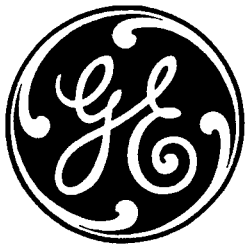


INSTRUCTIONS

GEI-10190L

DC AUXILIARY RELAYS

TYPE HGA17A TO F, H, M, R, S, T

GENERAL ELECTRIC

CONTENTS

DC AUXILIARY RELAYS

TYPE HGA17A TO F, H, M, R, S, T

DESCRIPTION

The Type HGA relays included in these instructions are double-pole, hinge-type relays suitable for application wherever a low-energy device with time-delay dropout is required. Table I lists the differences between the relays covered by these instructions.

CHARACTERISTICS

TABLE I

RELAY	Type of Connection	Contact Arrangement		Time Delay Cycles		*
		N. O.	N. C.	P. U. (Max.)	D. O. (Min.)	*
HGA17A	Back	2	1	**	15	
HGA17B	Front	2	1	**	15	
HGA17C	Front	2	1	**	15	
HGA17D	Front	2	2	3.5	**	
HGA17E	Front	0	2	3	15	
HGA17F	Back	0	2	3	15	
HGA17H	Back	2	2	3.5	**	
HGA17M	Front	2	1	**	15	
HGA17R	Front	2	2	3.5	**	
HGA17S	Front	2	1	**	15	
HGA17T	Front	2	2	3.5	**	

\+ At rated voltage and on a 60 cycle basis
** No factory calibration made

* All of these relays have a cover with the exception of the HGA17B, HGA17M and HGA17R relays.

RATINGS

The relays are available for continuous operation at DC voltage ratings up to 250 volts, and DC current ratings up to 10 amperes. They can also be supplied with a rectifier for use in AC circuits. See Table III for list of coil ratings.

The current-closing rating of the contacts is 30 amperes. The current-carrying rating is 12 amperes continuously or 30 amperes for one minute. The interrupting ratings (non-inductive circuits) for various voltages are listed in Table II.

* Indicates revision

TABLE II

VOLTS	Interrupt (single break) (Amps)	
	HGA17A, HGA17B HGA17C, HGA17M HGA17S	HGA17D, HGA17E HGA17F, HGA17H HGA17R, HGA17T
115 AC	20	30
230 AC	10	20
24 DC	3	20
48 DC	1.5	10
125 DC	0.6	3
250 DC	0.25	0.75

BURDENS

The burdens of the coils for the Type HGA relays are listed in Table III.

TABLE III

Coil Ratings Amps or Volts	Coil Resistance (Ohms)	Cold Watts	* Volt Amperes
250 VDC	10300	6.1	-
220 VDC	10300	4.8	-
150 VDC	3595	6.3	-
125 VDC	2280	6.9	-
110 VDC	1700	7.1	-
95 VDC	1470	6.2	-
72 VDC	880	5.9	-
62.5 VDC	585	6.2	-
48 VDC	375	6.2	-
32 VDC	153	6.2	-
24 VDC	98	5.8	-
12 VDC	24.5	5.9	-
10 ADC	0.055	5.5	-
5 ADC	0.21	5.3	-
4 ADC	0.35	5.6	-
3 ADC	0.62	5.6	-
2.5 ADC	0.84	5.3	-
2 ADC	1.4	5.6	-
1 ADC	5.6	5.6	-
0.5 ADC	24.5	6.2	-
460 VAC	-	-	43
230 VAC	-	-	22
208 VAC	-	-	20
115 VAC	-	-	11
70 VAC	-	-	16.5

*Includes burden of rectifier and resistor when used.

CONSTRUCTION

The relays covered by these instructions are of the same basic construction. The contact circuits are closed or opened by moving contact arms, controlled by a hinge-type armature, which in turn is actuated by an operating coil and restrained by an adjustable control spring. The length of control gap is adjustable by means of screw contacts and locknuts in the front fixed-contact positions. The armature gap and back-contact wipe can be controlled by the screws and locknuts located in the moving-contact arms. This latter feature makes it possible to reduce the pickup energy to a relatively low value. Because of this, it is necessary to back off the front left stationary-contact screw to ensure sufficient contact pressure on the remaining normally-closed contact. The coil is wound on a copper spool which also acts as a damping ring and provides a time delay on pickup and dropout.

INSTALLATION

LOCATION AND MOUNTING

The relay should be installed in a location that is clean, dry, and free from excessive vibration. It should be mounted on a vertical surface by means of the steel mounting strap on the back of the molded compound base. Care should be taken to allow sufficient clearance in front of the relay to remove the cover, if one is included.

The outline and panel drilling diagrams are shown in Figures 4 to 10. The outlines of the external resistor and external rectifiers used with AC relays are shown in Figures 11 and 12.

CONNECTIONS

The internal connection diagrams are shown in Figures 2 and 3. The external connection diagram showing the use of a rectifier with AC relays is shown in Figure 1.

MAINTENANCE

PERIODIC TESTING

Auxiliary relay equipment should be checked for operation at regular intervals, preferably at the same time that the associated protective devices are inspected. The relays should be checked for pickup and drop-out values and time settings. These settings should not require readjustment, but if changes are necessary the points discussed under ADJUSTMENTS AND INSPECTION should be observed.

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 roughtened 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 ensures the cleaning of the actual points of contact.

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 is included in the standard relay tool kit obtainable from the factory.

ADJUSTMENTS AND INSPECTION

*Relay types HGA17A, HGA17B, HGA17C, HGA17M, and HGA17S have been adjusted at the factory to pick up at 20 to 30 percent of rating for DC voltage relays and 30 to 40 percent of rating for AC voltage relays and DC current relays. Relay types HGA17D, HGA17E, HGA17F, HGA17H, HGA17R and HGA17T have been adjusted to pick up at approximately 60 per cent of rating for DC relays and 80 percent of rating for AC relays. These values may be affected by the adjustment of time delay but will be approximately equal to the values given above.

The relays adjusted for the 60 or 80 per cent pickup are set so as to produce contact pressure and wipe on two normally-closed contacts. As shipped from the factory, all relays having low (30 per cent) pickup are provided with one normally-closed contact circuit. The left-hand (front-view) screw contact is backed out of engagement with its moving contact. This is necessary since the low control-spring tension used on these relays is not great enough to give sufficient pressure on two normally-closed contacts. The low control-spring tension is necessary to facilitate the adjustment of time delay on dropout, as described in the following paragraphs.

As shipped from the factory, all relays have been adjusted for the approximate time delay as listed in Table I. This time-delay feature results from the damping effect of the copper spool. It may be adjusted over a small range by regulating the tension in the control spring. This of course affects the pickup adjustment.

The minimum recommended contact wipe is one turn of the screw in the moving contact arm. To set the wipe, close the armature by hand and adjust the screws so that they are just touching the contact carrier. Then back off each screw one full turn, and lock in place with the locknut. The minimum recommended contact gap is 3-1/2 turns of the fixed contact screw. To adjust, turn both screws in until the normally-open contacts just make. Then back off each screw 3-1/2 turns and lock in position with the locknut. Lower contact gaps are permissible in special applications but the interrupting capacities listed in TABLE II will not apply. These ratings are for the minimum recommended gap settings previously mentioned.

The pickup value is adjusted by means of the control spring located at the lower end of the armature. The control spring should be in the front hole of the spring post for relays adjusted for 30-40 per cent pickup and in the rear hole for relays adjusted for 60-80 per cent pickup.

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 catalog numbers as shown in Renewal Parts Bulletin No. GEF-2623.

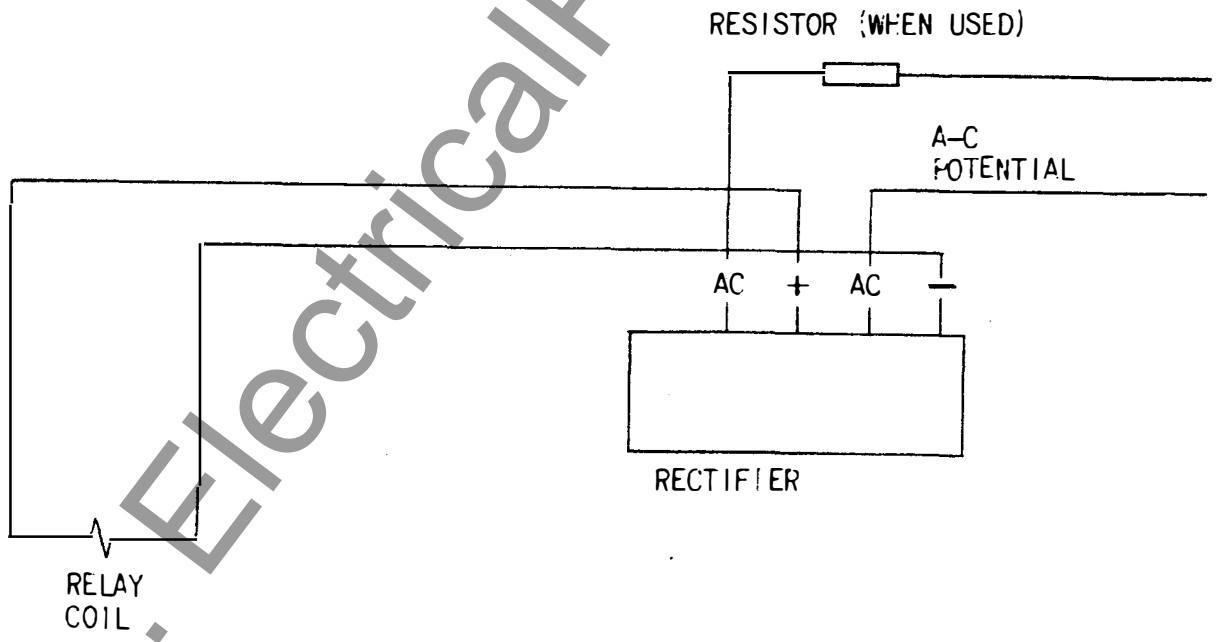


Fig. 1 (0418A0820-1) External Wiring Diagram for AC Operated HGA17 Relays

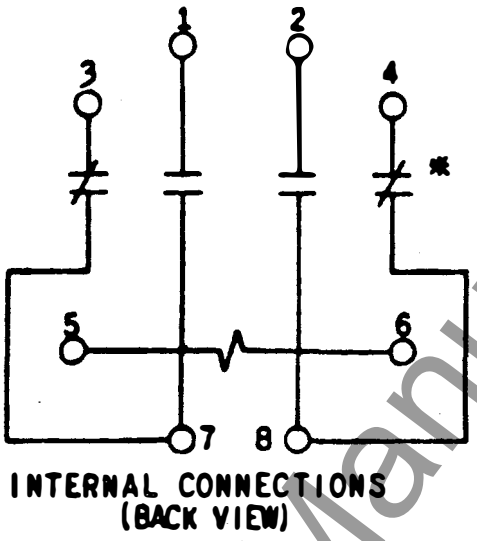


Fig. 2 (06077058-019) Internal Connection Diagram for HGA17A, HGA17B, HGA17C, HGA17D, HGA17H, HGA17M, HGA17R, HGA17S, and HGA17T Relays (Back View)

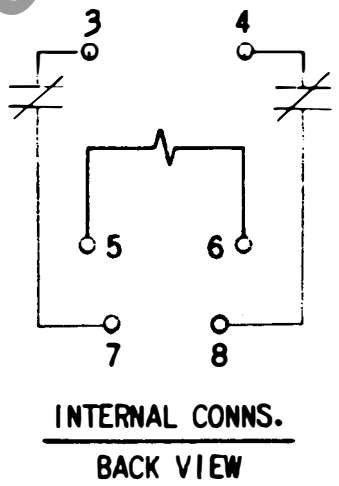
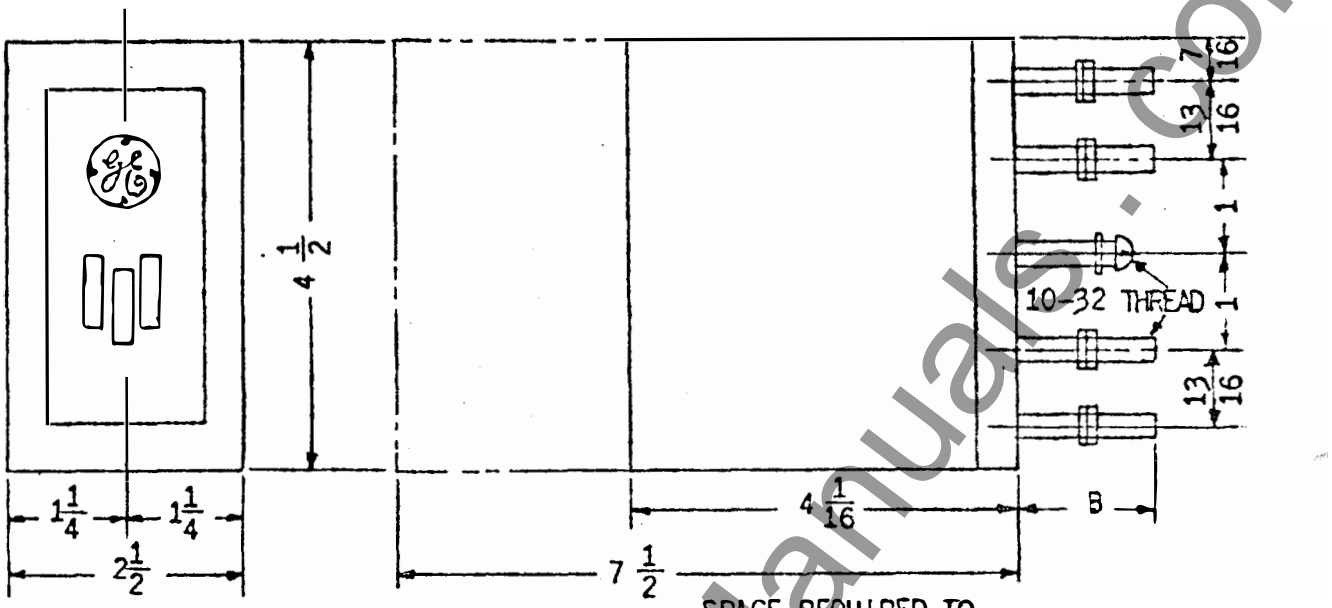
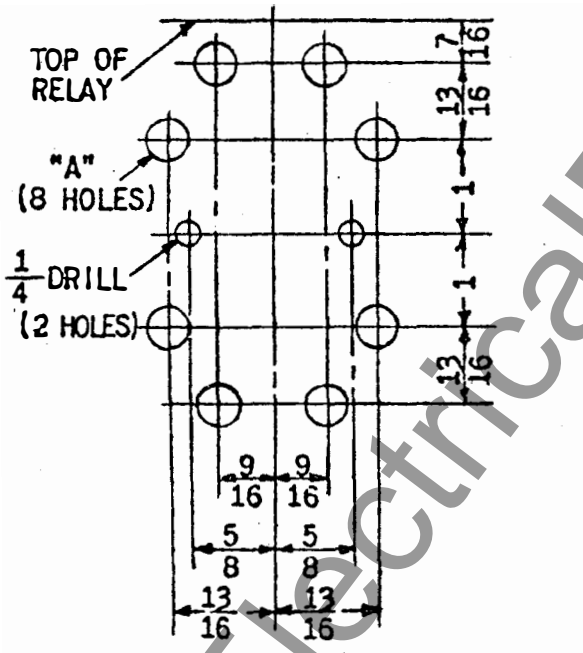


Fig. 3 (0104A8559-001) Internal Connection Diagram for HGA17E and HGA17F Relays (Back View)



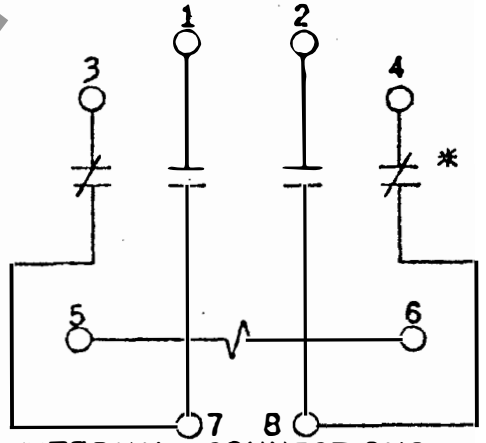
OUTLINE

SPACE REQUIRED TO REMOVE COVER



TYPE OF PANEL	"A"	"B"
INSULATING	7/16"	2-13/16"
STEEL	9/16"	1-3/8"

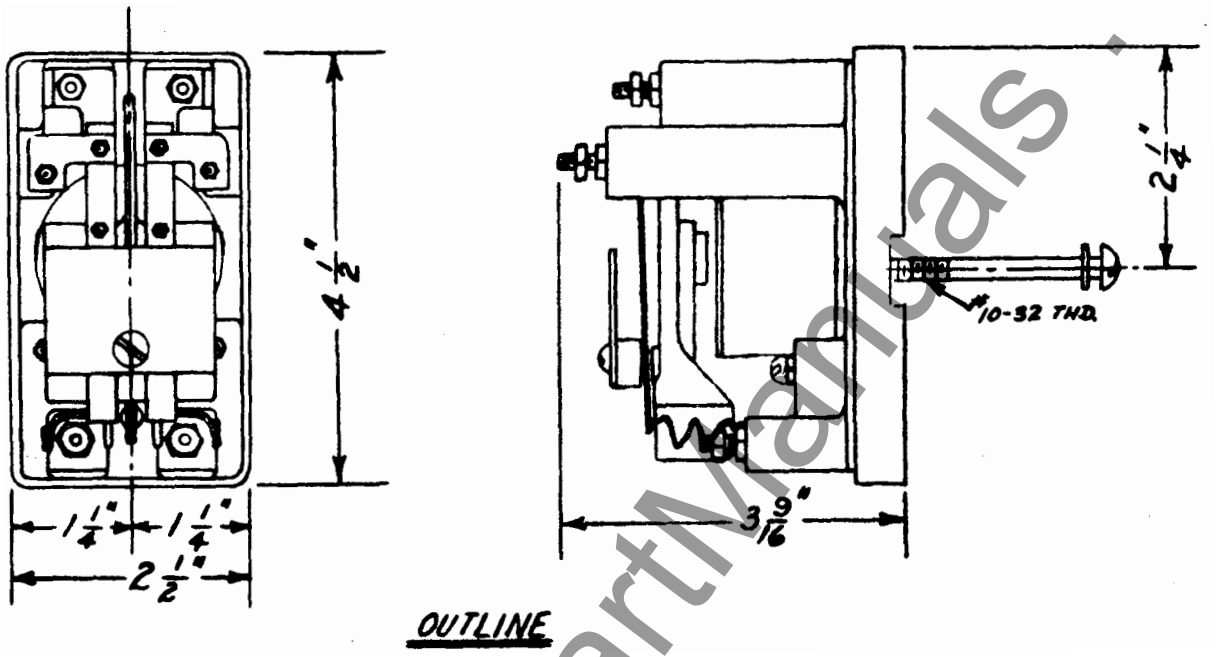
PANEL DRILLING (FRONT VIEW)



INTERNAL CONNECTIONS (BACK VIEW)

* = WITH HGA14A,14J,14K,14N,17A CONTACT 4 IS NOT USED UNLESS PICKUP IS RAISED TO 60% (DC) OR 80% (AC) OF RATING HGC11A DOES NOT USED CONTACT 4.

Fig. 4 (6077058 [20]) Outline and Panel Drilling for Surface Mounting of HGA17A and HGA17H Relays



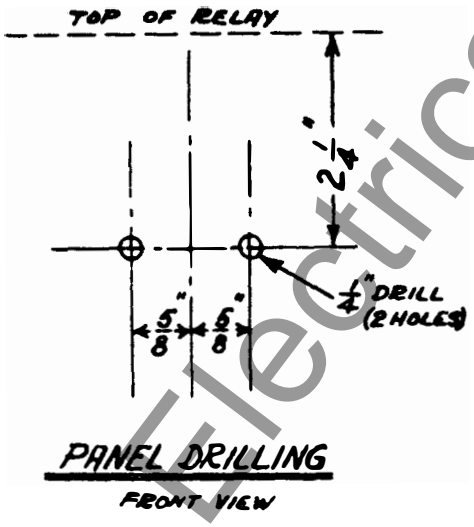


Fig. 5 (06154350-003) Outline and Panel Drilling for Surface Mounting of HGA17B Relay

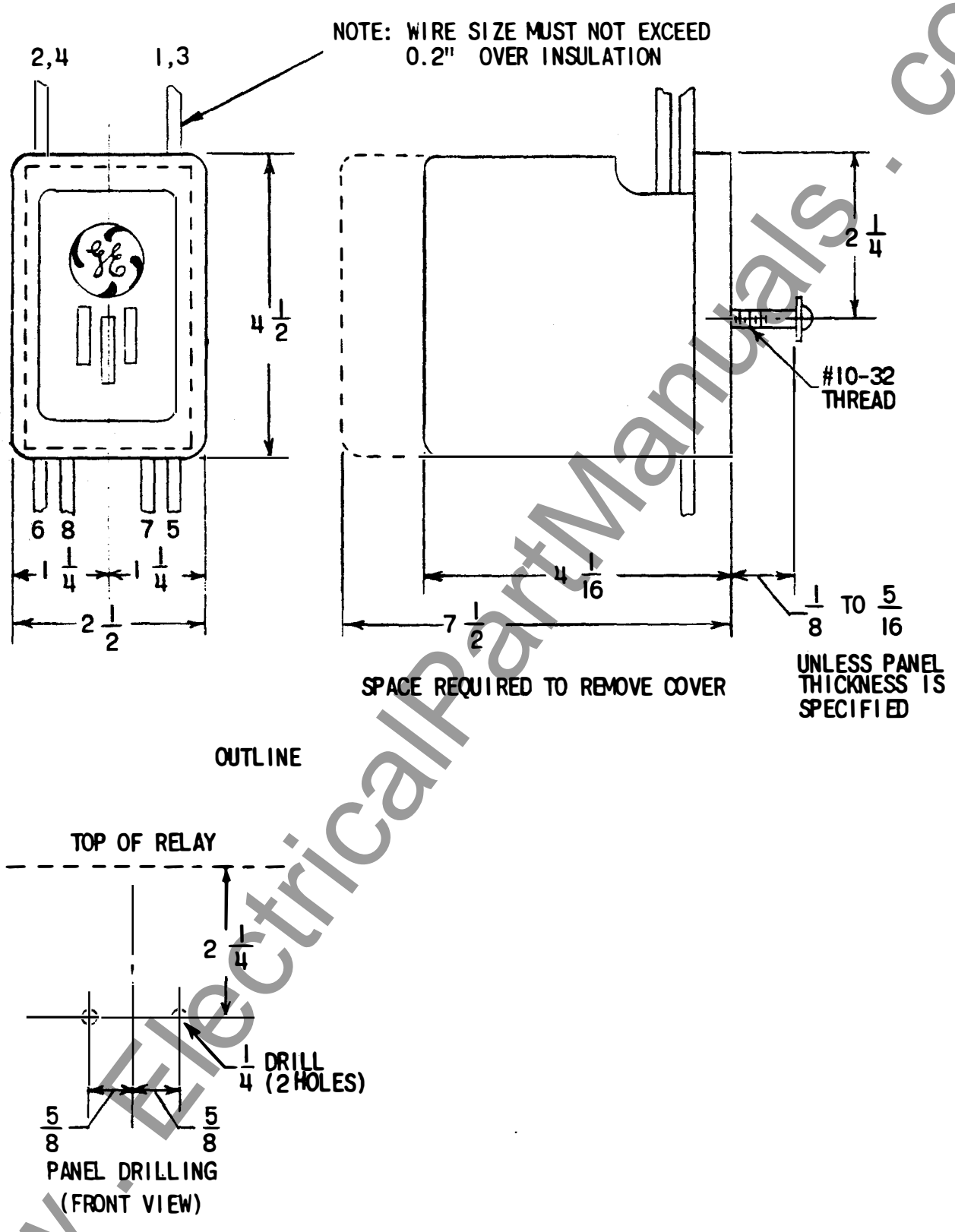
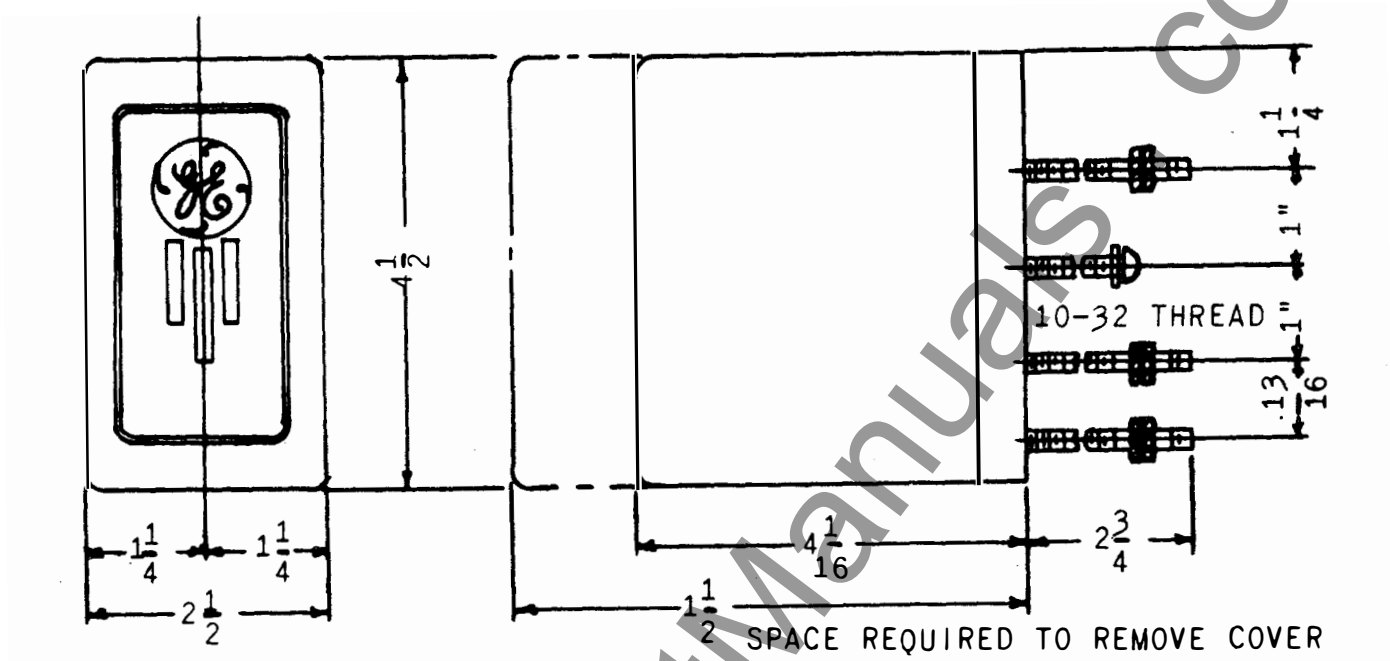
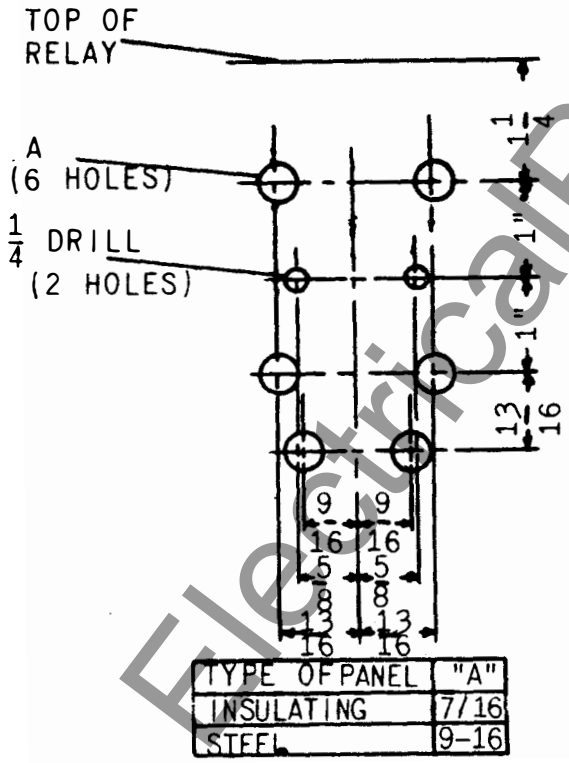


Fig. 6 (06375628-005) Outline and Panel Drilling for Surface Mounting of HGA17C, HGA17D and HGA17E Relays





TYPE OF PANEL	"A"
INSULATING	7/16
STEEL	9-16

PANEL DRILLING (FRONT VIEW)

Fig. 7 (06400409-002) Outline and Panel Drilling for Surface Mounting of HGA17F Relay

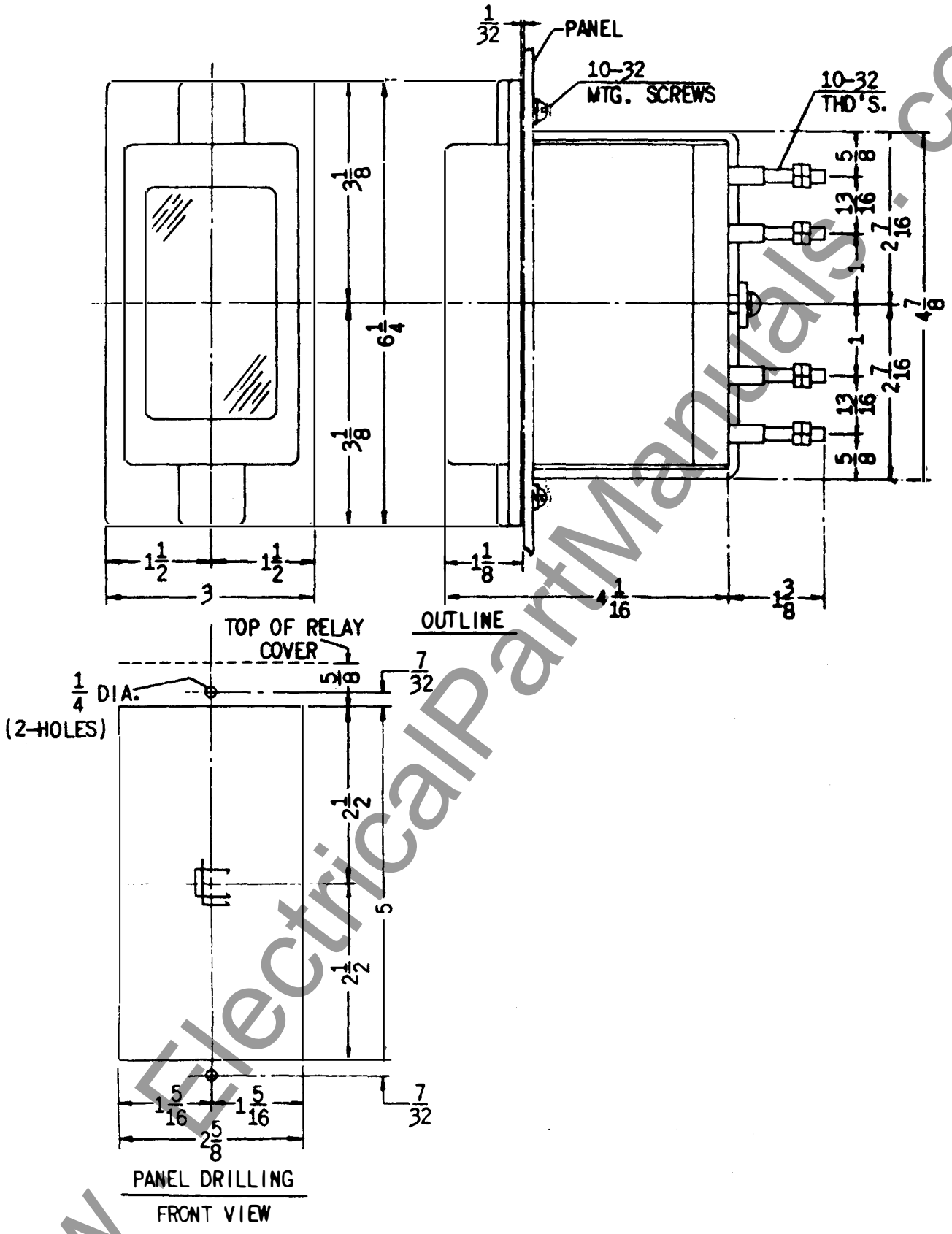


Fig. 8 (0104A8559-001) Outline and Panel Drilling for Semi-Flush Mounting of HFA17A, HGA17F and HGA17H Relays

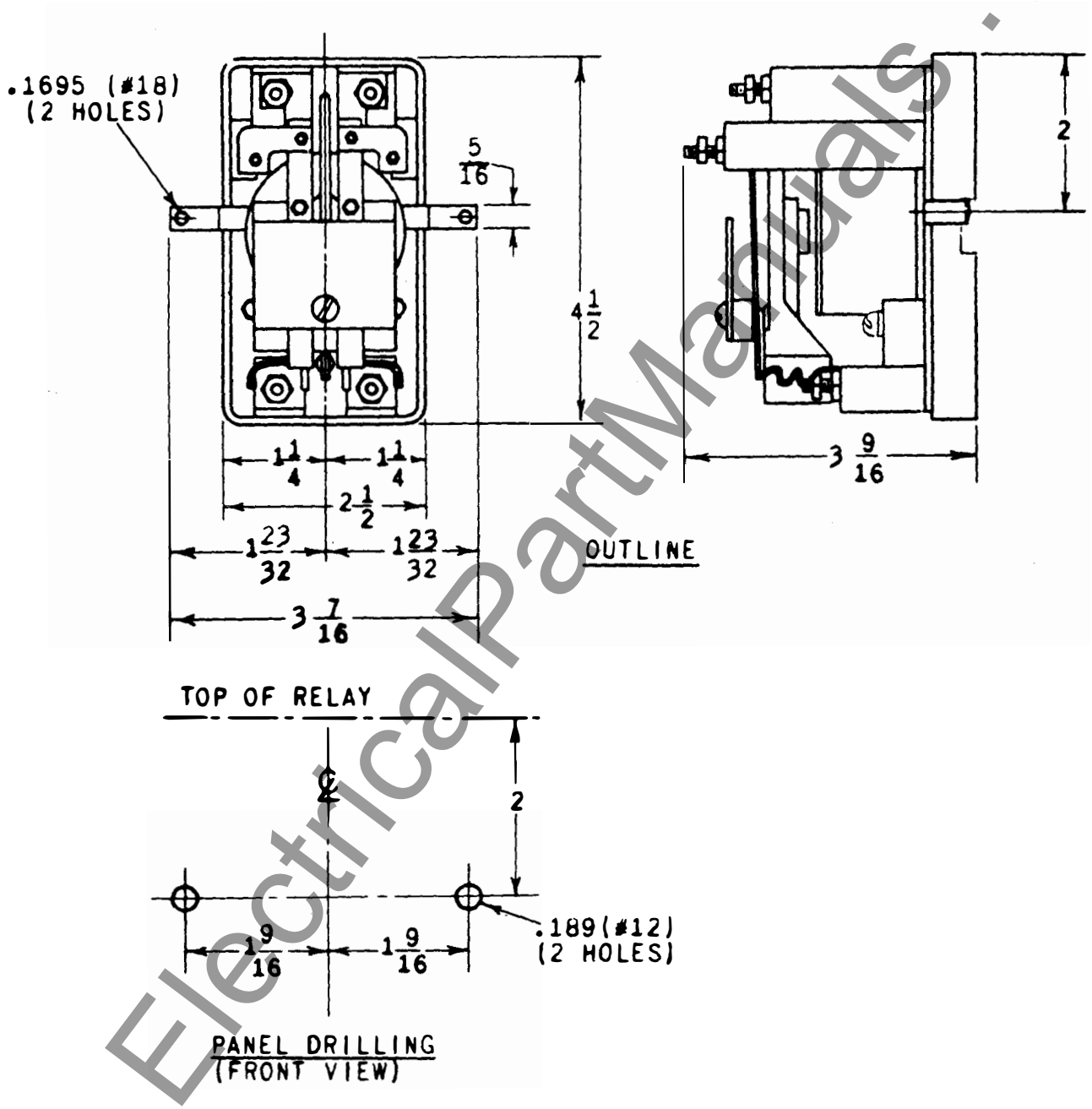


Fig. 9 (0148A3971-000) Outline and Panel Drilling for Front Mounting of HGA17M and HGA17R Relays

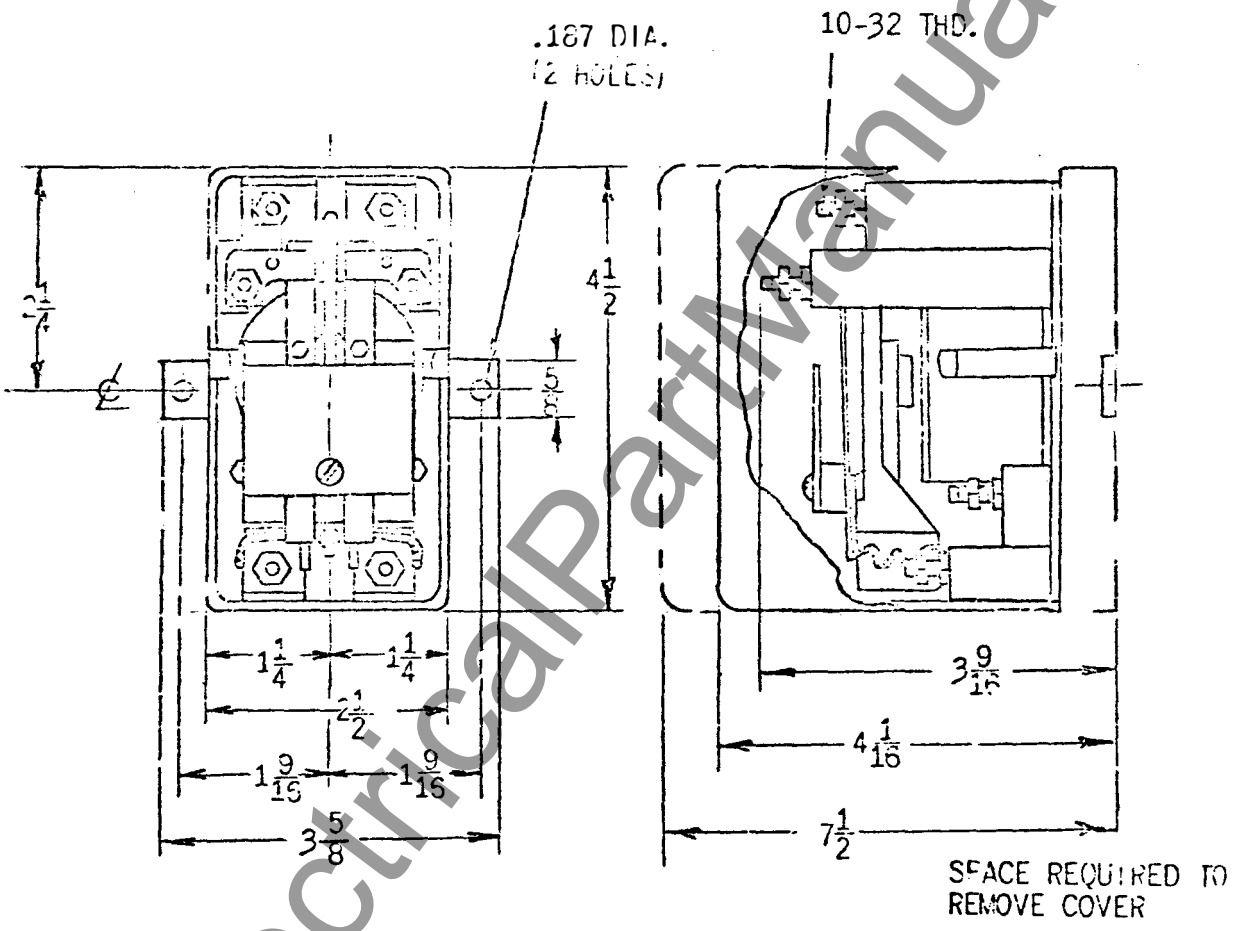


Fig. 10 (0165A7757-002) Outline and Panel Drilling for Front Mounting of HGA17S and HGA17T Relays

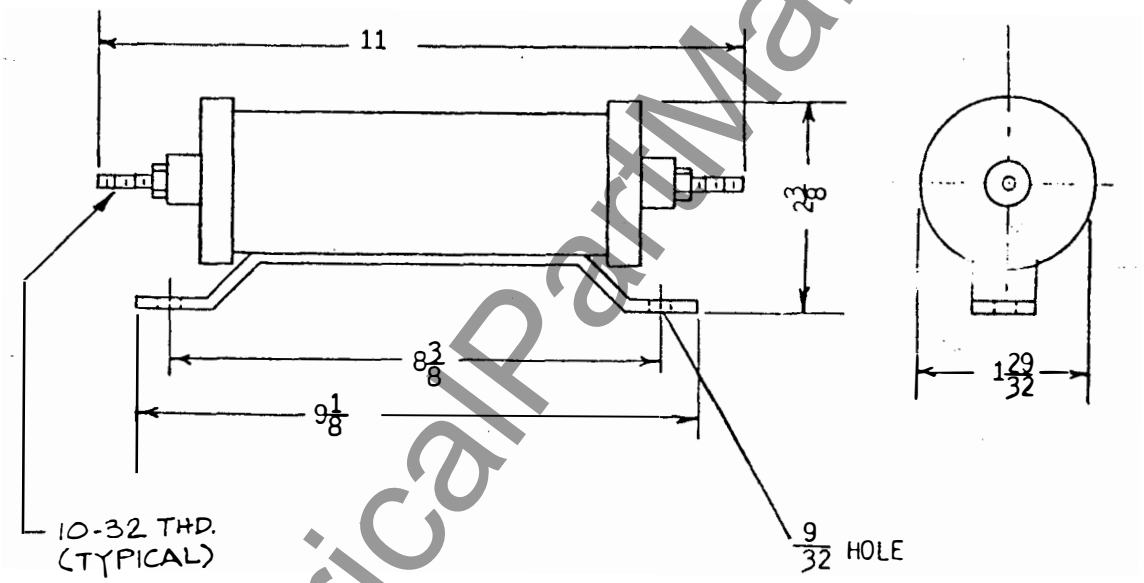


Fig. 11 (0389A0752 [2]) Outline of External Resistor Used with AC Voltage Rated HGA17 Relays

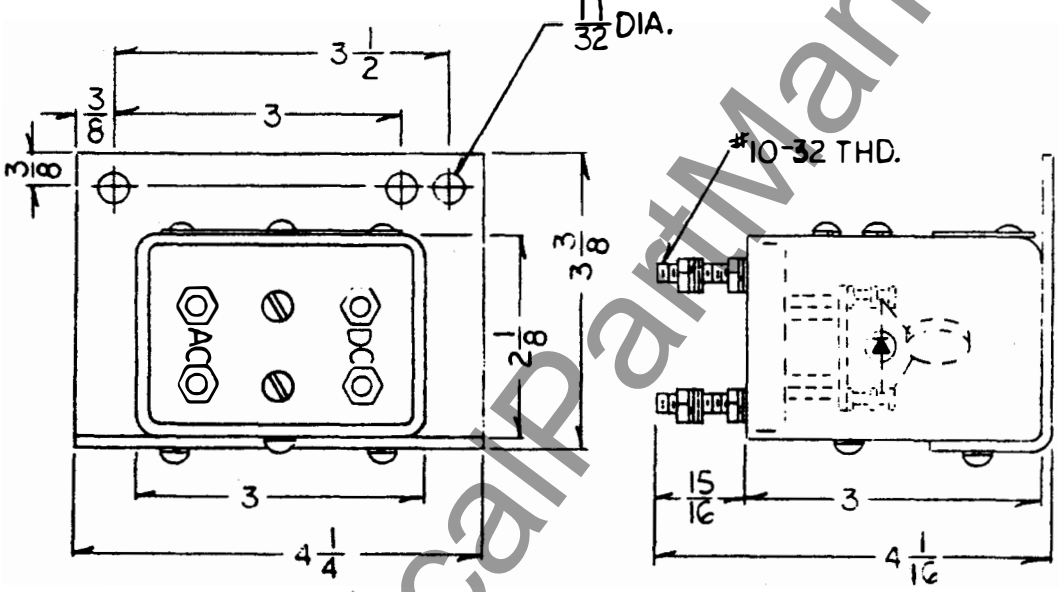


Fig. 12 (0246A6996-0) Outline and Panel Drilling for External Rectifier Used with AC Voltage Rated HGA17 Relays

INSTRUCTIONS

GEI-10190G

SUPERSEDES GEI-10190F

D-C AUXILIARY RELAYS

TYPE HGA

DESCRIPTION

INTRODUCTION

The Type HGA relays included in these instructions are double-pole, hinge-type relays suitable for application wherever a low-energy device with time-delay dropout is required. Table I lists the differences between the relays covered by these instructions.

CHARACTERISTICS

* TABLE I

RELAY	Type of Connection	Contact Arrangement		+Approx. Time Delay Cycles	
		N. O.	N. C.	P. U.	D. O.
HGA17A	BACK	2	1	‡	15
HGA17B	FRONT	2	1	‡	15
HGA17C	FRONT	2	1	‡	15
HGA17D	FRONT	2	2	3.5	‡
HGA17E	FRONT	0	2	3	15
HGA17F	BACK	0	2	3	15
HGA17H	BACK	2	2	3.5	‡

\+ At rated voltage and on a 60 cycle basis

‡ No factory calibration made

All of these relays have a cover with the exception of the HGA17B relay.

RATINGS

The relays are available for continuous operation at all standard DC voltage ratings up to 250 volts. They can also be supplied with a rectifier for use in AC circuits at 115 and 230 volts.

The current-closing rating of the contacts is 30 amperes. The current-carrying rating is 12 amperes continuously or 30 amperes for one minute. The interrupting ratings (non-inductive circuits) for the various voltages are listed in Table II.

TABLE II

VOLTS	Interrupt (single break) (Amps)	
	HGA17A, HGA17B HGA17C	HGA17D, HGA17E HGA17F, HGA17H
115 AC	20	30
230 AC	10	20
24 DC	3	20
48 DC	1.5	10
125 DC	0.6	3
250 DC	0.25	0.75

BURDENS

The burdens of the coils for the Type HGA relays are listed in Table III.

TABLE III

Coil Ratings (Volts)	Coil Resistance (Ohms)	Cold Watts	‡ Volt Amperes
250 DC	8700	7.2	——
125 DC	2200	7.1	——
48 DC	338	6.8	——
32 DC	146	7.0	——
24 DC	86	6.7	——
12 DC	21.5	6.7	——
115 AC	——	——	11
230 AC	——	——	22

‡ Includes burden of rectifier and resistor when used.

* Denotes change since superseded issue.

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.

LOW VOLTAGE SWITCHGEAR DEPARTMENT

GENERAL ELECTRIC

PHILADELPHIA, PA.

CONSTRUCTION

The relays covered by these instructions are of the same basic construction. The contact circuits are closed or opened by moving contact arms, controlled by a hinge-type armature, which in turn is actuated by an operating coil and restrained by an adjustable control spring. The length of contact gap is adjustable by means of screw contacts and locknuts in the front fixed-contact positions. The armature gap and back-contact wipe can be controlled by the screws and locknuts located on the moving-contact arms. This latter feature makes it possible to reduce the pick-up energy to a relatively low value. Because of this, it is necessary to back off the front left stationary-contact screw to insure sufficient contact pressure on the remaining normally-closed contact. The coil is wound on a copper spool which also acts as a damping ring and provides a time delay on pickup and dropout.

INSTALLATION

LOCATION AND MOUNTING

The relays should be installed in a location that is clean, dry, and free from excessive vibration. It should be mounted on a vertical surface by means of the steel mounting strap on the back of the molded compound base. Care should be taken to allow sufficient clearance in front of the relay to remove the cover, if one is included.

* The outline and panel drilling diagrams are shown in Figs. 4 to 8. The outlines of the external resistor and external rectifiers used with AC relays are shown in Figs. 9, 10 and 11.

CONNECTIONS

The internal connection diagrams are shown in Figs. 2 and 3. The external connection diagram showing the use of a rectifier with AC relays is shown in Fig. 1.

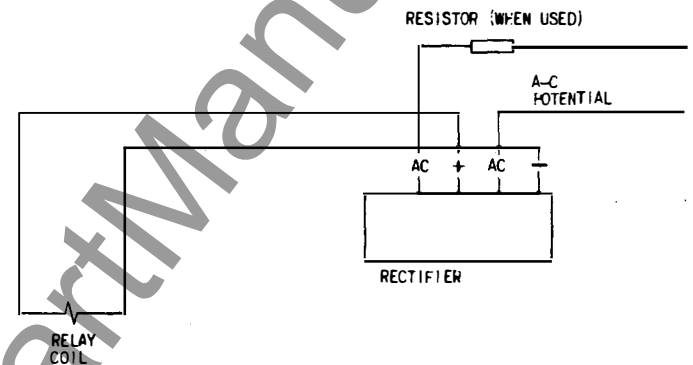


Fig. 1 (418A820-1)

* Fig. 1 External Wiring Diagram For AC Operated HGA17 Relays

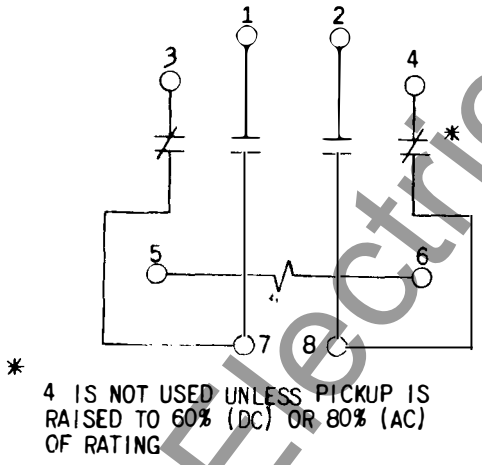


Fig. 2 (6077058-19)

Fig. 2 Internal Connection Diagram For HGA17A, HGA17B, HGA17C, HGA17D, And HGA17H Relays (Back View)

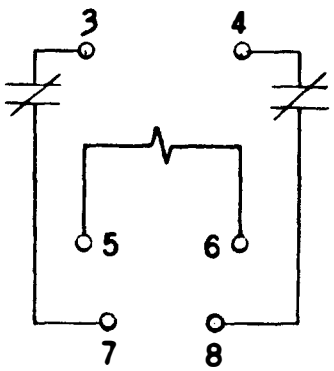


Fig. 3 (104A8559-1)

Fig. 3 Internal Connection Diagram For HGA17E And HGA17F Relays (Back View)

MAINTENANCE

PERIODIC TESTING

Auxiliary relay equipment should be checked for operation at regular intervals, preferably at the same time that the associated protective devices are inspected. The relays should be checked for pick-up and drop-out values and time settings. These settings should not require readjustment, but if changes are necessary the points discussed under ADJUSTMENTS AND INSPECTION should be observed.

* Denotes change since superseded issue.

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 roughtened 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.

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 is included in the standard relay tool kit obtainable from the factory.

ADJUSTMENTS AND INSPECTION

Relay types HGA17A, HGA17B, and HGA17C have been adjusted at the factory to pick up at 30 per cent of rating for DC relays and 40 per cent of rating for AC relays. Relay types HGA17D, HGA17E, HGA17F, and HGA17H have been adjusted to pick up at approximately 60 per cent of rating for DC relays and 80 per cent of rating for AC relays. These values may be affected by the adjustment of time delay but will be approximately equal to the values given above.

The relays adjusted for the 60 per cent pickup are set so as to produce contact pressure and wipe on two normally-closed contacts. As shipped from the factory, all relays having low (30 per cent) pickup are provided with one normally-closed contact circuit. The left-hand (front view) screw contact is backed out of engagement with its moving contact. This is necessary since the low control-spring tension used on these relays is not great enough to give sufficient pressure on two normally-closed contacts. The low control-spring tension is necessary to facilitate the adjustment of time delay on dropout, as described in the following paragraphs.

As shipped from the factory, all relays, have been adjusted for the approximate time delay as listed in Table I. This time delay feature results from the damping effect of the copper spool. It may be adjusted over a small range by regulating the tension in the control spring. This of course affects the pick-up adjustment.

The minimum recommended contact wipe is one turn of the screw in the moving contact arm. To set the wipe, close the armature by hand and adjust the screws so that they are just touching the contact carrier. Then back off each screw one full turn, and lock in place with the locknut. The minimum recommended contact gap is 3-1/2 turns of the fixed contact screw. To adjust, turn both screws in until the normally-open contacts just make. Then back off each screw 3-1/2 turns and lock in position with the locknut. Lower contact gaps are permissible in special applications but the interrupting capacities listed in TABLE II will not apply. These ratings are for the minimum recommended gap settings previously mentioned.

The pick-up value is adjusted by means of the control spring located at the lower end of the armature. The control spring should be in the front hole of the spring post for relays adjusted for 30-40 per cent pickup and in the rear hole for relays adjusted for 60-80 per cent pickup.

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-2623.

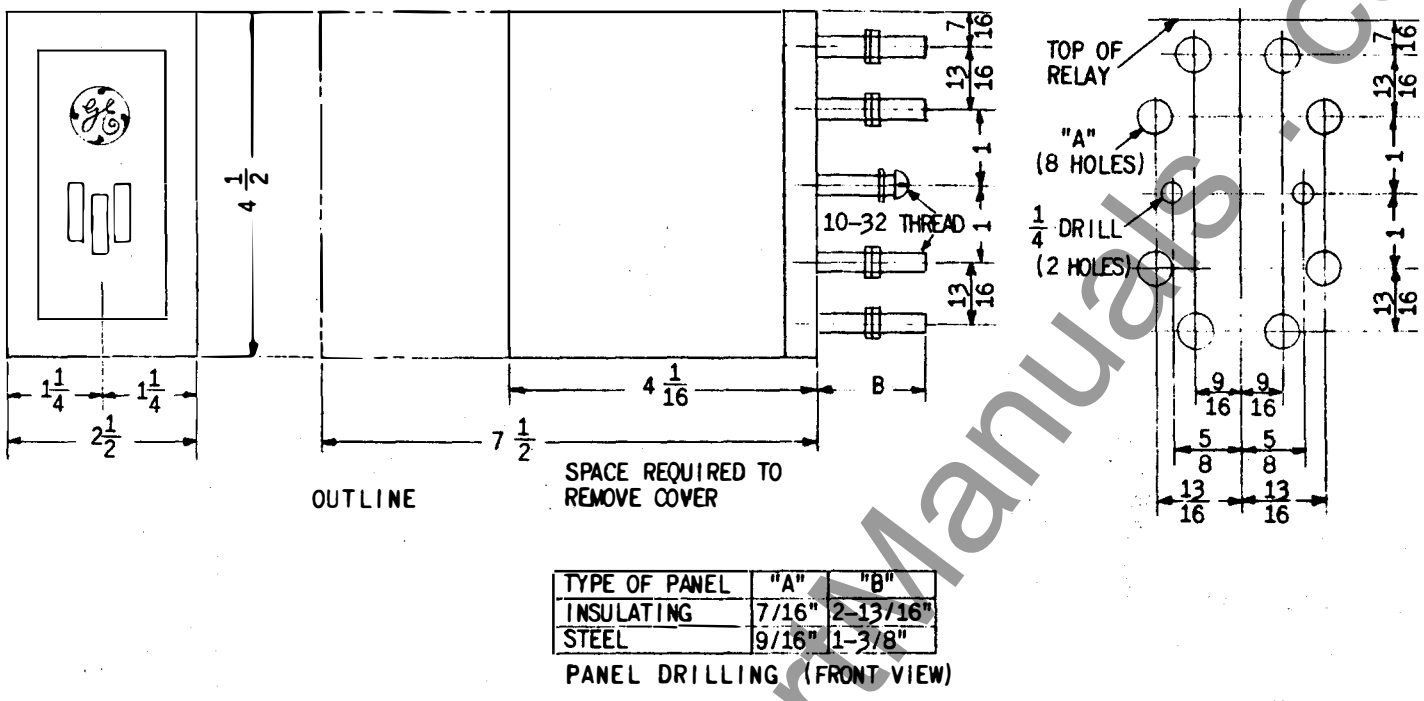


Fig. 4 (6077058-19)

Fig. 4 Outline And Panel Drilling For Surface Mounting Of HGA17A And HGA17H Relays

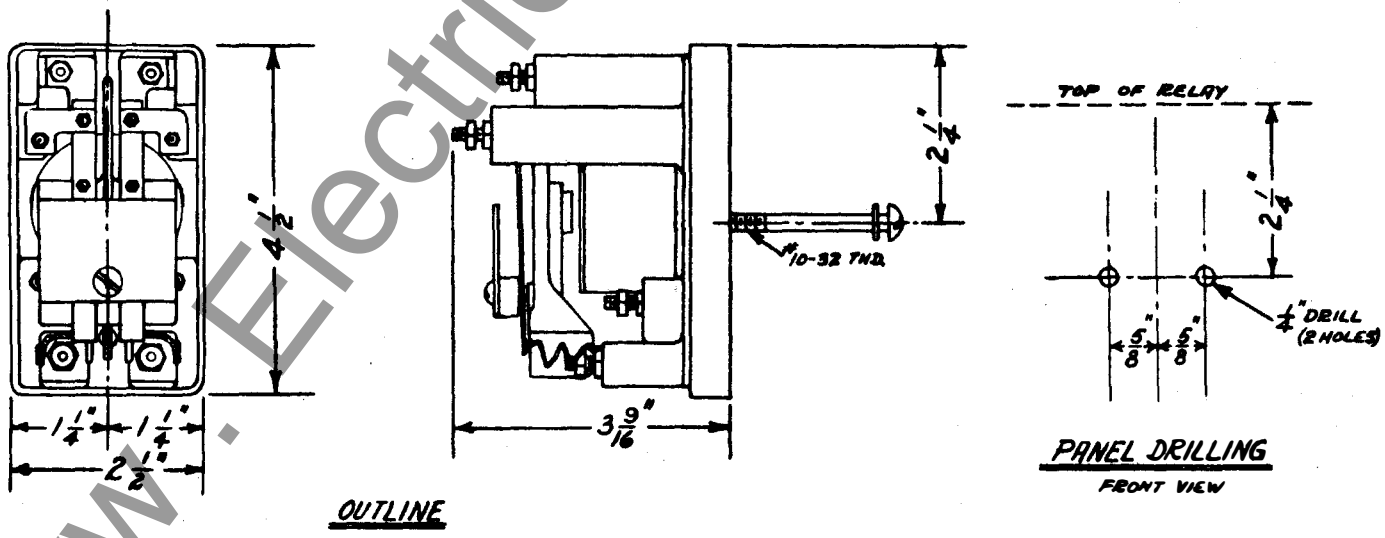


Fig. 5 (6154350-3)

Fig. 5 Outline And Panel Drilling For Surface Mounting Of HGA17B Relay

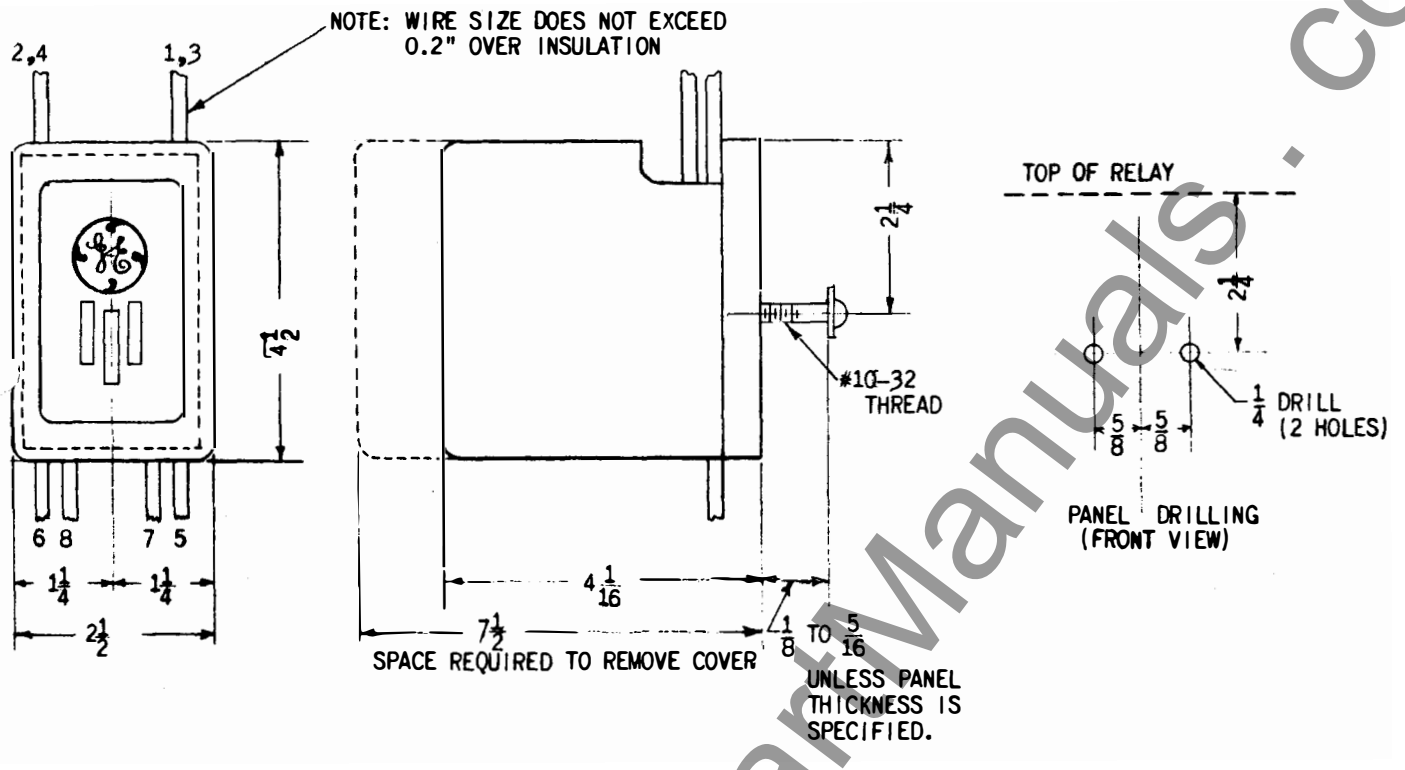


Fig. 6 (6375628-2)

Fig. 6 Outline And Panel Drilling For Surface Mounting Of HGA17D And HGA17E Relays

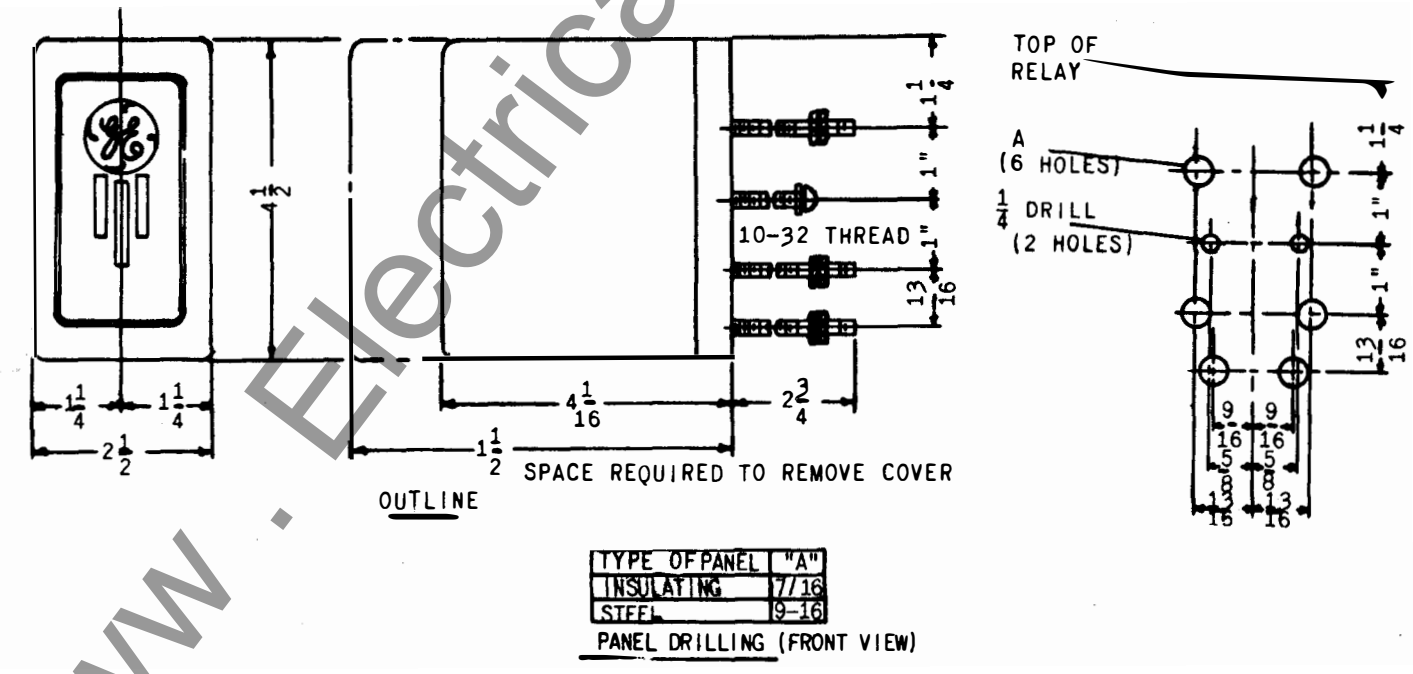


Fig. 7 (6400409-2)

Fig. 7 Outline And Panel Drilling For Surface Mounting Of HGA17F Relay

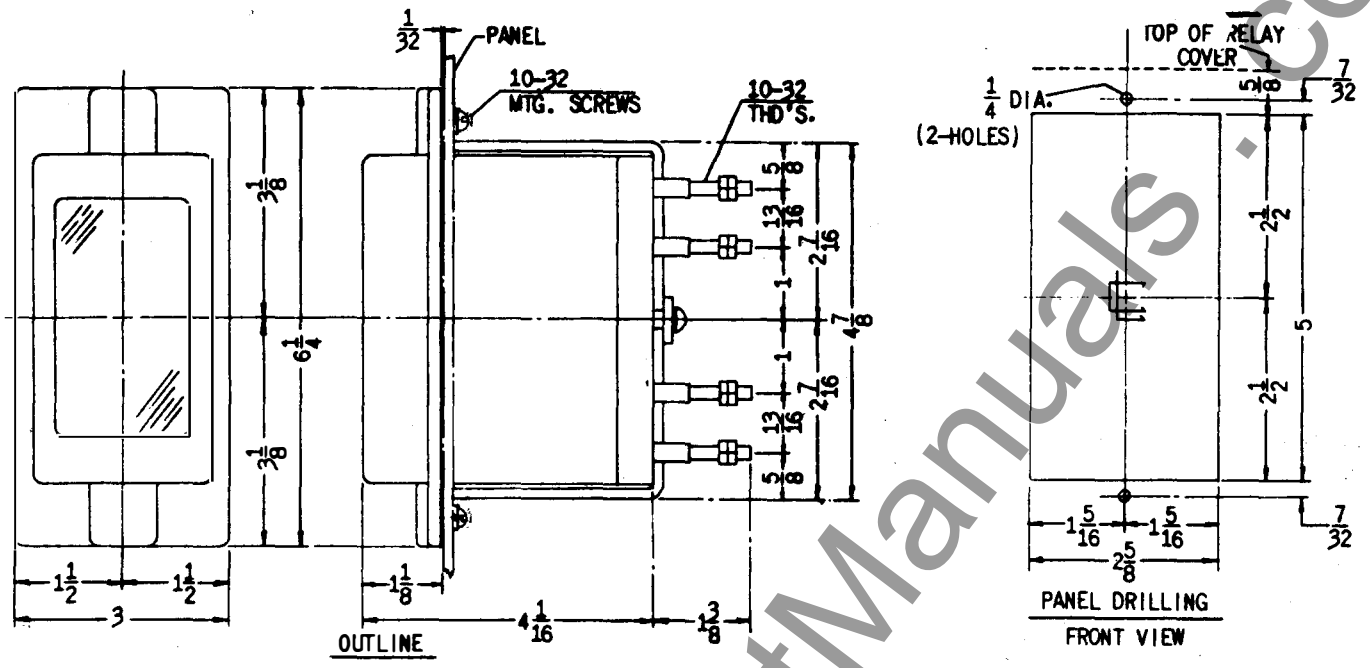


Fig. 8 (10A8559-1)

* Fig. 8 Outline And Panel Drilling For Semi-Flush Mounting Of HGA17A, HGA17F And HGA17H Relays

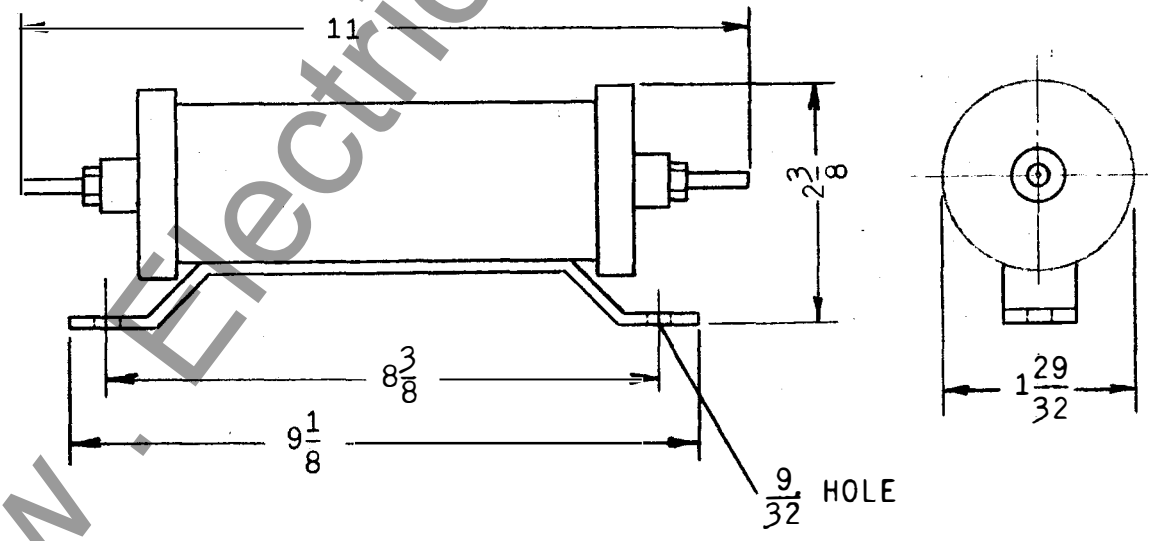


Fig. 9 (389A752-0)

* Fig. 9 Outline Of External Resistor Used With 230 Volt AC HGA17 Relays

* Denotes change since superseded book.

Fig. 10 (402A922-0)

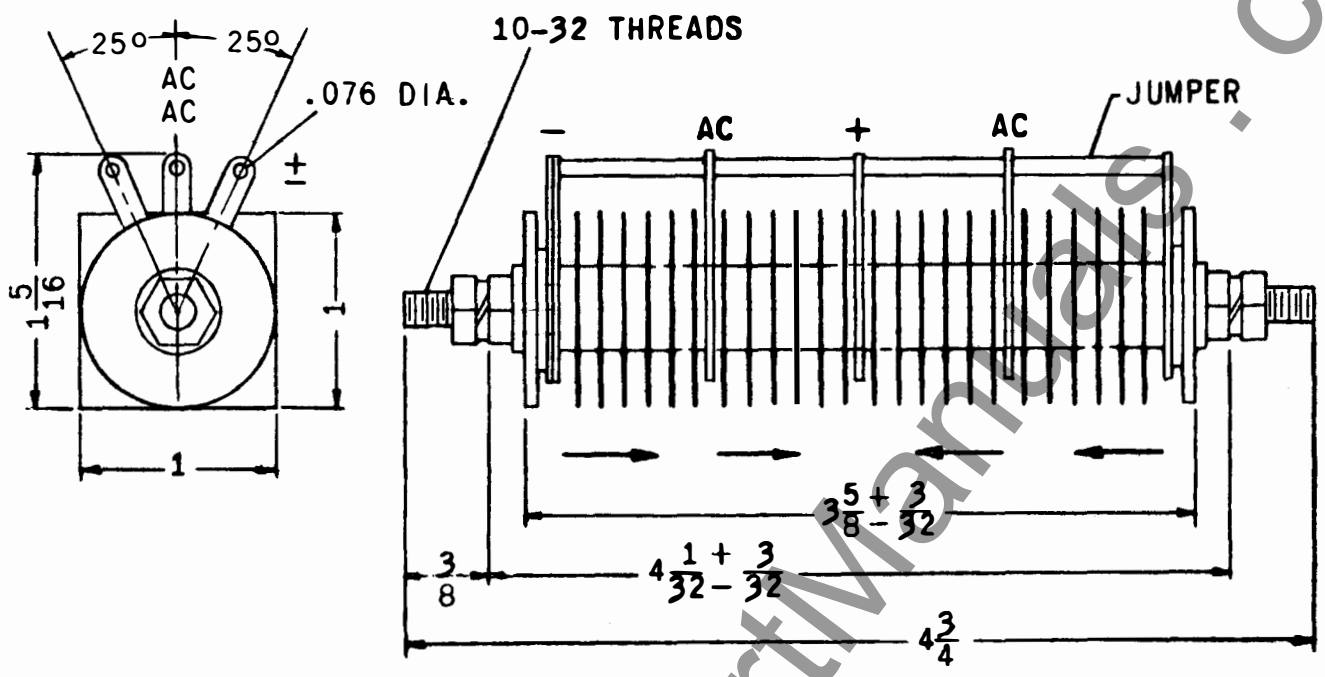


*Fig. 10 Outline Of External Rectifier Used With 115 Volt AC HGA17 Relays

Fig. 11 (1044B578-0)

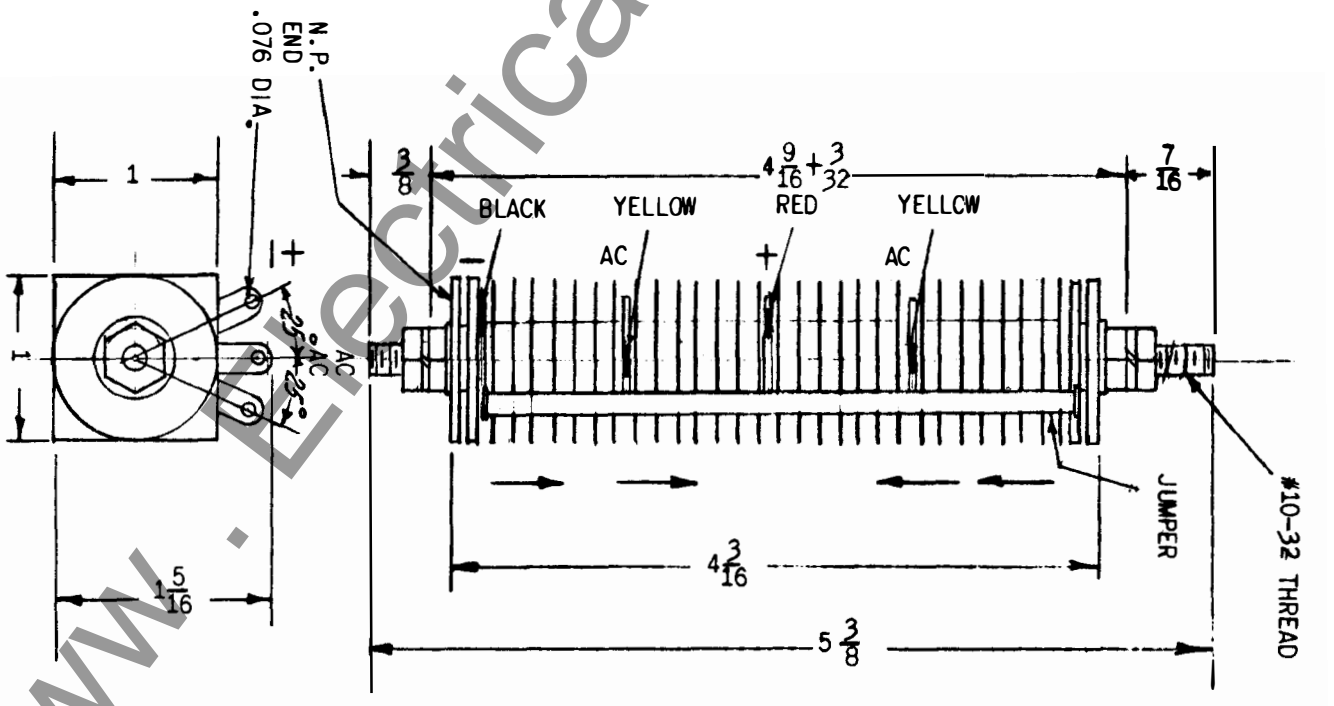


*Fig. 11 Outline Of External Rectifier Used With 230 Volt AC HGA17 Relays

* Denotes change since superseded issue.

GENERAL ELECTRIC SALES OFFICES

READY TO ASSIST YOU . . . When You Have Electrical Problems . . . Need Further Information . . . Require Ordering Instructions

SALES OFFICE CODE KEY
- * Industrial Equipment (includjng Agent and Distributor) Sales
- † Electric Utility Equipment Sales
- § Marine and Defense Equipment Sales
- ‡ Component Sales Operation

ALABAMA
- *†‡ Birmingham 35205 — 2151 Highland Ave.
- * Mobile 36602 — 704 Government St.

ARIZONA
- *†‡ Phoenix 85012 — 3550 N. Central Ave.
- *† Tucson 85711 — 151 S. Tucson Blvd.

ARKANSAS
- *‡ North Little Rock 72114 — 1900 E. Washington
- † Pine Bluff 71602 — P. O. Box 1033

CALIFORNIA
- * Fresno 93728 — 1532 N. West Ave.
- *† § Los Angeles 90054 — 212 N. Vignes St.
- ‡§ Los Angeles 90005 — 3325 Wilshire Blvd.
- * Oakland 94612 — 409 Thirteenth St.
- * Redwood City 94063 — 55 Veterans Blvd.
- *† Sacramento 95816 — 2407 "J" St.
- *† § San Diego 92103 — 2560 First Ave.
- *†‡§ San Francisco 94106 — 235 Montgomery St.
- * San Jose 95128 — 2155 So. First St.

COLORADO
- *†‡§ Denver 80201 — 201 University Blvd.

CONNECTICUT
- *† Hamden 06518 — 2905-2921 Dixwell Ave.
- *†‡ Hartford 06105 — 764 Asylum Ave.

DISTRICT OF COLUMBIA
- *† § Washington 20005 — 777—14th St., N.W.

FLORIDA
- § Cocoa Beach (Cape Canaveral Office) — 1325 N. Atlantic Ave.
- * Coral Gables 33146 — 250 Bird Road
- *† Jacksonville 32202 — 1901 Hill St.
- † Miami 33134 — 4100 West Flagler St.
- † Pensacola 32503 — First Bank Bldg.
- ‡ Tampa 33609 — Henderson Blvd. at Lois Ave.
- * Tampa 33609 — 2106 S. Lois Ave.

GEORGIA
- *†‡ Atlanta 30309 — 1860 Peachtree Rd., N.W.
- * Macon 31202 — 682 Cherry St.
- *† Savannah 31405 — 5002 Paulsen St.

IDAHO
- *† Boise 83706 — 1524 Idaho St.

ILLINOIS
- *†‡§ Chicago 60690 — 840 S. Canal St.
- *† Peoria 61603 — 2008 N.E. Perry Ave.
- * Rockford 61105 — 4223 East State St.
- † Springfield 62701 — 607 E. Adams St.

INDIANA
- *†‡ Evansville 47714 — 2709 Washington Ave.
- ‡ Fort Wayne 46807 — 1635 Broadway
- *† Fort Wayne 46806 — 3606 S. Calhoun St.
- *†‡ Indianapolis 46207 — 3750 N. Meridian St.
- *‡ South Bend 46601 — 430 N. Michigan St.

IOWA
- *† Cedar Rapids 52401 — 210 Second St., S.E.
- *†‡ Davenport 52805 — 1039 State St., Bettendorf, Iowa
- *† Des Moines 50310 — 3839 Merle Hay Rd.
- † Sioux City 51101 — 520 Pierce St.

KANSAS
- *† Wichita 67211 — 820 E. Indianapolis Ave.

KENTUCKY
- *† Lexington 40503 — 465 E. High St.
- *†‡ Louisville 40218 — 2300 Meadow Dr.

LOUISIANA
- † Alexandria 71302 — 720 Murray St.
- * Baton Rouge 70815 — 633 Oak Villa Blvd.
- * Lake Charles — 1424 Ryan St.
- †§ New Orleans 70112 — 837 Gravier St.
- * New Orleans 70125 — 4747 Earhart Blvd.
- *† Shreveport 71101 — 400 Travis St.

MAINE
- † Augusta — 152 State St.
- * Bangor 04402 — 77 Central St.

MARYLAND
- *†‡ Baltimore 21201 — 1 North Charles
- † Hagerstown — 49 East Franklin St.

MASSACHUSETTS
- *†‡§ Boston 02117 — 31 St. James Ave.
- * Springfield 01103 — 120 Maple St.
- * Worcester 01605 — 288 Grove St.

MICHIGAN
- *†‡ Detroit 48202 — 700 Antoinette St.
- * Flint 48503 — 316½ W. Court St.
- *‡ Grand Rapids 49508 — 2821 Madison Ave., S.E.
- *† Jackson 49201 — 210 W. Franklin St.
- * Kalamazoo — 927 S. Burdick St.
- † Lansing 48901 — 501 Bank of Lansing Bldg.
- * Saginaw 48607 — Second National Bank Bldg.

MINNESOTA
- *† Duluth 55802 — 14 W. Superior St.
- † Fergus Falls 56537 — 106 E. Washington St.
- *†‡ Minneapolis 55402 — 12 S. Sixth St.

MISSISSIPPI
- † Gulfport 39502 — P.O. Box 33
- † Jackson 39201 — 210 S. Lamar St.

MISSOURI
- * Joplin 64802 — 212½ W. Fifth St.
- *†‡ Kansas City 64105 — 106 W. Fourteenth St.
- *‡ St. Louis 63101 — 1015 Locust St.

MONTANA
- *† Billings 59101 — 303 N. Broadway
- *† Butte 59701 — 103 N. Wyoming St.

NEBRASKA
- *† Omaha 68102 — 409 S. Seventeenth St.

NEVADA
- † Las Vegas 89106 — 1711 S. 8th St.

NEW HAMPSHIRE
- † Manchester 03104 — 1662 Elm St.

NEW JERSEY
- *†‡ East Orange 07017 — 26 Washington St.

NEW MEXICO
- *† Albuquerque 87108 — 120 Madeira Drive, N.E.

NEW YORK
- *†§ Albany 12203 — 8 Colvin Ave.
- † Binghamton 13902 — 19 Chenango St.
- *†‡ Buffalo 14202 — 625 Delaware Ave.
- *†§ New York 10022 — 570 Lexington Ave.
- *†‡ Rochester 14604 — 89 East Ave.
- *†‡ Syracuse 13206 — 3532 James St.
- * Utica 13501 — 1001 Broad St.
- ‡ Waverly 14892 — P.O. Box 308

NORTH CAROLINA
- *†‡ Charlotte 28202 — 129 W. Trade St.
- * Greensboro 27405 — 801 Summit Ave.
- *† Raleigh 27602 — 16 W. Martin St.

NORTH DAKOTA
- † Bismarck 58501 — 418 Rosser Ave.

OHIO
- *† Akron 44313 — 2858 W. Market St.
- *† Canton 44701 — 515 Third St., N.W.
- *†‡ Cincinnati 45206 — 2621 Victory Pkwy.
- *†‡§ Cleveland 44104 — 4966 Woodland Ave.
- *† Columbus 43215 — 395 E. Broad St.
- ‡ Columbus 43212 — 937 Burrell Ave.
- *‡ Dayton 45402 — 11 W. Monument Ave.
- *†§ Dayton 45402 — 118 W. First St.
- ‡ Mansfield 44906 — 564 Park Ave., West
- *†‡ Toledo 43606 — 3125 Douglas Rd.
- * Youngstown 44507 — 272 E. Indianola Ave.

OKLAHOMA
- *† Oklahoma City 73106 — 2000 Classen Blvd.
- *† Tulsa 74114 — Columbia Bldg., 2651 E. 21st St.

OREGON
- *† Eugene 97401 — 1170 Pearl St.
- *† Medford 97501 — 107 E. Main St.
- *†‡ Portland 97210 — 2929 N.W. 29th Ave.

PENNSYLVANIA
- *† Allentown 18102 — 732 North 16th St.
- * Erie 16501 — 1001 State St.
- *† Johnstown 15902 — 841 Oak St.
- *†‡§ Philadelphia 19102 — 3 Penn Center Plaza
- *†‡ Pittsburgh 15222 — The Oliver Bldg., Mellon Sq.
- §Pittsburgh 15228 — 733 Washington Rd.
- *‡ York 17403 — 56 N. Harrison St.

SOUTH CAROLINA
- *† Columbia 29201 — 1310 Lady St.
- * Greenville 29602 — 108 W. Washington St.

TENNESSEE
- *†‡§ Chattanooga 37402 — 832 Georgia Ave.
- * Kingsport 37662 — 322 Commerce St.
- *† Knoxville 37916 — 1301 Hannah Ave., N.W.
- *† Memphis 38104 — 1420 Union Ave.
- * Murfreesboro — P.O. Box 1040
- *‡ Nashville 37203 — 1717 W. End Bldg.
- § Oak Ridge — 253 Main St., East

TEXAS
- † Abilene 79601 — 442 Cedar St.
- *† Amarillo 79101 — 403 Amarillo Blvd.
- *† Beaumont 77701 — 1385 Calder Ave.
- † Corpus Christi 78401 — 205 N. Chaparral
- *†‡ Dallas 75207 — 8101 Stemmons Freeway
- *† El Paso 79901 — 215 N. Stanton St.
- † Fort Worth 76102 — 408 W. Seventh St.
- *†‡§ Houston 77027 — 4219 Richmond Ave.
- *† Lubbock 79408 — 500 E. 50th St.
- * Midland — 122 North N St.
- *† San Antonio 78204 — 419 S. Main Ave.

UTAH
- *† § Salt Lake City 84110 — 200 S. Main St.

VERMONT
- † Rutland — 38½ Center St.

VIRGINIA
- * § Newport News 23601 — P.O. Box 1038, 311 Main St.
- *† Richmond 23230 — 3001 W. Broad St.
- *† Roanoke 24005 — 920 S. Jefferson St.

WASHINGTON
- † Pasco 99301 — 824 W. Lewis St.
- *† § Seattle 98104 — 710 Second Ave.
- * Spokane 99220 — S. 162 Post St.
- † Spokane 99220 — E. 1805 Trent St.

WEST VIRGINIA
- * Charleston 25328 — 306 MacCorkle Ave., S.E.
- *† Fairmont 26555 — 310 Jacobs Bldg.
- * Wheeling — 40 Fourteenth St.

WISCONSIN
- *† § Appleton 54910 — 510 W. College Ave.
- † Madison 53703 — 340 W. Washington Ave.
- *†‡ Milwaukee 53233 — 940 W. St. Paul Ave.

CANADA: Canadian General Electric Company, Ltd., Toronto

HAWAII: American Factors, Ltd., P.O. Box 3230, Honolulu 96801

GENERAL ELECTRIC SERVICE SHOPS

WHEN YOU NEED SERVCE . . . These G-E service shops will repair, recondition, and rebuild your electric apparatus. The facilities are available day and night, seven days a week, for work in the shops or on your premises. Latest factory methods and genuine G-E renewal parts are used to maintain peak performance of your equipment. For full information about these services, contact your nearest service shop or sales office.

ALABAMA
- Birmingham 35211, P.O. Box 3687 — 7—18th St., S.W.

ARIZONA
- (Phoenix) Glendale 85301 — 4911 West Colter St.

CALIFORNIA
- Los Angeles 90001 — 6900 Stanford Ave.
- *(Los Angeles) Ontario — Ontario International Airport
- Oakland 94608 — 3400 Wood St.
- Sacramento 95814 — 99 North 17th St.
- San Francisco 94103 — 1098 Harrison St.

COLORADO
- Denver 80205 — 3353 Larimer St.

CONNECTICUT
- (Southington) Plantsville 06479 — 370 Atwater St.

FLORIDA
- Jacksonville 32203 — P.O. Box 2932, 2020 W. Beaver St.
- (Miami) Hialeah 33010 — 1062 E. 28th St.
- Tampa 33601 — P.O. Box 1245

GEORGIA
- (Atlanta) Chamblee 30005 — 5035 Peachtree Industrial Blvd.

ILLINOIS
- Chicago 60632 — 4360 W. 47th St.

INDIANA
- Ft. Wayne 46803 — 1731 Edsall Ave.
- Indianapolis 46222 — 1740 W. Vermont St.

IOWA
- (Davenport) Bettendorf 52722 — 1025 State St.

KANSAS
- *(Strother) Arkansas City — G.E. Co., P.O. Box 797

KENTUCKY
- Louisville 40209 — 3900 Crittenden Drive

LOUISIANA
- New Orleans 70117 — 1115 De Armas St.

MARYLAND
- Baltimore 21230 — 920 E. Fort Ave.

MASSACHUSETTS
- (Boston) Medford 02155 — 3960 Mystic Valley Parkway

MICHIGAN
- Detroit 48202 — 5950 Third St.

MINNESOTA
- Minneapolis 55430 — 2025—49th Ave., N.

MISSOURI
- Kansas City 64120 — 3525 Gardner Ave.
- St. Louis 63110 — 1115 East Road

NEW YORK
- Albany 12205 — 1097 Central Ave.
- Buffalo 14211 — 318 Urban St.
- *(New York) Linden, N. J. — 1611 W. Elizabeth Ave.
- (New York) North Bergen, N. J. 07047 — 6001 Tonnelle Ave.
- Schenectady (Instrumentation Service) 12305 — 1 River Road

NORTH CAROLINA
- Charlotte 28208 — 2328 Thrift Road

OHIO
- Cincinnati 45202 — 444 W. Third St.
- *Cincinnati 45232 — 260 W. Mitchell Ave.
- Cleveland 44125 — 4477 East 49th St.
- Columbus 43223 — P.O. Box 6198, 2128 Eakin Rd.
- Toledo 43605 — 405 Dearborn Ave.
- Youngstown 44507 — 272 E. Indianola Ave.

OREGON
- Portland 97210 — 2727 N.W. 29th Ave.

PENNSYLVANIA
- Allentown 18103 — 668 E. Highland St.
- Johnstown 15902 — 841 Oak St.
- Philadelphia 19124 — 1040 E. Erie Ave.
- (Pittsburgh) Homestead 15120 — 4930 Buttermilk Hollow Rd., RD #1, West Mifflin, Pa. 15122
- York 17403 — 54 N. Harrison St.

TEXAS
- Corpus Christi 78401 — 115 Waco St.
- Dallas 75235 — 3202 Manor Way
- Houston 77020 — 5534 Harvey Wilson Drive
- Midland 79704 — 704 S. Johnston St.

UTAH
- Salt Lake City 84104 — 301 S. 7th West St.

VIRGINIA
- Richmond 23224 — 1403 Ingram Ave.
- Roanoke 24007 — P.O. Box 1327, 115 Albermarle Ave., S.E.

WASHINGTON
- Seattle 98134 — 3422 First Ave., S.
- *Seattle 98108 — 220 Dawson St.
- Spokane 99206 — E. 4323 Mission St.

WEST VIRGINIA
- Charleston 25328 — 306 MacCorkle Ave.

WISCONSIN
- Appleton 54910 — Midway Industrial Area
- P.O. Box 83 County Trunk P
- Milwaukee 53233 — 940 W. St. Paul Ave.

GENERAL ELECTRIC COMPANY, PHILADELPHIA, PA.

PRINTED IN U.S.A.