INSTRUCTIONS

GEK-45354

AUXILIARY LOGIC UNIT

TYPE SLA53B

POWER SYSTEMS MANAGEMENT DEPARTMENT

GENERAL ELECTRIC

PHILADELPHIA, PA.

CONTENTS

AUXILIARY LOGIC UNIT

TYPE SLA53B

DESCRIPTION

The SLA53B is a static auxiliary logic relay designed for use in a directional comparison transmission line protection scheme with single pole trip and reclose capability. It includes the necessary scheme logic and the channel interface and control circuits for a Type CS26 on-off power line carrier.

The SLA53B is packaged in a four rack unit (1 rack unit = 1 3/4 inches) enclosed metal case suitable for mounting on a 19 inch rack. The case outline and mounting dimensions are shown in Figure 1. The internal connections for the SLA53B are shown in Figure 2. The component and printed circuit card locations are shown in Figure 3.

APPLICATION

The SLA53B is intended for application with Type SLY51, SLY53, and SLYG51 directional distance relays, and SLC51 overcurrent relays in a directional comparison blocking scheme with Type CS26B power line carrier. Circuits are included to permit single pole switching by the use of a Type SLCN52 supervising phase selector relay. An SLAT53 output relay with individual pole control and an isolated $\pm$15V DC power supply, Type SSA50, are also required for a complete equipment for one terminal of a transmission line.

For a complete description of the overall scheme in which the SLAT53A relay is employed, refer to the overall logic diagram and the associated logic description which are supplied with each terminal of equipment. The only user adjustments which should be required are the following three timer settings:

TL4 - B/O second zone timer for delayed tripping by MT or MTG. Set B pickup time delay long enough to coordinate with clearing of faults in the next line section.

TL5 - 3/50 trip integrator. The three millisecond pickup time delay is based on proper coordination between local trip and received channel blocking signal at the comparer with a 1.5 millisecond CS26B channel. For longer channel times due to the use of narrow band carrier or longer than one millisecond propagation time (100 mile line), the pickup time should be increased accordingly. Refer to the specific logic description for details. The 50 millisecond reset time is to hold off blocking carrier transmission to the remote terminal once a local trip is initiated.

TL6 - 1/A is the comparer bypass timer. The A(2-20 cycle) drop-out time represents the duration of time for which direct tripping by MTG (or MT) is permitted following single pole reclosing. The minimum two cycle drop-out time will assure tripping on a sustained fault. Longer drop-out settings will accommodate operation of other output control circuits. Refer to the logic description for detailed considerations.

The other timers in the SLAT53B should be applied with the settings shown on the overall logic diagram, and no user adjustment should be required.

RATINGS

The Type SLA53B relay is designed for use in an environment where the air temperature outside the relay case is between -20°C and +65°C.

The Type SLA53B relay requires a $\pm$15 VDC power source which can be obtained from a Type SSA power supply.

BURDENS

The SLA53B relay presents a burden of 300 milliamperes to the +15 VDC supply of the Type SSA power supply.

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

OPERATING PRINCIPLES

A. LOGIC CIRCUIT

The functions of the Type SLA53B 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 one VDC represents OFF or LOGIC ZERO condition; an ON or LOGIC ONE condition is represented by a signal of approximatly +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 SLA53B 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 SLA53B relay is shown in Figure 5.

Some of the matrix block connections may be user 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 an external contact operation into a signal that is compatible with the logic circuit of the Type SLA53B relay. These contact converters are labeled CC1, CC2, and CC3.

CC1

Contact converter 1 stops all carrier transmission.

CC2

Contact converter 2 blocks carrier tripping and carrier transmission.

CC3

This contact converter is connected to matrix block points. Refer to the logic diagram for its use in a particular scheme.

C. DATA MONITORING POINTS

The Type SLA53B relay has provisions to provide up to 20 data monitoring outputs; the 20 points are brought out on two sockets C411 and C421. These data monitoring (DLA) points are selected by connecting the movable lead from the DLA socket pin (412-420, C422-C430) 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 SLA53B 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.

CALCULATION OF SETTINGS

This section covers those timers in the SLA53B which require field adjustment.

TL8 (10-80/10-80)

This timer is associated with the MOB out-of-step blocking function. Refer to the logic description for a discussion on how to determine the pickup delay setting of the TL8 timer. The reset delay should be set for 40 milliseconds.

CONSTRUCTION

The SLA53B 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 respectively.

The SLA53B relay contains printed circuit cards identified by a code number such as A112, 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 2.3K 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. Four 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 four blocks are yellow (Y), black (B), green (G), 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 bolts 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. WARNING: 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 SLA53B 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. 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.

A. GENERAL

The SLA53B 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.

B. OPERATIONAL CHECKS

Operation of the SLA53B unit can be checked by observing the signals at the twenty test points (TP1 to TP20) in the SLA53B 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.

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 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 card. If the timer card is provided with a variable reset relay, 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
TL1	E	D
TL2	AG	None*
TL3	F	B
TL4	AE	AK
TL5	H	AM
TL6	AJ	AD
TL7	AG	No test or adjustment required
TL8	AC	AB
TL9	AN	G in SLAT53B

*Turn DC supply switch on and off

E. CONTACT CONVERTER TESTS

Operation of the contact converters can be checked by connecting the station DC through a switch to the appropriate pair of terminals of the terminal strip, AH, mounted on the rear of the relay. The terminal numbers and polarity of connections for each of the three contact converters are shown in the internal connection diagram, Figure 2. The output of CC1 can be monitored at Pin 4 of card AF, the output of CC2 can be monitored at Pin 7 card AK, and the output of CC3 can be monitored at the input to the function which it drives (refer to the Logic Diagram).

F. ISOLATION INTERFACE TESTS

Operation of the three functions (received carrier, transmitter control, and transmitter auxiliary stop) of the isolation interface can be checked without direct connections to the subassembly. External test connections are made to the pins of the C111 socket mounted on the rear of the unit, see Figure 3. Logic circuit test connections are made at the socket pins of the channel control card in position "AF".

Received carrier operation test connections are shown in Figure 8A. For this test do not remove channel control card in position "AF". Closure of the normally open contact will simulate a received carrier signal and scope display will go from a logic "0" to a logic "1".

For the transmitter control and transmitter auxiliary stop checks remove the channel control card "AF" from its socket and replace it with a test card adapter and test card to gain access to the "AF" socket pins. Transmitter control test connections are shown in Figure 8B. The test contact in the open position simulates a logic "1" condition which holds off the transmitter control output of the isolation interface. Closure of the normally open contact generates a logic "0" condition initiating a transmitter control output producing a 5-6 volt DC signal across the output loading resistor. The transmitter auxiliary stop function can be tested in a similar manner using the test connections of Figure 8C and the output again will provide a 5-6 volt DC signal across the output loading resistor.

G. OVERALL EQUIPMENT TESTS

After the SLA53B 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 from the associated SLAT when the measuring units operate.

MAINTENANCE

A. PERIODIC TESTS

It should be sufficient to check the outputs produced at test points in the SLA53B 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 SLA53B 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 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 busses, or overheat the semi-conductor components. The repaired area should be re-covered 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 SLA53B relay are included in the card book GEK-34158.

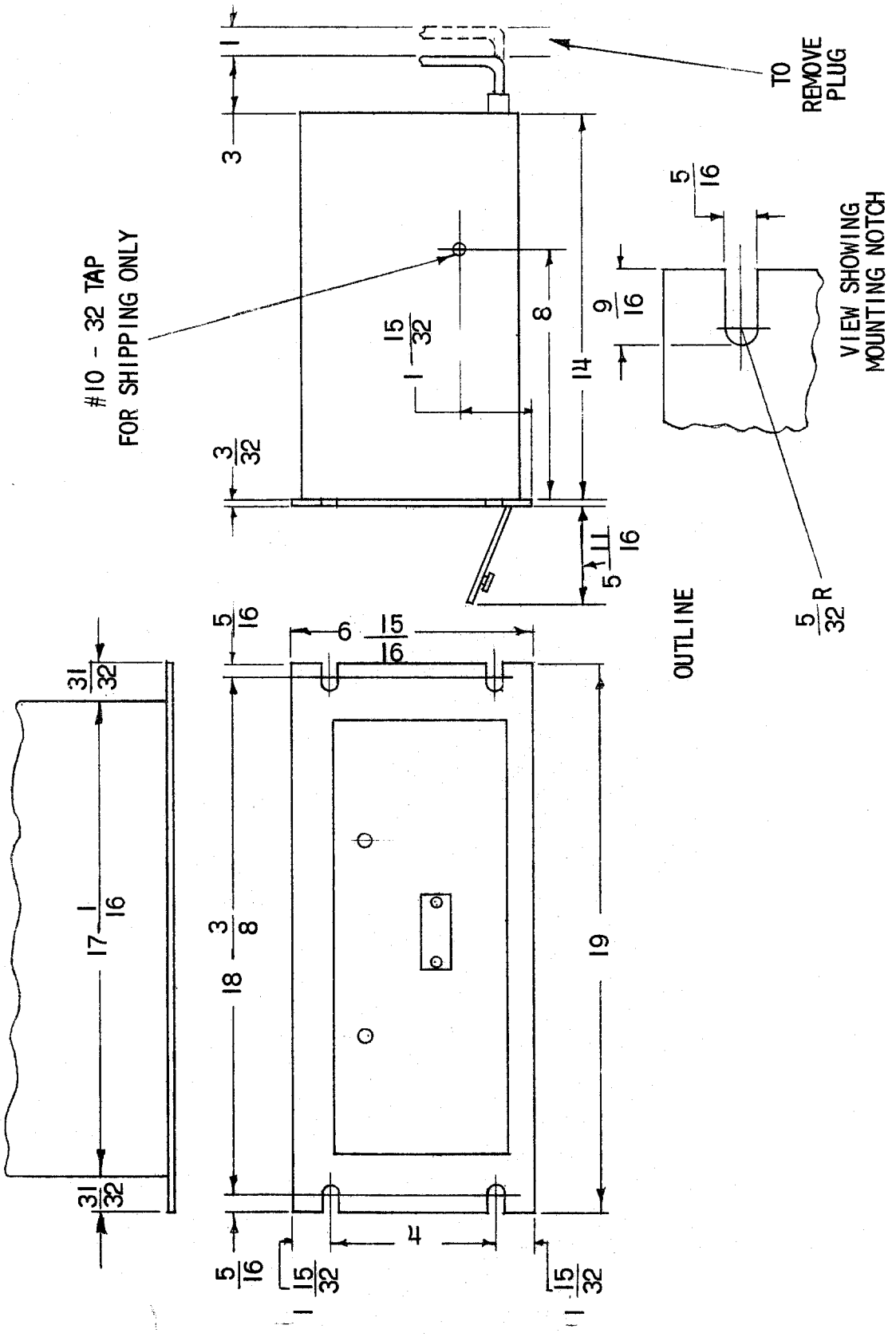


FIG. 1 (0227A2037-0) Outline and Mounting Dimensions

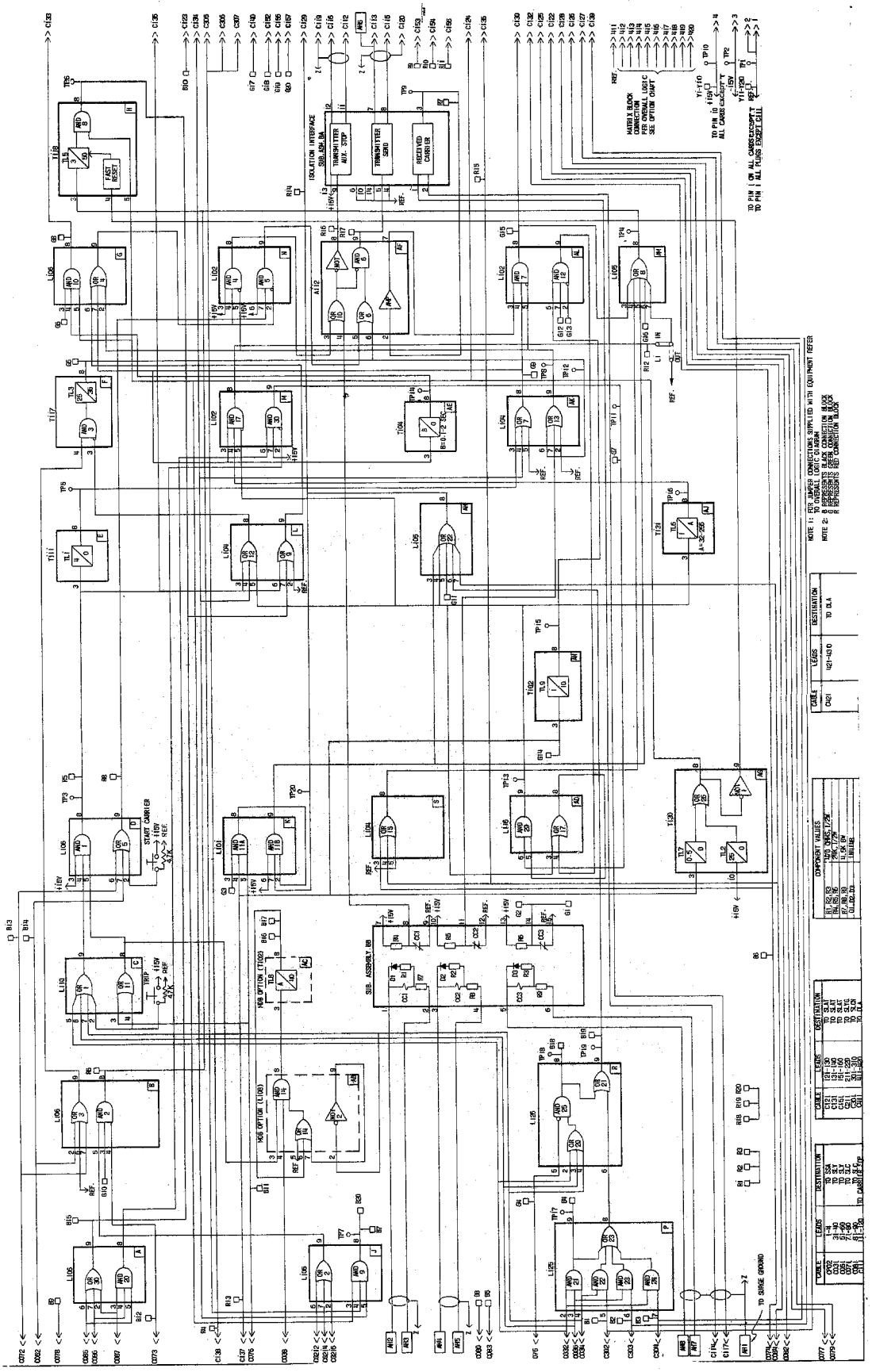
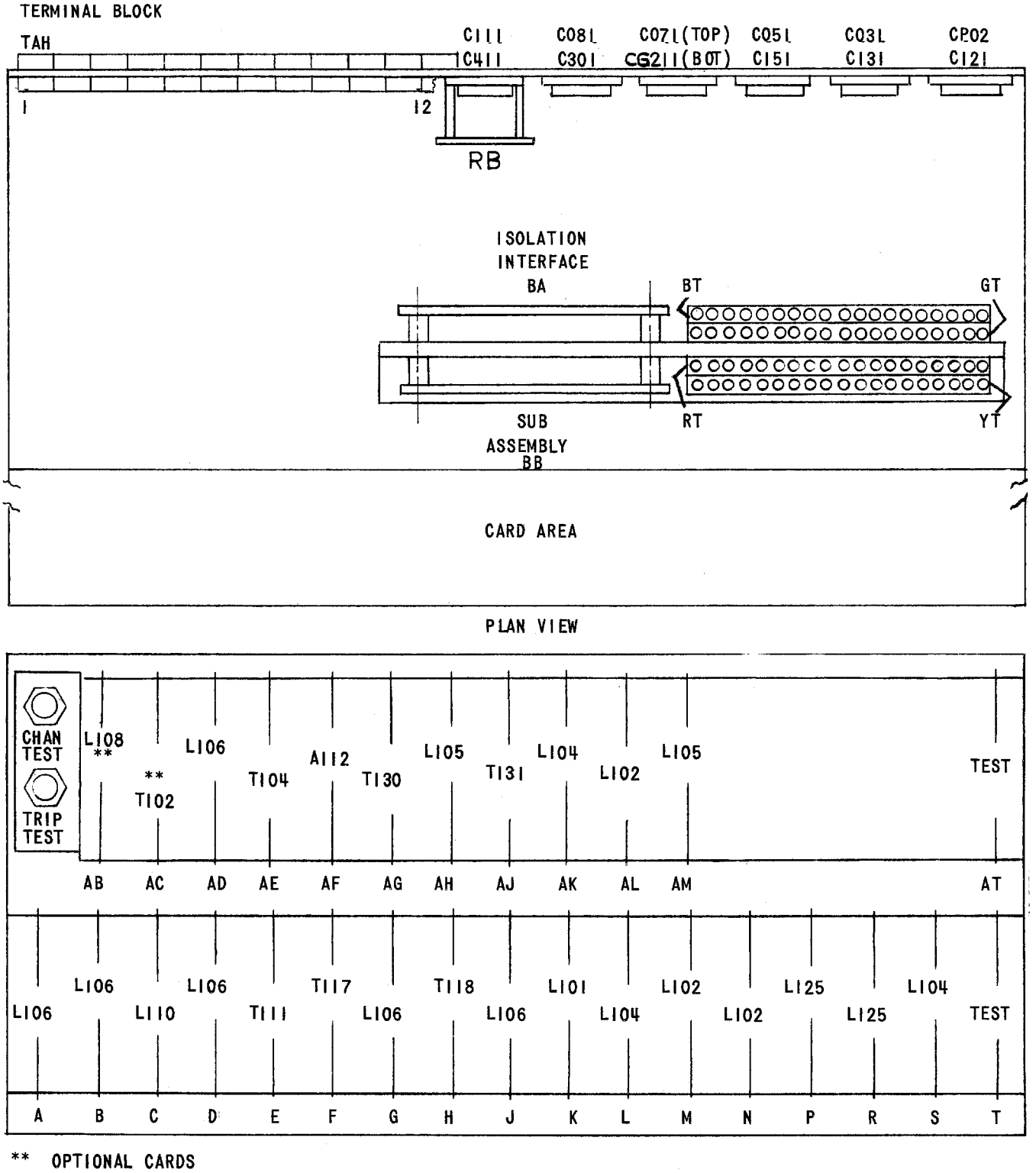


FIG. 2 (0126D3746-3) Internal Connections for the Type SLA53B Relay



** OPTIONAL CARDS

FIG. 3 (0257A6230-2) Component Location Diagram

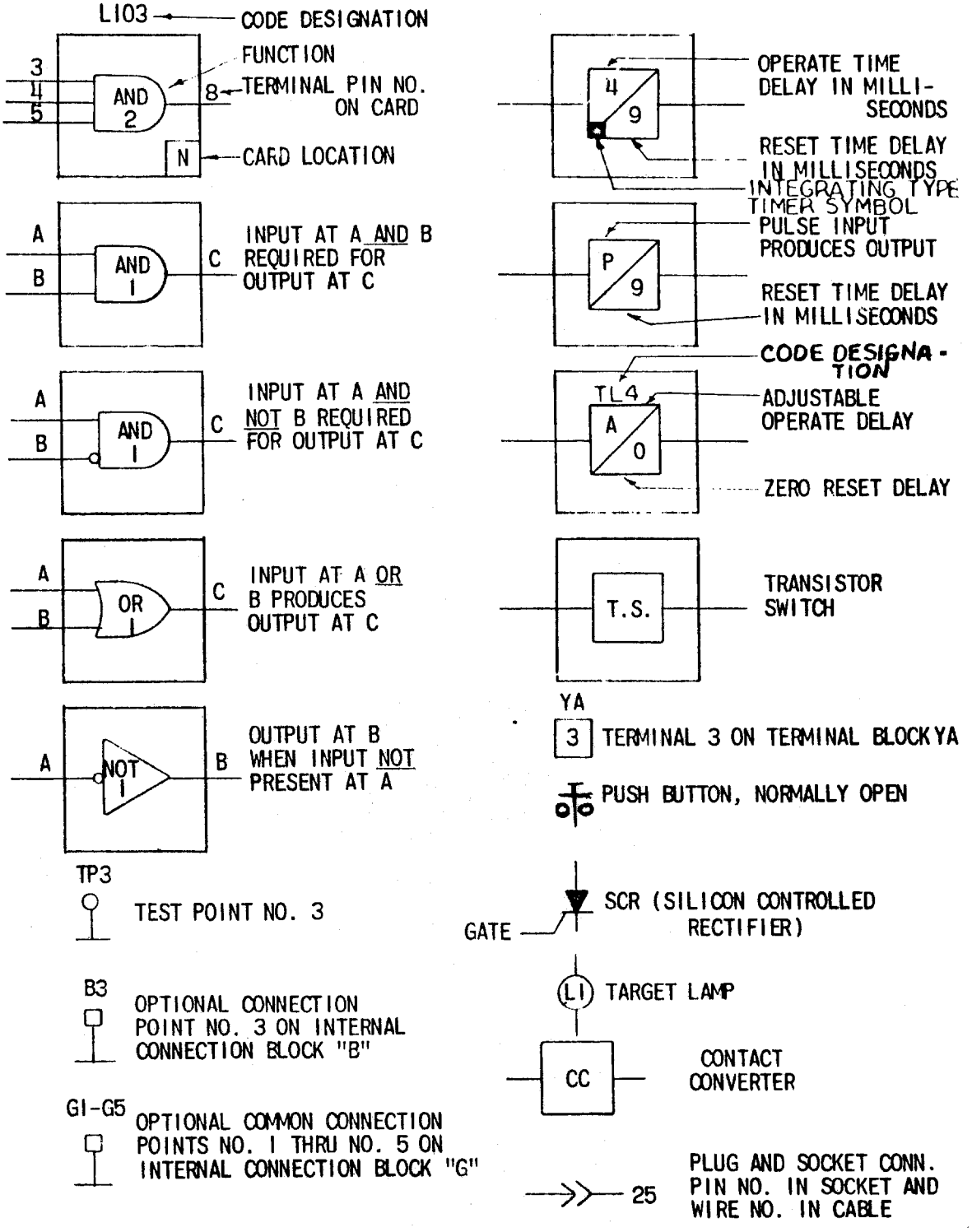


FIG. 4 (0227A2047-1) Internal Connections Diagram Legend

THE FOLLOWING CONNECTIONS ARE TO BE MADE TO THE TERMINAL BLOCKS IN THE SLA LOGIC UNIT.

44

FROM	TO
G1	G11
B20	B10
PL412	R5
PL413	R6
PL414	R7
PL415	R20
PL416	R9
PL417	R10
PL418	R11
PL419	B14
PL420	B13
PL422	R13
PL423	G19
PL424	B6
PL425	R15
PL426	R16
PL427	R17
PL428	G7
PL411	Y12
PL421	Y13
G16	Y14
G6	Y3
G3	Y2
B7	R18

FROM	TO
G20	R19
G12	Y4
G13	G14
G10	Y5

FROM	TO

FIG. 5 (0227A2050-1 SH 44) Sample Option Chart

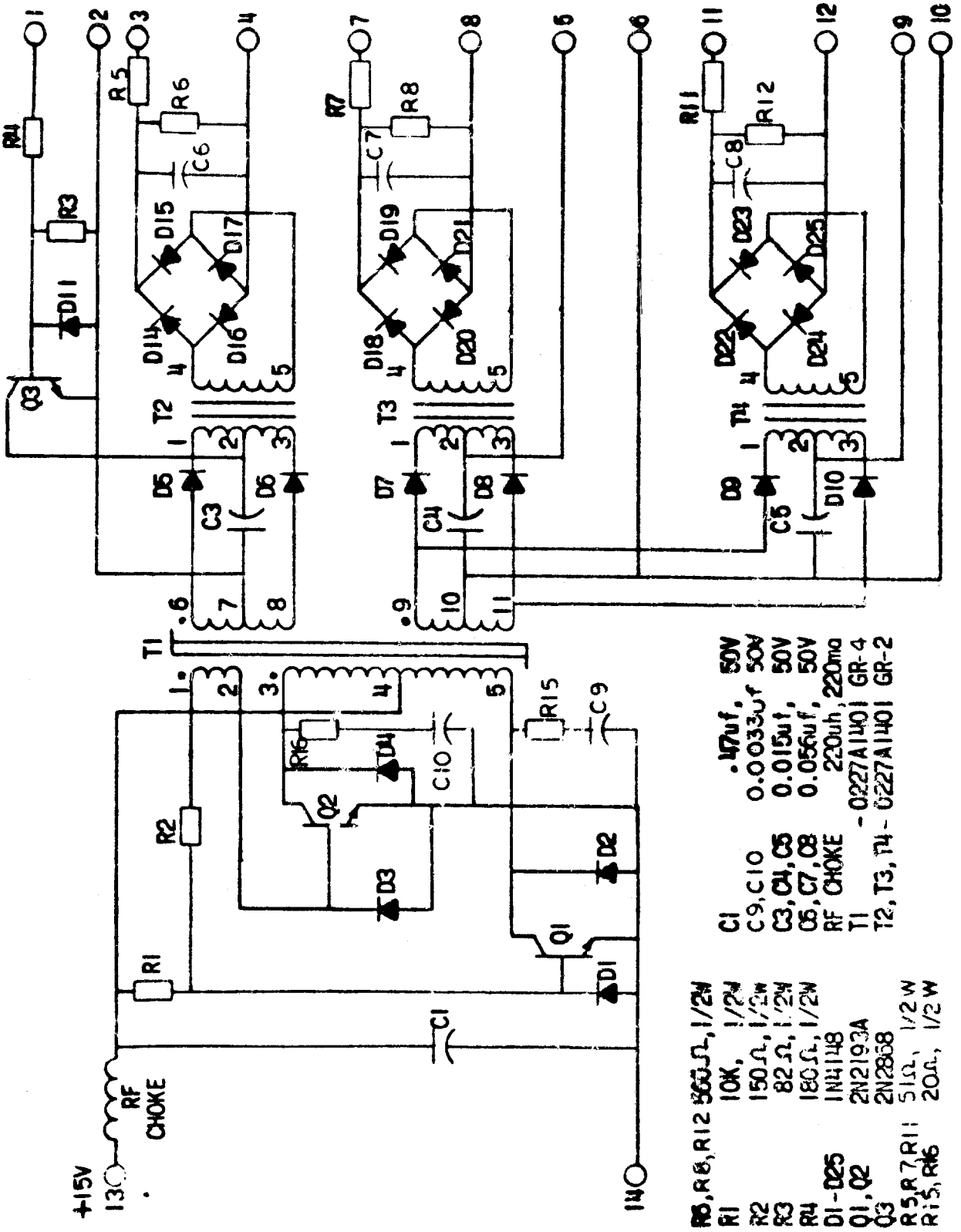
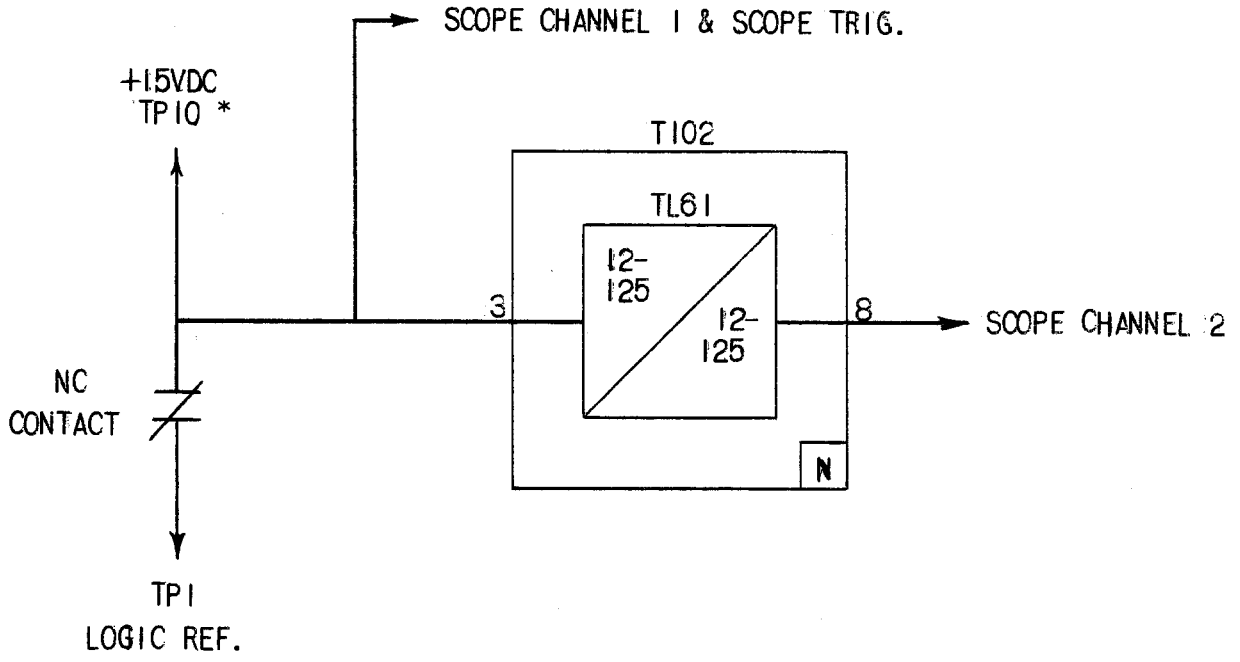


FIG. 6 (0208A5504AJ-1) Isolation Interface Internal Connections



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

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

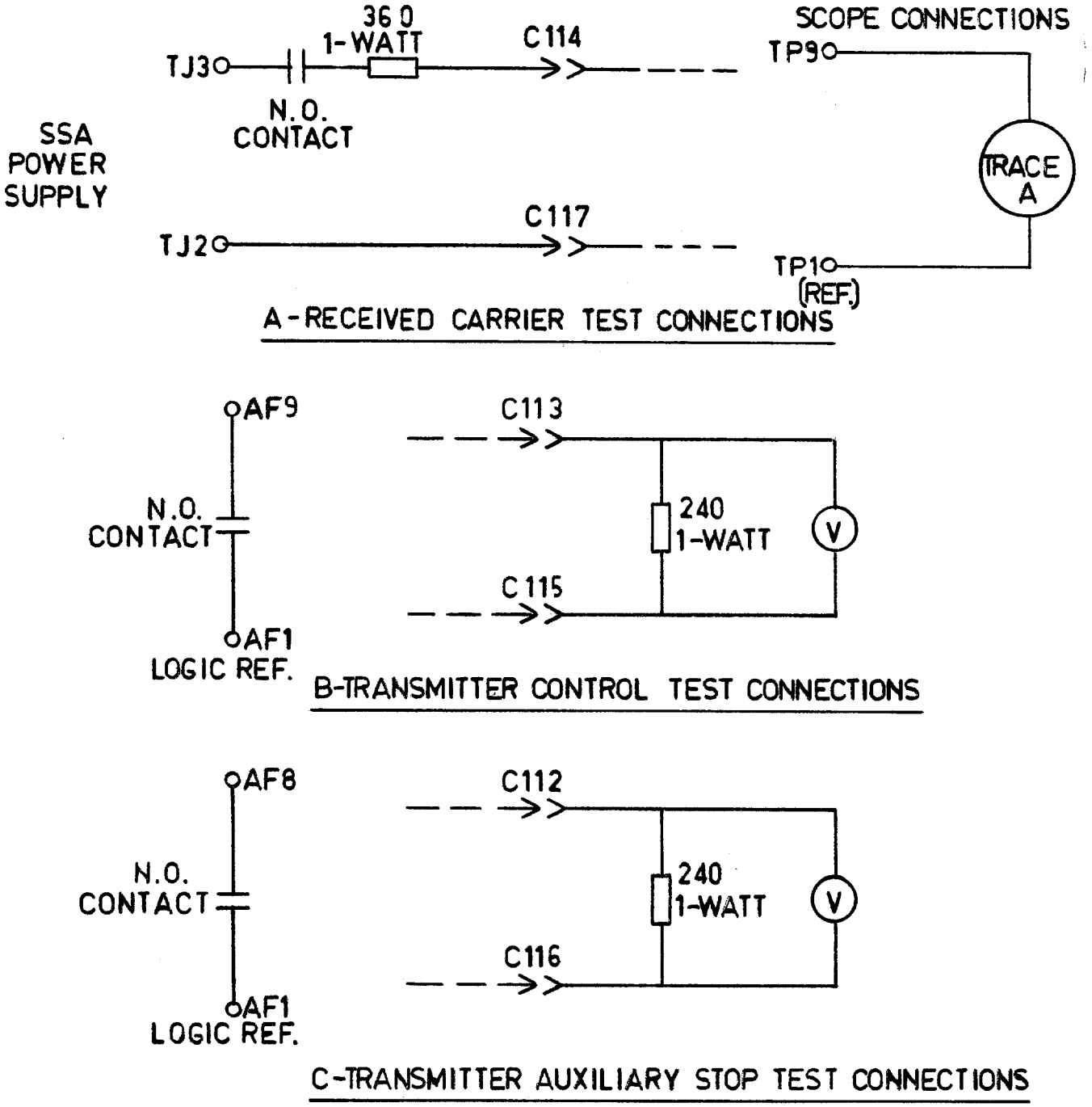


FIG. 8 (0257A8705-0) Isolation Interface Test Circuit

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