INSTRUCTIONS

GEI-39016 C
Supersedes GEI-39016 B

RECLOSING RELAYS

TYPES

HGA18H

HGA18J

GENERAL ELECTRIC

CONTENTS

RECLOSING RELAYS

TYPES

HGA18H and HGA18J

INTRODUCTION

These instructions are intended to provide the information to test and install the HGA18H and HGA18J relays.

DESCRIPTION

GENERAL

The HGA18H and J relays are self resetting, "single-shot" reclosing relays which initiate immediate reclosure of a power circuit breaker. They operate only if a predetermined time has elapsed since the last successful reclosure.

These relays are designed for use where a single immediate reclosure of circuit breakers is desired. In the event that the breaker reopens immediately after reclosure, indicating a continuation of abnormal conditions, the apparatus remains locked out. The relays are suited for use in applications where the requirements of continuity of service do not justify subsequent time reclosures, such as the Type ACR and Type NLR relays provide.

TABLE I

RELAY	TARGET AVAILABLE	CASE
HGA18H	No	S2
HGA18J	Yes	S2

These relays are available in ratings of 115 and 230 volts for a-c applications. They can be factory calibrated for operation at frequencies between 25 and 60 cycles.

A list of illustrations follows for the reader's convenience.

TABLE II

APPLICATION

The Type HGA18H and HGA18J single-shot reclosing relays are typically applied on transmission lines in locations where the control voltage is a-c. They can be operated at frequencies from 25 to 60 hertz, but must be calibrated at the factory for the required frequency.

Typical external connections for the HGA18H and HGA18J relays are shown in Figure 1. In this schem operation of the reclosing relay is initiated by a breaker "b" switch which would be typical of installations where a-c control voltage is involved, and reclosing of the breaker is by means of the indicated circuit breaker control device.

When making the connections, it is important to note that the operating and holding coils produce flux in the same magnetic circuit. Hence the polarity of the connections to these coils, as shown in Figure 1, must be observed.

CONTROL SWITCHES

It will be noted in Figure 1 that a Type SB1 control switch (model 16SB1B9) is recommended where these relays are used. The control switch diagram is shown in Figure 1. This switch has extra contacts which prevent the Type HGA18 relay from reclosing the breaker after it has been tripped by means of the control switch. If tripped in this manner, the breaker must be reclosed by the control switch before the automatic reclosing feature is restored.

UNDERVOLTAGE DEVICES

In order to obtain full advantage of immediate initial reclosure, undervoltage devices used on circuits reclosed by the Type HGA18 relays should have a one or two second time delay. This prevents shutting down of motors during the reclosing period.

LATCH CHECKING SWITCHES

In order to ensure successful operation of breakers reclosed by Type HGA18 relays, it is necessary to add a latch-checking switch to all trip-free solenoid mechanisms. This switch completes the closing circuit only after the mechanism latch is properly reset for the reclosure. Latch-checking switches are not required for non-trip-free solenoid mechanisms.

HOLDING COIL CIRCUIT

This circuit must be complete (except for its own 4-5 contact) no later than the instant when the operating coil becomes energized, and must remain complete until reclosure has progressed to the point where it will carry through even if the reclosing relay opens the closing circuit. The holding coil is suitable for continuous duty at relay rated voltage as indicated on the nameplate.

OVERCURRENT RELAYS

The protective relays that trip the breaker obviously must open their contacts before the breaker recloses; otherwise the breaker may trip a second time even though the fault has cleared. Some of the superseded types of induction relays, such as the IA-201, are not satisfactory for use with the Type HGA18 relays. Refer such cases to the General Electric Apparatus Sales Office for recommendations and prices.

PUMP-FREE CONTROL

The HGA18 operating coil circuit must be held closed long enough to discharge the capacitor to 10 percent of rated voltage, which will ensure at least 80 percent of nominal reset time. This minimum energization time is 7 cycles for the standard forms and 20 cycles for the shock-resistant forms (60 Hz base).

If the HGA18 is to provide the necessary pump-free feature, both the holding-coil circuits must be interrupted and the operating-coil circuit must reach dropout, at least 3 cycles before the closure of the main contacts of the controlled circuit breaker. (The time for the operating-coil circuit to reach dropout is the same as the 10 percent voltage time listed above.) Otherwise the control scheme must inherently provide pump-free operation with the HGA18 remaining closed.

CIRCUIT BREAKER INTERRUPTING RATINGS

The derating factors applying to the interrupting rating of the associated circuit breaker should be checked prior to the application of the HGA18 reclosing relays.

RATINGS

CONTACTS

The current-closing rating of the contacts is 30 amperes for voltages not exceeding 250 volts. The contacts have a current-carrying rating of 12 amperes continuously or 30 amperes for one minute. Interruption ratings (non-inductive circuits) for various voltages are given in the table below.

TABLE III

	D - C				A - C	
VOLTS	24	48	125	250	115	230
AMPS	3	1.5	0.6	0.25	20	10

TARGET

There are two ratings of target coils available. The choice between them depends on the current taken by the trip circuit.

The 0.2 ampere coils are for use with trip circuits that require currents ranging from 0.2 to 1.0 ampere at the minimum control voltage. If these coils are used in circuits that require 1.0 ampere or more, there is a possibility that the total resistance of the target circuit will limit the tripping current to so low a value that the breakers will not be tripped.

The 1.0 ampere coils should be used with trip circuits that take 1.0 ampere or more at the minimum control voltage if the current does not exceed 30 amperes at the maximum control voltage. When more than 30 amperes will flow, an auxiliary relay must be used to control the trip circuit. Connections must be such that tripping current does not flow through the contact circuit of the HGA relay.

When it is desirable to adopt one type of relay as standard to be used anywhere on a system, relays with the 1.0 ampere target and holding coil should be chosen. These relays should also be used where it is impossible to obtain trip-coil data, but attention is called to the fact that the target may not operate if used in connection with trip coils taking less than 1.0 ampere.

The ratings of the two forms of target coils are as shown in TABLE IV.

TABLE IV

	1.0 AMP A-C TARGET	0.2 AMP A-C TARGET
Minimum Pickup (amperes)	1.0	0.2
Tripping Duty (amperes)	30	5
Continuous Duty (amperes)	2.5	.4
R_{d-c} (ohms)	0.35	7.5
Impedance at 0.2 amps (ohms)		
1. Armature open	0.41+j0.42*	10.2+j10.5
2. Armature closed	0.46+j0.46*	11.5+j11.5

*Calculated by $Z = \left(\frac{N}{N'}\right)^2 Z'$.

CHARACTERISTICS

OPERATING PRINCIPLES

Type HGA18H and HGA18J relays consist of an HGA unit, an RC circuit, and a target (HGA18J only). These units are assembled into a drawout case.

The operation of these relays may be easily understood by referring to Figure 1. When the circuit breaker (152) is closed, the capacitor (179/CAP) is charged from the d-c output of the rectifiers which are connected to the a-c control circuit through the charging resistor (179/RES) and a contact of the control switch (152/CS). When the circuit breaker is tripped on overcurrent the auxiliary switch (152/b) connects the operating coil of the relay (179/OC) across the capacitor. The capacitor discharge picks up the relay, which seals itself in by means of its holding coil, and energizes the breaker closing relay (152/X). When the breaker closes, the control device auxiliary contact (152/X) opens the holding coil circuit and the relay drops out. If the breaker remains closed as long as the resetting time of the relay (15 seconds normally) or longer, the capacitor is again charged and the relay is ready for another operation, as described above. However, if a subsequent opening of the breaker has occurred before the resetting time of the relay, the capacitor will not have attained a sufficient charge to pick up the relay and reclose the breaker. Reclosing of the breaker must then be accomplished by some other means.

CONSTRUCTION

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 connection between the case blocks and cradle blocks is completed through removable connection plugs. See Figure 8. 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 front of the case and includes two interlock arms which prevent the cover from being replaced until the connection plugs have been inserted.

The case is suitable for semiflush mounting on panels. Hardware is available for all panel thicknesses up to two inches, but panel thickness must be specified on the order to ensure that the proper hardware will be provided. Outline and panel drilling dimensions are shown in Figure 5.

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.

ACCEPTANCE TESTS

GENERAL

The relay should be examined and tested upon delivery to ensure that no damage has been sustained in shipment and that the relay functions properly.

The following tests may be performed as part of the installation of the relay 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 the relays.

VISUAL INSPECTION

Check the nameplate stamping to ensure that the model number agrees with Table I.

Remove the relay from its case and check that there are no broken or cracked molded parts or other signs of physical damage, and that all the screws are tight.

MECHANICAL INSPECTION

1. The armature of the target unit (HGA18J only) should move freely when operated by hand.

2. The armature of the HGA unit should move freely when operated by hand.

3. Ensure that the HGA unit and internal capacitor are mounted securely.

CAUTION:

EVERY CIRCUIT IN THE DRAWOUT CASE HAS AN AUXILIARY BRUSH. IT IS ESPECIALLY IMPORTANT ON CURRENT CIRCUITS AND OTHER CIRCUITS WITH SHORTING BARS THAT THE AUXILIARY BRUSH BE BENT HIGH ENOUGH TO ENGAGE THE CONNECTING PLUG OR TEST PLUG BEFORE THE MAIN BRUSHES DO. THIS WILL PREVENT CT SECONDARY CIRCUITS FROM BEING OPEN CIRCUITED DURING INSERTION OF THE CONNECTING PLUG. SEE FIGURE 8.

DRAWOUT CASE

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.

TARGET UNIT CHECK

The pickup and dropout of the target unit can be tested as follows:

1. Apply 60 Hz current to terminal 1-through the target - through the HGA normally open contact - to terminal 2. The HGA must be blocked closed.

2. Apply rated current, see nameplate.

3. The target should pickup.

TIMING CHECK

1. Wire test circuit as shown in Figures 3 and 4.

2. Open S1 and S2.

3. Apply rated a-c voltage

4. By cut-and-try technique establish reset time as follows:

   a. Close S1. This begins to simultaneously charge the capacitor and start the clock.

   b. Watch clock. Close S2 when time is appropriate as established by previous trials. Use 15 seconds for first trial. Closing S2 stops the clock; if the relay picked up, the HGA unit will be sealed in until S1 is opened.

   c. Through several iterations of these steps, the reset time will be established.

5. If it is necessary to adjust the time, do so by changing the position of the normally closed contact backstop.

INSTALLATION PROCEDURE

INTRODUCTION

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

The relay should be mounted on a vertical surface. The outline and panel drilling dimensions are shown in Figure 5. Figures 6 and 7 show outlines of external rectifier and capacitor. These external devices are required when called for on the nameplate.

The internal connection diagrams for the relays are shown in Figure 2. A typical external connection diagram is shown in Figure 1.

TEST PLUGS

The relay may be tested without removing it from the panel by using a 12XLA13A test plug. This makes connections only with the relay and does not disturb any shorting bars in the case. Of course, the 12XLA12A test plug may also be used. Although this test plug allows greater testing flexibility, it also requires CT shorting jumpers and the exercise of greater care since connections are made to both the relay and the external circuitry. The XLA12A has 20 fingers which bring both the ten relay connections and the ten outside world connections to the front of the relay for easy access. The XLA13A test plug brings only the ten connections to the front of the relay without disturbing the CT shorting bars. A circuit for testing the HGA18H and J relays using two XLA13 test plugs is shown in Figure 4. Additional information on the XLA test plugs may be obtained from the nearest General Electric Apparatus Sales Office; reference Section 7332 in the General Electric Apparatus Handbook.

ELECTRICAL TESTS AND SETTINGS

Most operating companies use different procedures for installation tests. The section under ACCEPTANCE TESTS contains all necessary tests which may be performed as part of the installation procedure.

PERIODIC CHECKS AND ROUTINE MAINTENANCE

In view of the vital role of relays in the operation of a power system it is important that a period 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 under ACCEPTANCE TESTS be checked on the same schedule as the associated protective relays.

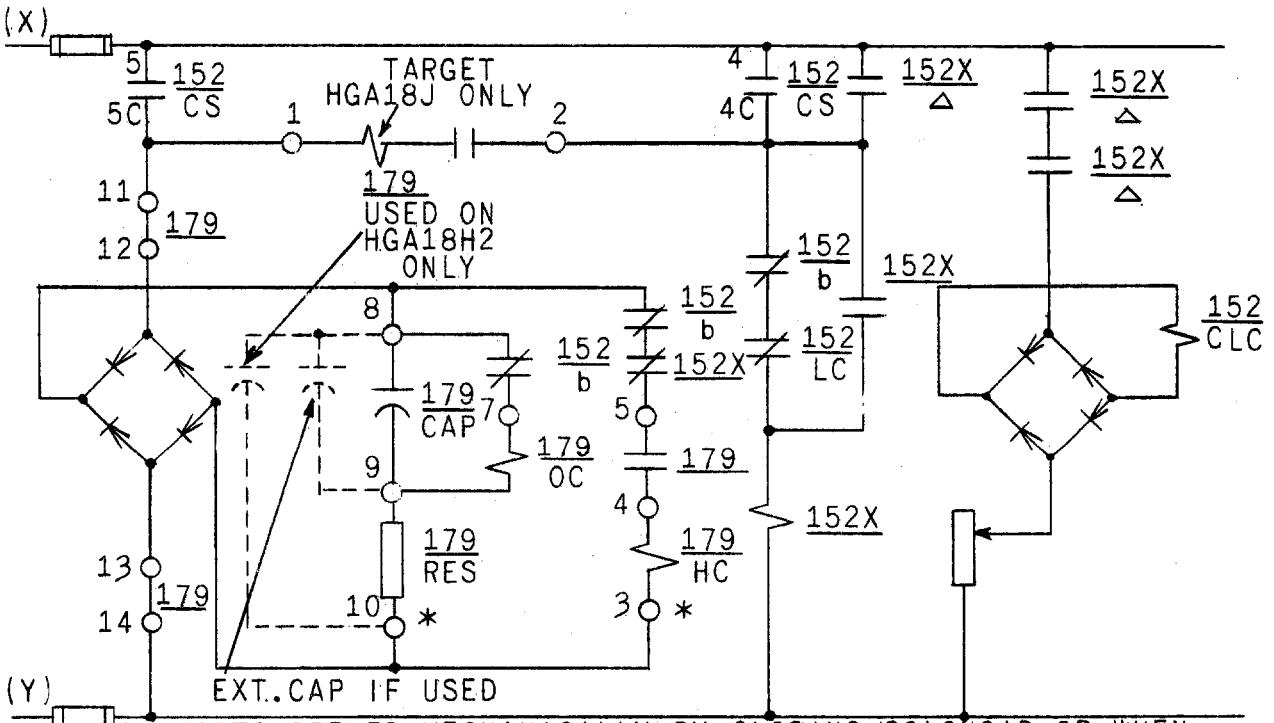
CONTACT CLEANING

For cleaning relay contacts, a flexible burnishing tool should be used. This consists of a flexible strip of metal with an etched-roughened surface resembling in effect a superfine file. The polishing action is so delicate that no scratches are left, yet it will clean off any corrosion thoroughly and rapidly. Its flexibility ensures the cleaning of the actual points of contact. Do not use knives, files, abrasive paper or cloth of any kind to clean relay contacts.

RENEWAL PARTS

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

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



CONTACTS HANDLE END		CLOSE	NORM. AFTER CLOSE	NORM. AFTER TRIP	TRIP
1 O O 2	1				X
	2				X
3 O O 4	3		X	X	
	4	X			
5 O O 6	5	X	X		
	6	X	X		

CONTROL SWITCH (152CS)
MODEL 16SBIB9-
SPRING RETURN TO NORMAL-
X DENOTES CONTACT CLOSED-
CONTACTS SHOWN IN NORMAL
AFTER CLOSE POSITION.

LEGEND

SYMBOL	DEVICE	DESCRIPTION
152		CIRCUIT BREAKER
152CLC		CIRCUIT BREAKER CLOSING COIL
152b		CIRCUIT BREAKER AUXILIARY SWITCH
152CS	16SBIB9	CIRCUIT BREAKER CONTROL SWITCH
152LC		CIRCUIT BREAKER LATCH CHECKING SWITCH
152X	K-6375988	CIRCUIT BREAKER CONTROL DEVICE
179	HGA18H&18J	RECLOSING RELAY
179 CAP.		RECLOSING RELAY CAPACITOR
179HC		RECLOSING RELAY HOLDING COIL
179 OC		RECLOSING RELAY OPERATING COIL
179 RES		RECLOSING RELAY CHARGING RESISTOR

*= TERMINALS 3 AND 10 MUST BE OF THE SAME POLARITY

FIG. 1 (0377A0148-1) TYPICAL EXTERNAL CONNECTIONS FOR HGA18H AND HGA18J RELAYS

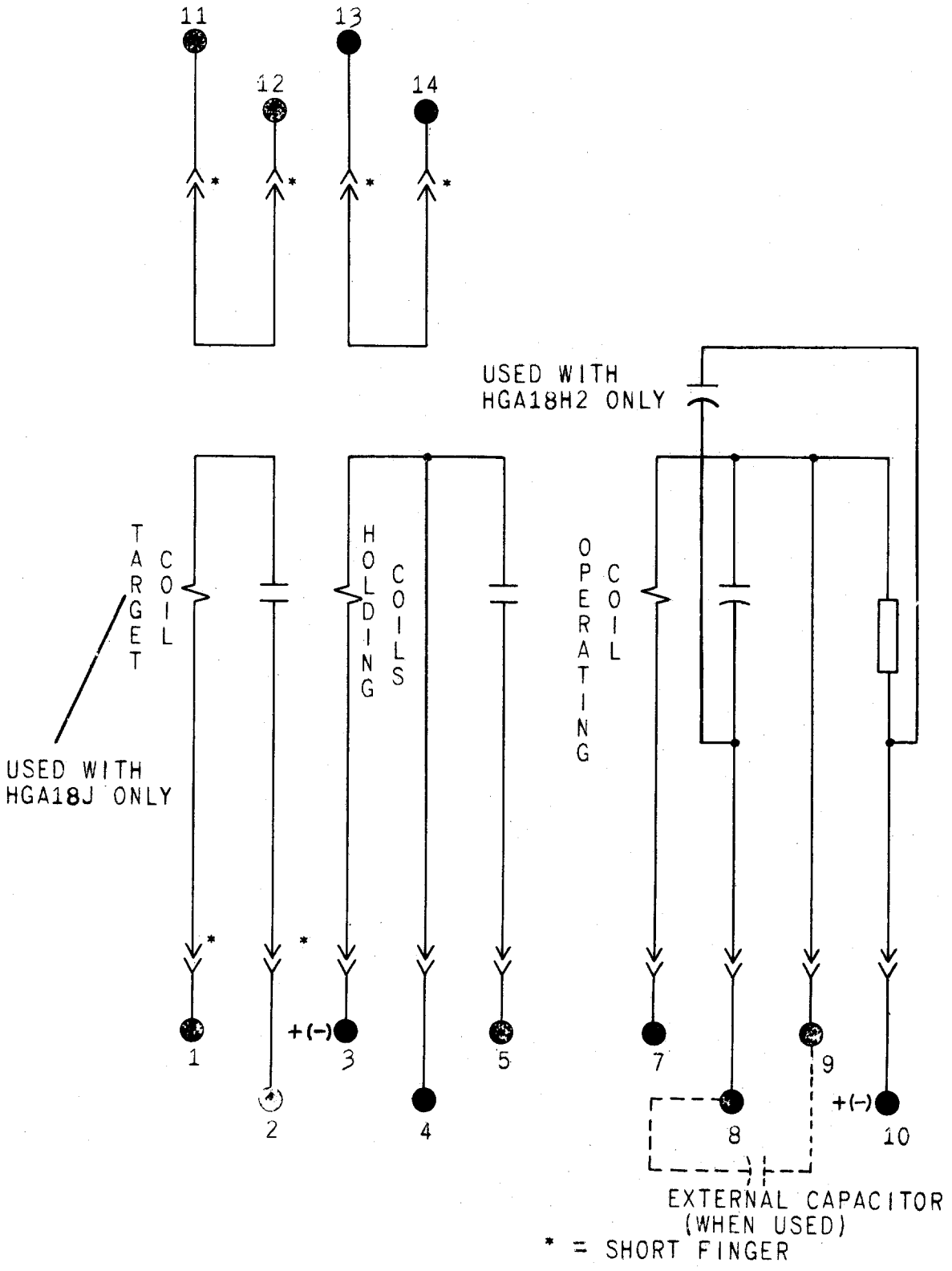


FIG. 2 (K-6507938-1) INTERNAL CONNECTIONS DIAGRAM FOR HGA18H AND HGA18J RELAYS

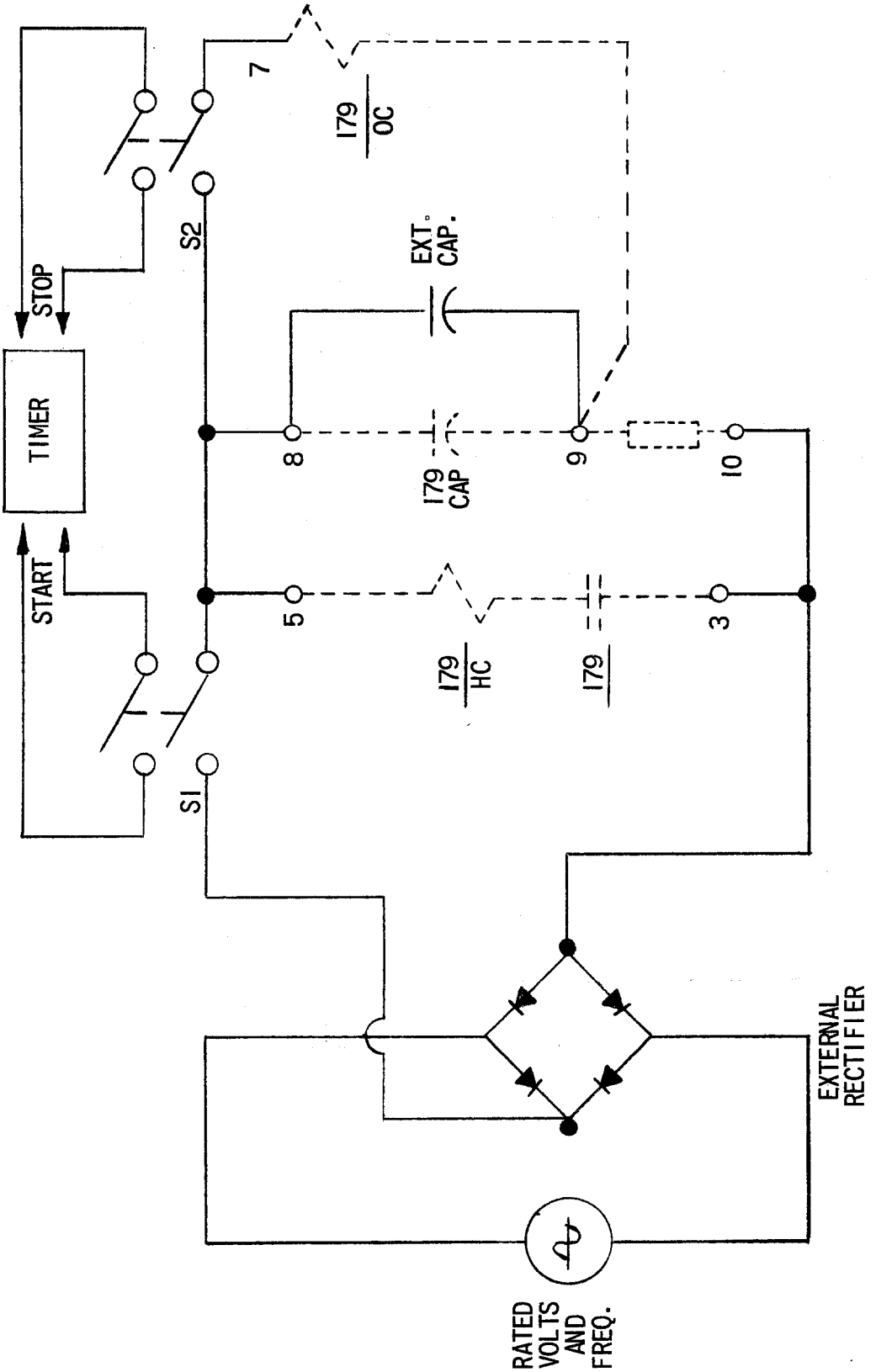


FIG. 3 (0257A8314-0) TEST SCHEMATIC FOR HGA18H AND HGA18J RELAYS

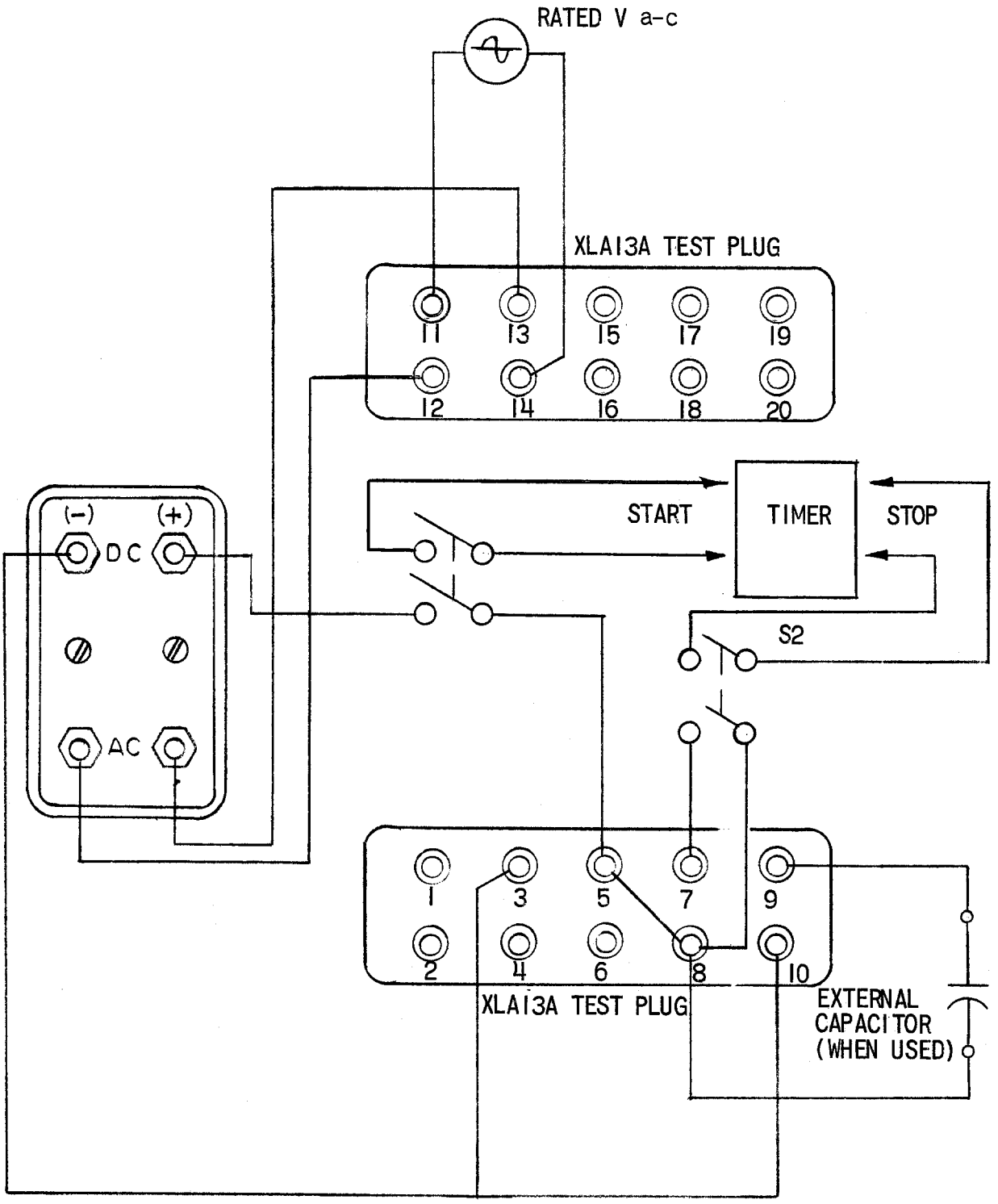


FIG. 4 (257A8315-1) TEST CONNECTIONS, USING XLA13A TEST PLUGS, FOR HGA18H AND HGA18J RELAYS

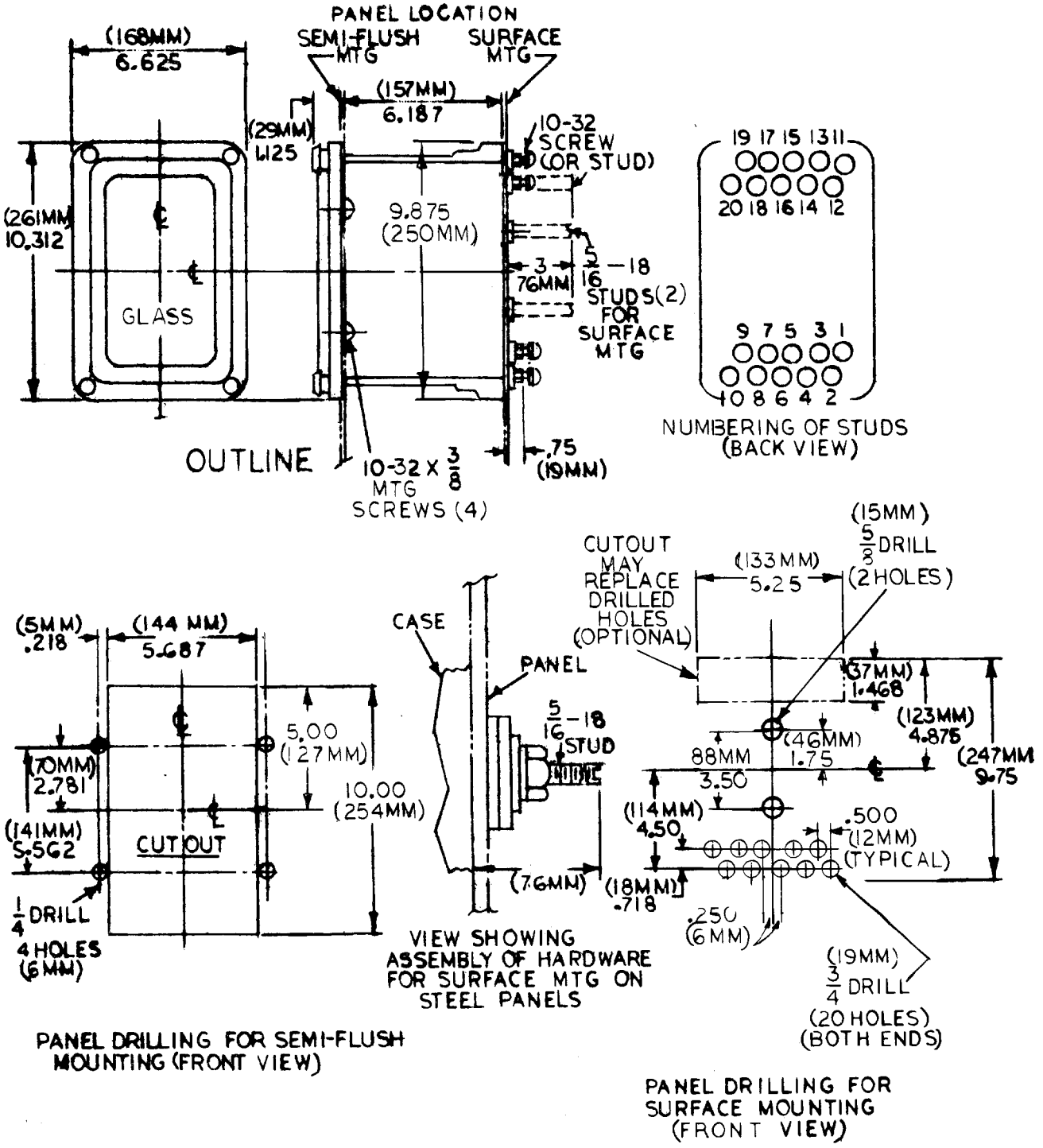


FIG. 5 (K-6209272-5) OUTLINE AND PANEL DRILLING FOR HGA18H AND HGA18J RELAYS

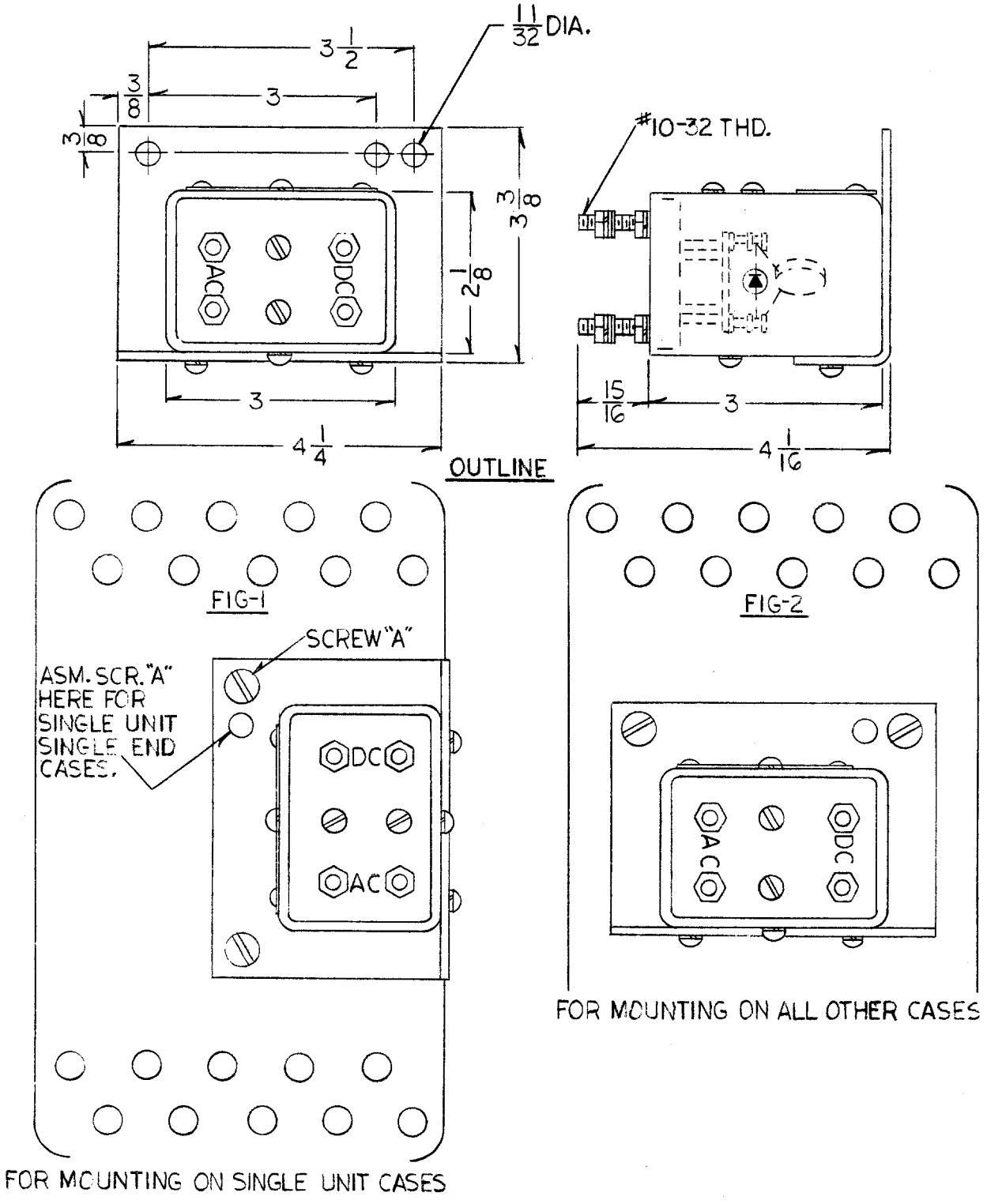


FIG. 6 (0246A6996-0) EXTERNAL RECTIFIER OUTLINE AND PANEL DRILLING FOR HGA 8H AND HGA18J RELAYS

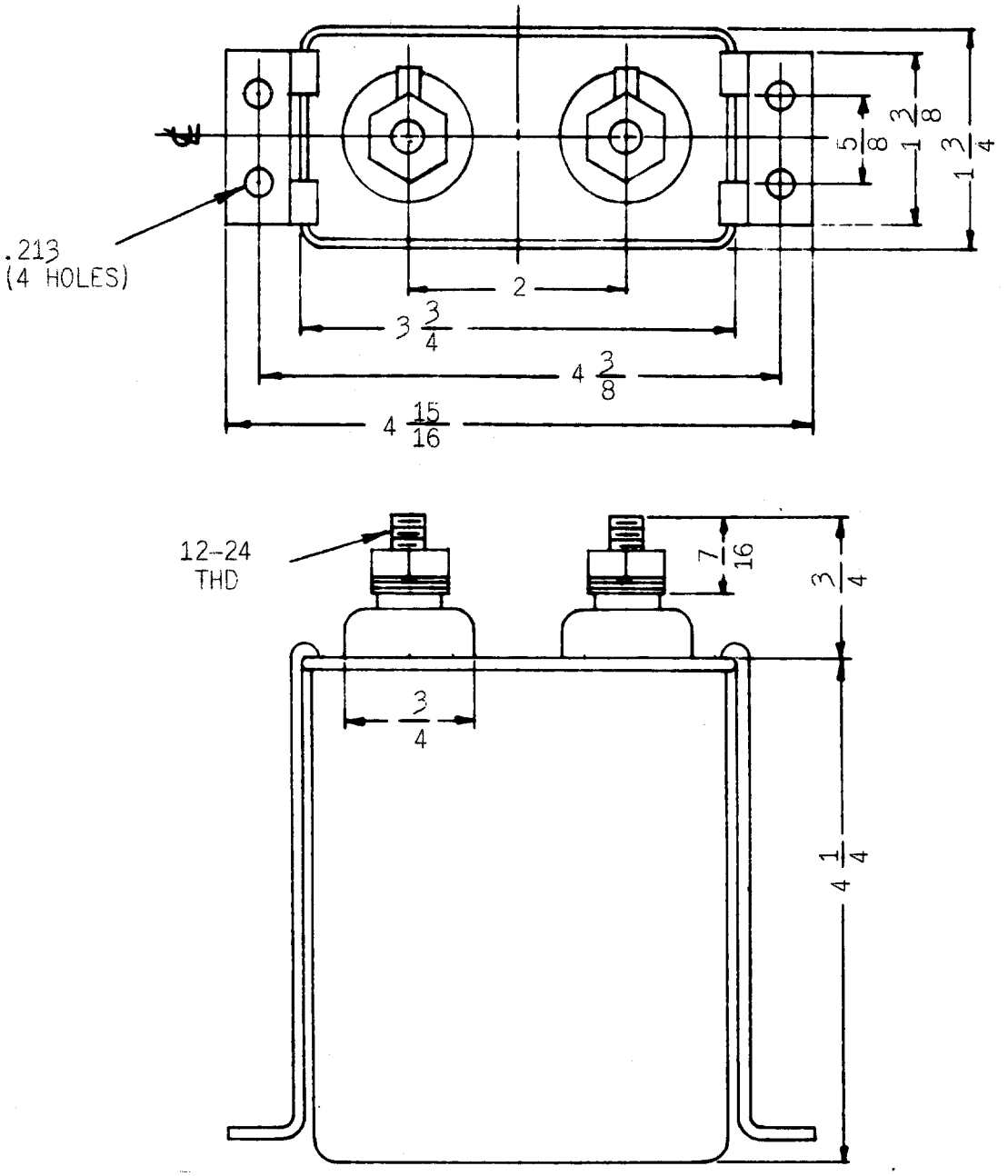
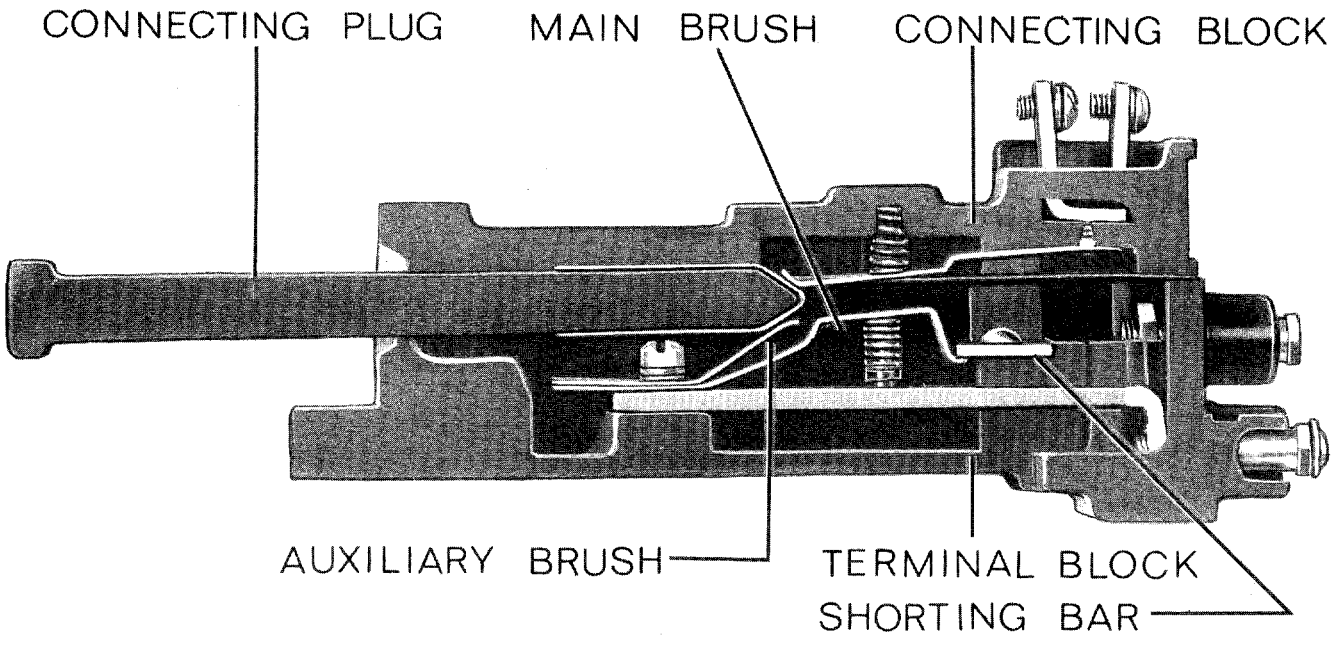


FIG. 7 (0165A6044-0) EXTERNAL CAPACITOR OUTLINE FOR HGA18H AND HGA18J RELAYS



NOTE: AFTER ENGAGING AUXILIARY BRUSH, CONNECTING PLUG TRAVELS 1/4 INCH BEFORE ENGAGING THE MAIN BRUSH ON THE TERMINAL BLOCK

FIG. 8 (8025039) DRAWOUT CASE CONTACT ASSEMBLY CUTAWAY