



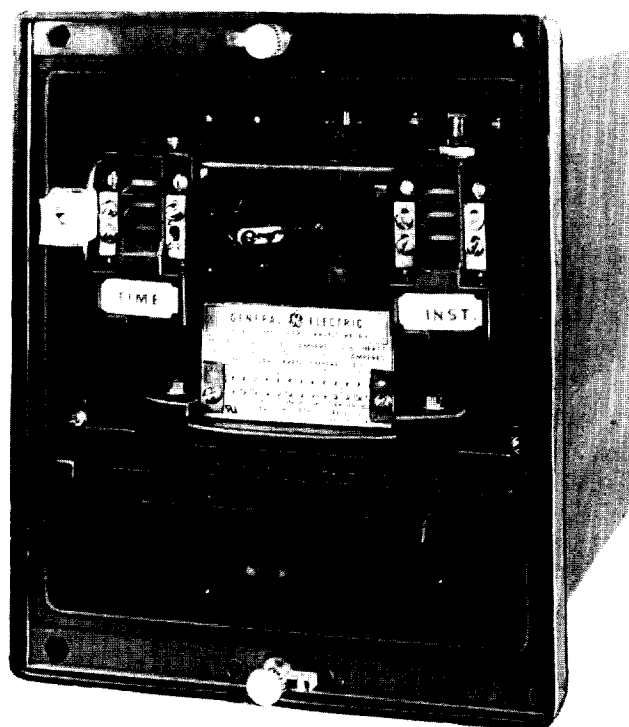
## INSTRUCTIONS

GEK-49951A  
Supersedes GEK-49951

TIME OVERCURRENT RELAYS

TYPE

IFC95F(-)A



GENERAL  ELECTRIC

CONTENTS

DESCRIPTION.....	3
APPLICATION.....	3
CONSTRUCTION.....	3
RATINGS.....	4
TIME OVERCURRENT UNIT.....	4
HIGH-SEISMIC INSTANTANEOUS UNIT.....	5
HIGH-SEISMIC TARGET AND SEAL-IN UNIT.....	6
BURDENS.....	7
CHARACTERISTICS.....	7
TIME-OVERCURRENT UNIT.....	7
HIGH-SEISMIC INSTANTANEOUS UNIT.....	8
HIGH-SEISMIC TARGET AND SEAL-IN UNIT.....	8
RECEIVING, HANDLING AND STORAGE.....	8
ACCEPTANCE TESTS.....	9
VISUAL INSPECTION.....	9
MECHANICAL INSPECTION.....	9
DRAW-OUT RELAY TESTING.....	9
POWER REQUIREMENTS, GENERAL.....	10
TIME OVERCURRENT UNIT.....	10
HIGH-SEISMIC INSTANTANEOUS UNIT.....	11
HIGH-SEISMIC TARGET AND SEAL-IN UNIT.....	12
INSTALLATION .....	12
TIME OVERCURRENT UNIT.....	13
HIGH-SEISMIC TARGET AND SEAL-IN UNIT.....	13
HIGH-SEISMIC INSTANTANEOUS UNIT.....	13
PERIODIC CHECKS AND ROUTINE MAINTENANCE....	13
TIME OVERCURRENT UNIT.....	13
HIGH-SEISMIC INSTANTANEOUS UNIT.....	14
HIGH-SEISMIC TARGET AND SEAL-IN UNIT.....	14
CONTACT CLEANING.....	14
COVER CLEANING.....	14
SYSTEM TEST.....	14
SERVICING.....	14
TIME OVERCURRENT UNIT.....	14
HIGH-SEISMIC INSTANTANEOUS UNIT.....	16
HIGH-SEISMIC TARGET AND SEAL-IN UNIT.....	17
RENEWAL PARTS.....	17
LIST OF FIGURES.....	18

## TIME OVERCURRENT RELAYS

### TYPE IFC95F(-)A

#### DESCRIPTION

The type IFC95F(-)A relay is an extended range, single phase, time overcurrent relay, having a short inverse time characteristic, a target/seal-in unit and a hinged armature instantaneous overcurrent unit. Both the time overcurrent unit and the instantaneous overcurrent unit are described in detail in the section on **CONSTRUCTION**.

The relays are mounted in a size C1 draw-out case of molded construction. The outline and panel drilling are shown in Figures 14 and 15. The relay internal connections are shown in Figure 3 for the IFC95F(-)A relay.

When semiflush mounted on a suitable panel, these relays have a high seismic capability, including both the target seal-in unit and the instantaneous overcurrent unit. Also, these relays are recognized under the Components Program of Underwriters Laboratories, Inc.

#### APPLICATION

The type IFC95F relays are designed for application where a fast inverse time characteristic in combination with a relatively low burden is required. A typical application is illustrated by Figure 6, where the relay is used to provide sensitive ground fault protection for equipment "downstream" from a grounded transformer.

#### CONSTRUCTION

The IFC induction disk relays consist of a molded case, cover, support structure assembly, and a connection plug to make up the electrical connection. See cover figure and Figures 1, 2 and 13. Figure 2 shows the induction unit mounted to the molded support structure. This disk is activated by a current-operating coil mounted on a laminated U-magnet. The disk and shaft assembly carries a moving contact which completes the alarm or trip circuit when it touches a stationary contact. The disk assembly is restrained by a spiral spring to give the proper contact closing current. The disk's rotation is retarded by a permanent magnet mounted in a molded housing on the support structure.

*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 draw-out connection/test system for the C1 case, shown in Figure 13, has provisions for 14 connection points, and a visible CT shorting bar located up front. As the connection plug is withdrawn, it clears the shorter contact fingers in the output contact circuits first. Thus, the trip circuit is opened before any other circuits are disconnected. Next, current circuit fingers on the case connection block engage the shorting bar (located at the lower front of the case) to short circuit external current transformer secondary connections. The window provides visual confirmation of CT shorting. The connection plug then clears the current circuit contact fingers on the case, and finally those on the relay support structure to completely de-energize the draw-out element.

There is a high-seismic target and seal-in unit mounted on the front to the left of the shaft of the time overcurrent unit (see Figure 1). The seal-in unit has its coil in series and its contacts in parallel with the contacts of the time overcurrent unit such that when the induction unit contacts close, the seal-in unit picks up and seals in. When the seal-in unit picks up, it raises a target into view that latches up and remains exposed until released by pressing a reset button located on the upper left side of the cover.

In addition to the above, the relay contains a high-seismic instantaneous unit (see Figure 1). The instantaneous unit is a small hinged-type unit that is mounted on the front to the right of the shaft of the time overcurrent unit. Its contacts are normally connected in parallel with the contacts of the time overcurrent unit and its coil is connected in series with the time overcurrent unit. When the instantaneous unit picks up, it raises a target that latches up and remains exposed until it is released. The same reset button that releases the target seal-in unit also releases the target of the instantaneous unit.

A magnetic shield is mounted to the support structure of the IFC relay, to eliminate the proximity effect of external magnetic materials.

Both the high-seismic target and seal-in unit and the high-seismic instantaneous unit have the letters "Hi-G" molded into their target blocks to distinguish them as high-seismic units. Seismic Fragility Level exceeds peak axial acceleration of 7.5 g's (4g ZPA) when tested using a biaxial multi-frequency input motion to produced a Required Response Spectrum (RRS) in accordance with IEEE Standard 501, Seismic Testing of Relays, 1978.

## RATINGS

The relays are designed for operation in an ambient air temperature from -20°C to +55°C.

### TIME OVERCURRENT UNIT

Ranges for the time overcurrent unit are shown in Table I.

TABLE I

Relay	Frequency (Hertz)	Current Range (Amperes)
IFC95F	50 and 60	0.5 - 4.0
		1.0 - 12.0

Available taps for the time overcurrent unit are shown in Table II.

TABLE II

Range (Amperes)	Taps Available (Amperes)												
0.5 - 4.0	0.5	0.6	0.7	0.8	1.0	1.2	1.5	2.0	2.5	3.0	4.0		
1 - 12	1.0	1.2	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0

The one-second thermal ratings are listed in Table III.

TABLE III

Time Overcurrent Unit (Amperes)	One-Second Rating Any Tap (Amperes)	K
0.5 - 4.0	82	6724
1.0 - 12.0	164	26896

Ratings less than one second may be calculated according to the formula:

$$I = \sqrt{K/T}, \text{ where } T \text{ is the time in seconds that the current flows.}$$

The continuous ratings for the time overcurrent unit are shown in Tables IV and V.

TABLE IV

0.5 - 4.0 Ampere Range Ratings												
Tap	0.5	0.6	0.7	0.8	1.0	1.2	1.5	2.0	2.5	3.0	4.0	
Continuous Current	1.2	1.4	1.5	1.6	1.9	2.1	2.4	2.9	3.3	3.7	4.5	

TABLE IV

1.0 - 2.0 Ampere Range Ratings													
Tap	1.0	1.2	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0
Cont. Curr.	2.0	2.3	2.7	3.3	3.9	4.5	5.5	6.6	7.5	8.4	9.3	10.9	12.5

#### HIGH-SEISMIC INSTANTANEOUS UNIT

The instantaneous coil is tapped for operation on either one of two ranges (H or L). Selection of the high or low range is accomplished by the positioning of the link located on the top of the support structure. See Figure 1 and Table VI.

TABLE VI

High Seismic Instantaneous Unit (Amps)	Link Position	*Range (Amps)	Continuous Rating (Amps)	**One Second Rating (Amps)	K
2 - 50	L	2 - 10	3.7	130	16,900
	H	10 - 50	7.5		
6 - 150	L	6 - 30	10.2	260	67,600
	H	30 - 150	19.6		

\*The range is approximate, which means that the 2-10, 10-50 may be 2-8, 8-50. There will always be at least 1 ampere overlap between the maximum L setting and the minimum H setting. Whenever possible, be sure to select the higher range, since it has the higher continuous rating.

\*\*Higher currents may be applied for shorter lengths of time in accordance with the formula:

$$I = \sqrt{K/T}$$

Since the instantaneous unit coil is in series with the time overcurrent unit coil, see Tables III, IV, V and VI to determine the current-limiting element for both continuous and short-time ratings.

#### HIGH-SEISMIC TARGET AND SEAL-IN UNIT

Ratings for the target and seal-in unit are shown in Table VII.

TABLE VII

	Tap	
	0.2	2
DC Resistance $\pm 10\%$ (Ohms)	8.0	0.24
Min. Operating (Amp.) $+0 - 60\%$	0.3	2.0
Carry Continuous (Amperes)	0.3	3.0
Carry 30 Amps for (Seconds)	0.03	4
Carry 10 Amps for (Seconds)	0.25	30
60 Hz Impedance (Ohms)	68.6	0.73

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.

#### CONTACTS

The current-closing rating of the contacts is 30 amperes for voltages not exceeding 250 volts. The current-carrying rating is limited by the ratings of the seal-in unit.

**BURDENS**

Burdens for the time overcurrent unit are given in Table VIII.

TABLE VIII

HZ	Range	Min Tap Amps	Burdens at Min.Pickup Min. Tap (Ohms)			Burdens in Ohms (Z) Times Pickup		
			R	J <sub>X</sub>	Z	3	10	20
60	0.5 - 4.0	0.5	6.30	24.20	25.00	21.30	9.96	6.13
	1.0 - 12.0	1.0	1.49	6.09	6.27	5.44	2.55	1.09
50	0.5 - 4.0	0.5	5.25	20.17	20.83	17.75	8.30	5.11
	1.0 - 12.0	1.0	1.24	5.08	5.23	4.53	2.13	0.91

Note: The impedance values given are those for minimum tap of each range; the impedance for other taps at pickup current (tap rating) varies inversely (approximately) as the square of the tap rating. For example, an IFC95 60 Hz relay with 1 - 12 amp range has an impedance of 6.27 ohms on the 1.0 amp tap. The impedance of the 2.0 amp tap is  $(1.0/2.0)^2 \times 6.27 = 1.57$  ohms.

The high-seismic instantaneous unit burdens are listed in Table IX.

TABLE IX

High Seismic Inst.Unit (Amps)	HZ	Link Position	Range (Amps)	Min. Pickup (Amps)	Burdens at Min. Pickup (Ohms)			Burdens in Ohms (Z) Times Pickup		
					R	J <sub>X</sub>	Z	3	10	20
2- 50	60	L	2- 10	2	0.750	0.650	0.992	0.634	0.480	0.457
		H	10- 50	10	0.070	0.024	0.074	0.072	0.071	0.070
6-150	60	L	6- 30	6	0.110	0.078	0.135	0.095	0.081	0.079
		H	30-150	30	0.022	0.005	0.023	0.022	0.022	0.022
2- 50	50	L	2- 10	2	0.625	0.542	0.827	0.528	0.400	0.380
		H	10- 50	10	0.058	0.020	0.062	0.060	0.059	0.058
6-150	50	L	6- 30	6	0.092	0.065	0.112	0.079	0.068	0.066
		H	30-150	30	0.018	0.004	0.019	0.018	0.018	0.018

**CHARACTERISTICS**TIME OVERCURRENT UNITPickup

Pickup in these relays is defined as the current required to close the contacts from the 0.5 time-dial position. Current settings are made by means of two movable leads, which connect to the tap block at the top of the support structure (see Figure 1). The tap block is marked A through N.

Example: The 2-amp tap for a 1 - 12 amp IFC95 time overcurrent relay requires one movable lead in position C and the other in position L (see Table X).

TABLE X

Taps	A M	A L	B L	B K	C K	C J	D J	D H	E H	E G	F G
Pickup, Amperes	0.5	0.6	0.7	0.8	1.0	1.2	1.5	2.0	2.5	3.0	4.0

Taps	A N	B M	C M	C L	D L	D K	D J	E J	F J	F H	G J	G H	J K
Pickup, A	1.0	1.2	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0	8.0	10	12

Operating Time Accuracy

IFC relays should operate within  $\pm 7\%$  or  $\pm$  the time dial setting times 0.010 seconds, whichever is greater, of the published time curve. Figures 4 and 5 show the various time-current characteristics for the IFC relays. The setting of the time dial determines the length of the time required to close the contacts for a given current. The higher the time-dial setting, the longer the operating time.

The contacts are just closed when the time dial is set to 0. The maximum time setting occurs when the time dial is set to 10 and the disk has to travel its maximum distance to close the contacts.

Reset

The unit resets at 90% of the minimum closing current. Reset times are proportionate to the time dial settings. The time to reset to the Number 10 time-dial position when the current is reduced to 0 is approximately 4 seconds for the IFC95 relays.

HIGH-SEISMIC INSTANTANEOUS UNIT

The instantaneous unit has a 25-to-1 range with a tapped coil. There are high and low ranges, selected by means of a link located on the top of the support structure (see Figure 1). The time-current curve for the instantaneous unit is shown in Figure 8.

HIGH-SEISMIC TARGET AND SEAL-IN UNIT

The target and seal-in unit has two tap selections located on the front of the unit (see Figure 1).

**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 damage resulting from rough handling is evident, file a damage claim at once with the transportation company and promptly notify the nearest General Electric Sales Office.

Reasonable care should be exercised in unpacking the relay in order that none of the parts are damaged 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.

### ACCEPTANCE TESTS

Immediately upon receipt of the relay an Inspection and Acceptance Test should be made to ensure that no damage has been sustained in shipment and that the relay calibrations have not been disturbed. If the examination or test indicates that readjustment is necessary, refer to the section on **SERVICING**.

Since operating companies use different procedures for acceptance and installation tests, the following section includes all applicable tests that may be performed on these relays. These tests may be performed as part of the installation or acceptance tests at the discretion of the user.

#### VISUAL INSPECTION

Check the nameplate to ensure 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 parts or any other signs of physical damage.

#### MECHANICAL INSPECTION

1. There should be no noticeable friction when the disk is rotated slowly clockwise. The disk should return by itself to its rest position.
2. Make sure the control spring is not deformed, nor its convolutions tangled or touching each other.
3. The armature and contacts of the seal-in units, as well as the armature and contacts of the instantaneous unit, should move freely when operated by hand; there should be at least 1/64 inch wipe on the seal-in and the instantaneous contacts.
4. The targets in the seal-in unit and in the instantaneous unit must come into view and latch when the armatures are operated by hand, and should unlatch when the target release button is operated.
5. Make sure that the brushes and shorting bars agree with the internal connections diagram.

#### CAUTION

**Should there be a need to tighten any screws DO NOT OVER TIGHTEN, to prevent stripping.**

#### DRAW-OUT RELAY TESTING

IFC relays may be tested without removing them from the panel by using the 12XCA11A1 four-point test probes. The 12XCA11A1 four-point test probe makes

connections to both the relay and the external circuitry, which provides maximum flexibility, but requires reasonable care since a CT shorting jumper is necessary when testing the relay. The CT circuit may also be tested by using an ammeter instead of the jumper. See the test circuit in Figure 9.

#### POWER REQUIREMENTS, GENERAL

All alternating-current-operated devices are affected by frequency. Since non-sinusoidal waveforms can be analyzed as a fundamental frequency plus harmonics of the fundamental frequency, it follows that alternating-current (AC) devices (relays) will be affected by the applied waveform. Therefore, in order to test alternating-current relays properly it is essential to use a sine wave of current and/or voltage. The purity of the sine wave (i.e., its freedom from harmonics) cannot be expressed as a finite number for any particular relay; however, any relay using tuned circuits, R-L or RC networks, or saturating electromagnets, (such as time overcurrent relays) would be essentially affected by non-sinusoidal waveforms. Hence a resistance-limited circuit, as shown in Figures 10-12, is recommended.

#### TIME OVERCURRENT UNIT

Rotate the time dial slowly and check by means of a lamp that the contacts just close at the 0 time-dial setting.

The point at which the contacts just close can be adjusted by running the stationary contact brush in or out by means of its adjusting screw.

With the contacts just closing at No.0 time setting, there should be sufficient gap between the stationary contact brush and its metal backing strip to ensure approximately 1/32 inch wipe.

The minimum current at which the contacts will just close is determined by the tap setting in the tap block at the top of the support structure. See **CHARACTERISTICS** section.

The pickup of the time overcurrent unit for any current tap setting is adjusted by means of a spring-adjusting ring. See Figure 1. The spring-adjusting ring either winds or unwinds the spiral control spring. By turning the ring, the operating current of the unit may be brought into agreement with the tap setting employed, if this adjustment has been disturbed. This adjustment also permits any desired setting intermediate between the various tap settings to be obtained. If such adjustment is required, it is recommended that the higher tap be used. It should be noted that the relay will not necessarily agree with the time-current characteristics of Figures 4 and 5 if the relay has been adjusted to pick up at a value other than tap value, because the torque level of the relay has been changed.

#### Time Setting

The setting of the time dial determines the length of time the unit requires to close the contacts when the current reaches a predetermined value. The

contacts are just closed when the time dial is set on 0. When the time dial is set on 10, the disk must travel the maximum amount to close the contacts and therefore this setting gives the maximum time setting.

The primary adjustment for the time of operation of the unit is made by means of the time dial. However, further adjustment is obtained by moving the permanent magnet along its supporting shelf; moving the magnet toward the disk and shaft decreases the time, while moving it away increases the time.

### Pickup Test

Set the relay at 0.5 time-dial position and the lowest tap. Using the test connections in Figure 10, the main unit should close the contacts within  $\pm 3\%$  of tap value current.

### Time Test

Set the relay at No.5 time-dial setting and the lowest tap. Using the test connection in Figure 11, apply 10 times tap current to the relay. The relay operating times to close its contact are listed in Table XI.

TABLE XI

Hz	Time (Seconds)	
	Min.	Max.
60	0.505	0.545
50	0.565	0.640

### HIGH-SEISMIC INSTANTANEOUS UNIT

Make sure that the instantaneous unit link is in the correct position for the range in which it is to operate. See the internal connections diagram, Figure 3, and connect as indicated in the test circuit of Figure 11. Whenever possible use the higher range since the higher range has a higher continuous rating.

### Setting the High-Seismic Instantaneous Unit

The instantaneous unit has an adjustable core located at the top of the unit, as shown in Figure 1. To set the instantaneous unit to a desired pickup, loosen the locknut and adjust the core. Turning the core clockwise decreases the pickup; turning the core counterclockwise increases the pickup. Bring up the current slowly until the unit picks up. It may be necessary to repeat this operation until the desired pickup value is obtained. Once the desired pickup value is reached, tighten the locknut.

#### **CAUTION**

**Refer to Table VI for the continuous and 1-second ratings of the instantaneous unit. Do not exceed these ratings when applying current to the instantaneous unit.**

The range of the instantaneous unit (see Table VI) must be obtained between a core position of 1/8 of a turn from "full clockwise" and 20 turns counterclockwise from the full-clockwise position. **Do not leave the core in the full-clockwise position.**

#### HIGH-SEISMIC TARGET AND SEAL-IN UNIT

The target and seal-in unit has an operating coil tapped at 0.2 and 2.0 amperes. The relay is shipped from the factory with the tap screw in the higher ampere position. The tap screw is the screw holding the right-hand stationary contact. To change the tap setting, first remove one screw from the left-hand stationary contact and place it in the desired tap. There will now be two screws in the right-hand stationary contact, one in each tap. **Screws should never be allowed to remain in both taps at the same time**, so next, remove the screw from the undesired tap and place it on the left-hand stationary contact where the first screw was removed (see Figure 1). This procedure is necessary to prevent the right-hand stationary contact from getting out of adjustment.

#### Pickup and Dropout Test

1. Connect relay studs 1 and 2 (see the test circuit of Figure 12) to a DC source, ammeter and load box so that the current can be controlled over a range of 0.1 to 2.0 amperes.
2. Turn the time dial to the 0 time-dial position.
3. Increase the current slowly until the seal-in unit picks up. See Table XI.
4. Move the time dial away from the 0 time-dial position; the seal-in unit should remain in the picked up position.
5. Decrease the current slowly until the seal-in unit drops out. See Table XII.

TABLE XII

Tap	Pickup Current	Dropout Current
0.2	0.12 - 0.20	0.05 or more
2.0	1.2 - 2.0	0.50 or more

#### **INSTALLATION**

The relay should be installed in a clean, dry location, free from dust and well lighted to facilitate inspection and testing.

The relay should be mounted on a vertical surface. The outline and panel drillings are shown in Figure 14 for semi-flush mounting and Figure 15 for various methods of surface mounting.

The internal connection diagram for the relays is shown in Figure 3. Typical external connections are shown in Figure 6.

The following tests are to be performed at the time of installation:

#### TIME OVERCURRENT UNIT

Set the tap block to the desired tap setting, and the time dial to the 0.5 position. Using the test circuit in Figure 10, gradually apply current until the contacts just close. This value of current is defined as pickup and should be within 3% of tap value.

Check the operating time at some multiple of tap value and the desired time-dial setting. This multiple of tap value may be 10 times tap rating, or the maximum fault current for which the relay must coordinate. The value used is left to the discretion of the user.

#### HIGH-SEISMIC INSTANTANEOUS UNIT

1. Select the desired range by setting the link in the proper position (see Figures 1 and 3). Whenever possible, be sure to select the higher range since it has a higher continuous rating.
2. Set the instantaneous unit to pick up at the desired current level. See Setting the High-Seismic Instantaneous Unit in the **ACCEPTANCE TESTS** section.

#### HIGH-SEISMIC TARGET AND SEAL-IN UNIT

1. Make sure that the tap screw is in the desired tap.
2. Perform pickup and dropout tests as outlined in the **ACCEPTANCE TESTS** section.

All tests described above under INSTALLATION TESTS must be performed at the time of installation. In addition, if those tests described in the **ACCEPTANCE TESTS** section were not performed prior to installation, it is recommended that they be performed at this time.

### **PERIODIC CHECKS AND 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. 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 points listed below be checked at an interval of from one to two years.

These tests are intended to ensure that the relays have not deviated from their original settings. If deviations are encountered, the relay must be retested and serviced as described in this manual.

#### TIME OVERCURRENT UNIT

1. Perform pickup test as described in the **INSTALLATION** section for the tap setting in service.

2. Perform the time test as described in the **ACCEPTANCE TESTS** section.

#### HIGH-SEISMIC INSTANTANEOUS UNIT

Check that the instantaneous unit picks up at the desired current level, as outlined in the **ACCEPTANCE TESTS** section.

#### HIGH-SEISMIC TARGET AND SEAL-IN UNIT

1. Check that the unit picks up at the values shown in Table X1.
2. Check that the unit drops out at 25% or more of tap value.

#### CONTACT CLEANING

A flexible burnishing tool should be used for cleaning relay contacts. This is a flexible strip of metal with an etched-roughened surface, which in effect resembles a superfine file. The polishing action of this file is so delicate that no scratches are left on the contacts, yet it cleans off any corrosion thoroughly and rapidly. The flexibility of the tool insures the cleaning of the actual points of contact. Relay contacts should never be cleaned with knives, files, or abrasive paper or cloth.

#### COVER CLEANING

The clear Lexan<sup>R</sup> cover should be cleaned with a soft cloth and water only. Cleaning solutions may damage the cover.

#### SYSTEM TEST

Although this instruction book is primarily written to check and set the IFC relay, overall functional tests to check the system operation are recommended at intervals based on the customer's experience.

### **SERVICING**

#### TIME OVERCURRENT UNIT

If it is found during installation or periodic testing that the time overcurrent unit is out of limits, the unit may be recalibrated as follows:

##### Pickup Tests

Rotate time dial to No.0 time-dial setting and check by means of an external contact-closing indicating light that the contacts just close.

The point at which the contacts just close can be adjusted by running the stationary contact brush in or out by means of its adjusting screw.

With the contacts just closing at No.0 time setting, there should be sufficient gap between the stationary contact brush and its metal backing strip to ensure approximately 1/32 inch wiper.

The pickup of the unit for any current tap setting is adjusted by means of a spring-adjusting ring. By turning the ring, the operating current of the unit may be brought into agreement with the tap setting employed, if for some reason this adjustment has been disturbed. This adjustment also permits any desired setting, intermediate between the various tap settings, to be obtained. If such adjustment is required, it is recommended that the higher tap setting be used. It should be noted that the relay will not necessarily agree with the time current characteristics of Figures 4 and 5 if the relay has been adjusted to pick up at a value other than tap value, because the torque level of the relay has been changed.

Connect the operating coil terminals to a source of the proper frequency and good waveform, having a voltage of 110 or more, with resistance load boxes for setting the current. See test circuit, Figure 10.

With the tap block set for the lowest tap and the time dial set where contacts are just open, adjust the control spring to just close the contacts within the limits given in Table XIII, which are  $\pm 1\%$  of the tap amps.

TABLE XIII

Tap Range	Tap	Min. Amps	Max. Amps
0.5 - 4	0.5	0.495	0.505
1.0 - 12.0	1.0	0.99	1.01

It should never be necessary to wind up the control-spring adjuster more than 30° (one notch) or unwind it more than 120° (three notches) from the factory setting to obtain the above pickup setting.

#### Time Tests

With the tap block set for the lowest tap and the time dial at No.10 setting, apply 10 times tap current to the relay.

Adjust the position of the drag magnet assembly to obtain an operating time at least within the limits listed in Table XIV, but preferably as near as possible to 0.525 seconds for 60 Hz relays and 0.595 seconds for 50 Hz relays..

TABLE XIV

Relay	Hz	Time (Seconds)	
		Min.	Max.
IFC95	50	0.578	0.612
	60	0.510	0.540

The drag magnet assembly should be approximately in the middle of its travel. The drag magnet assembly is adjusted by loosening the two screws securing it to the support structure. See Figure 1. Moving the drag magnet towards the disk and shaft decreases the operating time, and moving the drag magnet away

from the disk and shaft increases the operating time. **The screws securing the drag magnet assembly to the support structure must be tight before proceeding with other time checks.**

#### Mechanical Adjustment

The disk does not have to be in the exact center of either air gap for the relay to perform correctly. Should the disk not clear all gaps, the following adjustment can be made.

1. Determine which way the disk must be aligned to clear all gap surfaces by 0.010 inch.
2. Remove the drag magnet assembly by loosening the two screws securing it to the support structure.
3. Loosen the upper pivot-bearing set screw (1/16 inch hex wrench) slightly, so the upper pivot can move freely. Do not remove the set screw from the support structure.
4. Loosen the jewel-bearing set screw as in Item 3. above.
5. Apply a slight downward finger pressure on the upper pivot and turn the jewel-bearing screw, from the underside of the support structure, to position the disk as determined in Item 1. above.
6. Turn the jewel-bearing screw 1/8 turn clockwise and tighten the upper pivot set screw to 2.5-3.5 inch-pounds of torque.
7. Turn the jewel-bearing screw 1/8 turn counterclockwise. This will lower the disk and shaft assembly approximately 0.005 inch and permit proper end play. The shaft must have 0.005 to 0.010 inch of end play.
8. Tighten the jewel-bearing set screw to 2.5-3.5 inch-pounds of torque.
9. Rotate the disk through the electromagnet gap. The disk should clear the gap surfaces by 0.010 inch and be within 0.005 inch flatness. If the disk is not within 0.005 inch flatness, the disk should be replaced.
10. Reinstall the drag magnet assembly and check that the disk has at least 0.010 inch clearance from the drag magnet assembly surfaces.
11. Tighten the drag magnet assembly mounting screw with 7-to-10 inch-pounds of torque, after securely seating the assembly and positioning it according to the time test above.

#### HIGH-SEISMIC INSTANTANEOUS UNIT

1. Since mechanical adjustments may affect the Seismic Fragility Level, it is advised that no mechanical adjustments be made if seismic capability is of concern.
2. Both contacts should close at the same time.



3. The backing strip should be so formed that the forked end (front) bears against the molded strip under the armature.
4. With the armature against the pole piece, the cross member of the "T" spring should be in a horizontal plane and there should be at least 1/64 inch wipe on the contacts. Check this by inserting a 0.010 inch feeler gage between the front half of the shaded pole and the armature, with the armature held closed. Contacts should close with the feeler gage in place.

#### HIGH-SEISMIC TARGET AND SEAL-IN UNIT

Since mechanical adjustments may affect the Seismic Fragility Level, it is advised that no mechanical adjustments be made if seismic capability is of concern.

Check Items 2 and 3 as described under INSTANTANEOUS UNIT.

To check the wipe of the seal-in unit, insert a 0.010 inch feeler gage between the plastic residual of the armature and the pole piece, with the armature held closed. Contacts should close with the feeler gage in place.

#### **RENEWAL PARTS**

It is recommended that sufficient quantities of renewal parts be kept in stock for 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 the name of the part wanted, quantity required, and complete nameplate data, including the serial number, of the relay for which the part is required.

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. IFC95F Relay, Front View	19
2. IFC95F Relay, Rear View	20
3. IFC95F Internal Connections, Front View	21
4. 60 Hertz Time-Current Characteristics	22
5. 50 Hertz Time-Current Characteristics	23
6. External Connections	24
7. Transient Overreach Characteristics of the Hi-Seismic Instantaneous Unit	25
8. Time-current Characteristics of the Hi-Seismic Instantaneous Unit	26
9. Test Connections - CT Testing	27
10. Test Connections - Time Overcurrent Unit	28
11. Test Connections - High Seismic Instantaneous Unit	29
12. Test Connections - High Seismic Target and Seal-in Unit	30
13. Cross Section of IFC Draw-out Case Connections	31
14. Outline and Panel Drilling for Semi-Flush Mounting	32
15. Outline and Panel Drilling for Surface Mounting	33

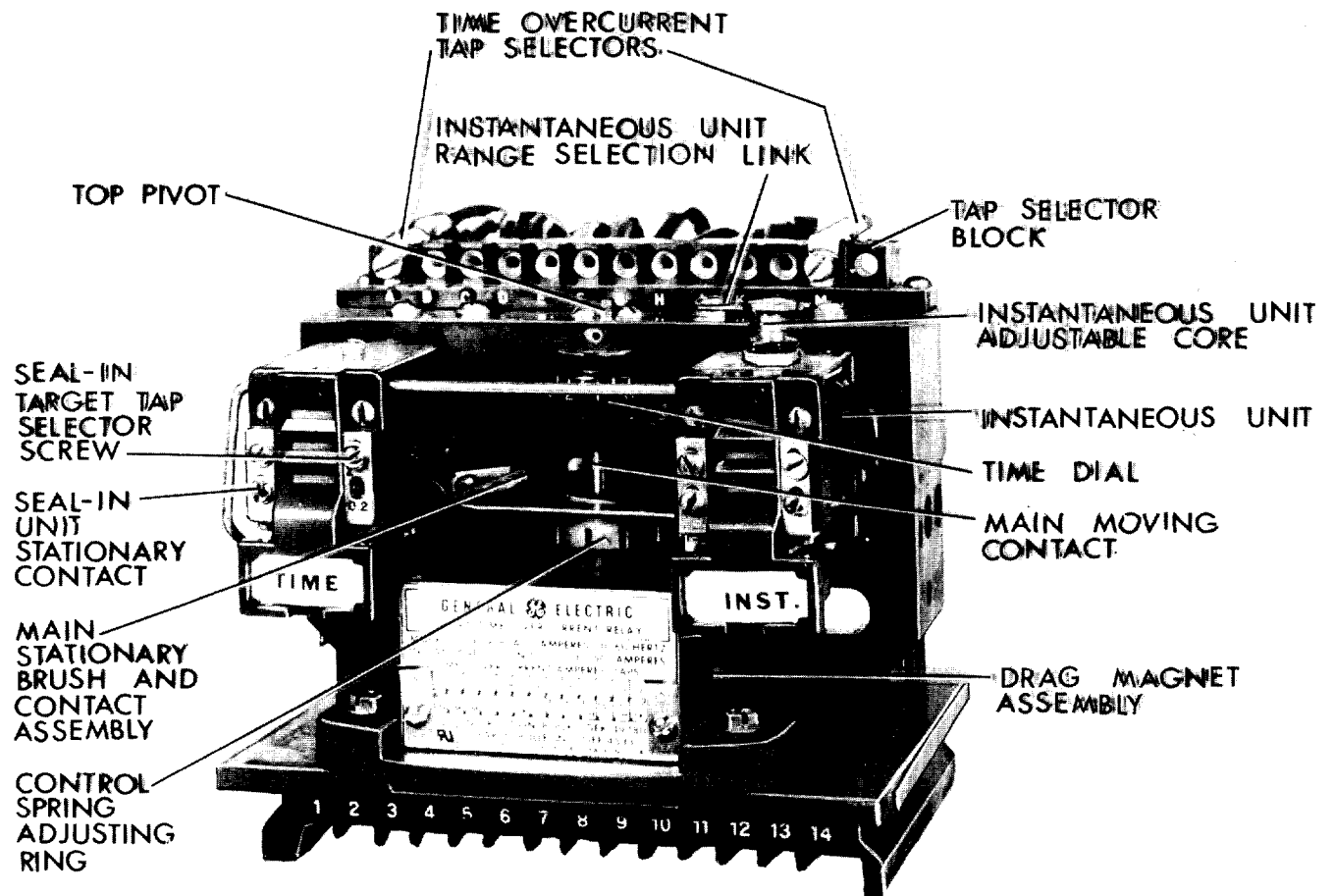


Figure 1 (8043006) IFC95F Relay, Removed from Case, Front View

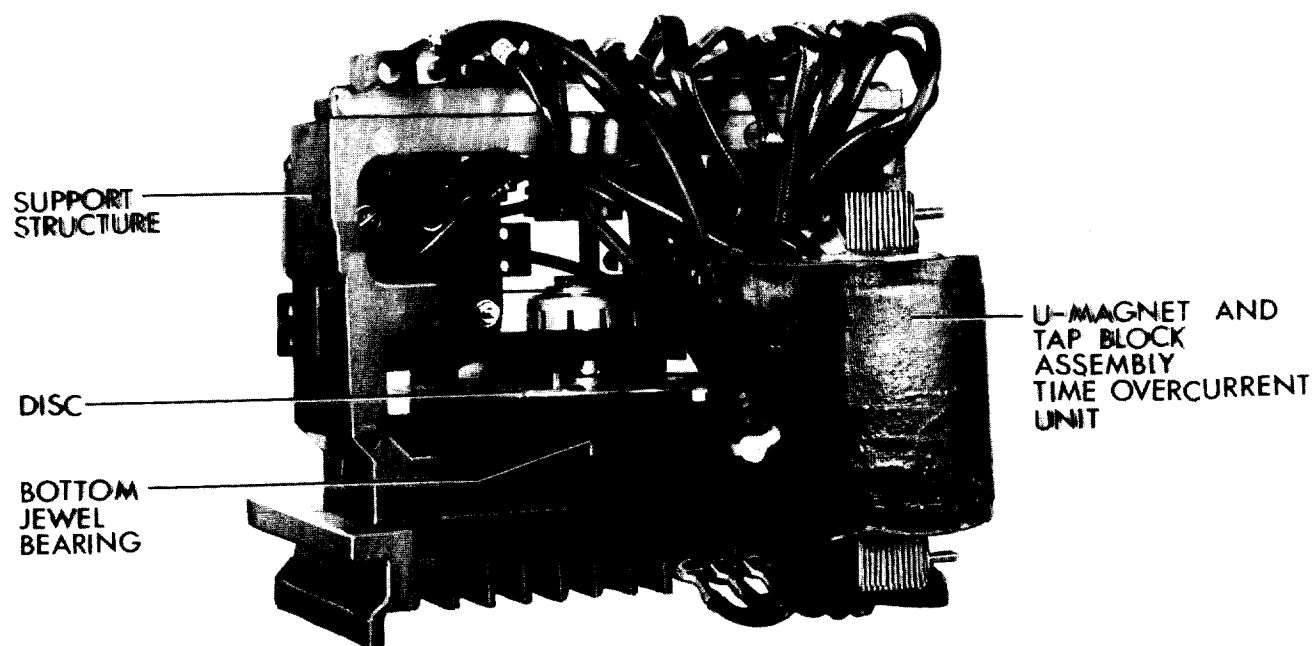


Figure 2 (8043010) IFC95F Relay, Removed from Case, Rear View

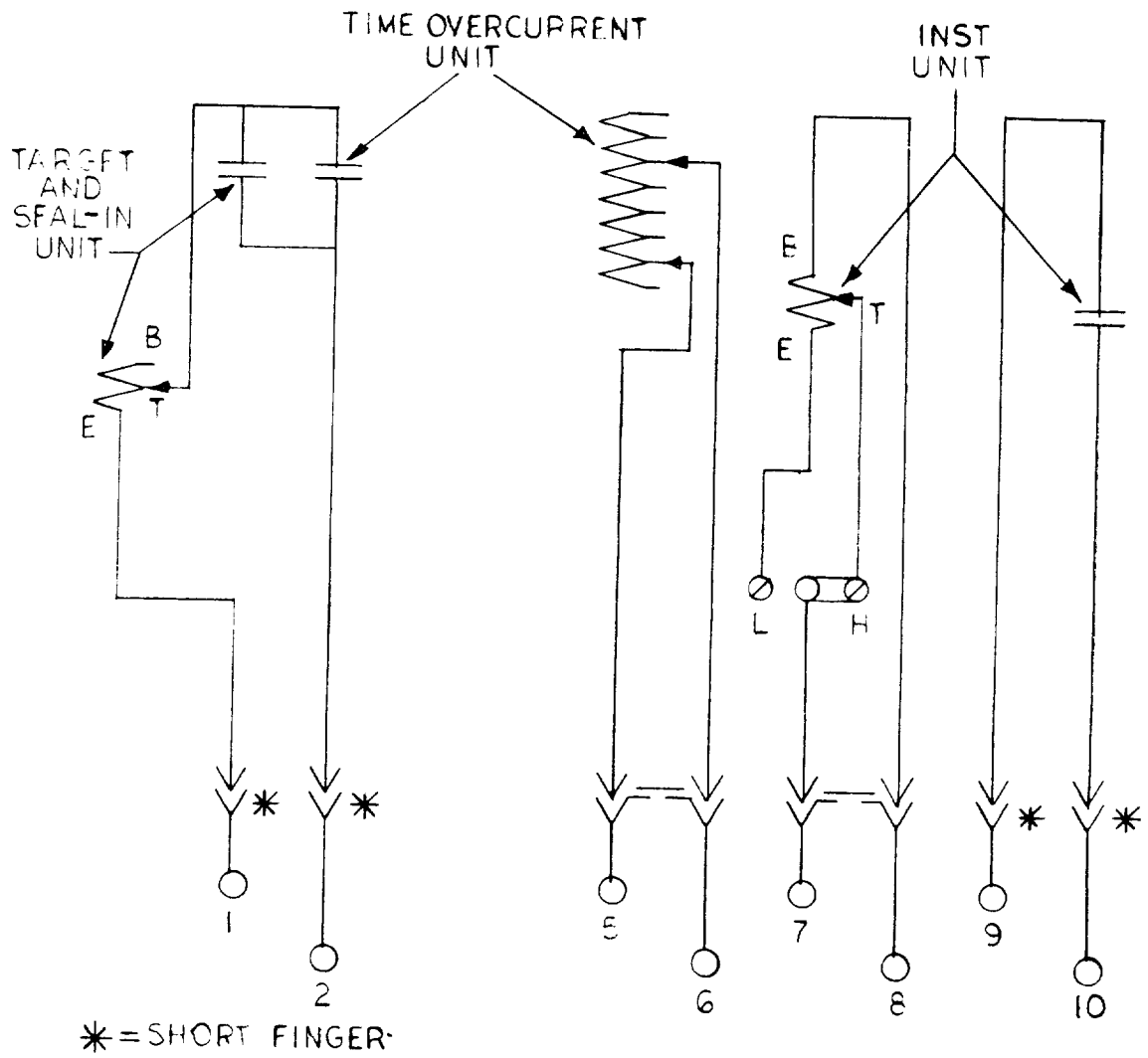


Figure 3 (0275A3214-0) IFC95F Internal Connections, Front View

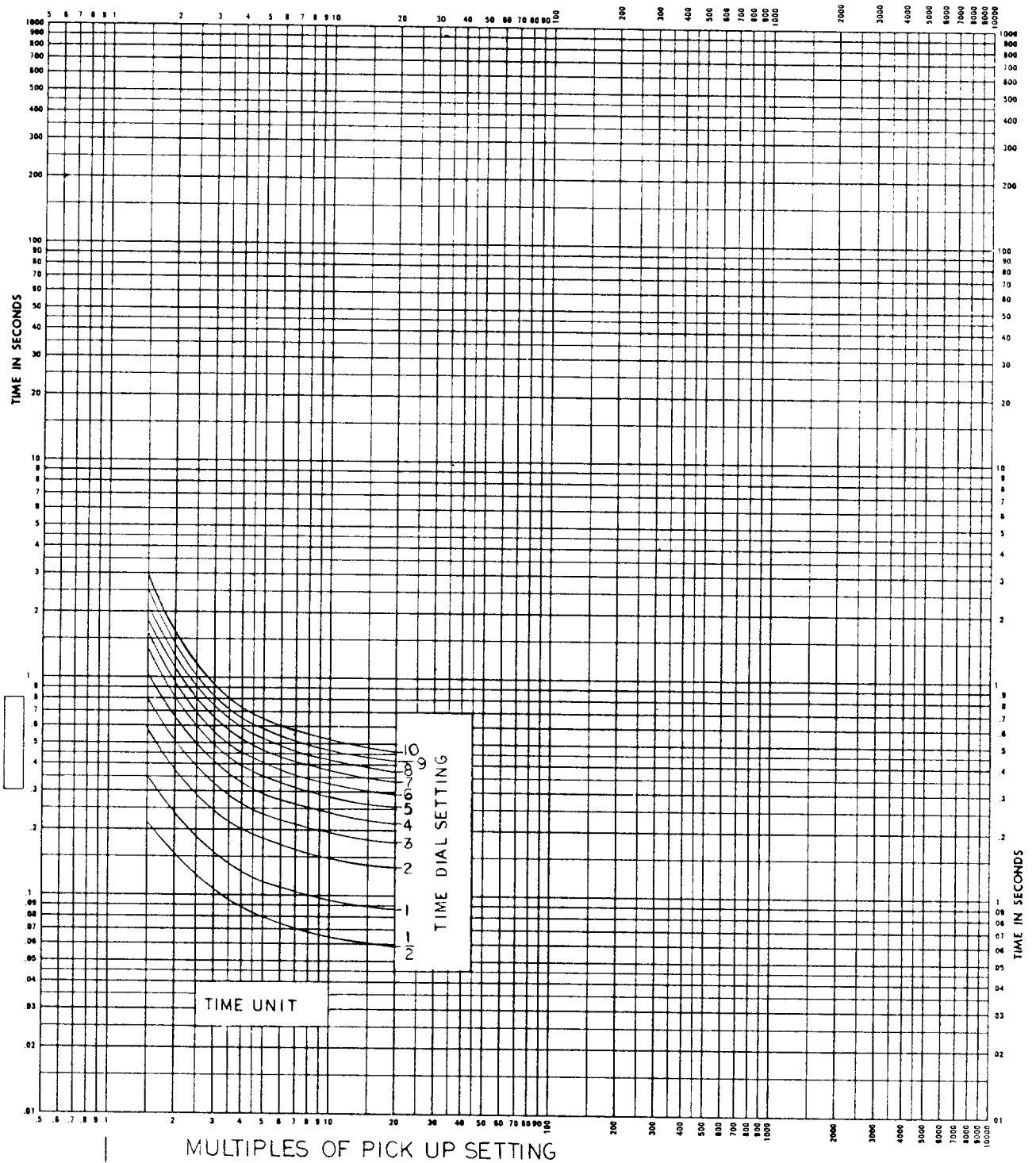


Figure 4 (0108B8966-1) 60 Hertz Time-Current Characteristics for IFC95F

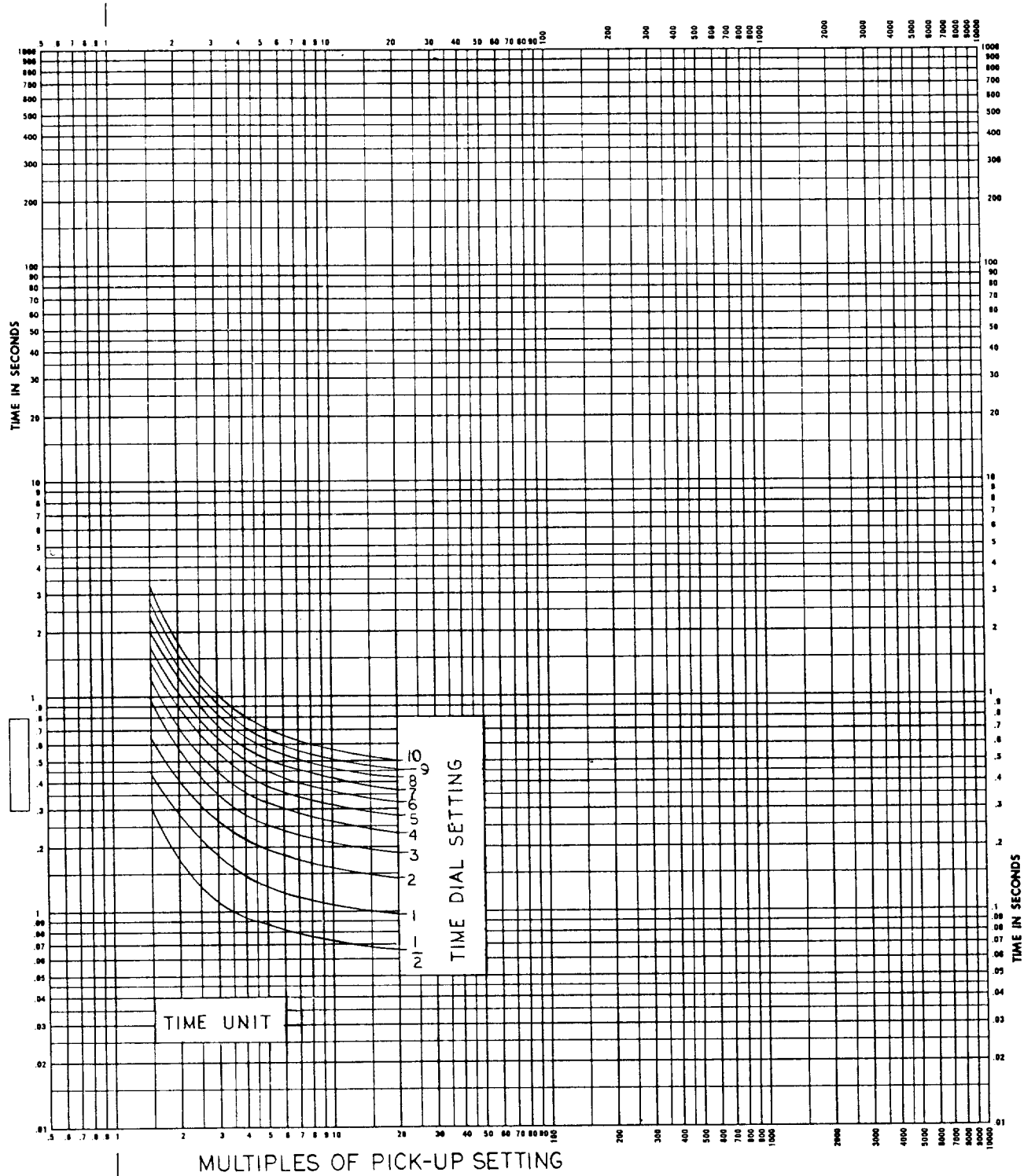
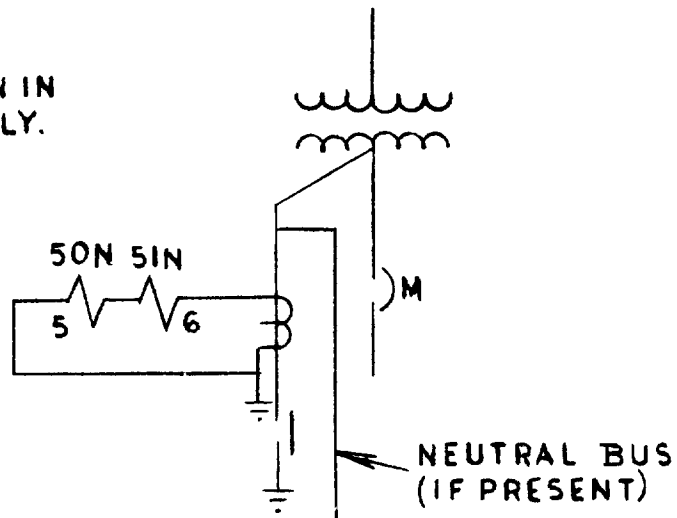


Figure 5 (0108B8965-1) 50 Hertz Time-Current Characteristics for IFC95F

NOTE:  
DEVICE 50N IN  
IFC95B ONLY.



GROUND FAULT SCHEME FOR TRANSFORMER MAIN SECONDARY BREAKER

Figure 6 (0269A3078-0) External Connections of Four IFC Relays used for Multi-Phase and Phase-to-Ground Fault Protection of a Three-Phase Circuit



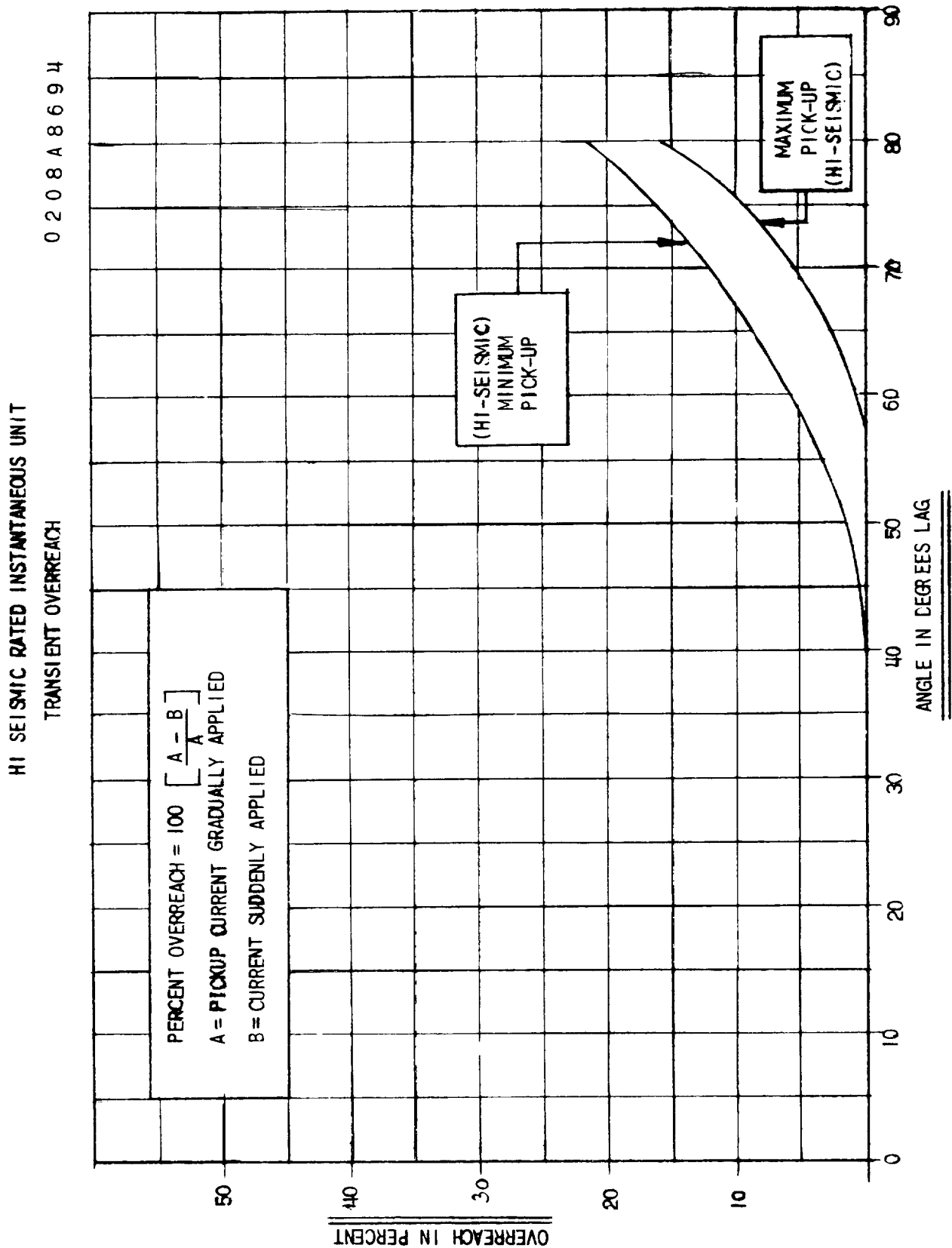


Figure 7 (0208A8694-1) Transient Overreach Characteristics of the Hi-Seismic Instantaneous Unit

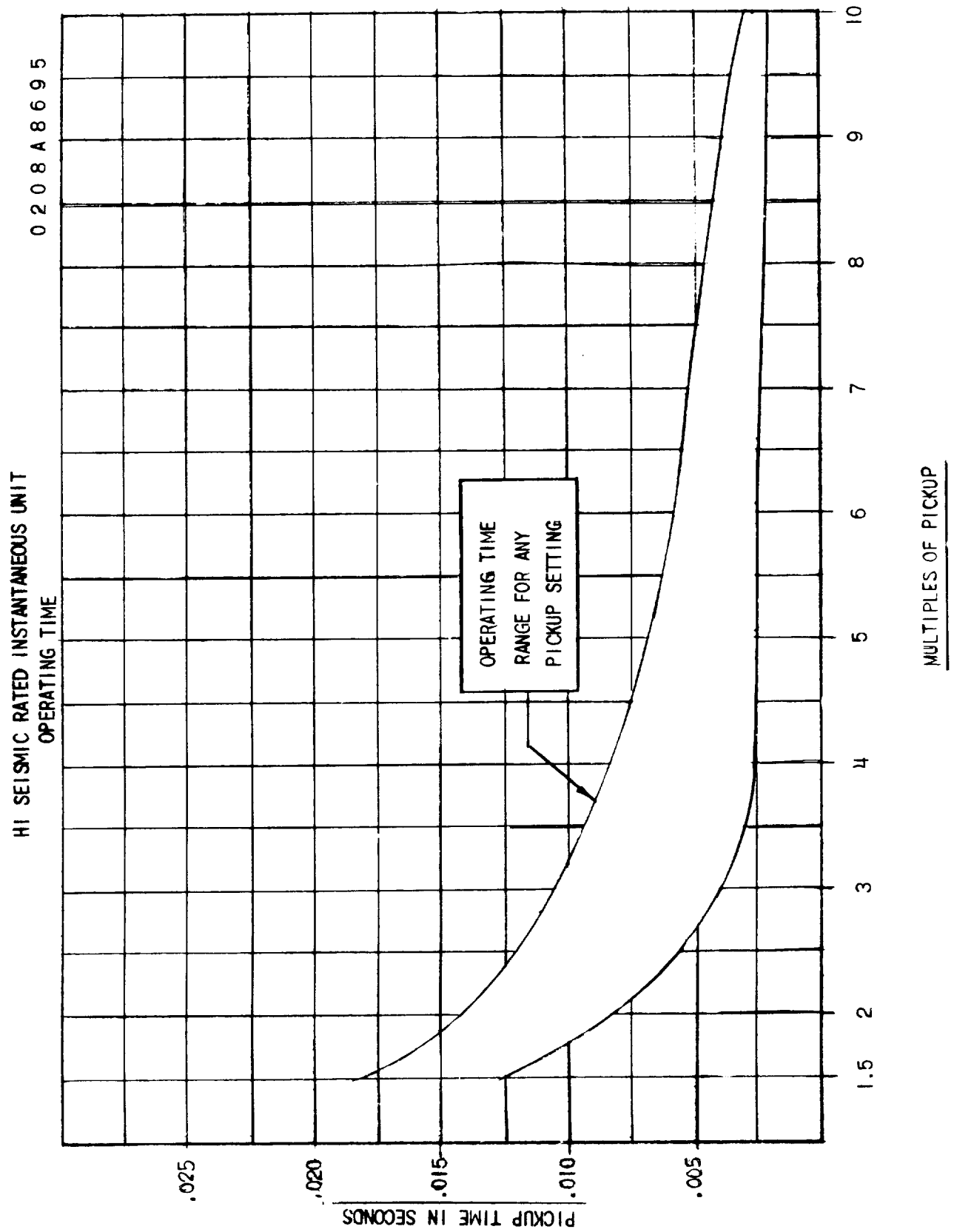
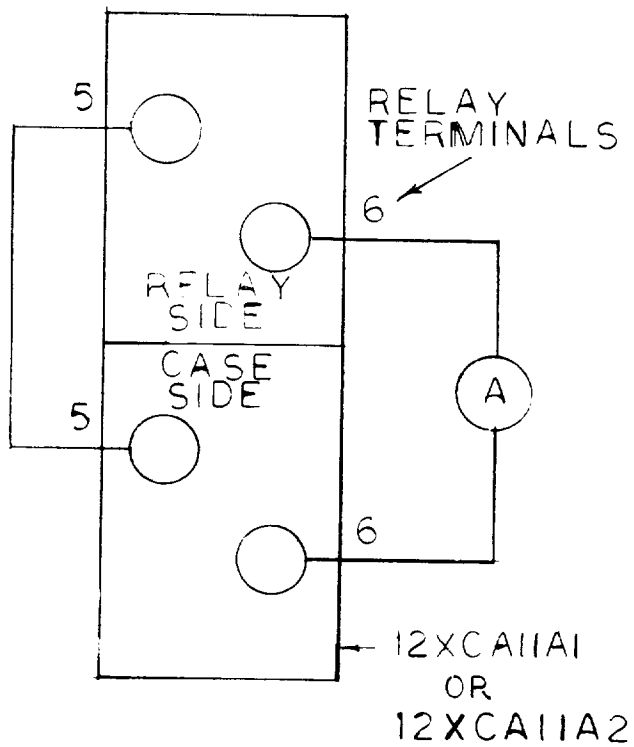
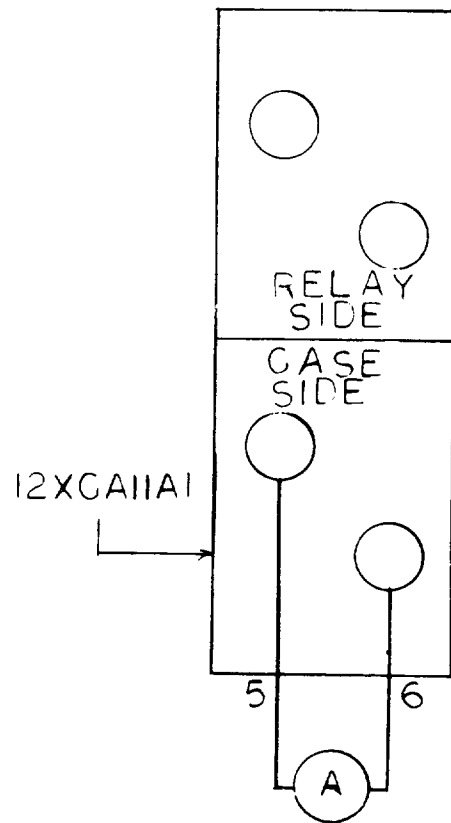


Figure 8 (0208A8695-0) Time-current Characteristics of the Hi-Seismic Instantaneous Unit

RELAY COIL  
IN CIRCUIT

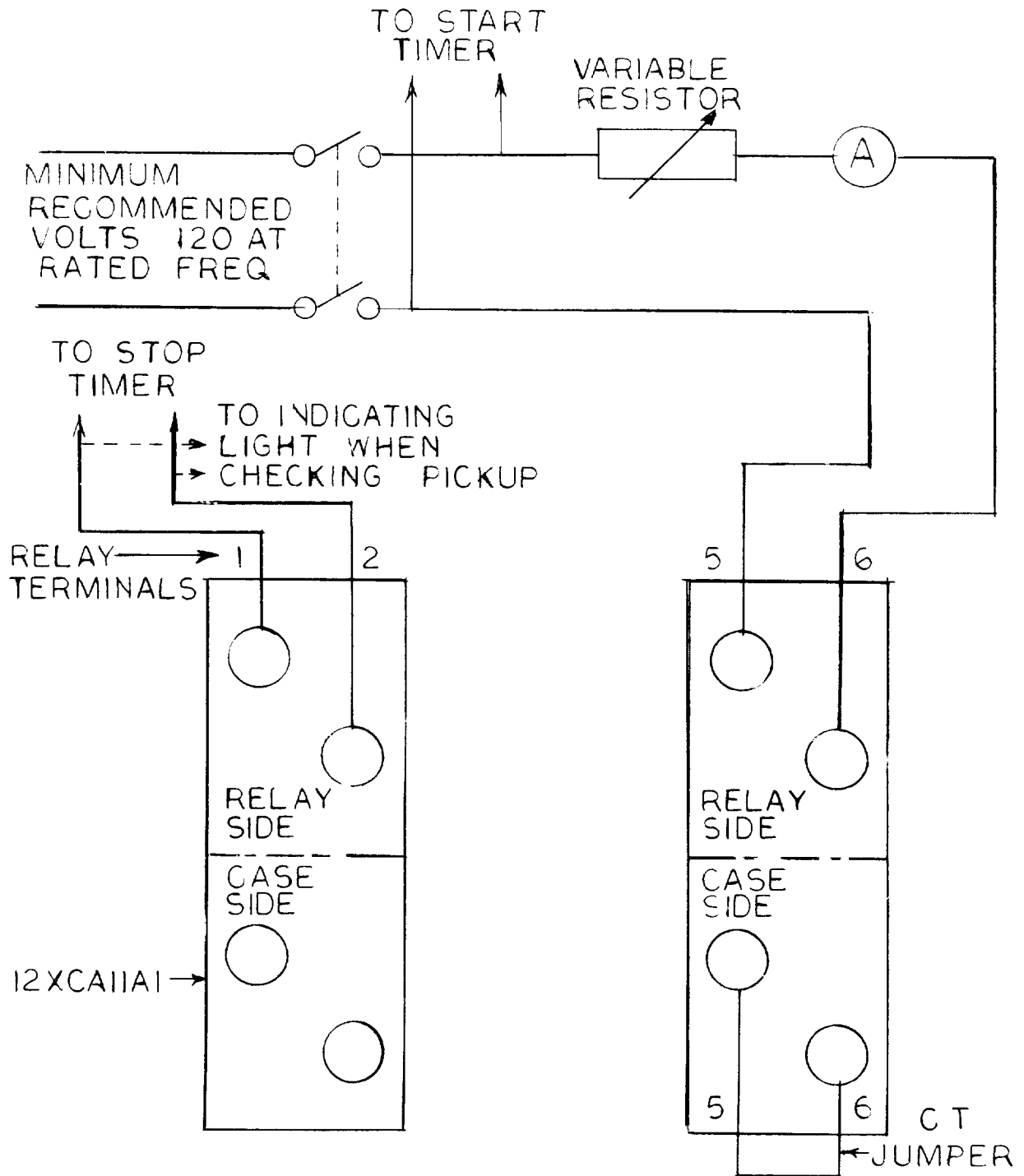


RELAY COIL  
NOT IN CIRCUIT



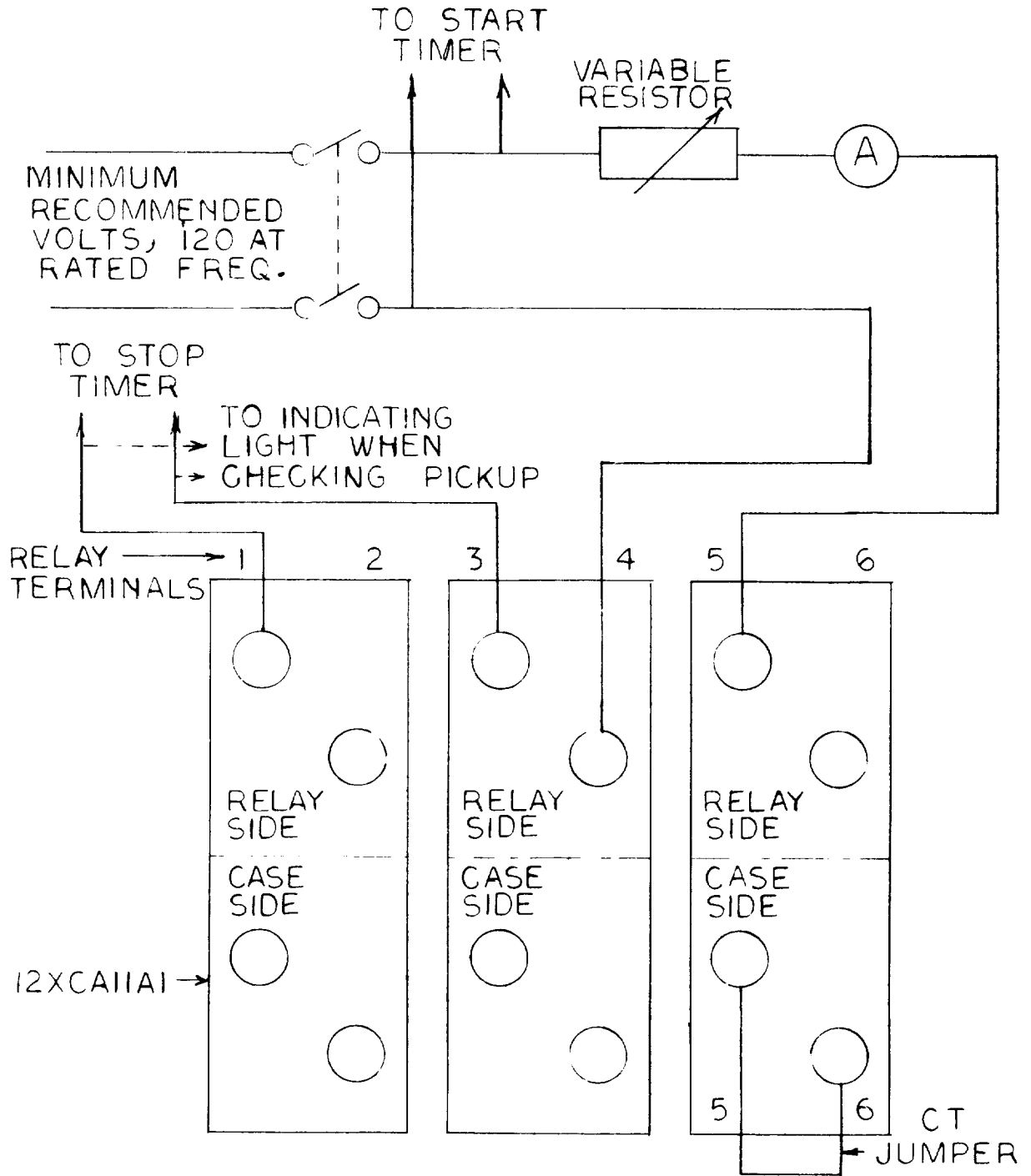
TEST CONNECTIONS FOR TESTING CT  
SECONDARY USED WITH THE IFC RELAY

Figure 9 (0269A1787-1) Test Connections for Testing  
CT Secondary Current Used with the IFC Relay



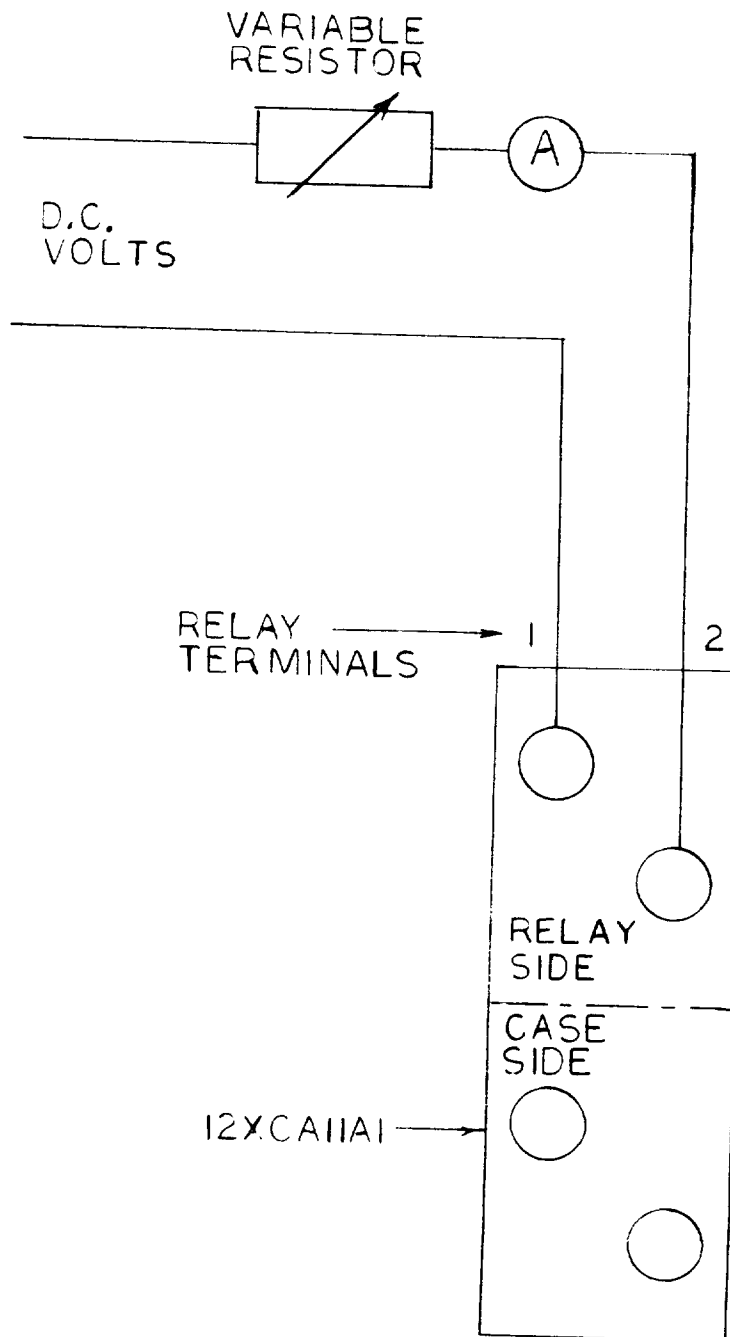
TEST CONNECTIONS FOR TESTING PICKUP AND  
OPERATING TIMES OF THE IFC RELAY TIME  
OVERCURRENT UNIT

Figure 10 (0269A1789-0) Test Connections for Testing Pickup and Operating Times  
of the IFC Relay Time Overcurrent Unit



TEST CONNECTIONS FOR TESTING PICKUP AND  
OPERATING TIMES OF THE IFC RELAY  
INSTANTANEOUS UNIT

Figure 11 (0269A1788-1) Test Connections for Testing Pickup and Operating Times  
of the IFC Relay High-Seismic Instantaneous Unit



TEST CONNECTIONS FOR TESTING THE TARGET AND SEAL IN UNIT USED WITH THE IFC RELAY

Figure 12 (0269A1790-0) Test Connections for Testing the High Seismic Target and Seal-in Unit Used with the IFC Relay

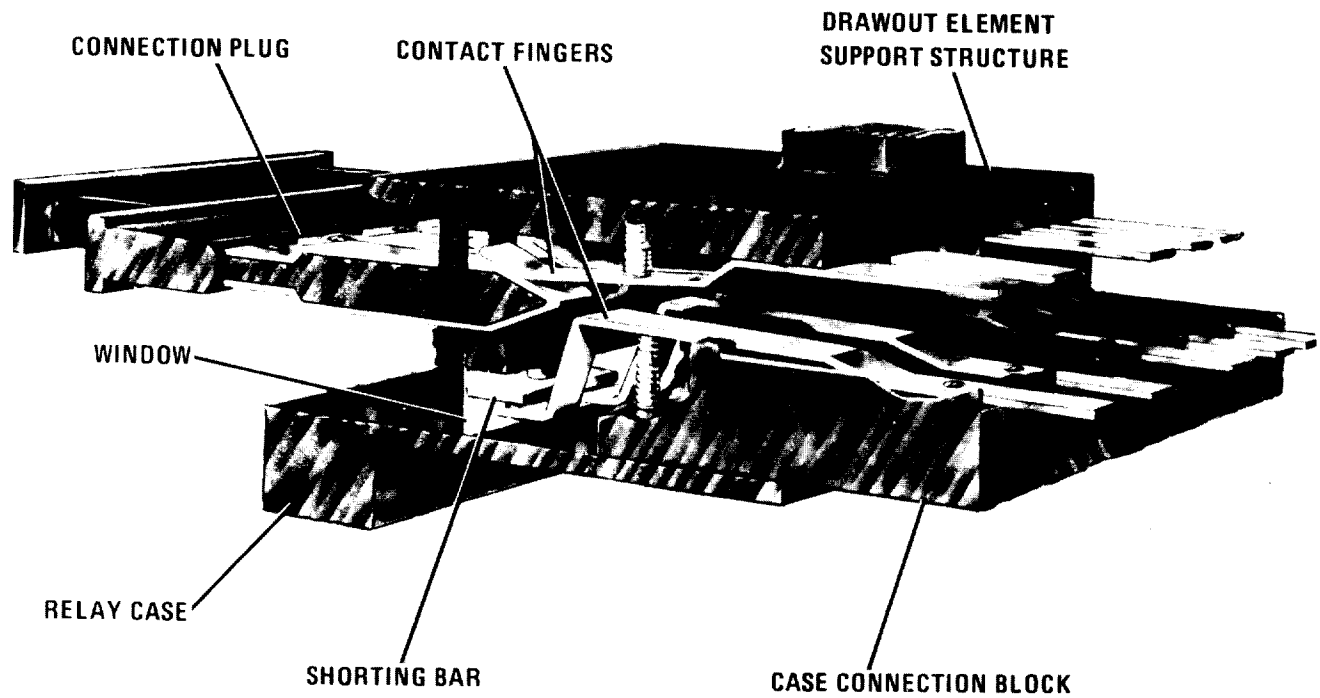


Figure 13 (8042715) Cross Section of IFC Draw-out Case Showing Shorting Bar

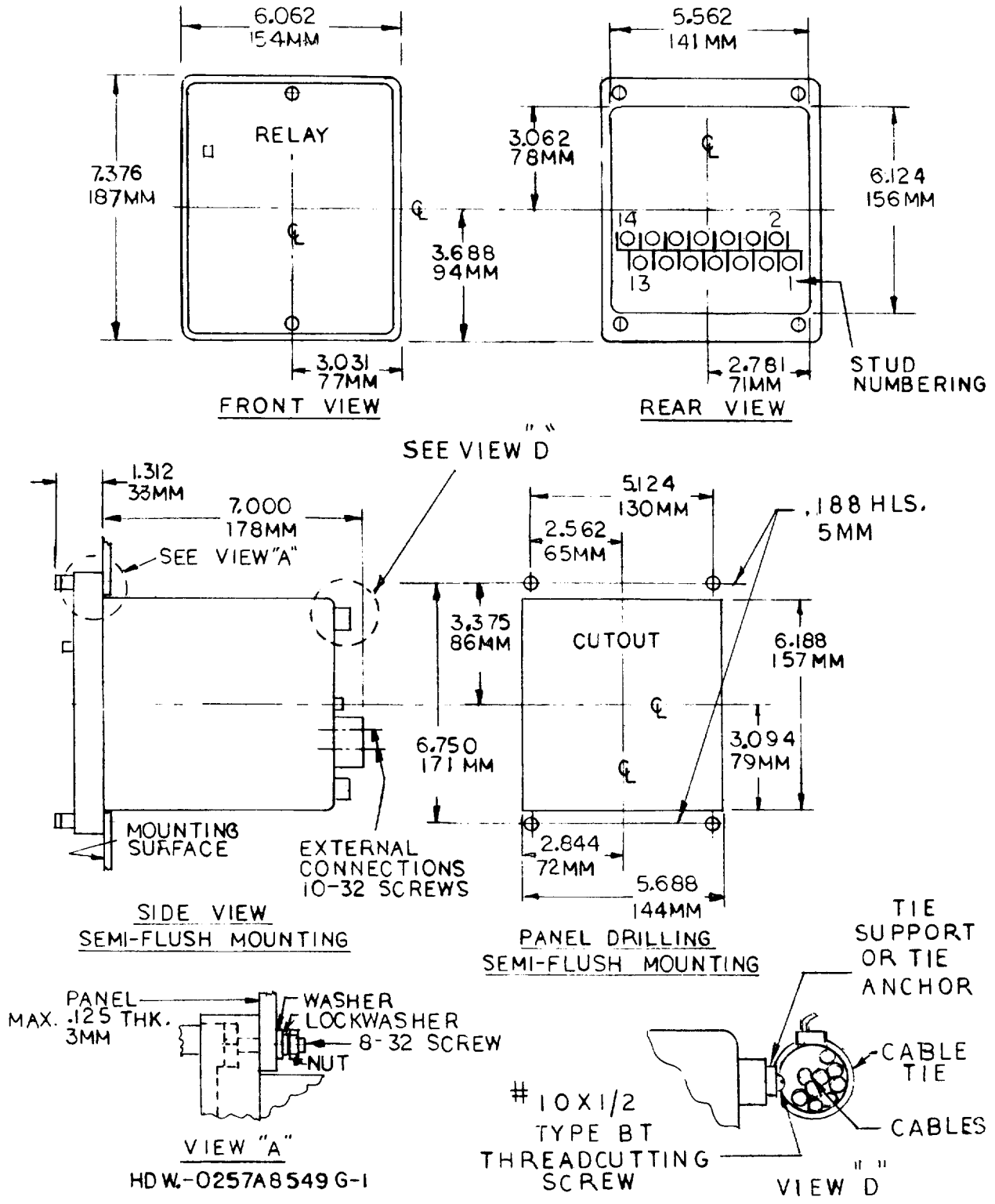


Figure 14 (0257A8452-3 Sheet 1) Outline and Panel Drilling for Semi-Flush Mounting of IFC95 Relay



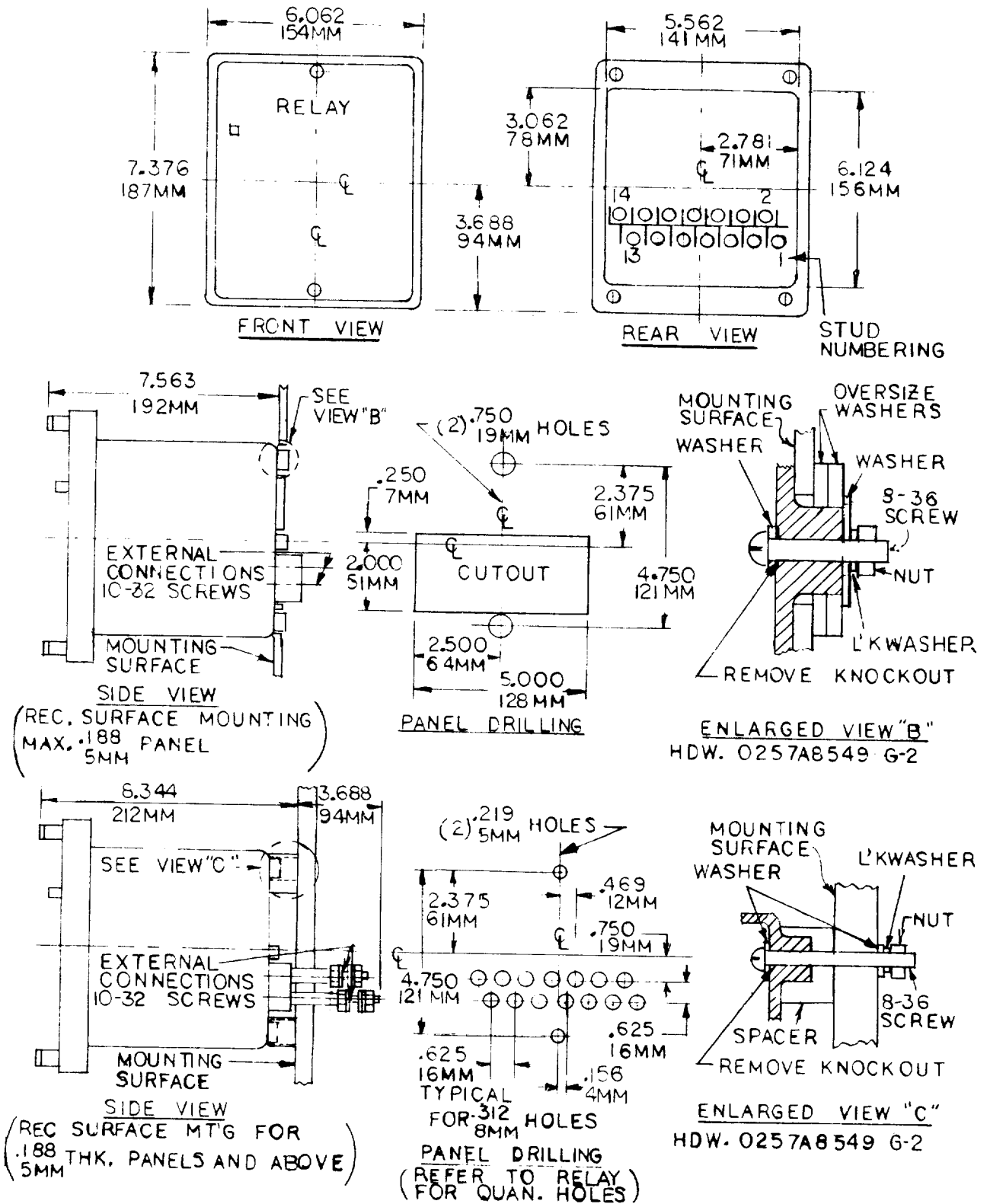


Figure 15 (0257A8452-3 Sheet 2) Outline and Panel Drilling for Surface Mounting of IFC95A Relay



---

***GE Power Management***

215 Anderson Avenue  
Markham, Ontario  
Canada L6E 1B3  
Tel: (905) 294-6222  
Fax: (905) 201-2098  
[www.ge.com/indsys/pm](http://www.ge.com/indsys/pm)