

# **H** TECHNICAL PROCEDURE

## HAS™ Series / HAS™ 40LH

**SUBJECT:** Service Instructions

**LIT NO:** 17730-212

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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 HAS™ Series suspension system.

The construction of the HAS Single air suspension is half of the HAS Tandem in appearance as shown in Figures 2-1 and 2-3.

### 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 HAS Series suspensions.

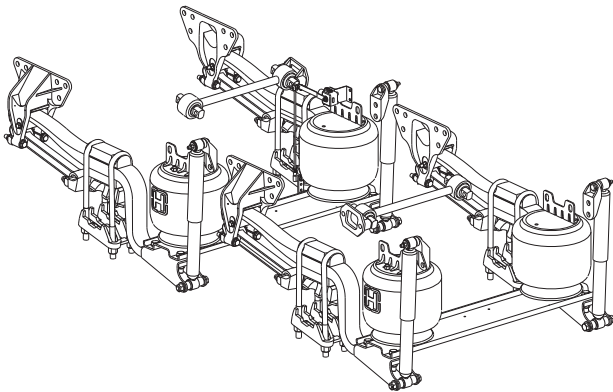
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**The latest revision of this publication is also available online at [www.hendrickson-intl.com](http://www.hendrickson-intl.com).**

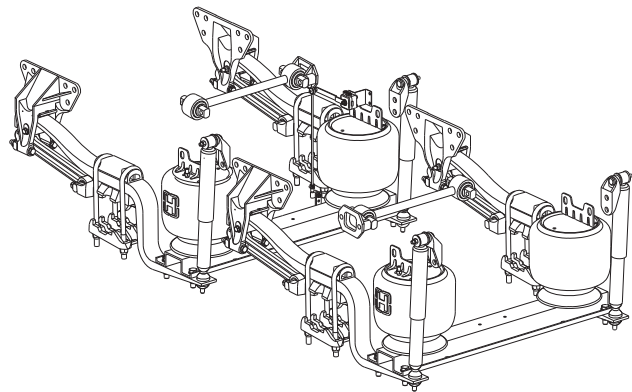
## SECTION 2

# Product Description

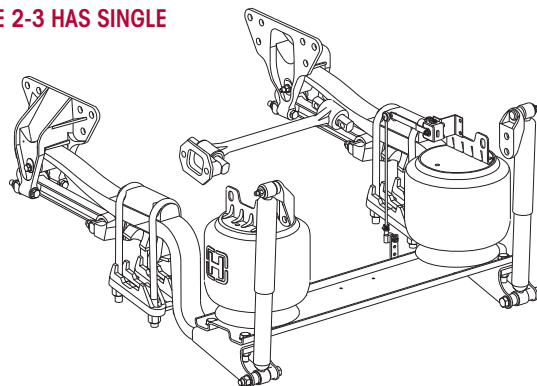
**FIGURE 2-1 HAS TANDEM**



**FIGURE 2-2 HAS 40LH**



**FIGURE 2-3 HAS SINGLE**



**THE HAS SERIES SUSPENSIONS** are ideal for operations with diminishing loads, such as tankers and grocery operations, and where ride quality both empty and loaded is important.

The HAS suspension ride height is controlled by a single height control valve. The valve has immediate air response with a 1.5° dead band and high air flow.

A switch installed in the cab controls a dump valve at the rear suspension. This permits the driver to exhaust the rear suspension air for trailer coupling and uncoupling.

A pressure protection valve located at the vehicle's air storage tanks protects the vehicle's primary air system should a failure occur in the suspension's air system.

All HAS Series suspensions are intended for installation on overall frame widths of 33.94" to 34.19", 34.50" to 34.81"; axle dowel pin centers of 40.00" or 40.25"; and axle spacing of 52.00", 54.00", 60.00", or 72.50".

The design features include:

- **Air springs** — Large volume air springs with rolling lobe design constantly adjust to changing road conditions to deliver superior ride quality.
- **Axle connection** — Wide seats provide a secure axle connection and axle integrity.
- **Frame hanger** — Low mount hanger design eliminates fifth-wheel notching. Provides a durable, low-friction surface for quiet main support member horizontal travel. Enlarged rebound roller limits vertical travel of main support member for enhanced control during braking.
- **Main support member** — Designed and manufactured with advanced materials and process technology. Substantial reduction in spring weight and increased strength.
- **ULTRA ROD® Series torque rods and bushings** — Optimized configuration helps improve handling and roll stiffness for expanded applications and stability during acceleration and braking. Premium bonded rubber bushings for increased service life.
- **Drop-in shims** — make axle alignment fast and easy for increased tire life.

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**NOTE**

Drive axle pinion angles are established by the vehicle manufacturer. The axle seats are cast to specific angles to meet their requirements. Empty chassis axle pinion angles will measure about 1° less as compared to when the vehicle is fully loaded. This is because the main support members will deflect slightly under full load.

Because the HAS suspension allows a high degree of axle articulation, applications with low ride height hardware and low fifth wheels may allow the drive tires to interfere with the trailer floor during maximum articulation or when the quick release valve is actuated.

### **Efficient Driveline GEometry (EDGE)**

In the commercial trucking industry, drivetrain vibration is a major issue. Pinion angles and suspension ride height can cause undesirable noise and vibration issues as well as premature driveline component failures when not properly set. The only affect that the suspension has on the driveline is setting the seat angles as developed by the OEM. The suspension does not effect other vibration problems such as: engine excited torsionals, driveline system resonance, rotating imbalance, driveshaft runout and bearing looseness. Hendrickson has developed a system approach to accurately control driveline angularity. This system promotes Efficient Driveline GEometry (EDGE).

For acceptable reductions in U-joint vibration all three features listed below must be applied.

The EDGE design features:

- **HI-TORQUE™ shock absorbers** — The HI-TORQUE shock contains a patented rebound spring inside, which limits rapid shock extension during acceleration. HI-TORQUE shocks control torque induced frame rise and help to reduce driveline vibration. HI-TORQUE shocks help provide longer life, and they function as traditional shock absorbers to deliver a smooth, high-quality ride.
- **Optimized high performance valve mounted on the front drive axle.**

## HAS SERIES SPECIFICATIONS

Model	Suspension Capacity (in lbs.)	GCW Tractor (in lbs.)	GVW Truck (in lbs.)	Tractor	Truck	Suspension Weight <sup>1</sup> (in lbs.)
HAS 120	12,000	N/A	20,000	No	Yes <sup>2</sup>	396
HAS 150	15,000	N/A	26,000	No	Yes <sup>2</sup>	396
HAS 190 <sup>5</sup>	19,000	N/A	26,000	No	Yes <sup>2</sup>	423
HAS 210	21,000	60,000	33,000	Yes <sup>4</sup>	Yes <sup>2</sup>	454
HAS 230	23,000	100,000	35,000	Yes <sup>4</sup>	Yes	470
HAS 400	40,000	120,000	55,000	Yes <sup>3</sup>	Yes <sup>2</sup>	905
HAS 402	40,000	138,000	66,000	Yes <sup>3</sup>	Yes <sup>2</sup>	920
HAS 460	46,000	150,000	76,000	Yes <sup>3</sup>	Yes <sup>2</sup>	937
HAS 40LH	40,000	80,000	N/A	Yes <sup>2,4</sup>	No	797

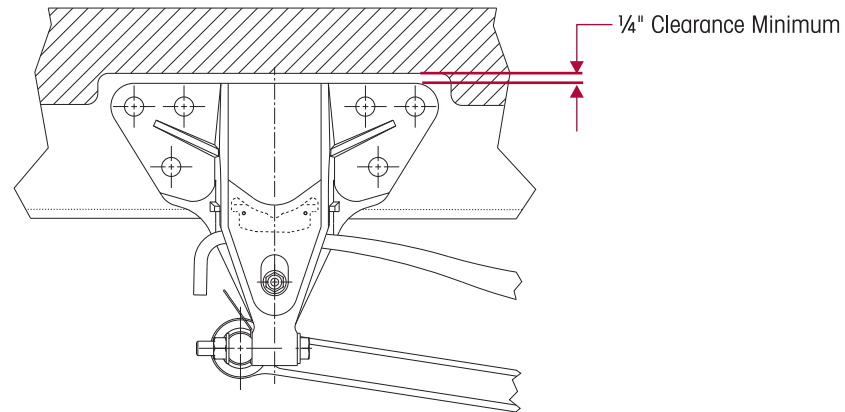
1. Includes complete suspension, torque rods, axle brackets and frame brackets and all hardware.
2. No add-on lift axles.
3. Approved one lift axle only. Maximum 50,000 pounds load on suspension for site travel.
4. Not approved with trailer belly lift axles.
5. Available for low profile for disc brakes.

## TECHNICAL NOTES

### FIFTH WHEEL MOUNTING ANGLE CLEARANCE

The frame hangers are designed to allow for fifth wheel mounting angle clearance. In some cases the mounting angles may extend down over the frame hangers and may have to be cut out to provide proper clearance, refer to Figure 2-4.

**FIGURE 2-4**



## SECTION 3

# Important Safety Notice

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

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

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



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

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**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 servicing being performed a little easier and/or faster.

Also note that particular service operations may require the use of special tools designed for specific purposes. These special tools can be found in the Special Tools Section of this publication.



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

## ■ SAFETY PRECAUTIONS

### WARNING

#### FASTENERS

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

LOOSE OR OVER TORQUED FASTENERS CAN CAUSE COMPONENT DAMAGE, LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE, OR SEVERE PERSONAL INJURY. MAINTAIN CORRECT TORQUE VALUE AT ALL TIMES. CHECK TORQUE VALUES ON A REGULAR BASIS AS SPECIFIED, USING A REGULARLY CALIBRATED TORQUE WRENCH. TORQUE VALUES SPECIFIED IN THIS TECHNICAL PUBLICATION ARE FOR HENDRICKSON SUPPLIED FASTENERS ONLY. IF NON HENDRICKSON FASTENERS ARE USED, FOLLOW TORQUE SPECIFICATION LISTED IN THE VEHICLE MANUFACTURER'S SERVICE MANUAL.

### WARNING

#### LOAD CAPACITY

ADHERE TO THE PUBLISHED CAPACITY RATINGS FOR THE 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

#### MODIFYING COMPONENTS

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

### WARNING

#### TORCH/WELDING

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

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

### WARNING



#### WORK SITE DUMPING

WHEN THE TRUCK/TRAILER BODY/BOOM AND/OR ATTACHMENT IS LIFTED IT IS MANDATORY TO COMPLETELY EXHAUST THE AIR FROM THE SUSPENSION SYSTEM TO HELP PROVIDE STABILITY WHEN LIFTED. FAILURE TO DO SO CAN RESULT IN LOSS OF VEHICLE CONTROL, ROLL-OVER, OR VEHICLE INSTABILITY, POSSIBLY CAUSING SEVERE PERSONAL INJURY, PROPERTY DAMAGE, OR DEATH. FIRST RAISE ANY AUXILIARY AXLES AND THEN EXHAUST ALL PRESSURE FROM PRIMARY AIR SUSPENSION SYSTEMS PRIOR TO RAISING THE BODY / BOOM OR ATTACHMENTS. FOLLOW THE VEHICLE MANUFACTURER'S OPERATING INSTRUCTIONS FOR MAINTAINING PROPER STABILITY.

### WARNING

#### TRANSVERSE RODS

HAS SERIES SUSPENSIONS INCORPORATE TRANSVERSE RODS FOR VEHICLE STABILITY. IF THESE COMPONENTS ARE DISCONNECTED OR ARE NON-FUNCTIONAL, THE VEHICLE SHOULD NOT BE OPERATED. FAILURE TO DO SO CAN RESULT IN ADVERSE VEHICLE HANDLING, LOSS OF VEHICLE CONTROL, POSSIBLE TIRE CONTACT WITH THE FRAME, PREMATURE COMPONENT DAMAGE, OR SEVERE PERSONAL INJURY.



**CAUTION**

**PROCEDURES AND TOOLS**

A MECHANIC USING A SERVICE PROCEDURE OR TOOL WHICH HAS NOT BEEN RECOMMENDED BY HENDRICKSON MUST FIRST SATISFY HIMSELF THAT NEITHER HIS SAFETY NOR THE VEHICLE'S SAFETY WILL BE JEOPARDIZED BY THE METHOD OR TOOL SELECTED. INDIVIDUALS DEVIATING IN ANY MANNER FROM THE INSTRUCTIONS PROVIDED 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 HAS 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 GENUINE PARTS CAN ALTER THE 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**

**AIR SPRINGS**

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



**WARNING**

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



**CAUTION**

**AIR SPRING INFLATION**

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



**WARNING**

**REPAIR OR RECONDITIONING**

THE REPAIR OR RECONDITIONING OF SUSPENSION OR OTHER COMPONENT IS NOT ALLOWED. ANY SUSPENSION OR OTHER COMPONENTS FOUND TO BE DAMAGED OR OUT OF SPECIFICATIONS MUST BE REPLACED. ALL MAJOR HENDRICKSON COMPONENTS ARE HEAT TREATED AND TEMPERED. HAS COMPONENTS CANNOT BE BENT, WELDED, HEATED, OR REPAIRED WITHOUT REDUCING THE STRENGTH OR LIFE OF THE COMPONENT. FAILURE TO FOLLOW THESE GUIDELINES CAN CAUSE LOSS OF VEHICLE CONTROL, POSSIBLE PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE AND WILL VOID APPLICABLE WARRANTIES.



**WARNING**

**SUPPORT THE VEHICLE PRIOR TO SERVICING**

PLACE THE VEHICLE ON A LEVEL FLOOR AND CHOCK THE WHEELS TO HELP PREVENT THE VEHICLE FROM MOVING. NEVER WORK UNDER A RAISED VEHICLE SUPPORTED BY ONLY A FLOOR JACK. ALWAYS SUPPORT A RAISED VEHICLE WITH SAFETY STANDS. CHOCK THE WHEELS AND MAKE SURE THE UNIT WILL NOT ROLL BEFORE RELEASING BRAKES. A JACK CAN SLIP OR FALL OVER. SERIOUS PERSONAL INJURY CAN RESULT.

**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. 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.

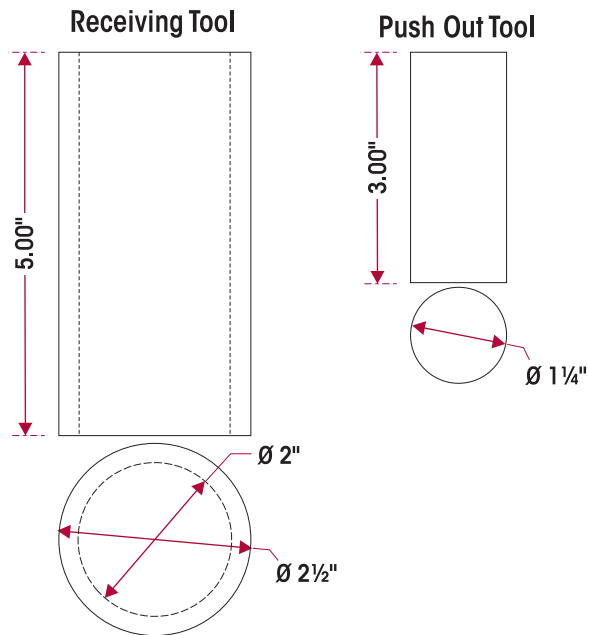
DO NOT USE HOT SOLUTION TANKS OR WATER AND ALKALINE SOLUTIONS TO CLEAN GROUND OR POLISHED PARTS. DOING SO WILL CAUSE DAMAGE TO THE PARTS AND VOID WARRANTY.



## SECTION 4 Special Tools

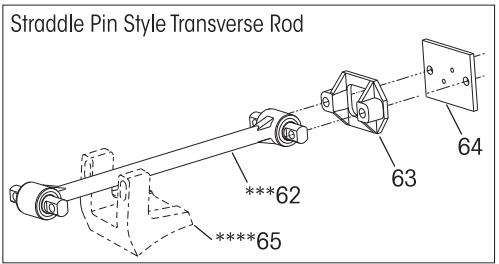
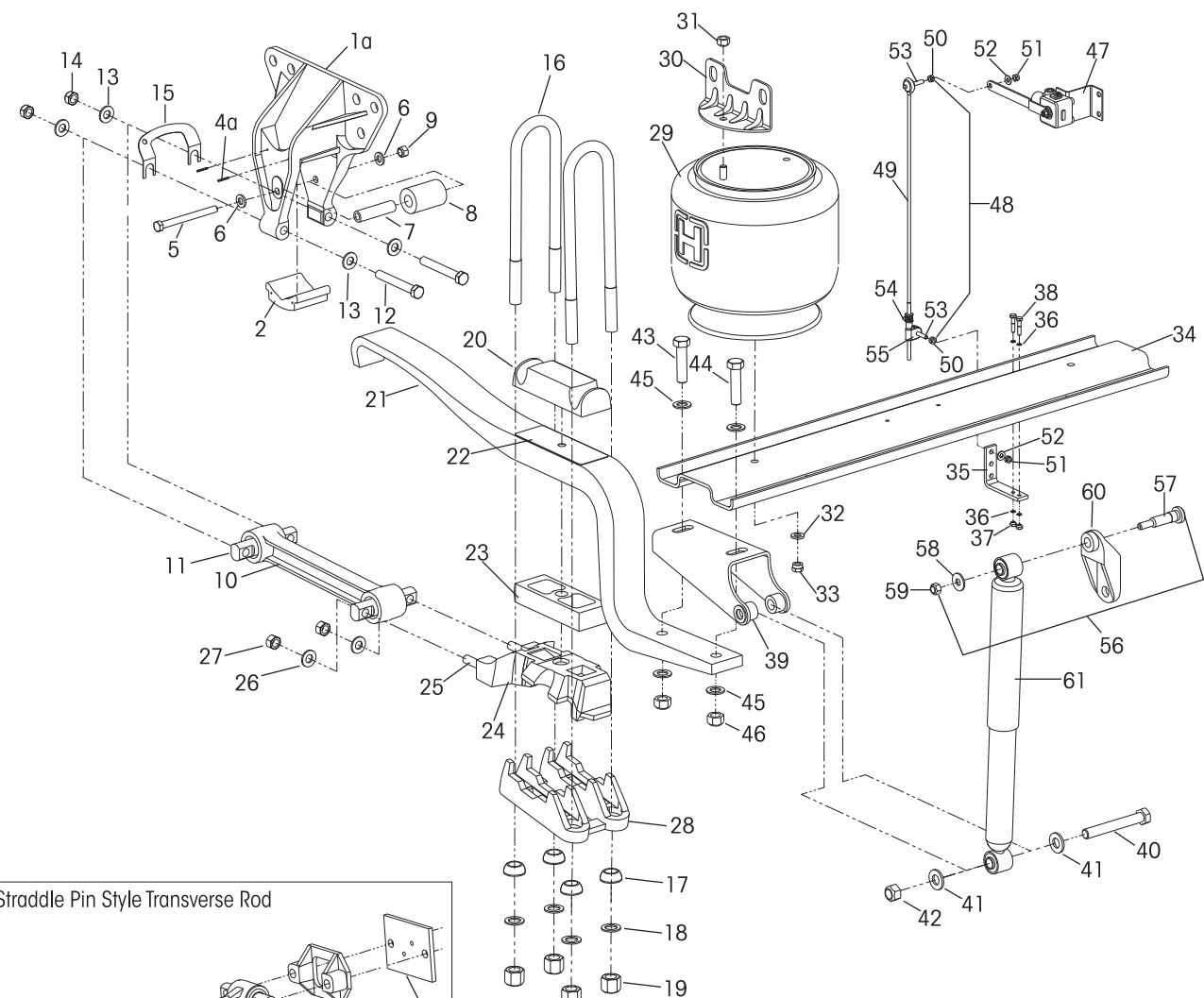
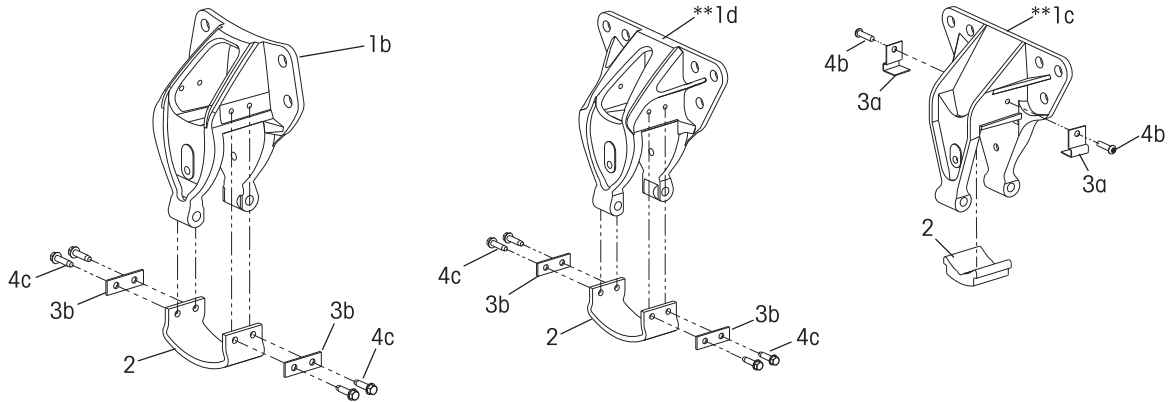
These shop made tools are designed for servicing bushings. Bushing tools are made from cold rolled steel or equivalent. The drawings are for reference only, Hendrickson does not supply these tool.

### TORQUE ROD BUSHING TOOLS



# SECTION 5 Parts Lists

## HAS Tandem 360/400/402/460





KEY NO.	PART NO.	DESCRIPTION	NO.REQ.
1		Front Frame Hanger Assembly, Includes Key Nos. 2-4	4
a	58425-001	HAS 400/402/460, • Standard Frame, Casting No. 57188-001, Replaces 57190-001 (**1c) and 50752-001 (**1d)	
	59045-003	• Standard Frame, Casting No. 59043-001	
	58688-001	• Rein. Frame, Casting No. 57476-001, Replaces 57478-001 (**1c)	
b	50753-001	HAS 360, Casting No. 49848-000 or 56666-001 <b>Slipper Pad Service Kit, One Hanger</b> , Includes Key Nos. 2-4 (See Selection Guide on Page 19)	
2		Slipper Pad (See Selection Guide on Page 19)	4
3		Retaining Bracket or Plate (See Selection Guide on Page 19)	8
a	57566-000	Retaining Bracket	
b	50597-000	Retainer Plate	
4		Retainer Lock Pin or Screw (See Selection Guide on Page 19)	
a	58287-001	1" Lock Pin - 1/8" Dia.	8
b	57540-000	3/8" Button Head Screw	16
c	57306-000	3/8" Rolok Screw	16
	49175-014	<b>Rebound Roller Kit, Axle Set</b> , Includes Key Nos. 5-9	
5	24531-015	1/2"-13 UNC Rebound Bolt	4
6	22962-014	1/2" Flat Hardened Washer	8
7	57988-000	Rebound Bolt Spacer, Replaces 47458-000	4
8	58624-000	Rebound Roller, Replaces 57989-000, 48883-000	4
9	49846-000	1/2"-13 UNC Locknut	4
10		Longitudinal Torque Rod Assembly Includes Key No. 11	4
	48411-006	HAS 360/400/402	
	62007-365	HAS 460, Replaces 50376-001 Torque Rod and 57256-000 Bushing	
11	47691-000L	Torque Rod Bushing	8
12	32043-005	5/8"-11 UNC 4.5" Bolt	8
13	22962-004	5/8" Flat Hardened Washer	16
14	47764-000	5/8"-11 UNC Locknut	8
15	49689-000	Torque Rod Shim - 1/16"	As Req.
	57856-000	Torque Rod Shim - 1/32"	
16		7/8"-14 UNF U-bolt (See Selection Guide on Page 19)	8
	48718-157	<b>U-bolt Fastener Service Kit, Two U-bolts</b> , Includes Key Nos. 17-19	
17	48574-000	7/8" Spherical Washer	16
18	22962-002	7/8" Flat Hardened Washer	16
19		U-bolt Nut	16
	50765-000	7/8"-14 UNF Locknut	
	57347-000	7/8"-14 UNF Nylocknut	
20	56805-000	Top Pad	4
21		Main Support Member, Includes Key No. 22 (See Page 12 for HAS 460 Plus Severe Service Kit)	4
	56940-000	HAS 360	
	56931-000	HAS 400 Low Profile	
	56943-000	HAS 400	
	56934-000	HAS 402 Low Profile, 460 Low Profile	
	56946-000	HAS 402, 460	
22	47905-000	Delrin Liner	4
23		Spring Seat Spacer, contact Hendrickson Sales Engineering for additional Ride Heights	4
	48902-000	1"	
	48903-000	1 1/2"	
24		Spring Seat Assembly, Includes Key Nos. 25-27 (See Selection Guide on Page 13)	
		Left Front, Right Front	(each) 1
		Left Rear, Right Rear	(each) 1
25	50918-000	5/8"-11 UNC Stud	8
26	22962-004	5/8" Flat Hardened Washer	8

KEY NO.	PART NO.	DESCRIPTION	NO.REQ.
27	47764-000	5/8"-11 UNC Locknut	8
28		Axle Bottom Cap HAS 400/402/460 • (Meritor RT40/41/44-145, RT46/50, RT40-160, RT46-158; Dana 404/405/454, DSP40/41, DSH40/44, DSS40/462/463, D40/46-170)	
	50216-000	LHF/RHF/LHR/RHR 0-9.5° Pinion Angle	
	50222-000	LHR/RHR 10-14° Pinion Angle	
	50216-000	• (Meritor SSSD, RT46-157)	
	50217-001	LHF 0-9.5° Pinion Angle	
	50221-001	RHF 0-9.5° Pinion Angle	
	50221-001	LHR 10-14° Pinion Angle	
	50222-000	RHR 10-14° Pinion Angle	
	50216-000	• (Dana D402/403/451)	
	50217-000	LHF 0-9.5° Pinion Angle	
	50217-000	RHF 0-9.5° Pinion Angle	
	50221-000	LHR 10-14° Pinion Angle	
	50222-000	RHR 10-14° Pinion Angle	
		HAS 402/460 • (Dana D461)	
	50085-000	LHF 0-9.5° Pinion Angle	
	50086-000	RHF 0-9.5° Pinion Angle	
	50095-000	LHR 10-14° Pinion Angle	
	50094-000	RHR 10-14° Pinion Angle	
29		Air Spring, Includes Key Nos. 30-31	4
	56917-002L	HAS 400L/402L	
	57122-002L	HAS 400/402/460	
30	50804-002	Air Spring Frame Bracket	4
31	17700-010	1/2"-13 UNC Air Spring Locknut	4
32	22962-014	1/2" Flat Hardened Washer	4
33	17700-010	1/2"-13 UNC Nylocknut	4
34		Cross Channel • HAS 360/400/402/460	2
	57317-001	40" Dowel Pin Centers	
	57317-002	40.25" Dowel Pin Centers	
	57317-003	40.5" Dowel Pin Centers	
	57317-004	40.63" Dowel Pin Centers	
	57317-006	40.25" Dowel Pin Centers w/ LH HCV	
	57773-001	• HAS 400/402/460 w/ Rear Inboard Shock	
	57773-002	40" Dowel Pin Centers	
	57773-002	40.25" Dowel Pin Centers	
	57773-003	40.5" Dowel Pin Centers	
	57773-004	40.63" Dowel Pin Centers	
	57430-000	<b>Control Valve Linkage Bracket Kit, Axle Set</b> Includes Key Nos. 35-38	
35	56789-000	Control Valve Linkage Bracket	1
36	22962-028	1/4" Flat Hardened Washer	4
37	49983-000	1/4"-20 UNC Locknut	2
38	56935-001	1/4"-20 UNC 1.0" Bolt, Replaces 56935-002	2
		Lower Shock Bracket Assembly, Includes Key Nos. 39-42	4
	57356-000	HAS 360/400/402/460	
	49690-002	HAS 400L/402L	
39		Lower Shock Bracket	4
	57355-000	HAS 360/400/402/460	
	49324-002	HAS 400L/402L	
40	50764-002	3/4"-10 UNC 5.5" Bolt	4
41	22962-001	3/4" Flat Hardened Washer	8
42	49842-000	3/4"-10 UNC Locknut	4
43		3/4"-10 UNC Bolt	4
	50764-005	HAS 360/400 - 3" Length	
	50764-003	HAS 402/460 - 3 1/2" Length	
44		3/4"-10 UNC Bolt	4
	50764-007	HAS 360/400 - 2 1/2" Length	
	50764-005	HAS 402/460 - 3" Length	
45	22962-001	3/4" Flat Hardened Washer	16
46	49842-000	3/4"-10 UNC Locknut	8
47	57977-000	Height Control Valve, Replaces 50433-001, -002	1

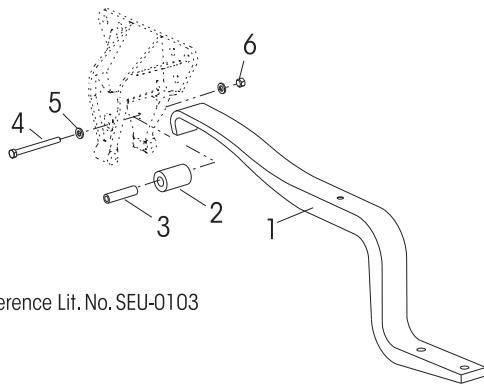


KEY NO.	PART NO.	DESCRIPTION	NO.REQ.
48	58994-	HCV Linkage Assembly, Specify Length, Contact Hendrickson for part no. Includes Key Nos. 49-55	1
49		*Linkage Rod, Specify Length	1
50		*5/16"-18 UNC Jam Nut	2
51		*5/16"-18 UNC Locknut	2
52		*5/16" Flat Hardened Washer	2
53		*5/16"-18 UNC Stud	2
54		*Linkage Rod Clamp	1
55		*Adjustable Linkage Rod Joint	1
56	57322-001	Upper Shock Bracket Assembly, Includes Key Nos. 57-60	4
57	50368-000	1/2"-13 UNC Serrated Shank Bolt	4
58	22962-031	1/2" Flat Hardened Washer	4
59	49846-000	1/2"-13 UNC Locknut	4
60		*Upper Shock Bracket	1

KEY NO.	PART NO.	DESCRIPTION	NO.REQ.
61		Shock Absorber	4
	60670-005L	HAS 360/400/402/460 Standard	
	60670-007L	HAS 400/402/460 Standard Inboard Rear	
	60675-003L	HI-TORQUE, Replaces 57905-001	
	60675-006L	HAS 400/402/460 HI-TORQUE Inboard Rear	
	60670-008L	HAS 400L/402L/460L	
62	60218-000	*** Two-Piece Transverse Torque Rod Kit, Includes Bushings	2
63	22186-000	Transverse Torque Rod Frame Bracket	2
64	45045-003	Back up Plate	2
65		****Transverse Torque Rod Axle Bracket	2
	48689-001	*****Aftermarket Quick Release Service Kit, Includes Key Nos. 1-3	
1	48914-000	Air Dump Switch (Located In Cab)	1
2	49193-001	Synchro-Relay Valve	1
3	48940-000	Air Switch Name Plate (Located In Cab)	1
4	30272-000	*****Pressure Protection Valve	1

## ■ HAS 460 PLUS

Severe Service Kit | Axle Set  
No. 49175-024



Reference Lit. No. SEU-0103

KEY NO.	PART NO.	DESCRIPTION	QTY.
	49175-024	<b>HAS 460 PLUS Severe Service Kit, Axle Set,</b> Includes Key Nos. 1-6 (Does not include Frame Hanger)	
1	59597-000	Main Support Member	2
2	59598-000	Rebound Roller	2
3	57988-000	Rebound Spacer	2
4	24531-015	1/2"-13 UNC 5.5" Rebound Bolt	2
5	22962-014	1/2" Flat Hardened Washer	4
6	49846-000	1/2"-13 UNC Locknut	2

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

\*\* These frame hangers are obsolete, although replacement slipper pads and hardware are currently still available.

\*\*\* Transverse torque rods are mandatory with the HAS Series Suspension. See Literature No. 59310-004 for mandatory use of transverse torque rods.

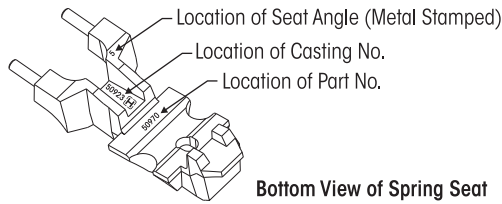
\*\*\*\* Not supplied by Hendrickson, used for reference only. Refer to vehicle manufacturer for more information. Hendrickson is not responsible for components supplied by vehicle manufacturer.

\*\*\*\*\* Only for vehicles built prior to 1996 equipped with Height Control Valves Part Nos. 50433-001 and -002.

Hendrickson HAS ride height gauges • Unloaded vehicles: Literature No. 45745-106, • Loaded vehicles: Literature No. 45745-050 can be obtained on-line at <http://72.3.226.140/literature/litform-new.asp>.



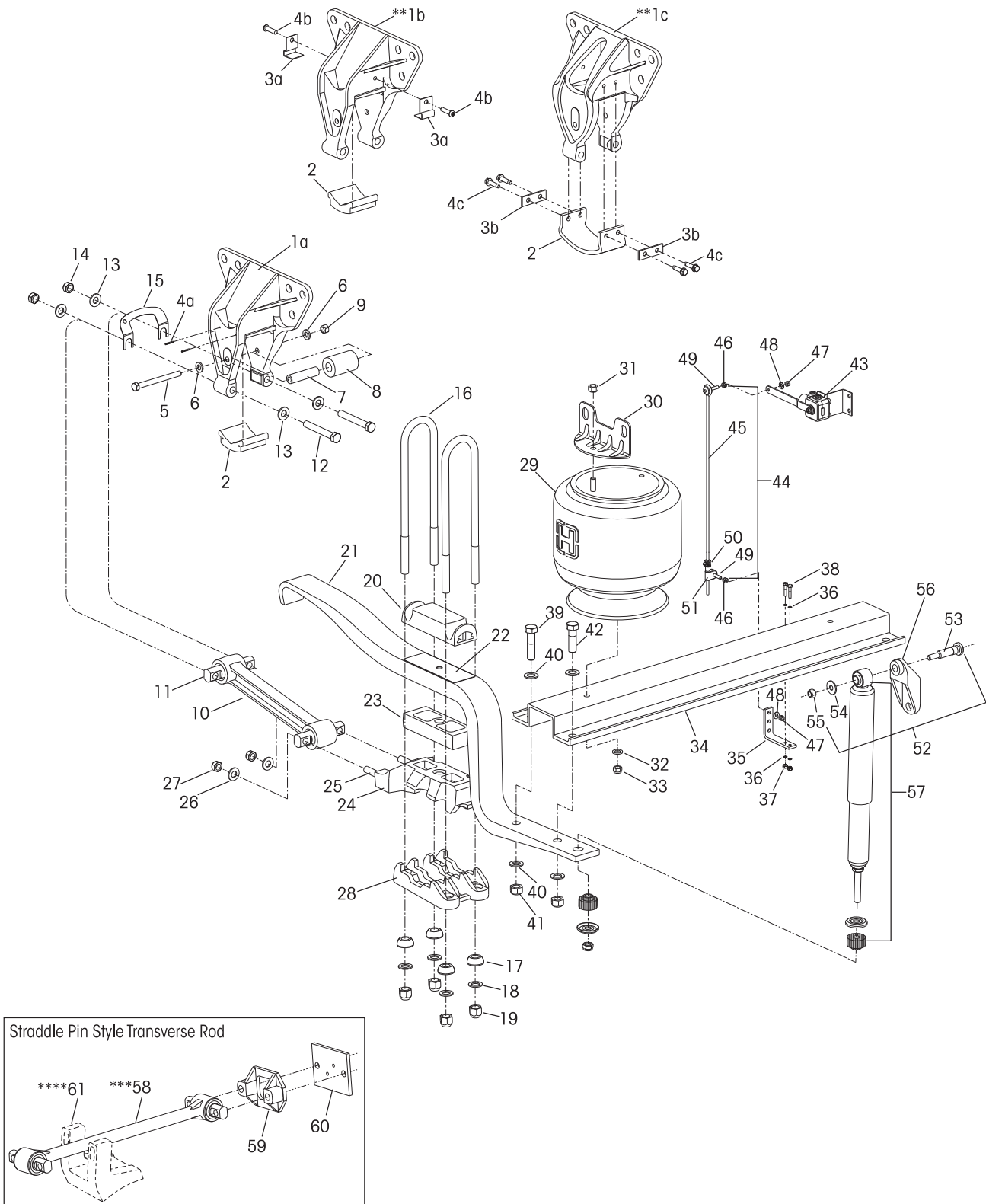
# HAS™ / HAS 40LH Tandem Spring Seat Selection Guide



**Spring Seats** include Key Nos. 25, 26, 27  
 Total of 4 spring seats are required per tandem.  
 One of each located at the left front, right front, left rear, and right rear.

LEFT FRONT			RIGHT FRONT				
<b>KEY NO. 24</b>	<b>Dana</b> D341/402/403 404/405/454 DSP40/41 DSH40/44 DSS40/462/463 D40/46-170	<b>Dana</b> D461	<b>KEY NO. 24</b>	<b>Dana</b> 404/405/454 DSP40/41 DSH40/44 DSS40/462/463 D40/46-170	<b>Dana</b> D341/402/403		<b>Dana</b> D461
	<b>Meritor</b> SL100/SQ100, SQHD RT40/41/44-145 RT46/50-160 RT40-160 RT46-157/158, SSHD			<b>Meritor</b> RS21-145/160 RS23-160/161 RT40/41/44-145 RT46/50-160 RT40-160, RT46-158	<b>Meritor</b> SL100/SQ100, SQHF	<b>Meritor</b> RT46-157, SSHD	
<b>CASTING NO.</b>	50923-000	50986-000	<b>CASTING NO.</b>	50923-000	50974-000	50974-000	50992-000
<b>SEAT ANGLE</b>	<b>H PART NO.</b>	<b>H PART NO.</b>	<b>SEAT ANGLE</b>	<b>H PART NO.</b>	<b>H PART NO.</b>	<b>H PART NO.</b>	<b>H PART NO.</b>
2.0°	50970-001	50988-001	2.0°	50970-001	50976-001	50976-012	50994-001
2.5°	50970-002	50988-002	2.5°	50970-002	50976-002	50976-016	50994-002
3.0°	50970-003	50988-003	3.0°	50970-003	50976-003	50976-013	50994-003
3.5°	50970-004	50988-004	3.5°	50970-004	50976-004	50976-017	50994-004
4.0°	50970-005	50988-005	4.0°	50970-005	50976-005	50976-014	50994-005
4.5°	50970-006	50988-006	4.5°	50970-006	50976-006	50976-018	50994-006
5.0°	50970-007	50988-007	5.0°	50970-007	50976-007		50994-007
5.5°	50970-008	50988-008	5.5°	50970-008	50976-008		50994-008
6.0°	50970-009	50988-009	6.0°	50970-009	50976-009		50994-009
6.5°	50970-010	50988-010	6.5°	50970-010	50976-010		50994-010
LEFT REAR			RIGHT REAR				
<b>KEY NO. 24</b>	<b>Dana</b> 404/405/454 DSP40/41 DSH40/44 DSS40/462/463 D40/46-170	<b>Dana</b> D341/402/403	<b>KEY NO. 24</b>	<b>Dana</b> D461		<b>Dana</b> D341/402/403 404/405/454 DSP40/41 DSH40/44 DSS40/462/463 D40/46-170	<b>Dana</b> D461
	<b>Meritor</b> RT40/41/44-145 RT46/50-160 RT40-160 RT46-158	<b>Meritor</b> SL100/SQ100, SQHP		<b>Meritor</b> RT46-157, SSHD		<b>Meritor</b> SL100/SQ100, SQHD RT40/41/44-145 RT46/50-160 RT40-160 RT46-157/158, SSHD	
<b>CASTING NO.</b>	50971-000	50977-000	<b>CASTING NO.</b>	50977-000	50995-000	50971-000	50989-000
<b>SEAT ANGLE</b>	<b>H PART NO.</b>	<b>H PART NO.</b>	<b>SEAT ANGLE</b>	<b>H PART NO.</b>	<b>H PART NO.</b>	<b>H PART NO.</b>	<b>H PART NO.</b>
5.0°	50973-011	50979-011	5.0°	50979-013	50997-011	50973-011	50991-011
6.5°	50973-012	50979-012	6.5°		50997-012	50973-012	50991-012
7.5°	50973-013	50979-014	7.5°			50973-013	
8.0°	50973-001	50979-001	8.0°		50997-001	50973-001	50991-001
8.5°	50973-002	50979-002	8.5°		50997-002	50973-002	50991-002
9.0°	50973-003	50979-003	9.0°		50997-003	50973-003	50991-003
9.5°	50973-004	50979-004	9.5°		50997-004	50973-004	50991-004
10.0°	50973-005	50979-005	10.0°		50997-005	50973-005	50991-005
10.5°	50973-006	50979-006	10.5°	50979-020	50997-006	50973-006	50991-006
11.0°	50973-007	50979-007	11.0°		50997-007	50973-007	50991-007
11.5°	50973-008	50979-008	11.5°	50979-019	50997-008	50973-008	50991-008
12.0°	50973-009	50979-009	12.0°		50997-009	50973-009	50991-009
12.5°	50973-010	50979-010	12.5°	50979-015	50997-010	50973-010	50991-010
13.0°	50973-015	50979-017	13.0°	50979-016	50997-013	50973-015	50991-013
13.5°	50973-014	50979-018	13.5°			50973-014	
14.0°	50973-016		14.0°			50973-016	

HAS 40LH

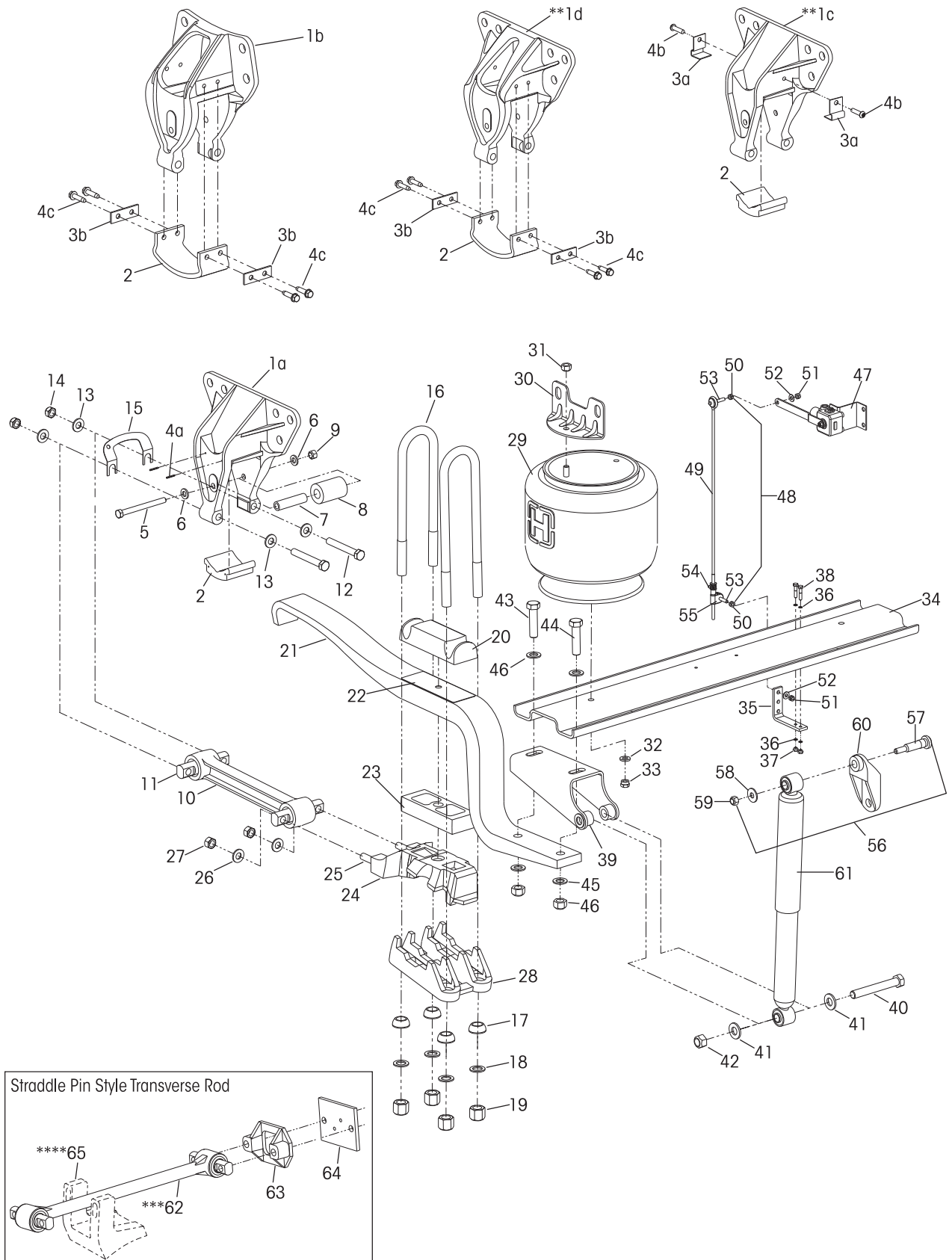




KEY NO.	PART NO.	DESCRIPTION	NO.REQ.
1		Front Frame Hanger Assembly, Includes Key Nos. 2-4	4
a	58425-001	• Standard Frame Casting No. 57188-001, <i>Replaces</i> <i>57190-001 (**1a) and 50752-001 (**1b)</i>	
	58688-001	• Rein. Frame, Casting No. 57476-001, <i>Replaces 57478-001 (**1a)</i>	
<b>Slipper Pad Service Kit, One Hanger, Includes</b> Key Nos. 2-4 ( <i>See Selection Guide on Page 19</i> )			
2		Slipper Pad ( <i>See Selection Guide on Page 19</i> )	4
3		Retaining Bracket or Plate ( <i>See Selection Guide on Page 19</i> )	8
a	57566-000	Retaining Bracket	
b	50597-000	Retainer Plate	
4		Retainer Lock Pin or Screw ( <i>See Selection</i> <i>Guide on Page 19</i> )	
a	58287-001	1" Lock Pin - 1/8" Dia.	8
b	57540-000	3/8" Button Head Screw	16
c	57306-000	3/8" Rolok Screw	16
	49175-014	<b>Rebound Roller Kit, Axle Set,</b> Includes Key Nos. 5-9	
5	24531-015	1/2"-13 UNC Rebound Bolt	4
6	22962-014	1/2" Flat Hardened Washer	8
7	57988-000	Rebound Bolt Spacer, <i>Replaces 47458-000</i>	4
8	58624-000	Rebound Roller, <i>Replaces 57989-000, 48883-000</i>	4
9	49846-000	1/2"-13 UNC Locknut	4
10	48411-006	Longitudinal Torque Rod Assembly Includes Key No. 11	4
11	47691-000L	Torque Rod Bushing	8
12	32043-005	5/8"-11 UNC 4.5" Bolt	8
13	22962-004	5/8" Flat Hardened Washer	16
14	47764-000	5/8"-11 UNC Locknut	8
15		Torque Rod Shim	As Req.
	49689-000	1/16"	
	57856-000	1/32"	
16		3/4"-16 UNF U-bolt ( <i>See Selection Guide</i> <i>on Page 19</i> )	8
	48718-158	<b>U-bolt Fastener Service Kit, Two U-bolts,</b> Includes Key Nos. 17-19	
17	49947-000	3/4" Spherical Washer	16
18	22962-001	3/4" Flat Hardened Washer	16
19	49685-000	3/4"-16 UNF Locknut	16
20	57195-000	Top Pad	4
21		Main Support Member,	4
	57217-000	Includes Key No. 22	
	60262-000	Mack only	
22	47905-000	Delrin Liner	4
23		Spring Seat Spacer	4
	48902-000	1"	
	48903-000	1 1/2"	
24		Spring Seat Assembly, Includes Key Nos. 25-27 ( <i>See Selection Guide on Page 13</i> )	
		Left Front, Right Front	(each) 1
		Left Rear, Right Rear	(each) 1
25	50918-000	5/8"-11 UNC Stud	8
26	22962-004	5/8" Flat Hardened Washer	8
27	47764-000	5/8"-11 UNC Locknut	8

KEY NO.	PART NO.	DESCRIPTION	NO.REQ.
28		Axle Bottom Cap	4
		• (Meritor RT40/41/44-145, RT46/50, RT40-160; RT46-158; Dana 404/405/454, DSP40/41, DSH40/44, DSS40/462/463, D40/46-170)	
	57198-000	LHF/RHF/LHR/RHR 0-9.5° Pinion Angle	
	57200-000	LHR/RHR 10-14° Pinion Angle	
		• (Dana D402/403/451)	
	57198-000	LHF 0-9.5° Pinion Angle	
	57197-000	RHF 0-9.5° Pinion Angle	
	57200-000	LHR 10-14° Pinion Angle	
	57199-000	RHR 10-14° Pinion Angle	
29	50898-002L	Air Spring, Includes Key Nos. 30-31	4
30	50804-002	Air Spring Frame Bracket	4
31	17700-010	1/2"-13 UNC Air Spring Locknut	4
32	22962-014	1/2" Flat Hardened Washer	4
33	17700-010	1/2"-13 UNC Nylocknut	4
34		Cross Channel	2
	57192-001	40" Dowel Pin Centers	
	57430-000	<b>Control Valve Linkage Bracket Kit, Axle Set,</b> Includes Key Nos. 35-38	
35	56789-000	Control Valve Linkage Bracket	1
36	22962-028	1/4" Flat Hardened Washer	4
37	49983-000	1/4"-20 UNC Locknut	2
38	56935-001	1/4"-20 UNC 1.0" Bolt, <i>Replaces 56935-002</i>	2
39	50764-002	3/4"-10 UNC 5.5" Bolt	4
40	22962-001	3/4" Flat Hardened Washer	8
41	49842-000	3/4"-10 UNC Locknut	4
42	50764-005	3/4"-10 UNC 3.0" Bolt	4
43	57977-000	Height Control Valve, <i>Replaces 50433-001, -002</i>	1
44	58994-	HCV Linkage Assembly, Specify Length, Contact Hendrickson for Part No. Includes Key Nos. 45-51	1
45		*Linkage Rod, Specify Length	1
46		*5/16"-18 UNC Jam Nut	2
47		*5/16"-18 UNC Locknut	2
48		*5/16" Flat Hardened Washer	2
49		*5/16"-18 UNC Stud	2
50		*Linkage Rod Clamp	1
51		*Adjustable Linkage Rod Joint	1
52	57322-001	Upper Shock Bracket Assembly, Includes Key Nos. 53-56	4
53	50368-000	1/2"-13 UNC Serrated Shank Bolt	4
54	22962-031	1/2" Flat Hardened Washer	4
55	49846-000	1/2"-13 UNC Locknut	4
56		*Upper Shock Bracket	1
57		Shock Absorber	4
	60680-001L	Standard	
	60685-001L	HI-TORQUE	
58	60218-000	*** <b>Two-Piece Transverse Torque Rod Kit,</b> Includes Bushings	2
59	22186-000	Transverse Torque Rod Frame Bracket	2
60	45045-003	Back up Plate	2
61		****Transverse Torque Rod Axle Bracket	2
	48689-001	***** <b>Aftermarket Quick Release Service Kit,</b> Includes Key Nos. 1-3	
1	48914-000	Air Dump Switch (Located In Cab)	1
2	49193-001	Synchro-Relay Valve	1
3	48940-000	Air Switch Name Plate (Located In Cab)	1
4	30272-000	*****Pressure Protection Valve	1

HAS Single 120/150/190/210/230





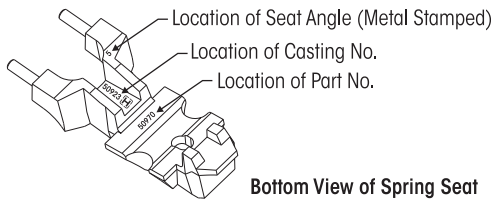


KEY NO.	PART NO.	DESCRIPTION	NO.REQ.	KEY NO.	PART NO.	DESCRIPTION	NO.REQ.
1		Front Frame Hanger Assembly, Includes Key Nos. 2-4	2	22	47905-000	Delrin Liner	2
		HAS 210/230		23		Spring Seat Spacer	2
a	58425-001	• Standard Frame, Casting No. 57188-001, <i>Replaces 57190-001 (**1c) and 50752-001 (**1d)</i>			48531-009	1", HAS 120/150 - 6¼" length	
	58688-001	• Rein. Frame, Casting No. 57476-001, <i>Replaces 57478-001 (**1c)</i>			48902-000	1", HAS 190/210/230 - 7¾" length	
		HAS 120/150/190			48903-000	1½", HAS 190/210/230 - 7¾" length	
b	50753-001	Casting No. 49848-000 or 56666-001		24		Spring Seat Assembly, Includes Key Nos. 25-27 <i>(See Selection Guide on Page 18)</i>	
	60636-001	Casting No. 60634-001				Left Front, Right Front	(each) 1
	59045-003	• Standard Frame, Casting No. 59043-001		25	50918-000	5/8"-11 UNC Stud	4
	59052-000	• Rein. Frame, Casting No. 59050-001		26	22962-004	5/8" Flat Hardened Washer	4
		<b>Slipper Pad Service Kit, One Hanger, Includes Key Nos. 2-4 (See Selection Guide on Page 19)</b>		27	47764-000	5/8"-11 UNC Locknut	4
2		Slipper Pad <i>(See Selection Guide on Page 19)</i>	2	28		Axle Bottom Cap	2
3		Retaining Bracket or Plate <i>(See Selection Guide on Page 19)</i>	4		57024-000	• (Meritor RS13-120, RS15-120, RS15-210) LHF/RHF 0-5° Pinion Angle	
a	57566-000	Retaining Bracket				• (Meritor RS21-145, RS21-160, RS23-160/161; Dana 19060/21060/21080/ 21090/23090/26090, S21/23/26-170/190)	
b	50597-000	Retainer Plate			50216-000	LHF/RHF 0-9.5° Pinion Angle HAS 190/210/230	
4		Retainer Lock Pin or Screw <i>(See Selection Guide on Page 19)</i>			50085-000	LHF 0-9.5° Pinion Angle	
a	58287-001	1" Lock Pin - ½" Dia.	4		50086-000	RHF 0-9.5° Pinion Angle	
b	57540-000	¾" Button Head Screw	8		50095-000	LHR 10-14° Pinion Angle	
c	57306-000	¾" Rolok Screw	8		50094-000	RHR 10-14° Pinion Angle HAS 230	
	49175-014	<b>Rebound Roller Kit, Axle Set, Includes Key Nos. 5-9</b>		29		Air Spring, Includes Key Nos. 30-31	2
5	24531-015	½"-13 UNC Rebound Bolt	2		57920-002L	HAS 120L	
6	22962-014	½" Flat Hardened Washer	4		56917-002L	HAS 150L/190L/210L/230L	
7	57988-000	Rebound Bolt Spacer, <i>Replaces 47458-000</i>	2		57122-002L	HAS 190/210/230	
8	58624-000	Rebound Roller, <i>Replaces 57989-000, 48883-000</i>	4	30	50804-002	Air Spring Frame Bracket	2
9	49846-000	½"-13 UNC Locknut	2	31	17700-010	½"-13 UNC Air Spring Locknut	2
10		Longitudinal Torque Rod Assembly Includes Key No. 11	2	32	22962-014	½" Flat Hardened Washer	2
	48411-006	HAS 120/150/190		33	17700-010	½"-13 UNC Nylocknut	2
	62007-365	HAS 230, <i>Replaces Torque Rod 50376-001 and Bushing 57256-000</i>		34		Cross Channel	1
						• HAS 120	
11	47691-000L	Torque Rod Bushing	4		57855-001	40" Dowel Pin Centers	
12	32043-005	5/8"-11 UNC 4.5" Bolt	4		57855-002	40.25" Dowel Pin Centers	
13	22962-004	5/8" Flat Hardened Washer	8		57855-003	40.5" Dowel Pin Centers	
14	47764-000	5/8"-11 UNC Locknut	4		57855-004	40.63" Dowel Pin Centers	
15	49689-000	1/16" Torque Rod Shim	As Req.			• HAS 150/190/210/230	
	57856-000	1/32" Torque Rod Shim			57317-001	40" Dowel Pin Centers	
16		U-bolt <i>(See Selection Guide on Page 19)</i>	4		57317-002	40.25" Dowel Pin Centers	
		¾"-16 UNF - HAS 120/150			57317-003	40.5" Dowel Pin Centers	
		7/8"-14 UNF - HAS 190/210/230			57317-004	40.63" Dowel Pin Centers	
		<b>U-bolt Fastener Service Kit, Two U-bolts, Includes Key Nos. 17-19 (See Selection Guide on Page 19)</b>			57317-006	40.25" Dowel Pin Centers w/ LH HCV	
17	49947-000	Spherical Washer ¾" - HAS 120/150	8		57430-000	<b>Control Valve Linkage Bracket Kit, Includes Key Nos. 35-38</b>	
	48574-000	Spherical Washer 7/8" - HAS 190/210/230	8	35	56789-000	Control Valve Linkage Bracket	1
18		Flat Hardened Washer	8	36	22962-028	¼" Flat Hardened Washer	4
	22962-001	¾" - HAS 120/150		37	49983-000	¼"-20 UNC Locknut	2
	22962-002	7/8" - HAS 190/210/230		38	56935-001	¼"-20 UNC 1.0" Bolt, <i>Replaces 56935-002</i>	2
19		U-bolt Nut	8			Lower Shock Bracket Assembly	2
	49685-000	¾"-16 UNF Locknut - HAS 120/150				Includes Key Nos. 39-42	
	50765-000	7/8"-14 UNF Locknut - HAS 190/210/230			49690-002	HAS 120L/150L/190L/210L/230L	
	57347-000	7/8"-14 UNF Nylocknut - HAS 190/210/230			57356-000	HAS 190/210/230	
20	57224-000	Top Pad - HAS 120/150	2	39		Lower Shock Bracket	2
	56805-000	Top Pad - HAS 190/210/230	2		49324-002	HAS 120L/150L/190L/210L/230L	
21		Main Support Member, Includes Key No. 22	2		57355-000	HAS 190/210/230	
	56925-000	HAS 120L/150 Low Profile		40	50764-002	¾"-10 UNC 5.5" Bolt	2
	56937-000	HAS 120/150		41	22962-001	¾" Flat Hardened Washer	4
	56928-000	HAS 190 Low Profile		42	49842-000	¾"-10 UNC Locknut	2
	56940-000	HAS 190		43		¾"-10 UNC Bolt	2
	56931-000	HAS 210 Low Profile			50764-005	HAS 120/150/190/210 - 3.0" Length	
	56943-000	HAS 210			50764-003	HAS 230 - 3.5" Length	
	56934-000	HAS 230 Low Profile		44		¾"-10 UNC Bolt	2
	56946-000	HAS 230			50764-007	HAS 120/150/190/210 - 2.5" Length	
					50764-005	HAS 230 - 3.0" Length	
				45	22962-001	¾" Flat Hardened Washer	8
				46	49842-000	¾"-10 UNC Locknut	4
				47	57977-000	Height Control Valve, <i>Replaces 50433-001, -002</i>	1



KEY NO.	PART NO.	DESCRIPTION	NO.REQ.
48	58994-	HCV Linkage Assembly, Specify Length Contact Hendrickson for Part No. Includes Key Nos. 49-55	1
49		*Linkage Rod, Specify Length	1
50		*5/16"-18 UNC Jam Nut	2
51		*5/16"-18 UNC Locknut	2
52		*5/16" Flat Hardened Washer	2
53		*5/16"-18 UNC Stud	2
54		*Linkage Rod Clamp	1
55		*Adjustable Linkage Rod Joint	1
56	57322-001	Upper Shock Bracket Assembly, Includes Key Nos. 57-60	2
57	50368-000	1/2"-13 UNC Serrated Shank Bolt	2
58	22962-031	1/2" Flat Hardened Washer	2
59	49846-000	1/2"-13 UNC Locknut	2
60		*Upper Shock Bracket	1

KEY NO.	PART NO.	DESCRIPTION	NO.REQ.
61		Shock Absorber	2
	60670-005L	HAS 190/210/230 Standard	
	60675-003L	HI-TORQUE, Replaces 57905-001	
	60670-010L	HAS 120L	
	60670-003L	HAS 150L	
	60670-008L	HAS 190L/210L/230L	
62	60218-000	***Two-Piece Transverse Torque Rod Kit, Includes Bushings	1
63	22186-000	Transverse Torque Rod Frame Bracket	1
64	45045-003	Back up Plate	1
65		****Transverse Torque Rod Axle Bracket	1
	48689-001	****Aftermarket Quick Release Service Kit, Includes Key Nos. 1-3	
1	48914-000	Air Dump Switch (Located In Cab)	1
2	49193-001	Synchro-Relay Valve	1
3	48940-000	Air Switch Name Plate (Located In Cab)	1
4	30272-000	****Pressure Protection Valve	1



### HAS SINGLE SPRING SEAT ASSEMBLY SELECTION GUIDE

Spring Seat Assembly includes Key Nos. 25, 26, 27  
Total of 2 spring seats required per suspension, one of each located at the left front and right front.

LEFT FRONT					
<b>Spring Seat KEY NO. 24</b>	Dana	Dana			
	19060/21060/21080/21090/23090/26090, S21/23/26-170/190	23080/23105/26015			
	Meritor		Meritor	Meritor	
	RS21-145/160, RS23-160/161		RS13-120, RS15-120, RS15-210	RS13-120, RS15-120, RS15-210	
	CASTING NO.	50923-000	50986-000	57021-000	59793-000
	SEAT ANGLE	PART NO.	PART NO.	PART NO.	PART NO.
	2.0°	50970-001	50988-001	57033-001	
	2.5°	50970-002	50988-002	57033-002	
	3.0°	50970-003	50988-003	57033-003	59795-001
	3.5°	50970-004	50988-004	57033-004	
4.0°	50970-005	50988-005	57033-005	59795-002	
4.5°	50970-006	50988-006	57033-006		
5.0°	50970-007	50988-007	57033-007		
5.5°	50970-008	50988-008			
6.0°	50970-009	50988-009			
6.5°	50970-010	50988-010			
RIGHT FRONT					
<b>Spring Seat KEY NO. 24</b>	Dana	Dana			
	19060/21060/21080/21090/23090/26090, S21/23/26-170/190	23080/23105/26015			
	Meritor		Meritor	Meritor	
	RS21-145/160, RS23-160/161		RS13-120, RS15-120, RS15-210	RS13-120, RS15-120, RS15-210	
	CASTING NO.	50923-000	50986-000	57021-000	59793-000
	SEAT ANGLE	PART NO.	PART NO.	PART NO.	PART NO.
	2.0°	50970-001	50988-001	57033-001	
	2.5°	50970-002	50988-002	57033-002	
	3.0°	50970-003	50988-003	57033-003	59795-001
	3.5°	50970-004	50988-004	57033-004	
4.0°	50970-005	50988-005	57033-005	59795-002	
4.5°	50970-006	50988-006	57033-006		
5.0°	50970-007	50988-007	57033-007		
5.5°	50970-008	50988-008			
6.0°	50970-009	50988-009			
6.5°	50970-010	50988-010			



U-BOLT SELECTION GUIDE	<p><b>KEY NO. 16</b></p> <p>Approximate location for stamped part number</p>	PAGE NO. 11	HAS 360/400/402/460		PAGE NO. 15	HAS 40LH			
		PAGE NO. 17	HAS 190/210/230		PAGE NO. 17	HAS 120/150			
		3/8"-14 UNF 2A U-bolt			7/8" U-bolt Fastener Kit	3/4"-16 UNF 2A U-bolt			3/4" U-bolt Fastener Kit
		Part No.	Length A	Thread Length B		Part No.	Length A	Thread Length B	
47417-001	16.25"	4.00"	*48718-157	49684-001	14.00"	4.00"	*48718-158		
47417-002	13.00"			49684-002	15.00"				
47417-003	17.50"			49684-003	15.50"				
47417-004	17.25"			49684-008	18.00"				
47417-005	16.75"			49684-011	12.50"				
47417-006	14.00"			49684-012	12.00"				
47417-007	15.00"			49684-013	13.00"				
47417-008	15.50"			49684-014	16.00"				
47417-009	18.00"			4.12"	49684-015			17.00"	
47417-010	19.00"			4.00"	49684-016			19.00"	

\* U-bolt fastener kit includes four (4) of each - Spherical Washer, Hardened Washer and Locknut, see Key Nos. 17-19 on page 11, 15 and 17. Two (2) kits per axle or four (4) kits per tandem will be required to do a replacement.

HANGER SLIPPER PAD SELECTION GUIDE	SLIPPER PAD SERVICE KITS		HANGERS	
	KIT NO. 56557-002		CASTING NO.	PART NO.
	<p>KIT INCLUDES:</p> <ul style="list-style-type: none"> <li>• 1 Slipper Pad</li> <li>• 2 Retaining Plates</li> <li>• 4 Self Tapping Screws</li> </ul> <p><b>SLIPPER PAD</b> PART NO. 50612-000</p>	<p>Frame Hanger</p> <p>Slipper Pad</p> <p>Retainer Plate</p> <p>Self Tapping Screw</p>	49676-000	50849-
			49676-000	56552-
			49848-000	50027-001
			56666-001	50753-001
		56669-001	56670-	
		56669-001	50752-	
		56885-001	56887-000	
KIT NO. 56557-004		CASTING NO.	PART NO.	
<p>KIT INCLUDES:</p> <ul style="list-style-type: none"> <li>• 1 Slipper Pad</li> <li>• 2 Retaining Brackets</li> <li>• 2 Self Tapping Screws</li> </ul> <p><b>SLIPPER PAD</b> PART NO. 56929-000</p>	<p>Frame Hanger</p> <p>Self-tapping Screw</p> <p>Slipper Pad Retaining Bracket</p> <p>Slipper Pad</p>	57188-001	57190-	
		57476-001	57478-	
KIT NO. 56557-005		CASTING NO.	PART NO.	
<p>KIT INCLUDES:</p> <ul style="list-style-type: none"> <li>• 1 Slipper Pad</li> <li>• 2 Slotted Spring Pins</li> </ul> <p><b>SLIPPER PAD</b> PART NO. 56929-000</p>	<p>Frame Hanger</p> <p>Slotted Spring Pin</p> <p>Slipper Pad</p>	57188-001	58425-	
		57476-001	58688-	
		57543-001	57544-	
		58659-001	58661-001	
		59043-001	59045-	
		59050-001	59052-002	
		59747-001	59768-	
KIT NO. 56557-006		CASTING NO.	PART NO.	
<p>KIT INCLUDES:</p> <ul style="list-style-type: none"> <li>• 1 Slipper Pad</li> <li>• 2 Roll Pins</li> </ul> <p><b>SLIPPER PAD</b> PART NO. 58959-000</p>	<p>Roll Pins</p> <p>Slipper Pad</p>	59050-001	59052-002	

## SECTION 6

# Preventive Maintenance

Following appropriate inspection procedures is important to help ensure the proper maintenance and operation of the HAS™ Series suspension system and component parts. Hendrickson recommends the HAS Series rear suspension be inspected at vehicle pre-delivery, the first 1,000 miles, and at the regular preventive maintenance intervals. Off-highway and severe service operating conditions require more frequent inspections than on-highway service operation.

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**NOTE**

Torque values shown in this publication apply only if Hendrickson supplied fasteners are used. If non-Hendrickson fasteners are used, follow the torque specification listed in the vehicle manufacturer's service manual.

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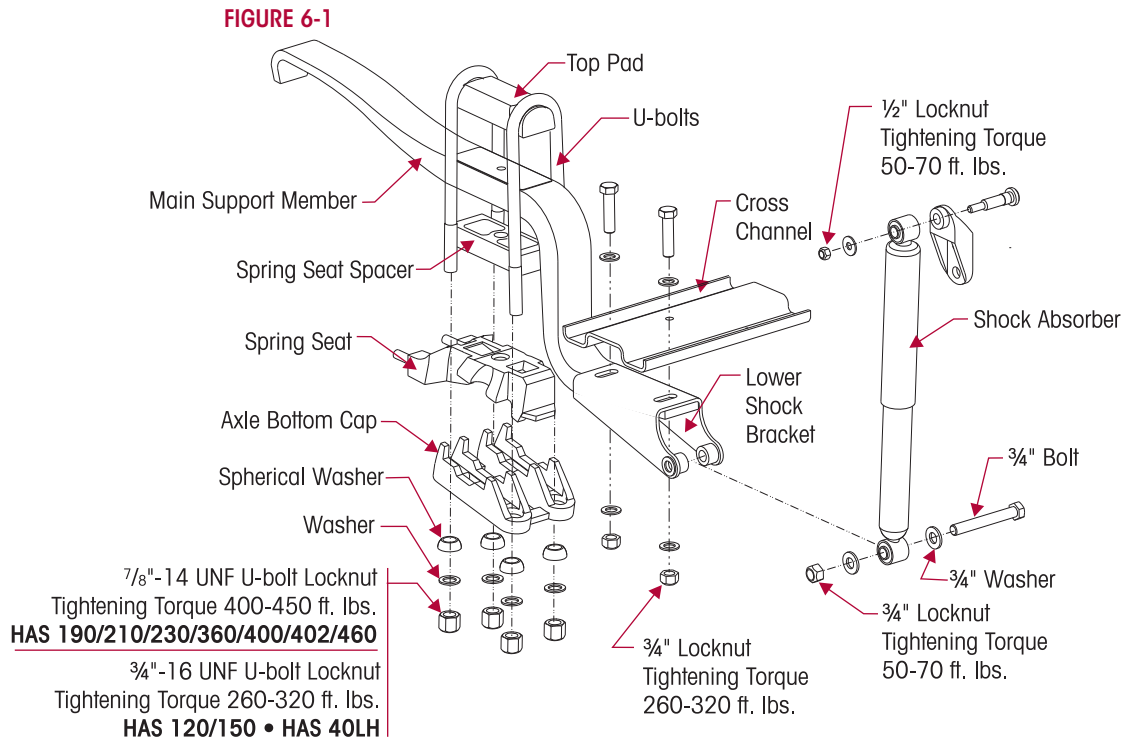
### PREVENTIVE MAINTENANCE INTERVALS

#### PRE-DELIVERY INSPECTION

1. Visually inspect the suspension for proper assembly.
2. Verify the alignment of drive axles are within the vehicle manufacturer's tolerances, contact the vehicle manufacturer for the correct alignment tolerances and instructions.
3. Check all fasteners for proper torque with special attention to the following suspension connections, see Figure 6-1:
  - Clamp group (U-bolts)
  - Shock absorber mounting bolts
  - Cross channel to main support member bolts
4. Ensure the suspension is at the proper ride height specification. Ride height is measured vertically from the bottom of the vehicle frame to the centerline of the axle. Refer to Alignment & Adjustments Section of this publication for the correct ride height specification and other detailed information.
5. Verify the front of the main support members (see Figure 6-1) are centered between the inside of the frame hanger legs.

#### INSPECTION AT THE FIRST 1,000 MILES

1. Visually inspect suspension components. Check for all of the following and replace components as necessary:
  - Proper suspension function
  - Any signs of unusual movement, loose or missing components
  - Any signs of abrasive or adverse contact with other components
  - Any damaged, bent or cracked parts
2. Check all fasteners for proper torque with special attention to the following suspension connections, see Figure 6-1.
  - Clamp group (U-bolts)
  - Shock absorber mounting bolts
  - Cross channel to main support member bolts



## PREVENTIVE MAINTENANCE

1. **Clamp group fasteners (U-bolts)** – Check fasteners for proper torque at regular intervals as experience dictates. **DO NOT** exceed 20,000 miles between U-bolt torque inspection intervals.

### SERVICE HINT

A fleet may determine its own torque inspection interval by inspecting U-bolt torque on a **MORE** frequent basis (for example; at 5,000 miles after in-service date, or 10,000 miles etc.). If the U-bolt torque is below specification, correct the U-bolt torque and decrease inspection intervals. If U-bolt torque is found within torque specification, inspection intervals may be increased, although **DO NOT** exceed 20,000 miles between U-bolt torque inspection intervals.

2. Inspect other components at the following intervals:
  - **Off-highway and severe service applications:** Every 25,000 miles or six (6) months, whichever comes first
  - **100% On-Highway applications:** Every 50,000 miles or twelve (12) months, whichever comes first
3. Visually inspect suspension components. Check for all of the following and replace components as necessary:
  - Proper suspension function
  - Any signs of unusual movement, loose or missing components
  - Any signs of abrasive or adverse contact with other components
  - Any damaged, bent or cracked parts
4. Check all fasteners for proper torque with special attention to the following suspension connections, see Figure 6-1.
  - Clamp group (U-bolts)
  - Shock absorber mounting bolts
  - Cross channel to main support member bolts

5. Verify the alignment of the drive axles are within the vehicle manufacturer's tolerances, contact the vehicle manufacturer for the correct alignment tolerances and instructions.
6. Ensure the suspension is at the proper ride height specification. Ride height is measured vertically from the bottom of the vehicle frame to the centerline of the axle. Refer to Alignment & Adjustments Section of this publication for the correct ride height specification and other detailed information.

## COMPONENT INSPECTION

### IMPORTANT NOTE

Replace all worn or damaged parts.

- **Air spring** — Visually inspect the outer surface of the air spring for chafing, uneven wear, cracks or any signs of component damage. Ensure that the upper bead plate is tight against the underside of the frame. Check for any lateral slippage at the lower air spring bracket. Verify all mounting hardware have the proper tightening torque values maintained. See the Torque Specification Section of this publication for recommended torque requirements.
- **Air supply (Pneumatic components)** — The air supply to the system plays a large role in the air springs' performance. Inspect, clean and replace, if necessary, any support products to the air springs, valves, regulators and air lines. See Air Fitting Inspection in this section if an air leak is suspected.
- **Clamp group** — Visually inspect for any loose or damaged fasteners. Verify the U-bolt locknuts have the proper tightening torque values maintained. See the U-bolt Locknuts in this section.
- **Cross channel** — Visually inspect for cracks, damage, metal shavings, or looseness.
- **Fasteners** — Visually inspect 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 Section in this publication for recommended torque requirements. Use a calibrated torque wrench to check torque in a tightening direction. As soon as the fastener starts to move, record the torque and correct the torque if necessary.
- **Frame hanger** — Visually inspect for any signs of loose fasteners, movement, or damage. Verify the frame attaching fasteners have the proper tightening torque values maintained. See the vehicle manufacturer for proper torque specifications.
- **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.
- **Shock absorbers** — Visually inspect for any signs of dents or leakage. Misting is not considered a leak. See Shock Absorber Inspection in this section.
- **Tire wear** — Visually inspect the tires for wear patterns that may indicate suspension damage or misalignment.
- **Torque rods** — All torque rods must be inspected for looseness, torn or shredded rubber, bushing walk-out, and for proper fastener torque. If there is metal-to-metal contact in the bushing joint, this is a sign of excessive bushing wear and the bushing needs to be replaced.
- **Wear and Damage** — Visually inspect all parts of the suspension for wear and damage. Look for bent or cracked parts.

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

## AIR FITTINGS 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, bent or being pulled upon.
4. Visually inspect the air fitting's o-ring seal for signs of damage or contamination.

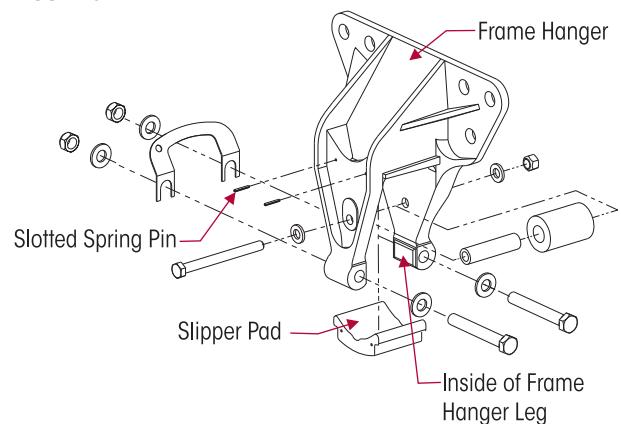
## FRAME HANGER SLIPPER PADS

**FIGURE 6-2**

The operation of the HAS suspension will result in some wear between the main support member and the frame hanger slipper pads, see Figure 6-2. In normal use the slipper pads will function satisfactorily even though they may show some wear.

If the slipper pads require replacement, identify which frame hanger you have, refer to the Hanger Slipper Pad Selections Guide in Parts List

Section of this publication. See Frame Hanger Slipper Pad replacement instructions in the Component Replacement Section of this publication.



## FRAME HANGER

The operation of the HAS suspension will result in some wear between the main support member and the frame hanger if the slipper pad has prematurely worn through. In normal use these components will function satisfactorily through the life of the vehicle even though the components may show some wear. However, premature wear will require the replacement of one or both pads. A frame hanger should be replaced if a frame hanger leg (see Figure 6-2) has been grooved by the main support member in excess of 1/8", or if slipper pad is worn through.

## MAIN SUPPORT MEMBERS

The operation of the HAS suspension will result in some wear between the main support member and the frame hanger slipper pad. In normal use these components will function satisfactorily through the life of the vehicle even though the components may show some wear. However, excessive wear can occur and will require the replacement of one or both main support members. A main support member should be replaced if the HAS exhibits 3/8" (1/4" for HAS 40LH) or more wear at the frame hanger slipper pad contact surface area.

Hendrickson has developed a service kit (No. 49175-024) for the HAS 460 suspension that enhances durability in logging and other severe service applications. When installed, the service kit upgrades the HAS 460 to HAS 460 Plus, and does require that both main support member be replaced, see Parts List Section of this publication.

## U-BOLT LOCKNUTS

**NOTE**

Hendrickson recommends the use of phosphate and oil coated Grade 8 bolts, hardened washers and Grade C locknuts for the U-bolt connection. All threads should be lubricated with SAE 20 oil before assembly to obtain the correct relationship of torque and fastener tension. U-bolt locknuts must be torqued as specified in Torque Specification Chart. **DO NOT** exceed specified torque on U-bolt locknuts.

Maintaining correct U-bolt torque is important to help ensure proper suspension component performance.

1. Inspect U-bolt for proper seating of components, i.e. no gaps, etc.
2. U-bolt locknuts must be torqued as specified in the Torque Specification Section of this publication. **DO NOT** exceed specified torque on U-bolt locknuts. U-bolt locknuts **MUST** be torqued:
  - At pre-delivery and at any U-bolt service
  - Next 1,000 miles
  - Thereafter, follow the inspection and re-torque intervals, every 20,000 miles

**WARNING**

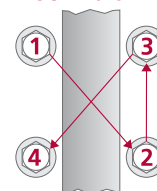
IT IS IMPORTANT THAT THE U-BOLT CONNECTION BE PROPERLY ALIGNED AND HAVE THE PROPER TORQUE VALUES MAINTAINED. METAL SURFACES CAN WORK AND WEAR THE SPRING SEATS, AXLE BOTTOM CAPS AND POSSIBLY OTHER COMPONENTS RELATED IN THE TOTAL ASSEMBLY. PROPERLY TIGHTENED U-BOLT LOCKNUTS WILL ELIMINATE COSTLY REPAIR, DOWNTIME AND POSSIBLE SEPARATION OF COMPONENTS AND LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE OR PERSONAL INJURY.

**EXAMPLE**

A fleet may determine its own torque inspection interval by inspecting U-bolt torque on a more frequent basis (for example at 5,000 miles, or 10,000 miles). If during the torque inspection U-bolt torque is found below torque specifications, correct the U-bolt torque and decrease the interval of the torque inspections. If U-bolt torque is found within torque specifications, inspection intervals may be increased. **DO NOT** exceed 20,000 miles between U-bolt torque inspection intervals.

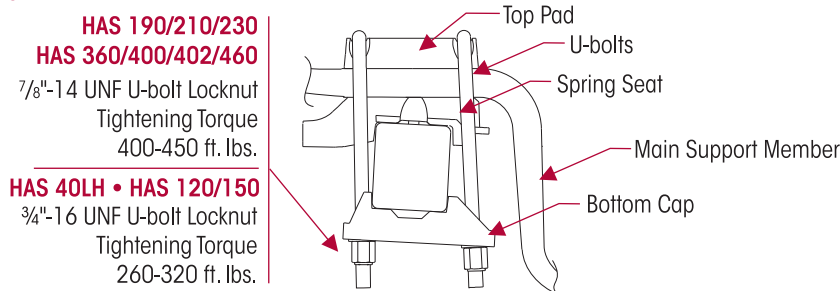
3. Tighten U-bolt locknuts in a crisscross pattern (see Figure 6-3) evenly in 50 foot pounds increments to achieve uniform bolt tension and correct (level) position of main support member, spring seat, and axle bottom cap at final torque as specified below, also see Figure 6-4.

**FIGURE 6-3**



- **HAS TANDEM** — 7/8"-14 UNF locknut, tighten to 400-450 foot pounds torque, rap the top of the U-bolts, and re-tighten to 400-450 foot pounds torque.
- **HAS 40LH** — 3/4"-16 UNF locknut, tighten to 260-320 foot pounds torque, rap the top of the U-bolts, and re-tighten to 260-320 foot pounds torque.
- **HAS 120/150** — 3/4"-16 UNF locknut, tighten to 260-320 foot pounds torque, rap the top of the U-bolts, and re-tighten to 260-320 foot pounds torque.

**FIGURE 6-4**





## SHOCK ABSORBER INSPECTION

Hendrickson uses a long service life, premium shock absorber on all HAS 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, also inspect the shock absorber mounting brackets and hardware for damage or wear, replace as necessary. For instructions on shock absorber replacement see the Component Replacement Section of this publication. It is not necessary to replace shock absorbers in pairs if one shock absorber requires replacement.

**WARNING**

### HEAT TEST

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

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

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

**FIGURE 6-5**



### VISUAL INSPECTION

Look for these potential problems when doing a visual inspection as shown in Figure 6-6. Inspect the shock absorbers fully extended. Replace as necessary.

**FIGURE 6-6**



### LEAKING VS. MISTING SHOCK VISUAL INSPECTION

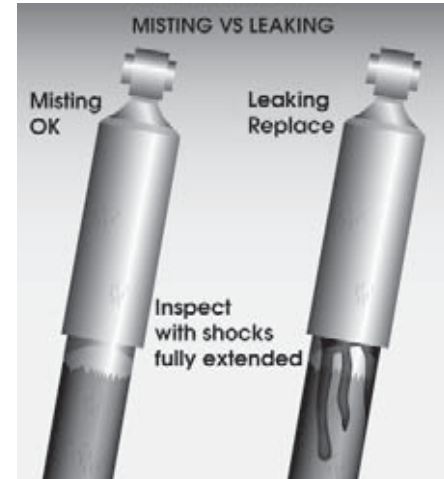
The inspection must not be conducted after driving in wet weather or a vehicle wash. Shocks need to be free from water. Many shocks are often misdiagnosed as failures. Misting is the process whereby very small amounts of shock fluid evaporate at a high operating temperature through the upper seal of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

A 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. Replace as necessary.

**NOTE**

The HAS 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.

**FIGURE 6-7****TRANSVERSE TORQUE RODS**

The transverse torque rods are a required component for the HAS suspension.

**WARNING**

HAS SUSPENSIONS INCORPORATE TRANSVERSE RODS FOR VEHICLE STABILITY. IF THESE COMPONENTS ARE DISCONNECTED OR ARE NON-FUNCTIONAL, THE VEHICLE SHOULD NOT BE OPERATED. FAILURE TO DO SO CAN RESULT IN ADVERSE VEHICLE HANDLING, LOSS OF VEHICLE CONTROL, POSSIBLE TIRE CONTACT WITH THE FRAME, PREMATURE COMPONENT DAMAGE, OR SEVERE PERSONAL INJURY.

**LONGITUDINAL TORQUE RODS**

**Torque rod looseness** inspection is necessary during preventive maintenance and service intervals per one of the following methods below. Inspect attaching fasteners for proper torque.

- **Method 1** — For tractor applications only with brakes applied, slowly rock the empty vehicle with power while a mechanic visually checks the action at both ends.
- **Method 2** — with the vehicle shut down, a lever check can be made with a long pry bar placed under each rod end and pressure applied.

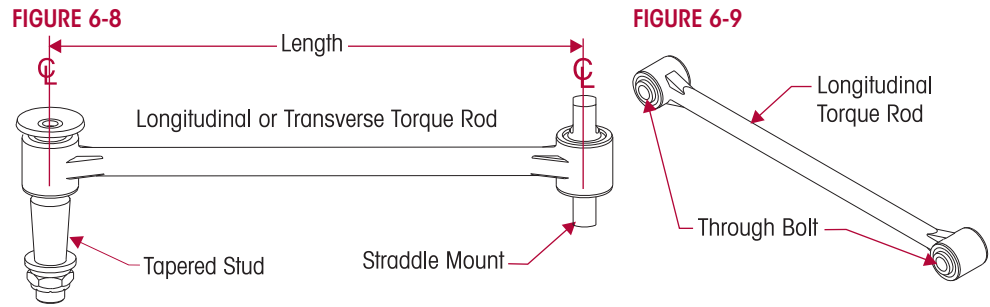
**NOTE**

Hendrickson recommends the use of Grade 8 bolts and Grade C locknuts for all straddle mount torque rod attachments.

**Longitudinal torque rod length** is determined by the truck manufacturer for optimum driveline angles. The longitudinal torque rods along with the bottom caps maintain these angles and control acceleration and brake forces, refer to the Pinion Angle Chart in the Parts Lists Section of this publication.

**Longitudinal torque rods** have attaching ends designated as “straddle mount,” “tapered stud,” or “through bolt” as shown in Figures 6-7. Most can be replaced by pressing out the worn torque rod bushing and installing a replacement bushing, others require complete torque rod assembly replacement. See Parts List Section of this publication.

**Visually inspect torque rod bushings** for torn or shredded rubber, inspect for bent, cracked, or broken torque rods, and for end hubs with an elongated “oval” shape. Any of these conditions will require component replacement.



Whether the rod ends are straddle mount, through bolt, or tapered stud, see Figures 6-8 and 6-9, torque rod bushings can be replaced by pressing out the worn end, and installing a replacement bushing. See Component Replacement Section of this publication.

A two-piece transverse torque rod is also available to cut and weld to the desired length, see Hendrickson publication no. 45745-148.

## SECTION 7

# Alignment & Adjustments

### LATERAL ALIGNMENT

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.
7. Ensure all drive axle tires are the same size and properly inflated.
8. Measure from the outside of the frame rail to the rim flange of the inner tire. Record the measurement.
9. Measure the same distance on the opposite side of the same axle. Record the measurement.
10. Subtract the two measurements to get a difference between the two. If the difference is greater than  $\frac{1}{8}$ " (3 mm), it will be necessary to correct the lateral alignment. Adding or removing shims that are located between the transverse torque rod and frame rail accomplishes this.
  - A general rule of thumb is to use a shim with a thickness that is half of the difference between the two measurements.

#### EXAMPLE

If the lateral alignment is out of specification by  $\frac{1}{4}$ " (6 mm), remove or install a  $\frac{1}{8}$ " (3 mm) shim between the transverse torque rod and frame rail as needed. Refer to Longitudinal and Transverse Torque Rod in Preventive Maintenance Section of this publication.

#### NOTE

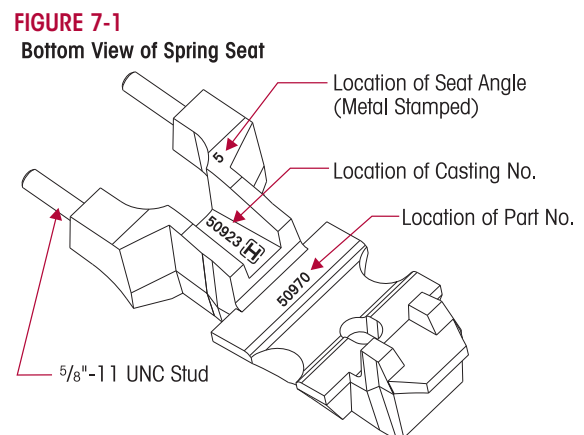
Hendrickson recommends the use of Grade 8 bolts and Grade C locknuts be used for all torque rod attachments.

### AXLE PINION ANGLE

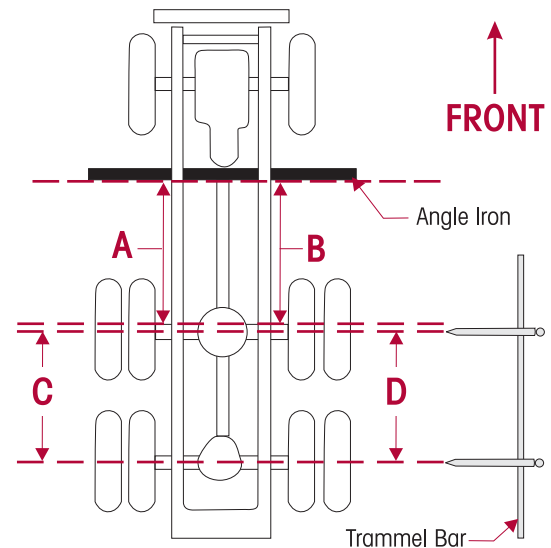
Pinion angle is set by the spring seat assembly. Pinion angle should be checked in the loaded condition, and is set by the vehicle manufacturer. If new spring seats are required, the seat angle as shown in Figure 7-1 must be specified when ordering, see the Parts Lists Section of this publication.

### DRIVE AXLE ALIGNMENT INSPECTION PROCEDURE

Proper alignment is essential for maximum ride quality, performance, and tire service life. This procedure should be performed if excessive or irregular tire wear is observed. The recommended alignment procedure is described below and should be performed after all repairs are completed and all suspension fasteners have been tightened to specified torque values.



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.
7. Ensure all drive axle tires are the same size and air up to the proper PSI.

**FIGURE 7-2**


8. 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 7-2. Select a location for the angle iron as far forward of the drive axle as possible where components will not interfere.
9. Accurately square the straight edge to the frame using a carpenter's square.
10. Using a measuring tape, measure from the straight edge to the forward face of the front drive axle arms at the centerline on both sides of the vehicle as shown in Figure 7-2, measure **A** and **B**.
11. Calculate the difference between measurements **A** and **B**.
  - a. If the front drive axle is within vehicle manufacturer's specifications, proceed to check the rear drive axle (Step 12).
  - b. If alignment of the front drive axle **IS NOT** within the vehicle manufacturer's specifications, then the alignment of this axle **MUST** be corrected **BEFORE** measuring the rear drive axle alignment (Step 12). Correct the alignment of this axle as per the alignment instructions in this section.

**NOTE**

Since the remaining drive axle(s) will be aligned relative to the front drive axle, it is essential that the front drive axle is aligned within the vehicle manufacturer's specifications prior to the alignment of the remaining drive axle(s).

12. Using a trammel bar, measure the distance from the spindle center of the front drive axle to the spindle center of the rear drive axle on both sides of the vehicle, see Figure 7-2, measure **C** and **D**.
13. Calculate the difference between measurements **C** and **D**.
  - a. If the measurements are within the vehicle manufacturer's specifications, then the rear drive axle alignment is acceptable. Proceed to check the pinion angles of the drive axles (Step 15).
  - b. If alignment of the rear drive axle **IS NOT** within the vehicle manufacturer's specifications, then the alignment of this axle **MUST** be corrected **BEFORE** checking the drive axle pinion angles. Correct the alignment of this axle as per the alignment instructions in this section.

14. Repeat Steps 12 and 13 for any remaining drive axle(s). Be sure all remaining drive axles are aligned relative to the front drive axle.

**NOTE**

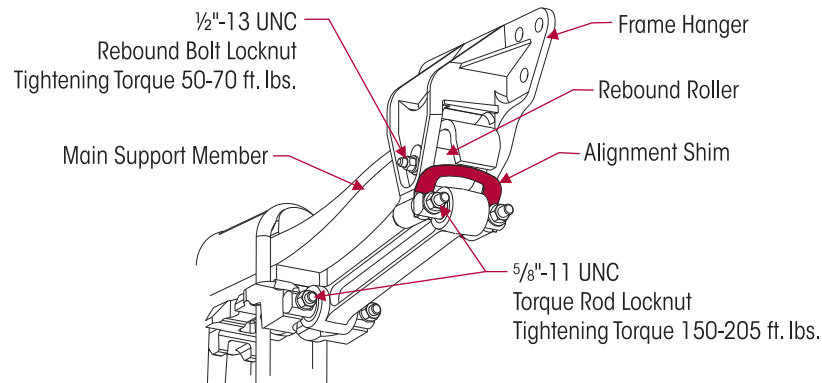
Drive axle pinion angles are established by the vehicle manufacturer. The axle seats are cast to specific angles to meet their requirements. Empty chassis axle pinion angles will measure about 1° less as compared to when the vehicle is fully loaded. This is because the main support members will deflect slightly under full load.

**FIGURE 7-3**

15. After all drive axles are aligned, check the pinion angle of each drive axle with a digital protractor. Refer to the vehicle manufacturer specifications for the required pinion angles, see Figure 7-3.
  - a. If all pinion angles are within the vehicle manufacturer's specifications then proceed to Step 16.
  - b. If any pinion angle is out of the vehicle manufacturer's specifications it must be corrected. Follow the correct Pinion Angle Adjustment Suspension Procedure for the HAS suspension model and ride height.
16. Recheck measurements to confirm adjustments. Repeat Steps 10 through 15 until the correct alignment and pinion angles are achieved.
17. When all drive axle alignments and pinion angles are within the vehicle manufacturer's specifications then the alignment procedure is complete.

**AXLE ALIGNMENT INSTRUCTIONS**

The following procedure is recommended to adjust thrust and scrub (tandem) angle. Pinion angle is set by the axle spring seat.

**FIGURE 7-4**

1. Follow Steps 1 through 11 of the Drive Axle Alignment Inspection Procedure in this section. If the difference between measurements **A** and **B** are not within manufacturer's specifications, adjust as follows.
2. Loosen the rebound bolt locknut on the side to be adjusted.
3. Loosen the torque rod bar pin locknuts on the frame hanger and add or remove alignment shims as shown in Figure 7-4. No more than four (4) shims may be used (1/4" total thickness maximum) on one end of the rod. Snug torque rod fasteners, **DO NOT** tighten at this time.
4. Re-measure **A** and **B**, calculate the difference between **A** and **B**. Adjust again if necessary.

5. Using measurement **C** and **D** for the rear axle, repeat Steps 2 through 4 above until vehicle is within vehicle manufacturer's specifications.
6. Tighten the torque rod to frame hanger fastener to 150-205 foot pounds torque.
7. Tighten the rebound bolt locknut to 50-70 foot pounds torque.

## RIDE HEIGHT

### INSPECTION

1. Drive the vehicle onto 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.
4. Chock the front wheels of the vehicle.
5. Verify and maintain the vehicle's air system is at full operating pressure.

### SERVICE HINT

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

### WARNING

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

6. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the air system.

### WARNING

SOME VEHICLE APPLICATIONS, SUCH AS VEHICLES EQUIPPED WITH OUTRIGGERS, RETAIN SOME AIR PRESSURE IN THE AIR SPRINGS AT ALL TIMES. PRIOR TO PERFORMING ANY MAINTENANCE, SERVICE, OR REPAIR OF THE SUSPENSION, VERIFY EACH AIR SPRING IS COMPLETELY DEFLATED. FAILURE TO DO SO COULD RESULT SERIOUS PROPERTY DAMAGE AND/OR SEVERE PERSONAL INJURY.

7. Detach the HCV linkage upper grommet from the height control valve arm and exhaust the air from the suspension by lowering the height control valve arm. Check the rubber components for any tearing or damage, replace as necessary.

8. Attach the HCV linkage upper grommet to the height control valve arm.

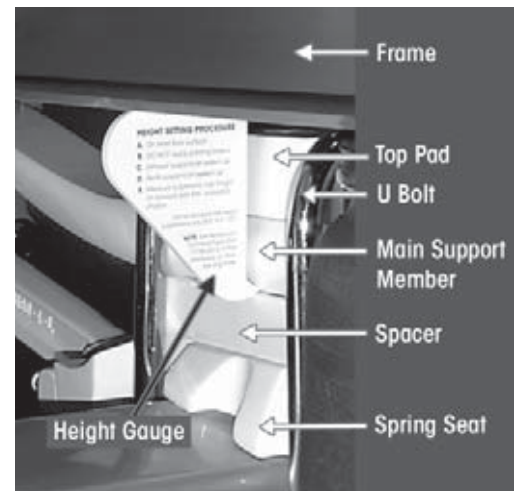
### NOTE

The referenced ride height is measured at the corner of the axle where the ride height control valve is located.

9. Using a Hendrickson height gauge (Lit. No. 45745-050 Loaded, 45745-106 Unloaded), see Figure 7-5.
10. The HAS referenced ride height specification, see Figure 7-6, is:
  - $4\frac{1}{4}'' \pm \frac{1}{8}''$  loaded or
  - $4\frac{3}{8}'' \pm \frac{1}{8}''$  unloaded

If the ride height is not within specification, an adjustment is necessary per the following adjustment procedure.

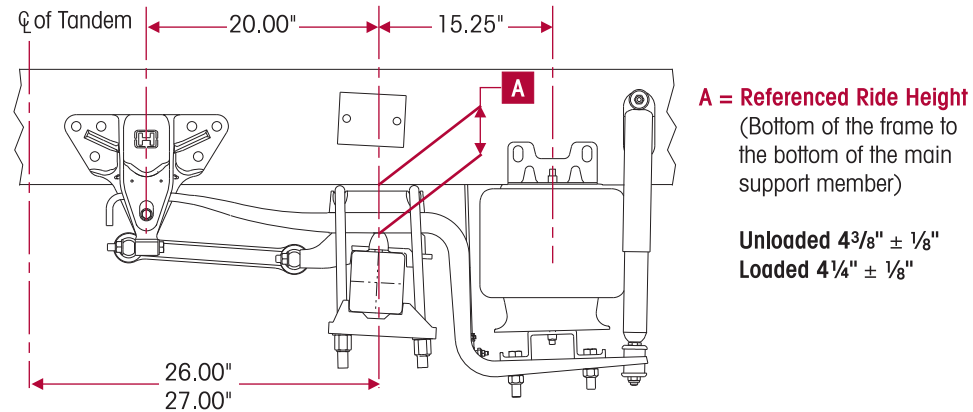
**FIGURE 7-5**



## ADJUSTMENT PROCEDURE

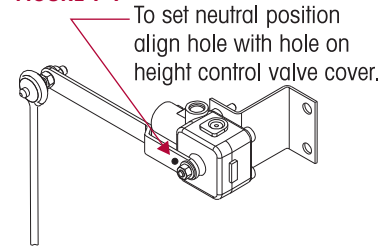
1. Follow Steps 1 through 7 of Ride Height Inspection in this Section.
2. Manually refill the suspension by raising the height control valve arm to a level above the proper suspension ride height.

**FIGURE 7-6**



3. Lower the leveling valve arm to exhaust the air system until the suspension is at proper ride height.
4. Use a  $\frac{1}{8}''$  wooden dowel rod (golf tee) to set the neutral position for the height control valve by aligning the hole in the leveling arm with the hole in the height control valve cover, as shown in Figure 7-7. **DO NOT** use a metal rod or nail as this may cause damage to the height control valve.
5. Correct the HCV lower linkage so the upper rubber grommet can be reconnected to the height control valve arm at the proper ride height.
6. Attach the rubber grommet to the height control valve arm.
7. Tighten the lower linkage rod clamp with a screwdriver until securely fastened.
8. Remove the dowel from the height control valve.
9. Verify the ride height by performing the Ride Height Inspection as detailed in this Section.

**FIGURE 7-7**



## FRAME SLOPE

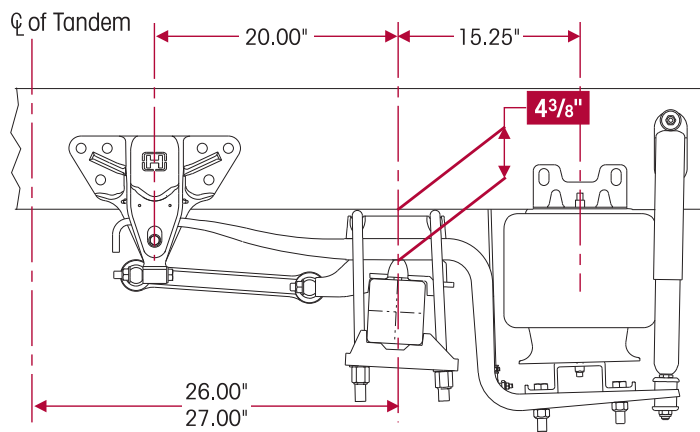
### INSPECTION

In most cases, the vehicle manufacturer installs spring seats and spacers that are of equal thickness on both the forward drive and the rear drive axles. These equal thickness spring seats are designed to have the frame rails parallel to the ground, which results in  $0^\circ$  frame slope. The intent is to maintain identical  $4\frac{3}{8}''$  unloaded referenced vehicle ride heights on the forward and rear drive axles, see Figure 7-8. By maintaining identical ride heights assures equal loading on both drive axles and the correct pinion angles.

1. Drive the vehicle on to 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.
4. Chock the front wheels of the vehicle.



5. Properly inflate the vehicle tires.
6. Verify the suspension is at the proper ride height for the front and rear.

**FIGURE 7-8**


7. Place a inclinometer on the frame flange.
8. Record frame slope.

If the chassis frame slope is in excess of 1° it may cause unequal loading between the two drive axles which may be detrimental to suspension performance. If this condition exist contact the vehicle manufacturer for guidelines or proceed with the following recommendations:

- If the frame slopes downward and toward the cab the front drive axle will, in all probability, weigh more than the rear drive axle.
- If the frame slopes upward towards the cab the rear drive axle will be the heavier of the two.
- If the tandem suspension is too low, it could be corrected by adding spring seat spacers to all four corners of the tandem drive axles between the main support members and the spring seats, see the procedure below.
  - a. **DO NOT** attempt to correct frame slope by adding a single spring seat spacer to only one drive axle.

**NOTE**

Shop made spring seat spacers can be made from ½" x 3" x 7" low carbon steel with a 1⅜" diameter hole drilled in the center for dowel clearance, with a maximum of two ½" shop made spring seat spacers between each main support member and spring seat. If a thicker spring seat spacer is needed to correct frame slope, a Hendrickson 1" or 1½" thick spacer is required, see Part List Section of this publication.

- b. A maximum of a single 1" or 1½" thick spacer is permissible per each spring seat location.
- c. Longer U-bolts may be required to accommodate the thicker spring seat spacers.
- d. If frame slope is greater than what can be corrected with a 1½" spacer contact the vehicle manufacturer.

**WARNING**

**DO NOT MAKE CHANGES TO THE STEER AXLE WITHOUT PRIOR APPROVAL AND SUPERVISION OF THE VEHICLE MANUFACTURER AS THE STEERING GEOMETRY COULD BE AFFECTED, THUS CAUSING STEERING PROBLEMS.**

- If the tandem suspension is too high, the spacers can be removed (if so equipped), or the front steer axle suspension can be raised per the vehicle manufacturer's specifications.

## ADJUSTMENT PROCEDURE

The following adjustment procedure is recommended when axle angle adjustment is required for the rear tandem axle using the HAS series suspension. Inspections can be performed on an unloaded vehicle.

1. Slacken or loosen the suspension by slowly moving vehicle back and forth several times without using the brakes. When coming to a complete stop make sure the brakes are released. Chock front wheels.
2. Verify that the front steer and rear drive tires are inflated to normal operating pressure.
3. Record the measurements obtained in the appropriate spaces provided on the Inspection Form in this section.

### NOTE

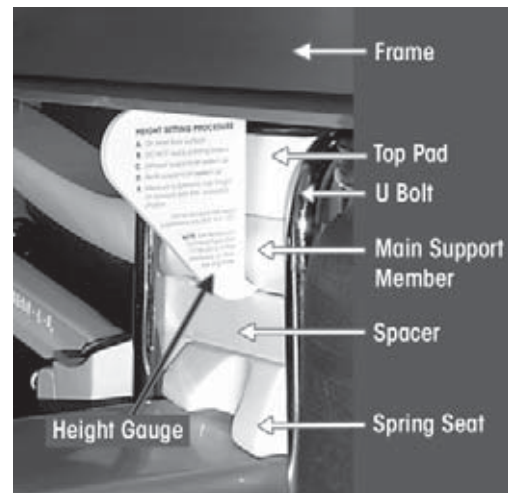
The referenced ride height is measured at the corner of the axle where the ride height control valve is located.

4. Using a Hendrickson height gauge (Lit. No. 45745-050 Loaded, 45745-106 Unloaded) see Figure 7-9, measure the referenced ride height on the forward and rear drive axles.
5. If the vehicle is equipped with equal thickness spring seats and the frame is level, all four main support members should have the same suspension height of:
  - $4\frac{1}{4}'' \pm \frac{1}{8}''$  loaded or  $4\frac{3}{8}'' \pm \frac{1}{8}''$  unloaded.

This measurement is from the bottom of the frame to the bottom of the main support member (spring) as shown in Figure 7-6.

6. If the frame slopes down toward the cab, (positive (+) frame slope) the front drive axle angle will be less compared to the vehicle manufacturer specified angle. If the frame slopes up toward the cab (negative (-) frame slope) the front drive axle angle will be higher than the vehicle manufacturer specified angle. The frame slope on empty vehicles equipped with equal thickness spring seat must be  $\pm 0.8^\circ$ .
7. To correct frame slope, spacer plates can be added or removed on all four corners of both drive axles between the main support member and the spring seat, as shown in Figure 7-9, or by adding spacer(s) to the front steer axle.

FIGURE 7-9



### NOTE

**DO NOT** make changes to the steering axle without prior approval and supervision of the vehicle manufacturer as the steering geometry could be affected.

8. If spacer plates are added, longer U-bolts will be required to accommodate the added spacer plates. Hendrickson has 1" thick spacers (Part No. 48902-000) and 1½" thick spacers (Part No. 48903-000) available. A maximum of **one** 1" thick, or **one** 1½" thick spacer is permissible.



### WARNING

DO NOT MAKE CHANGES TO THE STEER AXLE WITHOUT PRIOR APPROVAL AND SUPERVISION OF THE VEHICLE MANUFACTURER AS THE STEERING GEOMETRY COULD BE AFFECTED, THUS CAUSING STEERING PROBLEMS.

9. **DO NOT** attempt to correct frame slope by adding spacer plates on only one drive axle. The spacer plates can be made from ½" x 3" x 7" low carbon steel with a 1¼" diameter hole drilled in the center for dowel clearance. A maximum of two ½" shop made spacer plates between each main support member and spring seat is permissible. Longer U-bolts will be required to accommodate spacer plates.

- To remove or install the spacers, follow the Spring Seat replacement procedure in the Component Replacement Section of this publication.

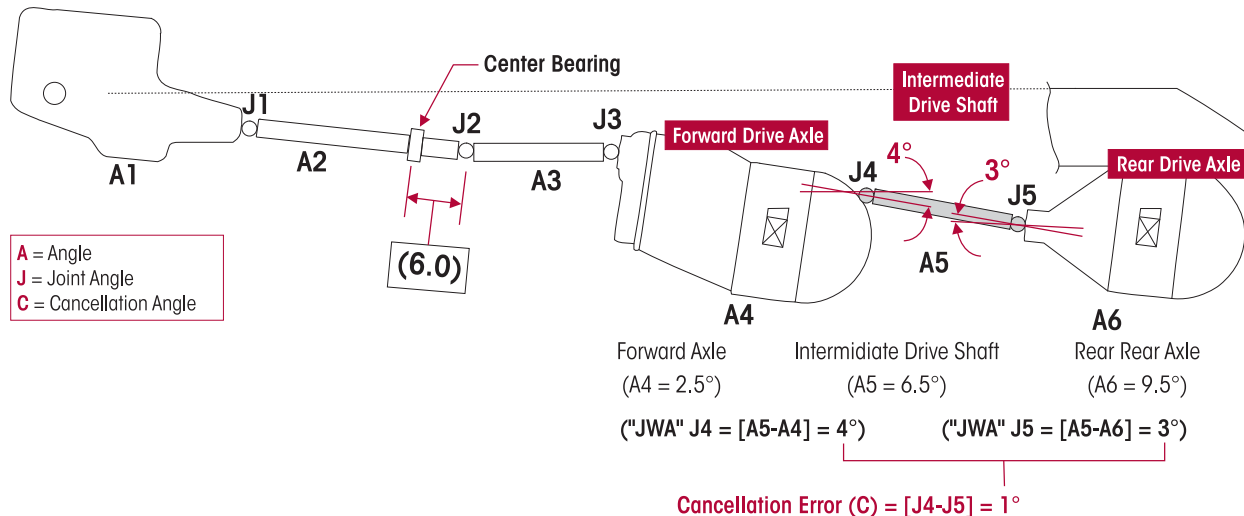
### DRIVELINE INSPECTION

- To measure driveline angles, the vehicle must be placed on a level floor.
- Inspections can be performed on either loaded or unloaded vehicles.
- The front steer and rear drive tires must be inflated to normal operating pressure.
- Slacken and loosen the suspension by slowly moving the vehicle back and forth several times without using the brakes. When coming to a complete stop make sure the brakes are released.
- Chock the front wheels.

**NOTE**

Pinion angles are set by the spring seat angle. To find the proper replacement spring seat, refer to the Spring Seat Assembly chart in the Parts List Section of this publication.

- Use Figure 7-10 as a guide to determine the correct angles to be measured.

**FIGURE 7-10**


- Using a digital inclinometer as the measuring tool, measure the driveline angles (A1-A6) and record them in the appropriate spaces on the Inspection Form in this section. Figure 7-11 shows the proper inclinometer placement for angles A4 and A6.

- Use the **driveline** angles A4, A5, and A6 that were recorded in the Driveline Inspection Form and calculate the **joint** working angles (JWA). The difference between (J4, J5) is the inter-axle cancellation angle (C3).
- Hendrickson's specification for good inter-axle cancellation (C3) is <2° and joint working angles <6° as shown Figure 7-10.

**SERVICE HINT**

The change in axle wind-up is less severe on the forward axle output (J4) than the rear axle input (J5). Optimum results occur when J4 is less than J5.

**FIGURE 7-11**


### DRIVELINE INSPECTION FORM

#### Vehicle Information

Vehicle Owner \_\_\_\_\_ Wheel Base \_\_\_\_\_

Vehicle Make \_\_\_\_\_ Drive Axle \_\_\_\_\_

Model \_\_\_\_\_ Tandem Suspension/Kit No. \_\_\_\_\_

VIN \_\_\_\_\_ Tandem Spread \_\_\_\_\_

Build Date \_\_\_\_\_ Mileage \_\_\_\_\_

By \_\_\_\_\_ Engine H.P./Torque \_\_\_\_\_

Date \_\_\_\_\_ Transmission Model/Speed \_\_\_\_\_

#### Data Collection

Frame Slope \_\_\_\_\_ Frame Height Front \_\_\_\_\_

Forward Drive Axle Height \_\_\_\_\_ Frame Height Center \_\_\_\_\_  
(Centerline to Ground)

Rear Drive Axle Height \_\_\_\_\_ Frame Height Rear \_\_\_\_\_  
(Centerline to Ground)

Engine/Trans Angle      A1 = \_\_\_\_\_

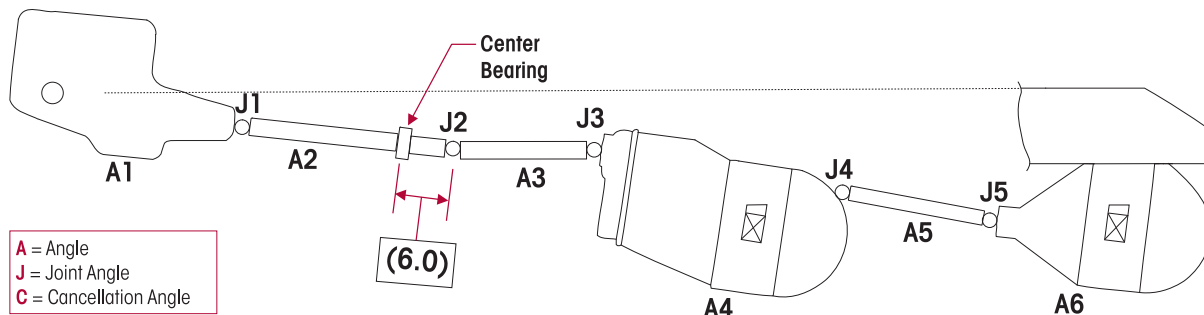
1st Drive Shaft Angle    A2 = \_\_\_\_\_    J1 = [A1-A2] = \_\_\_\_\_

Coupling Shaft Angle    A3 = \_\_\_\_\_    J2 = [A2-A3] = \_\_\_\_\_    C1 = [J1-J3] = \_\_\_\_\_

Forward Drive Axle Angle A4 = \_\_\_\_\_    J3 = [A3-A4] = \_\_\_\_\_    C2 = [J1-J3] = \_\_\_\_\_

Inter-Axle Shaft Angle    A5 = \_\_\_\_\_    J4 = [A4-A5] = \_\_\_\_\_

Rear Drive Axle Angle    A6 = \_\_\_\_\_    J5 = [A5-A6] = \_\_\_\_\_    C3 = [J4-J5] = \_\_\_\_\_



## SECTION 8

# Component Replacement

### FASTENERS

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

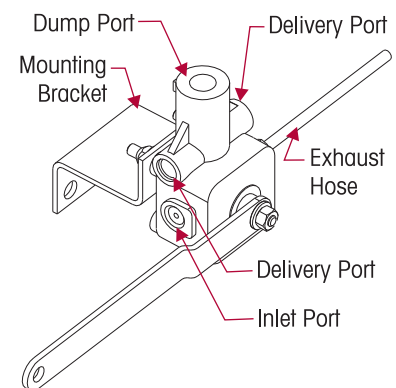
### HEIGHT CONTROL VALVE AND LINKAGE ASSEMBLY

The following height control valve replacement procedure is for vehicles built after 1996, see Figure 8-28.

#### DISASSEMBLY

1. Place the vehicle on a level floor.
2. Loosen or slacken the suspension joints by slowly moving the vehicle back and forth without applying the brakes. When coming to a complete stop make sure the parking brakes are released, not engaged.
3. Chock front wheels to prevent vehicle from moving.
4. Verify that the front steer and rear drive tires are set to normal operating pressure.
5. Disconnect the height control linkage assembly from the height control valve arm by sliding the rubber grommet from the stud.

**FIGURE 8-1**



#### **WARNING**

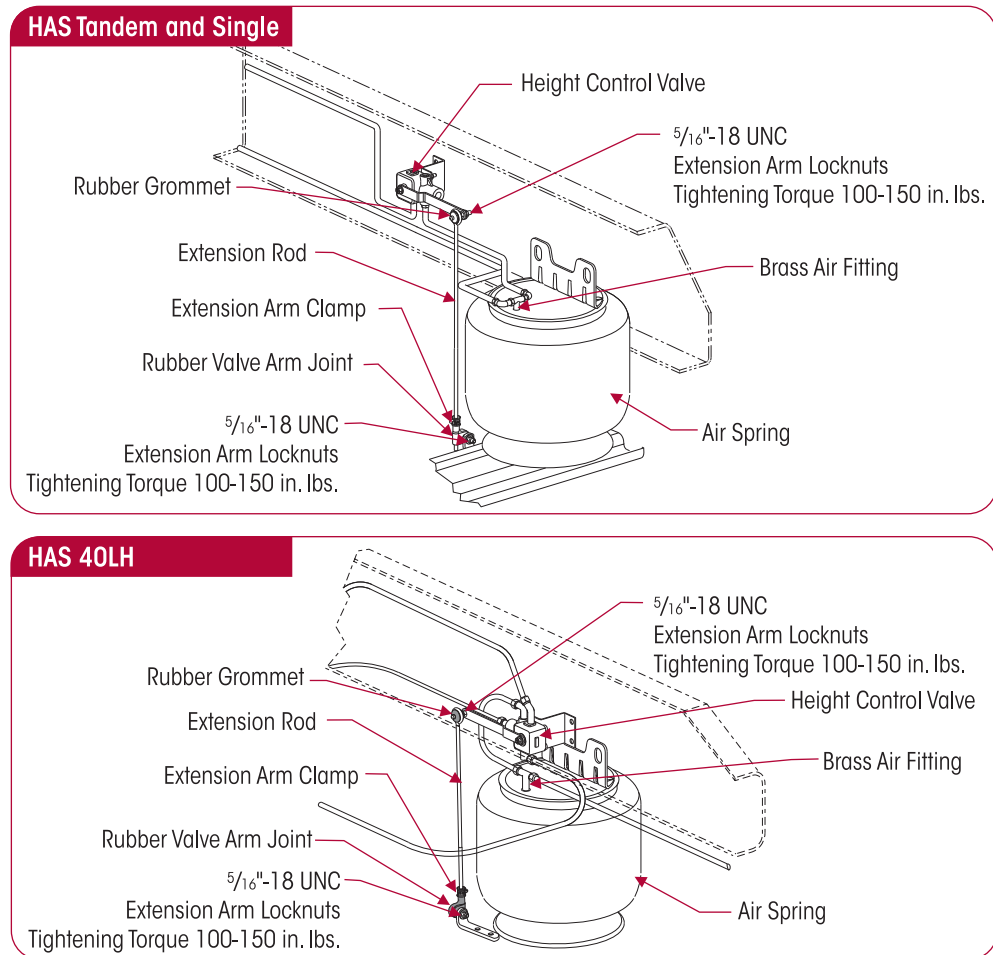
PRIOR TO AND DURING DEFLATION AND INFLATION OF THE AIR SUSPENSION SYSTEM, ENSURE ALL PERSONNEL AND EQUIPMENT ARE CLEAR FROM UNDER THE VEHICLE AND AROUND THE SERVICE AREA, FAILURE TO DO SO CAN CAUSE SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

6. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
7. Lower the height control valve arm to exhaust the air in the air springs and deflate the rear suspension.
8. Remove the existing height control valve fasteners and the lower linkage fasteners and discard, see Figure 8-2.

#### ASSEMBLY

1. Install the height control valve (Part No. 58994-000) to the mounting bracket. Tighten fasteners to 7-10 foot pounds torque.
2. Install the air fittings and air lines to the height control valve.
3. Install the linkage assembly by removing the outside 5/16" locknut and washer from the upper and lower part of the assembly. The 5/16" free running nuts remain on the assembly. The assembly orientation is with the rubber grommet located at the top of assembly as shown in Figure 8-2.
4. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
5. Inflate the suspension and verify that air system is at full operating pressure.

FIGURE 8-2



6. Exhaust the air in the air springs enough to relax the suspension. Then refill the air springs. The ride height will now be positioned on the bottom end of the height control valve dead band.
7. Set the referenced ride height to  $4\frac{1}{4}'' \pm \frac{1}{8}''$  loaded or  $4\frac{3}{8}'' \pm \frac{1}{8}''$  unloaded, refer to Ride height Adjustment in the Alignment & Adjustments Section of this publication.
8. Adjust the extension rod to fit the upper valve arm joint into the height control valve and the lower arm joint into the control valve arm bracket.
9. Insert the 5/16" fasteners. Tighten locknuts by holding the free running nut with an open end wrench and securing the outside locknut. Tighten fasteners to 100-150 inch pounds torque, see Figure 8-2.
10. Tighten clamp on the lower rubber valve arm joint with a screwdriver until securely fastened.

## AIR SPRING

### DISASSEMBLY

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

**WARNING**

THE VEHICLE MUST BE FIRMLY SUPPORTED WITH JACK STANDS PRIOR TO SERVICING. FAILURE TO DO SO CAN RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

3. Disconnect the height control linkage assembly from the height control valve arm by sliding the rubber grommet from the stud.

**WARNING**

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

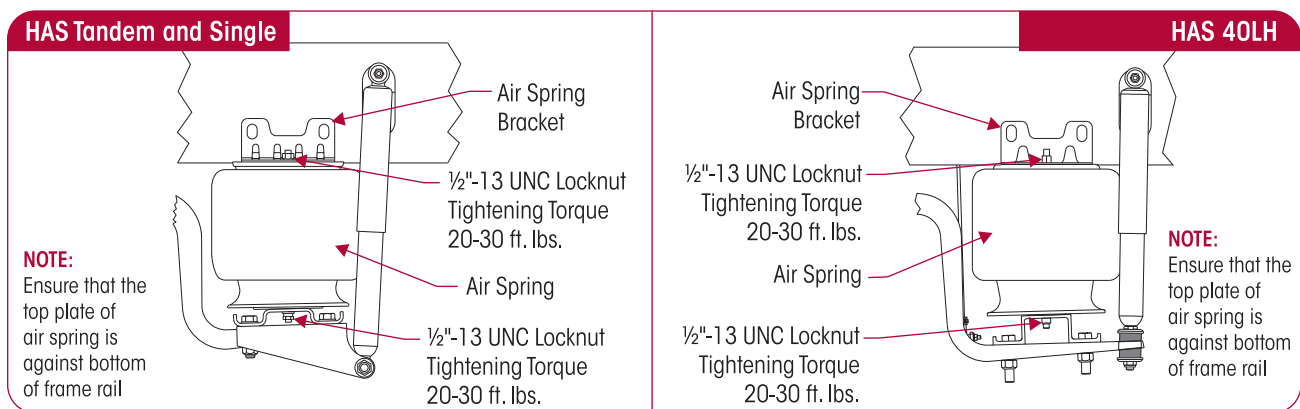
4. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
5. Lower the leveling valve arm to exhaust the air in the air springs and deflate the rear suspension.

**CAUTION**

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.

6. Remove and discard fasteners that connect the lower air spring to the cross channel.
7. Remove the air line connected to the air spring.
8. Remove the air fittings from air spring.
9. Remove and discard the upper air spring fastener to the upper air spring bracket, see Figure 8-3.
10. Remove the air spring.

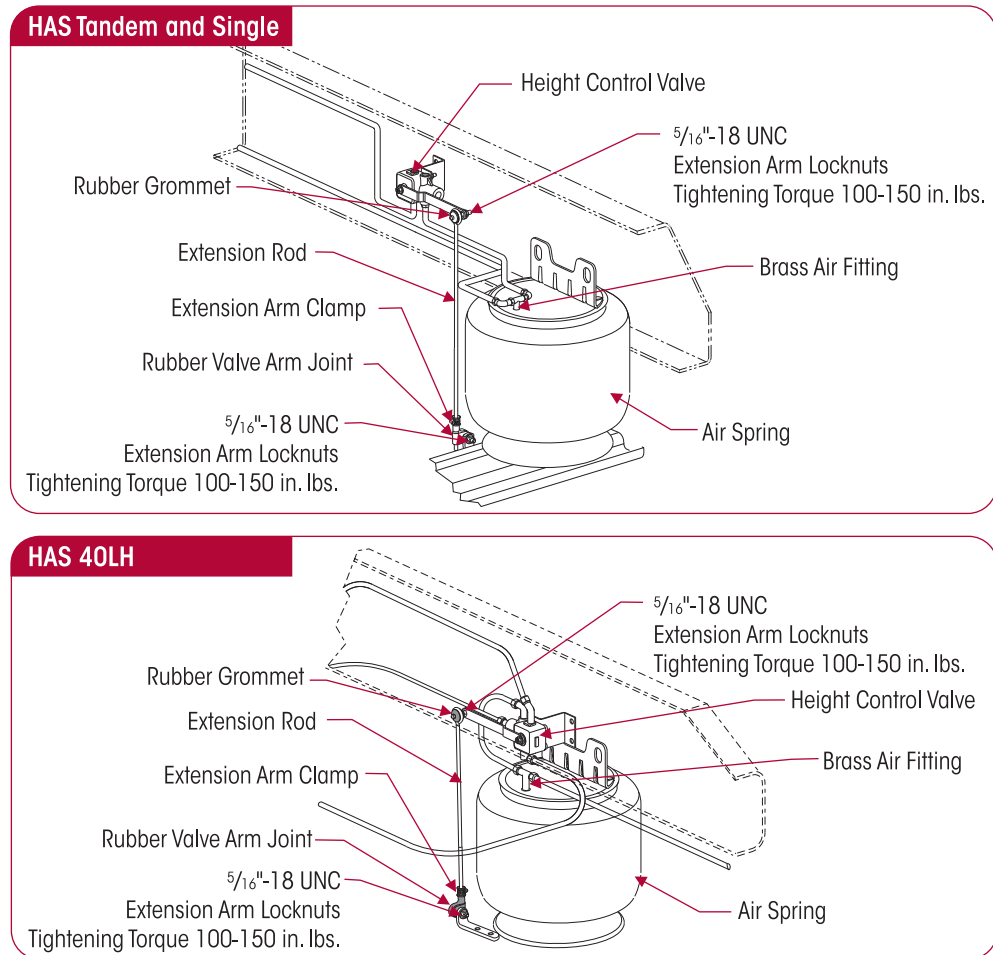
**FIGURE 8-3**



### ASSEMBLY

1. Install the upper air spring to the air spring bracket by inserting studs into appropriate holes. Install fasteners and hand tighten, **DO NOT** tighten to final torque at this time.
2. Install the air spring to cross channel fasteners and tighten to 20-30 foot pounds torque, see Figure 8-3.
3. Tighten the air spring to air spring bracket fasteners to 20-30 foot pounds torque, see Figure 8-3. **DO NOT** over tighten.

FIGURE 8-4



4. Assemble air fitting to the air spring using Teflon thread seal as shown in Figure 8-4.
5. Assemble the air lines to air springs.
6. Remove frame support.
7. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
8. Inflate the suspension.
9. Verify ride height, see Alignment & Adjustments Section of this publication.
10. Remove wheel chocks.

## UPPER AIR SPRING BRACKET

### DISASSEMBLY

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



### WARNING

THE VEHICLE MUST BE FIRMLY SUPPORTED WITH JACK STANDS PRIOR TO SERVICING. FAILURE TO DO SO CAN RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

3. Disconnect the height control linkage assembly from the height control valve arm by sliding the rubber grommet from the stud.



**WARNING**

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

4. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
5. Lower the leveling valve arm to exhaust the air in the air springs and deflate the rear suspension.
6. Remove air lines to air spring.
7. Remove the air spring bracket to the air spring fasteners.
8. Remove the air spring bracket to the frame rail fasteners, per the vehicle manufacturer's specifications.
9. Remove the upper air spring bracket.

**ASSEMBLY**

1. Install the air spring to the upper air spring bracket.
2. Tighten the air spring to air spring bracket fastener to 20-30 foot pounds torque, see Figure 8-3. **DO NOT** over tighten.
3. Install the air spring bracket to the frame fasteners and tighten per the vehicle manufacturer's torque specifications. Ensure the top plate of the air spring is against the bottom of frame rail.
4. Connect the air lines to air spring.
5. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
6. Inflate the suspension.
7. Remove the frame supports.
8. Remove the wheel chocks.

**STANDARD SHOCK ABSORBER****CAUTION**

THE SHOCK ABSORBERS ARE THE REBOUND TRAVEL STOPS FOR THE SUSPENSION. ANYTIME THE AXLE ON A HAS SERIES 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 GENUINE PARTS CAN ALTER THE TRAVEL OF THE SUSPENSION.

**NOTE**

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

There are two different diameter bore types of Hendrickson original equipment HAS shock absorbers:

**STANDARD** — 1.375" diameter bore, and

**HI-TORQUE** — 1.63" diameter bore, see HI-TORQUE description in the Product Description Section of this publication.

**SERVICE HINT**

The **HAS Series** and the **HAS 40LH** have different shock absorber mounting as stated below, more detail in the assembly in this section.

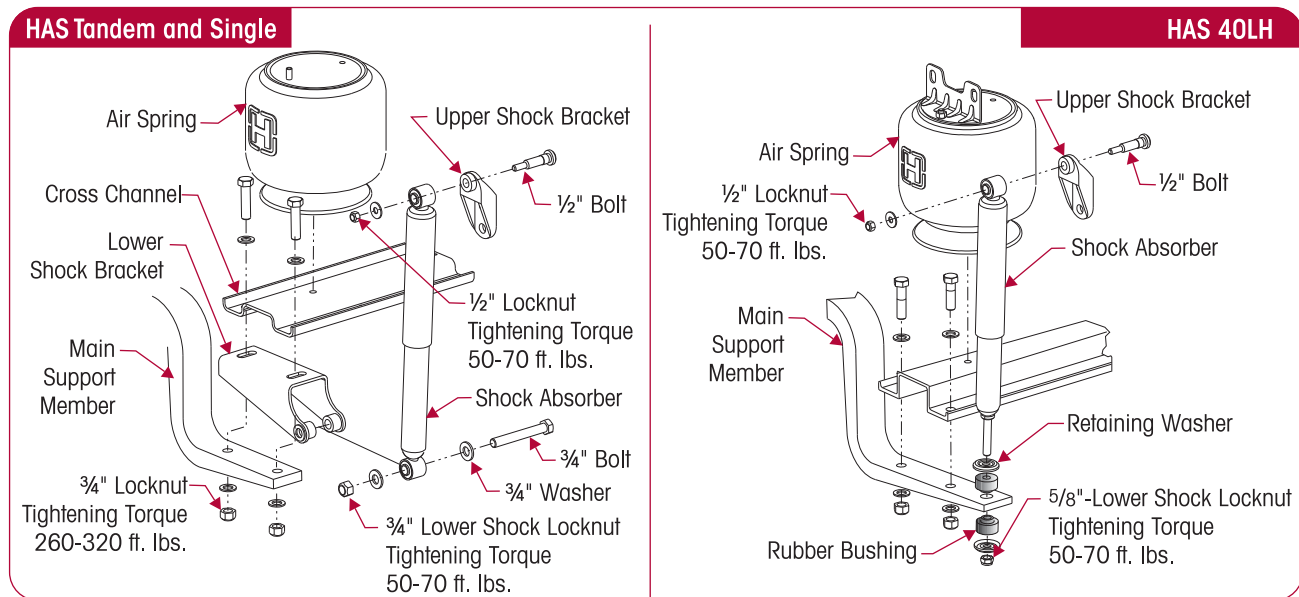
**HAS SERIES TANDEM AND SINGLE** — The lower end and the upper end are eye mount design, see Figure 8-5.

**HAS 40LH** — The lower end is a stem mount design and the upper end is a eye mount design, see Figure 8-5.

### DISASSEMBLY

1. Remove the upper shock mounting fasteners from the upper shock bracket and discard.
2. Remove lower shock mounting fasteners as follows:
  - **HAS TANDEM AND SINGLE** — Remove  $\frac{3}{4}$ " lower shock fasteners from the lower shock bracket, see Figure 8-5.
  - **HAS 40LH** — Remove  $\frac{5}{8}$ " lower fasteners from the main support member, see Figure 8-5.
3. Remove shock absorber.
4. Inspect the shock absorber mounting brackets and hardware for damage or wear, replace as necessary.

FIGURE 8-5



### ASSEMBLY

1. Install the shock absorber into the upper shock mounting bracket.
2. Install the upper  $\frac{1}{2}$ " shock mounting fasteners, **DO NOT** tighten at this time.
3. Install the lower shock absorber as follows:

### SERVICE HINT

To install or remove the **HI-TORQUE** shock absorber, release all air PSI from the air springs and apply some hand force to compress the internal rebound spring.

#### ■ HAS Tandem and Single

- a. Install the shock absorber into the lower shock bracket.
- b. Install  $\frac{3}{4}$ " lower shock washers on the both sides of the shock bracket.
- c. Install the lower  $\frac{3}{4}$ " shock bolt from inboard side and attach  $\frac{3}{4}$ " locknut.
- d. Tighten the upper and lower shock locknuts to 50 -70 foot pounds torque.

#### ■ HAS 40LH

- a. Install lower shock stud mount into the retaining washer, rubber washer and main support member, see Figure 8-5.
- b. Install the other rubber washer, retaining washer and locknut on the underside of the main support member.
- c. Tighten the upper and lower shock locknuts to 50 -70 foot pounds torque.

## EDGE — HI-TORQUE SHOCK ABSORBER (If equipped)

**NOTE**

Hendrickson original equipment HI-TORQUE shock absorbers, see Figure 8-6, are 1.63" diameter bore.

### EFFICIENT DRIVELINE GEOMETRY (EDGE)

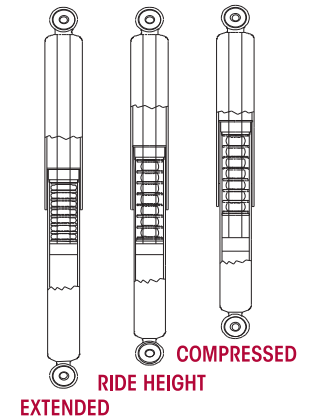
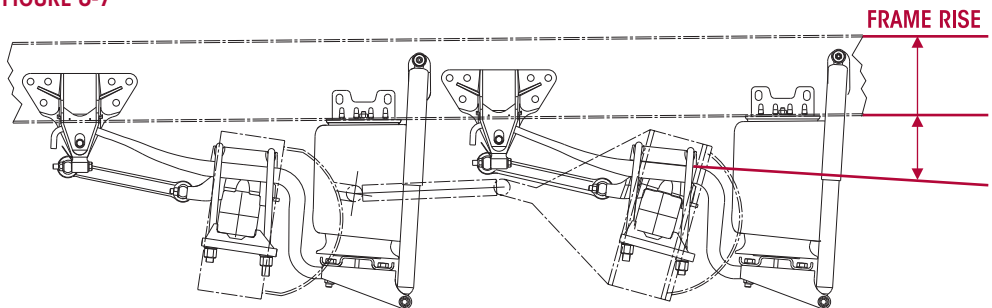
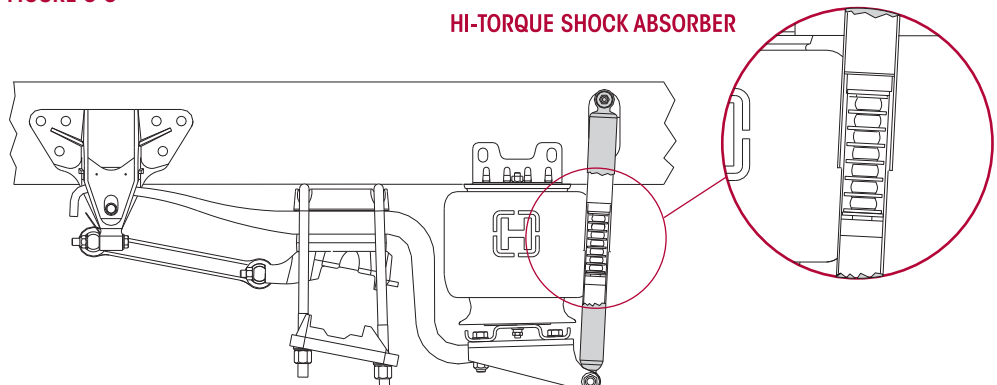
The EDGE is the combination of the Hendrickson heavy-duty HI-TORQUE shock and height control valve system. Together they perform Efficient Driveline GEometry. The EDGE is available for use on Hendrickson's HAS air suspension for vehicles with high torque engines.

**CAUTION**

- HI-TORQUE shocks provide increased carrying capacity and longer life, and they function as traditional shock absorbers to deliver a smooth, high-quality ride.
- The HI-TORQUE shock contains a patented rebound spring inside, which limits rapid shock extension during acceleration. HI-TORQUE shocks control torque induced frame rise, see Figure 8-7 and 8-8 and help to reduce driveline vibration.

REPLACING A HI-TORQUE SHOCK WITH A NON HI-TORQUE SHOCK, WILL CAUSE PREMATURE WEAR AND HAVE ADVERSE EFFECTS ON ALL OTHER DRIVELINE AND SUSPENSION COMPONENTS.

- The Hendrickson height control valve (Part No. 57977-000) eliminates the need for a separate quick release dump valve. A zero delay minimum dead band height control valve offers consistent, repeatable operation for precise ride height control.
- The valve reacts quickly to changes in suspension ride height due to load changes and uneven road surfaces, helping to maintain proper driveline angles.

**FIGURE 8-6**

**FIGURE 8-7**

**FIGURE 8-8**


**DISASSEMBLY**

**SERVICE HINT** On vehicles equipped with HI-TORQUE or EDGE shock absorbers, it may be necessary to dump the air suspension prior to installing/removing the shocks.

1. Chock the wheels.

**WARNING**

THE VEHICLE MUST BE FIRMLY SUPPORTED WITH JACK STANDS PRIOR TO SERVICING. FAILURE TO DO SO CAN RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

2. Disconnect the height control linkage assembly from the height control valve arm by sliding the rubber grommet from the stud.

**WARNING**

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

3. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
4. Lower the leveling valve arm to exhaust the air in the air springs and deflate the rear suspension.
5. Follow the Shock Absorber Disassembly in this section.

**ASSEMBLY**

**SERVICE HINT** When replacing an existing shock with a HI-TORQUE shock it will appear that the new replacement shock is too short. Human strength can not overcome the spring force when trying to extend the HI-TORQUE shock while the suspension system is at ride height.

**NOTE** To install or remove HI-TORQUE shock absorber, release all air PSI from air springs and apply some hand force to compress the internal rebound spring.

1. Install the new shock, follow the Shock Absorber Assembly in this section.
2. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
3. Assemble the height control valve linkage to the height control valve.
4. Inflate the suspension.

**NOTE** The shock will extend with the vehicle doing the extension.

5. Remove wheel chocks.

**UPPER SHOCK ABSORBER BRACKET****DISASSEMBLY**

**NOTE** To install or remove the HI-TORQUE shock absorber, release all air PSI from air springs and apply some hand force to compress the internal rebound spring.

1. Remove and discard the ½" fasteners, that connect shock absorber to upper shock bracket.
2. Remove and discard the fasteners that connect shock absorber to lower shock bracket.
3. Remove shock absorber.
4. Remove the fasteners that attach the upper shock bracket to frame as per vehicle manufacturer specifications.
5. Remove the frame bracket.

**ASSEMBLY**

1. Install the upper shock bracket to frame by attaching the fasteners per vehicle manufacturer specifications.
2. Install shock absorber to upper shock bracket by attaching ½" fasteners. **DO NOT** tighten at this time.
3. Complete the lower and upper shock absorber installation per the Shock Absorber Assembly instructions in this section.

**LOWER SHOCK ABSORBER BRACKET**
**NOTE**

The HAS 40LH is not equipped with a lower shock bracket, refer to Figure 8-5.

**DISASSEMBLY**

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


**WARNING**

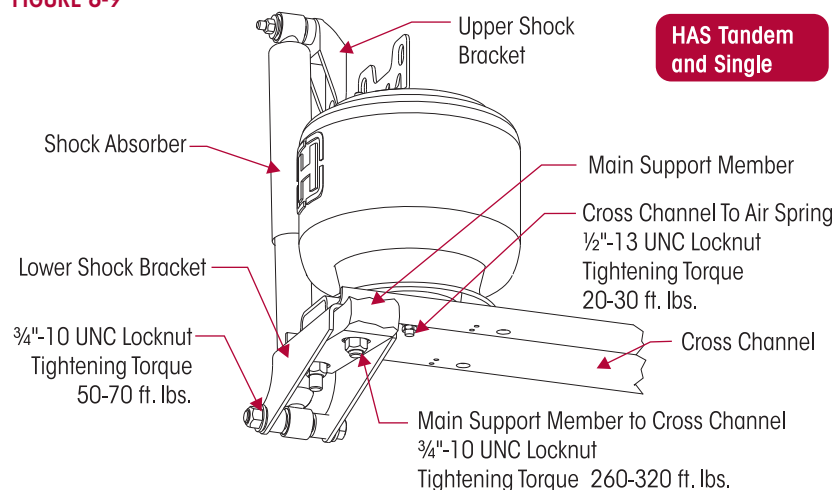
THE VEHICLE MUST BE FIRMLY SUPPORTED WITH JACK STANDS PRIOR TO SERVICING. FAILURE TO DO SO CAN RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

3. Disconnect the height control linkage assembly from the height control valve arm by sliding the rubber grommet from the stud.


**WARNING**

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

4. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
5. Lower the leveling valve arm to exhaust the air in the air springs and deflate the rear suspension.
6. Remove the ¾" shock absorber to the lower shock bracket fastener, see Figure 8-9.
7. Compress up the shock absorber and push out of the way.
8. Remove the ¾" fasteners that connect the cross channel and lower shock bracket to the main support member assembly on the affected side.
9. Loosen the ¾" bolts, washers and locknuts on the opposite side.
10. Remove lower shock bracket.

**FIGURE 8-9**


### ASSEMBLY

1. Install lower shock bracket in between the cross channel and the main support member assembly by attaching the ¾" fasteners.
2. Tighten ¾" locknuts on both sides of the cross channel to 260-320 foot pounds torque, see Figure 8-26.
3. Install ¾" shock absorber to lower shock bracket fasteners and tighten to 50-70 foot pounds torque.
4. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
5. Inflate the suspension.
6. Remove frame support.
7. Remove wheel chocks.

### FRAME HANGER

#### DISASSEMBLY

1. Chock the wheels.
2. Support the frame at ride height.
3. Disconnect the height control linkage assembly from the height control valve arm by sliding the rubber grommet off the height control valve arm's stud.
4. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the air system.
5. Lower the height control valve arm(s) to exhaust the air in the air springs and deflate the rear suspension.
6. Remove the rebound fastener, spacer and roller from the hanger, as equipped, see Figures 8-11 through 8-13.

#### NOTE

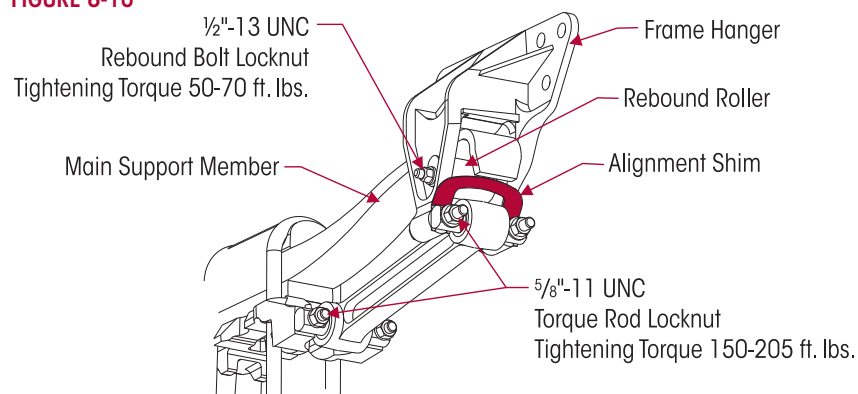
It might be necessary to raise or lower the frame in order to remove the torque rod fasteners.

#### SERVICE HINT

Prior to disassembly of the HAS longitudinal torque rod fasteners, note the orientation and quantity of torque rod shim. It is required that the longitudinal torque rod shims be installed in the same orientation and location as removed to preserve the existing alignment.

7. Remove the longitudinal torque rod to frame hanger and spring seat fasteners and any alignment shims, see Figure 8-10. Discard fasteners.

**FIGURE 8-10**



8. Remove the longitudinal torque rod.
9. Raise and support the frame of the vehicle high enough to remove the load from the main support member.

10. Remove and discard the frame hanger to frame fasteners per the vehicle manufacturer's specifications.
11. Remove the front frame hanger.

### ASSEMBLY

1. Position the frame hanger over the main support member.
2. Install new frame fasteners and tighten to the vehicle manufacturer's specifications.
3. Lower the frame back to ride height and support.
4. Position the longitudinal torque rod on the forward face of the spring hanger legs.

### CAUTION

FAILURE TO INSTALL THE HAS LONGITUDINAL TORQUE ROD SHIMS IN THE SAME ORIENTATION AND LOCATION WILL REQUIRE A VEHICLE ALIGNMENT. IMPROPER VEHICLE ALIGNMENT CAN INCREASE TIRE WEAR.

### NOTE

It is required that the HAS longitudinal torque rod shims be installed in the same orientation and location as removed to preserve the existing alignment.

5. Install all torque rod fasteners and any alignment shims that were removed.
6. Tighten the all torque rod fasteners to 150-205 foot pounds torque.
7. Install the rebound roller, spacer and fasteners in frame hanger and tighten to 50-70 foot pounds torque, see Figures 8-11 through 8-13.
8. Reconnect the height control linkage assembly to the height control valve arm.
9. Inflate the suspension slowly and verify that the air spring inflates uniformly without binding.
10. Remove the frame supports.
11. Verify proper ride height adjustment, (see ride height adjustment in the Preventive Maintenance Section of this publication).
12. Verify axle alignment, see Alignment & Adjustments Section of this publication.
13. Remove the wheel chocks.

## FRAME HANGER SLIPPER PADS

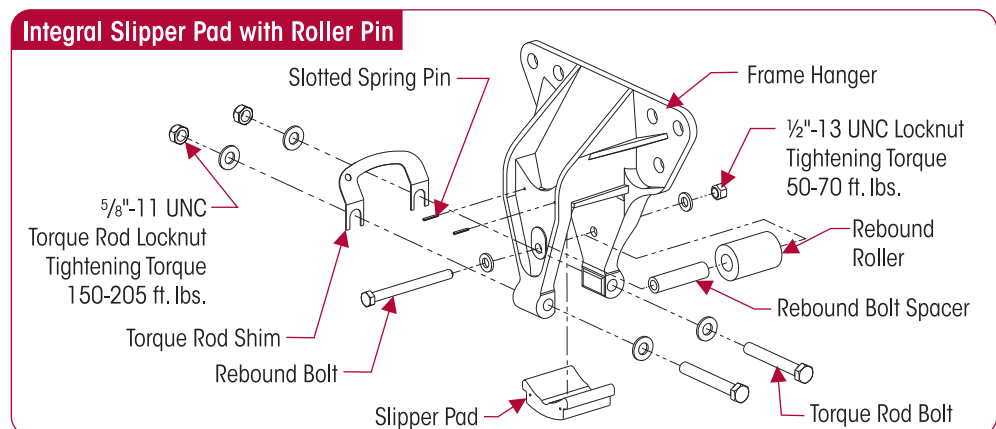
### NOTE

Refer to Hendrickson Selection Guide for slipper pad options and service kits, refer to the Parts List Section in this publication.

### ■ FRAME HANGER STYLE: INTEGRAL SLIPPER PAD WITH ROLL PIN

The following procedure is recommended if your frame hanger slipper pad attachment is the design as shown in Figure 8-11.

**FIGURE 8-11**



**DISASSEMBLY**

1. Chock the wheels.
2. Support the frame.

**WARNING**

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

3. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
4. Release all air from the air springs.
5. In most cases removal of the rebound roller and spacer may be required to disassemble the slipper pad. Remove the rebound fasteners, rebound roller and spacer.
6. Apply an upward force on the cross channel below the main support member with a jack or pry bar. This will cause the tips of the main support members to drop away from the slipper pad. Do not nick or gouge the cross channel.
7. With a blunt end 1/8" punch drive in current roll pin until it has passed through the foot of the hanger remove slipper pad with a screwdriver.

**ASSEMBLY**

1. Insert new slipper pad.
2. Raise main support member to secure slipper pad in place.
3. Remove jack / pry bar from under cross channel.
4. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
5. Inflate the suspension.
6. Drive new roll pin in place with punch until flush with front of frame hanger.
7. Reinstall the rebound roller assembly.
8. Tighten fasteners as shown in Figure 8-11.
9. Remove frame support.
10. Remove the wheel chocks.

**■ FRAME HANGER STYLE: INTEGRAL SLIPPER PAD WITH CLAMP**

The following procedure is recommended if your frame hanger slipper pad attachment is the hex head fastener design as shown in Figure 8-12.

**DISASSEMBLY**

1. Chock the wheels.
2. Support the frame.

**WARNING**

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

3. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
4. Release all air from the air springs.
5. In most cases removal of the rebound roller and spacer may be required to disassemble the slipper pad. Remove the rebound fasteners, rebound roller and spacer.

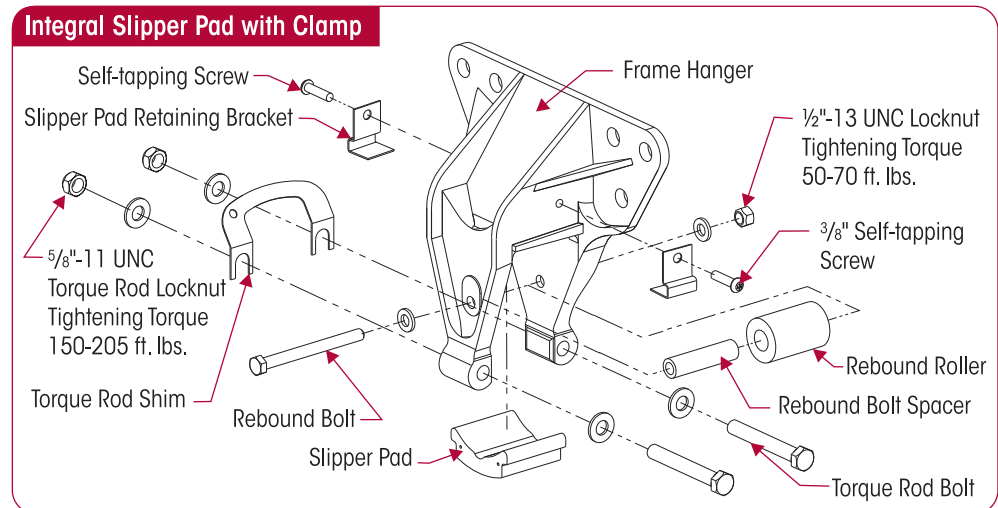


- Apply an upward force on the cross channel below the main support member with a jack or pry bar. This will cause the tips of the main support members to drop away from the slipper pad. Do not nick or gouge the cross channel.

**SERVICE HINT**

In some cases the screws may require to be drilled through using 11/32" drill size.

- Remove fasteners, (2)-3/8" hex head self-tapping screws. Remove the slipper pad.

**FIGURE 8-12**

**ASSEMBLY**

- Position the slipper pad and retainer plate on frame hanger, tighten the hex head self-tapping screws to 25 foot pounds torque.
- Remove jack / pry bar from under the cross channel.
- See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
- Inflate the suspension.
- Install the rebound roller assembly.
- Tighten the fasteners as shown in Figure 8-12.
- Remove frame stand.
- Remove the wheel chocks.

**■ FRAME HANGER STYLE: WRAP AROUND SLIPPER PAD**

The following procedure is recommended if your frame hanger slipper pad attachment is the design as shown in Figure 8-13.

**DISASSEMBLY**

- Chock the wheels.
- Support the frame.

**WARNING**

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

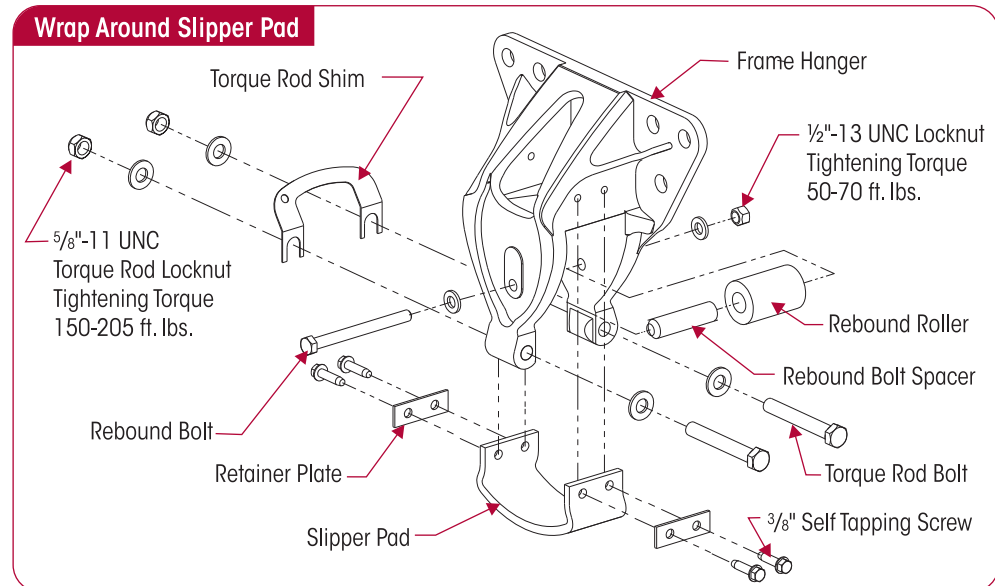
- See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
- Release air from the air springs.
- In most cases removal of the rebound roller and spacer may be required to disassemble the slipper pad. Remove the rebound fasteners, rebound roller and spacer.

- Apply an upward force on the cross channel below the main support member with a jack or pry bar. This will cause the tips of the main support members to drop away from the slipper pad. Do not nick or gouge the cross channel.

**SERVICE HINT**

In some cases the screws may require to be drilled through using  $1\frac{1}{32}$ " drill size.

- Remove fasteners, (4)  $\frac{3}{8}$ " hex head self-tapping screws. Remove the slipper pad.

**FIGURE 8-13****ASSEMBLY**

- Position the slipper pad and retainer plate on frame hanger, tighten the hex head self-tapping screws to  $\mathbb{N}$  25 foot pounds torque.
- Remove jack / pry bar from under cross channel.
- See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
- Inflate the suspension.
- Reinstall the rebound roller assembly.
- Tighten the fasteners as shown in Figure 8-13.
- Remove the frame support.
- Remove the wheel chocks.

**LONGITUDINAL TORQUE ROD**

Torque rods are fixed length and use drop-in shims as shown in Figure 8-14 for suspension alignment adjustment.

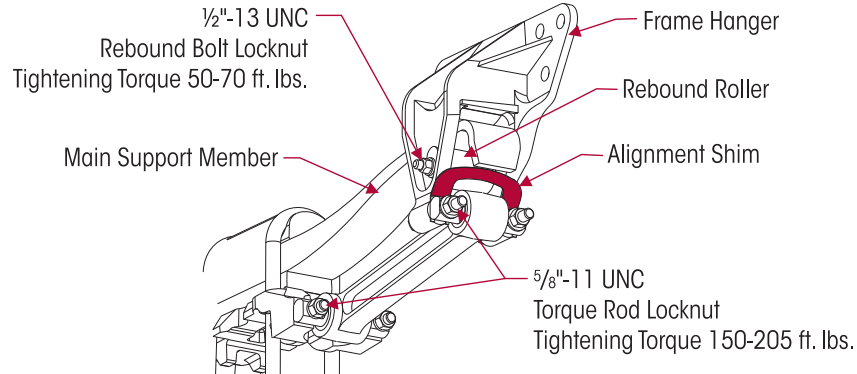
**DISASSEMBLY**

- Chock the wheels.

**SERVICE HINT**

Note the quantity and location of shims removed to maintain the alignment during assembly, see Alignment & Adjustments Section of this publication.

- Remove axle seat to longitudinal torque rod connection fasteners and discard. Take note of any alignment shims.

**FIGURE 8-14**


- Loosen (**DO NOT** remove) the rebound bolt fastener in the frame hanger.
- Remove the frame hanger to longitudinal torque rod connection fasteners and any alignment shims. Discard fasteners.
- Remove the longitudinal torque rod.
- Inspect the mounting surfaces for any wear or damage, replace if necessary.
- To replace torque rod bushings, refer to the Torque Rod Bushing Component Replacement in this Section.

### ASSEMBLY

- Position the new or re-bushed longitudinal torque rod and any alignment shims on the spring seat studs and hand tighten the fasteners.
- Position longitudinal torque rod on the forward face of the frame hanger legs and install fasteners and any alignment shims. Tighten fasteners to 150-205 foot pounds torque, see Figure 8-14.
- Tighten locknuts at axle end of torque rod to 150-205 foot pounds torque as shown in Figure 8-14.
- Tighten rebound bolt locknuts to 50-70 foot pounds torque as shown in Figure 8-14.
- Recheck alignment after torque rod is installed, see Alignment & Adjustments Section of this publication.
- Remove the wheel chocks.

### TRANSVERSE ROD



#### WARNING

HAS SUSPENSIONS INCORPORATE TRANSVERSE RODS FOR VEHICLE STABILITY. IF THESE COMPONENTS ARE DISCONNECTED OR ARE NON-FUNCTIONAL, THE VEHICLE SHOULD NOT BE OPERATED. FAILURE TO DO SO CAN RESULT IN ADVERSE VEHICLE HANDLING, LOSS OF VEHICLE CONTROL, POSSIBLE TIRE CONTACT WITH THE FRAME, PREMATURE COMPONENT DAMAGE, OR SEVERE PERSONAL INJURY.

### DISASSEMBLY

- Chock the wheels of the vehicle.

#### SERVICE HINT

Note the quantity and location of shims removed to maintain the lateral alignment of the axle during assembly, see the Alignment & Adjustments Section of this publication.

- Remove the transverse torque rod mounting fasteners.
- Remove the transverse torque rod.
- Inspect the mounting surfaces for any wear or damage. Repair or replace as necessary.

### ASSEMBLY

1. Install the transverse torque rod.
2. Install the mounting fasteners and any shims that were removed.

#### NOTE

Hendrickson recommends the using Grade 8 bolts and Grade C locknuts for all torque rod attachments.

3. Prior to tightening, ensure that the vehicle is at the proper ride height.
4. Tighten fasteners to the required torque specification, refer to original equipment manufacturer for specifications.
5. Check the lateral alignment. If out of the vehicle manufacturer's specified range, a lateral alignment is necessary. See Lateral Alignment in the Alignment & Adjustments Section of this publication.
6. Remove the wheel chocks.

### TORQUE ROD BUSHING

#### DISASSEMBLY

##### You will need:

- A vertical press with a capacity of at least 10 tons.
- A receiving / push out tool (see Special Tools Section of this publication)

#### CAUTION

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

1. Remove torque rod from suspension as detailed in this section.
2. Support torque rod end on receiving tool with end tube of torque rod centered on tool. Be sure torque rod is squarely supported on the press bed for safety.
3. Push directly on bushing straddle mount bar pin until the bushing is flush with the torque rod bore.
4. Raise the press and place the push-out tool centered on the bushing bar pin.
5. Push on the push-out tool until bushing clears torque rod end tube.
6. Clean and inspect inner diameter of torque rod ends, removing any nicks with emery cloth.

#### ASSEMBLY

#### NOTE

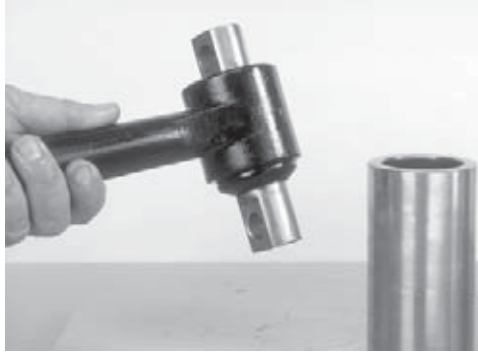
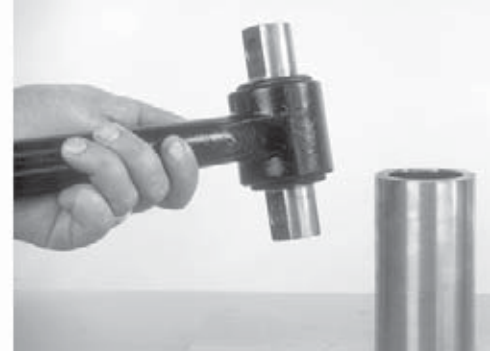
**DO NOT** use a petroleum or soap base lubricant. Such lubricants can cause adverse reactions with the bushing, such as deterioration of the rubber, causing premature failure.

1. Lubricate inner diameter of torque rod ends and new rubber bushings with light Naphthenic Base Oil, such as 60 SUS at 100°F, see Figure 8-15.
2. Press in new bushings. Support torque rod end on receiving tool with end tube of torque rod centered on receiving tool. The straddle mount bar pin bushings must have mounting flats positioned at zero degrees to shank of torque rod.
3. Press directly on straddle mount bar pin of bushing. Rubber bushings of bar pin must be centered within torque rod end tubes.

**FIGURE 8-15**



4. When pressing in new bushings, overshoot desired final position by approximately 3/16", see Figure 8-16.
5. Press bushing again from opposite side to center bar pin within torque rod end, see Figure 8-17.

**FIGURE 8-16**

**FIGURE 8-17**


6. Wipe off excess lubricant. Allow the lubricant four (4) hours minimum to dissipate before operating vehicle.

**CAUTION**

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

7. Install torque rod assembly as detailed in this section.

### MAIN SUPPORT MEMBER

The main support member assembly should function satisfactorily during normal vehicle operation. Replacement is only required when the main support member assembly has been damaged or worn.

**CAUTION**

THIS PROCEDURE TO REPLACE A MAIN SUPPORT MEMBER IS DONE WITH THE OTHER MAIN SUPPORT MEMBER PROPERLY CONNECTED TO THE FRAME HANGER AND AXLE. FAILURE TO HAVE THE OTHER MAIN SUPPORT MEMBER CONNECTED PROPERLY COULD ALLOW THE AXLE TO SHIFT RESULTING IN POSSIBLE DAMAGE TO COMPONENTS AND/OR PERSONAL INJURY. IF BOTH MAIN SUPPORT MEMBERS ARE TO BE REMOVED IT WILL BE NECESSARY TO SUPPORT THE AXLE PINION TO KEEP THE AXLE FROM SHIFTING.

### DISASSEMBLY

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

**WARNING**

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

3. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
4. Deflate the air spring(s) by removing the height control valve linkage(s) at the rubber grommet(s) and lowering the height control arm. This will exhaust the air pressure in the air springs.
5. Remove rebound bolt, locknut, washers, spacer tube, and rebound roller from frame hanger.
6. Raise rear of frame far enough to remove load from main support member.
7. Remove U-bolt fasteners, and spherical washers and discard.
8. Remove U-bolts and discard.

9. Remove the bottom cap and top pad, see Figure 8-18.
10. Remove cross channel to main support member fasteners and discard.
11. Lift the cross channel off the main support member, see Figure 8-18.
12. If vehicle is equipped with a HAS 40LH, it will be necessary to also remove the lower shock absorber fasteners and discard, see Figure 8-19.
13. Remove the main support member assembly.

FIGURE 8-18

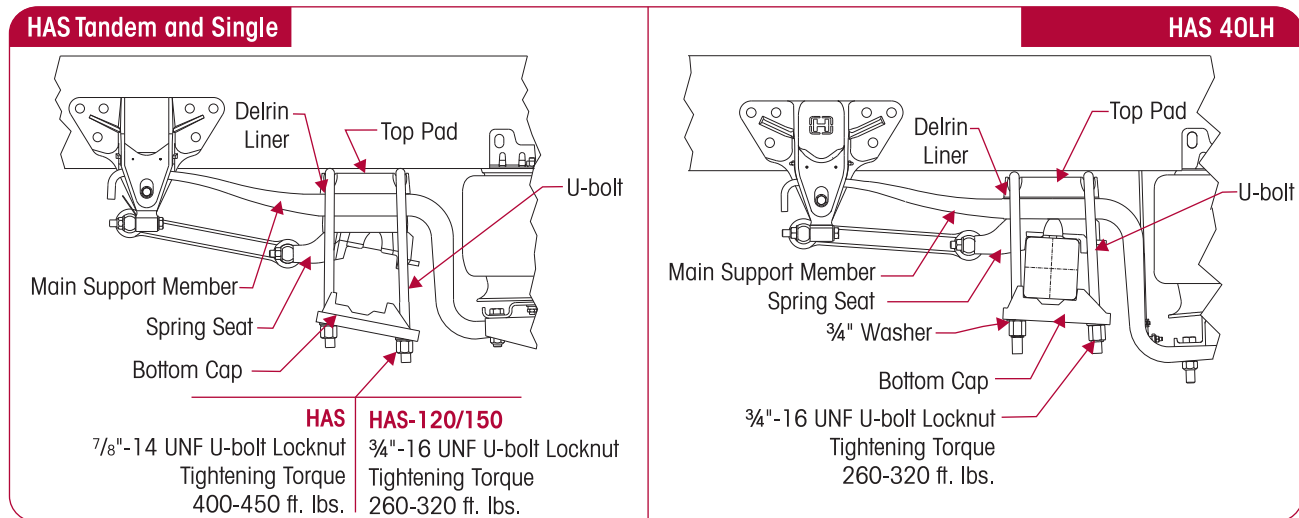
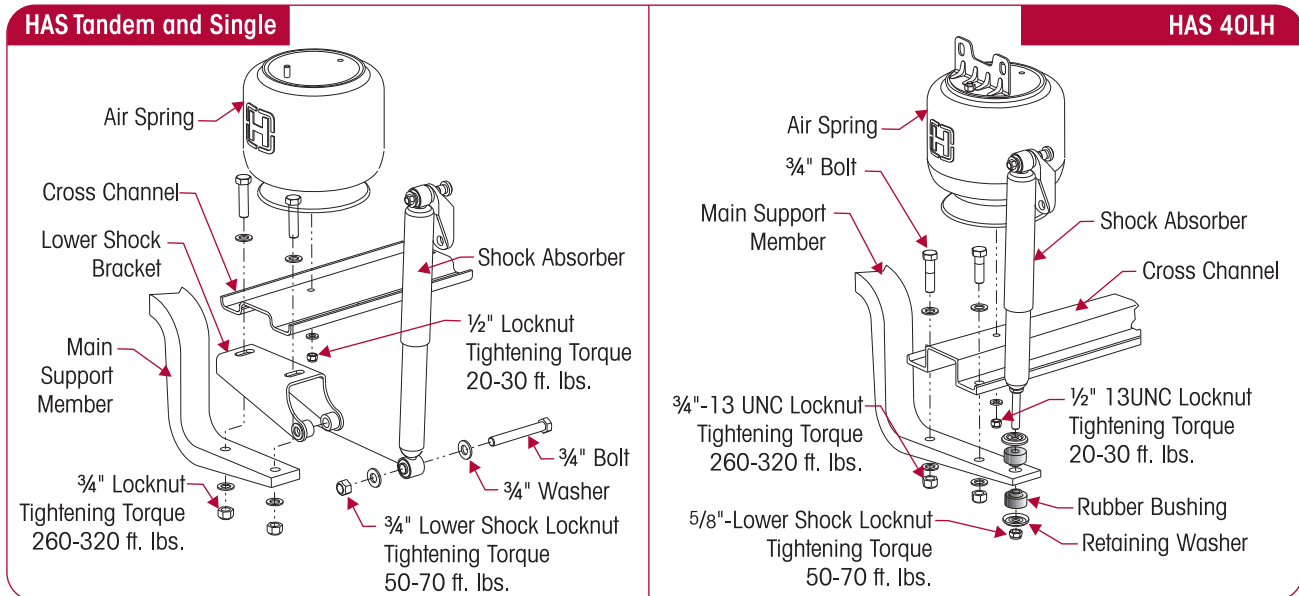


FIGURE 8-19



**ASSEMBLY**

1. Position the main support member on the axle seat, or on spacer plate (if equipped), with main support member center dowel pin piloting into hole in axle seat or spacer plate.
2. Ensure the Delrin liner is positioned on the top of the main support member, see Figure 8-20.
3. Install the U-bolts, top pad, bottom cap, spherical washers and U-bolt fasteners, see Figure 8-20. Snug fasteners, **DO NOT** tighten at this time.

**NOTE**

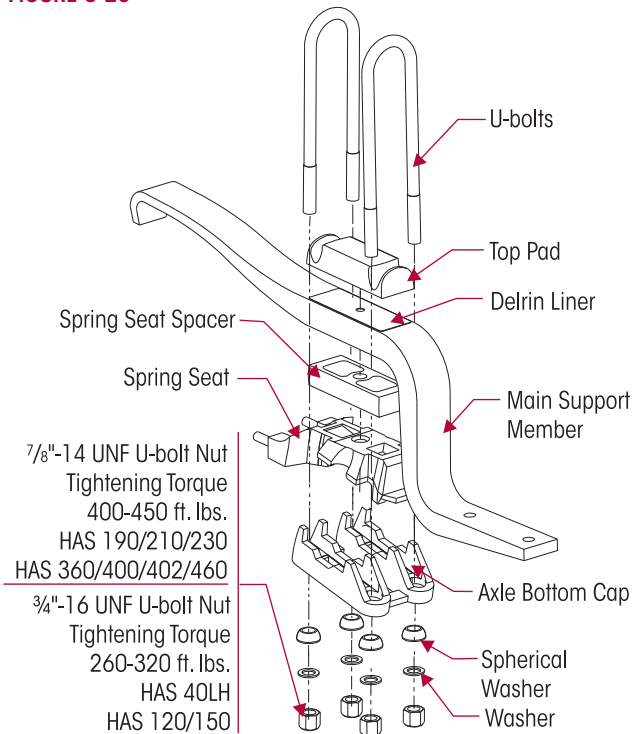
Ensure the torque rod mounting bolts of the spring seats are positioned toward the front of the vehicle.

4. Verify the top pad and bottom cap are installed correctly.

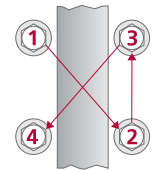
**NOTE**

An arrow on the top pad and bottom cap should be facing toward the front of the vehicle.

5. Lower the air spring and cross channel mounting bolts into main support member.
6. Lower the frame so that the spring hanger engage the main support member. Air up the system enough to seat the components and center the tip of the main support member between the spring hanger legs.
7. Install the cross channel fasteners to the main support member. Tighten the locknuts to 260-320 foot pounds torque as shown in Figure 8-19.

**FIGURE 8-20**

**FIGURE 8-21**

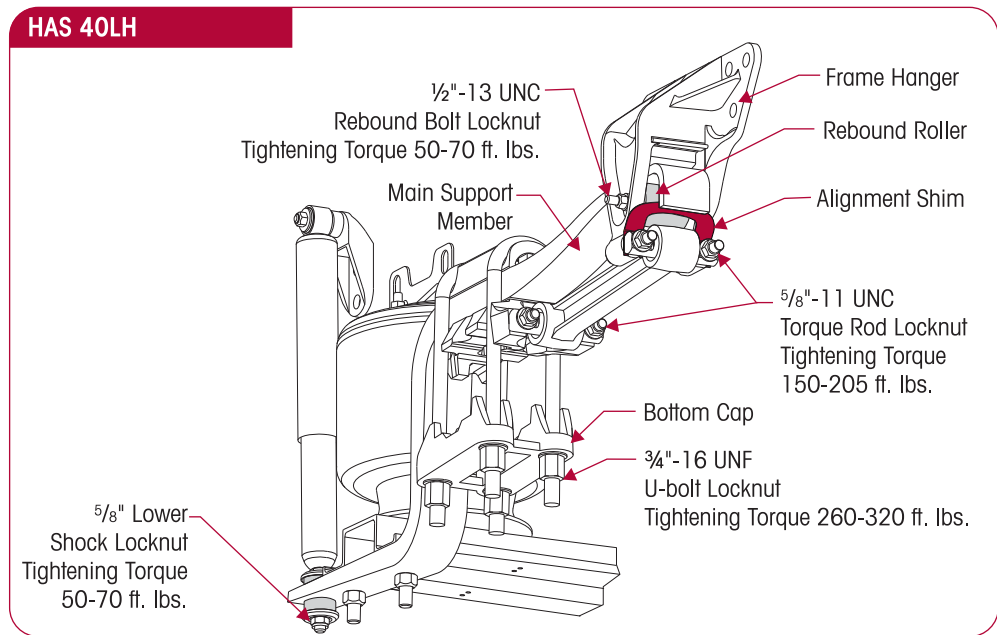
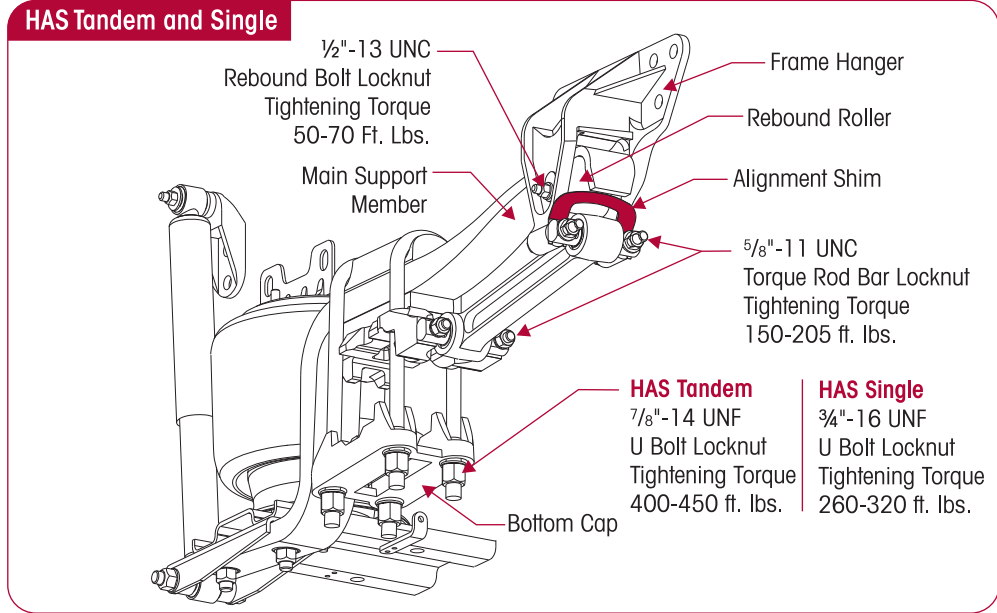
8. Evenly tighten U-bolt locknuts in the torque pattern shown, see Figure 8-21. **DO NOT** exceed the specified torque on U-bolt locknuts.
  - **HAS TANDEM** — 7/8"-14 UNF locknut, tighten to 400-450 foot pounds torque, rap the top of the U-bolts, and re-tighten to 400-450 foot pounds torque.
  - **HAS 40LH** — 3/4"-16 UNF locknut, tighten to 260-320 foot pounds torque, rap the top of the U-bolts, and re-tighten to 260-320 foot pounds torque.
  - **HAS 120/150** — 3/4"-16 UNF locknut, tighten to 260-320 foot pounds torque, rap the top of the U-bolts, and re-tighten to 260-320 foot pounds torque.


**NOTE**

U-bolt locknuts must be tightened to proper torque specification, refer to Torque Specifications Section of this publication, after first 1,000 miles of service, and at regular intervals thereafter as experience dictates, not to exceed 20,000 miles. **DO NOT** exceed specified torque on U-bolt locknuts.

9. Install rebound bolt, fasteners, spacer and roller in the spring hanger as shown in Figure 8-22. Tighten locknuts to 50-70 foot pounds torque.
10. **HAS 40LH** — Install the lower shock absorber to main support member fastener, tighten to 50-70 foot pounds torque.
11. Install the height control valve linkage.
12. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
13. Inflate the suspension and check the ride height, refer to the Alignment and Adjustment Section of this publication.
14. Recheck alignment after the new main support members are installed, see Alignment & Adjustments Section of this publication.
15. Remove the jack stands
16. Remove the wheel chocks.

FIGURE 8-22



**SPRING SEAT STUDS**

**NOTE** The clamp group does not have to be disassembled while replacing the torque rod mounting stud in the spring seat.

**DISASSEMBLY**

1. Chock the front wheels of the vehicle.
2. Support the frame rails at ride height.

**WARNING**

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

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



4. Deflate the suspension.

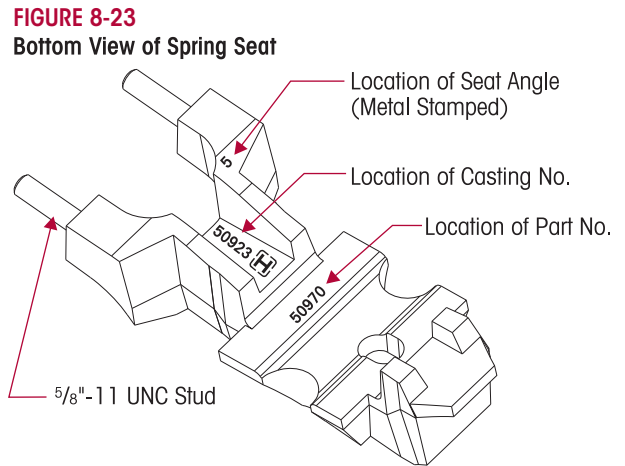
**SERVICE HINT**

Note the quantity and location of shims removed to maintain the lateral alignment of the axle during assembly, see the Alignment & Adjustments Section of this publication.

5. Remove the longitudinal torque rod fasteners and any alignment shims.
6. Remove the longitudinal torque rod.
7. Using a stud puller, remove the mounting studs from the spring seat, see Figure 8-23.

**ASSEMBLY**

1. Install the dog-point end (tap end) of the new studs into the spring seat until it bottoms out in the spring seat, see Figure 8-23. Using a stud driver, tighten the stud to 60-90 foot pounds torque.
2. Install the torque rod, fasteners and any alignment shims that were removed.
3. Tighten the longitudinal torque rod fasteners to 150-205 foot pounds torque.
4. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
5. Inflate the suspension.
6. Remove the frame supports.
7. Remove the wheel chocks.


**SPRING SEATS**
**WARNING**

THE PROCEDURE TO DISASSEMBLE THE CLAMP GROUP IS DONE WITH THE OTHER MAIN SUPPORT MEMBER PROPERLY CONNECTED TO THE FRAME HANGER AND AXLE. FAILURE TO HAVE THE OTHER MAIN SUPPORT MEMBER CONNECTED PROPERLY COULD ALLOW THE AXLE TO SHIFT RESULTING IN POSSIBLE DAMAGE TO COMPONENTS AND/OR PERSONAL INJURY. IF THE OTHER MAIN SUPPORT MEMBER ISN'T PROPERLY CONNECTED TO THE FRAME HANGER AND AXLE IT WILL BE NECESSARY TO SUPPORT THE AXLE PINION TO KEEP THE AXLE FROM SHIFTING.

**DISASSEMBLY**

1. Chock the front wheels.
2. Support the frame of the vehicle at ride height.

**WARNING**

THE VEHICLE MUST BE FIRMLY SUPPORTED WITH JACK STANDS PRIOR TO SERVICING. FAILURE TO DO SO CAN RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

3. Disconnect the height control linkage assembly from the height control valve arm by sliding the rubber grommet from the stud.

**WARNING**

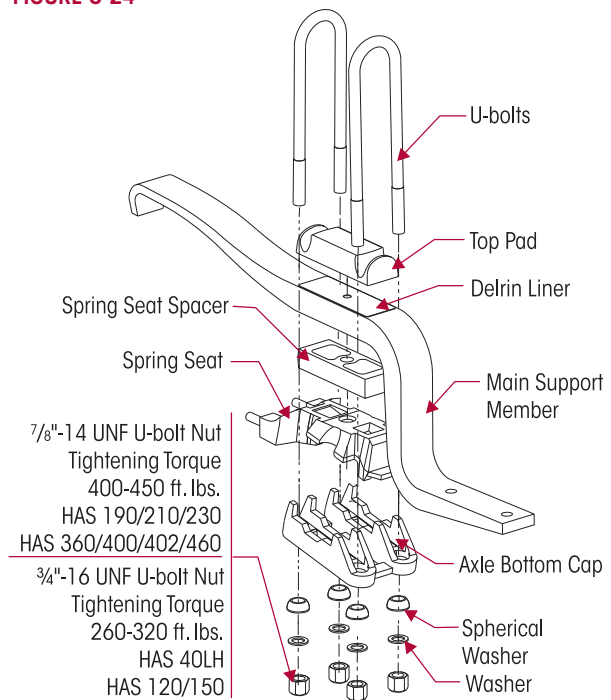
PRIOR TO AND DURING DEFLATION AND INFLATION OF THE AIR SUSPENSION SYSTEM, ENSURE ALL PERSONNEL AND EQUIPMENT ARE CLEAR FROM UNDER THE VEHICLE AND AROUND THE SERVICE AREA, FAILURE TO DO SO CAN CAUSE SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

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

5. Lower the leveling valve arm to exhaust the air in the air springs and deflate the rear suspension.

**FIGURE 8-24**

6. On the side being serviced, remove the U-bolt fasteners and U-bolts, and discard, see Figure 8-24.
7. Remove the axle bottom cap, top pad and spherical washers.
8. Remove the cross channel fasteners from the opposite side of the suspension being serviced.



**SERVICE HINT**

Removing the cross channel bolts from the opposite side allows accessibility to the clamp group being serviced without removing the main support member and the air spring.

9. Place a floor jack under the cross channel near the main support member being serviced. Raise the cross channel and main support member enough to remove the spring seat from under the main support member.

**SERVICE HINT**

Note the quantity and location of shims removed to maintain the alignment during assembly, see Alignment & Adjustments Section of this publication.

10. Remove the torque rod, fasteners and any alignment shims.
11. Remove the spring seat.

**INSPECTION**



**WARNING**

FAILURE OF THE MAIN SUPPORT MEMBER BETWEEN THE U-BOLTS WILL REQUIRE THE REPLACEMENT OF ALL CLAMP GROUP COMPONENTS. FAILURE TO DO SO CAN RESULT IN PREMATURE MAIN SUPPORT MEMBER OR CLAMP GROUP FAILURE, WHICH MAY RESULT IN LOSS OF VEHICLE CONTROL, PROPERTY DAMAGE AND/OR PERSONAL INJURY.

1. Inspect the main support member assembly for damage. Replace as necessary.
2. Inspect the top pad and axle bottom cap for excessive wear and cracks. Replace as necessary.
3. Inspect the axle housing for any cracks or wear. Repair or replace as necessary.

**ASSEMBLY**

1. Install the spring seat on the axle piloting to the aligning dowel on the axle into the hole located on the bottom of the spring seat, see Figure 8-24. Make sure torque rod studs are facing towards the front of the vehicle.
2. Install the longitudinal torque rod, fasteners and alignment shims (if equipped). **DO NOT** tighten at this time.
3. Lower the main support member assembly onto the spring seat piloting the aligning dowel pin on the bottom of the main support member to the top of spring seat dowel pin hole.

- Install top pad on the top of the main support member assembly making sure the dowel on the bottom of the top pad engages the liner and main support dowel pin holes.

**WARNING**

U-BOLTS THAT ARE FOUND TO BE LOOSE REQUIRE THAT MATING COMPONENTS BE INSPECTED FOR SIGNS OF WEAR. ANY COMPONENTS WORN MUST BE REPLACED. FAILURE TO DO SO CAN CAUSE PREMATURE CLAMP GROUP FAILURE, 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.

- Install NEW U-bolts, spherical washers and fasteners.

**NOTE**

Current Hendrickson U-bolts are either 7/8"-14 UNF (HAS 190/210/230/360/400/402/460) or 3/4"-16 UNF (HAS 40LH, HAS 120/150) and are Grade 8 and U-bolt locknuts are Grade C phosphate and oil coated.

- Verify that the top pad and bottom cap are installed correctly.

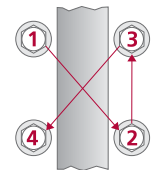
**NOTE**

The arrow on these parts should be facing towards the front of the vehicle.

- Lower the cross channel onto the opposite side lower shock bracket, if equipped, and main support member. Install the two 3/4" fasteners through the cross-channel, lower shock bracket, if equipped, and main support member. Loosely install the locknuts and washers. **DO NOT** tighten at this time.
- Verify that the U-bolts are seated properly in the channels of the top pad.
- Verify the main support member is centered in the frame hanger.

- Snug U-bolts prior to tightening (approximately 100 foot pounds tightening torque), in a crisscross pattern, see Figure 8-25.
- Tighten the cross-channel fasteners to 260-320 foot pounds.

**FIGURE 8-25**



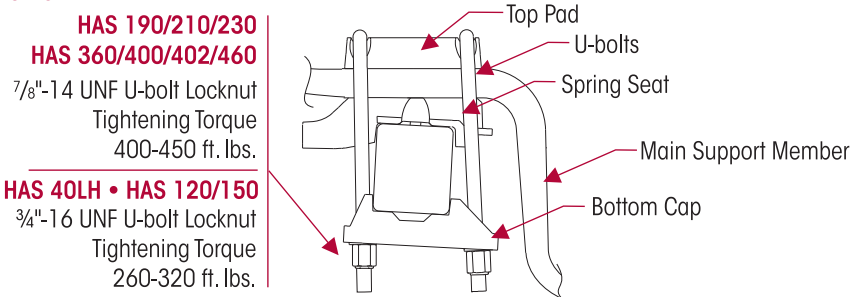
**NOTE**

**DO NOT** exceed specified torque on U-bolt locknuts.

- Tighten U-bolt locknuts in a crisscross pattern (see Figure 8-25) evenly in 50 foot pounds increments to achieve uniform bolt tension and correct (level) position of main support member, spring seat, and axle bottom cap at final torque to the specified torque procedure below, also see Figure 8-26.

- HAS TANDEM** — 7/8"-14 UNF locknut, tighten to 400-450 foot pounds torque, rap the top of the U-bolts, and re-tighten to 400-450 foot pounds torque.
- HAS 40LH** — 3/4"-16 UNF locknut, tighten to 260-320 foot pounds torque, rap the top of the U-bolts, and re-tighten to 260-320 foot pounds torque.
- HAS 120/150** — 3/4"-16 UNF locknut, tighten to 260-320 foot pounds torque, rap the top of the U-bolts, and re-tighten to 260-320 foot pounds torque.

**FIGURE 8-26**



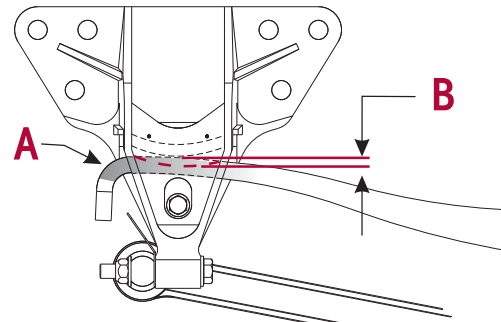
- See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.

14. Connect the leveling valve linkage rod to the height control valve arm to inflate the suspension.
15. Remove the frame supports.
16. Remove the wheel chocks.
17. Recheck alignment after the main support member is installed, see Alignment & Adjust

## OPTIONAL HAS 460 PLUS SERVICE KIT

Hendrickson has developed a service kit for the HAS 460 suspension that enhances durability in logging and other severe service applications. When installed, the service kit upgrades the HAS 460 to an HAS 460 Plus. The service kit has a unique rebound roller design and a main support member that is ¼" thicker at the tip, see Figure 8-27 Point "A".

FIGURE 8-27



### IMPORTANT NOTE

Hendrickson recommends that the main support members and all other components be replaced in pairs per axle when upgrading to the HAS 460 Plus.

The HAS 460 could be subjected to premature wear that could require the replacement of the both main support members and the slipper pads. Service Kit No. 49175-024 and **new slipper pads** should be installed (see Parts List Section of this publication), in these applications if the HAS 460 main support member exhibits  $\frac{3}{8}$ " or more wear at the frame hanger on the cam surface contact area, see Figure 8-27 point "B". The HAS 460 Plus service kit includes all the necessary components to upgrade the HAS 460 for one axle with the exception of slipper pads. If both axles require upgrading, then two kits are necessary. Follow the Main Support Member component replacement instructions in this section to upgrade to the HAS 460 Plus.

## CROSS CHANNEL

### DISASSEMBLY

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

### WARNING

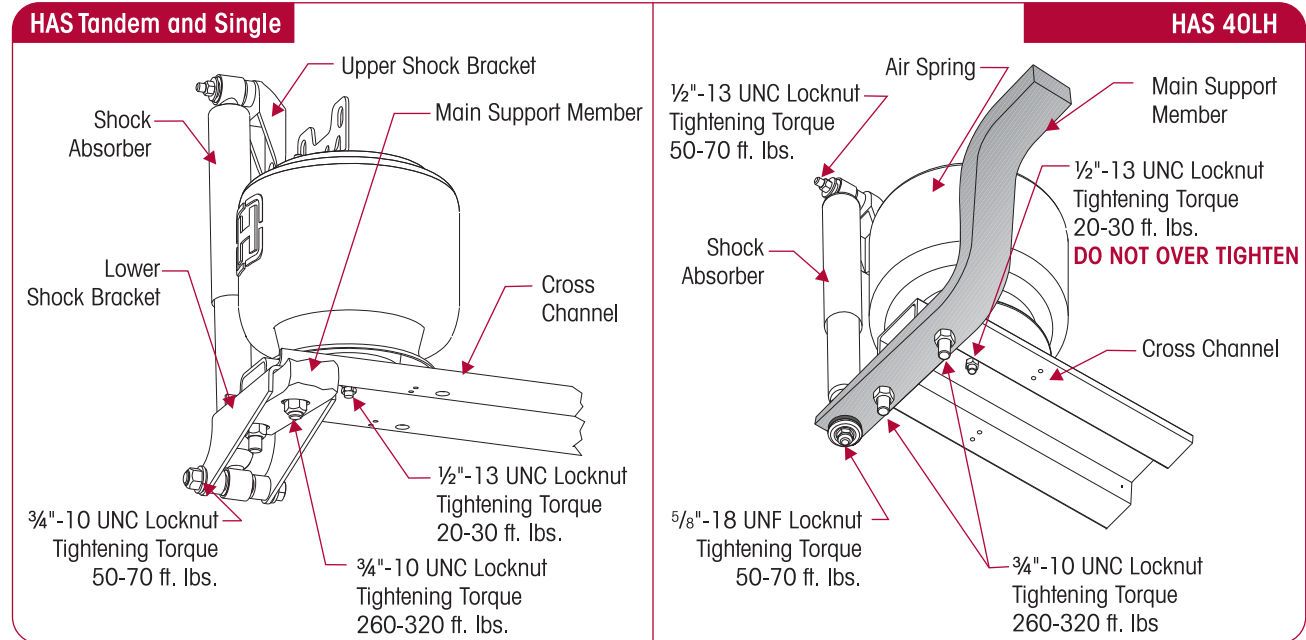
THE VEHICLE MUST BE FIRMLY SUPPORTED WITH JACK STANDS PRIOR TO SERVICING. FAILURE TO DO SO CAN RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

3. Disconnect the height control linkage assembly from the height control valve arm by sliding the rubber grommet from the stud.

### WARNING

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

4. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
5. Lower the leveling valve arm to exhaust the air in the air springs and deflate the rear suspension.
6. Remove the fasteners which connect the air spring to cross channel of both main support members, see Figure 8-28.
7. Remove fasteners from the cross channel to both main support member, see Figure 8-28.
8. Remove the cross channel.

**FIGURE 8-28**

**ASSEMBLY**

1. Install the fasteners which connect the cross channel to the main support members. Tighten the 3/4" fasteners to 260-320 foot pounds torque, see Figure 8-28.
2. Install the air springs to cross channel fasteners. Tighten the 1/2" air spring locknut to 20-30 foot pounds torque, see Figure 8-28.
3. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
4. Assemble the height control valve linkage to the height control valve.
5. Inflate the suspension.
6. Remove the frame support.
7. Remove the wheel chocks.

**OUTBOARD TO INBOARD SHOCK CONVERSION**

Refer to Shock Absorber Disassembly and Assembly in this section.

**DISASSEMBLY**

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

**WARNING**

THE VEHICLE MUST BE FIRMLY SUPPORTED WITH JACK STANDS PRIOR TO SERVICING. FAILURE TO DO SO CAN RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

3. Disconnect the height control linkage assembly from the height control valve arm by sliding the rubber grommet from the stud.

**WARNING**

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

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

5. Lower the leveling valve arm to exhaust the air in the air springs and deflate the rear suspension.
6. Remove air springs. Follow Air Spring Disassembly in this section. Do not remove the air fittings from the air springs.

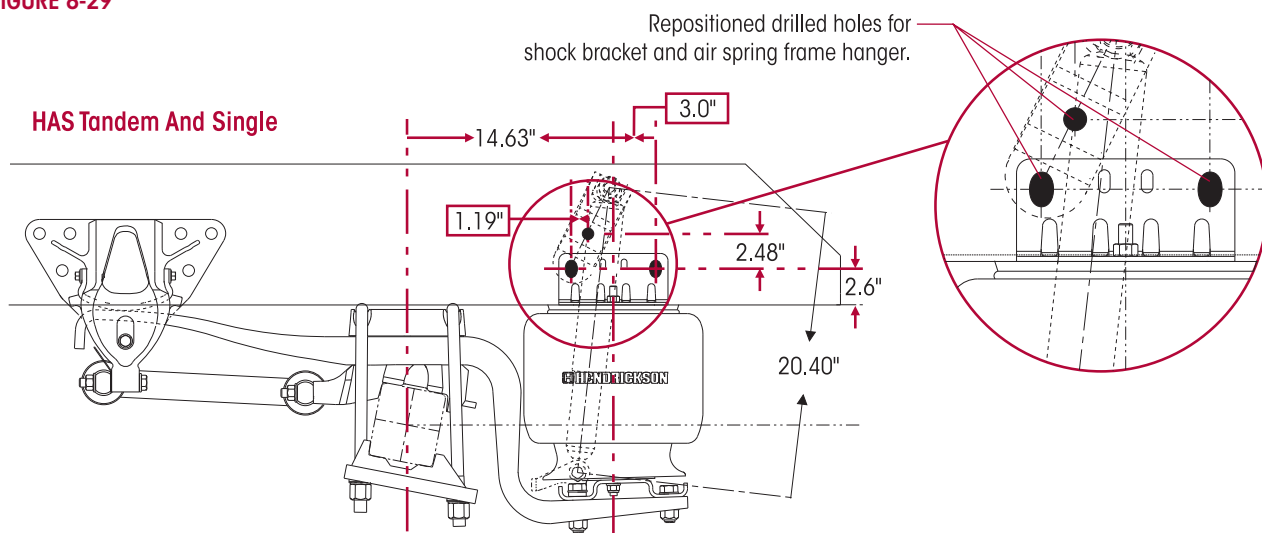
**NOTE**

If the height control valve is located at the rear axle or it is a single axle it is necessary to disconnect the bottom of the leveling valve rod.

7. Remove rear shock absorbers. Follow Upper Shock Bracket Disassembly in this section.
8. Remove the  $\frac{3}{4}$ " fasteners that connect the cross channel and lower shock bracket to the main support members.
9. Remove cross channel and lower shock brackets.

**ASSEMBLY**

1. Drill two 0.78" diameter holes to relocate air spring assembly 0.62" forward of current location on both sides of frame. Reference 14.63" dimension on Figure 8-29.
2. Drill a 0.78" diameter hole in the frame for the inboard upper shock bracket on both sides of the vehicle. This hole must be 2.48" above and 1.19" behind the forward air spring mounting hole, see Figure 8-29.

**FIGURE 8-29**

3. Install the new cross channel/inboard shock bracket assembly. For the proper service kit number, see Table 8-1 or contact Hendrickson Truck Parts.
4. Install the four cross channel fasteners bolts and torque to  $\mathbb{R}$  250-320 foot pounds.
5. Install the air spring, refer to the Air Spring Assembly, Steps 1-6, in this section.
6. Install the inboard upper shock bracket on frame. Follow torque specifications listed in vehicle manufacturer's service manual.

**NOTE**

Washers must be installed at both sides of each upper and lower shock bushing, that is four (4) washers per shock.

7. Install the shock absorber and fastener. Tighten both upper and lower locknuts to  $\mathbb{R}$  50-70 foot pounds torque.
8. If the height control valve is located at the rear axle reconnect the bottom end of the leveling valve rod to the new mount bracket on cross channel.
9. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
10. Inflate the suspension.

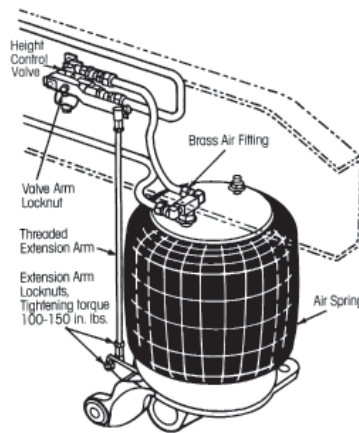
11. Remove the frame support.
12. Remove the wheel chocks.
13. Set ride height, see the Alignment & Adjustments Section of this publication for correct procedure for setting proper ride height.

## HEIGHT CONTROL VALVE CONVERSION

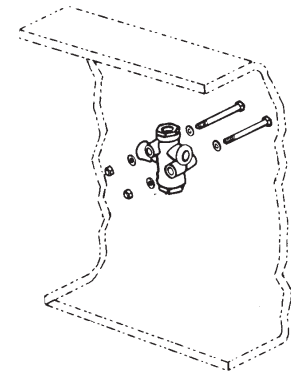
### ■ PART NOS. 50433-001 AND -002 FOR VEHICLES BUILT PRIOR TO 1996.

The following procedure is to replace the height control valve (Part Nos. 50433-001 and 50433-002), see Figure 8-30, and quick release dump valve (Part No. 48344-000), see Figure 8-31, to the new height control valve (Part No. 57977-000) and linkage assembly (Part No. 58994-XXX, see Parts List Section of this publication).

**FIGURE 8-30**



**FIGURE 8-31**



### DISASSEMBLY

1. Place the vehicle on a level floor.
2. Loosen or slacken the suspension joints by slowly moving the vehicle back and forth without applying the brakes. When coming to a complete stop make sure the parking brakes are released, not engaged.
3. Chock front wheels to prevent vehicle from moving.

**WARNING**

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

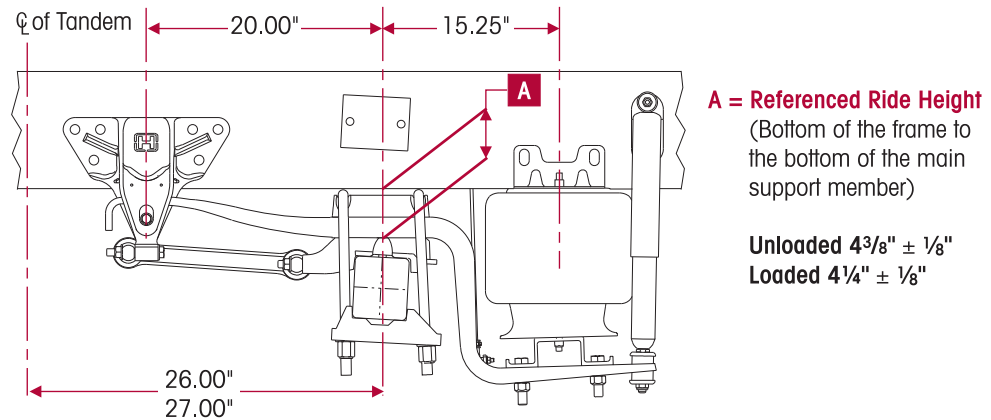
4. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
5. Release all air from vehicle air system.
6. Remove height control valve linkage assembly by removing the outside 5/16" locknut and washer.
7. Remove air lines and air fittings to height control valve.
8. Remove fasteners which connect the height control valve to frame mount. Discard fasteners.
9. Remove the height control valve.

### ASSEMBLY

1. Assemble the air fittings to height control valve.
2. Assemble bolts, washers, and locknuts which connect height control valve to frame mount.
3. Assemble the air lines to height control valve.

4. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
5. Inflate the suspension and verify that air system is at full operating pressure.
6. Exhaust the air in the air springs enough to relax the suspension. Then refill the air springs. The ride height will now be positioned on the bottom end of the height control valve dead band.
7. Set the ride height to the referenced ride height  $4\frac{1}{4}'' \pm \frac{1}{8}''$  loaded or  $4\frac{3}{8}'' \pm \frac{1}{8}''$  unloaded, see Figure 8-32.

**FIGURE 8-32**



8. Adjust the extension rod to fit the upper valve arm into the height control valve and the lower arm joint into the control valve arm bracket, refer to the Alignment & Adjustments Section of this publication.
9. Insert the  $\frac{5}{16}''$  washer and locknuts. Tighten locknuts by holding the free running nut with an open end wrench and securing the outside locknut. Tighten locknuts to  $\mathbb{N}$  100-150 inch pounds torque.
10. Tighten the clamp on the lower rubber valve arm joint with a screwdriver until securely fastened.

### QUICK RELEASE VALVE (If equipped)

The following procedure is recommended for replacement of the Hendrickson quick release valve, Figure 8-31. If not supplied by Hendrickson see vehicle manufacturer's guidelines. Quick release valve is not needed for New Hendrickson Height Control Valve (1996 to present).

### DISASSEMBLY

#### WARNING

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

1. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
2. Release all air from vehicle air system.
3. Remove air lines from quick release valve. Identify all air lines with some type of indication for assembly.
4. Remove the locknuts, washers and bolts which attach the quick release valve to the frame or cross member.
5. Remove air fittings from valve.



## ASSEMBLY

1. Install air fittings in valve.
2. Install fasteners which attach the quick release valve to the frame or cross member. Refer to vehicle manufacturer's torque specification.
3. Assemble air lines to valve making sure the identified air lines attach to the proper location.
4. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the suspension system.
5. Inflate the suspension.

## AFTERMARKET DUAL HEIGHT CONTROL VALVES

Although the HAS single and tandem suspensions does not require dual height control valves, Hendrickson understands there may be demand for a dual height control valve configuration in certain applications.

**Prior** to installing dual height control valves on your vehicle, **Hendrickson strongly recommends** the review of the vehicle application and contact with the vehicle manufacturer and Hendrickson to obtain authorization to equip the vehicle with dual height control valves, **failure to do so will void component warranty.**

Upon authorization from both the vehicle manufacturer and Hendrickson to add an additional HCV, Hendrickson service kits (No. 57977-000 Height Control Valve Assembly with mounting bracket plus, No. 58994-000 Linkage Assembly, and No. 57430-000 Linkage Bracket) are available. To install a the second height control valve, proceed with the following installation instructions.

## DUAL HEIGHT CONTROL VALVE INSTALLATION

1. Chock the wheels of the vehicle.



### WARNING

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

2. See additional Air Spring Cautions and Warnings in the Important Safety Notice Section of this publication prior to deflating or inflating the air system.
3. Deflate the suspension by disconnecting the height control valve linkage and lowering the height control valve arm.



### WARNING


SOME VEHICLE APPLICATIONS, SUCH AS VEHICLES EQUIPPED WITH OUTRIGGERS, RETAIN SOME AIR PRESSURE IN THE AIR SPRINGS AT ALL TIMES. PRIOR TO PERFORMING ANY MAINTENANCE, SERVICE, OR REPAIR OF THE SUSPENSION, VERIFY EACH AIR SPRING IS COMPLETELY DEFLATED. FAILURE TO DO SO COULD RESULT SERIOUS PROPERTY DAMAGE AND/OR SEVERE PERSONAL INJURY.

4. Measure the location on the frame of the existing height control valve mounting bracket and install the new frame bracket on the opposite side of the same axle. It will be necessary to drill the two frame mounting holes for the new bracket.
5. Install the height control valve mounting bracket onto the frame.

## NOTE

Refer to Plumbing Diagrams in this publication to facilitate installation for the preceding Steps.

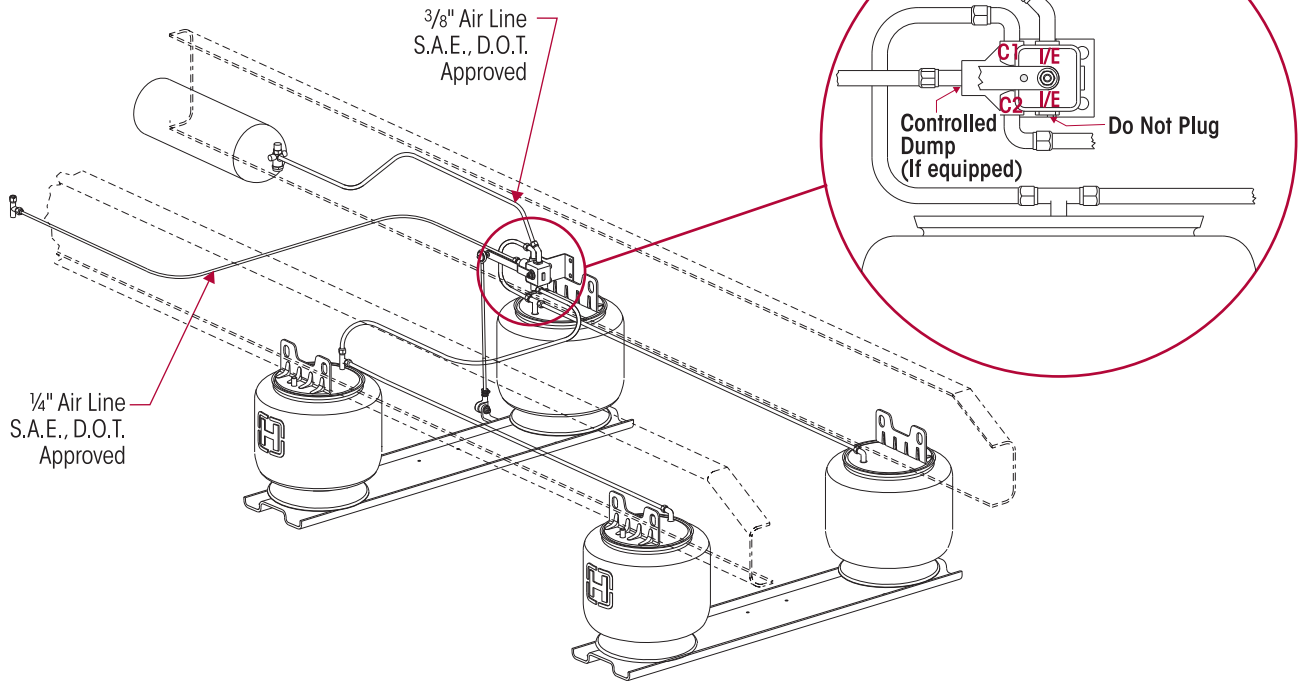
6. Install the new height control valve on the height control valve mounting bracket with the dump port and the height control valve arm facing the front of the vehicle.
7. Install a T-fitting (not provided) in the air supply line to the original height control valve.
8. Install and route a new air supply line from the T-fitting to the new height control valve intake port marked E/I.
9. Remove the opposite side air spring supply line from the original height control valve.

10. Plug the port on the original height control valve that the air spring supply line was removed from.
11. Route and install the air spring supply line into the port marked C1/C2 on the new height control valve.
12. Plug the opposite port marked C2/C1 on the new height control valve.
13. If the vehicle is equipped with a cab dump valve, install a T-fitting into the dump switch supply line.
14. Install and route a new dump switch supply line from the T-fitting to the new height control valve dump port.
15. Install lower height control valve bracket to cross channel.
16. Connect the leveling valve link rod to the height control valve arm.
17. Connect the adjustable valve arm joint to the height control valve linkage bracket and tighten the locknuts to  100-150 inch pounds torque.
18. Follow the ride height adjusting procedure for dual height control valves as shown in the Alignment & Adjustments Section of this publication.

# SECTION 9 Plumbing Diagrams

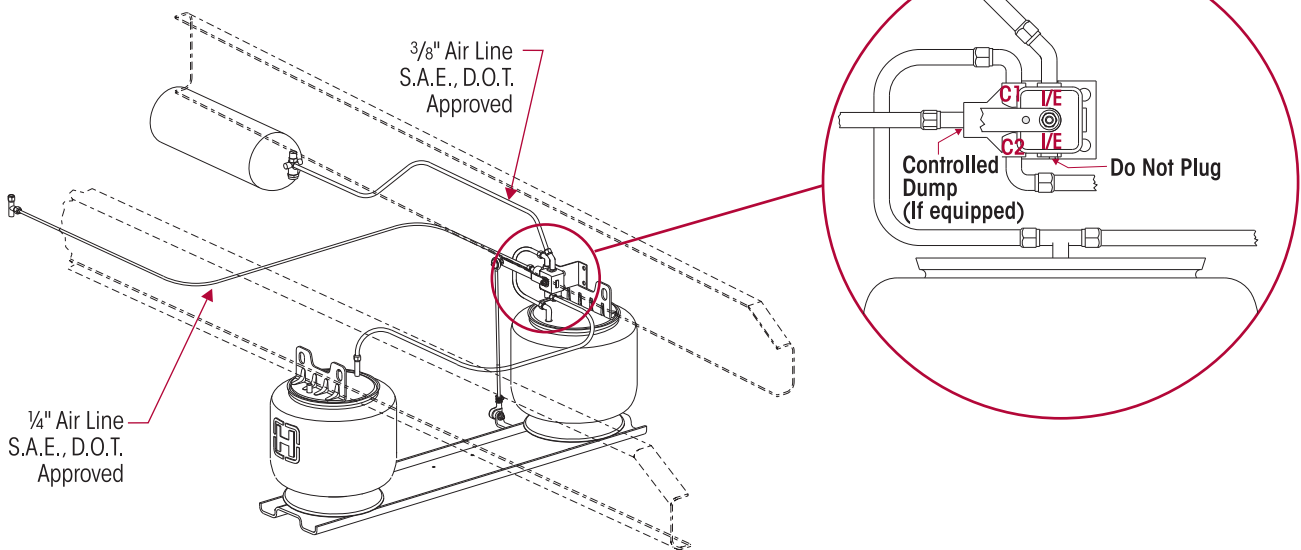
**HAS 360/400/402/460  
HAS 40LH**

Vehicles built after 1996 or equipped with height control valve Part No. 57977-000



**HAS 120/150/190/210/230**

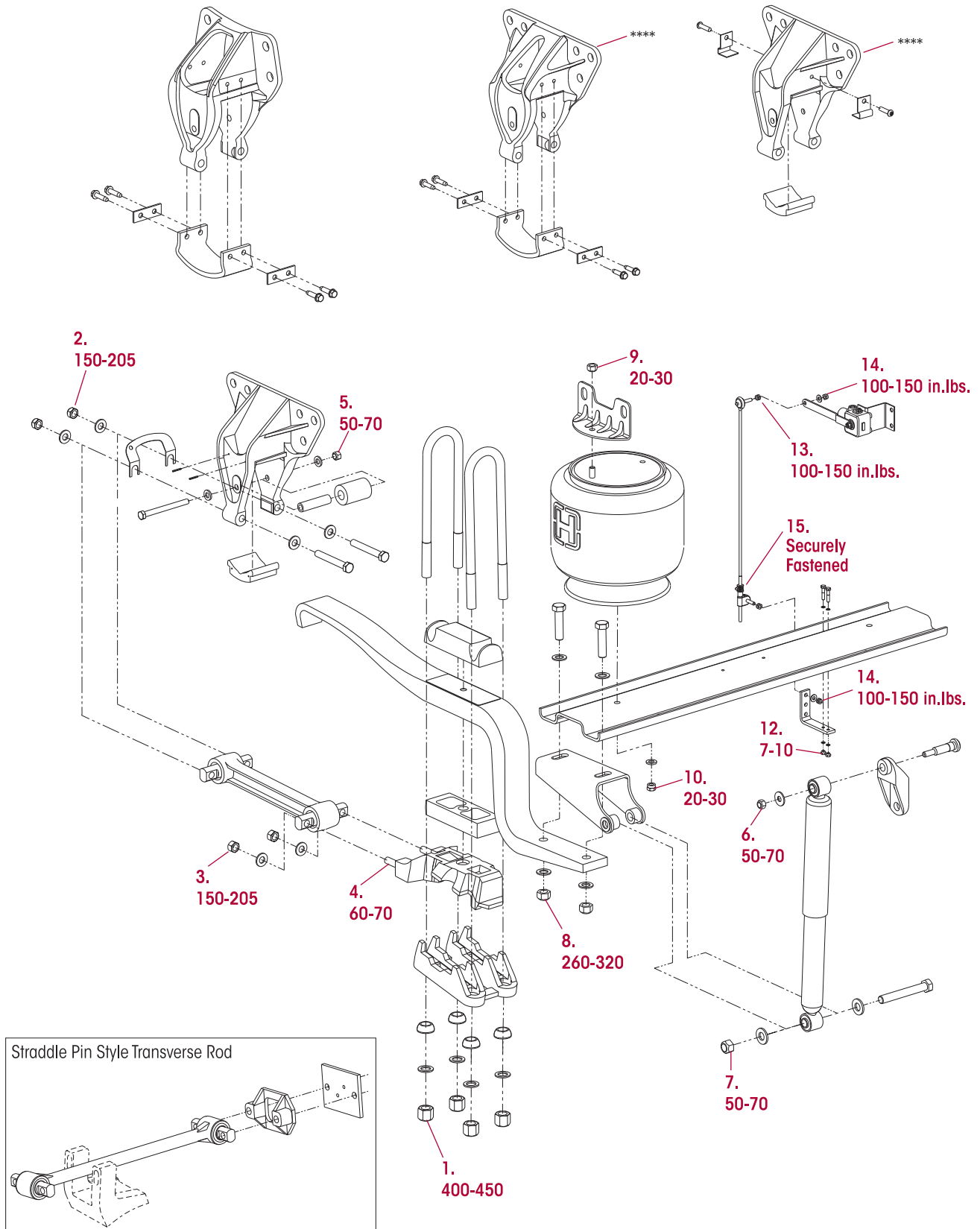
Vehicles built after 1996 or equipped with height control valve Part No. 57977-000



# SECTION 10 Torque Specifications

HAS Tandem 360/400/402/460

HENDRICKSON RECOMMENDED TORQUE VALUES  
PROVIDED IN FOOT POUNDS



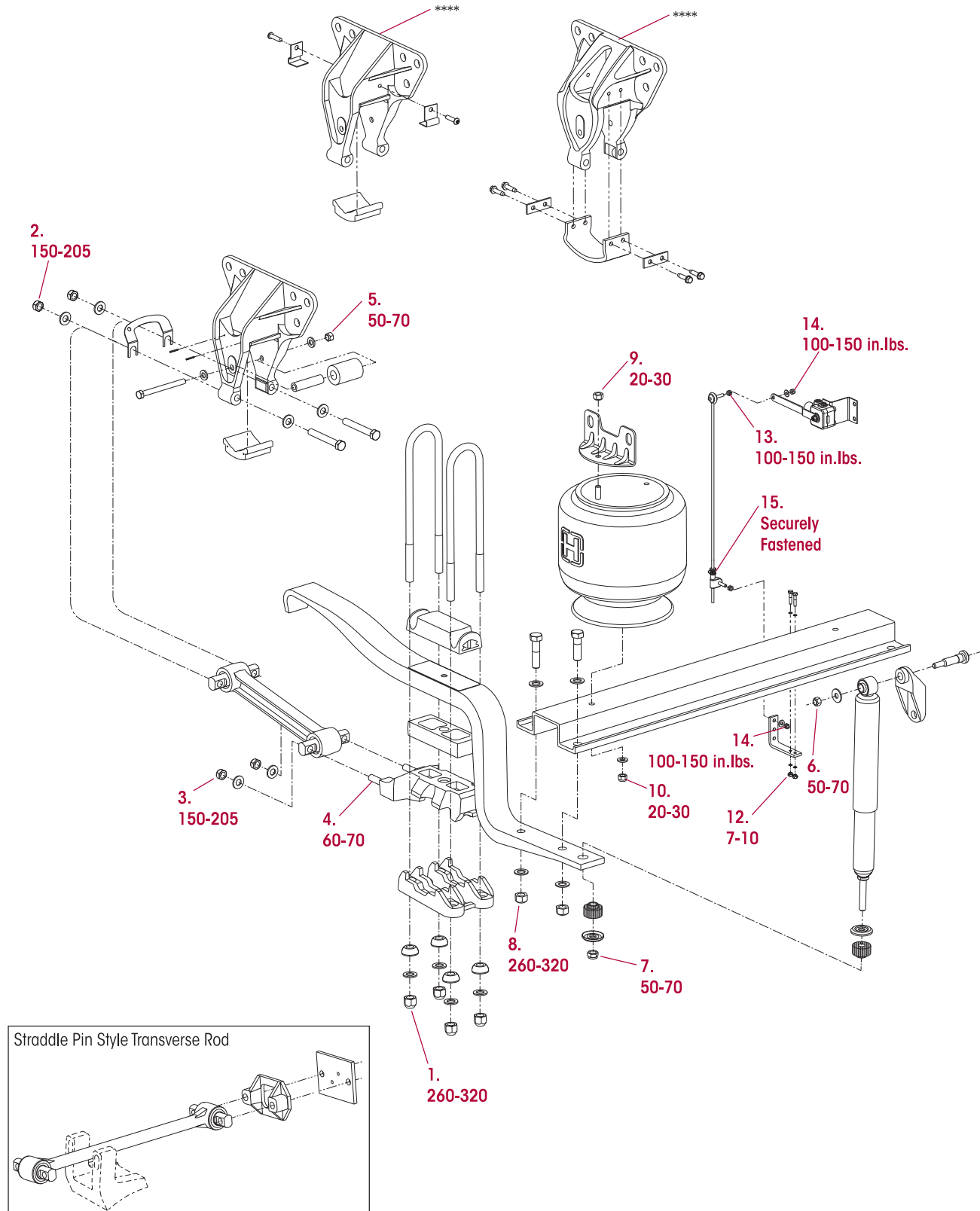


## HAS Tandem 360/400/402/460

HENDRICKSON RECOMMENDED TORQUE SPECIFICATIONS				
NO.	COMPONENT	Quantity	***SIZE	*TORQUE VALUE in foot pounds
	Frame fasteners are furnished and installed by the vehicle manufacturer. Vehicle manufacturer may use an equivalent HUCK fastener at frame mount. See vehicle manufacturer for torque requirements.			
1	U-bolt Locknut	16	7/8"-14 UNF-2B Grade C	**400-450
2	Longitudinal Torque Rod Bar Pin Locknut to Frame Hanger	8	5/8"-11 UNC-2B Grade C	150-205
3	Longitudinal Torque Rod Bar Pin Locknut to Spring Seat	8	5/8"-11 UNC-2B Grade C	150-205
4	Spring Seat Stud to Spring Seat	8	5/8"-11 UNC-2A Grade C	60-70
5	Rebound Bolt Locknut	4	1/2"-13 UNC-2B Grade C	50-70
6	Upper Shock Absorber Locknut	4	1/2"-13 UNC-2B Grade C	50-70
7	Lower Shock Absorber Locknut	4	3/4"-10 UNC-2B Grade C	50-70
8	Cross Channel to Main Support Member Locknut	8	3/4"-10 UNC-2B Grade C	260-320
9	Air Spring to Air Spring Frame Bracket	4	1/2"-13 UNC-2B Grade 5	20-30
10	Air Spring to Cross Channel	4	1/2"-13 UNC-2B Grade 5	20-30
11	Transverse Torque Rod Locknut, Straddle End (Not Shown)		5/8"-11 UNC-2B Grade C	150-205
12	Height Control Valve Bracket to Cross Channel	2	1/4"-20 UNC	7-10
13	HCV Linkage Jam Nut	2	5/16"-18 UNC-2B Grade 5	100-150 (Inch Pound)
14	HCV Linkage to HCV	2	5/16"-18 UNC-2B Grade 5	100-150 (Inch Pound)
15	HCV Linkage Clamp	1		Securely Fastened
<b>NOTE:</b>	<p>* 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>** Do not exceed torque on U-bolt locknuts.</p> <p>*** All threads must be clean and lubricated with SAE 20 oil before assembly to obtain the correct relationship of torque and fastener tension.</p> <p>**** These frame hangers are obsolete, although replacement slipper pads and hardware are currently available.</p> <p>After initial break-in period (up to 1,000 miles) all bolts and nuts should be checked to ensure recommended torque is being maintained. To obtain maximum service life from the suspension system, mounting fasteners should be checked at least once a year and tightened to specified torque.</p>			

HAS 40LH

HENDRICKSON RECOMMENDED TORQUE VALUES  
PROVIDED IN FOOT POUNDS



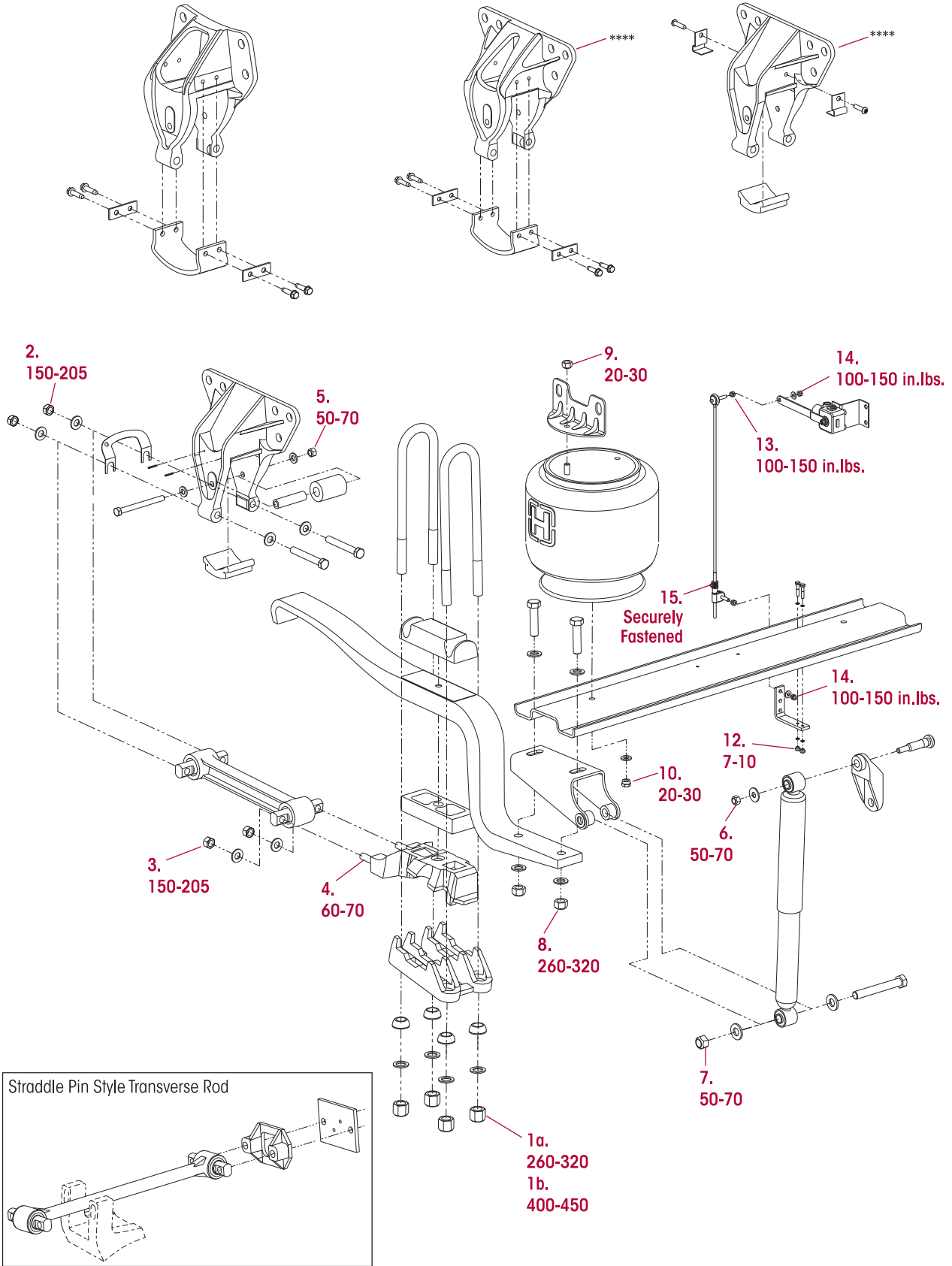


## HAS 40LH

HENDRICKSON RECOMMENDED TORQUE SPECIFICATIONS				
NO.	COMPONENT	Quantity	***SIZE	*TORQUE VALUE in foot pounds
	Frame fasteners are furnished and installed by the vehicle manufacturer. Vehicle manufacturer may use an equivalent HUCK fastener at frame mount. See vehicle manufacturer for torque requirements.			
1	U-bolt Locknut	16	¾"-16 UNF-2B Grade C	260-320
2	Longitudinal Torque Rod Bar Pin Locknut to Frame Hanger	8	⅝"-11 UNC-2B Grade C	150-205
3	Longitudinal Torque Rod Bar Pin Locknut to Spring Seat	8	⅝"-11 UNC-2B Grade C	150-205
4	Spring Seat Stud to Spring Seat	8	⅝"-11 UNC-2A Grade C	60-70
5	Rebound Bolt Locknut	4	½"-13 UNC-2B Grade C	50-70
6	Upper Shock Absorber Locknut	4	½"-13 UNC-2B Grade C	50-70
7	Lower Shock Absorber Locknut	4	⅝"-18 UNF-2B Grade C	50-70
8	Cross Channel to Main Support Member Locknut	8	¾"-10 UNC-2B Grade C	260-320
9	Air Spring to Air Spring Bracket	4	½"-13 UNC-2B Grade 5	20-30
10	Air Spring to Cross Channel	4	½"-13 UNC-2B Grade 5	20-30
11	Transverse Rod Locknut (Not Shown)		⅝"-11 UNC-2B Grade C	150-205
12	Height Control Valve Bracket to Cross Channel	2	¼"-20 UNC	7-10
13	HCV Linkage Jam Nut	2	⅝"-18 UNC-2B Grade 5	100-150 (Inch Pound)
14	HCV Linkage to HCV	2	⅝"-18 UNC-2B Grade 5	100-150 (Inch Pound)
15	HCV Linkage Clamp	1		Securely Fastened
<p><b>NOTE:</b> * 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>** Do not exceed torque on U-bolt locknuts.</p> <p>*** All threads must be clean and lubricated with SAE 20 oil before assembly to obtain the correct relationship of torque and fastener tension.</p> <p>**** These frame hangers are obsolete, although replacement slipper pads and hardware are currently available.</p> <p>After initial break-in period (up to 1,000 miles) all bolts and nuts should be checked to ensure recommended torque is being maintained. To obtain maximum service life from the suspension system, mounting fasteners should be checked at least once a year and tightened to specified torque.</p>				

HAS Single 120/150/190/210/230

HENDRICKSON RECOMMENDED TORQUE VALUES  
PROVIDED IN FOOT POUNDS







## HAS Single 120/150/190/210/230

HENDRICKSON RECOMMENDED TORQUE SPECIFICATIONS				
NO.	COMPONENT	Quantity	***SIZE	*TORQUE VALUE in foot pounds
	Frame fasteners are furnished and installed by the vehicle manufacturer. Vehicle manufacturer may use an equivalent HUCK fastener at frame mount. See vehicle manufacturer for torque requirements.			
1a	U-bolt Locknut – HAS 120/150	8	¾"-16 UNF-2B Grade C	260-320
1b	U-bolt Locknut – HAS 190/210/230	8	7/8"-14 UNF-2B Grade C	400-450
2	Longitudinal Torque Rod Bar Pin Locknut to Frame Hanger	4	5/8"-11 UNC-2B Grade C	150-205
3	Longitudinal Torque Rod Bar Pin Locknut to Spring Seat	4	5/8"-11 UNC-2B Grade C	150-205
4	Spring Seat Stud to Spring Seat	4	5/8"-11 UNC-2A Grade C	60-70
5	Rebound Bolt Locknut	2	½"-13 UNC-2B Grade C	50-70
6	Upper Shock Absorber Locknut	2	½"-13 UNC-2B Grade C	50-70
7	Lower Shock Absorber Locknut	2	¾"-10 UNC-2B Grade C	50-70
8	Cross Channel to Main Support Member Locknut	4	¾"-10 UNC-2B Grade C	260-320
9	Air Spring to Air Spring Bracket	2	½"-13 UNC-2B Grade 5	20-30
10	Air Spring to Cross Channel	2	½"-13 UNC-2B Grade 5	20-30
11	Transverse Rod Locknut (Not Shown)		5/8"-11 UNC-2B Grade C	150-205
12	Height Control Valve Bracket to Cross Channel	2	¼"-20 UNC	7-10
13	HCV Linkage Jam Nut	2	5/16"-18 UNC-2B Grade 5	100-150 (Inch Pound)
14	HCV Linkage to HCV	2	5/16"-18 UNC-2B Grade 5	100-150 (Inch Pound)
15	HCV Linkage Clamp	1		Securely Fastened
<b>NOTE:</b>	<p>* 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>** Do not exceed torque on U-bolt locknuts.</p> <p>*** All threads must be clean and lubricated with SAE 20 oil before assembly to obtain the correct relationship of torque and fastener tension.</p> <p>**** These frame hangers are obsolete, although replacement slipper pads and hardware are currently available.</p> <p>After initial break-in period (up to 1,000 miles) all bolts and nuts should be checked to ensure recommended torque is being maintained. To obtain maximum service life from the suspension system, mounting fasteners should be checked at least once a year and tightened to specified torque.</p>			

## SECTION 11

# Troubleshooting Guide

### HAS SERIES 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.
	Incorrect alignment	Adjust the alignment, see Alignment & Adjustment Section.
	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	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	Air spring not inflated to specification or damaged	Repair air system and check ride height, see Ride Height Adjustment in the Alignment & Adjustments Section.
	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.

**HAS SERIES TROUBLESHOOTING GUIDE (CONT.)**

CONDITION	POSSIBLE CAUSE	CORRECTION
Suspension will not reach ride height	Suspension is overloaded	Redistribute load to correct weight.
	Air Spring leaking or damaged	Replace air spring.
	Leak in air system	Inspect air fittings, see Air Fitting Inspection in the Preventive Maintenance Section of this publication. If necessary, repair air system and check ride height. See the vehicle manufacturer for proper ride height adjustment.
	Air line obstructed or improperly connected	Repair air system and check ride height. See the vehicle manufacturer for proper ride height adjustment.
	Height control valve dump port activated	Check height control valve dump port for proper connection and function
Air springs deflate when parked	Leak in air system	Inspect air fittings, see Air Fitting Inspection in the Preventive Maintenance Section of this publication. If necessary, repair air system and check ride height. See the vehicle manufacturer for proper ride height adjustment.
	Malfunctioning height control valve	Replace height control valve, see Height Control Valve in the Component Replacement Section
Excessive frame slope	Ride height set incorrectly	Adjust the vehicle's front and rear ride height to proper setting, refer to the Alignment and Adjustment Section.
	Suspension is overloaded	Redistribute load to correct weight.
	Frame Slope set incorrectly	Correct frame slope, refer to the Alignment and Adjustment Section.

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