ELECTRO-MOTIVE DIVISION • GENERAL MOTORS CORPORATION
SERVICE DEPARTMENT

MAINTENANCE INSTRUCTION

ELECTRO-MAGNETIC POWER CONTACTOR 8399648, 8399649, 8407466

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DESCRIPTION

The electro-magnetic power contactor, Fig. 1, is a single pole, single throw contactor with main contacts rated at 1000 amperes capacity and is designed for heavy duty service. Energizing the magnet coil closes the main contacts and mechanically actuates an interlock assembly mounted on the power contactor. The main contacts are held in a closed position by magnetic force and will open with the help of a recall spring when the magnet coil is de-energized.

Interlock contacts are enclosed in a dustproof housing. Circuit connections for the interlocks are provided by external terminal tabs. Terminal identification letters are molded into the interlock housing.

The contactor is constructed to protect the main contacts from arcing that may occur when the power circuit is opened. This device has a self protecting "Line Current Dropout" feature. The LCD feature prevents the device from opening when it is carrying more than 2000 amperes. Since this current is within the safe interruption capability of the device, the LCD feature protects the device from failure previously encountered when de-energized during fault current conditions. This feature is accomplished by separating the regular magnet armature along its vertical centerline and magnetically connecting the two armature halves with a magnet yoke around the movable contact bar. When the contactor carries current, flux is produced in the magnet yoke around the movable contact bar, conducted through the half armature to the top and bottom legs of the main magnet yoke, across the main magnet yoke to the other half armature and into the movable magnet yoke thus completing the magnetic circuit. The reluctance of this magnetic circuit is designed to provide enough pull between the armature halves and the main magnet yoke to prevent the device from opening at 2000 amperes even though the control coil is de-energized.

The arc chute assembly can be removed for inspection and service, but it should always be installed prior to operating equipment.

For additional information regarding the operation of the power contactor in locomotive electrical circuits, refer to the applicable schematic diagram.

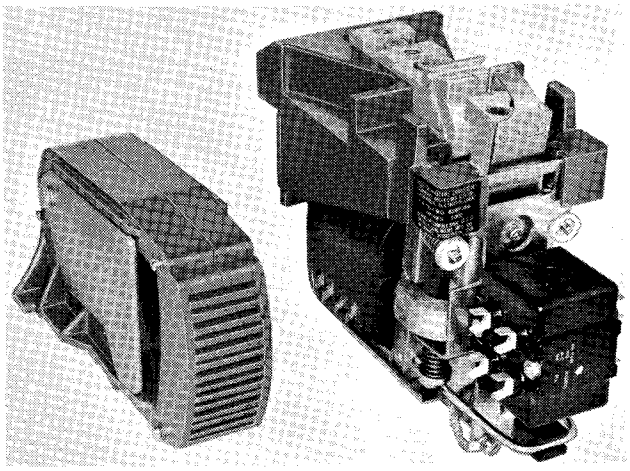

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Fig. 1 — Power Contactor With Arc Chute Removed

* This bulletin is revised and supersedes previous issues of this number.

MAINTENANCE

Minimum maintenance is required to keep the power contactor in serviceable condition. In addition to being kept clean and checking connections for tightness, the contactor should be inspected for wear at intervals as specified in the applicable Scheduled Maintenance Program.

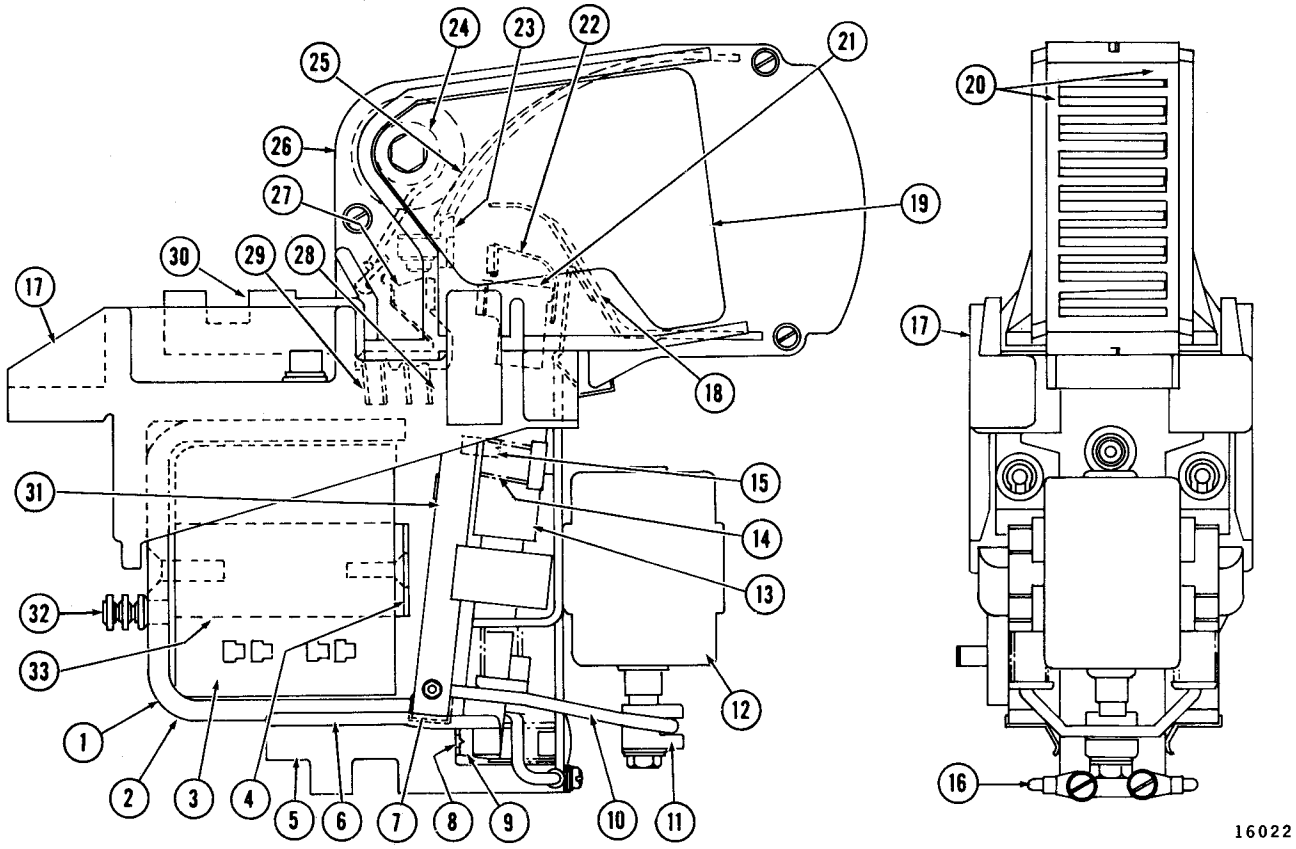
CAUTION: No lubrication of any type should be applied to any part of this contactor.

The silver alloy main contacts will operate satisfactorily even though blackened, pitted, or eroded. Contact surfaces should not be cleaned, dressed or filed. New contacts have about 1/8" thickness of special alloy material. Contacts must be replaced when the alloy wears through. For the best results, both stationary and movable contacts should be replaced if either alloy tip is worn to base metal. It is not necessary to adjust the contacts because of wear, as there is enough override in the plunger to compensate for allowable wear.

In applications where the current seldom reverses, one contact may show very little wear when it's mating contact is worn through. This condition is normal, however, it will not occur if the current at interruption reverses frequently and if the number of operations with each polarity are about equal.

Principle Of Operation (Refer To Fig. 2)

When the magnet coil is energized, the armature assembly is drawn towards the coil. The movable contact bar is connected to the armature assembly through contact springs.



1. Magnet Assembly
2. Magnet Yoke
3. Magnet Coil
4. Pole Plate (Main Coil)
5. Bottom Terminal Assembly
6. Armature Guide
7. Armature Shim (Bottom)
8. Dust Shield
9. Movable Contact Bar Assembly
10. Operating Lever Assembly
11. Interlock Operator
12. Interlock Assembly
13. Hold On Magnet
14. Spring (Return & Contact)
15. Open Stop
16. Pivot Shunt Assembly
17. Support Bracket Moulding
18. Latch Spring & Arc Runner Assembly
19. Pole Plate (Arc Chute Coil)
20. Arc & Chute LH & RH Moulding
21. Movable Main Contact Assembly
22. Arcing Tip Assembly (Movable)
23. Arcing Tip Assembly (Stationary)
24. Magnet Core (Blowout Coil)
25. Blowout Coil & Arc Runner Assembly
26. Arc Chute Assembly
27. Stationary Main Contact Assy. (Flex.)
28. Pivot Spring
29. Wipe Spring
30. Top Terminal Ass'y.
31. Armature Assembly
32. Insulator
33. Magnet Core Main (Coil)

Fig. 2 – Illustration Of Contactor

When the magnet coil is energized, the main contacts are closed. When the magnet coil is de-energized, the contacts are returned to the open position by return springs, provided the main contact current is not above the dropout value.

When main contacts separate, approximately 1/16", the arcing tip causes full load current to pass through the blowout coil setting up a powerful magnetic field in the area of the arcing tips and arc chute cavity. When the arcing tip opens the arc is forced up the upper runner and into the arc splitters where the arc is elongated, cooled and promptly extinguished.

Main Contact Structure

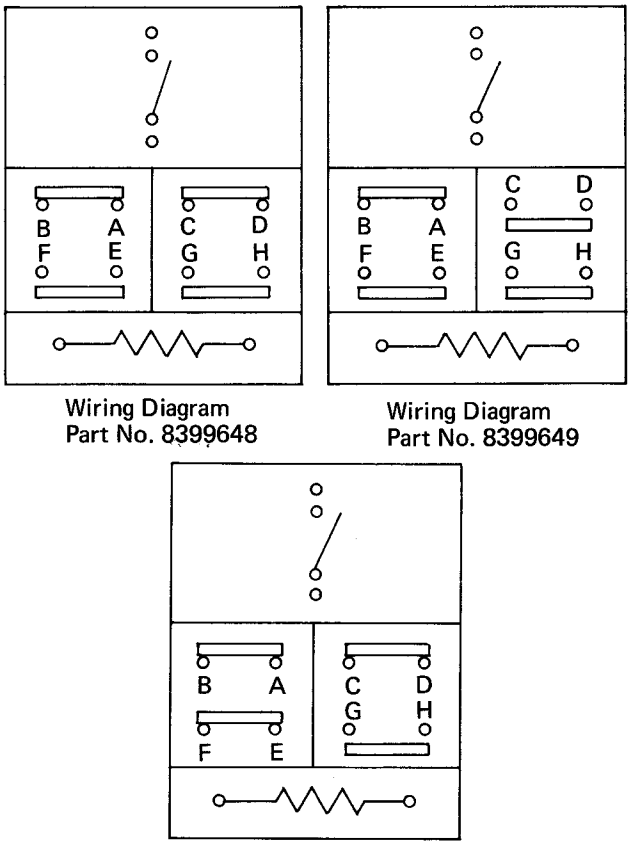
The main contact structure consists of a stationary contact assembly having a silver pivot at the lower end, held under approximately 50 lbs. force, and the main current carrying contact which closes against the flexible contact. While closing, the flexible contact moves approximately 3/64" and causes a definite wiping action between main contact and the flexible contact.

Arc Chute Assembly

The arc chute assembly consists of a molded body having arc splitters in one end arranged so when the arc is forced through them it is elongated and cooled. The arc chute has a blowout coil assembly with an iron core passing through it which connects the two-pole plates on the outside of the molding. The upper arc runner is also contained inside the arc chute and connected to one of the blowout coil assemblies. The other end of the blowout coil is connected to a brass hook which serves to hold the arc chute in place and make an electrical connection between the coil and upper terminal. The latch spring and arc runner assembly serves to hold the arc chute assembly in place and act as a conductor for the arc.

Magnet Assembly

The main magnet assembly consists of a magnet yoke with a round iron core, pole plate, and a molded magnet coil.



Wiring Diagram
Part No. 8399648

Wiring Diagram
Part No. 8399649

Wiring Diagram
Part No. 8407466

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Fig. 3 – Wiring Diagram Of Power Contactors

Auxiliary Interlock Assembly

The auxiliary interlock assembly is mounted on a support bracket and is actuated by the operating lever assembly.

REPLACEMENT OF MOVABLE ARCING AND CONTACT TIPS

Lift up and tilt the contactor arc chute assembly back from the main body of the contactor to remove the chute. Remove the hex socket head cap screw and lockwasher, Fig. 4, that holds the arcing tip spring to the movable main contact assembly, using a 5/32" Allen wrench. Compressing the movable contact overtravel springs by hand removes pressure from the arcing tip springs and permits their removal. The hold-down magnet, the arcing tip spring, and the movable main contact assembly are held in alignment by a swaged pin in the hold-down magnet. Use the fingers of one hand to rock the springs back and forth to disengage the pin while drawing up on the arcing tip assembly, Fig. 5.

Two hex socket head screws, Fig. 6, hold the movable contact tip in place. After removing these screws and lockwashers with a 3/16" Allen wrench the movable contact tip can be removed and replaced with a new one. Make sure the contact tip is secure and seated properly after tightening screws. Insert the new arcing tip assembly, Fig. 5. A rocking motion on the springs may be helpful.

Align the assembly and insert the hex socket head cap screw and lockwasher. Thread the screw in far enough to hold the parts in place without tension. Move the hold-down magnet and the arcing tip spring from side to side alternately to make sure the swaged pin is in place. A click can be heard as it snaps into position. Tighten down the hex socket head cap screw and lockwasher.

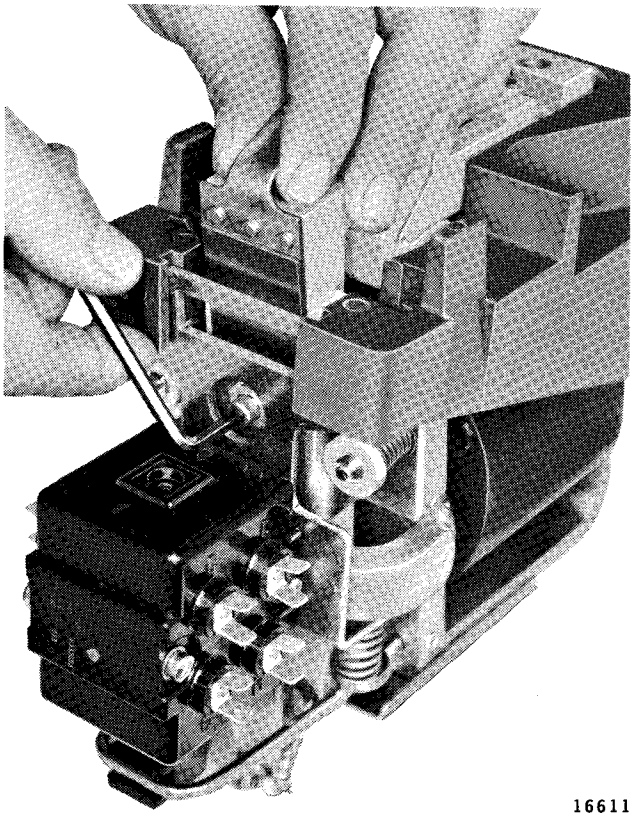

Fig. 4 – Removal Of Hex Socket Head Cap Screw

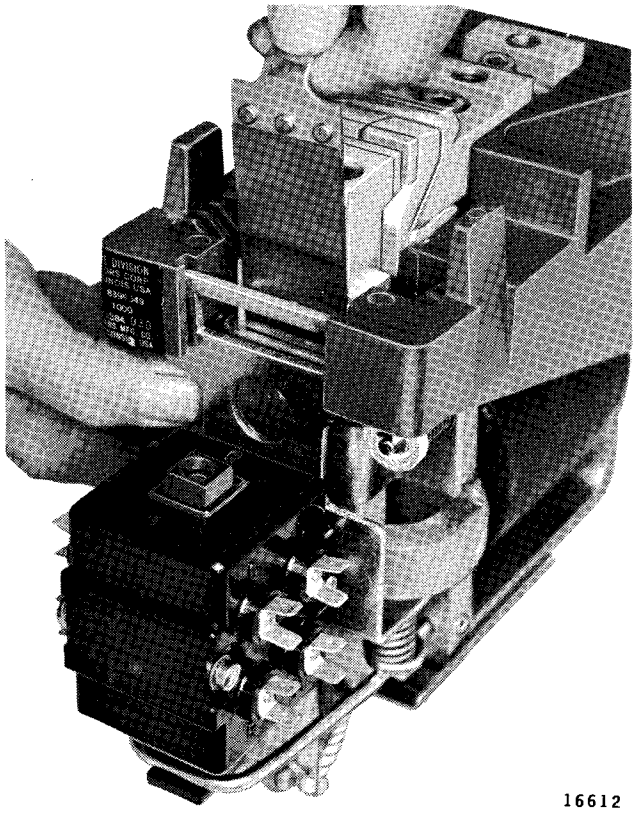

Fig. 5 – Removal And Insertion Of Arcing Tip Assembly

REPLACEMENT OF STATIONARY CONTACT TIPS

To replace stationary contact tip, remove leads and/or bus bars connected to the stationary contact assembly. Remove two hex socket head screws and lockwashers with a 1/4" Allen wrench, Fig. 7. Lift out the stationary contact tip and flexible stationary contact assembly. Place the new contact assembly in position being careful the spring assembly and wipe springs are in place and vertical. See the Maintenance Data page for contact gap. Replace the contact tip and tighten screws. Check movement between stationary contact tip and flexible stationary contact assembly, see Maintenance Data page. Replace leads and/or bus bars to stationary contact assembly.

To remove the current style bifurcated tips, Fig. 7, a slightly different procedure is used. Remove the socket head cap screws to free the stationary contact assemblies. Clean the spring recesses. Place pivot spring and cap assembly over the two spring bosses in the molding. Put wipe springs into recesses in the molding. Place spacer between the springs with locating key downward in pivot spring groove. Set the stationary contacts on the springs on each side of the spacer. While keeping contacts and springs engaged, insert top terminal until pivots are engaged. Insert the cap screws and tighten securely.

REPLACEMENT OF STATIONARY ARCING TIP

The stationary arcing tip is located within the arc chute and can be seen by looking through the opening at the base, Fig. 8. It can be replaced by removing the two slotted screws and lockwashers. Insert the new arcing tip and replace the two screws and lockwashers, making sure they are tightened securely. To replace the arc chute on the main body of the contactor, tilt the arc chute back so that it engages the hook on the main stationary contact tip, then bring it down firmly over the contact assemblies so the latching spring snaps into the slot on the main body of the contactor.

REPLACEMENT OF MAGNET COIL

Remove wires attached to coil terminals. Remove the arc chute. With a 1/4" Allen wrench remove two Allen head screws, lockwashers and washers from the top of the contactor molding. These two screws hold

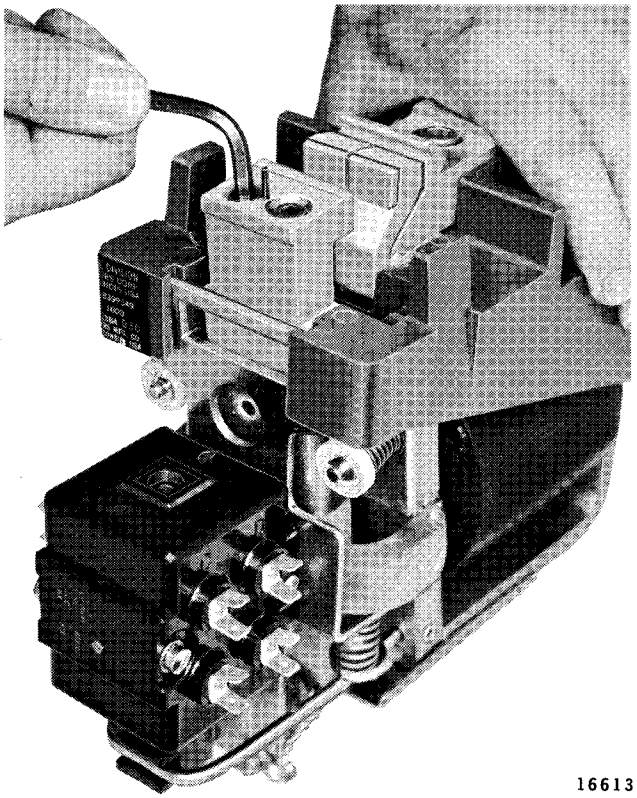

Fig. 6 — Removing Movable Contact Tip On Power Contactor

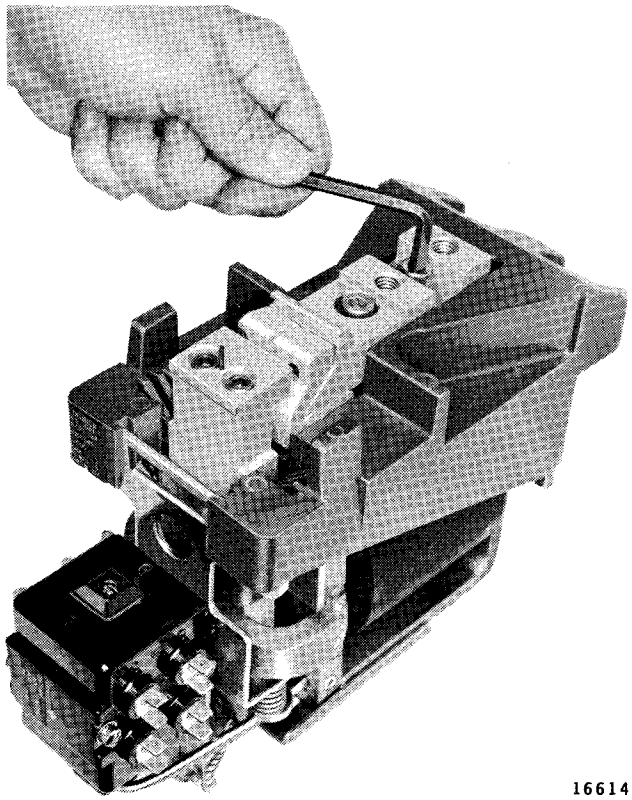

Fig. 7 — Removing Stationary Contact Tip On Power Contactor

the contactor molding to the magnet yoke. Remove the contactor molding which includes the stationary contact assembly from the magnet yoke. With a 3/16" Allen wrench remove one Allen head machine screw and external tooth lockwasher from the rear of magnet yoke. This screw holds the iron core within the center of the coil to the magnet yoke. Remove coil, core and spring washer from either side of the magnet yoke. Replace the coil and reassemble in reverse order of the disassembly procedure making certain the face plate of iron core is flush against coil, and the spring portion of spring washer is against the rear portion of the coil. The spring washer must be centered on rear of coil to be effective. The replacement coil should meet the requirements specified on the Maintenance Data page.

REPLACEMENT OF INTERLOCKS

When the interlocks are found defective, they may be replaced as a complete assembly, or the defective parts replaced. Contact tips must always be replaced in the same position so the normally closed - normally open operation is not changed. See Maintenance Data page for interlock contact positions.

To disassemble the interlock, first remove the two No. 10 through bolts from the contact covers. The covers may then be separated and the movable contact assembly removed without danger of losing small parts.

The movable assembly should be disassembled only in an area where the small parts will not be lost if accidentally dropped. All these parts are retained in assembly by the No. 8 single center screw.

When assembling the movable element into the covers, position the key so it is inside the "A-B, E-F" cover. A molded round button inside the opposite cover further assures a correct assembly.

After reassembly, the interlock movable assembly should be checked for freedom of motion from stop to stop. Each circuit should be electrically tested for continuity and function.

Absolute internal cleanliness is essential for reliable interlock performance.

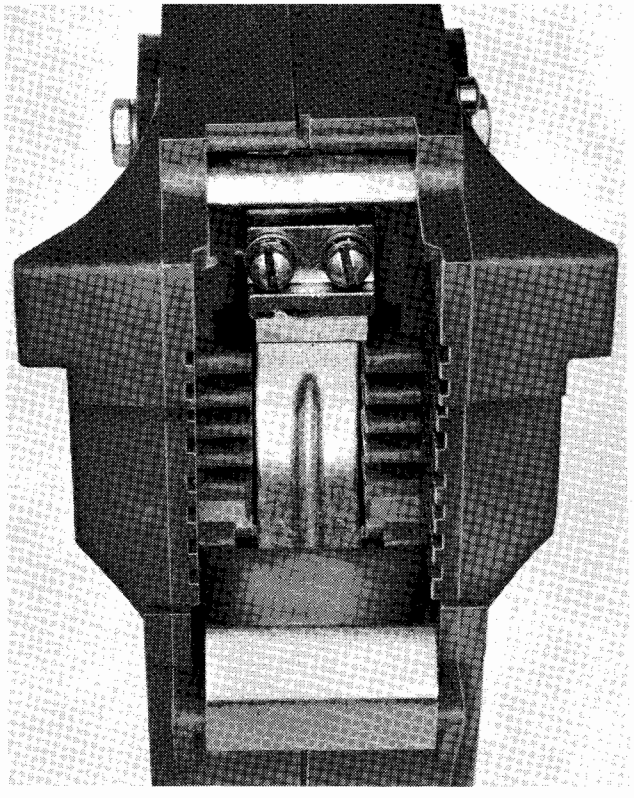

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Fig. 8 — Replacement Of Stationary Arcing Tip

Adjustment

The only adjustment required is to position the interlock operator. The interlock plunger in the de-energized position must be ± 1/32" of flush with top of interlock housing; and in the energized position the 1/64" step near bottom end of plunger must be ± 1/32" of flush with bottom of interlock housing. Adjustment is made by bending the operating lever.

MAINTENANCE DATA

Main Contacts

Contact Pressure	9 to 10 pounds (New Contacts)
Contact Wear Allowance	1/16" Each Contact
Contact Opening	15/32" Minimum (New Contacts)
Movement between stationary contact tip and flexible stationary contact	3/64" ± 1/64"

Interlock Contacts

Contact Spring Pressure	.25 pounds at 3/32" deflection
Contact Opening	3/16"
Contact Lift	3/32"
Contact Wear Allowance	1/32" each, maximum

Operation

Pickup	48 volts D.C. maximum at 20 C.
Dropout	5 to 28 volts D.C. at 20 C.
Rating	74 volts D.C. continuous

Magnet Coil	125 ohms 10% at 20 C.

Hi-Pot

Magnet Coil to Mounting	600 V. RMS, 60 Cycle, 1 Minute
Interlocks To Mounting	2400 V. RMS, 60 Cycle, 1 Minute
Main Contacts To Interlocks	2400 V. RMS, 60 Cycle, 1 Minute
Main Contacts To Mounting	2400 V. RMS, 60 Cycle, 1 Minute