

OUR GUARANTEE

The Warner Electric Brake Mfg. Co. guarantees each new electric brake manufactured by them against defects in material and workmanship under normal use providing the specified brake is used on the axle load recommended, their obligation under this guarantee being limited to replacing at their factory any part or parts thereof (lining and drums excepted) which shall within 90 days after delivery of such equipment to the original purchaser be returned to them with transportation charges prepaid and which their examination shall disclose to their satisfaction to have been thus defective; this guarantee being expressly in lieu of all other obligations or liabilities on the part, and they neither assume nor authorize any person to assume for them any other liability in connection with the sale of their products.

This guarantee shall not apply to any equipment which shall have been repaired or altered outside of their factory in any way, so as, in their judgment, to affect its stability or reliability, nor which has been subject to misuse, negligence or accident.

WARNER ELECTRIC BRAKE MFG. CO.

BELOIT, WISCONSIN, U. S. A.

(PRINTED IN U. S. A.)

WARNER ELECTRIC BRAKES

SERVICE MANUAL

14" x 2" BRAKES

105 MM. HOWITZER CARRIAGE, M2

3" GUN CARRIAGE, M & M5

CONTROL PARTS

Kit T261-B List on Page 17

IMPORTANT

If brakes do not operate correctly, check current to determine that the proper amount is being provided. If amperage readings are not correct, examine wiring and Controller before inspecting brakes. See page 4 for Brief Outline of Service Procedure.

When brakes are new, several applications must be made before normal efficiency is obtained, because the magnet pole faces must wear grooves in the armature to insure proper contact. See page 7.

Manufactured By
WARNER ELECTRIC BRAKE MANUFACTURING CO.

BELOIT, WISCONSIN, U. S. A.

NOVEMBER, 1942

(Supersedes October, 1942, Issue)

The Warner Electric Brake

How It Works

The Warner Electric Brake is a simple mechanical brake, operated by an electro-magnetic clutch. The magnet (Fig. 2) remains stationary on the axle. The armature (Fig. 3) is bolted to the drum, which revolves with the wheel. For maximum operation, the brake requires about the same amount of current used by a tail light. (See Page 4).

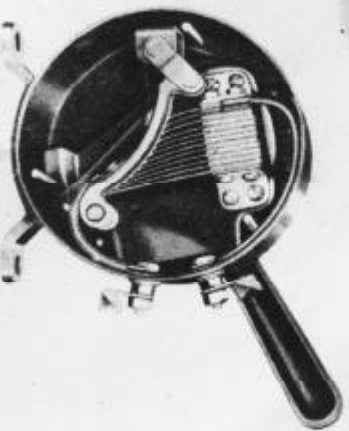


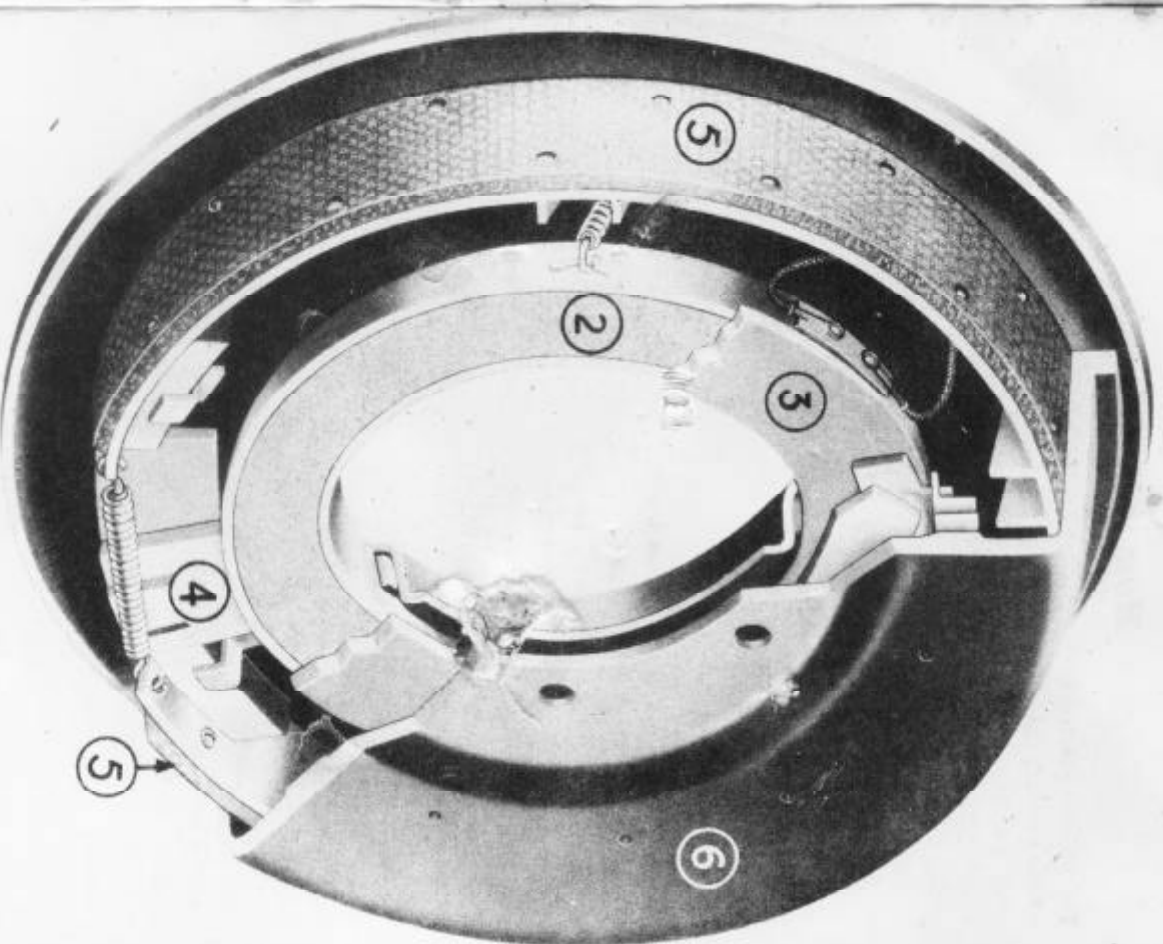
Fig. 1

The controller (Fig. 1) is operated from the driver's seat and permits the driver to apply any degree of braking power. As the hand lever is moved electric current flows through the electro-magnet (Fig. 2). The current energizes the magnet and causes it to cling to the revolving armature disc (Fig. 2). The more current the driver allows to reach the magnet, the tighter it clings to the armature disc. This causes the magnet to move.

Attached to the magnet is a lug (Fig. 4). When magnet moves, the lug presses the brake band (Fig. 5) against the revolving brake drum (Fig. 6). Grabbing is eliminated because there is a slight slipping action between the armature and magnet.

This type of brake offers several advantages. It permits the use of a flexible band that has approximately 50% more lining area than shoe brakes—thus providing longer lining life. It has unusual power because the rolling wheel causes the drum (Fig. 6) to multiply the lining pressure provided by the magnet.

NO BRAKE ADJUSTMENT IS NECESSARY. The magnet movement is sufficient to wear the brake lining down to the rivet heads. At this point the magnet comes against an automatic stop that prevents scoring of the drum.



A BRIEF OUTLINE FOR SERVICING BRAKES

The braking power of the brakes is in direct proportion to the amount of current used by the brakes. A BROKEN WIRE, LOOSE CONNECTIONS OR POOR CONTACTS reduce the amount of current that passes through the brakes. Each brake should draw no less than 3 nor more than 3.7 amperes. At controller, the sum of two brakes should not be less than 6 nor more than 7.4 amperes. If the amount of current is below the above requirements, find the poor connection (which includes the ground connection on the towing vehicle), loose, broken or partially broken wires. NOTE: The magnet capacity is 3.7 amperes, when connected directly across a 6 volt battery. This value is not obtainable due to circuit resistance. Therefore, if current consumption at controller is over 7.4 amperes, there is a ground or short circuit in the line or brake. If current consumption at each brake is over 3.7 amperes, there is a short circuit in the magnet coil. If the current consumption is within the above limits and the brakes line still not effective, the trouble will be found in the brake mechanism.

Remove the wheel with hub and examine the brakes. If the bands or magnets are grease coated, wash off all grease from inside $\frac{1}{2}$ drum and around brake. Refine band with lining $\frac{1}{2}$ recommended By Warner Electric Brake Mfg. Co.

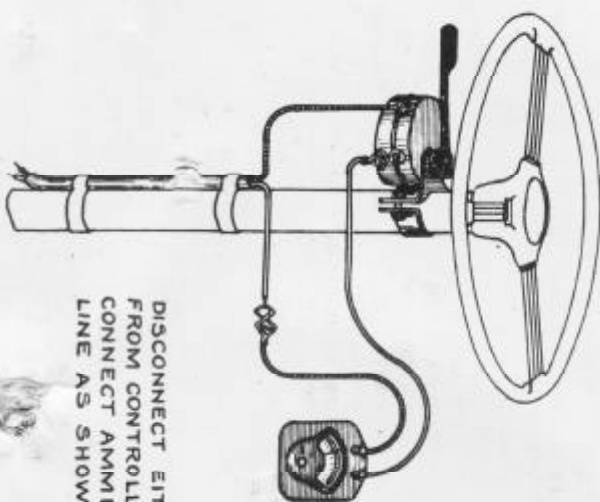
If the magnets and bands are not greasy, but if the magnet facing has a polished or glazed appearance, reface magnets as noted below.

REFACE MAGNETS BY PLACING THEM IN A LATHE AND HAVE FROM .007" to .010" REMOVED FROM FACING ONLY--see sketch showing action of armature on magnet, page 7; also see Note A, page 16. On page 6 is shown method of checking armature depression which should be not less than $\frac{1}{8}$ " nor more than $\frac{5}{32}$ ". Due to wear and machining variations this space may be under $\frac{1}{8}$ ". If so, use armature spacers between drum and armature mounting ring as required. See page 6.

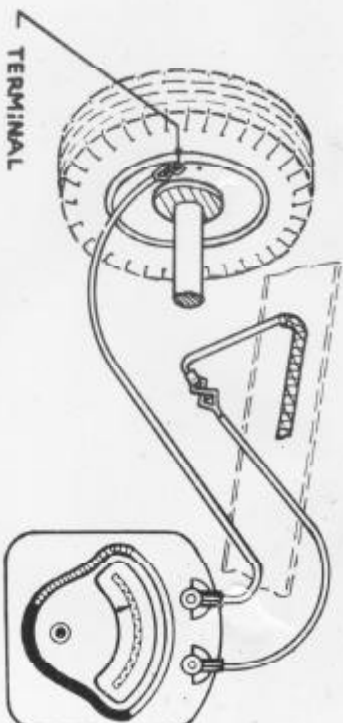
NOTE: When repacking wheel hub with grease BE SURE TO USE A GREASE that does NOT THIN OUT WITH HEAT.

Illustrations Show Method of Checking Amperage at CONTROLLER and at BRAKE

NOTE: Use a direct current ammeter having a 10 or 15 ampere maximum scale.



DISCONNECT EITHER WIRE FROM CONTROLLER AND CONNECT AMMETER IN LINE AS SHOWN.



REMOVE WIRE TERMINAL FROM BRAKE AND CONNECT TO AMMETER. CONNECT OTHER LEAD OF AMMETER TO BRAKE TERMINAL.

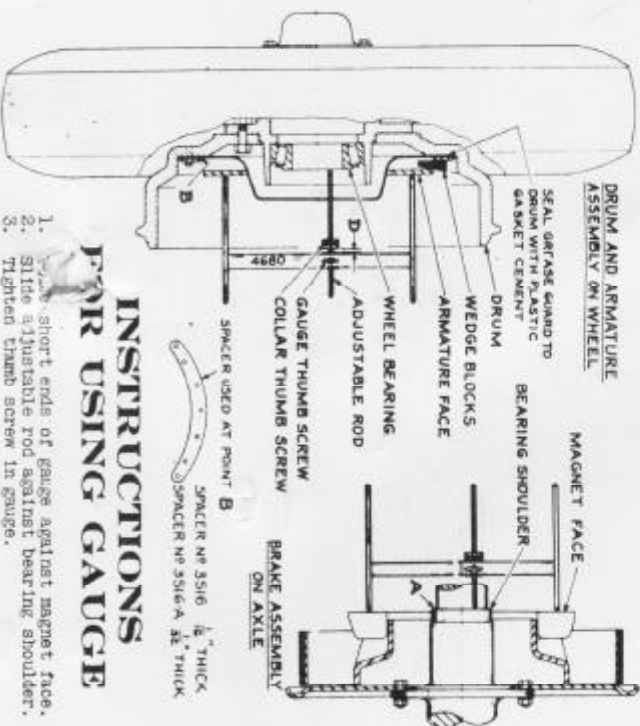
ONE WIRE SYSTEM

GAUGE FOR MEASURING ARMATURE DEPRESSION

The armature should be depressed approximately 5/32" against the magnet when the drum is mounted in running position. This can be determined before the drum is placed on axle by an armature gauge as shown below. The gauge may be obtained by writing our Service Department.

PART NO. 4690

DRUM AND ARMATURE ASSEMBLY ON WHEEL



INSTRUCTIONS FOR USING GAUGE

1. Place short end of gauge against magnet face.
2. Slide adjustable rod against bearing shoulder.
3. Tighten thumb screw in gauge.
4. Slide collar against frame.
5. Tighten thumb screw in collar.
6. Place inner bearing in hub.
7. At three places, wedge armature away from drum to its full travel.
8. Loosen thumb screw in gauge.
9. Slide adjustable rod against wheel bearing.
11. Tighten thumb screw in gauge.

NOTE

If "D" is under 1/8", then space out armature ring at "B", using spacers as required.

If "D" is greater than 5/32", space bearing out at bearing shoulder "A". Bearing spacers not furnished by Warner Electric Brake Mfg. Co.

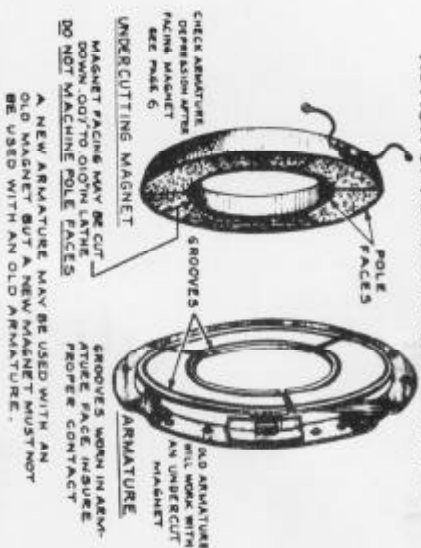
The distance "D" from collar to gauge is the armature depression after assembly and should be 9/64" plus or minus 1/64".

In assembling do not allow grease, however slight, to touch any part of the brake. Grease will cause grinding, locking or loss of power. Bearings must be packed with a good wheel bearing grease. Under no circumstances should a grease gun be used and all grease fittings on hubs must be plugged before releasing the unit for service.

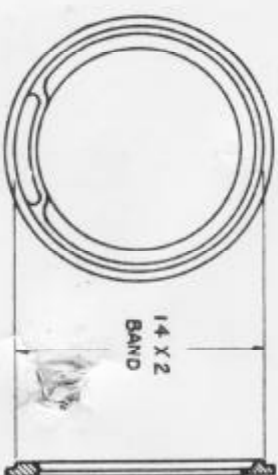
When drum is placed in running position, the axle nut must be pulled up snug to prevent loose bearings. The brake loses power if the armature is not kept firmly in contact with the magnet. R.H. armature must be mounted on right side of vehicle (facing direction of travel), L.H. armature on opposite side.

NOTE: FOLLOW FIELD ARTILLERY ARMATURE MARKINGS AND PRACTICE.

ACTION OF ARMATURE ON MAGNET



Instructions for Using Band Gauge No. 4843



To get the best performance out of a full wrap brake, it is necessary that the band be round. Check all bands for roundness when service work is done or the band is relined.

When band is correct, it should contact the gauge snugly over its entire circumference with a light tension holding it in place.

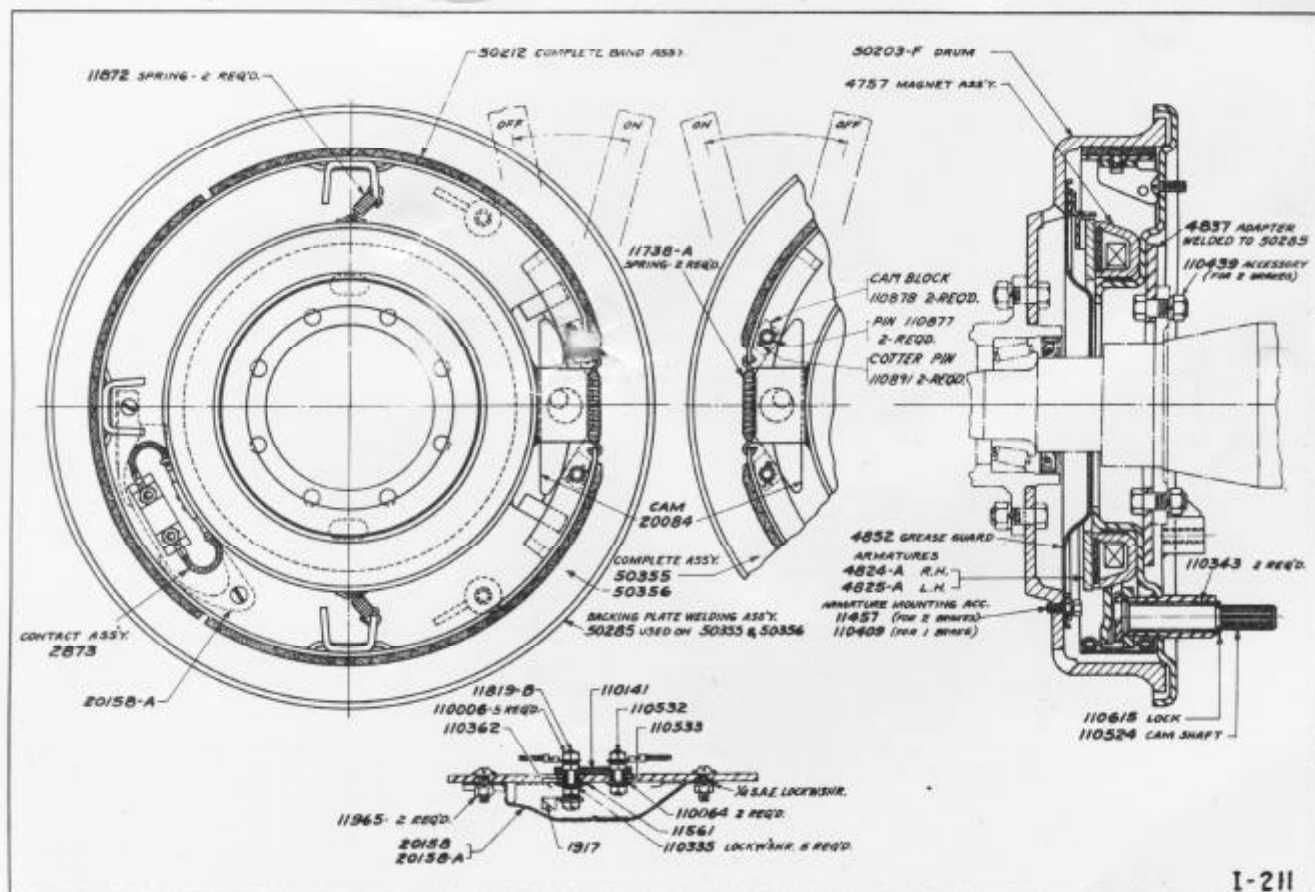
Bands which are out of round or have flat spots when checked on gauge should be corrected. This can be done by placing band on a wood top bench or block and striking band with a ball peen hammer where necessary. Care should be taken to avoid damaging rivet holes.

An out of round band can cause a weak brake to "grab". If the leading end (free end) of the band is bent away from the band gauge, the brake will be strong or "grabby". When bent in toward the center the brake will be weak.

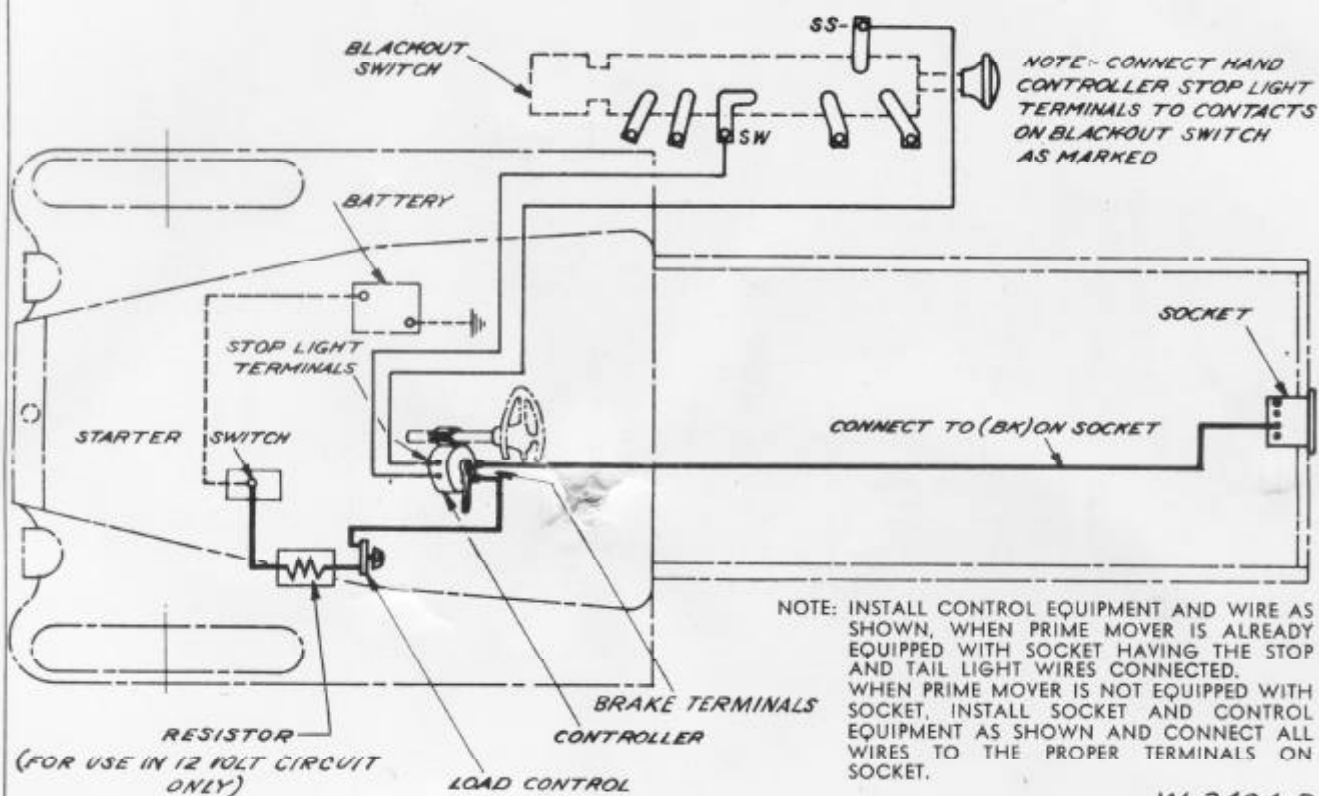
CAUTION: When replacing band on backing plate, do not spring bands out farther than necessary.

At the factory the bands are carefully fitted to a gauge before the assembly is made on the backing plate.

All shipments of separate bands are carefully packed so when they arrive at their destination they will be round and ready for installation.



WIRING DIAGRAM FOR CONTROLLER



W-3494-D

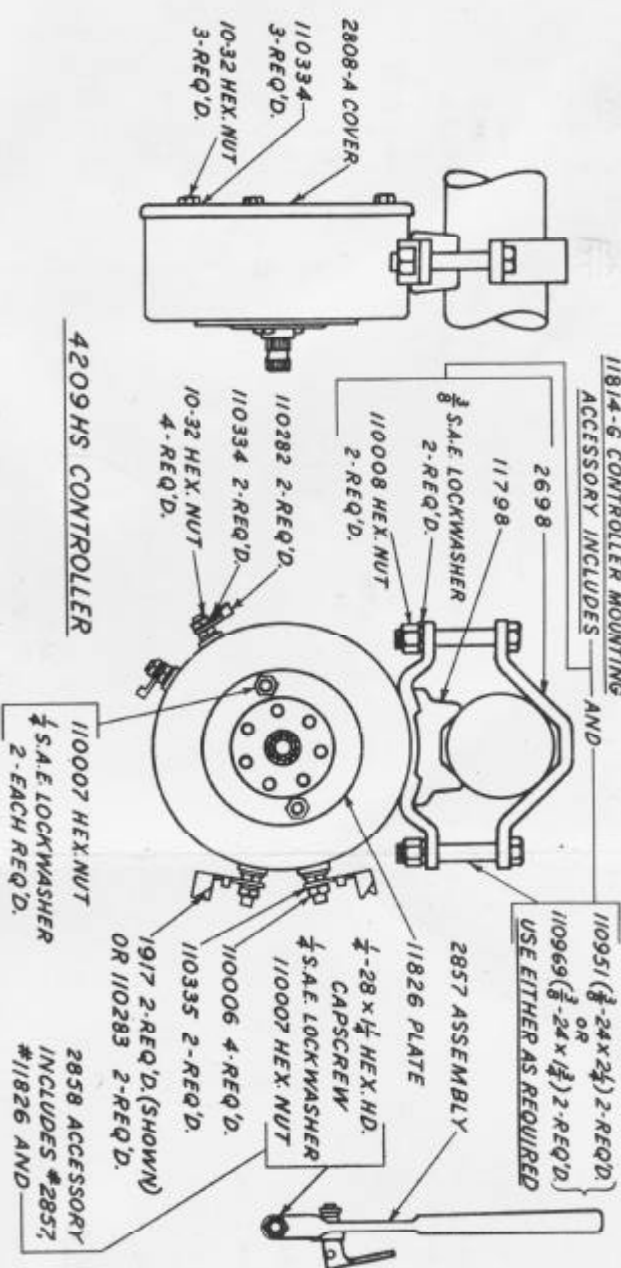
11814-G CONTROLLER MOUNTING ACCESSORY INCLUDES— AND

110951 ($\frac{3}{8}$ - 24 x 2 1/2) 2-REQ'D.
OR
110969 ($\frac{1}{8}$ - 24 x 1 1/2) 2-REQ'D.
USE EITHER AS REQUIRED

11539-F ACCESSORY INCLUDES PARTS GIVEN BELOW

11794 1969
STARTER POST CLAMP-
TERMINAL SINGLE
1-REQ'D. 10-REQ'D.

11094
CLAMP-DOUBLE
2-REQ'D.



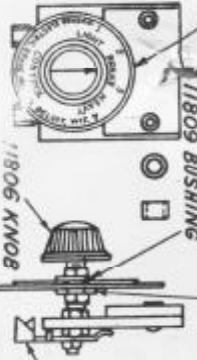
4209 HS CONTROLLER

11625-A DIAL

11808 2-REQ'D.

LOAD CONTROL

1917 OR 110283 2-REQ'D.



3363-B LOAD CONTROL

TO STARTER SWITCH

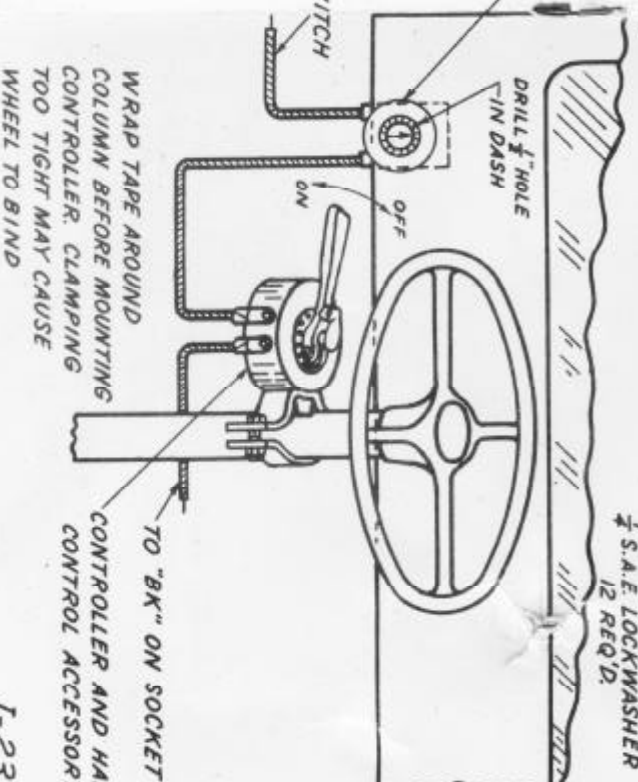
2523 #12 SINGLE CONDUCTOR WIRE

110830 #14 SINGLE CONDUCTOR WIRE

11965 ($\frac{1}{4}$ - 20) 2-REQ'D.

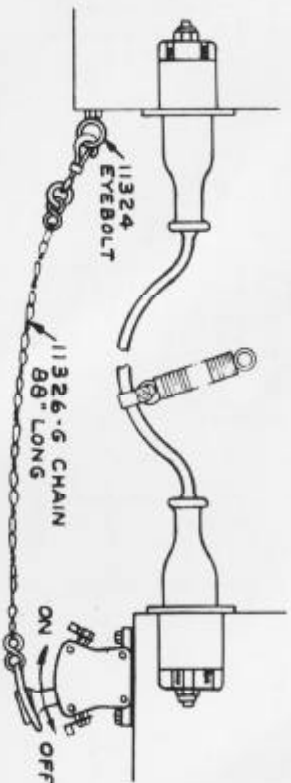
11324 EYE BOLT

110450 ACCESSORY



I-237B

SERVICE PROCEDURE



**SAFETY SWITCH CHAIN
ASSEMBLY NO. 110429**

* HAND & FOOT CONTROLLERS CAN BE SUPPLIED WITH INTEGRAL STOP LIGHT SWITCH

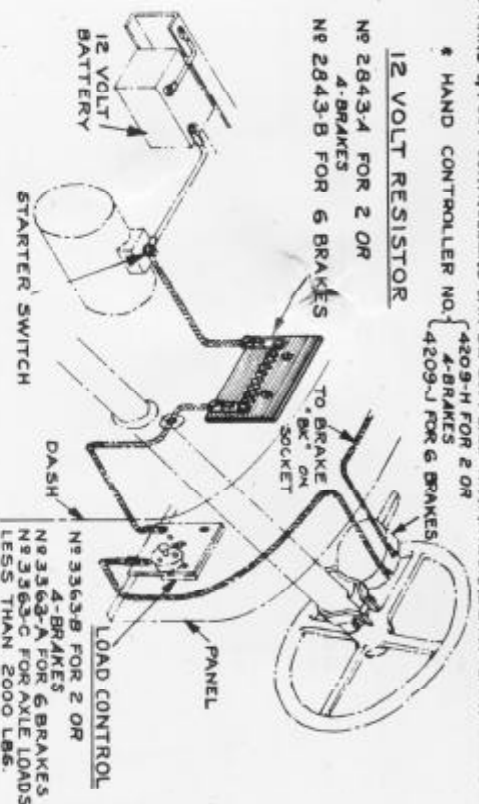
* HAND CONTROLLER NO. 4209-H FOR 2 OR 4-BRAKES

4209-J FOR 6 BRAKES

12 VOLT RESISTOR

№ 2843-A FOR 2 OR 4-BRAKES

№ 2843-B FOR 6 BRAKES



ELECTRIC BRAKES ARE DESIGNED TO OPERATE FROM A 6 VOLT SYSTEM. WHERE A 12 VOLT SYSTEM IS USED THIS RESISTOR REDUCES THE SYSTEM TO THE REQUIRED 6 VOLTS.

**12 VOLT RESISTOR
WIRING DIAGRAM**

COMPLAINT	CAUSE	REMEDY
No Brakes or Intermittent Brakes.	Broken Wire in Circuit.	Check entire wiring for broken wires.
	Controller defective.	Short out the controller by connecting both wires to one terminal and see if brakes are effective.
	Poor connections.	Check, clean and tighten all connections at brake, controller, load control and socket.
	Broken wire on magnet.	If broken wire is on outside of magnet, repair if possible. If no current flows thru magnet, replace with new magnet and armature.
	Poor ground connection in circuit.	Clean and tighten connections.
	Defective plug or socket.	Check plug and socket for loose connections, dirty or corroded blades or a broken socket. Repair or replace with new socket.
Very Weak Brakes.	To check current at brakes.	See Note (B) page 16.
	Armature contact with magnet.	See Page 6.
	Worn out or improper brake lining.	Replace with lining recommended by factory.
	Glazed magnet facing.	See Note (A) page 16.
	Greasy lining.	Replace with new lining recommended by factory.
	Grease on magnet face.	See Note (A) page 16.
	Stop lights connected in brake circuit.	See Note (C) page 16.
	Foot control out of adjustment.	When tractor brakes are adjusted, the pedal travel is shortened. This throws the controller out of adjustment. Reset your controller with new pedal travel to cover the full range of the controller.
	Wire broken in insulation. Loose connection. Poor contact at load control.	Check wiring for defective parts. Short out load control.
	Incorrect armature spacing.	The correct armature depression is 9/64 plus or minus 1/64. For complete instructions on use of armature gauge see page 6.

SERVICE PROCEDURE

COMPLAINT	CAUSE	REMEDY
Very Weak Brakes-- Concluded	Insufficient current.	Insufficient current may be due to poor connections at the brake, controller, load control, ground or the plug and socket. Clean and tighten all connections, check plug and socket for corroded or dirty blades. Repair or replace with new socket. Check battery. See Page 4 and Note (B) Page 16.
	Poor ground connection at the brakes.	Good electrical contacts must be made at the brake and frame. Weld connections to frame.
	Poor wiring.	Rewire prime mover as shown on wiring diagram, page 9. (For Carriage wiring consult Ordnance wiring diagram).
	Worn out brake lining.	The brake lining may be worn to the full extent of the magnet travel. Refine brake bands with factory approved lining.
	Worn wheel bearings.	Replace bearings. See Note (D) page 15.
	Loose or worn wheel bearings. Broken wheel hub.	Tighten or replace bearings. See Note (D) page 16.
	Sticky or grease coated lining.	Replace with new lining recommended by factory.
Brakes Grabbing.	Axle flange not mounted square with axle.	Reweld flange held in proper welding fixture.
	Axle loose on springs or frame.	Make necessary repairs.
	Drums out of round.	Bore out drum concentric with axle.
	Lining loose on rivets.	Tighten rivets or replace with new lining and rivets.
	Bands distorted.	Round up bands to fit snugly and uniformly in the drum or to fit the band gauge. Page 7.
	Only one brake working.	See Note (A) & (B) page 16 to check current at brakes.
	Stop lights in brake circuit.	See Note (C) page 16.
	Broken or weak band spring.	Replace with new springs.
	Poor electrical connection.	Check wiring for loose connections and broken wires in insulation.
	Controller burned out.	Replace with new controller.
	Contact arm in controller pitted.	Smooth out contactor arm with fine emery cloth.

SERVICE PROCEDURE

COMPLAINT	CAUSE	REMEDY
Brakes Grabbing-- Concluded.	Broken magnet spring.	Replace with new spring.
	Bushing in magnet worn out.	Replace magnet, bushing and armature, as old parts will be badly worn.
Brakes Drag.	Contactor blade spacing in controller.	Straighten blades with flat nose pliers.
	Drums out of round.	True up drum in lathe using stub spindle and wheel bearings.
	Broken spring in hand controller.	Replace with new spring.
	Not sufficient spacing between armature and magnet.	See page 6 for method of checking.
	Broken or weak band return springs.	Replace springs.
	Bands distorted, unequal clearance.	Round up bands to fit snugly and uniformly in the drum or to fit the band gauge. Page 7.
	When tractor is equipped with foot controller.	The controller pull rod assembly may be improperly adjusted so that the current is not shut off when the brake pedal is released.
Noisy Brakes.	Warped backing plate.	If plate is bent out of shape beyond repair, replace with new plate.
	Broken or loose parts.	Remove broken parts. Replace with new parts. Check brake for other injuries.
	Road grit, drum dust or metal particles in the lining.	Clean or replace lining.
	Loose or worn wheel bearings.	Tighten or replace bearings.
	Drum out of round.	Bore out drum concentric with axle.
Uneven Brakes.	Band distorted.	Round up bands to fit snugly and uniformly in the drum or to fit the band gauge. Page 7.
	Drum scored.	Bore out drum to remove most of scoring.
	Lining loose on rivets.	Tighten rivets or replace with new lining and rivets.
	Grease on lining.	Replace with new lining recommended by factory.
	Improper lining.	Replace with lining recommended by factory.
Uneven Brakes.	May be due to any of the previous complaints.	Check the weaker brake first to find the cause.

SERVICE PROCEDURE

NOTES

(A) - GLAZED MAGNET FACING.

This condition is caused by weak electric current in the brake circuit, light brake applications or grease or oil on the magnet facing. A magnet having a glazed or polished surface does not have sufficient friction to operate the brakes satisfactorily. To remedy cases of this kind, place the magnet in a lathe and turn from .007" to .010" off the magnet facing. The glazed surface may also be removed with a medium grade of emery cloth. Do not remove metal from pole faces of magnet. See Page 7.

(B) - TO CHECK THE CURRENT AT THE BRAKE

Load control must be on No. 4 position when checking current at the brakes. Disconnect brake wire. Connect one side of the ammeter to the brake terminal, the other side to the wire that was removed from the brake. Leave the other brake in the circuit. Place controller in full on position. Take reading, which should not be less than 3 amperes. If this amount of current is not obtained, the brake will not develop its maximum power. Check for poor connections and partly broken or worn wires. If current consumption is over 3.7 amperes, there is a short circuit in the magnet coil. (Also see page 4.) Check current consumption of the brake on opposite side, connect the other brake back in the circuit. The readings of both magnets should not vary more than one-tenth (1/10) of one ampere. In case there is a greater variation, check all connections for good contact or a broken wire at the magnet. See Page 5. (Battery should be charged sufficiently to turn over the starting motor.)

(C) -

Stop lights must not be connected into the brake circuit. It changes the graduation of the current as it passes through the controller resulting in weak or "grabbing" brakes.

(D) -

Worn bearings or loose wheels will cause erratic action of the brake and can be evidenced by the wide track the pole faces of the magnet make on the armature. Wheel hub may be cracked or broken and must be replaced.

SERVICE ON COUPLING CABLES

(RUBBER PLUG TYPE)

If cable plugs develop short circuit or broken wires, Warner Electric Brake Mfg. Co. will mold new ends for a nominal charge.

The cable is shortened about 8" for each new plug. If present cable uses all the slack it may be too short if new ends are made.

Cables covered with grease will not bond to new ends and therefore cannot be repaired.

(PLASTIC PLUG TYPE)

Special instruction sheet available upon request. Advise whether used with 3 or 4 conductor cable.

KIT LIST 7261-B

PART NO.	NAME OF PART	No. OF PIECES
4208-HS	HAND CONTROLLER--with Stop Light Switch	1
2858	HAND LEVER AND LOCK PLATE ACCESSORY	1
11814-3	CONTROLLER MOUNTING ACCESSORY	1
3363-3	LOAD CONTROL	1
110450	ACCESSORY--EYE BOLT AND NUTS	1
11839-F	WIRE CLAMP AND TERMINAL ACCESSORY	1
2523	No. 12 SINGLE CONDUCTOR WIRE	32 FT.
110630	No. 14 SINGLE CONDUCTOR WIRE	6 FT.
2843A	RESISTOR (When Specified)	1
	SERVICE MANUAL - 105 HOWITZER M2 3" GUN CARRIAGE M1 & M5	1

FOR ILLUSTRATION OF PARTS SUPPLIED
IN THIS KIT, SEE PAGES 10 AND 11
CONTROLLER WIRING DIAGRAM
SHOWN ON PAGE 9