INSTRUCTIONS

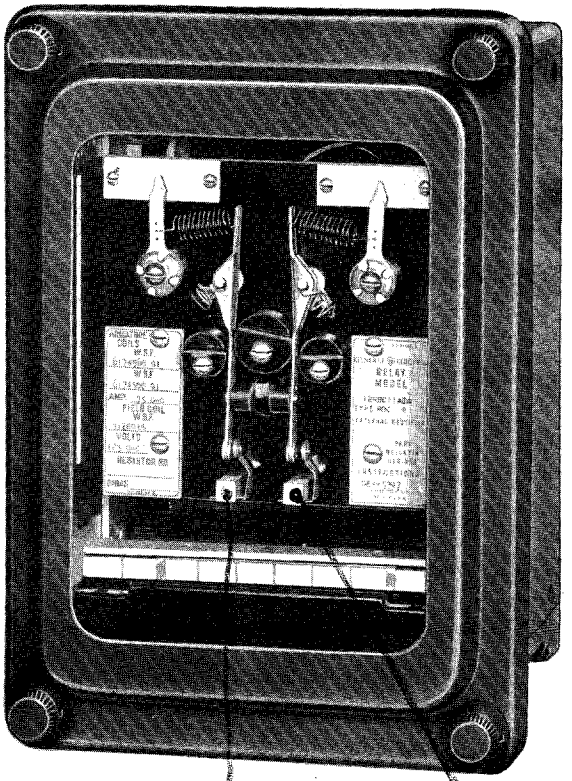
GEI-30989A

SUPERSEDES GEI-30989

CURRENT DIRECTIONAL AND UNDERCURRENT RELAYS

Types

RBC11A RBC13A
RBC12A RBC14A



LOW VOLTAGE SWITCHGEAR DEPARTMENT

GENERAL ELECTRIC

PHILADELPHIA, PA.

A

CURRENT DIRECTIONAL AND UNDERCURRENT RELAYS

TYPE RBC

INTRODUCTION

The Type RBC relay consists of a polarizing field coil, two armature coils, a framework forming part of the magnetic circuit, a contact mechanism and a calibrating attachment. The field coil, mounted on the upper part of the relay, is wound over an iron core which completes the magnetic circuit between both sides of the frame, while the armature coils are mounted end to end surrounding a brass tube which encloses the armature. These coils are located directly below the field coil and mounted at right angles to it.

APPLICATION

When these relays are applied in automatic stations to protect motor-generator sets and synchronous convertors against conditions of reverse current or undercurrent, they function either to open the direct current line contactor or to insert a differential series field or current limiting resistor in the bus feed.

RATINGS

The standard current coil has a rating of 50 amperes and is used with a suitable 100 MV shunt on all line currents above this value. In choosing the shunt it should be noted that the current coil of the relay takes 50 amperes. The total resistance of the leads to the coil should not exceed 0.0006 ohms.

The standard potential coil is rated at 27 volts d-c. Operation on higher voltages is permissable when series resistors are used in the circuit.

The current closing rating of the contacts is 20 amperes. The current carrying rating is 5 amperes continuously or 20 amperes for one minute. The interrupting ratings are listed in Table I.

USE TABLE AS IN GEI-30990 PER L.E.G. 6-7-61 PR7

TABLE I

Volts		Amperes (Non-Inductive)
A-C	D-C	
	125	0.2
	250	0.1
115		2.0
230		1.0

Burdens

BURDENS

The hot resistance of the current coils is 0.0014 ohms. The total resistance of the circuit should not exceed 0.002 ohms when hot.

The resistance of the potential coil is 140 ohms at 25° C. The total resistance of the circuit (at 25° C) is given in Table II.

TABLE II

Voltage	Resistance (Ohms)	
	Series	Total
27		140
48	100	240
125	500	640
250	1100	1240
625	3000	3140
750	3600	3740

1000

RECEIVING, HANDLING AND STORAGE

These relays, when not included as a part of a control panel, will be shipped in cartons designed to protect them against damage. Immediately upon receipt of the relay, an examination should be made for any damage sustained during shipment. If injury or damage resulting from rough handling is evident, a claim should be filed at once with the transportation company and the nearest Sales Office of the General Electric Company notified promptly.

Reasonable care should be exercised in unpacking the relay in order that none of the parts are injured or the adjustments disturbed.

If the relays are not to be installed immediately, they should be stored in their original cartons in a place that is free from moisture, dust, and metallic chips. Foreign matter collected on the outside of the case may find its way inside when the cover is removed and cause trouble in the operation of the relay.

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.

Cover (8009556)

DESCRIPTION

CASE

The case is suitable for either surface or semi-flush panel mounting and an assortment of hardware is provided for either mounting. The cover attaches to the case. Each cover screw has provision for a sealing wire.

The case has studs or screw connections at the bottom only for the external connections. The studs for the high current connections are brought out directly from the current coils. The electrical connections between the relay units and the case studs are made through spring backed contact fingers mounted in stationary molded inner and outer blocks between which nests a removable connecting plug which completes the circuits. The outer blocks, attached to the case, have the studs for the external connections, and the inner blocks have the terminals for the internal connections. The high current connections are not made through the connecting plug in order to eliminate the variation in contact resistance that is inherent in a wiping contact. The resistance of the shunt circuit must be kept as near constant as possible so that the relay will operate properly. This is accomplished by using the mechanically secure connections.

The relay mechanism is mounted in a steel framework called the cradle and is a complete unit. This cradle is held firmly in the case with a latch at the top and the bottom and by a guide pin at the back of the case. The cases and cradles are so constructed that the relay cannot be inserted in the case upside down. 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 fastened to the case by thumb screws, holds the connecting plug in place.

To draw out the relay unit the cover is first removed, and the connecting plug drawn out. The external connections to the high current studs are then disconnected and the outer fiber bushings removed from the studs (see Fig. 4). The relay unit can be easily drawn out after the latches have been released. To replace the relay unit, the reverse order is followed making certain that the fiber bushings have been replaced on the high current studs. These bushings do not allow the removal of the relay unit with the external connections intact.

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 relay unit can be drawn out and replaced by another which has been tested in the laboratory.

The relays in this group differ only in the operation of the contacts as shown in Table III.

TABLE III

Relay Type	On Under-Current The Right-hand Contact	On Reverse-Current The Left-hand Contact
RBC11A	Opens	Opens
RBC12A	Closes	Opens
RBC13A	Opens	Closes
RBC14A	Closes	Closes

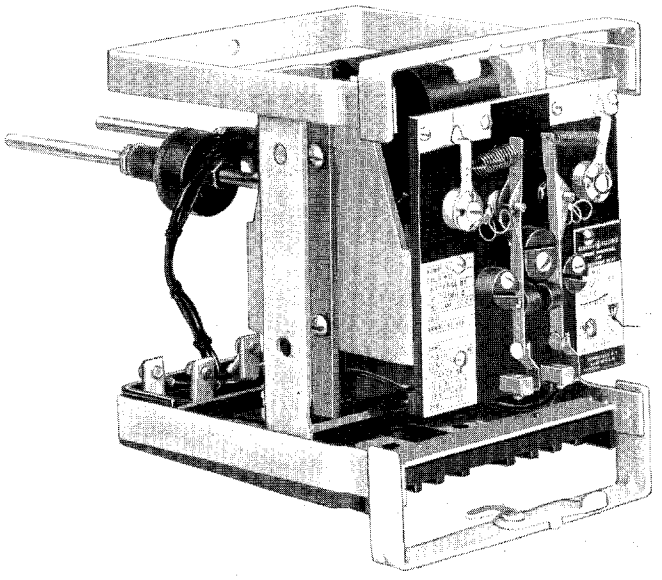


Fig. 1 Type RBC Relay (Front View)

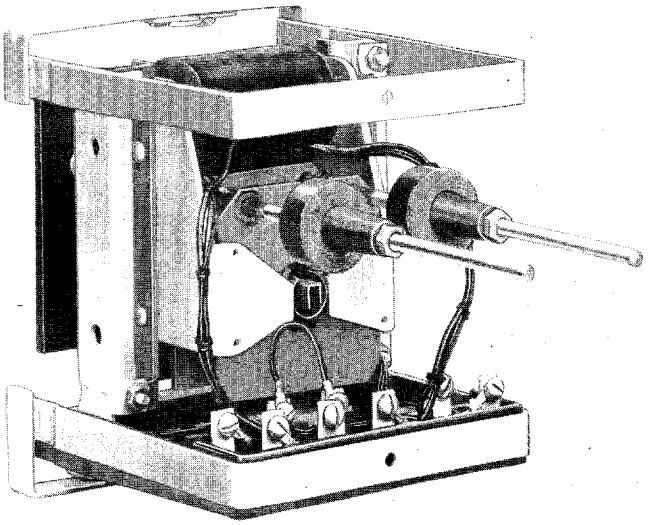


Fig. 2 Type RBC11A Relay (Rear View)

Fig. 1 (8023775)

Fig. 2 (8023776)

INSTALLATION

LOCATION

The location should be clean and dry, free from dust and excessive vibration, and well lighted to facilitate inspection and testing.

MOUNTING

The relay should be mounted on a vertical surface. The outline and panel diagram is shown in Fig. 9.

CONNECTIONS

Internal connection diagrams for the various relay types are shown in Figs. 4 to 7 inclusive. A typical wiring diagram is shown in Fig. 8.

One of the mounting studs or screws should be permanently grounded by a conductor not less than No. 12 B & S gage copper wire or its equivalent.

ADJUSTMENTS

To adjust the relay for operation at the correct load move the under-current calibration lever to the desired scale setting. The scale indications refer to the amperes at which the armature allows the right-hand contact to return to the de-energized position.

The reverse-current lever should be on the mark indicating the desired reverse-current setting.

The de-energized position of the armature may be adjusted by loosening the screw which holds the eccentric insulating roller, located between the contacts, and turning the roller clockwise or counter-clockwise. This changes the physical position of the armature with respect to the polarizing field.

To insure resetting of the relay after it has functioned on reverse-current, the voltage on the potential coil must be reduced to zero. This may be accomplished by means of an auxiliary switch on the line contactor or the field may be connected to a source which becomes de-energized when the contactor opens. This procedure is not required after under-current operation.

BEARINGS

The lower bearing should be adjusted for barely perceptible end play, and the armature and moving contact should operate without perceptible friction.

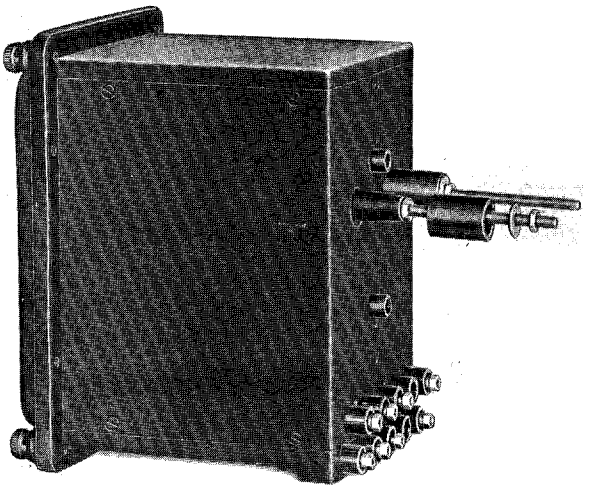


Fig. 3 (8009665)

Fig. 3 Rear View of Type RBC11A Relay Showing Stud Connections

TESTS

The relay should be tested with the shunt and leads as used in service and calibrated in terms of the total current in the circuit (shunt current plus relay current).

UNDER-CURRENT

With full potential excitation, raise the current from zero to the maximum probable over-current which the relay may have to carry, then reduce it rapidly to the under-current value at which the relay is expected to function. If the setting is wrong, correct it by adjusting the calibrating lever and repeat the test.

REVERSE-CURRENT

When the correct under-current operation has been obtained, decrease the current to zero and gradually increase it in the reverse direction until the armature moves to the left. Adjust the reverse-current calibrating lever if necessary and repeat the test starting from a positive current.

RESETTING

Increase the reverse current to the maximum probable value which may be encountered momentarily, then decrease it to zero. If the relay has not already reset, de-energize the potential coil and see that the armature resets firmly, promptly and properly. With the current circuit still open suddenly apply full voltage to the potential coil making sure that the armature remains in its neutral position without even momentarily swinging to close the reverse-current contacts. If the armature is not in the neutral position adjust the center eccentric roller and repeat the test.

PRINCIPLES OF OPERATION

The upper (field) coil is intended to be connected through a resistor to a source of constant potential. The lower (armature) coils are energized by the voltage drop across the shunt. When the armature is sufficiently magnetized in the normal direction of current flow, it tends to rotate so as to cause the right hand contact to function. This is the normal or non-operated position of the relay.

On under-current operation the armature loses its normal direction magnetization and, due to the spring tension on the moving contact arm, returns to the neutral position.

On reverse-current operation the armature is magnetized in the reverse direction thus causing the armature to rotate so as to cause the left contacts to function.

The relays are instantaneous in all operations, hence in many cases a definite time relay is used in conjunction with them on under-current protection.

MAINTENANCE

CONTACT CLEANING

For cleaning fine silver contacts, a flexible burnishing tool should be used. This consists of a flexible strip of metal with an etched roughened surface, resembling in effect a superfine file. The polishing action is so delicate that no scratches are left, yet corroded material will be removed rapidly and thoroughly. The flexibility of the tool insures the cleaning of the actual points of contact.

Fine silver contacts should not be cleaned with knives, files, or abrasive paper or cloth. Knives or files may leave scratches which increase arcing and deterioration of the contacts. Abrasive paper or cloth may leave minute particles of insulating abrasive material in the contacts and thus prevent closing.

The burnishing tool described is included in the standard relay tool kit obtainable from the factory.

RENEWAL PARTS

It is recommended that sufficient quantities of renewal parts be carried in stock to enable the prompt replacement of any that are worn, broken, or damaged.

When ordering renewal parts, address the nearest Sales Office of the General Electric Company, specify quantity required, name of part wanted, and give complete nameplate data. If possible, give the General Electric Company requisition number on which the relay was furnished.

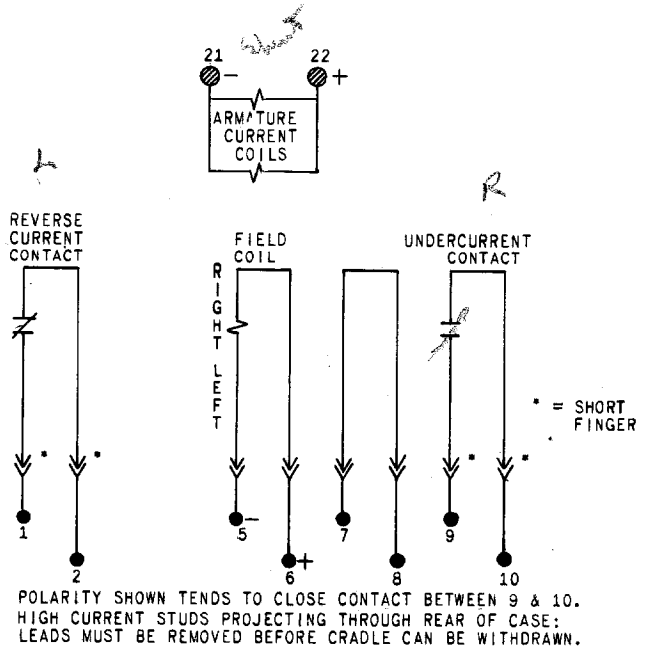


Fig. 4 Type RBC11A Relay, Internal Connections, (Front View)

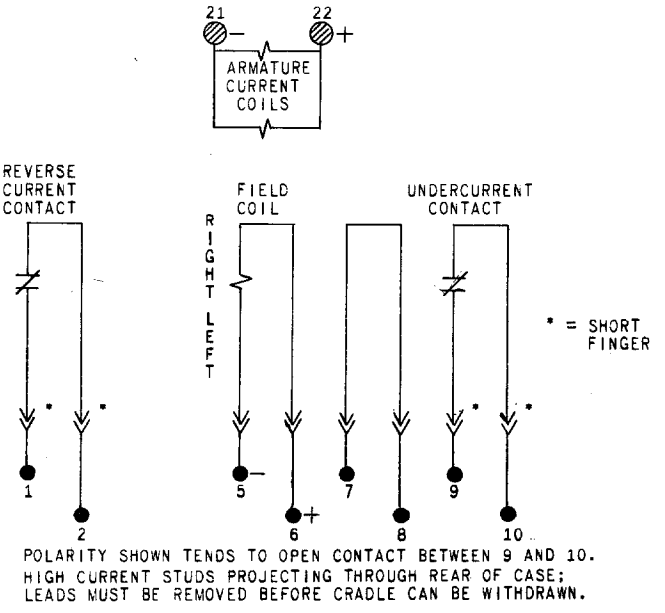


Fig. 5 Type RBC12A Relay, Internal Connections, (Front View)

Fig. 4 (K-6375753)

Fig. 5 (K-6375754)

Fig. 6 (K-6375755)

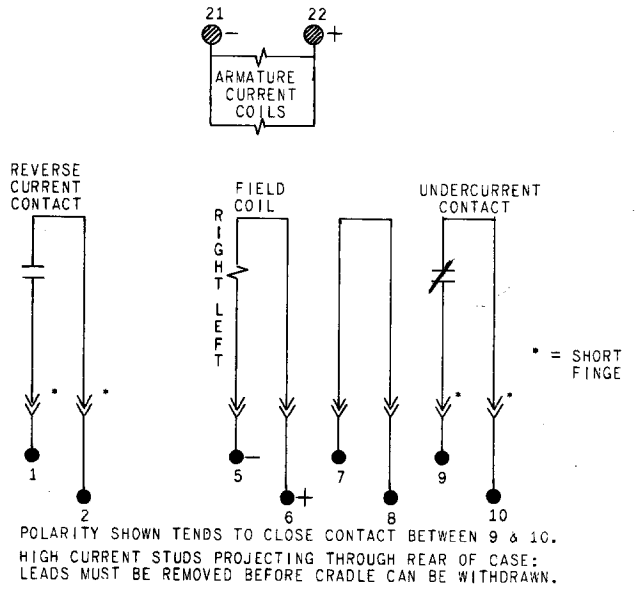


Fig. 7 (K-6375756)

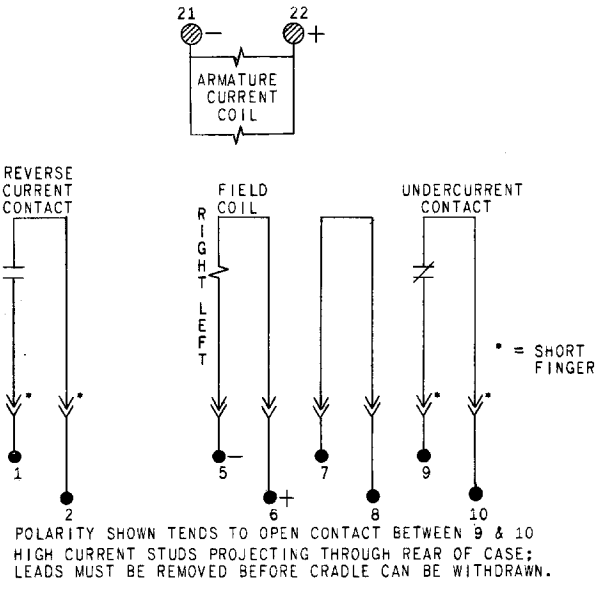


Fig. 6 Type RBC13A Relay, Internal Connections, (Front View)

Fig. 7 Type RBC14A Relay, Internal Connections, (Front View)

Fig. 8 (K-6154628)

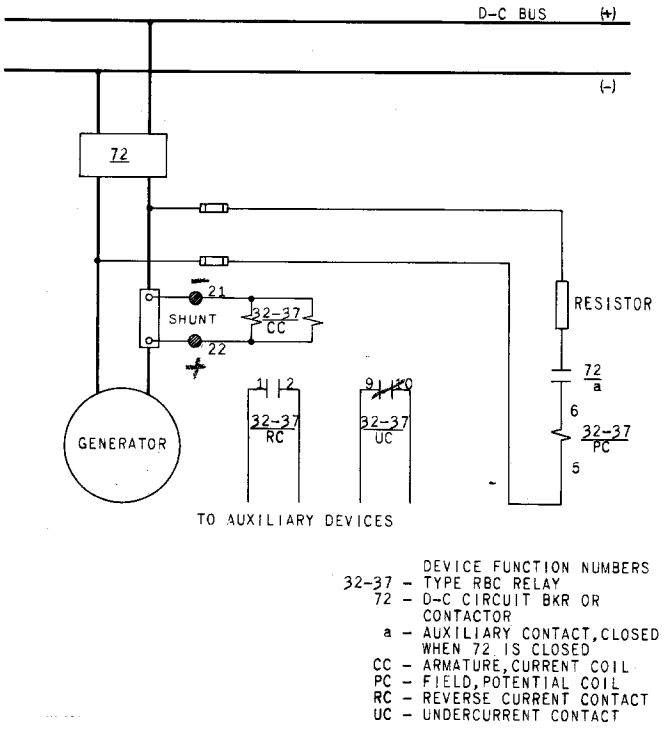


Fig. 8 Typical Elementary Connections for Undercurrent and Reverse Current Protection of a D-C Generator Using One Type RBC Relay

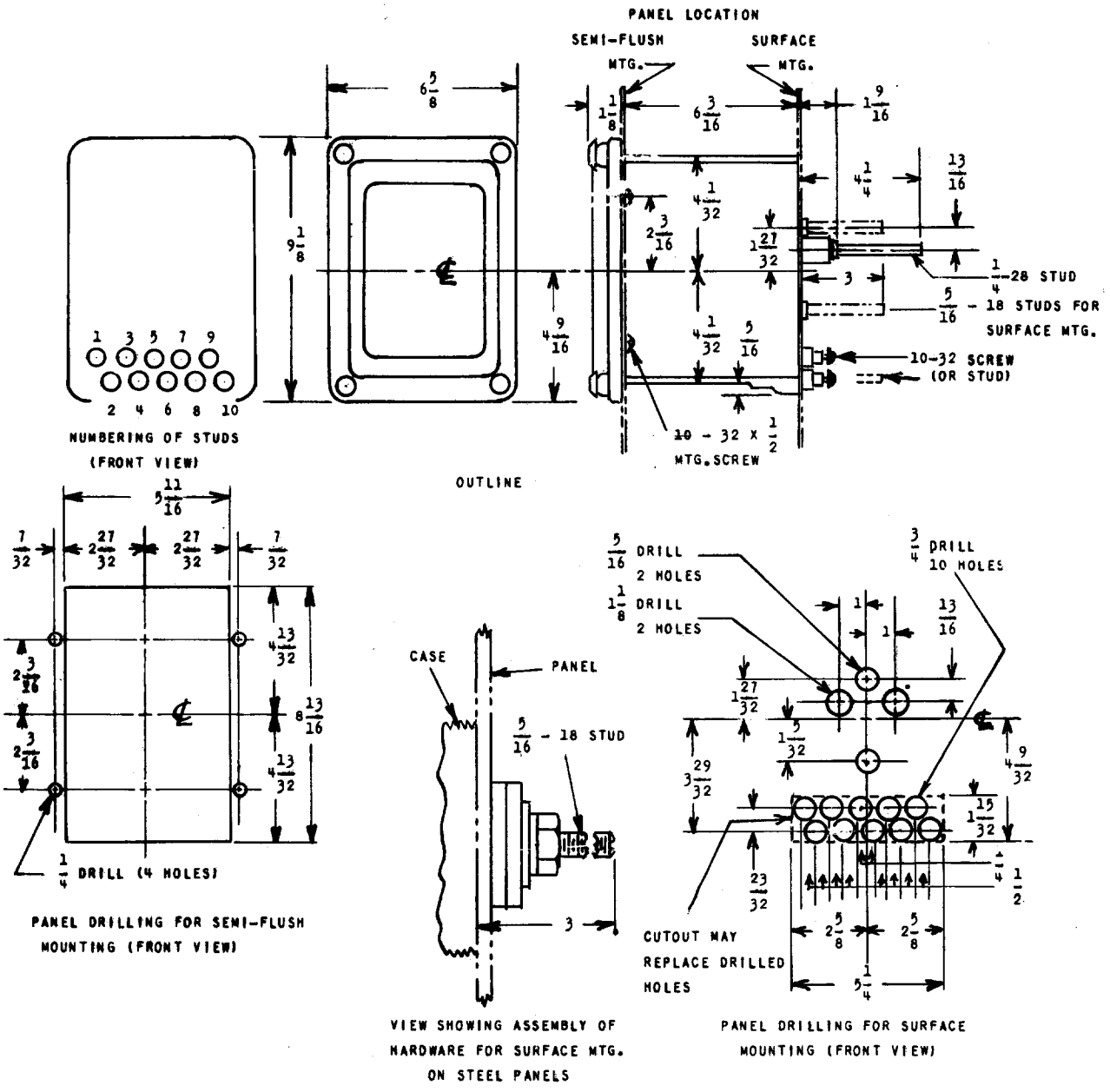


Fig. 9 (K-6375770)

Fig. 9 Outline and Panel Drilling Dimensions for Size SI Case for Type RBC Relays