



**INSTRUCTIONS**

**GEK-86658**

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**TLA9000**

**MODULAR RELAY SYSTEM**

**MODULAR AUXILIARY CASE**

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**GENERAL  ELECTRIC**

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**TLA9000  
MODULAR RELAY SYSTEM  
MODULAR AUXILIARY CASE**

**INTRODUCTION**

The TLA9000 is an auxiliary case that can be used to augment other General Electric modular transmission line or subtransmission line protection systems.

The TLA is packaged in a single four-rack unit modular case containing pluggable printed circuit boards, the input magnetics for potential and current, and the high current output relays. Multi-conductor cable(s) come with the unit to interconnect it with other modular relay cases.

The primary function of the TLA9000 is to provide additional outputs for Data Logging Amplifier (DLA) points originating in other modular cases. There are other optional features available, such as ground time overcurrent or directional ground time overcurrent protection, which may be included. See LIST OF RELAY MODELS.

**DESCRIPTION OF HARDWARE**

STEEL CASE ASSEMBLY

Construction

The case is fabricated from sheet steel. A heavier gauge steel is used on the rear cover plate and side mounting brackets for added strength in these critical areas. Overall case dimensions are given in the **SPECIFICATIONS** section and Figure 13.

The front cover consists of a steel frame with plate glass. It is hinged on the bottom and opened from the top by way of two spring-loaded latches. Sliding steel strips are included on the edges to restrain the cover from swinging open more than 96 degrees. This prevents the cover from blocking access to adjoining equipment while still allowing sufficient clearance for the removal of modules and the insertion of the test device.

The case is painted with a gray textured finished baked enamel. Gasketing is inserted around the edges of the rear cover plate and along the bottom edge of the front cover to minimize dust infiltration.

The modules are mounted vertically. The sockets internal to the case (towards the rear) serve both as mechanical supports and as the means of electrical connection. They hold the modules firmly in position. In addition, the front cover provides further restraint on the modules. Proper alignment is maintained by slotted guides, one above and one beneath each module (with the exception of the magnetics module which requires two guides above and two beneath).

*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.*

## Electrical Connections and Internal Wiring

External connections are made to the case through eight terminal blocks mounted on the rear cover plate. Each block contains 14 terminal points which consist of a Number 6 screw threaded into a flat contact plate.

Connection to the printed circuit board modules is made by means of 60-pin edge connectors. Connection to the MGM module is made by means of two connector sockets; an eight contact current block and a 104-pin signal block. The current block contacts are rated to handle current transformer (CT) secondary currents.

The case is connected to other modular units by a cable(s) which is terminated with 15-pin subminiature type D connectors. The cable(s) is included as part of the TLA9000 modular unit. The plug and socket are keyed to ensure proper polarity.

## Identification

The TLA system model number is located inside of the front cover.

A marking strip indicating the name and position of every module in the case is included on the lower inside edge of the front cover. It is placed to be read when the front cover is fully opened. Figure 5 shows the location of the modules and a summary of the functions performed by each.

The terminal blocks located on the rear of the modular case are uniquely identified by a two-letter code which is found directly beneath the outer-most edge of each terminal block. Also, the terminal points (1 through 14) are identified by stamped numbers.

## PRINTED CIRCUIT BOARD MODULES

### Basic Construction

Each module consists of a printed circuit board connected to a front panel. Two knobs are provided on the front panel for removing and inserting the module. Electrical connection is made by the contact pads at the back edge of the board. Not all module locations within the case have a printed circuit board. Some locations have a blank board and front panel.

### Identification

Each module has its own identification number consisting of a three-letter code followed by a three digit number. These are found at the bottom of each front panel and may be read when the case cover is opened.

## APPLICATION AND CALCULATION OF SETTINGS

### DATA LOGGING AMPLIFIER (DLA)

The DLA function is designed to operate from DLA signals generated in other modular relay systems. These 12 volt DC signals are injected into the TLA through external cables. The cables are supplied as part of the TLA.

When a DLA signal is received by the TLA, a reed relay becomes energized which, in turn, causes a set of normally open contacts to close. These contacts will remain closed only for the length of time that the DLA signal is present. When the DLA signal to the TLA is removed, the contacts open. These normally open contacts are all located on the IOM201 module and are accessible by connecting to the terminals on the back of the relay case. See Figures 12 and 13 to identify the names and locations of these terminals. The connector cable pin assignment is also found in Figure 12.

### GROUND TIME OVERCURRENT (Optional Feature)

The inverse time ground overcurrent function is an optional function and is intended to provide protection for high resistance and remote ground faults. The function may be non-directional or supervised by a dual-polarized zero-sequence directional unit. The inverse time-current characteristic is shown in Figure 8.

If the directional unit is present, the potential polarizing circuit may be energized from the broken delta secondary connection of three potential transformers whose primary windings are connected in wye. The current polarizing circuit may be energized from a current transformer in the neutral of a grounded neutral power transformer. Alternative current polarizing sources may be available or required, depending upon the power transformer connections and characteristics, as well as system characteristics. General Electric publication GER-3182 entitled, "Polarizing Sources for Directional Ground Relays," may be consulted for the basic considerations involved in selecting a reliable polarizing source.

Usually, both voltage and current polarization are used simultaneously where system facilities are available. The advantage of doing so is that some system conditions result in appreciable zero sequence voltage, but have little zero sequence current available to polarize the relay during ground faults while other system conditions result in appreciable zero sequence current, but little zero sequence voltage. In general, high polarizing currents and low polarizing voltages are available in stations where strong ground sources are present and in service. Little or no polarizing current and relatively high polarizing voltages are available in stations where there are weak or no ground sources available.

The only setting required for the directional unit is selection of the characteristic angle. The significance of the characteristic angle is shown on the R-X diagram of Figure 9. The characteristic angle link should be set on the tap value that is closest to the actual angle of the protected line's zero sequence impedance.

The pickup current setting of the overcurrent function must be above the residual (i.e.,  $3I_0$ ) current that can exist during maximum load conditions. Any current pickup setting above this value will be dependent upon the minimum ground fault for which protection is desired and coordination with similar downstream functions. The time overcurrent unit pickup tap setting should be low enough to ensure that the minimum current for which operation is desired is at least 1.5 times the tap setting. The time dial setting is selected based on time coordination with the local tripping units and other downstream overcurrent units.

**MODULE DESCRIPTIONS**

**CTM, CDM**  
(Optional Feature)

(See Figures 2 and 3)

The CTM and CDM modules are inverse time, ground overcurrent units that operate on  $3I_0$  current. The CTM is non-directional, while the CDM is supervised by a dual polarized zero sequence directional unit. The directional unit operating angle can be set to 15, 30, 45 or 60 degrees.

Front Panel

- >IS Amber light emitting diode lights to indicate that the input current exceeds the pickup level.
- IN> Red light emitting diode indicates trip. It is a latching type target which will remain latched until reset.
- IS Pickup current setting. Additive setting with a base of 0.1. The sum of the switches positioned to the right, multiplied by the rated input current, gives the pickup value.
- TM Time dial selects which time curve will be followed (see Time-Current Curve, Figure 8). It is adjustable from 0.05 to 1 (0.5-10). Two toggle switches provide intermediate settings of 0.025 and 0.05, and with both positioned to the right, 0.075.
- RESET Push button to reset IN> target.

On-Board Settings - CDM Module Only (See Figure 2)

- ANGLE Selects characteristic angle of 15°, 30°, 45° or 60°. Separate positions for 50 and 60 hertz.
- FREQUENCY Selects rated frequency for directional unit.

IOM10(-)

(See Figure 1)

The IOM10(-) module contains the contact converters which provide an isolated input of remote signals into the relay logic. The contact converters consist of a dropping resistor and a sensitive reed relay. Each contact converter has a voltage selection link which must be set to the DC voltage that will be energizing that contact converter.

IOM20(-)

The IOM20(-) module provides the DLA output contacts. The DLA outputs use reed type relays for speed, and the contacts are rated at 10 volt-amperes.

MGM

The magnetics module contains the current and potential transformers to couple the TLA measuring elements to the system. The potential circuits can be continuously operated at twice rated voltage without damage. The current circuits are dual-rated at one and five amperes, selected via a tap block at the rear of the module. The current circuits are continuously rated at ten amperes on either tap. The current transformer inputs are shorted automatically when the module is removed.

The ground time overcurrent trip relays are also mounted in this module, together with their drive interface. The tripping relays are telephone type relays, and pass the ANSI trip duty contact test.

PSM201

(See Figure 4)

This module provides power to operate the TLA system. The input voltage must be set by proper positioning of a voltage selection plug. The power supply is self-protecting and will not be damaged by a continuous short circuit. The output voltage will recover when the fault is removed. An output alarm is provided to indicate voltages outside of the desired limits. A green light emitting diode on the front panel indicates normal output voltage. A switch mounted on the front panel removes the battery voltage only from the input of the power supply module. A three amp, 250 volt DC fuse is provided on the board to protect the printed circuit board.

On-board Links

48 -  $\frac{110}{125}$  -  $\frac{220}{250}$  Set selection link to the DC voltage that will be energizing the modular relay



## TESTING

### DIELECTRIC TESTS

Dielectric testing may be performed 1) between all terminals (tied together) and the case, and 2) between independent circuit groups (refer to elementary diagram, Figure 12). The recommended voltage is 2000 volts rms for initial testing and 1500 volts rms for subsequent periodic testing. The test voltage should be applied for one minute.

### CAUTION

When hipot testing, it is necessary to remove the jumper between terminals BD13 and BD14. This removes the grounding connection between the surge capacitors and case ground. Failure to do so could result in damage to the noise filter capacitors on the PSM module when the DC supply terminals are tested.

### NOTE

ALL OTHER STUDS CAN BE TESTED WITH THE JUMPER IN PLACE WITHOUT DAMAGE; HOWEVER, LEAKAGE WILL BE INDICATED DUE TO CURRENT FLOWING THROUGH THE SURGE CAPACITORS.

### ACCEPTANCE TESTS

The operational tests described in this section should be conducted prior to the installation of the TLA auxiliary case. These tests may be done on a "bench top" basis.

### CAUTION

Remove all power from the TLA before removing or inserting any of the printed circuit board modules. Failure to observe this caution may result in damage to the relay.

One method of removing power is to turn off the power switch on the PSM power supply module and then remove both of the connection plugs located in the TPM position on the left side of the case.

### INITIAL TEST SETTINGS

To begin the acceptance tests, the module settings should be made as shown in Table I. This table also includes the settings for the optional modules that may be part of the TLA system.

TABLE I

MODULE NAME	MODULE FIGURE	CASE LOCATION	SETTINGS			
			LOCATION	TYPE	NAME	POSITION
*IOM10-	1	R	on board	link	48-110-220 125 250	DC source
IOM20-		A	none	-	-	-
*CDM102	2	T	on board	link	50/60 Hz	AC source
			"	"	60/45/30/15	15
			front panel	sw	I <sub>S</sub>	all left
			"	sw	TM	1.0
			"	sw	+.025, +.05	left
*CTM102	3	T	front panel	sw	I <sub>S</sub>	all left
			"	sw	TM	1.0
			"	sw	+.025, +.05	left
PSM201	4	V	on board	link	48-110-220 125 250	DC source

\*Optional module

DLA TESTS - IOM201 Module

**WARNING**

**OBSERVE THE WARNING AND CAUTION ASSOCIATED WITH THE CARD EXTENDER (SEE CARD EXTENDER).**

The IOM201 module contains the relays for the DLA contacts. This test is designed to operate each of these relays individually. Connect the TLA per Figure 6. Remove the IOM201 module from case location A. Insert a card extender in its place, then connect the IOM201 module to the extender.

Apply DC power to the TLA. Turn on the power switch on the PSM201 module and observe the green LED **ON** light illuminates, indicating that regulated DC power is being furnished to the IOM201 module.

Test per Table II found in Figure 6. The DLA contact operation can be observed in either of two ways: 1) by monitoring the continuity between test points on the card extender, or 2) by monitoring the continuity between the relay terminals on the case. When pin 2 of the card extender is connected to another pin per Table II, that DLA becomes energized and closes its contacts.

NON-DIRECTIONAL GROUND TIME OVERCURRENT UNIT (OPTIONAL FEATURE) - CTM MODULE

Pickup Current Check

Connect the TLA according to the test circuit given in Figure 7. It is not necessary to connect the timer at this point. Close SW1 and increase the current

slowly from zero until the yellow  $>I_S$  LED on the CTM module just lights. The current should be within five percent of 0.5 amperes (five amp relay) or 0.1 amperes (one amp relay). The  $I_S$  tap setting is  $0.1 \times I_N$ . The current pickup may be checked at other tap values if desired.

### Timer Checks

Adjust the variable auto-transformer so that  $I_{op}$  will be twice the pickup current when SW1 is closed. Connect the timer and close SW1. Verify a three pole trip after a delay of approximately ten seconds (refer to the time curves in Figure 8). The normally open contact between terminals should close, and the normally closed contact between terminals should open at the time of the trip, and remain open so long as current is still applied. The red  $I_N >$  LED on the CTM module should light and latch in.

Remove current and reset the trip target. Repeat the time tests for varying multiples of pickup current and different TM time dial settings, as desired, to verify the time curves given in Figure 8.

### DIRECTIONAL GROUND TIME OVERCURRENT TESTS (OPTIONAL FEATURE) - CDM MODULE

#### Pickup Current Check (with Current Polarization)

Connect the TLA according to the test circuit given in Figure 10. It is not necessary to connect the timer at this point. Adjust  $I_{POL}$  to 1.0 amperes (five amp relay) or 0.2 amperes (one amp relay). Close SW1 and adjust the phase shifter so that  $I_{POL}$  and  $I_{op}$  are in phase. Increase  $I_{op}$  slowly from zero until the yellow  $>I_S$  LED on the CDM module just lights. The current ( $I_{op}$ ) should be within five percent of 0.5 amperes (five amp relay), or 0.1 amperes (one amp relay). The  $I_S$  tap setting is  $0.1 \times I_N$ . The current pickup may be checked at other tap values, if desired.

#### Time Checks (with Current Polarization)

Maintain  $I_{POL}$  as above to enable the pickup level detector. Connect the timer and conduct the Timer Checks, as described in the previous section (Non-Directional Ground Time Overcurrent Tests).

#### Current Polarization Test

Leave the TLA connected according to Figure 10. The timer may be disconnected. Apply  $I_{op} = I_{POL} = 5$  amperes (five amp relay), or 1 ampere (one amp relay), in phase. The unit should trip (yellow  $>I_S$  and red  $I_N >$  LEDs on CDM both light). Adjust the phase shifter and verify that the yellow  $>I_S$  LED goes out when the angle between the two currents reaches 90 degrees (plus or minus four degrees). The directional unit is now blocking operation of the pickup level detector in the ground time overcurrent unit. Repeat to cover both a leading and lagging phase shift. The red  $I_N >$  LED will remain lit, because it is latched-in.

Voltage Polarization Test

Connect the TLA according to the test circuit given in Figure 11. Apply  $V_{POL} = 69$  volts, and  $I_{OP} = 5$  amperes (five amp relay) or 1 ampere (one amp relay) lagging  $V_{POL}$  by 15 degrees. This is the setting on the voltage polarization link within the CDM module. Verify a trip. Increase the phase shift and verify that the yellow  $>I_S$  LED goes out when the angle reaches  $90 + 15 = 105$  degrees lagging (plus or minus four degrees).

Repeat with  $I_{POL}$  leading  $V_{POL}$ . The cut-off point should now be  $90 - 15 = 75$  degrees leading (plus or minus four degrees). This test may be conducted using the other three angle settings (30, 45, 60) of the voltage polarization link in the CDM module, if desired.

PERIODIC TESTS

A periodic test program should be developed which checks all of the TLA functions. It is left to the user's discretion to choose from among the Acceptance Tests given in the previous section, for those tests which may be applicable as Periodic Tests for a particular installation scheme.

XTM TEST PLUGSDescription

The XTM test plugs are designed specifically for post-installation testing of the TLA system. There are two plugs; XTM28L1 (left-hand plug) and XTM28R1 (right-hand plug), each providing access to fourteen relay and fourteen system points. The system points are located on the outer edge. The plugs are keyed by the contact finger arrangement so that there may be no accidental interchange between the left-hand and right-hand plugs.

The plugs are fitted with a sliding handle which swings out to facilitate wiring to the terminals. The terminals consist of number 8 screws threaded into flat contact plates. The handles each have a tab on the outside edge to guide the wire dress of the test leads.

**CAUTION**

**Not all of the external connections to the TLA are wired through the test receptacle.**

Terminal Designation

The test receptacle and connection plugs are located to the left of the magnetics module. Their terminals are labelled 1 through 28 with 1 through 14 corresponding to the left-hand side and 15 through 28 corresponding to the right-hand side. These points are designated on the elementary diagram (Figure 12) as TP1 through TP28.

The left-hand test plug (XTM28L1) terminals are labelled 1R through 14R and 1S through 14S for the relay side and system side, respectively, with the system side labelled in red. Similarly, the right hand test plug (XTM28R1) terminals are labelled 15R through 28R and 15S through 28S.

### XTM Test Circuit Connections

Test circuit connections, designated as TP points in the elementary diagrams, should be made to the relay side of the test plug. Where it is desired to use available system quantities for testing, e.g., DC control power, jumpers may be inserted between the corresponding system side and relay side test plug terminals. Appropriate precautions should be taken when working with station battery DC.

Connections should be made to the test plugs prior to insertion into the TLA.

### Test Plug Insertion

To insert the test plugs, the two connection plugs must first be removed. In so doing, electrical continuity is broken between the power system and the TLA for those signals which are wired through the test receptacle (refer to TP points on elementary diagram, Figure 12). For the terminals connected to the current transformer secondaries, shorting bars are included on the system side of the test receptacle. These are clearly visible through the transparent plastic face plate on the receptacle. The shorting bars make contact before the connection plug contacts break during removal, so that the CT secondaries are never open-circuited.

When the test plugs are inserted into the receptacle, parts of the power system become isolated from the TLA. Refer to the TLA elementary diagram (Figure 12) for the TP points associated with each of the test plugs.

### **WARNING**

**IT IS CRITICAL THAT JUMPERS BE INSERTED ON THE SYSTEM SIDE TEST PLUG TERMINALS WHICH ARE CONNECTED TO THE CT SECONDARIES. IF THESE JUMPERS ARE LEFT OUT, THE RESULTING HIGH VOLTAGES DEVELOPED PRESENT A SERIOUS HAZARD TO PERSONNEL AND MAY SEVERELY DAMAGE EQUIPMENT.**

### CARD EXTENDER

The card extender (GE #0138B7406G1) is used to obtain information about the operation of an individual module. The extender may be inserted in the place of any of the printed circuit board modules. The module can then be inserted into the connector on the extender.

The extender has 60 test points which are identified by numbers 1 through 60.

**CAUTION**

Remove power from the TLA before removing or inserting any of the printed circuit board modules. Failure to observe this caution may result in damage to the relay.

One method of removing power is to turn off the power switch on the PSM power supply and then remove both of the connection plugs located in the TPM position on the left side of the case.

**WARNING**

CAUTION MUST BE EXERCISED WHENEVER A CARD EXTENDER IS INSERTED INTO AN IOM OR PSM POSITION SINCE STATION BATTERY POTENTIAL MAY BE PRESENT AT SOME POINTS. TURNING OFF THE POWER SWITCH ON THE PSM MODULE AND REMOVING BOTH CONNECTION PLUGS DOES NOT REMOVE ALL EXTERNAL POWER TO THE RELAY. FAILURE TO OBSERVE THIS WARNING MAY RESULT IN PERSONAL INJURY AND DAMAGE TO EQUIPMENT.

**RECEIVING, HANDLING AND STORAGE**

**CAUTION**

This relay contains electronic components which could be damaged by electrostatic discharge currents if those currents flow through certain terminals of the components. The main source of electrostatic discharge currents is the human body, and the conditions of low humidity, carpeted floors and isolating shoes are conducive to the generation of electrostatic discharge currents. Where these conditions exist, care should be exercised when removing and handling the modules to make settings on the internal switches. The persons handling the module should make sure that their body has been discharged by touching some surface at ground potential before touching any of the components on the modules.

Immediately upon receipt, the equipment 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.

If the equipment is not to be installed immediately, it should be stored indoors in a location that is dry and protected from dust, metallic chips, and severe atmospheric conditions.

**INSTALLATION**

ENVIRONMENT

The location should be clean and dry, free from dust and excessive vibration, and well lighted to facilitate inspection and testing.

MOUNTING

The TLA case has been designed for standard rack mounting. The case measures four rack units in height. The units may also be flush mounted on a panel. Refer to Figure 13 for the outline and mounting dimensions.

Provision has been made for surface panel mounting as well. This is accomplished by removing and reversing the side brackets so that the mounting wings are in the rear. For surface mounting, cutouts must be made in the panel to allow for the terminal blocks and interconnection cable(s).

EXTERNAL CONNECTIONS

External connections are made according to the elementary diagram given in Figure 12. This is a general diagram incorporating all of the available options. Connection need not be made to those terminals associated with options which will not be used.

The terminal block points are shown in Figure 13.

INTERCONNECTION CABLES

Interconnection cable(s) are included with the TLA auxiliary case for connection to other General Electric Company modular relay systems. The cable(s) carry the signals for DLA expansion. The cable(s) have connectors that fit into keyed sockets located on the back of the modular cases. The cable length is such that the TLA must be mounted directly above or below the modular unit having a port for optional DLA monitoring points.

**LIST OF RELAY MODELS**

RELAY MODEL NUMBER	PRIMARY FUNCTION	OPTIONAL FEATURES
TLA9001	12 point DLA	CDM102 (Directional ground time overcurrent)

**SPECIFICATIONS**

GENERAL

- Rated Frequency ● 50 or 60 hertz
- Rated Voltage ● 57.7/69 V phase-to-neutral
- Rated Current ●  $I_N = 1$  or 5 amperes
- DC Control Voltage ● 48, 110/125 or 220/250
- Maximum Permissible Currents
  - Continuous ● 10 amps
  - Three Seconds ●  $50 \times I_N$
  - One Second ●  $100 \times I_N$
- Maximum Permissible AC Voltage
  - Continuous ● 2.0 x rated
  - One Minute ● 3.5 x rated
- Ambient Temperature Range
  - For Storage ● -40 to +65 degrees Celsius
  - For Operation ● The TLA has been designed for continuous operation between  $-20^{\circ}\text{C}$  and  $+55^{\circ}\text{C}$  per ANSI Standard C37.90. In addition, the TLA will not malfunction nor be damaged by operation at temperatures up to  $+65^{\circ}\text{C}$ .
- Insulation Test Voltage ● 2 kV 50/60 hertz, one minute
- Impulse Voltage Withstand ● 5 kV peak, 1.2/50 milliseconds, 0.5 joule
- Interference Test Withstand ● In accordance with applicable IEC and ANSI Standards

Burdens

- Current Circuits
  - 0.03 ohm  $\angle$  2 degrees,  $I_N = 5$  amps
  - 0.04 ohm  $\angle$  8 degrees,  $I_N = 1$  amp
- Voltage Circuits
  - 0.2 VA  $\angle$  49 degrees, 60 hertz
  - 0.24 VA  $\angle$  48 degrees, 50 hertz



DC Battery

Normal	Tripped
7W	12 W

All Voltage Ratings

DC Battery  
(for Contact Converters)

- 1.4 milliamperes each

DC Battery  
(for Contact Converters)

- 1.4 milliamperes each

Contact Data

Trip Outputs

- Continuous rating = 3 amperes
- Make and carry for tripping duty (per ANSI C37.90) 30 amps
- Break 180 VA resistive at 125/250 VDC
- Break 60 VA inductive at 125/250 VDC

Auxiliary Outputs  
(including Alarms)

- Continuous rating = 3 amperes
- Make and carry for 30 seconds 5 amperes
- Break 25 watts inductive at 125/250 VDC
- Make and Carry continuously 50 watts
- Maximum of 250 volts or 0.5 amp

GROUND TIME OVERCURRENT CIRCUIT (optional)

Pickup Current

- 10 to 80 percent of nominal in 2 percent steps

Time "Dial"

- 0.05 to 1.0 in 0.025 steps.  
IEC 255-4 Type A Curve: See Figure 11 (BS 142 Normal Inverse Curve)
- NOTE: This curve is similar to the GE Type IAC relay inverse curve.

DIRECTIONAL UNIT FOR GROUND TIME OVERCURRENT CIRCUIT (optional)

Dual Polarization

- Using zero sequence voltage and zero sequence current

Characteristic Angle for Voltage Polarization

- 15, 30, 45 or 60 degrees; selectable

DIMENSIONS

- Standard rack mounted unit:
- 6-15/16 inches (176 millimeters) high
  - 19-1/16 inches (484 millimeters) wide (standard 19-inch rack)
  - 14 inches (359 millimeters) deep (including terminal blocks)

WEIGHT

Standard rack mounted unit weighs approximately 33 pounds (15 kilograms) net.

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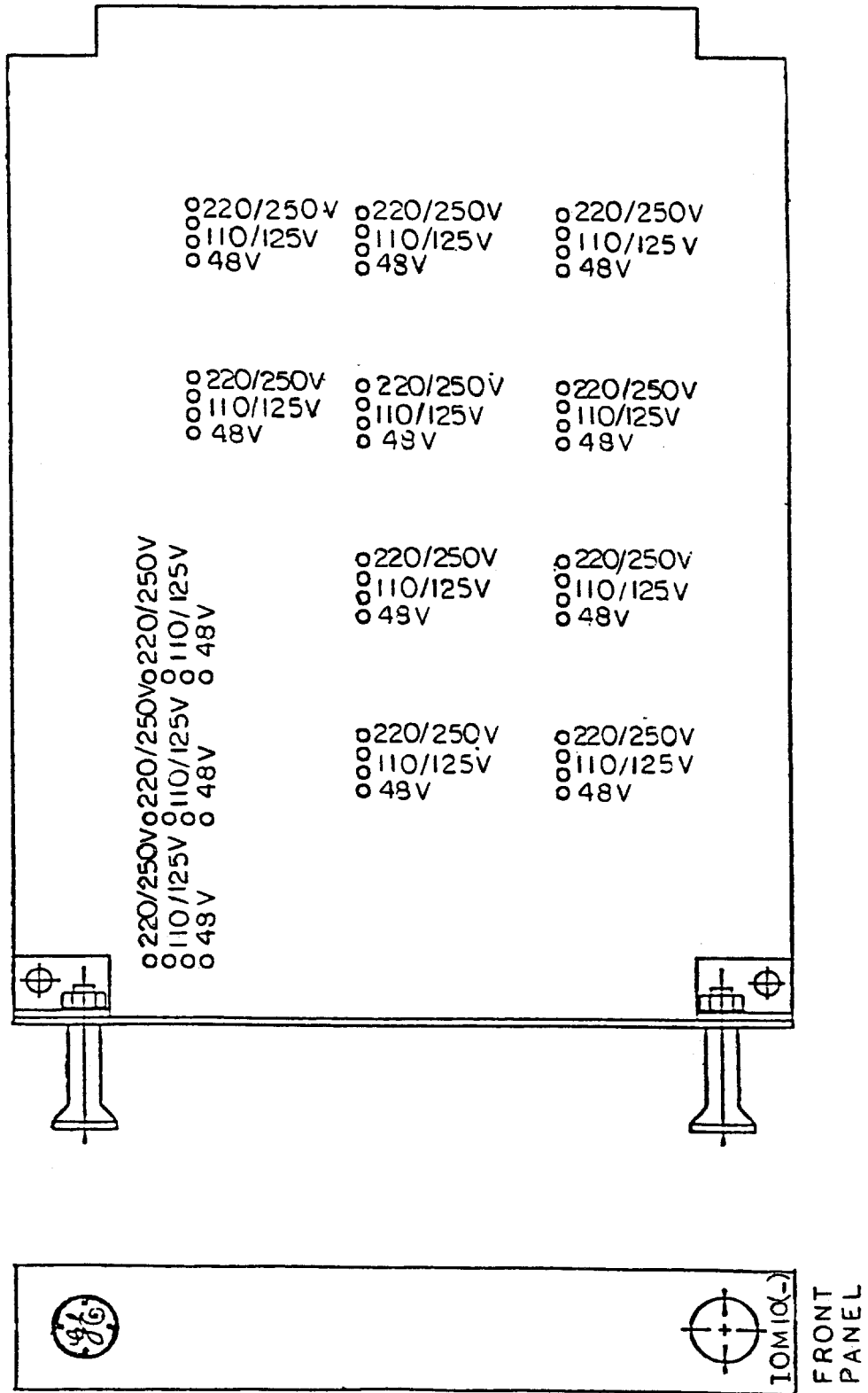


Figure 1 (0285A8888-0) Internal Links and Front Panel IOM10(-) Module

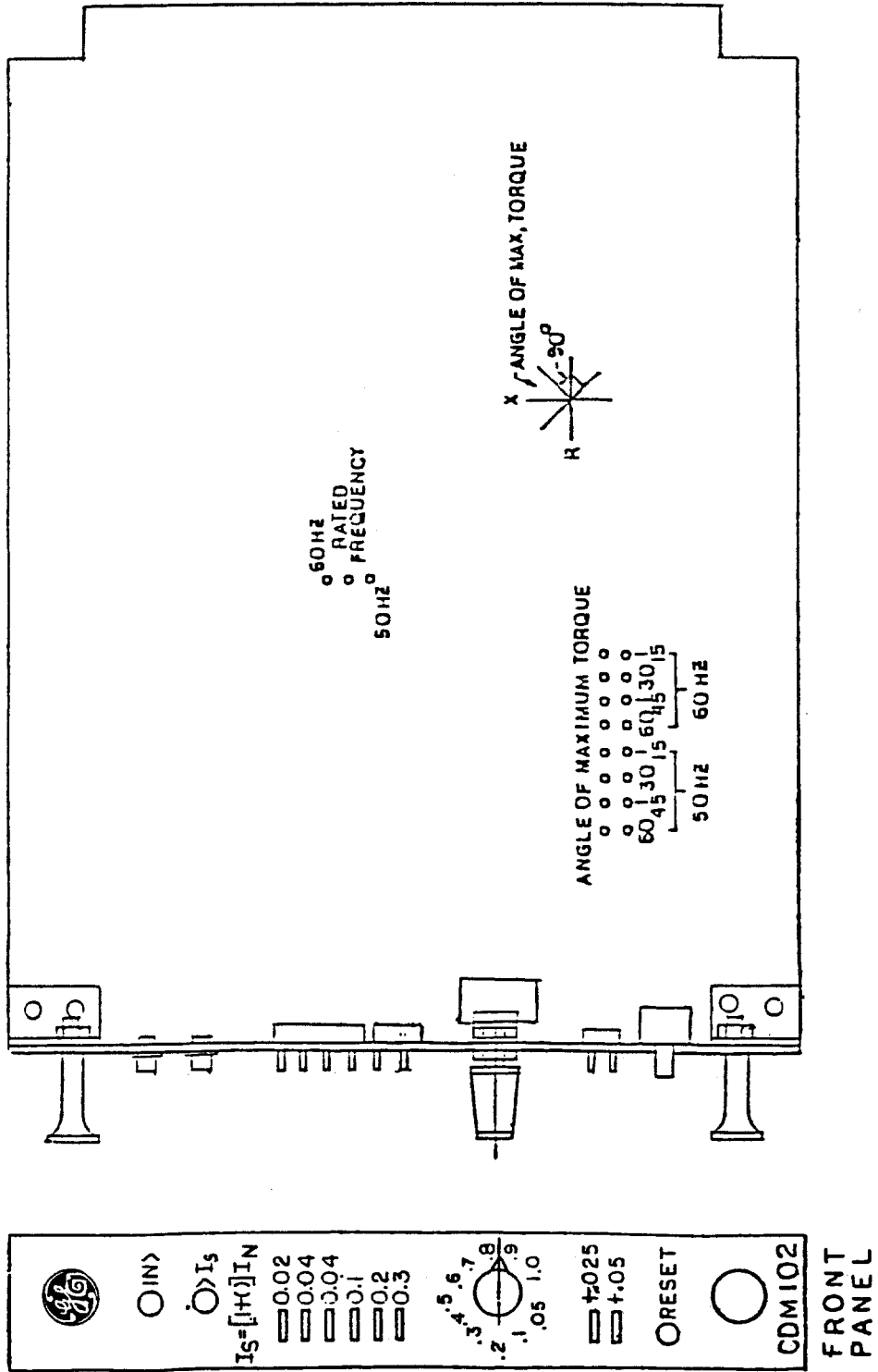


Figure 2 (0285A8237-2) Internal Links and Front Panel CDM102 Module

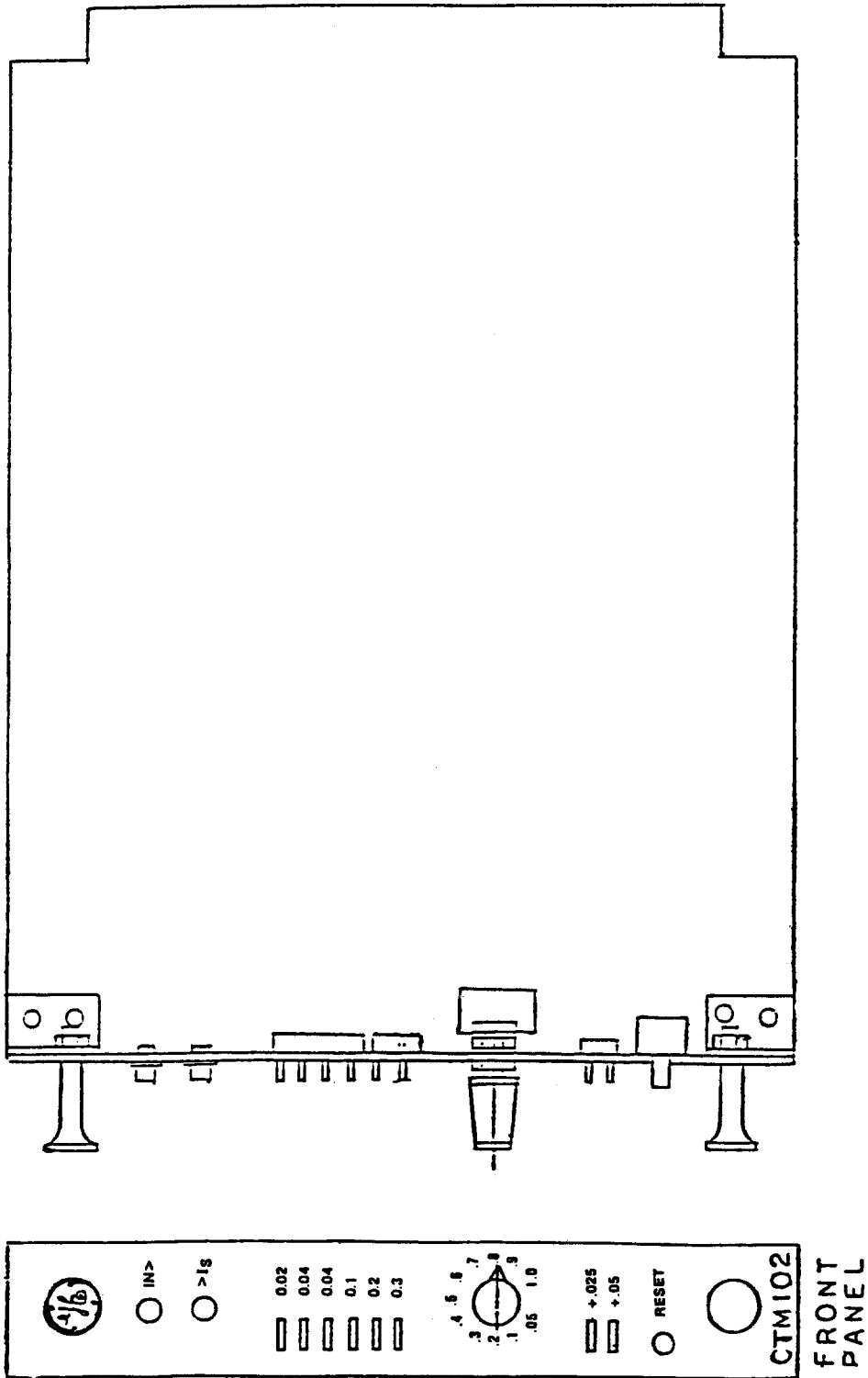


Figure 3 (0285A9161-0) Front Panel CTM102 Module

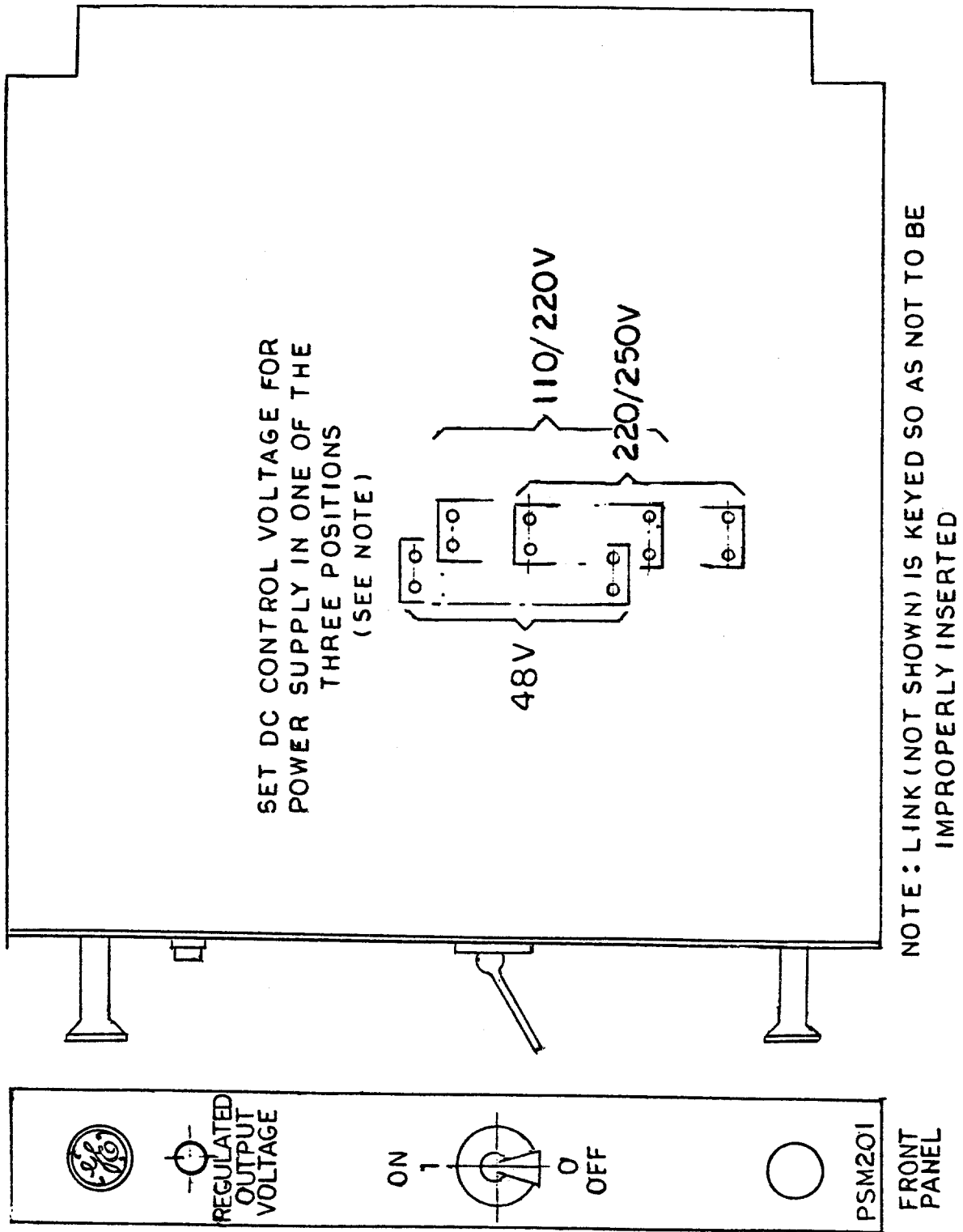


Figure 4 (0285A8202-1) Internal Link and Front Panel PSM201 Module

		MODULE LOCATION										
		V	T	R	N	L	J	F	C	A	NAME	FUNCTION
TPM	MGM212	PSM 201	CDM/CTM 102	IOM 101/102	BLANK	BLANK	BLANK	BLANK	BLANK	IOM 202		
	MAGNETICS AND TRIPPING RELAYS	POWER SUPPLY	GROUND TIME OVER-CURRENT DIRECTIONAL GND TIME OVER-CURRENT (CTM) NONE	CONTACT CONVERTER						DLA		FUNCTION
	CURRENT SELECTION TAPS	VOLTAGE SELECTION LINK	(CDM) 50/60HZ LINK CHARACTER ANGLE LINK	VOLTAGE SELECTION LINK						NONE		ON BOARD LINKS AND SWITCHES
		ON/OFF SWITCH	PICKUP CURRENT TAP TIME DIAL SUPPLY-MENTARY TIME DIAL SWITCHES RESET	NONE						NONE		FRONT PANEL SWITCH

Figure 5 (0183B3692-0) Module Location and Setting Diagram TLA9000



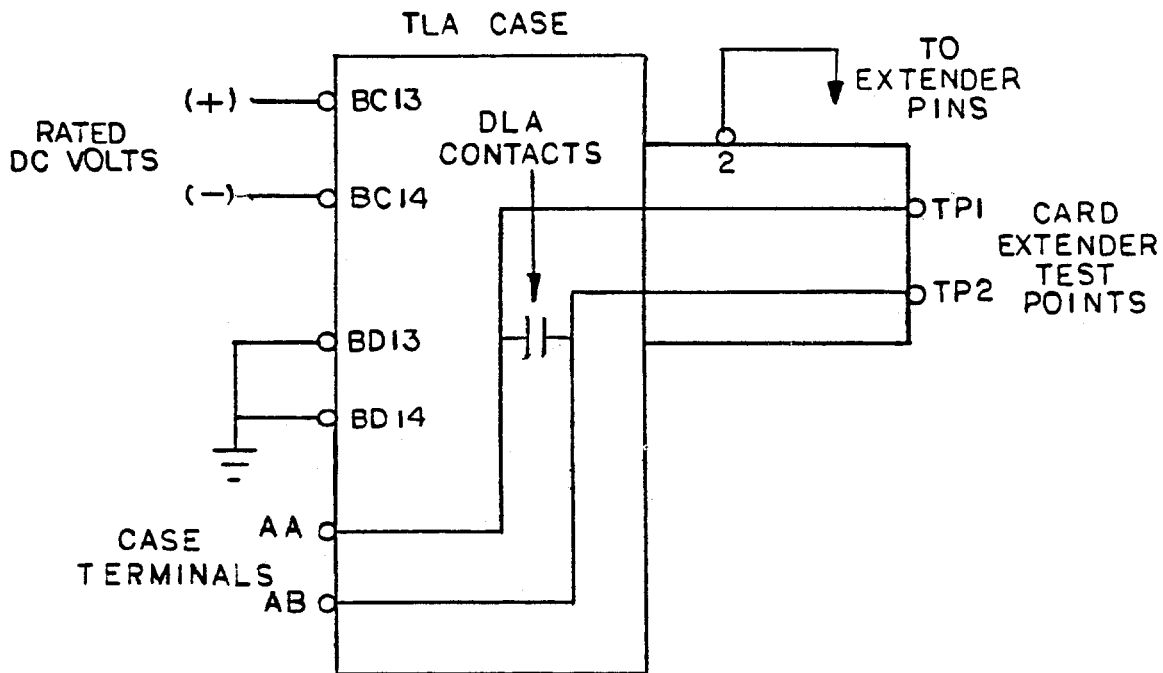


TABLE II

DLA	CARD EXTENDER		TLA CASE TERMINALS AA-AB
	CONNECT EXTENDER PIN 2 TO PIN:	EXTENDER TEST POINTS TP1 - TP2	
1	3	14 - 15	1 - 1
2	7	20 - 21	2 - 2
3	35	26 - 27	3 - 3
4	4	11 - 12	4 - 4
5	8	17 - 18	5 - 5
6	36	23 - 24	6 - 6
7	5	41 - 42	7 - 7
8	33	47 - 48	8 - 8
9	37	53 - 54	9 - 9
10	6	44 - 45	10 - 10
11	34	50 - 51	11 - 11
12	38	56 - 57	12 - 12

Figure 6 (0285A8906-0) Test Circuit for DLA

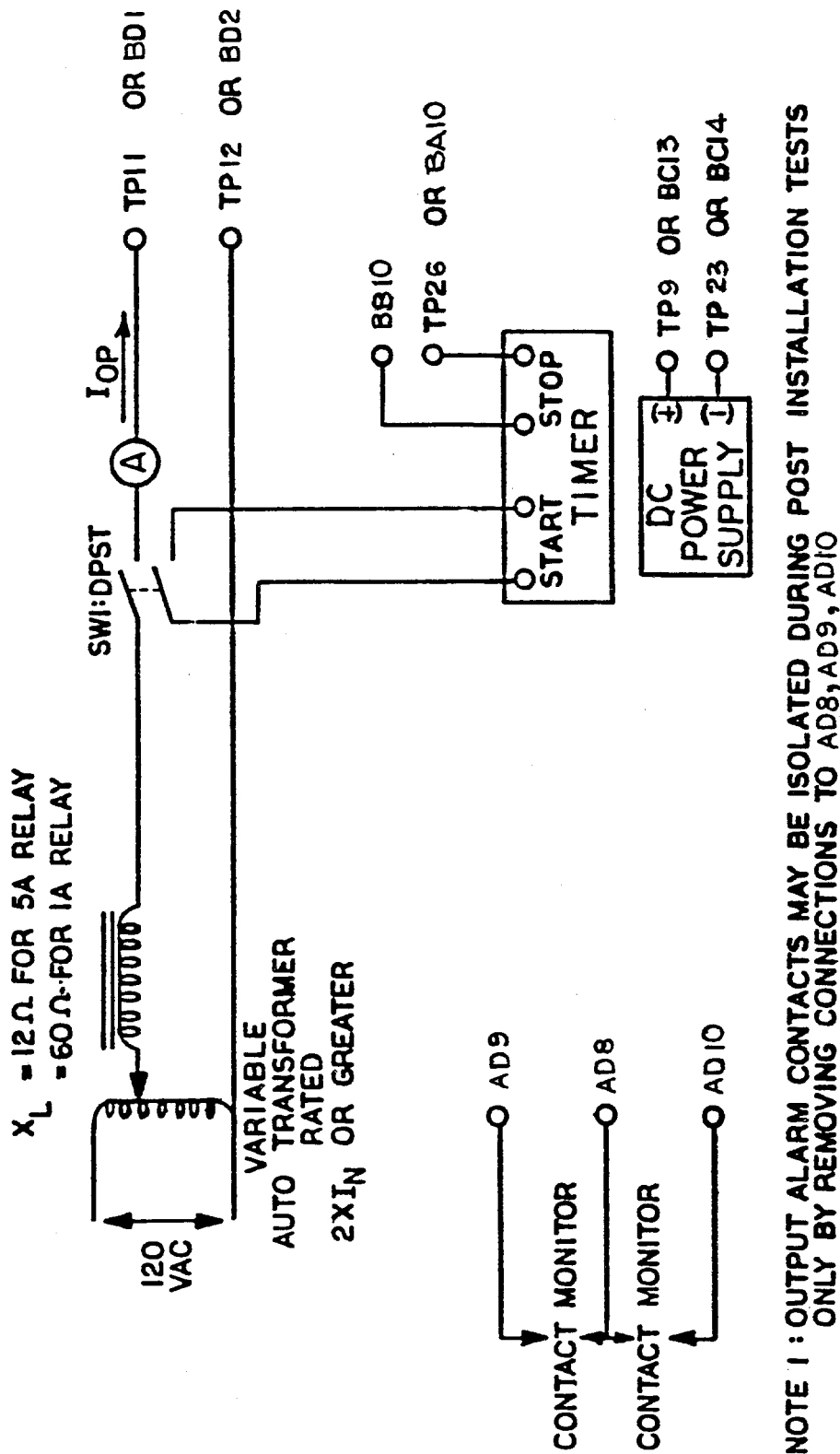


Figure 7 (0285A8877-0) Test Circuit for Time Overcurrent

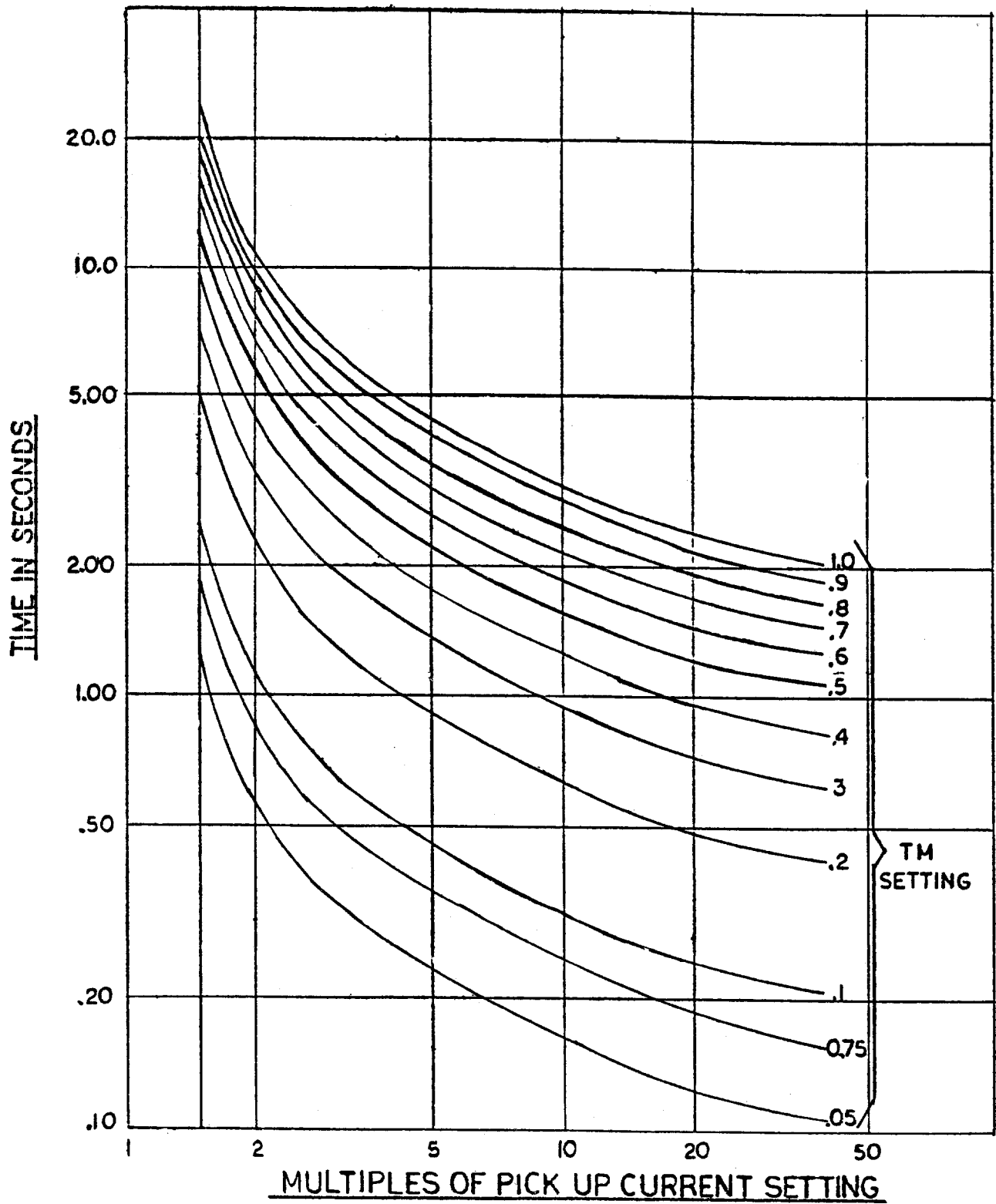
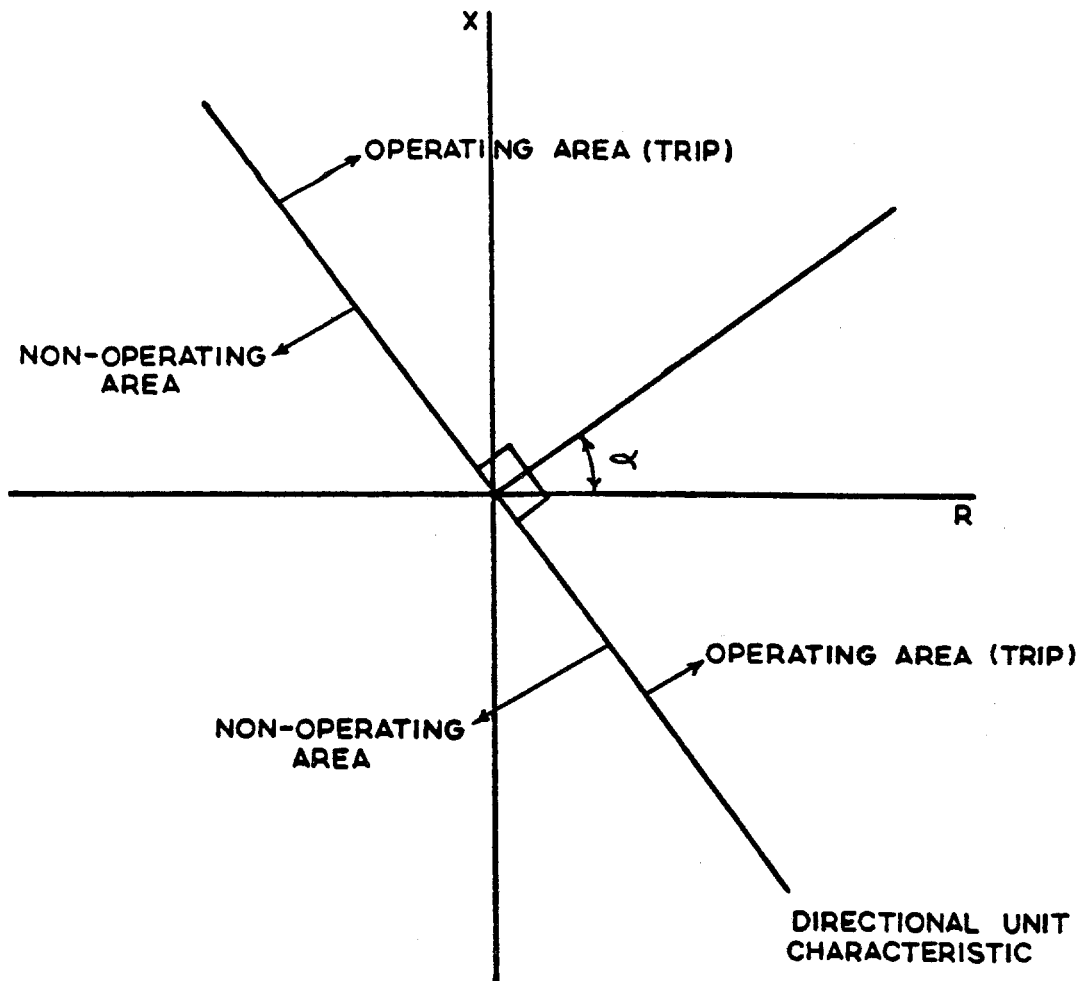
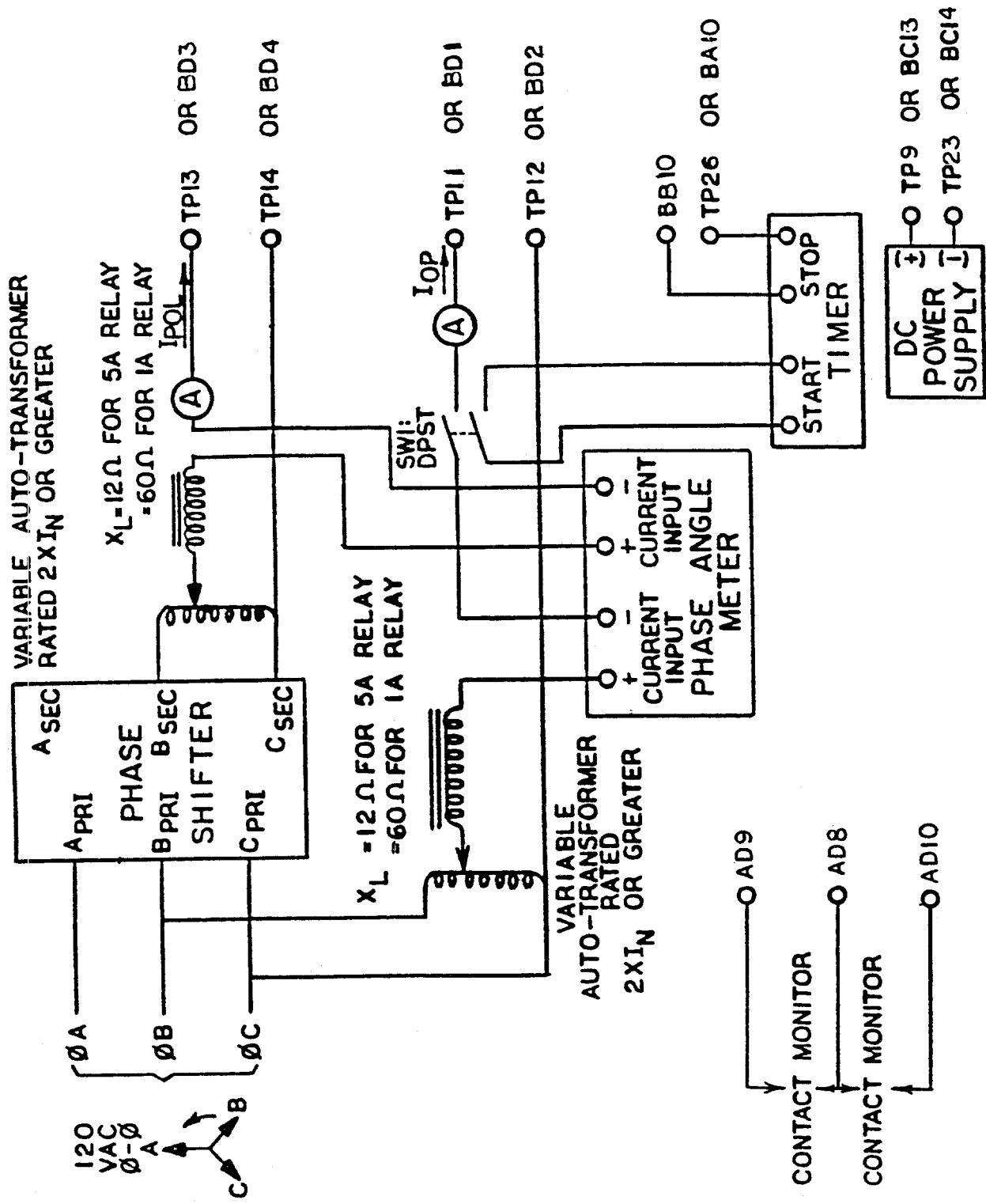


Figure 8 (0285A7557-0) Time Curves



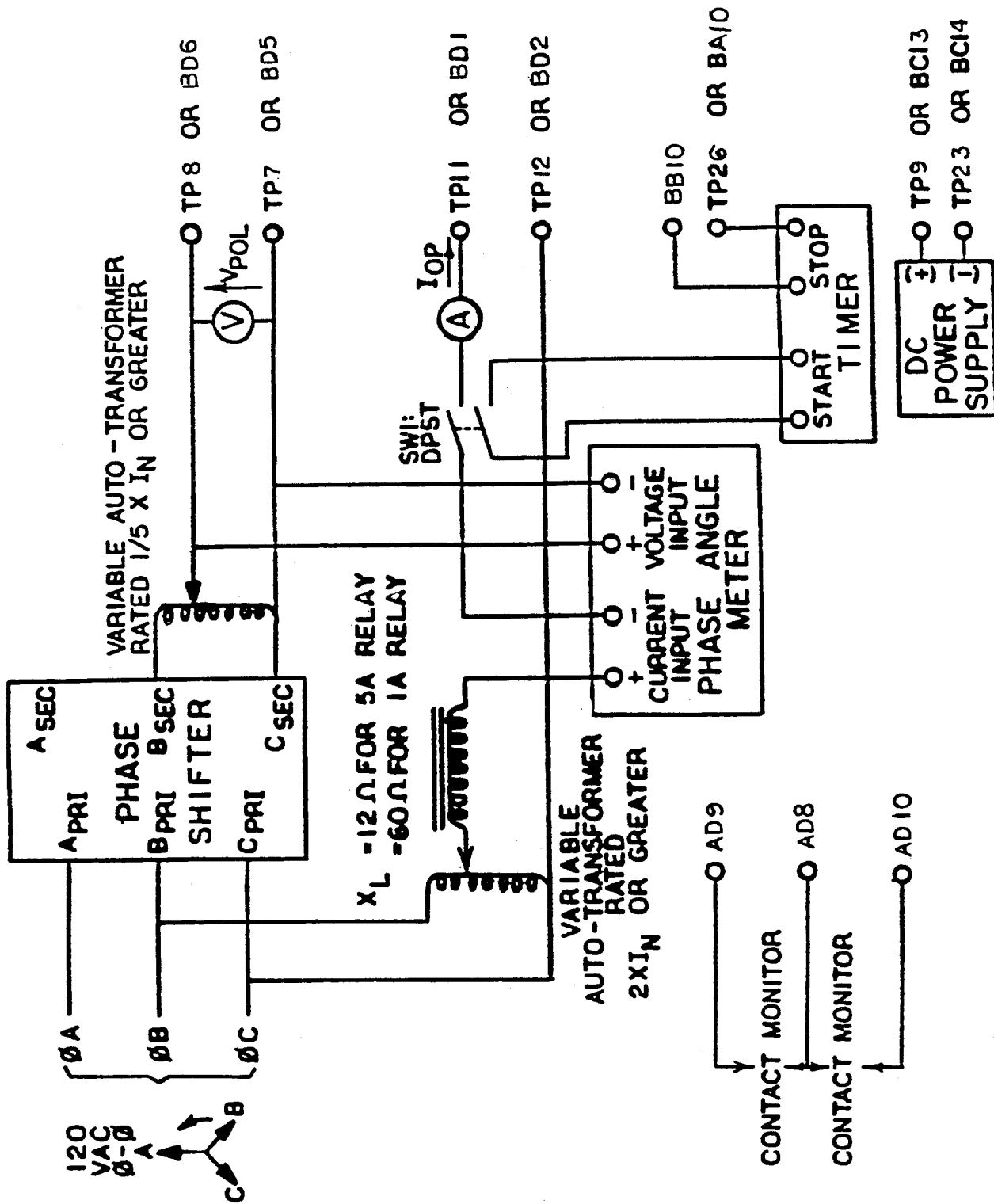
$\alpha$   $\equiv$  CHARACTERISTIC ANGLE SETTABLE AT  $15^\circ, 30^\circ, 45^\circ, 60^\circ$ .

Figure 9 (0285A7553-0) R-X Characteristic for Directional Unit with Voltage Polarization



NOTE 1: OUTPUT ALARM CONTACTS MAY BE ISOLATED DURING POST-INSTALLATION TESTS ONLY BY REMOVING CONNECTIONS TO AD8, AD9, AD10

Figure 10 (0285A8878-0) Directional Ground Time Overcurrent Test Circuit Using Current Polarization



NOTE 1: OUTPUT ALARM CONTACTS MAY BE ISOLATED DURING POST-INSTALLATION TESTS ONLY BY REMOVING CONNECTIONS TO AD8, AD9, AD10

Figure 11 (0285A8879-0) Directional Ground Time Overcurrent Test Circuit Using Voltage Polarization

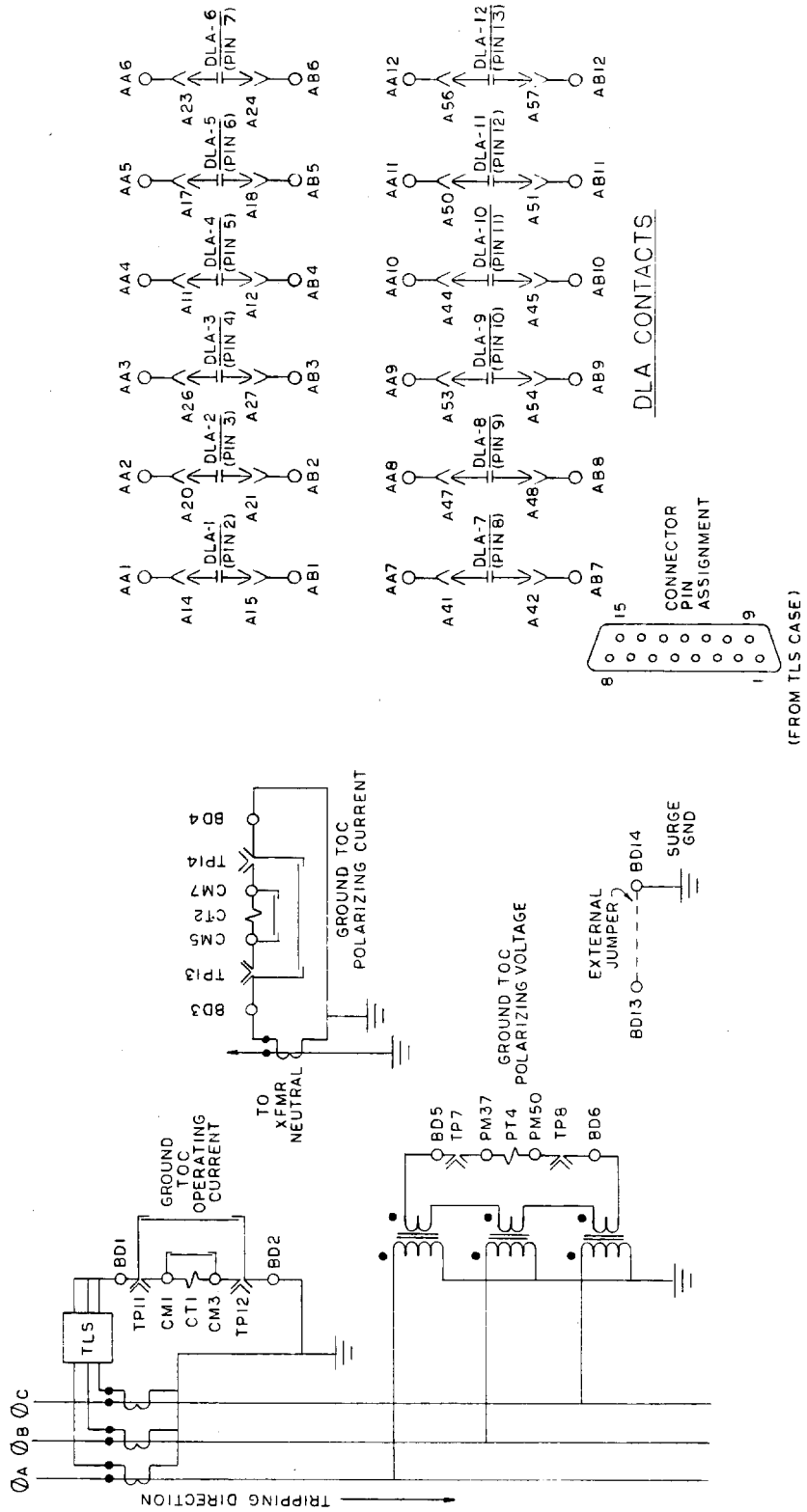


Figure 12A (018383675-1, Sh 1) Elementary Diagram for TLA9000 System

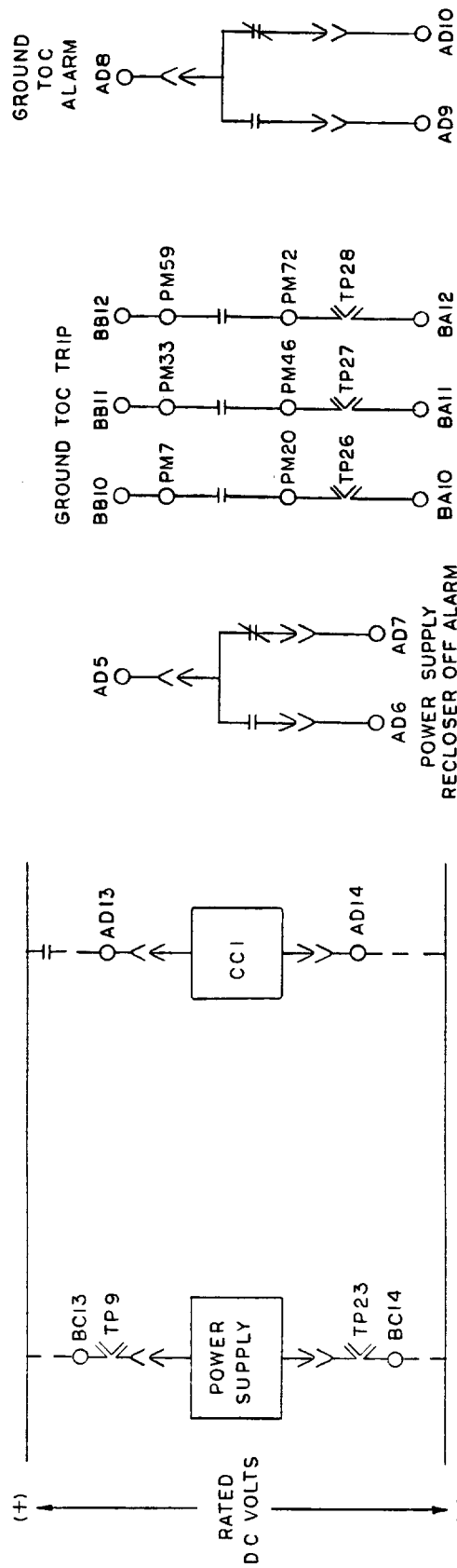


Figure 12B (0183B3675-2 Sh 2) Elementary Diagram for TLA9000 System



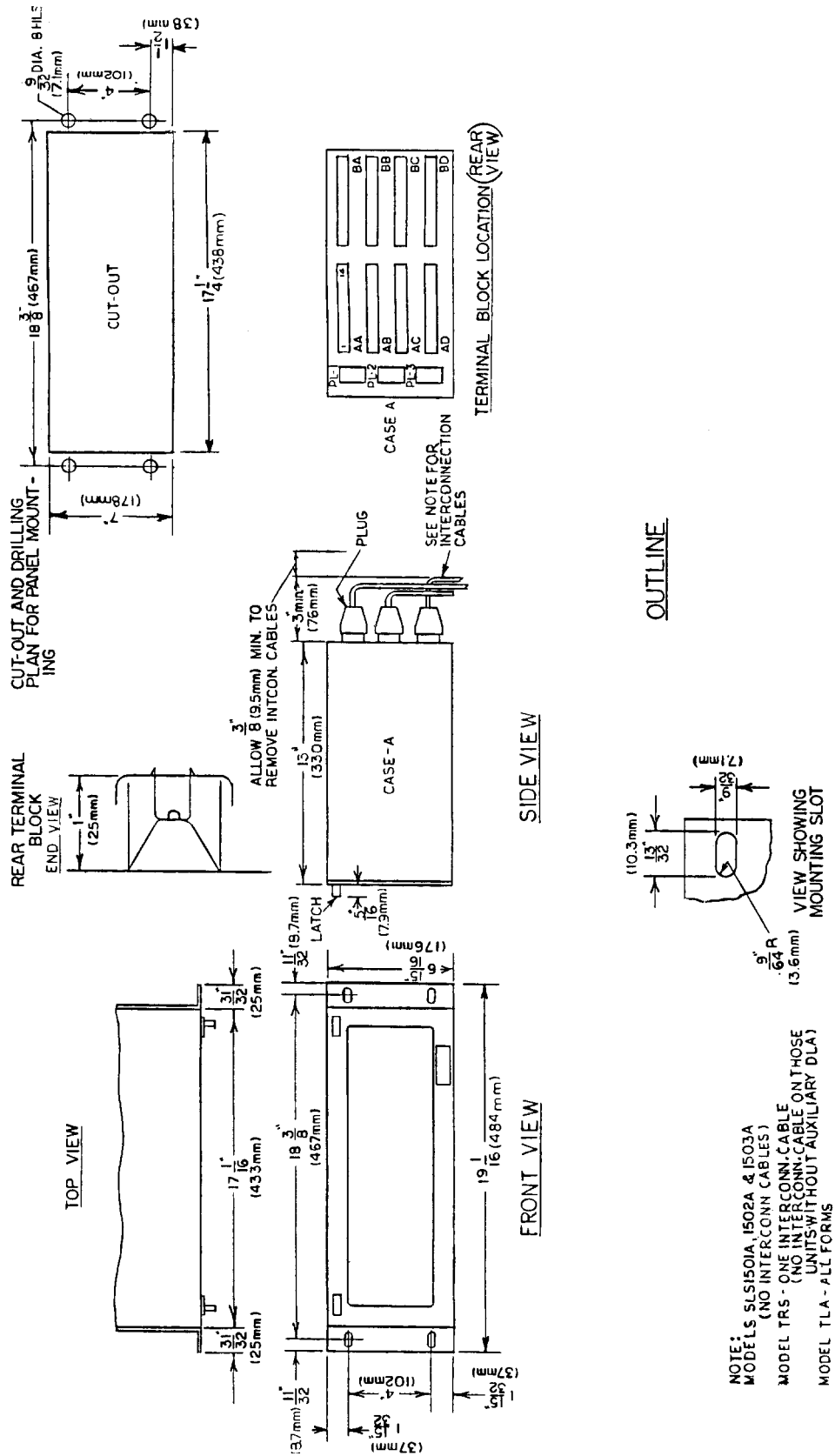


Figure 13 (0138B7600-0 Sh 1) Outline and Mounting Dimensions for TLA9000

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