INSTRUCTIONS

GEH-2044A

SUPERSEDES GEH-2044

HANDBOOK REFERENCE - 7264

DIRECTIONAL OVERCURRENT RELAYS

Types

CJC15E and CJCG15E21 and Up

POWER SYSTEMS MANAGEMENT DEPARTMENT

GENERAL ELECTRIC

PHILADELPHIA, PA.

DIRECTIONAL OVERCURRENT RELAYS TYPES CJC15E AND CJCG15E

INTRODUCTION

The Type CJC relay is a phase-directional overcurrent relay used primarily for the protection of feeders and transmission lines in applications where single-phase relays are desired or required.

The Type CJCG relay is a ground directional overcurrent relay which is used for the protection of feeders and transmission lines. The directional unit of this relay is dual polarized.

Types CJC and CJCG relays consist of an induction-cup directional unit (bottom) and an induction-cup instantaneous overcurrent unit (top) mounted in a two-unit, single end, drawout case.

APPLICATION

PHASE FAULTS

The Type CJC15E relay may be used for directional phase-to-phase fault protection of a single line as illustrated in Fig. 4. The quadrature or 90 degree connection of current and potential transformers, as shown in Fig. 4 is recommended as providing the most reliable potential for the directional unit during usual fault conditions. With this connection, the current (at unity power factor load) leads the potential by 90 degrees at the relay terminals. The directional unit has maximum torque when the fault current lags the unity-power-factor position by about 45 degrees. The quadrature connection is used with this relay because fault currents are usually highly lagging. With these connections the directional unit will have substantially maximum torque under usual fault conditions.

GROUND FAULTS

The Type CJCG15E relay may be used for directional overcurrent protection on ground faults as shown in Fig. 5 and Fig. 6. The directional unit of the Type CJCG relay is dual-polarized and may be polarized by current alone, voltage alone, or by both simultaneously. The simultaneous use of both sets of polarizing coils is advantageous on applications where current and potential polarizing sources are available and there is a possibility that one or the other source may be temporarily lost. When potential polarized, the potential coils of the relay are connected to a potential transformer which is connected in wye-broken delta. (Broken delta means a complete delta, with one corner left open and should not be confused with the open-delta of V-connection of two transformer windings.) If the potential transformers are connected wye-wye instead of wye-broken delta, auxiliary wye-broken delta potential transformers (Type YT-1557) should be used to obtain the necessary voltage. When current polarized, the current polarizing coils of the Type CJCG relay are connected to a current transformer in the neutral of the power transformer.

OPERATING CHARACTERISTICS

TYPE CJC15E RELAYS

The directional unit of the Type CJC15E relay has maximum torque when the current through the relay leads the voltage at the relay by 45 degrees. Therefore, the quadrature connections explained under APPLICATION will give the relay maximum torque when the line current lags its unity-power-factor position by 45 degrees. At the angle of maximum torque, the directional unit will operate at one percent of rated voltage with current as listed in Table I. The directional unit characteristics are shown in Fig. 12, Fig. 13, and Fig. 14.

TABLE I

DIRECTIONAL UNIT PICKUP CURRENT AT ONE PERCENT OF RATED VOLTAGE

RELAY RATING (AMPERES)	PICKUP CURRENT (AMPERES)
0.5-2	2
1-4	2
2-8	2
4-16	4
10-40	11
20-80	11

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.

To the extent required the products described herein meet applicable ANSI, IEEE and NEMA standards; but no such assurance is given with respect to local codes and ordinances because they vary greatly.

The instantaneous overcurrent unit in the relay will not operate until the contacts of the directional unit close and complete the control winding circuit through capacitor, C_1. The time characteristic for this unit is shown in Fig. 16.

Type CJC15E relay has single circuit closing contacts. In addition, a directional unit contact is brought out to a separate stud. The relay is furnished with a 0.2/2.0 target and seal-in unit.

TYPE CJCG15E RELAYS

Type CJCG15E relay has a contact arrangement and directional control of the instantaneous overcurrent unit similar to Type CJC15E relay. It is also furnished with a 0.2/2.0 target and seal-in unit. Time characteristics of the directional and instantaneous overcurrent units are shown in Fig. 15 and Fig. 16 respectively.

The directional unit of the Type CJCG15E relay is rated for a minimum pickup from 3.6 to 14.4 volt-amperes when potentially polarized and produces maximum torque when the current lags the voltage by 60 degrees.

When current polarized, the product pickup of amperes times amperes is 0.25 to 1.0. With current polarization, the directional unit produces maximum torque when the operating and polarizing currents are in phase.

When dual polarization is used, the directional unit pickup may be explained by the following equation for pickup at the minimum setting:

$$3.6 = I_0 V_P \cos(\theta - 60^\circ) + 14.4\ I_0 I_P \cos \phi$$

where: I_0 = operating current (amps)
V_P = polarizing voltage (volts)
I_P = polarizing current (amps)
θ = angle by which I_0 lags V_P
ϕ = angle between I_0 and I_P

RATINGS

CURRENT COILS

All current coils of Types CJC15E and CJCG15E relays are rated to carry 5 amperes continuously at rated frequency with the exception of the 0.5-2 ampere relay which is rated at 2.5 amperes continuously. Table II lists the short time ratings of the current operating circuits.

Type CJCG15E relay current polarizing coils have a one second rating of 150 amperes.

POTENTIAL COILS

Type CJC15E relay is rated for continuous operation with 120 volts on the potential circuit at rated frequency.

Type CJCG15E relay potential coils have an intermittent (4 minutes) rating of 120 volts and a short time (10 seconds) rating of 360 volts at rated frequency.

TABLE II

SHORT TIME RATINGS OF CURRENT OPERATING CIRCUIT

RANGE	CJC15E	CJCG15E
0.5-2	80	80
1-4	150	150
2-8	150	150
4-16	150	150
10-40	220	150
20-80	220	150

CONTACTS

Type CJC15E and CJCG15E relays have a contact current-closing rating of 30 amperes for voltages not exceeding 250 volts. The current-carrying rating is limited by the tap rating of the target and seal-in unit.

SEAL-IN UNIT

The rating and impedance of the seal-in unit for the 0.2 and 2 ampere taps are given in Table III. The tap setting used will depend on the current drawn by the trip coil.

TABLE III

SEAL-IN UNIT RATINGS

	2 AMP TAP	0.2 AMP TAP
Carry-Tripping Duty	30 Amps	5 Amps
Carry Continuously	4 Amps	0.4 Amps
D-C Resistance	0.13 Ohms	7.5 Ohms
Impedance (60 cycles)	0.53 Ohms	52 Ohms

The 0.2 ampere tap is for use with trip coils which operate on currents ranging from 0.2 up to 2.0 ampere at the minimum control voltage. If this tap is used with trip coils requiring more than 2 amperes, there is a possibility that the resistance of 7.5 ohms will reduce the current to so low a value that the breaker will not be tripped.

The 2-ampere tap should be used with trip coils that take 2 amperes or more at minimum control voltage, provided the current does not exceed 30 amperes at the maximum control voltage. If the tripping current exceeds 30 amperes, the connections should be arranged so that the instantaneous overcurrent unit contacts will operate an auxiliary relay which in turn energizes the trip coil or coils. On such an application, it may be necessary

to connect a loading resistor in parallel with the auxiliary relay coil to allow enough current to operate the target seal-in unit.

BURDENS

TYPE CJC15E RELAYS

The potential circuit burden of the directional unit at 60 cycles and rated voltage is 10 volt-amperes at 0.89 power factor. Table IV lists the total current circuit burden of the instantaneous overcurrent and directional units.

TABLE IV

CURRENT CIRCUIT BURDEN AT 5 AMPS, 60 CYCLES TYPE CJC15E RELAYS

CURRENT RANGE (AMPS)	IMPED. (OHMS)	VOLT AMPERES	POWER FACTOR
0.5-2	1.59	39.8	0.58
1-4	0.80	19.9	0.53
2-8	0.58	14.5	0.38
4-16	0.13	3.2	0.38
10-40	0.03	0.7	0.38
20-80	0.03	0.7	0.38

TYPE CJCG15E RELAYS

The capacitive burden of the directional unit potential polarizing circuit at 60 cycles and rated voltage is 19.6 volt-amperes at 0.87 power factor.

The burden, for all relay ratings, of the directional unit current polarizing circuit at 5 amperes and 60 cycles is 8.6 volt-amperes at 0.95 power factor with an impedance of 0.35 ohm.

Table V lists the total operating current circuit burden of the instantaneous overcurrent and directional units.

TABLE V

CURRENT CIRCUIT BURDEN AT 5 AMPS, 60 CYCLES TYPE CJCG15E RELAYS

RELAY RATING (AMPS)	IMPED. (OHMS)	VOLT-AMPERES	POWER FACTOR
0.5-2	1.40	35.0	0.39
1-4	0.66	16.5	0.39
2-8	0.53	13.2	0.39
4-16	0.50	12.5	0.39
10-40	0.48	12.0	0.58
20-80	0.48	12.0	0.58

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 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

DIRECTIONAL UNIT

The directional unit is of the induction-cylinder construction with a laminated stator having eight poles projecting inward and arranged symmetrically around a stationary central core. The cup-like aluminum induction rotor is free to operate in the annular air gap between the poles and the core. The poles are fitted with current operating coils and potential or current polarizing coils.

The principle by which torque is developed is the same as that of an induction disk relay with a wattmetric element, although, in arrangement of parts, the unit is more like a split-phase induction motor. The induction-cylinder construction provides higher torque and lower rotor inertia than the induction-disk construction, resulting in a faster and more sensitive relay.

INSTANTANEOUS OVERCURRENT UNIT

The unit is similar in construction to the directional unit described above, differing only in coils turns and connections. The four corner coils consist of two windings, an inner winding consisting of a large number of turns of fine wire, and an outer winding having a few turns of heavy wire. The outer windings of the corner coils are connected in series with the two side coils. The inner windings of the corner coils are all connected in series, and in turn are connected in series with a capacitor and the contacts of the directional unit. This circuit thus controls the torque of the instantaneous overcurrent unit. When the directional unit contacts are open, the instantaneous unit will develop no torque. When the directional unit contacts are closed, the

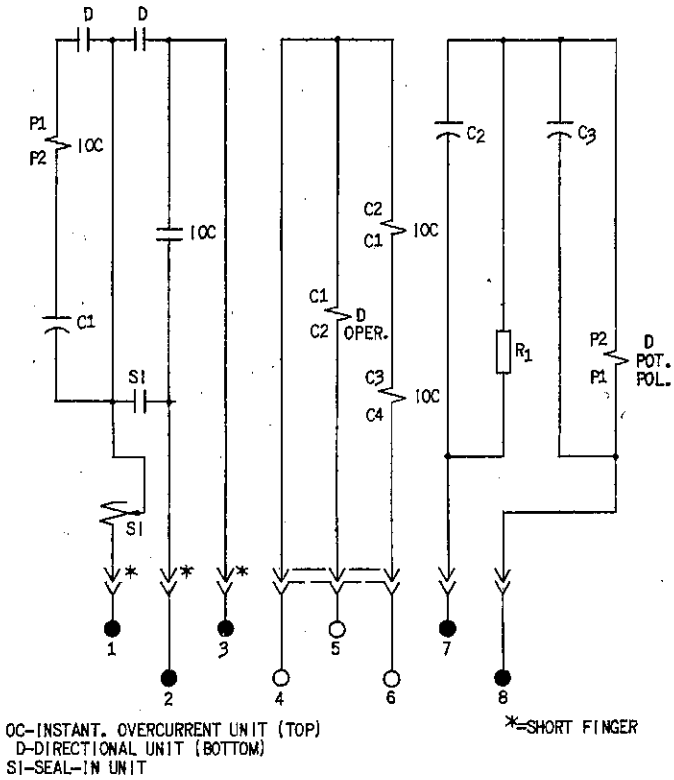


Fig. 1 Internal Connections For Type CJC15E Relay (Front View)

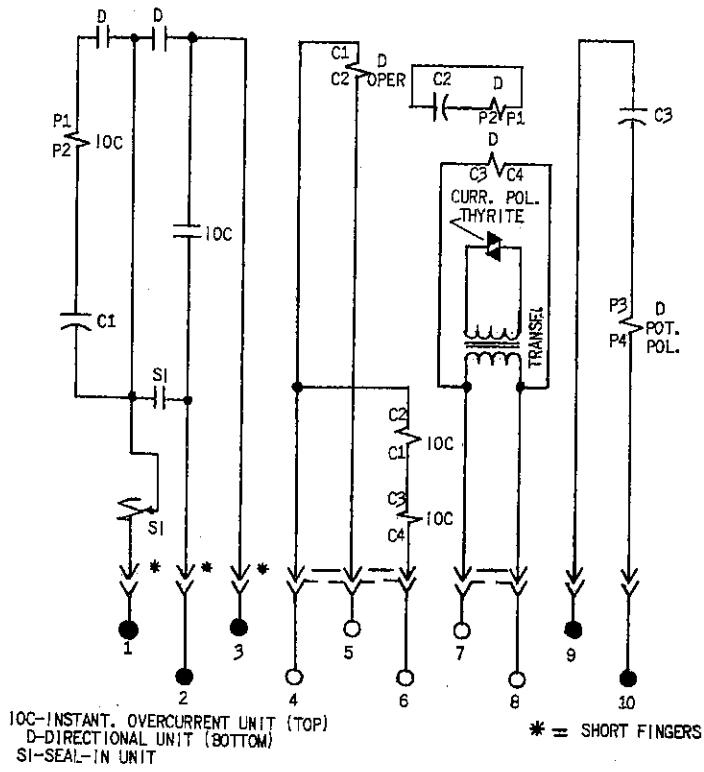


Fig. 2 Internal Connections For Type CJCG15E Relay (Front View)

Fig. 1 (418A875-)

Fig. 2 (0104A8984)

instantaneous unit will develop torque in proportion to the square of the current.

SEAL-IN UNIT

A seal-in unit is mounted on the left side of the instantaneous overcurrent unit. This unit has its coil in series and its contacts in parallel with the main contacts of the instantaneous overcurrent unit, arranged in such a manner that when the main contacts close, the seal-in unit picks up and seals-in around the main contacts. When the seal-in unit operates, it raises a target into view which latches up and remains exposed until manually released by pressing the button located at the lower-left corner of the cover.

CONTACTS

The contacts of both units shown in Fig. 3, are especially constructed to suppress bouncing. The stationary contact (G) 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 then to the ball, which is free to roll up the inclined tube. Thus, the moving contact comes to rest with substantially no rebound or vibration. To change the stationary contact mounting spring, 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 its flat spiral mounting spring may then be removed.

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. 17.

CONNECTIONS

Internal connection diagrams for the various relay types are shown in Figs. 1 and Fig. 2. Typical wiring diagrams are given in Fig. 4 to 6 inclusive.

Unless mounted on a steel panel which adequately grounds the relay case, it is recommended that the case be grounded through a mounting stud or screw with a conductor not less than #12 B & S gauge copper wire or its equivalent.

Fig. 3 (K-6077069-2)

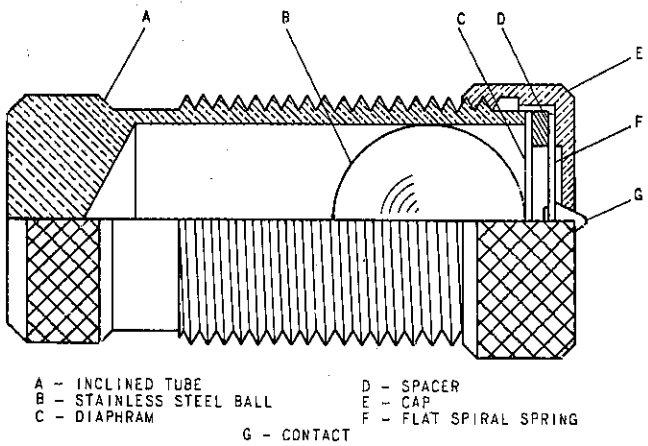


Fig. 3 Barrel Contact Assembly For Directional And Instantaneous Overcurrent Units

Fig. 4 (418A929-0)

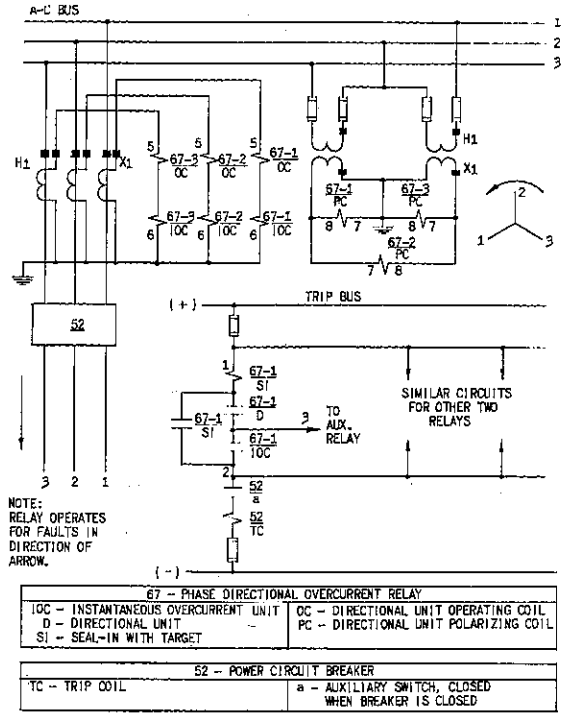


Fig. 4 External Connection Of Three Single Phase Type CJC15E Relays For Directional Phase Fault Protection Of A Single Line

Fig. 5 (418A935-2)

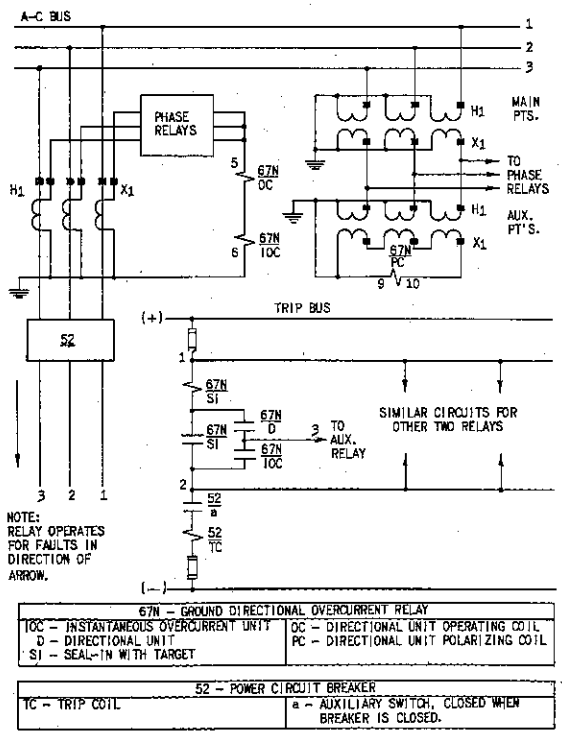


Fig. 5 External Connections For Type CJCG15E Relay For Directional Ground Fault Protection Of A Single Line (Potential Polarization)

Fig. 6 (418A936-2)

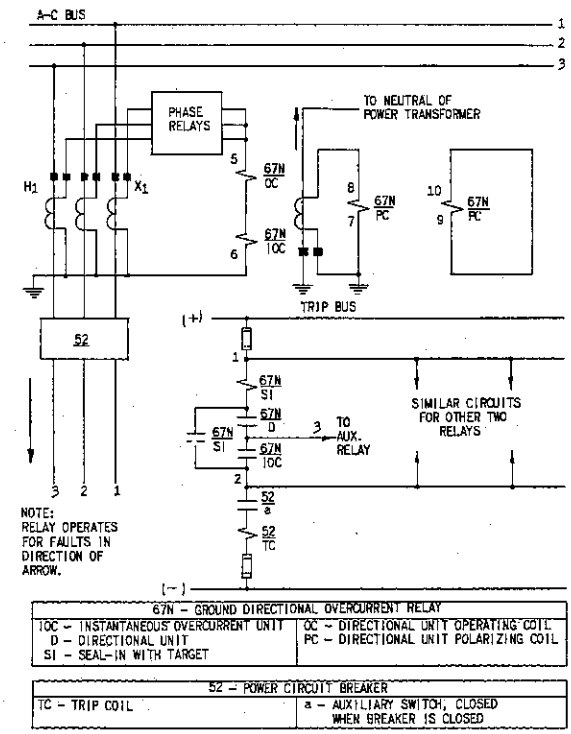


Fig. 6 External Connections For Type CJCG15E Relay For Directional Ground Fault Protection Of A Single Line (Current Polarization)

INSPECTION

At the time of installation, the relay should be inspected for tarnished contacts, loose screws, or other imperfections. If any trouble is found, it should be corrected in the manner described under MAINTENANCE.

OPERATION

Before the relay is put into service, it should be given a check to determine that factory adjustments have not been disturbed.

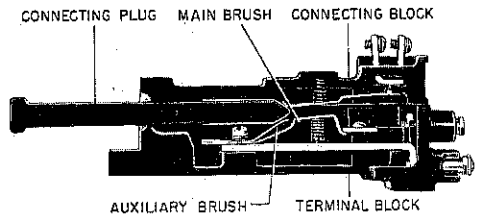
ADJUSTMENTS

PICKUP

The pickup of each unit is adjusted by means of the spring adjusting ring. The ring may be turned by inserting a tool in the holes around the edge after the locknut is loosened. The adjustment permits any desired setting within the range of the unit.

CAUTION

Every circuit in the drawout case has an auxiliary brush. It is especially important on current circuits and other circuits with shorting bars that the auxiliary brush be bent high enough to engage the connecting plug or test plug before the main brushes do. This will prevent CT secondary circuits from being opened.



NOTE: AFTER ENGAGING AUXILIARY BRUSH, CONNECTING PLUG TRAVELS 1/4 INCH BEFORE ENGAGING THE MAIN BRUSH ON THE TERMINAL BLOCK.

Fig. 7 Cross Section of Drawout Case Showing Position of Auxiliary Brush

Fig. 7 (8025039)

ADJUSTMENTS

ADJUSTMENTS OF TYPE CJC15E RELAY

POLARITY CHECK

The polarity of the external connections to the directional unit may be verified by observing the direction of contact armature torque when the line is carrying load at unity power factor, or slightly lagging power factor. Note that in most directional overcurrent relay applications, the desired direction is contact closing for power flow away from the bus. In case of doubt refer to Fig. 10 for a more accurate method of checking the polarity of the connections.

Fig. 8 shows the test connection for checking the polarity of the directional unit itself.

TARGET AND SEAL-IN UNIT

When used with trip coils operating on currents ranging from 0.2 to 2.0 amperes at the minimum control voltage, the target and seal-in tap screw should be set in the 0.2-ampere tap. When the trip coil current ranges from 2 to 30 amperes at the minimum control voltage, the tap screw should be placed in the 2.0 ampere tap.

The seal-in tap screw is the screw holding the right-hand stationary contact of the seal-in unit. To change the tap setting, first remove the connecting plug. Then take a screw from the left-hand stationary contact and place it in the desired tap. Next, remove the screw from the other tap and place it back in the left-hand contact. This procedure is necessary to prevent the right-hand stationary contact from getting out of adjustment. Tap screws should not be in both taps at the same time.

PICKUP - DIRECTIONAL UNIT

With the directional unit de-energized, the control spring should have barely enough tension to return the moving contact arm to the neutral position where it rests against the backstop. The relay will have the proper adjustment for pickup when the control spring adjusting ring is rotated about 1/2 inch from the neutral position in a direction such that the spring tension holds the contact arm against the backstop.

PICKUP - INSTANTANEOUS OVERCURRENT UNIT

Connect studs 4 and 6 to a power source of rated frequency through a variable resistor and an ammeter. Block the directional unit contacts closed. Adjust the control spring of the instantaneous overcurrent unit so the normally open contact just closes when the desired pickup current is applied. Lock the control spring locking screw.

ADJUSTMENTS OF TYPE CJCG15E RELAY

POLARITY CHECK

The polarity of the external connections to the directional unit, when it is potential polarized, may be checked using load currents. The idea is to obtain current from one current transformer and voltage from the same phase. The voltage is obtained by removing phase 1 from the primary of the wye-broken-delta transformer and shorting the phase-one primary winding. Current is obtained by shorting the current transformers in phases two and three and opening their circuits to the relay. This permits the current transformer in phase one to supply the operating current.

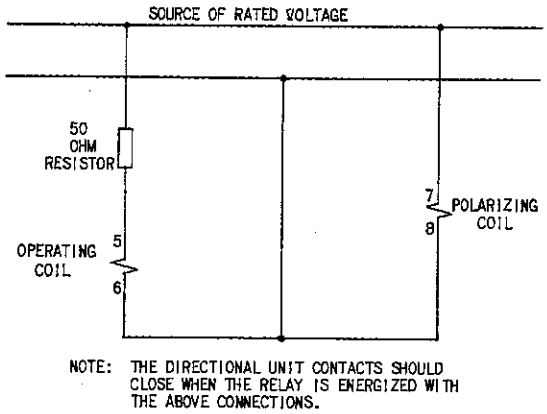


Fig. 8 Test Connections for Checking Polarity of the Internal Wiring of Type CJC15E Relay

Fig. 8 (418A970-0)

Connect a phase angle meter to read the angle between the current and voltage supplied to the relay. The relay has maximum torque at 60 degrees lag. With power flowing in the proper direction for operation, the relay should operate for phase angles within plus or minus 60 degrees of the maximum torque angle.

If the unit is current polarized from a current transformer in the power transformer neutral, such a check is not easily made. It is sometimes practical to introduce a single phase current in one phase of the primary circuits in such a way that current flows through both the transformer neutral current transformer and one of the line current transformers. If this cannot be done, a careful wiring check must suffice.

Fig. 8 shows the test connections for checking the polarity of the directional unit itself.

TARGET AND SEAL-IN UNIT

This adjustment is the same as that of the Type CJC15E relay.

PICKUP - DIRECTIONAL UNIT

To check or make adjustments for current polarization, jumper studs 6 and 7 and connect studs 5 and 8 to a power source of rated frequency through a variable resistor and an ammeter. Loosen the hexagonal locking screw on the upper control spring adjusting ring and wind up or loosen the control spring so that the contacts just close when the desired $I_0 \times I_p$ pickup described under OPERATING CHARACTERISTICS is applied to the unit. Lock the adjusting ring at the desired pickup.

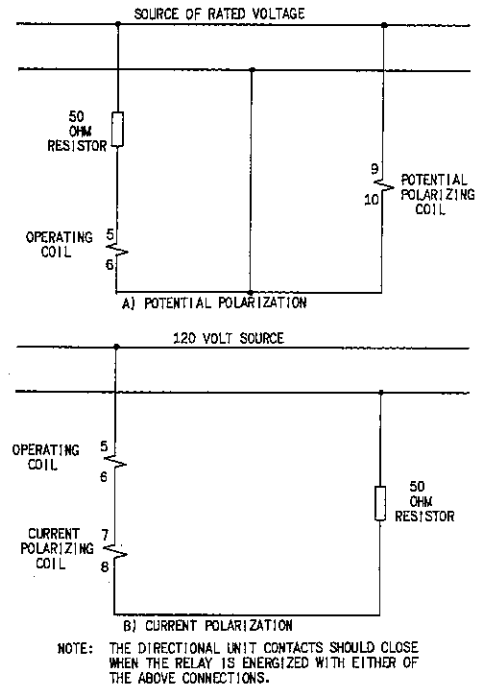


Fig. 9 Test Connections for Checkmng Polarity of the Internal Wiring of Type CJCG15E Relay

Fig. 9 (418A969-0)

To check or adjust the unit for potential polarization, connect studs 5 and 6 to a single phase power source of rated frequency through a variable resistor and an ammeter; connect studs 9 and 10 to a potential source. Studs 6 and 10 should be connected to the same side of the source. Adjust the spring so that the contacts close when the applied $V_p \times I_p \cos 60^0$ is equal to the desired $V_p \times I_p$ pickup at the maximum angle of torque. This should be done at a voltage of about 5 volts.

PICKUP - INSTANTANEOUS OVERCURRENT UNIT

This adjustment is the same as that of the instantaneous overcurrent unit of the Type CJC15E relay.

MAINTENANCE

These 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:

TYPE CJC15E RELAY

DIRECTIONAL UNIT

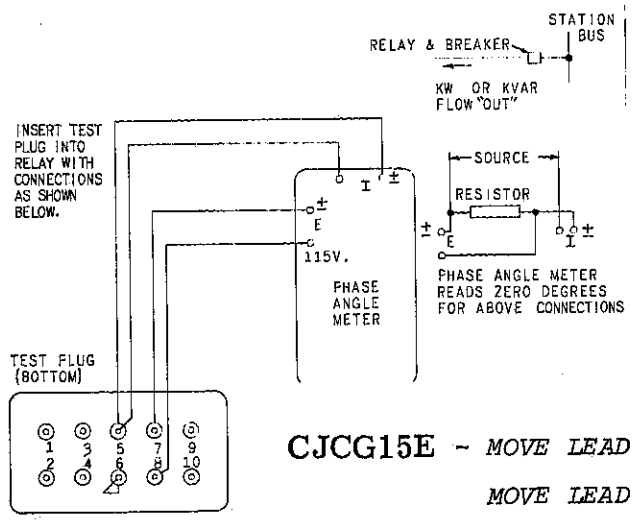
Bearings

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

Cup and Stator

Should it be necessary to remove the cup-type rotor from the unit, the following procedure should be followed:

All leads to the unit should first be disconnected and tagged for identification in reconnecting. The unit can then be removed from the cradle with its mounting plate still attached.



CJCG15E - *MOVE LEAD ON STUD 7 TO STUD 9*
MOVE LEAD ON STUD 8 TO STUD 10

POWER FACTOR ANGLE (DEG. LEAD)	0-45	45-90	90-135	135-180	180-225	225-270	270-315	315-360
KW & KVAR DIRECTIONS WITH RESPECT TO THE BUS	KW OUT> KVAR IN	KVAR IN > KW OUT	KVAR IN > KW IN	KW IN> KVAR IN	KW IN> KVAR OUT	KVAR OUT > KW IN	KVAR OUT> KW OUT	KW OUT> KVAR OUT
METER READING WITH PROPER EXT.CONNS.	90-135	135-180	180-225	225-270	270-315	315-360	0 45	45 90

THE ABOVE RANGES OF PHASE ANGLE METER READINGS ARE THE ANGLES BY WHICH THE CURRENT LEADS THE VOLTAGE WITH THE DESCRIBED CONDITIONS OF POWER (KW) AND REACTIVE POWER (KVAR) FLOW WITH THE STATION BUS CONSIDERED AS THE REFERENCE IN ALL CASES. >MEANS GREATER THAN.
CAUTION: MAKE CORRECTIONS FOR METER ERRORS ON LOW CURRENTS, INHERENT IN SOME PHASE-ANGLE METERS.

Fig. 10 Test Connections for Checking Polarity of the External Connections to the Type CJC15E Relay

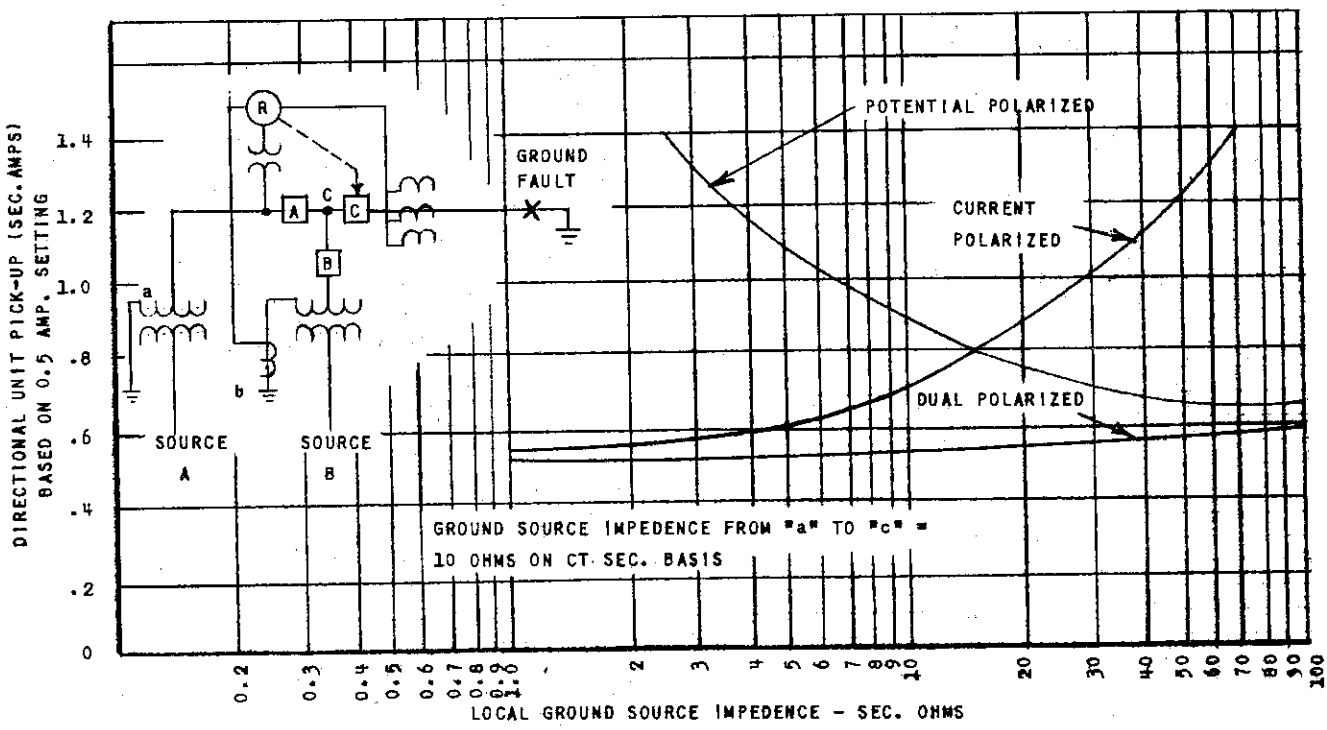


Fig. 11 A Typical Comparison of Current, Potential or Dual Polarization Showing Effect of Local Ground Impedance on Directional Unit of Type CJCG Relay

Fig. 11 (362A684-1)

Fig. 10 (377A195-1)

The upper of the three flat-head screws holding the unit to the plate should now be removed. On some models, it may be necessary to remove a resistor or capacitor to expose this screw. The four corner screws clamping the unit together, should next be removed, and the entire top structure lifted off. This gives access to the cup assembly and exposes the stator assembly, which should be protected to keep it free from dust and metallic particles until the unit is reassembled.

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 taken out of the side of the molded contact arm. The shaft and cup can now be pulled out of the molding. The rotor must be handled very carefully while it is out of the unit.

Contact Adjustment

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

The stationary stop fastened with a locknut should hold the moving contact arm in a neutral position, i.e., with the arm pointing directly forward. Then, by rotating the barrel, advance the stationary contact until it just touches the moving contact. Next, back it away 2/3 turn to obtain approximately 0.020 inch gap. Last, tighten the screw which secures the barrel.

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.

Torque Adjustment

The directional unit is provided with a notched core which is used to minimize the torque produced in the rotor by current alone in the operating coils with the polarizing circuits de-energized. This adjustment is made at the factory and may be checked as follows:

First, short out the potential polarizing circuit. Adjust the control spring so that the moving contact structure is balanced between the stationary contact and the stop. This can be done by loosening the hexagonal-head locking screw, which clamps the spring adjusting ring in position, and turning the ring to the left until the balance point is reached.

Energize the operating circuit with 30 amperes for relays with a current adjusting range of 1-4 amperes or less, or 60 amperes for all higher current ratings, and check that the contact arm does not move. The core should be turned in small steps until a point is reached where there is no "bias" torque from current alone. The core can be turned by loosening the large hexagonal nut on the bottom of the unit and turning the core by means of the slotted bearing screw. This screw should be held securely in position when the nut is retightened.

Keep in mind that currents of these magnitudes will cause the coils to overheat if left on too long. Therefore, leave the test current on only for short intervals and allow sufficient time between tests for the coils to cool.

After the torque adjustment has been made, the spiral spring should be set to have barely enough tension to swing the moving contact arm against the stop screw when the unit is de-energized. Sufficient tension will be obtained if the adjusting ring is rotated about 1/2 inch from the neutral position in the counter clockwise direction, as measured on the periphery of the ring.

Clutch Adjustment

The connections shown in Fig. 8 for the polarity check can also be used in making the clutch adjustment. The 50 ohm fixed resistor should be replaced with an adjustable resistor capable of providing the current range listed in Table VI for the relay type and rating in question. A screw, projecting from the side of the movable contact arm, controls the clutch pressure, and consequently, the current value which will cause the clutch to slip. With rated frequency and at rated volts, the clutch should be set to slip at the current values listed in Table VI. In all cases the current is in phase with the voltage.

TABLE VI

DIRECTIONAL UNIT CLUTCH ADJUSTMENT

Overcurrent Unit Pick-up Amp. Rating	Directional Unit Amps for Clutch to Slip
0.5-2.0	10
1-4	20
2-8	20
4-16	20
10-40	20
20-80	20

INSTANTANEOUS OVERCURRENT UNIT

Bearings, Cup and Stator, Contact Adjustment

The maintenance of these parts is as outlined under directional unit.

Clutch Adjustment

Adjust the clutch to slip at the value of current selected from Table VII by loosening or tightening the screw on the right side of the moving contact structure.

TABLE VII

INSTANTANEOUS OVERCURRENT UNIT CLUTCH ADJUSTMENT

Amp-Rating	P. U. Amps	Amps Clutch Should Not Slip At	Amps Clutch Should Slip At
2.5		3.75	5
5	below 1.0	7.5	10
5	1-4	7.5	10
5	2-8	12	16
5	4-16	24	32
5	10-40	Tighten to full extent of adjustment	
5	20-80		

TYPE CJCG15E RELAY

DIRECTIONAL UNIT

Bearings, Cup and Stator, Contact Adjustment

The maintenance of these parts is outlined under the directional unit of the CJC15E relay.

Torque Adjustment

Connect the current operating and current polarizing coils in series by connecting a jumper across terminals 6 and 7. Apply current to terminls 5 and 8 and adjust the directional unit spiral spring so that the unit picks up at 0.5 ampere.

The core of the directional unit has a small flat portion, the purpose of which is to minimize the effect of bias torques produced on the rotor. Such torques can be produced by any one of the operating or polarizing quantitites acting alone with the other two circuits de-energized. The adjustment of the core is made at the factory, but may be checked by observing that the unit responds as outlined below:

Short out the potential polarizing coil (terminals 9 and 10), leaving the current polarizing coil (terminals 7 and 8) unshorted. Supply 30 amperes through the operating coil (terminals 5 and 6) and check that the unit does not operate.

If the unit does not satisfy the above conditions, rotate the core to a position which causes it to do so. The core can be turned by loosening the large hexagonal nut at the bottom of the unit and turning the core by means of the slotted bearing screw. This screw should be held securely in position when the nut is retightened.

Keep in mind that thirty amperes will cause the current coils to overheat if left on too long. Therefore, leave the test current on only for short intervals and allow sufficient time between tests for the coils to cool.

Clutch Adjustment

Jumper studs 6 and 7 and connect studs 5 and 8 to a power source of rated frequency through a variable resistor and ammeter. Adjust the clutch by means of the adjusting screw on the right hand side of the contact structure until the clutch slips between the limits of 10 and 15 amperes. Remove the jumper between studs 6 and 7.

INSTANTANEOUS OVERCURRENT UNIT

The maintenance of this unit is as specified for the instantaneous overcurrent unit of the Type CJC15E relay.

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.

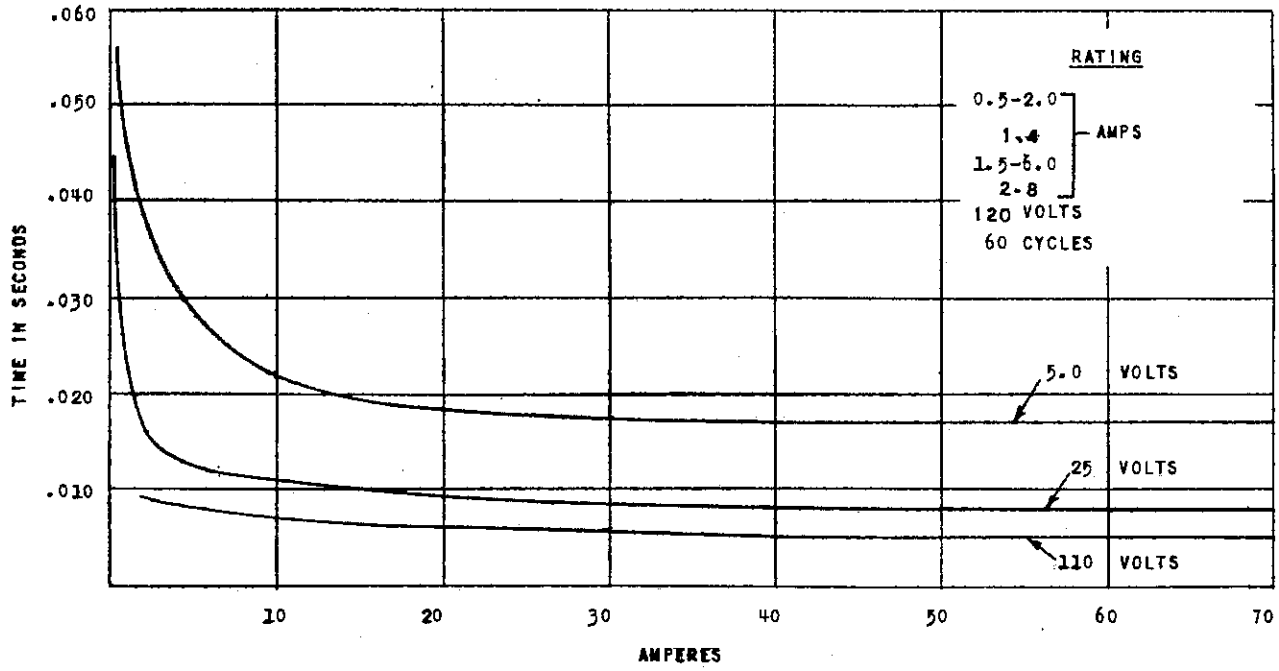


Fig. 12 (K-6154283-2)

Fig. 12 Directional Unit Time Curve (Ranges As Indicated) For Voltage Applied In Phase With Current For Type CJC15E Relay

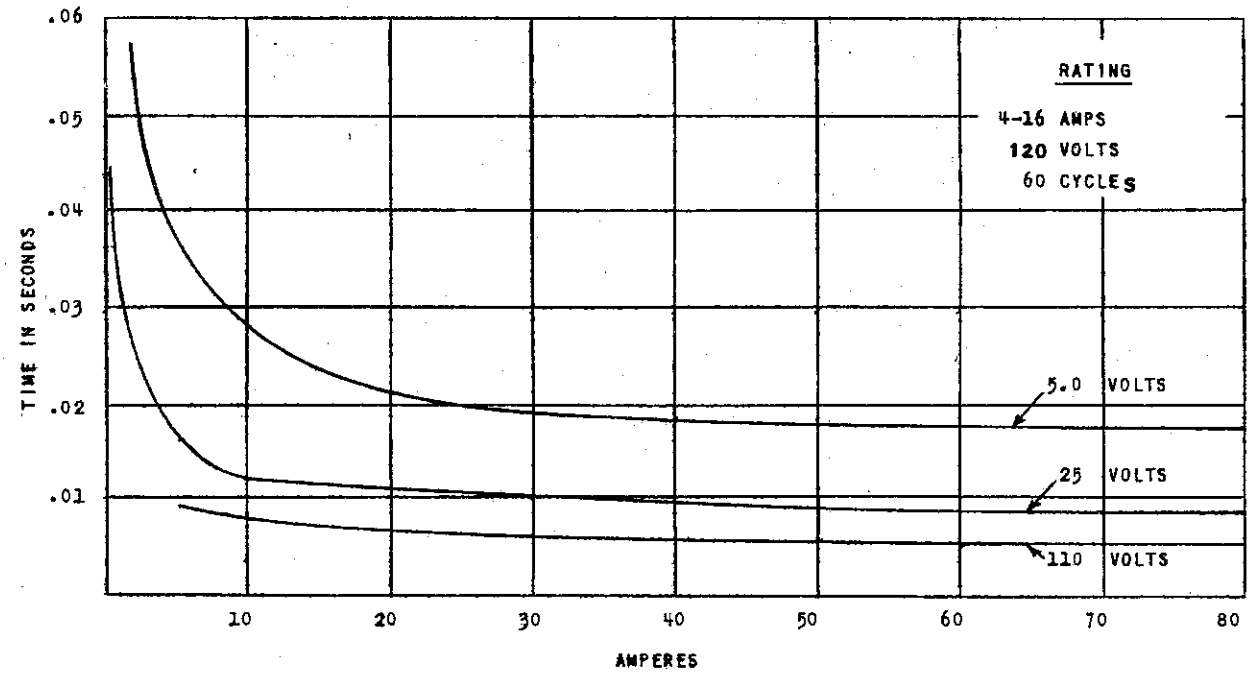


Fig. 13 (K-6154284-2)

Fig. 13 Directional Unit Time Curve (4/16 Range) For Voltage Applied In Phase With Current For Type CJC15E Relay

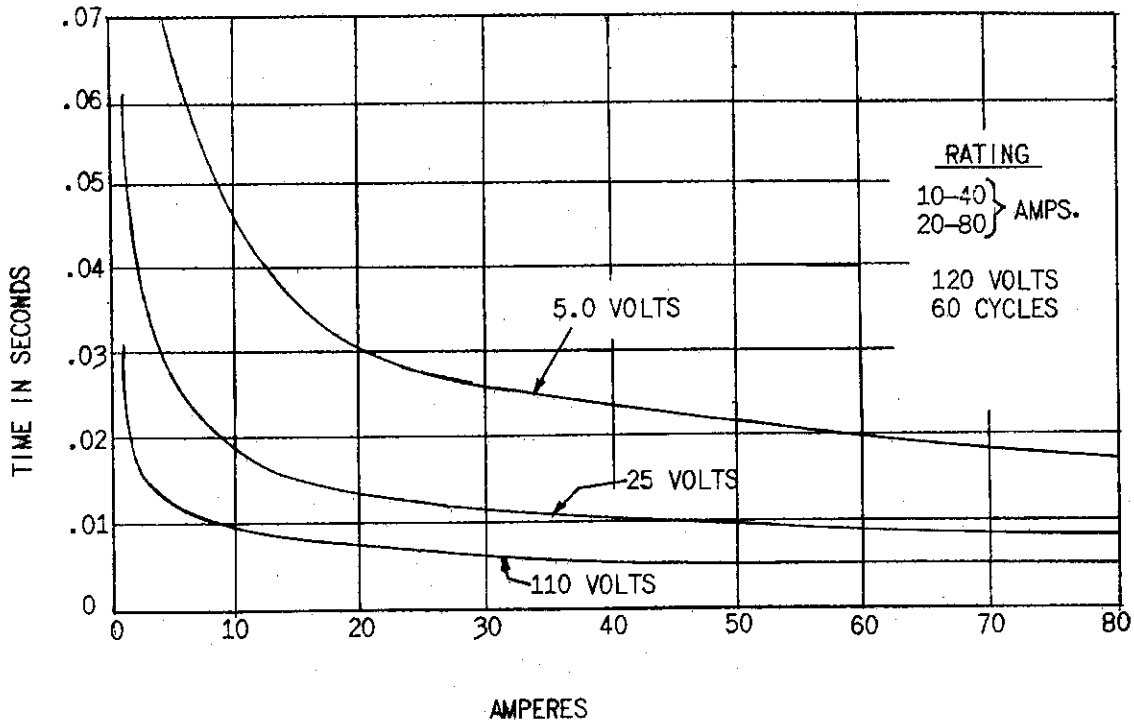


Fig. 14 (459A201-0)

Fig. 14 Directional Unit Time Curve (Ranges As Indicated) For Voltage Applied In Phase With Current For Type CJC15E Relay

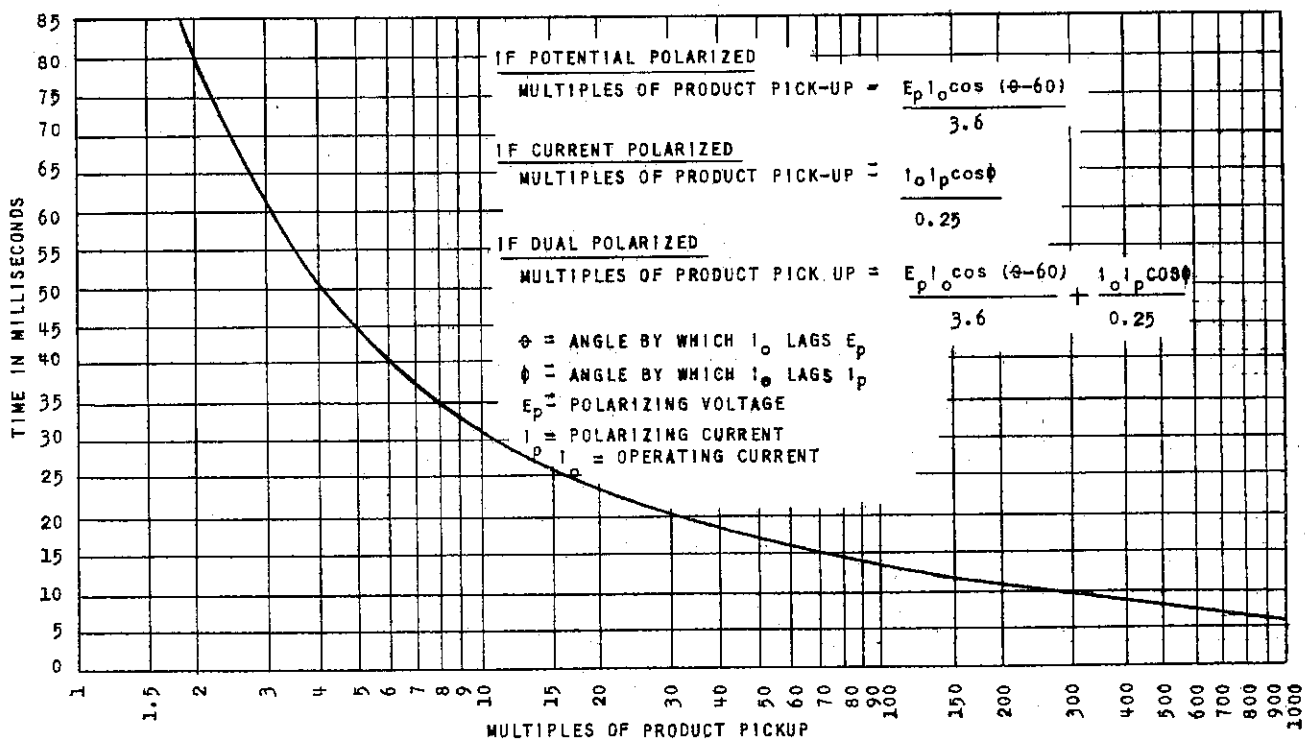


Fig. 15 (376A934-0)

Fig. 15 Directional Unit Time Curve, Current Or Potential Polarized, Type CJCG15E Relay

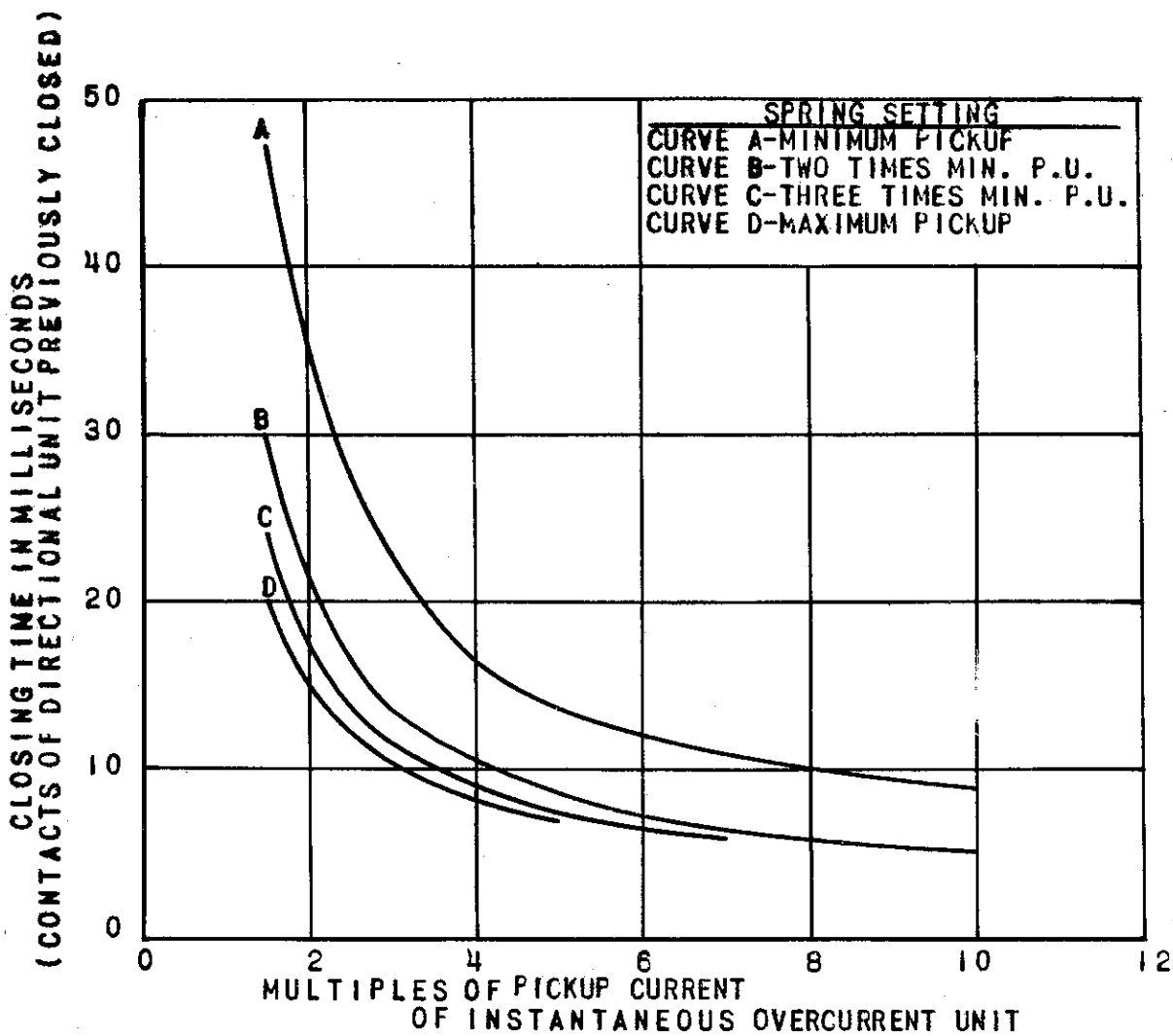


Fig. 16 (K-6556439-2)

Fig. 16 Instantaneous Overcurrent Unit Time Curves For Types CJC15E And CJCG15E Relays

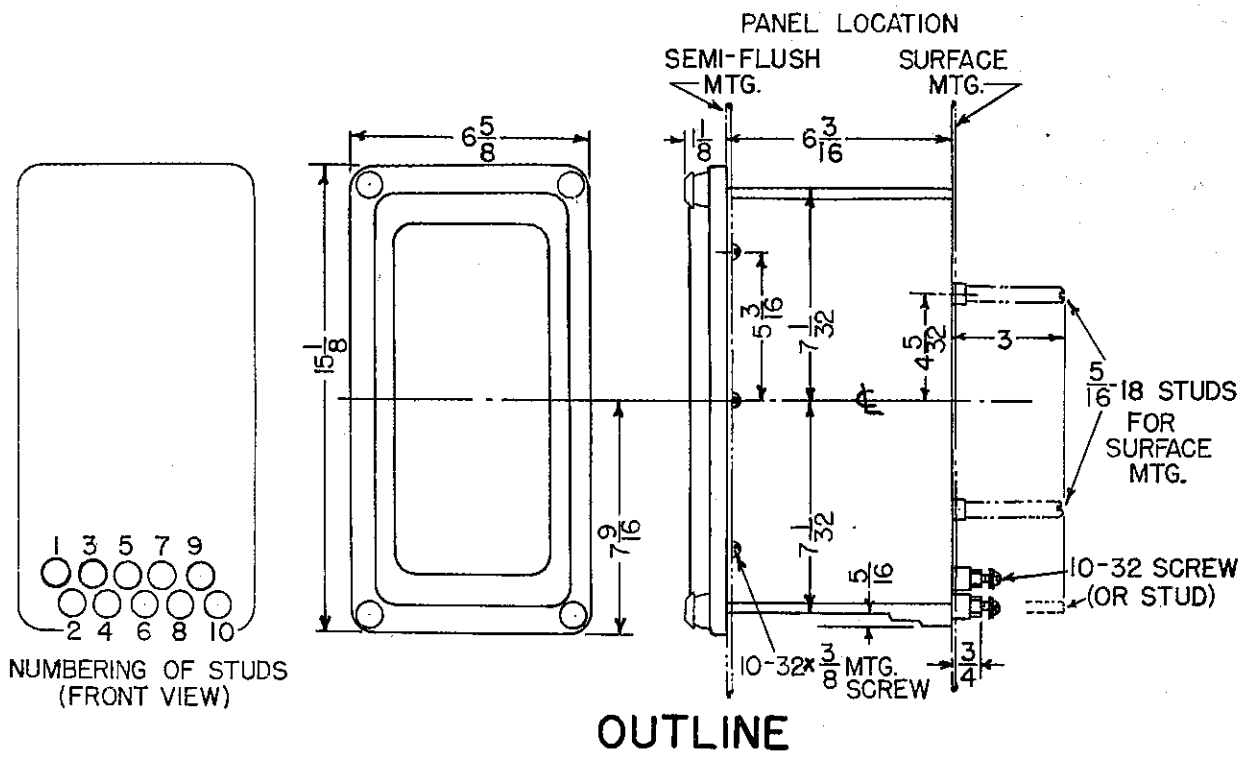
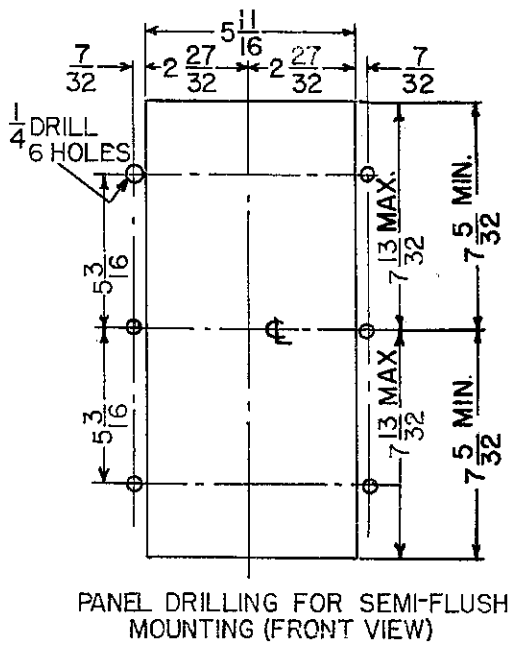
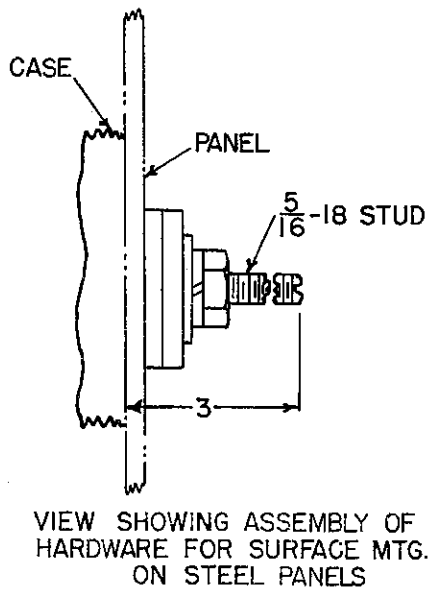


Fig. 17





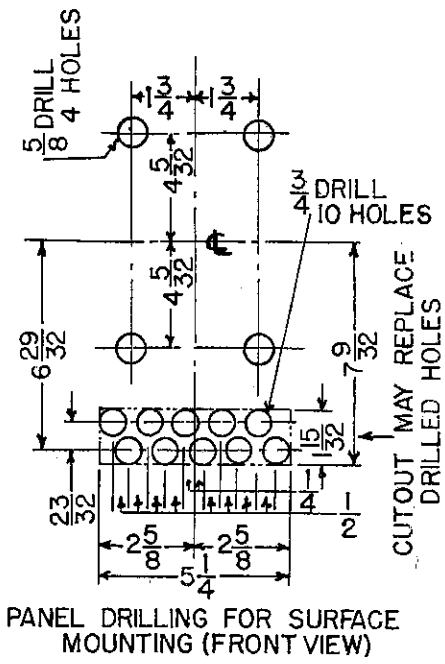


Fig. 17 Outlining And Panel Drilling Dimensions For Types CJC15E And CJCG15E Relays