

TECHNICAL PROCEDURE

TRAILER SUSPENSION SYSTEMS

SUBJECT: RF Model Service Manual

LIT NO: L1029

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GENERAL INFORMATION

The description and specifications contained in this service publication are current at the time of printing.

Hendrickson reserves the right to discontinue or modify its models and/or procedures and to change specifications at any time without notice.

IMPORTANT NOTICE

Any reference to brand names in this publication are made as an example of the types of tools and materials recommended for use and should not be considered an endorsement. Equivalents may be used.

 This symbol is used throughout this manual to call attention to procedures where carelessness or failure to follow specific instructions may result in personal injury and / or component damage.

Departure from the instructions, choice of tools, materials and recommended parts mentioned in this publication may jeopardize the personal safety of the service technician and vehicle operator.

 **WARNING: FAILURE TO FOLLOW INDICATED PROCEDURES CREATES A HIGH RISK OF PERSONAL INJURY TO THE SERVICING TECHNICIAN.**

 **CAUTION: Failure to follow indicated procedures may cause component damage or malfunction.**

 **IMPORTANT:** Highly recommended procedures for proper service of this unit.

NOTE: Additional service information not covered in the service procedures.

TIP: Helpful removal and installation procedures to aid in the service of this unit.

ALWAYS USE GENUINE HENDRICKSON PARTS

Hendrickson recommends following all manufacturers' recommendations for the proper handling and disposal of lubricants and solvents. For further information contact the supplier of lubricants and solvents.

 **CAUTION: Welding or machining on any axle component is prohibited unless noted otherwise in this document.**

INTRODUCTION

Hendrickson presents this publication to aid in maintenance and overhaul of Hendrickson Trailer Suspension Systems.

For any questions call Hendrickson Technical Service Department at 800-455-0043 in the United States or 800-668-5360 in Canada.

Instructions contained cover the models listed below.

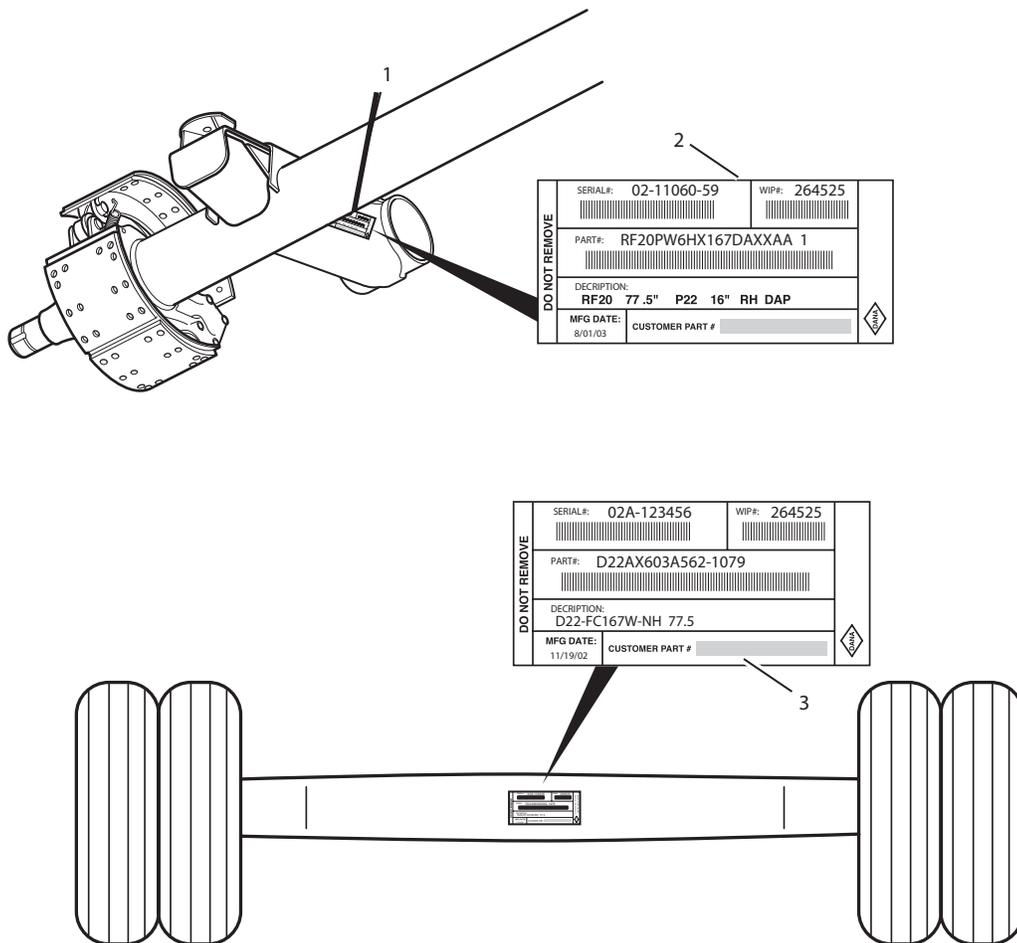


MODEL LISTING

This publication covers all RF models.

MODEL IDENTIFICATION

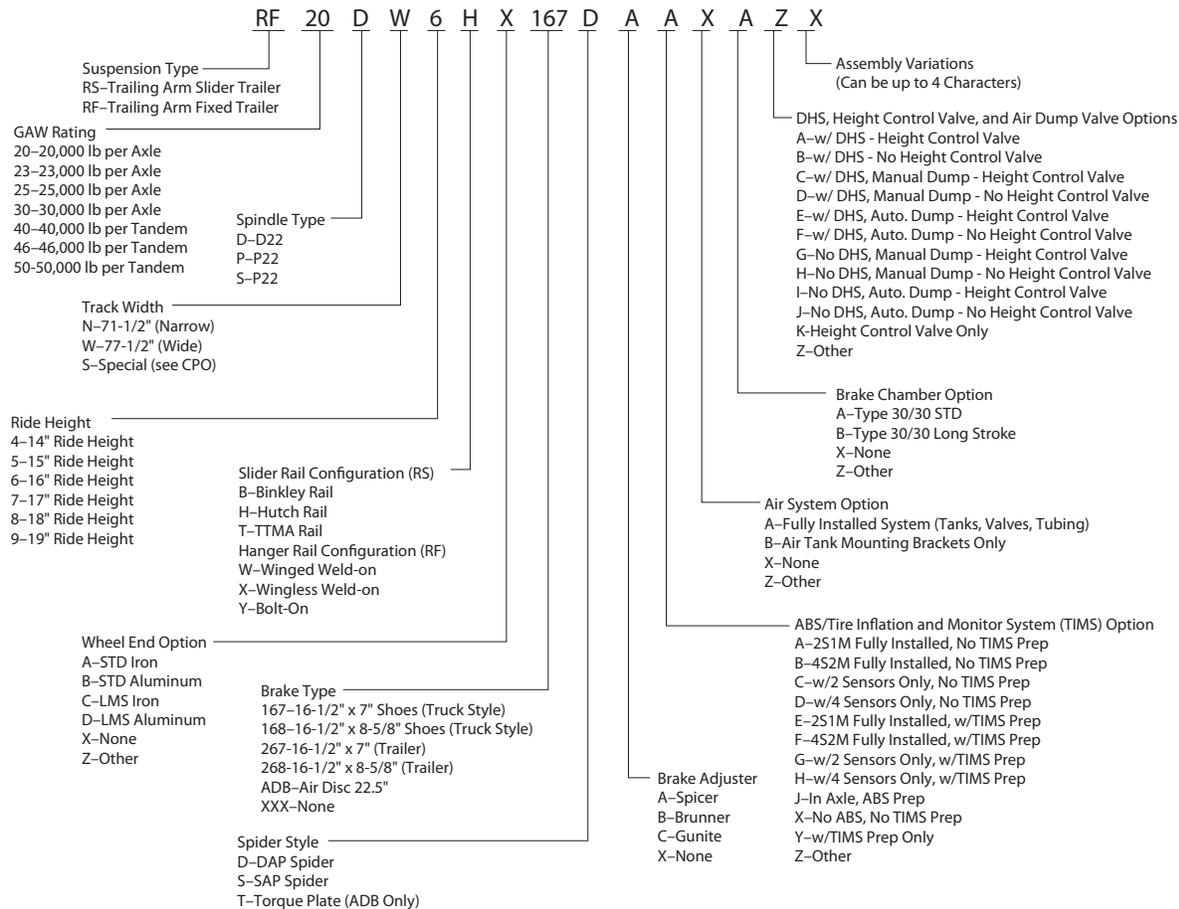
NOTE: Models shipped before January 5, 2007, will be equipped with a Dana Spicer identification tag and models shipped after January 5, 2007, will be equipped with a Hendrickson identification tag. All models listed are now serviced under Hendrickson Trailer Suspension Systems, regardless of manufacturer addressed on the identification tag. All other tag identification information has remains the same.



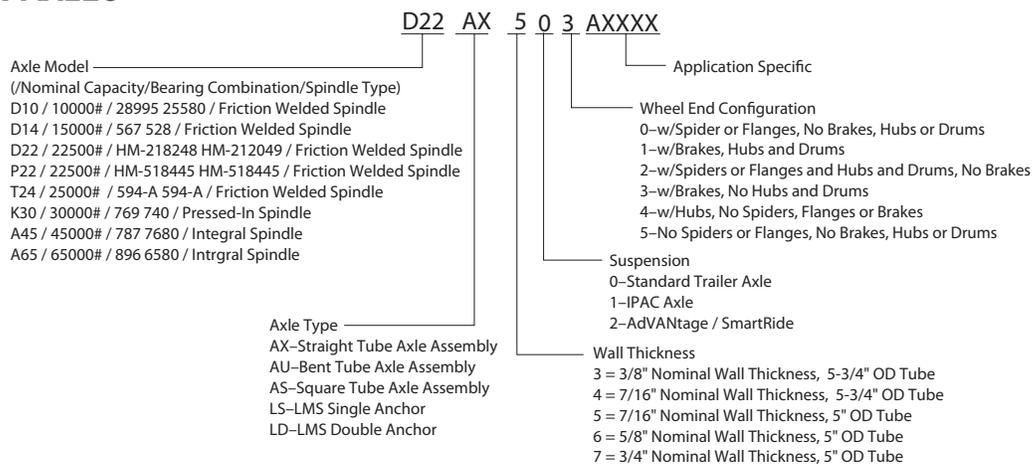
- 1 - Side of suspension arm
- 2 - Hendrickson suspension assembly identification tag
- 3 - Hendrickson axle identification tag



TRAILER SUSPENSION IDENTIFICATION

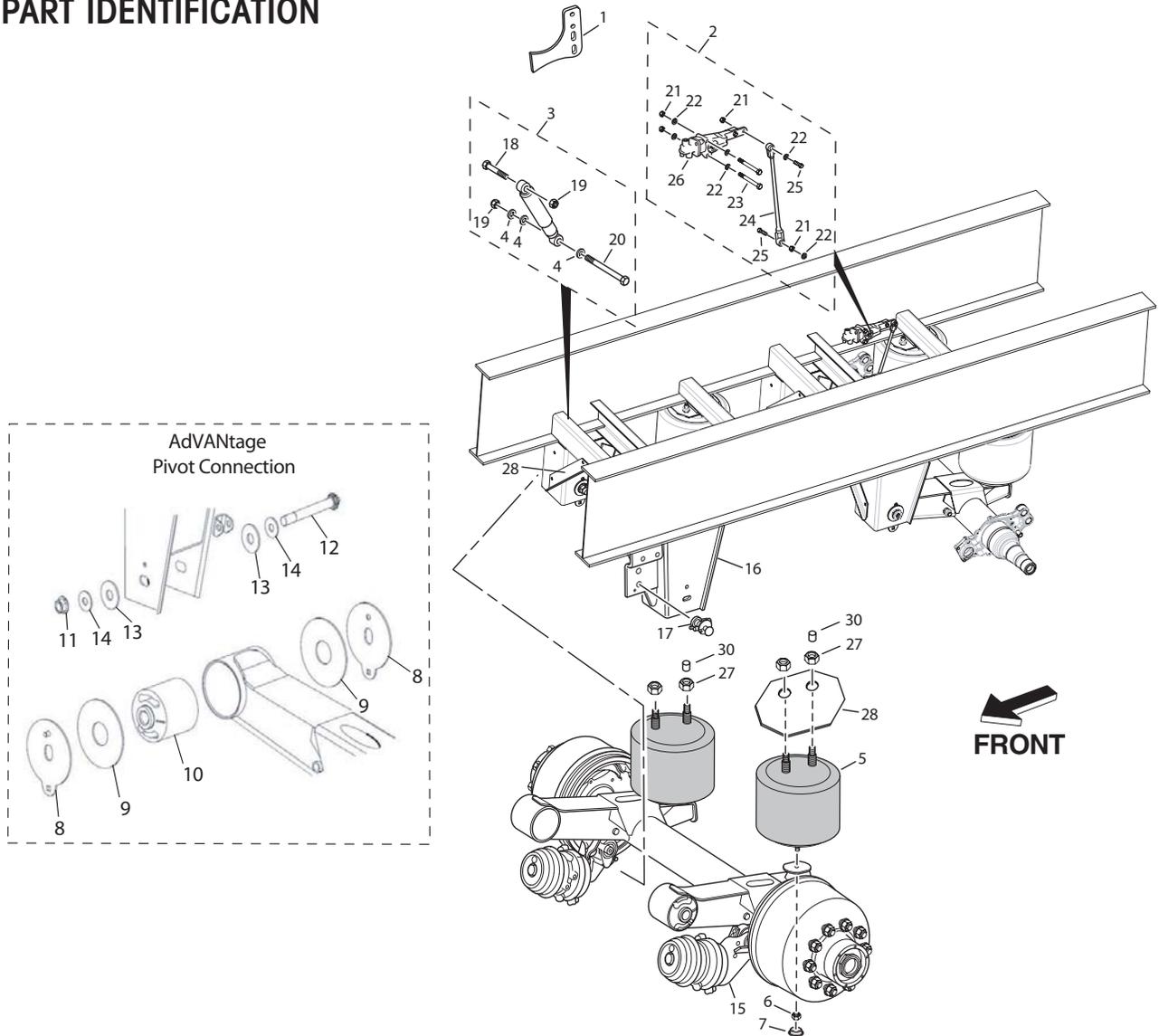


TRAILER AXLES





PART IDENTIFICATION



- 1 - Bracket, ride height valve
- 2 - Ride height valve assembly
- 3 - Shock absorber assembly
- 4 - Washer, flat
- 5 - Air spring, suspension
- 6 - Flanged lock nut
- 7 - Cap
- 8 - Washer, cam alignment
- 9 - Wear washer
- 10 - Bushing, pivot

- 11 - Lock nut, pivot
- 12 - Bolt, pivot bolt
- 13 - Washer flat, pivot bolt
- 14 - Hardened washer
- 15 - Brake assembly
- 16 - Frame bracket assembly
- 17 - Valve, air dump (optional)
- 18 - Bolt, shock, upper
- 19 - Nut, shock
- 20 - Bolt, shock, lower

- 21 - Nut, ride height valve
- 22 - Washer, ride height valve
- 23 - Bolt, ride height valve
- 24 - Linkage, ride height valve
- 25 - Bolt, ride height pivot
- 26 - Valve, ride height control
- 27 - Flanged lock nut, air bag
- 28 - Top plate
- 29 - Lateral gusset
- 30 - Plug, pipe

PROPER SUSPENSION OPERATION

Hendrickson air suspension models covered in this manual are controlled by a single height control valve. Use of more than one valve may be required for some widespread applications.

When properly adjusted, the height control valve will support the load being carried and maintain a constant ride height by controlling the air pressure in the air springs.

It is recommended that a Pressure Protection Valve (PPV) be used between the air supply and the height control valve. The trailer air pressure must be maintained in excess of 75 psig (5.2 bar). The opening pressure of the PPV is typically 75 psig (5.2 bar) and is required to open the air pressure protection valve, which maintains safe air brake pressure in the event of air loss in the suspension system.

NOTE: If equipped with a DHS system, the kickstand assembly will need to be manually disengaged before the suspension can be lowered onto the air spring internal bumpers.

⚠ CAUTION: Be sure tires are not rubbing the underside of the trailer or any other components.



INSPECTION

⚠ WARNING: TO PREVENT SERIOUS EYE INJURY, ALWAYS WEAR EYE PROTECTION WHEN PERFORMING VEHICLE MAINTENANCE OR SERVICE.

⚠ WARNING: A SCHEDULE FOR PHYSICAL AND VISUAL INSPECTIONS SHOULD BE ESTABLISHED BY THE OPERATOR BASED ON SEVERITY OF OPERATION.

During each pre-trip and safety inspection of the vehicle, perform a visual inspection of the suspension.

Listen for air leaks and visually check for:

- Bolt movement – loose dirt, rust or metal wear around bolt head and nut
- Air springs – wear damage and proper inflation
- Shock absorbers – leaking or damaged
- Cracked parts or welds

⚠ CAUTION: Always block wheels to prevent rollaway when working under the vehicle.

INSPECTION PROCEDURE

Prior to placing unit in service, check the following items:

1. Build air pressure above 75 psig (5.2 bar). With the vehicle shut off, check for air leaks.
2. With vehicle on level surface and air supply pressure in excess of 75 psig (5.2 bar), check air springs for equal firmness.
3. Check shock absorbers for proper installation. Torque bolts to 210-235 ft. lbs. (285-319 N•m).
4. Check for 1³/₄ in. (44 mm) minimum clearance around air springs with vehicle loaded.
5. Ride height should be within 1/8 in. (3 mm) of recommended height measured from bottom of frame to centerline of axle. Refer to your specific model for proper ride height measurement.
6. Verify torque on pivot nuts to 700-800 ft. lbs. (950-1085 N•m) on AdVANTage 1¹/₈ in bolt.

Refer to the table for inspection intervals.



SUSPENSION INSPECTION CHART

When (Frequency)	What (Activity)
Initial Inspection After first 5,000 miles (8,047 km)	<ul style="list-style-type: none"> • Check and re-torque all bolts and nuts at the suspension and axle connections (See Note 1) • Check and re-torque all other suspension related hardware (See Note 1)
Every 25,000 to 30,000 miles (43,233 to 48,279 Km)	<ul style="list-style-type: none"> • Check brake lining wear and estimate required replacement date <ul style="list-style-type: none"> - Replace brake shoes and lining assembly when lining thickness is $\frac{1}{4}$ in (6 mm) or less at thinnest point • Check brake shoes and lining assembly for damage <ul style="list-style-type: none"> - Replace immediately if lining is cracked, broken or oil soaked • Check brake camshaft, spider bushing and support brake bushing for damage or wear <ul style="list-style-type: none"> - Replace or repair if any signs of damage or wear are discovered
Annually (from in-service date)	<ul style="list-style-type: none"> • Inspect all suspension components for wear or damage • Re-torque of the pivot bolt connection [AdVANtage 700-800 ft. lbs. (950-1085 N•m)]
Every 100,000 Miles (160,930 Km) or whenever brake reline service is performed	<ul style="list-style-type: none"> • Check and re-torque all bolts and nuts at the suspension and axle connections (See Note 1) • Check and re-torque all other suspension related hardware (See Note 1) • Perform a thorough and complete inspection of the entire suspension assembly (See Note 2) <ul style="list-style-type: none"> - To prevent failure, tighten, repair or replace any parts or components found to be loose, damaged or worn • Replace wheel bearing lubricant (if specified) <ul style="list-style-type: none"> - NOTE: LMS wheel ends have a five-year lubricant change requirement • Check spring brake chambers and slack adjusters • Inspect brake rollers, anchor pins and bushings (Replace as required) • Check brake shoes for bent shoe ribs; cracks in shoe table welds or ribs, and elongated rivet holes replace if any of the conditions described are found

Note 1: See "Torque Specifications" on page 29.

Note 2: See "Inspection Procedure" above.



TRAILER SUSPENSION INSPECTION INTERVALS AND SUGGESTIONS

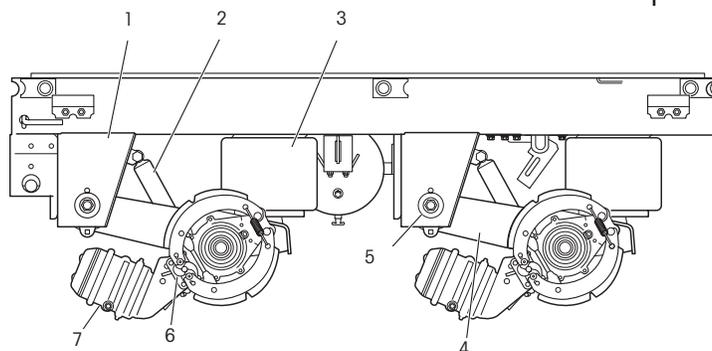
1. Inspections of trailer components should be performed routinely to locate early problems and prevent possible related or catastrophic damage.
2. Normal inspection should be performed as a pre-trip and a post-trip inspection per Federal Driver Regulations for daily trip inspections. During each trip, drivers are required to inspect vehicle at every rest stop or every four hours.
 - Good inspection habits include observing the vehicle upon initial walk-up a trained eye can catch a small problem before it turns into a big one
 - Every inspection should include a visual inspection of all components related to the trailer suspension
 - Visually check for leaks at the wheel ends or seal ends; loose or rusted fasteners and broken or cracked supports, frame and mounting hardware Check hoses and wires for cracks, leaks or chafing
 - Axle oil levels should be checked for proper fill if equipped with a sight glass
 - Air tanks should be drained daily to eliminate water contamination that may affect the air or brake system
3. Routine service should be performed at regular oil change intervals, biannually and annually.
4. Other inspections should be performed at the OEM's recommended service cycle.

SUSPENSION MAINTENANCE

⚠ WARNING: CHECK FASTENER TORQUE VALUES, TIGHTEN LOOSE FASTENERS AND REPLACE DAMAGED FASTENERS. LOOSE, DAMAGED OR MISSING FASTENERS CAN CAUSE LOSS OF VEHICLE CONTROL, DEATH, SERIOUS PERSONAL INJURY AND DAMAGE TO COMPONENTS.

1. Inspect for loose, broken or missing fasteners. Repair or replace as needed. See "Torque Specifications."
2. Inspect welds for cracks at the axle, frame bracket, pivot, gussets and hanger attachment.
3. Inspect bushings for ragged or loose pieces that can protrude from the connection area. Use a pry bar to check for looseness or freeplay.
4. Inspect the rubber part of the air spring for cuts and abrasions. Replace the air spring if it is cut or damaged.
 - Inspect pivot bolt connections for movement. See "Pivot Connection"
 - If equipped, inspect for proper operation of the DHS. See "Dock Lock"
5. Check for obstructions or interference to the air spring surface that can damage the air spring. Relocate and secure items, such as air hoses, that can contact the air spring.

⚠ CAUTION: The air spring surface must be free of interference or obstructions by items such as tires, loose steel, etc. Damage to components can result from abrasion.



- 1 - Frame bracket
- 2 - Shock absorbers
- 3 - Air springs
- 4 - Trailing beam and arm weldment
- 5 - Pivot bolt
- 6 - Brake cam
- 7 - Brake chamber

6. Check for leaks in the air lines, at the air spring bead plate, piston and mounting studs. Replace air lines, fittings or springs that leak.
7. Check HCV for proper orientation. See "Height Control Valve"
8. Inspect shock absorbers for worn bushings, oil leaks and dents. Check that mounting holes have not enlarged.
9. After normal operation, check shocks for heat as follows:
 - Warm shocks most likely indicate the shocks are operating correctly
 - Cold shocks can indicate that the shocks are not operating correctly and must be replaced. Replace shocks and bushings as necessary
10. Inspect the structure of the suspension for possible road damage including:
 - Axle welds
 - Frame bracket to frame welds or frame bracket to mounting plate welds
 - Brake interference (cam or chamber)
 - Frame brackets
 - Shock brackets
 - Frame bracket support gusset connections

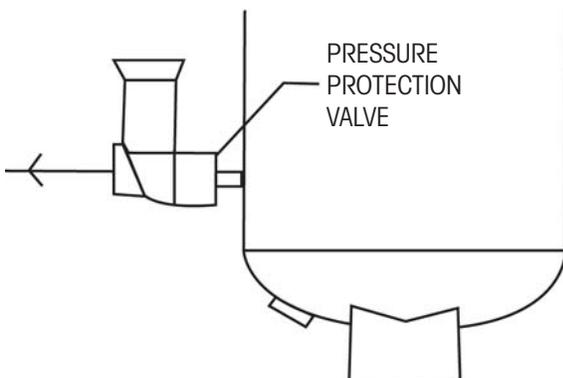
PRESSURE PROTECTION VALVE

The pressure protection valve (PPV) is located at the air reservoir. It supplies the ride height valve with air pressure and protects the system reservoir from being completely drained in the event of a failure in the air suspension allowing the brake system to remain operational.

To test, remove outlet line to the ride height valve. With system pressure above 75 psig, air should flow through the PPV, at system pressure below 75 psig the PPV will automatically close and stop air flow from the supply tank.

If air continues to flow and drain the air supply tank or does not function properly, replace the PPV.

⚠ WARNING: NEVER REMOVE THE PPV FROM THE SYSTEM OR SUPPLY AIR DIRECTLY TO THE HEIGHT CONTROL VALVE FROM THE RESERVOIR BY BYPASSING THE PPV.



DUMP VALVE (IF EQUIPPED)

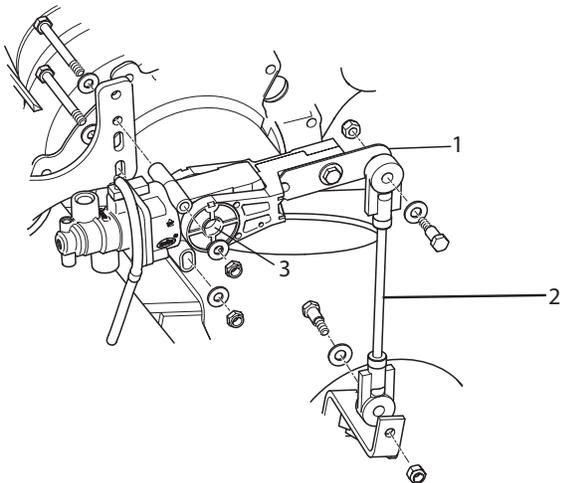
Dump valves are used to maintain rigid vertical trailer floor height during loading and unloading. When dumping, the valve exhausts air from the air springs and lowers the suspension to the bump stops, which are approximately 2½ in lower than the ride height.

⚠ CAUTION: Failure to inflate the trailer suspension before operating can result in damage to the suspension and/ components.

HEIGHT CONTROL VALVE

TEST PROCEDURE

1. Park the unloaded vehicle on a level surface.
2. Secure the vehicle and block the wheels.
3. Disconnect the height control linkage.
 - 1 – Lever arm, ride height
 - 2 – Linkage, height control
 - 3 – Valve, height control



⚠ WARNING: VERIFY THAT PEOPLE ARE CLEAR OF THE TRAILER BEFORE INFLATING OR DEFLATING THE AIR SPRINGS. THE AIR SUSPENSION HAS VARIOUS PINCH POINTS THAT CAN CAUSE SERIOUS INJURY.

4. Check the air supply to the height control valve. A minimum of 75 psig (5.2 bar) is typically required to correctly test the height control valve.

5. Rotate the lever up 30- to 45-degrees. With a delay style valve, air should begin to flow into the air springs between two and six seconds. Non-delay height control valves begin airflow or exhaust in less than one second.
6. Rotate the lever to the neutral position. Airflow should stop.
7. Rotate the lever down 30- to 45-degrees. Air should begin to flow out of the air springs exhausting at the height control valve in two to six seconds for a delay-style valve. Non-delay height control valves begin air flow or exhaust in less than one second.
8. Rotate the lever to the neutral position. Airflow should stop.

⚠ CAUTION: Do not add lubrication or cleaning solvents to the air system. These additives can contaminate the air system.

9. If the air does not flow to and from the air springs, drain the air from the system. Disconnect air lines to the height control valve. Use compressed air to clean the screens in the supply and delivery ports of the height control valve.
10. Connect the air lines to the height control valve and repeat steps 4-8. If air still does not flow to and from the air springs, or if the airflow cannot be stopped in the neutral position, replace the height control valve.
11. Inspect the height control valve for air leaks and cracked lever arm housing. If air leaks or cracks are detected, replace the height control valve.

PIVOT POINT CHECK, HEIGHT CONTROL LINKAGE

1. Verify that the pivot points rotate freely (do not bind).
- ⚠ CAUTION:** Failure of the pivot points to rotate freely about the fastener will result in damage to the linkage, brackets or suspension.
2. Verify the ends are secure. Loose ends will slip allowing the suspension to raise or lower beyond the ride height settings.

HEIGHT CONTROL VALVE REPLACEMENT PROCEDURE

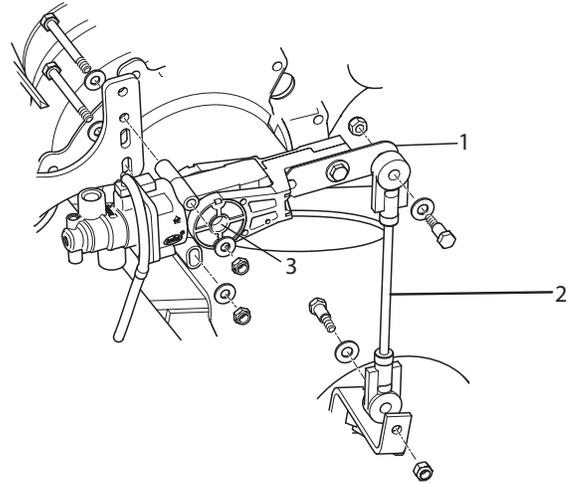
⚠ WARNING: TO PREVENT SERIOUS EYE INJURY, ALWAYS WEAR SAFE EYE PROTECTION WHEN YOU PERFORM VEHICLE MAINTENANCE OR SERVICE.

Replace worn or damaged components with genuine replacement parts. Installation of non-genuine parts can cause serious personal injury and damage to components.

⚠ WARNING: VERIFY THAT PEOPLE ARE CLEAR OF THE TRAILER BEFORE INFLATING OR DEFLATING THE AIR SPRINGS. THE AIR SUSPENSION HAS VARIOUS PINCH POINTS THAT CAN CAUSE SERIOUS PERSONAL INJURY.

1. Park the unloaded vehicle on a level surface.
2. Secure and block the wheels.
3. Drain all air from the supply tank and air springs. Exhaust air from the system by opening the drain valve at the bottom of the supply air tank to remove supply air pressure.
4. Remove air supply and delivery lines from the height control valve to be replaced.
5. Disconnect the linkage. Inspect for damage and replace bent or damaged linkage.
6. Detach the height control valve from the bracket.
7. Note location and orientation of fittings in height control valve. Remove fittings from valve.

8. Apply thread sealant to the pipe threads of the fittings and install in valve. Orient the fittings to the noted position.



9. Attach the new height control valve to the mounting bracket. Tighten the mounting bolts (96-144 in. lbs. [11-16 N•m]).
10. Insert the locating pin in the lever arm of the height control valve (See "Locating Pin Hole" on the following page).
11. Reconnect the lower linkage pivot. Tighten the lower linkage bolt (96-144 in. lbs. [11-16 N•m]).
12. Reattach the air supply and delivery lines.
13. Recharge air system to a minimum of 75 psig (5.2 bar). Avoid sharp bends in airlines. All connections must be free of leaks.
14. Using a soapy spray solution, check the entire system for air leaks.
15. Remove the locating pin at the lever arm of the height control valve.
16. Check ride height and adjust as described in "Ride Height Adjustment."

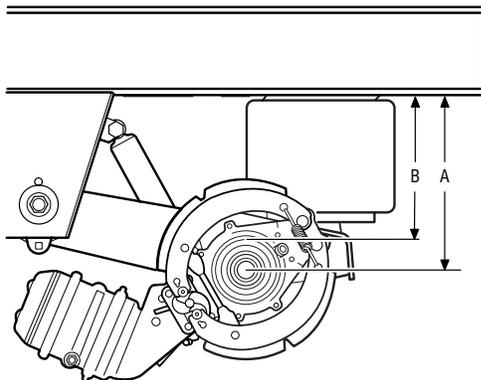


RIDE HEIGHT ADJUSTMENT

⚠ WARNING: OVERALL TRAILER HEIGHT OR CARGO HEIGHT MUST NOT EXCEED 13.50 FT. (4114 MM) IF VEHICLE CANNOT CLEAR BRIDGE UNDERPASSES DURING OPERATION, SERIOUS PERSONAL INJURY AND DAMAGE TO COMPONENTS WILL RESULT.

Ride height adjustment must be done on level ground.

1. Unload the trailer before adjusting the height control valve. Support the trailer king pin at the normal operating height.
2. Ride height measurement: Determine the correct ride height. As specified by the seventh digit of the suspension part number, see Introduction section of this manual, measure ride height from the centerline of the axle to the bottom of the slider frame (14-19 in [355-483 mm]).



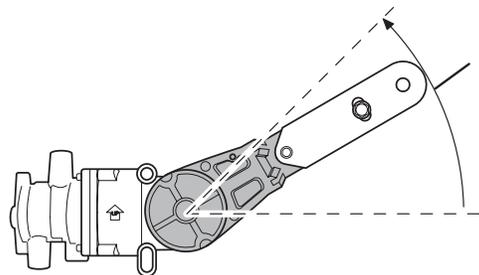
A - Height measurement at center line of axle
 B - Height measurement at top of axle

NOTE: Ride height may also be measured from the top of the axle to the bottom of the trailer frame by subtracting half of the axle diameter from the ride height. Use the following table to determine the dimension.

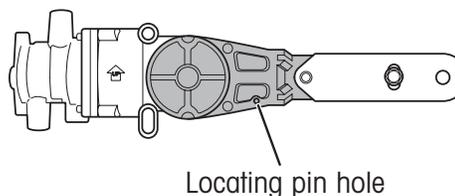
Ride Height	A	B
14	14	11 ¹ / ₈
15	15	12 ¹ / ₈
16	16	13 ¹ / ₈
17	17	14 ¹ / ₈
18	18	15 ¹ / ₈
19	19	16 ¹ / ₈

Table in inches

⚠ WARNING: VERIFY ALL PERSONNEL ARE CLEAR OF THE TRAILER BEFORE INFLATING OR DEFLATING THE AIR SPRINGS. THE AIR SUSPENSION HAS VARIOUS PINCH POINTS THAT CAN CAUSE SERIOUS PERSONAL INJURY.

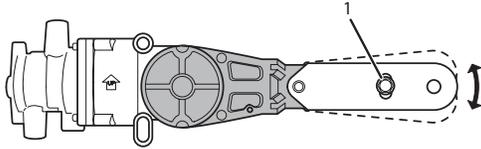


3. If linkage is connected to the ride height control; value lever arm, remove the upper linkage bolt.
4. Inflate or deflate the air springs by raising or lowering the height control lever arm 30- to 40-degrees. Hold the lever arm in the up position for at least 15 seconds or until the air bags are correctly inflated.
- 1 - Air rotate Up 30- to 45-degrees
5. Check the ride height. (See "Ride Measurement")
6. Insert the locating pin or a 1/8 in (3.2 mm) drill bit at the location specified in the height control valve. The valve should be locked in the neutral position.



Locating pin hole

- Loosen the 1/4 in (6.4 mm) adjusting screw located on the lever arm body. Allow the lever arm to swing free.

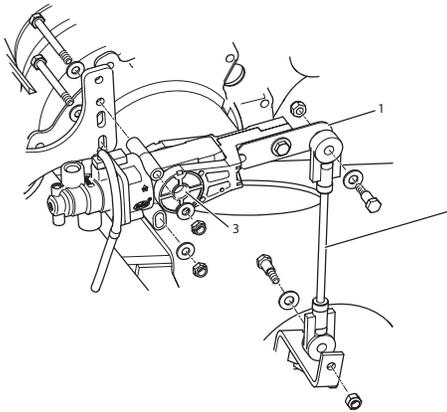


Adjusting screw

- Align the end of the lever arm to the top opening of the linkage. loosely insert the upper linkage bolt.
- Tighten the 1/4 in (6.35 mm) adjusting screw.
- Remove the locating pin or 1/8 in (3.2 mm) drill bit.

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- Connect the upper linkage bolt. Tighten the bolt to 96-144 in. lbs. (11-16 N•m).



- 1 - Lever arm, ride height
- 2 - Linkage, height control
- 3 - Valve, height control

- Check to verify that trailer height or cargo height does not exceed 13.50 ft (4114 mm). If ride height is not within specification, repeat steps 1-10 to adjust ride height. Verify that ride height is correct.

NOTE: If ride height is correct, then an over-height trailer is not the problem of the suspension. Gross over-height should not be corrected by lowering the ride height. At the normal position, there is only 3 in (76.2 mm) of up travel.

- If correct ride height cannot be achieved by performing Steps 1-11, the linkage will need to be replaced or modified as required to achieve correct ride height.

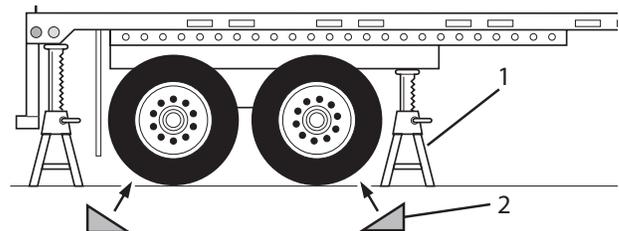
AIR SPRING REPLACEMENT

⚠ WARNING: BLOCK THE WHEELS TO PREVENT THE VEHICLE FROM MOVING. SUPPORT THE VEHICLE WITH SAFETY STANDS. DO NOT WORK UNDER A VEHICLE SUPPORTED ONLY BY JACKS. JACKS CAN SLIP OR FALL OVER. SERIOUS PERSONAL INJURY CAN RESULT.

- Identify the specific air spring that requires replacement.
- Block the tires to prevent forward and backward movement of the trailer.
- Raise and securely support the rear of the trailer with safety stands.
- With the trailer raised and securely supported, exhaust all air from the system by opening the valve at the bottom of the supply air tank.

⚠ WARNING: VERIFY ALL PERSONNEL ARE CLEAR OF THE TRAILER BEFORE INFLATING OR DEFLATING THE AIR SPRINGS. THE AIR SUSPENSION HAS VARIOUS PINCH POINTS THAT CAN CAUSE SERIOUS PERSONAL INJURY.

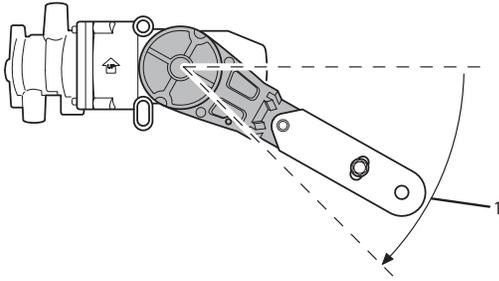
- 1 - Support trailer



- 2 - Block tires

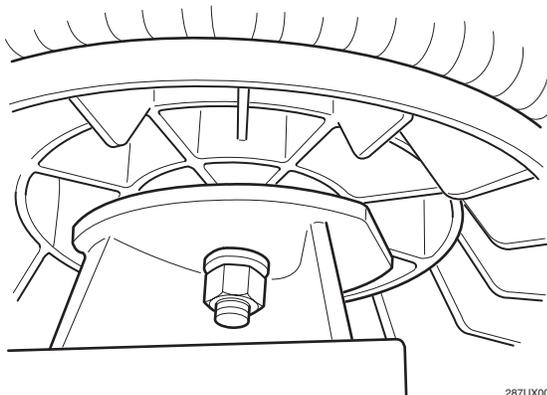


- Remove the ride height valve linkage and exhaust all air from the air springs by moving the valve arm down.



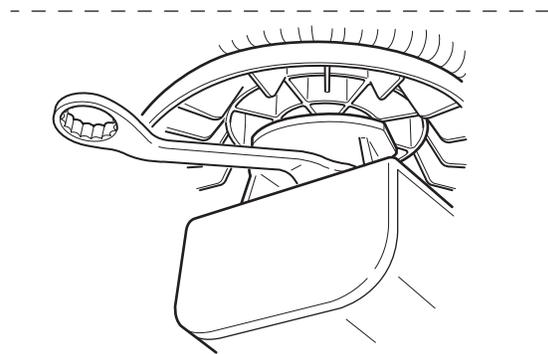
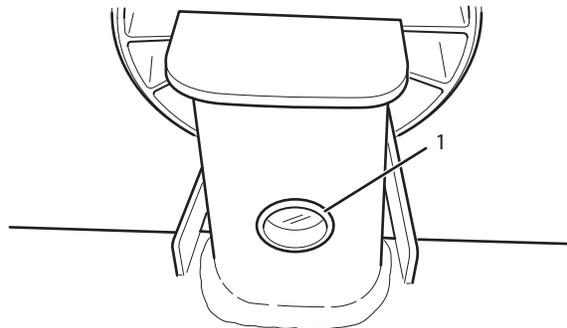
1 - Air out rotate down 30 to 40-degrees

- Remove the air inlet line and fitting from the damaged air spring (see appendix for plumbing diagram).
- Remove the nuts from the studs that secure the top of the air spring.



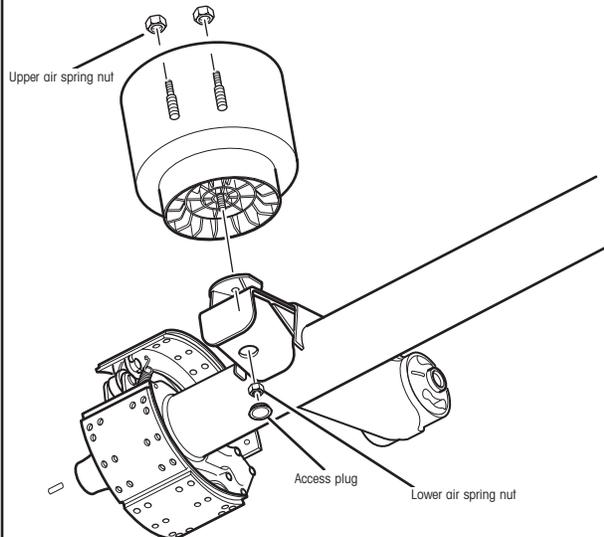
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- Remove the nut from the bottom of the air spring. The nut can be reached from inside the upper axle seat or by removing the access plug and using an extension and socket.



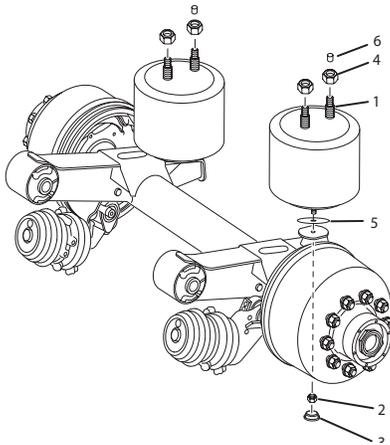
1 - Access plug

- Compress the air spring. Remove the spring from the suspension.



AIR SPRING INSTALLATION

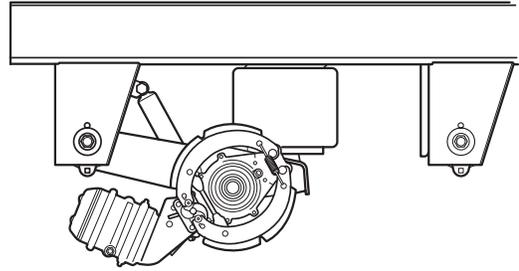
1. Apply a thread sealant to the pipe plug threads and install pipe plug into the stud air inlet port not used to inflate spring. Tighten to 25-30 lbs. (35-40 N•m) or two to three turns from finger tight.
2. Compress the new air spring. Slide the spring into the space between the axle seat and top plate.
3. Align the air inlet and mounting stud. Insert them into the holes in the top plate.



- 1 - Mounting stud
- 2 - Lower nut flange
- 3 - Access plug
- 4 - Upper nut
- 5 - Spacer (if required)
- 6 - Pipe plug

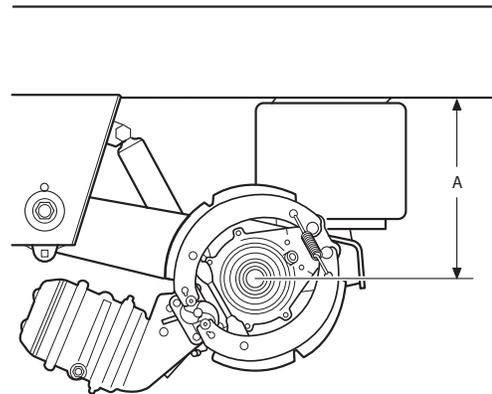
4. Install spacer if originally used.
5. Install the lower nut. Tighten the lower nut to 25-30 lbs. in. (34-41 N•m).
6. Install the nuts on the top of the air spring and tighten. Tighten the nut to 40-45 lbs. in. (54-61 N•m).
7. Install the inlet air line to the fitting on the air spring. Apply a thread sealant to the pipe threads of the fitting and install in the open air spring port.
8. Connect the ride height control valve linkage. Tighten the bolt to 96-144 lbs. in. (11-16 N•m).

9. Close the valve at the bottom of the air tank. Pressurize the air system.



⚠ CAUTION: The air spring surface must be free of interference or obstructions by items such as tires, loose steel, etc. Damage to components caused by abrasion can result.

10. Check that tires, loose steel, etc. do not interfere with the rubber part of the air spring.
11. Use a soap solution to check the entire system for air leaks. Check all the air lines and the components as illustrated in the air system diagram. Pay particular attention to the air line connections at each component. (See Appendix for plumbing diagram)
12. Raise the trailer. Remove the safety stands.
13. Verify that the ride height of the trailer is correct. If the ride height is incorrect, adjust the height control lever arm to obtain the correct ride height. Refer to the trailer OEM's specifications for the correct ride height.



A - Ride height measurement

⚠ CAUTION: A minimum 1 in tire clearance is required when all air springs are deflated.

SHOCK ABSORBER REPLACEMENT

Shock absorbers do not absorb shock, they absorb energy to prevent suspension oscillation. Shock absorbers are also used as rebound stops in most air suspensions. The shock absorber limits the stroke of an air spring, which prevents the air spring from being pulled apart. In some severe service applications, a sock strap is added to additionally aid in limiting the stroke of an air spring.

SHOCK ABSORBER REMOVAL

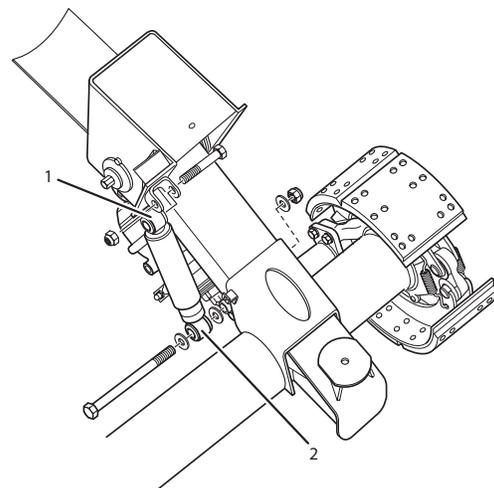
1. Remove the upper shock mounting bolt.
Discard the fasteners.
2. Remove the lower shock bolt.
Discard the fasteners.
3. Remove the shock absorber.

SHOCK ABSORBER INSTALLATION

To install a shock absorber:

1. Install shock with dust cover / bell down.
2. For top mount:
 - a. Place the shock in the upper bracket.
 - b. Insert the bolt through the bracket and upper shock mount.
 - c. Install the lock nut.
3. For bottom mount:
 - a. Place a washer on each side of the shock before inserting bolt.
 - b. Insert the bolt from each side of the axle and arm assembly.
 - c. Install washer and nut.
4. Torque top and bottom bolt to 210-235 ft. lbs. (285-319 N•m) from inside.

⚠ CAUTION: Do not lift the trailer without the shock absorbers in place. If shock absorbers are not in place, overextension of the air springs will occur. Damage may occur to the over extended air springs.



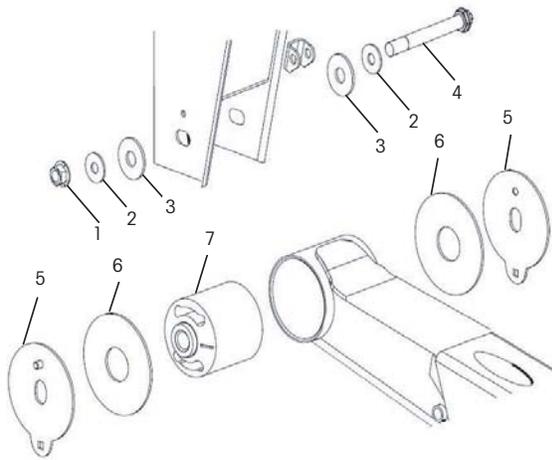
- 1 - Top mount
2 - Bottom mount



PIVOT CONNECTION

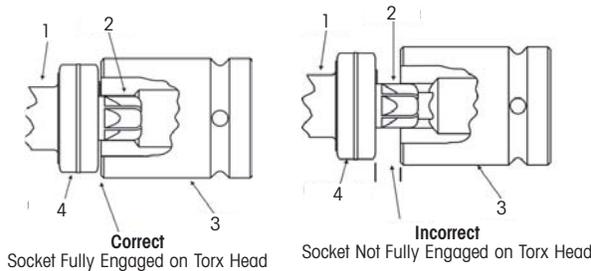
A correct pivot connection is crucial to the life of the suspension. The pivot fastener must continually provide a sufficient clamp load through the bushing to prevent premature suspension failure.

ADVANTAGE



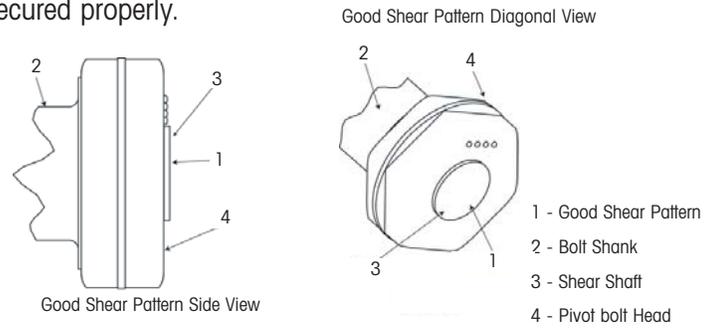
- 1 - Lock nut (pivot)
- 2 - Hardened washer
- 3 - Pivot washer
- 4 - Pivot bolt
- 5 - Alignment cam washer
- 6 - Wear washer
- 7 - Pivot bushing

The following illustrations show the proper engagement of the socket, which must be maintained as the bolt is torqued and the head is sheared off (a 1 "impact" should deliver enough torque to shear the head).

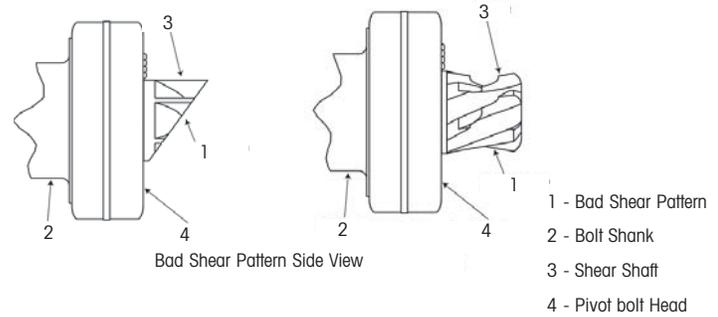


- 1 - Bolt Shaft
- 2 - Shear Shaft
- 3 - Socket
- 4 - Pivot bolt Head

The following illustrations show the results that will be visible to verify that the connection has been secured properly.



The following illustrations show the results that will be visible if the shear off procedure has taken place incorrectly. If this condition is found, even during routine inspections, contact the Hendrickson technical service department at 800-455-0043 in the United States or 800-668-5360 in Canada.



NOTE: It is recommended that a new bolt and nut are used when completing an axle alignment on the AdvANTage suspension.



PIVOT BUSHING

The pivot bushing has unique properties that will provide years of maintenance-free service. The bushing provides a resilient connection that allows an axle to walk without excessive flexing. The bushing, in conjunction with the rigid axle connection, results in a roll stable suspension design that resists trailer lean independent of the air spring loading.

There are times when a problem, seemingly in the area of suspension is diagnosed as a failed bushing. Closer inspection typically reveals another component or a faulty installation is the problem. If a problem is in the area of the suspension, see "Diagnostics," or contact the Hendrickson technical service department at 800-455-0043 in the United States or 800-668-5360 in Canada.

Re-bushing of a suspension requires the use of a bushing removal / installation tool and bushing kit, containing the required components for re-bushing. Contact the Hendrickson technical service department.

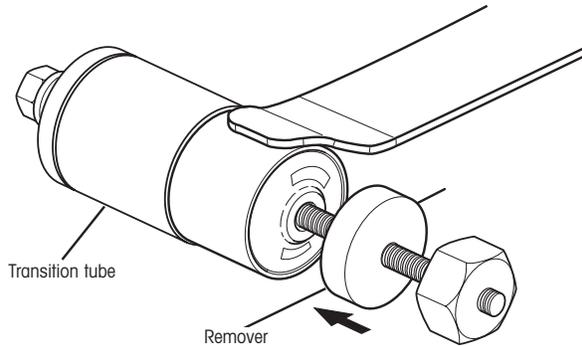
BUSHING REMOVAL

1. Support the trailer and exhaust the air from the air springs.
2. Remove the nut from the pivot bolt. Remove the pivot bolt from the suspension and the suspension bracket. Lower the suspension trailing beam down and out of the suspension frame bracket. Carefully remove the inner alignment cam and the outer alignment cam. Discard the nut bolt and wear spacer.
3. Before any bushing removal is attempted, chalk or scribe the bushing orientation on the beam tube to ensure proper positioning of the bushing for installation.

NOTE: Bushing voids must be located in the correct position. Voids must be on a vertical centerline when suspension is at ride height. Align indexing mark on the suspension beam with an indicator mark on the bushing. If the mark is not visible on the beam, be sure to install the voids in the same location as voids of the removed bushing.

4. Install a bushing removal tool on the bushing tube at the pivot bushing. The tool must consist of a transition tube to receive the bushing as it is removed and a remover that fits over the metal bushing bore to press the bushing out.

⚠ WARNING: THE END OF THE TRANSITION TUBE WHICH RECEIVES THE REMOVED BUSHING WILL ALWAYS BE POSITIONED AGAINST THE SUSPENSION BEAM DURING BUSHING REMOVAL AND INSTALLATION. THIS WILL CAUSE THE BUSHING TO ELONGATE DURING EITHER OPERATION.



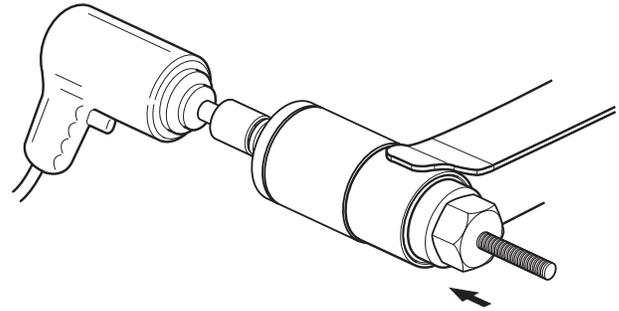
5. Apply high-pressure lube to the threads of the bushing removal tool hex bolt.

⚠ WARNING: DO NOT USE PRESSURE LUBE ON THE BUSHING. IT IS ONLY TO BE USED ON THE THREADS OF THE HEX HEAD BOLT.

6. Insert the hex head bolt of the assembled tool through the bushing until the transition tube rests squarely on the bushing tube. Slide the remover over the exposed threads on the hex head bolt. Snug the hex head bolt while ensuring the transition tube rests squarely on the bushing tube.
7. Turn the hex head bolt clockwise using $\frac{3}{4}$ in. impact wrench and a heavy-duty (Six-point) impact socket. If the bolt stops turning during the removal process, reverse the impact wrench and loosen the tool assembly. Check parts for damage. Reset the remover and try again.

NOTE: Use of a one in. impact wrench is not recommended. Damage to the threads of the hex head bolt could result.

NOTE: Ensure the transition tube remains properly seated against the bushing during bushing removal.

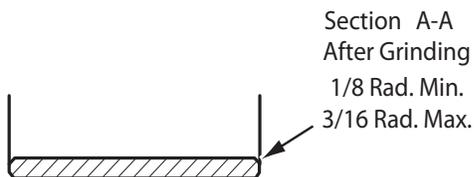
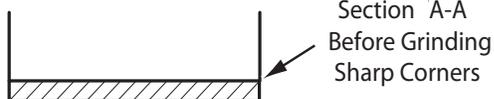
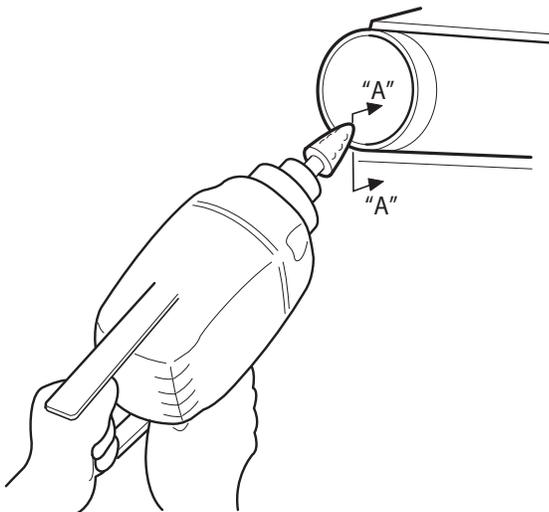


NOTE: As a last resort, a small amount of heat may be required to break the bushing loose. Do not overheat the bushing tube. Allow the bushing tube to cool before installing the new bushing.

8. Typical removal time should be four minutes or less.
9. After bushing removal, reverse the impact wrench to disassemble the tool.

BUSHING INSTALLATION

1. Clean the bushing tube on the trailer suspension beam. All rust, rubber and any other buildup must be removed before a new bushing can be installed. The bushing tube must be cool.
2. Check the edges of the bushing tube for burrs or sharp edges. Remove any burrs by grinding. If the edge of the tube is sharp, grind a small chamfer on the inside of the leading edge. This will aid wear pad life.



3. Lube the inside of the beam bushing tube, the outside diameter of the bushing and the inside of the transition tube of the bushing tool with Seagull type M, Cyclo-Lube, or an equivalent rubber assembly lube. Do not apply this lubricant to the threads of the bushing tool hex head bolt.

⚠ WARNING: DO NOT USE PETROLEUM BASED LUBRICANT ON THE PIVOT BUSHING, AS PETROLEUM BASED LUBRICANT WILL DAMAGE THE BUSHING RUBBER.

4. Push the bushing into the transition tube and assemble the bushing tool.

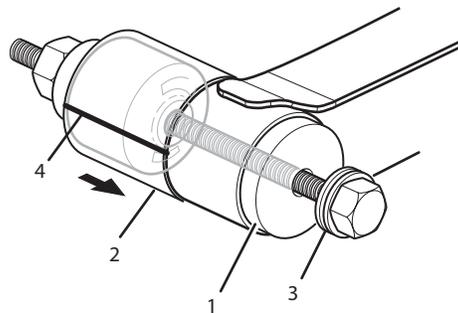
NOTE: Ensure that the indicator mark on the bushing is aligned with the scribe mark on the transition tube. Ensure the thrust bearing is greased and the threads of the hex head bolt are well lubricated with high-pressure lube.

5. Push the bushing and transition tube assembly over the threads of the hex head bolt until they contact the beam bushing tube. The lips of the transition tube and front plate should rest on the lip of the beam bushing tube.

NOTE: The bearing cup end of the transition tube should be resting against the beam bushing tube so the bushing will elongate during the installation process.

NOTE: The transition tube should be oriented with the chalk mark or scribe mark made during disassembly.

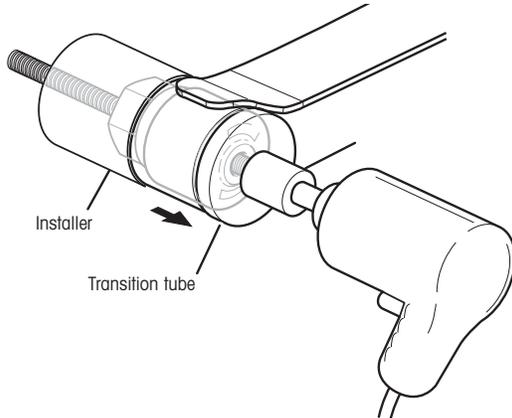
6. Hold the installer against the bushing and turn the hex head bolt to engage the threads of the nut.



- 1 - Installer
- 2 - Transition tube
- 3 - Thrust bearing
- 4 - Indicator mark

7. Snug the hex head bolt and recheck the alignment of the beam bushing tube and the bushing tool.

- Use a $\frac{3}{4}$ in. impact wrench and an impact socket to turn the hex head bolt. When the bushing is approximately halfway in the beam bushing tube, the impact wrench may slow down. After a very short time, the wrench will pick up speed again.



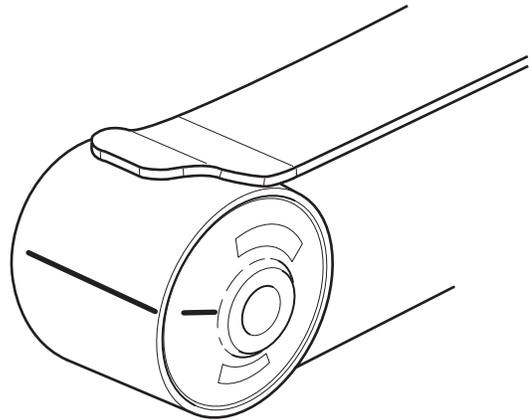
NOTE: If the installer is not sitting squarely on the bushing, rubber will work its way around the sides of the installer and stop any movement of the bushing. If the impact wrench stops, reverse the impact wrench and reset the installer on the bushing squarely.

- The transition tube will fall away before the bushing is seated totally in the beam bushing tube. Continue to tighten until the bolt stops turning.

⚠ WARNING: DO NOT ALLOW THE TRANSITION TUBE TO FALL OR THE TOOL COULD BE DAMAGED OR PERSONAL INJURY COULD RESULT.

NOTE: Do not over torque the hex head bolt or the bolt could be damaged.

- Verify that the bushing is aligned with the scribe marks on the suspension beam tube.



- Disassemble and clean the tool. Store the tool in a clean dry area.
- Reassemble the pivot connection. With fastener, snug only. Do not torque at this time.
- Check alignment. Adjust if necessary.

⚠ WARNING: DO NOT TACK WELD THE BOLT TO THE WASHERS.

- Use the shear feature on the bolt head for the AdvANTage suspension or manually torque to 700-800 ft. lbs. (949-1085 N•m).

- Verify alignment is correct after the torque process.

⚠ WARNING: FAILURE TO FOLLOW THESE PROCEDURES AND / OR TO PROPERLY TORQUE THE PIVOT FASTENERS COULD RESULT IN A FAILED PIVOT CONNECTION AND DAMAGE TO THE AXLE, SUSPENSION OR TRAILER.

SUSPENSION AXLE ALIGNMENT

⚠ WARNING: ALIGNMENT SHOULD ALWAYS BE DONE WHILE THE TRAILER IS EMPTY.

Proper preparation is a must for effective axle alignment. The vehicle, tools, equipment and work site must all be appropriate for axle alignment. The process also requires a trained technician who knows the specifications.

Axle alignment specifications may be stated in inches, degrees, minutes of angle (MOA or 1/60 of a degree) or mm/M. Each format can produce equivalent results. Hendrickson trailer axles are built to less than +/- 2.5 MOA run out at each spindle.

ADJUSTMENTS

TMC RP 708, *Trailer Axle alignment*, addresses all the steps needed to make the trailer ready for alignment.

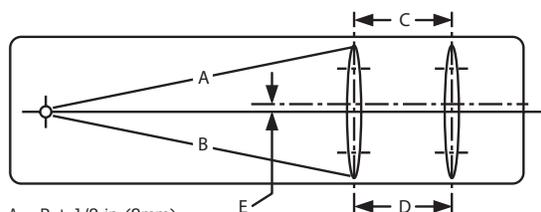
To review these:

- Inspect the suspension and the axles for any obvious damage
- Tighten, repair or replace any parts that do not meet suspension or axle manufacturer criteria for serviceability
- Check tires for proper inflation and matching diameters
- Park the trailer on a smooth and level pad with the parking brakes released

NOTE: After backing the trailer in, pull it forward in a straight line to gentle a stop. This will allow suspension parts to settle in a forward running position. Use wheel chocks to prevent injury due to accidental movement of the trailer.

- With the brakes still released, adjust the height control valve for the proper setting and the upper coupler (bolster plate) to the proper height by raising or lower the landing gear legs

- Do not proceed unless the wheel bearing end play is known to be in adjustment per TMC's recommended procedure, the bearing manufacturer, and / or Hendrickson Publication L496, *Wheel End Maintenance Procedures*, available at www.hendrickson-intl.com



A = B ± 1/8 in (3mm)
 C = D ± 1/16 in (1.5mm)
 A = B < 1/8 in (1.5mm)

Measure the distance from the trailer king pin to the centerline of the spindles on the first axle. It is recommended that a spindle extension be utilized. Dimensions A and B must be equal within 1/8 in (3.2 mm). Dimension E is equal to the distance between the trailer centerline and the axle centerline. Repeated difficulty in adjusting the axle to the desired reading is most often due to a loose wheel bearing, badly worn suspension component or a combination.

⚠ WARNING: NEVER BEND THE AXLE IN ORDER TO CORRECT ANY ALIGNMENT CONDITION. THIS COULD WEAKEN THE AXLE AND CAUSE AXLE FAILURE RESULTING IN SERIOUS INJURY OR DEATH.

1. The trailer must be on a level surface.
2. Adjust the trailer landing gear. The height of the king pin should be the same as when the trailer is connected.
3. Release the parking brakes. Secure and block the wheels of the axle not being aligned to keep the locking pins tight against the same side of the body railholes (front and rear).

ALIGNMENT METHOD FOR ADVANTAGE

1. Start with the pivot connection nut snug torqued at this point.
2. Using a $\frac{1}{2}$ in. drive pull handle to rotate the alignment washers to make necessary alignment adjustments.
3. Use the shear head feature on the bolt head or manually torque to 700-800 ft. lbs. (950-1085 N•m) on either side of the axle.
4. Verify alignment and repeat step three on opposite side of the axle.

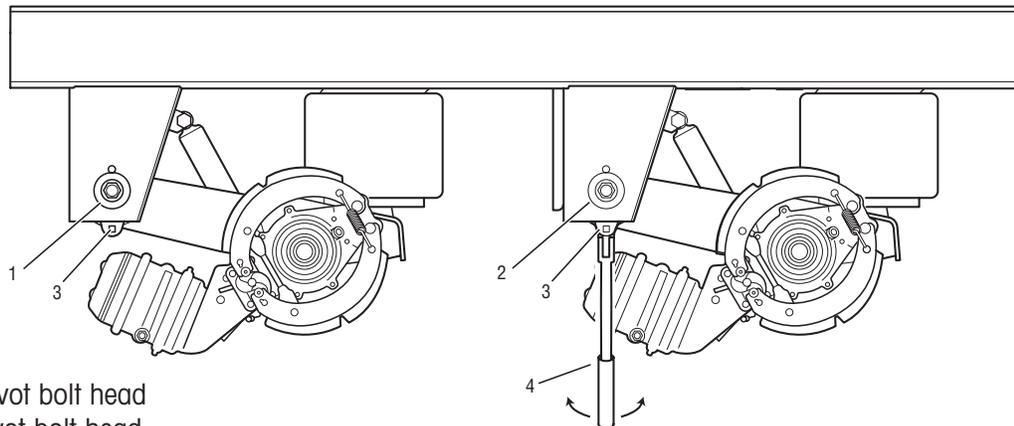
⚠ IMPORTANT: The use of a new pivot bolt and lock nut is required when completing axle alignment.

FIRST AXLE

1. Check to verify the suspension is at the correct ride height. Refer to the trailer OEM's specifications. Ride height information is also found in the seventh digit of the model number.
2. Measure from the king pin to each end of the first axle (measurements A and B). To obtain correct alignment, the dimensions must be within $\pm \frac{1}{8}$ in. (3 mm) at both ends of the axle.
 - If adjustment is required, proceed to "Alignment Method"
 - If adjustment is not required, proceed to "Rear Axle"

REAR AXLE

1. Check the dimension from the centerline of the first axle to the centerline of the rear axle (measurements C and D).
2. The dimensions must be within $\pm \frac{1}{16}$ in (1.5 mm) at both ends of the axle.
 - If adjustment is required, proceed to "Alignment Method"



- 1 - Front pivot bolt head
- 2 - Rear pivot bolt head
- 3 - $\frac{1}{2}$ in. drive pull handle



DIAGNOSTICS

The following tables provide information to aid in determining the root cause of a trailer suspension system problem.

Condition	Possible Cause	Recommended Action
All air springs flat	Insufficient air pressure in reservoir to allow the PPV to supply the RH valve.	Build air pressure to 75 psig (5.2 bar) or more. Check compressor for correct function. Check all air lines and fittings for leaks.
	Defective pressure protection valve.	Check and replace valve if necessary.
	Height control valve supply or delivery fitting clogged.	Inspect height control valve supply and delivery fittings for restrictions.
	Air leak in system.	Inspect entire system for leaks. Repair or replace as necessary.
	Suspension overloaded.	Review load to suspension rated capacity.
Air springs fully raised but don't exhaust	Height control valve delivery port of exhaust port plugged.	Inspect ports for restrictions. Repair or replace as necessary.
	Height Control linkage broken.	Replace linkage.
	Defective RH control valve.	Replace RH valve.
Vehicle body incorrect ride height during operation	Height control valve not adjusted properly.	Inspect and adjust as necessary.
	Height control lever bent or broken.	Replace lever.
	Insufficient air pressure to the suspension system (low-ride-height condition).	Check air compressor and pressure protection valve for proper operation. Inspect system for leaks. Repair or replace as necessary.
Main air pressure drops 65 psi (88 kPa) and lower	Ruptured air spring.	Inspect air springs and replace as necessary.
	Defective or inoperative PPV valve.	Inspect and replace as necessary.
	Leaking air lines.	Inspect air lines and repair or replace as necessary.
Hard ride	Improper ride height or air springs flat.	Check and adjust ride height. See first condition.
	DHS engaged (DHS equipped units only).	Verify operation of DHS when parking brake is released.
Suspension ride height not maintained during operation	Clogged air filters.	Inspect, clean or replace as necessary.
	Moisture in air tank.	Drain air tank and evacuate air system of moisture.
	Clogged filter screens in height control valve.	Inspect, clean or replace as necessary.
	Damaged linkage or incorrect valve mounting.	Replace, repair or adjust as necessary.
	Defective RH control valve.	Replace RH valve.



Condition	Possible Cause	Recommended Action
Incorrect tire clearance in full jounce	Incorrect tire size.	Replace tires with the recommended tire size.
Trailer not pulling straight (dog walk)	Trailer axles out of alignment.	Realign axles.
	Loose pivot bolts.	Align axles; replace and tighten alignment bolts to the proper torque.
Trailer wandering or unusual rattling	Worn bushings.	Inspect bushings and replace as needed.
	Loose pivot bolts.	Align axles; replace and tighten alignment bolts to the proper torque.



TROUBLESHOOTING PIVOT BUSHING

Condition	Possible Cause	Recommended Action
Trailer Leans ...		
Constantly in one direction	Suspension beams installed out of parallel.	Determine which beam is out of parallel, replace axle and beam weldment.
Varies from side to side	Axle welds missing or broken (must be welded by the manufacturer).	Replace axle and beam weldment.
Carries in one direction	Pivot bushing failed (rare).	Replace pivot bushing.
Trailer Dog Tracks ...		
Constantly in one direction	Trailer frame not square, king pin excessively off center or high crown highways.	Realign suspension per manuals and bias the alignment of both axles equally in opposite direction of the dog tracking.
Varies from side to side	Alignment collars loose.	Replace pivot bolt kit. Realign the trailer.
To one side under load	Suspension not square to the axle.	Contact Hendrickson technical service department.
	Air springs (bag) misaligned. drawing and reposition as required.	Compare the installation to the suspension.
	Failed pivot bushing (rare).	Replace the pivot bushing and realign per instructions.
Bushing Walk		
The suspension beams have shifted from the center of the pivot bushings service	Suspension beams are out of parallel (vertically or longitudinally).	Determine which beams are out of position. Re-bush both suspension pivots and realign per instructions.
	Frame bracket center does not match suspension beam centers.	Reposition the incorrect components and Re-bush both suspension pivots. Contact Hendrickson technical department for specific dimensions.
	Use of improper bushing lubricant (Seagull Type M, Cyclo-lube).	Re-bush using only the specified lubricant.
Pivot can be moved vertically	Normal travel.	No action is required.
Bushing protrudes from the bushing tube	Faulty or worn bushing.	If excessive rubber protrudes from one end, then it can indicate a bushing walk condition. Replace the bushing if this condition is present.
Grooving or deforming of spacer arm wear washer tube and bushing	Excessively dirty environment or fault worn bushing.	The wear pads act as filler pieces between the hanger and the bushing. The pads will show signs of wear due to the movement of the suspension beam during articulation. Replace pads if worn.
	Wear washer life cycles are shortened by wide spread axle applications.	Replace as needed.



TORQUE SPECIFICATIONS

⚠ WARNING: CHECK FASTENER TORQUE VALUES, TIGHTEN LOOSE FASTENERS AND REPLACE DAMAGED FASTENERS. LOOSE, DAMAGED OR MISSING FASTENERS CAN CAUSE LOSS OF VEHICLE CONTROL, DEATH, SERIOUS PERSONAL INJURY, AND DAMAGE TO COMPONENTS.

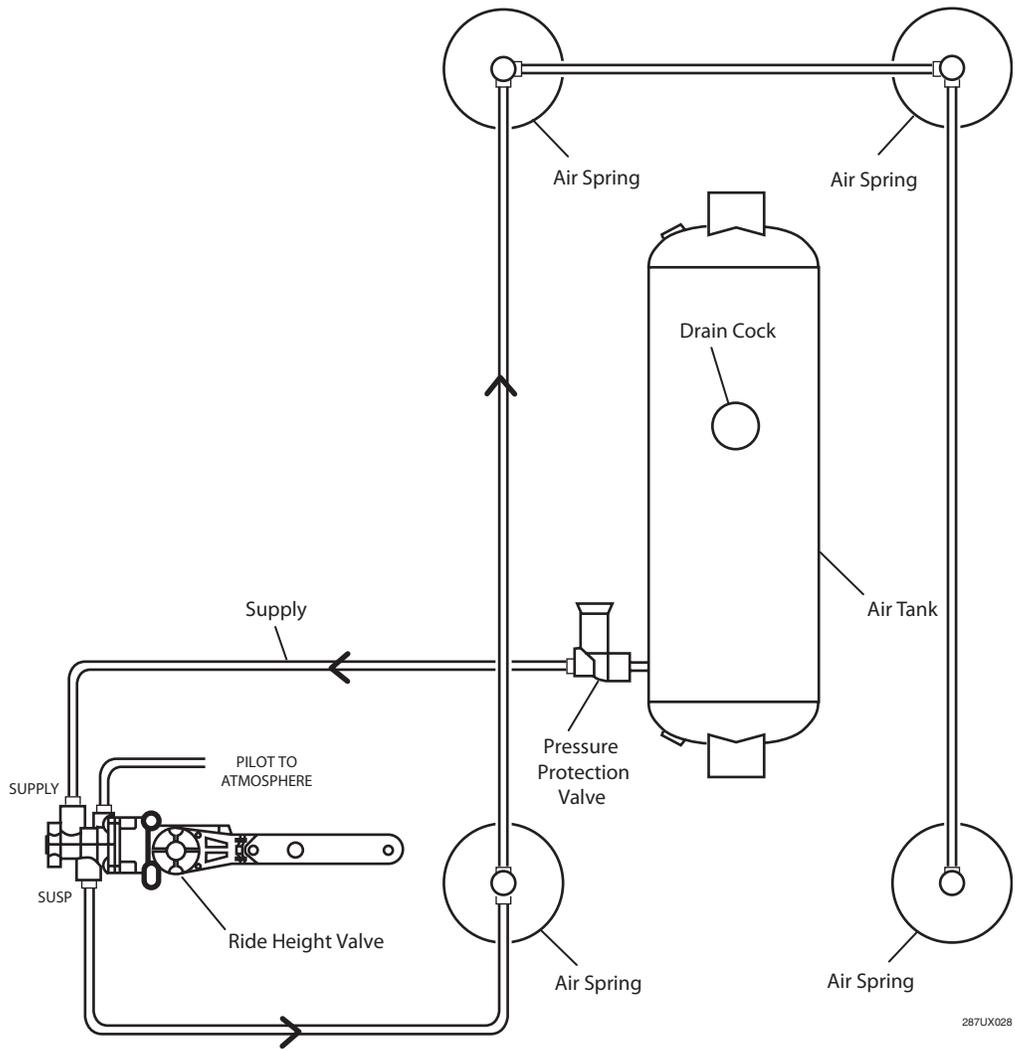
Torque Specifications Table

Fasteners	in. lbs.	ft. lbs.	N•m
Upper air spring nut	-	40-45	54-61
Lower air spring	-	25-30	34-41
Shock absorber-upper and lower	-	210-235	285-319
Air chamber mounting nuts	-	100-115	136-156
Cam tube assembly flange bolt	-	65-85	88-115
Pivot bolt (1 1/8" dia.)	-	700-800	950-1085
Advantage			
HalDEX Automatic Brake Adjuster control arm nut	-	8-12	11-16
Ride height valve fastener	96-144	-	11-16
Ride height valve linkage fastener	96-144	-	11-16
Slider hold down clip	-	80	110
Dock lock air bag	-	8-12	11-16
Dock lock pivot brackets	-	65-75	89-103
Dust shield mounting bolt	180-200	-	20-23

- Check fastener torque values after 1,000 miles (1,600 km) and annually thereafter
- Retighten loose fasteners
- Replace damaged fasteners to maintain correct torque values and comply with warranty requirements

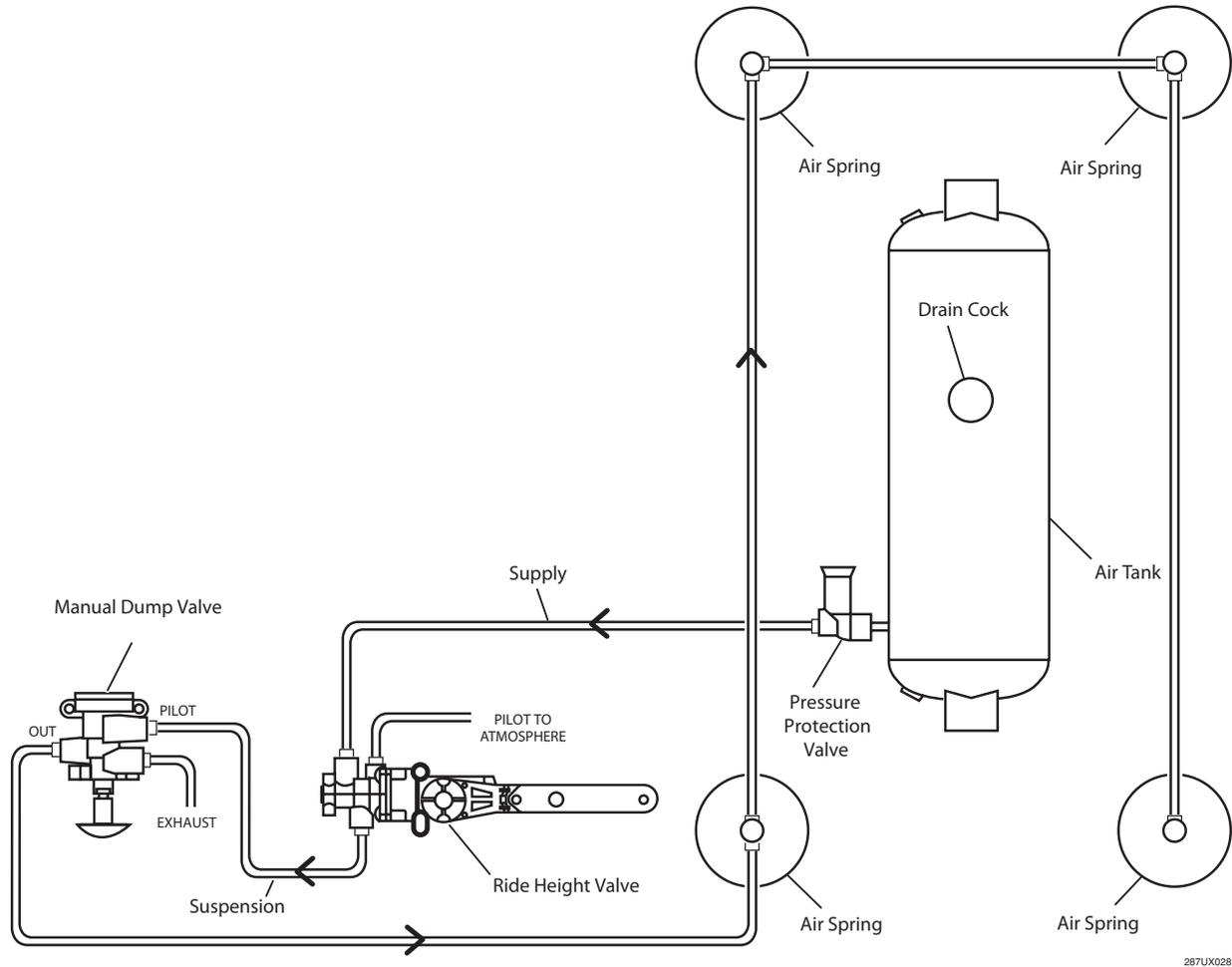
APPENDIX

TYPICAL TRAILER SUSPENSION AIR SYSTEM





TYPICAL TRAILER SUSPENSION AIR SYSTEM WITH MANUAL DUMP VALVE

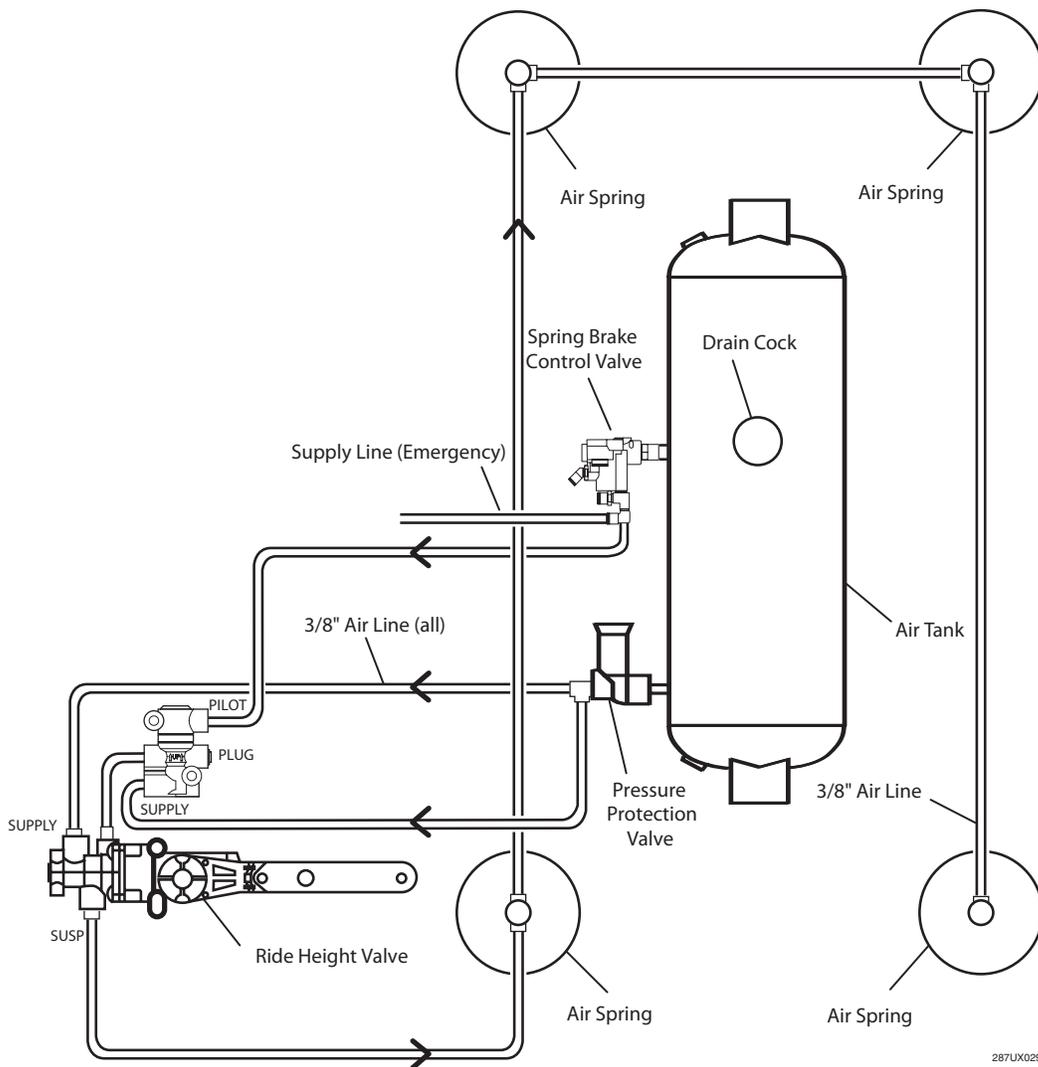


- Operator can manually deflate air springs allowing the trailer to rest on the air spring bumpers, or dock height support, if equipped
- Operator must manually reset the valve to inflate the air springs

⚠ CAUTION: Failure to inflate the trailer suspension before operating can result in damage to the suspension and / or components.



**TYPICAL TRAILER SUSPENSION AIR SYSTEM
WITH AUTO DUMP RIDE HEIGHT VALVE**



287UX029

SUPPLY LINE DE-ENERGIZED

- The air springs are de-flated automatically when the parking brakes are set, allowing the suspension to rest on the air spring bumpers or DHS, if equipped

NOTE: An empty or lightly loaded trailer may not rest on the air spring bumpers until being loaded. Expect a sudden squat of the suspension under this condition.

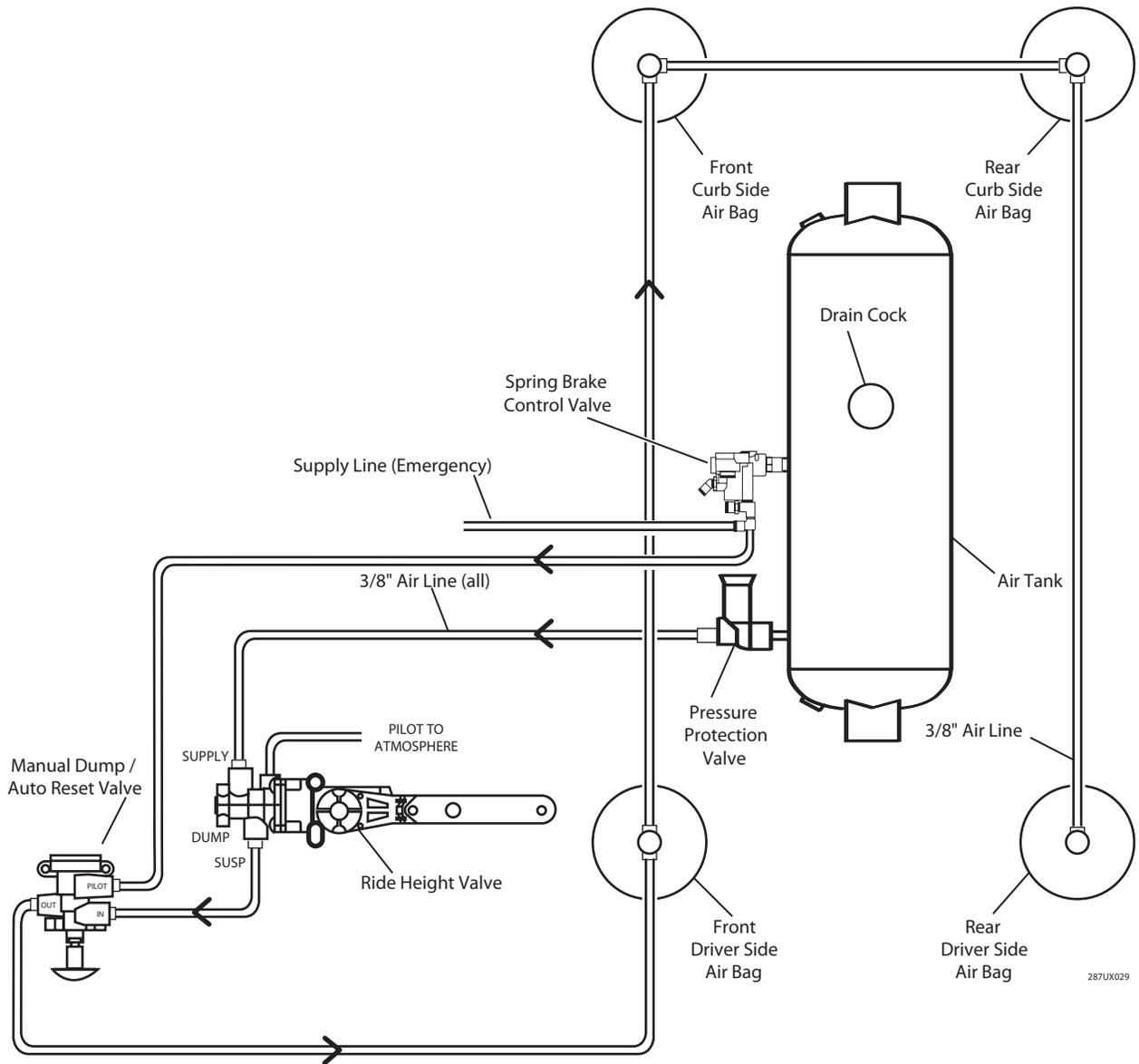
SUPPLY LINE ENERGIZED

- The air springs are re-flated when the parking brakes are released

⚠ CAUTION: Failure to inflate the trailer suspension before operating can result in damage to the suspension and / or components.



TYPICAL TRAILER SUSPENSION WITH MANUAL DUMP VALVE WITH AUTO RESET



- Operator can manually deflate air springs allowing the trailer to rest on the air spring bumpers, or dock lock, if equipped
- With the auto refill feature, air springs re-inflate when supply line is energized

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