



INSTRUCTIONS

GEI-25371B

TEMPERATURE RELAYS

Types CFT11A and CFT11B

A

GENERAL  ELECTRIC

TEMPERATURE RELAYS

TYPE CFT11A AND CFT11B

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 tapped bridge resistors and a resistance-temperature detector. 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 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.

APPLICATION

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, (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, separated from the series resistor 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.

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 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.

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

Function	Amperes, AC or DC *	
	1 Amp (0.25 Ohm) Coil	0.2 Amp (7 Ohm) Coil
Carry for Tripping Duty	30	5
Carry Continuously	4	0.4

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 as indicated in the above table.

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.

* Changed since last revision

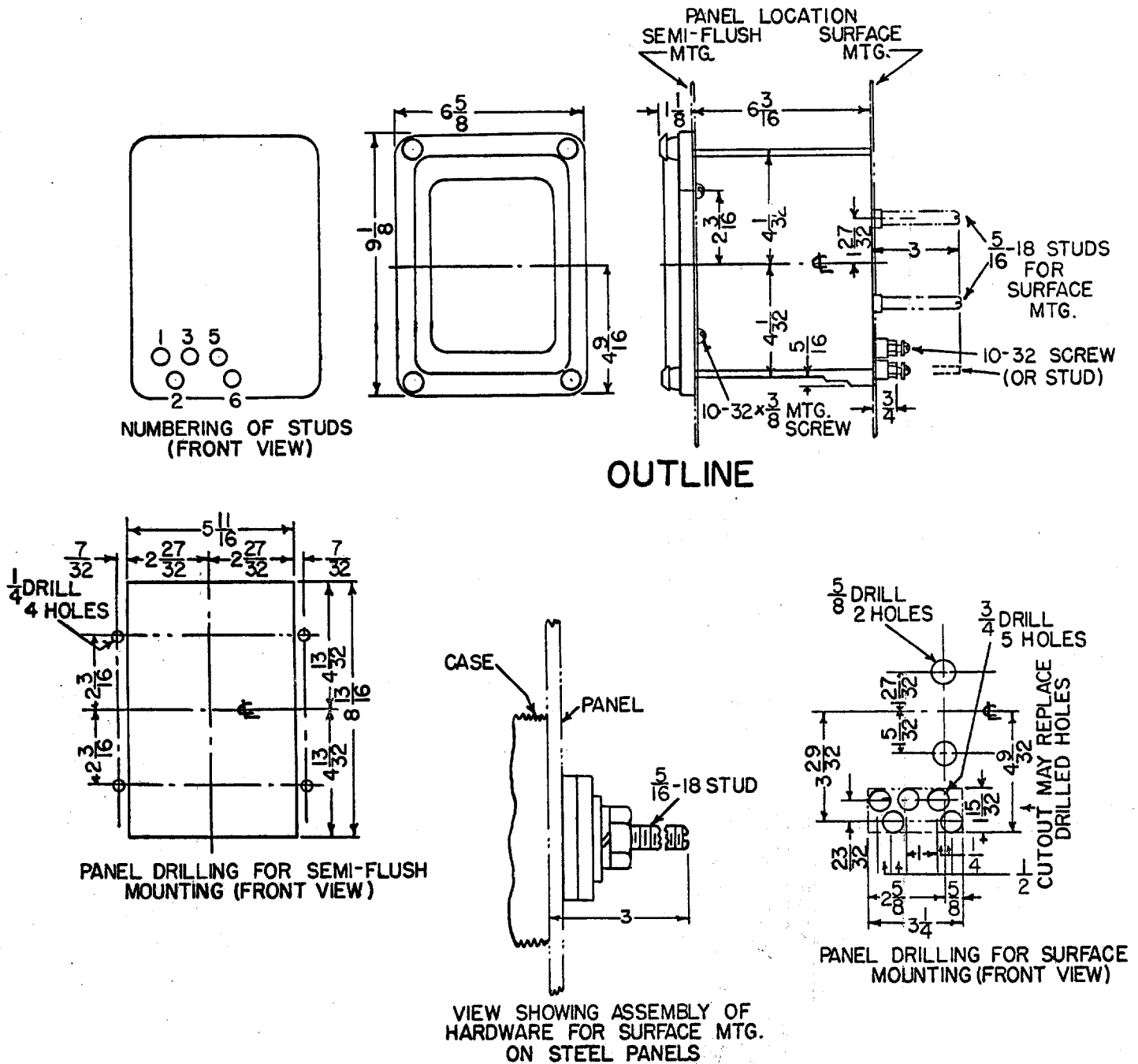


Fig. 1 (K-6299270)

Fig. 1 Outline And Panel Drilling For Type CFTIIA And CFTIIB Relays

BURDENS

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:

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 a relay, examine it for any damage sustained in transit. If injury or damage resulting from rough handling is evident, file a damage claim at once with the transportation company and promptly notify the nearest General Electric Apparatus Sales Office.

Reasonable care should be exercised in unpack-

ing 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 principal 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.

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 the bottom 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 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.

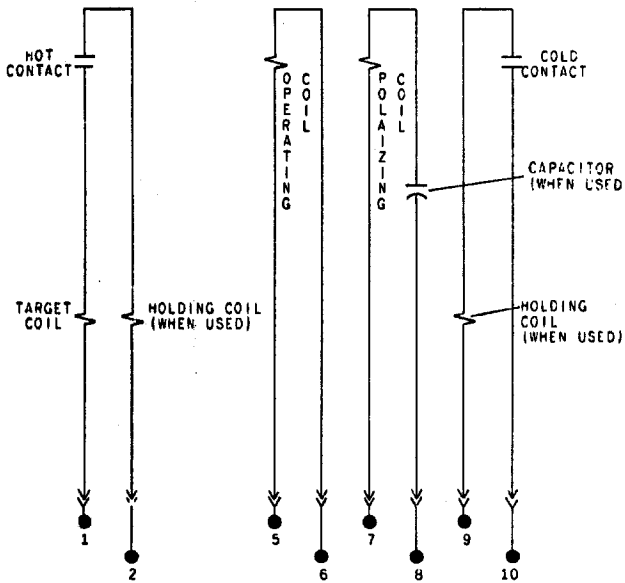


Fig. 2 Internal Connections For Type CFTIIA And CFTIIB Relays

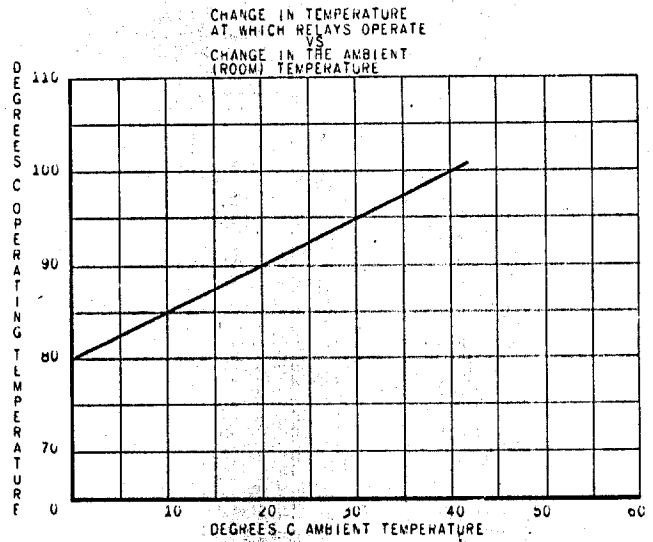


Fig. 3 Type CFT Temperature Relay Characteristics

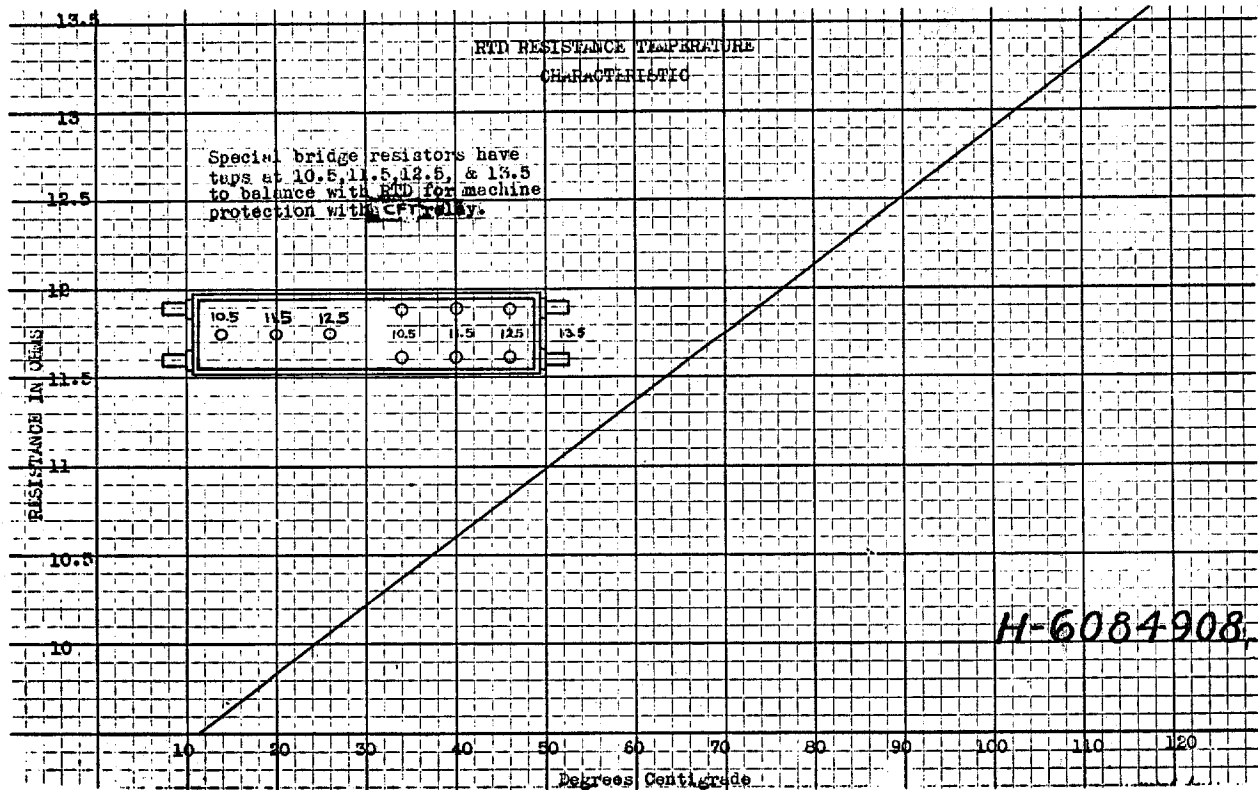


Fig. 4 RTD Resistance Temperature Characteristic

Fig. 2 (K-6154722)

Fig. 3 (K-6174152)

Fig. 4 (H-6084908)

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.

RELAYS WITH EXTERNAL AUXILIARIES

When external resistors and capacitors are furnished with relays they are identified by means of serial numbers. These numbers are of the form KX-1023 or OA-2155. The purpose of these numbers is to insure that each relay, when installed, will be provided with the same auxiliaries with which it was calibrated at the factory.

The reason for this precaution is to eliminate the variation in calibrations of the relays which would otherwise result from the variation in electrical properties of the auxiliaries.

TERMINAL BOARD FOR RESISTANCE TEMPERATURE DETECTORS

The terminal board for resistance temperature detectors is employed on installations in which the temperature meter is energized from an ungrounded direct-current supply circuit. It serves to connect the temperature detectors with the temperature meter, and to prevent the latter from receiving an excessive potential in the event of a failure of the stator-coil insulation adjacent to a detector. The latter function is accomplished by connecting each detector permanently with the ground.

The terminal board, Fig. 7, consists essentially of a moulded base (14) with cover (13), in which are arranged the connections (1-7) for joining together the leads from the temperature detectors and temperature meter. The center (b) row of connections is connected with the grounding strip (15). Part (16) serves as a ground connection and also as a stud for attaching the terminal board to its grounded support on the stator frame.

The "A" (red) leads from the temperature detectors and temperature meter are connected on the bottom row "A" connection studs, while one remaining lead from each detector and the meter are connected to the middle row "B" connection studs, and the third lead from each detector and meter are connected to the top row "C" connection studs.

If it should be desired permanently to insulate from ground one of the temperature detectors (usually the one giving the highest temperature readings in operation) for connection with a temperature relay, the following procedure should be observed: Remove the cover (13) and disconnect the temperature meter leads from all three connection studs of the detector in question. Remove the "B" lead of this detector from the center stud, and unscrew and remove this stud from the grounding strip. Using a small machine screw and nut suitable for the purpose, bolt together the "B" lead of the detector and the "B" lead from the relay. Wrap the joint thus formed with ordinary friction tape for insulating from the other studs and connections. The "A" and "C" leads of the relay should next be connected to the corresponding terminal-board studs, replacing the leads from the temperature meter which were removed, and the cover then replaced.

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. When the Type CFT11A relay is used with enclosed machines, its bridge resistors should be mounted in the incoming air path to the machine.

MOUNTING

This relay should not be mounted where it will be subjected to shocks such as the closing of circuit breakers.

The outline and panel drilling dimensions of Type CFT relay is shown in Fig. 1.

CONNECTIONS

Internal connection diagram for these relays is shown in Fig. 2. A typical wiring diagram is given in Fig. 5.

One of the mounting studs or screws should be permanently grounded by a conductor not less than No. 12 B & B 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. 4 and choose the hottest spot detector -- that is, the one which gives the highest resistance with the machine at full load.

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 Fig. 4. This curve gives the resistance of the temperature detector at various temperatures. Knowing the temperature at which the high

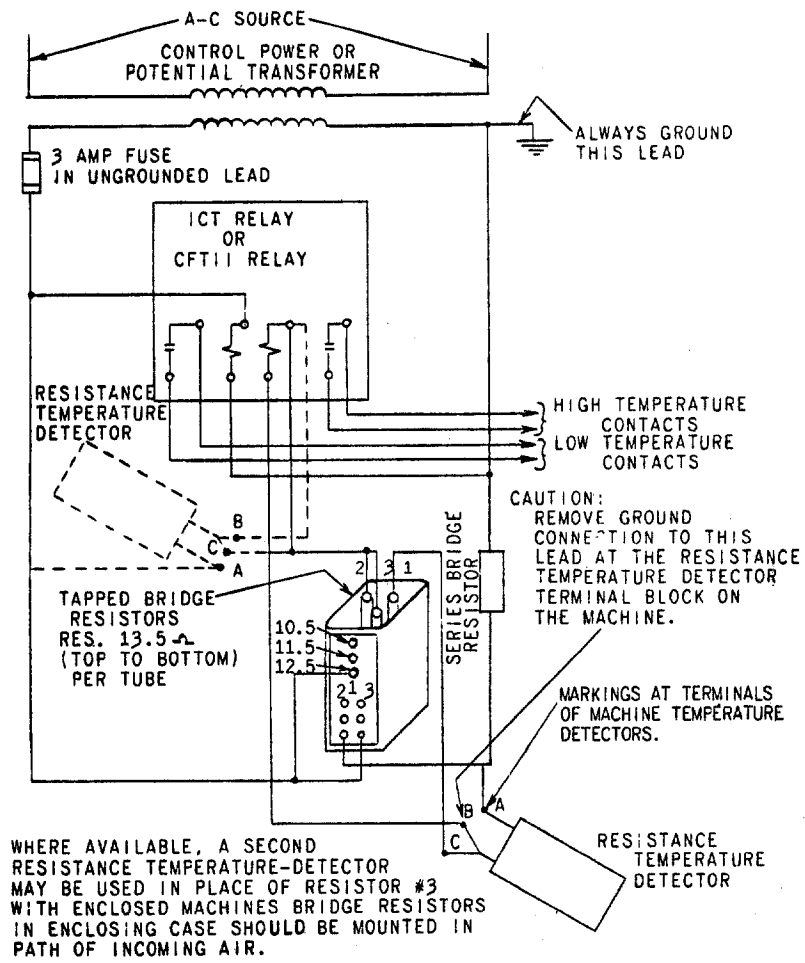


Fig. 5 Typical External Connections For CFT Relay

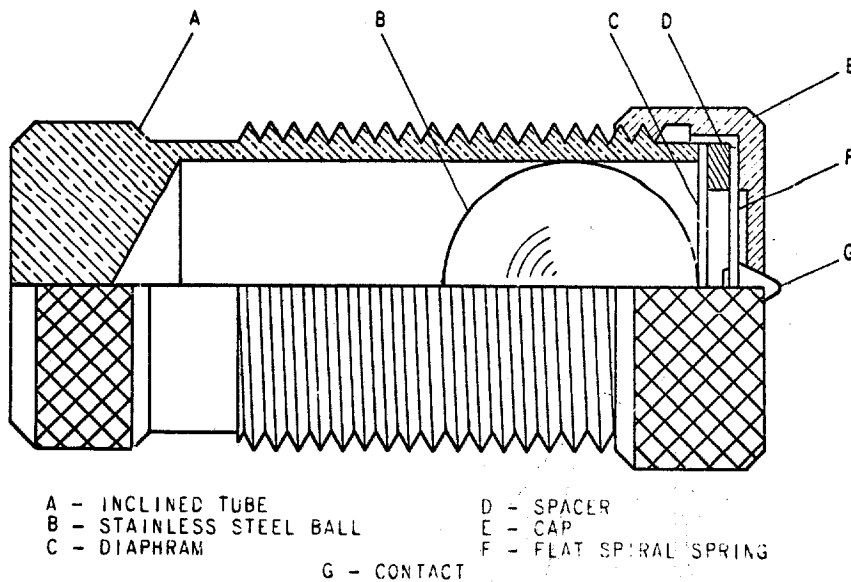


Fig. 6 Contact Assembly For Type CFT Relays

Fig. 5 (K-6154232)

Fig. 6 (K-6077069)

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 unbalanced of the bridge. Consequently it determines the temperature range between closing the high- and the low-temperature contacts. A resistor to give a 15 degree 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.

MAINTENANCE

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 inch end play to the shaft.

* Changed since last revision

CONTACTS

Each stationary contact, Fig. 6, 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 COIL

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 inch between the pole piece and the armature. This gap (0.055 inch) is equivalent to a 3/4 turn of the contact barrel. The holding coil gap must not be adjusted appreciably below 0.055 inch.

CONTROL SPRING

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.

TESTS

To test or to adjust this relay, connect it according to Fig. 5. Preheat the relay by applying rated voltage to the polarizing circuit (studs 7-8) for a period of 3/4 of an hour before proceeding with the calibration tests. 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. 4 for the particular temperature.

The lower jewel may be tested for fractures by exploring its surface with a fine needle.

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. Sometimes an ordinary file cannot reach the actual points of contact because of some obstruction from some other part of the relay.

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 above can be obtained 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, specifying the quantity required and describing the parts by catalogue numbers as shown in Renewal Parts Bulletin No. -3564.

1. Connections for leads from temperature detector No. 10
2. Connections for leads from temperature detector No. 9
3. Connections for leads from temperature detector No. 8
4. Connections for leads from temperature detector No. 7
5. Connections for leads from temperature detector No. 6
6. Connections for leads from temperature detector No. 5
7. Connections for leads from temperature detector No. 4
8. Leads from temperature detector No. 3
9. Leads from temperature detector No. 2
10. Leads from temperature detector No. 1
11. Insulation
12. Lead terminal
13. Cover for terminal board
14. Base for terminal board
15. Grounding strip
16. Stud for attaching to support
17. Temperature detector located in armature slot
18. Lead support
19. Hole for screw for stator frame and 18
20. Armored leads - temperature detector
21. Nut for 16
22. Nut for 23
23. Upset stud for 12
24. Lockwasher for 22
25. Acorn nut - for holding cover in place with 16
26. Washer for 21 and 25
27. Washer for 23
28. Leads from temperature meter

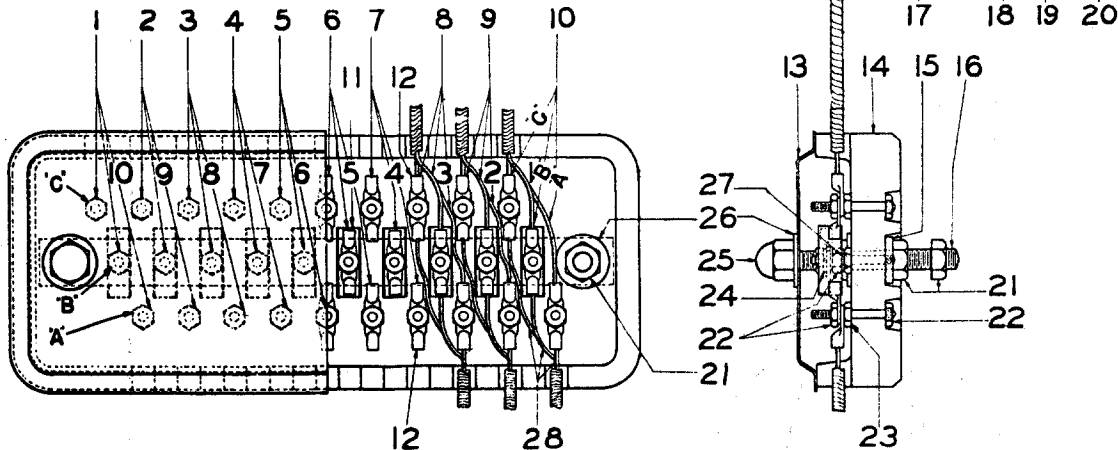


Fig. 7 Terminal Board For Resistance Temperature Detectors

Fig. 7 (GEI-25371)



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