INSTRUCTIONS

GEK – 49811

STATIC OUTPUT AND TRIPPING UNIT

TYPE SLAT54K

GENERAL ELECTRIC

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DESCRIPTION

The SLAT54K is a static logic and output unit, intended for use in a single pole tripping and reclosing scheme. The SLAT54K is intended for use with other units, such as an SLYP positive distance unit, an SLCN negative sequence directional overcurrent unit, an SLS breaker pole selection unit, an SLA52 auxiliary logic unit, an SLAT54 output auxiliary unit, an SSA power supply, and a test panel. This group of units forms a single or three pole tripping directional comparison scheme when used with appropriate channel facilities. The main purpose of the SLAT54K is to provide the additional logic and trip output required for a single pole tripping scheme over that required for a three pole tripping scheme.

APPLICATION AND SETTINGS

The SLAT54K is an integral part of an overall scheme and reference should be made to the overall logic diagram description for both application and setting information.

RATINGS

The Type SLAT54K relay is designed for use in an environment where the ambient temperature around the relay case is between -20°C and +65°C.

The Type SLAT54K relay requires a ±15VDC power source which can be obtained from a Type SSA50/51 power supply.

The SCR tripping circuits are rated for 48/125 or 250 VDC. Each has a series target which operates when 1.0 ampere is passed through the trip circuit. The tripping circuits are designed to carry 30 amperes for one second.

The contacts of the telephone-type relays will make and carry three amperes continuously; they will make and carry 30 amperes for one second. These contacts will interrupt up to 180 volt-amperes resistive (60 volt-amperes inductive).

The contacts of the BFI-A, BFI-B, and BFI-C reed relays will make and carry three amperes for tripping duty and are continuously rated for three amperes. The contacts will interrupt up to 100 volt-amperes resistive (35 volt-amperes inductive).

The contacts of the reed relays that are used for RR51, RR52, RR53 and RR54 are rated for 10 volt-amperes. They will carry 0.5 ampere continuously.

Each contact converter in this relay has a link for selecting the proper voltage for the coil circuit of the contact converter. The available voltage taps are for 48, 125, or 250 VDC.

Refer to the unit nameplate for the trip circuit rating of a particular relay.

BURDEN

The SLAT54K relay presents a maximum burden to the Type SSA power supply of:

200 ma from the +15 VDC supply

200 ma from the -15 VDC supply

FUNCTIONS

Not all of these functions will be supplied on every unit. Refer to the unit nameplate or associate overall logic for the included functions.

SCR TRIP CIRCUIT

Two sets of SCR trip circuits are provided, one for phase B and one for phase C. Each set consists of two electrically separate, isolated SCR trip circuits. Each circuit is capable of carrying 30 amperes for one second.

The internal connections for the SCR trip and isolator subassemblies are shown in Fig. 1. 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.

RI-1Ø 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-1Ø function uses a telephone-type relay with contact ratings stated under RATINGS.

BFI BREAKER FAILURE INITIATE CIRCUITS

Three sets of contacts are provided, one set for each phase. Each set consists of two electrically separate, normally open contacts. These contacts close within two milliseconds of the time the associated coil is energized by the logic. The contacts open within two milliseconds of the time the coil is de-energized. The BFI functions use reed relays with contact ratings as stated under RATINGS.

AUXILIARY REED RELAY OUTPUTS

The usage of reed relays RR51, RR52, RR53 and RR54, is determined by the particular scheme in which the SLAT54K is employed. Each relay has one normally open contact whose rating is specified under RATINGS.

CONTACT CONVERTERS

The purpose of the contact converters (CC6, CC7, CC8) included in the Type SLAT54K relay is to convert a contact operation into a signal that is compatible with an external contact if closed, a +15VDC signal is produced by the contact converter.

CC6 energizes the three pole trip bus.

The functions of CC7 and CC8 depend upon the scheme in which the relay is employed.

PHASE VOLTAGE LEVEL DETECTORS

Three single phase undervoltage detectors are provided.

TARGETS

Four electromechanical target coils are included, one in series with each SCR. 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.

LOGIC CIRCUITS

The functions included in the Type SLAT54K relay involve basic logical operations (AND, OR, 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 condition 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. 3.

The matrix blocks shown on the internal connections diagrams of the SLAT54K are connected by jumpers at the factory. These connections are used to implement the logic arrangement shown on the associated

overall logic diagram. These matrix jumpers are listed on the associated options chart. A typical option chart for the Type SLA54K relay is shown in Fig. 4. Some of the matrix block connections may be customer options. These connections will then be shown as optional connections on the overall logic and must be selected by the user before the unit is placed in service.

CONSTRUCTION

The SLAT54K 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. 5 and 6 respectively.

The SLAT54K relay contains printed circuit cards identified by a code number such as: A110, T114, L102 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 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 SLAT54K 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 SLAT54K 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 the mechanical targets to be seen. A push button is also provided to reset the electromechanical targets without opening the cover.

Logic options in the SLAT54K relay are selectable by means of jumper wires with taper tip pins on each end which are used to interconnect the matrix block points. These matrix blocks are located in the rear of the unit as shown in Fig. 6. The top cover of the relay must be removed to make the blocks accessible. The taper tip jumpers should be inserted and removed using the special tools which are supplied with each equipment. The green (G), black (B), white (W), violet (V), orange (O), and brown (BR) matrix blocks have 20 individual matrix points. The red (R) block has 20 points which are grouped in ten pairs. The yellow (Y) block has 20 points which are grouped in two sets of ten common points; Y1 to Y10 are connected to +15VDC, Y11 to Y20 are connected to reference.

RECEIVING, HANDLING AND STORAGE

This 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. Static relay equipment, when supplied in a swing rack cabinet, 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 SLAT54K 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 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. 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 INSOLATION PROVIDED.

GENERAL

The SLAT54K 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.

Timers should be set for the operating and 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.

OPERATIONAL CHECKS

Operation of the SLAT54K unit can be checked by observing the signals at the twenty test points (TP1 to TP20) in the SLAT54K, 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 Fig. 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.

Operation of any logic function may be checked by supplying the correct inputs to the card. This is accomplished by placing the card under test in a card extender, removing the cards which normally supply the input signals, and then connecting the card inputs to either TP10 or TP1. An output should be produced when the proper combination of inputs is supplied to the card.

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

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 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 Fig. 7. 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).

TRIP CIRCUIT TESTS

The SCR trip circuits and series mechanical targets may be checked by connecting an auxiliary lock-out relay, such as the Type HEA relay, in series with the SCR circuit. A typical circuit is shown in Fig. 8. The HEA relay should have the same DC rating as the SCR trip circuit of the SLAT54K. If an auxiliary lock-out relay is not available, it can be replaced by a resistive load which limits the trip circuit current to three amperes. In most equipments, the SCR can be gated by operating a test push button in the associated units.

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

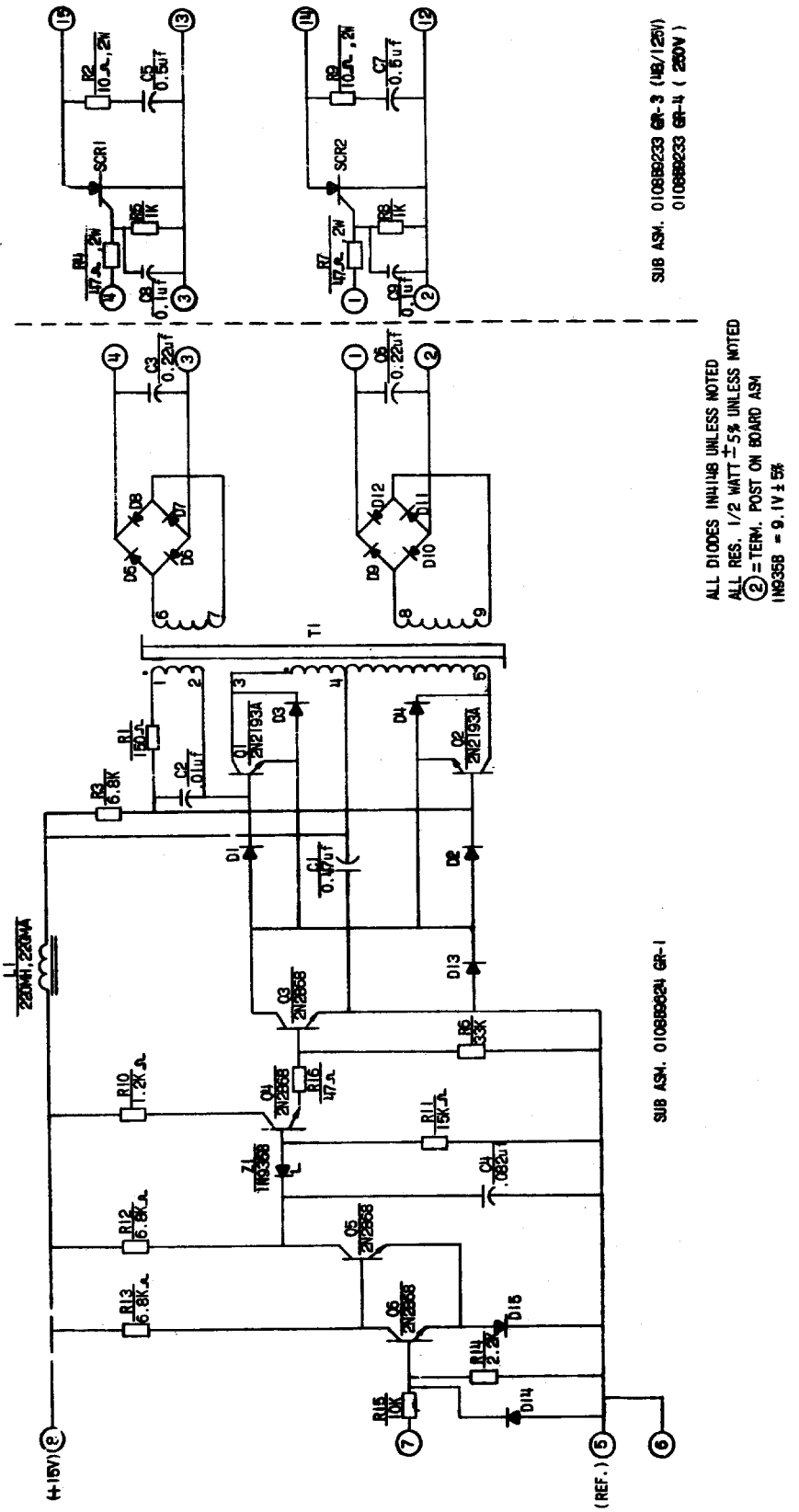


Fig. 1 (0108B9610-0) Internal Connections for the SCR Trip and Isolation Subassemblies

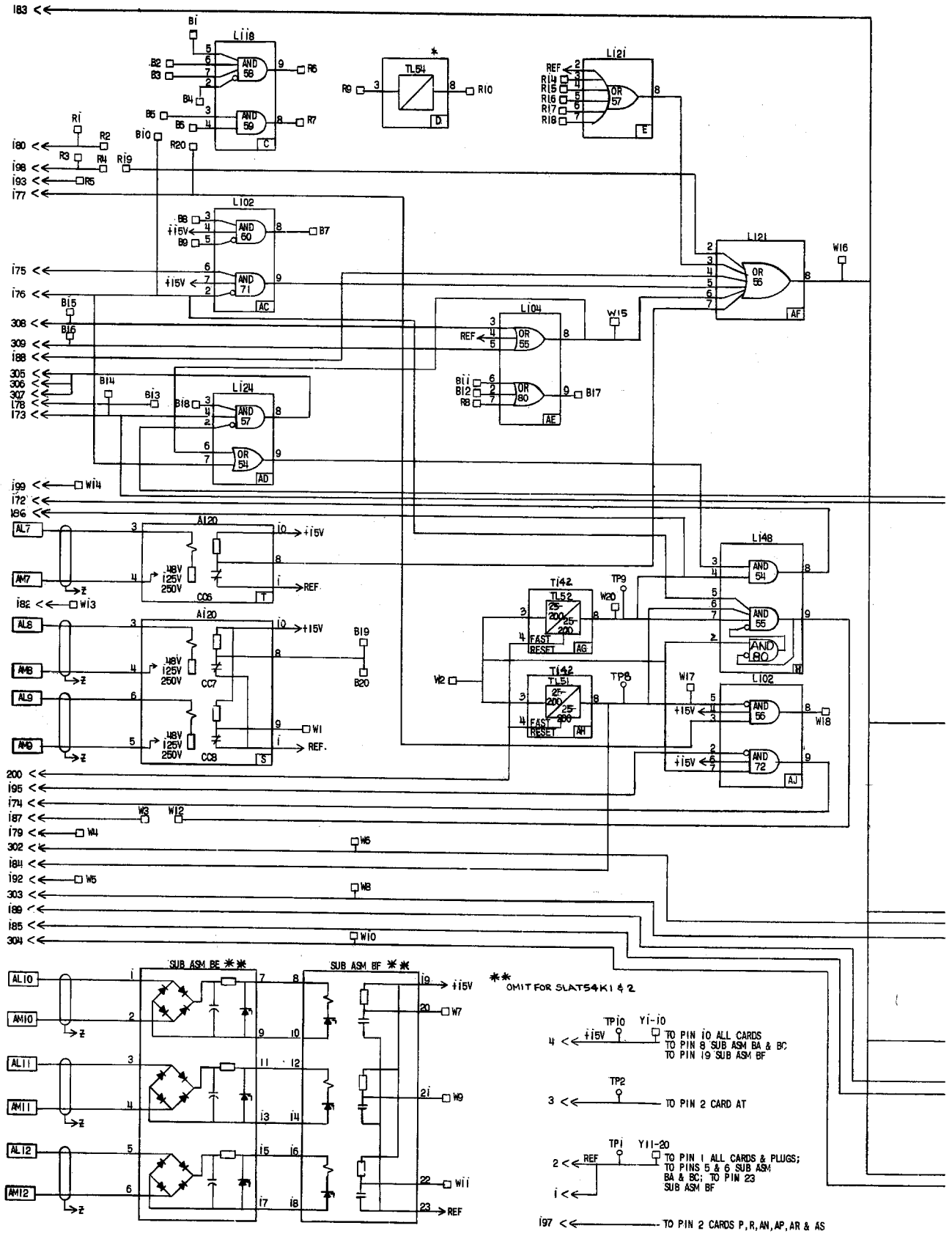


Fig. 2 (0136D3540-0) Internal Connectio

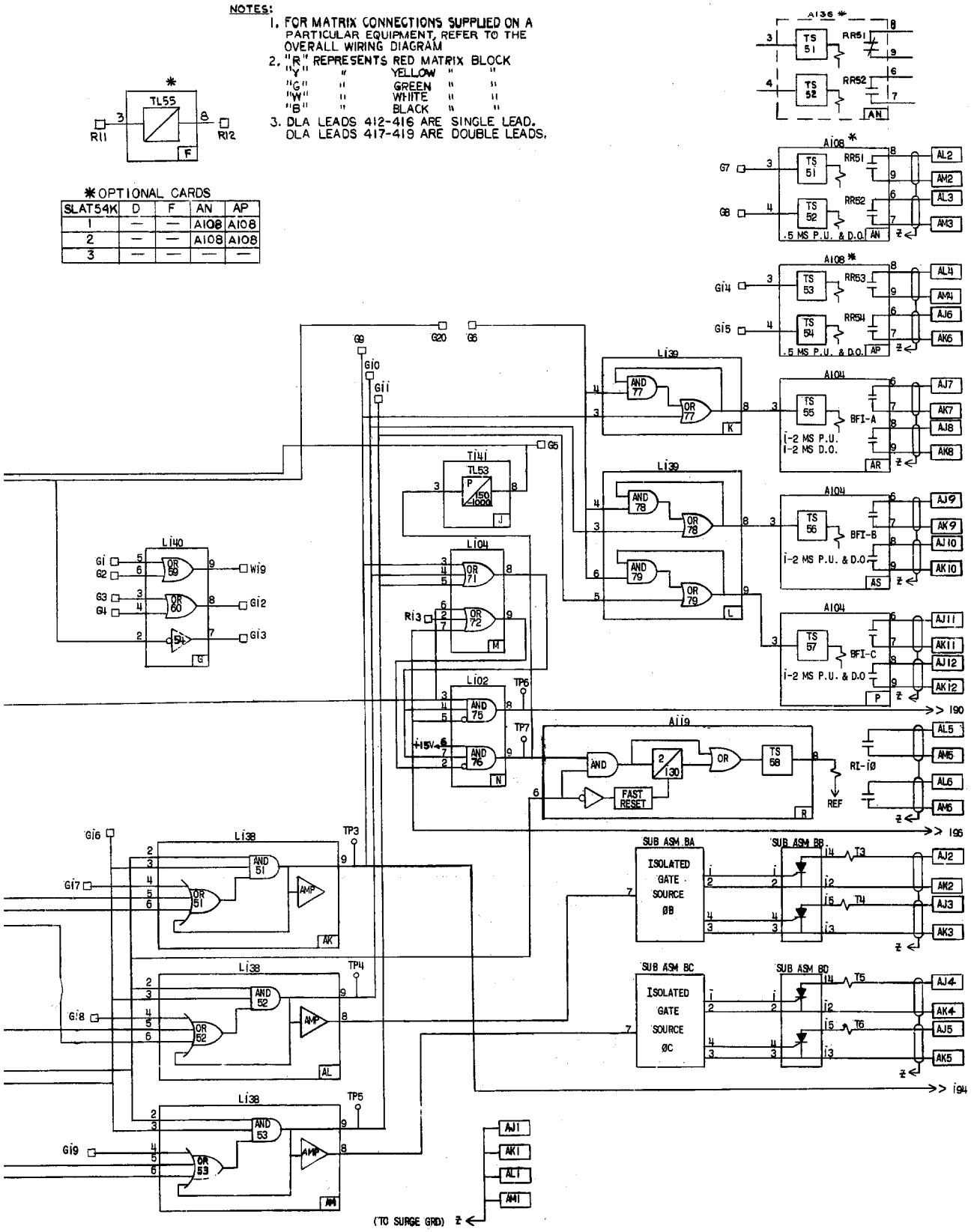


Diagram for the Type SLAT54K Relay

PHASE UNDERVOLTAGE DETECTORS

The operation of the phase undervoltage detectors may be checked using the test circuit of Fig. 9.

Use the following test procedure.

1) Set the applied voltage for 40 VRMS. Use connections of Table 1 and check for +15 VDC output

2) Set the applied voltage for 15 VRMS. Use the connections of Table 1 and check for less than 1 VDC output.

TABLE 1

	A	B	OUTPUT
ØA	AL10	AM10	W 7
ØB	AL11	AM11	W 9
ØC	AL12	AM12	W 11

OVERALL EQUIPMENT TESTS

After the SLAT54K 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

PERIODIC TESTS

It should be sufficient to check the outputs produced at test points in the SLAT54K 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 SLAT54K 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 SLAT54K relay are included in the card book GEK-34158.

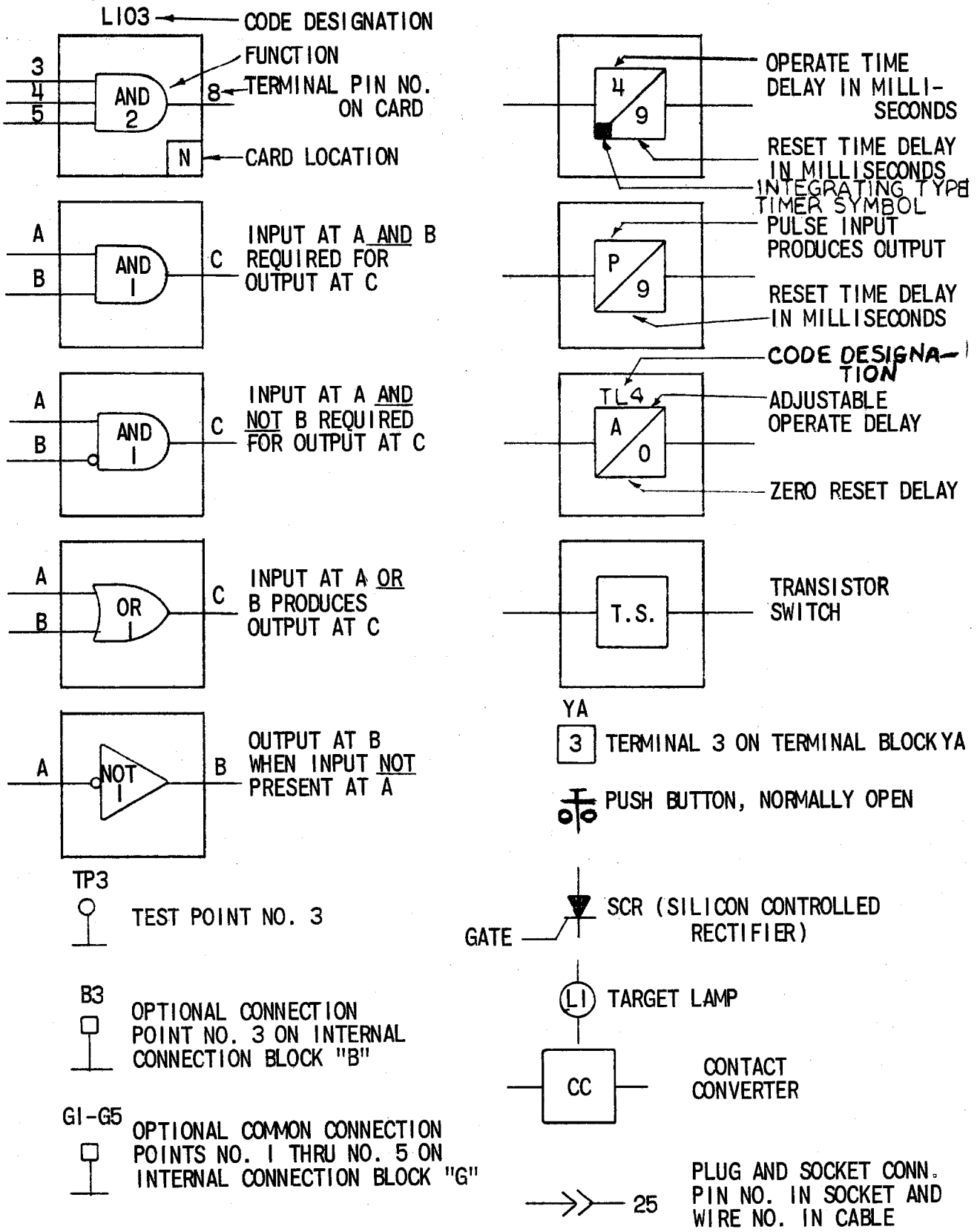


Fig. 3 (0227A2047-1) Internal Connection Diagram Legend

THE FOLLOWING ARE FACTORY CONNECTIONS MADE AT THE MATRIX BLOCKS INSIDE OF THE SLA RELAY ASSOCIATED WITH THIS EQUIPMENT.

SYMBOLS LISTED: PL=RELAY INTERCONNECTING CABLE LEAD
(5)=LOGIC FUNCTION CARD PIN NUMBER
‡=3-WAY CONNECTION
✕=DLA MONITOR CONNECTION AVAILABLE BUT NOT USED

(128)

MATRIX BLOCK JUMPERS		LOGIC FUNCTION	
FROM	TO	FROM	TO
B13	B18	PL178	AND 57
G20	G6	PL173	AND 77
W14	B19	PL199	CC7
B20	G1	CC7	OR 59
R4	R19	PL198	OR 56
W20	R18	TL52	OR 57
R14	Y11	OR57	REF.
R15	Y12	OR57	REF.
R16	Y13	OR57	REF.
R17	W13	OR57	PL182
W18	W4	AND56	PL179
W3	W12	PL187	AND55
R13	Y14	OR72	REF.
G2	G5	OR59	TL53
G17	Y15	OR51	REF.
W19	W2	OR59	TL51
G18	Y16	OR52	REF.
G19	Y17	OR53	REF.
W6	G7	ØA SEL.	RR51
W8	G8	ØB SEL.	RR52
W10	G14	ØC SEL.	RR53
W15	G15	3ØØSEL.	RR54

MATRIX BLOCK JUMPERS		LOGIC FUNCTION	
FROM	TO	FROM	TO

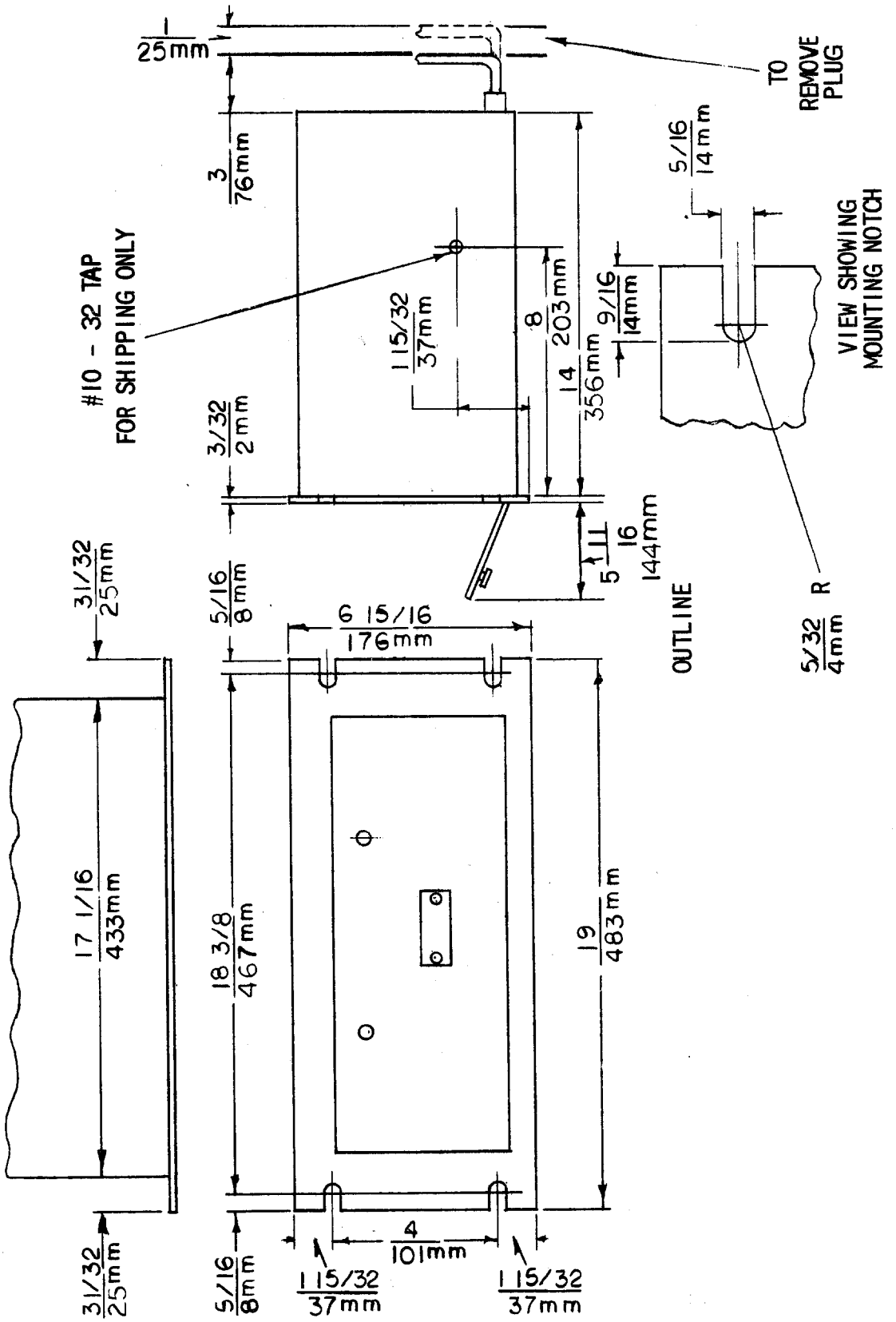


Fig. 5 (0227A2037-1) Outline and Mounting Dimensions for the SLAT54K Relay

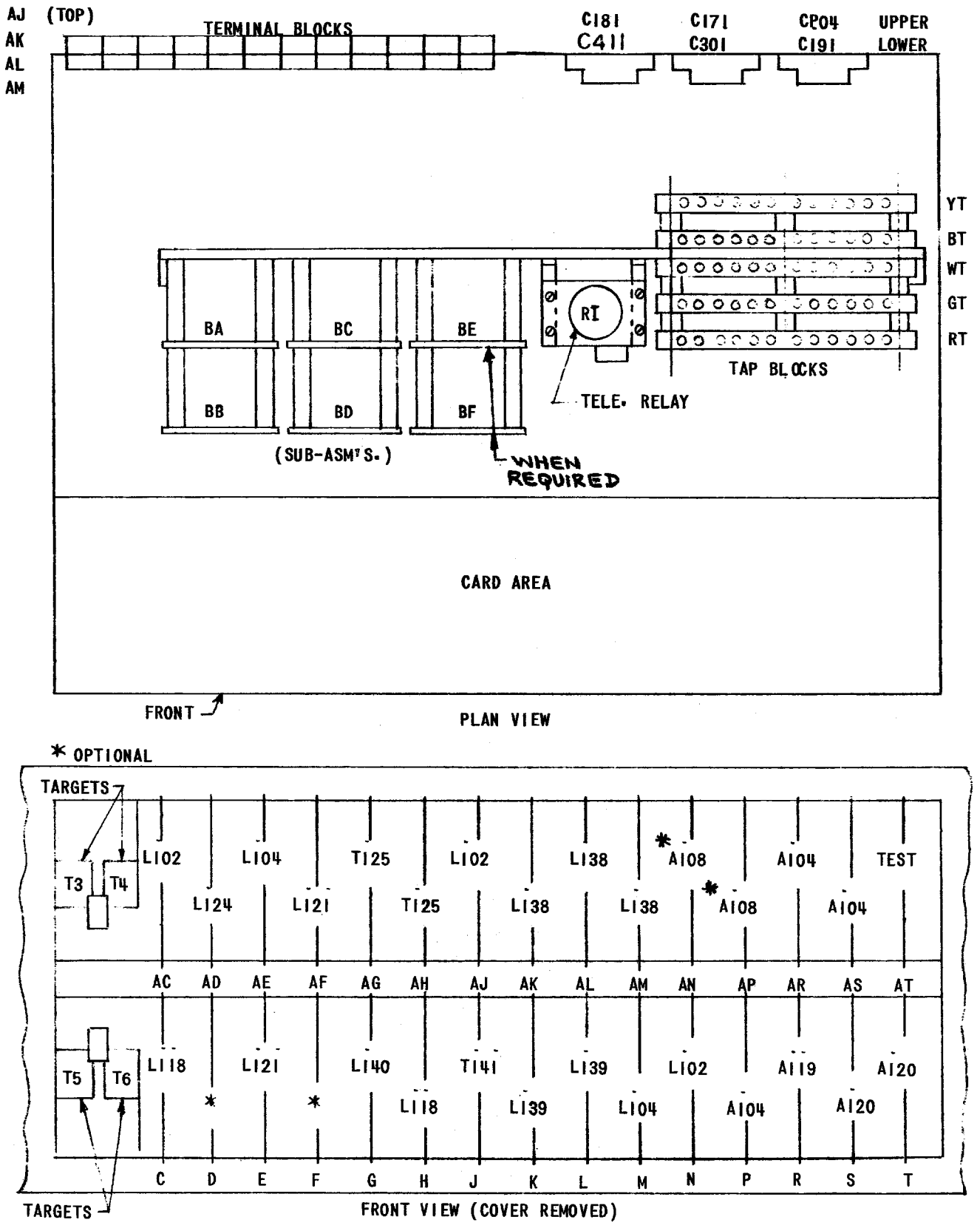
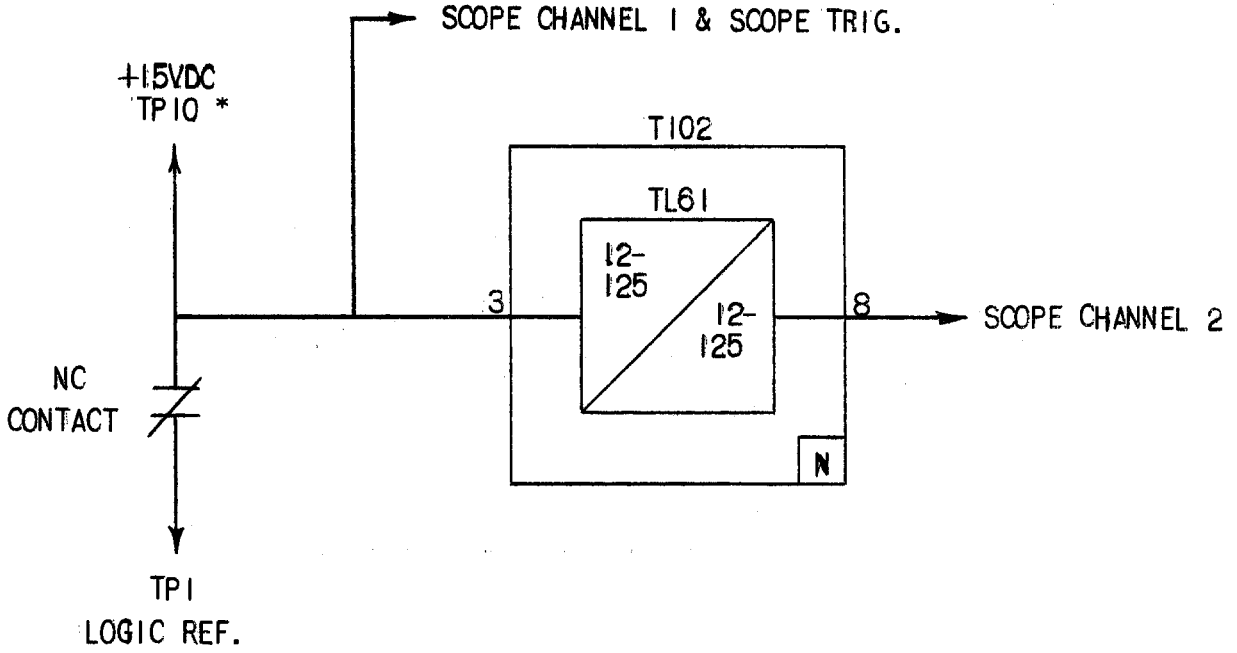


Fig. 6 (0269A3133-0) Components and Card Locations for the SLAT54K Relay



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

Fig. 7 (0246A7987-0) Logic Timer Test Circuit

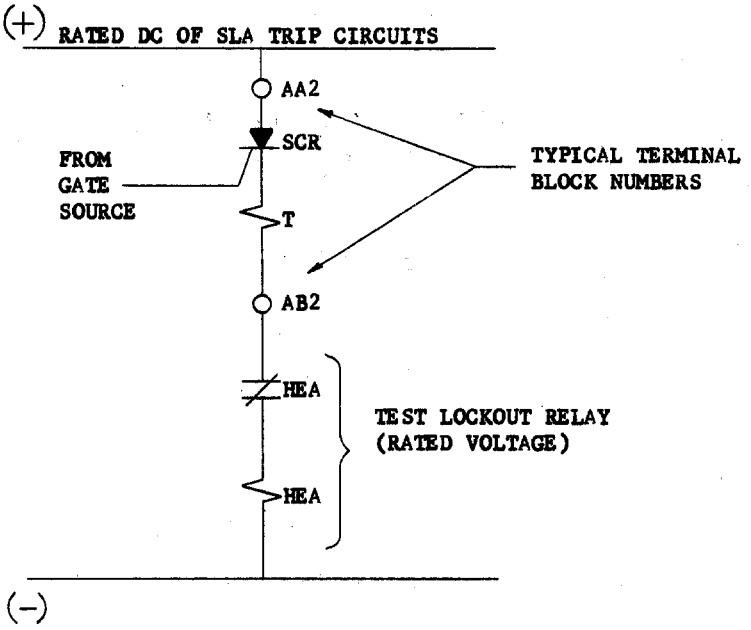
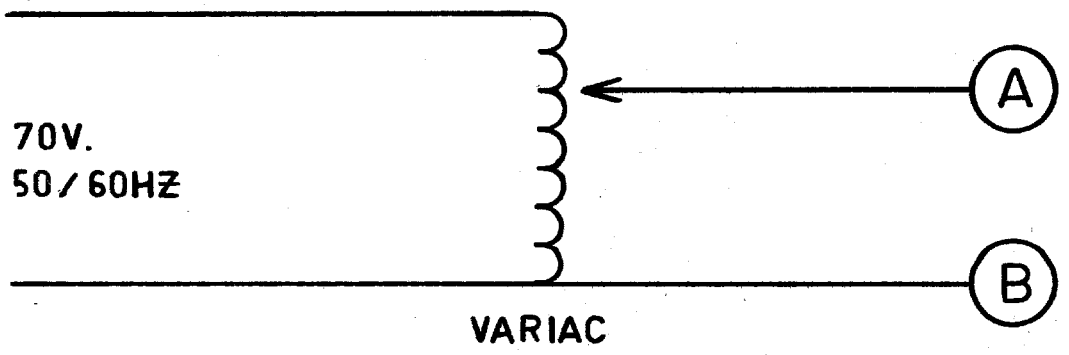


FIG. 7

TYPICAL SCR TEST CIRCUIT FOR TYPE SLA RELAYS

Fig. 8 (0208A2365-0) Typical SCR Trip Circuit Test Connections



PHASE UNDER TEST	CONNECTIONS		MEASURE OUTPUT
	A	B	
A	AL10	AM10	W 7 *
B	AL11	AM11	W 9 *
C	AL12	AM12	W 11 *

* USE OPTION CHART TO DETERMINE TO WHICH CARD INPUTS THESE MATRIX POINTS ARE CONNECTED. OUTPUT MAY BE MEASURED AT CARD INPUT PIN.

+ LOCATED ON REAR OF SLAT 54B UNIT.

Fig. 9 (0257A8704-0) Phase Voltage Level Detector Circuit