INSTRUCTIONS

# RECLOSING RELAYS

TYPES

HGA18A HGA18C

HGA18B HGA18D

IN

UNIVERSAL AND DRAWOUT CASES

*Switchgear*

GENERAL ELECTRIC

SCHENECTADY, N.Y.

# RECLOSING RELAYS

## TYPES HGA18A, HGA18B, HGA18C AND HGA18D

## IN

## UNIVERSAL AND DRAWOUT CASES

*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 General Electric Company.*

### APPLICATION

These are self-resetting reclosing relays which act to reclose a breaker only if a predetermined time has elapsed since the last successful reclosure.

They are primarily designed for reclosing service in cases where, following the automatic removal of apparatus from service, a single immediate reclosure or replacement in service is desired, but in the event that removal from service recurs immediately indicating a continuation of abnormal conditions, the apparatus remains locked out.

These three types differ from one another only in the following: HGA18B differs from HGA18A only in the addition of a target, the HGA18C and HGA18D differs from the HGA18A only in the arrangement of the internal connections.

Under each of the 4 types there are available shock resistance forms built for breaker housings or swinging panels.

### CONSTRUCTION

These relays all consist of a Type HGA unit with a capacitor and a resistor mounted in a six-inch universal case or drawout case. The relay unit is similar to the standard HGA unit except that it has been designed for a very low energy pick-up. Two windings are employed in separate circuits, one of which is sealed in by the closing of one set of contacts.

The drawout case has studs for external connections at the bottom. The electrical connections between the relay units and the case are made through stationary molded inner and outer blocks between which nests a removable connecting plug which completes the circuits. The outer block attached to the case has the studs for external connections and the inner block has terminals for the internal connections.

The relay mechanism is mounted in the steel framework called the cradle and is a complete unit with all leads being terminated at the inner block. This cradle is held firmly in the case with a latch at both top and bottom and by a guide pin at the back of the case. The connecting plug, besides making the electrical connections between the respective blocks of the cradle and case, also locks the latch in place. The cover, which is drawn to the cradle by thumbscrews, holds the connecting plug in place.

To draw out the cradle the cover must first be removed. Then, the connecting plug can be drawn out. After the plug has been removed, the latch can be released and the cradle easily drawn out. To replace the cradle, the reverse order is followed.

A separate testing plug can be inserted in place of the connecting plug to test the relay in place on the panel either from its own source of current and voltage, or from other sources. Or, the cradle can be drawn out and replaced by another which has been tested in the laboratory.

### INSTALLATION

Upon receipt of this relay remove all particles of packing material and dust which may adhere to the relay parts. Then examine the relay to see that it has sustained no damage in transit. Remove all blocking and operate the contacts manually a few times to see that the moving parts are free from binding and that the contacts meet in alignment.

The relay should be mounted on a vertical surface in a location reasonably free from excessive heat, moisture, dust and vibration.

The outline and panel drilling dimensions are shown in the figures whose numbers are listed in Table #1 for the various types of relays.

The relay case may be grounded, if desired, at either of its mounting studs using at least No. 12 B & S gauge copper wire or its equivalent.

TABLE #1

| Relay Type | Universal Case | | Drawout Case | |
|---|---|---|---|---|
| | Int. Conn. | Outline & P. D. | Int. Conn. | Outline & P. D. |
| HGA18A | Fig. 3 | Fig. 1 | Fig. 5 | Figs. 2, 2A |
| HGA18B | Fig. 3 | Fig. 1 | Fig. 5 | Figs. 2, 2A |
| HGA18C | Fig. 4 | Fig. 1 | | |
| HGA18D | Fig. 6 | Fig. 1 | | |

### CONNECTIONS

The internal connections for these relays are shown in the figures whose numbers are listed in Table #1 - for the various types of relays.

Typical external connection diagrams are shown by Figs. 7 and 8. The Figs. 9 and 10 show typical external connection diagrams in the schematic form for universal and drawout types of cases.

Fig. 11 shows the schematic connections for the model 12HGA18A12 relay which uses half wave rectification.

### OPERATION

The time relation between the contacts controlling the HGA18A is important, as will be evident from the following description.

The principle of operation of the Type HGA18A can best be explained by reference to the test diagram Fig. 11.

The inner coil is used as an operating coil and the outer coil serves as a holding coil. Assume that both relay coils are de-energized (relay reset) and that the capacitor "C" has zero charge (either due to the relay having just reset or due to initial application of d-c voltage or initial opening of contact switch $S_1$). Since R does not permit the flow of sufficient current to operate, or pick up the relay, a given time must elapse before closing $S_1$ in order that a sufficient charge may be built up in the capacitor "C" to provide energy sufficient to operate the relay. When the relay contacts close, the holding coil is energized, establishing a steady magnetic flux to replace the momentary magnetic flux from operating coil and thereby maintain the relay in the operated position.

Suppose $S_2$ is opened to de-energize the holding coil and drop out the relay; also that $S_1$ has been opened. Closing $S_1$ immediately after closing $S_2$ will not cause the relay to pick up as no time has been allowed between the closure of $S_2$ and $S_1$ for the capacitor "C" to charge to the required value. The capacitor "C" can never charge to the required value necessary to pick up the relay, upon reclosure of $S_1$, as long as $S_1$ remains closed. The resistor "R" permits a low value of current to flow through the operating coil when $S_1$ is closed. The voltage drop across the operating coil will be low, therefore, and in turn will limit the charge of the capacitor to a low value. The relay picks up, therefore, only on condition that the required time has elapsed between the opening and subsequent closing of $S_1$ after $S_2$ has been closed.

In the case of the HGA18A12 half wave rectification is used. To permit the use of the later a capacitor is connected across the resistor capacitor combination of the relay. Refer to Figs. 11 and 12. The externally connected capacitor acts as a reservoir maintaining a potential across the charging resistor and capacitor during the non-conducting half cycle of the rectifier. Without this capacitor the net flow of current into the capacitor shunting the coil would be too small to accumulate a charge sufficient to operate the HGA unit.

## CONTACTS

The contacts will make, carry and break the following current values:

| | |
|---|---|
| Make and carry | 30 amps for 1 minute |
| Carry | 5 amps continuously |
| Break | 1 amp at 230 volts a-c |
| Break | 2 amps at 115 volts a-c |
| Break | 0.1 amp at 250 volts d-c |
| Break | 0.2 amp at 125 volts d-c |

## ADJUSTMENTS

The relay has been adjusted at the factory but if a check shows that the adjustments have been disturbed, the outline below should be followed in restoring them.

The contact wipe, measured by the gap between the armature and the pole piece when the contacts just make, should be 0.020 inch. This gap may be obtained by means of the adjusting screws in the movable contacts. The locknuts on these screws must be tight in order to maintain the adjustment. The contact gap should be 1/16 inch or more.

The resetting time of the relay is known as the time required for the capacitor to absorb a sufficient charge to operate, or pick up, the relay. It is determined by the d-c supply voltage, the capacitance and resistance values, respectively, of the capacitor and charging resistor and the pick-up setting of the relay unit. The usual resetting time is 15 seconds. The steady state d-c voltage required to pick up the relay is considerably less than the capacitor voltage required to pick up the relay. While a low d-c voltage pick-up adjustment (of control spring and armature travel) assists in providing a consistent resetting time, the pick-up adjustment - by change of the armature travel - should not be used to adjust the resetting time. The control spring setting may be changed for slight changes in the resetting time. However, for larger changes in the resetting time, the capacitor charging resistor itself, which is easily replaceable, provides the most convenient and desirable means of making the change.

The resistor in the relay was selected to provide the rated resetting time but, if a different resetting time is desired, this resistor can be replaced with one whose resistance is proportional to the desired resetting time.

## MAINTENANCE

Beyond occasional inspection of the contacts the relay should not require attention. Dirty or pitted contacts may be refinished by scraping lightly with a sharp knife or a fine, clean file. Emery or crocus cloth should not be used for this purpose as they will imbed non-conducting particles in the contact surface.

## PERIODIC TESTING

An operation test and mechanical inspection of the relay and its connections at least every six months is recommended.

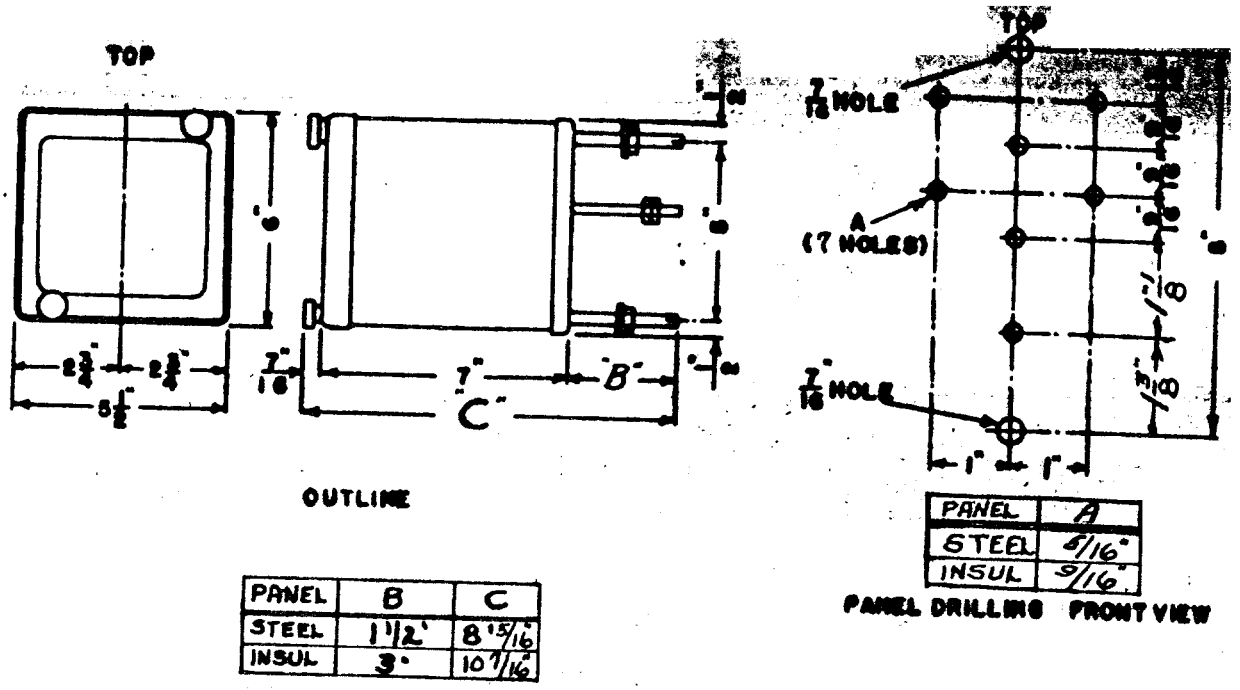
## TESTING

A convenient test circuit is shown by Fig. 11 for the HGA18A and HGA18B. The test diagrams for the HGA18C and HGA18D would be similar to these excepting for the change which would be necessitated by the changes in the internal connections. However, if it is permissible to open the controlled circuit breaker momentarily, the relay resetting time may be determined by the "cut and try" method. That is, it should reclose the breaker immediately when it is first tripped and again if tried 18 seconds after the first reclosure, but not if tried again 12 seconds after the second reclosure.

## REPAIRS AND RENEWAL PARTS

The relay is simple in construction and repairs may be effected easily.

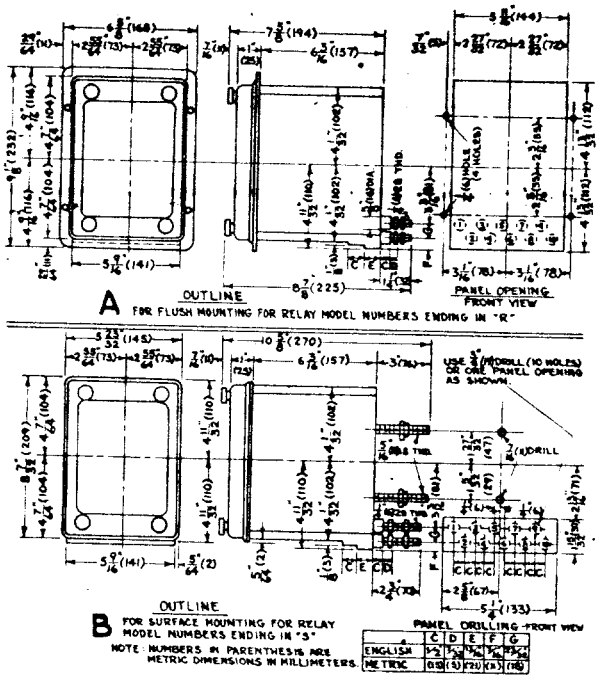
Orders for renewal parts should be placed on the company's nearest sales office. They should describe the required parts in detail giving all information shown on the nameplate and should also identify them by reference to the part bulletin, if possible.




| PANEL | B | C |
|---|---|---|
| STEEL | 1 1/2" | 8 5/16" |
| INSUL | 3" | 10 1/16" |

| PANEL | A |
|---|---|
| STEEL | 5/16" |
| INSUL | 9/16" |

FIG. 1
OUTLINE AND PANEL DRILLING FOR TYPES HGA18A, HGA18B, HGA18C AND HGA18D RELAYS. (UNIVERSAL CASE)




| | C | D | E | F | G |
|---|---|---|---|---|---|
| ENGLISH | 1/2 | 3/8 | 3/16 | 3/8 | 3/4 |
| METRIC | 013 | (9.5) | (4.76) | (9.5) | (19) |

FIG. 2
OUTLINE AND PANEL DRILLING FOR TYPE HGA18A AND HGA18B (D.C.) RELAYS - DRAWOUT CASE. ONE UNIT-SINGLE END.

(K-6174671)

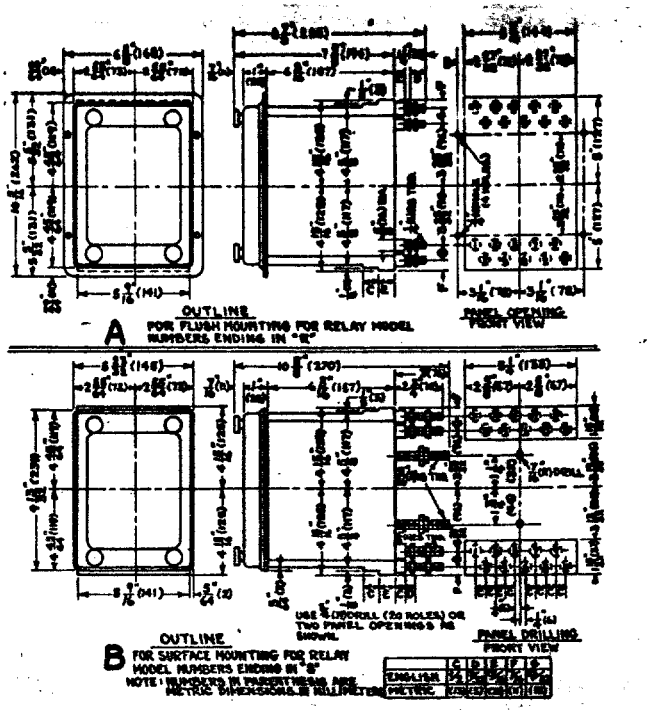



FIG. 2A

OUTLINE AND PANEL DRILLING FOR TYPE HGA18A AND HGA18B (A.C.) RELAYS - DRAWOUT CASE - ONE UNIT-DOUBLE END.

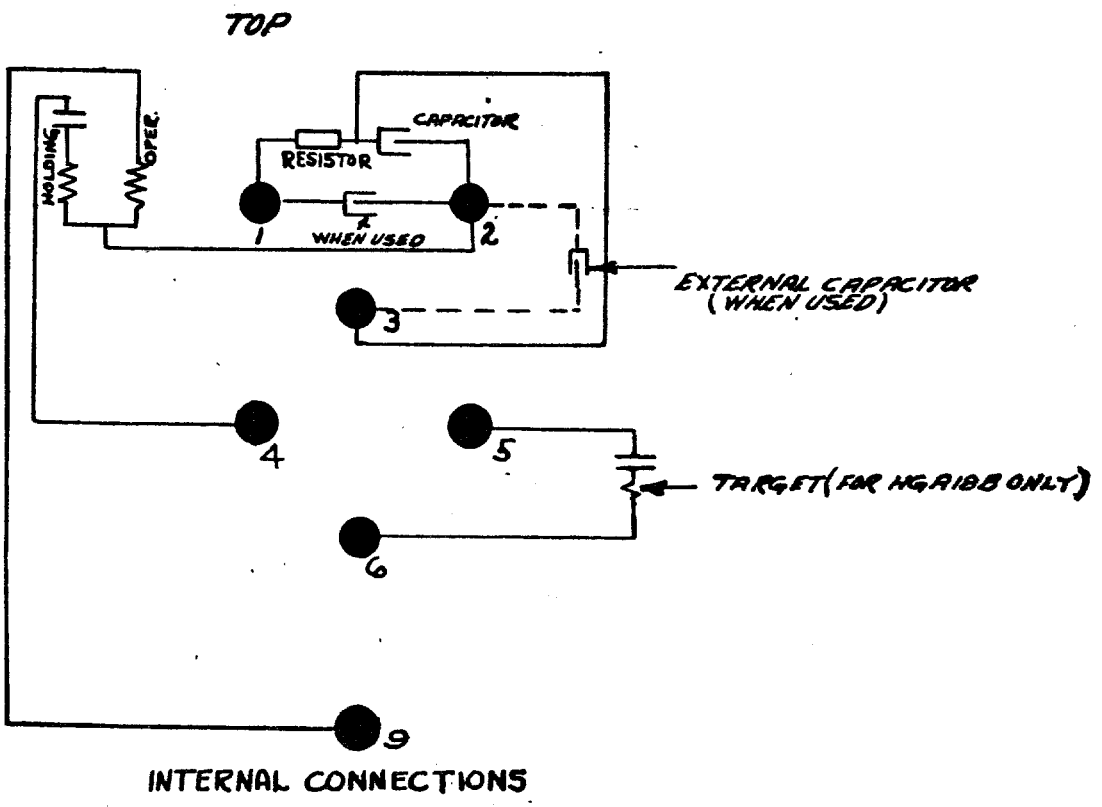



FIG. 3

INTERNAL CONNECTION DIAGRAM FOR TYPE HGA18A AND HGA18B RELAYS (UNIVERSAL CASE)

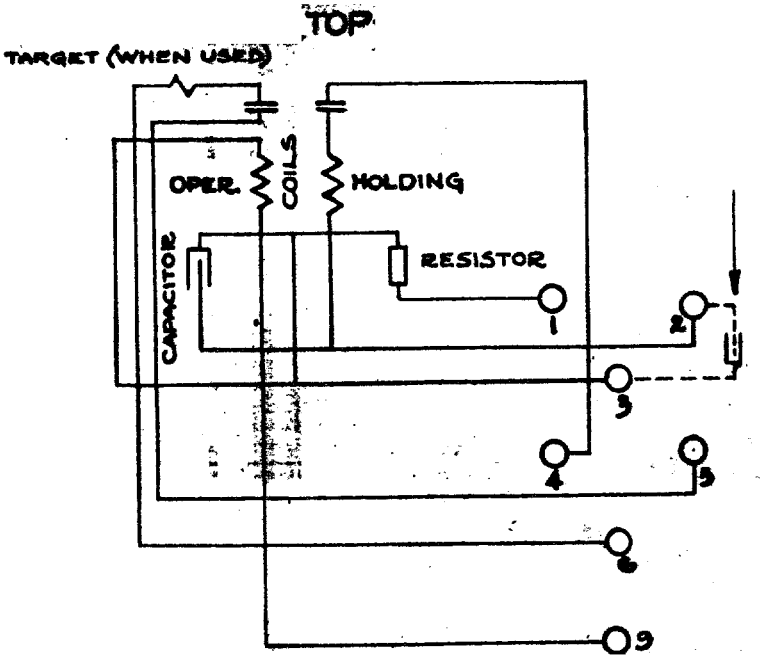



FIG. 4
INTERNAL CONNECTION DIAGRAM FOR TYPE HGA18C RELAY - UNIVERSAL CASE

EXTRA TERMINAL CONNECTIONS ADDED
FOR AC RELAYS (FOR RECTIFIER) (K-6400282)

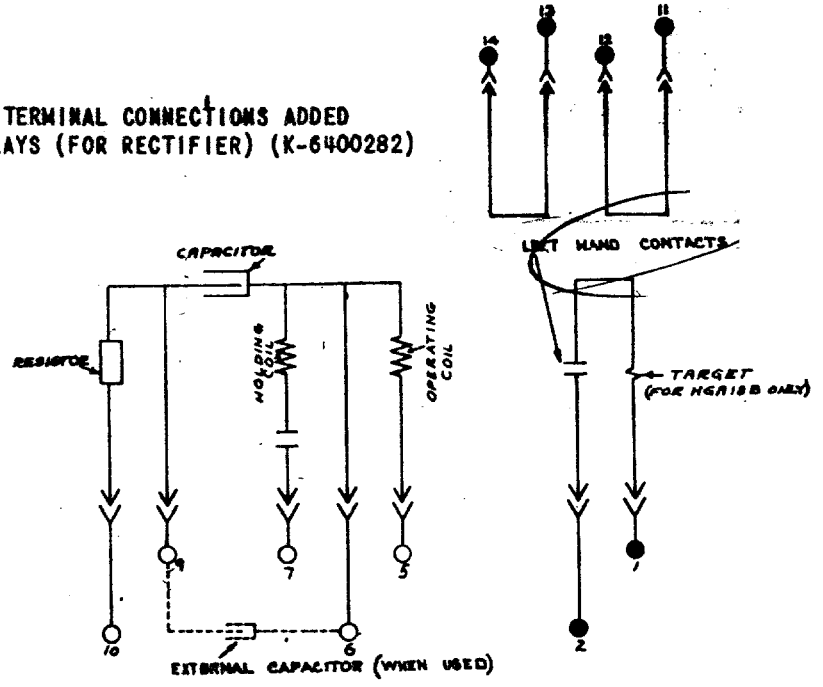
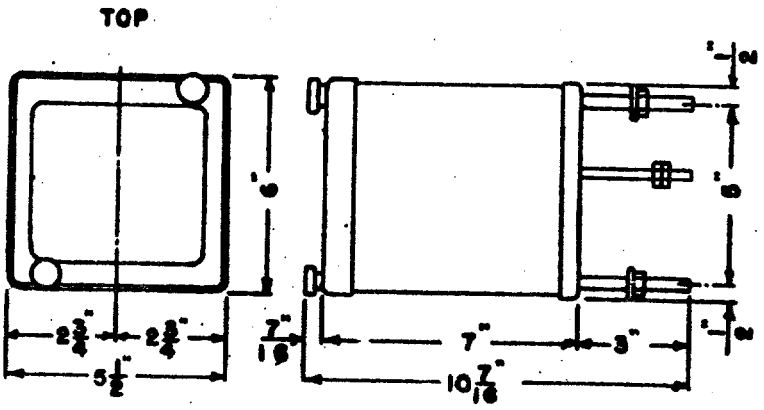
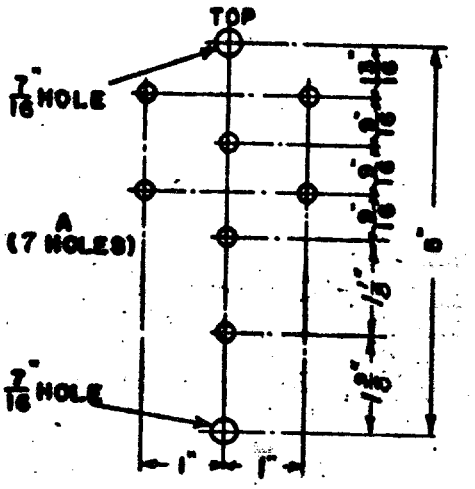



FIG. 5
INTERNAL CONNECTIONS FOR TYPES HGA18A AND HGA18B
RELAYS. DRAWOUT CASE

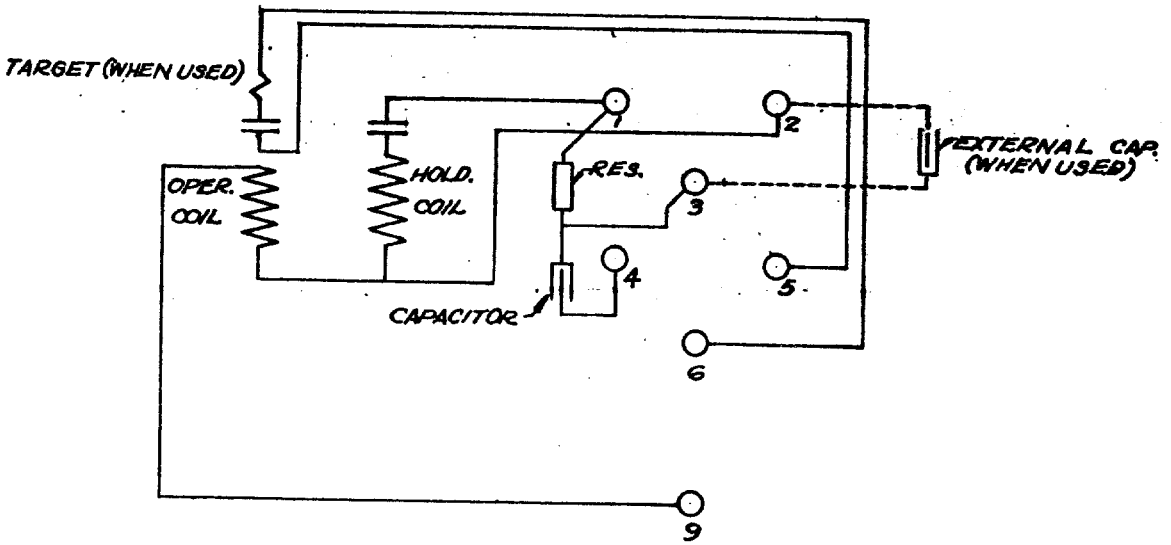



OUTLINE



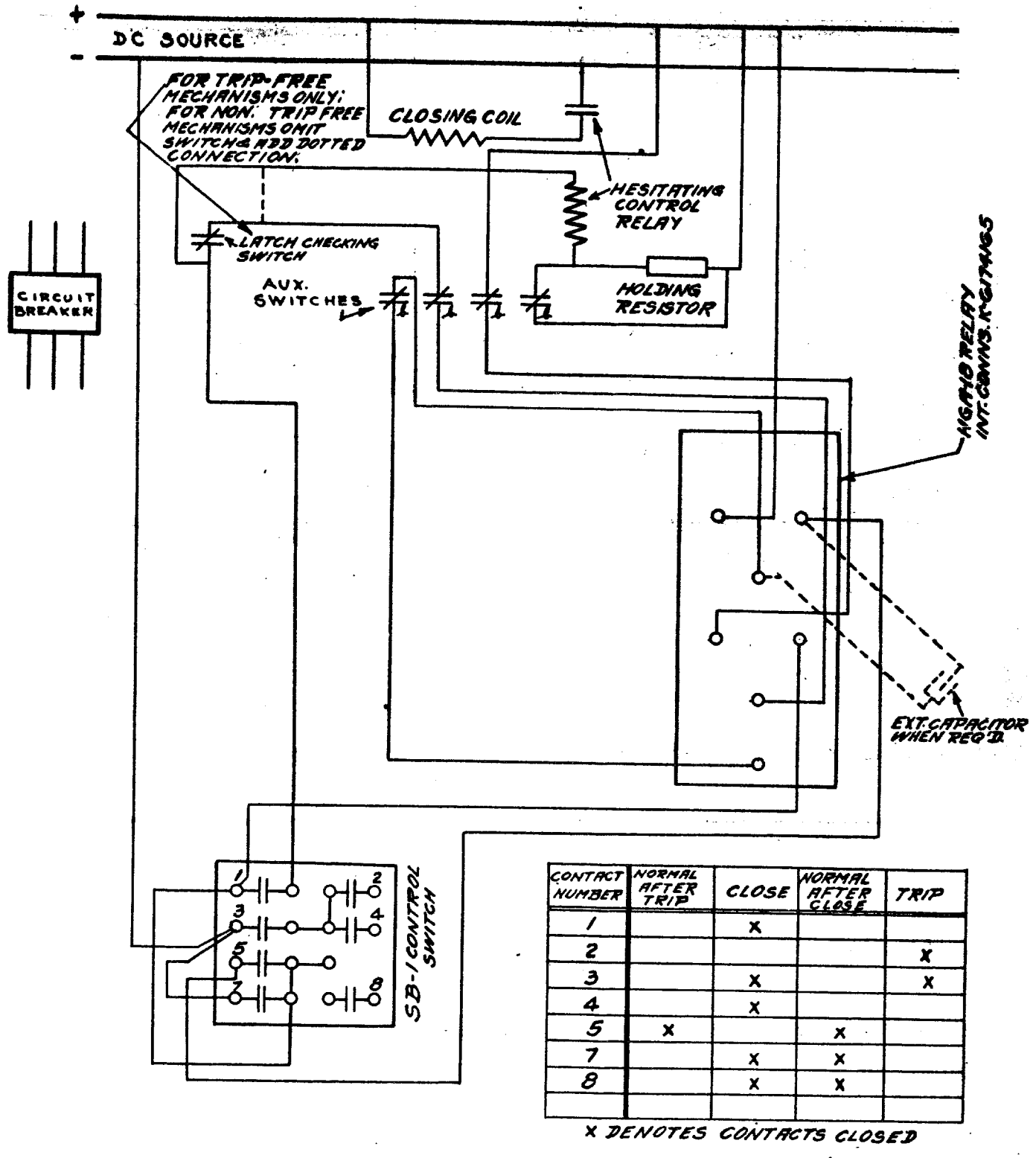

| A | TYPE OF PANEL |
|---|---|
| 5/16" | INSULATING |
| 3/16" | STEEL |

PANEL DRILLING FRONT VIEW




INTERNAL CONNECTIONS
(BACK VIEW)

FIG. 6
INTERNAL CONNECTIONS FOR TYPE HGA18D - UNIVERSAL CASE

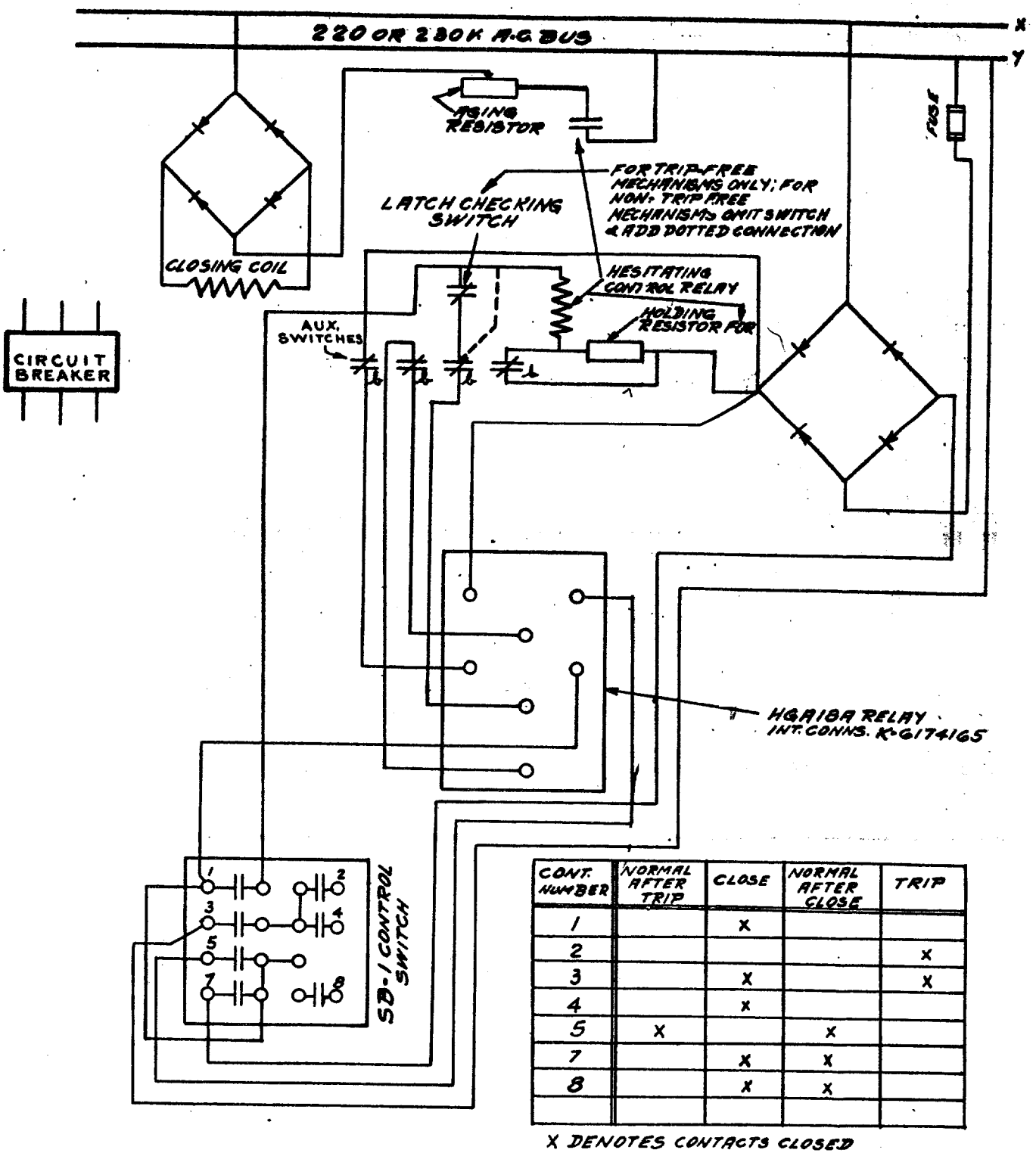



| CONTACT NUMBER | NORMAL AFTER TRIP | CLOSE | NORMAL AFTER CLOSE | TRIP |
|---|---|---|---|---|
| 1 | | X | | |
| 2 | | | | X |
| 3 | | X | | X |
| 4 | | X | | |
| 5 | X | | X | |
| 7 | | X | X | |
| 8 | | X | X | |
| | | | | |

X DENOTES CONTACTS CLOSED

FIG. 7

EXTERNAL CONNECTIONS FOR TYPE HGA18A RELAY IN UNIVERSAL CASE AND FOR USE WITH DC CONTROL VOLTAGES.

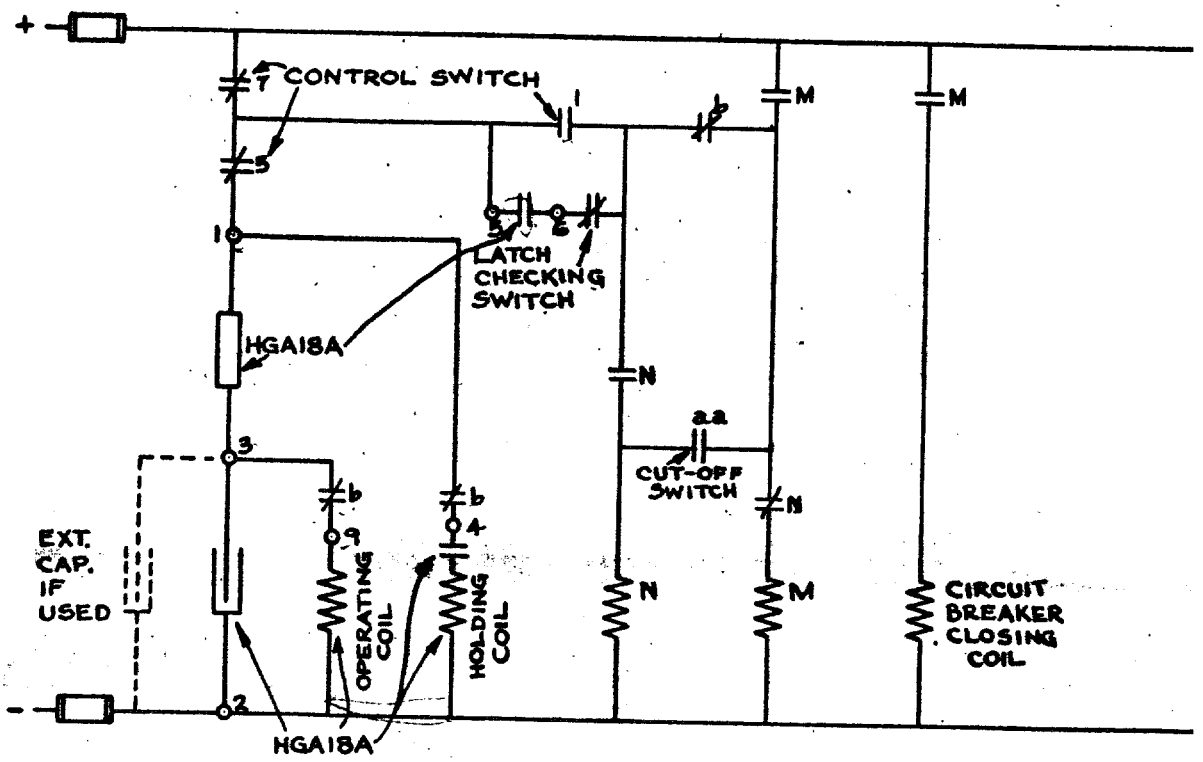



| CONT. NUMBER | NORMAL AFTER TRIP | CLOSE | NORMAL AFTER CLOSE | TRIP |
|---|---|---|---|---|
| 1 | | X | | |
| 2 | | | | X |
| 3 | | X | | X |
| 4 | | X | | |
| 5 | X | | X | |
| 7 | | X | X | |
| 8 | | X | X | |
| | | | | |

X DENOTES CONTACTS CLOSED

FIG. 8

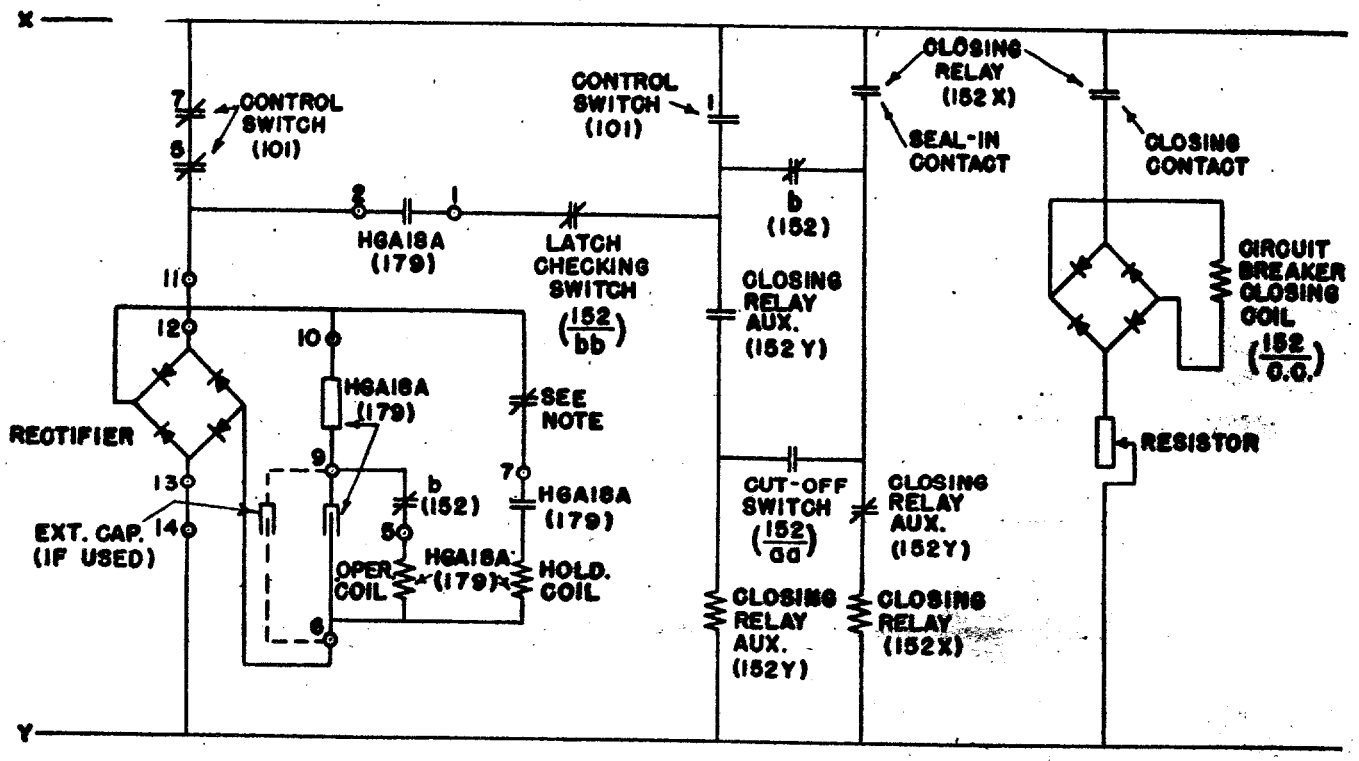
EXTERNAL CONNECTIONS FOR TYPE HGA18A RELAY IN UNIVERSAL CASE AND FOR USE WITH AC CONTROL VOLTAGES.




STUD NUMBERS REFER TO HGA18 STUDS
b = AUXILIARY SWITCH ON CIRCUIT BREAKER CLOSED WHEN BREAKER IS OPEN
a-a = CUT OFF SWITCH CLOSED WHEN OPERATING MECHANISM OF BREAKER IS IN OPERATED POSITION.
M = CLOSING RELAY
N = CLOSING RELAY AUXILIARY

| CONTACT NUMBER | NORMAL AFTER TRIP | CLOSE | NORMAL AFTER CLOSE | TRIP |
|---|---|---|---|---|
| 1 | | X | | |
| 5 | X | | X | |
| 7 | | X | X | |

FIG. 9
SCHEMATIC CONNECTIONS FOR TYPE HGA18A RELAYS. UNIVERSAL CASE

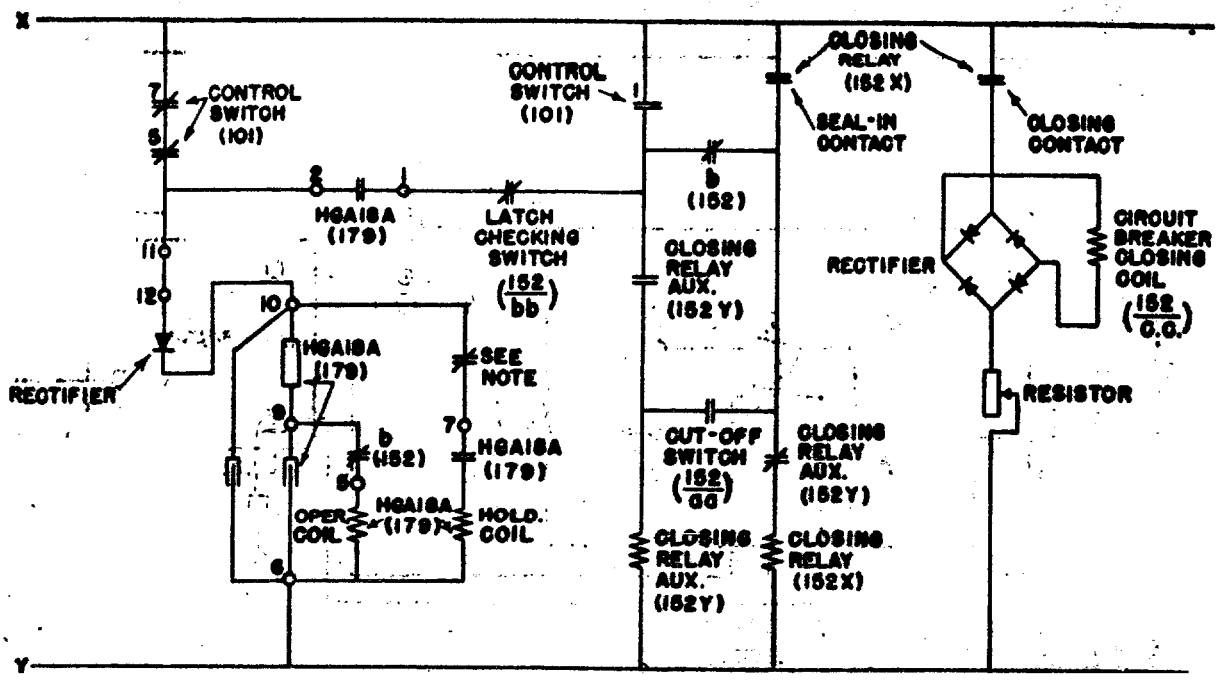



STUD NUMBERS REFER TO HGA18A STUDS (DRAWOUT CASE).
CONTROL SWITCH CONTACTS SHOWN IN "NORMAL AFTER CLOSE" POSITION.
NOTE: CONTACT IN SERIES WITH HGA18A HOLDING COIL CAN BE EITHER "b" AUX. SWITCH ON BREAKER (152) OR "b" CONTACT OF CLOSING RELAY (152X). IF THE LATTER, IT MUST OVERLAP 152X SEAL-IN CONTACT.

| HANDLE END | CONT. NO. | NORMAL AFTER TRIP | CLOSE | NORMAL AFTER CLOSE | TRIP |
|---|---|---|---|---|---|
| 1 1C 2 | 1 | | X | | |
| | 2 | | | | X |
| 3 4 | 3 | | X | | X |
| | 4 | | X | | |
| 5 5C | 5 | X | | X | |
| | | | | | |
| 7 8C 8 | 7 | | X | X | |
| | 8 | | X | X | |

CONTROL SWITCH (101) SB1B2
SPRING RETURN TO NORMAL.
X DENOTES CONTACT CLOSED.

FIG. 10
SCHEMATIC CONNECTIONS FOR TYPE HGA18A (A.C.) RELAY - DRAWOUT CASE

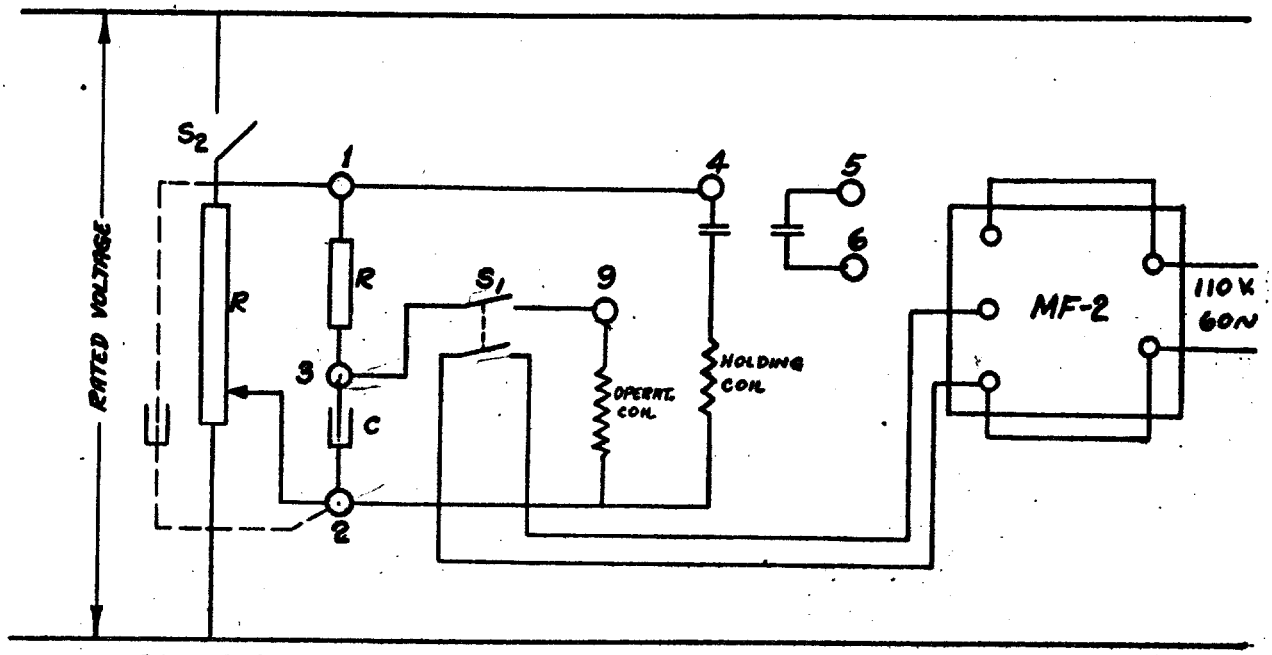



STUD NUMBERS REFER TO HGA18A STUDS (DRAWOUT CASE).
CONTROL SWITCH CONTACTS SHOWN IN "NORMAL AFTER CLOSE" POSITION.
NOTE: CONTACT IN SERIES WITH HGA18A HOLDING COIL CAN BE EITHER "b" AUX. SWITCH ON BREAKER (152) OR "b" CONTACT OF CLOSING RELAY (152X). IF THE LATTER, IT MUST OVERLAP 152X SEAL-IN CONTACT.

| HANDLE END | CONT. NO. | NORMAL AFTER TRIP | CLOSE | NORMAL AFTER CLOSE | TRIP |
|---|---|---|---|---|---|
| 1 1C 2 | 1 | | X | | |
| | 2 | | | | X |
| 3 4 | 3 | | X | | X |
| | 4 | | X | | |
| 5 5C | 5 | X | | X | |
| | | | | | |
| 7 8C 8 | 7 | | X | X | |
| | 8 | | X | X | |

CONTROL SWITCH (101) SB182
SPRING RETURN TO NORMAL.
X DENOTES CONTACT CLOSED.

FIG. 11
SCHEMATIC CONNECTIONS FOR MODEL 12HGA18A12 WITH A-C CONTROL USING HALF WAVE RECTIFICATION.




DOTTED CONNECTIONS USED ONLY FOR
HALF WAVE RECTIFIED VOLTAGE SUPPLY.

FIG. 12
TESTING CONNECTIONS TYPE HGA18A RELAYS.