



LIPPERT COMPONENTS, INC.

TRAILER AXLE OPERATION AND SERVICE MANUAL

THIS MANUAL COVERS ELECTRIC BRAKE SYSTEMS ONLY

SPRING AXLE MODELS NOS.

- LC128 = 2800 lb. Weight Rating
- LC135 = 3500 lb. Weight Rating
- LC152 = 5200 lb. Weight Rating
- LC160 = 6000 lb. Weight Rating
- LC170 = 7000 lb. Weight Rating

SPRING DROP AXLE MODELS NOS.

- LC128-D = 2800 lb. Weight Rating
- LC135-D = 3500 lb. Weight Rating
- LC152-D = 5200 lb. Weight Rating
- LC160-D = 6000 lb. Weight Rating
- LC170-D = 7000 lb. Weight Rating

TORSION MODELS NOS.

- LC128-T = 2800 lb. Weight Rating
- LC135-T = 3500 lb. Weight Rating
- LC152-T = 5200 lb. Weight Rating
- LC160-T = 6000 lb. Weight Rating
- LC170-T = 7000 lb. Weight Rating

NOTE: Models can be derated per manufacturer's preference or specifications.

INTRODUCTION

Combining years of experience in the trailer frame and recreational vehicle industry with the newest and most innovative technology, Lippert Components, Inc. introduces it's newest addition, The Axle and Running Gear Division. The following publication is designed to give the customer an easy-to-understand operation and service manual to provide useful and important information. The quality of the Lippert name and the finest materials utilized in the production of the Axles and Running Gear provide you with hubs, brakes, drums and spindles that make trailering and braking the finest in the industry.

- Quality comes first in Lippert Components, Inc.
- The latest technology and design.
- The finest quality materials.

All three points provide the customer with the best product they can possibly buy and the satisfaction of knowing they can trust the equipment on which they have spent their hard-earned money. Lippert Components, Inc. thanks you for purchasing our Axles and Running Gear. When you speak of Lippert Components, Inc., our quality stands beside you.

WARNING

The "WARNING" symbol above is a sign that a service or maintenance procedure has a safety risk involved and may cause serious injury or death if not performed safely and within the parameters set forth in this manual. Always wear eye protection when performing service or maintenance on the vehicle. Other safety equipment to consider would be hearing protection, gloves and possibly a full face shield. Depending on the nature of the service this manual provides general service and maintenance procedures. Many variables can change the circumstances of the service procedure. I.e., the degree of difficulty involved in the service operation and the ability level of the individual performing the operation. This manual cannot begin to plot out procedures for every possibility, but will provide the general instructions for effectively servicing the vehicle in the event the skill level required or the procedure is difficult, a certified technician should be consulted before performing the necessary service. Failure to correctly service the vehicle may result in voiding the warranty, inflicting injury or even death. The owner's manual for your unit may have more procedures for service and maintenance.

HUBS/DRUMS/BEARINGS

Hub Removal

To remove the hub assembly for inspection, maintenance or service, follow the six (6) steps below:

WARNING

Lift unit by the frame and raise the axle or suspension. Do not enter the unit unless it is properly supported by jack stands. Unsecured units can fall causing serious injury or death.

1. Lift trailer and support it per manufacturer's requirements.
2. Remove the wheel.
3. Remove the grease cap by prying the edge out of the hub.
4. Pull the cotter pin from the castle nut or, if the hub is equipped with the Super Lube system, bend the locking tang down and remove the outer spindle nut.
5. Remove the spindle washer.
6. Pull the hub off the spindle. Do not let the outer bearing cone fall free of the assembly. The inner bearing cone will be contained by the seal and will not fall out.

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

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 drum surface should be remachined if scored more than .020" or out of round by more than .015". The drum should be replaced if scoring or wear is greater than .090". The inner surface of the brake drum that contacts the brake magnet is the armature surface. If the armature surface is scored or worn unevenly, it should not be machined any more than .030". The magnets should be replaced whenever the armature surface is refaced and vice versa.

Drum	Diameter
10"	10.090"
12"	12.090"

NOTE: Make certain that the wheel bearing cavities are clean and free of contamination before reinstalling bearing and seals. Resurfacing procedures can produce metal chips and dust that can contaminate the wheel bearings and cause failure.

Bearing Inspection

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. If any pitting, spalling, or corrosion is present, then the bearing must be replaced. The bearing cup inside the hub must be protected.

NOTE: Bearings must always be replaced in sets of one cone and one cup.

WARNING

Always wear eye protection when servicing the axle, brakes, hubs, springs and wheels. Failure to wear eye protection may result in serious injury.

Bearing Lubrication - Grease

Bearing grease should be replaced every 12,000 miles or 12 months, whichever comes first. Remove all old grease from wheel hub and bearings first. Bearings should be packed by machine if possible. Packing bearings by machine is preferable, however, packing by hand is a viable alternative.

Follow these procedures to repack bearings by hand:

1. Remove the cap of your hand roller.
2. Press wheel end of bearing into the outer edge of the grease, forcing grease into the inner area of the bearing between the two adjacent rollers.
3. Repeat this process while turning bearing from roller to roller until all rollers are coated.
4. Apply a light coat of grease into the bearing cup surface.
5. Reassemble bearing into cup.

RECOMMENDED WHEEL BEARING LUBRICATION SPECIFICATIONS

Grease:	Grease:
Thickener Type Dropping Point Consistency Additives	Lithium Complex 230°C (446°F) minimum NLGI No. 2
Base Oil Viscosity Pour Point	EP Corrosion & Oxidation Inhibitors Solvent Refined Petroleum Oil @40°C (104°F) 150cSt(693 SUS) Min. -10°C (14°F) Minimum

Approved Sources:

- Mobil Oil
- Exxon/Standard
- Arcenal Oil
- Pennzoil Prod. Co.
- Modigrass HP
- Konax MP
- Konrad L-427
- Valvoline Val-Pier EP Grease
- Premium Wheel Bearing Grease 707L

Seal Inspection and Replacement

Always check the seal location that it is not damaged, nicked, cracked or torn and is in good working order. If there is any question of condition, replace the seal. Use only the seals specified in the Seal Replacement Chart in the Trailer Axle Manual found on the LCI website - www.lci.com

Procedure to replace seal:

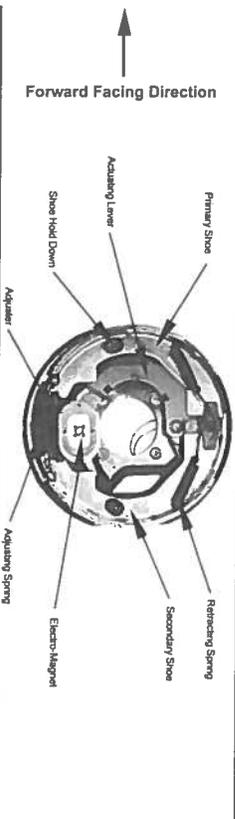
1. Pull seal from the hub with a seal puller. Never push the seal out with the bearing. The bearing may get damaged.
 2. Apply a PERMATEX sealant to the outside of the new seal.
 3. Tap the new seal into place using a clean, hard wood block.
- Bearing Adjustment/Hub Replacement**
- For adjusting bearings or replacement of removed hub, follow procedures below:
1. Remove the cotter pin and castle nut lock on axle spindle in the reverse order from which they were removed. Castle nut should be torqued to 50 ft. lbs.
 2. Loosen castle nut to back off the torque.
 3. Tighten castle nut finger tight until snug.
 4. Insert cotter pin (or locking tang if equipped with Super Lube). If cotter pin or tang does not line up with hole, back castle nut up slightly until pin or tang can be inserted.
 5. Bend cotter pin over to lock nut in place (or locking tang in the case of Super Lube). Nut should be free to move with only the cotter pin keeping it in place.

ELECTRIC BRAKES

THIS MANUAL COVERS ELECTRIC BRAKE SYSTEMS ONLY

The basic structure of the Electric Brakes on your trailer will resemble the brakes on your car or tow vehicle, with one major difference, your trailer 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 and the brake diagram to follow along:

1. Electric current is supplied to the trailer's braking system when the tow vehicle's brakes are applied.
2. From the tow vehicle's battery, the electricity flows to the brake's electromagnet.
3. When energized the electromagnets are attracted to the rotating surface of the drums.
4. The actuating cam at the end of the shoe forces the primary shoe out to the drum surface.
5. The actuating cam at the end of the shoe forces the secondary shoe to contact the drum.
6. The force of the primary shoe actuates the secondary shoe to increase the current flow to the electromagnet.
7. The force applied to the brake drum can be increased by elevating the current flow to the electromagnet.
8. Brake nuts to secure the backing plate to the flange should be torqued at 30-50 lbs.



How to Use Your Electric Brakes Properly

The LCI Electric Braking System is synchronized with your tow vehicle brakes.

WARNING!

Never attempt to slip the combined load of the tow vehicle and the trailer by using either the tow vehicle brakes or the trailer brakes only. They are designed to work together.

You may have to manually make small adjustments occasionally to accommodate changing loads and driving conditions. Synchronization of tow vehicle to trailer braking can only be accomplished by road testing. Locking up, excessive grab, or delayed application is quite often caused by incorrect adjustment of the tow vehicle and the trailer being towed. High voltage (24V), Low voltage (24V) or improperly adjusted brakes are the most common causes. The most common cause is the trailer brakes being too loosely tensioned. Prior to any adjustments, your trailer brakes should be burinised-in by applying the brakes 20-30 times with a 20 mph h. decrease speed to 10 mph. Allow ample time for brakes to cool between application. This allows the brake shoes and magnets to begin seating to the brake drum.

TRAILER WIRE GAUGE CHART

Number of Brakes	High-to-Axle Distance in Feet	Minimum Hookup Wire Gauge
2	Under 30	12 AWG
4	Under 30	12 AWG
4	30-50	10 AWG
6	Under 30	10 AWG
6	30-50	8 AWG

STORAGE

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 setup your trailer for storage:

1. If the trailer has an emergency breakaway battery remove it and store it inside, out of the weather. Change the battery at least every 90 days.
2. Jack up the trailer and place jack stands under the trailer frame so that the weight will be off the tires. Follow trailer manufacturer's guidelines to lift and support the trailer.
3. Lubricate mechanical moving parts such as the hitch, and suspension parts, that are exposed to the weather.
4. In the case of boat trailer axles that are subject to repeated immersion, remove brake drums, clean, dry and re-lubricate moving brake components, inspect bearings - clean and re-lubricate.

Extended Storage Inspection Procedures

- Trailer should remain on jack stands during this procedure
1. Remove all wheels and hubs or brake drums. Reinstall drum to same spindle and brake from where it was removed.
 2. Inspect suspension for wear.
 3. Check tightness of hanger bolt, shackle bolt, and U-bolt nuts of the suspension for correct torque.
 4. Check brake linings, brake drums and armature faces for excessive wear, scoring, damage or corrosion.
 5. Check brake magnets with an ohmmeter. The magnet resistance should check 3-2 ohms. If shorted or worn excessively, they must be replaced.
 6. Lubricate all brake moving parts using a high temperature brake lubricant.
 7. Remove any rust from braking surfaces and armature surface of drums with fine emery paper or crocus cloth. Be sure to protect bearings from contaminating dust.
 8. Inspect oil or grease seals for wear or nicks. Replace if necessary.
 9. Lubricate hub bearings.
 10. Reinstall hubs and adjust bearings.
 11. Mount and tighten wheels.

The Preparation Checklist

The following checklist offers several guidelines to prolonging the quality of your running gear and will provide trustworthy and safe trailering for years to come. Using the following checklist before starting a trip with your trailer is highly recommended. Allow plenty of time prior to any trip for any service or repairs that may need to be done before using the trailer.

1. Maintenance schedule should be current.
2. Inspect hitch for corrosion, lubrication and wear.
3. Inspect safety chains for rust and wear. Engage chains and breakaway switch actuating chains securely. Breakaway battery should be fully charged.
4. Electronic coupler must be secure. Run check on all lights and break engagement and synchronization.
5. Load trailer with 10% of total weight on the hitch end of trailer. Smaller trailers front end load should be increased to 15%.
6. **DO NOT OVERLOAD!** Consult your trailers id plate for gross vehicle weight restrictions.
7. Tires should be inflated to manufacturer's specs. Inspect tires for any damage or wear.
8. Inspect lug nuts/bolts. All should be torqued to spec.
9. Check torque of hanger bolt, shackle bolt, and U-bolt nuts on suspension.
10. Check that your trailer is towing level. Adjust hitch height if necessary to level trailer.

WARNING!

Always use proper tie-down technique and supervision. Do not drink or use drugs if it is necessary to operate a vehicle. Under no circumstances should you attempt to operate a vehicle with a blood alcohol content of 0.08% or higher. Always use proper tie-down technique.

MAINTENANCE SCHEDULE

Item	Function Required	Weekly	3 Monthly	6 Monthly	12 Monthly
			3000 Miles	6000 Miles	12000 Miles
Brakes	Test that they are operational		At Every Use		
Breakaway System	Check battery charge and switch operation				
Brake Adjustment	Adjust to proper operating clearance		*		
Brake Linings	Inspect for wear and current draw			*	
Brake Springs	Inspect for wear and contamination			*	
Brake Controller	Check for correct ampereage & modulation			*	
Trailer Brake Wiring	Inspect for bare spots, frays, etc			*	
Hub/Drum	Inspect for abnormal wear or scoring			*	
Wheel Bearing & Cup	Inspect for corrosion or wear. Clean and repack.			*	
Shocks	Inspect for leakage. Replace if removed			*	
Springs	Inspect for wear, loss of arch			*	
Suspension Parts	Inspect for bending, loose fasteners, wear			*	
Hangers	Inspect for wear			*	
Wheels and Bells	Tighten to specified torque values			*	
Tire Inflation	Inspect for cracks, dents or distortion			*	
Tire Inflation	Inflate tires to tire's specs	*			
The Condition	Inspect for cuts, wear, bulging, etc		*		

INTRODUCTION TO TROUBLESHOOTING

The following section is a guideline for ensuring proper and safe 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 towed vehicle.

Troubleshooting

Most brake malfunctions can be corrected by utilizing the Troubleshooting Chart below. Mechanical failure is the most common form of malfunction, however, if the brake system fails and it's 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 following Troubleshooting chart to determine the probable cause and corrective actions for a variety of issues with the braking system. Please remember to use only Lippert Components, Inc. replacement parts on these systems. Consult the Limited Warranty or call our Service Department for any other related issues.

TROUBLESHOOTING CHART

Probable Cause	Corrective Action
NO BRAKES	Find & Correct Faulty Connections Adjust Brakes
WEAK BRAKES	Clean or Replace Cause of Corrosion Machine or Replace Improper Synchronization Adjust Brakes Re-burnish or Replace Overloaded Trailer
LOCKING BRAKES	Adjust Correct
INTERMITTENT BRAKES	Tail & Correct Machine or Replace Find & Repair
DRUMS PULL TO ONE SIDE	Tail & Correct Repair or Replace Find & Repair
Broken Wires	Adjust
Wrong Adjust Lead Wire Color	Clean or Replace Find & Repair
Incorrect Adjustment	Adjust
Broken Wires on Lining or Magnets	Clean or Replace Find & Repair
Bad Connections	Adjust
Underadjustment	Adjust
Improper Synchronization	Adjust
NOISY BRAKES	Adjust
Underadjustment	Adjust
Lack of Lubrication	Lubricate
Broken	Replace Component
Incorrect Brake Components	Correct
Grease or Oil on Lining or Magnet	Clean or Replace
Out-of-Round or Cracked Brake Drums	Machine or Replace
Over-adjustment	Readjust
Out-of-Round Brake Drums	Machine or Replace
Incorrect Brake Components	Replace
Loose, Bent or Broken Brake Components	Repair or Replace
Fully Breakaway Switch	Repair or Replace
Bad Shackle	Replace Axle
NOTE: If trailer lights and brakes do not work, check your wiring and connections and make sure the ball is making total contact with the coupler. (That is how a trailer is grounded). Too much grease or not using dielectric grease on the ball and coupler can cause this to happen.	
Measuring Voltage	
The Brake System voltage is measured at the two lead wires of the magnet on any brake. Using 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 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 in the wiring of the system, the battery or the alternator of the tow vehicle may result. 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 trailer braking. A quick increase in voltage will cause the braking system to feel like the trailer is grabbing too quickly.	
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 trailer 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.	
Low or no voltage are 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 (using of fuses 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 trailer, then the short is in the trailer. If the amperage reading remains high with the brake magnets disconnected, the short is the trailer wiring. All electrical troubleshooting procedures should start at the controller. Most complaints regarding brake harness 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.	

Amperage Chart			
Amperage/amp	Two Brakes	Four Brakes	Six Brakes
3.0 Nom	6.0 Nom	12.0 Nom.	18.0 Nom

Brake Adjustment

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

Lippert Components, Inc. Electric Brakes are manually adjustable only. If manual adjusting is needed, the following 6-step procedure can be utilized. Initially, brakes should be adjusted after the first 200 miles of operation when the brake shoes are set to 1/8" in the following manner:

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

WARNING!

Life unit by the frame and never the axle or suspension. Be held in the under unit unless it is properly supported by jack stands. Unsprung parts can fall causing serious injury or death.

1. Remove the adjusting hole cover from the adjusting slot on the bottom of the brake backing plate.
2. With a screwdriver or standard adjusting tool, rotate the starwheel of the adjuster assembly to expand the brake shoes. Adjust the brake shoes until the drum pressure of the linings against the drum makes the wheel very difficult to turn.
3. Turn the drum around until the drum turns freely with a slight lining drag.
4. Repeat the adjusting hole cover and lower the wheel to the ground.
5. Repeat the above procedure on all brakes. For best results, the brakes should all be set at the same clearance.

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 this time, servicing the braking system once a year is considered normal. Increased usage will require service on a minimum schedule based on 3000-5000 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 need to 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 dust particles to be airborne.

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 including block mounted on the actuating arm.

Magnets

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 trailer. 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 trailer 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 to check 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 electromagnets 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.

Shoes and Linings

Shoes 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. Brake linings should be replaced with the similar lining material or obtained directly from LCI. Brake lining data can be found on the surface of the brake lining. This information can be used to find correct replacement brake lining material. After replacing shoes and linings, your trailer brakes should be burnished-in by applying the brakes 20-30 times with a 20 m.p.h. decrease in speed, 0.9-40 m.p.h. to 20 m.p.h. Allow ample time for brakes to cool between application. This allows the brake shoes and magnets to begin seating to the brake drum.

Axle & Suspension Installation

The single most important portion of axle installation is parallel alignment of the trailer axle(s) to the tow vehicle or drive axle(s). Parallel installation allows for correct and safe control, prolonged road life and will all but eliminate dog-tracking. Proper alignment is most easily achieved by measuring from the center of the trailer king pin to the center of each end of the axles. The tolerance should not vary any more than 1/16". The difference between the centers of one axle and end centers of the other axle must not vary more than 1/8" in multiple axle configurations. Lippert Components, Inc. tubular axles are made of high strength steel to prevent metal fatigue and provide the best possible welding conditions. The round tubular axles allow for even and uniform structure.

Directions:

1. Position Brake Axles (if used) so that lead wires are on the roadside of the trailer.
2. For Leaf Spring axles, use all AP Kits provided with axle to install as shown in Fig. 1 below and torque fasteners as specified in the chart below.

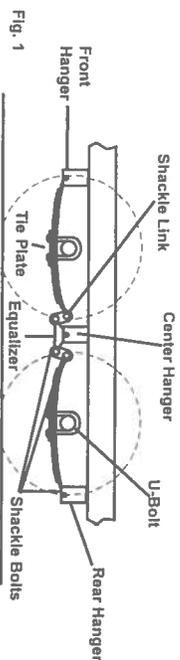


Fig. 1

Sprung Axle Torque Specifications		
Axle Size	Minimum ft.-lb.	Maximum ft.-lb.
U-Bolts	45	70
Shackle Bolts	30	50

GENERAL MAINTENANCE - ELECTRIC BRAKES

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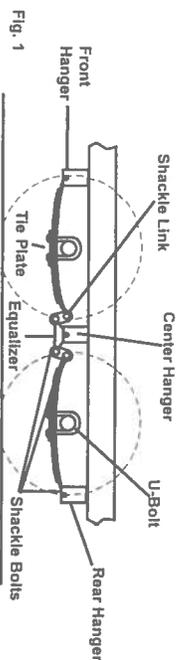


Fig. 1

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