

INSTRUCTIONS

TEMPERATURE RELAYS

TYPES CFT11A AND CFT11B

IN

UNIVERSAL AND DRAWOUT CASES

GENERAL  ELECTRIC
SCHENECTADY, N.Y.

TEMPERATURE RELAYS TYPES CFT11A AND CFT11B

These instructions are intended to assist in installing and testing the relays. If further information is desired, please refer to the nearest office of the General Electric Company.

GENERAL DESCRIPTION

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 tapped 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 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 watt-hour-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.

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 that 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.

These relays are 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 tapped bridge resistors for whatever tap is being used.

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.

TYPES

The Type CFT11A relay is for protecting rotating machinery and is supplied with a tapped 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, (Figure 5). 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, (Figure 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 CFT11B relay is for transformer protection and is supplied with a tapped bridge resistor that has a zero temperature-resistance co-efficient.

~~These relays are furnished in either the universal case or in the drawout case.~~

DRAWOUT CASE

The drawout cases are made in three major sizes each of which has studs for external connections at both ends or at the bottom only. 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 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 plug can be drawn out. In so doing, the trip circuit is first opened, then the current-transformer circuits are shorted and then disconnected from the relay elements, at the same time 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.

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

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.

Mount the relay on a vertical surface by means of the steel supporting studs or screws. A permanent ground connection to one of the steel supporting studs or screws is recommended. A conductor equivalent to No. 12 B & S copper wire or larger should be used.

The panel drilling and outline dimensions of the relay are shown in Figure 1, for drawout case, and Figure 2 for universal case.

Typical external connection diagrams are shown on Figure 7 for drawout case and Figure

6 for universal case.

Make certain that the temperature detector to be used in the relay bridge for machine protection has a characteristic like that shown on Figure 5 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 Figure 7 and Figure 6 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. The bridge resistors are provided with taps for adjusting the bridge to the temperature at which it should balance. To determine which tap should be used, refer to Figure 5. This curve gives the resistance of the temperature detector at various temperatures. Knowing the temperature at which the high-temperature contacts of the relay should close, read from the curve the resistance for this temperature and choose the tap which is the nearest value below this resistance.

If the leads from the bridge to the temperature detector have appreciable resistance compared to that of the temperature detector itself, the lead resistance should be added to that of the detector when determining the proper tap to use.

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.

Bearings

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.

The lower jewel may be tested for fractures by exploring its surface with a fine needle. If replaced with a new jewel a new pivot should be screwed into the end of the shaft at the same time, and a drop of General Electric meter-jewel oil, Cat. 66X728, placed in the new jewel before it is inserted.

Contacts

If the contacts become dirty or pitted slightly they should be cleaned by scraping 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 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.

Each stationary contact, Figure 8 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. When the moving contact hits 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 substantially no rebound or vibration. 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.

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".

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:

Function	Amperes A-C or D-C	
	1 amp (0.25 ohm) Target & Hold. Coil	0.2 amp (7 ohm) Target & Hold. Coil
Tripping Duty	30	5
Carry Continuously	2.5	0.5

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 impossible 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.

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 clockwise to increase the tension and counter-clockwise to decrease tension.

BURDEN

The total potential burden of the relay with a 400-ohm series resistor and the bridge circuit on the 12.5-ohm tap is as shown below:-

<u>Volts</u>	<u>Freq.</u>	<u>Amp.</u>	<u>Volt-amp.</u>	<u>Watts</u>
115	60	.36	41.2	37.8

TESTING

To test or to adjust this relay, connect it according to Figure 7 or Figure 6. 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 Figure 5 for the particular temperature.

REPAIRS

When major repairs are necessary, it is recommended that the relay be sent to the factory. Interchangeable renewal parts are available for those who wish to make their own repairs, and the design of the relay is such that ordinary repairs can be made by the purchaser.

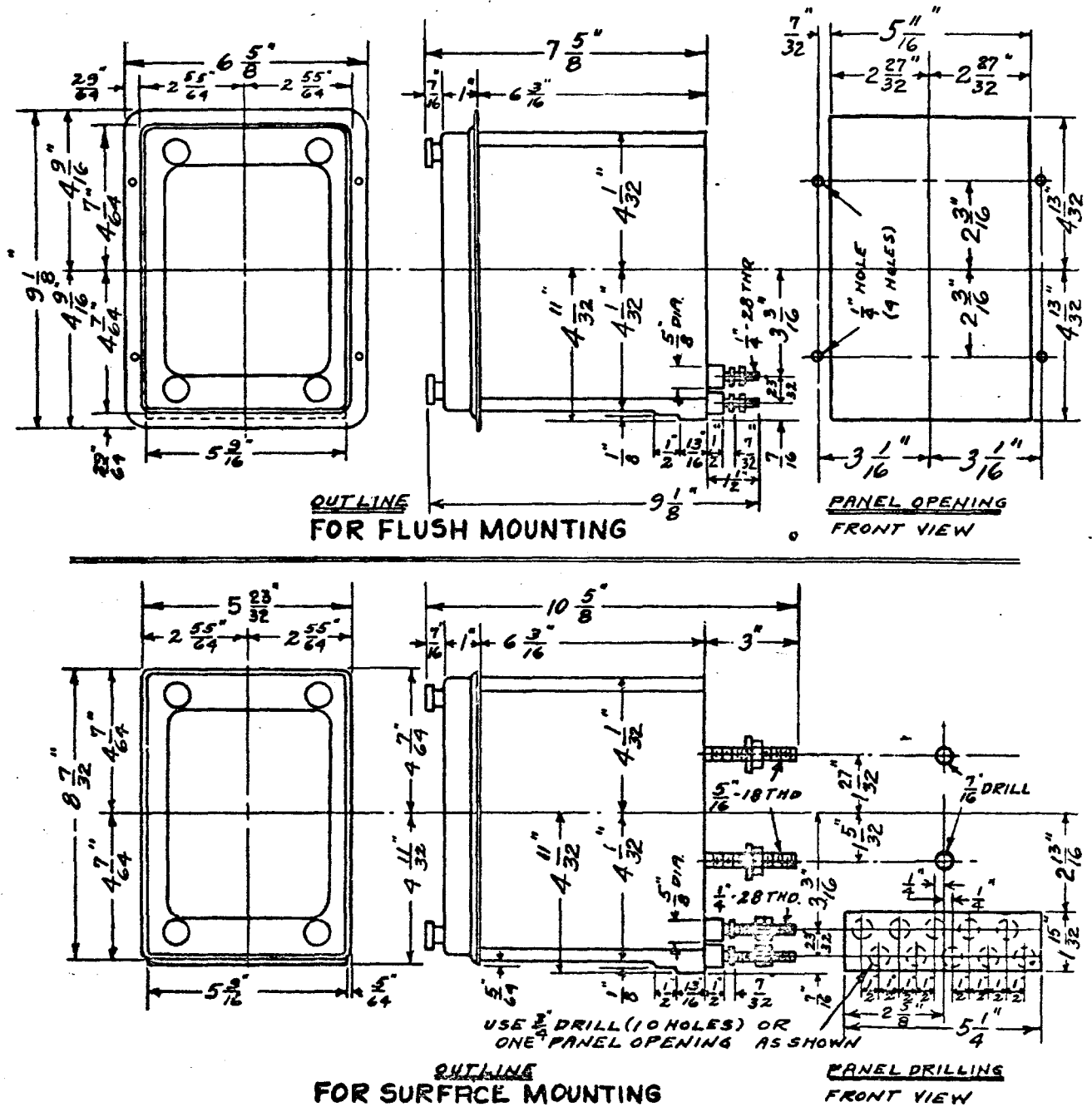


FIG. 1 - OUTLINE AND PANEL DRILLING FOR DRAWOUT CASE - ONE UNIT - SINGLE END. (K-6174671)

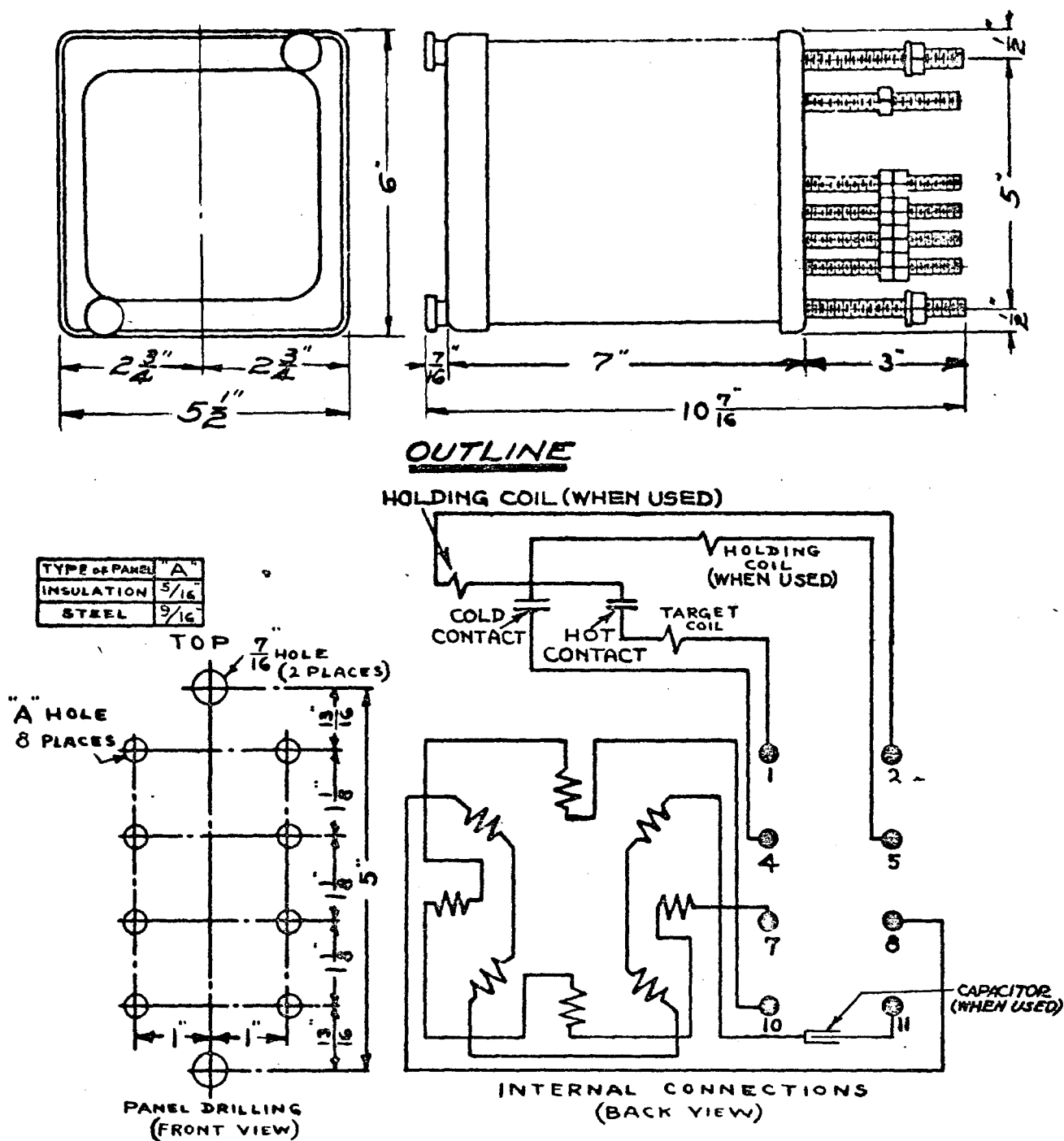


FIG. 2 OUTLINE, PANEL DRILLING AND INTERNAL CONNECTIONS FOR TYPE CFT11A, CFT11B RELAYS UNIVERSAL CASE. (K-6154721)

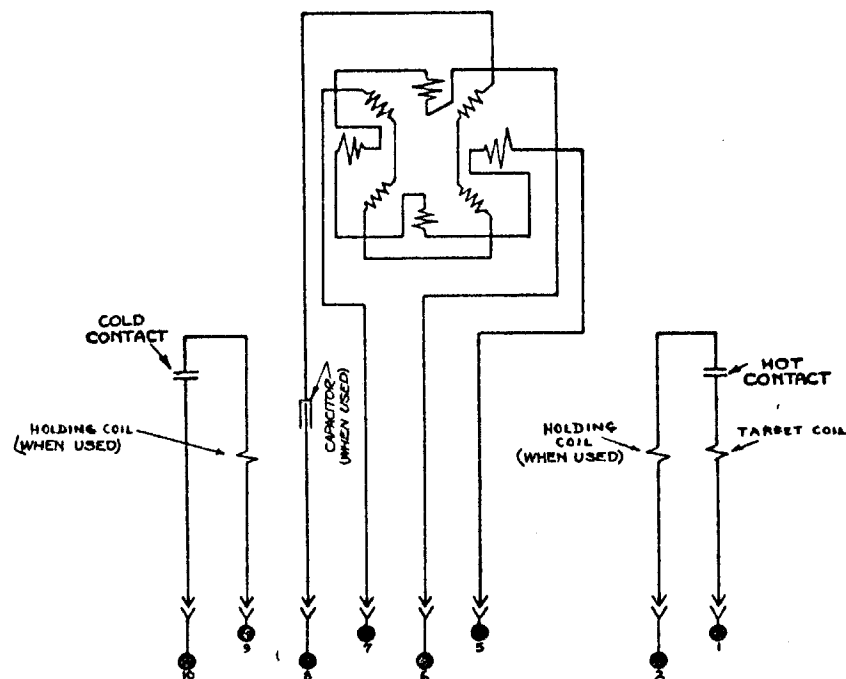


FIG. 3 INTERNAL CONNECTIONS FOR TYPE CFT11A-CFT11B RELAYS (DRAWOUT CASE). (K-6154722)

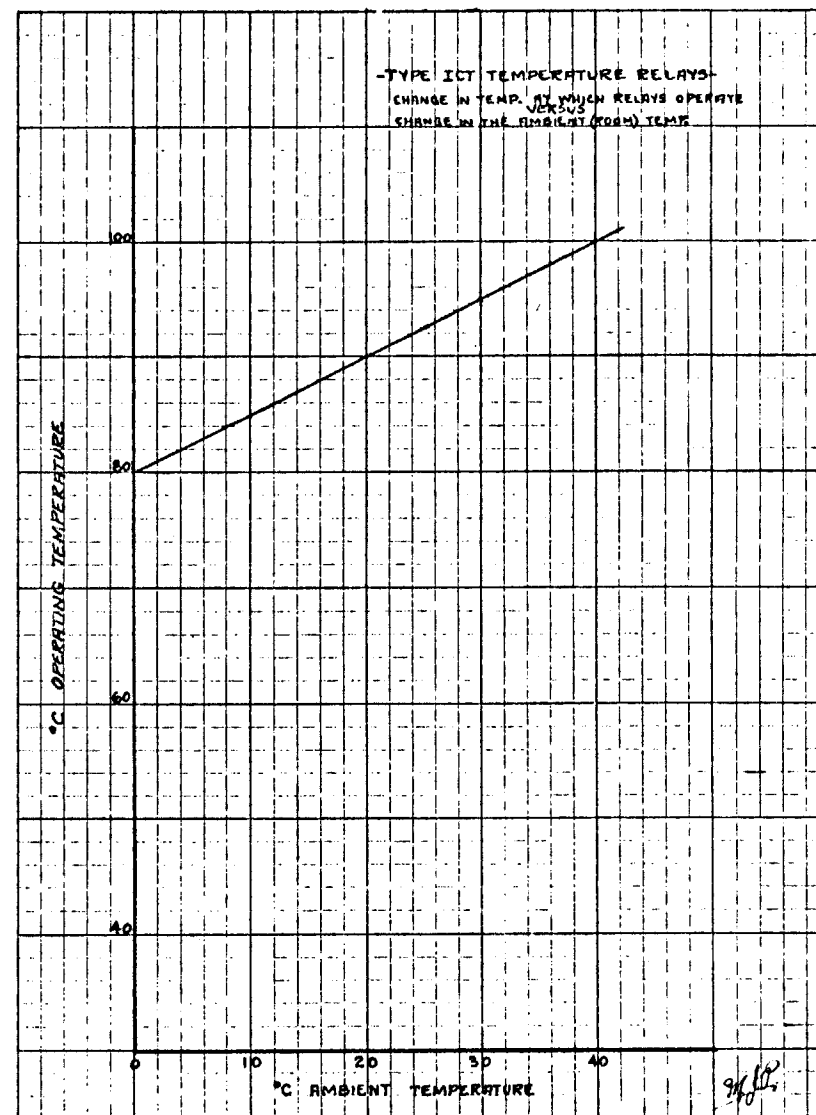


FIG. 4 TYPE ICT TEMPERATURE RELAY CHARACTERISTICS (K-6174152)

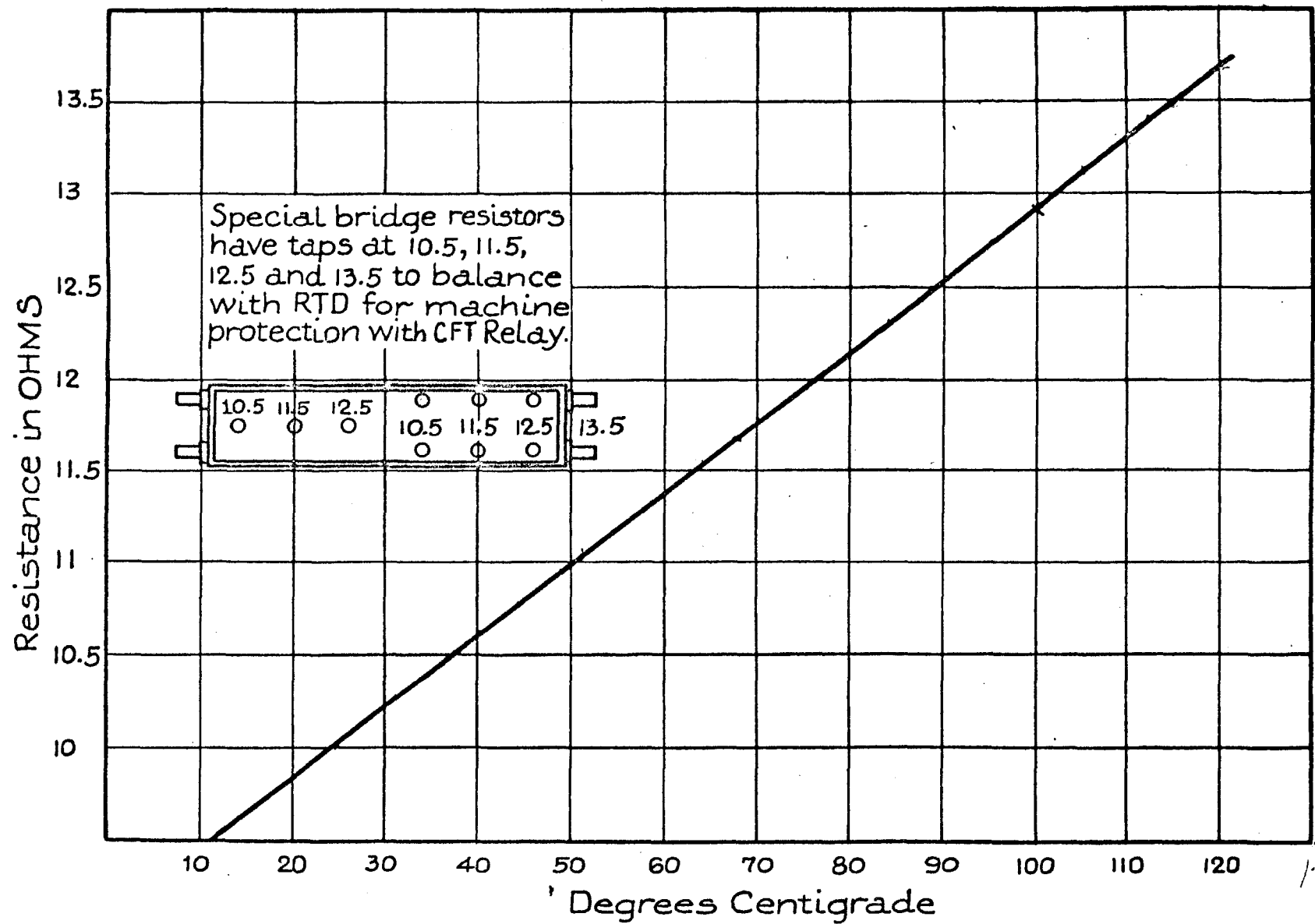
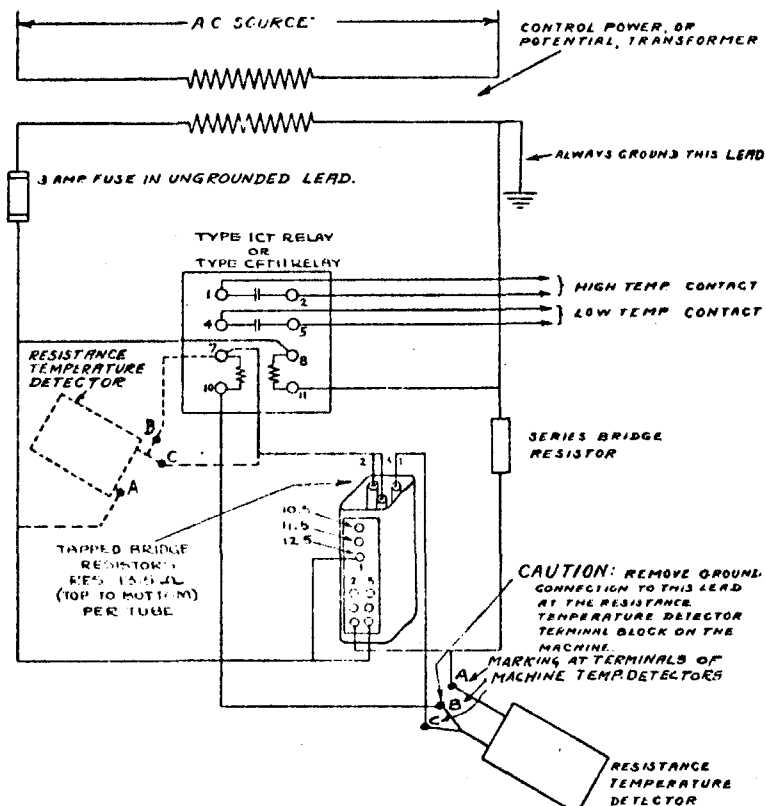
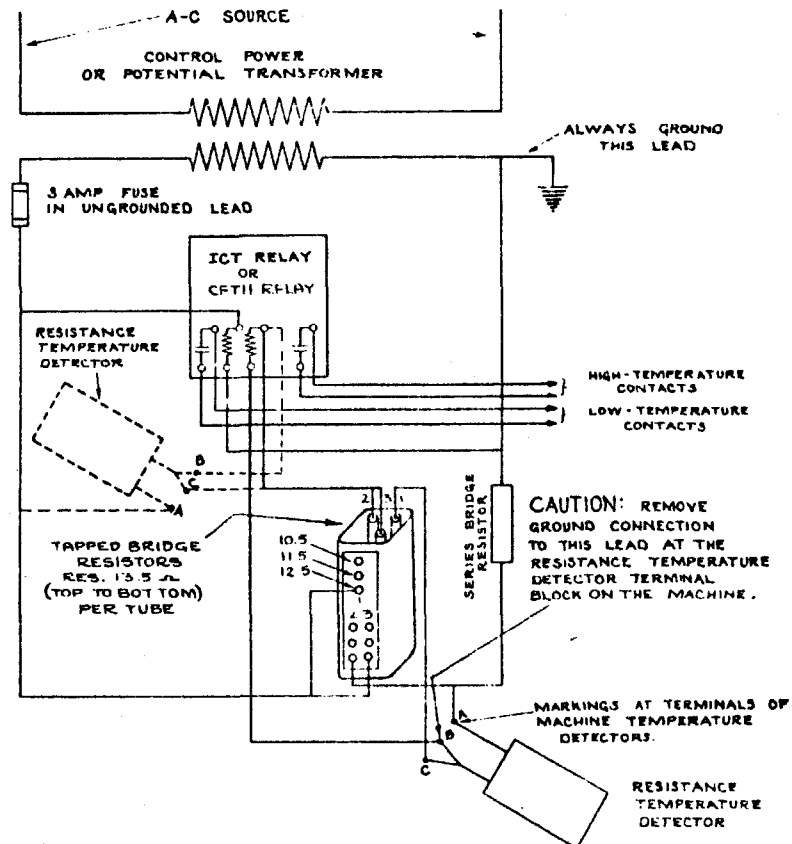


FIG. 5 RTD RESISTANCE TEMPERATURE CHARACTERISTIC
(H-6084908)



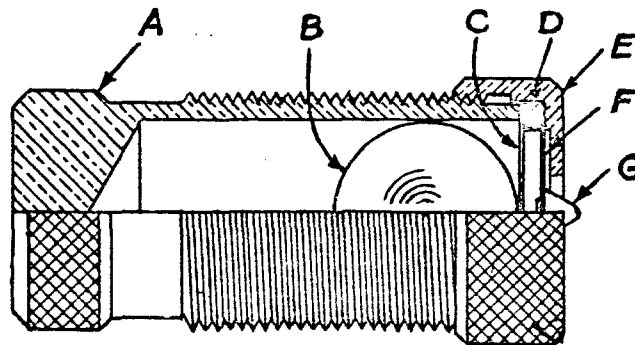
WHERE AVAILABLE, A SECOND RESISTANCE TEMPERATURE- DETECTOR MAY BE USED IN PLACE OF BRIDGE RESISTOR #3. WITH ENCLOSED MACHINES BRIDGE RESISTORS SHOULD BE MOUNTED IN PATH OF IN-COMING AIR & SHOULD BE IN ENCLOSING CASE.

FIG. 6 EXTERNAL CONNECTIONS FOR TEMPERATURE PROTECTION
TYPE CFT RELAYS IN UNIVERSAL CASE. (K-6074927)



WHERE AVAILABLE, A SECOND RESISTANCE TEMPERATURE- DETECTOR MAY BE USED IN PLACE OF RESISTOR #3. WITH ENCLOSED MACHINES BRIDGE RESISTORS IN ENCLOSING CASE SHOULD BE MOUNTED IN PATH OF INCOMING AIR EXTERNAL CONNECTIONS (BACK VIEW)

FIG. 7 EXTERNAL CONNECTIONS FOR TEMPERATURE PROTECTION
TYPE CFT RELAYS IN DRAWOUT CASES. (K-6154232)



**FIG. 8 CONTACT ASSEMBLY FOR CBP AND CCP RELAYS
(K-6077069)**