INSTRUCTIONS

GEK- 41955

AUXILIARY LOGIC UNIT

TYPE SLA53A

POWER SYSTEMS MANAGEMENT DEPARTMENT

GENERAL ELECTRIC

PHILADELPHIA, PA.

CONTENTS

DESCRIPTION

The Type SLA53A relay is an auxiliary logic unit. The Type SLA53A relay is not intended to be used by itself, but rather as a part of a complement of equipment that forms a protective relay scheme. For a description of the overall scheme in which this scheme is employed, refer to the overall logic diagram and its associated logic description which are supplied with each terminal of equipment.

The Type SLA53A relay is packaged in a four rack unit (1 R.U. = 1 3/4") enclosed in a metal case suitable for mounting on a 19 inch rack. The outline and mounting dimensions of the relay are shown in Figure 1. The internal connections for the SLA53A are shown in Figure 2. The component and card locations are shown in Figure 3.

APPLICATION

The Type SLA53A relay was originally designed to operate in conjunction with Type SLYP, Type SLCN, Type SLAT and Type SSA relays in a single pole tripping scheme for use on three terminal lines. The SLA53A design incorporates circuit flexibility to permit various logic options. Refer to the overall logic diagram and its associated option chart for a particular equipment to determine which logic options are utilized. Where unconnected logic option points (matrix points) are shown on the associated overall logic diagram, it is the user's responsibility to select the desired usage. The logic description that accompanies the overall logic diagram will discuss the merits of those options indicated on the overall logic diagram.

RATINGS

The Type SLA53A 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 SLA53A relay requires a $\pm$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.

BURDENS

The SLA53A relay presents a burden of 350 ma to the +15 VDC supply of the Type SSA power supply.

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

OPERATING PRINCIPLES

A. LOGIC CIRCUIT

The functions of the Type SLA53A 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 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 (Figure 2) are explained by the legend shown in Figure 4.

The matrix block connections shown in the internal connections of the SLA53A relay are prewired at the factory. The connections are shown on the associated overall logic and are listed on the associated option chart. A sample option chart for the Type SLA53A relay is shown in Figure 5.

Some of the matrix block connections may be customer options. In this instance, they will be shown as options on the overall logic and must be selected by the user before the unit is placed in service.

B. 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 SLA53A relay. These contact converters are labeled CC1, CC2, and CC3. A link is provided on each card to select operation from a 48, 125, or 250 VDC station battery.

CC1

Contact converter 1 is energized by a contact on the CCS switch, this contact is closed in the TEST position. The output of this contact converter prevents carrier tripping of the relay.

CC2

Contact converter 2 is energized by an external potential failure indication contact. This contact converter blocks all tripping at AND9.

CC3

Contact converter 3 is energized by an external contact. The output of CC# keys the transmitter to the trip frequency.

C. DATA MONITORING POINTS

The Type SLA53A relay has provisions to provide up to 27 data monitoring outputs; the 27 points are brought out on three sockets C411, C421, and C431. These data monitoring (DLA) points are selected by connecting the movable lead from the DLA socket pin (412-420, 422-430, or 432-440) to one of the available points on the matrix blocks. These connections are listed on the option chart (refer to sample option chart, Fig. 5). Any matrix points which are not being used for logic connections may be monitored; key points in the logic have more than one matrix point to allow both logic and monitoring connections.

A data logging amplifier (DLA) unit is used to convert the logic signals into usable outputs. The associated DLA unit determines the number of points which can be monitored at the same time.

D. CHANNEL INTERFACE

The logic of the Type SLA53A relay includes an isolation interface (Fig. 6) between the relays in the scheme and the associated channel equipment. The circuitry of the isolation interface provides a signal path but maintains metallic isolation. This feature makes it possible to maintain isolation between the DC supply used for the relays and that employed by the channel.

When pins 1 and 2 of the interface are both connected to relay reference, a positive voltage appears at pin 3 with respect to pin 4. This output is a 5 VDC, 20 ma signal.

When a 5 VDC signal is applied to pin 5 with respect to pin 6, an output signal (5 VDC, 20 ms) appears between pins 7 and 8. This signal is made compatible with the relay logic by the A115 channel control card in card position AN.

CALCULATION OF SETTINGS

This section covers those timers in the SLA53A which require field adjustment.

TL2 (10-80/10-80)

This timer is associated with the MOB out of step blocking function. Refer to the logic description and the SLYP instruction book for a discussion on how to determine the pickup delay setting of the TL1 timer. The reset delay should be set for 40 ms.

TL3 (.1 - 2 SEC/0)

This timer provides second zone backup protection. The pickup delay of this timer must be set to coordinate with the first zone relays at the remote end of the line.

CONSTRUCTION

The SLA531 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 Figures 1 and 3 respecitvely.

The SLA53A relay contains printed circuit cards identified by a code number such as A101, 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 in 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 +15 VDC through a 1.5K resistor. This resistor limits the current when TP10 is used to supply a logic signal to a card.

Logic options and data monitoring points are selected by means of taper tip jumpers and matrix blocks. These matrix blocks are located in the rear of the unit as shown in Figure 3. Six twenty-point blocks are supplied. Each block is a different color and its points are numbered from 1 to 20. The matrix points appear on the internal connections (Fig. 2) as small squares identified with a letter and a number such as G18. G18 is the eighteenth position on the green block. The six blocks are: yellow (Y), black (B), green (G), white (W), violet (V), and red (R). Tools for inserting and removing the taper tip jumpers are supplied with each equipment. The factory matrix connections are listed on the option chart (Fig. 5).

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 volt 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.

INSTALLATION TESTS

If the SLA53A relay that is to be tested is installed in an equipment which has already been connected to the power system, disconnect the trip outputs in the associated Type SLAT relay from 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 SLA53A 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 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.

The taps on the contact converter cards should be set for the station battery voltage.

B. OPERATIONAL CHECKS

Operation of the SLA53A unit can be checked by observing the signals at the twenty test points (TP1 to TP20) in the SLA53A, 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 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.

Relay control of the channel can be checked by means of the CHANNEL TEST push button.

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 sweep should be used.

In order to test the time cards it is necessary to remove the card which supplies the input to the timer and to place the timer card in a card adapter (see Table I). 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 7. 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 on the timer card clockwise; to decrease the time turn it counter-clockwise. Closing the contact causes the timer output to drop out after the reset time delay setting of 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
TL1	AH	NONE*
TL2	AC	K
TL3	AD	M
TL4	AG	AK
TL5	AF	AR
TL6	AE	M
TL7	AB	AK (SLAT53A)

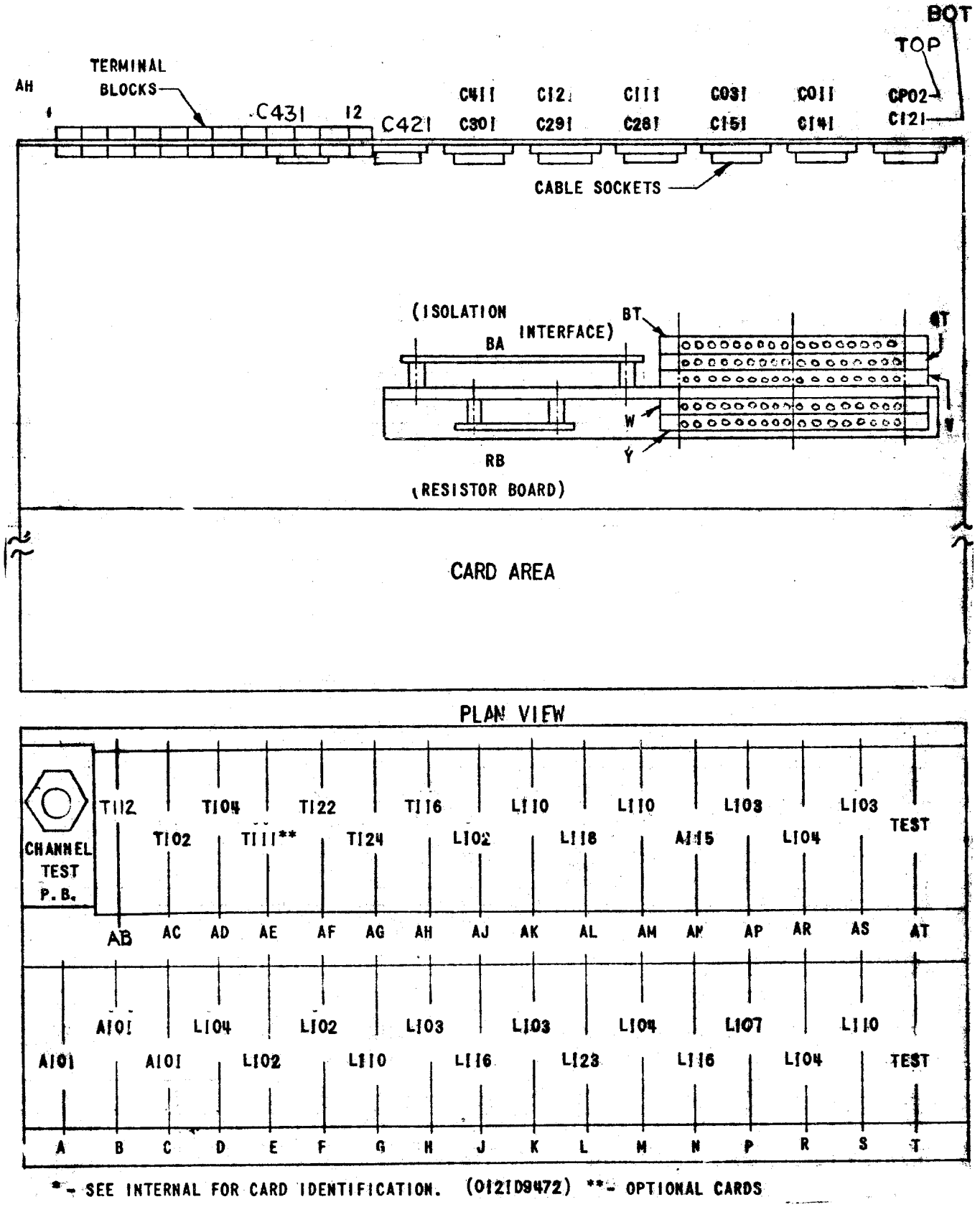
* Turn DC supply switch ON and OFF

E. OVERALL EQUIPMENT TESTS

After the SLA53A 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 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 from the associated SLAT when the measuring units operate.



*- SEE INTERNAL FOR CARD IDENTIFICATION. (0121D9472) **- OPTIONAL CARDS

FIG. 1 (0-27A2037-0) OUTLINE AND MOUNTING DIMENSIONS FOR THE TYPE SLA53A RELAY

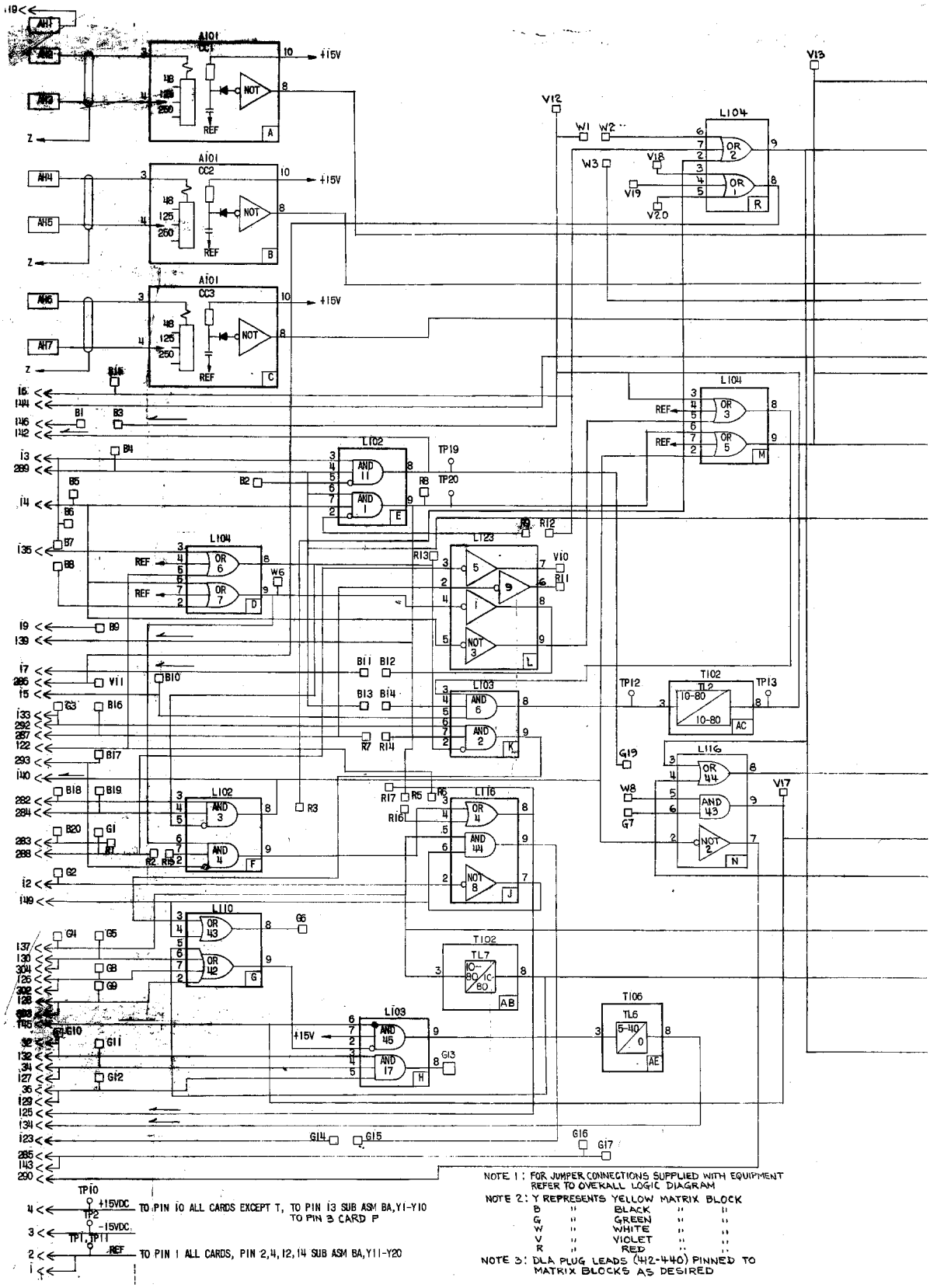
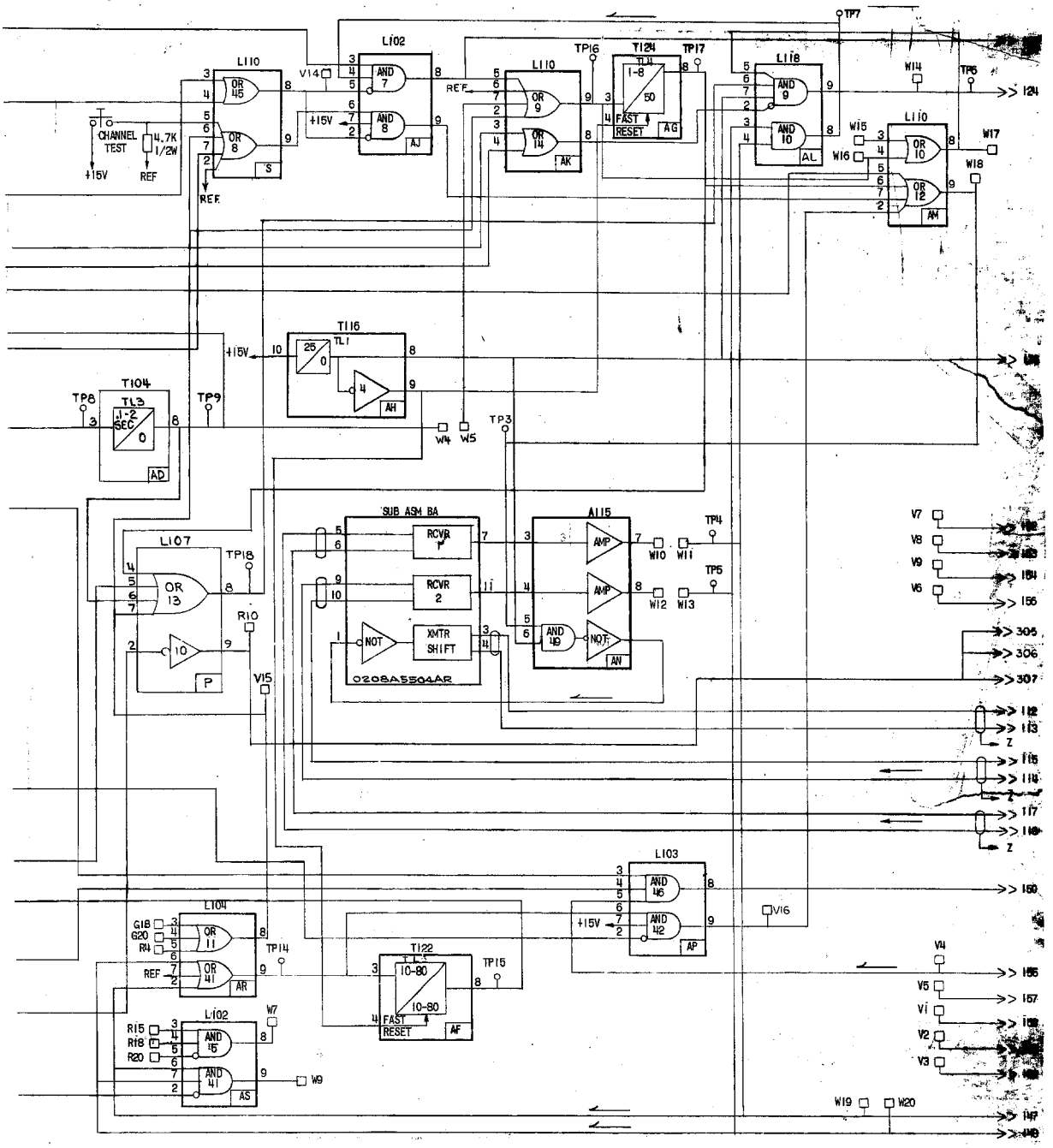


FIG. 2 (0121D9472-4) INTEI



PLUG CONNECTIONS

1-4	TO SSA
11-20	TO SLYP
121-130, 131-140, 141-150, 151-160	TO SLAT
281-290, 291-300	TO SLCN51
301-310	TO SLCN52
411-420, 421-430, 431-440	TO DLA

NS FOR THE TYPE SLA53A RELAY

MAINTENANCE

A. PERIODIC TESTS

It should be sufficient to check the outputs produced at test points in the SLA53A 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 SLA53A 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 lgoic 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 oscillsocope 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 buses, 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 SLA53A relay are included in the card book GEK-34158.

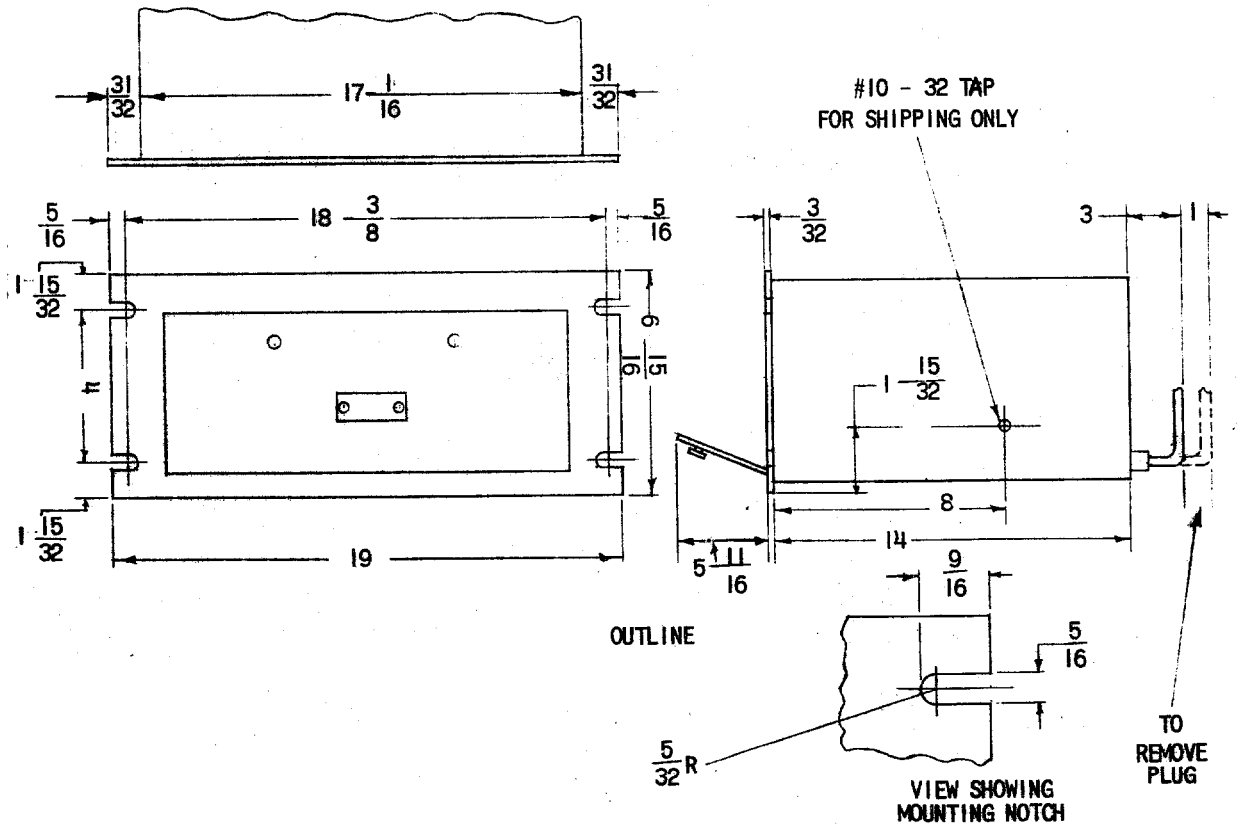


FIG. 3 (0257A3191-0) COMPONENT AND CARD LOCATIONS FOR THE TYPE SLA53A RELAY

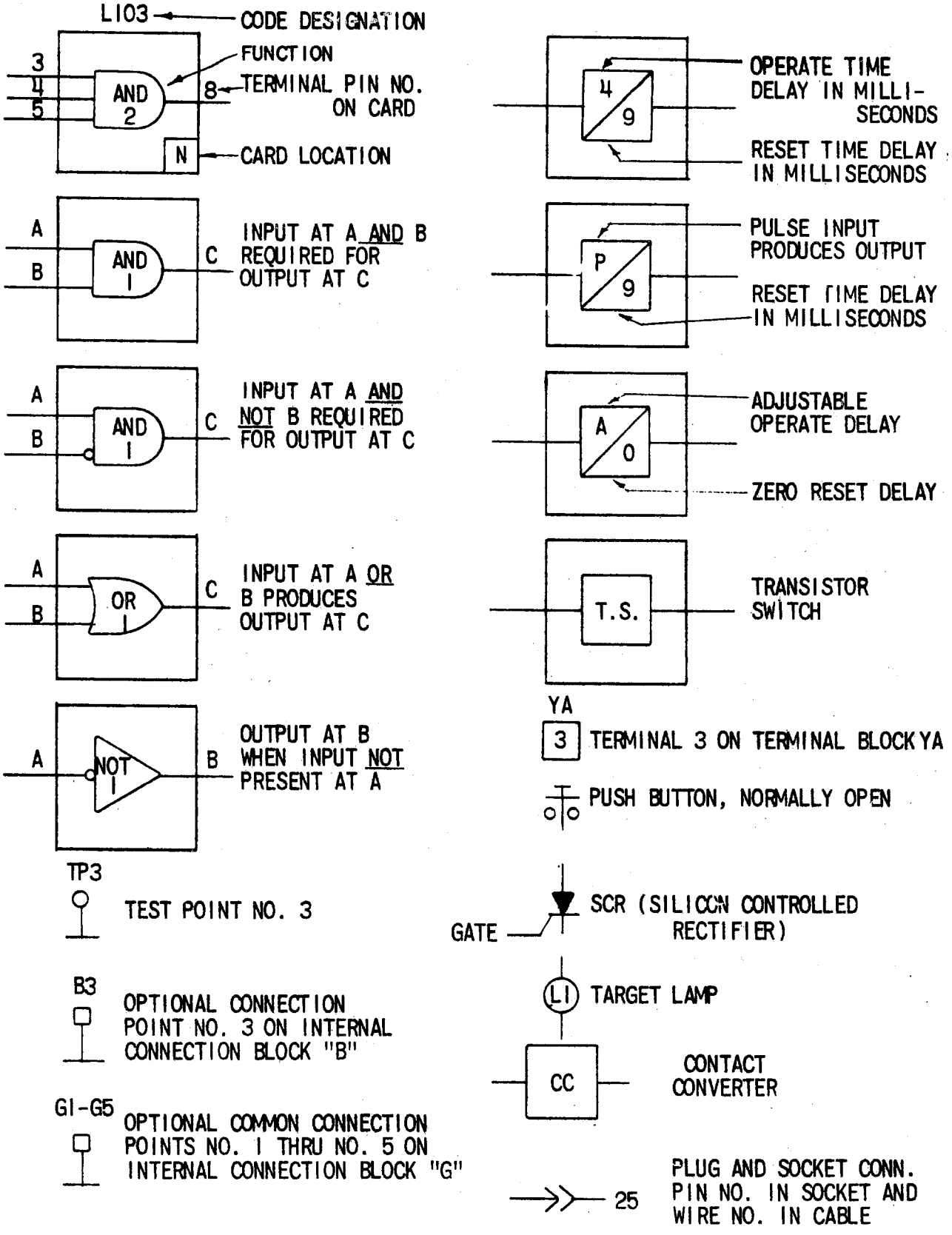


FIG. 4 (0227A2047-0) INTERNAL CONNECTIONS DIAGRAM LEGEND

THE FOLLOWING CONNECTIONS ARE TO BE MADE TO THE TERMINAL BLOCKS IN THE REAR OF THE SLA LOGIC UNIT. (34)

FROM	TO
Y1	R14
Y2	R19
Y11	W15
Y12	B2
Y13	W2
Y14	R4
Y15	R9
B1	B3
B7	B8
B9	R11
B11	B12
B13	B14
G6	G7
G13	R16
G17	G18
G19	G20
G11	G14
R1	R3
R13	V20

FROM	TO
V10	V18
W1	W3
W4	W5
W6	V19
W8	W9
W10	W11
W12	W13
412	V6
413	V7
414	V8
415	W19
416	W20
417	V4
418	V13
419	V14
422	V15
423	V9
424	V16
425	W18
426	B4
427	B16

FROM	TO
428	G1
429	G3
432	G5
433	G8
434	G9
435	G10
436	G16
437	G12
438	B5
439	B6

FIG. 5 (0227A2050-1 SH-34) SAMPLE OPTION CHART FOR THE SLA53A RELAY

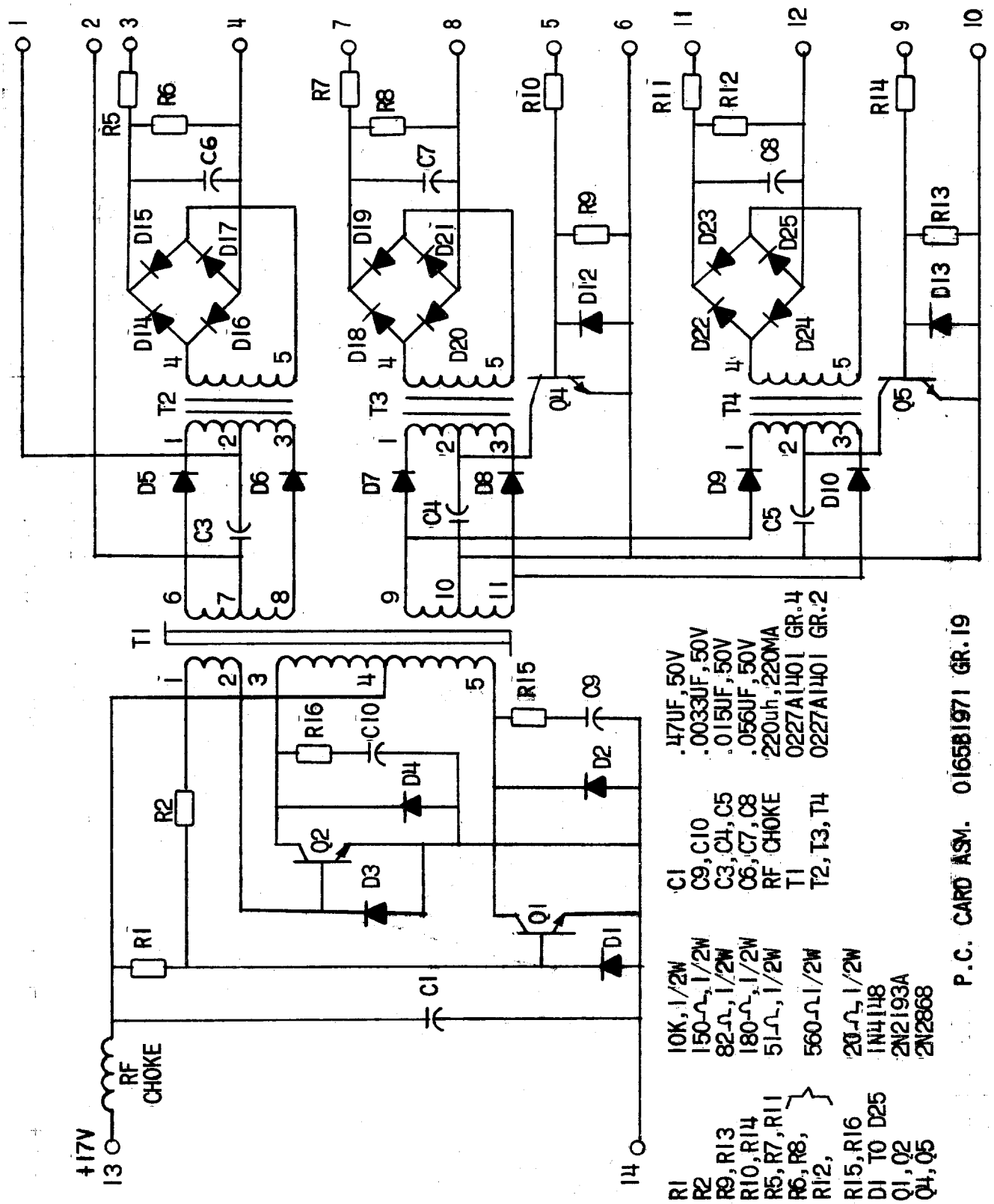
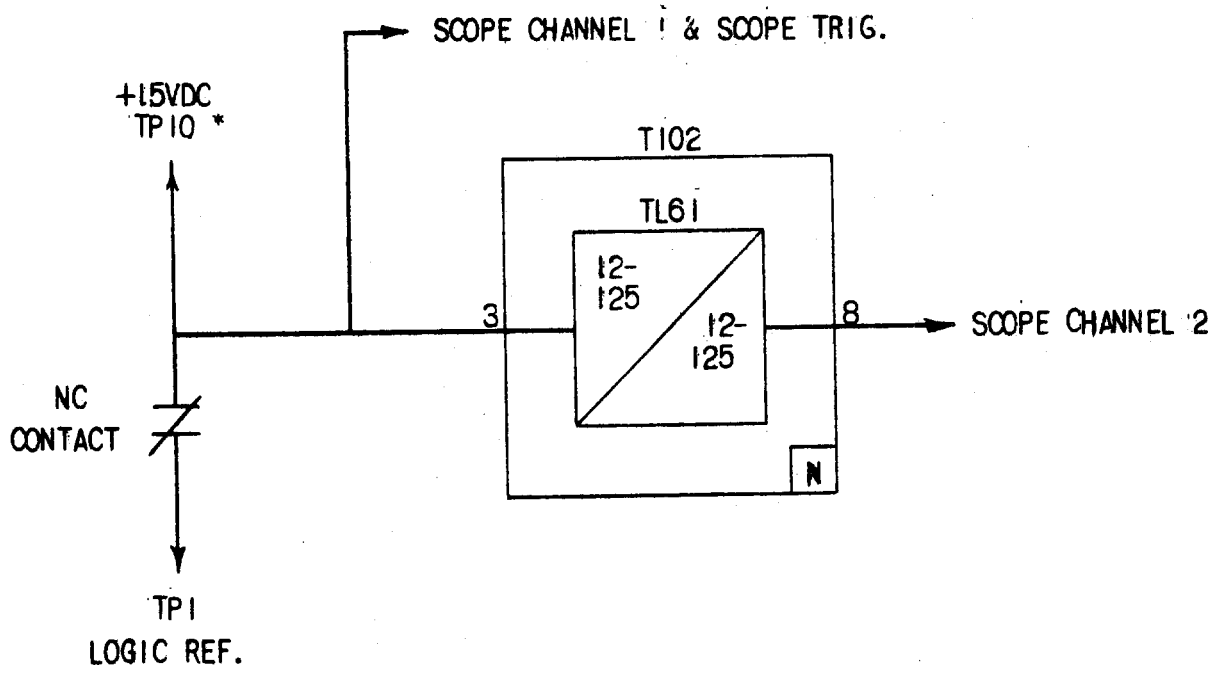


FIG. 6 (0208A5504AR-0) ISOLATION INTERFACE INTERNAL CONNECTIONS



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

FIG. 7 (0246A7987-0) LOGIC TIMER TEST CIRCUIT