RSS-233 - 20K Truck
Self-Steering Air-Ride Suspension

Installation and Service Manual

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SUSPENSION IDENTIFICATION

Introduction
It’s important that the proper suspension model be chosen for the application in which it is to be used. The Ridewell Self-Steering (RSS) 233 Suspension series is a fully integrated, auxiliary axle suspension system available for truck and trailer applications.

The RSS-233 20K Truck Suspension System can be configured with drum or disc brake axle assemblies and with an optional steering lock. The 20K Truck suspension can also be configured with drum brake assemblies for roll-off applications.

Refer to the 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.

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.

Notes on Self-Steering Option
Self-steering suspensions are designed to steer only in the forward direction. The suspension should be raised off the ground or locked into a non-steering configuration during reverse travel to avoid damaging the suspension.

Ridewell Suspensions strongly recommends the use of automated systems that raise/lock the lift-axle during reverse travel. For manual operations, Ridewell recommends the installation of a visual/audible indicator to assist the driver.

Use caution when maneuvering in reverse with the steering lock engaged. The driver should maintain slow maneuvering speeds and avoid extreme turns.

CAUTION: Failure to lift the suspension and/or engage the steering-lock during reverse travel can cause component damage and void the warranty.
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 auxiliary suspension, air springs, brake chambers, steering components, axle (including axle to driveline clearance) and tires.
Mounting the suspension to the frame

Refer to the engineering drawing for the range of ride heights available as well as spacing and clearance requirements of the suspension.

The RSS-233 20K Truck Suspension is shipped fully assembled. If the suspension system is taken apart for installation, the components must be reassembled with the proper torque applied (Appendix).

Bolt-On Installation Procedure
Suspension hangers are attached to the vehicle frame with six 5/8-inch Grade 8 bolts. Air spring mounting brackets require two 5/8-inch Grade 8 bolts.

Flanged locknuts or locknuts with hardened washers are required.

- Hanger locator flanges are pre-installed to match the ride height set by the air spring mounting plate.
  Ride height is adjusted by installing a 2” spacer on the air spring mounting plates. The hanger locator flange is then moved up or down on the hanger to match the height of the air spring mounting plate and spacer installation.

- A 2” spacer kit for the hangers and air spring mounting plates is available for the 233-20K disc brake and roll-off configurations.

1. Measure the vehicle frame width and the hanger-to-hanger inside dimensions of the suspension. Customer-supplied filler plates are required for the hangers and air spring mounting brackets if the vehicle frame width is narrower than that of the suspension.

2. Place the suspension (with hanger and air spring filler plates and the appropriate spacer(s), if required) in the desired location.

   NOTE: A crossmember must be located on the frame within six inches of the leading or trailing edge of the hanger.

3. Check that the location provides adequate clearance for suspension components. Make sure the top of the hangers and air spring mounting plates are parallel to the chassis frame to maintain the proper caster angle.

4. Hangers and air spring mounting plates should be perpendicular to the chassis frame and in alignment with each other. Clamp the hangers, mounting plates, and spacer and filler plates (if required) firmly in place.

5. Refer to the engineering drawing for the recommended bolt hole locations on the hangers and air spring mounting plates. If it is not possible to use the recommended bolt locations, space the bolt holes as far apart as possible to provide the greatest support for the suspension.

   CAUTION: Check to make sure that wires, hoses or other components located within the frame rail are not affected by drilling.

6. Center punch and drill six bolt holes in each hanger. Bolt the hangers to the frame with the recommended Grade 8 bolts and locknuts.

7. Center punch and drill two bolt holes in each air spring mounting bracket. Bolt the air spring brackets to the frame with the recommended Grade 8 bolts and locknuts.

8. Install/connect the air control kit (ACK) to the suspension (Page 6). Check the air system after installation for leaks and proper operation of controls.

9. Perform final assembly and inspection and check the wheel toe setting (Page 5)

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

1. Verify that all suspension component bolts/nuts are torqued to specifications (Appendix).

2. Install wheels and tires.

   **CAUTION** When lowering an auxiliary axle on an unloaded vehicle, pressure to the load air springs must be reduced to below 10 psi. Failure to reduce the air pressure could cause the vehicle’s drive axles to rise from the ground and the vehicle could roll in an unsafe manner.

3. Check that tires are inflated to recommended pressure. Check wheel hubs for proper level of lubricant recommended by the manufacturer.

4. Lift the axle to the raised position. Check the air system tubing and connections for leaks.

5. Check that wheels can rotate freely and that brakes and slack adjusters are properly adjusted.

6. Raise and lower the suspension assembly (wheels and tires installed) through the entire range of travel. Make sure that sufficient clearances for air springs, brake chambers and other components has been provided.

7. Check the vehicle’s reverse travel options:
   - 7.1 Check steer lock operation.
   - 7.2 Check automated system (if installed) to make sure that suspension raises/locks wheels during reverse travel.

   **CAUTION** Failure to check reverse travel operations can result in component damage and void the suspension warranty.

   **CAUTION** Do not lower the auxiliary axle while the vehicle is moving in forward or reverse travel above 10 mph.

8. Check wheel toe-in setting and adjust, if necessary (between 1/32” and 3/32”).

Wheel Toe Setting
Wheel toe is the relationship of the distance between the front of the tires and the distance between the rear of the tires on the same axle. When the front distance is less than the rear distance, the wheels are in a “toe-in” (positive toe) condition.

The correct setting for the RSS-233 suspension should be toe-in between 1/32” and 3/32”.

Air springs pressure regulates axle load

The load capacity of the auxiliary axle is adjusted by increasing or decreasing the pressure to the air springs. By applying more air, the lift axle takes on a greater percentage of the load’s weight. The load capacity is decreased as the air pressure decreases.

Accurate readings of the load capacity can be obtained by parking a loaded vehicle over a calibrated scale and lowering the axle onto the scale. The air pressure to the air springs is manually adjusted up or down to obtain the axle load weight at various air pressures.

**CAUTION** Do not exceed the rated load capacity of the suspension system or other components. Exceeding the capacity can cause component failure and void the warranty.

Check Wheel Toe Setting

1. Deflate the air springs.

2. Lift the axle enough for tires to rotate freely. Support with jack stands to ensure axle is level.

3. Position tires to point straight ahead. Spin each tire. Use a piece of chalk to mark a line on the center tread all the way around the tire.

4. Use the centerline mark to measure the distance from the front of the tire to the frame. Measure the distance from the back of the tire to the frame.

5. Subtract the front of the tire distance from the rear distance to obtain the wheel toe setting.

Adjust Wheel Toe

1. Loosen clamps on both ends of the tie rod. Twist the tie rod forward/backward to move the front of the tire towards or away from the frame.

2. Continue rotating the tie rod until the proper toe-in setting is achieved.

3. Torque tie-rod clamps to 60-80 ft-lb (81-108 N-m).
Install air system components

Connect the load and lift air springs and an air control kit to the air system (Figure 2).

The air control kit (ACK) consists of a pressure regulator with a gauge connected to an air valve controlled by an electric switch or manual knob. The ACK allows the operator to control the air spring pressure so that the auxiliary axle can support different loads.

Ridewell has a number of manual/electric ACK configurations available. Installation will vary by the type of configuration.

⚠️ CAUTION The installer is responsible for making sure that air system requirements comply with the appropriate Federal Motor Vehicle Safety Standards.

Troubleshooting – Air System Installation

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air springs fill but do not exhaust.</td>
<td>— Obstructed air line.</td>
<td>— Check for pinchedblocked lines.</td>
</tr>
<tr>
<td></td>
<td>— Faulty controls wiring.</td>
<td>— Check wiring with voltmeter and correct</td>
</tr>
<tr>
<td></td>
<td>— Manual override pushed in</td>
<td>wiring/installation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>— Release manual override.</td>
</tr>
<tr>
<td>Air system leaks down after a short period</td>
<td>— Leak in air system beyond accepted standards.</td>
<td></td>
</tr>
<tr>
<td>of time.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auxiliary unit will not stay up</td>
<td>— Loose Air Fittings.</td>
<td>— Check and retighten fittings. Repair or</td>
</tr>
<tr>
<td></td>
<td>— Damaged Air Lines.</td>
<td>replace component, as necessary.</td>
</tr>
<tr>
<td></td>
<td>— Air lines to lift and load air springs are reversed.</td>
<td>— Check installation. Air line from</td>
</tr>
<tr>
<td></td>
<td>— Damaged or Worn Air Springs.</td>
<td>regulator goes to (load) air springs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>— Replace if worn or damaged.</td>
</tr>
<tr>
<td>Auxiliary unit not getting the correct lift</td>
<td>— Air lines to lift and load air springs are reversed.</td>
<td>— Check installation. Air line from regulator</td>
</tr>
<tr>
<td></td>
<td>— Lift air springs do not have proper air pressure.</td>
<td>goes to (load) air springs.</td>
</tr>
<tr>
<td></td>
<td>— Interference with driveline or other chassis components.</td>
<td>— Check for loose fittings or worn/damaged</td>
</tr>
<tr>
<td></td>
<td>— Air control system not installed correctly.</td>
<td>lines. Verify air tank pressure with gauge.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>— Visually inspect unit operation for</td>
</tr>
<tr>
<td></td>
<td></td>
<td>proper clearance. Check for loose fasteners</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and retighten.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>— Check installation; refer to OEM installation</td>
</tr>
</tbody>
</table>

Figure 2. Example of Air Control Kit (ACK) installation
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.

### 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.
- 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 bolts/nuts to specifications (torque values chart in Appendix).

### Every 12,000 miles of use

- Lubricate Brake Cam and Slack Adjuster.
- Inspect kingpins and upper/lower kingpin bushings for wear. Grease thrust bearings.
- Inspect steering damper for damage/wear.
- Inspect air springs for any damage or excessive wear. Torque air spring bolts/nuts to specifications (Appendix).
- Check air system for leaks.

### First 50,000 miles of use

- Torque all suspension bolts/nuts to specifications (Appendix).
- Check wheel ends for excessive play.
- Check suspension pivot bushings for wear.
- Check operation of (reverse) steering lock (if equipped).
- Verify operation of manual/automatic lift-in-reverse control (if equipped).
- Inspect tie-rod and tie-rod ends for damage and wear. Lubricate tie-rod ends. Check that the tie-rod boot is in place and completely over the end of the tie-rod. Replace entire tie-rod end if boot is damaged.

### Annually/100,000 miles of use

- Inspect pivot connections for worn pivot bushings and replace, if necessary. Torque pivot hardware and component bolts/nuts to specifications (Appendix).
- Check suspension hanger and air spring mounting plate connections to frame.
- 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 system for leaks.
- Test air system pressure protection valve (if equipped).
- Check brake chambers and brakes for damage and proper function.

⚠️ **CAUTION** Failure to exhaust all pressure from the air system before working on the vehicle can cause serious injury.

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

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 Procedures |
| 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 645 | Tie Rod End Inspection and Maintenance Procedure |
| TMC RP 651 | Steer Axle Maintenance Guidelines |
Figure 3.
RSS-233 20K Truck Suspension – Standard/Wide Frame Width - Drum Brakes
Refer to the engineering drawing for the individual component part number.

NOTE: Spacer Kit for drum brake axle includes air spring spacer plates to adjust ride height
Figure 4.
RSS-233 - 20K Truck Suspension
With Drum Brakes-
Drum Brake Axle Assembly
(Steer Lock version)

Refer to the Steer Lock (S) version of the engineering drawing for the individual component part number.
Figure 5.
RSS-233 20K Truck Suspension – Disc Brakes
Refer to the engineering drawing for the individual component part number.

NOTE:
ADB Spacer Kit includes hanger and air spring spacer plates to adjust ride height
Figure 6.
RSS-233-20K Truck Suspension
With Disc Brakes-
Disc Brake Axle Assembly
(Steer Lock version)

Refer to the Steer Lock (S) version of the engineering drawing for the individual component part number.
Figure 7.
RSS-233 - 20K Truck - Roll-Off suspension – Drum Brakes
Refer to the engineering drawing for the individual component part number.

NOTE:
Roll-Off Spacer Kit includes hanger and air spring spacer plates to adjust ride height.
Figure 8.
RSS-233 - 20K Truck - Roll-Off Drum Brake Axle Assembly

Refer to the engineering drawing for the individual component part number.
### RSS-233 - 20K Truck Suspension – Bushing Replacement Kit

<table>
<thead>
<tr>
<th>Suspension Type</th>
<th>Bushing Replacement Kit - Part Number</th>
<th>Pivot Hardware</th>
<th>Torque Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>All models</td>
<td>6040142</td>
<td>Bushing kit - No pivot bolt</td>
<td>500 ft-lb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pivot Bolt (HHCS)</td>
<td>500 ft-lb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pivot Nut (Locknut)</td>
<td>678 N-m</td>
</tr>
</tbody>
</table>

**CAUTION** 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.

### Bushing Replacement Procedure – Standard/Wide Frame Width

Park the vehicle on a level surface. Chock wheels to keep vehicle from moving. Exhaust all air from the air system. Disassemble suspension, if necessary, to reach pivot connections.

**CAUTION** Failure to properly chock wheels and exhaust the air system could allow vehicle movement that could result in serious injury.

1. Count the number of wear washers on each side of the bushing on the Axle-End Torque Rod Assembly. The wear washer number varies according to the frame width set by the hangers (Figure 1).
2. Remove the pivot hardware and discard. Inspect the wear washers for excessive wear/damage. Replace, if necessary. 
   NOTE: Pivot hardware included with bushing replacement kit.
3. Remove bushing assembly from torque rod and discard. Clean the rod eye of any foreign debris/corrosion.
4. Apply Energy Suspensions® Formula 5 Prelube to the bore (inside) of new bushings. NOTE: Do not substitute - special urethane bushing lubricant included with all bushing kits.
5. Install new bushing into the eye of the torque rod. 
   NOTE: Mallet/press may be needed to install the bushing.
6. Hanger-End Torque Rod - Bushing Inner Sleeve - 4.1”
   Press inner sleeve into the installed bushing. Center the sleeve so that both ends extend slightly past the sides of the bushing. Assemble the pivot connection with one wear washer on each side of the bushing. Inner sleeve must be flush with or extend slightly past the outside of the wear washers on both ends.
7. Axle-End Torque Rod - Bushing Inner Sleeve - 4.8”
   Press inner sleeve into the installed bushing. Position the inner sleeve so that one end extends further past the bushing than the other end (Figure 1). Assemble pivot connection with appropriate number of wear washers on either end of the inner sleeve. Inner sleeve must be flush with or slightly past the outside of the wear washers on both ends.
8. Torque pivot nut to specifications (500 ft-lb - 678 N-m).
9. Reassemble suspension, if necessary. Torque components to specifications.
10. Check wheel toe-in setting (between 1/32” and 3/32”) and adjust, if necessary.
### RSS-233 20K Truck – Torque Specifications

<table>
<thead>
<tr>
<th>Fastener Type</th>
<th>Size</th>
<th>Torque Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Locknut - (Air Spring)</strong></td>
<td>1/2”-13NC</td>
<td>25 ft-lb</td>
</tr>
<tr>
<td><strong>Locknut - (Air Spring)</strong></td>
<td>1/2”-20NF</td>
<td>25 ft-lb</td>
</tr>
<tr>
<td><strong>Locknut - (Air Spring)</strong></td>
<td>3/4”-16NF</td>
<td>50 ft-lb</td>
</tr>
<tr>
<td><strong>Flanged Lock-Screw - (Air Spring)</strong></td>
<td>3/8”-16NC</td>
<td>25 ft-lb</td>
</tr>
<tr>
<td><strong>Locknut - (Tie Rod/Steering Damper)</strong></td>
<td>3/4”-10NC</td>
<td>160 ft-lb</td>
</tr>
<tr>
<td><strong>Locknut - (Cross Channel)</strong></td>
<td>5/8”-11NC</td>
<td>160 ft-lb</td>
</tr>
<tr>
<td><strong>Pivot Bolt - (Hex Head Cap Screw (HHCS))</strong></td>
<td>7/8”-14NF</td>
<td>500 ft-lb</td>
</tr>
<tr>
<td><strong>Pivot Nut - (Locknut)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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. All fasteners MUST be re-torqued after the first 6,000 miles of operation. 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 of the suspension model.
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.