INSTRUCTIONS

GEK-65573

TIME OVERCURRENT RELAYS

IAC60T, IAC80T, IAC90T

GENERAL ELECTRIC

CONTENTS PAGE

TIME OVERCURRENT RELAYS

IAC60T, IAC80T, IAC90T

DESCRIPTION

The IAC60T, IAC80T and IAC90T relays consist of two induction disk timer overcurrent units with wound shading coils for torque control, two plunger-type instantaneous overcurrent units and one dc auxiliary unit, all mounted in the L2 size drawout case. The three models differ only in the characteristic of the time overcurrent unit, which is inverse in the IAC60T, very inverse in the IAC80T and extremely inverse in the IAC90T. The relays do not include a target seal-in unit since this feature is provided by the associated distance relays.

The time overcurrent units are adjustable over a range of 8 to 1; the instantaneous units have an adjustment range of 25 to 1. The available ranges in amperes of both the time and instantaneous units, as well as information on their continuous and short time ratings, are provided in the section on **RATINGS.**

The outline and mounting dimensions of the L2 size drawout case are shown in Fig. 15.

APPLICATION

The IAC60T, IAC80T and IAC90T relays are specifically designed for use in conjunction with two zones of step-distance relays. In this application the contacts of the instantaneous overcurrent units are connected to supervise the first zone distance relay trip circuit to prevent incorrect tripping on loss of the ac potential supply. The time overcurrent units are torque controlled by means of wound shading coils and contacts of the dc auxiliary unit. The second zone distance relays operate the auxiliary unit, which in turn completes the wound shading coil circuit. Subsequent operation of the time overcurrent units provides the second zone time-delay tripping. This arrangement provides the means for obtaining close coordination between second zone tripping and overcurrent relays or fuses installed at tapped loads on the line. At the same time the scheme provides a definite second zone reach for the overall line protection and backup.

The elementary diagram in Fig. 10 illustrates how any one of the three IAC relays covered by this instruction book may be used in conjunction with the CEY51A and CEY52A mho-type distance relays to provide two-zone protection against multi-phase faults. The CEY51A is a first-zone directional mho relay that trips without time delay through contacts of the instantaneous units of the IAC relay. The CEY52A is the second zone directional mho relay that operates the dc auxiliary unit in the IAC relay to torque control the time overcurrent unit. The time overcurrent unit trips the breaker via the CEY52A contacts.

It is important to note that the instantaneous overcurrent units in the IAC relays are not designed for continuous operation in the picked-up position. For this reason these units must be set above the maximum expected full load current. However, if the contacts of these units are to be connected to supervise the first zone CEY51A contacts, it is obvious that they must operate reliably on the minimum internal line fault current.

The range and characteristics of the time overcurrent units must be selected to accomodate the desired pickup setting and at the same time permit time coordination with fuses and relays at other points on the system.

The scheme shown in Fig. 10 provides protection against multi-phase faults. Separate ground relays must be used for protection against single-phase-to-ground faults.

CONSTRUCTION

The inverse and very inverse time overcurrent units consist of a tapped current operating coil wound on a U-magnet iron structure. The several taps on the operating coil are connected to tap points on a tap block to provide a ready means of selecting the pickup point. The U-magnet includes wound shading coils which are connected to a contact of the auxiliary unit "A."

The extremely inverse time overcurrent unit is the watt-metric type. The upper portion of the iron structure has two concentric windings on the middle leg of the magnetic circuit. One of these is a tapped operating current winding connected to tap points on a tap block. The other is a floating winding which is connected in series with a resistor (and capacitor on the extremely inverse units) and the two coils on the lower legs of the magnetic circuit. This floating circuit is connected to a contact of the auxiliary unit "A."

In both types of time overcurrent units the disk and shaft assembly carry the moving contact which completes the trip circuit when it touches the stationary contact. The shaft is restrained by a spiral spring to give the proper contact closing current depending on tap setting, and its motion is retarded by an Alnico drag magnet, which acts on the disk to produce the desired time characteristic. The lower bearing for the shaft assembly consists of a polished pin driven into the shaft and riding on a sapphire jewel, spring mounted in a screw-type assembly. The upper bearing consists of an adjustable pivot assembly mounted on the frame and having a polished pin which projects into a bronze guide ring located at the top of the shaft.

The variable retarding force resulting from the gradient of the spiral spring is compensated by the spiral shape of the induction disk. This results in an increased driving force as the spring winds up. A calibrated time dial determines the distance of travel of the moving contact, thus controlling the pickup time.

Each of the instantaneous overcurrent units is of the plunger-type construction. The adjustable armature is mounted on the threaded portion of a plunger rod which carries the moving contacts upward as the armature is operated. The armature is drawn upward into the coil by the flux created in the rectangular magnet frame and a cylindrical pole piece inside the coil. Guides for the plunger rod are provided at the

top by a hole in the pole piece, and at the bottom by the fit of the molded contact carrier inside the calibration tube. Openings in the sides of the calibration tube allow access to the armature to adjust pickup.

The auxiliary unit "A" is a telephone-type relay. The construction of a typical telephone-type relay is shown in Fig. 11.

The components of each relay are mounted on a cradle assembly which can be easily removed from the relay case. The cradle is locked in the case by means of latches at the top and bottom. The electrical connections between the case blocks and cradle blocks are completed through removable connection plugs. Separate testing plugs can be inserted in place of the connection plugs to permit testing the relay in its case. The cover is attached to the case from the front and includes an interlock arm which prevents the cover from being replaced until the connection plug has been inserted.

RATINGS

TIME OVERCURRENT UNIT

Ratings of the time overcurrent unit are given in Table I.

TABLE I

RELAY	FREQUENCY CYCLES	PICKUP RANGE, AMPERES	
		MAIN (TIME) UNIT	INSTANTANEOUS UNIT
IAC60T	60	0.5 - 4.0 2.0 - 16.0	2 - 50
IAC80T IAC90T	60	0.5 - 4.0 1.5 - 12.0	

Available taps for time overcurrent units are shown on 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
1.5 - 12	1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 10.0, 12.0
2.0 - 16	2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 10.0, 12.0, 16.0

The one-second thermal ratings are listed in Table III

TABLE III

RELAY MODEL	RANGE (AMPS)	ONE-SECOND RATING (AMPS)
IAC60T	0.5 - 4 2 - 16	70 260
IAC80T	0.5 - 4 1.5 - 12	140 260
IAC90T	0.5 - 4 1.5 - 12	125 260

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 for the various taps of each model and current range are given in Tables IV, V and VI.

TABLE IV

CONTINUOUS RATING OF 0.5 - 4.0 AMP TOC UNITS

0.5 - 4.0 AMP RANGE												
MODEL	TAP	0.5	0.6	0.7	0.8	1.0	1.2	1.5	2.0	2.5	3.0	4.0
IAC60T	RATING (AMPS)	1.6	1.8	2.0	2.1	2.3	2.7	3.0	3.5	4.0	4.5	5.0
IAC80T		4.0	4.5	5.5	5.5	6.0	7.0	7.5	9.0	10.0	11.0	13.0
IAC90T		3.5	3.7	4.0	4.5	5.0	5.5	6.0	7.0	8.0	9.0	10.0

TABLE V

CONTINUOUS RATING OF 1.5 - 12.0 AMP TOC UNITS

1.5 - 12.0 AMP RANGE												
MODEL	TAP	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0
IAC80T	RATING (AMPS)	10.0	11.5	13.0	14.5	17.0	19.0	21.0	23.0	23.5	27.5	30.5
IAC90T		9.5	10.5	11.5	12.5	14.0	15.5	17.0	18.0	19.0	20.0	20.0

TABLE VI

CONTINUOUS RATING OF 2 - 16.0 AMP TOC UNITS

2 - 16.0 AMP RANGE												
MODEL	TAP	2.0	2.5	3.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0	16.0
IAC60T	RATING (AMPS)	8.0	9.0	10.0	12.0	14.0	15.0	16.0	17.5	20.0	20.0	20.0

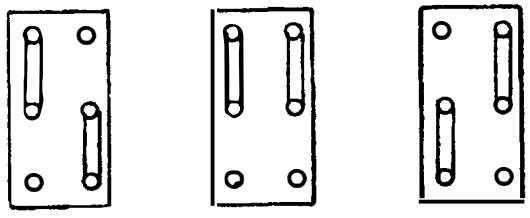
INSTANTANEOUS OVERCURRENT UNIT

These coils are suitable for dc and frequencies from 25 to 60 hertz. The coils are rated for five amperes continuous and have a one-second rating of 260 amperes. The instantaneous unit has a range of 2 to 50 amperes. Tap settings are made per Table VII

TABLE VII

Top of Relay

LINK POSITIONS



	2	5	12.5
Pickup Amperes (Calibration Marks)	3.2 5 8	8 12.5 20	20 31.3 50

AUXILIARY UNIT

The auxiliary unit "A" has a dual dc voltage rating of 48/125 volts.

CONTACTS

The contacts of both the time overcurrent and instantaneous units will close and carry 30 amperes dc momentarily for tripping duty at control voltages of 250 V dc or less. The breaker trip coil circuit should, however, always be opened by a circuit breaker auxiliary switch or other suitable means. If the tripping current exceeds 30 amperes, an auxiliary tripping relay should be used.

BURDENS

TIME OVERCURRENT UNIT

Burdens for the inverse time overcurrent unit (IAC60T) are given in Table VIII.

TABLE VIII

RANGE	HZ	MIN. TAP	BURDENS AT MIN. PICKUP MIN. TAP			BURDENS IN OHMS (Z)			VA AT 5 AMPS CALCULATED FROM IMPEDANCE AT MINIMUM PICKUP (I^2Z)
			R	Jx	Z	3 TIMES PICKUP	10 TIMES PICKUP	20 TIMES PICKUP	
0.5- 4.0	60	0.5	5.60	21.0	22.0	10.80	5.00	3.66	550.0
2.0-16.0	60	2.0	0.37	1.44	1.45	0.65	0.32	0.24	36.3

NOTE: The impedance values given are those for the minimum tap of each relay. The impedance for other taps at pickup 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 ohm tap is given as 22.0 ohms. The impedance of the 2.0 amp tap at 2.0 amperes is $(0.5/2)^2 \times 22 = 1.37$ ohms.

Burdens for the very inverse time overcurrent unit (IAC80T) are given in Table IX.

TABLE IX

RANGE	HZ	MIN. TAP	BURDENS AT MIN. PICKUP MIN. TAP			BURDENS IN OHMS (Z)			VA AT 5 AMPS CALCULATED FROM IMPEDANCE AT MINIMUM PICKUP (I^2Z)
			R	Jx	Z	3 TIMES PICKUP	10 TIMES PICKUP	20 TIMES PICKUP	
0.5- 4.0	60	0.5	1.40	3.90	4.15	4.20	2.90	2.20	104.0
1.5-12.0	60	1.5	0.23	0.53	0.58	0.58	0.36	0.28	14.5

NOTE: The impedance values given are those for the minimum tap of each relay. The impedance for other taps at pickup 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 ohm tap is given as 4.15 ohms. The impedance of the 2.0 amp tap at 2.0 amperes is $(0.5/2)^2 \times 4.15 = 0.26$ ohm.

Burdens for the extremely inverse time overcurrent unit (IAC90T) are given in Table X.

TABLE X

RANGE	HZ	MIN. TAP	BURDENS AT MIN. PICKUP MIN. TAP R	JX	Z	BURDENS IN OHMS (Z) 3 TIMES PICKUP	10 TIMES PICKUP	20 TIMES PICKUP	VA AT 5 AMPS CALCULATED FROM IMPEDANCE AT MINIMUM PICKUP (I^2Z)
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	0.147	0.17	0.17	0.17	0.17	4.25

NOTE: The impedance values given are those for the minimum tap of each relay. The impedance for other taps at pickup 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 ohm tap is given as 1.60 ohms. The impedance of the 2.0 amp tap at 2.0 amperes is $(0.5/2)^2 \times 1.60 = 0.10$ ohm.

INSTANTANEOUS OVERCURRENT UNIT

Burdens for the instantaneous overcurrent unit are given in Table IX.

TABLE XI

RANGE	VA AT 5 AMPS 60 HERTZ	W AT 5 AMPS 60 HERTZ	W AT 5 AMPS DC
2-50	9.6	5.3	1.98

AUXILIARY UNIT

The auxiliary unit coil has a resistance of 2500 ohms and a battery drain of 1.92 milliamperes at 48 VDC. A 1000 ohm series resistor is added for 125 VDC operation with a battery drain of 35.7 milliamperes.

CHARACTERISTICS

TIME OVERCURRENT UNIT

Pickup of the time overcurrent unit is defined as the current required to close the contacts from the 0.5 time-dial position. The pickup value is within three percent of 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 percentage of the minimum closing value of current that the unit will reset is:

IAC60T - 90 percent
IAC80T - 80 percent
IAC90T - 85 percent

The time to reset to the Number 10 time-dial position, when the current is reduced to zero, is approximately:

IAC60T - 7 seconds
IAC80T - 60 seconds
IAC90T - 57 seconds

The time-current characteristics are shown in Fig. 6, 7 and 8 for the IAC60T, IAC80T and IAC90T, respectively.

INSTANTANEOUS OVERCURRENT UNIT

The instantaneous overcurrent unit is continuously adjustable over a 25:1 range. Pickup is set by adjusting the vertical position of the armature relative to the markings on the calibration tube. The instantaneous unit will reset to the de-energized position between 85 and 95 percent of its pickup setting.

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 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 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 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

Time Overcurrent Unit

There should be no noticeable friction when the disk is rotated slowly clockwise. The disk should return by itself to its rest position.

Make sure the control spring is not deformed nor its convolutions tangled or touching.

Instantaneous Overcurrent Unit

The plunger assembly should exhibit no tendency to bind when operated by hand and the movable contact arms must be securely fastened to the molded contact support.

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 THE CT SECONDARY CIRCUITS FROM BEING OPENED.

DRAWOUT RELAY TESTING

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 CT 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 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.

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 inch 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 is adjusted by means of a spring-adjusting ring. See Fig. 2. The ring may be turned by inserting a screwdriver in the notches around the edge. 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. The unit is adjusted at the factory to close its contacts from any time-dial position at a minimum current within five percent of the tap-plug setting. The unit resets at 90 percent of the minimum closing value.

Time Setting

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

just closed when the dial is set on zero. When the 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 shaft decreases the time, while moving it away increases the time.

Pickup Test

Set the relay at the 0.5 time-dial position and 2.0 ampere tap. Using the test connections in Fig. 13, the main unit should close its contacts within plus or minus two percent of tap value current.

Time Test

Set the relay to the No. 5 time-dial position and the 2.0 ampere tap. Using the test connection in Fig. 13, apply five times tap current (10.0 amperes) to the relay. The relay will operate and the timing should be within the limits in Table XII.

TABLE XII

RELAY	TIME IN SECONDS
IAC60T	1.73 - 1.83
IAC80T	1.27 - 1.35
IAC90T	0.89 - 0.95

INSTANTANEOUS UNIT

Pickup and Reset

The units are normally supplied from the factory with the bottom of the armature aligned with the top mark on the calibration tube. This corresponds to the minimum pickup setting on the nameplate. It should be sufficient to check the pickup of each unit at this setting, see Fig. 14. With gradually increasing test current in the operating coil the unit should pick up, closing its normally open contacts with one continuous motion, at the calibration current level. The test current should then be gradually decreased until the contacts reset. The reset value should be between 85 and 95 percent of pickup.

AUXILIARY UNIT

The relays are normally shipped from the factory with the coil circuit of unit "A" connected for the lower value of the dc voltage rating shown on the nameplate. Apply 60 percent of the lower voltage rating across terminals 9 and 10 and check that unit "A" picks up and wipes in with one continuous motion of the armature.

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 drilling is shown in Fig. 15.

The internal connection diagrams for the relays are shown in Fig. 4 and 5. Typical external connections are shown in Fig. 10.

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 Fig. 13, apply approximatley 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 pickup and should be within two percent of tap value.

2. Check the operating time at some multiple of the 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.

Instantaneous Unit

1. Set the desired tap range.

2. Set the pickup by turning the bottom of the knurled armature to the approximate position in the calibration tube corresponding to the desired pickup setting.

3. Gradually apply current and adjust the armature as required for the correct pickup (see Fig. 14).

4. Check that the instantaneous unit resets between 85 and 95 percent of pickup.

Auxiliary Unit

The operating coil circuit of the auxiliary unit "A" has a dual dc rating as shown on the relay nameplate. As shipped from the factory the unit is connected for the lower of the two dc voltage ratings. If it is desired to operate the unit at the higher dc voltage, the leads to terminal points 9 and 9A should be interchanged so that resistor R1 is in series with the auxiliary unit coil. Refer to the internal connection diagrams, Fig. 4 and 6.

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 insure 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 tests as described in the **INSTALLATION** section for the tap setting in service.

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

INSTANTANEOUS UNIT

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

AUXILIARY UNIT

Check that the auxiliary unit operates when voltage is applied, as outlined in the **INSTALLATION** section.

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

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.

SERVICING

If any of the mechanical or electrical check points described in the previous sections are found to be out of limits, the following points should be observed in restoring them.

MECHANICAL ADJUSTMENTS

Time Overcurrent Unit

1. Contact Adjustment

The contacts should have aprroximately 1/32 inch wipe. That is, the stationary contact tip should be deflected about 1/32 inch when the disk completes its travel. The contact wipe is adjusted by turning the screws in the contact brush which regulate the position of the brush relative to the brush stop.

When the time dial is moved to the position where the contacts just close, the time-dial scale should indicate zero. If it does not and the brushes are correctly adjusted, regulate the dial to read zero. This is done by changing the position of the arm attached to the shaft, which is located below the time dial. Loosen the screw which clamps the arm to the shaft and turn the arm relative to the shaft until the contacts just make for zero time-dial setting.

The leaf spring on the stop arm should be so formed that there is approximately 1/64 inch deflection. The deflection can be increased, if necessary, by forcing a thin screwdriver blade between the leaf spring and the stop arm.

2. Shaft End Play

End play is determined by the relative positions of the lower jewel bearing and upper pivot. Both bearing and pivot are held in position by means of set screws in the die-cast supporting frame. The lower jewel must be located so that the disk is approximately centered in the air gaps of the driving magnet and the drag magnet. The upper pivot should then be located so that the shaft has 1/64 inch to 1/32 inch end play. Be sure that both set screws are securely tightened after the adjustment is completed.

3. Friction

If a tendency to bind or excessive friction is evident, first check for obstructions to the disk travel. Dirt or metallic particles in the wattmetric or drag magnet gaps can interfere with the motion of the disk.

Instantaneous Unit

1. Friction

If there is any tendency to bind or excessive friction is present, check to see that the moving contact guide pin is centered and moves freely in the U-shaped guide plate slot, and that no foreign matter is present between the armature and calibrating tube.

2. Moving Contact Leads

The flexible moving contact leads should be formed to keep the moving contact assembly centrally located. If these moving contact leads have been deformed, they should be reshaped as follows: the insulated portion of the lead should extend straight back to the slot in the compound mounting plate. There should be a 90-degree bend in the lead at a point just beyond the end of the insulating sleeve, and the bare lead should project either up or down to the terminal screw.

ELECTRICAL ADJUSTMENTS

Time Overcurrent Unit

1. Pickup Adjustments

The current at which the contacts operate is normally controlled by means of the tap screw in the tap block at the top of the unit. The tap screw should be screwed firmly into the tap position marked with the desired pickup current. Note that if the relay is in service the tap screw must not be removed until the relay connection plugs have been withdrawn.

The pickup of the unit for any current tap is adjusted by means of a spring-adjusting ring. The ring may be turned by inserting a screwdriver in the notches around the edge. 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 makes possible any desired setting between the various tap settings. The unit is adjusted at the factory to close its contacts from any time-dial position at a minimum current within five percent of the tap plug setting.

In making pickup checks, use the connections of Fig. 13.

Note that the "A" unit contacts must be closed during tests.

2. Pickup Time Adjustments

Normally pickup time is controlled by means of the time dial at the top of the unit. If the pickup time for a particular time-dial setting and pickup multiple is found to be outside the limits mentioned in **ACCEPTANCE TESTS** and **PERIODIC CHECKS**, it can be restored by changing the position of the drag magnet on its supporting shelf. Moving the magnet towards the shaft decreases the time while moving it away from the shaft increases the time. If the drag magnet is moved towards the shaft, be sure that in its final position is clears the counterweight on the disk for all positions of the disk and shaft assembly. If the magnet is moved away from the shaft, its outer edge must be at least 1/8 inch from the edge of the disk at the smallest radius of the disk.

Instantaneous Unit

Refer to the **INSTALLATION** section for current pickup adjustments.

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 give complete model number of the relay for which the part is required.

LIST OF FIGURES

Fig. 1 (Later) IAC60T Relay, Removed from Case, Front View

Fig. 2 (Later) IAC60T Relay, Removed from Case, Rear View

Fig. 3 (Later) Type IAC90T Relay, Removed from Case, Rear View

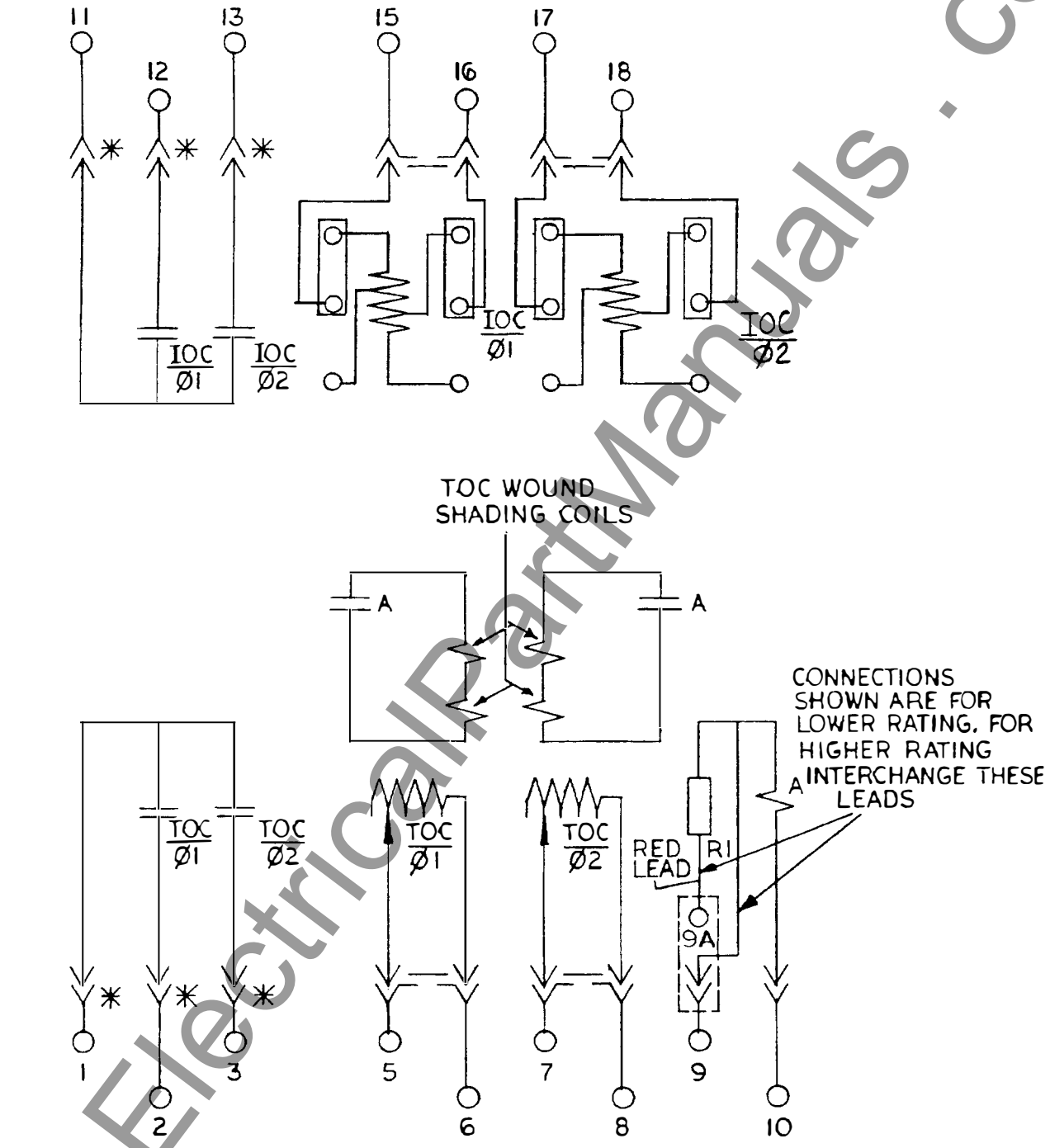
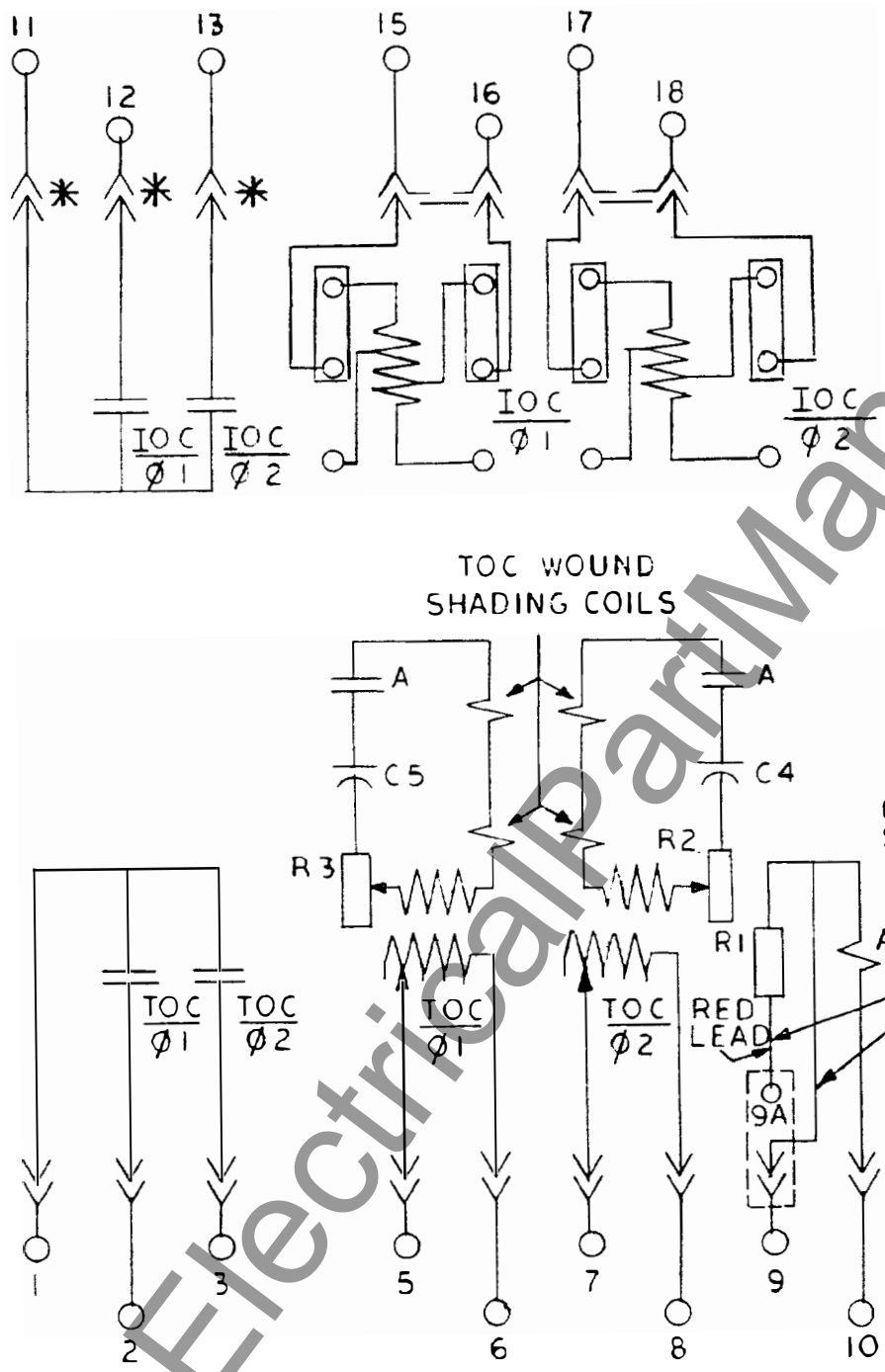


Fig. 4 (0275A4595-0) Internal Connections for Relay-Types IAC60T and IAC80T



✳ = SHORT FINGER

Fig. 5 (0275A4596-0) Internal Connections for Relay-Type IAC90T

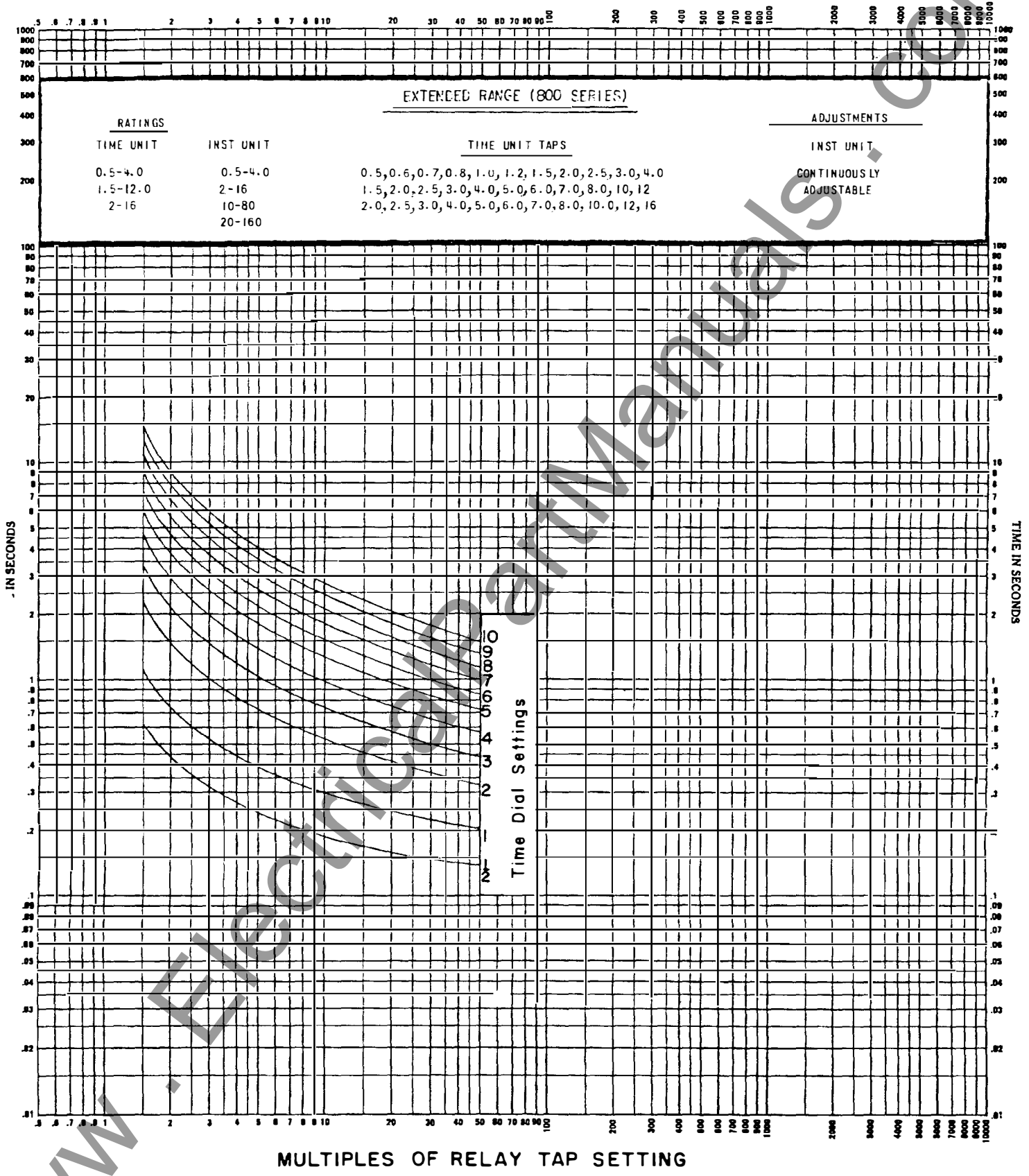


Fig. 6 (0888B0269-3) 60 Hertz Time-Current Characteristics for Relay-Type IAC60T

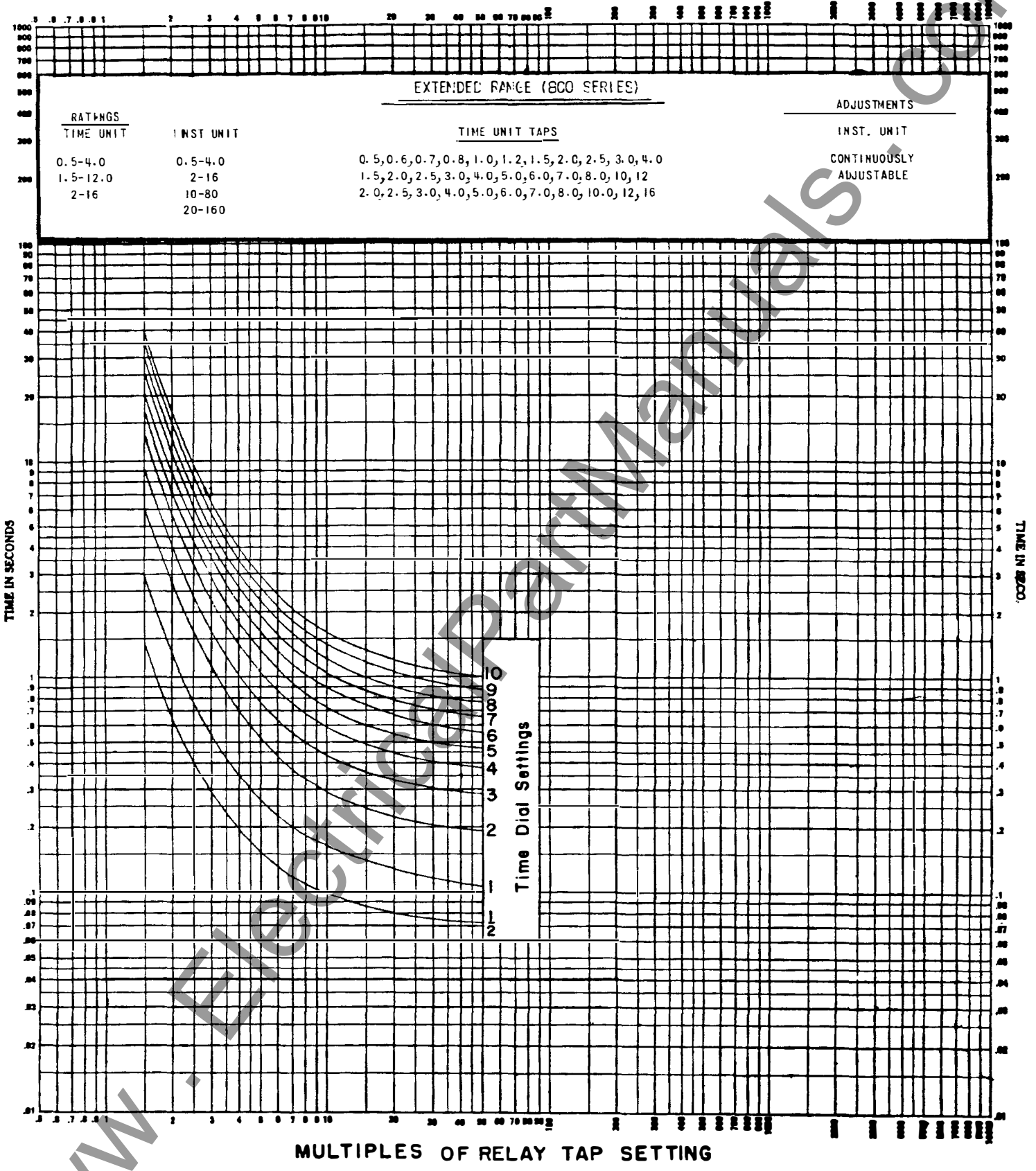


Fig. 7 (0888B0270-3) 60 Hertz Time-Current Characteristics for Relay-Type IAC80T

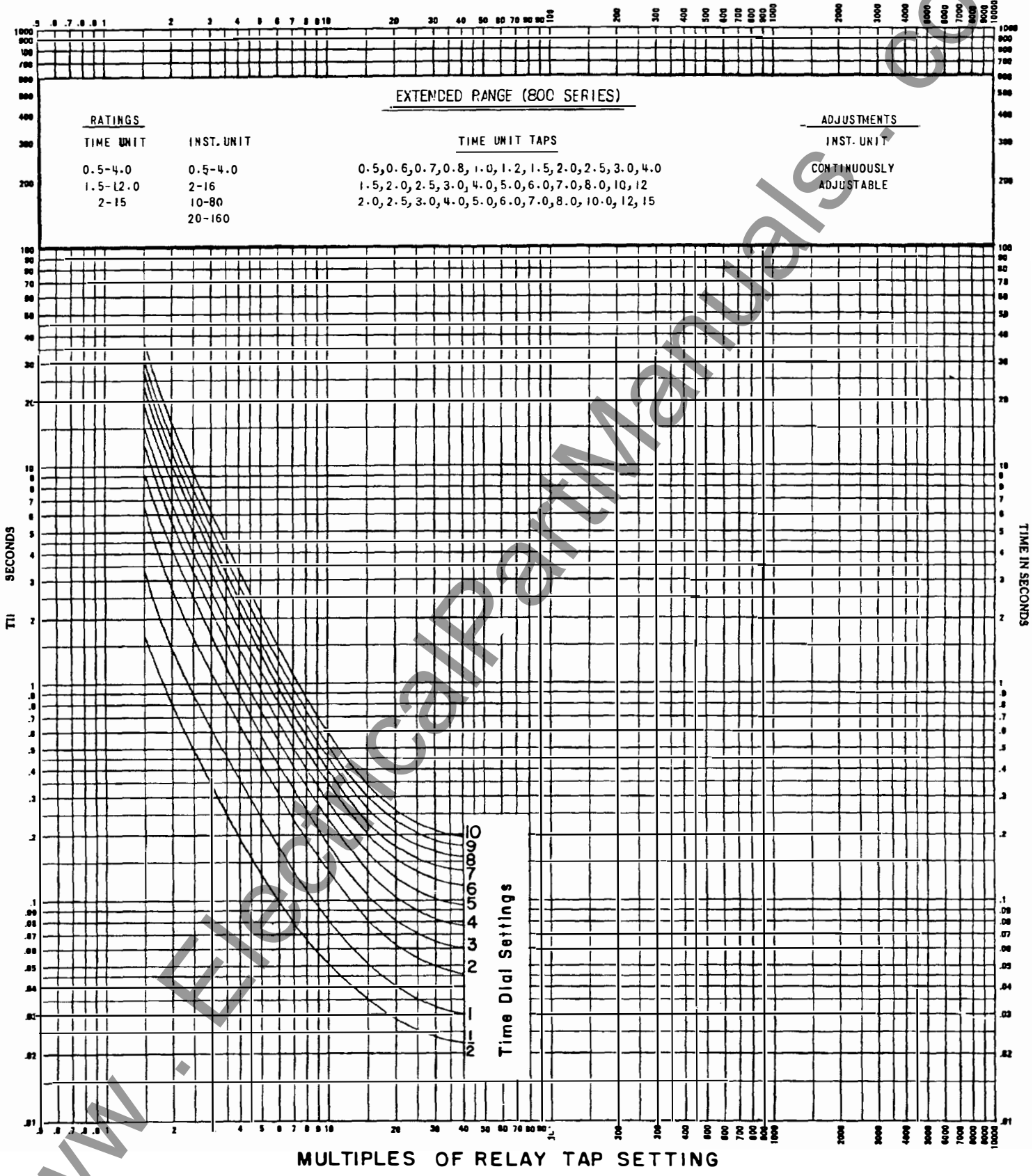


Fig. 8 (0888B0274-5) 60 Hertz Time-Current Characteristics for Relay-Type IAC90T

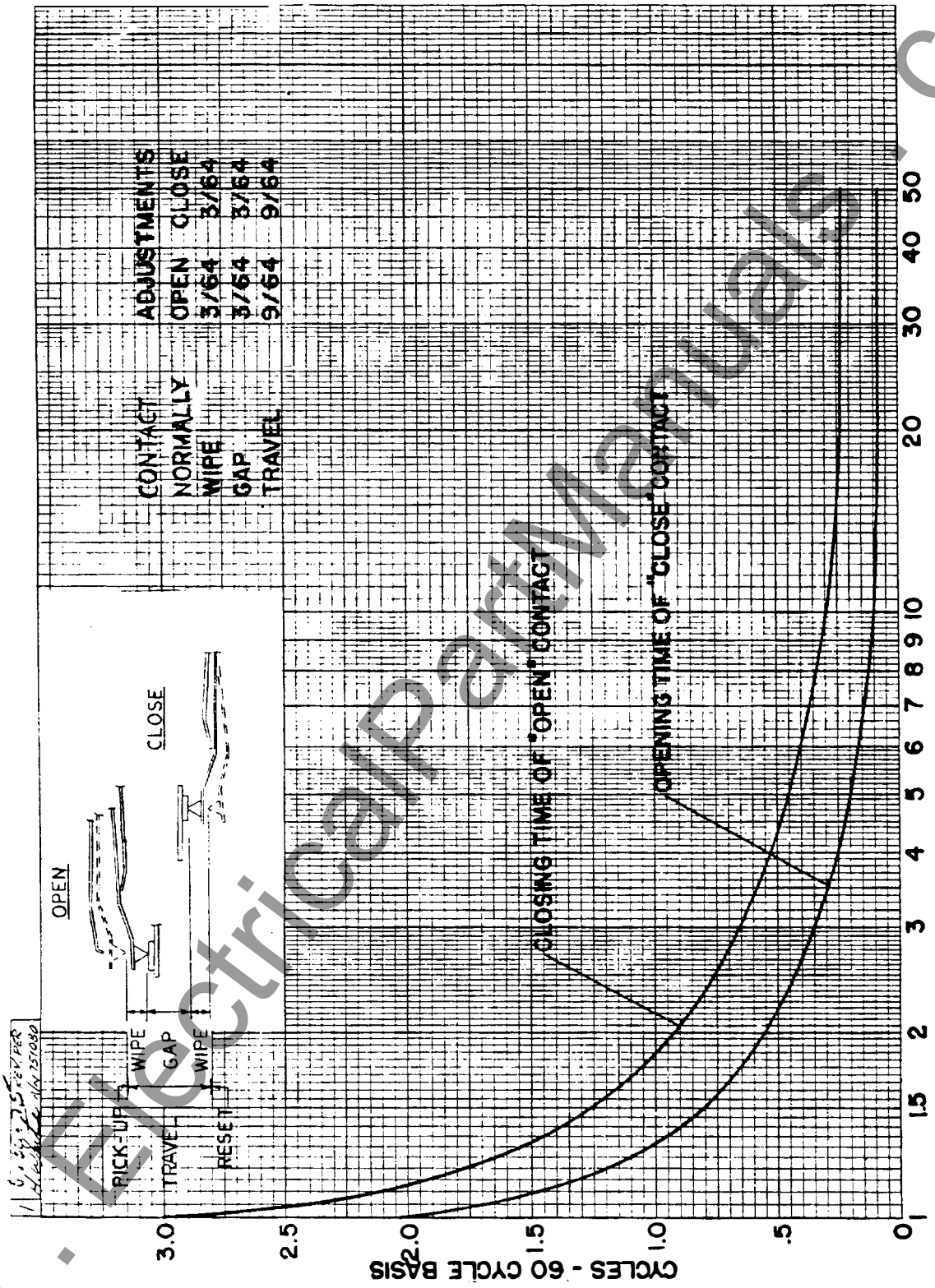


Fig. 9 (0418A711-0) Time-Current Curves for the Instantaneous Units of the IAC60T, IAC80T and IAC90T Relays

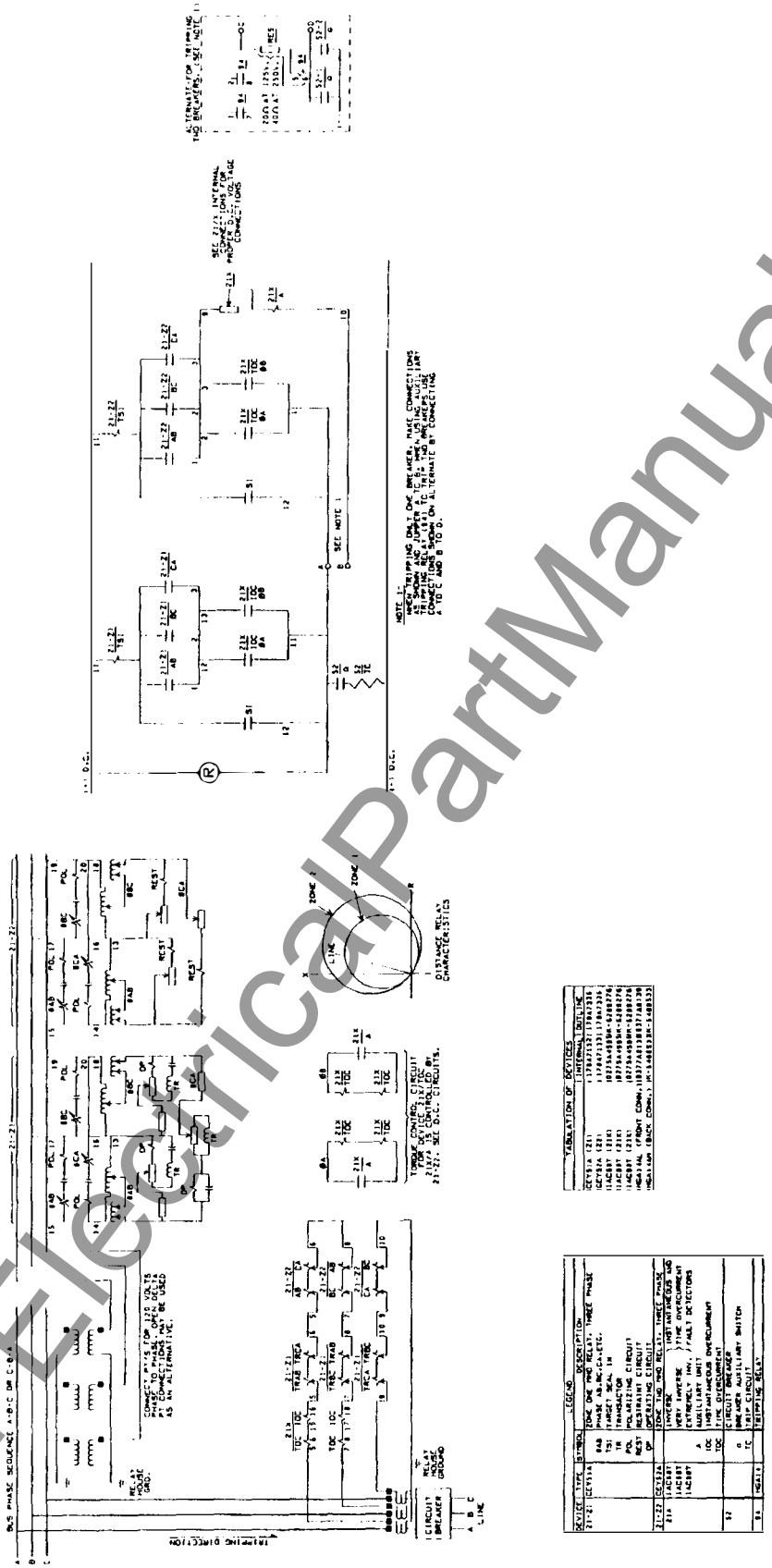


Fig. 10 (0145D7101-0) Elementary Diagram for Two Zone Distance Protection

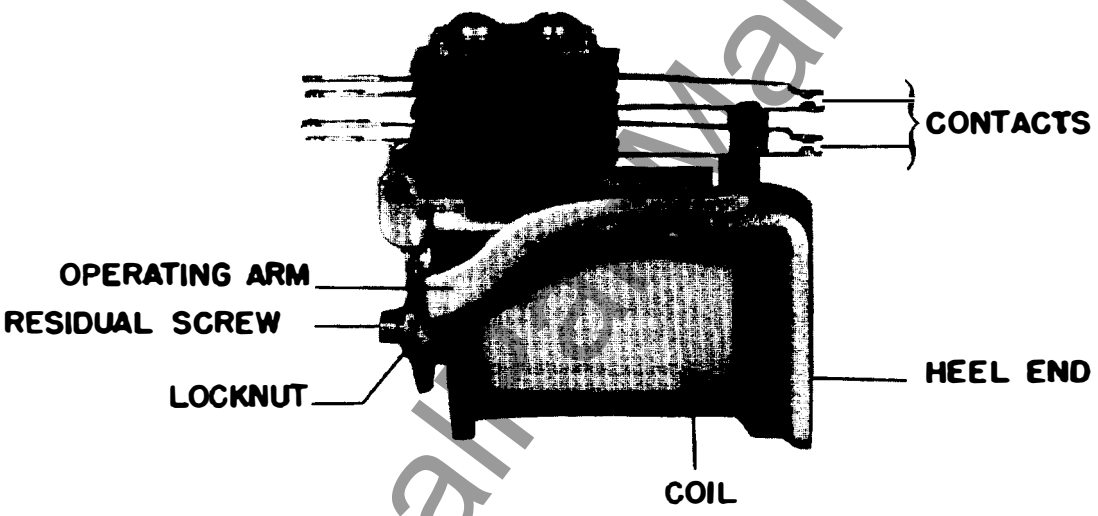


Fig. 11 (8030546) Typical Telephone-Relay Unit Used in the IAC60T, IAC80T and IAC90T Relays

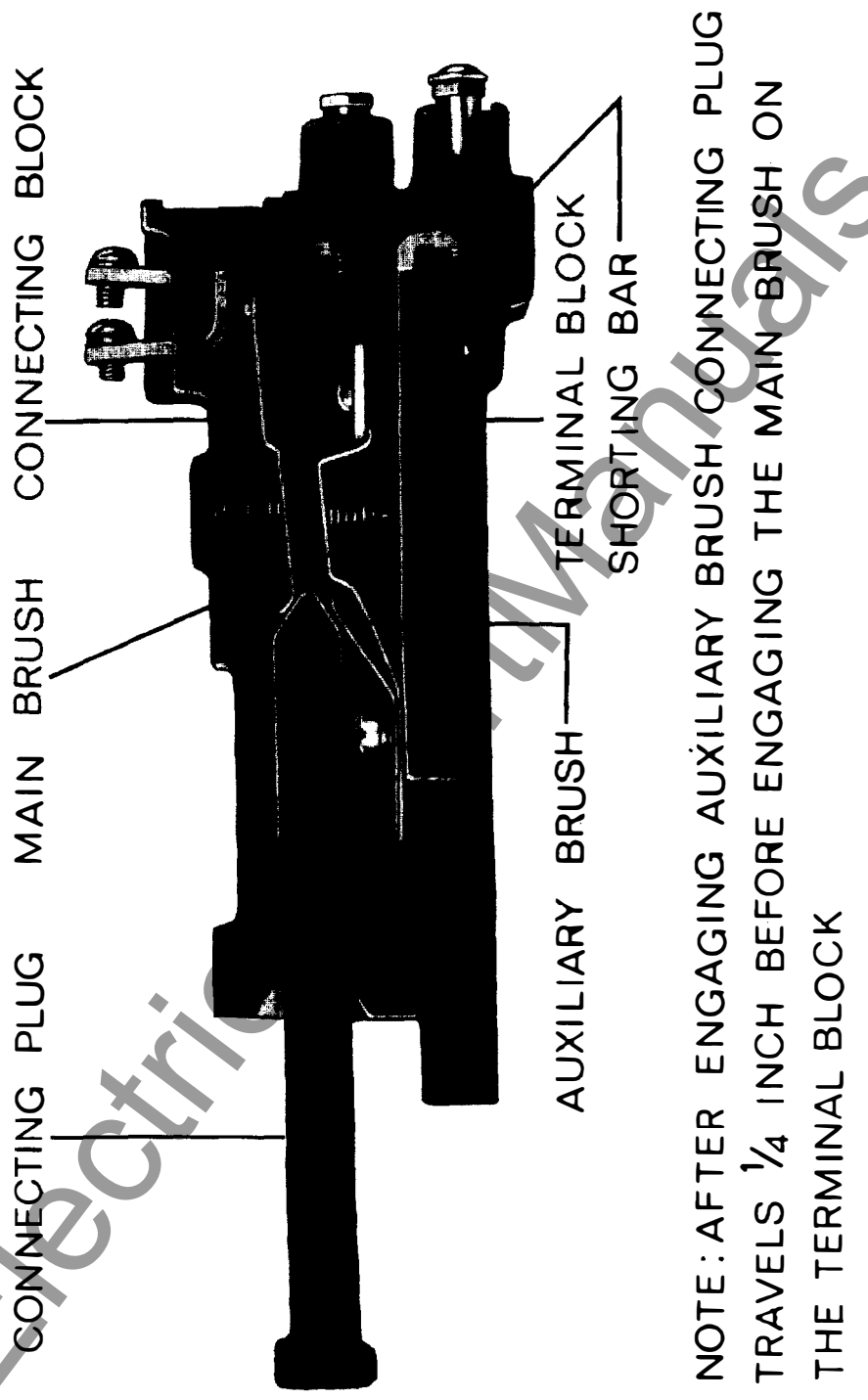


Fig. 12 (8025039) Cross Section of Drawout Case Showing Position of Auxiliary Brush and Shorting Bar

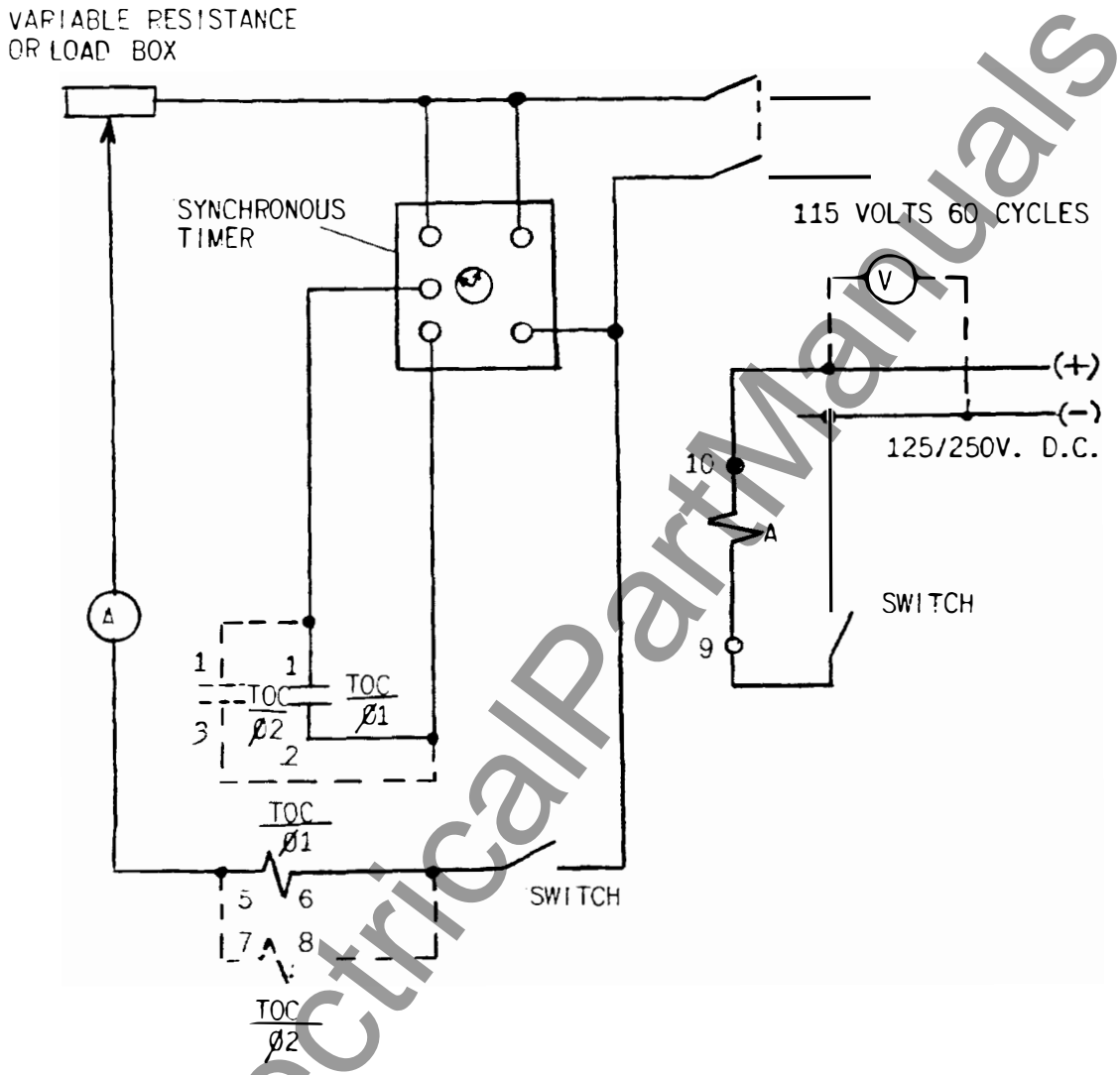


Fig. 13 (0165A6029-0) Test Connections for the Time Overcurrent Unit of the IAC60T, IAC80T and IAC90T Relays

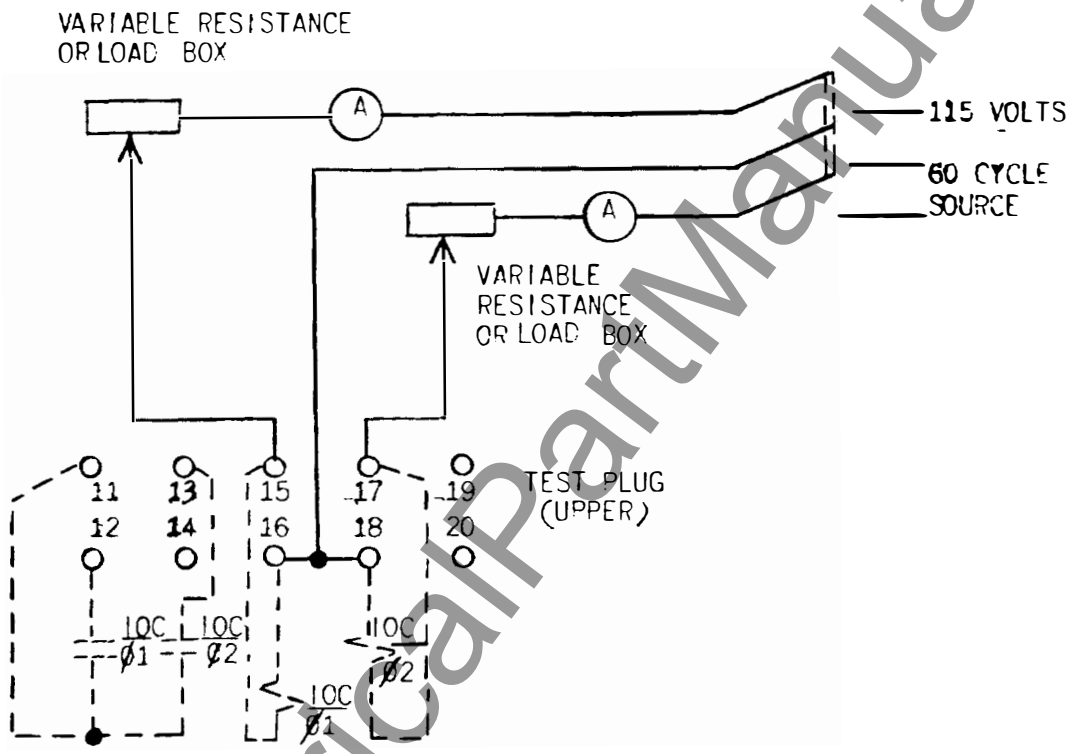


FIG. 14

Fig. 14 (0165A6028-0) Test Connections for the Instantaneous Overcurrent Units of the IAC60T, IAC80T and IAC90T Relays

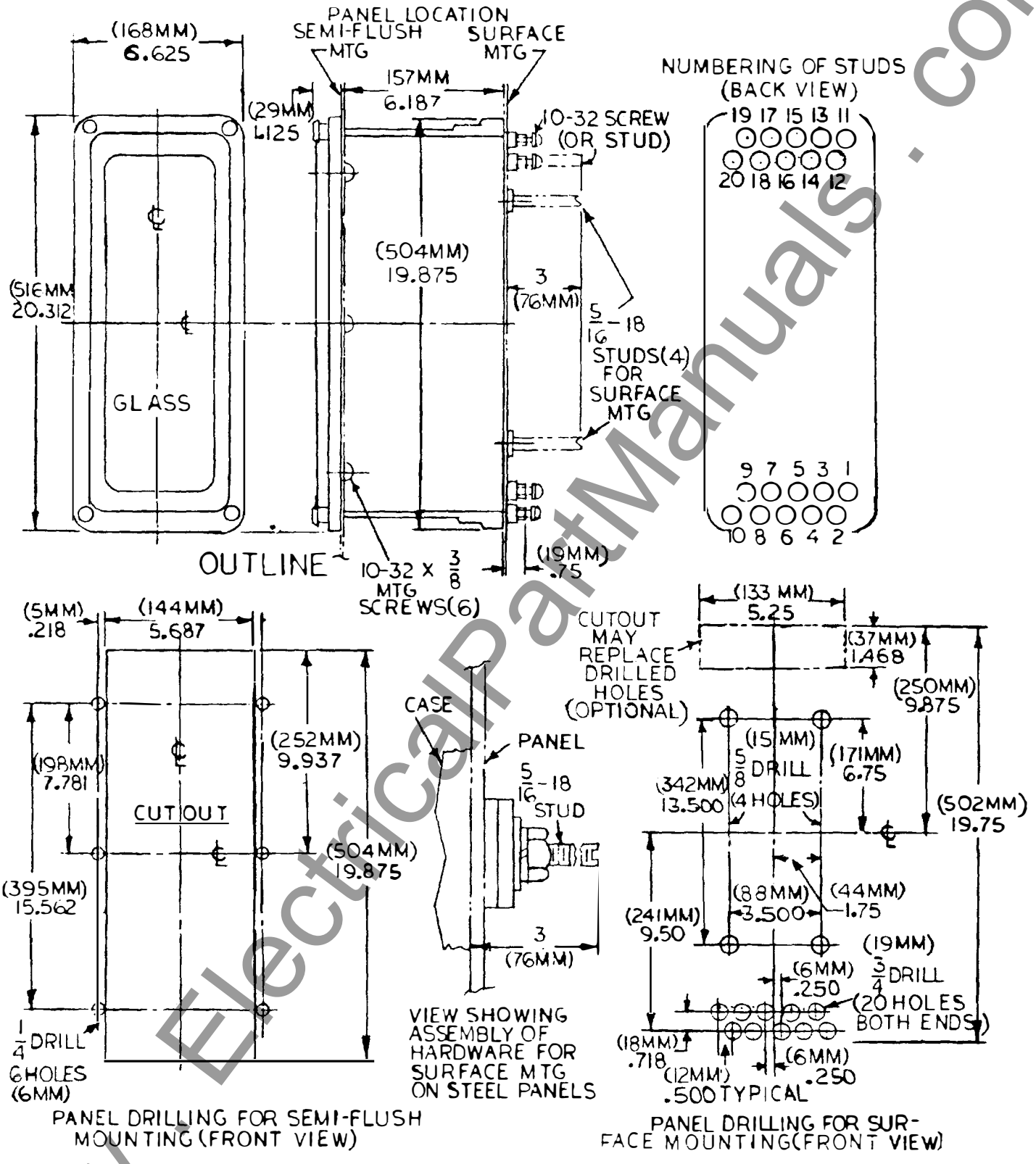


Fig. 15 (6209276-3) Outline and Panel Drilling Dimensions for the IAC60T, IAC80T and IAC90T Relays

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