



**INSTRUCTIONS**

GEK-86037

**AUXILIARY LOGIC UNIT  
TYPE SLA52T**

---

**GENERAL  ELECTRIC**

CONTENTS

	<u>PAGE</u>
<b>DESCRIPTION</b> .....	3
<b>APPLICATION</b> .....	3
<b>RATINGS</b> .....	3
<b>BURDENS</b> .....	4
<b>OPERATING PRINCIPLES</b> .....	4
<b>CONSTRUCTION</b> .....	5
<b>RECEIVING, HANDLING AND STORAGE</b> .....	5
<b>INSTALLATION TESTS</b> .....	6
CAUTION .....	6
GENERAL .....	6
OPERATIONAL CHECKS .....	6
TEST CARD ADAPTER .....	7
TIMER ADJUSTMENTS AND TESTS .....	7
OVERALL EQUIPMENT TESTS .....	7
<b>MAINTENANCE</b> .....	7
PERIODIC TESTS .....	7
TROUBLESHOOTING .....	7
SPARE PARTS .....	8

## AUXILIARY LOGIC UNIT

### TYPE SLA52T

### DESCRIPTION

The SLA52T is an auxiliary logic relay for use in schemes using frequency shift channel equipment. It is usually used with a Type SLYP positive sequence distance unit, a Type SLCN negative sequence directional overcurrent unit, a Type SLAT output tripping unit, a Type SSA power supply, and a test panel.

The SLA52T has appropriate interconnections for use with a Type SLAT54 auxiliary and tripping unit when applied in single pole tripping and reclosing schemes.

The SLA52T is designed with considerable flexibility to accommodate various types of schemes such as blocking, unblocking, permissive transfer tripping, or combined schemes such as an unblocking scheme combined with a direct transfer trip scheme. Provision is made for various auxiliary tripping circuits which may be supplied initially or easily added later in the field. These optional circuits include direct tripping overcurrent and distance functions, line "pickup" circuitry, "weak infeed" trip circuitry, out-of-step tripping or blocking circuitry, and second zone back-up timing circuitry.

### APPLICATION AND SETTINGS

Because of the flexibility of the Type SLA52T, the application and settings will vary with the particular type of scheme in which it is used. Refer to the overall logic diagram description for application and setting information for the particular scheme in which the SLA52T is used.

### RATINGS

The Type SLA52T relay is designed for use in an environment where the ambient temperature outside the relay case is between minus 20°C or plus 65°C.

The Type SLA52T relay requires a plus or minus 15 volt DC power source which can be obtained from a Type SSA50/51 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 available voltage taps are for 48 volts DC, 125 volts DC or 250 volts DC.

*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.*

## BURDENS

The SLA52T relay presents a burden of 350 milliamperes to the plus 15 VDC supply of the Type SSA power supply.

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

## OPERATING PRINCIPLES

The functions included in the Type SLA52T relay involve basic logic operations (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 condition 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.

The matrix block options shown in the internal connections diagram of the SLA52T relay are connected by jumpers at the factory. The connections are used to implement the logic arrangement shown on the associated overall logic diagram. These matrix jumpers are listed on the associated option chart. A typical option chart for the Type SLA52T relay is shown in Fig. 3. 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.

The purpose of the contact converters (CC1, CC2, CC3, CC4) included in the Type SLA52T relay is to convert a contact operation into a signal that is compatible with the logic circuitry of the relay. The function of each contact converter depends upon the particular relaying scheme in which it is employed.

The Type SLA52T relay has provisions for up to 18 outputs suitable for driving a Type DLA data logging amplifier unit. Any matrix block point which is not used as a logic connection may be monitored by connecting a lead from the 411 or 421 socket to the block. If it is desired to monitor a matrix point which is used as a logic connection, wires 412 to 420 and 422 to 430 may be used. These points have two leads with taper tips which are used to replace the logic jumper. This provides the logic signal path and also a signal for the DLA unit. Any factory selected DLA points are listed on the option chart.

The Type SLA52T relay includes an isolation interface between the relaying equipment and the associated channel. The internal connections of the interface card are shown in Fig. 4. 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 power supply used for the relays and that employed by the channel.

## CONSTRUCTION

The SLA52T 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. 5 and 6, respectively.

The SLA52T 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 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 plus 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 in the SLA52T 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 red (R), blue (BL), green (G), black (B), white (W), violet (V), orange (O) and brown (BR) matrix blocks have 20 individual matrix points. The yellow (Y) block has 20 points which are grouped in two sets of ten common points; Y1 to Y10 are connected to plus 15 VDC, Y11 to Y20 are connected to reference.

## 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 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

If the SLA52T 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.

### 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. 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

The SLA52T 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 or 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 SLA52T unit can be checked by observing the signals at the twenty test points (TP1 to TP20) in the SLA52T, 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 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.

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

### 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 supplies 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 plus 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 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).

### OVERALL EQUIPMENT TESTS

After the SLA52T 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 from the associated SLAT when the measuring units operate.

## **MAINTENANCE**

### PERIODIC TESTS

It should be sufficient to check the outputs produced at test points in the SLA52T when periodic calibration tests are made on the associated measuring units, for example, the phase and ground relay in the line relaying scheme. No separate periodic tests on the SLA52T 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.

## GEK-86037

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 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 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 SLA52T relay are included in the card instruction book GEK-34158.



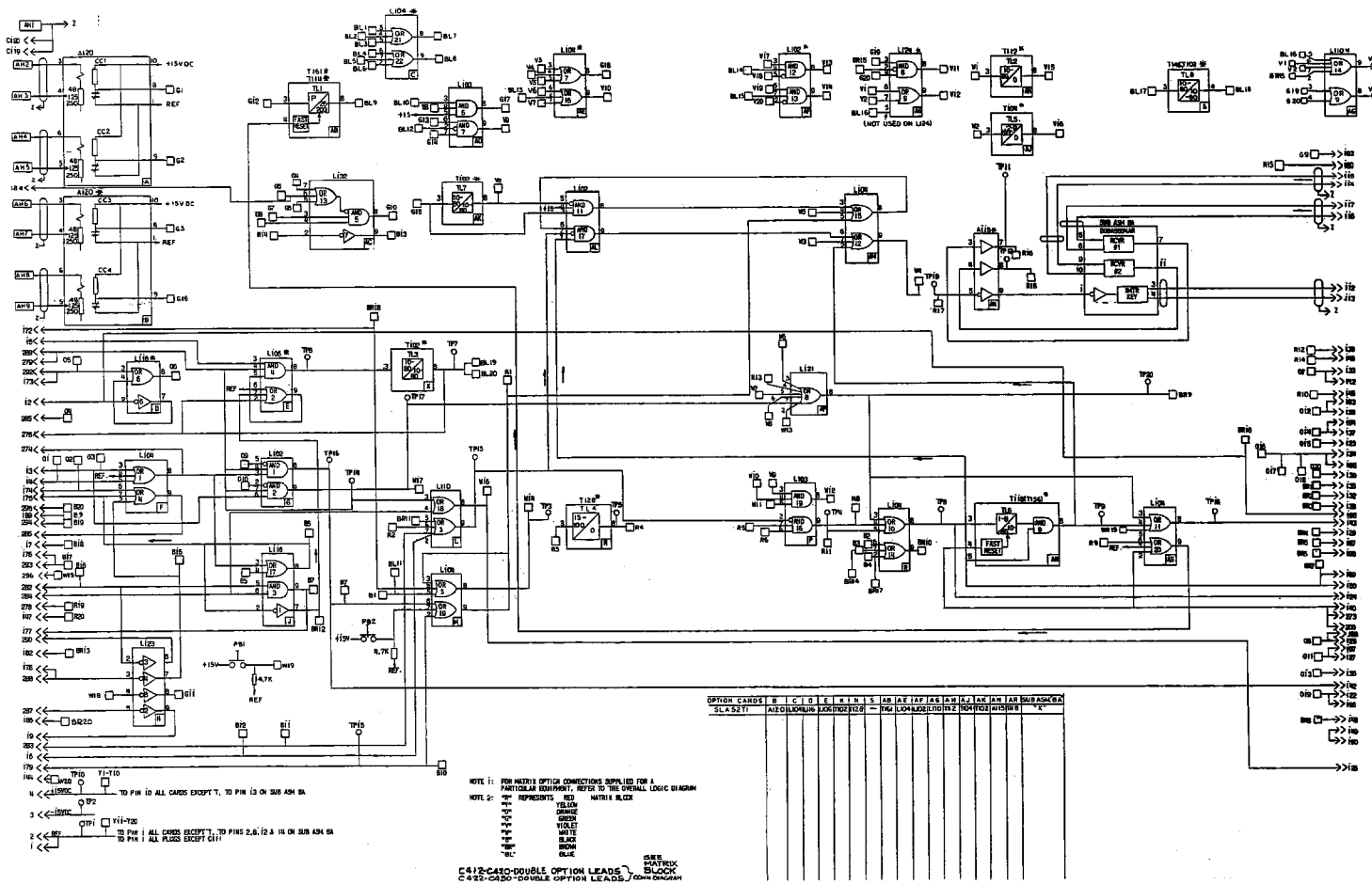


Fig. 1 (0145D8671-0) Internal Connections Diagram for the Type SLA52T Relay

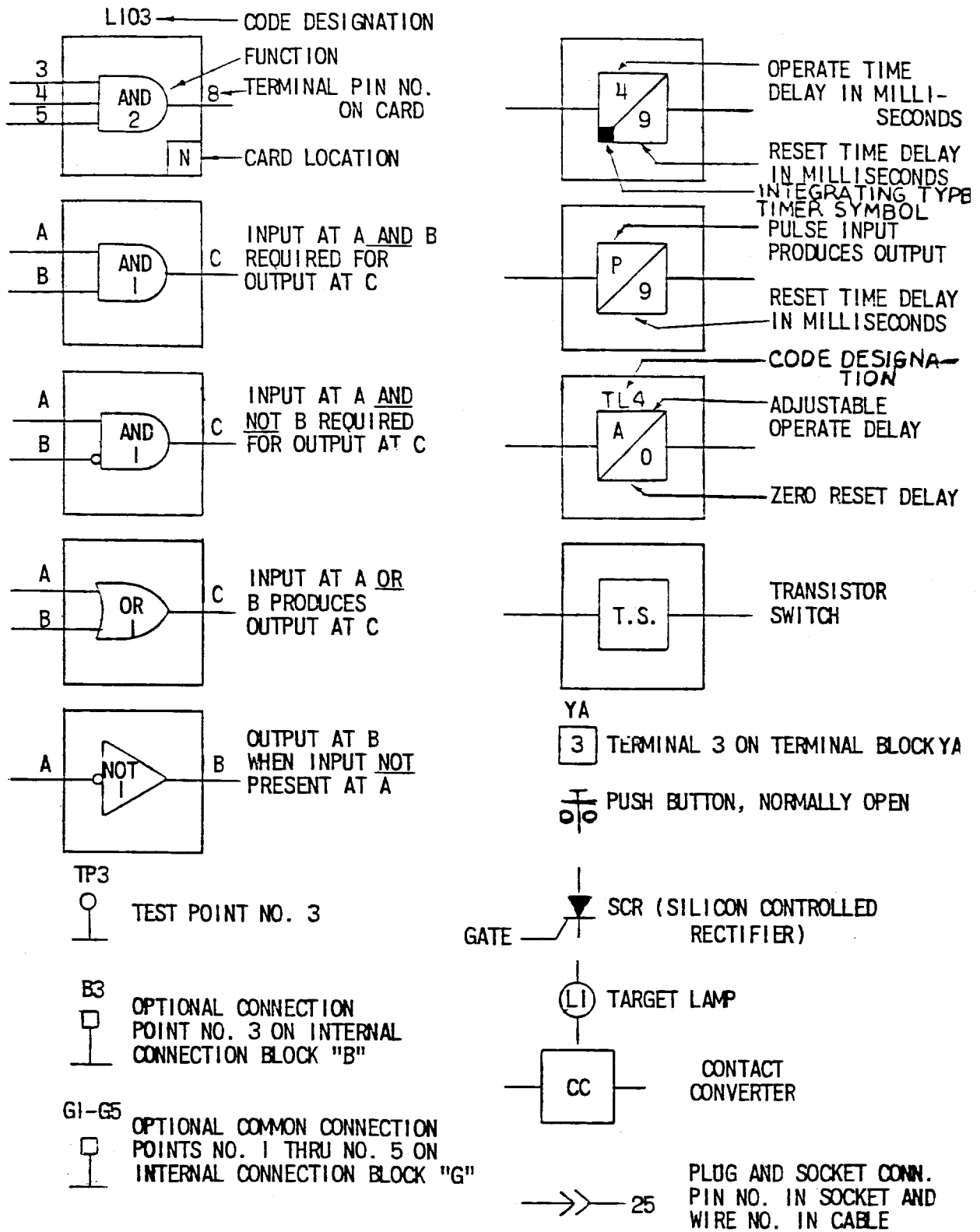


Fig. 2 (0227A2047-1) Internal Connection Diagram Legend

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  
 Δ = 4 WAY CONNECTION.

269A

MATRIX BLOCK JUMPERS		LOGIC FUNCTION		MATRIX BLOCK JUMPERS		LOGIC FUNCTION	
FROM	TO	FROM	TO	FROM	TO	FROM	TO
G2	V6	CC2(9)	OR16(6)	V7	‡ Y11	OR16(7)	REF
BR12	B18	NOT1(7)	PL017	BL6	‡ Y11	OR22(2)	REF
‡ B12	O20	PL016	PL139	G8	‡ Y12	AND5(4)	REF
‡ B12	O10	PL016	AND2(2)	G5	‡ Y12	OR13(6)	REF
O4	R13	PL285	OR8(4)	G6	‡ Y13	OR13(5)	REF
‡ B16	W9	PL282	AND19(3)	V18	‡ Y13	AND12(5)	REF
‡ B16	BR4	PL282	PL129	O9	‡ Y14	AND1(5)	REF
‡ B11	B14	PL283	NOT7(2)	BL12	‡ Y14	AND7(2)	REF
‡ B11	BR8	PL283	PL148	BL3	‡ Y15	OR21(5)	REF
B19	V17	PL294	AND12(3)	W7	‡ Y15	OR8(5)	REF
‡ BR16	R9	PL012	OR20(6)	W8	‡ Y16	OR8(6)	REF
‡ BR16	O15	PL012	PL123	W13	‡ Y16	OR8(2)	REF
W15	W10	PL296	AND19(4)	BL4	‡ Y17	OR22(6)	REF
B20	PL416	PL295	DLA	BL5	‡ Y17	OR22(7)	REF
PL416	BR15	DLA	OR14(2)	BR18	‡ Y18	OR5(4)	REF
BL19	BL13	TL3(8)	OR16(2)	W5	‡ Y18	OR15(4)	REF
BL20	O7	TL3(8)	PL133	‡ G18	R14	OR7(8)	PL146
V10	O13	OR16(9)	PL135	‡ G18	W6	OR7(8)	OR8(3)
V10	BL1	OR16(9)	OR21(3)	‡ V12	BL2	OR14(9)	OR21(4)
R16	G19	RCVR(7)	OR9(3)	‡ V12	V5	OR14(9)	OR7(5)
G3	G20	CC(8)	OR9(4)	PL417	BL16	DLA	OR14(5)
Δ V11	G15	OR9(8)	TL7(3)	V16	PL417	TL5(8)	DLA
Δ V11	R5	OR9(8)	AND16(7)	PL412	W2	DLA	TL5(3)
Δ V11	R12	OR9(8)	PL130	R7	PL412	AND1(8)	DLA
V8	G4	TL7(8)	OR13(7)	PL419	V4	DLA	OR7(4)
O6	G7	OR6(8)	AND5(9)	V15	PL419	TL2(8)	DLA
‡ B13	W11	NOT7(9)	AND19(5)	G17	V3	AND6(8)	OR7(3)
‡ B13	BL14	NOT7(9)	AND12(4)	R1	B8	OR19(9)	AND6(4)
G1	G12	CC1(8)	TL1(3)	PL414	B1	DLA	OR5(5)
Δ BL9	BL10	TL1(8)	AND6(3)	G10	PL414	AND5(8)	DLA
Δ BL9	G13	TL1(8)	AND7(6)	W12	V1	AND19(8)	OR14(6)
Δ BL9	B5	TL1(8)	OR17	V9	W1	AND7(9)	TL2(3)
V13	R3	AND12(8)	TL4(3)	W16	G14	OR18(8)	AND7(7)
R4	PL418	TL4(8)	DLA	PL418	V2	DLA	OR14(7)

Fig. 3 (0227A2050-0, Sh. 269A) Typical Option Chart for the Type SLA52T Relay

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

269B

MATRIX BLOCK JUMPERS		LOGIC FUNCTION		MATRIX BLOCK JUMPERS		LOGIC FUNCTION	
FROM	TO	FROM	TO	FROM	TO	FROM	TO
BR 9	PL415	OR 8(8)	DLA	R 11	‡ Y19	OR10(5)	REF
PL415	R 10	DLA	PL145	BL15	‡ Y19	AND13(7)	REF
B7	PL413	AND 3(9)	DLA	BR19	‡ Y20	OR11(5)	REF
PL413	BL6	DLA	OR22(DUMMY)	W 3	‡ Y20	OR12(7)	REF
‡ BL8	B10	OR22(DUMMY)	OR19	O 12	Y1	PL128	+15V
‡ BL8	W20	OR22(DUMMY)	PL144				
‡ W14	R6	OR5(8)	AND16(6)				
‡ W14	BR1	OR5(8)	PL136				
W4	V19	OR12(9)	AND13(6)				
‡ BL7	V20	OR21(8)	AND13(2)				
‡ V14	R17	AND13(9)	XMTR				
‡ V14	BR3	AND13(9)	PL138				
BL7	O19	OR21(8)	PL122				
O16	O14	PL134	PL137				
O17	BR2	PL134	PL132				
O18	R20	PL134	PL147				

Fig. 3 (0227A2050-0, Sh. 269B) Typical Option Chart for the Type SLA52T Relay

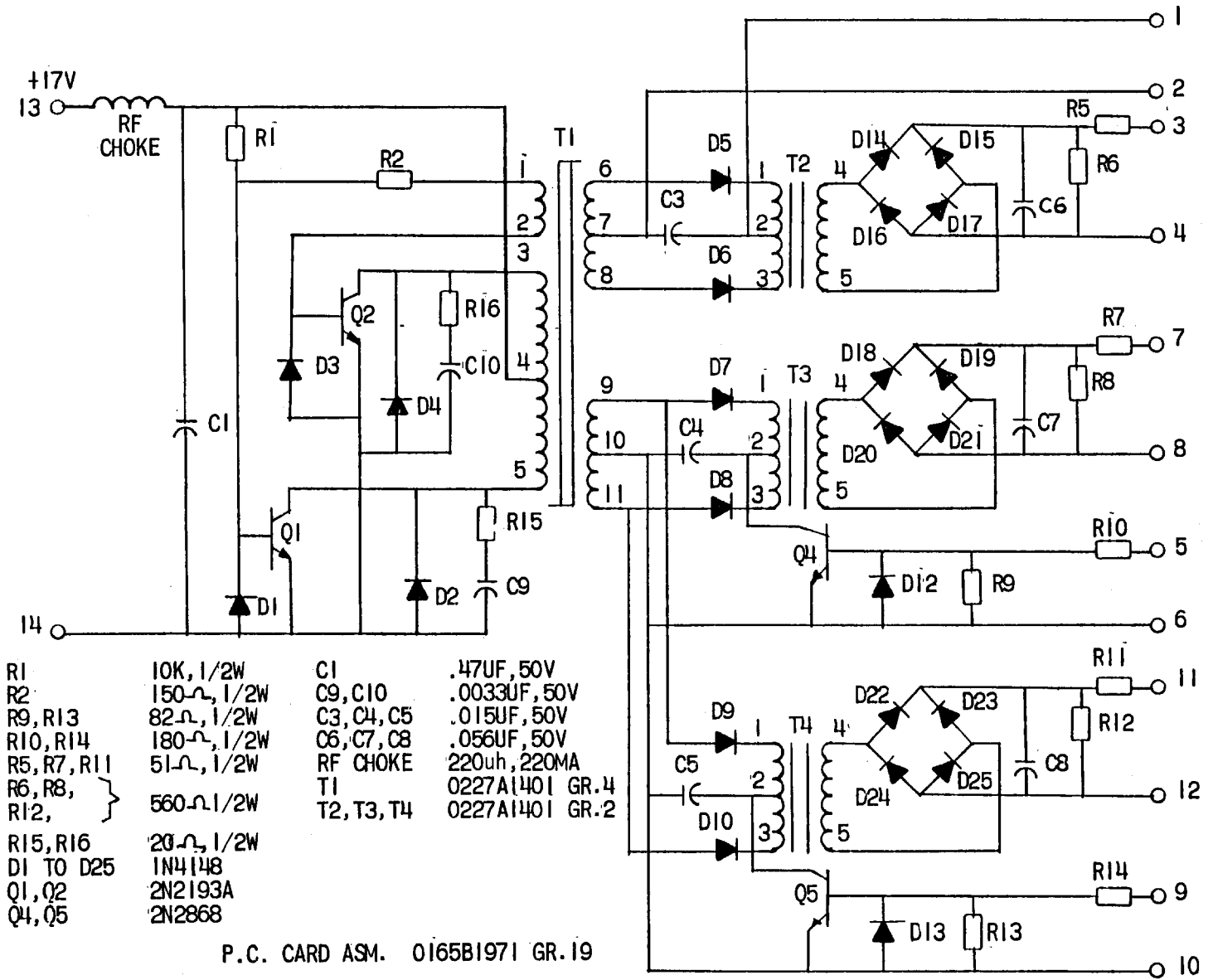


Fig. 4 (0208A5504AR-0) Isolation Interface Circuit

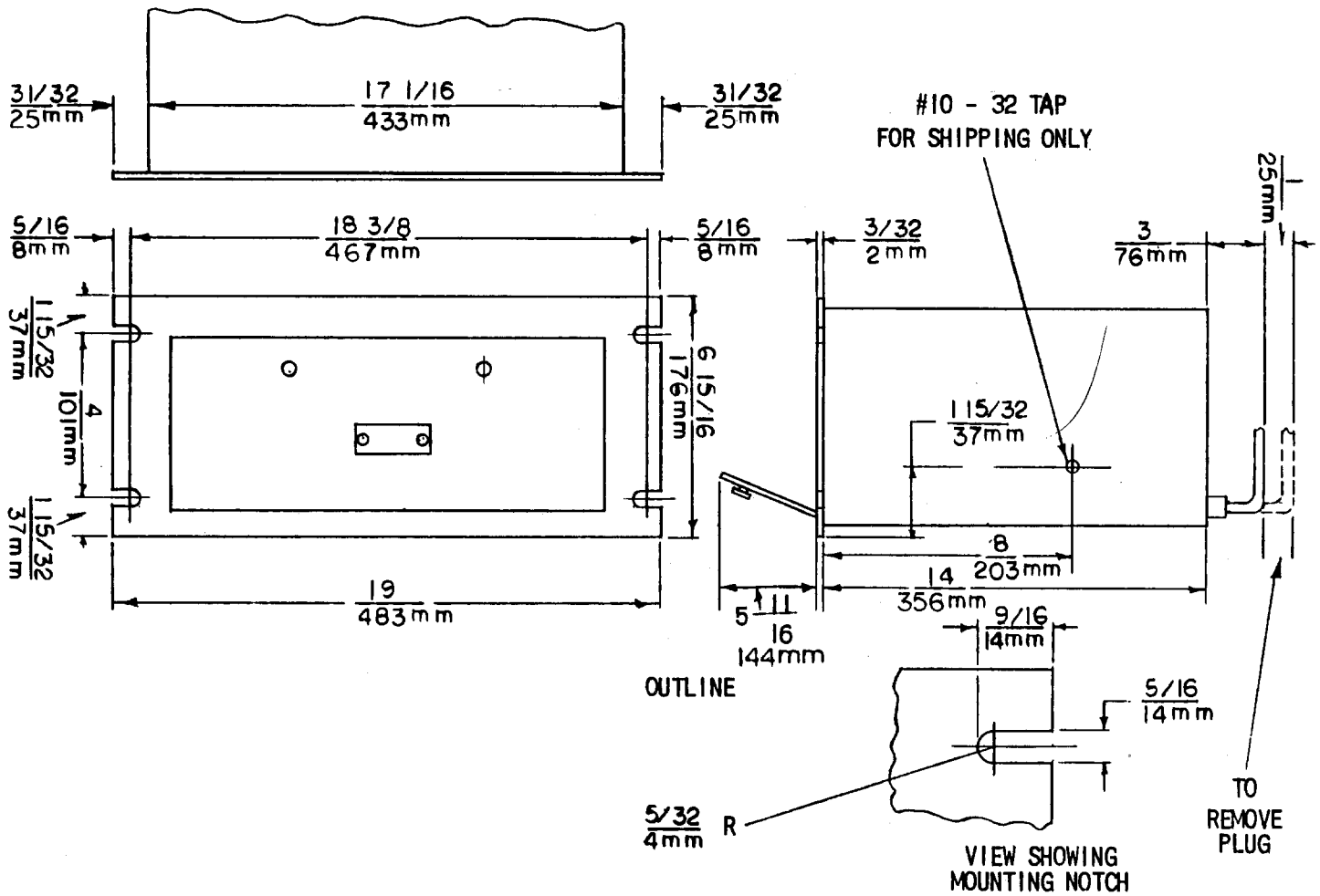
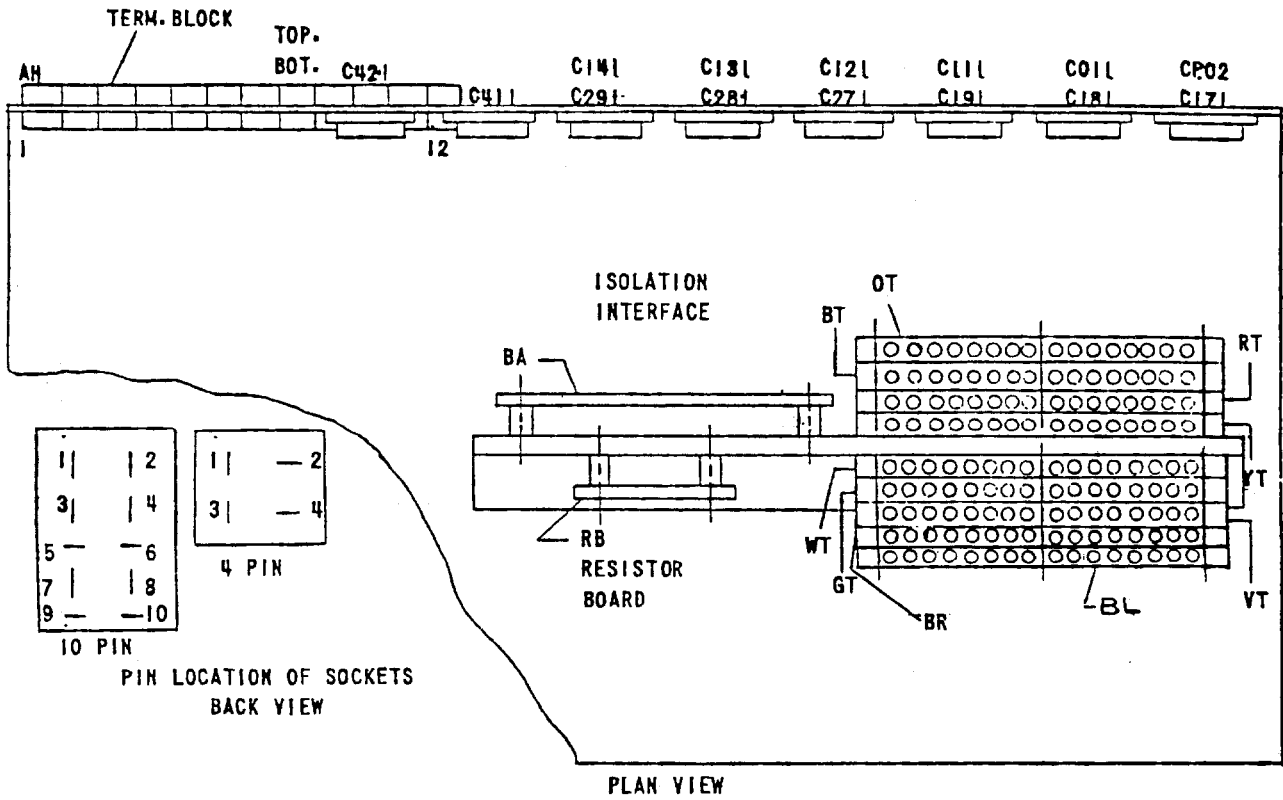


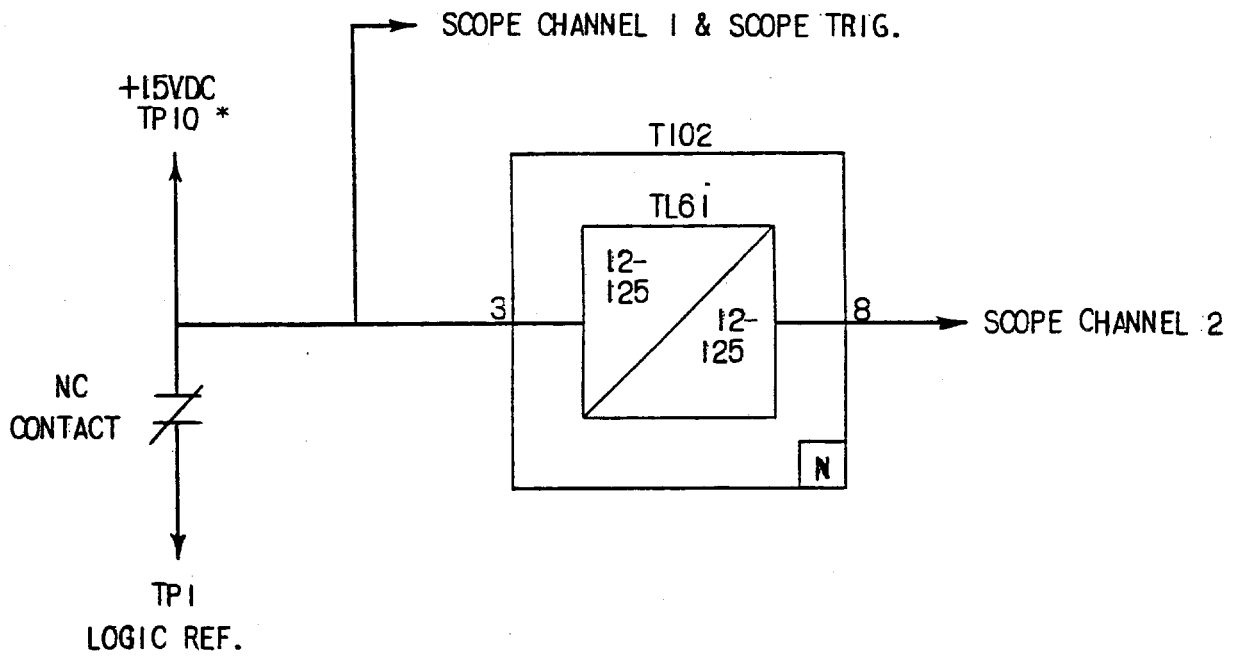
Fig. 5 (0227A2037-0) Outline and Mounting Dimensions for the Type SLA52T Relay



CHAN TEST TRIP TEST																		
		L103	L102*	L110*	T112*	T104*	T102	L104	L121	L104								
	T161*		L104*				L102		A115*		T118*							TEST
	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	AN	AP	AR	AS	AT		
	A120*		L116*	L106*	L102	L123	L116	T102*	L110	L104	L108	L104						
	A120	L104									T128*		L104					
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	

\* OPTION CARDS (SEE INTERNAL FOR CARD IDENTIFICATION-0145D8060)

Fig. 6 (0285A6181-0) Component and Card Location



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

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