



E&M+ Dual Voice Option Module

**Part Number
1200105L3**

E&M+ Dual Voice Plug-On Board

**Part Number
1200106L3**

User Manual

Trademarks:

Windows is a registered trademark of Microsoft Corp.

T-Watch PRO is a trademark of ADTRAN, Inc.

OpenView^R



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The following conventions are used in this manual.



Notes provide additional useful information.



Cautions signify information that could prevent service interruption.



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 bathtub, 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.
5. Do not dispose of batteries in a fire. They may explode. Check with local codes for special disposal instructions.

Save These Important Safety 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.



NOTE

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

WARNING

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

Product Warranty

ADTRAN will repair and return this product within the warranty period if it does not meet its published specifications or fails while in service. Warranty information can be found at www.adtran.com.

Product Registration

Registering your product helps ensure complete customer satisfaction. Please take time to register your products on line at www.adtran.com. Click *Service and Support* on the top of the page, and then click *Product Registration* under *Support*.

Customer Service, Product Support Information, and Training

ADTRAN will repair and return this product within five years from the date of shipment if the product does not meet its published specification, or if it fails while in service.

A return material authorization (RMA) is required prior to returning equipment to ADTRAN. For service, RMA requests, training, or more information, see the toll-free contact numbers given below.

Presales 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
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The Custom Extended Services (ACES) program offers multiple types and levels of service plans which allow you to choose the kind of assistance you need. For questions, call the ACES Help Desk.

ACES Help Desk	(888) 874-2237
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Repair and Return

If ADTRAN Technical Support determines that a repair is needed, Technical Support will coordinate with the Custom 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 Customer and Product Service
901 Explorer Blvd.
Huntsville, Alabama 35806

RMA # _____

Training

The Enterprise Network (EN) Technical Training offers training on our most popular products. These courses include overviews on product features and functions while covering applications of ADTRAN's product lines. ADTRAN provides a variety of training options, including customized training and courses taught at our facilities or at your site. For more information about training, please contact your Territory Manager or the Enterprise Training Coordinator.

Training - phone (800) 615-1176, ext. 7500

Training - fax (256) 963-6700

Training - email training@adtran.com

Table of Contents

List of Figures	ix
List of Tables	xi
Chapter 1. Introduction.....	1-1
E&M+ Dual Voice Overview	1-1
Functional Description.....	1-2
Features	1-2
E&M+ Option Module Specifications	1-3
Physical Description	1-4
Chapter 2. Installation.....	2-1
Unpack and inspect	2-1
Shipped by ADTRAN.....	2-1
Provided by Customer.....	2-1
Installing the option module	2-2
Modules With Hot Replaceable Label on Back Panel.....	2-2
Modules Without Hot Replaceable Label on Back Panel.....	2-2
Placement of the Option Module	2-3
Power Connection	2-3
Attaching the Plug-On Board	2-4
Rear Panel Connectors.....	2-5
Wiring	2-6
Power up testing and initialization	2-7
Successful Self-Test.....	2-7
Failed Self-Test.....	2-7
Operation Alarms.....	2-7
Chapter 3. Operation.....	3-1
Menu Structure	3-1
Menu Operation	3-1
E&M+ Menu Items	3-2
Port Status	3-3

E&M Status	3-3
View Signaling Bits (VIEW SIG BITS)	3-4
Port Configuration (Port Config)	3-4
Mode	3-5
Receive Level/Transmission Level Point (RX LVL (TLP))	3-6
Transmit Level/Transmission Level Point (TX LVL (TLP))	3-6
Fault Response (FAULT RESP)	3-6
2713 Hz Tone Detection (2713 TONE DET)	3-6
Port Utility (PORT UTIL).....	3-7
Port Test	3-7
1 kHz Tone	3-8
View Signaling Bits	3-8
Set Transmit Signal	3-9
Set E-Lead	3-9
Loopback	3-9
TSU Features Used with E&M+ Options	3-10
Factory Restore	3-10
Run Self Test.....	3-10
Appendix A. E&M+ Menu Tree	A-1
Appendix B. E&M+ Failure Messages	B-1
Appendix C. Signaling States	C-1
Index	Index-1

List of Figures

Figure 1-1. E&M+ Dual Voice Option Module	1-4
Figure 1-2. E&M Dual Voice Plug-on Board	1-4
Figure 2-1. Installing the Option Module	2-3
Figure 2-2. Attaching the Plug-on Board.....	2-4
Figure 2-3. E&M+ Option Module Rear View.....	2-5
Figure 3-1. TSU 100 Main Menu	3-2
Figure 3-2. Port Status Submenus.....	3-3
Figure 3-3. E&M Status Display	3-3
Figure 3-4. View Signaling Bits Display	3-4
Figure 3-5. Port Configuration Submenus.....	3-5
Figure 3-6. Port Utility Submenus.....	3-7
Figure 3-7. Port Test Submenus.....	3-8
Figure 3-8. View Signaling Bits Display	3-9
Figure A-1. E&M+ Menu Tree	A-2

List of Tables

Table 2-1. E&M Voice Pinout Connection	2-6
Table 3-1. Port Configuration Menu Items.....	3-5
Table 3-2. Port Test Parameters.....	3-8
Table C-1. E&M+ Signaling States	C-1

E&M+ DUAL VOICE OVERVIEW

The E&M+ Dual Voice option module (“the E&M+ voice module”) is one of the option modules available for ADTRAN’s TSU 100/120/600 (“the TSU”). The E&M+ voice module (P/N 1200105L3) provides two voice-grade interfaces, either 2-wire (2W) or 4-wire (4W). These interfaces serve as tie-trunks using E&M signaling or as dedicated transmission only (TO) interfaces for additional data services.

The E&M+ voice module accepts the E&M+ plug-on board as well as other plug-on modules. The E&M+ plug-on board provides up to four functional ports per option slot. (In addition, the E&M+ plug-on board may be plugged onto any existing TSU option module.)

The E&M+ voice module and E&M+ plug-on board are compatible with the following E&M interface types: Type I, Type II, and Type V (same premises wiring). The E-lead originates on these interface types, while the M-lead originates on interfaces typically found on PBXs and switching equipment.

Select the E&M signaling type using the jumper located near the rear panel of the TSU. Placing the jumper across Pins 1 and 2, enables Type I and Type II E&M signaling. Placing the jumper across Pins 2 and 3, enables Type V E&M signaling. (Appendix C, *Signaling States*, on page C-1 provides additional information.)

**NOTE**

- The **J1 JUMPER** is located on the E&M+ plug-on board (P/N 1200106L3) directly to the right of the ADTRAN logo.
- The **J2 JUMPER** is located on the E&M+ voice module board, (P/N 1200105L3) near the rear panel directly to the right of the ADTRAN logo.

Functional Description

The E&M+ voice module fits into the TSU's option slot, and, once installed, the TSU governs the E&M+ voice module's operation and control. To configure the E&M+ voice module, use the TSU front panel, or use ADTRAN's personal computer (PC) management program, T-Watch PRO. (The internal E&M+ voice module menus are automatically installed when it is plugged into the TSU.)

Features

Features of the E&M+ voice module include the following:

- 64 kbps voice port operation
- Menu configurable Tx and Rx levels (TLPs)
- 2W and 4W E&M signaling as well as 2W and 4W TO operation
- 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
- E&M+ plug-on board provides the TSU with four voice ports in one option slot
- Selectable E-lead force busy for carrier failure
- Full V.34 modem capable (28.8 kbps)

E&M+ Option Module Specifications

The E&M+ voice module conforms to the following specifications:

Voice Channels	Two (four with plug-on module installed)
Transmission Levels	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 TLP, 1 dB steps
Frequency Response	300 to 3400 Hz (± 1.0 dB)
4-wire Impedance	600 Ω
2-wire Impedance	600 Ω + 2.15 μ F
2-wire ERL	≥ 20 dB
2-wire SRL	≥ 15 dB
THL ERL	>25 dB
THL SRL	>20 dB
Longitudinal Bal	>52 dB
RX Idle Channel Noise	<20 dBrc
TX Idle Channel Noise	<20 dBrc
Operating Temperature	0-50°C, 95% relative humidity, noncondensing
Connector	RJ-45
Tests	<ul style="list-style-type: none"> • 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+ voice module plugs into the option slot in the rear of the TSU (see Figure 1-1). A removable plastic plug covers the E&M+ voice module rear panel cutout that can house additional connectors, such as the E&M+ plug-on board (see Figure 1-2).

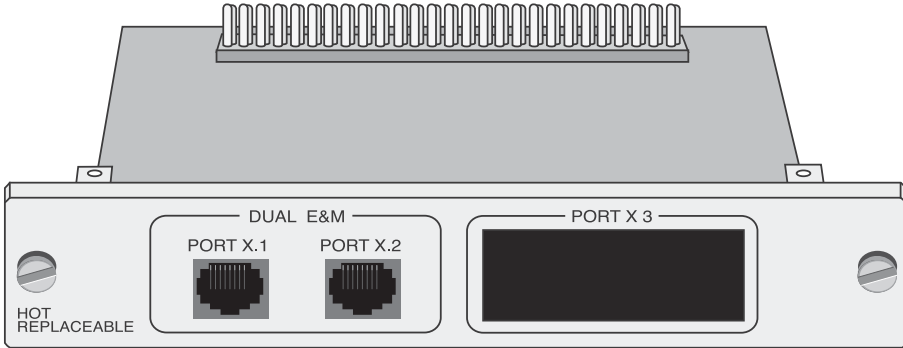


Figure 1-1. E&M+ Dual Voice Option Module

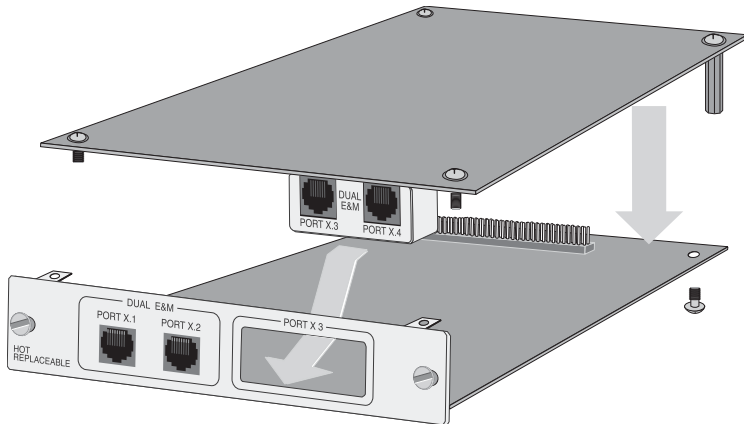


Figure 1-2. E&M Dual Voice Plug-on Board

The E&M+ plug-on board labels **PORT X.3** and **PORT X.4** correlate to the port numbering philosophy of the TSU 100/120/600 family where **X** represents the slot number, and **.3** and **.4** indicate the port numbers. In this application, the port designations for the two E&M+ voice module ports are 1.1 and 1.2. and, if added, the plug-on board port designations are 1.3 and 1.4. These port numbers appear in the front panel LCD menu displays.

UNPACK AND INSPECT

Carefully unpack and inspect the E&M+ voice module or E&M+ 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 returning the equipment 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 (P/N 1200105L3)
- E&M+ Dual Voice plug-on board (P/N 1200106L3)
- User Manual, to be inserted into main TSU 100/120/600 user manual. (P/N 61200105L3-1A)

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

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

The following steps and Figure 2-1 describe the proper placement of the E&M+ voice module.

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

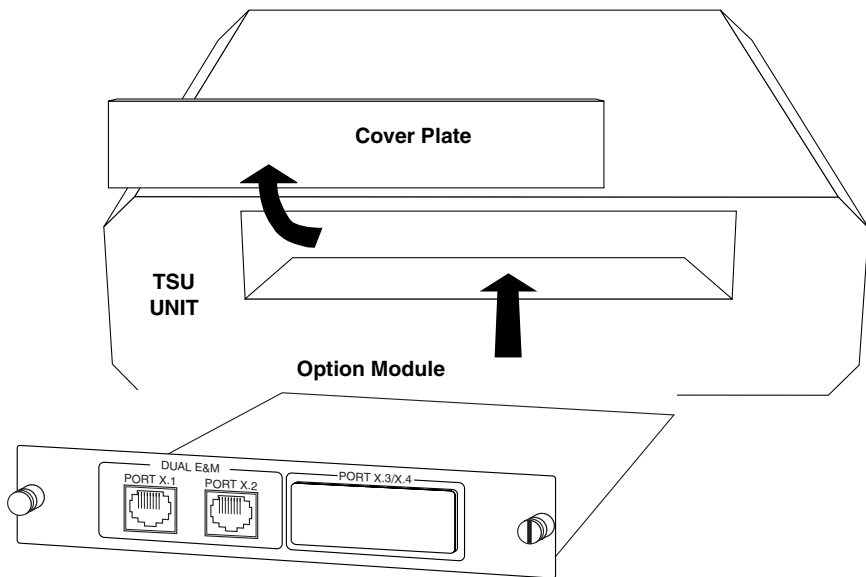


Figure 2-1. Installing the Option Module

Power Connection

Each E&M+ voice module derives power from the TSU 100/120/600 unit. (Power to the TSU 100/120/600 is supplied by a captive eight-foot power cord.)

Attaching the Plug-On Board

The following steps and Figure 2-2 describe the proper attachment of the E&M+ plug-on board to any option module.

1. Hold the E&M+ plug-on board above the option module.
2. Using a downward and right-to-left motion, slip the E&M+ plug-on board connector into the opening in the option module back panel.
3. Moving the E&M+ plug-on board downward, secure the connection of the header pins at the front of the boards.
4. Install two 4-40 screws at both front edges of the option module.
5. Install two 4-40 screws on each of the stand-offs on the rear of the plug-on module.

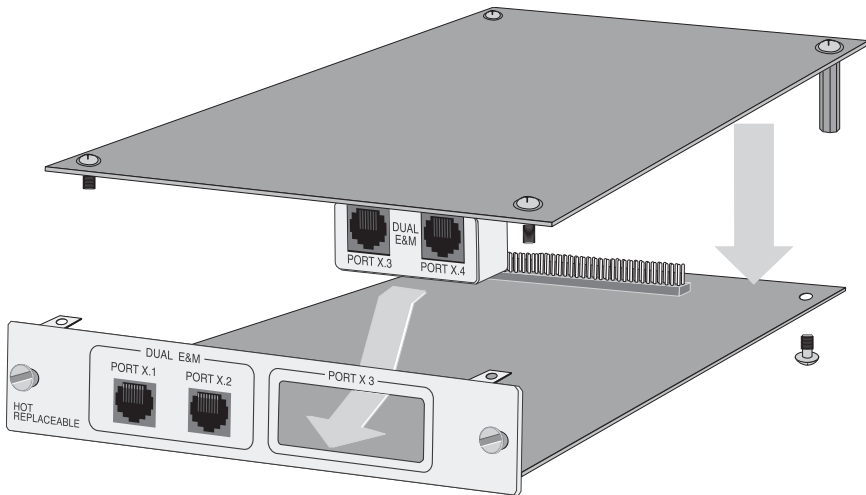



Figure 2-2. Attaching the Plug-on Board



Visually verify the proper connection of the header pins between the E&M+ voice module and the E&M+ plug-on board. An improper connection can result in severe damage to the equipment.

NOTE

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

Rear Panel Connectors

The rear panel contains two high-density subminiature DTE connectors which provide V.35 or EIA-232 interfaces via custom cables. Pin assignments for the DTE connections are listed in Table 2-1 on page 2-6. Figure 2-3 show the E&M+ voice module rear panel.

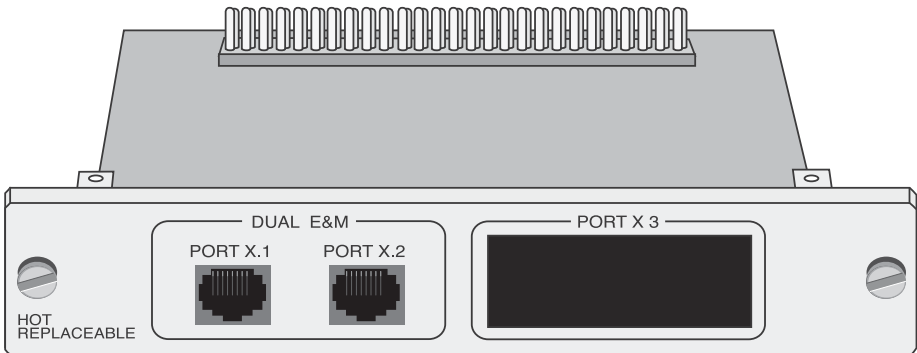


Figure 2-3. E&M+ Option Module Rear View

Wiring

The E&M+ voice module provides two analog voice interfaces. These universal connectors accept an RJ-45 (8-pin) connector. The required wiring connection is an 8-Pin Modular Jack, Mating Connector (P/N AMP # 2-383021-5). Table 2-1 shows the E&M+ voice module pinout connection.

Table 2-1. E&M Voice Pinout Connection

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

POWER UP TESTING AND INITIALIZATION

The E&M+ voice 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 TSU 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 E&M+ voice module fails one or more of the self-tests, the **LCD** displays a failure message during power up. Appendix B, *E&M+ Failure Messages* on page B-1, describes specific failures of the E&M+ voice module. (Also see the TSU 100/120/600 user manual.)

Operation Alarms

When an alarm condition exists, the **Red Alarm LED**, located with the module LEDs on the TSU front panel, turns **ON**.

The TSU 100/120/600 controls the E&M+ voice module. See the *TSU 100/120/600 User Manual* for descriptions of the TSU front panel indicators and buttons, and for additional operation information.

MENU STRUCTURE

When an E&M+ voice module is installed in the TSU 100/120/600, the TSU adds the module to its list of available options under **PORT MENU**. These menu items are shown in bold in the abbreviated TSU 100 menu shown in Figure 3-1 on page 3-2. See Figure A-1 on page A-2 for the complete E&M+ voice module menu tree. See the *TSU 100/120/600 User Manual* for a complete menu diagram.

MENU OPERATION

Before any option module menus are applicable, an option module must be selected from the listing in one of the **PORT MENU** options. To select an option module, place the cursor on one of the **PORT MENU** items, and press **Enter**. The resulting list displays all of the currently installed option modules. To activate menus for the E&M+ voice module, scroll through the list to display **X.1 E&M+** and press **Enter**.

Once the E&M+ voice 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 appropriate item and press **Enter** to display its first two submenu choices.

TSU 100 Main Menu	1) STATUS		1) NI PERF RPTS	
			2) NI ERRORS	
	2) CONFIG	1) NETWORK (NI)		3) ACTIVE ALARMS
		2) UNIT		4) VIEW HISTORY
		3) MAP XCHNG		5) PORT STATUS
		4) MAP IN USE (A) (B)		6) REMOTE PORT
		5) DSO MAP A		7) CLEAR PORT ALM
		6) DSO MAP B		8) ENET STATUS
		7) PORT CONFIG		
	3) UTIL		1) TIME/DATE	
4) TEST	1) NETWORK TESTS		2) FACT RESTORE	
	2) RUN SELFTEST		3) SET PASSCODE	
	3) PORT TEST		4) UNIT ID	
	4) CANCEL TESTS		5) PORT UTILITY	
			6) SOFTWARE REV	
		7) ENET ADDRESS		
		8) SERIAL NUMBER		
		9) CMD MODE		
		10) RST TEL PASS		

Code Rev "J"
Boot Rev "B"

Figure 3-1. TSU 100 Main Menu

E&M+ MENU ITEMS

The E&M+ voice module menu items 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 include the following:

- **PORT STATUS**
- **PORT CONFIGURATION**
- **PORT UTILITY**
- **PORT TEST**

Port Status

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

With **PORT STATUS** displayed, place the cursor over 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		
	5) PORT STATUS	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

Figure 3-3 shows there are two information fields: **E-LEAD** and **M-LEAD**. An asterisk (*) indicates an item is active.

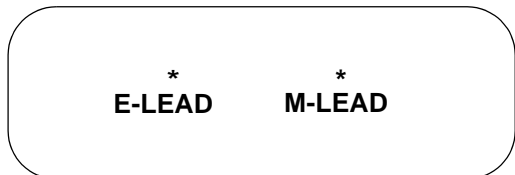


Figure 3-3. E&M Status Display

E-Lead

The presence of an asterisk indicates the **E-LEAD** is being grounded and the **RX A** signal bit is equal to **1**.

M-Lead

With Type I and II interfaces, the presence of an asterisk indicates that -48 volts are applied to the **M-LEAD** by the premises equipment. With a Type V interface, the presence of an asterisk indicates the **M-LEAD** is grounded by the premises equipment.

View Signaling Bits (VIEW SIG BITS)

VIEW SIG BITS displays the status of the Rx and Tx signaling bits in the DS-1 stream. Figure 3-4 shows the status of both the A and B bits.

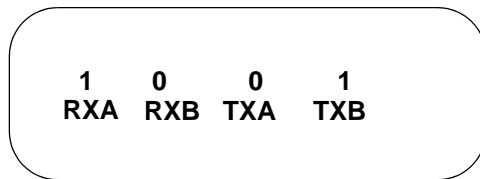


Figure 3-4. View Signaling Bits Display

Port Configuration (Port Config)

PORT CONFIGURATION, a submenu of the TSU 100/120/600 menu **CONFIGURATION**, is used to configure the E&M+ voice module. The following submenu items configure the module:

- **MODE**
- **RX LVL (TLP)**
- **TX LVL (TLP)**
- **FAULT RESP**
- **2713 HZ TONE DET**

With **PORT CONFIGURATION** displayed, place the cursor over it and press **Enter** to activate the submenu. Scroll to display the port to be configured and press **Enter** (see Figure 3-5).

			1) MODE
			2) RX LVL (TLP)
2) CONFIG	7) PORT CONFIG	1.2 E&M	3) TX LVL (TLP)
			4) FAULT RESP
			5) 2713 TONE DET

Figure 3-5. Port Configuration Submenus

The TSU displays the first of five submenu items. Table 3-1 identifies the available selections for **PORT CONFIGURATION**. Continue moving through the menus as previously described.

Table 3-1. Port Configuration Menu Items

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)	+13dB to -17dB, 1 dB steps between -17dB and +6dB, 7dB step between +6 dB and +13dB, *(+6dB)
FAULT RESP	*Normal, Seized
2713 TONE DET	Enabled, *Disabled

*Factory default

Mode

MODE sets the type of interface and T1 signaling. 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.

Choices:

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

Transmit Level/Transmission 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.

Choices:

+13 dB to -17dB; between -17 dB and +6 dB, the step size is 1 dB. From +6 dB to +13 dB is a single, 7 dB 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:

Normal; Seized

2713 Hz Tone Detection (2713 TONE DET)

2713 TONE DET enables or disables the 2713 Hz control tone coming from the network side (L3 versions only). The control tone operation is similar to AT&T PUB 43004, with tone level -24 dBm to -3dBm. This feature operates in TO mode only.

Port Utility (PORT UTIL)

PORT UTILITY, a submenu of the TSU 100/120/600 menu **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** displays, place the cursor over it and press **Enter** to display the first available port (see Figure 3-6).

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

Figure 3-6. Port Utility Submenus

Go to **1.1 E&M+** (scroll to display if necessary), and press **Enter**. The TSU displays the option module name and the software version installed. Although **PORT UTILITY** contains a second option for the E&M+ voice module, **CMD MODE**, this menu is reserved for factory use only. To exit the menu or to select another port, press **CANCEL**.

Port Test

PORT TEST, a submenu of the TSU 100/120/600 menu **TEST**, activates tests on selected data ports. Select **E&M+** to display tests available for the E&M+ voice module (see Figure 3-7 and Table 3-2 on page 3-8). When **PORT TEST** displays, place the cursor over it and press **Enter** to display the first available port. Scroll to select **1.1 E&M+** and press **Enter** to activate the following menus:

- **1 KHZ TONE**
- **VIEW SIG BITS**
- **SET TX SIGNAL**
- **SET E-LEAD**
- **LOOPBACK**

4) TEST	1) NETWORK TESTS	1.1 E&M+	1) 1 KHZ TONE
	2) RUN SELF TEST		2) VIEW SIG BITS
	3) PORT TEST		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) 1 KHZ TONE	Off; Near; Far
2) VIEW SIG BITS	Display only
3) SET TX SIGNAL	Off; A=0 B=0; A=1 B=0; A=0 B=1; A=1 B=1
4) SET E-LEAD	Off; E-Lead Open; E-Lead Grnded
5) LOOPBACK	Disabled; Enabled

1 kHz Tone

The 1 kHz Tone 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 E&M+ voice module). Use this tone for testing or relative level measurements.

Choices:
Off; Near; Far

View Signaling Bits

Use **VIEW SIG BITS** to see the status of the RX and TX signaling bits in the DS-1 stream (see Figure 3-8 on page 3-9). The display shows the status of both the A and B bits.

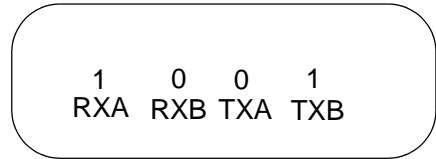


Figure 3-8. View Signaling Bits Display

Set Transmit Signal

SET TX SIGNAL forces the A and B signal bits in the TX direction to a desired state for test.

Set E-Lead

SET E-LEAD forces the E-lead output to a desired state for test. Set to **GROUND**ED or **OPEN**.

Loopback

Set **LOOPBACK** to **ENABLE** to provide a bidirectional analog loopback toward the network and toward the connected equipment. Use the loopback test to verify proper functioning of connected cables and equipment.

In **TO** mode, if the **2713 TONE DET** option is **ENABLED**, the bidirectional analog loopback can also be initiated by sending a 2713 Hz control tone from the network side (L3 versions only).



TEST / 5)LOOPBACK forces a loopback state while **CONFIG / 5)2713 TONE DET** only enables or disables the 2713Hz control tone detection coming from the network.

TSU FEATURES USED WITH E&M+ OPTIONS

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

Factory Restore

FACTORY RESTORE, a submenu of the TSU 100/120/600 menu item **UTILITIES (UTIL)**, restores the factory installed default settings 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. Table 3-1, *Port Configuration Menu Items*, on page 3-5 shows the factory defaults for port configuration parameters.

Run Self Test

RUN SELF TEST, a submenu of TSU 100/120/600 menu **TEST**, executes both the E&M+ voice module internal test and the TSU 100/120/600 internal test. The TSU LCD displays the results of the self-test. (See the *TSU 100/120/600 User Manual* for additional information on **SELF TEST**.)

To execute the self-test, place the cursor over **RUN SELF TEST** and press **Enter**. The TSU continuously changes the display in the LCD window until all test results are shown.

E&M+ Menu Tree

The menu tree for the E&M+ Dual Voice Option Module and Plug-On Board is shown in Figure A-1 on page A-2.

1) PORT STATUS	1) E&M STATUS	E-LEAD	RXA	
		M-LEAD	RXB	
2) PORT CONFIG	2) VIEW SIG BITS		TXA	
			TXB	
	1) MODE		4W_E&M	
			2W_E&M	
			4W_TO	
			2W_TO	
	2) RX LVL (TLP)	-17 dB to +7dB		
	3) PORT UTIL	3) TX LVL (TLP)	+13 dB to -17dB	
		4) FAULT RESP		NORMAL
				SEIZED
5) 2713 TONE DET			ENABLED	
			DISABLED	
3) PORT UTIL	1) SW REVSION			
	2) CMD MODE: 0,1			
4) PORT TEST	1) 1 KHZ TONE:	OFF		
		NEAR		
		FAR	RXA	
				RXB
	2) VIEW SIG BITS		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) LOOPBACK:	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

E06-SELF-TEST

Self-test failure

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 E&M+ 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

Index

Numerics

1 kHz Tone 3-8
2713 TONE DET 3-6

A

ACES help desk v
ADTRAN shipment
 contents of packing box, 2-1
applications support
 how to contact v

C

cable connection for unit 2-1
CAPS department
 how to contact vi
customer extended service plan
 ACES v
customer service v

D

damage inspection 2-1

E

E&M alarm messages B-1
E&M menu items, 3-2
E&M Status
 E-lead 3-3
 M-Lead 3-3
E&M+ Dual Voice option module
 pinout connection 2-6
E&M+ dual voice overview, 1-1
E&M+ option menu tree A-1
E&M+ option module, description 1-2
E&M+ specifications, 1-3
E&M+, physical description 1-4
E0 self-test, B-1
E01 - EPROM CS, B-1
E02 - RAM ERR, B-1

E10 - Signaling B-1

F

Factory Restore 3-10
failure messages at power up, B-1
FAULT RESP 3-6
FCC radio frequency interference, iv
features of E&M+ option module, 1-2

I

installing the option module, how to 2-2

L

Loopback 3-9

M

menu structure 3-1
menu tree
 TSU main menu 3-2
Mode, port config menu item, 3-5
modules
 with hot replaceable label 2-2
 without hot replaceable label 2-2

N

network pinout
 for E&M dual voice module, 2-6

O

operation alarms 2-7
operation, overview 3-1

P

physical description, E&M+ option module 1-4
plug-on board menu tree A-1
port configuration
 parameters 3-5
port configuration menu, 3-4
port status menu, 3-3

port test menu, 3-7
PORT UTIL 3-7
post-sales information v
power connection 2-3
power up failure messages, B-1
power up testing and initialization 2-7
presales inquiries
 how to contact v
product support information v

R

red alarm, 2-7
repair and return information vi
RMA requests v
Run Self Test 3-10
RX LVL (TLP) 3-6

S

safety instructions iii
self-test

 failed, 2-7
 successful, 2-7
Set E-Lead 3-9
Set Transmit Signal 3-9
signaling states C-1

T

technical support v
training information
 how to contact vi
TX LVL (TLP) 3-6

V

View Signaling Bits 3-8
view signaling bits 3-4

W

warranty 1-v
Wiring 2-4