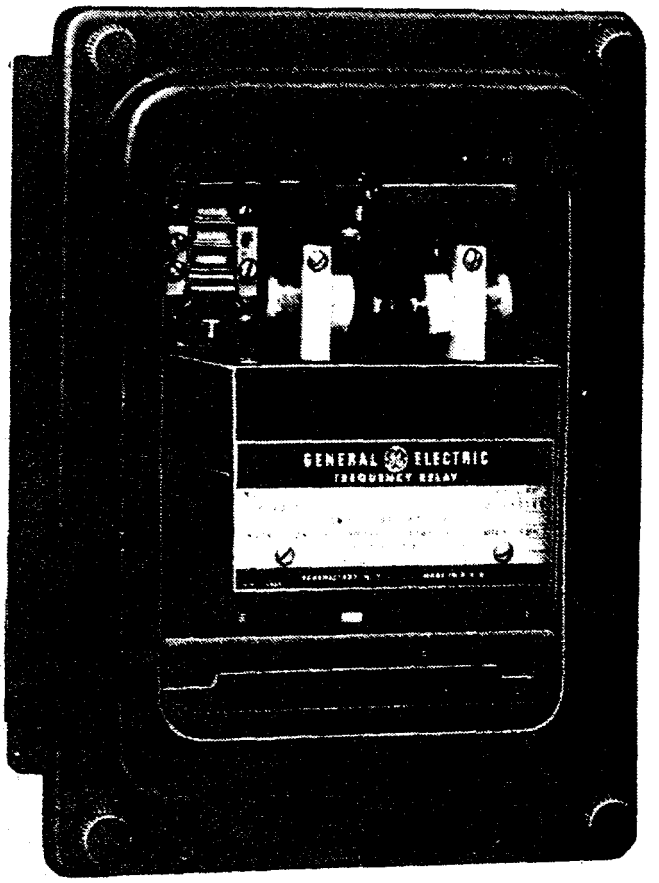
INSTRUCTIONS

GEI-44246D

SUPERSEDES GEI-44246C

UNDERFREQUENCY RELAY



Type CFF13A

GENERAL ELECTRIC

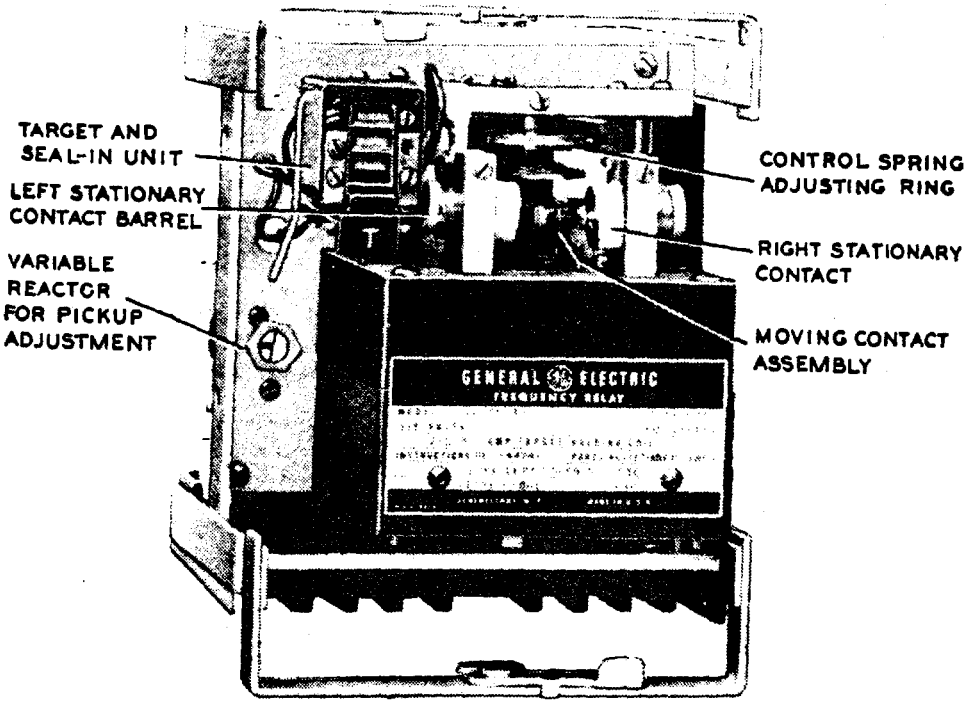


Fig. 1 (8021164) Type CFF13A Relay Removed From Case (Front View)

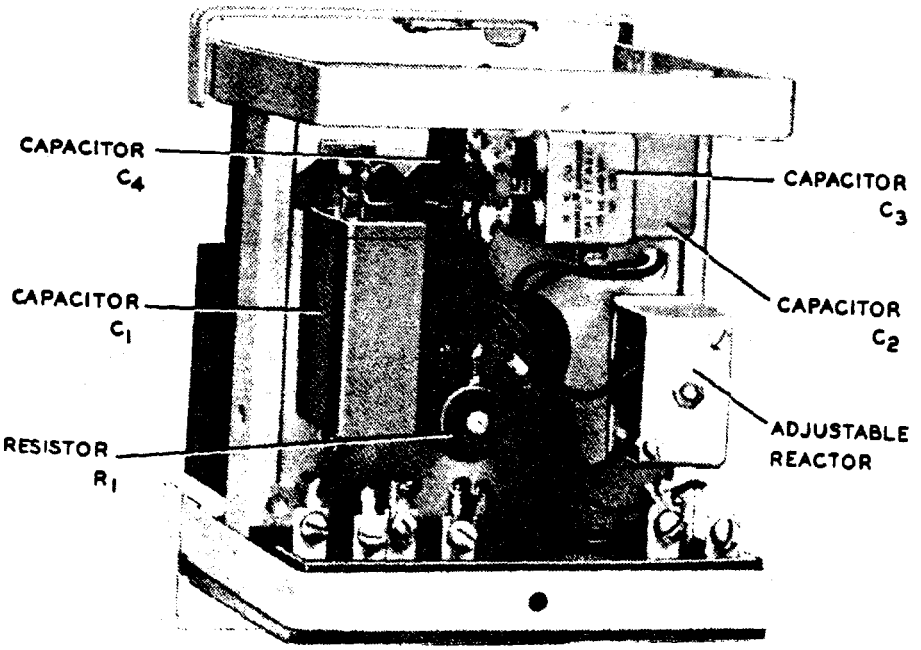


Fig. 2 (8021165) Type CFF13A Relay Removed From Case (Rear View)

Cover (8021166)

UNDERFREQUENCY RELAY
TYPE CFF13A

APPLICATION

The Type CFF13A relay is an induction cylinder device for the determination of under frequency conditions. The Type CFF13A relay should be considered only where the CFF12 cannot be used because the CFF13 has severe limitations on removal of potential. The operating elements employ tuned circuits which control the transient characteristics under system conditions of faults which suddenly reduce the voltage, even to zero, and which restore suddenly when the fault is cleared. This feature provides high speed operation, since a time delay auxiliary unit is not required to ride-out these transient conditions. The relay is also insensitive to the sudden application of voltage, however false operation will occur should the potential be suddenly removed such as switching from one source to another; or when the potential is interrupted by blowing a fuse to its potential supply. Since General Electric practice is not to use secondary potential transformer fuses, this difficulty is avoided.

If secondary fuses are insisted upon; then use separate secondary fuses for the CFF13 exclusively to free it from false operation due to fuse blowing on the remainder of the load supplied by the potential transformers such as meters and other relays. The use of fuses in the 35-60 ampere range for the CFF relay will also free it from false operation from temporary faults caused by accidentally short circuiting the potential supply by a dropped tool and the like.

The CFF13A then is ideally suited where high speed coordination between breakers is required. The necessity for this coordination usually arises where instantaneous first reclosure is employed on breakers protecting transmission lines that feed industrial loads with generation. The industrial load breaker is required to be tripped by the CFF13A relay, before the feeder is re-energized by the utility breakers reclosing instantaneously, as otherwise the industrial generation could be out of step with the utility system generation at the instant of reclosing. The rate of frequency drop after tripping the utility breakers will determine whether the CFF13A is applicable.

Where extra fast relay operation is not required, the CFF12A with 6-cycle delay should receive first consideration. The CFF12A is similar to the CFF13A except a 6-cycle delay by means of an auxiliary telephone relay is used to prevent false tripping because of dips and recoveries in the source voltage. The added delay in the CFF12 gives it an advantage for locations such as metal panels or swinging doors where it will be exposed to vibration and shock.

OPERATING CHARACTERISTICS

The relay operates to close its open contact when the applied source frequency is below a predetermined value. A typical time-frequency curve is shown in Fig. 3. The voltage-frequency curve is shown in Fig. 4.

RATINGS

The Type CFF13A underfrequency relay is rated 115 volts, at 50 or 60 cycles. It has a frequency range of 45 - 49.5 cycles and 55 - 59.5 cycles for the 50 and 60 cycle relays, respectively.

CONTACTS

The current closing rating of the trip circuit contact is 30 amperes for voltages not exceeding 250 volts. This contact must not be permitted to open while trip current is flowing. The current-carrying rating is limited by the two forms of the target-seal-in coils.

TARGET SEAL-IN

Table I list the ratings of the target seal-in unit. The current values are either AC or DC.

TABLE I

	2.0 Amp Tap	0.2 Amp Tap
Operating Range	2-30	0.2-2.0
Tripping Duty	30	5
Continuous Duty	3	0.3
Impedance at 60 Cycles	.53	52
Resistance DC	.13	7

If the tripping current exceeds 30 amperes an auxiliary relay should be used, the connections being such that the tripping current does not pass through the contacts or the target and seal-in coils of the protective relay.

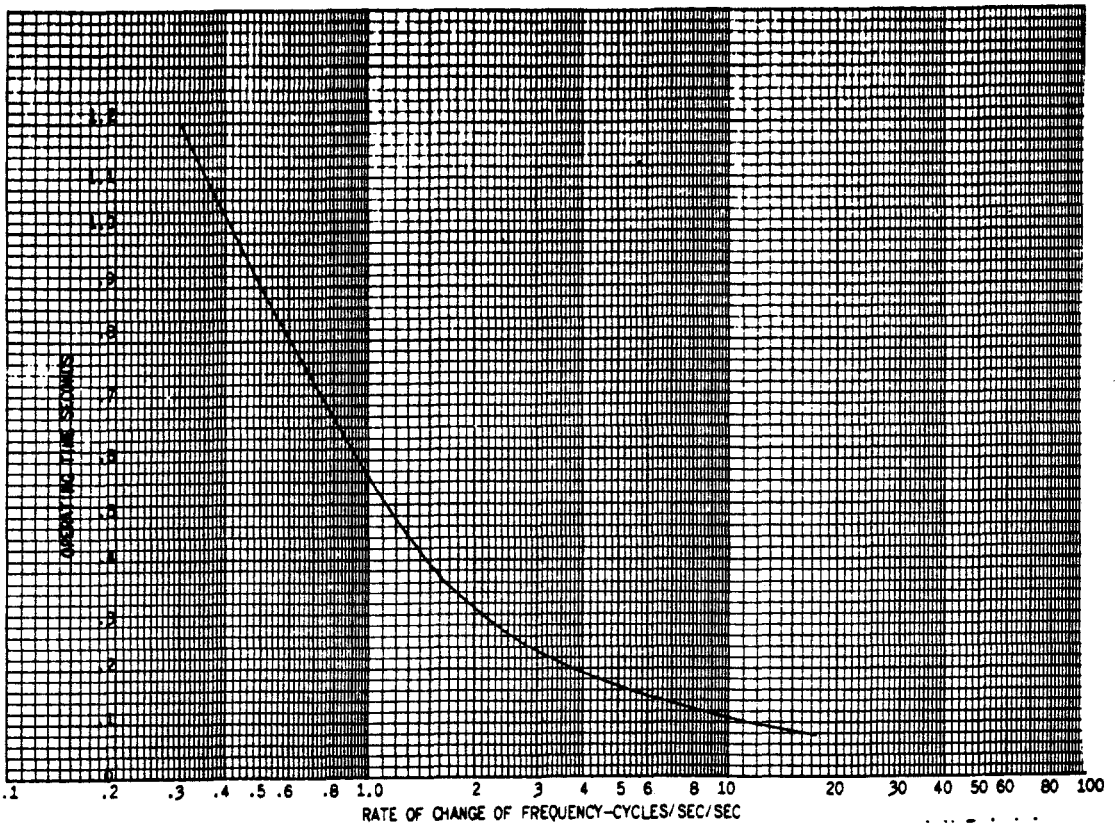


Fig. 3 (418A757-1) Time-Frequency Characteristic -- Operating Time After System Frequency Reaches Relay Setting

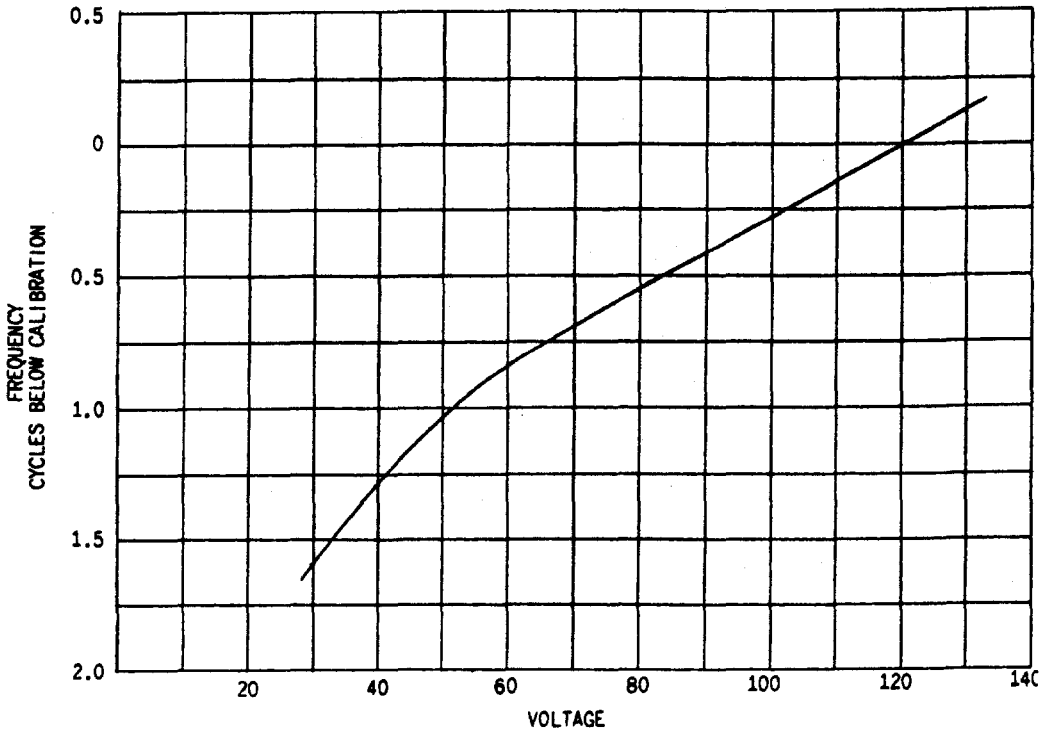


Fig. 4 (418A756-0) Frequency-Voltage Characteristic -- Change In Frequency Due To Change In Voltage

BURDENS

Table II lists the burden data for the 50 and 60 cycles relays at 115 volts and unit power factor.

TABLE II

Relay Freq. Rating	Calib. Cycles	Volt-Amps	Watts
50 Cycles	45.0 49.5	11.5 12.0	10.2 11.4
60 Cycles	55.0 59.5	15.9 16.4	15.8 15.9

RECEIVING, HANDLING AND STORAGE

These relays, when not included as 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 unpacking the relay in order that none of the parts are injured or the adjustments distrubed.

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

The Type CFF13A relay is an induction cup underfrequency relay. One open contact and one closed contact are available for external circuit connections. The two contact circuits are electrically separate. The left contact closes at a frequency below rated value by a predetermined amount. The frequency at which this contact closes is adjusted by means of a variable reactor (see Fig. 1) which is mounted in the relay case. The right contact is closed when the relay is de-energized, and also when the relay is energized at or above rated frequency. This relay also has a target-seal-in unit which is connected in the normally open contact circuit. The target indicates relay operation while the seal-in contacts maintain the trip circuit during tripping operation. The relay is mounted in a small single-end drawout case.

INTERNAL CONSTRUCTION

CUP AND STATOR

These relays are induction cylinder services for alternating current circuits. (See Fig. 1). 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 magnet core. The poles are wound 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, thus making these relays more sensitive.

CONTACT STRUCTURE

The contacts are silver-to-silver elements and are constructed with a non-bounce feature to insure a positive circuit closure. Fig. 5 shows the arrangement of the contact meachanism. The stationary contact (G) is mounted on a flat spiral spring (F) which is spaced from a thin diaphragm (C) by a washer (D). The cap (E) holds these in place on a slightly inclined tube (A) which contains a close fitting stainless steel ball (B). The energy of the moving contact is transferred to the spring and steel ball with the result that there is little or no rebound or vibration of the closing contacts.

The moving contacts are supported on a molded plastic arm which is attached to the rotor shaft. The arm is held from rotating freely by a control spring. This spring maintains a slight torque in the direction to close the right-hand contacts, and so holds them closed when the relay is de-energized.

TARGET UNIT

Relay, Type CFF13A, has a target-seal-in unit. The unit has a coil, and a hinged armature which is attracted upward to the core when current flows in the coil. The armature carries spring-backed contacts which bridge two stationary contacts when fully picked-up. As the contacts are raised they lift an orange colored target indication which latches in place. The indicator is reset by means of a

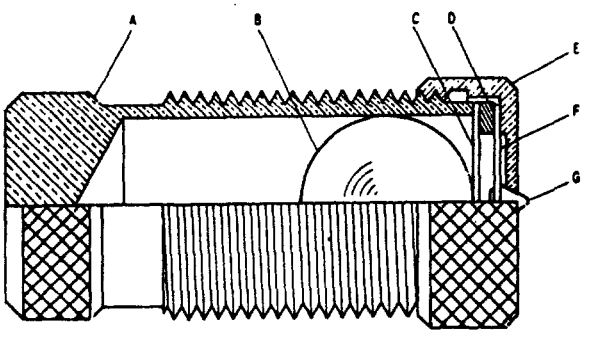


Fig. 5 (6077069-3) Stationary Contact Assembly

lever release operated from a reset button which extends through the lower left corner of the relay cover.

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 drilling for either surface or semiflush panel mounting is shown in Fig. 8.

CONNECTIONS

The internal connections diagram is shown in Fig. 6. A typical external connections diagram is shown 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.

ADJUSTMENTS

The relays are calibrated at the factory and should not require any further adjustment. If it is desirable to check the frequency characteristic, follow the procedure outlined under MAINTENANCE. At the time of installation of the Type CFF13A relay, the proper tap setting of the target-seal-in unit should be chosen. In changing taps it is recommended that the screw from the opposite stationary contact be inserted in the vacant tap before the existing tap screw is loosened. This will preserve the factory adjustment of the contact wipe and alignment.

MAINTENANCE

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.

SHAFT AND BEARINGS

The lower jewel screw can be removed from the unit by means of an offset screw driver or an end wrench. The 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.

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 of the shaft.

CYCLES	60	40	50
C1	1.5 MUF	2 MUF	.05 MUF
C2	0.5 MUF	.75 MUF	0.5 MUF
C3	.05 MUF	.25 MUF	.75 MUF
C4	-	-	1 MUF
C5	.04 MUF	.04 MUF	.04 MUF
C6	-	-	.04 MUF
R1	380 Ω	-	-

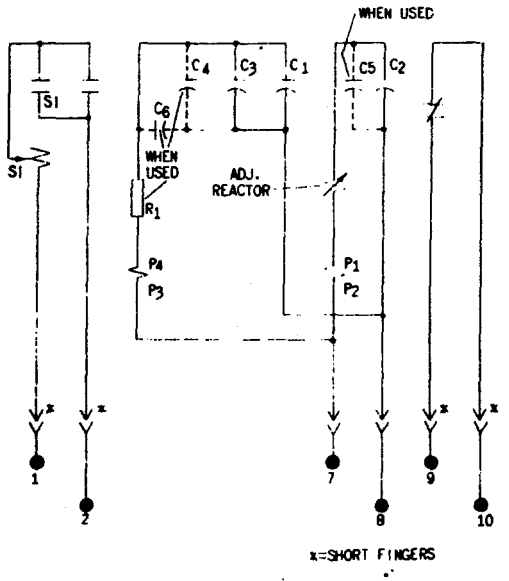


Fig. 6 (459A247-0) Internal Connection Diagram

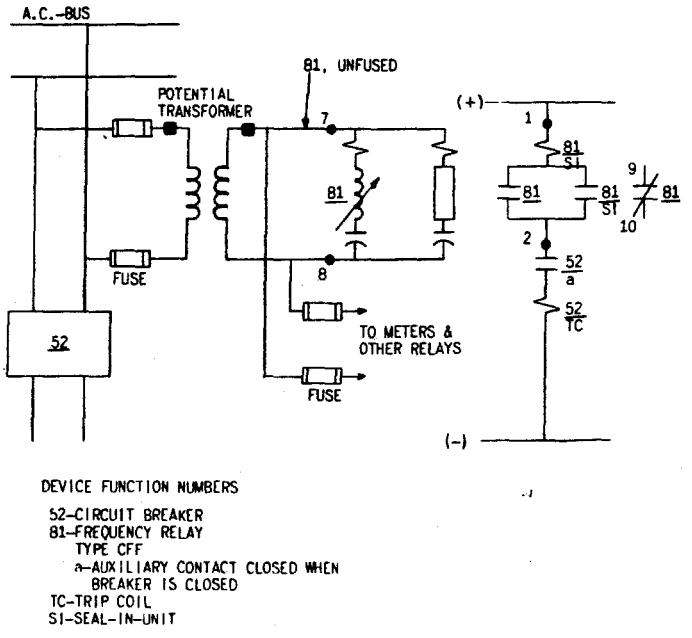


Fig. 7 (418A754-1) External Connection Diagram

To check the clearance between the iron core and the inside of the rotor cup, press down on the contact arm near the shaft, and thereby depress the spring mounted jewel until the cup strikes the iron. The shaft and cup should move about 1/16 inch.

CUP AND STATOR

If it is necessary to remove the rotor from the unit, the following procedure should be followed.

The leads should first be removed from the contact structure and tagged for identification in reconnecting. Then remove the three flat head screws which fasten the unit to the mounting plate from the back. Tilt the stator forward and remove the four corner screws which hold the contact head to the stator. The entire top structure with the rotor can then be lifted away from the stator to give access to the assembly. Care should be taken not to strain the leads entering the back of the stator. Unless there is reason for removing the stator from the cradle, these leads need not be disconnected.

To remove the shaft and rotor from the contact head assembly, the spring clip at the top of the shaft must be pulled out, and the clutch adjusting screw and spring taken out of the molded contact arm.

The rotor should be handled carefully while it is out of the unit, and the stator should be protected to keep it free from dust or metallic particles.

In reassembly, the rotor will go into the air gap easily if the parts are held in proper alignment.

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 of 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.

CONTACT ADJUSTMENT

Should it be necessary to change the stationary contact mounting spring (F) (Fig. 5), 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 and spring may then be removed.

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

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

The right contact should hold the moving contact arm in a neutral position, i.e., with it pointing directly forward. Bring the left stationary contact up until it just touches the moving contact by rotating the barrel. Then back it away two full turns to obtain 1/16 inch contact gap. Tighten the screws which secure the contact barrels.

CLUTCH ADJUSTMENT

If for any reason the moving contact arm has been removed or loosened from the rotor shaft it will be necessary to reset the clutch. The screw on the side of the contact arm should be tightened as far as possible so that the clutch is unable to slip.

CALIBRATION PROCEDURE

In order to calibrate this relay a source of variable frequency is required. The relay should be connected to the source as indicated in the external connection diagram, Fig. 7. An indicating lamp should be substituted for the breaker trip coil. A reliable frequency meter should be used when setting the relay for maximum frequency of 49.5 or 59.5 cycles, depending on the model relay.

With the relay de-energized, the control spring should be adjusted as follows:

1. Complete the contact adjustments as described previously.
2. Loosen the hexagonal locking screw which holds the back of the adjusting ring.
3. Turn the adjusting ring until the right contacts just part.
4. Turn the adjusting ring in the opposite direction (to close the right contact) 3/8 inch measured on its periphery. Tighten the hexagonal locking screw.
5. Apply rated voltage at tripping frequency to the cup unit.
6. Loosen nut on variable reactor and adjust until the left contacts just close. The nut on the reactor should be tightened in this position.

PERIODIC TESTING

Inspection of the relay at intervals of six months is recommended.

Inspection should include a check of contact conditions, a search for foreign matter, and a test of the freedom of movement of the moving contact arm.

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 of the relay. Refer to parts publication GEF-3857. If possible, give the General Electric Company requisition number on which the relay was furnished.

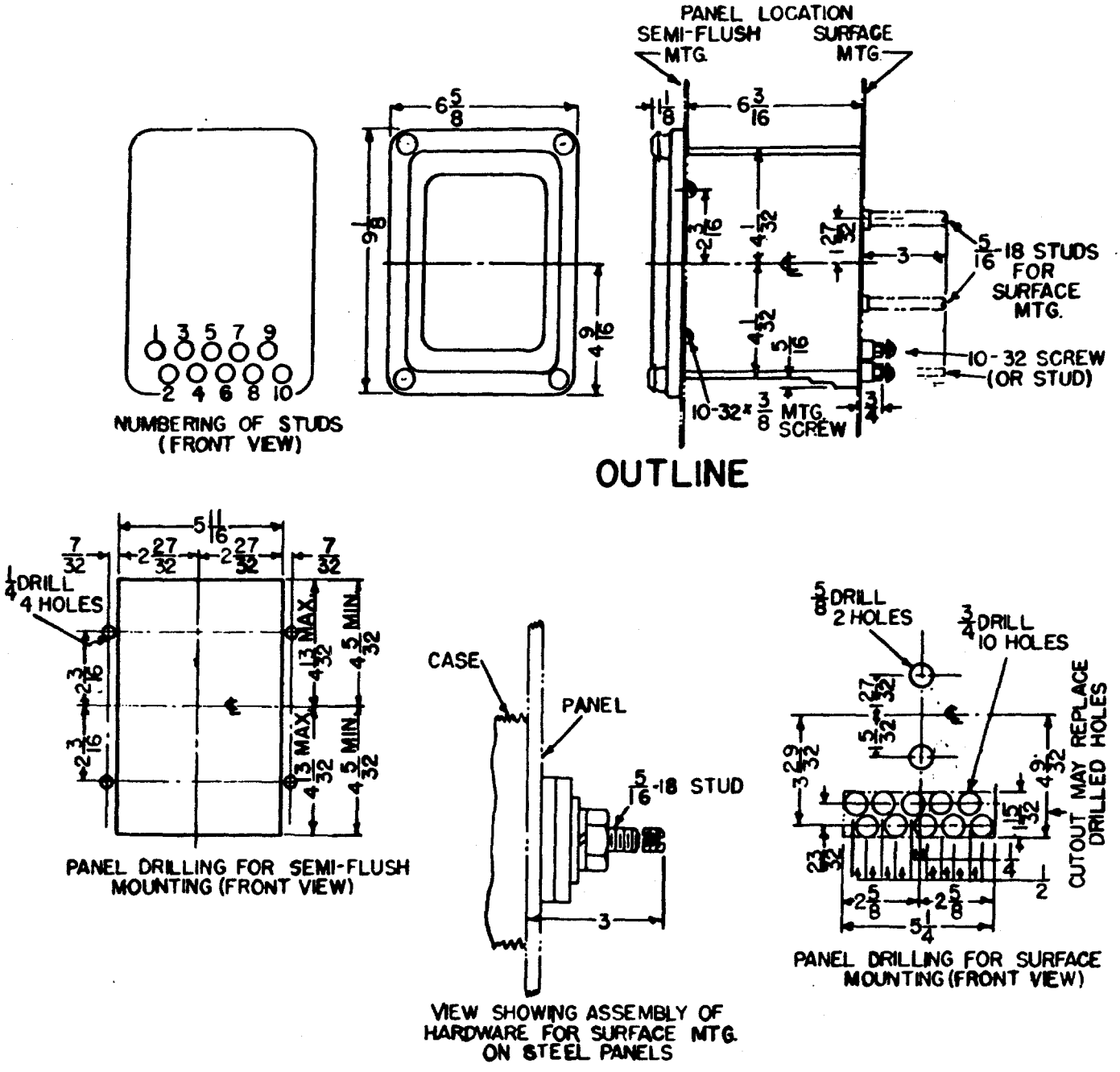


Fig. 8 (K-6209271-3) Outline And Panel Drilling Dimension Diagram