INSTRUCTIONS

GEK-86071

SOLID STATE AUXILIARY LOGIC RELAY

FOR

TRANSMISSION LINE PROTECTION

TYPES:

SLA56A
SLA56B
SLA56C
SLA56D

GENERAL ELECTRIC

CONTENTS

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DESCRIPTION

The SLA56 is an auxiliary logic relay containing the necessary logic to interpret output signals from associated measuring functions, and translate them to an appropriate auxiliary relay. In addition to the SLA relay, appropriate measuring relays, plus a power supply and auxiliary tripping relays are required to complete a particular relaying scheme.

These SLA relays are packaged in a four-rack unit enclosed metal case (one rack unit is 1-3/4 inches). The relay is suitable for mounting in a 19 inch rack. The case outline and mounting dimensions are shown in Figure 1. The internal connections for these relays are show in Figures 2, 3, 4 and 5, and the component and printed circuit card locations are shown in Figures 6, 7, 8 and 9.

APPLICATION

The Type SLA56A, B, C and D relays are intended for use in a generation reduction scheme which is designed to increase system stability. The logic for the generation reduction scheme is contained in the Type SLA56A relay. The Type SLA56B, SLA56C and SLA56D relays are used to provide coordinating time delays, and, in the SLA56B and SLA56D, to provide contact outputs.

TIMER SETTINGS

SLA56A

TL1, TL2, TL3, TL4

These timers are part of a logic scheme to provide an alarm indication when the line disconnect auxiliary switches or the line breaker auxiliary switches indicate that the line is open, but the I3Ø or current function associated with that line indicates that the line is carrying load current. The pickup setting of these timers should be long enough to allow coordination between the contacts and the I3Ø

function, and also to allow coordination between the line relay contact inputs to CC1, CC2, CC3 and CC4, and the resetting of the I3Ø when the line is cleared. A pickup delay of two seconds is suggested.

TL5

This timer is intended to provide an extended signal to the relay logic, indicating that the total power output of the generators is higher than the set level. A dropout time delay of two seconds is suggested.

TL6

TL6 is the DC supervision timer. This timer supervises the final trip bus and prevents false tripping due to transients when the logic level DC voltage is applied or removed. This timer has a non-adjustable pickup delay of 75 milliseconds.

TL7

TL7 is intended to provide a security delay before the trip bus can be energized, after an indication is given that three lines are out of service. The pickup delay of this timer determines the minimum operating time of the scheme.

TL8

This timer provides a 100 millisecond delay before initiating a trip signal during an inter-channel checkback. This timer is intended to prevent false tripping of the scheme due to "contact race" conditions when the inter-channel checkback cycle begins.

SLA56B, SLA56C, SLA56D

The pickup and dropout times of the various coordination timers included in these units are determined by their use in the particular scheme. The times are indicated on the scheme diagrams.

RATINGS

The Type SLA56 relays are designed for use in an environment where the air temperature outside the relay case is between minus 20°C and plus 65°C.

The Type SLA56 relays require a plus or minus 15 volt DC power source which can be obtained from a Type SSA50/51 power supply.

Each contact converter in these relays has a link for selecting the proper voltage for the coil circuit of the contact converter. The three available voltage taps are for 48, 125 or 250 volts DC.

BURDENS

Each contact converter, when energized, will draw approximately ten milliamperes from the station battery, regardless of the station battery voltage.

The relays present a burden to the plus 15 volt DC supply of the Type SSA50/51 power supply as follows:

Model	Approximate Burden
SLA56A	125 milliamperes
SLA56B	150 milliamperes
SLA56C	130 milliamperes
SLA56D	100 milliamperes

OPERATING PRINCIPLES

LOGIC CIRCUIT

The functions of the Type SLA56 relays 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 volt DC represents an OFF or LOGIC ZERO condition; an ON or LOGIC ONE condition is represented by a signal of approximately plus 15 volts DC.

The symbols used on the internal connection diagram are explained by the legend shown in Figure 10.

CONTACT CONVERTERS

The purpose of this function is to convert a contact operation into a signal that is compatible with the logic circuitry of Type SLA relays. These contact converters, which are labeled CC1 and up, have non-adjustable four millisecond pickup delay.

CONSTRUCTION

These relays are packaged in an enclosed metal case with hinged front covers and removable top covers. The outline and mounting dimensions of these cases are shown in Figure 1.

The SLA56 relays contain printed circuit cards identified by a code number, such as A120, L101, T158, where A designates an auxiliary function, L designates a logic function and T designates a time delay 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 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. TP10 is tied to plus 15 volts DC through a 1.5K resistor. This resistor limits the current when TP10 is used to supply a logic signal to a card.

RECEIVING, HANDLING AND STORAGE

These relays will normally be supplied as 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 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 INSTRUCTIONS

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 THE INSTRUMENT CHASSIS. IF THE INSTRUMENT USED TO TEST THE RELAY EQUIPMENT IS ISOLATED FROM GROUND, ITS CHASSIS MAY HAVE A 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.

GENERAL

If the SLA56 relay that is to be tested is installed in an equipment which has already been connected to the power system, disconnect the outputs from the system.

The SLA56 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 connection 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 overal 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.

OPERATIONAL CHECKS

Operation of the SLA56 unit can be checked by observing the signals at the twenty test points (TP1 to TP20). 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 plus 15 volts and TP2 is at minus 15 volts DC. The remaining points are located at various strategic points throughout the logic as shown on the associated internal connection diagram. The 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.

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 printed circuit card instruction book, GEK-34158.

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 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 11. Opening the normally closed contact causes the output to step up to plus 15 volts DC 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 the potentiometer on the timer card 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).

CONTACT CONVERTER TESTS

Operation of the contact converters can be checked by placing the contact converter card in a card adapter, after checking that the voltage tap selected agrees with the station battery voltage. Connect the station direct current through a switch to the appropriate pair of terminals of the terminal strip, AH, AJ, AK, AL or AM, mounted on the rear of the relay. The terminal numbers and polarity of connections for each of the contact converters are shown in the associated internal connection diagram, Figures 2, 3, 4 or 5. the output of the contact converter card may be monitored between pin 8 and pin 1 (reference) on the card adapter with either a scope or meter. Closure of the switch in the test source will provide a plus 15 volt DC signal at pin 8 of the card adapter.

OVERALL EQUIPMENT TESTS

After the SLA56 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 currents and voltages to the measuring units as specified in the instruction book for the measuring units and checking that proper outputs are obtained.

MAINTENANCE

PERIODIC TESTS

It should be sufficient to check the outputs produced at test points in the SLA56 when periodic calibration tests are made on the associated measuring units, for example, the phase and ground relays in the line relaying scheme. No separate periodic tests on the relay should be required.

TROUBLESHOOTING

In any troubleshooting 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.

SPARE PARTS

To minimize possible outage time, it is recommended that one spare card of each type be carried in stock. 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 buses, or overheat the semiconductor 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 SLA56 relay are included in the printed circuit card instruction book, GEK-34158.

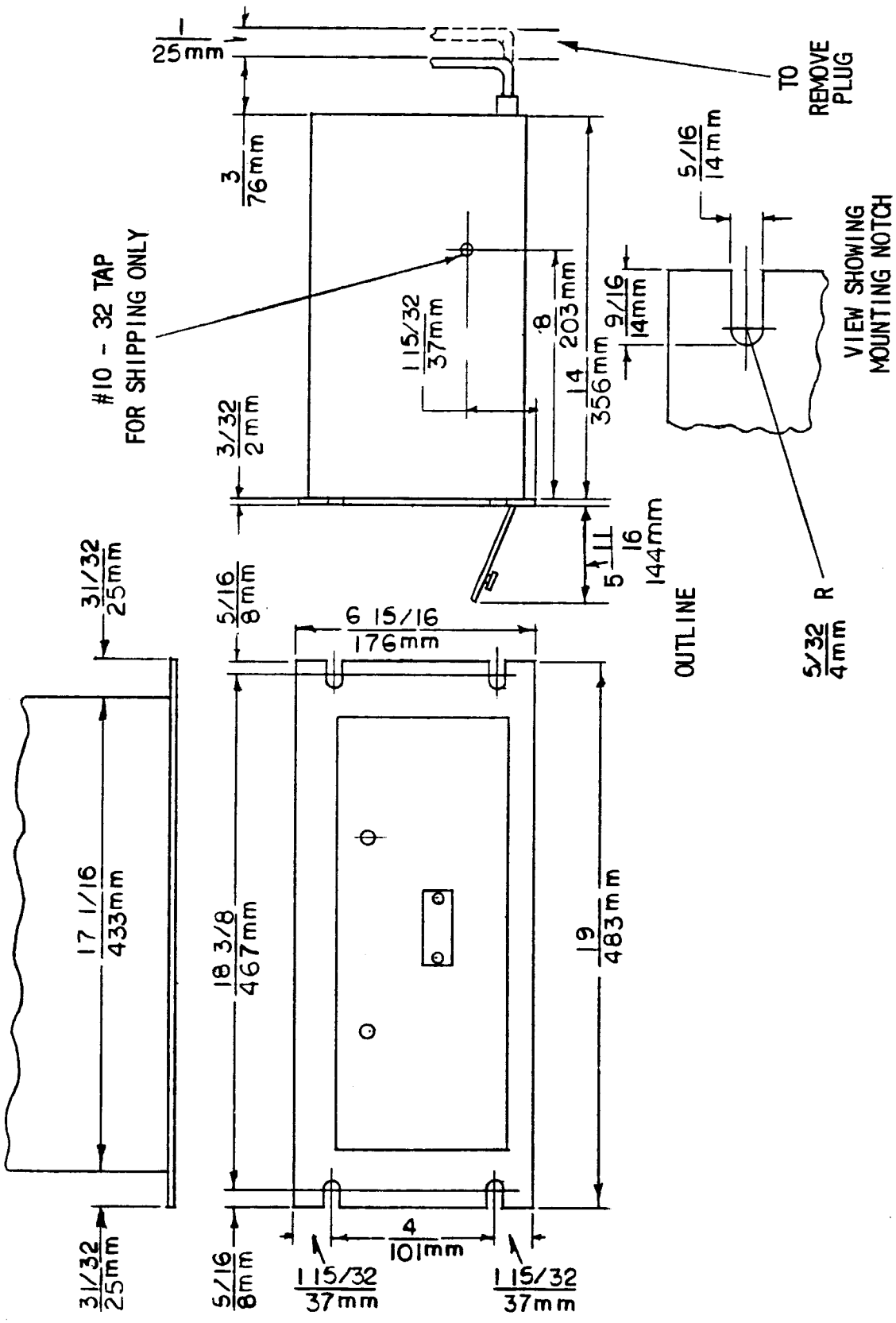


Figure 1 (0227A2037-0) Outline and Mounting Dimensions for Type SLA56 Relays

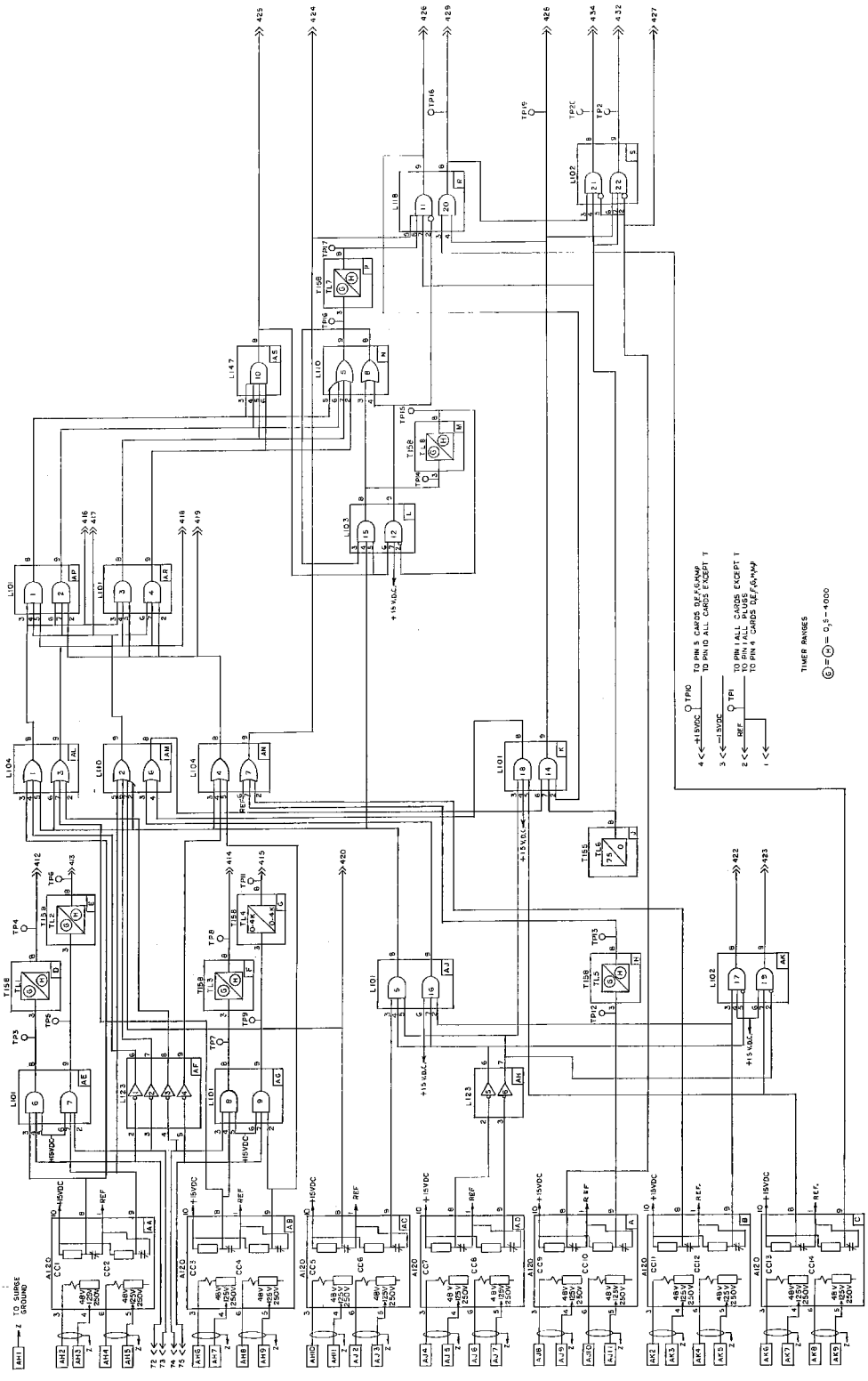


Figure 2 (0145D8703-0) Internal Connections Diagram
for Type SLA56A Relays

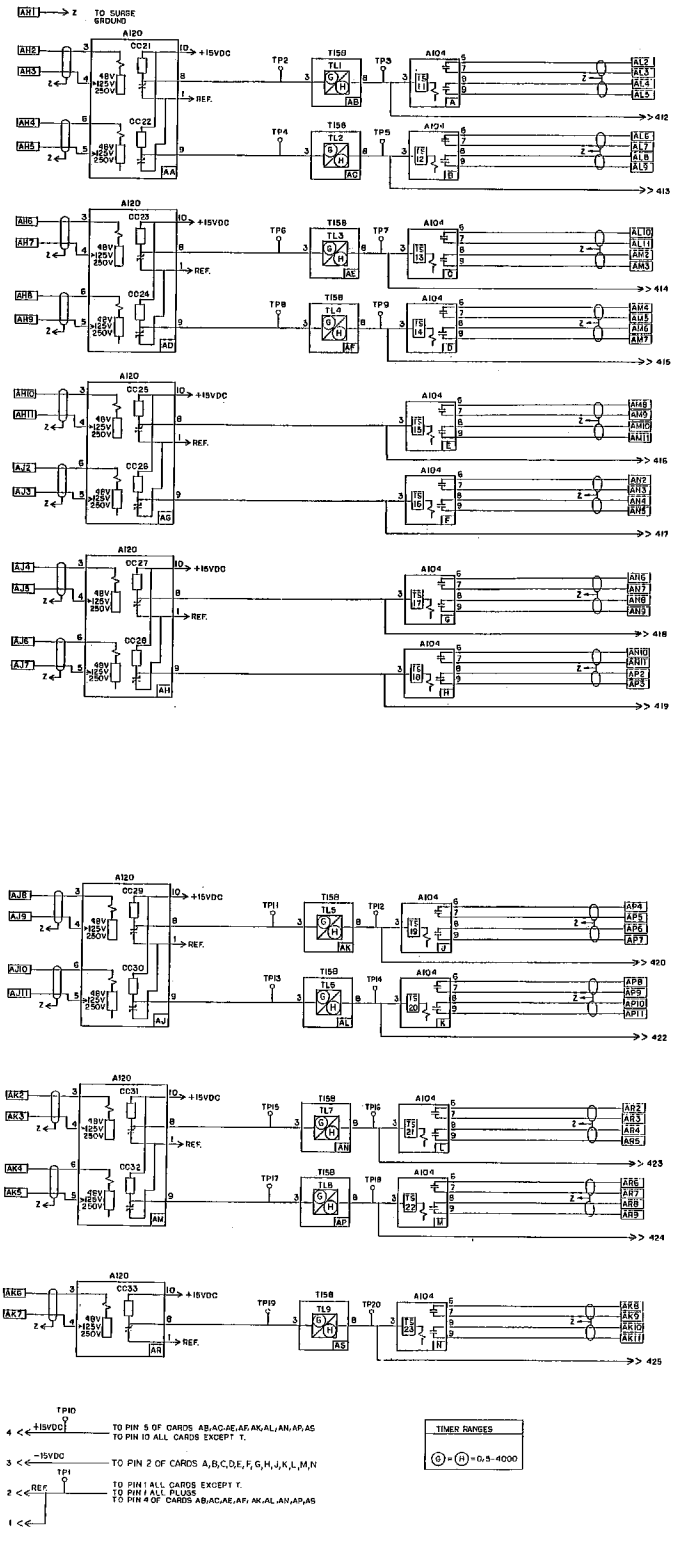


Figure 3 (0145D8704-0) Internal Connections Diagram for Type SLA56B Relays

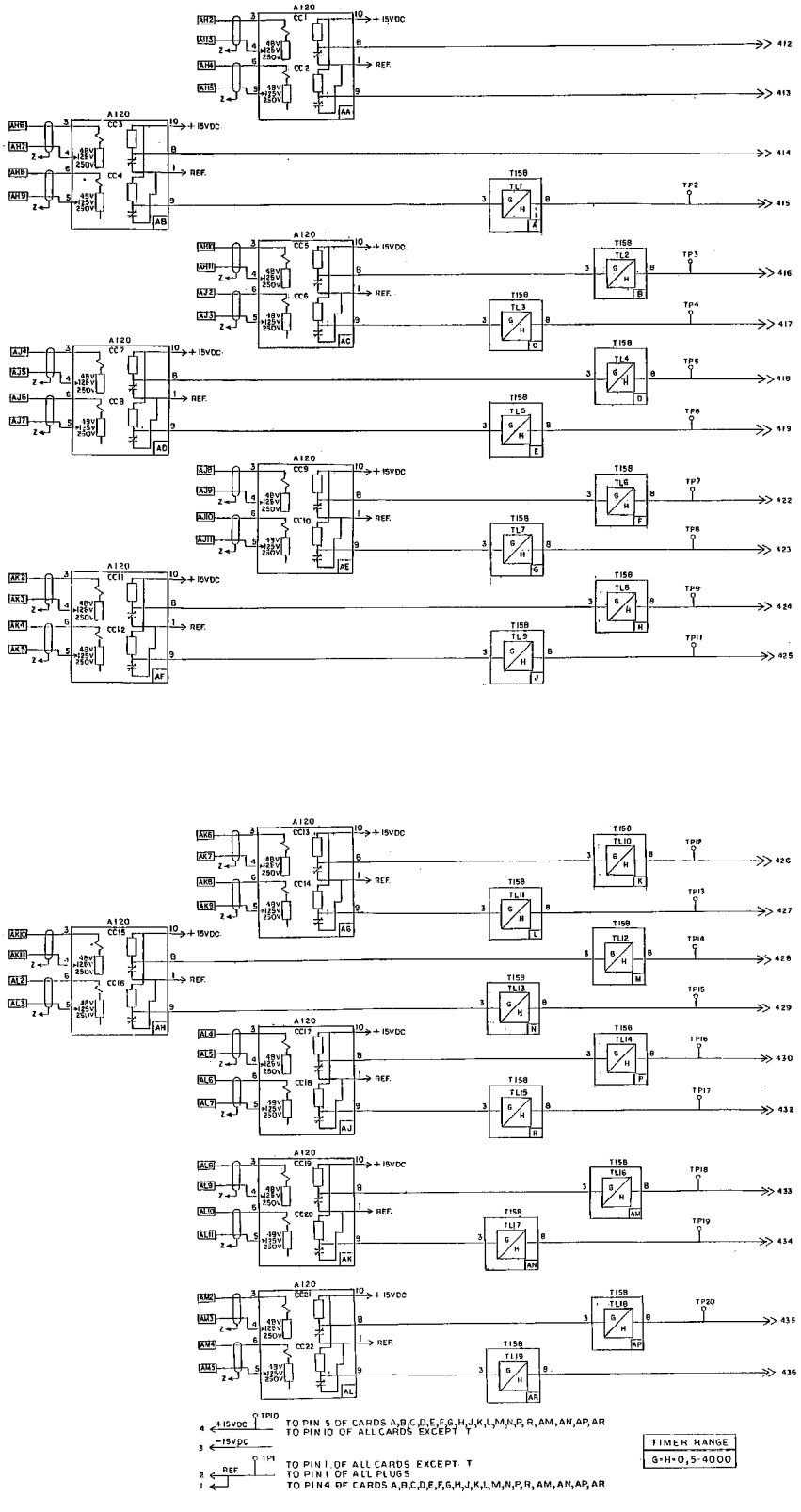


Figure 4 (0145D8705-0) Internal Connections Diagram for Type SLA56C Relays

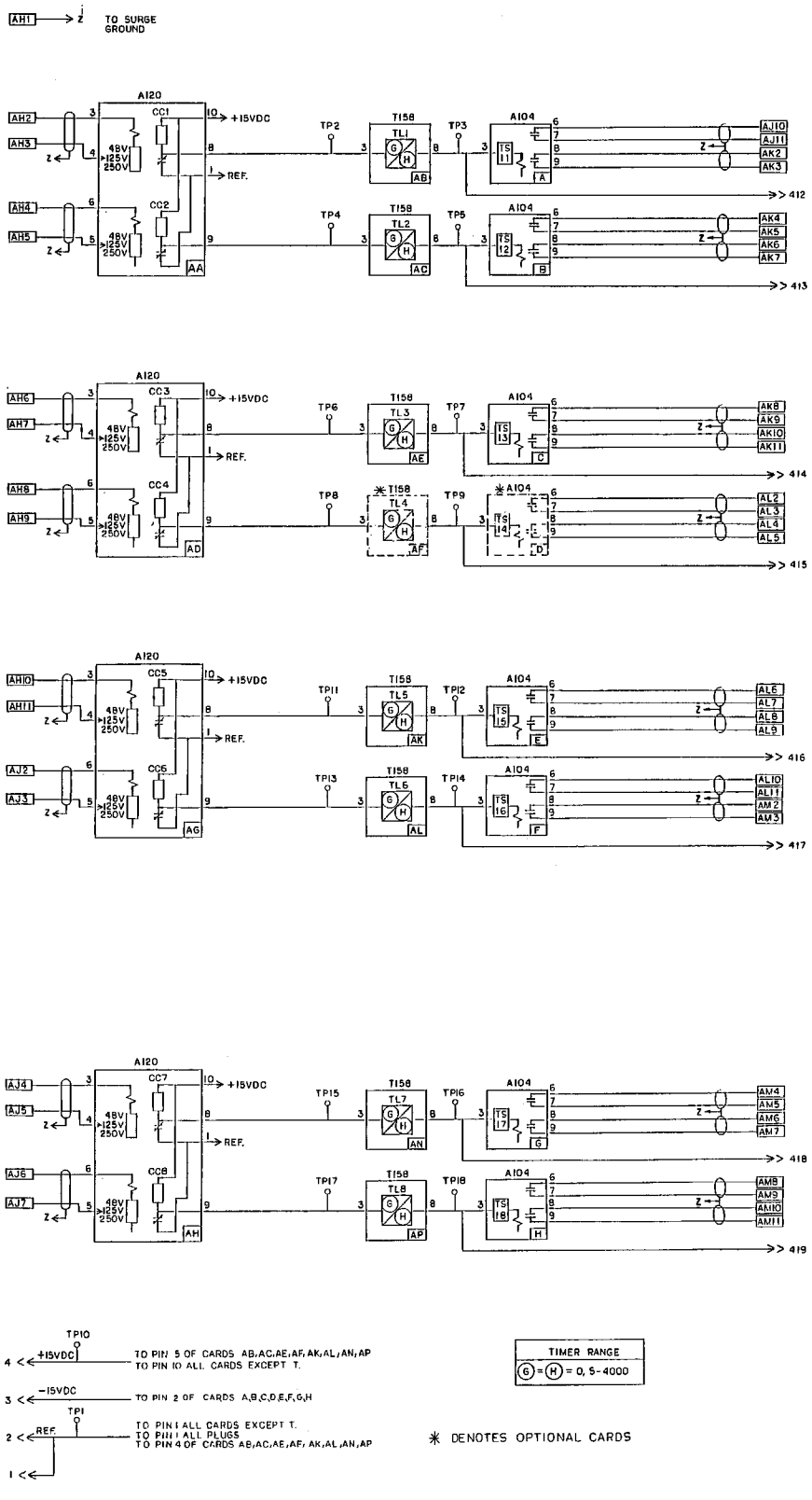
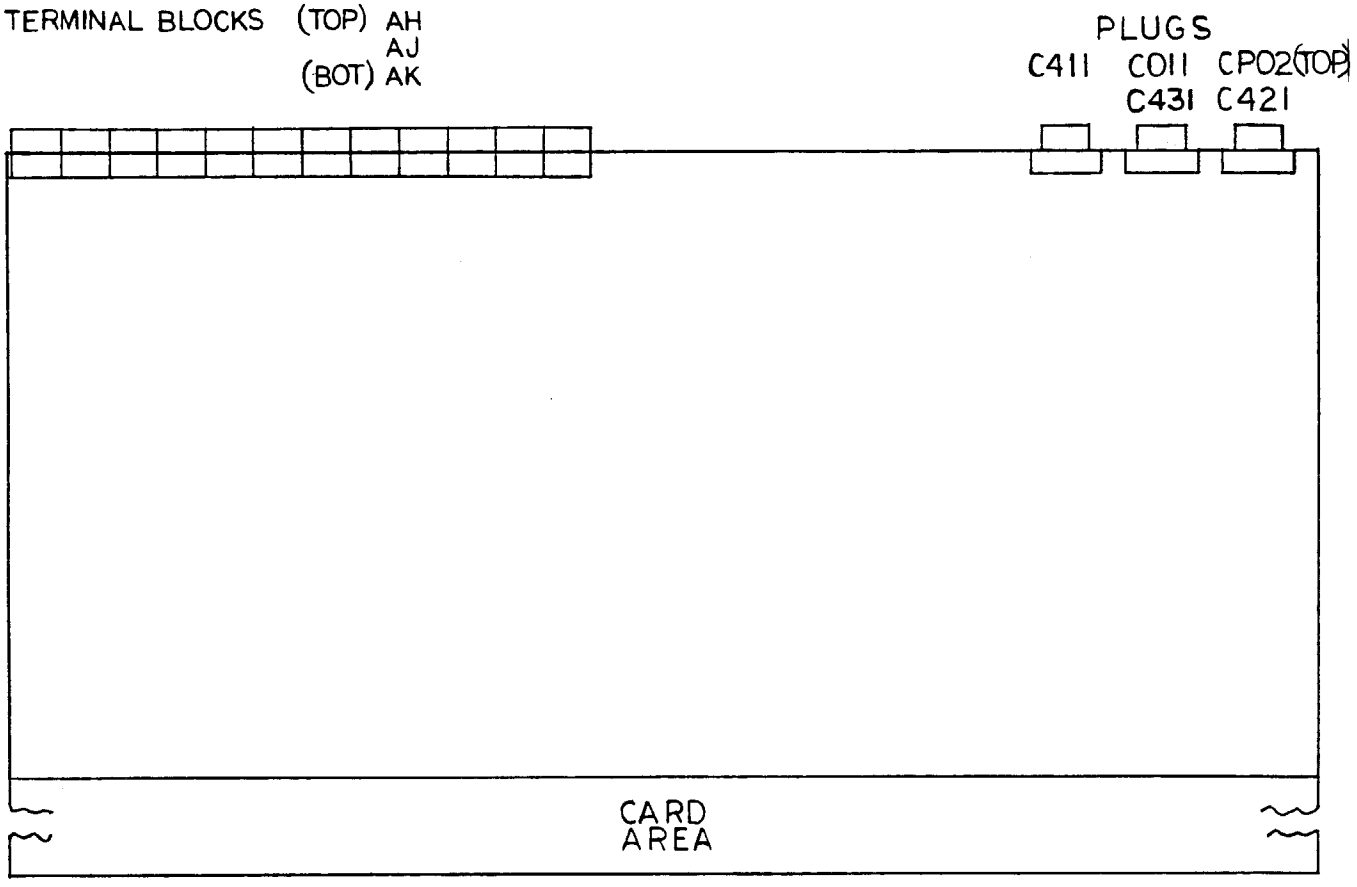


Figure 5 (0145D8706-0) Internal Connections Diagram for Type SLA56D Relays



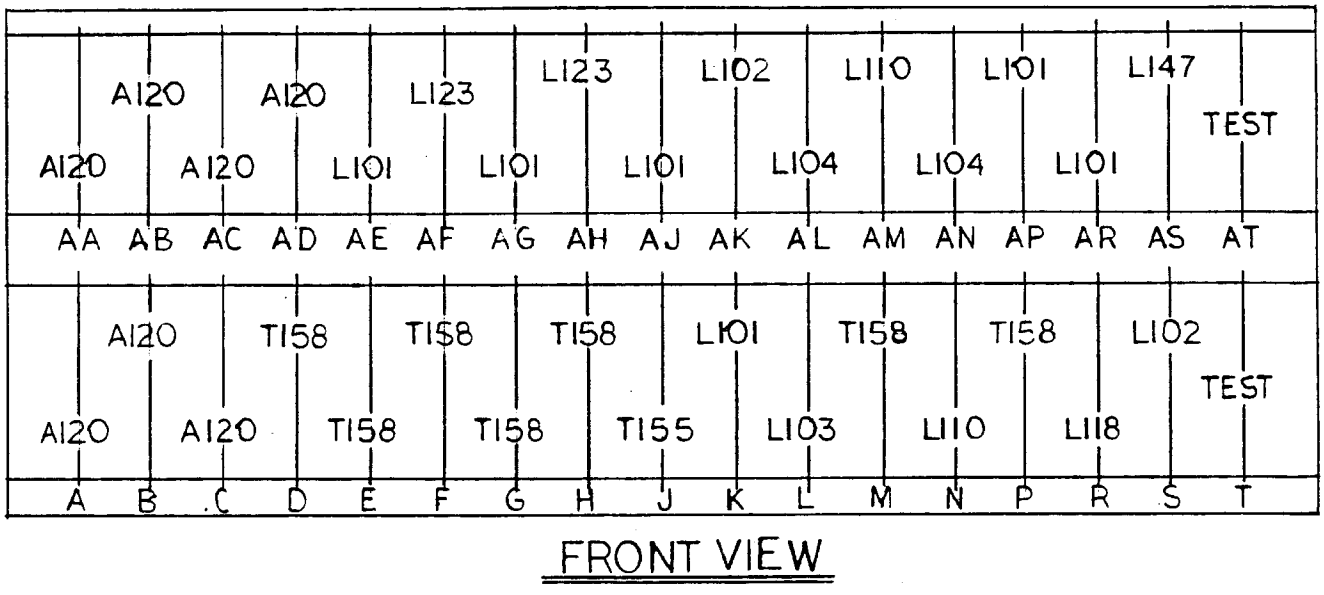


Figure 6 (0285A6219-0) Component and Printed Circuit Card Location Diagram for Type SLA56A Relay

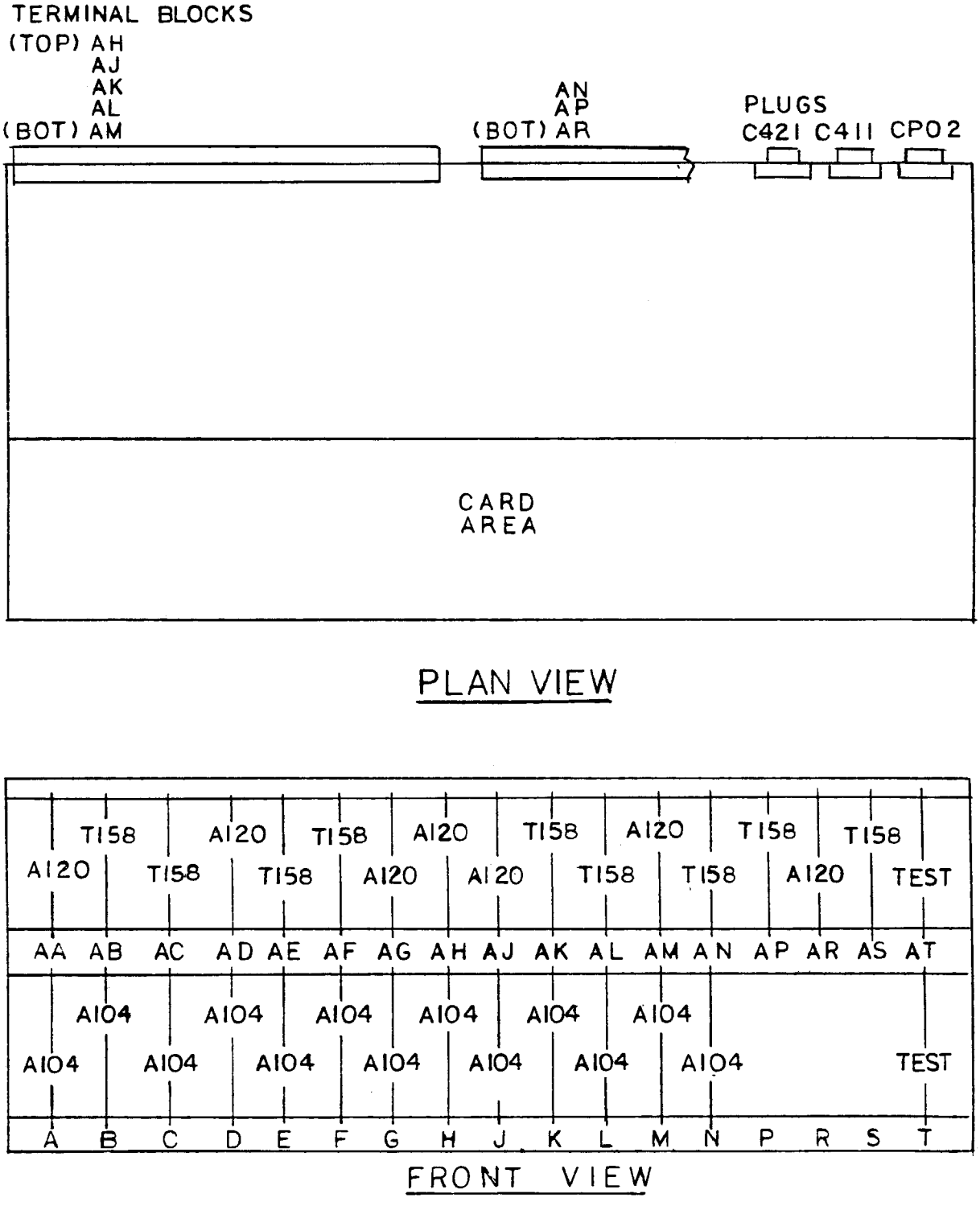
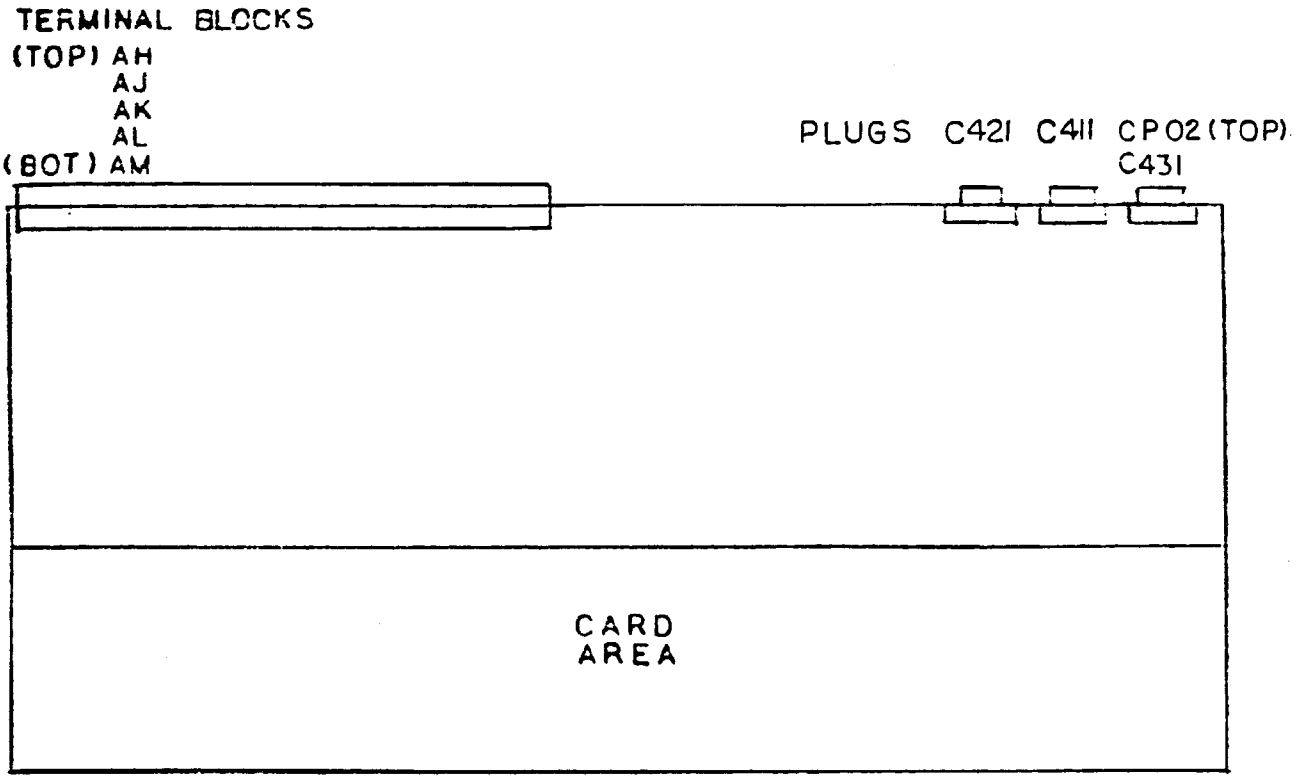
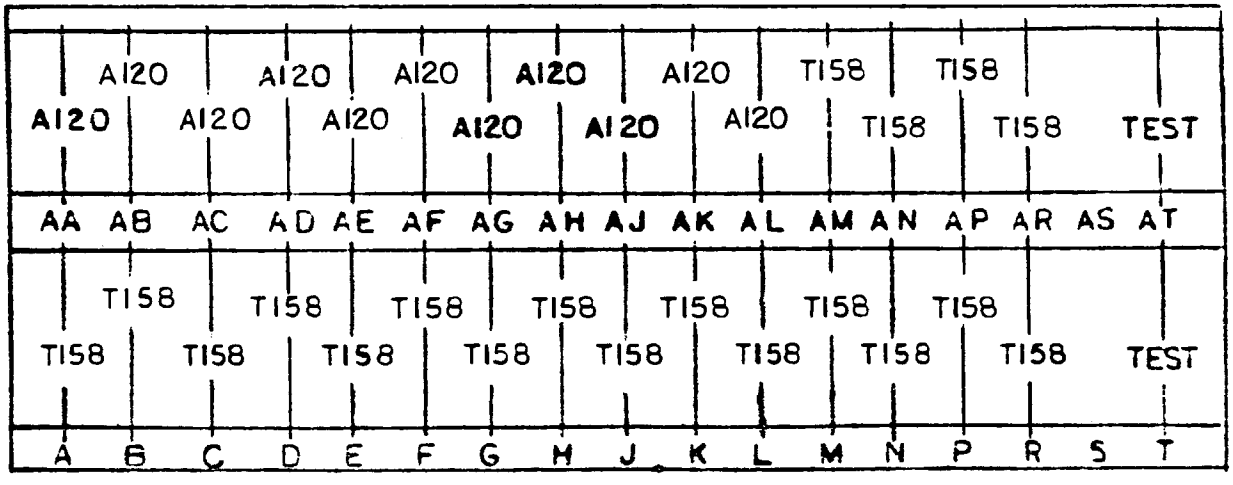


Figure 7 (0285A6220-0) Component and Printed Circuit Card Location Diagram for Type SLA56B Relay



PLAN VIEW



FRONT VIEW

Figure 8 (0285A6221-0) Component and Printed Circuit Card Location Diagram for Type SLA56C Relay

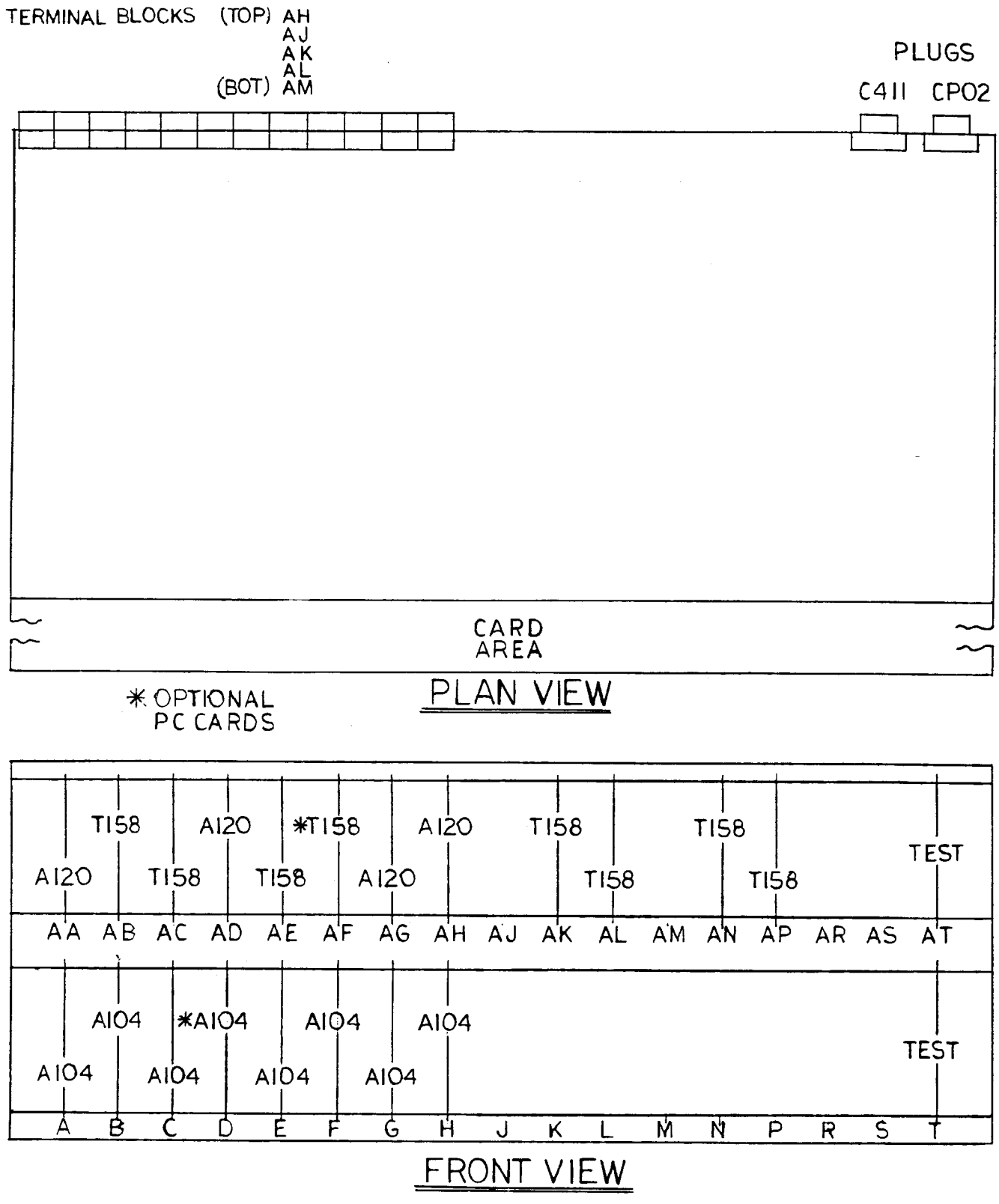


Figure 9 (0285A6222-0) Component and Printed Circuit Card Location Diagram for Type SLA56D Relay

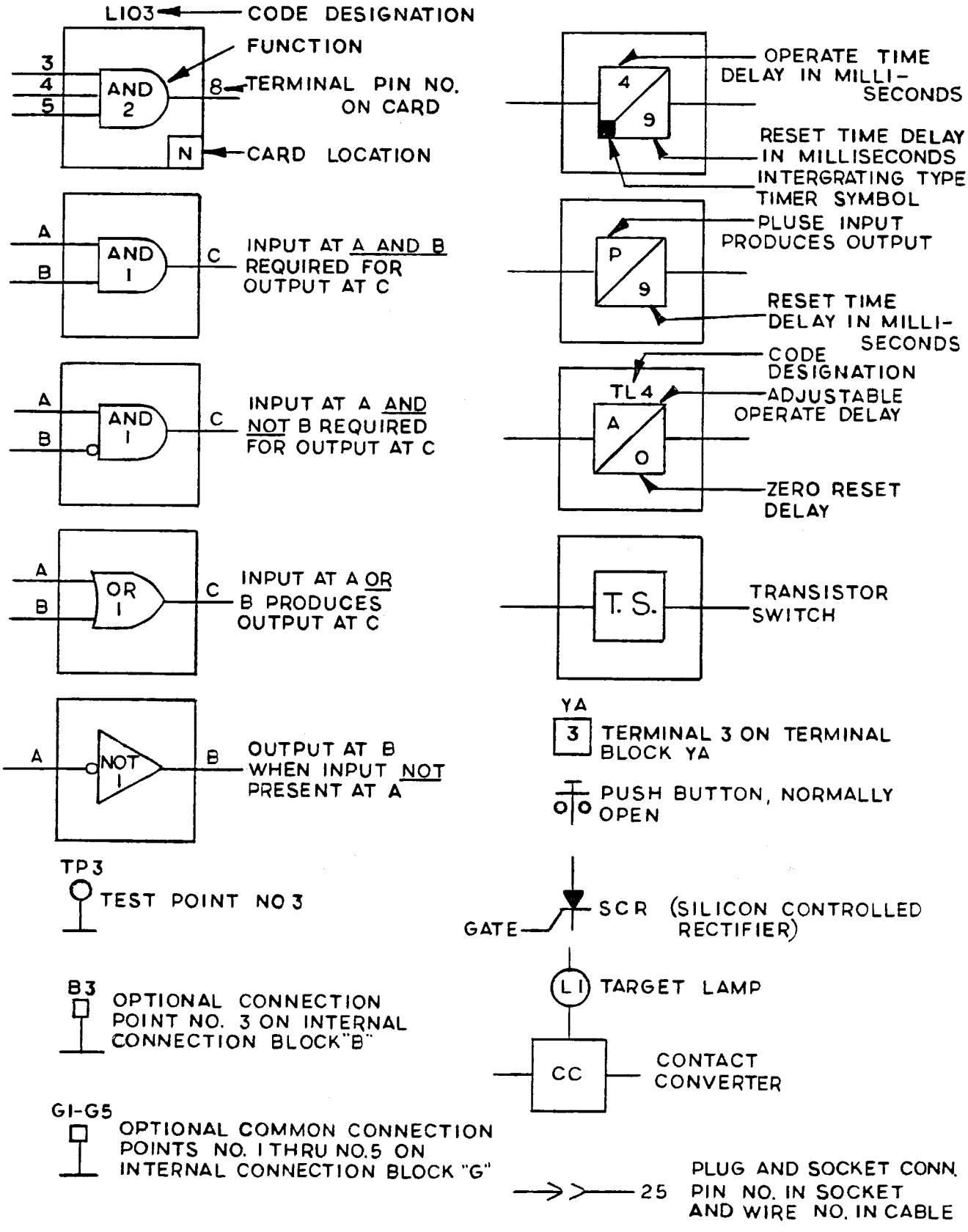
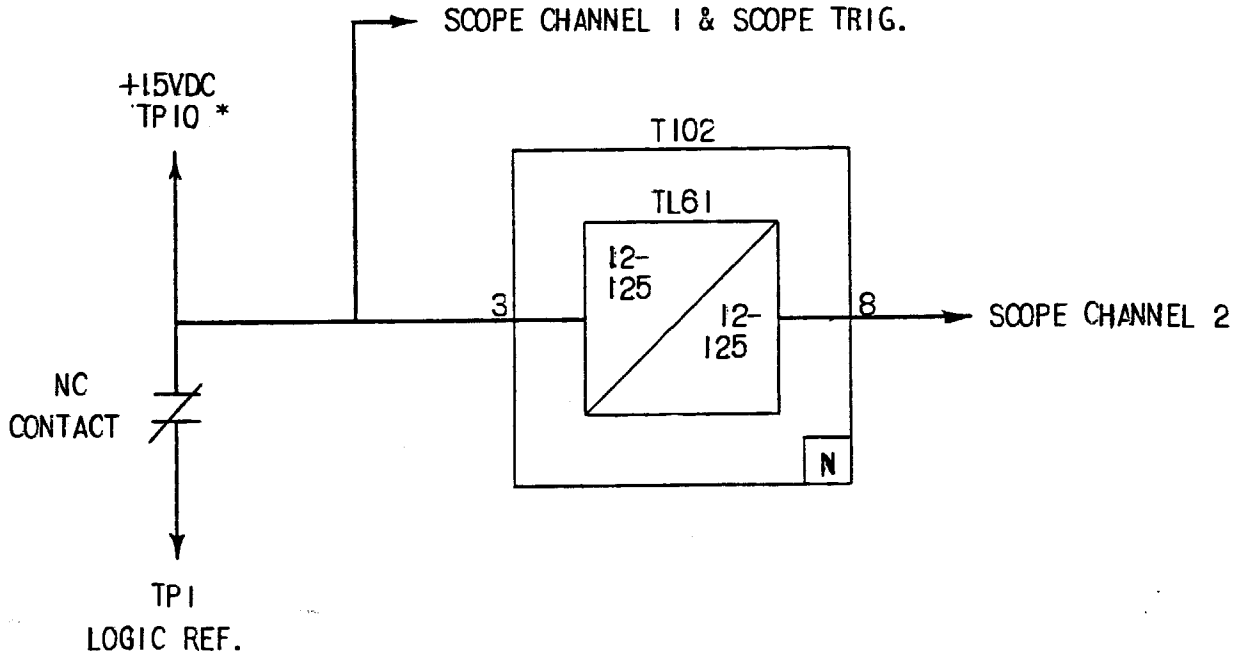


Figure 10 (0227A2047-0) Internal Connections Diagram Legend



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

Figure 11 (0246A7987-0) Logic Timer Test Circuit