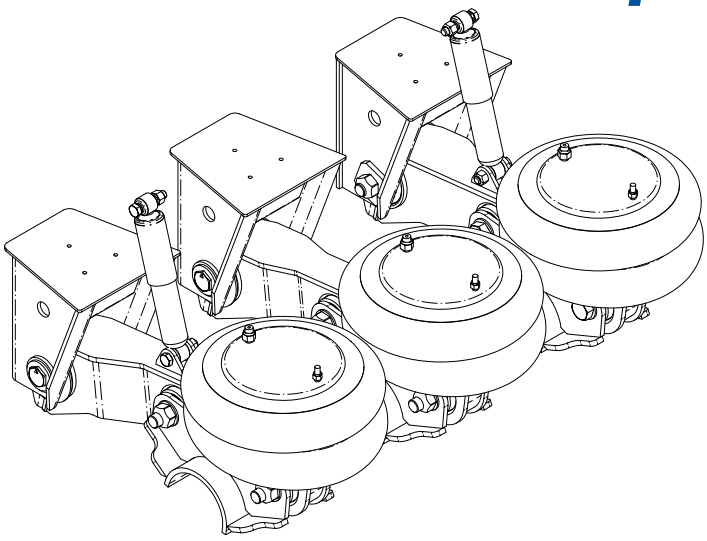
RAR 221–55K
Trailer Air-Ride Suspension



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RIDEWELL SUSPENSIONS

Part No: 9710127

Doc: 221-55K Trailer-ISM-RevA-04-21-21

SUSPENSION IDENTIFICATION

Introduction

The Ridewell Air Ride (RAR) 221 - 55K Trailer Suspension is available in a dedicated configuration specified by the application. The suspension can be purchased with or without an integrated axle.

Refer to the suspension model engineering drawing for detailed information on the suspension system components and operating parameters.

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" Technical Publication (P/N 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.

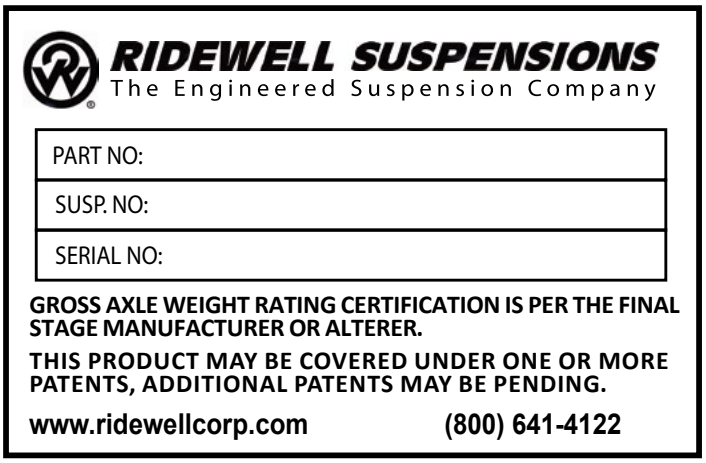


Figure 1.
The Suspension Model (Suspension Number) and date of manufacture (Serial Number) are listed on the Suspension Identification Tag.

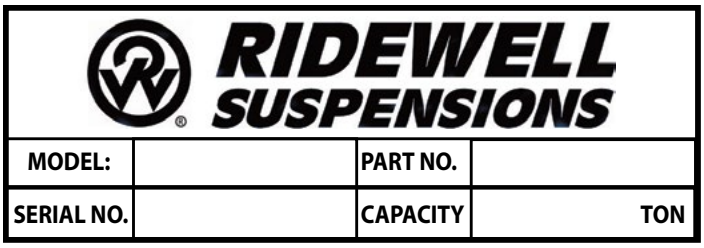


Figure 2.
The Base-Axle Part Number (165-) and the Serial Number assigned to the axle tube are listed on the Axle-Body Identification Tag.

Prior to Installation

Refer to the suspension model engineering drawing to confirm dimensional requirements and the available range of ride heights for installation.

The suspension is designed to fit onto standard I-beam trailer frames at the beam center distance that corresponds to the axle track width.

The installer is responsible for verifying clearances, axle capacity, proper fit-up, and any additional required support structure required by installing the suspension at beam centers other than those shown on the suspension model engineering drawing. NOTE: Installation at non-designated beam centers may reduce suspension clearances and can alter the suspension capacity.

- 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

Ridewell recommends supporting the axle and suspension with a weld fixture during axle integration. Contact Ridewell Customer Service for the correct weld fixture for your suspension model.

1. Center the axle assembly on the beam centers (Figure 3).
2. Check the engineering drawing for the brake component orientation (rotation) before clamping into place and making the final welds.
   Drum brake camshafts are spaced off the axle shoe of the load beam assembly. Verify brake chamber brackets are oriented properly and clamp the axle assembly into place.
3. Check gap between the axle and the axle seats before welding (Figure 5). 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).

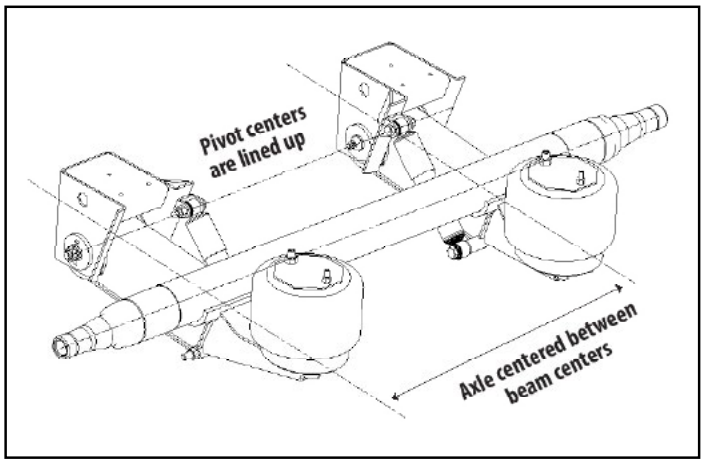


Figure 3.
Axle should be centered between beam centers. Beams and axle should be perpendicular. Refer to the engineering drawing for measurements.

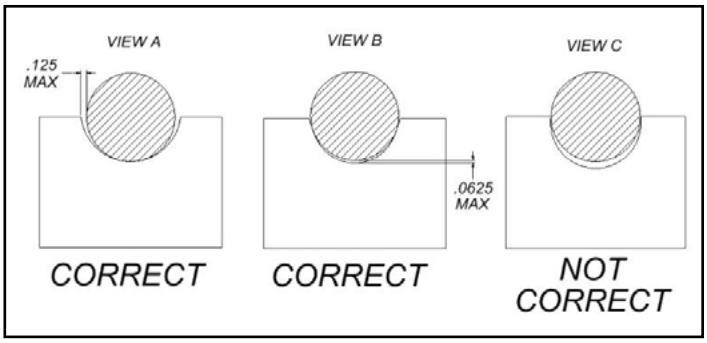
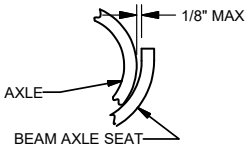
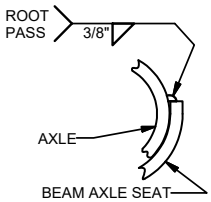


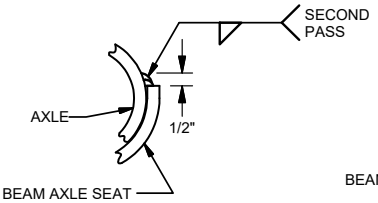
Figure 4.
Correct axle tube seating for welding.



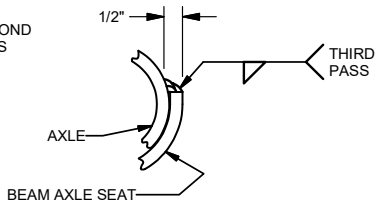
WELD JOINT PREPARATION



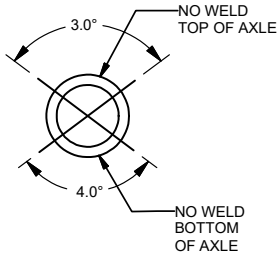
FIRST PASS



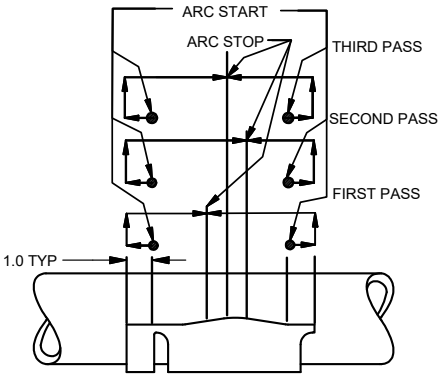
SECOND PASS



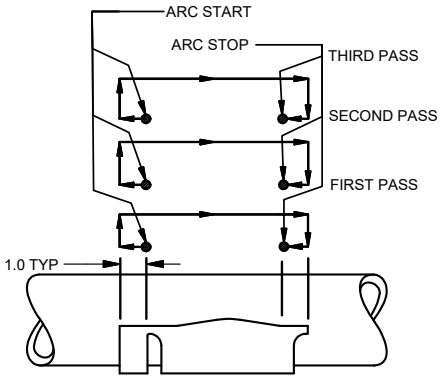
THIRD PASS



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.

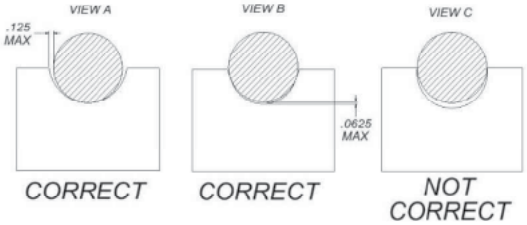
5 - The axle should fit into the beam assembly with a maximum root gap of 1/8-inch between the axle and the beam axle seat (see “WELD JOINT PREPARATION” illustration above).

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

Suspension Mounting

Refer to the engineering drawing for available ride heights; the recommended locations of any customer-furnished filler plates and supporting crossmembers; the torque values; and the spacing and clearance requirements of suspension components.

The RAR 221 55K Trailer Suspension requires the customer to provide and install a shock absorber upper mounting bracket that is configured to the vehicle installation.

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

Weld-On Installation Procedure

Determine the shock absorber upper mounting bracket location and installation procedure before installing the suspension.

CAUTION Welding method must use a minimum weld tensile strength of 70,000 psi, per AWS specifications.

1. Mark the desired location of the hangers and any customer-supplied filler plates on the vehicle frame. Hangers must be installed parallel to each other for proper axle alignment.
2. Mark the desired location of the air spring mounting plates and any customer-supplied filler plates on the vehicle frame.
3. Install filler plates for the hangers and air spring mounting plates on the frame. Weld filler plates to crossmembers with ¼" fillet welds down the length of the crossmember.
4. Weld the hangers to the frame/filler plates with 1/4" fillet welds completely around the hangers. Stop the welds 1/2" from the corners and edges.
5. Weld the air spring mounting plates to the frame/filler plates with 3/16" fillet welds.
6. Attach a crossmember or diagonal brace to the front of the hangers with 1/4" fillet welds.

Final Assembly and Inspection

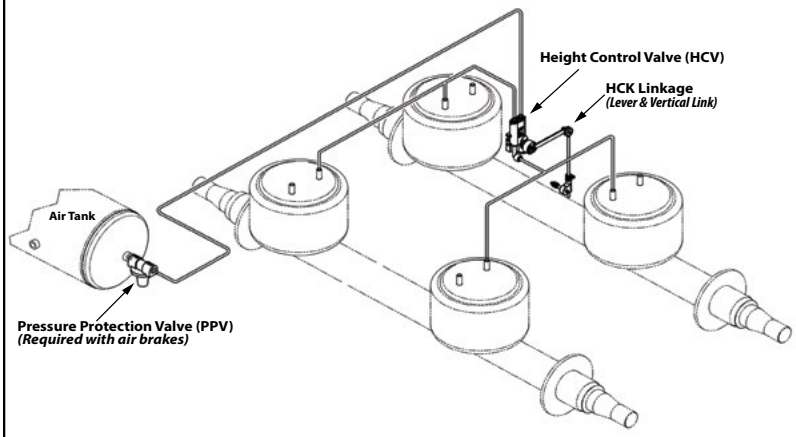
- Verify the welds of the hanger and air spring mounting plates.
- Verify clearances of suspension components.
- Attach beam and axle assemblies to hangers. Note: Do not fully torque pivot hardware until axle alignment is completed.
- Complete assembly and installation of air springs as shown on the engineering drawing. Torque to specifications (Page 12).
- Install shock absorbers.
  NOTE: If the suspension is painted after shocks are installed, make sure paint overspray does not get under the shock absorber dust covers.
- Install/connect the height control valve (HCV), if applicable (Page 7). 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 (Page 15).

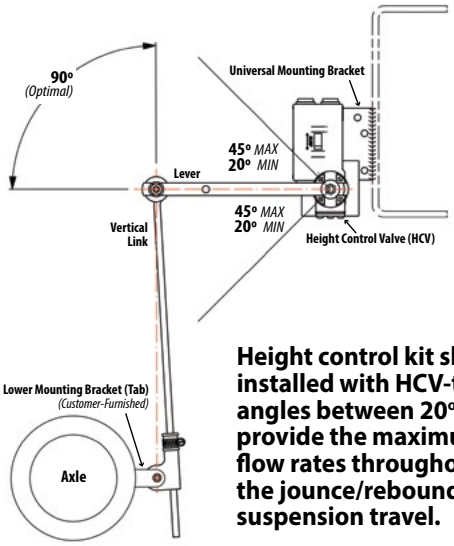
CAUTION Failure to torque bolts/nuts of suspension components to specifications can result in failure of the suspension and void the warranty.

The Ridewell Extreme Air® Height Control Kit (HCK) automatically adds and exhausts air from the air suspension to maintain the vehicle ride height. The (HCK) assembly consists of a lever connected to the height control valve (HCV) and a vertical rod arm (vertical linkage) connected to the suspension/axle (Figure 5).

Refer to the Extreme Air® installation guide for installation procedures. Be sure to check the air system after installation for leakage. ⚠CAUTION The installer is responsible for making sure that air system requirements comply with the appropriate Federal Motor Vehicle Safety Standards.

Figure 5.
Example of single Height Control Valve (HCV) installation on vehicle frame with linkage attached to the axle.





Height control kit should be installed with HCV-to-lever angles between 20°-45° to provide the maximum valve flow rates throughout the jounce/rebound of suspension travel.

Height Control Valve Installation – Troubleshooting

Problem	Possible Cause	Corrective Action
HCV is not receiving air/ HCV is not delivering air to the air springs.	___ Blocked air supply line.	___ Verify air lines are pressurized by removing supply line at HCV. Check for pinched lines.
	___ Air tank is not filling/ reaching set pressure.	___ Verify air tank pressure with manual/in-line pressure gauge.
	___ Pressure Protection Valve (PPV) not working correctly.	___ Check PPV operation by making sure valve opens when system reaches the desired pressure setpoint *(usually greater than 70 psi)*.
	___ Pilot port is not plumbed or is plumbed incorrectly.	___ Check HCV configuration and reinstall if necessary – Non-Dump; Pressure-Dump (Normally Open); Zero-Pressure Dump (Normally Closed).
Air springs fill but do not exhaust.	___ Obstructed air line.	___ Disconnect linkage. Rotate lever to down position (exhaust). If springs remain inflated, check for pinched/blocked lines.
	___ HCV installed backwards.	___ Check installation. Reinstall, if necessary.
	___ Supply line installed to suspension port	___ Move air supply line to HCV supply port.
Air system leaks down in a short period of time.	___ HCV installed backwards.	___ Disconnect HCV linkage and rotate lever to the up position (fill). If air springs do not inflate, reinstall HCV.
	___ Leak in air system beyond accepted standards.	___ To find leak in the HCV area, pressurize system and spray soapy water solution onto the valve and lines. Check for bubbles (leaks): No leak found – Do not remove valve, check rest of system for leaks. Check that tubing cuts are straight and smooth. Re-cut and reassemble if necessary.

Recommended Service Intervals

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 these Technology & Maintenance Council (TMC) publications for additional information	
RP 609	Self-Adjusting/Manual Brake Adjuster Removal, Installation and Maintenance
RP 618	Wheel Bearing Adjustment Procedure
RP 619	Air System Inspection Procedure
RP 622	Wheel Seal and Bearing Removal, Installation, and Maintenance
RP 631	Wheel End Lubrication Recommendations
RP 643	Air Ride Suspension Maintenance
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 suspension components to specifications (Page 10/Engineering Drawing).

___ Verify suspension operating at installed ride height.

Every 12,000 miles of use

___ Inspect air springs for damage/excessive wear. Torque air spring bolts/nuts to specifications (Page 10/Engineering Drawing).

___ Check air lines and connections for leaks.

Every 50,000 miles of use

___ Torque suspension components to specifications (Page 10/Engineering Drawing).

Annually/100,000 miles of use

___ Inspect pivot connection for worn pivot bushing and wear washers. Replace if necessary.

___ Torque component bolts/nuts to specifications (Page 10/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
(TMC RP 631-"100K/Annual Inspection").

___ 2) Semi-Fluid Grease:
Pull outer bearing and visually inspect the lubrication level. Refill/Replace as needed
(TMC RP 631-"Level 3 Lubrication Level Inspection")
(TMC RP 618-"Wheel Bearing Adjustment Procedure").

___ Check air lines and connections for leaks.

___ Test air system pressure protection valve (PPV).

___ Check height control valve (HCV) adjustment.

___ Verify suspension operating at installed ride height.

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

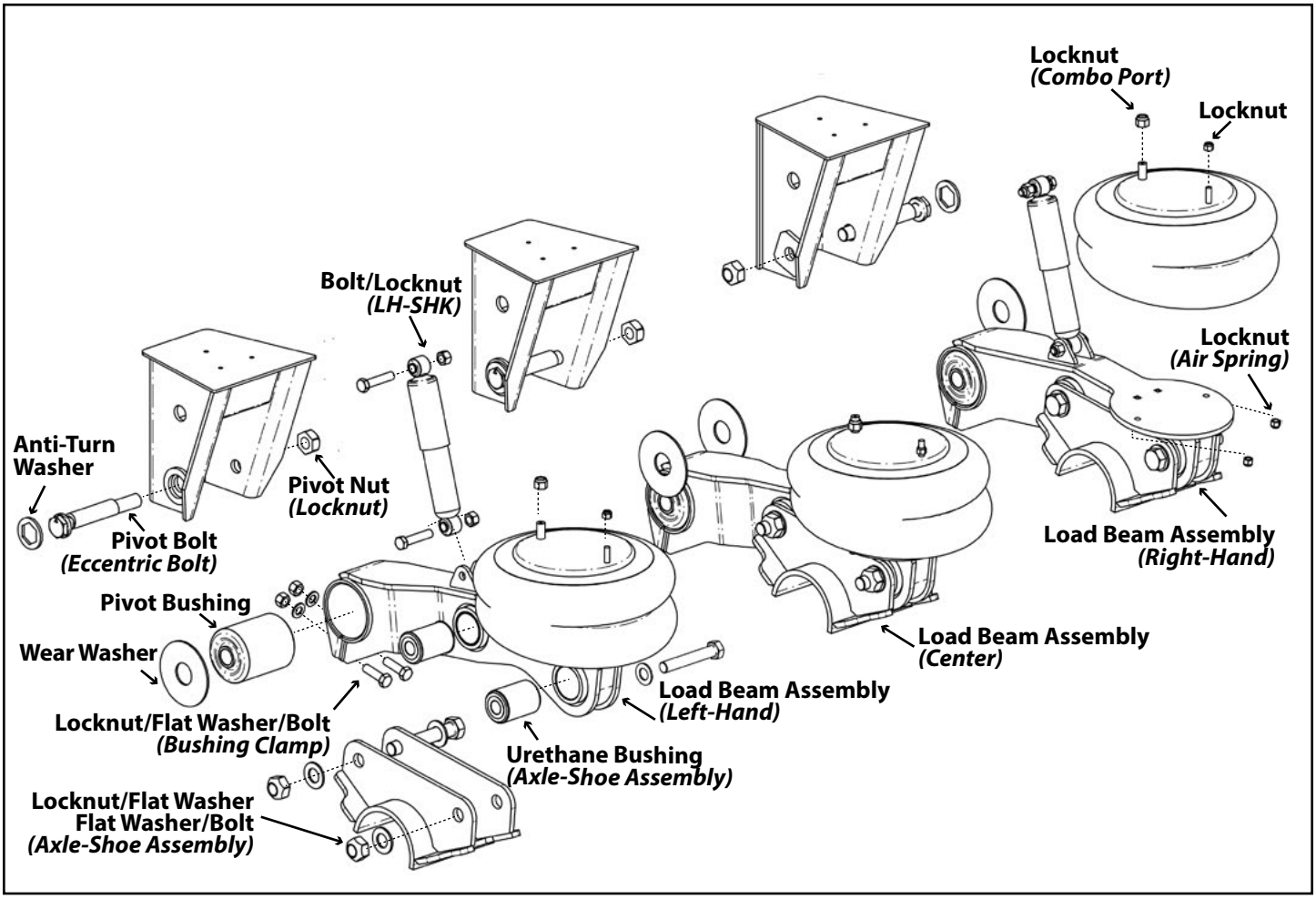


Figure 6.
RAR-221 55K Trailer Suspension
Refer to the suspension model engineering drawing for the individual component part number.

RAR 221 55K Trailer Suspension – Bushing Replacement/Torque Specifications

Part Number (Component)	Item Description	Size	Torque Values *(foot-pound; Newton-meter)*	
6040181–HGR Bushing Kit *Hanger Assembly (3X)*	Pivot Hardware - Eccentric Bolt/Locknut	1 1/4″-7NC	1000 ft-lb	1356 N-m
Bushing Clamp Hardware	Hex Head Cap Screw/Locknut/Flat Washer	3/4″-10NC	280-330 ft-lb	380-448 N-m
6040182–AX-Shoe Bush Kit *Axle-Shoe Assembly (3X)*	Hex Head Cap Screw/Locknut/Flat Washer *(3.13″OD x 1.25″ID x 4.438″-Urethane Bushing)*	1 1/4″-7NC	1500 ft-lb	2034 N-m
Fasteners	Locknut (Air Spring-Upper; Lower)	1/2″-13NC	25 ft-lb	34 N-m
	Locknut (Air Spring-Combo Port)	3/4″-16NF	50 ft-lb	68 N-m
	Locknut (Shock Absorber)	3/4″-10NC	200 ft-lb	271 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.All fasteners must be re-torqued after first 6,000 miles of operation. Failure to install and maintain fasteners at torque specifications could result in suspension failure and void the warranty.*

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

CAUTION Failure to properly chock the wheels; exhaust the air system; and, raise and safely support the vehicle could allow movement resulting in serious injury.

Bushing Replacement
Ridewell Suspensions recommends replacing all bushings within each bushing series at the same time.

Axle-Shoe Bushings
Removing the three load-beam/axle assemblies from the vehicle before replacing the urethane bushings in the axle-shoe assembly is recommended.
NOTE: Bushing press required for replacement.

Pivot Bushing Replacement Procedure
Remove wheels and tires. Remove shock absorber(s).

Remove pivot nut. Remove anti-turn washer from the eccentric bolt-head by grinding away the welds. Locate arrow on bolt-head. Turn bolt-head until the arrow points straight up. Remove bolt.

Rotate beam assembly down and out of hanger. Discard wear washer(s). NOTE: Wear washers included in bushing replacement kit.
Inspect pivot- bolt hole and hanger surfaces for wear/damage. Repair/replace components as needed.

Pivot Bushing Removal
Remove bolt/locknut from bushing clamp (Fig 7). Separate clamp. Remove pivot bushing.

Pivot Bushing Installation
Center replacement bushing assembly on bushing clamp. Torque nuts on clamp to 190 ft-lb.

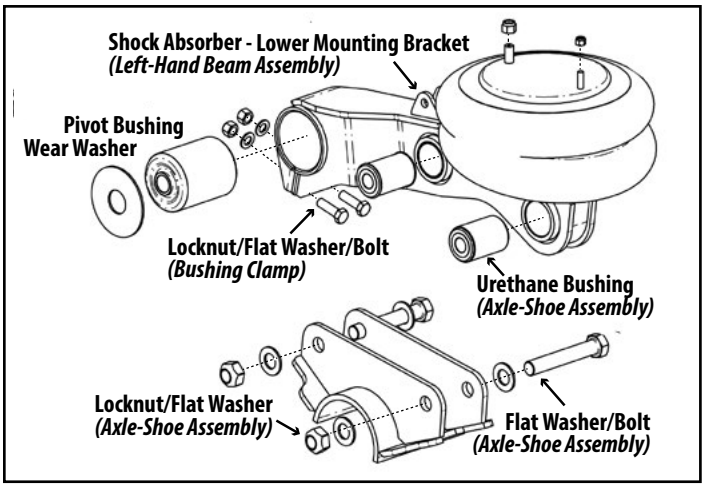


Figure 7.
Hanger bushing replacement kit includes wear washers and bushing clamp hardware to replace three hanger assemblies.

Verify bushing clamp surfaces are closed "metal-to-metal". Torque to 280-330 ft-lb (380-448 N-m).

Reassemble Suspension
Rotate beam(s) into hanger. Refer to engineering drawing for inboard/outboard wear washer location.

Coat the large diameter shank of the eccentric bolt with anti-seize compound, locate arrow on bolt-head and install bolt with arrow pointing straight up.

Align axle if necessary (Pg 11). Weld anti-turn washers over eccentric bolt head with 1/4″ fillet welds at top and bottom of bolt-head.

Install shock absorber(s). Install wheels and tires.

Raise the vehicle and remove support stands. Lower vehicle to the ground. Connect height control valve linkage, if necessary, and adjust ride height.

Verify suspension installed ride height. Torque pivot nut to 1,000 ft-lb (1,356 N-m).

Alignment should be performed on a level surface with the suspension at the desired ride height. Refer to the engineering drawing for the designed ride heights of the suspension model.

Align the suspension per TMC or SAE recommended standards. On a multiple-axle vehicle, the forward axle is moved into the proper alignment, then the remaining axles are positioned so that they are parallel to the forward axle.

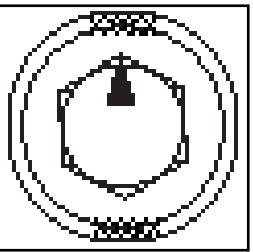
A maximum tolerance of 1/8-inch difference from side-to-side of the forward axle and 1/16-inch difference from side-to-side for the aft axles is acceptable (Figure 8).

Axle Alignment Procedure

1. Loosen the pivot nut enough for the beam to move. NOTE: If installed, remove the anti-turn washer by grinding away the welds.
2. Turn bolt head until arrow on bolt head points straight up (12 o'clock position).
3. Turn eccentric bolt to move beam forward or backward until axle reaches alignment. CAUTION Do not turn arrow past the 9 o'clock or 3 o'clock position (horizontal).
4. Weld anti-turn washer over bolt head with 1/4" fillet welds at top and bottom (Figure 9).
5. Torque pivot nut to 1,000 ft-lb (1,350 N-m).

CAUTION Failure to properly torque pivot hardware could result in suspension failure/void the warranty

Figure 9.
Weld anti-turn washer over bolt-head with 1/4" fillet welds at top and bottom



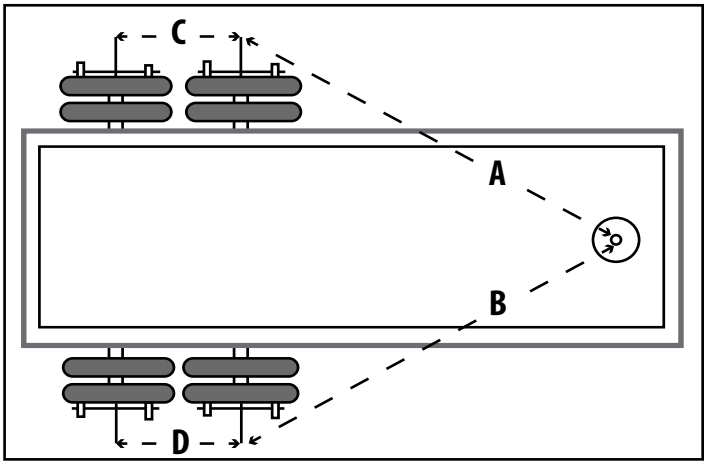


Figure 8.
Kingpin measurement for axle alignment

Check forward axle alignment by measuring from kingpin to both ends of the axle centers.

If the difference between "A" measurement and "B" measurement is greater than 1/8-inch, the forward axle needs to be aligned.

Adjust the aft axle if difference between the "C" and "D" measurement is greater than 1/16-inch.

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.