

T1 ESF CSU ACE

User Manual

Part Number 1203025L1

Trademark Information:

T-WATCH is a trademark of ADTRAN.

OpenView is a registered trademark of Hewlett Packard Company.

SunNet Manager is a trademark of Sun Micro Systems, Inc.



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

Save These Important Safety Instructions

Affidavit Requirements for Connection to Digital Services

- An affidavit is required to be given to the telephone company whenever digital
 terminal equipment without encoded analog content and billing protection is
 used to transmit digital signals containing encoded analog content which are
 intended for eventual conversion into voice band analog signal and transmitted
 on the network.
- The affidavit shall affirm that either no encoded analog content or billing information is being transmitted or that the output of the device meets Part 68 encoded analog content or billing protection specification.
- End use/customer will be responsible to file an affidavit with the local exchange carrier when connecting unprotected CPE to a 1.544 Mbps or subrate digital service.
- Until such time as subrate digital terminal equipment is registered for voice applications, the affidavit requirements for subrate services are waived.

Affidavit for Connection of Customer Premises Equipment to 1.544 MBPS and/ or Subrate Digital Services

For the work to be performed in the certified territory of	(telco name)
State of	
County of	
I, (name), (k (telephone number) being duly swor	ousiness address), n, state:
I have the responsibility for the operation and maintenance of to be connected to 1.544 Mbps and/orsu. The terminal equipment to be connected complies with Part 6 except for the encoded analog content and billing protections respect to encoded analog content and billing protection:	ubrate digital services. 8 of the FCC rules
() I attest that all operations associated with the establishment, ment of the digital CPE with respect to encoded analog content information continuously complies with Part 68 of the FCC rule	t and billing protection
() The digital CPE does not transmit digital signals containing tent or billing information which is intended to be decoded we cations network.	
() The encoded analog content and billing protection is factor the control of the customer.	ry set and is not under
I attest that the operator(s) maintainer(s) of the digital CPE re lishment, maintenance and adjustment of the encoded analog information has (have) been trained to perform these function completed one of the following (check appropriate blocks):	content and billing
() A. A training course provided by the manufacturer/grante to encode analog signals; or	e of the equipment used
() B. A training course provided by the customer or authorize training materials and instructions provided by the manufact equipment used to encode analog signals; or	
() C. An independent training course (e.g., trade school or te	chnical institution) rec-

ognized by the manufacturer/grantee of the equipment used to encode analog sig-

nals; or

	eeding training requirements, the operator(s)/maintainer(S) is of a supervisor trained in accordance with
I agree to provideto demonstrate compliant requested.	(telco's name) with proper documentation ince with the information in the preceding paragraph, if so
	Signature
	Title
	_ Date
Subscribed and sworn t	to before me
This day of _	, 20
Notary Public	
My commission expires	::

FCC regulations require that the following information be provided in this manual:

- 1. This equipment complies with Part 68 of the FCC rules. On the bottom of the equipment housing is a label that shows the FCC registration number and Ringer Equivalence Number (REN) for this equipment, if applicable. If required, this information must be given to the telephone company.
- 2. The following information may be required when applying to the local telephone company for leased line facilities.

Service Type	REN/SOC	FIC	USOC
1.544 Mbps - SF	6.0F	04DU9-BN	RJ48C
1.544 Mbps - SF and B8ZS	6.0F	04DU9-DN	RJ48C
1.544 Mbps - ESF	6.0F	04DU9-1KN	RJ48C
1.544 Mbps - ESF and B8ZS	6.0F	04DU9-1SN	RJ48C

- 3. An FCC compliant telephone cord with a modular plug may be provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack, which is FCC Part 68 compliant. See installation instructions for details.
- 4. If this equipment causes harm to the telephone network, the telephone company may temporarily discontinue service. If possible, advance notification is given; otherwise, notification is given as soon as possible. The telephone company will advise the customer of the right to file a complaint with the FCC.
- 5. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of this equipment. If this happens, the telephone company will provide advance notification and the opportunity to make the necessary modifications to maintain uninterrupted service.
- 6. If experiencing difficulty with this equipment, please contact ADTRAN for repair and warranty information. If the equipment is causing harm to the network, the telephone company may request this equipment to be disconnected from the network until the problem is resolved or it is certain that the equipment is not malfunctioning.
- 7. This unit contains no user-serviceable parts.
- 8. The FCC recommends that the AC outlet to which equipment requiring AC power is to be installed is provided with an AC surge arrester.

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.



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.

Canadian Emissions Requirements

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of the Department of Communications.

Cet appareil nuerique respecte les limites de bruits radioelectriques applicables aux appareils numeriques de Class A prescrites dans la norme sur le materiel brouilleur: "Appareils Numeriques," NMB-003 edictee par le ministre des Communications.

Canadian Equipment Limitations

Notice: The Canadian Industry and Science Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable methods of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above limitations may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

WARNING

Users should not attempt to make such connections themselves, but should contract the appropriate electric inspection authority, or an electrician, as appropriate.

The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the Load Numbers of all devices does not exceed 100.

Limited Product Warranty

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

EXCEPT FOR THE LIMITEDWARRANTY DESCRIBED ABOVE, THE FOREGOING CONSTITUTES THE SOLE AND EXCLUSIVE REMEDY OF THE CUSTOMER AND THE EXCLUSIVE LIABILITY OF ADTRAN AND IS IN LIEU OF ANY AND ALL OTHER WARRANTIES (EXPRESSED OR IMPLIED). ADTRAN SPECIFICALLY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING (WITHOUT LIMITATION), ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME STATES DO NOT ALLOW THE EXCLUSION OF IMPLIEDWARRANTIES, SO THIS EXCLUSION MAY NOT APPLY TO CUSTOMER.

In no event will ADTRAN or its suppliers be liable to Customer for any incidental, special, punitive, exemplary or consequential damages experienced by either Customer or a third party (including, but not limited to, loss of data or information, loss of profits, or loss of use). ADTRAN is not liable for damages for any cause whatsoever (whether based in contract, tort, or otherwise) in excess of the amount paid for the item. Some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to Customer.

Customer Service, Product Support Information, and Training

ADTRAN will replace or repair 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 ADT-RAN 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

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

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 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

Training - fax (256) 963 7941

Training - email training@adtran.com

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Chapter 1 Introduction

T1/FT1 OVERVIEW

T1 digital communication links have been used by telcos for the transmission of voice since the early sixties. The D4 channel bank is an example of a T1 digital carrier system that was introduced in the mid-seventies and is still widely used by the telcos. Communication demands of business continued to grow to the point that the telcos began offering T1 service directly to the public. D4 channel banks were used for T1 in corporate network topographies for voice. The technological advances in computer development also created a demand for T1 data communication which now is a large part of the T1 traffic.

T1 Service Offerings

T1 is a digital service that is delivered to the user over two pairs of wires from the service provider. The signal operates at 1.544 Mbps and is usually extended by repeaters installed approximately every mile after the first 6000 feet. The T1 signal is divided into 24 time slots which operate at 64 kbps (DS0s). Each time slot is occupied by digitized voice or by data.

The T1 signal originally used a type of framing known as D4 superframe (SF), which identifies how the T1 is multiplexed. An enhancement of that framing format, called extended superframe (ESF), is available. ESF provides a non-disruptive means of full-time monitoring on the digital facility. It was originally used by service providers to monitor the performance of their service

offering. Since the introduction of ESF, equipment installed in private networks can also provide this performance information to the user.

T1 ESF CSU ACE OVERVIEW

Most carriers (regional or local telcos), when supplying a T1 line to customer premises equipment (CPE), require an interface to monitor the T1 line. The T1 ESF CSU ACE (extended superframe channel service unit advanced communication equipment) provides the required interface between the CPE (such as DSUs, channel banks, T1 multiplexers, and PBXs) and telco or private T1 facilities. See Figure 1-1.

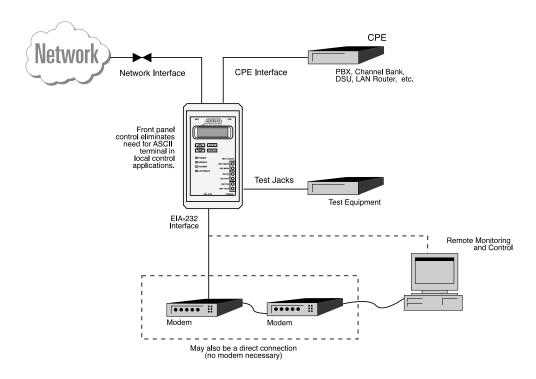
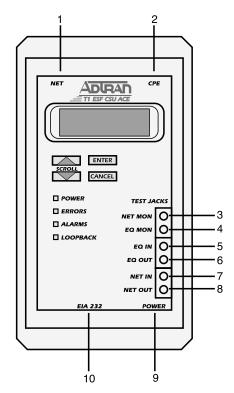


Figure 1-1. T1 ESF CSU ACE Application

The T1 ESF CSU ACE provides surge protection, signal regeneration, alarms, and loopbacks necessary for circuit operation and fault isolation. The unit provides the simultaneous use of performance report messages of ANSI T1.403 and maintenance messages of AT&T TR54016. The T1 ESF CSU ACE also provides conversion from SF to ESF framing formats, allowing older SF data terminal equipment (DTE) to take advantage of superior diagnostic capabilities of ESF T1 facilities.

The unit complies with Part 68 of FCC Rules and with applicable sections of AT&T 62411, ANSI T1.102, and T1.403.

Figure 1-2 shows the T1 ESF CSU ACE, and Figure 1-3 shows the jack signal directions.



Identification of Numbers

Item		Function
1.	NET	T1 network interface
2.	CPE	T1 customer premises equipment inter-
		face (terminal interface)
3.	MET MON	Bantam test jack
4.	EQ MON	Bantam test jack
5.	EQ IN	Bantam test jack
6.	EQ OUT	Bantam test jack
7.	NET IN	Bantam test jack
8.	NET OUT	Bantam test jack
9.	Power Input	-48 VDC Input
10.	EIA 232	Control port connection

Figure 1-2. T1 ESF CSU ACE Front View

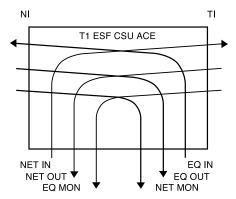


Figure 1-3. Jack Signal Directions

Features

The following features give the T1 ESF CSU ACE many advantages over other products of its kind:

- Smallest T1 ESF CSU ACE in the industry.
- Front panel interface eliminates the need for a terminal to configure the T1 ESF CSU ACE.
- Automatic ESF to D4 frame conversion
- Wall mount -48 VDC power supply eliminates the need for an external power supply.
- Power cable enables customers to use their own -48 VDC supply.
- Can be wall mounted to virtually any surface. There are rubber feet on the unit for use on a table top.
- Can configure a modem so that it does not have to be configured before installation.
- Backs up configuration data in NVRAM and EEPROM so that the configuration data is nonvolatile longer than the life of the lithium battery in the NVRAM. The NVRAM holds performance monitoring data as well.
- Automatic network interface line build out (LBO) eliminates confusion over transmit LBO setting (dependent on distance from last repeater to customer premises).

Interface Features

NI (Labeled NET)

The network interface (NI) port complies with the applicable ANSI and AT&T standards. Its features include the following:

- D4 or ESF framing
- AMI or B8ZS coding
- Automatic or manual LBO
- Network performance monitoring and reporting
- Local and remote test loopbacks
- Extensive self test

T1 (Labeled CPE)

Features of the terminal interface (TI) include the following:

- D4 or ESF framing (independent of NI)
- AMI or B8ZS coding
- Transmit LBO to 655 feet
- DTE loopback

Control Port Input (Labeled EIA-232)

Features of the control port include the following:

- EIA-232 input from a PC or a modem for control of the T1 ESF CSU ACE
- Up to 9600 baud operation
- Acts as input for PC or proxy agent control
- VT-100 terminal interface

FOUR METHODS OF CONTROL

Front Panel

The front panel provides complete and easy control of all items that can be configured through menu guided options. The front panel LCD displays the status of operation and performance reports for the unit. A complete discussion of the operation of the front panel and all the menu options is found in Chapter 3, *Operation*, on page 3-1.

ADTRAN PC Program

T-Watch is the ADTRAN PC control program. It provides complete control over the configuration of the T1 ESF CSU ACE using a graphic interface. The T-Watch program displays the same status and performance data as the front panel LCD. This data is displayed in the form of tables and graphs.

The T-Watch program has the following capabilities:

- Interface with modem permits dialing into a remote T1 ESF CSU ACE location to configure the unit or read the unit's status or performance.
- Performance data read from the units can be exported in a file which is compatible with common spreadsheet programs.

SNMP

The ADTRAN T1 ESF CSU ACE supports the Simple Network Management Protocol (SNMP) through the ADTRAN Advisor SNMP Proxy Agent (1950007L1) to a network management system such as OpenView® or SunNet Manager™. The proxy agent runs on a PC and can interface to the T1 ESF CSU ACE directly or through a modem, in the same manner as the T-Watch PC programs.

ASCII Terminal

The ADTRAN T1 ESF CSU ACE recognizes an escape sequence that puts the unit into the ASCII terminal mode. After receiving the sequence, the T1 ESF CSU ACE sends front panel information to the terminal. This interface acts exactly like the front panel, but the advantage is that it can be accessed remotely (through a modem). The escape sequence is:



The terminal or terminal emulation software must be VT-100 compatible.

T1 ESF CSU ACE TESTING

The T1 ESF CSU ACE offers three forms of testing:

- Self test
- Loopback tests
- · Pattern generation

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 be run with the network and DTE interfaces in place and will not disturb 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 standard background network performance monitoring as required by ANSI T1.403 and AT&T 54016, for which the results are stored.

Loopback Tests

A number of different loopbacks can be invoked locally from the front panel, by T-Watch commands, or remotely by using special inband codes (AT&T network loop-up and loop-down codes). Additionally, the loopbacks can be remotely controlled by out-of-band commands using the T1 ESF FDL, or from T-Watch using a modem connection. A discussion of network loopbacks and DTE interface loopbacks follows.

Network Loopbacks

There are two types of network loopbacks: line loopbacks and payload loopbacks. These are illustrated in Figure 1-4.

- 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.

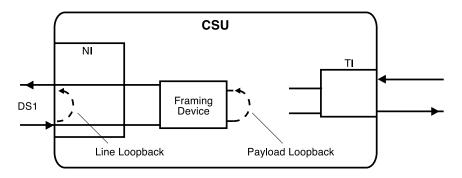


Figure 1-4. Network Loopback Tests

DTE Interface Loopbacks

Loops all data from the terminal interface (T1) back towards the T1. This loopback may be initiated using front panel, EIA-232 control port, or T-Watch commands. The DTE (or external test equipment) must provide any test pattern in order to check the DTE interface. See Figure 1-5.

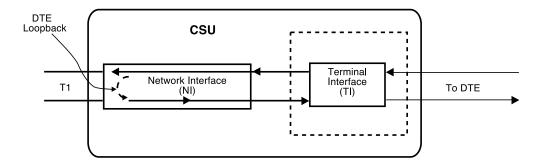


Figure 1-5. DTE Interface Loopback

Pattern Generation

The T1 ESF CSU ACE offers three test patterns: All Ones, All Zeros, and 1:8. These patterns can be initiated from the front panel, through the EIA-232 control port, or remotely via a management software like T-Watch.

All Ones

The All Ones pattern sends ones in all the payload bits.

All Zeroes

The All Zeros pattern sends zeros in all the payload bits and is useful for testing line code configuration (AMI/B8ZS mismatches).

1 in 8 (1:8)

Each channel of the T1 has only one bit set. This pattern is used in conjunction with external test equipment to determine whether the T1 line is performing acceptably under a stress condition.

APPLICATIONS

Three applications are shown in this section. Figure 1-6 shows a general data application; Figure 1-7 on page 1-12 shows a general voice application; and Figure 1-8 on page 1-12 shows a channel bank application.

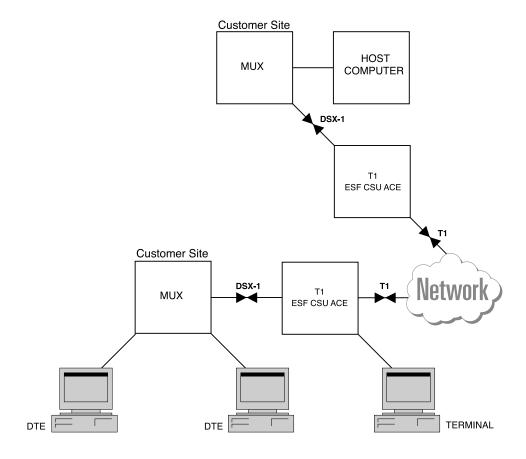


Figure 1-6. General Data Application

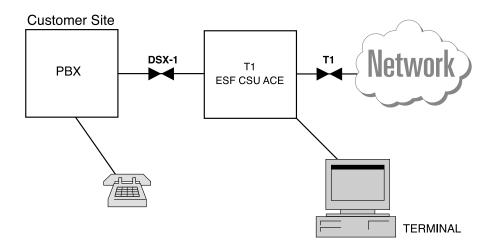


Figure 1-7. General Voice Application

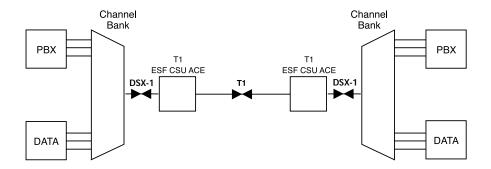


Figure 1-8. Channel Bank Application

Chapter 2 Installation

UNPACK AND INSPECT

Carefully inspect the T1 ESF CSU ACE for any shipping damages. If damage is suspected, file a claim immediately with the carrier and then contact ADTRAN Technical Support. If possible, keep the original shipping container to ship the T1 ESF CSU ACE back for repair or to verify damage during shipment.

Shipped by ADTRAN

The following items are included in the ADTRAN shipment:

- The T1 ESF CSU ACE
- Line interface cable: an 8-position/modular to 8-position/ modular
- -48 VDC power supply
- · The user manual

Provided by Customer

The following items must be supplied by the customer:

- DTE cable(s)
- · Cable for the EIA-232, if used

POWER CONNECTION

The T1 ESF CSU ACE can be powered in one of two ways:

- A wall-mount -48 VDC power supply (supplied with the unit)
- A power cable for use with an on-site -48 VDC power supply Both have a three-pin receptacle that plugs into the power connection on the bottom right edge of the T1 ESF CSU ACE. Once power has been applied to the unit, the power LED turns on. See Figure 2-1 for an illustration of the cable installation. Refer to Figure A-1 on page A-1 for power connection wiring.

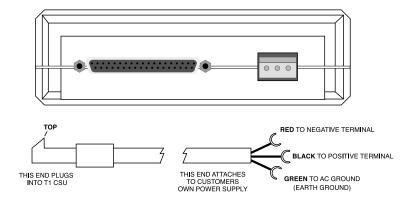


Figure 2-1. Power Connection



With the T1 ESF CSU ACE face up, plug the cable in with the plug oriented as shown in Figure 2-1.

WIRING

The connectors are described in this section.

RJ-48C Connectors

Two RJ-48C connectors are located on the top end of the T1 ESF CSU ACE. The NET connector connects the unit to the network. The connector marked CPE connects the unit to the data terminal equipment. These connectors have exactly the same pinouts.

See Table A-1 on page A-2 for the RJ-48 connector pin assignments.

EIA-232 Connector

The EIA-232 connector is used to connect the T1 ESF CSU ACE to a proxy agent, T-Watch, an ASCII terminal, or a modem.

See Table A-2 on page A-2 for the connector pin assignments.

Connector Type = Female DB-25

POWER-UP TESTING AND INITIALIZATION

When shipped from the factory, the T1 ESF CSU ACE is set to factory default conditions; it is not initialized. At the first application of power, the unit automatically executes self test followed by an initialization sequence that sets up the unit.

Self Test

Upon a power-up or self test, the LCD displays **ADTRAN T1 ESF CSU ACE INITIALIZING** and the LEDs illuminate momentarily. When the self test is completed with no failures detected, the LCD momentarily displays **ALL TESTS PASSED**. If a failure is detected, it is displayed in the LCD window. The automatic self test procedure consists of the following steps:

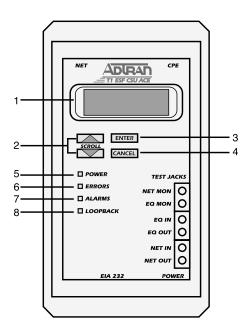
- Board level tests RAM tests: EPROM checksum
- 2. Unit level tests Front panel LED verification

Chapter 3 Operation

The T1 ESF CSU ACE can be configured and controlled via the local front panel, the EIA-232 control port, or T-Watch. This chapter describes configuration from the front panel.

FRONT PANEL OPERATION

The T1 ESF CSU ACE front panel operating functions are shown in Figure 3-1 and defined in this section.



Identification of Numbers

	Item	Function
1.	LCD Window	Displays menu items used in configuration and information useful in monitoring the unit.
2.	Up/Down Scroll	Used to travel up/down menu trees, increase/decrease numeric values, and scroll through selections.
3.	ENTER	Used to make selections.
4.	CANCEL	Used to exit selections or menu tree branches.
5.	POWER	LED on when power is received by ESF CSU.
6.	ERRORS	LED on when eerored events have occurred in the last second
7.	ALARMS	LED on when an alarm condition exists.
8.	LOOPBACK	LED on when until unit is in loopback or has placed a remote unit in loopback.

Figure 3-1. T1 ESF CSU ACE Front Panel Layout

GENERAL MENU OPERATION

The T1 ESF CSU ACE uses a multilevel menu structure containing both menu items and data fields. All menu operations and data are displayed in the LCD window. The menu items are numbered and can be viewed by using the up and down **SCROLL** keys.

Description of Menu Tools

Data Field

A menu item followed by a colon (:) identifies a field available for editing.

Display Field

This menu field contains alarm or error information.

Arrows

Menus that display small up or down arrows in the lower right corner indicate that there are more menu items viewable on the two-line LCD. Access additional menu items with the up or down **SCROLL** keys.

Example Menu Operation

Selecting a Main Menu Item

To select a menu item from the Main menu, follow these steps:

1. Use the up and down **SCROLL** keys to place the cursor on the desired menu item (in this example, 2)CONFIG). See Figure 3-2.

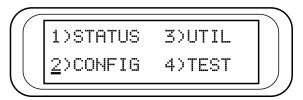


Figure 3-2. Selecting a Menu Item from the Main Menu

2. With the cursor on the number 2), press the **Enter** key. 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.

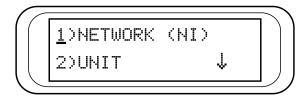


Figure 3-3. Menu with Additional Item(s) Not Shown

Selecting a Submenu Item

To select the desired submenu item (similar to selecting a Main menu item), follow these steps:

- 1. Use the up and down **SCROLL** keys to place the cursor on the desired menu item, in this example 1)NETWORK (NI). See Figure 3-3.
- 2. The unit responds by displaying the first two available data field items. The cursor is on the number of the first item. When there are more than two data field items for the selected submenu, a down arrow is visible on the lower right corner. See Figure 3-4.



Figure 3-4. Submenu Indicating Additional Items Not Shown

Setting/Cancelling the Data Field

Data fields available for editing are preceded by a colon (:). To set a data field, perform the following steps:

1. Press **Enter** while the cursor is located on the submenu item number. The cursor moves to the data field (to the right of the submenu item name). See Figure 3-5.



Figure 3-5. Editing a Data Field

- 2. Use the up and down **SCROLL** keys to scan the available value settings displayed one at a time in the data field position.
- 3. When the desired value is in the data field position, press Enter to set the value. The unit now is set for the value shown in the data field and the cursor moves back to the submenu item position, indicating that the operation is complete. Another submenu field may be selected, or use Cancel to return to the submenu.



Cancelling is available any time during the operation. If **Cancel** is used prior to pressing **Enter** after making a data change, the original data value is restored and the cursor returns to the submenu field.

View Display Only Data Fields

An example of a display only data field is found by selecting the following menu choices:

- 1. Select 1)STATUS from the Main menu.
- 2. Select submenu 2)NI ERR/ALM.
- 3. LOSS OF SIGNAL INACTIVE/ACTIVE is displayed, giving the current state of the alarm.

Exiting or Returning to Previous Menus

Press the **Cancel** key to exit a menu field or return to a previous menu level.

MENU STRUCTURE

The T1 ESF CSU ACE uses hierarchical menus to access its many features. The top-most, or Main menu level (see Figure 3-6 and Figure 3-8) leads to submenus which are grouped by functionality. All menu operations are displayed in the LCD window.

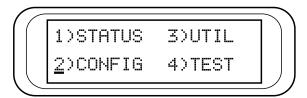


Figure 3-6. The Four Opening Menus

Figure 3-7 on page 3-7 shows the complete menu tree. Figure 3-8 on page 3-8 is a limited overview. Following this figure is a detailed description of each menu item, presented in menu order.

		1)NI PERF RPTS			RESET PERF CNTRS
					SES
			LOSS OF SIGNAL		ES
			AIS ALARM		%AV
		2)NI ERR/ALM	OUT OF FRAME	CLEAR HISTORY	%EF
			YELLOW ALARM	LOSS OF SIGNAL	CVS
	1)STATUS		RED ALARM	AIS ALARM	
	,	1	CODE VIOLATIONS	OUT OF FRAME	1)FORMAT
			BIPOLAR VIOLATIONS	YELLOW ALARM	2)CODE
			FRAME BIT ERRORS	RED ALARM	3)YEL ALRM
				CODE VIOLATIONS	4)XMIT PRM
		3)NI HIST		BIPOLAR VIOLATIONS	5)KEEP ALIVE
		4)T1 ERR ALM*		FRAME BIT ERRORS	6)BIT STUFFING
		5)T1 HISTORY**			7)SET LBO
		5,			8)NET LB
		1)NETWORK (NI)			9)RX SENSITIVITY
		1)NETWORK (NI)			3)ICX OLIVOITIVITI
				1)MODEM INIT	
MAIN MENU		2)UNIT	1)CONTROL PORT	2)DATA RATE	
		2,0	1,00.1111.021 0.111	2,5,11,110112	
	2)CONFIG		2)ALARMS	1)TRAPS	
				2)OUTPUT	1)FORMAT
				3)TEL NUM	2)CODE
		3)TERMINAL (T1)			3)SET LBO
					•
		1)TIME/DATE		TIME: HH:MM:SS	
				DATE: MM/DD/YY	
	3)UTIL	2)SOFTWARE REV (Dis- plays current s/w rev)			
		3)REINIT UNIT			
		4)ADDRESS			
		1,7.12.2.11.2.00	1)REMOTE UNIT (Select		
		5)SET PASSCODE	remote unit type)		
		6)FACT RESTORE (Returns all configs to factory settings)	2)SHELF SNMP ID:	NO LOOPBACK	
		7)REMOTE T-WATCH	3)SHELF SLOT:	DTE ON	
		.,	1,0	LINE ON	NO LOOPBACK
		1)LOCAL LOOPBACK		PAYLOAD ON	AT&T INBAND LLB
		1)EGGNE EGGN BROK		TAILEGAD GIV	ANSI FDL LLB
	4)TEST	2)REM LB			AT&T FDL PLB
	.,				MALIBETED
				NO PATTERN	
		3)TEST PATTERN		ALL ZEROS	
		,		1:8 ALL DS0s	
				ALL ONES	
		4)RUN SELFTEST			
		4)RUN SELFTEST		ALL ONLS	

*T1 ERR/ALM has same menu sub-branches as NI ERR/ALM. **T1 HISTORY has same as NI HISTORY.

Figure 3-7. T1 ESF CSU ACE MenuTree

			1)NI PERF RPTS
			2)NI ERR/ALM
	1)STATUS		3)NI HISTORY
			4)T1 ERR/ALM
	2)CONFIG	1)NETWORK (NI)	5)T1 HISTORY
		2)UNIT	
MAIN MENU		3)TERMINAL (T1)	1)TIME/DATE
			2)SOFTWARE REV
	3)UTIL		3)REINIT UNIT
			4)ADDRESS:
	4)TEST	1)LOCAL LOOPBK:	5)SET PASSCODE:
		2)REM LB:	6)FACT RESTORE
		3)TEST PATTERN:	7)REMOTE T-WATCH
		4)RUN SELFTEST	

Figure 3-8. Four Opening Menus and First Level Submenus

Menu flow is normally depicted from left to right. Arrows on the lower right of the screen indicate the direction of scrolling to view additional menu items. At every level of the menu, pressing the **Cancel** button returns the system to the previous menu level. Repeatedly pressing the **Cancel** button returns the system to the Main menu.

The opening menu is the access point to all other operations. There are four Main menu items: STATUS, CONFIGURATION, UTILITY, and TEST. Each Main menu item has several functions and submenus to identify and access specific parameters. In the discussions that follow, each Main menu item contains a complete menu diagram to identify the location of each operation.

The Four Opening Menu Functions

STATUS

The Status menu lets you view the status of the T1 ESF CSU ACE operation. This menu includes the following selections:

NI PERF RPTS

Use to view the user's set of data on the Network Interface Performance Reports in compliance with ANSI T1.403 and AT&T Document TR54016.

NI ERR/ALM

Use to view current network interface errors/alarms reported by the T1 ESF CSU ACE.

NI HISTORY

Use to view and clear network interface history errors and alarms.

T1 ERR/ALM

Use to view current terminal interface errors/alarms reported by the T1 ESF CSU ACE.

T1 HISTORY

Use to view and clear terminal history errors and alarms.

CONFIG

Use the Configuration menu to set T1 ESF CSU ACE operational configuration. This menu includes the following selections:

NETWORK (NI)

Use to set all of the parameters associated with the network interface.

LINIT

Use to control T1 ESF CSU ACE control port baud rate and to set up the dial out function.

TERMINAL (T1)

Use to set all parameters associated with the terminal interface.

UTIL

Use the Utility menu to view and set system parameters. This menu includes the following selections:

TIME/DATE

Access the display and set the current time and date.

SOFTWARE REV

Display the version number of the current software revision level. This information is required when requesting assistance from ADTRAN Customer Service or when updates are needed.

REINIT UNIT

Use to re-initialize the unit. This menu item will *not* restore the factory default settings, but will simply reset the unit.

ADDRESS

View and change current Unit Address used for control port access.

SET PASSCODE

View and change current passcode used for control port access only.

FACT RESTORE

Restore factory default settings for all unit parameters.

REMOTE T-WATCH

Configure the unit for communication with a remote unit via the FDL (facility data link).

TEST

Use the Test menu to initiate different types of tests and to view test results. Test results are displayed in the LCD window.



The execution of tests disrupts some normal operations. See individual menu items concerning test before executing.

LOCAL LOOPBACK

Use to select loopbacks internal to the T1 ESF CSU ACE.

REM LB

Use to send remote loopback codes to the far end T1 ESF CSU ACE.

TEST PATTERN

Use to select a test pattern to send out the network interface of the T1 ESF CSU ACE.

RUN SELFTEST

Use to initiate a self test.

DETAILED MENU OPERATION

Menu flow is normally depicted from left to right. Arrows on the lower right of the screen indicate the direction of scrolling to view additional menu items. At every level of the menu, pressing the **Cancel** button returns the system to the previous menu level. Repeatedly pressing the **Cancel** button returns the system to the Main menu.

1)STATUS

The Status menu branch lets you view the status of the T1 ESF CSU ACE operation. See Figure 3-9.

		RESET PERF CNTRS	LOSS OF SIGNAL
		SES	AIS ALARM
	1)NI PERF RPTS	ES	OUT OF FRAME
		%AV	YELLOW ALARM
		%EF	RED ALARM
		CVs	CODE VIOLATIONS
			BIPOLAR VIOLATIONS
	2)NI ERR/ALM		FRAME BIT ERRORS
1)STATUS			
	3)NI HISTORY	CLEAR HISTORY	
		LOSS OF SIGNAL	
		AIS ALARM	
		OUT OF FRAME	
		YELLOW ALARM	
		RED ALARM	
		CODE VIOLATIONS	
		BIPOLAR VIOLATIONS	
		FRAME BIT ERRORS	
	4)T1 ERR ALM*		
	5)T1 HISTORY**		

^{*}T1 ERR/ALM has the same menu sub-branches as NI ERR/ALM.

Figure 3-9. Status Menu Tree

^{**}T1 HISTORY has the same sub-branches as NI HISTORY.

1)NI PERF RPTS, Submenu of 1)STATUS

The Network Interface Performance Reports menu item displays the *user copy* of the performance data. The T1 ESF CSU ACE maintains this performance data on the network in compliance with ANSI T1.403 and AT&T document TR54016. The data displayed is data accumulated over the last 15 minutes and over the last 24 hours.



Figure 3-10. First Menu of NI PERF RPTS Menu

These fields cannot be edited, only cleared, as previously discussed. Only the user copy of the performance data is cleared. The network management performance data history remains unaffected.

Separate carrier totals are kept which can only be retrieved and reset from the network.

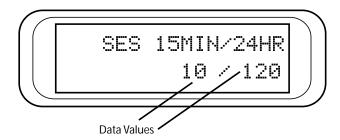


Figure 3-11. Performance Counter Screen

Terms that occur on the series of screens begun in Figure 3-11 include the following:

SES	Number of severely errored seconds
ES	Number of errored seconds
%AV	Percent of available seconds
%EF	Percent of error free seconds

Continue with standard operation procedures to exit the display.

Number of code violations



CVs

Since only the user's copy of performance data is cleared by the T1 ESF CSU ACE, the data displayed here might be different from the data being sent to the network as maintenance message data.

2)NI ERR/ALM, Submenu of 1)STATUS
The NI ERR/ALM menu is used for viewing currently active/inactive errors and alarms on the network interface.

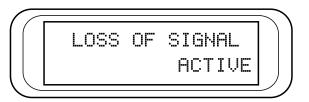


Figure 3-12. First Current NI Errors/Alarms Screen

The up and down **SCROLL** keys are used to access the complete display of the errors/alarms that are currently active. The alarms and errors which can be seen are shown below:

Loss of Signal	No pulses received at NI
AIS Alarm	Unframed all-ones received at NI
Out of Frame	No framing pattern sync at NI
Yellow Alarm	Receiving yellow alarm pattern from NI
Red Alarm	LOS (loss of signal)/out of frame (OOF)
	causing red alarm at NI

Code Violations Bipolar violations (BPVs), frame bit errors,

and cyclic redundancy check (CRC) errors in ESF or BPVs and frame bit errors in SF

were received at NI

Bipolar Violations BPVs in SF or ESF at NI

Frame Bit Errors Frame bits received incorrectly at NI

3)NI HISTORY, Submenu of 1)STATUS

The NI History menu is used for viewing history of errors and alarms on the network interface. If an alarm has occurred since the last Clear History selection, the menu will be active. If the condition hasn't occurred, the menu will be inactive. The Clear History screen is shown in Figure 3-13.

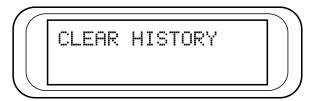


Figure 3-13. Clear History Screen

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

4)T1 ERR/ALM, Submenu of 1)STATUS The T1 ERR/ALM screens are the same as the NI ERR/ALM

screens except that they correspond to the terminal interface.

5)TI HISTORY, Submenu of 1)STATUS

The T1 HISTORY screens are the same as the NI HISTORY screens except that they correspond to the terminal interface.

2)CONFIG

Use the Configuration menu to set the T1 ESF CSU ACE operational configuration, including all of the network interface parameters and the terminal interface parameters. See Figure 3-14.

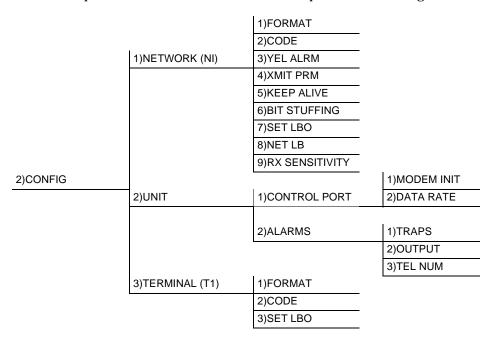


Figure 3-14. Configuration MenuTree

1)NETWORK (NI), Submenu of 2)CONFIG This menu is used to access the configuration of parameters associated with the network interface in the T1 ESF CSU ACE. There are nine submenu items that include setting the format and the line build out (LBO).

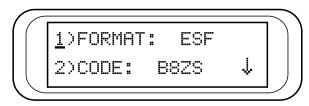


Figure 3-15. Network (NI) Submenu

Continue with standard operating procedures to edit the Network Interface parameters.

The fields and parameters available are as follows:

1)FORMAT

Sets the frame format for the NI. The factory default is ESF.

D4 ESF



D4 is equivalent to superframe format (SF).

2)CODE

Sets the line code for the NI. The factory default is B8ZS.

AMI B8ZS

3)YEL ALRM

Enables and disables the transmission of yellow alarms. The factory default is ENABLED.

ENABLED DISABLED

4)XMIT PRM

Enables and disables the transmitting of performance report messages (PRM) data on the facility data link (FDL). The PRM data continues to be collected even if PRM is disabled. (Possible only with ESF Format.) The factory default is OFF.

OFF ON

5)KEEP ALIVE

Selects framed or unframed keep alive signal to be transmitted from NI when TI is in red alarm. The factory default is UNFRAMED.

FRAMED UNFRAMED

6)BIT STUFFING

When enabled, bit stuffing causes the T1 ESF CSU ACE to monitor for ones (1s) density violations and inserts a one (1) when needed to maintain ones at 12.5 percent. This option should be disabled if B8ZS is enabled. The factory default is DISABLED.

ENABLED DISABLED

7)SET LBO

Selects the line build out for the network interface. In AUTO mode, the T1 ESF CSU ACE sets the LBO based on the strength of the receive signal. The factory default is 0 dB.

0 dB -7.5 dB -15 dB -22.5 dB AUTO



When interfacing to a Smart jack, the 0 dB setting typically works best because most Smart jacks expect a strong receive level. The AUTO setting should only be used when no Smart jack is present and the T1 ESF CSU ACE is interfacing to a repeater.

8)NET LB

When enabled, the T1 ESF CSU ACE responds to loopback codes from the network interface. The factory default is ENABLED.

ENABLED DISABLED

9)RX SENSITIVITY

Selects the sensitivity of the receiver on the network interface. The factory default is NORMAL.

NORMAL EXTENDED



For most applications, the normal sensitivity setting is sufficient. If more sensitivity is required, the extended sensitivity setting may be used.

2)UNIT, Submenu of 2)CONFIG

This menu is used to change control port and alarm trap options. See Figure 3-16.

<u>1</u>)CONTROL PORT 2)ALARMS

Figure 3-16. First 2)UNIT Submenu Screen

1)CONTROL PORT

Úsed to set up the unit to initialize a modem and the control port data rate.

1)MODEM INIT - The T1 ESF CSU ACE is capable of initializing a modem. Prior to modem initialization it should be physically connected to the T1 ESF CSU ACE 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. The factory default is DISABLED.

ENABLED DISABLED

2)DATA RATE - Selects the data rate for the control port. This should be consistent with the modem and/or PC/proxy agent serial port. The factory default is 9600.

1200 2400 9600

2)ALARMS

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

1)TRAPS - This setting determines whether alarm conditions should automatically send alarm messages (traps) to the controlling PC/proxy agent. The factory default is DISABLED.

ENABLED DISABLED

2)OUTPUT - Selects whether the alarm traps (if enabled) are sent directly, or whether the telephone number stored in the T1 ESF CSU ACE should be dialed first (industry-standard AT dial command sent to modem). The factory default is DIRECT.

DIRECT DIAL

3)TEL NUM - This is the telephone number dialed to obtain alarm traps. The string can be up to 20 characters in length and is terminated with a semicolon (;). A colon (;) is used to represent a pause in the dial string.

Example: Number 9:5551212; would dial 9, pause momentarily, and then send 5551212. This pause could be effected to access an outside line from a PBX, etc.

When editing a specific character, the **SCROLL** keys are used to scroll from 0 to 9, then (:) and semicolon (;). The new telephone number is entered into the T1 ESF CSU ACE only upon pressing **Enter** after typing the semicolon (;).

Input - 20 digits (0 through 9, : and ;)



The typed digits are accepted only after pressing **Enter**. The telephone numbers can be cleared by entering a semicolon (;) as the first digit.

3)TERMINAL (TI), Submenu of 2)CONFIG This menu item is used to select and configure the parameters associated with the T1 ESF CSU ACE terminal interface.

1)FORMAT

Sets the frame format for the T1. The factory default is ESF.

D4 ESF

2)CODE

Sets the line code for the T1. The factory default is B8ZS.

AMI B8ZS

3)SET LBO

Sets the transmit LBO for the T1. The factory default is 0 - 133 feet.

0 - 133 feet 133 - 266 feet 266 - 399 feet 399 - 533 feet 533 - 655 feet

3)UTIL

Use the Utility menu to view and set system parameters. See Figure 3-17. This includes setting the time and date and resetting all parameters to factory values or to re-initialize the unit. This menu is also used to view the unit's software revision and ID setting.

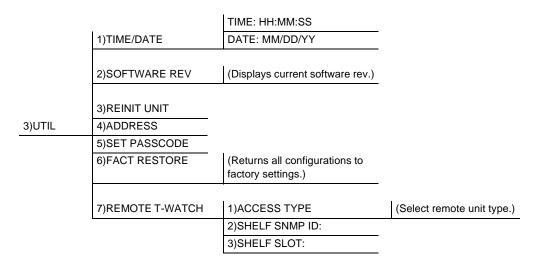


Figure 3-17. Utility Menu Tree

1)TIME/DATE, Submenu of 3)UTIL

This menu option is used to view or edit the current time and date. The time and date are maintained during power off conditions. Use arrow keys and **Enter** to set the date and the desired hour, minutes, and seconds.

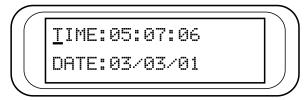


Figure 3-18. Time/Data Screen

Pressing **Enter** after any numeric change always records the entry and moves to the next editing position. If **Enter** is pressed at the editing position without making any change, the cursor moves to the next editing position. The up and down **SCROLL** keys also move the cursor to different fields to edit. Pressing **Cancel** at any time can be used to end the editing process.

2)SOFTWARE REV, Submenu of 3)UTIL

Use this submenu to display the current software revision level. This information is required when requesting assistance from ADTRAN Customer Service or when updates are needed. The top line gives the revision of interest. The bottom line displays information of use to ADTRAN only.

Follow standard operating procedures to access the 3)UTIL menu items.

3)REINIT UNIT, Submenu of 3)UTIL

Use this submenu to re-initialize the unit. This menu item does *not* restore factory default settings, but simply resets the unit and causes it to run through its self test and initialization cycles.

4)ADDRESS, Submenu of 3)UTIL

Use this submenu to access the current Unit Address setting. Unit identification numbers must be between 000 and 999. See Figure 3-19.



Figure 3-19. Re-initialize Unit/Address Screen

5)SET PASSCODE, Submenu of 3)UTIL

Use this submenu to access the passcode setting needed to control port access. The Unit Identification number is limited to four digits between 0001 and 9999.

6)FACT RESTORE, Submenu of 3)UTIL

Use this submenu to restore factory default settings for all unit parameters. This restores all parameters to the factory settings.

7) REMOTE T-WATCH, Submenu of 3) UTIL

To communicate with a far-end unit via the FDL (i.e., from a proxy such as T-Watch), identify the remote unit as a standalone or rackmount. Use this option to select the remote unit type, ID, and slot number. The ID and slot number are only applicable if the selected remote unit is rackmount, so these may be left blank if the remote unit is standalone.

1)ACCESS TYPE (REMOTE UNIT)

1)STANDALONE - The far-end unit is standalone. 2)RACKMOUNT - The far-end is a rackmount.

2)SHELF SNMP ID

Enter the SNMP ID of the far-end rackmount unit (0-255).

3)SHELF SLOT

Enter the slot number of the far-end rackmount unit (1-16).



This type of communication may not be available with all T1 products.

4)TEST

Use the Test menu to initiate different types of tests of the unit and view test results. The menu contains four sub-items. See Figure 3-20.



The execution of tests disrupts some of the normal operation. See individual menu items concerning tests before executing.

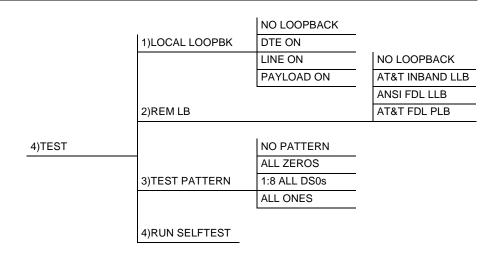


Figure 3-20. Test Menu Tree

Tests are used to control the activation of loopbacks, the initiation of data test patterns, and self test execution.

1)LOCAL LOOPBK, Submenu of 4)TEST

Four choices are available for setting the local loopback:

NO LOOPBACK
DTE ON
LINE ON
Activates the DTE loopback
Activates the line loopback
Activates the payload loopback
Activates the payload loopback

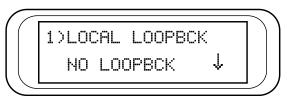


Figure 3-21. Local Loopback Test Screen

2)REM LB, Submenu of 4)TEST

Activates the same loopbacks as the LOCAL LOOPBCK but at the far end. This uses either the inband loop-up code as specified by AT&T 62411 for line loopback (ATT In-Band LLB), or the FDL as specified in ANSI T1.403 for line loopback codes. An FDL (formerly TABS) maintenance message corresponding to AT&T TR54016 can be used for payload loopback as well:

NO LOOPBACK	Deactivates the loopback.
THE EURI DITE	Deactivates the loopsach.

AT&T INBAND LLB Activates the line loopback using inband

code.

ANSI FDL LLB Initiates the transmission of an FDL line

loop-up code toward the far end.

AT&T FDL PLB Initiates the transmission of the PLB

maintenance messages on the FDL.



When a loopback method is selected, the T1 ESF CSU ACE displays LOOPING in the top right corner of the LCD and the yellow LOOP-BACK LED is turned on. When the T1 ESF CSU ACE determines that the far-end T1 ESF CSU ACE has looped up, the T1 ESF CSU ACE displays LOOPED. If the T1 ESF CSU ACE does not recognize the remote T1 ESF CSU ACE looped up after about 10 seconds, the T1 ESF CSU ACE sends the appropriate loop-down code and displays FAILED, and the LOOPBACK LED is turned off.

Excessive errors on the T1 line can cause this failure. The FDL loopbacks fail if the FDL is not intact from one end point to the other. FDL loopbacks are valid only in the ESF framing mode.

3)TEST PATTERN, Submenu of 4)TEST

Sets the pattern for the test and initiates the transmission of the pattern. The test is terminated by selecting **None**. There are four patterns available:

NO PATTERN	Terminates pattern generation.
ALL ZEROS	Generates an all zeros pattern in every
	channel.
1:8 ALL DS0s	Generates a 1 in 8 pattern in all DS0s.
ALL ONES	Generates an all ones pattern in every
	channel.

Use up and down SCROLL keys	To select, for example, 1:8 ALL DS0s.
Press Enter	To record selection.
Results	The T1 ESF CSU ACE starts to generate a 1:8 test pattern and inserts the pattern into all DS0s.
Select None	To end the test.

4)RUN SELFTEST, Submenu of 4)TEST

Use this menu selection 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 (see Figure 3-22).

Upon invoking the command, the LCD displays **INITIALIZING** and test failures are displayed in the LCD window.



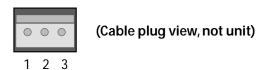
Figure 3-22. Self Test Result Screen

If a failure is detected, note the failure prior to contacting ADTRAN technical support.



The execution of a self test disrupts normal data flow and prevents remote communication until the self test is completed (approximately five seconds).

Appendix A Pinouts



Number	Туре	Color
1	Frame GND	Green
2	48 VDC	Red
3	GND	Black

Figure A-1. Power Connection Wiring

Table A-1. RJ-48C Connector Pin Assignments

Pin	Description	NET	CPE
1	R1	Receive data (from network to CSU)	Transmit data (from CSU to DTE)
2	T1	Receive data (from net- work to CSU)	Transmit data (from CSU to DTE)
3		Not used	Not used
4	R	Transmit data (from CSU to network)	Receive data (from DTE to CSU)
5	Т	Transmit data (from CSU to network)	Receive data (from DTE to CSU)
7		Not used	Not used
8		Not used	Not used

Table A-2. EIA-232 Connector Pin Assignments

Pin	Name	Description
2	TD	Data from DTE to CSU
3	RD	Data from CSU to DTE
7	SG	Signal ground

Appendix B Specification Summary

SPECIFICATIONS AND FEATURES

Specifications and features of the T1 ESF CSU ACE are provided in this chapter.

Network Interface

DSI interface per AT&T 62411 and ANSI T1.403

Network Framing Format

D4 (SF) or ESF

Network Line Code

AMI or B8ZS

Network TX LBO

Auto or manual from 0.0 to -22.5 dB

Performance Monitoring

As per ANSI T1.403 and AT&T 54016

DTE Interface

DSX-1 interface per ANSI T1.102

DTE Framing Format

D4 (SF) or ESF

DTE Line Code

AMI or B8ZS

DTE TX LBO

DSX-1 up to 655 feet of 22-gauge ADAM cable

Monitor and Configuration Access

- Front panel keypad and display
- EIA-232 control port
- T-Watch over FDL (ESF only)

Diagnostics

- Self Test
- Local Loopbacks
- Remote Loopbacks
- Test Patterns

Environment

Temperature:

Operating 0 to 50 deg C

(32 to 122 deg F)

Storage -20 to 70 deg C

(-4 to 158 deg F)

Relative humidity: Up to 95%, noncondensing

Hardware Specifications

• Dimensions: 1.585"H x 7.20"D x 4.05"W

Weight: 1 lb.

• Power: -48 VDC @ 50 mA; 115 VAC @ 60 mA

MTBF: 784,314 hoursCLEI: NCT1CDJBAA

Appendix C Acronyms/Abbreviations

ACK..... acknowledgment

ANSI American National Standards Institute

AR..... access rate

ARP address resolution protocol

async asynchronous

BECN backward explicit congestion notification

BOP bit oriented protocol

CCITT Consultive Committee for International Telephony and Telegraphy

CO carrier detect

CPE..... customer premise equipment

CRC cyclic redundancy check

CS clear to send

CSU channel service unit

CTS..... clear to send

dB..... decibel

DBU..... dial backup

DCD data carrier detect

DCE..... data communications equipment

DDS..... digital data service

DE..... discard eligible

DLCI..... data link connection identifier

DSAP..... directory scope analysis program

DSR data set ready

DSU..... data service unit

DTE data terminal equipment

DTR..... data terminal ready

FDL..... facility data link

FECN..... forward explicit congestion notification

FEP..... front end processor

FIFO..... first in first out

FR..... frame relay

FRAD frame relay access device

FRF..... frame relay forum

FSU frame relay service unit

HDLC..... high-speed data link control

IP..... internet protocol

ISDN integrated services digital network

ITU...... International Telecommunications Union

KA..... keep alive

LAN local area network

LED..... light emitting diode

LLC logical link control

LMI..... local management interface

LRC..... lateral redundancy check

MIB..... management information base

ms..... millisecond

NRZ..... non-return to zero

NRZI non-return to zero inverted

OCU..... office channel unit

OOS..... out of service

PLAR..... private line automatic ringdown

PPP point to point protocol

PU physical unit

PVC permanent virtual circuit

RD receive data

RDL..... remote digital loopback

RFC..... request for comments

RFECN..... remote forward explicit congestion notification

RIP..... routing information protocol

RMA..... return material authorization

RR..... receiver ready

RS recommended standard

RTS..... request to send

Rx.... receive

SAP..... service access point

SDLC..... synchronous data link control

SLIP..... serial line internet protocol

SNA..... systems network architecture

SNMP simple network management protocol

SNRM..... set normal response mode

SR data set ready

SVC switched virtual circuit

SW56 switched 56

sync synchronous

TD..... transmit data

TR data terminal ready

Tx..... transmit

UNI..... user-to-network interface

VRC..... vertical redundancy check

WAN..... wide area network

XID exchange identification

XMIT..... transmit

Appendix D Glossary

4-wire Switched 56

An AT&T proprietary 56/64 kbps switched digital data service offered by telco service providers and delivered to users over 4 copper wires. Compatible with the T1 ESF CSU ACE 4-wire Switched 56 DBU option.

ANSI

American National Standards Institute. Devices and proposes recommendations for international communications standards.

asynchronous

A method of data transmission which allows characters to be sent at irregular intervals by preceding each character with a start bit, followed by a stop bit.

bandwidth

The bandwidth determines the rate at which information can be sent through a channel (the greater the bandwidth, the more information that can be sent in a given amount of time).

BECN

backward explicit congestion notification. A bit set by a frame relay network to notify an interface device (DTE) that congestion avoidance procedures should be initiated by the sending device.

bridge

A device that supports LAN-to-LAN communications. Bridges may be equipped to provide frame relay support to the LAN devices they serve. A frame relay capable bridge encapsulates LAN frames in frame relay frames and feeds them to a frame relay switch for transmission across the network. A frame relay capable bridge also receives frame relay frames from the network, strips

the frame relay frame off each LAN frame, and passes the LAN frame on to the end device. Bridges are generally used to connect LAN segments to other LAN segments or to a WAN. They route traffic on the Level 2 LAN protocol (e.g. the Media Access Control address), which occupies the lower sub-layer of the LAN OSI data link layer. See also *router*.

CCITT

Consultive Committee for International Telephony and Telegraphy. A standards organization that devises and proposes recommendations for international communications. See also ANSI.

CD

carrier detect. A signal generated by a modem or DSU/CSU. CD indicates the presence of a carrier signal on a communications link.

clocking

An oscillator-generated signal that provides a timing reference for a transmission link. A clock provides signals used in a transmission system to control the timing of certain functions. The clock has two functions, (1) to generate periodic signals for synchronization and (2) to provide a time base.

CPE

customer premise equipment. All telecommunications terminal equipment located on the customer premises, including telephone sets, private branch exchanges (PBXs), data terminals, and customer-owned coin-operated telephones.

CRC

cyclic redundancy check. A computational means to ensure the accuracy of frames transmitted between devices in a frame relay network. The mathematical function is computed, before the frame is transmitted, at the originating device. Its numerical value is computed based on the content of the frame. This value is compared with a recomputed value of the function at the destination device. See also *FCS*.

CS

See CTS.

CSU

channel service unit. A device used to connect a digital phone line (T1 or Switched 56 line) coming in from the phone company to either a multiplexer, channel bank, or directly to another device producing a digital signal; for exam-

ple, a digital PBX, a PC, or data communications device. A CSU performs certain line-conditioning and equalization functions, and responds to loopback commands sent from the central office. A CSU regenerates digital signals. It monitors them for problems, and provides a way of testing the digital circuit.

CTS

clear to send. A signal on the DTE interface indicating that the DCE is clear to send data.

dB

decibel. A unit of measure of signal strength, usually the relation between a transmitted signal and a standard signal source.

DCE

data communications equipment. Device that provides all the functions required for connection to telephone company lines and for converting signals between telephone lines and DTE. Also see *DTE*.

DDS

digital data service. A private line digital service, for transmitting data end-to-end at speeds of 2.4, 4.8, 9.6, and 56 kbps and in some cases 19.2, 38.4, or 64 kbps. The systems can use central hub offices for obtaining test access, bridging legs of multipoint circuits, and cross connecting equipment. DDS is offered on an inter-LATA basis by AT&T and on an intra-LATA basis by the Bell operating companies.

DE

discard eligibility. A user-set bit indicating that a frame may be discarded in preference to other frames if congestion occurs, to maintain the committed quality of service within the network. Frames with the DE bit set are considered excess data.

DLCI

data link connection identifier. A unique number assigned to a PVC end point in a frame relay network. Identifies a particular PVC endpoint within a user's access channel in a frame relay network and has local significance only to that channel.

DSU

data service unit. A device designed to transmit and receive digital data on digital transmission facilities.

DSU loopback

A telco initiated test which loops the DSU back to the telco and is used to test the DDS circuit as well as the DSU/CSU.

DTE

data terminal equipment. The end-user terminal or computer that plugs into the termination point (DCE) of a communications circuit. The main difference between the DCE and the DTE is that pins two and three are reversed.

encapsulation

A process by which an interface device places an end device's protocol-specific frames inside a frame rely frame. The network accepts only frames formatted specifically for frame relay; therefore interface devices acting as interfaces to a frame relay network must perform encapsulation. See also *interface device* or *frame relay capable interface device*.

end device

The ultimate source or destination of data flowing through a frame relay network sometimes referred to as DTE. As a source device, it sends data to an interface device for encapsulation in a frame relay frame. As a destination device, it receives de-encapsulated data (i.e., the frame relay frame is stripped off, leaving only the user's data) from the interface device.

FCS

frame check sequence. The standard 16-bit cyclic redundancy check used for HDLC and frame relay frames. The FCS detects bit errors occurring in the bits of the frame between the opening flag and the FCS, and is only effective in detecting errors in frames no larger than 4096 octets. See also *CRC*.

FDL

facility data link. A 4 kbit/s non-disruptive management channel provided in ESF framing mode. This data link conforms to ANSI T1.403 and AT&T TR 54016 specifications.

FECN

forward explicit congestion notification. A bit set by a frame relay network to notify an interface device (DTE) that congestion avoidance procedures should be initiated by the receiving device. See also *BECN*.

file server

In the context of frame relay network supporting LAN-to-LAN communications, a device connecting a series of workstations within a given LAN. The device performs error recover and flow control functions as well as end-to-end acknowledgment of data during data transfer, thereby significantly reducing overhead within the frame relay network.

frame-relay-capable interface device

A communications device that performs encapsulation. Frame-relay-capable routers and bridges are examples of interface devices used to interface the customer's equipment to frame relay network. See also *interface device* and *encapsulation*.

frame relay frame

A variable-length unit of data, in frame-relay format that is transmitted through a frame relay network as pure data. Contrast with *packet*. See also *Q.922A*.

frame relay network

A telecommunications network based on frame relay technology. Data is multiplexed. Contrast with packet switching network.

HDLC

high level data link control. A generic link-level communications protocol developed by the International Organization for Standardization (ISO). HDLC manages synchronous code-transparent, serial information transfer over a link connection. See also *SDLC*.

hop

A single trunk line between two switches in a frame relay network. An established PVC consists of a certain number of hops, spanning the distance form the ingress access interface to the egress access interface within the network.

host computer

The primary or controlling computer in a multiple computer operation.

in-band

Signaling (dialing, diagnostics, management, configuration, etc.) over the same channel used for data.

ingress

Frame relay frames leaving from an access device in a direction toward the frame relay network.

interface device

Provides the interface between the end device(s) and a frame relay network by encapsulating the user's native protocol in frame relay frames and sending the frames across the frame relay backbone. See also *encapsulation* and *frame-relay-capable interface device*.

ISDN

Integrated Services Digital Network. A network architecture that enables end-toend digital connections. The network supports diverse services through integrated access arrangements and defines a limited set of standard, multipurpose interfaces for equipment vendors, network providers, and customers. Interworking with a public switched telephone network is retained.

LAN

local area network. A privately owned network that offers high-speed communications channels to connect information processing equipment in a limited geographic area.

out-of-band

Signaling that is separated from the channel carrying information (voice, data, video, etc.). Typically the separation is accomplished by a filter. The signaling includes dialing and other supervisory signals.

packet

A message containing both control information and data. The control information is used for routing the packet through a network to its final destination. Contrast with *frame relay frame*.

packet-switching network

A telecommunications network based on packet-switching technology, wherein a transmission channel is occupied only for the duration of the transmission of the packet. Contrast with *frame relay network*.

parameter

A numerical code that controls an aspect of terminal and/or network operation. Parameters control such aspects as page size, data transmission speed, and timing options.

ping

An internet protocol standard that provides loopback on demand for any device in an IP network. One device "pings" another by sending a loopback request to the device's IP address.

point-to-point

Type of communications link that connects a single device to another single device, such as a remote terminal to a host computer.

PVC

permanent virtual circuit. A frame relay logical link, whose endpoints and class of service are defined by network management. Analogous to an X.25 permanent virtual circuit, a PVC consists of the originating frame relay network element address, originating data link control identifier, terminating frame relay network element address, and termination data link control identifier. Originating refers to the access interface form which the PVC is initiated. Terminating refers to the access interface at which the PVC stops. Many data network customers require a PVC between two points. Data terminating equipment with a need form continuous communion use PVCs. See also *DLCI*.

remote configuration

A feature designed into ADTRAN DSU/CSU products that allow remote DSU/CSU to be configured from a local DSU/CSU or VT-100 compatible terminal.

router

A device that supports LAN-to-LAN communications. Routers may be equipped to provide frame relay support to the LAN devices they serve. A frame-relay-capable router encapsulates LAN frames in a frame relay frames and feeds those frame relay frames to a frame relay switch for transmission across the network. A frame-relay-capable router also receives frame relay frames from the network, strips the frame relay frame off each frame to produce the original LAN frame, and passes the LAN frame on to the end device. Routers connect multiple LAN segments to each other or to a WAN. Routers route traffic on the Level 3 LAN protocol (e.g., the internet protocol address). See also bridge.

SDLC

synchronous data link control. A link-level communications protocol used in an international business machines (IBM) systems Network Architecture (SNA) network that manages synchronous, code-transparent, serial information transfer over a link connection. SDLC is a subset of the HDLC protocol developed by ISO.

service

The provision of telecommunications to customers by a common carrier, administration, or private operating agency, using voice, data, and/or video technologies.

SNMP

simple network management protocol. A control and reporting scheme widely used to manage devices from different vendors. SNMP operates on top of the Internet protocol.

SR

data set ready. A signal on the EIA-232 interface that indicates if the communications is connected and ready to start handshaking control signals so communications can begin.

statistical multiplexing

Interleaving the data input of two or more devices on a single channel or access line for transmission through a frame relay network. Interleaving of data is accomplished using the DLCI.

switched network

The network of dial-up telephone lines using circuit switching to provide communications services to network users.

synchronous

Communications in which the timing is achieved by sharing a single clock. Each end of the transmission synchronizes itself with the use of clocks and information sent along with the transmitted data.

T1

Transmission rate of 1.544 Mbps on T1 communication lines. A T1 facility carriers a 1.544 Mbps digital signal. Also referred to as digital signal level 1 (DS-1). See also *E1*.

trunk line

A communications line connecting two frame relay switches to each other.

VT-100

A non-intelligent terminal or terminal emulation mode used for asynchronous communications. Used to configure the T1 ESF CSU ACE.

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