



INSTRUCTIONS

GEK-45416C
Supersedes GEK-45416B

STATIC OUTPUT AND TRIPPING UNIT

TYPE SMAT51C

GENERAL  ELECTRIC

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STATIC OUTPUT AND TRIPPING UNIT
TYPE SMAT51C

DESCRIPTION

The Type SMAT51C relay is a static output unit. The Type SMAT51C relay is not intended to be used by itself, but rather as part of a complement of equipment that forms a protective relaying scheme. For a complete description of the overall scheme in which this relay is employed, refer to the overall logic * diagram and its associated logic description that is supplied with each terminal equipment. Provisions are included to allow operation from front standard or exciter end pickup only.

The Type SMAT51C relay is packaged in a two rack unit (one rack unit equals 1 3/4 inches) enclosed metal case suitable for mounting on a 19 inch rack. The outline and mounting dimensions are shown in Fig. 1. The internal connections for the SMAT51C relay are shown in Fig. 2. The component and card locations are shown in Fig. 3.

RATINGS

The Type SMAT51C relay is designed for use in an environment where the air temperature outside the relay case does not exceed -20°C and $+65^{\circ}\text{C}$.

The Type SMAT51C relay requires a ± 15 VDC power source which can be obtained from a Type SSA power supply.

Refer to the unit nameplate for the ratings of a particular relay.

BURDENS

The SMAT51C relay presents a maximum burden to the Type SSA power supply of:

50 ma from the +15 VDC supply
100 ma from the -15 VDC supply

OUTPUTS

ROS - Relay out of service

Four electrically separate form B contacts are provided. The associated coils are normally energized thereby holding the contacts open. The contacts close within 2 milliseconds of the time the coil is de-energized. The contacts close when one of the following conditions occur; 1) DC power failure 2) both pickups are at limit 3) both trip busses are open. The ratings of these contacts can be found in Table 2.

* See single input operation

DAR - Discriminator alarm

Two electrically separate form A contacts are provided. These contacts close within 2 milliseconds from the time the associated coil is energized by the logic. The contacts open within 2 milliseconds from the time the coil is deenergized. The contacts close when either of the two discriminators switch to backup. The ratings of these contacts can be found in Table 2.

* See single input operation

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.

To the extent required the products described herein meet applicable ANSI, IEEE and NEMA standards; but no such assurance is given with respect to local codes and ordinances because they vary greatly.

LOS - Loss of one input

Two electrically separate form A contacts are provided. These contacts close within 2 milliseconds from the time the associated coil is energized by the logic. The contacts open within 2 milliseconds from the time the coil is deenergized. The contacts operate when either pickup is at limit. The ratings of these contacts can be found in Table 2.

Single Input Operation

When a single pickup operation is desired provisions exist in the SMAT51C to allow proper operation of all alarm outputs. Logic cards in positions K, J, and H are provided with two jumpers each. Follow Table 1 for proper jumper location.

TABLE 1

PICKUP USED	PC CARD LOCATION	JUMPER/PIN
3600 Hz 4800 Hz	L158/K,H	Jumper 7*/7 Jumper 6*/6
	L157/J	Jumper 5*/5 Jumper 6*/6
3600 Hz Exciter End	L158/K,H	Jumper 7*/7 Jumper 6*/1
	L157/J	Jumper 5*/10 Jumper 6*/6
4800 Hz Front Standard	L158/K,H	Jumper 7*/1 Jumper 6*/6
	L158/J	Jumper 6*/10 Jumper 5*/5

Jumper (#)* - Jumper opposite pin (#). For pin location, see PC card instruction book GEK-34158.

TABLE 2

ABSOLUTE MAXIMUM RATINGS		
100 VA RESISTIVE 35 VA INDUCTIVE** 3 AMPERES MAKE & CARRY CONTINUOUS 3 AMPERES MAKE & CARRY SHORT TIME		
VOLTS 1000 MAX	INTERRUPTION INDUCTIVE**	CAPACITY AMPS RESISTIVE
48	0.72	2
125	0.28	0.8
250	0.14	0.4

** The inductive rating is based on the inductance of a coil having an X_L/R ratio of 3 to 1.

CONTACT CONVERTERS

The purpose of a contact converter is to convert a contact operation into a signal that is compatible with the relay logic. There are two such units in the Type SMAT51C relay.

CC1 - provides an input when both trip busses are open

CC2 - provides an input when the breaker is closed, to permit operation of the DAR and LOS alarm functions.

VOLTAGE REGULATOR

The N113 card in position S provides a +12V source for use in the filter equipment alarm circuits. The output of the card can be monitored at TP8 +12 volts and TP9 - 12 volts with respect to reference TP1.

* Indicates revision

LOGIC CIRCUITS

The functions of the Type SMAT51C involve basic logic (AND, OR and NOT) where the presence or absence of signals, rather than their magnitude, controls operation. Signals are measured with respect to a reference bus accessible at TP1. In general a signal below one VDC represents an OFF of LOGIC ZERO condition; an ON or LOGIC ONE is represented by a signal of approximately +15 VDC.

The symbols used on the internal connection diagram Fig. 2 are explained by the legend shown in Fig. 4.

CONSTRUCTION

The SMAT51C relay is packaged in an enclosed metal case with hinged front cover and removable top cover. The outline and mounting dimensions of the case and the physical location of the components are shown in Figs. 1 and 3 respectively.

The SMAT51C relay contains printed circuit cards identified by a code number such as: A130, T144, L116 where A designates an auxiliary function, T designates a time-delay function, and L designates a logical function. The printed circuit cards plug in from the front of the unit. The sockets are marked with letter designations or "addresses" (D, E, F, etc.) which appear on the guide strips in front of each socket, on the component location drawing, on the unit internal connection diagram, and on the printed circuit card. The test points (TP1, TP2, etc.) shown on the internal connection diagram are connected to instrument jacks on a test card in position T with TP1 at the top of the T card. TP1 is tied to reference; TP10 is tied to +15 VDC through a 2.2K resistor. This resistor limits the current when TP10 is used to supply a logic signal to a card. TP2 is connected to -15 VDC.

The SMAT51C relay receives its inputs from the associated Type SMA relay. These units are interconnected by ten conductor shielded cables. The sockets for these cables are located on the rear panel of the unit. The SMAT51C output functions are connected to 12 point terminal trips, which are also located on the rear of the unit.

RECEIVING, HANDLING AND STORAGE

The SMAT51C relay will normally be supplied as a part of a static relay equipment, mounted in a rack or cabinet with other static relays and test equipment. Immediately upon receipt of a static relay equipment, it should be unpacked and examined 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 Sales Office.

Reasonable care should be exercised in unpacking the equipment. If the equipment is not to be installed immediately, it should be stored indoors in a location that is free from moisture, dust, metallic chips, and severe atmospheric contaminants.

Just prior to final installation the shipping support bolt should be removed from each side of all relay units, to facilitate possible future unit removal for maintenance. These shipping support bolts are approximately eight inches back from the relay front panel. **WARNING: STATIC RELAY EQUIPMENT, WHEN SUPPLIED IN SWING RACK CABINETS, SHOULD BE SECURELY ANCHORED TO THE FLOOR OR TO THE SHIPPING PALLET TO PREVENT THE EQUIPMENT FROM TIPPING OVER WHEN THE SWING RACK IS OPENED.**

TEST INSTRUCTIONSCAUTION

THE LOGIC SYSTEM SIDE OF THE DC POWER SUPPLY USED WITH MOD III STATIC RELAY EQUIPMENT IS ISOLATED FROM GROUND. IT IS A DESIGN CHARACTERISTIC OF MOST ELECTRONIC INSTRUMENTS THAT ONE OF THE SIGNAL INPUT TERMINALS IS CONNECTED TO THE INSTRUMENT CHASSIS. IF THE INSTRUMENT USED TO TEST THE RELAY EQUIPMENT IS ISOLATED FROM GROUND, ITS CHASSIS MAY HAVE AN ELECTRICAL POTENTIAL WITH RESPECT TO GROUND. THE USE OF A TEST INSTRUMENT WITH A GROUNDED CHASSIS WILL NOT AFFECT THE TESTING OF THE EQUIPMENT. HOWEVER, A SECOND GROUND CONNECTION TO THE EQUIPMENT, SUCH AS A TEST LEAD INADVERTENTLY DROPPING AGAINST THE RELAY CASE, MAY CAUSE DAMAGE TO THE LOGIC CIRCUITRY. NO EXTERNAL TEST EQUIPMENT SHOULD BE LEFT CONNECTED TO THE STATIC RELAYS WHEN THEY ARE IN PROTECTIVE SERVICE, SINCE TEST EQUIPMENT GROUNDING REDUCES THE EFFECTIVENESS OF THE ISOLATION PROVIDED.

IF THE SMAT51C RELAY THAT IS TO BE TESTED IS INSTALLED IN AN EQUIPMENT WHICH HAS ALREADY BEEN CONNECTED TO THE POWER SYSTEM, DISCONNECT THE OUTPUTS IN THE ASSOCIATED TYPE SMAT RELAY FROM THE SYSTEM DURING TEST.

GENERAL

The SMAT51C is supplied from the factory either as a separate unit, or mounted in a static relay equipment. All relay units for a given terminal of static relaying equipment are tested together at the factory, and each unit will have the same summary number stamped on its nameplate.

In general, when a time range is indicated on the internal connections diagram, the timer has been factory set at a mid-range value. Timers should be set for the operating or reset times indicated on the associated overall logic diagram. Where a time range is indicated on the overall logic diagram, the timer should be set for the value recommended for that function in the descriptive writeup accompanying the overall logic diagram. Where a setting depends upon conditions encountered on a specific application, this is so stated and the factors influencing the choice of setting are described. The procedure for checking and setting timers is described in a later section.

OPERATIONAL CHECKS

Operation of the SMAT51C unit can be checked by observing the signals at the ten test points (TP1 to TP10) in the SMAT51C, or by observing the output functions. The test points are located on the test card in position T, and are numbered 1 to 10 from top to bottom. TP1 is the reference bus for the logic circuit, TP10 is at +15 VDC and TP2 is at -15 VDC. The remaining points are located at various strategic points throughout the logic as shown in the internal connection diagram (Fig. 2). Test point voltages can be monitored with a portable high impedance voltmeter, the test lamps in the SMAT51B, or an oscilloscope.

TEST CARD ADAPTER

The test card adapter provides a convenient means of gaining access to any pin of a particular card. Detailed information on the use of the test adapter card is included in the card instruction book GEK-34158.

TIMER ADJUSTMENTS AND TESTS

There is only one timer in the type SMAT51C relay. The function of this timer is to prevent any outputs for a fixed time delay after the DC power is turned on. This timer can be checked by connecting an oscilloscope or digital timer to the output of the card (pin 8), and the trigger of the measurement instrument to the +15 volt DC input to the card (pin 10). The time measured should be within +10 percent of the value shown on the logic diagram.

OVERALL EQUIPMENT TESTS

After the SMAT51C relay and the associated static relay units have been individually calibrated and tested for the desired settings, a series of overall operating circuit checks is advisable.

The elementary, overall logic, and logic description for the specific job will be useful for determining the overall operation of the scheme.

MAINTENANCEPERIODIC TESTS

It should be sufficient to check the outputs produced at test points in the SMAT51C when periodic calibration tests are made. No separate periodic tests on the SMAT51C itself should be required.

TROUBLE SHOOTING

In any trouble shooting of equipment, it should first be established which unit is functioning incorrectly. The overall logic diagram supplied with the equipment shows the combined logic of the complete equipment and the various test points in each unit. By signal tracing, using the overall logic diagram and the various test points, it should be possible to quickly isolate the trouble.

A test adapter card is supplied with each static relay equipment to supplement the prewired test points on the test cards. Use of the adapter card is described in the card instruction book GEK-34158.

A dual trace oscilloscope is a valuable aid to detailed trouble shooting, since it can be used to determine phase shift, operate and reset times as well as input and output levels. A portable dual-trace oscilloscope with a calibrated sweep and trigger facility is recommended.

SPARE PARTS

To minimize possible outage time, it is recommended that a complete maintenance program should include the stocking of at least one spare card of each type. It is possible to replace damaged or defective components on the printed circuit cards, but great care should be taken in soldering so as not to damage or bridge-over the printed circuit busses, or overheat the semi-conductor components. The repaired area should be recovered with a suitable high-dielectric plastic coating to prevent possible breakdowns across the printed busses due to moisture and dust. The wiring diagrams for the cards in the SMAT51C relay are included in the card book GEK-34158.

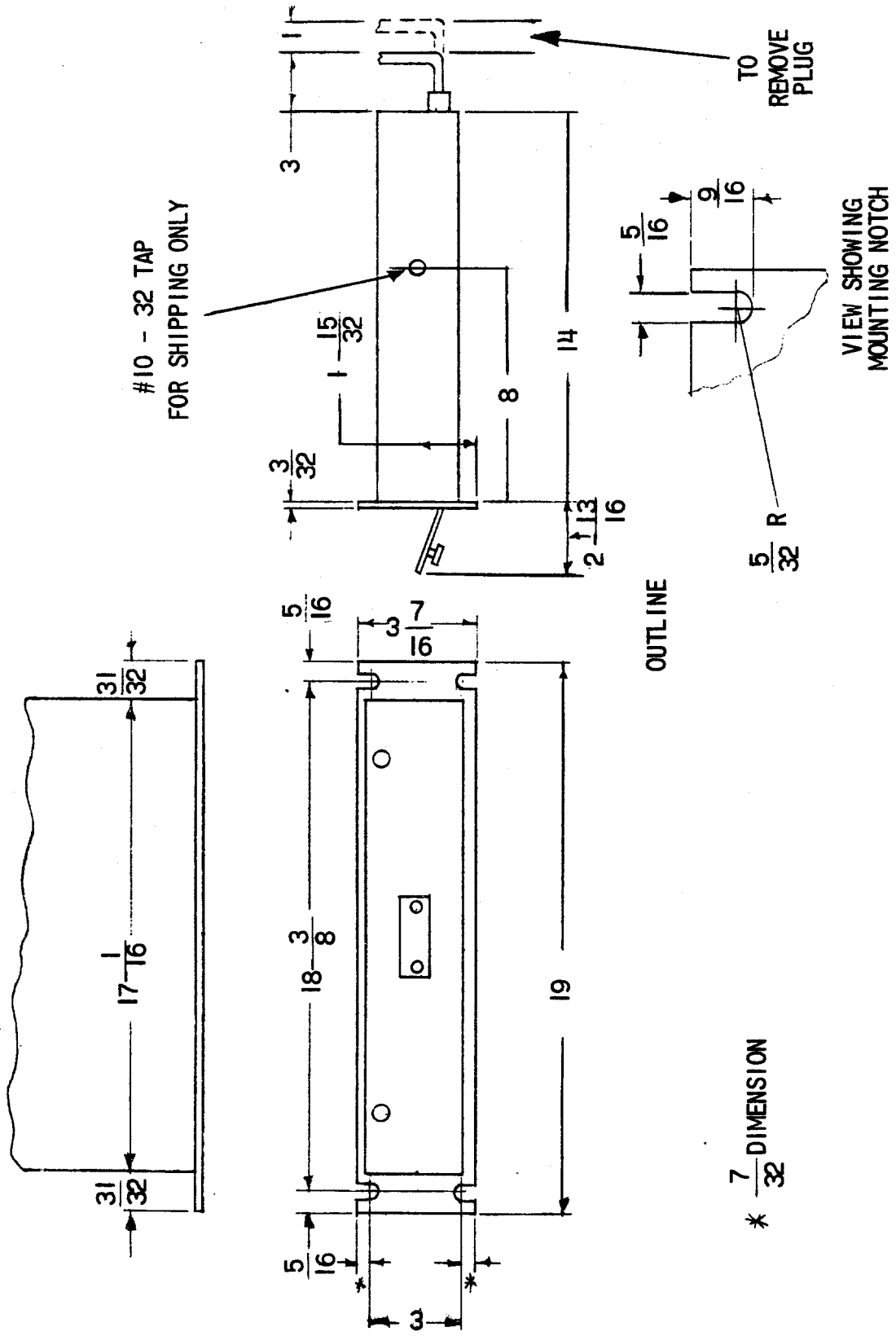


FIG. 1 (0227A2036-0) Outline and Mounting Dimensions.

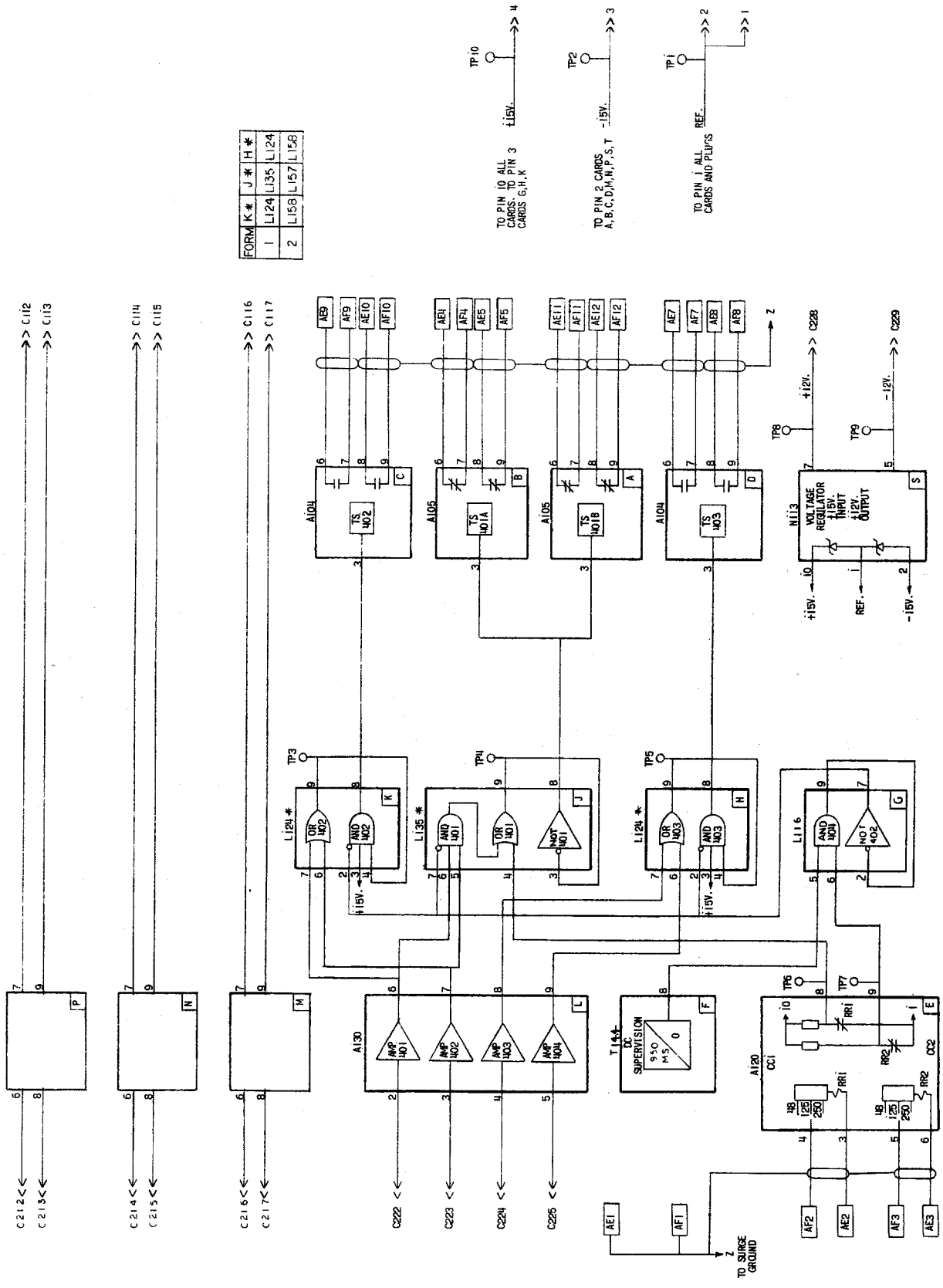
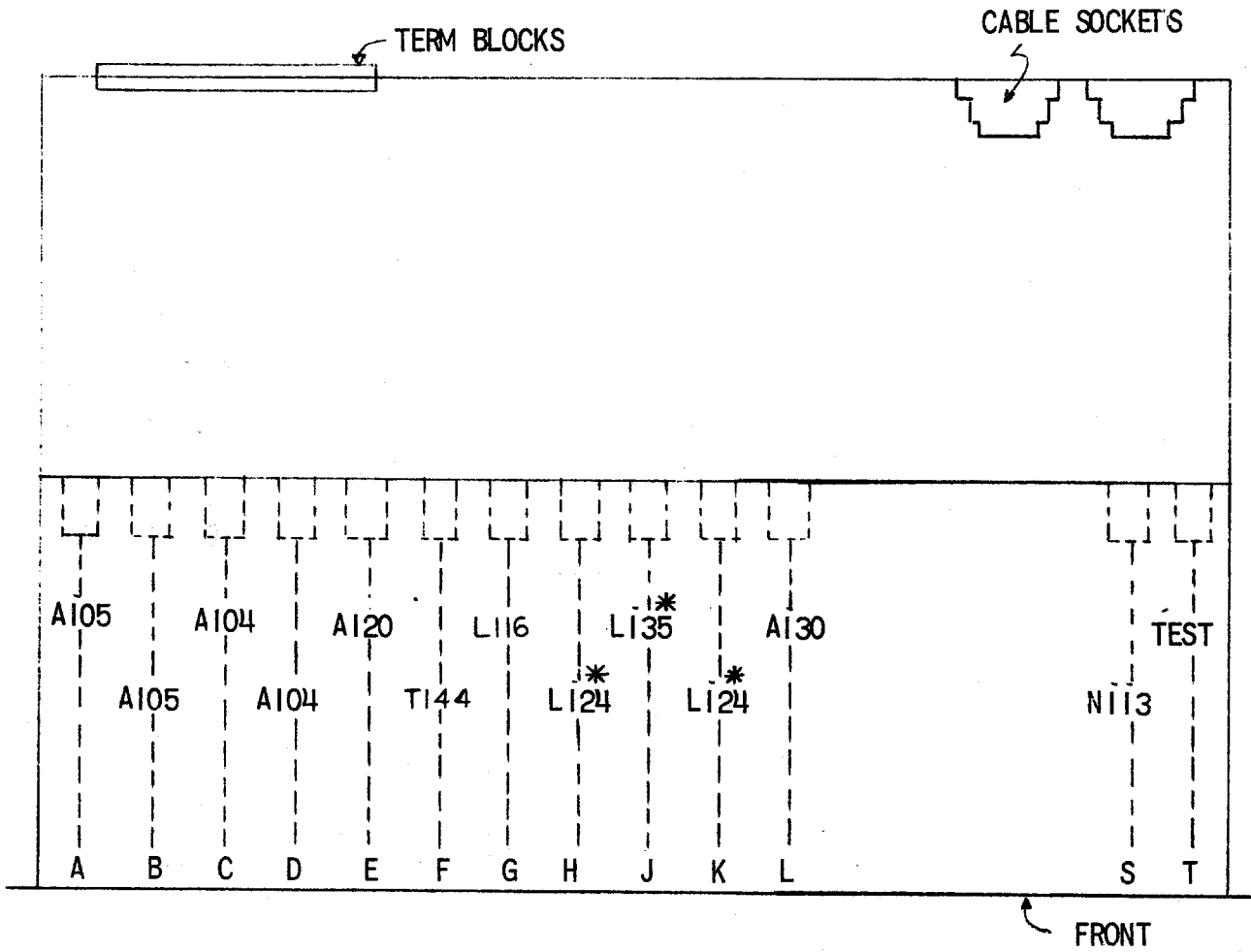


FIG. 2 (0167C8733-5) Internal Connections for the Type SMAT51C Relay.

TOP VIEW - COVER REMOVED
 REFER TO INTERNAL CONNECTIONS 016708733



PLAN VIEW

FORM	K	J	H
1	L124	L135	L124
2	L158	L157	L158

* FIG. 3 (0257A6273-2) Component Location Diagram

* Indicates revision

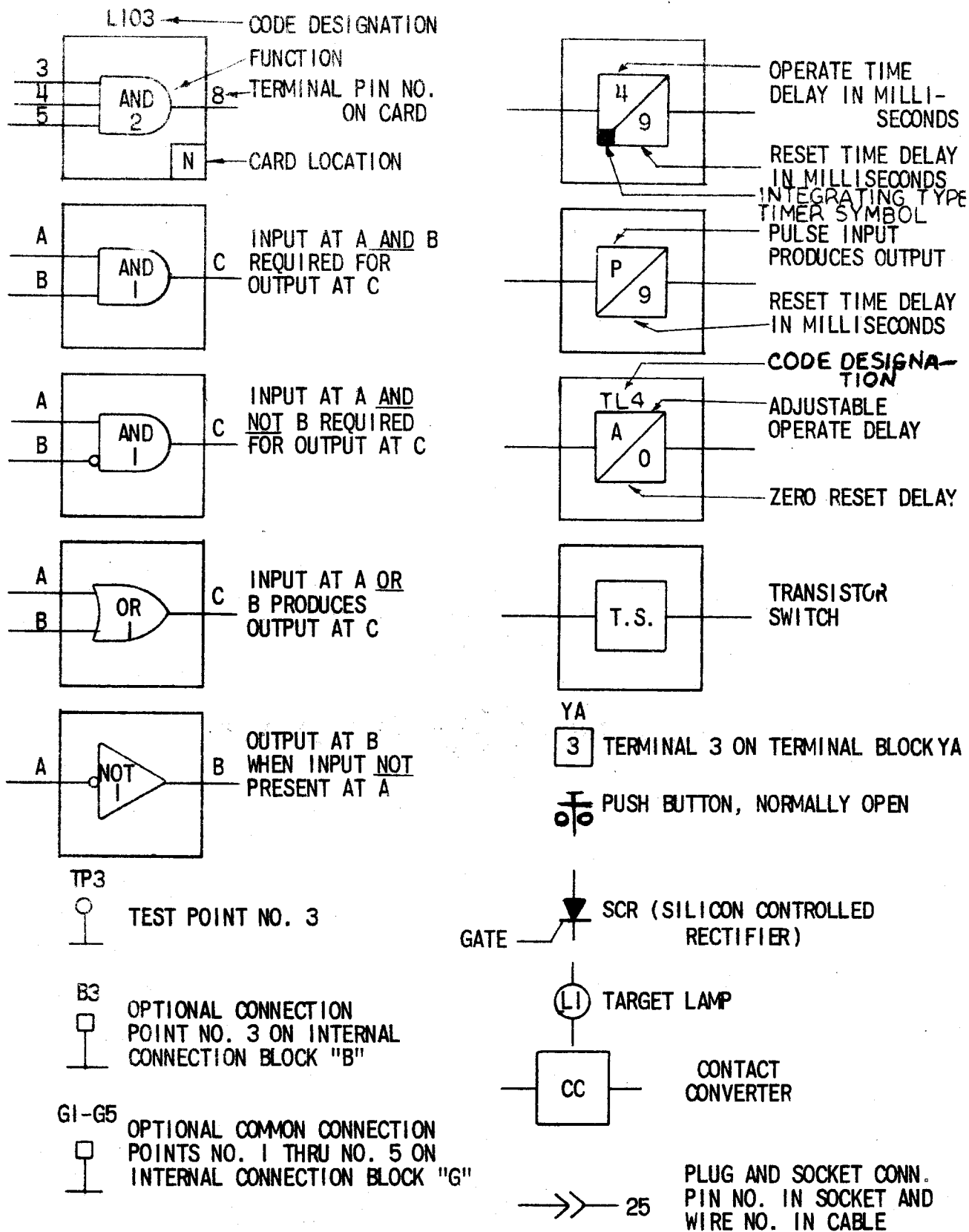


FIG. 4 (0227A2047-1) Logic and Internal Connection Diagram Legend.

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