

H[®] TECHNICAL PUBLICATION

HAS Tandem 400/402/460 Single 120/150/190/210/230

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SUBJECT: Service Instructions

DATE: January 1999 **REVISION:** C

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SUBJECT 1 INTRODUCTION

This publication is to acquaint and assist maintenance personnel in preventive maintenance and rebuild of the HAS Series Tandem and Single air series suspension system. The construction of the HAS Single air suspension is half of the HAS Tandem in appearance and in capacity as shown in Figures 1 and 2.

Note the date of this publication. Hendrickson Truck Suspension Systems periodically revises and updates all of its publications. If this copy is more than one year old, contact Hendrickson Truck Suspension Systems to determine if a later copy is available.

NOTE

Use only genuine Hendrickson parts for servicing this suspension system. Most Hendrickson parts can be identified by the  Hendrickson trademark.

Subject 2 IMPORTANT SAFETY NOTICE

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

There are various warnings and cautions that should be read carefully to minimize the risk of personal injury and to assure that proper methods are used. Improper servicing may damage the vehicle or render it unsafe in operation.

WARNING

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

DO NOT MODIFY OR REWORK PARTS. DO NOT USE SUBSTITUTE PARTS. USE OF A MODIFIED OR SUBSTITUTE PART IS NOT RECOMMENDED BECAUSE THE PART MAY NOT MEET HENDRICKSON'S SPECIFICATIONS, WHICH COULD RESULT IN FAILURE OF THE PART, LOSS OF VEHICLE CONTROL, AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

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

EXERCISE EXTREME CARE WHEN HANDLING OR PERFORMING MAINTENANCE IN THE AREA OF THE MAIN SUPPORT MEMBERS. DO NOT CONNECT ARC WELDING GROUND LINE TO THE MAIN SUPPORT MEMBERS. DO NOT STRIKE AN ARC WITH THE ELECTRODE ON THE MAIN SUPPORT MEMBERS. DO NOT USE HEAT NEAR THE MAIN SUPPORT MEMBERS. DO NOT NICK OR GOUGE THE MAIN SUPPORT MEMBERS. A MAIN SUPPORT MEMBER THAT HAS BEEN SUBJECTED TO ANY OF THESE CONDITIONS MAY FAIL, CAUSING LOSS OF VEHICLE CONTROL AND POSSIBLE PERSONAL INJURY OR PROPERTY DAMAGE.

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

Subject 3
DESCRIPTION

The HAS series suspensions are ideal for operations with diminishing loads, such as tankers and grocery operations, and where ride quality both empty and loaded is important.

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

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

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

All HAS Series suspensions are intended for installation on overall frame widths of 33.94" to 34.19", 34.5 to 34.81; axle dowel pin centers of 40.00" or 40.25"; and axle spacing of 52.00", 54.00", 60.00", or 72.5".

Figure 1
HAS Tandem

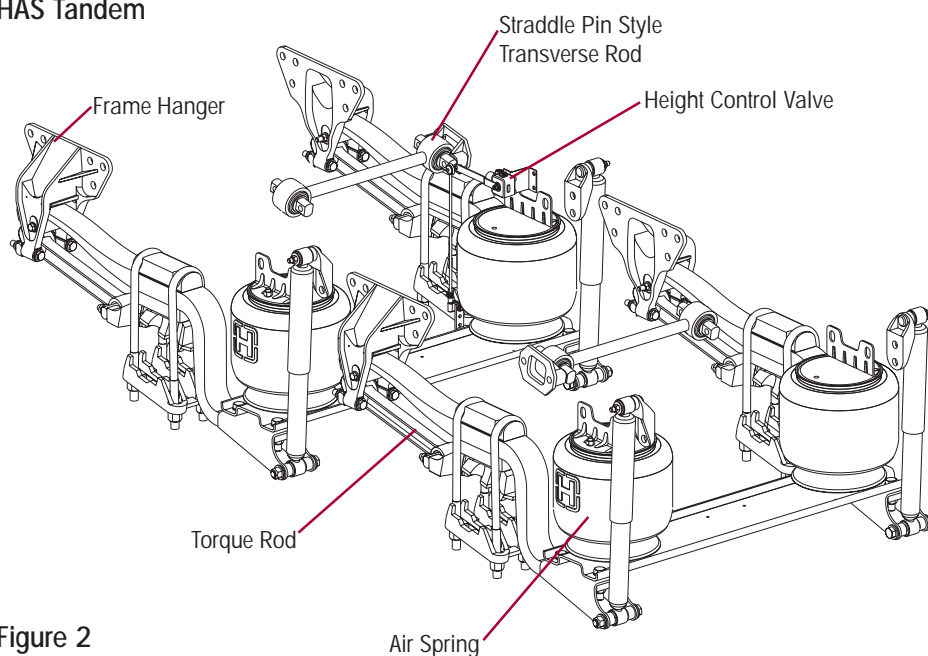
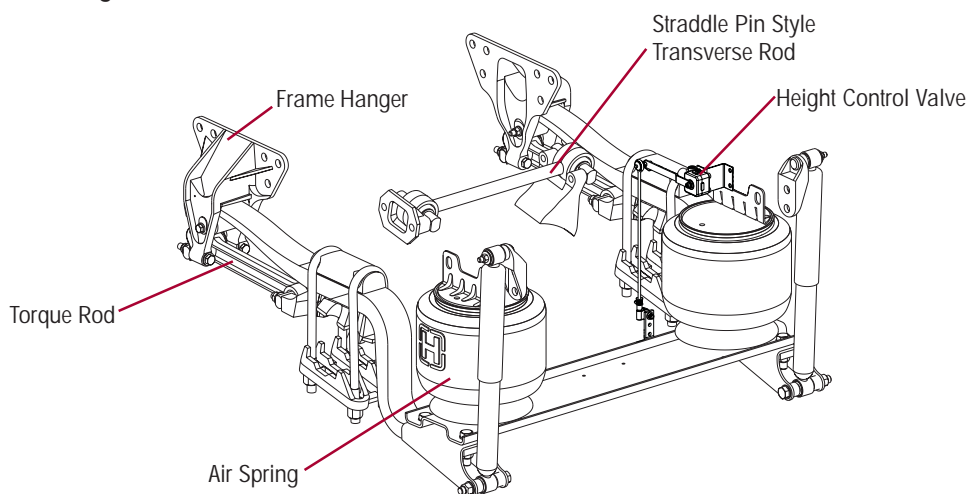


Figure 2
HAS Single Axle



Subject 3

DESCRIPTION (CONT.)

The design features include:

- constant ride height, empty and loaded
- one-piece cast nodular iron frame hangers, axle seats, and axle caps
- low frame height
- torque rods with premium rubber bushings
- no lubrication
- positive axle alignment through the use of drop-in shims

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 one degree less as compared to when the vehicle is fully loaded. This is because the main support members will deflect slightly under full load.

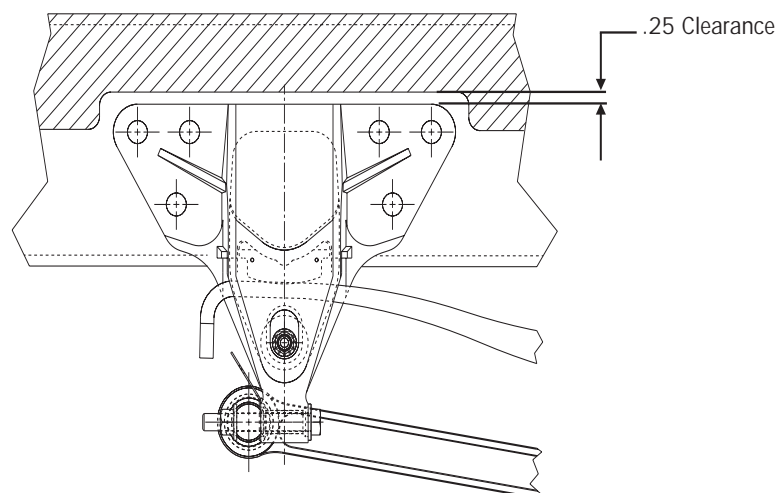
Because the HAS suspension allows a high degree of axle articulation, applications with low ride height hardware and low fifth wheels may allow the drive tires to interfere with the trailer floor during maximum articulation or when the quick release valve is actuated.

Subject 4

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. This is shown in Figure 3.

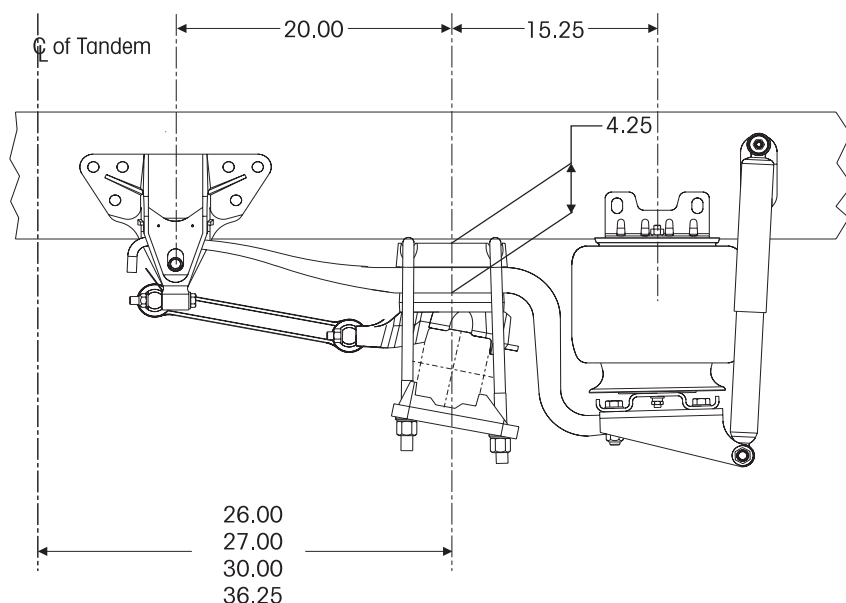
Figure 3



Subject 5
FRAME SLOPE

In most cases, the original vehicle manufacturer installs spring seats that are equal thickness on both the forward drive and the rear drive axles. These equal thickness spring seats are designed to have frames parallel to the ground which results in 0 degree frame slope. The intent is to maintain identical 4.25" main support member heights on the forward drive axle and the rear drive axle as shown in Figure 4. Maintaining these identical heights assures equal loading on both drive axles as well as correct axle pinion angles. If the chassis frame slope is in excess of one degree it may cause unequal loading between the two drive axles which may be detrimental to vehicle ride. If this condition persists contact the vehicle manufacturer for guidelines or proceed with the following recommendations:

Figure 4



1. If the frame slopes downward and toward the cab the front drive axle will, in all probability, weigh more than the rear drive axle.
2. If the frame slopes upward towards the cab the rear drive axle will be the heavier of the two.
3. If the tandem suspension is too low, it could be corrected by adding spacer plates to all four corners of the tandem drive axles between the main support members and the spring seats. Do not attempt to correct frame slope by adding spacer plates on only one drive axle. The spacer plates can be made from $\frac{1}{2}$ " x 3" x 7" low carbon steel with a $\frac{13}{16}$ " dia. hole drilled in the center for dowel clearance. A maximum of two $\frac{1}{2}$ " shop made spacer plates between each main support member and spring seat is permissible. Longer U bolts will be required to accommodate spacer plates. Hendrickson has 1" and 1 $\frac{1}{2}$ " thick spacers available as production items. A maximum of one 1" thick, or one 1 $\frac{1}{2}$ " thick spacer is permissible.
4. If frame slope is excessive (greater than what can be corrected for with a 1 $\frac{1}{2}$ " spacer) it should be corrected by the vehicle manufacturer.
5. If the tandem suspension is too high, the spacers can be removed (if so equipped), or the front steer axle suspension can be raised.
6. Do not make changes to the steering axle without prior approval and supervision of the O.E.M. as the steering geometry could be affected thus, causing steering problems.

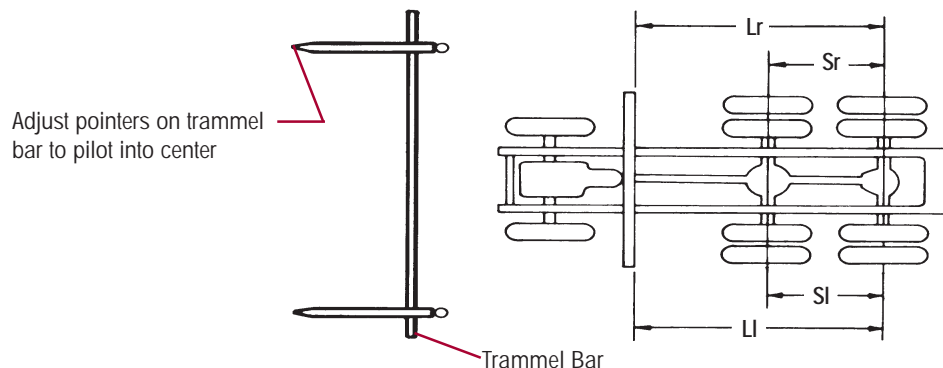
Subject 6

SUSPENSION ALIGNMENT

The following procedure should be performed after all repairs are completed and all suspension fasteners have been tightened to specified torque values.

1. Place tractor on level floor area. Free and center all suspension joints by slowly moving vehicle back and forth several times without using the brakes.
2. Chock front wheels and make sure tractor brakes are released.
3. Using "C" clamps, securely clamp a nine foot piece of STRAIGHT bar stock or angle iron across frame as shown in Figure 5. Select a location as far forward of forward drive axle as possible where components will not interfere. On some vehicles, lower frame flange may be preferred. Otherwise use upper frame flange.
4. Accurately square straight edge to frame using a carpenter's square.
5. Begin alignment by checking rear drive axle first. Use a trammel bar or its equivalent to measure from straight edge to center line of rear axle on both sides of vehicle as shown in Figure 5, LI and Lr. If both sides measure within $\frac{3}{16}$ " of being the same, alignment of rear drive axle is acceptable. If LI and Lr differ by more than $\frac{3}{16}$ ", first loosen rebound bolt locknut and then adjust rear drive axle by loosening up torque rod bar pin locknuts on frame hanger and add drop-in alignment shims as shown in Figure 6. Torque rod bar pin must always be mounted adjacent to forward face of frame hanger legs. No more than four shims may be used ($\frac{1}{4}$ " total thickness, maximum). Snug torque rod bar pin locknuts but do not torque to specification.
6. With rear drive axle properly aligned, front drive axle alignment can then be checked by measuring forward from rear drive axle center using a trammel bar as shown in Figure 5. If the forward drive axle spacing measurements differ by more than $\frac{1}{8}$ ", SI and Sr in Figure 5, make adjustments at forward frame hangers in a similar manner. Snug torque rod bar pin locknuts or torque rod clamp bolt locknuts.
7. Following alignment of both axles, move vehicle back and forth several times prior to removing straight edge from frame, and recheck alignment to confirm adjustments. Tighten torque rod bar pin locknuts to 150 to 205 foot pounds, and tighten rebound bolt locknuts to 50 to 70 foot pounds, as shown in Figure 12.

Figure 5



Subject 7
**PREVENTIVE
MAINTENANCE**

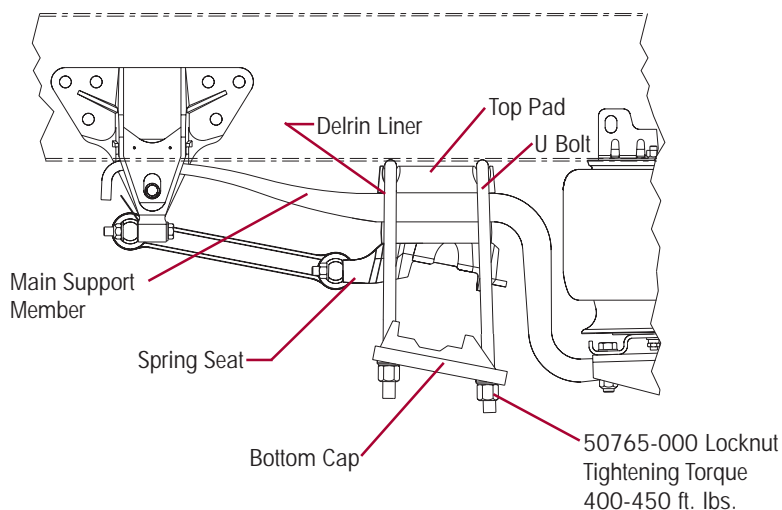
MAIN SUPPORT MEMBERS

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, premature wear can occur and will require the replacement of one or both pads. A main support member should be replaced if it exhibits $\frac{3}{8}$ " or more wear at the frame hanger cam surface contact area.

U BOLT LOCKNUTS

Retighten to 400 to 450 foot pounds torque, as shown in Figure 6 after first 1,000 miles of service on new vehicle or vehicle with serviced axle attachment assembly, and then at regular intervals as experience dictates, not to exceed 20,000 mile intervals. **Do not exceed specified torque on U bolt locknuts.**

Figure 6



RIDE HEIGHT CONTROL VALVE SETTING

Adjustment of the ride height control valve linkage can be achieved by loosening the threaded extension arm fasteners and turning the ends, or by loosening the extension arm locknut and repositioning the arm within the elongated hole in the arm as shown in Figure 7. All four main support members should have the same height of 4.25" as

Figure 7

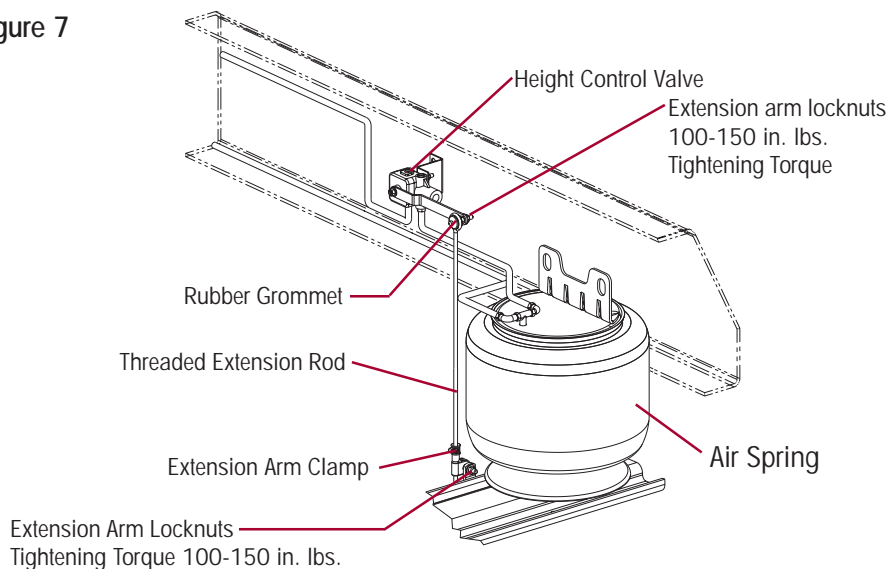
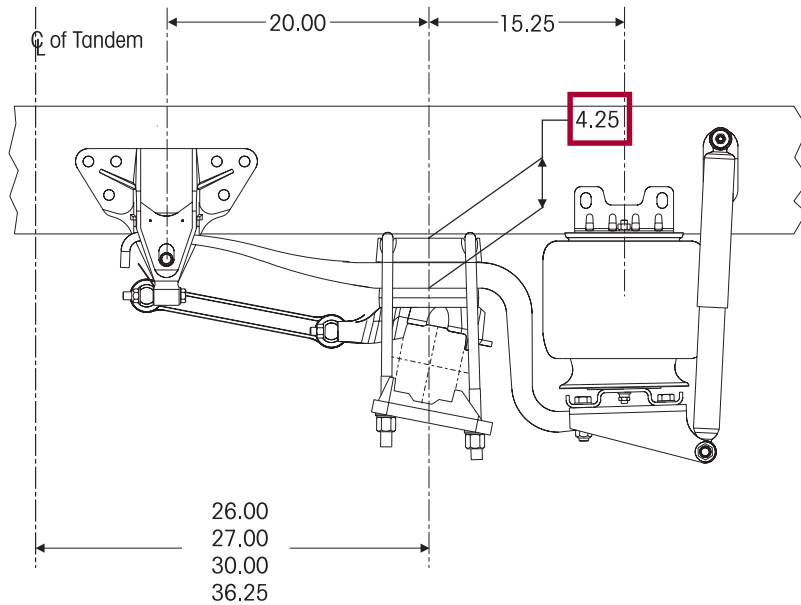


Figure 8



shown in Figure 8. A height gauge, Hendrickson part number 45745-050, is available from Hendrickson to simplify establishing the 4.25" dimension.

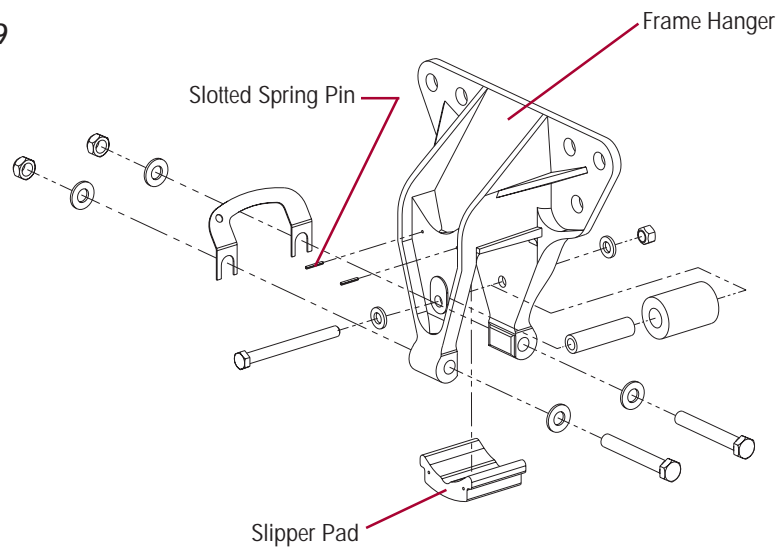
NOTE

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

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 9. 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 and how they are attached and follow instructions in the component replacement section of this publication.

Figure 9



Subject 8

**COMPONENT
REPLACEMENT**

MAIN SUPPORT MEMBERS

The following procedure is recommended to replace any of the four main support members. All four main support members are identical.

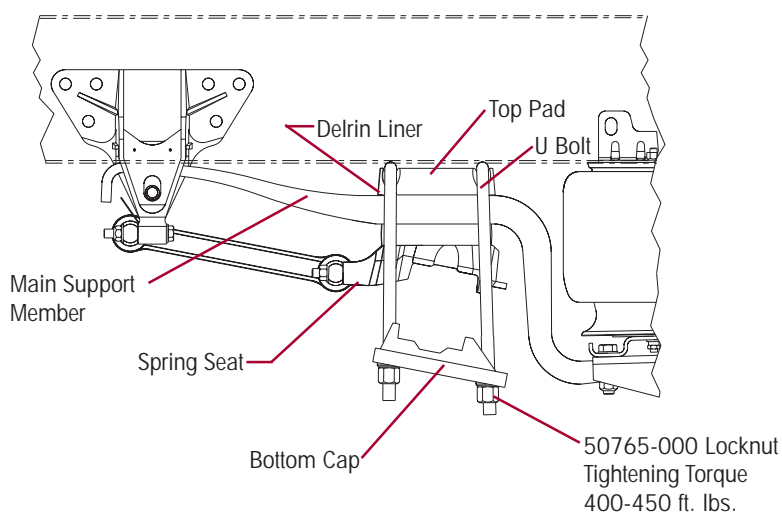
Disassembly:

1. Chock wheels of axle.
2. Support axle with jack stand.
3. Dump air pressure from air springs.
4. Remove height control valve link from valve by removing nut and lock washer.
5. Remove rebound bolt, locknut, washers, spacer tube, and rebound roller from frame hanger.
6. Raise rear of frame far enough to remove load from main support member.
7. Remove U bolt locknuts and washers.
8. Remove U bolts, bottom cap, and top pad.
9. Remove both locknuts and washers which connect the cross channel to both main support members.
10. Lift cross channel off of the main support member with jacks.
11. Remove main support member assembly.

Assembly:

1. Position main support member on axle seat, or on spacer plate if so equipped, with main support member center dowel pin piloting into hole in axle seat or spacer plate. Delrin liner must be positioned on the top side of the main support member.
2. Assemble top pad, U bolts, bottom cap, washers, and locknuts as shown in Figure 10. The torque rod mounting bolts of the spring seats must be positioned toward the front of the vehicle. Do not tighten U bolt locknuts at this time.

Figure 10

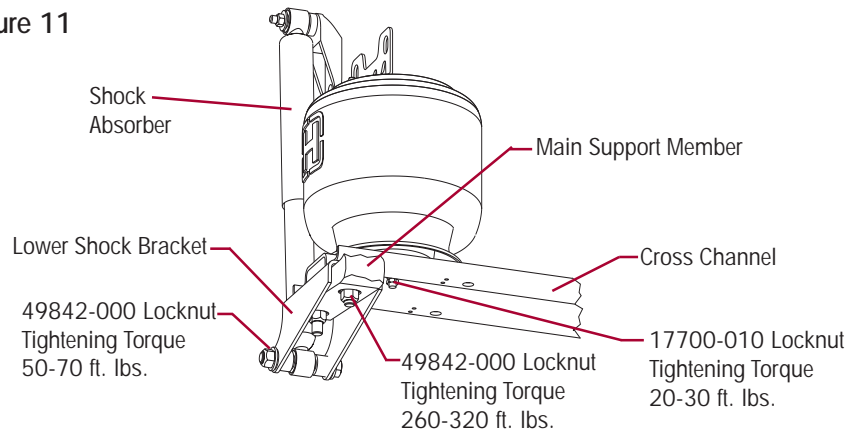


Subject 8

**COMPONENT
REPLACEMENT (CONT.)**

3. Lower the air spring and cross channel mounting bolts into main support members.
4. Assemble washers and locknuts which connect the cross channel to the main support members. Tighten the locknuts to 260 to 320 foot pounds torque as shown in Figure 11.

Figure 11

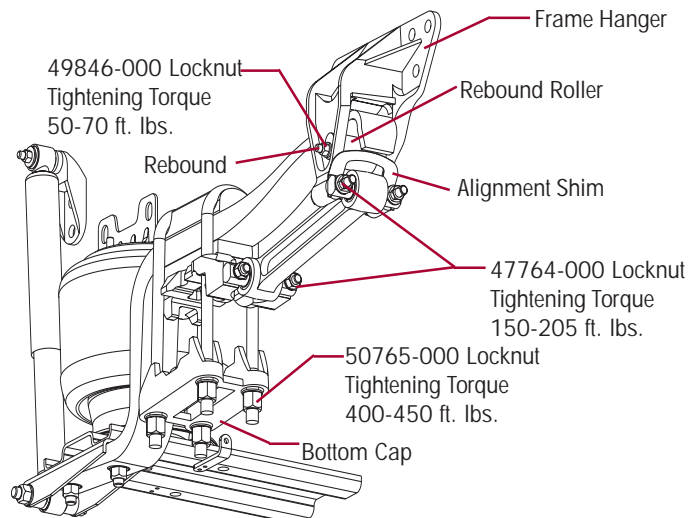


5. Lower frame so that frame hangers engage main support member. Air up the system and center the tip of the main support member between the frame hanger legs.
6. Evenly tighten U bolt locknuts to 400 to 450 foot pounds torque as shown in Figure 12, rap top of U bolts, and retighten to 400 to 450 foot pounds torque. **DO NOT EXCEED SPECIFIED TORQUE ON U BOLT LOCKNUTS.**
7. Assemble rebound bolt, spacer, roller, washers, and locknut in frame hangers as shown in Figure 12. Tighten locknut to 50 to 70 foot pounds torque.
8. Assemble height control valve link. Tighten locknut to 100 to 150 inch pounds torque.
9. Recheck alignment after the new main support members are installed.

NOTE

U bolt locknuts must be retightened to 400 to 450 foot pounds torque after first 1,000 miles of service, and at regular intervals thereafter as experience dictates, not to exceed 20,000 miles. **Do not exceed specified torque on U bolt locknuts.**

Figure 12

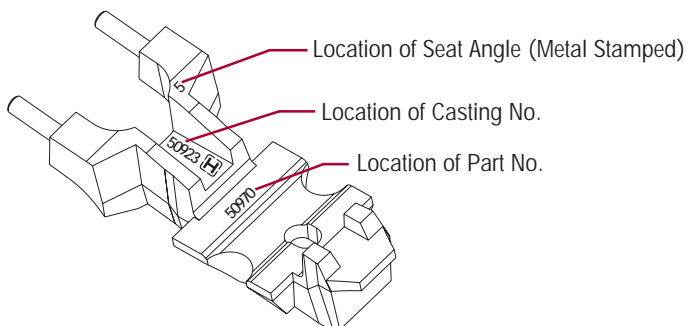


SPRING SEATS

The following instructions apply if the spring seat or the mounting stud for torque rod attachment requires replacement.

1. Follow earlier instructions to block and support the vehicle. Remove the U bolts and main support member and remove the spring seat.
2. If a new spring seat is required, the seat angle as shown in Figure 13, must be specified when ordering.

Figure 13
Bottom View of
Spring Seat



3. If only the stud requires replacement, it can be removed with a stud puller.
4. The new stud can then be installed with a stud driver. To assure proper assembly the stud should be inserted from the dog point end (tap end) first and bottom out in the threaded hole of the spring seat. Tighten to 60-70 foot pounds of torque.
5. Replace the spring seat, main support member and U bolts as described earlier.
6. Assemble the torque rod straddle mount bushing to the spring seat, and tighten the $\frac{5}{8}$ " locknuts to 150-205 foot pounds torque as shown in Figure 12.
7. Recheck all fasteners for proper torque prior to moving the vehicle.

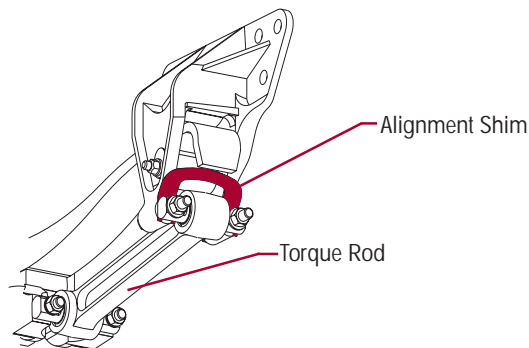
TORQUE ROD BUSHING REPLACEMENT

Torque rods are fixed length and use drop-in shims as shown in Figure 14 for suspension alignment adjustment. The following procedure is recommended to replace the torque rod bushings.

Disassembly

1. Chock wheels of drive axles.
2. Remove straddle mount bar pin locknuts and washers at axle end of torque rod.
3. Loosen rebound bolt locknut in the frame hanger.
4. Remove straddle mount bar pin locknuts, bolts, and washers, and any alignment shims at frame hanger ends of torque rod. Note the number of shims as they must be reinstalled in the same manner to avoid affecting alignment.

Figure 14



Subject 8

**COMPONENT
REPLACEMENT (CONT.)**

5. Push out old bushings. Use a vertical shop press with a capacity of at least 10 tons. A 5" long piece of 2" I.D. by ¼" wall steel tubing receiving tool is required. These bushings are not cartridge type bushings. They do not have outer metals. Support torque rod end on receiving tool with end tube of torque rod centered on tool. Push directly on bushing straddle mount bar pin until bushing clears torque rod end tube.

CAUTION

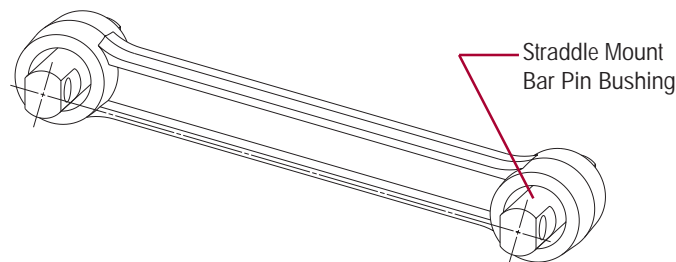
BE SURE THE TORQUE ROD IS SQUARELY SUPPORTED ON THE PRESS BED FOR SAFETY.

WARNING

DO NOT USE HEAT OR A CUTTING TORCH TO REMOVE THE BUSHINGS FROM THE TORQUE ROD. THE USE OF HEAT WILL ADVERSELY AFFECT THE STRENGTH OF THE TORQUE ROD.

6. Clean and inspect I.D. of torque rod ends, removing any nicks with emery cloth.
7. Lubricate I.D. of torque rod ends and new rubber bushings with a vegetable base oil (cooking oil or lard). **DO NOT** use a petroleum or soap base lubricant.
8. 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 zero degrees to shank of torque rod as shown in Figure 15. Press directly on straddle mount bar pin of bushing. Bushings must be centered within torque rod end tubes. When pressing in new bushings, overshoot desired final position by approximately $\frac{3}{16}$ " and press bushing again from opposite side to center bushing within torque rod end.

Figure 15



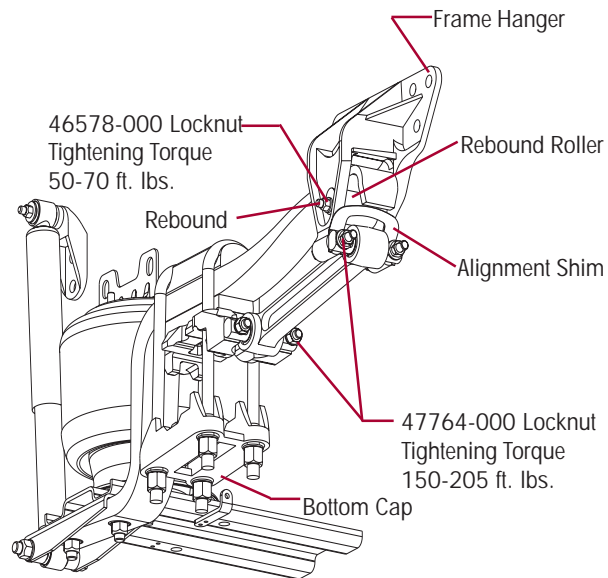
CAUTION

BE SURE THE TORQUE ROD IS SQUARELY SUPPORTED ON THE PRESS BED FOR SAFETY.

Assembly:

1. Position the new or rebushed torque rod in spring seat and assemble washers and locknuts. Hand tighten locknuts.
2. Position torque rod on forward face of frame hanger legs and assemble bolts, washers, locknuts, and any alignment shims. Tighten locknuts to 150 to 205 foot pounds torque as shown in Figure 16.
3. Tighten locknuts at axle end of torque rod to 150 to 205 foot pounds torque as shown in Figure 16.
4. Tighten rebound bolt locknuts to 50 to 70 foot pounds torque as shown in Figure 16.

Figure 16

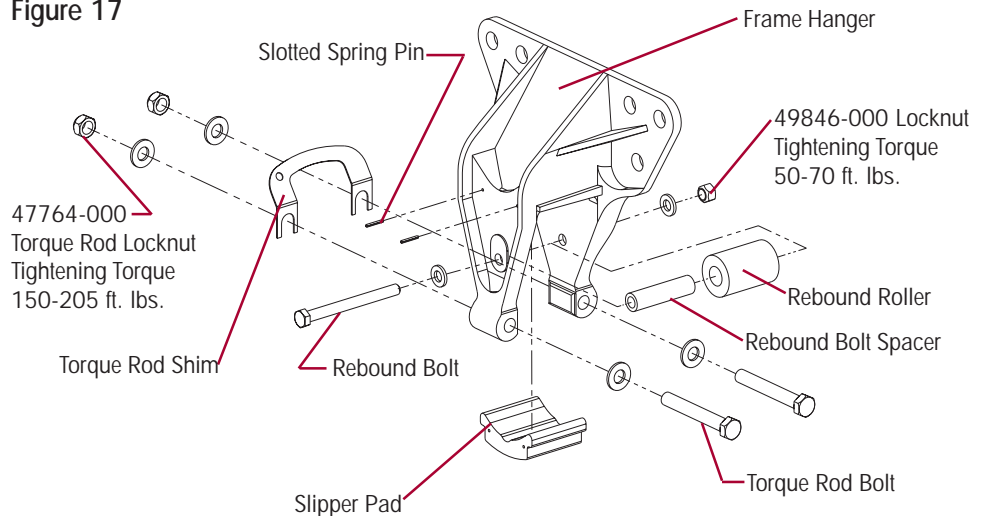


FRAME HANGER SLIPPER PADS

SPRING HANGER STYLE: INTEGRAL SLIPPER PAD WITH ROLL PIN

The following procedure is recommended if your frame hanger slipper pad attachment is the design as shown in Figure 17.

Figure 17



Disassembly:

1. Support the frame with frame stands.
2. Release all air from the air springs.
3. In most cases removal of the rebound roller and spacer may be required to disassemble the slipper pad. Remove the rebound bolt locknut, washer, bolt rebound roller and spacer.
4. 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.**
5. With a blunt end $\frac{1}{8}$ " punch drive in current rollpin until it has passed through the foot of the hanger remove slipper pad with a screwdriver.

**COMPONENT
REPLACEMENT (CONT.)**

Assembly:

1. Insert new slipper pad.
2. Raise main support member to secure slipper pad in place.
3. Drive new rollpin in place with punch until flush with front of frame hanger.
4. Tighten fasteners as shown in Figure 17.
5. Remove jack and air up system.

SPRING HANGER STYLE: INTEGRAL SLIPPER PAD WITH CLAMP

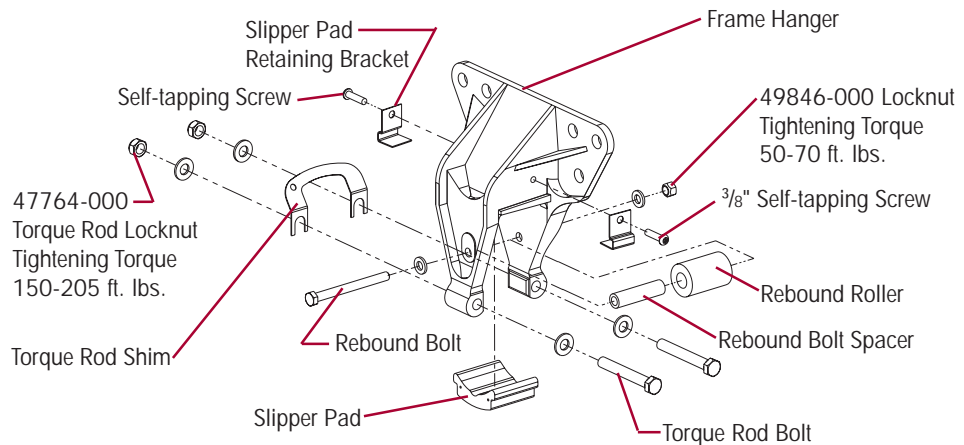
The following procedure is recommended if your frame hanger slipper pad attachment is the hex head fastener design as shown in Figure 18.

Disassembly:

1. Support the frame with frame stands.

Figure 18

57910-001



2. Release all air from the air springs.
3. In most cases removal of the rebound roller and spacer may be required to disassemble the slipper pad. Remove the rebound bolt locknut, washer, bolt rebound roller and spacer.
4. 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.**
5. Remove fasteners, (4)-3/8" hex head self-tapping screws. Remove the slipper pad. In some cases the screws may require to be drilled through using 1 1/32" drill size.

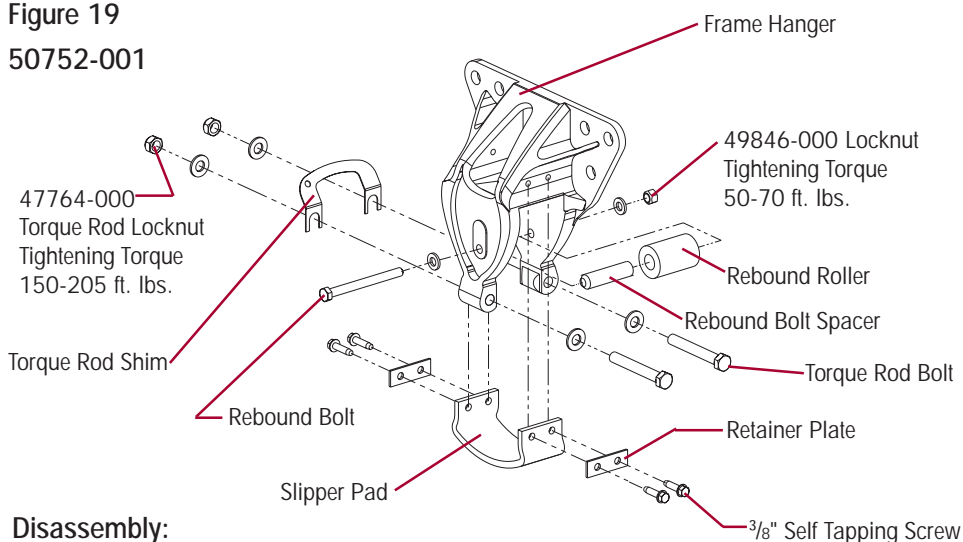
Assembly:

1. Position the slipper pad and retainer plate on frame hanger, tighten the hex head self-tapping screws to 25 foot pounds torque.
2. Remove jack and air up system.

SPRING HANGER STYLE: WRAP AROUND SLIPPER PAD

The following procedure is recommended if your frame hanger slipper pad attachment is the design as shown in Figure 19.

Figure 19
50752-001



Disassembly:

1. Support the frame with frame stands.
2. Release air from the air springs.
3. In most cases removal of the rebound roller and spacer may be required to disassemble the slipper pad. Remove the rebound bolt locknut, washer, bolt rebound roller and spacer.
4. 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.**
5. Remove fasteners, (4) $\frac{3}{8}$ " hex head self-tapping screws. Remove the slipper pad. In some cases the screws may require to be drilled though using $\frac{11}{32}$ " drill size.

Assembly:

1. Position the slipper pad and retainer plate on frame hanger, tighten the hex head self-tapping screws to 25 foot pounds torque.
2. Remove jack and air up system.

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 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 can occur and will require the replacement of one or both pads. A frame hanger should be replaced if a leg has been grooved by the main support member in excess of $\frac{1}{8}$ ", or if cam is worn through.

If the frame hangers require replacement, attachment to the frame should follow the specifications for the correct frame hanger as shown in Figures 17, 18 and 19. However, first dump air pressure from the air springs. Follow the vehicle manufacturer's specifications for hanger to frame fastener tightening torque values.

**COMPONENT
REPLACEMENT (CONT.)**

CROSS CHANNEL

The following procedure is recommended to replace a cross channel:

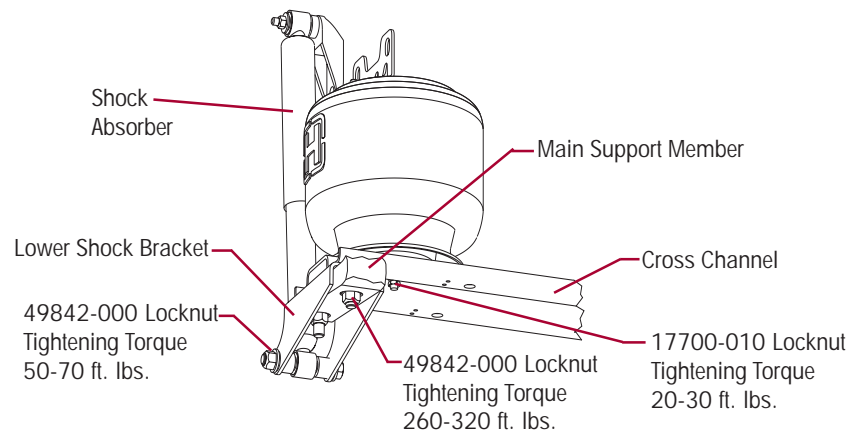
Disassembly:

1. Chock the wheels of the axle.
2. Remove height control valve link from valve by removing nut and lock washer.
3. Dump air pressure from air springs. Raise frame of vehicle to remove load from suspension.
4. Support frame with jack stands.
5. Remove the locknuts and washers which connect the air spring to cross channel and to both main support members.
6. Raise the cross channel by using jacks if required.

Assembly:

1. Assemble the cross channel to both air springs then lower the frame, piloting the bolt holes onto the main support member.
2. Assemble washers and locknuts which connect the cross channel to the main support member. Tighten the locknuts to 260 to 320 foot pounds torque as shown in Figure 20.
3. Air up system.

Figure 20



AIR SPRING

The following procedure is recommended for replacement of an air spring:

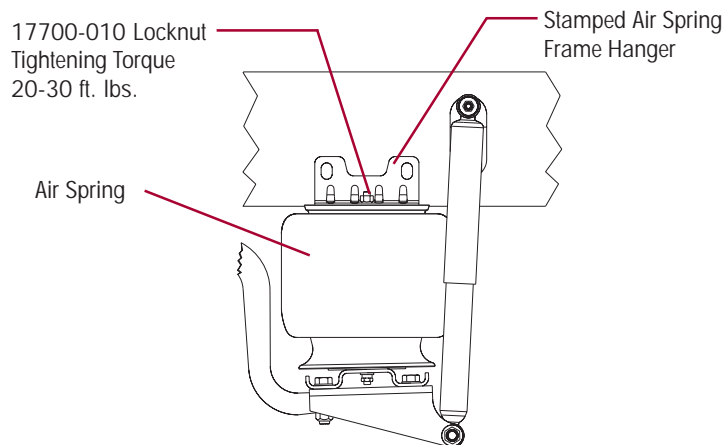
Disassembly:

1. Chock the wheels of the axle.
2. Dump air pressure from air springs.
3. Raise frame of vehicle to remove load from suspension.
4. Support frame with jack stands.
5. Remove locknuts and washers which connect air spring to the cross channel.
6. Remove air line to air spring.
7. Remove brass air fittings from air spring.
8. Remove locknuts and washers which connect air spring to the upper air spring frame hanger.
9. Remove air spring.

Assembly:

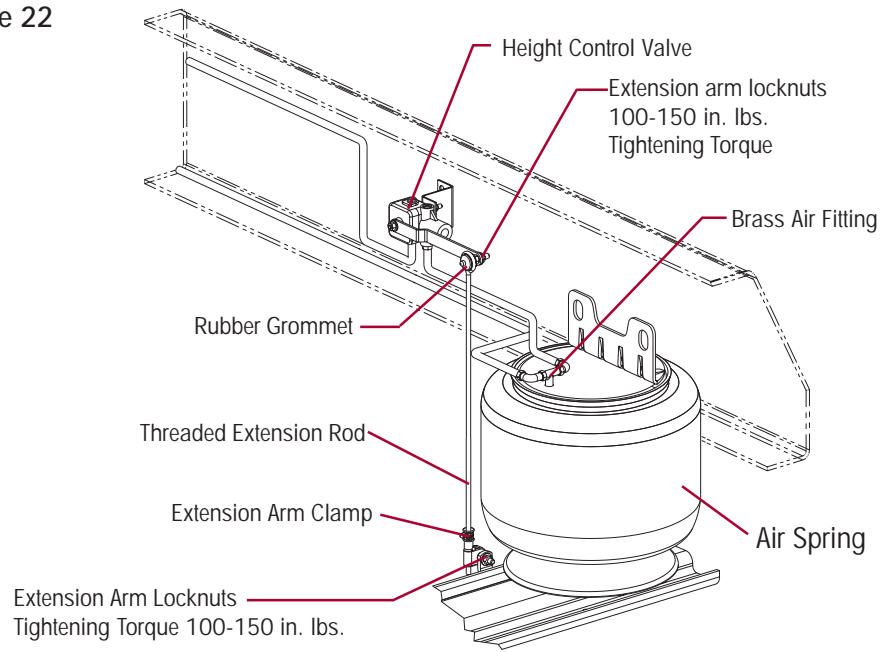
1. Assemble air spring to air spring frame hanger by inserting studs into appropriate holes.
2. Assemble air spring to cross channel by inserting studs into the holes.
3. Assemble washers and locknuts which connect air spring to the cross channel and tighten the locknuts to 20 to 30 foot pounds torque as shown in Figure 20.
4. Assemble washers and locknuts which connect air spring to air spring frame hanger. Tighten the outboard locknut to 20 to 30 foot pounds torque as shown in Figure 21.

Figure 21



5. Assemble brass air fitting to the air spring using teflon thread seal as shown in Figure 22.
6. Assemble air lines to air springs.
7. Lower frame of vehicle.
8. Air up system.

Figure 22



STAMPED AIR SPRING FRAME HANGER

The following procedure is recommended to replace an air spring frame hanger:

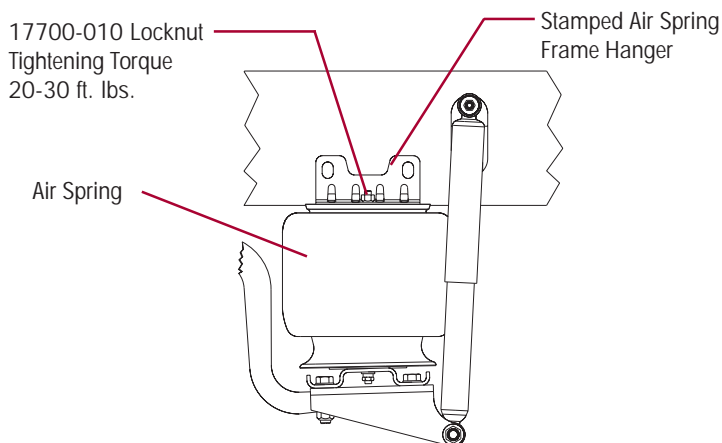
Disassembly:

1. Dump air pressure from air springs.
2. Raise frame of vehicle to remove load from suspension.
3. Remove air lines to air spring.
4. Remove brass air fitting from air spring.
5. Remove locknuts and washers which connect the air spring bracket to the frame side rail.
6. Remove locknuts, washers and bolts which connect the air spring to the air spring frame hanger.
7. Remove air spring frame hanger.

Assembly:

1. Assemble air spring frame hanger to top of air spring.
2. Assemble bolts, washers and locknuts which connect the air spring frame hanger to the frame. Follow the vehicle manufacturer's specifications for fasteners tightening torque values.
3. Assemble washers and locknuts which connect air spring to air spring frame hanger. Tighten outboard locknut to 20 to 30 foot pounds torque as shown in Figure 23.
4. Assemble brass air fitting to air spring using teflon thread seal as shown in Figure 22.
5. Assemble air lines to air spring.
6. Lower frame of vehicle.
7. Air up system.

Figure 23



SHOCK ABSORBER OUTBOARD FRAME HANGER BRACKET

The following procedure is recommended for replacement of a shock absorber outboard frame hanger bracket:

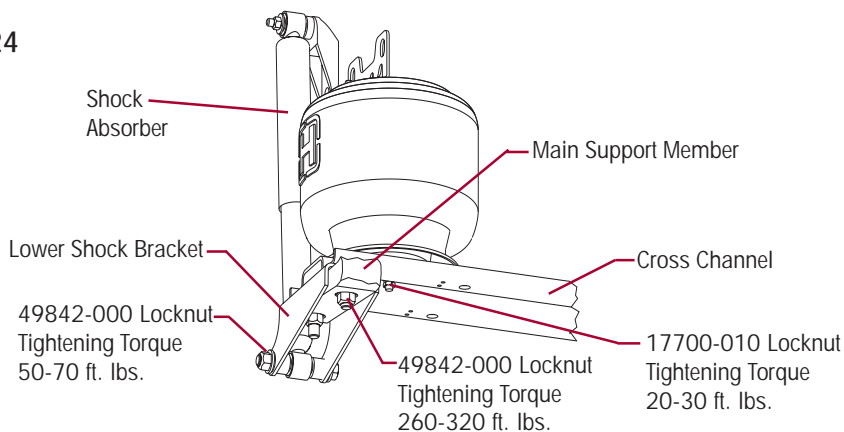
Disassembly:

1. Remove locknuts and washers at both ends of the shock absorber.
2. Remove shock completely from chassis.
3. Remove the locknuts and washers which connect the shock absorber bracket to the frame.
4. Remove the shock absorber bracket.

Assembly:

1. Assemble shock absorber bracket to frame.
2. Assemble washers and locknuts which connect shock absorber bracket to the frame. Follow the vehicle manufacturer's specifications for fasteners tightening torque values.
3. Install washers at both ends of shock. Note that washers are required at both sides of each shock bushing, that is four (4) washers per shock.
4. Assemble both locknuts and tighten to 50 to 70 foot pounds torque as shown in Figure 24

Figure 24



**COMPONENT
REPLACEMENT (CONT.)**

SHOCK ABSORBER OUTBOARD LOWER BRACKET

The following procedure is recommended for replacement of a shock absorber outboard lower bracket.

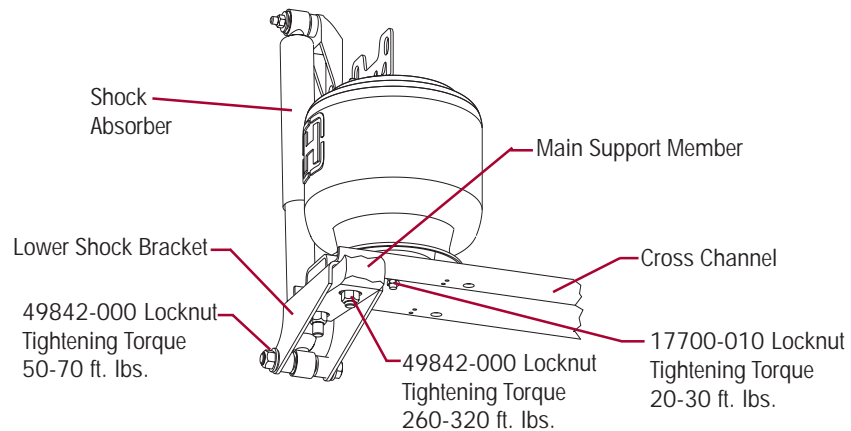
Disassembly:

1. Dump air pressure from air springs.
2. Raise frame of vehicle to remove load from suspension.
3. Remove shock absorber.
4. Remove locknuts, washers and bolts which connect the cross channel to the main support member.
5. Remove shock absorber outboard lower bracket by sliding bracket to rear.

Assembly:

1. Assemble bracket in between the cross channel and the main support member.
2. Assemble the bolts, washers and locknuts which connect the cross channels to the main support members. Tighten the locknuts to 260 to 320 foot pounds torque as shown in Figure 25.
3. Reassemble shock absorbers. Washers must be installed at both sides of each shock bushing, that is four (4) washers per shock.
4. Assemble bolts, washers and locknuts. Tighten the locknuts to 50 to 70 foot pounds torque as shown in Figure 25.

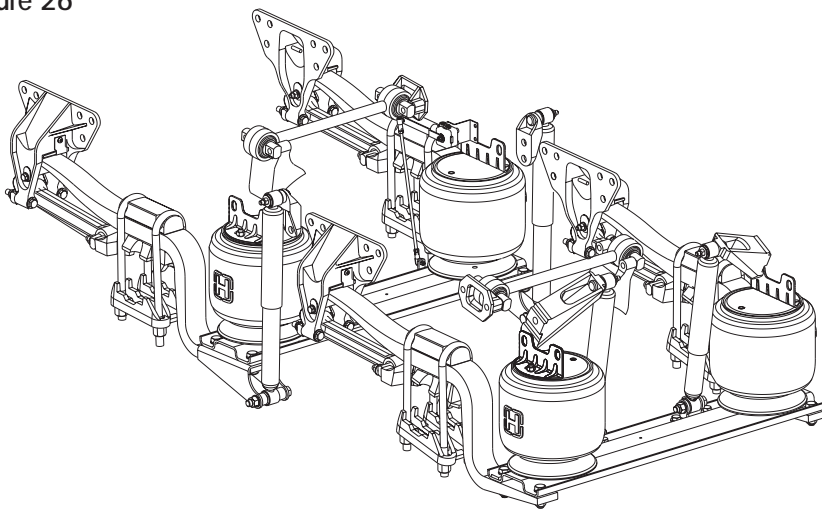
Figure 25



HAS CONVERSION FROM OUTBOARD TO INBOARD SHOCK

For shock replacement see the component replacement section of this publication.

Figure 26



Disassembly:

1. Chock wheels.
2. Support axle with jack stand.
3. Dump air pressure from air springs.
4. Remove the lower mounting nuts on the air spring.
5. Remove fasteners from air spring frame hanger and remove air spring from frame.

NOTE

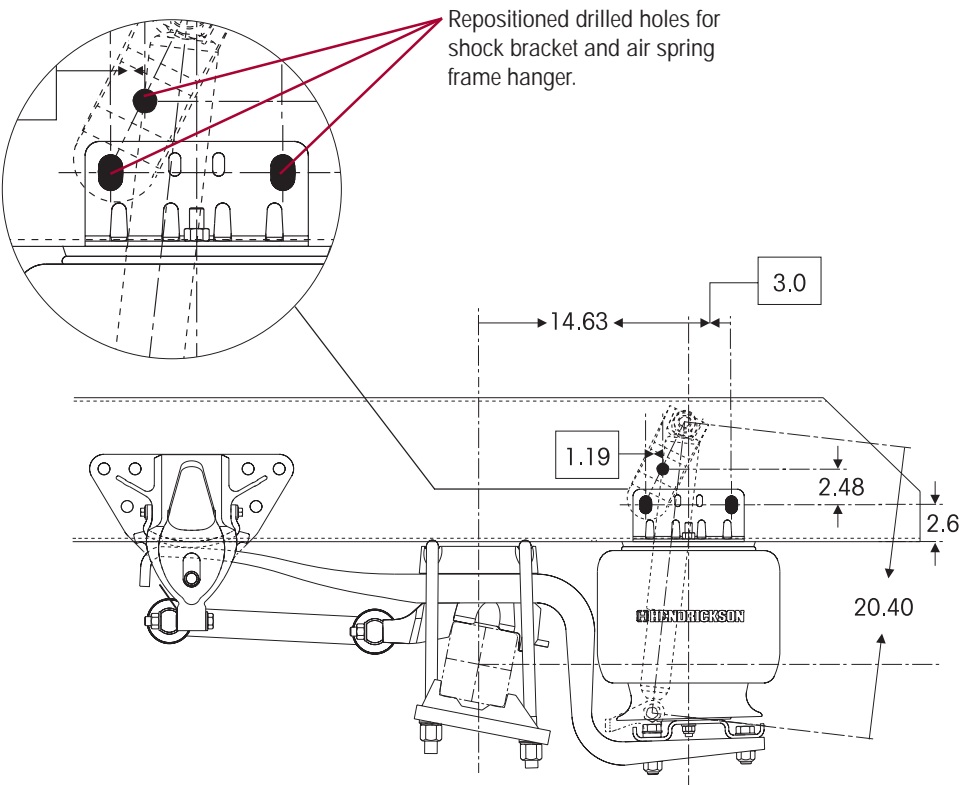
If the height control valve is located at the rear axle or it is a single axle it is necessary to disconnect the bottom of the leveling valve rod.

6. Remove rear shocks.
7. Remove the cross channel fastener bolts and slide out the lower shock brackets and remove cross channel.
8. Remove the upper shock brackets from the frame.

Assembly:

1. Drill two .78" dia. holes to relocate air spring assembly .62" forward of current location on both sides of frame. Reference 14.63" dimension on Figure 27.
2. Drill a .78" dia. 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 27.
3. Install the new cross channel/inboard shock bracket assembly and shocks. For proper kit part no. see matrix at the end of this section or contact your Hendrickson Sales Engineering Group.
4. Reinstall the four cross channel fasteners bolts and torque to 250-320 ft. lbs. Reconnect the lower air spring studs, 20-30 ft. lbs.

Figure 27



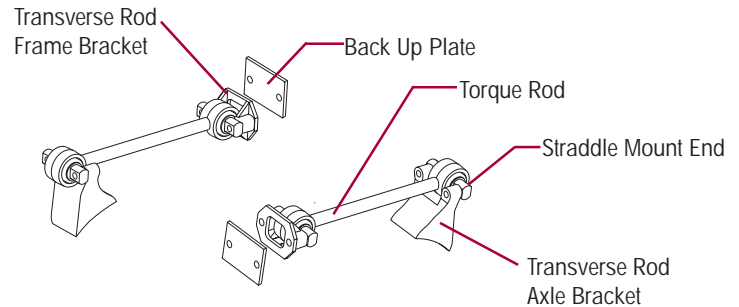
- 5. Install the inboard upper shock bracket on frame. Follow torque specifications listed in vehicle manufacturer's service manual.
- 6. Reassemble shock absorbers. Washers must be installed at both sides of each shock bushing, that is four (4) washers per shock.
- 7. Assemble shock bolts, washers and locknuts. Tighten locknuts to 50 to 70 foot pound torque.
- 8. If the height control valve is located at the rear axle reconnect the bottom end of the leveling valve rod to the new mount bracket on cross channel.
- 9. Remove the jack stands and air up suspension system.
- 10. Adjust ride height, see the Preventative Maintenance Section of this publication for correct procedure for setting proper ride height.

HAS Inboard Shock	
Mounting Kit No.	Main Support Member Mounting Center
57784-001	40"
57784-002	40.25"
57784-003	40.5"
57784-004	40.625"

TRANSVERSE ROD

The following procedure is recommended for replacement of a transverse rod with tapered stud at axle connection and straddle mount at frame connection as shown in Figure 28 (some transverse rod installations may have straddle mount design at both frame and axle connections):

Figure 28
Straddle Pin Style
Transverse Rod



Disassembly:

1. Remove locknuts and washers which connect transverse rod to frame (if double straddle design, remove axle fasteners also and go to step 4).
2. Remove locknut and washer which connects tapered stud to axle bracket.
3. Remove tapered stud from axle bracket by hitting only the axle bracket with a hammer.
4. Use Owatonna Tool Company's tool set to remove and install the torque rod bushings. Follow their instructions (if double straddle design, go to step 6 below).

Assembly:

1. The tapered hole in the axle bracket must be free of all foreign matter.
2. Assemble tapered stud in the bracket.
3. Assemble washer and locknut to the stud. Tighten locknut to 175 to 225 foot pounds torque.
4. After tightening, hit only the axle bracket with a hammer to seat tapered stud as shown in Figure 28.
5. Retighten locknut to 175 to 225 foot pounds torque.
6. Position straddle mount end of torque rod at transverse rod frame bracket.
7. Assemble washers and locknuts which connect transverse rod to frame. Tighten the locknuts to truck manufacturer's specifications (if double straddle design, repeat for axle bracket connection).

Subject 8

**COMPONENT
REPLACEMENT (CONT.)**

SHOCK ABSORBER

Original equipment shock absorbers are a 1.375" diameter bore with 18.34" compressed length and 30.00" extended length. The following procedure is recommended for replacement of a shock absorber:

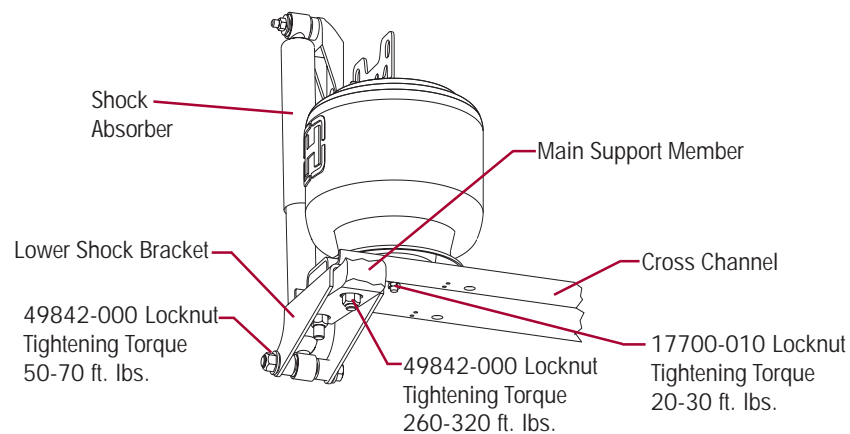
Disassembly:

1. Remove locknut and washer which connects shock absorber to shock absorber outboard frame hanger bracket.
2. Remove locknut, washer and bolt which connect shock absorber to lower shock absorber bracket.
3. Remove shock absorber.

Assembly:

1. Assemble shock absorber. Assemble bolts, washers and locknuts which connect shocks to brackets. Washers must be installed at both sides of each shock bushing, that is four (4) washers per shock. Tighten the locknuts to 50 to 70 foot pounds torque as shown in Figure 29.

Figure 29



HEIGHT CONTROL VALVE AND LINKAGE ARM ASSEMBLY

Disassembly for NEW height control valve as shown in Figure 30 and 31.

Figure 30

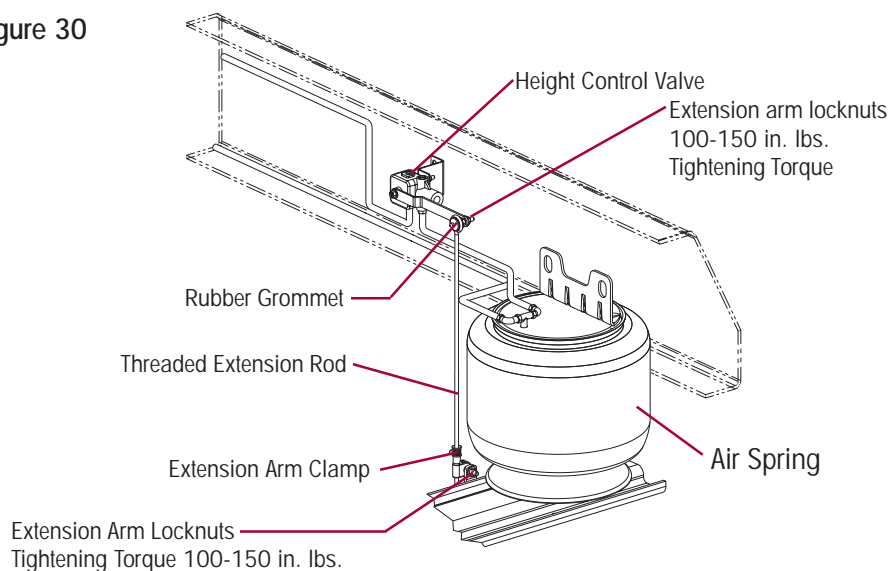
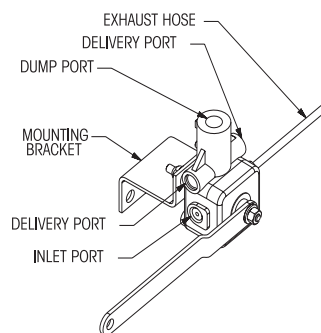


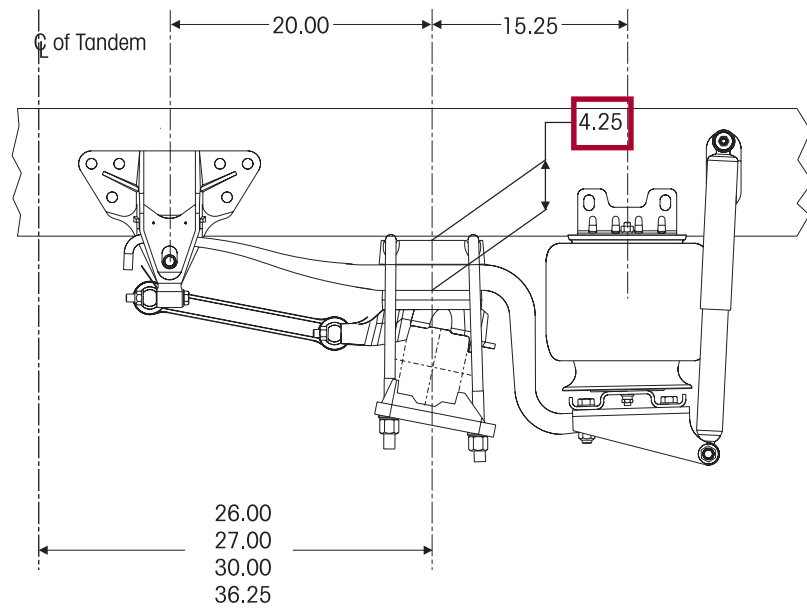
Figure 31

New Height Control Valve



1. Place the vehicle on level floor.
2. Free and center all suspension joints by slowly moving the vehicle back and forth without applying the brakes. When coming to a complete stop make sure the parking brakes are released, not engaged. Chock front wheels to prevent vehicle from moving.
3. Verify that the front steer and rear drive tires are set to normal operating pressure.
4. Remove the existing height control valve and linkage arm assembly by removing the upper and lower fasteners. See Figure 30.
5. Install Height Control Valve Arm Assembly 58994-000 and linkage arm assembly by removing the outside $\frac{5}{16}$ " locknut and washer from the upper and lower part of the assembly. The $\frac{5}{16}$ " free running nuts remain on the assembly. The assembly orientation is with the rubber grommet located at the top of assembly as shown in Figure 30.

Figure 32



6. Verify that air system is at full operating pressure. Exhaust the air in the air springs enough to relax the suspension. Then refill the air springs. The ride height will now be positioned on the bottom end of the height control valve dead band. Set ride height to (4.38" unloaded or 4.25" loaded) see Figure 32. For detailed instructions on setting ride height see Technical Publication No. 17730-233.
7. Adjust the extension rod to fit the upper valve arm joint into the Height Control Valve and the lower arm joint into the Control Valve Arm Bracket.
8. Insert the $\frac{5}{16}$ " washer and locknuts. Tighten locknuts by holding the free running nut with an open end wrench and securing the outside locknut. Torque locknuts to 100-150 in. lbs.
9. Tighten clamp on the lower rubber valve arm joint with a screwdriver until securely fastened.

OLD HEIGHT CONTROL VALVE AND LINKAGE ARM ASSEMBLY

The following procedure is recommended for replacement of the old height control valve to the new height control valve and linkage arm assembly, Figure 33. This height control valve requires a separate quick release dump valve, see Figure 34.

Figure 33

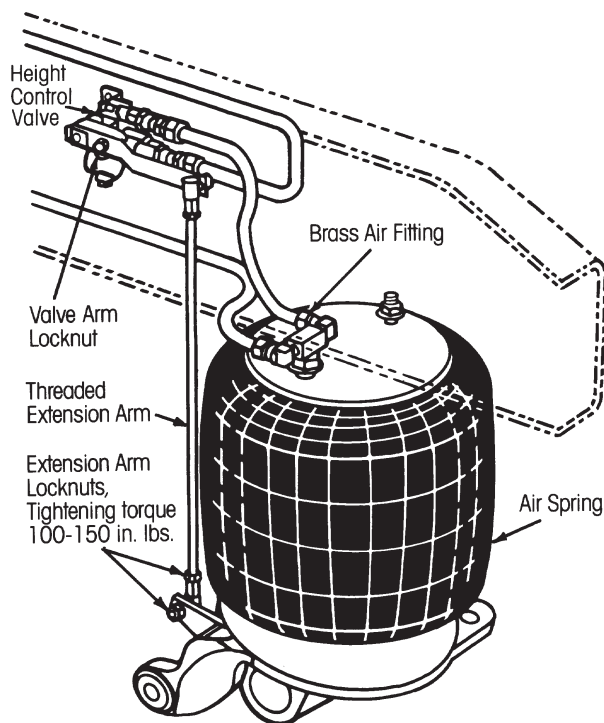
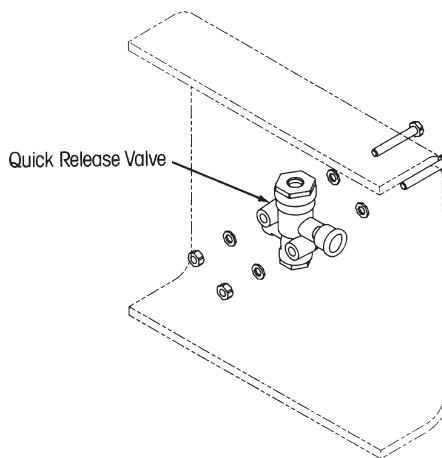


Figure 34



Disassembly:

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

Subject 8

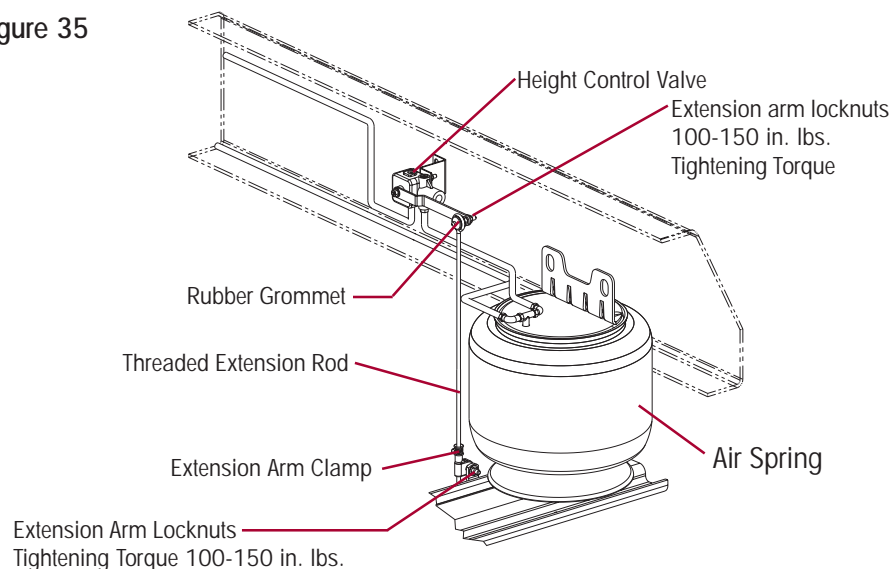
**COMPONENT
REPLACEMENT (CONT.)**

4. Remove height control valve and linkage arm assembly by removing the outside $\frac{5}{16}$ " locknut and washer from the upper and lower part of the assembly. The $\frac{5}{16}$ " free running nuts remain on the assembly. The assembly orientation is with the rubber grommet located at the top of assembly as in Figure 35.
5. Remove air lines to height control valve.
6. Remove locknuts, washers, and bolts which connect the height control valve to frame.
7. Remove brass air fittings from height control valve.

Assembly:

1. Assemble brass air fittings to height control valve.
2. Assemble bolts, washers, and locknuts which connect height control valve to frame.
3. Assemble air lines to height control valve.
4. Verify that air system is at full operating pressure. Exhaust the air in the air springs enough to relax the suspension. Then refill the air springs. The ride height will now be positioned on the bottom end of the height control valve dead band. Set ride height to (4.38" unloaded or 4.25" loaded) see Figure 32. For detailed instructions on setting ride height see Technical Publication No. 17730-233.
5. Assemble the extension rod to fit the upper valve arm joint into the Height Control Valve and the lower arm joint into the Control Valve Arm Bracket as shown in Figure 35.
6. Insert the $\frac{5}{16}$ " washer and locknuts. Tighten locknuts by holding the free running nut with an open end wrench and securing the outside locknut. Torque locknuts to 100-150 in. lbs.
7. Tighten clamp on the lower rubber valve arm joint with a screwdriver until securely fastened.

Figure 35



QUICK RELEASE VALVE

The following procedure is recommended for replacement of the Hendrickson quick release valve, Figure 36. If not supplied by Hendrickson see truck manufacturer's guidelines.

Disassembly:

1. Exhaust air pressure from vehicle primary air system.
2. Remove air lines from quick release valve. Identify the air line at the top of the valve with some type of indication.
3. Remove the locknuts, washers and bolts which attach the quick release valve to the frame or cross member.
4. Remove brass air fitting from valve.

Assembly:

1. Install brass air fitting in valve.
2. Assemble bolts, washers, and locknuts which attach the quick release valve to the frame or cross member as shown in Figure 37 and 38.
3. Assemble air lines to valve making sure the identified air line attaches to the top of the valve.
4. Air up system.

Figure 36

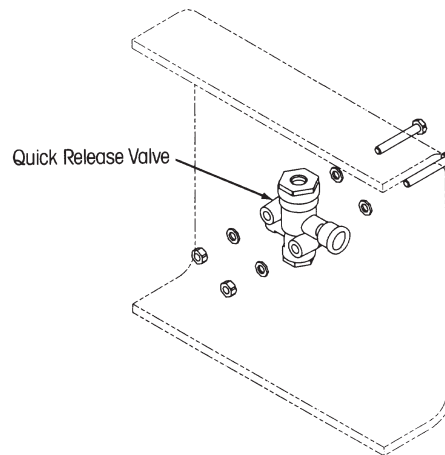


Figure 37

Plumbing With NEW Height Control Valve

The new height control valve eliminates the need for a separate quick release dump valve (1996-Present).

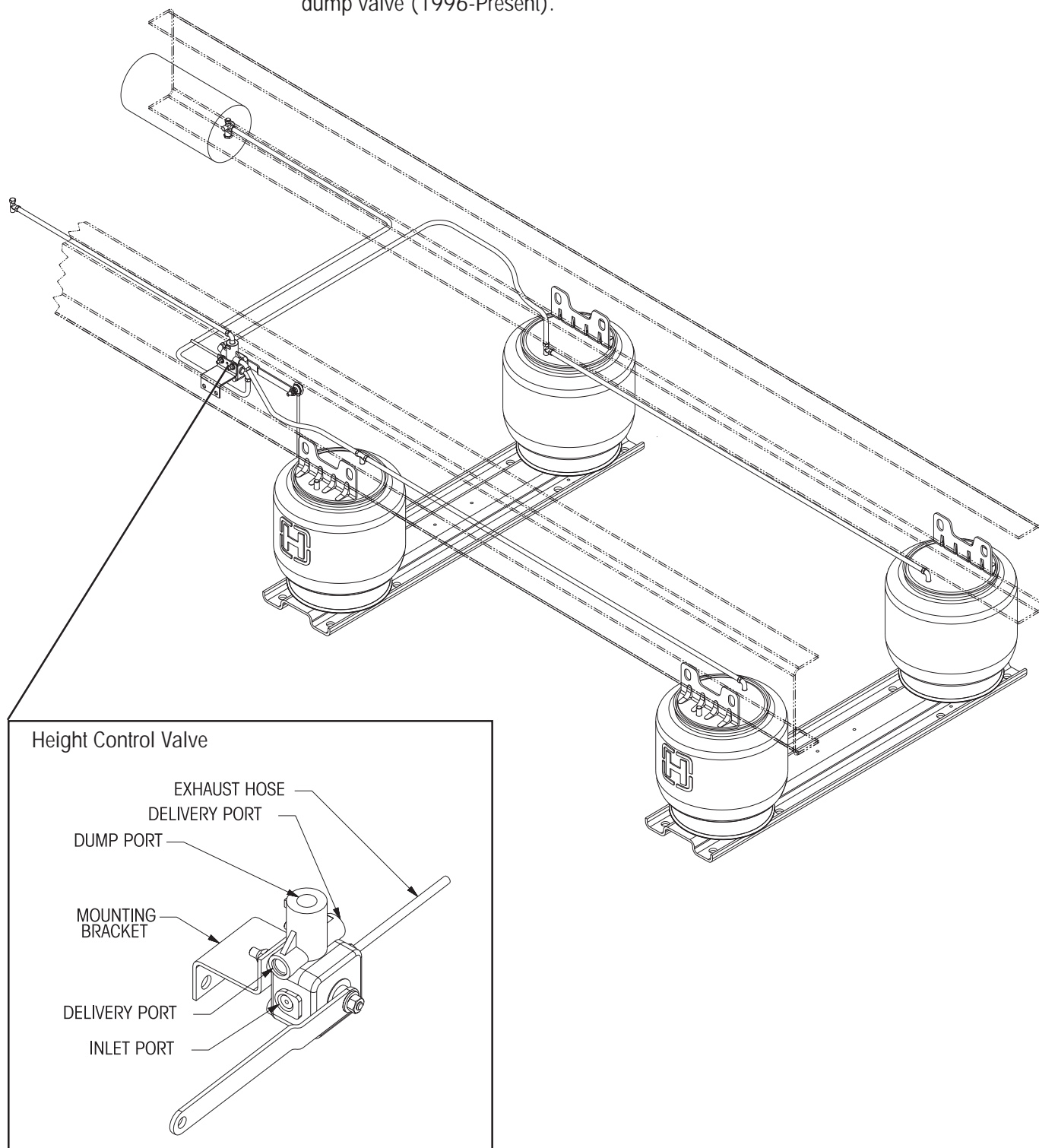
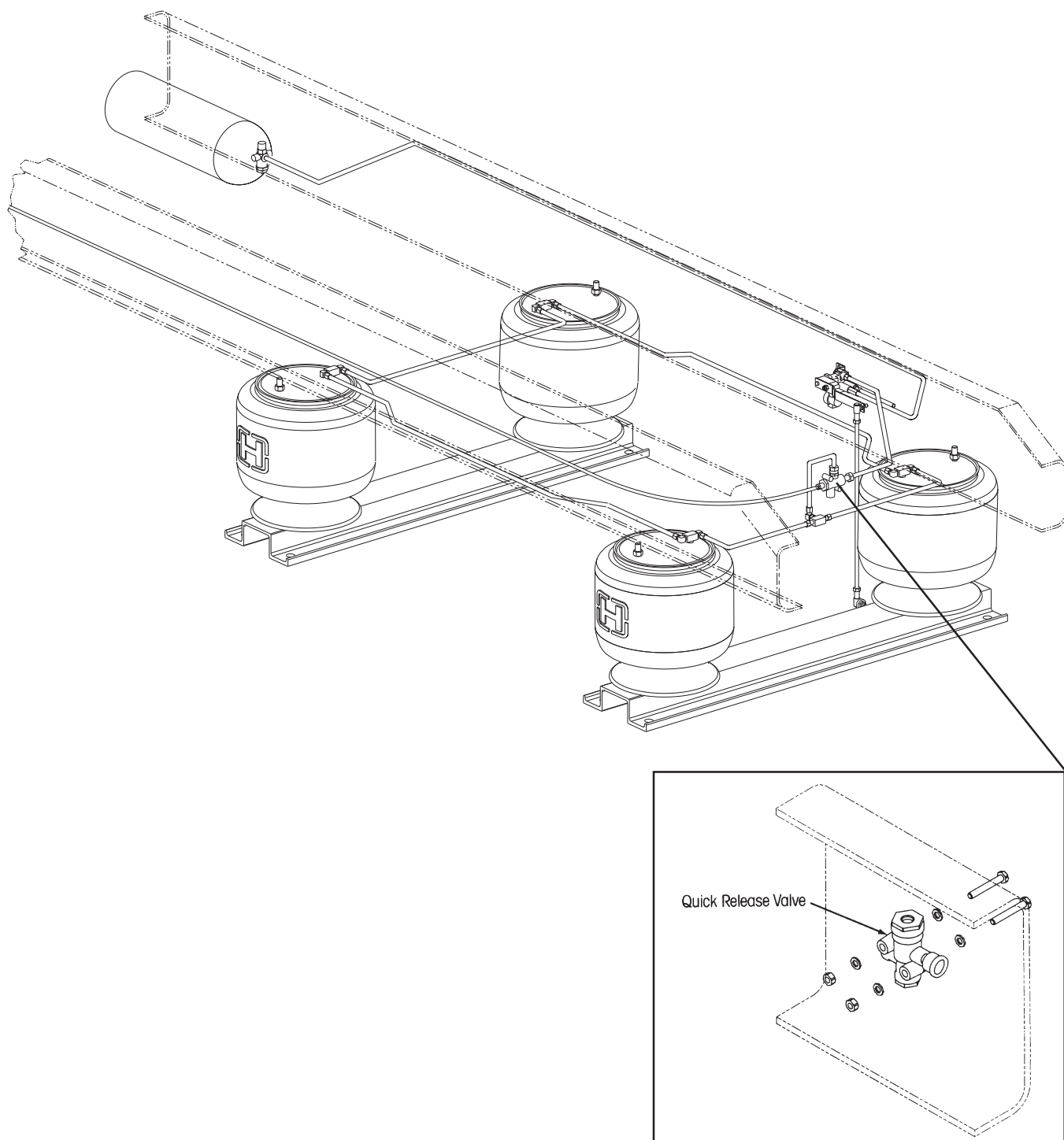


Figure 38
Plumbing with OLD height control valve
Quick Release Valve shown (1987–1998).



Subject 10

**TIGHTENING TORQUE
SPECIFICATION CHART**

Description	Part No.	Hendrickson Thread/Grade	Torque Ft./Lbs.
Spring Hanger to Vehicle Frame Bolts, Nuts, & Washers	None	Furnished & Installed by Truck Manufacturer	*
U Bolt Locknut	50765-000	7/8"-14 UNF-2B Grade C	400-450
Torque Rod Bar Pin Locknut	47764-000	5/8"-11 UNC-2B Grade C	150-205
Spring Seat Stud	50918-000	5/8"-11 UNC-2A Grade 8	60-70
Rebound Bolt Locknut	49846-000	1/2"13 UNC-2B Grade C	50-70
Shock Absorber Locknut/Upper	49846-000	1/2"-13UNC-2B Grade C	50-70
Shock Absorber Locknut/Lower	49842-000	3/4"-10 UNC-2B Grade C	50-70
Cross Channel to MSM Locknut	49842-000	3/4"-10 UNC-2B Grade C	260-320
Air Spring to Frame Hanger Locknut	17700-010	1/2"-13 UNC-2B Grade 5	20-30
Air Spring to Cross Channel Locknut	17700-010	1/2"-13 UNC-2B Grade 5	20-30
Transverse Rod Locknut	29749-000	1 1/4"-12 UNF-3B Grade 5	175-225
Extension Arm Jam Nut	17491-019	5/16"-24 UNF-2B Grade 5	100-150 IN/LBS.
Extension Arm Locknut	48948-000	5/16"-24 UNF-2B Grade C	100-150 IN/LBS.

DO NOT EXCEED TORQUE ON U BOLT LOCKNUTS.

All threads must be clean and lubricated with SAE 20 oil before assembly to obtain the correct relationship of torque and fastener tension.

To obtain maximum service life from the suspension system, mounting bolts and nuts should be checked at least once a year and tightened to specified torque.

IMPORTANT NOTE

*Torque values listed above apply only if Hendrickson supplied fasteners are used. If non-Hendrickson fasteners are used, follow torque specifications listed in vehicle manufacturer's service manual.





What's New...

The following are significant revisions you will find in this publication.

- Includes information on single and tandem axle pg 1, 2
- Maintenance on Main Support Members pg 7
- New Frame Hangers pg 13
- New air spring hangers pg 18
- Conversion of Outboard to Inboard Shock Mount pg 21
- New mount for shock absorbers pg 24
- New height control valve and linkage pg 25
- Plumbing to reflect new height control valve and linkage pg 30