INSTALLATION • OPERATION • MAINTENANCE

# INSTRUCTIONS

# TYPE MN RELAY

**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 MN relay is intended for d-c applications requiring substantially instantaneous overcurrent protection, where the relay must maintain its accuracy through conditions of severe shock and sustained vibration. It is available with circuit opening contacts, which normally latch in the operated position and must be reset either manually or electrically. If electrically reset contacts are not required, a circuit-closing contact may be added, electrically independent of the circuit-opening contact.

In certain applications of the MN relay, the characteristics of the associated equipment may require a slight delay in the operation of the relay after it is energized. For such applications, the operation of the relay is retarded by winding the operating coil upon a copper spool. However, this restricts the winding space and reduces the continuous current capacity of the coil.

## CONSTRUCTION

The type MN relay consists of a clapper type electromagnet mounted on a base moulded from insulating material and provided with a glass cover. The armature of the electromagnet is balanced about its bearings and when energized is held against a stop by a strong spring. This armature restraining spring is attached to a clamp which slides in a slot in the armature. A pointer on the clamp indicates on a calibrated scale the position of the spring for the desired operating current.

The armature bearings pins are pressed into the side edges of the armature, and are made of a hardened and polished stainless steel. The bearing pins are carried in bronze bearing screws mounted in the frame casting, and a stainless steel ball pressed into each bearing screw takes any end thrust which may exist.

When the armature is closed against the core of its operating coil, a piece of insulating material riveted to its upper end engages a flat spring in which the moving contact is riveted and moves this contact away from the stationary contact. At the same time a latch arm drops below the upper edge of the armature and prevents it from returning to its normal position when the coil is de-energized. The latch arm also is balanced to minimize the effect of vibration. A mechanical operation indicator, not supplied on standard relays but available as a special modification, is released by motion of the armature and drops into view when the latter latches.

The latch may be released by pressing the reset button at the outer end of the stud by which the glass cover is held in place. When electrical as well as manual reset is desired, a coil and core are mounted on the frame directly below the rear extension of the latch arm and above the main coil. An armature riveted to the arm is attracted when the reset coil is energized. This raises the front end of the latch arm and disengages it from the main armature. The reset button in the cover stud also resets the operation indicator

SUPERSEDES I.L. 41-383C
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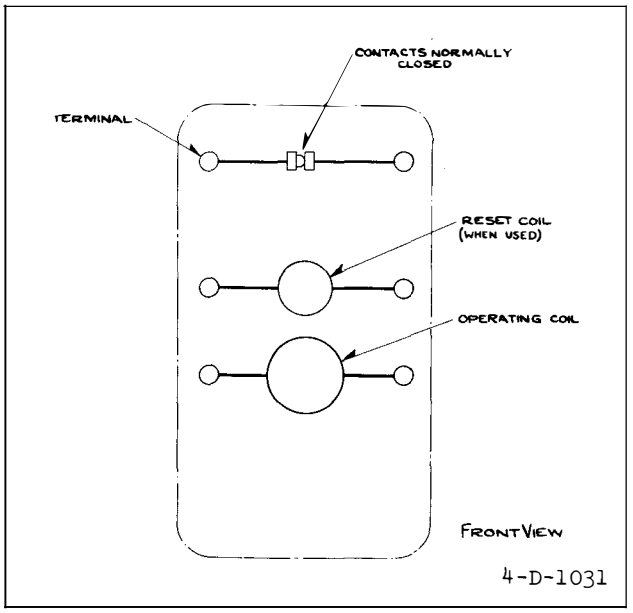


Fig. 1—Internal Wiring Diagram of the Type MN Relay.

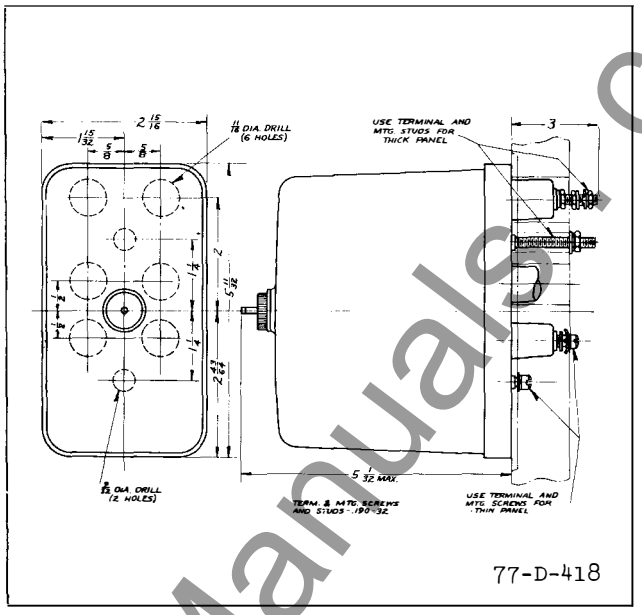


Fig. 2—Outline and Drilling Plan for the Type MN Relay.

(when supplied). The operation indicator must be reset manually, even on the relay with electrically reset armature latch.

All metal parts of the relay either are resistant to the corrosive effects of salt sea or tropical atmospheres or are protected against such atmospheres by suitable finishes.

## CHARACTERISTICS

Because of the balanced armature and the characteristics of the restraining spring, the operating current of the relay when subjected to vibration up to 1/32 inch amplitude (1/16 inch total travel) at frequencies up to 40 cycles per second is only about 15% less than the operating current under static conditions. For lower amplitudes and frequency of vibration, the reduction in operating current is correspondingly less. Also, at the higher, operating current settings the relay is less affected by vibration than at the lower settings.

Operating coils are available for currents ranging from .04 to 4.0 amperes. The spread from maximum to minimum operating current for any range is 4 to 1. Standard reset coil ratings are 115 volts d-c., 230 volts d-c. and 115 volts 60 cycles.

The operating time of the MN relay with the instantaneous coil varies from about .017 second at 125% of the current setting to .007 second at 300% of setting. The "delayed-action" coil gives an operating time of about .08 second at 125% and .024 second at 300% of setting.

### Coil and Contact Ratings

The operating coils which are wound on copper spools can be energized continuously at two and one half times their minimum rated operating values. The other coils can be energized continuously at three times the minimum rated values. Since the normal current will always be somewhat less than the relay setting and since its application may not require that the relay be energized continuously, the full scale range is usable in practically any application. The reset coil is designed for intermittent service only, and will overheat if energized longer than a few minutes. Reset coils are available for operation on either a-c or d-c.

The contacts will carry 5 amperes continuously and will interrupt this current at 115 or 230 volts a-c. They will interrupt 1.5 amperes at 125 volts d-c.

## SETTINGS

The operating current of the relay under static conditions is indicated on a calibrated scale adjacent to the slot in the armature. The setting is made by varying the position of the restraining spring clamp in the slot for the desired operating current.

## INSTALLATION

The relay should be mounted on a suitable panel of either steel or insulating material. Although the relay is designed for service where severe vibration is unavoidable it is desirable that the location be as free from dirt, moisture or excessive heat as possible. Mount the relay by means of the two mounting studs provided. While the usual mounting position is with the base vertical and the contacts at the top, the operation of the relay is not affected appreciably if it is mounted in any other position. The electrical connections may be made direct to the terminals by means of screws for steel mounting or to terminal studs furnished with the relay for ebony-asbestos or slate panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the studs and then turning the proper nut with a wrench.

## ADJUSTMENTS AND MAINTENANCE

The proper adjustments to insure correct operation of the relay have been made at the factory and should not be disturbed after receipt by the customer. If the adjustments have been changed, the relay taken apart for repairs or if it is desired to check the adjustments at regular maintenance periods, the adjustments should be made or checked in the following order since some of them affect others.

The bearing screws should be adjusted so that the armature is approximately centered in the frame, and the latch arm has sufficient clearance to both sides of the notch thru which it passes. The end play in the bearings should be perceptible but not more than a few thousandths of an inch.

The L-shaped bracket which supports the latch arm should be located so that there is a gap of approximately 1/64 inch between the ends of the latch armature and the frame casting when the main armature is latched closed.

On the relay with the electrical-reset coil, adjust the bushing which passes through the front of the cover so that with the push rod held in and the main armature closed, there is a gap of about .005 inch between the reset armature and the bronze pin in the center of the reset coil core. On relays without the electrical reset coil, adjust the bushing to obtain a gap of 1/64 inch to 1/32 inch between the latch plate and the armature when the reset rod is held in and the main armature is closed. On relays with operation indicator but no latch, adjust the bushing for 3/16 to 7/32 inch travel of push rod. The armature stop screw, located directly below the nameplate, should be screwed in until the armature just touches the bronze pin in the center of the core. Then it should be backed out exactly three turns and the lock nut should be tightened securely.

The adjustable latch plate which is on the outer end of the latch arm should be located so that there is a gap of .005 to .010 inch between the main armature and the core pin when the operating coil is de-energized but the armature is latched.

With the main armature restraining spring horizontal and the armature open, the spring should be extended by one or two turns of the screw into which the spring is hooked.

The stationary contact stud should be adjusted to obtain a contact gap of 1/16 to 3/32 inch on the circuit-opening contact when the armature is latched closed. With this contact closed, the screw which adjusts the contact pressure should be turned in until the back-up spring just touches the back of the contact,

and then it should be turned in 1-1/2 turns farther. If the relay has a circuit-closing contact, the moving contact assembly should be removed for access to the adjusting screw. The circuit-closing contact gap should be 1/16 inch or more with the armature open, and there should be a gap of 1/16 inch or more between the ends of the back-up springs for the two moving contacts.

The helical spring which rotates the operation indicator vane (when supplied) into view should be assembled with approximately 1 turn tension when the indicator is in the reset position. The vane assembly should be located on its shaft so that the end play is 1/64 to 1/32 inch and the vane is approximately 1/32 inch above the end of its latch spring when the reset button is fully depressed.

If the relay has been dismantled and reassembled, discrepancies may be found between the scale markings and the actual operating values since the original adjustments may not have been duplicated exactly. However, by further variation of the initial tension of the armature restraining spring it should be possible to obtain a scale substantially the same as the original one.

The contacts should be cleaned periodically with a fine file. S#1002110 file is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and thus impairing the contacts.

## 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 energy taken by any of the operating coils which are wound on a copper spool is approximately .9 watt at the minimum rated current. The energy taken by the other operating coils is approximately .65 watt at the minimum rated current. Reset coils require considerable energy, (approximately 30 watts at rated d-c voltage) to assure positive resetting when the relay is set at the maximum operating value, and should not be energized longer than 1-1/2 to 2 minutes.



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