



GM Locomotive Group

## M.I. 5413 MAINTENANCE INSTRUCTION

### HEAD END POWER AC CONTACTORS

40007849, 40007850, 40009090

#### Table Of Contents

Introduction	1
MAIN CONTACTS	3
MAIN COILS	3
FEEDER GROUP	4
AUXILIARY INTERLOCKS	4
ECONOMIZING INTERLOCK	4
OVERLOAD RELAY (STARTERS ONLY)	5
ARC CHUTE REMOVAL	5
MAIN COIL REMOVAL	6
MAIN CONTACT RENEWAL	7
OVERLOAD RELAY RENEWAL (STARTERS ONLY)	9
AUXILIARY INTERLOCK RENEWAL	9
ECONOMIZING INTERLOCK ADJUSTMENT	10

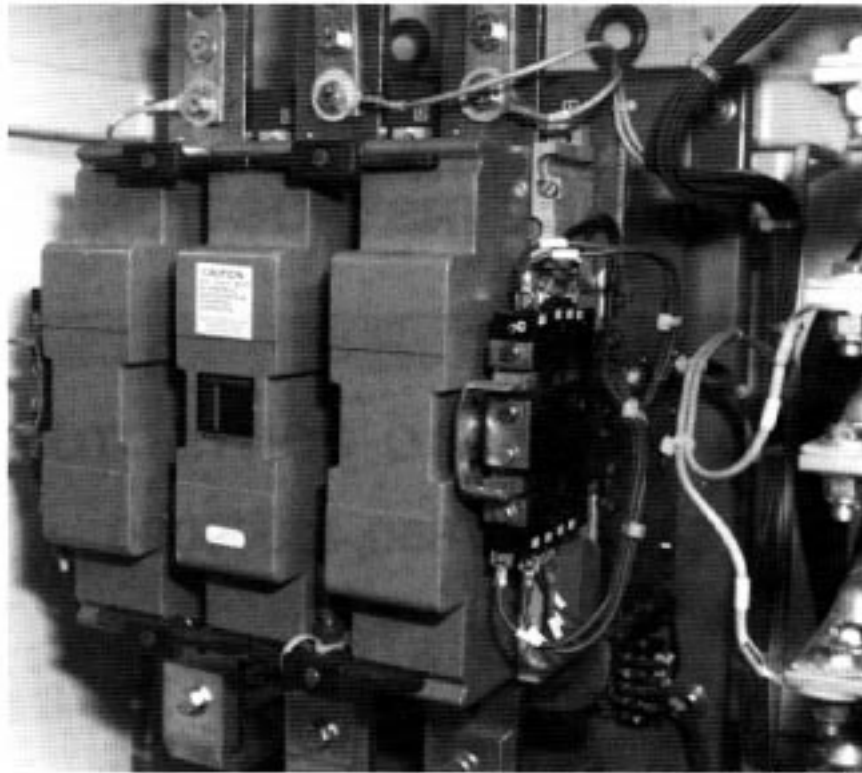
#### Introduction

Head end power (HEP) AC contactors, Figure 1 on page 2, are three-pole, three-phase contactors used on a locomotive as the main power switching device between the head end generator and the coaches. This Maintenance Instruction applies to three of these contactors -

- 40007849 - 810 A rating with overload protection.
- 40007850 - 810 A rating without overload protection.
- 40009090 - 1200 A rating with overload protection.

#### NOTE

Although all these devices are considered to be **contactors**, when they are equipped with overload protection they may be called *starters*.



34198

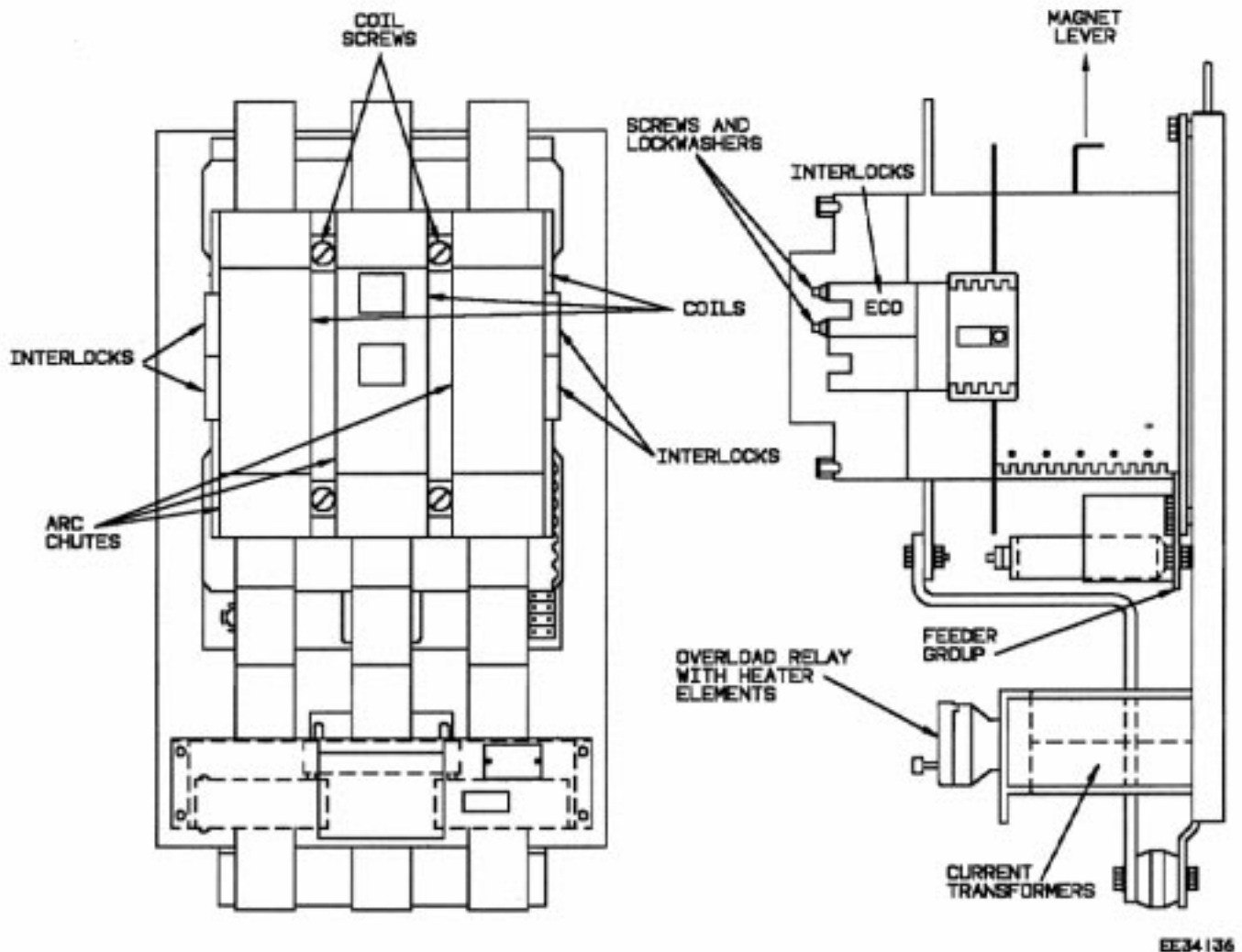
Figure 1. Typical HEP Contactor (Starter) Application

**WARNING**

Only skilled personnel familiar with electrical equipment and the hazards involved should be permitted to service a power contactor. All safety precautions must be observed.

***TO PREVENT ELECTRICAL SHOCK - BEFORE INSPECTING OR PERFORMING MAINTENANCE VERIFY THAT ALL POWER TO THE DEVICE HAS BEEN DISCONNECTED. IF THE DEVICE HAS BEEN IN SERVICE, THEN MAKE CERTAIN THAT THE PARTS HAVE COOLED SUFFICIENTLY BEFORE HANDLING.***

1. These devices require no mechanical maintenance. If maintenance is required for electrical components, then keep in mind that both metric and SAE (American) hardware is used on these contactors.
2. Annual inspection is recommended for interlocks and power contacts. Refer to Figure 2 on page 3. Arc chutes should be replaced when power contacts are replaced. When performing annual inspections check tightness of external power and control connections and, if so equipped, examine condition of overload relay (starters only). Contacts and arc chute parts are normally oxidized and smoked from regular service. Other contactor parts should not show visible effects of high temperature operation. Bearing surfaces of the contactor are designed to operate without lubrication. ***Do not oil or grease at any time.***



EE34136

Figure 2. Typical HEP Contactor (Starter) Assembly

## MAIN CONTACTS

Remove arc chutes to inspect main contacts. Refer to Figure 5 on page 6. All power contacts should be replaced at the same time before the contact tip material has worn away. Figure 3 on page 4 illustrates the general limits for contact tip replacement. When renewing contacts, arc chutes should be replaced as well.

## MAIN COILS

Main coils require no maintenance. Measurement of resistance and physical examination are recommended when inspecting coils. If coils have overheated it is likely that the device experienced additional damage that may not be apparent to maintenance personnel. In the event of coil overheat it is recommended that the entire device be returned to the factory for analysis and repair.

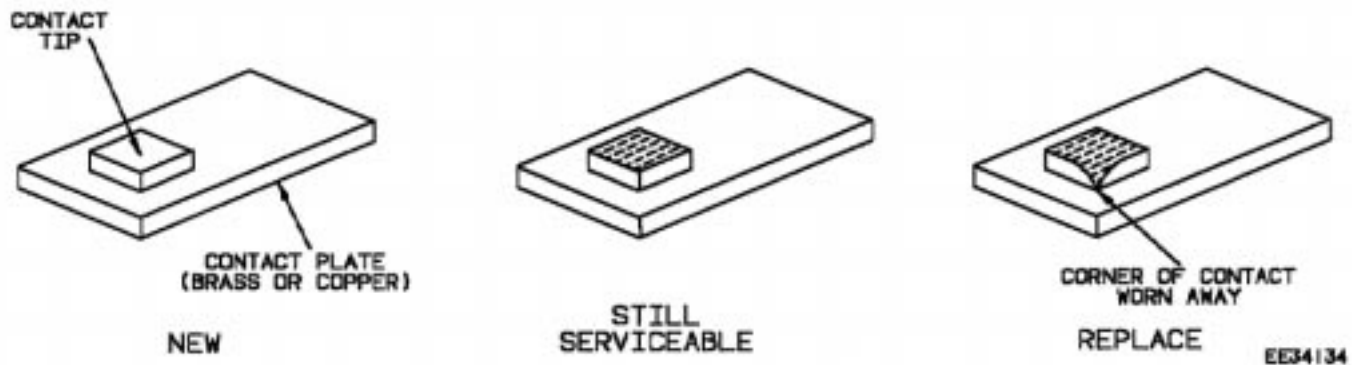


Figure 3. Tip Replacement Criterion

### FEEDER GROUP

The feeder group assembly contains a relay and resistors that are used for economization of the main coils. Physical examination, measurement of resistances for relay coil and resistors, and check of relay pole continuity are recommended for inspections. No maintenance is required. If either resistors or relay are damaged the entire assembly must be replaced. If the feeder group is damaged, examine the main coils for damage. When coils have overheated the entire device should be returned to the factory for analysis and repair. If feeder group replacement is attempted, note and mark control wiring and connection locations before disconnecting the assembly. Reconnect wiring to exact same locations to prevent main coil burnout.

### AUXILIARY INTERLOCKS

The electrical interlocks are renewable as a complete assembly. Interlocks are available in a NO/NC configuration. Little care is required for the interlocks beyond occasional checks of continuity and examination to ensure that parts move freely without interference and binding.

### ECONOMIZING INTERLOCK

The economizing interlock (Figure 2 on page 3) is factory adjusted to assure economization of the main coils. If this interlock requires replacement, then main coils were likely damaged. It is recommended that the economizing interlock not be field replaced. The entire device should be returned to the factory for repair of damage due to overheated coils and for replacement and adjustment of the interlock. If interlock replacement is attempted, note and mark wire connection locations before disconnecting control wiring from old interlocks. If wires are not reconnected in the same location, then main coil burnout could occur.

## OVERLOAD RELAY (STARTERS ONLY)

### NOTE

The overload relays *may not be supplied with heater elements in all cases*. See parts list to determine if heater elements must be ordered separately.

Overload relays, Figure 4, are factory calibrated and require no field maintenance. However, if the relay is to be replaced, then observe the following recommendations to provide continued protection against fire and shock hazard. If burnout of heater element occurs, then the complete relay must be replaced. To function properly, the overload relay requires three thermal units (heaters) of the same size and rating, wired so that each carries the same amount of current. When replacing relays, note and mark control wiring and connection locations before removing the device.



Figure 4. Typical Overload Relay

## ARC CHUTE REMOVAL

1. Disconnect all power to the starter.
2. Loosen the screws attached to the arc chute hold-downs far enough to rotate them 90°. (Figure 5 on page 6)
3. Remove the three arc chutes.
4. To reinstall arc chutes, reverse the preceding steps.

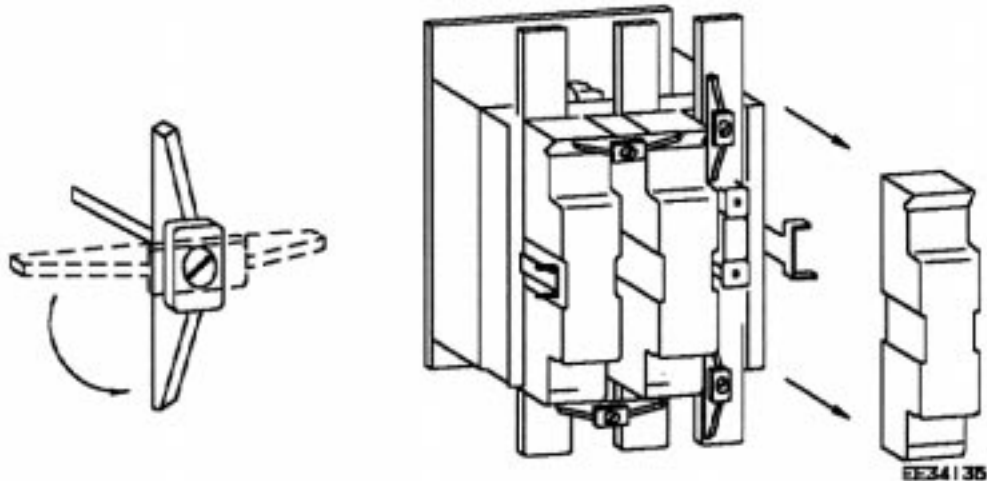


Figure 5. Removal Of Arc Chutes

### MAIN COIL REMOVAL

#### WARNING

IF THE DEVICE HAS BEEN IN SERVICE, MANY PARTS MAY STILL BE TOO HOT TO HANDLE.

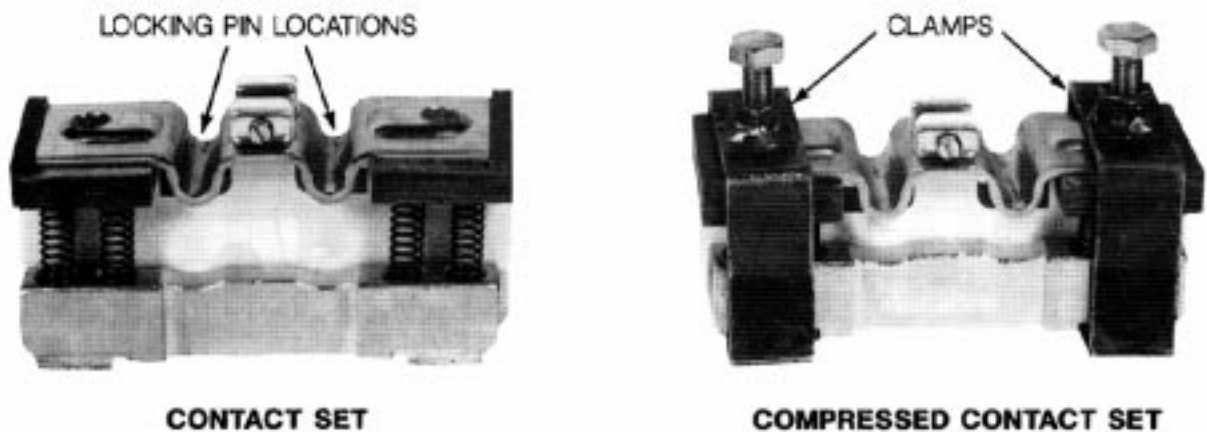
1. Disconnect all power to the starter.
2. Remove arc chutes. (Figure 5)
3. Loosen the two screws that secure each coil. (Figure 2 on page 3 )
4. Push on pole two movable contact assembly until the main contacts touch.
5. When main contacts touch, pull upward on the lever located directly behind the L2 terminal to lock open the magnets. (Figure 2 on page 3) Then remove pressure on the movable contacts until they stop at their full open position.
6. Grasp the coil by its handle and pull straight forward to remove.
7. Slide in new coils and tighten the screws to secure in place.
8. Push firmly on pole two movable contact assembly until the main contacts touch. The magnets will then lock into place. Release the movable contacts.
9. Reinstall the arc chutes.

## MAIN CONTACT RENEWAL

### WARNING

IF THE DEVICE HAS BEEN IN SERVICE, CONTACTS MAY STILL BE TOO HOT TO TOUCH.

1. Disconnect all power to the starter.
2. Remove arc chutes. (Figure 5 on page 6)
3. Install contact clamps over movable contact assembly. (Figure 6 )  
Tools are included in contact kit.



34195

Figure 6. Contact Set/Contact Set Compressed

4. Compress the contact springs by turning down screws of removal clamps. Locking pins will become loose.
5. Remove locking pins by sliding them to the right or left. (Figure 7 on page 8 ).
6. Remove movable contact assembly and clamps.
7. Remove stationary contacts by removing the three Allen screws. Use a 6 mm Allen wrench.
8. Install new stationary contacts and screws. Tighten screws to a torque of 36 in-lbs.
9. Assemble movable contacts, springs, and spring retainers. Arrange contacts with the cutout on sides of two contacts facing outward. Insert springs into holes in backside of contacts. Place spring retainer with barriers over springs. Hold entire assembly together using the contact clamps. (Figure 6)

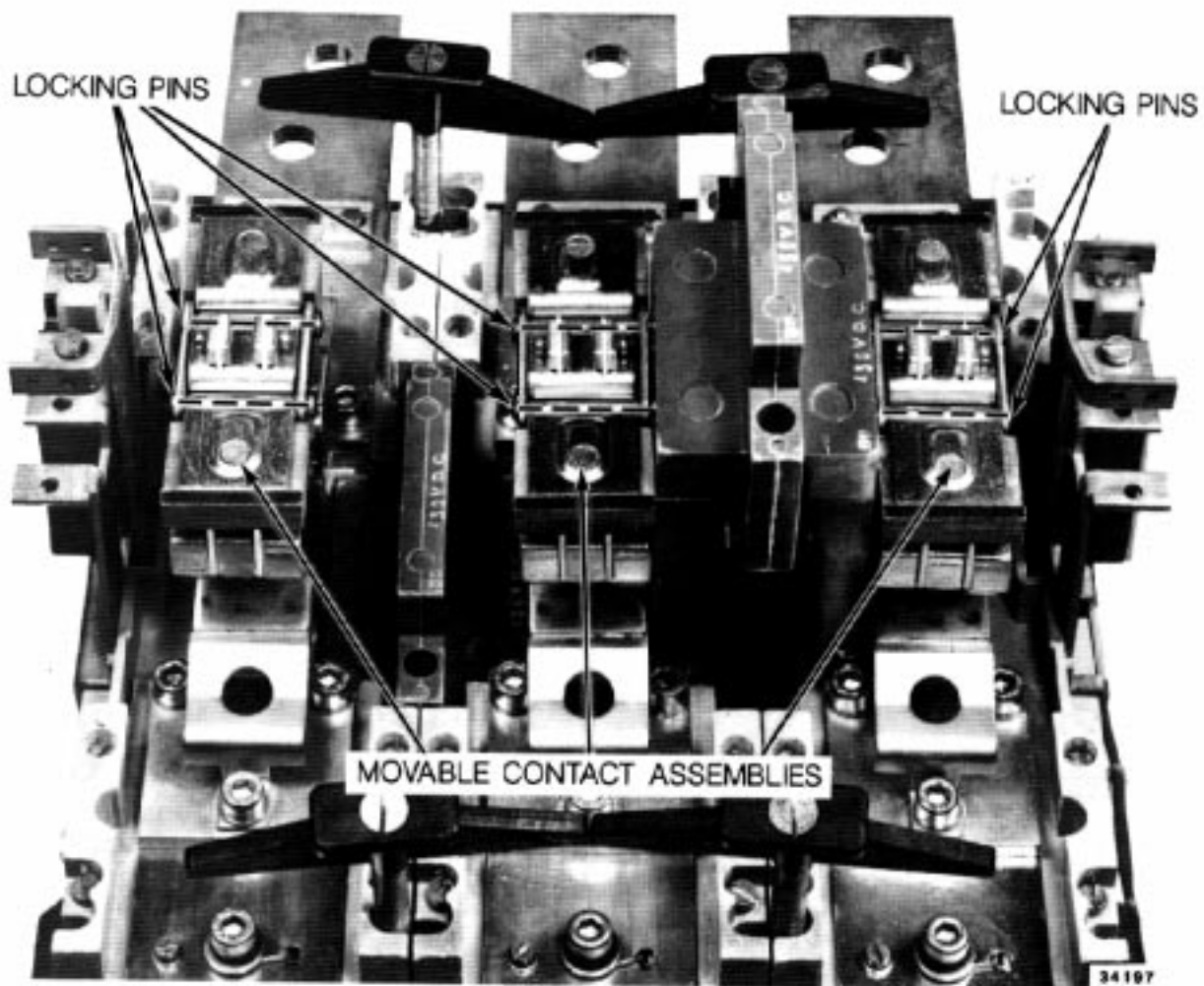


Figure 7. Movable Contact Assemblies/Locking Pins

**NOTE**

Springs must be engaged in all holes or contact welding may occur.

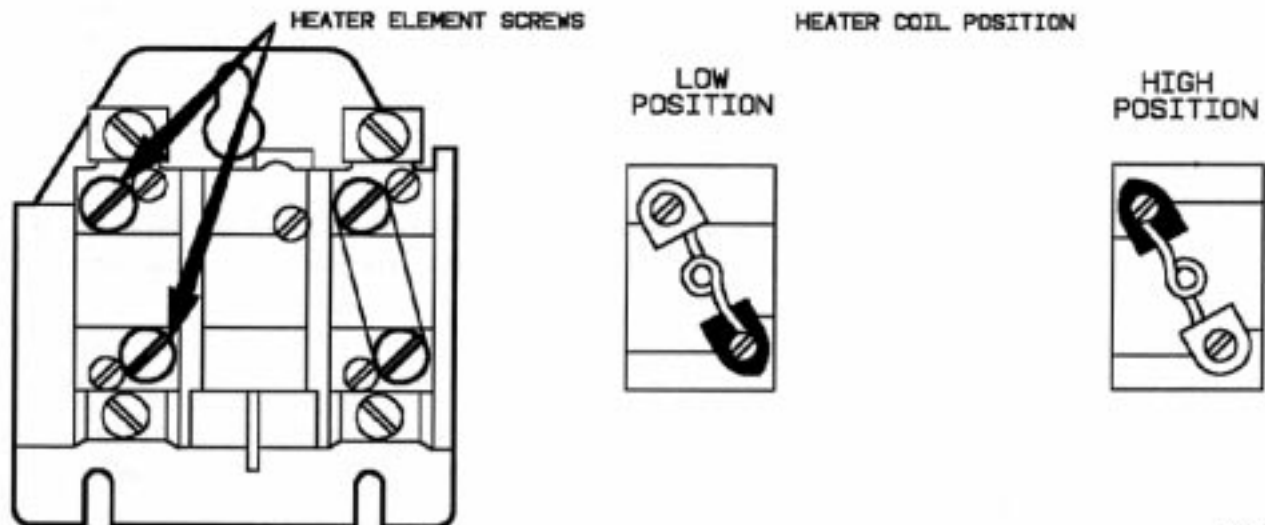
10. Place the movable contact assembly into the drive bracket.
11. Compress the contact springs using the clamps until the locking pins can slide into position.
12. Slide locking pins into place.
13. Remove contact clamps.
14. Install arc chutes.

## OVERLOAD RELAY RENEWAL (STARTERS ONLY)

1. Disconnect all power to the starter. Mark wiring connections. Disconnect wiring.
2. Remove the relay by removing the panhead screws that attach the relay bracket to the mounting plate.
3. Install the new relay reusing the original screws.

**Note:** Heater elements are pre-installed in most overload relays. Those relays are factory calibrated.

4. If heater elements must be installed, then remove the six pan head screws that will secure the heater elements. Refer to Figure 8.



EE34133

Figure 8. Heater Element Assembly

5. Install heater elements re-using the screws. The overload relay has two steps of adjustment - low or high, obtained by positioning the heater element as shown in Figure 8. Note the location of the pointed terminal on the heater element.
6. Re-attach control wiring to the relay.

## AUXILIARY INTERLOCK RENEWAL

1. Disconnect all power to the starter. Mark all wiring connections. Disconnect wiring.
2. The screws and lockwashers must be removed from the top of the interlock, Figure 2 on page 3. Refer to the following SCREW REMOVAL PROCEDURE.

### SCREW REMOVAL PROCEDURE

Place a hot soldering iron on the head of each interlock screw. Hold it on the head of the screw for 1 minute to soften adhesive. Try to remove the screw. If the screw will not turn, then reapply the soldering iron to the screw head for 2 minutes and remove the screw.

3. Line up holes in new interlock with desired holes in mounting frame—right or left side of device.
4. Apply Loctite 242 to the screws and mount the interlock to the frame by installing screws and lock washers.
5. Tighten screws to secure interlock to the mounting frame and re-attach control wiring to the interlock.

#### **ECONOMIZING INTERLOCK ADJUSTMENT**

1. After installing new economizing interlocks check economization of the main coils. Remove center pole arc chute. (Figure 5 on page 6)
2. Attach continuity tester across normally open contacts of economizing interlock. Push on movable contact assembly until main contacts touch. Normally open interlock contacts must remain open.
3. If interlock contacts remain open skip step 4. If contacts are closed remove interlock.
4. Reinstall interlock with two #10 flat washers between the face of the interlock and the mounting bracket. Place one washer over each screw. Recheck operation per step 2.

#### **WARNING**

KEEP HANDS CLEAR OF CONTACTORS WHEN IN OPERATION - CONTACTORS OPERATE INSTANTANEOUSLY WITH GREAT FORCE.

5. Connect voltage supply with adequate current capacity to coil inputs on the feeder group terminal block. Prepare to measure voltages across economizing interlock contacts and economizing resistors.

#### **CAUTION**

If conditions outlined in step 6 are not met, then remove power from coil immediately as coil overheat will occur.

6. Apply power. With the device picked up there should be approximately full supply voltage measured across the feeder group resistors and less than one volt measured across the economizing interlock contacts. If either condition is not met remove power immediately.
7. If voltage measurements are not correct, then recheck interlock installation, control wiring reconnection, or coil and feeder group resistances.