INSTRUCTIONS

GEK-49948A
Supersedes GEK-49948

TIME OVERCURRENT RELAYS

TYPES

IFC57AD AND IFC57BD

GENERAL ELECTRIC

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TIME OVERCURRENT RELAYS

TYPES IFC57D AND IFC57BD

DESCRIPTION

The type-IFC57AD relays covered by these instructions are extended-range, single-phase time-overcurrent relays having a medium-time inverse characteristic. The type-IFC57BD relays are similar except that they include, in addition, a hinged-armature instantaneous overcurrent unit that provides instantaneous tripping at high current levels when that feature is desired. Both the time-overcurrent unit and the instantaneous-overcurrent unit are described in detail in the section on **CONSTRUCTION.** Both relays are equipped with a dual-rated target and seal-in unit.

In addition to the contacts that are normally provided for tripping, each of the relays is provided with contacts that may be used for alarm, remote indication, or other purposes deemed suitable by the user. Note that the contacts associated with the target and seal-in unit will operate only after the time-overcurrent unit contacts close to draw trip current, hence they are not reliable for use as tripping contacts. See the internal and external connections for the exact contact arrangement used in each of the relays, Figures 3, 4, and 7.

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 when it is supplied. Also, these relays are recognized under the Components Program of Underwriters Laboratories, Inc.

The relays are mounted in a size-C1 drawout case of molded construction. The outline and panel drilling are shown in Figures 16 and 17. The relay internal connections are shown in Figure 3 for the IFC57AD and in Figure 4 for the IFC57BD.

APPLICATION

Time overcurrent relays find extensive general use in the protection of utility and industrial power-distribution systems and frequently as overload back-up protection at other locations. The medium-time inverse characteristic of the IAC57 relays is particularly useful as back-up ground-fault protection in low- and medium-voltage industrial systems when the relay is connected to a current transformer in the neutral of a power transformer or a generator. Typical external connections for such an application are shown in Figure 7.

These instructions do not purport to cover all details or variations in equipment nor 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.

When setting these relays to coordinate with downstream relays, a coordination time of from 0.25 to 0.40 second is generally allowed, depending on the clearing time of the breaker involved. These coordination times include, in addition to breaker clearing time, 0.10 second for relay overtravel and 0.17 second for safety factor. For example, if the breaker clearing time is 0.13 second (eight cycles), the coordination time would be 0.40 second (0.13 + 0.10 + 0.17).

If the relay time is set by test at the current level in question, the safety factor may be reduced to 0.07 second. Then if the downstream breaker time is five (5) cycles (0.08 second) a minimum of 0.25 second (0.08 + 0.10 + 0.07) could be allowed for coordination.

If relay coordination times are marginal or impossible to obtain, use the relay overtravel curves of Figure 8 to refine the relay settings. First determine the relay-operating time necessary to just match the operating time of the downstream relay with which coordination is desired. Determine the multiple of pickup and the necessary time-dial setting to provide this relay-operating time. Use the approximate curve of Figure 8 to determine the overtravel time in percent of operating time and convert this into real time. Add this time to the breaker time, the safety factor time, and the original relay-operating time to determine the final relay-operating time required. Set the relay to this value.

In the ground-fault back-up application it is not customary to use the instantaneous unit. On other applications where an instantaneous unit is needed, it must be realized that this unit has a transient overreach characteristic, as illustrated in Figure 9. This is the result of the DC offset that is usually present in the current at the inception of a fault. When determining the pickup setting for this unit, the transient overreach must be taken into consideration. The percent transient overreach should be applied to proportionately reduce the calculated pickup setting so that the instantaneous unit will not overreach a downstream device and thereby cause a loss of coordination in the system protection scheme. The operating-time characteristics of this unit are shown in Figure 10.

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 15. 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 that 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 rotation is retarded by a permanent magnet mounted in a molded housing on the support structure.

The drawout connection/test system for the C1 case, shown in Figure 15, 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 drawout element.

There is a High-Seismic target and seal-in unit on the front to the left of the shaft of the time-overcurrent unit, see Figure 1. The seal-in unit has two electrically separate contacts, one of which is in series with its coil and 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.

The IFC "B" model relays contain, in addition to the above, a High-Seismic instantaneous unit, see Figure 1. The instantaneous unit is a small hinged-type unit with electrically separate contacts, and is mounted on the front, to the right of the shaft of the time-overcurrent unit. One of its contacts is 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 rest button that releases the target seal-in unit also releases the target of the instantaneous unit.

A magnetic shield, depicted in Figure 1, is mounted to the support structure 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. The Seismic Fragility Level exceeds peak axial acceleration of 10g's (4g ZPA) when tested using a biaxial multi-frequency input motion to produce a Required Response Spectrum (RRS) in accordance with the IEEE Guide for Seismic Testing of Relays, STD501-1978.

RATINGS

The relays are designed for operation in an ambient air temperature from -20° 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)
IFC57AD and BD	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

MODEL	TIME-OVERCURRENT UNIT (AMPERES)	ONE-SECOND RATING, ANY TAP (AMPERES)	K
IFC57	0.5 - 4.0	128	16,384
	1.0 - 12.0	260	67,600

Ratings less than one second may be calculated according to the formula $I = \sqrt{K/T}$, where T 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

MODEL	IFC57										
TAP	0.5,	0.6,	0.7,	0.8,	1.0,	1.2,	1.5,	2.0,	2.5,	3.0,	4.0
CONT. CURR.	2.3,	2.5,	2.6,	2.9,	3.3,	3.6,	4.1,	4.7,	5.3,	5.8,	6.8

TABLE V
1.0 - 12.0 AMPERE RANGE RATINGS

MODEL	IFC57											
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.	3.9,	4.3,	4.8,	5.3,	6.2,	6.8,	7.8,	8.8,	9.7,	10.4,	11.1,	12.4, 13.6

HIGH-SEISMIC INSTANTANEOUS UNIT (IFC57BD)

The instantaneous coil is tapped for operation at either one of two ranges (H or L). The position of the link located on the top of the support structure determines whether the range is high or low. See Figure 2 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 one ampere overlap between the maximum L and the minimum H setting. Whenever possible, be sure to select the higher range in order to obtain the higher continuous and short-time ratings.

††† 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	2.0
DC Resistance + 10% (Ohms)	8.0	0.24
Minimum Operating (Amp) +0 -60%	0.2	2.0
Carry Continuous (Amperes)	0.3	3
Carry 30 Amps for (Seconds)	0.03	4
Carry 10 Amps for (Seconds)	0.25	30
60 Hertz Impedance (Ohms)	68.6	0.73

If the tripping current exceeds 30 amperes anauxiliary relay should be used, the connections beinf such 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

Model	HZ	Range	Min Tap Amps	Burdens at Min. Pickup Min. Tap (Ohms) R	Jx	Z	Burdens in Ohms (Z) Times Pickup 3	10	20
IFC57	50	0.5 - 4.0	0.5	2.27	7.18	7.35	3.89	1.68	1.12
		1.0 - 12.0	1.0	0.43	1.69	1.75	0.93	0.43	0.31
	60	0.5 - 4.0	0.5	2.72	8.62	9.04	4.67	2.01	1.34
		1.0 - 12.0	1.0	0.52	2.03	2.10	1.12	0.52	0.37

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 IFC57 60 hertz relay with 0.5 - 4.0 amp range has an impedance of 9.04 ohms on the 0.5 amp tap. The impedance of the 2.0 amp tap is $(0.5/2.0)^2 \times 9.04 = 0.565$ ohms.

The High-Seismic instantaneous unit burdens (IFC57BD) are listed in Table IX.

TABLE IX

High-Seismic Inst.Unit (Amps	Hz	Link Position	Range (Amps)	Min. Pickup (Amps)	Burdens at Min. Pickup Min. Tap (Ohms) R	Jχ	Z	Burdens in Ohms (Z) Times Pickup 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 UNIT

Pickup

Pickup on 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 that connect to the tap block at the top of the support structure, see Figure 1. The tap block is marked A through N. See the name plate on the relay for its tap settings.

Example:

The two-amp (2 amp) tap for a 1-to-12 IFC57 time-overcurrent relay requires one movable lead in position B and the other in position L.

Operating-Time Accuracy

The IFC relays should operate within ±7% of the published time curve. Figures 5 and 6 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 zero. 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 zero is approximately 60 seconds for the IFC57 relays.

HIGH-SEISMIC INSTANTANEOUS UNIT (IFC57BD)

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 10.

HIGH-SEISMIC TARGET AND SEAL-IN UNIT

The target and seal-in unit has two (2) tap selections located on the front of the unit. See Figure 1.

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 Sales Office.
Reasonable care should be exercised in unpacking the relay in order that none of the parts are injured nor 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 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 make sure 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**.

These tests may be performed as part of the installation or as acceptance tests, at the discretion of the user.

Since most operating companies use different procedures for acceptance tests and for installation tests, the following section includes all applicable tests that may be performed on these relays.

VISUAL INSPECTION

Check the nameplate to make sure 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.

3. The armature and contacts of the seal-in unit, 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 instantaneous-unit contacts (see **SERVICING** section for seal-in unit).

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.

6.

CAUTION

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

DRAWOUT RELAY TESTING

IFC relays may be tested without removing them from the panel by using either the 12XCA28A1 or 12XCA11A1 test probes. The test probes make 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 test probes are different in the number of connections that can be made. The 12XCA28A1 has a full complement of 28 connections and the 12XCA11A1 has four. Refer to instruction book GEK-49803 for additional information

POWER REQUIREMENTS, GENERAL

All devices operating on alternating current (AC) are affected by frequency. Since non-sinusoidal waveforms can be analyzed as a fundamental frequency plus harmonics of that fundamental frequency, it follows that alternating-current devices (relays) will be affected by applied waveforms. AC relays (and AC devices in general) are significantly affected by the application of non-sinusoidal waveforms.

Therefore, in order to test AC relays properly it is essential to use a test voltage and/or current waveform that is sinusoidal. 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, RL or RC networks, or saturating electromagnets (such as time-overcurrent relays) would be especially affected by non-sinusoidal wave forms.

TIME-OVERCURRENT UNIT

Rotate the time dial slowly and check, by means of a lamp in the circuit, that the contacts just close at the zero (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 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 tap setting is adjusted by means of a spring-adjusted ring. See Figure 1. The spring-adjusted 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 Figure 5 and 6, 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 zero (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 the 0.5 time-dial position and the lowest tap. Using the test connections in Figure 12 the main unit should close the contacts within ±3% of tap-value current for 60 hertz relays, and within ±7.5% of tap-value current for 50 hertz relays.

Time Test

Set the relay at the No. 5 time-dial setting and the lowest tap. Using the test connection in Figure 12, apply five times (5×) tap current to the relay. The relay operating times to close its contact are listed in Table X.

TABLE X

RELAY	Hz	TIME (SECONDS) MINIMUM	MAXIMUM
IFC57	60	9.35	9.65
	50	9.15	9.85

HIGH-SEISMIC INSTANTANEOUS UNIT (IFC57BD)

Make sure that the instantaneous unit is in the correct position for the range in which it is to operate. See the internal-connection diagram, Figure 4, and connect as indicated in the test circuit of Figure 13. Whenever possible use the higher range, since the higher range has a higher continuous rating.

Setting the High-Seismic Instantaneous Unit

The instant 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 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 one-second (1 sec) 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 of 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. 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. Screws should **never** be left in **both** taps at the same time.

Pickup and Dropout Test

1. Connect relay studs 1 and 2 (See the test circuit of Figure 14) 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 ZERO 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 ZERO 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 XI.

Table XI

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 Figures 16 and 17. Figure 16 shows the semi-flush mounting, and Figure 17 shows various methods of surface mounting.

The internal-connection diagrams for the relay are shown in Figures 3 and 4. Typical external connections are shown in Figure 7.

INSTALLATION TESTS

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

Time-Overcurrent Units

Set the tap block to the desired tap setting and the time dial to the 0.5 position. Using the test circuit in Figure 12, gradually apply current until the contacts just close. This value of current is defined as pickup and should be within 3% of tap value for 60 hertz relays, and within 7.5% of tap value for 50 hertz relays.

Check the operating time at some multiple of tap value and the desired time-dial setting. This multiple of tap value may be five times (5×) 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 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.

High-Seismic Instantaneous Unit (IFC57BD)

1. Select the desired range by setting the link in the proper position. (See Figure 1 and the internal-connections diagram). 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.

All the tests described above under **INSTALLATION TESTS** must be performed at the time of installation. In addition, if those tests described under the **ACCEPTANCE TESTS** section were not performed prior to installation, it is recommended 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. 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 points listed below be checked at an interval of from one to two years.

These tests are intended to make sure 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 for the tap setting in service, as described in the **INSTALLATION** section.

2. Perform the time tests, as described in the **INSTALLATION** section.

HIGH-SEISMIC INSTANTANEOUS UNIT (IFC57BD)

1. 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 XI.

2. Check that the unit drops out at 25% or more of tap value.

CONTACT CLEANING

For cleaning relay contacts, a flexible burnishing tool should be used. This consists of a flexible strip of metal with an etch-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

ensures the cleaning of the actual points of contact. Do not use knives, files, abrasive paper or cloth of any kind to clean relay contacts.

*COVER CLEANING

The clear Lexan® cover should be cleaned with a soft cloth and water only. No cleaning solutions should be used. Use of cleaning solutions may damage the clear cover.

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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 Test

Rotate time dial to No. 0 time-dial setting and check, by means of a lamp in the circuit, 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. This screw should be held securely in its support.

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 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 5 and 6, 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 12.

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

*Revised since last issue

given below, which are ±1% of the tap amps. See Table XII.

TABLE XII

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), nor 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. 5 setting, apply five times (5×) tap current to the relay.

Adjust the position of the drag magnet assembly to obtain an operating time as near as possible to 9.50 but at least within the range listed in Table XIII.

TABLE XIII

	TIME (SECONDS)	
RELAY	MINIMUM	MAXIMUM
IFC57	9.4	9.6

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 inches.

2. Remove the drag-magnet assembly, by **loosening** the two screws securing it to the support structure. The screw need not be removed.

3. **Loosen** slightly the upper pivot-bearing **set** screw (1/16 inch hex wrench), 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 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 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 0.005-0.010 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 screws with 7-10 inch pounds of torque, after securely seating the assembly and positioning it according to the time test above.

HIGH-SEISMIC INSTANTANEOUS UNIT (IFC57BD)

1. Both contacts should close at the same time.

2. The backing strip should be so formed that the forked end (front) bears against the molded strip under the armature.

3. 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. The contacts should close with the feeler gage in place.

4. Since mechanical adjustments may affect the seismic fragility level, it is advised that no mechanical adjustments be made if seismic capability is of concern.

HIGH-SEISMIC TARGET AND SEAL-IN UNIT

The left contact must make before the right contact

To check the wipe of the seal-in unit, insert a feeler gage between the residual button of the armature and the front end of the pole piece. The left contact should close with a 0.015 ± 0.002 feeler gage, and the right contact with a 0.010 ± 0.002 feeler gage.

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

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 the quantity required, the name of the part wanted, and the complete model number of the relay for which the part is required.

LIST OF FIGURES

*Revised since last issue

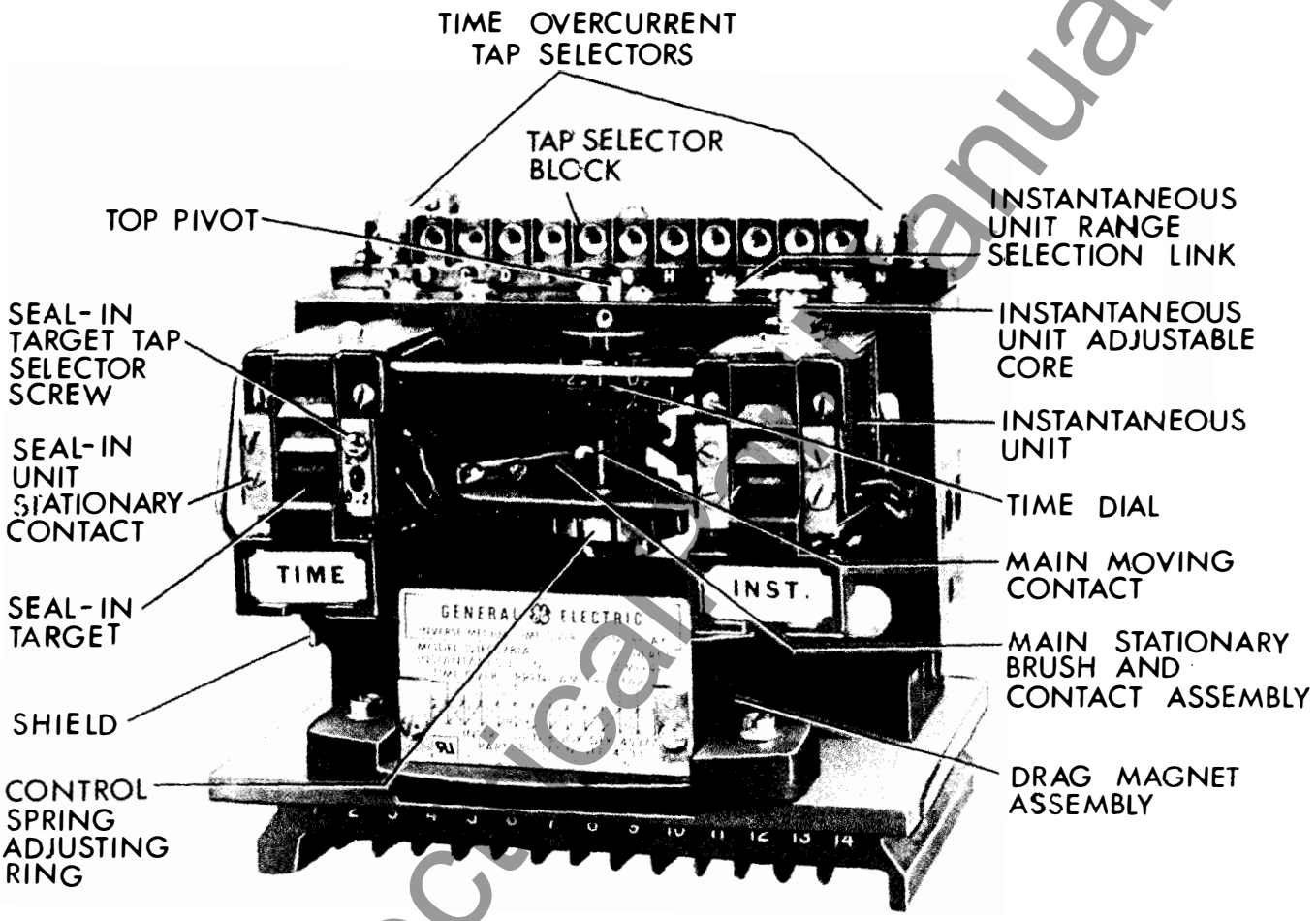


Figure 1 (8043009) Type IFC57BD Relay, Removed from Case, Front View

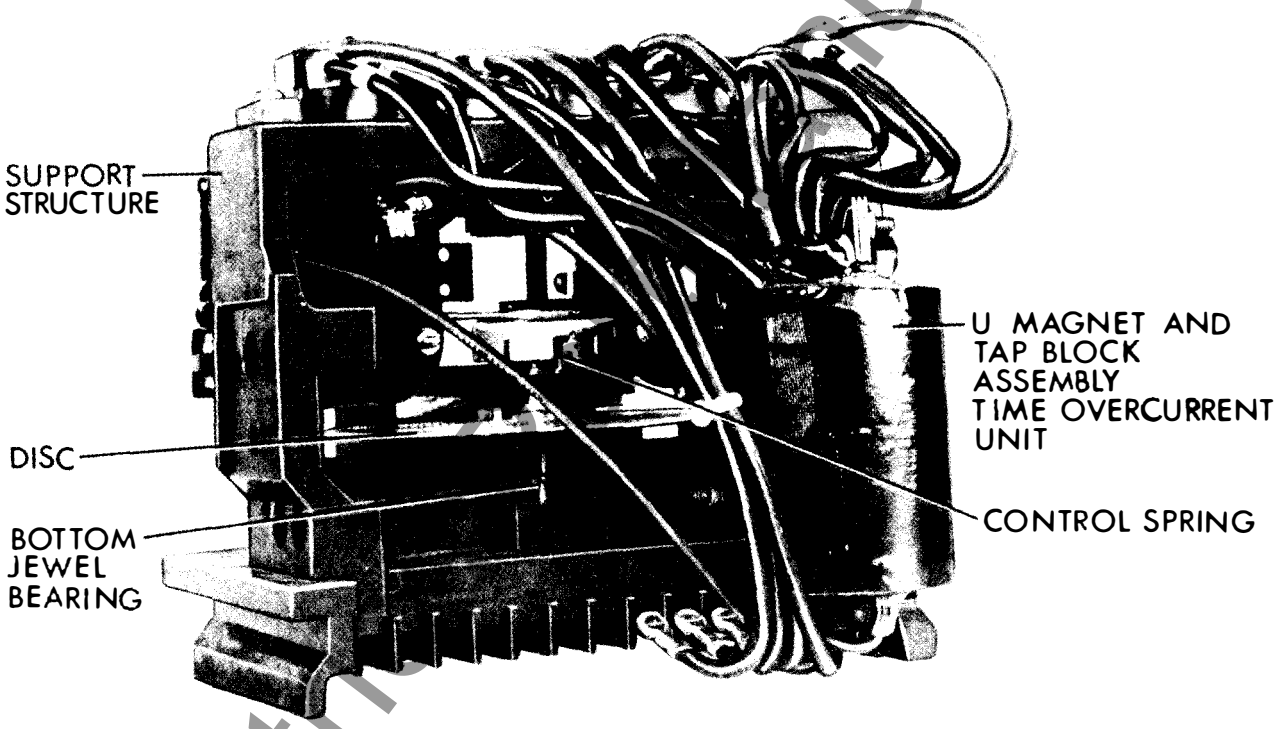
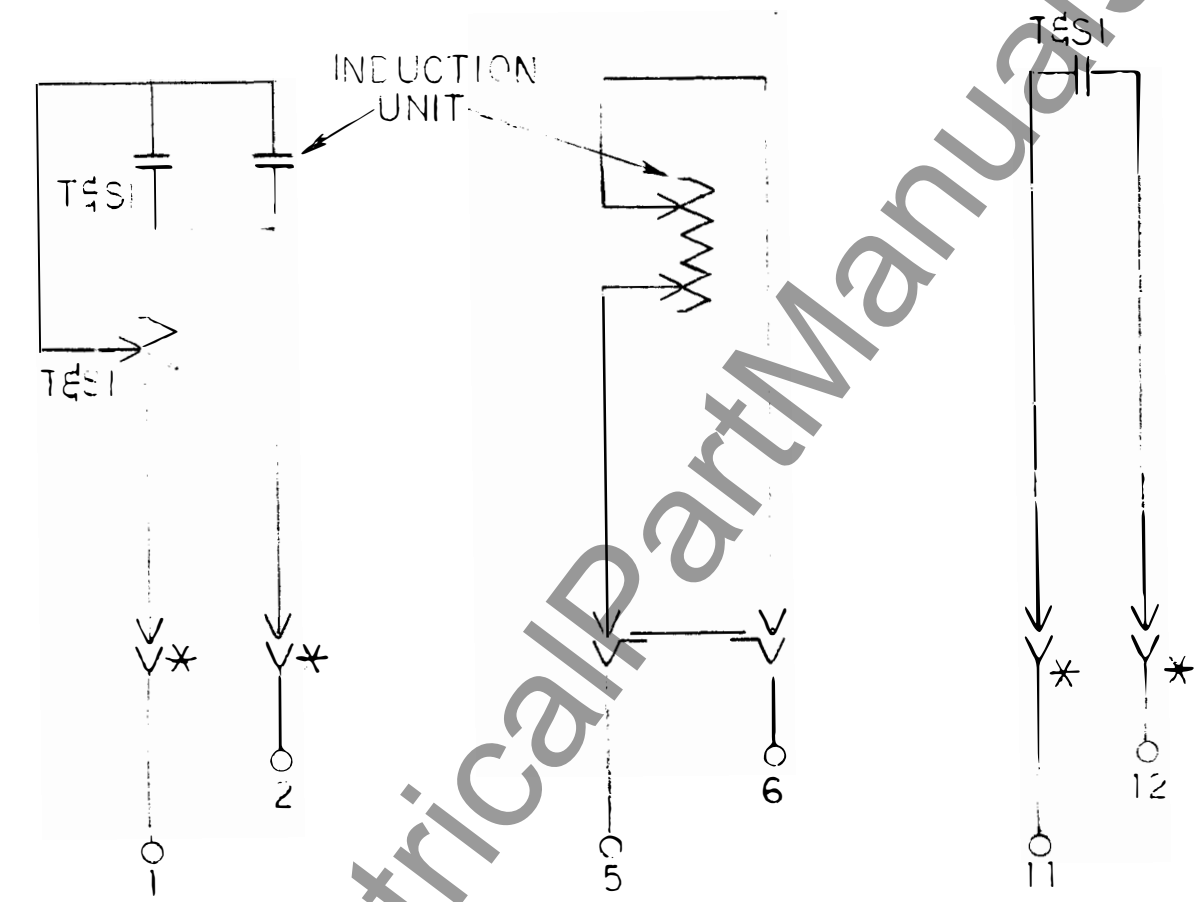
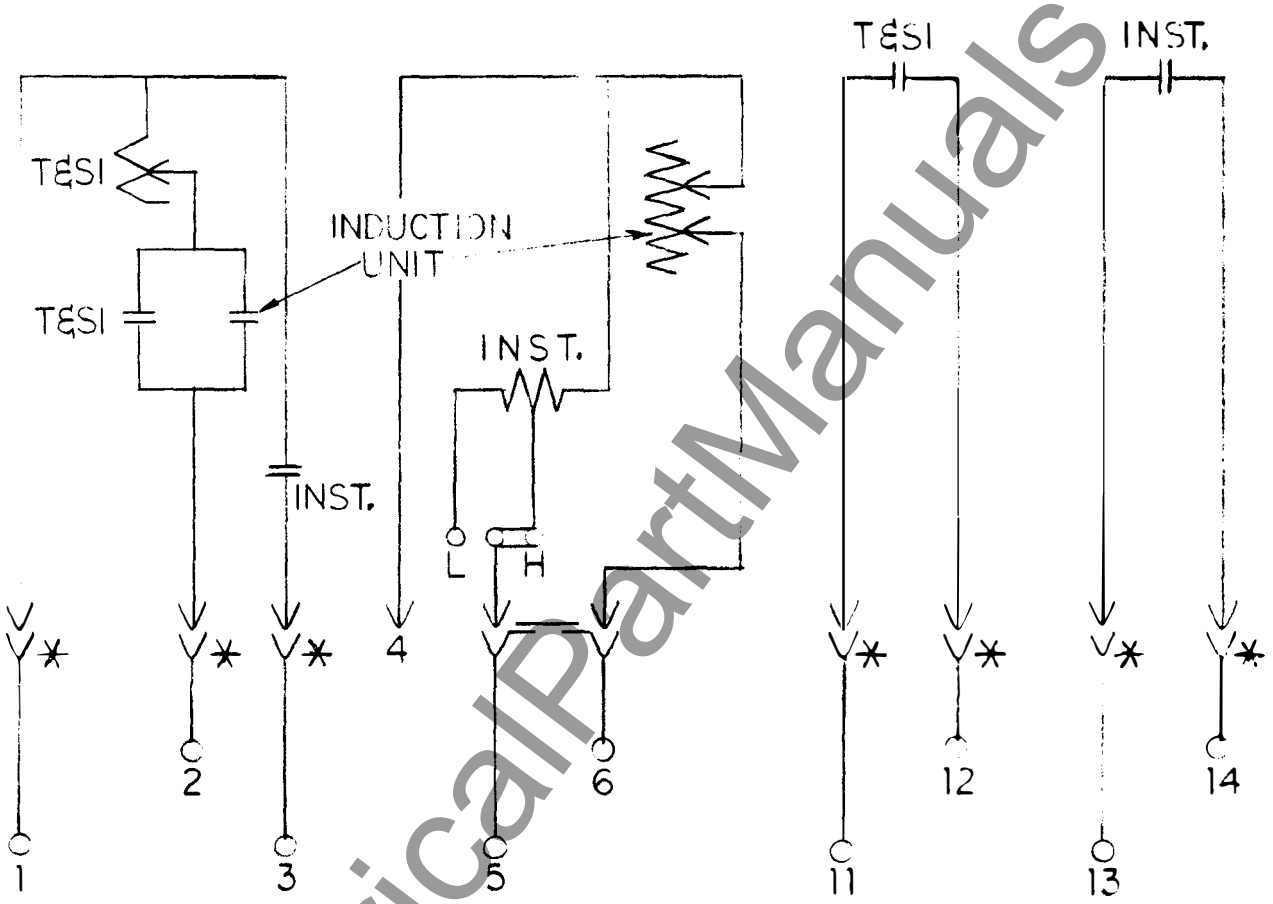


Figure 2 (8043013) Type IFC57BD Relay, Removed from Case, Rear View



*= SHORT FINGER

Figure 3 (0208A8514-1) Internal Connections for Relay Type IFC57AD, Front View



INSTANTANEOUS SETTINGS:
SET LINK TO "H" FOR HIGH RANGE AND TO "L" FOR LOW RANGE. LINK SHOWN IN HIGH RANGE POSITION.

✳=SHORT FINGER

Figure 4 (0208A8515-1) Internal Connections for Relay Type IFC57BD, Front View

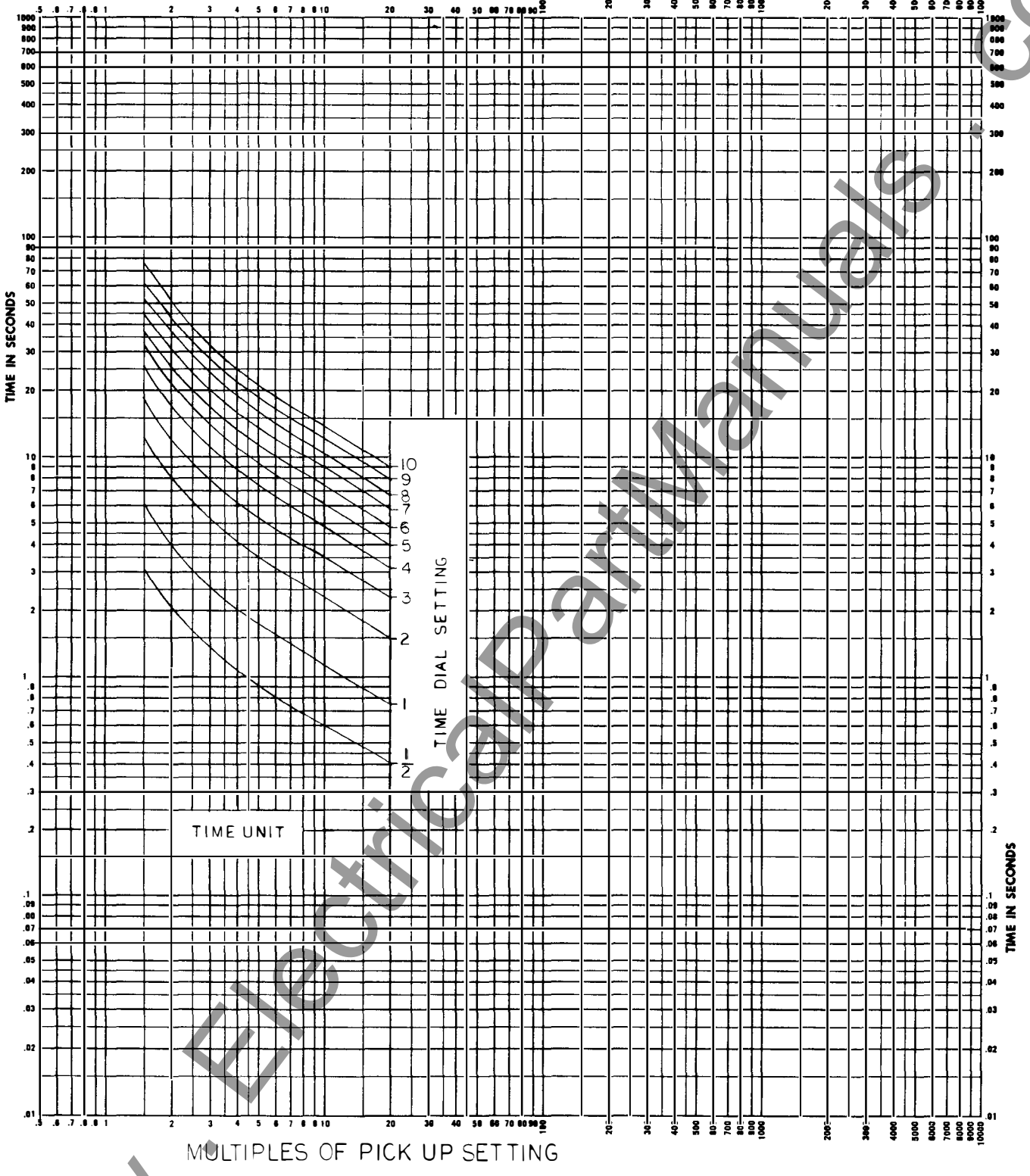


Figure 5 (0108B8971) 60 Hertz Time/Current Characteristics for Relay Types IFC57AD and IFC57BD

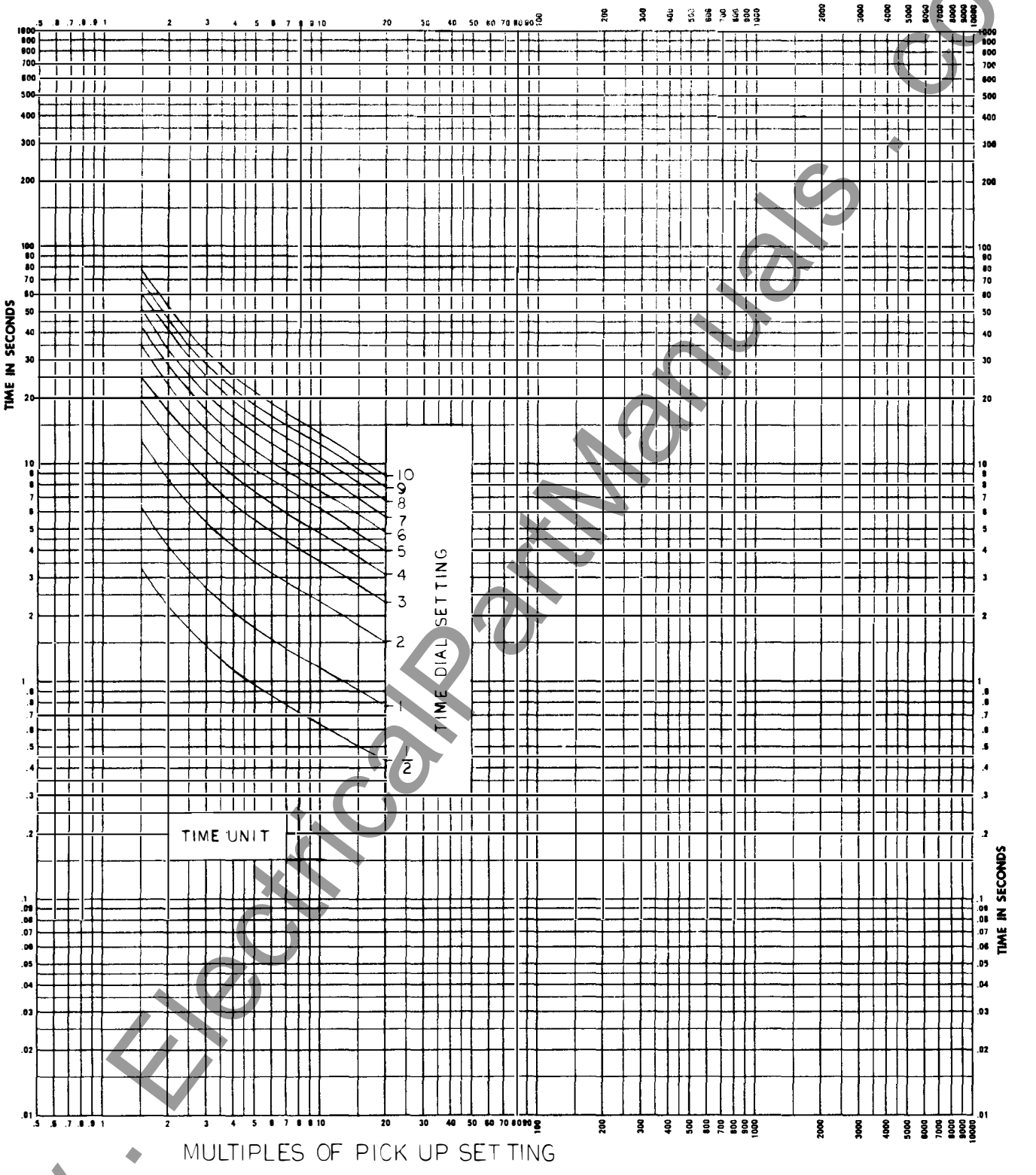


Figure 6 (0108B8972) 50 Hertz Time/Current Characteristics for Relay Types IFC57AD and IFC57BD

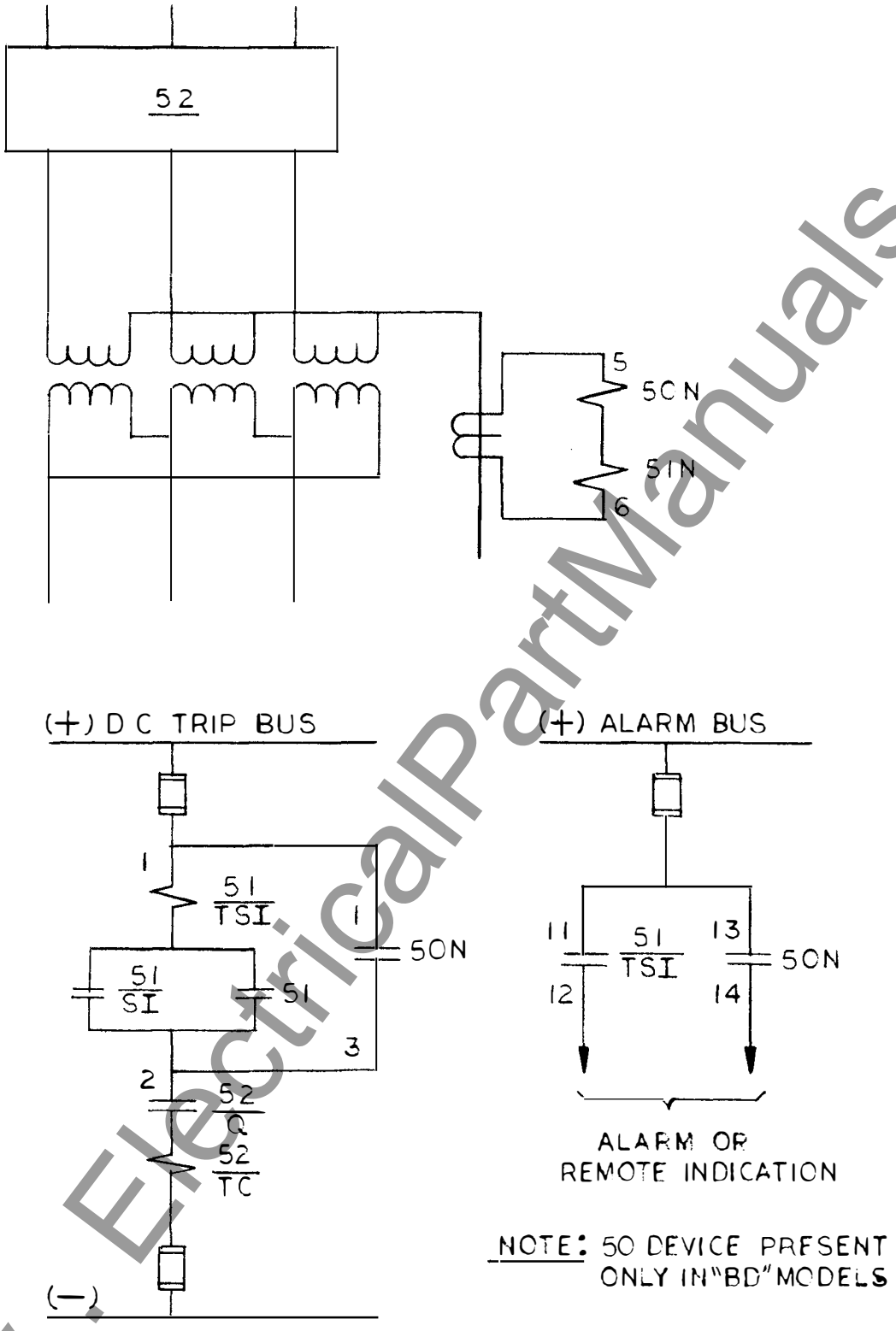


Figure 7 (0275A3836) External Connections for IFC57AD or IFC57BD Relay

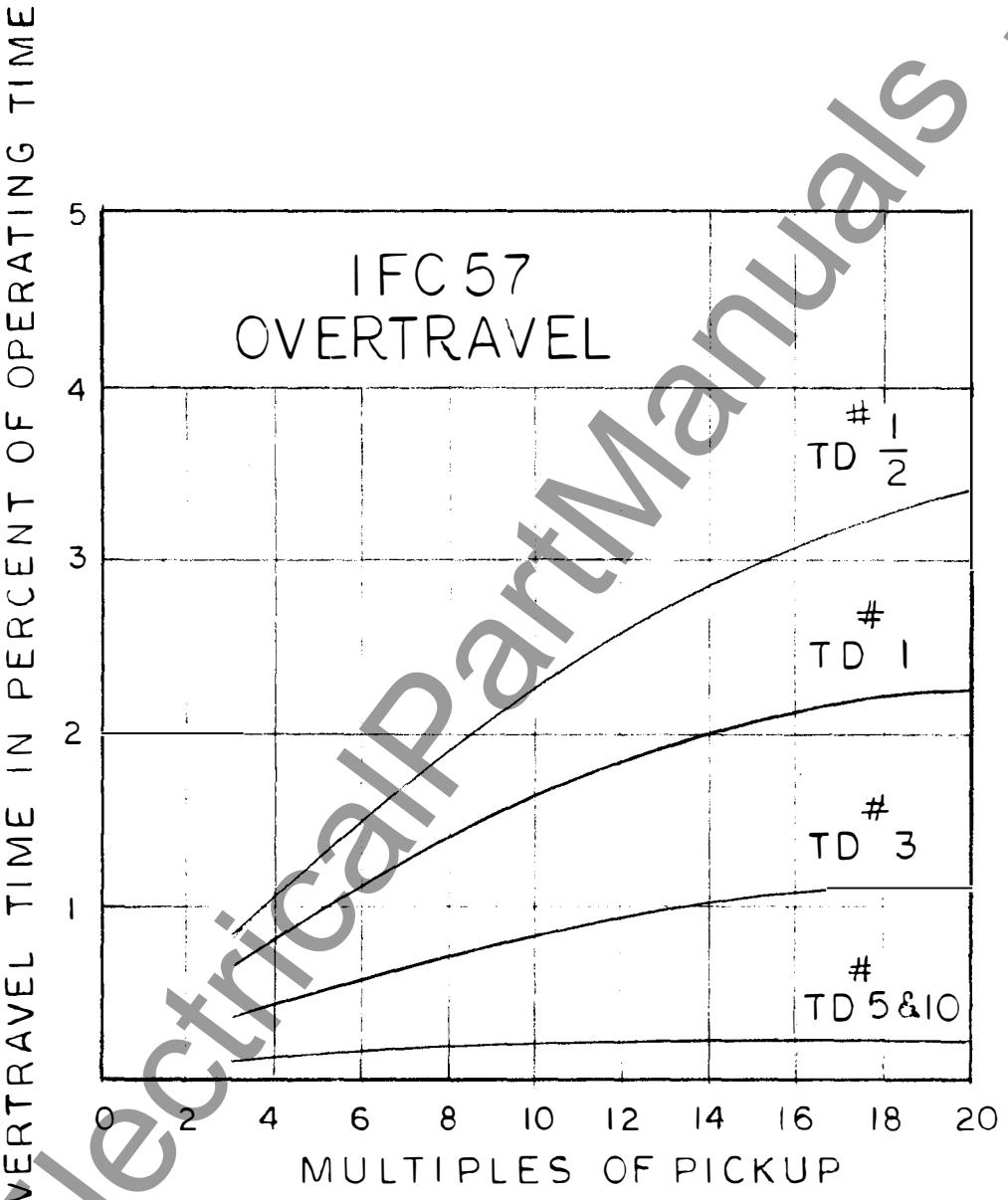


Figure 8 (0269A1883) Overtravel Curves for Relay Type IFC57

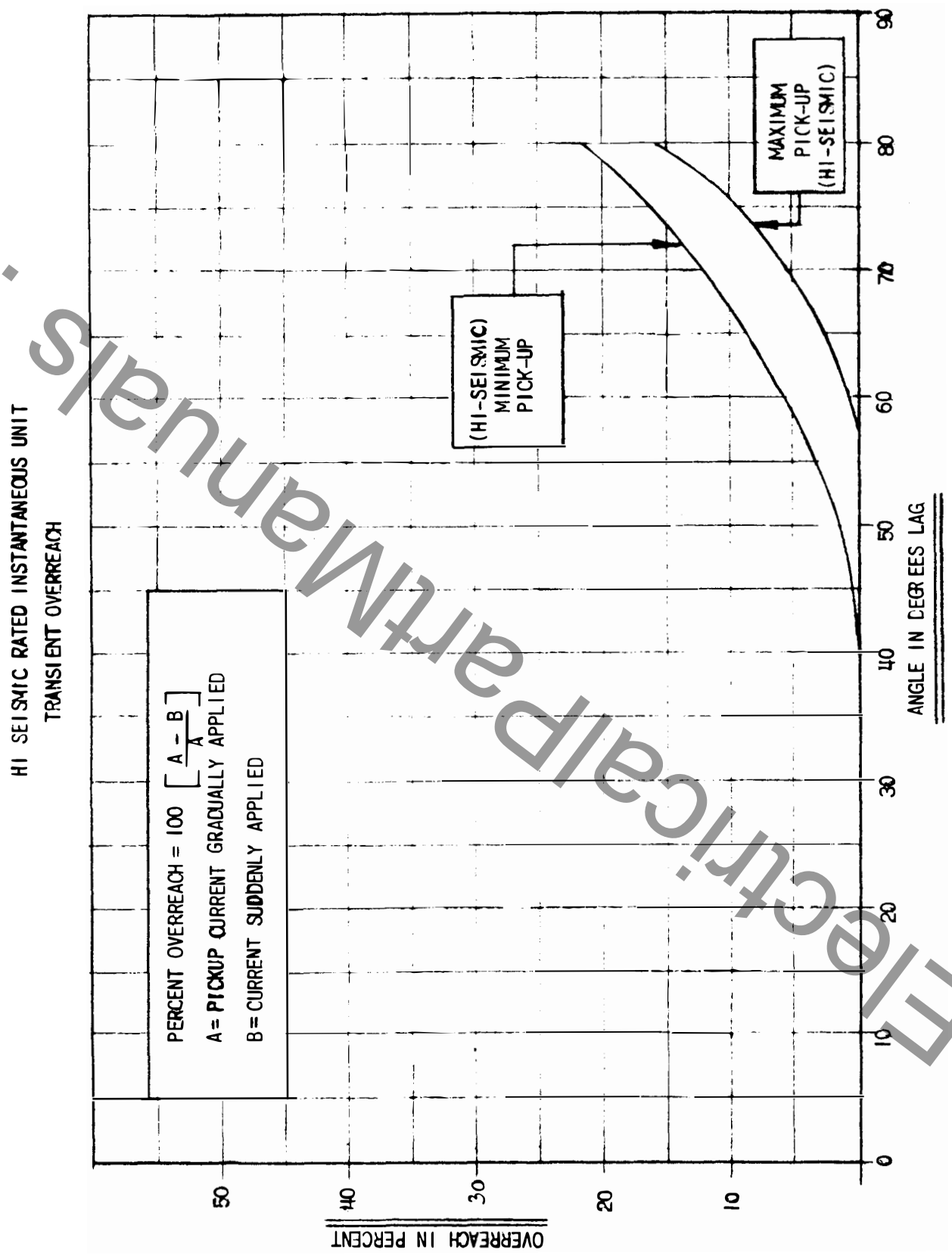


Figure 9 (0208A8694-2) Transient Overreach Characteristics of the High-Seismic Instantaneous Unit

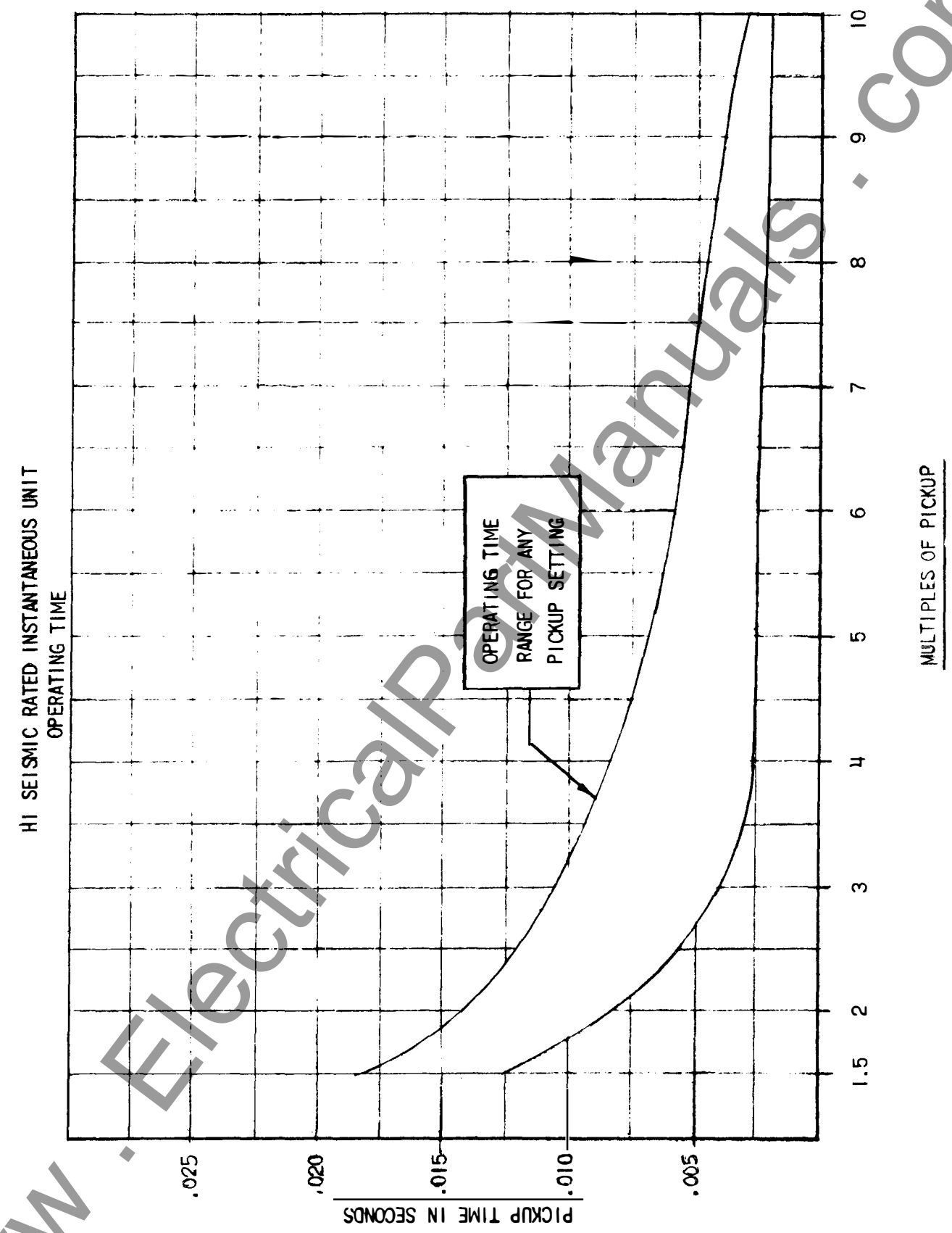
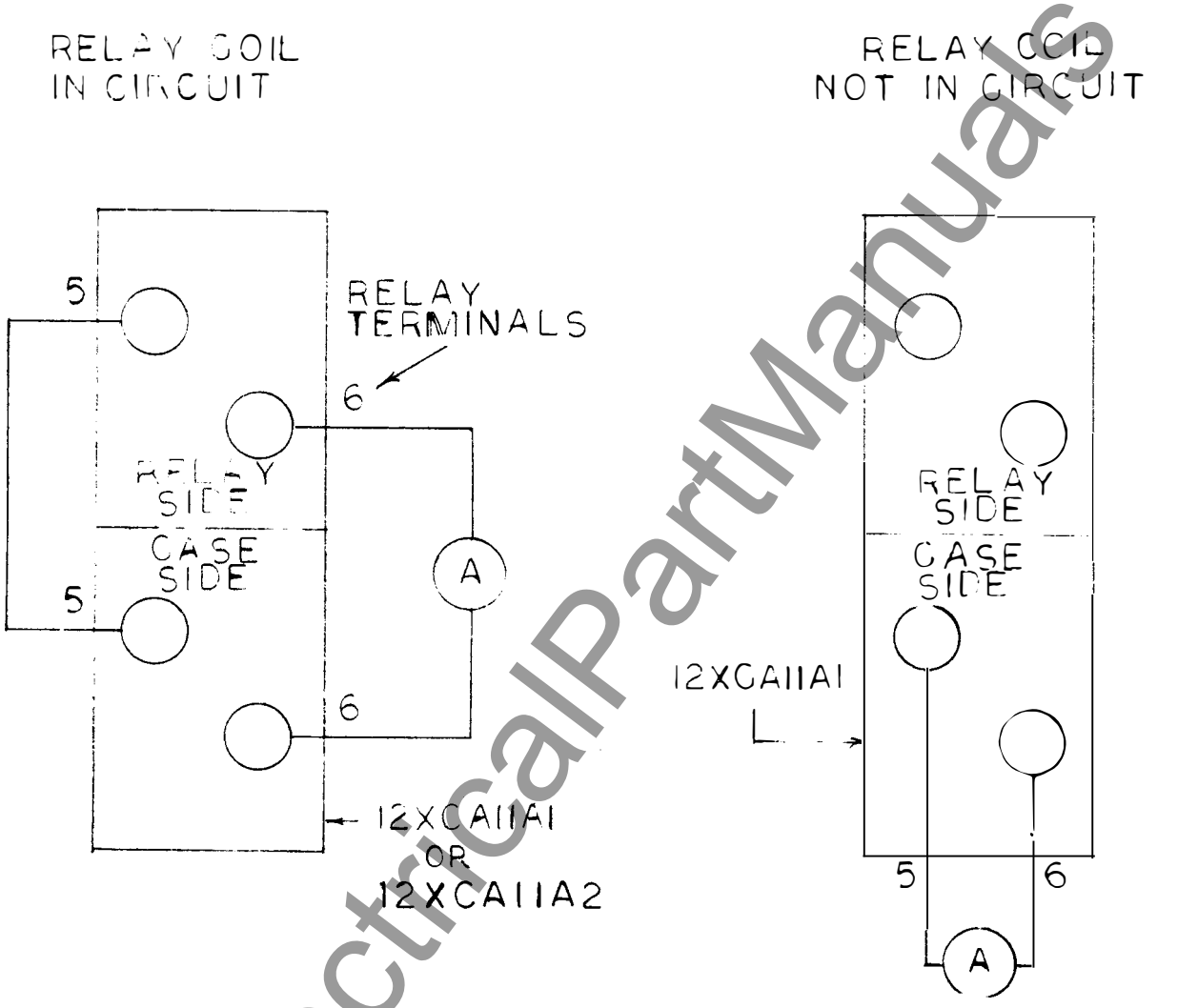
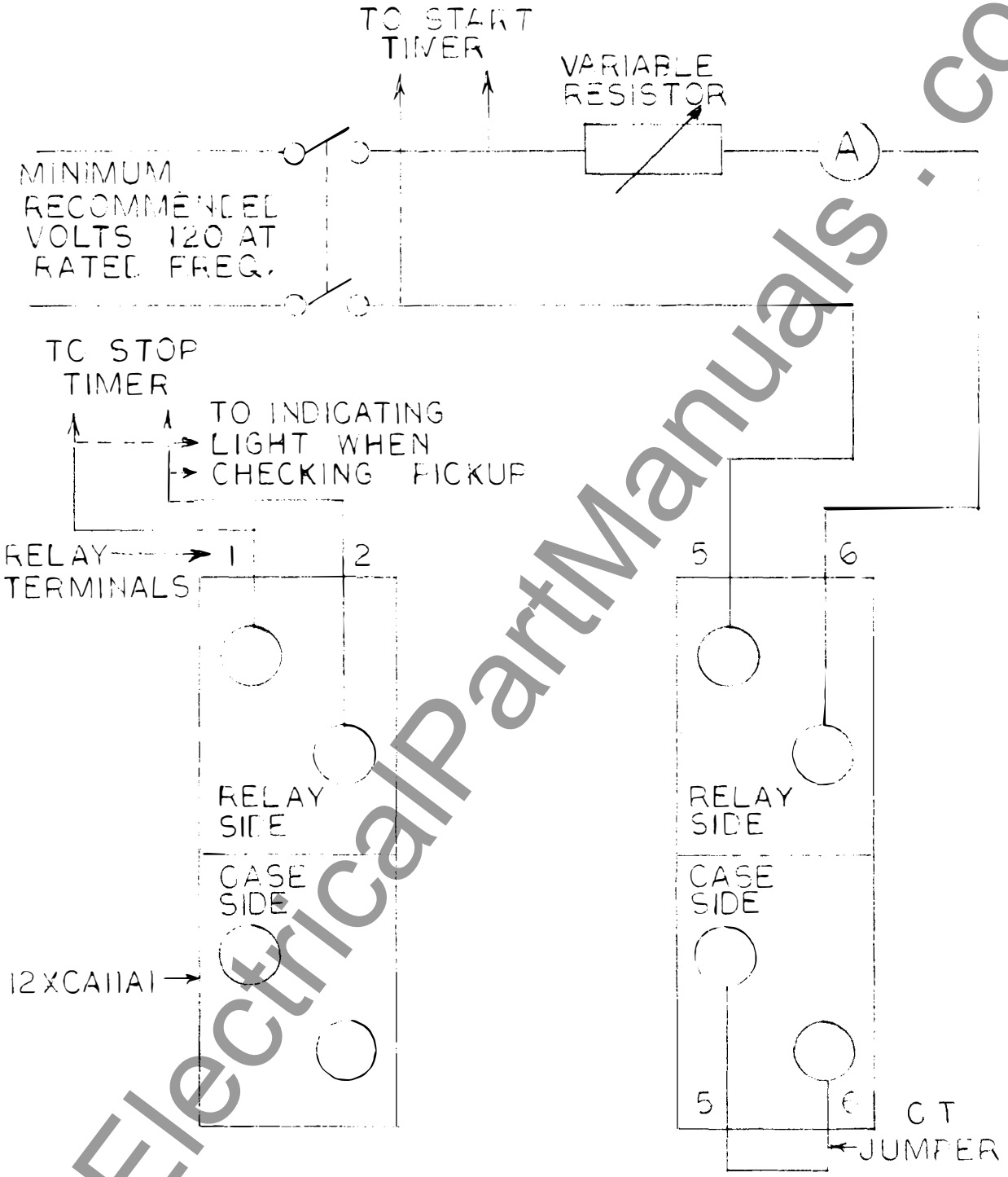


Figure 10 (0208A8695-1) Time/Current Characteristics of the High-Seismic Instantaneous Unit



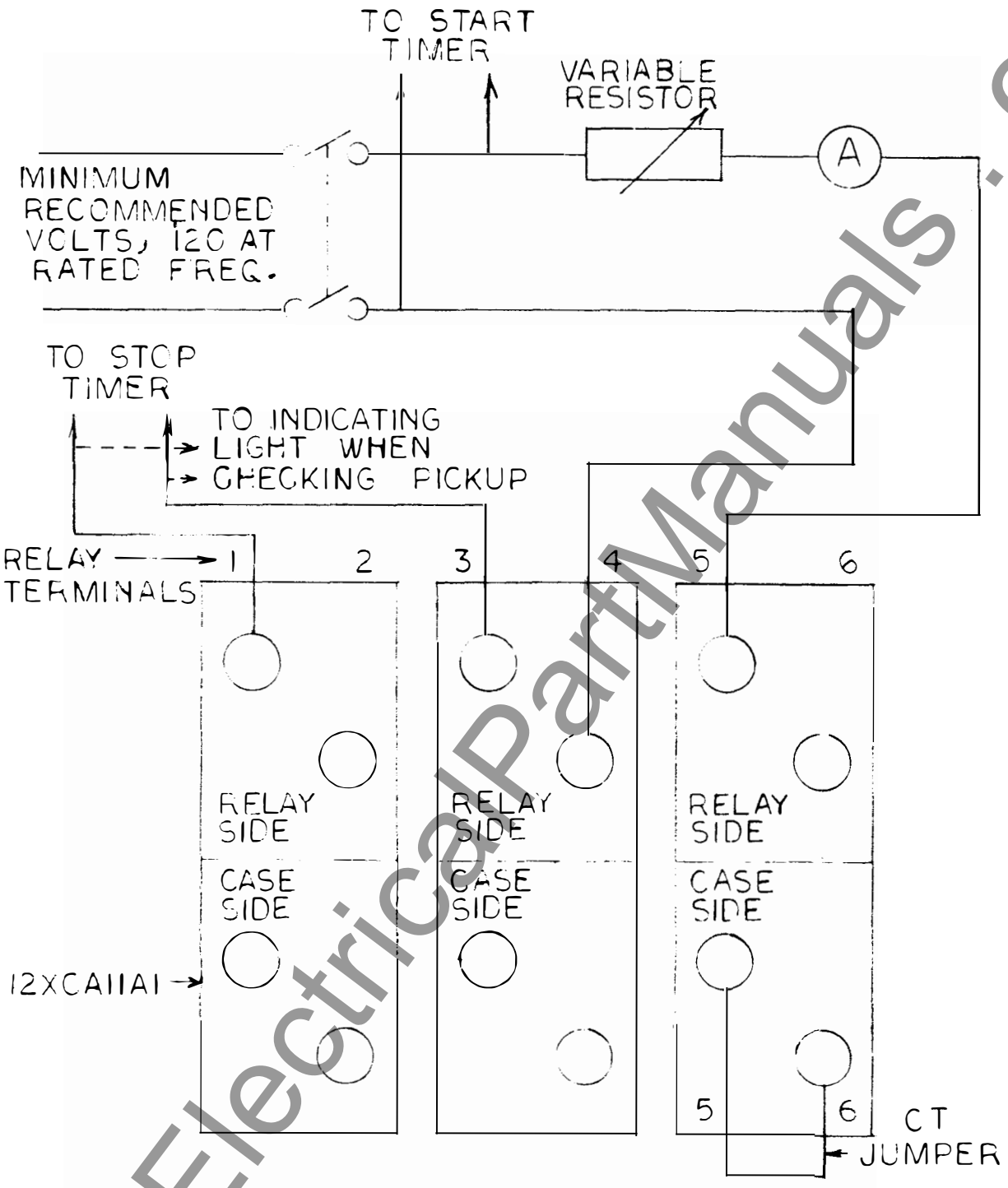
TEST CONNECTIONS FOR TESTING CT
SECONDARY USED WITH THE IFC RELAY

Figure 11 (0269A1787-1) Test Connections for Testing CT Secondary Used with the IFC Relay



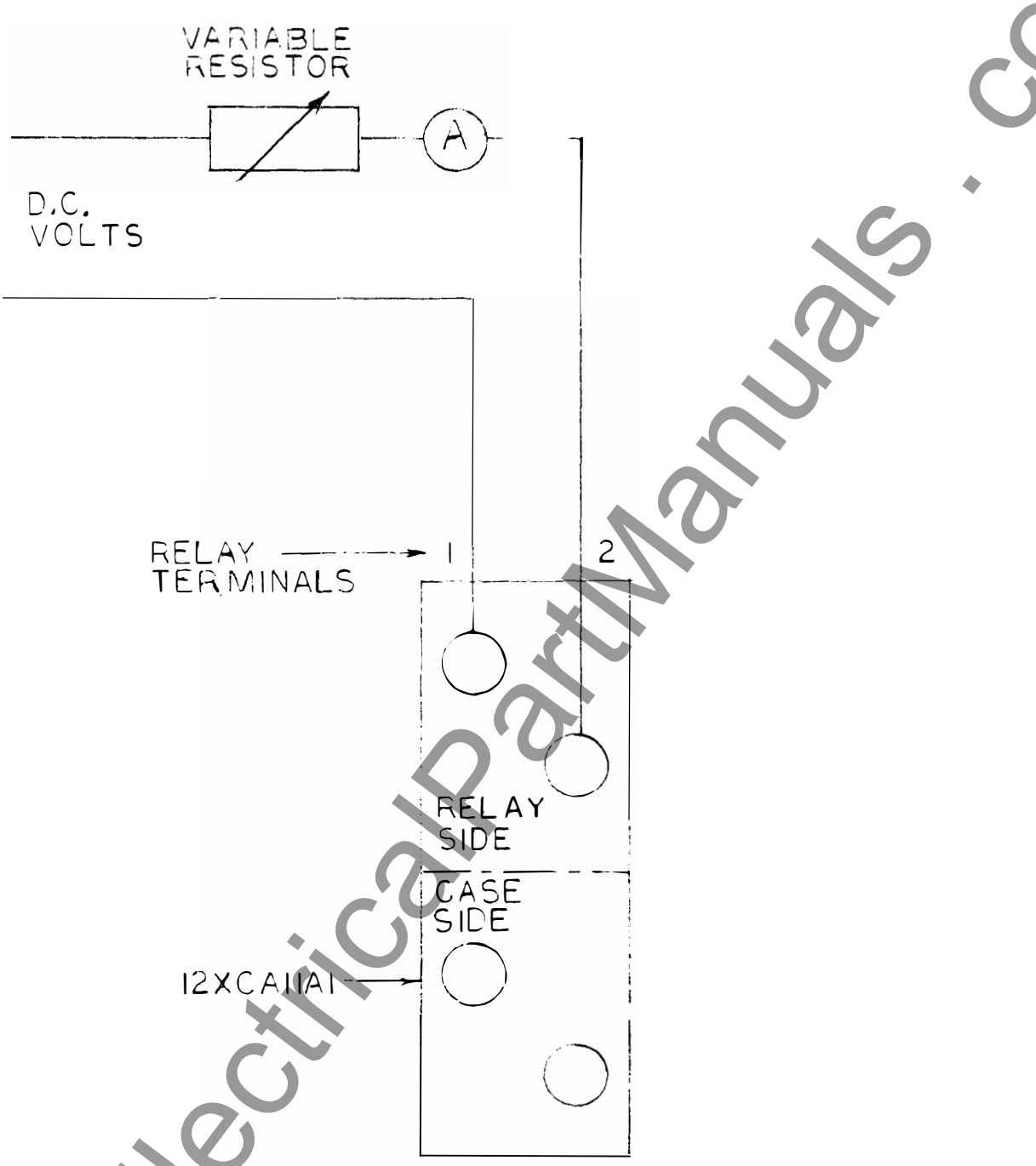
TEST CONNECTIONS FOR TESTING PICKUP AND OPERATING TIMES OF THE IFC RELAY TIME OVERCURRENT UNIT

Figure 12 (0269A1789) 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 13 (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 14 (0269A1790) Test Connections for Testing the High-Seismic Target and Seal-In Unit Used with the IFC Relay

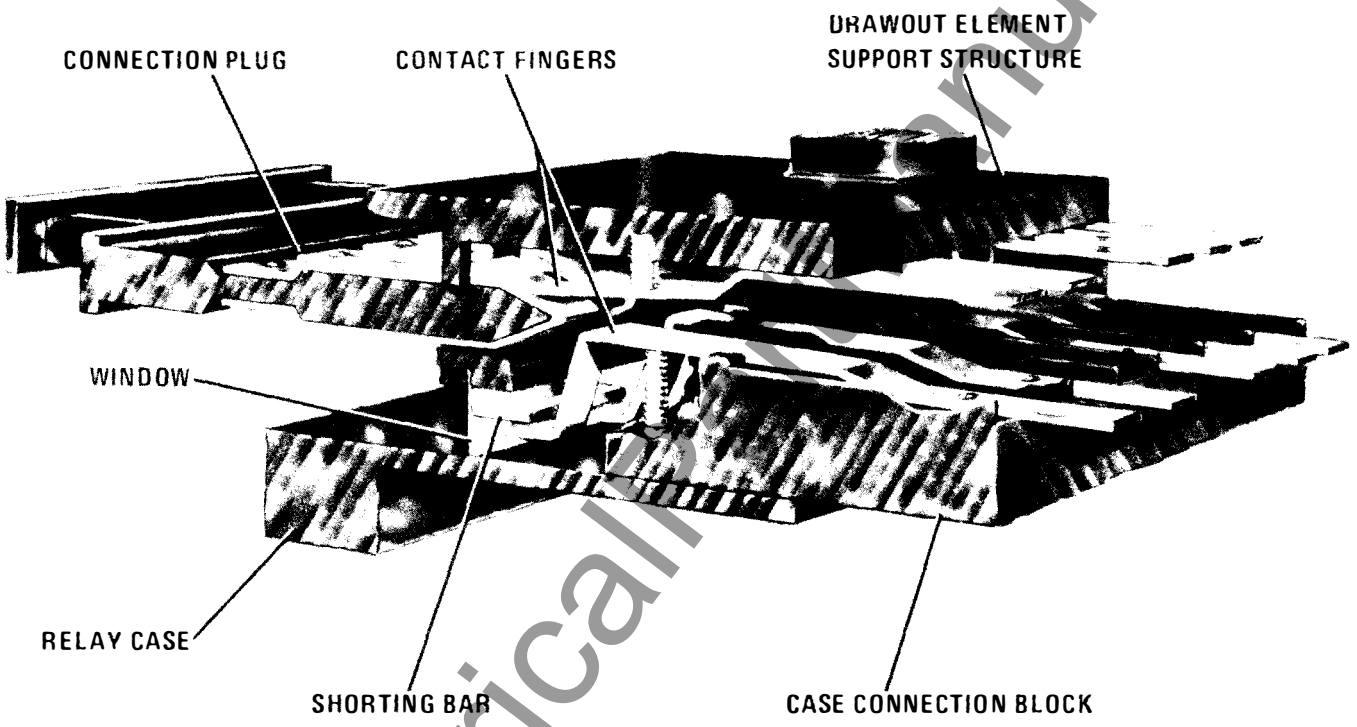


Figure 15 (8042715) Cross Section of IFC Drawout Case Showing Shorting Bar

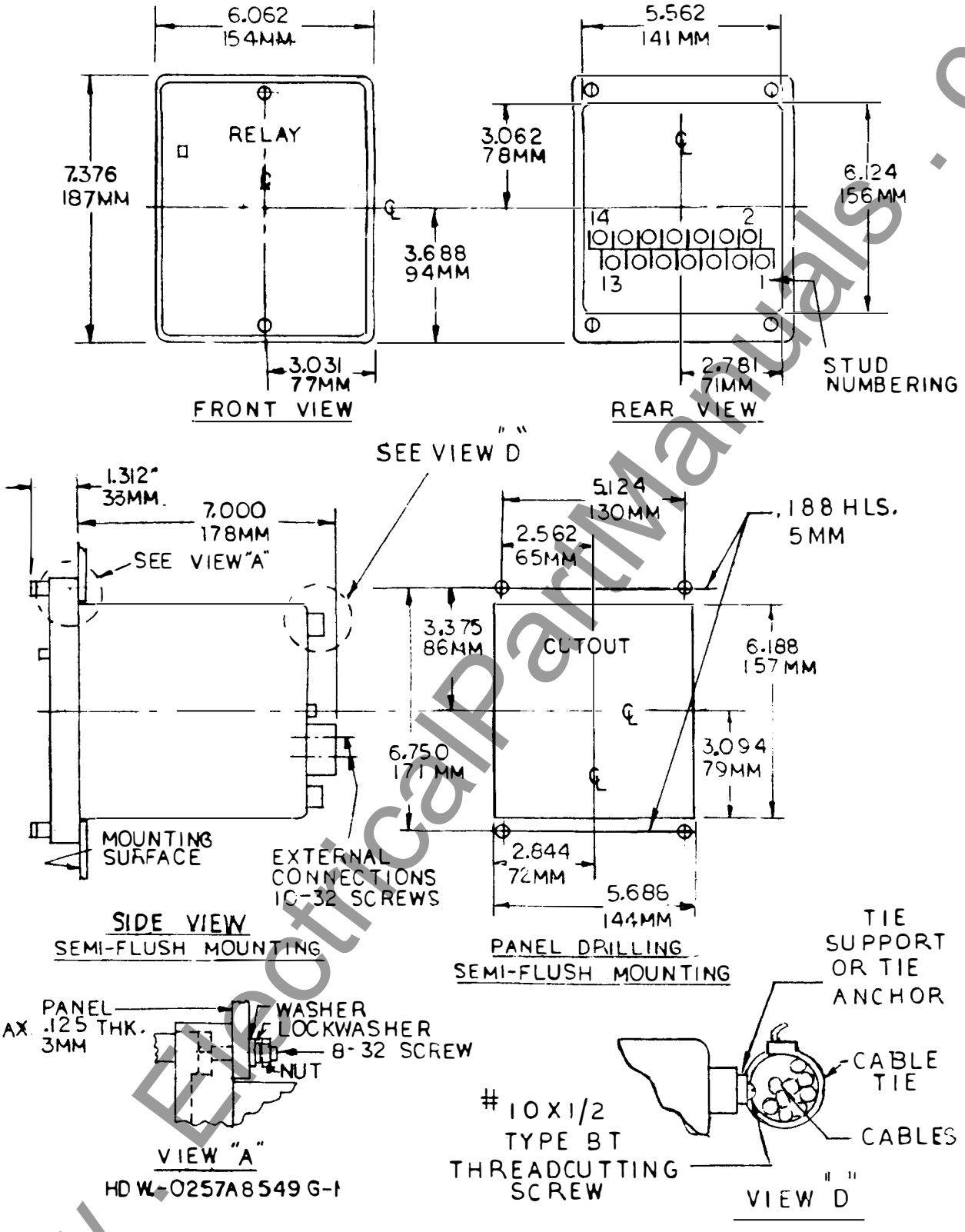


*Figure 16 (0275A8452 Sh.1 [3]) Outline and Panel Drilling for Semi-Flush Mounting of Relay Type IFC57

*Revised since last issue

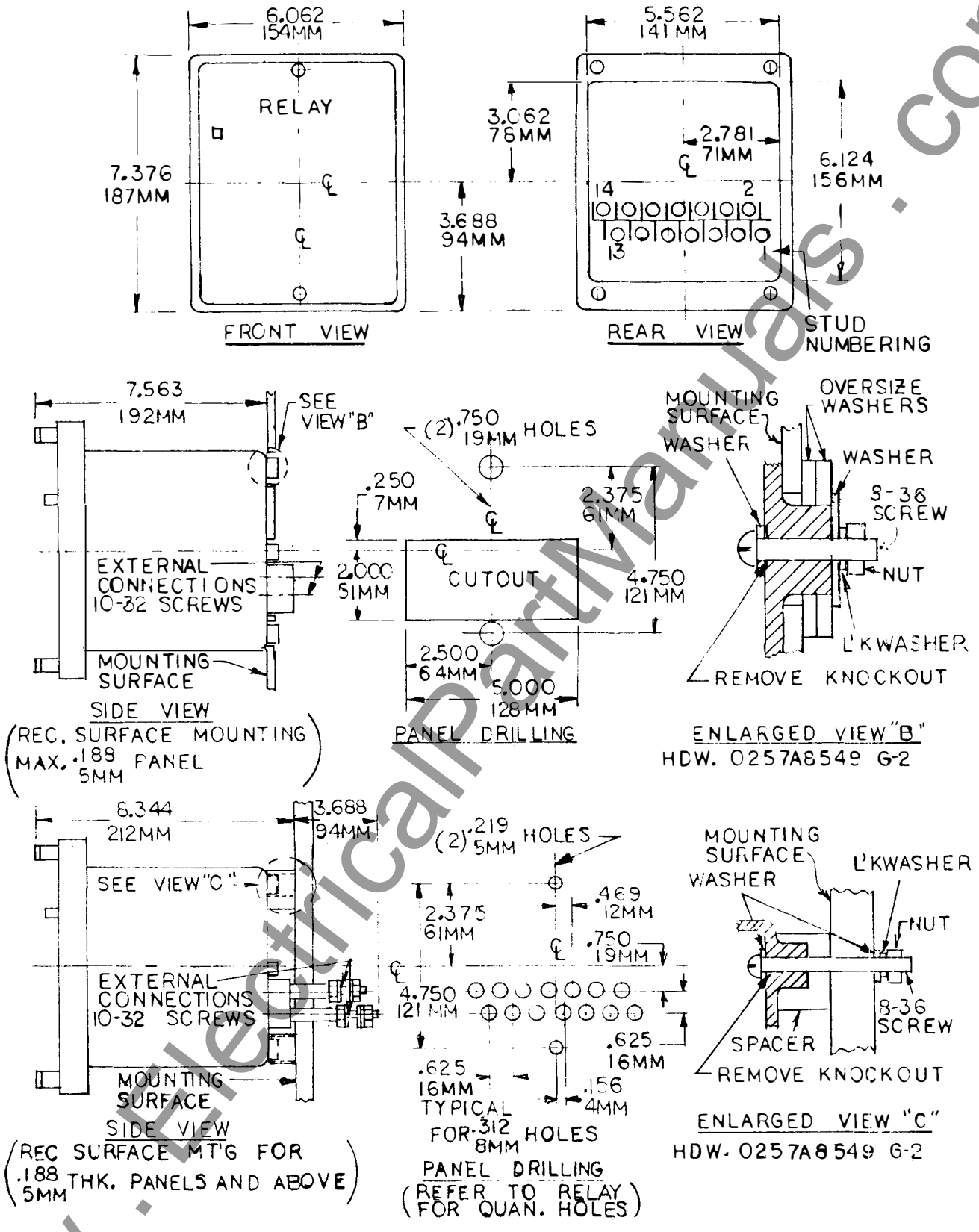


*Figure 17 (0257A8452 Sh.2 [3]) Outline and Panel Drilling for Surface Mounting of Relay Type IFC57

*Revised since last issue