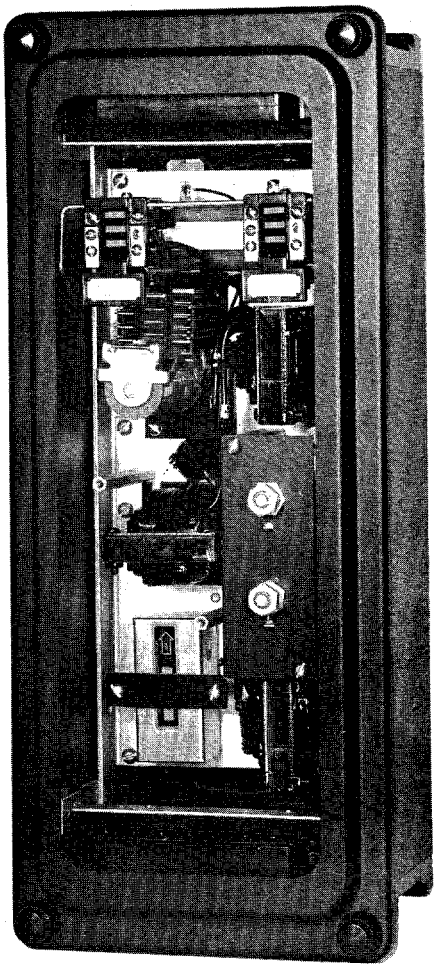
INSTRUCTIONS

GEK-1293A

THREE PHASE INSTANTANEOUS FAULT DETECTOR RELAY



TYPES

NHC11A

NHC11B

GENERAL ELECTRIC

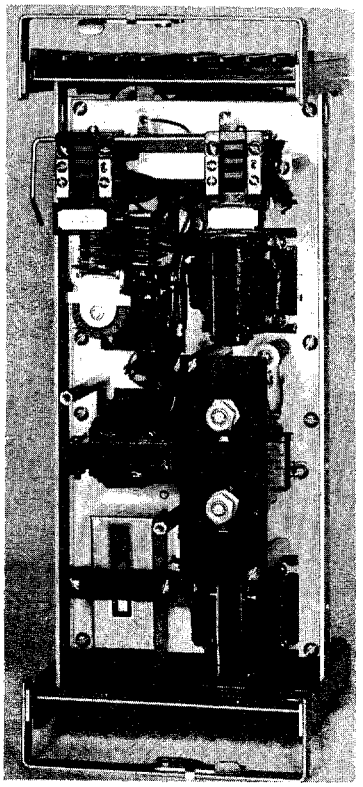


Fig. 1 (8036516) Type NHC11 Relay Removed From Case. (Front View)

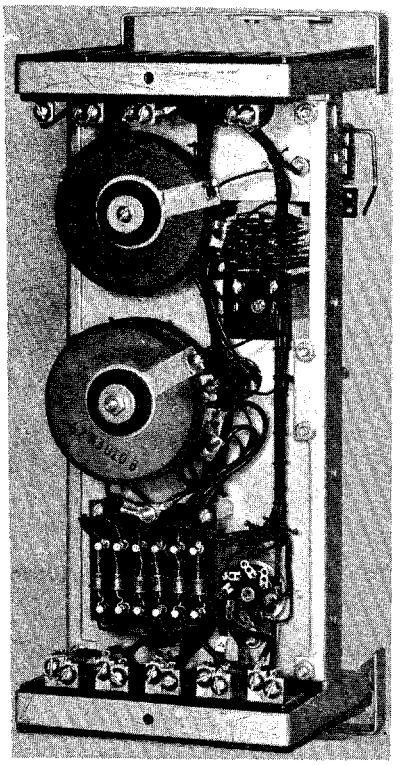


Fig. 2 (8036517) Type NHC11 Relay Removed From Case. (Rear View)

THREE PHASE INSTANTANEOUS FAULT DETECTOR RELAY TYPE NHC

INTRODUCTION

The NHC11A and NHC11B are three-phase stantaneous fault detector relays that differ from ıch other only in their target and stud arrange- ent. Both relays provide 4 electrically separate)ntacts and come in M2 cases, but the NHC11A has /o targets while the NHC11B has none. These ılays were specifically designed for use as fault ıtectors in breaker failure back-up schemes. The ternal connections for these devices are given Figures 3 & 4.

APPLICATION

Because these NHC11A and NHC11B relays were)ecifically designed for use as fault detectors breaker failure schemes, they have high speed ckup and dropout characteristics. (See Figures & 6.) These relays will operate to close their)ntacts when the current that flows in any one more of the three input circuits exceeds 1.0 npere. At the same time they may be continuously ıergized with 8 amperes in all three input circuits multaneously. As will be noted from the external)nnection diagram of Figure 8, the main measuring ıit (I) of the relays operates an internal auxiliary ı) to provide the four electrically separate con- cts. Thus, a DC source is required in the applica-)n of these relays.

RATINGS

While the NHC11 is rated at 5 amperes, it is ıpable of carrying 8 amperes continuously.

TABLE I

TARGET RATINGS

Tap Setting	Operating Range Amps	Trip Duty Amps	Res. Ohms
2.0	2-30	30	0.13
0.2	0.2-3.0	3	7

The relay has a one second rating of 300 amperes.

The auxiliary telephone relay is continuously rated at the nameplate DC voltage.

Table I lists the ratings of the two electrically operated targets.

Table II lists the ratings of the auxiliary relay contacts.

TABLE II

Rating	Continuous Current (Amps)	Interruption Current (Amps)	
		Ind.	Non-Ind.
125V - DC	1.0	0.3	0.75
250V - DC	1.0	0.01	0.2
115V - 60 cy.	1.0	2.0	4.0
230V - 60 cy.	1.0	1.0	2.0

OPERATING PRINCIPLES

The operating principles of the NHC11 relay can be understood by referring to the internal connections. The input circuit consists of 3 transactors (secondary voltage proportional to input current) one in each phase. The secondaries of these transactors are connected to the input of a three phase full wave rectifier bridge. The transactors are designed to saturate at a relatively low multiple of minimum pickup. A thyrite disc assembly is across the secondary of each transactor to clip any high voltages produced.

The detecting unit (I) and resistors R1 and R2 are across the output of the rectifier bridge. When an output voltage surge, enough to pickup the I unit is present, the I unit contacts close energizing the auxiliary telephone relay (A). One of these A unit "b" contacts opens and inserts resistor R2 into the bridge output increasing the dropout of the I unit.

The NHC11 relay has a fast dropout time from a large multiple of pickup to zero current. This is accomplished by having R1 and R2 to be a large value of resistance relative to the I unit. Thus the

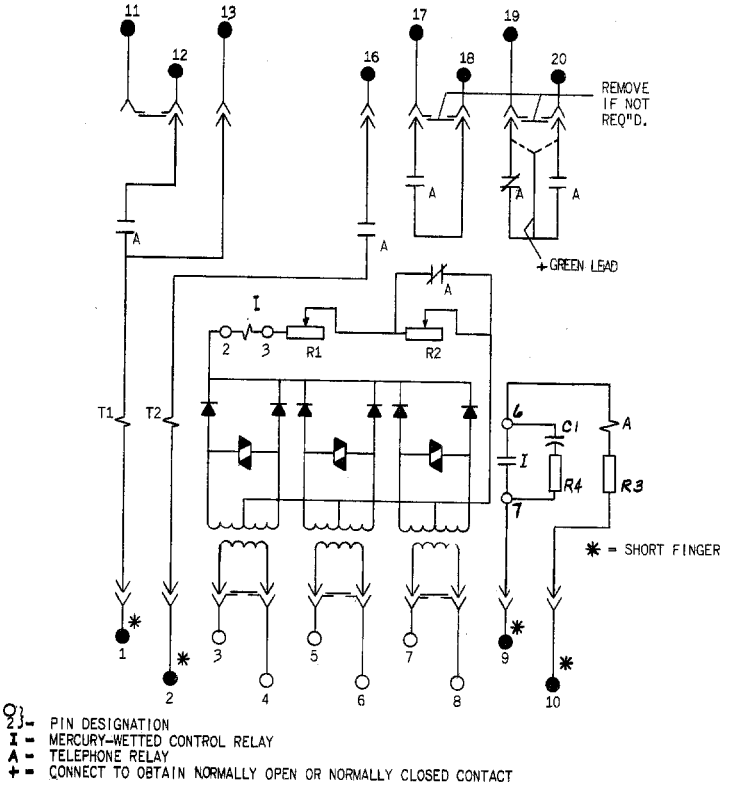


Fig. 3 (0178A9136-1) Internal Connection Diagram For Relay Type NHC11A. (Front View)

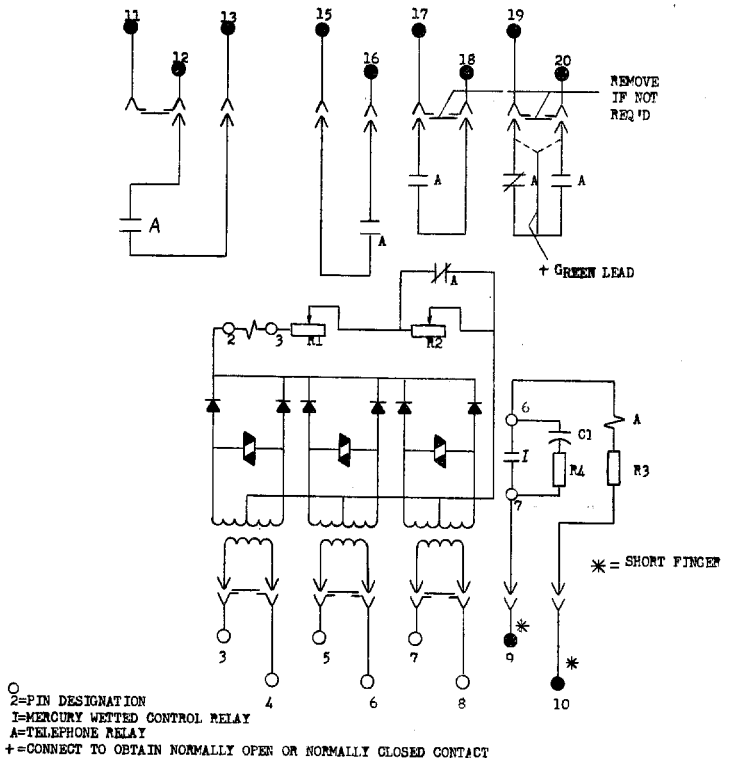


Fig. 4 (0195A4935-0) Internal Connection Diagram For Relay Type NHC11B. (Front View)

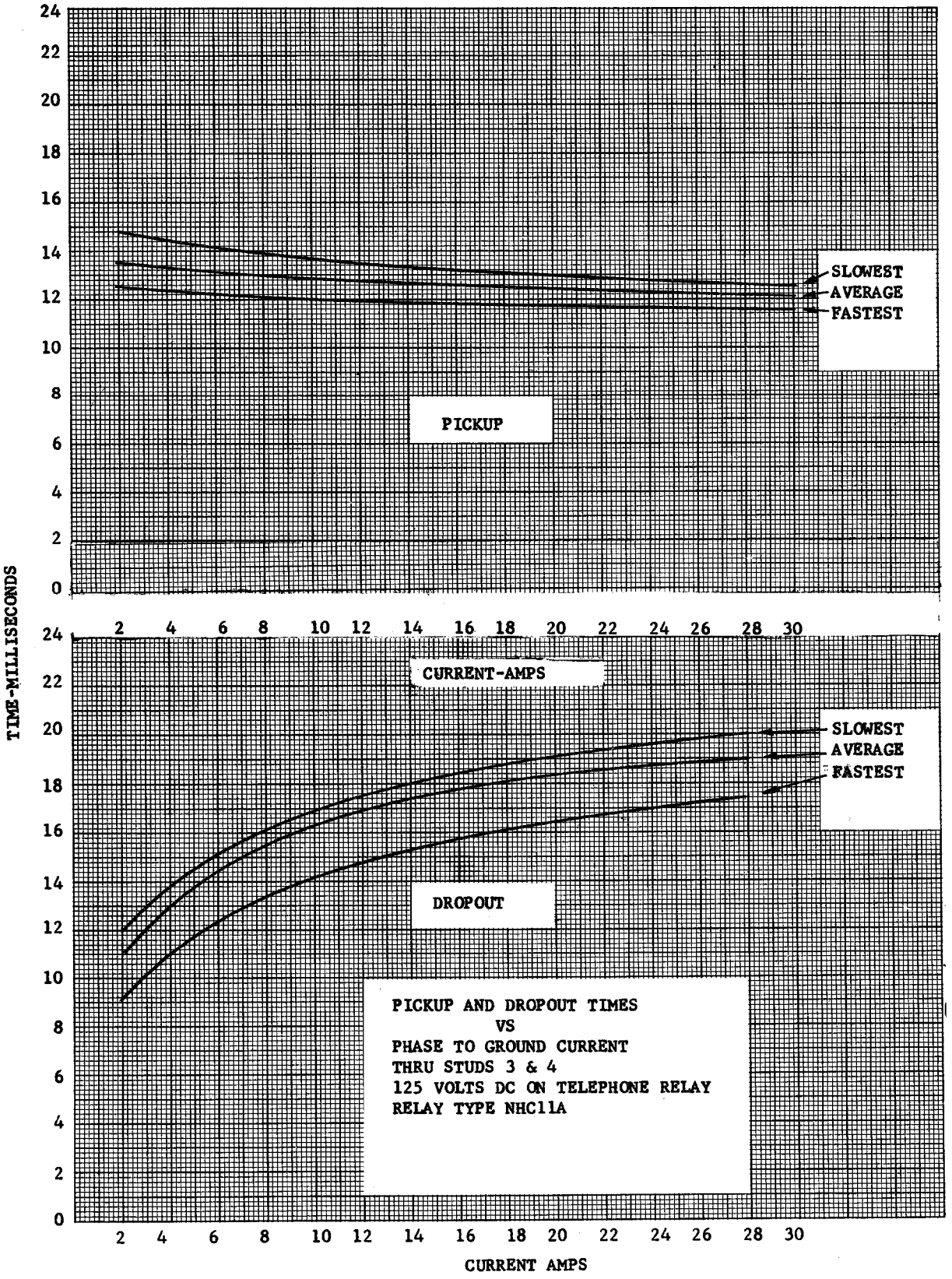


Fig. 5 (0195A9118-1) Time Current Curves For Phase To Ground FAults, Relay Type NHC

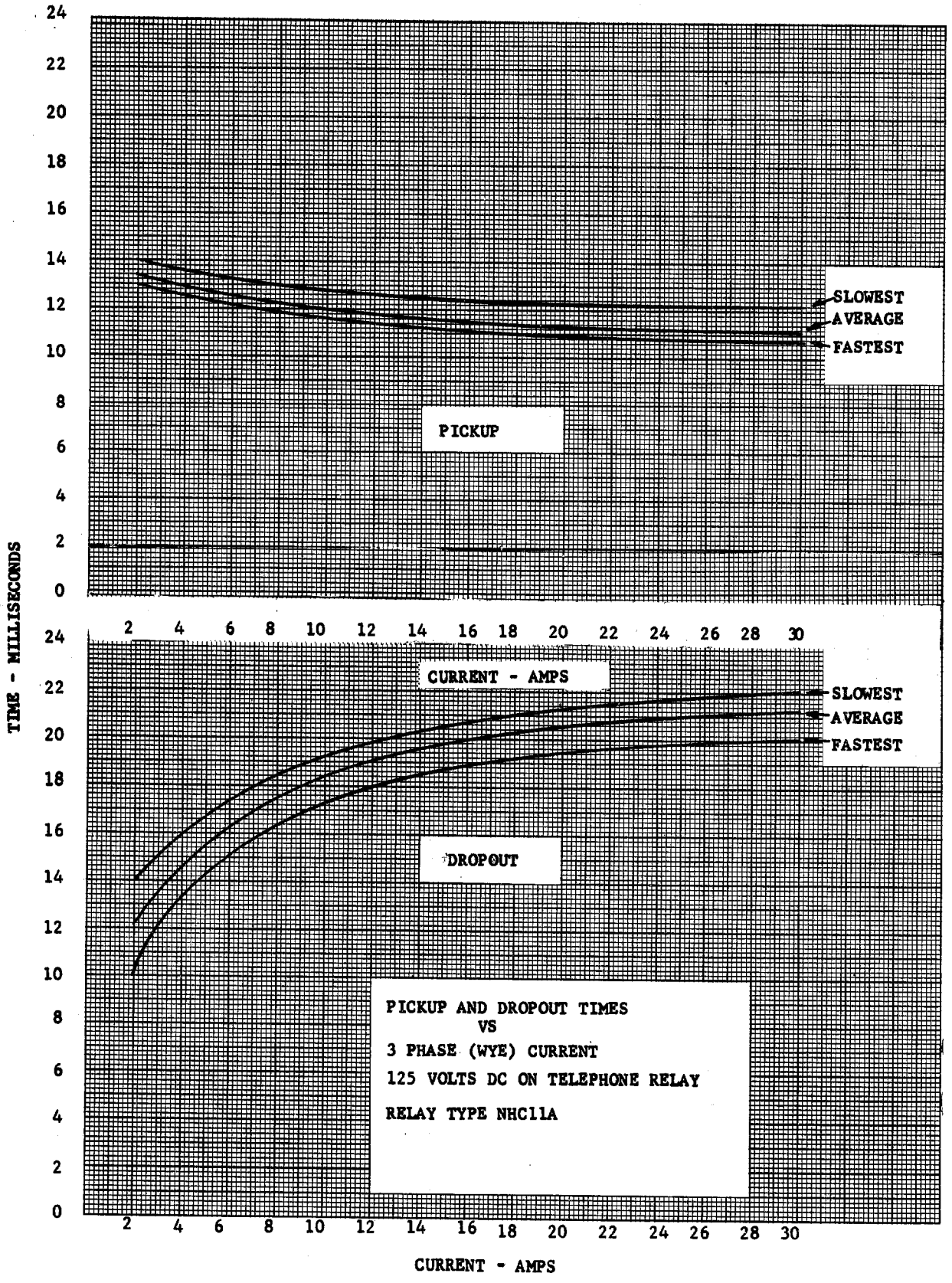


Fig. 6 (0195A9117-1) Time Current Curves For Three-Phase Faults.

energy in the transactors is mainly dissipated by the resistors rather than the I unit causing the I unit to drop out fast.

CHARACTERISTICS

The NHC11 relay has been adjusted to have a maximum pickup of 1 ampere when this current is flowing in any one or more of the three input circuits. The dropout has been adjusted so that the relay picks up without chatter.

The pickup and dropout time characteristics of the relay for these conditions are shown in Figures 5 and 6 for current in the one winding, and balanced current in all three windings.

Any increase in the pickup setting should reduce the dropout time. The pickup time should remain relatively constant.

BURDENS

The 60 cycle burden of each input circuit at 5 amperes and rated DC applied to the auxiliary relay is listed in Table III.

TABLE III

BURDEN OF EACH CURRENT CIRCUIT

Terminals	Volt-Amps	Impedance Ohms	Power Factor
3-4 or 5-6 or 7-8	5.5	0.22	0.91 lag.

CONSTRUCTION

The Type NHC11 relays are assembled in the standard medium size, double-ended (M2) drawout case having studs at the lower end in the rear for external connections. The electrical connections between the relay components and the case studs are made through stationary molded inner and outer blocks between which nests a removable connecting plug which completes the circuits. The outer block attached to the case has the studs for the external connections, and the inner block has the terminals for the internal connections.

The relay components are mounted on the steel framework called the cradle forming a complete unit with all leads terminated at the inner block. This cradle is held firmly in the case by latches at both top and bottom and by a guide pin at the back of the case. The connecting plug, besides making the electrical connections between the blocks of the cradle and case, also locks the latch in place. The cover, which is drawn to the case by thumbscrews, holds the connecting plugs in place. The target reset mechanism is a part of the cover assembly.

A separate testing plug can be inserted in place of the connecting plug to test the relay in place on the panel. Or the relay can be drawn out and replaced by another which has been tested in the laboratory.

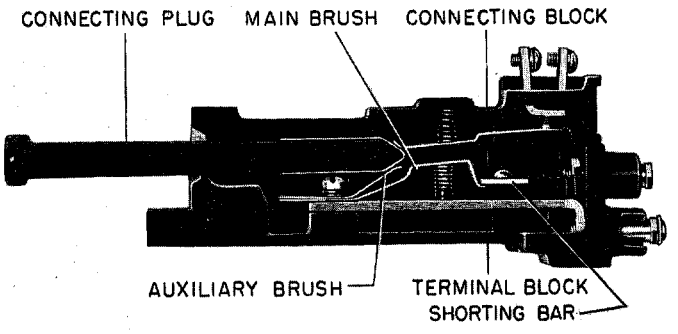
The relay case is suitable for either semi-flush or surface mounting on all panels up to 2 inches thick and appropriate hardware is available. However, panel thickness must be indicated on the relay order to insure that proper hardware will be included. For outline and drilling dimensions, see Fig. 10. Every circuit in the drawout case has an auxiliary brush, as shown in Fig. 7 to provide adequate overlap when the connecting plug is withdrawn or inserted. Some circuits are equipped with shorting bars and on these circuits it is especially important that the auxiliary brush makes contact as shown in Fig. 7 with adequate pressure to prevent the opening of important interlock circuits.

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 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. If the relays are not to be installed immediately, they should be stored in their original cartons in a place that is free from moisutre, 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.

Immediately upon receipt of the relay an INSPECTION AND ACCEPTANCE TEST should be made to insure that no damage has been sustained in shipment and that the relay calibrations have not



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

Fig. 7 (8025039) Cross Section Of Case And Cradle Showing Auxiliary Brush And Shorting Bar

been disturbed. If the examination or test indicates that readjustment is necessary, refer to the section on SERVICING.

VISUAL INSPECTION

Check the nameplate stamping to insure that the model number and rating of the relay agree with the requisition.

Remove the relay from its case and check that there are no broken or cracked molded parts or other signs of physical damage.

MECHANICAL INSPECTION

It is recommended that the following mechanical adjustments be checked:

1. Operate the auxiliary telephone-type unit (A) manually to be sure the armature is moving freely. With the armature closed the normally closed contacts should make with approximately .005" wipe. This can be checked by inserting a .005" shim, between the residual screw and the pole piece and operating the armature by hand. The NO contacts should make before the residual screw strikes the shim.

   With the armature open each normally open contact should have a gap of .010" to .015".

2. The armature of each target unit should move freely when operated by hand, and the target should latch in the exposed position before the armature strikes the pole piece.

   With all targets latched in the exposed position and the cradle assembly in the case, replace the cover and make sure that the targets can be reset by means of the button at the lower left corner of the cover.

3. Check the location of the contact brushes on the cradle and case blocks against the internal connection diagram (Fig. 3 or 4). Where a shorting bar is shown on the internal connections (Fig. 7), be sure it is present in the proper position on the case block.

ELECTRICAL TESTS

It is recommended that the following electrical tests be made immediately upon receipt of the relay. All tests should be made with the relay in its case and in a reasonably level position.

1. Overcurrent Unit

The relay should be connected as shown in Figure 9. Gradually increase the current into one pair of studs such as 3-4 until the relay operates as indicated by the auxiliary telephone relay picking up. Then measure the pickup of the relay with current in studs 5-6 and then 7-8. The highest current required to pickup on any current circuit should be 0.95-1.05 amperes. The dropout value for each current circuit will also vary between current circuits but all circuits should dropout above 90% of pickup.

2. Auxiliary Telephone Relay

With the relay connected as in Figure 9, apply current into a current circuit so that the overcurrent unit operates. Then reduce the applied DC voltage until the auxiliary relay drops out. Raise the DC voltage until the auxiliary relay picks up. This should be no more than 80% of rated DC voltage.

3. Target Unit (NHC11A)

The target unit has an operating coil tapped at 0.2 or 2.0 amperes. The relay is shipped from the factory with the top screw in the 2.0 ampere position. The operating point of one target can be checked by connecting a DC source (+) to stud 1 of the relay and from stud 13 through an adjustable resistor and ammeter back to (-). Increase the DC current until the target operates. It should pickup at or below top value. To check the other target reconnect the DC to studs 2 and 16 and operate the auxiliary telephone relay by hand to complete the circuit.

INSTALLATION PROCEDURE

LOCATION

The location of the relay should be clean and dry, free from dust, excessive heat and vibration and should be well lighted to facilitate inspection and testing.

MOUNTING

The relay should be mounted on a vertical surface. The outline and panel drilling dimensions are shown in Fig. 10.

CONNECTIONS

Internal connections are shown in Figure 3 for the NHC11A and in Figure 5 for the NHC11B. An external connection diagram for these relays is shown in Figure 8.

INSPECTION

If the relay has been stored for any length of time prior to installation, it is recommended that the visual and mechanical inspection points and the electrical tests listed under ACCEPTANCE TESTS be repeated.

TARGET TAP SETTING

Be sure that the tap screw on the right side of each target is in the correct position for the application. Normally the 1-ampere tap is used for 125 or 250 volt DC installations and the 4-ampere tap for 48 volts.

If it is necessary to change the tap setting, say from the 0.2-ampere to the 2.0-ampere tap, proceed as follows: Remove the spare screw from the left side of the target unit and insert it in the 2.0-ampere position of the right-hand tap plate. Then remove the screw from the 0.2-ampere tap and store it in the vacant position on the left side of the unit.

PERIODIC CHECKS & ROUTINE MAINTENANCE

In view of the vital role of protective relays in the operation of a power system, it is important that a periodic test program be followed. It is recognized that the interval between periodic checks will vary depending upon environment, type of relay, and the user's experience with periodic testing. Until the user has accumulated enough experience to select the test interval best suited to his individual requirements, it is suggested that the following points be checked at an interval of from one to two years.

1. Overcurrent pickup.
2. Operation of auxiliary telephone relay.
3. Operation of targets.

The procedure outlined under ACCEPTANCE TESTS and the connections of Fig. 9 can be followed.

CONTACT CLEANING

For cleaning relay 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 it will clean off any corrosion thoroughly and rapidly. Its flexibility insures the cleaning of the actual points of contact. Do not use knives, files, abrasive paper or cloth of any kind to clean relay contacts.

SERVICING

If it is found during the acceptance, installation or periodic test routines that any of the factory or field adjustments have been disturbed the settings can be restored as outlined in the following paragraphs.

AUXILIARY UNITS

Contact gaps of the telephone-type auxiliary unit can be adjusted by bending the stationary contact brush to obtain the specified .015" gap. After this adjustment is made the wipe of the circuit-closing contacts should be checked to be sure it is still .005". Wipe can be restored by bending the moving contact brush as required.

If it is found that the voltage pickup of the auxiliary telephone relay unit is too high, it can be reduced by decreasing the gap between armature and pole face by bending the stop below the contact operating arm. To raise the pickup voltage, the armature gap should be increased. After this adjustment, it will be necessary to readjust the contacts to restore the 0.015" gap and the .005" wipe.

OVERCURRENT UNIT

If it is desired to change the pickup of the overcurrent relay, connect the relay as in Figure 9 with the current circuit which had the highest pickup energized. The basic pickup adjustment of the relay is rheostat R1. Increasing the value of resistance in the circuit will increase the pickup. Thus, set the current at the desired pickup value and gradually change R1 until pickup occurs.

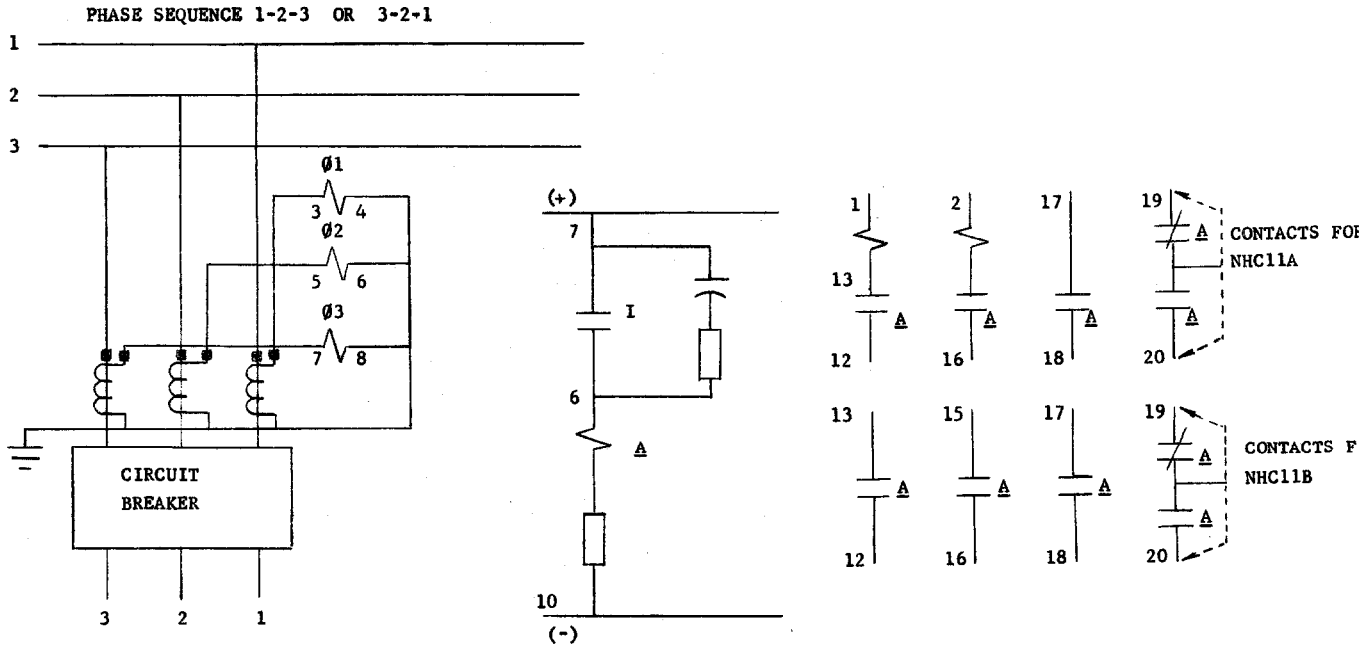
R2 controls the dropout of the relay. It should be set large enough to have the dropout over 90% of pickup but not too high as to cause chatter when the relay first operates. If R2 is set too high, it actually causes dropout to be above pickup and a continual chatter occurs. R2 is only in use after the overcurrent unit picks up.

Check that the other current circuits perform in a similar manner. The other two circuits may have a slightly different pickup value but the dropout value should still be above 90% of pcikup.

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 quantity required, name of the part wanted, and give complete nameplate data. If possible, give the General Electric requisition number on which the relay was furnished.



* Fig. 8 (0195A9116-2) External Connection Diagram For The Type NHC11A And NHC11B Relays

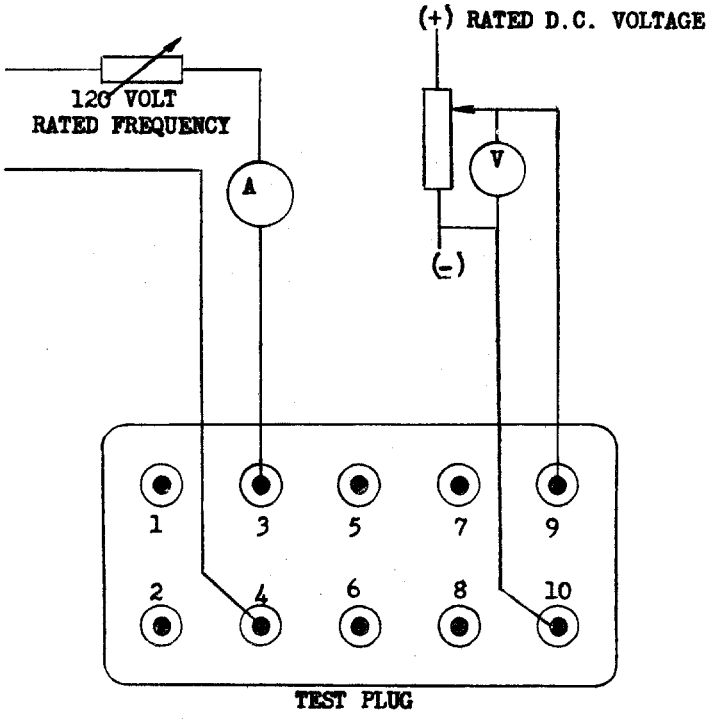
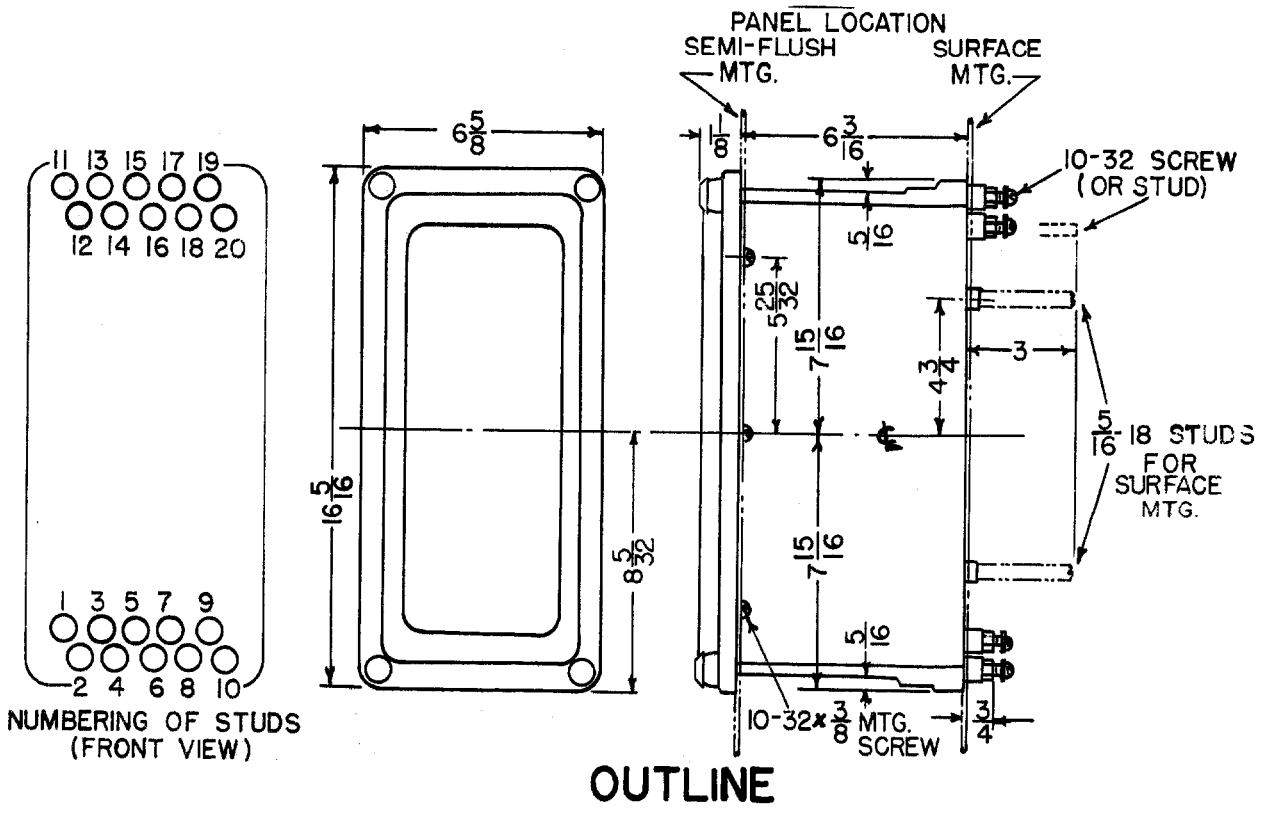
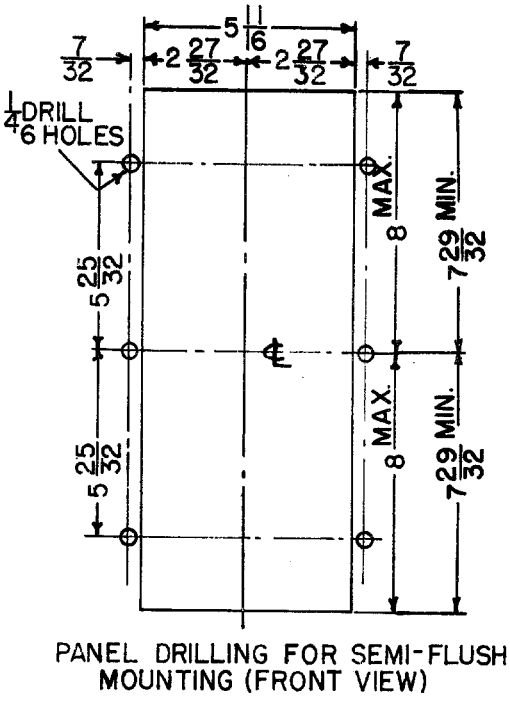
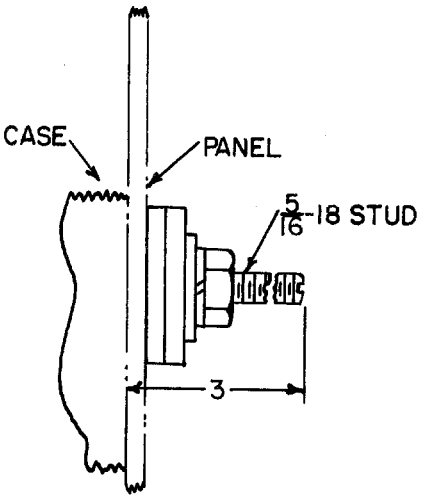


Fig. 9 (0195A9115-0) Field Test Connections For Type NHC11 Relays

* Denotes change since superseded issue.







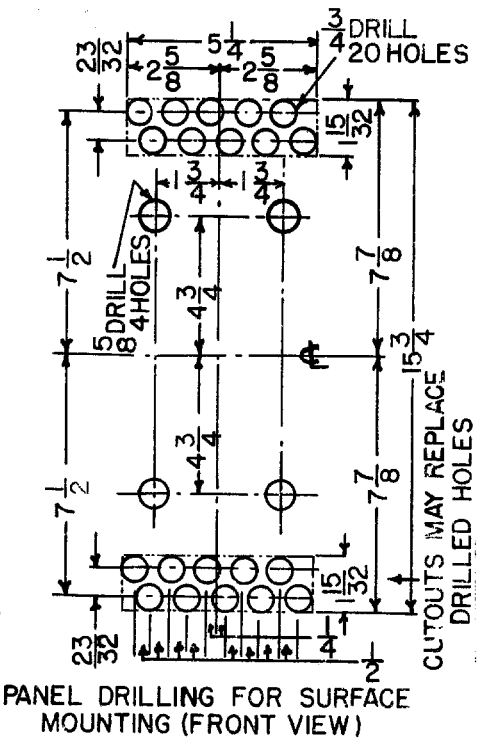


Fig. 10 (6209274-2) Outline And Panel Drilling Diagram For NHC11 Relay

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