castle nut to 185 foot pounds, then rotate until the first castle slot lines up with the cotter pin bore in the drag link. **DO NOT** back off nut for cotter pin installation.
17. Install the drag link cotter pin.
18. Install the brake backing plate assemblies and ABS sensor and torque all fasteners per manufacturer's specifications.
19. Install the brakes, hubs, and wheels per the manufacturer's guidelines.

*Tightening Torque Specifications controlled by the vehicle manufacturer.

20. Raise the vehicle and remove the frame supports.
21. Lower the floor jack and load the front axle with the truck's weight. Remove the floor jack.
22. Install the height control valve linkage and inflate the suspension to normal operating pressure.
23. Tighten the clamp group locknuts evenly in 50 foot pounds increments in the proper pattern to achieve uniform bolt tension, see Figure 9-27. Tighten to the vehicle manufacturer's torque specifications.
24. Tighten the lower shock mounting bolts to vehicle manufacturer's torque specifications.
25. Reconnect the height control valve and air up the suspension.
26. Verify proper ride height. See Alignment & Adjustments Section of this publication.
27. Tighten the front and rear spring eye $\frac{3}{4}$ " locknuts to vehicle manufacturer's torque specifications.
28. Remove the wheel chocks.
29. Fill the hubs with the proper lubricant, (see manufacturer's guidelines for recommended lubrication), if required.
30. Grease the front steering components as per lubrication guidelines in the Preventive Maintenance Section of this publication.

FIGURE 9-27



STEERING KNUCKLE DISASSEMBLY

DISASSEMBLY

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

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

1. Place the vehicle on 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.

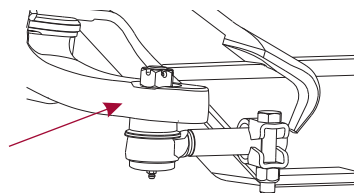
SERVICE HINT

Lightly tap the side of the Ackermann arm with a mallet to separate the tie rod end from the Ackermann arm, see Figure 9-28.

7. Remove the drag link from the knuckle if necessary.

FIGURE 9-28

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



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.

FIGURE 9-29

8. Remove the 2 socket head cap screws that connect upper kingpin connection to the steering knuckle, see Figure 9-29.
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

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

TO HELP PREVENT SERIOUS EYE INJURY, ALWAYS WEAR PROPER EYE PROTECTION WHEN PERFORMING 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.

 **CAUTION**

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

 **WARNING**

THE STEERTEK HAS A UNIQUE AXLE. THE KINGPIN IS CRYOGENICALLY INSTALLED IN THE AXLE. THE KINGPIN IS A NON-REPLACEABLE COMPONENT OF THE AXLE ASSEMBLY. DO NOT TRY TO REMOVE THE KINGPIN. DOING SO WILL DAMAGE THE AXLE AND MAY CAUSE LOSS OF VEHICLE CONTROL, PERSONAL INJURY OR PROPERTY DAMAGE. IF THE KINGPIN SHOWS SIGNS OF MOVEMENT, CONTACT HENDRICKSON PRODUCT ENGINEERING - TECH SERVICES.

1. Prepare and polish the kingpin by removing all grease and excess debris using a fine grit (220 grit or higher) emery cloth and parts solvent, see Figures 9-30 through 9-33.

FIGURE 9-30



FIGURE 9-32 KINGPIN BEFORE CLEANING



FIGURE 9-31



FIGURE 9-33 KINGPIN AFTER CLEANING



2. Inspect the kingpin for wear or damage. Use a micrometer and measure the upper and lower kingpin in two locations. Positions must be 90° opposed from each other. If the kingpin has less than 1.802" diameter, replacement of the axle is necessary, see Figures 9-34 through 9-37.

Kingpin minimum dimension is 1.802"

FIGURE 9-34

FIGURE 9-35

FIGURE 9-36

FIGURE 9-37


KINGPIN BUSHING REMOVAL

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

WARNING

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

CAUTION

BEFORE APPLYING HYDRAULIC PRESSURE TO REMOVE OR INSTALL THE KINGPIN BUSHING, SUPPORT THE LOWER STEERING KNUCKLE AS SHOWN IN FIGURES 9-38 AND 9-39. IMPROPER SUPPORT TO THE STEERING KNUCKLES CAN CAUSE COMPONENT DAMAGE.

3. Use the grease cap to press out the kingpin bushing and seal. Remove the grease zerk in the grease cap or use a hollow driver, (see Figure 9-38) to press out the kingpin bushing.
4. Install the lower steering knuckle upside down in press. Be sure to support the lower steering knuckle assembly so that it sits in-line with the press, see Figure 9-39.
5. Use the same procedure to remove the kingpin bushing in the upper kingpin connection or the steering arm, see Figures 9-38 through 9-40.
6. Clean the parts and inspect for reassembly, see Figure 9-41.

FIGURE 9-38



FIGURE 9-39



FIGURE 9-40



FIGURE 9-41



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 9-42 through 9-44. If the average measurement is more than the knuckle bore maximum diameter specification, replace the knuckle.

FIGURE 9-42



FIGURE 9-43



FIGURE 9-44



KINGPIN BUSHING INSTALLATION

1. A hydraulic shop press with a minimum forcing capacity of 5 tons will be required.

WARNING

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

2. Install the lower or upper steering knuckle in the press.
3. Install the kingpin bushing from the machined side (axle side) of the lower steering knuckle using a bushing driver, (see driver specifications in the Special Tools Section of this publication). Press in bushing to a depth of no less than $1\frac{5}{64}$ " (0.236") or 6 millimeters and no more than $\frac{5}{16}$ " (0.32") or 8 millimeters, see Figures 9-45 and 9-47.
4. Following this procedure it is necessary to ream the kingpin bushings to fit the kingpins, (see Kingpin Bushing Reaming Instructions).

FIGURE 9-45



FIGURE 9-46



FIGURE 9-47



KINGPIN BUSHING REAMING

CAUTION

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

WARNING

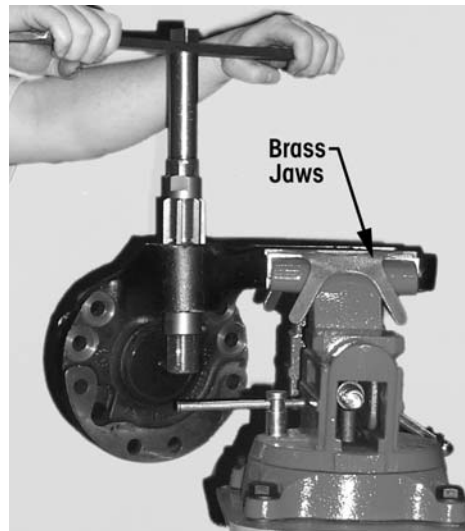
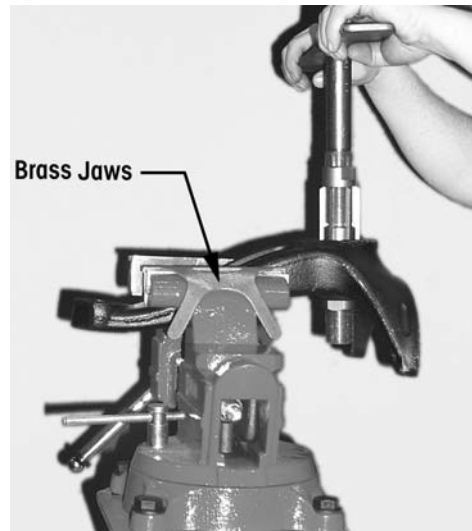
WHEN INSTALLING STEERING KNUCKLE COMPONENTS IN A VISE IT IS NECESSARY TO PROTECT THE MACHINED SURFACES FROM GOUGES OR MARRING BY USING BRASS JAWS. FAILURE TO DO SO CAN CAUSE PREMATURE PART DAMAGE, DAMAGE TO THE STEERING KNUCKLE COMPONENTS, LOSS OF WARRANTY, LOSS OF VEHICLE CONTROL, CAUSING PERSONAL INJURY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

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

SERVICE HINT

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

2. Install the reamer into the lower steering knuckle until the blades touch the kingpin bushing.
3. Rotate the reamer with light downward pressure. Rotate the reamer smoothly. Do not apply too much pressure, see Figures 9-48 and 9-49.
4. Slide the reamer out of the bottom of the steering knuckle assembly. If it is necessary to remove the reamer from the top, rotate the reamer opposite of cutting rotation.
5. Clean and remove all kingpin bushing material from the steering knuckle assembly. Take special attention to remove material from the grease channels and dimples.

FIGURE 9-48 Lower Steering Knuckle in Vise

FIGURE 9-49 Upper Steering Knuckle in Vise


6. Clean the $\frac{5}{8}$ " brake backing plate bolts with a wire wheel and run a tap through the threads of the lower steering knuckle assembly and then flush out with brake cleaner and dry with compressed air.

WARNING

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

NOTE

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

7. Install the upper and lower steering knuckle on the kingpin.
8. Check for the proper fit by rotating the knuckle assembly back and forth to verify there is no binding on the kingpin, see Figures 9-50 and 9-51.
9. If the bushing is too tight repeat Steps 1 through 8 until the proper clearance is achieved.

NOTE

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

FIGURE 9-50

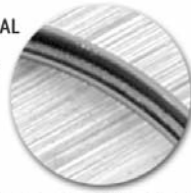
FIGURE 9-51


KINGPIN SEAL INSTALLATION

FIGURES 9-52 AND 9-53

MAGNIFICATION OF LIP SEAL

Lip seal faces toward axle.



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 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 9-52 and 9-53.

STEERING KNUCKLE ASSEMBLY

ASSEMBLY

After replacement of the kingpin bushings it is necessary to re-assemble the steering knuckle assemblies. The STEERTEK axle is equipped with two different thrust bearings installed. 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, see Figures 9-54 and 9-55. Do not substitute after-market components when servicing.

1. Install the thrust bearing on the lower kingpin with the seal facing up toward axle (the black seal will designate the top side). 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, see Figures 9-54 and 9-55.
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, see Figure 9-54 and 9-55.
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.

FIGURE 9-54



FIGURE 9-55



6. Install a bottle jack under the lower knuckle and slightly raise the knuckle until it is possible to thread in the (3) brake backing plate bolts by hand. These are for guide purposes only.
7. Snug the two socket head cap screws.
8. Lower the bottle jack so that all the vertical clearance is on the underside of the axle.

9. Affix a magnetic base dial indicator on the axle and place the tip of the dial indicator on top of the knuckle assembly, see Figure 9-56.

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.

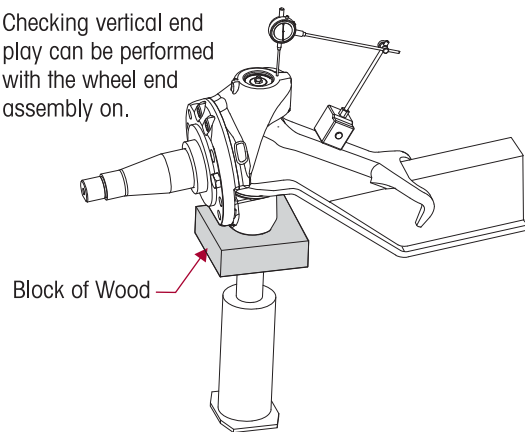
12. Check the reading on the dial indicator. The specification for vertical travel on the steering knuckle during assembly is 0.008" to 0.011".

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 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.

FIGURE 9-56


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

**NOTE**

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

WARNING

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

15. Remove one old socket head cap screw and replace with new socket head cap screw.
16. Remove second socket head cap screw and replace with new socket head cap screw. Tighten both socket head cap screws to  175-200 foot pounds torque.
17. Recheck the vertical clearance with the dial indicator or a 0.010" feeler gauge, see Figure 9-56.
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 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 brake spider bolts prior to installation into the brake spider. Tighten bolts to the vehicle manufacturer's torque specifications.

 **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 end into the lower steering knuckle arm.
22. Tighten the castle nuts to  185 foot pounds torque then rotate the castle nut to the next castle slot and install cotter pin.
23. Install the drag link into the steering arm and tighten to the vehicle manufacturer's torque 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 the wheel chocks.

TIE ROD END AND CROSS TUBE**NOTE:**

Hendrickson supplies different tie rod configurations. Prior to ordering, locate the part number on the tie rod tube. For additional information see Technical Bulletin SEU-0223 or contact Hendrickson Sales Engineering.

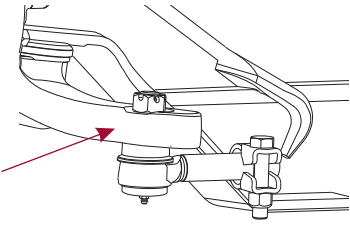
DISASSEMBLY

1. Chock the wheels.
2. Position the steer axle tires straight ahead.
3. Remove the cotter pin and castle nut.
4. Lightly tap the side of the Ackermann arm to loosen the tie rod end from the Ackermann arm, see Figure 9-57.

FIGURE 9-57

5. Repeat to Steps 3 and 4 to remove the other tie rod end.
6. Remove the cross tube and tie rod ends from the vehicle.
7. Mount the cross tube in a soft jaw vice.
8. Remove the hardware from the clamp on the cross tube.
9. Count the exposed threads on the tie rod end being replaced.
10. Remove the tie rod end from the cross tube.

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

**WARNING**

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

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

ASSEMBLY

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

NOTE

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

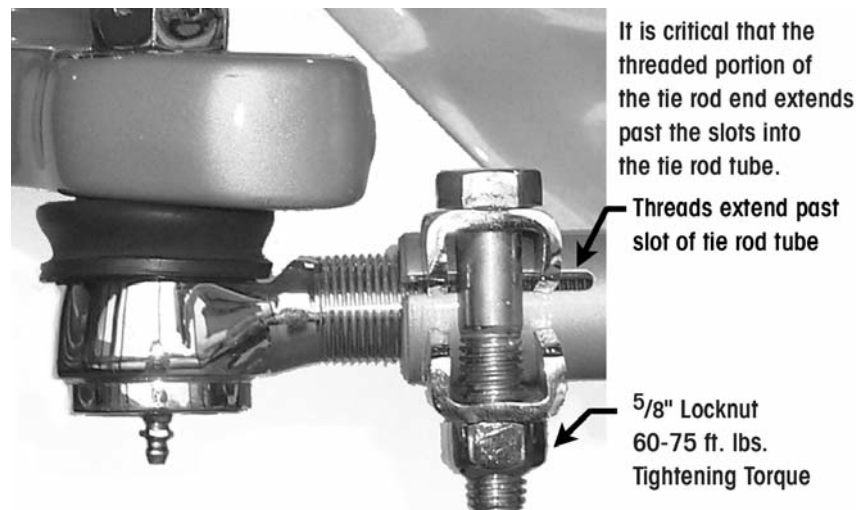
- A right hand threaded tie rod end will be installed into the right side Ackermann arm.
- A left hand threaded tie rod end will be installed into the left side Ackermann arm.

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

**WARNING**

THE THREADED PORTION OF THE TIE ROD END MUST EXTEND PAST THE SLOTS INTO THE TIE ROD CROSS TUBE, SEE FIGURE 9-58. FAILURE TO DO SO CAN CAUSE COMPONENT DAMAGE, LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.


FIGURE 9-58



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.

**WARNING**

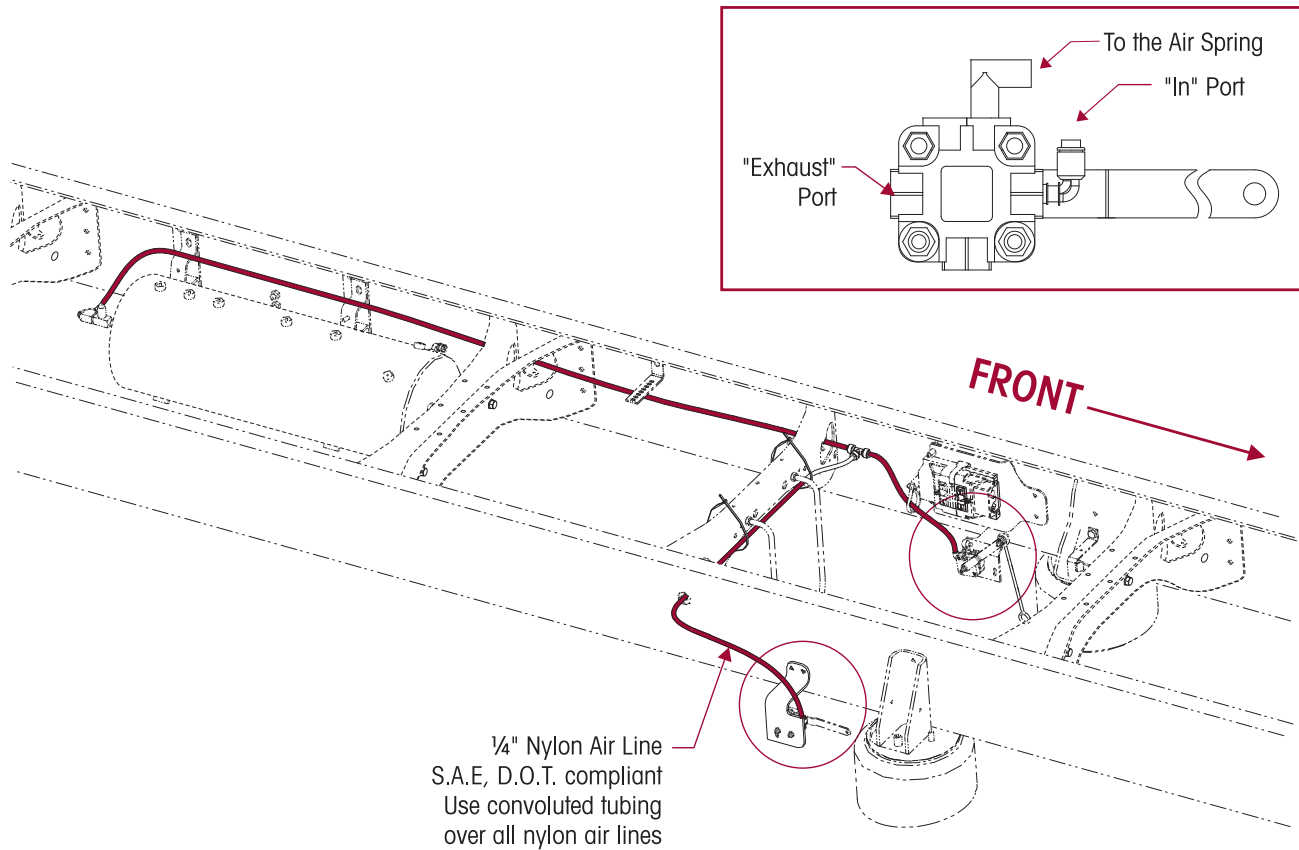
DO NOT HEAT THE CROSS TUBE WITH A TORCH TO ROTATE THE CROSS TUBE IN THE TIE ROD END. THE USE OF SUCH HEAT CAN ADVERSELY AFFECT THE STRENGTH OF THE CROSS TUBE. A COMPONENT DAMAGED IN THIS MANNER WILL RESULT IN LOSS OF WARRANTY, AND CAN RESULT IN THE LOSS OF VEHICLE CONTROL, AND POSSIBLE LOWER STEERING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

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

SECTION 10 Plumbing Diagrams

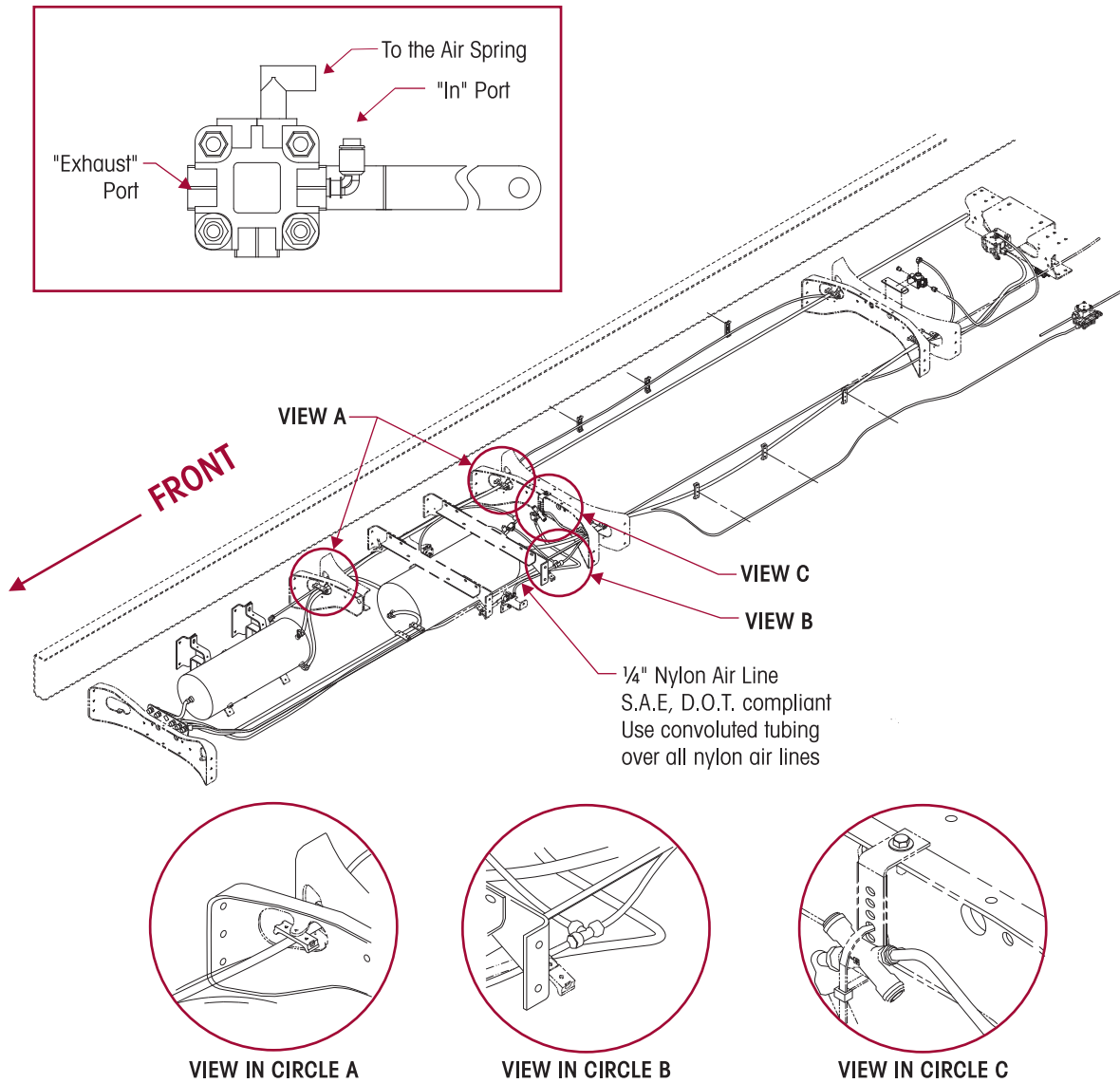
When replacing or installing nylon air line tubing into quick-connect fittings it is critical that the end of the air line is cut square. Improper cut of the end of the air line tubing can cause the air line to seat improperly in the quick connect fitting causing air leakage.

FRONT ENGINE PLUMBING DIAGRAM





REAR ENGINE PLUMBING DIAGRAM



SECTION 11

Troubleshooting Guide

AIRTEK		
TROUBLESHOOTING GUIDE		
CONDITION	POSSIBLE CAUSE	CORRECTION
Worn or damaged kingpins and kingpin bushings	Dirt in system– contaminated lubricant	Polish and inspect kingpin, replace bushing and seals, then follow specified lubrication procedures
	Incorrect lubricant	Lubricate axle with specified lubricant
	Axle not lubricated at scheduled frequency	Lubricant axle at scheduled frequency
	Incorrect lubrication procedures	Use correct lubrication procedures
	Lubrication interval not compatible with operating conditions	Change lubrication interval to match operating conditions
	Worn or missing seals	Replace worn or missing seals
Vibration or shimmy of front axle during operation	Caster out of specification	Check ride height and 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 shackle brackets and rear hanger clamps	Replace shackle brackets 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 tandem axle alignment	Align tandem axles
	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	Check ride height and 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 trouble shooting procedures per steering gear manufacturing guidelines.



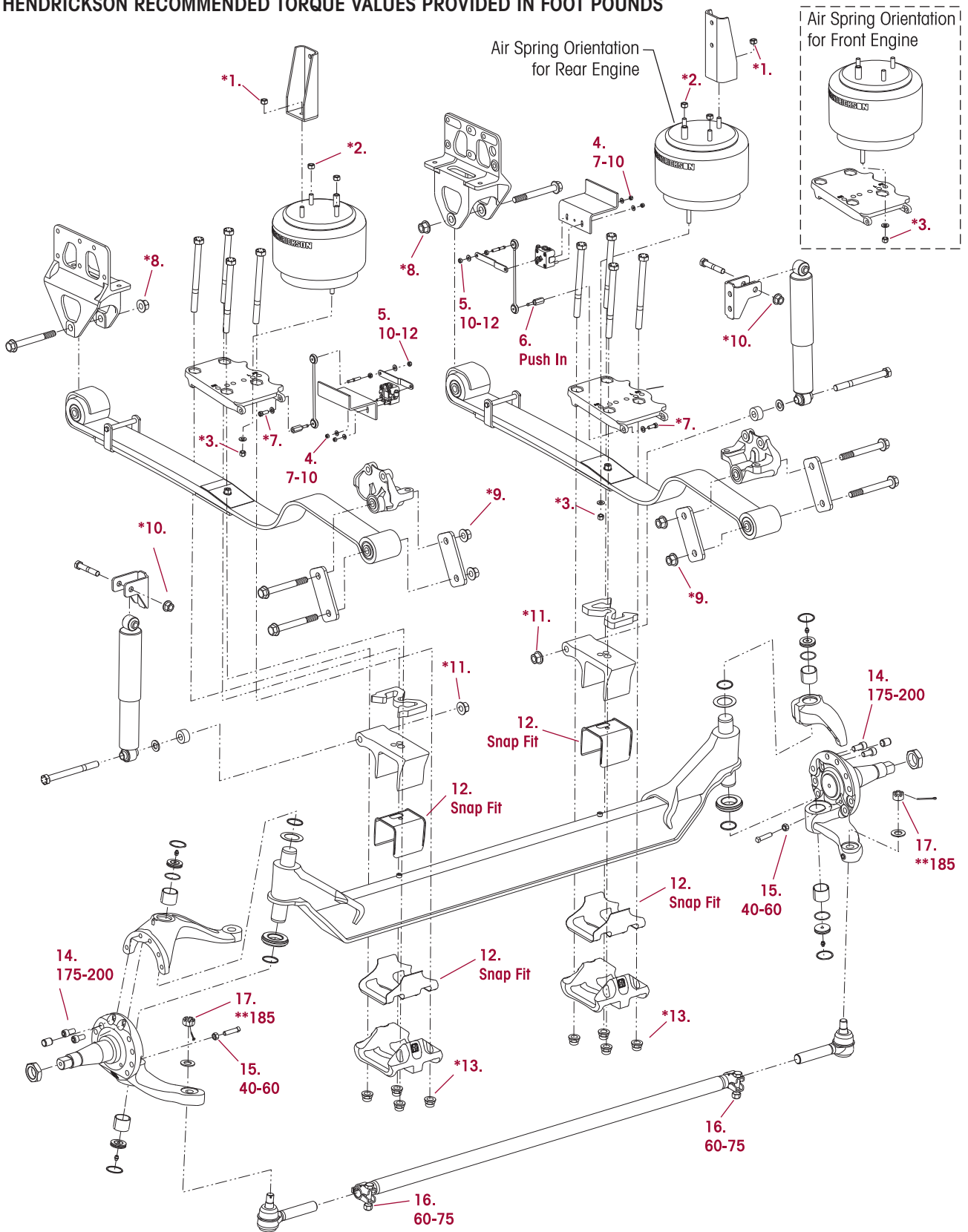
AIRTEK

TROUBLESHOOTING GUIDE (CONTINUED)

CONDITION	POSSIBLE CAUSE	CORRECTION
Tie rod ends are worn and require replacement	Tie rod ends need lubrication	Lubricate tie rod end. Make sure lubrication schedule is followed.
	Severe operating conditions	Increase frequency of inspection and lubrication intervals
	Damaged boot on tie rod end	Replace tie rod end
Bent or broken cross tube, tie rod end ball stud or tie rod end NOTE: Damaged components require replacement	Pump/gear relief valve pressure setting exceeds system specifications	Adjust power steering system to manufacturer's specified pressure
	Steering gear 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
	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	Air spring not inflated	Check air supply to air spring, repair as necessary
	Air spring ride height out of specification	Adjust ride height to proper specification
	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
	Air spring(s) are not inflated	Repair source of air pressure loss
	Leaf spring broken	Replace leaf spring
	Excessive weight bias	Contact the vehicle manufacturer or Hendrickson Tech Services
Vehicle wanders	Caster out of specifications	Check ride height prior and adjust caster to specification
	Incorrect toe setting	Adjust toe to specification
	Fifth wheel not greased	Grease fifth wheel
	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 11 Torque Specifications

HENDRICKSON RECOMMENDED TORQUE VALUES PROVIDED IN FOOT POUNDS





AIRTEK

HENDRICKSON RECOMMENDED TORQUE SPECIFICATIONS				
NO.	COMPONENT	QTY.	SIZE	TORQUE VALUE (in foot pounds)
1	Air Spring to Air Spring Bracket	2	¾"	*
2	Air Spring to Frame	4	½"	*
3	Air Spring to Top Pad	2	½"	*
4	Height Control Valve to HCV Bracket	4	¼"	7-10
5	Linkage Rod to Height Control Valve Arm	2	5/16"	10-12
6	Linkage Rod to Link Mount	None	Grommet	Push In
7	Link Mount to Top Pad	2	3/8"	*
8	Front Hanger to Leaf Spring	2	¾"	*
9	Rear Hanger to Leaf Spring	4	¾"	*
10	Upper Shock Absorber Locknuts	2	M16	*
11	Lower Shock Absorber Locknuts	2	¾"	*
12	Axle Wrap Liners for Clamp Group	4	Formed	Slip 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.				
13	Clamp Group Hardware	8	¾"	*
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.				
14	Knuckle Attachment Bolt (Socket Head Cap Screw)	4	5/8"	175-200
15	Knuckle / Axle Wheel Stop Bolt	2	5/8" Jam Nut	40-60
16	Tie Rod Tube to Tie Rod Ends	2	5/8"	60-75
17	Tie Rod Ends / Drag Link to Steering Knuckle	2	7/8" Castle Nut	**185-300
• All hardware ¼" and greater is Grade 8 with no additional lubrication.				
NOTE:				
* All hardware information highlighted in gray in the matrix denotes fasteners originally supplied by the vehicle manufacturer. Frame fasteners are furnished and installed by the vehicle manufacturer. Vehicle manufacturer may use an equivalent HUCK fastener at frame mount. If Hendrickson supplied fasteners are used, tighten to Hendrickson torque values. Hendrickson is not responsible for maintaining vehicle manufacturer's torque values.				
** Torque to 185 foot lbs., advance nut to next hex face to install cotter pin. Do not back off nut for cotter pin installation.				

SECTION 12

Front Alignment Specifications

AIRTEK for International IC Bus Vehicles

FRONT AIR MODULE SUSPENSION ALIGNMENT SPECIFICATION

CAMBER ¹	DESIGN SPECIFICATION	RANGE	
		MINIMUM	MAXIMUM
LEFT	0.0° ± 1.0°	-1.0°	+1.0°
RIGHT	-0.25° ± 1.0°	-1.25°	+0.75°
CROSS	+0.25° ± 1.0°	-0.75°	+1.25°

CAMBER NOTES:

¹The 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	6.0° ± 1.0°	+5.0°	+7.0°
RIGHT	6.0° ± 1.0°	+5.0°	+7.0°
CROSS ³	0.0° ± 1.5°	—	+1.5°

CASTER NOTES:

- ¹ Caster is determined with the vehicle at specified ride height for air suspension or at rated load for mechanical suspension systems. It is critical that the vehicle front and rear ride height is within specifications prior to performing a caster measurement or adjustment. See Hendrickson ride height specifications and procedure.
- 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 different angle caster shims will not correct cross caster.**
- ⁴ **Example of caster adjustment:** 4.5° RH/5° LH, would require one, 1.0 shim on each side to increase caster and achieve 5.5° RH/6.0° LH, that is in specification. **DO NOT** attempt to use uneven shims.

Hendrickson recommends following TMC² practices:

	DESIGN SPECIFICATION ¹	RANGE	
		MINIMUM	MAXIMUM
TOTAL TOE ²	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.

Reference Material

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

TMC

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

TMC/ATA
2200 Mill Road
Alexandria, VA 22314

Phone: 703-838-1763
Website: tmc.truckline.com
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


Video's

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

Other

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

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

1	3
●	●
4	2
●	●

 - a) 1,3,2,4
 - b) 1,4,2,3
 - c) 1,2,3,4
 - d) The torque sequence does not matter.
- 10) For a vehicle equipped with a STEERTEK axle it is an acceptable practice to tow using a tow chain wrapped around the axle.
True or False.
- 11) The front leaf spring eye bushing is non-serviceable.
True or False
- 12) To remove the STEERTEK knuckle you must.
 - a) Drive the kingpin out of the axle bore.
 - b) Remove the locking pins before driving the kingpin out.
 - c) Remove the two $\frac{5}{8}$ " socket head cap screws and separate the knuckle assembly.
 - d) None of the above.
- 13) Worn kingpins are easily removed and replaced.
True or False



- 14) What is the maximum allowable specification for lateral movement of the steering knuckle?
 - a) 0.001"
 - b) 0.075"
 - c) 0.030"
 - d) 0.015"
- 15) When AIRTEK ride height is checked, it is not necessary to cycle the leveling valve before check the ride height.
True or False
- 16) Although the AIRTEK is low maintenance, it is recommended to do a visual inspection on the axle and suspension every _____ miles.
 - a) 100,000 or 1 year
 - b) 25,000 or 6 months
 - c) Never
- 17) The STEERTEK axle combined with the clamp group and stiff front spring limb help to make the AIRTEK torsionally rigid and reduce body roll.
True or False
- 18) How many grease points are there on the STEERTEK axle?
 - a) 2
 - b) 6
 - c) 8
 - d) None
- 19) It is acceptable to replace a failed shock absorber with any brand that will fit.
True or False
- 20) A shock that is misting is classified as a leaking shock and should be replaced immediately.
True or False
- 21) Prior to performing a total vehicle alignment the following components must be inspected.
 - a) Front and rear spring hanger
 - b) Steer axle tires
 - c) Ride height
 - d) All of the above
- 22) Wheel bearing adjustment has no impact on tire wear.
True or False
- 23) When the clamp group is disassembled the use of a cutting torch is acceptable to help remove seized bolts and nuts.
True or False
- 24) Prior to steering knuckle re-assembly it is critical that residual Loctite be removed and re-applied from the upper kingpin connection.
True or False
- 25) AIRTEK is available exclusively with the STEERTEK axle.
True or False
- 26) To heat test a shock absorber you should drive a vehicle at moderate speeds for fifteen minutes.
True or False
- 27) The combination of the air spring and mechanical spring support 100% of the vertical load on the AIRTEK suspension. What is the load ratio distribution between the two springs?
 - a) 25% air spring – 75% leaf spring
 - b) 50% air spring – 50% leaf spring
 - c) 80% air spring – 20% leaf spring
 - d) Ratio will fluctuate with load
- 28) If the kingpin bushing is worn, then both bushings on that knuckle need to be replaced.
True or False



- 29) The unique packaging of the steering knuckle will allow up to _____ degrees of wheel cut on the STEERTEK axle.
- a) 50°
 - b) 32°
 - c) 87°
 - d) None of the above
- 30) A pre-alignment inspection reveals a tie rod end is worn out of specification. What is the correct action needed to complete the alignment.
- a) Fill the tie rod with grease to absorb excessive play.
 - b) Replace the tie rod and reset toe before alignment.
 - c) Perform alignment and then replace tie rod end and reset toe.
 - d) Align vehicle and do not repair tie rod end.
- 31) The seal on the thrust bearings are installed facing down.
- a) True
 - b) False
 - c) Doesn't matter
- 32) When servicing tie rod ends it is not necessary to have the part number located on the tie rod tube to order tie rod service kits.
True or False

CERTIFICATE

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

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



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