

TSU ESP T1 Service Unit with Embedded SNMP

User Manual

Part Number

1200169L1

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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), _____ (business address),

_____ (telephone number) being duly sworn, state:

I have the responsibility for the operation and maintenance of the terminal equipment to be connected to 1.544 Mbps and/or _______ subrate digital services. The terminal equipment to be connected complies with Part 68 of the FCC rules except for the encoded analog content and billing protection specification. With respect to encoded analog content and billing protection:

() I attest that all operations associated with the establishment, maintenance and adjustment of the digital CPE with respect to encoded analog content and billing protection information continuously complies with Part 68 of the FCC rules and Regulations.

() The digital CPE does not transmit digital signals containing encoded analog content or billing information which is intended to be decoded within the telecommunications network.

() The encoded analog content and billing protection is factory set and is not under the control of the customer.

I attest that the operator(s) maintainer(s) of the digital CPE responsible for the establishment, maintenance and adjustment of the encoded analog content and billing information has (have) been trained to perform these functions by successfully having completed one of the following (check appropriate blocks):

() A. A training course provided by the manufacturer/grantee of the equipment used to encode analog signals; or

() B. A training course provided by the customer or authorized representative, using training materials and instructions provided by the manufacturer/grantee of the equipment used to encode analog signals; or

() C. An independent training course (e.g., trade school or technical institution) recognized by the manufacturer/grantee of the equipment used to encode analog signals; or

() D. In lieu of the proceeding training requirements, the operator(s)/maintainer(S) is (are) under the control of a supervisor trained in accordance with ______ (circle one) above.

I agree to provide ______ (telco's name) with proper documentation to demonstrate compliance with the information in the preceding paragraph, if so requested.

_____Signature

_____ Title

_____ Date

Subscribed and sworn 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	6.0N	04DU9-BN	RJ-48C
1.544 Mbps - SF and B8ZS	6.0N	04DU9-DN	RJ-48C
1.544 Mbps - ESF	6.0N	04DU9-1KN	RJ-48C
1.544 Mbps - ESF and B8ZS	6.0N	04DU9-1SN	RJ-48C

- 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.



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 LIMITED WARRANTY 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 LIM-ITATION), ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PUR-POSE. SOME STATES DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, 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 ADTRAN Sales:

Applications Engineering	(800) 615-1176
Sales	(800) 827-0807

Post-Sale Support

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

Technical Support (888) 4ADTRAN

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) 963-6700
Training - email	training@adtran.com

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Chapter 1

Overview

PRODUCT OVERVIEW

The ADTRAN TSU ESP is a full-featured T1/FT1 Data Service/Channel Unit (DSU/CSU) with an integral embedded SNMP agent and optional dial backup (DBU) capabilities. It provides an interface between T1 or Fractional T1 service and the customer's data terminal equipment (DTE). The TSU ESP provides access to traditional dedicated point-to-point T1 services as well as frame relay, SMDS, and ATM services.

TSU ESP Product Features

- Single V.35 DTE interface
- Nx56 or Nx64 operation
- Embedded SNMP and Telnet
- Control port (chain-in) provides SLIP or PPP access to SNMP or VT 100 terminal configuration
- An optional LAN interface card for SNMP control
- Optional ESP DBU cards that include 4-wire SW56, single BRI and external DCE
- Automatic or manual dial backup
- Time of day and weekend dial backup lockout options
- Support for T-Watch PRO via chain-in/chain-out control port

Figure 1-1 shows a typical point-to-point application for the TSU ESP.



Figure 1-1. TSU ESP Point-to-Point Application

T1/FT1 Overview

	T1 is a digital service that service providers deliver to the user over two pairs of wires. The signal operates at 1.544 mega bits per second (Mbps) and is usually extended by repeaters that are installed about every mile after the first 6000 feet. The T1 signal is divided into 24 time slots, or digital signal lev- el zeros (DS0s), which operate at 64 kilobits per seconds (kbps). Each time slot is occupied by digitized voice or data. T1 signals originally used a type of framing known as D4 Superframe which identifies how the T1 is multiplexed. Extended Superframe (ESF) is an en- hancement of that framing format. ESF provides a non-disruptive means of full-time monitoring on the digital facility. Service providers originally used ESF to monitor the performance of their service offering. Since the introduc- tion of ESF, equipment that is installed in private networks can also provide the same performance information to the user.			
Fractional T1				
	Fractional T1 (FT1) provides less than a full T1 circuit between two points. Most carriers offer fractional T1 in increments of 56 or 64 kbps. The network allows multiple users to share the same inter-office T1 bandwidth.			
	FT1 remains almost exclusively an inter-exchange carrier (IXC) service. Lo- cal exchange carriers (LECs) typically do not offer FT1, so the user's proxim- ity to the IXC's point-of-presence (POP) is key in the savings that fractional T1 offers.			
SNMP				
C	Simple Network Management Protocol (SNMP) broadly refers to the mes- sage protocols used to exchange information between the network and the managed devices, as well as to the structure of network management data bases. SNMP has three basic components: a network manager, an agent, and a Management Information Base (MIB).			
Network Manager				
	The Network Manager is a control program that collects, controls, and pre- sents data pertinent to the operation of the network devices. It resides on a network management station.			
Agent				
	The Agent is a control program that resides in each network device connect- ed. This program responds to queries and commands from the network manager and returns requested information or invokes configuration chang- es the manager initiates.			

MIBThe MIB is an index to the organized data within a network device. It defines
the operation parameters that can be controlled or monitored.The TSU ESP supports the MIB-II standard, RFC 1213, RFC 1406, and ADT-
RAN Enterprise Specific MIB. MIB files are available in the post-sales sup-
port section of the ADTRAN web page at: http://www.adtran.com.The TSU ESP's embedded SNMP feature allows a network manager to ac-
cess and control the unit through either a device running SLIP or async PPP
protocol (connected to the CONTROL port of the TSU ESP) or through a
LAN. LAN connection requires the optional ESP ethernet card (P/N
1204005L1). This card provides a 10BaseT ethernet interface to the LAN.

TELNET

Telnet provides a password-protected, remote login facility to the TSU ESP. Telnet allows a user on a network manager to control the TSU ESP through the optional 10BaseT ethernet LAN modual (P/N 1204005L1.) See *VT 100 Terminal Connection And Operation* on page 36 for more information.

DIAL BACKUP OPERATION

The TSU ESP supports dial backup of fractional T1 circuits. For T1 backup, the TSU ESP enters dial backup based on physical line faults. During dial backup, the TSU ESP monitors the main line integrity and drops the dial backup call when the main line is restored.

The 4-wire SW56 DBU card is compatible with AT&T Accunet and Sprint SW56 type services. The ISDN 2B+D card supports a U-interface to the Basic Rate ISDN and is compatible with LUCENT 5ESS, DMS 100, and National ISDN TSU ESPs.

The TSU ESP's unique DBU cards are field-installable by the customer. See the section *DBU and Ethernet Card Slots* on page 34 for information on installing DBU cards. Also see the chapter *DBU Module* on page 54 for information on configuring DBU options.

The backup options are described in the following sections. Contact the local telco provider to determine which services are available in your area.

61200169L1-1

DBU Card Options

4-wire Switched 56 DBU Card (P/N 1204001L1)

This dial-up 4-wire SW56 card allows you to pay for data connection only for the time the unit is active. The regional operating companies provide the 4-wire local loop service to SW56 customers.

ISDN BRI DBU Card (P/N 1204004L1)

2B+D Basic Rate ISDN service provides backup over an ISDN circuit. 2B+D BRI service provides the customer with a switched 112/128 kbps circuit.



When placing a call from an ISDN DBU card to a switched 4-wire unit, append a #3 (requesting a digital data circuit) to the end of the phone number to ensure a reliable connection.

DCE Card (P/N 1204006L1)

The DCE DBU card allows you to use an existing piece of data communication hardware to back up the T1/FT1 network. The existing S4W unit, ISDN unit, or modem should be configured to dial when DTR is raised by the DCE DBU card.



The pinouts for the DBU cards are available in Network Pinouts on page 75.

Chapter 2

Installation

UNPACK, INSPECT, POWER UP

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

ADTRAN Shipments Include

The following items are included in ADTRAN shipments of the TSU ESP:

- TSU ESP unit
- T1 Line interface cable: 8-position modular to 8-position modular (15ft)
- Supervisory port cable: 8-position modular to 8-position modular (6ft)
- PC adapter: 8-position female modular to female DB-25 adapter for access to the Control/SLIP/PPP port
- Loopback plug
- The TSU ESP User Manual CD
- TSU ESP Quick Start Guide
- FCC Compliance Print

NOTE

The ADTRAN TSU ESP MIB is available from ADTRAN in the support section of the ADTRAN web page at www.adtran.com.

The following items are included in ADTRAN's shipments of ESP DBU cards:

- ESP DBU card
- An 8-position modular to 8-position modular cable for the 4-wire SW56 and ISDN dial backup options.

Customer Provides

The customer must provide the appropriate DTE cable to connect to the TSU ESP. The TSU ESP requires a male V.35 interface cable when connecting the unit to external data service equipment (i.e., router).

For SNMP management, the customer must provide access to the TSU ESP either through a SLIP port, Async PPP port (requires a male 25-pin D-type connector), or a 10BaseT ethernet port (requires an ADTRAN ESP ethernet card installed in the TSU ESP). See *Network Pinouts* on page 75 for the pin assignments for the control port (for SLIP and Async PPP) and the optional 10Base T Ethernet LAN Module port (P/N 1204005L1).

Power Up

The TSU ESP is provided with a captive 8-foot power cord, terminated by a three-prong plug which connects to a grounded 115 VAC power receptacle.



Power to the TSU ESP must be provided from a grounded 115 VAC, 60 Hz receptacle.

Chapter 3 Operation

FRONT PANEL MENU STRUCTURE

The TSU ESP uses a multilevel menu approach to access its many features. All menu operations are displayed in the LCD window or the terminal.

Main Menu

The following section briefly describes the Main menu's four branches, which are displayed on the front panel LCD (see Figure 3-1). Detailed information is provided in the individual chapters for each menu branch.

4) 0747110		\frown
1) STATUS	2) CONFIG	
3) UTIL	4) TEST	



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.

Main Menu Descriptions

The branches of the front panel Main menu are divided into options for **STATUS**, **TEST**, **CONFIGURATION** (**CONFIG**), and **UTILITY** (**UTIL**).

Status

STATUS menus display all relevant information for the network and DTE interfaces. The system returns to the **STATUS** display when idle. For more information, see Chapter 5, *Status* on page 41.

Configuration (CONFIG)

Use **CONFIGURATION** menus to select network and DTE operating parameters, configure testing and dialing options, select management functions, and configure unit utilities. See Chapter 6, *Configuration Menu* on page 45, for more information.

Test

Use **TEST** menus to control local and remote testing. Select **LOCAL** or **REMOTE** testing, and the type of test and test pattern when required. For more information, see Chapter 8, *Test Menu* on page 67.

Utility (U⊤IL)

The **UTILITY** menu displays and sets system parameters. See Chapter 7, *Utility Menu* on page 63 for detailed information on the available options.

Basic Menu Travel

Four function keys on the left side of the TSU ESP keypad allow the various menu branches to be entered, exited, and scrolled through. The four function keys are defined below.

Enter

Selects a displayed item.

Up Arrow

Scrolls up the submenu items.

Down Arrow

Scrolls down the submenu items.

Cancel

Exits (back one level) from the current branch of the menu.

To choose a menu item, press the corresponding number or alpha character on the keypad (press **Shift** to activate alpha characters). The item flashes on and off to show it is the currently selected (active) choice. Press the up or down arrow keys to scroll through the available menu items. Press **Enter** to select the flashing item.

Front Panel Menu Navigation

Some Management menus require that you enter letters rather than numbers. When configuring the unit using the front panel, you must follow special steps in order to enter letters. The following example shows how to enter the Telnet password.

Step	Action
1	From the main menu, press 2, then Enter. Press 5, then Enter.
2	Press 5, then Enter to select TELNET OPTIONS from the Management Menu.
3	Press 1, then Enter to select TELN PASSWORD.
4	Press Enter to begin editing. The cursor appears as an underscore ().
5	Use the up and down arrow keys to scroll to the appropriate letter.
6	Once the desired letter is displayed, press Enter . A block cursor appears in the next field.
7	Repeat this procedure until all letters have been entered.
8	When password entry is complete, press Enter. The cursor returns to the beginning of the option text.

	1)NETWORK		
	2)UNIT	1)INTERFACE	
2)CONFIG	3)PORT	2)CHAIN IN PORT	
	4)DBU MODULE	3)IP ADDRESS	
	5)MANAGEMENT	4)SNMP OPTIONS	1)TELNET PASSWORD
	6)TEST CONFIG	5)TELNET OPTIONS	2)TELN TIMEOUT

Figure 3-2. Example of Basic Menu Navigation

FRONT PANEL

The TSU ESP faceplate is shown in Figure 3-3. Descriptions of each part of the front panel follow the figure.



Figure 3-3. TSU ESP Front Panel

LCD Window

Displays menu items and messages in 2 lines by 16 characters.

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.

Keypad

The keypad contains dual-function keys numbered 0 through 9 with alpha characters A through F. These keys are used to activate menu items and enter information.

Shift

Enter alpha characters by pressing and releasing **Shift** before pressing the key representing the desired character. To activate a menu item designated by an alpha character rather than a number, press **Shift** and then the letter.

The menu item flashes, indicating which parameter is activated. Press **Enter** to select the item.

If a key is pressed without using **Shift***, the numbered item becomes active instead of the alpha item.*

Quick

NØTE

During most operations, the **Quick** key returns the display to the Main menu. During a test, the **Quick** key returns to the top of the **TEST** menu. In SW56 operations, if the unit is not in test, the **Quick** key returns to the **DIAL** menu.

Cancel

Pressing the **Cancel** key stops the current activity and returns to the previous menu. Repeat until the desired menu level is reached.

Up and Down Arrows

Up and down arrows scroll through the submenu items available in the current menu.

LED Descriptions

The TSU ESP has seven LED indicators: RS, CS, TD, RD, ERR, ALM, and TST. These LEDs are described in *Table 3-1*.

LED	Description
RS: Request to Send	Reflects the status of the request to send pin of the DTE interface.
CS: Clear to Send	Reflects the status of the clear to send pin of the DTE interface.
TD: Transmit Data	This LED is active when data is transmitted from the DTE.
RD: Receive Data	This LED is active when data is received from the net- work.
ERR: Error Indicator	This LED is active when an error, such as a BPV or CRC error, occurs on the network.
ALM: Alarm Indication	This LED activates whenever an alarm condition exists. Alarm conditions include: Network Signal Loss No Frame Synchronization Remote Alarm Indication
TST: Test Mode	This LED is on whenever the unit is in test mode.

Table 3-1. Front Panel LED Descriptions

REAR PANEL

The rear panel contains a DTE connector which provides primary channel V.35. An 8-pin telco jack, a control chain-in and chain-out port, a captive power cord, and a power switch are also located on the rear panel. Pin assignments for these connectors are listed in Appendix A, *Network Pinouts*. The TSU ESP rear panel is shown in Figure 3-4.



Item	Function
DBU Interface	ESP DBU card slot
LAN Interface	ESP Ethernet card slot
Network	Connects to dedicated circuit
Control	Connects to a VT 100 terminal or a device running SLIP or async PPP protocol
V.35	High speed DTE interface
Power Switch	Turns power on or off
115 VAC Connection	Power cord connection

Figure 3-4. DSU IV ESP Rear View

DBU and Ethernet Card Slots



The TSU ESP rear panel has two card slots for the installation of dial backup and ethernet cards. To insert cards, perform the following procedure:

1. Remove power from the TSU ESP.

- 2. Slide the card into the corresponding rear slot until the card panel is flush with the TSU ESP chassis.
- 3. Push card locks in (until they click) to secure the card and ensure proper installation.

NOTE

Card slots are keyed to prevent improper installation (i.e., putting a DBU card into the ethernet slot).

Network Interface Connection

The TSU ESP has an 8-position modular jack labeled **NETWORK**. The Network Interface (NI) port complies with the applicable ANSI and AT&T standards and has the following features:

- Alternate mark inversion (AMI) or binary 8 zero suppression (B8ZS) coding
- Automatic or manual line build-out
- Auto detect or manual settings for D4 or ESF framing
- Network performance monitoring and reporting
- Test loopbacks by local and remote
- Extensive self-testing

The pinout for this connector is listed in Appendix A, *Network Pinouts* on page 75.

V.35 Connector: DTE Data Connection/Primary DTE

The primary DTE should be connected to the V.35 DTE connector. The maximum cable length recommended for the V.35 is 100 feet.

- Data rates: N*56K or N*64K, where N=1 to 24 (DS0s)
- Invert data feature
- A V.35 interface
- Standard V.35 connector
- Test loopbacks with 511 pattern generation and check
- Extensive self-testing

The pin assignments for the connectors are listed in Appendix A, *Network Pinouts* on page 75.



To prevent possible radio frequency interference emissions, a shielded cable is required.

Control Port

The TSU ESP has an 8-position modular jack labeled **CONTROL**. The control port provides connection to a VT 100 EIA-232 compatible interface, a device running SLIP protocol, or a device running Async PPP protocol. An 8-foot adapter cable and connector provide a standard DB-25 EIA-232 interface. Features of the control port include:

- RS-232 input from a personal computer (PC) or a modem for control of the TSU ESP
- Chain input/output from another TSU ESP
- Up to 9600 baud operation

See Appendix A, Network Pinouts for the control port's pin assignments.

The control port also functions as the SLIP or Async PPP port when configured for SNMP management. The pinouts are identical when operating in an SNMP management mode.



Connect to the Control port using the following settings: 8 data bits, no parity bits, 1 stop bit.

VT 100 TERMINAL CONNECTION AND OPERATION

To control the TSU ESP using a VT 100 terminal, perform the following procedure:

- Select a terminal interface through the front panel. Select 2)CONFIG> 5)MANAGEMENT>1)INTERFACE >CHAIN IN.
- Set the DATA RATE to match the VT 100 terminal by choosing 2)CONFIG> 2)UNIT>1)CONTROL PORTS >3)DATA RATE.
- 3. Using the provided VT 100 terminal adapter cable, connect the **Com** port of a VT 100 compatible terminal or equivalent to the 8-pin modular jack labeled **CONTROL IN** on the rear of the TSU ESP. This connection is used for both local and remote configuration.
- 4. Establish the connection and press **<Ctrl-A><Ctrl-P><Ctrl-T>** or **<Ctrl-P><Ctrl-T>** until the **TERMINAL MENU** appears.
- 5. Make selections by entering the number corresponding to the chosen parameter. Press **ESC** to return to the previous screen.

The TSU ESP VT 100 interface is only available when the unit is configured for ADLP on the chain-in port and chain-in is selected as the management interface. This requirement prevents a conflict that would exist if you opened a telnet session over the ethernet interface at the same time that a VT 100 session was active on the chain-in port (that is, two terminal modes open simultaneously).



When establishing a Telnet session, the system prompts for a password. The default password is adtran. This password can be modified through the Management menu. See Management on page 58 for more information.
Applications

This chapter provides examples of some common TSU ESP applications. The examples include LAN applications with both SLIP/PPP and ethernet management and a dial backup application.

LAN APPLICATION WITH SNMP/TELNET MANAGEMENT

The TSU ESP can be managed through an established Telnet session or an SNMP-based network manager like HP Openview, IBM Netview, or SunNet Manager.



The ADTRAN TSU ESP MIB is available in the support section of the ADTRAN web page at www.adtran.com.

SNMP and Telnet management are provided by one of the following interfaces:

- A device (e.g., a router) running SLIP protocol. Connection is made through the TSU ESP's control port. See Figure 4-1.
- A device (e.g., a router) running Async PPP protocol. Connection is made through the TSU ESP's control port. See Figure 4-1.
- A LAN. Connection is made through the optional 10BaseT ethernet interface provided on the ESP ethernet card (P/N 1204005L1). See Figure 4-2.



Figure 4-1. SLIP/PPP LAN Application with SNMP/Telnet Management



Figure 4-2. Ethernet LAN Application with SNMP/Telnet Management

Minimum Configuration Requirements for SNMP/Telnet Access

The following options are the minimum configuration requirements for establishing SNMP or Telnet access. Once these options are configured, the remaining options may be configured using SNMP/Telnet. See the menu tree in Figure 6-9 on page 58 for the front panel menu path to these options.

Interface

Select SLIP Control, PPP Control, or Ethernet LAN as the TSU ESP interface type. The ESP ethernet card must be installed for the Ethernet LAN selection.

IP Address

Enter the TSU ESP IP address.

Subnet Mask

Enter the subnet number. This address is available from the network administrator.

Gateway IP Address (if required)

Enter the Gateway node IP address. This address is necessary only if the TSU ESP and the network manager are connected through a Gateway node. This address is available from the network administrator.

Special Features of this Application

Customize the SNMP/Telnet application using the following TSU ESP features:

• Designate SNMP hosts to receive SNMP traps from the TSU ESP (one to five entries).

• Secure the TSU ESP by limiting SNMP network management access. If enabled, the TSU ESP only responds to a user-configured list of SNMP network managers (one to five entries).

Configure these options through the Management portion of the Configuration menu. See *Management* on page 58 for more information.

DIAL BACKUP APPLICATION

The TSU ESP provides point-to-point connection to the network. With one of the ESP DBU option cards installed, the unit is capable of dial backup, allowing the unit to dial around a failed network. See Figure 4-3.

With the DBU options, configure the unit to:

- Enter DBU under specific primary network conditions.
- Lock out DBU over the weekend and/or at specified times of the day.
- Dial a specified number when a DBU activation condition is detected.



Figure 4-3. Dial Backup Application

Entering Dial Backup Mode

When a condition for entering dial backup mode is detected, the **ALARM** LED turns on and the buzzer sounds. The buzzer alternates between 30 seconds on and 30 seconds off unless the DDS line is restored or it is disabled by using the **Quick** key and selecting **TURN OFF BEEP**. See the section *Front Panel* on page 32 for more information on the **Quick** key.

Operation During Critical Times

The TSU ESP allows the user to select the conditions that initiate the dial backup mode. The factory default enables DBU mode upon detection of these conditions. The following four conditions can cause a TSU ESP to enter dial backup mode:

Red Alarm Condition

A Red Alarm condition occurs when the TSU ESP starts receiving major errors from the T1/FT1 network. Conditions that will cause a Red Alarm include **LOSS OF SIGNAL (LOS)** or **OUT OF FRAME (OOF)**.

Yellow Alarm Condition

A yellow alarm condition occurs when the remote TSU ESP receives major errors from the T1/FT1 network.

Inband Poll Failure

In situations where the FDL is not available, you can use inband polling to verify the integrity of the T1/FT1 network. Inband polling is automatically enabled when the inband option is set to on. In order for inband polling to work properly, both the local and remote TSU ESPs must have the inband option set to on.

Data Failure, All 1s or 0s

The network will usually generate this condition to indicate that some device (or devices) in the network are inoperative. This condition is only used as a dial backup condition if the **BACKUP ON: NET/DATA FAIL** option is selected.

Operation During Noncritical Times

The TSU ESP may be configured not to enter dial backup mode if data terminal ready (DTR) is low. This feature prevents the TSU ESP from entering dial backup during noncritical times such as nights and weekends.

For more information, see DBU Module on page 54.

Weekend and Time of Day Lockout

The TSU ESP may be configured not to enter dial backup mode based upon the time of day or weekend status. This protects the customer from being charged for a switched call during off hours should the dedicated circuit fail. See *Wkend Lockout* on page 56 for more information.

Conditions for Returning to the T1 Circuit

The TSU ESP automatically returns to the T1/FT1 circuit when the backup condition (red alarm, yellow alarm, data failure, or inband poll failure) is corrected. The TSU ESP can be configured to wait a specified amount of time before the network connection is restored.



See Restore Delay on page 57 for more detailed information.

Status

TSU ESP STATUS MENU

The **STATUS** menu displays the status of the TSU ESP operation. See Figure 5-1.

		1) RESET PERF CNTRS	
		2) %AV	
		3) %EF	
	1) N1 PERF RPTS	4) SES	1) LOSS OF SIGNAL
		5) ES	2) AIS ALARM
		6) UAS	3) OUT OF FRAME
			4) YELLOW ALARM
1) STATUS	2) CURR ERR/ALM		5) RED ALARM
			6) CODE VIOLATIONS
		1) CLEAR HISTORY	7) BIPOLAR VIOL
		2) LOSS OF SIGNAL	8) FRAME BIT ERRORS
		3) AIS ALARM	9) PLL ALARM
	3) ERR/ALM HIST	4) OUT OF FRAME	
		5) YELLLOW ALARM	
		6) RED ALARM	
		7) CODE VIOLATIONS	
		8) BIPOLAR VIOL	
		9) FRAME BIT ERRORS	1) DCD DTR DSR
		10) PLL ALARM	2) RTS CTS RI
			3) DBU SECS IN DBU
	4) DBU STATUS		4) DBU LINE STATUS

Figure 5-1. Status Menu

NI PERF RPTS

The **NETWORK INTERFACE PERFORMANCE REPORTS** menu displays the user copy of the performance data. The TSU ESP 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.

You cannot edit these fields, only clear them. Only the user copy of performance data is cleared.

The available options are listed below:

RESET PERF CNTRS

Reset local performance counters

%AV

Percentage of available seconds

%EF

Percentage of error free seconds

SES

Number of severely errored seconds

ES

Number of errored seconds

UAS

Number of unavailable seconds

Continue with standard operating procedures to exit the display. Since the TSU ESP only clears the user's copy of performance data, 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** displays currently active and inactive errors and alarms. Use the up and down arrows to access the complete display of the errors/alarms that are currently active. You can review the following alarms and errors.

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

Loss of signal/out of frame (LOS/OOF) causing red alarm at NI.

Code Violations

Cyclic redundancy check (CRC) errors in ESF, or bipolar violations (BPVs) in Superframe Format (SF) were received at NI Bipolar Violations BPVs in SF or ESF.

Bipolar Violations

Bipolar violations received at NI.

Frame Bit Errors

Frame Bits received incorrectly at NI.

PLL Alarm

Unable to sync up to selected clock.

ERR/ALM HIST

The **ERROR/ALARM HISTORY** menu displays the 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 then, the menu is **INACTIVE**. These conditions are the same as for the **CURR ERR/ALM** submenu except that these are **HISTORY ALARM/ERRORS** instead of **CURRENT ALARM/ERRORS**.

Clear History

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

Loss of signal/out of frame (LOS/OOF) causing red alarm at NI.

Code Violations

Cyclic redundancy check (CRC) errors in ESF, or bipolar violations (BPVs) in Superframe Format (SF) were received at NI Bipolar Violations BPVs in SF or ESF.

Bipolar Violations

Bipolar violations received at NI.

Frame Bit Errors

Frame Bits received incorrectly at NI.

PLL Alarm

Unable to sync up to selected clock.

DBU STATUS

The **DBU STATUS** menu only appears when a dial backup module is installed in the TSU ESP.

DCD DTR DSR

Displays the status of DCD, DTR, and DSR on the DBU card.

RTS CTS RI

Displays the status of RTS, CTS, and RI on the DBU card.

DBU SECS in DBU

Displays the number of seconds that the TSU ESP has been in dial backup mode and indicates whether or not the unit is currently in dial backup mode. You can clear the second counter by pressing **1** on the keypad.

DBU Line Status

Available only when either the ISDN or S4W card is installed. This message reports the status of the ISDN or switches 4-wire line.



DBU Line Status is not available when an external DCE DBU card is installed.

Configuration Menu

The **CONFIGURATION** menu sets the TSU ESP operational configuration, including all of the network interface parameters, and the allocation of the DS0s and the port parameters.

CONFIGURATION MENU

Network (NI)

This menu accesses the configuration of parameters associated with the network interface in the TSU ESP. There are eight submenu items that include setting the format, the line build out (LBO), and the clock source (see Figure 6-1).



Factory defaults are in bold type.

Figure 6-1. Network Configuration Menu Tree



This option is also referred to as looped timing as the transmission clock is derived from the received clock. See Figure 6-2.



Figure 6-2. Network Timed Clock Source

DTE Timing

The DTE is the source of timing. The TSU ESP 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 6-3.



Figure 6-3. DTE Clock Source

Internal Timing

The TSU ESP is the source of timing. The TSU ESP 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 6-4.

Figure 6-4. Internal Clock Source

Bit Stuffing

	When enabled, BIT STUFFING causes the TSU ESP to monitor for ones (1s) density violations and insert a one (1) when needed to maintain ones at 12.5 percent. Disable this option if B8ZS is enabled, if Nx56 is selected, or if alternate channels are being used. All of the other options already ensure pulse density requirements. Choices: ENABLE and DISABLE
Set LBO	
	Selects the line build-out for the network interface. In AUTO mode, the TSU ESP will set the line build-out based on the strength of the receive signal. Choices: <u>0dB</u> , AUTO , -22.5dB , -15dB , -7.5dB
RX Sensitivity	
	Selects the desired receiver sensitivity setting. NORMAL is adequate for most applications, and EXTENDED should be used only in applications where NORMAL will not suffice. Choices: NORMAL and EXTENDED

UNIT



The **UNIT** submenu changes control port and alarm options (see Figure 6-5).

Factory defaults are in bold type.

Figure 6-5. Unit Configuration Menu Tree

Control Ports

The control ports sets up the unit as the master or slave on a chain of units and determines whether to initialize a modem and the control port data rate.

Position

Determines whether the TSU ESP 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.

Setting the **POSITION** selection is necessary only when using a modem. In this case, the head unit should be **MASTER**, which also controls the modem. For all other cases, select **SLAVE**. Choices: **MASTER** and **SLAVE**

Modem Init

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

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/router serial port Choices: **9600**, **2400**, and **1200** baud

Alarms

Initializes the method by which the control port handles alarm conditions.

Traps

This setting determines whether alarm conditions should automatically send alarm messages (traps) to T-Watch Pro. The setting is for this unit, or for slaves if this unit is a master.

For applications where the **AUTO INBAND** selection is not acceptable, Traps should only be enabled with the Inband selection set to **ON** or **OFF**. Choices: **DISABLE** and **ENABLE**

Output

Selects whether the alarm traps (if enabled) are sent directly (**DIRECT**), or if the telephone number stored in the TSU ESP should be dialed first (industry-standard AT dial command sent to modem). Choices: **DIRECT** and **DIAL**

Tel Num

This is the telephone number which is dialed to report alarm traps. A colon (:) represents 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 from a PBX, etc.

PORT

The menu item **PORT** selects and then configures the parameters associated with the V.35 (see Figure 6-6).



Factory defaults are in bold type.

Figure 6-6. Port Configuration Menu Tree

Rate 56/64	
	This sets the base rate of the interface. The actual data rate depends on the number of DS0s assigned to the Nx port. The DTE data rate versus the number of DS0s appears in Appendix B, <i>DTE Data Rate Chart</i> on page 81. Choices: <u>64</u> and 56 kbps
Channels	
	This sets the unit to use alternate (ALT) or contiguous (CONT) channels in the T1 data stream. If more than 12 channels are used, then you must select CONTIGUOUS . If not, then you can use alternate channels to meet pulse density requirements (only necessary for Nx64 without B8ZS). If this is other than a private network, the carrier must be notified of this choice. Choices: CONT (CONTIGUOUS) and ALT (ALTERNATE)

DTE TX CLK	
	This option controls the clock the TSU ESP uses to accept the transmit (TX) data from the DTE. Most applications will allow for this to be set to INTER-NAL .
	If the interface cable is long (causing a phase shift in the data) you can select the clock as INT/INV (INTERNAL/INVERTED) . This switches the phase of the clock, which should compensate for a long cable.
	The AUTO DTE TX CLK setting will allow the TSU ESP to automatically detect the delay from the DTE device to the TSU ESP and set the proper phase of the clock. 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 TSU ESP will depend on an externally supplied clock to accept the TX data. Choices: <u>AUTO</u> , INT_INV (INTERNAL/INVERTED) , EXTERNAL , and INTERNAL
Start Chan	
	Used to select the channel in which the T1 stream will start. The setting must be consistent with the carrier if using a public network.
# of Chan	
	Used to select the number of DS0s (channels) that are to be used. The corresponding DTE rate will be this number times 56K or 64K, depending on Port Option number 1 . See <i>Rate 56/64</i> on page 51 for details.
Data	
	Used to control the inverting of the DTE data. This inversion can be useful when operating with an High level Data Link Control (HDLC) protocol. Often used as a means to ensure ones (1s) density. TSU ESPs on both ends must have identical option settings. Choices: NORMAL or INVERTED
CTS (Clear To Send)	
	Controls characteristics of CTS. Choices: <u>NORMAL</u> (see Table 6-1) or FORCE ON
DCD (Data Carrier Detec	ct)
	Indicates to the DTE when a valid signal is being received at the Network In- terface. Choices: NORMAL (see Table 6-1) or FORCE ON

DSR (Data Set Ready)

Indicates to the DTE that the DCE is turned **ON** and ready for operations. Choices: **NORMAL** (see Table 6-1) or **FORCE ON**

Table 6-1. Normal Mode Operation

Conditions Which Cause the Port Control Signals to be deactivated.

SIGNAL	RTS	TEST ACTIVE	ESF YELLOW ALM		
CTS	Follows	OFF	OFF		
DCD			—		
DSR	_	OFF	_		
- don't ooro n	- den't eere peremeter				

— = don't care parameter

Inband

The Inband Configuration Channel enables/disables an 8 kbps remote configuration channel (see Figure 6-7 on page 6-53). When this option is set to **ON**, the first DS0 occupied operates in 56K mode and the DTE clock rate is reduced by 8 kbps. The TSU ESP uses this 8 kbps channel to send and receive configuration data across a T1 span. This allows a PC connected to the chainin port on TSU ESP A to monitor/configure both TSU ESP A and B through T-Watch Pro. This feature is useful when FDL connectivity is not available across the T1 span.

The 8 kbps channel is only taken out of the first DS0. If two 64K DS0s are mapped, the DTE rate would be 120 kbps instead of 128 kbps. This menu option can also be set to **AUTO**, which activates the Inband Channel only when commands are sent from T-Watch to the remote unit (See TSU ESP B in Figure 6-7).

If no T-Watch activity is detected for 10 minutes, the Inband Channel is deactivated.

Choices: **OFF**, **AUTO**, and **ON**



Figure 6-7. Inband Remote Configuration

DBU Module

The DBU Module-specific options allow you to configure options pertaining to specific types of dial backup units. The menu displayed depends on the type of DBU module installed in the TSU ESP.

The TSU ESP supports the following dial backup modules:

- 4-wire Switched 56 DBU module (P/N 1204001L1)
- BRI ISDN DBU module (P/N 1204004L1)
- External DCE DBU module (P/N 1204006L1)

The following is a menu tree depicting the standard DBU Module Configuration parameters (see Figure 6-8).

2)CONFIG 1)INETWORK 1)INETWORK 1)INETWORK 2)INIT 2)BACKUP MODE 1)ISABLE 3)BACKUP ON 1)BACKUP ON 1)BACKUP ON 1)BABLE 4)WKEND LOCKOUT 1)BABLE 4)WKEND LOCKOUT 1)BABLE 4)WKEND LOCKOUT 1)BABLE 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						1)BACKUP RATE	Nx64	
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2)UNIT 2)BACKUP MODE ORIGINATE 2)BACKUP MODE ORIGINATE 4)LOC DIR NUMS 100 100 2 3)PORT 3)BACKUP ON NET/DATA FAIL 4)LOC DIR NUMBER 1 3)BACKUP ON NET/DATA FAIL 4)LOC DIR NUMBER 1 3)BACKUP ON NET/DATA FAIL 5)SPID NUMBER 2 4)WKEND LOCKOUT ENABLE 10SEC 5)ENABLE HR 10SEC 5)ENABLE HR 10SEC 70 5)ENABLE HR 10SEC 70 7)PHONE NUM- 70 10SEC 70 7)BACKUP DELAY 5 MIN 10SEC 76 8)RESTORE DELAY 70 8)RESTORE DELAY 70 9)RETRY DELAY 10SEC 70 10MIN 89 9)RETRY DELAY 10SEC 70 10MIN 89 10MIN 80 10MIN		1)NETWORK					AT&T 5ESS	
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4)DBU MODULE* 6)DISABLE HR 4)DBU MODULE* 6)DISABLE HR 4)DBU MODULE* 6)DISABLE HR 1 SEC 1 MIN 30 SEC 44			5)ENABLE HR			_		
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9)RETRY DELAY 10 MIN 5 MIN #9 #9 #9 #9 #9 #9 #9 #9 #9 #						1 SEC	#7	
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9)RETRY DELAY 9)RETRY DELAY 10 SEC 3 SEC 1 SEC NEVER 10 MIN 5 MIN						10 MIN	#9	
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3 SEC 1 SEC NEVER 10 MIN 5 MIN			9)RETRY DELAY		30 SEC	_		
1 SEC NEVER 10 MIN 5 MIN					10 SEC	_		
NEVER 10 MIN 5 MIN					3 SEC	-		
10 MIN 5 MIN					1 SEC	_		
5 MIN					NEVER	_		
					10 MIN	_		
					5 MIN	_		
A)NOM RETRIES			A)NUM RETRIES					

Factory defaults are in bold type.

*Options will vary depending on type of DBU card installed.

Figure 6-8. DBU Module Configuration Menu Tree

Module-Specific Options -- BRI ISDN DBU Module (P/N 1204004L1)

ISDN Options

Backup Rate

Configures the rate of a single B-channel. The number of B-channels times the backup rate yields the total dial backup rate. For example, if the desired backup rate is 128k, set the Backup Rate to **Nx64** and the Number of Channels to **2**.

Choices: **<u>Nx64</u>** and **Nx56** kbps

Num Channels

Sets the number of B-channels to be used. The number of B-channels times the backup rate yields the total dial backup rate. For example, if the desired backup rate is 128k, set the backup rate to **Nx64** and the number of channels to 2.

Choices: **<u>2 B CHANNELS</u>** and **1 B CHANNEL**

Switch Type

Configures the ISDN DBU card for the proper switch type. Choices: <u>AT&T</u> <u>5ESS</u>, NATIONAL ISDN1, and NT (NORTHERN TELECOM) DMS-100

Loc Dir Nums (LDN)

Sets the local directory numbers for the ISDN DBU card.

SPID Numbers (Service Profile ID)

Sets the service profile ID numbers for the ISDN DBU card.

DBU Hunt Options

When this option is set to **DISABLE**, the dial backup unit dials the number stored in phone number location 1. This is the only backup number the unit will use. The TSU ESP will retry this number until the Num Retries counter has expired. See *Num Retries* on page 57.

When this option is set to **ENABLE**, the dial backup unit dials the number stored in location 1. If the attempt fails, the unit will try the number stored in location 2. This will continue until location 10 is reached or until the first unused phone number location is encountered. When this occurs, the dial backup unit will start over again at location 1. This process will continue until the Num Retries counter has expired. See *Num Retries* on page 57. Choices: **DISABLE** and **ENABLE**

Phone Numbers

Stores up to 10 dial backup numbers.

Module-Specific Options - 4-Wire Switched 56 DBU Module (P/N 1204001L1)

S4W Options

DBU Hunt Options

When this option is set to **DISABLE**, the dial backup unit dials the number stored in phone number location 1. This is the only backup number the unit

will use. The TSU ESP will retry this number until the Num Retries counter has expired. See *Num Retries* on page 57.

When this option is set to **ENABLE**, the dial backup unit dials the number stored in location 1. If the attempt fails, the unit will try the number stored in location 2. This will continue until location 10 is reached or until the first unused phone number location is encountered. When this occurs, the dial backup unit will start over again at location 1. This process will continue until the Num Retries counter has expired. See *Num Retries* on page 57. Choices: **DISABLE** or **ENABLE**

Phone Numbers

Stores up to 10 dial backup numbers.

Module-Specific Options - External DCE DBU Module (P/N 1204006L1)

External DCE Options

Interface

Configures the interface for either **V.35** or **RS-232** operation. Choices: <u>V.35</u> or **RS-232**

Pattern Verify

Establishes the integrity of the dial backup link. When **ENABLED**, the DCE DBU generates an alternating ones pattern which can be detected by the far end unit. Once the pattern is detected, backup of the primary network will continue. For proper operation, this option must be enabled on both ends of the dial backup link. Choices: **ENABLE** or **DISABLE**

The following menus allow for configuration of generic dial backup options.

Backup Mode	
	Configures the TSU ESP to originate or to answer a dial backup call. You can completely disable dial backup. See <i>Backup Delay</i> on page 57 for details. Choices: <u>DISABLE</u> , ANSWER ALWAYS, ANSWER, and ORIGINATE
Backup On	
	Sets the dial backup criteria. NETWORK FAIL uses conditions such as RED ALARM, YELLOW ALARM , and INBAND POLL FAILURE as dial backup criteria. NET/DATA FAIL uses a data transition failure in addition to all of the Net- work Fail conditions. Choices: NETWORK FAIL and NET/DATA FAIL
Wkend Lockout	If enabled, no backup will occur from midnight Friday to midnight Sunday.
Enable HR	
	Sets the beginning of the dial backup window. Dial backup is only allowed between the enable and disable hours. If the enable and disable hours are set to ZERO , dial backup will be allowed 24 hours a day.

Disable HR	Sets the end of the dial backup window. Dial backup is only allowed between the enable and disable hours. If the enable and disable hours are set to ZERO , dial backup will be allowed 24 hours a day.
Backup Delay	Sets the delay time between the occurrence of a backup condition and the initiation of a dial backup session. Choices: 1 SEC, 3 SEC, 10 SEC, 30 SEC, <u>1 MIN</u>, 5 MIN, 10 MIN, NEVER
	If NEVER is selected, the TSU ESP will not go into dial backup mode, even when a backup condition is present.
	This is equivalent to disabling the dial backup feature.
Restore Delay	Sets the delay time for switching back to the T1/FT1 network after no backup conditions exist. Choices: 1 SEC , 3 SEC , 10 SEC , 30 SEC , <u>1 MIN</u> , 5 MIN , 10 MIN , NEVER .
	If NEVER is selected, the TSU ESP stays in dial backup even after no backup conditions exist on the primary network.
	To switch back to the primary network, select FORCED RESTORE from the DBU utilities menu.
Retry Delay	Sets the delay time between dial backup retries. Choices: 1 SEC, 3 SEC, 10 SEC, 30 SEC, <u>1 MIN</u>, 5 MIN, 10 MIN, NEVER .
	If NEVER is selected, the TSU ESP stays in dial backup mode even after no backup condition is present.
Num Retries	Sets the number of dial backup retries.

Management

The Management menu selects the desired management interface type and sets up the necessary parameters for establishing Telnet or SNMP management. See Figure 6-9 for the Management menu tree.



Factory defaults are in bold type.

*With installed ESP 10BaseT LAN Module.

Figure 6-9. Management Configuration Menu Tree

Interface

Select the management interface type. If you select **ETHERNET LAN**, an ESP ethernet card must be installed. Choices: **CHAIN-IN** and **ETHERNET LAN**

Chain In Port

Select the control port operating mode to match the connected device. **ADLP** control is used for T-Watch Pro or VT 100 terminal sessions. SLIP or PPP is used for SNMP/Telnet connections from a router. Choices: **ADLP CONTROL**, **PPP CONTROL**, and **SLIP CONTROL**

IP Address

When configuring the TSU ESP with the front panel, use the asterisk("*") key to enter a decimal point.

Unit IP Address

Enter the TSU ESP IP address in dotted decimal notation.

Subnet Mask

Enter the subnet number in dotted decimal notation. This address is available from the network administrator.

Gateway IP

Enter the Gateway node IP address in dotted decimal notation. This address is necessary only if the TSU and network manager are connected through a Gateway node. If an IP packet with an unknown IP address is received, the TSU ESP sends it to the Gateway.

IP Security

Configures the IP security option. If enabled, the TSU only accepts management commands from the IP addresses (up to 5) entered into the IP Filter Address field.

Choices: **ENABLE** and **DISABLE**

IP Filter Address

Enter the IP addresses of the management stations from which the TSU ESP should accept management commands. This filter must be enabled through the **IP SECURITY** field. The TSU ESP supports up to five IP Filter Addresses.

SNMP OPTIONS

The following options must be configured when using SNMP management.

Get Community

For SNMP operation, view and edit the Get Community string. The TSU ESP uses this string to validate SNMP Get (read) requests. The default value is **public**.

Set Community

For SNMP operation, view and edit the Set Community string. The TSU ESP uses this string to validate SNMP Set (write) requests. The default value is **private**.

Trap Community

For SNMP operation, view and edit the Trap Community string. The TSU ESP sends this string in SNMP trap messages to the network manager. The default value is **TSU ESP**.

SNMP Traps

Specify which traps the TSU ESP will send to the network manager. When enabled, the TSU ESP sends SNMP traps to network managers for alarm conditions.

Choices: **DISABLE** and **ENABLE**

Trap IP Address

Enter up to five IP addresses of the SNMP managers to which the TSU ESP should send traps.

Telnet Options

Telnet Password

View/edit the Telnet password. The default is **adtran**.

Telnet Timeout

Select the inactivity time limit. If the unit is idle for the designated amount of time the unit times out, closing the Telnet session. Choices: **10 MINUTES**, **30 MINUTES**, and **<u>60 MINUTES</u>**

Test Config

The **TEST CONFIG** menu configures the test parameters for the TSU ESP. See Figure 6-10 for the **TEST CONFIG** menu tree.

	1)NETWORK		
	2)UNIT		
	3)PORT		
2)CONFIG	4)DBU MODULE		
	5)MANAGEMENT		
	6)TEST CONFIG	1)TIMEOUT (SEC)	
		2)ANSWER TEST	DISABLE
			ENABLE

Factory defaults are in bold type.

Figure 6-10. Test Config Menu Tree

Timeout (sec)

The length of time that a test will remain active after it is initiated. Once the timeout is reached, the active test will be automatically disabled. If the timeout is set to zero, any tests that are initiated will have to be manually disabled.

Answer Test

Under normal operation, the dial backup unit will only answer an incoming call if the Backup Mode is set to **ANSWER** and a backup condition exists on the T1/FT1 network. If **ANSWER TEST** is enabled, the dial backup card will answer any incoming call and loop the received data back to the originating unit. The R1/FT1 network will be unaffected. This option can be used to send test patterns or other test data over the dial backup link. Choices: **DISABLE** and **ENABLE**

Utility Menu

UTIL

The **UTILITY** menu displays and sets system parameters (see Figure 7-1). This includes setting the time and date, resetting all parameters to factory values, or reinitializing the unit. This menu also displays the unit's software revision and the Unit ID settings.

	1)TIME/DATE	1)TIME 2)DATE	-		
	2)SOFTWARE REV.		REVISION CHECKSUM	-	
	3)LAN MAC ADDR		MAC ADDRESS	_	
	4)FACT RESTORE				
3)UTIL	5)UNIT ID				
	6)SET PASSCODE				
	7)KEYPAD	UNLOCKED LOCKED	-		1)DIAL STORED #
	8)DBU UTILITIES*	1)FORCED BACKUP			2)ENTER DIAL # 3)END FORCED DBU
		2)FORCED RESTORE	-		
	9)FRAMER/LIU			1)TYPE/REVISION	
	A)PRODUCT REV			2)T1 RX LEVEL	
	B)SERIAL NUMBER				

Factory defaults are in bold type.

*Options will vary depending on type of DBU card installed.

Figure 7-1. Utility Menu Tree

Time/Date

This menu option is used to view or edit the current time and date. The time and date are maintained during power off conditions.

Time

Displays the current time. To edit the time, select **Enter**. Enter the new time.

Date

Displays the current date. To edit the date, select **Enter**. Enter the new date.

Editing the Time and Date

To edit the time and date, do the following:

To record an entry and move the cursor to the next editing position, press **Enter** after any numeric change.

To end the editing process, either press **ENTER** (while in edit mode and no change has been made) or 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.

LAN MAC Addr

If an ESP Ethernet card (P/N 1204005L1) is installed, this menu will display the MAC Address.

Fact Restore

Restores the factory default settings for all unit parameters.

Unit ID

Accesses the current Unit Address setting. Unit identification numbers must be between 000 and 65535. This address is used for ADLP access via T-Watch PRO.

Set Passcode	
	Adds, changes, or deletes a passcode for ADLP access to T-Watch PRO and for keypad lockout. When the keypad is unlocked, the passcode is displayed. Factory default setting is 0000 . Initiating a factory re- store does not change the current passcode. When the keypad is locked, the LDC 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 altered by unauthorized personnel.
	When the keypad is locked, option settings can be viewed but not changed. The user-selected passcode is set on the SET PASSCODE screen and is not re- quired when initiating the keyboard lockout.
	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. Choices: <u>UNLOCKED</u> and LOCKED
DBU Utilities	
	Allows you to dial any of the ten stored numbers, dial any number by enter- ing it from the keypad, or hang up a DBU call.
Framer/LIU	
	Displays information about the TSU ESP T1 Framer and Line Interface Unit (LIU).
Type/Revision	
	Displays the type and revision of the current T1 Framer/LIU.
T1 Rx Level	
	Displays the current level of the T1 receive signal to the T1 Framer/LIU in decibels (dB).
Product Rev	
	Displays the current upper assembly hardware revision of the TSU ESP.
Serial Number	
	Displays the serial number of the TSU ESP. This number is programmed at ADTRAN and is read-only.

Test Menu

TEST MENU

The **TEST** menu initiates different types of unit tests and displays test results (see Figure 8-1). Test results display in the LCD window.

Executing tests will disrupt some of the normal operation. See individual menu items concerning tests before starting tests.



Factory defaults are in bold type.

*Option only available with the External DCE DBU card (P/N 1204006L1).

Figure 8-1. Complete Test Menu

Network Tests

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

The network tests are run on the network interface (NI). You can choose from three different test configurations to determine the type of loopback and the pattern to run. Test results display in the LCD window.

Local Loopback

There are three available choices for setting the local loopback:

No Loopback Deactivates the loopback

Line On Activates the line loopback

Payload On Activates the payload loopback

Remote Loopback

REMOTE LOOPBACK activates the same loopbacks as the **LOCAL LOOPBACK** but at the far end. This uses either the inband loopup code as specified by AT&T 62411 for line loopback (ATT In-Band LLB) or the FDL as specified in ANSI T1.403 for payload and 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.

FT1 Loopback

Indicates inband transmission of V.54 loopup pattern in channels occupied by DTE data only. This choice should be used for a public fractional network. This choice loops back only the active channels.

Only V.54 loopbacks can be used with fractional T1 since the full T1 stream including the FDL is not transported to the far end (unless it is a private network).

ANSI FDL LLB

Initiates the transmission of an FDL line loop-up code toward the far end.

AT&T Inband LLB

Activates the line loopback using inband code.

ANSI FDL PLB

Initiates the transmission of an FDL payload loop-up code toward the far end.

	AT&T FDL PLB Indicates the transmission of the PLB maintenance message on the FDL.
Test Pattern	
	Sets the pattern for the test and initiates the transmission of the pattern. There are three patterns available.
	No Pattern The test is terminated by selecting No PATTERN .
	511 Active DS0s Generates a 511 test pattern and inserts the pattern into currently active channels.
	All Zeros Generates an all zeros pattern in every channel.
	All Ones Generates an all ones pattern in every channel.
	QRSS Active DS0s Generates a quasi-pseudo random pattern on currently active channels.
Pattern Result	
	Displays the test pattern results.
Run Self-test	
	This menu selection executes an internal self-test. This is the same self-test that is performed automatically at power-up. The results of the self-tests display in the LCD. Upon invoking the command, the LCD displays INITIALIZ-ING and test failures are displayed in the LCD window. The self-test performs the following tests:
	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

If a failure is detected, note the failure number prior to contacting ADTRAN Technical Support.



When a self-test executes, it disrupts normal data flow and prevents remote communication until it is complete (approximately 10 seconds).

Port Tests

	PORT TESTS control the activation of a DTE loopback. This test loops data received at the V.35 interface back towards the DTE.	
DTE Loopback		
	Loops the data received at the V.35 interface back to the connected equip- ment. This is used to test cabling between the DTE and DCE. Choices: ON and OFF	
Data Loopback		
	Loops back all active channels towards the network. All ones are inserted into the idle channels. Choices: ON and OFF	

DBU Tests

DBU Loopback Test

When **ENABLED**, this option loops the DBU's transmit to its receive. The test is available to all of the DBU modules. Choices: **DISABLE** and **ENABLE**

Interface Test

Tests the integrity of the dial backup interface. In order to test both the transmit and receive sides of the interface, the remote DBU must be placed in loopback (TX and RX tied together). Displays the test results with the DBU Test Result option.



This option is only available on the External DCE DBU module.

DBU Test Result

This option is used in conjunction with the interface test to display the DBU test results.



This option is only available on the External DCE DBU module.

Testing and Troubleshooting

TEST OVERVIEW

The TSU ESP performs a variety of diagnostic functions that isolate portions of the circuit to identify the problem source. Tests may be initiated and terminated through the front panel, VT 100 terminal, SNMP, or Telnet.

The TSU ESP can run several tests, such as local and remote loopbacks, to aid in problem isolation. See Figure 9-1.







Initiating a Test

Initiate tests using the following steps:

- 1. Select **TEST** from the Main menu by pressing **4**. Then press **Enter**.
- 2. Select a **TEST OPTION** by selecting the corresponding number. Then press **Enter**.
- 3. Use the up and down arrows to view test options.
- 4. Select a test from the available options by pressing the corresponding number. Then press **Enter**.

			NO LOOPBACK
			LINE ON
		1) LOCAL LOOPBK	PAYLOAD ON
		2) REMOTE LOOPBK	
4)TEST	1) NETWORK TESTS	3) TEST PATTERN	1) CLEAR
	·	4) PATTERN RESULT	2) INSERT

Figure 9-2 shows the menu path for initiating a **LOCAL LOOPBACK** test.

Figure 9-2. Initiating a Test

Testing Example

Before actually using the TSU to pass data, it is recommended to run tests on the circuit.

The testing consists of sending a test pattern from end to end and checking for errors in the pattern. There are two ways to accomplish this.

- Send the pattern from one end and loopback the far end.
- Send the pattern from both ends and check at both ends.

Far End Looped Back Test

NØTE

Two types of tests can be executed with the far end looped. The first type checks the network and the network interfaces at both ends (511). The second type checks the DTE port.

Network Interface Test

The Network Interface Test can be run with any channel setup because the 511 pattern is always sent in the occupied channels.

- 1. At the Main menu, use the arrow keys to place the cursor on **TEST**.
- 2. Press Enter. The TEST submenu items display.
- 3. Use the arrow keys to place the cursor on **NETWORK TESTS.**
- 4. Press Enter again to enter the **NETWORK TEST** menu.
- 5. Use the arrow keys to place the cursor on **REMOTE LOOPBK**. Press **Enter** to select.
- 6. Use the up and down arrow keys to set **V.54 INBAND PLB** in the data field. (Must use **V.54 INBAND PLB** for Fractional T1 on Public Networks.)
- 7. Press **Enter** to activate a **REMOTE PAYLOAD LOOPBACK**. This initiates the transmission of a loop-up code toward the far end.
Displaying the Test Pattern

- 1. To activate the **TEST PATTERN** submenu, use the up and down arrows or the number 3 to select **TEST PATTERN**.
- 2. When the selection is activated, use the up and down arrow keys to select **511 ACT DS0s** and press **Enter**. The TSU always checks for 511 errors. The results of this check are shown under submenu item 4.
- 3. When finished viewing the results, press **Cancel** to return to submenu item **TEST PATTERN.** The far end will still be in loopback until the network **REMOTE LOOPBK** is set to **NO LOOPBACK** under **REMOTE LOOPBK**.
- 4. Select **NO PATTERN** to terminate the test and the 511 pattern generation.

Appendix A

Network Pinouts

WIRING

Network

On the rear panel, the TSU ESP has an eight-position modular jack labeled **NETWORK**. This connector is used for connecting to the network. The pinout is found below.

Connector Type	(USOC)	RJ-48C
Product Number	AMP# 55	5164-2

Pin	Name	Description
1	R1 RXDATA-RING	Receive data from network-RNG
2	T1 RXDATA-TIP	Receive data from network-TIP
3	UNUSED	N/A
4	R TXDATA-RING	Transmit data to network-RNG
5	T TDXDATA-TIP	Transmit data to network-TIP
6,7,8	UNUSED	N/A

Control-In/Chain-In

Use this as an RS-232 port for connection to a computer or modem (chain-in) or another TSU product (chain-out). The pinout is found below.

Connector Type	RJ-48
Product Number	AMP# 555164-2

Pin	Name	Description
1	GND	Ground connected to unit chassis
2	RTS	Request to send received by TSU
3	RXDATA	Data received by the TSU
4	DTR	Data Terminal Ready output by TSU
5	TXDATA	Data transmitted by the TSU
6	CD	Carrier Detect received by TSU
7	RI	Ring indicate from modem
8	CTS	Clear to Send out put by TSU



DTR, RI, and CD are used when the chain-in port is functioning as a DTE (connected to a modem). RTS and CTS are used when the chain-in port is functioning as a DCE (connected to a PC or a terminal).

Chain-Out

Use this to connect to another TSU ESP chain-in connector. The pinout for this connector is shown below.

Connector Type	RJ-48
Product Number	AMP# 555164-2

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

Nx56K/64K DTE (V.35)

The pinout for this connector is shown below.

Connector Type V.35 Product Number AMP# 92-4883-3-1

Pin	CCITT	Description
А	101	Protective ground (PG)
В	102	Signal ground (SG)
С	105	Request to send (RTS) from DTE
D	106	Clear to send (CTS) to DTE
E	107	Data set ready (DSR) to DTE
F	109	Received line signal detector (DCD) to DTE
Н	_	Data terminal ready (DTR) from DTE
J	—	Ring indicator (RI)
L	—	Local loopback (LL)
Ν	—	Remote loopback (RL)

R	104	Received data (RD-A) to DTE
Т	104	Received data (RD-B) to DTE
V	115	RX clock (RC-A) to DTE
Х	115	RX clock (RC-B) to DTE
Р	103	Transmitted data (TD-A) from DTE
S	103	Transmitted data (TD-B) from DTE
Y	114	TX clock (TC-A)
AA	114	TX clock (TC-B)
U	113	External TX clock (ETC-A) from DTE
W	113	External TX clock (ETC-B) from DTE
NN&K	_	Test mode (TM) to DTE

ESP 4-Wire Switched 56 DBU Card (P/N 1204001L1)

Use this to connect to a 4-wire switched 56 local loop for dial backup operation. The pinout is found below.

Pin	Name	Description
1	R1	Transmit data to network-Ring 1
2	T1	Transmit data to network-Tip 1
3-6	UNUSED	N/A
7	Т	Receive data from network-Tip
8	R	Receive data from network-Ring

ISDN DBU Card (P/N 1204004L1)

The pinout for the ISDN DBU card is found below.

Pin	Name	Description
1-3	UNUSED	N/A
4	Т	Network - Tip
5	R	Network - Ring
6-8	UNUSED	N/A

External DCE DBU Card (P/N 1204006L1)

Pin	Name	Description
1	AA	Protective Ground (PG)
2	BA	Transmit Data (TD)
3	BB	Receive Data (RD)
4	CA	Request to Send (RS)
5	СВ	Clear to Send (CS)
6	CC	Data Set Ready (SR)
7	AB	Signal Ground (SG)
8	CF	Received Line Signal Detector (CD)
9	-	+12 Test Point
10	-	-12 Test Point
15	DB	Transmit Clock (TC)
17	DD	Receive Clock (RC)
18	-	Local Loopback (LL)
20	CD	Data Terminal Ready (TR)
21	-	Remote Loopback (RL)
22	CE	Ring Indicator (RI)
24	DA	External TX Clock (ETC)
25	-	Test Indicator (T1)

The pinout for the External DCE DBU card is found below.

10Base T Ethernet Card (P/N 1204005L1)

The pinout for the LAN port on the 10Base T Eathernet card is found below.

Pin	Name	Description
1	TX1	Transmit Positive
2	TX2	Transmit Negative
3	RX1	Receive Positive
4, 5	Unused	N/A
6	RX2	Receive Negative
7, 8	Unused	N/A

Appendix B

DTE Data Rate Chart

Table B-1 shows the DTE data rate chart.

DTE RATE = 56k DTE RATE = 64k # OF DS0s (N) N=1 56k 64k 112k 128k N=2 168k 192k N=3 N=4 224k 256k N=5 280k 320k 336k 384k N=6 N=7 392k 448k N=8 448k 512k N=9 504k 576k N=10 560k 640k N=11 616k 704k N=12 672k 768k 728k N=13 832k 784k N=14 896k N=15 840k 960k N=16 896k 1024k 952k 1088k N=17 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

Table B-1. DTE Data Rate Chart

Appendix C Glossary

AIS

alarm indication signal. A signal transmitted instead of the normal signal to maintain continuity of transmission. The AIS indicates to the far end the existence and direction of the transmission fault on the line.

ANSI

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

ASCII

American National Standard Code for Information Interchange. The standard and predominant 7-bit (8-bit with parity) character code used for data communications and data processing.

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.

attenuation

The loss of signal amplitude during transmission. The received signal is lower in signal amplitude than the transmitted signal due to losses in the transmission medium (resistance in the cable). Attenuation is measured in decibels.

B8ZS

A method of ensuring the ones density requirements in the data flow (12.5% must be ones) are met by replacing eight zero bits with a code containing intentional bipolar violations (BPVs).

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).

BES

bursty errored second. A second in which between 2 and 319 CVs (code violations) occurred.

bipolar

The predominant signalling method used for digital transmission services, such as DDS and T1. In this method, the signal carrying the binary value successively alternates between positive and negative. Zero and one values are presented by the signal amplitude at either polarity (no-value spaces are at zero amplitude).

bipolar violation

See BPV.

bit

A binary digit. A signal, wave, or state is represented as either a binary 0 or 1.

bits per second (bps)

The number of bits passing a specific point per second. Examples of common rates are:

A Kilobit is one thousand bits per second (kbps)

A Megabit is one million bits per second (Mbps)

T1 operates at 1.544 Mbps per second.

BPV

bipolar violation. A violation in the alternate mark inversion line code for which consecutive 1s are represented by pulses of opposite polarity. Bipolar violations that are not intentional (B8ZS) are counted as errors. Could also be the presence of two consecutive 1 bits of the same polarity on the T-carrier line.

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.

bursty errored second

See BES.

byte

Generally, an 8-bit quantity of information, used mainly in referring to parallel data transfer, semiconductor capacity, and data storage. Also, it is generally referred to in data communications as an octet or character.

carrier

The provider of the T1 service to the customer site. Carriers can be local telephone companies, regional telephone companies or any inter-exchange carrier such as AT&T, Sprint, or MCI.

CD

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

channel bank

Equipment in a telephone central office or customer premises that performs multiplexing of lower speed digital channels into a higher speed composite channel. The channel bank also detects and transmits signalling information for each channel, thereby transmitting framing information so that time slots allocated to each channel can be identified by the receiver.

channel service unit

CSU. 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 example, 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.

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.

code violation

See CV.

control port

The electrical interface between the TSU ESP unit and a control terminal. The control terminal is used to communicate commands to the unit.

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.

C/R bit

In the Q.921 protocols, a bit that identifies a data-link-layer frame as either a command or a response.

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.

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 example: 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.

CV

code violation. Cyclic redundancy check (CRC) errors and frame bit errors when in ESF (extended super frame) format, or bipolar violations and frame bit errors when in SF (super frame) format.

data link

See FDL.

dB

The standard abbreviation for decibel. A decibel is a unit of measure for signal. A decibel is usually the relation between a transmitted signal and a standard signal source. Therefore, 6 dB of loss would mean that there is a 6 dB difference between what arrives down a communications circuit and what was transmitted by a standard signal generator.

DBU

dial backup. Providing a secondary, switched dial service to route data upon primary link failure.

DCE

data communications equipment. A 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. AT&T private line service for transmitting data over a digital system. The digital transmission system transmits electrical signals directly, instead of translating the signals into tones of varied frequencies as with traditional analog transmission systems. Digital techniques provide more efficient use of transmission facilities, resulting in lower error rates and costs than analog systems.

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.

EER

excess error rate. The number of code violations (CVs) are counted to determine a current error rate. If this rate exceeds a threshold set by the user, the line is said to be in an excess error rate (EER) condition or state.

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.

ESF

extended superframe. A framing format which consists of 192-bit frames grouped into 24-frame superframes where 12 of the 24 framing bits are used as an out-of-band communications channel. Of these twelve bits, six are used for frame synchronization and six are used for a cyclic redundancy check (CRC). This method greatly increases performance monitoring capability and enables remote performance monitoring not available in superframe (SF).

far end

The unit or units not on-site (at the customer's premises or the other end of the T1 link).

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 kbps data channel provided by 12 of the ESF framing bits. The FDL can be used by both the carrier and the TSU ESP unit for communication purposes. The TSU ESP unit uses the FDL for report requests, clearing error counters, and activation of the loopbacks.

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 recovery 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 network

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

framing

A control procedure used with multiplexed digital channels (such as T1 carriers) where bits are inserted so the receiver can identify time slots allocated to each subchannel. Framing bits may also carry alarm signals indicating specific alarm conditions, cyclic redundancy checks (CRCs), and an out-of-band data channel in the case of an extended superframe (ESF) T1 link. In T1 terminology, a frame consists of 192 data bits and one framing bit.

gateway

A device which enables information to be exchanged between two dissimilar systems or networks.

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.

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.

IP

internet protocol. A protocol which provides for transmitting blocks of data between hosts identified by fixed-length addresses.

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.

LBO

line buildout. The introduction of gain or loss in a signal to optimize the signal level for a receiver.

local loop

In telephony, the wire pair that connects a subscriber to a phone company end office. Four-wire local loops are common and are used on T1 facilities.

local loopback

A type of test used to verify the operation of the local terminal equipment, the CSU, and the connection between the two units. The signal from the DTE is looped back by the CSU and is sent back to the DTE.

loopback

The technique for testing the processing circuitry of a communications device. May be initiated locally or remotely via a telecommunications circuit. Device being tested will echo back received test data. The results are compared with the original data.

LOS

loss of signal. Defined as a line state in which no pulses are received for 175 bit positions.

MIB

management information base. A database of network management information used by SNMP.

modem

The equipment that connects DTE to analog (voice) communications.

multi-point

A configuration or topology designed to transmit data between a central site and a number of remote terminals on the same circuit. Individual terminals will generally be able to transmit to the central site but not to each other.

near end

The unit on-site.

network interface (NI)

The point of interconnection between the TSU ESP unit and the carrier's T1 network.

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.

PRI

Primary rate ISDN.

PRM

performance report message. A message sent to the network interface (NI) once per second over the FDL which contains performance monitoring and status information. This is available in ESF only.

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.

red alarm

A red alarm is declared on detection of an LOS or OOF not caused by an alarm indication signal (AIS) that persists for two seconds.

remote configuration

A feature designed into ADTRAN products that allows remote units to be configured from a local unit 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 into 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 of 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 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.

SES

severely errored second. A second in which more than 319 code violations (CVs) occurred or an OOF condition occurred.

SF

See superframe.

SNA

systems network architecture. The IBM protocol group which governs main-frame communication.

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.

SPID

service profile IDentifier. A sequence of digits identifying ISDN terminal equipment to the ISDN switch when more than one ISDN set has been attached to the same central office. The SPID is assigned by the telco when the ISDN line is installed and normally resembles a phone number.

SR

data set ready. A signal on the DTE 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.

superframe (SF)

A T1 framing format in which 192-bit frames are grouped into 12 frame superframes and all 12 framing bits are used for all frame synchronization.

switched network

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

synchronizing bits (sync bits)

A fixed pattern in synchronous transmission used to identify the boundaries of frames.

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

A digital transmission link with a capacity of 1.544 Mbps. T1 uses two pairs of normal twisted wires. T1 normally can handle 24 voice conversations with each conversation being digitized at 64 kbps. With more advanced digital voice encoding techniques, it can handle more voice channels. T1 is a standard for digital transmission in North America. It is also called T-1.

TELNET

The standard TCP/IP remote login protocol specified in RFC-854.

transmission

The dispatching of a signal, message, or other form of intelligence by wire, radio, telegraphy, telephony, facsimile, or other means. A series of characters, messages, or blocks including control information and user data. The signalling of data over communications channels.

T-span

A telephone circuit or cable through which a T1 carrier line runs.

UAS

unavailable seconds. An unavailable second (UAS) state is declared at the onset of ten consecutive severely errored seconds (SES). The UAS state is cleared at the onset of ten consecutive seconds with no SES.

VT 100

A non-intelligent terminal or terminal emulation mode used for asynchronous communications. Used to configure the TSU ESP.

yellow alarm

When the local CSU is in a red alarm condition, it sends a bit pattern (in-band in SF, out-of-band in ESF) towards the network to tell the carrier and the far-end CSU that there is a problem in the receive direction.

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