

Wheel-Brakes

12¼ x 5½, 15 x 3, 16½ x 5-6-7 (Std)

16 x 2½, 17¼ x 3-4-5

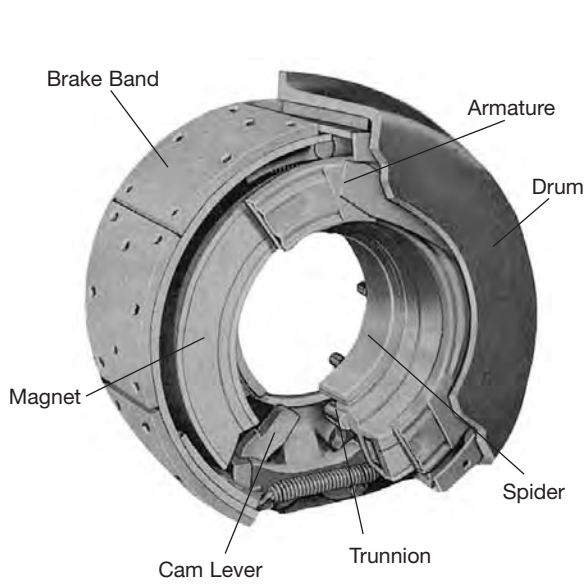
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Installation & Operating Instructions

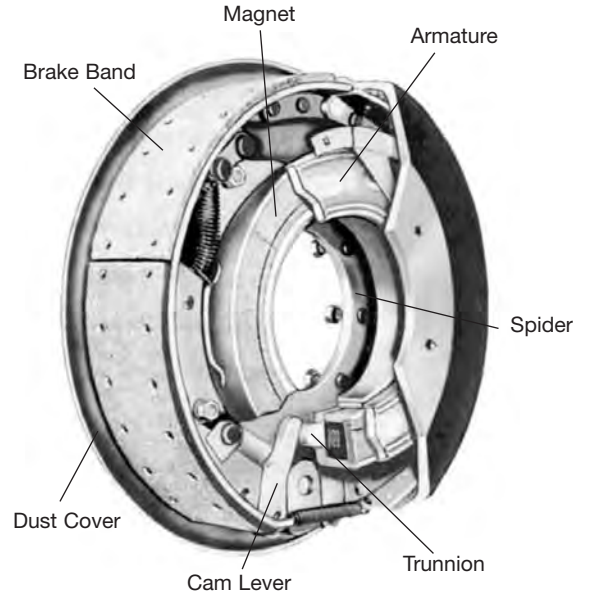


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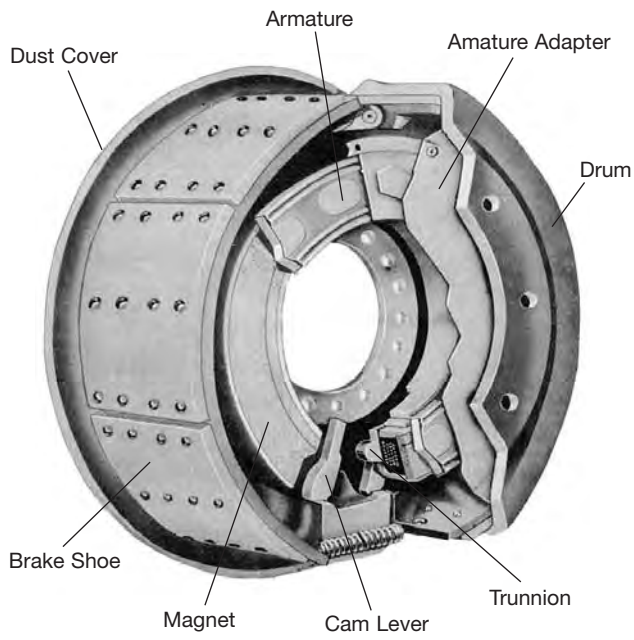
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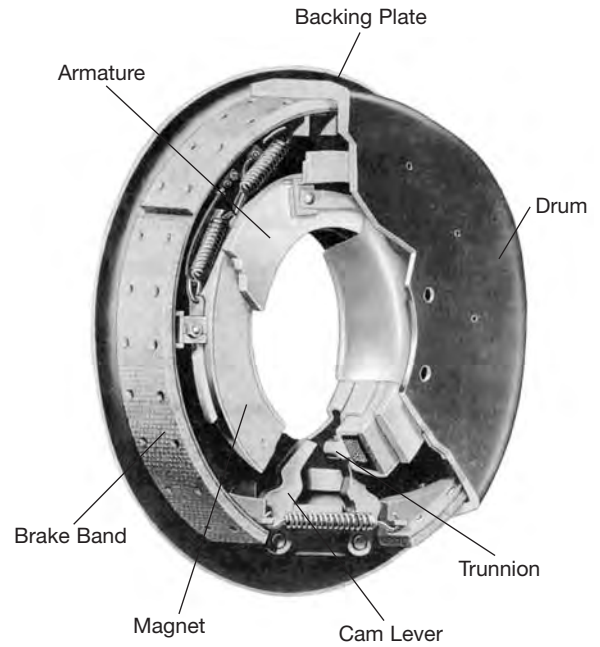
2-1/4 x 5-1/2 Brakes



15 x 3 Brakes



16-1/2 x 5-6-7 Brakes



16 x 2-1/2 and 17-1/4 x 3-4-5 Brakes

⚠ WARNING Failure to follow these instructions may result in product damage, equipment damage, and serious or fatal injury to personnel.

Section I Description and Operation

The Warner Electric Brake is basically a mechanical friction brake which uses a simple principle of electricity for its actuation. The small amount of electrical current required is obtained from the storage battery and/or generator with which every towing vehicle is equipped.

Unlike the ignition system of the engine, the Warner Electric Brake does not require the use of high tension current; therefore, no harmful shock is possible.

The main components of the Warner Electric Brake are the backing plate or brake spider, magnet, armature, brake band or brake shoes, cams and brake drum; the nomenclature of the brake components being dependent on method of fabrication, design, and to some extent on brake size. With the electro-mechanical actuating components (magnet and armature) removed, (Figure 1-1), the brake consists of a brake spider, which is mounted on the axle flange and supports the brake shoes and cams. These components are similar to, and functionally the same as, those components found in all other mechanical friction brakes.

The electro-mechanical actuating components comprise a "friction clutch" and serve to generate the force which multiplied by the cams, presses the brake shoes into the brake drum. One plate of this "clutch" is the armature, (Figure 1-2) which is bolted to the drum and rotates with the wheel. The other plate of this "clutch" is the magnet, (Figure 1-3) which is mounted on the brake spider and is free to rotate a limited number of degrees in either direction. When the "clutch" is engaged (upon application of an electric current to the magnet) any movement of the trailer wheel (forward or backward) causes the magnet to rotate and braking results.

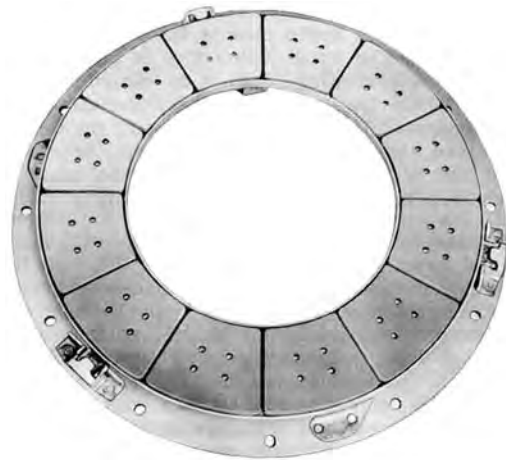


Figure 1-2
Armature Assembly

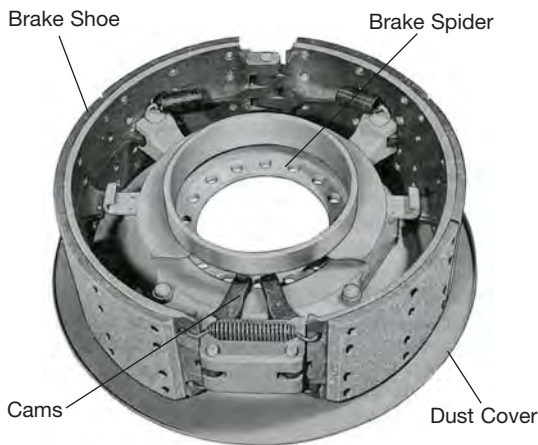


Figure 1-1
Electric Brake—Magnet Removed



Figure 1-3
Magnet Assembly

Operation

When the magnet rotates, a trunnion, located on the back of the magnet, moves the cam. The cam, bearing on the brake shoe end, moves the brake shoe into contact with the brake drum. After the toe end of the brake shoe is forced against the brake drum, the shoe (being free to float on its support and somewhat flexible in structure) will tend to follow the drum until the complete brake shoe assembly is making contact with the drum. The brake shoe is limited in its travel, however, since the heel end is forced against an anchor, which is part of the brake spider assembly.

As the amount of current applied to the magnet is increased, the attractive force between the magnet and armature becomes greater. With an increase in attractive force between magnet and armature, more torque is developed by the "clutch" and the pressure exerted by the magnet trunnion upon the brake shoe (through the cam) increases; and the shoe is pressed tighter into the drum.

Until the vehicle is brought to a stop, slippage between the magnet and armature occurs. However, if during a stop sufficient pressure is built up, slippage between the magnet and armature ceases and the entire unit (magnet, armature, brake shoe, and brake drum) will lock and slide the tire, providing the brake is of proper capacity for the wheel load.

No brake adjustment is necessary. The magnet movement is sufficient to wear the brake lining down to the rivet heads if the proper brake shoe to drum clearance is maintained when new lining is present. When the lining has worn out, the cams come against a positive stop (preventing further magnet rotation) preventing the rivet heads from scoring the drum. Improper clearance between brake shoe and drum initially will cause the magnet to reach full travel before completely wearing out the lining. In either case, as full magnet travel is reached, a gradual loss of brake power will result.

Thus from the foregoing description, it is readily seen that the Warner Electric Brake is a simple power-brake. The amount of power developed being controlled by the amount of current metered to the magnet by the brake controls. Maximum power being achieved by an amount of current approximately equal to that used by a tail-lite.

How to Break in Trailer Brakes

When the armatures and magnets are new, to prevent possible damage and to increase their efficiency, the following steps should be followed during the initial braking applications:

1. Attain a minimum vehicle speed of thirty miles per hour and apply trailer brakes only until the vehicle speed is retarded to approximately fifteen miles per hour, then release the brakes allowing the vehicle to regain speed. **DO NOT LOCK THE WHEELS.**
2. Next, drive for about one-half mile without applying the trailer brakes. Repeat Step No. 1.
3. It will be necessary to follow Steps No. 1 and 2 until you have traveled approximately six miles.
4. Allow the brakes to run free during the next four miles. Then apply the brakes to check their efficiency.

This procedure is also recommended whenever a wheel has been pulled for maintenance of any kind or when the trailer has set idle for any extended period of time.

How to Apply Brakes

A brake is designed for a fixed capacity based upon wheel load and tire size, and it is mounted in a minimum of space in order to clear springs and frames. Considering this, it should not be required to handle more than its own wheel load.

To obtain satisfactory trailer brake performance, the towing vehicle's brakes must handle their own load, and therefore, must be applied simultaneously with the trailer brakes. Consequently, the towing vehicle's brakes and the tractor trailer brake control system must be kept in good repair to obtain maximum results from the trailer brakes.

Overloading or using only the trailer brakes to stop the complete tractor-trailer unit, will cause the heat absorption capacity of the brake to be exceeded. Hotter brakes, longer stops, and shorter lining life will result.

Section II. Installation

Prepare Brake and Axle for Installation

The performance of an electric brake depends entirely upon an accurate installation. Follow instructions, for accuracy is definitely demanded and a brake properly installed assures long life and dependable performance.

In preparing for installation, make certain that the hub drum pilot (A, Figure 2-1) is at a perfect right angle with the drum mounting surface (B), and that the drum pilot (A) runs concentric with the axle spindle within .010" total indicator reading. This may be checked on the axle with a dial indicator or by removing the hub and placing it in a lathe, using its own bearings on the arbor for centering. If drum pilot bore and mounting holes are not already present, bore drum pilot, allowing a maximum of .004" clearance; and drill bolt holes, using the hub as a template.

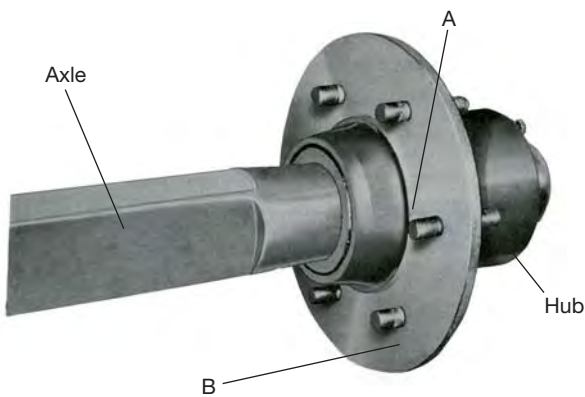


Figure 2-1
Installing Drum on Axle

Install and Check Drum

Mount drum on hub and tighten securely. Check drum for concentricity making certain that drum bore is concentric with axle spindle with .010" total indicator reading. Rotate drum on hub for best results. If drum is not within concentricity limits, place hub and drum assembly in drum lathe (Figure 2-2) and remove the very minimum of stock which will permit drum to run within concentricity limits. If it becomes necessary to remove more than 1/32" from drum bore (diameter), remove 1/16" stock from drum and use oversized lining of 1/32" shim stock under lining to maintain proper drum to lining clearance.



Figure 2-2
Checking Drum on Lathe

Install Flanges

If axle is equipped with brake mounting flanges suitable for installing electric brakes, clean flanges to insure proper fit between flange and brake spider. If axle is not equipped with flanges or old flanges are not suitable for installing electric brakes, new flanges - properly located - must be welded in position on the axle. Cut off old flanges with a cutting torch leaving axle clean and smooth.

Select the correct brake mounting flange for the size of brake to be installed.

#4604 for 15 x 3" brake

#40039 for 12 1/4 x 5 1/2" brake

#40039 for 16 1/2 x 5, 6, 7" brake

Mark the inside of the flange 1/16" larger than the actual size of the axle, (Figure 2-3). Cut the opening with a cutting torch or turn out on a lathe. If opening in flange is not large enough to permit assembly over axle collar, cut flange in half with a hacksaw. **Do not use a cutting torch!**

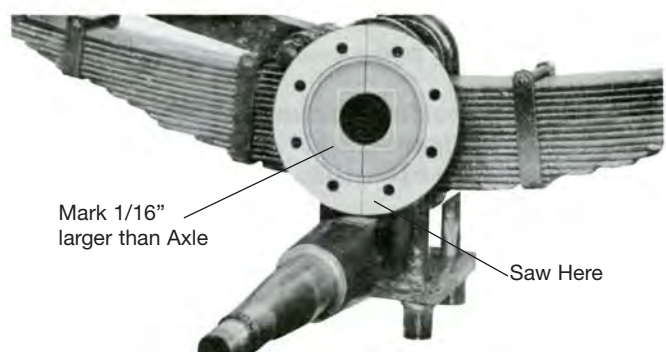


Figure 2-3
Installing New Mounting Flanges

Bevel edges of hacksaw cut to provide surface for good weld.

If a 16-½ x 5, 6, or 7” brake is to be installed, bolt armature adapter to the drum, (Figure 2-4).

- Adapter #3979 for 16-½ x 5” brake
- Adapter #3993 for 16-½ x 6” brake
- Adapter #3942 for 16-½ x 7” brake

It is important that a thin coating of “Permatex” or other suitable sealer be used between armature adapter and brake drum to prevent grease from leaking under adapter and getting into brake assembly.



Figure 2-4
Bolting Armature Adapter to Drum

Bolt the welding fixture inside of drum as illustrated in Figures 2-5, -6, -7.

Fixture #EQ-615A (Figure 2-7) for 16-½ x 5, 6, 7” brake.

Fixture #EQ-793 (Figure 2-5) for 12-¼ x 5-½” brake.

Fixture #EQ-730 (Figure 2-6) for 15 x 3” brake. If clearance between drum and fixture is present, center the fixture in drum by using shims between fixture and drum in four locations as shown.

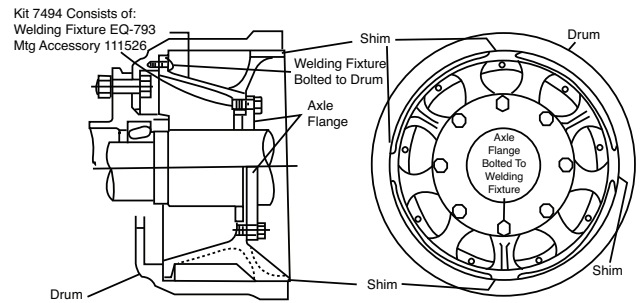


Figure 2-5
Location of Welding Fixture Inside of Drum
(12-1/4 x 5-1/2” Brake)

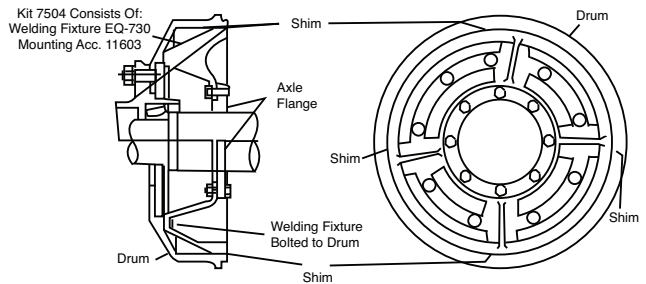


Figure 2-6
Location of Welding Fixture Inside of Drum
(15 x 3” Brake)

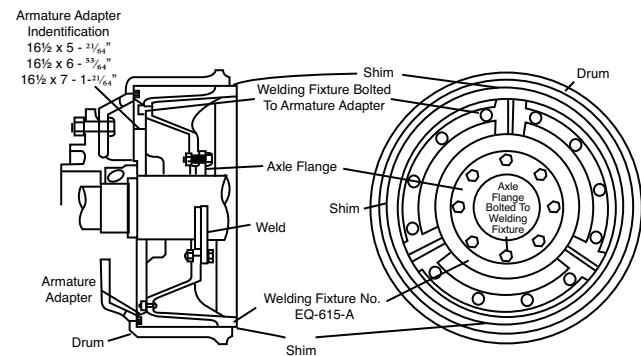


Figure 2-7
Location of Welding Fixture Inside of Drum
(16-1/2 x 5, 6, 7” Brake)

Bolt axle flange to welding fixture and install hub, drum, and welding fixture assembly in place on axle. Pull wheel bearing lock nut tight. If flange has been cut in half, insert shims (Figure 2-8) in hacksaw cut before welding to prevent shrinkage. If grease seal is used as a bearing spacer and is too large for flange or welding fixture to pass over, put welding fixture and flange on axle and assemble to drum after hub and drum assembly are placed on axle. Center welding fixture in drum by using shims as illustrated in Figures 2-5, -6, -7.

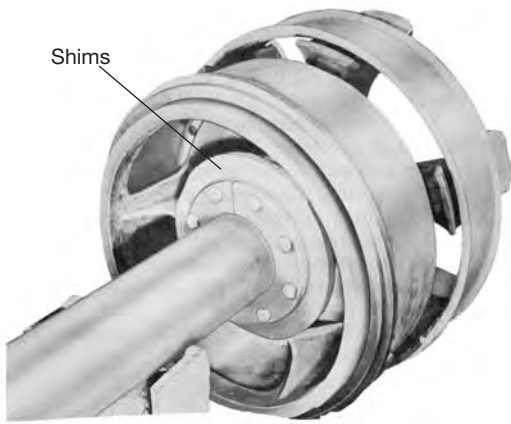


Figure 2-8
 Location of Shims for Welding Flange

With an electric arc, tack both outer edges of hacksaw cut, if cut is present. Tack flange (Figure 2-9) to axle in approximately four places. Complete weld by welding hacksaw cut first - outer edge to axle - then make continuous weld between flange and axle. Remove bolts that hold flange to welding fixture and remove hub, drum, and welding fixture from axle. Complete weld on opposite side of flange. Remove welding fixture from drum and clean all weld splatter from drum or spindle surfaces.

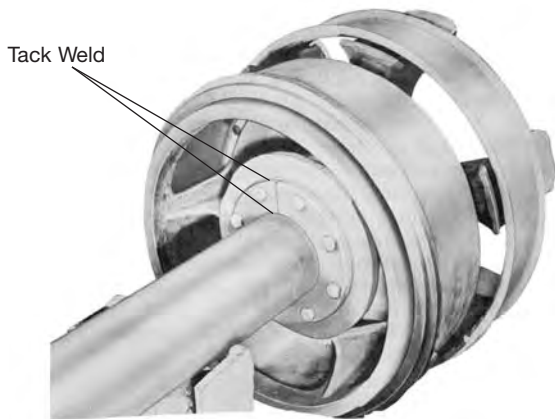


Figure 2-9
 Weld Points on Flange

NOTE: Do not use same hub and drum assembly as template for all wheels. Use hub and drum designated for each wheel location.

Install Brakes

The desired position for mounting brakes on the axle is indicated in Figure 2-10. Whenever possible they should be mounted so that the brake spider anchor is down and 45° to the rear as determined by forward vehicle travel. Mounting brakes in this position affords the best wheel bearing loading during application of brakes. If the brakes are marked right and left hand because of the type and location of lining segments in brake shoes, the woven lining (with arrow indicating drum rotation for forward vehicle travel) must always be on the toe end of the shoe ring. Left and right hand are determined by facing in the direction of forward vehicle travel. In the event it is not possible to locate the brake spider anchor as shown, the anchors must be in the same relative location for all wheels.

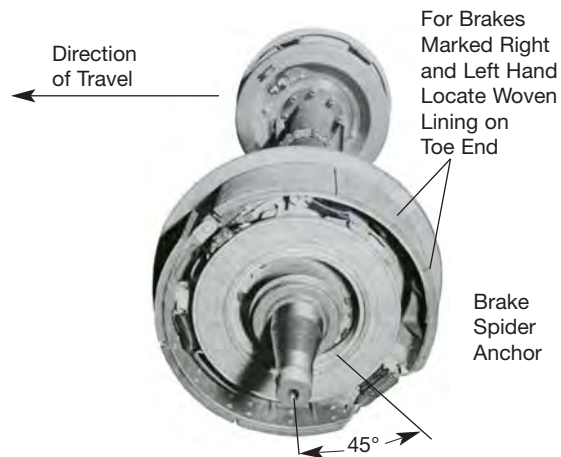


Figure 2-10
 Brake Mounted in Correct Position

Install Armature in Drum

Bolt armature inside of drum (Figure 2-11). Armature bolts directly to armature adapter for 16-1/2" series brakes. On 12-1/4 x 5-1/2" and 15 x 3" brakes, grease guard is placed between armature and drum when armature is bolted in place. A thin coating of "Permatex" or other suitable sealer must be used between grease guard and drum at this time.



Figure 2-11
Bolt Armature Inside of Drum

NOTE: Armatures are marked right and left hand, and they must be installed accordingly. Face in direction of forward vehicle travel to establish right and left hand relationship.

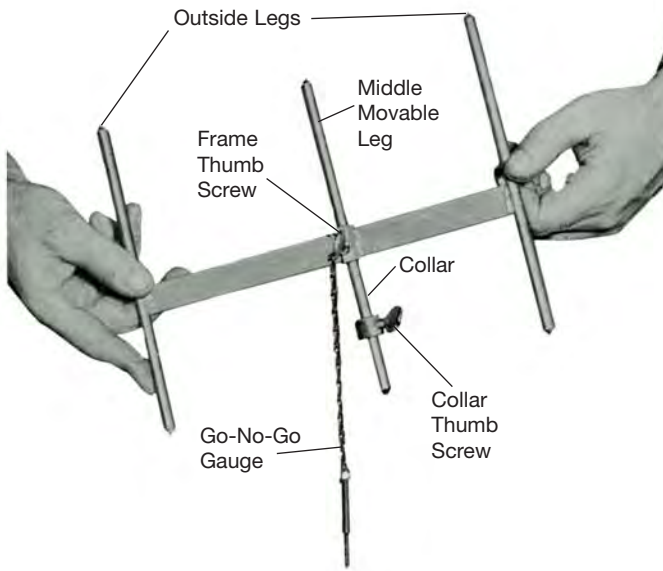


Figure 2-12
Armature Depression Gauge

Check Armature Depression

Before closing up the brake assembly by mounting the wheel on the axle, check the armature depression. Since the armature and magnet must run in light contact at all times (the armature is spring mounted to compensate for armature and magnet wear), it is absolutely necessary that the proper magnet and armature relationship, termed armature depression, is maintained at all times. Because this relationship between armature and magnet constitutes a blind assembly, an armature depression gauge (Figure 2-12) is used.

- Gauge #40252 for 12-1/4 x 5-1/2" brake
- Gauge #40252 for 15 x 3" brake
- Gauge #4812 for 16-1/2 x 5, 6, or 7" brake

Step 1 To determine the amount of depression, place the outside legs of the gauge against the magnet facing with both thumb screws loose and with collar on middle leg on the outside of gauge crossbar (Figure 2-13). Push the middle, movable leg into contact with the bearing shoulder. Make certain that the gauge is held perpendicular to the magnet and that the magnet is flush against the brake spider.

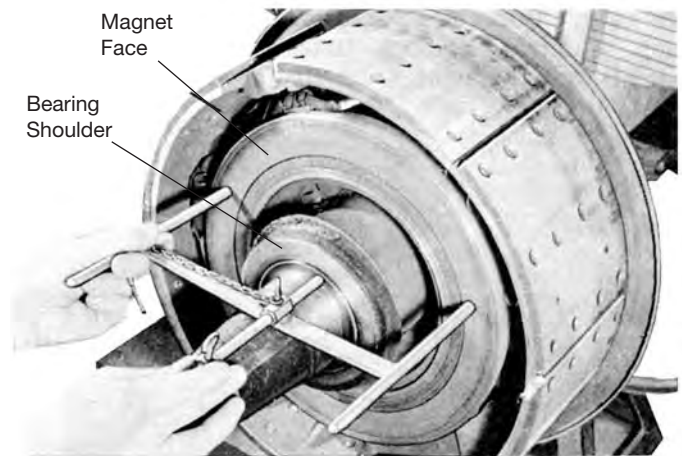


Figure 2-13
Using Depression Gauge—Step 1

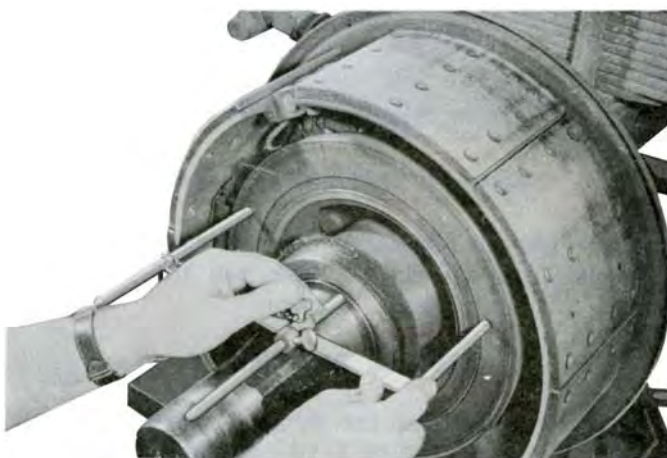


Figure 2-14
 Using Depression Gauge—Step 2

Step 2 Next, tighten the frame thumb screw, positioning the movable leg (Figure 2-14). Move the collar up against the frame and tighten the collar thumb screw fixing the collar securely upon the movable leg.



Figure 2-15
 Positioning Armature Disc

Step 3 With the wheel assembly lying down so that the armature is horizontal, place the inner bearing in the hub and rotate under light pressure to make certain bearing is fully seated. Have someone hold the armature disc (Figure 2-15) up against the stops or place three wedges equally spaced under the disc to hold it against the stops. Using wedges is the more accurate method.



Figure 2-16
 Using Depression Gauge—Step 3

Step 4 Reverse the gauge so collar on center leg is below gauge crossbar, and place the outside legs against the armature face (Figure 2-16). Make certain gauge legs are on armature face and not between segments or in welding projection holes. Loosen the thumb screw on the gauge frame only, and push the movable leg against the bearing. Tighten the gauge frame thumb screw fixing the movable leg in this new position. Check this position of the three legs in three points, 120° apart, to insure correct reading.



Figure 2-17
 Measuring Armature Depression

Step 5 The distance between the gauge frame and the collar on the movable leg is the armature depression (Figure 2-17). It should be between 1/8" and 3/16".



Figure 2-18
Using GO-NO-GO Gauge

Step 6 The armature gauge is provided with a Go-No-Go gauge (Figure 2-18) presenting an easy manner of checking for correct depression. The small end of the pin is 1/8" in diameter and should slip between the gauge frame and the collar. The large end of the pin is 3/16" in diameter and should not slip between the gauge frame and collar.



Spacer No. 3516 1/16" thick
 Spacer No. 3516A 1/32" thick

For use with 12-1/4" x 5-1/2"
 and 15" x 3" Brakes



Spacer No. 3313 1/16" thick
 Spacer No. 3313A 1/32" thick

For use with 16" x 2-1/2",
 17-1/4" x 3", 4", 5", and
 16-1/2" x 5", 6" and 7" Brakes

Figure 2-19
Armature Retainer Ring Shims

Adjust Armature Depression

If the depression is less than 1/8", the difference must be made up by placing shims (Figure 2-19) under the armature retaining ring. If the depression is more than 3/16", place a hardened bearing spacer between the inner bearing and the bearing shoulder on the axle. Warner Electric does not supply bearing spacers.

If wedges have been used under the armature to check depression, be sure to remove them.

Cleaning

Clean all grease and oil from the brake drum surface, armature face, magnet face, and brake lining with carbon tetrachloride before mounting wheels. Pack wheel bearings with a good grade of bearing grease. Be sure wheel bearings are tight, as loose bearings cause grabby, erratic brakes. Under no circumstances should a grease gun be used; and if any grease fittings are present, remove them and plug holes before releasing the unit for service.

Electrical Connections

Make necessary electrical connections in accordance with recommended wiring diagrams CWA-001 through CWA-008 furnished separately.

Section III Maintenance

During preventive maintenance periods or when attempting to diagnose brake troubles, three simple checking procedures should be followed. Merely by checking the current available for braking, the approximate amount of brake lining wear, and whether or not the wheel bearings are tight; most brake troubles can be pin pointed and the condition of the electric brake system determined.

Check Current Available

Be sure that the electrical circuit of the towing vehicle is connected to the electrical circuit of the trailer (Figure 3-1). It is good practice to check and clean the socket and plug contacts periodically to insure a clean, tight connection.



Figure 3-1
Towing Vehicle Electrical Connection

Remove either one of the brake circuit wires from a controller terminal and connect a low reading DC ammeter (15-25 amp. capacity) between the controller terminal and the wire just removed (Figure 3-2). Make certain load control is set at 100% (full on). Start engine and idle fast enough to insure full battery charge.



Figure 3-2
Connecting Ammeter to Controller and Brake Wire

Make a light, fast application of the controller (Figure 3-3) and observe the direction of movement of the ammeter needle. If needle moves in wrong direction, reverse the ammeter leads. Current of the wrong polarity in excessive amounts can damage the ammeter. When ammeter is correctly connected in the brake circuit, make a full application of the controller, noting the total current in the circuit as shown by the ammeter. Move the load control from 100% to 0 and observe movement of ammeter needle. There should be a gradual reduction of current. Return load control to 100% and note current reading. If same as previous reading, load control is operating correctly.



Figure 3-3
Checking Circuit Current

To determine whether proper current is available for braking, refer to Table I- Magnet Current Rating.

Table I - (Magnet Current Rating)

Brake Size	AMPS		Brake Size	AMPS
	6 Volt	12 Volt		
12-1/4 x 5-1/2"	3.7-4.1	3.0-3.7	*16 x 2-1/2"	3.4-3.8
15 x 3"	3.7-4.1	3.0-3.7	*17-1/4 x 3 & 4	3.0-3.4
16-1/2 x 5*, 6*, 7"	3.4-3.8	2.6-3.2	*17-1/4 x 5	4.0-4.5

* Not in production - service parts only.

When the towing vehicle has a 6-volt electrical system, all brakes will be connected in parallel; therefore, the total current in the brake circuit should be equal to the number of brakes times the value given in Table I.

If the towing vehicle has a 12-volt electrical system, all single axle trailers will be wired in parallel; and the total current in the brake circuit, should again be equal to the number of brakes times the value given in Table I. However, if the trailer is a tandem axle trailer, all brakes may be wired in parallel or the brakes on each axle may be wired in series and the axles wired in parallel. If all brakes on a tandem axle trailer are in parallel, the total current in the brake circuit should be equal to the number of brakes times the value given in Table I. If, on a tandem axle trailer, the brakes on each axle are wired in series and the axles are wired in parallel, the total current in the brake circuit should be equal to that of a single axle trailer wired in parallel.

If the reading at the controller is higher than the maximum based on Table I, check for a short in the wiring, cable, controller, or brake magnets (Figure 3-4). If the reading at the controller is less than the minimum based on Table I, check the complete electrical circuit for loose or dirty connections, broken wires, improper wire size, and conformity of wiring arrangement with Warner Wiring Diagrams. If towing vehicle has a 12-volt electrical system, check to make certain proper external resistor is being used. All splices and terminals should be soldered and ground connections made at battery or welded to the frame.

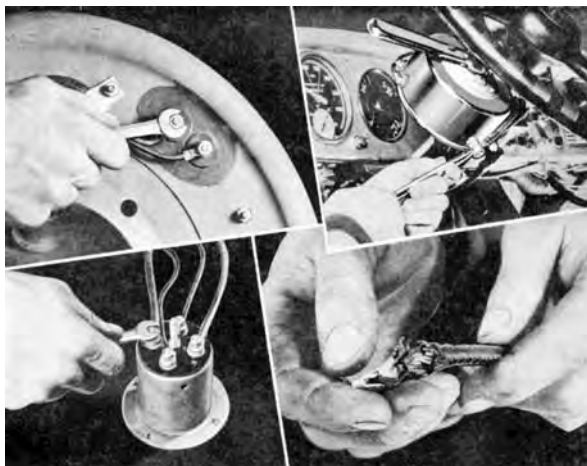


Figure 3-4
Checking Electrical Connections

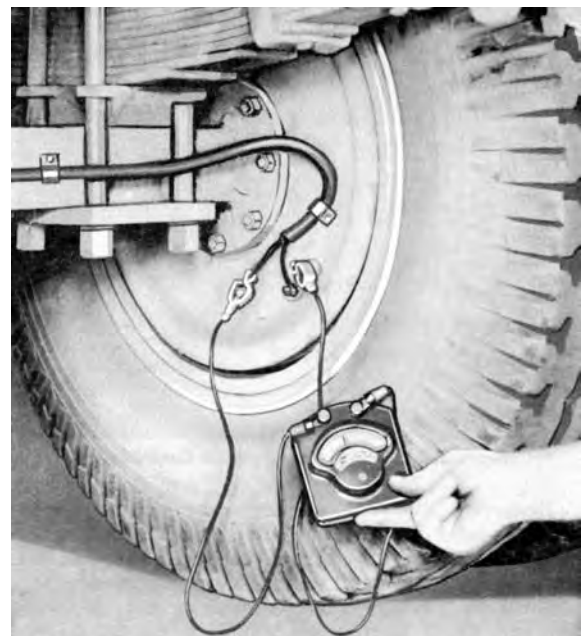


Figure 3-5
Checking Amperage at Brake Magnets

Check Amperage at Each Brake

Amperage check at the controller should be followed by an individual amperage check at each brake magnet (Figure 3-5). When all brakes are connected in parallel, connect the ammeter between either of the brake terminals and the wire removed from that terminal. Make light, fast controller application to insure that meter is properly connected into brake circuit with respect to polarity. The reading at each brake should be the same and equal to the value given in Table I. If brakes are connected in series on a given axle (tandem axle trailer and 12-volt tractor), current per axle is equal to one magnet based on Table I. To check each individual magnet when series is connected, disconnect both leads from one brake and connect ammeter between the two leads. The reading per magnet should be double that given in Table I. If current reading for any one brake is incorrect, inspect for broken wires, dirty or loose connections and shorts. Failure to find fault externally, when brake amperage is incorrect, will necessitate removal of wheel for further inspection.

Check for Lining Wear

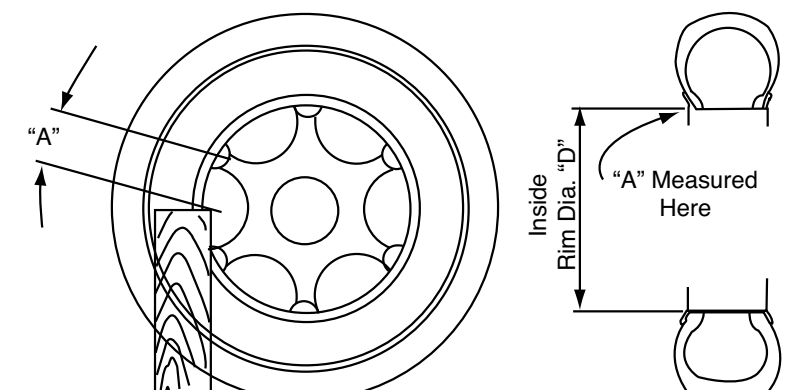
To check for lining wear, apply the tractor hand controller full on and back up the unit to set the trailer brakes hard. Do not release the brake, but mark the rim as indicated in Table II, page 15. Without releasing the brake, move the unit forward to set the trailer brakes hard, and again mark the rim as indicated in Table II. Measure the dimension "A" on the curve of the rim.

Note: The differences in loading and method of measuring give only approximate results which should be close enough to determine whether the magnet is approaching maximum travel and/or the lining is worn out. For greater accuracy, it may be necessary to disconnect all brakes except one and check each wheel individually. After setting brake as above, ease clutch off so as to allow deflection of trailer suspension, caused by brake application, to release.

If maximum travel based on Table II has been reached and loss of brake power has been experienced, wheels should be removed and the brakes relined.

Table II — Lining Wear

Tire Rim Size	Nom. "D" (in.)	C	"A" Maximum					
			12-1/4 x 5-1/2	15 x 3	16 x 2-1/2	16-1/2 x 5, 6, 7	17-1/4 x 3	17-1/4 x 4, 5
15	14.7	7.8	8.15					
16	15.7	7.3	8.7					
18	17.6	6.5	9.75	8.6				
20	19.6	5.85	10.8	9.6	6.0	11.3	9.1	12.3
22	21.6	5.3		10.5	6.6	12.45	10.0	13.5
24	23.7	4.87		11.6	7.25	13.65	10.9	14.8



Check For Loose Wheel Bearings

During brake inspection periods and before removing wheels, jack up each wheel and check for loose wheel bearings (Figure 3-6). If by using a bar under the tires, the wheels can be moved up and down on the axle the wheel bearings are loose or worn. This condition can cause grabby or noisy brakes, a dragging brake which creates undue heat and rapid lining wear, or a possible wheel lockup. **Bearings Must Be Kept Snug.**



Figure 3-6
Checking for Loose Wheel Bearings

When wheels must be removed for maintenance or repair, always check for worn or defective bearings and cups (Figure 3-7). Defective parts must be replaced. Also check the hub for cracks and for proper fit of the bearing cups in the hub.

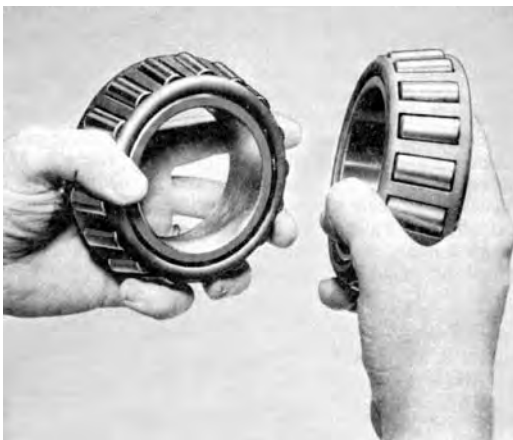


Figure 3-7
Inspecting Wheel Bearings

Inspect Drums

Before relining brakes or during regular maintenance periods, the drum should be checked for an out-of-round condition. This may be accomplished by an inside micrometer or a dial indicator mounted on a stub spindle (Figure 3-8). Drums should not be out-of-round more than .010", since such a condition can cause erratic, grabby brakes and possible difficulty in assembling the wheel onto the axle.

Whenever a wheel is removed, always check the drum mounting bolts. They must be kept tight, since a loose drum has the same effect as loose wheel bearings. A loose drum may also cause the drum mounting bolts to shear off during a brake application.

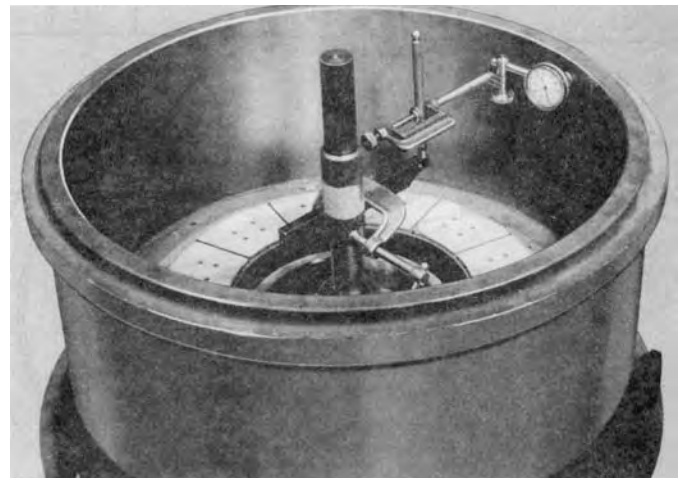


Figure 3-8
Checking Drum with Inside Micrometer
and Dial Indicator

Check drums for excessive heat checking and scoring. Heat checking may be a sign of an undersized brake, a dragging brake, or an unbalanced brake condition in the tractor-trailer unit. Heat checking will also be accompanied by excessive brake lining wear. If the brake drum is scored, check for loose lining rivets or foreign metal particles imbedded in the lining. Drums which have excessive heat checking or scoring should be turned.

Drum and Lining Clearance

Since the electric brake cannot be adjusted to compensate for drum and lining wear, clearance between drum and lining is one of the most important factors governing electric brake operation. This clearance is best controlled at the initial installation, during re-lines, and during drum replacement. If proper clearance between drum and lining is maintained at these times, the electric brake is so designed that the lining will be completely worn out by the time the maximum cam travel is reached. However, if too much clearance is present initially, maximum cam travel will be reached before the lining is completely worn out and a gradual loss of brake power will result. Too little clearance initially may cause a brake to drag with a possible wheel lockup, or make it difficult to assemble the wheel onto the axle. Considerable variation in drum to lining clearance between brakes on a given unit could cause unbalanced braking.

Relining Brakes

Brake shoe and lining assemblies as received from the factory are ground to give a drum to lining clearance of approximately .020" (.040" on the diameter) with respect to the nominal brake diameter. When relining or replacing a drum, the drum bore and overall lining diameter (Figure 3-9), should be matched to obtain approximately .020" clearance. Table III will serve as a guide for obtaining proper clearance.

Caution should be exercised when boring drums and relining shoes as there is no definite yardstick to follow as to how much a drum may be oversized. It is generally recommended that a drum shall not be bored oversize more than 1/4" on the diameter and that shim stock thicker than 1/8" shall not be used with riveted lining. In some operations, such as mountainous terrain, it is recommended that drums be replaced before this time. In order that peak brake efficiency be obtained, use only factory approved and tested lining as covered by Charts I-26011 and I-26012 in the replacement parts section of this manual.

Do not weld metal to band ends to compensate for drum wear, excessive drum to lining clearance, or wear of brake components.

Always check the brake shoe assembly for worn loose or greasy lining. If any of these conditions exists, replace with Warner recommended lining. The high radial pressures developed by the brakes will cause too soft a lining to wear rapidly, often causing damage to the drum and the brakes to fade under heat. Where greasy lining is encountered, inspect and replace grease seals. If enough grease is present, it may be necessary to remove the grease guard or armature adapter and clean grease from wheel and drum. When replacing the grease guard or armature adapter, a thin coating of "Permatex" or other suitable sealer must be used between adapter and drum. Surface grease on lining, drum braking surface, magnet, and armature can be removed with carbon tetrachloride or other suitable solvent. However, if grease has penetrated lining or magnet facing, they must be replaced since grease will seep to the surface under heat causing weak brakes.

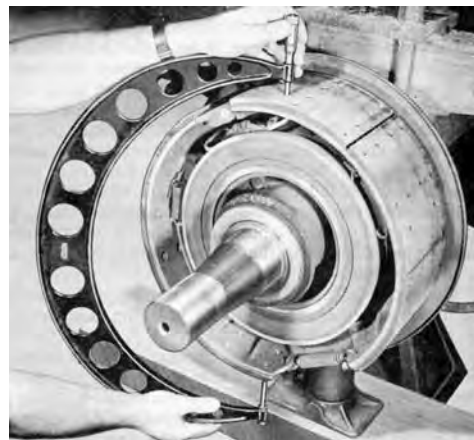


Figure 3-9
Measuring Band Size with Outside Micrometers

Table III - Drum Rebores and Brake Reline Tolerances

Brake Size	Brake Shoe Dia.	Replacement Lining Thickness Tolerances	
		Standard	Oversize
12-1/4 x 5-1/2"	11.442	0.385	—
	11.450	0.400	—
15 x 3	14.300	0.325	—
	14.310	0.330	—
16 x 2-1/2	15.4370	0.265	—
	15.4375	0.275	—
16-1/2 x 5, 6, 7	15.682	0.390	—
	15.692	0.400	—
17-1/4 x 3, 4, 5	16.370	0.385	—
	16.375	0.405	—

When brakes are relined, but the drum is not turned; the ridge left on the bell end of the drum, due to drum wear on the drum braking surface, should be removed. This may be accomplished by turning or by using a hand grinder (Figure 3-10) with a flexible disc.



Figure 3-10
 Removing Ridge on Drum

Check Magnet And Armature

Make certain that proper magnet and armature relationship is being maintained. That is, the magnet poles should always be in contact with the armature (metal to metal). This is initially accomplished by undercutting the magnet facing .005 to .007" below the magnet poles (Figure 3-11) at the factory. This insures that the magnet poles will be fully seated in their armature tracks before the magnet facing comes into contact with the armature. Normally the magnet pole tracks in the armature should be only slightly wider than the magnet poles. If excessively wide tracks are present on the armature, a loose drum or loose wheel bearings are usually at fault.

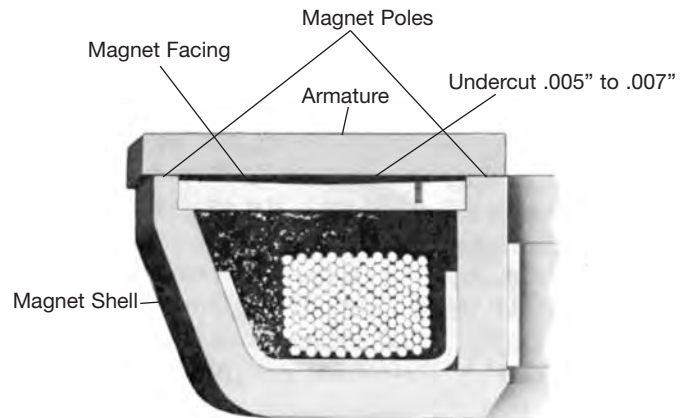


Figure 3-11
 Cross Section of Magnet and Armature

During normal operation, the face of the armature and magnet will become scored or grooved to some extent (Figure 3-12). This condition is not detrimental and does not show excessive wear or defective parts. In the case of some magnets, termed “air gap” and distinguished by an expansion groove in the magnet facing, a ridge will appear on the armature opposite this groove after considerable wear. It is recommended that the ridge be partially ground off, so that at maximum wear, it cannot cut through the magnet facing and short out the magnet coil.

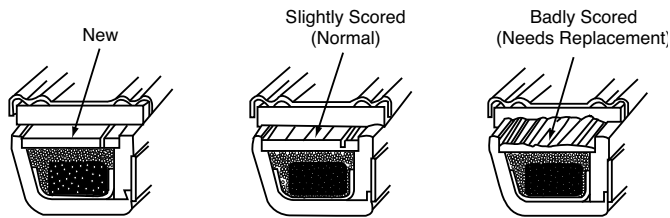


Figure 3-12
Typical Wear Patterns

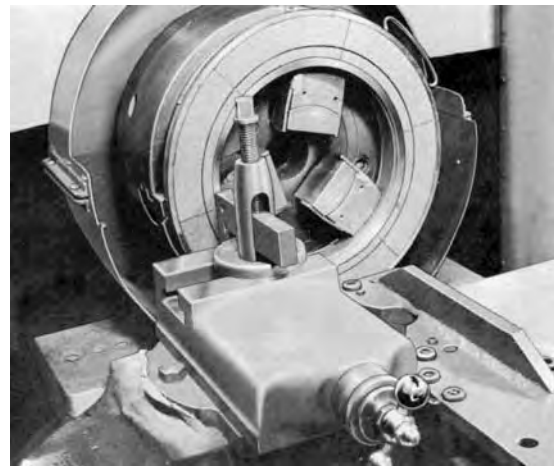


Figure 3-13
Undercutting the Magnet Facing

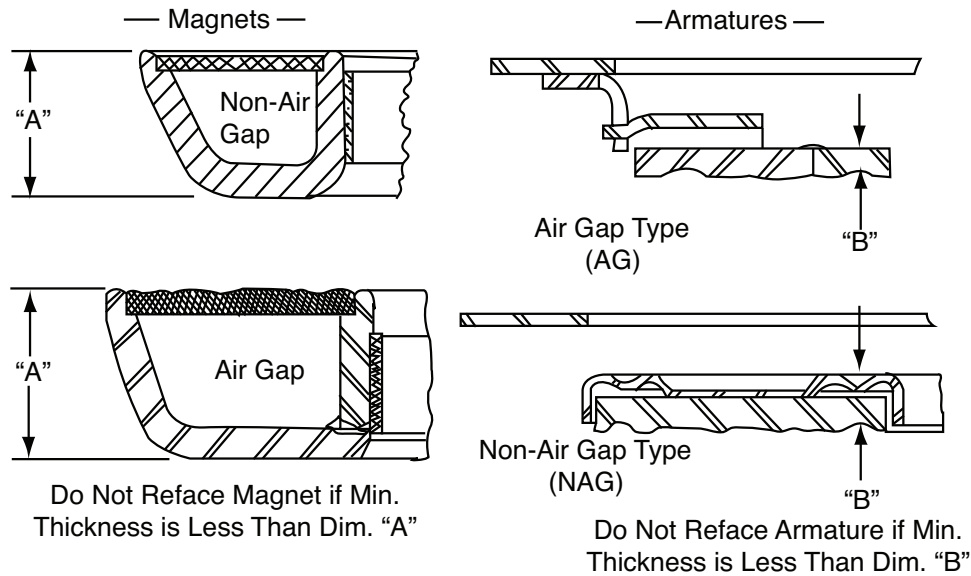
Often times, when there is a complaint of weak brakes and all other things appear normal, a glazed magnet facing is at fault or a condition exists whereby the magnet facing prevents the magnet poles from coming into direct contact with the armature. This condition may be remedied by placing the magnet in a lathe (Figure 3-13) and undercutting the magnet facing (**Do Not machine the magnet poles**) with a carbon tipped tool or by using a small piece of sandpaper (**Do Not use emery cloth**) on the finger tips or on a small block of wood. Whenever possible, use only sandpaper; undercutting the magnet facing in a lathe reduces magnet wear life.

Replacement of Magnets and Armatures

Note: All single wire magnets are replaceable with 2 wire magnets by grounding one wire to the brake.

Table IV is a guide to determine when magnet and armature should no longer be refaced. As indicated magnets and armatures may be used even when dimensions “A” and “B” are below the minimum; but they should never be refaced when below this minimum. If a magnet needs to be replaced, a new or refaced armature must be used. However, an armature may be replaced without replacing the magnet. In this case, merely make certain the magnet facing is below the magnet poles to insure proper pole contact initially.

Table IV — Magnet and Armature Wear



Magnet and Armature can be used if dimensions "A" and "B" are below minimum given, but they should not be refaced after minimum dimensions are reached.

Brake Size	Magnet	AG=Air Gap NAG=Non Air Gap	Dim. A	Armature	AG=Air Gap NAG=Non Air Gap	Dim. B
	No.	Type		No.	Type	
12-1/4 x 5-1/2	40122	2 wire AG	1-15/64	4998A, 9A	NAG	27/64
15 x 3	40110	2 wire AG	1-7/32	4998A, 9A	NAG	27/64
16 x 2-1/2	4696	1 wire NAG	1-9/32	4655C, 6C	AG	3/16
	4752	2 wire NAG	1-9/32	4655C, 6C	AG	3/16
	4752A	2 wire AG	1-9/32	40045-6	NAG	3/8
16-1/2 x 5, 6, 7	40040	2 wire AG	1-13/32	40047-8	NAG	27/64
	40092	2 wire AG	1-13/32	40047-8	NAG	27/64
17-1/4 x 3, 4	4653	1 wire NAG	1-9/32	4597A, 8A	AG	3/16
	4750	2 wire NAG	1-9/32	4597A, 8A	AG	3/16
	40031	2 wire AG	1-9/32	40019-20	NAG	25/64
	40093	2 wire AG	1-9/32	40019-20	NAG	25/64
17-1/4 x 5	4653	1 wire NAG	1-9/32	4597A, 8A	AG	3/16
	4708	2 wire NAG	1-9/32	4597A, 8A	AG	3/16
	40091	2 wire AG	1-9/32	40019-20	NAG	25/64
	40013					
40090						

NOTE: All single wire magnets are replaceable with 2 wire magnets by grounding one wire to the brake.



Non-Air Gap Magnet



Air Gap Magnet



Air Gap Armature



Non-Air Gap Armature

Figure 3-14,
Types of Magnets and Armatures

It is important that magnets and armatures be used in pairs (Figure 3-14), both from a wear pattern standpoint and for proper electrical characteristics. Therefore, during repair and maintenance periods, never interchange magnets and armatures. When new magnets and armatures are to be replaced, either individually or in pairs, make certain that proper electrical characteristics will be obtained. Thus, either the magnet or armature must have an air gap in order to insure proper brake release. If both magnet and armature have an air gap, weak brakes will result. Always order replacement parts by the number stamped on the armature retainer ring or the magnet nameplate.

Check the magnet bushing for damage or excessive wear. A new bushing is approximately 1/16" thick and should not be used when worn below 1/32". Worn bushings may be removed by driving a "prick punch" between magnet and bushing. Install new bushing by placing the magnet face down on a clean, smooth surface and pressing the bushing into the magnet 1/4" below the level of the magnet surface facing you. Remove any rough edges with a bearing scraper.

If, during the amperage check at each wheel a defective magnet was indicated, the magnet leads, backing plate terminals, and backing plate terminal block should be inspected. Defective parts should be replaced and all connections cleaned and tightened. If the trouble is not readily apparent, remove the magnet for further checking.

Testing Magnet



Figure 3-15
Testing Amperage Capacity of Magnet

Test the magnet for amperage capacity by using an ammeter and a 6-volt battery (Figure 3-15). The ammeter should indicate the amperage value given on the magnet nameplate, plus or minus 10%. The magnet amperage is rated at 70°F; therefore, a hot magnet will indicate slightly lower and a cold magnet will indicate slightly higher. If amperage reading is incorrect, the magnet should be replaced, after first making certain that the magnet leads are not defective and that the magnet leads are making a good positive connection with the magnet coil.

To test the magnet for a ground, connect an ammeter and a 6-volt battery to the magnet (Figure 3-16). If any amperage is indicated, a grounded condition exists. The ground may be in either the leads or within the magnet itself; therefore, check the leads thoroughly before replacing magnet. Old style magnets having a single magnet lead have one coil lead grounded to the magnet shell; and therefore, will indicate proper amperage when tested in this manner if not defective.



Figure 3-16
Testing Magnet for Ground

Replacing Magnet Leads

When magnet leads are found to be defective, they can readily be replaced in the field. Refer to the repair parts section for correct magnet lead to be used, or order leads by magnet number and brake size.

Where magnet lead wires are soldered to the magnet coil, it will be necessary to replace the complete magnet lead assembly whenever one of the leads is found to be defective. Pry up the two steel clips which hold the magnet leads to the magnet shell, just enough to slide wire out (Figure 3-17). Use a soldering iron to melt solder on terminals and open copper clips holding magnet coil leads.

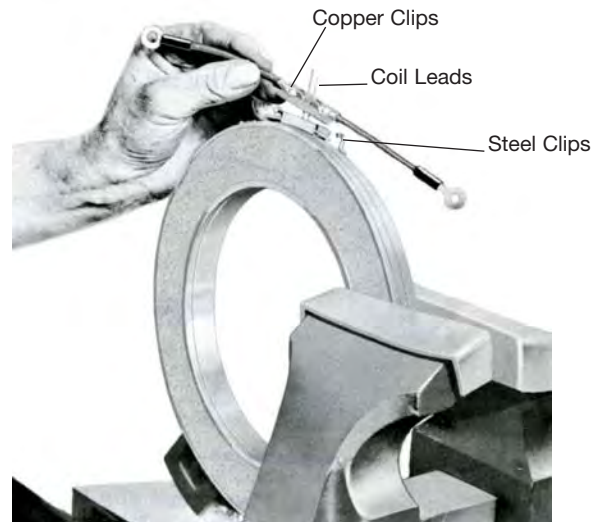


Figure 3-17
Installing Magnet Lead Wires

Straighten coil leads. Remove the old magnet lead assembly and replace with new. Bend steel clips tight against the fiber insulator and magnet leads. Fit the magnet coil leads into the copper clips, secure coil leads in clips, and solder (Figure 3-18). Use caution in soldering to prevent excess solder from grounding coil leads to magnet shell.

If magnet lead wire is mechanically connected, pry up steel clip holding lead to magnet shell, remove screw fasteners, and remove defective lead. Clean magnet coil lead and all contact surfaces.



Figure 3-18
Soldering Magnet Lead Wires

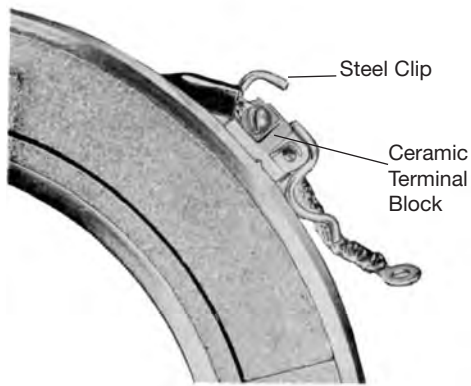


Figure 3-19
Removing Leads from Ceramic Block



Figure 3-20
Installing Leads in Ceramic Block

Replace with new lead and bend steel clip to clamp lead to magnet. Cover connection with Glyptal or other suitable sealer.

On magnets having a ceramic terminal block for magnet lead connections, minor repairs to the terminal block may be made by using a suitable ceramic filler. If the ceramic block is damaged extensively, use a hack saw, and cut through the steel clip holding the block in place. Remove screws, and other attaching parts holding magnet leads in place and straighten magnet coil leads. Use extreme caution and bend steel clip up (Figure 3-19) and slightly to the rear to permit removal of remainder of terminal block. Clean magnet coil leads and all contact surfaces of screw, and other attaching parts, before inserting new terminal block. Bend steel clip back in place to clamp terminal block to magnet, and re-assemble magnet leads (Figure 3-20). If steel clip is damaged during repair, it may be replaced by welding new clip in place if extreme care is used to prevent damage to magnet coil and coil insulation from over-heating. Do not allow weld splatter to get on magnet poles. Test magnet for short or ground after any attempt at welding.

While wheel is removed, blow out brake assembly with air hose, making certain that all wheel bearings and bearing surfaces are protected. Check the magnet and brake cams for movement; removing and cleaning thoroughly if necessary. Check magnet and band return springs for damage or loss of tension. Springs will lose tension after considerable use due to heat; therefore, it is recommended that at each reline all springs be replaced. Never use diagonal cutters to remove or replace springs.

Before replacing the wheel, always check the armature depression. Follow the procedure outlined in the brake installation section beginning with Figure 2-12. While checking depression, check to make certain armature face is parallel with the armature mounting ring. To do so, measure the highest extended height of the armature face at each armature stop. Pry up armature stops, which are low if necessary.

Clean all grease and oil from the brake drum surface, armature face, magnet facing and poles, and brake lining with carbon tetrachloride. Pack wheel bearings with a good grade of bearing grease and mount wheel and drum assembly on axle. Draw up wheel bearing lock nut tight enough to avoid loose wheel bearings.

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