



ESU LT
User Manual

Part Number 1200410L1

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The following conventions are used in this manual.



Cautions signify information that could prevent service interruption.



Notes provide additional useful information.



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

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 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. 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.



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.

Canadian Emissions Requirements

The Class B digital apparatus meets all requirements of the Canadian Interference Equipment Regulations.

Cet appareil numérique de la Class B respecte les exigences du Règlement sur le matériel brouilleur du Canada.

International Cordset Selection

The following list is a selection of recommended cordset configurations to ensure protective earthing continuity when utilizing this product internationally. This list gives the proper rating, cordage type, and plug/connector configuration for the specific country where the product is to be utilized.

Country	Minimum Rating	Cordage Type	Plug Type	Connector Type
Austria Belgium Czech Republic Finland France Germany Greece Hungary Iceland Luxembourg Netherlands Norway Poland Portugal Slovenia Spain Sweden Yugoslavia	250 VAC, 10A	HAR	CEE 7/7	IEC 60320 C13
Australia, China	250 VAC, 10A	V76419	AS 3112	IEC 60320 C13
Denmark	250 VAC, 10A	HAR	Afsnit 107-2-D1	IEC 60320 C13
India/South Africa	250 VAC, 10A	HAR	BS 546	IEC 60320 C13
Israel	250 VAC, 10A	HAR	SI-32	IEC 60320 C13
Italy	250 VAC, 10A	HAR	CEI-23-16/VII	IEC 60320 C13
Japan	125 VAC, 7 A	12-1367 Yukita 300 V	JIS 8303	IEC 60320 C13
Russian Federation	250 VAC, 10A	HAR	GOST 7396	IEC 60320 C13
Switzerland	250 VAC, 10A	HAR	SEV 1011	IEC 60320 C13
Ireland; United Kingdom	250 VAC, 10A	HAR	BS 1363	IEC 60320 C13
Korea	125 VAC, 10A	HAR	KSC 8305	IEC 60320 C13
North America	125 VAC, 10A	AWG	NEMA 5-15	IEC 60320 C13

Warranty and Customer Service

ADTRAN will replace or repair 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/warranty.

Customer Service, Product Support Information, and Training

ADTRAN will repair and return this product if within the warranty period from the date of shipment the product does not meet its published specification or the product 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, use the contact information given below.

Repair and Return

If you determine that a repair is needed, please contact our Customer and Product Service (CAPS) department to have an RMA number issued. CAPS should also be contacted to obtain information regarding equipment currently in house or possible fees associated with repair.

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. (East Tower)
Huntsville, Alabama 35806

RMA # _____

Pre-Sales Inquiries and Applications Support

Your reseller should serve as the first point of contact for support. If additional pre-sales support is needed, the ADTRAN Support web site provides a variety of support services such as a searchable knowledge base, latest product documentation, application briefs, case studies, and a link to submit a question to an Applications Engineer. All of this, and more, is available at:

<http://support.adtran.com>

When needed, further pre-sales assistance is available by calling our Applications Engineering Department.

Applications Engineering (800) 615-1176

Post-Sale Support

Your reseller should serve as the first point of contact for support. If additional support is needed, the ADTRAN Support web site provides a variety of support services such as a searchable knowledge base, updated firmware releases, latest product documentation, service request ticket generation and trouble-shooting tools. All of this, and more, is available at:

<http://support.adtran.com>

When needed, further post-sales assistance is available by calling our Technical Support Center. Please have your unit serial number available when you call.

Technical Support (888) 4ADTRAN

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The ADTRAN Custom Extended Services (ACES) program offers multiple types and levels of installation and maintenance services which allow you to choose the kind of assistance you need. This support is available at:

<http://www.adtran.com/aces>

For questions, call the ACES Help Desk.

ACES Help Desk (888) 874-ACES (2237)

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The Enterprise Network (EN) Technical Training Department 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

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ESU LT OVERVIEW

This section provides a functional description of the ESU LT, describes its features, and illustrates its four interfaces.

Functional Description

The ADTRAN ESU LT (Figure 1-1) is one of several E1 CSU/DSUs that offer complete flexibility for connection of various data sources to E1 or FE1 facilities. This family of ESU products includes the following:

- **ESU LT** - E1 CSU/DSUs with a single Nx56K/64K serial port.
- **ESU 120e** - Same as the ESU LT with the added feature of a G.703 drop port and a slot in the rear panel to house an option module. Each module offers up to four additional data ports.

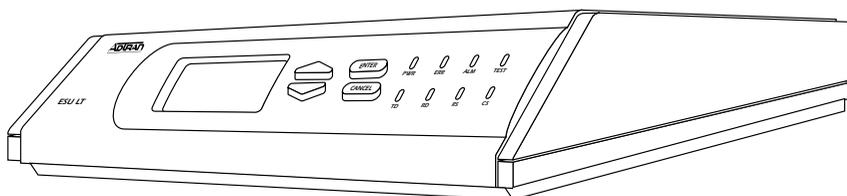


Figure 1-1. ESU LT Unit

The ESU LT serves as the link between user data sources such as local area network (LAN) bridges and routers, computers, CAD systems, and teleconferencing equipment. The amount of bandwidth allocated to the port is user-programmable. The data terminal equipment (DTE) data can occupy contiguous or alternate channels in the E1 stream, and the channels may start at any position.

ESU LT Features

- An E1 interface and an Nx56/64 DTE serial interface port.
- Easy configuration capabilities using simplistic menus displayed in a liquid crystal display (LCD) window operated by a front panel keypad.
- Data port supports V.35, EIA-530, V.36 and X.21 electrical interfaces.
- Selectable timing from the network, the Nx56/64 DTE port, or internally.
- All ones, all zeros, 511, QRSS, and 1:8 test patterns.
- Extensive self-testing and monitoring ensures proper operation.
- Flexible channel allocation (any starting channel and alternate or contiguous).
- Remote management via 8K inband channel or 64K dedicated TS0 (using T-Watch as the network manager).

ESU LT CONFIGURATION APPLICATION

The following example illustrates a possible ESU LT application.

Bridge/Router Application

A bridge or router can be interfaced to the network by using the DTE interface. The bandwidth used is programmable at Nx56 or Nx64 data rates for E1 or FE1 service. The bandwidth can be selected as contiguous or alternate. Figure 1-2 shows a simple bridge application.

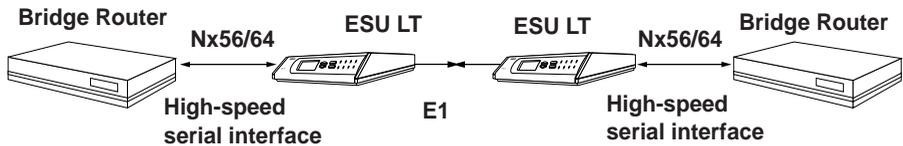


Figure 1-2. Simple Bridge Application on an E1 or FE1 Circuit

UNPACK, INSPECT, POWER UP

Receipt Inspection

Carefully inspect the ESU LT for any shipping damage. If damage is suspected, file a claim immediately with the carrier and then contact ADTRAN Customer Service. If possible, keep the original shipping container for use in shipping the ESU LT back for repair or for verification of damage during shipment.

ADTRAN Shipments Include

The following items are included in the ADTRAN shipment:

- ESU LT unit
- DB-15 to BNC adapter
- ESU LT User Manual
- DB-15 to solid conductor cable

Customer Provides

- DTE cable(s)
- Cable for supervisory port, if used
- Power cable
- Cable for connection to either the 120Ω DB-15 or 75Ω BNC network interface

POWER CONNECTION

Power is supplied to the ESU LT through an IEC-type power connector on the rear of the unit.



Power to the ESU LT must be from a grounded 90-240 VAC, 50/60 Hz power source.

Grounding Instructions

Grounding instruction information from the *Underwriters' Laboratory UL 1950 3rd Edition* is provided in this section. An equipment grounding conductor that is not smaller in size than the ungrounded branch-circuit supply conductors is to be installed as part of the circuit that supplies the product or system. Bare, covered, or insulated grounding conductors are acceptable. Individually covered or insulated equipment grounding conductors shall have a continuous outer finish that is either green, or green with one or more yellow stripes. The equipment grounding conductor is to be connected to ground at the service equipment.

The attachment-plug receptacles in the vicinity of the product or system are all to be of a grounding type, and the equipment grounding conductors serving these receptacles are to be connected to earth ground at the service equipment. A supplementary equipment grounding conductor shall be installed between the product or system and ground that is in addition to the equipment grounding conductor in the power supply cord.

The supplementary equipment grounding conductor shall not be smaller in size than the ungrounded branch-circuit supply conductors. The supplementary equipment grounding conductor shall be connected to the product at the terminal provided, and shall be connected to ground in a manner that will retain the ground connection when the product is unplugged from the receptacle. The connection to ground of the supplementary equipment grounding

conductor shall be in compliance with the rules for terminating bonding jumpers at Part K or Article 250 of the National Electrical Code, ANSI/NFPA 70. Termination of the supplementary equipment grounding conductor is permitted to be made to building steel, to a metal electrical raceway system, or to any grounded item that is permanently and reliably connected to the electrical service equipment ground.

Bare, covered, or insulated grounding conductors are acceptable. A covered or insulated grounding conductor shall have a continuous outer finish that is either green, or green with one or more yellow stripes.

The supplemental grounding conductor shall be connected to the equipment using a number 8 ring terminal. The terminal should be fastened to the grounding lug provided on the rear panel of the equipment. The ring terminal should be installed using the appropriate crimping tool (AMP P/N 59250 T-EAD Crimping Tool or equivalent).

IDENTIFICATION OF REAR PANEL LAYOUT

ESU LT Rear Panel

Figure 2-1 shows the ESU LT rear panel and a description of the components.

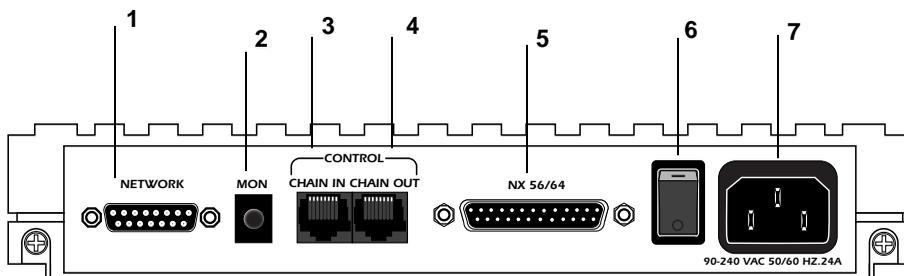


Figure 2-1. ESU LT Rear Panel

Number Identification for ESU LT Rear Panel

#	Name	Description
1	Network	E1-FE1 network interface
2	MON (Monitor)	Bantam test jack
3	Chain-In	Interface of chain-in
4	Chain-Out	Connects to chain-in of another ESU LT
5	Nx56/64	DTE port
6	Power Switch	Used to turn power on or off
7	Power Cord Connector	IEC connector for power cord

ESU LT Interfaces

The ESU LT is equipped with four interfaces:

- E1 Network interface per ITU G.703
- Nx56/64 high-speed, multi-protocol serial interface
- Control input (EIA-232)/Chain port input
- Chain port output

See Figure 2-2 and the following descriptions in this section.

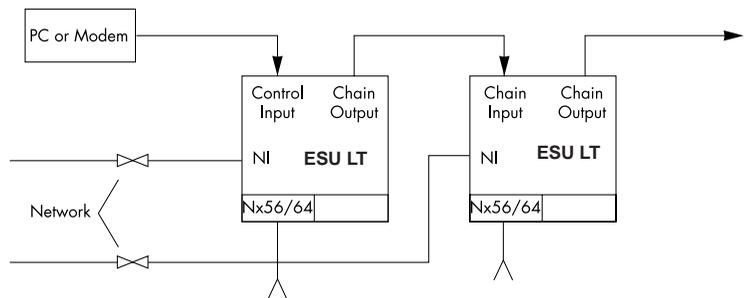


Figure 2-2. ESU LT Interfaces

Network Interface (NI)

The Network Interface (NI) port provides the connection to the E1. This port complies with the applicable ANSI and CCITT standards. Either the 120Ω DB-15 or the 75Ω BNC interface (adapter provided) may be used for the NI. The 75/120 selection must be made with the front panel menus. For more information, see *Wiring* on page 69.

Network Test Interface

The MON test jack provides a bridged access jack for non-intrusive monitoring of the incoming E1.

Nx56/64 Serial Interface

The Nx56/64 provides a serial interface that operates from 56 kbps to 2.048 Mbps. The Nx56/64 can be configured as a V.35, V.36, EIA-530, or V.11 electrical interface through the front panel menus.

Control Port Input

The control port input provides an EIA-232 input from a PC or a modem for control of the ESU LT. You can also use it as a chain input from another ESU LT or ESU 120e. For more information, see *Wiring* on page 69.

Chain Port Output

The chain port output provides an EIA-232 output to chain control to other ESU LTs or ESU 120es. For more information, see *Wiring* on page 69.

POWER UP TESTING AND INITIALIZATION

When shipped from the factory, the ESU LT is set to factory default conditions. At the first application of power, the unit automatically executes self-tests followed by an initialization sequence which sets up the unit.

Self-Test

The self-test checks the integrity of the internal operation of the electronic components by performing memory tests and by sending and verifying data test patterns through all internal interfaces. Although actual user data cannot be passed during these tests, the self-test can run with the network and DTE interfaces in place, without disturbing any external interface.

The self-test automatically executes upon power-up. It can also be commanded from a front panel menu or from the control port.

In addition to the specified self-tests, background tests are run on various parts of the internal electronics. These run during normal operation to confirm continued correct functioning. The background tests include the following:

- Monitoring the phase-locked loop for lock.
- Standard background network performance monitoring.

Table 2-1 on page 27 explains how self-tests work.

Table 2-1. Self-Test Results

Test	Results
Self-Test (power-up or commanded)	<p>The LCD displays ADTRAN ESU LT INITIALIZING, and the LEDs illuminate sequentially.</p> <p>If the self-test is completed with no detected failures, the LCD momentarily displays ALL TESTS PASSED.</p> <p>If a failure is detected during the self-test process, the failure is displayed in the LCD window.</p> <p>The automatic self-test consists of the following tests:</p> <ul style="list-style-type: none"> • Board level tests. • Random access memory (RAM) tests; erasable programmable read only memory (EPROM) checksum. • On-board data path. Sending a known test pattern through an on-board loop. • Unit level tests. • Front panel LED verification. • Phase lock loop verify.

FRONT PANEL OVERVIEW

The ESU LT front panel monitors operation and controls the configuration of the unit. Figure 3-1 shows the ESU LT front panel. Table 3-1 describes each part of the front panel. Front panel operation is more fully described in subsequent pages.

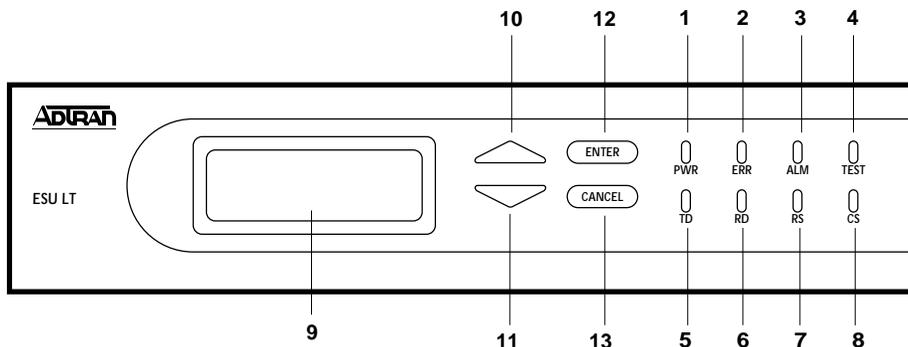


Figure 3-1. Front Panel Layout

Table 3-1. Front Panel Descriptions

Item	Name	Description
1	PWR	LED ON when power is received by ESU LT.
2	ERR	LED ON when errors such as BPV, CRC-4, FAS word or E-bit errors have occurred in the last second.
3	ALM	LED ON when an alarm condition exists.
4	TEST	LED ON when unit is in test mode.
5	TD	LED ON when DTE data is being transmitted.
6	RD	LED ON when DTE data is being received.
7	RS	LED ON when request to send (RTS) active from DTE.

Table 3-1. Front Panel Descriptions (Continued)

Item	Name	Description
8	CS	LED ON when ESU LT has clear to send (CTS) active toward DTE.
9	LCD	A 2X16 LCD window that displays menu items used in configuration and displays information useful in monitoring the unit. It also displays alarm and status information.
Operation Keys		
10 & 11	Up/Down	Up and down arrows scroll through and activate the submenu items available in the current menu. When the submenu items are scrolled, the flashing cursor indicates the active parameters.
12	Enter	Selects active menu items. To select a menu item, press the number of the item. The menu item flashes, indicating it is activated. Press ENTER to select the menu item.
13	Cancel	Press CANCEL to stop the current activity and return to the previous menu. Repeat until the appropriate menu level is reached. When a submenu item is displayed, press CANCEL to exit the current display and return to the previous menu.

FRONT PANEL MENU STRUCTURE AND OPERATION

Menu Structure

The ESU LT uses a multilevel menu structure containing both menu items and data fields. All menu operations and data are displayed in the LCD window.

The opening menu is the access point to all other operations. Each Main menu item has several functions and submenus to identify and access specific parameters. The menu items are numbered and can be viewed by scrolling with the up and down arrows. (Menu operation is discussed on page 31.)

The front panel LCD of the Main menu contains four options: **STATUS**, **CONFIG**, **UTIL**, and **TEST**.

Status

The **STATUS** menu displays all relevant information for the network and DTE interfaces. For detailed information on status options, see *Status Menu* on page 35.

Config (Configuration)

The **CONFIGURATION** menu displays and sets the ESU LT operational configuration, including all network interface parameters, the allocation of the TS0s, and the port parameters. For detailed information on configuration options, see *Configuration Menu* on page 41.

Util (Utilities)

The **UTILITY** menu displays and sets system parameters. For detailed information on utility options, see *Utility Menu* on page 53.

Test

The **TEST** menu initiates different types of unit tests and displays test results in the LCD window. For detailed information on test options, see *Test Menu* on page 57.

Menu Operation

To choose menu items, place the cursor on the appropriate menu item by pressing the number corresponding to the menu item or highlighting the menu item with the up and down arrow (also see Table 3-1 on page 29). All fields followed by a colon (:) are editable. Menu fields followed by an equal sign (=) cannot be edited; these fields are used for display only. As an example, Table 3-2 describes how to activate the **NETWORK** menus from the **CONFIG** Menu.

Table 3-2. Activating the Network Menus from the Config Menu

Step	Action
1	Use the up and down arrows to place the cursor on the appropriate menu item (in this example CONFIG). See Figure 3-2 on page 32.
2	Place the cursor on the number 2 and press Enter . The unit responds by displaying the first two available submenu fields. The cursor is on the first field. If there are more than two menu fields, a down arrow is visible on the lower right corner. See Figure 3-3 on page 32.

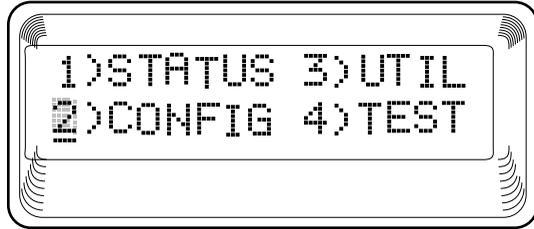


Figure 3-2. Cursor on Menu Item

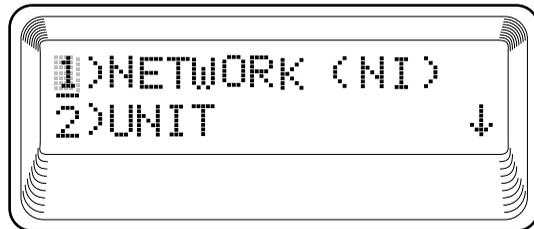


Figure 3-3. Submenu Fields

Editing Data Fields

You can edit data fields preceded by a colon (:). Table 3-3 describes using the front panel keys to edit data fields.

Table 3-3. Editing a Data Field

Step	Action	Result
1	With the cursor positioned on the submenu item number, press ENTER .	The cursor moves to the data field, (to the right of the submenu item name).
2	Using the arrows, scroll to scan the available value settings.	The value settings display one at a time in the data field position.
3	When the appropriate value is displayed in the data field position, press ENTER to set that value.	When the value is set, the cursor moves back to the submenu item position, indicating the operation is complete.

Table 3-3. Editing a Data Field

Step	Action	Result
4	Select another submenu field or press CANCEL to return to the submenu.	Pressing CANCEL prior to pressing ENTER voids any data changes. The original data value is restored and the cursor returns to the submenu field.

Exiting Menu Field Operation Or Display

Press **CANCEL** as many times as required to return to the appropriate menu level.

Alternate Methods of Control

T-Watch PRO Management Software Program

T-Watch PRO is the ADTRAN management software program that allows the user to control the ESU LT from a PC. It provides complete control over the configuration of the ESU LT using a graphic interface. The T-Watch PRO program displays the same status and performance data as the front panel LCD. This data is displayed as tables and graphs.

The T-Watch PRO program has the following capabilities:

- Interfaces with a modem which permits dialing into a remote ESU LT location to configure the unit or read the unit's status or performance.
- The performance data read from the units can be exported into a file which is compatible with common spread sheet programs.

STATUS

The **STATUS** menu branch allows you to view the status of the ESU LT operation. See Figure 4-1.

		RESET PERF CNTRS	
		%AS	
		%EF	
	1) NI PERF RPTS	ES	
	2) CURR ERR/ALM	BES	LOSS OF SIGNAL
		SES	LOSS OF FRAME
		DM	LOSS OF TS16 MF
		UAS	LOSS OF CRC-4
1)STATUS	3) ERR/ALM HIST	CLEAR HISTORY	AIS RECEIVED
		LOSS OF SIGNAL	TS16 AIS RCVD
		LOSS OF FRAME	REMOTE ALARM
		LOSS OF TS16 MF	REMOTE MF ALARM
		LOSS OF CRC-4	EXT CLOCK ALARM
		OUT OF FRAME	BPV/CV RCVD
		AIS RECEIVED	FAS WORD ERROR
		TS16 AIS RCVD	E-BIT ERROR
		REMOTE ALARM	PLL ALARM
		REMOTE MF ALARM	
		EXT CLOCK ALARM	
		BPV/CV RCVD	
		FAS WORD ERROR	
		E-BIT ERROR	
		PLL ALARM	

Figure 4-1. Status Menu

NI PERF RPTS

The Network Interface Performance Reports display the user's copy of the performance data. The ESU LT maintains this performance data on the network based on G.821. The data displayed is data accumulated over the last 15 minutes and over the last 24 hours.

These fields cannot be edited, only cleared as previously discussed. Only the user copy of performance data is cleared. See Figure 4-2. Continue with standard operating procedures to exit the display.

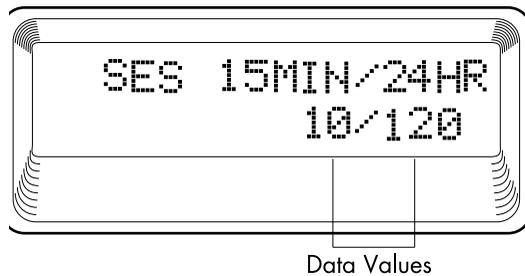


Figure 4-2. Severely Errored Seconds Screen

Reset Perf CNTRS

Resets the user's copy of the performance data.

%AS

Percentage of available seconds.

%EF

Percentage of error-free seconds.

ES

Number of errored seconds (1 or more errors/second).

BES

Between 2 and 832 errored/seconds.

SES

Number of severely errored seconds (more than 832 CRC errors/sec., approximately equivalent to a bit error rate of 1×10^{-3} .)

DM

Number of minutes with bit error rate 1×10^{-6} .

UAS

Number of unavailable seconds (10 or more consecutive seconds).



Since only the user's copy of performance data is cleared by the ESU LT, the data displayed here might be different from the data being sent to the network as performance report message (PRM) data.

CURR ERR/ALM

The **CURRENT ERROR/ALARM** menu is used for viewing currently Active/Inactive errors and alarms (see Figure 4-3).

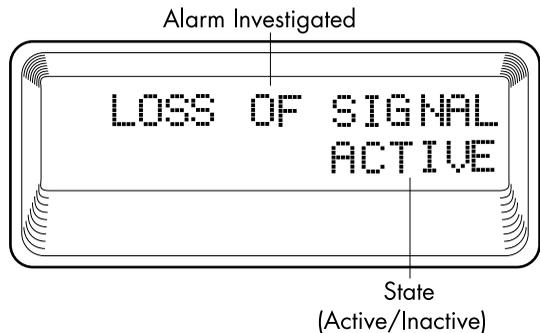


Figure 4-3. Loss of Signal (Current Errors/Alarms) Screens

The up and down arrows are used to access the complete display of the errors/alarms that are currently active.

Alarms and Errors

The following alarms and errors can be displayed.

LOSS OF SIGNAL

No signal detected at NI.

LOSS OF FRAME

NI unable to frame align with incoming FAS /NFAS framing pattern. Remote Alarm (Bit 3 of NFAS word) is transmitted out the network interface.

LOSS OF TS16 MF

NI unable to sync on TS16 multiframe signal. Valid only when CAS/TS16 framing enabled. Remote Multiframe Alarm is transmitted out the network interface.

LOSS OF CRC-4

NI unable to sync on CRC-4 multiframe signal. Valid only when CRC-4 framing is enabled. Remote Alarm is transmitted out the network interface.

AIS RECEIVED

Unframed ones being received at network interface.

TS16 AIS RCVD

Unframed ones being received in TS16 on network interface. Remote Multiframe Alarm transmitted out network interface.

REMOTE ALARM

Remote alarm signal (Bit 3 of NFAS word) being received at network interface.

REMOTE MF ALARM

Remote multiframe alarm signal (Bit 6 of TS16 for three consecutive multiframes) being received at network interface.

EXT CLOCK ALARM

No external clock at DTE.

BPV/CV RCVD

Indicates that a bipolar violation has occurred when set for AMI line coding. Indicates that a code violation has occurred when set for HDB3 line coding.

FAS WORD ERROR

Indicates word errors have occurred in the Frame Alignment Signal.

E-BIT ERROR

Indicates that a Far End Block Error (FEBE) has occurred. This is reported by the first bit of frames 13 and 15 on E1 lines that are configured for CAS with CRC-4.

PLL ALARM

Unable to sync up to selected clock.

ERR/ALM Hist

The **ERROR/ALARM HISTORY** menu is used for viewing history of errors and alarms. If an alarm has occurred since the last **CLEAR HISTORY** selection, the menu is *active*. If the condition has not occurred, the menu is *inactive* (see Figure 4-4).

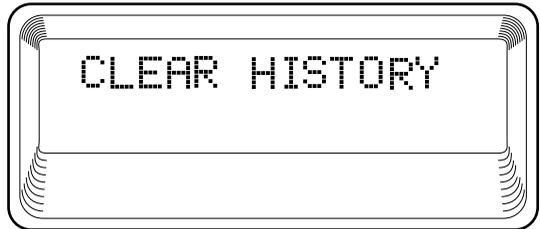


Figure 4-4. Clear History Screen

These conditions are the same as for the **CURR ERR/ALM** submenu except that these are *history* Alarm/Errors instead of *current* Alarm/Errors.

CONFIG

The **CONFIGURATION** menu is used to set the ESU LT operational configuration, including all of the network interface parameters and the allocation of the time slots and the port parameters. See Figure 5-1.

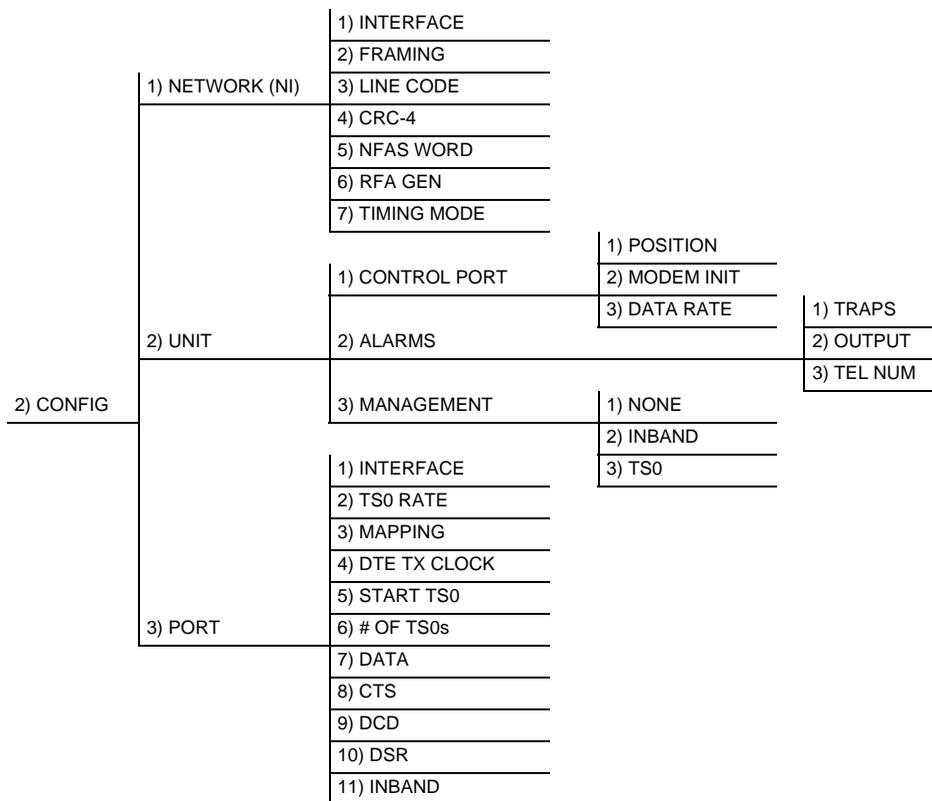


Figure 5-1. Configuration Menu

Network (NI)

This menu is used to access the configuration of parameters associated with the network interface in the ESU LT. There are seven submenu items that include setting the framing type, the line code, and the clock source. See Figure 5-2.



Figure 5-2. Network Submenu

The fields and parameters available are listed in the following sections.

Interface

Selects either the 120Ω DB-15 interface or the 75Ω BNC interface. The DB-15 to BNC adapter must be used for 75Ω operation.

Choices: **120Ω BAL**; **75Ω BAL**; **75Ω UNBAL**

NOTE

*In **75Ω UNBAL** mode, both Tx and Rx are shield grounded.*

Framing

The ESU LT can operate in three different framing modes: Common Channel Signaling (**CCS**), Channel Associated Signaling (**CAS**), or **UNFRAMED**.

CCS

CCS uses a 7-bit pattern called the Frame Alignment Signal (FAS) to establish and maintain frame synchronization. The FAS word is located in timeslot 0 of even frames. Odd numbered frames may contain the Not FAS word (NFAS) in timeslot 0. The ESU LT can be configured to require the NFAS word for frame sync.

In CCS mode, there are 31 channels (timeslots 1-32) available for user data. Timeslot 16 cannot be used to carry signaling information in this mode.

CAS/TS16

CAS, also known as timeslot 16 multiframing, requires a multiframe alignment signal to be present for frame sync. The Multiframe Alignment Signal (MFAS) is inserted into the 16th timeslot of frame 0 of the 16-frame multiframe. The MFAS word consists of four zeros, an unused bit, the multiframe alarm bit and two more unused bits. Frames 1 through 15 carry the A,B,C and D bits for timeslots 1-15 and 17-32.

The ESU LT is designed for data transmission; therefore, the signaling bits used for voice traffic are set to **ALL ONES**.

In CAS mode, there are 30 channels available for user data. If timeslot 16 is included in the unit's mapping, it will be disregarded. For example, if the starting TS0 is set to 1 and the number of TS0s is set to 20, user data will be mapped to timeslots 1 to 15 and 17 to 21.

UNFRAMED

The ESU LT can operate in unframed mode. In this mode, user data is inserted into all 32 channels of the E1 stream. Since the object of running without framing is to utilize the full bandwidth of the E1 line, the starting TS0 and number of TS0s option settings are ignored.

Other option settings that have no effect in unframed mode include: **CRC4, NFAS WORD, RFA GEN, AUTO DTE TX CLK, MAPPING, DATA INVERT, INBAND.**

Choices: **CCS; CAS/TS16; UNFRAMED**

Line Code

Selects either Alternate Mark Inversion (**AMI**) or High Density Bipolar Order 3 (**HDB3**) line coding. **AMI** provides a 12.5% minimum ones pulse density and alternates signal polarity of transmitted ones from positive to negative. **HDB3** is an extension of **AMI** that inserts a bipolar violation (signal of the wrong polarity) whenever there are 4 or more transmitted zeros.

Choices: **HDB3**; **AMI**

CRC-4

When enabled, the CRC-4 checksum bits are transmitted in the outgoing E1 data stream. Also the received signal is checked for errors. CRC-4 can be enabled in both CCS and CAS modes. A CRC-4 checksum cannot be sent in unframed mode.

Choices: **ENABLE**; **DISABLE**

NFAS Word

If enabled, the network interface receiver requires the NFAS word (time slot 0 in odd frames) and the FAS word (time slot 0 in even frames) for frame sync. When disabled, only the FAS word is needed for frame sync.

Choices: **ENABLE**; **DISABLE**

RFA Gen

When enabled, remote frame alarm is transmitted toward the network during alarm.

Choices: **ENABLE**; **DISABLE**

Timing Mode

Selects the clock source for transmission toward the network from the NI.

Choices: **NETWORK**; **INTERNAL**; **DTE**



The clocking option selected always designates the clock source for transmission. Clocking necessary for receiving data is always recovered from incoming data.

Network Timing

The network is the source of timing. The received data clocking is looped back to the network where it is used to determine the transmission timing. This option is also referred to as looped timed as the transmission clock is derived from the received clock. See Figure 5-3.

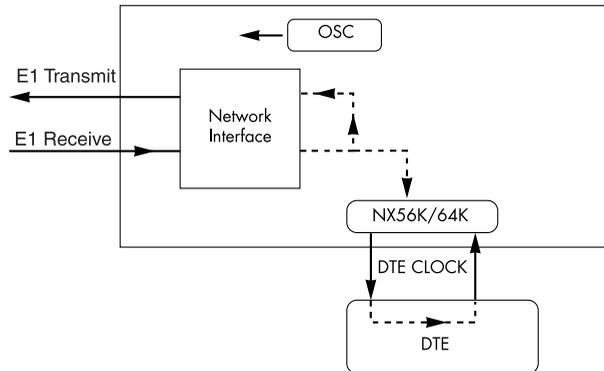


Figure 5-3. Network Timed Clock Source

Internal Timing

The ESU LT is the source of timing. The ESU LT is configured to use its own internal oscillator as the source of timing. Applications include private line driver circuits where one end is set to network and the other to internal. See Figure 5-4.

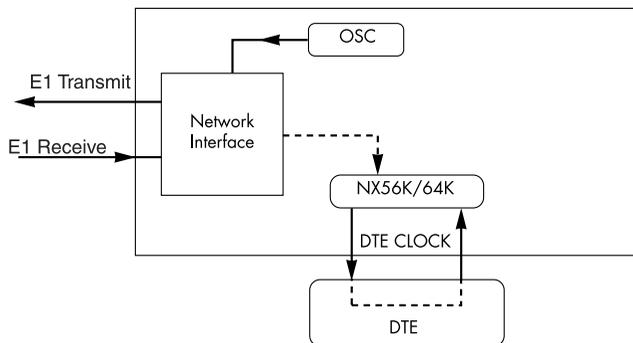


Figure 5-4. Internal Timing Clock Source

DTE Timing

The DTE is the source of timing. The ESU LT uses the incoming DTE clock to determine the transmission timing. This is typically used in applications such as limited distance line drivers, where it is necessary to have the DTE as the primary clock source. See Figure 5-5.

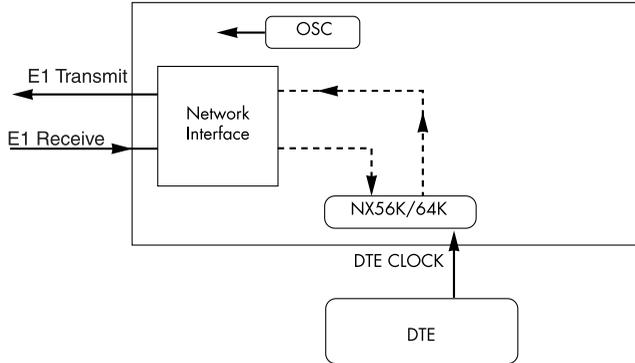


Figure 5-5. DTE Clock Source

Unit

The **UNIT** submenu is used to change control port and alarm options, and to select the management channel.

Follow standard operating procedure to access the **UNIT** Menu items. See Figure 5-6.

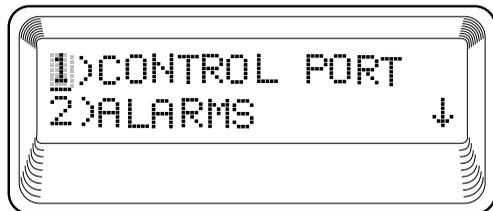


Figure 5-6. Unit Submenu

CNTRL Port

Used to set the unit up as the master or slave on a chain of units, and to initialize a modem and the control port data rate. Sets baud rate for communications with PC or modem.

Position

Determines whether this ESU LT is at the head of a chain of units (directly connected to the modem or PC). The head of the chain is referred to as the master unit. Units down the chain are referred to as slaves or a slave unit. The setting of the **POSITION SELECTION** is necessary only when using a modem, in which case the head unit should be **MASTER**. For all other cases, select **SLAVE**. (The master is in charge of control of the modem.)

Choices: **MASTER**, **SLAVE**

Modem Init

The ESU LT can initialize a modem. This menu selection is used to perform this initialization and should be selected only when the ESU LT is serving as the **MASTER** unit. Prior to modem initialization, it should be physically connected to the ESU LT and the power turned on. At this point, an industry-standard AT command string is used to initialize the modem. The string is also used following future power-up sequences.

Choices: **ENA**; **DISA**

Data Rate

Selects the data rate for the control port. This should be consistent with all units on a chain and with the modem and/or PC serial port.

Choices: **1200**; **2400**; **9600**

Alarms

Used to initialize the method by which the control port handles alarm conditions.

Traps

Determines whether alarm conditions should automatically send alarm messages (traps) to the controlling PC. The setting is for this unit, or for slaves if this unit is a master.

Choices: **ENA**, **DISA**

Output

Selects whether the alarm traps (if enabled) are sent directly, or whether the telephone number stored in the ESU LT should be dialed first (industry-standard AT dial command sent to modem).

Choices: **DIRECT**, **DIAL**

Tel Num

This is the telephone number which is dialed to obtain alarm traps. The string can be up to 20 characters in length and is terminated with a semicolon (;) as the last character. A colon (:) character is used to represent a pause in the dial string.

For example, for number 9:5551212; dial 9, pause momentarily, and then dial 5551212. This pause could be necessary to access an outside line, such as a PBX.

When editing a specific character, the arrows are used to scroll from 0 to 9, then colon (:) and semicolon (;). The new telephone number is entered into the ESU LT only upon pressing **Enter** after typing the semicolon.

Choices: 20 digits (0-9, :, and ;)

**NOTE**

*The typed digits are accepted only after pressing **Enter**.*

Management

Selects the management channel. Units with firmware revision D or greater can choose between a 64 kbps TS0 management channel, or the existing 8 kbps inband channel. This would be used for remote management applications, such as using T-Watch PRO to send and receive configuration across an E1 span to a remote unit. For units with firmware less than revision D, the inband channel can be turned on or off from the port configuration menu.

None

Indicates that neither the inband channel nor the TS0 management channel is utilized.

Inband

Selects the 8K Inband Channel as the management channel. When this option is selected, the first time slot occupied operates in 56K mode and the DTE clock rate is reduced by 8 kbps. This channel can be configured to always on (**NORMAL**), or active only when traffic is present (**AUTO**). If the channel is configured for **AUTO** and no T-Watch PRO activity is detected for 10 minutes, the Inband Channel is deactivated. This option is selected in the port configuration menu.

The 8 kbps channel is only taken out of the first time slot. If two 64K TS0s are mapped, the DTE rate would be 120 kbps instead of 128 kbps.

The Inband Channel is not available in unframed mode.

TS0

Selects a full 56/64K TS0 as the management channel. The management channel is automatically allotted to the first active TS0, and the DTE clock rate decreases by either 56K or 64K (depending on the Nx configuration). For example, on a full E1 circuit with TS0 management enabled, channel 1 is the management channel and the DTE clock rate will drop from 1984K to 1920K.

On a fractional E1 with channels 3 and 4 mapped and TS0 management enabled, channel 3 will be the management channel and the DTE clock rate would drop from 128K to 64K.

TS0 management is not available in unframed mode.

Port (Port Configuration)

The menu item **PORT** is used to select and then to configure the parameters associated with the high-speed serial interface.

Interface

This option sets the electrical interface for the Nx56/64 port.

TS0 Rate

This sets the base rate of the interface. The actual data rate depends on the number of time slots used.

Choices: **56K**; **64K**

Mapping

This sets the unit to use alternate or contiguous channels in the E1 data stream. If more than 16 channels are used in CCS mode, contiguous must be used. If more than 15 channels are used in CAS mode, contiguous must be used. If other than a private network is used, the carrier must be notified of this choice.

Choices: **ALT** (alternate); **CONT** (contiguous)

DTE TX Clock

Controls the clock used by the ESU LT to accept the transmit (TX) data from the DTE. Most applications will allow for this to be set to **INTERNAL**. If the interface cable is long (causing a phase shift in the data), the clock can be selected as **INT/INV** (Internal/Inverted). This switches the phase of the clock, thus compensating for a long cable.

The factory default setting for this option is **AUTO**. The **AUTO DTE TX CLK** setting will allow the ESU LT to automatically detect the delay from the DTE device to the ESU LT and set the proper phase of the clock. **AUTO DTE TX CLK** is not available in unframed mode.

This feature will automatically select between the **INTERNAL** and **INT-INV** settings. If the DTE provides a clock with TX data, the clock selection is set to **EXTERNAL**. The ESU LT will depend on an externally supplied clock to accept the Tx data.

Choices: **INTERNAL**; **INT-INV**; **EXTERNAL**; **AUTO**

Start TS0

Used to select the time slot in which the E1 data stream will start. In CAS mode, time slot 16 may not be used as the starting time slot. This option setting is ignored in unframed mode since all time slots are automatically used.

Choices: CCS mode (all TS0s - **01** to **31**);

CAS mode (all TS0s except **16**)

Number of TS0s

Used to select the number of time slots to be used. The DTE rate will be this number times 56K or 64K, depending on the TS0 rate setting (see *DTE Data Rate Chart* on page 67). This option setting is ignored in unframed mode since all time slots are automatically used.

Choices: CCS mode (**01** to **31**);
CAS mode (**01** to **30**)

Data

Used to control the inverting of the DTE data. This inversion can be useful when operating with an HDLC protocol. This is often used as a means to ensure ones (1s) density. ESU LTs on both ends of the circuit must have this option configured the same way. This option is ignored in unframed mode.

Choices: **NORMAL**; **INVERT**

CTS

Used to control characteristics of CTS.

Choices: **NORMAL** (see Table 5-1); **FORCE ON**

DCD

Data Carrier Detect - Indicates to the DTE when a valid signal is being received at the Network Interface.

Choices: **NORMAL** (see Table 5-1); **FORCE ON**

DSR

Data Set Ready - This signal indicates to the DTE when the DCE is turned **ON** and ready for operations.

Choices: **NORMAL** (see Table 5-1); **FORCE ON**

Table 5-1. Normal Mode Operation for Port Control Signals

NORMAL MODE OPERATION							
Conditions which cause the Port Control Signals to be deactivated							
SIGNAL	RTS	V.54 LOOP BK	511 TST ON	SELF-TEST ACTIVE	NETWK TEST ACTIVE	NO TS0 MAPPED	NETWORK ALARM
CTS	Follows	OFF	OFF	OFF	OFF	OFF	OFF
DCD	—	—	—	OFF	—	OFF	OFF
DSR	—	OFF	OFF	OFF	OFF	OFF	—
Where "—" = don't care							

Inband

If Inband is selected as the management channel, set to **NORMAL** or **AUTO**.

In **NORMAL** mode, the channel is always enabled.

In **AUTO** mode, the channel is enabled only when commands are sent from T-Watch PRO. After 10 minutes of idle activity, it is disabled.

Utility Menu

UTIL

The **UTILITY** menu is used to view and to set system parameters. See Figure 6-1. This includes setting the time and date, resetting all parameters to factory values, and re-initialize the unit. This menu is also used to view the unit's software revision and the unit ID setting.

3) UTIL	1) TIME/DATE	TIME: HH:MM:SS DATE: MM/DD/YY
	2) SOFTWARE REV	Displays current software revision
	3) REINIT UNIT	
	4) ADDRESS	
	5) SET PASSCODE	
	6) KEYPAD	
	7) FACT RESTORE	Returns all configurations to factory settings

Figure 6-1. Utility Menu

Time/Date

TIME/DATE is used to view or to edit the current time and date. The time and date are maintained during power off conditions (see Figure 6-2). To edit the date and time, follow the steps outlined in Table 6-1.

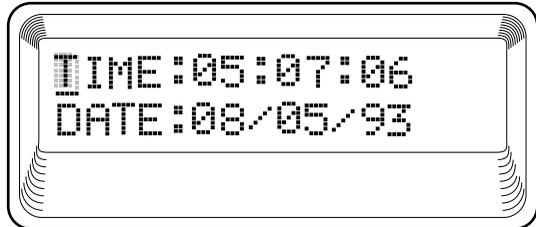


Figure 6-2. Time/Date Screen

Table 6-1. Editing the Time/Date

To....	Do this...
Record the entry and move to the next editing position	Press Enter (after any numeric change).
Move to the next editing position or field	Press Enter without making any changes at the cursor. Press the up and down arrow keys.
End the editing process	Press Cancel .

Software Rev

Use the **SOFTWARE REVISION** submenu to access the display of the current software revision level. This information is required when requesting assistance from ADTRAN Customer Service or when updates are needed.

Reinit Unit

The **REINIT UNIT** submenu is used to reinitialize the unit. This menu item *is not* used to restore the factory default settings for all parameters.

Address

ADDRESS is used to access the current **UNIT ADDRESS** setting. Unit identification numbers must be between 000 and 256. See Figure 6-3.

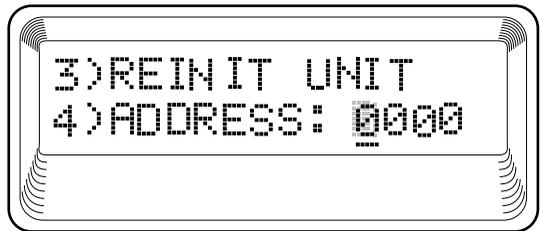


Figure 6-3. Address Screen

Set Passcode

SET PASSCODE allows a passcode to be set for T-Watch PRO and keypad lockout. When the keypad is locked, the LCD will display???? in place of the passcode.

Keypad

Allows the user to lock or unlock the front panel keypad. This feature keeps the unit configuration from being changed by unauthorized personal.

When the keypad is **LOCKED**, option settings can be viewed but not changed. The user-selected passcode is not required to lock the keypad.

When **UNLOCKED** is selected, the user is required to enter the four-digit passcode. If an incorrect passcode is entered, the unit will remain locked.

Fact Restore

The **FACTORY RESTORE** submenu is used to restore the factory default setting for all unit parameters. This restores all parameters to the factory settings.

TEST

The **TEST** menu is used to initiate different types of tests and to view test results (see Figure 7-1). Test results are displayed in the LCD window.

 **NOTE** *Test execution will disrupt some of the normal operation. See individual menu items concerning tests before executing.*

				NO LOOPBACK
		1) LOCAL LOOPBK		LINE ON
				PAYLOAD ON
		2) REMOTE LOOPBK	NO LOOPBACK	
			FE1 LOOPBACK	NO PATTERN
4) TEST	1) NETWORK TESTS			1:8 ALL TS0s
		3) TEST PATTERN		QRSS ACT. TS0s
		4) CLR ERRS (displays results)		511 ACT. TS0s
		5) INSERT QRSS or 511 ERRORS		ALL ZEROS
				ALL ONES
	2) RUN SELFTEST	(Displays results)		
	3) PORT TESTS	1) DTE LOOPBK:	ON	
			OFF	
	4) CANCEL TESTS			

Figure 7-1. Test Menu

Network Tests

Network tests are used to control the activation of loopbacks and the initiation of data test patterns.

The network tests are run on the network interface (NI). Three different test configurations can be selected to determine the type of loopback and the pattern to run. Test results are displayed in the LCD window. See Figure 7-2.

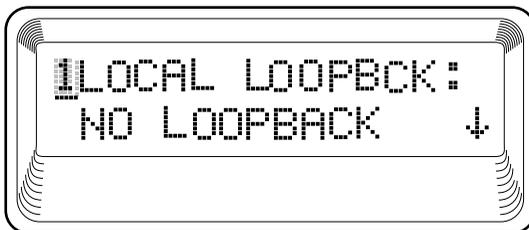


Figure 7-2. Local Loopback Screen

Loopback Tests

A number of different loopbacks can be invoked locally from the front panel, by T-Watch commands, or remotely by using special in-band codes (AT&T D4 network loop-up and loopdown codes). Additionally, the loopbacks can be remotely controlled by means of out-of-band commands by the E1 ESF FDL or from T-Watch PRO via a modem connection.

Network Interface Loopbacks

Network interface loopbacks affect the entire E1 data stream (see Figure 7-3 on page 59). The two types of network loopbacks are described below.

Line Loopback

Loops all of the received data back toward the network. The transmitted data is the identical line code that was received, including any bipolar violations or framing errors.

Payload Loopback

Similar to line loopback, except that the framing is extracted from the received data and then regenerated for the transmitted data.

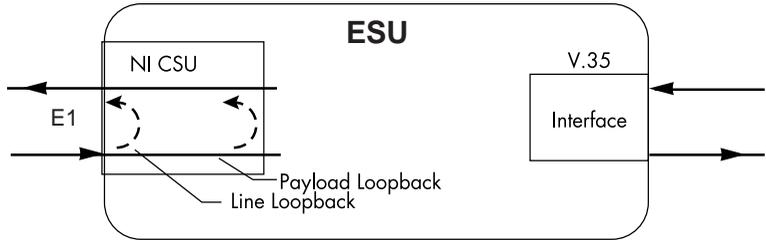


Figure 7-3. Network Loopback Tests

DTE Interface Loopbacks

The Nx56K/64K serial interface offers a DTE loopback. See Figure 7-4.

DTE Loopback

Loops all data from the DTE back towards the DTE. This loopback may be initiated by using the front panel or T-Watch PRO commands. The DTE (or the external test equipment) must provide a test pattern to check the DTE interface.

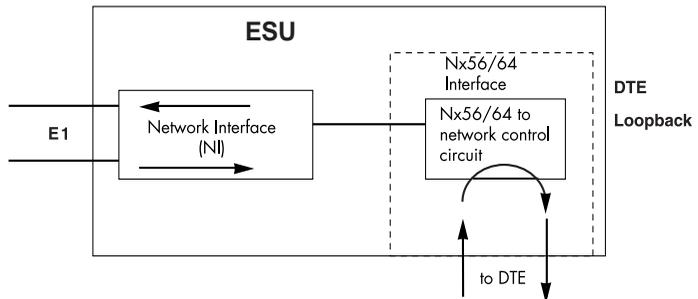


Figure 7-4. DTE Interface Loopback

LOCAL LOOPBK

There are three choices available for setting the local loopback:

No Loopback

Deactivates the loopback.

Line On

Activates the line loopback.

Payload On

Activates the payload loopback. The payload loopback is not supported in unframed mode.

REMOTE LOOPBK

No Loopback

Deactivates the loopback.

FE1 Loopback

FE1 loopback sends V.54 loopback code in all mapped TS0s toward the network. The far end unit will respond by initiating a local line loopback. This loopback is not available when operating in unframed mode.

TEST PATTERN

Sets the pattern for the test and initiates the transmission of the pattern. There are four patterns available. The test is terminated by selecting **NO PATTERN**.

1:8 ALL TS0s

The 1:8 is a stress pattern which places the maximum number of 0s in the transmitted data. This is always done over all time slots.

This pattern is used in conjunction with external test equipment to determine if the E1 line is performing acceptably under a stress condition. Each channel of the E1 has only one bit set.

QRSS ACT TS0s

The ESU LT has an internal QRSS pattern generator and detector. The pattern only appears in the TS0s assigned to the Nx56K/64K port. The QRSS test pattern can be used in conjunction with network loopbacks to perform end-to-end tests.

511 Active TS0s

The 511 pattern is generated and checked by the Nx56K/64K serial interface. It only appears in the TS0s assigned to the Nx56K/64K port.

When used in conjunction with the payload loopback at the far end, an end-to-end integrity check can be made on the DTE ports.

All Zeros

Generates an all zero's pattern in every channel.

All Ones

Generates an all one's pattern in every channel.

CLR ERRORS

CLR ERRORS has two functions.

1. To clear out the 511 error total when you press **Enter**.
2. To display a total of the 511 errors. If 511 errors are being received, the display is updated accordingly. See Figure 7-5.

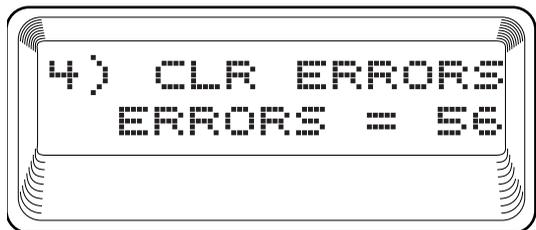


Figure 7-5. Clear Errors Screen

This menu function is very useful for testing end-to-end integrity of the network. First loop up the far end ESU LT. Then send a 511 pattern from the local ESU LT. The **CLR ERRORS** screen can then be used to determine if the link is functioning properly by verifying that no errors are being counted.

INSERT QRSS OR 511 ERRORS

When running a 511 or QRSS pattern test, press **ENTER** to insert an error into the pattern.

Run Self-test

This menu selection is used to execute an internal self-test. This is the same self-test that is performed automatically at power up. The results of the self-tests are displayed in the LCD. Upon invoking the command, the LCD displays **INITIALIZING** and test failures are displayed in the LCD window (see Figure 7-6). The following board-level tests are performed during self-test.

Order	Test
1	RAM tests; EPROM checksum
2	On-board data path; sending a known test pattern through an on-board loop
3	Front panel LED verification
4	Phase lock loop verify If a failure is detected, note the failure number and contact ADTRAN Technical Support.



Executing self-test disrupts normal data flow and prevents remote communication until the self-test is completed (approximately 15 seconds).

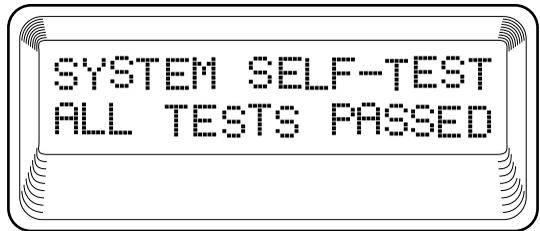


Figure 7-6. Self Test Results Screen

Port Tests

Port Tests are used to control the activation of a DTE loopback. This test loops data received at the high-speed serial interface back towards the DTE. See Figure 7-7.

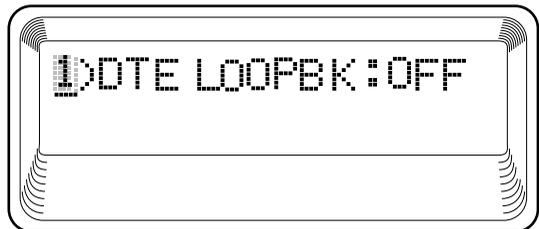


Figure 7-7. Loopback Setting Screen

Cancel Tests

Use to deactivate all active tests.

TESTING EXAMPLES

Before using the ESU LT to pass data, ADTRAN recommends running tests on the circuit. Testing consists of sending a test pattern from end-to-end and checking for errors in the pattern. There are two types of tests used to accomplish this:

- Loop-up the far end and then send a test pattern.
- Send a test pattern from both ends and check at both ends.

Far End Looped Back Test

E1 CSU/DSUs should respond to a loop-up code sent over the E1 circuit. The remote unit will “loop” the network interface providing a path for data from the local unit over the circuit and back again. Sending a known test pattern over this loop and checking for errors verifies circuit connectivity. The following example loops the remote unit and sends 511 or QRSS pattern through the data path. Use the 511 or QRSS test pattern with any E1 configuration (regardless of the channel configuration) because 511 and QRSS are always sent in the occupied channels. (See *Test Menu* on page 57 for a complete **TEST** menu tree.) Complete the steps outlined in Table 8-1 on page 66 to loop-up the remote E1 CSU/DSU and send a test pattern.

Table 8-1. Initiating a Remote Loopback

Step	Action
1	Select TEST from the main menu.
2	Use the up and down arrows to place the cursor on TEST and press Enter to select.
<i>Result: The first two TEST submenu items display.</i>	
3	Using the up and down arrows, place the cursor on NETWORK TESTS .
4	Press Enter to enter the NETWORK TEST menu.
<i>Result: Beginning display of the submenu items. Each menu item can be selected with the up and down arrows.</i>	
5	Use the up and down arrows to place the cursor on REMOTE LOOPBK .
6	Press Enter to select FE1 Loopback.
7	Use the up and down arrows to select TEST PATTERN .
8	Press Enter again to activate the TEST PATTERN submenu.
9	Use the up and down arrows to select 511 ACT TS0s . (QRSS ACT TS0s is also an available test pattern.)
10	Press Enter to activate the selection.
<i>Result: The ESU LT always checks for 511 errors. The results of this check are shown under submenu item 4.</i>	

When you have finished viewing the results, complete the following steps to return the ESU LT to normal operation:

Step	Action
1	Press Cancel to return to submenu item TEST PATTERN .
2	Select No PATTERN to terminate the test and the 511 pattern generation.
<i>Result: The far end remains in loopback until the network REMOTE LOOPBK is set to No LOOPBACK under submenu item REMOTE LOOPBK.</i>	

DTE Data Rate Chart

The DTE data rate chart is shown in Table A-1.

Table A-1. DTE Data Rate vs. TS0s

# OF TS0s (N)	DTE RATE=56K	DTE RATE=64K
N=1	56K	64K
N=2	112K	128K
N=3	168K	192K
N=4	224K	256K
N=5	280K	320K
N=6	336K	384K
N=7	392K	448K
N=8	448K	512K
N=9	504K	576K
N=10	560K	640K
N=11	616K	704K
N=12	672K	768K
N=13	728K	832K
N=14	784K	896K
N=15	840K	960K
N=16	896K	1024K
N=17	952K	1088K

Table A-1. DTE Data Rate vs. TS0s (Continued)

# OF TS0s (N)	DTE RATE=56K	DTE RATE=64K
N=18	1008K	1152K
N=19	1064K	1216K
N=20	1120K	1280K
N=21	1176K	1344K
N=22	1232K	1408K
N=23	1288K	1472K
N=24	1344K	1536K
N=25	1400K	1600K
N=26	1456K	1664K
N=27	1512K	1728K
N=28	1568K	1792K
N=29	1624K	1856K
N=30	1680K	1920K
N=31	1736K	1984K
N=32	1792K	2048K

WIRING

Network interface Connector

The network connections are as follows:

Connector Type 15-pin female D connector

Table B-1. Network Pinouts

Pin	Name
1	Tx data (output)
2	Frame ground
3	Rx data (input)
4	Frame ground
5	Frame ground
7	Frame ground
9	Tx data (output)
11	Rx data (input)
6,8,10,12, 13,14,15	Not Used

Control-In/Chain-In

Use this as an EIA-232 port for connection to a computer or modem (chain-in) or another ESU (chain-out). See Table B-2 for the pin assignment for this connector.

Connector Type RJ-48

Table B-2. Control-In/Chain-In Pin Assignments

Pin	Name	Description
1	GND	Ground connected to unit chassis.
2	UNUSED	—
3	RXDATA	Data received by the ESU.
4	UNUSED	—
5	TXDATA	Data transmitted by the ESU.
6	UNUSED	—
7	RI	Ring indicate from modem.
8	UNUSED	—

Chain-Out

Use this to connect to another ESU LT chain-in connector. The pinout for this connector is shown in Table B-3.

Connector Type RJ-48

Table B-3. Chain-Out Pin Assignments

Pin	Name	Description
1	GND	Ground-connected to unit chassis. Connect to GND of next unit (pin 1).
2	UNUSED	—
3	TXDATA	Data transmitted to chained units by the ESU. Connect to RX DATA of the next unit (chain-in pin 3).
4	UNUSED	—
5	RXDATA	Data received from chained units by the ESU. Connect to TX DATA of the next unit (chain-in pin 3).
6,7,8	UNUSED	—

Data Port Interface

Connector Type 25-pin female D connector

Table B-4. Nx56/64 Pin Assignments for EIA-530 and V.36

Pin	EIA/CCITT	Description	Source
1	Shield		–
2	BA (A)/103	Transmitted Data (TD-A)	DTE
3	BB (A)/104	Received Data A (RD-A)	DCE
4	CA (A) /105	Request to Send A (RTS-A)	DTE
5	CB (A) /106	Clear to Send A (CTS-A)	DCE
6	CC (A)/107	DCE Ready (DSR-A)	DCE
7	AB /102	Signal Ground	DTE
8	CF (A) /109	Received Line Detector (DCD-A)	DCE
9	DD (B) /115	Receiver Element Timing (RC-B)	DCE
10	CF (B)/109	Received Line Detector (DCD-B)	DCE
11	DA (B) /113	External Clock B (ETC-B)	DTE
12	DB (B)/114	Transmit Element Timing (TC-B)	DCE
13	CB (B)/106	Clear to Send (CTS-B)	DCE
14	BA (B)/103	Transmitted Data (TD-B)	DTE
15	DB (A)/114	Transmit Element Timing (TC-A)	DCE
16	BB (B) /104	Received Data (RD-B)	DCE
17	DD (A) /115	Receiver Element Timing (RC-A)	DCE
18	Not supported		
19	CA (B)/105	Request to Send (RTS-B)	DTE
20	Not supported		
21	Not supported		
22	CC (B)/107	DCE Ready (DSR-B)	DCE
23	Not supported		
24	DA (A) /113	External Clock A (ETC-A)	DTE
25	Not supported		

Table B-5. Nx56/64 Pin Assignments for V.35 Mode

Pin	Name	CCITT	Description	Source
1	GND		Protective GND	–
2	TD-A	103	Tx Data A	DTE
3	RD-A	104	Rx Data A	DCE
4	RTS	105	RTS	DTE
5	CTS	106	CTS - Clear to Send	DCE
6	DSR	107	DSR - Data Set Ready	DCE
7	GND	102	Signal GND	DTE
8	DCD	109	Rec Line Det	DCE
9	RC-B	115	Rx Timing B	DCE
10			Not Used	
11	ETC-B	113	External Clock B	DTE
12	TC-B	114	Tx Timing B	DCE
13			Not Used	DCE
14	TD-A	103	Tx Data B	DTE
15	TC-A	114	Tx Timing A	DCE
16	RD-B	104	Rx Data B	DCE
17	RC-A	115	Rx Timing A	DCE
18			Not Supported	
19			Not Used	
20		108	Not Supported	
21			Not Supported	
22			Not Supported	
23			Not Used	
24	ETC-A	113	External Clk A	DTE
25			Not supported	

Part Number 1200285L1

Table B-6. DB-25 to V.35, 34-Pin Winchester Cable

DB-25	34 Pin	Name
1	A	Protective GND
2	P	Tx Data A
3	R	Rx Data A
4	C	RTS or RR
5	D	CTS
6	E	DSR
7	B	Signal GND
8	F	Rec Line Sig Det (DCD)
9	X	Rx Signal Timing B
10		Not Connected
11	W	External Clock B
12	AA	Tx Signal Timing B
13		Not Connected
14	S	Tx Data B
15	Y	Tx Signal Timing A
16	T	Rx Data B
17	V	Rx Signal Timing A
18	J	Local Loopback
19		Not Connected
20	H	DTR
21	B	Remote Loopback
22		Not Connected
23		Not Connected
24	U	External Clk A
25	K	Test Mode

Table B-7. Nx56/64 Pin Assignments for V.11/X.21 Mode

Pin	Name	Description	Source
1		Protective GND (shield)	n/a
2	T(A)	Transmit A	DTE
3	R(A)	Receive A	DCE
4	C(A)	Control A	DTE
7	G	Signal GND	n/a
8	I(A)	Indication A	DCE
9/12	S(B)	Signal Timing B	DCE
10	I(B)	Indication B	DCE
14	T(B)	Transmit B	DTE
15/17	S(A)	Signal Timing A	DCE
16	R(B)	Receive B	DCE
19	C(B)	Control B	DTE

Table B-8. Adapter Cable DB-25 to X.21, DB-15 Connector

Name	DB-25	DA15S
Protective GND (Shield)	1	1
Signal GND	7	8
Control A	4	3
Control B	19	10
Indication A	8	5
Indication B	10	12
Transmit A	2	2
Transmit B	14	9
Receive A	3	4
Receive B	16	11
Signal Timing A	15/17	6
Signal Timing B	9/12	13

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