ELECTRIC BRAKES

OWNER'S AND SERVICE MANUAL

LIPPERT COMPONENTS®

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Safety Information

⚠CAUTION

Moving parts can pinch, crush, or cut. Keep clear at all times.

⚠WARNING

The coach MUST be supported per manufacturer's specifications before working underneath. Failure to do so may result in death or serious injury.

⚠WARNING

Failure to follow the instructions provided in this manual may result in death, serious injury, vehicle damage, or voiding of the component warranty.

⚠WARNING

Always wear eye protection when performing service or maintenance to the coach. Other safety equipment to consider would be hearing protection, gloves and possibly a full face shield, depending on the nature of the service.

Additional information about this product can be obtained from www.lci1.com/support or by downloading the free myLCI app. The app is available on iTunes® for iPhone® and iPad® and also on Google Play™ for Android™ users.

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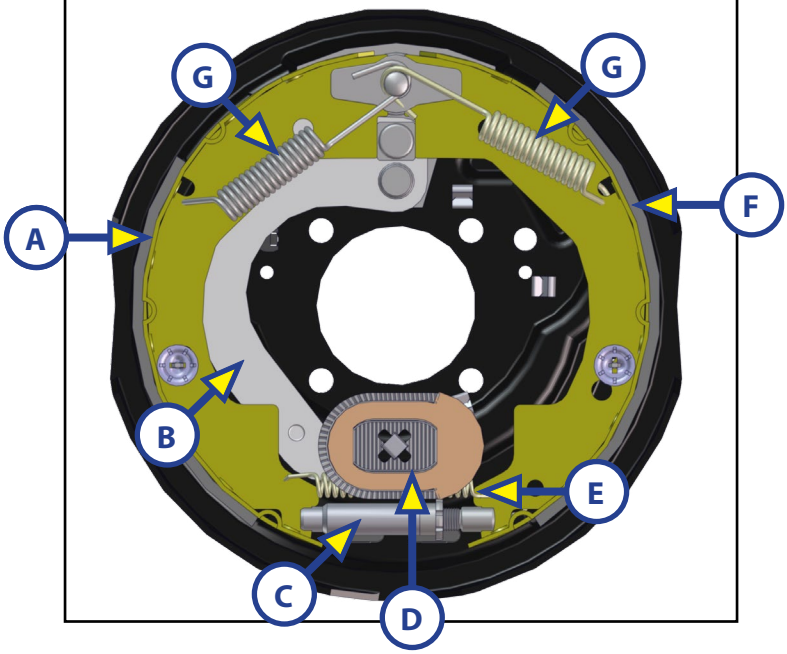
Electric Brake Structure

The basic structure of the Electric Brakes on your coach will resemble the brakes on your car or tow vehicle, with one major difference: your coach implements an electric actuation system and your tow vehicle utilizes a hydraulic system. The Electric Braking System operates in the following order of steps: (Refer to the Electric Braking System Diagram (Fig. 1) and the brake diagram table below to follow along.)

1. Electric current is supplied to the coach braking system when the tow vehicle's brakes are applied.
2. From the tow vehicle's battery, the electricity flows to the coach brake magnet.
3. When energized, the magnets are attracted to the rotating surface of the drums.
4. This moves the actuating levers in the direction the drums are turning.
5. The actuating cam at the end of the shoe forces the primary shoe out to the drum surface.
6. The force of the primary shoe actuates the secondary shoe to contact the drum.
7. The force applied to the brake drum can be increased by elevating the current flow to the magnet.

Fig. 1



Callout	Description
A	Primary Shoe
B	Actuating Lever
C	Adjuster
D	Magnet
E	Adjusting Spring
F	Secondary Shoe
G	Retracting Spring

How To Use Lippert Electric Brakes Properly

The Lippert Components, Inc. Electric Braking System is synchronized with the tow vehicle brakes. Never attempt to stop the combined load of the tow vehicle and the coach by using either the tow vehicle brakes or the coach brakes only. They are designed to work together.

Your brake controller must be set up according to the manufacturer's recommendations to ensure proper synchronization between the tow vehicle and the coach.

Synchronizing The Coach Brakes

Small manual adjustments may occasionally be necessary to accommodate changing loads and driving conditions. Synchronization of tow vehicle braking to coach braking can only be accomplished by road testing.

Make several hard stops from 20 mph on a dry, paved road free from sand and gravel. If the coach brakes lock and slide, decrease the gain setting on the controller. If they do not slide, slightly increase the gain setting. Adjust the controller just to the point of impending brake lockup and wheel skid.

Locking up, excessive grab, or delayed application is quite often due to the lack of synchronization between the tow vehicle and the coach being towed. High voltage (2V+), Low voltage (2V-) or improperly adjusted brakes are the most common causes of these problems and can be easily remedied.

NOTE: To ensure safe brake performance, read the brake controller manufacturer's instructions completely before attempting any procedure.

For proper braking performance, it is recommended the controller be adjusted to allow the coach brakes to come on just slightly ahead of the tow vehicle brakes. When proper synchronization is achieved, smooth braking will be achieved with no pushing of the tow vehicle and no jerking sensation.

General Maintenance

Break-In Period For Electric Drum Brakes (Burnishing)

Prior to any adjustments, your coach brakes should be burnished-in.
The break-in period is a typical phenomenon with drum brakes and especially electric drum brakes. Electric drum brakes will require a break-in period to achieve full performance. This break-in period applies for new axles and any time new brake shoes and/or magnets are installed as part of regular maintenance.
Lippert Components has found through extensive brake testing that the break-in period for our drum brakes can range from 20 to 50 brake applications.
Brakes can be seated in by applying approximately 8-10 volts to the coach brakes at an initial speed of 40 mph and allowing the truck/coach combination to slow down to 20 or 25 mph. For best results do not use truck brakes during this procedure. The coach brakes will seat in faster by using them to stop both the truck and coach. The easiest method is to apply the coach brakes using the manual activation lever located on the in-cab brake controller. Care must be taken to not overheat the lining material, therefore brake applications conducted at one mile intervals will suffice. The driver should feel a noticeable difference in the brake performance during this period, sometimes in as few as 10 applications. After 50 applications, the brake lining material will be fully cured from the heat and develop close to 100% contact with the brake drum surface.
This break-in period not only seats the shoe lining material but also seats in the brake magnets. During the break-in period, the linings will wear at a faster rate than they do after they are seated in.

NOTE: Brakes should be manually adjusted after the first 200 miles of operation and periodically thereafter, at approximately 3,000 mile intervals.

NOTE: Lippert Components, Inc. recommends that the following inspections, troubleshooting, component replacement, and verifications be completed only by certified RV technicians.

Brake Adjustment

⚠WARNING

Prior to testing or adjusting brakes, be sure area is clear of any people and vehicles. Failure to perform test in a clear area may result in death or serious injury.

Lippert Components, Inc. Electric Brakes are automatic adjust only. If manual adjusting is needed, the following 6-step procedure can be utilized. The brakes should be adjusted in the following manner:

1. Jack up coach and secure on adequate capacity jack stands. Follow coach manufacturer's recommendations for lifting and supporting the coach. Make sure the wheel and drum rotates freely.

⚠WARNING

Lift unit by frame and never the axle or suspension. Do not go under unit unless it is properly supported by jack stands. Unsupported units can fall causing death or serious injury.

2. Remove the rubber plug from the adjusting slot on the bottom of the brake backing plate (Fig. 2).
3. Insert a screwdriver or standard adjusting tool into the adjusting slot to rotate the starwheel (Fig. 3) of the adjuster assembly to expand the brake shoes. Adjust the brake shoes out until the pressure of the linings against the drum makes the wheel very difficult to turn.
4. Then rotate the starwheel in the opposite direction until the wheel turns freely with a slight lining drag.

NOTE: A second screwdriver will be needed to push the auto adjusting lever away from the starwheel so that the starwheel can be rotated backwards.

5. Replace the rubber plug in the adjusting slot and lower the wheel to the ground.
6. Repeat the above procedure on all brakes. For best results, the brakes should all be set at the same clearance.

Fig. 2

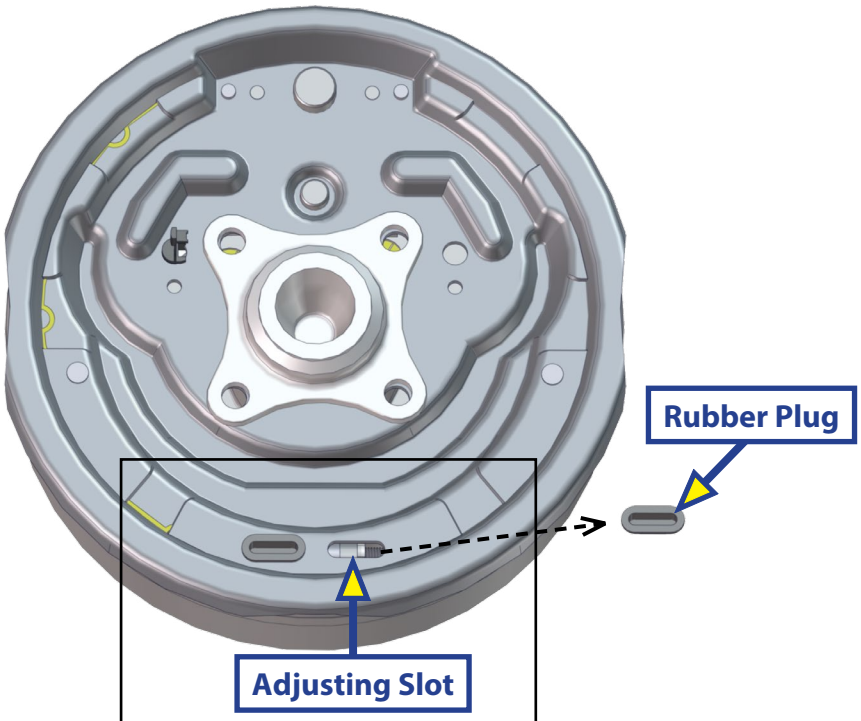
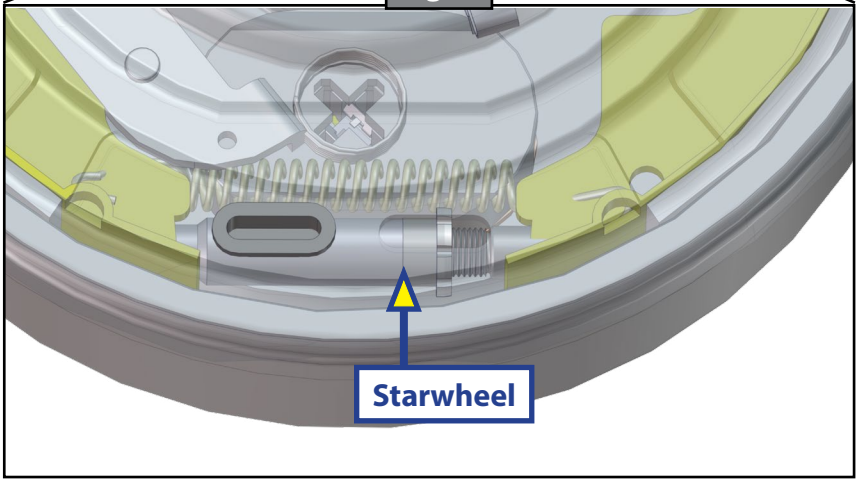


Fig. 3



Hub Removal

1. Lift and support coach per manufacturer's requirements.

⚠WARNING

Lift unit by the frame and never the axle or suspension. Do not go under unit unless it is properly supported by jack stands. Unsupported units can fall causing death or serious injury.

2. Remove the lug nuts from the wheel and set aside (Fig. 4).
3. Remove the wheel from the axle hub and set aside (Fig. 5).

Fig. 4

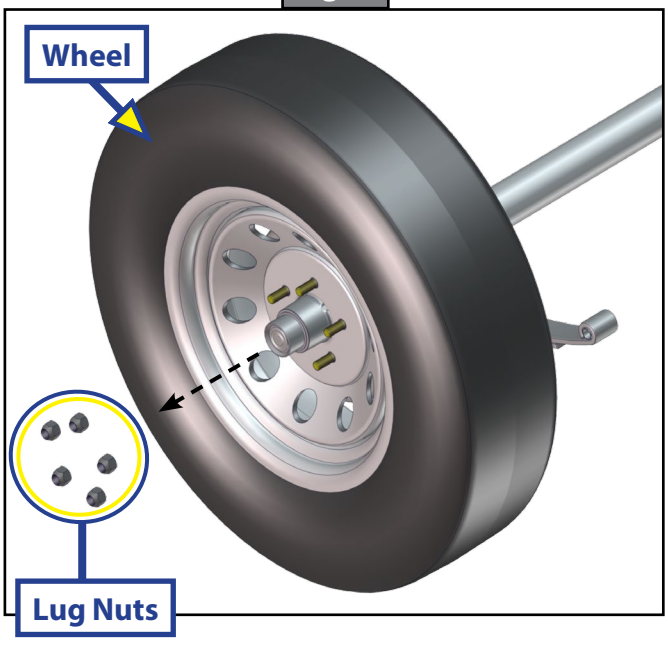
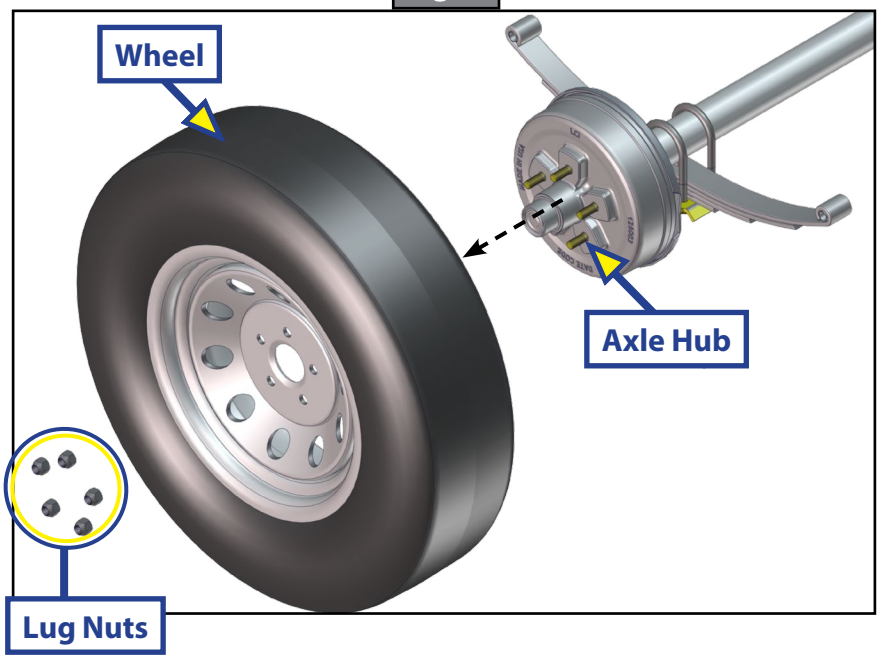


Fig. 5



4. Remove the dust cap by prying the edge out of the hub (Fig. 6). If equipped with oil lubrication, unscrew oil cap using a 2 ½" socket. Let oil drain into pan.
5. Pull the cotter pin from the castle nut and ***DISCARD THE COTTER PIN*** (Fig. 7).

Fig. 6

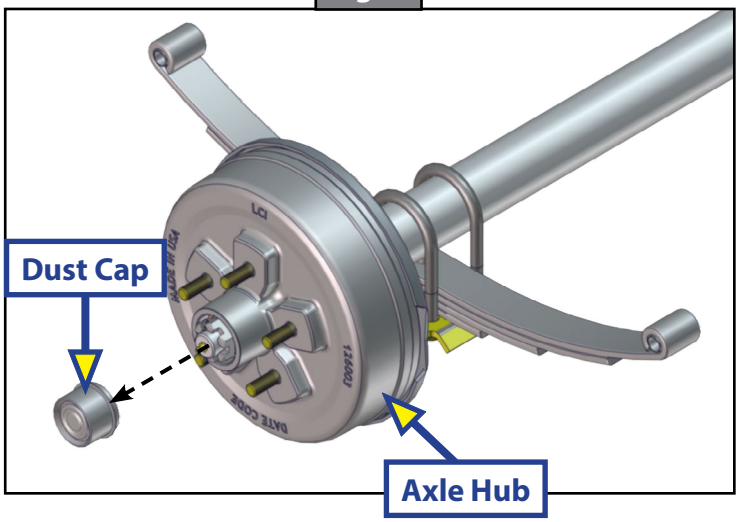
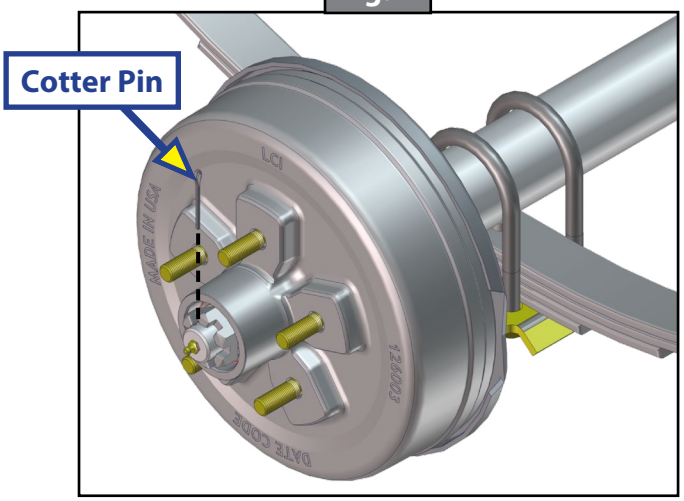


Fig. 7



6. Remove the castle nut from the spindle (Fig. 8).
7. Remove the spindle washer from the spindle (Fig. 9).
8. Place hand over nose of hub during removal to contain outer bearing cone or remove outer bearing cone prior to removal of hub. Remove the hub from the spindle (Fig. 10).

NOTE: Brakes may need to be adjusted or backed off to remove drum from spindle.

NOTE: A gear puller may be necessary to remove hub from spindle.

⚠ CAUTION

Be aware that when hubs and braking components are opened, disassembled, or otherwise tampered with, there is a possibility of grease coating the brake pads, magnet and braking surfaces of the hub, greatly reducing the mechanism's ability to effectively bring the vehicle to a slower speed or stop. If grease is present on the brake pads, magnet or the braking surface of the hub, the hub and brake assembly MUST be replaced.

Fig. 8

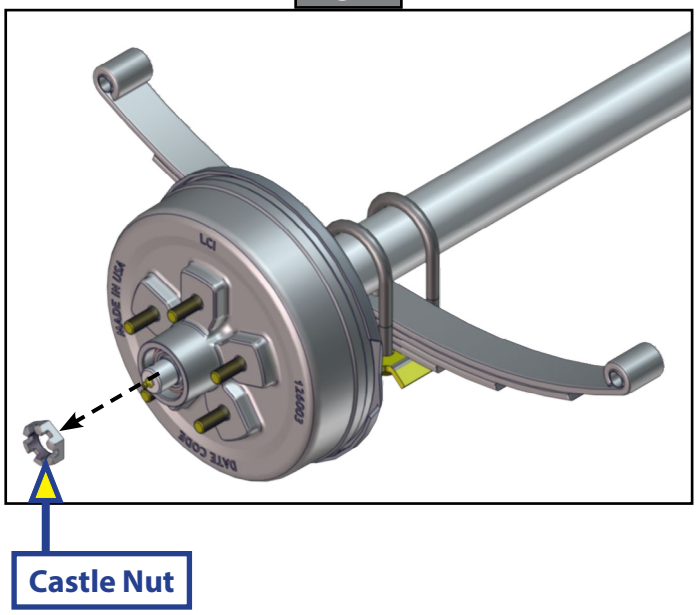


Fig. 9

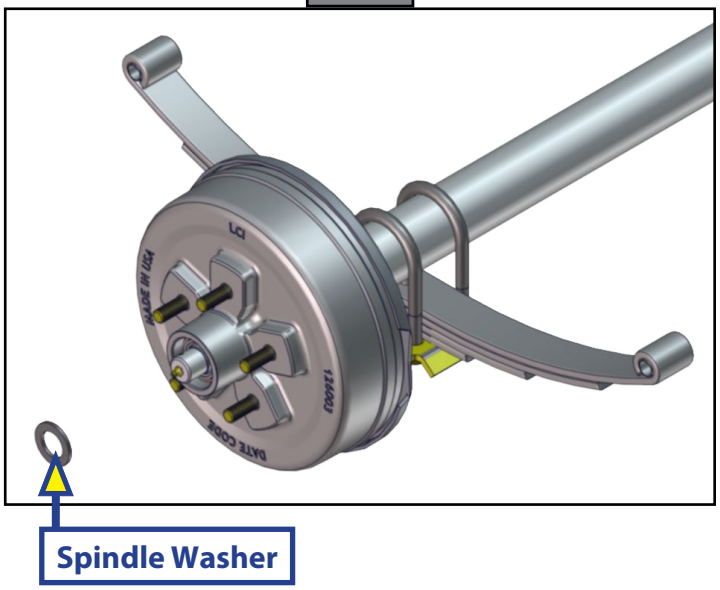
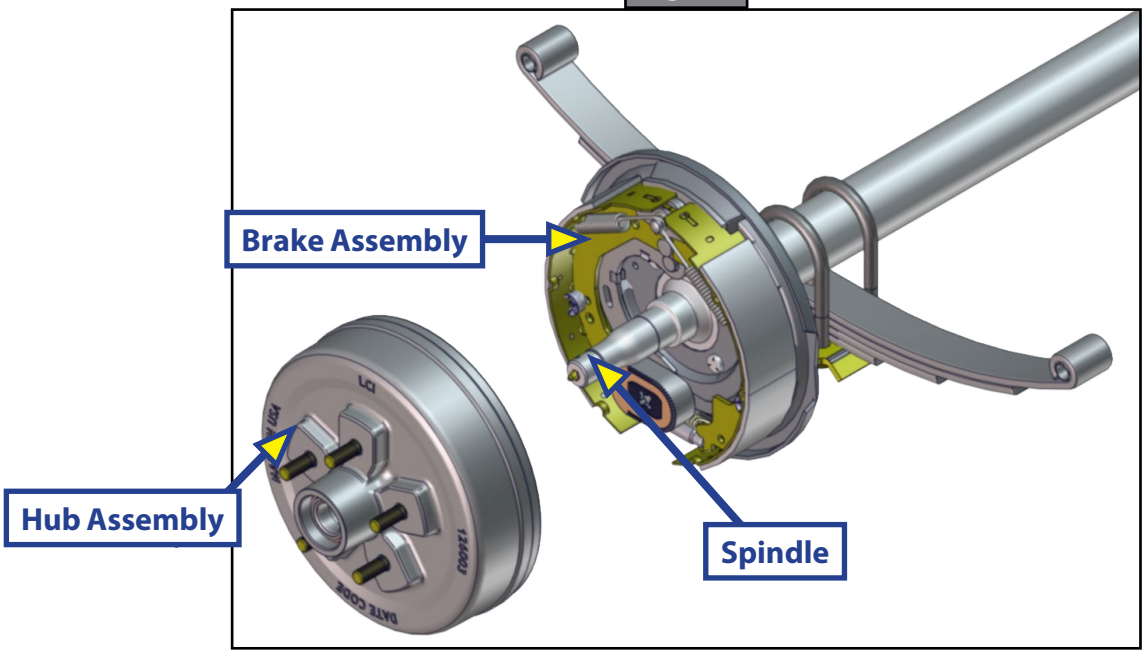


Fig. 10



Brake Drum Inspection

The brake shoes contact the drum surface and the magnet contacts the armature. These surfaces are subject to wear and should be inspected periodically. The hubs and brake assembly must be inspected for excess grease existing on the spindle area of the axle. Excess grease can coat the brake pads, magnets and the braking surfaces inside of the hubs (Figs. 11 and 12). Fig. 13 shows a hub that has grease on the spindle only. This is acceptable.

Fig. 11

Fig. 12

Fig. 13

Lubricate Brakes

Prior to reassembling the brake drum assembly, remember to apply a light film of white grease or an anti-seize compound on the brake anchor pin, the actuating arm bushing and pin, and the areas on the backing plate that are in contact with the brake shoes and magnet lever arm. In addition apply a light film of grease on the actuating block mounted on the actuating arm.

Clean and Inspect Brakes

In the event the braking system encounters symptoms of improper application or failure, immediate inspection and service must be implemented. During normal use, servicing the braking system once a year is considered normal. Increased usage will require service on a regulated schedule based on 3000-6000 mile increments. As magnets and shoes become worn, they need to be changed to maintain maximum braking capability.

Be sure, when disassembling brakes for cleaning, to clean the backing plate, magnet arm, magnet and shoes. Also, make sure that any and all parts removed for cleaning are placed back into the same brake drum assembly. This is also an excellent time to check for parts that have become loose or worn.

⚠WARNING

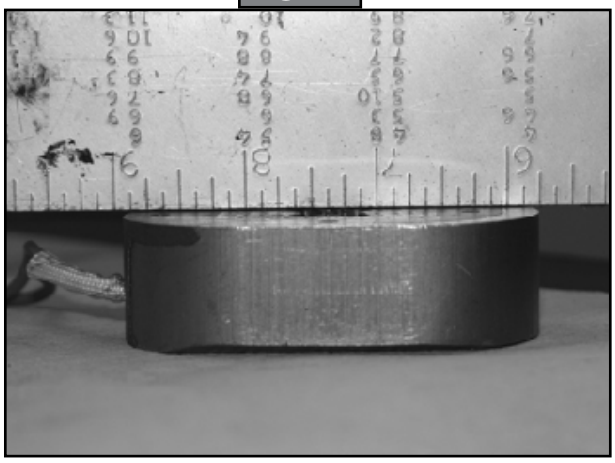
Potential Asbestos Dust Hazard.

Older brake linings have the potential to contain asbestos dust, which has been linked to serious or fatal illnesses. Certain precautions must be taken when servicing brakes:

1. Avoid creating and/or breathing any brake dust.
2. Do not machine, file, or grind the brake linings.
3. Remove with a damp brush or cloth. Dry brushing or compressed air will cause the dust particles to become airborne.

Magnets

Fig. 14



This electric braking system utilizes an electromagnet to actuate the brake shoes. These high-quality magnets provide superior force and friction to safely and effectively stop the coach. These magnets should be inspected and serviced on the same schedule as the rest of the axle system, at least once a year for normal use and more often if the coach is used extensively. Abnormal or uneven wear is a sign that the magnet needs to be replaced. Check the surface of the magnet with a straight edge for uneven wear. The surface of the magnet should be completely flat. If the magnet's coil is exposed in any way, even if normal wear is evident, the magnets should be replaced immediately. If the magnets are replaced, the drum armature surface should also be refaced.

If a magnet is replaced on one side of an axle, it is recommended that the magnet on the opposite brake assembly also be replaced to ensure even braking capacity.

(Fig. 14) shows an magnet with little or no wear. If there are any pronounced gaps on the surface of the magnet, the magnet should be replaced.

Shoes and Linings

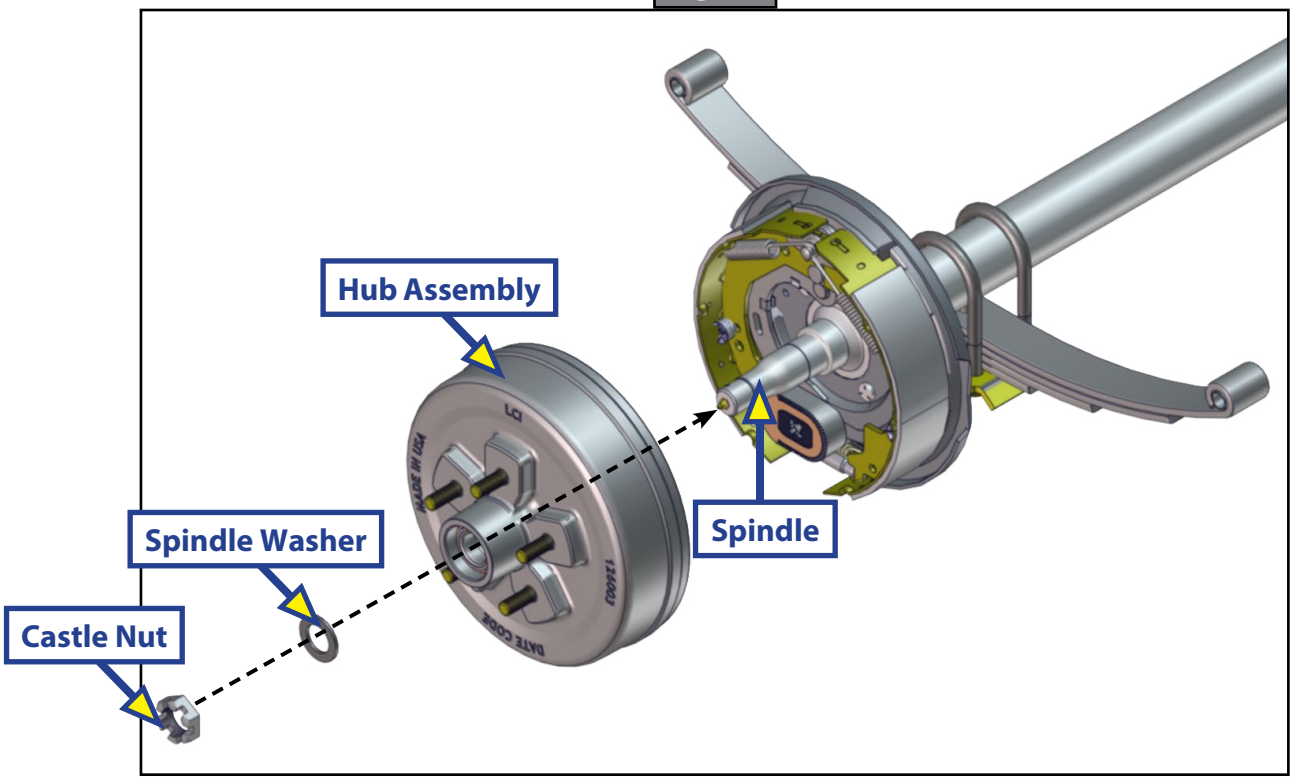
Linings should be replaced if the material is worn to 1⁄16" or less. Shoes should also be replaced if they become contaminated with grease or oil or have become scored, pitted or gouged. Heat cracks are normal and rarely require attention. When replacing shoes, both shoes on the same brake and the brakes on the same axle should all be replaced at the same time, once again ensuring even braking capacity. After replacing shoes and linings, your coach brakes should be burnished-in. See the Break-in Period for Electric Drum Brakes (Burnishing) section on Page 4 of this manual for the proper brake burnishing procedure.

Hub Replacement

NOTE: Wipe all grease from spindle prior to hub install to prevent brake contamination after hub install.

1. Place new hub assembly onto the axle spindle followed by the spindle washer and castle nut (Fig. 15). Castle nut should be torqued to 50 ft.-lb. Rotate the hub during the tightening process.

Fig. 15



2. Loosen castle nut to back off the torque.
3. Tighten castle nut finger tight until snug.
4. Insert ***NEW*** cotter pin (Fig. 16). If cotter pin does not line up with hole, back castle nut up slightly until pin can be inserted.
5. Bend cotter pin over to lock nut in place (Fig. 17). Nut should be free to move with only the cotter pin keeping it in place.

Fig. 16

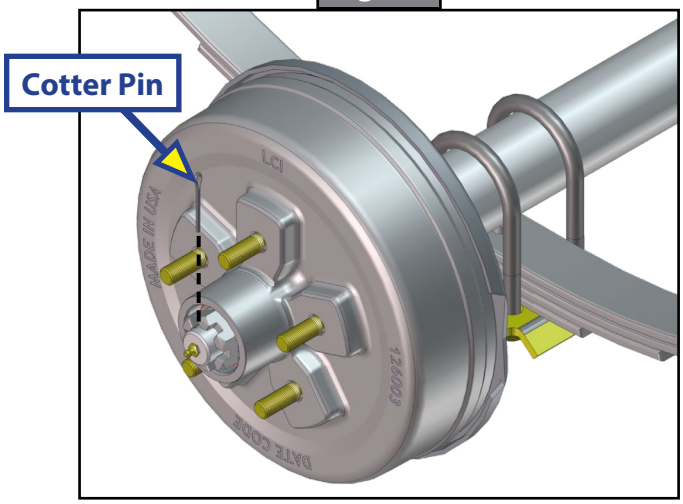
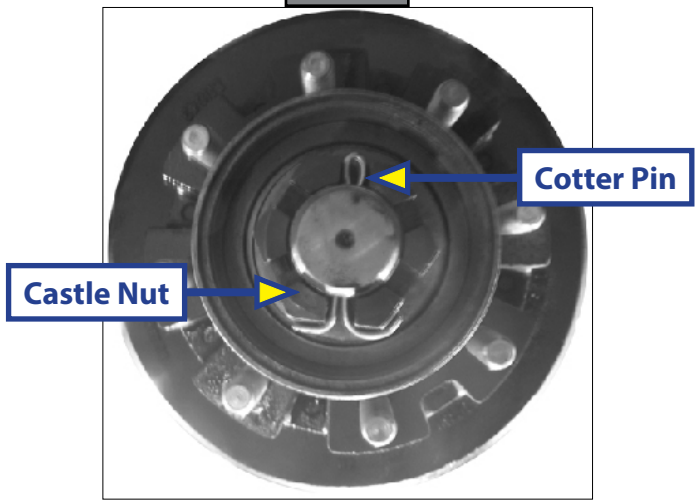


Fig. 17



6. Re-install dust cap into the hub assembly (Fig. 18).
7. Re-install the wheel onto the hub assembly (Fig. 19).
8. Re-install the lug nuts onto the hub studs (Fig. 20).

Fig. 18

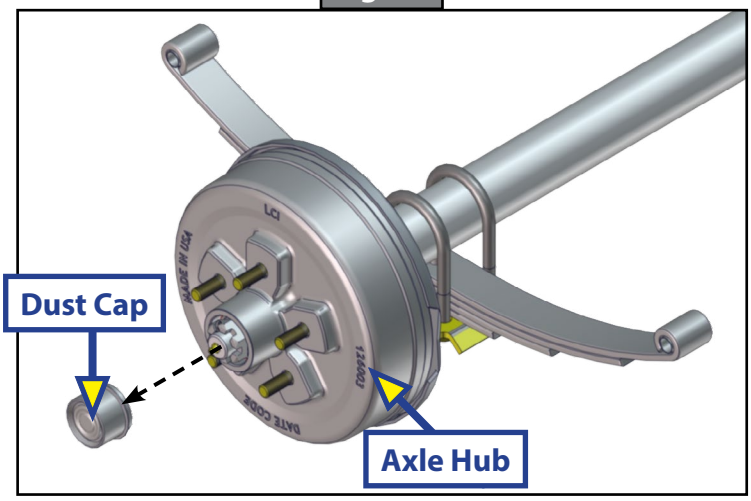


Fig. 19

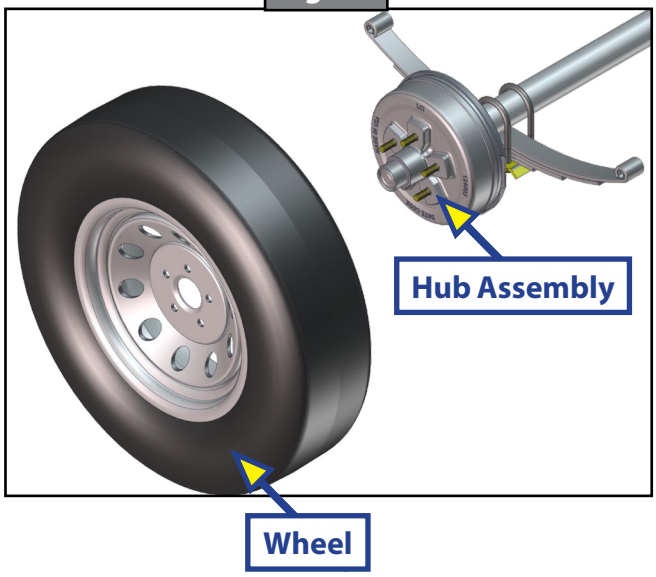
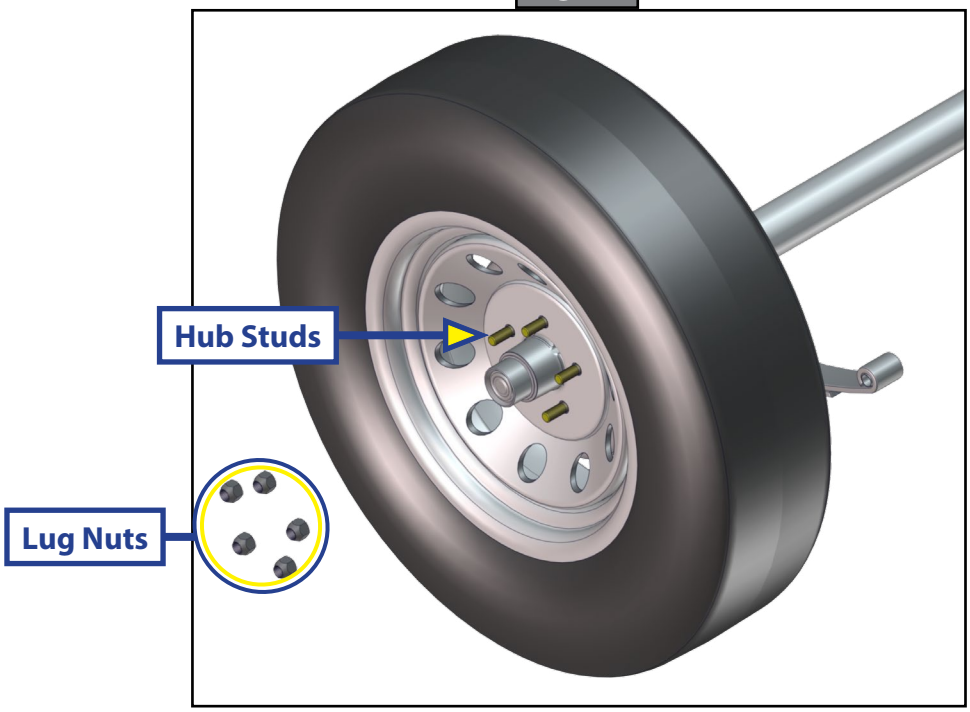


Fig. 20



Troubleshooting Chart

What Is Happening?	Why?	What Should Be Done?
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.

Introduction To Troubleshooting

The following section is a guideline for ensuring operation of your braking system. The safety of you, those traveling with you and those sharing the road is paramount and it starts with the ability to safely stop the tow vehicle and the coach.

Troubleshooting

Most brake malfunctions can be corrected by utilizing the Troubleshooting Chart on the previous page. Mechanical failure is the most common form of malfunction, however, if the brake system fails and it is not mechanical, it is usually electrical. A Voltmeter and Ammeter are essential tools to diagnose these problems. Mechanical problems are mostly self-evident; something is bent or broken. Consult the troubleshooting chart on Page 12 to determine the probable cause and corrective actions for a variety of issues with the braking system.

Remember to use only Lippert Components, Inc. replacement parts on these systems.

Visit http://store.lci1.com to order replacement parts online or call (574) 537-8900 to speak to a Customer Service representative.

Measuring Voltage

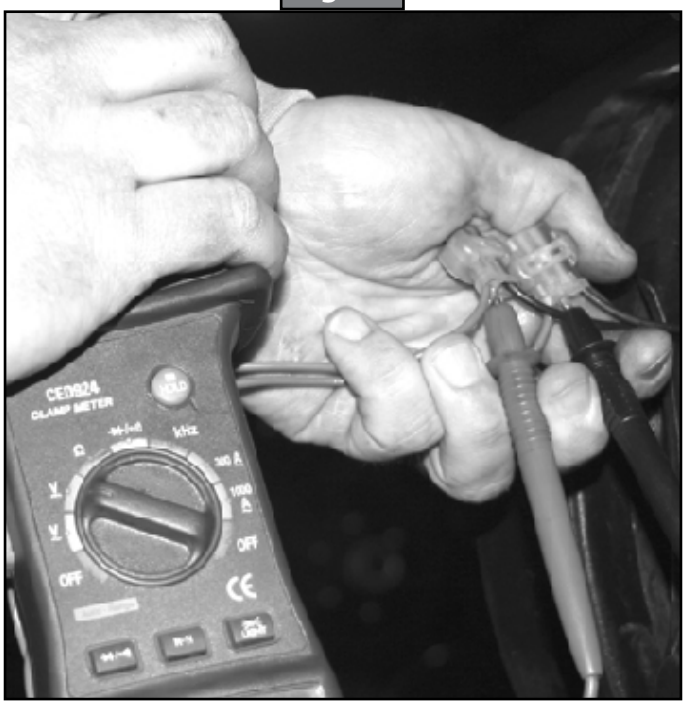
The Braking System voltage is measured at the two lead wires of the magnet on any brake. Use the pin probes inserted through the insulation of the lead wires. To ensure that the battery is indicating a full charge, the towing vehicle engine should be running with the coach coupler connected when checking the voltage.

Voltage in the system should begin at 0 volts and, as the brake pedal of the tow vehicle is applied, voltage will gradually increase to about 12 volts. If the system does not indicate at least 12 volts, problems may occur in the wiring of the system, the battery or alternator of the tow vehicle.

When the brakes are applied, a gradual increase in voltage is preferable to a quick increase to 12 volts. A gradual increase in voltage ensures smooth and firm coach braking. A quick increase in voltage will cause the braking system to feel like the coach is grabbing too quickly.

Taking a voltage reading is usually done with probes inserted into the wire connector (Fig. 21).

Fig. 21



Measuring Amperage

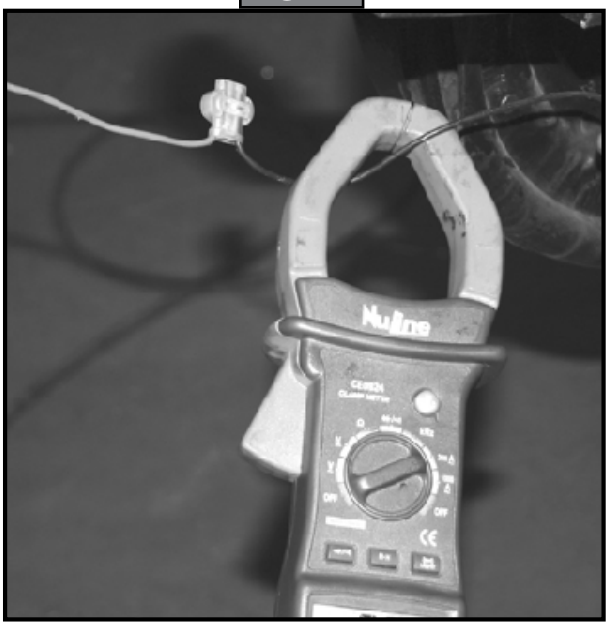
The Braking System amperage is the amount of current flowing through the system when all magnets have been energized. The amperage will change proportionately with the voltage. To ensure that the battery is indicating a full charge, the towing vehicle engine should be running with the coach coupler connected when checking the voltage.

If a resistor is used in the brake system, it must be set at zero or bypassed completely to obtain the maximum amperage reading. Individual amperage draw can be measured by inserting the ammeter in the line at the magnet you want to check. Disconnect one of the magnet lead wire connectors and attach the ammeter between the two wires. Consult Amperage Chart below for normal amp readings.

Make sure that the wires are properly reconnected and sealed after testing is completed. Testing for Amperage can be done with probes (Fig. 22) or alligator clips on the leads or an amp clamp (Fig. 23).

Fig. 22

Fig. 23



Amperage Chart

Amps/Magnet	Two Brakes	Four Brakes	Six Brakes
3.0	6.0	12.0	18.0

Low or no voltage is the most common problem with the Braking System. Amperage at the brakes is also a relatively common issue.

Common causes of these conditions are:

1. Low quality electrical connections
2. Open circuits
3. Insufficient wire gauge
4. Broken wires
5. Blown fuses (fusing of brakes is not recommended)
6. Short circuits (indicated by high amperage)

Possible causes of shorts are:

1. Shorted magnet coils
2. Bare wires contacting a grounded object

Finding the cause of a short circuit in the system is done by isolating one section at a time. If the high amperage reading drops to zero by unplugging the coach, then the short is in the coach. If the amperage reading remains high with all the brake magnets disconnected, the short is in the coach wiring.

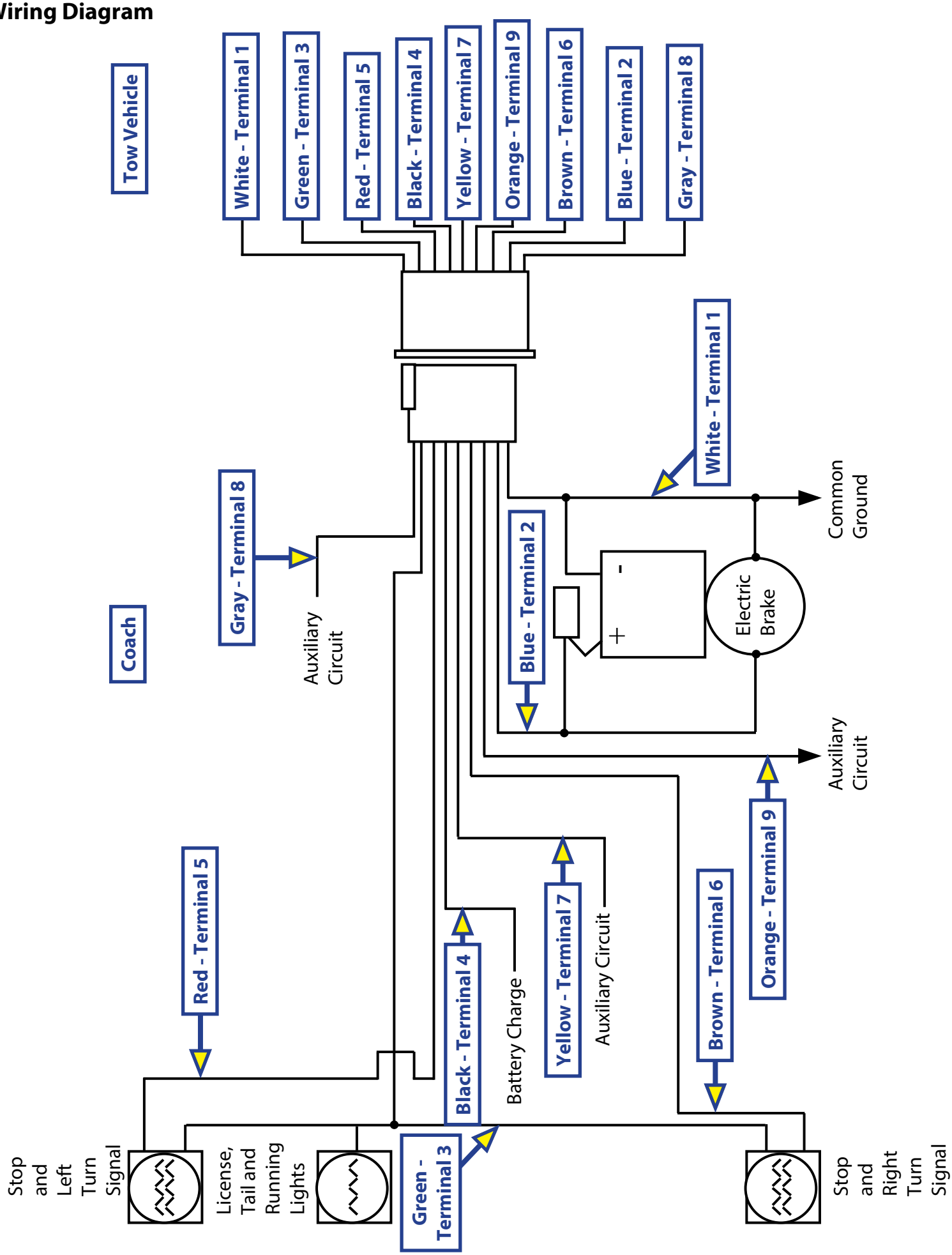
All electrical troubleshooting procedures should start at the controller. Most complaints regarding brake harshness or malfunction are traceable to improperly adjusted or nonfunctional controllers. See your controller manufacturer's data for proper adjustment and testing procedures. For best results, all the connection points in the brake wiring should be sealed to prevent corrosion. Loose or corroded connectors will cause an increase in resistance which reduces the voltage available for the brake magnets.

Maintenance Schedule

Item	Function Required	Weekly	3 Months / 3,000 Miles	6 Months / 6,000 Miles	12 Months / 12,000 Miles
Brakes	Test that they're operational.	At Every Use			
Brake Adjustment	Adjust to proper operating clearance.		◆		
Brake Magnets	Inspect for wear and current draw.			◆	
Brake Linings	Inspect for wear or contamination.				◆
Brake Controller	Check for correct amperage and modulation.			◆	
Coach Brake Wiring	Inspect wiring for bare spots, fray, etc.				◆
Hub/Drum	Inspect for abnormal wear or scoring.				◆

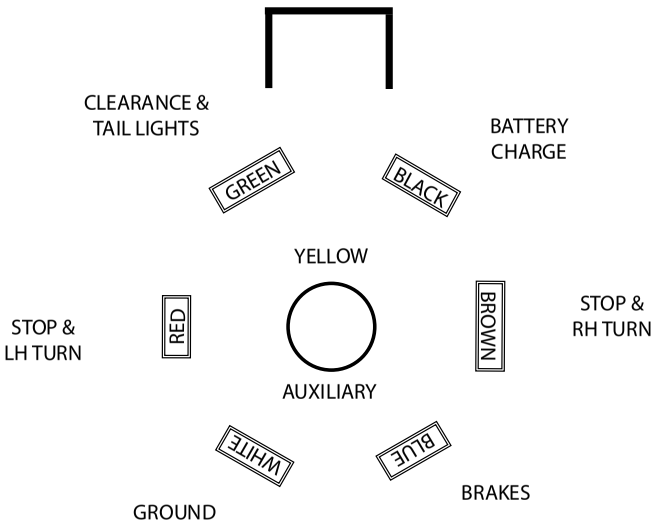
Coach Wire Gauge Chart		
Wire Gauge and Type	# of Axles	Length of Run
16 Ga Stranded Copper	1	N/A
14 Ga Stranded Copper	2	Under 30 ft. (9.1m) from hitch to center of axles
12 Ga Stranded Copper	2 or 3	Over 30 ft. (9.1m) from hitch to center of axles

Wiring Diagram

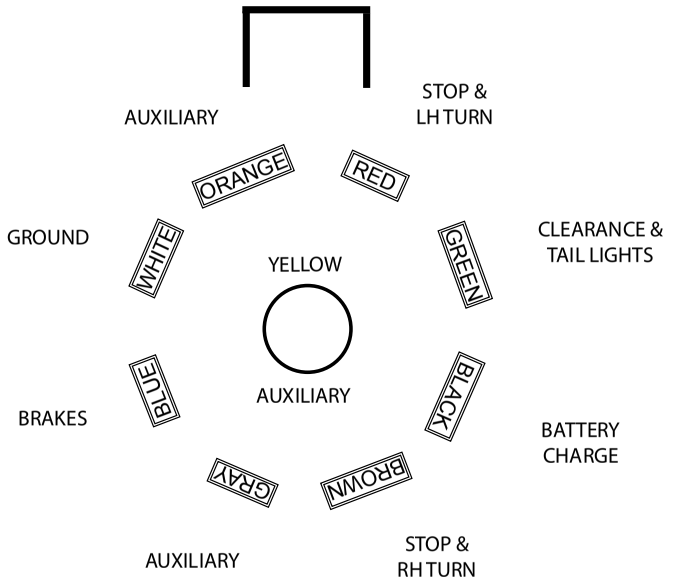


COACH LIGHTS PIGTAIL - DOES NOT OPERATE BRAKES

7-PIN COUPLER



9-PIN COUPLER



COACH BRAKE AND LIGHT COUPLER - OPERATES BRAKES

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