BOSTAIL

MAINTENANCE AND OPERATION MANUAL

7,000 LB. AXLE

WWW.BOSTAIL.COM

Scope of This Manual

This *Apex Axle Maintenance and Operation Manual* provides important, valuable, but easy-to-understand information about the safe operation, preventative maintenance, and servicing of the Apex Axle(s). Bostail strongly encourages reading this manual in entirety for an enhanced understanding of how to safely operate and prolong the life of your Apex Axle(s).

Combining decades of expertise in the trailer components industry with advanced and innovative engineering, Bostail is proud to offer our premium line of axles and running gear. This manual is designed to provide clear, comprehensive guidance on the operation, service, and maintenance of Bostail's Apex Axles.

The quality of Bostail components reflects our commitment to:

1. Using only premium materials.
2. Incorporating innovative technology in design and production.
3. Adhering to stringent quality control measures from raw materials to final assembly.

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1.0 Safety Notice

1.1 Introduction

The safety and dependability of your Bostail axle(s) and associated components are essential and directly related to the life and reliable operation of axle(s). This manual describes a variety of common service and repair methods using established industry standards and practices. Bostail cannot provide all methods to complete the procedures described in this manual. Nor can Bostail anticipate all the variables that can and will affect the circumstances of the service and maintenance procedures.

The general service and maintenance instructions and procedures found in this manual should be followed unless and until superseded by a revised edition. As a word of caution, before deviating from this manual's instructions and procedures, verify you are not endangering personal safety or compromising the integrity or effectiveness of the axle(s).

⚠ WARNING

Failure to correctly service the axle(s) may void the warranty and could result in personal injury or death.

If the service procedures described in this manual are unclear or beyond the skill level of the owner, consult a certified technician or a licensed trailer repair facility for guidance. Consult the *Owner's Manual* of your trailer for additional safety precautions, methods, and procedures related to the operation and maintenance of your trailer.

The safety-specific information in this manual is designated by the following safety call-outs:

⚠ DANGER

An imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

A potentially hazardous situation which, if not avoided, may result in death or serious injury.

⚠ CAUTION

A potentially hazardous situation which, if not avoided, could result in death or serious injury.

NOTE

A helpful tip from Bostail.

1.2 General Safety Guidelines

- Always wear Personal Protective Equipment (PPE) including eye protection, gloves, and hearing protection as appropriate.
- Ensure your workplace is clean and free of hazards such as spills or loose tools.
- Be aware that improper service, maintenance, or installation may void warranties or lead to equipment failure.

1.3 Professional Assistance

If there is any doubt in safely and successfully performing any procedure described in this manual, consult a certified technician. The *Owner's Manual* for your trailer may also contain additional guidelines for specific maintenance and service tasks.

Your personal safety is our priority. Proper preparation ensures you can perform maintenance with confidence.

2.0 Axle Selection

Use the following formula to ensure the properly rated Apex Axle has been selected for your trailer. **Failure to follow this formula in the selection process will void any warranty:**

$$Axle\ Rating\sqrt{Curbweight} \leq .33\ or\ 33\%$$

AXLE - 7K 95"HF 80"SC EBS 8-6.5" BP 5-0.5625 TS

Part number: ##########

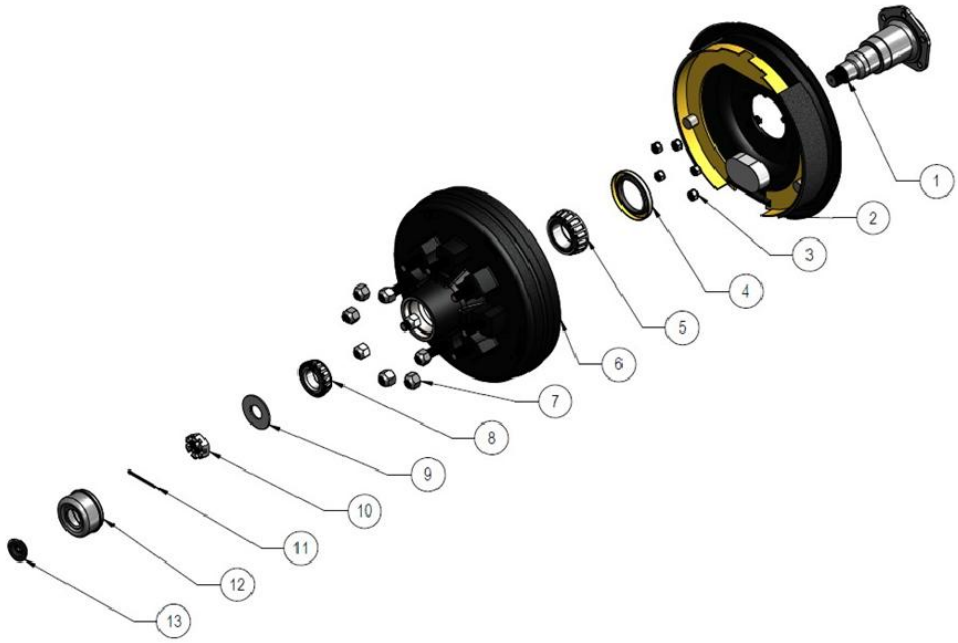
MFG Date: MM/DD/YYYY

Manufacturing order: ########

Lot: ##########

Serial Number: ####################

3.0 Axle Components for Ordering Replacement Parts



Item No.	Part Number	Description	Qty./Side
1	300100002	SPINDLE	1
2	300400001	ELECTRIC BRAKE RH	1
2	300400002	ELECTRIC BRAKE LH	1
3	300600005	K-LOCK NUT	5
4	301100002	RADIAL SEAL	1
5	301000002	INNER BEARING	1
6	300200001	BRAKE DRUM	1
7	300600002	WHEEL NUT	8
8	301000001	OUTER BEARING	1
9	300800001	FLAT WASHER	1
10	300600001	CASTLE NUT	1
11	300900001	COTTER PIN	1
12-13	304600006	DUST CAP KIT	1

Visit www.bostail.com to order replacement Apex Axle components and kits.

4.0 Maintenance

NOTE

Periodically check the torque on all lug nuts on the trailer for safer transportation practices (refer to page 59-60 of this manual).

4.1 Maintenance Schedule

Always	Test the trailer brakes to ensure functionality before transporting.
	Verify your battery is charged and trailer breakaway systems (and switches) are functioning properly.
	Ensure proper inflation of tires in accordance with tire manufacturer's specifications.
First 1,000 Miles	Complete a full Pro Safety Inspection checklist (refer to pages 73-74 of this manual).
4 Months or 4,000 Miles (whichever comes first)	Check trailer wheels for any dents, distortions, or cracks.
8 Months or 8,000 Miles (whichever comes first)	Inspect the brake controller for correct modulation and amperage.
	Inspect brake magnets or excessive wear and correct current draw.
	Check suspension components such as fasteners, hangers, springs, and equalizers for bending, cracking excessive wear, and loosening.
15 Months or 15,000 Miles (whichever comes first)	Complete a full Pro Safety Inspection checklist (refer to pages 73-74 of this manual).

4.2 Quick Check Guide

Brake Synchronization	See the brake controller's manufacturer's specifications.
Brake Adjustment	All Apex Axles come with either self-adjusting or manual brakes.
Tire Pressure	Refer to the tire manufacturer's specifications.
Lug Nut Torque	Refer to pages 59-60 of this manual for torque specifications. On new trailers, the torque on the lug nuts must be checked and re-torqued at the first 25, 50, and 100 miles.

⚠ CAUTION

A licensed/certified/experienced professional should complete any modifications or adjustments to your trailer components. Any modifications made to Apex Axle(s) may void all axle warranties.

Scan the following QR code or visit Bostail.com/resources for video installations, troubleshooting guides, and more.

5.0 Capacity and Loading

Gross Vehicle Weight Rating (GVWR) = Trailer Load Capacity + Trailer Curb Weight (empty)

Gross Axle Weight Rating (GAWR) = Trailer Load-Carrying Capacity of a single axle specified by the manufacturer

⚠ CAUTION

GVWR vs. GAWR

Your trailer's load-carrying capacity must never be greater than the load capacity of the weakest component-rated capacity on the trailer.

NOTE

Check the Trailer Safety Certification Label or tag on your trailer. This provides basic information about your specific trailer, such as its GVWR and GAWR. Use these specifications when determining the cargo weight chosen to load on your trailer.

⚠ WARNING

An overloaded trailer can result in loss of control of the trailer, leading to death or serious injury.

Do not load a trailer so that the weight on any tire exceeds its rating.

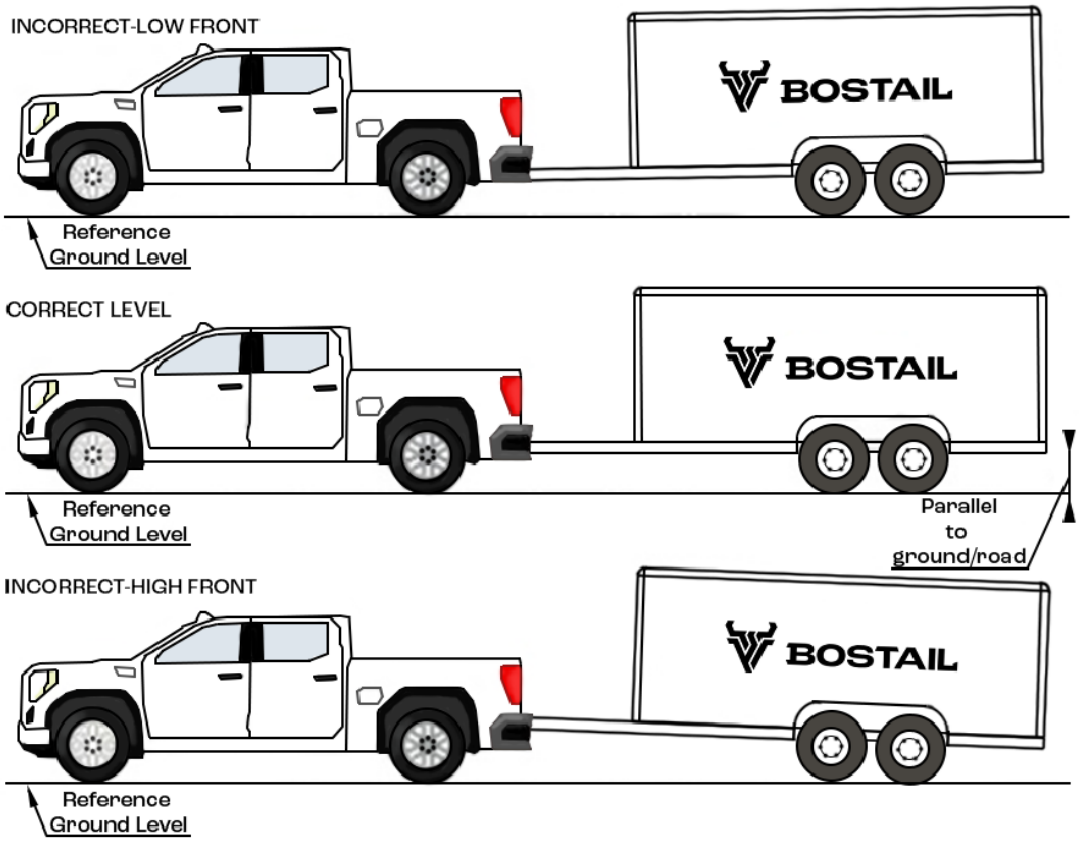
Do not exceed the trailer Gross Vehicle Weight Rating (GVWR) or the Gross Axle Weight Rating (GAWR).

5.1 Levelling Your Trailer and Weight Distribution

Maintaining a level load on your trailer is essential to the safe operation and prolonging the life of your trailer and its components. Too much weight toward the rear or the front of the trailer will result in uneven weight distribution to the axle(s). Overloading the axle will change the center of gravity leading to premature or excessive wear on components and will cause undesirable sway at towing speeds.

NOTE

On a level surface (both front/back and left/right) and after loading cargo onto the trailer, step away from the trailer so it is in full view and ensure that the trailer frame is level with the ground.



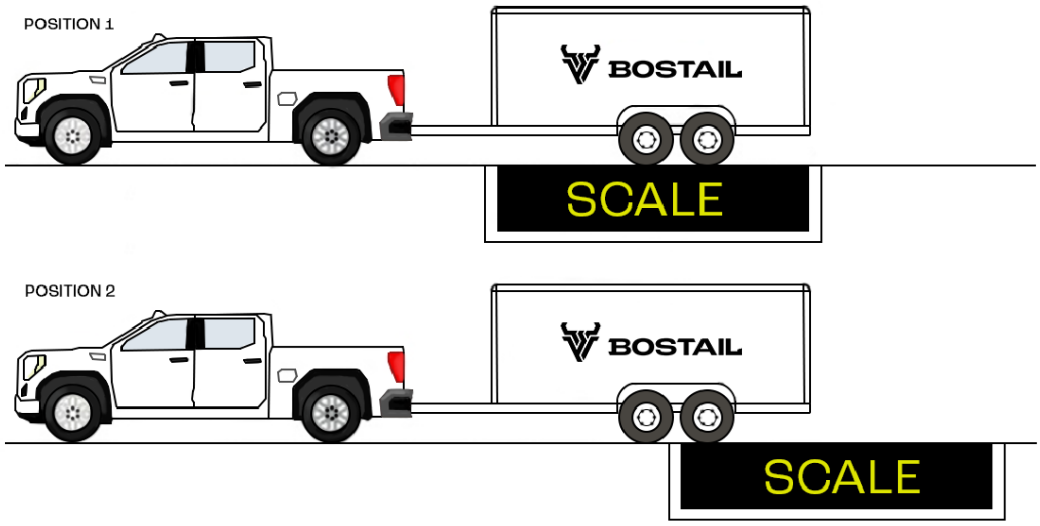
5.2 Measuring Trailer Weight Distribution

The most accurate method of measuring the weight distribution of your trailer after it has been loaded and the load evenly distributed is to use a certified truck scale available at most truck stops. Below is an example of how to measure the load on each individual axle. If your trailer is only equipped with a single axle, then you only need to use Position 1, with no Position 2 weight to be subtracted.

5.3 Calculating Individual Weight(s) on Axle(s)

Front Axle Weight = (Axle Weight Position 1) – (Axle Weight Position 2)

Rear Axle Weight = Axle Weight Position 2

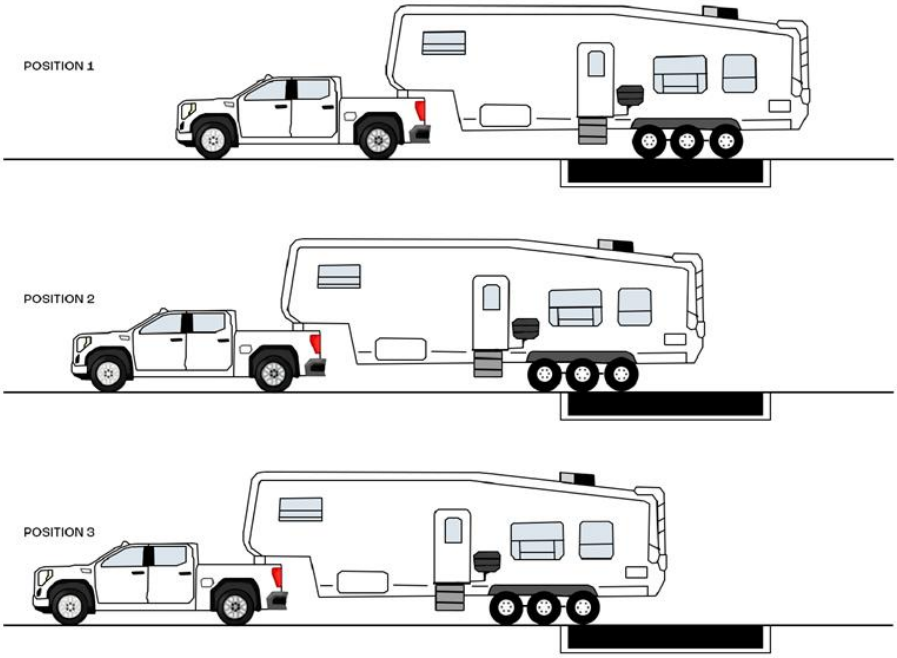


5.4 Calculating Individual Axle Weight

Front Axle Weight = (Axle Weight Position 1) – (Axle Weight Position 2)

Mid Axle Weight = (Axle Weight Position 2) – (Axle Weight Position 3)

Rear Axle Weight = Axle Weight Position 3



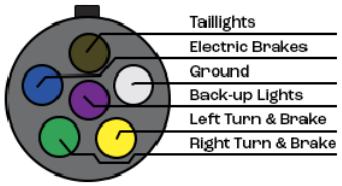
6.0 Trailer Electrical

6.1 Trailer Electrical Connector

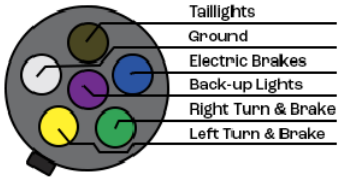
The electrical connector connects the trailer to the tow vehicle. The diagrams below will help determine which trailer electrical connector you have and what the wiring orientation within the connector should be. It is not common to see electrical trailer brakes used with 4-way and 5-way trailer electrical connectors.

Number of Brakes	Wire Length from Connector to Axle	Minimum Wire Gauge
2	Any Length	12 AWG
4	30 Feet or Less	12 AWG
4	30 - 50 Feet	10 AWG
6	30 Feet or Less	10 AWG
6	30 - 50 Feet	8 AWG

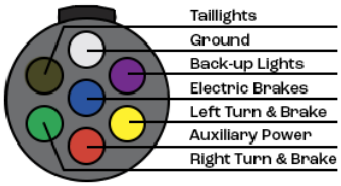
6-Way Round
(Trailer Side)



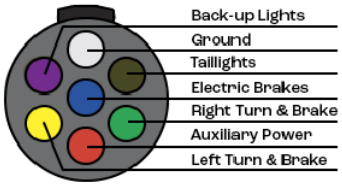
6-Way Round
(Car Side)



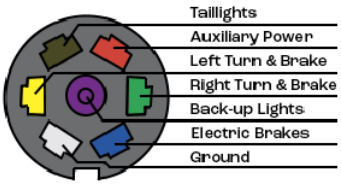
7-Way Pin Style
(Trailer Side)



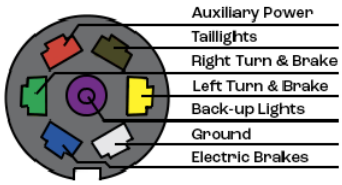
7-Way Pin Style
(Car Side)



7-Way RV Blade Style
(Trailer Side)



7-Way RV Blade Style
(Car Side)



For more information on your trailer's electrical connector, consult the manual provided by the trailer manufacturer.

6.2 Trailer Electric Brakes and Braking System(s)

6.2.1 Features

Electrically actuated brakes offer numerous benefits compared to alternative brake actuation systems, including:

1. Manual adjustability to ensure appropriate braking power for diverse road and load conditions.
2. Modulation capacity for more precise control over braking force, reducing strain on the towing vehicle.
3. Emergency braking capability that can operate independently of the tow vehicle in critical situations.

6.2.2 Electric Brake Operation

The electric brakes installed on your trailer share similarities with the drum brakes found on your tow vehicle. However, electric trailer brakes use an electromagnet instead of hydraulic pressure to activate the braking system. When all brake components are properly connected, the electric braking system operates as follows (refer to electric brake assembly illustration on page 18): Once the tow vehicle's brakes are applied, the electric-brake controller supplies electrical current to the system. The electrical current flows through the electro-magnets housed in the brakes. These high-capacity electromagnets become energized and are attracted to the rotating armature surface of the drums, which moves the actuating levers in the same direction as the drums are turning. As a result, the actuating cam block at the shoe end of the lever pushes the primary shoe out towards the inside surface of the brake drum. Through the adjuster link, the force exerted by the primary shoe moves the secondary shoe outward, contacting the brake drum. Increasing the electrical current flowing to the electromagnet results in a stronger grip on the armature surface of the brake drum. That stronger grip increases the pressure against the shoes and brake drums until the desired stop is achieved. If wired and connected properly, the trailer brakes will be actuated gradually and slightly before your towing vehicle's brakes.

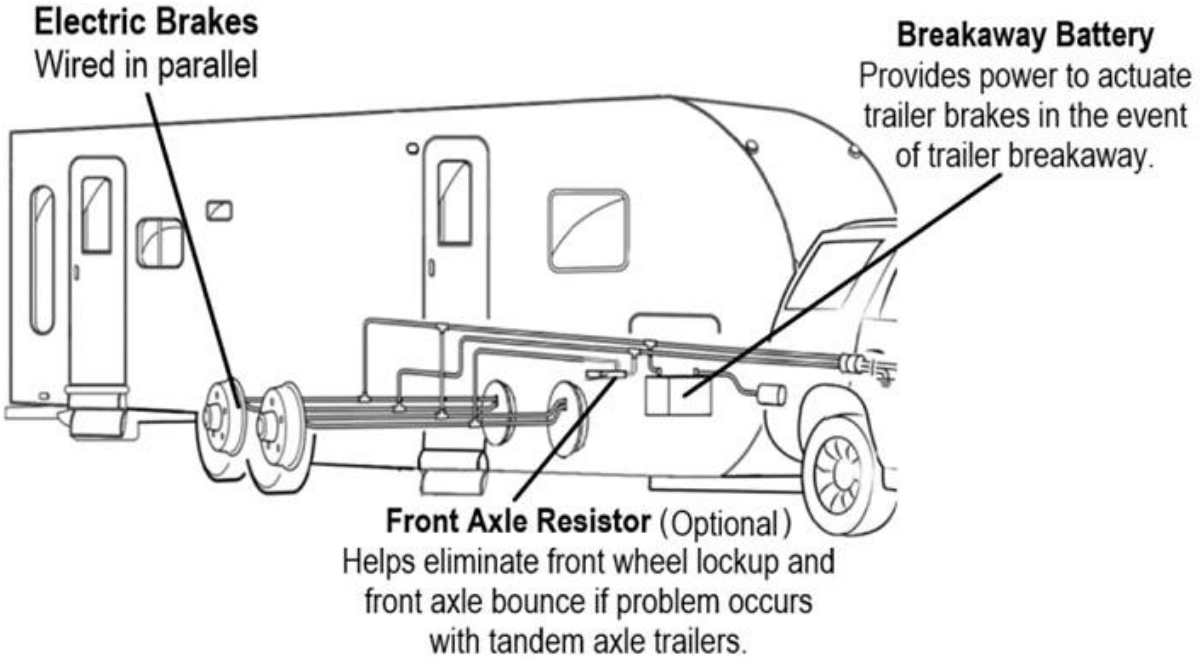
6.2.3 Brake Installation

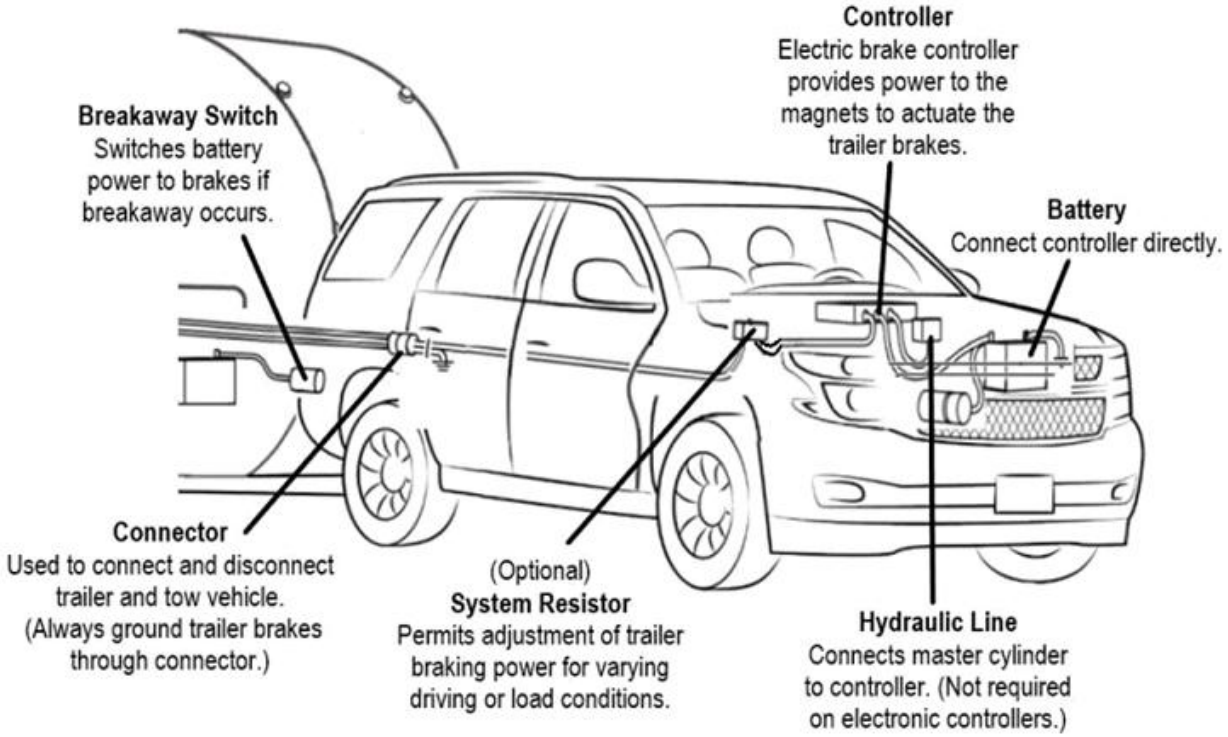
When installing electric brakes, always use Grade 8 bolts. OEM bolt torque specifications can be found on pages 59-60 of this manual.

NOTE

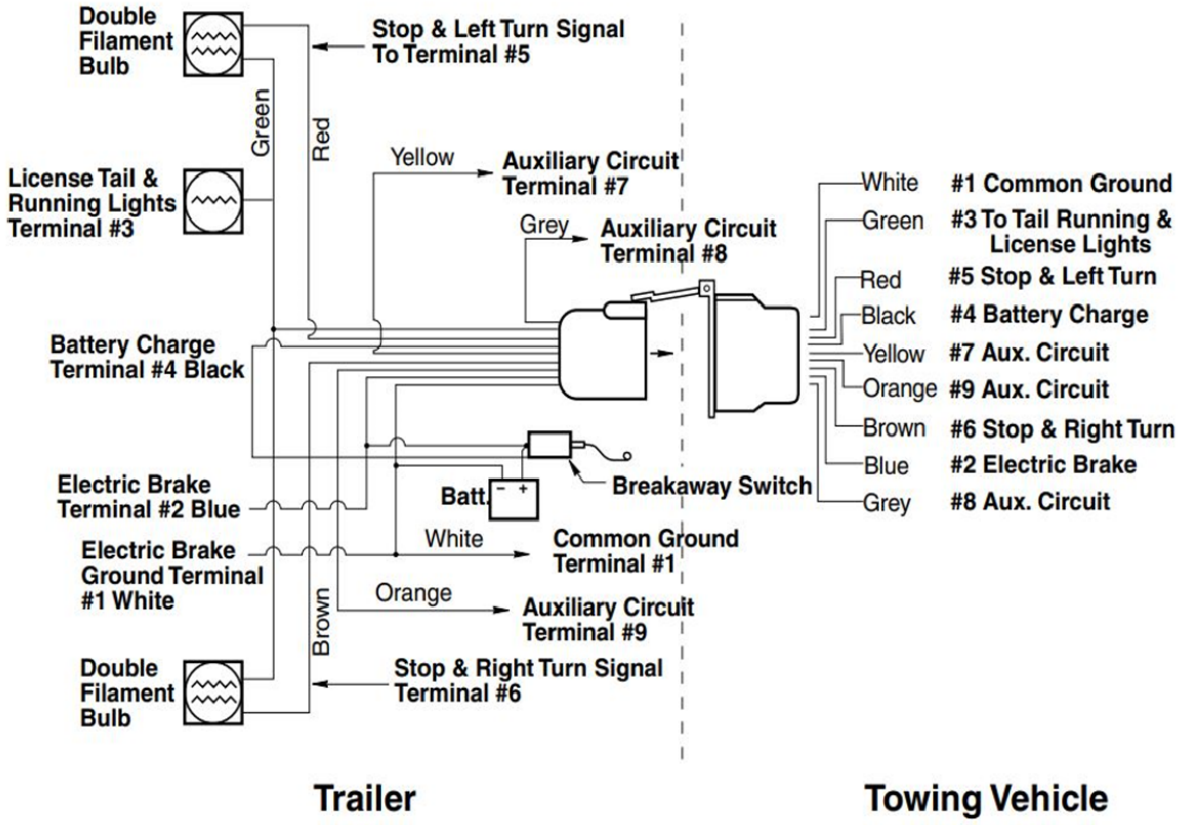
If installing multiple axles and only implementing a single braking axle.

Always consult DOT (Department of Transportation) requirements for trailer axle(s) installation laws.

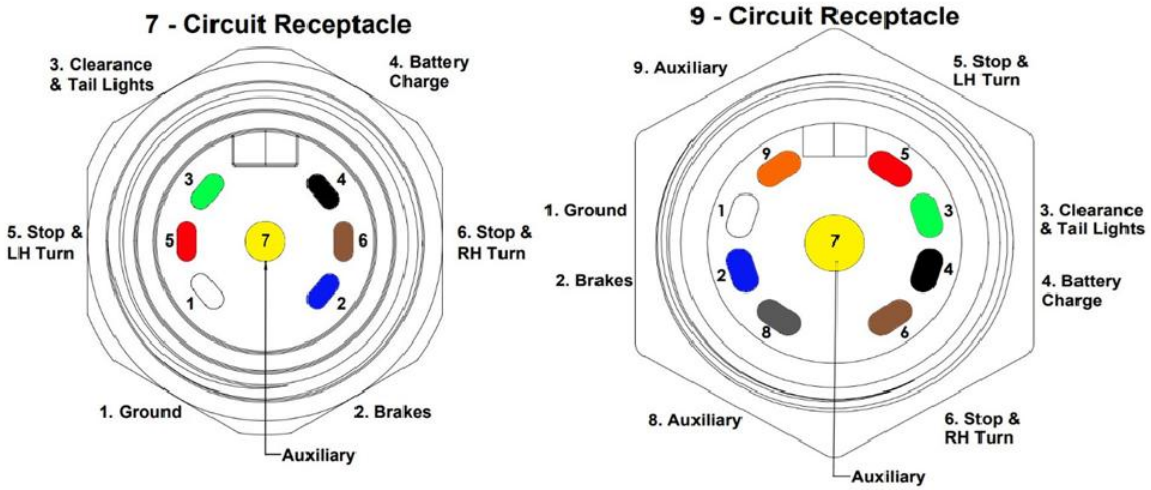

Electric Brakes
Wired in parallel
Breakaway Battery
Provides power to actuate trailer brakes in the event of trailer breakaway.
Front Axle Resistor (Optional)
Helps eliminate front wheel lockup and front axle bounce if problem occurs with tandem axle trailers.


Controller
Electric brake controller provides power to the magnets to actuate the trailer brakes.
Breakaway Switch
Switches battery power to brakes if breakaway occurs.
Battery
Connect controller directly.
Connector
Used to connect and disconnect trailer and tow vehicle. (Always ground trailer brakes through connector.)
(Optional)
System Resistor
Permits adjustment of trailer braking power for varying driving or load conditions.
Hydraulic Line
Connects master cylinder to controller. (Not required on electronic controllers.)

6.3 Brake and Electrical Hookup



View Looking into Tow Vehicle Receptacle



6.4 Trailer Wire Size Chart

Number of Brakes	Hitch-to-Axle Distance in Feet	Recommended Minimum Hookup Wire Size (Copper)
2		12 AWG
4	Under 30	12 AWG
4	30-50	10 AWG
6	Under 30	10 AWG
6	30-50	8 AWG

7.0 Proper Usage and Brake Setup

The brakes on your trailer are designed to work together (in junction) with those on your tow vehicle. It is important to note that relying solely on either the trailer brakes or tow vehicle brakes to stop the combined load can be dangerous. In most cases, the amperage flow to the brake magnets will not be adequate for comfortable and safe braking, unless proper brake system adjustments are made. Various factors such as trailer load and driving conditions, as well as fluctuations in alternator and battery output, can lead to unstable current flow to the brake magnets. Therefore, it is crucial to maintain and adjust your brakes as directed in this Manu-al, use an appropriately modulated brake controller, and perform the synchronization procedure described below.

7.1 Proper Synchronization

Synchronizing the brakes of your tow vehicle and trailer is important to ensure brakes will perform as designed and avoid early or excessive wear on braking components. It is crucial to thoroughly read the brake controller manufacturer's instructions before attempting any synchronization procedure to ensure safe brake performance and synchronization.

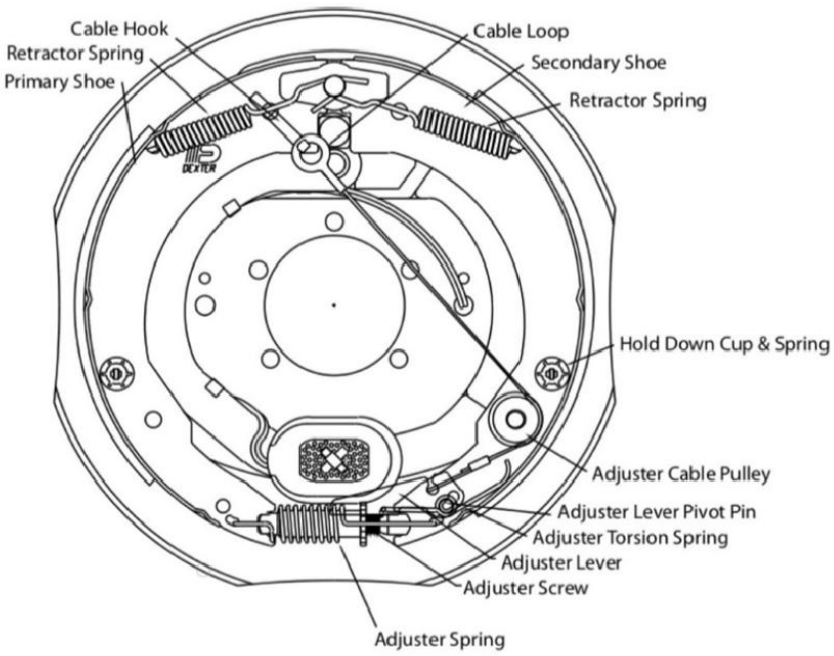
⚠ CAUTION

Before road testing, verify the area is clear of vehicular and pedestrian traffic. Failure to brake safely could result in an accident and personal injury to yourself and/or others.

Proper synchronization of the tow vehicle and trailer braking starts with and can only be achieved by road testing. Aggressive brake lockup or harshness often occur due to improper or a lack of braking synchronization between the tow vehicle and trailer, excessively high threshold voltage (over 2 volts), or under-adjusted brakes.

7.2 Initial Brake Setup and Use

Before making any synchronization adjustments, verify your trailer brakes have been properly burnished. Burnishing is a crucial technique used to ensure adequate “seating” and “breaking-in” of the brake components. **Observe state road laws and regulations when driving a vehicle and towing your trailer.**



With your trailer securely hitched onto your towing vehicle, bring the towing vehicle and trailer up to a safe speed and apply the brakes 20-30 times, decreasing speed by 20 mph (for example, from approximately 40 mph to 20 mph). Allow enough time for brakes to cool between each application, enabling the brake shoes and magnets to wear in slightly to the brake drum surfaces.

After burnishing the trailer brakes, to properly adjust those brakes for optimal performance, conduct several hard stops from 20 mph on a dry, paved road free of sand and gravel. If the trailer brakes lock and slide, decrease the gain setting on the electric brake controller. Conversely, if the trailer brakes do not slide, slightly increase the gain setting. The controller should be adjusted to the point of approaching brake lockup and wheel skid.

NOTE

While minimum vehicle stopping distances are achieved when wheels approach lockup, avoiding brake lockup is important as lockup results in poor vehicle stability and poor or loss of control. Depending on factors such as load, brake type, wheels, and tires, not all trailer brakes are capable of wheel lockup.

If the controller is applying the trailer brakes before the tow vehicle brakes, you must modify the controller level adjustment so that the trailer brakes come on in synchronization with (and just before) the tow vehicle brakes. For optimal braking performance, the controller should be adjusted to allow the trailer brakes to come on slightly ahead of the tow vehicle brakes. Once proper synchronization is achieved, there will be no sensation of the trailer "jerking" or "pushing" the tow vehicle during braking.

⚠ CAUTION

Do not adjust this control outside the parameters outlined by the brake controller manufacturer's instructions.

In addition to the synchronization adjustment, electric brake controllers come equipped with a modulation function that varies the current to the electric brakes based on the pressure applied to the brake pedal or the amount of deceleration of the tow vehicle. Your brake controller must supply around 2 volts to the braking system when the brake pedal is initially depressed and gradually increase the voltage to 12 volts as brake pedal pressure increases. A controller that immediately jumps to the high voltage output, even during a gradual stop, will cause the electric brakes to be fully energized, leading to harsh braking and potential wheel lockup.

7.3 Controller Adjustment

Verify the trailer brakes are accurately adjusted before proceeding (refer to page 42 for instructions). The gain and level controls are commonly found on most controllers. They allow for the adjustment of the amount of current and deceleration that is sensed by the controller's inertia sensor. The level adjustment can also be used to determine when the trailer braking will be felt. The gain or output control adjustment typically regulates the maximum amount of amperage that is provided to the brakes, which can be modified based on the trailer load. The chart below provides a breakdown of the available adjustments for various brake controllers.

Controller	Adjustment to Control Brake	Adjustment for Brake Force
Tekonsha 9030, 9035, 9040, 9045, 9055	Level	Gain
Kelsey 81741A	Level	Gain
Draw-Tite 5100	Sync	Output

⚠ CAUTION

DOUBLE CHECK!

1. ***Verify the correct brake controller adjustments have been applied so the braking system will properly engage and provide safe and effective braking.***
2. ***Check the ground wires to ensure a secure connection.***

8.0 Break-In Period for Electric Drum Brakes

To ensure optimal performance, Bostail's electric drum brakes require a break-in period. This process is necessary whenever new axles, brake shoes, or magnets are installed.

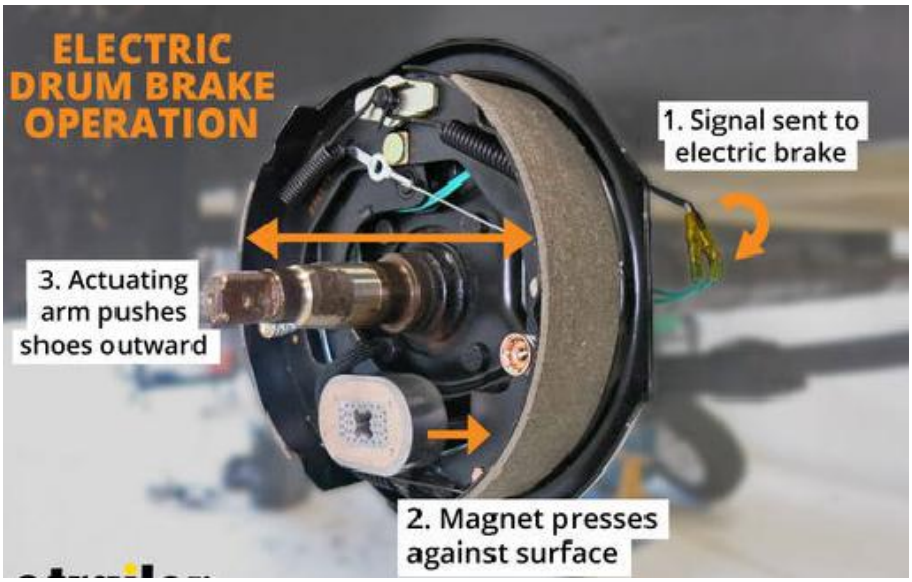
Brake Adjustment Schedule:

- Adjust brakes manually after the first 200 miles of operation.
- Thereafter, inspect and adjust brakes every 3,000 miles.

Break-In Procedure:

- Drive at an initial speed of 40 mph. Apply approximately 8-10 volts to the trailer brakes to slow down the truck and trailer combination to 20-25 mph.
- Avoid using truck brakes during this process for faster brake seating.
- Repeat this procedure approximately every mile, taking care to avoid overheating the brake linings.

After 20-50 brake applications, the linings will seat properly, providing close to 100% contact with the drum surface. Full performance will be achieved as the brake material cures and conforms to the drum surface.



9.0 Hubs, Drums, and Bearings Maintenance and Inspection

9.1 Hub Removal

Removing the hub is a fundamental step for various maintenance tasks, including bearing inspection and drum replacement. Follow these steps for safe and effective removal:

1. Secure the trailer on jack stands and remove the wheel.
2. Pry off the dust cap using a flathead screwdriver or specialized tool.

3. Remove the cotter pin and spindle nut, keeping track of their placement.
4. Carefully slide the hub and drum assembly off the spindle, avoiding damage to the components.

⚠ CAUTION

Do not lift or support trailer on any part of the axle or the suspension system.

9.2 Trailer Axle Brake Inspection

Regular brake inspections are crucial to maintaining safety and performance:

- Conduct inspections annually or every 36,000 miles, whichever comes first.
- For trailers under heavy use or extreme conditions, inspect brakes more frequently.
- If braking performance issues arise, perform immediate inspection and service.

9.3 Recommended Component Inspection Periods

To maintain the reliability and safety of your axles, we recommend regular inspections of key components:

- Periodic Bearing Inspection - Perform annually or every 36,000 miles, whichever comes first.
- Bearing Lubrication Inspection - Perform annually, or more frequently if brake inspections indicate abnormal braking performance.
- Brake Cleaning and Inspection - Perform annually or every 36,000 miles, whichever comes first.

NOTE

A small amount of residual grease on a new brake hub is normal. Wipe off any residual grease, but if grease continues to appear after installation, the hub may require professional inspection. Excess grease can coat brake pads, magnets, and braking surfaces, reducing braking effectiveness.

9.4 Brake Hub Removal

When servicing hubs, follow these safety and procedural guidelines:

Always lift the trailer by its frame rather than the axle or suspension. Axles and suspension components are not designed to support the weight of the trailer during lifting. Wear appropriate PPE (eye protection, gloves, etc.) to prevent injury during maintenance.

1. Prepare the trailer:
   - Park on level ground and ensure trailer is stable.
   - Chock the tires to prevent movement during maintenance.
2. Loosen lug nuts:
   - Slightly loosen the lug nuts before lifting the trailer to prevent the wheel from spinning.
3. Raise the trailer:
   - Use a jack to lift the trailer until the tire spins freely. Secure the trailer with jack stands placed under the *frame*.
4. Remove the wheel:
   - Unscrew the lug nuts and remove the wheel. Set the wheel and lug nuts aside for reassembly.
   - Avoid leaning the wheel against the trailer or jacks to prevent damage or instability.

5. Prepare a clean work area:
   - Set up a clean surface to place removed parts and avoid contamination.
6. Remove the dust cover:
   - Use a pry tool to gently remove the dust cover from the hub. For lubricated hubs, ensure proper drainage and cleanliness.
7. Remove the cotter pin:
   - Pull out the cotter pin from the spindle nut and discard it. Cotter pins are single-use items.
8. Disassemble the hub:
   - Remove the spindle nut, spindle washer, and outer bearing cone while securing the hub to prevent parts from falling.
   - Carefully remove the grease seal using a seal puller. Discard the used seal; it cannot be reused.

⚠ CAUTION

Failure to appropriately raise and secure the trailer may cause serious injury or death.

⚠ CAUTION

Never crawl under your trailer unless it is resting on properly placed jack stands.

9.5 Seal Removal and Installation

Replacing the seal after every removal is crucial to prevent further damage/failure.

1. Using a screwdriver, remove the seal from the hub. Use care to prevent scratching the hub surface or inner bearing.
2. Apply PERMATEX (a gasket sealant) to the outside of the new seal.

3. Tap the new seal into place using a clean wood block.

9.6 Brake Drum Inspection

Periodically inspect the contact area of the brake shoe and armature of the drum surface for excessive wear. Look closely for uneven surface wear and irregular scoring or gouging. If any of the trailer brake drums are 0.020 inches oversize or 0.015 inches out of round, resurfacing your drums is strongly recommended. If the diameter of the brake drum has been worn to greater than 12.340 inches, the drum must be replaced. If an uneven surface is present on the armature, it will need to be resurfaced; however, ensure that no more than 0.030 inches or no more than 120 micro inches is removed from the surface. If resurfacing the armature, verify the magnets are also replaced to prevent further damage.

In sum:

- To ensure proper contact between the armature face and the magnet face, the magnets should be re-placed whenever the armature surface is refaced, and the armature surface should be refaced whenever the magnets are replaced.
- Clean and inspect the hub and surfaces to remove any metal shavings or dust.

Replace the brake drum if worn to greater than 12.340 inches. The following chart includes specific part numbers for replacement.

Brake drum inspections are critical to maintaining effective braking performance:

1. Check the braking surface for signs of wear, such as grooves, scoring, or cracks.
2. Use a brake drum micrometer to measure the internal diameter and ensure it is within specifications.
3. Replace the drum if it shows defects or exceeds the wear limit.

Electric Brake Size	Part Number	Description
10-inch	300200004	3.5K Brake Drum
12-inch	300200003	5.2K Brake Drum
12-inch	300200001	7k Brake Drum
12-inch	300200002	8K Brake Drum
12 ¼-inch	300200006	10K Brake Drum
12 ¼-inch	300200005	12K Brake Drum

9.7 Cleaning the Brake Drum

⚠ CAUTION

Older brake linings may contain hazardous materials such as asbestos dust.

9.7.1 Safety Guidelines

- Do not use compressed air, brushes, or dry rags to clean brake dust. This could release harmful particles into the air.
- Wear PPE, including a mask and gloves, and use an aerosol brake cleaner to remove brake dust safely.

9.7.2 Cleaning Steps

- Place a drip pan beneath the drum to catch any residue or cleaning solution.
- Use aerosol brake cleaner to thoroughly clean the drum, backing plate, and magnet arm, and brake shoes.
- Ensure all pockets of grease, oil, or brake dust are removed.
- Repeat the cleaning process if necessary.

- Once cleaned, inspect the brake drum and components for wear or damage before reassembling.

⚠ CAUTION

Asbestos Dust Hazard!

Since some brake shoe friction materials contain asbestos, certain procedures need to be taken when servicing brakes:

1. ***Avoid creating or breathing dust.***
2. ***Avoid machining, filing or grinding the brake linings.***
3. ***Do not use compressed air or dry brushing for cleaning (dust can be removed with a damp brush).***

9.8 Hub Replacement and Bearing Adjustment

To replace or adjust the bearing and hub, follow these steps:

1. Reassemble the hub:
   - Place the hub, bearing, washers, and castle nut back onto the axle spindle in the reverse order from when they were removed.
   - Torque the castle nut to 50 ft-lbs while rotating the hub.
2. Loosen the castle nut:
   - After tightening, loosen the castle nut back off the torque.
3. Tighten the castle nut:
   - Tighten the castle nut finger tight until it is snug.
4. Insert the cotter pin:
   - Insert the cotter pin. If the pin doesn’t align with the hole, slightly back off the castle nut until the pin can be inserted.

5. Secure the cotter pin:
    - Bend the cotter pin to lock the nut in place ensuring it remains free to move but secure with the cotter pin.

9.9 Brake Lubrication

Prior to reassembling brake components, apply a thin layer of lubricant or a comparable grease or anti-seize compound to the brake anchor pin, actuating arm bushing, and pin, as well as to the backing plate sections that contact the brake shoes and magnet lever arm. It is also important to apply a light coat of grease to the actuating block situated on the actuating arm.

⚠ CAUTION

Do not get grease or oil on the brake linings, drums, or magnets.

9.10 Bearing Maintenance

Apex Axle bearings should be periodically inspected as instructed below to ensure no premature or excessive wear is present. Axle bearings play a major role in the performance and life of your axle(s). Checking the bearings regularly helps prevent major axle failure. Regularly injecting grease or oil in the grease fittings of your axle(s) will improve the performance and life of your axle(s), although necessary, doing so will not prevent all performance issues. Ensure your trailer is properly lifted and secured before performing any maintenance on axle(s).

9.11 Bearing Inspection (Inner & Outer)

Routine inspection of bearings helps identify early wear and prevent failure. Bearings should appear like new to be reused.

Important notes:

- Matched sets: Bearings (cones) and cups must always remain paired and replaced as a set.
- The brake drum's inner surface should be re-machined if wear exceeds 0.030 inches or if it is out-of-round by more than 0.015 inches. Replace the drum if wear is greater than 0.090 inches.

Inspection procedure:

1. Wash all grease from bearing cones using a suitable solvent.
2. Dry bearings with a lint-free cloth.
3. Inspect for pitting, spalling, corrosion, flat spots, or discoloration. Replace any defective cone and cup as a matching set.
4. Use a clean area to handle bearings to prevent contamination.

9.12 Race and Bearing Cup Removal and Installation

When necessary, replacing the bearings and races in pairs is important to avoid premature failure.

1. Using a flat surface, lay the hub and race that are needing removal, facing downward.
2. Dislodge the race by using a soft brass punch and tapping around the top surface.
3. Thoroughly clean the hub to remove all lint, metallic flakes, or debris.
4. Wash all grease and oil from the bearing cone using a suitable solvent. Dry the bearing with a clean, lint-free cloth and inspect each roller completely.
5. If any pitting, spalling, or corrosion is present, replace the bearing. The bearing cup inside the hub must be inspected.
6. Use a soft brass punch to install the new race. Ensure the race is fully seated in the hub.

10.0 Brake and Idler Hub Installation

After completing bearing inspections and replacements, follow these steps to reassemble the hub:

1. Ensure both bearing cups are securely seated in the hub bores.
2. Pack bearings with fresh grease (replace grease every 36,000 miles or 12 months). Machine packing is preferred, but hand packing is acceptable.
3. Install the inner bearing cone and grease seal.
4. Slide the hub onto the axle spindle, ensuring a proper fit.
5. Continue assembly per torque and safety guidelines in the manual.

⚠ CAUTION

Never mix lithium, calcium, sodium, or barium complex greases, as mixing incompatible greases can form corrosive or toxic compounds that pose serious health risks, including skin and lung exposure.

Always ensure all old grease is removed before applying a new type.

Hand-packing the inner bearing cone:

1. If the inner bearing cone is reusable, place a generous amount of grease into your palm. Select an appropriate grease rated for the wheel's operating temperature (refer to Recommended Wheel Bearing Grease Specifications on page 60).
2. Press the widest end of the bearing into the grease pile, forcing the grease between the rollers. Repeat for each roller until all are fully coated with grease.
3. Apply a light coat of grease onto the bearing cup (race) surface.
4. Install the grease-packed bearing.

NOTE

If the previously removed inner bearing cone cannot be reused, obtain a new one.

10.1 Grease Seal Installation

Bostail recommends replacing the grease seal whenever bearing packing is required.

Installation steps:

1. Place a new grease seal into the hub's seal bore.
   - Apply a light film of sealant around the outer rim of the seal.
   - Ensure the seal is set squarely before pressing it into place to avoid damage.
2. Use a clean hardwood block and hammer to drive the seal into the seal bore.
   - Tap evenly around the seal to ensure it seats squarely without damaging the seal or the hub.
3. Continue tapping until the seal's outer face is flush with the hub's seal bore face.

10.2 Periodic Bearing Inspection

A physical bearing inspection should be conducted every 36,000 miles or 12 months, whichever comes first.

Inspection steps:

1. Bearings should appear brand-new if reusable.
   - Inspect for discoloration, pitting, corrosion, flat spots, or any abnormal condition.
   - If any imperfections are found, both the bearing and race should be replaced as a matched set.
2. Tighten the oil cap to 25 ft-lbs, ensuring it is not over-tightened to prevent oil leaks.

Refer to pages 31-32 for more detailed inspection steps.

10.3 Spindle Nut Adjustment

Follow this method for proper spindle nut assembly:

1. After installing the hub onto the spindle, install the outer bearing.
2. Install the spindle washer (if applicable), and thread the spindle nut with the slots facing outward.

3. Tighten the spindle nut with slip joint pliers to approximately 50 ft-lbs.
4. Back off the nut by 1/4 turn, then finger-tighten it.
5. Align the nut's slit with the hole in the spindle, inserting the cotter pin. If alignment is not correct, back off the nut until it is.
6. Bend the cotter pin legs over the end of the spindle, ensuring they don't interfere with the oil cap during assembly.

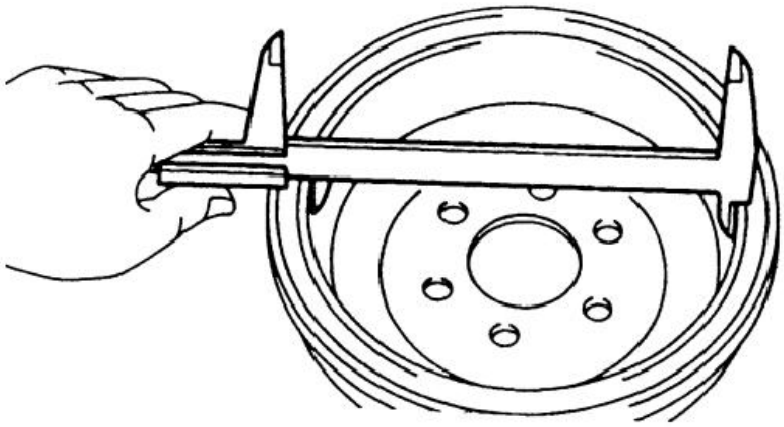
11.0 Brake Shoes, Drums, and Magnet Wear

Brake shoes contact the drum's inner surface, while the brake magnet engages with the armature. These surfaces are subject to wear and should be inspected periodically.

11.1 Brake Drum Specifications

Maximum re-bore diameter:

- 10-inch Drum: 10.09 inches.
- 12-inch Drum: 12.09 inches.

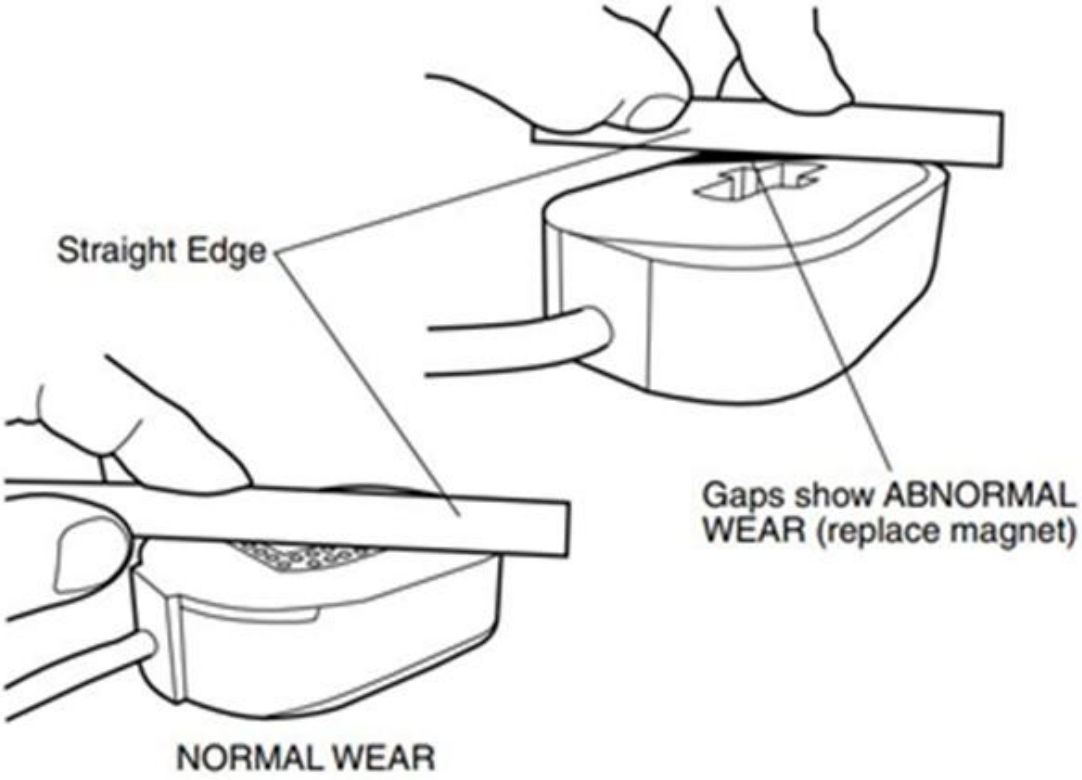


NOTE

- ***The armature surface (inner drum surface where the magnet contacts) must not be machined more than 0.030 inches.***
- ***Replace magnets whenever the armature surface is refaced. Similarly, replace the armature surface whenever a magnet is replaced.***

11.2 Brake Magnets Inspection and Replacement

The electromagnets in your electric brakes are of high quality and designed to deliver optimal input force and friction characteristics. Therefore, it is necessary to inspect the magnets periodically to ensure abnormal wear or damage is not present and to replace them if there is any unusual or uneven wear. The use of a straight-edge can help detect any signs of wear, as shown in the illustration below.



It is advisable to replace the magnets, even if wear is normal as indicated by the straightedge, when any part of the magnet coil is visible through the friction material facing. Along with visually inspecting the magnets, use a voltmeter to ensure the magnets are drawing the correct amperage. Allowed amperage ranges are listed on pages 46-47 of this manual. Additionally, when replacing magnets, you should refinish the drum armature surface (refer to page 28 for *Brake Drum Inspection)*. Always replace magnets in pairs on both sides of an axle and use only genuine Apex replacement parts. The magnet replacement kits listed below include specific part numbers for replacement.

Electric Brake Size	Part Number	Description
10-inch	300400005	ELECTRIC BRAKE RH 3.5K
10-inch	300400006	ELECTRIC BRAKE LH 3.5K
12-inch	300400001	ELECTRIC BRAKE RH 5.2K
12-inch	300400002	ELECTRIC BRAKE LH 5.2K
12-inch	300400001	ELECTRIC BRAKE RH 7K
12-inch	300400002	ELECTRIC BRAKE LH 7K
12-inch	300400001	ELECTRIC BRAKE RH 8K
12-inch	300400002	ELECTRIC BRAKE LH 8K
12 ¼-inch	300400009	ELECTRIC BRAKE RH 10K
12 ¼-inch	300400010	ELECTRIC BRAKE LH 10K
12 ¼-inch	300400007	ELECTRIC BRAKE RH 12K
12 ¼-inch	300400008	ELECTRIC BRAKE LH 12K

The electromagnets used in the Bostail Electric Braking System are crucial for proper operation. They should be inspected annually under normal use and more frequently with extensive use. Follow these steps:

1. Use a straight edge to check the surface of the electromagnet for uneven wear. The surface should be flat. If gaps are seen, the electromagnet needs replacing.
2. If the coil is exposed or shows any damage, replace the electromagnet immediately.
3. If replacing an electromagnet on one side of an axle, replace the other magnet on the opposite brake assembly to ensure even braking capacity.

11.3 Brake Shoes and Linings Inspection and Replacement

Inspection steps:

1. Check for grease or oil. Inspect the brake shoes and linings for any grease or oil contamination.
2. Look for surface scoring, pitting, or gouges. These physical damages may affect the braking efficiency and should be addressed.
3. Replace both shoes if necessary.
    - If one shoe is contaminated with lubricant or shows physical damage, replace both shoes (two on each brake, four on both brakes on the same axle).
    - Replacing both shoes ensures even braking capacity.
4. Measure lining thickness.
    - The lining thickness should not be less than 1/16 inch.
    - If the lining is less than 1/16 inch, replace the shoe.
    - Ensure to repeat the inspection on all brake shoes.
5. Heat cracks. Heat cracks are normal and typically do not require attention.

11.4 Burnishing-In the New Shoes and Linings

After replacing the brake shoes and linings, the system should be burnished-in.

1. Apply the brakes 20-30 times while gradually decreasing speed from 40 mph to 20 mph.
2. Allow ample time for the brakes to cool between applications to ensure proper seating or the brake shoes and magnets on the brake drum.

⚠ CAUTION

Always wear protective gear to prevent inhalation of brake dust.

12.0 Electric Brake Overview

The basic structure of the electric brakes on your trailer is similar to those on your tow vehicle. With one key difference: your trailer uses an Electric Actuation System, whereas the tow vehicle employs a hydraulic system.

Electric Braking System Steps:

1. When the tow vehicle's brakes are applied, electrical current is supplied to the trailer's braking system.

2. Electricity flows from the tow vehicle's battery to the brake's electromagnet.

3. Once energized, the magnets are attracted to the rotting surface of the drums.

4. This causes the actuating levers to move in the direction the drums are turning.

5. The actuating cam at the end of the shoe forces the primary shoe to engage with the drum surface.

6. The force from the primary shoe engages the secondary shoe to contact the drum.

7. The braking force is increased by increasing the current flow to the magnet.

12.1 How to Use Electric Brakes Properly

The Electric Braking System is synchronized with the tow vehicle's brakes.

⚠ CAUTION

Never attempt to stop the combined load of the tow vehicle and the trailer using only the tow vehicle or trailer brakes; they are designed to work together.

Small adjustments may occasionally be necessary to accommodate changing loads and driving conditions. Synchronization can only be verified through road testing. Common issues like locking up, excessive grabbing, or delayed application are often due to lack of synchronization. These can be corrected by adjusting the voltage or fixing brake settings.

12.2 Burnishing-In the Brakes

Before making any adjustments, it is recommended to burnish-in the brakes by applying them 20-30 times, decreasing speed from 40 mph to 20 mph. Allow time for brakes to cool between applications to allow the brake shoes and magnets to seat to the drum surface properly.

12.3 Brake Adjustment Process

Adjust brakes in the following manner: at the first 200 miles of operation when the brake shoes and drums have "seated," and at 3000-mile intervals thereafter, or as use and performance require.

Electric brakes come with manual and automatic adjustments. If manual adjustment is needed, follow these steps:

1. Lift the trailer using an appropriate jack and secure it on jack stands. Ensure the wheel and drum rotate freely.

⚠ CAUTION

Always work in a clear area free of people and vehicles. Make sure the trailer is supported correctly, not just by the axle or suspension.

2. Remove the adjusting hole cover from the brake backing plate.
3. Use a screwdriver or adjusting tool to rotate the starwheel of the adjuster assembly. Expand the brake shoes until the wheel is difficult to turn, indicating that the shoes are pressing against the drum.
4. Rotate the starwheel in the opposite direction until the wheel turns freely with slight lining drag, or after approximately ten (10) click adjustments.
5. If working with self-adjusting brakes, use a second screwdriver to move the auto-adjusting lever away from the starwheel to enable backward rotation.
6. Replace the adjusting hole cover and lower the wheel.
7. Repeat the adjustment process for each brake.

NOTE

For uniformity, adjust all brakes to the same clearance.

12.4 Lubricating Brakes

Before reassembling the brake drum assembly, apply a light film of white grease or anti-seize compound to:

- The brake's anchor pin.
- The actuating arm bushing of the pin.
- Areas of the backing plate that contact the brake shoes and magnet lever arm.
- The actuating block mounted to the actuating arm.

12.5 Cleaning and Inspecting Brakes

If any issues are detected, such as improper brake application or failure, immediate inspection and service is required. Regular servicing should occur annually under normal use, or every 3,000-6,000 miles under heavy use. Follow this cleaning procedure:

1. Clean the backing plate, magnet arm, magnet, and shoes.
2. Ensure all parts are returned to their proper positions after cleaning.
3. Inspect for any worn or loose parts and replace or service them as necessary.

13.0 Electric Brake Troubleshooting

Electric brake malfunctions that cannot be remedied through brake or synchronization adjustments are often attributable to electrical system failure. Mechanical issues are usually visible, such as bent or broken parts, worn linings or magnets, seized lever arms or shoes, scored drums, or loose components. The troubleshooting process for electrical issues should always begin at the controller. Improperly adjusted or malfunctioning controllers are often the cause of brake harshness or malfunction. Refer to the controller manufacturer's data for proper adjustment and testing procedures. Also, see the section in this manual, "Troubleshooting Guide," starting on page 65, for more information about pinpointing the cause of trailer brake system failure.

The most frequent electrical issue in the electric brake system is the lack of voltage and amperage at the brakes. The following are the common reasons for this condition:

1. Faulty electrical connections.
2. Open circuits.
3. Inadequate wire size.
4. Broken wires.
5. Blown fuses (brake fusing is not recommended).
6. Improperly functioning controllers or resistors.

Another common issue in the electric brake system is shorted or partially shorted circuits. This is often indicated by abnormally high system amperage and can be challenging to detect. Possible causes include:

1. Shorted magnet coils.
2. Defective controllers.
3. Bare wires coming into contact with a grounded object.

Proper troubleshooting of electric brake malfunction requires essential tools such as a voltmeter and ammeter to measure system voltage and amperage accurately.

Common troubleshooting tips:

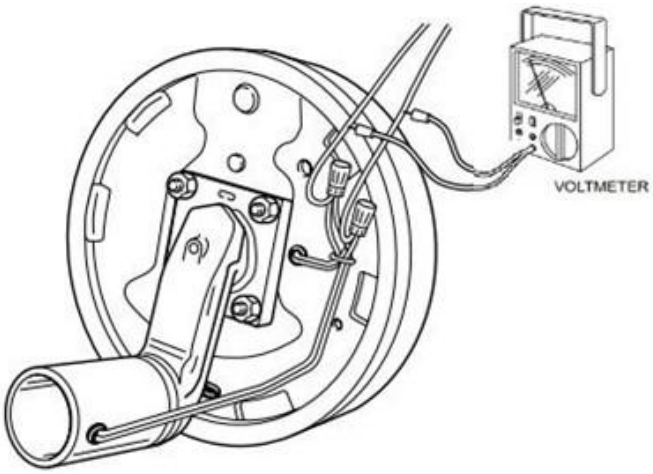
- Mechanical issues with the brake system are usually self-evident (e.g., parts may be bent or broken).
- If the problem is mechanical, use the Troubleshooting Chart to identify the probable cause and take corrective actions.
- Always use Bostail replacement parts when addressing mechanical issues.

Electrical problems:

- If the malfunction isn't mechanical, the issue is likely electrical (e.g., wiring problems or issues with the brake magnets).
- Check the wiring plug connections, ensure solid contact with the coupler, and use dielectric grease to prevent poor connections.

13.1 How to Measure Voltage

When measuring the electrical system voltage at the magnets, connect a voltmeter to the two (2) magnet lead wires of any brake. This can be done by using a pin probe to puncture the insulation of the wires that drop down from the chassis or by cutting the wires. Check the voltage with the engine of the towing vehicle running to ensure that a low battery does not affect the readings.

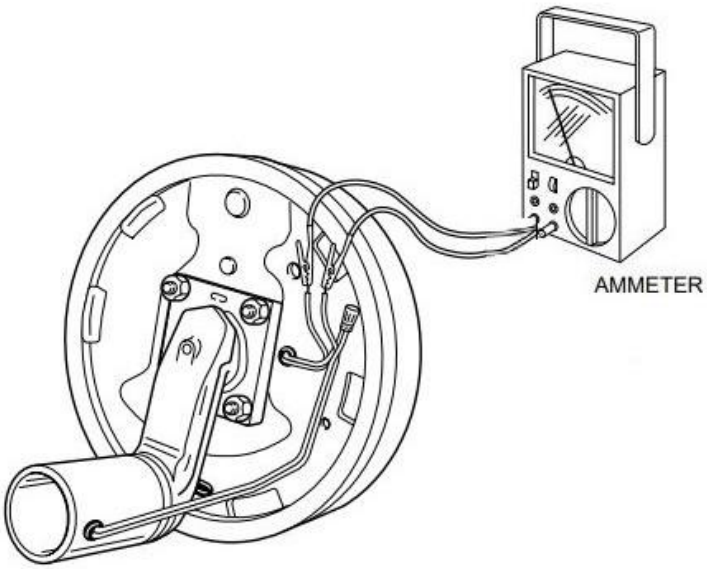


The voltage in the system should start at zero and gradually increase to around twelve (12) volts as the controller bar is slowly actuated by gradually increasing brake pedal pressure, a process known as modulation. If there is no modulation, it means that when the controller starts to apply voltage to the brakes, it immediately applies a high voltage that results in the brakes exerting instant maximum power, producing a harsh braked stop and potential wheel lockup.

The initial voltage that is applied to the brakes when the controller is activated is known as the threshold voltage. Smoother brake operation is achieved with a lower threshold voltage. Heavy-duty controllers are often set with a threshold voltage exceeding two (2) volts, which can result in harsh and aggressive brakes.

13.2 How to Measure Amperage

When checking the system amperage, ensure that the engine of the towing vehicle is running since it depicts the amperage being drawn by all brakes on the trailer.



To measure system amperage, disconnect the BLUE wire of the controller, which is the output to the brakes, and put the ammeter in series into the line. The amperage draw should match the values in the following chart. Ensure that the ammeter has sufficient capacity and note polarity to prevent damage. If a resistor is present in the brake system, it must be set at zero or bypassed completely to obtain the maximum amperage reading.

To measure individual amperage draw, insert the ammeter in the line at the magnet you wish to check. Disconnect one (1) of the magnet lead wire connectors and attach the ammeter between the two (2) wires. Once the testing is completed, ensure that the wires are reconnected properly and sealed.

To isolate a system short suspected of causing electrical brake malfunction, the high amperage reading must be located. If unplugging the trailer causes the high reading to drop to zero, the short is in the trailer. However, if the amperage reading remains high even with all brake magnets disconnected, the short is in the trailer wiring.

If voltage and amperage are not satisfactory, proceed to the connector and then to the individual magnets to isolate the problem source. A 12-volt output at the controller should equate to a minimum of 10.5 volts at each magnet. The nominal system amperage at twelve (12) volts, with magnets at normal operating temperatures (not cold), system resistor at zero, and controller at maximum gain should be as specified in the following chart:

Brake Size	Amps/ Magnet	Two Brakes	Four Brakes	Six Brakes	Magnet Ohms
7 x 1-1/4 inch	2.5	5.0	10.0	15.0	3.9
10 x 1-1/2 inch	3.0	6.0	12.0	18.0	3.2
10 x 2-1/4 inch	3.0	6.0	12.0	18.0	3.2
12 x 2 inch	3.0	6.0	12.0	18.0	3.2
12-1/4 x 2-1/2 inch	3.0	6.0	12.0	18.0	3.2
12-1/4 x 3-3/8 inch	3.0	6.0	12.0	18.0	3.2

Symptom	Probable Cause	Corrective Action
No Brakes	Open Circuits	Find & Correct
	Severe Under-Adjustment	Adjust Brakes
	Faulty Controller	Test & Correct
	Short Circuits	Find & Correct
Weak Brakes	Grease or Oil on Magnets or Linings	Clean or Replace
	Corroded Connections	Clean & 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	Refurbish or Replace
	Overloaded Trailer	Correct
Locking Brakes	Under-Adjustment	Adjust
	Improper Synchronization	Correct
	Faulty Controller	Test & Correct
	Loose, Bent, or Broken Brake Components	Replace Components
	Out-of-Round Brake Drums	Machine or Replace
	Insufficient Wheel Load	Adjust System Resistor and Synchronize
Intermittent Brakes	Faulty Controller	Test & Correct
	Broken Wires	Repair or Replace
	Loose Connections	Find & Repair
Brake Pull to One Side	Incorrect Adjustment	Adjust
	Grease or Oil on Magnets or Linings	Correct
	Improper Controller	Change
	Faulty Controller	Test & Correct
Harsh Brakes	Under-Adjustment	Adjust
	Improper Synchronization	Lubricate
	Improper Controller	Change
	Faulty Controller	Test & 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 Magnets or Linings	Clean or Replace
	Our-of Round or Cracked Brake Drums	Machine or Replace
	Faulty Controller	Test & Correct
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

14.0 Axle and Suspension Inspection and Installation

The most important part of axle installation is ensuring the axle(s) are square to the trailer's centerline. If the axle is mounted out of square, the trailer may exhibit a dog-tracking effect, causing it to swing left or right until the axle aligns with the direction of travel.

14.1 Axle Alignment Process

1. Set the first axle square.

   When installing multiple axles, ensure the first axle is aligned square to the trailer frame. This can be done by measuring from the center of the hitch to the center of the axle spindle.

2. Align remaining axles.

   After aligning the first axle, set the remaining axles parallel to it to ensure proper alignment and trailer control.

14.2 Proper Alignment Ensures

1. Correct and safe control.
2. Prolonged tread life.
3. Prevention of dog-tracking.

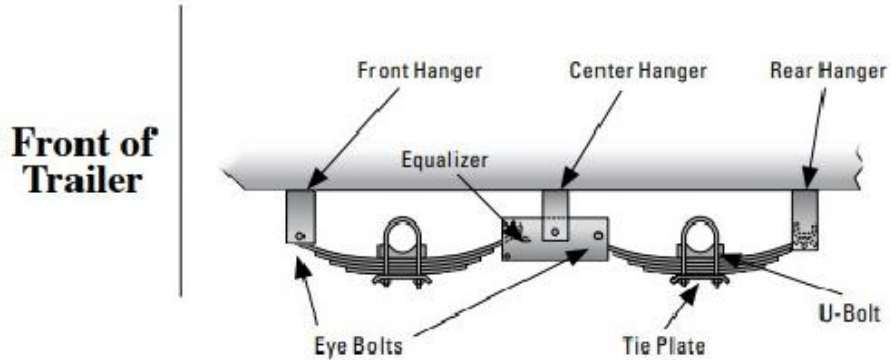
14.3 Bostail's Apex Axles

1. Apex axles are made from high-strength steel to prevent metal fatigue.
2. The round tubular design allows for even and uniform structure, providing the best welding conditions.

Apex also manufactures and provides suspension components for trailer axles. Apex suspension systems are designed to work for your trailer and towing vehicle to deliver a smooth towing experience.

14.4 Inspecting Suspension Components

Periodically inspecting the trailer's suspension components is crucial to identify potential safety issues before they result in catastrophic failure.



14.5 Spring Replacement

The removal and replacement process of the trailer springs is listed below:

1. After the trailer has been properly and safely lifted and secured, position another jack stand or block under the axles at the end needing repair. These jack stands or blocks are only intended to remove the load from the axle(s) needing repair. They should not support the entire trailer.
2. Remove the tie plates from the axle by first removing the U-bolts.
3. Take out the eye bolts from the springs and then slide the spring out.
4. If necessary, use a C-clamp or vice to press out and replace the worn bushing(s). Use a vice or C-clamp to press the replacement bushings back into place.
5. Procedure for reinstallation of replacement springs is the reverse of removal.

14.6 Replacing the Equalizer

Use the instructions below to remove the equalizer bar or related components.

1. After the trailer has been properly lifted and secured, position another jack stand or block under the axles at the end needing repair. These jack stands or blocks are only

intended to remove the load from the axle(s) needing repair. They should not support the entire trailer.

2. Take out the spring eye bolts and equalizer bolts.
3. Disconnect the equalizer bar.
4. If necessary, use a C-clamp or vice to press out and replace the worn bushing(s). Use a vice or C-clamp to press the replacement bushings back into place.
5. The procedure for reinstallation of the equalizer bar is the reverse of removal. Use new lock nuts to secure the equalizer bar in place. Follow torque specifications found on pages 59-60.

⚠ CAUTION

Failure to appropriately raise and secure the trailer may cause serious injury or death.

15.0 Trailer Braking and Suspension System Maintenance Checklist

To maintain the safety and efficiency of your trailer, regular inspection and maintenance are required. Below is a maintenance schedule that specifies the function to check, the required frequency, and the items that need attention.

Item	Function	Required Maintenance
Brakes	Test to verify brakes are operational.	At Every Use
Brake Adjustment	Adjust to proper operating clearance.	Every 3,000 Miles
Brake Magnets	Inspect for wear and current draw.	Every 3,000 Miles
Brake Lining and Pads	Inspect for wear or contamination.	Every 3,000 Miles
Hub/Drum and Rotors	Inspect for abnormal wear or scoring.	Every 3,000 Miles
Wheel Bearing	Inspect for corrosion or wear. Clean and repack.	Every 3,000 Miles
Seals	Inspect for leakage. Replace if removed.	Every 3,000 Miles
Springs	Inspect for wear and loss of arch.	Every 3,000 Miles
Suspension Parts	Inspect for bending, loose fasteners, or wear.	Every 3,000 Miles
U-bolts	Tighten to specified torque values.	Every 3,000 Miles

Additional notes:

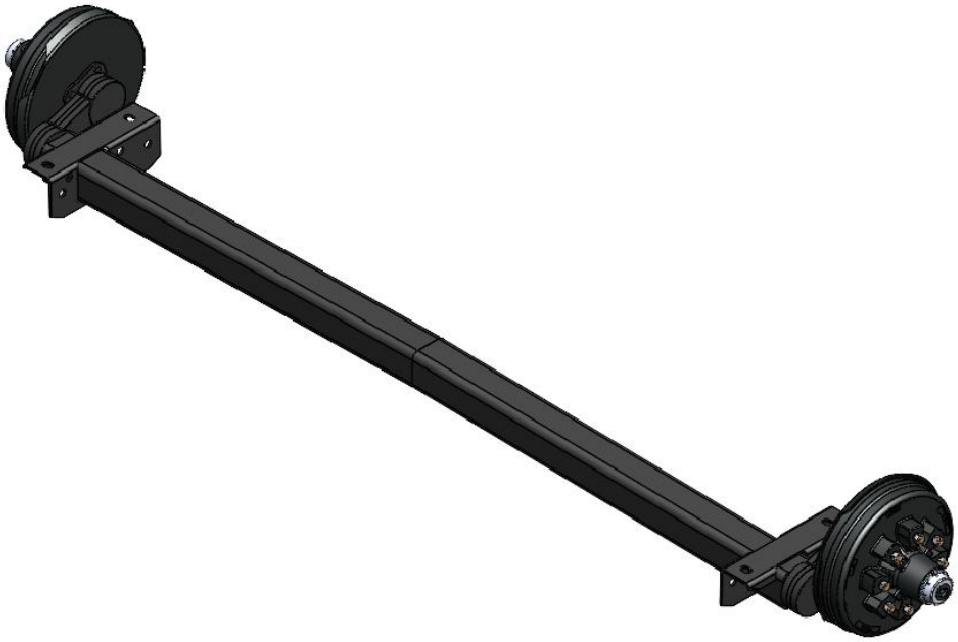
- Brakes should be tested at every use to ensure they are functioning properly.
- Oil levels in hubs should be checked regularly to avoid overheating or friction damage.
- Brake components like magnets, linings, and pads should be inspected every 3,000 miles or 12 months, whichever comes first.
- Hub, drum, rotors, and wheel bearings require inspection for wear, corrosion, and contamination, and should be cleaned and repacked as needed.
- Seals, springs, and suspension parts should be inspected for damage, leakage, or wear, and U-bolts should be torqued to the specified values to prevent any loosening during use.

This maintenance checklist will help ensure that your trailer’s braking and suspension system remains in top condition for safe operation.

16.0 Torsion Suspension System

The Bostail Torsion Suspension System provides enhanced performance compared to traditional leaf spring technology, offering superior qualities such as:

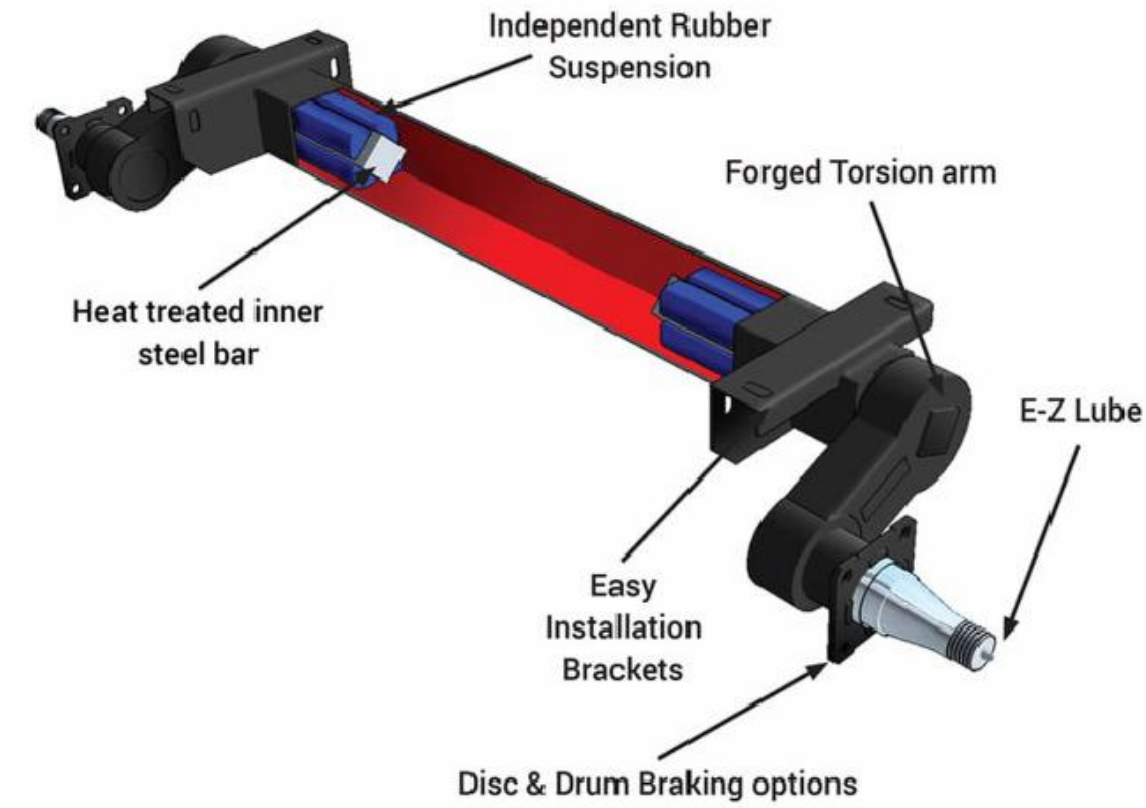
- Independent Wheel End Suspension: Each wheel is independently suspended, providing a smoother ride and reducing the effects of road irregularities.
- Quieter Ride: The torsion system operates with less noise, offering a more comfortable and peaceful experience for those using the trailer.
- Increased Vertical Wheel Travel: This system allows for more vertical wheel movement, contributing to a softer, smoother ride.
- Durability and Low Maintenance: The torsion suspension system requires very little maintenance, as it has fewer moving parts compared to leaf spring systems.



16.1 System Design

- The torsion system is bracketed to the trailer's frame and housed inside the axle tube.
- The axle tube contains a spindle connected to a swing arm, which is linked to a square inner bar. The bar is surrounded by four rubber cords inside the axle tube.

- As the swing arm rotates due to torque from driving conditions, the rubber cords absorb and distribute resistance loads, providing improved suspension performance.



16.2 Installation

When installing the Torsion Suspension System:

1. Mount the axle bracket to the frame bracket:
   - Attach the axle bracket to the frame bracket as shown in the installation diagram.
2. Torque fasteners:
   - Secure the fasteners according to the Torsion Axle Torque Specifications chart to ensure proper installation.
3. Washer placement:
   - Ensure that washer(s) are placed against the slotted hole in the axle bracket.
   - For low-profile brackets, the holes are plain and round.

16.3 Suspension System Inspection

It is crucial to conduct regular inspections of the suspension system to ensure safe and efficient performance. The Bostail Torsion Suspension System should be inspected annually or every 36,000 miles, whichever comes first. Below is a guide for inspecting the suspension system.

Inspection steps:

1. Visual inspection:
    - Check all suspension components for signs of wear damage, or deformation.
    - Look for cracks, chafing, or any damage to the rubber cords, spindle, swing arm, and the axle tube.
    - Ensure there is no loose hardware or missing fasteners.
2. Fasteners:
    - Tighten any loose fasteners and replace those that are worn or damaged.
    - Follow the torque specifications provided in the Spring Axle Torque Specifications and Torsion Axle Torque Specifications table to ensure the fasteners are correctly torqued.
3. General check:
    - Ensure that the system is securely mounted to the frame and that all connections are intact.
    - Inspect the swing arm, axle brackets, and other suspension elements for smooth movement and proper alignment.

Key areas to focus on:

1. Rubber cords.

    Check for signs of cracking or excessive wear, as the rubber absorbs the majority of the shock.

2. Swing arm.

    Ensure the swing arm rotates freely and is securely connected.

3. Axle and bracket connections.

   Ensure that the axle is properly aligned and mounted to the frame without signs of movement.

By following these inspection procedures, you can maintain the effectiveness of the suspension system and ensure the safety and longevity of your trailer.

16.4 Suspension System Component Replacement

When servicing or replacing suspension components, it's important to follow proper procedures to ensure safety and preserve the integrity of the system. Here's a step-by-step guide on replacing worn spring eye bushings and damaged or broken springs.

Preparation and safety:

Lift the trailer

- Lift the trailer by the frame, not by the axle or suspension.
- Never work under an unsupported trailer. Always use jack stands to properly secure the trailer before working underneath it to prevent injury or death. Unsupported trailers can fall causing severe damage to the frame, axles, suspension system, and other components.
- Wear eye protection to protect your eyes from debris or parts when servicing axles, brakes, hubs, springs, and wheels.

Step-by-step process:

1. Support the trailer:
   - Lift the trailer and support it with jack stands according to the trailer manufacturer's recommendations.
   - Place a suitable block under the axle tube near the area to be repaired. The block will support the axle's weight, allowing the suspension components to be serviced freely.
   - For multi-axle trailers, ensure the weight of each axle is supported before disassembling any suspension system component.
2. Disassemble suspension components:

- Remove U-bolts, nuts, and tie plates that secure the suspension system components.
- Remove spring eye bolts and the spring assembly.

3. Replace spring eye bushings (if applicable):
   - If the spring eye bushings need replacement, press out the old bushing sung your hands or a punch tool.
   - Use a new free-floating nylon bushing which does not require lubrication.
   - Press the new bushing into the spring eye by hand, or gently tap it into place using a bounce-less rubber or plastic mallet.
4. Reassemble suspension components:
   - Install the repaired or new suspension components in the reverse order of disassembly.
   - Ensure all components are securely fastened and torqued to the manufacturer's specifications.

Final check:

- After reassembling the suspension system, ensure all parts are properly aligned and tightened.
- Perform a visual inspection for any loose components or signs of damage before lowering the trailer.

17.0 Wheels and Tires

17.1 Tire Tread Wear Patterns

Certain wear patterns on your tires can indicate problems with the braking system or alignment. Here's how to recognize and address these issues.

Wear Pattern		Cause	Action
	**Center Wear**	Over inflation	Adjust pressure to particular load per tire catalog.
	**Edge Wear**	Under inflation	Adjust pressure to particular load per tire catalog.
	**Side Wear**	Loss of camber or overloading	Make sure load doesn't exceed axle rating. Align at alignment shop.
	**Toe Wear**	Incorrect toe-in	Align at alignment shop.
	**Cupping**	Out-of-balance	Check bearing adjustment and balance tires
	**Flat Spots**	Wheel lockup & tire skidding	Avoid sudden stops when possible and adjust brakes.

Tire maintenance tips:

- Check tire pressure weekly for optimal tire and tread life.
- Inspect tire tread wear patterns frequently to avoid serious alignment or load issues.

It is imperative that the correct torque values are used and the prescribed lug nut tightening pattern is followed on wheel lug nuts. Ensure that wheel mounting pilot diameters are accurate on hub-piloted wheels.

1. Align the wheel bolt holes with the axle threads and slide the wheel over them.
2. Hand-tighten all lug nuts to prevent cross-threading.
3. Tighten lug nuts to proper torque values after all lug nuts have been “snugged” in accordance with the sequential tightening pattern shown.

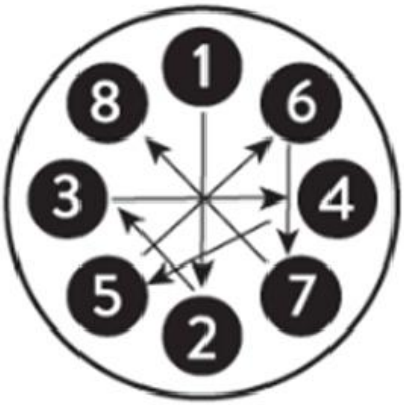
⚠ CAUTION

Failure to properly torque lug nuts can result in personal injury or death.

⚠ CAUTION

Failure to select the proper wheel pilot can result in personal injury or death.

17.2 Lug Nut Tightening Pattern



8 Lug Tightening Pattern

17.3 Torque Requirements for Suspension Components

Item	Size	Torque (Ft. Lbs)
U-Bolt 7K	½ inch – 20	60-90
Spring Eyebolt	¾ inch – 16	0-1/16 inch End Play
Equalizer Bolt 7K	1 inch – 8	0-1/16 inch End Play
Brake Nuts	½ inch – 20	70-100
Lug Nuts	7K	90-120

18.0 Grease Specifications

Use this guide to select the proper high-quality lithium grease for maintenance on your axle(s).

Lithium-Based Grease Specification Sheet:

Specification	Characteristic
NLGI Grade #	2
NGLI Certified, ASTM D 7950	GC-LB
Dropping Point (ASTM D 2265)	500°F
Color	Blue/Red
Thickener	Lithium Complex
Viscosity	80
Additives	EP/Anti-wear, Rust, and Oxidation Inhibited

19.0 Extended Storage

19.1 Storage Preparation

If your trailer is to be stored for an extended period of time, the trailer will need to be prepared prior to going into storage. Follow these guidelines to set up your trailer for storage:

1. Emergency breakaway battery.

- If your trailer has an emergency breakaway battery, remove it and store it inside in a dry, temperature-controlled location.
- Charge the battery at least every 90 days during storage to ensure it remains in good working condition.

2. Lift the trailer.
   - Jack up the trailer and place jack stands under the trailer frame to keep the weight off the tires.
   - Always follow the manufacturer's guidelines for lifting and supporting the trailer.
3. Lubricate moving parts.

   Lubricate all mechanical moving parts, such as the hitch and suspension parts, to prevent weather-related wear and corrosion.

Additional notes:

- Refer to your trailer's manufacturer's specifications for proper lifting points to support your trailer while in storage. Stowing your trailer on lift points and not the tires will greatly prolong the life of tires while not in use.
- If at any point your axle(s) become immersed in water, it is essential that you remove hubs and thoroughly clean and lubricate bearings. Follow the re-installation instructions above.

19.2 Storage Inspection

When the trailer is placed on jack stands during storage, follow these steps to ensure everything is in proper condition:

1. Remove wheels and hubs or brake drums.

   Remove all wheels and brake drums (if applicable), then reinstall the drums to the same spindle and brake from which they were removed.

2. Inspect suspensions.

Inspect the suspension system for signs of wear or damage.

3. Check suspension fasteners.

   Tighten hanger bolts, shackle bolts, and U-bolt nuts to the correct torque specifications.

4. Inspect brakes.

   Check brake linings, brake drums, and armature faces for excessive wear, scoring, damage, or corrosion.

5. Test brake magnets.

   Use an ohmmeter to check brake magnets. They should read around 3.2 ohms. If the reading is lower or higher, the magnets may be worn or shorted and need to be replaced.

6. Lubricate brake moving parts.

   Apply a high-temperature brake lubricant to all moving brake parts to keep them functioning smoothly.

7. Clean brake drums.

   Remove any rust or contamination from the braking surfaces and armature surfaces of the drums using fine emery paper or crocus cloth. Be sure to protect bearings from dust and debris.

8. Inspect oil or grease seals.

   Check for any signs of wear or damage on the oil or grease seals. If necessary, replace them to avoid leaks.

9. Lubricate hub bearings.

   Lubricate the hub bearings to prevent wear and corrosion.

10. Reinstall hubs and adjust bearings.

    Reinstall the hubs, adjust the bearings to the correct specifications, and tighten the wheels properly.

Important notes:

- Do not get grease or oil on brake linings, pads, or magnet surfaces, as this could impair braking performance.
- Inspection and lubrication during storage will help ensure that your trailer is ready for use when needed and prevent issues that could arise from long-term storage.

19.3 After Storage

1. Inspect bushings and suspension components for loose bolts or signs of wear.
2. Disconnect brake drums, inspect for wear, and use an emery cloth to remove the oxidation if present.
3. Thoroughly inspect the brake system(s) for signs of wear such as excessive movement of parts, worn magnets, cracked linings, and oxidation. Clean and replace, as necessary.
4. Remove seal(s) and check bearings and races for wear/oxidation.
5. Replace seal(s) and follow the re-assembly of drum instructions.
6. Mount wheels and torque according to torque requirements set out on pages 59-60.

19.4 Trip Preparation Checklist

Before starting any trip with your trailer, it's essential to ensure that the trailer is properly maintained, load-ed, and ready for safe travel. Use this checklist to prolong the life of your trailer's running gear and ensure a safe and smooth journey:

1. Maintenance schedule:
   - Ensure the maintenance schedule is up-to-date, and all maintenance tasks are completed.

2. Inspect the hitch:
    - Check the hitch for any signs of corrosion, wear, or insufficient lubrication. Proper hitch function is critical for safe towing.
3. Safety chains:
    - Inspect the safety chains for rust and wear.
    - Ensure that the chains are properly engaged, and the breakaway switch actuating chain is secure.
    - Charge the breakaway battery to ensure it is fully functional.
4. Electronic coupler and lights:
    - Confirm that the electronic coupler is secure and properly connected.
    - Perform a check on all trailer lights, including brake engagement and synchronization.
5. Load distribution:
    - Load the trailer so that 10% of the total weight is placed on the hitch. For smaller trailers, increase the front-end load to 15%.
    - Ensure that the load is balanced to prevent swaying or instability during travel.
6. Avoid overloading:
    - Do not exceed the gross vehicle weight rating (GVWR) of the trailer. Refer to the trailer's ID plate for maximum weight limitations.
7. Tire inspection:
    - Ensure that all tires are inflated to the manufacturer's recommended specifications.
    - Inspect tires for damage or excessive wear. Replace any tires that are damaged or worn.
8. Lug nuts/bolts inspection:
    - Inspect lug nuts/bolts to ensure they are properly torqued to the specified valued. Refer to the Wheel Torque Requirements Chart for proper torque limits.

9. Suspension check:
    - Check the torque of hanger bolts, shackle bolts, and U-bolt nuts to ensure they are tight and secure.
    - Verify that the trailer is being towed level. Adjust the hitch height if necessary to maintain a level tow.

Additional tips:

- Allow sufficient time before your trip to carry out any necessary service or repairs. This will ensure a smooth and safe towing experience.
- Double-check everything, from the brake system to tires, as any malfunction could lead to safety hazards during the trip.

20.0 Troubleshooting

Trailers with less than 250 miles on them or less than two (2) weeks old are considered "new." Otherwise, they are considered "used."

NOTE

Some integrated brake controllers will not work with all trailer braking systems. Please review the towing vehicle's owner's manual for guidance.

20.1 Braking

For specifics on troubleshooting electric brake system failures, see troubleshooting tips on page 44 of this manual.

1. Weak or inoperative brakes on new trailer:
    - The trailer brakes might still be in the “burnishing” phase if the trailer still has less than 250 miles on it. Safely monitor brakes to see if their performance improves.
    - Check your towing vehicle’s brake controller and ensure all electrical connections are secure and connected correctly.
    - A voltmeter can be used to ensure proper electric flow when towing vehicle brakes are applied (refer to pages 45-46 on how to properly measure voltage).
    - Ensure the trailer is not overloaded (refer to pages 11-14).
    - Trailer brakes may need to be adjusted (refer to page 42).
    - Check magnet(s) for grease or oil. Clean as necessary.
2. Weak or inoperative brakes on used trailer:
    - Check your towing vehicle’s brake controller and ensure all electrical connections are secure and connected correctly. A voltmeter may be used to measure the electrical draw(s) (refer to pages 45-46).
    - Trailer brakes may need to be adjusted (refer to page 42).
    - See pages 60-65 if the trailer has been stored for longer than three (3) months.
    - Check brake lines for glazing.
    - Excessive wear on magnets.
    - Check magnet(s) for grease or oil. Clean as necessary.
    - Refer to pages 11-14 to ensure proper loading of the trailer and use weigh scales to ensure the trailer is not overloaded.
    - Large static load radius (SLR) Tires.
    - Severely worn or scored brake drums (refer to page 28).
3. Dragging brakes on new trailer:

- Ensure trailer electrical connections, breakaway switch, and brake controller are properly set up.
- Brake adjustment required (refer to page 42).
- Incorrectly mounted brake assembly.
- Loose bearings (refer to pages 31-32).
- Out-of-round drums (refer to page 28).
- Detached brake lines.
- Inspect brake components for debris.

4. Dragging brakes on used trailer:
   - Ensure trailer electrical connections, breakaway switch, and brake controller are properly set up.
   - Brake adjustment required (refer to page 42).
   - Brake lining contamination.
   - Incorrectly mounted brake assembly.
   - Bent spindle.
   - Excessive brake dust in brake drums(s). Brake adjustment is required (refer to page 42).
   - Detached brake lines.
   - Seized brakes. Brake adjustment is required. See page 42. Also, see the prolonged storage section on pages 60-65.
   - Out-of-round drums (refer to page 28).
   - Ensure brake components move freely. Lubricate if needed.
5. Squealing brakes on new trailer:
   - Some brake squeal can be normal in humid environments.
   - Excessive brake dust in brake drums(s). Brake adjustment is required (refer to page 42).
   - Seized brakes. Brake adjustment is required. See page 31. Also, see the prolonged storage section on pages 60-65.

- Inspect brake linings for wear patterns (refer to pages 39-40).
- If brakes also drag after adjustment or with a squeal, refer to “Troubleshooting Guide – Brakes on new trailer drag”.

6. Squealing brakes on used trailer:
   - Some brake squeal can be normal in humid environments.
   - Excessive brake dust in brake drums(s). Brake adjustment is required (refer to page 42).
   - Refer to pages 60-65 if the trailer has been stored for longer than three (3) months.
   - If brakes also drag after adjustment or with a squeal, see “Troubleshooting Guide – Brakes on new trailer drag”.
   - Bent brake shoe.
   - Bent spindle.
   - Ensure brake components move freely. Lubricate if needed.
7. Excessively warm or hot trailer brakes:
   - It is normal to find brake temperatures more than 400℉. New trailer brakes can have different operating temperatures. Monitor brake temperatures to ensure the temperatures align from one hub to another.
   - Check the source of the excessive heat. Ensure it is not the hub portion of the brake assembly. The brake drum should always be hotter than the drum at the oil/grease cap.
   - If dragging or squealing accompanies the excessive heat, see the above section(s).
   - Ensure trailer electrical connections, breakaway switch, and brake controller are properly set up.
8. Brakes on new trailer are locking up:
   - Ensure trailer electrical connections, breakaway switch, and brake controller are properly set up.
   - If the rolling back trailer releases brakes, brakes require adjustments (refer to page 42).

- Inspect the full brake assembly for loose components or foreign debris.
- Ensure the correct installation of brake and axle assembly.
- Potential lining contamination.
- Detached brake lines.
- Loose bearings (refer to pages 31-32).
- Out-of-round drums (refer to page 28).

9. Brakes on used trailer are locking up:
   - Ensure trailer electrical connections, breakaway switch, and brake controller are properly set up.
   - Inspect the full brake assembly for loose components or foreign debris.
   - Ensure the correct installation of brake and axle assembly.
   - Detached brake lines.
   - If rolling back the trailer releases brakes, brakes require adjustments (refer to page 42).
   - Spindle(s) may be bent.
   - Bent brake shoes. Inspect shoe lining for excessive wear (refer to pages 39-40).
   - Out-of-round drums (refer to page 28).
10. Intermittent brake issues on trailer:
    - Ensure trailer electrical connections, breakaway switch, and brake controller are properly set up.
    - Inspect all electrical wires for pinched or broken wires.
    - Brake adjustment required (refer to page 42).
11. Harsh trailer braking:
    - Ensure trailer electrical connections, breakaway switch, and brake controller are properly set up.
    - Brake adjustment required (refer to pages 42).

12. Trailer brakes are surging (grab and release):
    - Brake linings may be contaminated. Inspect the brake shoes for debris (refer to pages 39-40).
    - Inspect brake magnets for grease or oil (refer to pages 36-39).
    - Out-of-round drums (refer to page 28).
    - Ensure trailer electrical connections, breakaway switch, and brake controller are properly set up.

20.2 Bearings and Hubs

1. When towing, excessive vibration occurs:
    - Inspect trailer tires for flat spots, bulges, etc.
    - Vibrations produced by hubs peak at ~50mph. Visually inspect the brake drum for distortions.
    - Measure bearing endplay.
    - Tire tilt: 0.005 inches per inch of tire diameter or less is acceptable.
    - No more than 0.010 inches.
    - If the above possible sources are not present, inspect suspension components for breaks (springs, bushings, U-bolts, etc.).
2. Hub or drum shows signs of excessive heat:
    - Over-torqued spindle nut (refer to pages 34-35).
    - Absence of or incorrect type of grease used (refer to pages 33 and 60).
    - Ensure grease has a dark hue. Pale-colored grease is a sign of water contamination.
3. Dust caps keep falling off:
    - Incorrect installation. Replace, as necessary.

- If new dust cap(s) do not fix the problem, the hub may be defective. Replace hub(s) as necessary.

4. Axle seal(s) leak(s):
   - Seal(s) may be installed incorrectly (refer to pages 27-28).
   - Hub housing has been damaged.
   - The spindle has been damaged. The finish on the spindle(s) should be at or below 100 micro inches.

20.2.1 Suspension

1. Premature wear on rubber bushings:
   - Trailer is or has been overloaded (refer to pages 11-14).
   - Bushing bolts have been incorrectly tightened. Refer to pages 59-60 for proper torque requirements.
   - Ensure hangers and other mounting components are welded correctly.
   - Inspect the bushing housing for excessive wear or damage. Refer to the manufacturer's requirements for bushing holes.
2. Bushing housing is cracked:
   - Trailer is or has been overloaded (refer to pages 11-14).
   - No lubrication on metal-to-metal surfaces. Replacement of components may be necessary and refer to the maintenance schedule for lubrication procedures.
3. Failure of leaf springs:
   - U-bolts are loose. Springs may fail at the center of U-Bolts. Refer to torque requirements on pages 59-60.
   - Corrosion is likely the reason for the failure of many components. This is commonly found in marine applications.
   - It is important to wash all trailer components regularly and remove corrosive debris. (e.g. road salt, salt water, fuel, pooling water on surfaces, etc.).

- Failure from fatigue. Shorter leaf springs will fail first.
- Failure from fatigue. If leaf springs appear to be flattened out when no load is on the trailer, they will need to be replaced before further use of the trailer.
- Suspected material flaw. This can only be determined by testing the material.

BOSTAIL

AXLE SERVICE CHECKLIST

Date: _____

Customer Name: _____ Phone Number: _____

Address: _____

Axle Model: _____ Axle Serial No. _____

Wheels & Tires

OK	Repair	Replace		Notes:
☐	☐	☐	Check tire for noticeable wear	
☐	☐	☐	Check for tire or wheel damage	
☐	☐	☐	Check tire for proper inflation	
☐	☐	☐	Check all lug nuts for proper torque	

Axle(s) Suspension

OK	Repair	Replace		Notes:
☐	☐	☐	Inspect the axle beam for any damage and check for proper alignment	
☐	☐	☐	Check for loss of camber and inspect the spindle bearing & seal journals	
☐	☐	☐	Lubricate where applicable	
☐	☐	☐	Check for worn or broken components (springs, mounting brackets, shackle links, hangers, bolts)	

Hubs, Drums

OK	Repair	Replace		Notes:
☐	☐	☐	Check for any broken studs or missing caps	
☐	☐	☐	Check the hub or drum for cracks, scoring, or excessive damage	
☐	☐	☐	Inspect the inner drum shoe surface and armature surface for wear	
☐	☐	☐	Check for visible damage to bearings & races	
☐	☐	☐	Replace seals after hub removal and inspection	

BOSTAIL

AXLE SERVICE CHECKLIST

Wheels & Tires

OK	Repair	Replace		Notes:
☐	☐	☐	Visually inspect brakes	
☐	☐	☐	Magnet surface is flat and worn evenly	
☐	☐	☐	Check lining thickness for wear, chipped, and intact	
☐	☐	☐	Check for broken or missing refractor springs	
☐	☐	☐	Check that wiring is properly connected	
☐	☐	☐	Check that wiring insulation is intact	
☐	☐	☐	On self-adjusting brakes, check cable	
☐	☐	☐	Burnish brakes	
☐	☐	☐	Adjust brakes (after hubs & drums have been reinstalled)	

Additional Notes

Bostail.com