

TECHNICAL PROCEDURE

COMPOSILITE® SC Steerable Auxiliary Axle Suspension Systems

SUBJECT: Installation & Preventive Maintenance

LIT NO: TP-H633

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TABLE OF CONTENTS

Section 1	Introduction	2	Section 8	Component Replacement	
Section 2	Product Description	2		Steering Knuckle Disassembly	31
Section 3	Important Safety Notice	5		Kingpin Preparation and Measurement	31
Section 4	Special Tools	10		Fabricated Knuckle Kingpin Bushing	33
Section 5	Pre-Installation/Installation Check List			Cast Knuckle Kingpin Bushing Removal	34
	Adjustable Ride Height (If Required)	12		Cast Knuckle Bore Measurement	34
	Ride Height Spacer (If Equipped)	12		Cast Knuckle Kingpin Bushing Reaming	35
	Adjustable Frame Width	13		Kingpin Bushing Reaming	35
	Suspension Mounting Installation	13		Kingpin Seal Installation	37
	Suspension Frame Rail	14		Steering Knuckle Assembly	37
	Upper Air Spring Plate & Air Spring	16		Auxiliary Axle Brake Replacement	39
	Install and Inspection Checklist	17		Urethane Bushings and Inner Sleeves	41
Section 6	Initial Axle Adjustments/Final Inspection		Section 9	Air Control Systems	42
	Toe Setting	18	Section 10	Torque Specifications	43
	Turn Angle - Mechanical Stop	18	Section 11	Troubleshooting Guide	44
	Axle Controls	18			
	Lock Straight	18			
	Manual and Automatic Lift	18			
	Final Inspection	19			
Section 7	Preventive Maintenance				
	Hendrickson Inspection Intervals	20			
	Component Inspection	20			
	Lubrication Intervals	21			
	Kingpin Lubrication	21			
	Tie Rod End Lubrication	21			
	Lift Axle and Compliant Tie Rod Inspection	22			
	Tie Rod Adjustment/Toe Setting	22			
	Tie Rod End Inspection	22			
	Kingpin Bushing Inspection	25			
	Steering Knuckle Inspection/Adjustment	25			
	Bushings	26			
	Stabilizer	27			
	Tire Inspection	28			

SECTION 1 Introduction

This publication is intended to acquaint and assist maintenance personnel with the installation and preventive maintenance of Hendrickson COMPOSILITE® SC Steerable Auxiliary Axle Suspension Systems.

NOTE

USE ONLY HENDRICKSON GENUINE PARTS FOR SERVICING THIS SUSPENSION SYSTEM. REFERENCE HENDRICKSON COMPOSILITE SC PART LIST, LITERATURE NO. H732.

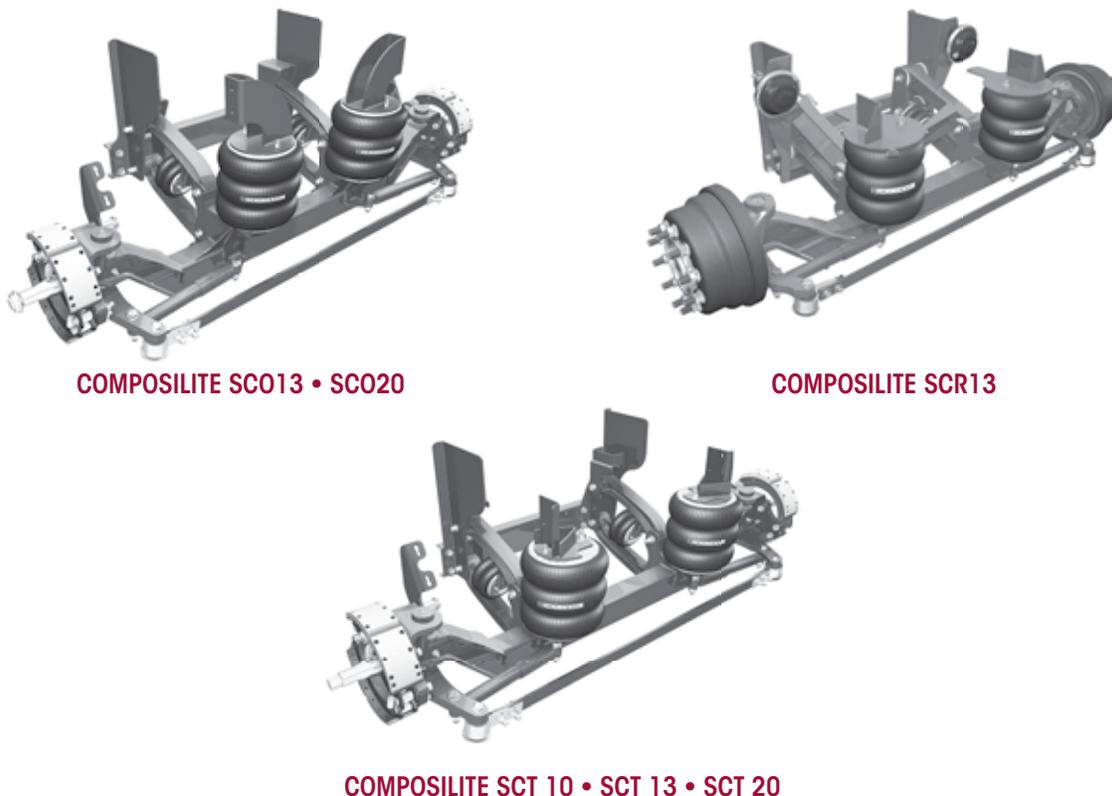
It is important to read and understand this entire publication prior to performing any installation, service or maintenance of the product. The information in this publication contains product images, safety information, product specifications, features and proper installation, service and maintenance instructions for Hendrickson SC steerable auxiliary axle suspension systems.

Hendrickson reserves the right to make changes and improvements to its products and publications at any time. Contact Hendrickson Tech Services for information on the latest version of this manual at 1-800-660-2829 (toll-free U.S. and Canada), 1-740-929-5600 (Outside U.S. and Canada), or e-mail: liftaxle@hendrickson-intl.com.

The latest revision of this publication and the COMPOSILITE SC Parts List Lit. No. H732 are also available online at www.hendrickson-intl.com.

SECTION 2 Product Description

FIGURE 2-1





Hendrickson’s COMPOSILITE SC family of lift axles for steerable truck and trailer applications delivers reliability, cost-effectiveness and innovation. The COMPOSILITE SC family offers a full range of capacities from 10,000 to 20,000 pounds, including axles for roll-off and twin steer applications.

COMPOSILITE STEERABLE LIFT AXLE SPECIFICATIONS

MODEL	MAXIMUM CAPACITY (lbs.)	APPLICATION WEIGHT (lbs.)		RIDE HEIGHTS (Inches +/- 1")
		TRUCK	TRAILER	
SC 08	8,000	735	778	12.5 - 20.5
SC 10	10,000	735	778	12.5 - 20.5
SC 13	13,500	848	865	8.5 - 18.5
SC 20	20,000	1,357	1,402	9.5 - 13.5
SCO 13	13,500	851	N/A	8.5 - 18.5
SCO 20	20,000	1,393	N/A	9.5 - 13.5
SCH 10	10,000	1,133	N/A	10.5 - 20.5
SCR 13	13,500	1,029	N/A	9.0 - 15.0

IDENTIFYING YOUR LIFT AXLE SUSPENSION(S)

NOTE

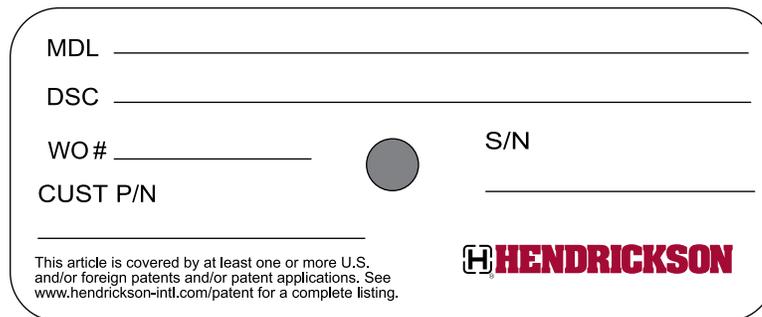
ALL HENDRICKSON AUXILIARY LIFT AXLES ARE MANUFACTURED WITH A SERIAL NUMBER PLATE TO HELP IN IDENTIFICATION, SEE FIGURE 2-2.

When identifying your Hendrickson Auxiliary Lift Axle visually, see Figure 2-2 to compare with your suspension.

AXLE TAG IDENTIFICATION

The Serial Number Label shown in Figure 2-2, is stainless steel label and attached to the body of the suspension system. The label contains the serial number and the part number unique to that particular suspension system. These two numbers are important to use when contacting Hendrickson for customer service, replacement parts, and warranty issues.

FIGURE 2-2 Serial Number Label





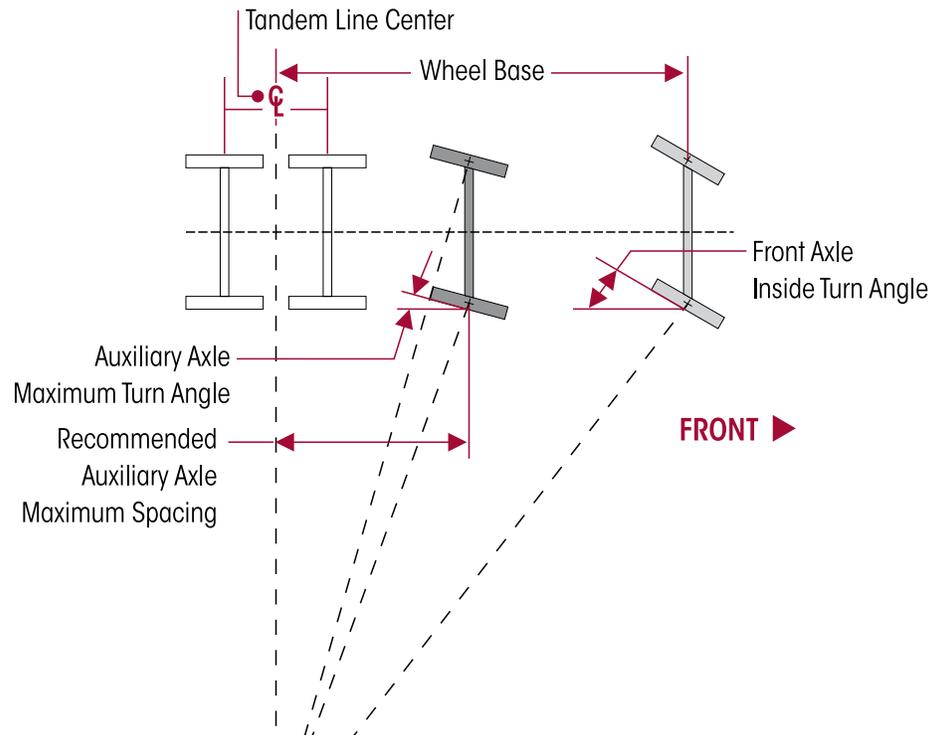
AUXILIARY AXLE SUSPENSION LOCATION

1. Locate your vehicle wheel base as shown in Table 2-1.
2. Follow the row to the right column that most closely represents your vehicle's front inside turn angle.
3. The number in the **front Axle Inside Turn Angle** column (shaded area in Table 2-1) is the recommended maximum distance that the self-steer auxiliary axle can be placed in front of the vehicle's rear tandem, see Figure 2-3.

TABLE 2-1

Vehicle Wheel Base	COMPOSILITE SC SUSPENSION LOCATION CHART		
	Front Axle Inside Turn Angle		
	35°	40°	45°
140"	120"	100"	84"
160"	137"	115"	96"
180"	154"	129"	108"
200"	171"	143"	120"
220"	189"	157"	132"
240"	206"	172"	144"
260"	223"	186"	156"
280"	240"	201"	168"

FIGURE 2-3





SECTION 3

Important Safety Notice

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

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

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



To the left 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.



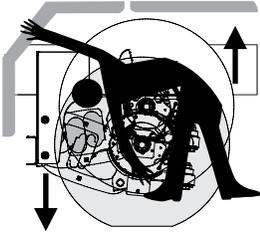
INDICATES A POTENTIAL HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, MAY RESULT IN MINOR OR MODERATE INJURY.

NOTE AN OPERATING PROCEDURE, PRACTICE CONDITION, ETC. WHICH IS ESSENTIAL TO EMPHASIZE.

SERVICE HINT A HELPFUL SUGGESTION THAT WILL MAKE THE SERVICING BEING PERFORMED A LITTLE EASIER AND/OR FASTER.



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

SAFETY PRECAUTIONS:**⚠ WARNING****LIFT AXLE RAPID MOVEMENT**

LIFT AXLE RAPID MOVEMENT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

IF LIFT AXLE IS OPERATED BY AN AUTOMATIC OR SEMI-AUTOMATIC LIFT AXLE CONTROL SYSTEM, SUCH SYSTEM MAY CAUSE LIFT AXLE TO RAISE OR LOWER AUTOMATICALLY UNDER DIFFERENT CONDITIONS. LIFT AXLE ACTIVATION AND MOVEMENT MAY VARY DEPENDING ON THE BRAND, CONFIGURATION, AND OPERATING CONDITION OF THE LIFT AXLE CONTROL SYSTEM AND/OR OTHER FACTORS. READ, UNDERSTAND, AND COMPLY WITH ALL APPLICABLE OPERATING INSTRUCTIONS AND SAFETY INFORMATION PROVIDED BY THE LIFT AXLE CONTROL SYSTEM MANUFACTURER AND VEHICLE MANUFACTURER. ENSURE ALL PERSONNEL ARE CLEAR OF LIFT AXLE BEFORE AND DURING VEHICLE LOADING AND LIFT AXLE ACTIVATION UP OR DOWN.

⚠ CAUTION**LIFT AXLE ACTIVATION**

DO NOT LOWER THE LIFT AXLE WHILE THE VEHICLE IS MOVING IN REVERSE OR TRAVELING FORWARD AT MORE THAN 15 MPH. FAILURE TO COMPLY WITH THIS RULE CAN CAUSE COMPONENT DAMAGE.

⚠ CAUTION**NAVIGATING A 90 DEGREE CURVE OR TURN**

TO MINIMIZE PREMATURE TIRE WEAR OR POSSIBLE DAMAGE TO NON-STEERABLE LIFT AXLE COMPONENTS (IF APPLICABLE), THE LIFT AXLE MAY BE RAISED TO THE UP POSITION PRIOR TO NAVIGATING A 90 DEGREE OR TIGHTER CURVE OR TURN. COMPLY WITH ALL FEDERAL, STATE / PROVINCIAL AND / OR LOCAL WEIGHT, DIMENSION AND CONFIGURATION REGULATIONS UNDER LOADED AND UNLOADED CONDITIONS.

⚠ WARNING**LOAD CAPACITY**

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

⚠ CAUTION**DAILY/PRE-TRIP OPERATOR INSPECTION**

DAILY (AND BEFORE EACH TRIP) INSPECT ALL LIFT AXLE COMPONENTS FOR PROPER OPERATING CONDITION AND PROPER INSTALLATION TO THE TRUCK / TRAILER FRAME. THIS ESSENTIAL DAILY / PRE -TRIP OPERATOR INSPECTION MUST ALSO INCLUDE A VISUAL INSPECTION OF ALL WHEEL SEALS AND GASKETS FOR LEAKS, A VERIFICATION OF PROPER OIL LEVEL IN THE HUBS (IF APPLICABLE), INSPECTION OF ALL LIFT AND RIDE AIR SPRINGS FOR WEAR, AND INSPECTION OF ALL TIRES FOR PROPER INFLATION AND ABNORMAL WEAR PATTERNS. IDENTIFY AND REPAIR / REPLACE ANY LOOSE, DAMAGED OR IMPROPERLY INSTALLED COMPONENTS. FOR ADDITIONAL SERVICE, REPAIR, AND REBUILD INSTRUCTIONS, REFER TO THE CURRENT VERSION OF OTHER HENDRICKSON PUBLICATIONS THAT APPLY TO THE PARTICULAR LIFT AXLE SUSPENSION. SUCH PUBLICATION NUMBERS MAY INCLUDE, BUT ARE NOT LIMITED TO, OM-H754, OM-H757, TP-H633, AND H621, ALL OF WHICH ARE AVAILABLE ONLINE AT WWW.HENDRICKSON-INTL.COM

⚠ WARNING**REPAIR AND RECONDITIONING**

THE REPAIR OR RECONDITIONING OF LIFT AXLE COMPONENTS THAT ARE BENT, DAMAGED OR OUT OF SPECIFICATION IS NOT ALLOWED. ANY LIFT AXLE COMPONENTS FOUND TO BE DAMAGED OR OUT OF SPECIFICATION MUST BE REPLACED. LIFT AXLE COMPONENTS CANNOT BE BENT, WELDED, HEATED, OR REPAIRED WITHOUT REDUCING THE STRENGTH OR LIFE OF THE COMPONENT. FAILURE TO FOLLOW THESE GUIDELINES CAN CAUSE ADVERSE VEHICLE HANDLING, 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 YOU PERFORM VEHICLE MAINTENANCE, REPAIR OR SERVICE.

CAUTION

PROCEDURES AND TOOLS

A MECHANIC PERFORMING A SERVICE PROCEDURE OR USING A TOOL THAT HAS NOT BEEN RECOMMENDED BY HENDRICKSON MUST FIRST ASSURE 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 POTENTIAL PERSONAL INJURY OR DAMAGE TO EQUIPMENT INVOLVED.

WARNING

FASTENERS

DISCARD USED FASTENERS. ALWAYS USE NEW FASTENERS TO COMPLETE A REPAIR. FAILURE TO DO SO COULD RESULT IN FAILURE OF THE PART OR MATING COMPONENTS, Adverse vehicle handling, PERSONAL INJURY, OR PROPERTY DAMAGE. LOOSE OR OVER-TORQUED FASTENERS CAN CAUSE COMPONENT DAMAGE, Adverse vehicle handling, PROPERTY DAMAGE, OR SEVERE PERSONAL INJURY. MAINTAIN CORRECT TORQUE VALUE AT ALL TIMES. CHECK TORQUE VALUES ON A REGULAR BASIS AS SPECIFIED, USING A REGULARLY CALIBRATED TORQUE WRENCH. TORQUE VALUES SPECIFIED IN THIS TECHNICAL PUBLICATION ARE FOR HENDRICKSON-SUPPLIED FASTENERS ONLY. IF NON-HENDRICKSON FASTENERS ARE USED, FOLLOW TORQUE SPECIFICATIONS FROM THE FASTENER MANUFACTURER.

WARNING

MODIFYING COMPONENTS

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

THE VEHICLE MANUFACTURER SHOULD BE CONSULTED BEFORE MAKING ANY CHANGES TO THE VEHICLE'S FRAME. TYPICALLY, CUTTING OR ALTERING THE VEHICLE'S FRAME OR SIDE RAIL IS NOT PERMITTED AND MAY AFFECT THE MANUFACTURER'S WARRANTY COVERAGE.

ANY INSTALLATION DEVIATIONS MUST BE APPROVED IN WRITING BY HENDRICKSON'S PRODUCT ENGINEERING DEPARTMENT. FAILURE TO COMPLY WITH ANY OF THE ABOVE WILL VOID APPLICABLE WARRANTIES.

WARNING

DAMAGED AXLE COMPONENTS

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

IN ADDITION, IN THE EVENT A CRASH RESULTS IN EXCESSIVE SIDE LOAD DAMAGE TO ADJACENT PARTS, SUCH AS A BENT WHEEL, HUB, OR SPINDLE, IT IS STRONGLY RECOMMENDED TO REPLACE SUCH ADJACENT PARTS AND THE COMPLETE LIFT AXLE ASSEMBLY.

CONTACT HENDRICKSON TECHNICAL SERVICES DEPARTMENT WITH ANY QUESTIONS. FAILURE TO REPLACE ANY DAMAGED COMPONENTS CAN CAUSE ADVERSE VEHICLE HANDLING, POSSIBLE PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE AND WILL VOID ANY APPLICABLE WARRANTIES.

WARNING**LIFT AXLE CAMBER**

UNAUTHORIZED WELDING OR MODIFICATIONS CAN CAUSE CRACKS OR OTHER LIFT AXLE STRUCTURAL DAMAGE AND RESULT IN ADVERSE VEHICLE HANDLING, SEVERE PERSONAL INJURY OR DEATH. DO NOT BEND, WELD OR MODIFY AXLE WITHOUT AUTHORIZATION FROM HENDRICKSON. AXLE CAMBER IS NOT ADJUSTABLE. DO NOT CHANGE THE AXLE CAMBER ANGLE OR BEND THE AXLE BEAM. BENDING THE AXLE BEAM TO CHANGE THE CAMBER ANGLE CAN DAMAGE THE AXLE AND REDUCE AXLE STRENGTH, CAN CAUSE ADVERSE VEHICLE HANDLING, POSSIBLY CAUSING PERSONAL INJURY OR PROPERTY DAMAGE AND WILL VOID APPLICABLE WARRANTIES.

WARNING**IMPROPER JACKING METHOD**

IMPROPER JACKING METHOD CAN CAUSE STRUCTURAL DAMAGE AND RESULT IN ADVERSE VEHICLE HANDLING, SEVERE PERSONAL INJURY OR DEATH. DO NOT USE AXLE BEAM OUTBOARD OF AXLE SPRING SEATS. REFER TO VEHICLE MANUFACTURER FOR PROPER JACKING INSTRUCTIONS.

WARNING**SUPPORT THE LIFT AXLE PRIOR TO SERVICING**

PLACE THE VEHICLE/TRAILER ON A LEVEL FLOOR AND CHOCK THE WHEELS TO HELP PREVENT THE VEHICLE/TRAILER FROM MOVING. PRIOR TO SERVICING A LIFT AXLE IN THE RAISED POSITION, (1) PROPERLY SUPPORT THE LIFT AXLE WITH SAFETY STANDS, AND (2) RELEASE ALL AIR PRESSURE IN LIFT AXLE'S AIR SPRINGS AND RIDE SPRINGS. DO NOT WORK AROUND OR UNDER A RAISED LIFT AXLE SUPPORTED ONLY WITH FLOOR JACKS OR OTHER LIFTING DEVICES. FAILURE TO DO SO CAN CAUSE DEATH, PERSONAL INJURY OR DAMAGE TO COMPONENTS.

WARNING**AIR SPRINGS**

AIR SPRING ASSEMBLIES MUST BE DEFLATED PRIOR TO LOOSENING ANY ADJACENT 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**AIR SPRINGS**

EXHAUST ALL PRESSURE IN THE LIFT AXLE'S AIR SPRINGS AND VEHICLE AIR SYSTEM BEFORE WORKING ON OR AROUND THE LIFT AXLE. FAILURE TO DO SO CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

WARNING**AIR SPRINGS**

PRIOR TO AND DURING DEFLATION AND INFLATION OF THE 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 SEVERE PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

CAUTION**AIR SPRINGS**

INFLATE THE SUSPENSION'S AIR SPRINGS SLOWLY AND MAKE SURE THE RUBBER BLADDER OF THE AIR SPRING INFLATES UNIFORMLY AND IS NOT BINDING. FAILURE TO DO SO CAN CAUSE DAMAGE TO THE AIR SPRING AND / OR MOUNTING BRACKETS AND WILL VOID APPLICABLE WARRANTIES.

WARNING**OFF ROADWAY TOWING**

HENDRICKSON DOES NOT RECOMMEND TOWING A VEHICLE BY THE LIFT AXLE. DOING SO WILL DAMAGE THE AXLE AND WILL VOID APPLICABLE WARRANTIES.



 **WARNING**

PARTS CLEANING

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

4. WEAR PROPER EYE PROTECTION.
5. WEAR CLOTHING THAT PROTECTS YOUR SKIN.
6. WORK IN A WELL VENTILATED AREA.
7. DO NOT USE GASOLINE OR SOLVENTS THAT CONTAIN GASOLINE. GASOLINE CAN EXPLODE.
8. 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 APPLICABLE WARRANTIES.



SECTION 4

Special Tools

The following tools / materials are needed when installing and servicing Hendrickson COMPOSILITE SC steerable systems:

Bushing Inspection

- Two jack stands
- Small bottle jack
- Block of wood
- Magnetic base dial indicator

Steering Knuckle Disassembly

- ½" Impact
- Wrench or socket: 7/16" and 1 5/16"
- 1 5/16" Box wrench
- Deep well socket: 1 5/16" and 1 1/8"
- Brake spring tool or notched screw driver
- Needle nose pliers

Kingpin Inspection and Replacement

- Cleaning solvent and emery cloth (220 grit or higher)
- 1"-2" Micrometer measuring device
- 1 1/16" Socket and impact gun
- 3/8" Punch
- Hammer
- Portable hydraulic (5-10 ton) press

Bushing Housing Replacement

- Hydraulic shop press with a minimum force capacity of 5 tons
- Bushing driver
- Magnetic base dial indicator

Steering Knuckle Assembly

- 1 5/16" Box wrench and deep well socket
- Brake spring tool or notched screw driver
- Wrench or socket: 7/16", 1 5/16"
- Two 0.010" feeler gauges
- Magnetic base dial indicator
- Needle nose pliers
- Torque wrench capable of 500 foot pounds

Kingpin Lubrication

- Multipurpose NLGI-2 grease
- Grease gun

Integrated Brake Replacement

- Brake spring tool or notched screw driver

Steering Stabilizer Inspection and Replacement

- 1 1/8" Wrench and socket
- Torque wrench
- Digital protractor or equivalent device

Steer Ahead and Toe Setting

- 1 5/16" Wrench and socket
- ½" Impact
- Can of white spray paint
- Torque wrench capable of 60 foot pounds and 500 foot pounds
- Straight blade screwdriver for scribing line in tire
- Linear measuring instrument (tape measure or scales)
- Jack stand

Lubrication

- Hand or pneumatic grease gun
- NLGI-1 or NLGI-2 grease

Miscellaneous

- Wheel chocks



SECTION 5

Pre-Installation/Installation Check List

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

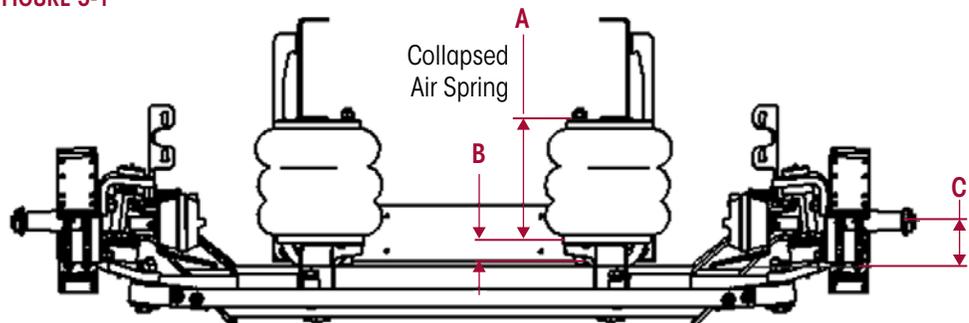
NOTE

EVERY SUSPENSION PARTS BOX SHIPPED CONTAINS YOUR PARTICULAR SUSPENSION ASSEMBLY DRAWING SUPPLIED BY HENDRICKSON.

BEFORE BEGINNING THE INSTALLATION:

1. Verify that the suspension model configuration (axle drop, suspension and axle seat type) is compatible with the vehicle's loaded frame-to-ground measurement, intended tire size and driveline clearance.
 - Driveline clearances should be considered when deciding the correct axle drop. In lifted position there should be more than 2" clearance between driveline and axle
 - **Driveline drop clearance measurement**, see Figure 5-1, Dimensions **A + B** with axle in full up position, Dimension **C** is the Spindle Centerline to Axle

FIGURE 5-1



2. On a truck or trailer auxiliary axle suspension application:
 - a. Verify that the axle spacing conforms to Federal and local bridge laws.
 - b. Verify that the auxiliary axle suspension location is based on:
 - Front axle steer angle
 - Vehicle wheel-base
 - Maximum recommended auxiliary axle spacing
 - c. Verify that the vehicle will have the proper load distribution after installation.
 - d. Verify that there is sufficient fore/aft frame rail clearance to mount the auxiliary axle suspension(s).
3. On truck frames:
 - a. Verify that the frame width is within the allowable mounting range of the auxiliary axle suspension (refer to the suspension assembly drawing provided in your parts box).
 - b. Mark the location of the suspension side rails on the frame rails (refer to the suspension assembly drawing provided in your parts box). Check for interferences with any existing brackets or mounting bolts.
 - c. Verify that the vehicle cross members and backing plates are correctly positioned for proper support of the auxiliary axle suspension.



CAUTION

ADEQUATE SUSPENSION SUPPORT MUST BE PROVIDED WITHIN THE VEHICLE FRAME. A CROSS MEMBER MUST BE LOCATED 12" FORE OR AFT OF THE SIDE RAIL PIVOT BOLT CENTERLINE. FAILURE TO PROVIDE ADEQUATE SUSPENSION SUPPORT COULD RESULT IN SUSPENSION DAMAGE AND/OR DAMAGE TO THE VEHICLE FRAME, SEE FIGURE 5-1.

- Verify that the components listed in your particular suspension assembly drawing (supplied by Hendrickson in your parts box) provide the components listed and in accurate quantities. Contact the Hendrickson Auxiliary Axle Customer Service Department if any components are missing or damaged.

ADJUSTABLE RIDE HEIGHT (If Required)

The adjustable ride height feature accommodates five different ride heights.

The following ride height adjustment spacers are provided for the bushing saddle and the upper air spring plate to adjust to a higher ride height.

- Two (2) one-inch and two (2) two-inch bushing saddle spacers
- Two (2) one-inch two (2) two-inch upper air spring plate spacers

TABLE 5-1

Measured Vehicle Ride Height	Spacer Requirements
11.5"	None
12.5"	None
13.5"	1" spacer (optional)
14.5"	1" spacer required, 2" spacers (optional)
15.5"	2" spacers

Example shown in Table 5-1 uses a suspension kit specified with a 12.5" ride height and lists the spacers required to meet different measured vehicle ride heights (see Table 5-1).

NOTE

RIDE HEIGHT IS ALWAYS ± 1".

RIDE HEIGHT SPACER (If Equipped)

INSTALLATION

- Determine if a spacer is needed based on the measured vehicle ride height and the nominal suspension kit ride height.
- If no spacers are required, move to the Adjustable Frame Width in this section. If spacers are required, move to Step 3.
- Position the ride height spacers to accommodate required ride height, see Figures 5-2 and 5-3. The same spacer size must be used for both the bushing saddle spacer and upper air spring plate spacer.

NOTE

DO NOT DRILL HOLES IN THE FRAME RAIL UNTIL THE RIDE HEIGHT IS DETERMINE TO BE OPTIMAL. DO NOT WELD SPACER IN POSITION AND DO NOT REMOVE AFTER INSTALLATION.

FIGURE 5-2

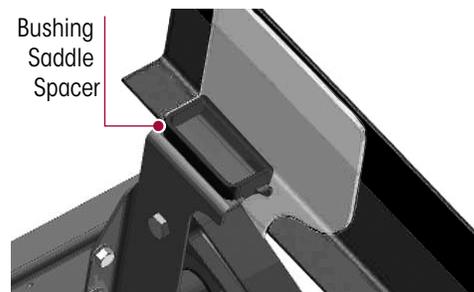
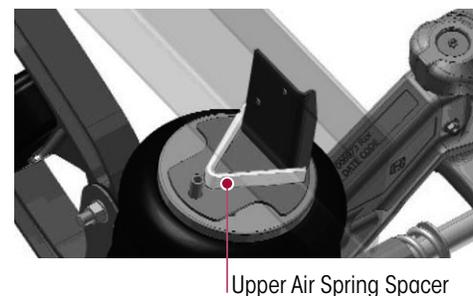


FIGURE 5-3





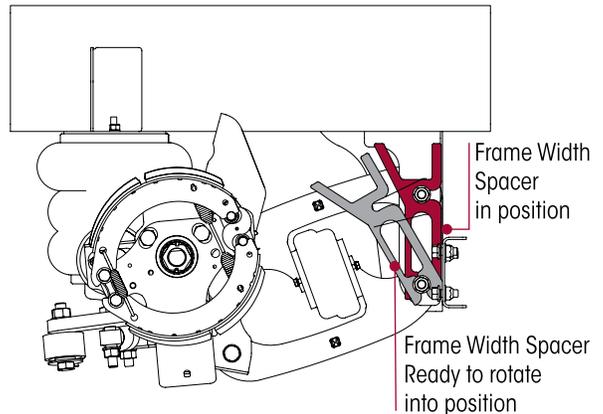
ADJUSTABLE FRAME WIDTH

The adjustable frame width feature allows the same suspension to accommodate frame width ranging from 33.5 inches to 34.5 inches. The suspension will ship at 34.0 inches with one frame width spacer in position on each side. The parts box will include two additional frame width spacers.

ADJUSTMENT PROCEDURES

1. For the following procedures, refer to your particular suspension assembly drawing supplied by Hendrickson in your parts box.
2. Determine the vehicle's frame width.
 - **34.0 inch vehicle frame width** — **DO NOT** adjust the suspension frame width.

FIGURE 5-4



- **33.5 inch vehicle frame width:**
 - a. Loosen but **DO NOT** remove the four pivot bolts connecting the hanger to the bushing saddle.
 - b. Loosen the four bolts connecting the cross member to the hangers.
 - c. Remove the frame width spacer on both sides of the suspension.
 - d. Re-torque the pivot bolts and cross member bolts. Refer to the Torque Specifications section in this publication.
 - e. Reference Figure 5-4 for vehicle frame width spacer.
- **34.5 inch vehicle frame width:**
 - a. Loosen but **DO NOT** remove the four pivot bolts connecting the hanger to the bushing saddle.
 - b. Loosen the four bolts connecting the cross member to the hangers.
 - c. Add one frame width spacer to both sides of the suspension.
 - d. Re-torque the pivot bolts and cross member bolts. Refer to the Torque Specifications section in this publication.
 - e. See Figure 5-4 for vehicle frame width spacer reference.

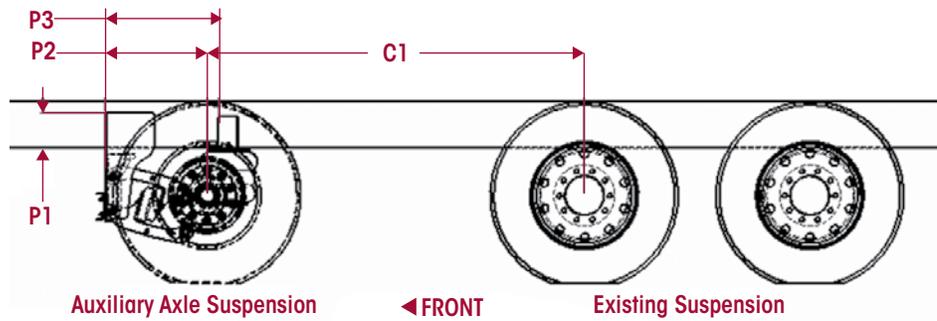
SUSPENSION MOUNTING INSTALLATION

PRIOR TO INSTALLING A SUSPENSION:

1. Position the vehicle on a flat level surface.
2. Chock the wheels.
3. Determine the location of the auxiliary axle mounting position on the outside of the vehicle frame rails. Refer to your particular suspension assembly drawing supplied by Hendrickson in your parts box and mark the position on the front edge of the auxiliary suspension side rails on the vehicle frame, see Figure 5-5.
4. Correct any interference that may occur between the auxiliary suspension mounting surface and any existing frame bolts or brackets (in the marked areas in Step 3). The auxiliary suspension side rail(s) can be drilled to accommodate existing bolts.



FIGURE 5-5

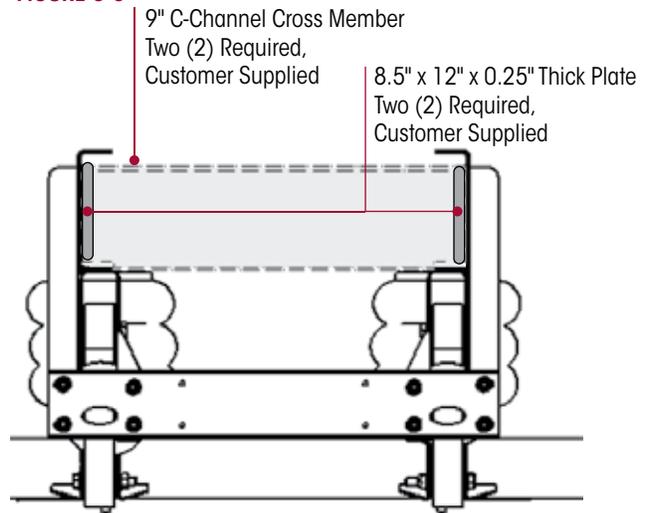


C1 = Axle location

P1, P2, P3 = Dimensions located on Hendrickson suspension assembly drawing provided in your parts box.

- Before any modifications to the hanger are made, contact Hendrickson Engineering at (800) 660-2843. Refer to the suspension assembly drawing to verify that vehicle cross members and backing plates are positioned correctly for the intended axle location (See Figure 5-6).

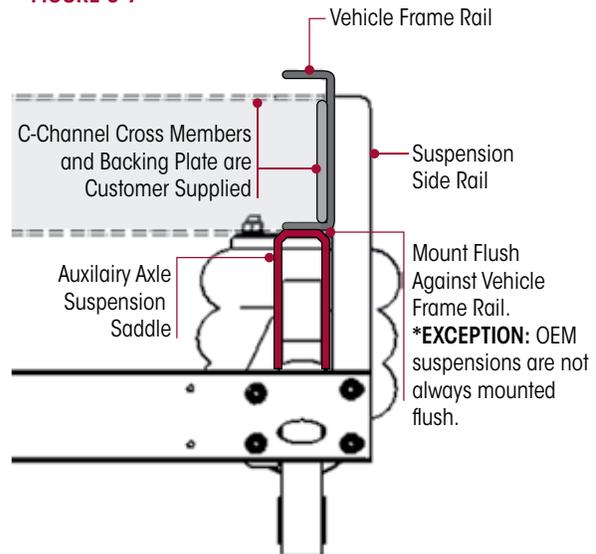
FIGURE 5-6



SUSPENSION FRAME RAIL INSTALLATION

- With the cross members and backing plates installed in the intended suspension location, raise the auxiliary suspension into position. Use both the cross members and the previously marked suspension side rail marks as locators.
- Once the suspension is positioned, use C-clamps to hold the suspension side rail and saddle on the truck frame rail.

FIGURE 5-7



NOTE

***AFTERMARKET ONLY: THE SUSPENSION'S MOUNTING SURFACES MUST BE FLUSH WITH BOTH THE SIDE AND BOTTOM OF THE VEHICLE'S FRAME RAILS OR SPACERS. FAILURE TO DO SO WILL VOID APPLICABLE WARRANTIES (SEE FIGURE 5-7).**



- The auxiliary suspension must remain aligned (parallel) to the other properly aligned axles on the vehicle during the entire installation process. Verify the alignment of the suspension using a trammel bar or measuring tape.

NOTE

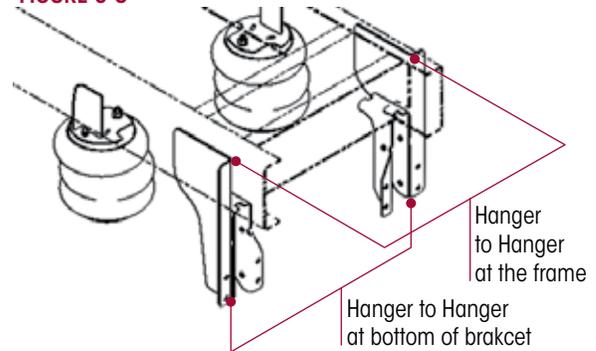
DUE TO THE STEERING OF THE AXLE, MEASURING TO THE WHEEL CENTERS IS NOT RECOMMENDED. FOR A PROPER ALIGNMENT MEASURE TO THE FRONT EDGE OF THE SUSPENSION SIDE RAIL.

- Verify the measurements between the suspension hanger brackets at the frame and at the bottom of the brackets are within the allowable tolerance ($\pm 0.5"$) see Figure 5-8. Hangers must be parallel to one another vertically.

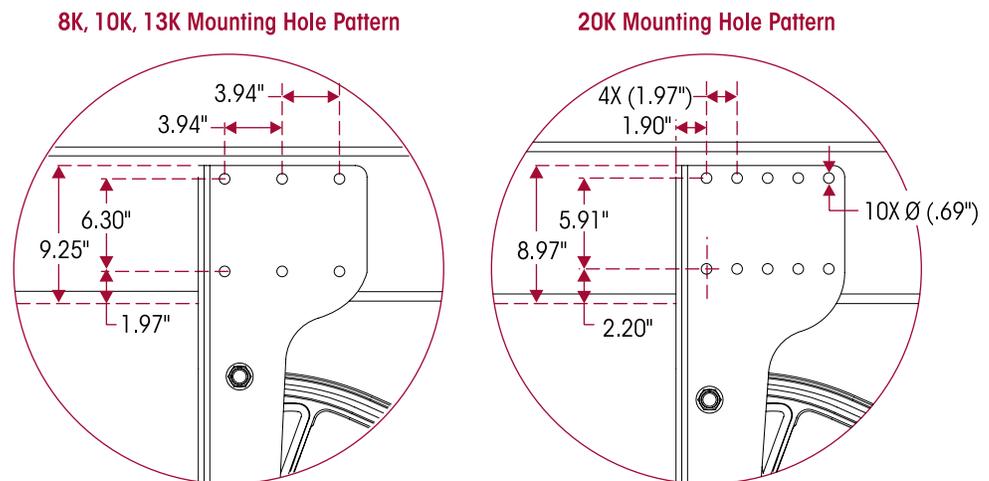
**WARNING**

A CROSS MEMBER MUST BE WITHIN 12 INCHES (MINIMUM), FORE OR AFT OF THE FRAME BRACKET PIVOT BOLT CENTERLINE. FAILURE TO PROPERLY AND SUFFICIENTLY ATTACH THE FRAME BOLT CONNECTIONS TO SUPPORT THE SUSPENSION OR REINFORCE THE VEHICLE FRAME CAN RESULT IN PREMATURE FRAME FAILURE, ADVERSE VEHICLE HANDLING AND WILL VOID APPLICABLE WARRANTIES.

- Minimum recommended bolt hole pattern for hanger to frame attachment. Refer to Figure 5-9 for mounting bolt hole pattern for 8K, 10K, 13K and 20K applications.
- Use a $\frac{5}{8}$ "-11 UNC Grade 8 Hex Bolt for frame mounting. Tighten to required torque according to the fastener manufacturer's specifications.

FIGURE 5-8**NOTE**

CONTACT HENDRICKSON AUXILIARY AXLE CUSTOMER SERVICE WITH YOUR SPECIFIC BOLT PATTERN FOR EVALUATION OF APPLICABILITY.

FIGURE 5-9

UPPER AIR SPRING PLATE & AIR SPRING

INSTALLATION

1. Chock the wheels.
2. Position the upper air spring plate assembly under the vehicle frame rail. Once the assembly is at the correct position (refer to the suspension assembly drawing provided by Hendrickson in your parts box),
3. Clamp air spring plate assembly to the vehicle frame rail with C-clamps.

NOTE

THE TRUCK FRAME RAIL MUST EXTEND AT LEAST ONE INCH (1") BEYOND THE BOTTOM PLATE OF THE AIR SPRING PLATE ASSEMBLY.

FIGURE 5-10

4. With the upper air spring plate assembly tight against the vehicle frame rail, mark the location of the mounting holes on the outward side of the assembly. Punch mark all hole centers, see Figures 5-10 and 5-11 for position and recommended hole pattern.
5. Drill two (2) 1¹/₁₆" diameter holes through the upper air spring plate assembly, the vehicle frame rail and the customer supplied backing plate, see Figure 5-10 for bolt pattern specifications. Hendrickson recommended backing plate size: 8.5" x 6" x 1/4" thickness.

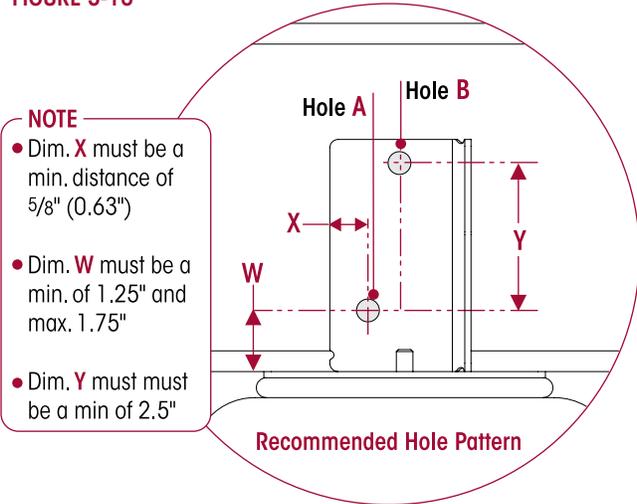
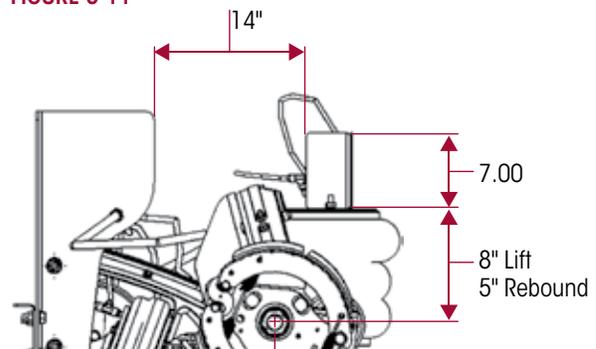


FIGURE 5-11

6. Verify the upper air spring plate assembly location.
7. Attach the upper air spring plate assembly to the vehicle frame rail with the one of the following fastener combinations:
 - 5/8"-11 x 2 1/4" Grade 8 flange bolt and 5/8"-11 steel hex Grade 8 flange locknut
 - 5/8"-11 x 2 1/2" hex bolt Grade 8 with 5/8" zinc hardened washer and a 5/8"-11 steel hex locknut Grade 8 with a 5/8" zinc washer hardened.



NOTE: Shown at nominal ride height

8. Center of hole **A** vertically must have a minimum of 1.25" and a maximum of 1.75" up from bottom of the vehicle side rail (Dimension **W**) (See Figure 5-10).
9. Center of all hanger holes (Dimension **X**) must have a minimum of 5/8" (0.63") away from any edge of plate (See Figure 5-10).
10. The distance between (Dimension **Y**) hole centers **A** and **B** must have a minimum dimension of 2.5" (See Figure 5-10).



11. Drill holes as verified and install hanger. Snug, **DO NOT** tighten the remaining fasteners on that side.
12. Inspect the position of the opposite side of the suspension. Ensure the upper air spring plate assembly is snug against the vehicle frame rail.
13. Ensure that the auxiliary axle is parallel to existing axles. Repeat Steps 4 and 11 for the opposite side of the suspension.
14. Remove the C-clamps from both sides of the vehicle frame rail.
15. Align the upper air spring stud with the hole on the upper air spring plate assembly. Insert and reinstall fasteners.
16. Tighten to proper torque, refer to the Torque Specification section in this publication.
17. Remove wheel chocks.

INSTALL AND INSPECTION CHECKLIST

1. Install all miscellaneous hardware and torque the suspension mounting bolts. Refer to torque specifications section in this publication.
2. Install the air controls and plumbing per Hendrickson or other supplier's instructions.
3. Install wheels and lug nuts, tighten to proper torque, refer Torque Specification section in this publication.
4. Ensure there is lubrication in the wheel end by using the necessary inspection methods, reference TMC Recommended Maintenance Practices Manual, Recommended for Wheel End Lubrication Section.
5. Install the air brake lines for the steer axle brakes, per the chassis manufacturer's specifications.

NOTE

SUSPENSIONS PURCHASED FROM HENDRICKSON AUXILIARY AXLE SYSTEMS REQUIRE BRAKE ADJUSTMENT (REFER TO THE BRAKE MANUFACTURER FOR PROCEDURE), SUPPLIED WITH AUTOMATIC SLACK ADJUSTERS.

6. Inspect the brakes and adjust if necessary.

SECTION 6

Initial Axle Adjustments/Final Inspection

TOE SETTING

Toe is the relationship of the distance between the front of the tires and the distance between the rear of the tires on the same self-steer axle measured at spindle height. When the front distance is less than the rear distance, the wheels are in a “toe-in” condition.

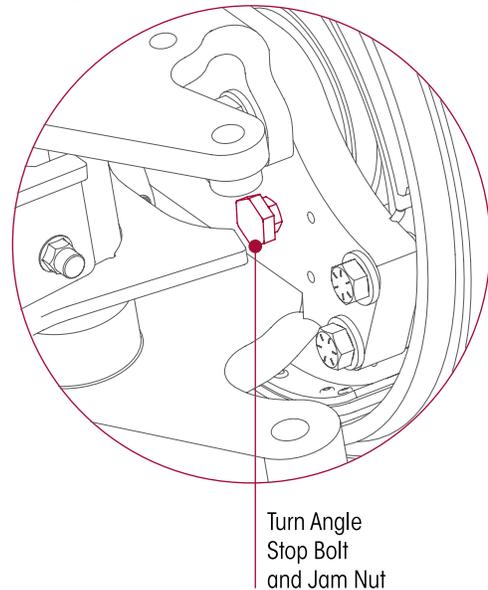
The steer axles come pre-aligned, however it is the responsibility of the installer to ensure the toe is correct prior to the vehicle entering service.

Refer to Hendrickson Literature No. TP-H785 for Toe Setting Procedure.

TURN ANGLE - MECHANICAL STOP

A mechanical turn angle stop bolt is an adjustable fastener that limits the axle’s turn radius angle and allows users to avoid tire contact with the vehicle accessories. Ensure that the turn angle stop is set so wheel interference does not occur.

FIGURE 6-1

**NOTE****FACTORY SETTINGS OF TURN ANGLE STOP BOLTS VARIES.**

1. Adjust the auxiliary axle turn angle stop bolt, see Figure 6-1, to achieve maximum turn angle while providing adequate chassis clearance.
2. Tighten the turn angle jam nut to the specified torque. Refer to the Torque Specifications Section in this publication.

■ OPTIONS**AXLE CONTROLS**

When operating a truck in reverse (backing), a conventional self-steering axle must be either raised or locked into a non-steering configuration. Refer to Hendrickson publication **OM-H817 LC Auxiliary Axle Control Kits**.

LOCK STRAIGHT

The lock straight kit is available as an option on the Hendrickson COMPOSILITE suspension system. This kit straightens the self-steer axle wheels and locks them in place in the down or up position. This kit is only available on select models and must be specified at time of purchase.

MANUAL AND AUTOMATIC LIFT

An alternative method to locking the steering mechanism is to lift the suspension when reversing. Various manual and electric air control kits are available as options. Contact Hendrickson Auxiliary Axle Customer Service for more details.



FINAL INSPECTION

1. Check that all suspension bolts are tightened, refer to Torque Specifications section in this publication.
2. Check the air control system and plumbing for leaks and proper valve function.
3. Move the suspension through its entire travel with wheels and tires installed to ensure that adequate component clearances (i.e. air springs, brake chambers, etc.) have been provided.



WITH THE VEHICLE UNLOADED, THE RIDE (OR DOWN) AIR SPRING AIR PRESSURE MUST BE LIMITED TO A MAXIMUM OF 30 PSI TO AVOID IMPROPER VEHICLE LOADING OR COMPONENT DAMAGE.

4. Inspect the auxiliary axle for the following:
 - Wheels lug nuts are tightened to torque
 - Wheels rotate freely
 - Brakes are properly adjusted
 - Wheel hubs are sufficiently filled with the manufacturer's recommended lubricant



SECTION 7 Preventive Maintenance

Following appropriate inspection procedures is important to help ensure the proper maintenance and operation of the steerable suspension and component parts. Hendrickson recommends the COMPOSILITE suspension be inspected at pre-delivery, the first in-service inspection and regular preventive maintenance intervals. Inspection must include the following items and other components referenced in this section.

HENDRICKSON INSPECTION INTERVALS	FIRST IN-SERVICE INSPECTION	PREVENTIVE MAINTENANCE
Wheel Bearings – Verify end play is between 0.001" and 0.005". Adjust and lubricate as required	Within the first 3,000 Miles	8,000 Miles or every 3 months, whichever comes first
Tie Rod Ends – Inspect for leaking and lubricate as required		10,000 Miles or every 6 month, whichever comes first
Kingpin Bushings – Check for wear and grease as required		10,000 Miles or every 6 months, whichever comes first
Pivot Connections – Verify Torque		5,000 Miles or as needed
Stabilizers – Check for leaking and adequate return	3,000 Miles	20,000 Miles or every 10 months, whichever comes first
Brake Assembly Components – Inspect for leaking and component wear		

COMPONENT INSPECTION

- **Air Spring** — Look for chaffing or any signs of spring or component damage
- **Fasteners** — Look for any loose or damaged fasteners on the entire axle assembly. Ensure all fasteners are tightened to the specified torque. 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.
- **Operation** — All steering components must move freely through the full range of motion from axle stop to axle stop
- **Steering pivot points** — Check for looseness at all pivot points. Inspect and lubricate all pivot points
- **Tire wear** — Inspect tires for wear patterns that may indicate suspension damage or misalignment. See Tire Inspection in this section
- **Wear and damage** — Inspect all parts of axle for wear and damage. Look for bent or cracked parts. Replace all worn or damaged parts

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

NOTE

NON-FUNCTIONING COMPONENTS ARE TO BE RETURNED TO HENDRICKSON SPECIALTY PRODUCTS - AUXILIARY AXLE SYSTEMS, IN EXCHANGE FOR REPLACEMENT COMPONENTS, PROVIDED PRODUCT WARRANTY CONDITIONS ARE MET.



LUBRICATION INTERVALS

Regular lubrication intervals should be followed to help prevent premature wear to the kingpin bushings and tie rod ends.

GREASING AND LUBRICATION SPECIFICATIONS		
COMPONENT	GREASING INTERVAL	GREASE
Kingpin Break In	5,000 miles or as needed	NLGI-1 or NLGI-2
Kingpin Bushing	10,000 miles or every 6 months	
Taper Tie Rod End		

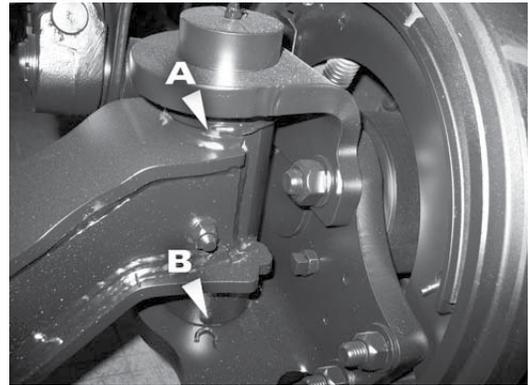
KINGPIN LUBRICATION

On the Hendrickson COMPOSILITE, the kingpin grease fittings are located on the top and bottom of the kingpin grease caps.

1. Prior to greasing the kingpins, the axle must be on the ground in a loaded condition.
2. Clean off all the grease fittings with a clean shop towel prior to lubrication.

3. Lubricate the kingpins through the grease fittings on the top and bottom of the steering knuckle.
4. Force the required lubricant into the upper and lower kingpin grease fittings until new lubricant flows from locations **A** and **B**, see Figure 7-1.

FIGURE 7-1



NOTE

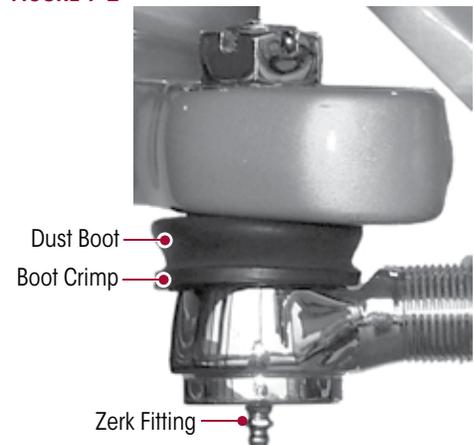
GREASING AT THE LOWER ZERK SHOULD PURGE GREASE FROM THE THRUST BEARING SHELL.

TIE ROD END LUBRICATION

LUBRICATION PROCEDURE

1. Wipe the grease zerk and grease gun tip with clean shop towels.
2. Wipe the seal/boot clean with shop towels.
3. Attach a grease gun to the grease zerk. 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).

FIGURE 7-2



EXCEEDING THE MAXIMUM AIR PRESSURE TO THE GREASE ZERKS CAN CAUSE DAMAGE TO THE DUST BOOT AND COMPONENT FAILURE.

4. Dirt, water, and discolored old grease should flow from the relief vents or purge holes near the boot crimp or bellows area, see Figure 7-2. Continue to purge grease until fresh grease flows from the purge area.



5. If the tie rod end is designed for lube service and it will not accept grease proceed as follows:
 - a. Remove the grease zerk.
 - b. Inspect the threaded grease zerk hole in the tie rod end and remove any obstructions.
 - c. Install a new grease zerk.
 - 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.
6. Apply grease until all the old grease is purged from the boot.

LIFT AXLE AND COMPLIANT TIE ROD INSPECTION

Periodic inspection of the lift axle (LA) and compliant tie rod (CTR) are strongly recommended. Cleaning the LA and CTR prior to the inspection will improve the ability to see all structural component condition.

TIE ROD ADJUSTMENT/TOE SETTING

For additional information regarding toe settings or lift axle systems, please contact the Hendrickson Customer Service Department at 800-660-2829.

Refer to Hendrickson Literature No.TP-H785 to adjust the toe setting procedure.

TIE ROD END INSPECTION

■ STANDARD TAPER TIE ROD

INSPECTION PROCEDURE

Before beginning this inspection procedure, the entire system must be unloaded.



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



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. Chock the rear wheels of vehicle.
2. Set the parking brake.
3. Raise the lift axle and support with jack stands.
4. Check that the boots are in place and completely installed over the tie rod ends.
5. 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.



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. A MISSING COTTER PIN CAN CAUSE THE TIE ROD END NUT TO BECOME LOOSE AND CAUSE ADVERSE AUXILIARY AXLE PERFORMANCE.

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



⚠ WARNING

IT IS CRITICAL TO CHECK THE 5/8" TIE ROD CLAMP BOLT HEAD LOCATION TO VERIFY THE CLAMP FASTENERS HAVE SUFFICIENT CLEARANCE AWAY FROM THE LOWER STABILIZER MOUNT AT FULL WHEEL CUT. THE FASTENERS MUST NOT CONTACT THE LOWER STABILIZER MOUNT. FAILURE TO DO SO CAN CAUSE ONE OR MORE COMPONENTS TO FAIL CAUSING ADVERSE VEHICLE HANDLING AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

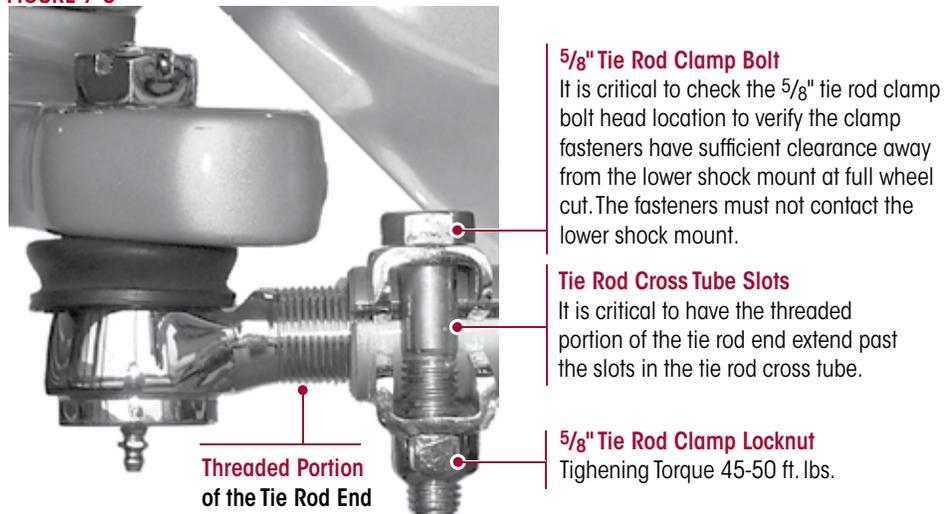
7. Verify the 5/8" tie rod clamp bolt head does not contact the lower shock mount at full wheel cut, see Figure 7-3.

⚠ WARNING

THE THREADED PORTION OF THE TIE ROD END MUST EXTEND PAST THE SLOTS INTO THE TIE ROD CROSS TUBE, SEE FIGURE 7-3. FAILURE TO DO SO CAN CAUSE COMPONENT DAMAGE, ADVERSE VEHICLE HANDLING AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

8. Check that the tie rod end is threaded correctly into the tie rod cross tube and is engaged deeper than the end of the tie rod cross tube slot. The tie rod end must be visible the entire length of the tie rod cross tube slot, see Figure 7-3.
9. Check that grease zerks are installed. Replace a damaged grease zerk with a new one.

FIGURE 7-3



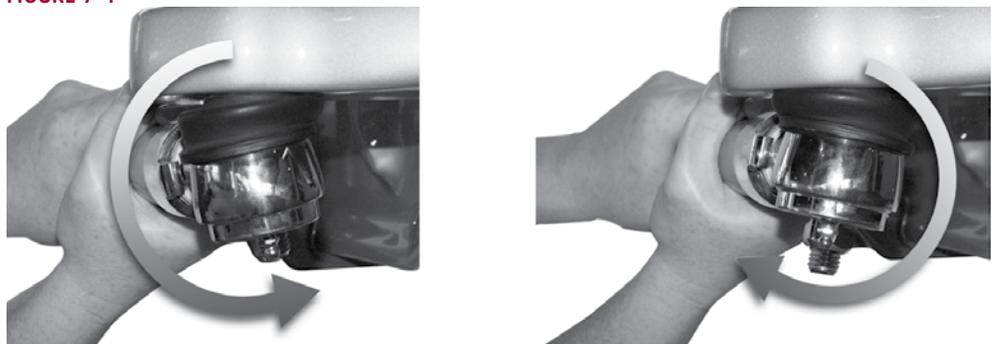
⚠ CAUTION

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

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

10. By hand rotate the tie rod cross tube toward the front of the vehicle and then toward the rear. After rotating, center the tie rod cross tube. If the tie rod cross tube will not rotate in either direction, replace both tie rod ends, see Figure 7-4.

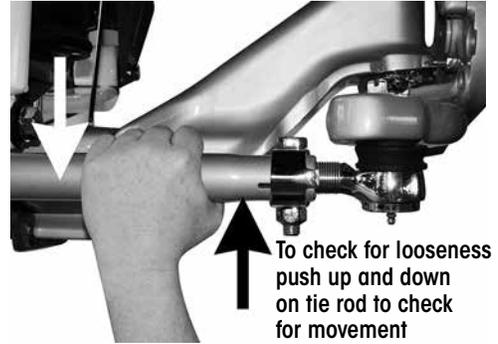
FIGURE 7-4





11. Position yourself directly below the tie rod end. Using both hands, grab the assembly end as close to the tie rod end as possible (no more than 6" or 152.4 mm). Apply hand pressure with reasonable human effort vertically up and down in a push-pull motion several times (using approximately 50-100 pounds of force). Check for any movement or looseness at both tie rod end locations (See Figure 7-5).

FIGURE 7-5



12. If there is any movement in the tie rod assembly, install a magnetic based dial indicator on the Ackermann arm (See Figure 7-6).
13. Set the dial indicator to zero.
14. 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.
15. If the reading is more than 0.060", replace both tie rod ends at the next service interval.
16. 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.
17. Remove jack stands and lower the lift axle.
18. Remove wheel chocks.

FIGURE 7-6

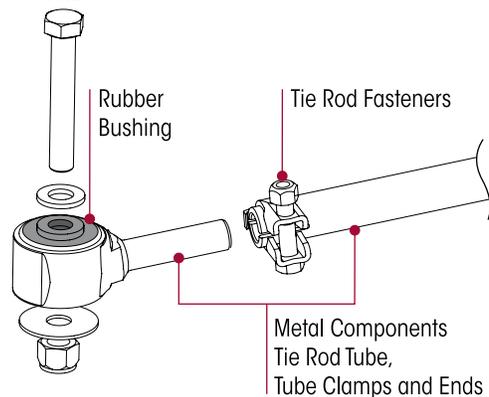


■ HEAVY-DUTY COMPLIANT TIE ROD (HD CTR)

INSPECTION PROCEDURE

1. Chock the rear wheels of vehicle.
2. Set the parking brake.
3. Raise the lift axle and support with jack stands.
4. Inspect rubber bushing for wear or damage (See Figure 7-7).
5. Inspect all metal components for a bent or cracked condition (See Figure 7-7).
6. Inspect and verify torques values for all fasteners. Refer to Torque Specification Section of this publication for torque requirements.

FIGURE 7-7





NOTE

CONTACT HENDRICKSON AUXILIARY AXLE CUSTOMER SERVICE WITH ANY QUESTIONS OR CONCERNS.

7. Remove jack stands and lower the lift axle.
8. Remove wheel chocks.

KINGPIN BUSHING INSPECTION

INSPECTION PROCEDURE

1. Chock the rear wheels to help prevent the vehicle from moving.
2. Set the parking brake.
3. Raise the lift axle and support with jack stands.
4. **CHECKING THE UPPER KINGPIN BUSHING.**
 - a. Affix a magnetic base dial indicator on the axle and place the tip of the dial indicator on the inside of the upper kingpin connection as shown in Figure 7-8.
 - b. Set the dial indicator to "0" zero.
 - c. Move the top of the tire in and out by applying reasonable, constant pressure and then releasing.
 - d. Check the reading on the dial indicator. If the dial indicator moves more than 0.025", the upper bushing is worn or damaged. Replace both bushings. Refer to the Kingpin Bushing Removal and Installation sections in this publication.
5. **CHECKING THE LOWER KINGPIN BUSHING**
 - a. 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.
 - b. Set the dial indicator to "0" zero.

IMPORTANT

IF ONE BUSHING IS WORN OR DAMAGED, IT IS MANDATORY TO REPLACE BOTH THE TOP AND BOTTOM BUSHINGS ON THAT KNUCKLE ASSEMBLY.

FIGURE 7-8

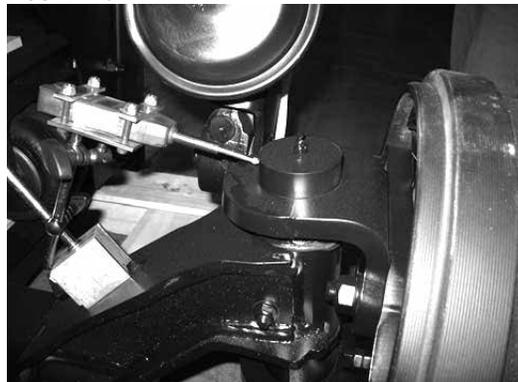
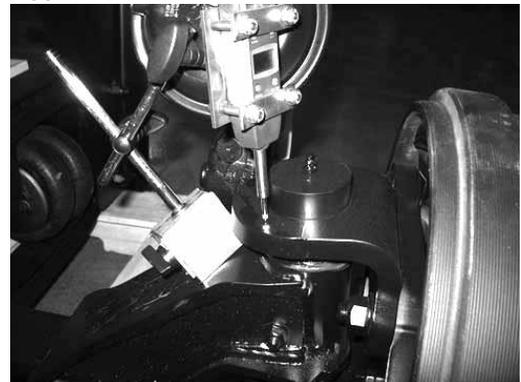


FIGURE 7-9



6. Remove jack stands and lower the lift axle.
7. Remove wheel chocks.

STEERING KNUCKLE INSPECTION/ADJUSTMENT

CHECKING VERTICAL END PLAY (UP AND DOWN MOVEMENT)

1. Chock the rear wheels of the vehicle.
2. Set the parking brake.



3. Raise the lift axle and support with jack stands.
4. If necessary, remove the wheels, hubs and drums.
5. Place a dial indicator on each side of the axle as follows:
 - a. Ensure wheels are positioned straight ahead.
 - b. Place the magnetic dial indicator base on the axle.
 - c. Place the tip of the dial indicator on top of the upper kingpin connection.
6. Place a jack and a wood block (with a hole that allows clearance for the lower kingpin grease fitting) under the lower kingpin grease cap area (See Figure 7-9).
7. Set the dial indicator to "0" zero.
8. Raise the jack until the dial indicator shows the end of vertical travel. Measure and record the dial indicator reading. Vertical (up and down) inspection clearance must be between 0.008" and 0.030".

ADJUSTING VERTICAL END PLAY

1. If vertical clearance is greater than 0.030", replace the thrust bearing.
2. After replacing the thrust bearing, if vertical clearance is greater than 0.018", install shims (Hendrickson Part No. R-001764-1Q12) between the top of the axle and the bottom of the upper kingpin connection to obtain the proper clearance specification. See the Steering Knuckle Disassembly section.
3. If vertical clearance is less than 0.008", remove the shims from between the top of the axle and the bottom of the upper kingpin connection to obtain the proper clearance specification.
4. Repeat Steps 2 or 3 until proper clearance is achieved.
5. Remove jack stands and lower the lift axle.
6. Remove wheel chocks.

BUSHINGS

INSPECTION

The aim of the inspection procedures below is to determine the amount of fore and aft movement (play) around the polyurethane bushings.

1. Lower the lift axle.
2. Chock the vehicle's rear wheels to prevent vehicle movement.
3. Release all pressure in the suspension's air system (ride and lift bags).
4. Rotate the tire fore and aft repeatedly.
5. Look for excessive movement around the bushings.
6. Measure any witnessed movement according to the following steps:
 - a. Attach magnetic dial indicator to side rail with indicator pin touching the beam.
 - b. Set the indicator to zero.
 - c. Rotate the tire for and aft.
 - d. Measurement of more than 0.080 of an inch is considered excessive.



FIGURE 7-9

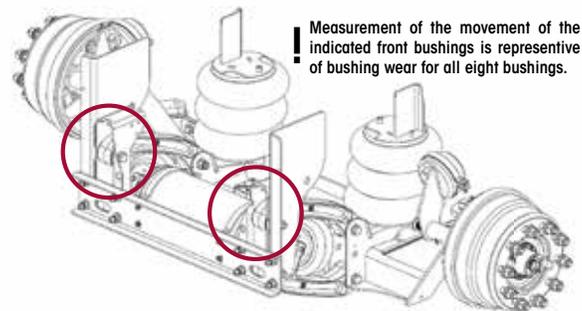
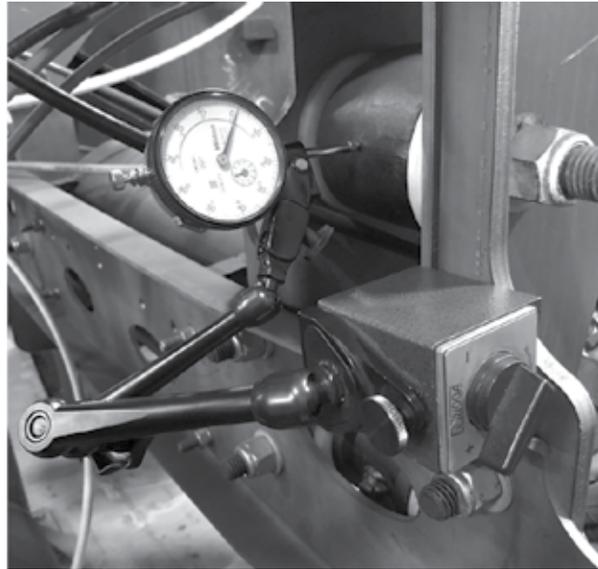


FIGURE 7-10



STABILIZER

INSPECTION

Inspection of the stabilizer can be performed by conducting a visual inspection for leaking or damage.

1. Lower the axle to the ground
2. Chock the rear wheels to help prevent the vehicle from moving.
3. Set the parking brake.

NOTE

IT IS IMPORTANT TO INSPECT THE STABILIZER FULLY EXTENDED.

4. Evidence of the following potential problems indicates replacement of your stabilizer is necessary:
 - Damaged inner or outer mounts
 - Damaged inner or outer bushings
 - Damaged dust cover
 - Bent or dented stabilizer
 - Evidence of improper installation. For instance, washers installed incorrectly.
 - Fluid leaking in streams from the upper seal
5. Remove wheel chocks.

ALTERNATE INSPECTION PROCEDURE

1. Remove the stabilizer.
2. Once removed, shake the suspected stabilizer and listen for the sound of metal parts rattling inside. Rattling of internal parts can indicate a failure.
3. Replace as needed.
4. Remove jack stands and lower the lift axle.
5. Remove wheel chocks.

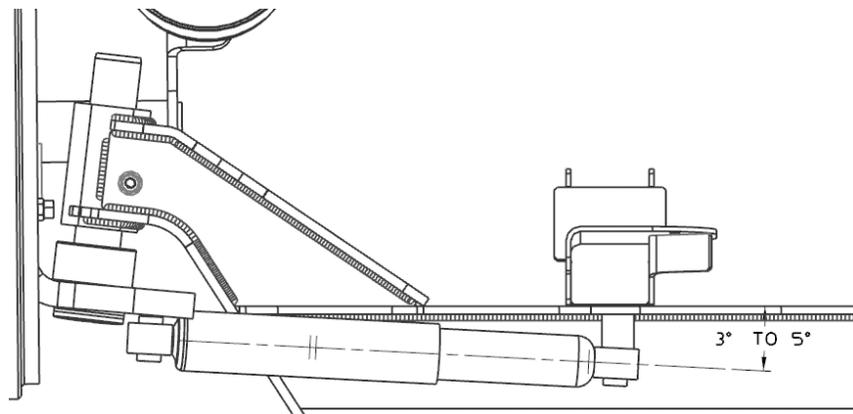
FIGURE 7-11



STABILIZER ANGLE INSPECTION

Hendrickson recommends verifying the stabilizer angle to ensure it is within the recommended 3 to 5 degree angle (See Figure 7-12). This can be done by use of a digital protractor or equivalent device. If the angle of your stabilizer does not meet the 3 to 5 degrees, contact Hendrickson Customer Service for the necessary spacers. After necessary spacers are added repeat procedure to verify angle is within specifications.

FIGURE 7-12



TIRE INSPECTION

The leading potential causes of tire wear on commercial vehicles according to TMC (The Technology & Maintenance Council) 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 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 No. RP 642 (Guidelines for Total Vehicle Alignment).



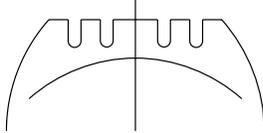
Tire wear is normally the best indicator of vehicle alignment condition. If tires are wearing too rapidly or irregularly, alignment corrections may be needed. The tire wear patterns described below can help isolate specific alignment problems.

The most common conditions of concern are:

- Overall Fast Wear
- Feather Wear
- Cupping
- Diagonal Wear
- Rapid Shoulder Wear (one shoulder only)
- One-Sided Wear

FIGURE 7-13

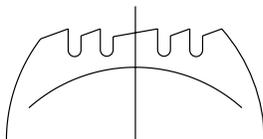
OVERALL FAST WEAR (Miles per 32nd)



Overall Fast Wear is fast wear that 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 Literature No. RP 219 (“Radial Tire Wear Conditions and Causes”). For information on how to accurately measure and record tire rates, see TMC Literature No. RP 230 (“Tire Test Procedures for Tread Wear, Serviceability, and Fuel Economy”).

FIGURE 7-14

FEATHER WEAR



Feather Wear occurs when tread ribs or blocks are 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 Literature No. RP 219 (“Radial Tire Wear Conditions and Causes”), page 5.

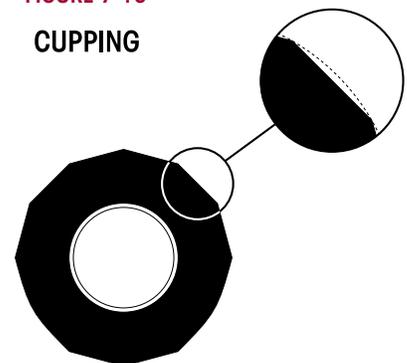
If feather wear on both steer tires is in the same direction, drive axle or other chassis misalignment is indicated. If one steer tire shows feather wear and the other steer tire has normal wear, a combination of toe and drive axle or chassis misalignment is indicated.

FIGURE 7-15

CUPPING

Cupping is 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 Literature No. RP 219 (“Radial Tire Wear Conditions and Causes”), page 7.

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



To solve cupping problems:

- *Tires* - Correct mis-mount 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 Literature No. RP 219 (“Radial Tire Wear Conditions and Causes”), page 20.

Diagonal wear is usually caused by bad wheel bearings, toe-out, mi-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 7-16
DIAGONAL
WEAR**

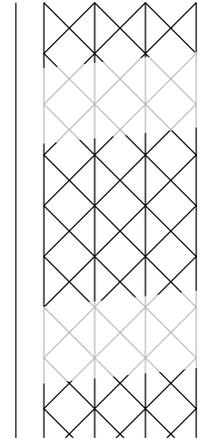
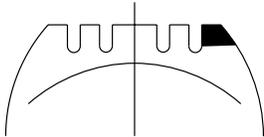


FIGURE 7-17

**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 Literature No. RP 219 (“Radial Tire Wear Conditions and Causes”), page 22.

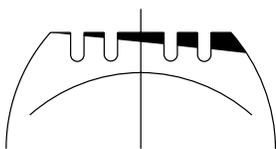
This wear condition is usually caused by excessive toe or excessive camber. These conditions can be created by a misaligned or bent axle and can also be caused by loose or worn wheel bearings.

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 7-18

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 Literature No. RP 219 (“Radial Tire Wear Conditions and Causes”), 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



SECTION 8

Component Replacement

STEERING KNUCKLE DISASSEMBLY

1. Chock the rear wheels of the vehicle.
2. Set the parking brake.
3. Raise the lift axle and support with jack stands.
4. Remove the wheel and hub assembly.
5. Remove the brake components from the steering knuckle.
6. Remove the tie rod assembly (See Figure 8-1).
7. Remove the bolts that connect upper kingpin assembly to the steering knuckle.

FIGURE 8-1



WARNING

REMOVAL OF THE BOLTS WILL ALLOW THE STEERING KNUCKLE TO SEPARATE FROM THE AXLE WHICH CAN RESULT IN COMPONENT DAMAGE AND/OR PERSONAL INJURY. STEERING KNUCKLE MUST BE SUPPORTED BEFORE REMOVAL OF THE TWO BOLTS.

SERVICE HINT

REMOVE THE GREASE ZERKS FROM THE KNUCKLE ASSEMBLIES. THIS WILL ALLOW THE KNUCKLE ASSEMBLIES TO FREELY SLIDE UP AND DOWN THE KINGPINS WITHOUT CREATING BACK PRESSURE.

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

KINGPIN PREPARATION AND MEASUREMENT

CLEANING THE GROUND OR POLISHED PARTS

- Use a cleaning solvent to clean ground or polished parts and surfaces. **DO NOT USE GASOLINE**



CAUTION

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

CLEANING THE ROUGH PARTS

- Rough parts can be cleaned with the ground or polished parts. Rough parts can also be cleaned in hot solution tanks with a weak alkaline solution. The parts must remain in the hot solution tanks until they are completely cleaned and heated.

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.



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



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

1. WEAR PROPER EYE PROTECTION.
2. WEAR PROTECTIVE CLOTHING.
3. WORK IN A WELL-VENTILATED AREA.
4. 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.

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 8-2 through 8-5.

FIGURE 8-2



FIGURE 8-3



FIGURE 8-4



FIGURE 8-5



2. Inspect the kingpin for wear or damage. Use a micrometer, measure the upper and lower kingpin in two locations. Positions must be 90 degrees (perpendicular) from each other, see Figures 8-6 through 8-9.
3. If the kingpin diameter is **less than 1.802"**, kingpin replacement may be necessary.



FIGURE 8-6



FIGURE 8-7



FIGURE 8-8



FIGURE 8-9



FABRICATED KNUCKLE KINGPIN BUSHING

YOU WILL NEED:

- A hydraulic shop press with a minimum forcing capacity of 5 tons



WARNING

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

The kingpin bushing housing on a fabricated knuckle includes pre-reamed bushings and seals.

KINGPIN BUSHING REMOVAL

1. Install the steering knuckle assembly or upper kingpin connection in the press. Ensure is securely supported on the prior to applying hydraulic pressure to press out the bushing.
2. Remove worn kingpin bushing housing.
3. Install the new kingpin bushing housing (refer to Figure 8-10) from the machined side (axle side) of the steering knuckle and upper kingpin connection. Ensure that the kingpin bushing housing is tight against the machined surface, see Figures 8-11 through 8-13.

FIGURE 8-10



FIGURE 8-11

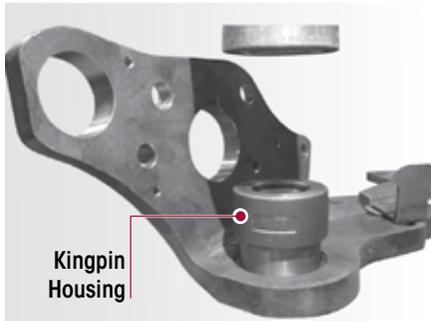


FIGURE 8-12

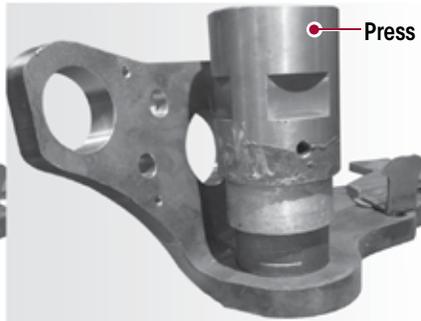
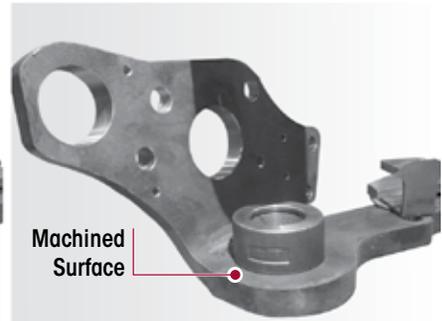


FIGURE 8-13



CAST KNUCKLE KINGPIN BUSHING REMOVAL

YOU WILL NEED:

- A hydraulic shop press with a minimum forcing capacity of 2.5 tons (minimum press capacity of 5,000 psi or use an arbor press)

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 AND/OR COMPONENT DAMAGE.

1. Remove the grease cap retaining ring.
2. Install the steering knuckle upside down in press. Be sure to support the steering knuckle assembly so that it sits in-line with the press (See Figure 8-14).
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, to press out the kingpin bushing.
4. Use the same procedure to remove the kingpin bushing in the upper kingpin connection.
5. Clean the parts and then inspect before reassembling.

FIGURE 8-14



CAST 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. The 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 degrees opposed from each other, see Figures 8-15 through 8-17. If the average measurement is more than the knuckle bore maximum diameter specification, replace the knuckle.

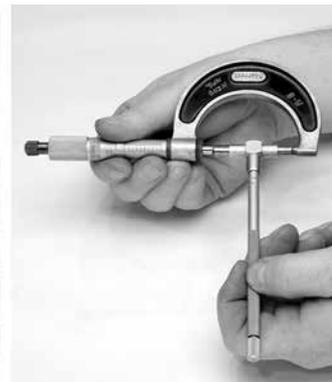
FIGURE 8-15



FIGURE 8-16



FIGURE 8-17





CAST KNUCKLE KINGPIN BUSHING REAMING

YOU WILL NEED:

- A hydraulic shop press with a minimum forcing capacity of 5 tons



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 AND/OR COMPONENT DAMAGE.

1. Install the steering knuckle assembly, steering arm or upper kingpin connection in the press.
2. Always install the kingpin bushing from the machined side (axle side) of the steering knuckle using a bushing driver. Press in bushing to a depth of no less than $\frac{1}{16}$ " (0.236") or 6 millimeters and no more than $\frac{5}{16}$ " (0.32") or 8 millimeters, see Figures 8-18 and 8-19.
3. Following this procedure it is necessary to ream the kingpin bushings to fit the kingpins, see Kingpin Bushing Reaming Instructions in this section.

FIGURE 8-18

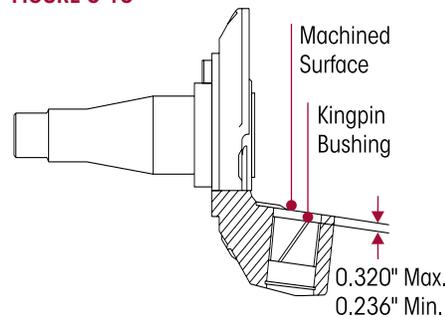


FIGURE 8-19



KINGPIN BUSHING REAMING



REAM THE KINGPIN BUSHINGS WITH AN ADJUSTABLE STRAIGHT FLUTE REAMER. DO NOT HONE OR BURNISH THE KINGPIN BUSHINGS. HONING OR BURNISHING WILL DAMAGE THE BUSHINGS AND WILL VOID APPLICABLE WARRANTIES.



WHEN INSTALLING STEERING KNUCKLE COMPONENTS IN A VICE, IT IS NECESSARY TO PROTECT THE MACHINED SURFACES FROM GOUGES AND/OR MARRING BY USING BRASS JAWS. FAILURE TO DO SO CAN CAUSE PREMATURE PART DAMAGE, DAMAGE TO THE STEERING KNUCKLE COMPONENTS, ADVERSE VEHICLE HANDLING, PERSONAL INJURY OR PROPERTY DAMAGE AND WILL VOID APPLICABLE WARRANTIES.

1. Install the 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 steering knuckle until the blades touch the kingpin bushing.
3. Rotate the reamer smoothly with light downward pressure. **DO NOT** apply too much pressure, see Figure 8-20 and 8-21.



FIGURE 8-20

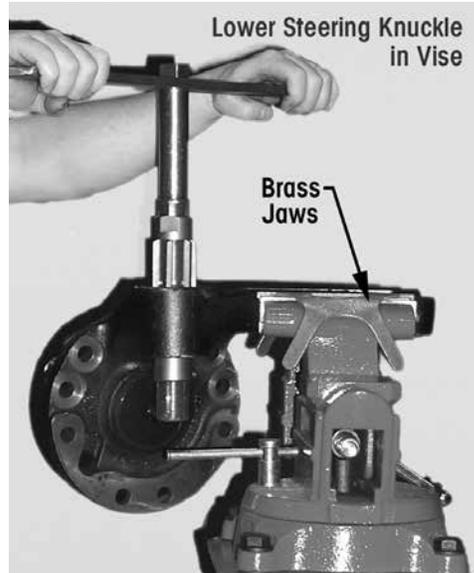
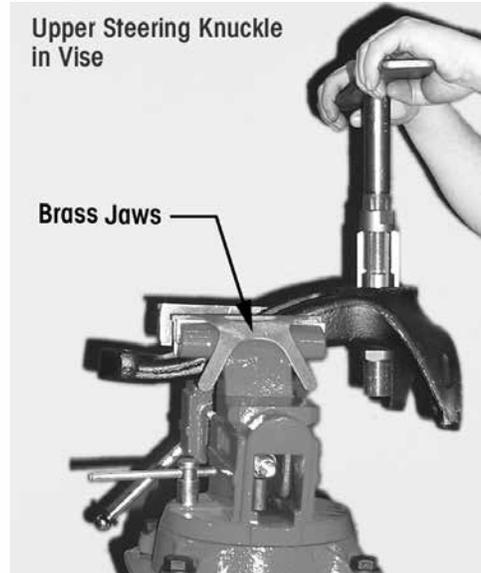


FIGURE 8-21



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 the cutting rotation.
5. Clean and remove all bearing material from the knuckle assembly. Be sure to remove material from the grease channels and dimples.
6. Clean the 5/8" brake backing plate bolts with a wire wheel and run a tap through the threads of the steering knuckle / upper kingpin connection. Flush out with brake cleaner and dry with compressed air.
7. Repeat Steps 1 through 6 to the upper kingpin connection.



WARNING

PRIOR TO INSTALLATION ENSURE THAT ALL RESIDUAL LOCTITE MATERIAL IS REMOVED FROM THE MOUNTING BOLTS AND THE THREADED HOLES IN THE UPPER KINGPIN CONNECTION, 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 ADVERSE VEHICLE HANDLING RESULTING IN PERSONAL INJURY OR PROPERTY DAMAGE.

NOTE

THE HENDRICKSON GENUINE PART SOCKET HEAD CAP SCREW (PART NUMBER: 6110C125H4A8) COMES WITH A PRE-APPLIED LOCTITE COMPOUND.

8. Install the steering knuckle and upper kingpin connection on the kingpin.
9. Check for the proper fit by rotating the knuckle assembly back and forth to verify there is no binding on the kingpin, see Figures 8-22 and 8-23.

FIGURE 8-22



FIGURE 8-23



10. If the bushing is too tight, repeat Steps 1 through 9 until the proper clearance is achieved.



KINGPIN SEAL INSTALLATION

1. Place the steering knuckle 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) (See Figure 8-24).
2. Lay the kingpin seal into the bore of the steering knuckle. The seal lip should face outward (toward the axle) (See Figure 8-25).
3. Use a bushing driver tool to press the seal firmly into the steering knuckle.
4. Install the kingpin seal until it makes contact with the kingpin bushing.
5. Repeat Steps 1 through 4 on the upper kingpin connection.

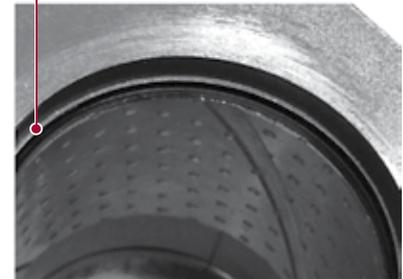
FIGURE 8-24

STEERING KNUCKLE



FIGURE 8-25

Lay the kingpin seal into the bore of the steering knuckle. The lip should face outward, toward the axle.



STEERING KNUCKLE ASSEMBLY

After replacing the kingpin bushings, it is necessary to reassemble the steering knuckle assemblies.

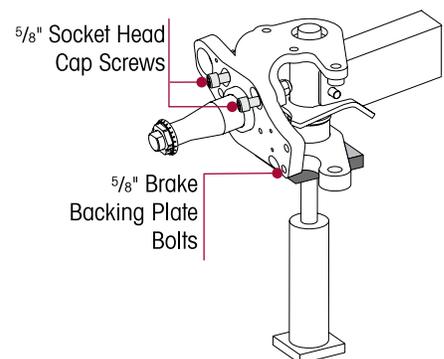
1. Install the thrust bearing on the lower kingpin, so the top side is up (the thrust bearing may be stamped **TOP** or the black seal will designate the top side), when the axle is in the operating position.
2. Pack the bearing dimples with multipurpose grease (NLGI Grade 2).
3. Install the steering knuckle assembly on the kingpin. It will be necessary to support the steering knuckle assembly with a bottle jack and a block of wood under the steering knuckle assembly.

SERVICE HINT

THE EASIEST WAY TO INSTALL THE KNUCKLE IS WITH THE GREASE CAP NOT INSTALLED IN THE STEERING KNUCKLE ASSEMBLIES. IN THIS MANNER, IT DOES NOT CREATE BACK PRESSURE. THE ASSEMBLY CAN THEN FREELY SLIDE UP AND DOWN ON THE KINGPIN.

4. Raise the bottle jack so that there is no free play between the steering knuckle, thrust bearing and the bottom of the axle.
5. Install the upper kingpin connection on the upper kingpin (See Figure 8-26).
6. Install the left and right brake backing plate bolts finger tight. These are for guide purposes only.

FIGURE 8-26



NOTE

TWO GUIDE STUDS MAY BE SUBSTITUTED IN PLACE OF THE BRAKE BACKING PLATE BOLTS.

7. Install the two new socket head cap screws until they are finger tight.
8. Apply slight upward pressure on the upper kingpin connection.



FIGURE 8-27



9. Insert feeler gauges between the upper kingpin connection and the top of the axle. Check the clearance between the upper kingpin connection and the top of the axle (See Figure 8-27).
10. Remove the brake backing plate bolts and socket head cap screws (See Figure 8-26).
11. Remove the upper kingpin connection.
12. Install the appropriate number of shims to achieve 0.008" to 0.011" clearance between the upper kingpin connection and the top of the axle.

EXAMPLE

IF 0.050" CLEARANCE WERE MEASURED, 0.040" SHIMS WOULD BE REQUIRED TO OBTAIN THE REQUIRED 0.008" TO 0.011" CLEARANCE.

13. Install the upper kingpin connection onto the kingpin.
14. Slide two 0.010" feeler gauges on each side of the kingpin between the axle and the upper kingpin connection.

WARNING

PRIOR TO INSTALLATION ENSURE THAT ALL RESIDUAL LOCTITE MATERIAL IS REMOVED FROM THE MOUNTING BOLTS AND THE THREADED HOLES IN THE UPPER KINGPIN CONNECTION, 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 ADVERSE VEHICLE HANDLING RESULTING IN PERSONAL INJURY OR PROPERTY DAMAGE.

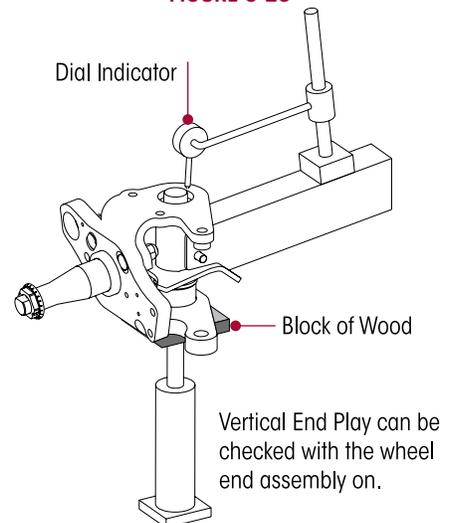
15. Install the socket head cap screws and tighten. Refer to torque specifications section in this publication.

NOTE

APPLY LOCTITE TO THE HENDRICKSON GENUINE PART SOCKET HEAD CAP SCREWS (PART NUMBER: R-6110C125H4H8).

16. Once the final torque of the socket cap screws has been obtained, remove the two 0.010" feeler gauges and lower the bottle jack. Check the remaining bolt holes to ensure that the bolts will thread in.

FIGURE 8-28



17. Affix a magnetic base dial indicator on the axle and place the tip of the dial indicator on top of the upper kingpin connection (See Figure 8-28).
18. Zero the dial indicator.
19. Raise the bottle jack until there is no clearance between the steering knuckle and the bottom of the axle.
20. Check the reading on the dial indicator. The specification for vertical travel on the steering knuckle assemblies is 0.008" to 0.011".
21. If the clearance is not within the required specification, repeat Steps 3 through 9 until the proper clearance is obtained by adding or removing shims.
22. If the vertical travel is not within the specification, repeat Steps 3 through 16 until the proper vertical travel is obtained.
23. Remove the bottle jack to remove the load off the knuckle assembly and continue assembling the wheel ends.



24. Install the tie rod cross tube into the tie rod arm.
25. **Compliant Tie Rod** – Tighten the mounting bolts. Refer to torque specifications section in this publication.
Rigid Tie Rod – Tighten the castle nuts to 185 foot pounds torque, then rotate the castle nut to the next castle slot and install the cotter pin. Tighten bolts. Refer to torque specifications section in this publication.

NOTE

LOCTITE APPLIED TO KNUCKLE ASSEMBLY BOLTS IS A CRITICAL PROCEDURE TO ENSURE THAT THESE BOLTS SUSTAIN THE TORQUE REQUIREMENT OF THE KINGPIN CONNECTION.

26. Install new O-rings on the grease caps and lubricate the O-rings with grease.
27. Install grease caps and new retaining rings.

AUXILIARY AXLE BRAKE REPLACEMENT



WARNING

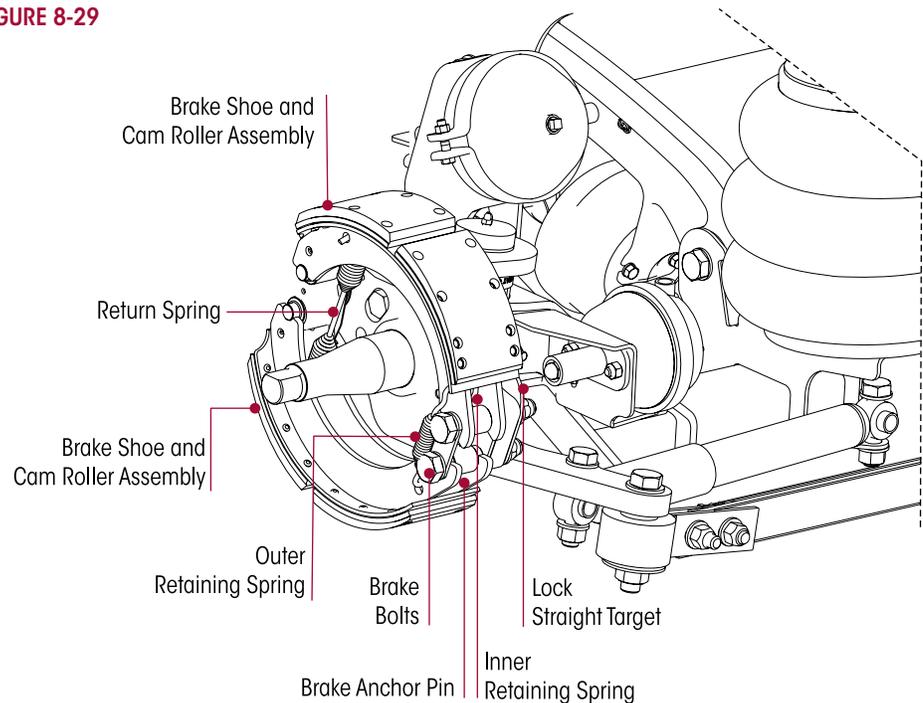
SUPPORT THE LIFT AXLE PRIOR TO SERVICING

PLACE THE VEHICLE ON A LEVEL FLOOR AND CHOCK THE WHEELS TO HELP PREVENT THE VEHICLE FROM MOVING. PRIOR TO SERVICING A LIFT AXLE IN THE RAISED POSITION, (1) PROPERLY SUPPORT THE LIFT AXLE WITH SAFETY STANDS, AND (2) RELEASE ALL AIR PRESSURE IN THE LIFT AXLE AIR SPRINGS AND RIDE SPRINGS. DO NOT WORK AROUND OR UNDER A RAISED LIFT AXLE SUPPORTED ONLY WITH FLOOR JACKS OR OTHER LIFTING DEVICES, FAILURE TO DO SO CAN CAUSE DEATH, PERSONAL INJURY OR DAMAGE TO COMPONENTS.

For replacement brake service kits or If a part is not included in the brake service kit, contact Hendrickson Customer Service Department at (800) 660-2843.

1. Chock the rear wheels of the vehicle.
2. Set the parking brake.
3. Raise the lift axle and support with jack stands.
4. Remove wheel, brake drum and axle end components to expose the brake shoes.

FIGURE 8-29



5. Remove the outer retaining spring and inner retaining spring (See Figure 8-30).



6. Support the lower brake shoe assembly and remove the return spring (See Figure 8-31). Set parts aside and remove the upper brake shoe.
7. Remove the brake bolts and brake anchor pin. If lock straight target is present, note the position for proper reassembly location (See Figure 8-32.)
8. Hendrickson replacement brake kits for each specific axle will have the necessary parts to be replaced. Discard worn or damaged parts.
9. Install brake bolts through the anchor pin. Tightened to 160 foot pounds torque.
10. Install new parts in reverse order from Step 5.

NOTE

WHEN REINSTALLING THE RETAINING SPRING, ENSURE THE RETURN SPRING IS COMPLETELY CLIPPED INTO THE MOUNTING HOLE (SEE FIGURE 8-33).



WARNING

ENSURE THE RETURN SPRING IS COMPLETELY CLIPPED INTO THE MOUNTING HOLE. FAILURE TO DO SO COULD RESULT IN BRAKE FAILURE.

FIGURE 8-30

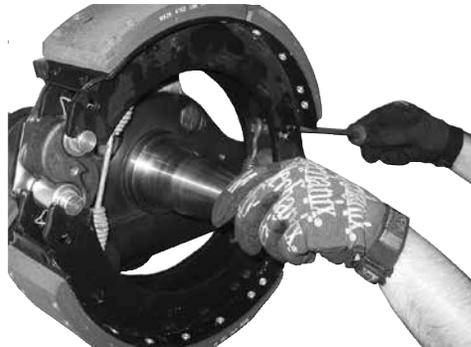


FIGURE 8-31



FIGURE 8-32

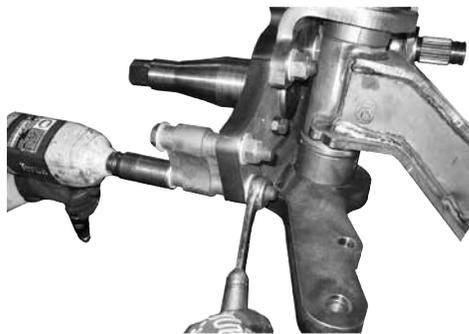


FIGURE 8-33

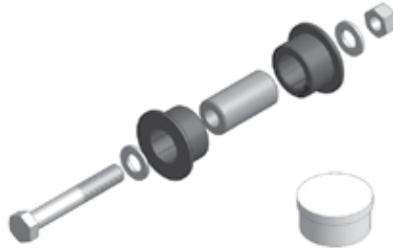


11. Install the wheel, brake drum and axle end components.
12. Remove jack stands and lower the lift axle.
13. Remove wheel chocks.



URETHANE BUSHINGS AND INNER SLEEVES

FIGURE 8-34



PIVOT BUSHING / BOLT KITS

SUSPENSION	KIT NO.
SC10/13	R-008839
SC10/13 Adjustable	R-008839-1
SC20	R-008839-2
SC20 Adjustable	R-008839-3

YOU WILL NEED

- A hydraulic shop press with a minimum forcing capacity of 5 tons

DISASSEMBLY

1. Remove all urethane bushings and internal metal sleeves.
2. Clean the inner diameter of the lift beam bushing holes.

ASSEMBLY

NOTE

DO NOT LUBRICATE THE OUTER DIAMETER OF URETHANE BUSHING.

1. Lubricate the inner diameter of the urethane bushing.
2. Lubricate the outer diameter of the metal sleeve (included in service kit).
3. Press in the urethane bushings.
4. Press in the internal metal sleeves.
5. Once completed, ensure that the inner metal sleeves are flush with the urethane bushing.



SECTION 9 Air Control Systems

Table 9-1 below shows the Hendrickson **LC Auxiliary Lift Axle Control Kits**, which were introduced in 2019. For more information about these **LC Auxiliary Lift Axle Control Kits**, see Hendrickson Literature **OM-H817**.

For information and schematics for **HAC Air Kits**, which were current upon the original release of **TP-H633** in 2018, please see Hendrickson literature **OM-H719**.

TABLE 9-1

AVAILABLE MODELS

	LIFT AXLE APPLICATION	INSIDE-MOUNTED	OUTSIDE-MOUNTED (COMPOSITE)	OUTSIDE-MOUNTED (STAINLESS)
* DOWN	Non-Steerable	LC-NSI	LC-UCO	LC-USO
	Steerable	LC-SSI		
	Reverse Lift & Lock	LC-LSI	LC-LCO	LC-LSO
	Reverse Down & Lock	LC-RSI	LC-RCO	LC-RSO
	Reverse Caster	LC-ASI	LC-ACO	LC-ASO
* UP	Non-Steerable		LC-MCA	
	Steerable			
	Non-Steerable (Maryland Spec)		LC-MSO	
	Steerable (Maryland Spec)			

NOTE: *Automatic position when the vehicle is powered off.



SECTION 10 Torque Specifications

COMPOSILITE Steerable Suspension System

HENDRICKSON RECOMMENDED TORQUE SPECIFICATIONS			
NO.	DESCRIPTION	SIZE	TORQUE VALUE (FOOT POUNDS)
1	Air Spring Bolt (Lower)	3/8"	28 ± 2
2	Air Spring Nut (Upper)	1/2"	48 ± 2
3	Air Spring Bolt (Lower)	1/2"	28 ± 2
4.	Shift Chamber Attachment	7/16"	45 ± 5
5	Shift Chamber Yoke Attachment	7/16"	80 ± 10
6.	Brake Bolts	9/16"	100 ± 10
7.	Bolt-on Brake Attachments	5/8"	170 ± 10
8.	Compliant Tie Rod (CTR) Adjustment	5/8"	185 ± 5
9.	Heavy-duty (HD) Tie Rod Adjustment	5/8"	185 ± 5
10.	Round Tube Tie Rod Adjustment	5/8"	48 ± 2
11.	Shift Chamber Attachment	5/8"	140 ± 10
12.	Shift Chamber Yoke Attachment	5/8"	40 ± 5
13.	Suspension Cross Member Bolt	5/8"	170 ± 10
14.	Air Spring Nut (Upper)	3/4"	48 ± 2
15	Frame Attachment Bolt (Recommended)	3/4"	313 ± 12
16	Pivot Bolt	3/4"	288 ± 12
17	Stabilizer Shock Bolt	3/4"	100 ± 25
18	Compliant Tie Rod (CTR) Attachment	7/8"	450 ± 25
19	Heavy Duty (HD) Compliant Tie Rod Attachment	7/8"	450 ± 25
20	Pivot Bolt / Shift Arm	7/8"	450 ± 25
21	Round Tube Tie Rod Attachment	7/8"	153 ± 27
22	Radius Rod Bolt	7/8"	450 ± 25
23	U-bolts	7/8"	473 ± 22
24	Turn Angle Jam Nut	1/2"	25 ± 5
25	Wheel Flange Nuts	M22 x 1.5	*

NOTE: Torque values shown apply only if Hendrickson supplied fasteners are used. If non-Hendrickson fasteners are used, follow the torque specification listed in vehicle manufacturer's service manual.
Use only Hendrickson Genuine parts for servicing this suspension system. Reference Hendrickson COMPOSILITE SC Part List, Literature No. H732.
* Contact wheel manufacturer for torque specifications.



SECTION 11 Troubleshooting Guide

PROBLEM	POSSIBLE CAUSE	CORRECTION
Not getting the desired load on the axle	Not having proper air pressure to the ride air springs	a. Adjust the air pressure at regulator valve b. Verify sufficient pressure to the air control system
	Air control system not properly installed	Check plumbing of air system, refer to Hendrickson Publication No. H817
	Mounted too high Incorrect ride height specification	a. Larger tire b. Change axle seat height
Unit not getting the correct lift	Lift air springs not getting proper air pressure	a. Check system pressure b. Check air system plumbing, refer to Hendrickson Publication No. H817 c. Check air spring pressure
	Interference with chassis, drive line or other components	Inspect for interference
	Unit not installed properly	Check installation with factory installation drawing
Unit has vertical hop	Not running sufficient load	Increase air pressure
	Unbalanced tires	Balance tires
Axle Shimmy	Improper caster setting	Readjust caster if possible
	Toe setting is incorrect	Readjust toe setting, refer to Hendrickson Publication No. H674
	Axle bolt connection loose	Re-torque to factory torque values, see Torque Specification Section in this publication
	Pivot bolt connection loose	Re-torque to factory torque values, see Torque Specification Section in this publication
	Axle out of alignment	Re-align axle
	Tires different size on each side	Use same size tires
	Tires unbalanced	Balance tires
	Air pressure in tires different from side to side Stabilizers worn	Equalize air pressure Verify stabilizer resistance and replace as necessary
Axle does not track forward	Toe setting	Set toe, refer to Hendrickson Publication No. H674
Axle does not track in reverse. (Reverse Caster Only)	Inadequate air pressure to forward caster shift chambers	Increase psi minimum (100 psi)
	One or both forward caster shift chambers is damaged	Replace chamber(s)
	Hanger bracket mounted incorrectly on the frame rail	Remount frame rail bracket
	Installed unit is not designed to accommodate the reverse castor option	a. Contact Hendrickson Customer Service to spec out a unit with reverse caster if required or b. Lift axle is in reverse, if reverse caster is not necessary
Axle in reverse caster when lifted.	Incorrect air line plumbing	Correct air plumbing, refer to Hendrickson Publication No. H817

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

Call Hendrickson at 800.660.2829 or 800.668.5360 in Canada for additional information.



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