TERRAN AXLE

Setting New Expectations

OPERATING MANUAL

1 Westbrook Corporate Center, Suite 300 | Westchester, IL 60154
312.312.7767 | service@terranaxle.com | www.terranaxle.com

INTRODUCTION

This operating manual provides important information for the service and maintenance of axles and component parts manufactured by Terran Axle. This operating manual is not comprehensive but addresses the most common axle service and maintenance procedures.

Safety is our top priority. This operating manual furnishes important information for safe and proper servicing and maintenance. Given the wide range of procedures for axle service and maintenance, this operating manual is only able to address a limited number of procedures. In the event an owner or qualified technician deviates from these procedures, it is important to consider (i) safety in performing the service or maintenance, (ii) the impact of the procedure on safe and efficient axle functioning and (iii) that failure to comply with these procedures renders the Terran Axle warranties null and void. **Before road operation, it is important to confirm that the axle and component parts are operating properly.**

Be sure to review the operating manuals for your tow vehicle, trailer and key component parts before initiating service or maintenance. For your safety, please review this manual closely and if you have any questions, please contact your trailer manufacturer or visit our website at www.terranaxle.com.

From our experience in the trailer axle industry, we designed our axles and component parts to meet our customers' needs. Terran Axle bearings, spindles, brakes, drums, hubs, beams and other component parts reflect our commitment to deliver dependable and durable axles.

SAFETY INFORMATION

It is critically important that service and maintenance be performed in accordance with tow vehicle, trailer and component parts' operating manuals. Failure to follow prescribed procedures may result in serious injury or death to the persons performing the service or maintenance as well as to vehicle occupants and others from road operation. Given the numerous variations in service and maintenance procedures across the spectrum of tow vehicles and trailers, this manual does not provide comprehensive instructions for performance of service and maintenance under all conditions. If any procedures are either not fully understandable, do not address your specific question, or you lack the necessary equipment for the safe completion of the procedure, contact a qualified technician to advise on or to perform the procedure before returning the trailer to operation. If a procedure is not performed in accordance with the applicable tow vehicle, trailer or other operating manuals, the Terran Axle warranty is null and void.

CAUTION

FOLLOW ALL SAFETY PRECAUTIONS SET FORTH IN THIS MANUAL AND ALL MANUALS FOR YOUR TRAILER, TOW VEHICLE AND COMPONENT PARTS.

Please pay close attention to the caution alerts (under heading "CAUTION") and the specific instructions for safety measures and certain risks involved in each procedure. Importantly, this operating manual is instructive but not comprehensive and all risks from each service and maintenance procedure cannot be fully addressed. Failure to follow these procedures (and other safety protocols not addressed in this operating manual) could result in injury and death, lead to axle and trailer malfunction and result in dangerous road operation.

CAUTION

ALWAYS USE EYE PROTECTION (SAFETY GLASSES) WHEN UNDERTAKING ANY SERVICE, MAINTENANCE OR OTHER PROCEDURE IN THIS MANUAL. FAILURE TO DO SO MAY RESULT IN SERIOUS PHYSICAL INJURY AND PERMANENT PHYSICAL DAMAGE.

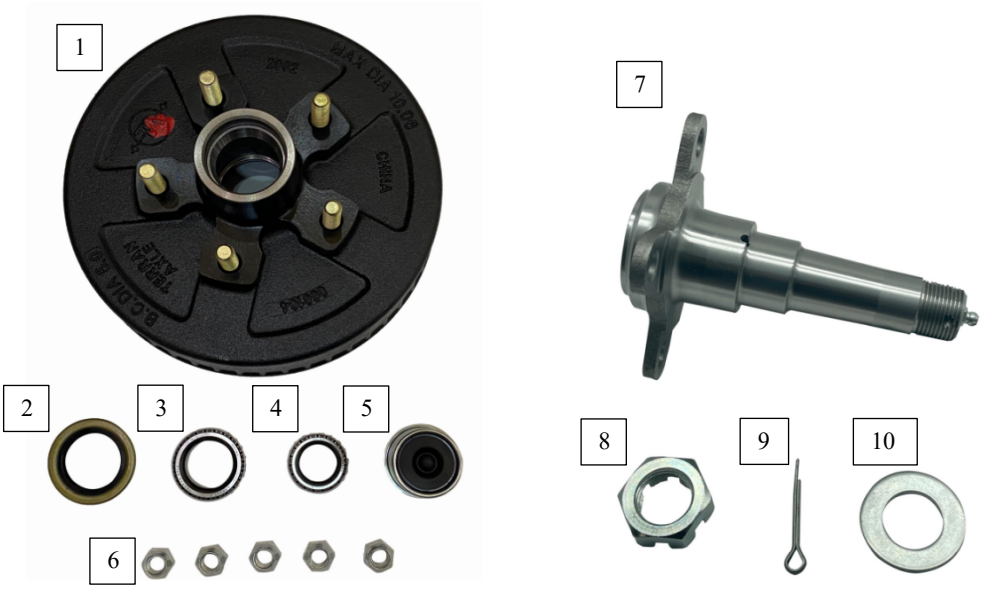
1. RECOMMENDED NEW AXLE SETTINGS AND ADJUSTMENTS

Wheels	Wheel Nut Torque Check*	At 50, 1000, 2000 and every 3000 miles thereafter
Tires	Tire Pressure	Manufacturer recommendations
Brakes	Adjustment	At 250 miles and every 3000 miles thereafter

*See torque values for wheels under section entitled “Wheels & Tires.”

2. HUBS, DRUMS AND BEARINGS

Terran Axle hub, drum and axle component part configuration follows industry standards. Each axle is assembled and inspected according to factory specifications; before use, it is good practice to check for proper rotation of the brake drum assemblies to ensure bearings are seated and pre-loaded. Each brake drum should rotate freely with very slight drag. There should be no excessive drag, play, looseness or wobbling of the drum to spindle connection.



1	Brake Drum
2	Grease Seal, Double Lip
3	Race
4	Bearing
5	Dust Cap
6	Wheel Nuts
7	EZ Lube Spindle
8	Castle Nut
9	Cotter Pin
10	Spindle Washer, Flat Round

CAUTION

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2.1 Drum Removal and Bearing Lubrication

The drum will be removed for a number of procedures in this operating manual, including bearing lubrication. The recommended procedure to remove and repack bearings follows (with reference to the corresponding photo):

1. Ensure your trailer is on a level surface and follow the manufacturer's instructions for wheel removal, including safely jacking up the trailer on jack stands designed to support your trailer type, size and weight.
2. Loosen and remove lug nuts and wheel.
3. Once the wheel is off, using a soft blow hammer, gently tap the perimeter of the grease cap until loosened to remove [photo #1].
4. Remove cotter pin by straightening the ends with pliers and prying the cotter pin from the spindle.
5. Unscrew the castle nut using the appropriately-sized wrench [photo #2].
6. Remove the spindle washer.
7. Remove the hub from the spindle (should retain the outer bearing assembly) [photo #3].
8. Remove the outer bearing. Pull out the bearing [photo #4].
9. Remove the seal and inner bearing. With either a seal puller tool or a screwdriver, carefully pry out the seal without causing damage. If necessary, try to use the inside diameter of the seal and the hub face as leverage points and gently pry up around the perimeter seal circumference [photo #5].

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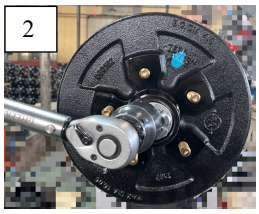
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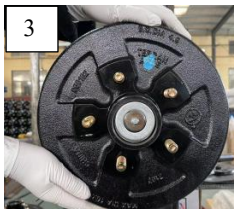
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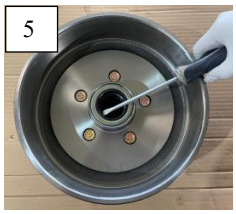
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10. Clean and remove all grease from the bearings and examine for damage or wear. Be sure to inspect the bearing race and spindle surface for wear or other damage.
11. If you do not have a bearing grease packer tool, wearing gloves put grease onto your hand and place the bearing into the grease, moving the bearing until each roller and all gaps are fully packed with grease. Repeat for each bearing [photo #6].
12. Insert the cleaned and repacked inner bearing into the hub (on the back side) [photo #7].
13. Insert your grease seal into the hub with the rubber side facing in. If you do not have a bearing/race removal tool, carefully tap the seal with a block of wood until the seal is flat against the hub surface. Grease the seal lip.
14. Return the hub to the spindle and replace parts in the same order in which the parts were removed (repacked outer bearing, washer, castle nut and cotter pin).
15. Apply a small amount of grease to the castle nut. Tighten the castle nut until it stops, check hub rotation for resistance, then line up the nut until you are able to insert the cotter pin through the spindle [photos #8, 9].
16. Reinstall the grease cap onto the wheel hub [photo #10].

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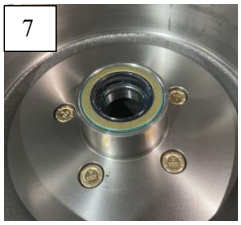
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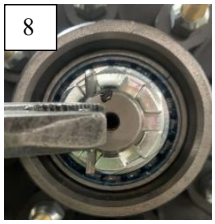
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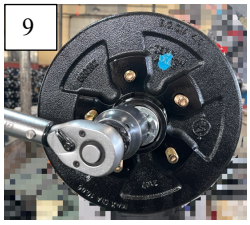
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2.2 Brake Drum Check

To check the condition of brake parts, follow the above drum removal procedure to closely examine (i) the drum surface where the brake shoes make contact to examine the level of wear and (ii) for electric brakes, the armature surface where it makes contact with the electromagnet. For the drum surface, check for scoring and wear. Follow a qualified technician's recommendations on whether a drum surface should be resurfaced or replaced. **Terran Axle does not advise on whether or not the drum surface should be resurfaced or replaced.**

The area of a drum that makes contact with the electromagnet is the armature surface. If the armature surface shows wear, consult with a qualified technician to assess refinishing. Electromagnets should be replaced when the armature surface is refinished; conversely, when electromagnets are replaced, a qualified technician should determine whether to refinish the armature surface to maintain the proper contact with the electromagnet. Instead of refinishing the armature surface, oftentimes replacement is advised by a qualified technician.

2.3 Seal Check and Replacement

With either a seal puller tool or a screwdriver, follow the above drum removal procedure to carefully pry out the seal without causing damage. If necessary, use the inside diameter of the seal and the hub face as leverage points for the screwdriver to gently pry up around the perimeter seal circumference. Examine the grease seal for wear and damage whenever the hub is removed. If worn or damaged, replace to ensure a proper seal.

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2.4 Idler Hub Removal and Inspection Procedure

1. Ensure your trailer is on a level surface and follow the manufacturer's instructions for wheel removal, including safely jacking up the trailer on jack stands designed to support your trailer type, size and weight.
2. Loosen and remove lug nuts and wheel.
3. Once the wheel is off, using a soft blow hammer, gently tap the perimeter of the grease cap until loosened to remove.
4. Remove cotter pin by straightening the ends with pliers and prying the cotter pin from the spindle.
5. Unscrew the castle nut using the appropriately-sized wrench.
6. Remove the spindle washer.
7. Remove the idler hub from the spindle (should retain the outer bearing assembly).
8. Inspect the idler hub surface for wear and any damage. If idler hub surface is worn or scored, consult with a qualified technician for idler hub repair or replacement.
9. Return the idler hub to the spindle and replace parts in the same order in which removed (repacked outer bearing, washer, castle nut and cotter pin).
10. Apply a small amount of grease to the castle nut. Gently hand tighten and click the tab into place but avoid over-tightening. If using a cotter pin, tighten the castle nut until it stops, check idler hub rotation for resistance, then line up the nut until you are able to insert the cotter pin through the spindle.
11. Reinstall the grease cap onto the wheel hub.

2.5 Spindle Nut Torqueing Procedure

1. Remove the dust cap using rubber mallet.
2. Carefully remove the cotter pin with pliers without causing damage.
3. Loosen the spindle nut with torque wrench using a size 38 socket.
4. Tighten the spindle nut with torque wrench set at 61.5lb.ft for 3500 lb. capacity axle, or 88.5lb.ft for 6000-7000 lb. capacity axle, until you hear two clicks.

Note: The higher torque removes any tension and overload on the bearing/cup/cone.

5. Rotate the hub/drum 90°.

Note: This applies even force inside the bearing.

6. Loosen the spindle nut approximately 90-120°.
7. Tighten the spindle nut with torque wrench set at 43.4lb.ft for 3500 lb capacity axle, or 73.76lb.ft for 6000-7000 lb. axle capacity, until you hear two clicks.

Note: This is the normal torque for bearing load which leaves no space between the cup and cone.

8. Reverse the spindle nut 90°, not exceeding 120°, to align the cotter pin hole.

Note: This range leaves proper space between the cup and cone for grease.

9. Insert the cotter pin with pliers.
10. Apply more grease if needed, using Mobil XHP 222 grease.
11. Install the dust cap with rubber mallet.
12. Give the hub/drum a final spin to ensure smooth rotation.

2.6 EZ Lubrication

CAUTION

DUE TO POSSIBLE DANGEROUS CHEMICAL REACTIONS, DO NOT MIX GREASES, ESPECIALLY THOSE CONTAINING LITHIUM, CALCIUM, SODIUM OR BARIUM. WHEN USING NEW GREASE, COMPLETELY REMOVE ALL EXISTING GREASE PRIOR TO APPLYING NEW GREASE. FAILURE TO REMOVE OLD GREASE BEFORE APPLYING NEW GREASE COULD RESULT IN COMPONENT FAILURE AND DAMAGE RESULTING IN MECHANICAL INOPERABILITY OR FAILURE.

The following procedure is recommended for utilizing the E-Z lubrication feature:

1. Ensure your trailer is on a level surface and follow the manufacturer's instructions for wheel removal, including safely jacking up the trailer on jack stands designed to support your trailer type, size and weight.
2. Remove the rubber plug from the end of the grease cap.
3. Insert a grease gun nozzle onto the grease fitting at the end of the spindle.
4. While slowly rotating the idler hub or drum, pump grease slowly into the fitting and when new grease is seen protruding from the front of the spindle, remove the grease gun and clean excess grease.
5. Return the rubber plug to the end of the grease cap.

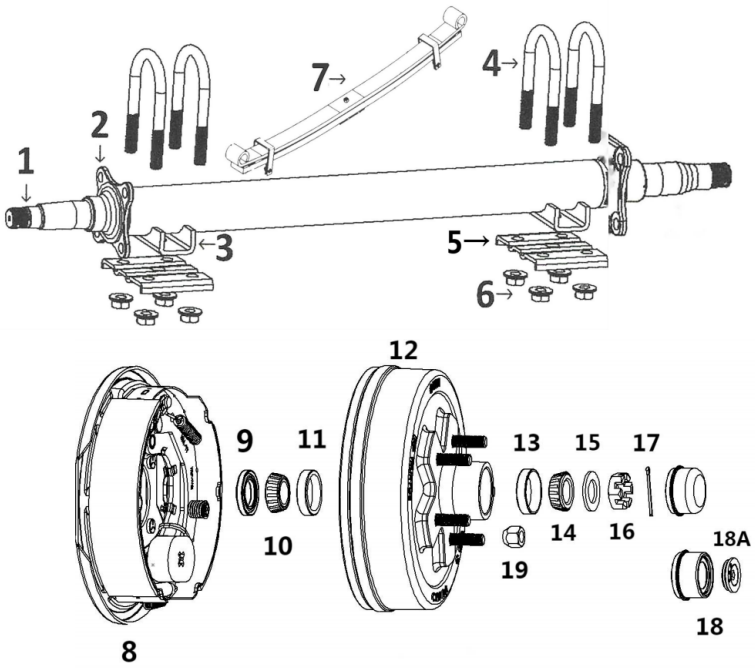
3. AXLE & SUSPENSION SYSTEM

Axle suspensions are designed to absorb shock from the road, maintain trailer balance while in motion, improve ride evenness and alleviate wear on and damage to your trailer frame, wheels and tires.

Alignment. Ensure proper alignment by checking axle alignment on both sides. The axle must be parallel to the drive axle of the tow vehicle. To measure alignment, use a tape measure or other device from the center of the front king pin pivot mount to the center line of each axle end. There should be no more than 1/16" difference between each side measurement. If this measurement exceeds this 1/16" then other underlying issues are present with your frame or mounting points. These issues need to be addressed and repaired before proceeding.

Inspection. Inspect all axle components at least every 5,000 miles for signs of wear, elongation of bolt holes and loosening of fasteners. Any replaced fasteners should be torqued pursuant to the specifications in the torque value chart below.

Configuration of Axle Components.

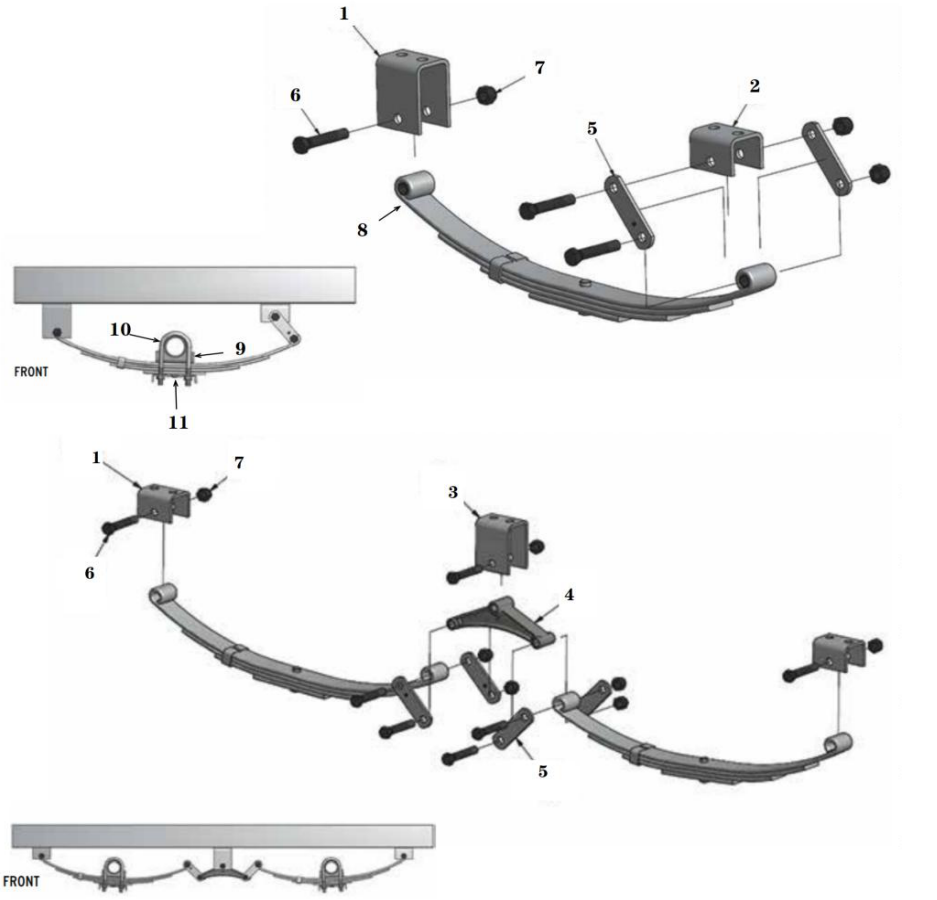


1	Integrated Flange Spindle	11	Inner Bearing, Cup
2	Brake Flange	12	Brake Drum
3	Spring Seat	13	Outer Bearing, Cup
4	U-Bolt	14	Outer Bearing, Cone
5	Tie Plate	15	Spindle Washer, Flat Round
6	Nut Flange	16	Spindle Nut
7	Leaf Spring, Double-Eye	17	Cotter Pin
8	Brake Assembly	18	Dust Cap
9	Grease Seal, Double Lip	18A	Rubber Plug for Dust Cap Hole
10	Inner Bearing, Cone	19	Wheel Nut, Cone

Axle Examination Prior to Installation. Proper axle installation and alignment is the responsibility of the axle installer. Prior to installation, inspect your trailer frame and mounting components for durability and soundness. Never attempt to mount your new axle assembly to broken, cracking or rusted mounting points. This could result in mounting point failures during installation and on the road lead to potential injury or death. Repair or replace all damaged or aging mounting components prior to installation. Use new and appropriately-sized mounting fasteners. Rusted and fatigued bolts and nuts lose strength after repeated usage from wear and tear. Also, closely examine the condition of any existing nylon bushings on equalizers and leaf spring ends.

3.1 Installation of Axle with Double Eye Leaf Springs

Double Eye Leaf Springs. Double eye leaf springs have a bolt hole at the end of each spring. Each leaf curls at the end and attaches to the suspension bolts at each end of the spring. Double eye leaf spring suspensions are comprised of the following component parts: hangers, leaf springs, shackle straps, bushings, suspension bolts, U-Bolts, U-bolt plates and spring seats. Equalizers and matching mounting brackets may also be used for tandem axle installations.



1	Front Hanger	7	Hex Lock
2	Rear Hanger	8	Leaf Spring
3	Center Hanger	9	Spring Seat
4	Equalizer	10	U-Bolt
5	Shackle Strap	11	U -Bolt Plate
6	Shackle Bolt		

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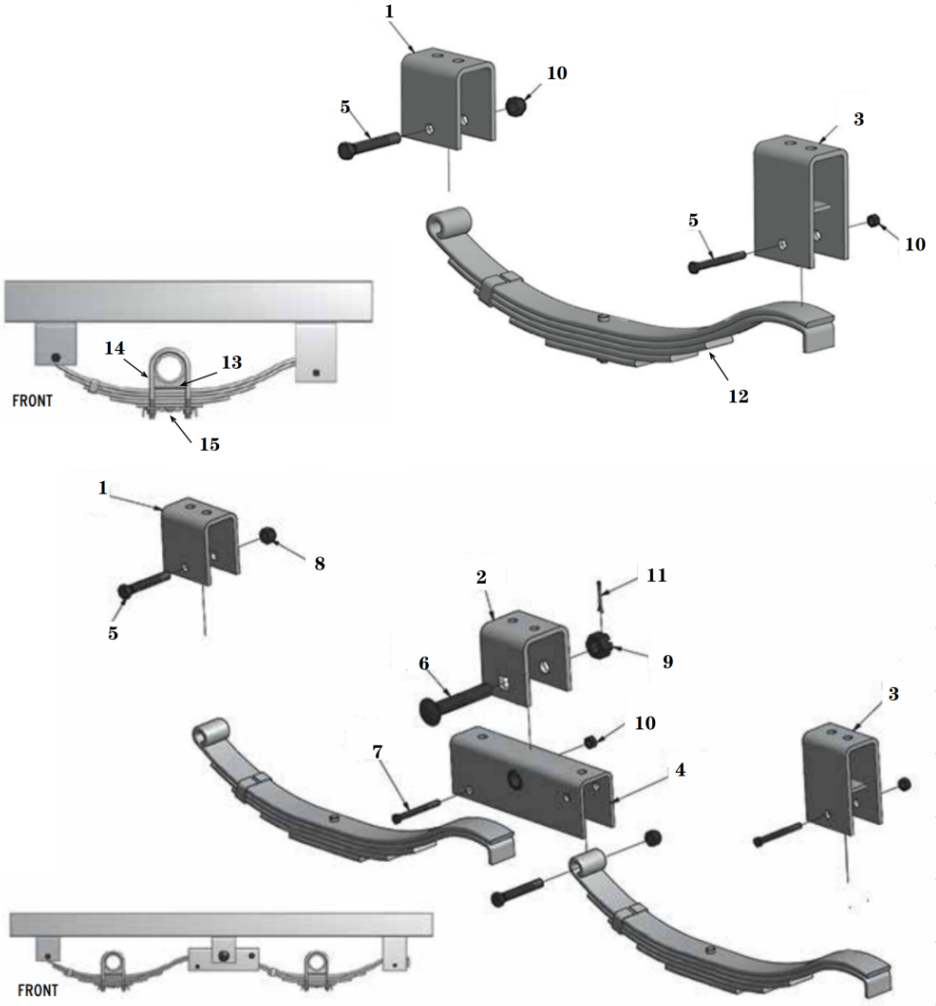
The following procedure details the installation of the axle with double eye leaf springs:

1. Ensure your trailer is on a level surface and follow the manufacturer's instructions for safely raising the trailer on jack stands designed to support your trailer type, size and weight.
2. If replacing existing axles, remove the prior axle assembly in accordance with best practices and appropriate safety measures.
3. Thoroughly inspect the new axle and components and carefully position your axle under the frame.
4. Position the axle assembly with the manufacturer label facing the rear of the frame. This will orientate the mounted brakes to the correct rotational position.
5. Align spring eyes to front hanger or shackle straps. Insert the bolt from the inside of the frame and insert the bolt through the bracket and leaf spring eye end. Loosely install the nut on the outside of the bracket.
6. Align other spring eye to rear hanger or equalizer, as applicable. Insert the bolt from the inside of the frame and insert the bolt through the bracket and leaf spring eye end. Loosely install the nut on the outside of the bracket.
7. Level the equalizer (if using) to the frame.
8. Tighten the mounting bolt using a wrench to hold the head and another wrench to turn the nut. Using a hammer, carefully strike the head side of the mounting bolt until it is fully flush with the bracket face. This is required as the mounting bolt has splines around the head shank diameter to seat the mounting bolt securely into the bracket. Set the torque limit of the torque wrench to the proper pound-foot level. Fully tighten the mounting nut using the torque wrench and proper fitting socket. Continue to tighten until reaching the torque value. Repeat this procedure for the rear leaf spring and the other side of the axle.
9. Ensure that other ancillary frame pivot mounts are properly secured.
10. Connect either hydraulic brake lines for hydraulic brakes or electrical brake wires for electric brakes.

Bolt Type & Size	**Axle Weight Capacity**	**Torque**
3/8" U-Bolt Nuts	2000 lb	25 ft per lb
1/2" U-Bolt Nuts	3500 lb	40 ft per lb
9/16" U-Bolt Nuts	6000 to 8000 lb	60 ft per lb
Shackle, Spring and Equalizer Nuts	Double Eye Style	20 to 40 ft per lb
Shackle, Spring and Equalizer Nuts	Slipper Style	Snug Nut Only

3.2 Installation of Axle with Slipper Leaf Springs

Slipper Leaf Springs. Slipper leaf springs have a bolt hole on one end and the other slipper end slides into the appropriate hanger or equalizer attached to the trailer frame. Slipper leaf springs suspensions are comprised of the following primary component parts: hangers, leaf springs, bushings, suspension bolts, U-Bolts, U-bolt plates and spring seats. Equalizers and matching mounting brackets may also be used for tandem axle applications.



1	Front Hanger	9	Castle Nut
2	Center Hanger	10	Hex Lock Nut
3	Rear Hanger	11	Cotter Pin
4	Equalizer	12	Leaf Spring
5	Shackle Bolt	13	Spring Seat
6	Equalizer Bolt	14	U-Bolt
7	Spring Keeper Bolt	15	U-Bolt Plate
8	Hex Lock Nut		

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The following procedure is recommended for the installation of an axle with slipper leaf springs:

1. Ensure your trailer is on a level surface and follow the manufacturer's instructions for safely raising the trailer on jack stands designed to support your trailer type, size and weight.
2. If replacing existing axles, remove the prior axle assembly in accordance with best practices and appropriate safety measures.
3. Thoroughly inspect the new axle and components and carefully position your axle under the frame.
4. Position the axle assembly with the manufacturer label facing the rear of the frame. This will orientate the mounted brakes to the correct rotational position.
5. Align the slipper side of the leaf spring and insert into the hanger or equalizer, as applicable.
6. Align the spring eye end of the leaf spring to the other hanger, equalizer or shackle straps, as applicable.
7. Insert the bolt from the inside of the frame and insert the bolt through the bracket and leaf spring eye end. Install the nut on the outside of the bracket. Tighten the mounting bolt using a wrench to hold the head and another wrench to turn the nut. Using a hammer, carefully strike the head side of the mounting bolt until it is fully flush with the bracket face. This is required as the mounting bolt has splines around the head shank diameter to seat the mounting bolt securely into the bracket. Set the torque limit of the torque wrench to the proper pound-foot level. Fully tighten the mounting nut using the torque wrench and proper fitting socket.
8. Do not over-tighten. Repeat this procedure for the other side of the axle.
9. Ensure that other ancillary frame pivot mounts are properly secured.
10. Connect either hydraulic brake lines for hydraulic brakes or electrical brake wires for electric brakes.

3.3 Bushing Replacement Procedure

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Bushing Replacement. Our axles utilize nylon bushings for spring eye axle ends and equalizer pivots. The frequency of bushing replacement depends upon on your mileage and type of usage. This procedure applies to spring eye axle ends and equalizer bushing replacement.

1. Ensure your trailer is on a level surface and follow the manufacturer's instructions for wheel removal, including safely jacking up the trailer on jack stands designed to support your trailer type, size and weight.
2. Loosen and remove lug nuts and wheel.
3. Loosen nut on spring through bolt. Do not remove.
4. Place a secondary jack under the axle U-bolt spring plate. Slowly raise the axle enough to relieve spring pressure on the mounting hanger/shackle straps/equalizer.
5. Tap out the mounting bolt by striking the nut to dislodge the serrated bolt head from its mounting.
6. Remove mounting bolt and nut. The spring should now be free from the mounting point.
7. Remove spring eye bushing. In most cases the bushing will simply fall out. If not, then use an appropriately sized socket to tap the bushing out.
8. Inspect the inside diameter of the spring eye and clean and remove any debris or dirt.
9. Install new bushing into the spring eye. If necessary, tap the bushing in using a wood block or the appropriate mounting bolt to seat the bushing into the spring eye.
10. Reinstall the spring to its original mounting position to the mounting hanger/shackle straps/equalizer.
11. Inspect mounting bolt and nut for any fatigue or rust. Replace with new if required.
12. Install the mounting bolt and nut. Tighten the bolt using a wrench to hold the head and another wrench to turn the nut. Using a hammer, carefully strike the head side of the mounting bolt until it is fully flush with the bracket face. This is required because the mounting bolt has splines around the head shank diameter to seat the mounting bolt securely into the bracket. Set the torque limit of the torque wrench to the proper pound-foot level. Fully tighten the mounting nut using the torque wrench and proper fitting socket. Continue to tighten until reaching the torque value.
13. Ensure that other ancillary frame pivot mounts are properly secured.
14. Remove axle jack, reinstall wheel, tighten lug nuts to specified torque values and carefully lower trailer.

3.4 Installation of AP Kit

CAUTION

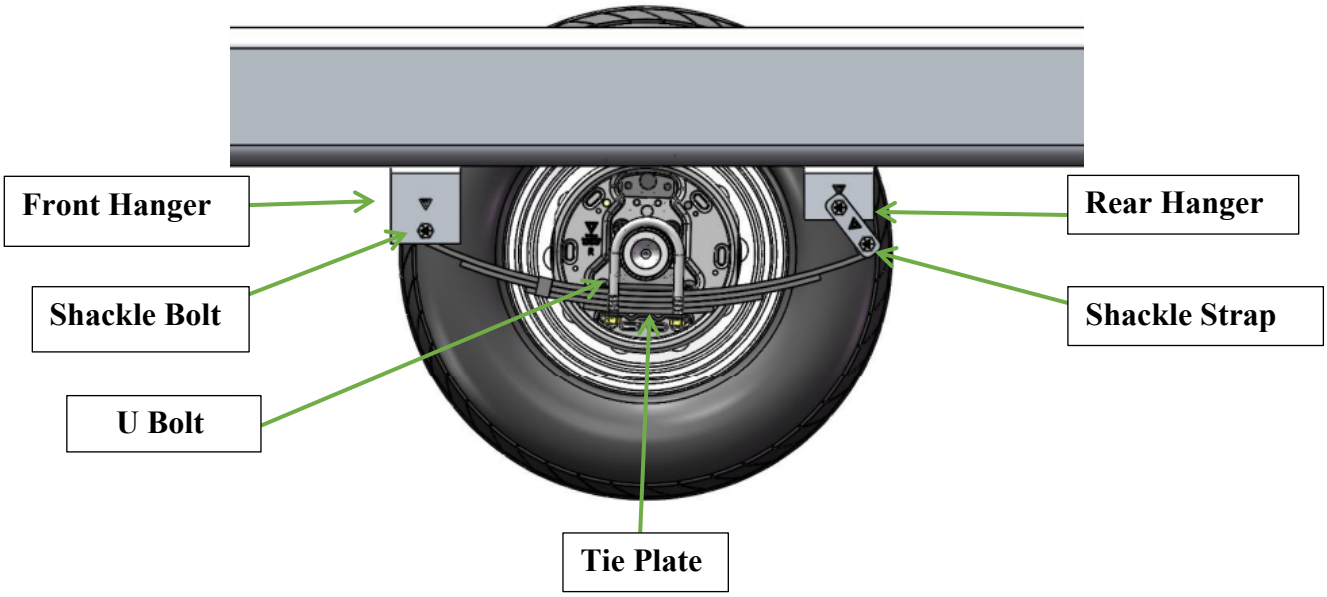
RAISE TRAILER ONLY USING JACK STANDS ATTACHED TO FRAME AND APPROVED FOR THE LOAD. NEVER ATTACH JACK STANDS TO THE AXLE OR SUSPENSION. NEVER GO UNDER THE TRAILER UNLESS THE TRAILER IS SECURELY SUPPORTED BY JACK STANDS APPROVED FOR THE LOAD. FAILURE TO SECURELY SUPPORT THE TRAILER CAN CAUSE SERIOUS INJURY OR DEATH.

The following procedure details the installation of a single axle with double eye leaf springs:

1. Ensure your trailer is on a level surface and follow the manufacturer's instructions for safely raising the trailer on jack stands designed to support your trailer type, size and weight.
2. If replacing existing axles, remove the prior axle assembly in accordance with best practices and appropriate safety measures.
3. Thoroughly inspect the axle components and carefully position your axle under the frame.

4. Position the axle assembly with the manufacturer label facing the rear of the frame. This will orientate the mounted brakes in the correct rotational position.
5. Insert the required number of shackle bolts into the shackle straps. Make sure the head side of the bolts is fully flush with the shackle strap surface.
6. Align spring eyes to the front hanger. Insert the bolt from the inside of the frame then insert the bolt through the bracket and leaf spring eye end. Loosely install the lock nut on the outside of the bracket.
7. Align other spring eye to rear hanger. Insert the shackle bolt from the inside of the frame then insert the shackle bolt through the bracket and leaf spring eye end. Place the shackle strap to the other end of the shackle bolt. Loosely install the lock nut on the outside of the strap.
8. Using a rubber mallet, carefully strike the head side of the shackle bolt inserted into the front hanger until it is fully flush with the bracket face. This is required as the shackle bolt has splines around the head shank diameter to seat the shackle bolt securely into the bracket. Tighten the shackle bolt using a wrench to hold the head and another wrench to turn the lock nut, snug fit only (with at least 2-3 threads out). Repeat this procedure for the other side of the axle.
9. Connect either hydraulic brake lines for hydraulic brakes or electrical brake wires for electric brakes.

Double Eye Spring for Single Axle



CAUTION

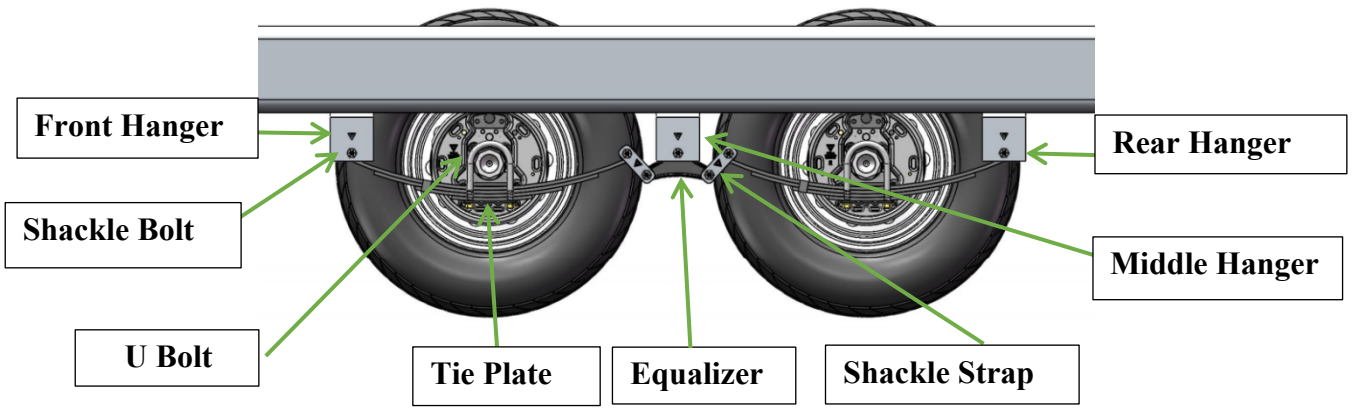
RAISE TRAILER ONLY USING JACK STANDS ATTACHED TO FRAME AND APPROVED FOR THE LOAD. NEVER ATTACH JACK STANDS TO THE AXLE OR SUSPENSION. NEVER GO UNDER THE TRAILER UNLESS THE TRAILER IS SECURELY SUPPORTED BY JACK STANDS APPROVED FOR THE LOAD. FAILURE TO SECURELY SUPPORT THE TRAILER CAN CAUSE SERIOUS INJURY OR DEATH.

The following procedure details the installation of the double axles with double eye leaf springs:

1. Ensure your trailer is on a level surface and follow the manufacturer's instructions for safely raising the trailer on jack stands designed to support your trailer type, size and weight.
2. If replacing existing axles, remove the prior axle assembly in accordance with best practices and appropriate safety measures.
3. Thoroughly inspect the axle components and carefully position your axle under the frame.

4. Position the axle assembly with the manufacturer label facing the rear of the frame. This will orientate the mounted brakes in the correct rotational position.
5. Insert the required number of shackle bolts to the shackle straps. Make sure the head side of the bolts is fully flush with the shackle strap surface.
6. Align spring eyes to the front hanger. Insert the bolt from the inside of the frame and insert the bolt through the bracket and leaf spring eye end. Loosely install the lock nut on the outside of the bracket.
7. Align the equalizer to middle hanger; insert the shackle bolt through the bracket and the center hole of the equalizer. Loosely install the lock nut on the outside of the bracket.
8. Insert the shackle bolt into the other spring eye of the front axle and the equalizer. Place the shackle strap to the other end of the shackle bolt. Loosely install the lock nut on the outside of the strap.
9. Align the spring eye of the rear axle to the rear hanger. Insert the shackle bolt from the inside of the frame and insert the bolt through the bracket and leaf spring eye end. Loosely install the lock nut on the outside of the bracket.
10. Insert the shackle bolt into the equalizer and the other spring eye of the rear axle. Place the shackle strap to the other end of the shackle bolt. Loosely install the lock nut on the outside of the strap.
11. Using a rubber mallet, carefully strike the head side of the shackle bolt inserted into the front, middle and rear hangers until they are fully flush with the bracket face. This is required as the shackle bolt have splines around the head shank diameter to seat the shackle bolt securely into the brackets. Tighten the shackle bolt using a wrench to hold the head and another wrench to turn the lock nut, snug fit only (with at least 2-3 threads out). Repeat this procedure for the other side of the axle.
12. Connect either hydraulic brake lines for hydraulic brakes or electrical brake wires for electric brakes.

Double Eye Springs for Double Axle



Suspension Fastener Torque Values

Bolt Type & Size	Axle Weight Capacity	Torque
3/8”U-Bolt Nuts	2000 lb	26 ft-lbs
1/2”U-Bolt Nuts	3500 lb	45 ft-lbs
9/16”U-Bolt Nuts	6000 to 8000 lb	60 ft-lbs
Shackle, Spring and Equalizer Nuts	Double Eye Style	30-50 ft-lbs
Shackle, Spring and Equalizer Nuts	Slipper Style	Snug Nut Only

4. BRAKES

Trailer and tow vehicle brakes are designed to operate in coordination. In actual operation, accurately synchronized trailer brakes apply braking power slightly before the towing vehicle brakes. This allows for smooth braking. Never use trailer or towing vehicle brakes separately to slow the vehicle and trailer.

4.1 Service and Maintenance

Brakes on your trailer should be adjusted 250 miles after seating and then at least every 3000 miles thereafter. For each adjustment, refer to the lug nut torque requirements, brake adjustment recommendations, tire pressure settings and brake controller specifications from each manufacturer.

4.2 Cleaning and Examination

WARNING – ASBESTOS
Potential Asbestos Dust Hazard in Older Brake Linings
Follow Recommended Asbestos Safety Precautions in Servicing Older Brakes

As a general rule, brakes should be serviced after one year of operation to maintain optimal performance and immediately upon any failure or signs of less than optimal performance. In the event of heavy usage, brakes should be serviced more frequently. During brake servicing, the qualified technician should check for any loose or worn parts and replace parts (such as the electromagnets and brake shoes) with excessive or uneven wear or damage. Brake shoes, electromagnets, magnet arms and backing plates should be cleaned during servicing. Brake shoes that are damaged or have visible signs of grease should be replaced. Importantly, all brake shoes on an axle should be replaced at the same time and then re-seated according to the procedure set forth below.

4.3 Seating Brakes

CAUTION

WHEN CONDUCTING ROAD TESTS FOR SEATING OR ANY OTHER PURPOSE, SELECT A ROAD WITH NO TRAFFIC, EITHER PEDESTRIAN OR VEHICULAR. MISAPPLICATION OR FAILURE OF BRAKES PRIOR TO SEATING OR PROPER ADJUSTMENT COULD RESULT IN SERIOUS INJURY, DEATH AND PROPERTY DAMAGE.

Before any brake adjustments, the operator should initiate a process called burnishing or seating, which varies slightly between brake manufacturers. This process enables the brakes shoes and electromagnets to begin seating in the brake drum.

This seating procedure should be performed on a road with no traffic. To achieve seating, we advise making 30 slow stops from 30 m.p.h. with a 30 second or so cool down. This procedure will need to be performed each time you replace key brake parts.

4.4 Procedure for Brake Adjustments

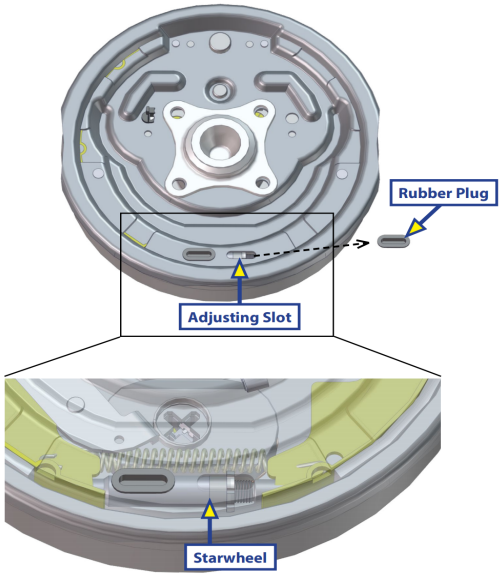
CAUTION

RAISE TRAILER ONLY WITH A SUITABLE FLOOR JACK AND JACK STANDS WHICH ARE APPROVED FOR THE LOAD. ATTACH JACK STANDS TO FRAME AND NEVER ATTACH JACK STANDS TO THE AXLE OR SUSPENSION. NEVER GO UNDER THE TRAILER UNLESSTRAILER IS SECURELY SUPPORTED BY JACK STANDS APPROVED FOR THE LOAD. FAILURE TO SECURELY SUPPORT THE TRAILER MAY CAUSE SERIOUS INJURY OR DEATH.

The following procedure is for adjustment of brakes without a self-adjustment mechanism.

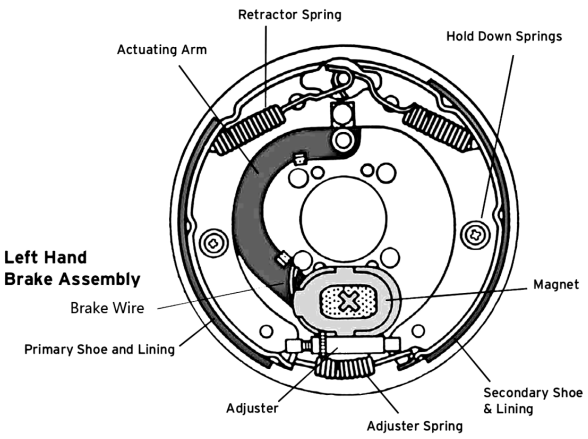
1. Ensure your trailer is on a level surface and follow the trailer manufacturer's instructions for safely raising the trailer on jack stands designed to support your trailer type, size and weight.
2. Jack up the trailer until the wheel is clear of the ground and rotates freely.

3. Remove the cover from the adjusting hole on the backing plate.
4. Utilize a brake adjusting tool to turn the starwheel of the adjuster to expand the brake shoes until the wheel is difficult to turn. If the axle has a drop spindle, a special tool may be needed to complete the adjustment.
5. Then use the brake adjusting tool to turn the starwheel in the opposite direction until the wheel turns with a slight drag.
6. Return the cover to the adjusting hole on the backing plate.
7. Use the jack to return the wheel carefully to the ground.
8. Utilize this procedure for the other wheels and ensure all brakes are adjusted at the same time to a consistent slight drag on each wheel.



4.5 Electric Brakes

Electric brakes are powered by electrical current that activates an electromagnet in each brake. When activated by the driver pressing the brake pedal, the brake controller sends an electrical current to the electromagnets in the trailer brakes causing the actuating levers to move the brakes shoes against the rotating brake drums, thereby slowing wheel rotation. Increasing electrical current to the electromagnets (from more force on the brake pedal) will elevate the force of the brake shoes on the rotating brake drums and result in greater deceleration. For more information on the brake controller and brake operation, please refer to information provided by your trailer, tow vehicle and controller manufacturers.



CAUTION

WHEN CONDUCTING ROAD TESTS FOR SEATING OR ANY OTHER PURPOSE, SELECT A ROAD WITH NO TRAFFIC, EITHER PEDESTRIAN OR VEHICULAR. MISAPPLICATION OR FAILURE OF BRAKES PRIOR TO SEATING OR PROPER ADJUSTMENT COULD RESULT IN SERIOUS INJURY, DEATH AND PROPERTY DAMAGE.

4.5.1 Brake Controller and Synchronization

Review your brake controller manual for instructions to synchronize trailer and tow vehicle brakes. Your controller must be installed and set in accordance with the manufacturer's specifications for proper brakes operation. Lack of synchronization is a cause of uneven braking. Accurate synchronization is achieved by setting the controller to the manufacturer's specifications and, if necessary, by making slight adjustments from the initial road testing.

4.5.2 Electromagnet Servicing

Electromagnets should be serviced at least once per year for normal use. The surface of the magnet must be completely flat for proper operation. Replace the electromagnet if there is uneven wear on the electromagnet surface or exposure of the electromagnet coil. Qualified technicians recommend replacement or refinishing of armature surfaces whenever the electromagnet is replaced as well as replacement of the electromagnet on the other side of the brake. **Terran Axle does not advise on whether or not an armature surface should be resurfaced or replaced.**

4.5.3 Lubrication

CAUTION

WHEN LUBRICATING BRAKE PARTS, BE SURE TO AVOID ANY GREASE OR OIL CONTACTING OR BEING APPLIED TO, EITHER ACCIDENTALLY OR INTENTIONALLY, TO BRAKE LININGS, BRAKE DRUMS OR THE ELECTROMAGNETS. FAILURE TO DO SO COULD RESULT IN BRAKE MALFUNCTION AND RESULT IN SERIOUS INJURY OR DEATH.

Before reassembling the brake drum, apply a light layer of approved brake grease or anti-seize compound to the brake anchor pin, actuating arm bushing and pin, actuating block and areas on the backing plate that are in contact with the brake shoes and electromagnet lever arm. **Do not lubricate brake linings, drums or electromagnets.**

4.5.4 Voltage Measurements

To identify electrical problems or to obtain electrical system readings, test the brake for voltage and amperage utilizing the proper testing equipment and procedure. Be sure to adhere to instructions in voltmeter and ammeter manuals.

To check system voltage, connect the voltmeter to the two wire leads to a brake. Follow the voltmeter instructions for attaching the voltmeter to the wires. Be sure that the engine is running when measuring voltage. When the controller is not activated, voltage should be zero and as activated rise to no more than 12 volts. If the voltmeter does not produce these readings, check your brake controller manual for information on voltage control troubleshooting. Note that high voltage readings may result in severe or uneven braking.

Amperage is checked using an ammeter with sufficient capacity. At the brake controller, first disconnect the (blue) wire running to the brakes and then connect the ammeter in series into the line. The engine should be running when checking the amperage. The following amperage chart sets forth acceptable ampere readings for brake systems.

Brake Size	Amps/Magnet	Two Brakes	Four Brakes	Six Brakes
10″×2 1/4″	3.0	6.0	12.0	18.0
12″×2″	3.0	6.0	12.0	18.0
12 1/4″×3 3/8″	3.0	6.0	12.0	18.0

If the brake system has a resistor, either set the resistor at zero or bypass before testing amperage in order to receive an accurate amperage reading. To check amperage for individual brakes, insert the ammeter at the magnet by disconnecting the magnet lead wires and attaching the ammeter between the two wires. Reconnect the wires after testing.

4.5.5 Troubleshooting Electric Brakes

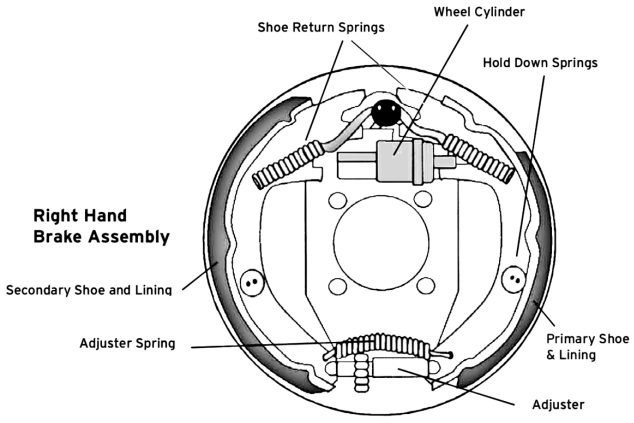
Troubleshooting Chart

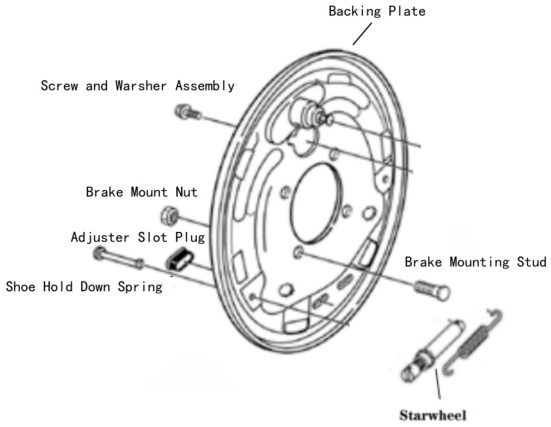
PROBLEM	POSSIBLE CAUSE	REMENDY
No brakes	Open circuits	Find and correct
	Short circuits	Test and correct
	Severe under-adjustment	Adjust brakes
Weak brakes	Grease or oil on magnets or linings	Clean or replace
	Corroded connections	Clean and correct cause of corrosion
	Worn linings or magnets	Replace
	Scored or grooved brake drums	Machine or replace
	Improper synchronization	Correct
	Under-adjustment	Adjust brakes
	Glazed Linings	Re-burnish or replace
Locking brakes	Under-adjustment	Adjust
	Improper synchronization	Correct
	Loose, bent or broken brake components	Test and correct
	Out-of-round brake drums	Machine or replace
	Insufficient wheel load	Adjust system resistor and synchronize
Intermittent brakes	Broken wires	Test and correct
	Loose connections	Repair or replace
	Faulty ground	Find and repair
Brakes pull to one side	Wrong magnet lead wire color	Adjust
	Incorrect adjustment	Correct
	Grease or oil on linings or magnets	Clean or replace
	Broken wires	Find and repair
	Bad connections	Find and repair
Harsh brakes	Under-adjustment	Adjust
	Improper synchronization	Correct
Noisy brakes	Under-adjustment	Adjust
	Lack of lubrication	Lubricate
	Broken brake components	Replace component
	Incorrect brake components	Correct
Surging brakes	Grease or oil on linings or magnets	Clean or replace
	Out-of-round or cracked brake drums	Machine or replace
Dragging brakes	Over-adjustment	Readjust
	Out-of-round brake drums	Machine or replace
	Incorrect brake components	Replace
	Loose, bent or broken brake components	Replace
	Faulty breakaway switch	Repair or replace
	Loose wheel bearing adjustment	Adjust
	Bent spindle	Replace Axle

NOTE: If all coach lights and brakes do not work, check your wiring plug connection and make sure the ball is making solid contact with the coupler (that is how a coach is grounded). Too much grease or not using dielectric grease on the ball and coupler can cause this to happen.

4.6 Hydraulic Brakes

Hydraulic brakes use the force of a slowing tow vehicle to initiate trailer deceleration. The trailer is equipped with an actuation system to activate hydraulic brakes. As the tow vehicle brakes are engaged, force is applied to a hydraulic cylinder through the release of brake fluid and creation of pressure that activates the trailer brakes by forcing the brakes shoes into the drum. The more force the driver puts on the brake pedal, the greater the pressure inside the brake lines, and the more the shoes will press against the drum resulting in increased deceleration.





4.6.1 Lubrication

Before reassembling the brake drum, apply a light layer of approved brake grease or anti-seize compound to the brake anchor pin, actuating arm bushing and pin, and areas on the backing plate that are in contact with the brake shoes. **Do not lubricate brake linings or drums.**

5. WHEELS & TIRES

5.1. Wheels Selection

When selecting wheels for your trailer, be sure to follow the proper tire and axle dimensions, load capacity and bolt layout. There are several key items to align: the drum bolt layout must match the wheel (carefully measure); the wheel

load capacity and pressure rating must be consistent with maximum tire and trailer load capacity; and the offset must be consistent with the original wheel.

5.2. Wheel Installation

CAUTION

FAILURE TO TIGHTEN LUG NUTS TO TORQUE LIMITS CAN DAMAGE STUDS AND LUG NUTS, CAUSE WHEEL LOOSENING AND IMBALANCE AND EFFECT STRUCTURAL DAMAGE TO THE WHEEL, STUDS AND LUG NUTS, AND MAY RESULT IN SERIOUS INJURY OR DEATH.

CAUTION

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1. Ensure your trailer is on a level surface and follow the manufacturer's instructions for wheel removal, including safely jacking up the trailer on jack stands designed to support your trailer type, size and weight.
2. Mount the wheel over the studs and begin to tighten the lug nuts by hand to prevent cross threading.
3. Tighten the lug nuts in the sequence to the torque values provided below.
4. Retorque the lug nuts before the first road use, after 50 miles of use and as necessary thereafter.

5.2.1. Torque Requirements

Wheel Size	Stud Size	Torque Sequence		
		1st Stage	2nd Stage	3rd Stage
14″	1/2″	20-25 ft-lbs	50-60 ft-lbs	90-120 ft-lbs
15″	1/2″	20-25 ft-lbs	50-60 ft-lbs	90-120 ft-lbs
16″	1/2″	20-25 ft-lbs	50-60 ft-lbs	90-120 ft-lbs
16.5″×6.75″	1/2″	20-25 ft-lbs	50-60 ft-lbs	90-120 ft-lbs
16″	9/16″	20-25 ft-lbs	60-70 ft-lbs	120-130 ft-lbs
16.5″×6.75″	9/16″	20-25 ft-lbs	60-70 ft-lbs	120-130 ft-lbs

5.3. Tire Selection

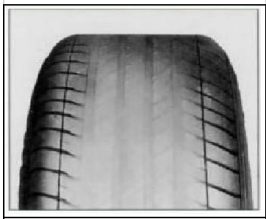
Select the tire that matches wheel rim size and contour as well as trailer load capacity. Tire specifications are detailed in the manufacturer catalog and trailer load capacity is in the trailer operating manual. Importantly, increasing tire load capacity does not increase trailer load capacity. For your trailer, you will need to look for either LT (Light Truck) or ST (Specialty Tires) tires. Tire specifications located on the sidewall include tire dimensions, load capacities and purpose.

5.4. Tire Installation and Maintenance

CAUTION

TIRES SELECTED MUST BE COMPATIBLE WITH THE SPECIFICATIONS FOR THE WHEELS AND RIMS. FAILURE TO ACCURATELY PRESSURIZE IN ACCORDANCE WITH TIRE AND WHEEL SPECIFICATIONS COULD RESULT IN TIRE AND WHEEL FAILURE AND RESULT IN SERIOUS INJURY OR DEATH.

Visually inspect tire sidewalls and treads and check the p.s.i. with a tire pressure gauge regularly (test when the tire is cold). Consult tire manufacturer manual for proper installation and maintenance.

	Over Inflation Excessive wear at the center of the thread indicates that the tire pressure is consistently too high.
	Under Inflatin This type of wear usually results from consistent under inflation or overloading.
	Feathering The most common cause of feathering is incorrect toe-in setting.
	One Side Wear There is excessive camber in the front suspension, causing the wheel lean too much to inside or outside and putting too much load on one side of the tire.
	Cupping Wheel imbalance usually shows up as bald spots between the outside edges and center of the tread.

6. LIMITED WARRANTY

   https://www.terranaxle.com/warranty

7. AXLE SPECIFICATIONS

   https://www.terranaxle.com/axles