



## INSTRUCTIONS

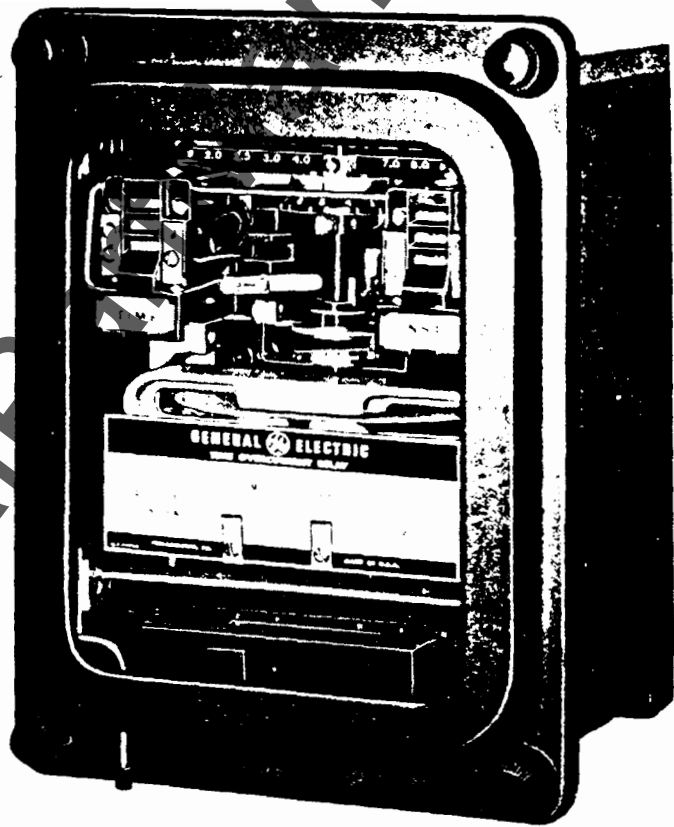
GEK-34055C

Supersedes GEK-34055B

### TIME OVERCURRENT RELAYS

#### TYPES

IAC77A FORM 800 AND UP  
IAC77B FORM 800 AND UP  
IAC78A FORM 800 AND UP  
IAC78B FORM 800 AND UP



GENERAL  ELECTRIC

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CONTENTS

	<u>PAGES</u>
DESCRIPTION . . . . .	3
APPLICATION . . . . .	3
CONSTRUCTION . . . . .	4
RATINGS . . . . .	4
TIME OVERCURRENT UNIT . . . . .	4
INSTANTANEOUS UNIT . . . . .	5
TARGET SEAL-IN UNIT . . . . .	6
CONTACTS . . . . .	6
BURDENS . . . . .	6
CHARACTERISTICS . . . . .	7
RECEIVING, HANDLING AND STORAGE . . . . .	7
ACCEPTANCE TESTS . . . . .	8
VISUAL INSPECTION . . . . .	8
MECHANICAL INSPECTION . . . . .	8
DRAWOUT RELAYS GENERAL . . . . .	8
POWER REQUIREMENTS GENERAL . . . . .	8
TIME OVERCURRENT UNIT . . . . .	9
PICKUP TEST . . . . .	9
TIME TEST . . . . .	9
INSTANTANEOUS UNIT . . . . .	9
SETTING THE INSTANTANEOUS UNIT . . . . .	9
PICK UP TESTS . . . . .	10
TARGET AND SEAL-IN UNIT . . . . .	10
PICK-UP AND DROPOUT TEST . . . . .	10
INSTALLATION TESTS . . . . .	10
TIME OVERCURRENT UNIT . . . . .	10
TARGET AND SEAL-IN UNIT . . . . .	10
INSTANTANEOUS UNIT . . . . .	11
PERIODIC CHECKS AND ROUTINE MAINTENANCE . . . . .	11
TIME OVERCURRENT UNIT . . . . .	11
INSTANTANEOUS UNIT . . . . .	11
TARGET AND SEAL-IN UNIT . . . . .	11
CONTACT CLEANING . . . . .	11
SYSTEM TEST . . . . .	11
SERVICING . . . . .	11
TIME OVERCURRENT UNIT . . . . .	11
INSTANTANEOUS UNIT . . . . .	13
TARGET AND SEAL-IN UNIT . . . . .	13
RENEWAL PARTS . . . . .	13

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TIME OVERCURRENT RELAYS  
TYPES IAC77A, 77B, 78A, 78B FORM 800 and UP  
DESCRIPTION

Type IAC77 and IAC78 relays are single-phase, current operated, a-c devices with extremely inverse time-current characteristics. They can be utilized to protect commercial, industrial, and utility power distribution systems against either multi-phase or phase to ground faults.

Each relay consists of a basic induction-disk time overcurrent unit, a dual-rated target seal-in unit, and may include a hinge-type instantaneous overcurrent unit. Both the time overcurrent unit and the instantaneous unit are adjustable over a range of about 8 to 1. The available ranges in amperes of both units as well as information on their continuous rating, contact rating, and tap ratings of the target seal-in unit are given in the section on RATINGS.

A standard S1 case is used to mount each relay. The outline and mounting dimensions of this case are shown in Figures 11 and 12.

The basic differences between the relays covered by these instructions are noted in the following Table I.

TABLE I

TYPE	INSTANTANEOUS UNIT	CONTACT CIRCUITS	INTERNAL CONNECTIONS
IAC77A	NO	1	FIG. 4
IAC77B	YES	1	FIG. 5
IAC78A	NO	2	FIG. 6
IAC78B	YES	2	FIG. 7

APPLICATION

The extremely inverse time current characteristics make the IAC77 and IAC78 relays particularly well suited for the protection of primary distribution circuits. In such applications, because the relay characteristics closely parallel those of the power fuses normally employed in these circuits, it is possible to obtain selective fault protection with a minimum time delay.

The unique time-current characteristics of these relays also make them well suited for picking up cold loads. For any given cold load pick up capability, the resulting setting will provide faster protection at high fault currents with the extremely inverse relay than with less inverse devices.

The general practice is to use a set of three relays for interphase faults. A separate relay, residually connected, can be utilized for single-phase-to-ground faults. Use of a separate ground relay is advantageous because it can be adjusted to provide more sensitive protection on ground faults. Typical connections for applying these relays are shown in Figures 14 and 15.

In the application of IAC77 and 78 relays with automatic reclosing devices, the reset time should be considered. The reset time of all relays covered by these instructions is approximately 60 seconds from the fully closed to the fully open position when set at the number 10 time dial.

When setting these relays to coordinate with "downstream" relays, a coordination time of from 0.25 to 0.40 seconds is generally allowed. These coordination times include, in addition to breaker clearing time, 0.10 seconds for relay overtravel and 0.17 seconds for safety factor. For example, if the breaker clearing time is 0.13 seconds (8 cycles) the coordination time would be 0.40 seconds. If the relay time is set by test at the current level in question, the safety factor may be reduced to 0.07 seconds. Then if the "downstream" breaker time is 5 cycles (0.08 seconds) a minimum of 0.25 seconds could be allowed for coordination. If the downstream devices are fuses rather than circuit breakers, then the maximum clearing time of the fuse should be used and the time allowed for breaker clearing time should be omitted.

*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.*

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CONSTRUCTION

The induction unit is the basic unit in all Type IAC relays. Figs. 2 and 3 show the induction unit mounted in the cradle. These units are of the induction-disk construction type.

The disk is actuated by a wattmetric type current operating element. This is similar to the standard element as used in watthour meters, except the actuating coils above and below the operating disk are connected in series. A capacitor and variable resistor connected in series with the inner coil on the upper laminated structure makes up the phase-shifting circuit. The disk shaft carries the moving contact which completes the trip or alarm circuit. The disk shaft is restrained by a spiral spring to give proper contact closing current and its motion is retarded by a permanent magnet acting on the disk to give correct time delay.

There is a target and seal-in unit mounted on the front to the left of the shaft of the time overcurrent unit. 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 which latches up and remains exposed until released by pressing a button beneath the lower left corner of the cover.

The instantaneous unit is a small hinge type unit which may be 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 which latches up and remains exposed until it is released. The same button that releases the target of the seal unit also releases the target of the instantaneous unit.

RATINGSOVERCURRENT UNIT

ratings of the time overcurrent unit are given in Table II.

TABLE II

RELAY	FREQ. CYCLES	PICK UP RANGE, AMPERES	
		MAIN (TIME) UNIT	INSTANTANEOUS UNIT
IAC77A and IAC78A	50	0.5 - 4.0	
	60	1.5 - 12.0	
		2.0 - 15.0	
IAC77B and IAC78B	50	0.5 - 4.0	0.5 - 4.0
	60	1.5 - 12.0	2.0 - 16.0
		2.0 - 15.0	10.0 - 80.0
			20.0 - 160.0

Available taps of the time overcurrent unit are shown on Table II.

TABLE III

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
1.5 - 12.0	1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 10.0, 12.0
2.0 - 15.0	2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 10.0, 12.0, 15.0

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The one second thermal ratings are listed in Table IV.

TABLE IV

TIME OVERCURRENT UNIT (AMPS)	1-SEC. RATING (AMPS)	K
0.5 - 4.0	125.0	15,625
1.5 - 12.0	260.0	67,600
2.0 - 15.0	260.0	67,600

For ratings of less than one second, the rating may be calculated according to the formula

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

where T is the time in seconds that the current flows.

The continuous ratings of the time overcurrent units are shown in Table V.

TABLE V

0.5 - 4.0 AMP RANGE					1.0	1.2	1.5	2.0	2.5	3.0	4.0
TAP	0.5	0.6	0.7	0.8	1.0	1.2	1.5	2.0	2.5	3.0	4.0
RATING	3.5	3.7	4.0	4.5	5.0	5.5	6.0	7.0	8.0	9.0	10.0

1.5 - 12.0 AMP RANGE					4.0	5.0	6.0	7.0	8.0	10.0	12.0
TAP	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0
RATING	9.5	10.5	11.5	12.5	14.0	15.5	17.0	18.0	19.0	20.0	20.0

2.0 - 15.0 AMP RANGE					5.0	6.0	7.0	8.0	10.0	12.0	15.0
TAP	2.0	2.5	3.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0	15.0
RATING	10.0	11.0	12.0	13.0	15.0	17.0	18.0	19.0	20.0	20.0	20.0

#### INSTANTANEOUS UNIT

The instantaneous unit has a double wound coil for operation on either one of two ranges. Any setting obtained in the lower range (series connected) is doubled, within  $\pm 3\%$ , when the unit is connected for high range operation (parallel connected).

The instantaneous unit has a continuous rating of 1.5 times minimum setting or 25 amperes whichever is smaller. Example: The 2.0-16.0 ampere instantaneous unit when set on the low range (2.0-8.0 amperes) has a continuous rating of 3.0 amperes, and when connected for high range operation (4.0-16.0 amperes) has a continuous rating of 6.0 amperes. The continuous and one second ratings for the instantaneous unit are shown in Table VI.

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TABLE VI

RANGE		***	CONTINUOUS RATING	*ONE SECOND	K
0.5-4.00	0.5-2.00	S	0.75	25.0	625
	1.0-4.00	P	1.5	50.0	2500
2.0-16.0	2.0-8.00	S	3.0	130.0	16900
	4.0-16.00	P	6.0	260.0	67600
10.0-80.0	10.0-40.0	S	15.0	400.0	160000
	20.0-80.0	P	25.0	600.0	360000
20.0-160.0	20.0-80.0	S	25.0	600.0	360000
	40.0-160.0	P	25.0	600.0	360000

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

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

\*\* S = Series connected, P = Parallel connected

#### TARGET SEAL-IN UNIT

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

TABLE VII

	TAP	
	0.2	2.0
D.C. RESISTANCE $\pm 10\%$ (OHMS)	7	0.13
MIN. OPERATING (AMPERES) $\pm 0-25\%$	0.2	2.0
CARRY CONT. (AMPERES)	0.3	3.0
CARRY 30 AMPS FOR (SEC.)	0.03	4.0
CARRY 10 AMPS FOR (SEC.)	0.25	30.0
60 HZ IMPEDANCE (OHMS)	52.0	0.53

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.

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TABLE VIII

RANGE	HZ	MIN. TAP	BURDENS AT MIN. PICKUP MIN. TAP			BURDENS IN OHMS (Z)			V.A. AT 5 AMPS CALCULATED FROM IMPEDANCE AT MIN. PICKUP ( $I^2 Z$ )
			R	J <sub>X</sub>	Z	3 TIMES PICKUP	10 TIMES PICKUP	20.0 TIMES PICKUP	
0.5 - 4.0	60	0.5	0.80	1.38	1.60	1.60	1.60	1.60	40
1.5 - 12.0	60	1.5	0.085	.147	0.17	0.17	0.17	0.17	4.25
2.0 - 15.0	60	2.0	0.05	0.086	0.099	0.10	0.10	0.10	2.5

NOTE: The impedance values given are those for the minimum tap of each relay. The impedance for other taps at pick-up current (tap rating) varies inversely (approximately) as the square of the tap rating. For example, for a relay with 0.5 - 4.0 amp range, the impedance of the 0.5 amp tap is given as 1.60 ohms. The impedance of the 2.0 amp tap at 2.0 amperes is  $(.5/2)^2 \times 1.6$  or 0.10 ohm.

The instantaneous unit burdens are listed in Table IX.

TABLE IX

RANGE 60 HZ RELAYS ONLY (AMPS)	CONNEC- TIONS *	MIN. TAP AMPS	BURDENS AT MIN. PICKUP			BURDENS IN OHMS (Z)			VA AT 5 AMPS CALCULATED FROM IMPEDANCE AT MIN. PICK-UP ( $I^2 Z$ )
			R OHMS	J <sub>X</sub> OHMS	Z OHMS	3 TIMES PICKUP	10 TIMES PICKUP	20 TIMES PICKUP	
0.5-4.0	LOW	0.5	12.7	11.5	17.1	9.6	8.7	8.2	427.5
	HIGH	1.0	3.18	2.87	4.28	2.40	2.18	2.04	107.0
2.0-16.0	LOW	2.0	0.76	0.72	1.05	0.59	0.53	0.50	26.25
	HIGH	4.0	0.189	0.180	0.261	0.147	0.133	0.125	6.63
10.0-80.0	LOW	10.0	0.042	0.029	0.051	0.029	0.026	0.024	1.28
	HIGH	20.0	0.010	0.007	0.013	0.007	0.007	0.006	0.33
20.0-160.0	LOW	20.0	0.015	0.008	0.017	0.010	0.009	0.008	0.43
	HIGH	40.0	0.004	0.002	0.004	0.002	0.002	0.002	0.10

\* Low means two windings connected in series.  
High means two windings connected in parallel.  
See Internal Connections diagram for additional information.

### CHARACTERISTICS

Pick-up of these relays is defined as the current required to close the contacts from the 0.5 time dial position. The pick-up value in the IAC77 relays is within 3% of the tap value.

The setting of the time dial determines the length of time the unit requires to close its contacts when the current reaches the predetermined value. The contacts are just closed when the dial is set at zero. When the dial is set at 10, the disk must travel the maximum distance to close the contacts; this gives the maximum time setting. The unit resets at 85% of the minimum closing value of current. Figure 9 shows the 50 HZ and Figure 10 shows the 60 HZ Time Current Characteristics for Relay types IAC77 and IAC78. The time to reset to the 10 time dial position when the current is reduced to zero is approximately 57 seconds.

The time current curve for the instantaneous unit is shown on Figure 8.

### 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

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

Reasonable care should be exercised in unpacking the relay in order that none of the parts are injured or the adjustments disturbed.

If the relays are not to be installed immediately, they should be stored in their original cartons in a place that is free from moisture, dust, and metallic chips. Foreign matter collected on the outside of the case may find its way inside when the cover is removed and cause trouble in the operation of the relay.

### 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 calibration has 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 on acceptance tests at the discretion of the user. Since most operating companies use different procedures for acceptance and installation tests, the following section includes all applicable tests that may be performed on these relays.

### VISUAL INSPECTION

Check the nameplate stamping 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 molded parts or other signs of physical damage, and that all the screws are tight.

### 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. 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 1/32" wipe on the seal in 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 lever is operated.
5. Make sure that the fingers and shorting bars agree with the internal connections diagram.

### CAUTION:

EVERY CIRCUIT IN THE DRAWOUT CASE HAS AN AUXILIARY BRUSH. IT IS ESPECIALLY IMPORTANT ON CURRENT CIRCUITS AND OTHER CIRCUITS WITH SHORTING BARS THAT THE AUXILIARY BRUSH BE BENT HIGH ENOUGH TO ENGAGE THE CONNECTING PLUG OR TEST PLUG BEFORE THE MAIN BRUSHES DO. THIS WILL PREVENT CT SECONDARY CIRCUITS FROM BEING OPENED. SEE FIGURE 1.

### DRAWOUT RELAYS GENERAL

Since all drawout relays in service operate in their cases, it is recommended that they be tested in their cases or an equivalent steel case. In this way, any magnetic effects of the enclosure will be accurately duplicated during testing. A relay may be tested without removing it from the panel by using a 12XLA13A test plug. This plug makes connections only with the relay and does not disturb any shorting bars in the case. The 12XLA12A test plug may also be used. Although this test plug allows greater testing flexibility, it requires C.T. shorting jumpers and the exercise of greater care, since connections are made to both the relay and the external circuitry.

### 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 devices (relays) will be affected by the applied waveform.

Therefore, in order to properly test alternating current relays it is essential to use a sine wave 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 affect-

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ed by non-sinusoidal wave forms.

#### TIME OVERCURRENT UNIT

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

Where 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" wipe.

The minimum current at which the contacts will just close is determined by the position of the tap screw in the tap block at the top of the relay.

When changing the current setting of the relay while in the case, remove the connection plug to short the current transformer secondary circuit. Next, screw the tap screws into the tap marked for the desired current and then replace the connection plug.

The pickup of the unit for any current tap setting is adjusted by means of the variable resistor in the phase-shifting circuit. This adjustment also permits any desired setting intermediate between the various tap settings to be obtained. The control spring is prewound approximately 660 degrees with the contacts just closed. Further adjustment of this setting is seldom required. The unit is adjusted at the factory to close its contacts from any time dial position at a minimum current within five per cent of the tap setting. The unit resets at 85 percent of the minimum closing value.

#### PICKUP TEST

Set the relay at the 0.5 time dial position and 2.0 amp tap. Using the test connections of Figure 13, the main unit should close its contacts within 42% of tap value current (1.96-2.04 amp.).

#### TIME TEST

Set the relay at the 5.0 time dial position and 2.0 amp tap. Using the test connections of Figure 13 and applying 5 times tap current (10.0 amp.), the relay should operate in 0.92 seconds  $\pm 0.03$  seconds.

#### INSTANTANEOUS UNIT

Make sure that the instantaneous unit is wired for the range in which it is to operate (see Internal Connections Diagram Fig. 5 or Fig. 7) and connected as indicated in Test Circuit Figure 13. Whenever possible, use the higher range, since the higher range has a higher continuous rating.

#### SETTING THE INSTANTANEOUS UNIT

Loosen the locknut and turn the pole piece toward the desired setting. See Figure 2. Turning the pole piece up increases the pick up, turning the pole piece down decreases the pick up. Bring up the current slowly until the unit picks up. It may be necessary to repeat this operation until the desired pick up value is obtained. Once the desired pick up value is reached, tighten the locknut.

CAUTION: THE INSTANTANEOUS UNIT IS RATED 1.5 TIMES MINIMUM PICKUP. DO NOT LEAVE THE CURRENT ON TOO LONG AS IT MAY DAMAGE THE UNIT.

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PICK UP TESTS

With the unit connected for high range operation (parallel connections) and the target in the "Down" position, check the pickup at the maximum calibration mark: the pick up should be within the limits in Table X.

TABLE X

UNIT RANGE AMPERES	MINIMUM AMPERES	CALIBRATION AMPERES	MAXIMUM AMPERES
0.5-4.0	3.6	4.0	4.5
2.0-16.0	14.4	16.0	17.7
10.0-80.0	72.0	80.0	89.0
20.0-160.0	144.0	160.0	177.0

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 lower 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 2. This procedure is necessary to prevent the right hand stationary contact from getting out of adjustment. Screws should never be in both taps at the same time.

PICK-UP AND DROPOUT TEST

1. Connect relay studs 1 and 2 (See Internal Connections Diagram) to a D.C. 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.  
Move the time dial away from the ZERO TIME DIAL position, the seal-in unit should remain in the picked up position.
4. Decrease the current slowly until the seal-in unit drops out. See Table XI.

TABLE XI

TAP	PICK-UP CURRENT	DROPOUT CURRENT
0.2	0.15 - 0.195	.05 OR MORE
2.0	1.50 - 1.95	.55 OR MORE

INSTALLATION TESTS

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

TIME OVERCURRENT UNIT

1. Set tap screw on desired tap.  
Using the test circuit in Figure 13, apply approximately twice tap value until contacts just close. Reduce the current until the light in series with the contacts begins to flicker. This value of current is defined as pick up and should be within 5% of tap value.
2. Check the operating time at some multiple of tap value. This multiple of tap value may be five 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.

TARGET AND SEAL-IN UNIT

Make sure that the tap screw is in the desired tap.  
Perform pick up and drop out tests as outlined in the Acceptance Test Section.

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INSTANTANEOUS UNIT

1. Select the desired range by making the proper connections at the rear of the relay (See Internal Connections Diagram). Whenever possible, always select the higher range since it has higher continuous rating.
2. Set the instantaneous unit to pick up at the desired current level. See "Setting the Instantaneous Unit", in the "Acceptance Test 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 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. 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 ensure that the relays have not deviated from their original setting. If deviations are encountered, the relay must be retested and serviced as described in this manual.

TIME OVERCURRENT UNIT

1. Perform Pick-up test as described in the "Installation Section" for the tap in service.
2. Perform the Time Tests as described in the "Installation Section."

INSTANTANEOUS UNIT

1. Check that the Instantaneous Unit picks up at the desired current level, as outlined in the "Acceptance Test Section."

TARGET AND SEAL-IN UNIT

1. Check that the unit picks up at the values shown in Table XI.
2. Check that the units drops out at 30% 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 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 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.

SYSTEM TEST

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

SERVICINGTIME 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:

1. Rotate time dial to No. 0 time dial setting and check by means of a lamp that the contacts just close.

Where 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" wipe.

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2. Connect the operating coil terminals to a source of the proper frequency and good waveform having a voltage of 120 or more, with pure resistance load boxes for setting the current. See test circuit Fig. 13.
3. Set the tap plug in the 2 amp tap, and the time dial where the contacts are just open. Set the resistor at the midpoint of its range and check the current required to just close the contacts. It should fall within the limits given in Table XII.

TABLE XII

TAP RANGE	TAP	MINIMUM AMPS	MAXIMUM AMPS
0.5-4.0	2 AMP	1.96	2.04
1.5-12.0	2 AMP	1.96	2.04
2.0-15.0	2 AMP	1.96	2.04

It should never be necessary to wind up the control spring adjustor more than 30 degrees (one notch) or unwind it more than 90 degrees (three notches) from the factory setting to obtain the above pickup setting.

4. After pick up has been set within the prescribed limits, the compensation must be checked. With the 2 amp tap setting as in paragraph 3, set the time dial at No. 10 and check the current required to just move the disk away from the stop arm. This current should be within the limits shown in Table XIII which are  $\pm 6\%$  of tap amperes. If the disc moves at the lower limit, check that movement is not over  $1/2$ " measured along the periphery of the disc.

TABLE XIII

TAP RANGE	TAP	MINIMUM AMPS	MAXIMUM AMPS
0.5-4.0	2 AMP	1.88	2.12
1.5-12.0	2 AMP	1.88	2.12
2.0-15.0	2 AMP	1.88	2.12

If the current falls outside these limits, the following steps should be taken. Reset the control spring until compensation at #10 time dial setting is within the limits shown above. Then set at  $\#1/2$  T.D.S. and restore pick up by adjusting the resistor. Compensation should be rechecked after the resistor adjustment.

With the contacts just open, check the current required to just close the contacts on each of the other taps. This current should be within  $\pm 3\%$  of tap value.

With the time dial at No. 10 time setting and the tap plug in the 2 amp tap, apply sufficient current to the relay to definitely close the contacts. Reduce the current to 80 percent of tap value and the disk should reset all the way to the No. 10 dial setting position.

With the tap plug in the 2 amp tap and the time dial at No. 5 time setting, apply five times tap current to the relay.

Adjust the drag magnet to obtain a closing time from 0.89 to 0.95 seconds. However, it is preferable to adjust the time delay as near as possible to 0.92 seconds. The magnet should be approximately in the middle of its travel. The magnet is adjusted by loosening the nut under the magnet shelf. Moving the magnet in decreases the time, moving the magnet out increases the time.

When adjusting the drag magnet, be sure the outer edge of the magnet never extends out beyond the cut out in the disk. Be sure the nut clamping the drag magnet to its supporting shelf is tight before proceeding with other time checks. Make sure the drag magnet does not hit the counterweight at any position of the disk.

With the tap plug in the 2 amp tap and the time dial at the No. 5 time setting, check the contacts closing at 2 and 10 times tap value. These times must be within the limits in Table XIV.

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TABLE XIV

TAP	AMPS	60HZ		50HZ	
		MIN. SEC.	MAX. SEC.	MIN. SEC.	MAX. SEC.
2.0	4.0	6.27	7.22	6.58	7.56
2.0	20.0	0.26	0.30	0.27	0.31

INSTANTANEOUS UNIT

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 1/32 inch wipe on the contacts. Check this by inserting a 0.012 inch feeler gage between the front half of the shaded pole and the armature with the armature held closed. Contacts should close with feeler gage in place.

TARGET AND SEAL-IN UNIT

Check steps 1 and 2 as described under Instantaneous Unit.

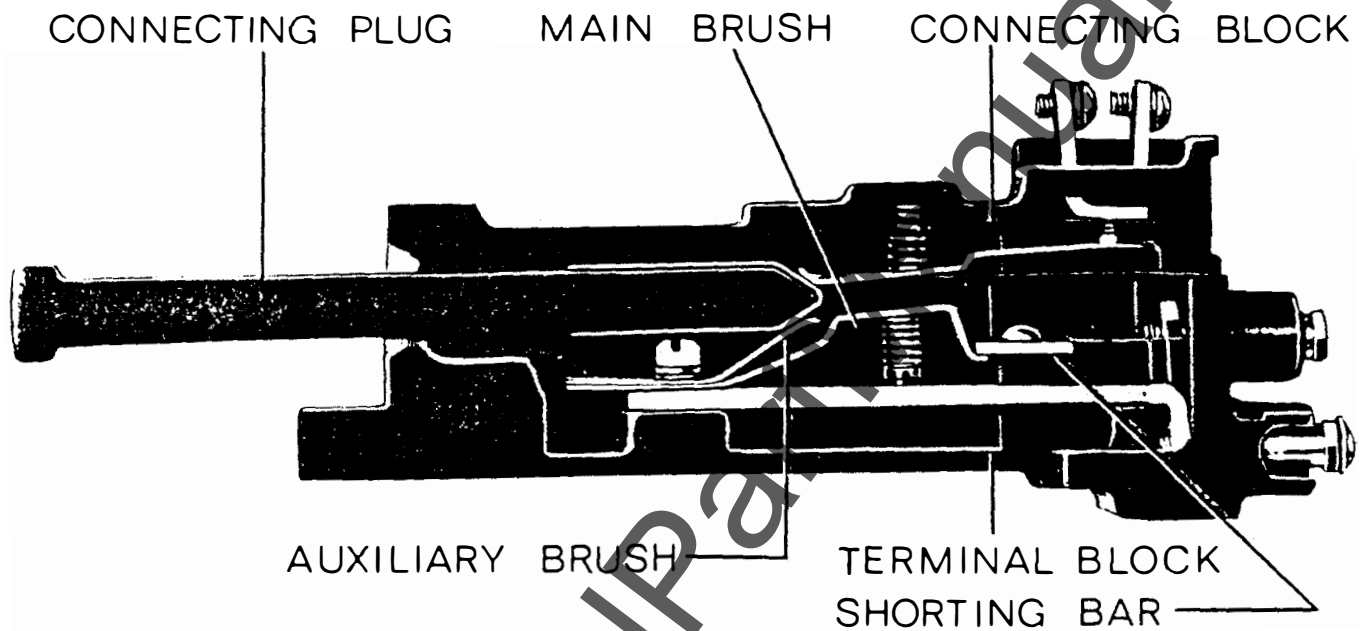
To check the wipe of the seal-in unit, insert a 0.012 inch feeler gage between the plastic residual of the armature and the pole piece with the armature held closed. Contacts should close with the feeler gage in place.

RENEWAL PARTS

It is recommended that sufficient quantities of renewal parts be carried in stock to enable the prompt replacement of any that are worn, broken, or damaged.

When ordering renewal parts, address the nearest Sales Office of the General Electric Company, specify quantity required, name of the part wanted, and the complete model number of the relay for which the part is required.

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NOTE: AFTER ENGAGING AUXILIARY BRUSH, CONNECTING PLUG TRAVELS  $\frac{1}{4}$  INCH BEFORE ENGAGING THE MAIN BRUSH ON THE TERMINAL BLOCK

FIG. 1 (8025039 ) CROSS SECTION OF DRAWOUT CASE SHOWING POSITION OF AUXILIARY BRUSH

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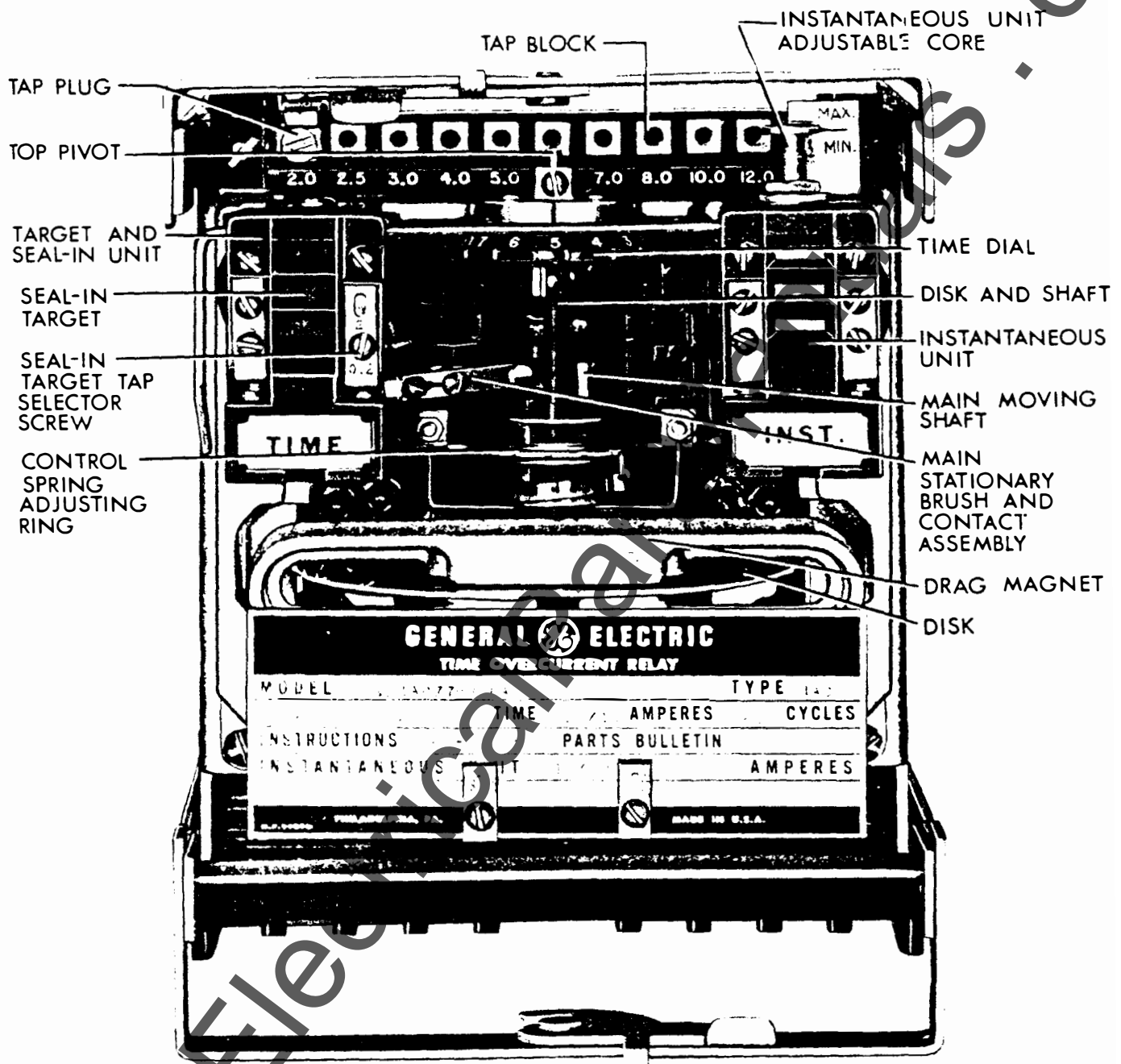


FIG. 2 (8041298 ) TYPE IAC77 800 SERIES RELAY REMOVED FROM CASE (FRONT VIEW)

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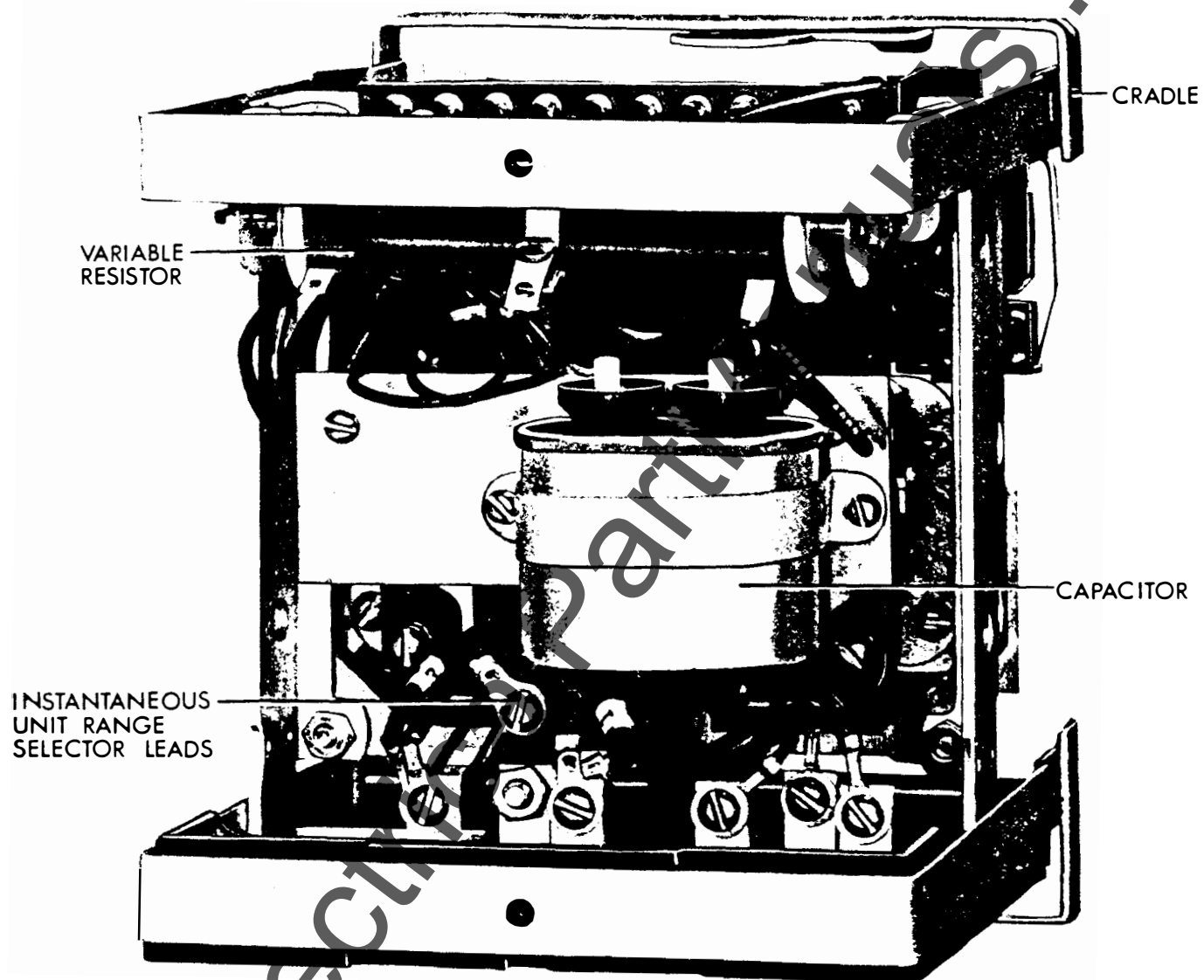
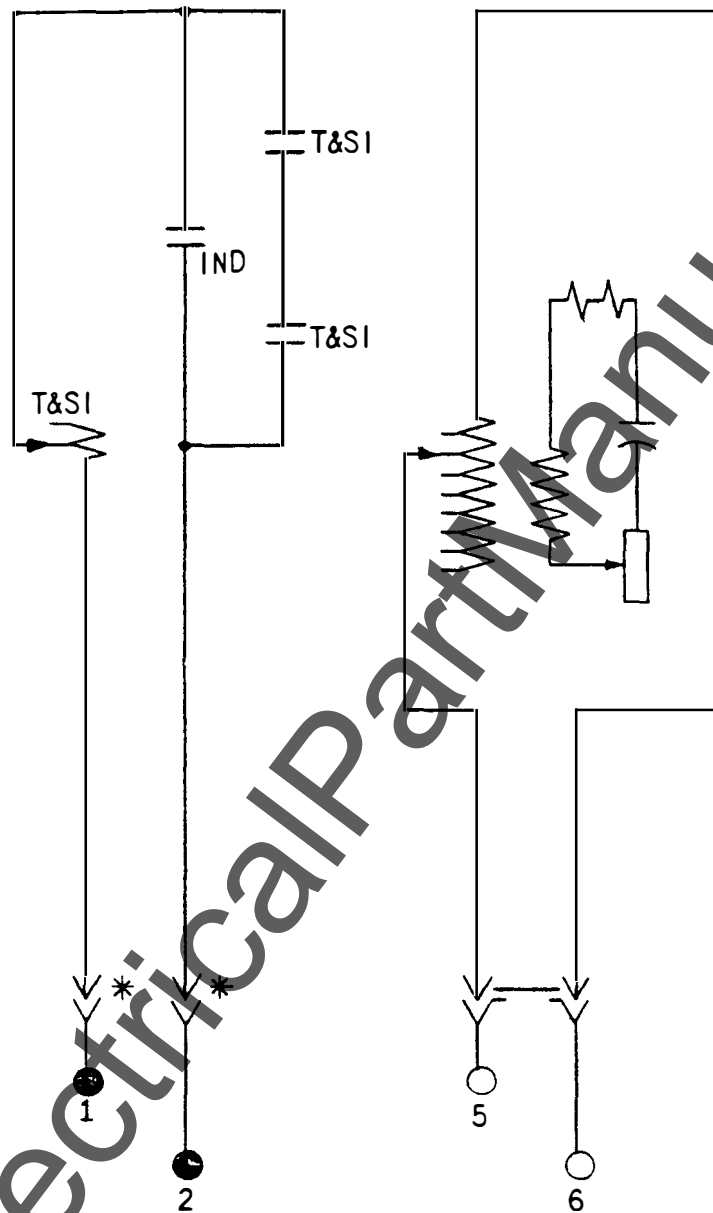


FIG. 3 (8041297 ) TYPE IAC77 800 SERIES RELAY REMOVED FROM CASE (REAR VIEW)

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\* = SHORT FINGERS

FIG. 4 (0165A7758-0 ) TYPE IAC77A 800 SERIES RELAY INTERNAL CONNECTIONS (FRONT VIEW)

[www.ElectricalPartManuals.com](http://www.ElectricalPartManuals.com)

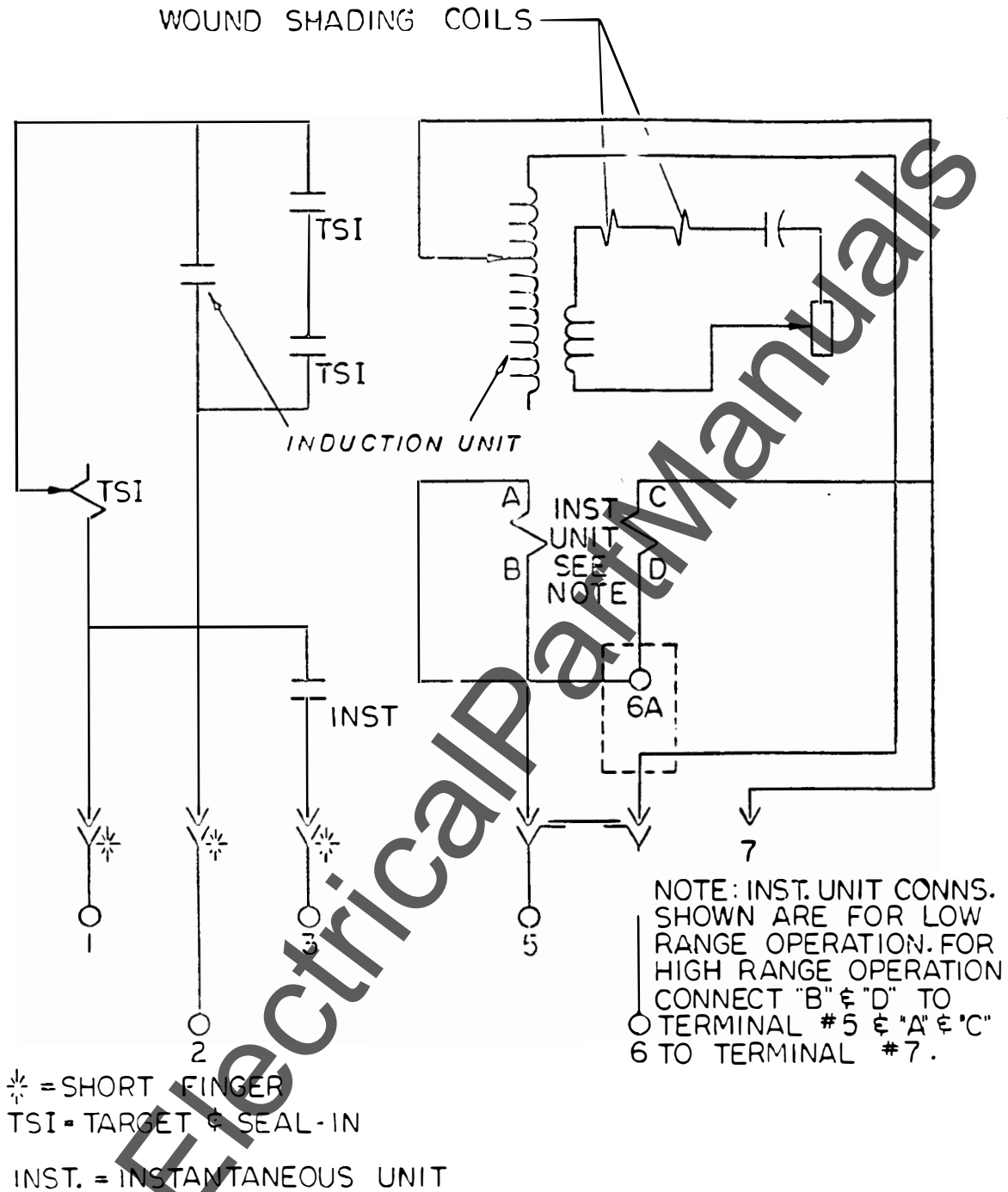


FIG. 5 (0246A2200-1 ) TYPE IAC77B 800 SERIES RELAY INTERNAL CONNECTIONS (FRONT VIEW)

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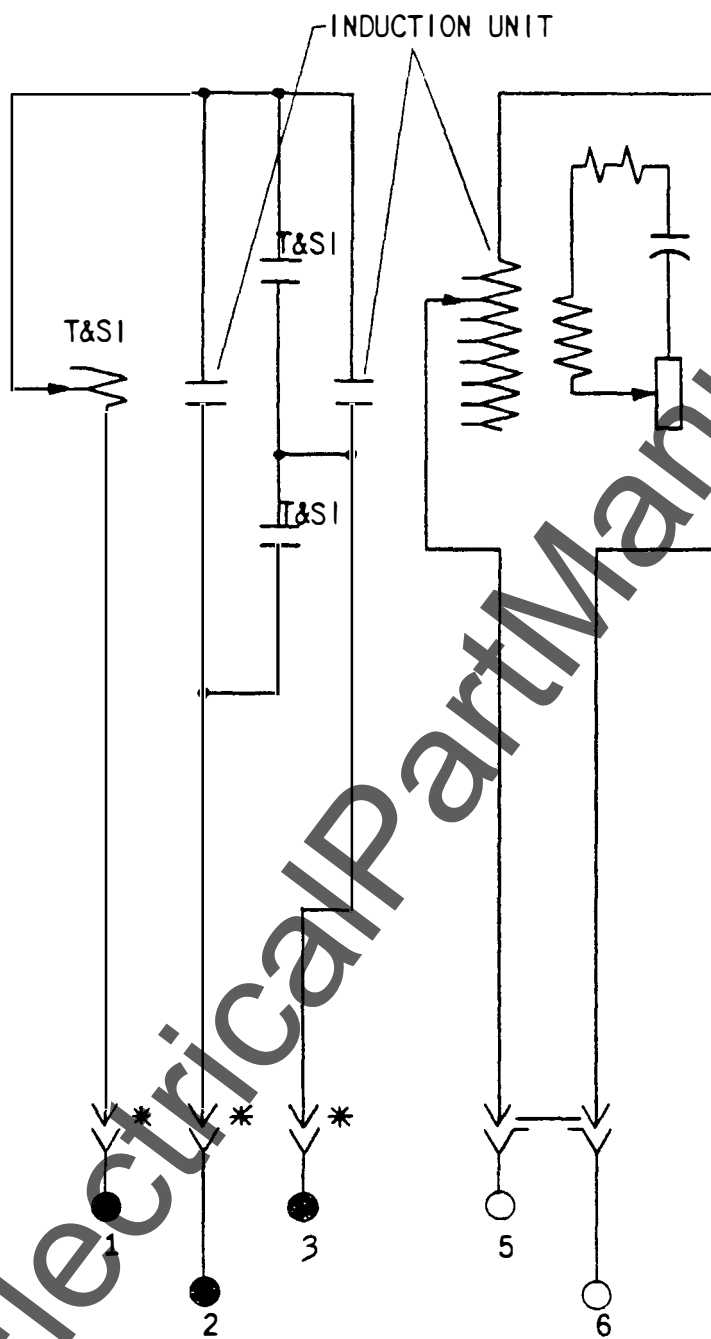
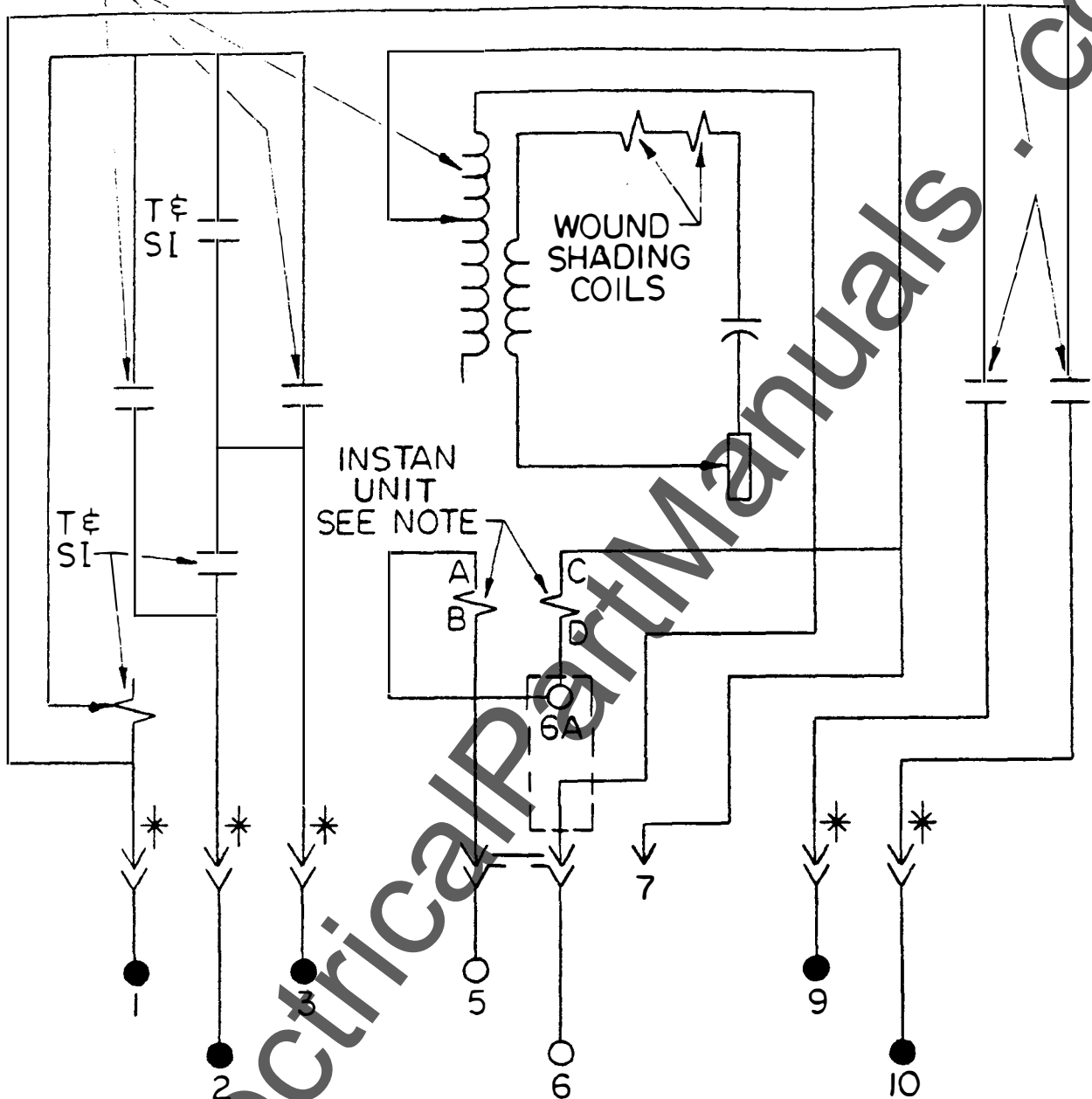


FIG. 6 (0165A7781-0 ) TYPE IAC78A 800 SERIES RELAY INTERNAL CONNECTIONS (FRONT VIEW)

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TIME OVERCURRENT  
UNIT

INSTANTANEOUS UNIT



\* = SHORT FINGER

T &amp; SI = TARGET &amp; SEAL-IN

NOTE:- INSTANTANEOUS UNIT CONNECTIONS SHOWN ARE FOR  
LOW RANGE OPERATION. FOR HIGH RANGE OPERATION  
CONNECT "B" & "D" TO TERMINAL 5 & "A" & "C" TO  
TERMINAL 7

FIG. 7 (0246A2286-1 ) TYPE IAC78B 800 SERIES RELAY INTERNAL CONNECTIONS (FRONT VIEW)

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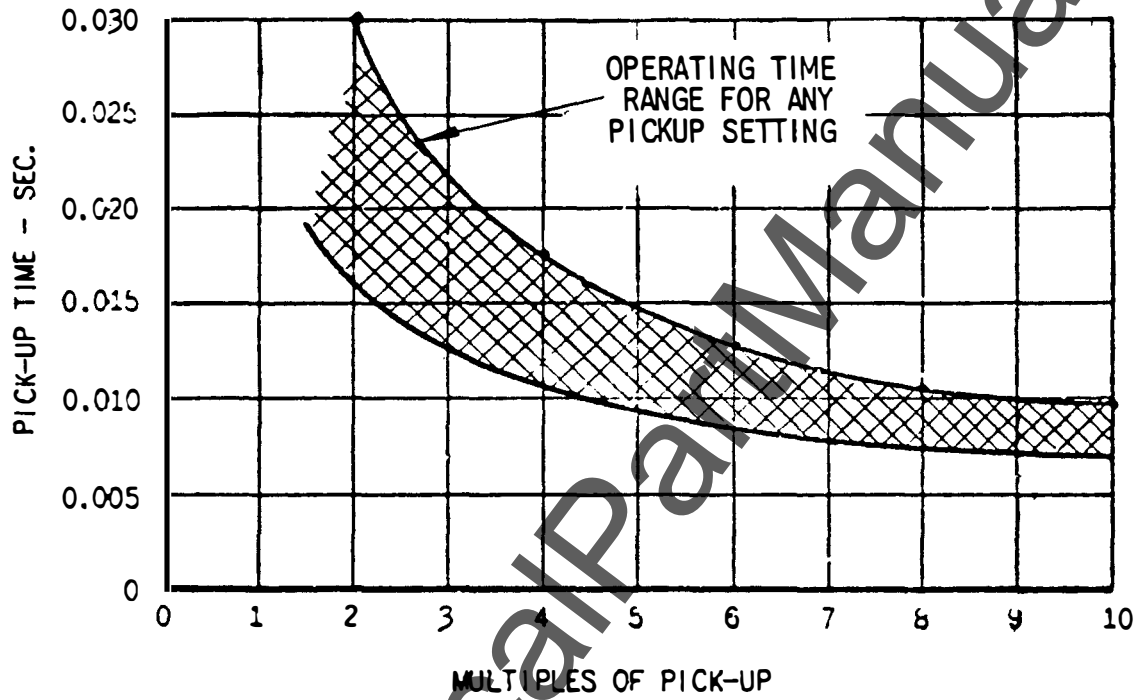


FIG. 8 (K-6306872- 5 ) TIME CURRENT CURVE OF THE INSTANTANEOUS UNIT

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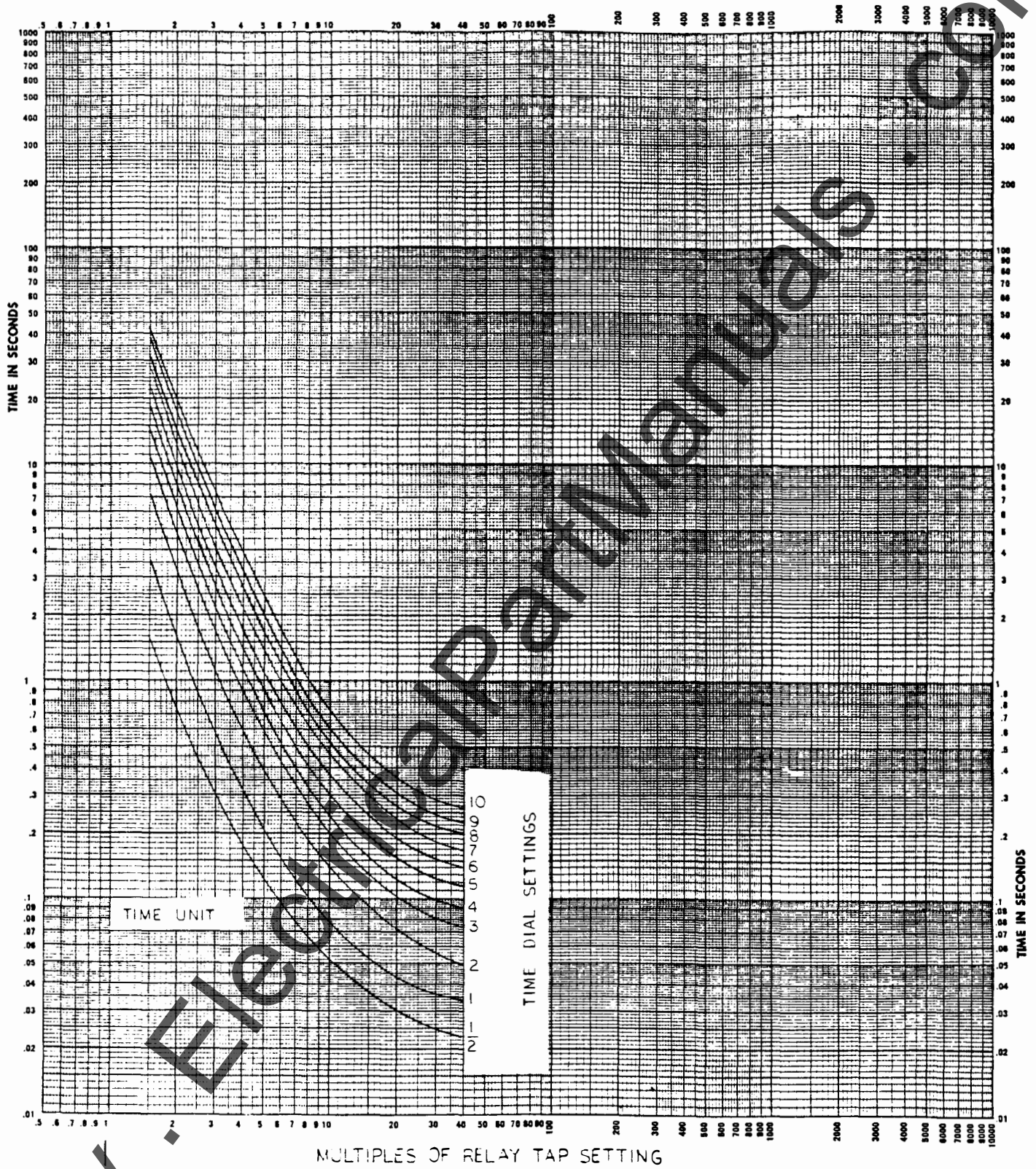


FIG. 9 (0108B8940-2 ) TIME CURRENT CHARACTERISTICS OF 50 HZ TYPES IAC77 AND IAC78 800 SERIES RELAYS

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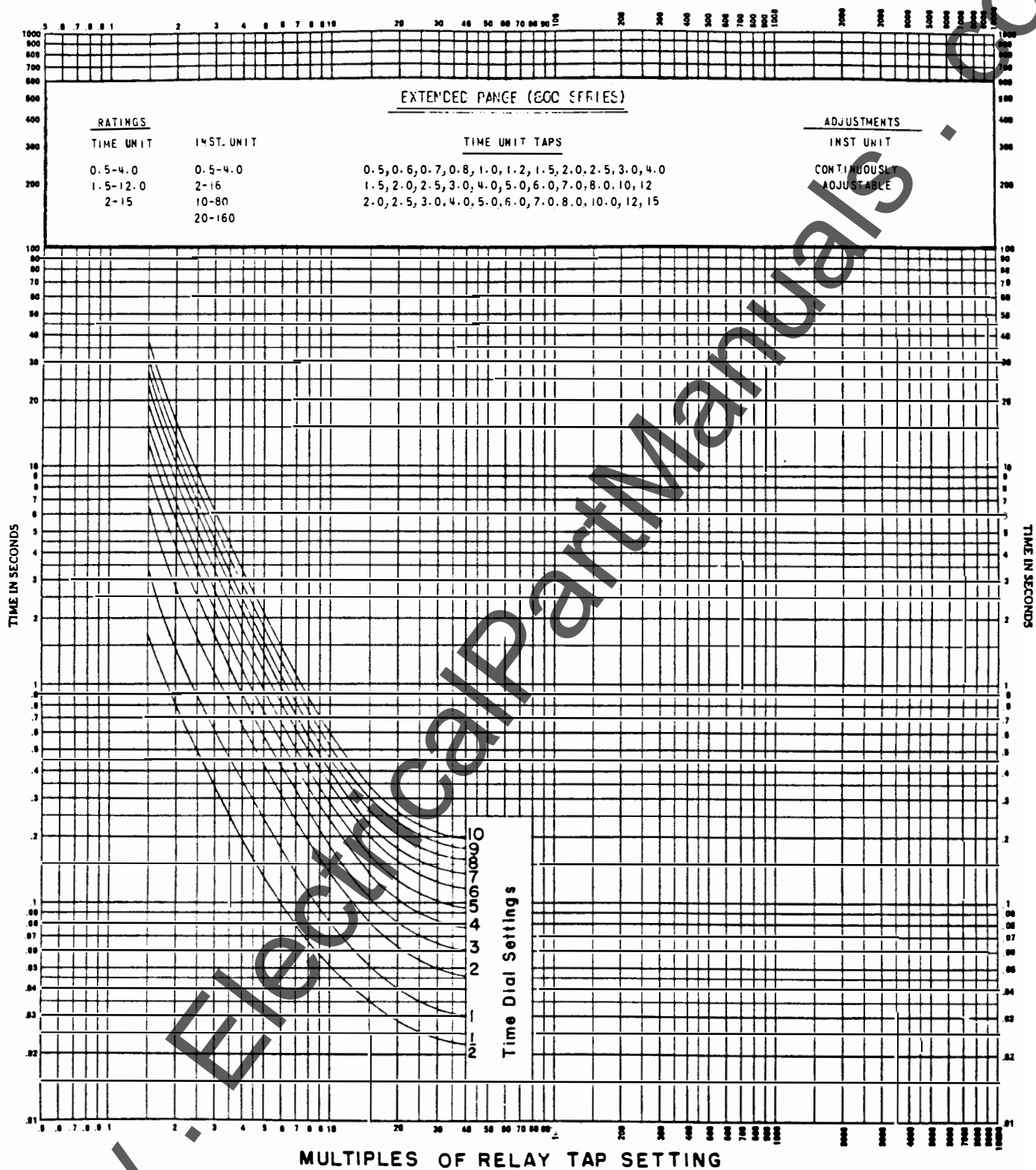


FIG. 10 (0888B0274-5 ) TIME CURRENT CHARACTERISTICS OF 60 HZ TYPES IAC77 AND IAC78 800 SERIES RELAYS

[www.ElectricalPartManuals.com](http://www.ElectricalPartManuals.com)

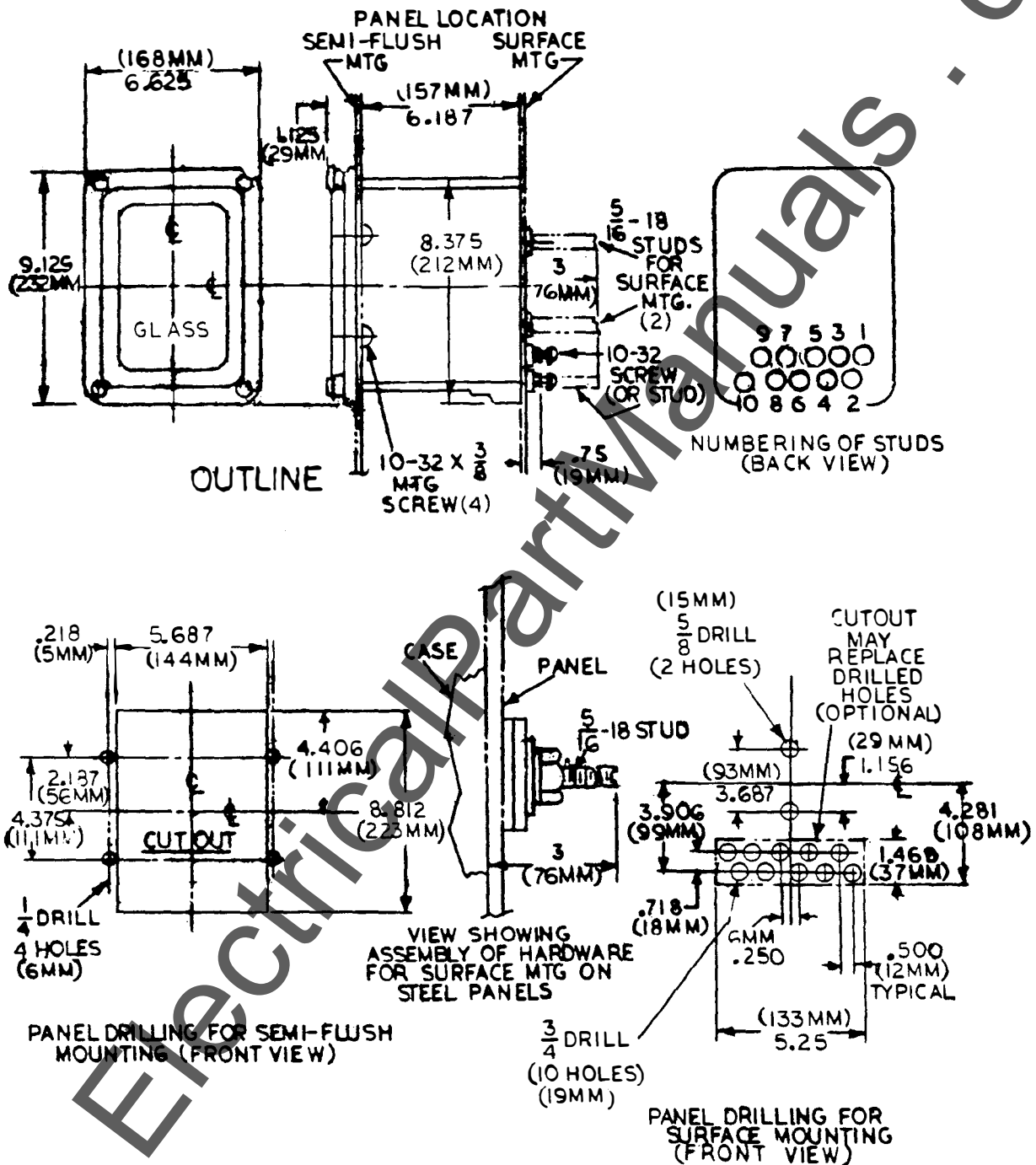


Fig. 11 (K-6209271-5) Outline and Panel Drilling for the IAC78B 800 Series Relay

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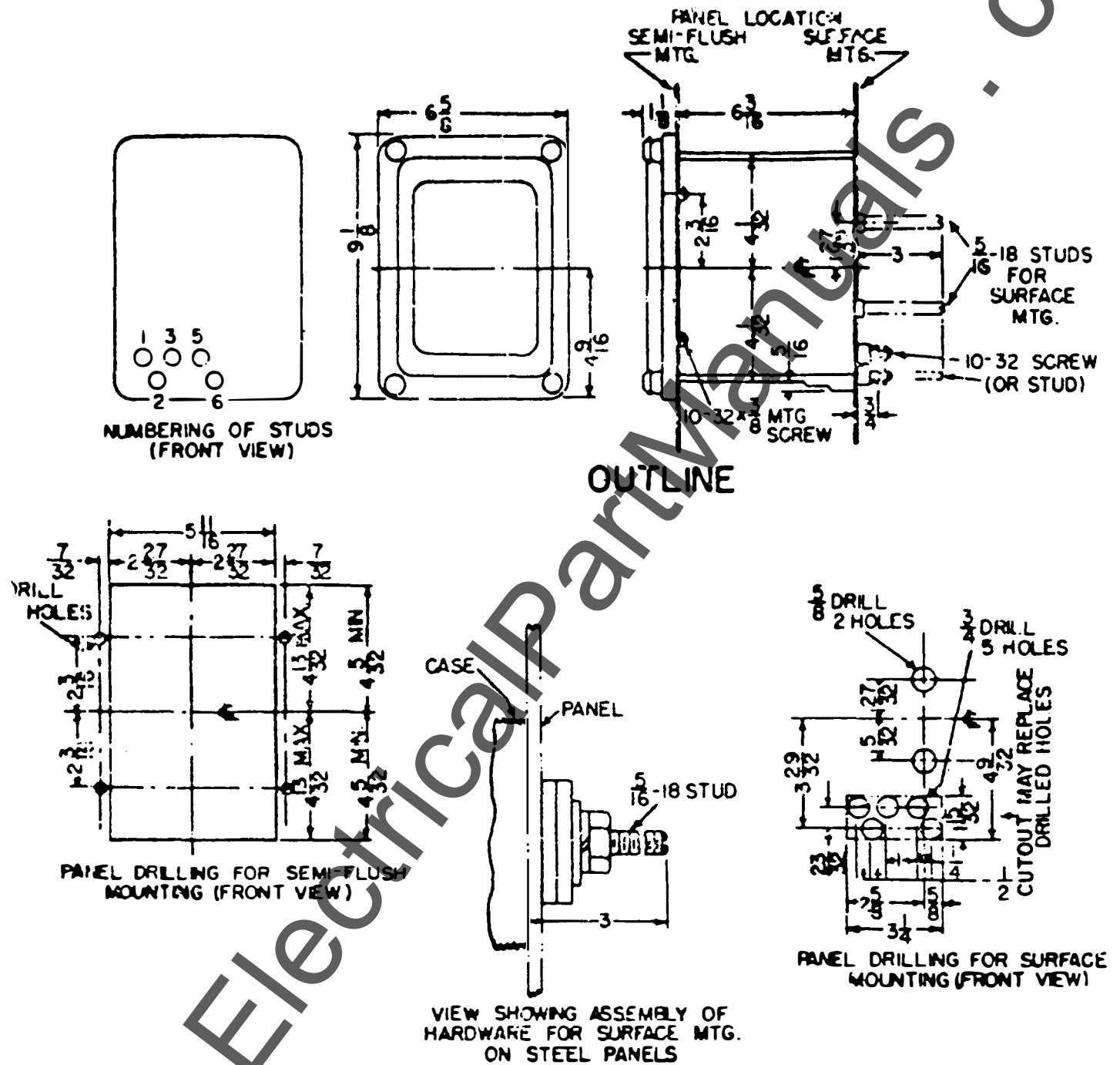


FIG. 12 (K-6209270-2 ) OUTLINE AND PANEL DRILLING FOR TYPES IAC77A, IAC77B AND IAC78A 800 SERIES RELAYS

[www.ElectricalPartManuals.com](http://www.ElectricalPartManuals.com)

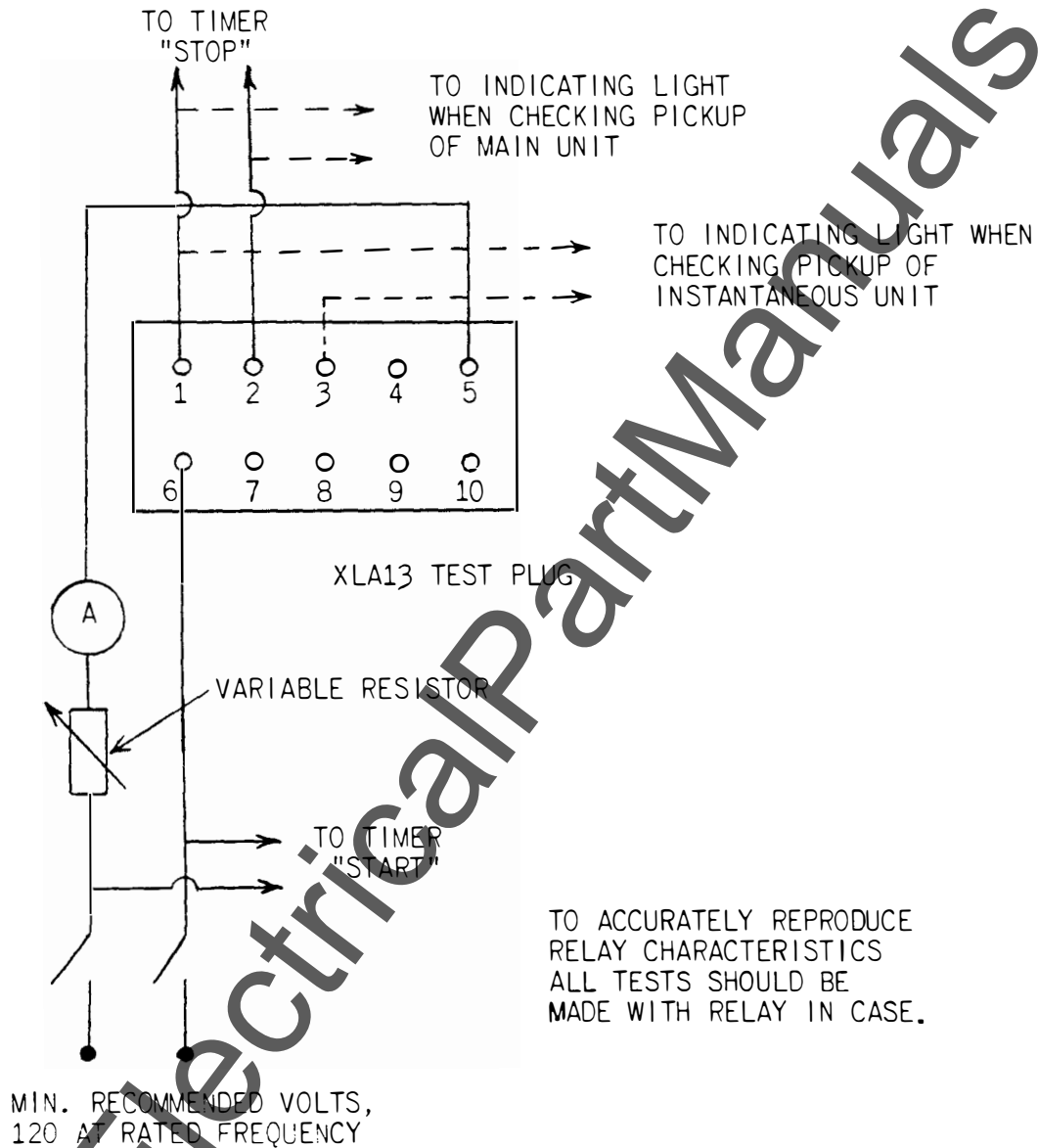


FIG. 13 (K-6154399-7 ) TEST CONNECTIONS FOR TESTING PICK-UP AND TIME CURVE OF IAC RELAYS

[www.ElectricalPartManuals.com](http://www.ElectricalPartManuals.com)

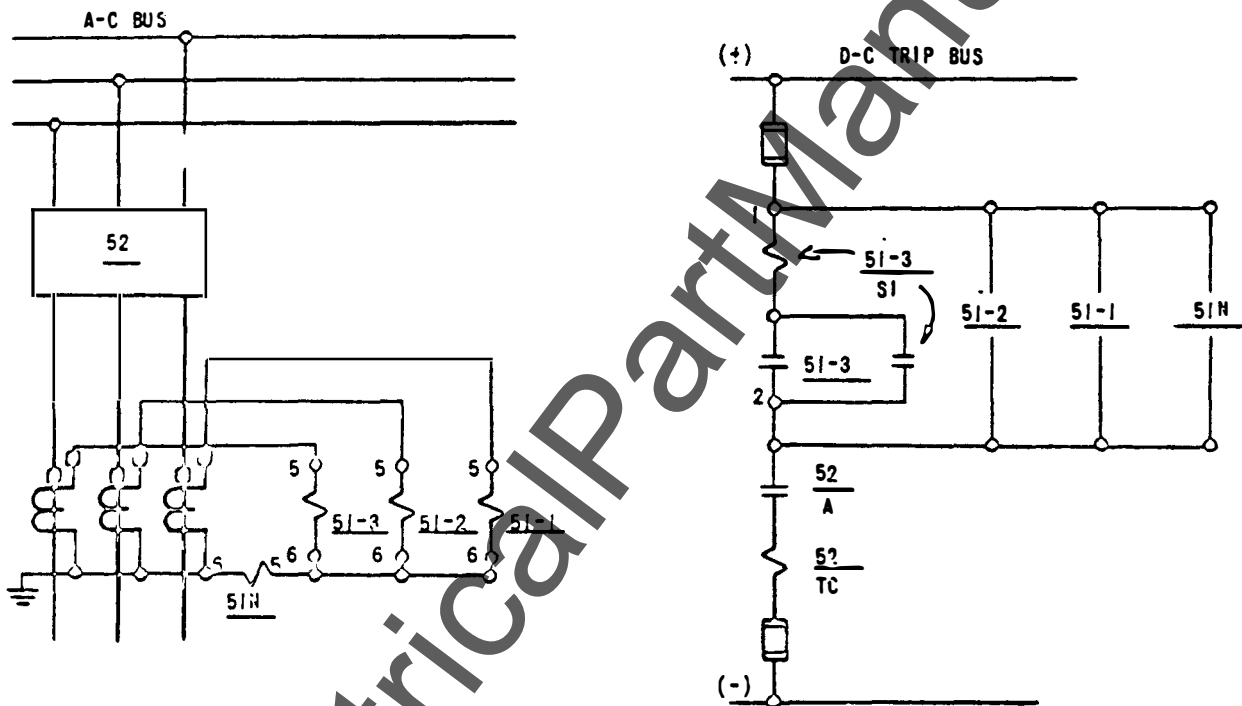


FIG. 14 (0246A6966-0 ) EXTERNAL CONNECTIONS OF FOUR IAC77A RELAYS USED FOR MULTI-PHASE AND PHASE TO TO GROUND FAULT PROTECTION OF A 3-PHASE CIRCUIT

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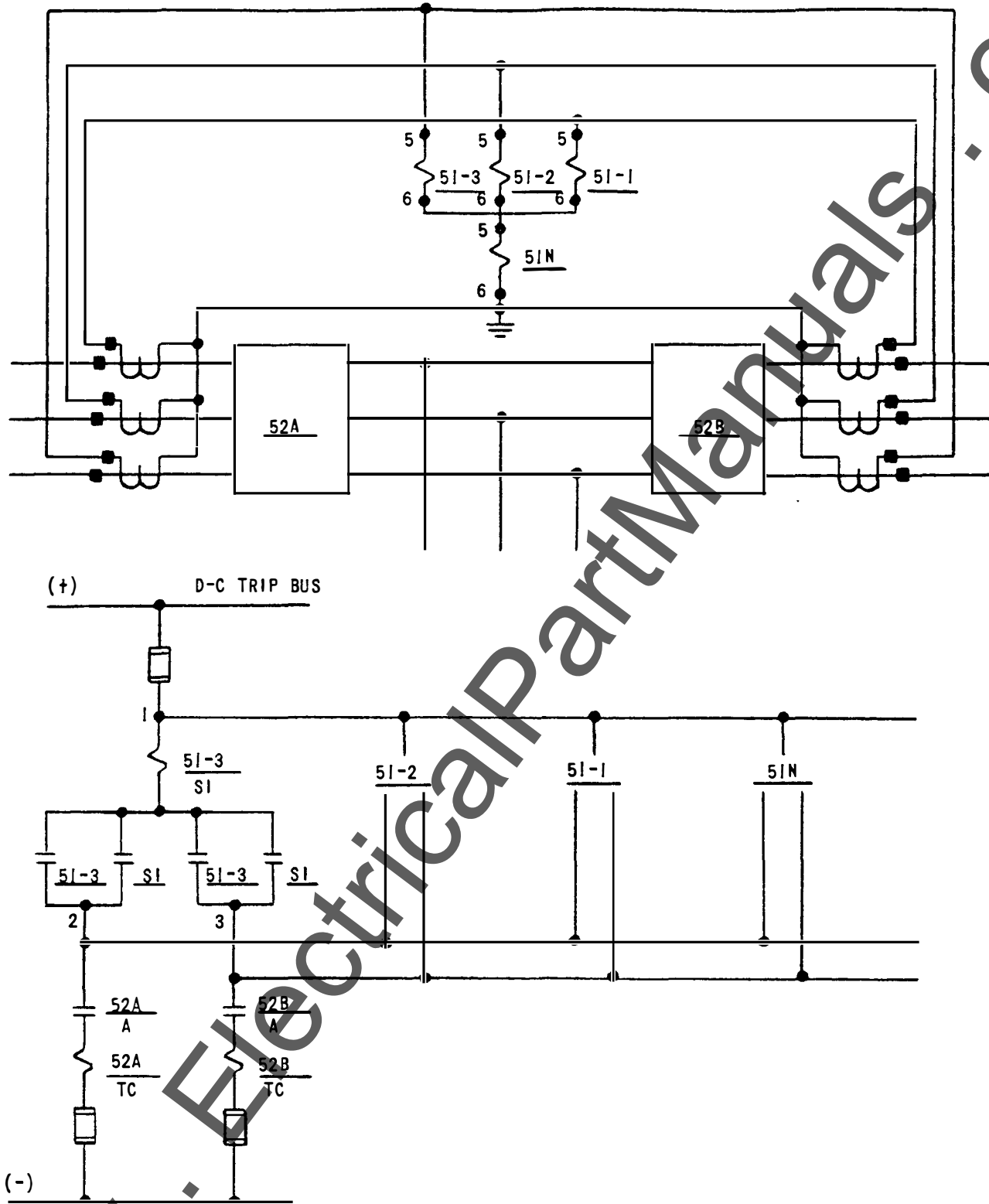


FIG. 15 (0246A6967-0) EXTERNAL CONNECTIONS OF FOUR IAC78A RELAYS PROTECTING A 3-PHASE CIRCUIT AGAINST MULTI-PHASE AND PHASE TO GROUND FAULTS

[www.ElectricalPartManuals.com](http://www.ElectricalPartManuals.com)