INSTRUCTIONS

GEK-86673

STATIC OUTPUT AND TRIPPING UNIT

TYPE SLAT54W

GENERAL ELECTRIC

CONTENTS

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DESCRIPTION

The Type SLAT54W relay is a static logic and output unit, intended for use in a single-pole tripping and relaying scheme with other units, such as an SLYP positive distance unit, SLCN negative sequence directional overcurrent unit, SLS breaker pole selection unit, SLA52 auxiliary logic unit, SLAT54 output auxiliary unit, 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 SLAT54W 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 SLAT54W relay is an integral part of an overall scheme. Refer to the overall logic description and diagram for both application and setting information.

RATINGS

The Type SLAT54W 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 SLAT54W relay requires a $\pm$15 VDC power source which can be obtained from a Type SSA power supply.

The tripping contact circuits are each provided with a series target which operates when 1.0 ampere is passed through the trip circuit.

The tripping relay contacts will make and carry 3 amperes continuously; they will make and carry 30 amperes for 1 second. They 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 3 amperes for tripping duty and are continuously rated for 3 amperes. The contacts will interrupt up to 100 volt-amperes resistive (35 volt-amperes inductive).

The contacts of the reed relays 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 volts DC.

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

BURDENS

The SLAT54W relay presents a maximum burden to the Type SSA power supply of:

200 milliamperes from the +15 VDC supply
200 milliamperes from the -15 VDC supply

FUNCTIONS

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

A. TR1, TR2

Two electrically separate contact trip circuits are provided, one for phase B and one for phase C. Each can carry up to 30 amperes for one second. The trip contacts close within four milliseconds from the time the trip relay (TR) is energized.

B. 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 de-energized. The RI-1Ø function uses a telephone type relay with contact ratings as stated under RATINGS.

C. BFI BREAKER FAILURE INITIATE CIRCUITS

Three sets of contacts are provided, one set for each phase. Each set consists of 2 electrically separate normally-open contacts. These contacts close within 2 milliseconds from the time the associated coil is energized by the logic. These contacts open within 2 milliseconds from the time the coil is de-energized. The BFI functions use reed relays with contact ratings as stated under RATINGS.

D. AUXILIARY REED RELAY OUTPUTS

The use of reed relays RR51, RR52, RR53 and RR54 is determined by the particular scheme in which the SLAT54W is employed. Each relay has one normally-open contact, whose rating is specified under **RATINGS.**

E. CONTACT CONVERTERS

The purpose of the contact converters CC51, CC52, CC53, included in the Type SLAT54W relay, is to convert a contact operation into a signal that is compatible with the relay logic. When the external contact is closed, a +15 volt DC signal is produced by the contact converter.

CC51 energizes the three pole trip bus; the functions of CC52 and CC53 depend upon the scheme in which the relay is employed.

TARGETS

Four electromechanical target coils are included; one in series with each trip contact. These targets operate on 1 ampere of trip current when the associated contact passes current. The trip circuit resistance in the relay is 0.40 ohm.

LOGIC CIRCUITS

The functions included in the Type SLAT54W 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 1 volt DC represents an OFF or LOGIC ZERO condition; an ON or LOGIC ONE condition is represented by a signal of approximately +15 volts DC.

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

The matrix blocks shown on the internal connections diagram of the SLAT54W 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 options chart. Figure 3 is a typical options chart for the SLAT54W. 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 SLAT54W 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 Figures 4 and 5, respectively.

The SLAT54W 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 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 circuit card. The test points (TP1, TP2, etc.) shown on the internal connections diagram are connected to instrument jacks on the test card in position T or AT with TP1 at the top of the AT card. TP1 is tied to reference; TP10 is tied to +15 VDC through a 2.2K resistor. This resistor limits the current when TP10 is used to supply a logic signal to a card.

The SLAT54W 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 SLAT54W 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 E/M targets without opening the cover.

Logic options in the SLAT54W are selected by jumper wires with taper tip pins on each end that are used to interconnect the matrix block points. These matrix blocks are located in the rear of the unit as shown in Figure 5. The top cover of the relay must be removed to make the blocks accessible. Insert and remove the taper tip pins with the special tool 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, grouped in 10 pairs. The yellow (Y) block has 20 points which are grouped in two sets of ten common points; Y1 to Y10 are connected to +15 volts DC, Y11 to Y20 are connected to reference.

RECEIVING, HANDLING AND STORAGE

The SLAT54W relay is normally 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 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.

TEST INSTRUCTIONS

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.

IF THE SLAT54W 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 DURING TEST.

A. GENERAL

The SLAT54W 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.

In general, when a time range is indicated on the internal connections diagram, the timer has been factory set at a mid-range value. 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.

B. OPERATIONAL CHECKS

Operation of the SLAT54W unit can be checked by observing the signals at the twenty test points (TP1 to TP20) in the SLAT54W, by observing the operation of the associated channel equipment, or by observing the output functions. The test points are located on the 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 in the internal connection diagram (Figure 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 can be checked by supplying the correct inputs to the card. Place the card under test in a card extender, removing the cards that normally supply the input signals, then connect the card inputs to either TP10 or TP1. The proper combination of inputs supplied to the card should produce an output.

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 card adapter 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 horizontal sweep should be used.

In order to test the timer cards, it is necessary to remove the card that 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 on Figure 6. 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).

E. TRIP CIRCUIT TESTS

The trip contact 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 trip circuit. A typical circuit is shown in Figure 7. The HEA relay should have the same DC rating as the trip circuit of the relay. If an auxiliary lock-out relay is not available, it can be replaced by a resistive load which limits the trip circuit current to 3 amperes. In most equipments, a trip output can be obtained 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 trip outputs connected to trip the circuit breakers.

F. OVERALL EQUIPMENT TESTS

After the SLAT54W 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.

An overall equipment test can be performed by applying the 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 when the measuring units operate.

MAINTENANCE

A. PERIODIC TESTS

It should be sufficient to check the outputs produced at test points in the SLAT54W when periodic calibration tests are made on the associated measuring units, for example, the phase and ground relays in a line relaying scheme. No separate periodic tests on the SLAT54W itself should be required.

B. 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 isolate the trouble quickly.

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 printed circuit 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.

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 semiconductor components. The repaired areas should be re-covered with a suitable hi-dielectric plastic coating to prevent possible breakdowns across the printed buses due to moisture and dust. The wiring diagrams for the cards in the SLAT54W relay are included in the printed circuit card instruction book GEK-34158.

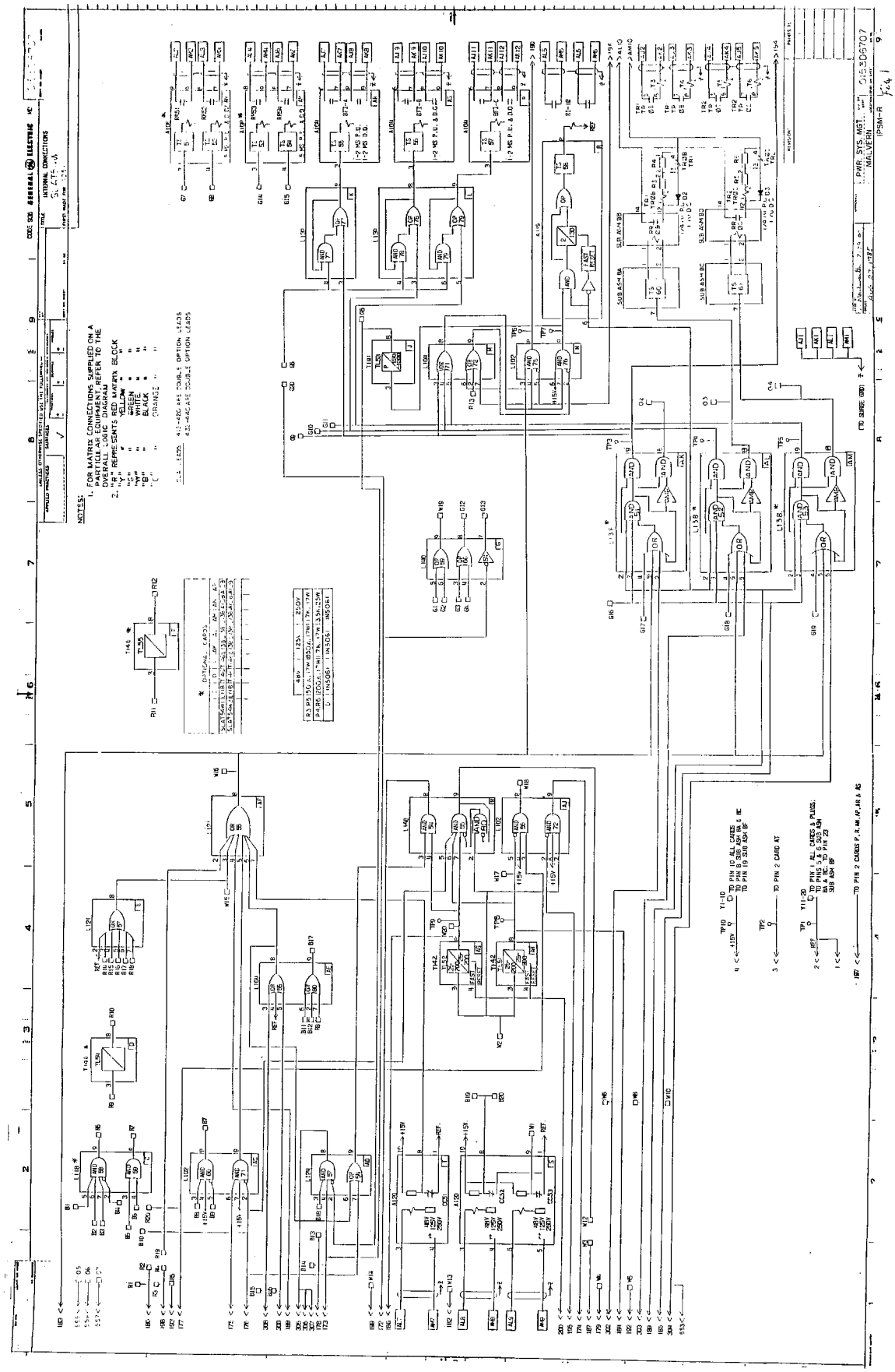

Figure 1 (0153D6707) Internal Connections for the Type SLAT54W Relay

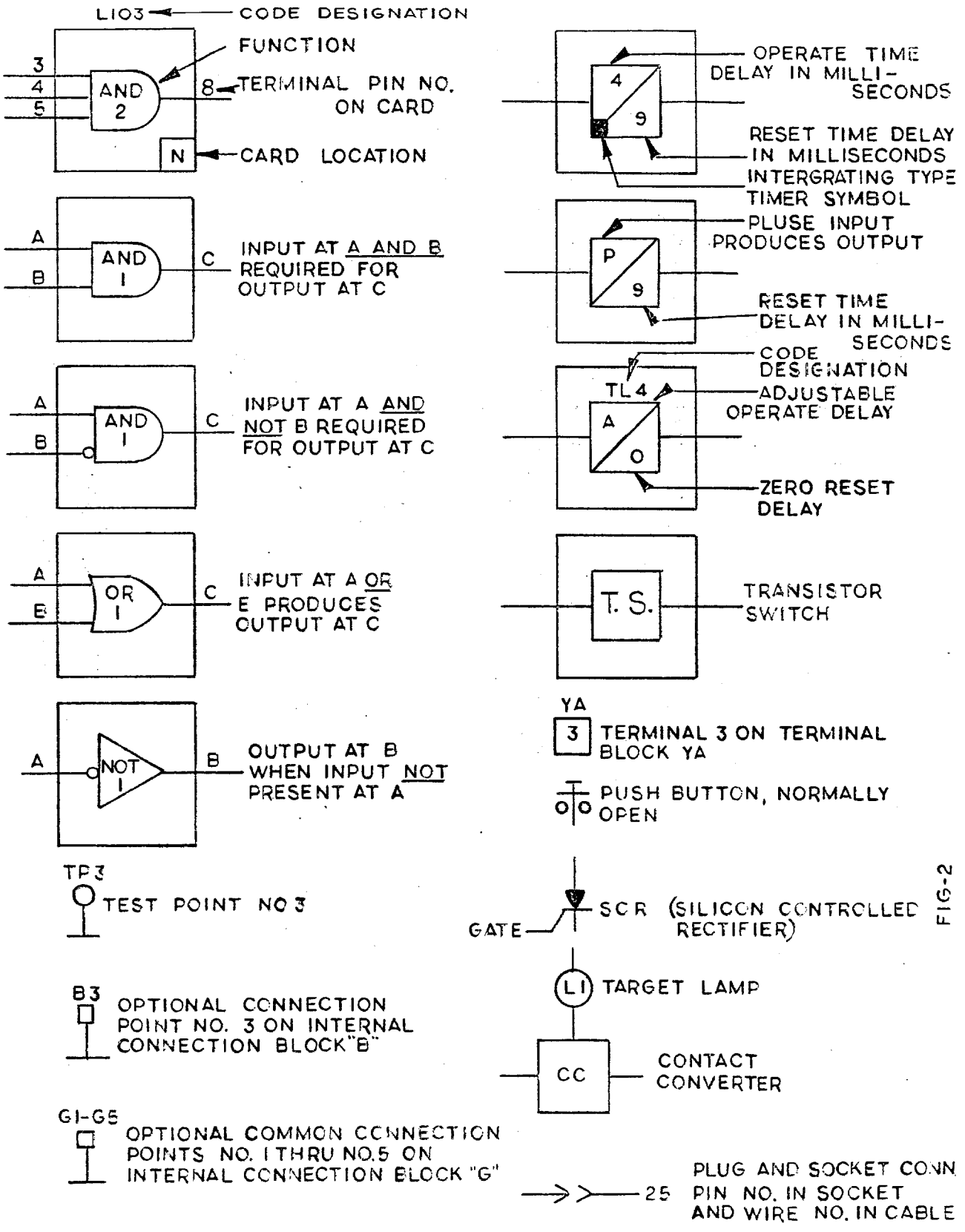

FIG-2

Figure 2 (0227A2047) Logic and 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

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MATRIX BLOCK JUMPERS		LOGIC FUNCTION	
FROM	TO	FROM	TO
B13	B18	PL178	AND57(3)
B19	G2	CC52(8)	OR59(6)
G5	G1	TL53(8)	OR59(5)
W19	W2	OR59(9)	TL52(3)
W13	R14	PL182	OR57(3)
W20	R15	TL52(8)	OR57(4)
R1	R16	PL180	OR57(5)
Y12	R17	REF	OR57(6)
Y13	R18	REF	OR57(7)
W3	W12	PL187	AND55(9)
W18	W4	AND56(8)	PL179
R4	R19	PL198	OR56(2)
02	G7	AND51(8)	TS51(3)
03	G8	AND52(8)	TS52(4)
04	G14	AND53(8)	TS53(3)
Y14	R13	REF	OR72(2)
G17	Y11	OR51(4)	REF
G18	Y12	OR52(4)	REF
G19	Y13	OR3(4)	REF
R5	G15	PL193	TS54(4)
‡G20	B8	PL173	AND60(3)
‡G20	R9	PL173	TL54(3)
R10	B9	TL54(8)	AND60(5)
B7	G6	AND60(8)	AND77(4)
B10	B5	PL176	AND59(3)
W17	B6	TL51(8)	AND59(4)
R7	R11	AND59(8)	TL55(3)
R12	W5	TL55(8)	PL192
W18	W4	AND56(8)	PL179
W6	PL432	PL302	DLA
W8	PL433	PL303	DLA
W10	PL434	PL304	DLA
B15	PL435	PL308	DLA
B16	PL436	PL309	DLA

MATRIX BLOCK JUMPERS		LOGIC FUNCTION	
FROM	TO	FROM	TO
R5	G3	PL193	ORG0(3)
R2	G4	PL180	ORG0(4)
G12	G15	ORG0(3)	TS54(4)

Figure 3 (0227A2050, Sh. 331) Typical Option Chart for Type SLAT54W Relays

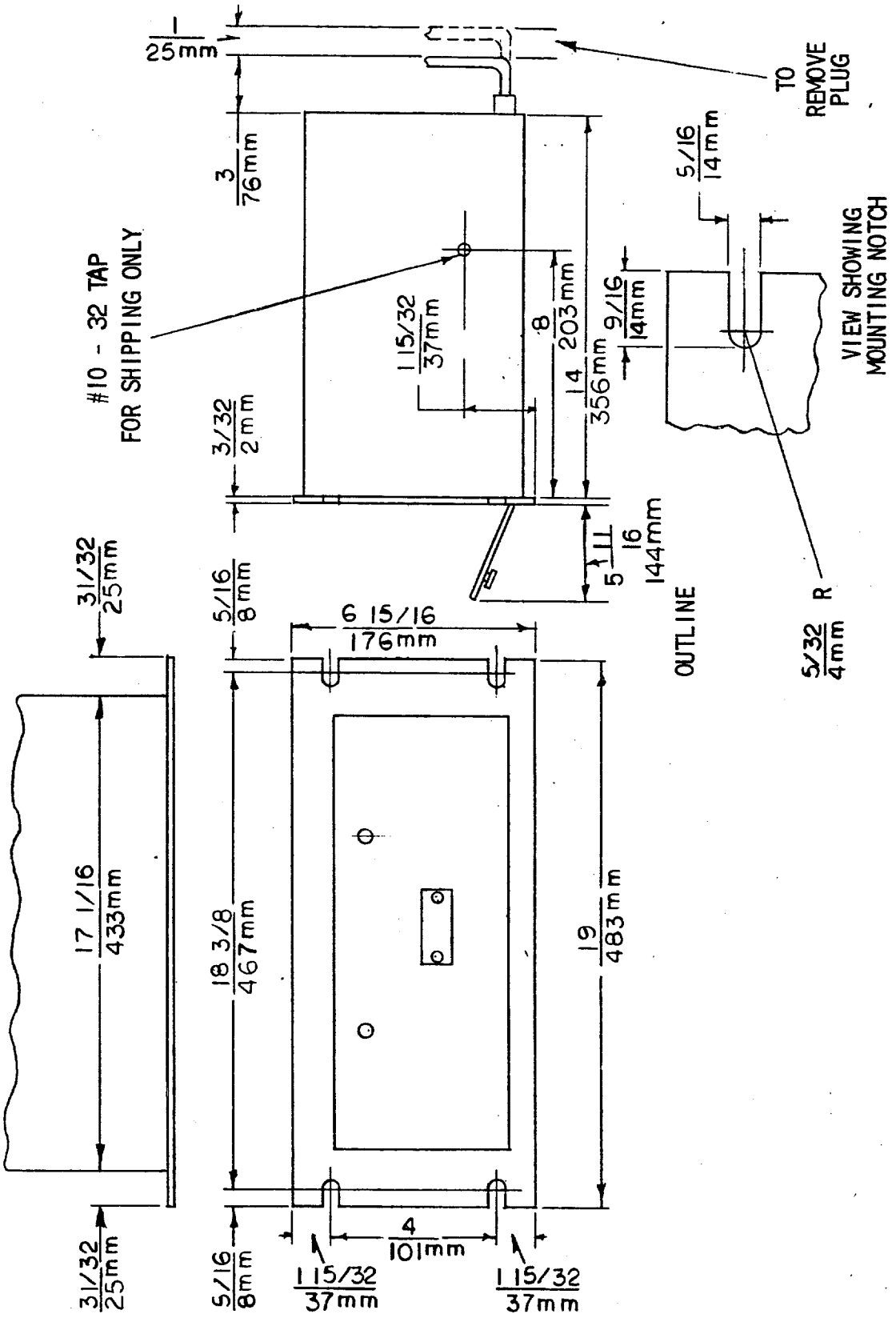
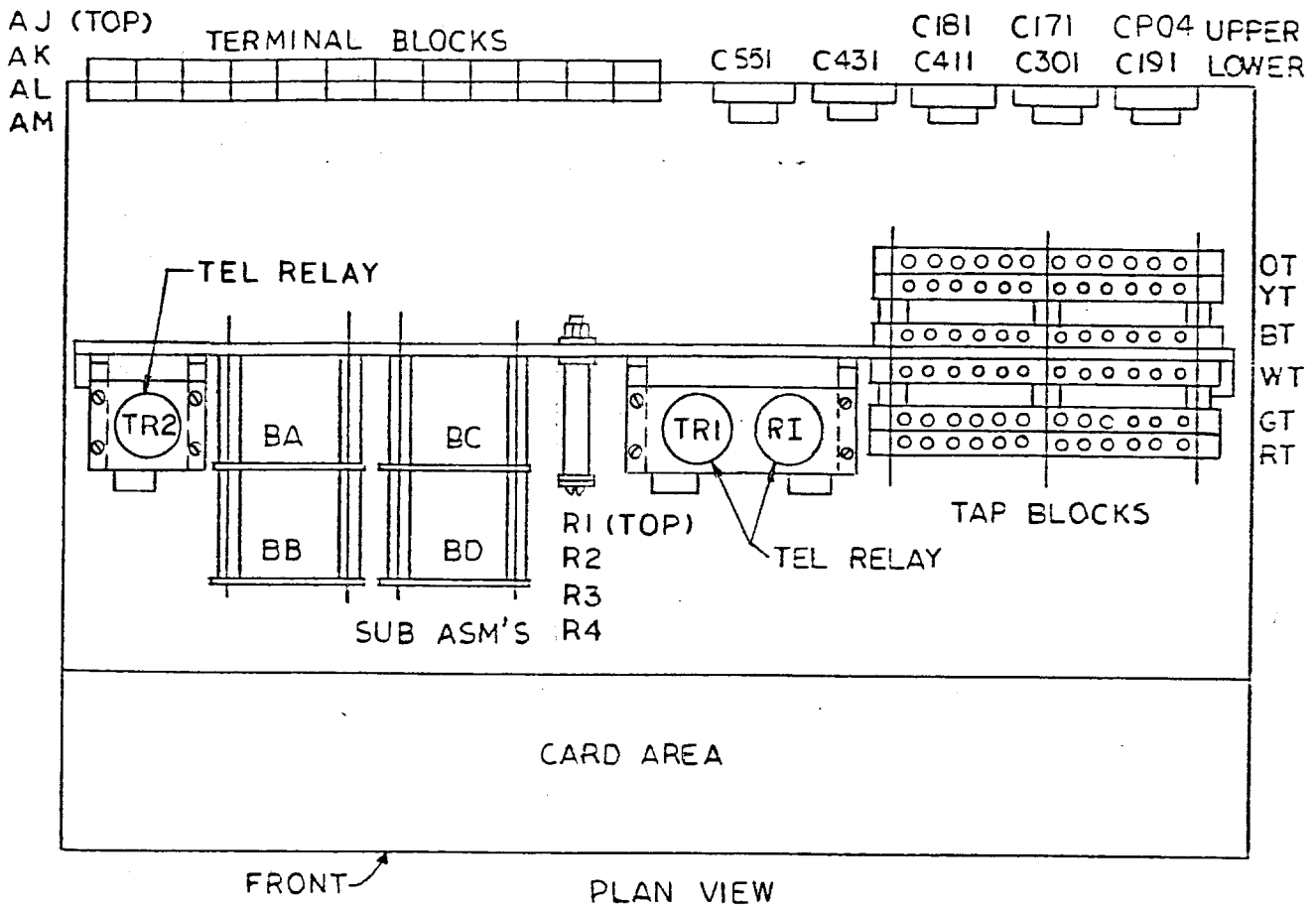


Figure 4 (0227A2037) Outline and Mounting Dimensions
for Type SLAT54W Relays



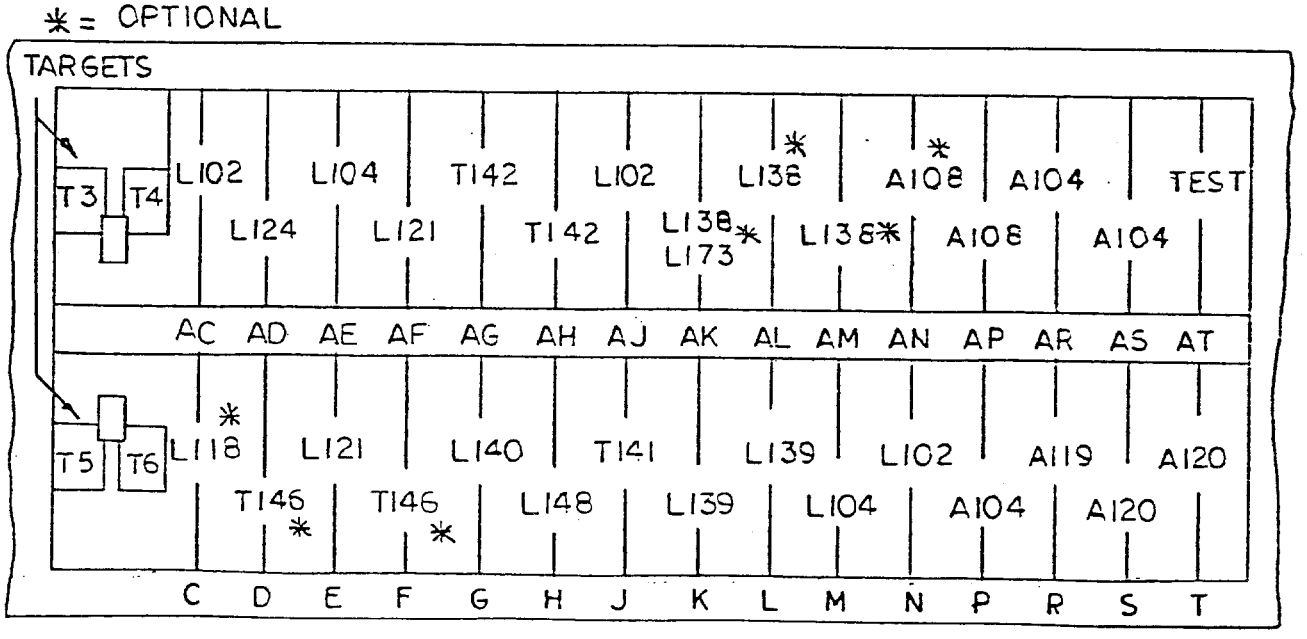
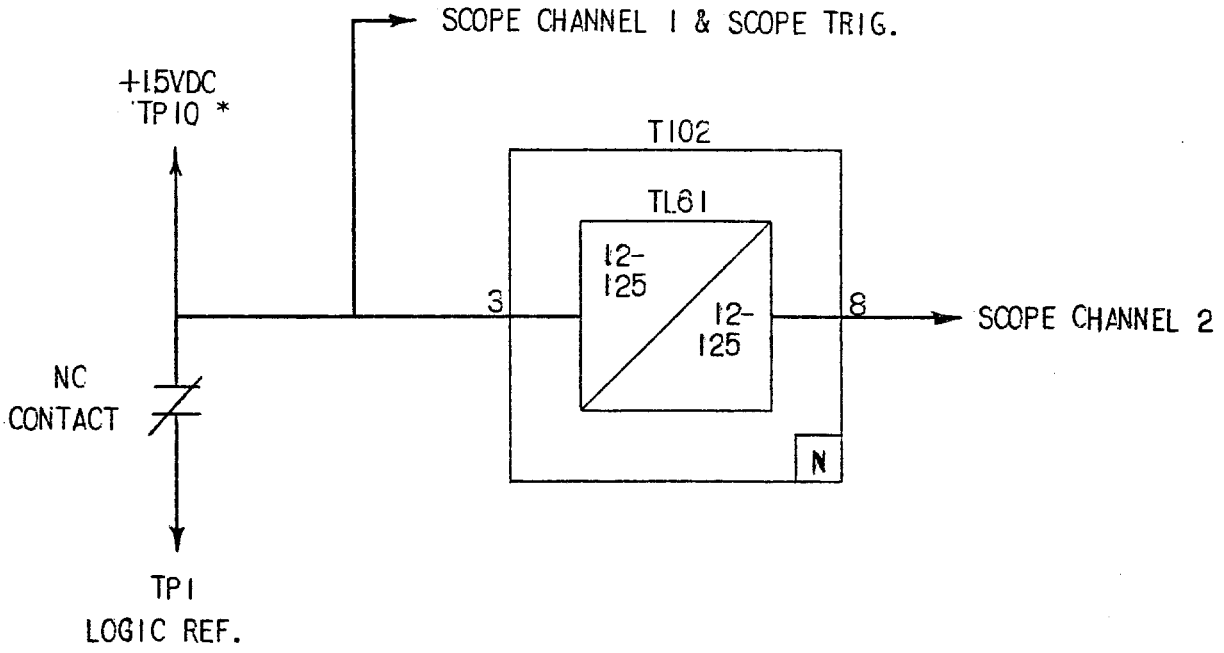


Figure 5 (0285A8937) Component and Card Location Diagram
For Type SLAT54W Relays



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

Figure 6 (0246A7987) Logic Timer Test Circuit

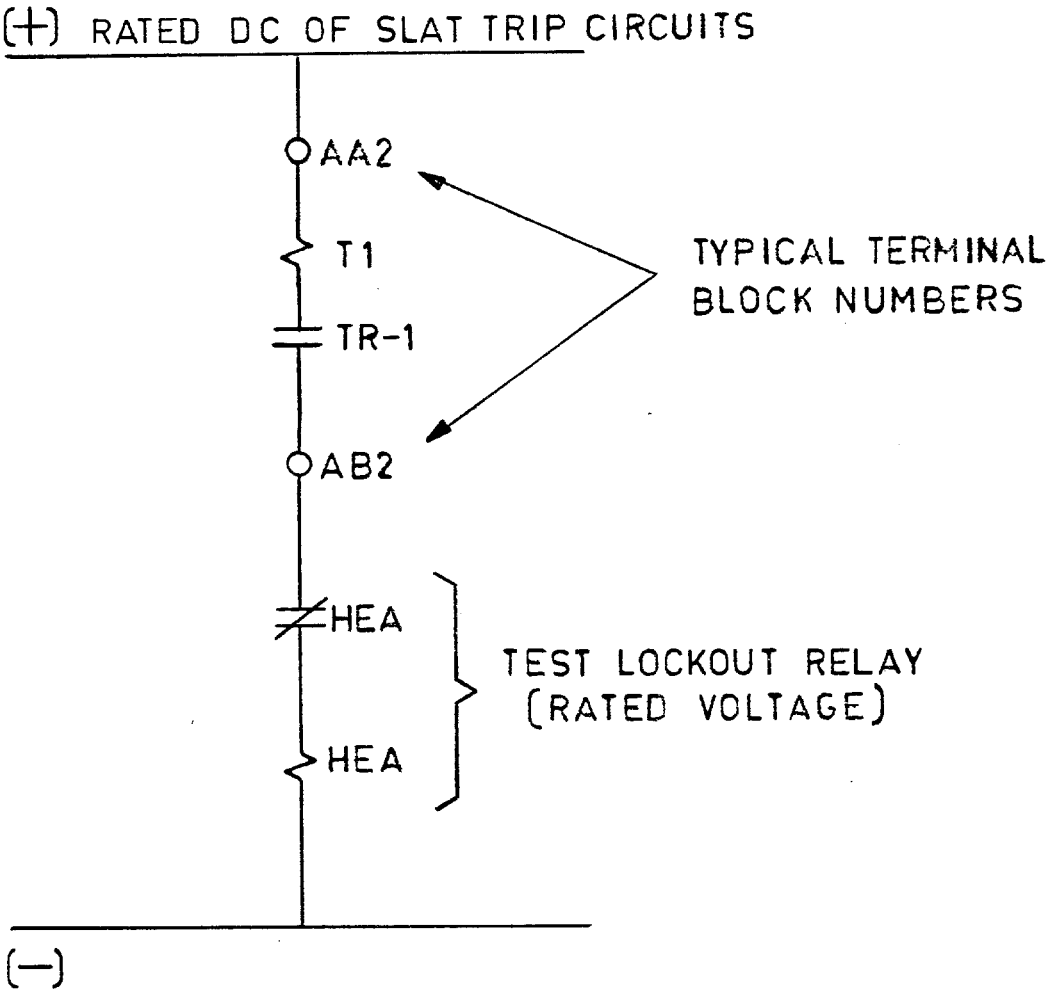


Figure 7 (0257A8788-0) Typical Trip Circuit Test Connections for Relays with Trip Contacts