INSTRUCTIONS

GEK-41956

STATIC OUTPUT AND TRIPPING UNIT

TYPE SLAT53A

POWER SYSTEMS MANAGEMENT DEPARTMENT

GENERAL ELECTRIC

PHILADELPHIA, PA.

CONTENTS

DESCRIPTION

The Type SLAT53A relay is a static output and tripping unit. The Type SLAT53A is not intended to be used by itself, but rather as a 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 of equipment.

The Type SLAT53A relay is packaged in a four rack unit (1 R.U. = 1 3/4") enclosed metal case suitable for mounting on a 19 inch rack. The outline and mounting dimensions are shown in Figure 1. The internal connections for the SLAT53A relay are shown in Figure 2. The component and card locations are shown in Figure 3.

APPLICATION

The Type SLAT53A relay was originally designed to operate in conjunction with Type SLYP, Type SLCN, Type SLA and Type SSA relays in a single pole tripping scheme. The following is a listing of the various output functions together with a general description of their intended use.

SCR

Six silicon controlled rectifier trip circuits, two per phase, are provided to permit tripping of the associated circuit breaker.

RI-1Ø

These reclose initiation outputs are provided to initiate automatic reclosing after a single pole trip.

RI-3Ø

These reclose initiation outputs are provided to initiate automatic reclosing after a three pole trip.

BFI

Breaker failure initiation outputs, two per phase, are provided for breaker failure protection.

RX

Received channel outputs are provided.

If any of these functions are not required, the outputs may be used for whatever purposes their characteristics are suited.

RATINGS

The Type SLAT53A relay is designed for use in an environment where the air temperature outside the relay case is between $-20^{o}C$ and $+65^{o}C$.

The Type SLAT53A relay requires a $\pm$15 VDC power source which can be obtained from a Type SSA power supply.

The SCR tripping circuits are rated for 48/125 or 250 VDC. Each has a 1.0 ampere series target. The tripping circuits are designed to carry 30 amperes for one second.

The contacts of the telephone type relays that are used for RI-1Ø and RI-3Ø will make and carry 3 amperes continuously. They will make and carry 30 amperes for tripping duty. The contacts will interrupt 180 VA resistive (60 VA inductive).

The contacts of the reed relays used for BFI-A, BFI-B, BFI-C, RX1 and RX2 will make and carry 3 amperes continuously or short time. The contacts will interrupt 100VA resistive (35 VA inductive).

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

BURDENS

The SLAT53A relay presents a maximum burden to the Type SSA power supply of:

120 ma from the +15 VDC supply
20 ma from the -15 VDC supply

In addition, each target lamp draws 80 ma from the -15 VDC supply.

Each contact converter, when energized, will draw approximately 10 ma from the station battery, regardless of tap setting.

FUNCTIONS

A. SCR TRIP CIRCUIT

Electrically separate, isolated SCR trip circuits are provided to trip two breakers. Each circuit is capable of carrying 30 amperes for one second.

The internal connections for the SCR trip and isolator subassemblies are shown in Figure 4. The isolator card, by means of a DC to DC converter, provides a signal path but maintains metallic isolation. This feature makes it possible to isolate the relay power supply from the trip circuit power supply.

B. RI-1Ø - SINGLE POLE RECLOSE INITIATE CIRCUIT

Two electrically separate normally open contacts are provided. These contacts close within 17 ms from the time the associated coil is energized by the logic. The contacts open within 170 MS from the time the coil is deenergized. The RI-1Ø function uses a telephone type relay with contact ratings stated under RATINGS.

C. RI-3Ø - THREE POLE RECLOSE INITIATE CIRCUIT

Two electrically separate normally open contacts are provided. These contacts close within 17 ms. from the time the associated coil is energized by the logic. The contacts open within 170 ms from the time the coil is deenergized. The RI-3Ø function uses a telephone type relay with contact ratings stated under RATINGS.

D. BFI - BREAKER FAILURE INITIATE CIRCUITS

Two electrically separate normally open contacts are provided for each phase. These contacts close within 2 MS of the time that the associated coil is energized by the logic. The contacts open within 2 MS from the time the coil is deenergized. The BFI functions use reed relays with contact ratings stated under RATINGS.

E. CONTACT CONVERTERS

The purpose of this function is to convert a contact operation into a signal that is compatible with the logic circuit of the Type SLAT53A relay. These contact converters are labeled CC4 and CC5.

A link is provided on each card to select operation from a 48, 125, or 250 VDC station battery.

CC4

Contact converter 4 is energized by a pole disagreement circuit.

CC5

Contact converter 5 is energized by an external contact and causes the relay to trip 3 pole for any fault.

TARGETS

Two electromechanical target coils are included, one in series with each SRC. These targets operate on one ampere of trip current when the associated SCR passes current. The trip circuit resistance in the relay is 0.40 ohm.

Six target lamps are included in the SLAT53A. These are designated as indicated on the internal connection diagram of Figure 2.

LOGIC CIRCUITS

The functions of the Type SLAT53A relay involve basic logic (AND, OR, AND NOT) where the presence or absence of signals, rather than their magnitude, controls the operation. Signals are measured with respect to a reference bus accessible at TP1. In general a signal below 1 VDC represents an OFF or LOGIC ZERO condition, an ON or LOGIC ONE state 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 Figure 5.

CALCULATION OF SETTINGS

This section covers those timers in the SLAT53A which require field adjustment.

TL12 (25-200/25-200)

This timer is associated with the pole disagreement circuit. The TL12 timer is intended to provide a means of coordinating the 52/a - 52/b contact opening and closing with the breaker main pole position. The pickup delay must be sufficient to cover the time between the closure of the 52/b contact and the opening of the main breaker contacts (or arcing contacts, if present) plus the reset time of the trip functions plus a 5 ms margin. The reset delay of the TL12 timer must be sufficient to cover the time spread between the 52/b opening and main breaker pole reclosing plus margin.

TL3 (.2 - 4 SEC/O)

To prevent prolonged operation with one pole open, CC4 energizes the TL13 timer. The output from TL13 provides a three pole trip initiation to open all of the other breaker poles. The pickup delay setting must exceed the maximum time needed to fault clearing and reclosing.

CONSTRUCTION

The SLAT53A 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 Figures 1 and 3 respectively.

The SLAT53B relay contains printed circuit cards identified by a code number such as: A104, T114, L102 where A designated an auxiliary function, T designated a time delay function, and L designated 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 or AT with TP1 at the top of the AT card. TP1 and TP11 are tied to reference; TP10 and TP20 are tied to +15 VDC through a 1.5K resistor. This resistor limits the current when TP10 or TP20 is used to supply a logic signal to a card.

The SLAT53A relay receives its inputs from the associated Type SLA relay. These units are interconnected by ten conductor shielded calbes. The sockets for these cables are located on the rear panel of the unit. The SLAT53A output functions are connected to 12 point terminal strips, which are also located on the rear of the unit.

A window is provided in the hinged cover of the relay to allow target lamps and the mechanical targets to be seen. Push buttons are also provided to reset the targets and lamps without opening the cover.

RECEIVING, HANDLING AND STORAGE

These relays 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 unpackaged 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 8 inches back from the relay front panel. 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 INSTRUCTIONS

If the SLAT53A relay that is to be tested is installed in an equipment which has already been connected to the power system, disconnect the outputs to the system.

CAUTION

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 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. 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.

A. GENERAL

The SLAT53A relay is supplied from the factory either mounted in a static relay equipment as a separate unit associated with measuring relays, a Type SSA power supply, and some form of channel 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.

Timers should be set for the operating on 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 the timers is described in a later section.

B. OPERATIONAL CHECKS

Operation of the SLAT53A unit can be checked by observing the signals at the twenty test points (TP1 to TP20) in the SLAT53A by observing the operation of the associated channel equipment, or by observing the output functions. The test points are located on two test cards in positions T and AT, and are numbered 1 to 20 from top to bottom. TP1 is the reference bus for the logic circuit, TP10 is at +15 VDC. The remaining points are located at various strategic points throughout the logic as shown on the internal connection diagram (Figure 2). Test point voltages can be monitored with a portable high impedance voltmeter, the voltmeter on the test panel of the associated equipment, or an oscilloscope.

C. 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 card adapter is included in the card instruction book GEK-34158.

D. TIMER ADJUSTMENTS AND TESTS

When the time delay cards are to be adjusted or checked, an oscilloscope that can display two traces simultaneously and that has a calibrated horizontal sweep should be used.

In order to test the timer cards it is necessary to remove the card which supplied the input to the timer (see Table I) and to place the timer card in a card adapter. The card adapter allows access to the input and output of the timer if they are not brought out on test points. The timer test circuit is shown in Figure 6. Opening the N.C. contact causes the output to step up to +15 VDC after the pickup delay of the timer. To increase the pickup time, turn the upper potentiometer to the timer card clockwise; to decrease the time turn it counter-clockwise. Closing the contact causes the timer output to dropout after the reset time delay setting of the card. If the timer card is provided with a variable reset delay, it can be adjusted by the lower potentiometer on the timer card (CW increases reset time).

TABLE I

TIME UNDER TEST	POSITION	REMOVE CARD IN POSITION
TL11	K	PG
TL12	AG	AE
TL13	G	AG

E. TRIP CIRCUIT TESTS

The SCR trip circuits and series mechanical targets may be checked by connecting an auxiliary lockout relay, such as the Type HEA relay, in series with the SCR circuit. A typical circuit is shown in Figure 7. The HEA relay should have the same D.C. rating as the SCR trip circuit of the SLAT53A. If an auxiliary lockout relay is not available, it can be replaced by a resistive load which limits the trip circuit current to 3 amperes.

Prior to final installation, a check of the overall trip circuit should be made with the SCR outputs connected to trip the circuit breakers.

F. OVERALL EQUIPMENT TESTS

After the SLAT53A 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.

Overall equipment test can be performed by applying AC current and voltages to the measuring units as specified in the instruction book for the measuring units and checking that proper outputs are obtained when the measuring units operate.

MAINTENANCE

A. PERIODIC TESTS

It should be sufficient to check the outputs produced at test points in the SLAT53A where periodic calibration tests are made on the associated measuring units, for example, the phase and ground relays in line relaying scheme. No separate periodic tests on the SLAT53A itself should be required.

B. 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.

C. 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 buses due to moisture and dust. The wiring diagrams for the cards in the SLAT51C relay are included in the card book GEK-34158.

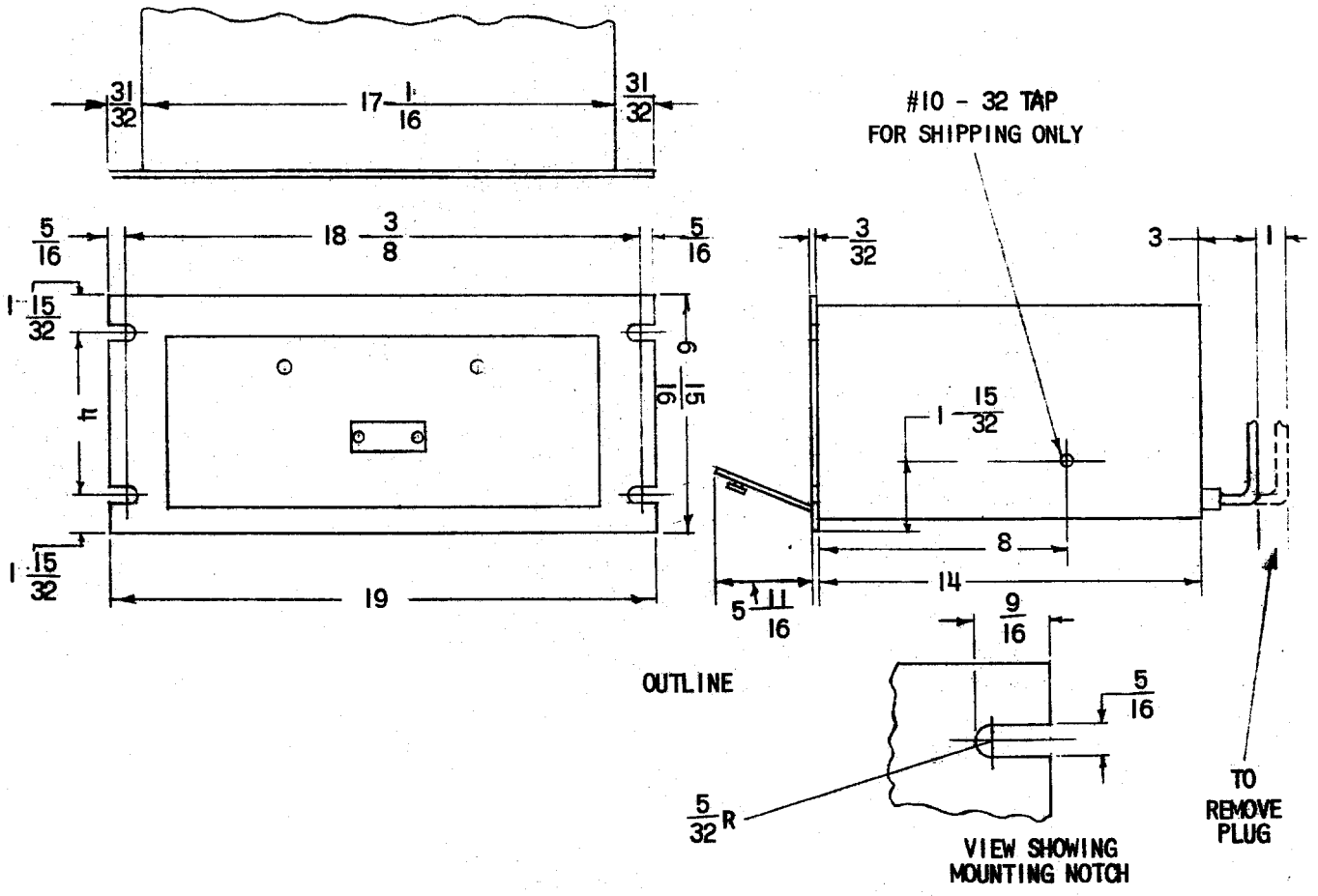


FIG. 1 (0227A2037-0) OUTLINE AND MOUNTING DIMENSIONS FOR THE TYPE SLAT53A

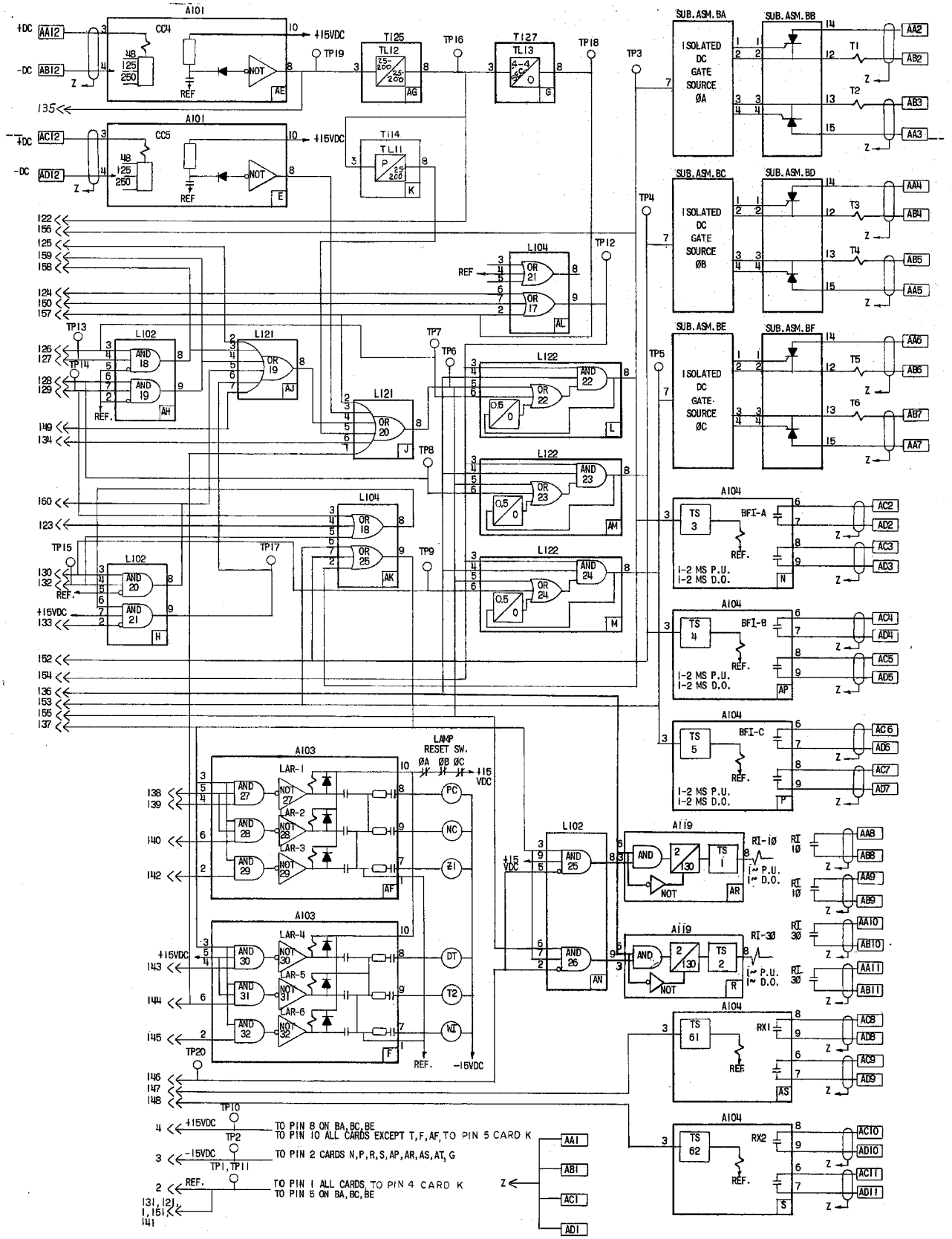
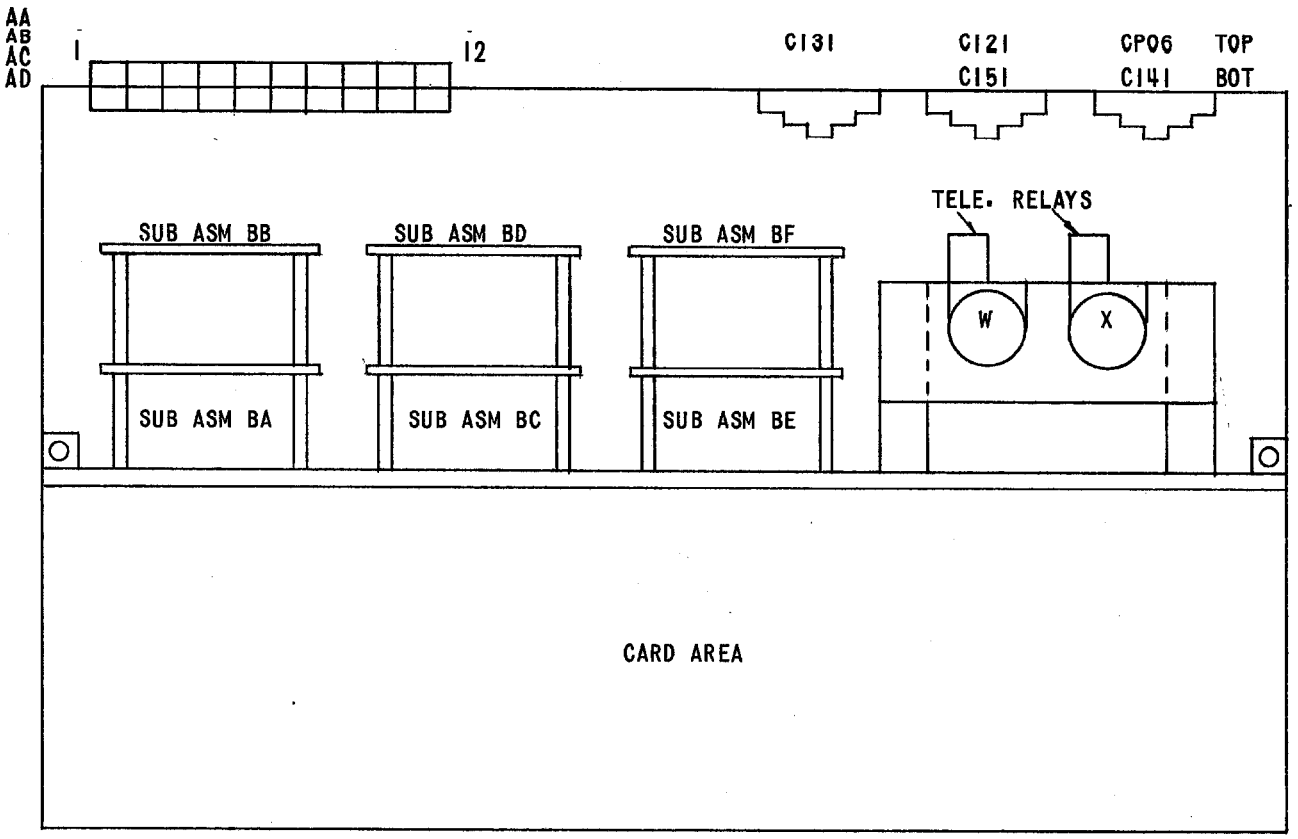


FIG. 2 (0149C7361-2) INTERNAL CONNECTIONS FOR THE TYPE SLAT53A



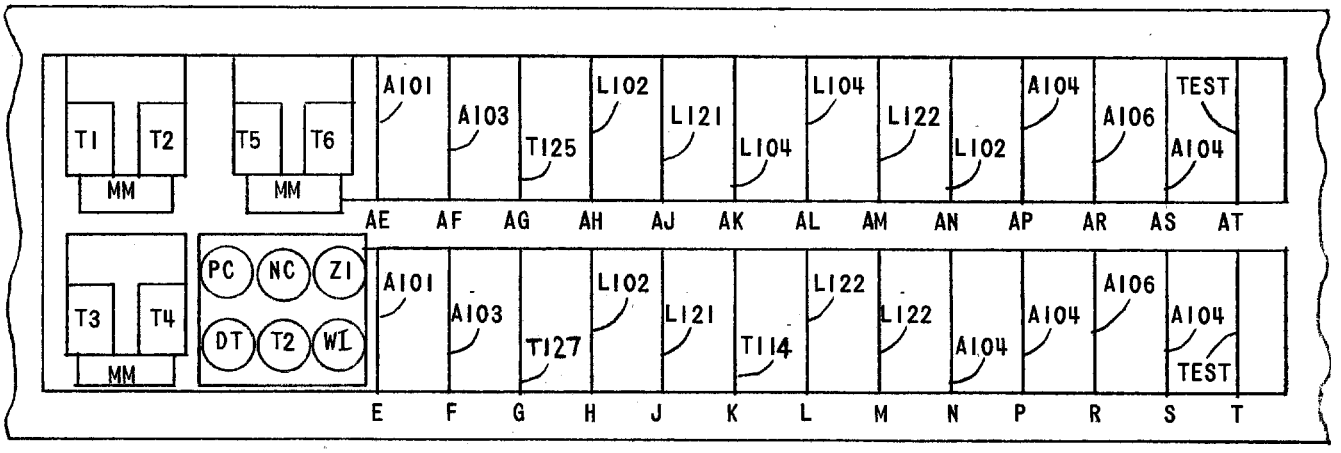


FIG. 3 (0227A2181-0) COMPONENT AND CARD LOCATION DIAGRAM FOR THE TYPE SLAT53A

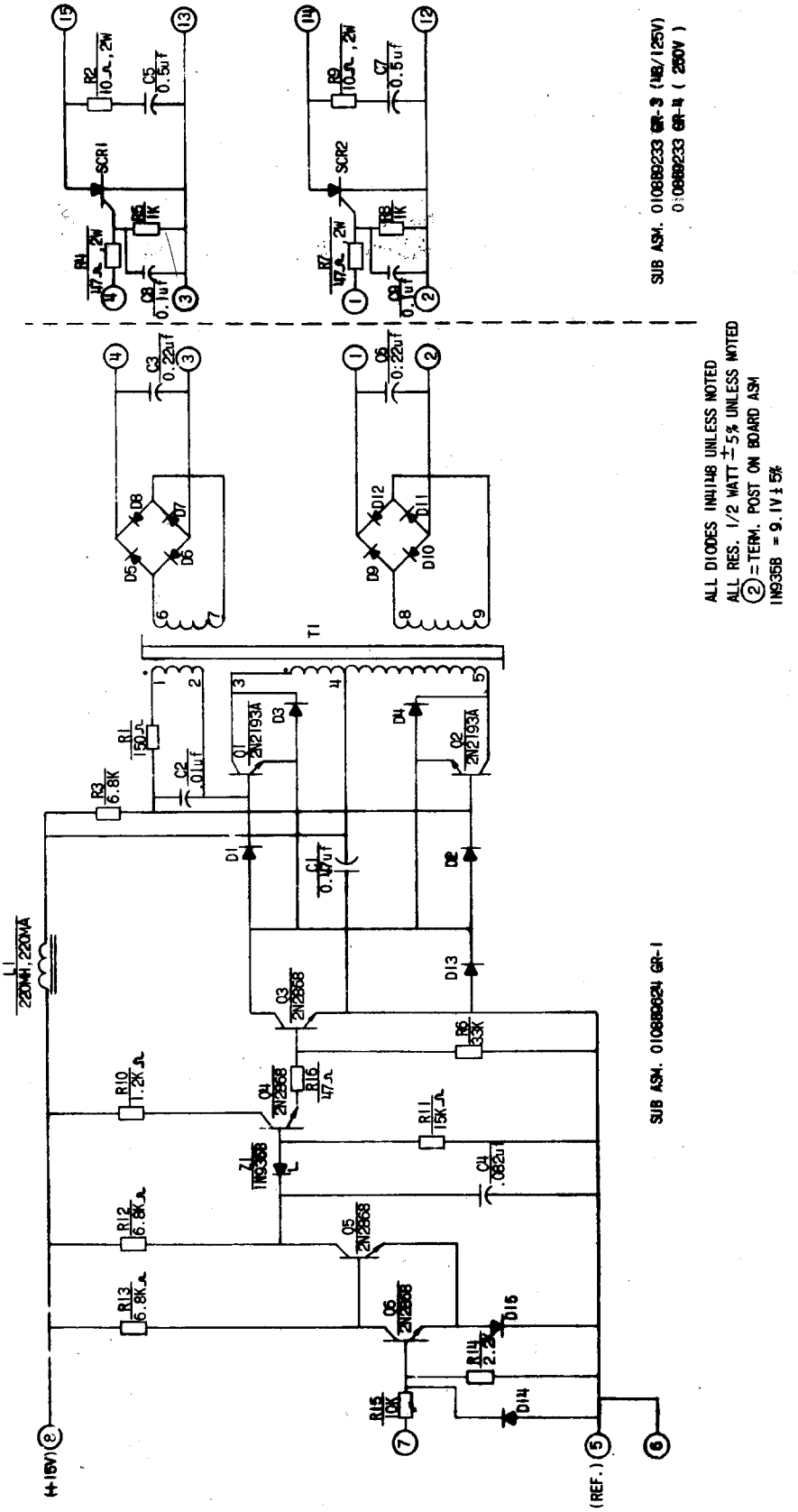


FIG. 4 (0108B9610-0) INTERNAL CONNECTIONS FOR THE SCR TRIP AND ISOLATION SUBASSEMBLIES

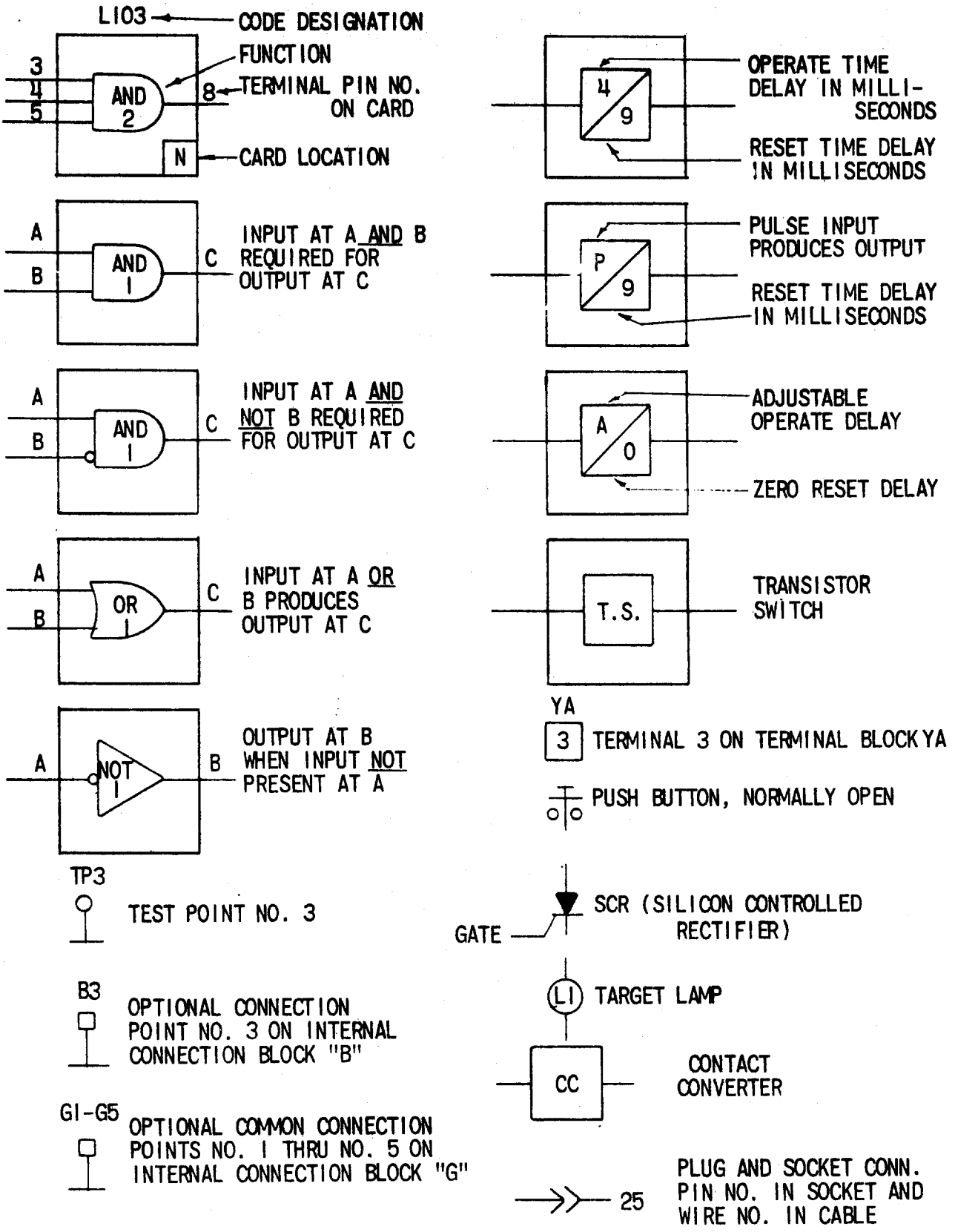
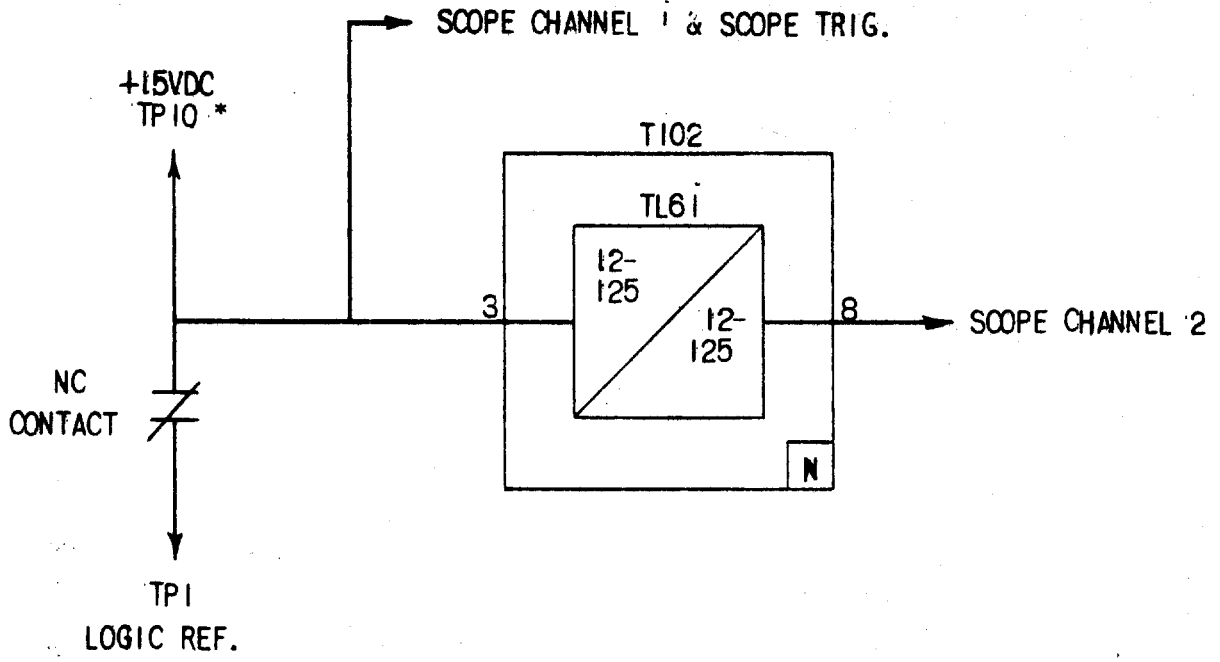


FIG. 5 (0227A2047-0) INTERNAL CONNECTION DIAGRAM LEGEND



* THE 15VDC SIGNAL AT PIN 10 HAS A CURRENT LIMITING RESISTOR MOUNTED ON THE TEST CARD.

FIG. 6 (0246A7987-0) LOGIC TIMER TEST CIRCUIT

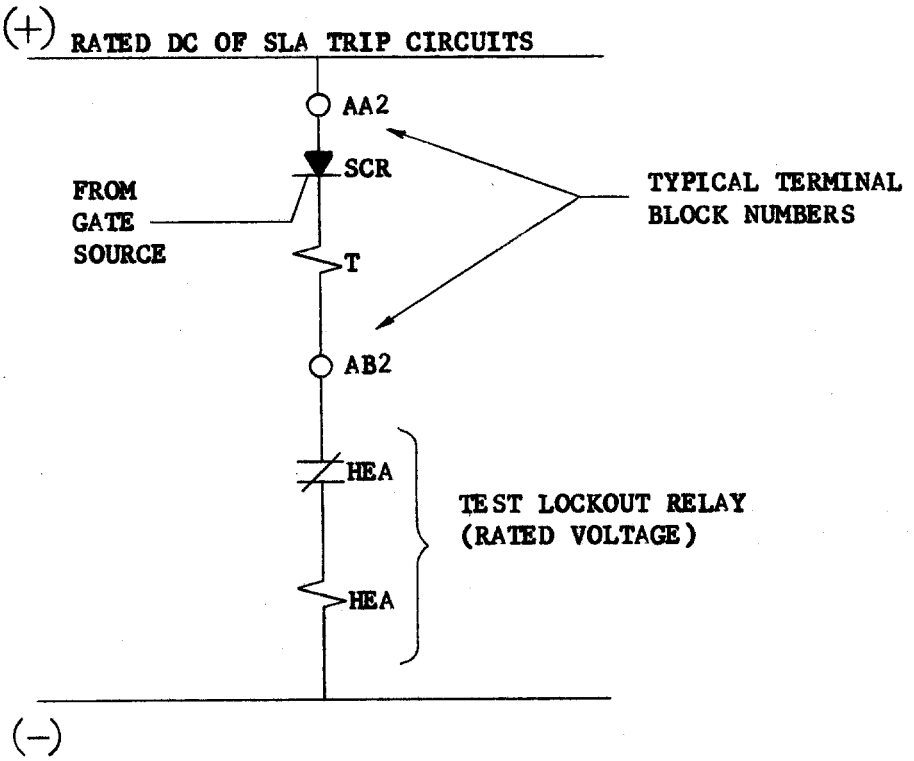


FIG. 7

TYPICAL SCR TEST CIRCUIT FOR TYPE SLA RELAYS

FIG. 7 (0208A2365-0) TYPICAL SCR TRIP CIRCUIT TEST CONNECTIONS

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- • * St. Louis 63110 . . . . . 1115 East Rd.

NEW JERSEY
- • New Brunswick 08902 . . . . . 3 Lawrence St.

NEW MEXICO
- • Albuquerque 87109 . . . 4420 McLeod Rd. NE

NEW YORK
- • Albany 12205 . . . . . .1097 Central Ave.
- • * (Buffalo) Tonawanda 14150 . . 175 Milens Rd.
- • (Long Island) Old Bethpage 11804 . . . . . 183 Bethpage-Sweet Hollow Rd.
- • (New York City) North Bergen, N. J. 07012 . . . . . 6001 Tonnelle Ave.
- * (New York City) Clifton, N. J. 07012 . . . . . 9 Brighton Rd.
- • * Δ Schenectady 12305 . . . . . 1 River Rd.
- • Syracuse 13208. . . . 1015 E. Hiawatha Blvd.

NORTH CAROLINA
- • * Charlotte 28208 . . . . . 2328 Thrift Rd.

OHIO
- • Akron (Canton) 44720 . . . . . 7900 Whipple Ave. N. W.
- • * Cincinnati 45202. . . . . .444 West 3rd St.
- • * Δ Cleveland 44125 . . . . . 4477 East 49th St.
- • Columbus 43229 . . . . . 6660 Huntley Rd.
- • * Toledo 43605 . . . . . 405 Dearborn Ave.
- • Youngstown 44507. . . . 272 E. Indianola Ave.

OKLAHOMA
- • Tulsa 74145 . . . . . 5220 S. 100th East Ave.

OREGON
- • Eugene 97402 . . . . . 570 Wilson St.
- • * Portland 97210 . . . . . 2727 NW 29th Ave.

PENNSYLVANIA
- • Allentown 18103 . . . . . 668 E. Highland St.
- * (Delaware Valley) Cherry Hill, N. J., 08034 . . . . . 1790 E. Marlton Pike
- • Johnstown 15802 . . . . . 841 Oak St.
- • Philadelphia 19124 . . . 1040 East Erie Ave.
- • * (Pittsburgh) West Mifflin 15122 . . . . . 4930 Buttermilk Hollow Rd.
- • York 17403 . . . . . .54 N. Harrison St.

SOUTH CAROLINA
- • (Charleston) No. Charleston 29401 . . . . . 2490 Debonair St.

TENNESSEE
- • Knoxville 37914 . . . . . 2621 Governor John Sevier Hwy.
- • Memphis 38107. . . . . 708 North Main St.

TEXAS
- • Beaumont 77705 . . . . . 1490 W. Cardinal Dr.
- • Corpus Christi 78401 . . . . . 115 Waco St.
- • * Dallas 75235 . . . . . .3202 Manor Way
- • Houston 77036 . . . . 5534 Harvey Wilson Dr.
- * Houston 77036 . . . . . .6916 Harwin Dr.
- • Midland 79701 . . . . . 704 S. Johnston St.

UTAH
- • * Salt Lake City 84110 . . . 301 S. 7th West St.

VIRGINIA
- • * Richmond 23224 . . . . . 1403 Ingram Ave.
- • Roanoke 24013 . . . . . 1004 River Ave., SE

WASHINGTON
- • * Seattle 98134 . . . . . 3422 First Ave., South
- • Spokane 99211 . . . . . E. 4323 Mission St.

WEST VIRGINIA
- • * Charleston 25328 . .306 MacCorkle Ave., SE

WISCONSIN
- • (Appleton) Menasha 54910 . . 1725 Racine St.
- • Milwaukee 53207 . . . 235 W. Oklahoma Ave.

• Electrical/Mechanical Service Shop * Instrumentation Shop Δ Special Manufacturing Shop