



**INSTRUCTIONS**

GEK-65575

**STATIC LOGIC AUXILIARY RELAY**

**TYPE SLA53E**

**GENERAL  ELECTRIC**

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**STATIC LOGIC AUXILIARY RELAY  
TYPE SLA53E**

**DESCRIPTION**

The Type SLA53E relay is a solid state, rack mounted auxiliary logic unit which provides the single pole tripping logic for a directional comparison scheme. Other solid state relays, a power supply, and a test panel are required for a complete protective system.

**APPLICATION**

Refer to the overall logic diagram and its associated logic description for the particular scheme in which this relay is employed for an application guide.

**RATINGS**

The Type SLA53E relay is designed for use in an environment where the air temperature outside the relay case does not exceed minus 20°C or plus 65°C.

The Type SLA53E relay requires a plus or minus 15 VDC power source which can be obtained from a Type SSA power supply.

Each contact converter in this relay has a link for selecting the proper voltage for the coil circuit of the contact converter. The three possible voltages are 48 VDC, 125 VDC and 250 VDC.

The contacts of the reed relays RR53, RR54 and RR55, will make and carry three amperes continuously. The contacts will interrupt up to 100 volt-amperes resistive (35 volt-amperes inductive).

**BURDENS**

The SLA53E relay presents a maximum burden of 110 milliamperes to the plus 15 VDC supply and 250 milliamperes to the minus 15 VDC supply of the Type SSA power supply.

Each contact converter, when energized, draws ten milliamperes from the station battery, regardless of tap setting.

*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.*

## OPERATING PRINCIPLES

### LOGIC CIRCUIT

The functions of the Type SLA53E 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 plus 15 VDC.

The symbols used on the internal connection diagram (Fig. 1) are explained by the legend shown in Fig. 2.

### PHASE UNDERVOLTAGE DETECTORS

Three phase-to-neutral undervoltage level detectors are included. These level detectors are non-adjustable. A 13-15 VDC output is produced when the applied voltage is less than 15 VDC. The internal connections for the level detector subassemblies are shown in Fig. 3.

### AUXILIARY REED RELAY OUTPUTS

Three reed relay auxiliary outputs RR53, RR54 and RR55 are supplied. Each has two electrically separate, normally open contacts which close within two milliseconds of the time a logic signal is applied to the relay driver. The contacts open within two milliseconds of the time the logic signal is removed. The contact ratings of these auxiliary relays are stated under **RATINGS**.

## CONSTRUCTION

The SLA53E relay is packaged in an enclosed metal case with hinged front covers and removable top cover. The outline and mounting dimensions of the case and the physical location of the components are shown in Fig. 4 and 5, respectively.

The SLA53E relay contains printed circuit cards identified by a code number, such as A111, T102, L104; where A designates auxiliary function, T designates time-delay function, and L designates logic 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 VDC through a 1.5K resistor. This resistor limits the current when TP10 is used to supply a logic signal.

## 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 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.

## INSTALLATION TESTS

### 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 SLA53E 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 SLAT relay from the system.

The SLA53E 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.

OPERATIONAL CHECKS

Operation of the SLA53E unit can be checked by observing the signals at the ten test points (TP1 to TP10) in the SLA53E, by observing the operation of the associated channel equipment, or by observing the output functions in the associated Type SLAT tripping relay. 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 plus 15 VDC. The remaining points are located at various strategic points throughout the logic as shown on the internal connection diagram (Fig. 1). 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 card instruction book, GEK-34158.

PHASE UNDERVOLTAGE DETECTOR

The operation of the phase undervoltage level detectors may be checked using the test circuit of Fig. 6. Use the following procedures and connections of Table I.

- 1) Set the applied voltage for 40 Vrms. Check for less than one VDC at the point indicated in Table I.
- 2) Set the applied voltage for 15 Vrms. Check for 13-15 VDC at the indicated point.

TABLE I

PHASE	A	B	OUTPUT
A - N	AL2	AL3	Pin 5 of M Card
B - N	AL4	AL5	Pin 6 of M Card
C - N	AL6	AL7	Pin 7 of M Card

OVERALL EQUIPMENT TESTS

After the SLA53E 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 voltage to the measuring units as specified in the instruction book for the measuring units and checking that proper outputs are obtained from the associated SLAT when measuring units operate.

## MAINTENANCE

### PERIODIC TESTS

It should be sufficient to check the outputs produced at test points in the SLA53E 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 SLA53E itself 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.

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 troubleshooting, 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 a 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 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 SLA53E relay are included in the card book, GEK-34158.

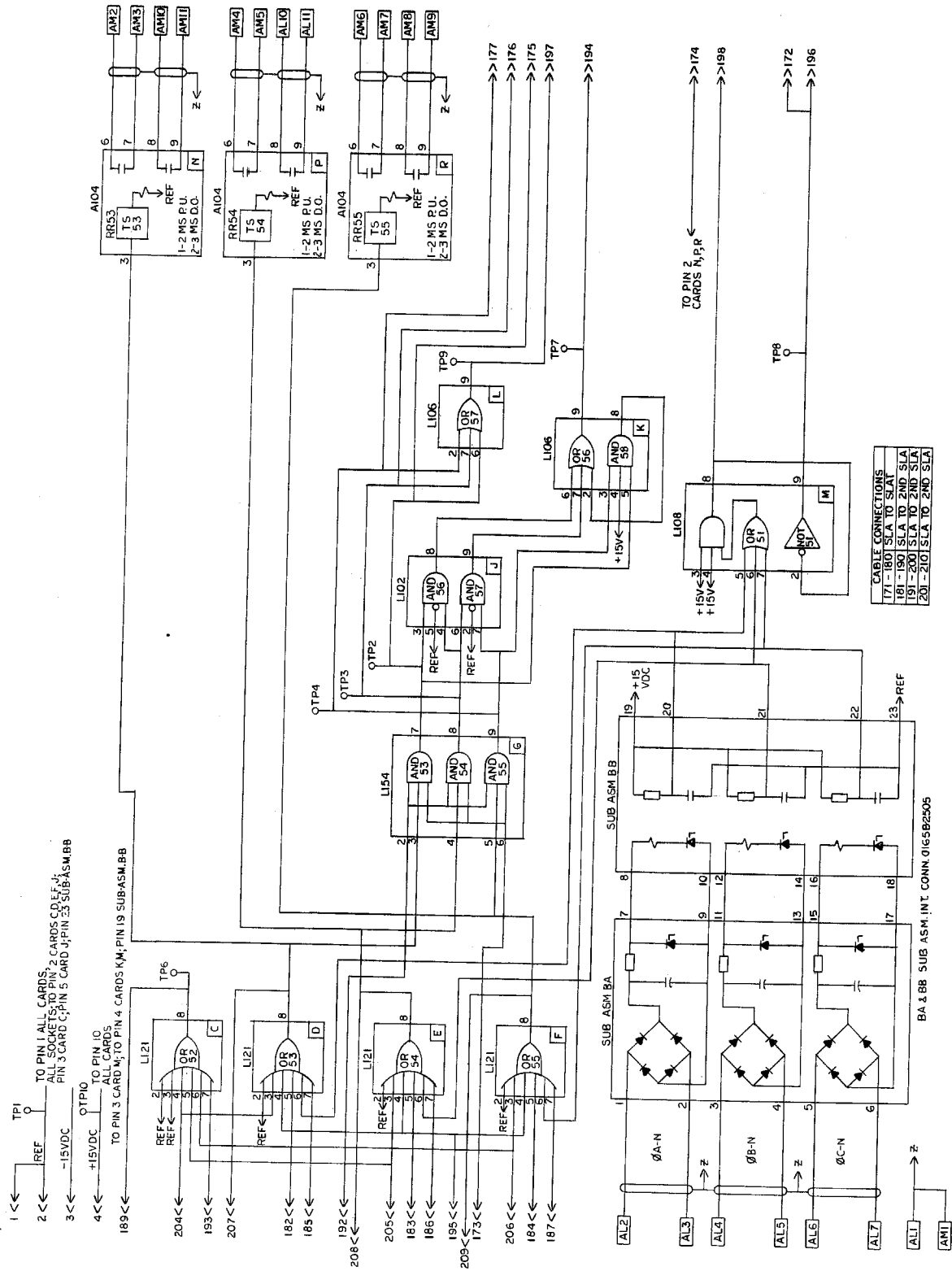


Fig. 1 (0179C6122-0) Internal Connection Diagram for the SLA53E Relay



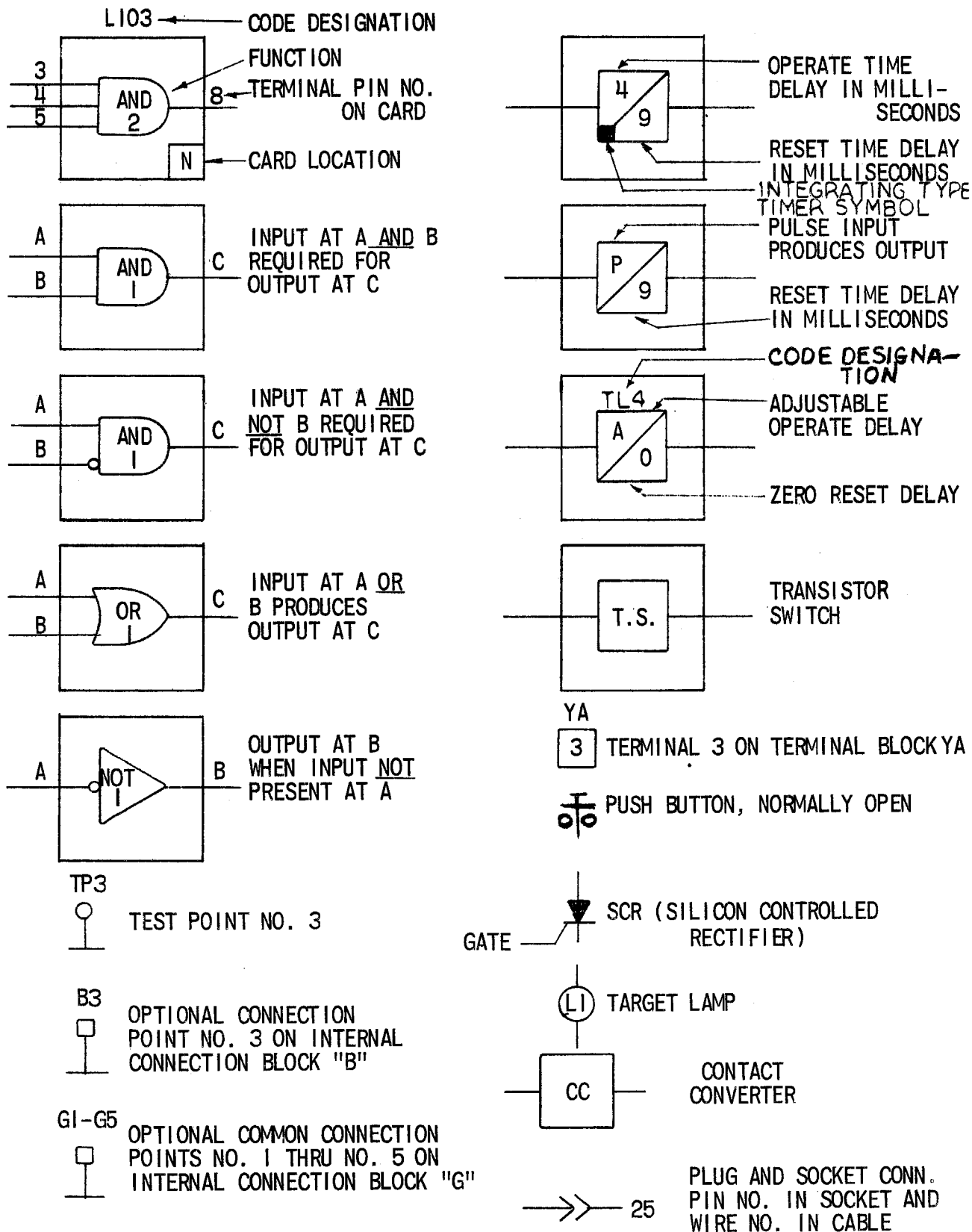
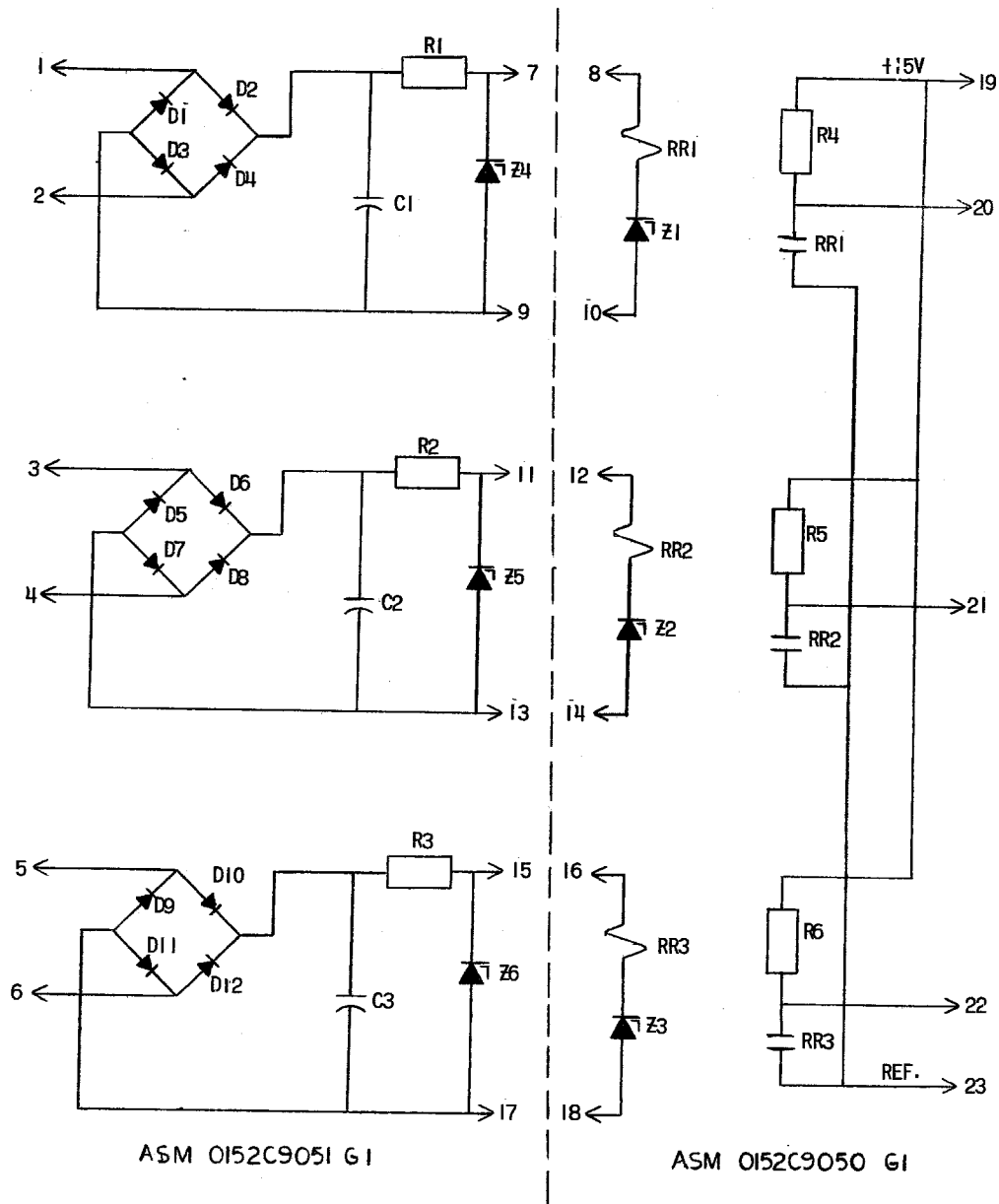


Fig. 2 (0227A2047-1) Internal Connection Diagram Legend



COMPONENT VALUES	
D1-D12	1N5061
C1-C3	5 $\mu$ f, 200V
R1-R3	4.7K, 2W
R4-R6	22K, 1/2W
Z1-Z3	24V, 400MW
Z4-Z6	36V, 1W
RR1-RR3	RA50021981

Fig. 3 (0165B2505-2) Internal Connections for the Phase Undervoltage Level Detectors

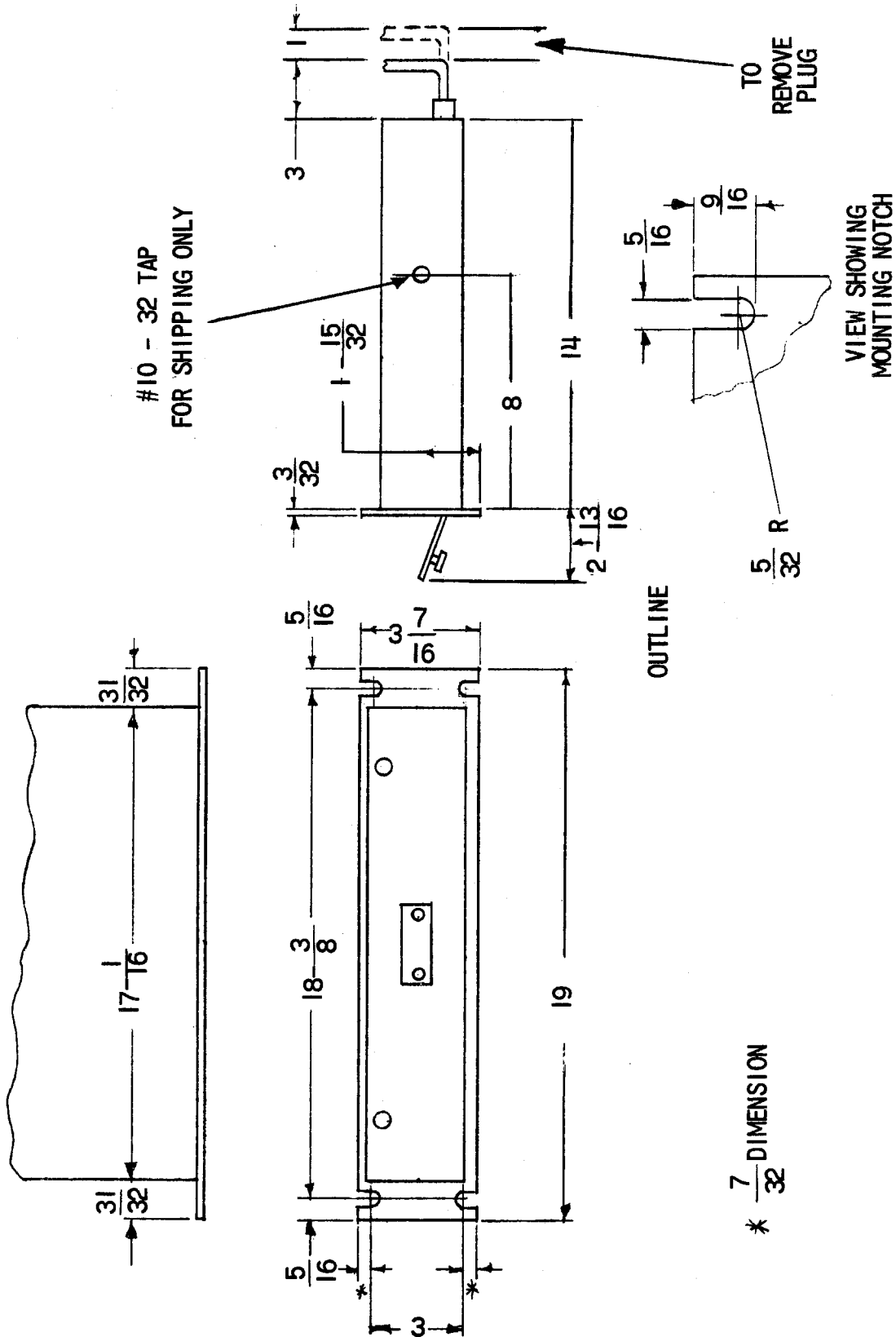
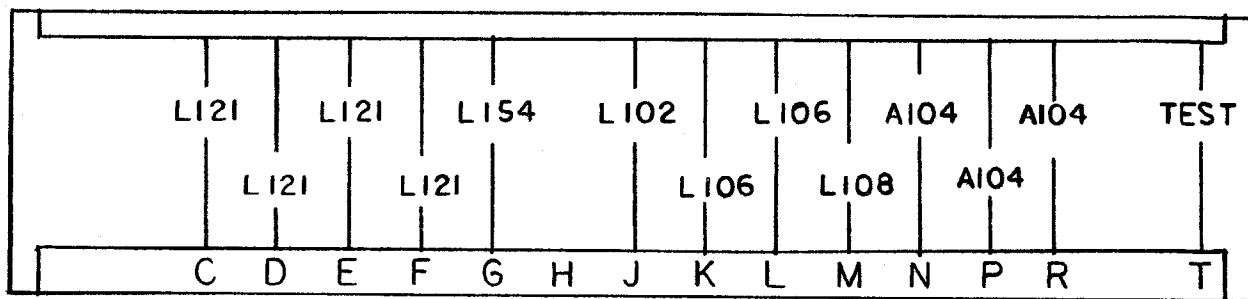
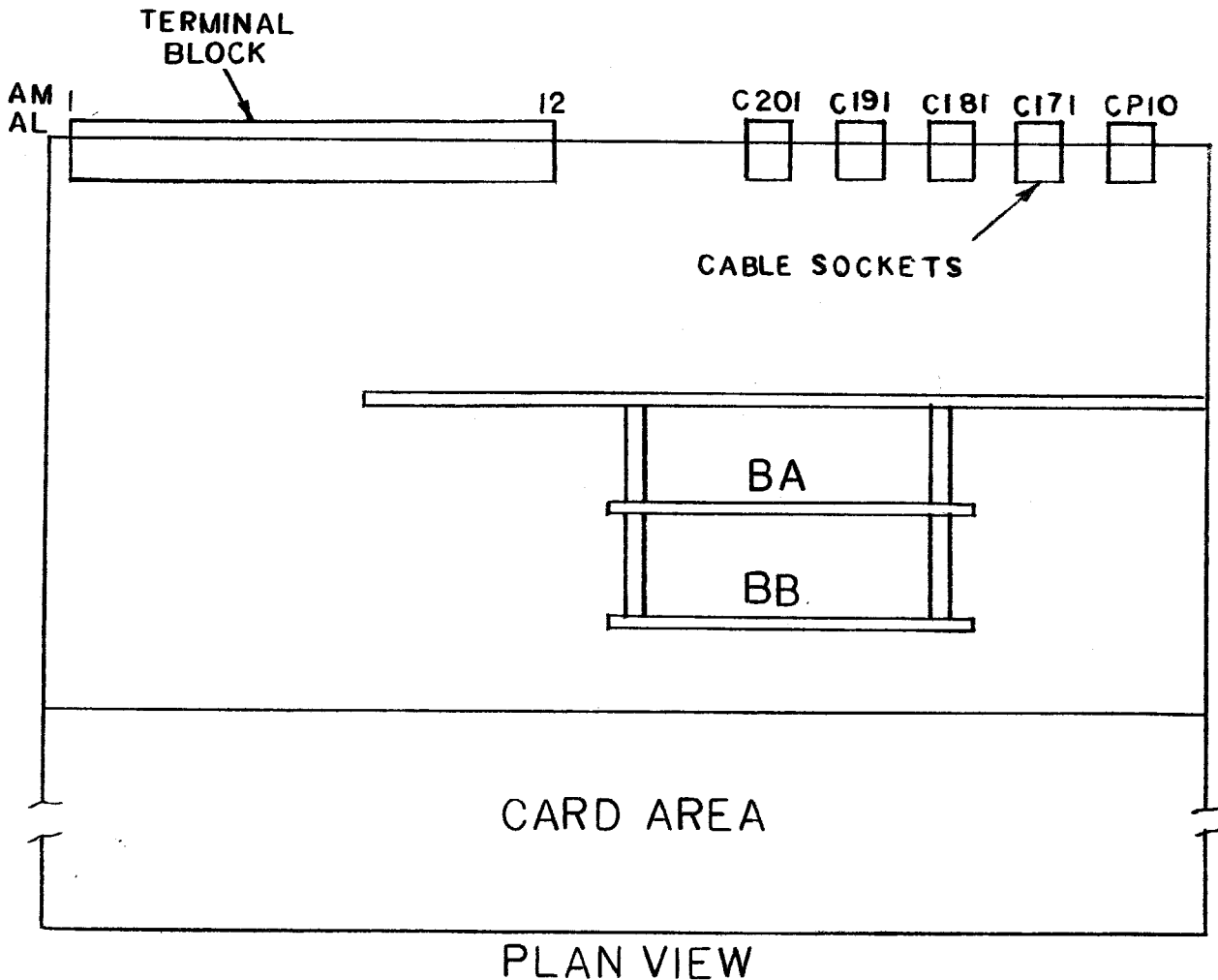
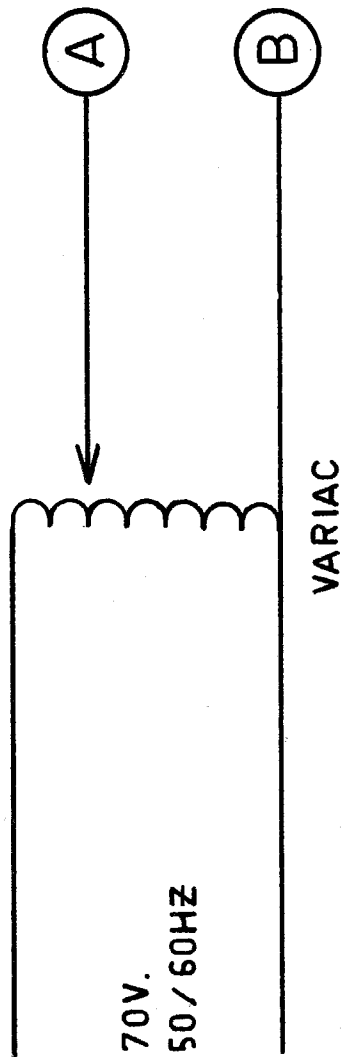


Fig. 4 (0227A2036-0) Outline and Mounting Dimensions for the SLA53E Relay



SEE INTERNAL FOR CARD IDENTIFICATION (0179C6122)

Fig. 5 (0275A4580-0) Component Location Diagram for the SLA53E Relay



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 \$4B UNIT.

Fig. 6 (257A8704-0) Phase Undervoltage Detector Test Circuit

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