INSTALLATION • OPERATION • MAINTENANCE

# INSTRUCTIONS

# TYPES SM-1 AND SM-3 INSTANTANEOUS OVERCURRENT RELAYS

**CAUTION** Before putting relays into service, remove all blocking which may have been inserted for the purpose of securing the parts during shipment, make sure that all moving parts operate freely, inspect the contacts to see that they are clean and close properly, and operate the relay to check the settings and electrical connections.

## APPLICATION

The type SM relays are used to provide instantaneous overcurrent protection of transmission lines and electrical equipment. They are commonly used to supplement existing induction type overcurrent relays to provide instantaneous protection for heavy faults. In these applications the system characteristics should permit selective operation on overcurrent alone so that the relay may be set to operate on internal faults and not operate for external faults either at the near or remote busses.

The type SM-1 relay has a single overcurrent element, and the type SM-3, three overcurrent elements.

## CONSTRUCTION AND OPERATION

The type SM-1 relay consists of one overcurrent element and one operation indicator. The type SM-3 relay consists of three overcurrent elements, three operation indicators, and one contactor switch.

### Overcurrent Element

The overcurrent element is a small solenoid type element. A cylindrical plunger rides up and down on a vertical guide rod in the center of the solenoid coil. The guide rod is fastened to the stationary core, which in turn screws into the element frame. A silver disc is fastened to the moving plunger through a helical spring. When the coil is energized, the plunger moves upward carrying the silver disc which bridges three conical-shaped stationary contacts. In this position, the helical spring is compressed and the plunger is free to move while the contact remains stationary. Thus, a-c vibrations of the plunger are prevented from causing contact bouncing. A Micarta disc mounted on a tapped bushing can be screwed up or down on the threaded guide rod to change the initial position of the plunger, thus determining the pick-up current. A locknut secures the disc in its selected position.

### Operation Indicator

The operation indicator is a small solenoid coil connected in the trip circuit. When the coil is energized, a spring-restrained armature releases the white target which falls by gravity to indicate completion of the trip circuit. The indicator is reset from outside of the case by a push rod in the cover or cover stud.

### Contactor Switch

The contactor switch is similar to the overcurrent element except that a silver disc is fastened directly to the moving plunger for d-c operation, and there is no calibrated scale. The coil is in series with the main contacts of the relay and with the trip coil of the breaker. When the relay contacts close, the coil becomes energized and closes the switch contacts. This shunts the main relay contacts, thereby relieving them of the

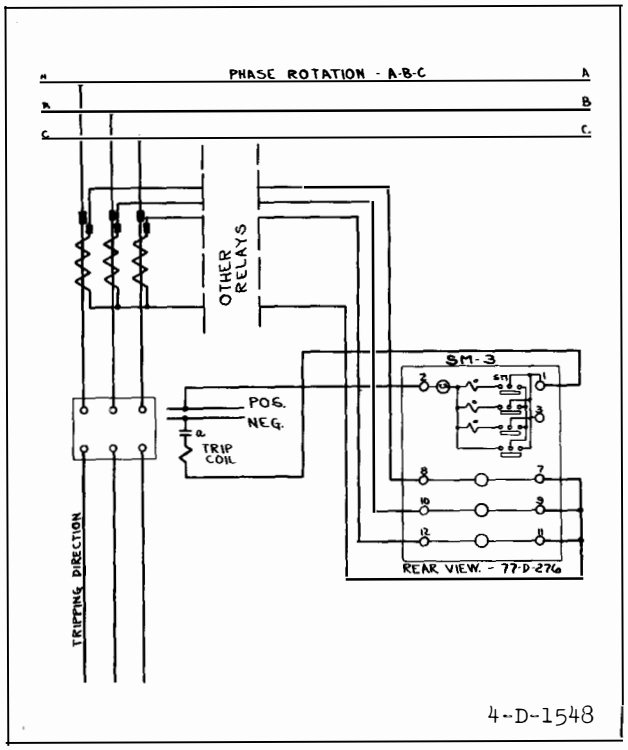


**Fig. 4—Typical External Connections of the Type SM-3 Relay in the Standard Case for Phase Instantaneous Overcurrent Protection of a Three Phase Line.**

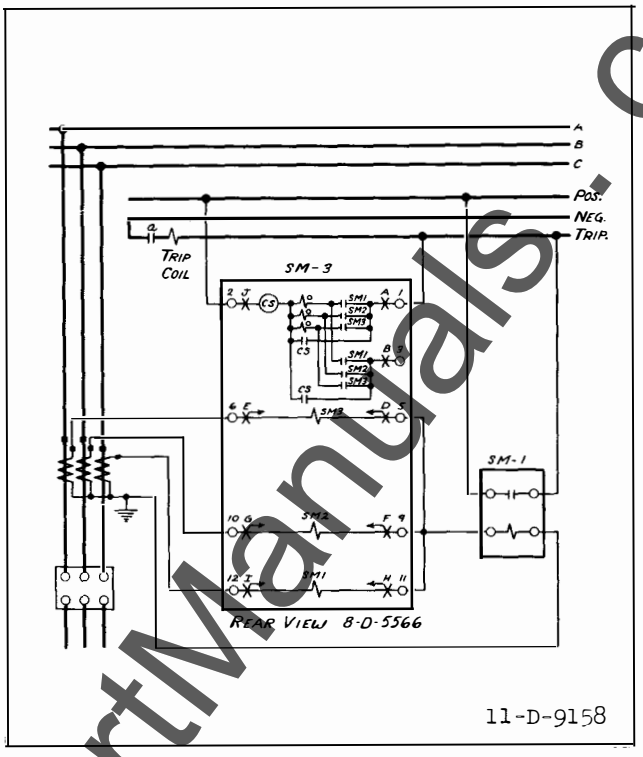


**Fig. 5—Typical External Connections of the Type SM-3 Relay in Type FT Case and the Type SM-1 Relay for Phase and Ground Instantaneous Overcurrent Protection of a Three Phase Line.**

a clearance between the stationary core and the moving core when the switch is picked up. This can be most conveniently done by turning the relay up-side-down. Screw up the core screw until the moving core starts rotating. Now, back off the core screw until the moving core stops rotating. This indicates the point where the play in the moving contact assembly is taken up, and where the moving core just separates from the stationary core screw Back off the stationary core screw one-half turn beyond this point and lock in place. This prevents the moving core from striking and sticking to the stationary core because of residual magnetism. Adjust the contact clearance for 3/32 inch by means of the two small nuts on either side of the Micarta disc. The switch should pick up at 2 amperes d-c. Test for sticking after 30 amperes d-c have been passed thru the coil. The coil resistance is approximately 0.25 ohm.

## RENEWAL PARTS

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data.

## ENERGY REQUIREMENTS

The burden of the type SM-1 or each element of the type SM-3 relays at 5 amperes, 60 cycles is as follows:

| Ampere Range | Voltamperes Min. Setting | P.F. Angle (Lag) |
|---|---|---|
| 4 - 16 | 0.8 | 26° |
| 10 - 40 | 0.13 | 26° |
| 20 - 80 | 0.03 | 26° |
| 40 - 160 | 0.009 | 26° |

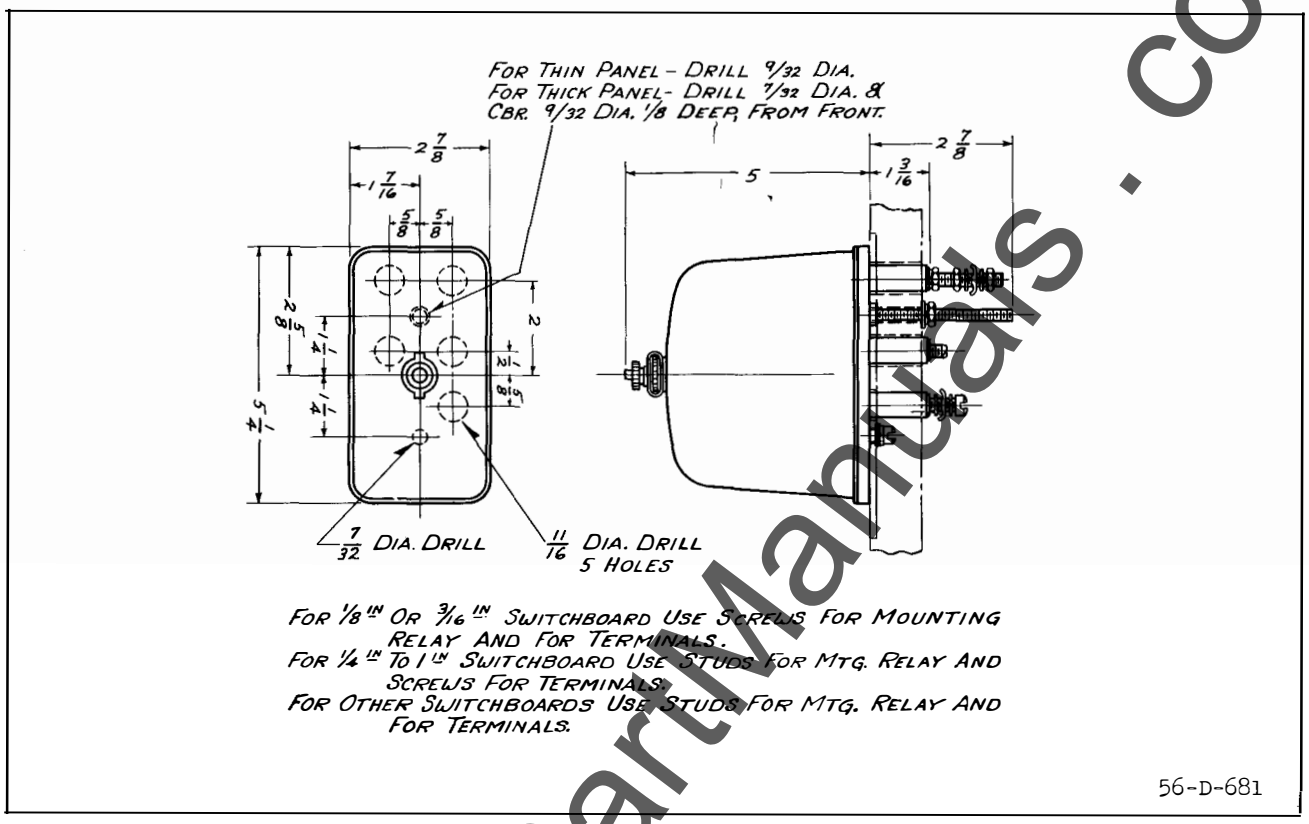


**Fig. 6—Outline and Drilling Plan of the Type SM-1 Relay. (For Reference Only).**

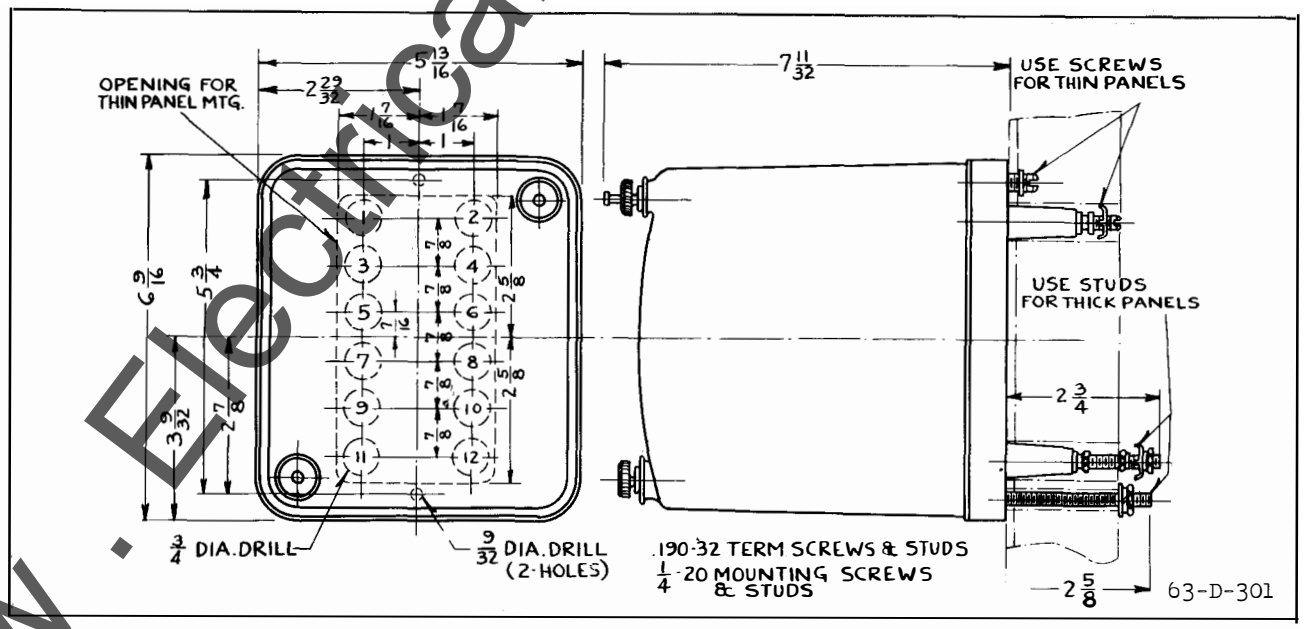


**Fig. 7—Outline and Drilling Plan of the Type SM-3 Relay in the Standard Case. (For Reference Only). See the Internal Wiring for the Terminals Supplied.**




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