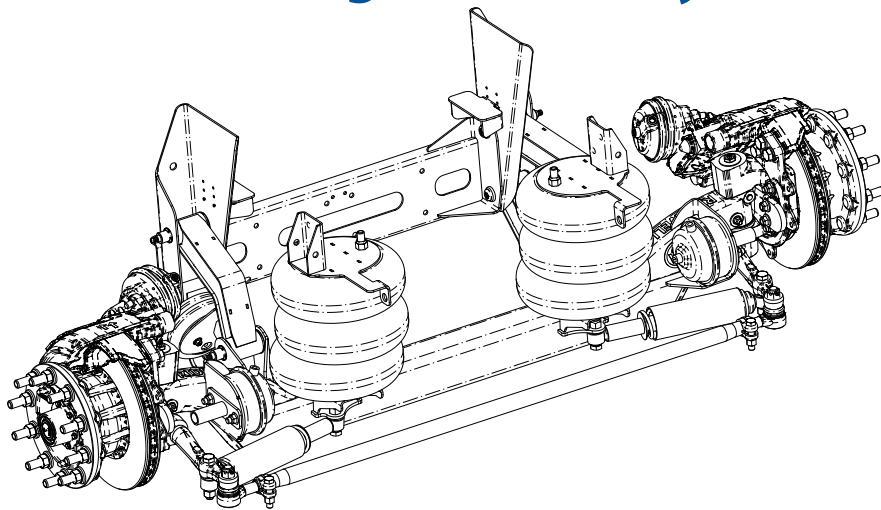


RSS-233 - 13K Truck

Self-Steering – Auxiliary Axle Suspension



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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 13K Truck Suspension System can be configured with drum or disc brake axle assemblies and optional steering lock. The suspension system should be configured with a drum brake axle assembly for Roll-Off Applications.

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

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

Suspension Identification Tag

A (606-) **Installation/Assembly Number** is listed as the **Part Number** when other system components are factory installed with the suspension. The **Suspension Number** and **Serial Number** refer to the suspension model and the date of manufacture (Figure 1).

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 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.


 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.	
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.

Prior to Installation

Refer to the suspension model engineering drawing to confirm dimensional requirements and available ride heights.

Installations can vary. 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 the 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.

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 component damage and void the warranty.

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 for 233 13K Truck Suspensions are factory installed to the ride height set by the air spring installed without a spacer (Figure 2).

The 233 13 Roll-Off Truck Suspension does not use hanger flanges. A 2" spacer is available for the hangers/air spring mounting plates (Figure 3).

Bolt-On Installation Procedure

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

Loosen crosschannel and pivot nuts on the hanger end of the 233 13K Roll-Off Suspension before installation. Torque to specifications during final assembly.

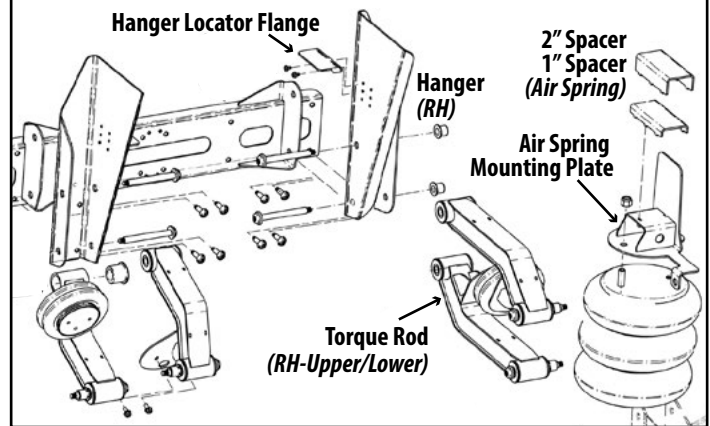
1. Measure vehicle frame width and the hanger-to-hanger inside dimensions of the suspension. Customer-supplied filler plates are required for the hangers and air spring mounting plates if the vehicle frame width is narrower than the suspension pre-set frame width.
2. Place the suspension, with any hanger/air spring filler plates or hanger/air spring spacer, in the desired installation location.
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 recommended 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.

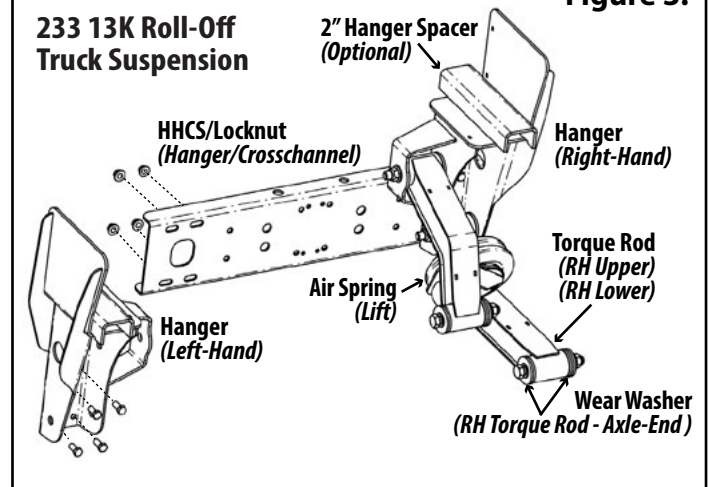
233 13K Truck Suspension -
Hanger locator flange is installed
at factory pre-set ride height.

Figure 2.



233 13K Roll-Off
Truck Suspension

Figure 3.



6. Center-punch and drill six bolt-holes in each 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 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.
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.
Do not lower the auxiliary axle while the vehicle is moving above 10 mph.
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 clearance 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.
8. Check wheel toe-in setting and adjust if necessary (between 1/32" and 3/32").

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

Check Wheel Toe Setting

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

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 each tire.
4. Use a tape measure to measure the distance between the center mark at the front and the rear of the tires.
5. Subtract the distance measured at the front of the tires from the distance measured at the rear of the tires to obtain the wheel toe setting (between 1/32" and 3/32").

Adjust Wheel Toe

1. Loosen the clamps on both ends of the tie rod. Twist the tie rod forward/backward to move the front of the tires towards or away from each other (increase/decrease toe-in setting).
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).

Air system component information

Connect the load and lift air springs and an air control kit to the air system (Figure 4).

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.

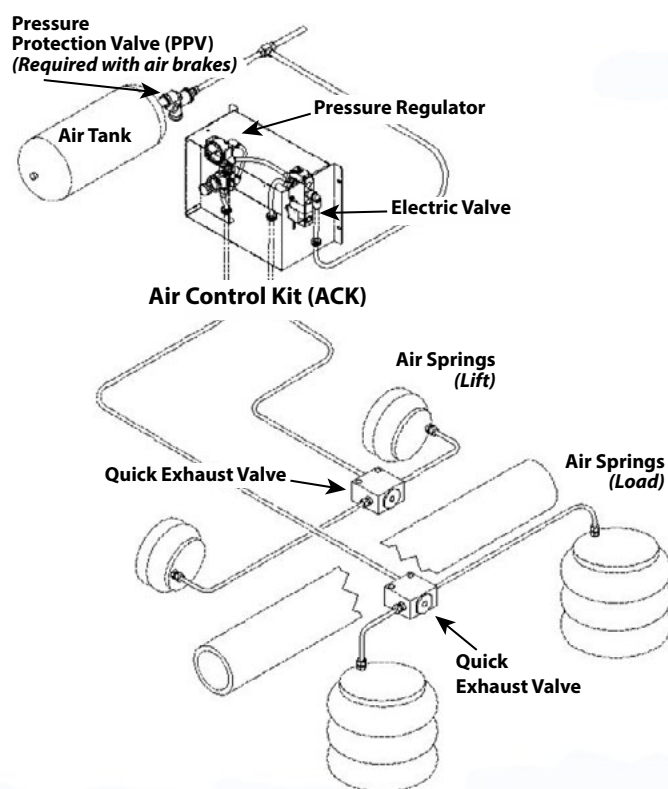


Figure 4.
Example of Air Control Kit (ACK) installation

AIR CONTROL KIT — TROUBLESHOOTING

Problem	Possible Cause	Solution
Air springs fill but do not exhaust.	<ul style="list-style-type: none"> — Obstructed air line. — Faulty controls wiring. — Manual override pushed in. 	<ul style="list-style-type: none"> — Check for pinched/blocked lines. — Check wiring with voltmeter and correct wiring/installation. — Release manual override.
Air system leaks down after a short period of time.	<ul style="list-style-type: none"> — Leak in air system beyond the accepted standards. NOTE: Some valves will leak at an acceptable rate. 	<ul style="list-style-type: none"> — Pressurize system and spray soapy water solution onto the tubing, valves and fittings. Check for bubbles (leaks). — Check that tubing cuts are straight and smooth. Re-cut and reassemble fitting joints, if necessary.
Auxiliary unit will not stay up	<ul style="list-style-type: none"> — Loose Air Fittings. Damaged Air Lines. — Air lines to lift and load air springs are reversed. — Damaged or Worn Air Springs. 	<ul style="list-style-type: none"> — Check and retighten fittings. Repair or replace component, as necessary. — Check installation. Air line from regulator goes to (load) air springs. — Replace if worn or damaged.
Auxiliary unit not getting the correct lift	<ul style="list-style-type: none"> — Air lines to lift and load air springs are reversed. — Lift air springs do not have proper air pressure. — Interference with driveline or other chassis components. — Air control system not installed correctly. 	<ul style="list-style-type: none"> — Check installation. Air line from regulator goes to (load) air springs. — Check for loose fittings or worn/damaged lines. Verify air tank pressure with gauge. — Visually inspect unit operation for proper clearance. Retighten any loose fasteners. — Check air control kit 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
(See 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	380008G	(CITGO) MP GearOil 631310001-80W-90
Synthetic Oil	1980006	(SHELL) Synthetic API GI-5 75W-90 Oil
Synthetic Hard-Pack Grease	1980007	(CITGO) Synthetic Grease

233 13K TRUCK (EXCEPT FOR 13K ROLL-OFF) – BUSHING REPLACEMENT/TORQUE SPECIFICATIONS

Part Number (Component)	Item Description	Size	Torque Values	
			foot-pound	Newton-meter
6040134-Bushing Kit	Pivot Bolt/Nut (HHCS/Locknut)	3/4" -16NF	310 ft-lb	420 N-m
6040078-Bushing Kit	Pivot Bolt/Nut (Huck® Hardware)	3/4"	—	—
6040133-Bushing Kit	No Pivot Hardware	NA	310 ft-lb	420 N-m
Fasteners	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 - (Steering Damper)	3/4" -10NC	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.

Vehicle Preparation

Park the vehicle on a level surface. Chock wheels to keep vehicle from moving.

Exhaust all the air from the air system. Disassemble suspension to reach pivot connections if necessary.

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

7. Reassemble suspension, if necessary. Torque to specifications (Chart/Engineering Drawing).

8. Check that the wheel toe-in setting is between 1/32" and 3/32" and adjust, if necessary (Page 5).

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

Bushing Replacement Procedure

Replace bushing in the eight pivot connections at the same time (Figure 5).

1. Remove the pivot hardware by cutting/grinding away the Huck® Collar. Discard.

2. Remove bushing assembly from rod eye. Clean the rod eye of debris/corrosion.

3. Apply Energy Suspensions® Formula 5 Prelube to the bore (inside) of each bushing half.
NOTE: Do not substitute - Urethane bushing lubricant supplied with kit.

4. Press bushing halves into torque rod eye until bushing half is snug against the eye.
NOTE: Mallet may be needed to install.

5. Press inner sleeve into the installed bushing opening. Check that inner sleeve is flush with both sides of installed bushing.
NOTE: Mallet or bushing press needed to insert inner bushing sleeve.

6. Install pivot hardware. Torque to specifications (Chart/Engineering drawing).

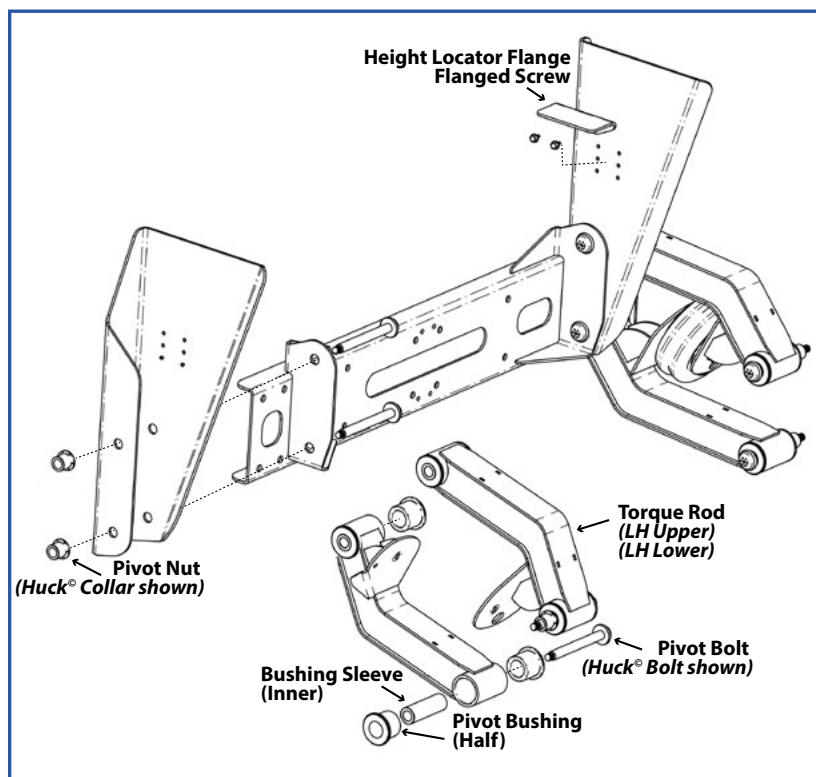


Figure 5.
233 13K Truck Suspension. Bushing kit includes replacement components for eight pivot connections.

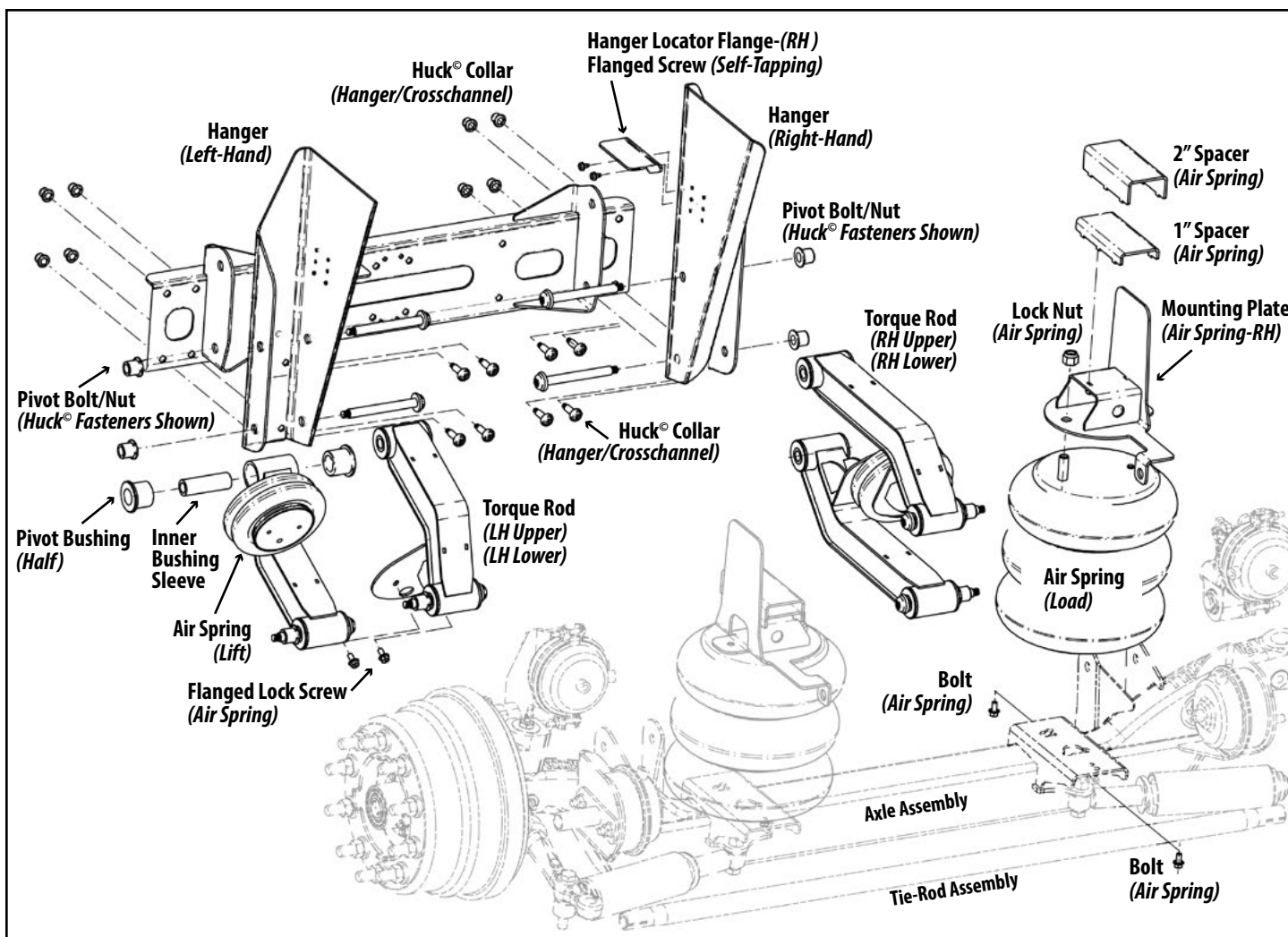


Figure 6.
233-13K Truck Suspension System
 Refer to the SteerLock (S) version of the engineering drawing for the component part number.

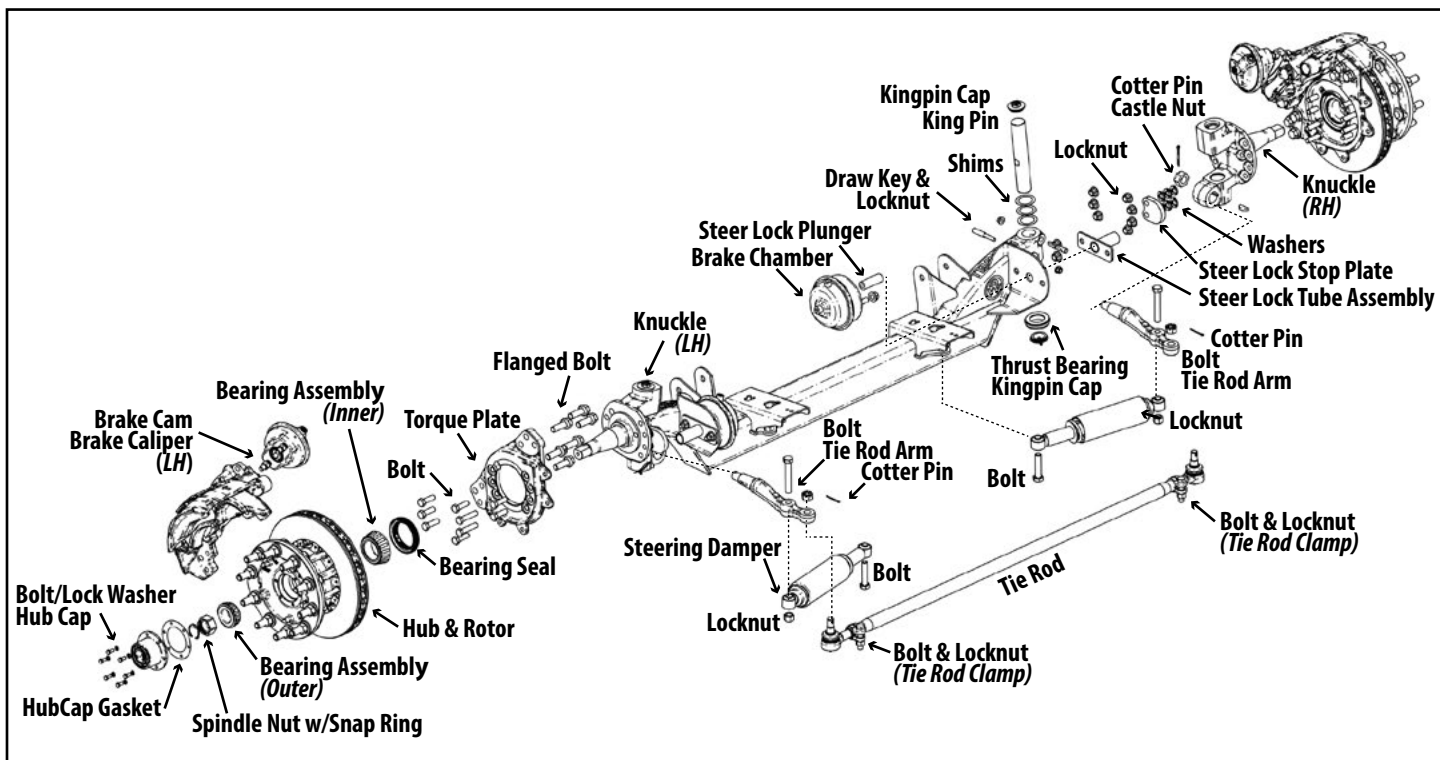


Figure 8.
233-13K Truck – Disc Brake Fabricated Axle Assembly w/ steering lock
 Refer to the SteerLock (S) version of the engineering drawing for component part number.

233 13K Roll-Off Truck Suspension — BUSHING REPLACEMENT/TORQUE SPECIFICATIONS

Part Number (Component)	Item Description	Size	Torque Values	
			foot-pound	Newton-meter
6040218 - Bushing Kit	Pivot Bolt/Nut (HHCS/Locknut)	3/4"-16NF	310 ft-lb	420 N-m
6040217 - Bushing Kit	No Pivot Hardware	NA	310 ft-lb	420 N-m
Fasteners	Flanged Lock Screw - (Air Spring)	3/8"-16NC	25 ft-lb	35 N-m
	Locknut - (Air Spring)	3/4"-16NF	50 ft-lb	68 N-m
	Locknut - (Crosschannel)	1/2"-13NC	25 ft-lb	35 N-m
	Locknut - (Steering Damper)	3/4"-10NC	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.

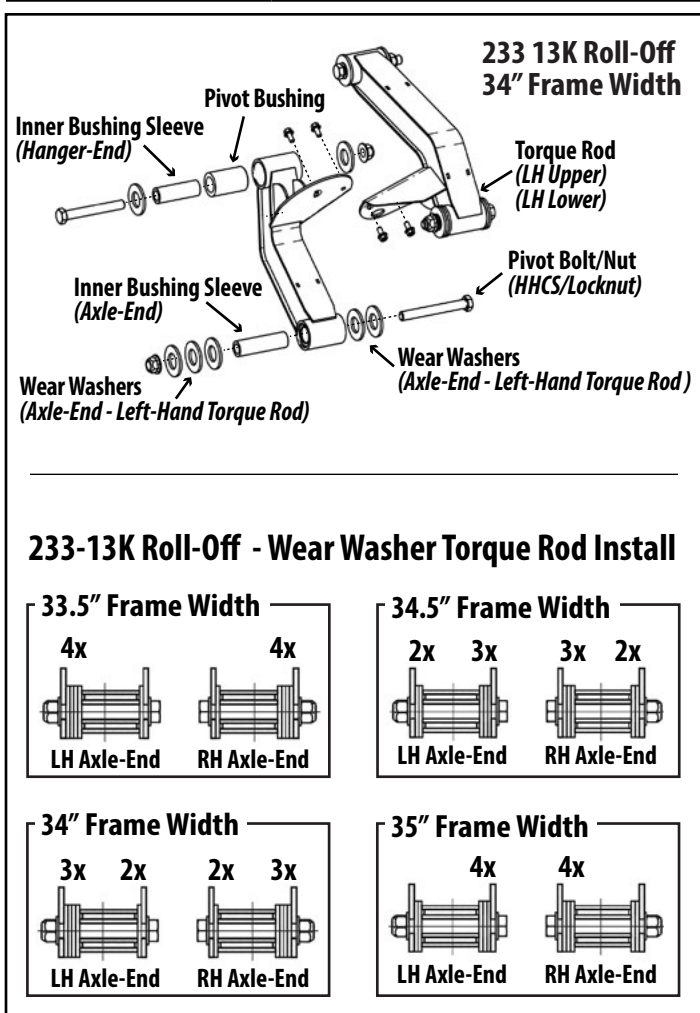


Figure 9.
Refer to the suspension model engineering drawing for the number of wear washers on the axle-end of the left-hand and right-hand torque rod. Number varies by the pre-set frame width.

Vehicle Preparation

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.

Bushing Replacement Procedure

- Count the number of wear washers on each side of the bushing on the Axle-End Torque Rod Assembly. The number of wear washers varies according to the pre-set frame width (Figure 9).
- Remove pivot hardware and discard. Inspect wear washers for wear/damage. Replace if necessary. NOTE: Pivot hardware/wear washers are included with bushing replacement kit.
- Remove bushing and discard. Clean rod eye.
- 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.
- Install new bushing into the eye of the torque rod. NOTE: Mallet /press needed to install bushing.
- Torque Rod Hanger-End (Bushing Sleeve - 4.1") Press inner sleeve into installed bushing. Center the sleeve so that both ends extend slightly past the bushing sides. Assemble pivot connection with one wear washer on each side of the bushing. Sleeve must be flush with or extend slightly past the outside of wear washers on both ends.

continued on next page

Bushing Replacement Procedure – 13K Roll-Off Suspension

7. Torque Rod Axle-End (Bushing Sleeve - 4.8")
Press inner sleeve into the installed bushing.
Position inner sleeve so that one end extends further past the bushing on appropriate side as determined by the frame width.
Assemble pivot connection with appropriate number of wear washers on either end of the inner sleeve on the axle-end of the torque rod (Figure 9).
NOTE: Inner sleeve must be flush with or slightly past the outside of installed wear washers on both sides of torque rods. Adjust sleeve if necessary.
8. Torque pivot nut to spec (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 (Page 5).

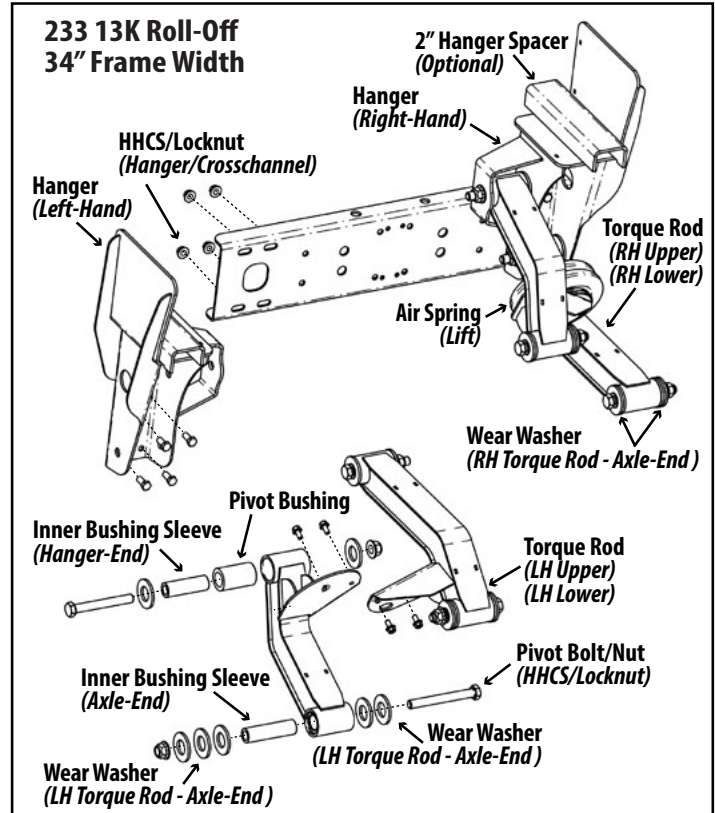


Figure 10.
13K Roll-Off Suspension bushing kit includes components to replace eight pivot connections.

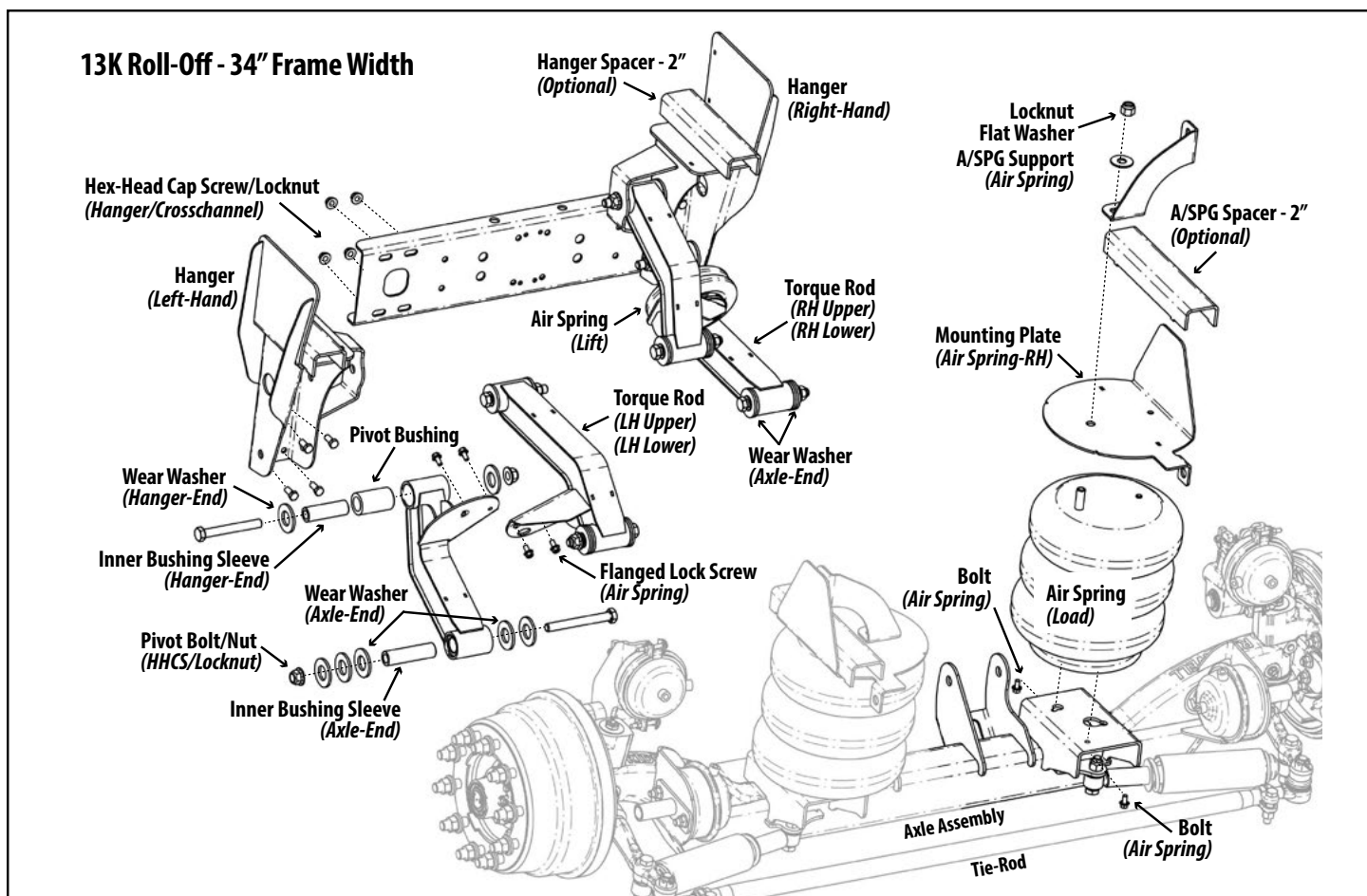


Figure 11.
RSS 233 13K Roll-Off Truck Suspension w/ drum brake axle.

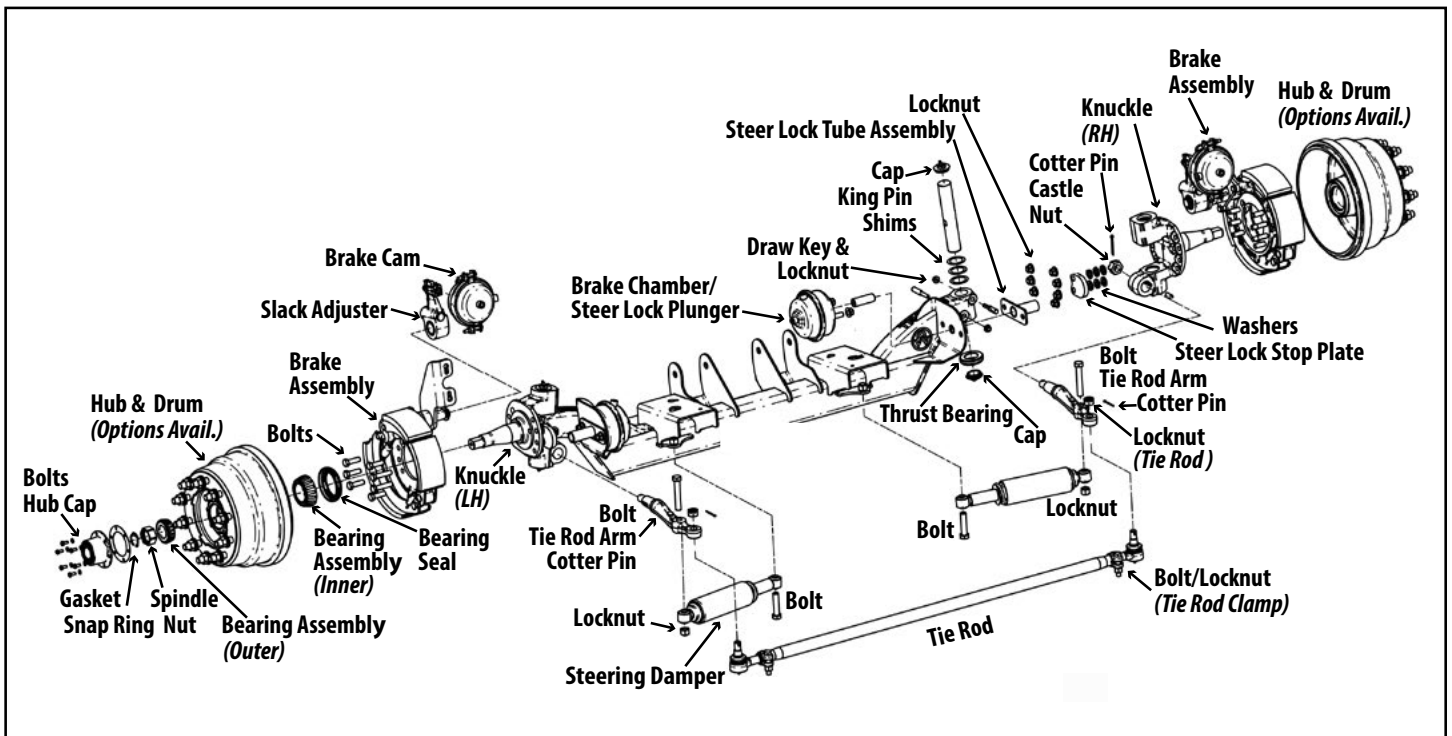


Figure 12.
233-13K Roll-Off Truck – Drum Brake Fabricated Axle Assembly w/ steering lock
 Refer to the SteerLock (S) version of the engineering drawing for the component part number.

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.