Switchgear

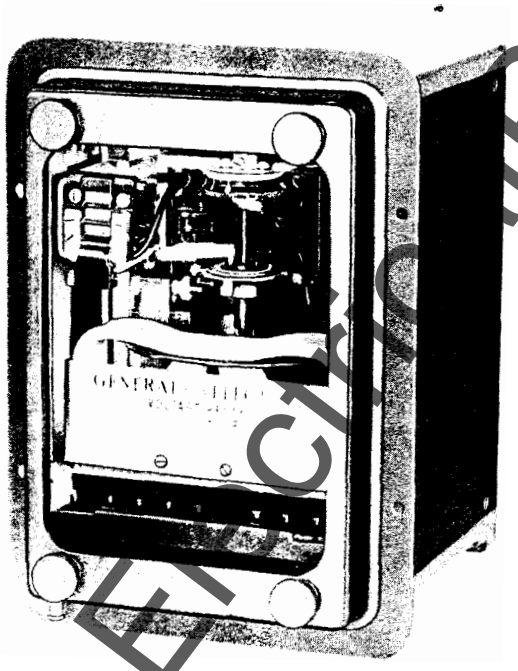
INSTRUCTIONS

UNDERVOLTAGE AND OVERVOLTAGE RELAYS

TYPES

IAV51A IAV53A
IAV52A IAV54A
IAV55A

IN THE DRAWOUT CASE



GENERAL ELECTRIC

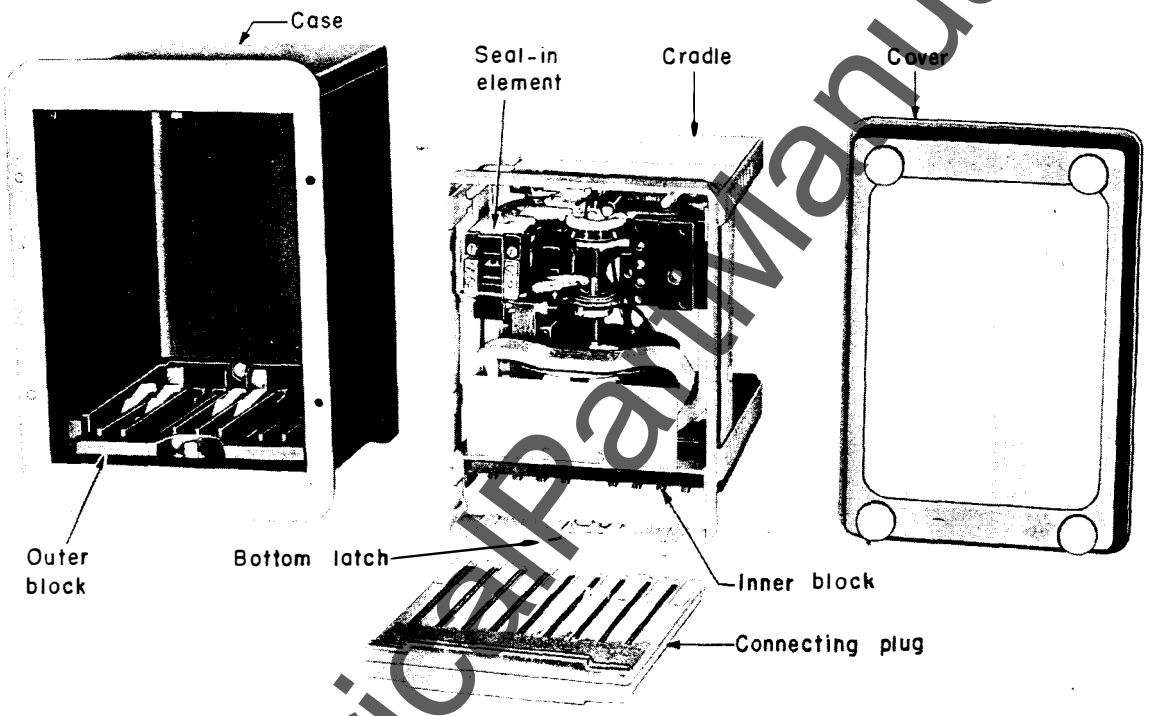


Fig. 1. Type IAV51A relay withdrawn from case

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.

VOLTAGE RELAYS
TYPE IAV

General

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 element mounted to the left of the shaft as shown in Fig. 1. This element has its coil in series and its contacts in parallel with the main contacts such that when the main contacts close, the seal-in element picks up and seals in. When the seal-in element 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 drawout cases. The drawout case has studs for external connections at the bottom end. The electric connections between the relay unit and the case are made through stationary molded inner and outer blocks; between the blocks nests a removable connecting plug which completes the circuits. The outer block, attached to the case, has the studs for external connections, and the inner block has terminals for the internal connections.

The relays may be surface or semiflush mounted. Surface mounted relays have studs extending from the back of the case and are mounted on the panel surface. Semiflush mounted relays have a flange around the front of the case and are mounted in panel openings, the flange being attached to the panel surface.

The cover page shows a typical drawout-case relay. The component parts such as the cradle, case, connecting plug, and cover, are shown in Fig. 1.

The relay mechanism is mounted in the 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 by a latch at both top and bottom and by a guide pin at the back of the case. The connecting plug, besides making the electric connections between the respective blocks of the cradle and case, also locks the lower latch in place. The cover, which is drawn to the cradle by thumbscrews, holds the connecting plug in place.

To draw out the cradle, the cover must first be removed. Then the connecting plug can be drawn out. In so doing, the trip circuit is first opened, then the voltage circuits are opened. After the connecting plug has been removed, the lower latch can be released and the cradle easily drawn out. To replace the cradle, the reverse order should be followed.

Note: Care must be taken to insert the connecting plug slowly on relays that have contacts which are closed when de-energized but open under normal operating conditions. Put the plug in until its contacts just touch those of the terminal blocks, which can easily be felt. After relay contacts open, push plug in all the way.

Application

These relays are protective devices 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 IAV51A relay has single-circuit closing contacts which close as the voltage increases to the pick-up value as set on the tap block. The time delay in closing the contacts is determined by the setting of the time dial at the top of the shaft. The time-voltage characteristics of the IAV51A relay are shown in Fig. 2.

The IAV52A relay is similar to the IAV51A relay except that it has additional contacts for closing a second circuit.

The IAV53A relay has double-throw contacts. The left-hand contacts close as the voltage increases to some predetermined value. The right-hand contacts close when the voltage decreases to some lower value. Between these two voltage values both contacts are open. Time voltage characteristics are shown in Fig. 3.

The IAV54A relay has single-circuit contacts which close when the voltage is reduced to some predetermined value. Thus, the contacts are closed when the relay has no voltage applied to its terminals. Time-voltage characteristics are shown in Fig. 4.

The IAV55A relay is similar to the IAV54A relay except that it has additional contacts for closing a second circuit.

Ratings

The operating circuit ratings available are 115 or 230 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:

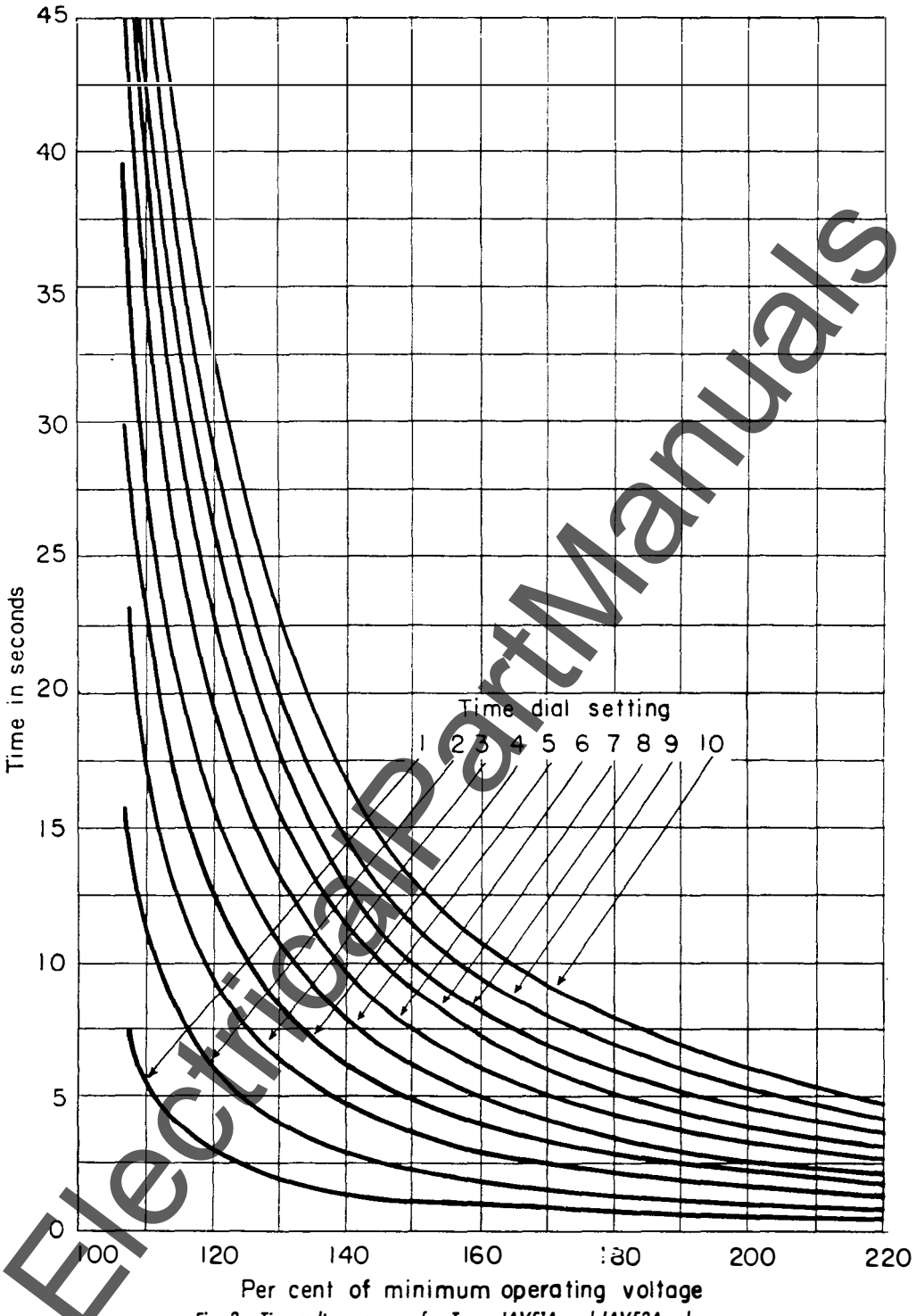


Fig. 2. Time-voltage curves for Types IAV51A and IAV52A relays

Function	Amperes, A-c or D-c	
	2-amp Tap (0.13 Ohm) Target and Seal-in Coil	0.2-amp Tap (7 Ohms) Target and Seal-in Coil
Tripping Duty	30	5
Carry Continuously	4	0.8

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 two amperes, there is a possibility that the seven ohms resistance will reduce the current to so low a value that the breaker will not be tripped.

The 2.0-ampere tap should be used with trip

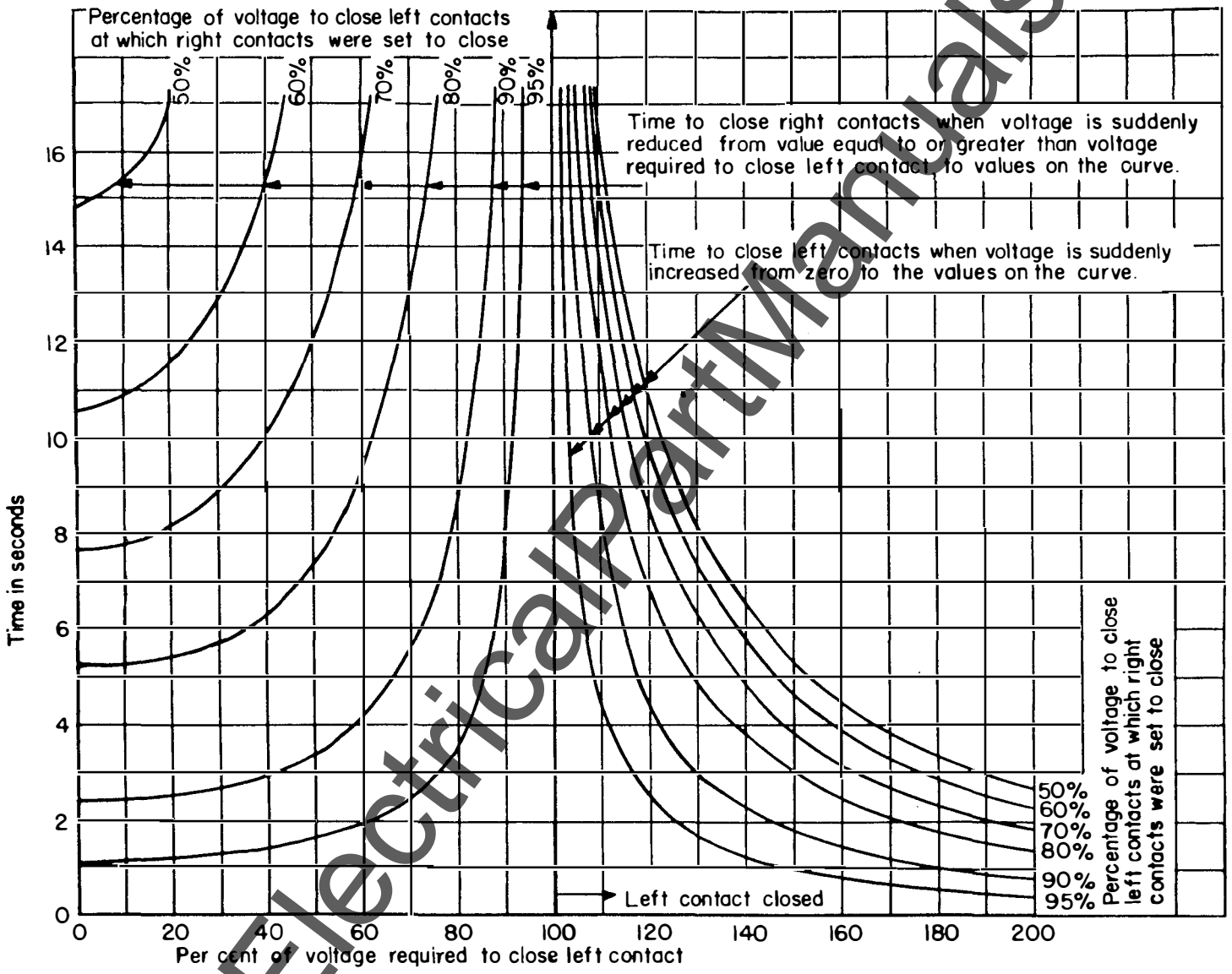


Fig. 3. Time-voltage curves for Type IAV53A relay

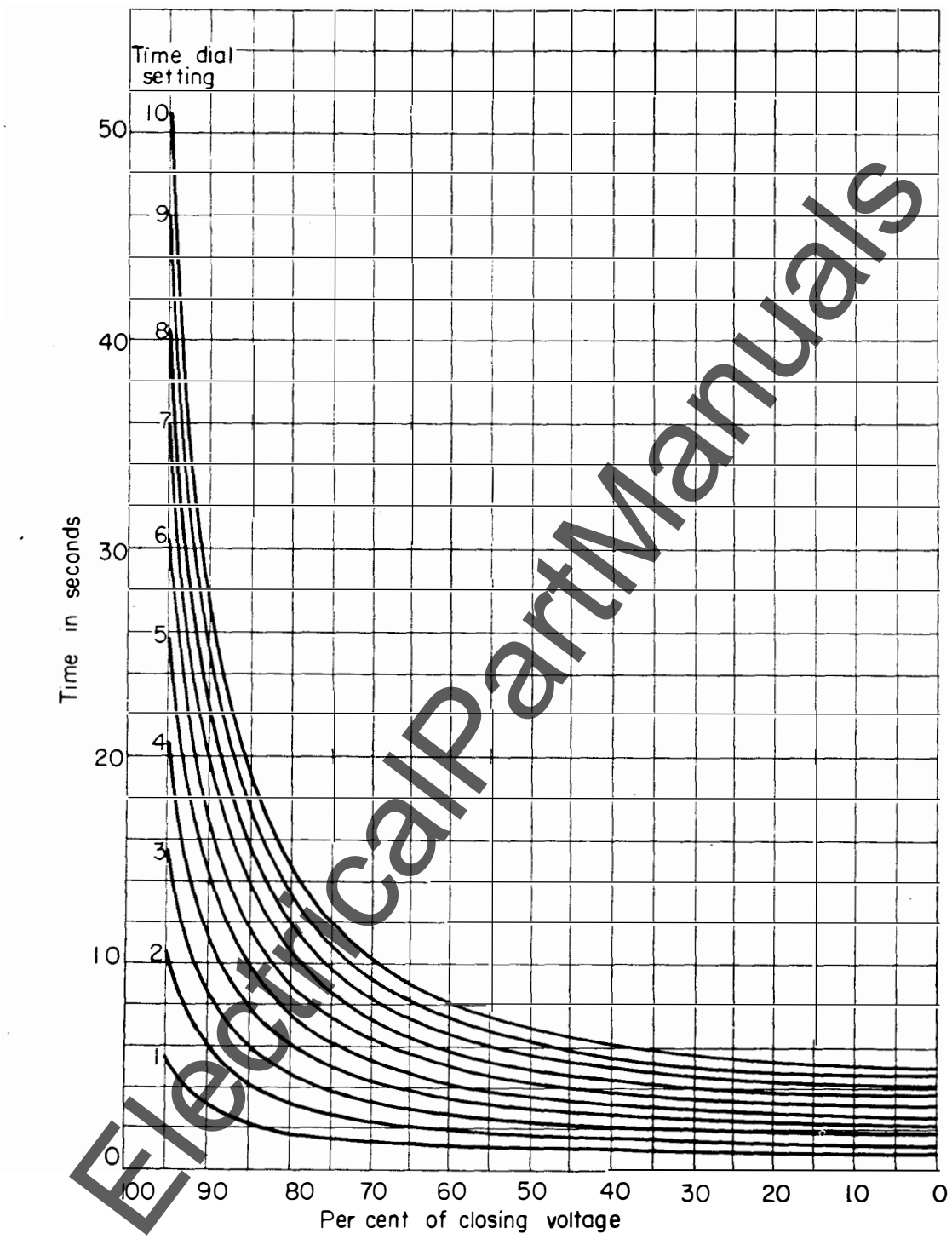


Fig. 4. Time-voltage curves for Types IAV54A and IAV55A relays

coils that take 2.0 amperes or more at 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 for the various relay types are given in the following table:

Relay	Voltage Rating	Tap Setting 115 V Coil	Volt Amperes	Power Factor	Watts
60-cycle Burdens					
IAV51A IAV52A	115	140	1.3	.34	0.4
		120	1.8	.35	0.5
		105	2.4	.34	0.7
		93	3.1	.33	0.9
		82	3.9	.32	1.2
		70	5.4	.31	1.7
		64	6.6	.31	2.1
		55	9.2	.35	3.2
IAV53A IAV54A IAV55A	115	140	2.2	.32	0.7
		120	3.0	.30	0.9
		105	4.0	.31	1.2
		93	5.4	.31	1.7
		82	7.0	.32	2.2
		70	9.9	.34	3.4
		64	12.0	.36	4.3
		55	17.0	.39	6.6
50-cycle Burdens					
IAV51A IAV52A	115	140	1.2	.34	0.4
		120	1.6	.34	0.5
		105	2.1	.34	0.7
		93	2.8	.34	1.9
		82	3.6	.36	1.3
		70	5.1	.34	1.7
		64	6.2	.34	2.1
		55	8.6	.34	2.9
IAV53A IAV54A IAV55A	115	140	1.9	.32	0.6
		120	2.5	.30	0.8
		105	3.4	.29	1.0
		93	4.6	.31	1.4
		82	6.0	.32	1.9
		70	8.4	.35	2.9
		64	12.9	.29	3.7
		55	13.2	.35	4.6
25-cycle Burdens					
IAV51A IAV52A	115	140	1.1	.50	0.5
		120	1.5	.49	0.8
		105	2.1	.49	1.0
		93	2.7	.47	1.2
		82	3.4	.49	1.7
		70	4.8	.49	2.4
		64	5.8	.49	2.9
		55	8.2	.49	4.0
IAV53A IAV54A IAV55A	115	140	1.7	.32	0.5
		120	2.3	.30	0.7
		105	2.9	.30	0.9
		93	4.2	.30	1.3
		82	5.3	.32	1.7
		70	7.5	.34	2.6
		64	9.5	.34	3.3
		55	12.9	.39	5.0

Shipping—Unpacking—Storage

Shipping

These relays, when not shipped as a part of a control panel, will be shipped in cartons designed to protect them against damage. Immediately upon receipt of the relay, an examination should be made for any damage sustained during shipment. If injury or rough handling is evident, a damage claim should be filed at once with the transportation company and the nearest General Electric Sales Office notified promptly.

Unpacking

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

Storage

If the relays are not to be installed immediately, they should be stored in their original carton 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.

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. 5 for relay Types IAV51A, IAV52A, IAV54A, and IAV55A. Fig. 6 shows the outline and panel drilling for Type IAV53A.

Connections

Internal connections are shown in Fig. 7 to 11 for the various relays.

Ground Connection

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 Element

For trip coils operating on currents ranging from 0.2 up to 2.0 amperes at the minimum control voltage, set the target and seal-in tap plug in the 0.2-ampere tap.

For trip coils operating on currents ranging from 2 to 30 amperes at the minimum control voltage, place the tap plug in the 2.0-ampere tap.

The tap plug is the screw holding the right-hand stationary contact of the seal-in element. To change the tap setting, first remove the connecting plug. 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 pickup for d-c will be the higher tap value and a-c pickup will be greatly increased.

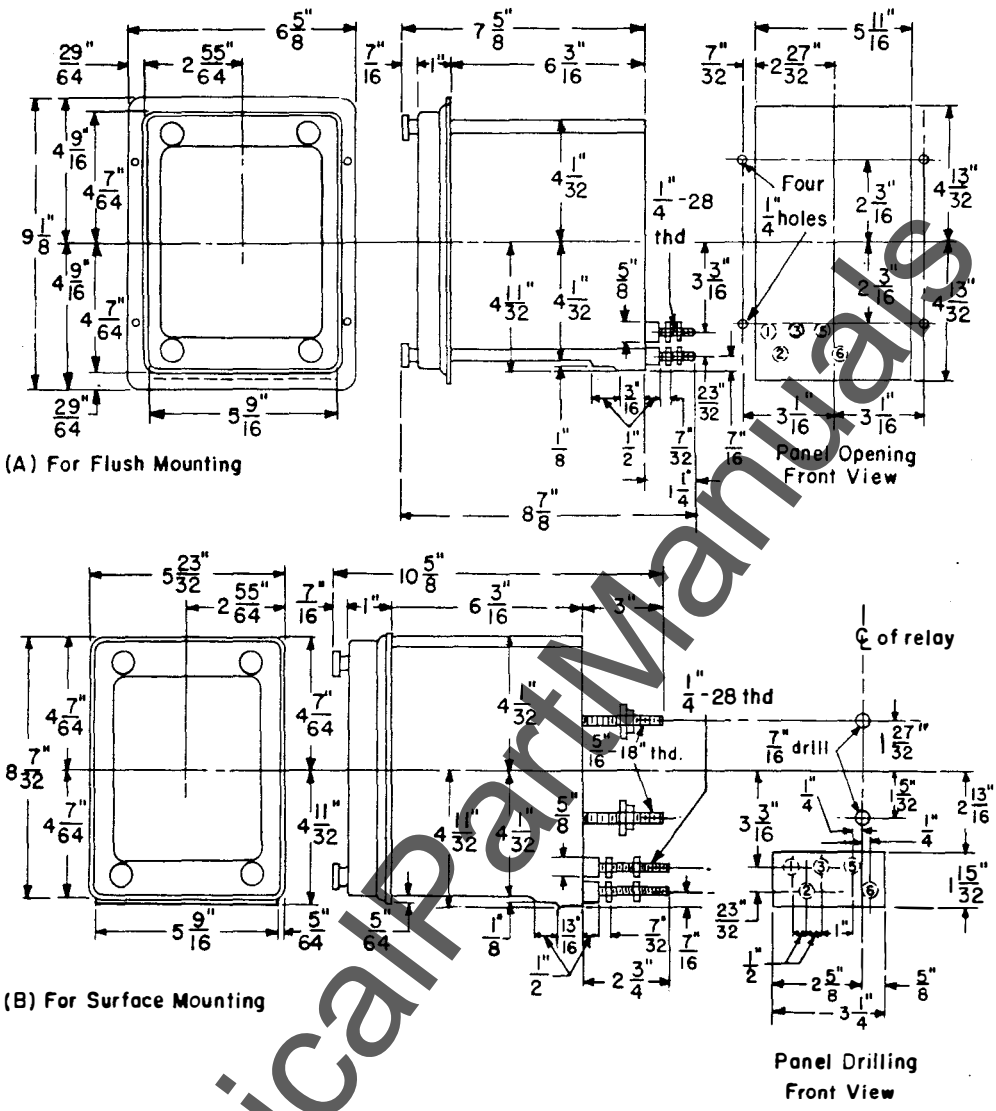


Fig. 5. Outline and panel drilling for relay Types IAV51A, IAV52A, IAV54A and IAV55A

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 and 110 to 280 volts on the 230-volt ratings. Screw the tap plug firmly into the tap marked for the desired voltage (below which the relay is not to operate).

The pickup of the relay for any voltage tap is adjusted by means of a spring adjusting ring. The ring may be turned by inserting a tool in the notches around the edge (see Fig. 14). By turning the ring, the operating voltage of the relay may be brought into agreement with the tap setting employed if, for some reason, this adjustment has been disturbed. The adjustment also permits any desired setting between the various taps. The relay is adjusted at the factory to operate from any time-dial position at a minimum voltage within five per cent of the tap-plug setting. The relay resets at 90 per cent of the minimum operating value on all relays listed except the IAV53A which will be explained later.

Operating voltage for the IAV51A and the IAV52A is the minimum voltage for a given tap setting at which the contacts just make. Operating voltage for the IAV54A and the IAV55A is the minimum voltage for a given tap setting at which the contacts just break.

On the IAV53A, the operating voltage for a given tap setting is the minimum voltage at which the left-hand contacts close. The right-hand contacts will then close at a certain percentage of operating voltage. If it is desired to change this percentage, the right-hand moving contact may be rotated on the shaft after first loosening the clamping screws that hold it in place. Changing the position of this contact gives an adjustment of the voltage to close the right-hand contacts between 50 and 95 per cent of the voltage which closes the left-hand contacts. Changing position of the right-hand moving contact changes the voltage at which the left-hand con-

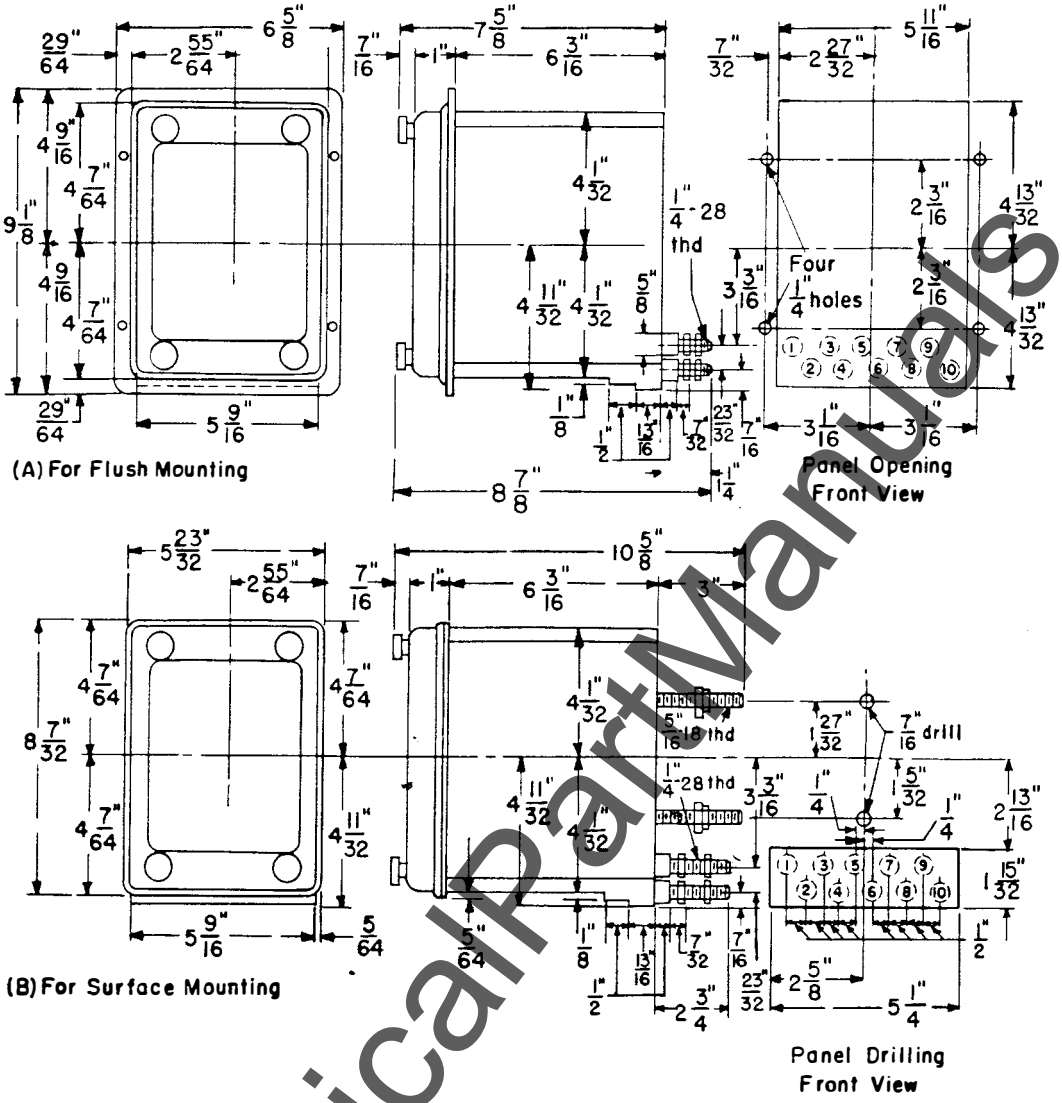


Fig. 6. Outline and panel drilling for relay Type IAV53A

tacts close. Hence, simultaneous adjustments for closing left and closing right must be made to obtain a desired characteristic.

Time Setting

The time of operation of the IAV51A, IAV52A, IAV54A, and the IAV55A is determined primarily by the setting of the time dial, while that for the IAV53A is determined by the spread of the contacts as explained under "voltage setting." 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.

Fig. 2 shows the time-voltage characteristics of the IAV51A and the IAV52A with the dial setting for obtaining each characteristic. To make time settings, set the time dial to the number required (to give the desired characteristic) 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 increased from a value below pickup to the value on the curve.

Time settings on the IAV54A and the IAV55A are quite similar except that their characteristics, as shown in Fig. 4, indicate the time required to close the contacts when voltage is suddenly reduced from operating value or above, to the values on the curves.

Fig. 3 shows the characteristics of the IAV53A. The time characteristic of the relay is automatically determined by the setting of the ratio of the voltage to close the right contacts to the voltage to close the left contacts.

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.

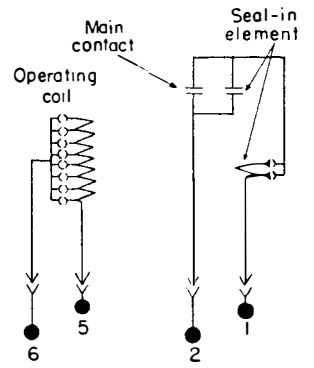


Fig. 7. Internal connections, back view, for Type IAV51A relay

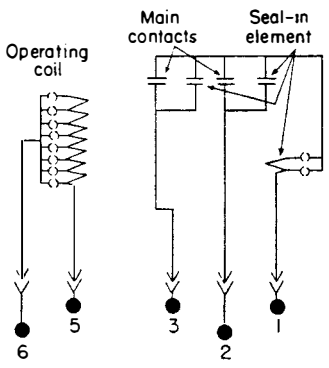


Fig. 8. Internal connections, back view, for Type IAV52A relay

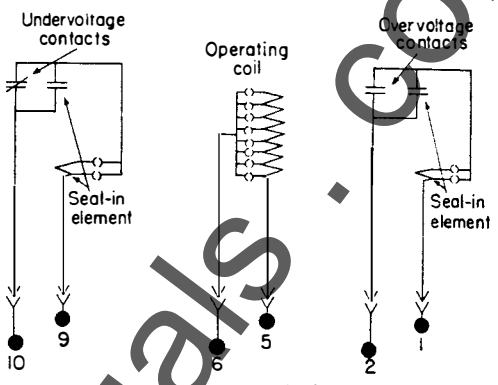


Fig. 9. Internal connections, back view, for Type IAV53A relay

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 in order to open the relay contacts.

The pickup voltage should be checked on one or more taps on relays which close contacts on increasing voltage. The dropout voltage should be checked on one or more taps on relays which close contacts on decreasing voltage.

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

Recommended test connections for the above tests are shown in Fig. 12 for the IAV51A and the IAV-52A. Fig. 13 shows test connections for the IAV54A and the IAV55A. The IAV53A can be checked for time of closing left contacts by using connections shown in Fig. 12, and for closing right contacts

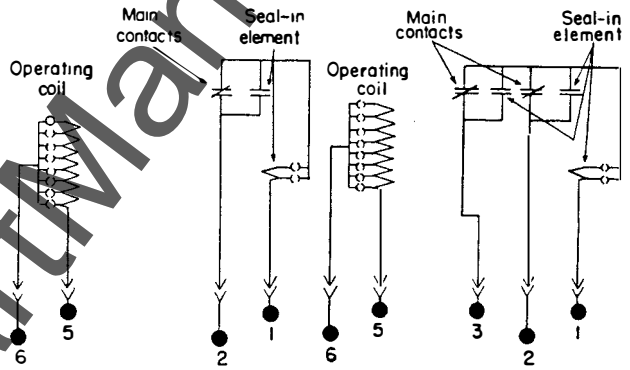


Fig. 10. Internal connections, back view, for Type IAV54A relay

Fig. 11. Internal connections, back view, for Type IAV55A relay

except that terminal studs 9 and 10 should be used instead of 1 and 2 (see internal connections, Fig. 9).

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

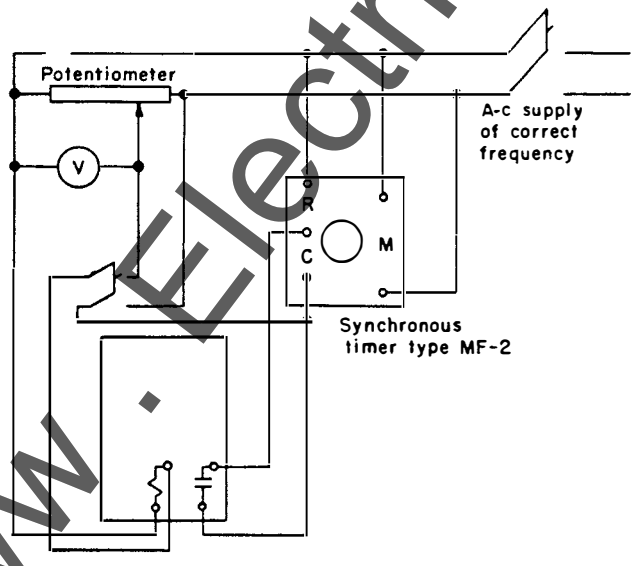


Fig. 12. Connections for testing Types IAV51A and IAV52A relays, back view

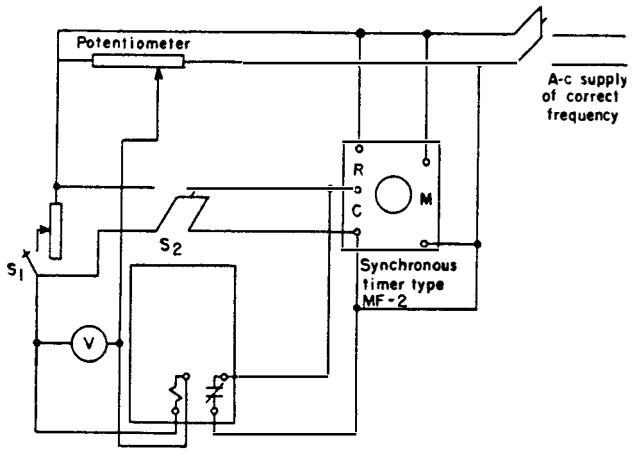


Fig. 13. Connections for testing Types IAV54A and IAV55A relays, back view

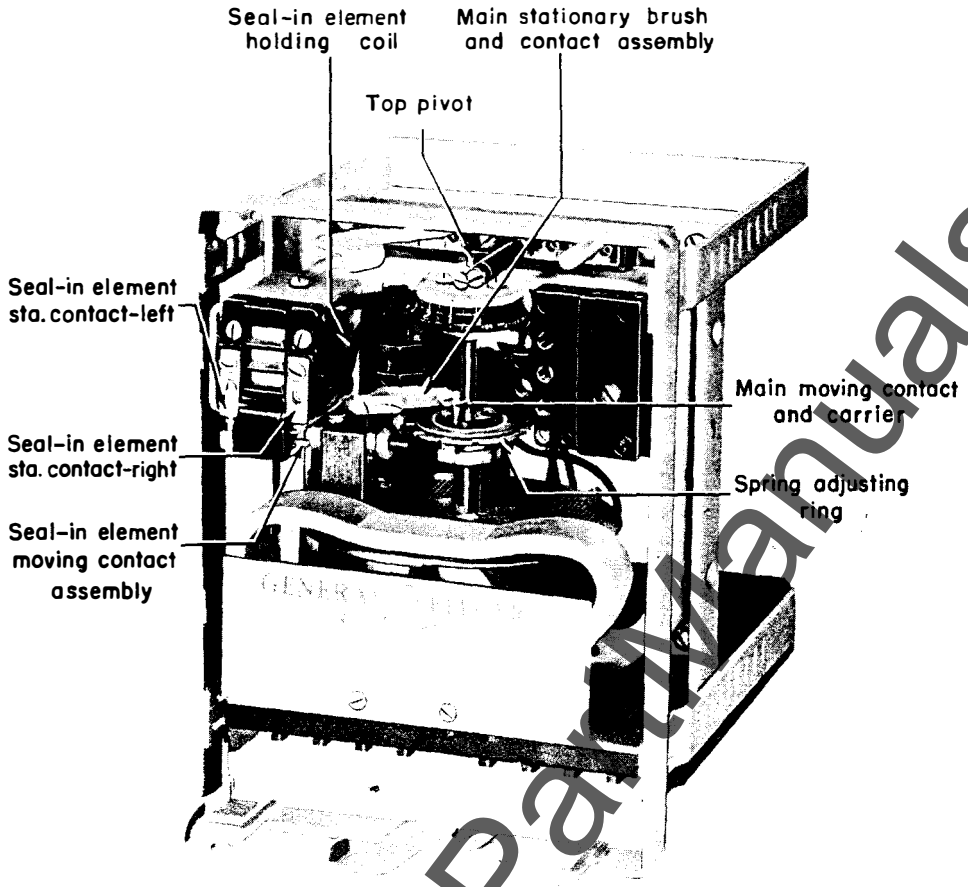


Fig. 14. Front view of Type IAV51A relay withdrawn from case

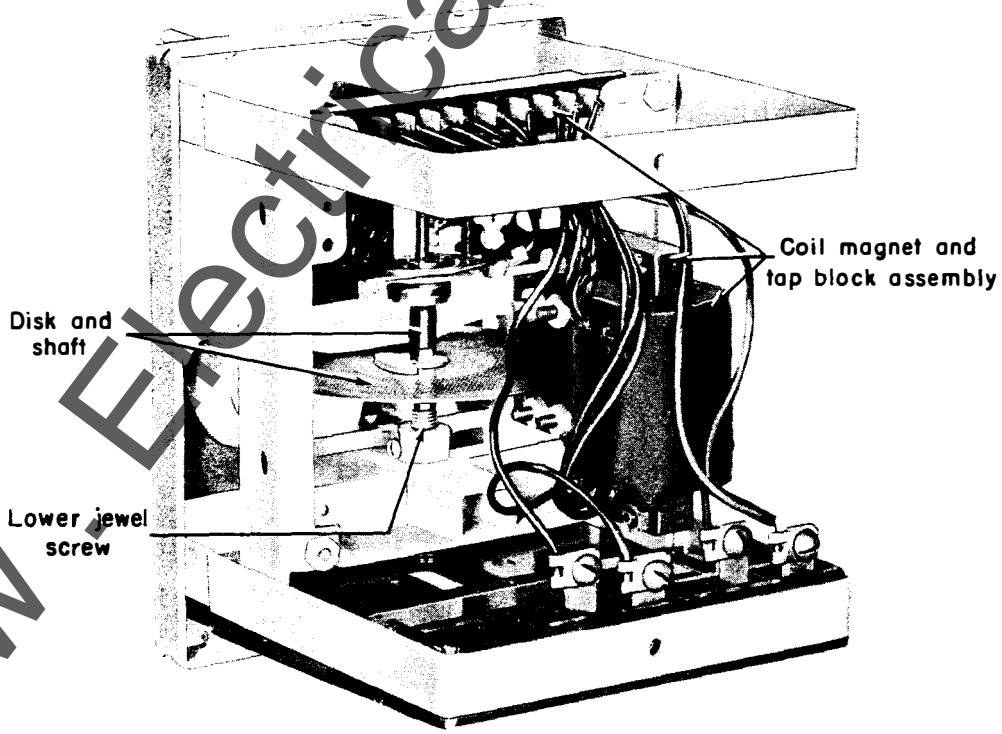


Fig. 15. Back view of Type IAV51A relay withdrawn from case

Maintenance

These relays are adjusted at the factory and it is advisable not to disturb the adjustments. If, for any reasons, 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. If it is necessary to replace the jewel, a very small drop of G-E meter jewel oil, Cat. No. 66X728 should be placed on the new jewel before it is inserted. 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.

Contacts (Cleaning)

If the contacts become dirty or slightly pitted, they should be cleaned by scraping the surface lightly with a sharp knife or by using a fine clean file. Under no circumstances should emery or crocus cloth be used on fine-silver relay contacts. Finish by wiping the contacts with a clean, soft cloth and avoid touching them with the fingers.

Periodic Testing

An operation test and inspection of the relay at least once every six months are recommended. Test connections are shown in Fig. 12 and 13.

Renewal Parts

It is recommended that sufficient quantities of renewal parts be carried in stock to enable the prompt replacement of any worn, broken, or damaged parts. Those most subject to wear in ordinary operation and to damage due to possible abnormal conditions are listed below. For illustration of parts see Fig. 14 and 15.

Ordering Directions

When ordering renewal parts, address the nearest Sales Office of the General Electric Company, specify quantity required, name of part wanted as shown by Fig. 14 and 15 and give complete nameplate data, including serial number. If possible give the General Electric Company's requisition on which the relay was furnished.

Name of Part	Quantity per Relay	Recommended Stock	
		1 Relay	5 Relays
Coil, Magnet, and Tap-block Assembly	1	1	1
Main Moving Contact and Carrier	1	1	2
Main Stationary Brush and Contact Tip Assembly	1	1	2
Seal-in Element Holding Coil	1	1	1
Seal-in Element Stationary Contact Right	1	1	2
Seal-in Element Stationary Contact Left	1	1	2
Seal-in Element Moving Contact Assembly	1	1	2
Lower Jewel Screw	1	1	1
Top Pivot	1	1	1
Disk and Shaft	1	1	1

APPARATUS DEPARTMENT

GENERAL ELECTRIC

SCHENECTADY, N. Y.

8-48 (6500)

Supersedes GEH-1266A

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