

# **TECHNICAL PROCEDURE**

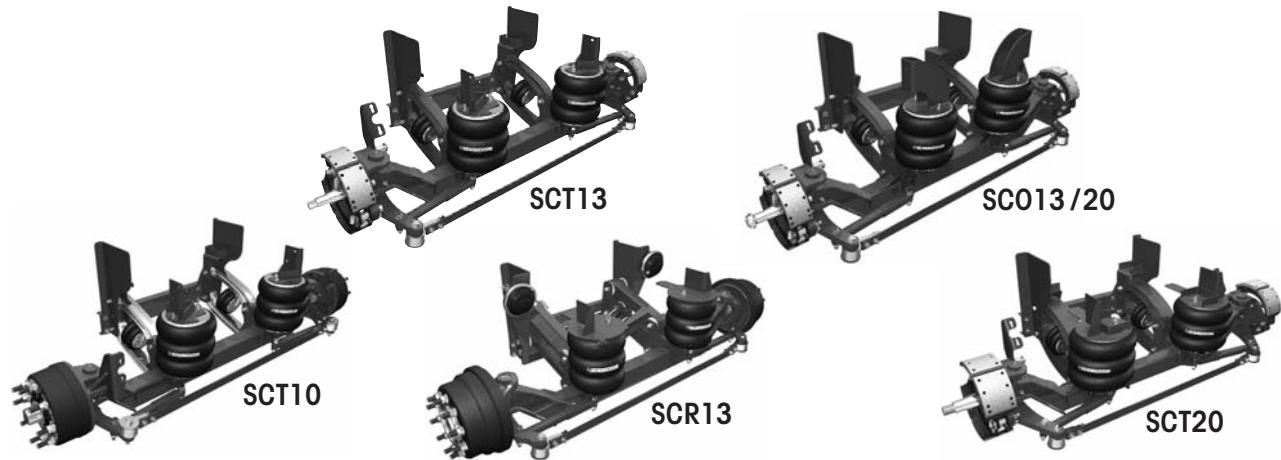
## **STEERABLE SUSPENSION SYSTEM**

**SUBJECT:** Installation and Preventative  
Maintenance Procedures

**LIT NO:** H633

**DATE:** May 2011

**REVISION:** E

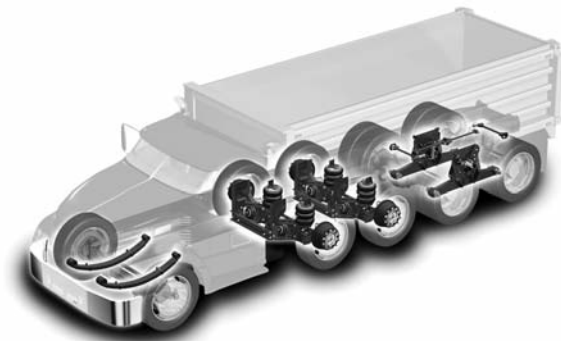


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## INTRODUCTION

Why use a Lift Axle? Hendrickson suspensions carry countless loads of freight and raw materials off-road and over the highways. The Hendrickson Auxiliary Axle Suspension System with optimized weight, short package space and a CTR with PerfectTrak™ technology improves product performance and durability while offering owner-operators increased payload and reduced maintenance.



The lift axle suspension also helps to meet U.S. Department of Transportation FHWA-HOP-06-105.

For further information, contact:  
U.S. Department of Transportation  
Federal Highway Administration  
Office of Freight Management and Operations  
Phone: 202-366-9210  
Fax: 202-366-3302  
Web site: [http://www.ops.fhwa.dot.gov/freight/publications/brdg\\_frm\\_wghts/](http://www.ops.fhwa.dot.gov/freight/publications/brdg_frm_wghts/)

The following instructions are intended for use with Hendrickson COMPOSILITE™ Auxiliary Liffable Air Ride Suspensions.

**NOTE:** Read the entire installation instruction document thoroughly before proceeding with a suspension installation.

It is very important that the proper suspension is selected for the vehicle application. The following criteria must be considered when selecting a suspension:

- required capacity
- loaded frame-to-ground measurement
- driveline clearance
- axle travel
- axle spacing
- tire size for auxiliary axle
- Requirement for a steerable or non-steerable suspension

For additional information concerning suspension selection, or other suspension models contact the Hendrickson Auxiliary Axle System's Customer Service Department.

**⚠ CAUTION:** Steerable suspension systems, as with all air suspension systems, must be installed with the proper amount of tire-to-ground clearance to help ensure proper operation. If there is too much ground clearance, the suspension will not carry its share of the load. Too little ground clearance may result in damage to the suspension or other vehicle components installing a suspension with a ride height that is "out of range" may result in:

- insufficient axle lift
- improper axle load
- insufficient ground clearance
- component overload

The vehicle manufacturer should be consulted before making any changes to the vehicle's frame. Typically, vehicle manufacturers do not permit cutting or altering the vehicle's frame or side rail and doing so could void any applicable manufacturer warranty coverage.

## SPECIAL NOTES

Non-functioning components are to be returned to Hendrickson Auxiliary Axle Systems, in exchange for replacement components, provided product warranty conditions are met.

Hendrickson Auxiliary Liffable Air Ride Suspensions with factory installed axles may require toe setting adjustments. Also, check for sufficient wheel bearing lubrication (oil).

It is the responsibility of the installer to ensure that the vehicle will function properly under the increased weight conditions and loading that will exist when an additional axle is installed, particularly braking.

It is the responsibility of the installer to determine the correct location of the suspension in order to provide the proper vehicle load distribution. The load carried by each axle must not exceed the rated capacity of



the components involved or the applicable State and Federal laws where the truck is to be operated.

It is the installer's responsibility to ensure that proper clearances exist:

- Between the drive shaft and/or roll-off cylinder and the auxiliary axle (if applicable)
- Around the tires—laterally, fore, aft, and vertically
- Around the air springs when they are at their maximum diameter (refer to suspension assembly drawing for specifications)
- Around any moving suspension components

No welding to any of the suspension components is permitted, except where specified by Hendrickson Auxiliary Axle Systems.

No alteration of any of the suspension components is permitted.

Any installation deviations must be approved, in writing, by Hendrickson Auxiliary Axle Systems Product Engineering Department. Failure to comply with these installation instructions without written permission will void the suspension warranty.

**⚠ CAUTION:** Subjecting aluminum components to certain acid washes may result in premature corrosion and warranty could be affected. It is recommended that you monitor which cleaning solvents are being used on your vehicle.

**⚠ CAUTION:** Acid washes also degrade the rubber, urethane and plastic parts or the axle assembly.

### REQUIRED EQUIPMENT AND MATERIALS FOR INSTALLATION

The following equipment and materials are needed when installing a Hendrickson Steerable Auxiliary Liffable Air Ride Suspension:

1. Frame Fasteners: 5/8-11 x 2 1/4" long grade 8 flange bolts and 5/8 IFI Grade C prevailing torque flange nuts and the corresponding frame drill bit.

2. Torque wrench (capability of 450 ft. lbs. for frame bolt installation).
3. Tape measure or scale(s) and machinist square.
4. Trammel bar.
5. Crane or other lifting device.
6. Hammer and center punch.
7. Compressed air supply.
8. Air impact gun.
9. Air fittings, tubing and associated tools.
10. Socket set and wrenches, including the following sizes:
  - 3/8"
  - 9/16"
  - 3/4"
  - 15/16"
  - 1-1/8"
  - 1-1/4" deep well socket
11. C-clamps or bar clamps with the minimum opening equal to the vehicle frame height.
12. Suspension assembly drawing supplied by Hendrickson. Plumbing schematics supplied for pre-plumb suspensions only.
13. Angle measuring instrument (magnetic protractor) for self-steer axle.
14. Wheel chocks.
15. Frame jacks or supports.

## INSTALLATION INSTRUCTIONS

### SAFETY FIRST

Be sure to read and follow all installation and maintenance procedures.

### LIFTING

Practice safe lifting procedures. Consider size, shape and weight of assemblies. Obtain help or the assistance of a crane or lift truck when lifting heavy assemblies. Make sure the path of travel is clear.

### PARTS HANDLING

When handling parts, be sure to wear appropriate gloves, eyeglasses and other safety equipment to prevent serious injury.

### UNPACK AXLE

Separate kitted parts for use during installation.

## PRE-INSTALLATION CHECKLIST AND PROCEDURES

Before beginning the installation:

1. Check that the new suspension matches the specifications provided by your Production or Engineering Department.
2. 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 drive line and axle.

Drive line drop clearance measurement, Figure 1, Dimensions "A" + "B" with axle in full up position Dimension "C" is the Spindle CL to Axle

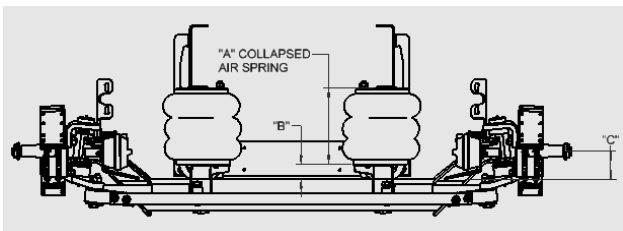


Figure 1. Driveline Drop Clearance

3. On a truck or trailer auxiliary suspension application:
  - a. Verify that the axle spacing conforms to Federal and local bridge laws.
  - b. Verify that the auxiliary suspension location is based on: front axle steer angle, vehicle wheel-base and 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 suspension(s).
4. On truck frames:
  - a. Verify that the frame width is within the allowable mounting range of the suspension (refer to the suspension assembly drawing).
  - b. Mark the location of the suspension side rails on the frame rails. (Refer to the suspension assembly drawing) Check for interferences with any existing bracketry or mounting bolts.
  - c. Check for any interferences between the axle and the drive shaft, if applicable (refer to the suspension assembly drawing).
  - d. Verify that the vehicle crossmembers and backing plates are correctly positioned for proper support of the suspension.

**⚠ WARNING: ADEQUATE SUSPENSION SUPPORT MUST BE PROVIDED WITHIN THE VEHICLE FRAME! A CROSSMEMBER 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 1)**

5. Confirm that the components listed on the suspension assembly drawing have been provided in sufficient quantities. Contact the Hendrickson Auxiliary Axle Customer Service Department if any components are missing or damaged.



## PRIOR TO INSTALLATION

### AXLE IDENTIFICATION

The serial number tag is a identification label attached to the suspension system. It contains a unique serial number and the model identification number for that specific suspension system. (Label is located on the rear center of the axle or side rail.)

### SUSPENSION ADJUSTABILITY

Suspension flexibility can be achieved with adjustable spacers which allows for a ride height range of four (4) inches.

Hendrickson Auxiliary Axle offers frame width and ride height adjustability with certain models reducing multiple part number stocking.

### ADJUSTABLE RIDE HEIGHT (IF REQUIRED)

The adjustable ride height feature accommodates five different ride height requirements.

Ride height adjustment spacers are provided for the bushing saddle and the upper air spring plate to adjust to a higher ride height. The parts box will include the following ride height adjustment spacers:

- Two one-inch bushing saddle spacers
- Two one-inch air spring plate spacers
- Two two-inch bushing saddle spacers
- Two two-inch air spring plate spacers

The following example uses a suspension specified with a 12.5-inch base ride height and shows which spacers are need based on the required ride height.

RIDE HEIGHT REQUIRED	SPACER REQUIRED
11.5	No spacers required
12.5	No spacers required
13.5	1" spacer optional
14.5	1" required, 2" optional
15.5	2" required

**NOTE:** Ride height is always +/-1".

### RIDE HEIGHT SPACER INSTALLATION (IF EQUIPPED)

1. Determine if a spacer is needed based on the ride height required and the base ride height of suspension model to be installed.
2. If no spacers are required, move to the adjustable frame width feature section. If spacers are required move to step 3.

3. Position spacers, per figures 2 and 3, to accommodate required ride height. The same spacer size must be used for bushing saddles and air spring plates.

**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.

### ADJUSTABLE FRAME WIDTH

The adjustable frame width feature allows the same suspension to accommodate frame width ranges of 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.



Figure 2 - Bushing saddle spacer

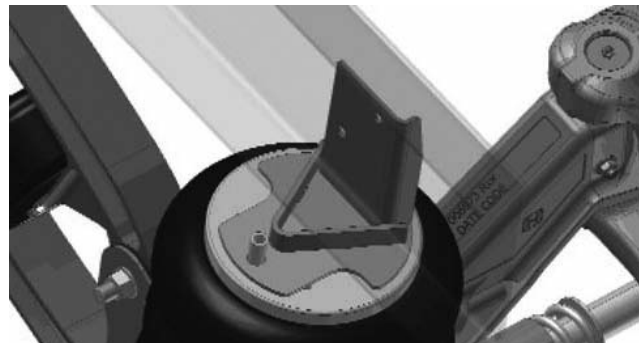


Figure 3 - Air spring plate spacer



**FRAME WIDTH ADJUSTMENT PROCEDURES**

1. Determine the required frame width based on the vehicle's dimension.
2. If a 34.0-inch frame width is needed, do not adjust the frame width. Proceed with standard suspension installation.
3. If a 33.5 inch frame width is needed, loosen but do not remove the four pivot bolts connecting the hanger to the bushing saddle. Next, loosen the four bolts connecting the cross member to the hangers. Remove the frame width spacer on both sides of the suspension. Retorque the pivot bolts and cross member bolts. See torque values below. (See figure 4 for frame width spacer reference)
4. If a 34.5 inch frame width is needed, loosen but do not remove the four pivot bolts connecting the hanger to the bushing saddle. Next, loosen the four bolts connecting the cross member to the hangers. Add one frame width spacer to both sides of the suspension. Retorque the pivot bolts and cross member bolts. See torque values below. (See figure 3 for frame width spacer reference)

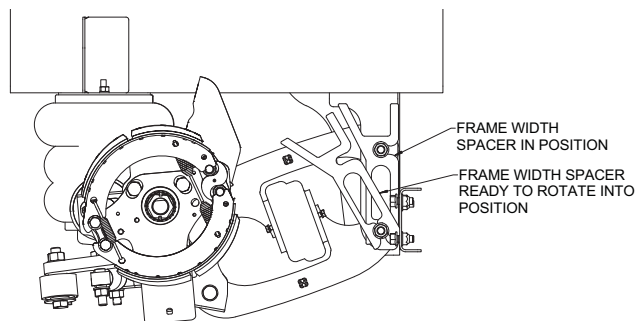


Figure 4 - Frame width spacer

**SC10/13**

BOLT	TORQUE VALUE
Pivot Bolts	225 ft-lbs
Cross member	180 ft-lbs

**SC20**

BOLT	TORQUE VALUE
Pivot Bolts	425 ft-lbs
Cross member	180 ft-lbs

**SUSPENSION MOUNTING  
INSTALLATION PROCEDURES**

Before installing a suspension:

1. Check that the correct auxiliary suspension and axle was chosen based on the individual design criteria. Review the pre-installation check.
2. If the vehicle frame is forward-sloping or tapered, see Caster Angle Section before drilling.
3. Position the vehicle on a flat level surface.
4. Determine the location of the auxiliary axle mounting position on the outside of the vehicle frame rails. Refer to the suspension assembly drawing and mark the front edge of the auxiliary suspension side rails on the vehicle frame. (See Figure 5)
5. Correct any interferences that occur between the auxiliary suspension mounting surface and any existing frame bolts or brackets (located in the marked areas). The auxiliary suspension side rail(s) can be drilled to accommodate existing bolts.

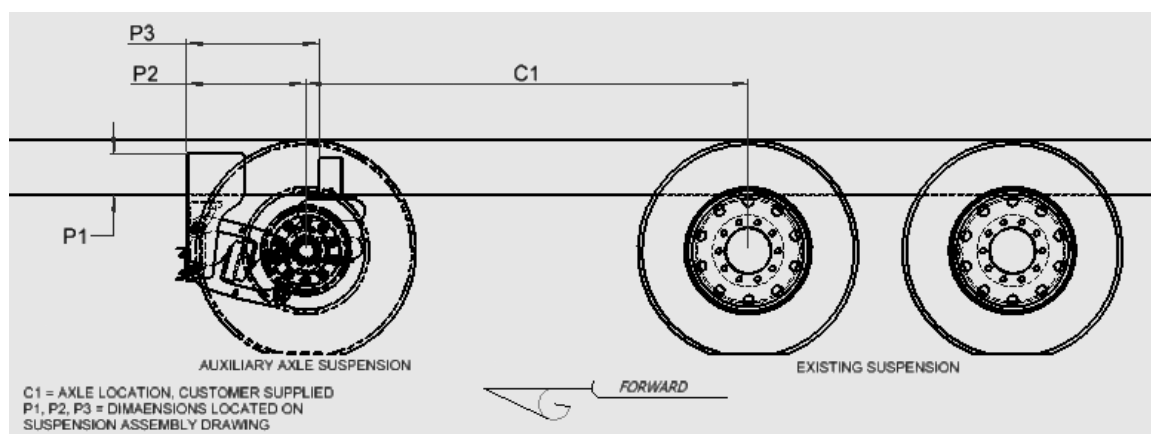


Figure 5. Suspension Mounting Position



- Before any modifications to the hanger are made, contact 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)

**⚠ WARNING: FAILURE TO PROPERLY AND SUFFICIENTLY ATTACH FRAME BOLT CONNECTIONS TO SUPPORT THE SUSPENSION OR REINFORCE THE VEHICLE FRAME CAN RESULT IN PREMATURE FRAME FAILURE, LOSS OF VEHICLE CONTROL, AND LOSS OF SUSPENSION WARRANTY COVERAGE. A CROSS MEMBER MUST BE WITHIN 12 INCHES (MINIMUM), FORE OR AFT OF THE FRAME BRACKET PIVOT BOLT CENTERLINE.**

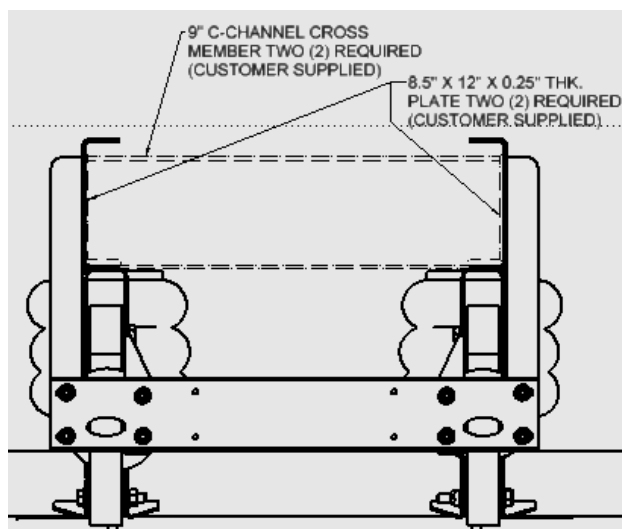


Figure 6. Cross Member Positioning (Customer Supplied)

### 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.

**NOTE:** The entire auxiliary suspension mounting surfaces must be flush with both the side and bottom of the vehicle frame rails or spacers. Failure to do so will void the suspension warranty. (See Figure 8)

- 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 that the measurements between the suspension hanger brackets (see Figure 9) at the frame and at the bottom of the brackets are within the allowable tolerance. Hangers must be parallel to one another vertically.
- Minimum recommended bolt hole pattern for hanger to frame attachment. Figure 7 shows a reference mounting bolt hole pattern. Use 5/8 - 11 Hex Bolt Grade 8 for frame mounting and torque to 180 ft-lbs. Contact Hendrickson Auxiliary Axle Customer Service with your specific bolt pattern for evaluation of applicability.

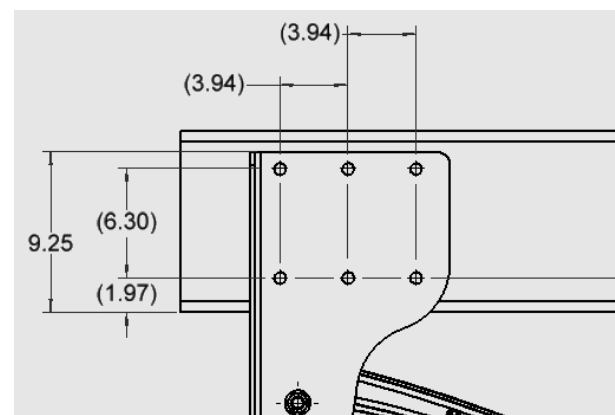


Figure 7. Reference Mounting Bolt Pattern

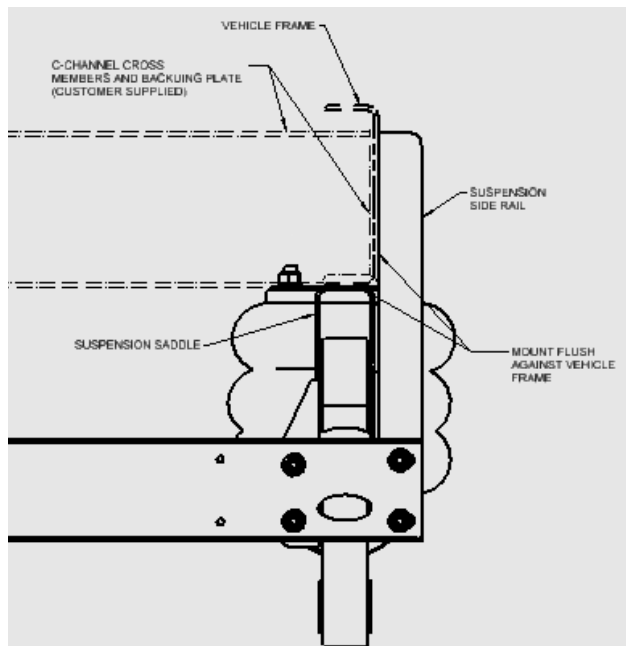


Figure 8. Suspension Mounting to Frame

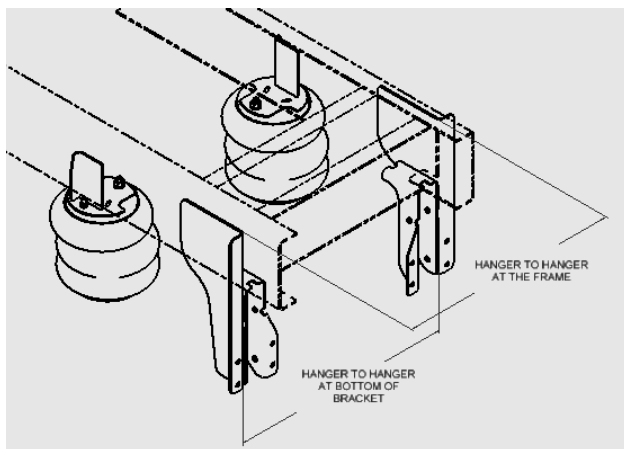


Figure 9. Hanger Positioning

## UPPER AIR SPRING PLATE ASSEMBLY AND AIR SPRING INSTALLATION

1. Raise and 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), clamp it to the vehicle frame rail with C-clamps.
2. 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 the supplied suspension assembly drawing for recommended hole locations.)

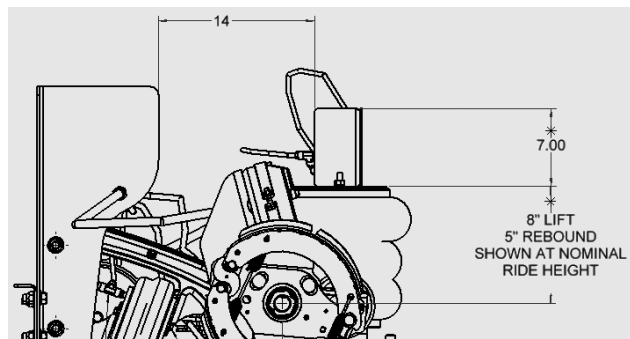


Figure 10. Upper Air Spring Plate Location

3. Drill one 13/16" diameter hole through the upper air spring assembly, vehicle frame rail and the customer supplied backing plate. Check the upper air spring plate assembly location. Fasten with one 5/8"-11 x 2-1/4" large flange grade 8 bolt, 5/8" SAE grade 8 and a 5/8" IFI grade C prevailing-torque type steel hex flange nut. (See Figure 11) Torque to 180 ft-lbs.

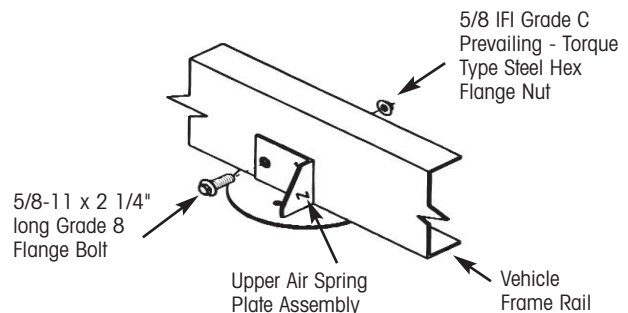


Figure 11. Upper Air Spring Plate Assembly Installation

4. Drill, install and snug the remaining fasteners on that side.
5. Inspect the position of the opposite side of the suspension. Make sure the upper air spring plate assembly is snug against the vehicle frame rail. Also check that the auxiliary axle is parallel to existing axles. Repeat steps #3 and #4 for the opposite side of the suspension.
6. Remove the clamps from both sides of the vehicle frame rail.
7. Align the upper air spring stud with the hole on the upper air spring plate assembly. Insert and reinstall fasteners.



## AXLE ADJUSTMENTS

### 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. (See Figure 12)

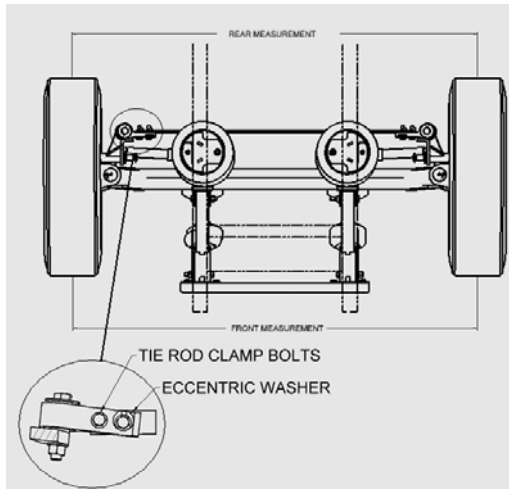


Figure 12. Determining TOE

1. Lift axle until tires are free to spin. Scribe a line on center tread of each tire while rotating tires.
2. Use a trammel bar or tape measure to measure the distance between the scribed lines on the front and rear of the tires at spindle height.
3.
  - a. Compliant Tie Rod: Loosen the tie rod clamp bolts. Rotate eccentric washer to a toe setting of  $\frac{1}{16}$ " to  $\frac{1}{8}$ " toe-in. Rotate CW to increase toe and CCW to Decrease. (See Figure 12)
  - b. Rigid Tie Rod: Loosen the tie rod clamp bolts. Rotate tie rod tube to provide a toe-in setting of  $\frac{1}{16}$ " to  $\frac{1}{8}$ " toe-in.
4. Torque the clamp bolts to Hendrickson Auxiliary Axle System's recommended values. (See Appendix)

### TURN ANGLE - MECHANICAL STOP

A mechanical turn angle stop (bolt) is an adjustable fastener that limits the steer axle's turn radius angle and allows users to avoid tire contact with vehicle accessories. Customer supplied axle(s) must have a turn angle stop. It is important that the stop is set so wheel interference does not occur.

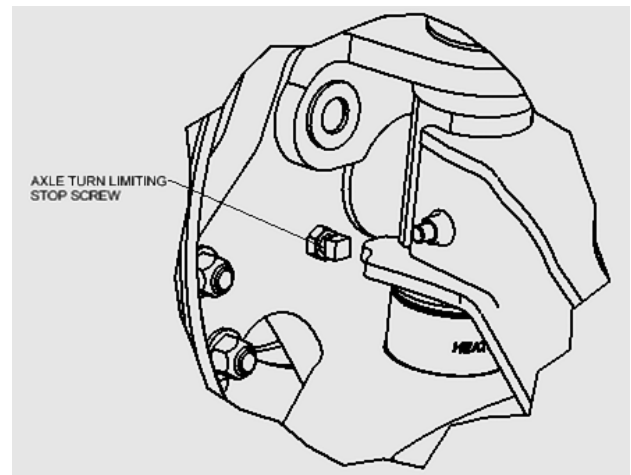


Figure 13. Axle Turn Limiting Stop Screw

1. Adjust the axle turn limiting stop screw for maximum turn angle (See Assembly Drawing) while providing adequate chassis clearance.
2. Torque the clamp bolts to Hendrickson Auxiliary Axle System's recommended values. (See Suspension Assembly Drawing.)

**NOTE:** Factory setting of turn limiting screw varies.

## 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. See [H] HAC Series Air Kit Literature for all options.

### 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 Customer Service for more details.

### FINAL ASSEMBLY

1. Install all miscellaneous hardware and torque the mounting bolts as per the suspension assembly drawing.
2. Install air controls and plumbing.

3. Install wheels and torque lug nuts.
4. Check that the steer axle wheel bearings are filled with oil by inspecting hub cap fill level.
5. Install air brake lines for the steer axle brakes, per the chassis manufacturer's specifications.
6. Inspect brakes and adjust if necessary.

**NOTE:** Suspensions purchased from Hendrickson Auxiliary Axle Systems require brake adjustment, however they are supplied with automatic slack adjusters.

## FINAL INSPECTION

1. Check that all suspension bolts are tightened to Hendrickson Auxiliary Axle System's recommended torque values. (See Suspension Assembly Drawing)
2. Check the air control system 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.

**⚠ CAUTION:** 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 torqued.
  - Wheels rotate freely.
  - Brakes are properly adjusted.
  - Wheel hubs are sufficiently filled with the manufacturer's recommended lubricant.

## PREVENTATIVE MAINTENANCE

Regular lubrication intervals should be followed to help prevent premature wear to the kingpin bushings.

### GREASING AND LUBRICATION SPECIFICATIONS

COMPONENT	GREASING INTERVAL	GREASE
KINGPIN BREAK IN	5,000 miles or as needed	NLGI-1 or NLGI-2
KINGPIN BUSHINGS	10,000 miles or every 6 months	NLGI-1 or NLGI-2

## 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 on the vehicle the suspension must be 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 14)

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

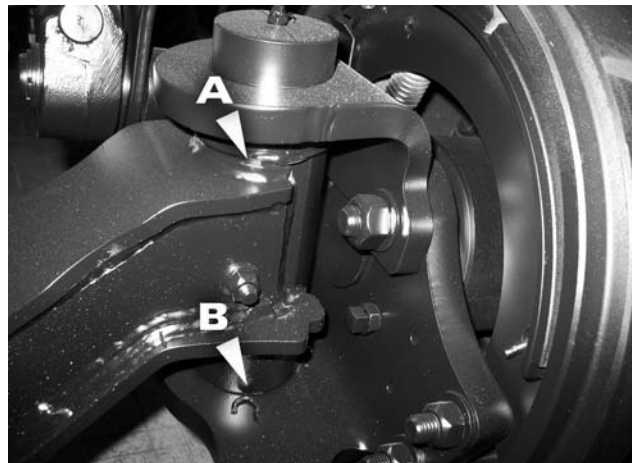


Figure 14. Kingpin Lubrication

## KINGPIN BUSHING INSPECTION INSPECTION PROCEDURE

1. Chock the wheels to help prevent the vehicle from moving. Set the parking brake.
2. Raise the lift axle off the ground.

### CHECKING THE UPPER KINGPIN BUSHING

3. 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 15.

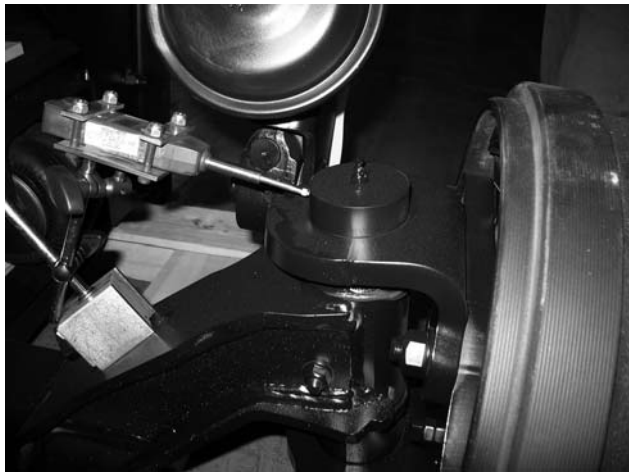


Figure 15. Upper Kingpin Bushing Check

4. Set the dial indicator to "0" zero.
5. Move the top of the tire in and out by applying reasonable, constant pressure and then releasing.
6. 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.

### CHECKING THE LOWER KINGPIN BUSHING

7. 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.
8. 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.

## STEERING KNUCKLE INSPECTION AND ADJUSTMENT

### CHECKING VERTICAL END PLAY (UP AND DOWN MOVEMENT)

1. Chock the tires to help prevent the vehicle from moving.
2. Set the parking brake.
3. Raise the lift axle off the ground.

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 16)
7. Set the dial indicator to "0" zero.



Figure 16. Vertical End Play Checking

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. Lower the jack.

## STEERING KNUCKLE DISASSEMBLY

1. Remove the wheel and hub assembly.
2. Remove the brake components from the steering knuckle.
3. Remove the tie rod assembly. (See Figure 17)



Figure 17. Knuckle Disassembly

4. Remove the bolts that connect upper kingpin assembly to the backbone.

**⚠ WARNING: REMOVAL OF THE BOLTS WILL ALLOW THE BACKBONE TO SEPARATE FROM THE AXLE WHICH CAN RESULT IN COMPONENT DAMAGE AND/OR PERSONAL INJURY. BACKBONE MUST BE SUPPORTED BEFORE REMOVAL OF THE TWO BOLTS.**

**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.

5. Remove the backbone from the kingpin by sliding it down the kingpin.
6. 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.

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

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

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 19 through 22)



Figure 19.



Figure 20.



Figure 21. Dirty Kingpin



Figure 22. 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 degrees (perpendicular) from each other. (See Figures 23 through 26) If the kingpin diameter is less than 1.802", kingpin replacement may be necessary. Contact the Hendrickson Customer Service Department at 800-660-2843.



Figure 23.



Figure 24.



Figure 25.



Figure 26.

## FABRICATED KNUCKLE KINGPIN BUSHING INSTALLATION

1. A hydraulic 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 AND/OR COMPONENT DAMAGE.**

2. Install the backbone assembly or upper kingpin connection in the press.
3. Remove worn kingpin bushing housing
4. Install the new kingpin housing from the machined side (axle side) of the backbone ensuring squareness between the housing and the backbone.



Figure 27.



Figure 28.



### LIFT BEAM URETHANE BUSHINGS REPLACEMENT OF THE LIFT BEAM URETHANE BUSHINGS AND INNER SLEEVE.

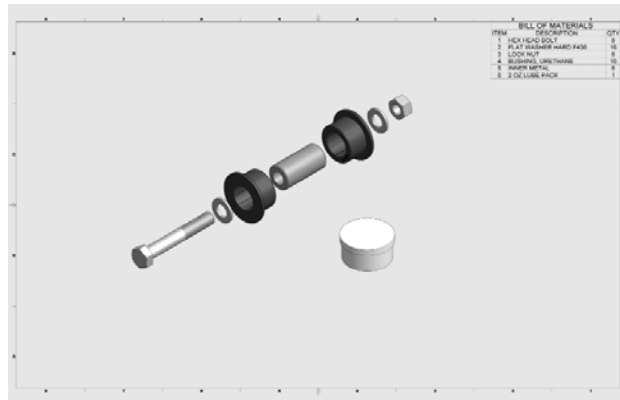


Figure 29. Urethane Bushing Service Kit

#### Pivot Bushing/Bolt Kits:

SC10/13: R-008839

SC10/13 Adjustable: R-008839-1

SC20: R-008839-2

SC20 Adjustable: R-008839-3

Remove all urethane bushings and internal metal sleeves. Clean the ID of the lift beam bushing holes. Press in the urethane bushings. Lube the ID of the bushings and the OD of the sleeves with lubricant provided in service kit. Press in the internal metal sleeves. Once completed, ensure that the inner metal sleeves are flush with the urethane bushing.

### LIFT AXLE (LA) AND COMPLIANT TIE ROD (CTR) STRUCTURAL INSPECTION

Periodic inspection of the LA and CTR are strongly recommended. Cleaning the LA and CTR prior to the inspection will improve the ability to see all structural component condition.

Contact Hendrickson Auxiliary Axle Customer Service for replacement parts or parts kits (800) 660-2843.

### PRE SC ROUND TUBE TIE ROD ADJUSTMENT

In order for a steerable suspension system to steer or track correctly, it is necessary for the wheels to be in a "toe-in" condition. Toe is the difference between the foremost and rearmost point on the tires at spindle height. When the foremost distance is less than the rearmost distance, the wheel pair is said to have toe-in. Toe not only affects tire wear, but also straight-line

stability and corner handling. Having a proper toe setting is important for directional stability. On steerable axles, the toe is pre-set during assembly, however sometimes it becomes necessary to adjust the toe. It is also necessary to verify the toe upon axle installation.

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

To adjust the toe setting, follow these instructions.

### DETERMINING THE TOE SETTING

**⚠ WARNING: NEVER PERFORM MAINTENANCE ON A SUSPENSION WITHOUT FIRST RELEASING AIR PRESSURE FROM AIR SPRINGS. COMPONENT DAMAGE, INJURY OR DEATH CAN OTHERWISE RESULT.**

1. Lift axle until tires are free to spin.
2. Support the suspension with jack stands.
3. Scribe a line on center tread of each tire while rotating tires.
4. Use a trammel bar or tape measure to measure the distance between the scribed lines on the front side of the tires at spindle height.
5. Use a trammel bar or tape measure to measure the distance between the scribed lines on the back side of the tires at spindle height.
6. Subtract the distance between the front side and back side of the tires. This is the toe setting.  
Toe Setting = Rear Distance - Front Distance
7. If the toe setting is set in between 1/16" and 1/8", no adjustment is required. If the toe setting is set in more or less than the 1/16" to 1/8" range, refer to the Adjusting the Toe Setting section of this publication as adjustment is necessary.

## ADJUSTING THE TOE SETTING

1. Loosen the tie rod clamp bolts, stabilizer mounting u-bolts (if applicable) and nuts.
2. Rotate tie rod tube to provide a toe-in setting of 1/16" to 1/8".
3. Torque the clamp bolts to 50 ft-lbs.

## CAST KNUCKLE KINGPIN BUSHING REMOVAL

**NOTE:** A hydraulic press with a minimum forcing capacity of 2.5 tons (minimum press capacity of 5,000 psi or use an arbor press) is required.

**⚠ WARNING:** BEFORE APPLYING HYDRAULIC PRESSURE TO ANY TOOLING SETUP, 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.

1. Remove the grease cap retaining ring.
2. Install the backbone upside down in press. Be sure to support the backbone assembly so that it sits in-line with the press. (See Figure 30)
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.



Figure 30.

4. Use the same procedure to remove the kingpin bushing in the upper kingpin connection.
5. Clean the parts and then inspect before reassembling.

## CAST 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. The steering knuckle bore diameter is 1.938" +/- 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 31 through 32) If the average measurement is more than the knuckle bore maximum diameter specification, replace the knuckle.



Figure 31.



Figure 32.

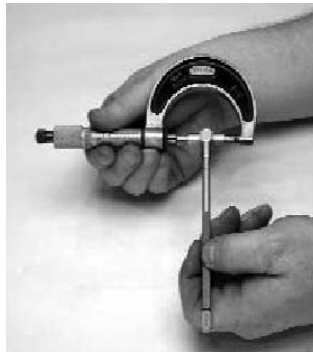


Figure 33.

## 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 backbone assembly, steering arm or upper kingpin connection in the press.
3. Install the kingpin bushing from the machined side (axle side) of the backbone using a bushing driver. Press in bushing to a depth of no less than 15/64" (.236") or 6 millimeters and no more than 5/16" (.32") or 8 millimeters. (See Figures 34 and 35)

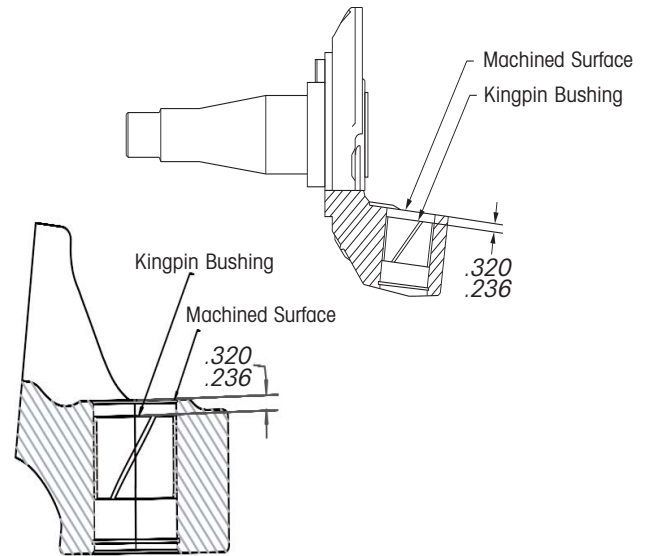


Figure 34.



Figure 35.

4. Following this procedure, it is necessary to ream the kingpin bushings to fit the kingpins. (See Kingpin Bushing Reaming Instructions.)

## KINGPIN BUSHING REAMING

**⚠ Caution:** 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 void the warranty.

**⚠ WARNING:** 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, LOSS OF WARRANTY, LOSS OF VEHICLE CONTROL, PERSONAL INJURY OR PROPERTY DAMAGE.**

1. Install the backbone assembly in a vise with brass jaws. 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 backbone until the blades touch the kingpin bushing.

**NOTE:** The bushing bore diameter is to be 0.001 larger than the kingpin diameter.

3. Rotate the reamer smoothly with light downward pressure. Do not apply too much pressure. (See Figure 36)

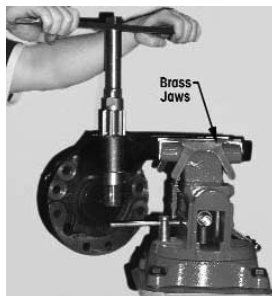


Figure 36.

4. Slide the reamer out of the bottom of the backbone 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 backbone / 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 LOSS OF VEHICLE CONTROL RESULTING IN PERSONAL INJURY OR PROPERTY DAMAGE.**

**NOTE:** The Hendrickson Genuine Part socket head cap screw (PN: 6110C125H4A8) comes with a pre-applied loctite compound.

8. Install the backbone 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 37 and 38)
10. If the bushing is too tight, repeat steps 1 through 9 until the proper clearance is achieved.



Figure 37.



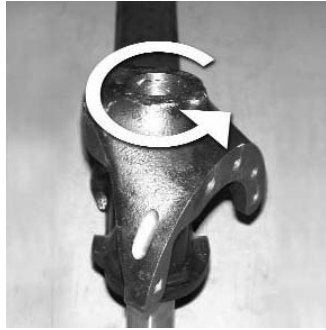


Figure 38.

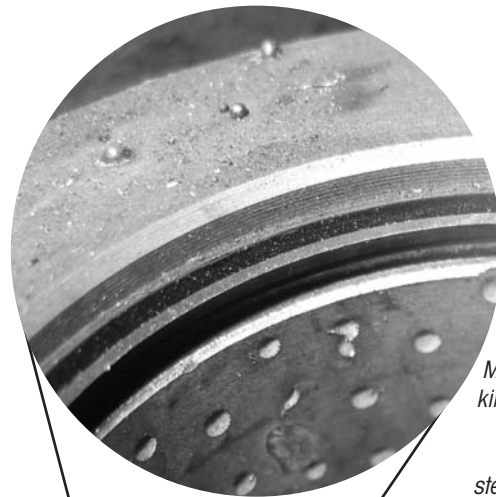
## KINGPIN SEAL INSTALLATION

1. Place the backbone in a vise with brass jaws or place on a suitable workbench. The backbone will have the machined surface facing up (axle side up).
2. Lay the kingpin seal into the bore of the backbone. The seal lip should face outward (toward the axle).
3. Use a bushing driver tool to press the seal firmly into the backbone.
4. Install the kingpin seal until it makes contact with the kingpin bushing. (See Figures 39 and 40)
5. Repeat steps 1 through 4 on the upper kingpin connection.

## 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 backbone assembly on the kingpin. It will be necessary to support the backbone assembly with a bottle jack and a block of wood under the backbone assembly.



Magnification of kingpin bushing and lip seal installed in steering knuckle.

Figure 39.

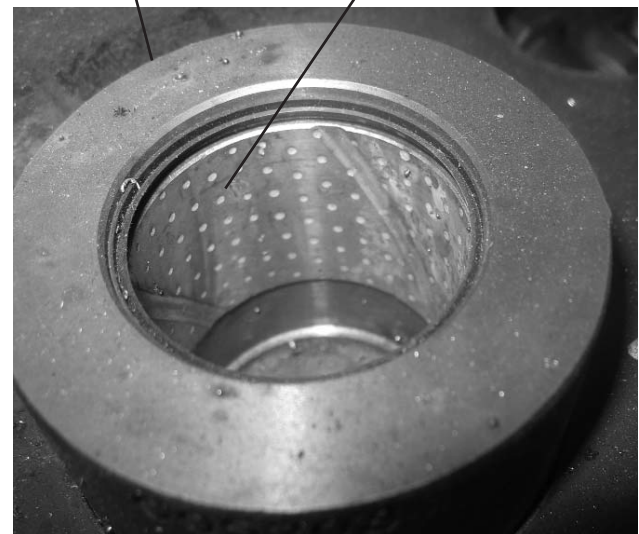


Figure 40.

**Hint:** The easiest way to install the knuckle is with the grease cap not installed in the backbone 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 backbone, thrust bearing and the bottom of the axle.
5. Install the upper kingpin connection on the upper kingpin. (See Figure 41)
6. Install the left and right brake backing plate bolts finger tight. These are for guide purposes only.

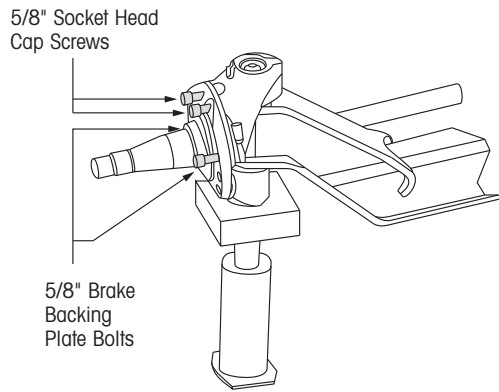


Figure 41.

**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.
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 42)
10. Remove the brake backing plate bolts and socket head cap screws. (See Figure 41)
11. Remove the upper kingpin connection.
12. Install the appropriate amount of shims to achieve 0.008" to 0.011" clearance between the upper kingpin connection and the top of the axle.



Figure 42.

**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 LOSS OF VEHICLE CONTROL RESULTING IN PERSONAL INJURY OR PROPERTY DAMAGE.**

15. Install the socket head cap screws and tighten to 175-200 ft-lbs torque.

**NOTE:** The Hendrickson Genuine Part socket head cap screws (PN: R-6110C125H4H8). Apply LocTite.

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.

## Vertical End Play

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

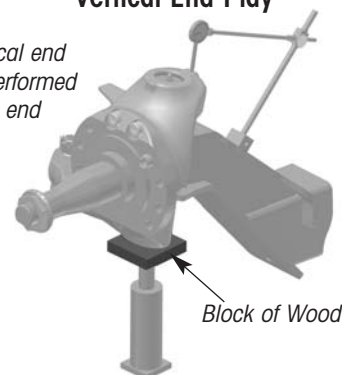


Figure 43.



- NOTES:

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## APPENDIX A

### RECOMMENDED BOLT TORQUES

Refer to suspension assembly drawings for bolt torque values.

### AUXILIARY SUSPENSION LOCATION

1. Locate your vehicle wheel base on the table below.
2. Follow the row to the right column that most closely represents your vehicle's front inside turn angle.

COMPOSILITE™ SUSPENSION LOCATION CHART

VEHICLE WHEEL BASE	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"

Table 1. Suspension Location Chart

3. The number in the front axle inside turn angle column (shaded area) is the maximum distance that the self-steer axle can be placed in front of the vehicle's rear tandem. (See Figure 44)

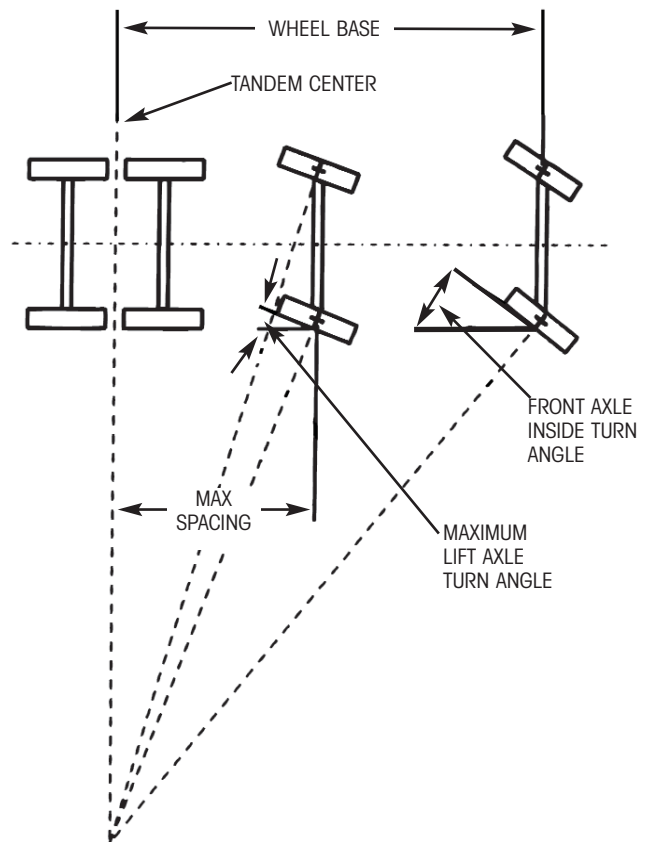


Figure 44. Maximum Auxiliary Suspension Spacing

### COMPOSILITE™ STEERABLE LIFT AXLE SPECIFICATIONS

MODEL	MAXIMUM CAPACITY (lbs.)	APPLICATION WEIGHT (lbs.)		RIDE HEIGHTS (inches +/- 1")
		Truck	Trailer (SCW)	
SC10	10,000	675	664	12.5 - 20.5
SC13	13,500	796	785	8.5 - 18.5
SC20	20,000	1,340	1,315	9.5 - 13.5
SCO13	13,500	856	N/A	8.5 - 18.5
SCO20	20,000	1,326	N/A	9.5 - 13.5
SCH10	10,000	1,133	N/A	10.5 - 20.5
SCR13	13,500	1,029	N/A	9.0 - 15.0

Table 2. Steerable Lift Axle Specifications

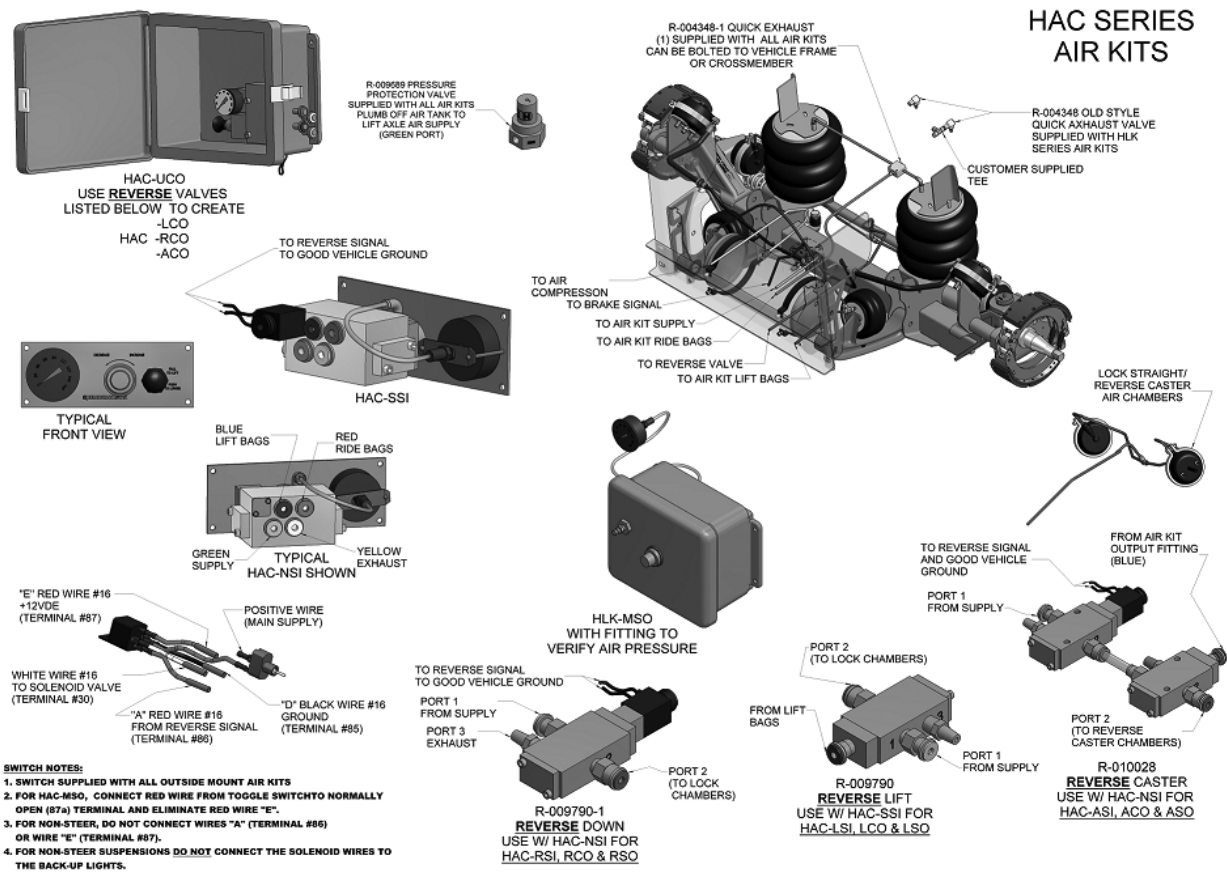


Figure 45. HAC Series Air Kit

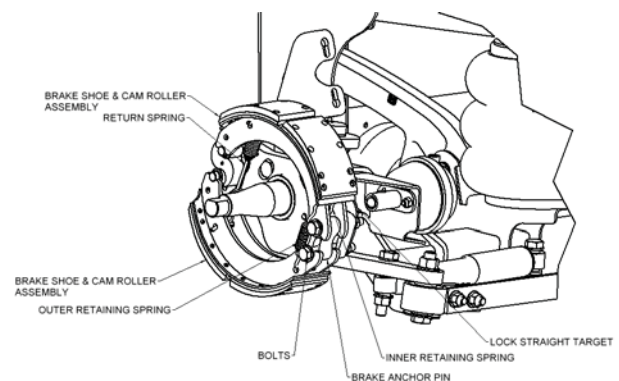
## APPENDIX B

### BRAKE REPLACEMENT

**⚠ WARNING: ADEQUATE SUSPENSION SUPPORT MUST BE PROVIDED! FAILURE TO PROVIDE ADEQUATE SUSPENSION SUPPORT COULD RESULT IN SERIOUS BODILY HARM OR FATAL INJURY. EYE PROTECTION STRONGLY RECOMMENDED**

For replacement brake kits, contact the Hendrickson Customer Service Department at (800) 660-2843

1. Raise and support the suspension to which the brakes are to be replaced. Remove wheel, brake drum and axle end components to expose the brake shoes.



2. Remove the outer retaining spring and inner retaining spring.





Figure 46. Removal of Outer and Inner Retaining Spring

3. Support the lower brake shoe assembly and remove the return spring. Set parts aside and remove the upper brake shoe.



Figure 47. Removal of Return Spring

4. Remove the brake bolts and brake anchor pin. If lock straight target is present, note position for proper reassembly location.



Figure 48. Removal of Brake Bolts and Anchor Pin

5. Replacement brake kit for each specific axle will have the necessary parts to be replaced. Discard worn or damaged parts. If a part is not included in the kit, contact customer service (800) 660-2843.
6. Install new parts in reverse order from step 4. Brake bolts through the anchor pin are to be installed with a torque of 160 ft-lbs.

When reinstalling the spring, be sure the spring is completely clipped into the mounting hole. Failure to do so could result in brake failure.



Figure 49. Spring Clipped Completely Into Mounting Hole

[www.hendrickson-intl.com](http://www.hendrickson-intl.com)



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