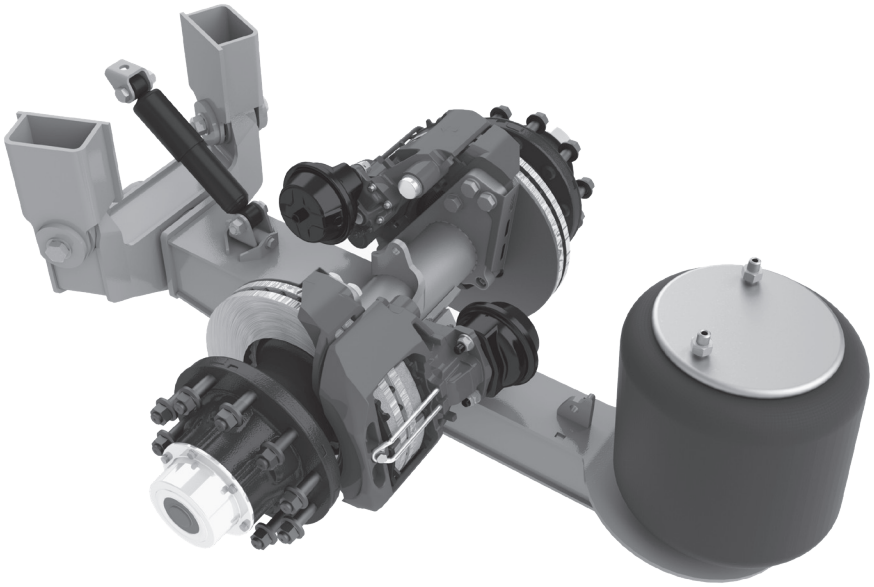
RAR-251 - Stub Axle Suspension

Trailer Air-Ride Suspension



Installation and Service Manual

RIDEWELL SUSPENSIONS

Part No.: 9710119
Doc: 251-Trailer-ISM-RevA-05-09-19

SUSPENSION IDENTIFICATION

Introduction

The Ridewell Air Ride 251-Trailer Suspension can be purchased with or without an integrated stub-axle.

The mounting hardware kit enclosed with the suspension is designed for a basic vehicle installation that accommodates up to 5/8"-thick hanger side plates. Ridewell can design a suspension hanger for a specific application.

Suspension Identification Tag

A (**606-) Installation/Assembly Number** will be listed as the **Part Number** when other system components are factory installed with the suspension (Figure 1).

The **Suspension Number** and **Serial Number** on the Suspension ID Tag refer to the model and the date of manufacture of an individual suspension system.

Please refer to the suspension number/part number and serial number on the Suspension Identification Tag when contacting Ridewell for customer service, replacement parts and warranty information.

Axle-Body Identification Tag

The **Base-Axle Part Number (165-)** and the **Serial Number** of the axle tube are listed on the Axle-Body ID Tag of Ridewell-branded round axles (Figure 2).

The **Base-Axle Part Number** refers to Ridewell-branded round axles manufactured in various axle wall thicknesses and widths.

More information on Ridewell-branded axles can be found in the "Trailer Axle Parts Guide" (9710029).

Notes and Cautions

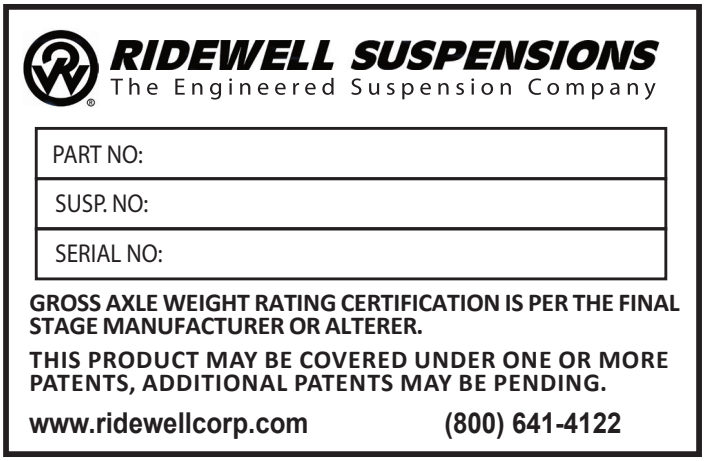
All work should be completed by a properly trained technician using the proper/special tools and safe work procedures.

Read through the entire Installation and Service Manual (ISM) before performing any installation or maintenance procedures.

The ISM uses two types of service notes to provide important safety guidelines, prevent equipment damage and make sure that the suspension system operates correctly. The service notes are defined as:

"NOTE": Provides additional instructions or procedures to complete tasks and make sure that the suspension functions properly.

⚠CAUTION Indicates a hazardous situation or unsafe practice that, if not avoided, could result in equipment damage and serious injury.


RIDEWELL SUSPENSIONS
The Engineered Suspension Company

PART NO:
SUSP. NO:
SERIAL NO:

GROSS AXLE WEIGHT RATING CERTIFICATION IS PER THE FINAL STAGE MANUFACTURER OR ALTERER.

THIS PRODUCT MAY BE COVERED UNDER ONE OR MORE PATENTS, ADDITIONAL PATENTS MAY BE PENDING.

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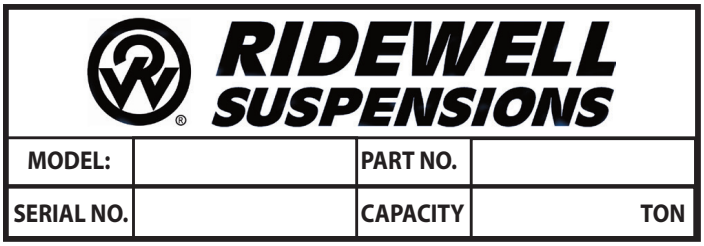
Figure 1.
The Suspension Model (Suspension Number) and date of manufacture (Serial Number) are listed on the Suspension Identification Tag.


RIDEWELL SUSPENSIONS

MODEL:		PART NO.	
SERIAL NO.		CAPACITY	TON

Figure 2.
The Base-Axle Part Number (165-) and the Serial Number assigned to the axle tube are listed on the Axle-Body Serial Identification Tag.

Prior to Installation

Refer to the engineering drawing to confirm dimensional requirements and the range of ride heights available.

Installations can vary and procedures should be adapted for different vehicles, as needed.

- The Gross Axle Weight Rating (GAWR) is determined by the system component with the lowest load rating. Please consult with tire, wheel, axle and brake manufacturers before installation to determine the GAWR.
- If vehicle chassis modifications are required, consult with the vehicle manufacturer to ensure that such changes are permitted.
- Welding or altering suspension components is not permitted without the express written permission of Ridewell Suspensions.

Installer Responsibilities

The installer of the suspension has the sole responsibility for proper attachment of the suspension system to the vehicle chassis.

- The installer is responsible for locating the suspension system on the vehicle to provide the proper load distribution.
- The installer must verify that vehicle crossmembers are positioned to support the suspension at the installing location.
- It is the installer's responsibility to determine that axle spacing conforms to any applicable federal and local bridge laws.
- The installer must verify that air reservoir volume requirements are met after suspension installation. Consult the vehicle manufacturer or Federal Motor Vehicle Safety Standards (FMVSS) 121 for more information.
- The installer must verify there is sufficient clearance for proper functioning of the suspension, air springs, brake chambers, axle and tires.

Axle Integration

Suspension systems are available with and without a factory integrated axle. Customer-supplied axle assemblies must be positioned and oriented (rotated) properly before welding the axle to the axle seats.

Use the top-center mark on the axle, if available, to identify the center of the axle and orient the axle assembly on the suspension. The axle assembly should be installed so that the camshafts, when activated, rotate in the same direction as the wheels.

CAUTION Failure to follow procedures and design specifications could result in injury, damage to the axle or suspension and void the warranty.

Weld Preparation

The joint to be welded should be positioned in the flat or horizontal position. All grease, dirt, paint, slag or other contaminants must be removed from the weld joint.

The axle and suspension components should be at a minimum temperature of 60°F (15.5°C). Pre-heat the weld zone to the axle manufacturer's recommended pre-heat temperature, if required.

Weld Procedure

1. Center the axle assembly on the beam center (Figure 3).
2. Check the engineering drawing for the brake component orientation (rotation) before clamping into place and making the final welds.
   - 2.1 Drum brake camshafts are spaced off the tail of the trailing arm beam. Make sure the brake chamber brackets are oriented properly and clamp the axle assembly into place.
   - 2.2 Disc brake assemblies have a right- and left-hand caliper assembly. Make sure the callipers are located on the correct side and rotated to the proper position before clamping the axle assembly into place.
3. Check the gap between the axle and the axle seats before welding (Figure 4). Side gaps should be no greater than 1/8". The gap at the bottom of the axle seat should be no greater than 1/16".
4. Weld the axle to the seat according to Ridewell Weld Process #1 (Page 5).

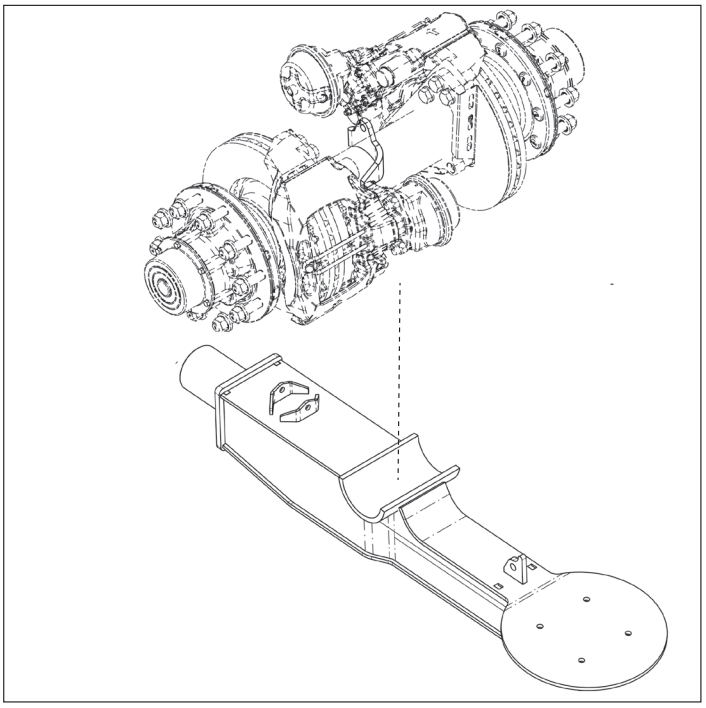


Figure 3.
Axle should be centered on beam. Refer to the engineering drawing for measurements.

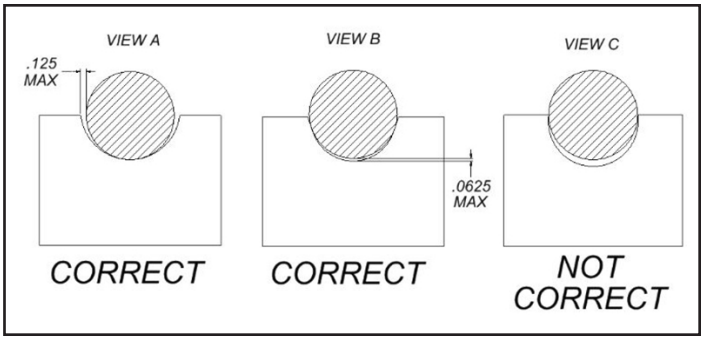
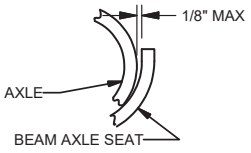
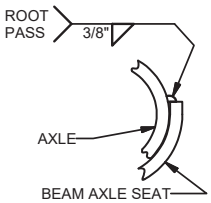


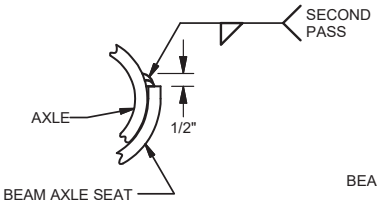
Figure 4.
Correct axle tube seating for welding.



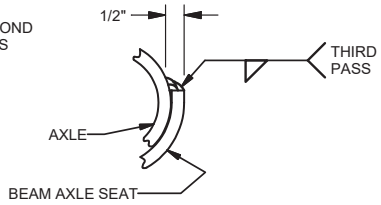
WELD JOINT PREPARATION



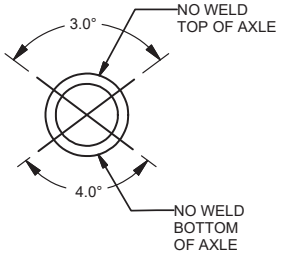
FIRST PASS



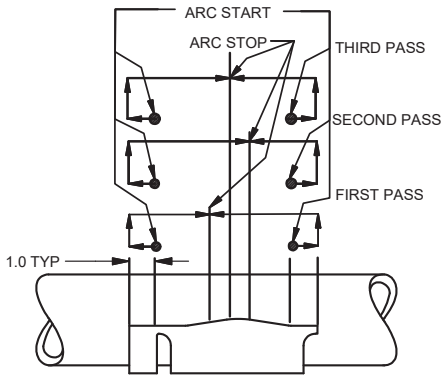
SECOND PASS



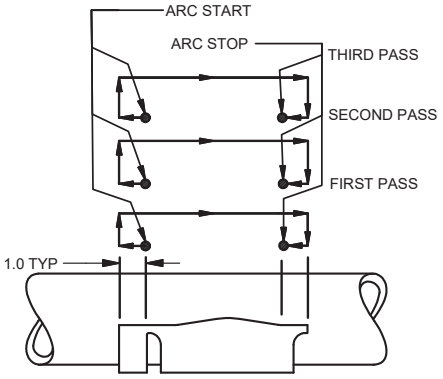
THIRD PASS



NO WELDING ZONE



SMAW



GMAW / FCAW

REPRESENTATIVE AXLE SEAT (PROFILE DEPENDENT ON SUSPENSION PRODUCT)

1 - CAUTION: All welds must be kept away from the top and bottom of the axle where maximum stresses occur (see “NO WELDING ZONE” illustration above). Do not test-weld the arc on any part of the axle tube.

2 - All welders and welding operators should be certified as per the requirements of the American Welding Society (AWS) or equivalent. All electrodes used should meet the AWS specifications and classifications for welding carbon and low-alloy steels.

3 - Recommended Welding Methods: Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW) or Flux Cored Arc Welding (FCAW). The welding method used and the electrode selected must develop a minimum weld tensile strength of 70,000 psi per AWS specifications. The best fusion and mechanical properties will be obtained by using the voltage, current, and shielding medium recommended by the electrode manufacturer. If the SMAW method is used, the stick electrodes must be new, dry, free of contaminants and stored per AWS specifications.

4 - Weld Joint Preparation: The joint to be welded should be positioned in the flat or horizontal position. All grease, dirt, paint, slag or other contaminants must be removed from the weld joint without gouging the axle tube. CAUTION: Never weld when the axle is cold. The axle and beam assemblies to be welded should be at a temperature of at least 60℉ (15℃). Pre-heat the weld zone to the axle manufacturer's recommended pre-heat temperature, if required. This will reduce the chance of an area of brittle material forming adjacent to the weld.

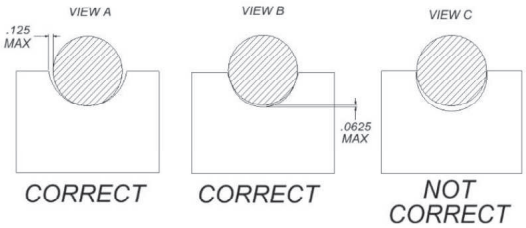
5 - The axle should fit into the beam assembly with a maximum root gap of 1/8-inch between the axle and the beam axle seat (see “WELD JOINT PREPARATION” illustration above).

6 - NOTE: Clamp the axle to the beam axle seat with a C-clamp prior to welding to make sure that proper contact occurs (see “CORRECT” illustration below).

7 - Ground the axle to one of the attached axle parts such as the brake chamber brackets, cam brackets or brake spider. Never ground the axle to a wheel or a hub as the spindle bearing may sustain damage.

8 - Multiple pass welding should be used on the beam/axle connection using the following guidelines: 8.1-Total fillet weld size should be 1/2-inch. 8.2-Weld pass starts and stops should be performed as illustrated above. 8.3-Never start or stop welds at the end of the weld joint. 8.4-Each pass must be accomplished in one or two segments. 8.5-Start welds at least 1-inch from the end and backweld over the start. Backstep fill all craters. 8.6-If process is not GMAW all slag must be removed between passes.

8.7-Welds must go to within 1/8-inch +/- 1/16-inch of the ends of the axle seat and must not go beyond or around the ends of the axle seat. 8.8-Post-weld peening is recommended, but not required: Needle peen the entire toe of the second pass, including around the ends of the axle seat. Hold the needles perpendicular to the axle. A uniform dimpled pattern will appear when properly peened.



REV	PROJECT	DESCRIPTION	DATE	BY	CHK	APPD
F	16101	ADDED MAXIMUM TO 5, ADDED GMAW NOTE TO 8.6 UPDATED CORRECT VIEWS	2/10/2016	G.H.	B.B.	CJB
E	15101	REVISED TEXT. REMOVED LIST OF MODELS.	6/30/15	G.H.	MDJ	CJB

DRAWN BY: CBC	2/1/2016	RIDEWELL CORPORATION
CHECKED: MDJ	2/21/2003	PO BOX 4586 SPRINGFIELD, MISSOURI 65808
APPROVED: CJB	2/21/2003	
PROJECT NO: 03103	SCALE: A-SIZE: NTS	TITLE: RIDEWELL WELD PROCESS #1, 5" DIA. AXLE, 3 PASS WELD
MATERIAL: -	WEIGHT: -	
SHEET 1 OF 1	PART NO: WELD PROCESS #1	REV: F

Mounting the suspension to the frame

Refer to the engineering drawing for the range of ride heights available, torque values, spacing and clearance requirements of the suspension.

Frame hangers are an optional component of the RAR-251 Trailer Suspension. Ridewell can design a suspension hanger for a specific application.

It is the responsibility of the trailer OEM to design a hanger and alignment mechanism that fits to the trailer frame.

The suspension installer has the final responsibility of attaching the suspension to the vehicle frame.

(Optional Hanger) Weld-On Installation

Check that the location provides adequate clearance for suspension components.

Hangers and air spring mounting plates should be perpendicular to the chassis frame and in alignment with each other.

1. Mark the desired location of the hangers on the vehicle frame. Hangers must be installed as shown on the engineering drawing for proper axle alignment.
2. Weld the hangers to the frame with 1/4" fillet welds completely around the hangers. Stop the welds 1/2" from the corners and edges.
3. Mark the desired location of the air spring mounting plates on the frame. A minimum 0.75-inch clearance must be maintained around the air spring when it is at maximum diameter.
4. Weld the air spring mounting plates to the frame with 3/16" fillet welds.

Stub axle suspensions are designed with a roll joint. Roll stops are not provided in this suspension. Tire rub plates must be installed on the trailer frame to limit roll to 10-degrees or less.

Final Assembly and Inspection

- Verify the welds of the hanger and air spring mounting plates.
- Brake chamber clamps and ports must be clocked (rotated) to prevent interference with surrounding components.
- Attach pivot assemblies to hangers.
  Note: Do not fully torque pivot hardware until axle alignment is completed.
- Installer must set the suspension to the specified mounting height before torquing the pivot bolt to prevent pre-loading the rubber in the bushing.
- Dowel pin must be installed in roll joint before welding on anti-turn washer. Anti-turn washer must cover dowel pin.
- Refer to engineering drawing to install shock absorber. Torque to specifications (Page 7).
- Complete assembly and installation of air springs as shown on the engineering drawing. Torque to specifications (Page 7).
- Install/connect the height control valve (HCV), if applicable. Check the air system tubing and fittings after installation for leaks.
- Verify the suspension ride height is adjusted within the range shown on the engineering drawing and complete axle alignment procedure.

The Limiter Chain connection point shown on the drawing is for reference only. Locate the chain so that the chain cannot interfere with the axle assembly, the brake chambers, or the wheels/tires.

The Frame Tab should be placed after the suspension has been installed, with the suspension in full rebound position. The Limiter Chain must be the suspension travel limiter.

⚠CAUTION Failure to torque bolts/nuts of suspension components to specifications can result in failure of the suspension and void the warranty.

RAR-251 Trailer Suspension - Torque Specifications

Fastener Type	Size	Torque Values foot-pound	Newton-meter
Center Bolt (HHCS) - Lower Beam Assembly	1 1/4″-7NC	750 ft-lb	1017 N-m
Pivot Bolt/Pivot Nut (Pivot Assembly)	1″-14NF	500 ft-lb	678 N-m
Nut (Air Spring)	3/4″-16NF	50 ft-lb	68 N-m
Bolt (Air Spring)	1/2″-13NC	25 ft-lb	34 N-m
Bolt/Locknut (Shock Absorber)	3/4″-10NC	160 ft-lb	217 N-m
Bolt/Locknut (Gimbal-Shock Absorber)	1/2″-13NC	80 ft-lb	108 N-m

Torque values reflect a lubricated thread condition (Nuts are pre-lubed). Do not overtorque.

⚠CAUTION *Suspension is shipped with minimal torque applied to fasteners. It is the installer's responsibility to apply the proper torque values. Failure to install and maintain fasteners at torque specifications could result in suspension failure and voiding of the warranty. Refer to the engineering drawing for torque specifications.*

MAINTENANCE

A visual inspection of the suspension structure should be performed during each pre-trip/safety inspection. Ridewell Suspensions recommends the following minimum service intervals for standard duty, on-highway usage applications. More frequent intervals are recommended for heavier duty applications.

Refer to the following Technology & Maintenance Council (TMC) publications for additional maintenance information:

TMC RP 609	Self-Adjusting and Manual Brake Adjuster Removal, Installation and Maintenance
TMC RP 618	Wheel Bearing Adjustment Procedure
TMC RP 619	Air System Inspection Procedure
TMC RP 622	Wheel Seal and Bearing Removal, Installation, and Maintenance
TMC RP 631	Recommendations for Wheel End Lubrication
TMC RP 643	Air Ride Suspension Maintenance Guidelines
TMC RP 728	Trailer Axle Maintenance

Daily/Pre-Trip Inspections

___ Check tires for proper inflation, damage or excessive wear.

___ Check wheel-ends for obvious signs of lubricant leakage. Check for missing components.

___ Check axle assemblies for damage or loose components.

___ Visually inspect suspension structure for signs of damage or excessive wear.

___ Check for loose or missing bolts/nuts. Check for irregular movement in suspension components.

___ Make sure air controls are operating properly. Drain all moisture from air reservoirs.

First 6,000 miles of use

___ Torque all suspension component bolts/nuts to specifications (Engineering drawing).

___ Verify that the suspension is operating at the installed ride height.

Every 12,000 miles of use

___Inspect air springs for any damage or excessive wear. Torque air spring bolts/nuts to specifications (Engineering drawing).

___ Check air lines and connections for leaks.

Every 50,000 miles of use

___ Torque all suspension component bolts/nuts to specifications (Engineering drawing).

Annually/100,000 miles of use

___Inspect pivot connection for worn pivot bushing and wear washers. Replace components, if necessary. Torque suspension component bolts/nuts to specifications (Engineering drawing).

___Check arm beam-to-axle connection welds.

___ Check lubrication level in wheel ends:
1) Oil-Filled Wheel Ends:
Refill/Replace lubricant as needed (Refer to TMC RP 631 "100K/Annual Inspection").
2) Semi-Fluid Grease:
Pull outer bearing and visually inspect lubrication level. Refill/Replace as needed
(Refer to TMC RP 631 "Level 3 Lubrication Level Inspection" and TMC RP 618 "Wheel Bearing Adjustment Procedure").

___ Check air lines and connections for leaks.

___ Test air control system pressure protection valve (PPV), if equipped.

___ Check height control valve (HCV) adjustment.

___Verify that the suspension is operating at the installed ride height.

⚠CAUTION Failure to torque the bolts/nuts of suspension components to specifications can result in failure of the suspension and voiding of the warranty.

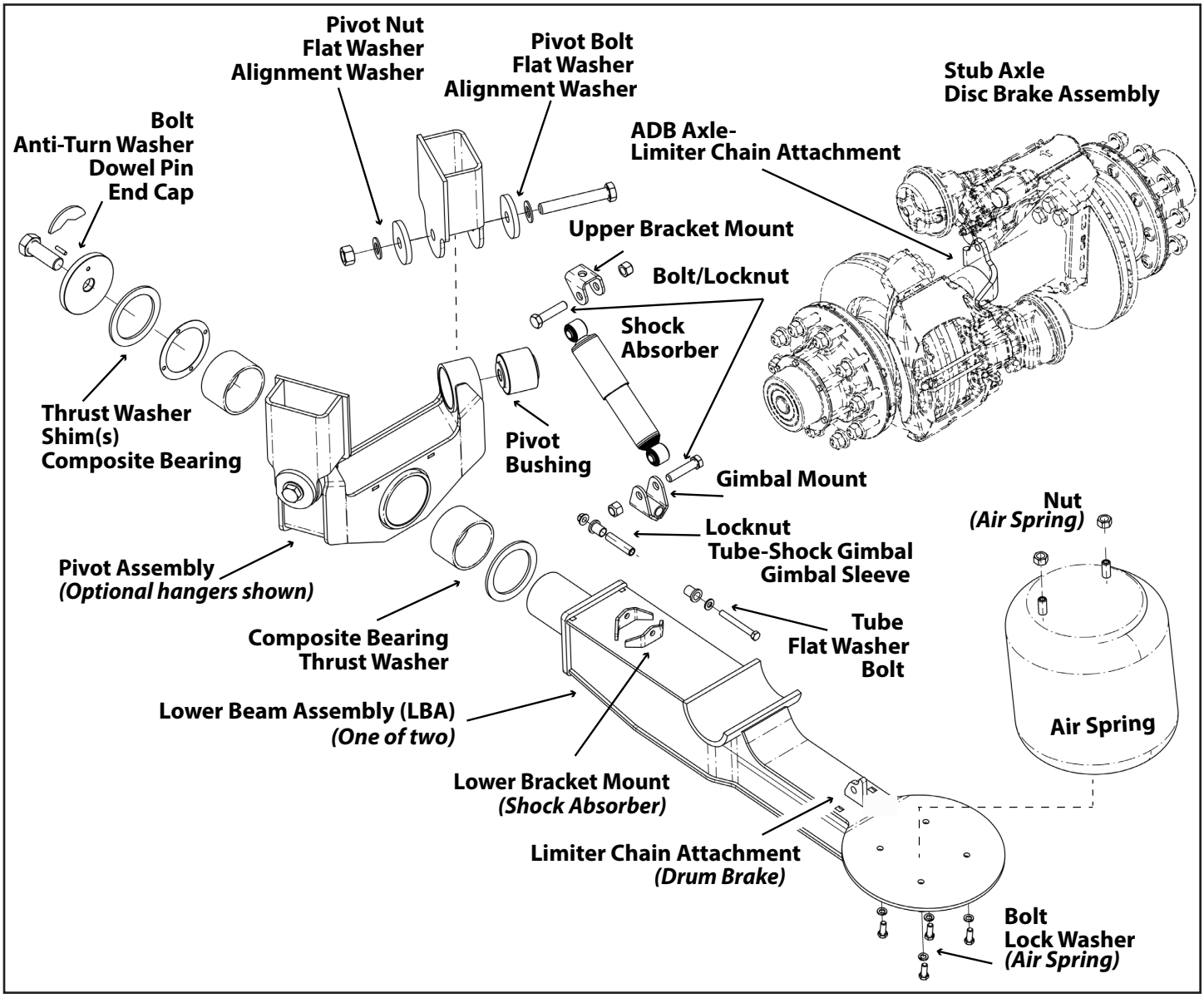


Figure 5.
RAR-251 Trailer Suspension for stub axle (Air Disc Brake Assembly shown).
Refer to the engineering drawing for the component part number.

RAR-251 Trailer Suspension – Pivot Bushing Replacement Components			
Replacement Part Numbers	**Hardware Description**	**Torque Values**	
		foot-pound	**Newton-meter**
11400016 **1150031**	Pivot Bolt (HHCS) 1″-14NF (Grade 8) Pivot Nut	500 ft-lb	675 N-m
1110088	Spherical Bushing		
7002768	Alignment Washer		
1161480B100	Flat Washer		
Lower Beam Assembly (LBA) – Bearing Replacement Components			
1145923B105	Center Bolt (HHCS) 1-1/4″-7NC	750 ft-lb	1017 N-m
1120045	Composite Bearings for Pivot Assembly		
1160022	Thrust Washer 1/4		
7002339	End Cap		
7002747	Shim, End Cap		
9280042	Dowel Pin		
9003092B000	Anti-Turn Washer		

CAUTION *Failure to install and maintain suspension component fasteners at torque specifications could result in suspension failure and void the warranty. Refer to the engineering drawing for torque values.*

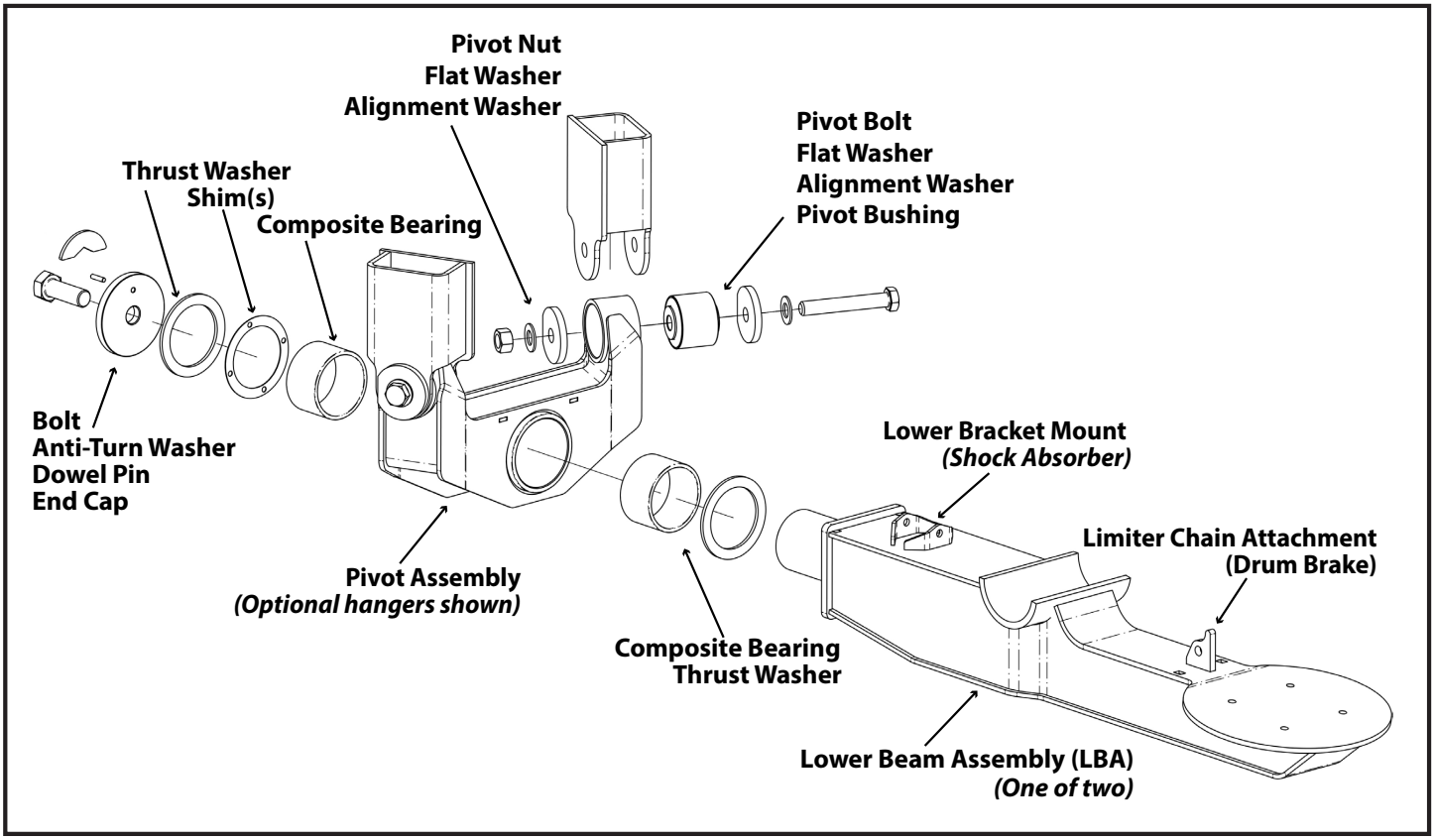


Figure 6.
Bushing replacement should include components for two pivot connections (one pivot assembly) on each axle. Pivot bushings should be replaced in both pivot connections at the same time.

Pivot Bushing and Lower Beam Assembly (LBA) Bearing Replacement

Chock wheels. Raise vehicle to height that removes load from suspension and support with jack stands. Disconnect the linkage from the height control valve(s), if necessary, and exhaust all air from the air springs.

⚠CAUTION Failure to properly chock wheels, exhaust the air system and raise and safely support the vehicle could allow vehicle/suspension movement that could result in serious injury.

Pivot Bushing Replacement Procedure

Bushings should be replaced in the two (2) pivot connections at the same time (Figure 6).

1. Remove wheels and tires. Support lower beam/pivot assembly.
2. Remove the shock absorber. Disconnect limiter chain. Disconnect air spring from frame.
3. Disassemble pivot connections. Discard pivot hardware. Inspect flat washers and alignment washers. Replace, if necessary.
4. Remove lower beam assembly (LBA)/Pivot Assembly from hangers.
5. Remove two pivot bushings and discard.
6. Inspect end cap and washers on pivot assembly for damage/wear.
7. Check pivot assembly for excessive play by moving assembly back and forth. Remove from LBA for further inspection and replacement, if necessary (Figure 6).
8. Clean any foreign debris and corrosion out of the pivot connection eyes with a wire brush.
9. Liberally apply P80® lubricant to the inside of the eyes and outside of replacement bushings.
10. Press bushings into the pivot connections. Check that bushings are centered within each eye.
11. Attach LBA/Pivot Assembly to hangers. Install pivot hardware and washers. NOTE: Do not apply final torque.
12. After aligning axle to SAE or TMC recommended standards, torque pivot bolts to 500 ft-lb (675 N-m).
    NOTE: Set the suspension to specified mounting height before torquing pivot bolt to prevent preloading the rubber in the bushing.
13. Reassemble suspension. Torque to spec (Page 7).
14. Connect height control valve linkage (if disconnected). Inflate air springs.
15. Install wheels and tires.
16. Raise vehicle and remove support stands. Lower vehicle to ground.

LBA-Bearing Replacement Procedure

1. Remove wheels and tires. Support lower beam/pivot assembly.
2. Remove the shock absorber. Disconnect Limiter Chain. Disconnect air spring from frame.
3. Disassemble pivot connections on pivot assembly. Inspect and replace components as necessary.
4. Remove lower beam assembly (LBA)/Pivot Assembly from hangers.
5. Grind/Cut weld around anti-turn washer. Remove LBA bolt, end-cap and dowel pin. Inspect and replace components as necessary (dowel pin must be retained for re-assembly).
6. Separate LBA from pivot assembly.
7. Remove bearing and thrust washer from lower beam assembly and discard. Remove End-Cap shim(s); thrust washer and composite bearing from pivot assembly and discard.
8. Inspect LBA for excessive wear (Outside Diameter of roll joint should be 4.438-inches ± 0.003”).
9. Press new composite bearing into both sides of pivot assembly. Bearings should meet in the center of the pivot assembly
10. Install thrust washer onto roll joint of lower beam assembly. Insert LBA into the pivot assembly.
11. Check pivot assembly gap by installing thrust washer, end-cap and bolt onto end of LBA roll joint and tightening. Shim(s) will not be needed if gap is less than 0.040” between roll joint end and outside of pivot assembly.
12. Complete assembly by installing shim (if needed), thrust washer, end-cap and bolt onto end of LBA roll joint. Torque the lower beam assembly bolt to 750 ft-lb (1017 N-m).
13. Insert dowel pin into end-cap. Weld anti-turn washer to end cap as shown on engineering drawing.
14. Install pivot assembly to hangers with pivot hardware. Torque pivot bolt/nut hardware to 500 ft-lb (675 N-m).
15. Attach air spring, shock absorber, and limiter chain. Torque to specifications (Page 7).
16. Connect height control valve linkage and inflate air springs.
17. Install wheels and tires.
18. Raise vehicle and remove support stands. Lower vehicle to ground.

⚠CAUTION Failure to torque suspension hardware can result in suspension failure and void the warranty.

WARRANTY

Terms and coverage in this warranty apply only to the United States and Canada.

Ridewell Suspensions warrants the suspension systems manufactured by it to be free of defects in material and workmanship. Warranty coverage applies only to suspensions that have been properly installed, maintained and operated within the rated capacity and recommended application of the suspension. The responsibility for warranty coverage is limited to the repair/replacement of suspension parts. The liability for coverage of purchased components is limited to the original warranty coverage extended by the manufacturer of the purchased part.

All work under warranty must have prior written approval from the Ridewell warranty department. Ridewell has the sole discretion and authority to approve or deny a claim and authorize the repair or replacement of suspension parts. All parts must be held until the warranty claim is closed.

Parts that need to be returned for warranty evaluation will be issued a Returned Materials Authorization (RMA). Parts must be returned to Ridewell with the transportation charges prepaid. The transportation charges will be reimbursed if the warranty claim is approved.

This non-transferable warranty is in lieu of all other expressed or implied warranties or representations, including any implied warranties of merchantability or fitness or any obligations on the part of Ridewell. Ridewell will not be liable for any business interruptions, loss of profits, personal injury, any costs of travel delays or for any other special, indirect, incidental or consequential losses, costs or damages.

Contact the Ridewell Warranty Dept. at 417.833.4565 - Ext. 135, for complete warranty information.