

TECHNICAL PROCEDURE

HTB™ 400LT for International Truck Vehicles

SUBJECT: Service Instructions

LIT NO: 17730-251

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SECTION 1

Introduction

This publication is intended to acquaint and assist maintenance personnel in the preventive maintenance, service, repair and rebuild of the HTB™ 400LT suspension system.

NOTE

Use only Genuine  Hendrickson parts for servicing this suspension system.

It is important to read and understand the entire Technical Procedure publication prior to performing any maintenance, service, repair, or rebuild of this product. The information in this publication contains parts lists, safety information, product specifications, features, proper maintenance, service, repair and rebuild instructions for the HTB 400LT Suspension.

Hendrickson reserves the right to make changes and improvements to its products and publications at any time. Contact Hendrickson Tech Services at 630.910.2800 or email techservices@hendrickson-intl.com for information on the latest version of this manual.

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

SECTION 2

Product Description

The HTB™ — Lightweight, non-torque reactive rear air suspension system combines superior ride, improved stability, reduced weight and reduced maintenance. Unique design and components make the HTB 400LT reliable and rugged, as well as the lightest suspension in its class. Weighing just 700 pounds, HTB 400LT saves up to 250 pounds compared to industry standard 40,000 pound capacity suspensions.

- **Air Springs** — HTB 400LT improves ride by as much as 34% over typical trailing-arm suspensions by supporting the entire load on large volume air springs. HTB 400LT also has a highly optimized motion ratio since the air spring and axle travel at the same rate.
- **Torque Box** — HTB 400LT's unique, maintenance-free torque box system improves multi-axial stability and control. The parallelogram design controls suspension windup and corresponding frame rise. Maintaining pinion angles throughout axle travel reduces suspension-induced driveline vibration and extends driveline component life.
- **Rubber Bushings** — All pivot points come equipped with premium rubber bushings requiring no lubrication. Torque box bushings are designed for long life.
- **U Bolts** — Re-torque of the clamp group reduced since no twisting is applied to the clamp group.
- **Axle Alignment** — The torque box, torque rods and clamp group joints provide consistent axle alignment and reduce the need for realignment.



HTB™ 400LT SPECIFICATIONS¹

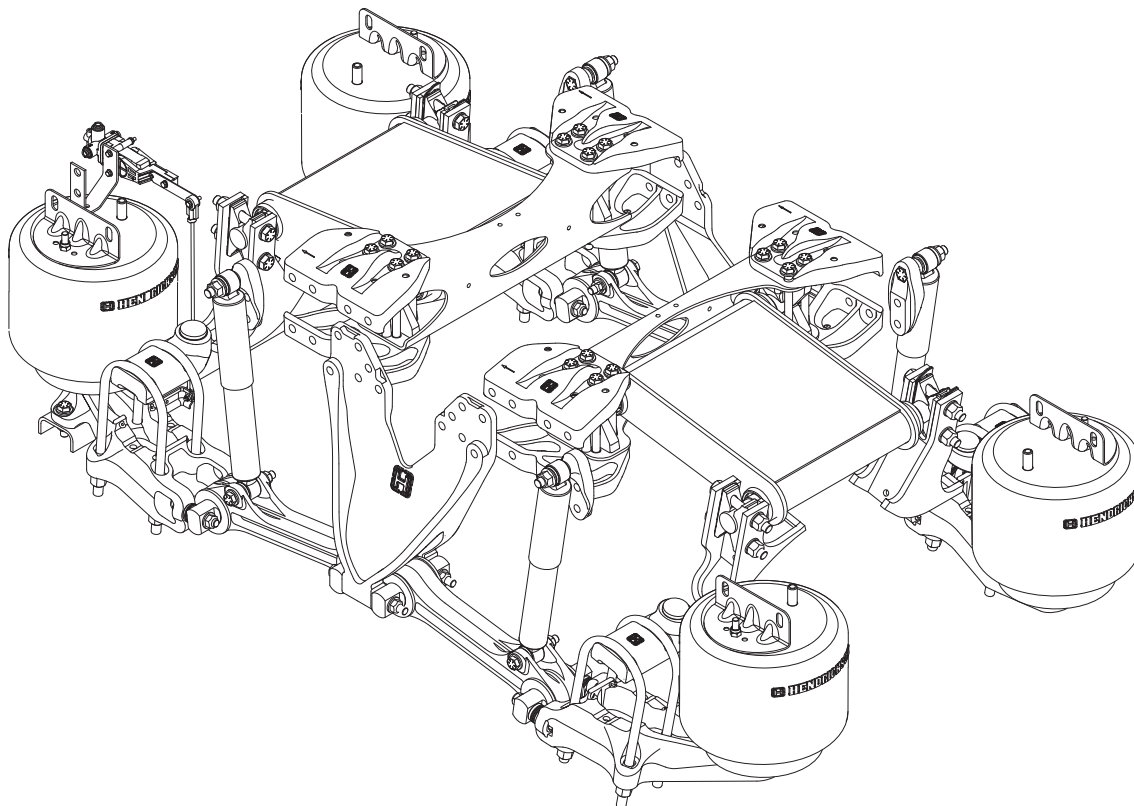
Capacity	40,000 lbs.
Installed Weight	700 lbs.
Off-highway Rating	10%
Axle Configuration	Tandem
GVW Approval	55,000 lbs.
GCW Approval	120,000 lbs.
Ride Heights	9.25"
Engine Torque Restrictions	None
Axle Spacing	52"
Applications ²	
General Freight (Van, Flatbed)	Yes
Refrigerated	Yes
Car Carrier	Yes
Bulk Hauler (Liquid, Dry)	Yes
Beverage	Yes
Dump ³	Yes

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

2 These are indicative of typical applications. Please contact your dealer or a Hendrickson service representative before using suspension on other applications.

3 Not for rock-body or mobile mix applications.

FIGURE 2-1 • HTB™ 400LT
LIGHTWEIGHT, NON-TORQUE REACTIVE REAR AIR SUSPENSION





SECTION 3

IMPORTANT SAFETY NOTICE

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

The warnings and cautions should be read carefully to help prevent personal injury and to assure that proper methods are used. Improper maintenance, service or repair may damage the vehicle, cause personal injury, render 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 that provided by the vehicle manufacturer before conducting any maintenance, service or repair.

EXPLANATION OF SIGNAL WORDS

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



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

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



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



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



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

NOTE	An operating procedure, practice condition, etc. which is essential to emphasize.
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SERVICE HINT	A helpful suggestion that will make the service being performed a little easier and/or faster. Also, note that particular service operations may require the use of special tools designed for specific purposes. These special tools can be found in the Special Tools Section of this publication.
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SAFETY PRECAUTIONS



WARNING

FASTENERS

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



WARNING

LOAD CAPACITY

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



WARNING

TORQUE BOX CLAMP BOLTS

IT IS IMPORTANT THAT THE TORQUE BOX CLAMP CONNECTIONS BE TIGHTENED IN THE PROPER SEQUENCE AND HAVE THE PROPER TIGHTENING TORQUE VALUES MAINTAINED. FAILURE TO DO SO CAN RESULT IN THE DEFORMATION OF PARTS, RESULTING IN THE LOSS OF CLAMP FORCE, BOLT FAILURE, LOSS OF THE AXLE'S ALIGNMENT, LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR PERSONAL INJURY.



WARNING

TORQUE BOX ALIGNMENT SHIMS

EACH AXLE HAS ONE (1) AXLE BRACKET WITH ADJUSTABLE BAR PIN CLAMPS AND FOUR (4) AXLE BRACKET SHIMS, AND ONE (1) AXLE BRACKET WITH NON-ADJUSTABLE BAR PIN CLAMPS. THE BAR PIN CLAMP PAIRS CAN BE CHANGED FROM SIDE TO SIDE BUT CANNOT BE MIXED. ALL FOUR (4) SHIMS MUST BE USED WITH THE ADJUSTABLE BAR PIN CLAMPS, WHICH ARE THINNER THAN THE NON-ADJUSTABLE BAR PIN CLAMPS. FAILURE TO DO SO CAN RESULT IN THE DEFORMATION OF PARTS, LOSS OF CLAMP FORCE, BOLT FAILURE, LOSS OF THE AXLE'S ALIGNMENT, LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR PERSONAL INJURY.



WARNING

U BOLT CLAMP GROUP CONNECTION

IT IS IMPORTANT THAT THE U BOLT CLAMP GROUP CONNECTION BE PROPERLY ALIGNED AND HAVE THE PROPER TIGHTENING TORQUE VALUES MAINTAINED. METAL SURFACES CAN WORK AND WEAR AGAINST OTHER RELATED CLAMP GROUP COMPONENTS IF NOT PROPERLY ALIGNED OR PROPERLY TIGHTENED TO MAINTAIN THE PROPER CLAMP FORCE. FAILURE TO DO SO CAN CAUSE PREMATURE COMPONENT WEAR, POSSIBLE SEPARATION OF THE CLAMP GROUP, CAUSING LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR PERSONAL INJURY.



WARNING

ALUMINUM COMPONENTS

THE HTB 400LT CONTAINS VARIOUS ALUMINUM COMPONENTS. EXERCISE EXTREME CARE WHEN HANDLING OR PERFORMING MAINTENANCE NEAR OR ON ALUMINUM COMPONENTS. DO NOT USE A CUTTING TORCH TO REMOVE ANY ATTACHING FASTENERS. THE USE OF HEAT ON SUSPENSION COMPONENTS WILL ADVERSELY AFFECT THE STRENGTH OF THESE PARTS. A COMPONENT DAMAGED IN THIS MANNER CAN RESULT IN THE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

ALUMINUM COMPONENTS WERE DESIGNED TO BE LIGHTWEIGHT OPTIONS WHERE WEIGHT REDUCTION IS DESIRABLE. THEIR USE SHALL BE CONFINED TO APPLICATIONS WHERE THE RATED CAPACITY OF THE SUSPENSION WILL NOT BE EXCEEDED. FAILURE TO LIMIT THE ALUMINUM COMPONENT APPLICATIONS TO RATED CAPACITY CAN RESULT IN FAILURE OF THE COMPONENT AND LOSS OF VEHICLE CONTROL, POSSIBLY CAUSING PERSONAL INJURY OR PROPERTY DAMAGE.

**WARNING****ALUMINUM COMPONENTS (continued)**

ALUMINUM COMPONENTS SUCH AS, TORQUE RODS, TORQUE ROD BAR PIN, CLAMP BLOCKS, AIR SPRING BRACKETS, FRAME HANGER, CROSS MEMBER GUSSETS, TOP PAD, CROSS BAR, ETC., CAN BE DAMAGED WITH PROLONGED EXPOSURE TO SALT, OR ACID. CONTINUED EXPOSURE CAN RESULT IN A FAILURE OF THESE PARTS AND LOSS OF VEHICLE CONTROL POSSIBLY CAUSING PERSONAL INJURY OR PROPERTY DAMAGE.

ALUMINUM COMPONENTS CAN ALSO BE DAMAGED BY CONTACT WITH HARD OBJECTS WHICH GOUGE THESE PARTS. THESE CONDITIONS COULD RESULT IN A FAILURE OF THESE PARTS WHICH CAN RESULT IN THE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

**DANGER****LONGITUDINAL TORQUE ROD**

THE AIR SPRING TRANSFERS LOAD TO THE FRAME HANGER THROUGH THE LONGITUDINAL TORQUE ROD. PRIOR TO LONGITUDINAL TORQUE ROD REMOVAL THE SUSPENSION AIR SYSTEM MUST BE DEFLATED. FAILURE TO DO SO WILL CAUSE THE AIR SPRING TO ROTATE AND/OR SHIFT, RESULTING IN POSSIBLE DAMAGE TO COMPONENTS AND/OR PERSONAL INJURY.

**WARNING****AIR SPRING INFLATION AND DEFLATION**

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

**CAUTION****AIR SPRING INFLATION**

INFLATE THE SUSPENSION SLOWLY, ENSURE THAT 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 AIR SPRING MOUNTING BRACKETS VOIDING WARRANTY.

**CAUTION****AIR SPRING DEFLATION**

IF THE AIR SPRING IS BEING REMOVED, IT IS MANDATORY TO LUBRICATE THE LOWER AIR SPRING FASTENERS WITH PENETRATING OIL AND REMOVE WITH HAND TOOLS TO PREVENT DAMAGE TO THE LOWER AIR SPRING MOUNTING STUD. FAILURE TO DO SO CAN CAUSE COMPONENT DAMAGE AND VOID WARRANTY.

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

DO NOT USE A CUTTING TORCH TO REMOVE ANY ATTACHING FASTENERS. THE USE OF HEAT ON SUSPENSION COMPONENTS WILL ADVERSELY AFFECT THE STRENGTH OF THESE PARTS.

**WARNING****MODIFYING COMPONENTS**

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



CAUTION

PROCEDURES AND TOOLS

A TECHNICIAN USING A SERVICE PROCEDURE OR TOOL WHICH HAS NOT BEEN RECOMMENDED BY HENDRICKSON MUST FIRST SATISFY HIMSELF THAT NEITHER HIS SAFETY NOR THE VEHICLE'S SAFETY WILL BE JEOPARDIZED BY THE METHOD OR TOOL SELECTED. INDIVIDUALS DEVIATING IN ANY MANNER FROM THE INSTRUCTIONS PROVIDED WILL ASSUME ALL RISKS OF CONSEQUENTIAL PERSONAL INJURY OR DAMAGE TO EQUIPMENT INVOLVED.



WARNING

SHOCK ABSORBERS

THE SHOCK ABSORBERS ARE THE REBOUND TRAVEL STOPS FOR THE SUSPENSION. ANYTIME THE AXLE ON A HTB 400LT SUSPENSION IS SUSPENDED IT IS MANDATORY THAT THE SHOCK ABSORBERS REMAIN CONNECTED. FAILURE TO DO SO CAN CAUSE THE AIR SPRINGS TO SEPARATE FROM THE PISTON AND RESULT IN PREMATURE AIR SPRING FAILURE. REPLACEMENT OF SHOCK ABSORBERS WITH NON-HENDRICKSON PARTS CAN ALTER THE REBOUND TRAVEL OF THE SUSPENSION.



WARNING

PERSONAL PROTECTIVE EQUIPMENT

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



WARNING

PARTS CLEANING

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

1. WEAR PROPER EYE PROTECTION.
2. WEAR CLOTHING THAT PROTECTS YOUR SKIN.
3. WORK IN A WELL-VENTILATED AREA.
4. DO NOT USE GASOLINE OR SOLVENTS THAT CONTAIN GASOLINE. GASOLINE CAN EXPLODE.
5. ACIDIC SOLUTIONS CANNOT BE USED ON ALUMINUM COMPONENTS.
6. HOT SOLUTION TANKS OR ALKALINE SOLUTIONS MUST BE USED CORRECTLY. FOLLOW THE MANUFACTURER'S RECOMMENDED INSTRUCTIONS AND GUIDELINES CAREFULLY TO HELP PREVENT PERSONAL ACCIDENT OR INJURY. DO NOT USE HOT SOLUTION TANKS OR WATER AND ALKALINE SOLUTIONS TO CLEAN GROUND OR POLISHED PARTS. DOING SO WILL CAUSE DAMAGE TO THE PARTS AND VOID WARRANTY.



WARNING

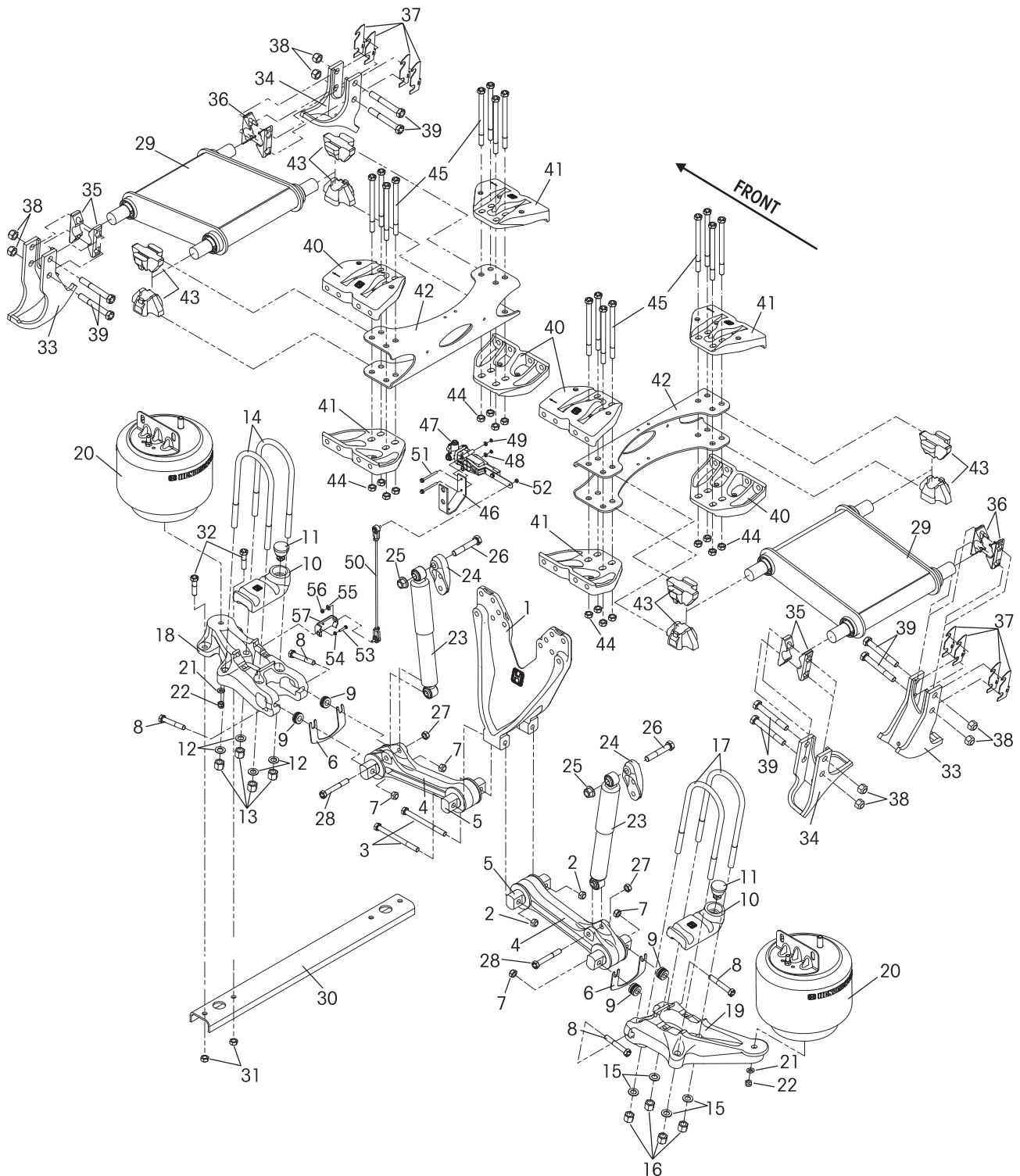
JACKING METHODS

IMPROPER JACKING METHODS CAN CAUSE STRUCTURAL DAMAGE AND RESULT IN LOSS OF VEHICLE CONTROL, SEVERE PERSONAL INJURY OR DEATH AND WILL VOID HENDRICKSON'S WARRANTY.

- DO NOT USE THE SUSPENSION CROSS BAR AS A JACKING POINT.
- REFER TO VEHICLE MANUFACTURER FOR PROPER JACKING INSTRUCTIONS.

SECTION 4

HTB 400LT Parts List





KEY NO.	PART NO.	DESCRIPTION	NO.REQ.	KEY NO.	PART NO.	DESCRIPTION	NO.REQ.
1	65700-000	Frame Hanger	2	27		*5/8"-18 UNF Lower Shock Mount Flange Locknut	4
2		*5/8"-18 UNF Frame Hanger Flange Locknut	4	28		*5/8"-18 UNF 4.5" Lower Shock Mount Hex Bolt	4
3		*5/8"-18 UNF 7.5" Frame Hanger Hex Bolt	4	29	64785-001	Torque Box Assembly	2
4	64768-398	Torque Rod Assembly (Includes Key No. 5)	4	30	65890-001	Cross Bar	1
5	64664-000L	**Torque Rod Bushing	8	31		*5/8"-18 UNF Cross Bar Flange Locknut	4
6		Torque Rod Shims	As Req'd.	32		*5/8"-18 UNF 2.5" Cross Bar Flange Hex Bolt	4
	65640-001	0.030"		33		*Tall Axle Bracket	2
	65640-002	0.060"		34		*Short Axle Bracket	2
	65640-003	0.120"		35	66174-000	Axle Bracket Bar Pin Clamp, Non-Adjustable	4
7		*5/8"-18 UNF Torque Rod Flange Locknut	8	36	66274-000	Axle Bracket Bar Pin Clamp, Adjustable	4
8		*5/8"-18 UNF Torque Rod Hex Bolt (See matrix for length)	8	37	65737-001	Axle Bracket Shims (3/32")	8
9	66193-00X	Pinion Spacer (See matrix)		38		*3/4"-16 UNF Axle Bracket Flange Locknut	8
10	65708-000	Axle Top Pad Assembly (Includes Key No. 11)	4	39		*3/4"-16 UNF 5.5" Axle Bracket Hex Bolt	8
11	64080-000	Axle Stop	4	40	65705-001	LH Top, RH Bottom	4
	48718-115	U Bolt Fastener Kit Front (Includes Key Nos. 12-14)	1	41	65705-002	LH Bottom, RH Top	4
12	22962-001	3/4" Hardened Flat Washer	8	42	64970-000	Cross Member C-Channel	2
13	49685-000	3/4"-16 UNF U Bolt Locknut	8	43	65144-000	Cross Member Bar Pin Clamp	8
14	64102-001	3/4"-16 UNF 13.5" U Bolt	4	44		*5/8"-18 UNF Cross Member Flange Locknut	16
	48718-116	U Bolt Fastener Kit Rear (Includes Key Nos. 15-17)	1	45		*5/8"-18 UNF 8.75" Cross Member Hex Bolt	16
15	22962-001	3/4" Hardened Flat Washer	8	46		*Height Control Valve Bracket	1
16	49685-000	3/4"-16 UNF U Bolt Locknut	8	47		*Height Control Valve	1
17	64102-002	3/4"-16 UNF 14.0" U Bolt	4	48		*M6 Washer	2
18		Lower Air Spring Bracket Front (See matrix)	2	49		*M6 Locknut	2
	65638-001	LH-2°-5° Pinion Angle		50		*Linkage Assembly	1
	65638-002	RH-2°-5° Pinion Angle		51		*M6 x 70mm Bolt	2
19		Lower Air Spring Bracket Rear (See matrix)	2	52		*1/4"-20 UNC Nut	1
	64764-001	LHR-11°-13° Pinion Angle		53		*M6 x 25mm Bolt	1
	65698-001	LHR-8°-10° Pinion Angle		54		*M6 Washer	1
	64764-002	RHR-11°-13° Pinion Angle		55		*1/4" Washer	1
	65698-002	RHR-8°-10° Pinion Angle		56		*1/4"-20 UNC Nut	1
20	60977-002L	Air Spring Assembly	4	57		*Lower HCV Linkage Mounting Bracket	1
	49177-006	Air Spring Fastener Kit (Includes Key Nos. 21-22)	4				
21	22962-014	1/2" Hardened Flat Washer	4				
22	17700-010	1/2"-13 UNC Nylon Locknut	2				
23	60657-006	Shock Absorber	4				
24	65000-002	Shock Absorber Frame Bracket	4				
	50754-022	Upper Shock Mount Fastener Kit (Includes Key Nos. 25-26)	4				
25	66137-000	3/4"-10 UNC Flange Locknut	1				
26	50764-010	3/4"-10 UNC 4.25" Hex Bolt	1				

NOTE:

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

** Easy HTB torque rod bushing replacement can be done using the Hendrickson Torque Rod Bushing Assembly Tool (Funnel), Part No. 66086-000.

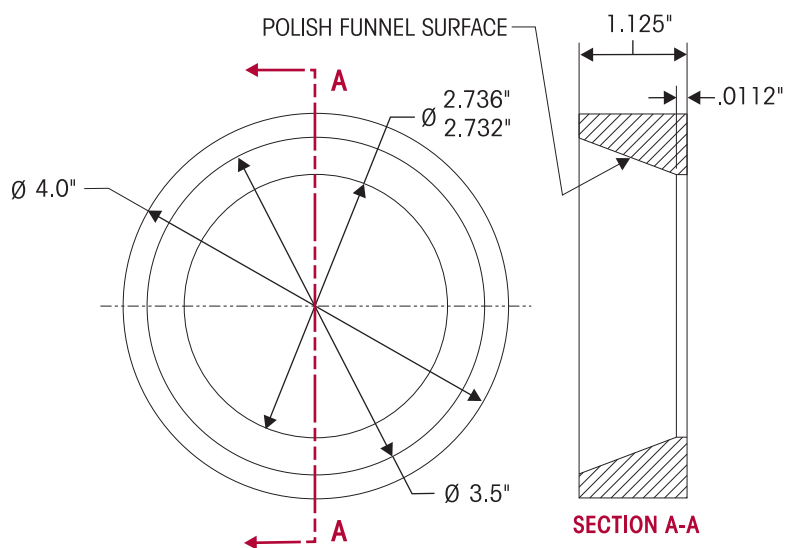
HTB 400LT PINION ANGLE MATRIX						
	PINION ANGLE	KEY NO. 18, 19		KEY NO. 9		KEY NO. 8
		AIR SPRING BRACKET	AIR SPRING BRACKET	PINION SPACER NO.	PINION SPACER THICKNESS	BOLT LENGTH
		LH	RH			
FRONT	2.0°	65638-001	65638-002	None	None	4.00"
	3.0°			66193-001	8mm	4.25"
	4.0°			66193-002	16mm	4.50"
	5.0°			66193-003	24mm	5.00"
REAR	8.0°	65698-001	65698-002	66193-003	24mm	5.00"
	9.0°			66193-002	16mm	4.50"
	10.0°			66193-001	8mm	4.25"
REAR	11.0°	64764-001	64764-002	66193-003	24mm	5.00"
	12.0°			66193-002	16mm	4.50"
	13.0°			66193-001	8mm	4.25"

SECTION 5

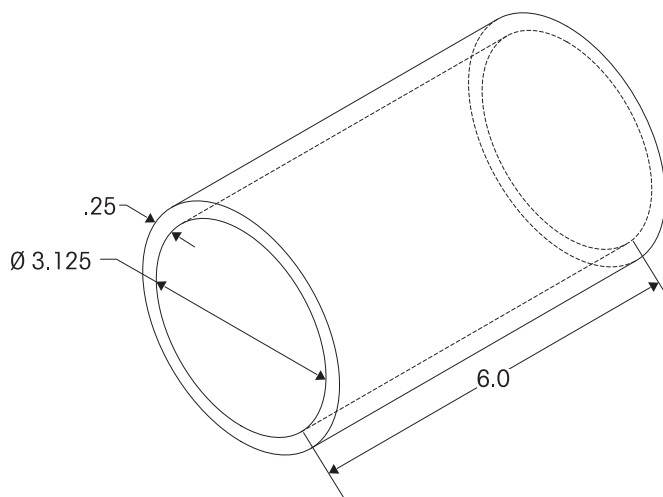
Special Tools

TORQUE ROD BUSHING ASSEMBLY TOOL (FUNNEL)

PART NO. 66086-000



TORQUE ROD BUSHING RECEIVING TOOL





SECTION 6

Preventive Maintenance

VISUAL INSPECTION

A visual inspection of the suspension should be performed every 25,000 miles or every six months, whichever comes first, to help insure all components function to their highest efficiency.

- **Wear and damage** — Inspect all parts of the suspension for wear and damage. Look for bent or cracked parts. Replace all worn or damaged parts.
- **Air spring** — Inspect air springs for chafing or any signs of air spring or component damage. Insure that the upper bead plate is tight against the underside of the frame. Check for any lateral slippage at the lower air spring bracket. Slippage of $\frac{1}{8}$ " in either direction is acceptable. Replace all worn or damaged parts.
- **Fasteners** — Look for any loose or damaged fasteners on the entire suspension. Make sure all fasteners are tightened to a torque value within the specified torque range. See Torque Specification Chart in this publication for Hendrickson recommended torque requirements. Use a calibrated torque wrench to check torque in the tightening direction. As soon as the fastener starts to move, record the torque. Correct the torque if necessary. Replace any worn or damaged fasteners.

NOTE

Hendrickson recommends the use of Grade 8 bolts and Grade C locknuts for all suspension component attachments.

- **Air spring bracket** — Check the overall condition of the upper and lower air spring brackets for dents, dings, cracks or other damage. Check the cross bar on the front lower air spring bracket (if equipped) for dents, dings, cracks or other damage. Check for any signs of looseness in the clamp group. Check all fasteners for proper torque. Replace all worn or damaged parts.
- **Frame hanger bracket** — Inspect the frame hanger bracket for any signs of loosening or damage. Inspect all fasteners securing the frame hanger bracket to the frame rails as well as the longitudinal torque rod mounting fasteners. Check all fasteners for proper torque. Replace all worn or damaged parts.
- **Cross member and gussets** — Inspect the cross member and gussets for any signs of loosening or damage. Inspect the bar pin clamp blocks for any signs of looseness or movement. Check all fasteners for proper torque. Replace all worn or damaged parts.
- **Shock absorbers** — Look for any signs of dents or leakage. Misting is not considered a leak. See Shock Absorber Inspection in this section.
- **Tire wear** — Inspect the tires for wear patterns that may indicate suspension damage or misalignment. Replace all worn or damaged parts. Verify proper alignment and correct as necessary.
- **S-cam support tube bracket** (if equipped) — Inspect the S-cam support tube brackets for damage. Check all fasteners for proper torque. Replace all worn or damaged parts.
- **Height control valve and air lines** — Check the suspension air system for air leaks. Check all air lines for proper routing. Check for chafing or pinched air lines. Check the height control valve linkage for damage or interference with peripheral components. Replace all worn or damaged parts.

- **Top pad and rubber axle stop** — Look for cracks and or missing rubber axle stops. The rubber axle stop is exposed to contact forces in extreme jounce conditions. It will be necessary to visually inspect the rubber axle stop for wear at the specified inspection interval. The rubber axle stop must be replaced when the contact rubber is worn down to a $\frac{1}{16}$ " above the bump stop pedestal. See the Component Replacement Section of this publication for replacement.

U BOLT LOCKNUTS

1. U Bolt locknuts must be re-torqued to specification at preparation for delivery.
2. U Bolt locknuts must be re-torqued at 1,000 miles or first service interval.
3. Thereafter, follow annually or 100,000 mile inspection and re-torque interval.

NOTE

Current Hendrickson Truck Suspension Systems U Bolt clamp group hardware for the HTB 400LT suspension are $\frac{3}{4}$ "-16 UNF Grade C high locknuts and $\frac{3}{4}$ "-16 UNF Grade 8 U Bolts are phosphate and oil coated.


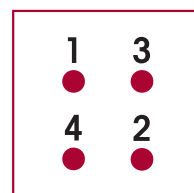
Tighten the U Bolt locknuts evenly in 50 foot pounds increments to  350-400 foot pounds torque in the proper pattern to achieve uniform bolt tension as shown in Figure 6-1.

FIGURE 6-1



WARNING

IT IS IMPORTANT THAT THE U BOLT CLAMP GROUP CONNECTION BE PROPERLY ALIGNED AND HAVE THE PROPER TIGHTENING TORQUE VALUES MAINTAINED. METAL SURFACES CAN WORK AND WEAR AGAINST OTHER RELATED CLAMP GROUP COMPONENTS IF NOT PROPERLY ALIGNED OR PROPERLY TIGHTENED TO MAINTAIN THE PROPER CLAMP FORCE. FAILURE TO DO SO CAN CAUSE PREMATURE COMPONENT WEAR, POSSIBLE SEPARATION OF THE CLAMP GROUP, CAUSING LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR PERSONAL INJURY.

TORQUE BOX

It is important to inspect the torque box during preventive maintenance service. Visually inspect the torque box for cracks, damage, torn or shredded rubber, or any signs of looseness at the bar pin clamps. Replace all worn or damaged parts. The torque box is a non-serviceable item and must be replaced as an assembly, if damaged, or the bushings are worn out. Check all fasteners for proper torque, see Tightening Torque Specifications Section of this publication.

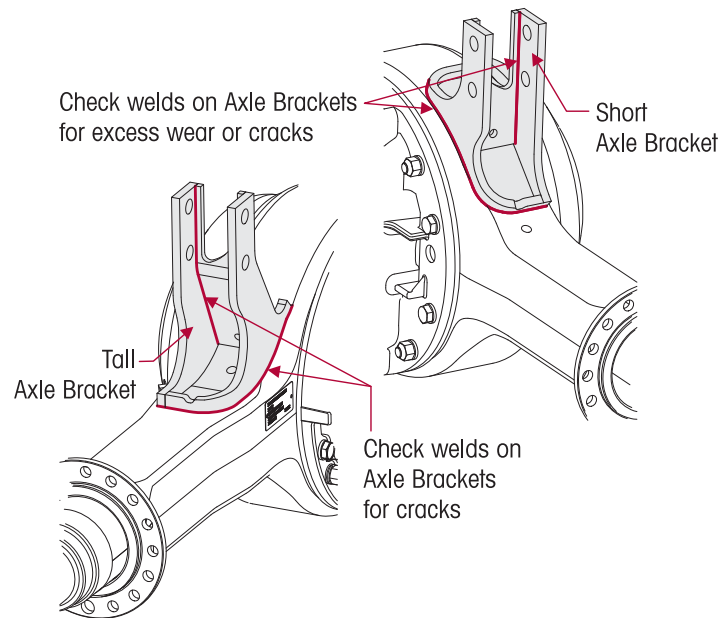
AXLE BRACKETS

Due to the complexity and importance of the axle bracket-to-axle weld, the axle brackets and the axle housing are non-serviceable items. If the axle brackets show excessive wear or the welds have cracks, the axle housing assembly (includes axle brackets) must be replaced.

1. Inspect the axle brackets for signs of excessive wear. Check the welds for signs of cracking. see Figure 6-2.
2. Inspect the axle bracket to axle weld for signs of cracking, see Figure 6-2.

If damaged, excessive wear, or cracking is detected on any of these inspections, the axle housing assembly must be replaced.

FIGURE 6-2



LATERAL ALIGNMENT INSPECTION

The torque box maintains lateral alignment of the drive axles and controls axle walkout during cornering. If the lateral alignment of the drive axles is incorrect, it may be necessary to align the torque box and/or the axle. See Lateral Alignment in the Alignment & Adjustments Section of this publication.

LONGITUDINAL TORQUE RODS

The longitudinal torque rods, air spring brackets, pinion spacers, and the torque box, maintain driveline angles while controlling acceleration, cornering, and braking forces. All torque rods and mounting hardware should be inspected for damage and proper fastener torque every six months. Follow the vehicle manufacturer's specifications for tightening torque values.



DANGER

THE AIR SPRING TRANSFERS LOAD TO THE FRAME HANGER THROUGH THE LONGITUDINAL TORQUE ROD. PRIOR TO LONGITUDINAL TORQUE ROD REMOVAL THE SUSPENSION AIR SYSTEM MUST BE DEFLATED. FAILURE TO DO SO WILL CAUSE THE AIR SPRING TO VIOLENTLY SHIFT, RESULTING IN POSSIBLE DAMAGE TO COMPONENTS AND/OR PERSONAL INJURY.

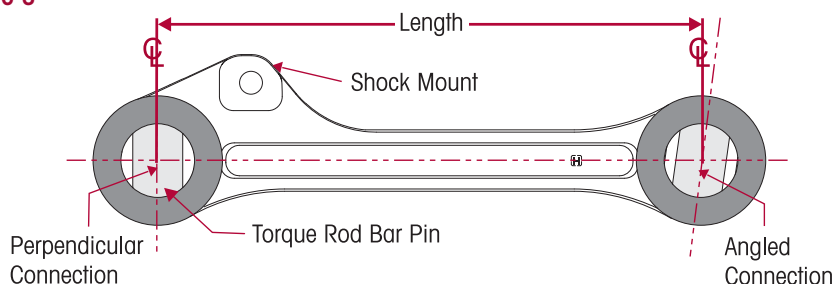
INSPECTION

1. Chock the wheels.
2. Support the frame.
3. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system.
4. Disconnect the height control linkage assembly from the height control valve lever. Lower the height control valve lever to exhaust the air in the air springs and deflate the rear suspension. (See vehicle manufacturer's instructions).
5. Visually inspect the following:
 - a. The torque rods for cracks, bends, breaks, or end hubs, which are elongated or oval. Any of these conditions require torque rod replacement.
 - b. The torque rod bushings for torn or shredded rubber. Any of these conditions require torque rod bushing replacement.
 - c. The torque rod assembly for movement while applying pressure with a long pry bar to each torque rod end. If movement is detected, replace torque rod bushings and/or torque rod as required.

To replace the torque rod, or the torque rod bushings, see the Component Replacement Section of this publication.

6. See Air Spring Warnings and instructions in the important Safety Notice section of this publication prior to inflating or deflating the suspension system.
7. Inflate the suspension by raising the height control valve lever.
8. Reconnect the height control linkage assembly to the height control valve lever by sliding the rubber grommet onto the stud.
9. Remove the frame supports.
10. Remove the wheel chocks.
11. Verify the vehicle is at the correct ride height. Correct as necessary. Refer to Ride Height Adjustment in the Alignment & Adjustment section of this publication.

FIGURE 6-3



RIDE HEIGHT INSPECTION

NOTE

All ride height measurements must be conducted on the axle spindle adjacent to the height control valve. Measuring at other points will cause an inaccurate reading.

1. Use a work bay with a level surface.
2. Relax the suspension by slowly moving the vehicle back and forth several times in a straight line without using the brakes. This will slacken or loosen the suspension as the vehicle is positioned. End with all wheels positioned straight ahead. Try to roll to a stop without the brakes being applied. **DO NOT** set the parking brake.
3. Chock the front wheels of the vehicle.
4. Verify and maintain the air system at full operating pressure.
5. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system.
6. Cycle the suspension using method A or B.

METHOD A — If equipped with a suspension dump system in the cab

Cycle the suspension air system by using the cab dump valve. Completely exhaust air from the suspension system. Inflate the suspension air system and allow several minutes for the suspension to stabilize prior to measuring suspension ride height.

METHOD B

Disconnect the height control linkage assembly from the height control valve lever. Lower the height control valve lever to exhaust the air in the air springs and deflate the rear suspension. (See vehicle manufacturer's instructions). Reconnect the height control valve lever to the height control valve linkage assembly to inflate the suspension. Allow several minutes for the suspension to stabilize, see Figure 6-4.

7. Measure vehicle ride height using Method C or D.

METHOD C — Reference ride height measuring shock absorber length

- a. Using a tape measure, measure the referenced vertical ride height on the front drive axle from the centerline of the upper shock mounting bolt to the centerline of the lower shock mounting bolt.
- b. The referenced ride height measurement is $18\frac{1}{2}" \pm \frac{1}{8}"$ (See dimension "A" in Figure 6-5).
- c. If the ride height is not within this range the ride height will need to be corrected. See Ride Height Adjustment in the Alignment & Adjustments Section of this publication.

METHOD D — Design ride height

- a. Measure from the bottom of the frame rail to the axle centerline.
- b. The ride height dimension should be $9\frac{1}{4}" \pm \frac{1}{8}"$. (See dimension "B" in Figure 6-5)
- c. If the ride height is not within this range the ride height will need to be corrected. See Ride Height Adjustment in the Alignment & Adjustments Section of this publication.

Figure 6-4

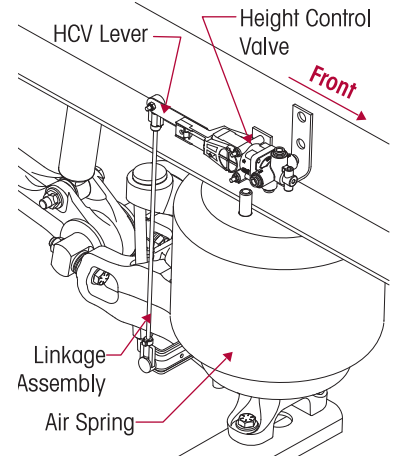
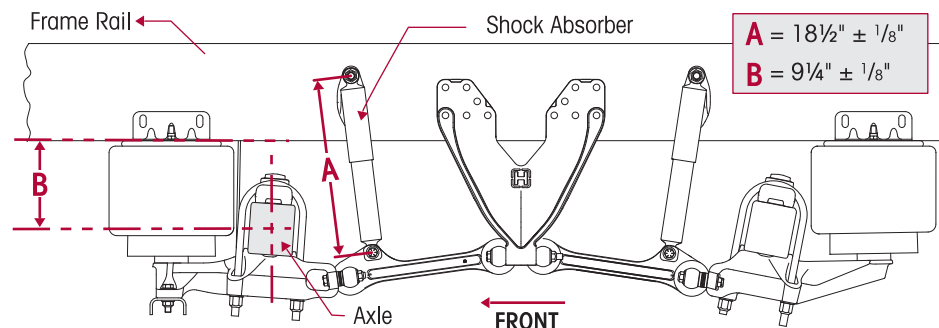


FIGURE 6-5



AIR FITTING INSPECTION

1. If an air leak is suspected, begin by building up the air system to normal operating pressure.
2. Spray all nylon tube air fittings with a soapy water solution to detect the leak location.

NOTE

Air lines and fittings may be inspected for leaks using a soapy water solution. The height control valve, however, cannot be inspected using this method. All height control valves have an allowable leakage rate. The only acceptable method for inspection of the height control valves is the height control valve test found in this section.

3. If an air leak is located, ensure the tubing end is clean and in good condition and the end is cut square. Check to see if the tubing is binding, being pulled upon or bent.
4. Visually inspect the air fittings for signs of damage or contamination.

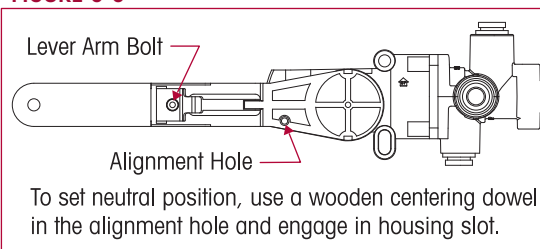
HEIGHT CONTROL VALVE TEST

NOTE

These components are not supplied by Hendrickson. Hendrickson is not responsible for components supplied by the vehicle manufacturer. For assistance with maintenance and rebuild instructions on these components see vehicle manufacturer.

1. With a minimum of 90 psi at the supply port, rotate the lever up (as indicated on the side of the valve) 30° to 45°. Air should begin to flow into the air springs within seconds.
2. Rotate the lever to the neutral position. Air flow should stop.
3. Rotate the lever down 30° to 45°. Air should begin to exhaust from the air springs within seconds.
4. Rotate the lever to the neutral position. Air flow should stop.
5. If the valve fails to flow air or shut off as specified, replace the valve with a new one.
6. Replace the height control valve, if the:
 - Height control valve did not pass the test procedure
 - Excessive leakage from the height control valve
 - Height control valve is damaged

FIGURE 6-6



SHOCK ABSORBER INSPECTION

Hendrickson uses a long service life, premium shock absorber on all HTB 400LT suspensions. If shock absorber replacement is necessary, Hendrickson recommends that the shock absorbers be replaced with identical Hendrickson Genuine parts for servicing. Failure to do so will affect the suspension performance, durability, and will void the warranty.

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

HEAT TEST

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



WARNING

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

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

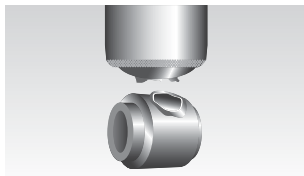
FIGURE 6-7



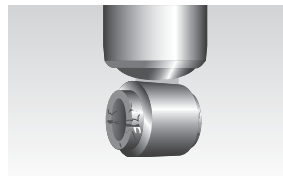
VISUAL INSPECTION

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

FIGURE 6-8



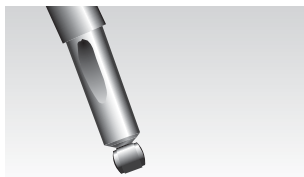
Damaged upper or lower mount



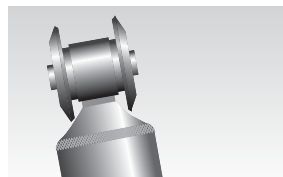
Damaged upper or lower bushing



Damaged dust cover and/or shock body



Bent or dented shock



Improper installation
example: Washers installed
backwards (if equipped)

LEAKING VS. MISTING SHOCK VISUAL INSPECTION

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

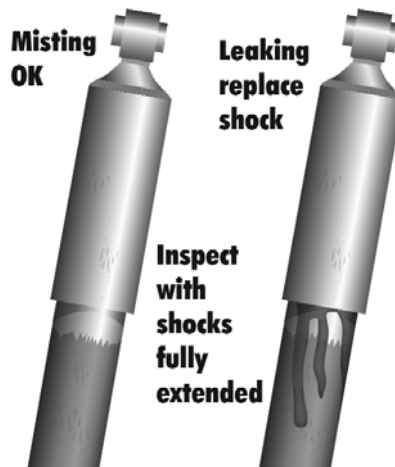
FIGURE 6-9

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

NOTE

The HTB 400LT suspension is equipped with a premium seal on the shock, however this seal will allow for misting to appear on the shock body (misting is not a leak and is considered acceptable).

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



SECTION 7

Alignment & Adjustments

RIDE HEIGHT ADJUSTMENT

The HTB 400LT suspension is equipped with a height control valve (supplied by the vehicle manufacturer), located above the front, left air spring, on the inside of the left frame rail. Please refer to the Plumbing Diagram Section of this publication.

1. Use a work bay with a level surface.
2. Relax the suspension by slowly moving the vehicle back and forth several times in a straight line without using the brakes. This will slacken or loosen the suspension as the vehicle is positioned. End with all wheels positioned straight ahead. Try to roll to a stop without the brakes being applied. **DO NOT** set the parking brake.
3. Chock the front wheels of the vehicle.
4. Verify and maintain the air system at full operating pressure.
5. See Air Spring Warnings and Instructions in the Important Safety Notice Section of this publication prior to inflating or deflating the suspension system.

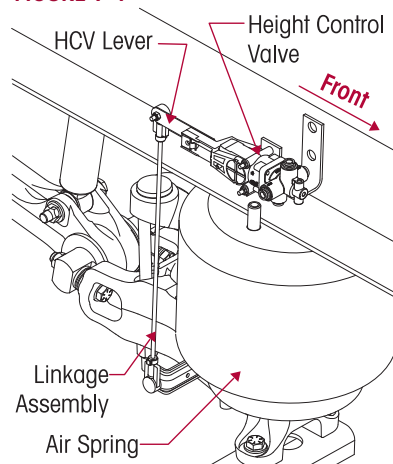
NOTE

The cycling of the height control valve will help make the adjustment more accurate. Be sure to maintain full system air pressure while setting or inspecting ride height.

NOTE

During cycle operation of the height control valve it is normal to experience a limited amount of exhaust noise.

FIGURE 7-1



6. Cycle the suspension using Method A or B.

METHOD A — If equipped with a suspension dump system in the cab

Cycle the suspension air system by using the cab dump valve. Completely exhaust air from the suspension system. Inflate the suspension air system and allow several minutes for the suspension to stabilize prior to measuring suspension ride height.

METHOD B

Disconnect the height control linkage assembly from the height control valve lever. Lower the height control valve lever to exhaust the air in the air springs and deflate the rear suspension. (See vehicle manufacturer's instructions). Reconnect the height control valve lever to the height control valve linkage assembly to inflate the suspension. Allow several minutes for the suspension to stabilize, see Figure 7-1.

7. Measure vehicle ride height using Method C or D.

METHOD C — Reference ride height measuring shock absorber length

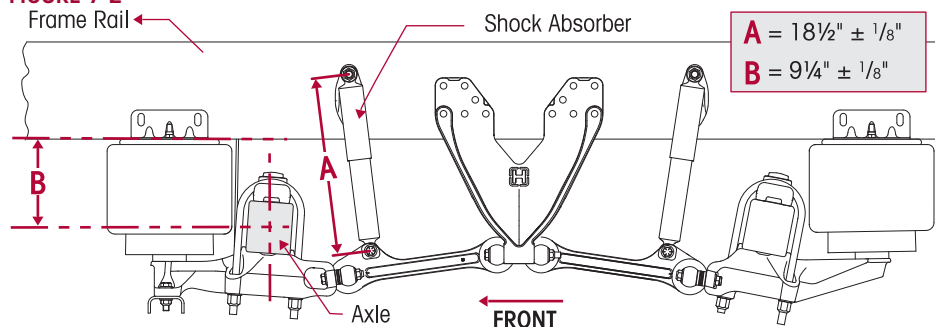
- a. Using a tape measure, measure the referenced vertical ride height on the front drive axle from the centerline of the upper shock mounting bolt to the centerline of the lower shock mounting bolt.
- b. The referenced ride height measurement is $18\frac{1}{2}'' \pm \frac{1}{8}''$ (See dimension "A" in Figure 7-2)
- c. If the ride height is not within this range the ride height will need to be corrected.

METHOD D — Design ride height

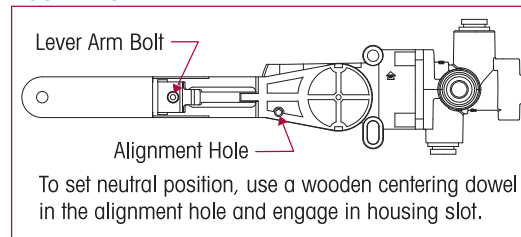
- Measure from the bottom of the frame rail to the axle centerline.
- The ride height dimension should be $9\frac{1}{4}'' \pm \frac{1}{8}''$. (See dimension "B" in Figure 7-2)
- If the ride height is not within this range the ride height will need to be corrected.

NOTE

If an adjustment is required, verify and maintain the air system at full operating pressure.

FIGURE 7-2

- See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system.
- Disconnect the height control linkage assembly from the height control valve lever. Lower the height control valve lever to exhaust the air in the air springs and deflate the rear suspension. (See vehicle manufacturer's instructions).
- Refill the suspension by raising the height control valve lever by hand, so that the suspension is at the proper ride height.

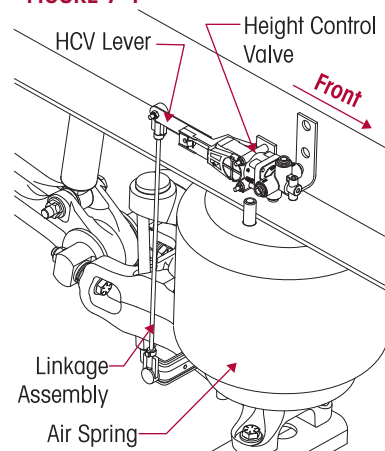
FIGURE 7-3

- To set neutral position, use a wooden centering dowel (golf tee) in the alignment hole and engage in housing slot, as shown in Figure 7-3. **DO NOT USE A METAL ROD OR NAIL AS THIS MAY CAUSE DAMAGE TO THE HEIGHT CONTROL VALVE.**

- Loosen the lever arm bolt.
- Pivot the lever arm as needed until the height control linkage can be connected.
- Tighten the lever arm bolt on the height control valve to vehicle manufacturer's specifications, see Figure 7-4.
- Remove the wooden centering dowel (golf tee) from the height control valve.

NOTE

The cycling of the height control valve will help make the adjustment more accurate. Be sure to maintain full system air pressure while setting or inspecting ride height.

FIGURE 7-4

**NOTE**

During cycle operation of the height control valve it is normal to experience a limited amount of exhaust noise.

16. Cycle the suspension air system using Method A or Method B as detailed in Step 6.
17. Recheck the ride height.
18. Repeat Steps 8 through 17 until the ride height is within specification.

AXLE ALIGNMENT AND ADJUSTMENTS

ALIGNMENT

Checking and correcting alignment involves performing the following Steps in the sequence listed.

STEP	DESCRIPTION	COMMENTS
A	Preparing the vehicle	
B	Measuring the lateral alignment of the torque box	
C	Correcting torque box lateral alignment	(if necessary)
D	Measuring the lateral alignment of the axle	
E	Correcting lateral alignment of the axle	(if necessary)
F	Measuring axle thrust angle	
G	Correcting axle thrust angle	(if necessary)
H	Final Torque	(if adjustments were made)

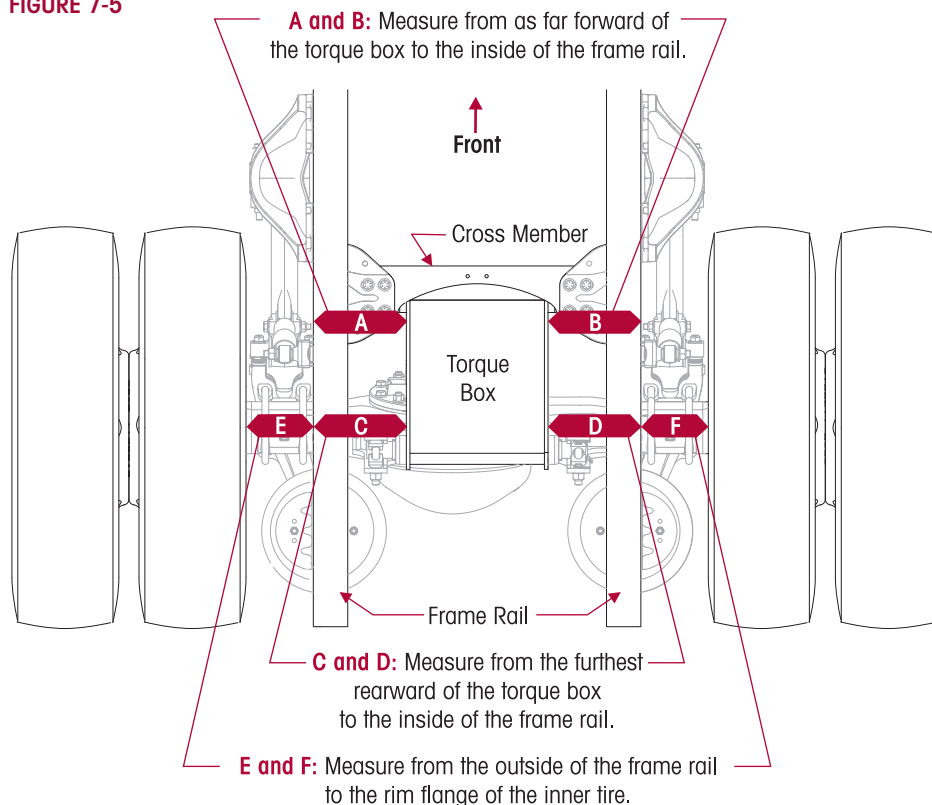
STEP A. PREPARING THE VEHICLE

1. Use a work bay with a level surface.
2. Relax the suspension by slowly moving the vehicle back and forth several times in a straight line without using the brakes. This will slacken or loosen the suspension as the vehicle is positioned. End with all wheels positioned straight ahead.
3. **DO NOT** set the parking brake. Chock the front wheels of the vehicle.
4. Verify and maintain the air system at full operating pressure.
5. Verify the vehicle is at the correct ride height. Correct as necessary. Refer to Ride Height Adjustment in this section.
6. Verify all suspension components are in good condition. Repair or replace any worn or damaged suspension components before proceeding with the alignment process.

STEP B. MEASURING TORQUE BOX LATERAL ALIGNMENT (See Figure 7-5)

7. Measure the distance between the left front side of the torque box and the left inside frame rail (A). Record the measurement.
8. Measure the distance between the right front side of the torque box and the right inside frame rail (B). Record the measurement.
9. Measure the distance between the left rear side of the torque box and the left inside frame rail (C). Record the measurement.
10. Measure the distance between the right rear side of the torque box and the right inside frame rail (D). Record the measurement.

FIGURE 7-5



11. Calculate the difference between A-B.
12. Calculate the difference between C-D.
13. Calculate the difference between A-C.
 - a. If all the calculated differences in Steps 11-13 are equal to or less than $\frac{1}{4}$ " then proceed to Step D "Measuring the Lateral Alignment of the Axle."
 - b. If any of the calculated differences in Steps 11-13 are greater than $\frac{1}{4}$ ", this indicates the box is either offset or rotated. It will be necessary to correct the lateral alignment of the torque box. Proceed to Step C "Correcting Lateral Alignment of the Torque Box."
14. On a vehicle equipped with tandem drive axles, repeat Steps 7 thru 13 for the remaining torque box.

STEP C. CORRECTING TORQUE BOX LATERAL ALIGNMENT (IF NECESSARY)

NOTE

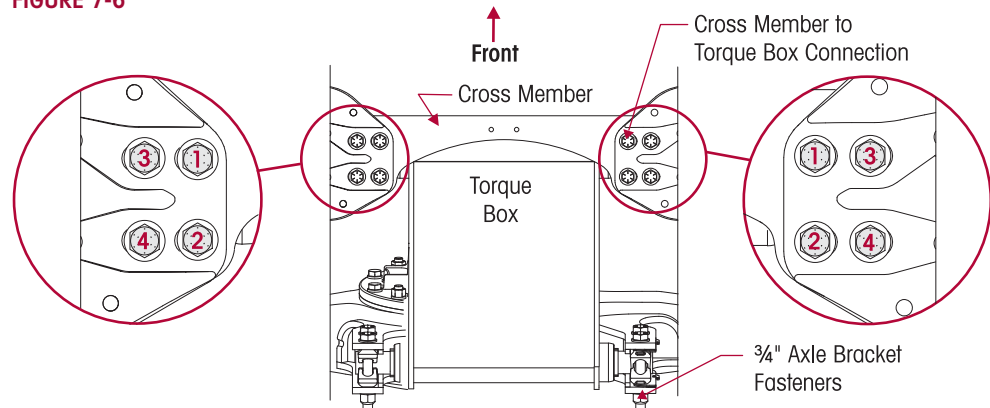
This Step is only necessary if the torque box lateral alignment needs to be corrected as determined in Step B.

15. Support the frame at ride height.
16. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system. Disconnect the height control linkage assembly from the height control valve lever. Lower the height control valve lever to exhaust the air in the air springs and deflate the rear suspension. (See vehicle manufacturer's instructions).
17. Loosen the torque box clamp bolts at all four corners of the torque box.
18. Using a pry bar, center the torque box in the frame rails. Measurements (A and B), (C and D) and (A and C) should be within $\frac{1}{4}$ " of each other. This will center the torque box and ensure parallelism of the torque box to the frame rails.

WARNING

IT IS IMPORTANT THAT THE TORQUE BOX CLAMP CONNECTIONS BE TIGHTENED IN THE PROPER SEQUENCE AND HAVE THE PROPER TIGHTENING TORQUE VALUES MAINTAINED. FAILURE TO DO SO CAN- RESULT IN THE DEFORMATION OF PARTS, RESULTING IN THE LOSS OF CLAMP FORCE, BOLT FAILURE, LOSS OF THE AXLE'S ALIGNMENT, LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR PERSONAL INJURY.

19. First snug, and then tighten the torque box to cross member clamp bolts in the proper sequence (inboard fasteners first then outboard fasteners), to prevent cross member deformation, see Figure 7-6. Tighten the locknuts per vehicle manufacturer's torque specifications.

FIGURE 7-6


Snug and then tighten $\frac{5}{8}$ " cross member fasteners in the proper sequence (inboard side to outboard side) (See vehicle manufacturer's tightening torque specifications)

20. Hand-tighten the torque box to axle bracket clamp bolts. **DO NOT** apply final tightening torque to the locknuts at this time as further adjustments may be required.
21. Verify measurements, (A and B), (C and D) and (A and C) should be within $\frac{1}{4}$ " of each other.
22. On a vehicle equipped with tandem drive axles, repeat Steps 17 thru 21 for the remaining torque box on the other axle, only if the lateral alignment of that torque box needs to be corrected as determined in Step B.

STEP D. MEASURING THE LATERAL ALIGNMENT OF THE AXLE (See Figure 7-5)

23. Measure the distance from the outside of the left frame rail to the rim flange of the left inner tire (E). Record the measurement.
24. Measure the distance from the outside of the right frame rail to the rim flange of the right inner tire (F). Record the measurement.
25. Calculate the difference between the two measurements (E-F).
 - (E-F $\leq \frac{1}{4}$ ") – If the difference is $\frac{1}{4}$ " or less then proceed to Step F "Measuring Axle Thrust Angle."
 - (E-F = $>\frac{1}{4}$ ") – If the difference is greater than $\frac{1}{4}$ ", it will be necessary to correct the lateral alignment of the axle. Proceed to Step E "Correcting Lateral Alignment of the Axle".
26. On a vehicle equipped with tandem drive axles, repeat Steps 23 thru 25 for the other drive axle.

STEP E. CORRECTING LATERAL ALIGNMENT OF THE AXLE (IF NECESSARY)

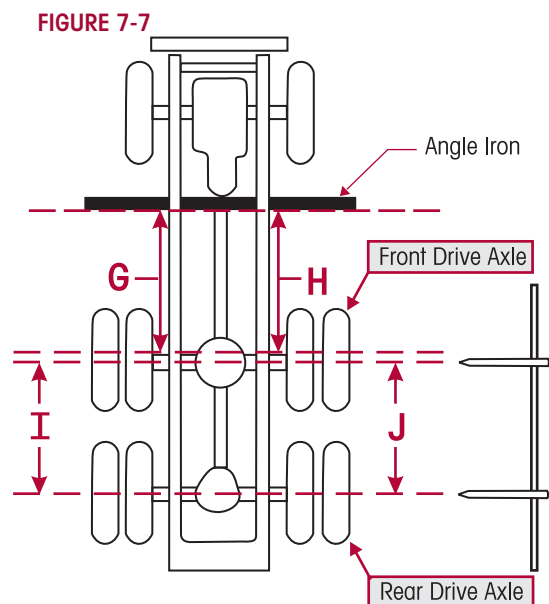
NOTE This Step is only necessary if the lateral alignment of the axle needs to be corrected as determined in Step D.

NOTE It is important to ensure the torque box is centered and parallel to the frame rails before correcting lateral alignment on an axle. Refer to Step B.

27. Support the frame at ride height.
28. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system. Disconnect the height control linkage assembly from the height control valve lever. Lower the height control valve lever to exhaust the air in the air springs and deflate the rear suspension. (See vehicle manufacturer's instructions).
29. Using the measurements from Step D "Measuring the Lateral Alignment of the Axle" determine which direction the axle needs to be moved to center the axle under the vehicle.
30. Loosen the torque box to axle bracket clamp bolts. The bolts may already be loose from Step 20. **DO NOT** loosen the torque box to cross member bolts.
31. Move the axle in the direction required to center the axle under the vehicle. Measurements (E) and (F) should be within $\frac{1}{4}$ " of each other.
32. Hand-tighten the torque box to axle bracket clamp fasteners. **DO NOT** final torque the bolts at this time.
33. Verify measurement (E) and (F) are within $\frac{1}{4}$ " of each other.
34. On a vehicle equipped with tandem drive axles, repeat Steps 29 through 33 for the remaining drive axle, only if the lateral alignment of that axle needs to be corrected as determined in Step D "Measuring the Lateral Alignment of the Axle."

STEP F. MEASURING AXLE THRUST ANGLE

35. If axle alignment equipment is not available, using "C" clamps, securely clamp a six-foot piece of straight bar stock or angle iron across the lower frame flange as shown in Figure 7-7. Select a location as far forward of the drive axle as possible where components will not interfere.
36. Accurately square straight edge to frame using a carpenter's square.
37. Using a measuring tape, measure from the straight edge to the forward face of the front drive axle arm at the centerline of the axle top pad assembly on both sides of vehicle as shown in Figure 7-7, (E) and (F).



- a. If measurements (G) and (H) are within the vehicle manufacturer's specifications then the thrust alignment of the front drive axle is acceptable. Proceed to Step 38.

- b. If measurements (G) and (H) are not within the vehicle manufacturer's specifications, it will be necessary to correct the front drive axle's thrust angle. Proceed to Step G "Correcting Axle Thrust Angle."
- 38. When the front drive axle is within specification, proceed to check the rear drive axle.
- 39. Using a trammel bar measure from spindle center to spindle center on both sides of the vehicle, see Figure 7-7, (I) and (J).
 - a. If both sides measure within original equipment manufacturer's specifications, alignment of the rear drive axle is acceptable.
 - b. If measurements (I) and (J) are not within the vehicle manufacturer's specifications, it will be necessary to correct the axle's thrust angle. Proceed to Step G "Correcting Axle Thrust Angle."

STEP G. CORRECTING AXLE THRUST ANGLE (IF NECESSARY)

NOTE

The HTB 400LT is a parallelogram suspension. When correcting an axle's thrust angle, the shims on both the torque box and longitudinal torque rod must be adjusted in order to maintain parallelism and drive axle pinion angles.

SERVICE HINT

When using a trammel bar to measure the rear axle alignment it is important to verify that the front drive axle is within specifications prior to correcting the rear drive axle thrust angle.

- 40. Support the frame at ride height.
- 41. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system. Disconnect the height control linkage assembly from the height control valve lever. Lower the height control valve lever to exhaust the air in the air springs and deflate the rear suspension. (See vehicle manufacturer's instructions).
- 42. Loosen the torque box to axle bracket clamp bolts. The bolts may already be loose from Step 20. **DO NOT** loosen the torque box to cross member bolts.



WARNING

EACH AXLE HAS ONE (1) AXLE BRACKET WITH ADJUSTABLE BAR PIN CLAMPS AND FOUR (4) AXLE BRACKET SHIMS, AND ONE (1) AXLE BRACKET WITH NON-ADJUSTABLE BAR PIN CLAMPS. THE BAR PIN CLAMP PAIRS MAY BE CHANGED FROM SIDE TO SIDE BUT CAN NOT BE MIXED. ALL FOUR (4) SHIMS MUST BE USED WITH THE ADJUSTABLE BAR PIN CLAMPS, WHICH ARE THINNER THAN THE NON-ADJUSTABLE BAR PIN CLAMPS. FAILURE TO DO SO CAN RESULT IN THE DEFORMATION OF PARTS, LOSS OF CLAMP FORCE, BOLT FAILURE, LOSS OF THE AXLE'S ALIGNMENT, LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR PERSONAL INJURY.

- 43. Locate the axle bracket that contains the adjustable bar pin clamps and axle bracket shims, see Figure 7-8.
- 44. Remove all the axle bracket shims from the axle bracket connection with the adjustable bar pin clamps. **DO NOT** remove adjustable axle bracket bar pin clamps, it is not necessary to remove the adjustable bar pin clamps or the axle bracket connection clamp bolts to perform adjustment.

FIGURE 7-8

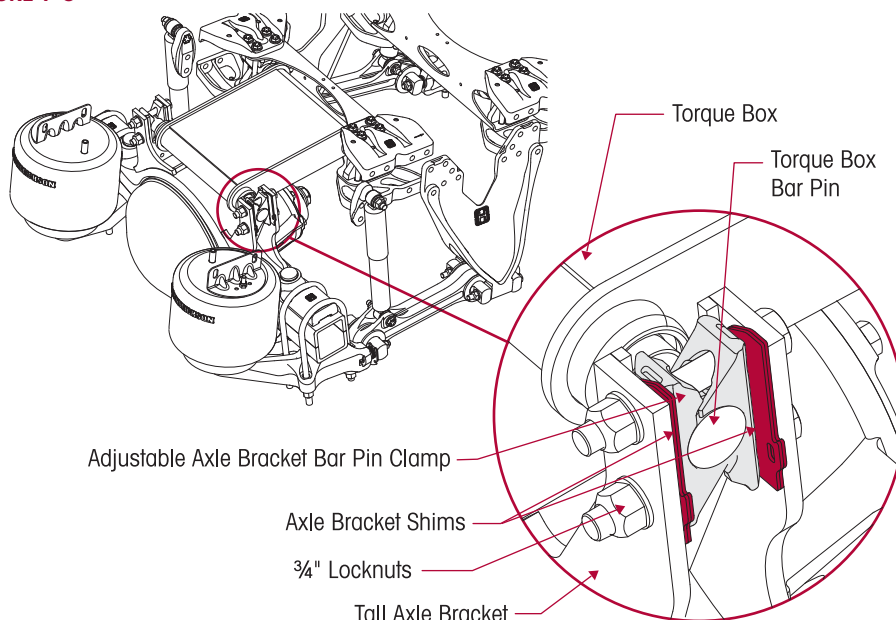
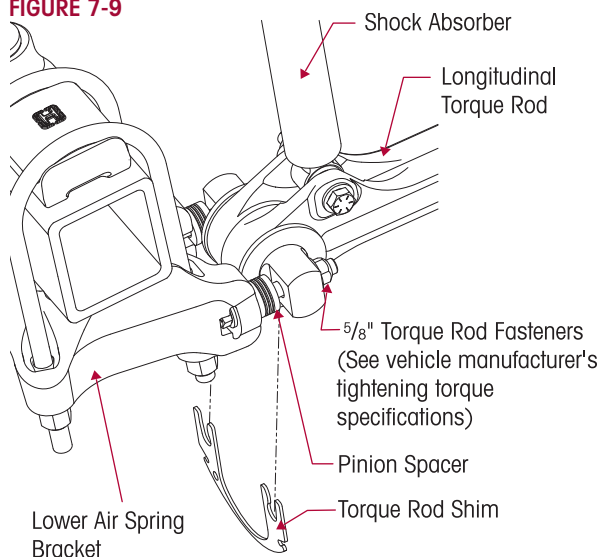


FIGURE 7-9

45. Loosen the longitudinal torque rod fasteners and remove the torque rod shims from both ends of the longitudinal torque rod. **DO NOT** remove the pinion spacer, see Figure 7-9.
46. Adjust the axle in the direction necessary to correct the thrust angle.
47. Fill any gap between the longitudinal torque rod and lower air spring bracket with longitudinal torque rod shims, see Figure 7-9. Longitudinal torque rod shims should only be placed on one side of the axle to adjust the thrust angle. Adding longitudinal torque rod shims to both torque rods will affect the axle pinion angle.
48. Tighten the longitudinal torque rod locknuts per vehicle manufacturer's torque specifications.


WARNING

EACH AXLE HAS ONE (1) AXLE BRACKET WITH ADJUSTABLE BAR PIN CLAMPS AND FOUR (4) AXLE BRACKET SHIMS, AND ONE (1) AXLE BRACKET WITH NON-ADJUSTABLE BAR PIN CLAMPS. THE BAR PIN CLAMP PAIRS MAY BE CHANGED FROM SIDE TO SIDE BUT CAN NOT BE MIXED. ALL FOUR (4) SHIMS MUST BE USED WITH THE ADJUSTABLE BAR PIN CLAMPS, WHICH ARE THINNER THAN THE NON-ADJUSTABLE BAR PIN CLAMPS. FAILURE TO DO SO CAN RESULT IN THE DEFORMATION OF PARTS, LOSS OF CLAMP FORCE, BOLT FAILURE, LOSS OF THE AXLE'S ALIGNMENT, LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR PERSONAL INJURY.

49. Fill the gap between the axle bracket and the adjustable bar pin clamps with the axle bracket shims removed in Step 44. All four axle bracket shims must be re-installed. **DO NOT** force the axle forward or backwards to install the axle bracket shims. The axle bracket shims may be arranged in any order to achieve an easy fit.

EXAMPLE

The axle bracket shim arrangement may end up being three shims in front and one behind the adjustable bar pin clamps, or no shims in front and four behind the adjustable bar pin clamps, etc.

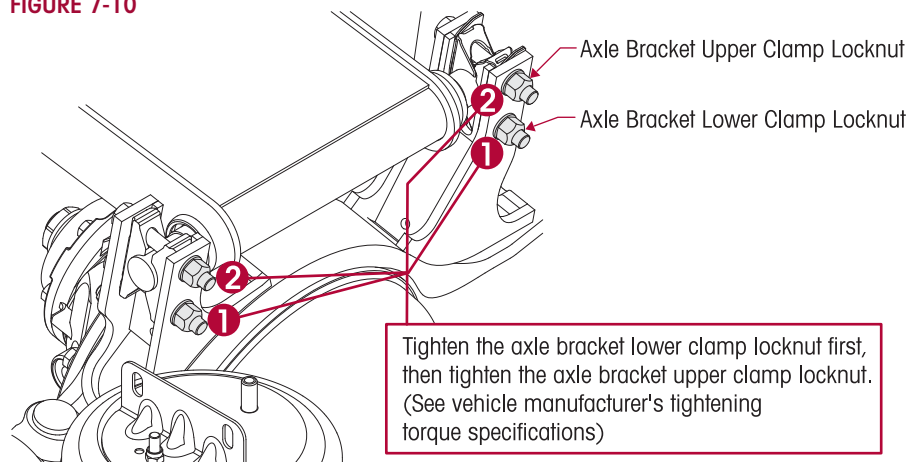
50. Verify measurements (G) and (H) are within the vehicle manufacturer's specifications.
51. Repeat Steps 42 thru 50 for the remaining drive axle, only if the thrust angle of that axle needs to be corrected as determined in Step F "Measuring Axle Thrust Angle".

STEP H. FINAL TORQUE AXLE BRACKET CLAMP BOLTS

WARNING

IT IS IMPORTANT THAT THE TORQUE BOX CLAMP CONNECTIONS BE TIGHTENED IN THE PROPER SEQUENCE AND HAVE THE PROPER TIGHTENING TORQUE VALUES MAINTAINED. FAILURE TO DO SO CAN RESULT IN THE DEFORMATION OF PARTS, RESULTING IN THE LOSS OF CLAMP FORCE, BOLT FAILURE, LOSS OF THE AXLE'S ALIGNMENT, LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR PERSONAL INJURY.

52. Tighten the axle bracket clamp locknuts in the proper sequence. Tighten the lower clamp locknut first, then the upper clamp locknut, see Figure 7-10. Tighten the locknuts per vehicle manufacturer's torque specifications.

FIGURE 7-10


53. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system.
54. Connect the height control lever to the height control valve linkage assembly to inflate the suspension.
55. Remove the frame supports. Verify the ride height is correct, refer Ride Height Adjustment in this section.
56. Engage the parking brake.
57. Remove the wheel chocks.

PINION ANGLE

The vehicle manufacturer establishes drive axle pinion angles(s). Contact the vehicle manufacturer for the proper drive axle pinion angle(s) for your vehicle.

1. Use a work bay with a level surface.
2. Relax the suspension by slowly moving the vehicle back and forth several times in a straight line without using the brakes. This will slacken or loosen the suspension as the vehicle is positioned. End with all wheels positioned straight ahead. Try to roll to a stop without the brakes being applied. **DO NOT** set the parking brake.
3. Chock the front wheels of the vehicle.

FIGURE 7-11



4. Verify and maintain the air system at full operating pressure.
5. Verify the vehicle is at the correct ride height. If the vehicle is not at the correct ride height it will be necessary to correct the ride height before proceeding.
6. Place the digital protractor on the frame rail, at the centerline of the tandem, and zero the protractor.
7. Place the digital protractor on the axle housing as shown in Figure 7-11.
8. Record the pinion angle for each drive axle. Determine if the pinion angles are within the vehicle manufacturer's specified range.
9. If drive axle pinion angle is out of specification:
 - a. Verify the correct pinion spacers are installed, see HTB 400LT Pinion Angle Matrix, in the Parts List Section of this publication.
 - b. If the correct pinion spacers are installed and a correction to the drive axle pinion angle is required, it will be necessary to adjust the torque rod shims on both sides (left hand and right hand) of the axle in equal amounts. This will maintain axle alignment while correcting the pinion angle.
10. Determine which direction the axle needs to be tilted in order to achieve the correct pinion angle.
11. Add/remove shims at the longitudinal torque rod connections as required to achieve the proper pinion angle. Adjustments must be equal on both sides of the axle in order to maintain axle alignment.
12. When the pinion angle is correct tighten all fasteners to the proper torque specifications per the vehicle manufacturer and recheck the pinion angles.
13. Remove wheel chocks.

SECTION 8

Component Replacement

FASTENERS

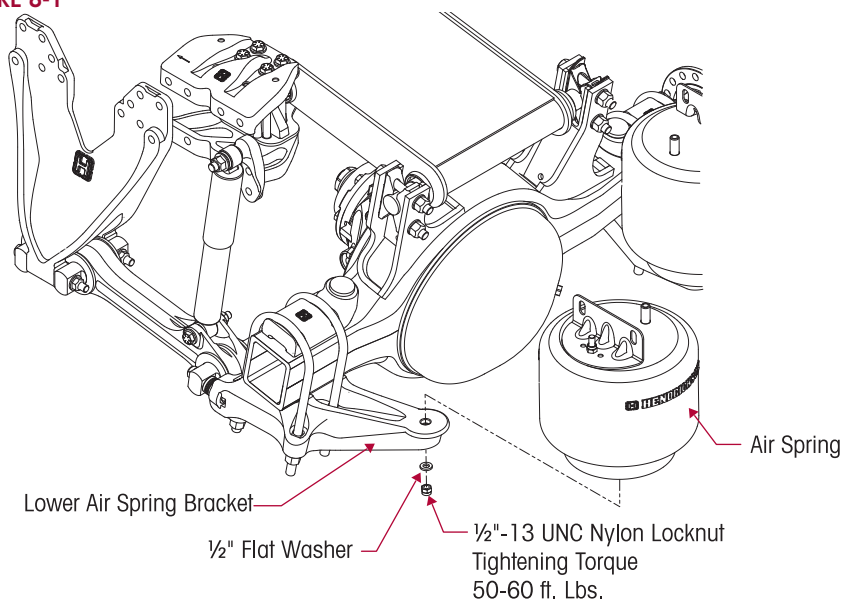
Hendrickson recommends when servicing the vehicle, replace all removed fasteners with new equivalent fasteners. Maintain correct torque values at all times. Check torque values as specified. See Hendrickson's Tightening Torque Specifications Section of this publication. If non-Hendrickson fasteners are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

AIR SPRING

DISASSEMBLY

1. Chock the wheels.
2. Support the frame.
3. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system.
4. Disconnect the height control linkage assembly from the height control valve lever. Lower the height control valve lever to exhaust the air in the air springs and deflate the rear suspension. (See vehicle manufacturer's instructions).
5. Remove the air line from the air spring.
6. Lubricate the lower mounting fasteners with penetrating oil. This will help prevent the air spring mounting studs from breaking during the removal process.
7. Using **HAND TOOLS ONLY**, remove the lower mounting fastener from the air spring through the access hole in the cross bar. The cross bar does not need to be removed for air spring removal.
8. Remove the fasteners from the upper air spring mounting bracket to the frame rail.
9. Remove the air spring.

FIGURE 8-1



INSPECTION

1. Inspect all mounting surfaces and mounting brackets for any damage, replace as necessary.
2. Inspect air spring flex member for signs of damage or chaffing. Replace as necessary.

ASSEMBLY

1. Install the air spring between the frame and the lower air spring bracket, see Figure 8-2.

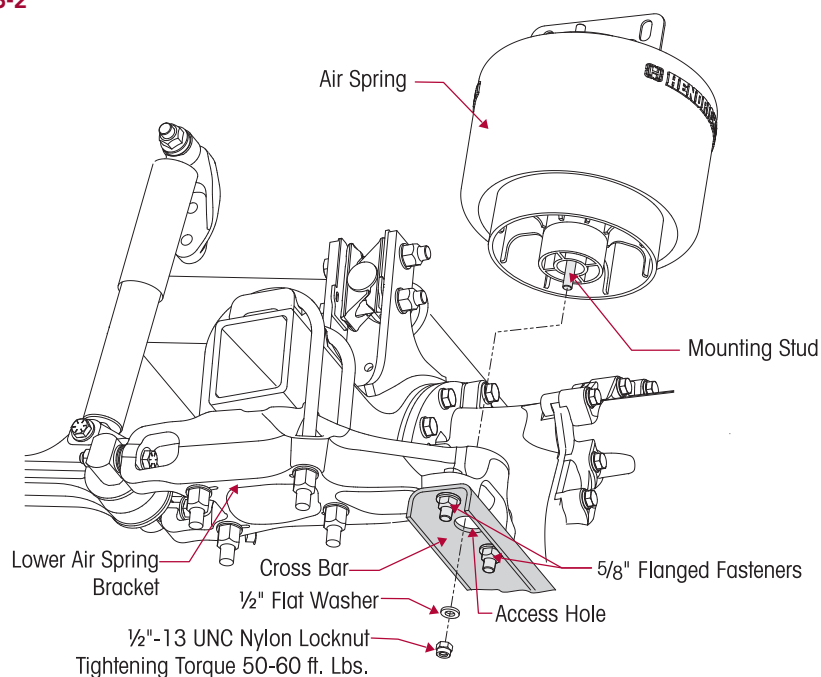


WARNING

FAILURE TO PRESS THE AIR SPRING AGAINST THE UNDERSIDE OF THE FRAME RAIL WHILE TIGHTENING THE UPPER AIR SPRING BRACKET CAN CAUSING COMPONENT DAMAGE AND PERSONAL INJURY OR PROPERTY DAMAGE.

2. While holding the top of the air spring against the bottom of the frame rail, tighten the upper mounting fasteners to the frame rail. Tighten the fasteners to vehicle manufacturer's torque specifications.
3. Insert the lower mounting stud through the mounting hole in the air spring bracket.
4. Using **HAND TOOLS**, tighten the lower air spring mounting fastener through the access hole in the cross bar to 50-60 foot pounds of torque.
5. Reconnect the air line to the air spring.
6. See Air Spring Warnings and instructions in the important Safety Notice section of this publication prior to inflating or deflating the suspension system.
7. Re-inflate the suspension by raising the height control valve's height control lever.
8. Reconnect the height control linkage assembly to the height control valve's height control lever by sliding the rubber grommet onto the stud.
9. Remove the frame supports.
10. Remove the wheel chocks.
11. Verify the vehicle is at the correct ride height. Correct as necessary. Refer to Ride Height Adjustment in the Alignment & Adjustment section of this publication.

FIGURE 8-2



CROSS BAR

DISASSEMBLY

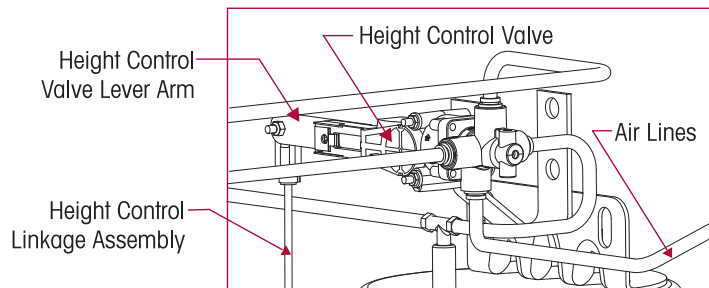
1. Chock the wheels of the vehicle.
2. Remove $\frac{5}{8}$ " fasteners from the cross bar to the lower air spring bracket.
3. Remove the cross bar.
4. Inspect the cross bar and mating component surfaces for damage, replace as necessary.

ASSEMBLY

1. Install new flanged bolts through the lower air spring bracket.
2. Install the cross bar onto the flanged bolts. Ensure that the flat surface mates to the lower air spring bracket, see Figure 8-2.
3. Install flanged locknuts and tighten to vehicle manufacturer's torque specifications.
4. Remove wheel chocks.

HEIGHT CONTROL VALVE AND LINKAGE ASSEMBLY

FIGURE 8-3



NOTE

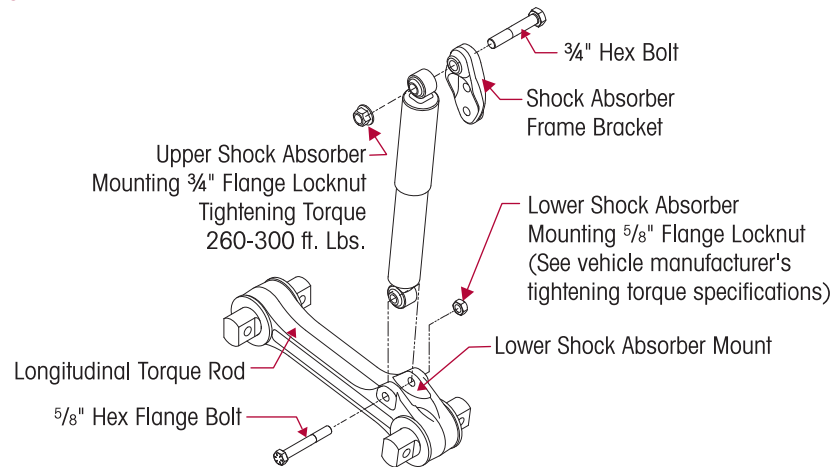
These components are not supplied by Hendrickson. Hendrickson is not responsible for components supplied by the vehicle manufacturer. For assistance with maintenance and service instructions on these components see the vehicle manufacturer.

SHOCK ABSORBER

DISASSEMBLY

1. Chock the wheels of the vehicle.
2. Remove the fasteners from the lower shock absorber mount, see Figure 8-4.
3. Remove the flange locknut from the upper shock absorber through bolt.
4. Slide the shock absorber out of the lower mount.
5. Remove the shock absorber from the upper mounting through bolt.


FIGURE 8-4



INSPECTION

1. Inspect the shock absorber mounting brackets and hardware for damage or wear, and replace as necessary, see Preventive Maintenance Section of this publication.

ASSEMBLY

1. Install the shock absorber onto the upper mounting through bolt.
2. Install the flange locknut on the upper shock absorber mounting through bolt.
3. Install the lower shock absorber into the lower shock absorber mount on the longitudinal torque rod, see Figure 8-4.
4. Install the fasteners through the lower shock mount. Install the flange locknut on the through bolt, see Figure 8-4. Tighten the lower shock absorber locknut to vehicle manufacturer's torque specifications.
5. Tighten the upper shock absorber flange locknut to  260-300 foot pounds of torque, see Figure 8-4.
6. Remove the wheel chocks.

LONGITUDINAL TORQUE ROD

Prior to disassembly of the longitudinal torque rod fasteners, note the orientation and quantity of torque rod shims and pinion spacers, see Figure 8-5. It is required that the longitudinal torque rod shims and pinion spacer be installed in the same orientation and location as removed to preserve the existing alignment and pinion angles.



DANGER

THE AIR SPRING TRANSFERS LOAD TO THE FRAME HANGER THROUGH THE LONGITUDINAL TORQUE ROD. PRIOR TO LONGITUDINAL TORQUE ROD REMOVAL THE SUSPENSION AIR SYSTEM MUST BE DEFLATED. FAILURE TO DO SO WILL CAUSE THE AIR SPRING TO VIOLENTLY SHIFT, RESULTING IN POSSIBLE DAMAGE TO COMPONENTS AND/OR PERSONAL INJURY.



WARNING

THIS PROCEDURE FOR SERVICING A LONGITUDINAL TORQUE ROD IS PERFORMED WITH THE TORQUE RODS ON THE OPPOSITE SIDE OF THE VEHICLE PROPERLY CONNECTED TO THE FRAME HANGER AND LOWER AIR SPRING BRACKET. FAILURE TO DO SO CAN CAUSE THE AXLES TO ROTATE AND/OR SHIFT, RESULTING IN POSSIBLE DAMAGE TO COMPONENTS AND/OR PERSONAL INJURY. IF THE TORQUE RODS ON BOTH SIDES OF THE VEHICLE ARE TO BE REMOVED IT WILL BE NECESSARY TO SUPPORT THE AXLE PINION TO KEEP THE AXLE FROM SHIFTING.



CAUTION

FAILURE TO INSTALL THE TORQUE ROD SHIMS AND PINION SPACERS IN THE SAME ORIENTATION AND LOCATION MAY REQUIRE A VEHICLE ALIGNMENT. IMPROPER VEHICLE ALIGNMENT CAN INCREASE TIRE WEAR.

DISASSEMBLY

1. Chock the wheels.
2. Support the frame.
3. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system.
4. Disconnect the height control valve linkage assembly from the height control valve lever. Lower the height control valve lever to exhaust the air in the air springs and deflate the rear suspension. (See vehicle manufacturer's instructions).
5. Prior to disassembly of the longitudinal torque rod fasteners, note the orientation and quantity of torque rod shims and pinion spacers, see Figure 8-5. It is required that the longitudinal torque rod shims and pinion spacer be installed in the same orientation and location as removed to preserve the existing alignment and pinion angles.
6. Remove the fasteners from the lower shock absorber mount, see Figure 8-5.
7. Slide the shock absorber out of the lower shock absorber mount.
8. Remove the flange locknuts connecting the longitudinal torque rod to the lower air spring bracket.
9. Remove the fasteners and shim(s) connecting the torque rods to the frame hanger.

SERVICE HINT

It may be necessary to pry the longitudinal torque rod down away from the frame hanger.

10. Remove the longitudinal torque rod.

INSPECTION

1. Inspect all mating components for damage or wear. Replace as necessary.

ASSEMBLY

1. Install the fasteners in the lower air spring bracket slots, see Figure 8-5.

2. Install any pinion spacers and shims between the longitudinal torque rod and lower air spring bracket. It is required that any longitudinal torque rod shims and pinion spacers be installed in the same orientation and location as removed to preserve the existing alignment and pinion angles.

NOTE

The longitudinal torque rod must be installed with the shock absorber mount facing upward adjacent to the lower air spring bracket, see Figure 8-5.


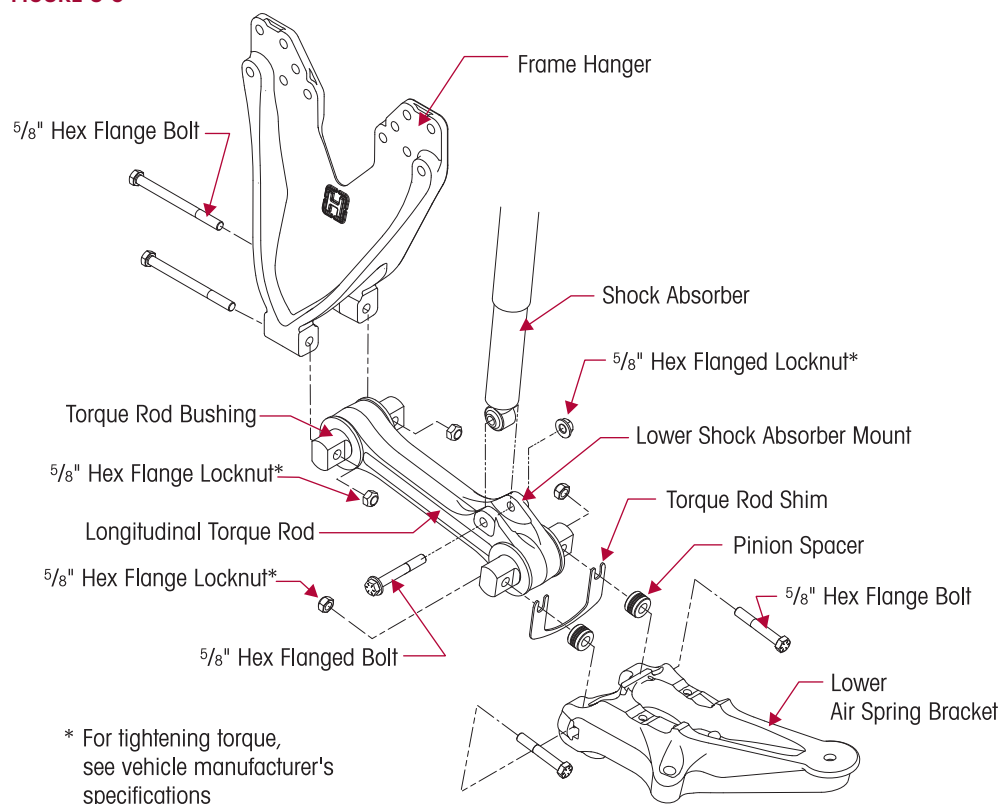
3. Install the longitudinal torque rod onto the lower air spring bracket.
4. Loosely install the lower air spring bracket flange locknuts.
5. Pivot the longitudinal torque rod in line with the mounting holes of the frame hanger.
6. Install the frame hanger fasteners and any torque rod shim that may have been removed from this connection.
7. Install the shock absorber into the lower shock absorber mount on the longitudinal torque rod.
8. Install the lower shock absorber fasteners.
9. Tighten all fasteners per vehicle manufacturer's  torque specifications.
10. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system.
11. Inflate the suspension by raising the height control valve lever.
12. Reconnect the height control linkage assembly to the height control valve lever.
13. Remove the frame supports.
14. Remove the wheel chocks.
15. Verify the vehicle is at the correct ride height. Correct as necessary. Refer to Ride Height Adjustment in the Alignment & Adjustment section of this publication.

FIGURE 8-5

LONGITUDINAL TORQUE ROD BUSHING

DISASSEMBLY

You will need:

- A vertical press with a capacity of at least 10 tons.
- Torque Rod Bushing Receiving Tool (see Section 5, Special Tools)
- Torque Rod Bushing Assembly Tool (Funnel) – H Part No. 66086-000 (see Section 5, Special Tools)



WARNING

DO NOT USE HEAT OR USE A CUTTING TORCH TO REMOVE THE BUSHINGS FROM THE LONGITUDINAL TORQUE ROD. THE USE OF HEAT WILL ADVERSELY AFFECT THE STRENGTH OF THE LONGITUDINAL TORQUE ROD. HEAT CAN CHANGE THE MATERIAL PROPERTIES. A COMPONENT DAMAGED IN THIS MANNER CAN RESULT IN THE LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

1. Remove the longitudinal torque rod as detailed in this section.
2. Install the longitudinal torque rod in the press. Support the longitudinal torque rod end hub on the receiving tool with the end hub of the longitudinal torque rod centered on the tool. Be sure the longitudinal torque rod is squarely supported on the press bed.
3. Push directly on the bar pin until the bushing clears the longitudinal torque rod end hub.

INSPECTION AND CLEANING

1. Inspect the longitudinal torque rod for straightness, wear, or cracks. Replace as necessary.

NOTE

Care must be used when servicing the aluminum longitudinal torque rod and aluminum bar pin components to avoid damaging them.

2. Clean and inspect the inner diameter of the longitudinal torque rod end tubes. Break any sharp edges and remove any nicks with an emery cloth or a rotary sander, see Figure 8-6.

FIGURE 8-6



FIGURE 8-7



ASSEMBLY

NOTE

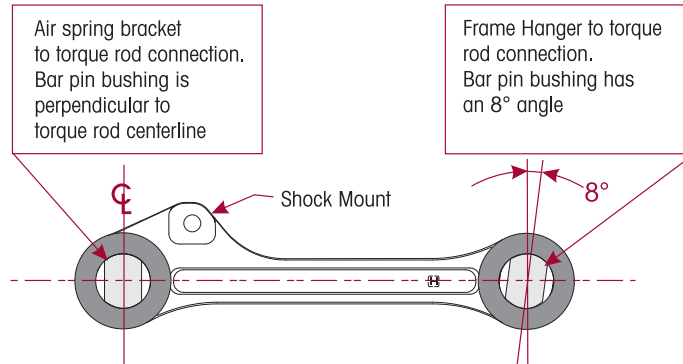
DO NOT use a petroleum or soap base lubricant. Such lubricants can cause adverse reactions with the bushing, such as deterioration of the rubber, causing premature failure.

1. Lubricate the inner diameter of the torque rod end hub and the assembly funnel, and the new rubber bushing with P-80® or vegetable base oil (cooking oil), see Figure 8-7.
2. Support the torque rod end hub on the receiving tool with the end hub of the torque rod centered on the receiving tool.

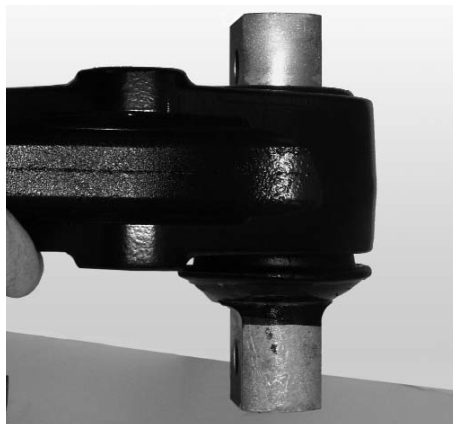
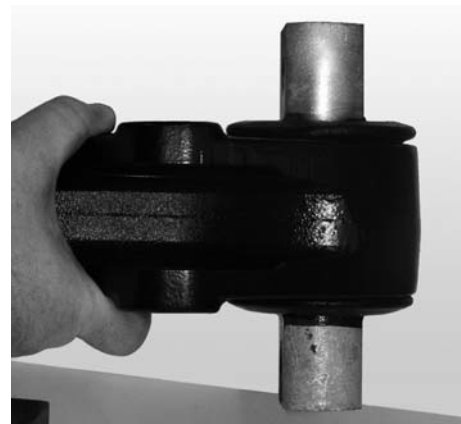
3. Place the assembly funnel centered on the torque rod end hub, see Figure 8-8.

FIGURE 8-8**FIGURE 8-9**

4. Place the torque rod bushing centered in the assembly funnel, see Figure 8-9. The bar pin must have the mounting flats positioned as indicated in Figure 8-10.

FIGURE 8-10

5. Press the bar pin through the assembly funnel into torque rod end hub until the rubber clears the assembly funnel. When pressing in the new bushings overshoot the desired final position by approximately $\frac{3}{16}$ ", see Figure 8-11.
6. Remove the assembly funnel.

FIGURE 8-11**FIGURE 8-12**

7. Press the bar pin again from the opposite side to center the bar pin within the torque rod end hub, see Figure 8-12. The rubber bushing and the bar pin must be centered within the torque rod end hubs.

8. Wipe off any excess lubricant. Allow the lubricant a minimum of four hours to dissipate before operating the vehicle.

**CAUTION**

IF THE TORQUE ROD ASSEMBLY IS NOT ALLOWED THE ALLOTTED TIME FOR THE LUBRICANT TO DISSIPATE, THE BUSHING WILL SLIDE FROM THE LONGITUDINAL TORQUE ROD END HUB. IF THIS OCCURS, THE BUSHING MAY BE DAMAGED AND THE BUSHING WILL THEN NEED TO BE REMOVED AND A NEW BUSHING RE-INSTALLED.

9. Install longitudinal torque rod assembly as detailed in this section.

TORQUE BOX

It is important to inspect the torque box during preventive maintenance service. Visually inspect the torque box for cracks, damage, torn or shredded rubber, or any signs of looseness at the bar pin clamps. Replace all worn or damaged parts. The torque box is a non-serviceable item and must be replaced as an assembly, if damaged, or the bushings are worn out. Check all fasteners for proper torque, see Tightening Torque Specifications Section of this publication.

SERVICE HINT

To access the torque box for service or removal it may be necessary to remove the fifth wheel. Follow the manufacturers recommendations for fifth wheel removal and installation.

DISASSEMBLY

1. Chock the wheels.
2. Support the frame at ride height.

**WARNING**

THE TORQUE BOX ALONG WITH THE TORQUE RODS RESTRAIN THE AXLE, PREVENTING AXLE MOVEMENT. PRIOR TO TORQUE BOX AND/OR TORQUE ROD DISASSEMBLY VERIFY THAT THE AXLE BEING SERVICED IS SUPPORTED UNDER THE PINION HOUSING/DIFFERENTIAL, SO THAT THE AXLE DOES NOT MOVE OR ROTATE. FAILURE TO DO SO CAN ALLOW THE AXLE TO ROTATE AND/OR SHIFT, CAUSING COMPONENT DAMAGE, AND/OR SEVERE PERSONAL INJURY.

3. Support the pinion housing/differential on the axle being serviced.
4. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system.
5. Disconnect the height control linkage assembly from the height control valve lever. Lower the height control valve lever to exhaust the air in the air springs and deflate the rear suspension. (See vehicle manufacturer's instructions).

**CAUTION**

THE TORQUE BOX IS HEAVY (APPROXIMATELY 95 LBS.), THE USE OF A CRANE OR LIFT IS REQUIRED FOR REMOVAL AND INSTALLATION OF THE TORQUE BOX. DO NOT ATTEMPT REMOVAL OR INSTALLATION WITHOUT THE PROPER EQUIPMENT.

6. Position the two (2) large C-clamps on the torque box as shown in Figure 8-13. Connect the C-clamps to the lifting device (crane, hoist, lift, etc.)
7. Remove the slack from the lifting device.
8. Prior to disassembly of the torque box clamp connections, note the orientation and quantity of axle bracket shims and bar pin clamps, see Figure 8-14. It is required that the axle bracket shims and bar pin clamps be installed in the same orientation and location as removed to preserve the existing alignment and pinion angles.
9. Remove the torque box to axle bracket fasteners.

EACH AXLE WILL HAVE ONE AXLE BRACKET WITH ADJUSTABLE BAR PIN CLAMPS AND FOUR (4) AXLE BRACKET SHIMS, AND ONE (1) AXLE BRACKET WITH NON-ADJUSTABLE BAR PIN CLAMPS. THE BAR PIN CLAMP PAIRS MAY BE CHANGED FROM SIDE TO SIDE BUT MAY NOT BE MIXED. ALL FOUR (4) SHIMS MUST BE USED WITH THE ADJUSTABLE BAR PIN CLAMPS, WHICH ARE THINNER THEN THE NON-ADJUSTABLE BAR PIN CLAMPS. FAILURE TO DO SO MAY RESULT IN THE DEFORMATION OF PARTS, LOSS OF CLAMP FORCE, BOLT FAILURE, LOSS OF THE AXLE'S ALIGNMENT, LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR PERSONAL INJURY.

10. Loosen the eight (8) cross member bolts (four per side), connecting the torque box to the cross member.
11. Raise the hoist slowly. This will pivot the torque box up and out of the axle brackets. Retain the shims and bar pin clamps from the axle brackets.
12. Remove the eight (8) previously loosened bolts from the cross member.
13. Slide the torque box out of the cross member. Retain the clamp blocks from the cross member.

FIGURE 8-13

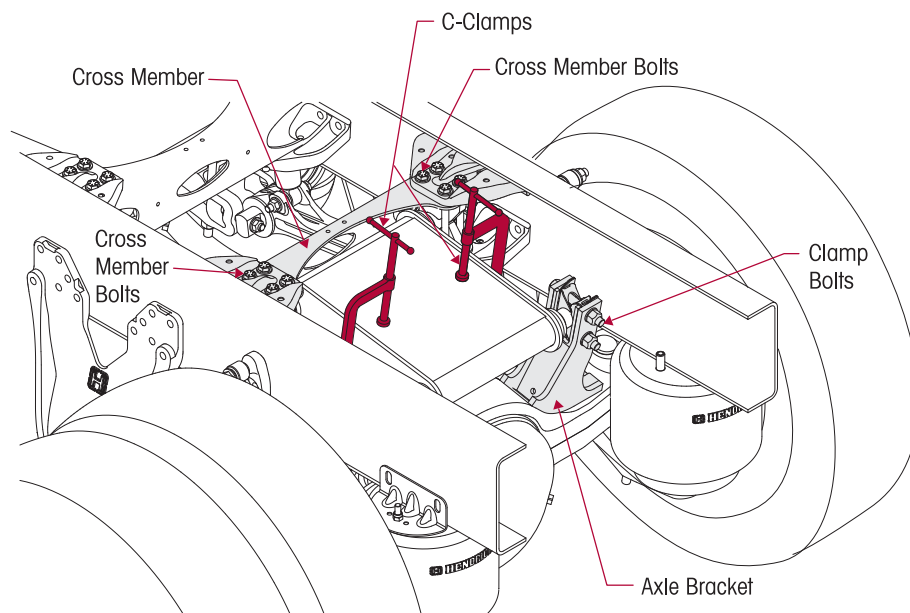
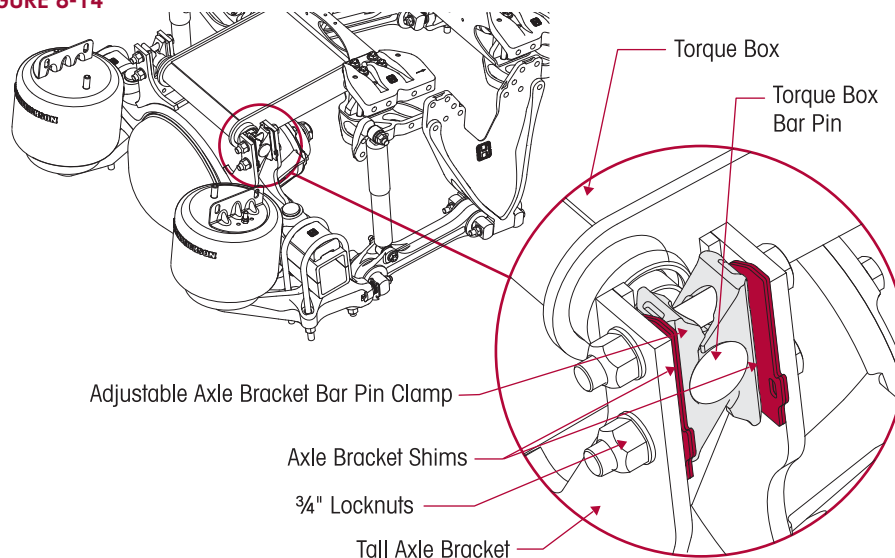


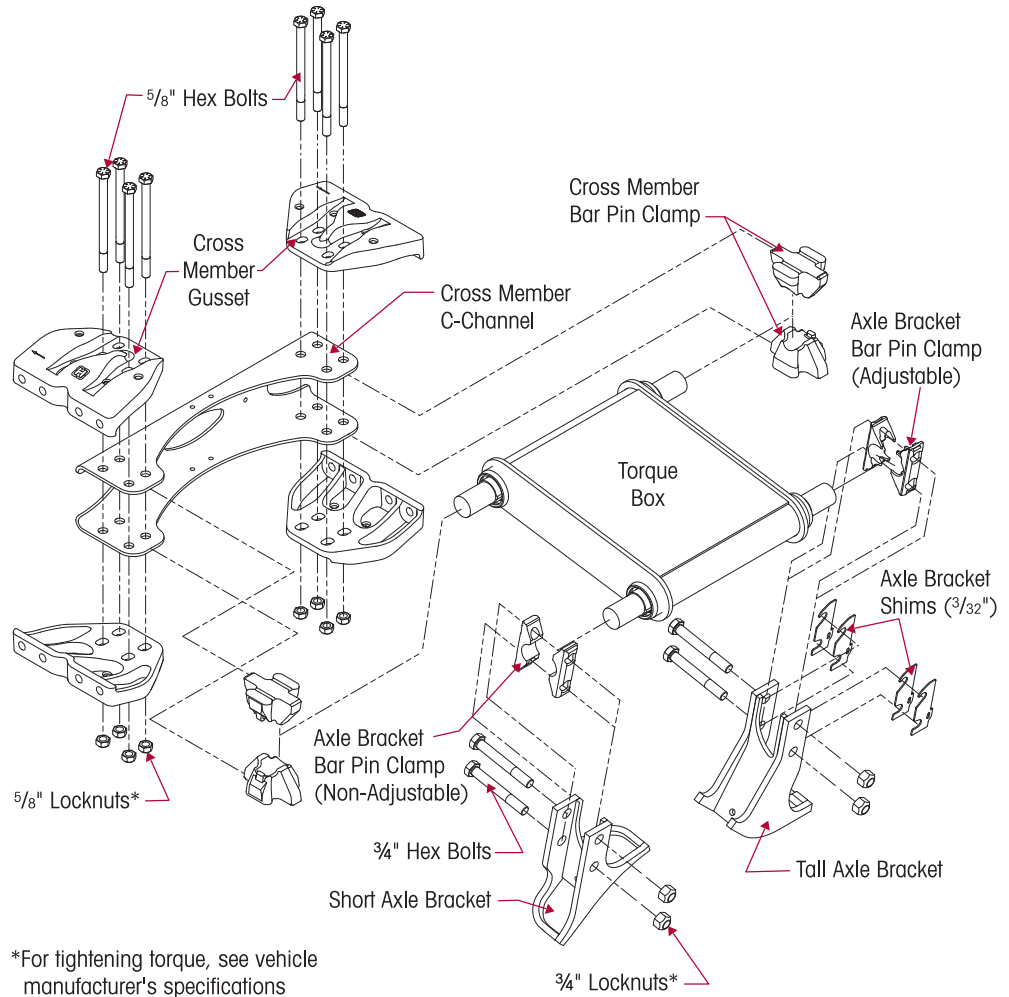
FIGURE 8-14



INSPECTION

1. Inspect all mating components including torque box, torque box bushings, and bar pin clamps for cracks, damage or wear. Replace as necessary.
2. Inspect cross member C-channel, cross member gussets, and bar pin clamps for cracks, signs of damage, or wear. Replace as necessary.
3. Inspect the axle brackets and axle welds for cracks, signs of damage, or wear. Replace the axle housing as necessary. The axle housing is a non-serviceable item. See Preventive Maintenance Section of this publication.

FIGURE 8-15



ASSEMBLY



CAUTION

THE TORQUE BOX IS HEAVY (APPROXIMATELY 95 LBS.), THE USE OF A CRANE OR LIFT IS REQUIRED FOR REMOVAL AND INSTALLATION OF THE TORQUE BOX. DO NOT ATTEMPT REMOVAL OR INSTALLATION WITHOUT THE PROPER EQUIPMENT.



WARNING

1. Position the two (2) large C-clamps on the torque box as shown in Figure 8-13. Connect the C-clamps to the lifting device (crane, hoist, lift, etc.)
2. Raise the hoist slowly. Maneuver the torque box into position by first sliding the torque box bar pin into the cross-member, then into the axle brackets.
3. With the hoist still attached, slide the cross member bar pin clamps onto the torque box bar pin from the side. Loosely install the eight cross member bolts through the cross member and cross member bar pin clamps, see Figure 8-15.

WARNING

EACH AXLE WILL HAVE ONE AXLE BRACKET WITH ADJUSTABLE BAR PIN CLAMPS AND FOUR (4) AXLE BRACKET SHIMS, AND ONE (1) AXLE BRACKET WITH NON-ADJUSTABLE BAR PIN CLAMPS. THE BAR PIN CLAMP PAIRS MAY BE CHANGED FROM SIDE TO SIDE BUT MAY NOT BE MIXED. ALL FOUR (4) SHIMS MUST BE USED WITH THE ADJUSTABLE BAR PIN CLAMPS, WHICH ARE THINNER THEN THE NON-ADJUSTABLE BAR PIN CLAMPS. FAILURE TO DO SO MAY RESULT IN THE DEFORMATION OF PARTS, LOSS OF CLAMP FORCE, BOLT FAILURE, LOSS OF THE AXLE'S ALIGNMENT, LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR PERSONAL INJURY.

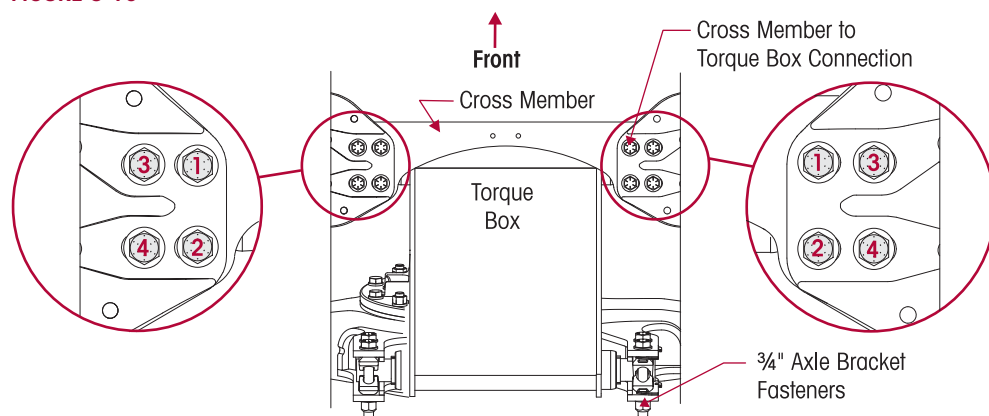
4. Install the axle bracket bar pin clamps and all four (4) shims that were removed during disassembly. Ensure all axle bracket shims are installed in the same position as noted upon disassembly, see Figure 8-14.

WARNING

IT IS IMPORTANT THAT THE TORQUE BOX CLAMP CONNECTIONS BE TIGHTENED IN THE PROPER SEQUENCE AND HAVE THE PROPER TIGHTENING TORQUE VALUES MAINTAINED. FAILURE TO DO SO MAY RESULT IN THE DEFORMATION OF PARTS, RESULTING IN THE LOSS OF CLAMP FORCE, BOLT FAILURE, LOSS OF THE AXLE'S ALIGNMENT, LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR PERSONAL INJURY.

5. Center the torque box within the frame rails. See Axle Alignment, Step B in the Alignment & Adjustment section in this publication.
6. First snug, and then tighten the torque box to cross member clamp bolts in the proper sequence (inboard fasteners first then outboard fasteners), to prevent cross member deformation, see Figure 8-16. Tighten the locknuts per vehicle manufacturer's torque specifications.

FIGURE 8-16



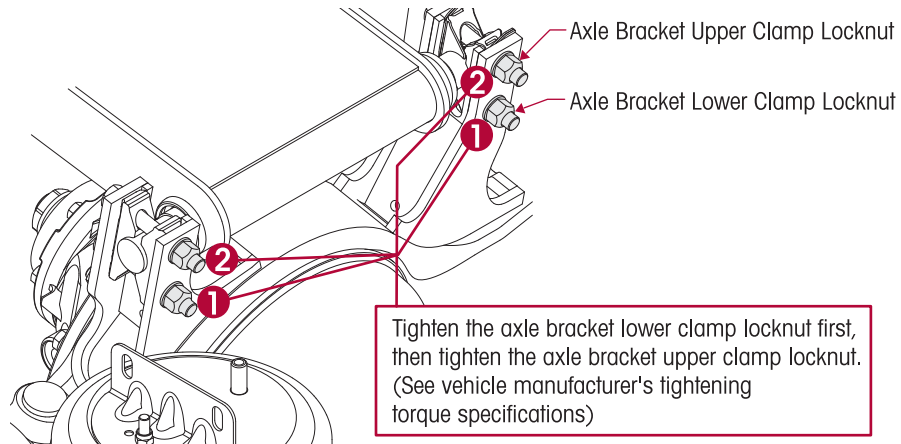
Snug and then tighten $\frac{5}{8}$ " cross member fasteners in the proper sequence (inboard side to outboard side, (See vehicle manufacturer's tightening torque specifications)

WARNING

IT IS IMPORTANT THAT THE TORQUE BOX CLAMP CONNECTIONS BE TIGHTENED IN THE PROPER SEQUENCE AND HAVE THE PROPER TIGHTENING TORQUE VALUES MAINTAINED. FAILURE TO DO SO MAY RESULT IN THE DEFORMATION OF PARTS, RESULTING IN THE LOSS OF CLAMP FORCE, BOLT FAILURE, LOSS OF THE AXLE'S ALIGNMENT, LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR PERSONAL INJURY.

7. Tighten the axle bracket clamp locknuts in the proper sequence. Tighten the lower clamp locknut first, then the upper clamp locknut, see Figure 8-17. Tighten the locknuts per vehicle manufacturer's torque specifications.
8. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system.

FIGURE 8-17



9. Connect the height control lever to the height control valve linkage assembly to inflate the suspension.
10. Remove the frame and the axle housing/differential supports.
11. Verify proper ride height adjustment, (see Ride Height Adjustment in the Alignment & Adjustments Section of this publication). Correct as necessary.
12. Verify proper alignment of the axle. See Alignment in the Alignment & Adjustments Section of this publication. Correct as necessary.
13. Remove the Wheel chocks.

CLAMP GROUP (TOP PAD, LOWER AIR SPRING BRACKET, U BOLTS)



WARNING

IT IS IMPORTANT THAT THE U BOLT CLAMP GROUP CONNECTION BE PROPERLY ALIGNED AND HAVE THE PROPER TIGHTENING TORQUE VALUES MAINTAINED. METAL SURFACES CAN WORK AND WEAR AGAINST OTHER RELATED CLAMP GROUP COMPONENTS IF NOT PROPERLY ALIGNED OR PROPERLY TIGHTENED TO MAINTAIN THE PROPER CLAMP FORCE. FAILURE TO DO SO CAN CAUSE PREMATURE COMPONENT WEAR, POSSIBLE SEPARATION OF THE CLAMP GROUP, CAUSING LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR PERSONAL INJURY.



WARNING

THIS PROCEDURE TO SERVICE THE CLAMP GROUP IS PERFORMED WITH THE CLAMP GROUP, FRAME HANGER, AND TORQUE RODS ON THE OPPOSITE SIDE OF THE VEHICLE PROPERLY CONNECTED. FAILURE TO DO SO COULD ALLOW THE AXLES TO SHIFT RESULTING IN POSSIBLE DAMAGE TO COMPONENTS AND/OR PERSONAL INJURY. IF COMPONENTS ON BOTH SIDES OF THE VEHICLE ARE TO BE REMOVED IT WILL BE NECESSARY TO SUPPORT THE AXLE AND AXLE PINION TO KEEP THE AXLE FROM SHIFTING.

DISASSEMBLY

1. Chock the wheels.
2. Support the frame at ride height.
3. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system.
4. Disconnect the height control linkage assembly from the height control valve lever. Lower the height control valve lever to exhaust the air in the air springs and deflate the rear suspension. (See vehicle manufacturer's instructions).
5. Remove the air line from the air spring.

FIGURE 8-18

6. Lubricate the lower mounting fasteners with penetrating oil. This will help prevent the air spring mounting studs from breaking during the removal process.
7. Using **HAND TOOLS ONLY**, remove the lower mounting fastener from the air spring.
8. Remove the fasteners from the upper air spring bracket to the frame rail, see Figure 8-18.
9. Remove the air spring.
10. Prior to disassembly of the longitudinal torque rod fasteners, note the orientation and quantity of torque rod shims and pinion spacers, see Figure 8-19. It is required that the longitudinal torque rod shims and pinion spacer be installed in the same orientation and location as removed to preserve the existing alignment and pinion angles.
11. Remove the flange locknuts connecting the longitudinal torque rod to the lower air spring bracket.

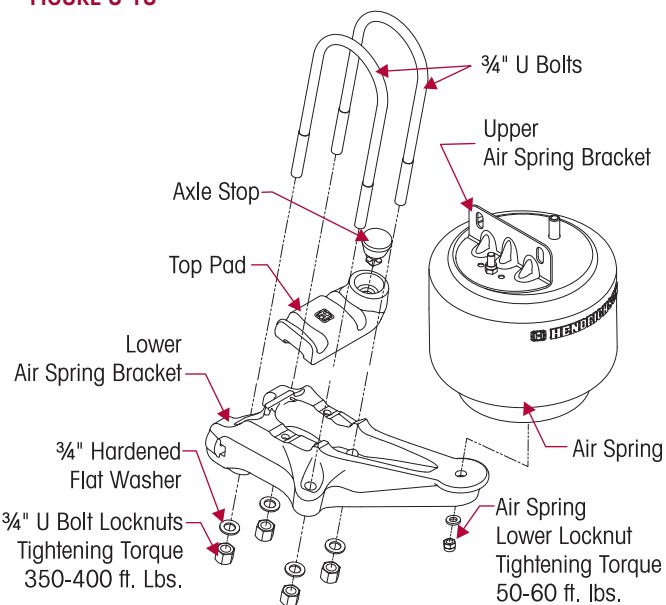
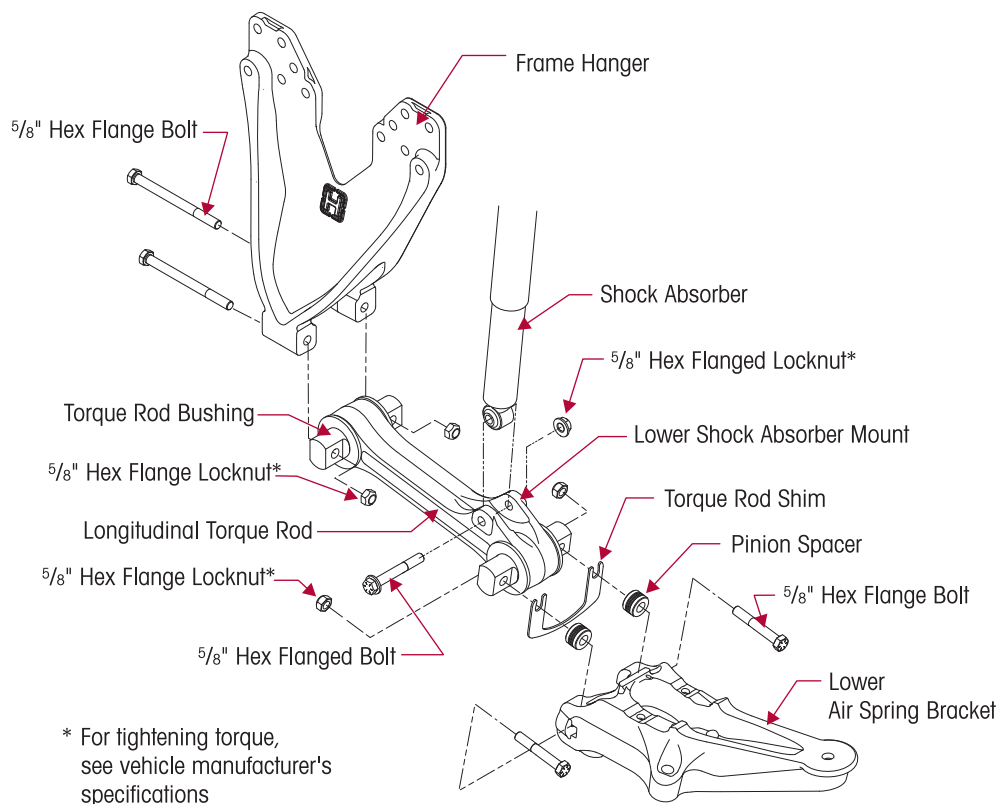


FIGURE 8-19



12. Remove the four U Bolt locknuts and washers. Discard the fasteners.
13. Pry the longitudinal torque rod down and remove the lower air spring bracket.
14. Remove the U Bolts and top pad.

INSPECTION

1. Inspect the air spring bracket, top pad, rubber axle stop, longitudinal torque rod for cracks, damage, or excessive wear. Replace as necessary. See Preventive Maintenance Section of this publication.

ASSEMBLY

1. Install the two longitudinal torque rod flange bolts in the slots of the air spring bracket, see Figure 8-20.
2. Install any pinion spacers and shims between the longitudinal torque rod and air spring bracket. It is required that any longitudinal torque rod shims and pinion spacers be installed in the same orientation and location as removed to preserve the existing alignment and pinion angles.
3. Install the longitudinal torque rod bar pin onto the flange bolts. Loosely install the flange locknuts on the longitudinal torque rod bolts.

NOTE

Verify the longitudinal torque rod is installed correctly. The lower shock mount on the longitudinal torque rod should be facing up, adjacent to the lower air spring bracket, see Figure 8-20.

4. Loosely install the flange locknuts on the longitudinal torque rod bolts.
5. Install the top pad on top of the axle housing. Verify the axle stop is on the inboard side. Ensure that the top pad has engaged the dowel pin on the axle housing.
6. Install new U Bolts over the top pad and through the lower air spring bracket. Verify U Bolts sit in the channels of the top pad.
7. Install hardened flat washers and locknut on U Bolts.

FIGURE 8-20

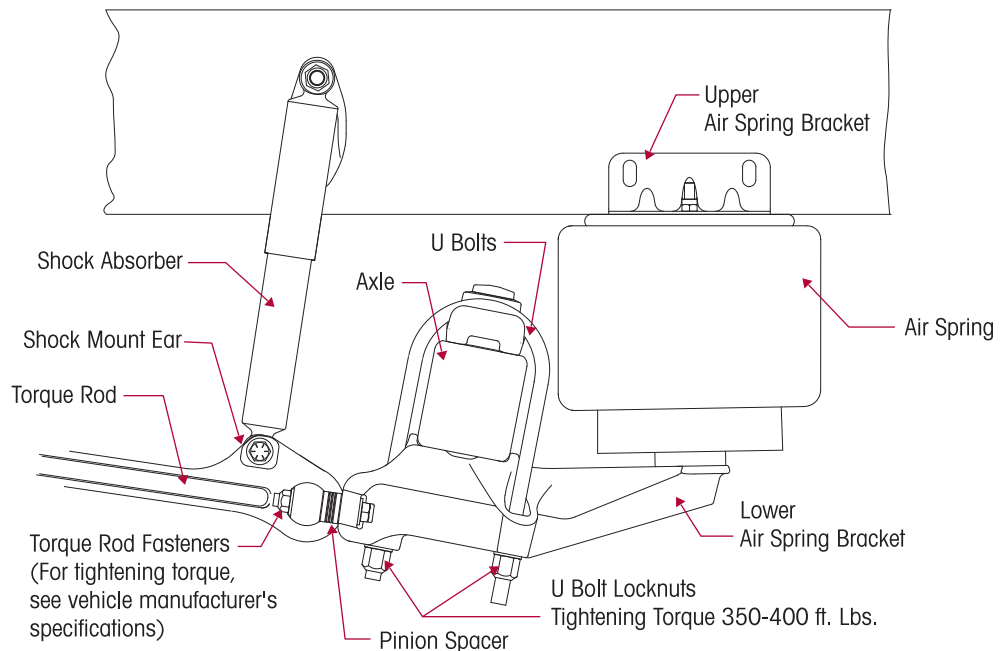
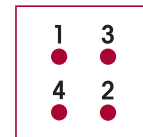


FIGURE 8-21

8. Snug U Bolt locknuts evenly, see Figure 8-21. Verify the lower air spring bracket is seated properly against the axle housing.
9. Tighten the U Bolt locknuts evenly in 50 foot pounds increments to 350-400 foot pounds torque in the proper pattern to achieve uniform bolt tension, see Figure 8-21.
10. Tighten the longitudinal torque rod fasteners per vehicle manufacturer's torque specifications.

**WARNING**

FAILURE TO PRESS THE AIR SPRING AGAINST THE UNDERSIDE OF THE FRAME WHILE TIGHTENING THE UPPER AIR SPRING BRACKET CAN RESULT IN COMPONENT DAMAGE AND PERSONAL INJURY OR PROPERTY DAMAGE.

11. Insert the upper air spring fasteners through the upper air spring bracket and the frame rail. Be sure the top plate of the air spring maintains contact with the lower flange of the frame rail while tightening the fasteners. Tighten the fasteners per vehicle manufacturer's torque specifications.
12. Insert lower air spring mounting stud through the lower air spring bracket. Install the flat washer and nylon locknut. Using **HAND TOOLS ONLY**, tighten the locknut to 50-60 foot pounds of torque.
13. Connect the air line to the air spring.
14. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system.
15. Connect the height control lever to the height control valve linkage assembly to inflate the suspension.
16. Remove the frame supports.
17. Verify ride height is correct. Refer to Alignment & Adjustments Section of this publication.
18. Remove Wheel Chocks.

AXLE STOP

The axle stops are rubber plugs installed in the top pad assembly. They may be renewed without disassembly of the suspension.

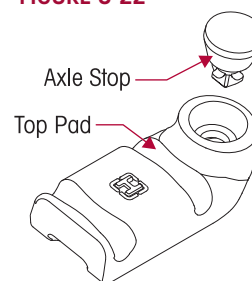
FIGURE 8-22

DISASSEMBLY

1. Chock the wheels.
2. Insert a small pry bar between the top pad and the axle stop. Pry axle stop up and out of the top pad.

ASSEMBLY

1. Lubricate the new axle stop with a vegetable-based oil. **DO NOT** use a petroleum-based oil, as this will cause deterioration of the rubber.
2. Place axle stop over the mounting hole in the top pad, see Figure 8-22.
3. Using a rubber mallet, lightly tap the axle stop to seat it in the top pad.
4. Remove the wheel chocks.



FRAME HANGER



DANGER

THE AIR SPRING TRANSFERS LOAD TO THE FRAME HANGER THROUGH THE LONGITUDINAL TORQUE ROD. PRIOR TO LONGITUDINAL TORQUE ROD REMOVAL THE SUSPENSION AIR SYSTEM MUST BE DEFLATED. FAILURE TO DO SO WILL CAUSE THE AIR SPRING TO VIOLENTLY SHIFT, RESULTING IN POSSIBLE DAMAGE TO COMPONENTS AND/OR PERSONAL INJURY.



WARNING

THIS PROCEDURE TO SERVICE THE FRAME HANGER IS PERFORMED WITH THE CLAMP GROUP, FRAME HANGER, AND TORQUE RODS ON THE OPPOSITE SIDE OF THE VEHICLE PROPERLY CONNECTED. FAILURE TO DO SO COULD ALLOW THE AXLES TO SHIFT RESULTING IN POSSIBLE DAMAGE TO COMPONENTS AND/OR PERSONAL INJURY. IF COMPONENTS ON BOTH SIDES OF THE VEHICLE ARE TO BE REMOVED IT WILL BE NECESSARY TO SUPPORT THE AXLE AND AXLE PINION TO KEEP THE AXLE FROM SHIFTING.

DISASSEMBLY

1. Chock the wheels.
2. Support the frame.
3. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system.
4. Disconnect the height control linkage assembly from the height control valve lever. Lower the height control valve lever to exhaust the air in the air springs and deflate the rear suspension. (See vehicle manufacturer's instructions).
5. Prior to disassembly of the longitudinal torque rod fasteners, note the orientation and quantity of torque rod shims and pinion spacers, see Figure 8-16. It is required that the longitudinal torque rod shims and pinion spacer be installed in the same orientation and location as removed to preserve the existing alignment and pinion angles.
6. Remove the fasteners securing the longitudinal torque rod to the frame hanger.
7. Remove the fasteners securing the frame hanger to the frame rail.
8. Remove the frame hanger by sliding it up and out from between the torque rods.

SERVICE HINT

The axles may have to be spread apart to remove the frame hanger. The use of a pry bar may be required.

INSPECTION

1. Inspect the frame hanger, frame rail, longitudinal torque rods and cross member gussets for any signs of excessive wear, cracking or damage. See Preventative Maintenance section in this publication. Replace as necessary.

ASSEMBLY

SERVICE HINT

The axles may have to be spread apart to install the frame hanger. The use of a pry bar may be required.

1. Slide the frame hanger down between the longitudinal torque rods and position the frame hanger against the frame rail.

NOTE

There are several different length fasteners used to connect the frame hanger to the frame rail. Verify the proper fastener length is used in the proper location. Refer to the vehicle manufacturer's specifications.

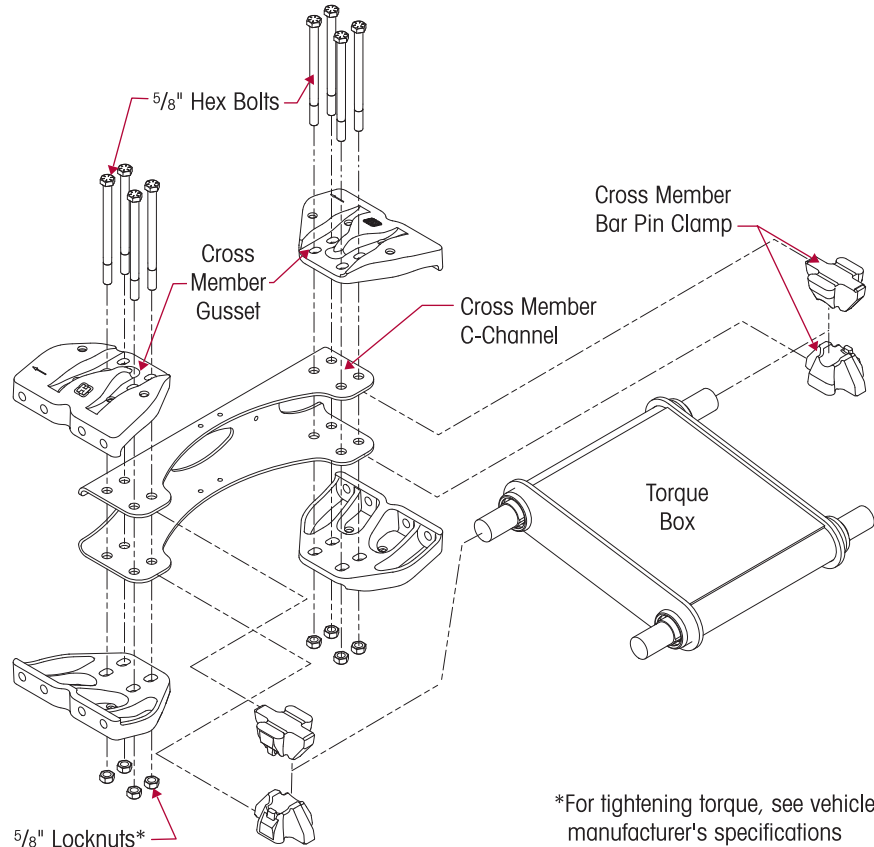
2. Loosely install the fasteners through the frame hanger, frame rail, and cross member gussets.

CROSS MEMBER

SERVICE HINT

To access the torque box for service or removal it may be necessary to remove the fifth wheel. Follow the manufacturers recommendations for fifth wheel removal and installation.

FIGURE 8-24



*For tightening torque, see vehicle manufacturer's specifications

DISASSEMBLY

1. Chock the wheels.
2. Support the frame at ride height.
3. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system.
4. Disconnect the height control linkage assembly from the height control valve lever. Lower the height control valve lever to exhaust the air in the air springs and deflate the rear suspension. (See vehicle manufacturer's instructions).
5. Support the axles and axle housing/differential so axles will not shift/rotate during service.
6. Remove the vertical fasteners which connect the torque box to the cross member, see Figure 8-24.
7. Remove the torque box clamp blocks.
8. Remove the cross member C-channel.
9. Remove the fasteners securing the frame hangers and cross member gussets to the frame rails.
10. Remove the cross member gussets, see Figure 8-24.

INSPECTION

1. Inspect the cross member C-channel and gussets, frame rails, and frame hanger for signs of excessive wear, cracking or damage. Replace as necessary. See Preventive Maintenance Section of this publication.

ASSEMBLY

CAUTION

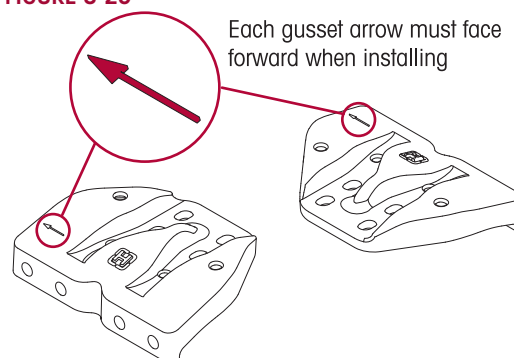
THE CORRECT GUSSET MUST BE INSTALLED IN THE PROPER POSITION AND ORIENTATION. EACH GUSSET HAS AN ARROW THAT MUST BE FACING FORWARD WHEN INSTALLED, SEE FIGURE 8-25.

NOTE

There are several different length fasteners used to connect the frame hanger to the frame rail. Verify the proper fastener length is used in the proper location. Refer to the vehicle manufacturer's specifications.

1. Position the cross member gussets and frame hangers against the frame rail. Verify the correct cross member gusset is installed in the correct position and the arrow on each cross member gusset is facing forward. Loosely install the proper length fasteners through gussets, frame rail, and frame hangers.
2. Position the C-channel of the cross member between the cross member gussets.
3. Install the torque box clamp blocks onto the torque box bar pin shaft.
4. Install the vertical clamp bolts through the cross member C-channel. Ensure the torque box clamp blocks are between the vertical clamp bolts.
5. Tighten the frame hanger fasteners per vehicle manufacturer's torque specifications.

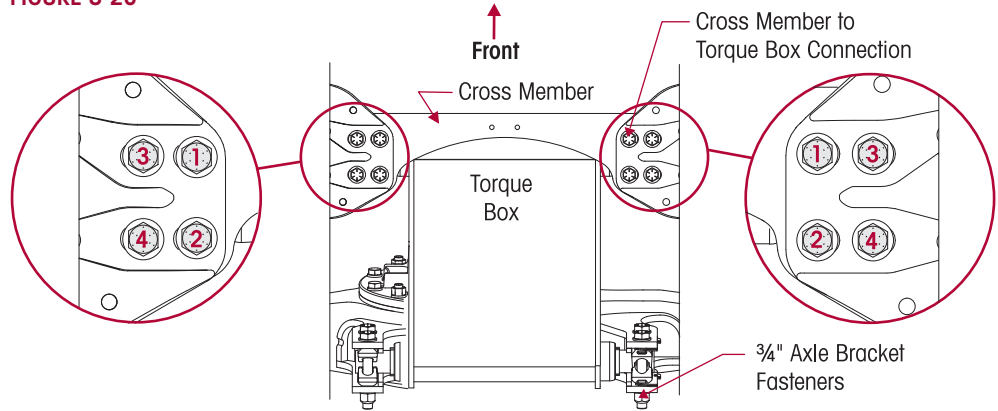
FIGURE 8-25



WARNING

IT IS IMPORTANT THAT THE TORQUE BOX CLAMP CONNECTIONS BE TIGHTENED IN THE PROPER SEQUENCE AND HAVE THE PROPER TIGHTENING TORQUE VALUES MAINTAINED. FAILURE TO DO SO MAY RESULT IN THE DEFORMATION OF PARTS, RESULTING IN THE LOSS OF CLAMP FORCE, BOLT FAILURE, LOSS OF THE AXLE'S ALIGNMENT, LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR PERSONAL INJURY.

6. First snug, and then tighten the torque box to cross member clamp bolts in the proper sequence (inboard fasteners first then outboard fasteners), to prevent cross member deformation, see Figure 8-26. Tighten the locknuts per vehicle manufacturer's torque specifications.

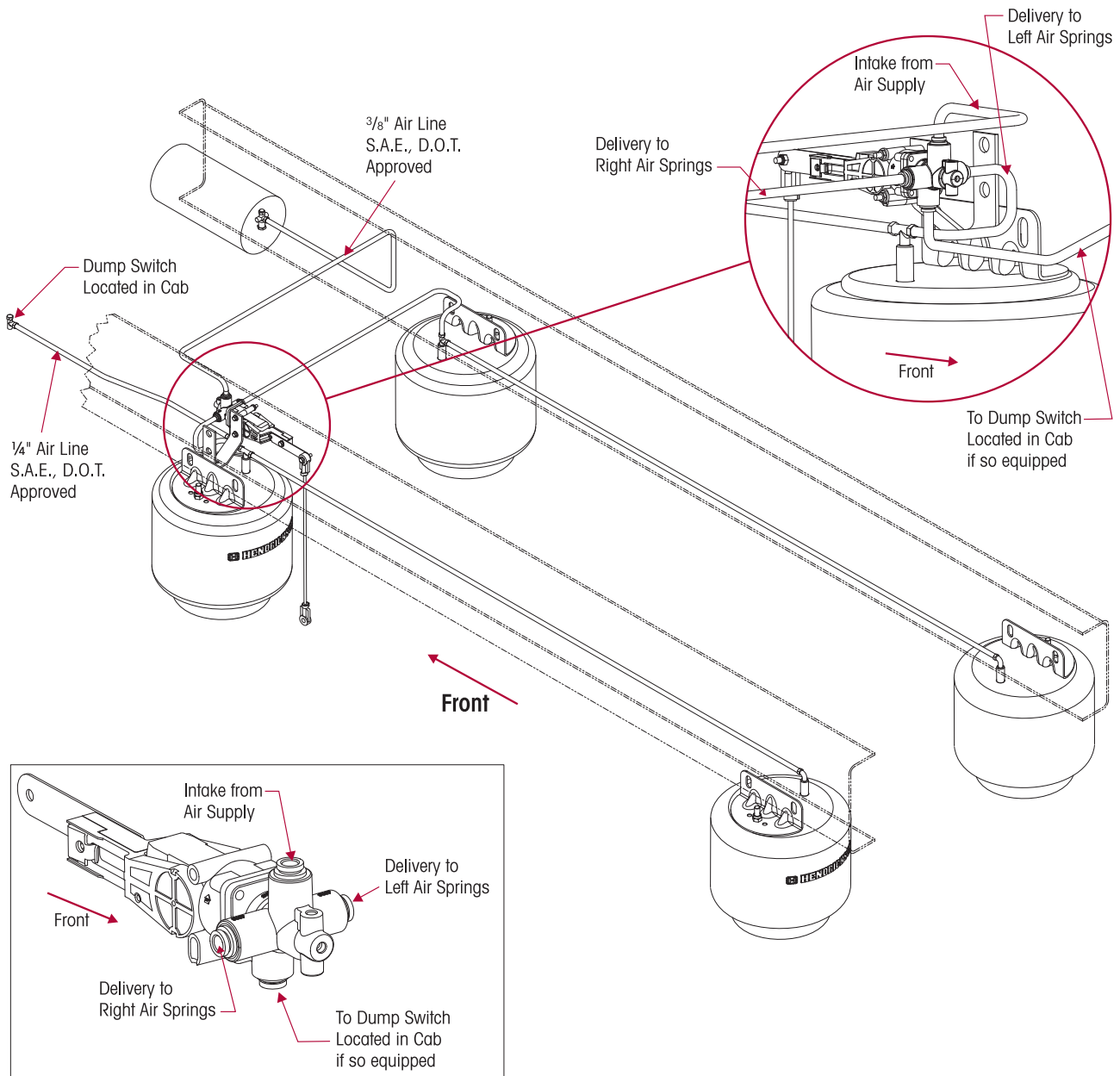
FIGURE 8-26


Snug and then tighten $\frac{5}{8}$ " cross member fasteners in the proper sequence (inboard side to outboard side). (See vehicle manufacturer's tightening torque specifications)

7. See Air Spring Warnings and instructions in the important Safety Notice Section of this publication prior to inflating or deflating the suspension system.
8. Connect the height control lever to the height control valve linkage assembly to inflate the suspension.
9. Remove the frame and the axle housing/differential supports.
10. Verify proper ride height adjustment, (see Ride Height Adjustment in the Alignment & Adjustments Section of this publication). Correct as necessary.
11. Verify proper alignment of the axle. See Alignment in the Alignment & Adjustments Section of this publication. Correct as necessary.
12. Remove the Wheel chocks.

SECTION 9

Plumbing Diagram





SECTION 10

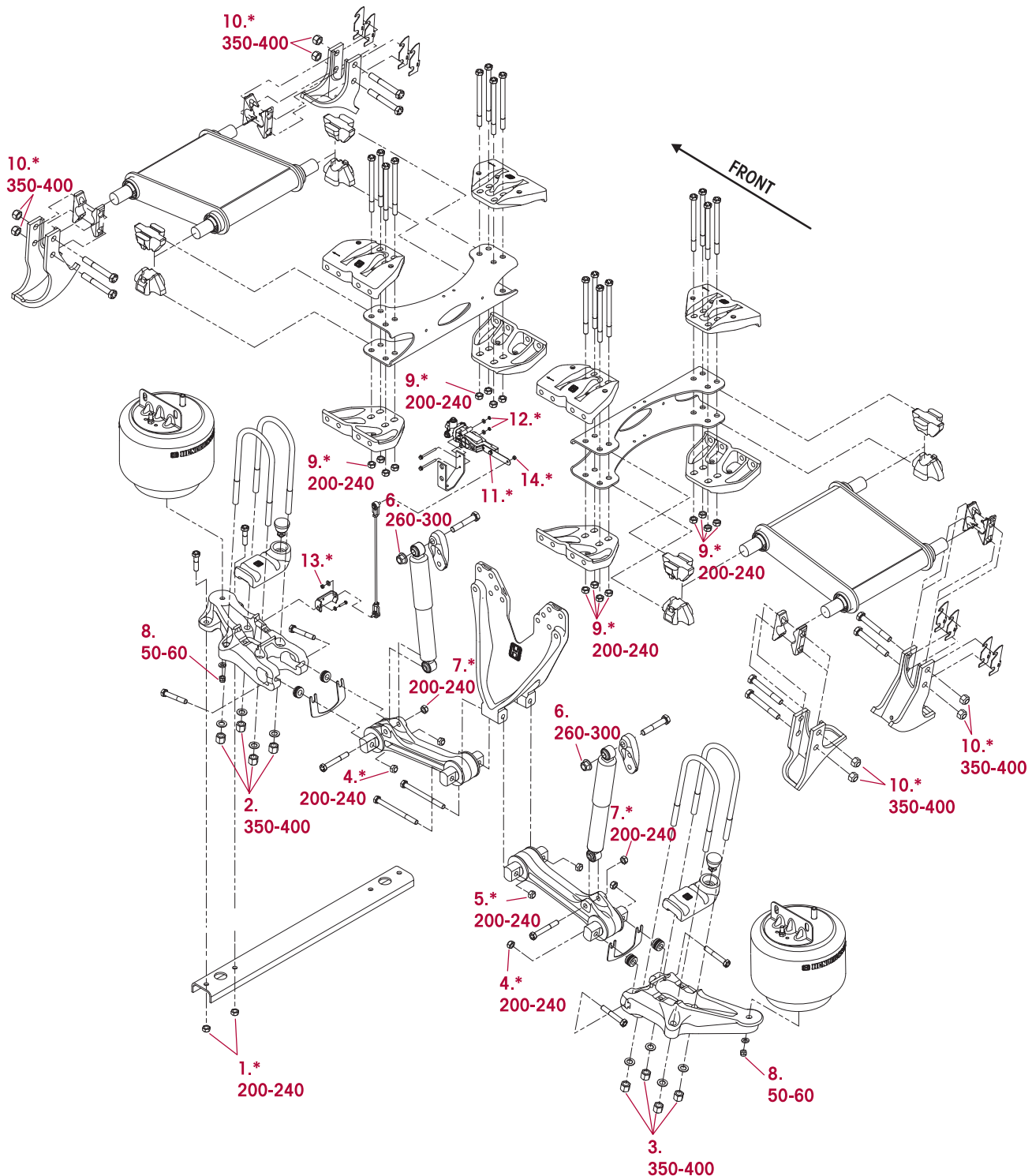
Troubleshooting Guide

HTB 400LT TROUBLESHOOTING GUIDE		
CONDITION	POSSIBLE CAUSE	CORRECTION
Suspension has harsh or bumpy ride	Air spring not inflated to specification or damaged	Repair air system and check ride height. See Ride Height Adjustment in the Alignment & Adjustments Section.
	Ride height set incorrectly	Adjust ride height to proper setting. See Ride Height Adjustment in the Alignment & Adjustments Section.
	Suspension is overloaded	Redistribute load to correct weight.
Irregular tire wear	Incorrect tire inflation pressure	Correct tire pressure per vehicle manufacturer and tire manufacturer specifications.
	Axle Alignment	Check vehicle alignment. Adjust if necessary. See Alignment & Adjustment Section.
	Worn torque box bushings	Replace torque box as necessary.
	Worn torque rod bushings	Replace torque rod bushings as necessary.
Excessive driveline vibration	Incorrect pinion angle(s)	Adjust pinion angle(s), refer to the Vehicle Manufacturer for specifications.
	Ride height set incorrectly	Adjust ride height to proper setting. See Ride Height Adjustment in the Alignment & Adjustments Section.
	Air spring not inflated to specification or damaged	Repair air system and check ride height. See Ride Height Adjustment in the Alignment & Adjustments Section.
Suspension is noisy	Broken shock or loose shock	Check fasteners for proper torque requirements and inspect for damage. See Preventive Maintenance Section of this publication. Replace as necessary.
	Loose U Bolts	Tighten U Bolts to specifications, see Preventive Maintenance Section.
	Worn torque rod bushings	Replace torque rod bushings as necessary.
Vehicle bouncing excessively	Damaged or leaking shock absorber	Replace shock absorber.
	Ride height set incorrectly	Adjust ride height to proper setting. See Ride Height Adjustment in the Alignment & Adjustments Section.
Vehicle leaning	Incorrect tire inflation pressure	Correct tire pressure per vehicle manufacturer and tire manufacturer specifications.
	Load not centered	Redistribute the load.
	Frame twisted	Straighten the frame per vehicle manufacturer guidelines.
	Axle housing bent or broken	Replace axle housing per vehicle manufacturer guidelines and align vehicle.
	Loose U Bolts	Tighten U Bolts to specifications, see Preventive Maintenance Section.
	Front suspension	Inspect and repair front suspension.

SECTION 11

Torque Specifications

RECOMMENDED TORQUE VALUES PROVIDED IN FOOT POUNDS





HTB 400LT for INTERNATIONAL TRUCK VEHICLES

HENDRICKSON RECOMMENDED TORQUE SPECIFICATIONS				
NO	COMPONENT	QTY.	SIZE	TORQUE FT./LBS.
1	Cross Bar to Front Air Spring Bracket	4	5/8"-18 UNF Flange Locknut	200-240*
2	U Bolt to Front Axle	4	3/4"-16 UNF U Bolt Locknut	350-400
3	U Bolt to Rear Axle	4	3/4"-16 UNF U Bolt Locknut	350-400
4	Torque Rod to Lower Air Spring Bracket	8	5/8"-18 UNF Flange Locknut	200-240*
5	Torque Rod to Frame Hanger	4	5/8"-18 UNF Flange Locknut	200-240*
6	Shock Absorber to Shock Absorber Frame Bracket	4	3/4"-10 UNC Flange Locknut	300-370
7	Shock Absorber to Lower Shock Mount	4	5/8"-18 UNF Flange Locknut	200-240*
8	Air Spring to Lower Air Spring Bracket	4	1/2"-13 UNC Nylon Locknut	50-60
9	Torque Box to Cross Member C-Channel	16	5/8"-18 UNF Flange Locknut	200-240*
10	Torque Box to Axle Bracket	8	3/4"-16 UNF Flange Locknut	350-400*
11	Height Control Valve to HCV Lever	1	1/4" Bolt	*
12	Height Control Valve to HCV Bracket	2	6mm Locknut	*
13	HCV Linkage to Lower HCV Linkage Mounting Bracket	1	1/4" Locknut	*
14	HCV Linkage to HCV Lever	1	1/4" Locknut	*
<p>NOTE: All hardware grayed out denotes items not supplied by Hendrickson. For torque requirements see vehicle manufacturer. Torque values listed above apply only if Hendrickson supplied fasteners are used. If non Hendrickson fasteners are used, follow torque specification listed in vehicle manufacturer's service manual.</p> <p>* Torque calculations based on specific fasteners, using alternate fasteners may alter torque values. See vehicle manufacturer for more information.</p>				





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