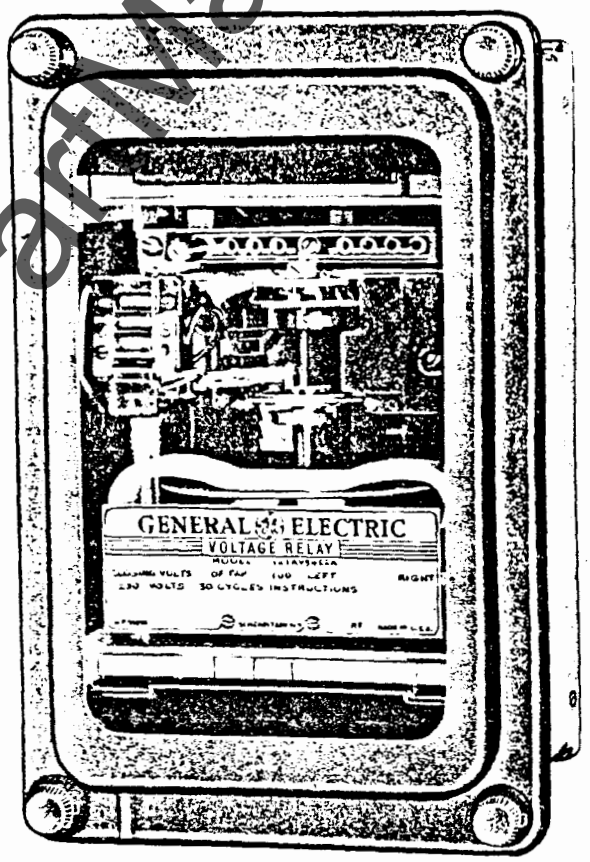
INSTRUCTIONS

GEH-1768 C
Supersedes GEH-1768 B

UNDERVOLTAGE RELAYS



Types

IAV54E

IAV54F	IAV55F
IAV54H	IAV55H
IAV55C	IAV55J

GENERAL ELECTRIC

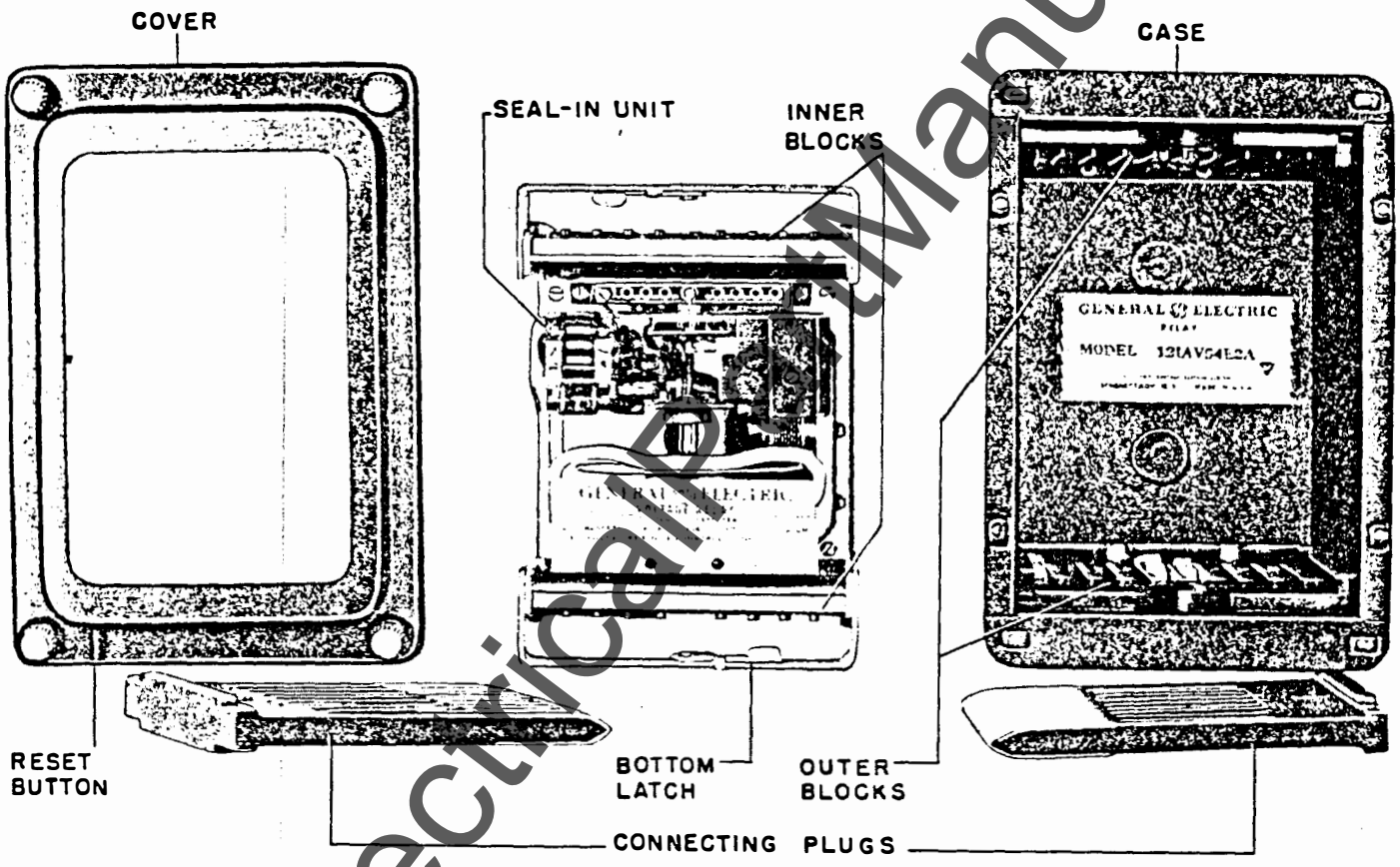


Figure 1. (8007477) The Type IAV54E Relay Disassembled

UNDERVOLTAGE RELAYS

TYPE IAV

INTRODUCTION

These relays are of the induction-disk construction. The disk is actuated by a potential operating coil on a laminated U-magnet. The disk shaft carries the moving contact which completes the trip or alarm circuit when it touches the stationary contact or contacts. The disk shaft is restrained by a spiral spring to give the proper contact-closing voltage and its motion is retarded by permanent magnets acting on the disk to give the correct time delay.

There is a seal-in unit mounted to the left of the shaft as shown in Fig. 1. This unit has its coil in series and its contacts in parallel with the main contacts such that when the main 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 relays are all mounted in single-unit double-end cases. The case has studs for external connections at both ends. The electrical connections between the relay and the case are made through stationary molded inner and outer blocks between which rests a removable connecting plug which completes the circuits. The molded outer blocks carry the studs for the external connections while the inner blocks carry the terminals for the internal connections. The operating coil is connected in parallel with both the upper and the lower inner molded blocks while the trip circuit is connected in series with these blocks. In this way, insertion of either the upper or lower connecting plug will energize the operating coil but the trip circuit will not be completed until the second connecting plug is inserted. For relays which have contacts closed when the relay is de-energized but open under normal operating conditions, the double connecting plug feature allows the relay contacts to open before the trip circuit is completed, thus minimizing the possibility of incorrect tripping when returning the relay to service after tests and inspection.

APPLICATION

These relays are protective devices designed to close trip or alarm circuits whenever the voltage applied to their operating coils reaches some predetermined value. The functions are described in greater detail in the following paragraphs.

OPERATING CHARACTERISTICS

The Type IAV54E relay has a single circuit-closing contact which closes when the voltage is reduced to some predetermined value. Thus, the contacts are closed at zero volts. This relay is a time undervoltage relay with inverse time characteristics which are shown in Fig. 2.

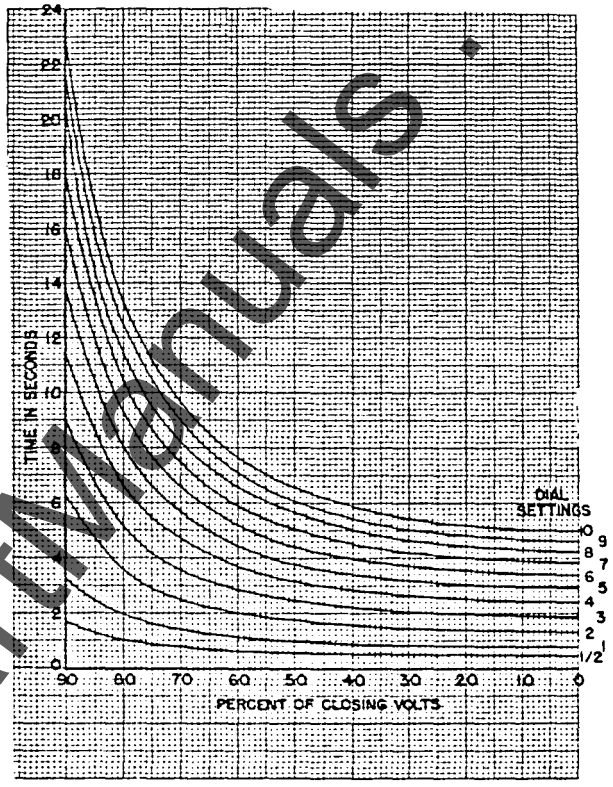


Figure 2. (362A648-0) Time-Voltage Curves for Relay Types IAV54E and IAV55C

The Type IAV54F relay is similar to the Type IAV54E relay except that it has a longer operating time. The time characteristics are shown in Fig. 3.

The Type IAV54H relay is also similar to the Type IAV54F relay except that it has much longer operating time than either the Type IAV54E or the Type IAV54F relays. The time characteristics are shown in Fig. 4.

The Type IAV55C relay is similar to the Type IAV54E relay except that it has two circuit-closing contacts.

The Type IAV55F relay is similar to the Type IAV54F relay except that it has two circuit-closing contacts.

The Type IAV55H relay is similar to the Type IAV54H relay except that it has two circuit-closing contacts.

The Type IAV55J relay is similar to the Type IAV55H relay except that it is provided with two separate seal-in units; one for each set of normally closed contacts.

(800T476) Cover

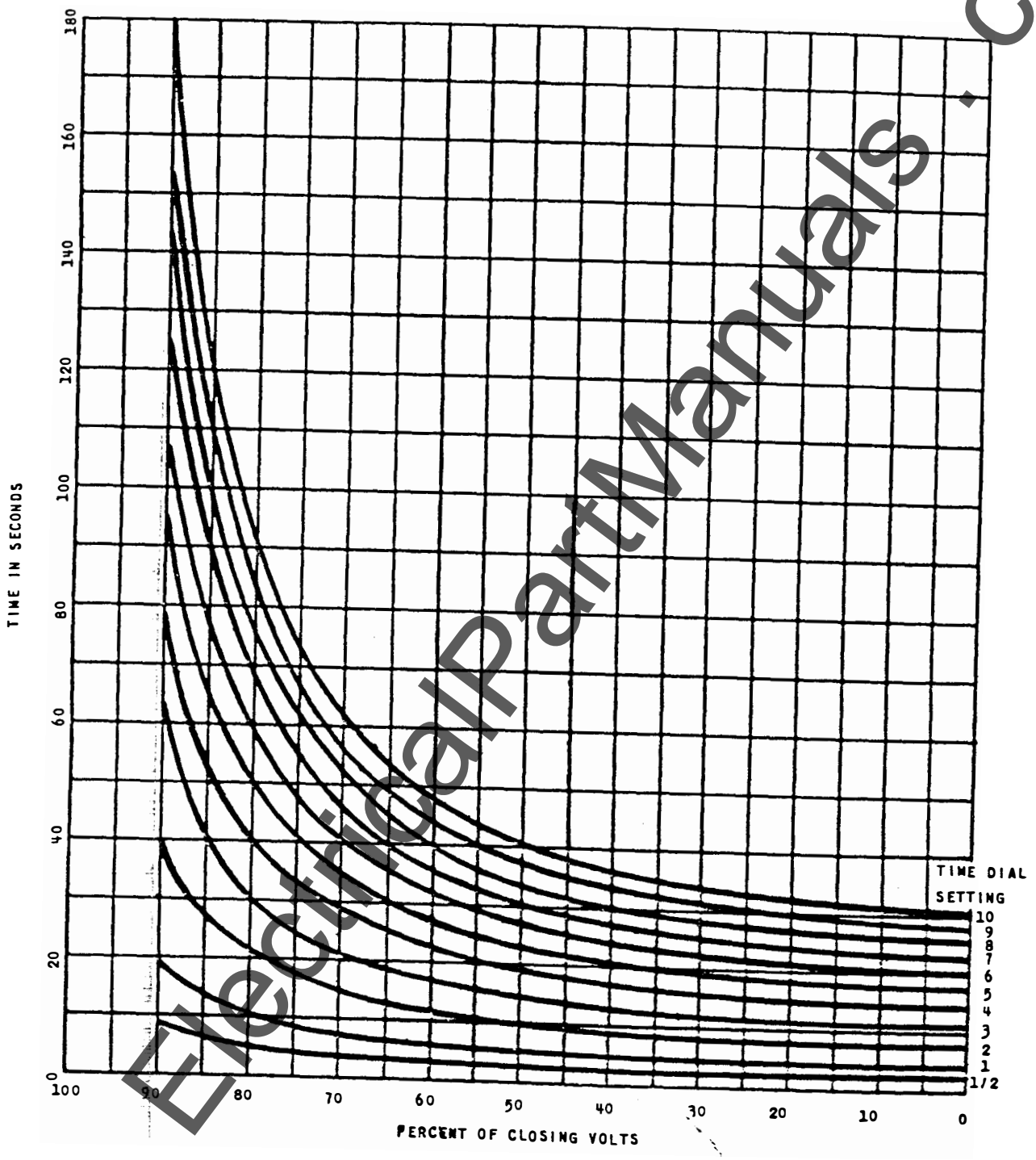


Figure 3. (362A668-0) Time-Voltage Curves for Types IAV54F and IAV55F

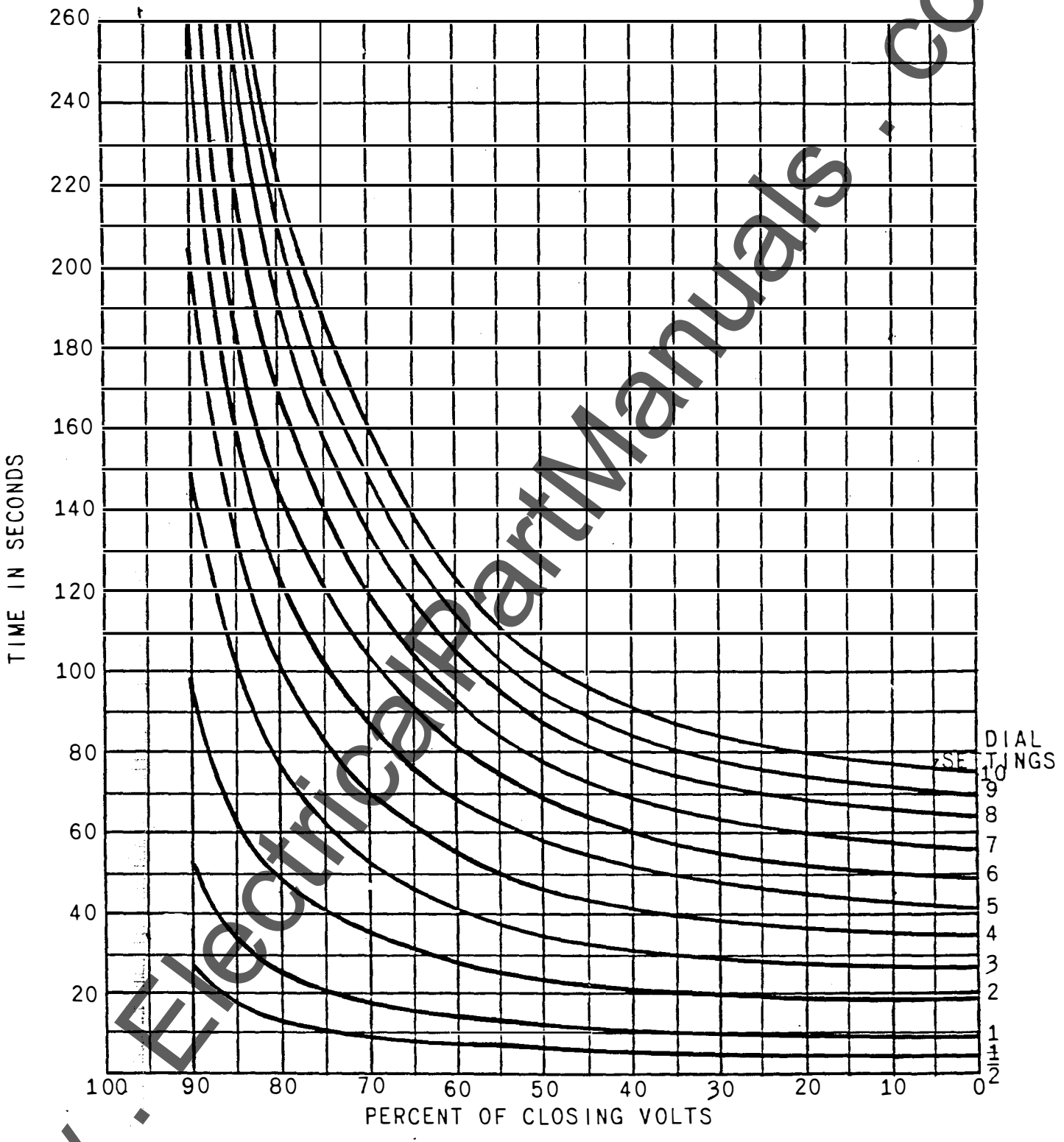


Figure 4. (362A650-1) Time-Voltage Curves for Relay Types IAV54H and IAV55H

RATINGS

The operating circuit ratings available are 115, 230 or 460 volts at 60, 50, or 25 cycles. The operating coil will stand rated voltage continuously on any tap and will stand tap voltage continuously on the taps above rated voltage.

The current-closing rating of the contacts is 30 amperes for voltages not exceeding 250 volts. The current-carrying ratings are affected by the selection of the tap on the seal-in coil as indicated in the following table:

Function	Amperes, A-C or D-C	
	2 Amp Tap	0.2 Amp Tap
Tripping Duty	30	5
Carry Continuously	4	0.8

The 2-ampere tap has a d-c resistance of 0.13 ohms and a 60 cycle impedance of 0.53 ohms, while the 0.2-ampere tap has a 7 ohm d-c resistance and 52 ohm 60 cycle impedance. The tap setting used on the seal-in element is determined by the current drawn by the trip coil.

The 0.2-ampere tap is for use with trip coils that operate on currents ranging from 0.2 up to 2.0 amperes at the minimum control voltage. If this tap is used with trip coils requiring more than 2 amperes, there is a possibility that the 7 ohm resistance will reduce the current to so low a value that the breaker will not be tripped.

The 2-ampere tap should be used with trip coils that take 2 amperes or more at the minimum control voltage, provided the tripping current does not exceed 30 amperes at the maximum control voltage. 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 coil of the protective relay.

BURDENS

Burdens at rated voltage for the various relay types are given in Table I.

* TABLE I

Relay	Tap Settings		Tap Settings	Rated Freq	At Rated Voltage		
	115V Coil	230V Coil	460V Coil		Volt-Amps	Power Factor	Watts
IAV54E and IAV55C	140	280	560	60	3.0	0.26	0.78
	120	240	480	60	4.0	0.26	1.0
	105	210	420	60	5.2	0.26	1.4
(Burdens for IAV54F and IAV55F are approximately 60% of these values)	93	186	372	60	6.8	0.28	1.9
	82	164	328	60	8.9	0.28	2.5
	70	140	280	60	12.4	0.29	3.6
	64	128	256	60	15.1	0.30	4.5
	55	110	220	60	21.6	0.31	6.7
(Burdens for IAV54H and IAV55H are approximately 40% of these values)	140	280	560	50	2.5	0.28	0.70
	120	240	480	50	3.3	0.28	0.92
	105	210	420	50	4.3	0.28	1.2
	93	186	372	50	5.7	0.28	1.6
	82	164	328	50	7.4	0.28	2.1
	70	140	280	50	10.3	0.29	3.0
	64	128	256	50	12.6	0.30	3.8
	55	110	220	50	18.0	0.31	5.6
	140	280	560	25	2.3	0.26	0.60
	120	240	480	25	3.1	0.26	0.81
	105	210	420	25	4.0	0.27	1.1
	93	186	372	25	5.2	0.28	1.5
	82	164	328	25	6.8	0.28	1.9
	70	140	280	25	9.5	0.30	2.8
	64	128	256	25	11.6	0.30	3.5
	55	110	220	25	16.5	0.31	5.1

* Indicates Revision

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 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.

DESCRIPTION

CASE

The case is suitable for either surface or semiflush panel mounting and an assortment of hardware is provided for either mounting. The cover attaches to the case and also carries the reset mechanism when one is required. Each cover screw has provision for a sealing wire.

The case has studs or screw connections at both ends or at the bottom only for the external connections. The electrical connections between the relay units and the case studs are made through spring backed contact fingers mounted in stationary molded inner and outer blocks between which nests a removable connecting plug which completes the circuits. The outer blocks, attached to the case, have the studs for the external connections, and the inner blocks have the terminals for the internal connections.

The relay mechanism is mounted in a steel framework called the cradle and is a complete unit with all leads being terminated at the inner block. This cradle is held firmly in the case with a latch at the top and the bottom and by a guide pin at the back of the case. The cases and cradles are so constructed that the relay cannot be inserted in the case upside down. The connecting plug, besides making the electrical connections between the respective blocks of the cradle and case, also locks the latch in place. The cover, which is fastened to the case by thumbscrews, holds the connecting plug in place.

To draw out the relay unit the cover is first removed, and the plug drawn out. Shorting bars are provided in the case to short the current transformer circuits. The latches are then released, and the relay unit can be easily drawn out. To replace the relay unit, the reverse order is followed.

A separate testing plug can be inserted in place of the connecting plug to test the relay in place on the panel either from its own source of current and voltage, or from other sources. Or, the relay unit can be drawn out and replaced by another which has been tested in the laboratory.

INSTALLATION

LOCATION

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

MOUNTING

The relay should be mounted on a vertical surface. The outline and panel drilling dimensions are shown in Fig. 12.

CONNECTIONS

The internal connection diagrams are shown in Figs. 5, 6 and 7. Typical external connections are shown in Fig. 8.

One of the mounting studs or screws should be permanently grounded by a conductor not less than No. 12 B&S gage copper wire or its equivalent.

ADJUSTMENTS

TARGET AND SEAL-IN UNIT

For trip coils operating on currents ranging from 0.2 up to 2 amperes at the minimum control voltage, set the target and seal-in tap plug in the 0.2 ampere tap.

The tap plug is the screw holding the right-hand stationary contact of the seal-in unit. To change the tap setting, first remove the connecting plugs. Then take a screw from the left-hand stationary contact and place it in the desired tap. Next, remove the screw from the other tap, and place it in the left-hand contact. This procedure is necessary to prevent the right-hand stationary contact from getting out of adjustment. Screws should not be in both taps at the same time, as d-c pickup will have a higher tap value, whereas a-c pickup will be increased.

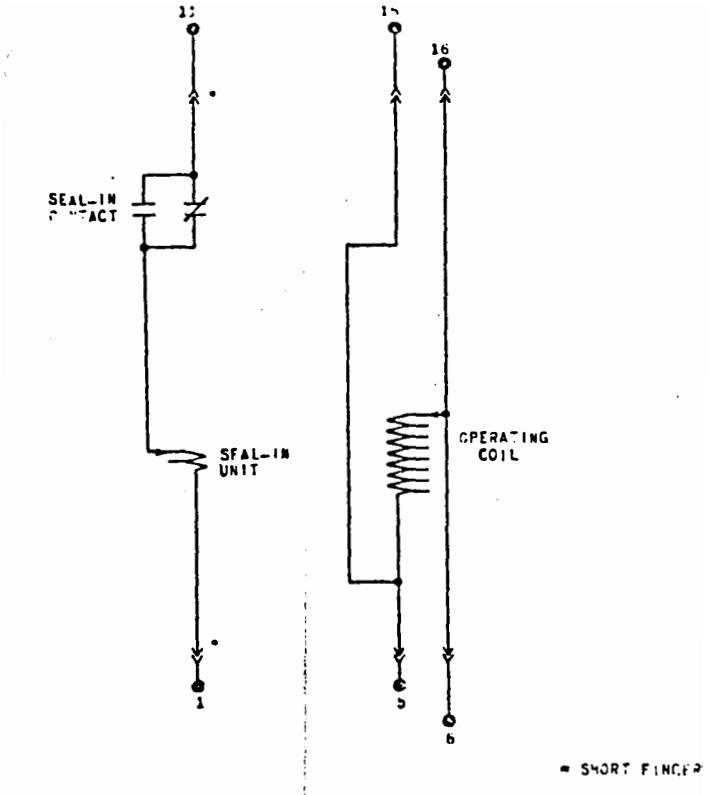


Figure 5. (6209253-3) Internal Connections for Relay Types IAV54E, IAV54F, and IAV54H (Front View)

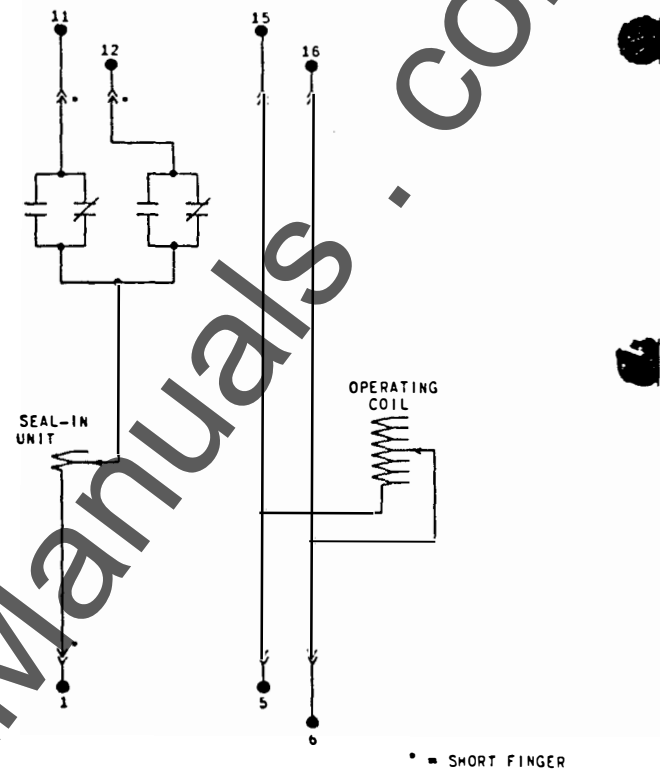


Figure 6. (6400515-3) Internal Connections for Relay Types IAV55C, IAV55F, and IAV55H (Front View)

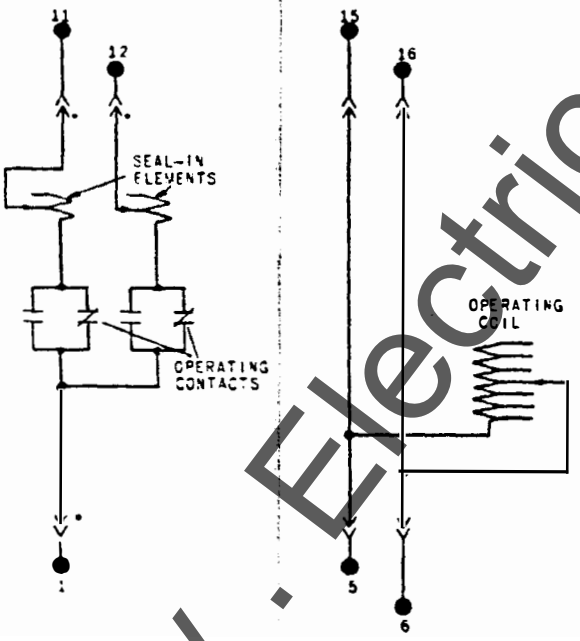


Figure 7. (K-6375840-0) Internal Connections for Relay Type IAV55J (Front View)

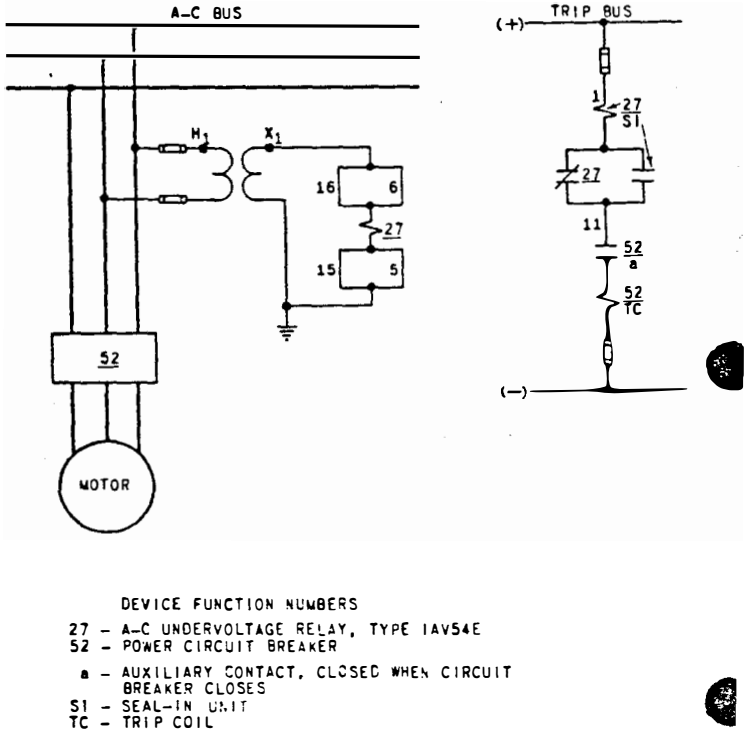


Figure 8. (6209277-2) Typical External Connections using an IAV54E Relay for the Undervoltage Protection of an A-C Motor

VOLTAGE SETTINGS

The voltage at which the contacts operate may be changed by changing the position of the tap plug in the tap block at the top of the relay. The range of this adjustment is from 55 to 140 volts on the 115 volt ratings, 110 to 280 volts on the 230 volt ratings, and 220 to 560 volts on the 460 volt ratings. Screw the tap plug firmly into the tap marked for the desired voltage (above which the relay is not to operate).

The tap settings indicate voltage values at which the contacts will close. A spring adjusting ring is provided for a sensitive adjustment of the relay operation. If the factory adjustment has been disturbed; the desired operating value may be obtained by inserting a tool in the notches around the edge of the ring (see Fig. 10) and turning the ring to the desired position. This adjustment also permits any desired setting between the taps. The relay has been adjusted at the factory to close its contacts, from any time-dial position, at a voltage within 5 per cent of the tap-plug setting. For example: If the tap plug setting is 55 volts, the contacts will close when the voltage is reduced from a higher value down to 55 volts. The relay contacts will open at 110 per cent of the tap setting or less. For the 55 volt tap setting, the contacts will open when the voltage is increased to 61 volts or less.

TIME SETTINGS

The time of operation of the relay is determined primarily by the setting of the time dial. Further adjustment is obtained by moving the permanent magnet along its supporting shelf; moving the magnet in toward the back of the relay decreases the time while moving it out increases the time.

Figs. 2, 3, and 4 show the time-voltage characteristics of the various relays with the time-dial settings for obtaining each characteristic. To make time settings, set the time dial to the number required (to give the desired characteristics) by turning it until the number lines up with the notch in the adjacent frame. The time indicated by the curves is the time required to close the relay contacts when the voltage is suddenly decreased from operating value or above to the value on the curve.

The time-voltage curves are plotted in per cent thus making them applicable for all tap settings.

INSPECTION

At the time of installation, the relay should be inspected for tarnished contacts, loose screws, or other imperfections. If any trouble is found, it should be corrected in the manner described under MAINTENANCE.

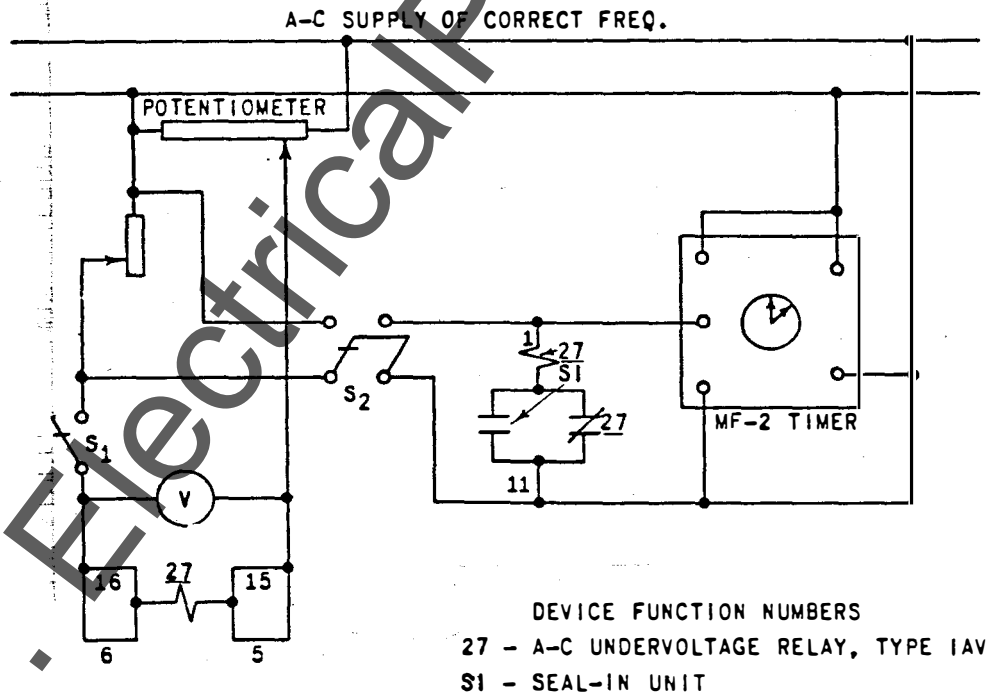


Figure 9. (6154392-5) Connections for Testing Relay Types IAV54 and IAV55

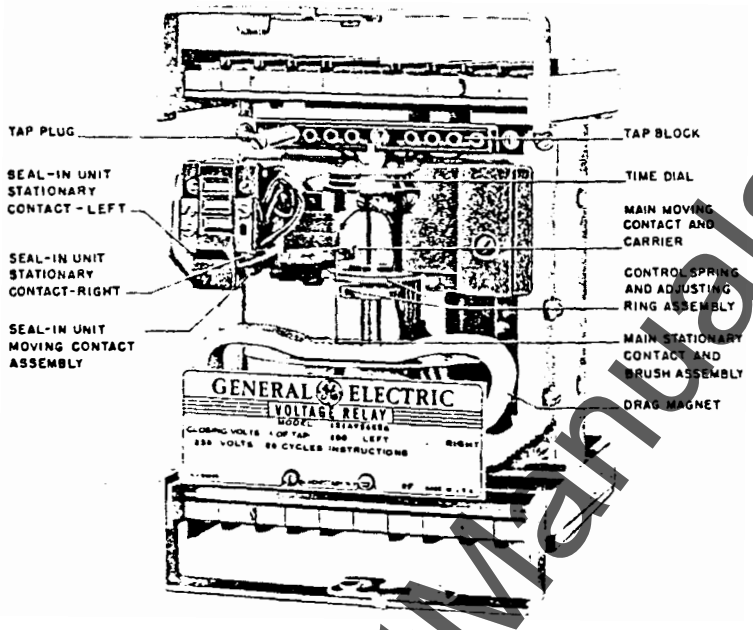


Figure 10. (8007475) Type IAV54E Relay Removed From Case (Front View)

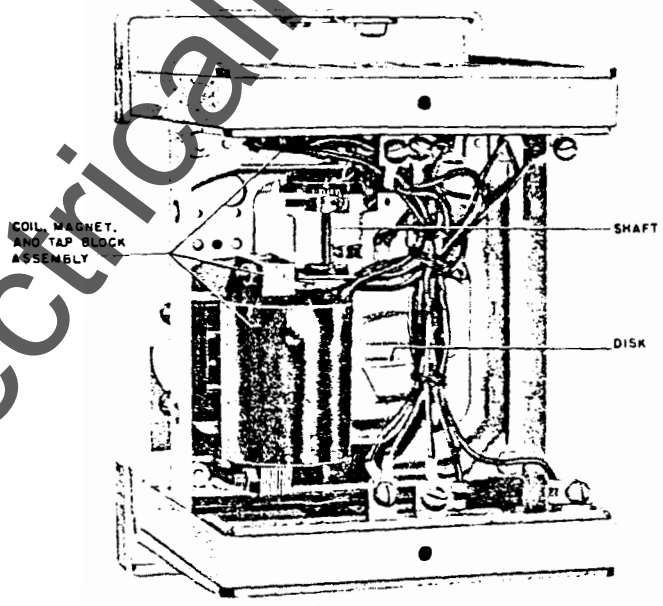


Figure 11. (8007478) Type IAV54E Relay Removed from Case (Back View)

OPERATION

Before the relay is put in service, it should be given a partial check to determine that factory adjustments have not been disturbed. On relays which have time dials, the dials will be set at zero before the relay leaves the factory. It is necessary to change this setting so that the relay contacts may be opened.

The drop-out voltage should be checked on one or more taps making certain that the contacts close.

The time voltage curves should be checked for one or more settings.

Recommended test connections for the above tests are shown in Fig. 9.

The relay may be tested while mounted on the panel, either from its own or another source of power, by inserting separate testing plugs in place of the connecting plugs. Or, the cradle can be drawn out and replaced by another which has been laboratory tested.

MAINTENANCE

These relays are adjusted at the factory and it is advisable not to disturb the adjustments. If for any reason, they have been disturbed, the following points should be observed in restoring them:

DISK AND BEARINGS

The lower jewel may be tested for cracks by exploring its surface with the point of a fine needle. The jewel should be turned up until the disk is centered in the air gap, after which it should be locked in position by the set screw provided for the purpose.

CONTACT CLEANING

For cleaning fine silver 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 corroded material will be removed rapidly and thoroughly. The flexibility of the tool insures the cleaning of the actual points of contact. Sometimes an ordinary file cannot reach the actual points of contact because of some obstruction from some other part of the relay.

Fine silver contacts should not be cleaned with knives, files, or abrasive paper or cloth. Knives or files may leave scratches which increase arcing and deterioration of the contacts. Abrasive paper or cloth may leave minute particles of insulating abrasive material in the contacts and thus prevent closing.

The burnishing tool described above can be obtained from the factory.

RENEWAL PARTS

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

When ordering renewal parts, address the nearest Sales Office of the General Electric Company, specifying the quantity required and describing the parts by catalogue numbers as shown in Renewal Parts Bulletin No. GEF-3897.

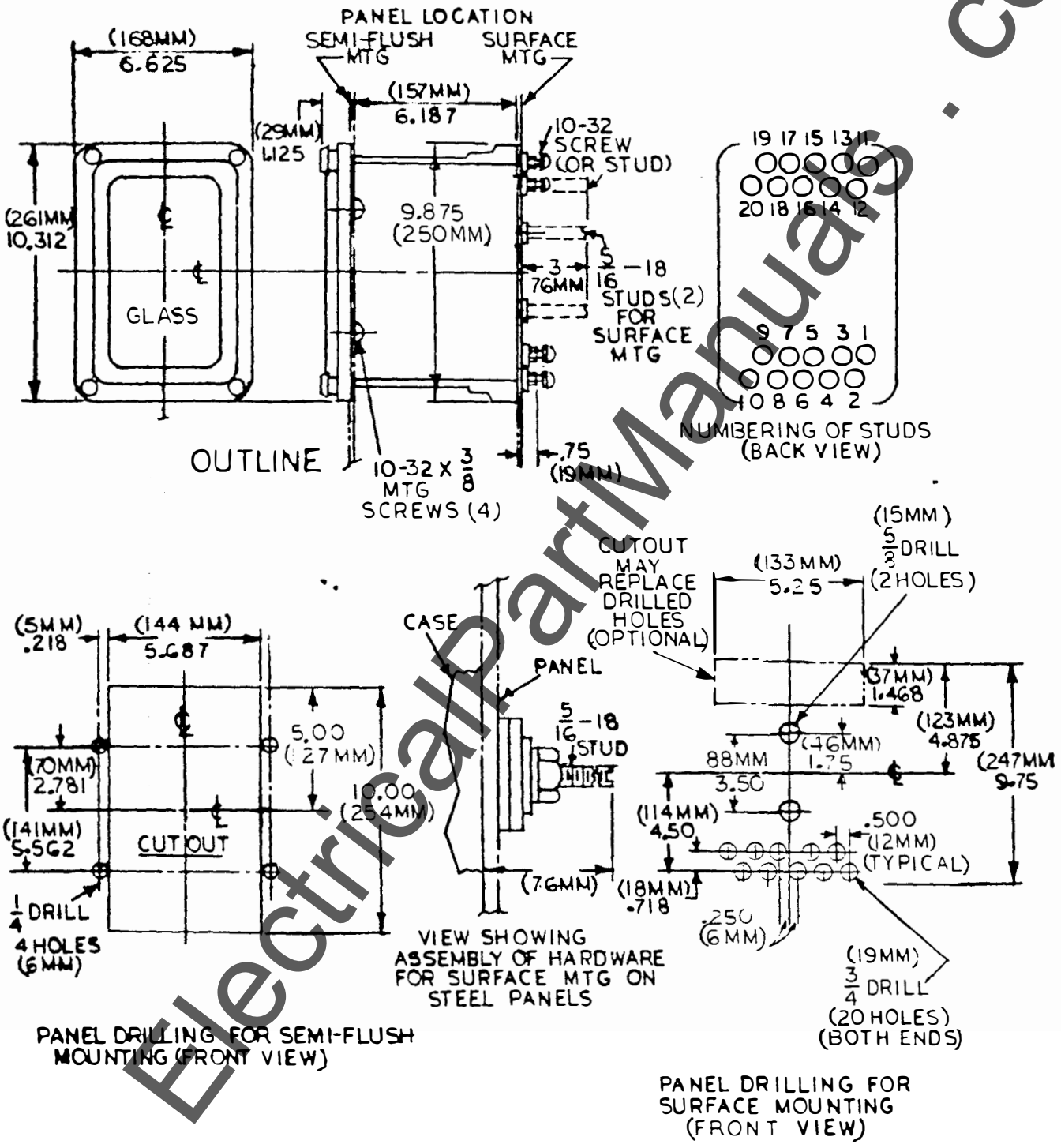


Figure 12. (K-6209272-5) Outline and Panel Drilling Dimensions for the Type IAV54 and IAV55 Relays