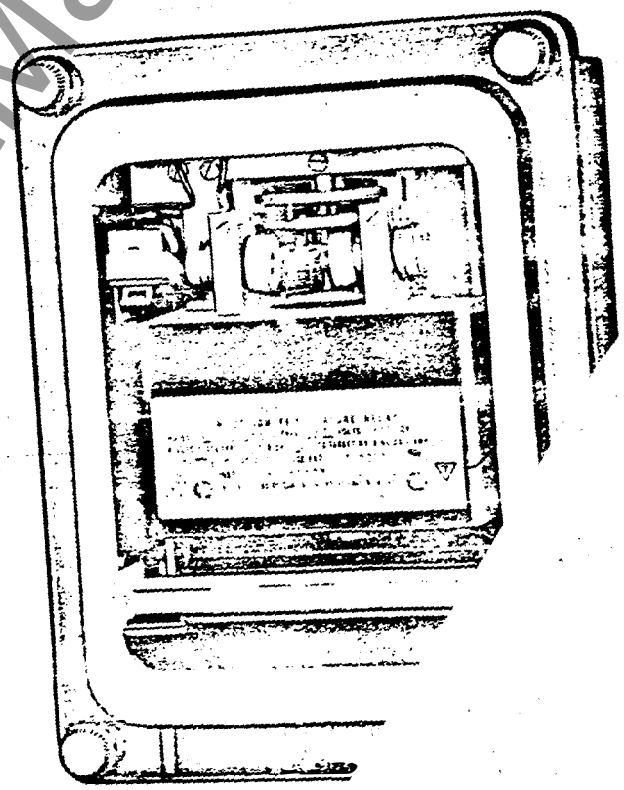
INSTRUCTIONS

Switchgear

TEMPERATURE RELAYS



Types
CFT12A and CFT12B

GENER

CONTENTS

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.

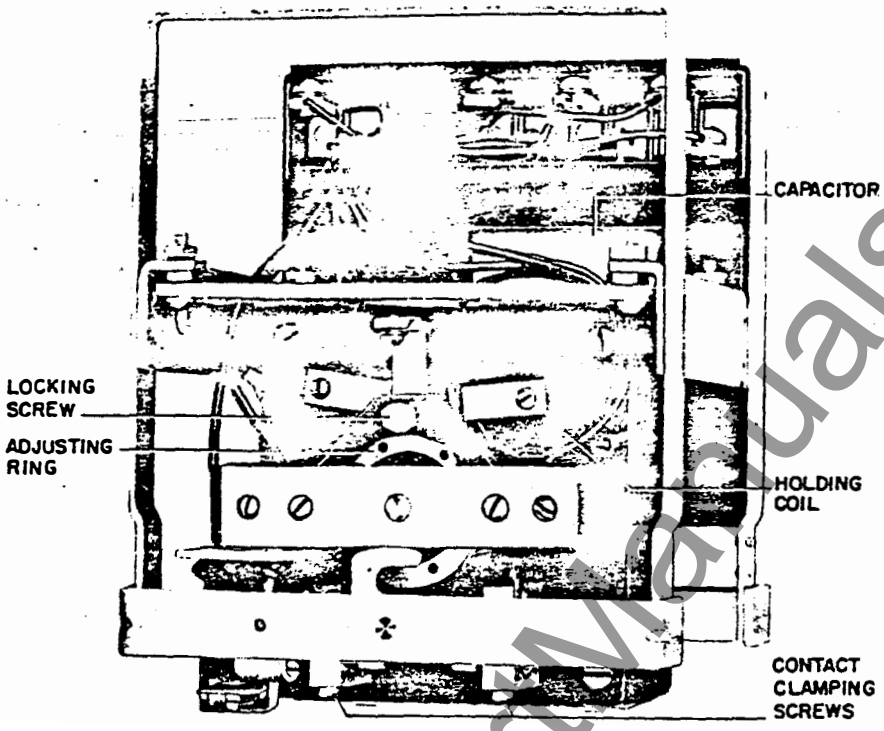


Fig 1 The Type CFT12A Relay Removed from Case (Top View)

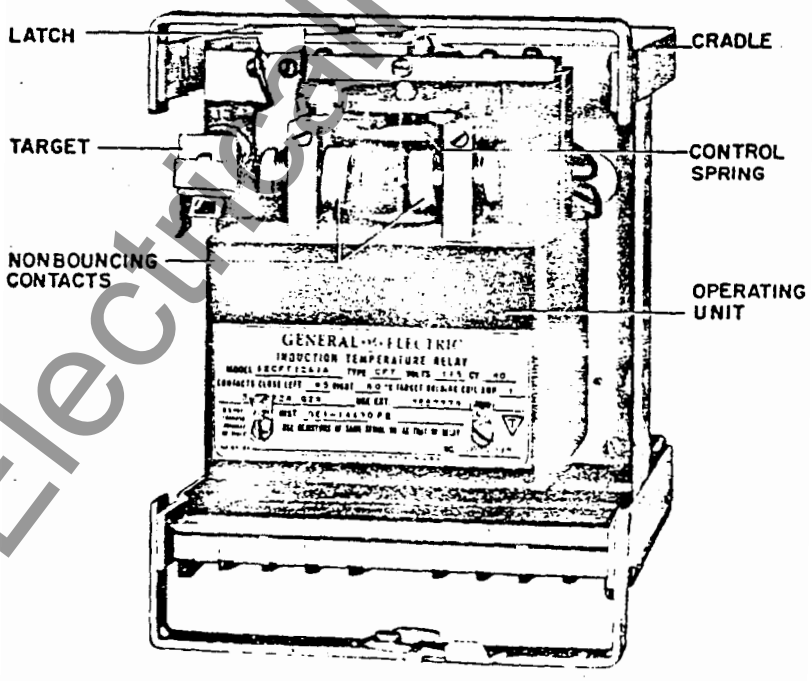


Fig. 2 The Type CFT12A Relay Removed from Case (Front View)

TEMPERATURE RELAYS

TYPE CFT

INTRODUCTION

The Type CFT relay is intended for use with a Wheatstone Bridge circuit to protect a-c machines and transformers against overheating due to excessive load, either by operating an alarm or by tripping circuit breakers. It is emphasized that this relay is not intended for protection in the case of short circuits.

The Wheatstone Bridge circuit is composed of three bridge resistors and a resistance temperature detector. Two opposite corners of the bridge are connected to an a-c source through a series bridge resistor. The other two opposite corners of the bridge are connected to the side coils of the CFT relay. The corner coils of the relay are connected across the a-c source to which the bridge is connected.

These relays are of the directional type whose operating torque reverses when the resistance of the temperature detector varies from a value below to a value above that necessary to cause the bridge to be balanced. The bridge is balanced when the resistance of the temperature detector is the same as that of the bridge resistors.

Thus the relay will close its low-temperature (right-hand) contacts for all values of resistance, or temperature, of the detector below a given amount and will slowly open these contacts as the temperature increases and finally close its high-temperature (left hand) contacts when the temperature reaches the value for which they are adjusted to close.

APPLICATION

The Type CFT12A relay is for protecting rotating machinery and is supplied with a bridge resistor that has a special temperature-resistance co-efficient of approximately one-half that of copper over the usual working range, while the resistance of the temperature detector varies with the absolute temperature, (Fig. 3). The standard adjustment of the relay and its bridge at 30°C is such that the relay will close its low-temperature contacts when the temperature detector is at 80°C or less, and will close its high-temperature contacts at 95°C or more with rated voltage and frequency supplied to the bridge and the relay, (Fig. 4).

The purpose of the special temperature-resistance co-efficient of approximately one half that of copper is to correct for the difference between the "hot spot" temperature and the detector temperature which is a function of the total rise. The bridge resistors are mounted in a cage of their own separately from the series resistor so as to permit them to respond to the true ambient temperature.

The Type CFT12B relay is for transformer protection and is supplied with a bridge resistor that has a zero temperature-resistance co-efficient.

RATINGS

TARGET AND HOLDING COILS

There are two ratings of these coils available. The choice between them depends on the current taken by the tripping circuit.

The 0.2-ampere coil is for use with trip coils that operate on currents ranging from 0.2 to 1.0 ampere at the minimum control voltage. If this coil is used with trip coils that take 1.0 ampere,

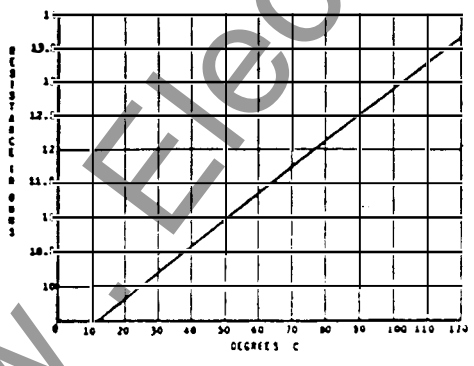


Fig. 3 Type RTD Resistance Temperature Detector Characteristic

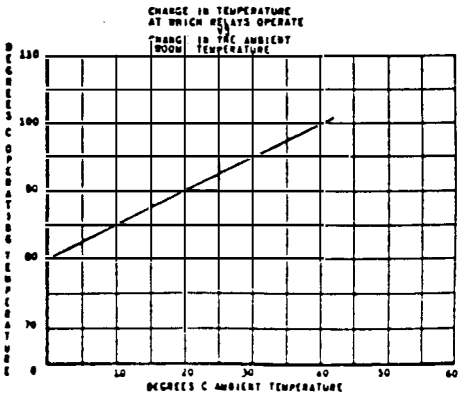


Fig. 4 Type CFT Temperature Relay Characteristic

or more, there is a possibility that the 7-ohm resistance will [illegible] a value that the [illegible] will not be tripped.

The 1.0-ampere coils 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 of the target and holding coil of the Type CFT relays.

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 target and holding coil should be chosen. These relays should also be used where it is impossible to obtain trip-coil data, but attention is called to the fact that the target may not operate if used in connection with trip coils taking less than 1.0 ampere.

The ratings of the two forms of target and holding coils are as follows:

Function	Amperes	
	1 Amp (0.25 Ohm) Coil	0.2 Amp (7 Ohm) Coil
Carry for Tripping Duty	30	5
Carry Continuously	4	0.8

CONTACTS

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.

BURDENS

The total potential burden of the relay with a 400 ohm series resistor and the bridge circuit is as follows:

Volts	Freq.	Amp.	Volt-Amp.	Watts
115	60	.36	41.2	37.8

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.

DESCRIPTION

These relays are induction-cylinder devices for alternating-current circuits. The principle by which torque is developed is the same as that employed in an induction-disk relay with a watthour-meter element, though in arrangement of parts they are more like split-phase induction motors.

The stator has eight laminated magnetic poles projecting inward and arranged symmetrically around a central magnetic core. The poles are fitted with potential coils. In the annular air gap between the poles and central core is the cylindrical part of the cup-like aluminum rotor, which turns freely in the air gap. The central core is fixed to the stator frame; the rotor alone turns.

This construction provides higher torque and lower rotor inertia than the induction-disk construction, making these relays faster and more sensitive.

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 and also carries the reset mechanism when one is required. Each cover screw has provision for a sealing wire.

The case has studs or screw connections at both ends or at the bottom only for the external connections. 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 relay mechanism is mounted in a 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 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 thumbscrews, holds the connecting plug in place.

To draw out the relay unit the cover is first removed, and the plug drawn out. Shorting bars are provided in the case to short the current transformer circuits. The latches are then released, and the relay unit can be easily drawn out. To replace the relay unit, 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.

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 the voltage, or from other sources. Or, the relay unit can be drawn out and replaced by another which has been tested in the laboratory.

CONTACTS

The contacts are specially constructed to suppress bouncing. The stationary contact consists of a flexible contact mounted in front of a thin diaphragm in a slightly inclined tube. A stainless steel ball normally rests against the diaphragm. When the moving contact strikes the stationary contact, the energy of the former is imparted to the latter and thence to the ball, which is free to roll up the inclined tube. Thus, the moving contacts come to rest with little or no rebound or vibration.

The contact head is constructed so the holding coils may be supplied or may be omitted. In general, holding coils are supplied on both circuit-opening and circuit-closing contacts. However, they may easily be cut out by moving one lead from one holding coil terminal to the other.

INSTALLATION

LOCATION

Install the relay in a place that is clean and dry, free from dust and excessive vibration, and well lighted to facilitate inspection and testing, and mount the bridge resistors where they will be subject to the same ambient temperature as the machine. If the machine is enclosed, the bridge resistors should be mounted in the incoming air path to the machine.

MOUNTING

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

CONNECTIONS

Internal connection diagram for these relays is shown in Fig. 6. A typical wiring diagram is given in Fig. 7.

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.

Make certain that the temperature detector to be used in the relay bridge for machine protection has a characteristic like that shown on Fig. 3 and choose the hottest spot detector--that is, the one which gives the highest resistance with the machine at full load.

Also observe the caution given on Fig. 7 relative to removing lead B from the grounding strip on the terminal board for machine protection. See GEI-7173 for reference to the temperature detector terminal board connections.

ADJUSTMENTS

BRIDGE

Each bridge resistor has a resistance of 12.5 ohms and is not adjustable. Referring to Fig. 3, it will be noted this value of 12.5 ohms is midway between the two values of resistance of the temperature detector corresponding to 80°C and 95°C.

The series bridge resistor is not adjustable. This resistor determines the amount of current which will flow in the relay current coil for a given unbalance of the bridge. Consequently it determines the temperature range between closing the high and the low-temperature contacts. A resistor to give a 15°C range is recommended and furnished with each relay. Do not insert a series bridge resistor which will permit more than 0.4 ampere to flow into the bridge because the temperature detectors will overheat.

RELAY

The relay was properly adjusted at the factory to obtain the characteristics given above and it is advisable not to disturb these adjustments. If for

any reason it becomes necessary to remove the molded head and rotor, proceed in the following manner:

(a) Disconnect eight leads at terminals in base.

(b) Remove unit intact with its mounting plate from the base.

(c) Remove upper screw supporting unit on mounting plate.

(d) Avoiding any disturbance to the top bearing plate, remove the entire top molded structure and rotor assembly of the unit from the stator assembly by removal of the four corner screws. This will give access to both the rotor and stator assemblies.

(e) In this way all parts will be aligned by the dowel pins when replaced.

(f) To remove rotor assembly from top molded structure, remove small pin from groove at upper end of shaft and back off on clutch screw located on right side of movable contact arm.

Use care in handling the rotor while it is out of the relay, and see that the air gap and rotor are kept clean.

In reassembly, the rotor will go into the air gap easily without forcing if the parts are held in line properly.

CONTACTS

Each stationary contact, Fig. 5 is mounted on a flat spiral spring (F) backed up by a thin diaphragm (C). These are both mounted in a slightly inclined tube (A). A stainless steel ball (B) is placed in the tube before the diaphragm is assembled. To change the stationary contact brush, remove the contact barrel and sleeve as a complete unit after loosening the screw at the front of the contact block. Unscrew the cap (E). The contact brush may then be removed.

The contact gap may be adjusted by loosening slightly the same screw at the front of the contact block. The screw should be loose enough only to allow the contact barrel to rotate in its sleeve.

Each moving contact may be removed by loosening the screw which secures it to the contact arm and sliding it from under the screw head.

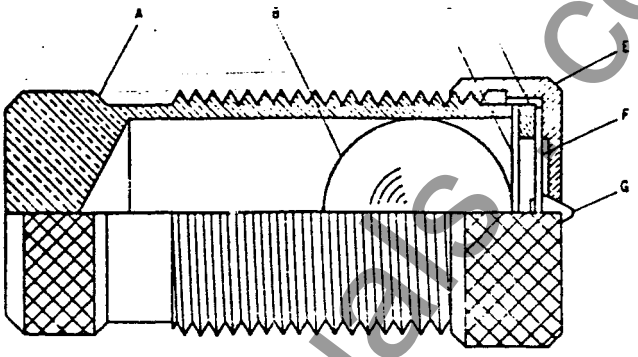


Fig. 5 Non-bounce Contact Assembly

HOLDING COILS

The location of each holding coil may be adjusted by loosening the mounting screw and sliding the coil either to the left or the right in a groove provided for that purpose. The holding coils are located in the factory so that there is a gap of about 0.055" between the pole piece and the armature. This gap (0.055") is equivalent to 1-3/4 turns of the contact barrel. The holding coil gap must not be adjusted appreciably below 0.055".

CONTROL SPRINGS

The control spring in the relay was adjusted at the factory to the neutral tension position so that both left and right-hand contacts are open with the relay de-energized. The tension of the control spring may be changed by loosening the hexagonal screw located at the rear of the adjusting ring and turning this ring counter-clockwise to increase the tension and clockwise to decrease tension.

TESTS

To test or to adjust this relay, connect it according to Fig. 7. In place of each temperature detector connect a variable resistor whose range covers 10 to 15 ohms. If it is desired to adjust the relay for a particular temperature, set each variable resistor to the resistance shown on Fig. 3 for the particular temperature.

MAINTENANCE

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, or fine watch oil, should be placed on the new jewel before it is inserted.

The lower jewel bearing should be screwed all the way in until its head engages the end of the threaded core. The upper bearing should be adjusted to allow about 1/64" end play to the shaft.

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, including serial number. If possible, give the General Electric Company requisition number on which the relay was furnished.

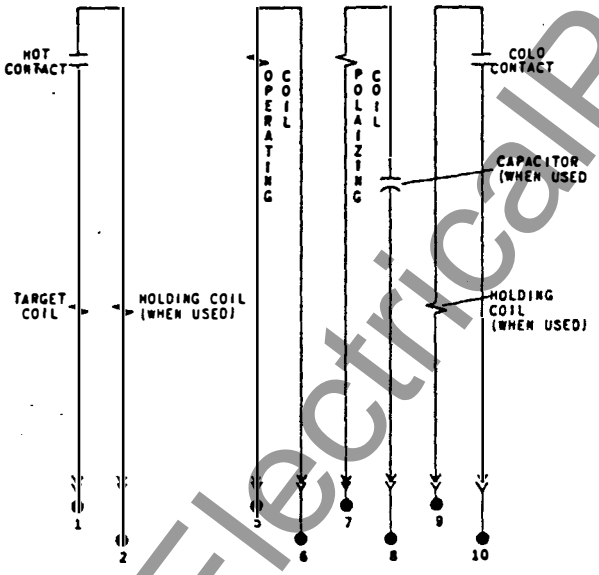


Fig. 6 Type CFT12A and CFT12B Relays Internal Connections (Front View)

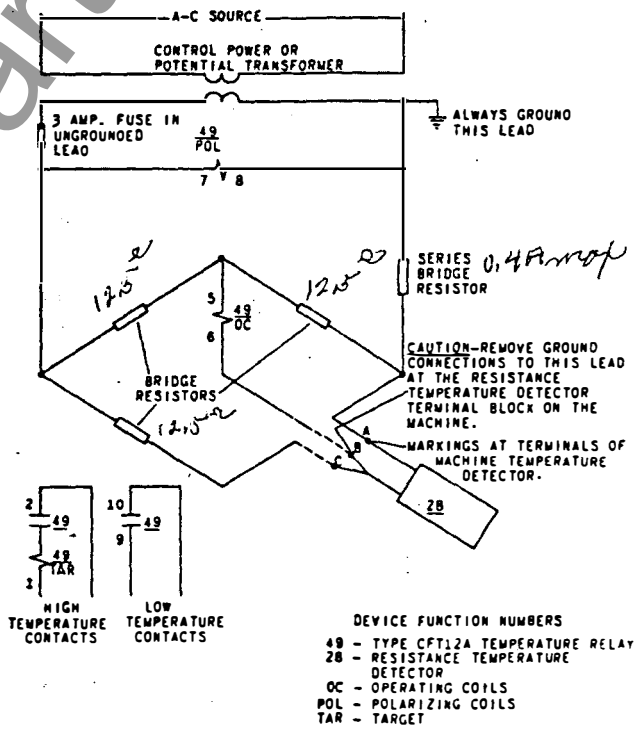


Fig. 7 Typical Elementary Connections for Type CFT12A Relay

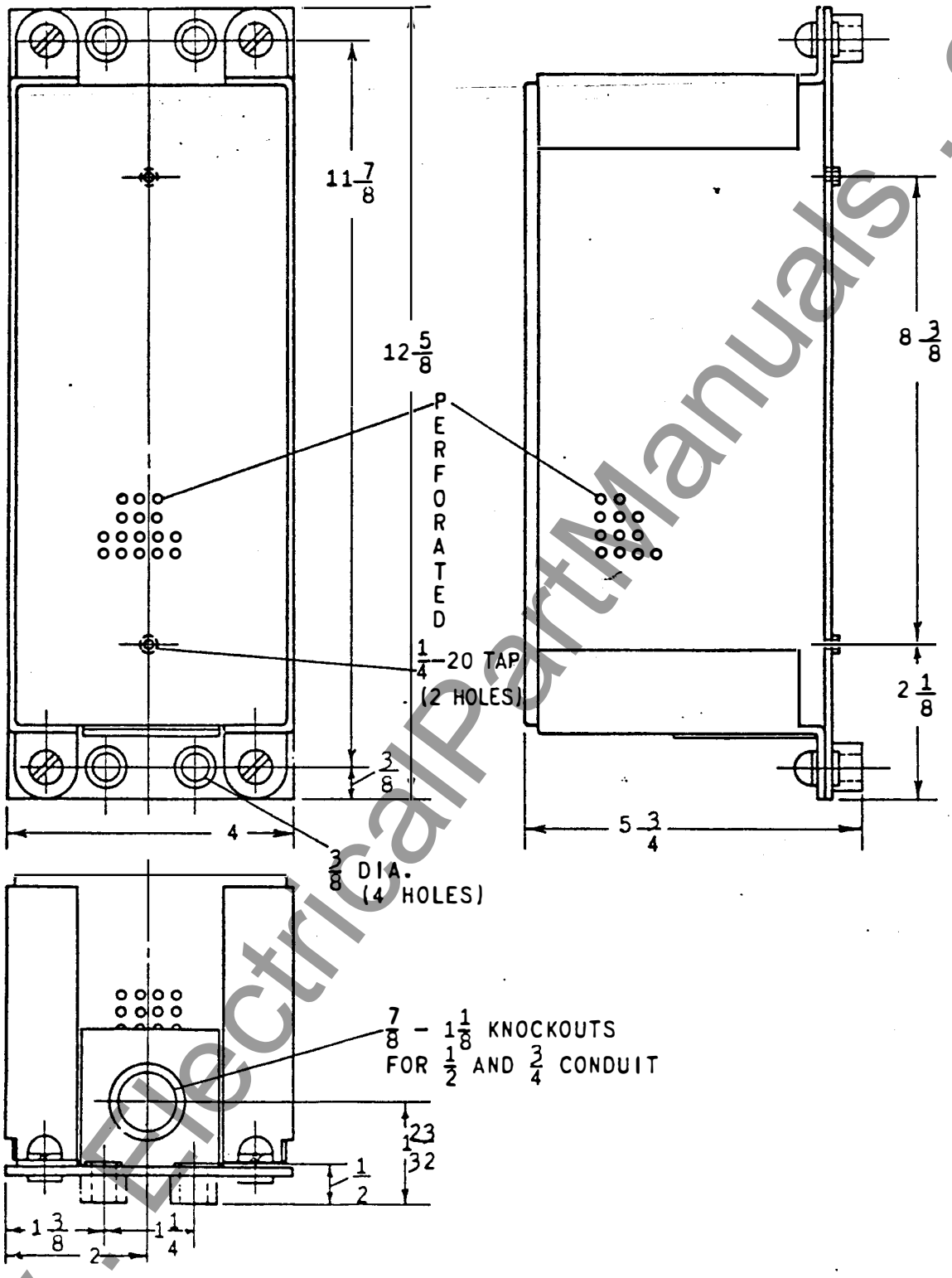
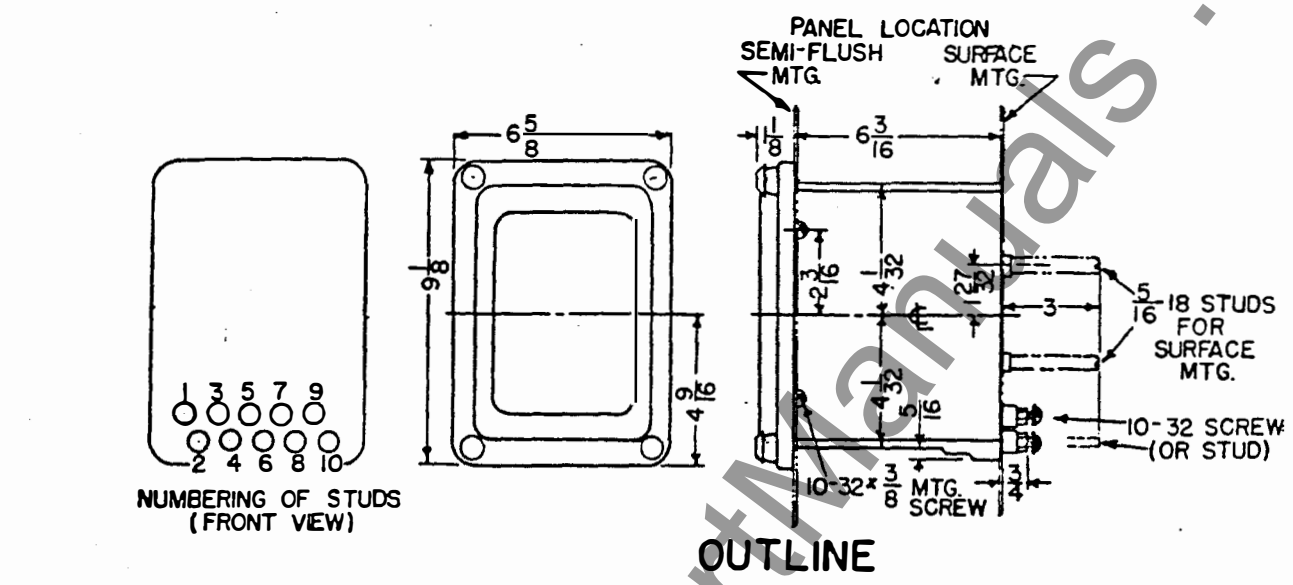
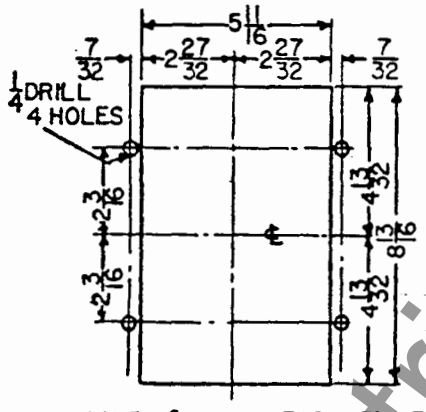
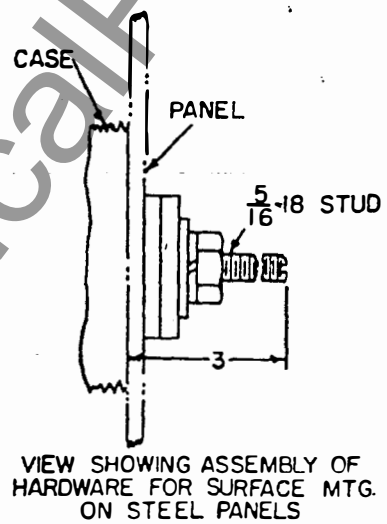


Fig. 8 Outline Dimensions for External Resistor used with Type CFT12A Relay







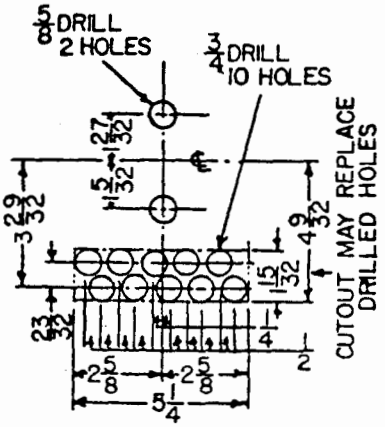


Fig. 9 Outline and Panel Drilling Dimensions for Size S-1 Case