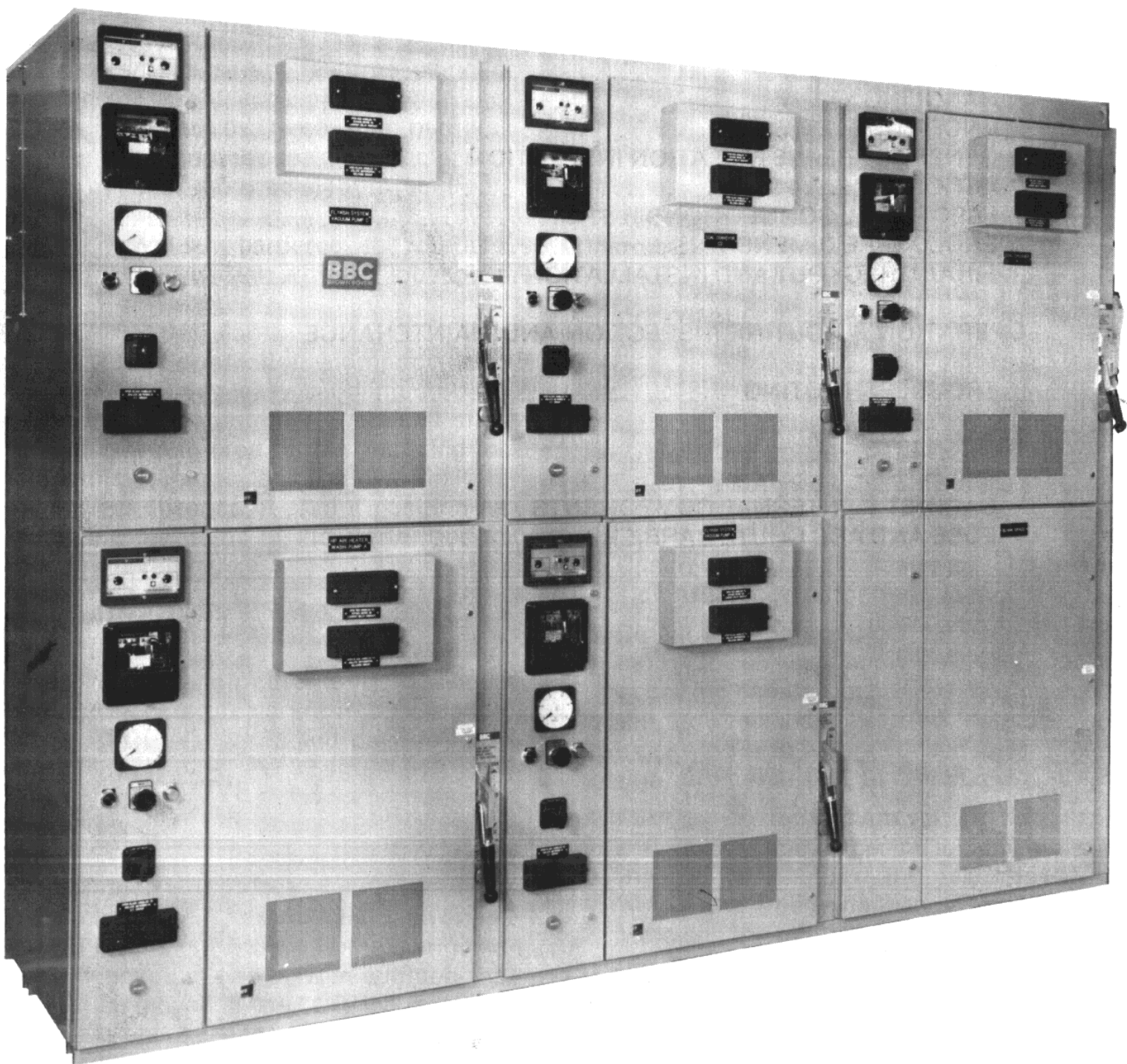


## Installation/Maintenance Instructions

### High Voltage Motor Starter

Series 7850  
2400 and 5000 Volts



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These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes the matter should be referred to the nearest District Office.

## HIGH VOLTAGE STARTERS AIR BREAK 2500-5000 VOLTS MAXIMUM NEMA CLASS E2

The Series 7850 starter is designed for safe and dependable operation of 2200 V thru 5000 V, 50/60 Hertz, AC motors.

### CONTROLLER

The NEMA Class E2 controller is a compact design with numerous safety features using a drawout contactor. Front accessible power and control fuses, isolated by removable barriers, makes fuse removal an easy task. Contacts and coil are easily changed (no special tools required).

Arc chutes are individually barriered, and rotate to a contact inspection position with the loosening of one bolt.

The Series 7850 controller compact and lightweight design allows easy handling, cutting installation costs. The controller's reduced size, allows generous wiring area further reducing installation cost. This unique design allows flexibility in making field changes in starter position as well as changing the rating of the starter due to changing HP requirements.

### INTERLOCK SYSTEMS

The Series 7850 enclosure and drawout mechanism interlock systems are in accordance with NEMA and UL standards and provide maximum safety for personnel and equipment.

#### A - Door Interlock

The controller door is interlocked with the main isolating switch handle. The door cannot be opened if the main isolating switch is in the energized or "CONN" (connected) position. In addition the handle cannot be moved to the "CONN" position while the door is open. In case of an emergency, a defeater is provided to allow the door to open while the switch is energized. The defeater can be reached by removing the set screw on the face of the operating mechanism just above the handle assembly. Refer to Fig. No. 1.

## "IMPORTANT INSTRUCTION" FOR KNOWLEDGEABLE AND QUALIFIED ELECTRICAL MAINTENANCE PERSONNEL ONLY

If the contactor position "ON" "OFF" indicator in the viewing window at the lower left corner of the controller door remains in the "ON" position, and the red release button below the operating handle mechanism **cannot be depressed** after a "stop/open" signal has been completed in the control circuit, an interlocking mechanism prevents opening the isolating gap (moving the operating handle mechanism to withdraw the contactor stabs from the line and load bus).

To defeat this interlock feature, use the following instructions.

1. **DISCONNECT HIGH VOLTAGE FEEDING THE CONTROLLER** — Contactor "ON" indication may be the result of welded high voltage contacts.

**CAUTION: FAILURE TO DISCONNECT HIGH VOLTAGE FEEDING THE CONTROLLER MAY RESULT IN DANGER TO LIFE AND DAMAGE TO PROPERTY.**

2. Unscrew the captive fasteners along the right side of the contactor door.
3. Defeat the door interlock by removing the 7/16 inch slotted set screw at the top of the operating handle mechanism casting and rotate the now exposed slotted defeater counter clockwise with a screwdriver. After this operation, **REPLACE THE SLOTTED SET SCREW.**
4. With the controller high voltage door open, the area of interference can be located at the end of the rod attached to the red release button (below the operating handle mechanism). By removing the bolt that attaches the "stop" onto the drawout contactor shaft, and removing the stop, the red release button can be depressed and in turn will allow the operating handle to be moved to the "DISC" position (simultaneously withdrawing the contactor and closing the line bus shutter).
5. Remove the contactor for inspection and/or repair.

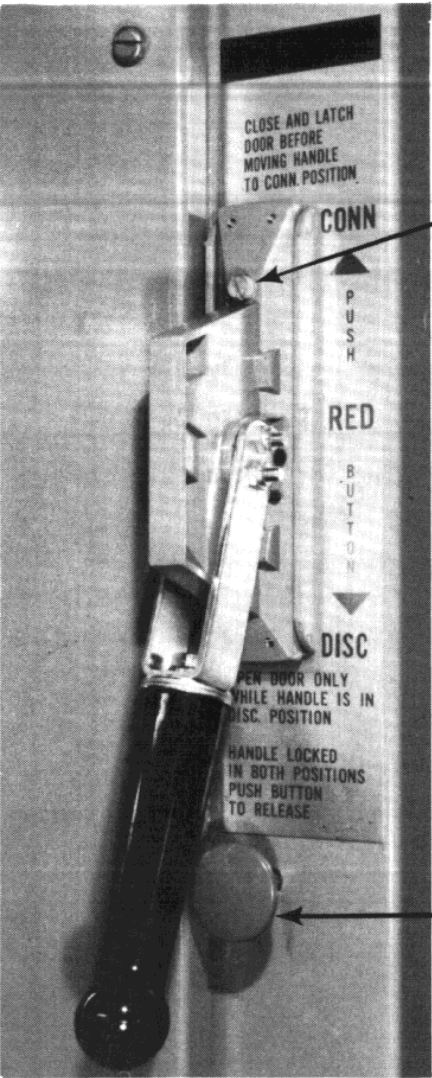


Figure 1  
Mechanical Door Interlock

B - Handle and Contactor Interlock (Mechanical)

To prevent accidental withdrawal of the contactor when it is energized, a mechanical interlock is provided. To move the operating handle from the "CONN" to the "DISC" (disconnected) position, it is necessary to first de-energize the contactor; then push the red handle release button located below the operating handle and hold while moving from "CONN" to "DISC". Reference Figure No. 1.

When the contactor is energized it should not be possible to push the button in. If the button can be depressed, it should be adjusted as shown in Figure No. 2.

C - Mechanical Latch

The mechanical latch is mounted on the right contactor carriage rail and serves to locate and hold the contactor in both the disengaged and test positions. The latch is released by pivoting the latch assembly upward and manually rolling the controller into the desired position. Reference Figure No. 3.

D - Switch Electrical Interlock  
(Contactor to Frame)

The normally open electrical interlock, located on the left side of the rear wall of the main switch compartment, closes only when the contactor is fully engaged, supplying power to the control circuit. The switch is pre-set at the factory and no adjustment is required. Reference Figure No. 4.

LOOSEN BOLT.  
DEPRESS HANDLE RELEASE BUTTON AND  
ADJUST IN ¼ TURN INCREMENTS TO  
ELIMINATE PLAY IN RELEASE BUTTON  
WHEN UNIT IS ENERGIZED.  
RETIGHTEN BOLT.

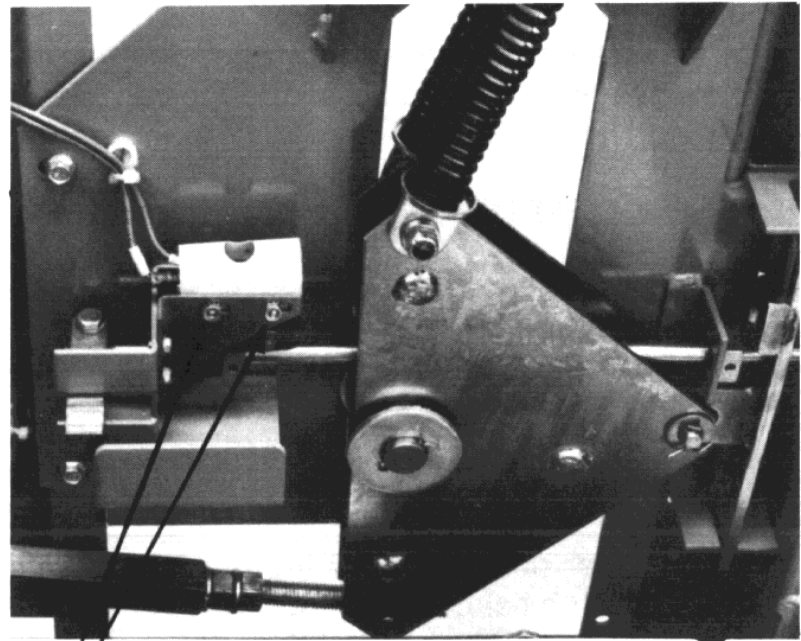


Figure 2  
Handle and Contactor Interlock Adjustment  
(Illustrated with handle release button depressed.)

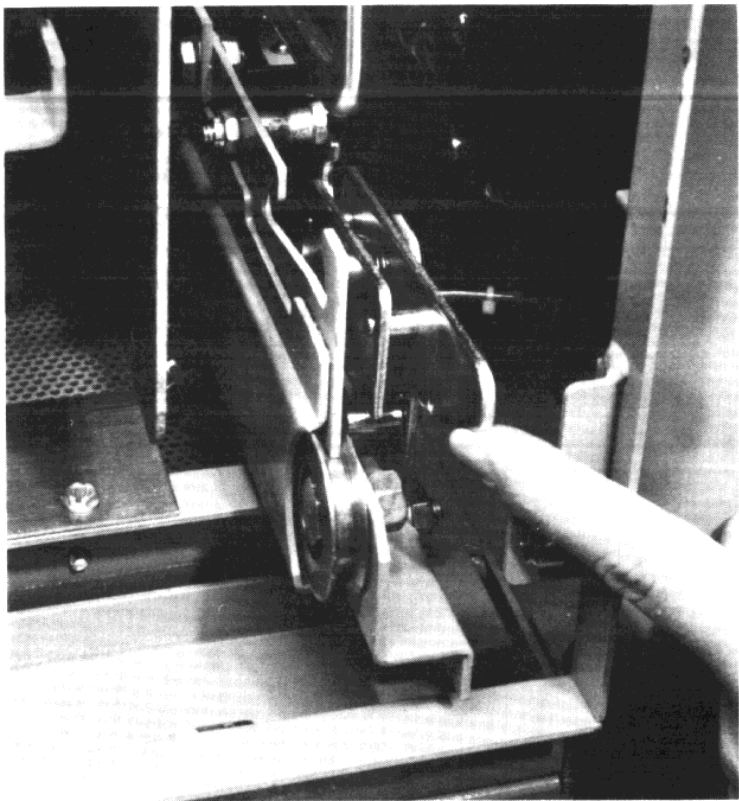


Figure 3  
Pivot Upward to Defeat Latch

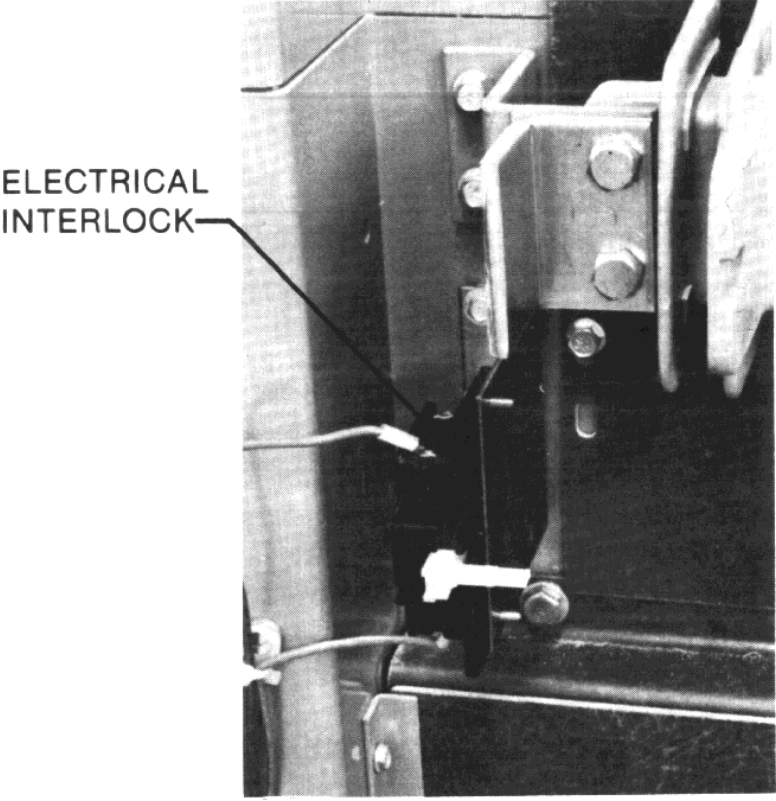


Figure 4  
Electrical Interlock Switch

E - Test Power Switch

The test power switch interlock located on the middle of the right contactor carriage rail, disconnects the test circuit when the contactor is moved from the test position to the disengaged position. If this does not occur, the action of this switch may be adjusted by loosening the mounting screws as shown in Figure No. 5.

F - Handle Interlock Switch  
(Electrical)

This electrical interlock works in conjunction with the handle and contactor interlock, section "B", page 2. The normally closed electrical interlock opens while the handle release button is depressed, disconnecting the fused leg of the control power transformer from the control circuit. If this does not occur, the action of this switch may be adjusted by loosening the mounting screws as shown in Figure No. 2.

LOOSEN TO ADJUST  
SWITCH POSITION

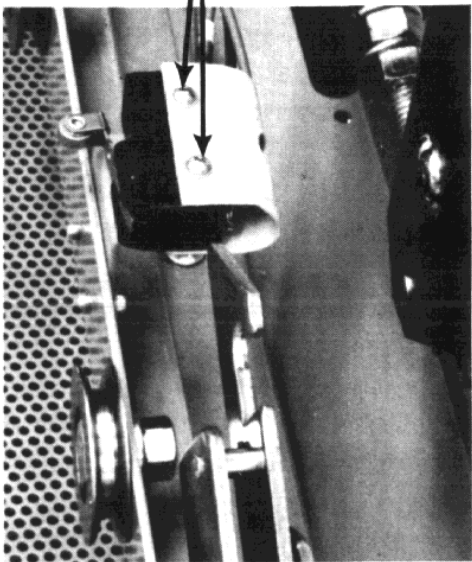


Figure 5  
Test Power Switch Adjustment



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#### DUAL CONTACTOR POSITION INDICATION

In addition to the "CONN-DISC" handle indication, a mechanical indicator mechanically operated by the magnet gives positive indication that the contactor is in either the "ON" or "OFF" position. This is seen at the lower left corner of the starter door.

#### OVERCURRENT PROTECTION

Ambient compensated thermal overload relays with external hand reset are provided as standard overload protection. Special switchboard or magnetic type overcurrent protection is available.

#### ENCLOSURES

Rugged, heavy gauge steel, NEMA 1 construction.

#### Features:

- Basic welded starter modules, 29" wide by 45" high by 24" deep.

- Add-on type modular, separate low voltage compartments with individual doors.

- Ventilated openings at the top and bottom of the enclosure for heat dissipation. Optional ventilated openings in starter module doors can be provided.

- Load terminals provided for customer motor leads in a separate compartment on fully rated standoff type insulators, accessible from the inside of the controller compartment by removing a barrier.

- Completely self-contained drawout mechanism with all wheels and moving parts mounted in the enclosure, allowing a lighter controller assembly.

- Line connections are provided with an automatic shutter that operates with the movement of the main isolating switch handle.

#### FINISH

The metal is thoroughly cleaned, degreased and given an iron phosphate rinse after which it is given 2 clear water rinses. The metal is then thoroughly dried after which an epoxy dry powder is applied electrostatically to a minimum thickness of 1-1/2 mils and then cured in an oven at a temperature of 325 degrees F. This standard finish exceeds requirements for the 200 hour salt spray test for corrosion resistant enclosures. Standard color is ASA 61, Gray.

CONTACTOR OPERATION DATA

Voltage (A.C.)	2400/5000 volts
Frequency	50/60 Hz.
Current <sup>①</sup>	NEMA Rated 180 amps (enclosed) 200 amps (open) NEMA Rated 360 amps (enclosed) 400 amps (open)
Interrupting Capacity, E2 Rating	200/350 MVA
Control Voltage (A.C.)	120 volts, 50/60 Hz.
Control Current: (120 volts 60 Hz.)	
Inrush	11.5 amp
Sealed	0.25 amp
Cycles to Close	13 cycles
Cycles to Open	6 cycles

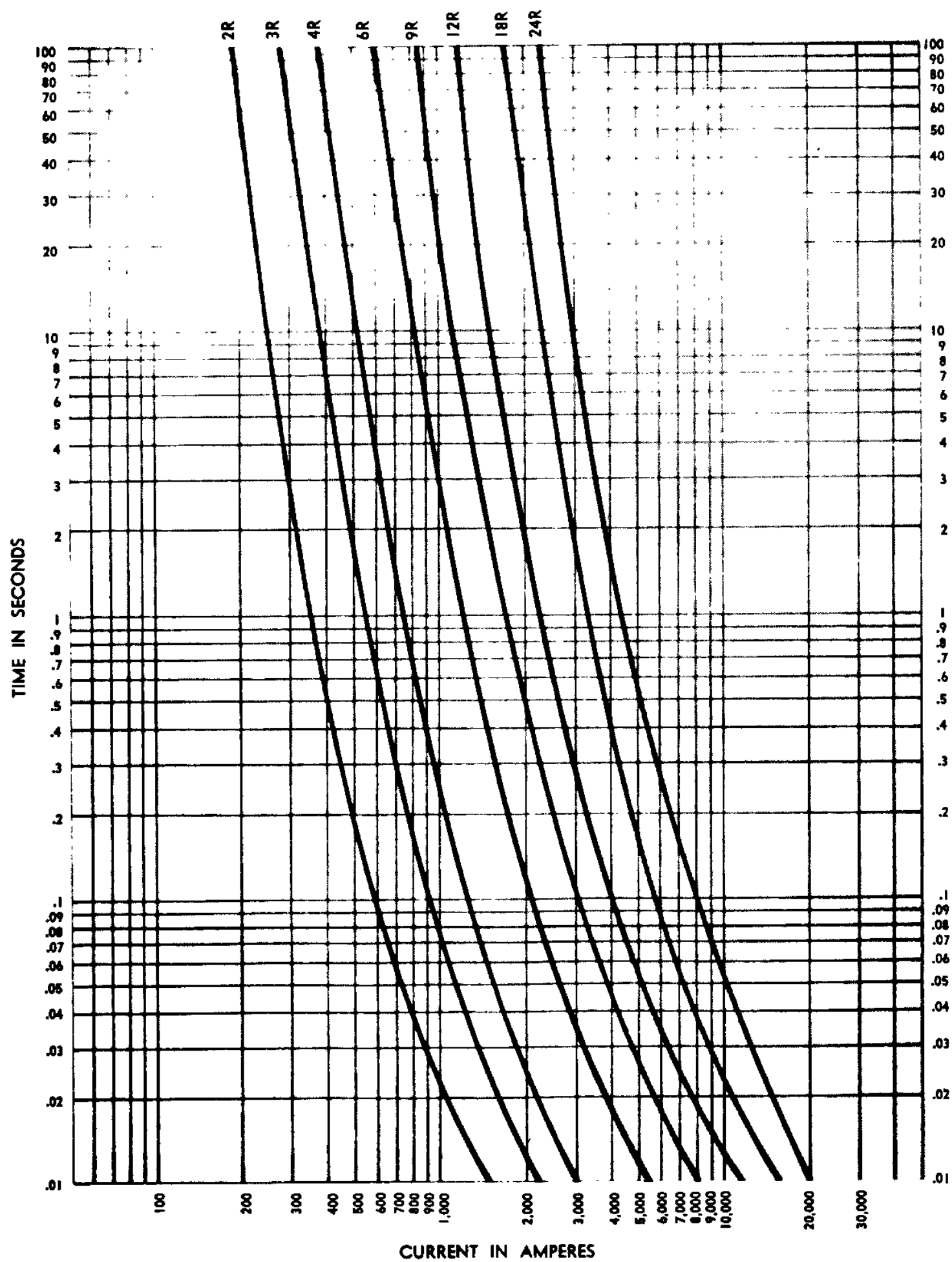
①Consult factory for UL Listed equipment.

RATING DATA FOR GOULD SHAWMUT TYPE A240R, A480R AND  
GENERAL ELECTRIC TYPE E-J-2 POWER FUSES<sup>①</sup>

FUSE CATALOG NUMBER <sup>①</sup>		FUSE VOLTAGE RATING	FUSE SIZE	FUSE CONTINUOUS CURRENT AT 40 C AMBIENT	FUSE BODY	INTERRUPTING RATINGS 60Hz	
GOULD SHAWMUT	GENERAL ELECTRIC					TOTAL RMS AMPS (ASYMMETRICAL)	THREE-PHASE MVA (SYMMETRICAL)
A240R- 2R A240R- 3R	9F60LCB502 9F60LCB503	2400	2R 3R	70 100	SINGLE BARREL	80,000 @ 2400V	210 @ 2400V
A240R- 4R A240R- 6R	9F60LCB504 9F60LCB506		4R 6R	130 170			
A240R- 9R A240R-12R	9F60LCB509 9F60LCB512		9R 12R	200 230			
A240R-18R A240R-24R	9F60MCB518 9F60MCB524		18R 24R	390 450	DOUBLE BARREL		
A480R- 2R A480R- 3R	9F60LJD502 9F60LJD503	4800	2R 3R	70 100	SINGLE BARREL	G.E.- 80,000 @ 4800V  GOULD- 100,000 @ 4800V	G.E.- 415 @ 4800V  GOULD- 500 @ 4800V
A480R- 4R A480R- 6R	9F60LJD504 9F60LJD506		4R 6R	130 170			
A480R- 9R A480R-12R	9F60LJD509 9F60LJD512		9R 12R	200 230			
A480R-18R A480R-24R	9F60MJD518 9F60MJD524		18R 24R	390 450	DOUBLE BARREL		

① POWER FUSE REPLACEMENT – Equipment bearing the Underwriters Laboratories Inc. Listing mark must use only General Electric power fuses selected from above table.

### A240R and A480R Amp-trap "R" Rated Fuses

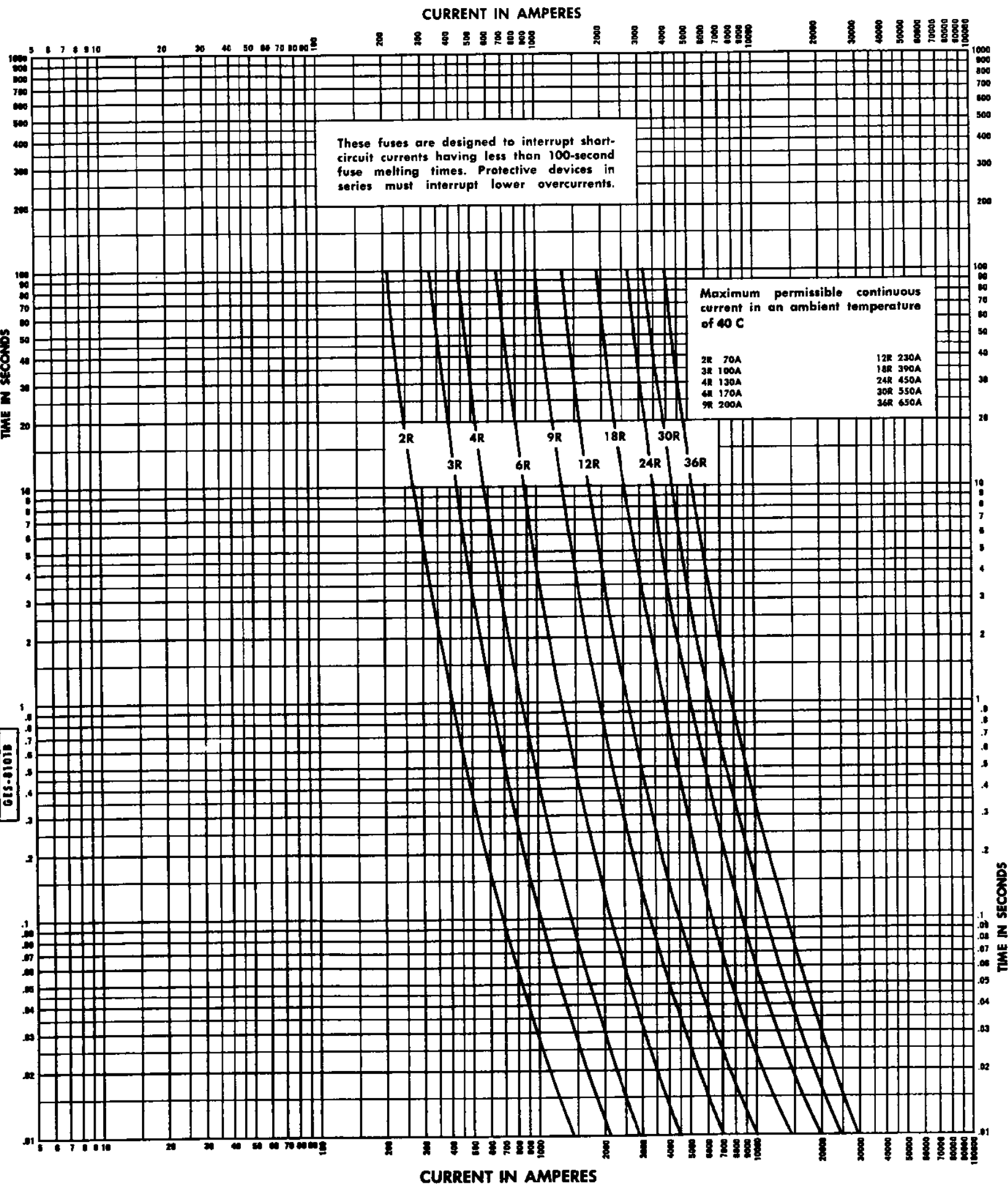




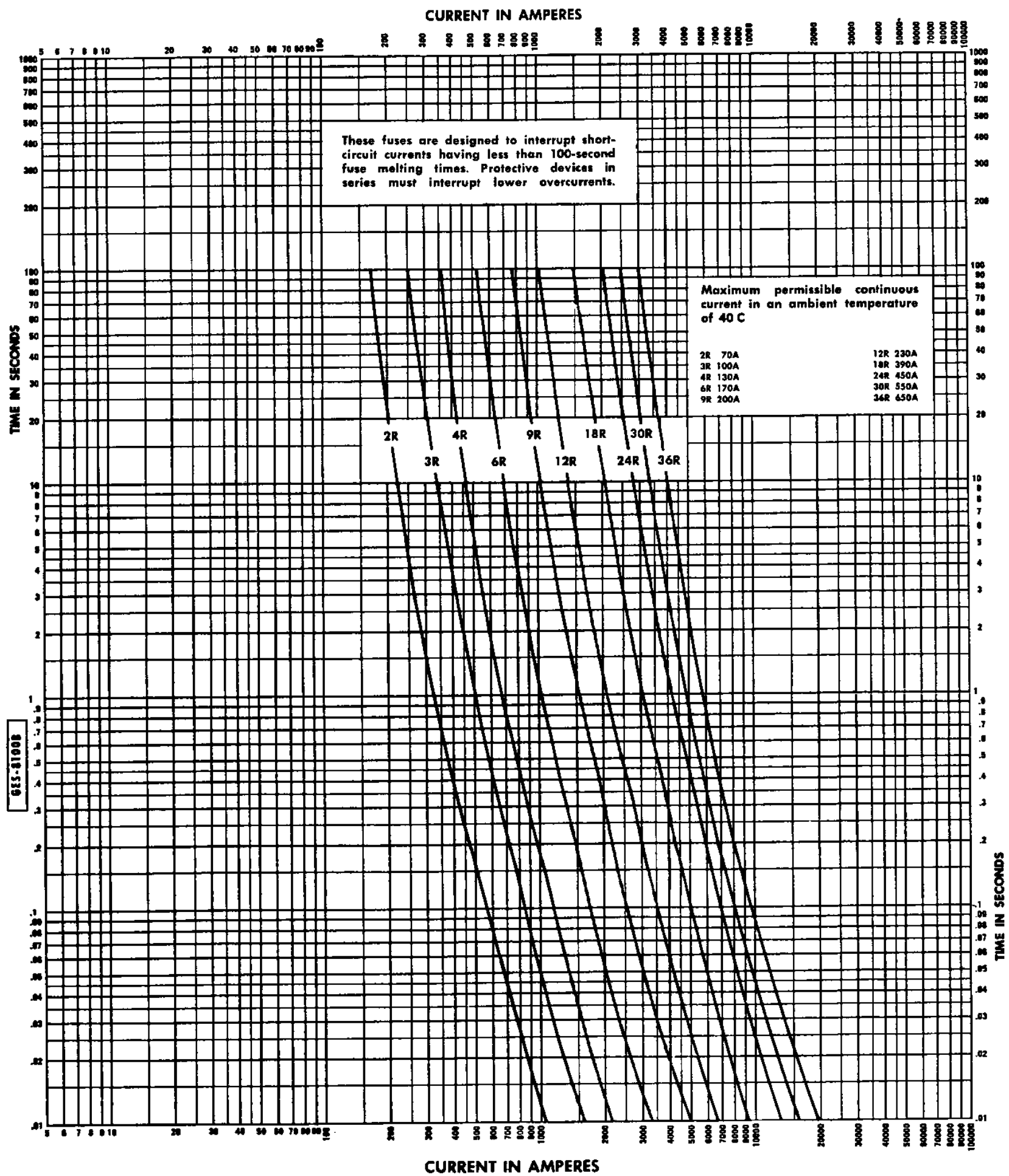
The graph illustrates the relationship between Time in Seconds (Y-axis) and Current in Amperes (X-axis) for various resistor ratings. The Y-axis is logarithmic, ranging from 0.01 to 100 seconds. The X-axis is also logarithmic, ranging from 100 to 20,000 amperes. Eight curves are plotted, each corresponding to a resistor rating: 2R, 3R, 4R, 6R, 9R, 12R, 18R, and 24R. The curves show that for a given resistor rating, the time decreases as the current increases. Higher resistor ratings allow for higher currents at the same time.

Resistor Rating	Current (A) at 100s	Current (A) at 10s	Current (A) at 1s	Current (A) at 0.1s	Current (A) at 0.01s
2R	100	100	100	100	100
3R	150	150	150	150	150
4R	200	200	200	200	200
6R	300	300	300	300	300
9R	450	450	450	450	450
12R	600	600	600	600	600
18R	900	900	900	900	900
24R	1200	1200	1200	1200	1200

TOTAL CLEARING TIME-CURRENT CURVES  
FOR 2400 AND 4800 VOLT  
GENERAL ELECTRIC TYPE EJ-2 "R" RATED  
FUSES



MINIMUM MELT TIME CURRENT CURVES  
FOR 2400 AND 4800 VOLT  
GENERAL ELECTRIC TYPE EJ-2 "R" RATED  
FUSES



---

INSTALLATION

## RECEIVING

Before accepting shipment from the transportation company, a thorough inspection of the Series 7850 High Voltage Starters should be made. If damage has been incurred during transit, the carrier should be notified at once and damage claim filed. The Company is not responsible for damage after equipment is released to the carrier. The Company will, upon request, assist in filing a claim with the carrier. The nearest Brown Boveri Sales Office should be notified and all pertinent information provided.

## STORAGE

After receipt and in the event that installation cannot be made at once, the unit should be stored in a clean, dry, well-ventilated location. Equipment should not be stored outdoors even if completely covered. If units are subjected to either low temperature or moisture, approximately 100 watts of heat should be introduced into each section. It is recommended that the factory-installed plastic covering be left intact until the equipment is ready for installation.

## HANDLING

All Series 7850 Starters should be handled with utmost care to avoid possible damage due to severe shock. Shipping skids, plastic covering, and open crating should be left intact as long as possible to facilitate handling and protection. Equipment may be moved with fork lift type equipment or by the use of rollers. Any force used to move equipment should be applied to the skid rather than the units themselves. Equipment should be stabilized while being moved to prevent any possibility of tipping. 7850 Starters may also be moved with an overhead crane. When using overhead equipment, the slings should be supported under the skids and cable spreaders should be used above the equipment to avoid damage. 7850 Starters may be supplied with lifting angles, if specified, to facilitate overhead handling.

## UNCRATING

**CAUTION****DO NOT UNPACK UNITS BEFORE READING  
ALL UNPACKING INSTRUCTIONS FULLY**

Care should be taken during unpacking to avoid damage to units. Equipment should be allowed to attain room temperature before removing the covering in order to minimize condensation. When the unit is at room temperature, remove covering and crating material.

**"DO NOT MOVE THE OPERATING HANDLE"**

For shipping purposes the handle interlock mechanism has been blocked. Damage will occur if the handle is operated before the unit is completely and properly unpacked. Reference Figure No. 6 & 7.

Unscrew the captive door fasteners and open the door. Remove the tie wraps holding the interlock mechanism behind the operating handle. Remove the shipping stop in the front of the left contactor carriage rail. The contactor is now free to be slowly racked forward to the "DISC" position by using the operating handle. Using the mechanical latch, see Fig. 3, the contactor may be pulled forward to the "TEST" position. The contactor will latch in the test position. See Figure No. 7. After the equipment is unpacked it should be checked against the packing list. Should any shortages or deviations occur, contact the local Gould Inc. office.

## GENERAL PRE-INSTALLATION INSPECTION

- 1 - With the optional 7850 PLD lift mechanism or other lifting means in position, defeat the mechanical latch mechanism as described in section "C", page 2. Roll the contactor out of the cabinet and follow steps 2 — 8 that follow.

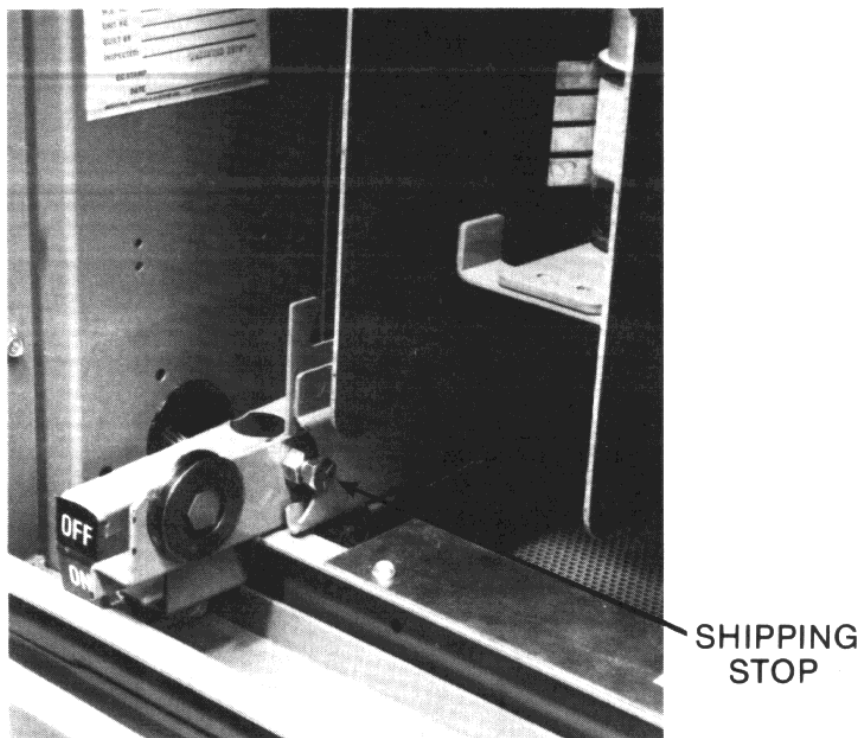


Figure 6  
Shipping Stop Location

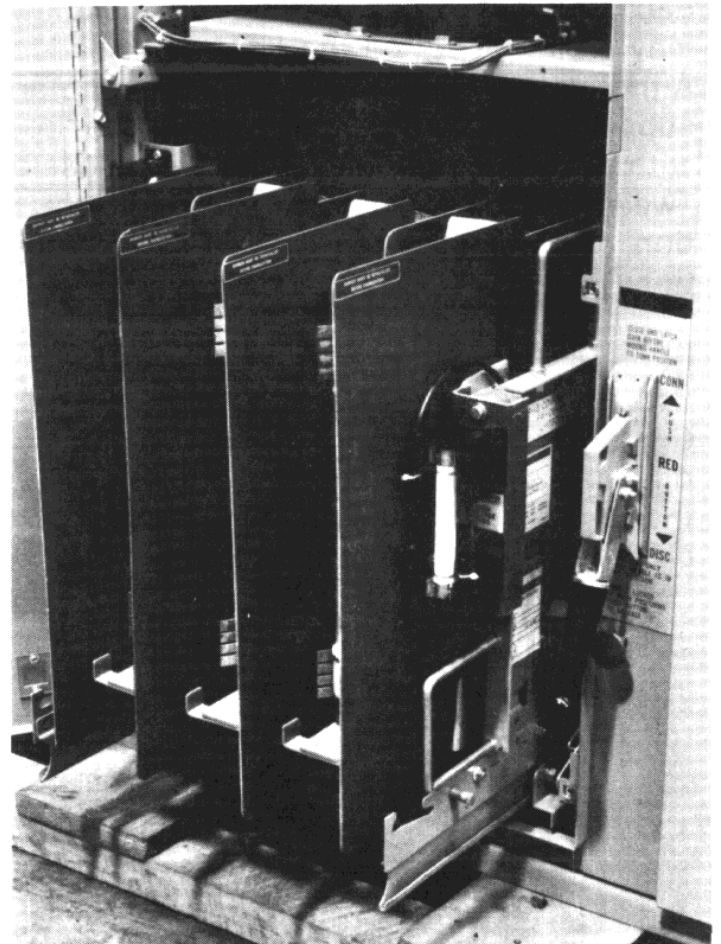


Figure 7  
Test Position

- 2 - Check all parts for secure mounting and good electrical connections. Inspect visually for overall good condition.
- 3 - Check fuses for snug fit in clips. Check fuse clips for deformity and secure mounting.
- 4 - By defeating door and handle interlocks (reference interlock section for description, page 1) while contactor is removed from the cabinet, inspect the line stab assembly and operation of isolation shutter.
- 5 - Manually operate the contactor shaft. Release the shaft and check that the shaft rotates freely and instantly out of engagement.
- 6 - Inspect cabinet for dents or other damage. Swing doors to make sure they pivot easily. Check wiring for secure connections and to be sure insulation is in good condition.
- 7 - Check control circuit plug and receptacles for bent pins or other damage.
- 8 - Make sure cable clamps and insulators are in good condition.

#### POSITIONING

All 7850 Starters should be positioned with as much clearance as possible away from all columns and obstructions. At least the minimum space as allowed by local code should be provided in front of the unit. If the optional 7850 PLD contactor lift mechanism is to be used, allow at least 39" in front of units. The rear of these devices may be placed against the wall, however, the rear covers are removable and the units may be mounted with space behind them for installation convenience. Reference page 12 for basic cabinet dimensions. Refer to outline drawings supplied with specific equipment for exact mounting bolt locations and conduit areas. **CAUTION:** Observe warning with regard to combustible floors.

Each unit is provided with mounting channels that may either be set on the floor or embedded in it. Although these units are free standing and self-supporting, they should be securely bolted down with anchor bolts to eliminate the possibility of "walking" in the event of a seismic event. In addition, all units must be level to insure proper operation.

ELECTRICAL CONNECTIONS

Customer leads are connected to the terminals provided simply by removing the contactor from the cabinet. Be sure to disconnect the control plug before attempting removal of contactor.

Line connections should be made first. A separate incoming line section may be supplied for cable sizes as specified by the customer.

Load cables are connected directly to the load terminals located behind the low voltage compartment.

These terminals can be reached by removing the barrier between the contactor compartment and the terminal compartment. See Figure No. 8.

External control connections are made to the terminal block located in the low voltage compartment.

HIGH VOLTAGE STARTER ENCLOSURES

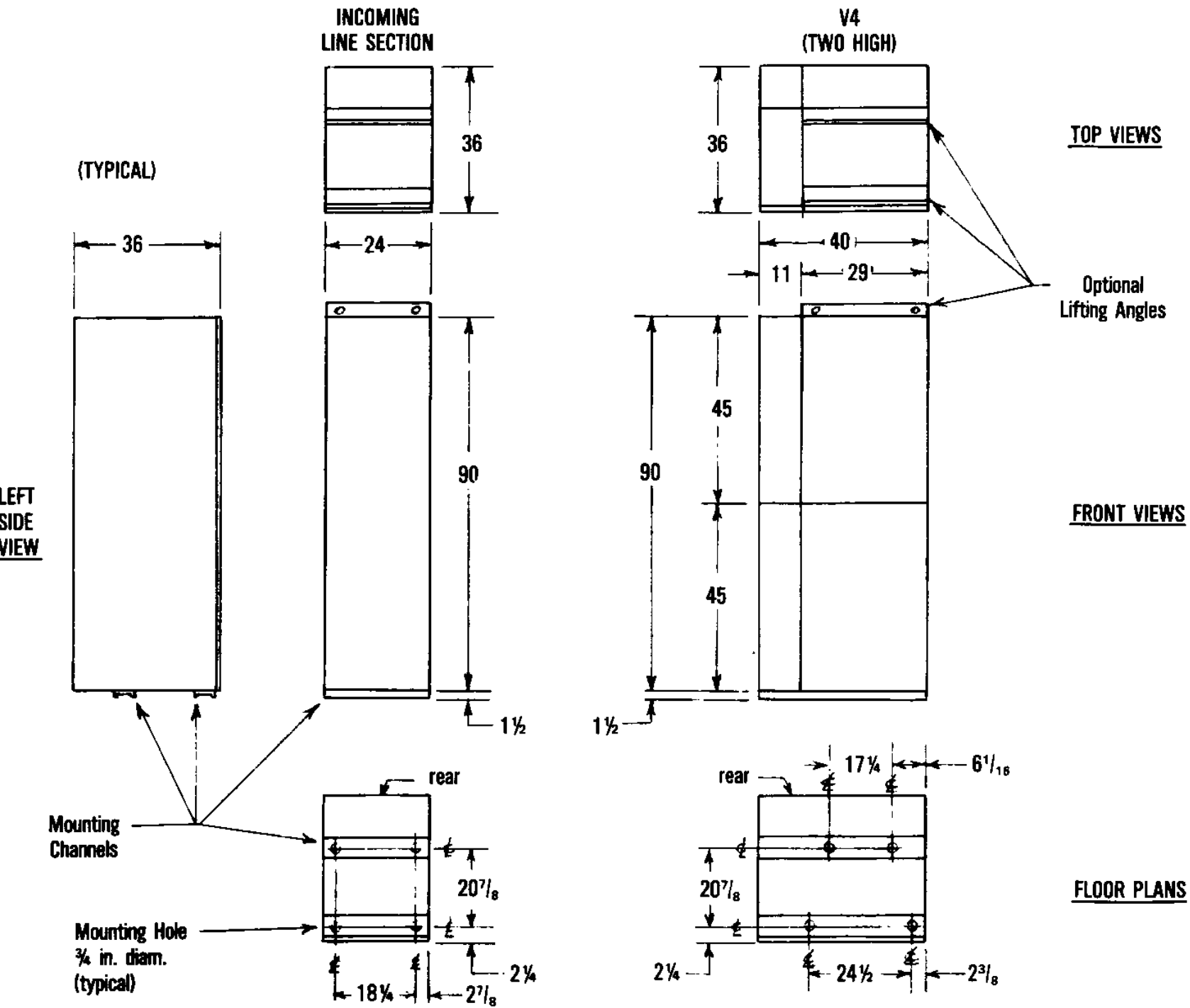






Figure 8  
Load Terminal Access  
(Illustrated with barrier removed)

MAKE SURE RAISED BUTTONS  
ON CORE SUPPORTS SEAT  
INTO DEPRESSIONS ON ARC  
CHUTES

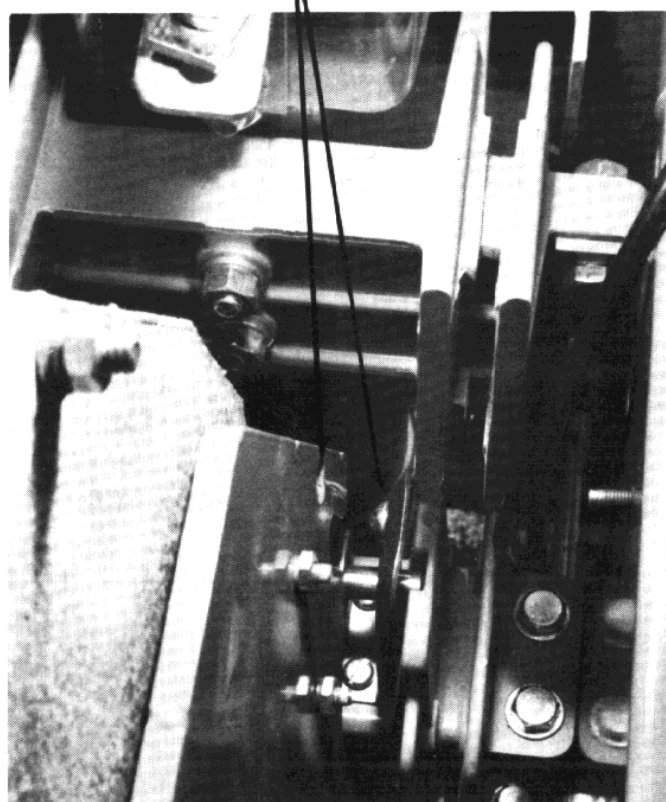


Figure 9  
Engagement of Arc Chutes

## FINAL CHECKOUT AND INSTALLATION

### CAUTION

**MAKE SURE MAIN SWITCH IS LOCKED OPEN  
BEFORE INSTALLING CONTACTOR**

Install contactor in the cabinet in the "test" position. See Figure No. 7 for "test" position. Connect the control plug. Connect test source to the proper test terminals as shown in the wiring diagram provided with the specific device. (The high voltage control transformer is not connected to the circuit in the test position.) Move the "TEST-RUN" selector switch, located in the low voltage compartment, to the "TEST" position. Energize the contactor. Tilt back the arc chutes and inspect the contacts to be sure they mate fully and evenly across the full surface of the contacts. Return the arc chutes to their normal position. Check that the arc chutes are fully engaged. Reference Figure

No. 9. While the unit is energized, push the contactor back into the enclosure to its "stop" position. The contactor should de-energize during this procedure. If the contactor has not de-energized by the time the unit has reached this position, return it to the "test" position. De-energize the contactor using the control circuit stop button. Disconnect the control plug and remove the unit from the cabinet. Check the operation of the test power microswitch and adjust or replace as necessary. See "interlock systems" section of description, page 5, section E.

All other contactor operation assemblies have been set and checked at the factory. If, during start up, the main contactor does not close, refer to maintenance section for trouble shooting information.

OPERATION & ROUTINE INSPECTION AND  
MAINTENANCE

OPERATION

**CAUTION**

**BEFORE PLACING UNIT INTO  
OPERATION, VERIFY THAT ALL NECESSARY  
FIELD INSTALLATION TESTS, INCLUDING  
DIELECTRIC AND PROPER PHASING,  
HAVE BEEN MADE**

With the operating handle in the "DISC" position, check to be sure all parts removed during the inspection and testing have been replaced. Close the doors and retighten the captive fasteners. The operating handle may now be moved to the "CONN" position, moving the contactor into the engaged position. Electrical sequence of the starter can be traced on the schematic wiring diagram(s) provided with the equipment.

MAINTENANCE

**CAUTION**

**MAKE SURE THE CONTACTOR IS DISENGAGED  
BEFORE ANY INSPECTION OR MAINTENANCE  
PROCEDURES ARE ATTEMPTED**

Under normal operating conditions, starters should be inspected monthly. In applications where frequent starting is required or where unusually dirty or corrosive conditions exist, a more frequent inspection interval is recommended.

Contactors should be routinely cleaned and all dirt and dust removed. Special attention should be paid to the stationary and movable contact faces. If the contacts are excessively pitted or worn, they should be replaced.

TROUBLESHOOTING CHART

PROBLEM	PROBABLE CAUSES	CORRECTIVE ACTION
Contacts chatter	Loose connection in control circuit	Tighten connections in control circuit
	Defective control relay	Check control relay - replace as required
	Defective magnet	Check coil or rectifier
	Low control voltage	Check line voltage
Contacts overheat	Loose connection	Tighten connections
	Contacts not making firmly	Check for weak or deformed contact spring - replace as required
	Dirt or foreign matter on contact surfaces	Clean contacts
	Contact material consumed	Replace contacts
Contactor will not close	Control circuit or main fuses blown	Inspect fuses, replace if blown
	Magnet coil defective	Check magnet operation - replace coil as necessary
	Control relays defective	Check control relays and replace if defective
	Potential transformer defective	Check potential transformer - replace if defective
	Overload Relay defective	Check overload relay - replace if defective
	Rectifier defective	Check rectifier and replace if defective
	Remote reset button or solenoid defective	Replace defective parts
	TEST-RUN switch in test position	Move switch to RUN position
	Electrical interlocks defective	Check function of interlocks - replace as required

CABINET — INTERNAL COMPONENTS

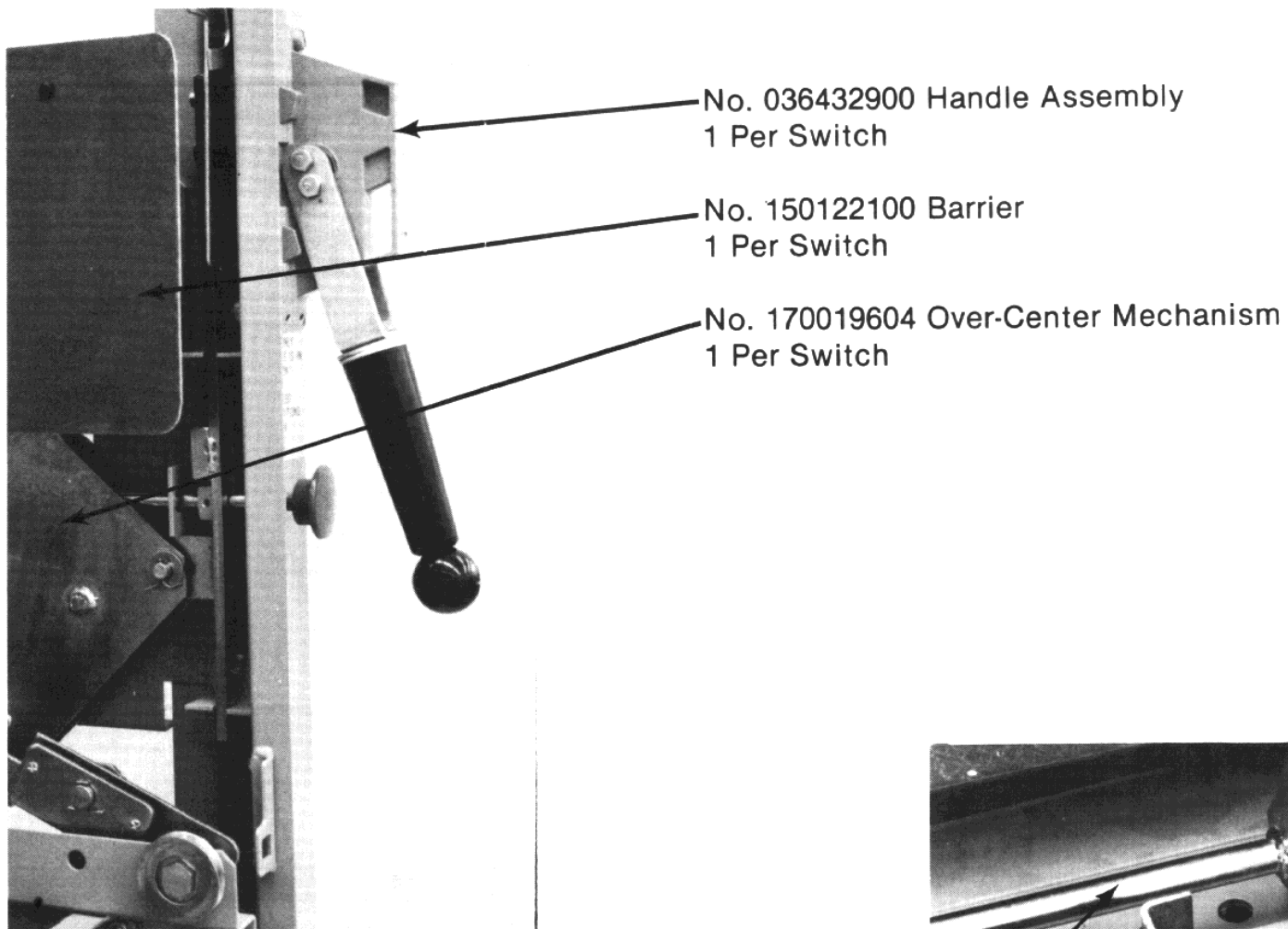


Figure 10

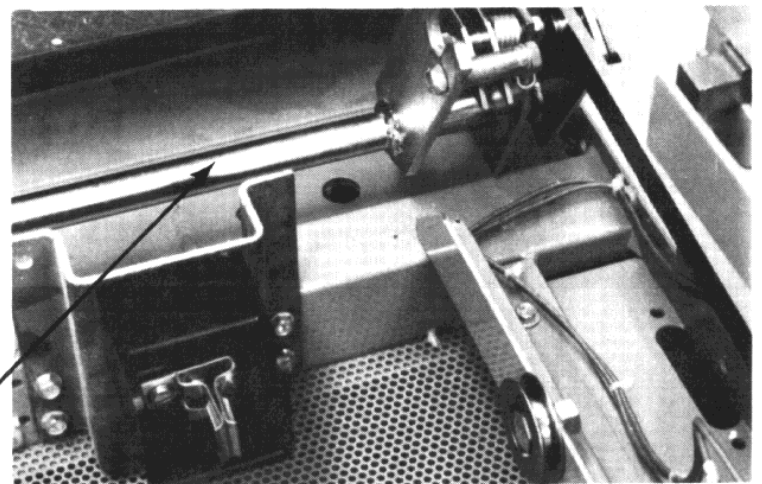


Figure 11

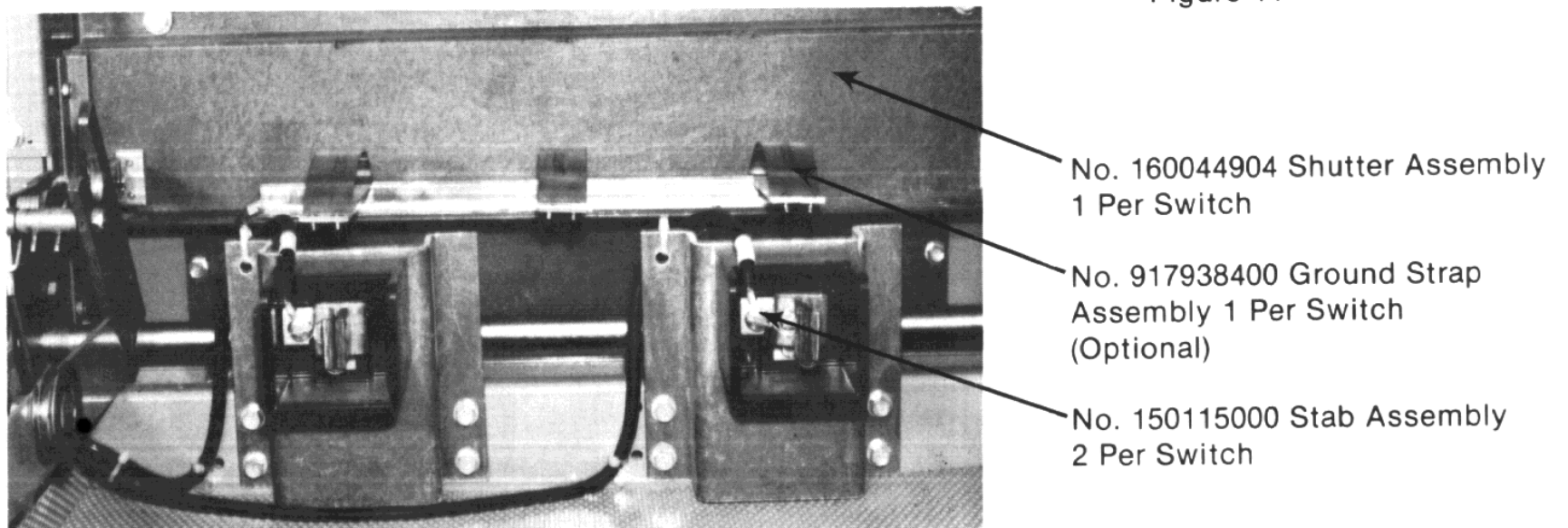


Figure 12

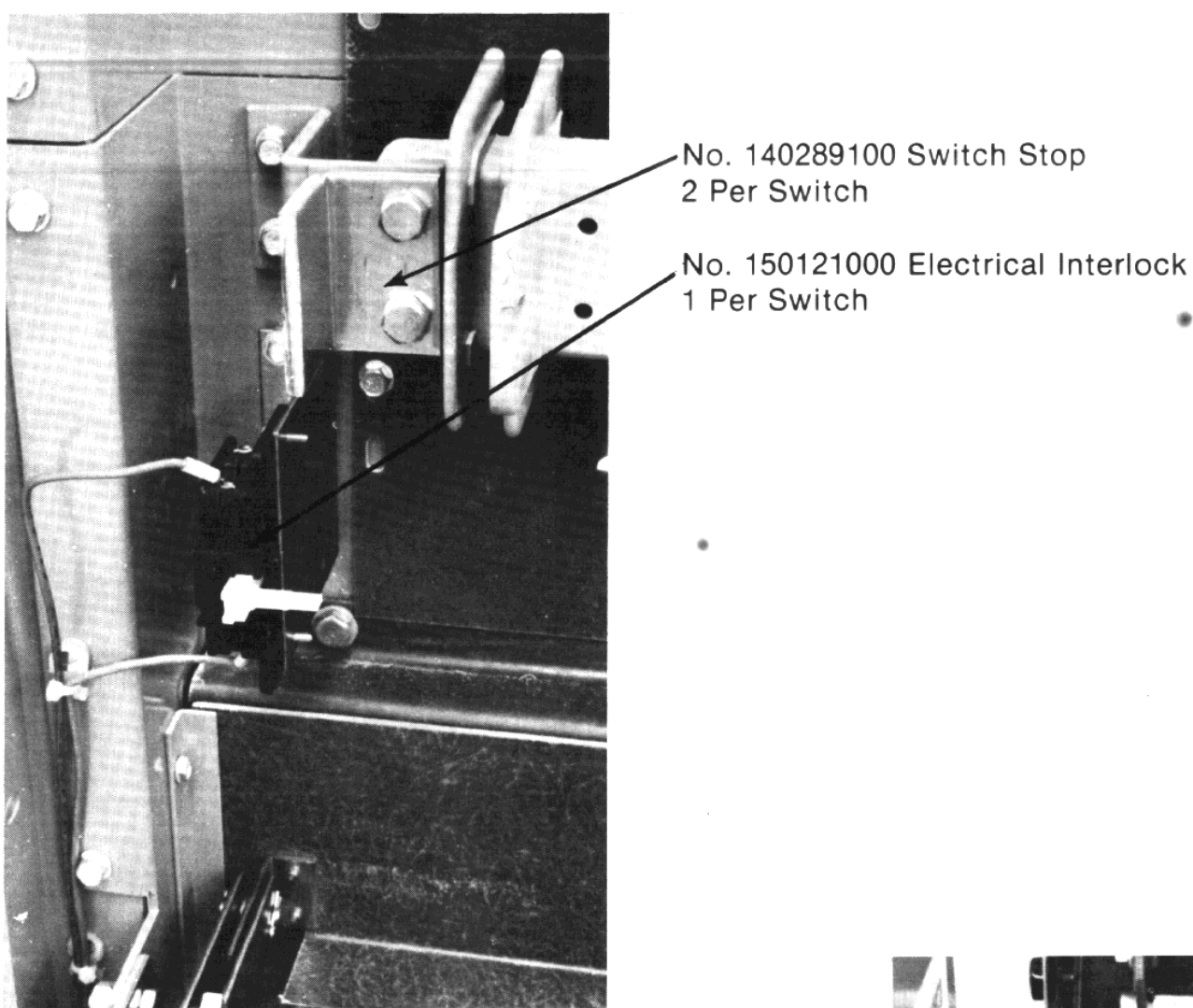


Figure 13

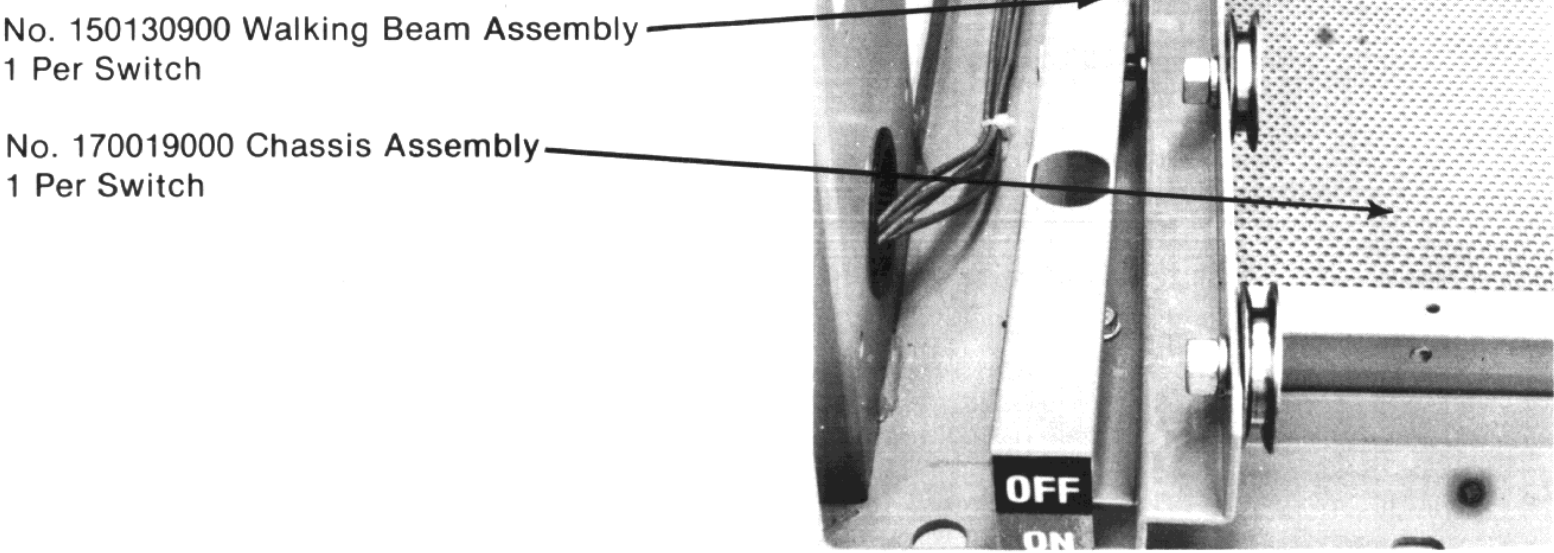


Figure 14

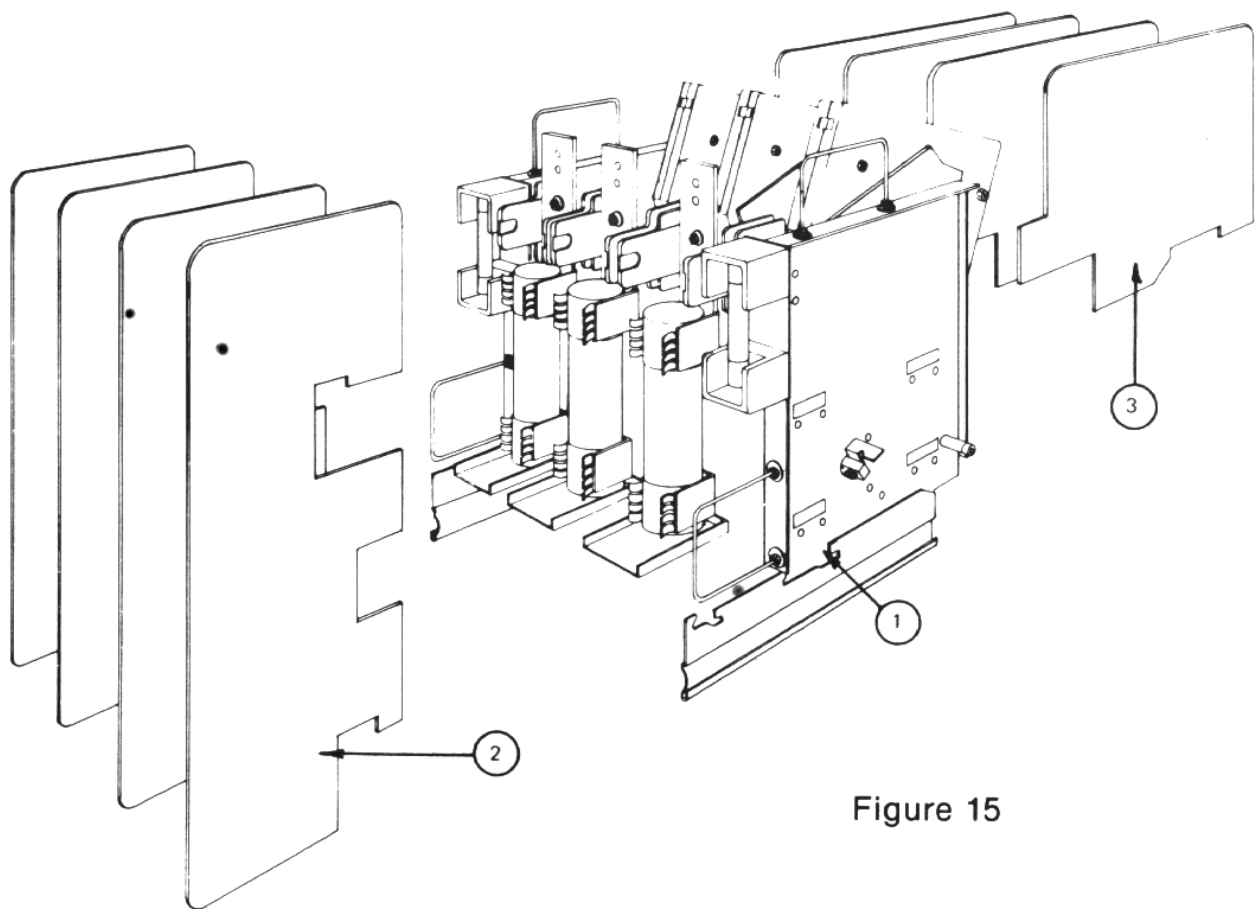


Figure 15

Fuse and Arc Chute Barriers (Non-Vented Starter Door)

Fig. & Index No.	Part Number	Description
15-1		Typical Controller
15-2	150104803	Fuse Barriers (4 required)
15-3	150104700	Switch Barriers (4 required)

Fuse and Arc Chute Barriers (Optional Vented Starter Door)

Fig. & Index No.	Part Number	Description
15-1		Typical Controller
15-2	150104800	Fuse Barriers (4 required - not as shown)
15-3	150104700	Switch Barriers (4 required)
15-4	027091900	Front Barrier (1 required - not shown)

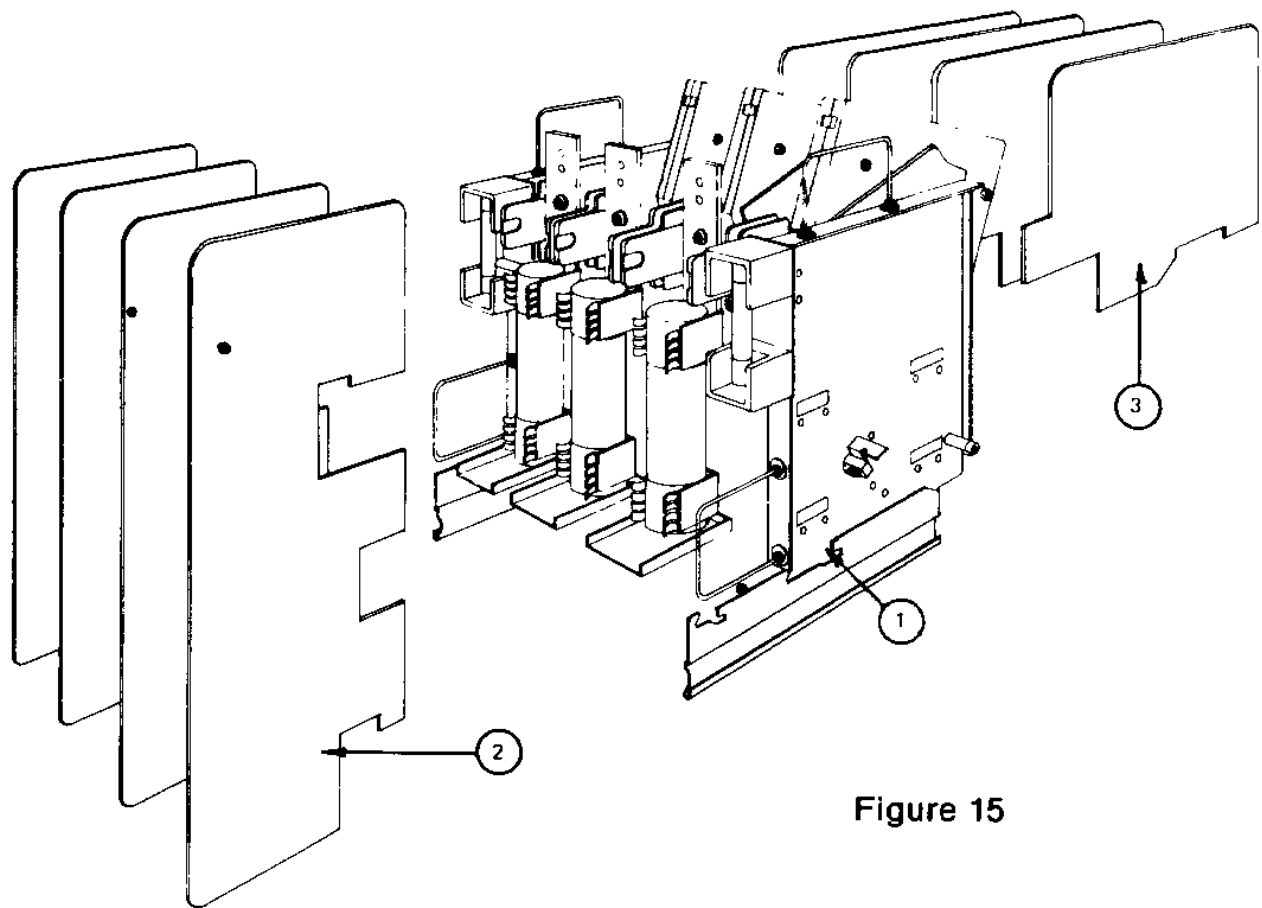


Figure 15

Fuse and Arc Chute Barriers (Non-Vented Starter Door)

Fig. & Index No.	Part Number	Description
15-1		Typical Controller
15-2	150104803	Fuse Barriers (4 required)
15-3	150104700	Switch Barriers (4 required)

Fuse and Arc Chute Barriers (Optional Vented Starter Door)

Fig. & Index No.	Part Number	Description
15-1		Typical Controller
15-2	150104800	Fuse Barriers (4 required - not as shown)
15-3	150104700	Switch Barriers (4 required)
15-4	027091900	Front Barrier (1 required - not shown)



**BBC**  
BROWN BOVERI

7, 8, 9, 10, 11, 12, 13

40-66153

40 66 152

13 14 16 15

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Switchgear Products Group  
Spring House, PA 19477

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Printed in U.S.A. 2M CMC 386

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