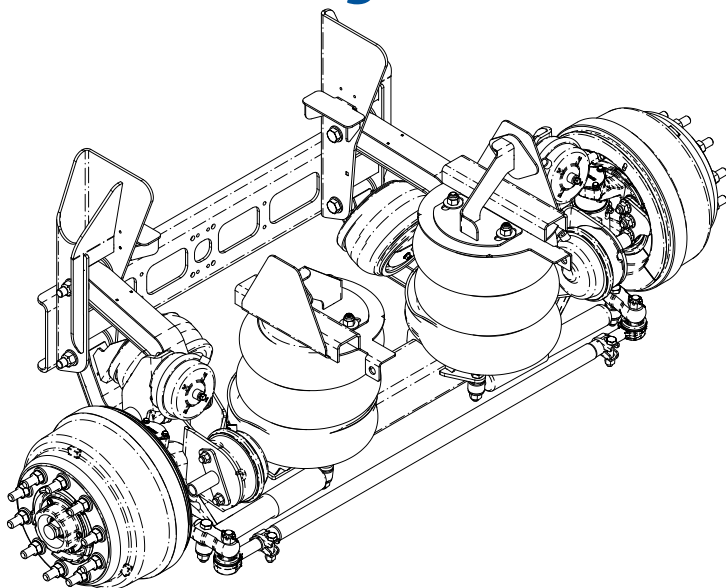


# **RSS-233 - 20K Truck**

## ***Self-Steering Air-Ride Suspension***



## **Installation and Service Manual**

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## SUSPENSION IDENTIFICATION

### Introduction

The Ridewell Self-Steering (RSS) 233 Suspension series is a fully integrated auxiliary axle suspension system for truck and trailer applications.

The RSS 233 20K Truck Suspension System can be configured an optional steering lock on either a drum- or disc-brake axle assembly.

NOTE: The suspension system should be integrated with a drum-brake axle assembly configured for 20K Truck Roll-Off Applications.

Additional information on optional kingpin configurations and pivot bushing replacement is found in "233\_232-Kingpin/Bushing-Parts Guide" (9710033).

### Suspension Identification Tag

A (606-) **Installation/Assembly Number** will be listed in the **Part Number** when other 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 service notes to provide important safety guidelines for the suspension operation.

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.

 <b>RIDEWELL SUSPENSIONS</b> 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.	
www.ridewellcorp.com	(800) 641-4122

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

### Self-Steering Option

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

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

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

**CAUTION** Failure to lift the suspension and-or engage the steering-lock during reverse travel can cause

## 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 of 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.
- The installer must verify there is sufficient clearance for proper functioning of the installed auxiliary suspension – air springs; brake chambers; steering components; axle (including axle to driveline clearance); and, tires and wheels.
- 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.

## Suspension Mounting

Refer to the suspension model engineering drawing for the suspension travel table; torque specifications; and, the spacing and clearance requirements for mounting the suspension.

The hanger locator flanges are factory installed to a pre-set ride height determined by the air spring mounting plate installed without a spacer (Figure 2).

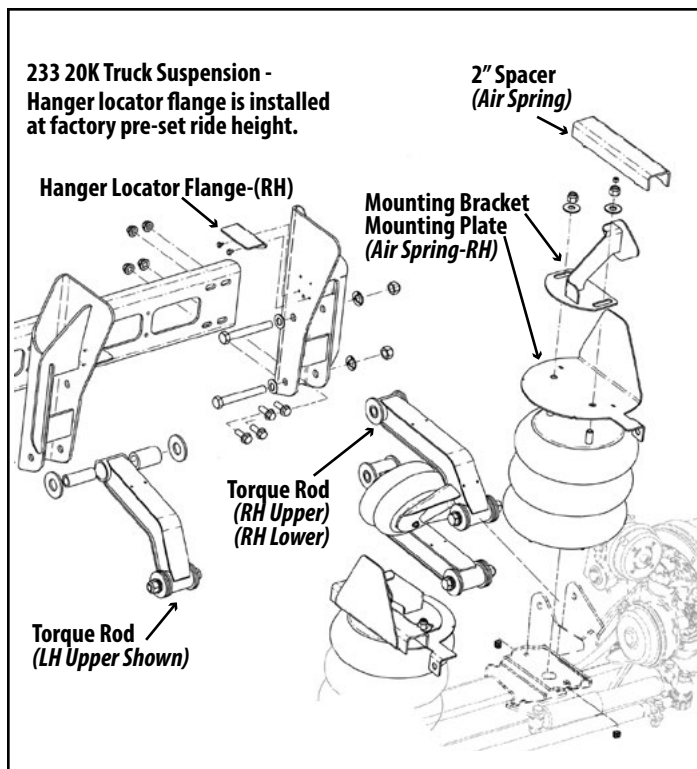
A 2" spacer kit for the hangers and air spring mounting plates is available for the 233-20K disc brake and roll-off configurations.

### Bolt-On Installation Procedure

Grade-8 bolts, flanged locknuts or locknuts with hardened washers are supplied by the installer.

Loosen the crosschannel and pivot nuts on the hanger end of the 233 20K Roll-Off Suspension before installation (pg 14). Torque to specifications during final assembly.

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 plates if the vehicle frame width is narrower than the suspension pre-set frame width.



**Figure 2.**  
Hanger locator flanges are factory preset to ride height-air spring mounting plates without spacer.

2. Place the suspension, with any hanger/air spring filler plates or hanger/air spring spacers, in the desired location for installation.  
NOTE: A crossmember must be located on the frame within six inches of the leading or trailing edge of the hanger.
3. Check the installation location for adequate clearance of suspension components. The top of the hangers and air spring mounting plates must be parallel to the chassis frame to maintain the proper caster angle.
4. The frame hangers and air spring mounting plates should be perpendicular to the chassis frame and in alignment with each other. Clamp the hangers, the mounting plates, and any required spacer and filler plates firmly in place.
5. Refer to the engineering drawing for the hanger/air spring mounting plate bolt-hole locations.  
**CAUTION** If the recommended bolt-hole locations are not available, locate and drill the bolt-holes as far apart as possible to provide the most support for the assembled suspension. 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 frame hanger. Bolt each hanger to the frame with 5/8-inch Grade 8 bolts and locknuts.
7. Center-punch and drill two bolt-holes in each air spring mounting bracket. Bolt each air spring bracket to the frame with two 5/8-inch Grade 8 bolts and locknuts.
8. Install/connect the air control kit (ACK) to the suspension (Page 6). Check the entire air system after installation for leaks and proper operation of air controls.
9. Perform final assembly and inspection.

### Final Assembly and Inspection

1. Verify that all suspension component bolts/nuts are torqued to specifications (Page 8).
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.

*continued on next page*

### Final Assembly (continued from previous page)

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.

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

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

### Regulate load with air spring pressure

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.

### 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".

### 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).



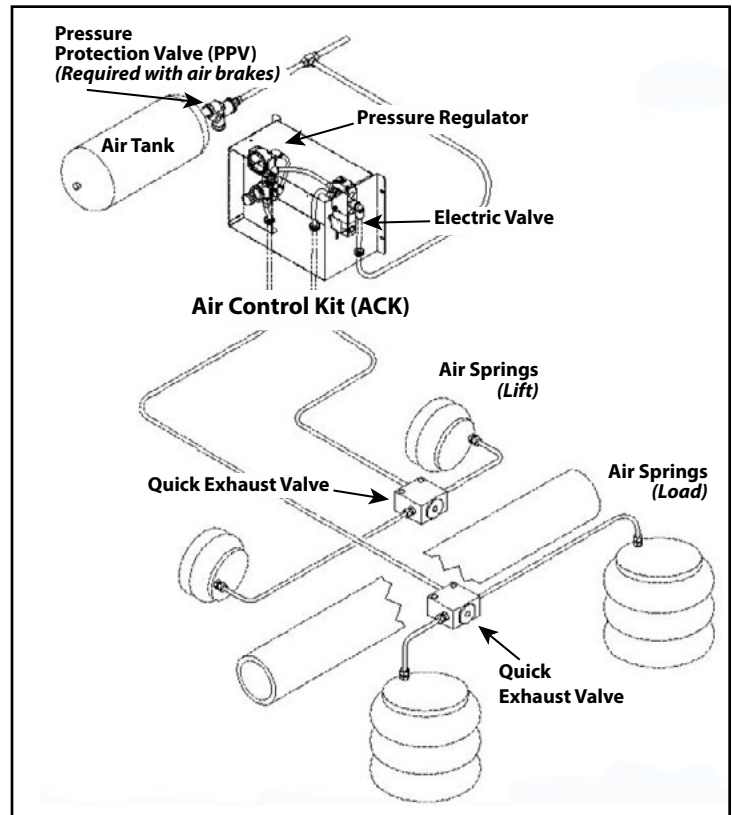
## Install air system components

Connect the load and lift air springs and an air control kit to the air system (Figure 3).

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.



**Figure 3.**  
**Example of Air Control Kit (ACK) installation**

### AIR CONTROL KIT – TROUBLESHOOTING

Problem	Possible Cause	Solution
<b>Air springs fill but do not exhaust.</b>	— Obstructed air line.	— Check for pinched/blocked lines.
	— Faulty controls wiring.	— Check wiring with voltmeter and correct wiring/installation as necessary.
<b>Air system leaks down after a short period of time.</b>	— Manual override pushed in	— Release manual override.
	— Leak in air system beyond accepted standards.	— Pressurize system and spray soap water solution onto the tubing, valves and fittings. Check for bubbles (leaks). Note: Some valves leak at an acceptable rate.
<b>Auxiliary unit will not stay up</b>	— Check that tubing cuts are straight and smooth. Re-cut and reassemble fitting joints, if necessary.	— Check that tubing cuts are straight and smooth. Re-cut and reassemble fitting joints, if necessary.
	— Loose Fittings/Damaged Air Lines.	— Check and retighten fittings. Repair or replace component, as necessary.
	— Air lines to lift and load air springs are reversed.	— Check installation. Air line from regulator goes to (load) air springs.
<b>Auxiliary unit not getting the correct lift</b>	— Damaged/Worn Air Springs.	— Replace if worn or damaged.
	— Air lines to lift and load air springs are reversed.	— Check installation. Air line from regulator goes to (load) air springs.
	— Lift air springs do not have proper air pressure.	— Check for loose fittings or worn/damaged lines. Verify air tank pressure with gauge.
	— Interference with driveline or other chassis components.	— Visually inspect unit operation for proper clearance. Check for loose fasteners and retighten.
	— Air control system not installed correctly.	— Check installation; refer to OEM installation procedures.

## Recommended Service Intervals

Ridewell Suspensions recommends these minimum service intervals for standard duty, on-highway usage applications. More frequent intervals are recommended for heavier duty applications.

### Daily/Pre-Trip Inspections

- \_\_\_ 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.
- \_\_\_ Check tires for proper inflation, damage or excessive wear.
- \_\_\_ Check wheel-ends for obvious signs of lubricant leakage. Check for missing 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 (Page 8/Engineering Drawing).

### 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/excessive wear. Torque air spring bolts/nuts to specifications (Page 8/Engineering Drawing).
- \_\_\_ Check air system for leaks.

### First 50,000 miles of use

- \_\_\_ Torque all suspension bolts/nuts to specifications (Page 8/Engineering Drawing).
- \_\_\_ Check wheel ends for excessive play.
- \_\_\_ Check 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 the tie-rod ends for excessive damage/wear. Lubricate tie-rod ends. Check that tie-rod boot is in place and completely over the end of the tie-rod.  
Replace entire tie-rod end if boot is damaged.

### Annual/100,000 Miles Inspection

- \_\_\_ Inspect pivot connections for worn bushings/wear washers. Replace if necessary. Torque all hardware to spec. (Pg 8/ENG Drawing).
- \_\_\_ Check hanger and air spring mounting plate connections to frame.

#### Check lubrication level in wheel ends:

- \_\_\_ Oil-Filled Wheel Ends:  
Refill/Replace lubricant as needed  
(TMC RP 631-“100K/Annual Inspection”).
- \_\_\_ Check air system for leaks.
- \_\_\_ Test air tank pressure protection valve (PPV) if equipped.
- \_\_\_ Check brake chambers/brakes for damage and proper function.

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

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

#### Refer to these Technology & Maintenance Council (TMC) Recommended Procedures 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 Maintenance
RP 631	Wheel End Lubrication Procedures
RP 643	Air Ride Suspension Maintenance Guidelines
RP 645	Tie-Rod End Inspection/Maintenance
RP 651	Steer Axle Maintenance Guidelines

#### AVAILABLE WHEEL-END LUBRICANTS

Lubricant Type	P/N	Item Description
Mineral Oil	<b>380008G</b>	(CITGO) MP GearOil 631310001-80W-90
Synthetic Oil	<b>1980006</b>	(SHELL) Synthetic API GL-5 75W-90 Oil
Synthetic Hard-Pack Grease	<b>1980007</b>	(CITGO) Synthetic Grease

## 233 20K TRUCK SUSPENSION — BUSHING REPLACEMENT/TORQUE SPECIFICATIONS

Part Number (Component)	Item Description	Size	Torque Values	
			foot-pound	Newton-meter
6040145 - Bushing Kit	Pivot Bolt/Nut (HHCS/Locknut)	7/8"-14NF	500 ft-lb	678 N-m
6040142 - Bushing Kit	No Pivot Hardware	NA	500 ft-lb	678 N-m
<b>Fasteners</b>	Locknut - (Air Spring)	1/2"-13NC	25 ft-lb	34 N-m
	Locknut - (Air Spring)	1/2"-20NF	25 ft-lb	34 N-m
	Locknut - (Air Spring)	3/4"-16NF	50 ft-lb	68 N-m
	Flanged Lock Screw - (Air Spring)	3/8"-16NC	25 ft-lb	35 N-m
	Locknut - (Tie Rod/Steering Damper)	3/4"-10NC	160 ft-lb	217 N-m
	Locknut - (Crosschannel)	5/8"-11NC	160 ft-lb	217 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.

### 233 20K Truck Bushing Replacement Procedure – Standard/Wide Frame Width

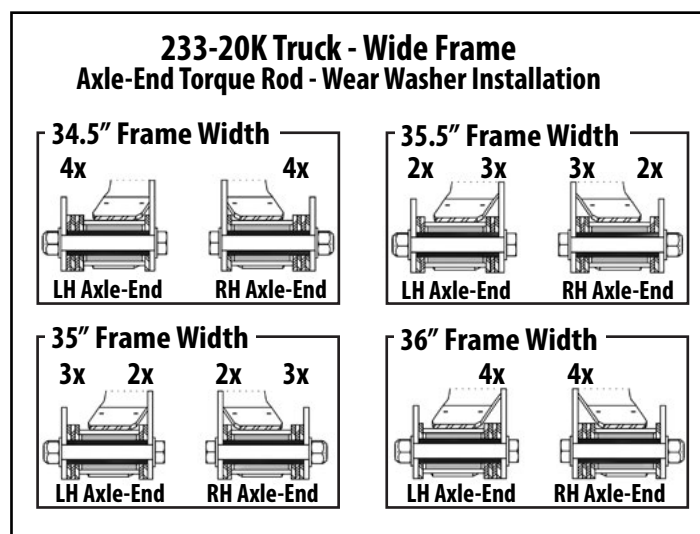
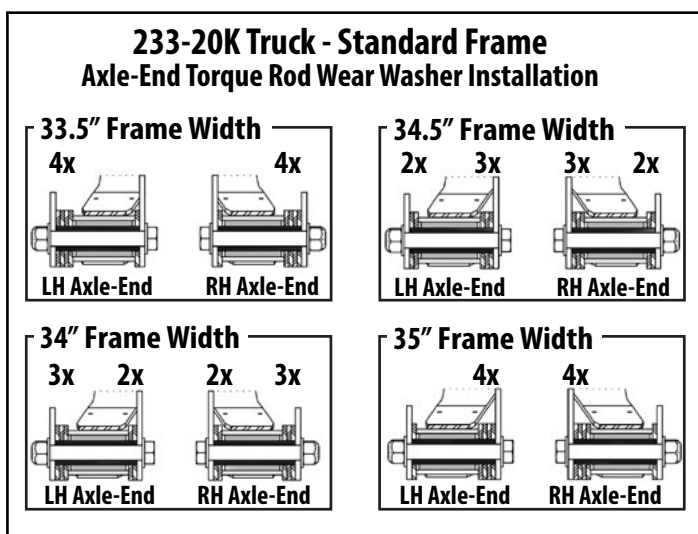
Park the vehicle on a level surface. Chock wheels to keep vehicle from moving. Exhaust all air from the air system. Disassemble suspension, if necessary, to reach pivot connections.

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

- 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 4).

- Remove pivot hardware and discard. Inspect wear washers for wear/damage. Replace, if necessary.  
NOTE: Wear washers/Pivot hardware included with bushing replacement kits.
- Remove bushing assembly from torque rod and discard. Clean rod eye of debris/corrosion.
- 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.

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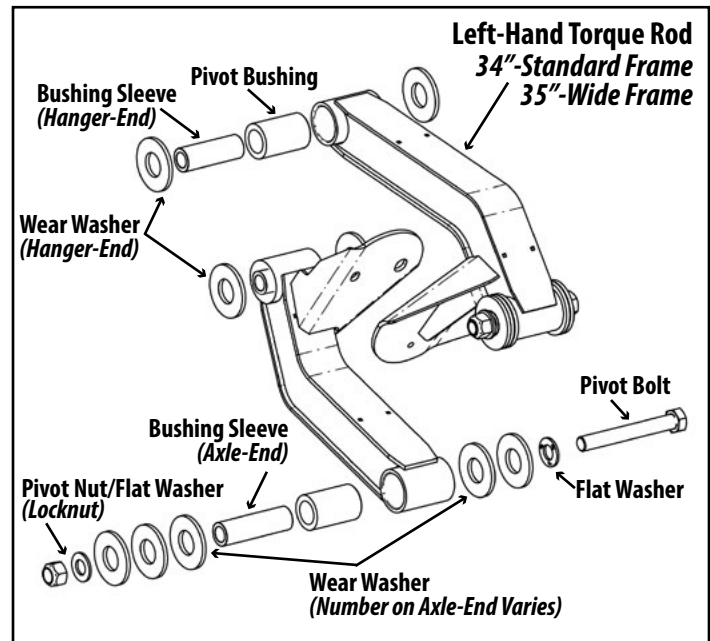
**Figure 4.**

Refer to the suspension model engineering drawing for the number of wear washers installed on the axle-end of the torque rod. The number of washers varies by the factory pre-set frame width.

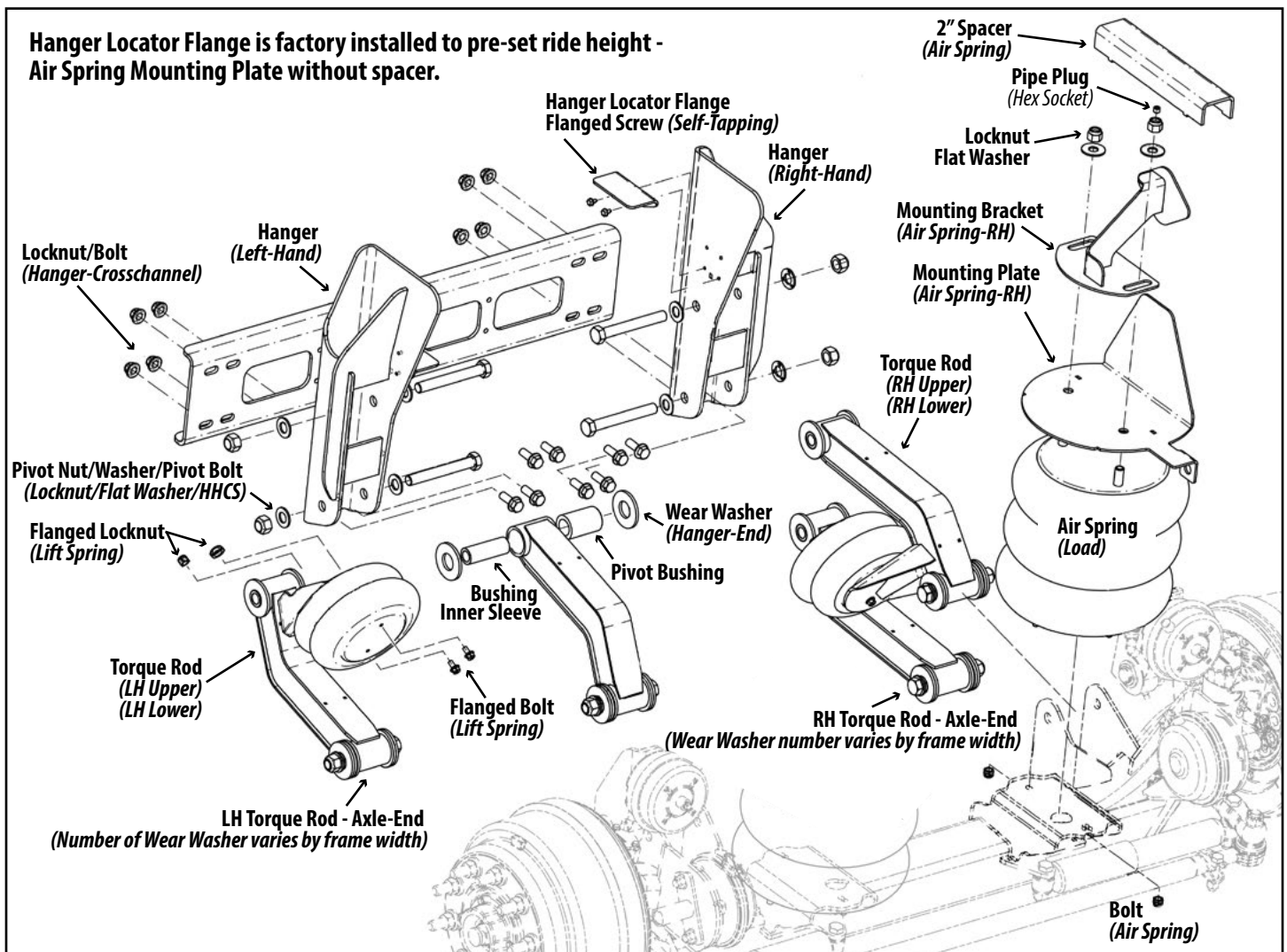


### 233 20K Truck – Bushing Replacement (continued)

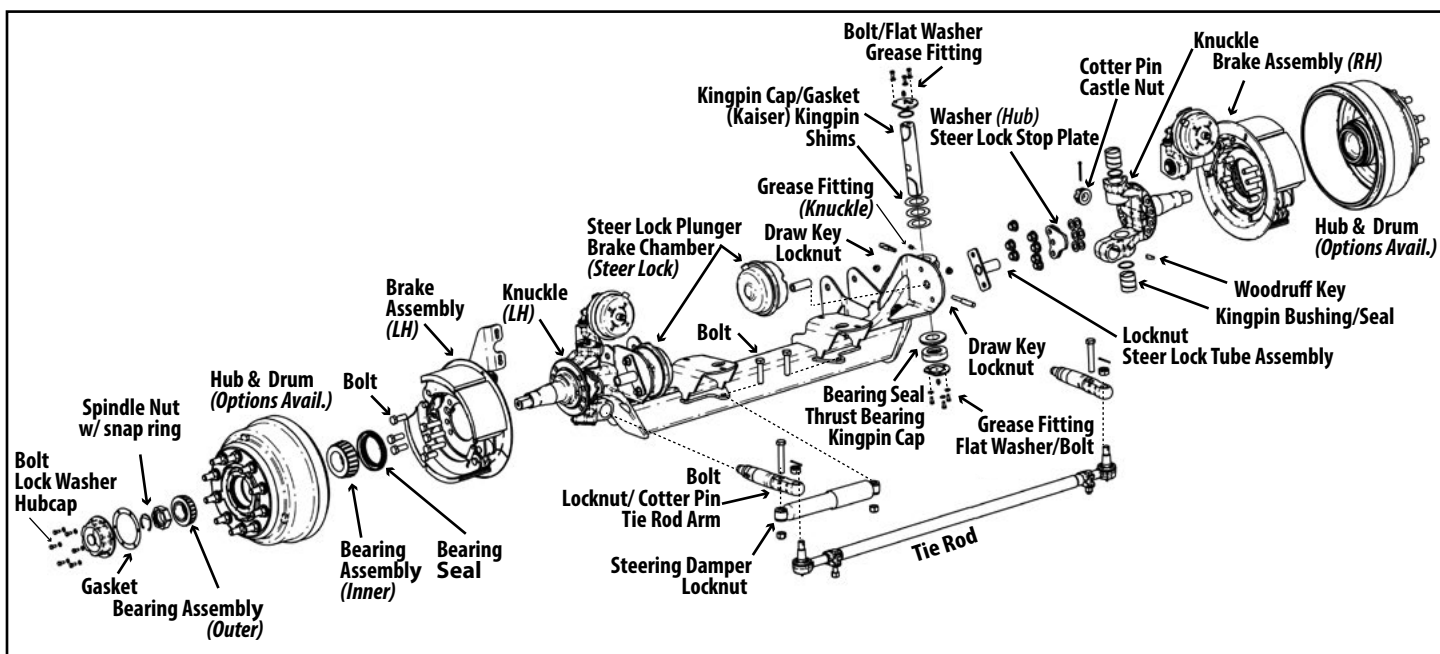
5. Install new bushing into the eye of the torque rod.  
NOTE: Mallet /press needed to install bushing.
6. **Hanger-End Torque Rod Bushing Installation-  
Bushing Inner Sleeve - 4.1"**  
Press inner sleeve into the installed bushing. Center the sleeve so that both ends extend slightly past the sides of the bushing.  
Assemble the pivot connection with one wear washer on each side of the bushing (Figure 5). Inner sleeve must be flush with or extend slightly past the outside of wear washers on both ends.
7. **Axle-End Torque Rod Bushing Installation-  
Bushing Inner Sleeve - 4.8"**  
Press inner sleeve into the installed bushing. Position inner sleeve so that one end extends further past the bushing than the other end.  
Assemble pivot connection with appropriate number of wear washers on either end of the inner sleeve (Figure 4). 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. Verify wheel toe-in setting between 1/32" and 3/32". Adjust if necessary (Page 5).



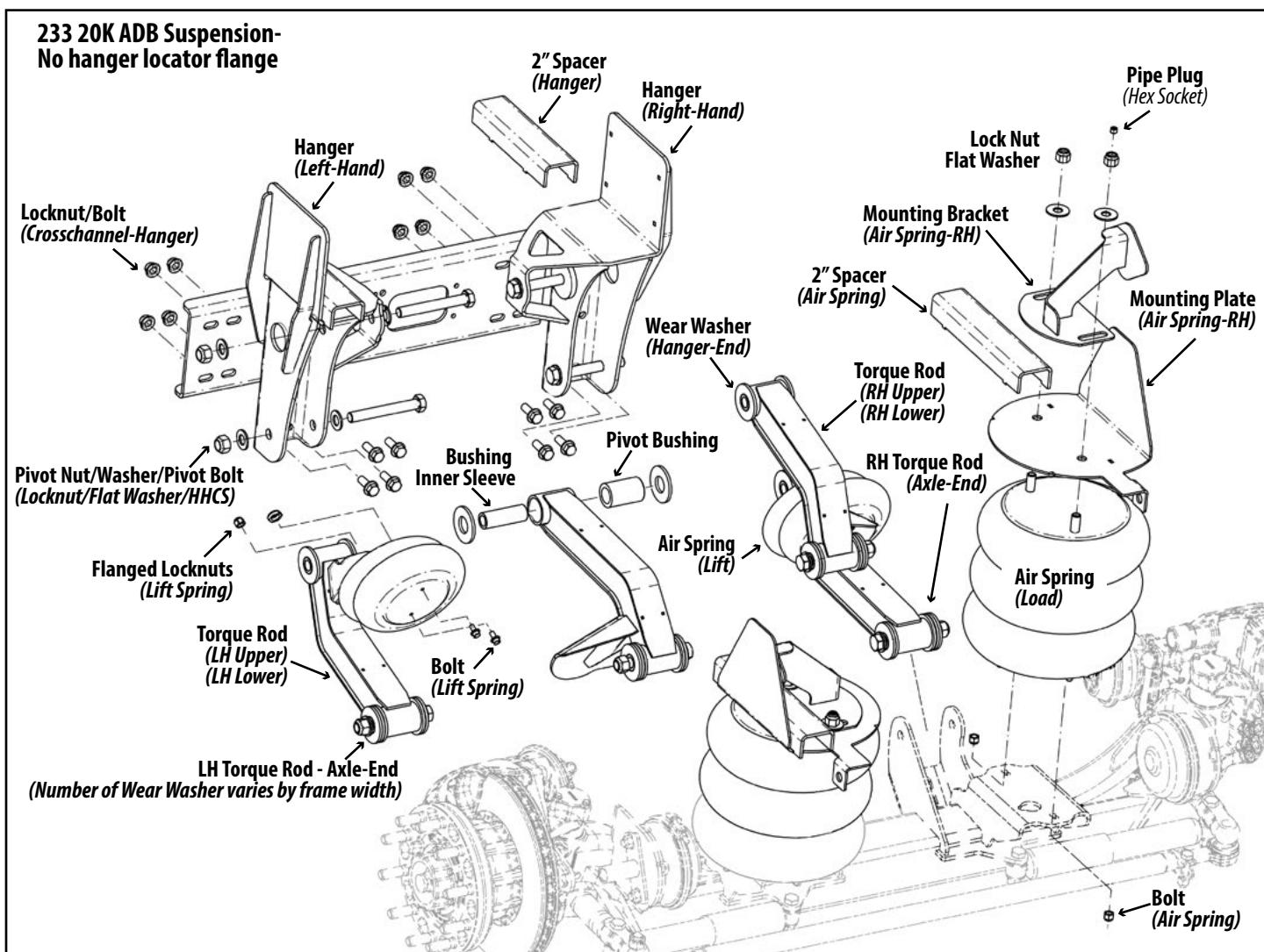
**Figure 5.**  
The number of wear washers on the torque rod axle-end varies by the pre-set frame width.



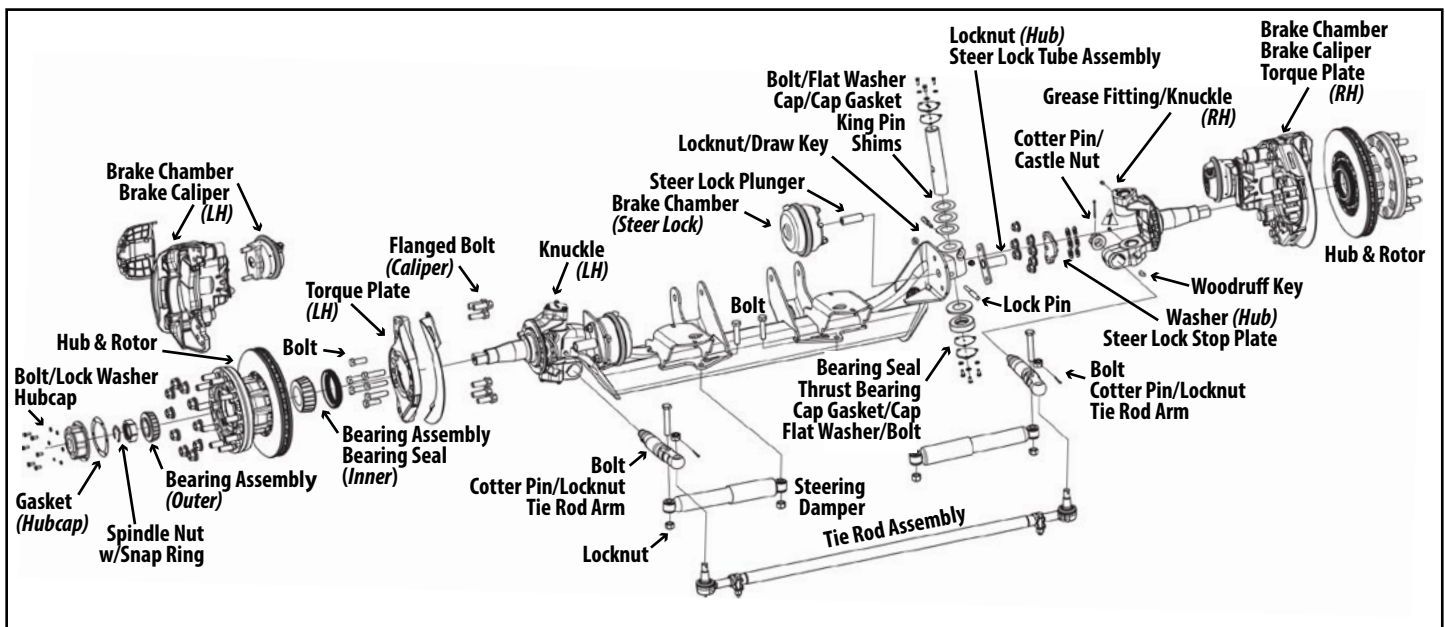
**Figure 6.**  
**RSS-233 20K Truck Suspension with Drum Brakes**  
 Refer to the engineering drawing for the individual component part number.



**Figure 7.**  
**Drum Brake Axle Assembly - Kaiser Kingpin (Steer Lock version)**  
 Refer to the Steer Lock (S) version of the engineering drawing for the individual component part number.

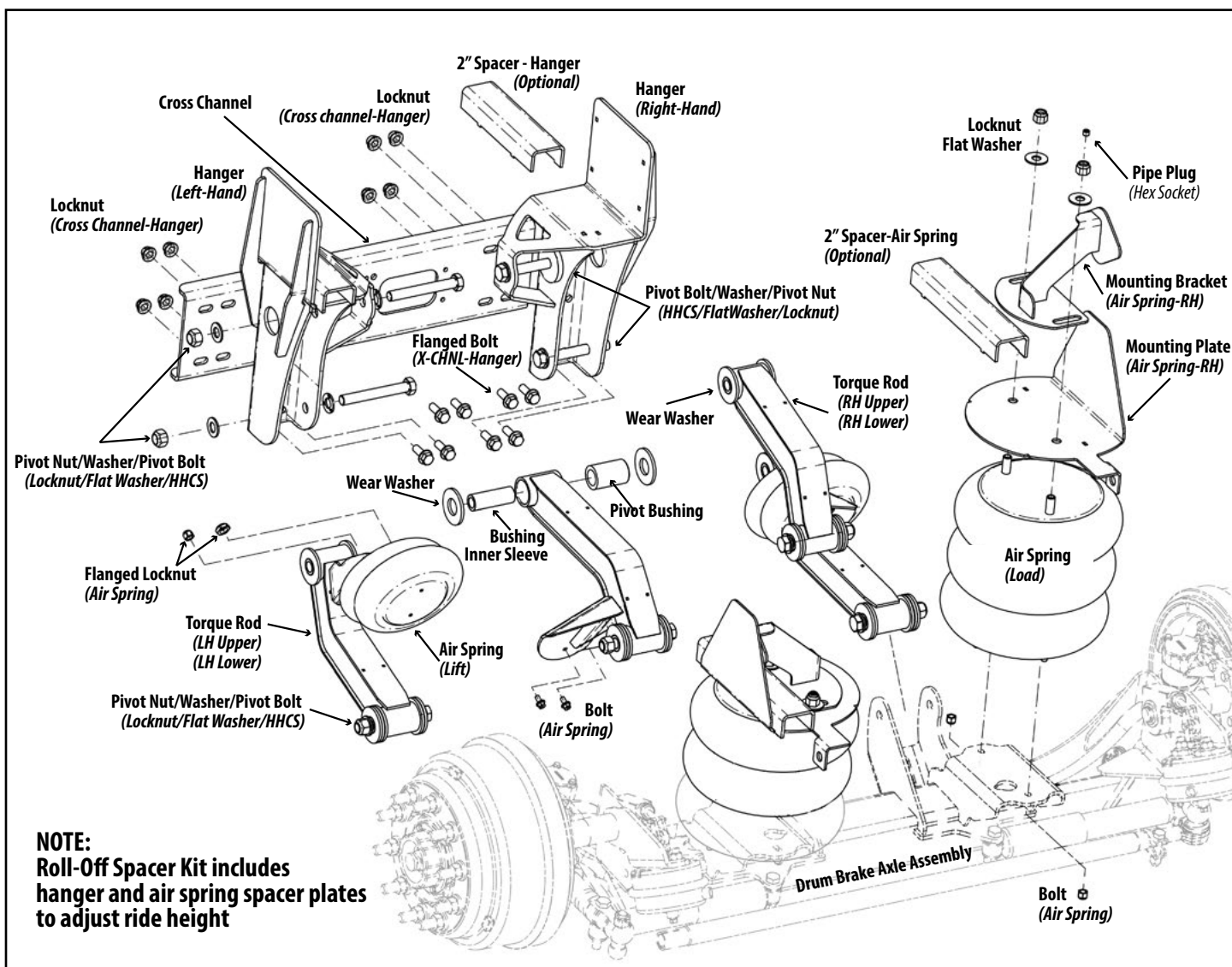


**Figure 8.**  
**RSS-233 20K Truck Suspension with Disc Brakes**  
 Refer to the engineering drawing for the individual component part number.



**Figure 9.**  
**Disc Brake Axle Assembly-Standard Kingpin (Steer Lock version)**  
 Refer to the Steer Lock (S) version of the engineering drawing for the individual component part number.





**Figure 10.**  
**RSS-233 - 20K Roll-Off Truck Suspension with drum brakes**  
Refer to the engineering drawing for the individual component part number.



**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.**