



# **H** TECHNICAL PROCEDURE

## **HAS™ • HAS™ 40LH Rear Air Suspensions**

**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™ rear air suspension system.

The construction of the HAS single air suspension is half of the HAS tandem in appearance as shown in Figure 2-1.

### NOTE

Use only Genuine Hendrickson parts for servicing this suspension system.

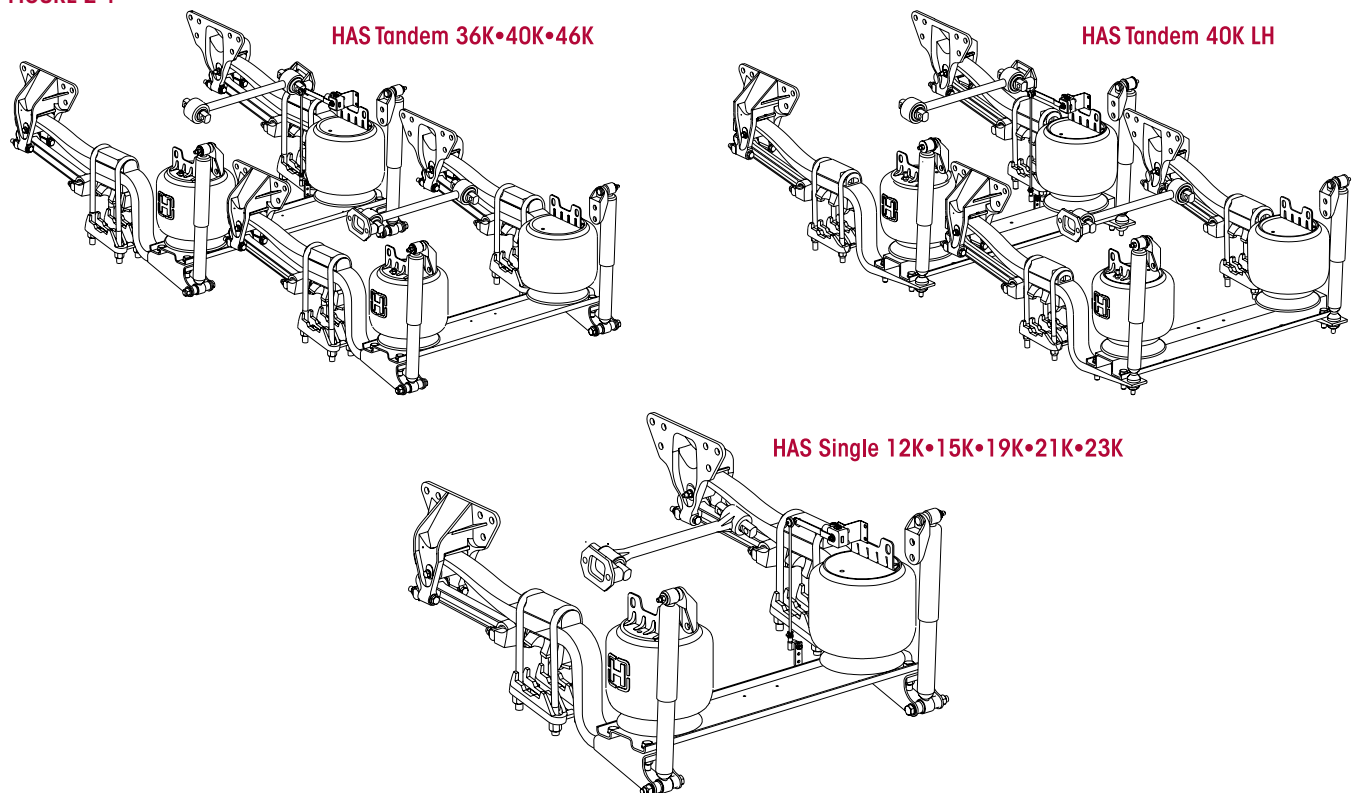
It is important to read and understand this entire Technical Procedure publication prior to performing any maintenance, service, repair, or rebuild of this product. The information in this publication contains parts lists, safety information, product specifications, features, proper maintenance, service,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

Hendrickson reserves the right to make changes and improvements to its products and publications at any time. Contact Hendrickson Tech Services for information on the latest version of this manual at 1-866-755-5968 (toll-free U.S. and Canada), 630-910-2800 (outside U.S. and Canada) or e-mail: techservices@hendrickson-intl.com.

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

## SECTION 2 Product Description

FIGURE 2-1





**THE HAS 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 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® 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.

## 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, certain vehicle configurations 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. Contact Hendrickson and the vehicle manufacturer to help address any such conditions.

## Efficient Driveline GEometry (EDGE)

Hendrickson has developed a system approach to accurately control driveline angularity. This system promotes Efficient Driveline GEometry (EDGE). HI-TORQUE™ shock absorbers are required on vehicles equipped with engines that exceed specific torque ratings.

The EDGE design features:

- **HI-TORQUE™ shock absorbers** — The HI-TORQUE shock absorbers contain a 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 height control valve** mounted on the front drive axle.

## HAS SPECIFICATIONS

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

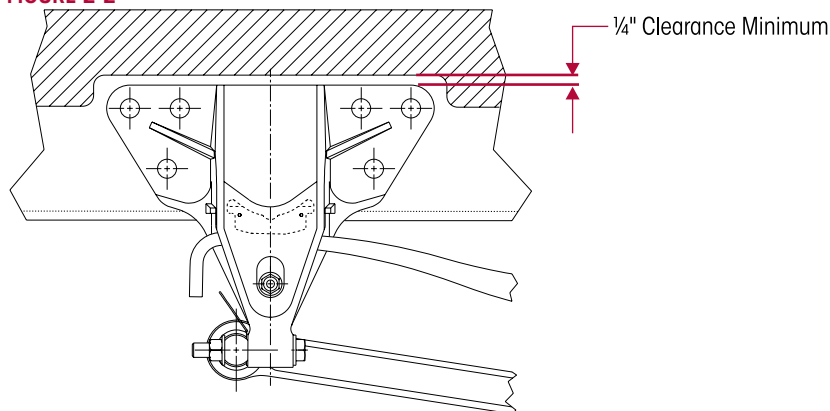
1. Includes complete suspension, torque rods, axle brackets and frame brackets and all hardware.
2. Not approved for add-on lift axles.
3. Approved for use with one lift axle only. Maximum 50,000 pounds load on suspension for job site travel.
4. Not approved for use with trailer belly lift axles.
5. Available 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 2-2.

**FIGURE 2-2**



**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 maintenance, service, or repair may damage the vehicle, cause personal injury, render it unsafe in operation, or void manufacturer’s warranty.

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

**NOTE**

An operating procedure, practice condition, etc. which is essential to emphasize.

**SERVICE HINT**

A helpful suggestion that will make the servicing being performed a little easier and/or faster.

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, ADVERSE VEHICLE HANDLING, PERSONAL INJURY, OR PROPERTY DAMAGE.

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

### WARNING

#### **U-BOLT FASTENERS**

U-BOLTS THAT ARE FOUND TO BE LOOSE REQUIRE THAT MATING COMPONENTS BE INSPECTED FOR SIGNS OF WEAR. ANY WORN COMPONENTS MUST BE REPLACED. FAILURE TO DO SO CAN CAUSE PREMATURE CLAMP GROUP FAILURE, COMPONENT DAMAGE, ADVERSE VEHICLE HANDLING, PROPERTY DAMAGE, OR SEVERE PERSONAL INJURY. MAINTAIN CORRECT TORQUE VALUES AT ALL TIMES. CHECK TORQUE VALUES ON A REGULAR BASIS AS SPECIFIED.

### WARNING

#### **LOAD CAPACITY**

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

### WARNING

#### **SUPPORT THE VEHICLE PRIOR TO SERVICING**

PLACE THE VEHICLE ON A LEVEL FLOOR AND CHOCK THE WHEELS TO PREVENT THE VEHICLE FROM MOVING OR ROLLING. DO NOT WORK AROUND OR UNDER A RAISED VEHICLE SUPPORTED BY ONLY A FLOOR JACK. ALWAYS SUPPORT A RAISED VEHICLE WITH RIGID SAFETY STANDS. FAILURE TO DO SO CAN CAUSE SERIOUS PERSONAL INJURY OR DAMAGE TO EQUIPMENT.

### CAUTION

#### **PROCEDURES AND TOOLS**

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

### WARNING

#### **PERSONNEL PROTECTIVE EQUIPMENT**

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

### WARNING

#### **MODIFYING COMPONENTS**

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

### WARNING

#### **TORCH / WELDING**

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



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



## WARNING

### MAIN SUPPORT MEMBER

FAILURE OF THE MAIN SUPPORT MEMBER BETWEEN THE U-BOLTS WILL REQUIRE THE REPLACEMENT OF THE MAIN SUPPORT MEMBER AND ALL CLAMP GROUP COMPONENTS. FAILURE TO DO SO CAN RESULT IN CLAMP GROUP FAILURE AND FURTHER FAILURE TO THE MAIN SUPPORT MEMBER, WHICH CAN CAUSE ADVERSE VEHICLE HANDLING, PROPERTY DAMAGE OR SEVERE PERSONAL INJURY.



## WARNING

### TORQUE RODS

THIS HENDRICKSON SUSPENSION REQUIRES TORQUE RODS FOR SUSPENSION PERFORMANCE AND VEHICLE STABILITY. IF THESE TORQUE RODS ARE DISCONNECTED OR NON-FUNCTIONAL, DO NOT OPERATE THE VEHICLE. OPERATING A VEHICLE WITH DISCONNECTED OR NON-FUNCTIONAL TORQUE RODS CAN RESULT IN ADVERSE VEHICLE HANDLING, COMPONENT DAMAGE, SUSPENSION/VEHICLE DAMAGE, AND/OR SEVERE PERSONAL INJURY.



## WARNING

### CROSS CHANNEL

IMPROPER JACKING METHODS CAN CAUSE STRUCTURAL DAMAGE WHICH CAN CAUSE ADVERSE VEHICLE HANDLING, PROPERTY DAMAGE OR SEVERE PERSONAL INJURY AND WILL VOID HENDRICKSON'S WARRANTY.

- REPLACE ANY SAFETY DECALS THAT ARE FADED, TORN, MISSING, ILLEGIBLE, OR OTHERWISE DAMAGED. CONTACT HENDRICKSON TO ORDER REPLACEMENT LABELS
- DO NOT USE THE SUSPENSION CROSS CHANNEL AS A JACKING POINT
- REFER TO VEHICLE MANUFACTURER FOR PROPER JACKING INSTRUCTIONS



## 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 ADVERSE VEHICLE HANDLING, ROLL-OVER, OR VEHICLE INSTABILITY, POSSIBLE PERSONAL INJURY, PROPERTY DAMAGE, OR DEATH. FIRST RAISE ANY AUXILIARY AXLES AND THEN EXHAUST ALL PRESSURE FROM REAR TRACTOR / TRAILER AND TRUCK AIR SUSPENSION SYSTEMS PRIOR TO RAISING THE BODY / BOOM OR ATTACHMENTS. FOLLOW THE VEHICLE MANUFACTURER'S OPERATING INSTRUCTIONS FOR MAINTAINING PROPER STABILITY.



## WARNING

### AIR SPRING INFLATION AND DEFLATION

PRIOR TO DISASSEMBLY OF THE SUSPENSION, AIR SPRING ASSEMBLIES MUST BE DEFLATED. 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.

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.

 **CAUTION****AIR SPRING LOWER MOUNTING STUDS**

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

 **WARNING****AIR SPRING PRESSURE RETENTION**

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 IN SERIOUS PROPERTY DAMAGE AND/OR SEVERE PERSONAL INJURY.

 **WARNING**

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

 **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 PARTS CAN ALTER THE REBOUND TRAVEL OF THE SUSPENSION.

 **WARNING****PARTS CLEANING**

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

6. WEAR PROPER EYE PROTECTION
7. WEAR CLOTHING THAT PROTECTS YOUR SKIN
8. WORK IN A WELL VENTILATED AREA
9. DO NOT USE GASOLINE, OR SOLVENTS THAT CONTAIN GASOLINE. GASOLINE CAN EXPLODE
10. 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 ANY APPLICABLE WARRANTY.



## SECTION 4 Special Tools

### ULTRA ROD TORQUE ROD BUSHING TOOLS

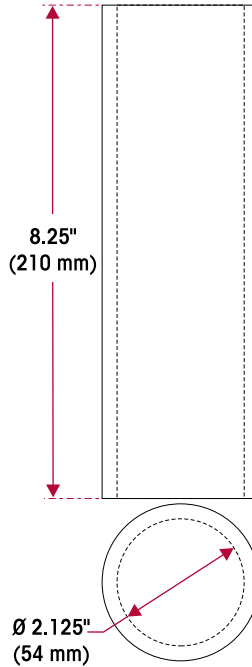
#### FUNNEL

Hendrickson Part No. 66086-001L

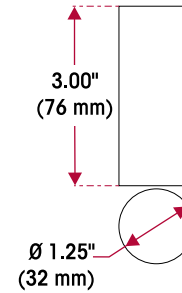


These shop made tools are designed to install and remove torque rod bushings. ULTRA ROD torque rod bushing tools are made from cold rolled steel or equivalent. Drawings are for reference only. Hendrickson does not supply these tools.

#### Receiving Tool



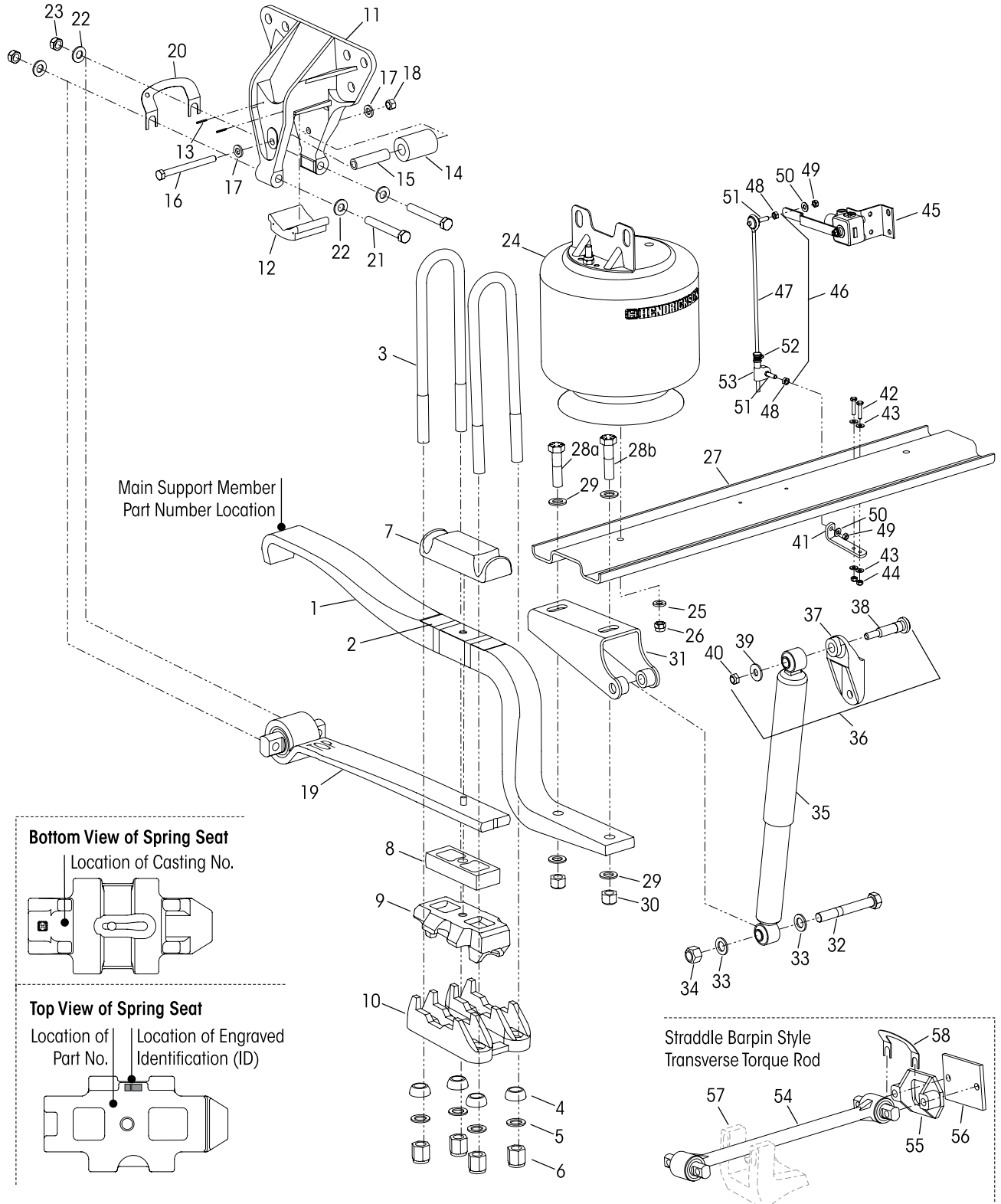
#### Installation / Removal Tool



# SECTION 5 Parts Lists

HAS Single 21K • 23K | Tandem 40K • 46K

Vehicles equipped with Air Disc Brakes





# HAS™ 21K • 23K • 40K • 46K Vehicles equipped with Air Disc Brakes

KEY NO.	PART NO.	DESCRIPTION	*VEHICLE QTY.
1	59193-000	Main Support Member, Includes Key No. 2, <i>See Part No. Location on Page 10</i>	4
2		**Delrin Liner	4
3	47417-XXX	7/8"-14 UNF U-bolt, <i>See Selection Guide on Page 21</i>	8
	48718-502	<b>U-bolt Fastener Service Kit, Two U-bolts,</b> Includes Key Nos. 4-6	
4		**7/8" Spherical Washer	16
5		**7/8" Flat Hardened Washer	16
6		**7/8"-14 UNF U-bolt Nut	16
7	56805-000	Top Pad	4
8	48531-020	Spring Seat Spacer - 1 1/4" Height	4
9		Spring Seat Assembly, <i>See Selection Guide below</i>	4
10		Axle Bottom Cap	4
		•LHF/RHF/LHR/RHR Meritor RT 40-145, RT 46-160	
		•LHF/RHR Meritor SSHD, SQ-100; Dana DS-402/451	
	93302-000	2°-9.5° Pinion Angle, <i>Replaces 50216-000</i>	
	93315-000	10°-12° Pinion Angle, <i>Replaces 50222-000</i>	
11	58425-001	Frame Hanger Assembly, Includes Key Nos. 12-13	4
	56557-005	<b>Slipper Pad Service Kit, One Hanger,</b> Includes Key Nos. 12-13	
12	56929-000	Slipper Pad	4
13	58287-001	1" Roll Pin - 1/8" Diameter	8
	49175-014	<b>Rebound Roller Kit, Axle Set,</b> Includes Key Nos. 14-18	
14	57989-000	Rebound Roller	4
15	57988-000	Rebound Bolt Spacer	4
16	24531-015	1/2"-13 UNC x 5 1/2" Hex Bolt	4
17	22962-014	1/2" Flat Washer	8
18	49846-000	1/2"-13 UNC Locknut	4
19	53350-000	Single Leaf Spring with Bushing	4
20	49689-000L	Shim - 1/16"	4
21	32043-005	5/8"-11 UNC x 4 1/2" Bolt	8
22	22962-004	5/8" Flat Hardened Washer	16
23	47764-000	5/8"-11 UNC Locknut	8
24	50898-002L	Air Spring Assembly	4
25	22962-014	1/2" Flat Hardened Washer	4
26	17700-010	1/2"-13 UNC Nylocknut	4
27	57317-001	Cross Channel - 40" Dowel Pin Centers	2
28a	50764-003	3/4"-10 UNC x 3 1/2" Bolt	8
b	50764-005	3/4"-10 UNC x 3" Bolt	

KEY NO.	PART NO.	DESCRIPTION	*VEHICLE QTY.
29	22962-001	3/4" Flat Hardened Washer	16
30	49842-000	3/4"-10 UNC Locknut	8
	57356-000	Lower Shock Bracket Assembly, Includes Key Nos. 31-34	4
31	57355-000	Lower Shock Bracket	4
32	50764-002	3/4"-10 UNC x 5 1/2" Bolt	4
33	22962-001	3/4" Flat Hardened Washer	8
34	49842-000	3/4"-10 UNC Locknut	4
35	60670-005L	Shock Absorber	4
36	57322-002	Upper Shock Bracket Assy, Includes Key Nos. 37-40	4
37		**Upper Shock Bracket	4
38	50368-000	1/2"-13 UNC x 3 3/4" Serrated Shank Bolt	4
39	22962-031	1/2" Flat Hardened Washer	4
40	49846-000	1/2"-13 UNC Locknut	4
	57430-000	<b>Lower Linkage Bracket Kit</b> Includes Key Nos. 41-44	
41	56789-000	Lower Linkage Lower Bracket	1
42	56935-001	1/4"-20 UNC x 1" Bolt	2
43	22962-028	1/4" Flat Hardened Washer	4
44	49983-000	1/4"-20 UNC Locknut	2
45	57977-000	Height Control Valve	1
46	58994-XXX	Linkage Assembly, Specify Length, Includes Key Nos. 47-53	1
47		**Linkage Rod, Specify Length	1
48		**5/16"-18 UNC Jam Nut	2
49		**5/16"-18 UNC Locknut	2
50		**5/16" Flat Hardened Washer	2
51		**5/16"-18 UNC Stud	2
52		**Linkage Rod Clamp	1
53		**Adjustable Linkage Rod P Mount	1
54		****Transverse Torque Rod, Includes Bushings	2
a	8240-0000-XXX	****TRAAX ROD	
b	62000-XXX	ULTRA ROD	
c	60218-000	ULTRA ROD Two-Piece Kit	
55			
56	22186-000	Transverse Torque Rod Frame Bracket	2
57	45045-010	Backup Plate, <i>Replaces 45045-003</i>	2
58		*Transverse Torque Rod Axle Bracket	2
59	49689-000L	Torque Rod Shim 1.52 mm	As Req.
Not Shown	70867-001	P-80 Lubricant - 10 ml	Per Bushing

**NOTE:** \* Quantities specified are shown for tandem suspension. Adjust quantities for single suspensions. Quantities of service kit components may vary from amount shown in the list. For all other (\*) see Notes on Page 14.

## ■ Spring Seat Selection Guide | HAS Single 21K•23K | Tandem40K•46K Vehicles equipped with Air Disc Brakes

Total of two (2) spring seats required per single and four (4) spring seats per tandem suspension. One of each located at the left / right front and left / right rear. See Page 10 for locations of ID, Casting No. and Part No.

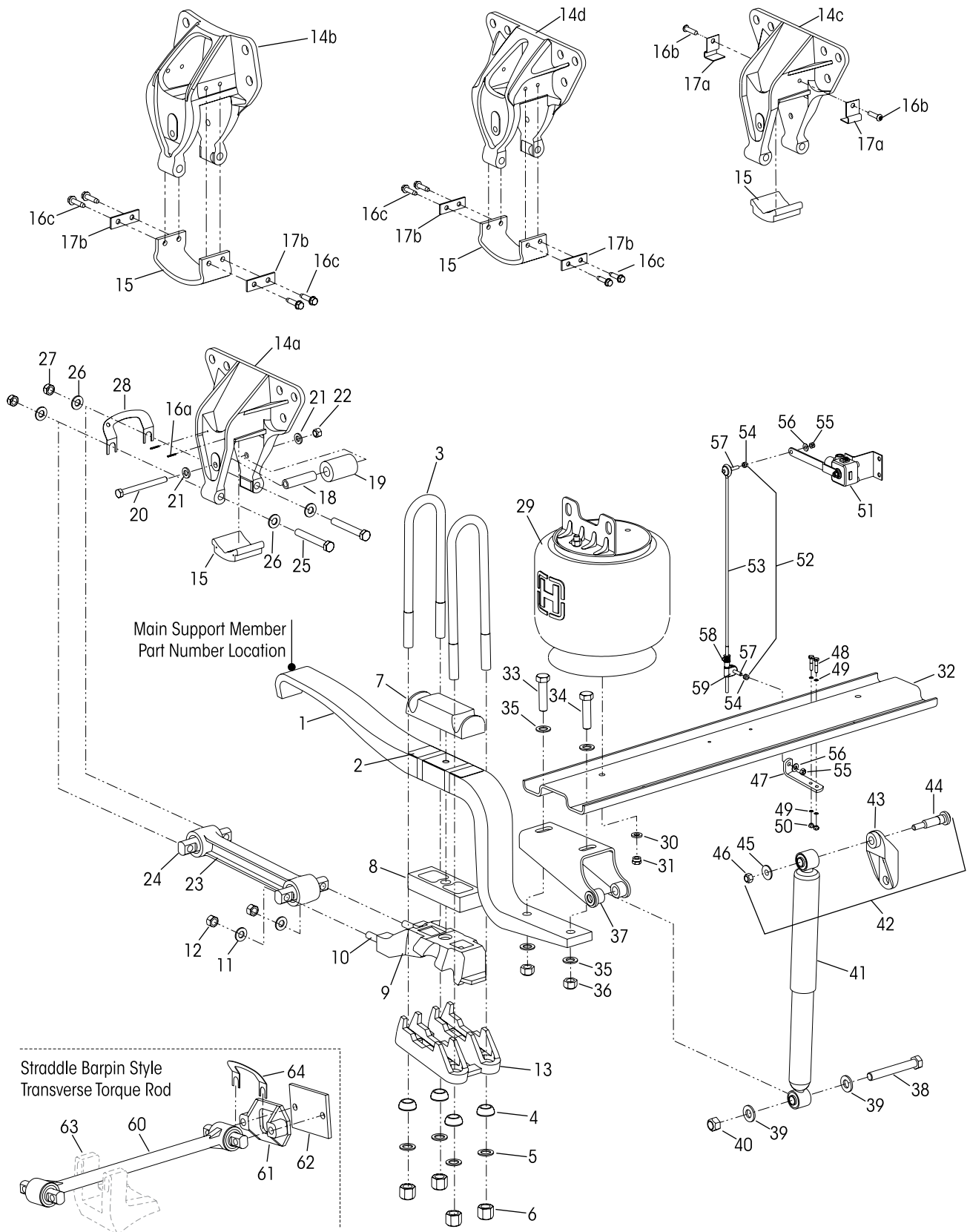
	Key No. 9	FRONT RIGHT HAND						REAR LEFT HAND					
		Casting No. ① 56500						Casting No. ② 56504					
		Seat Angle	Part No.	ID	Seat Angle	Part No.	ID	Seat Angle	Part No.	ID	Seat Angle	Part No.	ID
<b>SPRING SEATS</b>		0.0°	56501-037	D37	3.5°	56501-029	D29	8.0°	70856-001	E01	11.0°	70856-007	E07
		0.5°	56501-038	D38	4.0°	56501-030	D30	8.5°	70856-002	E02	11.5°	70856-008	E08
		1.0°	56501-039	D39	4.5°	56501-031	D31	9.0°	70856-003	E03	12.0°	70856-009	E09
		1.5°	56501-040	D40	5.0°	56501-032	D32	9.5°	70856-004	E04	12.5°	70856-010	E10
		2.0°	56501-035	D35	5.5°	56501-033	D33	10.0°	70856-005	E05	13.0°	70856-011	E11
		2.5°	56501-036	D36	6.0°	56501-034	D34	10.5°	70856-006	E06	13.5°	70856-012	E12
		3.0°	56501-028	D28									

Corresponding axles:

① Dana: 17060, 19060, 21060, 21080, 21090, 23090, 26090, P20060, P22060, ② Dana: DS-402, Meritor: SQ100, SSHD, RT-40, RT-46

HAS Tandem 36K • 40K • 46K

Vehicles equipped with Drum Brakes





# HAS™ Tandem 36K • 40K • 46K Vehicles equipped with Drum Brakes

KEY NO.	PART NO.	DESCRIPTION	VEHICLE QTY.
1		Main Support Member, Includes Key No. 2 <i>see Part No. Location on Page 12, 46K Severe Service Kit on Page 14</i>	4
	56940-000	36K, 1.75" Thickness	
	56931-000	40K Low Profile, 1.875" Thickness	
	56943-000	40K, 1.875" Thickness	
	56934-000	46K Low Profile, 2" Thickness	
	56946-000	40K, 46K, 2" Thickness	
2	47905-000	Delrin Liner	4
3	47417-XXX	7/8"-14 UNF U-bolt, <i>see Selection Guide on Page 21</i>	8
	48718-157	<b>U-bolt Fastener Service Kit, Two U-bolts,</b> Includes Key Nos. 4-6	
4	48574-000	7/8" Spherical Washer	16
5	22962-002	7/8" Flat Hardened Washer	16
6		U-bolt Nut	16
	50765-000	7/8"-14 UNF Locknut	
	57347-000	7/8"-14 UNF Nylocknut	
7	56805-000	Top Pad	4
8		Spring Seat Spacer, (If Equipped)	4
	48902-000	1"	
	48903-000	1 1/2"	
9		Spring Seat Assembly, Includes Key Nos. 10-12, <i>See Selection Guide on Page 15</i>	
		Left Front, Right Front (each)	1
		Left Rear, Right Rear (each)	1
10	50918-000	5/8"-11 UNC Stud	8
11	22962-004	5/8" Flat Hardened Washer	8
12	47764-000	5/8"-11 UNC Locknut	8
13		Axle Bottom Cap	4
		• 40K • 46K	
		<b>Meritor</b> RT40/41/44-145, RT46/50, RT40-160, RT46-158; <b>Dana</b> 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	
		<b>Meritor</b> SSHD, RT46-157; <b>Dana</b> D402/403/451	
	50216-000	LHF 0-9.5° Pinion Angle	
	50217-001	RHF 0-9.5° Pinion Angle	
	50222-006	LHR 10-14° Pinion Angle, <i>Replaces 50221-001</i>	
	50222-000	RHR 10-14° Pinion Angle	
		• 40K • 46K	
		<b>Dana</b> 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	
14		Frame Hanger Assembly	4
a		40K • 46K, Includes Key Nos. 15-16	
	58425-001	• Standard Frame, Casting No. 57188-001, <i>Replaces 57190-001 (***) &amp; 50752-001 (***)</i>	
	59045-003	• Standard Frame, Casting No. 59043-001	
	58688-001	• Rein. Frame, Casting No. 57476-001, <i>Replaces 57478-001 (***)</i>	
b	50753-001	36K, Includes Key Nos. 15-17 Casting No. 49848-000 or 56666-001	
		<b>Slipper Pad Service Kit, One Hanger,</b> <i>see Selection Guide on Page 21</i>	
15		Slipper Pad, <i>see Selection Guide on Page 21</i>	4
16		Retainer Roll Pin or Screw, <i>see Selection Guide on Page 21</i>	
a	58287-001	1" Roll Pin - 1/8" Diameter	8
b	57540-000	3/8" Button Head Screw	8
c	57306-000	3/8" Rolok Screw	16

KEY NO.	PART NO.	DESCRIPTION	VEHICLE QTY.
17		Retaining Bracket or Plate, <i>see Selection Guide on Page 21</i>	8
a	57566-000	Retaining Bracket	
b	50597-000	Retaining Plate	
	49175-013	<b>Rebound Roller Kit, Axle Set,</b> Includes Key Nos. 18-22	
18	57988-000	Rebound Bolt Spacer, <i>Replaces 47458-000</i>	4
19	57989-000	Rebound Roller, <i>Replaces 48883-000</i>	4
20	24531-015	1/2"-13 UNC x 5 1/2" Rebound Bolt	4
21	22962-014	1/2" Flat Hardened Washer	8
22	49846-000	1/2"-13 UNC Locknut	4
23		ULTRA ROD Longitudinal Torque Rod Assembly Includes Key No. 24	4
	48411-006	36K • 40K	
	62007-365	46K, <i>Replaces 50376-001 Torque Rod &amp; 57256-000 Bushing</i>	
24	47691-000L	Torque Rod Bushing	8
25	32043-005	5/8"-11 UNC x 4 1/2" Bolt	8
26	22962-004	5/8" Flat Hardened Washer	16
27	47764-000	5/8"-11 UNC Locknut	8
28		Torque Rod Shim	As Req.
	49689-000L	1/16"	
	57856-000	1/32"	
29		Air Spring Assembly with Upper Frame Bracket	4
	56917-002L	40K Low Profile	
	50898-002	40K Low Profile (Kenworth only)	
	57122-002L	40K • 46K	
30	22962-014	1/2" Flat Hardened Washer	4
31	17700-010	1/2"-13 UNC Nylocknut	4
32		Cross Channel	2
		• 36K • 40K • 46K	
	57317-001	40" Dowel Pin Centers	
	57317-002	40 1/4" Dowel Pin Centers	
	57317-003	40 1/2" Dowel Pin Centers	
	57317-004	40 5/8" Dowel Pin Centers	
	57317-006	40 1/4" Dowel Pin Centers with Left Hand HCV	
		• 40K • 46K with Rear Inboard Shock	
	57773-001	40" Dowel Pin Centers	
	57773-002	40 1/4" Dowel Pin Centers	
	57773-003	40 1/2" Dowel Pin Centers	
	57773-004	40 5/8" Dowel Pin Centers	
33		3/4"-10 UNC Bolt	4
	50764-005	36K • 40K - 3" Length	
	50764-003	40K • 46K - 3 1/2" Length	
34		3/4"-10 UNC Bolt	4
	50764-007	36K • 40K - 2 1/2" Length	
	50764-005	40K • 46K - 3" Length	
35	22962-001	3/4" Flat Hardened Washer	16
36	49842-000	3/4"-10 UNC Locknut	8
		Lower Shock Bracket Assembly, Includes Key Nos. 37-40	4
	57356-000	36K • 40K • 46K	
	49690-002	40K Low Profile	
37		Lower Shock Bracket	4
	57355-000	36K • 40K • 46K	
	49324-002	40K Low Profile	
38	50764-002	3/4"-10 UNC x 5 1/2" Bolt	4
39	22962-001	3/4" Flat Hardened Washer	8
40	49842-000	3/4"-10 UNC Locknut	4
41		Shock Absorber	4
	60670-005L	36K • 40K • 46K Standard	
	60670-007L	40K • 46K Standard Inboard Rear	
	60675-003L	Hi-Torque, <i>Replaces 57905-001</i>	
	60675-006L	40K • 46K Hi-Torque Inboard Rear	
	60670-008L	40K • 46K Low Profile	
42	57322-001	Upper Shock Bracket Assembly, Includes Key Nos. 43-46	4
43		**Upper Shock Bracket	4

## HAS Tandem 36K • 40K • 46K

KEY NO.	PART NO.	DESCRIPTION	VEHICLE QTY.
44	50368-000	½"-13 UNC x 3¾" Serrated Shank Bolt	4
45	22962-031	½" Flat Hardened Washer	4
46	49846-000	½"-13 UNC Locknut	4
	57430-000	<b>Lower Linkage Bracket Kit,</b> Includes Key Nos. 47-50	
47	56789-000	Lower Linkage Bracket	1
48	56935-001	¼"-20 UNC x 1" Bolt, <i>Replaces 56935-002</i>	2
49	22962-028	¼" Flat Hardened Washer	4
50	49983-000	¼"-20 UNC Locknut	2
51	57977-000	Height Control Valve	1
52	58994-XXX	Linkage Assembly, Specify Length, <i>Contact Hendrickson for Part Number,</i> Includes Key Nos. 53-59	1
53		**Linkage Rod, Specify Length	1
54		**5/16"-18 UNC Jam Nut	2

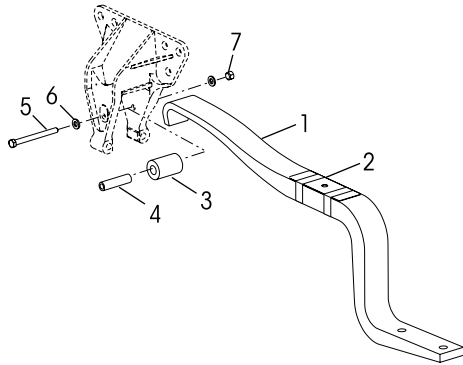
## Vehicles equipped with Drum Brakes

KEY NO.	PART NO.	DESCRIPTION	VEHICLE QTY.
55		**5/16"-18 UNC Locknut	2
56		**5/16" Flat Hardened Washer	2
57		**5/16"-18 UNC Stud	2
58		**Linkage Rod Clamp	1
59		**Adjustable Linkage Joint	1
60		****Transverse Torque Rod, Includes Bushings	2
a	8240-0000-XXX	*****TRAAX ROD	
b	62000-XXX	ULTRA ROD	
c	60218-000	ULTRA ROD Two-Piece Kit	
61	22186-000	Transverse Torque Rod Frame Bracket	2
62	45045-003	Back up Plate	2
63		*Transverse Torque Rod Axle Bracket	2
64	49689-000L	Torque Rod Shim 1.52 mm	As Req.
Not Shown	70867-001	P-80 Lubricant - 10 ml	Per Bushing

## HAS 46K Severe Service Kit

Severe Service Kit | Axle Set  
No. 49175-024

Reference Lit. No. SEU-0103



KEY NO.	PART NO.	DESCRIPTION	KIT QTY.
	49175-024	<b>Main Support Member Severe Service Kit, 46K,</b> <b>Axle Set,</b> Includes Key Nos. 1-7, Frame Hanger not included	
1	59597-000	Main Support Member, Includes Key No. 2	2
2	47905-000	Delrin Liner	2
3	59598-000	Rebound Roller	2
4	57988-000	Rebound Spacer	2
5	24531-015	½"-13 UNC x 5½" Rebound Bolt	2
6	22962-014	½" Flat Hardened Washer	4
7	49846-000	½"-13 UNC Locknut	2

**NOTE:** \* Not supplied by Hendrickson, used for reference only. Hendrickson is not responsible for components supplied by the vehicle manufacturer. For assistance with maintenance and rebuild instructions on these components see vehicle manufacturer.

\*\* Item included in kit/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 on HAS suspensions, refer to Hendrickson Lit. No. 59310-004 and 59310-058 for more information.

\*\*\*\*\* TRAAX ROD bushings are non-serviceable, the entire torque rod assembly requires replacement. Visit the TRAAX ROD website [www.traaxrods.com](http://www.traaxrods.com) for more information.

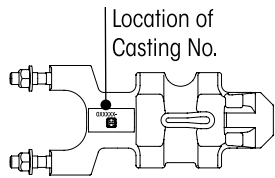
Hendrickson HAS ride height gauges can be obtained on-line at [www.hendrickson-intl.com/litform](http://www.hendrickson-intl.com/litform)

- **Unloaded vehicles:** Literature No. 45745-106
- **Loaded vehicles:** Literature No. 45745-050

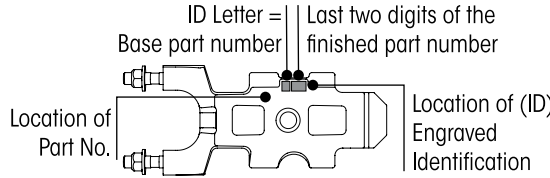


■ Spring Seat Selection Guide | HAS Tandem • HAS 40K LH for vehicles equipped with Drum Brakes

Bottom View of Spring Seat



Top View of Spring Seat



Includes fasteners.  
Total of four (4) spring seats required per tandem suspension. One of each located at the left / right front and left / right rear.

Key No. 9  
Pages 12,16

		LEFT FRONT						RIGHT FRONT					
Casting No.	50923_①		50923_② <i>Replaces 50986_</i>		50923_①		50923_③ <i>Replaces 50974_</i>				50923_④ <i>Replaces 50986_</i>		
	Seat Angle	Part No.	ID	Part No.	ID	Part No.	ID	Part No.	ID	Part No.	ID	Part No.	ID
FRONT SPRING SEATS	2°	50970-001	A01	50988-001	K01	50970-001	A01	50976-001	M01	50976-012	M12	50994-001	I01
	2.5°	50970-002	A02	50988-002	K02	50970-002	A02	50976-002	M02	50976-016	M16	50994-002	I02
	3°	50970-003	A03	50988-003	K03	50970-003	A03	50976-003	M03	50976-013	M13	50994-003	I03
	3.5°	50970-004	A04	50988-004	K04	50970-004	A04	50976-004	M04	50976-017	M17	50994-004	I04
	4°	50970-005	A05	50988-005	K05	50970-005	A05	50976-005	M05	50976-014	M14	50994-005	I05
	4.5°	50970-006	A06	50988-006	K06	50970-006	A06	50976-006	M06	50976-018	M18	50994-006	I06
	5°	50970-007	A07	50988-007	K07	50970-007	A07	50976-007	M07			50994-007	I07
	5.5°	50970-008	A08	50988-008	K08	50970-008	A08	50976-008	M08			50994-008	I08
	6°	50970-009	A09	50988-009	K09	50970-009	A09	50976-009	M09			50994-009	I09
	6.5°	50970-010	A10	50988-010	K10	50970-010	A10	50976-010	M10			50994-010	I10
	7°	50970-011	A11	50988-011	K11	50970-011	A11	50976-011	M11			50994-011	I11

		LEFT REAR						RIGHT REAR					
Casting No.	50971_⑤		50971_③ <i>Replaces 50977_</i>				50971_④ <i>Replaces 50995_</i>		50971_⑤		50971_④ <i>Replaces 50989_</i>		
	Seat Angle	Part No.	ID	Part No.	ID	Part No.	ID	Part No.	ID	Part No.	ID	Part No.	ID
REAR SPRING SEATS	5°	50973-011	B11	50979-011	C11	50979-013	C13	50997-011	J11	50973-011	B11	50991-011	L11
	6.5°	50973-012	B12	50979-012	C12			50997-012	J12	50973-012	B12	50991-012	L12
	7.5°	50973-013	B13	50979-014	C14					50973-013	B13		
	8°	50973-001	B01	50979-001	C01			50997-001	J01	50973-001	B01	50991-001	L01
	8.5°	50973-002	B02	50979-002	C02			50997-002	J02	50973-002	B02	50991-002	L02
	9°	50973-003	B03	50979-003	C03	50979-026		50997-003	J03	50973-003	B03	50991-003	L03
	9.5°	50973-004	B04	50979-004	C04	50979-027		50997-004	J04	50973-004	B04	50991-004	L04
	10°	50973-005	B05	50979-005	C05	50979-028		50997-005	J05	50973-005	B05	50991-005	L05
	10.5°	50973-006	B06	50979-006	C06	50979-020	C20	50997-006	J06	50973-006	B06	50991-006	L06
	11°	50973-007	B07	50979-007	C07	50979-030		50997-007	J07	50973-007	B07	50991-007	L07
	11.5°	50973-008	B08	50979-008	C08	50979-019	C19	50997-008	J08	50973-008	B08	50991-008	L08
	12°	50973-009	B09	50979-009	C09	50979-032		50997-009	J09	50973-009	B09	50991-009	L09
	12.5°	50973-010	B10	50979-010	C10	50979-015	C15	50997-010	J10	50973-010	B10	50991-010	L10
	13°	50973-015	B15	50979-017	C17	50979-034		50997-013	J13	50973-015	B15	50991-013	L13
	13.5°	50973-014	B14	50979-018	C18	50979-016	C16			50973-014	B14		
	14°	50973-016	B16			50979-038				50973-016	B16		

Corresponding axle:

① Dana: DS-402, Meritor: SQ100, SSHD, RT-40, RT-46

② Dana: DS-461, 23105

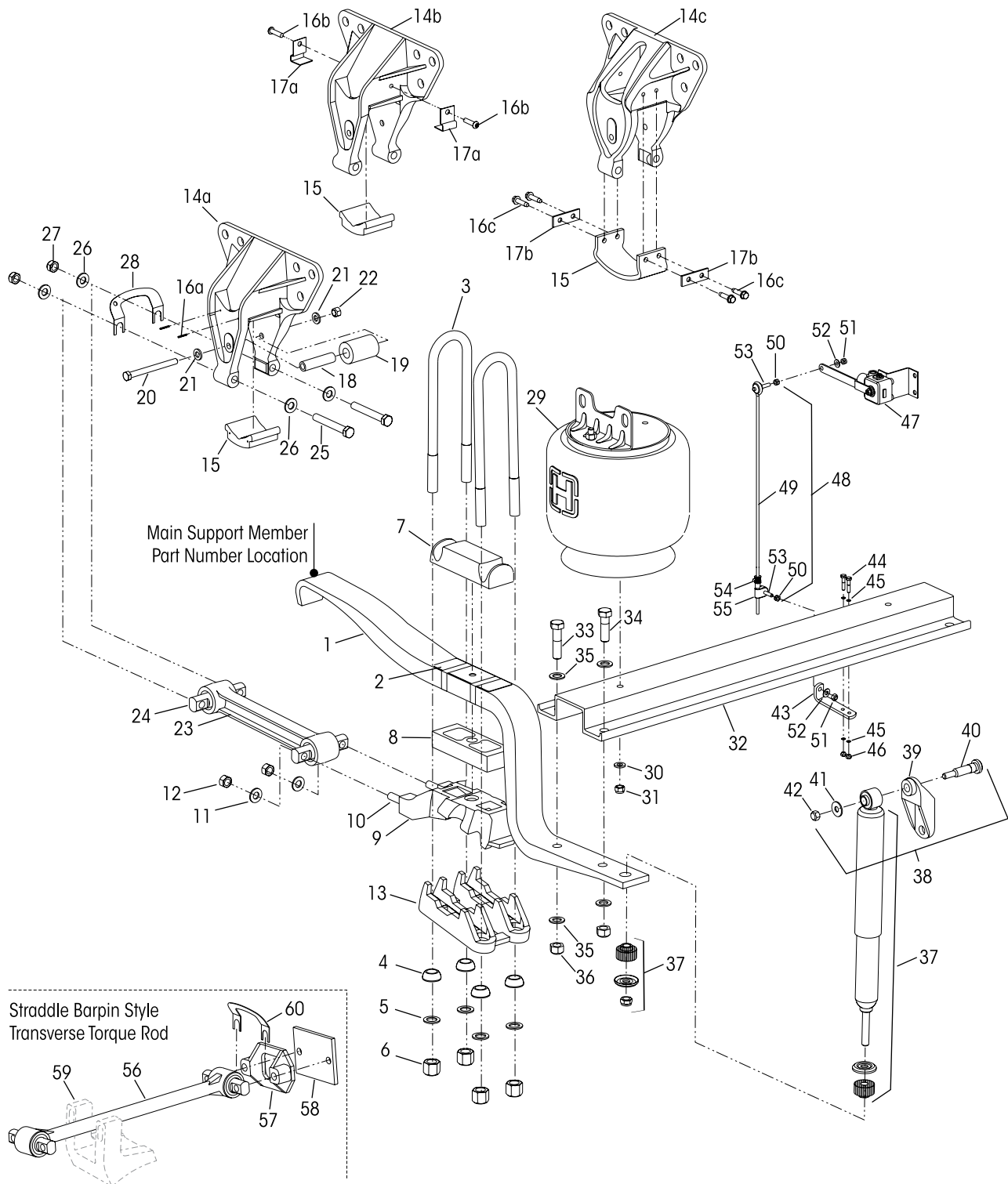
③ Dana: DS-402; Meritor: SQ100

④ Dana: DS-461

⑤ Dana: DS-401, Meritor: SQ100, SSHD, RT-40, RT-46

HAS Tandem 40KLH

Vehicles equipped with Drum Brakes







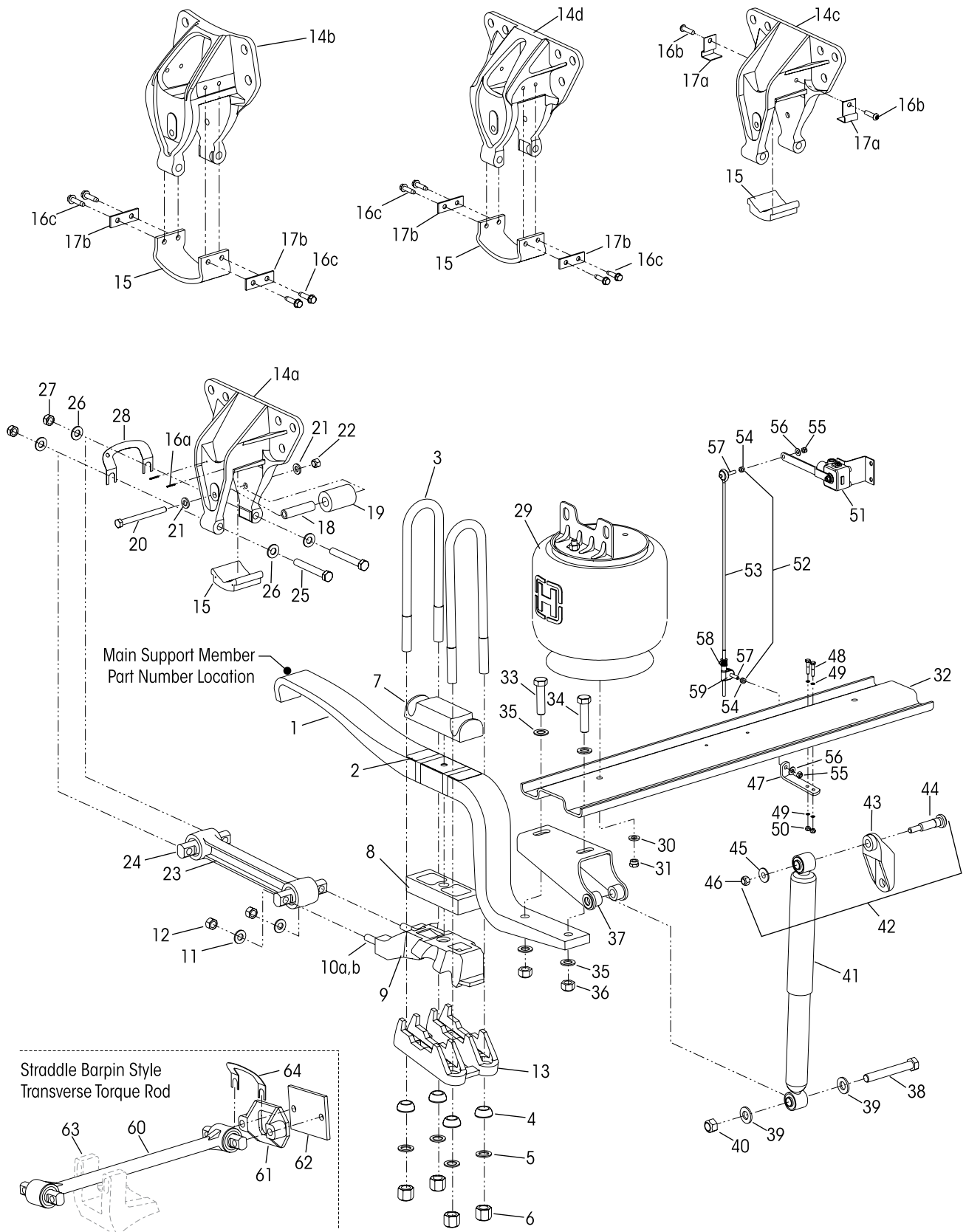
# HAS™ Tandem 40K LH Vehicles equipped with Drum Brakes

KEY NO.	PART NO.	DESCRIPTION	VEHICLE QTY.
1		Main Support Member, <i>see Part No. Location on Page 16</i>	4
	57217-000	Includes Key No. 2	
	60262-000	Mack only	
2	47905-000	Delrin Liner	4
3		¾"-16 UNF U-bolt, <i>see Selection Guide on Page 21</i>	8
	48718-158	<b>U-bolt Fastener Service Kit, Two U-bolts,</b> Includes Key Nos. 4-6	
4	49947-000	¾" Spherical Washer	16
5	22962-001	¾" Flat Hardened Washer	16
6	49685-000	¾"-16 UNF Locknut	16
7	56805-000	Top Pad, <i>Replaces 57195-000</i>	4
8		Spring Seat Spacer (If Equipped)	4
	48902-000	1"	
	48903-000	1½"	
9		Spring Seat Assembly, Includes Key Nos. 10-12, <i>see Selection Guide on Page 15</i>	
		Left Front, Right Front (each) 1	
		Left Rear, Right Rear (each) 1	
10	50918-000	⅝"-11 UNC Stud	8
11	22962-004	⅝" Flat Hardened Washer	8
12	47764-000	⅝"-11 UNC Locknut	8
13		Axle Bottom Cap	4
		<b>Meritor</b> RT40/41/44-145, RT46/50, RT40-160; RT46-158; <b>Dana</b> 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	
		<b>Dana</b> 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	
14a		Frame Hanger Assembly, Includes Key Nos. 15-16 4	
	58425-001	• Standard Frame Casting No. 57188-001, <i>Replaces 57190-001 (**14b) &amp; 50752-001 (**14c)</i>	
	58688-001	• Frame Hanger, Casting No. 57476-001, <i>Replaces 57478-001 (**14b)</i>	
		<b>Slipper Pad Service Kit, One Hanger,</b> <i>see Selection Guide on Page 21</i>	
15		Slipper Pad, <i>see Selection Guide on Page 21</i>	4
16		Retainer Roll Pin or Screw, <i>see Selection Guide on Page 21</i>	
	a 58287-001	1" Roll Pin - ⅜" Diameter	8
	b 57540-000	⅝" Button Head Screw	8
	c 57306-000	⅝" Rolok Screw	16
17		Retaining Bracket or Plate, <i>see Selection Guide on Page 21</i>	
	a 57566-000	Retaining Bracket	8
	b 50597-000	Retaining Plate	8
	49175-013	<b>Rebound Roller Kit, Axle Set,</b> Includes Key Nos. 18-22	

KEY NO.	PART NO.	DESCRIPTION	VEHICLE QTY.
18	57988-000	Rebound Bolt Spacer, <i>Replaces 47458-000</i>	4
19	57989-000	Rebound Roller, <i>Replaces 48883-000</i>	4
20	24531-015	½"-13 UNC x 5½" Rebound Bolt	4
21	22962-014	½" Flat Hardened Washer	8
22	49846-000	½"-13 UNC Locknut	4
23	48411-006	ULTRA ROD Longitudinal Torque Rod Assembly Includes Key No. 24	4
24	47691-000L	Torque Rod Bushing	8
25	32043-005	⅝"-11 UNC x 4½" Bolt	8
26	22962-004	⅝" Flat Hardened Washer	16
27	47764-000	⅝"-11 UNC Locknut	8
28		Torque Rod Shim	As Req.
	49689-000L	⅛"	
	57856-000	⅜"	
29	50898-002L	Air Spring Assembly with Upper Frame Bracket	4
30	22962-014	½" Flat Hardened Washer	4
31	17700-010	½"-13 UNC Nylocknut	4
32	57192-001	Cross Channel, 40" Dowel Pin Centers	2
33	50764-002	¾"-10 UNC x 5½" Bolt	4
34	50764-005	¾"-10 UNC x 3" Bolt	4
35	22962-001	¾" Flat Hardened Washer	16
36	49842-000	¾"-10 UNC Locknut	8
37		Shock Absorber	4
	60680-001L	Standard	
	60685-001L	Hi-Torque	
38	57322-001	Upper Shock Bracket Assembly, Includes Key Nos. 39-42	4
39		**Upper Shock Bracket	4
40	50368-000	½"-13 UNC x 3¾" Serrated Shank Bolt	4
41	22962-031	½" Flat Hardened Washer	4
42	49846-000	½"-13 UNC Locknut	4
	57430-000	<b>Lower Linkage Bracket Kit,</b> Includes Key Nos. 43-46	
43	56789-000	Lower Linkage Bracket	1
44	56935-001	¼"-20 UNC x 1" Bolt, <i>Replaces 56935-002</i>	2
45	22962-028	¼" Flat Hardened Washer	4
46	49983-000	¼"-20 UNC Locknut	2
47	57977-000	Height Control Valve,	1
48	58994-XXX	Linkage Assembly, Specify Length, <i>contact Hendrickson for Part Number,</i> Includes Key Nos. 49-55	1
49		**Linkage Rod, Specify Length	1
50		**⅝"-18 UNC Jam Nut	2
51		**⅝"-18 UNC Locknut	2
52		**⅝"-18 Flat Hardened Washer	2
53		**⅝"-18 UNC Stud	2
54		**Linkage Rod Clamp	1
55		**Adjustable Linkage Joint	1
56		****Transverse Torque Rod, Includes Bushings	2
	a 8240-0000-XXX	****TRAAX ROD	
	b 62000-XXX	ULTRA ROD	
	c 60218-000	ULTRA ROD Two-Piece Kit	
57	22186-000	Transverse Torque Rod Frame Bracket	2
58	45045-003	Back up Plate	2
59		*Transverse Torque Rod Axle Bracket	2
60	49689-000L	Torque Rod Shim 1.52 mm	As Req.
Not Shown	70867-001	P-80 Lubricant - 10 ml	Per Bushing

HAS Single 12K • 15K • 19K • 21K • 23K

Vehicles equipped with Drum Brakes





# HAS™ Single 12K • 15K • 19K • 21K • 23K Vehicles equipped with Drum Brakes

KEY NO.	PART NO.	DESCRIPTION	VEHICLE QTY.
1		Main Support Member, Includes Key No. 2, <i>see Part No. Location on Page 18</i>	2
	56925-000	12K Low Profile/15K Low Profile	
	56937-000	12K/15K	
	56928-000	19K Low Profile	
	56940-000	19K	
	56931-000	21K Low Profile	
	56943-000	21K	
	56934-000	23K Low Profile	
	56946-000	23K	
2	47905-000	Delrin Liner	2
3		U-bolt, <i>see Selection Guide on Page 21</i>	4
	49684-XXX	¾"-16 UNF - 12K • 15K	
	47417-XXX	7/8"-14 UNF - 19K • 21K • 23K	
		<b>U-bolt Fastener Service Kit, Two U-bolts,</b> Includes Key Nos. 4-6	
	48718-158	¾" - 12K • 15K	
	48718-157	7/8" - 19K • 21K • 23K	
4		Spherical Washer	8
	49947-000	¾" - 12K • 15K	
	48574-000	7/8" - 19K • 21K • 23K	
5		Flat Hardened Washer	8
	22962-001	¾" - 12K • 15K	
	22962-002	7/8" - 19K • 21K • 23K	
6		U-bolt Nut	8
	49685-000	¾"-16 UNF Locknut - 12K • 15K	
	50765-000	7/8"-14 UNF Locknut - 19K • 21K • 23K	
	57347-000	7/8"-14 UNF Nylocknut - 19K • 21K • 23K	
7		Top Pad	2
	57224-000	12K • 15K	
	56805-000	19K • 21K • 23K	
8		Spring Seat Spacer (If equipped)	2
	48531-009	1", 12K • 15K - 6¼" length	
	48902-000	1", 19K • 21K • 23K - 7¾" length	
	48903-000	1½", 19K • 21K • 23K - 7¾" length	
9		Spring Seat Assembly, Includes Key Nos. 10-12, <i>see Selection Guide on Page 20</i>	2
10a	50918-000	5/8"-11 UNC x 4" Stud for Part Nos. 50970-XXX & 50988-XXX	4
b	32043-005	5/8"-11 UNC x 4½" Hex Bolt for Part Nos. 57033-XXX & 59795-XXX	4
11		5/8" Flat Hardened Washer	4
a	22962-004	for Part Nos. 50970-XXX & 50988-XXX	
b	22962-025	for Part Nos. 57033-XXX & 59795-XXX	
12	47764-000	5/8"-11 UNC Locknut	4
13		Axle Bottom Cap	2
	57024-000	<b>Meritor</b> RS13-120, RS15-120, RS15-210 LHF/RHF 0-5° Pinion Angle • 19K • 21K • 23K <b>Meritor</b> RS21-145, RS21-160, RS23-160/161; <b>Dana</b> 19060/21060/21080/21090/23090/ 26090, S21/23/26-170/190 LHF/RHF 0-9.5° Pinion Angle • 23K <b>Dana</b> 23080/23105/26015 LHF 0-9.5° Pinion Angle RHF 0-9.5° Pinion Angle LHR 10-14° Pinion Angle RHR 10-14° Pinion Angle	
14		Front Frame Hanger Assembly, 21K • 23K, Includes Key Nos. 15-16	2
a	58425-001	• Standard Frame, Casting No. 57188-001, <i>Replaces 57190-001 (***)14c) &amp; 50752-001 (***)14d)</i>	
	58688-001	• Rein. Frame, Casting No. 57476-001, <i>Replaces 57478-001 (***)14c)</i>	

KEY NO.	PART NO.	DESCRIPTION	VEHICLE QTY.
		12K • 15K • 19K, Includes Key Nos. 15-17 Casting No. 49848-000 or 56666-001	
b	50753-001		
	60636-001	Casting No. 60634-001	
	59045-003	• Standard Frame, Casting No. 59043-001	
		<b>Slipper Pad Service Kit, One Hanger,</b> <i>see Selection Guide on Page 21</i>	
15		Slipper Pad, <i>see Selection Guide on Page 21</i>	2
16		Retainer Roll Pin or Screw, <i>see Selection Guide on Page 21</i>	
a	58287-001	1" Roll Pin - 1/8" Diameter	4
b	57540-000	3/8" Button Head Screw	4
c	57306-000	3/8" Rolok Screw	8
17		Retaining Bracket or Plate, <i>see Selection Guide on Page 21</i>	4
a	57566-000	Retaining Bracket	
b	50597-000	Retaining Plate	
	49175-014	<b>Rebound Roller Kit, Axle Set,</b> Includes Key Nos. 18-22	
18	57988-000	Rebound Bolt Spacer, <i>Replaces 47458-000</i>	2
19	57989-000	Rebound Roller, <i>Replaces 48883-000</i>	2
20	24531-015	½"-13 UNC x 5½" Rebound Bolt	2
21	22962-014	½" Flat Hardened Washer	4
22	49846-000	½"-13 UNC Locknut	2
23		ULTRA ROD Longitudinal Torque Rod Assembly Includes Key No. 24	2
	48411-006	12K • 15K • 19K	
	62007-365	23K, <i>Replaces Torque Rod 50376-001 &amp; Bushing 57256-000</i>	
24	47691-000L	Torque Rod Bushing	4
25	32043-005	5/8"-11 UNC x 4½" Bolt	4
26	22962-004	5/8" Flat Hardened Washer	8
27	47764-000	5/8"-11 UNC Locknut	4
28		Torque Rod Shim	As Req.
	49689-000L	1/16"	
	57856-000	1/32"	
29		Air Spring Assembly with Upper Frame Bracket	2
	57920-002L	12K Low Profile	
	56917-002L	15K Low Profile • 19K Low Profile • 21K Low Profile • 23K Low Profile	
	57122-002L	19K • 21K • 23K	
30	22962-014	½" Flat Hardened Washer	2
31	17700-010	½"-13 UNC Nylocknut	2
32		Cross Channel, <i>Replaces 57855-XXX</i>	1
	57317-001	40" Dowel Pin Centers	
	57317-002	40¼" Dowel Pin Centers	
	57317-003	40½" Dowel Pin Centers	
	57317-004	40¾" Dowel Pin Centers	
	57317-006	40¼" Dowel Pin Centers with LH HCV	
33		¾"-10 UNC Bolt	2
	50764-005	12K • 15K • 19K • 21K - 3" Length	
	50764-003	23K - 3½" Length	
34		¾"-10 UNC Bolt	2
	50764-007	12K • 15K • 19K • 21K - 2½" Length	
	50764-005	23K - 3" Length	
35	22962-001	¾" Flat Hardened Washer	8
36	49842-000	¾"-10 UNC Locknut	4
		Lower Shock Bracket Assembly Includes Key Nos. 37-40	2
	49690-002	12K Low Profile • 15K Low Profile • 19K Low Profile • 21K Low Profile • 23K Low Profile	
	57356-000	19K • 21K • 23K	
37		Lower Shock Bracket	2
	49324-002	12K Low Profile • 15K Low Profile • 19K Low Profile • 21K Low Profile • 23K Low Profile	
	57355-000	19K • 21K • 23K	
38	50764-002	¾"-10 UNC x 5½" Bolt	2
39	22962-001	¾" Flat Hardened Washer	4
40	49842-000	¾"-10 UNC Locknut	2



## HAS Single 12K • 15K • 19K • 21K • 23K

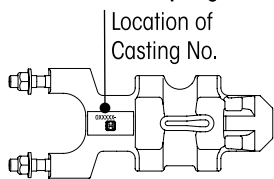
## Vehicles equipped with Drum Brakes

KEY NO.	PART NO.	DESCRIPTION	VEHICLE QTY.
41		Shock Absorber	2
	60670-005L	19K • 21K • 23K Standard	
	60675-003L	Hi-Torque, <i>Replaces 57905-001</i>	
	60670-010L	12K Low Profile	
	60670-003L	15K Low Profile	
	60670-008L	19K Low Profile • 21K Low Profile • 23K Low Profile	
42	57322-001	Upper Shock Bracket Assembly, Includes Key Nos. 43-46	2
43		**Upper Shock Bracket	2
44	50368-000	½"-13 UNC x 3¾" Serrated Shank Bolt	2
45	22962-031	½" Flat Hardened Washer	2
46	49846-000	½"-13 UNC Locknut	2
	57430-000	<b>Lower Linkage Bracket Kit</b> , Includes Key Nos. 47-50	
47	56789-000	Linkage Bracket	1
48	56935-001	¼"-20 UNC x 1" Bolt, <i>Replaces 56935-002</i>	2
49	22962-028	¼" Flat Hardened Washer	4
50	49983-000	¼"-20 UNC Locknut	2
51	57977-000	Height Control Valve,	1

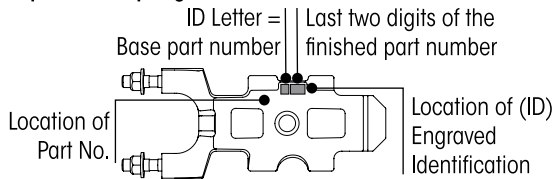
KEY NO.	PART NO.	DESCRIPTION	VEHICLE QTY.
52	58994-XXX	Linkage Assembly, Specify Length, <i>contact Hendrickson for Part Number</i> , Includes Key Nos. 53-59	1
53		**Linkage Rod, Specify Length	1
54		**5/16"-18 UNC Jam Nut	2
55		**5/16"-18 UNC Locknut	2
56		**5/16" Flat Hardened Washer	2
57		**5/16"-18 UNC Stud	2
58		**Linkage Rod Clamp	1
59		**Adjustable Linkage Joint	1
60		****Transverse Torque Rod, Includes Bushings	2
	a 8240-0000-XXX	****TRAAX ROD	
	b 62000-XXX	ULTRA ROD	
	c 60218-000	ULTRA ROD Two-Piece Kit	
61	22186-000	Transverse Torque Rod Frame Bracket	1
62	45045-003	Back up Plate	1
63		*Transverse Torque Rod Axle Bracket	1
64	49689-000L	Torque Rod Shim 1.52 mm	As Req.
Not Shown	70867-001	P-80 Lubricant - 10 ml	Per Bushing

### ■ Spring Seat Selection Guide | HAS Single 12K•15K•19K•21K•23K for vehicles equipped with Drum Brakes

Bottom View of Spring Seat



Top View of Spring Seat



Includes fasteners.  
Total of two (2) spring seats required per single suspension. One of each located at the left front and right front.

Key No. 9 • Page 18

		LEFT • RIGHT			
Casting No.		50923_①		50923_② <i>Replaces 50986_</i>	
SPRING SEATS	Seat Angle	Part No.	ID	Part No.	ID
	2°	50970-001	A01	50988-001	K01
	2.5°	50970-002	A02	50988-002	K02
	3°	50970-003	A03	50988-003	K03
	3.5°	50970-004	A04	50988-004	K04
	4°	50970-005	A05	50988-005	K05
	4.5°	50970-006	A06	50988-006	K06
	5°	50970-007	A07	50988-007	K07
	5.5°	50970-008	A08	50988-008	K08
	6°	50970-009	A09	50988-009	K09
	6.5°	50970-010	A10	50988-010	K10
7°	50970-011	A11	50988-011	K11	

Corresponding axle:

① Dana: DS-402, Meritor: SQ100, SSHD, RT-40, RT-46

② Dana: DS-461, 23105



■ U-bolt and Slipper Pad Selection Guide

U-BOLT		HAS 19K•21K•23K•36K•40K•46K				HAS 12K•15K•40K LH			
		7/8"-14 UNF 2A U-bolt				3/4"-16 UNF 2A U-bolt			
		Part No.	Length A	Thread Length B	*7/8" Fastener Kit	Part No.	Length A	Thread Length B	*3/4" Fastener Kit
	47417-001	16¼"	4"	48718-157	49684-001	14"	4"	48718-158	
	47417-002	13"							
	47417-003	17½"							
	47417-004	17¼"							
	47417-005	16¾"							
	47417-006	14"							
	47417-007	15"	4½"		49684-011	12½"			
	47417-008	15½"			49684-012	12"			
	47417-009	18"			49684-013	13"			
	47417-010	19"		4"	49684-014	16"			
					49684-015	17"			
					49684-016	19"			

\* U-bolt fastener kit includes four (4) of each - spherical washer, hardened washer and locknut. Two (2) kits per axle or four (4) kits per tandem will be required to do a replacement.

FRAME HANGER SLIPPER PAD	SLIPPER PAD SERVICE KITS			FRAME HANGERS	
	KIT NO.	KIT INCLUDES:	SLIPPER PAD PART NO.	Casting No.	Part No.
	56557-002	<ul style="list-style-type: none"> <li>1 Slipper Pad</li> <li>2 Retaining Plates</li> <li>4 Self Tapping Screws</li> </ul>	50612-000		◆49676-000 50849-XXX ◆49676-000 56552-XXX 49848-000 50027-001 56666-001 50753-001 56669-001 56670-XXX 56669-001 50752-XXX ◆56885-001 ◆56887-000
	56557-004	<ul style="list-style-type: none"> <li>1 Slipper Pad</li> <li>2 Retaining Brackets</li> <li>2 Self Tapping Screws</li> </ul>	56929-000		57188-001 57190-XXX 57476-001 57478-XXX
	56557-005	<ul style="list-style-type: none"> <li>1 Slipper Pad</li> <li>2 Roll Pins</li> </ul>	56929-000		57188-001 58425-XXX 57476-001 58688-XXX 57543-001 57544-XXX 58659-001 58661-001 59043-001 59045-XXX ◆59050-001 ◆59052-002 59747-001 59768-XXX
56557-006	<ul style="list-style-type: none"> <li>1 Slipper Pad</li> <li>2 Roll Pins</li> </ul>	58959-000		◆59050-001 ◆59052-002	

◆ Part number no longer in production, contact Hendrickson Truck Parts for available options.



## SECTION 6 Preventive Maintenance

Following appropriate inspection procedures are important to help ensure the proper maintenance and operation of the HAS suspension systems and component parts.

**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.

<b>HENDRICKSON RECOMMENDED INSPECTION INTERVALS</b>	<b>PRE-DELIVERY INSPECTION</b>	<b>FIRST IN-SERVICE INSPECTION</b>	<b>PREVENTIVE MAINTENANCE</b>
<ul style="list-style-type: none"> <li>• Visually inspect for proper assembly and function. Check for all of the following and replace components as necessary:</li> <li>• Signs of unusual movement, loose or missing components</li> <li>• Signs of abrasive or adverse contact with other components</li> <li>• Damaged, or cracked parts</li> <li>• Improper suspension function or alignment</li> </ul>			
<p>Visually inspect the overall condition and any signs of damage to:</p> <ul style="list-style-type: none"> <li>• Main Support Member Assembly</li> <li>• Clamp Group</li> <li>• Air springs and air lines</li> </ul>	<p>Within the first 100 miles (160 km)</p>	<p>Within the first 1,000 miles (1,600 km) or 100 Hours, whichever comes first</p>	<p><b>Off-highway and</b> Every 6 Months /1,200 Hours, or 25,000 miles (40,000 km) whichever comes first</p>
<p>Inspect fasteners for proper torque as recommended in the Torque Specification section of this publication:</p> <ul style="list-style-type: none"> <li>• Shock absorber fasteners</li> <li>• Cross channel to main support member fasteners</li> </ul>			<p><b>100% On-Highway</b> Every 12 Months or 50,000 miles (80,000 km), whichever comes first</p>
<p>Inspect the Clamp Group U-bolt fasteners for proper torque, refer to U-bolt Locknuts in this section.</p>			<p><b>DO NOT</b> exceed 20,000 miles (32,200 km)</p>
<p>Verify:</p> <ul style="list-style-type: none"> <li>• The lateral alignment of the drive axles are within the vehicle manufacturer's tolerances</li> <li>• The ride height. Refer to the Alignment &amp; Adjustment section of this publication</li> </ul>			<p>Every 12 Months / 2400 Hours</p>

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



## 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. A  $\frac{1}{8}$ " of slippage in either direction is acceptable. Verify all mounting hardware have the proper torque values maintained. Refer to the Torque Specifications section in this publication.
- **Air supply (Pneumatic components)** — The air supply to the system plays a large role in the air springs' performance. Inspect, clean any support products to the air springs, valves, regulators and air lines and replace as necessary. See Air Fittings 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 torque values maintained, see U-bolt Locknuts in this section.
- **Cross channel** — Visually inspect for cracks, damage, metal shavings, or looseness at the main support member connection.
- **Fasteners** — Visually inspect for any loose or damaged fasteners on the entire suspension. Ensure all fasteners are tightened to the specified torque range. See the Torque Specifications section of 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 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 and any interference with peripheral components. Refer to the Air Fittings inspection procedure in this section.
- **Main support member assembly** — Look for signs of looseness, cracks, or other damage. Inspect the cross channel connection for looseness or damage. Inspect the isolator puck for wear or damage. Correct the torque as necessary. Replace all worn or damaged parts.
- **Shock absorbers** — Visually inspect for any signs of dents or leakage. Misting is not considered a leak, see Shock Absorbers in this section.
- **Single leaf spring** (if equipped) — Look for signs of looseness, cracks, or other damage and proper fastener torque. See the Torque Specifications Section in this publication.
- **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, and proper fastener torque. See the Torque Rod inspection in this section
- **Wear and Damage** — Visually inspect all parts of the suspension for wear and damage, and replace as necessary.

### 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 requires replacement if the HAS exhibits  $\frac{3}{8}$ " ( $\frac{1}{4}$ " for HAS 40LH) or more wear at the frame hanger slipper pad contact surface area.

### NOTE

Hendrickson offers a service kit (No. 49175-024) to upgrade the HAS 46K to HAS 46K Plus that enhances durability in logging and other severe service applications. The service kit requires both main support members to 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.

**WARNING**

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

Maintain correct U-bolt torque to help ensure proper suspension component performance.

1. Inspect U-bolt for proper seating of components, i.e. no gaps, etc.
1. U-bolt locknuts must be torqued to specification at preparation for delivery.
2. U-bolt locknuts must be re-torqued at 1,000 miles.
3. Thereafter, follow the inspection and re-torque intervals below:
  - **Off-highway and severe service** – Every 25,000 miles or 6 months, whichever comes first.
  - **100% On-highway** – Every 50,000 miles or 12 months, whichever comes first.

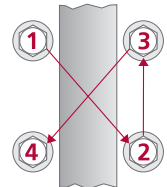
Off-highway and severe service operating conditions require more frequent inspections than on-highway service operation.

**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.

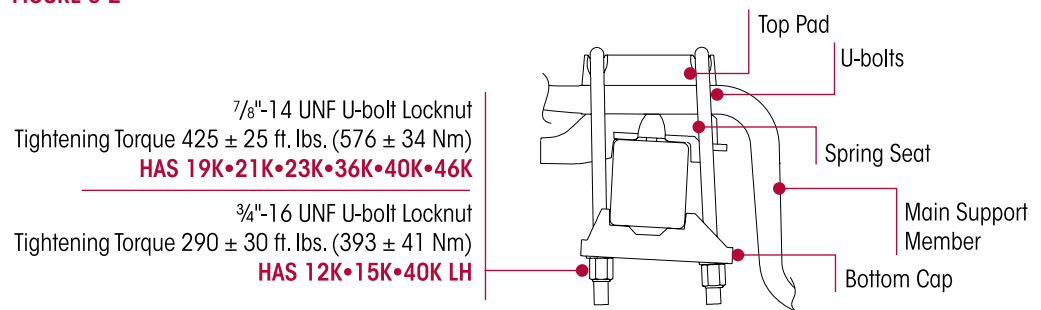
4. Tighten the U-bolt locknuts in the proper sequence, (see Figure 6-1) evenly in 50 foot pounds increments to achieve uniform bolt tension and correct (level) position of main support member, spring seat, and axle bottom cap at final torque, see Figure 6-2.

**FIGURE 6-1**



- **HAS Single 19K•21K•23K | HAS Tandem 36K•40K•46K** — 7/8"-14 UNF locknut, tighten to 425 ± 25 foot pounds torque, rap the top of the U-bolts, and re-tighten to 425 ± 25 foot pounds torque.
- **HAS Single 12K•15K | HAS Tandem 40KLH** — 3/4"-16 UNF locknut, tighten to 290 ± 30 foot pounds torque, rap the top of the U-bolts, and re-tighten to 290 ± 30 foot pounds torque.

**FIGURE 6-2**





## FRAME HANGER SLIPPER PADS

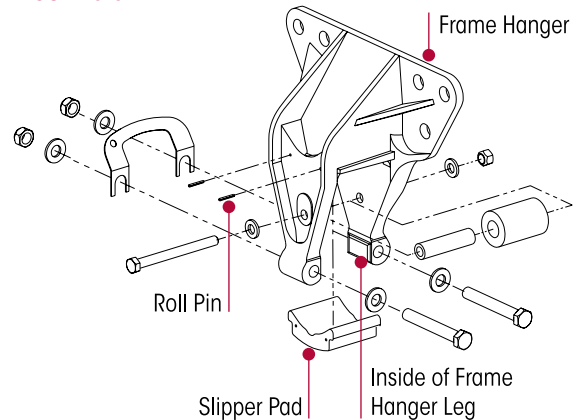
The operation of the HAS suspension will result in some wear between the main support member and the frame hanger slipper pads, see Figure 6-3. In normal use the slipper pads will function satisfactorily even though they may show some wear.

If the slipper pads require replacement, identify which frame hanger you have, refer to the Frame 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 HANGERS

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 6-3) has been grooved by the main support member in excess of 1/8", or if slipper pad is worn through.

FIGURE 6-3



## SHOCK ABSORBER

### NOTE

It is not necessary to replace shock absorbers in pairs if one (1) shock absorber requires replacement.

Hendrickson uses a long service life, premium shock absorber on all HAS suspensions. When the shock absorber replacement is necessary, Hendrickson recommends that the shock absorbers be replaced with identical Hendrickson Genuine parts for servicing. Failure to do so will affect the suspension performance, durability, and will void any applicable warranty. See vehicle manufacturer's applicable publications for other shock absorber inspection requirements.

Inspection of the shock absorber can be performed by doing a heat test, and a visual inspection. Replace as necessary, refer to the Component Replacement section in this publication.

FIGURE 6-4



### HEAT TEST AND PHYSICAL INSPECTION

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

DO NOT GRAB THE SHOCK ABSORBER AS IT COULD POSSIBLY BE HOT AND CAUSE PERSONAL INJURY.

- a. Perform a heat test by carefully touching or placing a hand near the shock absorber body below the dust cover. Touch the frame to get an ambient reference, see Figure 6-4. A shock absorber that is warm to the touch is acceptable, a cold shock absorber should be replaced.



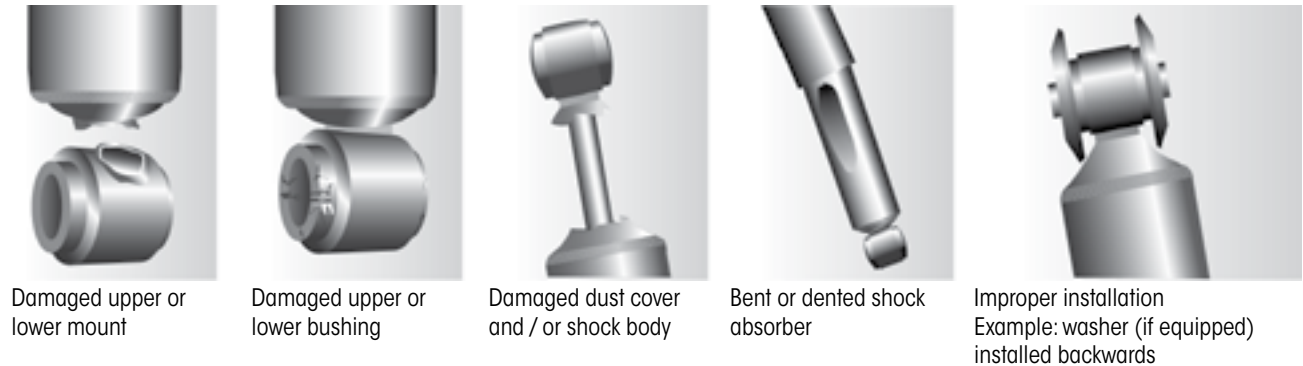
2. **Physical Inspection:** To inspect for an internal failure, remove and shake the suspected shock absorber. Listen for the sound of metal parts rattling inside. The rattling of metal parts can indicate that the shock absorber has an internal failure and the shock absorber should be replaced.

**VISUAL INSPECTION**

Look for these potential problems when doing a visual inspection, see Figure 6-5. Inspect the shock absorbers fully extended. Replace as necessary.

**FIGURE 6-5**

**SHOCK ABSORBER VISUAL INSPECTION – UNACCEPTABLE CONDITIONS**



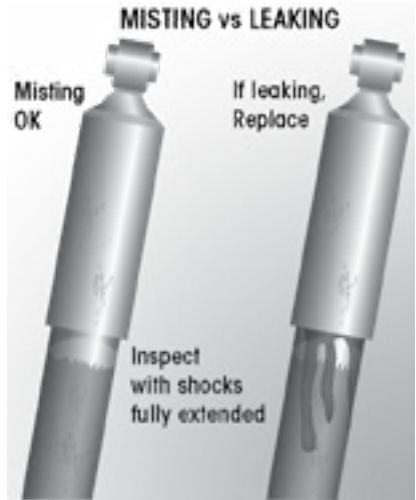
**LEAKING VS. MISTING SHOCK ABSORBER**

**INSPECTION**

The inspection must not be conducted after driving in wet weather or a vehicle wash. The shock absorber needs to be free from water.

Many shock absorbers are often misdiagnosed as failures. Misting is the process whereby very small amounts of shock absorber fluid evaporate at a high operating temperature through the upper seal of the shock absorber. When the “mist” reaches the cooler outside air, it condenses and forms a film on the outside of the shock absorber body. Misting is perfectly normal and a necessary function of the shock absorber. The fluid which evaporates through the seal area helps to lubricate and prolong the life of the seal.

**FIGURE 6-6**



**NOTE**

The HAS system is equipped with a premium seal on the shock absorber, however, this seal will allow for misting to appear on the shock absorber body (misting is not a leak and is considered accep).

Inspect the shock absorber fully extended. **A shock absorber that is truly leaking** will show signs of fluid **leaking in streams from the upper seal**, see Figure 6-6. These streams can easily be seen, underneath the main body (dust cover) of the shock absorber. Replace as necessary.

**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.

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.

## LONGITUDINAL AND TRANSVERSE TORQUE RODS

### WARNING

THIS HENDRICKSON SUSPENSION REQUIRES TORQUE RODS FOR SUSPENSION PERFORMANCE AND VEHICLE STABILITY. IF THESE TORQUE RODS ARE DISCONNECTED OR NON-FUNCTIONAL, DO NOT OPERATE THE VEHICLE. OPERATING A VEHICLE WITH DISCONNECTED OR NON-FUNCTIONAL TORQUE RODS CAN RESULT IN ADVERSE VEHICLE HANDLING, COMPONENT DAMAGE, SUSPENSION/VEHICLE DAMAGE, AND/OR SEVERE PERSONAL INJURY.

### NOTE

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

### INSPECTION

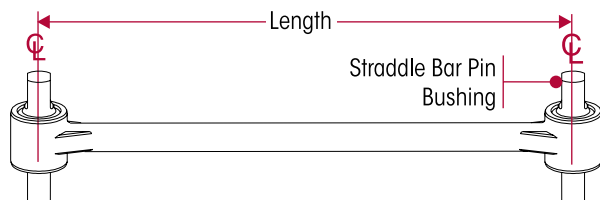
All torque rods equipped on the HAS suspensions need to be inspected during preventive maintenance and service for looseness by one of the following methods.

**Torque rod looseness** inspection is necessary per one of the following methods below.

- **Method 1** — Due to visibility, this procedure is for **ONLY on-highway tractor applications**. With the brakes applied, slowly rock the empty vehicle with power while a second technician 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.

Visually inspect (1) **torque rod bushings** for any torn or shredded rubber material interfaces or elongated oval shapes and (2) **torque rods** for any metal to metal contact, bent, cracked or broken components. The torque rod and/or the torque rod bushings will require replacement if any of these conditions are encountered.

FIGURE 6-7



- **Longitudinal torque rod length** is determined by the original vehicle manufacturer for optimum driveline angle(s). The longitudinal torque rods along with the bottom caps maintain these angles and control acceleration and brake forces.
- **Transverse rod length** is also determined by the vehicle manufacturer to center the axles under the frame.

- If the lateral alignment of the axles is incorrect, it may be necessary to shim the transverse torque rod at the straddle mount end. Shims can be installed between the transverse torque rod and the transverse torque rod frame bracket or between the transverse torque rod and axle tower bracket. Refer to the vehicle manufacturer for proper shim location; also see Lateral Alignment in the Alignment & Adjustments section of this publication.
- The transverse torque rods control axle walk-out during cornering. The mounting brackets at the axle housing end of the torque rods are furnished and welded into position on the axle housings by the axle or vehicle manufacturer.

**Transverse and longitudinal torque rods** equipped with **straddle mount or tapered stud bushings**, as shown in Figure 6-7, can be replaced by pressing out the worn torque rod bushing and installing a new Hendrickson bushing, others require complete torque rod assembly replacement. See Parts List section of this publication.

Hendrickson provides **two-piece torque rods** that are available to cut and weld to the desired length, for more information refer to Hendrickson Literature No. 45745-148.



## SECTION 7

# Alignment & Adjustments

### DRIVE AXLE ALIGNMENT INSPECTION

Proper alignment is essential for maximum ride quality, performance, and tire service life, the recommended alignment procedure is described below. This procedure should be performed if excessive or irregular tire wear is observed.

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.
4. Chock the front wheels of the vehicle.
5. Verify and maintain the air system at full operating pressure.
6. Verify the vehicle is at the correct ride height. Refer to Ride Height Adjustment in this section. Correct as necessary.
7. Verify all suspension components are in good condition. Repair or replace any worn or damaged suspension components before proceeding with the alignment process.
8. Ensure all drive axle tires are the same size and inflated to the correct tire pressure.
9. Use an alignment machine to calculate the drive axle readings.

#### NOTE

Depending on your alignment equipment, enter the vehicle year, make, model and design into the system's computer to determine the vehicle manufacturer's alignment specifications per the alignment equipment instructions. That data will be compared to the vehicle's actual alignment status to determine necessary corrections. Some systems allow you to simply scan the VIN to recall specs. Vehicle manufacturers have set specific alignment specifications.

10. 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 11).
  - a. If the 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.
  - b. Correct the alignment of this axle by following the Alignment Adjustment instructions as shown in this section.
11. After all drive axles are aligned, check the pinion angle of each drive axle with a digital protractor, see Figure 7-1. Refer to the vehicle manufacturer specifications for the required pinion angles.
  - a. If all pinion angles are within the vehicle manufacturer's specifications then proceed to Step 12.
  - b. If any pinion angle is out of the vehicle manufacturer's specifications it must be corrected. Follow the Pinion Angle Adjustment procedure in this section.
12. Recheck measurements to confirm adjustments until the correct alignment and pinion angles are achieved.
13. When all drive axle alignments and pinion angles are within the vehicle manufacturer's specifications then the alignment procedure is complete.
14. Remove the wheel chocks.

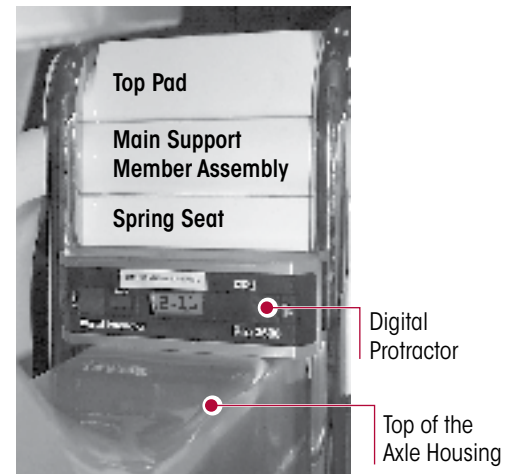
## AXLE PINION ANGLE

Drive axle pinion angles are set by the spring seat assembly. Pinion angle should be checked in the loaded condition, and is set by the vehicle manufacturer. Refer to the Parts Lists section of this publication for Spring Seat Selection Guide.

To check the pinion angle:

1. Verify the suspension is at the proper ride height (see the Ride Height in this section).
2. Place a digital protractor on the axle housing as shown in Figure 7-1.
3. Verify the pinion angle is within the range specified by the vehicle manufacturer.
4. Contact the vehicle manufacturer if it is necessary to fine-tune the pinion angle.

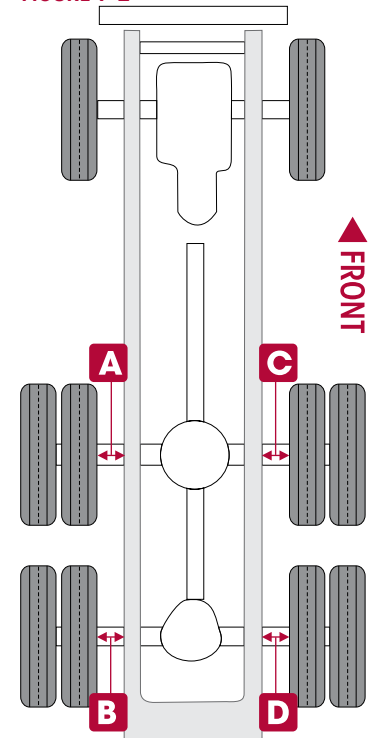
**FIGURE 7-1**



## AXLE 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. Try to roll to a stop without the brakes being used.
3. **DO NOT** set the parking brake.
4. Chock the front wheels of the vehicle.
5. Measure from the outside of the frame rail to the rim flange of the inner tire. Record the measurements **A** and **B**, see Figure 7-2.
6. Measure the same distance on the opposite side of the same axle. Record the measurement of **C** and **D**, see Figure 7-2.
7. Verify the axle lateral alignment is within the vehicle manufacturer's specifications. Adding or removing shims that are located between the transverse torque rod and the frame rail will normally correct the axle lateral alignment.
  - A general rule of thumb is to use a torque rod shim with a thickness that is half of the difference between the two measurements.

**FIGURE 7-2**



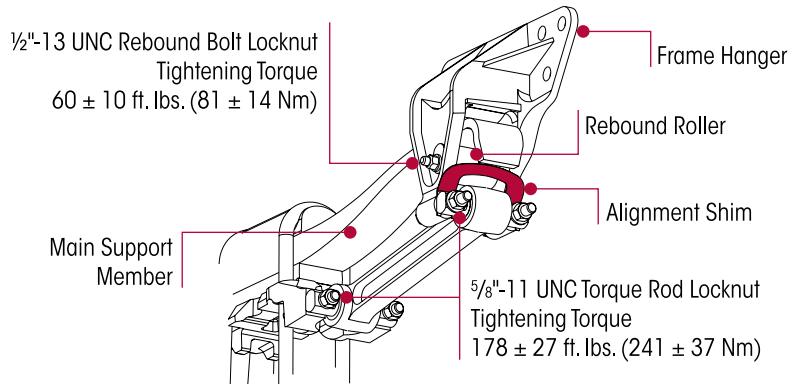
### EXAMPLE

If the axle lateral alignment is out of specification by  $\frac{1}{4}$ " (6 mm), remove or install a  $\frac{1}{8}$ " (3 mm) torque rod shim between the transverse torque rod and frame rail as needed.

## AXLE ALIGNMENT ADJUSTMENT

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

**FIGURE 7-3**



Follow the Drive Axle Alignment Inspection Procedure in this section. If the measurements are not within manufacturer's specifications, adjust as follows:

1. Loosen the rebound bolt locknut on the side to be adjusted.
2. Loosen the torque rod bar pin locknuts on the frame hanger and add or remove alignment shims as shown in Figure 7-3. 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.
3. Re-measure using alignment equipment and adjust again if necessary.
4. Repeat for the rear axle until vehicle is within vehicle manufacturer's specifications.
5. Tighten the torque rod to frame hanger fastener to  $\mathbb{R}$  178 ± 27 foot pounds torque.
6. Tighten the rebound bolt locknut to  $\mathbb{R}$  60 ± 10 foot pounds torque, see Figure 7-3.

## 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.

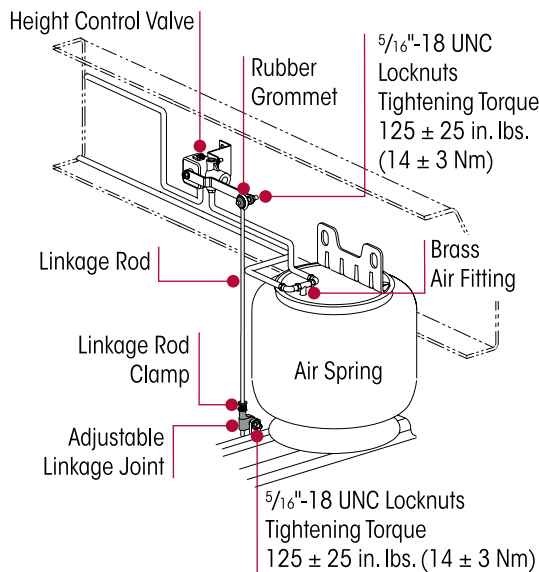
### WARNING

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.

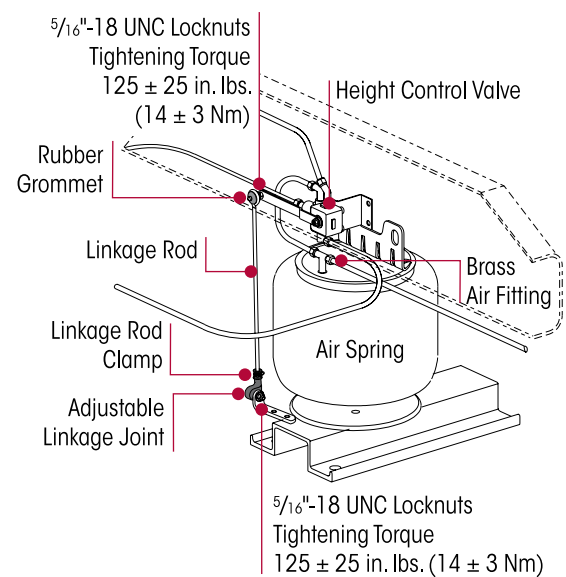
- Disconnect the linkage assembly from the height control valve arm. Lower the height control valve arm to exhaust the air in the air springs and deflate the rear suspension, see Figure 7-4.

**FIGURE 7-4**

**HAS**



**HAS Tandem 40LH**



- Connect the linkage assembly to the height control valve arm to inflate the suspension. Verify the air springs inflate uniformly without binding.

**NOTE**

A vehicle equipped with dual height control valves must measure the ride height at each height control valve location.

- Measure the suspension ride height by using one of the following methods

**Method A:**

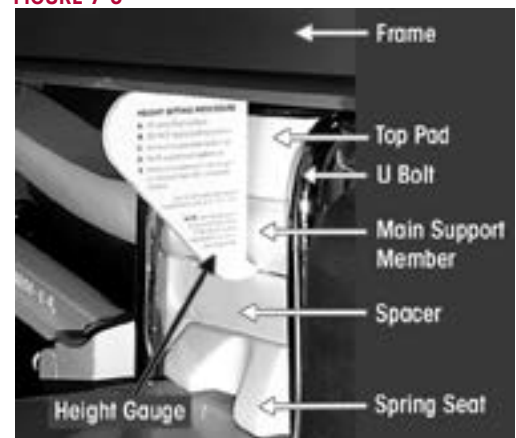
Use a Hendrickson ride height gauge (Hendrickson Lit. No. 45745-050 Loaded, 45745-106 Unloaded available online at [www.hendrickson-intl.com](http://www.hendrickson-intl.com)), see Figure 7-5, to simplify establishing the referenced ride height of:

- 4<sup>3</sup>/<sub>8</sub>" ± 1/8" in the **unloaded** condition or
- 4<sup>1</sup>/<sub>4</sub>" ± 1/8" in the **loaded** condition.

**NOTE**

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

**FIGURE 7-5**



**Method B:**

If a height gauge is not available, measure the actual vertical ride height from the bottom of the frame rail to the axle centerline, (there are various HAS ride heights, refer to the vehicle specification (tolerance of 1/8").

If the ride height is out of specification, height control valve adjustment is required, proceed to the Adjustment Procedure in this section.

## ADJUSTMENT PROCEDURE

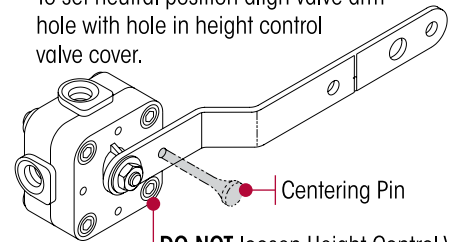
### SERVICE HINT

Dual height control valves are available in the aftermarket, when inspecting or setting ride height on a vehicle equipped with dual height control valves, it is necessary to have a load on the vehicle. Loading the vehicle to its normal operating condition, such as a tractor with a loaded trailer, increases ride height setting accuracy.

1. Follow Steps 1 through 7 of Ride Height in this section.
2. Manually refill the suspension by raising the height control valve arm to a level above the proper suspension ride height.
3. Lower the leveling valve arm to exhaust the air system until the suspension is at proper ride height.
4. Use a 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 7-6. **DO NOT** use a metal rod or nail as this may cause damage to the height control valve.
5. Raise or lower linkage rod in the adjustable linkage joint to the correct ride height, see Figure 7-4.
6. Attach the upper rubber grommet to the height control valve arm.
7. Tighten the lower linkage rod extension arm clamp with a screwdriver until securely fastened, see Figure 7-4.
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.
10. Remove the wheel chocks.

**FIGURE 7-6**

■ To set neutral position align valve arm hole with hole in height control valve cover.



**DO NOT** loosen Height Control Valve housing socket head cap screws to adjust ride height.

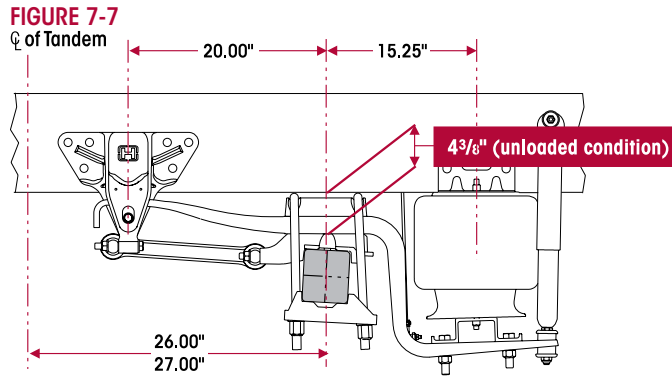
## FRAME SLOPE

### 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° frame slope. The intent is to maintain identical 4 3/8" unloaded referenced vehicle ride heights on the forward and rear drive axles, see Figure 7-7. 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.
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 1/2" x 3" x 7" low carbon steel with a 1 3/8" diameter hole drilled in the center for dowel clearance, with a maximum of two 1/2" 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 1 1/2" thick spacer is required, see Part List section of this publication.

- b. A maximum of a single 1" or 1 1/2" 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 1 1/2" spacer contact the vehicle manufacturer.
- 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 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 7-5, measure the referenced ride height on the forward and rear drive axles.

5. If the vehicle is equipped a tandem suspension with equal thickness spring seats and the frame is level, all four main support members should have the same suspension ride height of:
  - $4\frac{1}{4}'' \pm \frac{1}{8}''$  loaded or  $4\frac{3}{8}'' \pm \frac{1}{8}''$  unloaded.

This measurement is taken from the bottom of the frame to the bottom of the main support member as shown in Figure 7-7.

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 7-5, or by adding spacer(s) to the front steer axle.



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.

8. If spacer plates are added, longer U-bolts will be required to accommodate the added spacer plates. Hendrickson has 1" thick spacers and 1 1/2" thick spacers available, refer to the Parts List section of this publication. A maximum of **one** 1" thick, or **one** 1 1/2" thick spacer is permissible.
9. **DO NOT** attempt to correct frame slope by adding spacer plates on only one drive axle. The spacer plates can be made from 1/2" x 3" x 7" low carbon steel with a 1 3/16" diameter hole drilled in the center for dowel clearance. A maximum of two 1/2" shop made spacer plates between each main support member and spring seat is permissible. Longer U-bolts will be required to accommodate spacer plates.
10. To remove or install the spacers, follow the Spring Seat replacement procedure in the Component Replacement section of this publication.

## DRIVELINE INSPECTION

1. To measure driveline angles, the vehicle must be placed on a level floor.
2. Inspections can be performed on either loaded or unloaded vehicles.
3. The front steer and rear drive tires must be inflated to normal operating pressure.
4. 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.
5. 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.

6. Use Figure 7-8 as a guide to determine the correct angles to be measured.

FIGURE 7-8

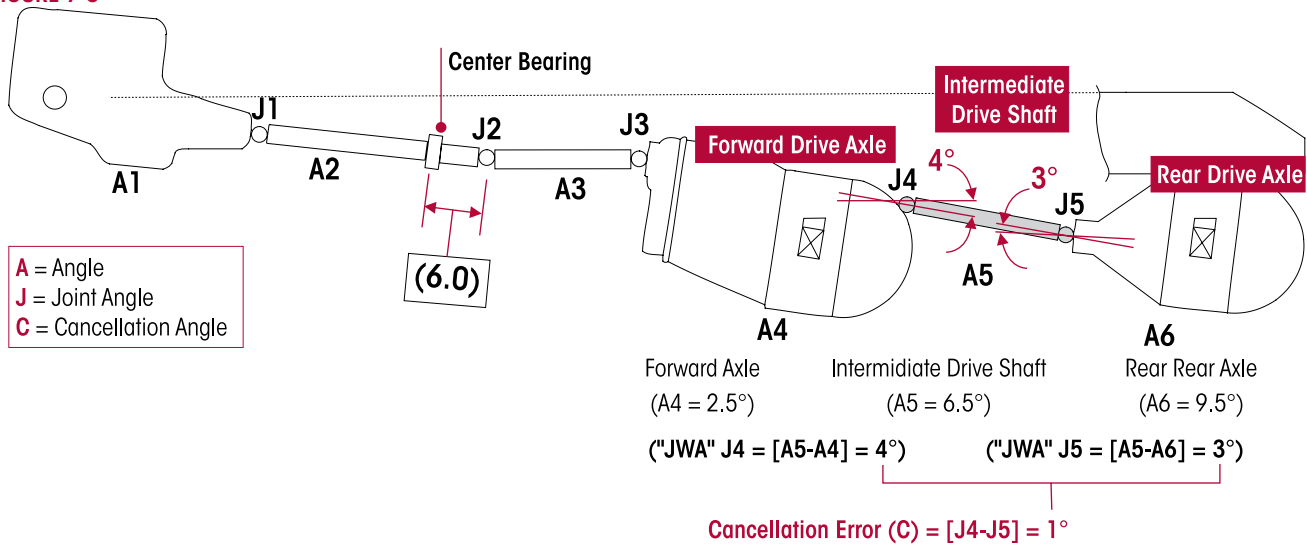
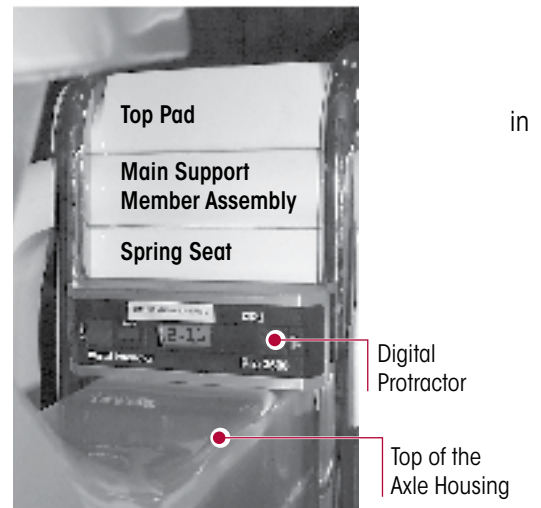


FIGURE 7-9

7. 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 this section. Figure 7-9 shows the proper inclinometer placement for angles A4 and A6.
8. 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).
9. Hendrickson's specification for good inter-axle cancellation (C3) is <2° and joint working angles <6° as shown Figure 7-8.



### 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.

### 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 (Centerline to Ground) \_\_\_\_\_ Frame Height Center \_\_\_\_\_

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

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

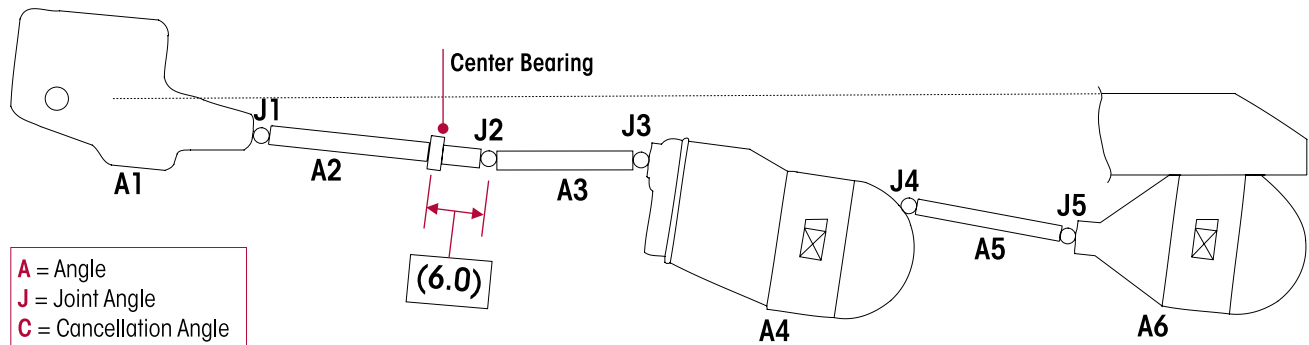
1st Drive Shaft Angle      A2 = \_\_\_\_\_      J1 = [A1-A2] = \_\_\_\_\_

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 & LINKAGE ASSEMBLY

#### DISASSEMBLY

1. Chock the wheels of the vehicle.


**WARNING**

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

2. Support the frame with safety stands.
3. Remove and discard the fasteners that connect the upper linkage assembly to the height control valve arm.


**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.

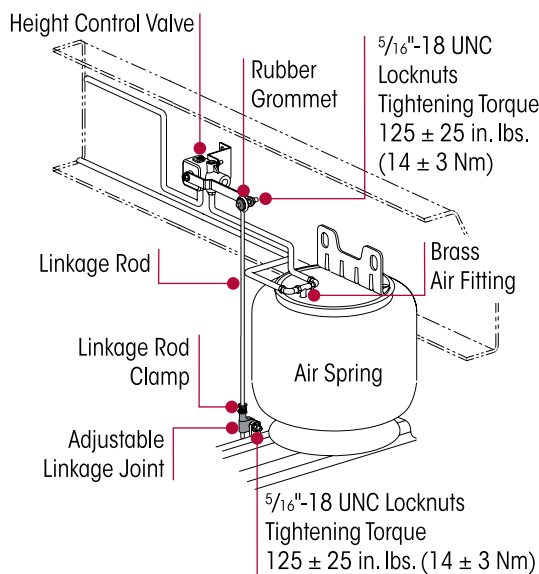
4. See additional Air Spring Cautions and Warnings in the Important Safety Notice section of this publication prior to deflating or inflating the air system.
5. Lower the height control valve arm to exhaust the air from the air springs.


**WARNING**

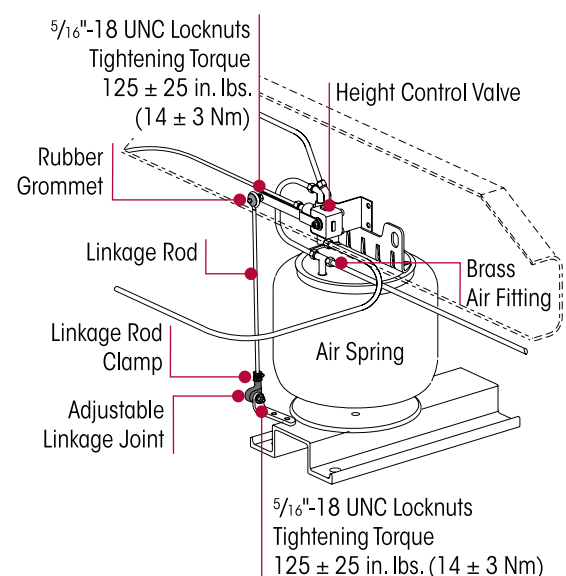
SOME VEHICLE APPLICATIONS, SUCH AS VEHICLES EQUIPPED WITH OUTRIGGERS, RETAIN SOME AIR PRESSURE IN THE AIR SPRINGS AT ALL TIMES. PRIOR TO PERFORMING ANY MAINTENANCE, SERVICE, OR REPAIR OF THE SUSPENSION, VERIFY EACH AIR SPRING IS COMPLETELY DEFLATED. FAILURE TO DO SO COULD RESULT SERIOUS PROPERTY DAMAGE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

6. Remove the air lines and air fittings from the height control valve.

**FIGURE 8-1  
HAS**



**HAS Tandem 40LH**



7. Remove and discard the 1/4" height control valve fasteners to the frame mounting bracket.
8. Remove the height control valve, see Figure 8-1.
9. If replacement of the linkage assembly is necessary, remove lower mounting fasteners from the lower linkage bracket, see Figure 8-1.

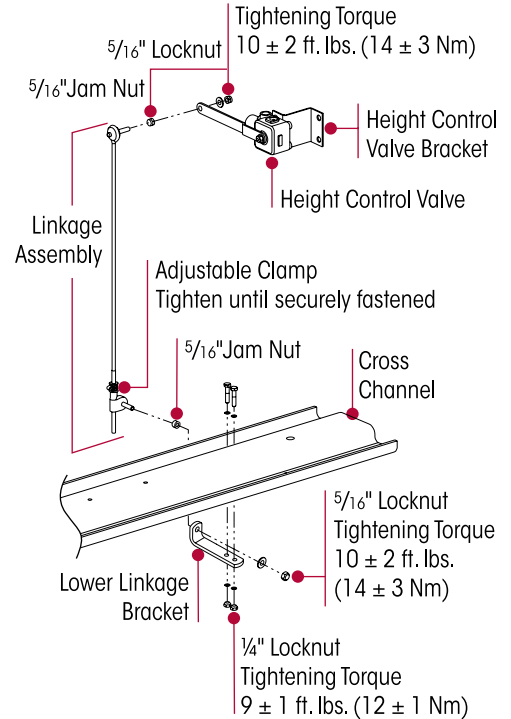
**ASSEMBLY**

**NOTE**

The replacement height control valve comes equipped with the frame bracket attached, refer to the Parts List section of this publication.

1. Attach the height control valve bracket to the frame rail as per vehicle manufacturer's specifications.
2. Install the height control valve to the height control valve mounting bracket. Tighten 1/4" locknuts to  $6 \pm 2$  foot pounds torque.
3. Install the air fittings into the height control valve. Ensure the Teflon® thread sealing ring is seated around the base of the fitting's hex shoulder. Tighten to  $9 \pm 6$  foot pounds torque.
4. Install the air lines to the height control valve. Refer to the Plumbing Diagram section of this publication.
5. Install the upper linkage assembly to the height control valve arm by attaching the 5/16" fasteners. Tighten to  $10 \pm 2$  foot pounds torque, see Figure 8-2.
6. Install the lower linkage assembly to the lower linkage bracket and attach the 5/16" fasteners. Ensure the jam nut is properly installed, see Figure 8-2:
7. Tighten 5/16" fasteners to  $10 \pm 2$  foot pounds torque, see Figure 8-2.
8. See additional Air Spring Cautions and Warnings in the Important Safety Notice section of this publication prior to deflating or inflating the air system.
9. Inflate the suspension. Verify the air springs inflate uniformly without binding.
10. Verify proper ride height. Refer to the Alignment & Adjustments section of this publication.
11. Remove the frame safety stands.
12. Remove the wheel chocks.

**FIGURE 8-2**



**AIR SPRING & UPPER AIR SPRING BRACKET**

**DISASSEMBLY**

1. Chock the front wheels.



**WARNING**

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

2. Support the frame with safety stands.
3. Disconnect the height control valve arm(s) from the linkage assembly(s).

**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.

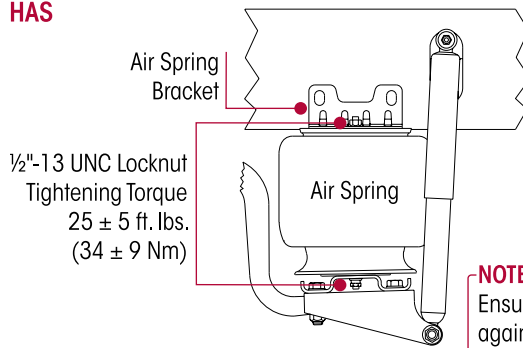
4. See additional Air Spring Cautions and Warnings in the Important Safety Notice section of this publication prior to deflating or inflating the air system.
5. Lower the height control valve arm(s) to exhaust the air in the air springs and deflate the rear suspension.
6. Remove the air line and air fittings from the air spring.

**CAUTION**

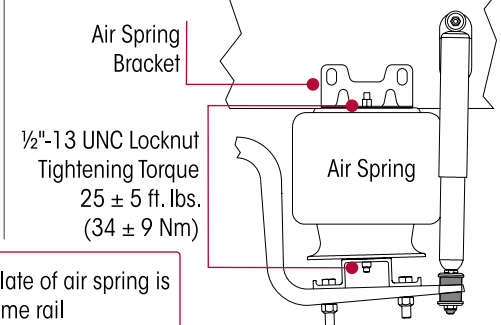
IF THE AIR SPRING IS BEING REMOVED FOR AN ALTERNATE REPAIR, IT IS MANDATORY TO LUBRICATE THE LOWER AIR SPRING FASTENERS WITH PENETRATING OIL AND REMOVE WITH HAND TOOLS TO PREVENT DAMAGE TO THE LOWER AIR SPRING MOUNTING STUD. FAILURE TO DO SO CAN CAUSE COMPONENT DAMAGE AND VOID WARRANTY.

7. If the air spring is being removed for an alternate repair, use **hand tools only**. It will be necessary to clean and lubricate the lower mounting fasteners with penetrating oil. This will help prevent the air spring mounting studs from breaking during the removal process.
8. Remove and discard the ½" lower air spring mounting locknut, see Figure 8-3.
9. Remove and discard the air spring bracket to frame fasteners.
10. Remove the air spring.

**FIGURE 8-3  
HAS**



**HAS Tandem 40LH**



**ASSEMBLY**

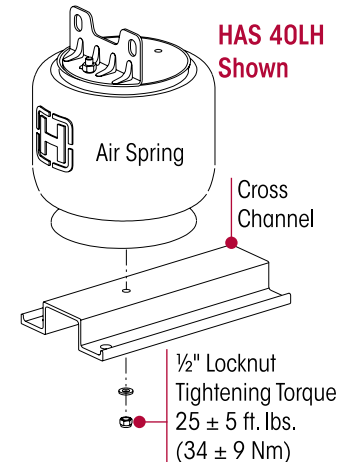
1. Install the lower air spring stud **USING HAND TOOLS ONLY** into the main support member and the upper air spring bracket on the frame, see Figure 8-4.

**CAUTION**

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

2. Hold the air spring bracket tight against the bottom frame flange and install the upper air spring bracket fasteners to the frame. Install fasteners and hand tighten, **DO NOT** tighten to final torque at this time.
3. Install the lower air spring fasteners to cross channel and tighten to 25 ± 5 foot pounds torque, see Figure 8-4.
4. Install and tighten the upper air spring bracket fasteners to the frame per the vehicle manufacturer's instructions and torque specifications.
5. Install the air line fitting to the air spring using Teflon (or equivalent) thread seal.

**FIGURE 8-4**



6. Reconnect the air line to the air spring.
7. See additional Air Spring Cautions and Warnings in the Important Safety Notice section of this publication prior to deflating or inflating the air system.
8. Reconnect the linkage assembly(s) to height control valve arm(s) to inflate the suspension.
9. Inflate the suspension slowly and verify that the air spring bladder inflates uniformly without binding.
10. Remove the frame safety stands.
11. Verify proper ride height. Refer to the Alignment & Adjustments section of this publication.
12. Remove the wheel chocks.

### STANDARD SHOCK ABSORBER — HAS & HAS 40 LH

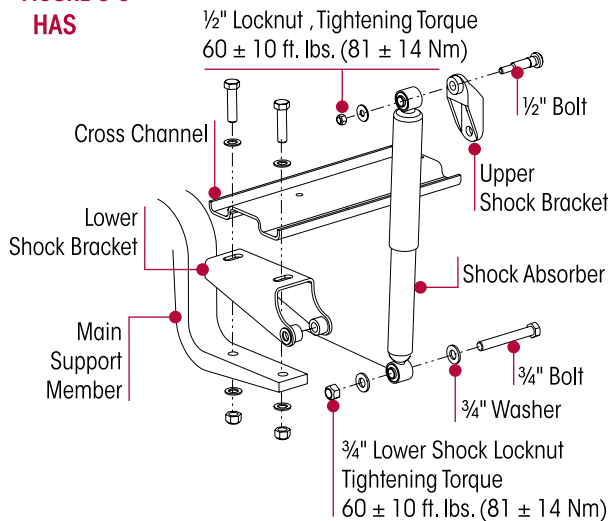
**NOTE** It is not necessary to replace shock absorbers in pairs if one (1) shock absorber requires replacement.



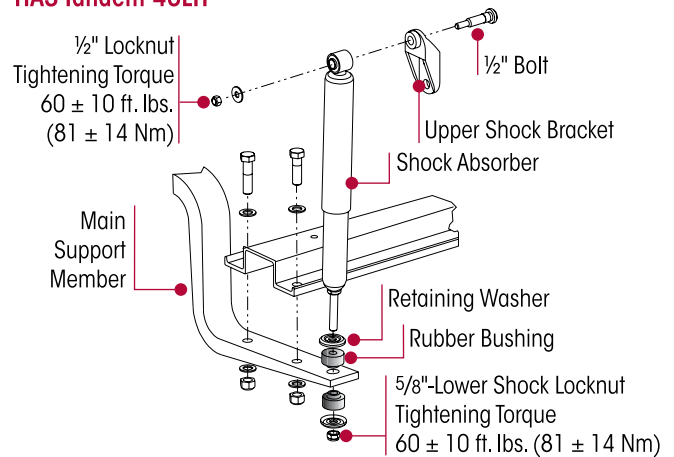
**WARNING** THE SHOCK ABSORBERS ARE THE REBOUND TRAVEL STOPS FOR THE SUSPENSION. ANYTIME THE AXLE ON A COMFORT AIR SUSPENSION IS SUSPENDED IT IS MANDATORY THAT THE SHOCK ABSORBERS REMAIN CONNECTED. FAILURE TO DO SO CAN CAUSE THE AIR SPRINGS TO SEPARATE FROM THE PISTON AND RESULT IN PREMATURE AIR SPRING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

**NOTE** The HAS and HAS Tandem 40LH are equipped with different shock absorber designs. The HAS Tandem 40LH is equipped with a lower stem mount design, see Figure 8-5

**FIGURE 8-5  
HAS**



**HAS Tandem 40LH**



### DISASSEMBLY

1. Chock the wheels of the vehicle.
2. Remove the shock absorber:
  - **HAS TANDEM and SINGLE**, see Figure 8-5
    - a. Remove and discard the 3/4" fasteners from the lower shock bracket.
    - b. Slide the shock absorber out of the lower shock bracket.
    - c. Remove and discard the 1/2" locknut from the upper shock absorber mounting stud.



- **HAS 40LH**, see Figure 8-5
  - a. Remove and discard the  $\frac{5}{8}$ " lower locknut, retaining washer and rubber bushings from the shock absorber stud to the main support member.
  - b. Slide the shock absorber out of the main support member.
  - c. Remove and discard the  $\frac{1}{2}$ " locknut from the upper shock absorber mounting stud.
- 3. Remove the shock absorber from the upper shock bracket.
- 4. Inspect the shock absorber mounting bracket, main support member, and hardware for damage or wear, and replace as necessary, see the Preventive Maintenance section of this publication.

## ASSEMBLY

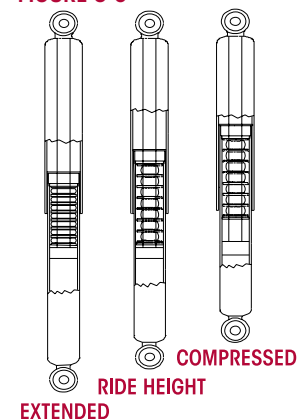
1. Install the shock absorber onto the upper mounting stud.
  - **HAS Tandem and Single**
    - a. Install the  $\frac{1}{2}$ " fasteners on the upper shock absorber mounting stud.
    - b. Install the  $\frac{3}{4}$ " fasteners through the lower shock mount and lower shock bracket.
    - c. Tighten the upper and lower locknuts to  $\mathbb{R}$  60 ± 10 foot pounds torque, see Figure 8-5.
  - **HAS 40LH**
    - a. Install the shock absorber into the upper shock absorber bracket. Install and snug the  $\frac{1}{2}$ " fasteners, **DO NOT** tighten to torque at this time.
    - b. On the lower shock absorber stud, install the retaining washer and rubber washer, then place through main support member, see Figure 8-5.
    - c. Below the main support member, on the shock absorber stud install the rubber washer, retaining washer and  $\frac{5}{8}$ " locknut, see Figure 8-5. Tighten the  $\frac{5}{8}$ " locknut to  $\mathbb{R}$  60 ± 10 foot pounds torque, see Figure 8-5.
    - d. Tighten the  $\frac{1}{2}$ " upper shock absorber fasteners to  $\mathbb{R}$  60 ± 10 foot pounds torque, see Figure 8-5.
2. Remove the wheel chocks.

## EDGE HI-TORQUE SHOCK ABSORBER (if equipped)

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.

- 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 rebound spring inside, which limits rapid shock extension during acceleration. HI-TORQUE shocks control torque induced frame rise, see Figures 8-6 to 8-8 and help to reduce driveline vibration.

FIGURE 8-6



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 8-7

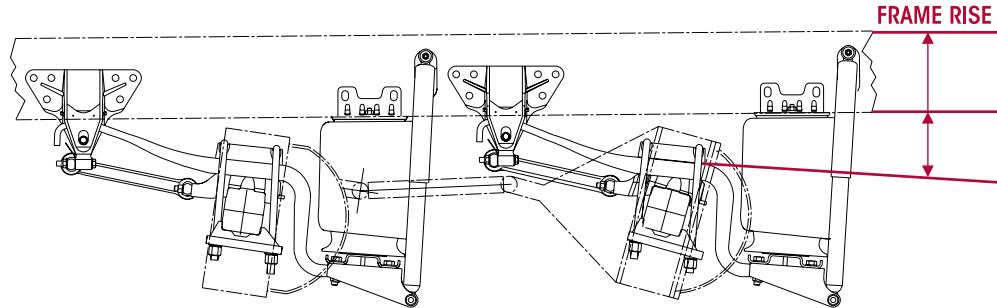
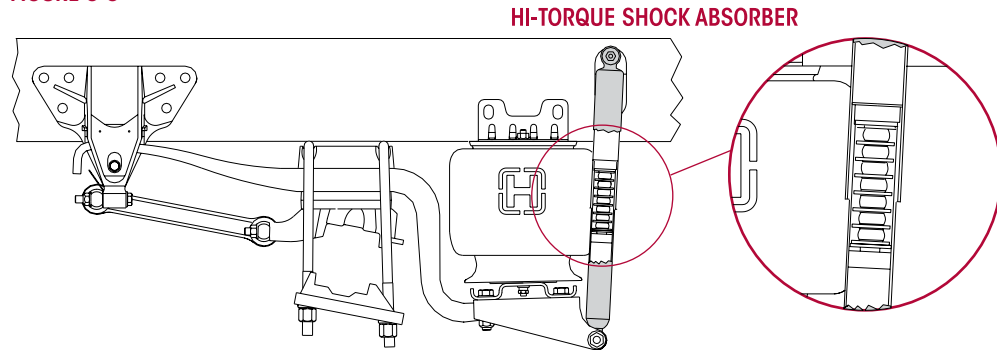


FIGURE 8-8



## 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 front wheels.

### WARNING

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

2. Support the frame with safety stands.
3. Disconnect the height control valve arm from the linkage assembly.

### 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 air system.
5. Lower the height control valve arm to exhaust the air in the air springs and deflate the rear suspension.
6. Remove and discard the  $\frac{3}{4}$ " fasteners from the lower shock bracket.
7. Slide the shock absorber out of the lower shock bracket.
8. Remove and discard the  $\frac{1}{2}$ " locknut from the upper shock absorber mounting stud.
9. Remove shock absorber.

## 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.

1. Install the shock absorber onto the upper mounting stud.



2. Install the ½" fasteners on the upper shock absorber mounting stud.
3. To facilitate installation, raise the suspension slightly with a floor jack to align with the lower shock bracket hole.
4. Install the ¾" lower shock absorber fasteners into lower shock bracket.
5. Tighten the upper and lower locknuts to  $\boxed{3}$  60 ± 10 foot pounds torque, see Figure 8-5.
6. Lower the suspension and remove floor jack.
7. See additional Air Spring Cautions and Warnings in the Important Safety Notice section of this publication prior to deflating or inflating the air system.
8. Reconnect the linkage assembly to height control valve arm to inflate the suspension.
9. Inflate the suspension slowly and verify that the air spring bladder inflates uniformly without binding.

---

**NOTE**

The shock absorber will extend with suspension when it is lowered.

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10. Remove the frame safety stands.
11. Remove the wheel chocks.

## UPPER SHOCK ABSORBER BRACKET

### DISASSEMBLY

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**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 (if equipped)

### ■ HAS Tandem and Single Only

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**NOTE**

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

---

### DISASSEMBLY

1. Chock the front wheels.

**WARNING**

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

2. Support the frame with safety stands.

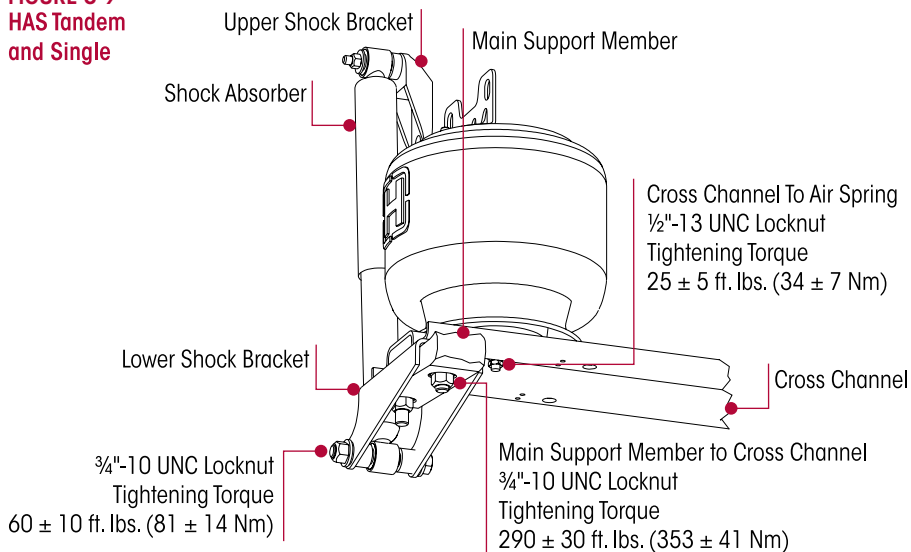
**WARNING**

3. Disconnect the height control valve arm from the linkage assembly.

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 air system.
5. Lower the height control valve arm to exhaust the air in the air springs and deflate the rear suspension.
6. On the side being serviced, remove the lower air spring fasteners.
7. Remove the  $\frac{3}{4}$ " bolt from the lower shock mount, see Figure 8-9.

**FIGURE 8-9**  
HAS Tandem  
and Single



8. Remove the air lines from the air springs and compress to facilitate removal of the lower shock bracket.
9. Slide the shock absorber out of the lower shock bracket.
10. Remove and discard the  $\frac{3}{4}$ " fasteners that connect the cross channel and lower shock bracket to the main support member assembly on the side being serviced.
11. Use a floor jack under the center of the cross channel and raise the cross channel slightly to facilitate removal of the lower shock bracket.
12. Remove the lower shock bracket.

### ASSEMBLY

1. Install the lower shock absorber mounting bracket over the end of the main support member.
2. Lower the cross channel on top of the main support member and the lower shock absorber mounting bracket.
3. Loosely install the two (2)  $\frac{3}{4}$ " bolt and washer through the cross channel holes, lower shock bracket and main support member on each end of the cross channel, see Figure 8-9.
4. Install  $\frac{3}{4}$ " fasteners on the cross channel bolts. Tighten the cross channel fasteners to  $\mathbb{R}$   $290 \pm 30$  foot pounds torque.
5. Slide the shock absorber lower mount into the lower shock absorber mounting bracket.
6. Install the  $\frac{3}{4}$ " fasteners through the lower shock absorber mount and lower shock bracket. Tighten the fasteners to  $\mathbb{R}$   $60 \pm 10$  foot pounds torque, see Figure 8-9.
7. Reconnect the air lines to the air springs.

8. See additional Air Spring Cautions and Warnings in the Important Safety Notice section of this publication prior to deflating or inflating the air system.
9. Reconnect the linkage assembly(s) to height control valve arm(s) to inflate the suspension.
10. Remove the frame supports.
11. Verify proper ride height. Refer to the Alignment & Adjustments section of this publication.
12. Remove the wheel chocks.

## CROSS CHANNEL

### DISASSEMBLY

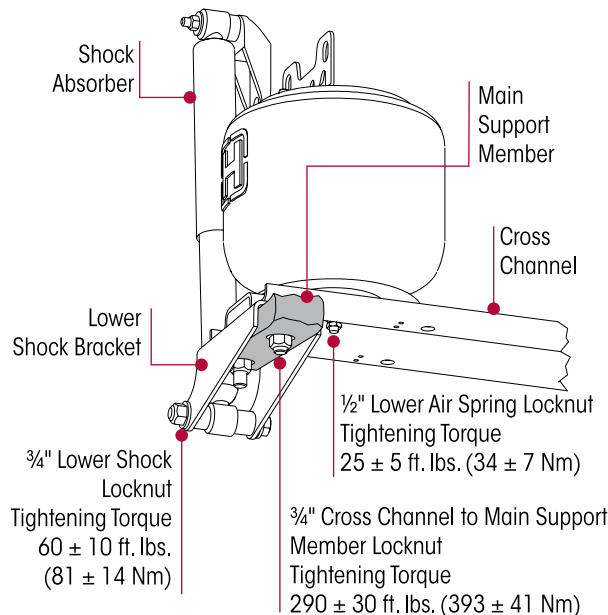
1. Chock the front wheels.
2. Raise the frame of the vehicle at ride height and support with safety stands.



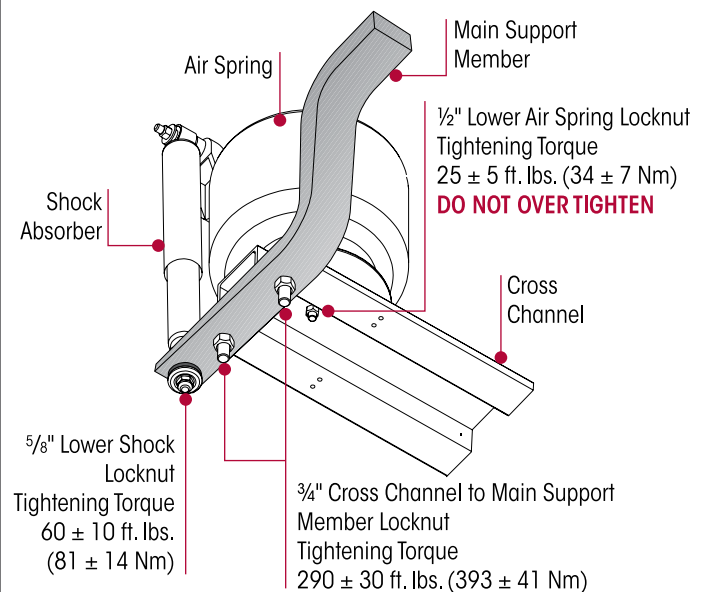
THE VEHICLE MUST BE FIRMLY SUPPORTED WITH SAFETY STANDS PRIOR TO SERVICING. FAILURE TO DO SO CAN RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE.

3. Remove the air springs as detailed in the Air Spring in this section.
4. Remove the height control valve lower linkage bracket as detailed in Height Control Valve in this section.
5. Remove and discard lower shock fasteners, see Figure 8-10.
6. Remove and discard the four (4) 3/4" bolts from the cross channel to main support member, see Figure 8-10.
7. Remove the cross channel.

**FIGURE 8-10**  
**HAS Tandem and Single**



**HAS Tandem 40LH**



### ASSEMBLY

1. Install the cross channel:


#### HAS Tandem and Single

- a. Place the cross channel on top of the lower shock bracket and main support member.
- b. Loosely install the two (2) 3/4" bolts through the cross channel holes, lower shock bracket and main support member for each side of the cross channel, see Figure 8-10.



- c. Install the lower shock absorber into the lower shock bracket. Refer to Lower Shock Absorber Bracket in this section.

#### HAS Tandem 40 LH

- a. Place cross channel on top of the main support member.
  - b. Loosely install the two (2) ¾" bolts through the cross channel holes and main support member for each side of the cross channel, see Figure 8-10.
  - c. Install the lower shock absorber. Refer to Shock Absorber in this section.
2. Tighten the ¾" cross channel fasteners to  290 ± 30 foot pounds torque, see Figure 8-10.
  3. Install the height control valve lower bracket to the cross channel. Refer to the Height Control Valve in this section.
  4. Install the air spring between the frame and cross channel. Refer to the Air Springs in this section.
  5. Connect the air line to the air spring.
  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.
  7. Reconnect the linkage assembly(s) to height control valve arm(s) to inflate the suspension.
  8. Remove the frame safety stands.
  9. Verify proper ride height. Refer to the Alignment & Adjustments section of this publication.
  10. Remove the wheel chocks.

### MAIN SUPPORT MEMBER & CLAMP GROUP (Vehicles equipped with Drum Brakes)

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.

#### DISASSEMBLY

#### NOTE

The replacement procedure is done on one side with the other main support member still attached.



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.

1. Chock the front wheels.



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

2. Support the frame with safety stands.
3. Disconnect the height control valve arm from the linkage assembly.



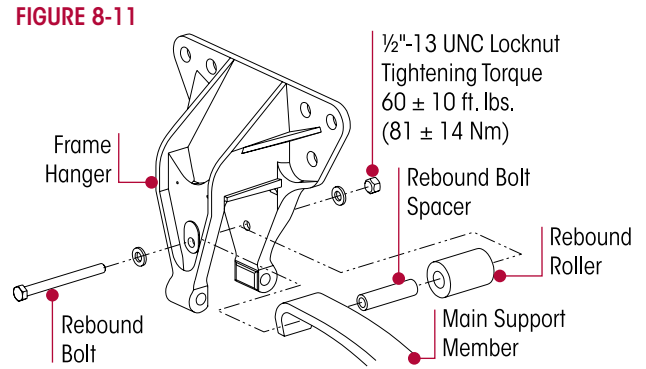
PRIOR TO AND DURING DEFLATION AND INFLATION OF THE AIR SUSPENSION SYSTEM, ENSURE THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR FROM UNDER THE VEHICLE AND AROUND THE SERVICE AREA, FAILURE TO DO SO CAN CAUSE SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

4. See additional Air Spring Cautions and Warnings in the Important Safety Notice section of this publication prior to deflating or inflating the air system.
5. Lower the height control valve arm to exhaust the air in the air springs and deflate the rear suspension.
6. Remove the air spring, see Air Spring in this section.
7. Remove the shock absorber, see Shock Absorber in this section.
8. Remove the cross channel, see Cross Channel in this section.

- Remove rebound bolt, locknut, washers, rebound bolt spacer and rebound roller from frame hanger, see Figure 8-11.

**WARNING**

DO NOT STRIKE SUSPENSION COMPONENTS WITH A HAMMER. DO NOT NICK OR GOUGE THE MAIN SUPPORT MEMBER. SUCH IMPROPER ACTIONS CAN CAUSE DAMAGE; THE MAIN SUPPORT MEMBER ASSEMBLY COULD FAIL AND CAUSE ADVERSE VEHICLE HANDLING AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.



- On the side being serviced, remove and discard the U-bolts and fasteners.
- Remove the axle bottom cap, spring seat spacer and top pad. Lift the back of the main support member assembly and remove the spring seat from under main support member. Lower the main support member onto the axle housing, see Figure 8-12.
- If equipped with a **HAS 40LH**, remove the lower shock absorber fasteners and discard, see Shock Absorber in this section.
- Remove the main support member assembly.

### ASSEMBLY

- Install the spring seat and spacer on top of the axle housing, see Figure 8-12.

**NOTE**

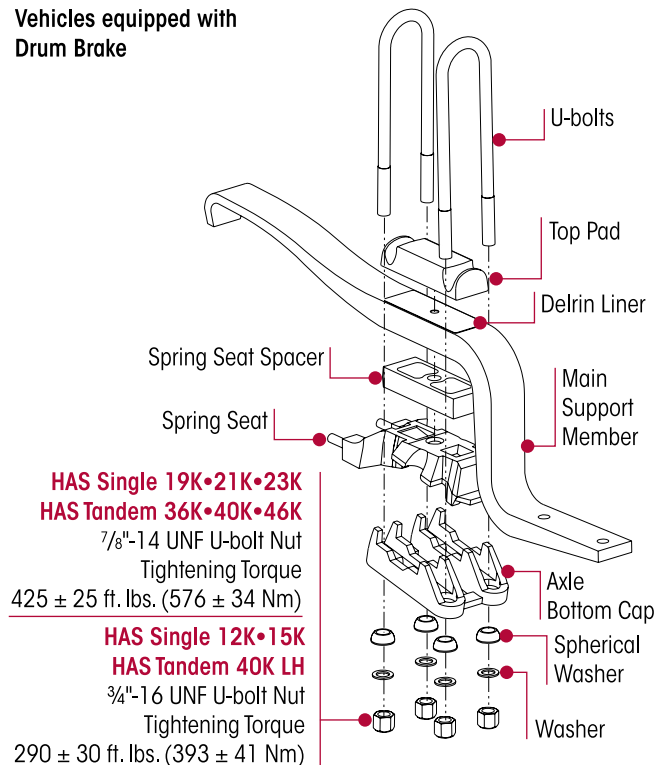
Ensure the torque rod mounting bolts of the spring seats are positioned toward the front of the vehicle.

- Lower the main support member assembly on the spacer and spring seat.
- Position the main support member assembly with the center locator piloting into hole in spring seat and spacer.
- Ensure to engage the alignment locator on the axle housing with the hole in the bottom of the spring seat.
- Install the top pad on the top of the main support member, see Figure 8-12.

**NOTE**

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

**FIGURE 8-12**  
Vehicles equipped with Drum Brake



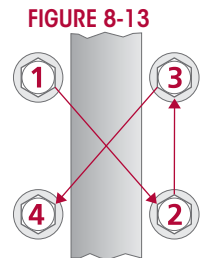
- Ensure the locator hole on the bottom of the top pad engages the main support locator holes. Verify the Delrin liner is positioned on the top of the main support member assembly.
- Install the **NEW** U-bolts, spherical washers and U-bolt fasteners, see Figure 8-12. Snug fasteners, **DO NOT** tighten at this time.

8. Verify the top pad and axle bottom cap are aligned properly.
9. Lower the air spring and cross channel onto the main support member.
10. Lower the frame so that the frame 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.
11. Install the cross channel fasteners to the main support member. Tighten the locknuts to 290 ± 30 foot pounds torque. Refer to Cross Channel in this section.

**WARNING**

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

12. Tighten the U-bolt locknuts evenly in 100 pound increments in the a criss-cross pattern to achieve uniform bolt tension, see Figure 8-13. Rap the top of the U-bolts with a dead blow mallet, and retighten to specified torque. **DO NOT** exceed specified torque on U-bolt locknuts.



- **HAS Single 19K•21K•23K | HAS Tandem 36K•40K•46K —**  
7/8"-14 UNF locknut, tighten to 425 ± 25 foot pounds torque.
- **HAS Single 12K•15K | HAS Tandem 40LH —**  
3/4"-16 UNF locknut, tighten to 290 ± 30 foot pounds torque,.

13. Install the rebound bolt, spacer, roller and fasteners in the frame hanger as shown in Figure 8-11. Tighten locknuts to 60 ± 10 foot pounds torque.
14. If equipped with a **HAS 40LH**, install the lower shock absorber fasteners that connect to the main support member, refer to Shock Absorber in this section.
15. See additional Air Spring Cautions and Warnings in the Important Safety Notice section of this publication prior to deflating or inflating the air system.
16. Reconnect the linkage assembly(s) to height control valve arm(s) to inflate the suspension.
17. Remove the frame safety stands.
18. Remove the wheel chocks.

## MAIN SUPPORT MEMBER, SINGLE LEAF SPRING & CLAMP GROUP (Vehicles equipped with Disc Brakes)

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.

### DISASSEMBLY

**NOTE**

The replacement procedure is done on one side with the other main support member still attached.

**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.

1. Chock the front wheels.

**WARNING**

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



2. Support the frame with safety stands.
3. Disconnect the height control valve arm from the linkage assembly.

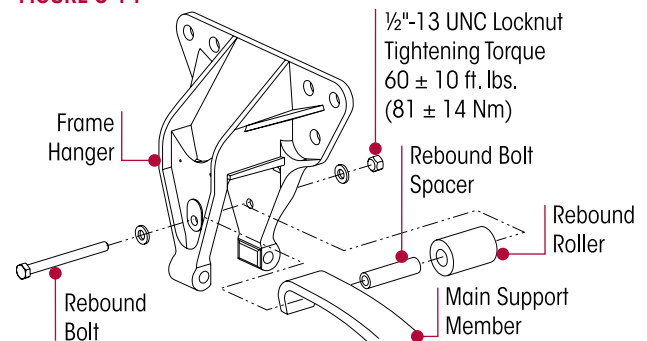
**WARNING**

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 air system.
5. Lower the height control valve arm to exhaust the air in the air springs and deflate the rear suspension.
6. Remove the air spring, see Air Spring in this section.
7. Remove the shock absorber, see the Shock Absorber disassembly in this section.
8. Remove the cross channel, see Cross Channel in this section.

**FIGURE 8-14**

9. Remove rebound bolt, locknut, washers, rebound bolt spacer and rebound roller from frame hanger, see Figure 8-14.


**WARNING**

DO NOT STRIKE SUSPENSION COMPONENTS WITH A HAMMER. DO NOT NICK OR GOUGE THE MAIN SUPPORT MEMBER. SUCH IMPROPER ACTIONS CAN CAUSE DAMAGE; THE MAIN SUPPORT MEMBER ASSEMBLY COULD FAIL AND CAUSE ADVERSE VEHICLE HANDLING AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

10. On the side being serviced, remove and discard the U-bolts and fasteners.
11. Remove the axle bottom cap and top cap from the main support member, see Figure 8-15.
12. Remove the main support member assembly.
13. Remove and discard the leaf spring fasteners connected to the frame hanger.
14. Remove the leaf spring.
15. Remove the spring seat spacer and spring seat from under the main support member.

**ASSEMBLY**

1. Install the spring seat and spacer on top of the axle housing, see Figure 8-15.
2. Ensure to engage the alignment locator on the axle housing with the hole in the bottom of the spring seat.
3. Install the single leaf spring, ensure the word **TOP** on the leaf spring is facing upward. Ensure the leaf spring locator pin pilots into the hole in the spring seat spacer, see Figure 8-15.
4. Install and snug the leaf spring fasteners to the frame hanger. **DO NOT** tighten to torque at this time.
5. Lower the main support member assembly onto the single leaf spring.
6. Ensure the center hole in the main support member aligns with the center locator pin in the single leaf spring, see Figure 8-15.
7. Install the top pad on the top of the main support member, see Figure 8-15.

**NOTE**

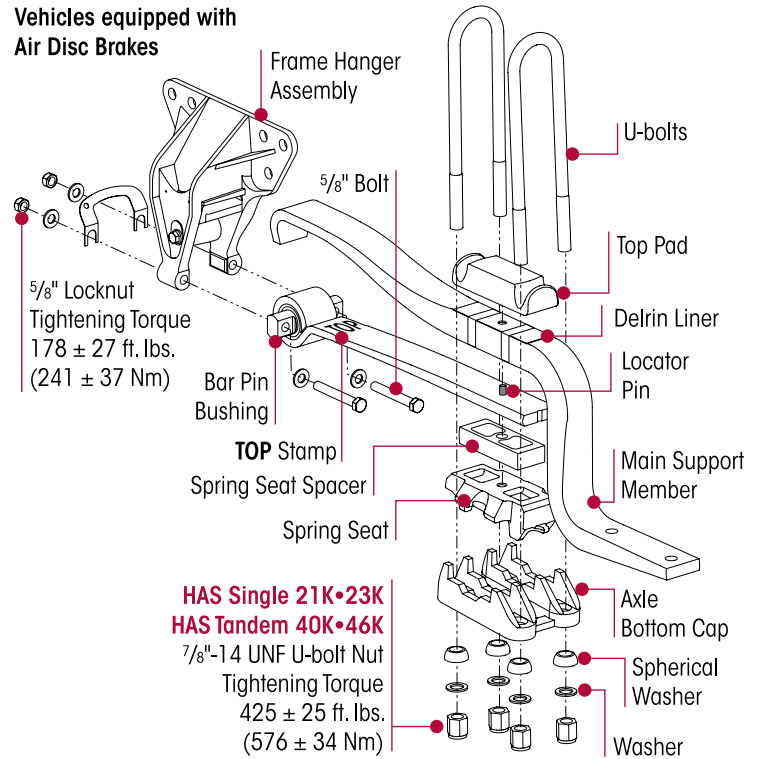
An arrow on the top pad and bottom cap should be facing toward the front of the vehicle.

8. Ensure the locator hole on the bottom of the top pad engages the main support locator holes. Verify the Delrin liner is positioned on the top of the main support member assembly.

9. Install the **NEW** U-bolts, spherical washers and U-bolt fasteners, see Figure 8-15. Snug fasteners, **DO NOT** tighten at this time.
10. Verify the top pad and axle bottom cap are aligned properly.
11. Lower the air spring and cross channel onto the main support member.
12. Lower the frame so that the frame 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.

**FIGURE 8-15**

Vehicles equipped with Air Disc Brakes



13. Install the cross channel fasteners to the main support member. Tighten the locknuts to 290 ± 30 foot pounds torque. Refer to Cross Channel in this section.

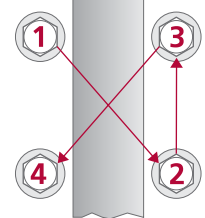
**WARNING**

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

14. Tighten the U-bolt locknuts evenly in 100 pound increments in the a criss-cross pattern to achieve uniform bolt tension, see Figure 8-16. Rap the top of the U-bolts with a dead blow mallet, and retighten to specified torque. **DO NOT** exceed specified torque on U-bolt locknuts.

- **HAS Single 21K•23K | Tandem 40K•46K**  
 $\frac{7}{8}$ "-14 UNF locknut, tighten to 425 ± 25 foot pounds torque.

**FIGURE 8-16**



15. Install the rebound bolt, spacer, roller and fasteners in the frame hanger as shown in Figure 8-16. Tighten locknuts to 60 ± 10 foot pounds torque.
16. See additional Air Spring Cautions and Warnings in the Important Safety Notice section of this publication prior to deflating or inflating the air system.
17. Reconnect the linkage assembly(s) to height control valve arm(s) to inflate the suspension.
18. Remove the frame safety stands.
19. Remove the wheel chocks.

## SPRING SEAT STUDS (if equipped)

**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.

**WARNING**

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

2. Support the frame with safety stands.
3. Disconnect the height control valve arm from the linkage assembly.

**WARNING**

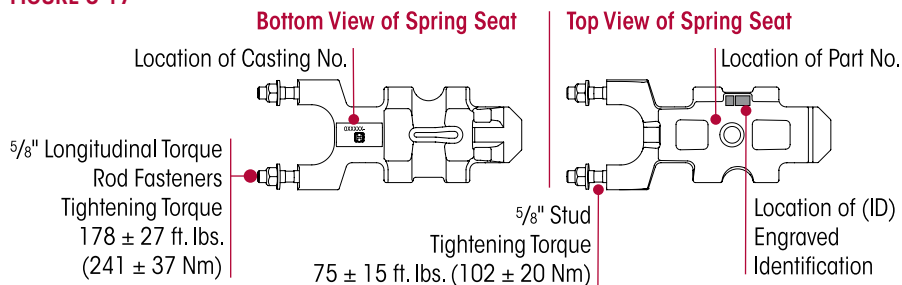
PRIOR TO AND DURING DEFLATION AND INFLATION OF THE AIR SUSPENSION SYSTEM, ENSURE THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR FROM UNDER THE VEHICLE AND AROUND THE SERVICE AREA, FAILURE TO DO SO CAN CAUSE SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

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

6. Remove the longitudinal torque rod fasteners and any alignment shims.
7. Remove the longitudinal torque rod.
8. Using a stud puller, remove the mounting studs from the spring seat, see Figure 8-17.

**FIGURE 8-17**

**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. Using a stud driver, tighten the stud to 75 ± 15 foot pounds torque, see Figure 8-17.
2. Install the torque rod, fasteners and any alignment shims that were removed.
3. Tighten the longitudinal torque rod fasteners to 178 ± 27 foot pounds torque, see Figure 8-17.
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. Reconnect the linkage assembly(s) to height control valve arm(s) to inflate the suspension.
6. Remove the frame safety stands.
7. Verify proper ride height. Refer to the Alignment & Adjustments section of this publication.
8. Remove the wheel chocks.

## FRAME HANGER ASSEMBLY

**NOTE** The frame hanger assemblies (Part Nos. 58425-001, 58688-001 and 59045-003) come equipped with the slipper pad and roll pins. Refer to the Parts List section in this publication.

### DISASSEMBLY

**NOTE** The frame hanger assembly replacement procedure is done on one side with the other frame hanger assembly still attached.

1. Chock the front wheels.

**WARNING**

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

2. Support the frame with safety stands.
3. Disconnect the height control valve arm from the linkage assembly.

**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.

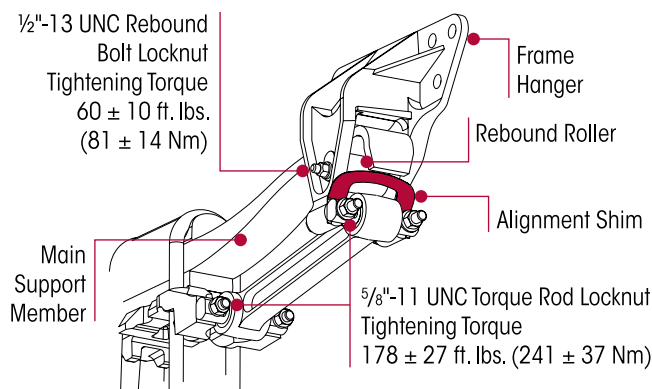
4. See additional Air Spring Cautions and Warnings in the Important Safety Notice section of this publication prior to deflating or inflating the air system.
5. Lower the height control valve arm to exhaust the air in the air springs and deflate the rear suspension.
6. Remove the rebound fastener, spacer and roller from the hanger, as equipped, see Frame Hanger Slipper Pads (Figures 8-19 to 8-21) in this section.

**NOTE** It might be necessary to raise or lower the frame in order to remove the longitudinal torque rod/single leaf spring fasteners.

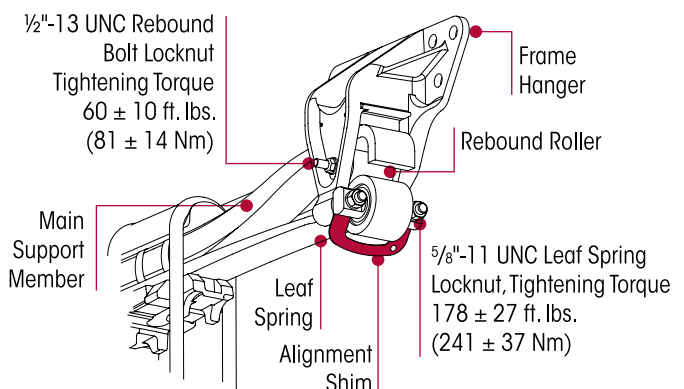
**SERVICE HINT** Prior to disassembly of the longitudinal torque rod / single leaf spring fasteners, note the orientation and quantity of torque rod shims, see Figure 8-18. It is required that the shims be installed in the same orientation and location as removed to preserve the existing alignment.

7. Disassemble frame hanger connection:
  - a. **Equipped with drum brakes** — remove and discard the longitudinal torque rod to frame hanger and spring seat fasteners and any alignment shims, see Figure 8-18. Remove the longitudinal torque rod.
  - b. **Equipped with air disc brakes** — remove and discard the single leaf spring fasteners and any alignment shims, see Figure 8-18.

**FIGURE 8-18**  
Equipped with Drum Brakes



**Equipped with Air Disc Brakes**



8. Raise and support the frame of the vehicle high enough to remove the load from the main support member.
9. Remove and discard the frame hanger to frame fasteners per the vehicle manufacturer's specifications.
10. 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.



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. Assemble frame hanger connection:
  - a. **Equipped with drum brakes** — install the longitudinal torque rod to the frame hanger and the spring seat. Install the fasteners and any alignment shims, see Figure 8-18.
  - b. **Equipped with air disc brakes** — install the single leaf spring fasteners and any alignment shims, see Figure 8-18.
6. Tighten all torque rod / single leaf spring fasteners to 178 ± 27 foot pounds torque, see Figure 8-18.
7. Install the rebound bolt, roller, spacer and fasteners in frame hanger and tighten to 60 ± 10 foot pounds torque, see Figure 8-18.
8. See additional Air Spring Cautions and Warnings in the Important Safety Notice section of this publication prior to deflating or inflating the air system.
9. Reconnect the linkage assembly(s) to height control valve arm(s) to inflate the suspension.
10. Remove the frame safety stands.
11. Verify proper ride height. Refer to the Alignment & Adjustments section of this publication.
12. Remove the wheel chocks.

### FRAME HANGER SLIPPER PADS

### NOTE

Refer to Hendrickson Selection Guide for slipper pad options and service kits in the Parts List section of this publication.

### YOU WILL NEED:

- Blunt end 1/8" punch

### DISASSEMBLY

1. Chock the front wheels.



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

2. Support the frame with safety stands.
3. Disconnect the height control valve arm from the linkage assembly.

**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.

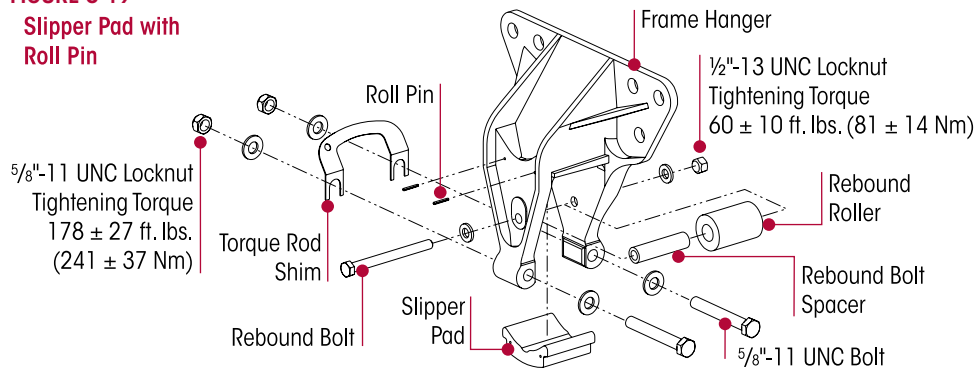
4. See additional Air Spring Cautions and Warnings in the Important Safety Notice section of this publication prior to deflating or inflating the air system.
5. Lower the height control valve arm to exhaust the air in the air springs and deflate the rear suspension.
6. In most cases removal of the rebound roller and spacer may be required to disassemble the slipper pad. Remove the rebound fasteners, rebound roller and spacer, see Figure 8-19.
7. 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.

**FRAME HANGER STYLE: SLIPPER PAD WITH ROLL PIN**

- a. Use a blunt end 1/8" punch to drive in the current roll pin until it has passed through the frame hanger leg to remove slipper pad with a screwdriver.

**FIGURE 8-19**

**Slipper Pad with Roll Pin**



**FRAME HANGER STYLE: SLIPPER PAD WITH RETAINING BRACKET**

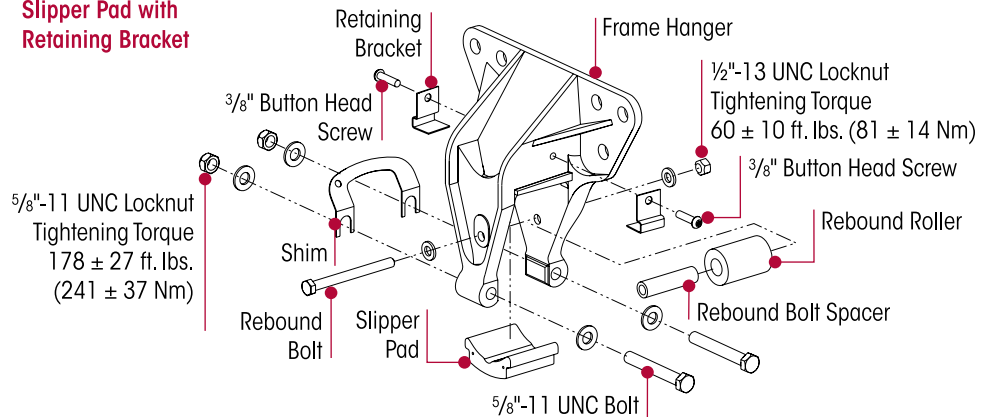
**SERVICE HINT**

In some cases the screws may require to be drilled through using 1 1/32" drill size.

- a. Remove the fasteners, (2)-3/8" hex head self-tapping screws, see Figure 8-20.

**FIGURE 8-20**

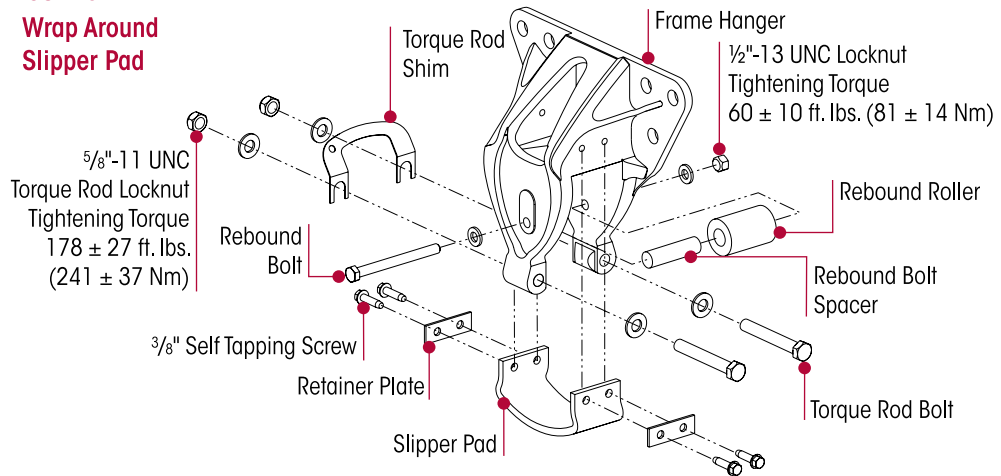
**Slipper Pad with Retaining Bracket**



**FRAME HANGER STYLE: WRAP AROUND SLIPPER PAD**
**SERVICE HINT**

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

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

**FIGURE 8-21**
**Wrap Around  
Slipper Pad**


8. Remove the slipper pad.

**ASSEMBLY**

1. Insert the new slipper pad.
2. Raise the main support member to secure slipper pad in place.
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. Reconnect the linkage assembly(s) to height control valve arm(s) to inflate the suspension.

**FRAME HANGER STYLE: SLIPPER PAD WITH ROLL PIN**

- a. Drive the new roll pin in place with a punch until flush with the front of frame hanger.

**FRAME HANGER STYLE: RETAINING BRACKET**

- a. Position the slipper pad and retainer bracket on frame hanger, tighten the hex head self-tapping screws to 25 foot pounds torque.

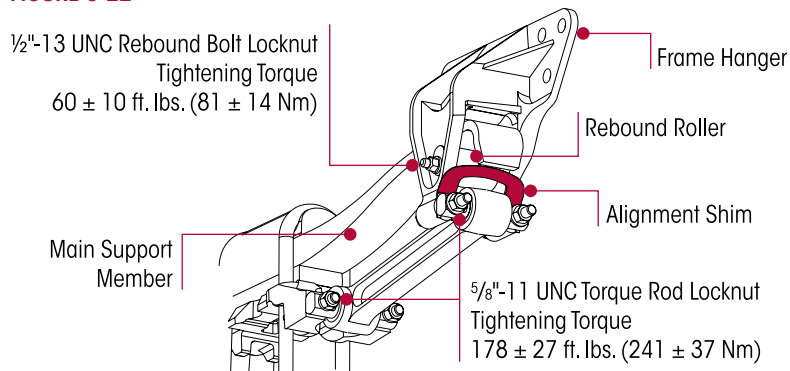
**FRAME HANGER STYLE: WRAP AROUND**

- a. Position the slipper pad and retainer plate on frame hanger, tighten the hex head self-tapping screws to 25 foot pounds torque.
5. Remove jack / pry bar from under cross channel.
6. Install the rebound roller bolt, spacer, roller and fasteners in the frame hanger and tighten to  $60 \pm 10$  foot pounds torque, see Figure 8-19.
7. Remove the frame safety stands.
8. Remove the wheel chocks.

## LONGITUDINAL TORQUE ROD (if equipped)

Torque rods are fixed length and use drop-in shims as shown in Figure 8-22 for suspension alignment adjustment.

**FIGURE 8-22**



### DISASSEMBLY

1. Chock the front wheels.



**WARNING**

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

2. Support the frame with safety stands.

### SERVICE HINT

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

3. Remove spring seat to longitudinal torque rod connection fasteners and discard, see Figure 8-22. Take note of any alignment shims.
4. Loosen (**DO NOT** remove) the rebound bolt fastener in the frame hanger.
5. Remove the frame hanger to longitudinal torque rod connection fasteners and any alignment shims. Discard fasteners.
6. Remove the longitudinal torque rod.
7. Inspect the mounting surfaces for any wear or damage, replace if necessary.
8. To replace torque rod bushings, refer to the Torque Rod Bushing in this section.

### ASSEMBLY

1. Position the new or re-bushed longitudinal torque rod and any alignment shims on the spring seat studs and hand tighten the fasteners.
2. Position longitudinal torque rod on the forward face of the frame hanger legs and install fasteners and any alignment shims. Tighten fasteners to  $\boxed{178 \pm 27}$  foot pounds torque, see Figure 8-22.
3. Tighten locknuts at axle end of torque rod to  $\boxed{178 \pm 27}$  foot pounds torque as shown in Figure 8-22.
4. Tighten rebound bolt locknuts to  $\boxed{60 \pm 10}$  foot pounds torque as shown in Figure 8-22.
5. Recheck alignment after torque rod is installed, see Alignment & Adjustments section of this publication.
6. Remove the wheel chocks.



## TRANSVERSE TORQUE ROD

### WARNING

THIS HENDRICKSON SUSPENSION REQUIRES TORQUE RODS FOR SUSPENSION PERFORMANCE AND VEHICLE STABILITY. IF THESE TORQUE RODS ARE DISCONNECTED OR ARE NON-FUNCTIONAL, DO NOT OPERATE THE VEHICLE. OPERATING A VEHICLE WITH DISCONNECTED OR NON-FUNCTIONAL TORQUE RODS CAN RESULT IN ADVERSE VEHICLE HANDLING, COMPONENT DAMAGE, SUSPENSION/VEHICLE DAMAGE, AND/OR SEVERE PERSONAL INJURY.

### DISASSEMBLY

1. Chock the wheels.

#### SERVICE HINT

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

2. Remove and discard the torque rod mounting fasteners.
3. Remove any shims.
4. Remove the transverse torque rod.
5. Inspect the mounting surfaces for any wear or damage. Repair or replace as necessary.

### ASSEMBLY

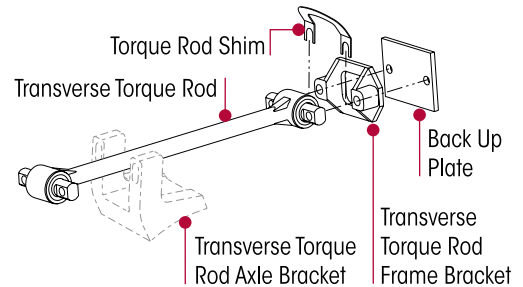
1. Install the transverse torque rod.
2. Install any shims in the same quantity and location that were removed to preserve the existing lateral alignment.
3. Install the new mounting fasteners per the vehicle manufacturer's instructions.

#### NOTE

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

4. Prior to tightening, ensure that the vehicle is at the proper ride height.
5. Tighten all fasteners to the required torque specification. Refer to vehicle manufacturer for specifications.
6. Check the lateral alignment. If not within vehicle manufacturer's specified range, a lateral alignment is necessary. See Lateral Alignment in the Alignment & Adjustments section of this publication.
7. Remove the wheel chocks.

**FIGURE 8-23**



## TORQUE ROD BUSHINGS

### DISASSEMBLY

#### You will need:

- A vertical press with a capacity of at least 10 tons
- A receiving, installation and removal tool, see the 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 8-24.
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.
4. When pressing in new bushings, overshoot desired final position by approximately  $\frac{3}{16}$ ", see Figure 8-25.
5. Press bushing again from opposite side to center bar pin within torque rod end, see Figure 8-26.
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.

FIGURE 8-24



FIGURE 8-25



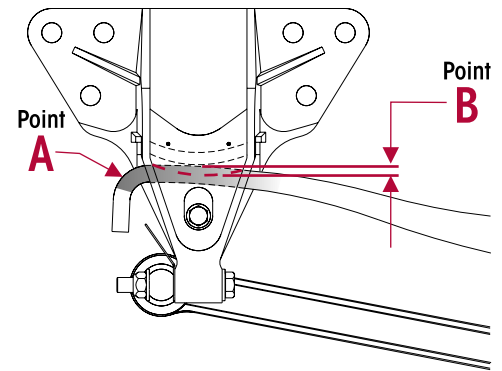
FIGURE 8-26



## AFTERMARKET HAS 46K PLUS

Hendrickson developed a service kit for the HAS 46K capacity suspension that enhances durability in logging and other severe service applications. When installed, the Service Kit No. 49175-024 upgrades the HAS 46K to an HAS 46K 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 installing the HAS 46K Plus service kit.

Service Kit No. 49175-024 and **new slipper pads** should be installed (see the Parts List section of this publication), in these applications if the HAS 46K main support member exhibits ⅜" or more wear at the frame hanger on the cam surface contact area, see Figure 8-27, Point **B**.

The HAS 46K Plus service kit includes the necessary components (with the exception of the slipper pads) to upgrade the HAS 46K for one axle. To upgrade the tandem (two axles), it will require two HAS 40K Plus service kits. Follow the Main Support Member component replacement instructions in this section to install the HAS 46K Plus service kit.

## OUTBOARD TO INBOARD SHOCK ABSORBER CONVERSION

### DISASSEMBLY

1. Chock the front wheels.

#### WARNING

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

2. Support the frame with safety stands.
3. Disconnect the height control valve arm from the linkage assembly.

#### 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 air system.
5. Lower the height control valve arm to exhaust the air in the air springs and deflate the rear suspension.
6. Remove the air springs. Follow the Air Spring in this section. **DO NOT** remove the air fittings from the air springs.

### NOTE

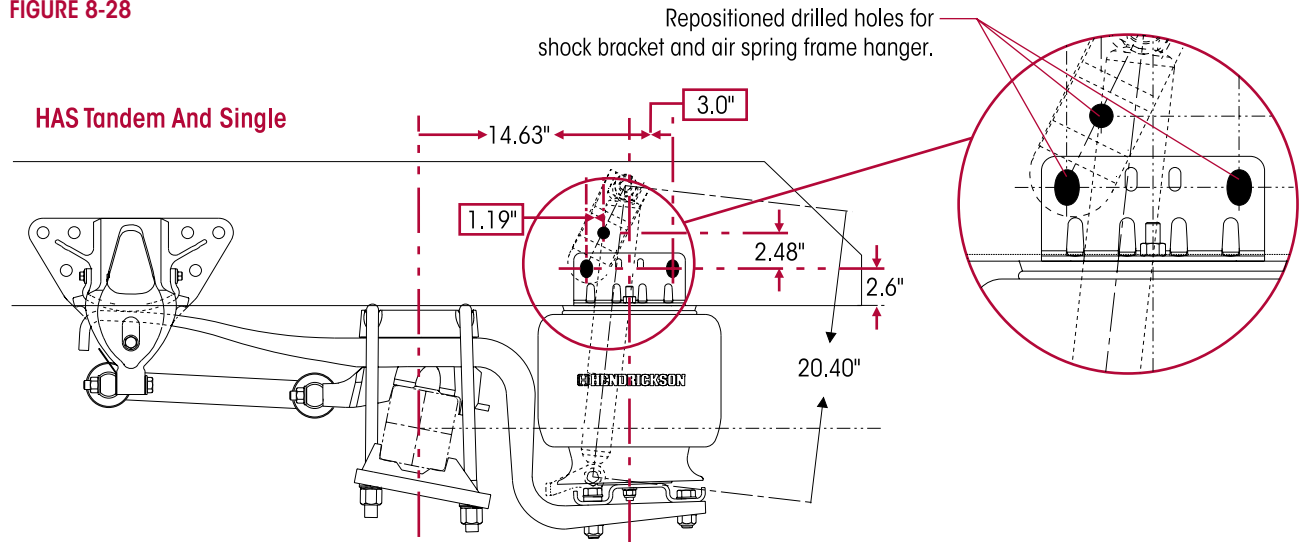
If the height control valve is located at the rear axle or it is a single axle it is necessary to disconnect the bottom of the leveling valve rod.

7. Remove the rear shock absorbers. See Upper Shock Bracket in this section.
8. Remove the ¾" fasteners that connect the cross channel and lower shock bracket to the main support members.
9. Remove the 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 8-28.
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 8-28.

**FIGURE 8-28**



3. Install the new cross channel/inboard shock bracket assembly. For the proper service kit number, see Table 8-1, or contact Hendrickson at truckparts@hendrickson-intl.com.

**TABLE 8-1**

HAS INBOARD SHOCK ABSORBER	
Mounting Service Kit No.	Main Support Member Mounting Center
57784-001	40"
57784-002	40.25"
57784-003	40.5"
57784-004	40.625"

5. Install the four cross channel fasteners bolts and torque to  $\boxed{290} \pm 30$  foot pounds.
6. Install the air spring, refer to the Air Spring Assembly, Steps 1-6, in this section.
7. 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 absorber bushing, four (4) washers per shock absorber.

8. Install the shock absorber and fastener. Tighten both upper and lower locknuts to  $\boxed{60} \pm 10$  foot pounds torque.
9. 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.
10. See additional Air Spring Cautions and Warnings in the Important Safety Notice section of this publication prior to deflating or inflating the air system.
11. Reconnect the linkage assembly(s) to height control valve arm(s) to inflate the suspension.
12. Remove the frame safety stands.
13. Verify proper ride height. Refer to the Alignment & Adjustments section of this publication.
14. Remove the wheel chocks.

## AFTERMARKET DUAL HEIGHT CONTROL VALVES

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

Prior to installing dual height control valves on the vehicle, Hendrickson strongly recommends the review the vehicle application and to authorization from the vehicle manufacturer and Hendrickson. Failure to do so will void component warranty. Upon authorization from both the Hendrickson and vehicle manufacturer, See Table 8-2 for the necessary components to add dual height control valves.

**TABLE 8-2**

HAS DUAL HEIGHT CONTROL VALVE COMPONENTS	
Part No.	Description
58994-000	Height Control Valve Assembly with mounting bracket
58994-000	Linkage Assembly
57430-000	Linkage Bracket

### INSTALLATION

1. Chock the front wheels.



**WARNING**

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

2. Support the frame with safety stands.
3. Disconnect the height control valve arm from the linkage assembly.



**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 air system.
5. Lower the height control valve arm to exhaust the air in the air springs and deflate the rear suspension.



**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.


6. 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.
7. 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.

8. 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.
9. Install a T-fitting (not provided) in the air supply line to the original height control valve.
10. Install and route a new air supply line from the T-fitting to the new height control valve intake port marked E/I.
11. Remove the opposite side air spring supply line from the original height control valve.
12. Plug the port on the original height control valve that the air spring supply line was removed from.
13. Route and install the air spring supply line into the port marked C1/C2 on the new height control valve.

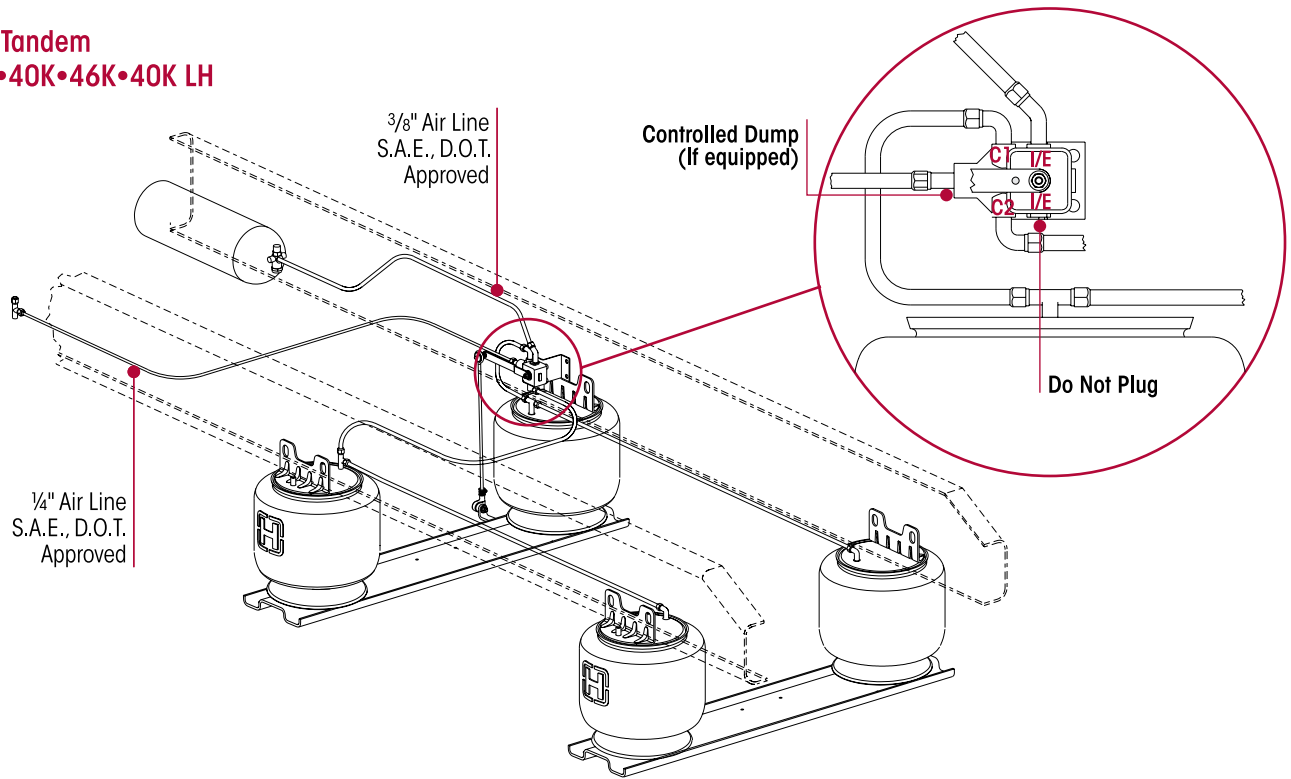


14. Plug the opposite port marked C2/C1 on the new height control valve.
15. If the vehicle is equipped with a cab dump valve, install a T-fitting into the dump switch supply line.
16. Install and route a new dump switch supply line from the T-fitting to the new height control valve dump port.
17. Install lower height control valve bracket to cross channel.
18. Connect the leveling valve link rod to the height control valve arm.
19. Connect the adjustable linkage joint to the height control valve linkage bracket and tighten the locknuts to  10 ± 2 foot pounds torque.
20. See additional Air Spring Cautions and Warnings in the Important Safety Notice section of this publication prior to deflating or inflating the air system.
21. Reconnect the linkage assembly(s) to height control valve arm(s) to inflate the suspension.
22. Remove the frame safety stands.
23. Verify proper ride height. Refer to the Alignment & Adjustments section of this publication.
24. Remove the wheel chocks.

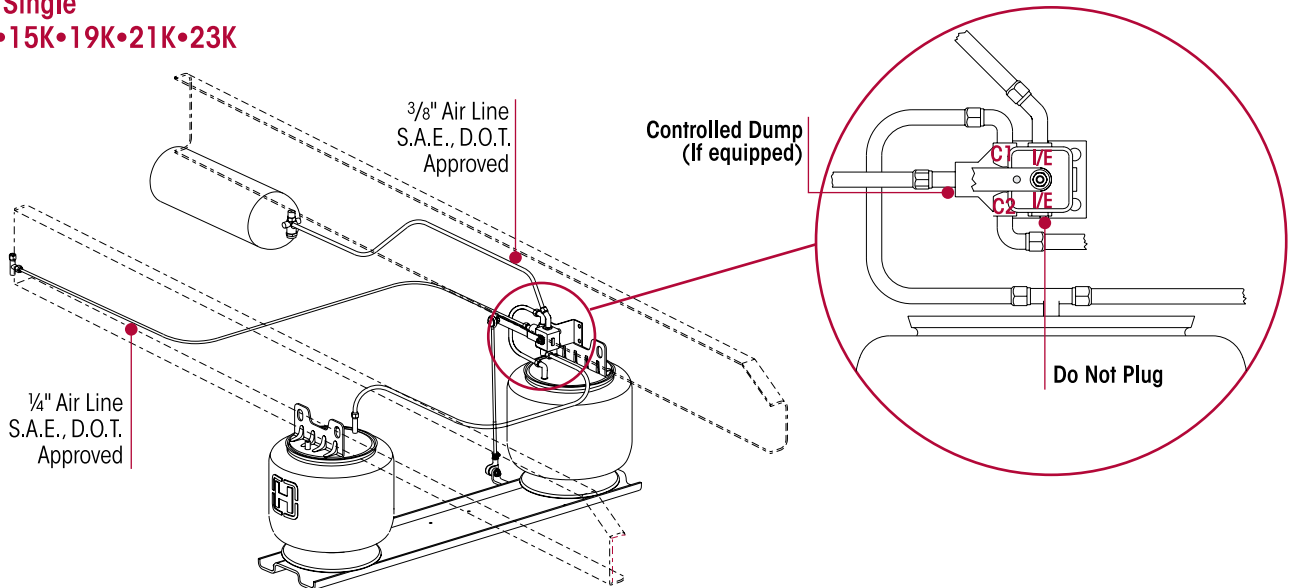


# SECTION 9 Plumbing Diagrams

## HAS Tandem 36K•40K•46K•40K LH



## HAS Single 12K•15K•19K•21K•23K

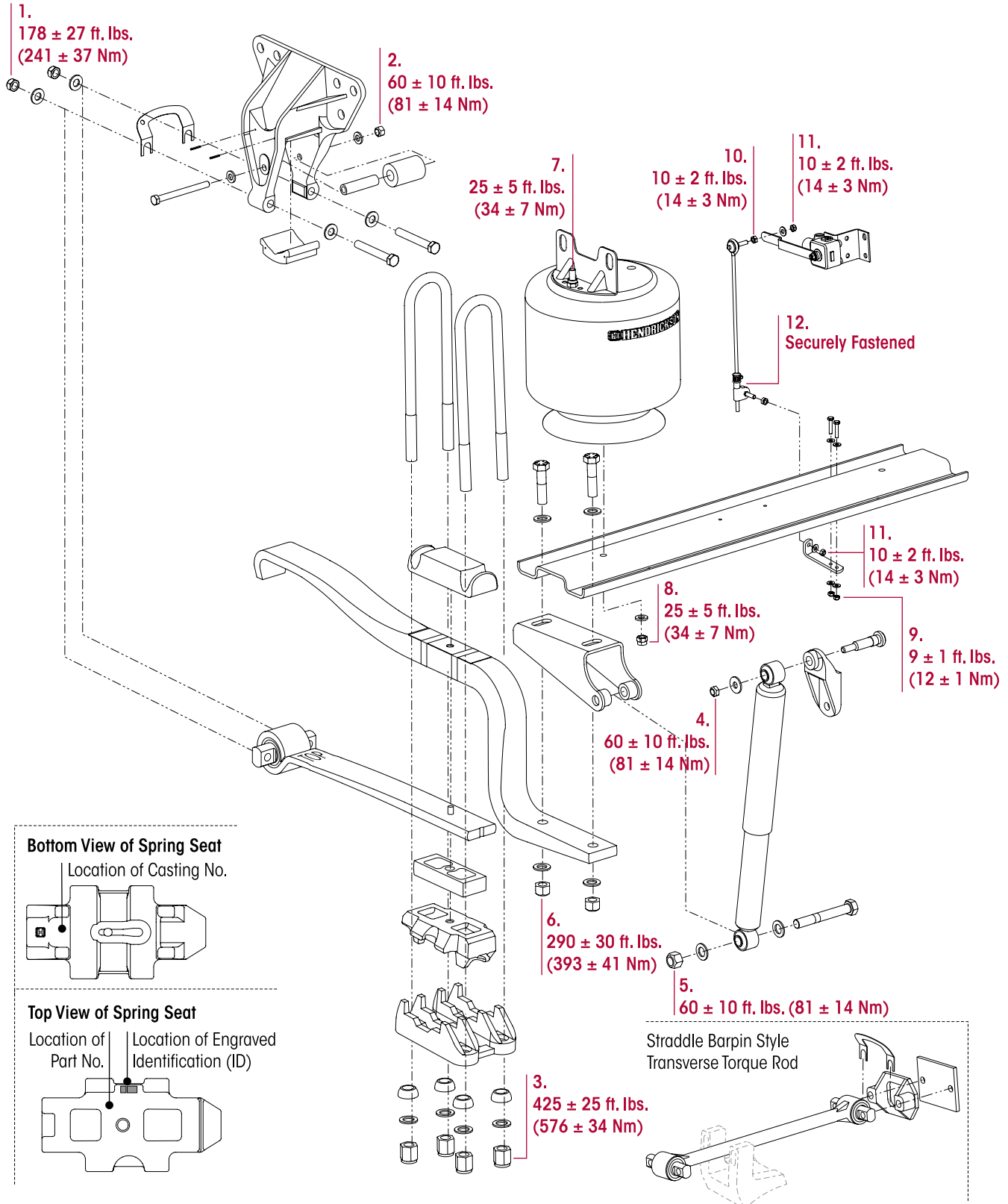


# SECTION 10 Torque Specifications

Hendrickson recommended torque values provided in Foot Pounds and in Newton Meters

HAS Single 21K • 23K | Tandem 40K • 46K

Vehicles equipped with Air Disc Brakes







## HAS Single 21K • 23K | HAS Tandem 40K • 46K

Vehicles equipped with Air Disc Brakes

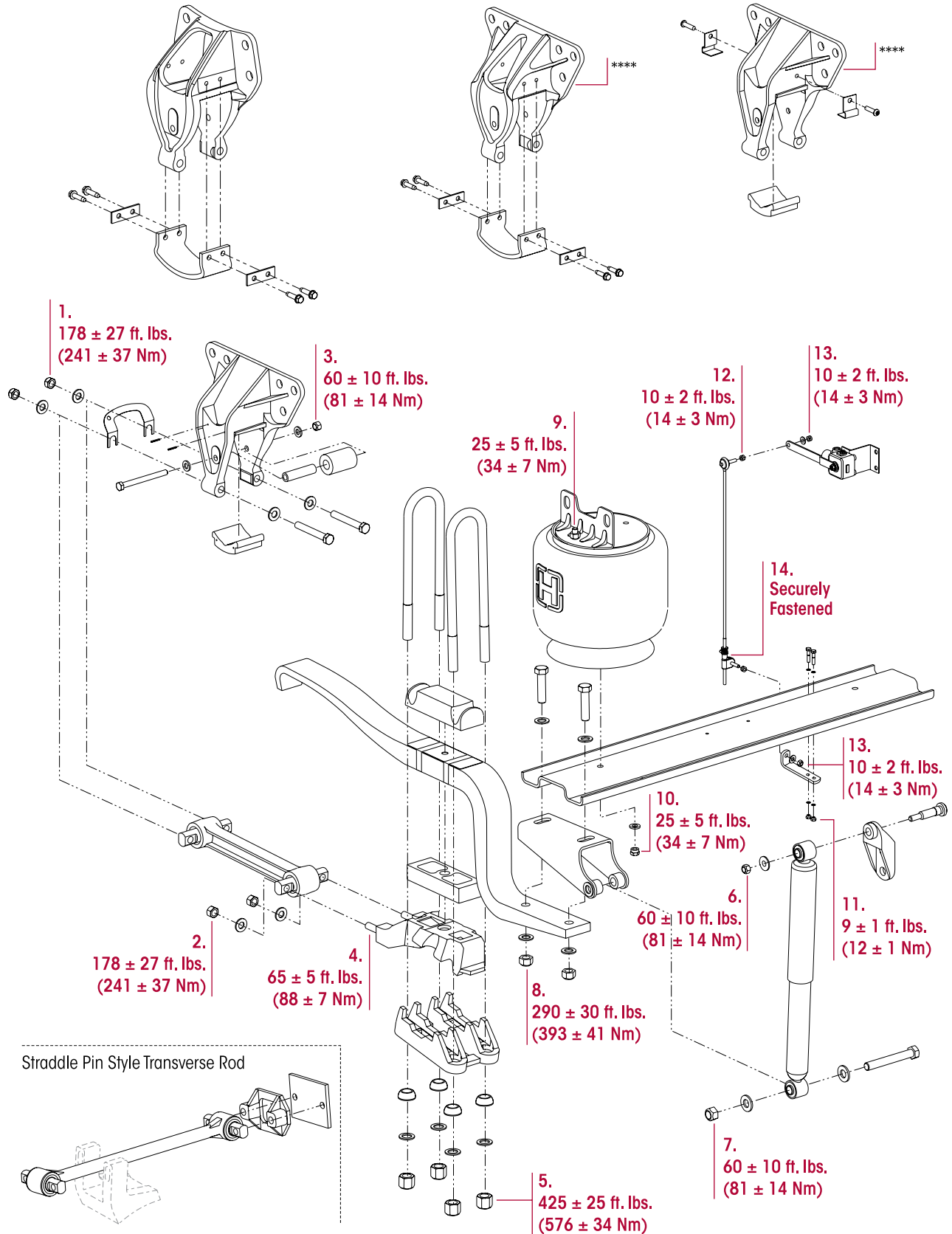
## HENDRICKSON RECOMMENDED TORQUE SPECIFICATIONS

NO.	COMPONENT	FASTENER		***TORQUE VALUE	
		*QUANTITY	**SIZE	FOOT POUNDS	NEWTON METER
Frame fasteners are furnished and installed by the vehicle manufacturer. Vehicle manufacturer may use an equivalent HUCK fastener at frame mount. See the vehicle manufacturer for torque requirements.					
1	Longitudinal Torque Rod Bar Pin Locknut to Frame Hanger	8	5/8"-11 UNC	178 ± 27	241 ± 37
2	Rebound Bolt Locknut	4	1/2"-13 UNC	60 ± 10	81 ± 14
3	U-bolt Locknut	16	7/8"-14 UNF	****425 ± 25	****576 ± 34
4	Upper Shock Absorber Locknut	4	1/2"-13 UNC	60 ± 10	81 ± 14
5	Lower Shock Absorber Locknut	4	3/4"-10 UNC	60 ± 10	81 ± 14
6	Cross Channel to Main Support Member Locknut	8	3/4"-10 UNC	290 ± 30	393 ± 41
7	Air Spring to Air Spring Frame Bracket	4	1/2"-13 UNC	25 ± 5	34 ± 7
8	Air Spring to Cross Channel	4	1/2"-13 UNC	25 ± 5	34 ± 7
9	Height Control Valve Bracket to Cross Channel	2	1/4"-20 UNC	9 ± 1	12 ± 1
10	Linkage Jam Nut	2	5/16"-18 UNC	10 ± 2	14 ± 3
11	Linkage to HCV	2	5/16"-18 UNC	10 ± 2	14 ± 3
12	Linkage Clamp	1		Securely Fastened	
<p><b>NOTE:</b> * Quantities specified are shown for tandem suspension. Adjust quantities for single suspensions.</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>*** 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>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 12K • 15K • 19K • 21K • 23K HAS TANDEM 36K • 40K • 46K

Vehicles equipped with Drum Brakes

Hendrickson recommended torque values provided in Foot Pounds and in Newton Meters





**HAS Single 12K•15K•19K•21K•23K**  
**HAS Tandem 36K•40K•46K**

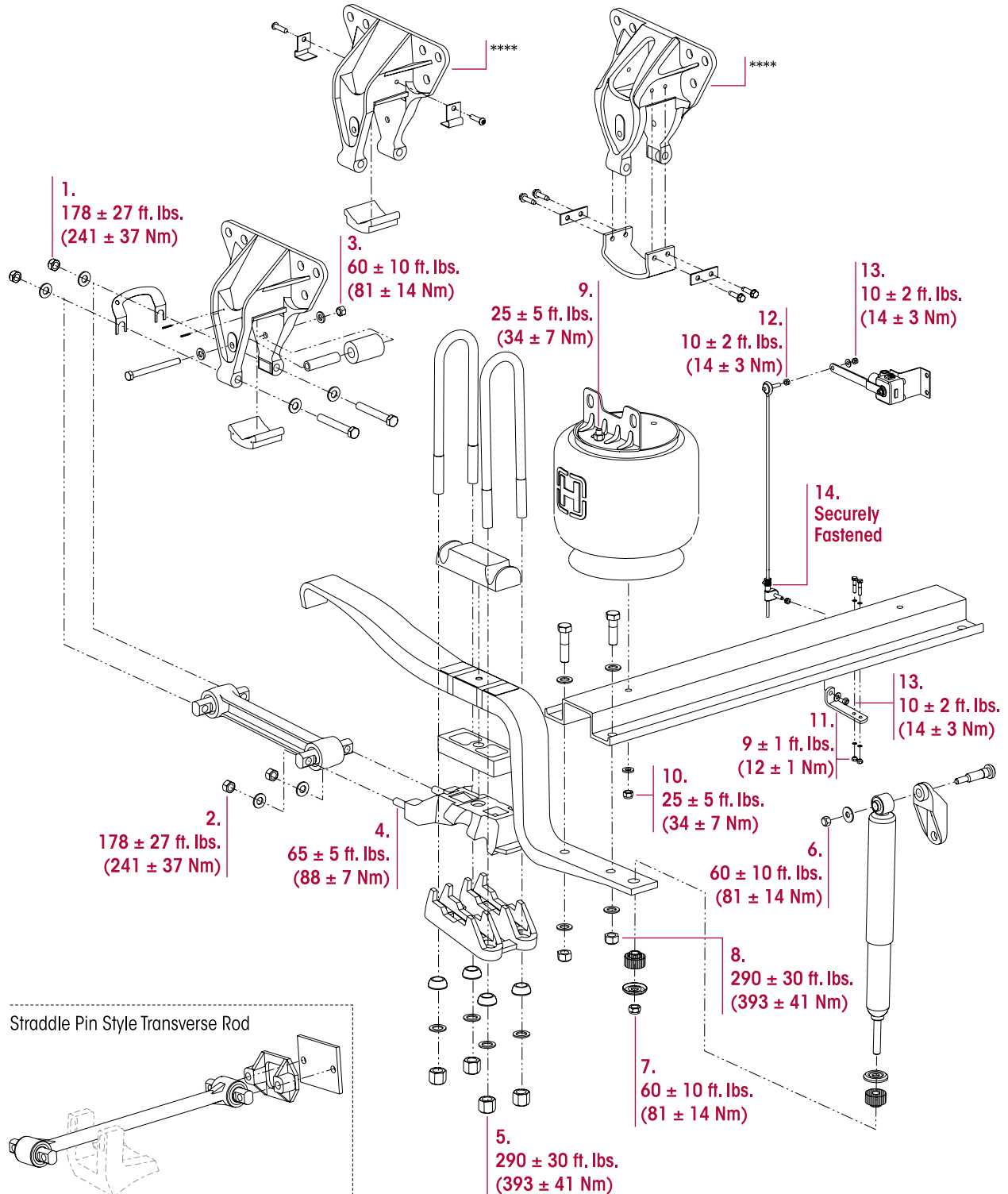
Vehicles equipped with Drum Brakes

**HENDRICKSON RECOMMENDED TORQUE SPECIFICATIONS**

NO.	COMPONENT	FASTENER			**TORQUE VALUE	
		QUANTITY		*SIZE	FOOT POUNDS	NEWTON METER
		SINGLE	TANDEM			
Frame fasteners are furnished and installed by the vehicle manufacturer. Vehicle manufacturer may use an equivalent HUCK fastener at frame mount. See the vehicle manufacturer for torque requirements.						
1	Longitudinal Torque Rod to:					
2	Frame Hanger	4	8	5/8"-11 UNC	178 ± 27	241 ± 37
3	Spring Seat					
3	Rebound Bolt Locknut	2	4	1/2"-13 UNC	60 ± 10	81 ± 14
4	Spring Seat Stud to Spring Seat	4	8	5/8"-11 UNC	65 ± 5	88 ± 7
5	U-bolt Locknut	8	16	7/8"-14 UNF	***425 ± 25	***576 ± 34
6	Upper Shock Absorber Locknut	2	4	1/2"-13 UNC	60 ± 10	81 ± 14
7	Lower Shock Absorber Locknut	2	4	3/4"-10 UNC	60 ± 10	81 ± 14
8	Cross Channel to Main Support Member Locknut	4	8	3/4"-10 UNC	290 ± 30	393 ± 41
9	Air Spring to Air Spring Frame Bracket	2	4	1/2"-13 UNC	25 ± 5	34 ± 7
10	Air Spring to Cross Channel	2	4	1/2"-13 UNC	25 ± 5	34 ± 7
11	Height Control Valve Bracket to Cross Channel	2	2	1/4"-20 UNC	9 ± 1	12 ± 1
12	Linkage Jam Nut	2	2	5/16"-18 UNC	10 ± 2	14 ± 3
13	Linkage to HCV	2	2	5/16"-18 UNC	10 ± 2	14 ± 3
14	Linkage Clamp	1	1		Securely Fastened	
<p><b>NOTE:</b> * 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>** 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>**** These frame hangers are obsolete, although replacement slipper pads and hardware are currently available.</p> <p>After the initial break-in period (up to 1,000 miles) all fasteners 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 Tandem 40KLH**  
Vehicles equipped with Drum Brakes

Hendrickson recommended torque values provided in Foot Pounds and in Newton Meters





## HAS Tandem 40K LH

## HENDRICKSON RECOMMENDED TORQUE SPECIFICATIONS

NO.	COMPONENT	FASTENER		**TORQUE VALUE	
		QUANTITY	*SIZE	FOOT POUNDS	NEWTON METER
Frame fasteners are furnished and installed by the vehicle manufacturer. Vehicle manufacturer may use an equivalent HUCK fastener at frame mount. See the vehicle manufacturer for torque requirements.					
1	Longitudinal Torque Rod Bar Pin Locknut to Frame Hanger	8	5/8"-11 UNC	178 ± 27	241 ± 37
2	Longitudinal Torque Rod Bar Pin Locknut to Spring Seat	8	5/8"-11 UNC	178 ± 27	241 ± 37
3	Rebound Bolt Locknut	4	1/2"-13 UNC	60 ± 10	81 ± 14
4	Spring Seat Stud to Spring Seat	8	5/8"-11 UNC	65 ± 5	88 ± 7
5	U-bolt Locknut	16	3/4"-16 UNF	290 ± 30	393 ± 41
6	Upper Shock Absorber Locknut	4	1/2"-13 UNC	60 ± 10	81 ± 14
7	Lower Shock Absorber Locknut	4	5/8"-18 UNF	60 ± 10	81 ± 14
8	Cross Channel to Main Support Member Locknut	8	3/4"-10 UNC	290 ± 30	393 ± 41
9	Air Spring to Air Spring Frame Bracket	4	1/2"-13 UNC	25 ± 5	34 ± 7
10	Air Spring to Cross Channel	4	1/2"-13 UNC	25 ± 5	34 ± 7
11	Height Control Valve Bracket to Cross Channel	2	1/4"-20 UNC	9 ± 1	12 ± 1
12	Linkage Jam Nut	2	5/16"-18 UNC	10 ± 2	14 ± 3
13	Linkage to HCV	2	5/16"-18 UNC	10 ± 2	14 ± 3
14	Linkage Clamp	1		Securely Fastened	
<p><b>NOTE:</b> * 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>** 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>**** These frame hangers are obsolete, although replacement slipper pads and hardware are currently available.</p> <p>After the initial break-in period (up to 1,000 miles) all fasteners 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

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



HAS

TROUBLESHOOTING GUIDE (continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
Suspension will not reach ride height	Suspension is overloaded	Redistribute the load to correct weight.
	Air Spring leaking or damaged	Replace the air spring.
	Leak in air system	Inspect the 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 Alignment & Adjustment Section for ride height inspection.
	Air line obstructed or improperly connected	Repair the air system and check the ride height. See the Alignment & Adjustment Section for ride height inspection.
	Height control valve dump port activated	Check the height control valve dump port for proper connection and function.
Air springs deflate when parked	Leak in air system	Inspect the 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 Alignment & Adjustment Section for ride height inspection.
	Malfunctioning height control valve	Replace the 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 the proper setting, refer to the Alignment and Adjustment section.
	Suspension is overloaded	Redistribute the load to correct weight.
	Frame Slope set incorrectly	Correct the frame slope, refer to the Alignment and Adjustment section.

Call Hendrickson at **1.866.755.5968** (toll-free) or **1.630.910.2800** for additional information.



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