INSTRUCTIONS

Switchgear

Types ICP15A, ICP15B, ICP20A
ICP21A, and ICP22A

POWER DIRECTIONAL RELAYS

IN UNIVERSAL AND DRAWOUT CASES

GENERAL ELECTRIC

POWER DIRECTIONAL RELAYS

TYPES ICP15A, 15B, 20A, 21A AND 21B

These relays are single-phase power directional relays of the induction disk type. They are calibrated in single-phase relay watts, using line-to neutral voltage.

The Type ICP15A is an overpower relay with single circuit-closing contacts which are open when the relay is de-energized. It has an inverse-time characteristic and a time lever. The outline, panel drilling, and internal connections are shown in Fig. 2 for universal case relays. The outline and panel drilling for drawout-case relays are shown in Fig. 1 and the internal connections in Fig. 3.

The Type ICP15B is an overpower relay and differs from the Type ICP15A only in that it is furnished with an external auxiliary which consists of two reactors for obtaining a neutral on a delta circuit. The outline, panel drilling, and internal connections for universal-case relays are shown in Fig. 2. The outline and panel drilling for drawout-case relays are shown in Fig. 1, and the internal connections in Fig. 3.

The Type ICP20A is a power relay and differs from the Type ICP15A only in that it has double-throw contacts, and no time lever. The right contact of the relay is closed when the relay is de-energized. The left contact closes when the single-phase watts are greater than the tap setting of the relay and the right contact closes when the single-phase watts are a definite percentage below the tap setting of the relay. The outline, panel drilling, and internal connections for the universal-case relays are shown in Fig. 5. The outline and panel drilling for drawout-case relays are shown in Fig. 1, and the internal connections in Fig. 4.

The Type ICP21A is an overpower relay and differs from the Type ICP15B only in that it has two circuit-closing contacts. The outline, panel drilling and internal connections are shown in Fig. 6 for universal-case relays. The outline and panel drilling for drawout-case relays are shown in Fig. 1, and the internal connections in Fig. 7.

The Type ICP22A is an underpower relay. It differs from the Type ICP15A only in that its contacts are closed when de-energized. The relay is calibrated to close its contacts when the single-phase watts are less than the tap setting of the relay. The outline, panel drilling and internal connections are shown in Fig. 8 for universal-case relays. The outline and panel drilling for drawout case relays are shown in Fig. 1, and internal connections in Fig. 8.

The above relays are available in either the universal case or the drawout-case. The drawout cases are made in three principal sizes, each of which has studs for external connections at both ends or only at the bottom. These are respectively referred to as "double-end" and "single-end" cases. In either construction, the electrical connections between the relay units and the case are made through stationary molded inner and outer blocks; between the blocks 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 by 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 plug can be drawn out. In so doing, the trip circuit is first opened, then the current-transformer circuits are short-circuited and finally the voltage circuits are opened. 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.

NOTE: Care must be taken to insert the connecting plug slowly on relays that have contacts which are closed when de-energized but open under normal operating conditions.

The relay may be tested while mounted on the panel, either from its own or another source of power, by replacing the connecting plug with a separate testing plug. Or the cradle can be drawn out and replaced by another, which has been laboratory tested.

INSTALLATION

Install the relay in a place that is clean, dry, free from dust, and excessive vibration, and well lighted to facilitate inspection and testing.

The relay should be mounted on a vertical surface by means of the supporting studs or screws. Permanently ground one of these studs by a copper wire of not less than No. 12 B & S gauge or its equivalent.

The lower jewel bearing has been oiled at the factory and the top bearing filled with vaseline; no further lubrication of any part of the relay should be attempted.

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.

Contact Rating

The current-closing rating of the contacts is 30 amperes for voltages not exceeding 250 volts. The current-carrying ratings are limited by the two different ratings of target and holding coils as indicated in the following Table:-

	Amperes A-c or D-c	
	1 Amp (0.25 Ohm) Target &	0.2 Amp (7 Ohm) Target &
Function	Hold Coil	Hold Coil
Tripping Duty	30	5
Carry Continuously	4	0.8

The 0.2-ampere coil is for use with trip coils that operate on currents ranging from 0.2 up to 1.0 ampere at the minimum control voltage. If this coil is used with trip coils that take 1.0 ampere or more, there is a possibility that the 7 ohms resistance will reduce the tripping current to so low a value that the breaker will not be tripped. This coil can safely carry tripping currents as high as 5 amperes.

The 1.0-ampere coil should be used with trip coils that take 1.0 ampere or more at the minimum control voltage, provided the tripping current does not exceed 30 amperes at the maximum control voltage. If the tripping current exceeds 30 amperes, an auxiliary relay must be used to control the trip coil circuit; the connections being such that the tripping current does not pass through the contacts or the target and holding coil of the protective relay.

When it is desirable to adopt one type of relay as standard to be used anywhere on a system, relays with the 1.0-ampere coil should be chosen. These relays should also be used when it is possible to obtain trip coil data, but attention is called to the fact that the target may not operate if used with trip coils taking less than 1.0 ampere.

ADJUSTMENT AND CARE

The relays are adjusted at the factory and it is advisable not to disturb the adjustments. If, for any reason, they have been disturbed the following points should be observed in restoring them.

Disk and Bearings

The lower jewel may be tested for cracks by exploring its surface with the point of a fine needle. If it is necessary to replace the jewel, a new pivot should be screwed into the bottom of the shaft at the same time. A very small drop of General Electric meter-jewel oil, Cat. 66X728, or fine watch oil should be placed on the new jewel before it is inserted. The jewel should be turned up until the disk is centered in the air gaps, after which it should be locked in this position by the set-screw provided for this purpose. The upper bearing pin should next be adjusted until very little end play can be felt between the pin and the steel ball in the recess at the top of the shaft; about 0.005" is correct.

Gear Mesh

The gear and pinion should be meshed as deeply as possible without binding in any position when the disk is rotated. This adjustment is correct when a slight backlash can be felt in all disk positions. The two screws holding the contact mechanism assembly to the relay frame should be tightened securely after this adjustment is made.

Contacts

If the contacts become dirty or pitted slightly, they should be cleaned by scrapping the surfaces lightly with a sharp knife or by using a fine, clean file. Under no circumstances should emery or crocus cloth be used on fine-silver relay contacts. Finish by wiping the contacts with a clean soft cloth and avoid touching them with the fingers. Contacts cleaned in this manner will remain in good condition for many months under ordinary conditions of service.

With the contacts just closed, there should be enough space between the contact-holding armature and the poles of the holding magnet to permit the fixed contact tips to be deflected about 1/32" when the armature is finally pushed against its poles. The tips should lie in the same vertical plane. These adjustments are obtained by moving each contact brush by means of the screw in the front of the brush block which pushes against it near its center.

When the relay has a time lever and it is moved to the position where it holds the contacts just touching (and closed), it should indicate zero on the time lever scale. If it does not, and the brushes are correctly adjusted, shift the scale slightly after loosening the two small screws holding it to the underside of the contact plate.

BURDENS

The burdens imposed on current and potential transformers by these relays are given in the following tables.

Potential Burden

	Rating				Volt-	
Watt Range	Volts	Cyc.	Volts	Amps	Amps	Watts
10-40	70	60	70	0.165	11.5	1.65
25-100	70-125	60	70	0.069	4.84	0.69
50-200	70-125	60	70	0.069	4.84	0.69
100-400	70-125	60	70	0.069	4.84	0.69
200-800	70-125	60	70	0.017	1.18	0.20

Current Burden

	Rating				Volt-	
Watt Range	Amps	Cyc.	Amp	Volts	amps	Watts
10-40	5	60	5	0.72	3.60	1.80
25-100	5	60	5	0.72	3.60	1.80
50-200	5	60	5	0.36	1.80	0.90
100-400	5	60	5	0.225	0.45	0.23
200-800	5	60	5	0.225	0.45	0.23

SETTINGS

The minimum watts at which the contacts will just close is determined by the positions of the plugs in the tap block at the top of the relay.

When changing taps on a universal-case relay always screw the spare plug into the desired tap before the plug previously used is removed. On drawout case relays, remove the connecting plug before changing the tap plug. This prevents opening the secondary circuit of the current transformer.

The time delay at any given watts for relays having a time lever, is determined by the position of the time lever over the graduated scale on the contact mechanism plate.

TESTING

The testing source should be at least 115 volts, of good wave-form, and constant frequency. Low-voltage transformers (or phantom loads) should not be used for testing induction relays as their use will result in a distorted wave-form.

Minimum Operating Current

The least watts required to rotate the disk very slowly and close the contacts should be within 5 per cent of the values marked on the tap plate.

Adjustment of the minimum operating watts is made by changing the tension of the spiral on the contact shaft by shifting the adjustable support for the outer end of the spring.

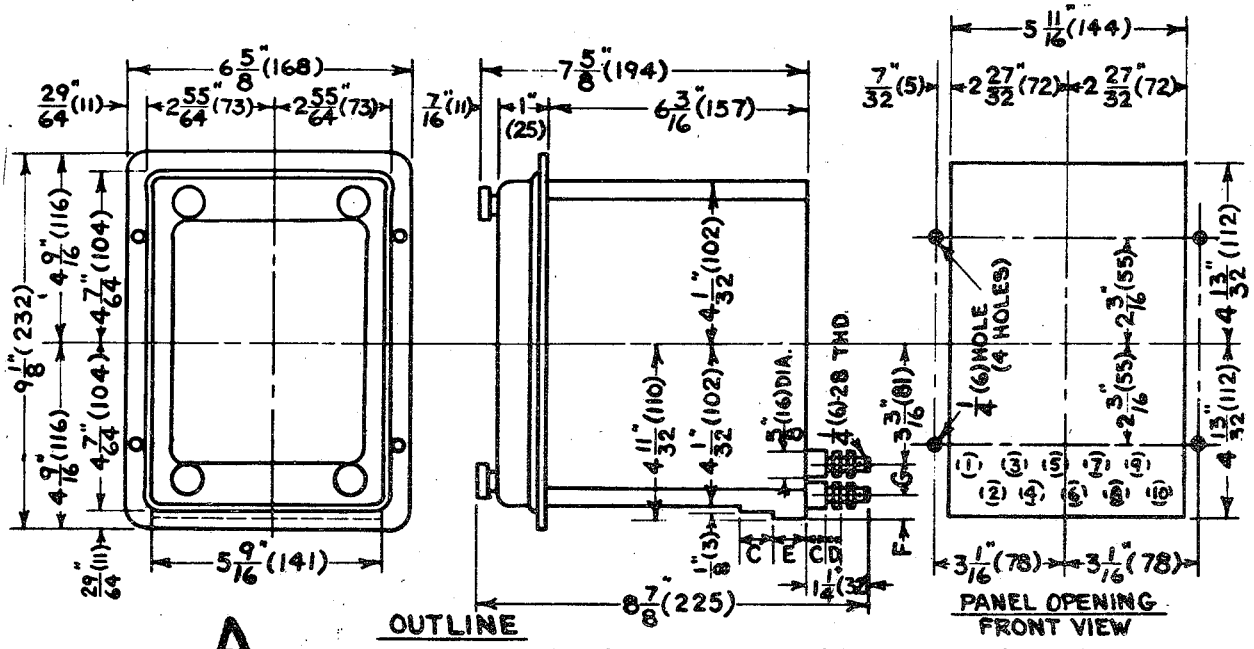
RENEWAL PARTS

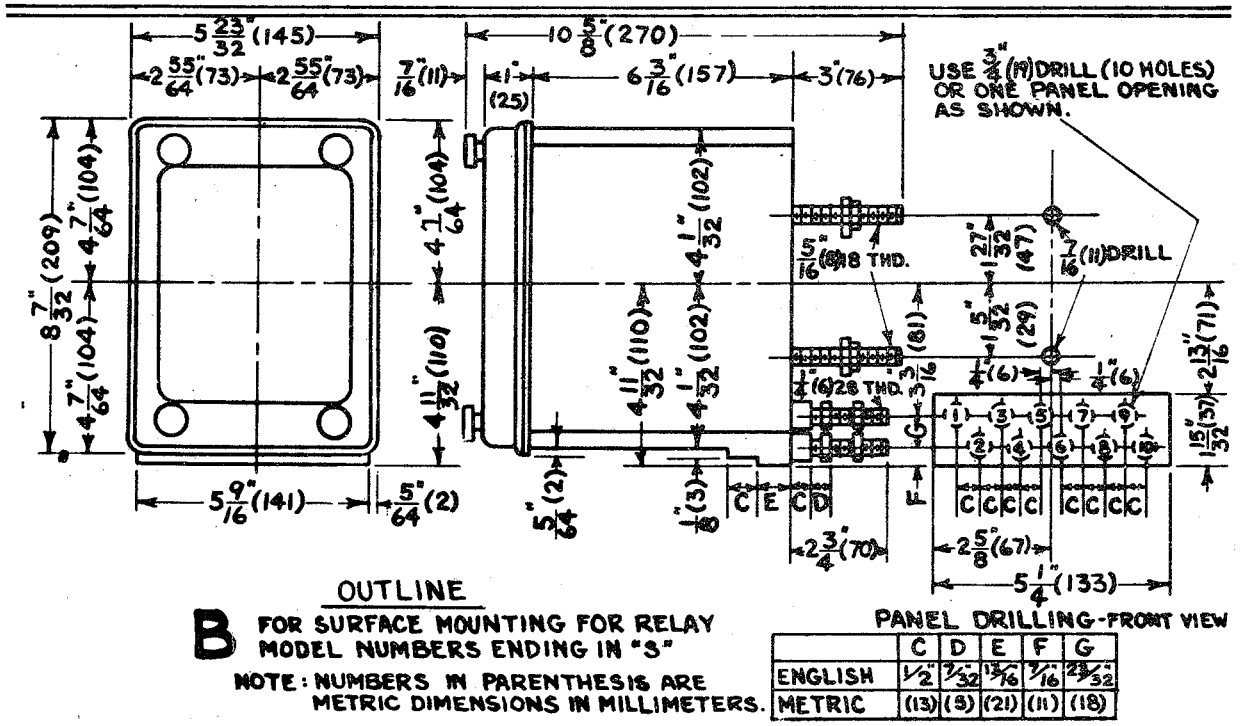
When ordering renewal parts, describe the required part in detail and give the model number and rating of the relay as they appear on the relay nameplate.

In ordering target and holding coils, it should be noted that this coil is available in ratings, 1 amp and 0.2 amp. The 1-amp coil is recommended if it is preferred to standardize on and stock only one kind of coil, because with the 1-amp coil any contact-circuit current will be satisfactory for the entire range up to 30 amperes, but the target will not function on currents much below 1 ampere. The resistance of the 1-amp coil is 1/4 ohm.

The 0.2-amp coil operates the target at 0.2 ampere or slightly less, but cannot be used with large tripping currents because of its high resistance (7 ohms).

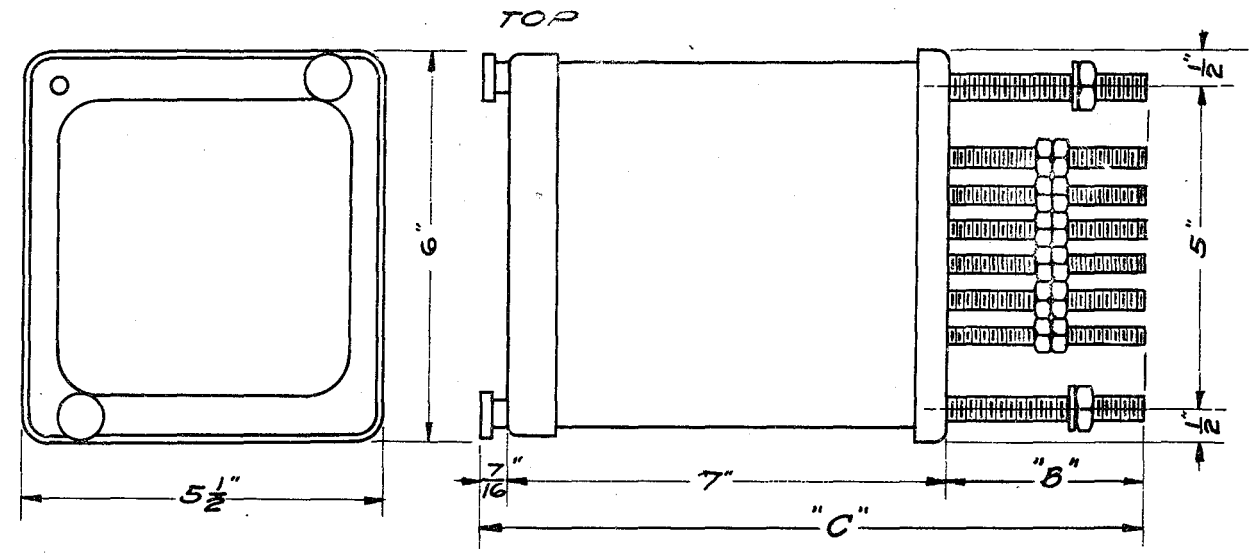
At a current of approximately 2 amperes on the 1-amp coil, or approximately 0.5 ampere on the 0.2-amp coil, the contacts are sealed in positively.



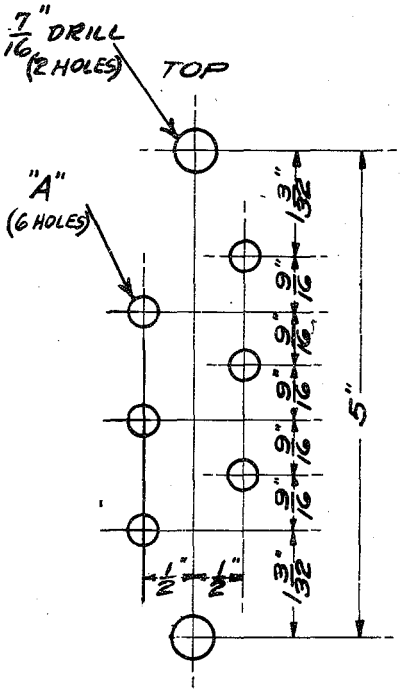


	C	D	E	F	G
ENGLISH	1/2"	7/32"	13/16"	5/16"	23/32"
METRIC	(13)	(5)	(21)	(11)	(18)

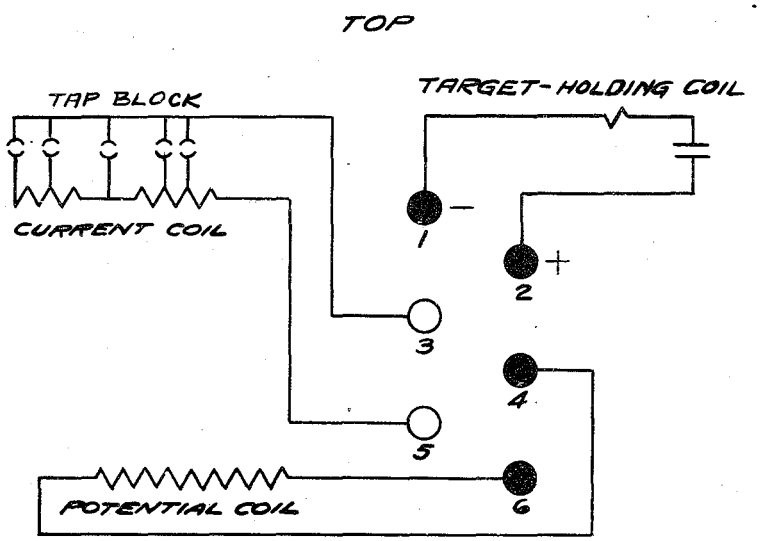
FIG. 1
OUTLINE & PANEL DRILLING FOR DRAWOUT CASE. ONE-UNIT, SINGLE-END.



OUTLINE



PANEL DRILLING
FRONT VIEW



INTERNAL CONNECTIONS
BACK VIEW

PANEL	"A"	"B"	"C"
INSULATING	5/16" DRILL	3"	10 7/16"
STEEL	9/16" DRILL	1 1/2"	8 15/16"

FIG. 2
OUTLINE, PANEL DRILLING, AND INTERNAL CONNECTIONS FOR TYPES ICP15A AND ICP15B RELAYS IN THE UNIVERSAL CASE.

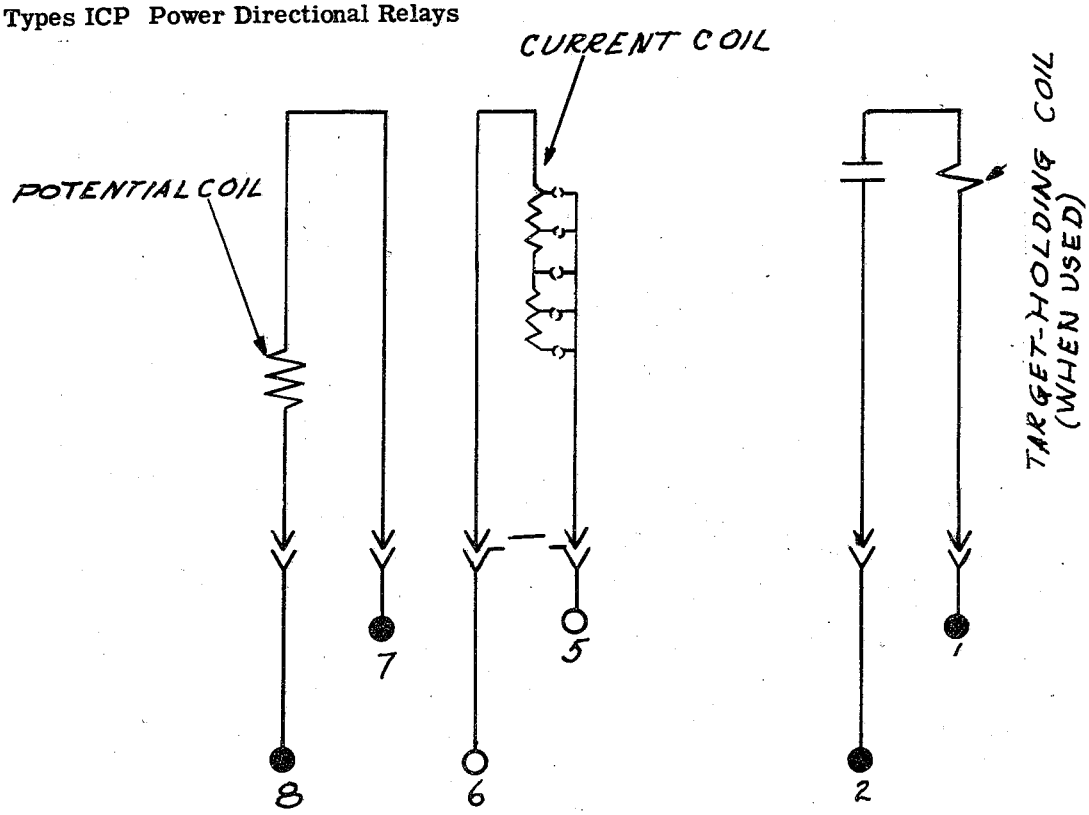


FIG. 3
INTERNAL CONNECTIONS OF THE TYPES ICP15A AND ICP15B RELAYS IN THE DRAWOUT CASE.

(K-6174723)

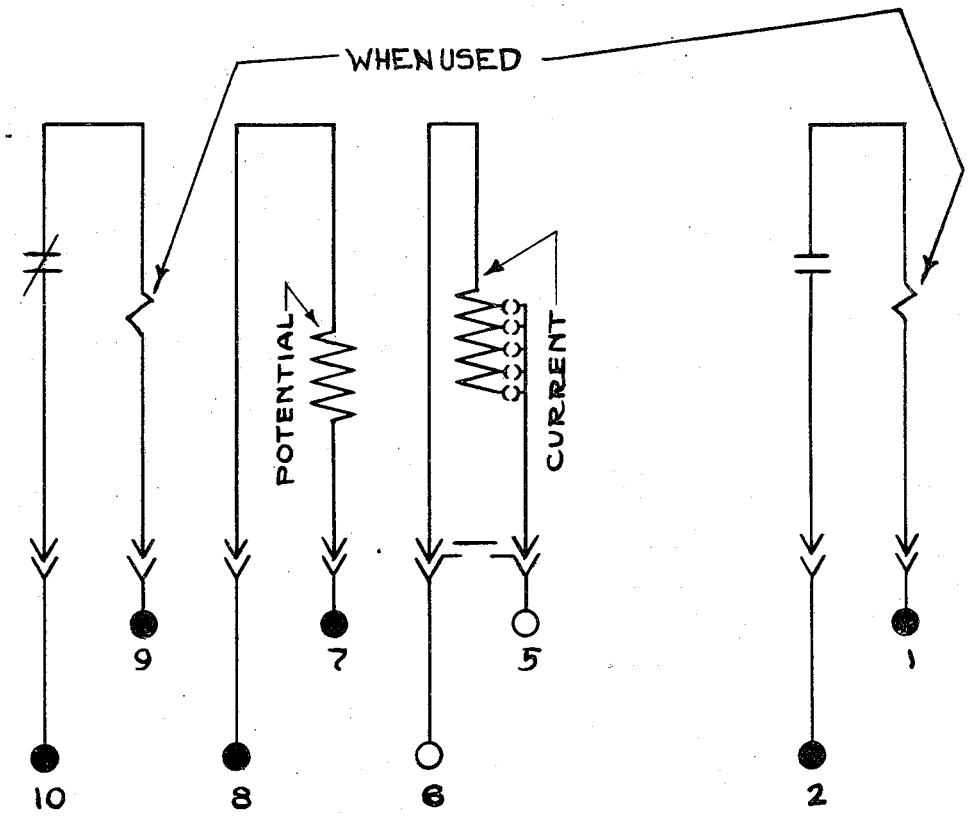
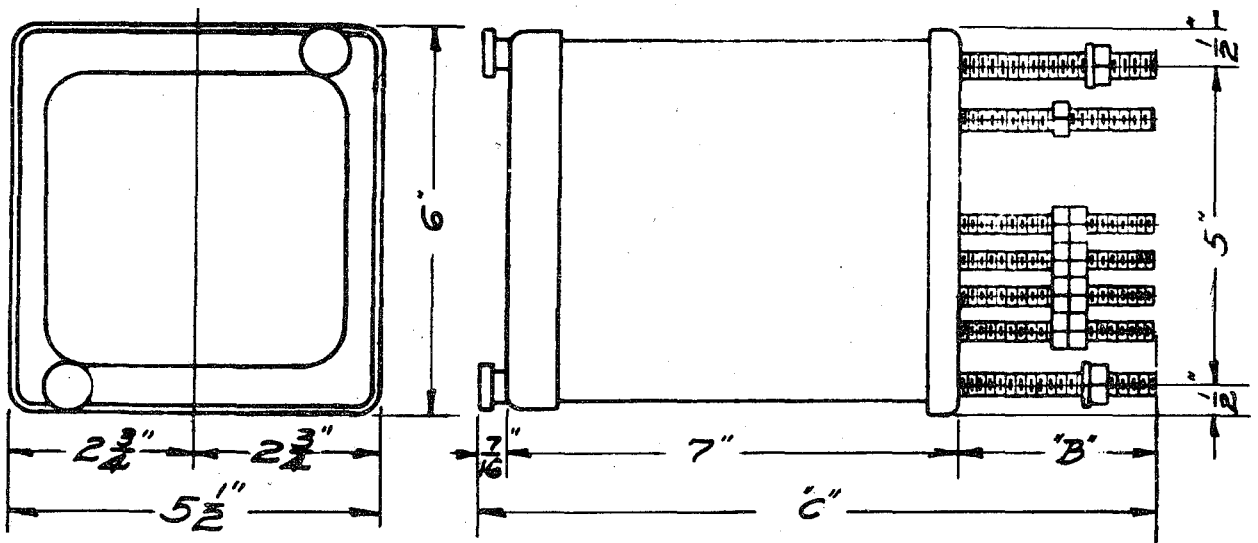


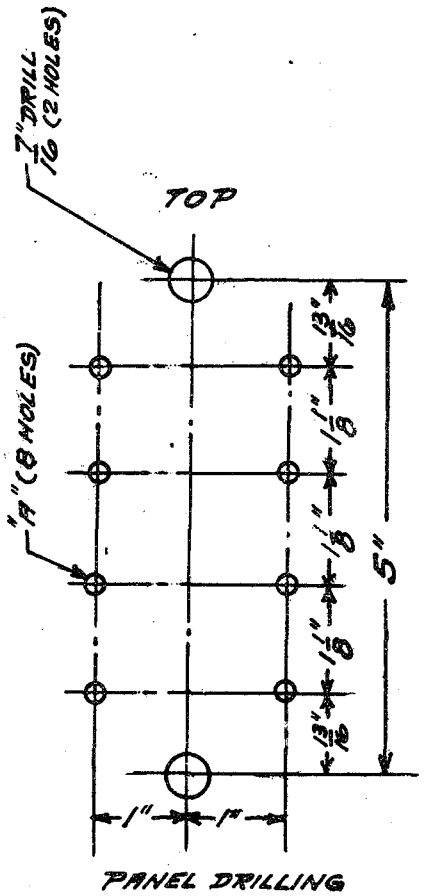
FIG. 4
INTERNAL CONNECTIONS FOR THE TYPE ICP20A RELAY IN THE DRAWOUT CASE.

(K-6154120)

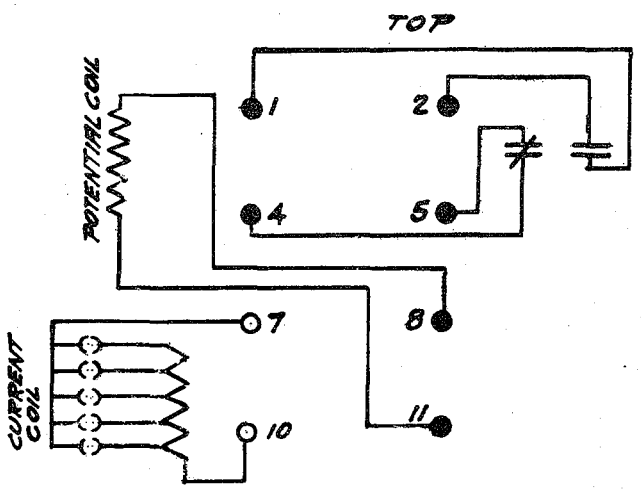


OUTLINE

TYPE OF PANEL	"A" DIA. HOLE	"B" LENGTH OF TERMINAL	"C" OVERALL DEPTH
INSULATING	5/16"	3"	10 7/16"
STEEL	9/16"	1 1/2"	8 15/16"



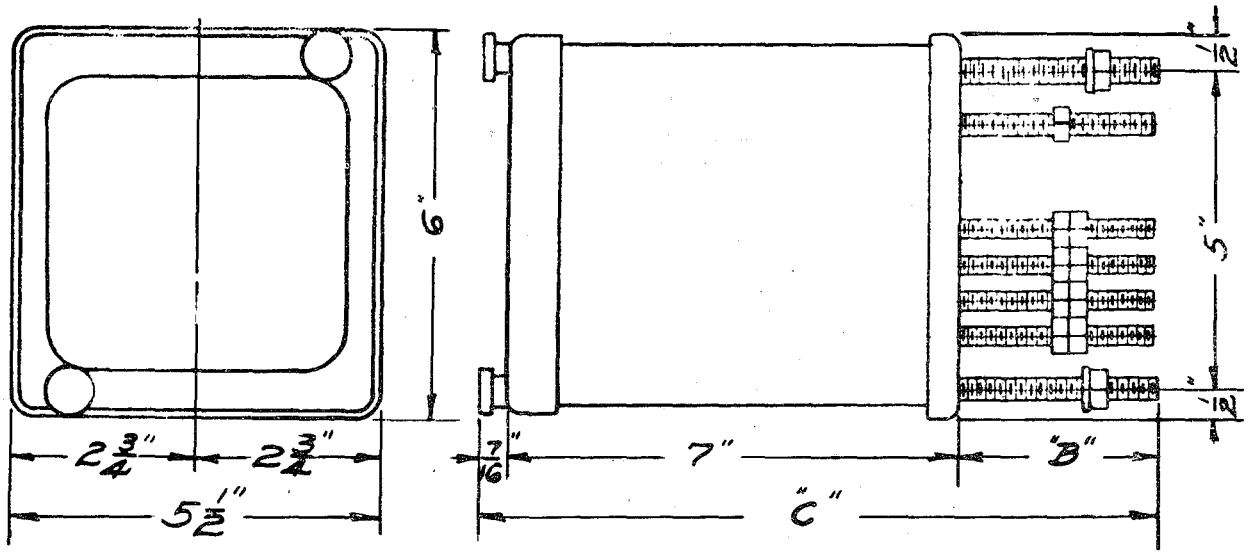
PANEL DRILLING



INTERNAL CONNECTIONS (BACK VIEW)

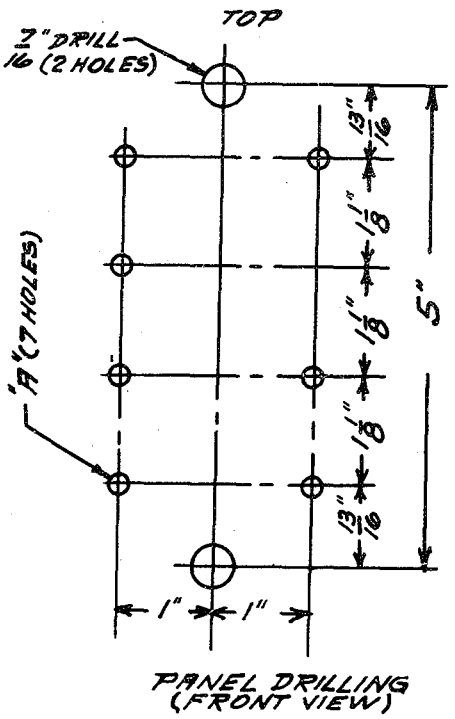
FIG. 5
OUTLINE, PANEL DRILLING, AND INTERNAL CONNECTIONS FOR THE TYPE ICP20A RELAY IN THE UNIVERSAL CASE.

(K-6174688)

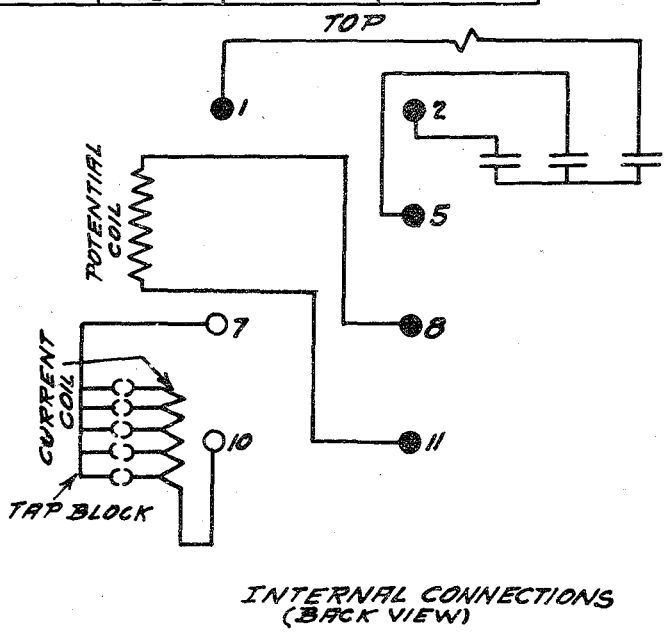


OUTLINE

TYPE OF PANEL	"A" DIA. HOLE	"B" LENGTH OF TERMINAL	"C" OVERALL DEPTH
INSULATING	5/16"	3"	10 7/16"
STEEL	9/16"	1 1/2"	8 15/16"



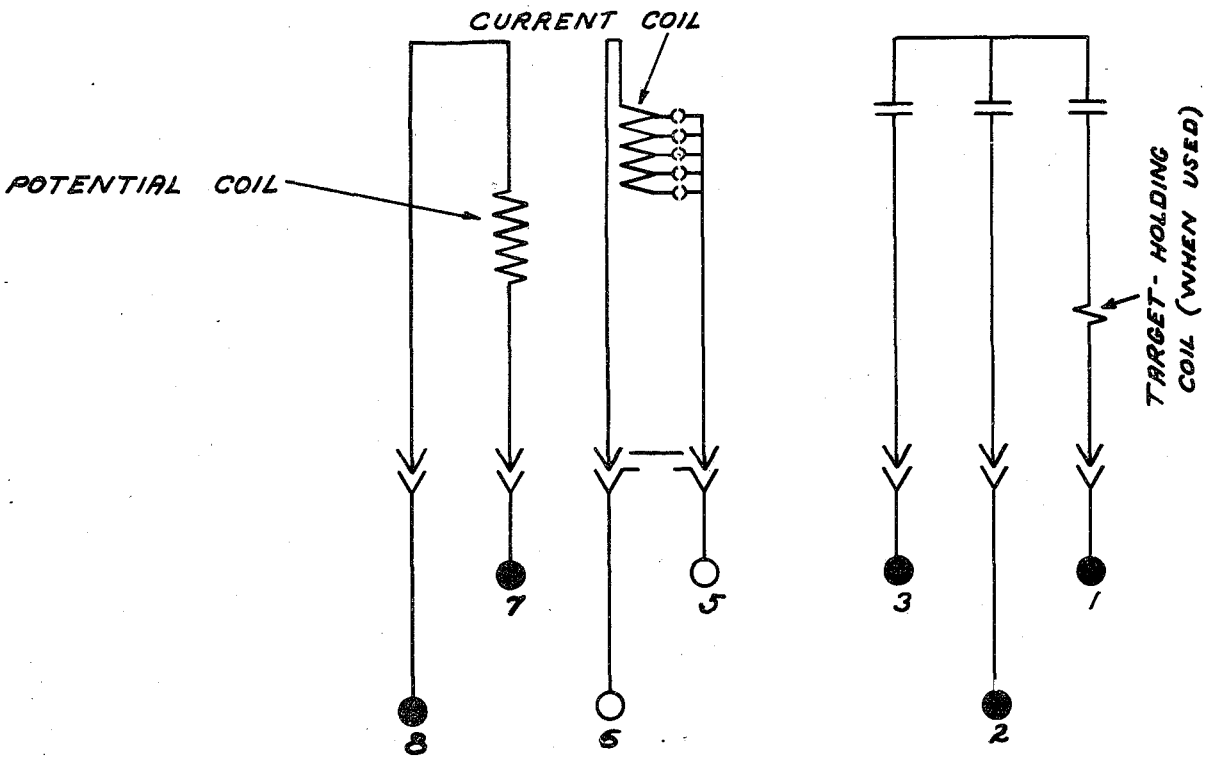
PANEL DRILLING (FRONT VIEW)



INTERNAL CONNECTIONS (BACK VIEW)

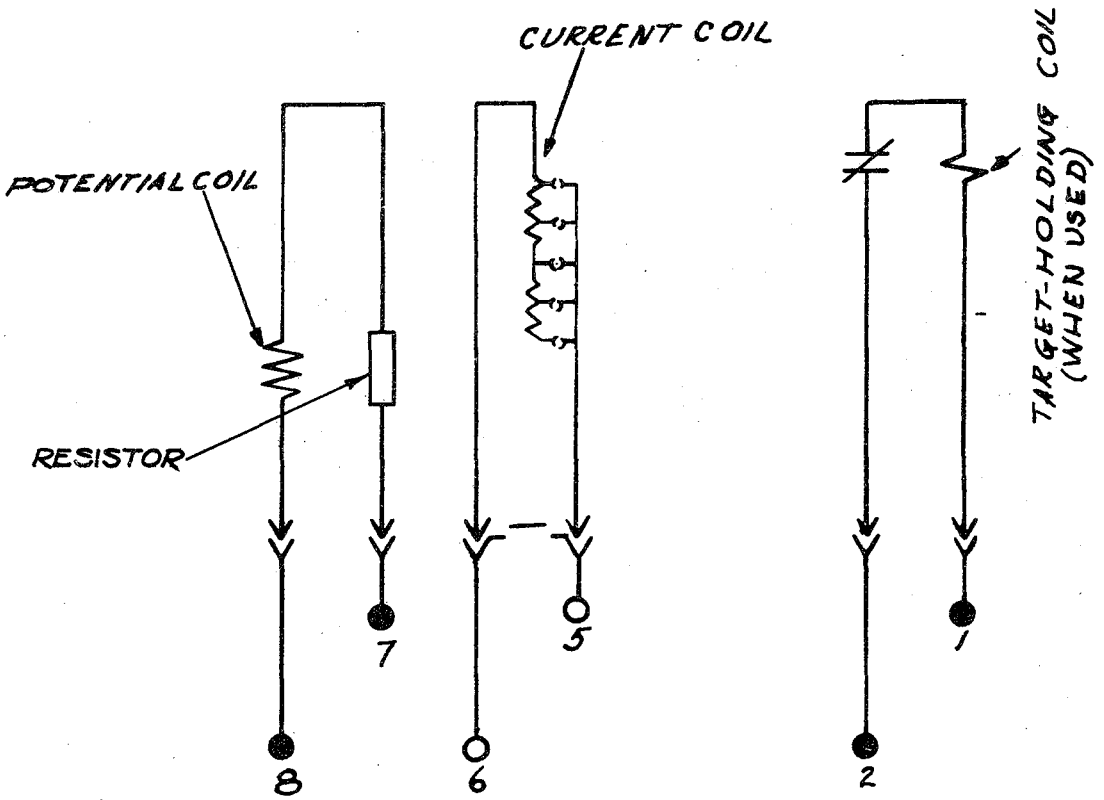
FIG. 6
OUTLINE, PANEL DRILLING, AND INTERNAL CONNECTIONS FOR THE TYPE ICP21A RELAY IN THE UNIVERSAL CASE.

(K-6154018)



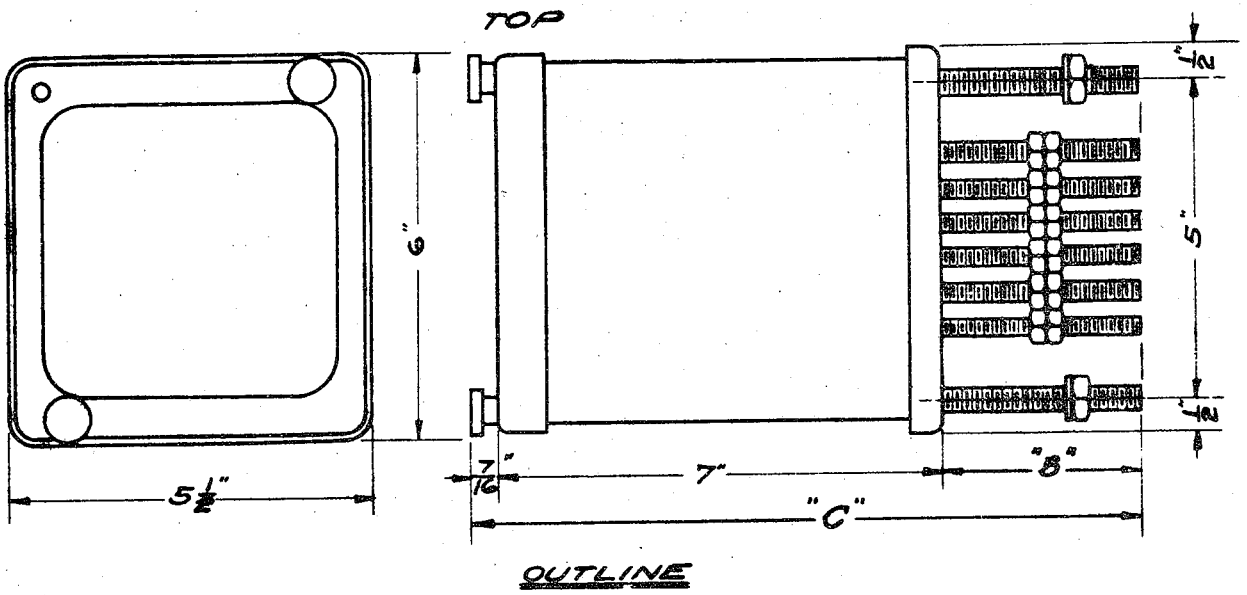
(K-6154119)

FIG. 7
INTERNAL CONNECTIONS FOR THE TYPE ICP21A RELAY IN THE DRAWOUT CASE.

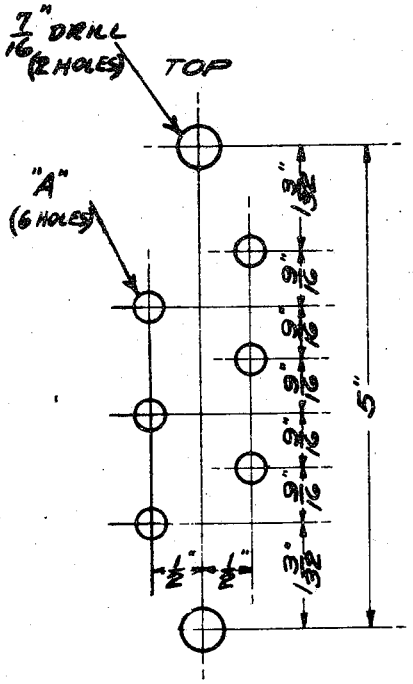


(K-6154744)

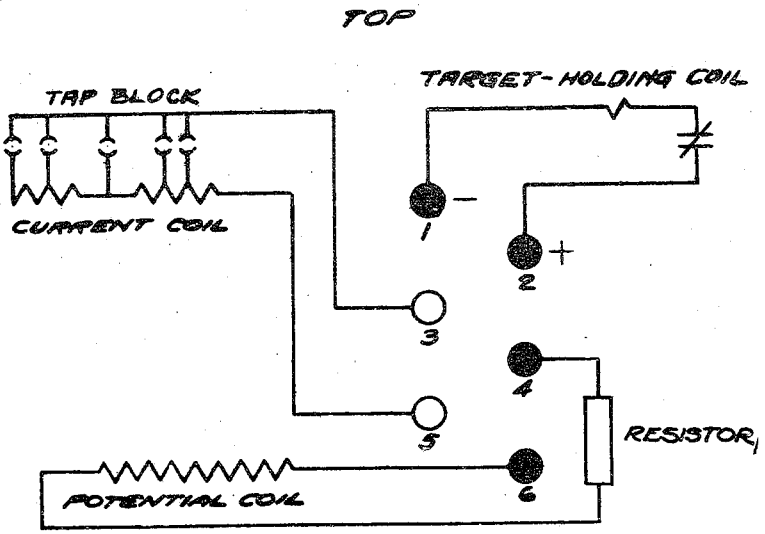
FIG. 8
INTERNAL CONNECTIONS FOR THE TYPE ICP22A RELAY IN THE DRAWOUT CASE.



OUTLINE



PANEL DRILLING
FRONT VIEW



INTERNAL CONNECTIONS
BACK VIEW

PANEL	"A"	"B"	"C"
INSULATING	5/16" DRILL	3"	10 7/16"
STEEL	9/16" DRILL	1½"	8 15/16"

(K-6154743)

FIG. 9
OUTLINE, PANEL DRILLING, AND INTERNAL CONNECTIONS FOR THE TYPE ICP22A RELAY IN THE UNIVERSAL CASE.

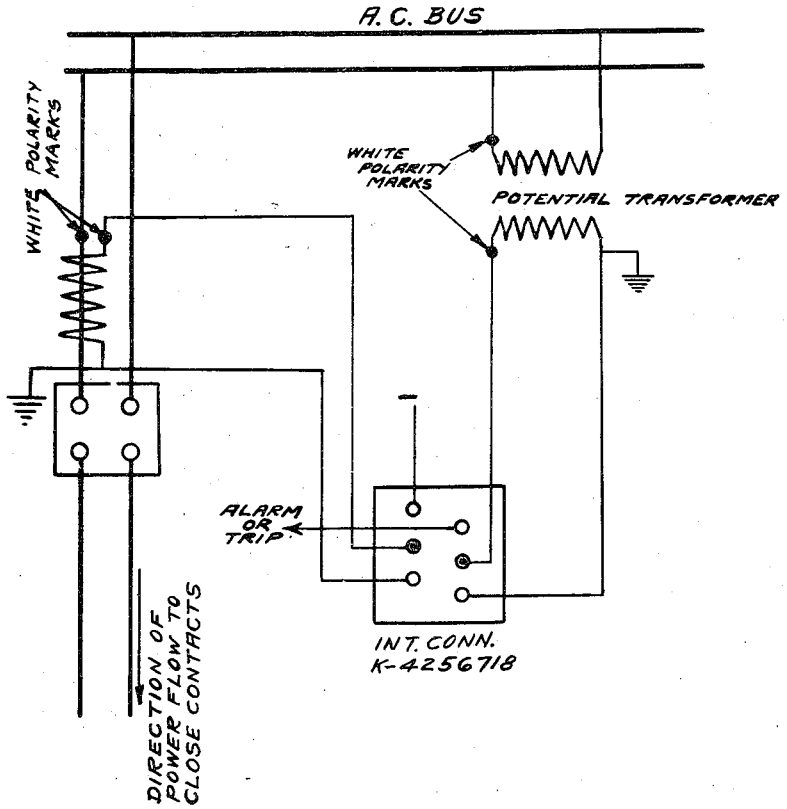


FIG. 10

TYPICAL EXTERNAL CONNECTIONS FOR THE TYPE ICP15A OVER POWER RELAY IN THE UNIVERSAL CASE.

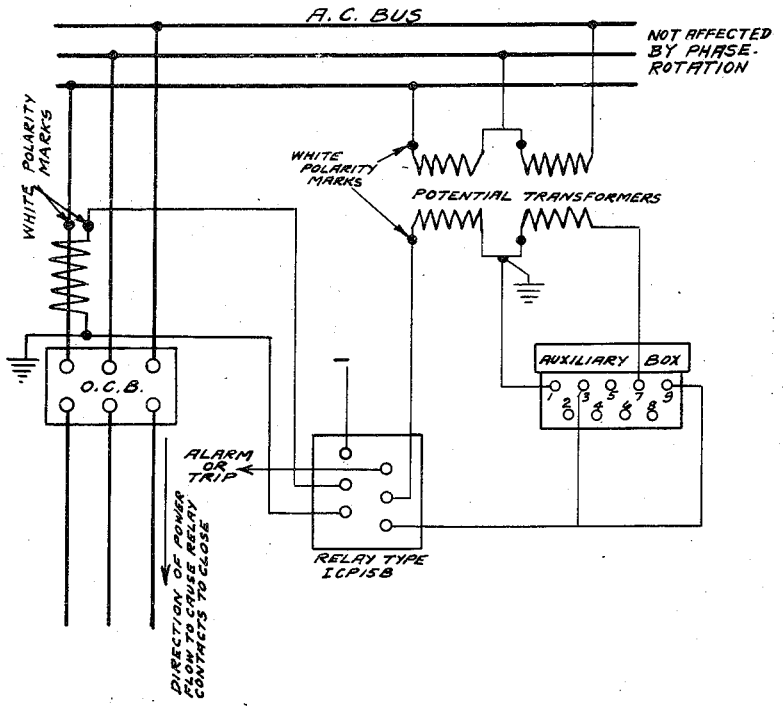
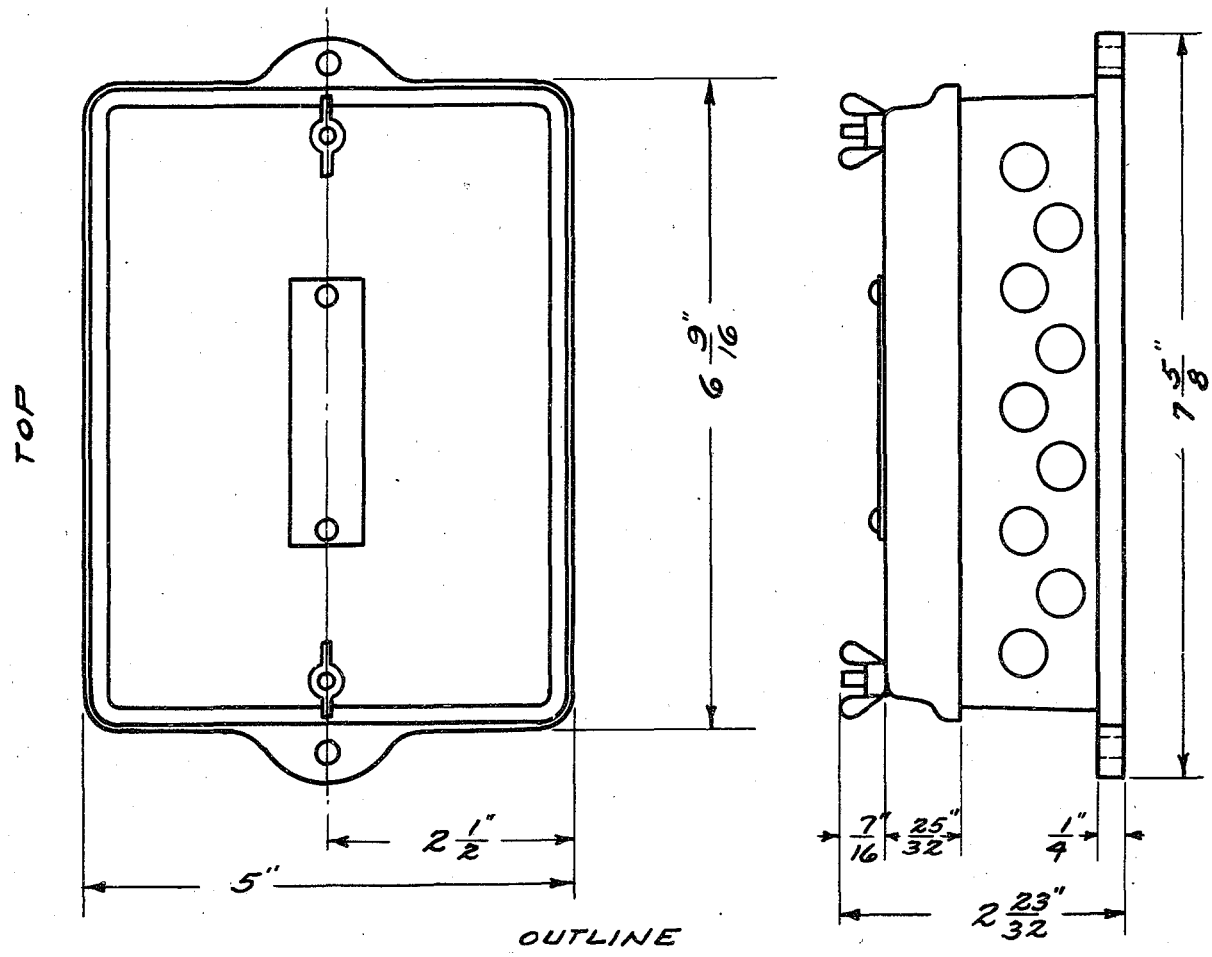


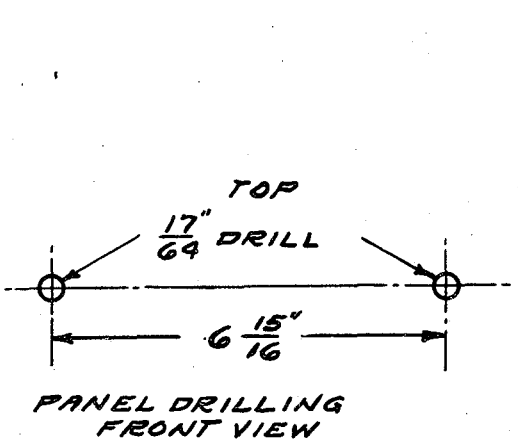
FIG. 11

TYPICAL EXTERNAL CONNECTIONS FOR THE TYPE ICP15B OVER POWER RELAY IN THE UNIVERSAL CASE.

(K-6178936)

(K-6073846)





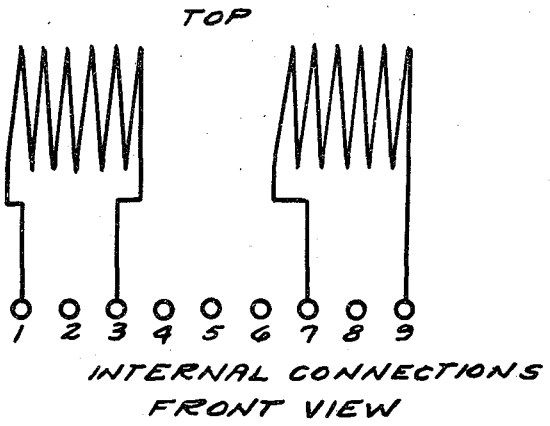


FIG. 12

OUTLINE, PANEL DRILLING, AND INTERNAL CONNECTIONS OF THE AUXILIARY REACTORS FOR THE TYPE ICP15B OVER POWER RELAY.

(K-6073821)