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AXLE OPERATING MANUAL



Who We Are

- > Leader in setting new expectations***
- > Expert at pinpoint accuracy design***
- > Innovator of precision engineering***
- > Builder of premium quality products***



Table of Contents

I.	INTRODUCTION	1
II.	SAFETY	2
III.	RECOMMENDED MAINTENANCE SCHEDULE	3
IV.	HUBS, DRUMS & BEARINGS	4
	4.1 – Assembly Components	
	4.2 – Drum Removal & Bearing Lubrication Procedure	
	4.3 – Brake Drum Check	
	4.4 – Seal Check & Replacement	
	4.5 – Idler Hub Removal & Inspection Procedure	
	4.6 – Spindle Nut Torquing Procedure	
	4.7 - EZ Lubrication Procedure	
V.	AXLE & SUSPENSION SYSTEM	13
	5.1 – Axle Alignment	
	5.2 – Basic Parts of Axles	
	5.3 – Axle Examination Prior to Installation	
	5.4 – Leaf Suspension Systems	
	5.4.1 – Double Eye Springs Suspension	
	5.5 – Double Eye Springs Axle Installation Procedure	
	5.6 – Slipper Springs	
	5.7 – Slipper Springs Installation Procedure	
	5.8 – Torsion Suspension System	
	5.9 – Spring Eye Axle Ends & Bushing Replacement Installation Procedure	
	5.10 – AP Kit Installation Procedure	
	5.11 – Single Axle, Double Eye Springs	
	5.12 – Double Axle, Double Eye Springs	
	5.13– Suspension Fastener Torque Values	



VI.	Braking System	28
	6.1 – Brake Assembly	
	6.2 – Features of Electronically Actuated Brakes	
	6.2.1 – Brake Self-Adjusting Feature	
	6.3 – Proper Brake Usage	
	6.4 – Proper Brake Usage	
	6.5 – Proper Brake Installation	
	6.6– Brakes Burnishing	
	6.7 – Proper Synchronization	
	6.8 – Testing	
	6.9 – Brake Adjustment Procedure	
	6.10 – General Maintenance	
	6.10.1 – Lubrication	
	6.10.2 – Voltage Testing	
	6.10.3 – Electromagnets Testing	
	6.10.4 – Brake Shoes & Linings	
	6.10.5 – Amperage Measurements	
	6.10.6 – Cleaning	
	6.11 – Troubleshooting Electric Brakes Chart	
	6.12 – Hydraulic Brakes	
	6.12.1 – Hydraulic Brake Lubrication	
VII.	WHEEL INSTALLATION	39
	7.1 – Tire Installation Procedure	
	7.2 – Torque Requirements	
	7.3 – Tire Selection	
	7.4 – Post Installation Inspection Checklist	
VIII.	WARRANTY & TECHNICAL SPECIFICATIONS	46
	8.1 – Warranty	
	8.2 – Technical Specifications	



I. INTRODUCTION



We at **Terran Industries**, are dedicated to safety. That commitment to your safety drove development of the Terran Axle Operating Manual. The Manual provides essential information and procedures for the service and maintenance of axles and component parts provided by **Terran Industries** ("**Terran**"). This Manual includes standard preventative axle service and maintenance procedures necessary to maintain good operating condition.

In this Manual you will see intentionally placed signs to advise safety and caution in service and maintenance. Service and maintenance on Terran axles needs to be conducted in accordance with the following:



- ⇒ **Safety First** – safety must be the #1 priority from start to finish during service, maintenance and operation.
- ⇒ **Think Ahead** – before planning or performing any service or maintenance, identify, consider, and address any potential safety and/or operating risks.
- ⇒ **Know the Warranty** –service and maintenance must be performance in accordance with this Manual to maintain efficient operation and protect the Warranty.
- ⇒ **Review Manual First** – to be prepared for the operation, service or maintenance of your tow vehicle, trailer and key component parts, you must review this Manual as well as all applicable operating manuals for other trailer, tow vehicle and components.
- ⇒ **Follow Instructions** – to ensure successful service and maintenance, follow the instructions -step by step- detailed in this Manual.
- ⇒ **Do Pre-operation Checks** - before any road operation, confirm that your tow vehicle, trailer and key component parts are properly functioning in accordance with manufacturer specifications.



If you have any questions, please call Terran at **312.312.7767** or go to **www.terrان1.com**.



II. SAFETY



Terran is committed to safety as our top priority, and it must be for customers as well. Your experiences and observations may reveal safety and performance issues. This Manual provides instructions for properly performing service and maintenance on Terran products to reduce the risk of malfunction, which could lead to serious injury or even death.

Numerous factors can affect the correct service and maintenance procedures due to the wide range of tow vehicles and trailers on the market. This Manual does not provide instructions for every scenario or problem that may occur during service, maintenance, or operation. Certain service and maintenance tasks may require specialized mechanical or customized tools. If you lack the knowledge, experience, or necessary tools for safe completion of a service or maintenance procedure, contact a qualified technician to perform the procedure. If service and maintenance are not performed in accordance with this Manual, the Warranty for your axles is null and void.

Watch for words: **WARNING & CAUTION**



WARNING

Failure to properly service and maintain your axles in accordance with this Manual will void your Warranty.

CAUTION

! Always use eye (safety glasses) and ear protection 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.

! Always follow all precautions and safety procedures in this Manual and all other applicable manuals for trailers, tow vehicles and components. Do not perform service or maintenance without the required knowledge, experience and tools.



Please pay close attention to the “**WARNING**” and “**CAUTION**” signs and the specific instructions for safety measures when performing a procedure. This Manual does not cover all risks from each service or maintenance procedure. Failure to follow the instructions could lead or contribute to axle and trailer malfunctions resulting in dangerous road operation and serious injury, permanent damage, or even death.



III. RECOMMENDED MAINTENANCE SCHEDULE

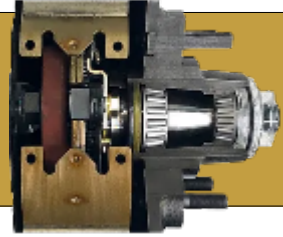


Maintenance Schedule					
	Frequency	Type of Service & Maintenance	Repair or Replace	Potential Issues	Instructions
Bearings	Initial: 6 months or 6,000 miles (the earlier of) Recurring after initial: 12 months or 12,000 miles (the earlier of)	Visual Inspection: bearings	Repair (adjustments)	- Excessive wear & tear - Irregular wear marks - Inadequate lubrication	See Section: Hubs, Drums & Bearings
Brake Operation	Before every use	Operation Test	Repair (adjustments)	Irregular response	See Section: Braking Systems - Electric
Manual Brakes	1st Check: 250 miles 2nd Check to end of brake life every 3,000 miles	Visual Inspection: brakes	Repair (adjustments)	- Irregular response - Excessive wear and tear - Lining contamination - Bad wiring connection - Leakage - Cut hoses (hydraulic brakes only)	See Section: Braking Systems – Electric Subsection: General Maintenance – Electric Brakes
Brakes Drums	12 months or 12,000 miles (the earlier of)	Visual Inspection: drums	Repair (adjustments)	- Excessive wear & tear - Irregular wear marks - Inside cracks	See Section: Braking Systems – Electric Subsection: Drum Removal & Bearing Lubrication
Brake Armature	12 months or 12,000 miles (the earlier of)	Visual Inspection & Technician Consultation	Repair (adjustments)	- Excessive wear - Irregular wear marks	Consult a service technician about potential resurfacing or replacement
Electromagnet Brakes	6 months or 6,000 miles (the earlier of)	Visual Inspection & Electric Operation Test	Replace (new part when armature surface is refinished)	- Excessive wear - Irregular wear marks	See Section: Braking Systems – Electric Subsection: Drum Removal & Bearing Lubrication
Hubs	12 months or 12,000 miles (the earlier of)	Visual Inspection: hubs	Consult a technician	- Irregular wear - Pitting - Scratches - Other unusual marks	See Section: Hubs, Drums & Bearings.
Seals	6 months or 6,000 miles (the earlier of)	Visual Inspection: seals	Replace (new part)	- Cracking - Splitting - Other damage - Grease build up - Leakage	See Section: Hubs, Drums & Bearings.
Suspension	6 months/6,000 miles	Visual Inspection: bolts, nuts, connectors, and all other hardware	Replace (new part)	Failure to properly absorb road impact	See Section: Axle & Suspension System
U-Bolts	50 miles 1,000 miles 2,000 miles 3,000 miles Followed by every 3,000 miles	Visual Inspection: U-Bolts	Repair (adjustments)	- Loose fasteners - Excessive rust	See Section: Wheels & Tires Subsection: Torque Requirements. Refer to pg. 27 for torque values
Wheel Nuts	50 miles 1,000 miles 2,000 miles 3,000 miles Followed by every 3,000 miles	Visual Inspection: wheel nuts	Repair (adjustments)	- Loose lug nuts - Stripped studs and nuts (over-tightened)	See Section: Wheels & Tires Subsection: Torque Requirements
Wheels	Every 6 months or 6,000 miles (the earlier of)	Visual Inspection & Monitor Road Operation	Repair (adjustments)	- Cracks - Dents - Deformation	See Section: Wheels & Tires Subsection: Wheel Selection
Tires Inflation Pressure	Before every use	Visual Inspection and regularly check psi with tire gauge per tire mfr requirements	Repair (adjustments)	- Bulging - Cuts - Excessive wear - Unusual wear - Cracked wheel	See Section: Wheels & Tires Subsection: Tire Selection

NOTE: The above maintenance frequency is for normal conditions only. The maintenance frequency shall be more frequent appropriately based on local climate, usage and driving conditions.



IV. HUBS, DRUMS & BEARINGS



Every Terran axle hub, drum, bearing, and component part is manufactured and assembled to Terran specifications and quality standards. Each axle is subject to inspection and quality control. In operation, customers must follow best practices including, for example, prior to initial operation checking for proper rotation of the brake drum assembly to ensure the axle bearings are seated and pre-loaded.

4.1 – Assembly Components

Bearing	
Brake Drum	
Spindle Nut	
Cotter Pin	
Dust Cap	
EZ Lube Spindle	
Grease Seal, Double Lip	
Race	
Spindle Washer, Flat Round	



4.2 – Drum Removal & Bearing Lubrication Procedure

CAUTION

USE APPROVED FLOOR JACKS & JACK STANDS ONLY.

- ! Only raise a trailer with suitable floor jacks and jack stands approved for the total load weight.
- ! Only attach jack stands to the frame, **NEVER** to the axle or suspension.
- ! Never go under a trailer unless it is securely supported by suitable floor jacks and jack stands approved for the total load weight. Failure to securely support the trailer may cause serious injury or death.



	1	Prepare the Trailer Park the trailer on a level surface in an open area without obstacles, then lower the tongue jack.
	2	Jack up the Trailer Loosen all wheel nuts and remove most of the wheel nuts first, leaving 3 loosened but not removed wheel nuts evenly distributed on the axle. Place the proper floor jack on one side of the trailer underneath the frame and jack up; place a jack stand under the frame on the opposite side; lower the floor jack until the chassis lays evenly on the jacks. Confirm that the jacks and the frame are secure and not capable of movement. CAUTION ! USE APPROVED FLOOR JACKS & JACK STANDS ONLY! Only raise a trailer with suitable floor jacks and jack stands approved for the total load weight.
	3	Remove Lug Nuts & Tire Remove remaining 3 loosened wheel lug nuts with a wrench. After all lug nuts are removed, pull off the tire. Be careful not to impact the threads on the screw when removing lug nuts and tires. Frequent impact on the screw may cause thread damage, making it difficult to reinstall the nuts.
	4	Remove Dust Cap Locate the dust cap. To release, gently tap the perimeter of the dust cap with a rubber mallet. For certain axle models, the dust cap may be connected by thread and needs to be loosened with a special wrench. A special wrench may have been furnished at sale for this purpose.
	5	Remove Cotter Pin Locate the cotter pin, carefully straighten each end of the cotter pin with pliers and pry off.
	6	Remove Spindle Nut & Washer Remove the spindle nut using a wrench with a 38 mm socket and then remove the washer.



	7	Remove Brake Drum Carefully remove drum from the spindle and leave the outer bearing cone within the drum.
	8	Remove Outer Bearing Pull off the outer bearing and place on a clean surface free from dust or debris to prevent bearing grease contamination.
 Take Note: The seal cannot be used after removal with a screwdriver.	9	Remove Seal & Inner Bearing (A) Using a seal puller or screwdriver, pry out the seal without causing damage. For leverage, use seal's inside diameter and the hub face to gently pry up around the perimeter of seal. Note: Seal cannot be reused after removal with screwdriver. (B) Examine the grease seal for any wear and damage, replace grease seal.
	10	Clean & Remove Grease 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	Grease Bearing If you do not have a bearing grease packer tool, wearing gloves deposit 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.
	12	Insert Repacked Bearing (A) Insert the cleaned and repacked inner bearing into the hub (on the back side). (B) Insert the grease seal into the hub with the rubber side facing in. If no bearing/race removal tool, carefully tap seal with a block of wood until flat against the hub surface. (C) Grease the seal lip.
	13	Reinstall Brake Drum Return the brake drum to the spindle.
	14	Reinstall Parts & Tighten Spindle Nut Replace parts in reverse order (repacked outer bearing, washer, and spindle nut). Tighten the spindle nut as specified in 4.7 - Spindle Nut Torquing Procedure.
	15	Grease Fitting While slowly rotating the brake drum, pump grease into the fitting. As soon as new grease protrudes from the front of the spindle, stop and remove the grease gun and clean off any excess grease. Recommend Mobil XHP 222 grease.



	16	Reinstall Dust Cap Use a rubber mallet to gently tap the dust cap to reinstall. For some axle models, the dust cap may be connected by thread and needs to be tightened with a special wrench. A special wrench may have been furnished at sale for this purpose.
	17	Final Spin Give the hub and drum a final spin to ensure smooth rotation.

4.3 – Brake Drum Check

Brake drums need to be checked at the frequency designated in the Maintenance Schedule. Complete this check by following the instructions in 4.2 - Drum Removal & Bearing Lubrication Procedure in this Manual. As part of 4.2, closely examine the brake drum surface for scoring and wear as well as where the brake shoe makes contact. If any unusual wear or defects are seen, ask a qualified technician whether the drum surface should be resurfaced or replaced.

ALWAYS check with a qualified technician whether a brake drum surface should be resurfaced or replaced.

Terran does not provide advice on whether a drum surface should be resurfaced or replaced

4.4 – Grease Seal Check & Replacement

To advise on this procedure, follow relevant portions of the 4.2 - Drum Removal & Bearing Lubrication Procedure in the Manual. To check the condition of the grease seal, with a seal puller tool or a screwdriver, carefully pry out the grease seal without causing damage. If necessary, use the inside diameter as leverage points. With a screwdriver gently pry up around the perimeter of the seal circumference. Examine the grease seal for wear, tear and damage whenever the hub is removed. If worn or damaged, replace the grease seal as a properly fitting seal is absolute necessary for axle operation.



4.5 – Idler Hub Removal & Inspection Procedure

CAUTION

USE APPROVED FLOOR JACKS & JACK STANDS ONLY.

- ! Only raise a trailer with suitable floor jacks and jack stands approved for the total load weight.
- ! Only attach jack stands to the frame, **NEVER** to the axle or suspension.
- ! **NEVER** go under a trailer unless it is securely supported by suitable floor jacks and jack stands approved for the total load weight. Failure to securely support the trailer may cause serious injury or death.



	1	Prepare the Trailer Park the trailer on a level surface. Lower the trailer tongue jack until it is secure and place a block beside each tire to prevent movement.
	2	Jack up the Trailer Loosen all wheel nuts and remove most of the wheel nuts first, leaving 3 loosened but not removed wheel nuts evenly distributed on the axle. Place the proper floor jack on one side of the trailer underneath the frame and jack up; place a jack stand under the frame on the opposite side; lower the floor jack until the chassis lays evenly on the jacks. Confirm that the jacks and the frame are secure and not capable of movement.
	3	Remove Lug Nuts & Tire Remove remaining 3 loosened wheel lug nuts with a lug nut wrench. After all lug nuts are removed, pull off the tire. Be careful not to impact the threads on the screw when removing nuts and tires. Frequent impact on the screw may cause damage to the threads, making it difficult to reinstall the nuts.
	4	Remove Dust Cap Locate the dust cap. To release, gently tap the perimeter of the dust cap with a rubber mallet. For some axle models, the dust cap may be connected by thread and needs to be loosened with a special wrench. A special wrench may have been furnished at sale for this purpose.
	5	Remove Cotter Pin. Locate the cotter pin, carefully straighten each end of the cotter pin with pliers and pry off.
	6	Remove Spindle Nut & Washer Remove the spindle nut using a wrench with a 38 mm socket and then remove the washer.



	7	Remove Idler Hub Carefully remove idler hub from the spindle and leave outer bearing cone within idler hub.
	8	Remove Outer Bearing Remove the outer bearing and place on clean surface to avoid contamination from dust or debris.
	9	Inspect The Idler Hub Examine the idler hub surface for wear or damage. If the idler hub surface is worn or scored, consult with a qualified technician for idler hub repair or replacement.
	10	Reinstall Idler Hub Return the idler hub to the spindle. Replace parts in reverse order (repacked outer bearing, washer and spindle nut). Tighten the spindle nut as specified in 4.7 - Spindle Nut Torquing Procedure.
	11	Grease Fitting While rotating the idler hub, slowly pump grease into the fitting. As soon as grease protrudes from the front of the spindle, remove the grease gun and clean off any excess grease. Use Mobil XHP 222 grease for better performance.
	12	Reinstall Dust Cap Use a rubber mallet to gently tap dust cap to reinstall. For some axle models, the dust cap may be connected by thread and needs to be tightened with a special wrench. A special wrench may have been furnished at sale for this purpose.
	13	Final Spin Give the idler hub a final spin to ensure smooth rotation.



4.6 – Spindle Nut Torquing Procedure

CAUTION

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- ! **NEVER** go under a trailer unless it is securely supported by suitable floor jacks and jack stands approved for the total load weight. Failure to securely support the trailer may cause serious injury or death.



	1	Remove Dust Cap Locate the dust cap. To release, gently tap the perimeter of the dust cap with a rubber mallet. For some axle models, the dust cap may be connected by thread and needs to be loosened with a special wrench. A special wrench may have been furnished at sale for this purpose.
	2	Remove Cotter Pin Locate the cotter pin, carefully straighten each end of the cotter pin with pliers and pry off.
	3	Loosen Spindle Nut Loosen the spindle nut using wrench with a 38 mm socket and take off the washer.
	4	Tighten Spindle Nut Tighten the spindle nut with a torque wrench set at 81.13 ft./lbs. Stop when you hear a click. <i>Note: This is the normal torque for bearing load which leaves no space between the cup and cone.</i>
	5	Loosen Spindle Nut Loosen the spindle nut approximately 60-90°. Make sure the spindle hole is exposed.
	6	Insert Cotter Pin Insert the cotter pin with pliers and bend the ends of the cotter pin up.
	7	Grease Apply more grease if needed (recommend Mobil XHP 222).
	8	Reinstall Dust Cap Use a rubber mallet to reinstall the dust cap. For some axle models, the dust cap may be connected by thread and needs to be tightened with a special wrench. A special wrench may have been furnished at sale for this purpose.



	9 Final Spin Give the brake hub and drum a final spin to ensure smooth rotation.
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NOTE: If you are installing a new drum, follow steps 1, 2 and 3 to remove old drum, and follow steps 4 to 7 for Spindle Nut Torquing Procedure.

4.7 - EZ Lubrication Procedure



! NEVER MIX GREASES.

Mixing greases may result in dangerous chemical reactions, especially if greases contain lithium, calcium, sodium, or barium.

! FIRST, REMOVE OLD GREASE.

Before applying new grease, completely remove existing grease. Failure to remove the existing grease could result in component failure and damage resulting in failure in operation.



USE APPROVED FLOOR JACKS & JACK STANDS ONLY.

! Only raise a trailer with suitable floor jacks and jack stands approved for the total load weight.

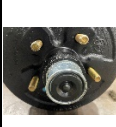
! Only attach jack stands to the frame, **NEVER** to the axle or suspension.

! **NEVER** go under a trailer unless it is securely supported by suitable floor jacks and jack stands approved for the total load weight. Failure to securely support the trailer may cause serious injury or death.



	1 Prepare the Trailer Park the trailer on a level surface. Lower the trailer tongue jack until it is secure and place a block beside each tire to prevent movement.
	2 Jack up the Trailer Loosen all wheel nuts and remove most of the wheel nuts first, leaving 3 loosened but not removed wheel nuts evenly distributed on the axle. Place the proper floor jack on one side of the trailer underneath the frame and jack up; place a jack stand under the frame on the opposite side; lower the floor jack until the chassis lays evenly on the jacks. Confirm that the jacks and the frame are secure and not capable of movement. CAUTION ! USE APPROVED FLOOR JACKS & JACK STANDS ONLY! Only raise a trailer with suitable floor jacks and jack stands approved for the total load weight.



	3	Remove Lug Nuts & Tire Remove remaining 3 loosened wheel lug nuts with a lug nut wrench. After all lug nuts are removed, pull off the tire. Be careful not to impact the threads on the screw when removing nuts and tires. Frequent impact on the screw may cause damage to the threads, making it difficult to reinstall lug nuts.
	4	Remove Dust Cap Locate the dust cap. To release, gently tap the perimeter of the dust cap with a rubber mallet. For some axle models, the dust cap may be connected by thread and needs to be loosened with a special wrench. A special wrench may have been furnished at sale for this purpose.
	5	Remove Rubber Plug Remove rubber plug from the end of the grease cap.
	6	Grease Fittings Insert a grease gun nozzle onto the grease fitting at the spindle end.
	7	Rotate & Grease While slowly rotating the brake drum, pump grease into the fitting. As soon as new grease protrudes from the front of the spindle, stop and remove the grease gun and clean off any excess grease (recommend Mobil XHP 222 grease).
	8	Return Plug Return the rubber plug to the end of the grease cap.



V. AXLE & SUSPENSION SYSTEM



Axle suspensions are designed to absorb shock from the road, maintain trailer balance and deliver a smoother riding experience. Axle suspensions alleviate wear and prevent damage to the trailer frame, wheels, and tires.

5.1 – Axle Alignment

Ensure proper alignment by inspecting both sides of the axle, measuring the distance to confirm within the standard range.

1. How To Measure

With a tape measure, determine the distance from the front king pin pivot mount center to each axle's end center line.

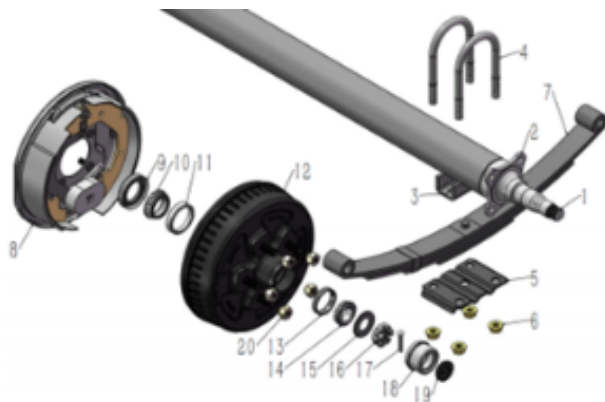
2. Standard Range

There should be no more than 1/16" difference between each side measurement. If this measurement exceeds 1/16" difference, remeasure. If the measurement exceeds 1/16" difference, there could with issues with the frame or mounting points. These must be addressed and repaired before use.

5.2 – Basic Parts of Axles

Configuration of Axle Components.

- | | |
|--------------------------------|-----------------------------------|
| 1. Integrated Flange Spindle | 16. Spindle Nut |
| 2. Brake Flange | 17. Cotter Pin |
| 3. Spring Seat | 18. Dust Cap |
| 4. U-Bolt | 19. Rubber Plug for Dust Cap Hole |
| 5. Tie Plate | 20. Wheel Nut |
| 6. Nut Flange | |
| 7. Leaf Spring, Double-Eye | |
| 8. Brake Assembly | |
| 9. Grease Seal, Double Lip | |
| 10. Inner Bearing, Cone | |
| 11. Inner Bearing, Race | |
| 12. Brake Drum | |
| 13. Outer Bearing, Cup | |
| 14. Outer Bearing, Race | |
| 15. Spindle Washer, Flat Round | |





5.3 – Axle Examination Prior to Installation

Inspect all axle components as indicated in the Maintenance Schedule for signs of wear, elongation of bolt holes and fastener loosening. Any replaced fasteners should be torqued pursuant to the specifications in the torque value chart below. Proper axle installation and alignment is the responsibility of the axle installer. Prior to installation, installers are advised to inspect the trailer frame and mounting components for durability and soundness.

Repair or replace all damaged or aging mounting components prior to installation. Always 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.



! Never attempt to mount your new axle assembly to broken, cracking or rusted mounting points. This could result in mounting point failure during installation, and while driving cause serious injury or death.

5.4 – Leaf Suspension Systems

There are two main types of leaf suspension systems. Double-eye Springs and Slipper Springs.

5.4.1 – Double-Eye Springs Suspension

Double-Eye Springs have a bolt hole at the end of each spring. Each leaf curls at the end and attaches to the suspension using bolts at each end of the spring. Equalizers and matching mounting brackets may also be used for tandem axle installations.

Double Eye Springs Suspension Parts

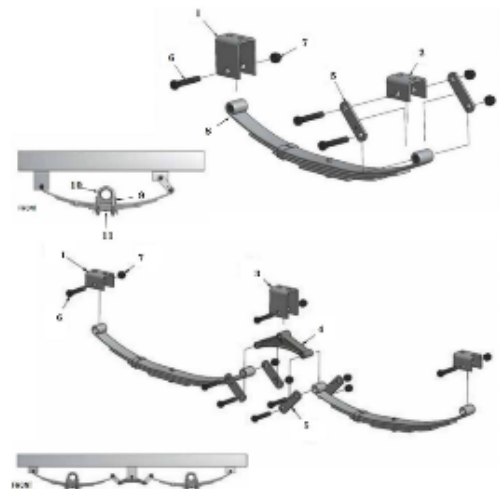
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|-----------------------------|-----------------------|
| 1. Front Hanger | 7. Lock Nuts |
| 2. Rear Hanger | 8. Leaf Spring |
| 3. Center Hanger | 9. Spring Seat |
| 4. Equalizer | 10. U-Bolt |
| 5a. Shackle Link Assemblies | 11. U-Bolt Plate |
| 5b. Shackle Links | 12. U-Bolt Nut Flange |
| 6. Shackle Bolt | |



5A Link assemblies come with shackle bolts installed.



5B Shackle links are loose parts that attach to the other side of the shackle link assemblies.





5.5 – Double Eye Springs Axle Installation Procedure

CAUTION

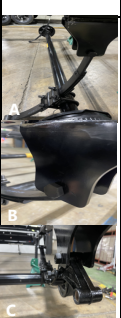
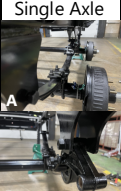
USE APPROVED FLOOR JACKS & JACK STANDS ONLY.

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- ! Only attach jack stands to the frame, **NEVER** to the axle or suspension.
- ! **NEVER** go under a trailer unless it is securely supported by suitable floor jacks and jack stands approved for the total load weight. Failure to securely support the trailer may cause serious injury or death.

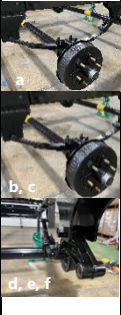
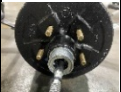


	1	Park the Trailer Park the trailer on a level surface in an open area without obstacles, then lower the tongue jack.
	2	Jack up the Trailer Loosen all wheel nuts and remove most of the wheel nuts first, leaving 3 loosened but not removed wheel nuts evenly distributed on the axle. Place the proper floor jack on one side of the trailer underneath the frame and jack up; place a jack stand under the frame on the opposite side; lower the floor jack until the chassis lays evenly on the jacks. Confirm that the jacks and the frame are secure and not capable of movement
	3	Remove Lug Nuts & Tire Remove remaining 3 loosened wheel lug nuts with a lug nut wrench. After all lug nuts are removed, pull off the tire. Be careful not to impact the threads on the screw when removing nuts and tires. Frequent impact on the screw may cause damage to the threads, making it difficult to reinstall lug nuts.
	4	Remove Axle(s) To replace a single axle (after removing both tires from axle): (A) (i) Disconnect the trailer 5-Pin or 7-Pin connector from the truck receptacle, (ii) disconnect the trailer or RV battery if equipped, (iii) remove the connectors from the driver side axle brake and main line wiring. (B) Remove the front axle shackle bolts from both hangers to release the spring. (C) Remove the rear axle shackle bolts from both hangers to release the spring. To replace tandem axles (after removing both tires from axle): (A) (i) Disconnect the trailer 5-Pin or 7-Pin connector from the truck receptacle, (ii) disconnect the trailer or RV battery if equipped, (iii) remove the connectors from the driver side front axle brake and main line wiring. Repeat for the rear axle brake. (B) Remove the shackle assemblies from the equalizers and springs. One axle at the time. (C) Remove the axle shackle bolts for the front axle to release the springs. (D) Repeat the process for the rear axle to release the springs. Use new hardware when installing new axles.



	5	Inspect Axle(s) Closely inspect the new axle components for any dents on the backing plates, damaged studs, cut wires and damaged wire connectors.
	6	Place & Position Axle Carefully place new axle under the frame with manufacturer label facing the rear of the frame. This will align the mounted brakes to the correct rotational position.
	7	Install Springs on Front Hangers (A) Insert the leaf springs into the front chassis hanger by aligning the spring eyes with the hanger holes. (B) Insert the shackle bolts from outside the frame. (C) Loosely install the lock nuts on the inside of the hangers. (D) Follow steps 8 to 12 for final installation.
Single Axle  Tandem Axle  Triple Axle  First Axle 	8	Install Springs on Rear Hangers Single Axle (A) Insert the shackle link from the outside of the frame through leaf spring eyes and aligned rear hangers. (B) Insert the shackle link into the shackle link assemblies, and loosely install the lock nuts on the inside. (C) Follow steps 8 to 12 for final installation. Tandem Axle (A) Align the axle equalizer into the center chassis hanger hole. (B) Install the shackle bolt from the outside of the chassis, and loosely install the lock nuts on the inside. (C) Then insert the shackle link assembly into the front axle leaf spring eye and into the equalizer hole, install the shackle links into the shackle links assemblies and loosely install the lock nuts on the inside of the hangers. (D) Once front axle springs are installed, align the rear axle spring eye into the rear hanger hole and install the shackle bolt from the outside of the chassis, and loosely install the lock nuts on the inside. (E) Then insert the shackle link assembly into the rear axle leaf spring eye and into the equalizer hole, install the shackle links into the shackle links assemblies and loosely install the lock nuts on the inside. (F) Follow steps 8 to 12 for final installation. Triple Axle Align the front triple equalizers into the second chassis hanger holes and install the shackle bolt from the outside of the chassis, land loosely install the lock nuts on the inside of the hangers. First Axle (a) Insert the shackle link assembly into the front axle leaf spring eye and into the triple equalizer hole. (b) Install the shackle links into the shackle links assemblies. (c) Loosely install the lock nuts on the inside of the hangers.



 Second Axle a, b, c d, e, f g, h, i j, k		Second Axle (a) Insert and align the center axle spring eye into the triple axle equalizer. (b) Install the shackle bolt from the outside. (c) Loosely install the lock nuts on the inside of the hangers. (d) Insert the shackle link assembly into the center axle leaf spring eye and into the rear equalizer hole. (e) Install the shackle links into the shackle links assemblies. (f) Loosely install the lock nuts on the inside. (g) Insert the other shackle link assemblies from the outside into the center axle. spring eyes. (h) Insert the other shackle link bolt assembly into the second equalizer eye. (i) Loosely install the lock nuts on the inside of the hangers. (j) Align the rear axle equalizer into the third chassis hanger hole. (k) Install the shackle bolt from the outside of the chassis. (l) Loosely install the lock nuts on the inside of the hangers. (m) Follow steps 8 to 12 for final installation.
 Third Axle a b, c d, e, f		Third Axle (a) Install middle axle springs. (b) Insert the other shackle link assemblies from the outside into the rear axle spring eyes, then insert them into the second equalizer eye. (c) Loosely install the lock nuts on the inside of the hangers. (d) Insert the shackle link assemblies from the outside into the other side of the rear axle springs. (e) Insert the other side of the leaf spring into the rear chassis hanger hole. (f) Loosely install the lock nuts on the inside of the hangers. (g) Follow steps 8 to 12 for final installation.
 A B C D	9	Tighten Lock Nuts (A) Using a 3-pound hammer strike the head side of the mounting bolt until fully flush with the hanger face. Splines on the mounting bolt securely connect it to the bracket. (B) Tighten mounting bolt using a wrench to hold the head and an impact tool/torque wrench with the properly sized socket. Note: The mounting nut must be tightened at 65FT/LB. (C) Fully tighten the mounting nuts. (D) Continue tightening until seeing 2-3 threads out. Repeat this procedure for the rear leaf spring and the other side of the axle.
	10	Check Pivot Mounts Ensure that other ancillary frame pivot mounts are properly secured.
	11	Connect the Brakes Connect either hydraulic brake lines for hydraulic brakes or electrical brake wires for electric brake.
	12	Test Brakes Confirm brake amperage reading is correct according to the number of axles per unit. Use an ammeter to measure brake amperage.
	13	Apply More Grease Apply more grease if needed (recommend Mobil XHP 222).



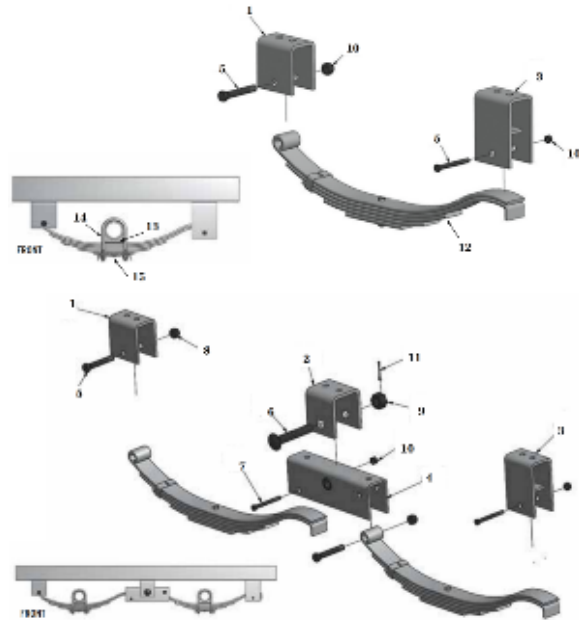
	14	Reinstall Dust Cap Use a rubber mallet to tap the dust cap to reinstall. For some axle models, the dust cap may be connected by thread and needs to be tightened with a special wrench. A special wrench may have been furnished at sale for this purpose.
	15	Final Spin Give the brake hub and drum a final spin to ensure smooth rotation.

5.6 – Slipper Springs

Slipper Springs generally have a greater weight capacity and fewer component parts than Double-Eye Springs. Slipper Springs generally ride a little more roughly than their Double-Eye counterparts.

Slipper Spring Parts

- | | |
|-------------------|------------------------|
| 1. Front Hanger | 10. Castle Nut |
| 2. Center Hanger | 11. Hex Lock Nut |
| 3. Rear Hanger | 12. Cotter Pin |
| 4. Equalizer | 13. Leaf Spring |
| 5. Shackle Bolt | 14. Spring Seat |
| 6. Equalizer Bolt | 15. U-Bolt |
| 7. Spring | 16. U-Bolt Plate |
| 8. Keeper Bolt | 17. U-Bolt Nuts Flange |
| 9. Hex Lock Nut* | |



CAUTION

- ! When lubricating brake parts, be sure to avoid any grease or oil contacting or being applied to, either accidentally or intentionally, brake linings, brake drums or electromagnets.
- ! Failure to do so could result in brake malfunction and result in serious injury or death.
- ! Failure to securely support a trailer may cause serious injury or death.



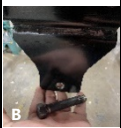
5.7 – Slipper Springs Installation Procedure



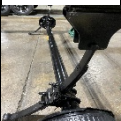
USE APPROVED FLOOR JACKS & JACK STANDS ONLY.

- ! Only raise a trailer with suitable floor jacks and jack stands approved for the total load weight.
- ! Only attach jack stands to the frame, **NEVER** to the axle or suspension.
- ! **NEVER** go under a trailer unless it is securely supported by suitable floor jacks and jack stands approved for the total load weight. Failure to securely support the trailer may cause serious injury or death.



	1	Park the Trailer Park the trailer on a level surface in an open area without obstacles, then lower the tongue jack.
	2	Jack up the Trailer Loosen all wheel nuts and remove most of the wheel nuts first, leaving 3 loosened but not removed wheel nuts evenly distributed on the axle. Place the proper floor jack on one side of the trailer underneath the frame and jack up; place a jack stand under the frame on the opposite side; lower the floor jack until the chassis lays evenly on the jacks. Confirm that the jacks and the frame are secure and not capable of movement. CAUTION ! USE APPROVED FLOOR JACKS & JACK STANDS ONLY! Only raise a trailer with suitable floor jacks and jack stands approved for the total load weight.
	3	Remove Lug Nuts & Tire Remove remaining 3 loosened wheel lug nuts with a lug nut wrench. After all lug nuts are removed, pull off the tire. Be careful not to impact the threads on the screw when removing nuts and tires. Frequent impact on the screw may cause damage to the threads, making it difficult to reinstall lug nuts.
  	4	Remove Current Axle To remove a single axle (after removing both tires from axle): (A) (i) Disconnect the trailer 5-Pin or 7-Pin connector from the truck receptacle, (ii) disconnect the trailer or RV battery if equipped, (iii) remove the connectors from the driver side axle brake and main line wiring. (B) Remove the front axle shackle bolts from both hangers to release the spring. (C) Remove the rear axle shackle bolts from both hangers to release the spring. To remove tandem axles (after removing both tires from axle): (A) (i) Disconnect the trailer 5-Pin or 7-Pin connector from the truck receptacle, (ii) disconnect the trailer or RV battery if equipped, (iii) remove the connectors from the driver side front axle brake and main line wiring. Repeat for the rear axle brake. (B) Remove the shackle assemblies from the equalizers and springs. One axle at the time. (C) Remove the axle shackle bolts for the front axle to release the springs. (D) Repeat the process for the rear axle to release the springs. Use new hardware when installing new axles.



	5	Inspect The Axle Thoroughly inspect the new axle and components.
	6	Place & Position Axle Assembly Carefully place a new axle assembly under the frame with the manufacturer label facing frame rear. This will orient the mounted brakes to the correct rotational position.
	7	Align Spring Eye Side Align the spring eye end of the leaf spring to the other hanger or equalizer, as applicable.
  	8	Align Spring Slipper End The procedures here shall be performed simultaneously on both sides of the axle. (A) Align the slipper side of the leaf spring and insert into the hanger or equalizer, as applicable. (B) Using a 3-pound hammer strike the head side of the mounting bolt until it is fully flush with the hanger face. This is required as the mounting bolt has splines around the head shank diameter to seat the mounting bolt securely into the bracket. (C) Fully tighten the mounting nuts using the impact tool/torque wrench and proper fitting socket. Continue to tighten until seeing 2-3 threads out. Note: The mounting nut must be tightened at 65FT/LB.
	9	Check Frame Shackle Bolts Ensure all mounting bolts are properly secured and seated.
	10	Connect Brakes Connect either hydraulic brake lines for hydraulic brakes or electrical brake wires for electric brakes.
	11	Test Brakes Check brake amperage to ensure correct reading for the number of axles per unit. Amperage levels are based upon the voltage, brake wiring gauge and length.

5.8 – Torsion Suspension System

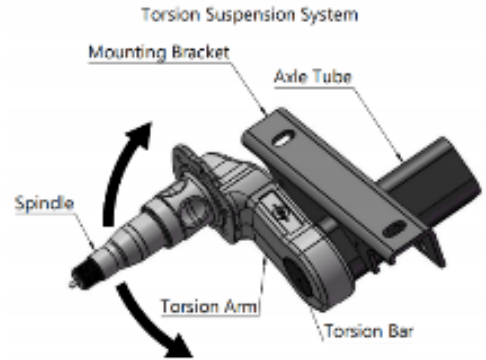
The Terran Torsion Suspension System ("Torsion Axle") is a torsion arm suspension structure completely contained within the axle tube. It attaches directly to the trailer frame using brackets which are a critical part of the Torsion Axle Assembly.

The Torsion Axle design has a steel torsion bar surrounded by four (4) natural rubber cords within the main structure of the axle beam. In operation, suspension is provided through the mechanics of this Torsion Axle design.



As depicted in the illustration, the Torsion Axle spindle is attached to a torsion arm which is fastened to a rubber-encased torsion bar. In operation, as load is applied, the torsion bar rotates causing a rolling and generating compressive resistance in the rubber cords within the axle beam.

This way of operation delivers the same suspension performance as conventional spring axles brakes plus certain independent suspension. As with all brakes, to maintain safety and performance periodic inspections are necessary and recommended. At a minimum, the Torsion Axle should be inspected in accordance with the inspection procedures for suspension system components as indicated in this Operating Manual.



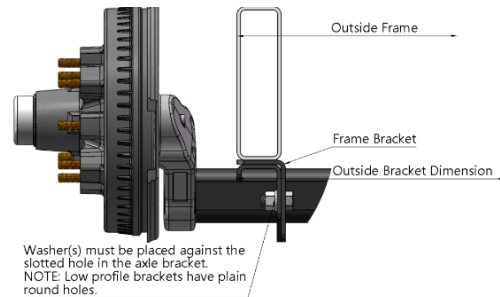
CAUTION

! Do not weld on the torsion's beam, arm, or bar because it contains rubber cords. The heat generated by welding could cause damage.

Capacity & Range

Bolt Size	Axle Weight Capacity	Torque Range
9/16	3500 lbs.	90-100 ft./lbs.
5/8	6000 lbs. to 10000 lbs.	120-130 ft./lbs.

Composition Illustration





5.9 – Spring Eye Axle Ends & Bushing Replacement Installation Procedure

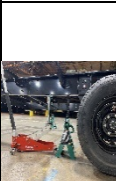


USE APPROVED FLOOR JACKS & JACK STANDS ONLY.

- ! Only raise a trailer with suitable floor jacks and jack stands approved for the total load weight.
- ! Only attach jack stands to the frame, **NEVER** to the axle or suspension.
- ! **NEVER** go under a trailer unless it is securely supported by suitable floor jacks and jack stands approved for the total load weight. Failure to securely support the trailer may cause serious injury or death.



Our axles utilize nylon bushings for Spring Eye Axle ends and equalizer pivots. The frequency of bushing replacement depends upon on your mileage, type of usage, and level of impact from usage. The following procedure is for Spring Eye Axle ends and equalizer bushing replacement.

	1	Park the Trailer Park the trailer on a level surface in an open area without obstacles, then lower the tongue jack.
	2	Jack up the Trailer Loosen all wheel nuts and remove most of the wheel nuts first, leaving 3 loosened but not removed wheel nuts evenly distributed on the axle. Place the proper floor jack on one side of the trailer underneath the frame and jack up, place a stand jack under the frame away from the tire, lower the floor jack until the chassis lays evenly on the jacks. Verify that the jacks and the frame are secure. CAUTION ! USE APPROVED FLOOR JACKS & JACK STANDS ONLY! Only raise a trailer with suitable floor jacks and jack stands approved for the total load weight.
	3	Remove Lug Nuts & Tire Remove remaining 3 loosened wheel lug nuts with a lug nut wrench. After all lug nuts are removed, pull off the tire. Be careful not to impact the threads on the screw when removing nuts and tires. Frequent impact on the screw may cause damage to the threads, making it difficult to reinstall lug nuts.
	4	Loosen Nuts Loosen the nut on the spring bolt, but do not remove the nut.
	5	Place Secondary Jack Place a secondary floor jack directly under the axle's U-bolt spring plate or axle beam. Slowly raise the axle enough to relieve spring pressure on the mounting hanger/shackle assembly/equalizer.



	6	Tap Out Mounting Bolt Tap out the mounting bolt by striking the lock nut to dislodge the serrated bolt head from its mounting.
	7	Remove Mounting Bolt & Nut Remove mounting bolt and nut. The spring should now be free from the mounting point.
	8	Remove Spring Eye Bushing Remove spring eye bushing. In most cases the bushing will simply fall out but if not, use an appropriately size socket wrench to tap the bushing out.
	9	Inspect & Clean Spring Eye Inspect the inside diameter of the spring eye and clean and remove any debris or dirt.
	10	Install New Bushing Install new bushing into the spring eye. If necessary, tap the bushing in using a wood block with rubber mallet or the appropriate shackle mounting bolt to seat the bushing into the spring eye. Make sure it is flush.
	11	Reinstall Spring Reinstall the spring to its original mounting position to the mounting hanger/shackle assemblies and shackle links/equalizer.
	12	Hammer Mounting Bolt Using a 3-pound hammer strike the head side of the mounting bolt until it is fully flush with the hanger face. This is required as the mounting bolt has splines around the head shank diameter to seat the mounting bolt securely into the hanger.
	13	Tighten Mounting Nuts Fully tighten the mounting bolt nuts using the impact tool/torque wrench with proper fitting socket. Continue to tighten until seeing 2-3 threads out. Note: The mounting nut must be tightened at 65FT/LB.
	14	Check Frame Shackle Bolts Ensure all mounting bolts are properly secured and seated.
	15	Remove Jack & Reinstall Wheel Remove the floor jack from the axle, reinstall wheel, and tighten lug nuts to specified torque values.



5.10 – AP Kit Installation Procedure



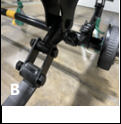
USE APPROVED FLOOR JACKS & JACK STANDS ONLY.

- ! Only raise a trailer with suitable floor jacks and jack stands approved for the total load weight.
- ! Only attach jack stands to the frame, **NEVER** to the axle or suspension.
- ! **NEVER** go under a trailer unless it is securely supported by suitable floor jacks and jack stands approved for the total load weight. Failure to securely support the trailer may cause serious injury or death.



	1	Park the Trailer Park the trailer on a level surface in an open area without obstacles, then lower the tongue jack.
	2	Jack up the Trailer Loosen all wheel nuts and remove most of the wheel nuts first, leaving 3 loosened but not removed wheel nuts evenly distributed on the axle. Place the proper floor jack on one side of the trailer underneath the frame and jack up; place a jack stand under the frame on the opposite side; lower the floor jack until the chassis lays evenly on the jacks. Confirm that the jacks and the frame are secure and not capable of movement. CAUTION ! USE APPROVED FLOOR JACKS & JACK STANDS ONLY! Only raise a trailer with suitable floor jacks and jack stands approved for the total load weight.
	3	Remove Lug Nuts & Tire Remove remaining 3 loosened wheel lug nuts with a lug nut wrench. After all lug nuts are removed, pull off the tire. Be careful not to impact the threads on the screw when removing nuts and tires. Frequent impact on the screw may cause damage to the threads, making it difficult to install the nuts again.
	4	Remove Current Axle To replace a single axle (after removing both tires from axle): (A) (i) Disconnect the trailer 5-Pin or 7-Pin connector from the truck receptacle, (ii) disconnect the trailer or RV battery if equipped, (iii) remove the connectors from the driver side axle brake and main line wiring. (B) Remove the front axle shackle bolts from both hangers to release the spring. (C) Remove the rear axle shackle bolts from both hangers to release the spring. To replace tandem axles (after removing both tires from axle): (A) (i) Disconnect the trailer 5-Pin or 7-Pin connector from the truck receptacle, (ii) disconnect the trailer or RV battery if equipped, (iii) remove the connectors from the driver side front axle brake and main line wiring. Repeat for the rear axle brake. (B) Remove the shackle assemblies from the equalizers and springs. One axle at the time. (C) Remove the axle shackle bolts for the front axle to release the springs. (D) Repeat the process for the rear axle to release the springs. Use new hardware when installing new axles.

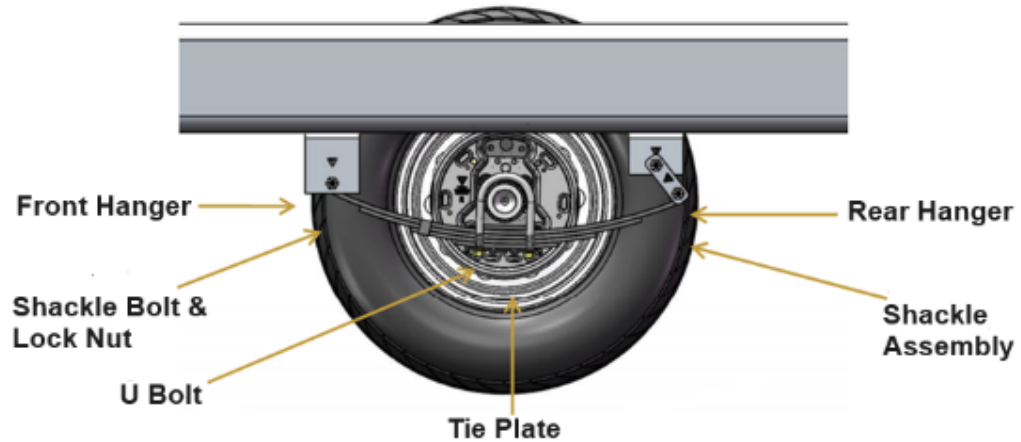


	5	Inspect The Axle Thoroughly inspect the axle components and carefully position your axle under the frame.
	6	Place & Position Axle Carefully place a new axle under the frame with the manufacturer label is facing toward the frames rear. This will orient the mounted brakes to the correct rotational position.
 	7	Align Spring Eyes (A) Align spring eyes to the front hanger. Insert the mounting bolt from outside of the frame through the bracket and leaf spring eye end. Loosely install the lock nut on the inside of the hanger. (B) Align other spring eye to rear hanger. Insert the shackle bolt from outside of the frame through the bracket and leaf spring eye end. Place the shackle assembly to the other end of the shackle bolt. Loosely install the lock nut on the inside of the assembly.
	8	Hammer Mounting Bolt Using a 3-pound mallet, strike the head side of the shackle bolt inserted into the front hanger until fully flush with the hanger face. The shackle bolt has splines around the head shank diameter to seat the shackle bolt securely into the hanger.
	9	Tighten Mounting Nuts Fully tighten the mounting nuts using the impact tool/torque wrench and proper fitting socket. Continue to tighten until seeing 2-3 threads out. Note: The mounting nut must be tightened at 65FT/LB.
	10	Connect Brakes Connect either hydraulic brake lines for hydraulic brakes or electrical brake wires for electric brakes.
	11	Test Brakes Using ammeter, confirm the brake amperage reading is correct according to the number of axles per unit. Each brake must read 3 amps or more depending on the battery voltage, brake wiring gauge and length.
	12	"W" Shape on AP Kits - Tandem Axle Only Remove jack stands, lower the floor jack and remove it, make sure the shackle assemblies make "W" shape with the equalizer.



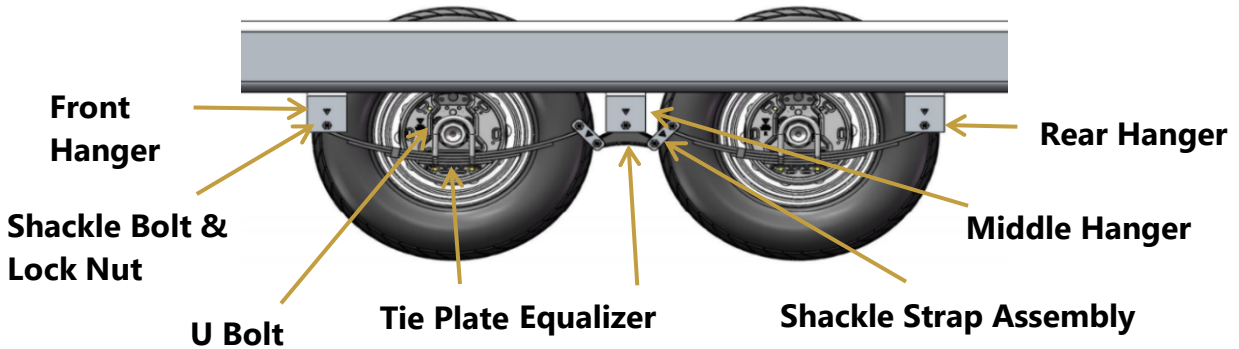
5.11 – Single Axle, Double Eye Springs

Single Axle, Double Eye Springs Parts



5.12 – Double Axle, Double Eye Springs

Double Axle, Double Eye Springs Parts





5.13– Suspension Fastener Torque Values

Suspension Fastener Torque Values - U-BOLTS				
Bolt Size	Tube OD	Axle Weight Cap.	Torque	Bolt and Nut Grade
3/8" U-Bolt Nut	2.375"	2000 lb	33±3 FT/LB	Grade 5 or greater
1/2" U-Bolt Nut	2.375"	2800-3500 lb	63±3 FT/LB	Grade 5 or greater
9/16" U-Bolt Nut	3"	3500-7000 lb	81±3 FT/LB	Grade 5 or greater
9/16" U-Bolt Nut	3.5"	8000 lb	118±3 FT/LB	Grade 5 or greater

Suspension Fastener Torque Values - AP-KIT			
Bolt Size	Spring Style	Torque	Bolt and Nut Grade
9/16" Lock Nut with 3 Teeth Only	Double Eye and Slipper Style	Snug Nut Only, 2-3 Threads Out	Grade 5 or greater
1/2" Lock Nut Only	Double Eye and Slipper Style	65±3 FT/LB	Grade 5 or greater



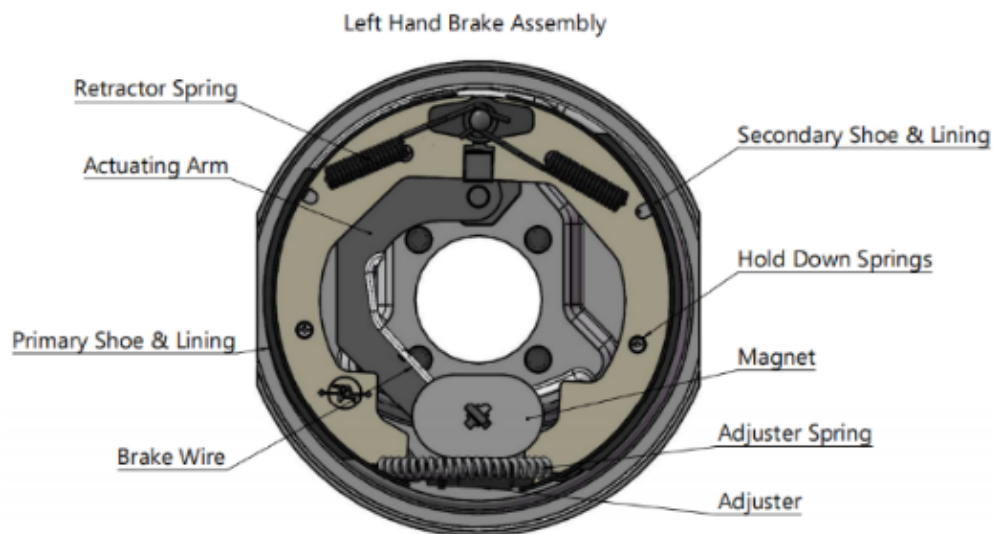
VI. Braking System



Terran's electric brakes are a premium brake system that is far superior to mechanical brakes for several reasons, including better responsiveness which provides a smoother deceleration. Other benefits include faster deceleration, ability to stopping abruptly, simpler installation, and less time and money for maintenance costs.

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 brake 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.

6.1 – Brake Assembly





6.2 – Features of Electronically Actuated Brakes

Electrically actuated brakes have certain advantages over other brake actuation systems:

1. Able to be manually adjusted at the controller to provide the correct braking capability for varying road and load conditions.
2. Able to be modulated to provide more or less braking force thus easing the brake load on the towing vehicle.
3. Less lag time from the moment the tow vehicle's brakes are actuated until the trailer brakes are actuated.
4. In emergency situations provide some braking independent of the tow vehicle.

6.3 – Brake Self-Adjusting Feature

Terran electric forward self-adjusting brakes feature enable the brakes to adjust on both forward and reverse stops. Brake adjustment occurs when lining wear expands the gap between the shoes and the brake drum surface. When such a gap develops, the adjuster mechanism (deployed by rotating the screw at the bottom of the assembly) expands the distance between the brake shoes and reduces the gap between the shoes and the brake drum surface.

6.4 – Proper Brake Usage

Trailer brakes are designed to work in synchronization with your tow vehicle brakes. Never use your tow vehicle or trailer brakes alone to stop the combined load. To this end, brake controller must be set up according to the manufacturer's recommendations to ensure proper synchronization between the tow vehicle and the trailer. To accommodate changing loads and driving conditions, brake controller adjustments may be necessary to achieve synchronization. Importantly, read the brake controller manual before proceeding with brake synchronization.

Lack of synchronization can cause brake lockup or lack of smooth braking can be caused by lack of synchronization, excessive threshold voltage (over 2 volts) or under adjusted brakes. Proper synchronization can only be achieved through road testing. Before any synchronization adjustments are made your trailer brakes should be burnished-in, see step 6.6 for burnishing procedure.

Synchronization adjustments should only be done on burnished brakes. To check synchronization, make several hard stops from 20 mph on a dry, paved road free of any sand, gravel, water or ice. If the trailer brakes lock, follow the brake controller manual to adjust/decrease the gain. On the other hand, if the brakes do not lock, slightly increase the gain in accordance with brake controller manual.

Note: Not all trailer brakes are capable of wheel lockup. Load (weight and distribution), brake type and wheel & tire size can impact whether a brake will lock. For safety and proper function, it



is not beneficial to lock up the brakes and slide the tires. This can result in uneven tire wear and loss of tow vehicle and trailer control.

If the brake controller engages the trailer brakes more than just slightly before tow vehicle brakes, then the controller should be adjusted to achieve synchronization in accordance with the brake controller manual. The controller setting should enable the trailer brakes to engage slightly before tow vehicle brakes. If there is proper synchronization, the trailer will not jerk or push the tow vehicle during braking.

6.5 – Proper Brake Installation

CAUTION

- ! Trailer brakes are designed to work in synchronization with tow vehicle brakes.
- ! **NEVER** use tow vehicle or trailer brakes **ALONE** to stop a combined load (vehicle & trailer). It could cause damage to the vehicle or trailer and injury to the operator.

First, read the manufacturer's manual, instructions, and recommendations. The brake controller must be installed and set according to the manufacturer's manual to ensure proper synchronization between the tow vehicle and the trailer.

To accommodate changing loads and driving conditions, brake controller adjustments may be necessary to achieve synchronization. Achieving synchronization is critical, because absent synchronization can cause brakes to lock up, cause rough deceleration, lead to excessive threshold voltage (over 2 volts), or under adjusted brakes.

6.6– Brakes Burnishing

CAUTION

- ! Before road procedure, make sure the area is clear of vehicular and pedestrian traffic. Failure to brake safely could result in an accident and personal injury to yourself or others on the road.
- ! **NEVER** pass posted speed limits.



Before synchronization, trailer brakes should be burnished in. To accomplish it.

1. Turn the trailer brake controller gain to the maximum level.
2. Drive up to 40 mph.
3. Slide the brake controller knob to apply 8 to 10 volts to the trailer brakes allowing the towing vehicle to decrease in speed to 20 mph. (Do not use towing vehicle brakes during this procedure to seat the brakes faster, use the trailer brakes only)
4. Release the brake controller knob.
5. Continue down the road applying the brake controller at one-mile intervals. Note: A noticeable difference might be felt during this process.

Note: Allow ample time for brakes to cool between application. This allows the brake shoes and electromagnets to begin "seating" to the brake drums.

6. After 30-50 applications, the burnishing process will have been done. Pull over to a safe area to verify the procedure results.



! NEVER touch the brake drum directly, hover a hand around the drum only.

After the burnishing process has been done, the brake drum may be hot, this is normal. If a temperature gun is available, check the drum temperature, the temperature may be between 350 and 400 degrees. If a temperature gun is not available, hover the drum with your hand and verify if it's hot.

Smoke from the drum/brake or axle may be visible due to the high temperature of the burnish.

When completed, allow ample time for brakes to cool. This allows the brake shoes and magnets to begin "seating" to the brake drums. Repeat the process as needed. *

***Note:** If the brake drum is cold after the procedure, the burnishing could not finish properly, perform the process again following the above directions.

For electric trailer brakes to perform as intended, the brake controller and related components should be installed as in the manufacturer's manual. Failure to do so may prevent brake synchronization. The first step is to review the manufacturer's manual.



6.7 – Proper Synchronization

Following the manufacturer's manual is also important for completing synchronization. You will also need to do road testing for proper synchronization. Unsuccessful synchronization can reduce brake performance, cause brake lockup, unsmooth braking experiences or excessive threshold voltage (over 2 volts).



- ! Before road testing, make sure the area is clear of vehicular and pedestrian traffic. Failure to brake safely could result in an accident and personal injury to yourself or others on the road.
- ! Avoid locking up brakes and sliding the tires. It is unsafe and prevents proper brake function. This can cause uneven tire wear as well as loss of tow vehicle and trailer control.

6.8 – Testing

To test synchronization, make several hard stops starting from 20 mph on a dry and paved road free of any sand, gravel, water, or ice. Below are several issues that may occur and the appropriate action.

- **Trailer brakes lock**

If the trailer brakes lock, refer to brake controller adjustment instructions in the brake controller manual. When correctly synchronized, the controller setting should enable the trailer brakes to engage slightly before the tow vehicle brakes.

- **Trailer brakes do not lock**

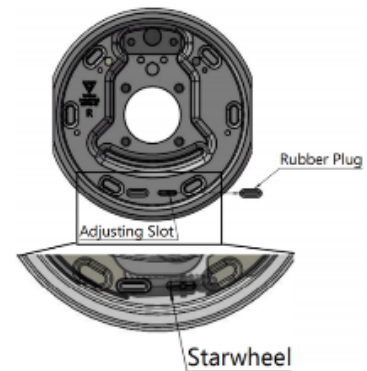
If the trailer brakes do not reach the point of impending lockup, slightly increase the gain following adjustment instructions in the brake controller manual. The controller should be adjusted so that braking nearly reaches the point of impending brake lockup. If the problem persists, check if the brake magnet is grounded.

- **Jerking or Pushing**

If the trailer jerks or pushes the tow vehicle during braking than adjustments may be needed to the brake controller as instructed in the manufacturer's manual.

Other Considerations

- Not all trailer brakes are capable of wheel lockup.
- Load (weight and distribution), brake type, wheel and tire size can impact whether a brake will lock.





6.9 – Brake Adjustment Procedure

CAUTION

USE APPROVED FLOOR JACKS & JACK STANDS ONLY.

- ! Only raise a trailer with suitable floor jacks and jack stands approved for the total load weight.
- ! Only attach jack stands to the frame, **NEVER** to the axle or suspension.
- ! **NEVER** go under a trailer unless it is securely supported by suitable floor jacks and jack stands approved for the total load weight. Failure to securely support the trailer may cause serious injury or death.



Terran self-adjusting electric brakes require **NO** manual adjustment. Brakes without the self-adjusting feature should be initially adjusted at 250 miles, and then every 3,000 miles for the life of the brakes. If a loss in performance is experienced between adjustments periods, earlier or more frequent adjustments may be required.

	1	Park the Trailer Park the trailer on a level surface. Lower the trailer tongue jack until it is secure and place a block beside each tire to prevent movement.
	2	Jack up the Trailer Loosen all wheel nuts and remove most of the wheel nuts first, leaving 3 loosened but not removed wheel nuts evenly distributed on the axle. Place the proper floor jack on one side of the trailer underneath the frame and jack up; place a jack stand under the frame on the opposite side; lower the floor jack until the chassis lays evenly on the jacks. Confirm that the jacks and the frame are secure and not capable of movement.
CAUTION ! USE APPROVED FLOOR JACKS & JACK STANDS ONLY! Only raise a trailer with suitable floor jacks and jack stands approved for the total load weight.		
	3	Remove Lug Nuts & Tire Remove remaining 3 loosened wheel lug nuts with a lug nut wrench. After all lug nuts are removed, pull off the tire. Be careful not to impact the threads on the screw when removing nuts and tires. Frequent impact on the screw may cause damage to the threads, making it difficult to reinstall lug nuts.
	4	Remove Rubber Plug Remove the rubber plug from the adjusting hole on the backing plate.
	5	Expand the Adjuster Utilize a brake adjusting tool to turn the starwheel of the adjuster up 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.



	6	Final Adjustment Then use the brake adjusting tool to turn the starwheel in the opposite direction until the wheel turns with a slight drag.
	7	Return Rubber Plug Return the rubber plug to the adjusting hole on the backing plate.

Use the jack to return the wheel carefully to the ground.

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.

6.10 – General Maintenance

As with all mechanical systems, owners are strongly advised to follow in comply with manufacturer recommendations. The Maintenance Schedule provides details on inspections, testing, and repairs or replacements. Plus, Terran requires service after one year of use to maintain optimal performance.

For heavy brake usage, maintenance should be done at more frequent intervals. Also, maintenance should be conducted immediately after any failure or signs of less-than-optimal performance.

6.10.1 – 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.



! 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.



WARNING

Do not lubricate brake linings, drums, or electromagnets.



6.10.2 – Voltage Testing

Voltage testing is necessary at regular intervals during the life of your brakes. To check system voltage, connect the voltmeter to the two magnet lead wires at the brake. This may be accomplished by using a pin probe inserted through the insulation of the wires. The engine should be running when checking the voltage so that a low battery will not affect the readings.



Voltage in the system should begin at 0 volts. As the controller bar is slowly actuated it should gradually increase to about 12 volts. If the controller does not produce this voltage level, consult your brake controller manual.

The threshold voltage of a brake controller is the voltage applied to the brakes when the controller first turns on. Lower threshold voltage will provide for smoother braking. If the threshold voltage is too high the brakes may feel grabby and harsh.

6.10.3 – Electromagnets Testing

Electromagnets should be inspected and serviced at least once per year. The surface of the electromagnet must be completely flat for proper operation and should be replaced if there is uneven wear on the electromagnet surface or exposure of the electromagnet coil.

Qualified technicians recommend replacement or refinishing of armature surfaces when an electromagnet is replaced. It is advisable to also replace the electromagnet on the other side of the brake.

Terran does not advise on armature resurfacing or replacement.

6.10.4 – Brake Shoes & Linings

Brake shoes and linings should be inspected as part of preventative maintenance at regular intervals. This includes regular voltage testing. Brake lining should be replaced if worn to 1/16" or less.

Brake shoes contaminated with grease or oil or abnormally scored or gouged should also be replaced. Hairline heat cracks are normal in bonded linings and should not be cause for concern; however, monitor for further degradation and more severe cracking. When replacement is necessary, replace all shoes and brakes on each axle. This will help retain the "balance" of your brakes.

After replacement of brake shoes and linings, the brakes must be re-burnished to seat in the new components. See step 6.6 for burnishing procedure.



6.10.5 – Amperage Measurements

Brake system amperage indicates the level of current flowing through the system when all magnets are energized. Amperage should be tested using an ammeter with sufficient capacity. Note that amperage will vary in proportion to voltage.

To test amperage, at the brake controller disconnect the (blue) wire running to the brakes and connect the ammeter in series into the line. The engine should be running when checking the amperage. If the brake system has a resistor, either set the resistor at zero or bypass before testing amperage to obtain an accurate amperage reading.



The following are 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

To check amperage for individual brakes, disconnect the magnet lead wires and attach the ammeter between the two wires. Reconnect the wires after testing.

WARNING ASBESTOS

- ! Potential asbestos hazard is present in dust from older brake linings!
- ! Follow OSHA asbestos safety precautions when servicing older brakes.

6.10.6 – Cleaning

Brakes should be serviced after one year of operation to ensure safety and proper 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. Change worn magnets and shoes as needed to maintain maximum braking capability.

Brake shoes, electromagnets, magnet arms and backing plates should be cleaned. Make sure that all the parts removed are replaced in the same brake and drum assembly. Inspect for any loose or worn parts and stretched or deformed springs; replace as necessary.



6.11 – Troubleshooting Electric Brakes Chart

Troubleshooting Chart

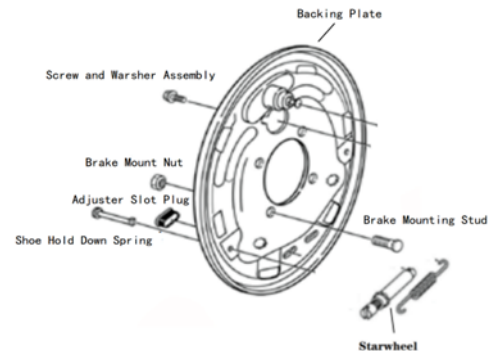
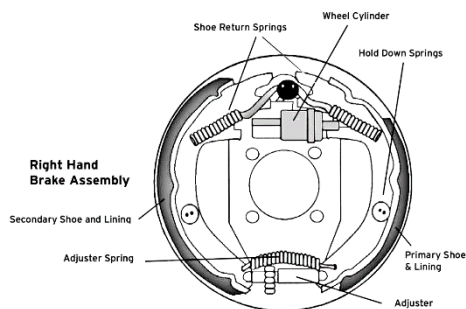
PROBLEM	POSSIBLE CAUSE	REMEDY
No brakes	Open circuits	Find and correct
	Short circuits	Test and correct
	Severe under-adjustment	Adjust brakes
Weak brakes	Grease or oil on magnets or linings	Clean or replace
	Corroded connections	Clean and correct cause of corrosion
	Worn linings or magnets	Replace
	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.



6.12 – 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.



6.12.1 – Hydraulic Brake Lubrication

Before reassembling the brake drum, apply a light layer of approved brake grease or anti-seize compound to the brake anchor pin, actuating the arm bushing and pin, and areas on the backing plate in contact with the brake shoes.

Do not lubricate brake linings or drums.



VII. WHEEL INSTALLATION



⚠ CAUTION

! Failure to tighten lug nuts to torque limits can cause structural and other damage to studs and lug nuts, wheel loosening and imbalance and wheel, studs, and lug nuts, and may cause serious injury or death.

7.1 – Tire Installation Procedure

⚠ CAUTION

USE APPROVED FLOOR JACKS & JACK STANDS ONLY.

- ! Only raise a trailer with suitable floor jacks and jack stands approved for the total load weight.
- ! Only attach jack stands to the frame, **NEVER** to the axle or suspension.
- ! **NEVER** go under a trailer unless it is securely supported by suitable floor jacks and jack stands approved for the total load weight. Failure to securely support the trailer may cause serious injury or death.



	1	Raised Trailer With the trailer raised and secured, inspect the drum or hub stud conditions, tire air pressure and wheel before mounting the wheel.
	2	Mount Wheel. Mount the wheel over the studs and begin to tighten the lug nuts by hand to prevent cross threading.



Tighten Lug Nuts.

Tighten the lug nuts to torque values (provided below) in sequence. The lug nuts shall be tightened in three stages and in a star pattern. After all nuts are pre-tightened, tighten all nuts to moderate torque, and then final torque gradually in the same order. This is to make sure that force is evenly distributed.

The tightening sequence is as shown in the figures below.

LUG NUT TORQUE SEQUENCE



5 BOLT



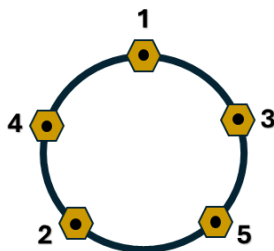
6 BOLT



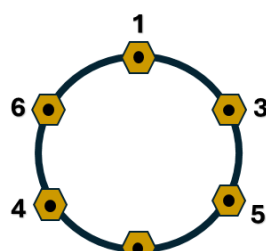
8 BOLT

3

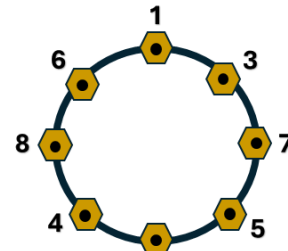
LUG NUT TORQUE SEQUENCE



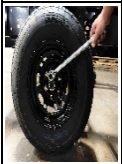
5 BOLT



6 BOLT



8 BOLT



Retorque Lug Nuts.

Retorque the lug nuts before the first road use, after 50 miles of use and as necessary thereafter.

4



7.2 – 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

7.3 – Tire Selection

Select a tire that matches the wheel rim size, contour, and trailer load capacity. Tire specifications are detailed in the tire manufacturer catalog and on the tire itself. Trailer load capacity is in the trailer manufacturer's operating manual.

IMPORTANT

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 Trailer) tires. Tire specifications located on the sidewall include tire dimensions, load capacities and purpose.



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 at times cause tire and wheel failure and result in serious injury or death.

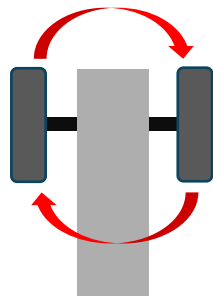


7.4 – Tire Maintenance

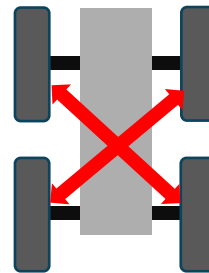
Visually inspect tire sidewalls and treads. Regularly check the pressure (psi) in the tires using a tire pressure gauge. Test in both hot and cold weather. The psi reading should match psi specifications prescribed for the tires. If the reading is low, add air until psi on the pressure gauge reading is correct. Consult the tire manufacturer manual for proper installation and maintenance.

In order to achieve longer service life for the tire set, as directed by your tire manufacturer manual or upon the appearance of one side wear on tires, it is recommended to switch the tires in a cross pattern, as shown in the figures below.

Single axle tire switch



Double axle tire switch



	Over Inflation Excessive wear at the center of the thread indicates that the tire pressure is consistently too high.
	Under Inflation 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.



CAUTION

! Always use eye (safety glasses) and ear protection when undertaking any service, maintenance, or other procedure in this manual. Failure to comply may result in serious physical injury and permanent physical damage.



! Always follow all precautions and safety procedures. Do not perform service or maintenance without the required knowledge, experience, and tools.



7.5 – Post Installation Inspection Checklist

After brake installation, you need to conduct a post-installation inspection. The following checklist provides important areas that need to be inspected prior to usage.



WARNING

Before you start a post installation inspection, park your trailer on a flat surface where it cannot move or roll which could cause injury. Select a sufficiently large -place free of obstacles and vehicle traffic to avoid potential accidents and injuries.

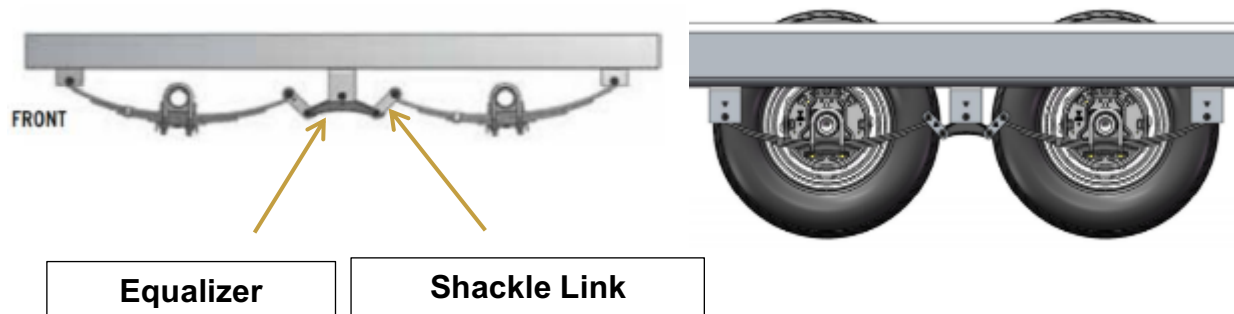


Post Installation Checklist		
Test	Task	☒ Mark As Completed
Gross Axle Weight Check	- Confirm that the Gross Axle Weight Rating (GAWR) for the installed axles are suitable for the trailer or recreational vehicle. <i>GAWR is the maximum amount of weight that can be placed on each axle.</i> - Check the axle label located at the axle center for the GAWR designated by the manufacturer.	☐
Tire Pressure Check	Confirm using a tire pressure gauge (on cold tires) that tire pressure follows the manufacturer's recommendations.	☐
Tire Clearance Check	Tire clearance is critical for safe operation as the axle moves during suspension travel. Each tire must be measured for sufficient tire clearance. To check tire clearance, measure the distance between the outside of the tire and the nearest point of contact. Each tire clearance measurement must be performed with proper tire inflation at GAWR. For spring axles, ensure at least 3" of tire clearance at GAWR.	☐
Wheel Nut Torque Values Check	For each tire, check the torque values on each lug nut to confirm compliance with the Terran torque values under section entitled "Wheels & Tires."	☐
Equalizer Shackle Links Check	For the tandem axle install: Verify the shackle links are pointing up to form the "W" shape, or in the 10 o'clock and 2 o'clock position. For proper positioning of the shackle links of a tandem axle installation refer to Illustration A.	☐
Voltage Check	Connect each voltmeter pin probe to a magnet lead wire of the brake. With the voltmeter connected to the lead wires and the engine running, as the brake is applied the voltage should increase from 0 to approximately 12 volts. If less than 10.5 volts. Confirm that you followed the steps for the voltage test and then check for problems with the vehicle's electrical system. Repeat this test for each brake.	☐



Amperage Check	To check amperage for individual brakes, disconnect the magnet lead wires and attach the ammeter between the two wires. Reconnect the wires after testing. Confirm at least 3 amperes. If less than 3 amperes, confirm that you followed the ampere test and then check for problems with the vehicle's electrical system. Reconnect the wires after testing.	☐
Brake Engagement Check	Confirm that each brake engages by rotating the drum carefully by hand. The drum will lock when the brakes properly engage. If the drum continues rotating, and the brakes are not engaging, refer to the Braking System Procedures and follow testing and adjusting steps. If an issue persists, consult a professional.	☐

Illustration A – Tandem Axle Shackle Link Positioning





VIII. WARRANTY & TECHNICAL SPECIFICATIONS

8.1 – Warranty

To learn about Terran's Limited Warranty visit
<https://terranindustries.com/contact/warranty/>.

TERRAN INDUSTRIES LIMITED WARRANTY

Coverage

This Limited Warranty covers the Terran Industries products set forth herein (each a "Product," collectively the "Products"). Please refer to the Terran Industries Operation Maintenance and Service Manual (the "Operating Manual") at www.terranindustries.com/operatingmanual for instructions on proper operations, service and maintenance of the Products which are required to be followed in order to submit a valid claim under this Limited Warranty. Normal wear and tear is excepted from this Limited Warranty (see the section entitled "Exclusions").

Subject to the terms of this Limited Warranty, Terran Industries warrants only to the original purchaser from the date of original purchase at retail (the "Purchaser") that the Products will be free from defects in materials and workmanship beginning on the date of initial retail purchase subject to the following restrictions and warranty periods:

8.2 – Technical Specifications

For technical specifications on Terran's axle products visit
<https://terranindustries.com/products/axles/full-axle-assembly/>.

3,500 LB TERRAN INDUSTRIES ASSEMBLY	
 Made to Order	
QAI	
FEATURES AND OPTIONS	
TUBING	2.375" OD 3" OD
BEARINGS	L68149 & L68111 L44649 & L44610
HUB	5 Lug on 4.5", 4.75", 5.0" or 5.5" 6 Lug on 5.5"
BRAKE	10" x 2.25" Electric 10" x 2.25" Hydraulic Optional Self-Adjusting Brake
SUSPENSION	Double Eye Springs Slipper Springs Hanger Kit
LUBRICATION	EZ-Grease

www.terran1.com