



## **E&M+ Dual Voice Option Module**

**Part Numbers**

**1200105L2**

**1200105L3**

## **E&M+ Dual Voice Plug-On Board**

**Part Number**

**1200106L2**

**1200106L3**

## **User Manual**



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*Notes provide additional useful information.*



*Cautions signify information that could prevent service interruption.*

**WARNING**

*Warnings provide information that could prevent damage to the equipment or endangerment to human life.*

## **Important Safety Instructions**

When using your telephone equipment, please follow these basic safety precautions to reduce the risk of fire, electrical shock, or personal injury:

1. Do not use this product near water, such as near a bath tub, wash bowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool.
2. Avoid using a telephone (other than a cordless-type) during an electrical storm. There is a remote risk of shock from lightning.
3. Do not use the telephone to report a gas leak in the vicinity of the leak.
4. Use only the power cord, power supply, and/or batteries indicated in the manual. Do not dispose of batteries in a fire. They may explode. Check with local codes for special disposal instructions.

## **SAVE THESE INSTRUCTIONS**

## Federal Communications Commission Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio frequencies. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense



*Shielded cables must be used with this unit to ensure compliance with Class A FCC limits.*



*Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.*

### Warranty and Customer Service

ADTRAN will replace or repair this product within five years from the date of shipment if it does not meet its published specifications or fails while in service. For detailed warranty, repair, and return information refer to the ADTRAN Equipment Warranty and Repair and Return Policy Procedure.

Return Material Authorization (RMA) is required prior to returning equipment to ADTRAN.

For service, RMA requests, or further information, contact one of the numbers listed at the end of this manual.

## LIMITED PRODUCT WARRANTY

ADTRAN warrants that for five (5) years from the date of shipment to Customer, all products manufactured by ADTRAN will be free from defects in materials and workmanship. ADTRAN also warrants that products will conform to the applicable specifications and drawings for such products, as contained in the Product Manual or in ADTRAN's internal specifications and drawings for such products (which may or may not be reflected in the Product Manual). This warranty only applies if Customer gives ADTRAN written notice of defects during the warranty period. Upon such notice, ADTRAN will, at its option, either repair or replace the defective item. If ADTRAN is unable, in a reasonable time, to repair or replace any equipment to a condition as warranted, Customer is entitled to a full refund of the purchase price upon return of the equipment to ADTRAN. This warranty applies only to the original purchaser and is not transferable without ADTRAN's express written permission. This warranty becomes null and void if Customer modifies or alters the equipment in any way, other than as specifically authorized by ADTRAN.

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## E&M+ DUAL VOICE OVERVIEW

The E&M+ Dual Voice (E&M+) option module is one of the option modules available for use with the ADTRAN TSU 100/120/600. The E&M+ module provides two 2-wire (2W) or 4-wire (4W) voice-grade interfaces serving as tie-trunks using E&M signaling or as dedicated transmission only (TO) interfaces for additional data services.

The E&M+ option module also accepts the E&M+ plug-on board to provide up to four E&M+ functional ports per option slot used, as well as accepting other plug-on modules.

The E&M+ plug-on board may be plugged onto any existing TSU option module.

The E&M option module and plug-on board are compatible with Type I, Type II, and Type V (same premises wiring) E&M signaling. E-lead originates on this interface type, and is directly compatible with Type I, II, and V M-lead originate interfaces typically found on PBXs and switching equipment.

The E&M signaling type is selectable by the jumper located near the rear panel. The **J1 JUMPER** is located on the *plug-on* board (Part number 1200106L3) directly to the right of the ADTRAN logo. The **J2 JUMPER** is located on the *plug-in* board (Part number 1200105L3) near the rear panel directly to the right of the ADTRAN logo. By placing the jumper across Pins 1 and 2, Type I and Type II E&M signalling is enabled. By placing the jumper across pins 2 and 3, Type V E&M signaling is enabled.

## Functional Description

The E&M+ Dual Voice Option Module is designed to fit in the option slot of the TSU 100/120/600 and is subject to its operation and control. The E&M+ option module is configured from the front panel of the TSU 100/120/600 or by an external personal computer (PC) program (T-Watch). The internal menus for its configuration are a part of the E&M+ option module and are automatically installed when it is plugged into the unit.

## Features

The E&M+ Dual Voice option module has the following features:

- 64 kbps voice port operation
- Menu configurable Tx and Rx levels (TLPs)
- 2W and 4W E&M as well as 2W and TO operating modes
- E-lead originate E&M interface
- Type I, II, and V signaling
- Extensive testing capabilities:
  - Rx and Tx signal bit monitoring
  - E-lead and M-lead status monitoring
  - Integral 1 kHz tone generation sends test tone towards near or far end
  - Manual control of Tx A and B signal bits
  - Manual control of E-lead output
  - Bidirectional analog loopback
  - Loopback control by means of 2713 Hz tone from network side (-L3 versions only).
- E&M+ plug-on board provides TSU 100/120/600 with four voice ports in one option slot.
- Selectable E-lead make busy for carrier failure
- Full V.34 modem capable (28.8 kbps)

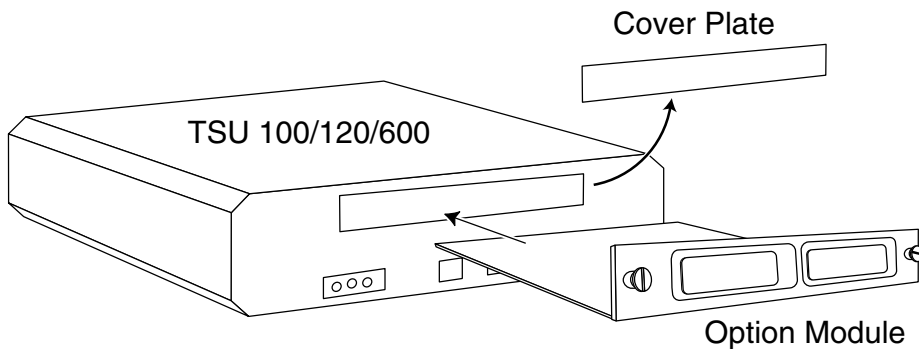
## E&M+ Option Module Specifications

The E&M+ Dual Voice option module conforms to the following specifications:

<b>Voice Channels</b>	Two (four with plug-on module installed)
<b>Transmission Levels</b>	TX: +13 to -17 dB TLP, 1 dB steps between -17 db and +6 dB, 7 dB step between +6 dB and +13 dB RX: -17 to +7 dB LP, 1 dB steps
<b>Frequency Response</b>	300 to 3400 Hz ( $\pm 1.0$ dB)
<b>4-wire Impedance</b>	600 $\Omega$
<b>2-wire Impedance</b>	600 W + 2.15 $\mu$ F
<b>2-wire ERL</b>	$\geq 20$ dB
<b>2-wire SRL</b>	$\geq 15$ dB
<b>THL ERL</b>	$> 25$ dB
<b>THL SRL</b>	$> 20$ dB
<b>Longitudinal Bal</b>	$> 52$ dB
<b>RX Idle Channel Noise</b>	$< 20$ dBrc
<b>TX Idle Channel Noise</b>	$< 20$ dBrc
<b>Operating Temperature</b>	0 to 50 degrees C, 95% relative humidity, non-condensing
<b>Connector</b>	RJ-45
<b>Tests</b>	Power-on circuit test Signal Bits Monitoring and Setting 1 kHz test tone generation Settable E-lead port output state  Analog bidirectional loopback, controlled from front panel (all versions). Also by 2713 Hz control tone from the network side. (-L3 versions only). Control tone operation is similar to AT&T PUB 43004, with tone level -24 dBm to -3 dBm. This feature operates in TO mode only.

## Physical Description

The E&M+ is an option module which plugs into the option slot in the rear of the TSU 100/120/600. See Figure 1-1.



**Figure 1-1. E&M+ Dual Voice Option Module**

The E&M+ option module rear panel includes a plastic plug over a cutout for additional connectors. This allows a plug-on board to be added to the E&M+ option module.

The PORT X.3/X.4 indication is linked to the port numbering philosophy of the TSU 100/120/600 product family. The **X** represents the slot number, and the **.3** indicates the port number.

For the TSU 100/120/600 application, there is only one option slot. Therefore the port designations for the two E&M voice ports are 1.1 and 1.2. If added, the plug-on board port designation would be 1.3 and 1.4. These port numbers appear in the front panel LCD menu displays.



### **UNPACK AND INSPECT**

Carefully inspect the E&M+ DualVoice option module and/or plug-on board for any shipping damage. If damage is suspected, file a claim immediately with the carrier and then contact ADTRAN Technical Support. If possible, keep the original shipping container for use in shipping the equipment back for repair or for verification of damage during shipment.

### **Shipped by ADTRAN**

The following items are included in the ADTRAN shipment:

- E&M+ Dual Voice option module and/or plug-on board
- User Manual (to be inserted into main TSU 100/120/600 user manual).

### **Provided by Customer**

The customer must provide a cable for connection to the station.

## INSTALLING THE OPTION MODULE



*Before installing the option module, check the back panel for the presence or absence of a Hot Replaceable label on the back panel.*

### Modules *With* Hot Replaceable Label on Back Panel

For ease of replacement, power to the TSU 100/120/600 may be **ON** when installing or removing the option module *with* a Hot Replaceable label on the back panel.

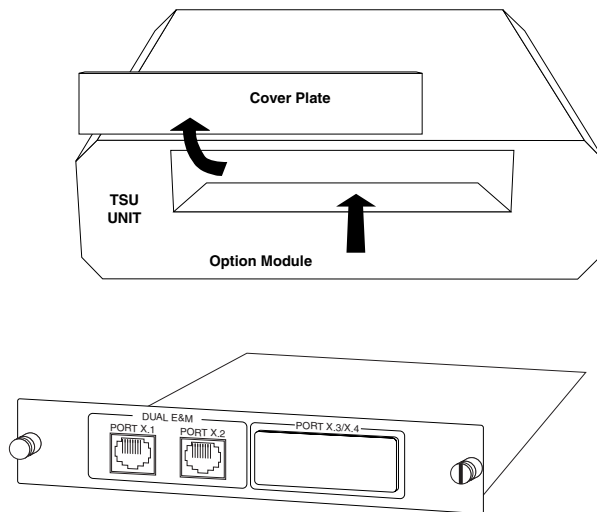
### Modules *Without* Hot Replaceable Label on Back Panel

Power to the TSU 100/120/600 must be **OFF** when installing or removing the option module *without* a Hot Replaceable label on the back panel.

## Placement of the Option Module

Figure 2-1 represents the action required for proper placement of the option module.

1. Remove cover plate from the TSU 100/120/600 rear panel.
2. Slide option module into the rear panel until it is positioned firmly against the front of the TSU 100/120/600.
3. Fasten thumbscrews at both edges of the option module.



**Figure 2-1. Installing Option Module**

## Power Connection

Each option module derives power from the base TSU 100/120/600 unit. Power to the TSU 100/120/600 is supplied by a captive eight-foot power cord.

## Wiring

The E&M+ Dual Voice option module offers two connectors for an analog voice interface. The connector is universal and accepts an RJ-45 (8-pin) connector. The pinout is shown in Table 2-1.

The required wiring connection is given below:

Connector Type 8-Pin Modular Jack, Mating Connector  
Part Number AMP # 2-383021-5

**Table 2-1. E&M Voice Pinout Connection**

Name	Pin	Description
Tip	2	Customer TX Tip; also 2W Tip
Ring	1	Customer TX Ring; also 2W Ring
Tip 1	7	Customer RX Tip 1 (4W only)
Ring 1	8	Customer RX Ring (4W only)
E-lead	3	Customer originate E-lead
M-lead	6	Network originate M-lead
SG	4	E-lead ground return
SB	5	M-lead battery source

## POWER UP TESTING AND INITIALIZATION

The option module executes a partial self test during the power up sequence, as described in the TSU 100/120/600 manual. A full self test can be activated from the Test menu. No initialization input is required. Any previously configured setting for the option module is restored automatically upon power up.

### Successful Self Test

The green **OK LED**, located with the Module LEDs on the front panel, turns **ON** when a successful self test is completed and the configuration is successfully restored. See *Front Panel Operation* in the TSU 100/120/600 user manual.

### Failed Self Test

If the option module fails one or more of the self tests, a message is displayed in the LCD during power up. See the TSU 100/120/600 user manual. Specific failures of the E&M+ option module are identified in Appendix B, *E&M+ Failure Messages*.

### Operation Alarms

The red Alarm LED with the Module LEDs on the front panel turns **ON** when an alarm condition is detected.



### OVERVIEW

The **E&M+ DUAL VOICE (E&M) OPTION MODULE** is controlled as part of the TSU 100/120/600 using the same methods as described in the user manual. See the *TSU 100/120/600 User Manual* for descriptions of front panel indicators and buttons.

### Menu Structure

When an **E&M+ OPTION MODULE** is installed in the TSU 100/120/600, the unit adds it to the list of available options under the **PORT MENU** items. These menu items are shown in bold in the limited overview of the TSU 100 menu shown in Figure 3-1. The complete E&M+ option module menu tree is provided in Appendix A, *E&M+ Menu Tree*. See the *TSU 100 User Manual* for a complete menu diagram.

### Menu Operation

An option module must be selected from the listing in one of the **PORT MENU** options before any option module menus are applicable. With the cursor on one of the **PORT MENU** items, press **Enter** to display a list of the currently installed option modules. To activate menus for the **E&M+ OPTION MODULE**, scroll through the list to display **X.1 E&M+** and press **Enter**.

Once the option module is selected, the **E&M+ MENUS** appear as a subset of, and operate the same as, menus for the TSU 100/120/600. With the cursor on one of the TSU 100/120/600 four main menu choices, press **Enter** or a menu number to display the first two submenu items.

Use the **Up** and **Down Arrows** to place the cursor on the desired item and press **Enter** to display the first two submenu choices.

TSU 100 Main Menu	1) STATUS		1) NI PERF REPORTS
	2) CONFIG	1) NETWORK (NI)	2) NI ERRORS
		2) UNIT	3) ACTIVE ALARMS
	3) UTIL	3) MAP XCHNG	4) VIEW HISTORY
		4) MAP IN USE (A) (B)	<b>5) PORT STATUS</b>
		5) DS0 MAP A	6) REMOTE PORT
		6) DS0 MAP B	7) CLEAR PORT ALARM
		<b>7) PORT CONFIG</b>	
	4) TEST	1) NETWORK TESTS	1) TIME/DATE
		2) RUN SELF TEST	2) FACTORY RESTORE
	<b>3) PORT TEST</b>	3) SET PASSCODE	
	4) CANCEL TESTS	4) UNIT ID	
		5) SOFTWARE REV	
		<b>6) PORT UTILITY</b>	

**Figure 3-1. TSU 100 Main Menu**



## E&M+ Menu Items

The **E&M+ MENUS** are accessed from, and operate the same as, menus for the TSU 100/120/600. The **E&M+** items are submenu choices of the TSU 100/120/600 four Main menus, as shown in Figure 3-1 on page 3-2. For information on **FACTORY RESTORE** and **RUN SELF TEST** see *TSU Features Used with E&M+ options* on page 3-10.

The E&M+ menu items are:

- Port Status
- Port Configuration
- Port Utility
- Port Test

### Port Status

**PORT STATUS**, a submenu of TSU 100/120/600 Main menu item **STATUS**, displays active status information about the E&M+ interface.

When the **PORT STATUS** is displayed, place the cursor on it and press **Enter** to display the first available port. See Figure 3-2. Scroll to select 1.1 E&M+ and press **Enter** to activate either of the following submenus:

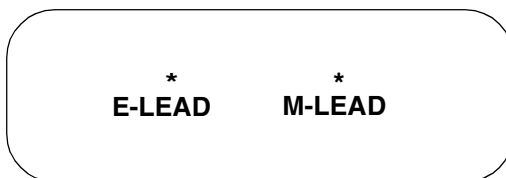
- E-lead and M-lead status (E&M STATUS)
- View Signaling Bits (VIEW SIG BITS)

STATUS	1) NI PERF REPORTS		
	2) NI ERRORS		
	3) ACTIVE ALARMS		
	4) VIEW HISTORY		
	<b>5) PORT STATUS</b>	1.1 E&M+	E&M+ STATUS
	6) REMOTE PORT		VIEW SIG BITS
	7) CLEAR PORT ALARM		

**Figure 3-2. Port Status Submenus**

### E&M Status

There are two information fields, **E-LEAD** and **M-LEAD**. See Figure 3-3. An Asterisk (\*) indicates an item is active.



**Figure 3-3. E&M Status Display**

#### ***E-Lead***

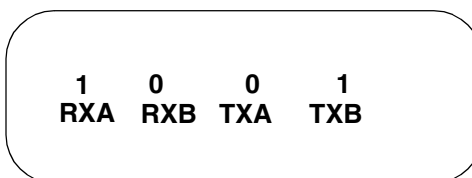
An asterisk is present if the E-Lead is being grounded and the Rx A signal bit is equal to 1.

#### ***M-Lead***

In type I and II, an asterisk is present if -48 volts is being applied to the M-Lead by the premises equipment. In type V, an asterisk is present if the M-lead is grounded by the premises equipment.

### **View Signaling Bits (VIEW SIG BITS)**

**VIEW SIG BITS** is used to view the status of the Rx and Tx signaling bits in the DS-1 stream. See Figure 3-4. The status of both the A and B bits is displayed.



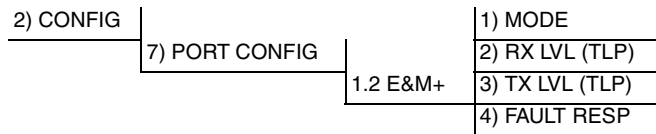
**Figure 3-4. View Signaling Bits Display**

## Port Configuration (Port Config)

**PORT CONFIGURATION**, a submenu of TSU 100/120/600 Main Menu item **CONFIGURATION**, is used to configure the E&M+ option module. The following submenu items are used to configure the parameters:

- Mode
- RX LVL (TLP)
- TX LVL (TLP)
- Fault Resp

When **PORT CONFIGURATION** is displayed, place the cursor on it and press **Enter** to activate. Scroll to display the port to be configured and activate with **Enter**. See Figure 3-5.



**Figure 3-5. Port Configuration Submenus**

The unit displays the first of four submenu items. Table 3-1 identifies the available selections for **PORT CONFIGURATION**. Continue with standard operating procedures.

**Table 3-1. Port Configuration Parameters**

MENU ITEM	PARAMETER CHOICES
Mode	*4W_E&M, 2W_E&M, 4W_TO, 2W_TO
RX LVL (TLP)	-17 dB to +7 dB, 1 dB steps *( -16 dB)
TX LVL (TLP)	-17 dB to +13 dB *(+6 dB)
fault resp	*normal, seized
* Factory Default	

## Mode

**MODE** sets the type of interface and T1 signaling to be used.

Choices include:

- 4W\_E&M (four-wire E&M)  
4-wire transmission; uses E-Lead and M-Lead signaling
- 2W\_E&M (two-wire E&M)  
2-wire transmission; uses E-Lead and M-Lead signaling
- 4-W\_TO (four-wire transmission only)  
4-wire transmission; no signaling
- 2W\_TO (two-wire transmission only)  
2-wire transmission; no signaling

## Receive Level/Transmission Level Point (RX LVL (TLP))

**RX LVL (TLP)** sets the receive direction transmission level points (TLP). The **TLP** is indicated in dB and the relative loudness is indicated by a bar graph display. Settings change immediately as the bar graph is scrolled.

Choice range:

-17 dB to +7 dB, in 1 dB steps

## Transmit Level/Transmit Level Point (TX LVL (TLP))

**TX LVL (TLP)** sets the transmit direction transmission level points (TLP). The **TLP** is indicated in dB and the relative loudness is indicated by a bar graph display. Settings change immediately as the bar graph is scrolled.

Choice range:

-17 dB to +13 dB; between -17 dB and +6 dB, the step size is 1 dB. From +6 dB to +dB is a single step.

## Fault Response (FAULT RESP)

**FAULT RESPONSE**, normal or seized, determines the E-Lead output during a carrier alarm. For a network alarm, the E-Lead appears busy if set for **SEIZED**. If set for **NORMAL**, the E-Lead remains not busy.

Choices include: Normal; Seized

## Port Utility (PORT UTIL)

**PORT UTILITY**, a submenu of the TSU 100/120/600 Main menu item **UTILITIES (UTIL)** displays the current software information for each port installed in the unit. This information is required when requesting assistance from ADTRAN Customer Service or when updates are needed.

When **PORT UTILITY** is displayed, place the cursor on it and press **Enter** to display the first available port. See Figure Figure 3-6.

	1) TIME/DATE		
	2) FACTORY RESTORE		
3) UTIL	3) SET PASSCODE		
	4) UNIT ID		
	5) SOFTWARE REV		
	6) PORT UTILITY	1.1 E&M+	1) SW REVISION
			2) COMMAND MODE

**Figure 3-6. Port Utility Submenus**

Display 1.1 E&M+ (scroll to display if necessary), and press **Enter**. The unit displays the option module name and the software version installed.

The submenu **PORT UTILITY** contains a second option, 2)CMD Mode, for the E&M+ module. This option is reserved for factory use only.

Press **CANCEL** to exit or select another port.

## Port Test

**PORT TEST**, a submenu of the TSU 100/120/600 Main menu item **TEST**, activates tests of the selected data ports. Selecting the E&M+ displays tests available for this option module. See Figure 3-7 and Table 3-2.

When Port Test is Displayed, place the cursor on it and press **Enter** to display the first available port. Scroll to select 1.1 E&M+ and press **Enter** to activate the following submenu items:

- 1 kHz Tone
- View Sig Bits
- Set TX Signal
- Set E-Lead
- Loopback

	1) NETWORK TESTS		1) 1 KHZ TONE
	2) RUN SELF TEST		2) VIEW SIG BITS
4) TEST	3) PORT TEST	1.1 E&M+	3) SET TX SIGNAL
	4) CANCEL TESTS		4) SET E-LEAD
			5) LOOPBACK

**Figure 3-7. Port Test Submenus**

**Table 3-2. Port Test Parameters**

MENU ITEM	PARAMETER CHOICES
1 kHz Tone	Off; Near; Far
View Sig Bits	Display only
Set TX Signal	Off; A=0 B=0; A=1 B=0; A=0 B=1; A=1 B=1
Set E-lead	Off; E-Lead Open; E-Lead Grnded
Loopback	Disabled; Enabled

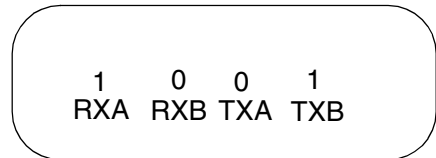
### 1 kHz Tone

This test injects a 1004 Hz sine wave either toward the far end (TX Direction toward the T1 network) or toward the near end (the 2/4-wire interface on the option module). This tone may be used for testing or relative level measurements.

Choices include: Off; Near; Far

### View Signaling Bits

**VIEW SIG BITS** is used to view the status of the RX and TX signaling bits in the DS-1 stream. See Figure 3-8. The status of both the A and B bits is displayed.



**Figure 3-8. View Signaling Bits Display**

### Set Transmit Signal

**SET TX SIGNAL** allows the A and B signal bits in the TX direction to be forced to a desired state for test.

### Set E-Lead

**SET E-LEAD** allows the E-lead output to be forced to a desired state for test. It may be set to grounded or open.

### Loopback

Setting Loopback to **ENABLE** provides a bidirectional analog loopback toward the network and toward the connected equipment. This may be used to verify connected cables and equipment.

Bidirectional analog loopback can also be enabled, in TO mode, by means of a 2713 Hz control tone from the network side (-L3 versions only).

## TSU FEATURES USED WITH E&M+ OPTIONS

In addition to the **E&M+** menu items, two additional menu items of the TSU 100/120/600 may be operated in conjunction with the E&M+ option module. These are **FACTORY RESTORE** and **RUN SELF TEST**.

### Factory Restore

**FACTORY RESTORE**, a submenu of the TSU 100/120/600 Main menu item **UTILITIES (UTIL)**, restores the factory installed default setting for all E&M+ option module parameters.

When **FACTORY RESTORE** displays, place the cursor on it and press **Enter**. The unit is restored to preset factory defaults and returns to the TSU 100/120/600 Main menu. The factory default for port configuration parameters is shown in Table 3-1 on page 3-5.

### Run Self Test

**RUN SELF TEST**, a submenu of the TSU 100/120/600 Main menu item **TEST**, executes both the E&M+ internal test and the TSU 100/120/600 internal test. The results of the self test are displayed in the LCD. See the TSU 100/120/600 user manual for additional information on **SELF TEST**.

When **RUN SELF TEST** displays, place the cursor on it and press **Enter** to execute the test. The unit continuously changes the display in the LCD window until all test results are shown.



## Appendix A

# E&M+ Menu Tree

The menu tree for the E&M+ Dual Voice Option Module and Plug-On Board is provided in Figure A-1.

1) PORT STATUS	1) E&M STATUS (E-LEAD, M-LEAD)
	2) VIEW SIG BITS (RXA RXB TXA TXB)
2) PORT CONFIG	1) MODE: 4W_E&M, 2W_E&M, 4W_TO, 2W_TO
	2) RX LVL (TLP): -17 dB to +7dB
	3) TX LVL (TLP): +7 dB to -17dB
	4) FAULT RESP: NORMAL, SEIZED
3) PORT UTIL	1) SW REVISION
	2) COMMAND MODE: 0
4) PORT TEST	1) 1 KHZ TONE: OFF, NEAR, FAR
	2) VIEW SIG BITS (RXA, RXB, TXA, TXB)
	3) SET TX SIGNAL: OFF, AB=00, AB=01, AB=10, AB=11
	4) SET E-LEAD: E-LEAD OPEN, E-LEAD GRNDED
	5) LOOPBK: DISABLED, ENABLED

**Figure A-1. E&M+ Menu Tree**



## FAILURE MESSAGES AT POWER-UP

The following messages indicate a probable component failure on the E&M+ Dual Voice option module or plug-on board:

**E01 - EPROM CS**

EPROM checksum error

**E02 - RAM ERR**

Static RAM error

**E10 - SIGNALING**

Failure of signal bit transmission

## E&M ALARM MESSAGES

No alarms are specified for the E&M+ Dual Voice option module or plug-on board.



## SIGNALING STATES

Table C-1 describes the signaling states for the E&M+ Dual Voice option module and plug-on board and the DS-1 PCM stream.

**Table C-1. E&M+ Signaling States**

E-LEAD OUTPUT	RXA	RXB	TXA	TXB	M-LEAD INPUT
	X	X	0	0	M-lead IDLE (0 V - Type I/II) (-48 V - Type V)
	X	X	1	1	M-lead ACTIVE (-48 V - Type I/II) (0 V - Type V)
E-lead IDLE (-48 V)	0	X	X	X	
E-lead ACTIVE (0 V)	1	X	X	X	

The A and B signal bit states on the DS-1 signal are as follows:

0 = logic 0 is the DS-1 stream

1 = logic 1 is the DS-1 stream

X = value is not significant

Loop Open = phone on-hook

Loop Closed = phone off-hook



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## Product Support Information

### Pre-Sales Inquiries and Applications Support

Please contact your local distributor, ADTRAN Applications Engineering, or ADTRAN Sales:

Applications Engineering      (800) 615-1176

Sales      (800) 827-0807

### Post-Sale Support

Please contact your local distributor first. If your local distributor cannot help, please contact ADTRAN Technical Support and have the unit serial number available.

Technical Support      (888) 4ADTRAN

### Repair and Return

If ADTRAN Technical Support determines that a repair is needed, Technical Support will coordinate with the Customer and Product Service (CaPS) department to issue an RMA number. For information regarding equipment currently in house or possible fees associated with repair, contact CaPS directly at the following number:

CaPS Department      (256) 963-8722

Identify the RMA number clearly on the package (below address), and return to the following address:

ADTRAN, Inc.  
CaPS Department  
6767 Old Madison Pike  
Progress Center  
Building #6, Suite 690  
Huntsville, AL 35807

RMA # \_\_\_\_\_

