



# INSTRUCTIONS

GEK-45435

AUXILIARY LOGIC AND TRIPPING UNIT

TYPE SLAT54D

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**POWER SYSTEMS MANAGEMENT DEPARTMENT**

**GENERAL  ELECTRIC**

**PHILADELPHIA, PA.**

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AUXILIARY LOGIC AND TRIPPING UNITTYPE SLAT54DDESCRIPTION

The SLAT54D is a static logic, output and tripping unit for use in directional comparison schemes. In addition to the SLAT54D relay, the appropriate measuring units, logic unit, power supply, and channel equipment is required to complete a particular relaying scheme.

The outputs of the SLAT54D include a trip output with two electrically separate output contacts (TR); a transferred trip output with two electrically separate output contacts (TT); an out-of-step output with two electrically separate output contacts (OST); a reclose initiation output with two electrically separate output contacts (RI); a positive sequence voltage auxiliary output with three electrically separate output contacts (V1); a reclose cancellation auxiliary output with two electrically separate output contacts (RC); a key tripping auxiliary output with two electrically separate output contacts (KT); and a zone two tripping output with two electrically separate output contacts (Z2). The inputs to the SLAT54D are logic signals from the associated logic units.

The SLAT54D relay is packaged in a four rack unit 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 SLAT54D relay are shown in Figure 2. The component and card locations are shown in Figure 3.

APPLICATION

The SLAT54D provides contact outputs to operate the associated trip and control circuits for type SLYP-SLCN transmission line protection. The high speed TR 100 volt-ampere contacts are intended for operation of a multi-contact auxiliary tripping relay, rather than tripping a circuit breaker directly.

The SLAT54D does not include any targets to indicate what function in the line protection scheme operated to produce a trip output. The SLAT54 can be applied with a data logging amplifier unit such as the DLA52C to provide hand reset target outputs. A DC to DC isolated power supply such as the SSA50 or SSA51 is required to provide DC power and bias voltages for the SLAT54D. This should be the common power supply for the measuring and logic units included in the equipment.

Contact converter CC31 is included to permit disabling all outputs from the SLAT54D with a single control switch contact input.

The only user adjustment in the SLAT54D is the drop-out time-delay setting on the transfer trip keying contact. A reset time range of 25-200 milliseconds is provided by timer TL32. This reset time must set sufficiently long to insure transfer tripping is accomplished at the remote line terminal for all cases.

The operation of the complete line protection scheme is covered by the specific logic diagram and associated logic description supplied with a particular equipment. The system interconnections to the SLAT54D are shown in the elementary diagram supplied with the particular equipment.

RATINGS

The Type SLAT54D relay is designed for use in an environment where the air temperature outside the relay case does not exceed -20°C and +65°C.

The Type SLAT54D relay requires a  $\pm 15$  VDC power source which can be obtained from a Type SSA power supply.

The contacts of the reed relays that are used for TR, OST, Z2, KT and RC are rated for 100 VA DC resistive (35 VA inductive). They will make and carry three amperes continuously.

The contacts of the telephone type relays that are used for RI and V1 will make and carry three amperes continuously and will interrupt up to 0.5 ampere (inductive) at 125 VDC or 0.25 ampere (inductive) at 250 VDC.

The contacts of the reed relay that is used for TT is rated for 10 VA DC. They will carry 500 milliamperes and will withstand a maximum voltage of 250 VDC.

*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.*

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

#### BURDENS

The SLAT54D relay presents a maximum burden to the Type SSA power supply of:

85 ma from +15 VDC supply  
450 ma from -15 VDC supply

#### FUNCTIONS

##### TR TRIPPING CIRCUIT

Two electrically separate normally open contacts are provided; these contacts are to be connected externally to high speed auxiliary relays to provide contact multiplication for tripping and other related functions. These contacts close within 2 milliseconds from the time the associated coil is energized by the logic. These contacts open within 2 milliseconds from the time the coil is deenergized. The TR function uses a reed relay with contact ratings stated under RATINGS.

##### TT TRANSFERRED TRIPPING CIRCUIT

Two electrically separate normally open contacts are provided for high speed keying of channel equipment. These contacts close within 0.5 milliseconds from the time the associated coil is energized by the logic. These contacts open within 0.5 milliseconds from the time the coil is deenergized. The TT function uses a reed relay with contact ratings stated under RATINGS.

##### RI RECLOSE INITIATE CIRCUIT

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

##### V1 POSITIVE SEQUENCE VOLTAGE AUXILIARY CIRCUIT

Three electrically separate contacts (two normally closed and one normally open) are provided. The normally open contacts close and the normally closed contacts open within 17 milliseconds from the time the associated coil is energized by the logic. The normally open contacts open and the normally closed contacts close within 170 milliseconds from the time the coil is de-energized. The V1 function uses a telephone type relay with contact ratings stated under RATINGS.

##### OST OUT-OF-STEP TRIPPING CIRCUIT

Two electrically separate normally open contacts are provided. These contacts close within two milliseconds from the time the associated coil is energized by the logic. These contacts open within 2 milliseconds from the time the coil is de-energized. The OST function uses a reed relay with contact ratings stated under RATINGS.

##### Z2 ZONE TWO TRIPPING CIRCUIT

Two electrically separate normally open contacts are provided. These contacts close within two milliseconds from the time the associated coil is energized by the logic. These contacts open within two milliseconds from the time the coil is de-energized. The Z2 function uses a reed relay with contact ratings stated under RATINGS.

##### KT KEY TRIPPING AUXILIARY CIRCUIT

Two electrically separate normally open contacts are provided. These contacts close within two milliseconds from the time the associated coil is energized by the logic. These contacts open within two milliseconds from the time the coil is de-energized. The KT function uses a reed relay with contact ratings stated under RATINGS.

##### RC RECLOSE CANCELLATION AUXILIARY CIRCUIT

Two electrically separate normally open contacts are provided. These contacts close within two milliseconds from the time the associated coil is energized by the logic. These contacts open within two milliseconds from the time the coil is de-energized. The RC function uses a reed relay with contact ratings stated under RATINGS.

##### CONTACT CONVERTERS

The purpose of the contact converter (CC31) included in the Type SLAT54D relay is to convert a contact operation into a signal that is compatible with the logic circuitry of the relay.

When the external contact associated with CC31 operates, the output relays are blocked from operation.

TL31 DC SUPERVISION TIMER

TL31 is a non-adjustable timer (25/0) that provides DC supervision of relay logic circuits. When DC is removed, TL31 will prevent any trip outputs until 25 ms after DC has been reestablished. NOT 31 provides a fast reset signal to all timers with reset times longer than 25 ms that could produce a spurious trip output upon removal of DC.

LOGIC CIRCUITS

The functions of the Type SLAT54D 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 one VDC represents an OFF or 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 (Figure 2) are explained by the legend shown in Figure 4.

CONSTRUCTION

The SLAT54D 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 SLAT54D 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 with TP1 at the top of the T card. TP1 is tied to reference; TP10 is tied to +15 VDC through a 1.5K resistor. This resistor limits the current when TP10 is used to supply a logic signal to a card.

The SLAT54D relay receives its inputs from the associated Type SLA 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 SLAT54 output functions are connected to 12-point terminal strips, which are also located on the rear of the unit.

RECEIVING, HANDLING AND STORAGE

The SLAT54D 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. 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

IF THE SLAT54D RELAY TO BE TESTED IS PART OF A COMPLETE RELAY TERMINAL EQUIPMENT IN SERVICE, THE VARIOUS OUTPUTS FROM THE SLAT54D MUST BE DISCONNECTED PRIOR TO ANY TEST.

A. GENERAL

The SLAT54D relay is supplied from the factory either mounted in a static relay equipment or 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.

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 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 SLAT54D unit can be checked by observing the signals at the ten test points (TP1 to TP10) in the SLAT54D, or by observing the output functions. The test points are located on a 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. The remaining points are located at various strategic points throughout the logic as shown in 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 adapter card 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 previous 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 5. Opening the normally closed 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 on the timer card clockwise; to decrease the time turn it counterclockwise. Closing the contact causes the timer output to drop out 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 (clockwise increases reset time).

TABLE I

TIME UNDER TEST	POSITION	REMOVE CARD IN POSITION
TL32	AR	AP
TL31	AS	NONE*

\*Turn power supply switch on and off.

E. OVERALL EQUIPMENT TESTS

After the SLAT54D 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 tests can be performed by applying alternating 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 SLAT54D when 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 SLAT54D 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 busses due to moisture and dust. The wiring diagrams for the cards in the SLAT54D relay are included in the card book GEK-34158.

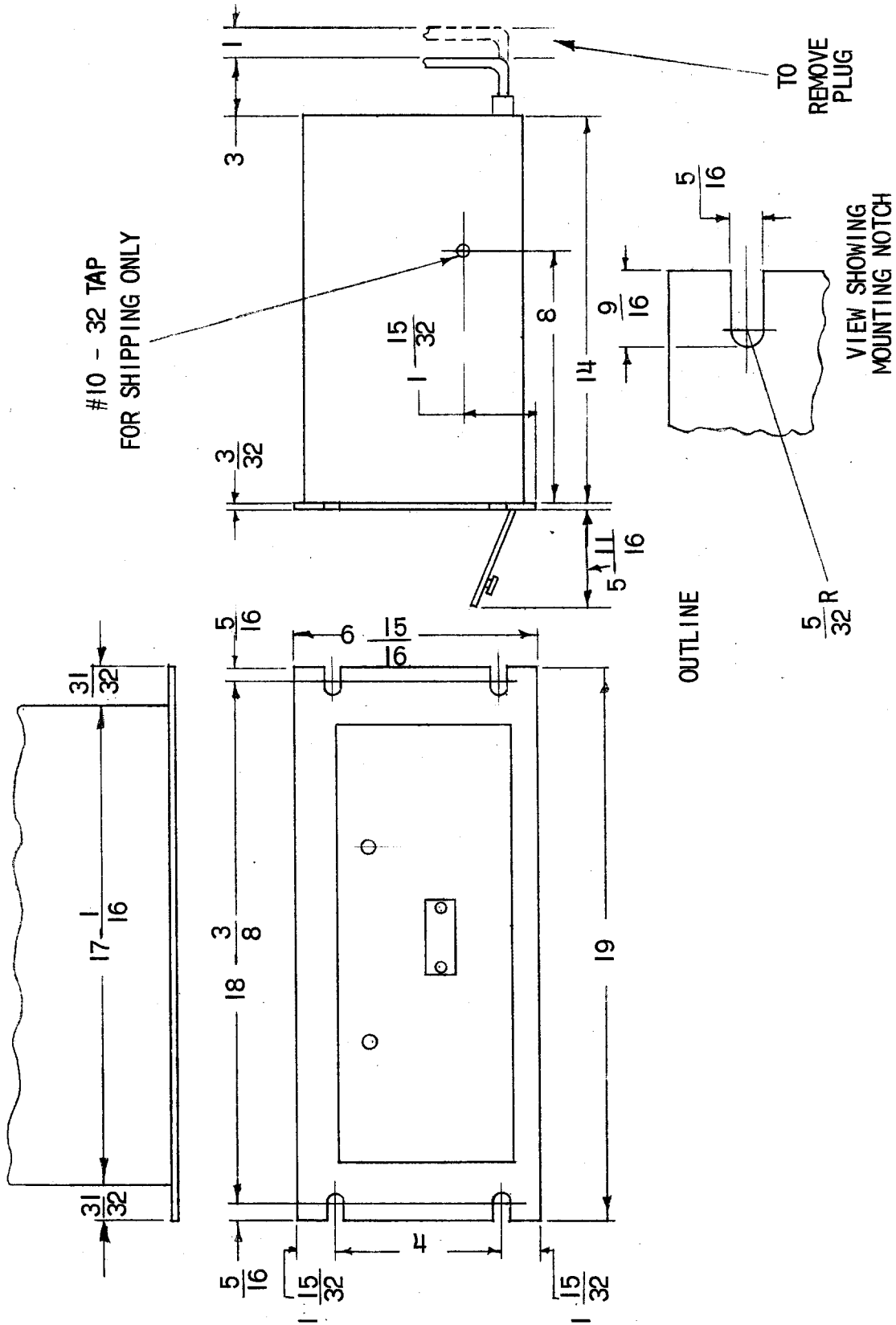


Fig. 1 (0227A2037-0) OUTLINE AND MOUNTING DIMENSIONS FOR THE TYPE SLAT54D RELAY



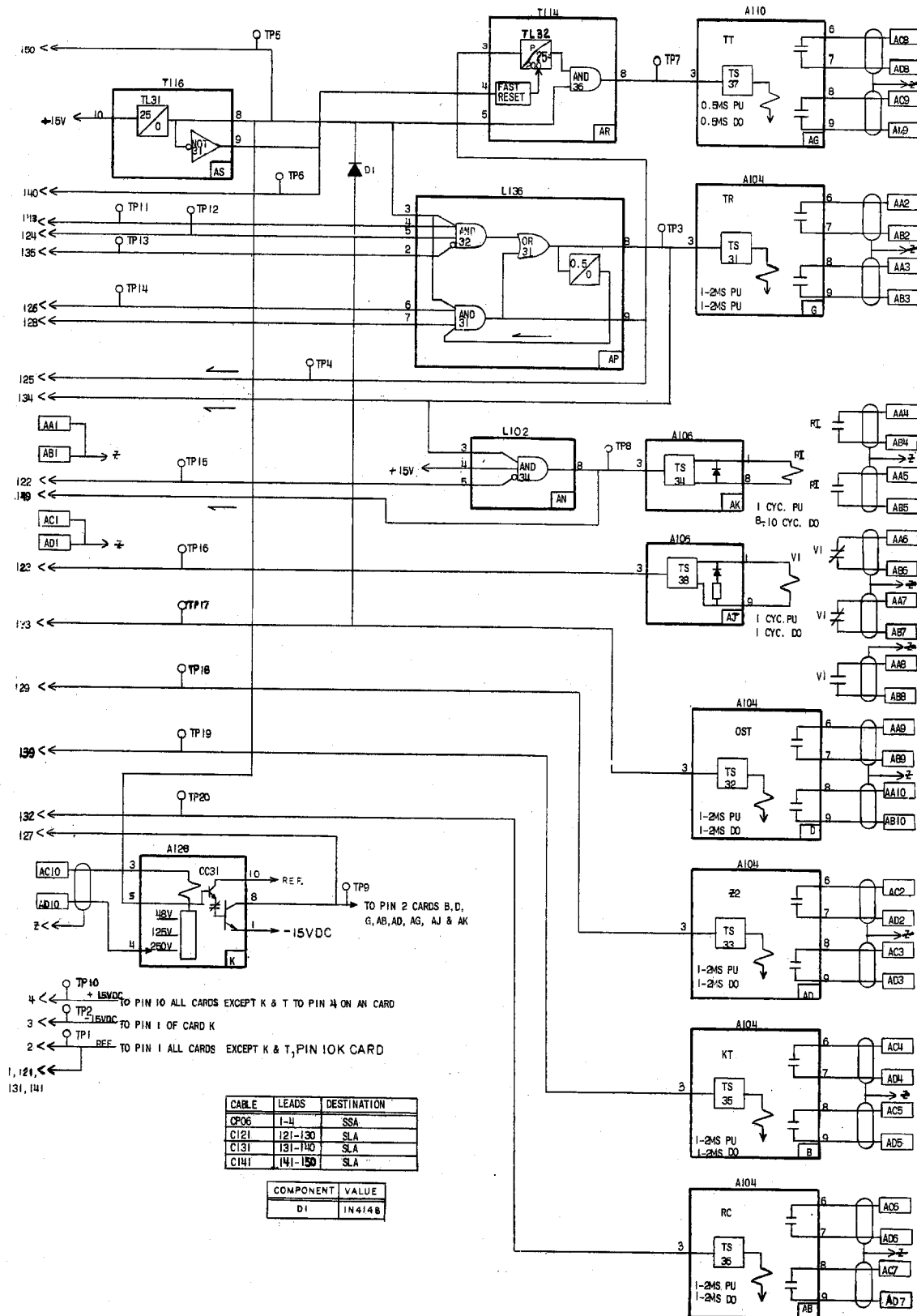
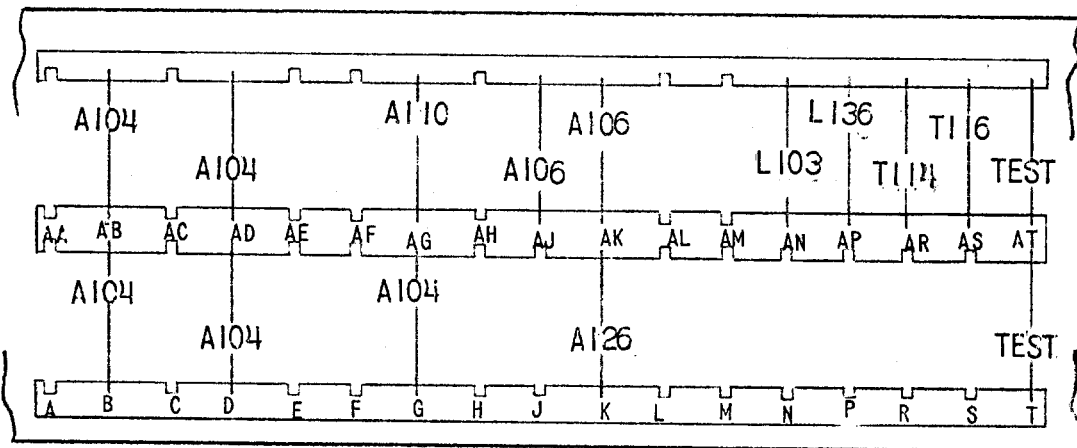
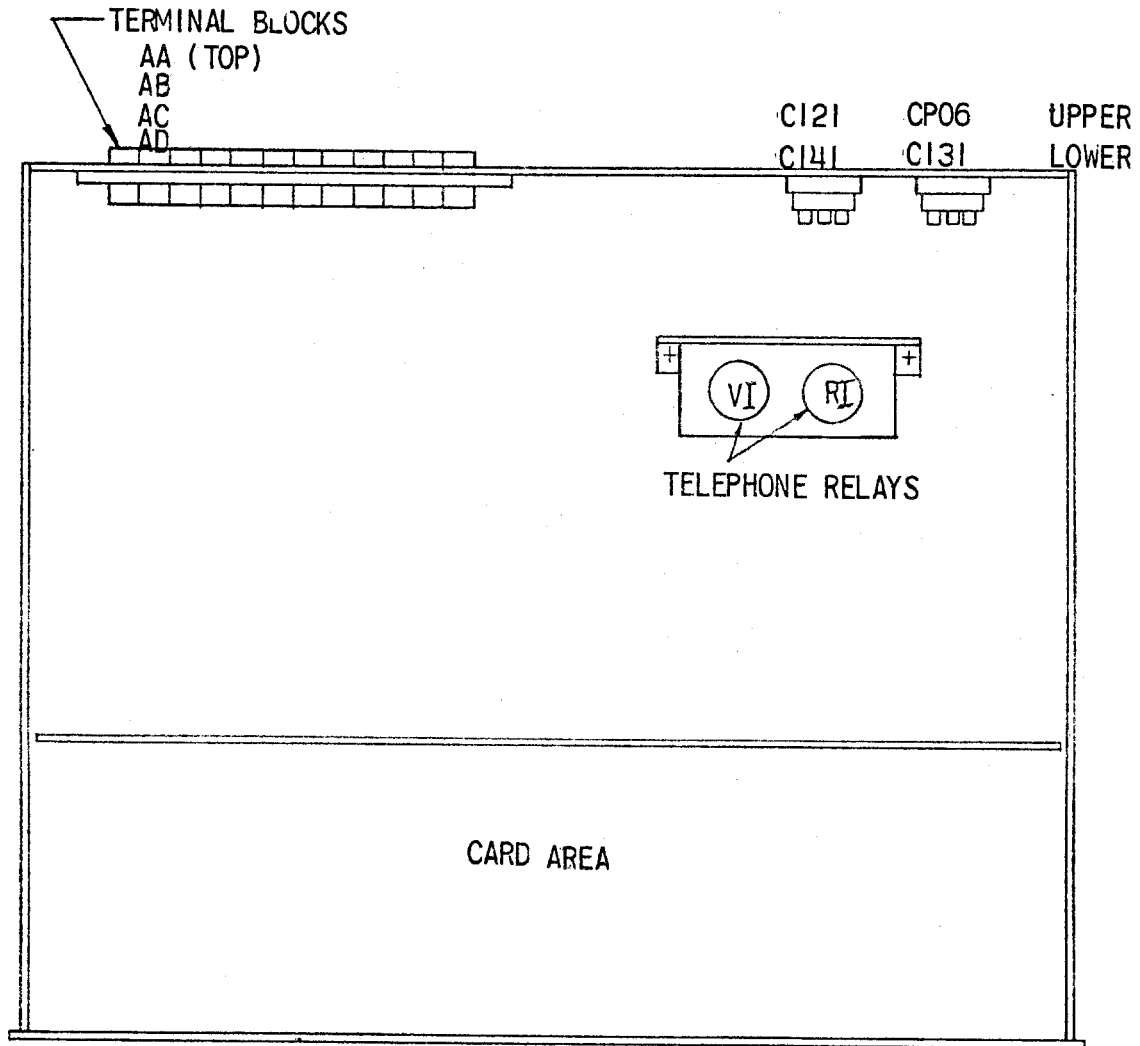


Fig. 2 (0167C8776-3) INTERNAL CONNECTIONS FOR THE TYPE SLAT54D RELAY



FRONT VIEW

Fig. 3 (0257A8377-0) COMPONENT LOCATIONS FOR THE TYPE SLAT54D RELAY

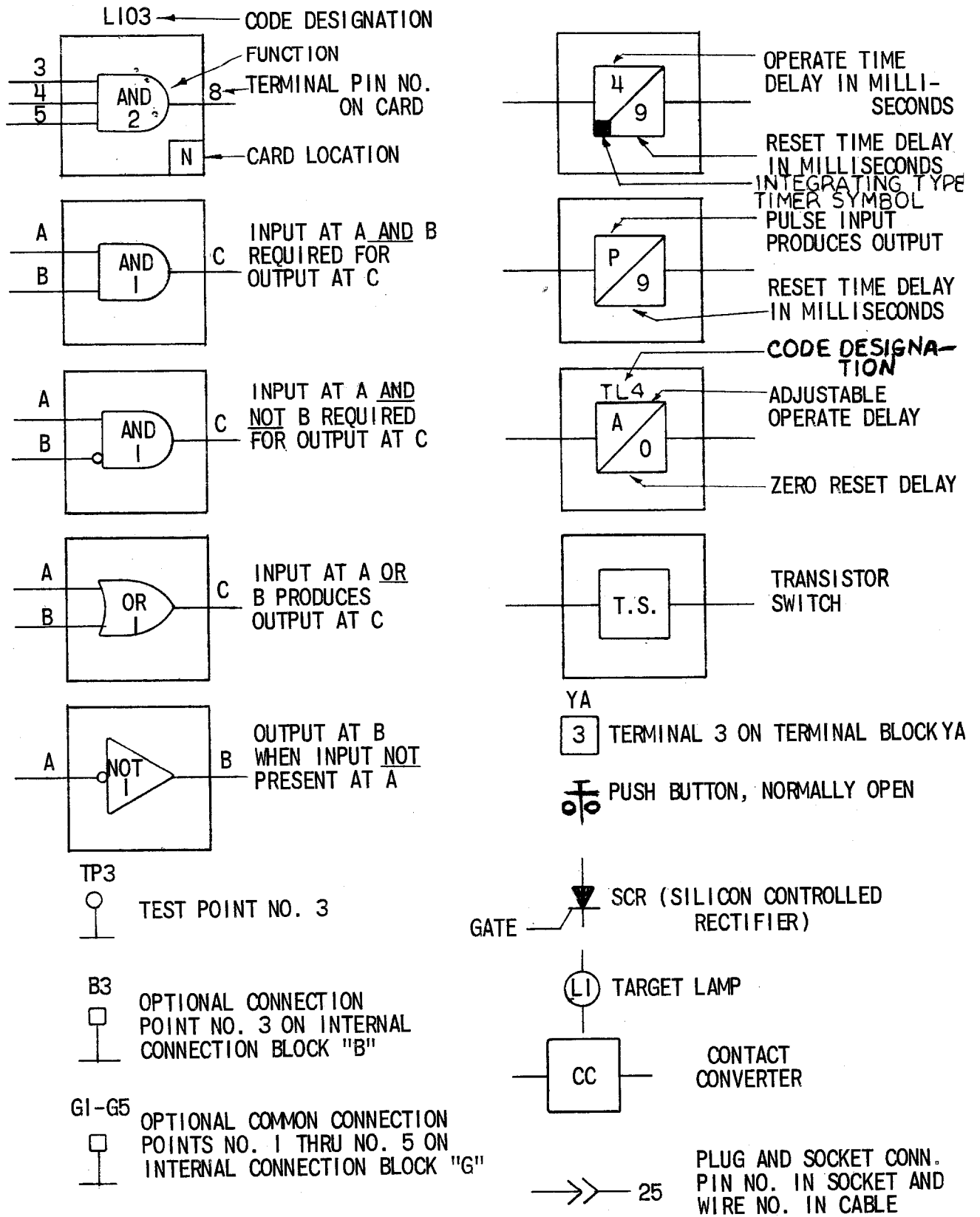
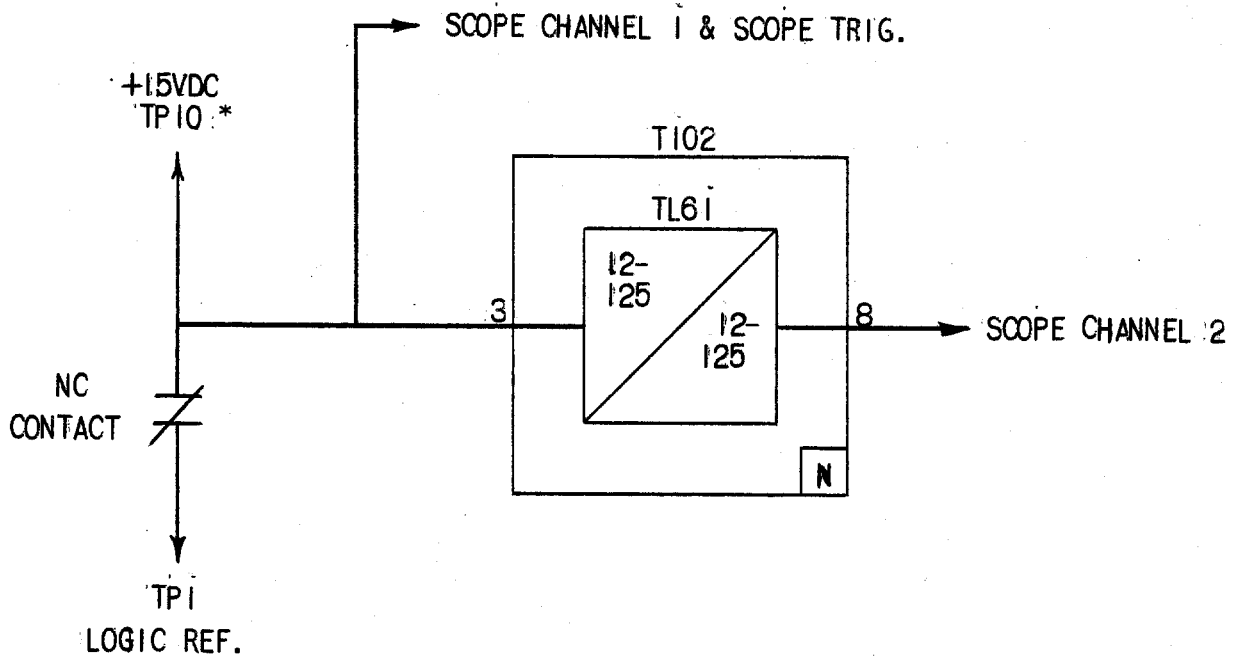


Fig. 4 (0227A2047-1) LOGIC AND INTERNAL CONNECTIONS DIAGRAM LEGEND



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

Fig. 5 (0246A7987-0) LOGIC TIMER TEST CIRCUIT