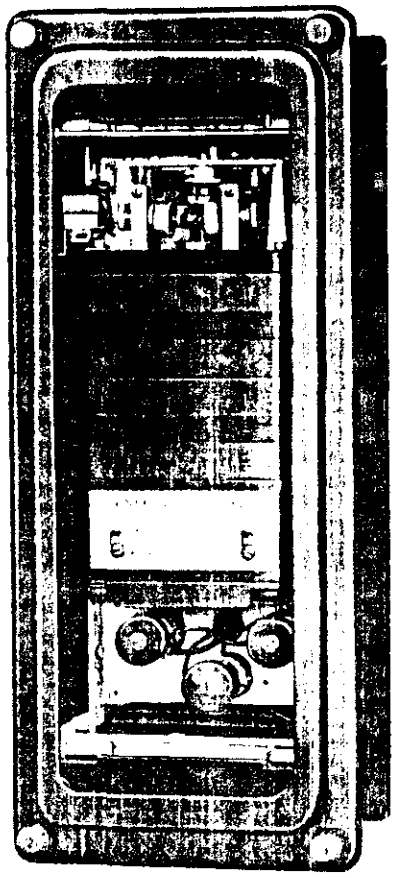
INSTRUCTIONS

GEI-23980D

SUPERSEDES GEI-23980C

THREE-PHASE DIRECTIONAL RELAY

Type CCP13D



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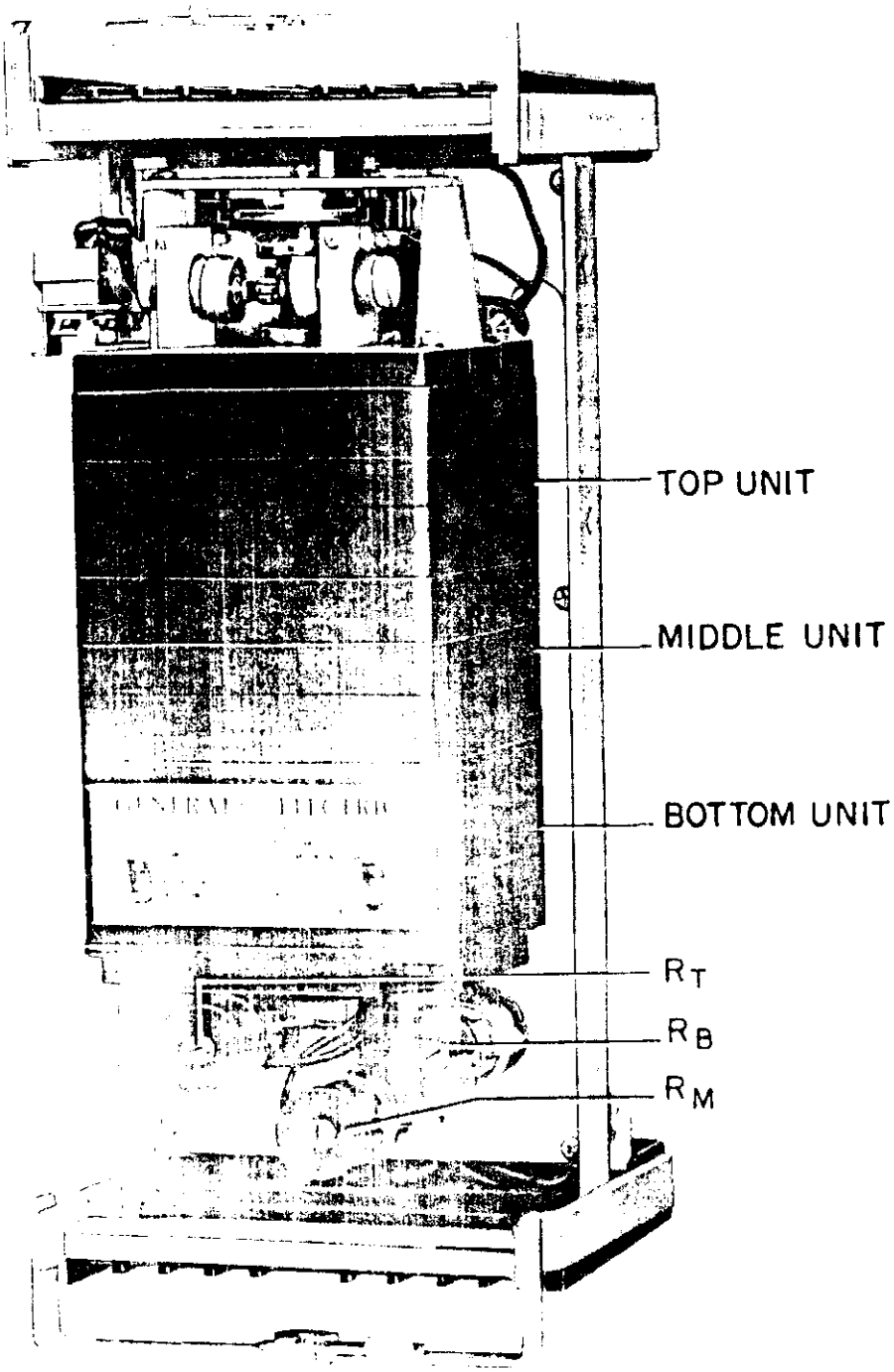


Fig. 1 Type CCP13D Relay Removed from Case (Front View)

Fig. 1 (8010272)

Cover (8010273)

THREE-PHASE DIRECTIONAL RELAY TYPE CCP13D

DESCRIPTION

INTRODUCTION

The Type CCP13D relay is a very sensitive induction cylinder power directional relay for three-phase or single-phase alternating current circuits. The relay consists of three directional units with three rotors mounted on a single shaft. The contact assembly consists of two electrically separate contacts, one normally open and one normally closed. The normally closed contacts are held closed when the relay is not energized, by means of two spiral springs which also complete the control circuit to the moving contacts. There is a target which is brought out to separate studs so that it may be connected in any circuit.

APPLICATION

The relay can be used either connected in one potential phase and one current phase or the three units can be connected to the three different phases. For single phase applications the potential coils are connected in parallel and the current coils are connected in series.

RATINGS

Relays are available with potential coils rated at 115, 208 or 216 volts. The current coils in all CCP13D relays are rated at 5 amperes, but the pick-up current ratings may be 0.004, 0.008, 0.025 ampere depending on the relay model.

The ratings of both the target and the holding coils are listed in Table I and are for either AC or DC.

TABLE I

TARGET AND HOLDING COIL RATINGS

FUNCTION		
Coil Rating (Amps)	0.2	1.0
Resistance (Ohms)	7	0.25
Carry for Tripping Duty (Amps)	5	30
Carry Continuously (Amps)	0.8	4

BURDENS

CURRENT COILS

The burden imposed on the current transformers at 5 amperes and 60 cycles, for each circuit is 17.0 volt-amperes at 0.40 power factor.

POTENTIAL COILS

The burden imposed on the potential transformers at rated voltage and 60 cycles, for each circuit is 17.5 volt amperes at 0.50 power factor.

INTERNAL CONSTRUCTION

DIRECTIONAL UNIT

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 current and potential coils; four potential coils which are internally connected forming a single circuit as well as four current coils similarly connected. 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. The three units are mounted one on top of the other. The three rotors are mounted on a single shaft.

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

CONTACTS

The contacts (see Fig. 2) are especially constructed to supress 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 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.

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.

INSTALLATION

RECEIVING

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.

INSPECTION

The wipe of each contact, that is, the clearance between the flat-spiral mounted silver contact and the diaphragm behind it should be 0.004 to 0.009 inch. The contact gap should be 3/64 inch.

The vertical end play of the shaft should not exceed 1/32 inch.

CAUTION: Every circuit in the drawout case has an auxiliary brush; this is the short one in the case (not on the cradle) which the connection plug or test plug should engage first. On every current circuit or other circuit with a shorting bar, make sure these auxiliary brushes are bent high enough to engage the connection plug or test plug before the main brushes in the case do, as otherwise the CT secondary circuit may be opened (where one brush touches the shorting bar) before the circuit is completed from the plug to the other main brush.

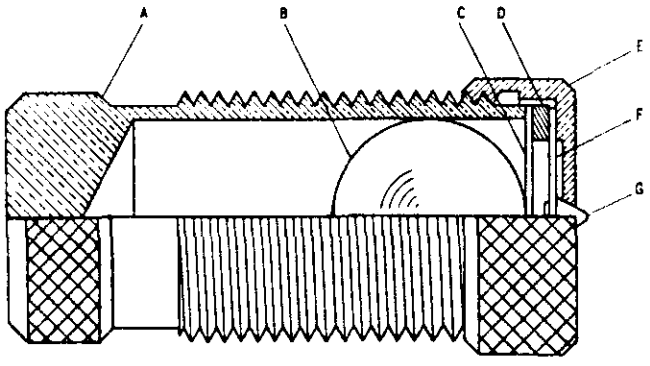
CHECK TESTS

CONTACTS

With the relay de-energized and in a completely level position, both vertically and horizontally, the contact should be in a neutral position so that both contacts are open.

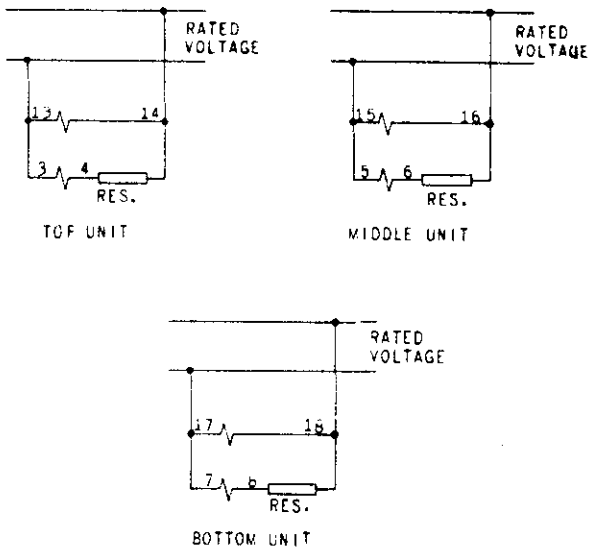
POLARITY

Complete polarity tests are made at the factory but these may be checked by using the connections shown in Fig. 3. Each unit should be checked



A - Inclined Tube
B - Stainless Steel Ball
C - Diaphram
D - Spacer
E - Cap
F - Flat Spiral Spring
G - Contact

Fig. 2 Barrel Type Contact Assembly



RES = 50-100 OHMS.
NOTE = LEFT-HAND CONTACT, (FRONT VIEW)

Fig. 3 External Connections for Checking Polarity of Type CCP13D Relay

Fig. 2 (6077069)
Fig. 3 (6507918)

separately. The cup should rotate in the direction to close the left hand contact (front view).

BIAS VOLTAGE

With relay studs 13, 15 and 17 connected to one side of a single phase source of rated voltage and frequency and studs 14, 16 and 18 connected to the other side, and no current applied to the current circuits, the moving contact should remain in its neutral position.

PICK UP

The pickup of the CCP13D relay may be checked by applying rated voltage and frequency to the relay as in Fig. 4. The relay should close its left contact at the current specified on the nameplate.

CLUTCH

The clutch should not slip at rated voltage and 10 amperes when the relay is connected as in Fig. 4.

OVERALL TESTS

A check on the overall connections to the relay can be made by referring to Fig. 6. The relay need not be in service for this to be accomplished.

LOCATION AND MOUNTING

The location should be clean and dry, free from dust and excessive vibration, and well lighted to facilitate inspection and testing. The relay should be mounted on a vertical surface. The outline and panel drilling diagram is shown in Fig. 8.

CONNECTIONS

The internal connection diagram for Type CCP-13D is shown in Fig. 5. A typical external wiring diagram is shown in Fig. 7.

One of the mounting studs or screws should be permanently grounded by a conductor, not less than No. 12B & S gage copper wire or its equivalent.

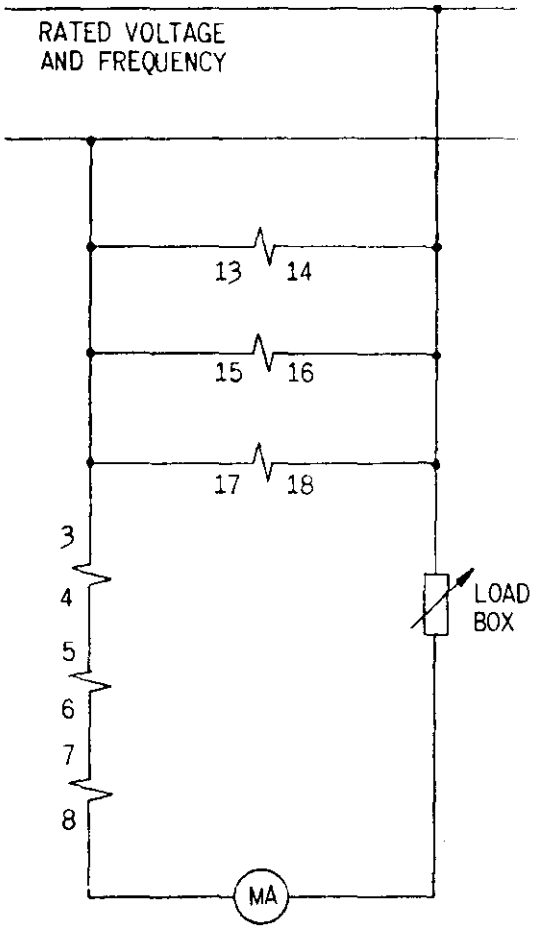


Fig. 4 (1044851)

Fig. 4 Test Connections for Checking Pick Up and Clutch Adjustments of Type CCP13D Relay

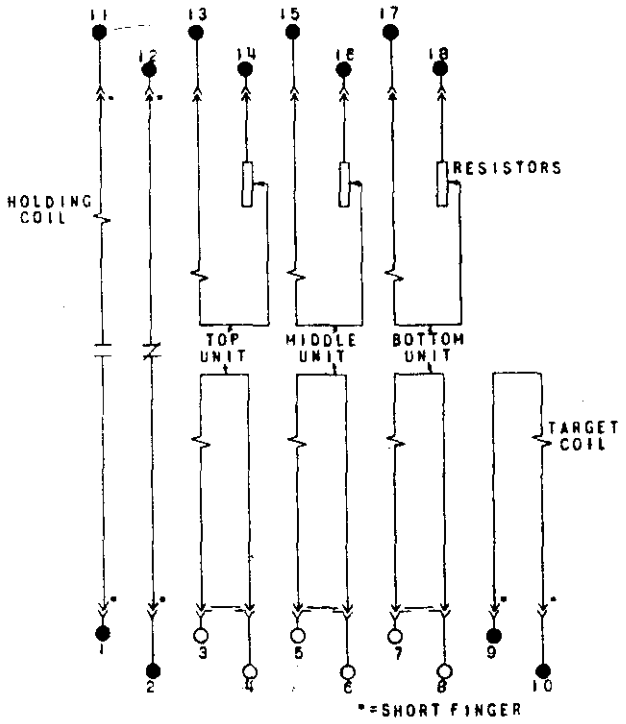
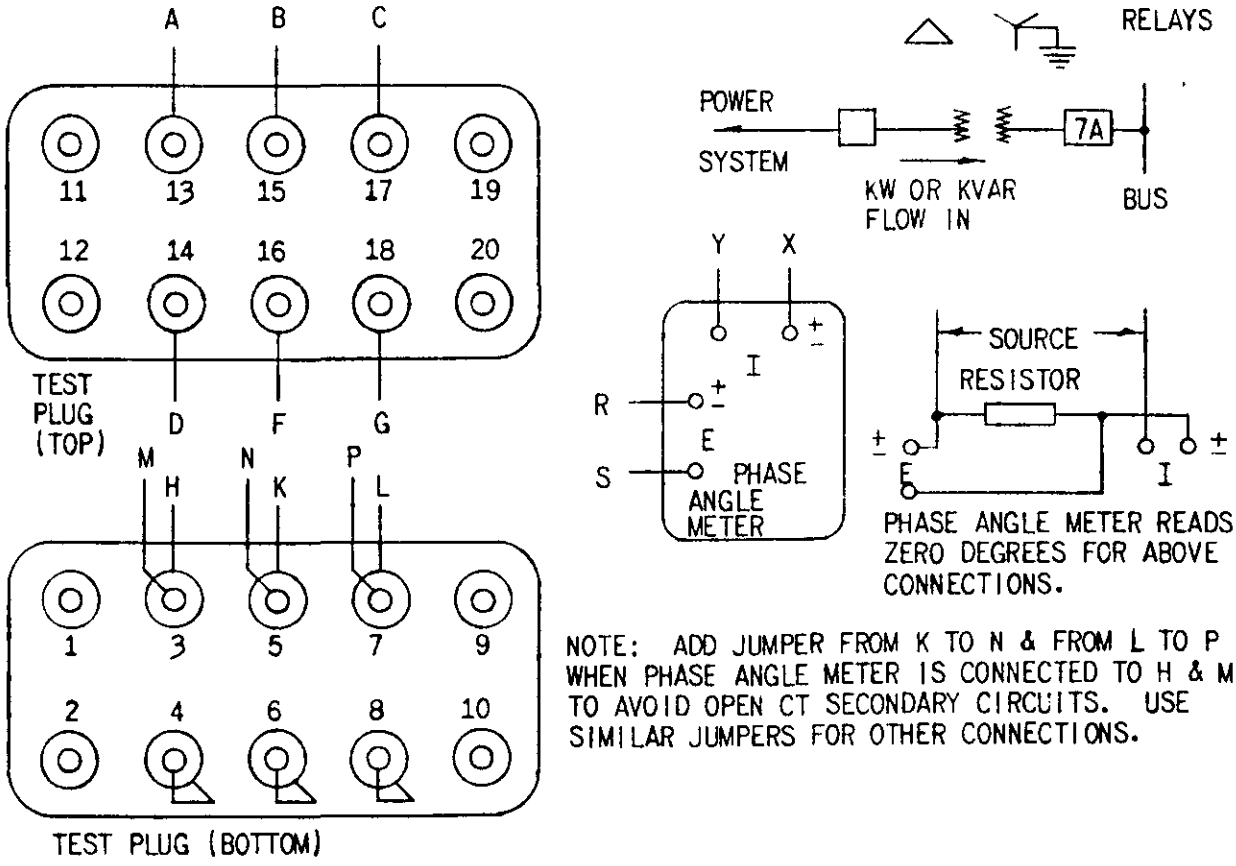


Fig. 5 (6400664)

Fig. 5 Internal Connection Diagram for Type CCP13D Relay (Front View)



NOTE: ADD JUMPER FROM K TO N & FROM L TO P WHEN PHASE ANGLE METER IS CONNECTED TO H & M TO AVOID OPEN CT SECONDARY CIRCUITS. USE SIMILAR JUMPERS FOR OTHER CONNECTIONS.

Fig. 6 (10U8513)

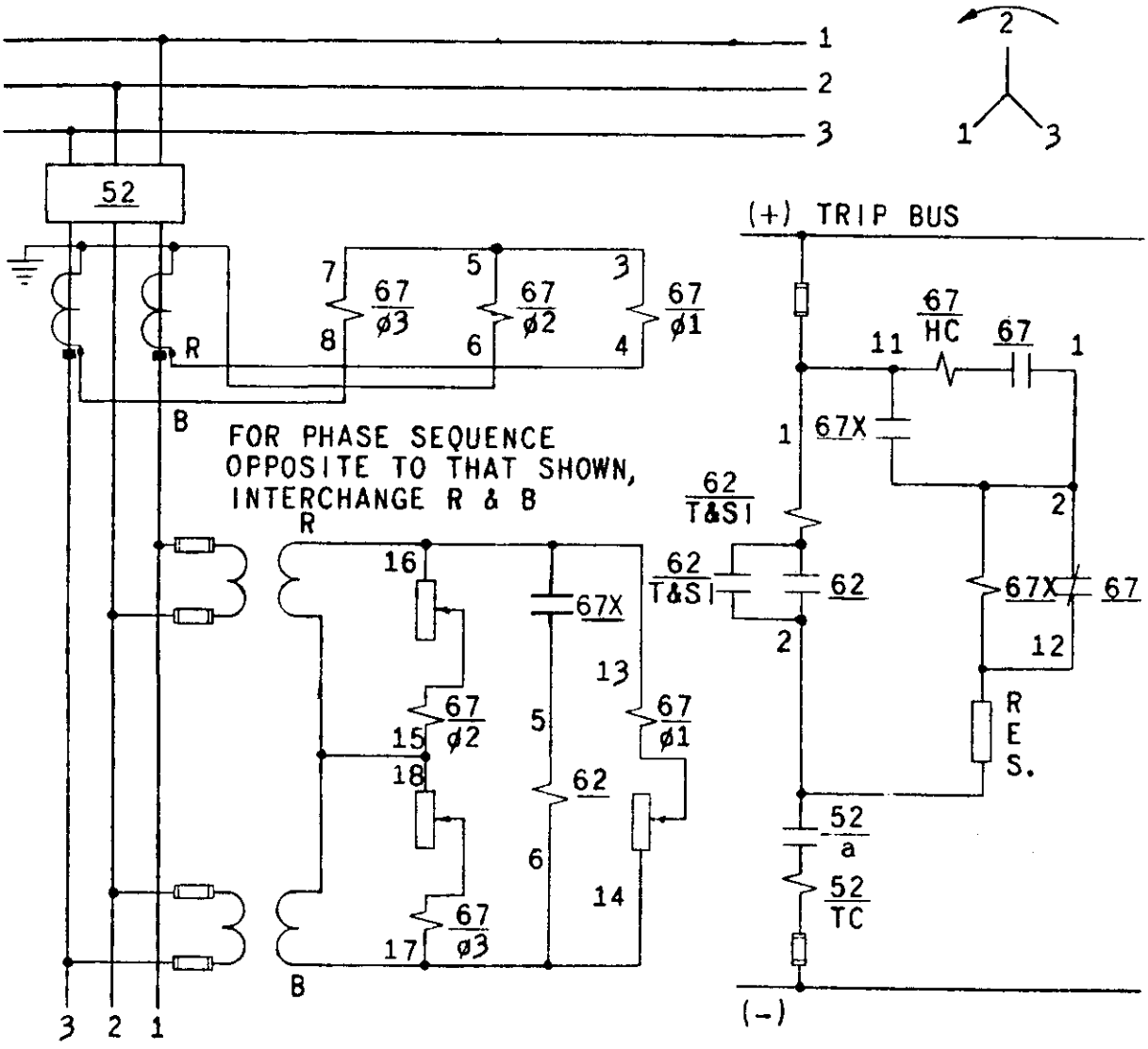
		PHASE ANGLE METER READING WITH PROPER EXT. CONNS.			
POWER FACTOR ANGLE* DEGREES LEAD OR LAG AS NOTED		90° TO 45°	45° TO 0°	0° TO -45°	-45° TO -90°
RELAY CONNECTIONS	R TO F , S TO B X TO K , Y TO N M TO H , P TO L	120° † TO 75°	75° † TO 30°	30° † TO 345°	345° † TO 300°
	R TO G , S TO C X TO L , Y TO P M TO H , N TO K	120° † TO 75°	75° † TO 30°	30° † TO 345°	345° † TO 300°
	R TO D , S TO A X TO H , Y TO M N TO K , P TO L	120° † TO 75°	75° † TO 30°	30° † TO 345°	345° † TO 300°

† THESE RANGES OF PHASE ANGLE METER READINGS ARE THE ANGLES BY WHICH THE CURRENT LEADS THE VOLTAGE WITH THE DESCRIBED CONDITIONS OF LOAD POWER FACTOR ANGLE.

CAUTION: MAKE CONNECTIONS FOR METER ERRORS ON LOW CURRENTS, INHERENT IN SOME PHASE ANGLE METERS.

*AS DETERMINED FROM INSTRUMENTS READING POWER INTO BUS FROM THE POWER SYSTEM. NEGATIVE SIGN FOR LAG. POSITIVE SIGN FOR LEAD.

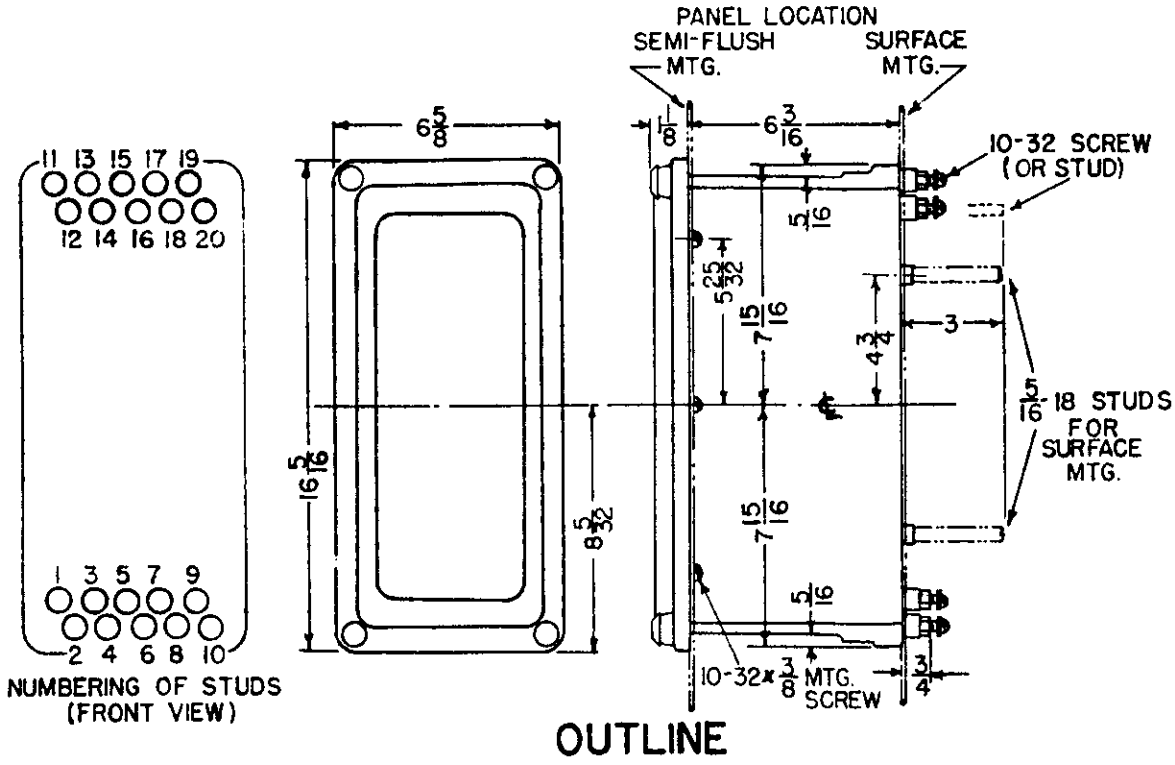
Fig. 6 Test Connections for Checking Polarity of Wiring to the CCP13D Relay

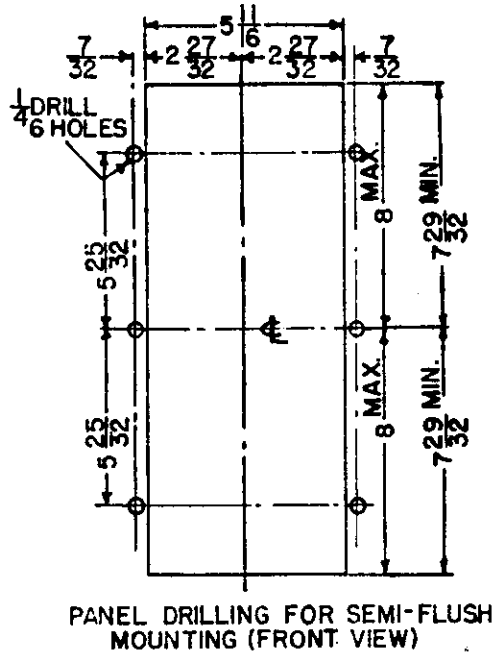


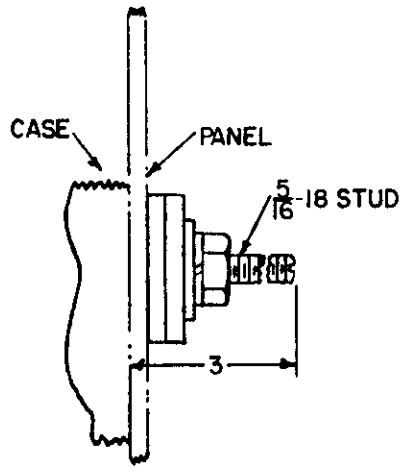
DEVICE FUNCTION NUMBERS

52 - CIRCUIT BREAKER
62 - TIME DELAY RELAY, TYPE IAV
67 - THREE PHASE DIRECTIONAL RELAY, TYPE CCP13D.
67X- AUXILIARY RELAY, TYPE HGA
HC - HOLDING COIL
a - AUXILIARY CONTACT WHEN BREAKERS IS CLOSED
TAR - TARGET
TC - TRIP COIL
ø - PHASE
T&SI-TARGET & SEAL-IN

Fig. 7 Typical External Connections of Type CCP13D Relay for Protection of an Alternator Against Running Light as a Motor







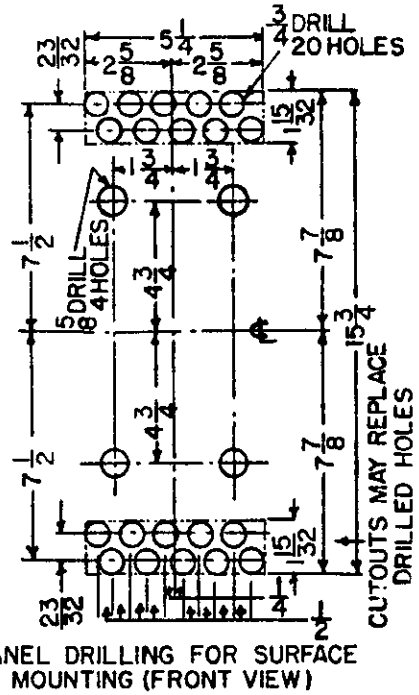


Fig. 8 (K-6209274)

Fig. 8 Outline and Panel Drilling Dimensions Diagram for Type CCP13D Relay

MAINTENANCE

LABORATORY TESTS

CONTROL SPRING

If the moving contact is not in a neutral position (both contacts open), when the relay is in its level panel position and de-energized, the control spring may be adjusted slightly to bring it to a neutral position.

BIAS VOLTAGE

Should any torque be developed when this test is made at the time of installation, the lower unit core may be adjusted so that the moving contact terminates at a neutral position. The control spring must not be used to eliminate this bias torque. After this adjustment is made be sure to tighten the core locking nut.

TORQUE ADJUSTMENT

If the maximum angle of torque (30^{o} lead) of the relay has been disturbed, it may be restored by referring to Fig. 9. With rated voltage and frequency applied to the potential circuit and 5 amperes flowing in the current circuit, the potential circuit resistor is adjusted so that the contact will not move at a phase angle meter reading of 120^{o} or 300^{o} (angles of zero torque). The relay should close its left contact at all angles between 120^{o} and 300^{o}. This test is performed by energizing one unit at a time.

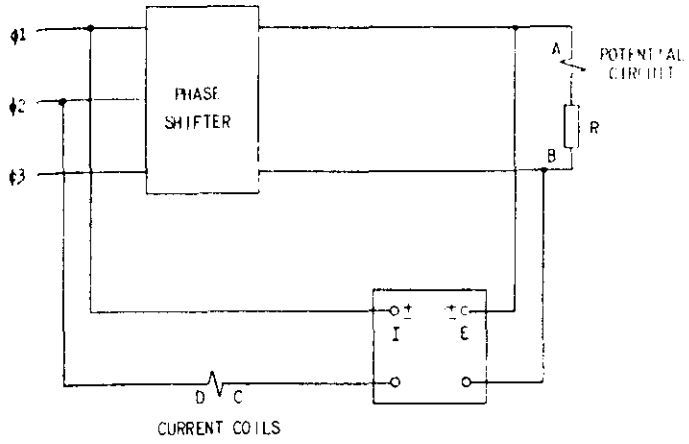


Fig. 9 (10A8512)

RELAY UNIT	ADJUST. RESISTOR	POWER CONNECTIONS	
		POTENTIAL STUDS A-B	CURRENT STUDS C-D
TOP	R_T	13-14	3-4
MIDDLE	R_M	15-16	5-6
BOTTOM	R_B	17-18	7-8

Fig. 9 Test Connections For Making The Torque Adjustment Of Type CCP13D Relay

PICKUP ADJUSTMENT

With Type CCP13D relay connected as shown in Fig. 4 and rated voltage and frequency applied at the angle of maximum torque (phase angle meter reading 30^{o}), adjust the control spring so that the left contact closes at the current specified on the nameplate.

SERVICING

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.

CONTACT ADJUSTMENT

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 be then removed. (See Fig. 2.)

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.

The normally closed or right contact should hold the moving contact arm in a neutral position, i.e., with it pointing directly forward. Then bring the stationary contact up until it just touches the moving contact by rotating the contact barrel. Next, back it away 1-1/2 turns to obtain approximately .047 inch contact 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.

CUP UNIT

If for any reason it becomes necessary to disassemble the induction unit the following procedure should be followed:-

(a) Disconnect the leads to the unit at the terminal in the base.

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

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

(d) Avoiding any disturbance to the top bearing plate, remove the entire top molded structure and rotor assembly from the stator assembly by removing the four corner screws. This will give access to both the rotor and stator assemblies and all parts will be aligned by the dowel pins when replaced.

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

After reassembly the tests outlined under the LABORATORY TESTS SECTION must be performed.

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 1/32 inch end play of the shaft.

Press down on the contact arm near the shaft to check the clearance between the iron core and the inside of the rotor cup and thus depress the spring-mounted jewel until the cup strikes the iron - the shaft should move about 1/16 inch.

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 the part wanted, and give complete nameplate data. If possible, give the General Electric Company requisition number on which the relay was furnished. The renewal parts publication for Type CCP13D relay is GEF-3916.