DSU IV ESP

Data Service Unit with Embedded SNMP

User Manual

Part Number	Version
1204011L1	DSU IV ESP
1204001L1	ESP 4-wire Switched 56 DBU Card
1204002L2	ESP V.34 DBU Card
1204004L1	ESP ISDN DBU Card
1204005L1	ESP Ethernet Card

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Openview is a registered trademark of Hewlett-Packard Company.
SunNet Manager is a registered trademark of Sun Microsystems, Inc.
Netview is a registered trademark of IBM

901 Explorer Boulevard
P.O. Box 140000
Huntsville, AL 35814-4000
(256) 963-8000

The following conventions are used in this manual.

Notes provide additional useful information.

Cautions signify information that could prevent service interruption.

WARNING

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

Important Safety Instructions

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

1. Do not use this product near water, such as near a 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	Digital Facility Interface Code	Service Order Code	Network Jacks
2.4 kbps Digital Interface	04DU5-24	6.0F	RJ-48S
4.8 kbps Digital Interface	04DU5-48	6.0F	RJ-48S
9.6 kbps Digital Interface	04DU5-96	6.0F	RJ-48S
19.2 kbps Digital Interface	04DU5-19	6.0F	RJ-48S
38.4 kbps Digital Interface	04DU5-38	6.0F	RJ-48S
56 kbps Digital Interface	04DU5-56	6.0F	RJ-48S
64 kbps Digital Interface	04DU5-64	6.0F	RJ-48S

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

Federal Communications Commission Radio Frequency Interference Statement

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

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

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

Canadian Emissions Requirements

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

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

Canadian Equipment Limitations

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

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

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

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

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

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

ISDN Service Ordering Information for the ADTRAN DSU IV ESP with ISDN Dial Backup

For ADTRAN DSU IV ESP ISDN applications, the following guide can be used as an aid in ordering basic ISDN service from your local telephone company. The ADTRAN DSU IV ESP ISDN includes NT1 and Terminal adapter functionality and supports data rates up to 64 kbps.

Request an ISDN Basic Rate Interface (BRI) line with the following features:

- U-interface reference point
- 2BIQ line coding
- 1 B+D Service (supports up to 64 kbps)

The DSU IV ESP ISDN supports the following switch types and software protocols:

- AT&T 5ESS - Custom, 5E6 and later software, National ISDN-1
- NT DMS-100 BCS-32 and later software (Pvc1), National ISDN-1 (Pvc2)
- Siemens EQSD National ISDN-1

Request that the ISDN line allocate one DYNAMIC Terminal Endpoint Identifier (TEI) for the number

For service offered from an AT&T 5ESS, request a point-to-point line with the following features:

- Feature: *Value*
- B1 Service: *On Demand (DMD)*
- Data Line Class: *Point-to-Point*
- Maximum B Channels: *1 (1B+D)*
- Circuit Switched Data (CSD) Bearer Channels: *Any*
- Number of CSD Calls: *1 (1B+D)*
- Terminal Type: *Type A*

Turn the Following Features Off:

- Packet Mode Data
- Multi-line Hunt
- Multiple Call Appearances
- Electronic Key Telephone Sets (EKTS)
- Shared Dictionary Numbers
- Accept Special Type of Number
- Intercom Groups
- Network Resource Selector (Modem Pools)
- Message Waiting
- Hunting
- InterLata Competition

For Service offered from a Northern Telecom DMS-100, request a Point-to-Point Multi-Point line with the following features:

- Line Type: *Basic Rate, Functional*
- Electronic Key Telephone Sets (EKTS): *No*
- Call Appearance Handling (CACH): *No*
- Non-Initializing Terminal: *No*
- Circuit Switched Service: *Yes*
- Packet Switched Service: *No*
- TEI: *Dynamic*
- Bearer Service: *Circuit Switched voice and data permitted on any B channel (packet mode data not permitted).*

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 LIMITATION), ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. 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 7941
Training - email	training@adtran.com

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Chapter 1 Introduction

PRODUCT OVERVIEW

The ADTRAN DSU IV ESP (data service unit with embedded SNMP) provides a reliable, high speed data connection for customer data terminal equipment (DTE) through digital data service (DDS) lines. The DSU IV ESP has an embedded SNMP (simple network management protocol) agent that provides complete SNMP access to the unit through an integral SLIP or PPP async port. The DSU IV ESP's unique, modular approach provides optional 10BaseT ethernet access for SNMP. Optional ESP DBU cards are available to provide automatic or manual dial backup for the dedicated circuit.

The DSU IV ESP has the following features:

- DDS rates supported from 2.4 to 64 kbps including 19.2 and 38.4
- 4-wire Switched 56 (SW56) operation
- Embedded SNMP and Telnet
- Control port provides SLIP and Async PPP access to SNMP or VT 100 terminal configuration
- Two ESP option slots
- 10BaseT ethernet SNMP port available with ESP ethernet Card
- Automatic or manual DBU
- DBU available with ESP DBU cards; options include 4-wire Switched 56, V.34, and ISDN
- Time of day and weekend DBU lockout options

The DSU IV ESP provides both V.35 and EIA-232 electrical and physical DTE interfaces to accommodate a variety of applications.

To ensure a reliable connection, the unit features an extended receiver capability which permits operation over long loops (3.4 miles or 5.5 km of 26 AWG at 56 kbps).

The ESP 4-wire SW56 DBU card and the base unit's integrated SW56 capabilities are compatible with AT&T Accunet and Sprint SW56 type services. The V.34 DBU card allows switched backup over the public switched telephone network (PSTN). The ESP ISDN 1B+D card is compatible with National ISDN and supports a U-interface to the Basic Rate ISDN.

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

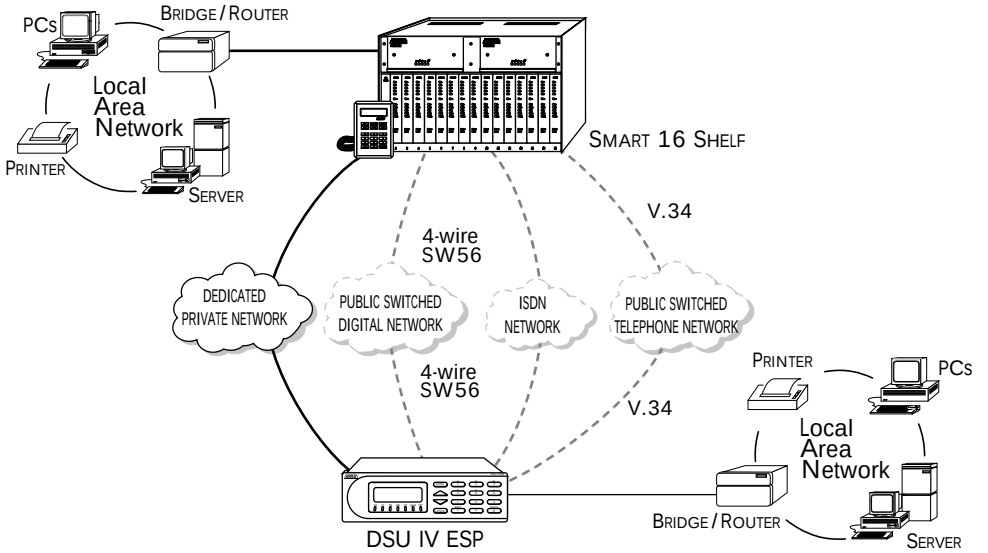


Figure 1-1. Typical Point-to-Point Application for DSU IV ESP

DDS Operation Overview

DDS is a nationwide service that allows interconnection and transport of data at speeds up to 64 kbps. The local exchange carriers provide the local loop service to DDS customers and may provide data for routing InterLATA to an interexchange carrier. In DDS mode, the DSU IV ESP supports 2.4 to 64 kbps DDS service rates yielding DTE rates of 2.4, 4.8, 9.6, 19.2, 38.4 (sync or async), 56 kbps, and 64 kbps. An additional rate of 57.6 is available in asynchronous mode. The unit can be configured to run slower DTE rates (async or sync) over the 56 or 64 kbps service.

Switched 56 Operation Overview

This dial-up, 4-wire Switched 56 DDS allows customers 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. The DSU IV ESP supports DTE rates of 2.4, 4.8, 9.6, 19.2, 38.4, and 56 kbps (synchronous) and 2.4, 4.8, 9.6, 19.2, 38.4, and 57.6 kbps (asynchronous).

SNMP OVERVIEW

The term SNMP broadly refers to the message 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:

Network Manager

Control program that collects, controls, and presents data pertinent to the operation of the network devices. It resides on a network management station.

Agent

Control program that resides in each network device connected. This program responds to queries and commands from the network manager and returns requested information or invokes configuration changes initiated by the manager.

MIB

Index to the organized data within a network device. It defines the operation parameters that can be controlled or monitored.

The DSU IV supports the MIB-II standard, RFC 1213, and ADTRAN Enterprise Specific MIB. MIB files are available from ADTRAN in the support section of the ADTRAN webpage at www.adtran.com.

The DSU IV's embedded SNMP feature allows the unit to be accessed and controlled by a network manager through either a device running SLIP or async PPP protocol (connected to the CONTROL port of the DSU) or through a LAN. A 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 DSU IV. Telnet allows a user on a network manager to control the DSU IV through the terminal menus. See *Applications* on page 4-1 and *Terminal Menu Structure* on page C-1 for more information.

DIAL BACKUP OPERATION

The DSU IV ESP's unique DBU cards are field-installable by the customer. See *Installation* on page 2-1 for information on installing DBU cards. All DBU cards are compatible with other ADTRAN ESP products supporting DBU (see the following note). The three backup options are described in the following sections. Contact the local telco provider to determine which services are available in your area. See *Applications* on page 4-1 for more information, including an example of a dial backup application.

Although the ESP V.34 DBU (P/N 1204002L2) is compatible with the DSU IV ESP, it is not compatible with the TSU ESP (P/N 1200169L1).

ESP Dial Backup Options

4-Wire Switched 56 Card

The dial-up 4-wire SW56 DBU card (P/N 1204001L1) allows customers to pay for actual usage of the data connection when the unit is active. The regional operating companies provide 4-wire local loop service to SW56 customers. This card supports DTE rates of 2.4, 4.8, 9.6, 19.2, 38.4 (asynchronous or synchronous), and 56 kbps (synchronous). An additional DTE rate of 57.6 kbps is available in async modes.

V.34 Card

The V.34 DBU card (P/N 1204002L2) supports V.32 bis modem modes of operation, V.34, and V.FC modes. The V.34 option runs synchronous rates up to 33.6 kbps, and the V.32 operates up to 14.4 kbps. Asynchronous mode provides the throughput of 57.6 kbps and is less dependent on data types.

ISDN Card

The 1B+D Basic Rate ISDN DBU card (P/N 1204004L1) provides the customer a backup switched 56/64 kbps ISDN circuit. Synchronous and asynchronous DTE rates of 2.4, 4.8, 9.6, 19.2, and 38.4 kbps per CCITT V.120 are also supported. An additional DTE rate of 57.6 kbps is available in async mode and is compatible with the 4-wire SW56 DBU card.

The BRI DBU card (P/N 1204004L1) provides a full 2B+D BRI ISDN service when installed in the TSU ESP or TSU IQ but only provides a one 64K bearer channel (1B+D) when installed in the DSU IV ESP.

Chapter 2 Installation

UNPACK, INSPECT, POWER UP

Carefully inspect the DSU IV ESP for any 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 DSU IV ESP for repair or for verification of damage during shipment.

ADTRAN Shipments Include

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

- DSU IV ESP unit
- An 8-position modular to 8-position modular cable
- An 8-position female modular to female DB-25 adapter for access to the Control / SLIP / PPP port
- The User Manual

The ADTRAN DSU IV ESP MIB is available from ADTRAN in the support section of the ADTRAN webpage 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 1 B+D ISDN dial backup options.
- An 8-position modular to 4-position modular cable for the V.34 backup option.

Customer Provides

The customer must provide a male EIA-232 (standard 25-pin, D-type) or a male V.35 interface cable to use when connecting the unit to an external data service (i.e., router).

For SNMP management, the customer must provide access to the DSU IV 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 DSU IV ESP). See *Pinouts* on page A-1 for the pin assignments for the control port (for SLIP and Async PPP) and the ethernet port.

Power Up

The DSU IV 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 DSU must be provided from a grounded 115 VAC, 60 Hz receptacle.

Chapter 3 Operation

FRONT PANEL MENU STRUCTURE

The DSU IV ESP uses a multilevel menu approach to access its many features. All menu operations are displayed in the LCD window or the terminal. See Figure 3-5 on page 3-11 for the terminal Main menu.

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.

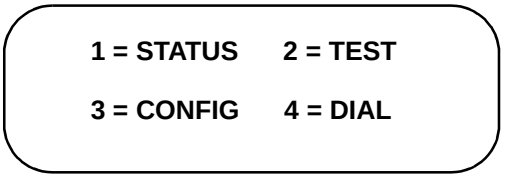


Figure 3-1. Main Menu LCD Display

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 **DIAL**.

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 *Viewing Status Information* on page 14-1.

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 *Testing and Troubleshooting* on page 13-1.

Configuration

Use **CONFIGURATION** menus to select network and DTE operating parameters, configure testing and dialing options, select management functions, and configure unit utilities.

This menu branch is divided into several chapters for easier reference. The division includes a brief overview chapter followed by a separate chapter for each of the six submenus: *Configuring Network Options* on page 6-1, *Configuring DTE Options* on page 7-1, *Configuring Test Options* on page 8-1, *Configuring Dial Options* on page 9-1, *Management Functions* on page 10-1, and *Configuring Unit Utilities* on page 11-1.

Dial

DIAL provides manual dial backup or SW56 dial functions. For more information, see *Activating Dial Functions* on page 12-1.

The Dial selection in the Main menu is only available when a SW56 network type is selected or when a DBU card is installed in the rear of the DSU IV ESP.

Basic Menu Travel

Four function keys on the left side of the DSU IV 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

Perform the following steps to select the DSU IV ESP menu options. See the menu tree in Figure 3-2.

Step	Action
1	Press **3** to activate **CONFIGURATION** (**CONFIG**). When the activated menu item flashes, press **Enter.**
2	Select **LOCAL** or **REMOTE** configuration by pressing the corresponding number; then press **Enter**.
3	Use the arrow keys to view submenu items.
4	Choose an item on the submenu such as **NETWORK OPTIONS** (**NETWORK OPT**).
5	Activate **NETWORK OPT** by pressing **1**. Then press **Enter**.
6	Activate **LOOP RATE** options by pressing **1**. Then press **Enter.**
7	Press the number corresponding to the desired loop rate. Then press **Enter**

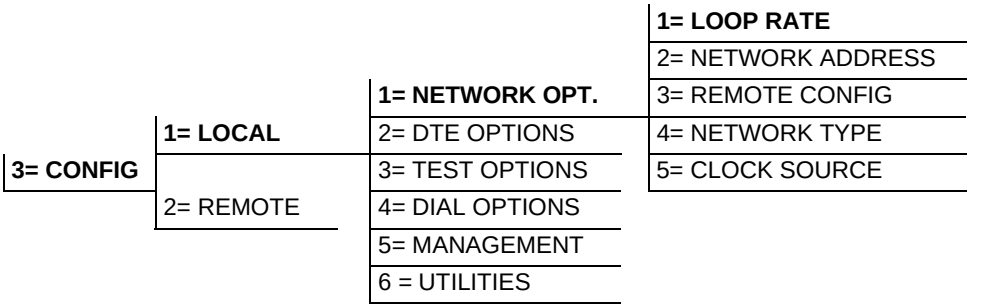


Figure 3-2. Example of Basic Menu Navigation

FRONT PANEL

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

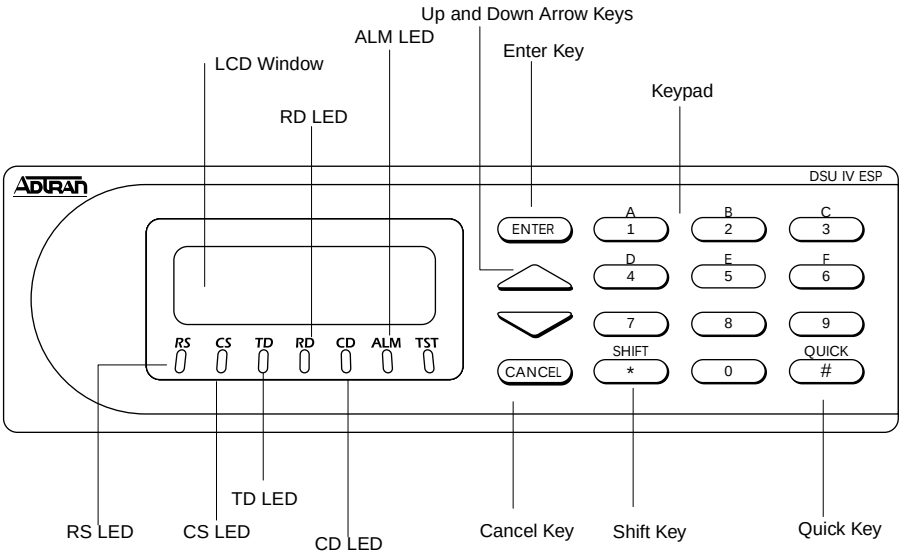


Figure 3-3. DSU IV ESP Front Panel

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

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

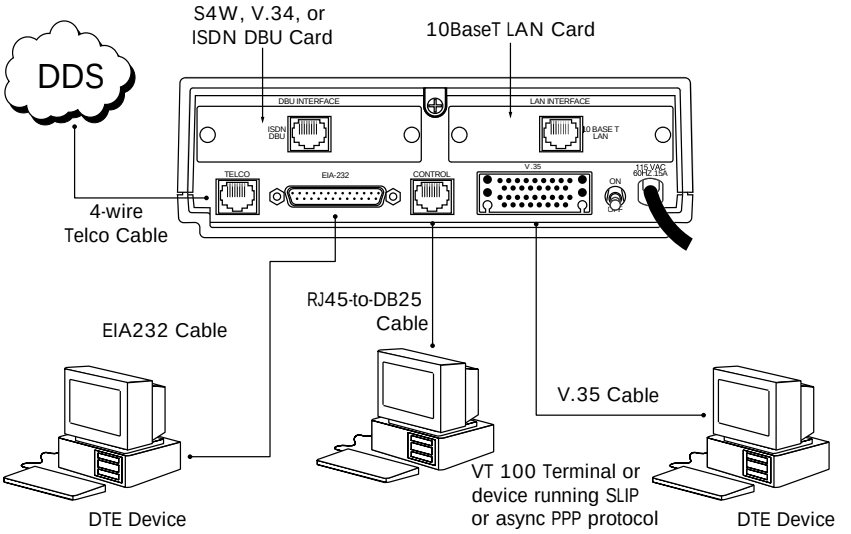
The DSU IV ESP has seven LED indicators: RS, CS, TD, RD, CD, ALM, and TST. These LEDs are described in Table 3-1 on page 3-7.

Table 3-1. Front Panel LED Descriptions

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 network.
CD: Carrier Detect	This LED is active when frame synchronization is achieved and the DSU IV ESP is ready to transfer data.
ALM: Alarm Indication	This LED activates whenever an alarm condition exists. Alarm conditions include: Open loop on network No frame synchronization Unit in dial backup Problem on dial backup line
TST: Test Mode	This LED is on whenever the unit is in test mode.

REAR PANEL

The rear panel contains two DTE connectors which provide primary channel V.35 or EIA-232. An 8-pin telco jack, a control port, a captive power cord, and a power switch are also located on the rear panel. Pin assignments for these connectors are listed in *Pinouts* on page A-1. The DSU IV ESP rear panel is shown in Figure 3-4 with optional ESP cards installed.



Item	Function
DBU Interface	ESP DBU card slot
LAN Interface	ESP Ethernet card slot
Telco	Connects to dedicated circuit
EIA-232	Connects to a DTE interface
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 DSU IV 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 DSU IV ESP.
2. Slide the card into the corresponding rear slot until the card panel is flush with the DSU IV ESP chassis.
3. Push card locks in (until they click) to secure the card and ensure proper installation.

Remove power from the unit before installing or removing ESP option cards.

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

Telco Connector: Network Interface Connection

The DSU IV ESP has an 8-position modular jack labeled **TELCO**. The telco connector is used for connecting to the DDS network. The pinout for this connector is listed in *Pinouts* on page A-1.

Each ESP DBU card has a connector which is used for connection to the switched backup network. The pinout for the connector depends on the card type. Pinouts for 4-wire Switched 56,V.34, and ISDN 1B+D DBU options are shown in Appendix A, *Pinouts* on page A-1.

EIA-232 and V.35 Connectors: DTE Data Connection/ Primary DTE

The primary DTE should be connected to either the EIA-232 DTE connector or the V.35 DTE connector. The maximum cable lengths recommended are 50 feet for the EIA-232, and 100 feet for the V.35. The pin assignments for the connectors are listed in *Pinouts* on page A-1.

The V.35 connector is recommended for use with data rates above 19.2 kbps. The EIA-232 connector works up to 56 kbps with a low capacitance cable or with the external transmit clock option selected. The primary DTE rate is configured from the front panel. The primary DTE equipment can operate in asynchronous or synchronous modes.

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

Control Port

The DSU IV 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.

See Appendix A, *Pinouts* on page A-1 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.

VT-100 TERMINAL CONNECTION AND OPERATION

To control the DSU IV ESP using a VT-100 terminal, perform the following procedure:

1. Select a terminal interface through the front panel. Select **CONFIG**> **MANAGEMENT**> **INTERFACE** >**TERM CONTROL**.
2. Set the **CONTROL RATE** to match the VT 100 terminal.
3. Using the provided VT-100 terminal adapter cable, connect the **COM** port of a VT 100 compatible terminal or equivalent to the eight-pin modular jack labeled **CONTROL** on the rear of the DSU IV ESP. This connection is used for both local and remote configuration.
4. Establish the connection and press **Enter** repeatedly until the **TERMINAL MENU** appears (Figure 3-5).

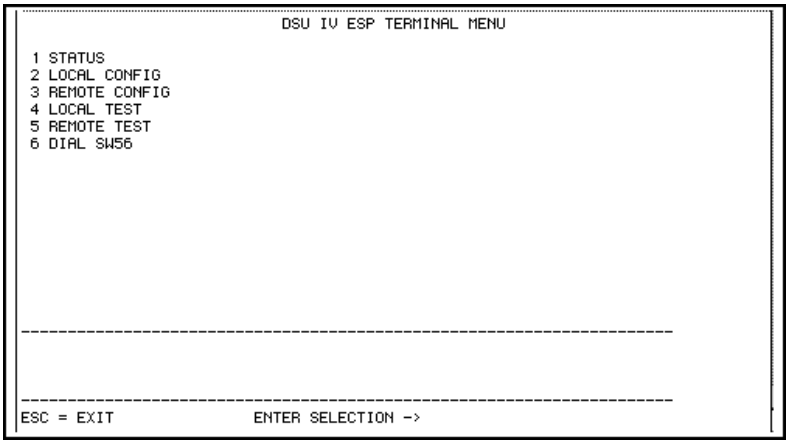


Figure 3-5. Terminal Interface Main Menu (SW56 Mode)

5. Make selections by entering the number corresponding to the chosen parameter. Press **ESC** to return to the previous screen.

NOTE

Due to the increased display capabilities, the VT-100 menu structure differs from the front panel interface. Appendix C, Terminal Menu Structure on page C-1 includes the VT-100 screens as well as a complete menu tree for accessing configuration selections. Descriptions of individual menu options are provided throughout this manual based on the front panel menu structure. See Figure 5-1 on page 5-3 and Figure 5-2 on page 5-4 for the front panel configuration menu trees.

NOTE

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 Chapter 10, Management Functions on page 10-1 for more information.

Chapter 4 Applications

This chapter provides examples of some common DSU IV 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 DSU IV can be managed through an established Telnet session or an SNMP-based network manager like HP Openview, IBM Netview, or SunNet Manager.

> NOTE
>
> *The ADTRAN DSU IV ESP MIB is available in the support section of the ADTRAN webpage 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 DSU IV's control port. See Figure 4-1 on page 4-2.
- A device (e.g., a router) running async PPP protocol. Connection is made through the DSU IV's control port. See Figure 4-1 on page 4-2.

- A LAN. Connection is made through the optional 10BaseT ethernet interface provided on the ESP ethernet card (P / N 1204005L1). See Figure 4-2.

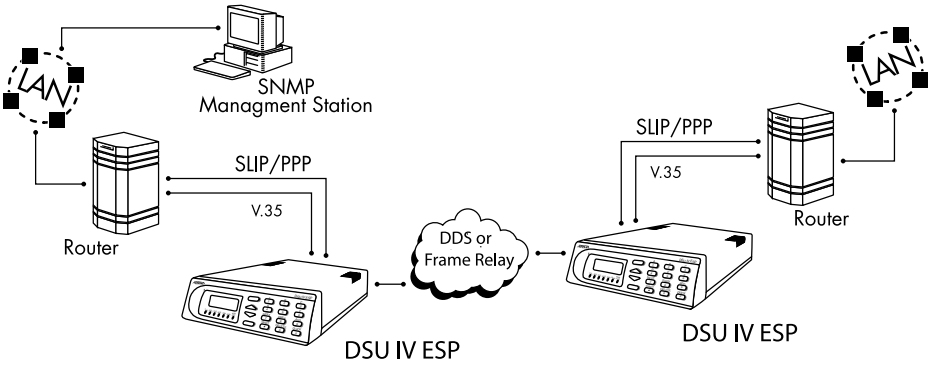


Figure 4-1. SLIP/PPP LAN Application with SNMP/Telnet Management

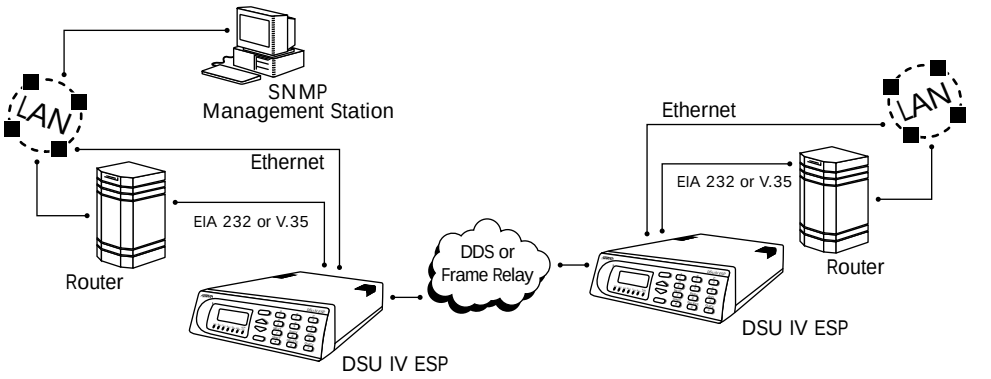


Figure 4-2. Ethernet LAN Application with SNMP/Telnet Management

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 10-1 on page 10-2 for the front panel menu path to these options.

Interface

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

IP Address

Enter the DSU IV 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 DSU IV 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 DSU IV ESP features:

- Designate SNMP hosts to receive SNMP traps from the DSU IV (one to five entries).
- Secure the DSU IV by limiting SNMP network management access. If enabled, the DSU IV 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 Chapter 10, *Management Functions* on page 10-1 for more information.

DIAL BACKUP APPLICATION

The DSU IV 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.

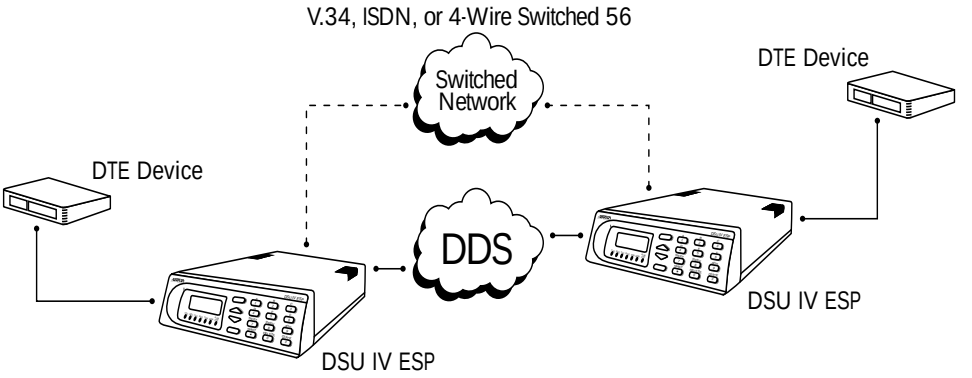


Figure 4-3. Dial Backup Application

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 3-5 for more information on the **Quick** key.

Operation During Critical Times

The DSU IV 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 DSU IV ESP to enter dial backup mode:

Loss of Sealing Current

Sealing current is a low voltage DC current provided by the central office (CO) to prevent corrosion over the copper wires used in the local loop. Sealing current may also be used for local loop testing purposes. An absence of sealing current generally is an indication that the loop is open.

Out of Service (OOS) Signal

An OOS signal, generated by the network, indicates a device (or devices) in the network is out of service.

No Receive Signal

This is an indication that the local loop copper pairs may be either open or shorted or the OCU in the CO is inoperative. In a private network this may indicate that the transmitter of the remote DSU is inoperative.

All 1s or all 0s Condition

This condition is usually generated by the network to indicate some device (or devices) in the network is inoperative. Upon detecting an all 1s or all 0s condition, the DSU IV ESP initiates a handshake routine to determine whether the remote unit's DTE is the source of the all 1s or 0s condition or if an actual network failure exists.

Answer Always

When this option is enabled, the unit goes into DBU mode if a call is present regardless of the status of the dedicated circuit. It is recommended that the DBU Passcode be used in this mode since inadvertent calls could stop data flow indefinitely.

The DBU Answer Test is disabled if this option is chosen.

Operation During Noncritical Times

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

For more information, see *Configuring Dial Options* on page 9-1.

Weekend and Time of Day Lockout

The DSU IV 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 *Configuring Dial Options* on page 9-1 for more information.

Conditions for Returning to the DDS Circuit

The DSU IV ESP can be configured to automatically revert to the DDS circuit from the dial backup mode or wait to be returned to the DDS manually. Once the DSU IV ESP enters dial backup mode, the unit polls the DDS circuit once every 100 ms to determine if the condition causing the DDS circuit failure has been corrected. Once the DSU IV ESP determines that the problem has been properly corrected and the DDS circuit is stable, it will wait for the amount of time specified in the restore timer (1 to 255 minutes) before reverting to the DDS circuit. Polling of the DDS circuit is non-intrusive and return to the DDS circuit generally takes 2 to 3 seconds. The backup connection is maintained for one minute after the DDS circuit is restored.

See Chapter 9, Configuring Dial Options on page 9-1 for more detailed information.

Chapter 5 Configuration Overview

The DSU IV ESP contains four different user profiles (sets of configuration options) stored in read only memory; see *Configuration Profiles* on page D-1. The unit is shipped from the factory with profile number 1 (default configuration) loaded into the current (nonvolatile configuration) memory. If profile 1 matches requirements for the system, then no additional configuration is required to put the unit into service. If profile 1 does not match system requirements, it can be modified or one of the other profiles that more closely matches the system requirements can be loaded into current memory. When a different profile is loaded or the existing profile is modified, it is stored in the current (nonvolatile configuration) memory. The DSU IV ESP is then configured with that profile every time power is turned on or the unit is reset.

CONFIGURATION METHODS

The DSU IV ESP responds to the following methods of configuration:

- AT commands
- V.25 commands
- Front panel commands
- A VT 100 compatible terminal
- SNMP / Telnet through a device running SLIP / PPP protocol
- SNMP / Telnet through a LAN running ethernet protocol (available when the optional ESP Ethernet card is installed)

AT and V.25 commands have limited access to configuration parameters. See *AT Commands* on page 5-5 and Appendix B, *AT Commands* on page B-1 for more information. See Chapter 2, *Installation* on page 2-1 and Chapter 3, *Operation* on page 3-1 for more information on all other configuration methods. For an example application using the SLIP / PPP or ethernet interface, see *Applications* on page 4-1.

Descriptions of each Configuration menu item are given in the following chapters: *Configuring Network Options* on page 6-1, *Configuring DTE Options* on page 7-1, *Configuring Test Options* on page 8-1, *Configuring Dial Options* on page 9-1, *Management Functions* on page 10-1, and *Configuring Unit Utilities* on page 11-1.

A complete Configuration menu for the front panel is shown in Figure 5-1 on page 5-3 and Figure 5-2 on page 5-4. The VT 100 menu tree is shown in *Terminal Menu Structure* on page C-1.

Due to the increased display capabilities, the VT 100 menu structure differs from the front panel interface. Appendix C, Terminal Menu Structure on page C-1 includes the VT 100 screens as well as a complete menu tree for accessing configuration selections. Descriptions of individual menu options are provided throughout this manual based on the front panel menu structure. See Figure 5-1 on page 5-3 and Figure 5-2 on page 5-4 for the front panel configuration menu trees.

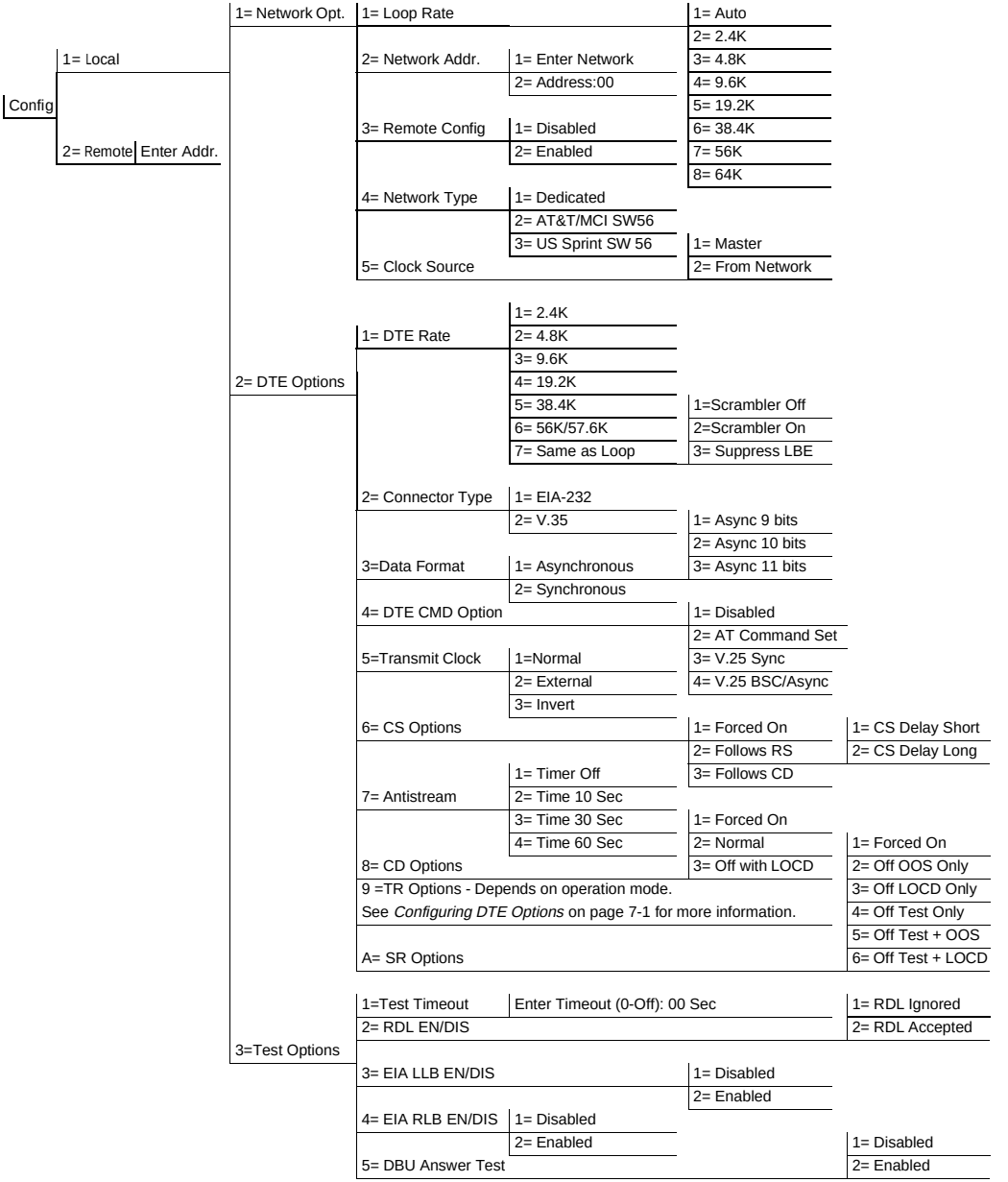


Figure 5-1. Configuration Menu Tree for Network, DTE, and Test Options

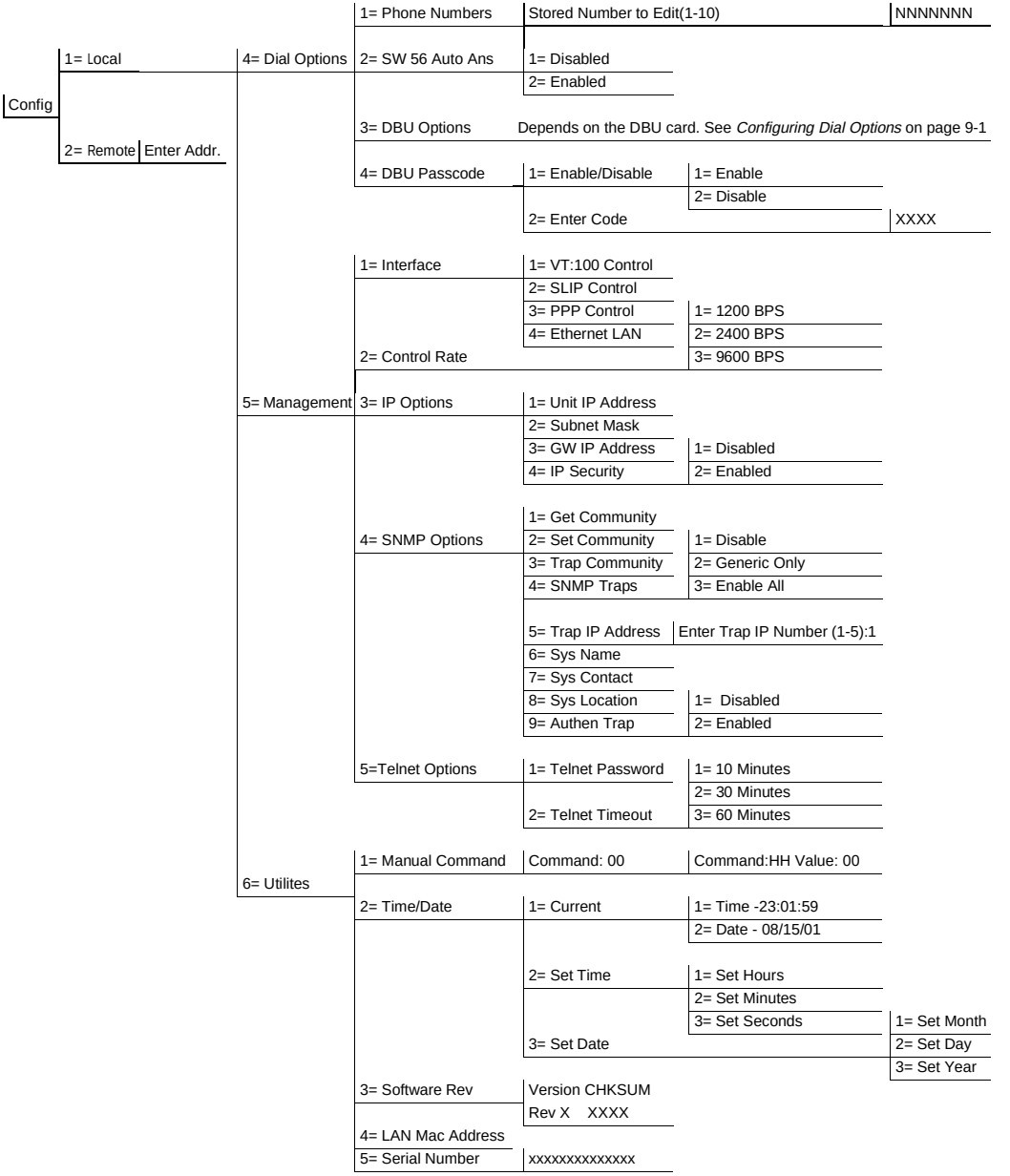


Figure 5-2. Configuration Menu Tree for Dial, Management, and Utilities Options

AT Commands

The DSU IV ESP can be configured and controlled with in-band AT commands from an asynchronous DTE port just as modems are.

To exit the data mode and enter the command mode, the asynchronous DTE device must transmit a proper escape sequence of three pluses (+++) to the DSU IV ESP. A specified time delay must occur between the last data character and the first escape sequence character. This is the guard time delay, and it can be changed by writing a value to the S12 register. The default value for the guard time is one second. For a valid escape sequence to occur, the DTE must transmit the escape code character three times in succession with delay between each character being less than the guard time.

Once the command mode is entered, AT commands can be transmitted to the DSU IV ESP to configure most of the options or initiate tests to check both the DSU IV ESP and the network connections. All command lines must begin with the AT character set in either capital or lower case letters.

The command line may contain a single command or a series of commands after the AT attention code. When a series of commands is used, the individual commands may be separated with spaces for readability. The maximum length for a command line is 40 characters. Each command line is executed by the DSU IV ESP upon receipt of a terminating character. The default terminating character is a carriage return (ASCII 013), but it can be changed by writing a different value to register S3.

Before the terminating character is transmitted, the command line can be edited by using the backspace character (ASCII 008) to erase errors so the proper commands can be entered.

Not all parameters can be selected using these commands. Valid commands are listed in Appendix B, AT Commands on page B-1.

V.25 Bis Commands

When configured for the V.25 bis option, the DSU IV ESP accepts in-band dialing and configuration commands from both synchronous and asynchronous DTE ports.

The V.25 bis option supports the following protocols:

- SDLC
- Bi-Sync
- Asynchronous

SDLC Option

Character Format

- Data bits - 8
- Parity bit - Ignored

Command Structure

[F][A][C][V.25 bis COMMAND][FCS][F]

The address field [A] is FFH. The control field [C] is set to 13H except for cases of multi-frame responses. For this case, the control field is set to 03H in all but the last frame. The 03H in the control field indicates that other frames are to follow while the 13H in the control field indicates the final frame.

Bi-Sync Option

Character Format

- Data bits - 7
- Parity bit - Odd

Command Structure

[SYN][SYN][STX][V.25 bis COMMAND][ETX]

Asynchronous Option

Character Format

- Start bit - 1
- Data bits - 7
- Parity bit - Even
- Stop bit - 1

Command Structure

[V.25 bis COMMAND][CR][LF]

Command Descriptions

The ADTRAN V.25 bis command set is a subset of the CCITT V.25 bis command set. In addition to the CCITT commands supported, ADTRAN has added configuration commands for both local and remote DSUs. The ADTRAN V.25 bis command set follows:

CNL	Configuration local
CNR	Configuration remote

Possible responses to V.25 bis commands follows:

VALA	Valid V.25 command processed
INV	An invalid command detected
INVCU	Unknown command detected
INVPS	Invalid parameter syntax
INVPV	Invalid parameter value
INVBL	Invalid local password
INVBM	Invalid remote password

If verbose responses are disabled (ATV0), the following three-character responses are the only ones returned:

VAL	Valid V.25 command processed
INV	Invalid command received

Syntax and Possible Responses

CNL (Configuration Local)

This command is used to pass AT commands to the local DSU via the V.25 bis command processor. This allows the DSU IV ESP to be configured with AT commands using a synchronous interface. The format is as follows:

CNL[LOCAL PASSWORD];AT[ONE OR MORE AT COMMANDS]

A local password may not be required depending on the present configuration of the unit. Responses to CNL commands are returned in the data format currently configured. Possible responses include: VALA and INVAn.

CNR (Configuration Remote)

This command is used to pass AT commands over the network to the remote DSU via the V.25 bis command processor. This allows a remote DSU IV ESP to be configured from a synchronous interface. The format of this command follows:

CNR[REMOTE PASSWORD];AT[ONE OR MORE AT COMMANDS]

The remote password may or may not be required depending on the present configuration of the remote unit. Responses to the CNR commands are returned in the data format currently configured. Possible responses include: VAL and INVAn.

Chapter 6 Configuring Network Options

NETWORK OPTIONS

The **NETWORK OPTIONS** configuration parameters control the loop operation of the DSU IV ESP. Once a parameter is set, **COMMAND ACCEPTED** is displayed briefly before returning to the active menu. Table 6-1 on page 6-3 shows the AT commands used to set the Network Options.

See Figure 6-1 on page 6-2 for the **NETWORK OPTIONS** menu tree.

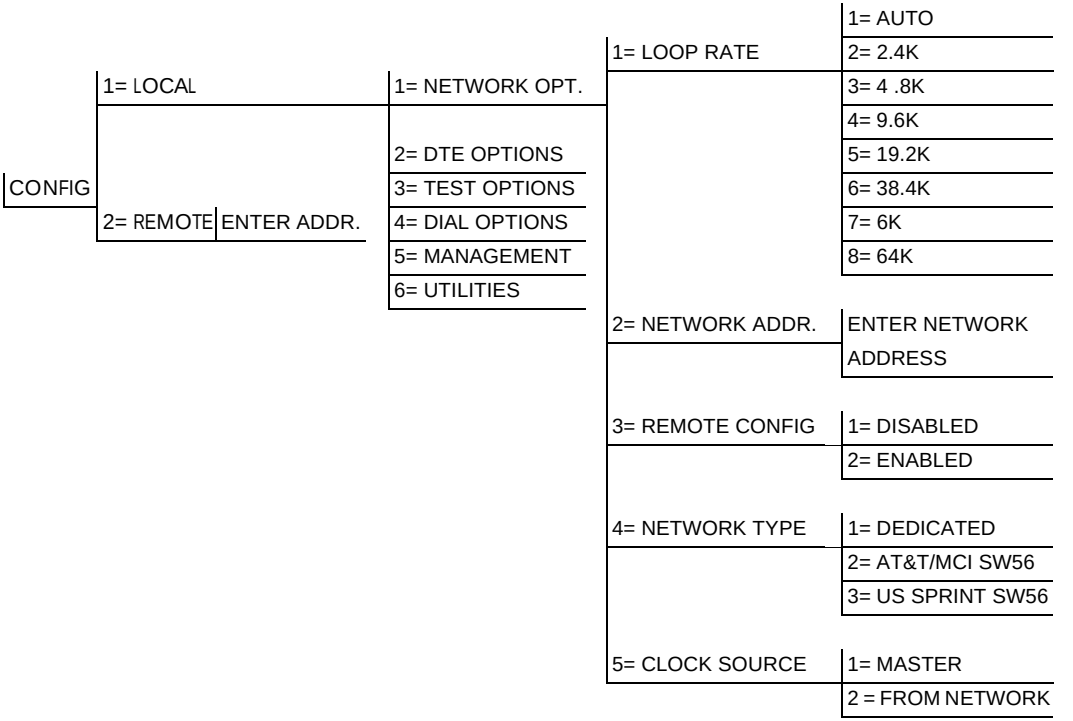


Figure 6-1. Network Options Menu Tree

Table 6-1. Network Options AT Commands

Front Panel	AT Command
Loop Rate	
AUTO	%B0
2.4K	%B1
4.8K	%B2
9.6K	%B3
19.2K	%B4
38.4K	%B5
56K	%B6
64K	%B7
Network Address	
XX (decimal)	_N=xx
Remote Configuration	
1 = DISABLED	&P4
2 = ENABLED	&P5
Network Type	
1 = DEDICATED	none
2 = AT&T/MCI SW56	none
3 = US SPRINT SW56	none
Clock Source	
1 = Master	_X0
2 = FROM NETWORK	_X1

Loop Rate

The **LOOP RATE** option sets the loop operating speed. The unit should be set to the rate required by the DDS Service. The DSU IV ESP also supports subrate DTE data over a 56 or 64 kbps loop. The loop rate must be set independently of the DTE rate. Eight loop rate selections are available. See Figure 6-1.

The default factory setting is **AUTO**. The various loop rates and format selections are listed in Table 6-1 on page 6-3 with the

equivalent AT commands that perform the same configuration functions.

Network Address

A two-digit decimal address can be assigned to each DSU IV ESP. This addressing capability makes it possible to perform remote configuration and testing in point-to-point and multi-drop networks. Figure 6-1 on page 6-2 shows the menu path used to change the network address. The factory default setting is **0**.

Remote Configuration

This option sets up the DSU IV ESP to accept or reject remote configuration commands. The factory default setting is **ENABLED**.

Network Type

Select the appropriate network type. The choices are **DEDICATED**, **AT&T/MCI SW56**, and **US SPRINT SW56**. The factory default setting is **DEDICATED**.

Clock Source

The **CLOCK SOURCE** option specifies the timing source for the DSU IV ESP's internal circuitry. The factory default setting is **FROM NETWORK**.

When operating on a DDS network, the timing should be **FROM NETWORK**. On a point-to-point private network, one DSU IV ESP must be set for **MASTER**, the other set for **FROM NETWORK**.

When the DSU IV ESP is set to the Master Clock source, it will default to its internal oscillators as the clock reference. To enable the External DTE Port as the reference clock for the circuit, see Chapter 7, *Configuring DTE Options* on page 7-1 regarding the transmit clock options.

Chapter 7 Configuring DTE Options

DTE OPTIONS

The **DTE OPTIONS** menu is used to select the configuration parameters that control the operation of the DTE Interface of the DSU IV ESP. The **DTE OPTIONS** menu tree is shown in Figure 7-1 on page 7-2.

The AT commands and their available options are shown in Table 7-1 on page 7-3.

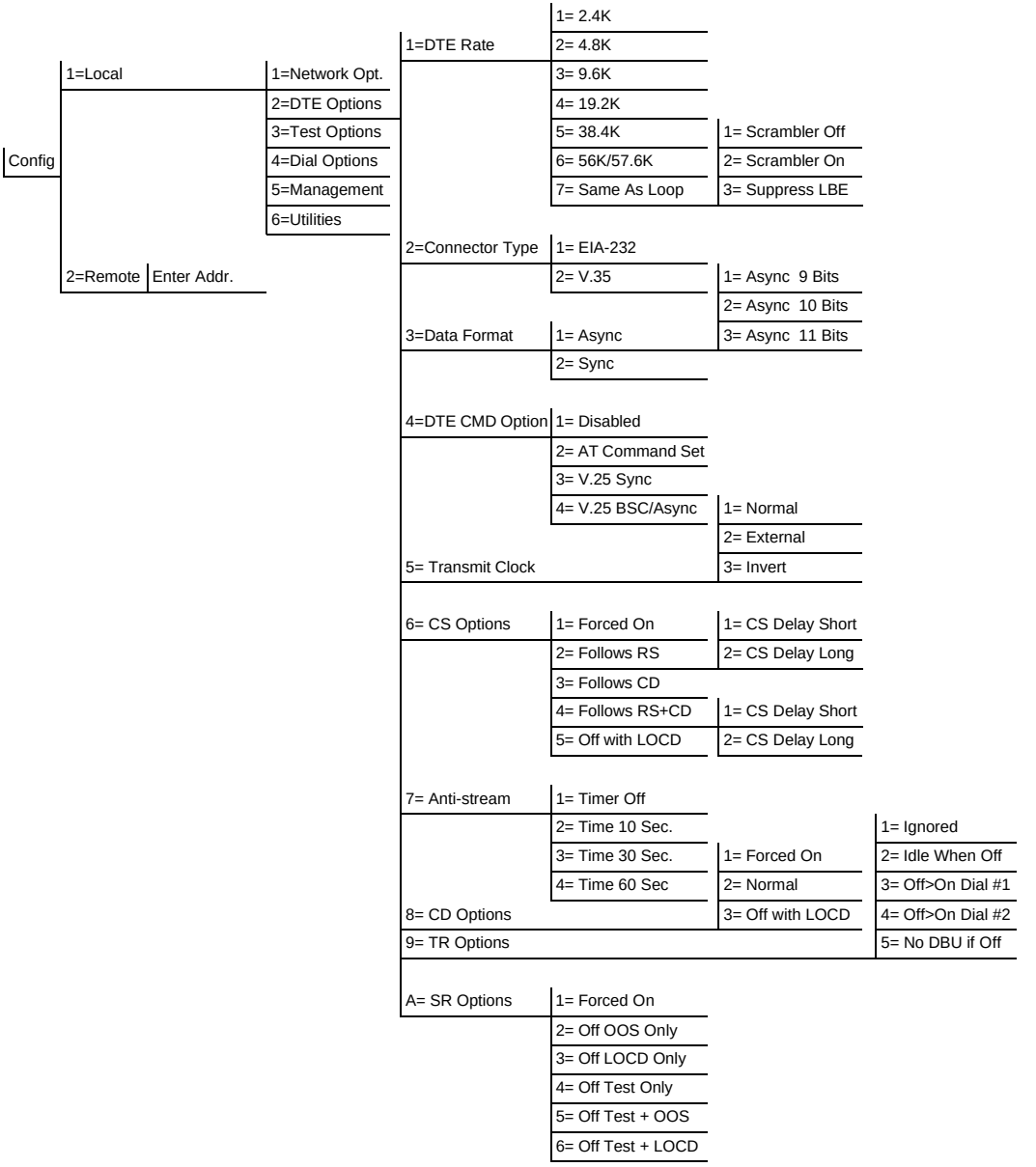


Figure 7-1. DTE Options Menu Tree

Table 7-1. DTE Options AT Commands

Front Panel	AT Command	Description
DTE Rate		
1= 2.4K	%k3	DTE Rate: 2.4K sync and async
2 = 4.8K	%k4	DTE Rate: 4.8K sync and async
3 = 9.6K	%k5	DTE Rate: 9.6K sync and async
4 = 19.2K	%k6	DTE Rate: 19.2K sync and async
5 = 38.4K	%k7	DTE Rate: 38.4K sync and async
6 = 56/57.6K	%k8	DTE Rate: 56 sync or 57.6 async
7 = Same as Loop	%k9	DTE Rate matches loop rate
1 = Scrambler Off	_F0	DTE data scrambler disabled (64kbps loop rate only)
2 = Scrambler On	_F1	DTE data scrambler enabled (64kbps loop rate only)
3 = Suppress LBE	_F2	Suppresses loopback enable code (LBE) in transmit data from the DTE after 30 bytes in a row detected (64 kbps loop rate only)
Data Format		
1= Asynchronous	&Q0	Asynchronous DTE operation mode
2= Synchronous	&Q2	Synchronous DTE operation mode
DTE CMD Option		
1 = Disabled	none	Disables all DTE command Modes
2 = AT Command Set	none	Enables AT command mode for DTE
3 = V.25 Sync	none	Enables V.25 (SDLC) command mode for DTE
4 = V.25 BSC/ASYNC	none	Enables V.25 (bisync or async) command mode for DTE
Transmit Clock		
1 = Normal	&X0	Tx Clock from DSU selected
2 = External	&X1	ETC Clock from DTE selected
3 = Invert	&X3	Inverted Tx Clock from DSU selected

Table 7-1. DTE Options AT Commands (Continued)

Front Panel	AT Command	Description
CS Options		
1 = Forced On	&R0	CS always on
2 = Follows RS	&R1	CS state same as RS state
3 = Follows CD	&R2	CS state same as CD state
4 = Follows RS+CD	&R3	CS state same as RS and CD state
5 = Off with LOCD	&R4	Off 5 seconds after LOCD (SW56 only)
For **FOLLOWS RS** options, select the length of the delay:		
1 = CS delay short	_D0	Short delay from RS to CS selected
2 = CS delay long	_D1	Long delay from RS to CS selected
Anti-Stream		
1 = Timer Off	&T0	Anti-stream timer disabled
2 = Time 10 Sec	&T1	Timeout equals 10 seconds
3 = Time 30 Sec	&T2	Timeout equals 30 seconds
4 = Time 60 Sec	&T3	Timeout equals 60 seconds
CD Options		
1 - Forced On	&C0	On all the time
2 - Normal	&C1	On only when data present on loop
3 - Off with LOCD	&C2	On except after disconnect (SW56 only)
TR Options		
1 = Ignored	&D0	Ignore the TR input
2 = Idle when off	&D2	See the note at the end of this table.
3 = Off>On dial #1	&D3	Dial Stored #1: TR goes off to on (SW 56 only)
4 = Off>On dial #2	&D4	Dial Stored #2: TR goes off to on (SW 56 only)
5 = No DBU if Off	&D3	No dial backup if TR is off. (valid only when DBU ESP card is installed and Network Type is set to Dedicated).

Table 7-1. DTE Options AT Commands (Continued)

Front Panel	AT Command	Description
SR Options		
1 = Forced On	&S0_C1	Always on
2 = Off OOS only	&S1_C1	Off when network out of service
3 = Off LOCD Only	&S3	Off 5 sec after disconnect (SW56 only)
4 = Off Test only	&S0_C0	Off for test only
5 = Off test + OOS	&S1_C0	Off for test and OOS
6 = Off test + LOCD	&S5	Off 5 seconds after disconnect or test

NOTE

*For **IDLE WHEN OFF** option: In SW56 mode, TR off causes the DSU to go On Hook (Idle). The unit does not dial out if TR is off. In dedicated mode, the DSU goes into DTE command mode when TR goes off. When TR goes on, if the DSU does not receive a command in the number of seconds set in S40, the DSU goes into data mode.*

DTE Rate

The DSU IV allows subrate looprates. If a DTE rate higher than the current loop rate is selected, the DTE rate automatically sets to match the slower loop rate; the DSU IV ESP briefly displays **DTE RATE SAME AS THE NETWORK** before returning to the status screen. The factory default setting is **SAME AS LOOP**.

If the DSU IV ESP is set for a loop rate of 64 kbps, then scrambler on / off options are available. The factory default setting is **SCRAMBLER OFF**.

CAUTION

*For 64 kbps clear channel operation, the DTE data sequences might mimic network loop maintenance functions and erroneously cause other network elements to activate loopbacks. To prevent this, the **SCRAMBLER ON** option should be selected for both the local and remote DSU IV ESP.*

Connector Type

The **CONNECTOR TYPE** option is used to specify which of the primary channel connectors is used to connect to the DTE. The factory default setting is **V.35**. There are no AT commands available to set the connector type.

Data Format

The **DATA FORMAT** option is used to select either the synchronous or asynchronous mode of operation for the DTE interface. The factory default setting is **SYNCHRONOUS**. If **ASYNCHRONOUS** is chosen, the length of the data bytes must be selected.

Table 7-1 on page 7-3 shows the AT commands that can be used to set the Data Format to asynchronous or synchronous.

DTE Command Option

The **DTE COMMAND** option is used to enable a DTE command mode or disable all modes. The available modes are AT V.25 synchronous, and V.25 bisynchronous / asynchronous commands. See Table 7-1 on page 7-3.

Transmit Clock

The **TRANSMIT CLOCK** option is used to select the source of the clock used to transfer data from the DTE into the DSU IV ESP. Table 7-1 on page 7-3 shows the AT commands used to set the **TRANSMIT CLOCK** options. Figure 7-2 shows the menu path used to set the Transmit Clock option. The factory default is **NORMAL**.

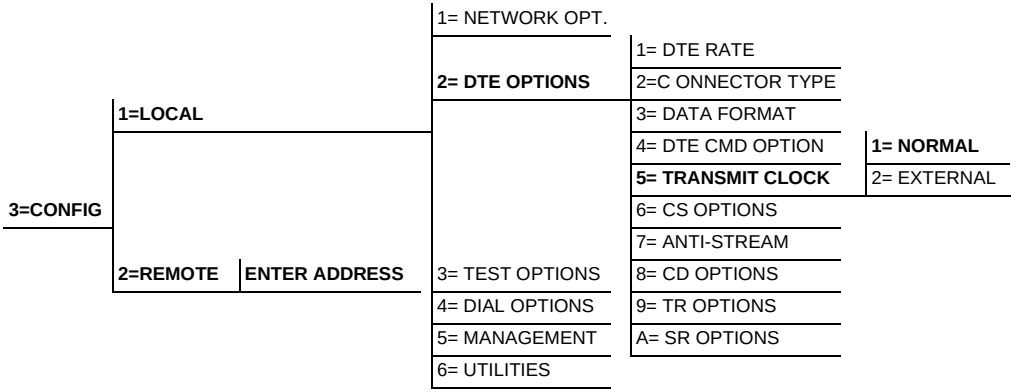


Figure 7-2. Transmit Clock Options

Table 7-2 shows the AT commands used to set the **TRANSMIT CLOCK** option.

Table 7-2. Transmit Clock AT Commands

Front Panel	AT Command	Description
1=NORMAL	&X0	TX clock from DSU selected
2=EXTERNAL	&X1	ETC clock from DTE selected

The **EXTERNAL CLOCK** option allows the DSU IV ESP to accept **MASTER CLOCK** timing from the External DTE Port as defined under DTE Options connector type. The **CLOCK SOURCE** under **NETWORK OPTIONS** must also be set to **MASTER** as noted in the section, *Clock Source* on page 6-4.

The **EXTERNAL CLOCK** option is normally used in modem tail circuit applications. A DSU Tail Circuit cable interconnect diagram for this application is shown in Figure E-1 on page E-2 in Appendix E.

The **EXTERNAL CLOCK** option is also recommended when the EIA-232 connector is used for 56 kbps and 64 kbps applications. Using this option eliminates data errors caused by excessive delays in the DTE transmit clock receiver and transmit data driver.

The **INVERT CLOCK** option is recommended when the EIA-232 connector is used for rates other than 56 kbps or 64 kbps.

Clear to Send (CS) Options

The **CS OPTIONS** menu is used to select the control mode for the CS lead. The default factory setting is **FOLLOWS RS WITH CS DELAY SHORT**.

If one of the options chosen involves **REQUEST TO SEND** (RS), then the delay from RS to CS must be selected. Table 7-1 on page 7-3 shows the AT Commands used to set the CS options.

Specified times for the short and long delays at the different operating speeds are shown in Table 7-3.

Table 7-3. Short & Long Delays at Different Operating Speeds

Rate	Short Delay	Long Delay
64	1.1 ms	16.1 ms
56	1.1 ms	16.1 ms
19.2	1.5 ms	16.5 ms
4.8	1.5 ms	16.5 ms
2.4	1.5 ms	16.5 ms

Anti-Stream

The **ANTI-STREAM** option is used to select the anti-stream timeout. The anti-stream timeout is the maximum time the DSU IV ESP transmits data into the network from the DTE. This feature prevents one DTE device on a multi-drop network from continuously tying up the transmit circuit back to the master DSU.

The anti-stream timer is reset to zero when RS changes to the active state and is updated every second while RS is active. When the anti-stream timeout expires, the DSU IV ESP stops transmitting DTE data into the network but continues to accept data from it. This condition exists until the DTE deactivates the RS input.

The factory default setting is **TIMER OFF**. Table 7-1 on page 7-3 shows the available options and their AT commands.

CD Options

The **CD OPTIONS** menu is used to select the control mode for the receive line signal detector (CD) lead. The default factory setting is **NORMAL**. Table 7-1 on page 7-3 shows the equivalent AT commands for setting CD options.

Data Terminal Ready (TR) Options

The **TR OPTIONS** menu is used to select the DSU IV ESP response to the data terminal ready (TR) lead. The factory default setting is **IGNORED**. Table 7-1 on page 7-3 shows the equivalent AT commands for setting TR options.

*The **NO DBU IF OFF** selection is available only when a DBU ESP card is installed and the Network Type is set to DEDICATED.*

*To disable DBU when DTR is off, set this option for **IDLE WHEN OFF**.*

Data Set Ready (SR) Options

The **SR OPTIONS** menu is used to select the operating mode for the data set ready (SR) lead from the DTE options menu.

To activate the **SR OPTIONS**, press **Shift + A** and **Enter**. The factory default setting is **OFF TEST ONLY**. Table 7-1 on page 7-3 shows the AT commands for setting SR options.

Chapter 8 Configuring Test Options

TEST OPTIONS

The **TEST OPTIONS** menu enables or disables different test modes and specifies the maximum test time allowed. See Figure 8-1 for the **TEST OPTIONS** menu tree.

The AT commands and their available options are listed in Table 8-1 on page 8-2.

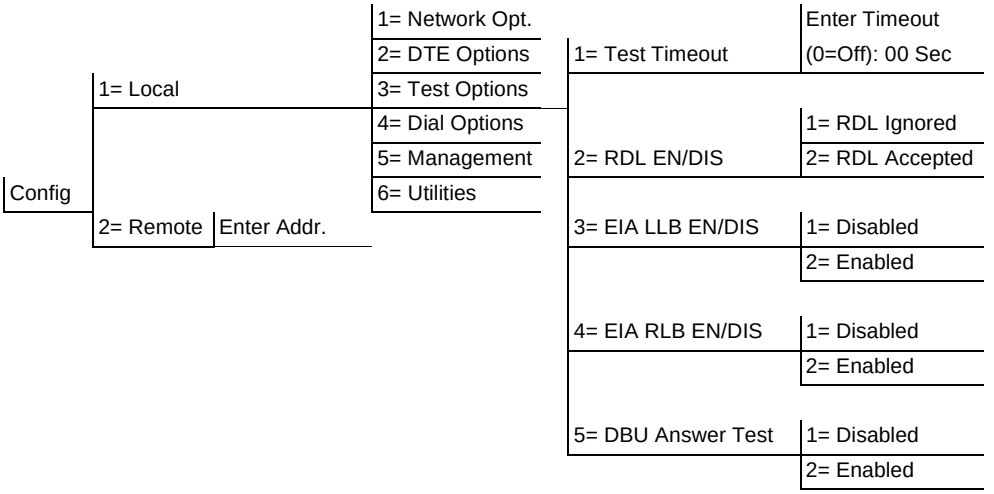


Figure 8-1. Test Options Menu Tree

Table 8-1. Test Options AT Commands

Front Panel	AT Command	Description
Test Timeout		
Enter Timeout	S18=x	Specify 0 to 255 second test timeout
RDL Enable/Disable		
1=RDL Ignored	&T5	RDL request from remote DSU ignored
2= RDL Accepted	&T4	RDL request accepted
EIA LLB Enable/Disable		
1= Disabled	_A0	No response to local loopback
2= Enabled	_A1	Responds to local loopback
EIA RLB Enable/Disable		
1=Disabled	_R0	No response to remote loopback
2=Enabled	_R1	Responds to remote loopback
DBU Answer Test		
1= Disabled	none	Remote unit does not accept DBU tests from far end
2= Enabled	none	Remote unit accepts DBU tests from far end

Test Timeout

The **TEST TIMEOUT** option sets the length of time a DSU IV ESP remains in a test mode before automatically returning to the data mode. Enter the timeout in two-digit decimal value. The factory default setting is **OFF** (**0**).

Remote Digital Loopback (RDL)

The **RDL** option specifies whether the DSU IV ESP responds to an RDL request from the far end of the circuit. The factory default setting is **RDL ACCEPTED**.

EIA LLB

The **EIA LLB** (Electronics Industries Association local loopback) option specifies whether the DSU IV ESP responds to the local loopback input from the DTE. The factory default setting is **DISABLED**.

EIA RLB

The **EIA RLB** (remote loopback) option specifies whether the DSU IV ESP responds to the RLB input from the DTE. The factory default setting is **DISABLED**.

DBU Answer Test

The dial backup connection can be tested while data is passing on the DDS. In order for this test to be performed, **DBU ANSWER TEST** must be enabled on the remote unit. If **DBU ANSWER TEST** is not enabled, the remote unit will not accept a DBU test from the other end. The factory default setting is **DISABLED**.

*The **DBU ANSWER TEST** is not available if the **DBU CRITERIA** option **ANSWER ALWAYS** is enabled.*

Chapter 9 Configuring Dial Options

DIAL OPTIONS

The **DIAL OPTIONS** menu stores up to ten phone numbers, enables / disables the SW56 auto answer capability, defines the dial backup operation when the DDS circuit fails, and programs the passcode security feature.

Figure 9-1 on page 9-2 shows the full Dial Backup Options (4=Dial Options) menu. Note that some items are restricted to certain DBU cards.

DIAL BACKUP MODULES

The DSU IV ESP provides an optional dial backup slot in the rear of the chassis for disaster recovery across the switched network in case of a primary link failure. The DSU IV ESP supports the following DBU modules:

- V.34 Analog POTS DBU (33.6Kbps; ADTRAN P / N 1204002L2)
- 4-Wire Switched 56 DBU (ADTRAN P / N 1204001L1)
- 1B+D Basic Rate ISDN (BRI) DBU (ADTRAN P / N 1204004L1)

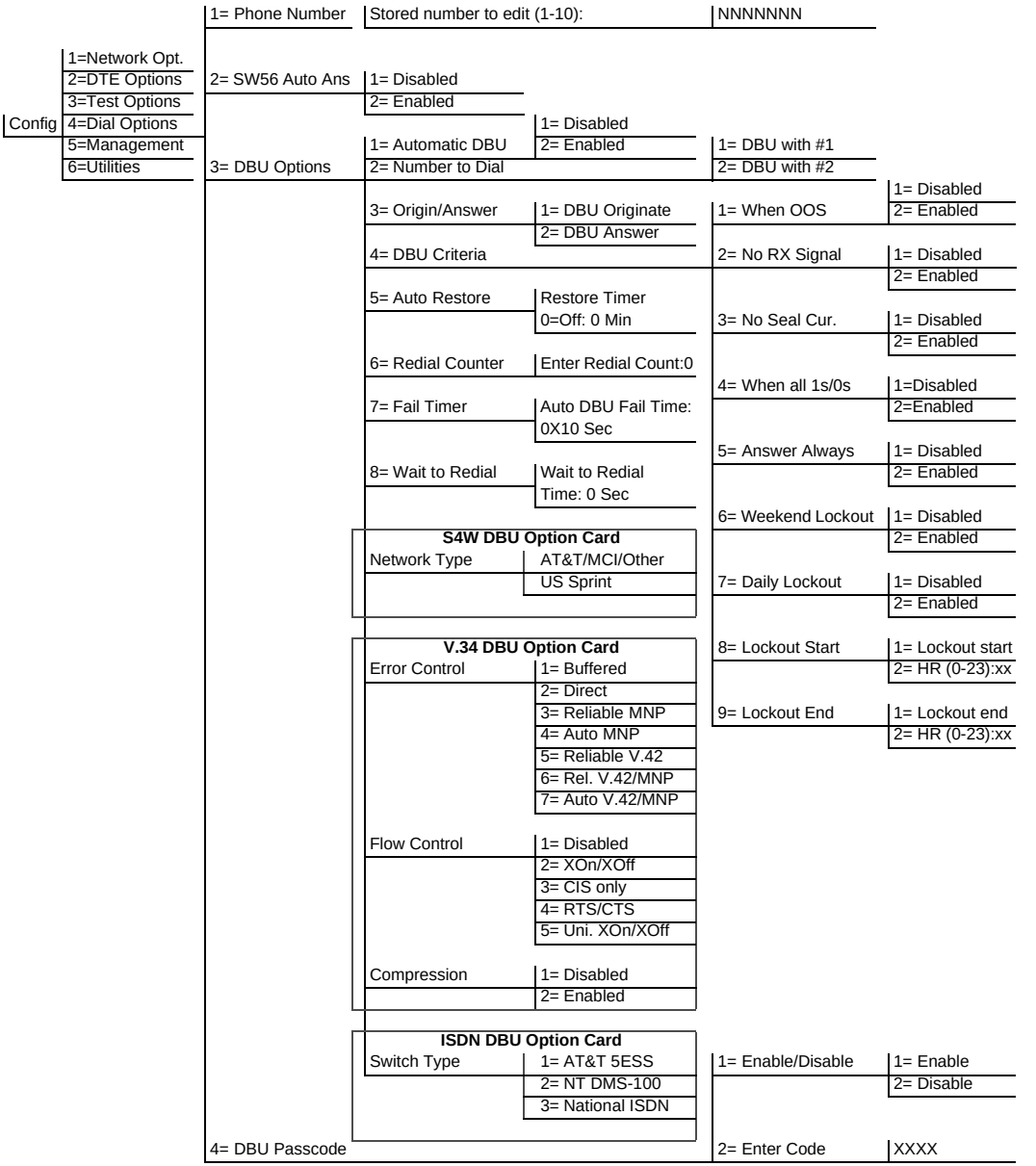


Figure 9-1. Dial Options Configuration Menu Tree

Phone Numbers

The DSU IV ESP stores up to 10 numbers of 36 digits each. Edit a phone number by reentering the entire number. This process overwrites the previously stored number.

Table 9-1 shows the AT Commands available for the **PHONE NUMBER** option.

Table 9-1. AT Commands for Storing Phone Numbers

AT Command	Description
&Zn=	Store Phone Number
&Z9	Enter SPID Number for ISDN dial backup
&Z10=	Edit LDN for ISDN dial backup

ISDN Dial Backup

Setting the Service Profile Identifier (SPID)

For ISDN dial backup, the service profile identifier (SPID) is stored in Stored Number 9. The SPID is 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 line. The SPID is assigned by the telco when the ISDN line is installed and normally resembles the phone number.

Only the AT&T 5ESS switch is capable of recognizing a point-to-point configuration, eliminating the need for a SPID. All other switch types require a SPID.

Setting the Local Directory (LDN) Number

For ISDN dial backup, the LDN is stored in Stored Number 10. See Table 9-1, above.

SW56 Auto Answer

The SW56 Auto Answer option is used to specify how incoming calls are to be answered. If **ENABLED**, incoming calls are automatically answered by the DSU IV. If **DISABLED**, an incoming call can be answered manually, by an AT or V.25 command from the DTE, or by raising TR from the DTE.

DBU Options

The DBU Options are used to select the modes of operation for the Dial Backup features. There are ten standard options available with additional options for specific backup services.

Table 9-2 lists the DBU options and their AT commands for all models.

Table 9-2. DBU Options AT Commands for All Models

Front Panel	AT Command	Description
Automatic DBU		
1 = Disabled	_K0	Automatic DBU disabled
2 = Enabled	_K1	Automatic DBU enabled
Number to Dial		
1 = DBU with #1	_B0	Dial stored #1
2 = DBU with #2	_B1	Dial stored #2
Originate/Answer		
1 = DBU originate	_E0	Originates call if DDS fails
2 = DBU answer	_E1	Answers call if DDS fails
DBU Criteria		
When Out of Service		
1= Disabled	_G0	No DBU for OOS
2 = Enabled	_G1	DBU when OOS

Table 9-2. DBU Options AT Commands for All Models (Continued)

Front Panel	AT Command	Description
No Receive (Rx) Signal		
1= Disabled	_H0	No DBU when RX signal absent
2 = Enabled	_H1	DBU when RX signal absent
No Sealing Current		
1= Disabled	_I0	No DBU when sealing current absent
2 = Enabled	_I0	DBU when sealing current absent
When All 1s/0s		
1 = Disabled	_P0	No DBU when all 1s/0s detected
2 = Enabled	_P0	DBU when all 1s/0s condition exists
Answer Always		
1 = Disabled	none	Answer unit answers only under specified conditions.
2 = Enabled	none	Answer unit answers any incoming call regardless of failed condition.
Weekend Lockout		
1 = Disabled	none	Disables weekend lockout feature
2 = Enabled	none	No backup occurs from midnight Friday to midnight Sunday
Daily Lockout		
1 = Disabled	none	Sets dial backup lockout starting hour
2 = Enabled	none	Sets dial backup lockout ending hour
Lockout Start	none	Sets hour to enable dial backup
Lockout End	none	Sets hour to disable dial backup
Auto Restore	S31=x	Sets restore timer
Redial Counter	S57=x	Sets redial counter
Fail Timer	S58=x	Sets fail timer
Wait to Redial	S59=x	Sets time between redial attempts

Standard DBU Options

Automatic DBU

The **AUTOMATIC DBU** option specifies whether the unit automatically enters dial backup mode or waits for manual setup. The factory default setting is **DISABLED**.

Number to Dial

The **NUMBER TO DIAL** option offers a selection of stored numbers for the unit to automatically dial. If the leased line fails, and the DSU IV ESP is set to originate, it dials the numbers (in chronological order) specified under this option to set up the dial backup line. The factory default setting is **DIAL WITH #1**.

Originate/Answer

The **ORIGINATE/ANSWER** option specifies whether the DSU IV ESP originates or waits to answer if the dedicated circuit fails. One end must be set to **ORIGINATE** and the other to **ANSWER**. The factory default setting is **ANSWER**.

DBU Criteria for Entering Dial Backup Mode

These options specify the conditions that will cause the DSU IV ESP to enter the backup mode.

When Out of Service (OOS)
When enabled, the DSU IV ESP enters backup mode if an out-of-service condition is detected. The factory default setting is **ENABLE**.

No Receive (RX) Signal
When enabled, the DSU IV ESP enters backup mode when a loss of signal is detected. The factory default setting is **ENABLE**.

No Sealing Current
When enabled, the DSU IV ESP enters backup mode when a loss of sealing current is detected. The factory default setting is **ENABLE**.

When all 1s/0s
When this option is enabled, the DSU IV ESP monitors the receive data for strings of 1s or 0s that are longer than the Fail Timer. If this

condition is detected, the local DSU IV ESP initiates a handshake routine with the remote unit to determine if the DTE is generating the constant data pattern or if the network has failed.

Answer Always
If enabled, the answer unit answers any incoming call regardless of failed conditions.

Weekend Lockout
If enabled, no backup will occur from midnight Friday to midnight Sunday.

Weekend and daily lockout apply to automatic DBU only. Manual DBU is not affected. Also, this parameter affects the originate end only. The answer end remains DBU-capable at all times.

Daily Lockout
Enable / disable the **DAILY LOCKOUT** specified by the fields **ENABLE HOUR** and **DISABLE HOUR**.

Lockout Start
Enter the hour that the daily lockout begins and dial backup is disabled (0 to 23). Only applies if the **DAILY LOCKOUT** parameter is **ENABLED**.

Lockout End
Enter the hour that the daily lockout ends and dial backup is reactivated (0 to 23). Only applies if the **DAILY LOCKOUT** parameter is **ENABLED**.

Auto Restore

Once the DDS circuit is down, the DSU IV ESP remains in backup until the DDS circuit is active for the length of time specified for the restore timer. The selection is entered in minutes (up to 255). If set to 0, the DDS must be restored manually. The factory default setting is **1 MINUTE**.

RESTORE TIMER
(0=OFF): __ __ MIN

Redial Counter

This option sets the number of times the DSU IV ESP redials the far end when entering backup mode. The redial count, which is manually entered, can be up to a maximum of 99 attempts. If the DSU IV ESP encounters a busy or reorder, it attempts to establish the call the specified number of times. The factory default setting is **5**.

ENTER REDIAL
COUNT: __ __

Fail Timer

This option sets the amount of time the dedicated circuit failure condition must be active before the DSU IV ESP attempts backup. The amount of time, which is manually entered, can be up to 990 seconds. The factory default setting is **30 SECONDS**.

AUTO DBU FAIL
TIME: __ __ x 10sec

Wait to Redial

This option works in conjunction with the preceding Redial Counter. It selects the amount of time between redial attempts to connect the backup line. The amount of time, which is manually entered, can be up to 99 seconds. The factory default setting is **10 SECONDS**.

WAIT TO REDIAL
TIME: __ __ SEC

DBU Options for S4W Card

Network Type

This option selects the company providing the switched digital service. When US Sprint is selected, an automatic echo canceler suppressor tone is emitted by the DSU IV ESP when dialing. Options include: **AT&T/MCI/OTHER** and **US SPRINT**.

DBU Options for V.34 Card

Table 9-3 shows the equivalent AT commands for setting **ERROR CONTROL**, **FLOW CONTROL**, and **COMPRESSION** options.

Table 9-3. DBU Options AT Commands for V.34 Card

Front Panel	AT Command	Description
Error Control		
1= BUFFERED	\N0	Normal operation. No error control. Allows speed matching, buffering, and flow control.
2= DIRECT	\N1	Direct operation. No error control, no buffer, and no flow control.
3= RELIABLE MNP	\N2	Reliable MNP Operation. Uses MNP Error Control.
4= AUTO MNP	\N3	Auto-reliable MNP operation. Tries MNP error control first; uses normal operation if necessary.
5= RELIABLE V.42	\N4	Reliable V.42 (LAPM) operation. Uses V.42 (LAPM) error control. If V.42 (LAPM) error control cannot be used the call is disconnected.
6= REL. V.42/MNP	\N5	Reliable V.42 (LAPM) or MNP operation. Uses either V.42 (LAPM) or MNP error control. If neither can be used the call is disconnected.
7= AUTO V.42\MNP	\N6	Auto-reliable V.42(LAPM) or MNP operation. Tries to use V.42(LAPM) error control first, and MNP error control next. If neither can be used, then Normal operation is used.
Flow Control		
1= Disabled	\Q0	Flow control disabled
2= XON/XOFF	\Q1	Enables XON/XOFF flow control
3= CTS ONLY	\Q2	Enables CTS flow control from DCE
4= RTS/CTS	\Q3	Enables CTS flow control from DCE and RTS from DTE
5 = UNI XON/XOFF	\Q4	Unidirectional XOn/XOff

Table 9-3. DBU Options AT Commands for V.34 Card (Continued)

Front Panel	AT Command	Description
Compression		
1= Disabled	%C0	Compression disabled
2= Enabled	%C1	Compression enabled

Error Control

This option determines the type of error control to be negotiated at the start of a V.34 modem connection. The factory default setting is **AUTO V.42/MNP**.

Flow Control

This option is used to select the type of flow control used by the V.34 modem. The factory default setting is **CTS ONLY**.

Compression

This option is used to select V.42 bis data compression for V.32 bis or V.34 operation when running asynchronously. When enabled, data throughput speeds as high as 57.6 kbps may be achieved. For synchronous applications, the speed is limited to a maximum of 33.6 kbps for the V.34. The factory default setting is **ENABLED**.

DBU Options for ISDN Card

Switch Type

This option selects the type of telco CO switch providing the ISDN service. There are three options for ISDN switch types:

- AT&T 5ESS
- NT DMS-100
- National ISDN

DBU Passcode

The dial backup passcode adds an additional level of security to the DSU IV ESP. A passcode of one to ten characters can be programmed into the unit.

When a dial backup connection is established, the originate unit transmits a pre-programmed passcode to the answer unit over the dial backup connection before the connection is considered valid. The answer unit compares the received passcode to a pre-programmed passcode. If the passcode matches, the receive unit sends a **PASSCODE OK** message to the originate unit and goes on-line. If the passcode does not match, the receive unit sends an Invalid Passcode message to the originate unit and terminates the dial backup connection. If a passcode is not received by an answer unit with passcode enable, or if the **PASSCODE OK** message is not received by an originate unit with passcode enable, the dial backup connection is terminated.

Chapter 10 Management Functions

CONFIGURING MANAGEMENT FUNCTIONS

The **MANAGEMENT** menu is used to select the desired management interface type and to set up the necessary parameters for establishing Telnet or SNMP management. See Figure 10-1 on page 10- 2 for the **MANAGEMENT** menu tree.

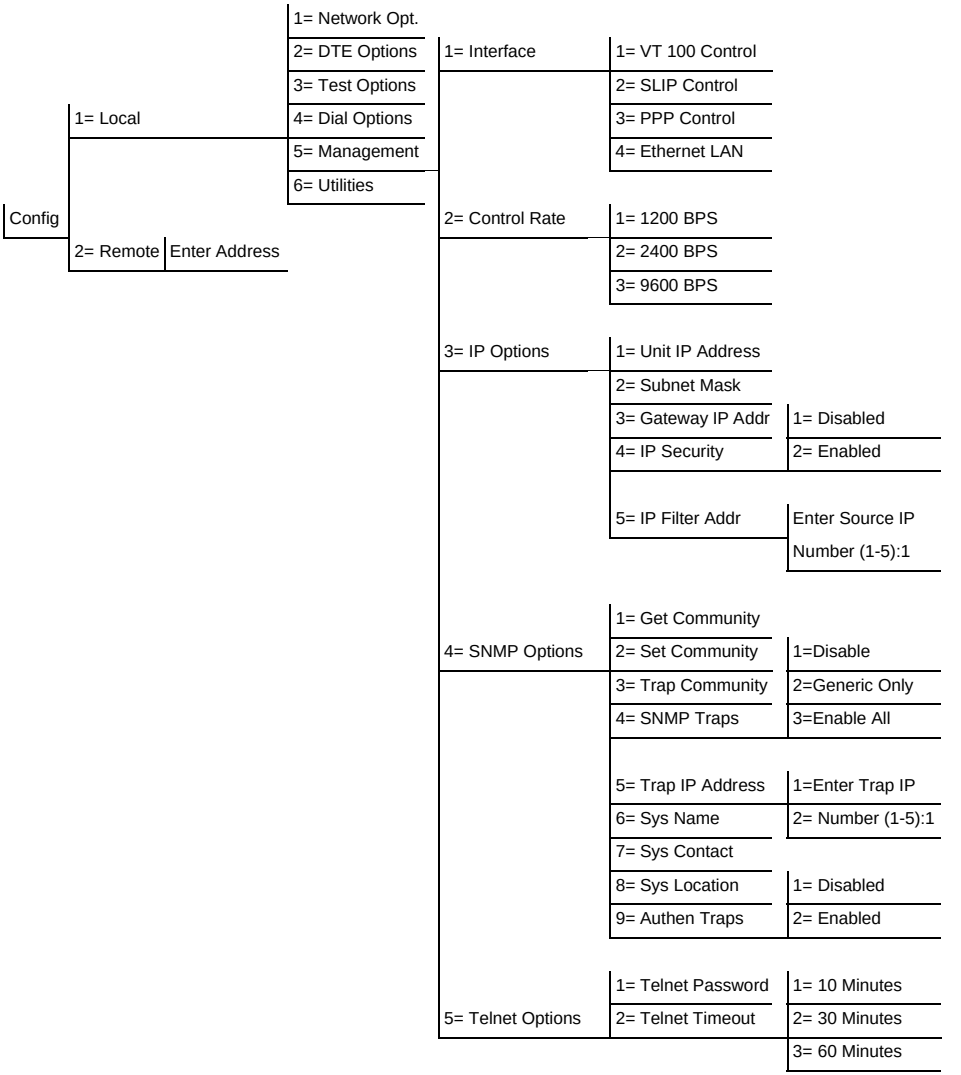


Figure 10-1. Management Menu Tree

Interface

Select the management interface type (VT 100 terminal, SLIP, or PPP) or select Ethernet LAN (ESP Ethernet card must be installed).

Control Rate

Select the control port operating speed to match the connected device (this selection only applies when the interface options is set for VT 100 terminal, SLIP, or PPP).

IP Options

When configuring the DSU IV ESP with the front panel, use the "" key to enter a decimal point.*

Unit IP Address

Enter the DSU IV 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 Address

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

IP Security

Enable / disable the **IP SECURITY** option. If enabled, the DSU IV ESP only accepts management commands from the IP addresses (up to 5) entered into the **IP FILTER ADDRESS** field.

IP Filter Address

Enter the IP addresses of the management stations from which the DSU IV ESP should accept management commands. This filter must be enabled though the IP Security field.

SNMP Options

The following options must be configured when SNMP management is used.

Get Community

For SNMP operation, view and edit the **GET COMMUNITY** string. The DSU IV ESP uses this string to validate SNMP Get (read) requests. The default value is public. If using front panel entry, see the section *Entering Letters Using The Front Panel* on page 10-6 for more information.

Set Community

For SNMP operation, view and edit the **SET COMMUNITY** string. The DSU IV ESP uses this string to validate SNMP Set (write) requests. The default value is private. If using front panel entry, see the section *Entering Letters Using The Front Panel* on page 10-6 for more information.

Trap Community

For SNMP operation, view and edit the **TRAP COMMUNITY** string. The DSU IV ESP sends this string in SNMP trap messages to the network manager. The default value is dsuiv. If using front panel entry, see the section *Entering Letters Using The Front Panel* on page 10-6 for more information.

SNMP Traps

Specify which traps the DSU IV ESP will send to the network manager. When enabled, the DSU IV ESP sends SNMP traps to network managers for alarm conditions. The options are **DISABLE**, **GENERIC ONLY**, and **ENABLE ALL**. The **GENERIC ONLY** option enables the Generic Standard traps specified in the SNMP standard, RFC 1157. The **ALL** option sends both Generic Standard traps and the enterprise-specific traps specified in the ADTRAN DSU IV ESP MIB.

Trap IP Address

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

System Name, Contact, and Location

These data fields are general information strings (defined in MIB-II standard, RFC 1213) which can be stored by the user and retrieved by the SNMP management station. If using front panel entry, see the section *Entering Letters Using The Front Panel* on page 10-6 for more information.

Authentication Traps

Enable / disable the DSU IV ESP to send SNMP authentication traps to the SNMP management station. If enabled, the DSU IV ESP sends these traps when an SNMP request with an invalid community name string is received.

> **NOTE** *The ADTRAN DSU IV ESP MIB is available in the support section of the ADTRAN webpage at www.adtran.com.*

Telnet Options

Telnet Password

View / edit the Telnet password. If using front panel entry, see the section *Entering Letters Using The Front Panel* on page 10-6 for more information.

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.

ENTERING LETTERS USING THE FRONT PANEL

Some Management menus require the entry of letters rather than numbers. When configuring the unit using the front panel, special steps must be taken in order to perform these entries. The following example of entering the Telnet Password illustrates this procedure:

1. Press **5**, then **Enter** to select **TELNET OPTIONS** from the Management menu.
2. Press **1**, then **Enter** to select **TELN PASSWORD**.
3. Press the up arrow to delete the existing entry.
4. Press the **Shift** key. The cursor appears as an underscore (_).
5. Use the up and down arrow keys to scroll to the appropriate letter
6. When the letter displays, press **Shift**. A block cursor appears in the next field.
7. To enter another letter, press **Shift**. The cursor again appears as an underscore.
8. Repeat this procedure until all letters have been entered.
9. Once password entry is complete, press **Enter**.

A block cursor signifies movement from field to field. When this cursor is active, pressing the up arrow key deletes the current entry of that field. Pressing the down arrow key advances the cursor to the next field. An underscore cursor signifies letter entry. When active, pressing the up and down arrow keys scrolls the alphabet.

Chapter 11 Configuring Unit Utilities

The **UTILITIES** menu is used to enter manual commands, set and view the time and date, and view the software version, LAN MAC address, and the unit serial number. See Figure 11-1 on page 11-2 for the **UTILITIES** menu tree.

AT commands are not available for this menu.

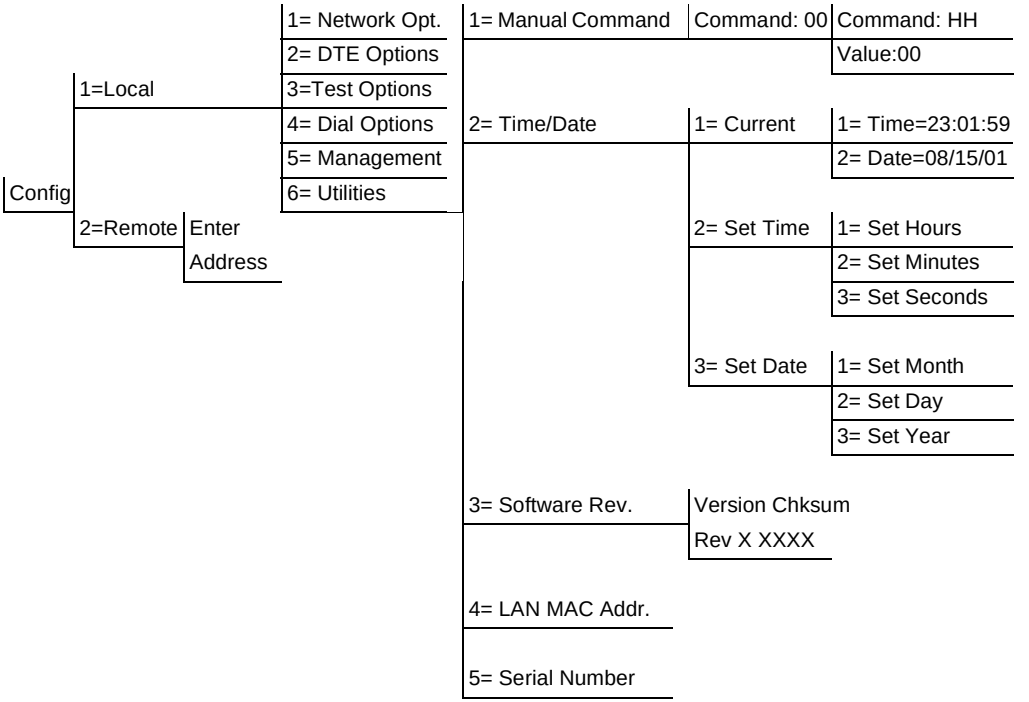


Figure 11-1. Utilities Menu Tree

Manual Command

The **MANUAL COMMAND** option is a shortcut method for entering configuration and control commands for the DSU IV ESP. Figure 11-1 shows the menu path for the manual command. The available manual commands are listed in Table 11-1 on page 11-4. When using the front panel, perform the following steps to enter a manual command:

1. From the Main menu select **CONFIG**>**LOCAL>UTILITIES**.
2. Then select **MANUAL COMMAND**.

The first display prompts for command number entry:

```
COMMAND:00
```

3. Use the up arrow key to delete the current entry, then use the number keys to enter the new value. Press **Shift** to activate letters **A-F**.
4. Press **Enter** to complete the **COMMAND** entry.
5. Once the command number is entered, the display shows both the command number and the present value or setting for the command. The command value can be edited or reissued with the existing value.

```
COMMAND: XX
VALUE: 00
```

6. Use the number keys to enter the hexadecimal value. Press **Enter** to complete. The system briefly displays **COMMAND ACCEPTED** (if the entry is valid) and returns to the active menu.

Table 11-1. Manual Commands

Command Description	Command	Value
AT Command Echo		
Disable	82	00
Enable	82	01
AT Result Code		
Disable	85	00
Enable	85	01
AT Long or Short Code		
Short Form (numeric)	86	00
Long Form (verbose)	86	01
AT Escape Character	2	00 to FF
AT CR Character	3	00 to FF
AT LF Character	4	00 to FF
AT BS Character	5	00 to FF
AT Escape Char. Timer	0C	00 to FF
Abort Call Timer	7	00 to FF
DTR Recognize Delay	19	00 to FF
DTR Initiated Command Timeout	28	00 to FF
Load Factory Options		
Option Set # 1	8A	00
Option Set # 2	8A	01
Option Set # 3	8A	02
Option Set # 4	8A	03
Network Address Lock		
Network Addr. Unlock	C3	00
Network Addr. Lock	C3	01
Front Panel En/Dis		
Disable	AA	01
Enable	AA	01

Time/Date

View / set the current time and date. Entering this information is only necessary for the Weekend and Time of Day Lockout features.

Software Revision

View the current revision of the software installed in the DSU IV ESP.

LAN MAC Address

View the LAN MAC address. This address is available when the ESP ethernet option card is installed.

Serial Number

View the DSU IV ESP's serial number.

Chapter 12 Activating Dial Functions

DIAL OPTIONS

The dial options available from the Main menu (**4=DIAL**) vary depending on the network type selection (**CONFIG**>**NETWORK OPT> NETWORK TYPE**).

If **AT&T/MCI SW56** or **US SPRINT SW56** is selected, the options appear as shown in Figure 12-1.

If **DEDICATED** is selected and a DBU card is installed, the options appear as shown in Figure 12-2 on page 12- 2.

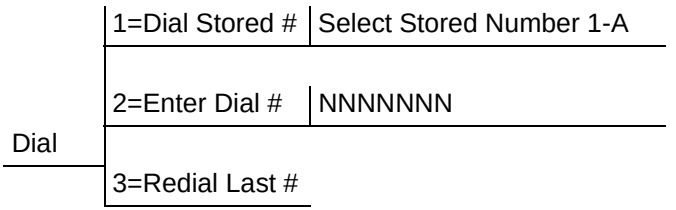


Figure 12-1. Dial Options Menu (SW56)

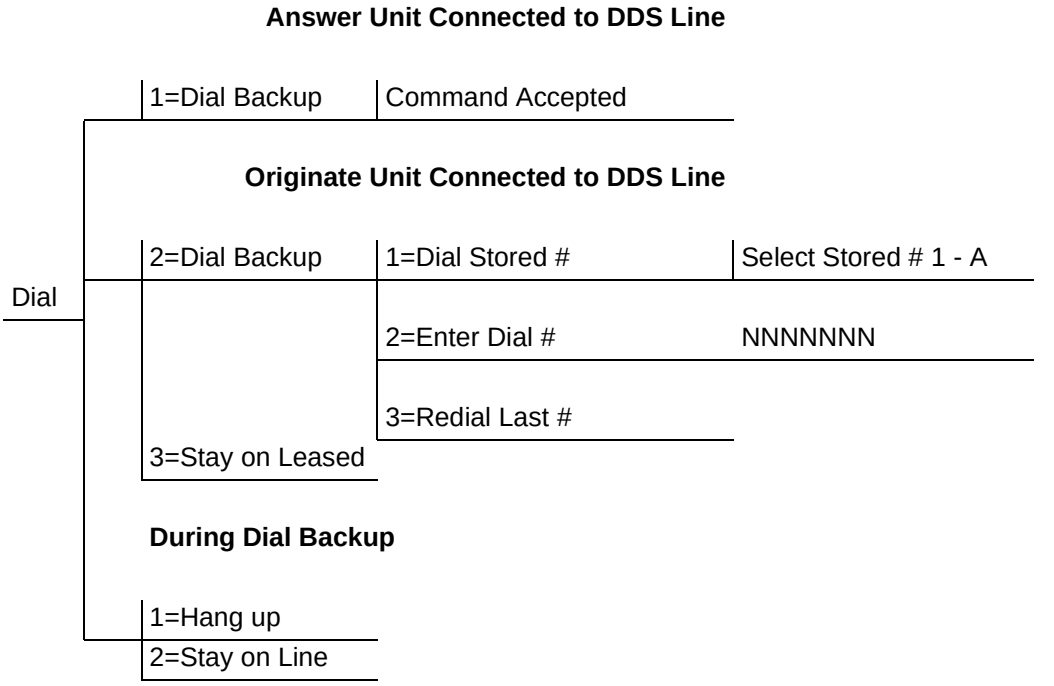


Figure 12-2. Dial Options Menu (Dedicated)

Answer Unit Connected to DDS Line

Dial Backup

The message **COMMAND ACCEPTED** is displayed and the DSU IV ESP waits for an incoming call. When an incoming call is detected, the DSU IV ESP answers the call and enters dial backup.

Originate Unit Connected to DDS Line

Dial Backup

The DSU IV ESP prompts to dial a stored number or enter a number to dial for dial backup.

Stay on Leased

The DSU IV ESP remains on the leased line and does not enter dial backup mode.

Dial Options During Dial Backup

Hang Up
Terminates the dial backup connection and attempts to reestablish communication on the DDS line.

Stay On Line
This DSU IV ESP remains in dial backup mode and returns to the **STATUS** menu.

Chapter 13 Testing and Troubleshooting

TEST OVERVIEW

The DSU IV 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. In asynchronous mode, AT commands can control the testing from the DTE interface. For synchronous operation, V.25 bis commands can provide test control.

The unit also responds to standard DDS network tests initiated from telco test centers. In addition, it can run several tests such as local and remote loopbacks to aid in problem isolation. See Figure 13-1.

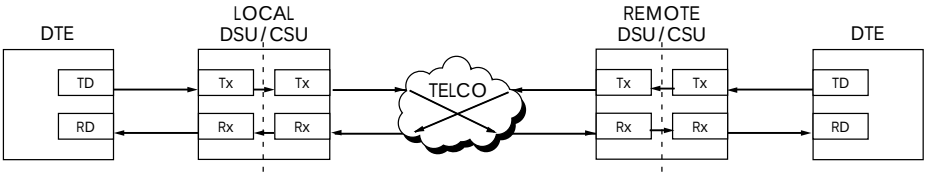


Figure 13-1. Normal Operation Before Initiating Loopback Test

CAUTION

All diagnostic tests disrupt data flow.

Initiating a Test

Initiate tests using the following procedure:

1. Select **TEST** from the Main menu by pressing **2**, then **Enter**.
2. Specify **LOCAL**, **REMOTE**, or **DBU TESTING** by selecting the corresponding number, followed by **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, followed by **Enter**.

Figure 13-2 shows the menu path for initiating a local DTE and Loop test.

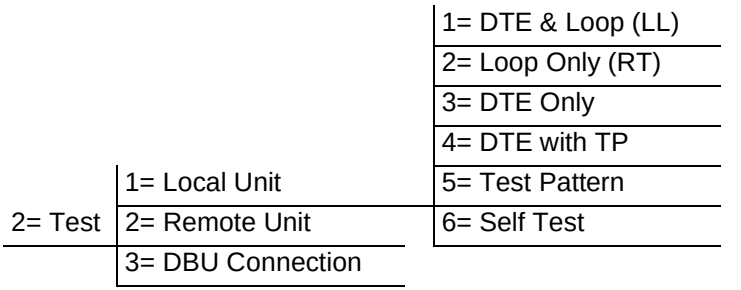


Figure 13-2. Initiating a Test

Once a test is initiated, **PLEASE WAIT** is displayed briefly, followed by the status screen.

Test Status Display

The **TEST STATUS** display appears automatically during a test. The **TEST STATUS** display is similar to the status screen described in Chapter 14, *Viewing Status Information* on page 14-1, with additional prompts for the type of test and the number of errors (for tests with a test pattern).

Figure 13-3 shows an example of a **TEST STATUS** display for a test with a test pattern.

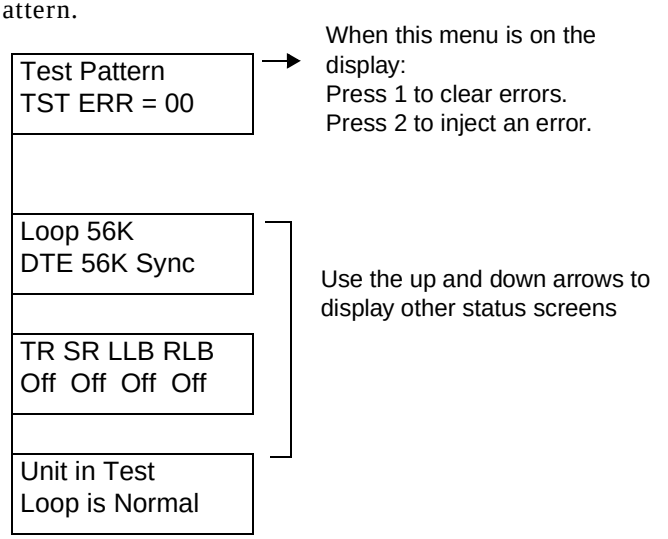


Figure 13-3. Sample Test Status Displays

Exiting a Test

During a test, press **Quick** to access the **EXIT TEST/DISPLAY STATUS** menu or press **Cancel** to return to the Main menu. The **EXIT TEST/ DISPLAY STATUS** menu provides the following options, which are available only after a test has been initiated (see Figure 13-4 on page 13- 4):

Exit Test
Exits the current test and returns to the Main menu.

Display Status
Reenters test display.

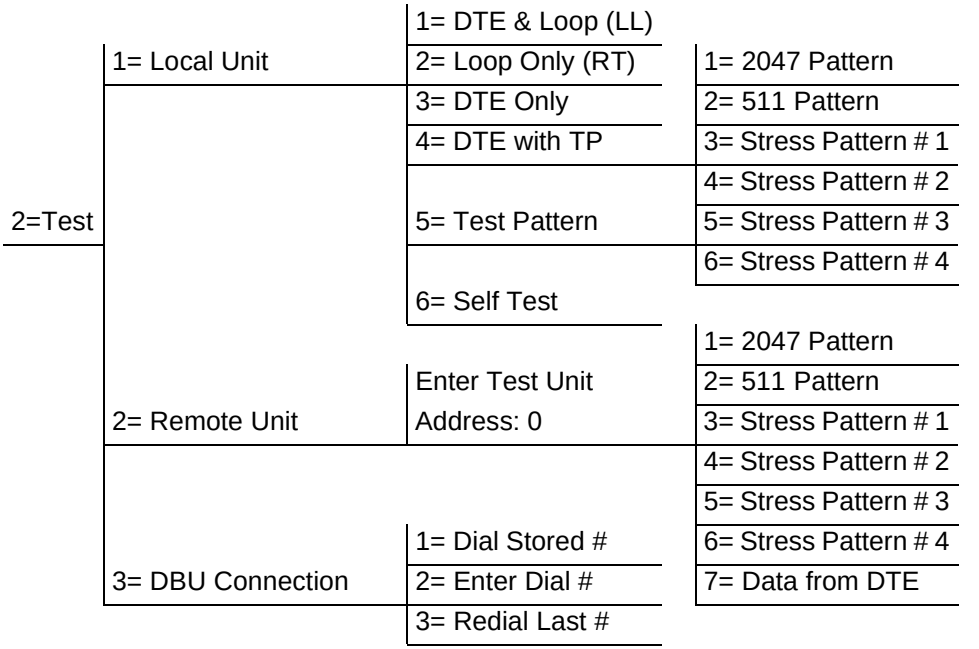


Figure 13-4. Complete Test Menu

TROUBLESHOOTING

This section is intended to provide a quick and easy means of diagnosing suspected problems associated with local or remotely attached ADTRAN DSU/CSUs.

Messages from the DSU/CSU

Messages on the LCD display and LEDs give information concerning the status of the unit and the local loop. If the **ALARM LED** is on, at least one of the messages shown in Table 13-1 on page 13-5 is displayed on the LCD.

NOTE

*The **STATUS** menu must be selected in order for the unit to display status messages. Pressing **Quick** returns to the Main menu, where **STATUS** can be selected.*

Table 13-1. Messages from the DSU/CSU

Message	Meaning	Probable Cause	Action
Loop is Normal	Good local loop signal being received from the telco	Indicates good local loop	No action required; unit properly connected to telco circuit
Open Loop	Unit not receiving a signal from the telco	Bad telco cable from the DSU to telco jack or bad circuit to telco	Replace telco cable from DSU to wall jack. If a problem persists, contact telco provider
No RX Signal	Unit detects sealing current but no data signal from telco	Bad conductor in telco cable from DSU to telco jack or bad circuit to telco	Replace telco cable from DSU to wall jack. If a problem persists, contact telco provider
OOS/OOF From Net	Unit detects an out-of-service or out-of-frame condition from the telco	Telco is having problems with DDS circuit or remote unit is turned off or disconnected	Check remote unit. Contact telco service provider
Check Telco LIne	Transmit/receive pair reversal detected	Telco wall jack wired incorrectly	Switch wire pairs in wall jack or contact telco service provider
Test from Telco	Telco activated a loopback to test the DDS circuit	Telco is testing circuit	Wait until test is complete or contact telco service provider

Troubleshooting New Installs

Before initiating diagnostics on a newly installed unit and / or DDS circuit and before contacting ADTRAN Technical Support, please check the items in Table 13-2 to ensure the unit is configured properly.

After verifying the items listed in Table 13-2, the unit should operate properly and display the following:

DATA MODE
LOOP IS NORMAL

If a status message other than **DATA MODE LOOP IS NORMAL** is shown, begin performing diagnostics described in the section *Test Sequence for Troubleshooting New Installs or Existing Circuits* on page 13-7.

Table 13-2. Troubleshooting New Installs

Configuration Item to Check	Option Selection	Action
DTE Type	EIA-232 or V.35	From the **CONFIGURATION** menu, select the type of DTE interface option to connect to the DSU/CSU.
Loop Rate	Auto, 2.4 to 64 kbps	From the **CONFIGURATION** menu, select the DDS loop rate of the DDS circuit.
Data Format	Async or Sync	From the **CONFIGURATION** menu, select the type of data to be used.
DTE Cable	N/A	Verify DTE cable connection to the proper DTE connector on the DSU/CSU.
Telco Cable	N/A	Verify the telco cable is securely connected to the DSU/CSU and wall jack.
Power the Unit Off and then On	N/A	Verify the unit passes self-test during power-up (displayed on the LCD).

Test Sequence for Troubleshooting New Installs or Existing Circuits

If your DSU...	Do this...
seems to be having problems	Perform a self-test to determine whether the unit is operational.
is receiving excessive errors requiring retransmission of data,	First perform a DTE with Test Pattern to determine whether the unit's internal transmitter and receiver are operating error free. If problem persists, perform a Remote Test to verify the connection between the local and remote unit is error free. Run the test using all available test patterns.
fails any of these tests or the problem has not been determined,	Contact ADTRAN Technical Support. This information is located in the front section of this manual.

If an external BERT tester is available, these additional tests may be performed: DTE & Loop Test, DTE Only Test, Loop Only Test.

LOCAL UNIT DIAGNOSTICS

The local DSU IV ESP can perform six different tests as described in Table 13-3.

Table 13-3. Test AT Commands

Front Panel Display	AT Command	Description
DTE & Loop (LL)	&T10	TD/TD and TX/TX Loopbacks
Loop Only (RT)	&T11	RX/TX Loopback at Network Interface
DTE Only	&T1	TX/RX Loopback at DTE Interface
DTE with TP	&T8	TX/RX Loopback with Test Pattern
Test Pattern	&T9	Transmit/Receive Test Pattern
Self Test	Z	Check internal components (Resets unit)
Exit Test	&T0	Stops test, returns to data mode

TD = Customer Transmit Data
RD = Customer Receive Data
TX = Network Transmit Data
RX = Network Receive Data

The test patterns shown in Table 13-4 on page 13-9 are available for the DTE with Test Pattern and Test Pattern tests.

Table 13-4. DTE With Test Pattern Commands

Front Panel	AT Command	Description
1 - 2047 Pattern	_T0&T8	Standard 2047 random data pattern.
2 - 511 Pattern	_T1&T8	Standard 511 random data pattern.
3 - Stress Pattern # 1	_T2&T8	Stress pattern with alternating high and low ones densities. Repeated pattern of 100 octets: 1111 1111, followed by 100 octets: 0000 0000.
4- Stress Pattern # 2	_T3&T8	Stress pattern with alternating medium and low ones densities. Repeated pattern of 100 octets: 0111 1110, followed by 100 octets: 0000 0000.
5 - Stress Pattern # 3	_T4&T8	Stress pattern with medium ones density. Continuous series of octets: 0011 0010.
6 - Stress Pattern # 4	_T5&T8	Stress pattern with low ones density. Continuous series of octets: 0100 0000.

DTE & Loop (LL)

The **DTE & LOOP** test splits the DSU IV ESP into two separate DTE and loop interface sections and then loops the receive data of each interface back to its respective transmit data. The **DTE & LOOP** test provides a bidirectional loopback at the DSU/CSU. Figure 13-5 illustrates the loopback points and the signal paths for this test.

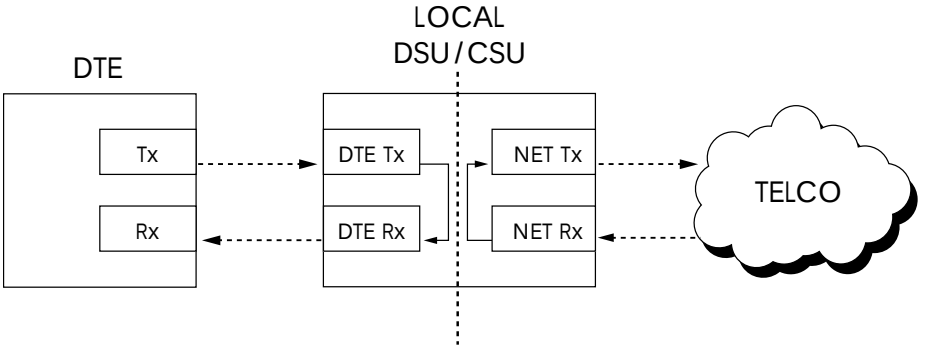


Figure 13-5. DTE & Loop Test

Test Purpose

The **DTE & LOOP** test is used for the following purposes:

- Verify integrity of the DTE interface and cable.
- Provide a loopback for network tests.

Interpreting Test Results

A BERT tester must be used to interpret the test results of a **DTE & LOOP** test.

Loop Only (RT)

The **LOOP ONLY** (RT) test allows the loop interface and a major portion of the DTE interface for the local DSU IV ESP to be tested from the remote site over the actual communication circuit. Figure 13-6 illustrates the loopback point and the signal paths for this test.

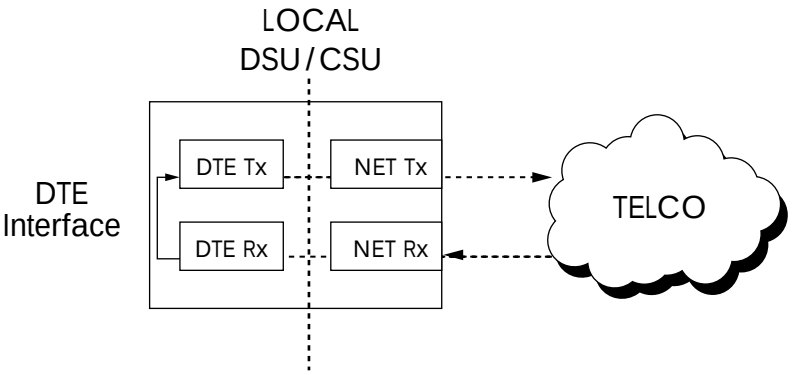


Figure 13-6. Loop Only Test

Test Purpose

The **LOOP ONLY** test is used to provide a loopback for network tests.

Interpreting Test Results

The **LOOP ONLY** test is used for the purpose of looping the DDS circuit back to the telco. No test results are available from the local DSU IV ESP.

DTE Only

The **DTE ONLY** test provides a method for testing both the DTE interface drivers and receivers of the local DSU IV ESP plus its loop transmitter and receiver. For this test, the loop transmit data is connected to the loop receive data at a point close to the physical network interface. This test can be used to verify proper operation between the local DTE and the local DSU IV ESP.

> **NOTE** *When this test is implemented, the far unit receives an OOS/OOF message from the network and enters an alarm state.*

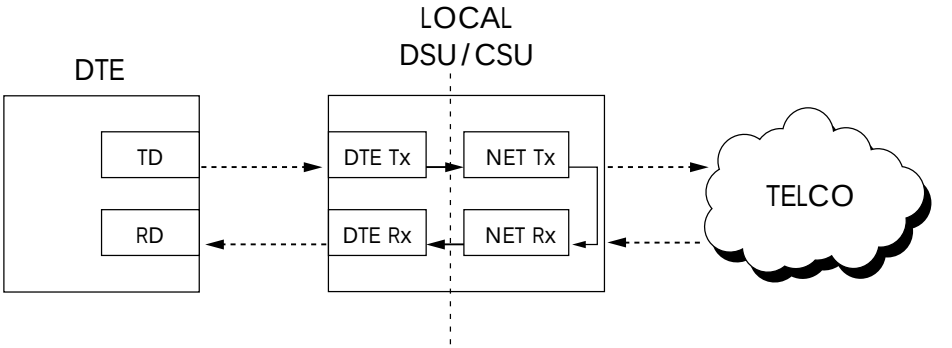


Figure 13-7. DTE Only Test Diagram

Test Purpose

The **DTE ONLY** test is used for the following purposes:

- Verify integrity of the DTE interface.
- Verify integrity of connection between DTE and DSU IV ESP.

Interpreting Test Results

A BERT tester must be used to interpret the test results of a **DTE ONLY** test, because the BERT originates external to the local DSU.

DTE With Test Pattern

The **DTE WITH TP** (test pattern) test is similar to the **DTE ONLY** test described previously except the test pattern is generated in the DSU / CSU internal test pattern generator. This test can be used to detect deficiencies within the internal drivers and receivers of the DSU IV ESP. Figure 13-8 illustrates the loopback point and the data paths for this test.

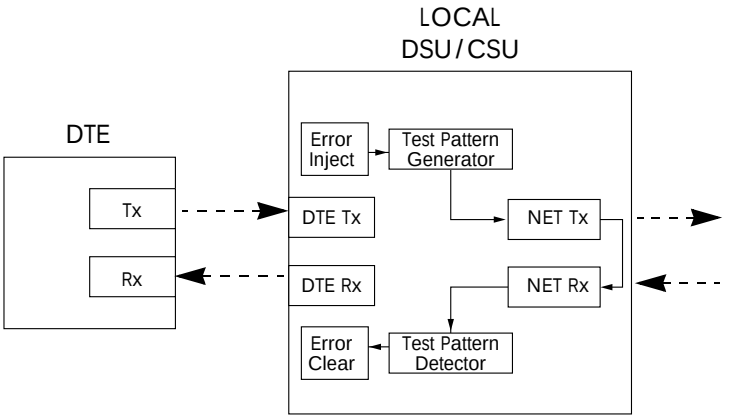


Figure 13-8. DTE with Test Pattern

Test Purpose

A DTE test using a test pattern is used for the following purposes:

- Verify integrity of the DTE interface.
- Verify integrity of connection between DTE and DSU IV ESP.

Interpreting Test Results

If the unit is functioning properly, the DSU IV ESP displays:

```
DTE WITH TP
TST ERR=XX
```

The first line of the display indicates the type of test being performed, while the second line of the display indicates the number of errors accumulated by the test pattern detector.

If errors occur during this test, press **1** to reset the test error count to zero.

To verify proper operation of this test, single bit errors can be injected into the transmitted test pattern by pressing **2**. These errors appear on the **TEST ERR** display.

Test Pattern

The **TEST PATTERN** option converts the local DSU IV ESP into a BERT tester for the purpose of testing the DDS circuit. If this test is used, the remote DSU/CSU must be in loopback or transmitting a test pattern. Figure 13-9 illustrates the data paths for this mode.

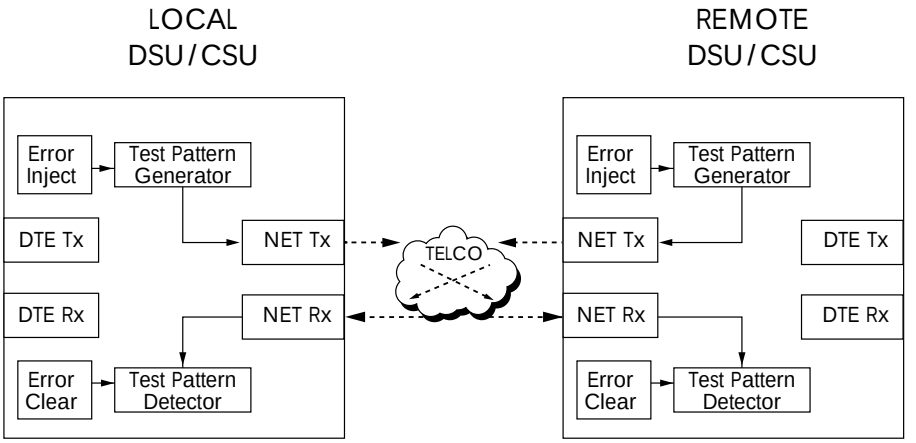


Figure 13-9. Test Pattern Only

Test Purpose

Testing using a test pattern is used for the following purposes:

- Transmits user-selected test pattern using an internal test pattern generator, and compares the received data using internal test pattern detector to detect if there are any errors on the DDS circuit.
- Injects errors and verifies the unit transmits data across the communication circuit to the remote unit.
- Helps determine from which direction the circuit is receiving errors.

Interpreting Test Results

If the unit is functioning properly, the test error count should be 0.

Self Test

The **SELF TEST** verifies current operation of the DSU IV ESP. It can be performed at any time and is recommended if there is any question about the DSU's health.

Test Purpose

The purpose of this test it to determine if the DSU is functioning properly.

Interpreting Test Results

Once **SELF TEST** is activated, the LEDs cycle on and off as the system runs the self test. A pass or fail status will be displayed on the LCD along with a checksum indicating the current firmware revision.

REMOTE UNIT DIAGNOSTICS

A remote DSU IV ESP can perform seven different tests; seeTable 13-5.

Table 13-5. Remote Tests and AT Commands

Front Panel	AT Command	Description
1 - 2047 Pattern	_T0&T7	Standard 2047 random data pattern.
2 - 511 Pattern	_T1&T7	Standard 511 random data pattern.
3 - Stress Pattern # 1	_T2&T7	DDS stress pattern # 1
4- Stress Pattern # 2	_T3&T7	DDS stress pattern # 2
5 - Stress Pattern # 3	_T4&T7	DDS stress pattern # 3
6 - Stress Pattern # 4	_T5&T7	DDS stress pattern # 4
7 - Data from DTE	&T6	Data from DTE

The **REMOTE UNIT** submenu allows a remotely installed DSU to be placed into loopback. There are six test patterns to choose from, or **DATA FROM THE DTE** may be selected. See Figure 13-10.

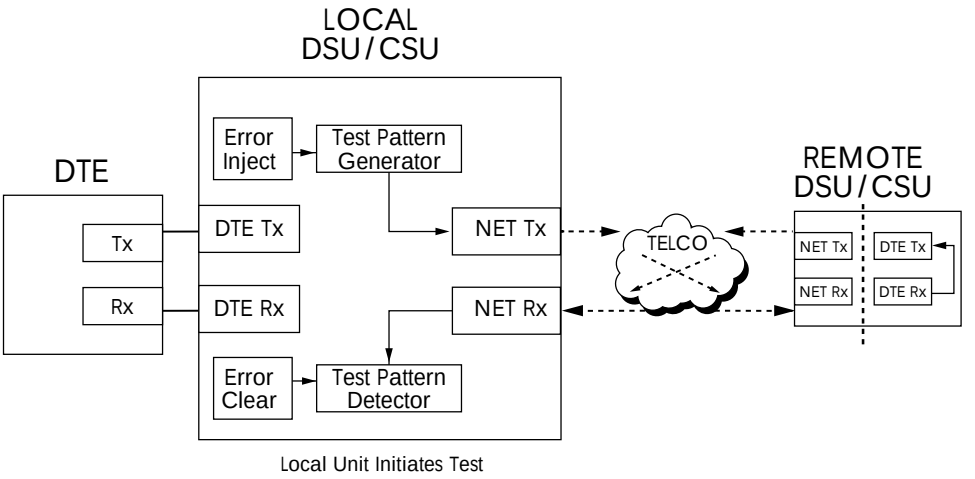


Figure 13-10. V.54 RDL with Test Pattern

Test Purpose

The test purpose is to test the local DSU, the DDS circuit, and the remote DSU.

Initiating

Follow the menu path outlined in Figure 13-11 to place a remote DSU IV ESP into loopback.

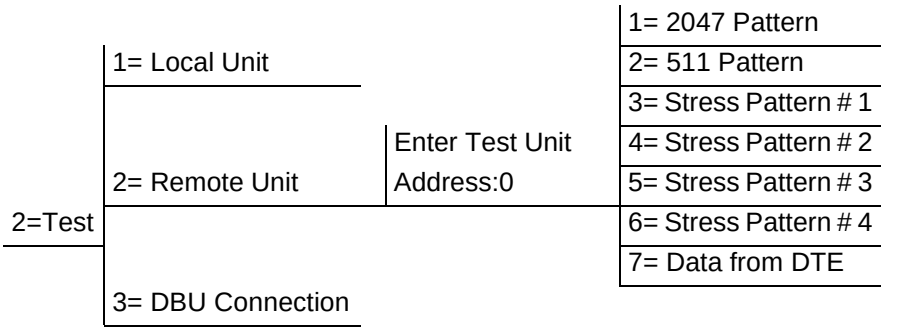


Figure 13-11. Initiating a Remote Test

After selecting **REMOTE UNIT** from the menu, the following prompt is displayed for entering the address for the remote unit:

```
ENTER TEST UNIT
ADDRESS:XX
```

Use the number keys to type the address of the remote DSU; then press **Enter**. The test pattern selections are displayed. After a test pattern is selected, the system briefly displays **PLEASE WAIT**.

Test Results

If the test is successful, the status menu is displayed. If the test is not successful, **UNABLE TO EXECUTE TEST** is displayed.

Interpreting Test Results

If the unit is functioning properly, the test error count should be 0.

DBU CONNECTION

When the DSU IV ESP is equipped with a dial backup option, the **DBU CONNECTION** option appears as one of the **TEST** menu selections. This test allows the dial backup network to be tested while data is transmitted on the main line. See Figure 13-12.

When this option is selected, choose a stored number, enter a number to dial, or redial the last dialed number. After establishing DBU connection, the DSU IV ESP designated at the answer unit is placed into loopback and a test pattern is transmitted from the originate unit to the answer unit. Receive data is checked for errors and the results displayed on the front panel. While running this test, errors may be injected by pressing **2** and cleared by pressing **1**. During the DBU test, the **TEST LED** is On.

> **NOTE**
>
> *When running at a subrate over a 56k or 64k loop (or a 64k loop with Scrambler activated), the DSU will not send data during a DBU test. The DBU Answer Test option must be enabled. Enabling DBU Answer test does not affect the unit during dial backup.*

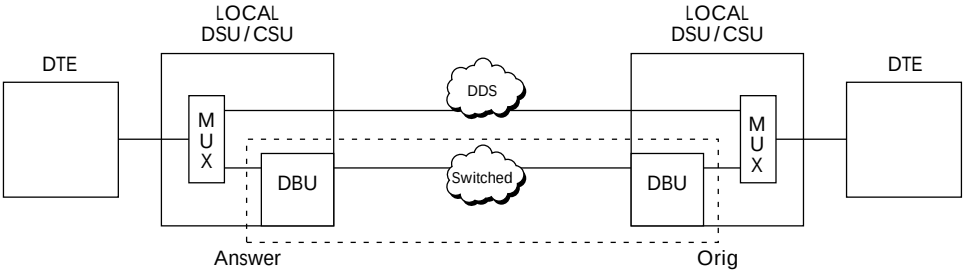


Figure 13-12. DBU Connection Test

Test Purpose

The purpose of this test is to verify that the DBU circuit and DBU modules in both the local and remote DSU IV ESP are functioning properly.

Initiating

Follow the menu path outlined in Figure 13-13 to initiate a DBU connection test.

			1= 98376113
			2= Empty
			3= Empty
	1= Local Unit	1= Dial Stored #	4= Empty
2=Test	2= Remote Unit	2= Enter Dial #	5= Empty
	3= DBU Connection	3= Redial Last #	6= Empty
			7= Empty
			8= Empty
			9= Empty
			A= Empty

Figure 13-13. Initiating a DBU Connection Test

Interpreting Test Results

If the unit is functioning properly, the DSU IV ESP displays:

DBU TEST PATTERN
TST ERR = 0000

Chapter 14 Viewing Status Information

STATUS

The **STATUS** selection displays two lines of the current operational status of the network and the DTE interfaces.

After 30 seconds of no front panel operation, the DSU IV ESP automatically reverts to the Status display; see Figure 14-1.

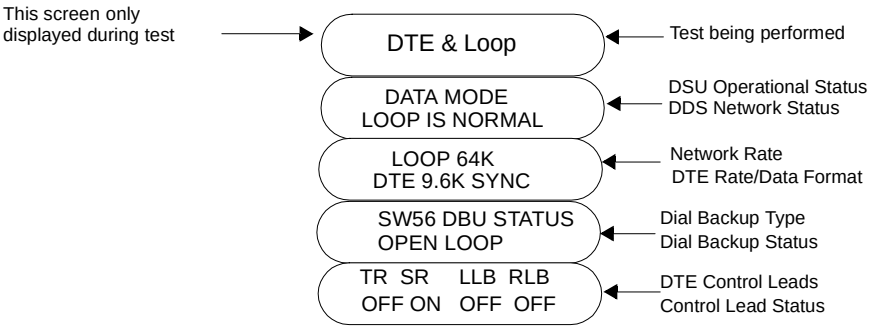


Figure 14-1. Status Display

Network Rate, DTE Rate, and Data Format

This display line (see Figure 14-1 on page 14-1) indicates the current loop rate on the first line. The DTE data rate and format (as selected in configuration) are shown on the second line.

Dial Backup Information

Type of Dial Backup Service

This display line (see Figure 14-1 on page 14-1) indicates the type of dial backup service installed in the DSU IV ESP. The following messages are displayed according to the dial backup option installed in the DSU IV ESP:

ISDN DBU Status
1 B+D Basic Rate ISDN backup option installed.

SW56 DBU Status
4-wire Switched 56 backup option installed.

V.34 DBU Status
V.34 backup option installed.

DBU Status Not Installed
No backup service option card installed in the DSU IV ESP unit.

Current Status of Dial Backup Mode

This display line (see Figure 14-1 on page 14-1) indicates the backup service status. Possible messages include the following:

Answering Call
The DSU IV ESP detected an incoming call message and is initiating call setup procedure.

Call Disconnect
Call disconnect message received from the remote end.

Called Unit Busy
The unit called is currently busy and cannot be connected (ISDN only).

Dialing
The unit is dialing the selected number.

Going to DBU
The DSU IV ESP is entering dial backup mode.

Idle
Messages are not being transmitted but the service is immediately available for use.

Incoming Call
Incoming call messages being received.

In Dial Backup
The DSU IV ESP is currently in dial backup mode.

No RX Signal
Sealing current detected but no data signal received from telco. Also indicates ISDN line is inactive.

No Wink from CO
Switched 56 provider encountered a service problem (4-wire SW56 only).

Not Installed
No dial backup option installed in the DSU IV ESP.

OOS/OOF From Net
Out-of-service signal or out-of-frame condition exists. The call cannot be completed because the called terminal or the called terminal's access line is out of service or is faulty (4-wire SW56 only).

Open Loop
The physical connection to the backup line has been broken (4-wire SW56 only).

DBU Line in RDL
Remote end initiated a test.

Test From Telco
The network provider has activated the CSU loopback (4-wire SW56 only).

DBU Test Pattern
The DSU IV ESP is currently performing a test with a pattern.

Waiting for Call
The originating DSU IV ESP is waiting on a call from the remote end.

Inactive
A DBU card is installed but the DSU IV ESP is set to SW56 mode.

Getting TEI
The ISU card is getting its first terminal endpoint identifier from the network.

Register SPID
The ISU card is registering its first SPID with the network.

DSU Operation and Network Status

Current DSU IV ESP Status
This display line (see Figure 14-1 on page 14-1) indicates current DSU IV ESP status. Possible messages are:

Data Mode - In data mode, the data set ready (SR) and request to send (RTS) circuits are on, and the DSU IV ESP is ready to send data.

Unit inTest - The DSU IV ESP is currently in test mode; use the arrows to scroll through the menus to display the type of test being performed.

Current DDS Network Status
This display line (see Figure 14-1 on page 14-1) displays the status of the main telco line. For normal operation this should display LOOP IS NORMAL; other possible messages are described as follows:

Answering Call - The DSU IV ESP detects an incoming call.

Check Telco - The transmit and receive (Tx/Rx) pairs of the loop connection are reversed. The pairs should be swapped for normal operation.

Going To DBU - This message is displayed briefly while switching from the dedicated service to dial backup mode.

In Dial Backup - The DSU is in dial backup mode.

LL Test From Telco - An LL test has been initiated from the telco.

Loop is Normal - The DSU is connected to the dedicated line.

OOS/OOF - The telco is transmitting an out-of-service code.

Open Loop - The DDS physical connection has been broken.

Waiting for Call - The DBU module is waiting for a call.

DTE Control Leads and Status

Four additional DTE interface leads are displayed with their current status (on or off) displayed below. The leads are identified as follows:

TR - Data terminal ready

SR - Data set ready

LLB - Local loopback

RLB - Remote loopback.

Appendix A Pinouts

The following tables give the pin assignments for the connectors located on the back of the DSU IV ESP, the DBU cards, and ESP ethernet card.

For more information on the connectors, see Chapter 2 *Installation* on page 2-1.

Table A-1. Pin Assignments for Telco Connector

Pin	DDS Loops	Description
1	R1	Transmit Data from DSU to Network-Ring 1
2	T1	Transmit Data from DSU to Network-Tip 1
3	N/A	-
4	N/A	-
5	N/A	-
6	N/A	
7	T	Receive Data from Network to DSU-Tip
8	R	Receive Data from Network to DSU-Ring

Table A-2. Pin Assignments for ESP DBU Card Connectors

Pin	Name	Description
4-Wire Switched 56		
1	R1	Transmit Data from DSU to Network-Ring 1
2	T1	Transmit Data from DSU to Network-Tip 1
3-6	-	Not Used
7	T	Receive Data from Network to DSU-Tip
8	R	Receive Data from Network to DSU-Ring
V.34 and 1 B+D ISDN		
1-3	-	Not Used
4	T	Network-Tip
5	R	Network-Ring
6-8	-	Not Used

Table A-3. Pin Assignments for Primary EIA-232 Connector

DB25 Pin	EIA	Description
1	AA	Protective Ground (PG)
2	BA	Transmit Data (TD)
3	BB	Receive Data (RD)
4	CA	Request to Send (RS)
5	CB	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)

Table A-4. Pin Assignments for Primary V.35 Connector

Pin	CCITT	Description
A	101	Protective Ground (PG)
B	102	Signal Ground (SG)
C	105	Request to Send (RTS)
D	106	Clear to Send (CTS)
E	107	Data Set Ready
F	109	Received Line Signal Detector (CD)
H	-	Data Terminal Ready (DTR)
J	-	Ring Indicator
L	-	Local Loopback (LL)
N	-	Remote Loopback (RL)
R	104	Received Data (RD-A)
T	104	Received Data (RD-B)
V	115	Receiver Signal Element Timing (SCR-A)
X	115	Receiver Signal Element Timing (SCR-B)
P	103	Transmitted Data (SD-A)
S	103	Transmitted Data (SD-B)
Y	114	Transmitter Signal Element Timing (SCT-A)
AA	114	Transmitter Signal Element Timing (SCT-B)
U	113	External TX Signal Element (SCX-A)
W	113	External TX Signal Element (SCX-B)
NN	-	Test Indicator (TI)

Table A-5. Pin Assignments for Control Connector

DB25	DB9	RJ Pin #	Name	Description
7	5	1	GND	-
4	7	2	RTS	I
2	3	3	TD	I
6	6	4	DSR	O
3	2	5	RD	O
5	8	6	CTS*	O
		7	not used	not used
		8	not used	not used
*Used for hardware flow control				

Table A-6. Pin Assignments for 10BaseT Connector

Pin	Name	Description
1	TD+	The positive signal for the TD differential pair. This signal contains the serial output data stream transmitted onto the network.
2	TD-	The negative signal for the TD differential pair (pins 1 and 2).
3	RD+	The positive signal for the RD differential pair. This signal contains the serial input data stream received from the network.
4,5	N/A	not used
6	RD-	The negative signal for the RD differential pair (pins 3 and 6).
7,8	N/A	not used

Appendix B AT Commands

Table B-1 shows the AT commands available for the DSU IV ESP.

Table B-1. AT Commands

Command	Title	Default
A/	Reexecute Command	none
ATA	Answer	none
ATDn	Dial Number	none
ATE	Echo Command	1
ATH	Hang Up Call	none
ATO	Go Online	none
ATQn	Result Code Display	0
ATSn	Read S-Register	none
ATSn=x	Write to S-Register	none
ATVn	Result Code From Firmware	1
ATZ	Self Test	none
AT&Cn	CD Option	0
AT&Dn	TR Option	0
AT&Fn	Restore Factory Options	none
AT&Ln	Network Type	0
AT&Pn	Remote Configuration	
AT&Qn	DTE Data Format	0
AT&Rn	CS Options	0
AT&Sn_Cn	SR Options	0
AT&Zn=x	Store Phone Number	none

Table B-1. AT Commands (Continued)

Command	Title	Default
AT\Nn	Error Control (V.34 DBU)	0
AT\Qn	Flow Control (V.34 DBU)	
AT\Tn	Inactivity Timer	
AT%Bn	Loop Rate Select	0
AT%Cn	Compress Option (V.34 DBU)	0
AT%Kn	DTE Rate Select	
AT%P	Password Control	0
AT%P=x	Password Entry	0
T%P>x	Password Verify	0
AT%Rx	Initiate Remote Config	
AT%Tn	Anti-stream Option	0
AT_An	LLB Control	0
AT_Bn	DBU Number to Dial	0
AT_Cn	SR Control During Test	0
AT_Dn	RTS-CTS Delay	0
AT_En	DBU Originate/Answer	0
AT_Fn	Scrambler Control	0
AT_Gn	DBU When OOS	0
AT_Hn	DBU When No TX Signal	0
AT_In	DBU When No Sealing Current	0
AT_Jn	Auto Answer Enable/Disable	0
AT_Kn	DBU Enable/Disable	0
AT_Ln	DTE Routing Main/Backup	0
AT_N=xx	Set Network Address	none
AT_Pn	Front Panel Enable/Disable	0
AT_Rn	RLB Enable/Disable	0
AT_S=xx	Set Serial Number	none
AT_Tn	Select Test Pattern	0
AT_Xn	Clock Source Select	0
AT_Yn	Secondary Channel Rate Select	0

Table B-2. DTE Options AT Commands

Front Panel	AT Command	Description
DTE Rate		
1= 2.4K	%k3	DTE Rate: 2.4K sync and async
2 = 4.8K	%k4	DTE Rate: 4.8K sync and async
3 = 9.6K	%k5	DTE Rate: 9.6K sync and async
4 = 19.2K	%k6	DTE Rate: 19.2K sync and async
5 = 38.4K	%k7	DTE Rate: 38.4K sync and async
6 = 56/57.6K	%k8	DTE Rate: 56 sync or 57.6 async
7 = Same as Loop	%k9	DTE Rate matches loop rate
1 = Scrambler Off	_F0	DTE data scrambler disabled (64kbps loop rate only)
2 = Scrambler On	_F1	DTE data scrambler enabled (64kbps loop rate only)
3 = Suppress LBE	_F2	Suppresses loopback enable code (LBE) in transmit data from the DTE after 30 bytes in a row detected (64 kbps loop rate only)
Data Format		
1= Asynchronous	&Q0	Asynchronous DTE operation mode
2= Synchronous	&Q2	Synchronous DTE operation mode
DTE CMD Option		
1 = Disabled	none	Disables all DTE command Modes
2 = AT Command Set	none	Enables AT command mode for DTE
3 = V.25 Sync	none	Enables V.25 (SDLC) command mode for DTE
4 = V.25 BSC/ASYNC	none	Enables V.25 (bisync or async) command mode for DTE
Transmit Clock		
1 = Normal	&X0	Tx Clock from DSU selected
2 = External	&X1	ETC Clock from DTE selected
3 = Invert	&X3	Inverted Tx Clock from DSU selected

Table B-2. DTE Options AT Commands (Continued)

Front Panel	AT Command	Description
CS Options		
1 = Forced On	&R0	CS always on
2 = Follows RS	&R1	CS state same as RS state
3 = Follows CD	&R2	CS state same as CD state
4 = Follows RS+CD	&R3	CS state same as RS and CD state
5 = Off with LOCD	&R4	Off 5 seconds after LOCD (SW56 only)
For **FOLLOWS RS** options, select the length of the delay:		
1 = CS delay short	_D0	Short delay from RS to CS selected
2 = CS delay long	_D1	Long delay from RS to CS selected
Anti-Stream		
1 = Timer Off	&T0	Anti-stream timer disabled
2 = Time 10 Sec	&T1	Timeout equals 10 seconds
3 = Time 30 Sec	&T2	Timeout equals 30 seconds
4 = Time 60 Sec	&T3	Timeout equals 60 seconds
CD Options		
1 - Forced On	&C0	On all the time
2 - Normal	&C1	On only when data present on loop
3 - Off with LOCD	&C2	On except after disconnect (SW56 only)
TR Options		
1 = Ignored	&D0	Ignore the TR input
2 = Idle when off	&D2	See the note at the end of this table.
3 = Off>On dial #1	&D3	Dial Stored #1: TR goes off to on (SW 56 only)
4 = Off>On dial #2	&D4	Dial Stored #2: TR goes off to on (SW 56 only)
5 = No DBU if Off	&D3	No dial backup if TR is off. (valid only when DBU ESP card is installed and Network Type is set to Dedicated).

Table B-2. DTE Options AT Commands (Continued)

Front Panel	AT Command	Description
SR Options		
1 = Forced On	&S0_C1	Always on
2 = Off OOS only	&S1_C1	Off when network out of service
3 = Off LOCD Only	&S3	Off 5 sec after disconnect (SW56 only)
4 = Off Test only	&S0_C0	Off for test only
5 = Off test + OOS	&S1_C0	Off for test and OOS
6 = Off test + LOCD	&S5	Off 5 seconds after disconnect or test

Table B-3. Network Options AT Commands

Front Panel	AT Command
Loop Rate	
AUTO	%B0
2.4K	%B1
4.8K	%B2
9.6K	%B3
19.2K	%B4
38.4K	%B5
56K	%B6
64K	%B7
Network Address	
XX (decimal)	_N=xx
Remote Configuration	
1 = DISABLED	&P4
2 = ENABLED	&P5
Network Type	
1 = DEDICATED	none
2 = AT&T/MCI SW56	none
3 = US SPRINT SW56	none
Clock Source	
1 = Master	_X0
2 = FROM NETWORK	_X1

Table B-4. Test Options AT Commands

Front Panel	AT Command	Description
Test Timeout		
Enter Timeout	S18=x	Specify 0 to 255 second test timeout
RDL Enable/Disable		
1=RDL Ignored	&T5	RDL request from remote DSU ignored
2= RDL Accepted	&T4	RDL request accepted
EIA LLB Enable/Disable		
1= Disabled	_A0	No response to local loopback
2= Enabled	_A1	Responds to local loopback
EIA RLB Enable/Disable		
1=Disabled	_R0	No response to remote loopback
2=Enabled	_R1	Responds to remote loopback
DBU Answer Test		
1= Disabled	none	Remote unit does not accept DBU tests from far end
2= Enabled	none	Remote unit accepts DBU tests from far end

Table B-5. AT Commands for Storing Phone Numbers

AT Command	Description
&Zn=	Store Phone Number
&Z9	Enter SPID Number for ISDN dial backup
&Z10=	Edit LDN for ISDN dial backup

Table B-6. DBU Options AT Commands for All Models

Front Panel	AT Command	Description
Automatic DBU		
1= Disabled	_K0	Automatic DBU disabled
2 = Enabled	_K1	Automatic DBU enabled
Number to Dial		
1 = DBU with #1	_B0	Dial stored #1
2= DBU with #2	_B1	Dial stored #2
Originate/Answer		
1 = DBU originate	_E0	Originates call if DDS fails
2 = DBU answer	_E1	Answers call if DDS fails
DBU Criteria		
When Out of Service		
1= Disabled	_G0	No DBU for OOS
2 = Enabled	_G1	DBU when OOS
No Receive (Rx) Signal		
1= Disabled	_H0	No DBU when RX signal absent
2 = Enabled	_H1	DBU when RX signal absent
No Sealing Current		
1= Disabled	_I0	No DBU when sealing current absent
2 = Enabled	_I0	DBU when sealing current absent
When All 1s/0s		
1= Disabled	_P0	No DBU when all 1s/0s detected
2 = Enabled	_P0	DBU when all 1s/0s condition exists

Table B-6. DBU Options AT Commands for All Models (Continued)

Front Panel	AT Command	Description
Answer Always		
1= Disabled	none	Answer unit answers only under specified conditions.
2 = Enabled	none	Answer unit answers any incoming call regardless of failed condition.
Weekend Lockout		
1= Disabled	none	Disables weekend lockout feature
2= Enabled	none	No backup occurs from midnight Friday to midnight Sunday
Daily Lockout		
1= Disabled	none	Sets dial backup lockout starting hour
2= Enabled	none	Sets dial backup lockout ending hour
Lockout Start	none	Sets hour to enable dial backup
Lockout End	none	Sets hour to disable dial backup
Auto Restore	S31=x	Sets restore timer
Redial Counter	S57=x	Sets redial counter
Fail Timer	S58=x	Sets fail timer
Wait to Redial	S59=x	Sets time between redial attempts

Table B-7. DBU Options AT Commands for V.34 Card

Front Panel	AT Command	Description
Error Control		
1= BUFFERED	\N0	Normal operation. No error control. Allows speed matching, buffering, and flow control.
2= DIRECT	\N1	Direct operation. No error control, no buffer, and no flow control.
3= RELIABLE MNP	\N2	Reliable MNP Operation. Uses MNP Error Control.
4= AUTO MNP	\N3	Auto-reliable MNP operation. Tries MNP error control first; uses normal operation if necessary.
5= RELIABLE V.42	\N4	Reliable V.42 (LAPM) operation. Uses V.42 (LAPM) error control. If V.42 (LAPM) error control cannot be used the call is disconnected.
6= REL. V.42/MNP	\N5	Reliable V.42 (LAPM) or MNP operation. Uses either V.42 (LAPM) or MNP error control. If neither can be used the call is disconnected.
7= AUTO V.42\MNP	\N6	Auto-reliable V.42 (LAPM) or MNP operation. Tries to use V.42 (LAPM) error control first, and MNP error control next. If neither can be used, then Normal operation is used.
Flow Control		
1= Disabled	\Q0	Flow control disabled
2= XON/XOFF	\Q1	Enables XON/XOFF flow control
3= CTS ONLY	\Q2	Enables CTS flow control from DCE
4= RTS/CTS	\Q3	Enables CTS flow control from DCE and RTS from DTE
5 = UNI XON/XOFF	\Q4	Unidirectional XOn/XOff

Table B-7. DBU Options AT Commands for V.34 Card (Continued)

Front Panel	AT Command	Description
Compression		
1= Disabled	%C0	Compression disabled
2 = Enabled	%C1	Compression enabled

Appendix C Terminal Menu Structure

This appendix describes the terminal menus used when managing the DSU IV ESP through either a VT 100 terminal interface or a Telnet session.

The terminal menu tree is shown in Figure C-1 on page C-2. An example of a terminal screen is shown in Figure C-2 on page C-3.

Due to the increased display capabilities, the VT 100 menu structure differs from the front panel interface. Descriptions of individual menu options are provided throughout this manual based on the front panel menu structure. Chapter 5, Configuration Overview on page 5-1 contains front panel configuration menu trees.

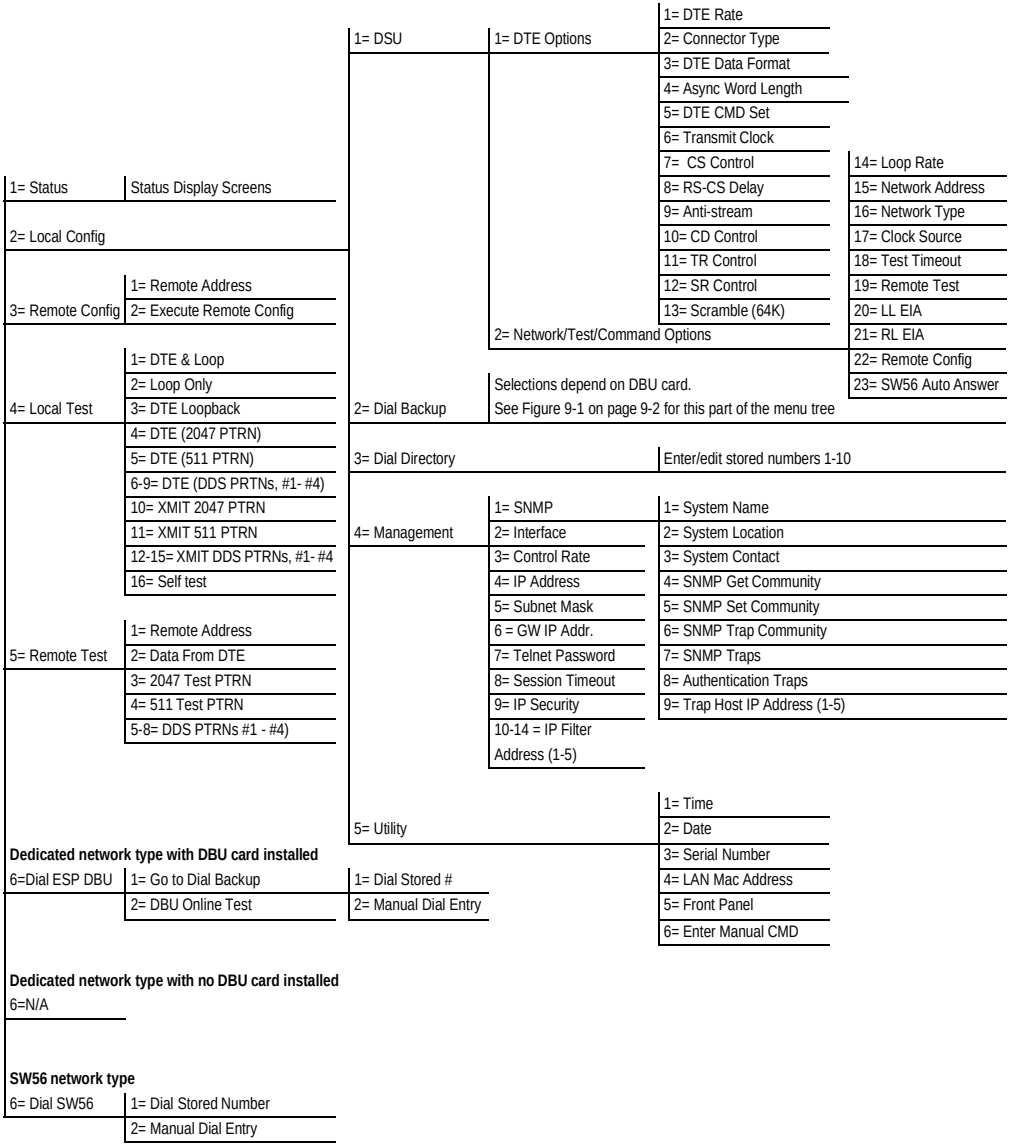


Figure C-1. Terminal Menu Tree

TERMINAL INTERFACE MAIN MENU

The **TERMINAL INTERFACE** menu is the opening menu to all operations of the DSU IV ESP. Select one of the choices by pressing the corresponding number; then press **Enter**. See Figure C-2.

*The **DIAL** selection in the terminal Main menu is determined by two things: the Network Type selected in the Configuration menu and the presence/absence of a DBU card. See Table C-1.*

Table C-1. Terminal Main Menu Dial Selection

Network Type Selected	DBU Card	Sixth Selection
Dedicated	installed	Dial ESP DBU
SW56	N/A	Dial SW56
Dedicated	not installed	no selection available

```
                        DSU IV ESP TERMINAL MENU

 1 STATUS
 2 LOCAL CONFIG
 3 REMOTE CONFIG
 4 LOCAL TEST
 5 REMOTE TEST
 6 DIAL SW56

--------------------------------------------------------------------------------


--------------------------------------------------------------------------------
ESC = EXIT              ENTER SELECTION ->
```

Figure C-2. Terminal Interface Main Menu

Status Menus

STATUS menus display all relevant information for the network and DTE interfaces. See Figure C-3. For more information, see *Viewing Status Information* on page 14-1.

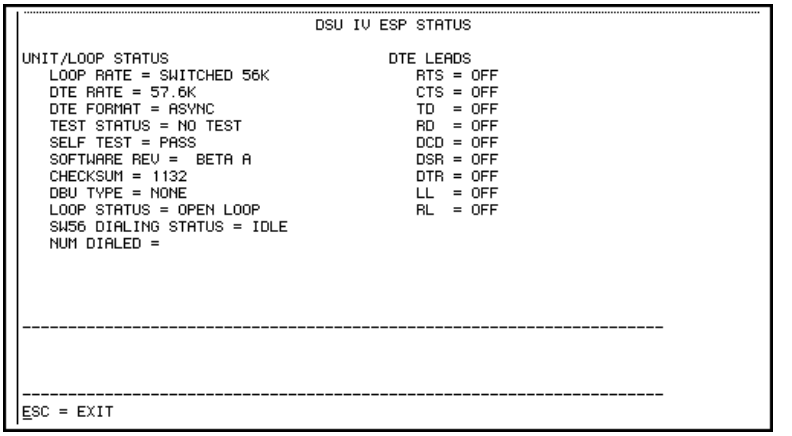


Figure C-3. Status Menus

Local/Remote Configuration Menus

When **LOCAL CONFIGURATION** is selected, the screen in Figure C-5 appears. For **REMOTE CONFIGURATION**, the remote address must be entered through the menu shown in Figure C-4. After entering the address, the menu in Figure C-5 appears.

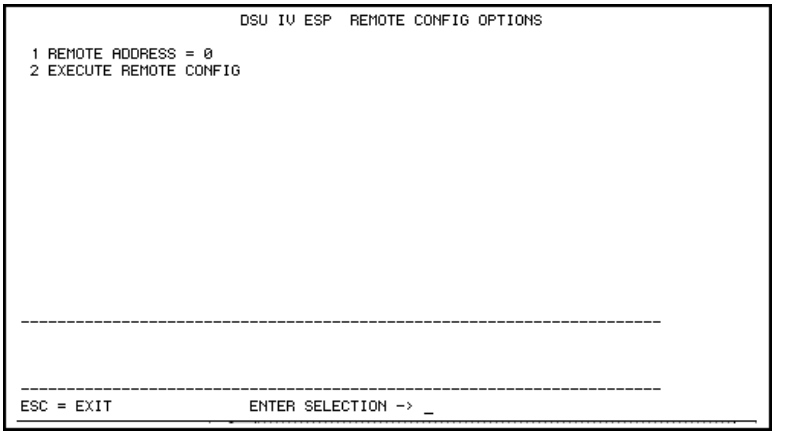


Figure C-4. Remote Configuration Options

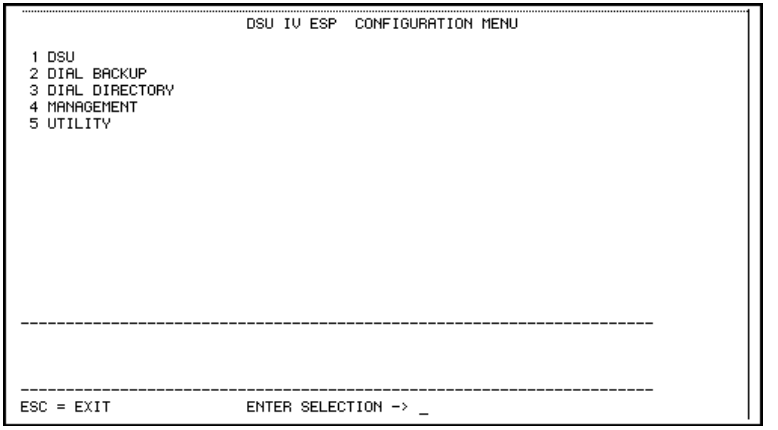


Figure C-5. Main Configuration Menu

DSU Configuration (DTE, Network, and Test options)

The chapters *Configuring Network Options* on page 6-1, *Configuring DTE Options* on page 7-1, *Configuring Test Options* on page 8-1, and *Configuring Dial Options* on page 9-1 include detailed descriptions of these parameters. Figure C-6 shows the DSU Configuration menu.

```
                          DSU IV ESP DSU CONFIGURATION

DTE OPTIONS                                NETWORK/TEST/COMMAND OPTIONS
 1 DTE RATE(@56K/64K) = SAME AS LOOP       14 LOOP RATE = AUTO
 2 CONNECTOR TYPE = V.35                   15 NETWORK ADDRESS = 0
 3 DTE DATA FORMAT = SYNCHRONOUS           16 NETWORK TYPE = DEDICATED
 4 ASYNC WORD LENGTH = 10 BITS             17 CLOCK SOURCE = FROM NETWORK
 5 DTE CMD SET = DIS                       18 TEST TIMEOUT = 0
 6 TRANSMIT CLOCK = NORMAL                 19 REMOTE TEST = EN
 7 CS CONTROL = FOLLOWS RS                 20 LL EIA = DIS
 8 RS-CS DELAY = SHORT                     21 RL EIA = DIS
 9 ANTI-STREAM = TIMER OFF                 22 REMOTE CONFIG = EN
10 CD CONTROL = NORMAL                     23 SW56 AUTO ANSWER = EN
11 TR CONTROL = IGNORED
12 SR CONTROL = OFF TEST+OOS
13 SCRAMBLE(64K) = OFF


--------------------------------------------------------------------------------



--------------------------------------------------------------------------------
ESC = EXIT                 ENTER SELECTION -> _
```

Figure C-6. DSU Configuration Menu

DBU Configuration

This menu changes depending on which DBU card is installed. See *Configuring Dial Options* on page 9-1 for more information. The menu for the S4W DBU card is shown in Figure C-7.

> **NOTE**
>
> *If **DBU CONFIGURATION** is selected when no DBU card is installed, the message **DSU IV ESP DBU NOT INSTALLED** appears. Press the **ESC** key to return to the previous screen of selections. If this message is received when a card is installed, ensure that the card is properly seated in the slot and then restart the unit.*

```
                        DSU IV ESP S4W DIAL BACKUP

DBU OPERATION                          DBU CRITERIA
 1 DBU PASSCODE = 123                  11 DBU EN/DIS = DIS
 2 PASSCODE = DIS                      12 W/OOS = DIS
 3 NUM TO DIAL = NUM 1                 13 W/NO RX = DIS
 4 ORG/ANS = ANS                       14 W/NO SEAL CURR = DIS
 5 AUTO RESTORE TIMER = 1              15 ALL 1s/0s = DIS
 6 REDIAL COUNTER = 5                  16 ANSWER ALLWAYS = DIS
 7 FAIL COND TIMER = 3                 17 WEEKEND LOCKOUT = DIS
 8 WAIT TO REDIAL = 10                 18 DAILY LOCKOUT = DIS
 9 DBU NETWORK TYPE = US SPRINT        19 LOCKOUT EN HOUR = 17
10 DBU ONLINE TEST = DIS               20 LOCKOUT DIS HOUR = 08

--------------------------------------------------------------------------------


--------------------------------------------------------------------------------
```

Figure C-7. S4W Dial Backup

Dial Directory Configuration

Enter / edit stored numbers. See *Configuring Dial Options* on page 9-1 for more information.

Management Configuration

Select the management interface and set the unit up to respond to the selected interface. See *Configuring Management Functions* on page 10-1 for more information. The **MANAGEMENT** menu is shown in Figure C-8. The SNMP menu which branches from the **MANAGEMENT** menu is shown in Figure C-9.

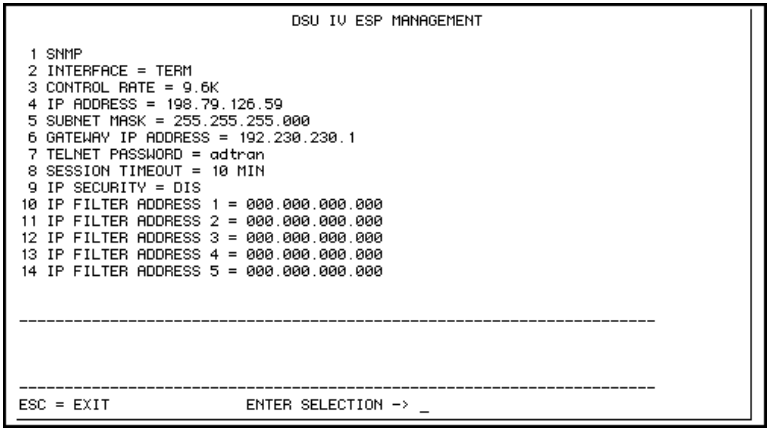


Figure C-8. Management Menu

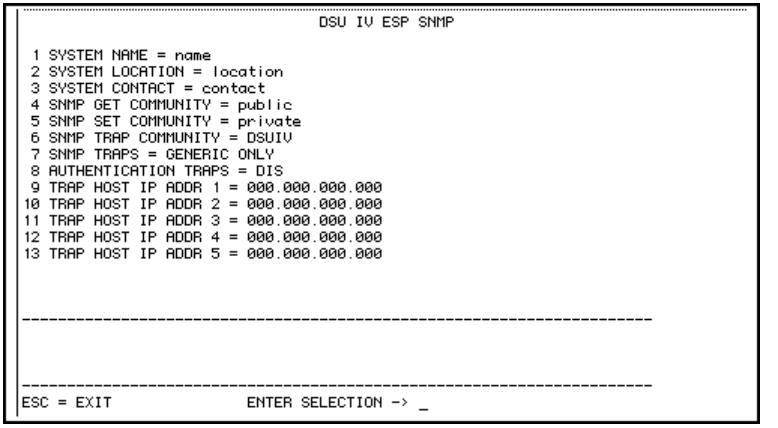


Figure C-9. SNMP Management Menu

Utility Configuration

View / set the time of day and date, view the LAN MAC address (if the ESP ethernet card is installed), enable / disable the front panel, or enter manual commands. *Configuring Unit Utilities* on page 11-1 provides more detailed information. See Figure C-10.

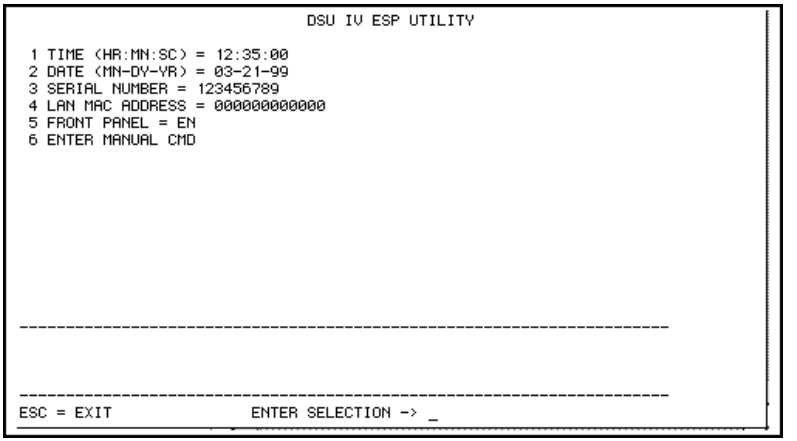


Figure C-10. Utility Menu

Local/Remote Test Menus

The **LOCAL TEST OPTIONS** menu is shown in Figure C-11. The **REMOTE TEST OPTIONS** menu is shown in Figure C-12. For information on these menu items, see *Testing and Troubleshooting* on page 13-1.

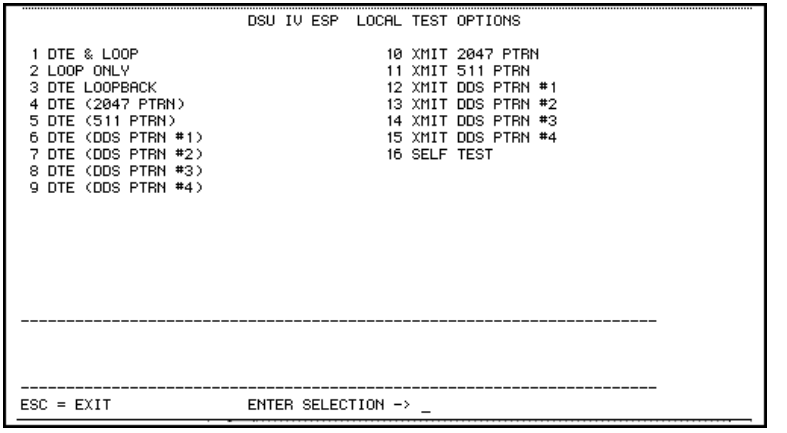


Figure C-11. Local Test Options Menu

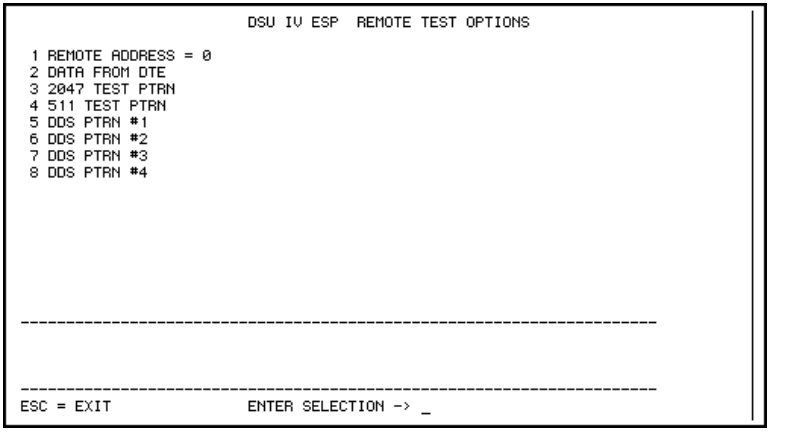


Figure C-12. Remote Test Options Menu

Dial SW56/Dial ESP DBU

When in SW56 mode (**SW56 NETWORK TYPE** selected), the **DIAL SW56** selection is shown in the **TERMINAL INTERFACE** menu (see Figure C-2 on page C-3 and Table C-1 on page C-3). When a DBU ESP card is installed and the **DEDICATED NETWORK TYPE** is selected, the **DIAL ESP DBU** selection is shown instead.

Dial SW56 Options

This menu is available when operating in SW56 mode (see Figure C-13). Choose to dial a stored number or enter a number manually.

```
                          DSU IV ESP DIALING MENU

 1 DIAL STORED NUMBER
 2 MANUAL DIAL ENTRY

--------------------------------------------------------------------------------


--------------------------------------------------------------------------------
ESC = EXIT                ENTER SELECTION -> _
```

Figure C-13. SW56 Dialing Menu

Dial ESP DBU

The menu shown in Figure C-14 is available when an ESP option card is installed in the DSU IV ESP and the **NETWORK TYPE** is set to **DEDICATED**.

See Chapter 12, *Activating Dial Functions* on page 12-1 for more information on individual menu selections.

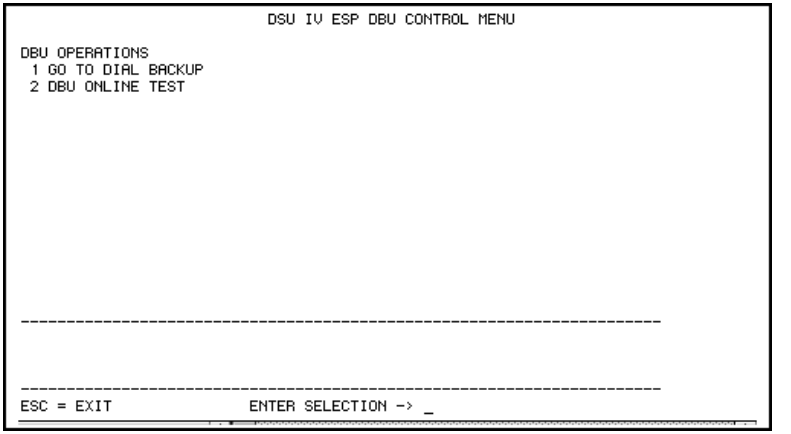


Figure C-14. Dial ESP DBU Menu

Appendix D Configuration Profiles

The DSU IV ESP contains four different user profiles (sets of configurations options) stored in read-only memory; see Table D-1 on page D-2. The unit is shipped from the factory with profile 1 loaded into the nonvolatile configuration memory. See *Manual Command* on page 11-3 for more information on entering the manual commands required to load these profiles.

PROFILE 1

Profile 1 is configured for a 56 kbps, synchronous, point-to-point or dial-up operation with a V.35 connector. **AUTOMATIC DBU** has been disabled for this configuration profile.

PROFILE 2

Use profile 2 for a 56 kbps, asynchronous, point-to-point or dial-up operation, with an EIA-232 connector. **AUTOMATIC DBU** has been disabled for this configuration profile.

PROFILES 3 AND 4

Profiles 3 and 4 are identical to profile 1 with the addition of dial backup capability. These profiles are used for enabling dial backup using two DSU IV ESP units. One unit must be set for **ANSWER** and the other for **ORIGINATE**. Use profile 3 to set the remote unit to **ANSWER** and profile 4 to set the host unit to **ORIGINATE**.

Table D-1. Configuration Profiles

	Profile Numbers			
	(00) 1	**(01) 2**	**(02) 3**	**(03) 4**
Manual Command				
Escape Character	43 - 2BH	43 - 2BH	43 - 2BH	43 - 2BH
CR Character	13- 0DH	13- 0DH	13- 0DH	13- 0DH
LF Character	10- = 0AH	10- = 0AH	10- = 0AH	10- = 0AH
BS Character	8	8	8	8
DBU Abort Call Timer	50 - 32H	50 - 32H	50 - 32H	50 - 32H
Escape Guard Timer	50 - 32H	50 - 32H	50 - 32H	50 - 32H
Command Echo	Enable	Enable	Enable	Enable
Result Code	Enable	Enable	Enable	Enable
Long or Short Code	Long	Long	Long	Long
Test Pattern Type	2047	2047	2047	2047
CS Delay	Short	Short	Short	Short
DTE Recog. Delay (x100ms)	3	3	3	3
DTR Command Timeout (x100)	8	8	8	8
Front Panel En/Dis	Enable	Enable	Enable	Enable
Inactivity Timer	Off	Off	Off	Off
AT Password Control	Disable	Disable	Disable	Disable
Network Options				
Loop Rate	Auto	Auto	Auto	Auto
Network Address	0	0	0	0
Remote Conf. En/Dis	Enable	Enable	Enable	Enable
Clock Source	From Network	From Network	From Network	From Network
DTE Options				
Remote DSU Address	0	0	0	0
DTE Rate (56k loop)	56k/57.6k	56k/57.6k	56k/57.6k	56k/57.6k
Scrambler Mode	OFF	OFF	OFF	OFF
Connector Type	V.35	RS-232	V.35	V.35
DTE Data Format	SYNC	ASYNC	SYNC	SYNC
DTE Command Options	DIS	DIS	DIS	DIS

Table D-1. Configuration Profiles (Continued)

	Profile Numbers			
	(00) 1	**(01) 2**	**(02) 3**	**(03) 4**
Transmit Clock	Normal	Normal	Normal	Normal
CS Options	Follow RS	Follow RS	Follow RS	Follow RS
Anti-stream Timer	Timer Off	Timer Off	Timer Off	Timer Off
CD Option	Normal	Normal	Normal	Normal
TR Options	Ignored	Ignored	Ignored	Ignored
SR Options	Off Test+OOS	Off Test+OOS	Off Test+OOS	Off Test+OOS
Secondary Channel Rate	OFF	OFF	OFF	OFF
Test Options				
Test Timeout	OFF	OFF	OFF	OFF
RDL En/Dis	RDL Accepted	RDL Accepted	RDL Accepted	RDL Accepted
EIA Controlled LLB	Disable	Disable	Disable	Disable
EIA Controlled RLB	Disable	Disable	Disable	Disable
DBU Answer Test	Disable	Disable	Disable	Disable
Dial Options				
Automatic DBU	Disable	Disable	Enable	Enable
DBU Number to Dial	#1	#1	#1	#1
DBU Originate/Answer	Answer	Answer	Answer	Originate
DBU when OOS	Enable	Enable	Enable	Enable
DBU when No RX Signal	Enable	Enable	Enable	Enable
DBU when No Sealing Current	Enable	Enable	Enable	Enable
DBU Auto Restore Timer	1 minute	1 minute	1 minute	1 minute
DBU Redial Counter	5	5	5	5
DBU Fail-Timer (x10 seconds)	3	3	3	3
DBU Redial Wait Time	10	10	10	10
When all 1s/0s	Disable	Disable	Disable	Disable
Network Type	AT&T	AT&T	AT&T	AT&T
Error Control	Auto V.42/MNP	Auto V.42/MNP	Auto V.42/MNP	Auto V.42/MNP
Flow Control (V.32)	CTS Only	CTS Only	CTS Only	CTS Only
Data Compression (V.32)	Enabled	Enabled	Enabled	Enabled

Appendix E DSU to DSU Tail Circuit

MODEM TAIL CIRCUIT APPLICATION

A DDS Tail Circuit is a serial connection of two DDS circuits as shown in Figure E-1 on page E-2. The two circuits are joined at the DTE port interface of each DSU unit. A special tail circuit crossover cable is required so that the transmit line connects to the receive line on the other DSU and the DTR, CTS, RTS, and CD signal lines get matched appropriately. Figure E-2 on page E-3 details the crossover cable wiring.

ADTRAN DSU/CSU units will operate in this configuration.

ADTRAN does not recommend the tail circuit mode due to the potential for clock slippage and data loss when using this configuration. Moreover, further problems can occur when each DDS circuit is using a different master clock source and will require additional hardware called a tail circuit buffer to reduce the risk of data overruns and clock slips.

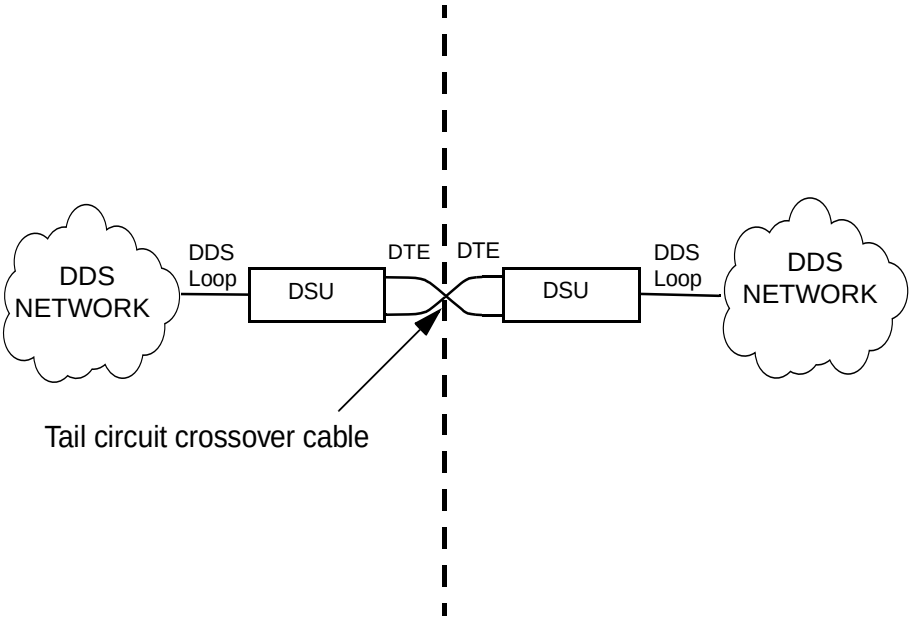


Figure E-1. DDS Tail Circuit

An EIA-232 DB-25 DSU tail circuit cable diagram for a DSU tail circuit application is shown in Figure E-2.

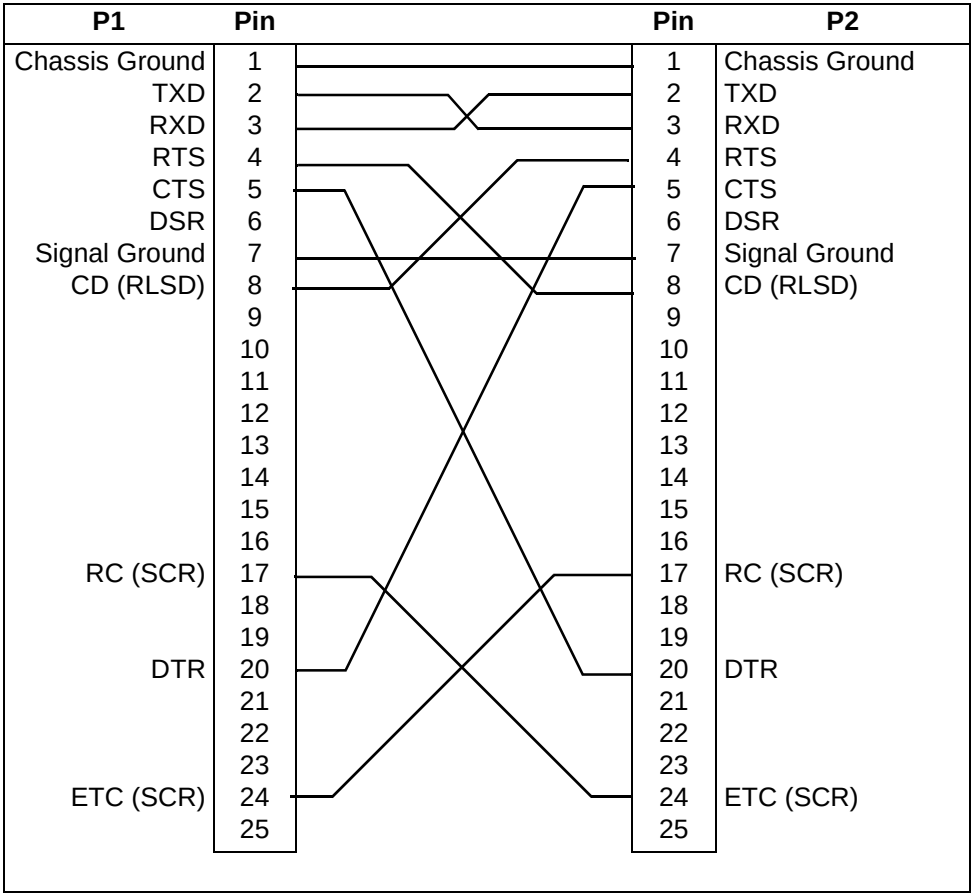


Figure E-2. Standard EIA-232-D Crossover Cable

Appendix F Specifications Summary

This section describes the standard specifications and features incorporated in the DSU IV ESP.

Operating Modes

- Dedicated DDS (point-to-point, multi-point)
- Switched 56 (4-wire)
- ISDN (1B+D) (in dial backup)
- PSTN (V.34) (in dial backup)

Network Data Rates

- Dedicated mode service rates: 2.4, 4.8, 9.6, 19.2, 38.4, 56, 64 kbps.
- Switched mode service rate: 56 kbps.

Dial Backup

- Switched 56 (56 kbps)
- V.34 (2.4 - 33.6 kbps)
- ISDN (56 or 64 kbps)

DTE Rates Provided

- DTE rates match service rates
- DTE-to-loop rate matching in both dedicated and switched modes
- Synchronous rates: 2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 kbps
- Asynchronous rates: 2.4, 4.8, 9.6, 19.2, 38.4, and 57.6 kbps

DTE Interfaces

- Both EIA-232 andV.35 electrical and physical DTE interfaces

SNMP and Telnet

- Integrated SLIP / PPP port
- Physical Connector RJ-48S and DB-25
- Optional 10BaseT interface with ESP Ethernet Card
- MIB II RFC 1213 complaint
- Enterprise-specific MIB
- SNMP traps

Clocking

- Normal DDS (slaved to network receive clock)
- Private network master (internal)
- Private network master (slaved to external DTE clock)
- Normal DDS tail circuit

Switched Mode Dialing Options

- Stored number
- Front panel keypad
- DTR dialing of stored numbers
- In-band AT commands
- V.25 bis in-band dialing

Diagnostics

- Network: CSU and DSU loopbacks
- User: Local DTE and loop, remote V.54
- Test Patterns: 2047, 511, DDS stress patterns 1-4

Line Requirements

Loop transmission parameters as defined in:

- AT&T PUB 62310: Dedicated DDS
- AT&T PUB 4146B: Switched 56
- Sprint TS 0046: Switched 56

Line Interface

- RJ-48S, 4-wire, full duplex

Receiver Sensitivity

- -45 dB at all rates

Agency Approvals

- U.L. 1950
- C-U.L. 1950
- FCC Part 15, Class A
- FCC Part 68
- CS03

Environment

- Operating Temperature: 0 to 50 ^{O}C (32 to 122 ^{O}F)
- Storage Temperature: -20 to 70 ^{O}C (-4 to 158 ^{O}F)
- Relative Humidity: Up to 95%, non-condensing

Hardware Specifications

- Dimensions: 2.4”H; 8.0“W, 10.4”D
- Weight: 4.5 lbs.
- Power: 115 Vac, 60 Hz, 75 mA max 8.6 watts
- MTBF: 337,924 hours
- CLEI: DDS3PKCAAA

Appendix G Acronyms/Abbreviations

ACK..... acknowledgment
ALM ..... alarm
ANSI ..... American National Standards Institute
AR..... access rate
ARP ..... address resolution protocol
async ..... asynchronous
BECN ..... backward explicit congestion notification
BOP ..... bit oriented protocol
CCITT..... Consultive Committee for International Telephony and Telegraphy
CD ..... carrier detect
CIR ..... committed information rate
CO ..... central office
CPE..... customer premise equipment
CR, C/R..... command response
CRC..... cyclic redundancy check
CS ..... clear to send
CSU ..... channel service unit
CTS..... clear to send
dB..... decibel
DBU..... dial backup
DCD ..... data carrier detect

DCE ..... data communications equipment
DDS..... digital data service
DE ..... discard eligible
DLCI..... data link connection identifier
DSAP..... destination service access point
DSR ..... data set ready
DSU ..... data service unit
DTE ..... data terminal equipment
DTR..... data terminal ready
EA ..... extended address
EBCDIC ..... extended binary coded decimal interexchange code
FECN ..... forward explicit congestion notification
FEP..... front end processor
FIFO..... first in first out
FR..... frame relay
FRAD ..... frame relay access device
FRF..... frame relay forum
FSU ..... frame relay service unit
GUI..... graphical user interface
HDLC..... high-speed data link control
IA ..... inactive
IP..... internet protocol
ISDN ..... integrated services digital network
ITU..... International Telecommunications Union
KA..... keep alive
kbps..... kilobits per second
LAN ..... local area network
LED..... light emitting diode
LI..... link integrity

LLC..... logical link control
LMI..... local management interface
LRC ..... lateral redundancy check
MIB ..... management information base
ms ..... millisecond
OCU ..... office channel unit
OOS..... out of service
PPP ..... point-to-point protocol
PU ..... physical unit
PVC ..... permanent virtual circuit
RD ..... receive data
RDL..... remote digital loopback
RFC..... request for comments
RFECN..... remote forward explicit congestion notification
RIP..... routing information protocol
RMA..... return material authorization
RNR..... receiver not ready
RR..... receiver ready
RS ..... request to send; also recommended standard
RTS..... request to send
Rx..... receive
SAP..... service access point
SDLC..... synchronous data link control
SLIP..... serial line internet protocol
SNA..... systems network architecture
SNMP ..... simple network management protocol
SPID..... service profile identifier
SR ..... data set ready
SVC ..... switched virtual circuit

SW56 ..... switched 56

sync..... synchronous

TD ..... transmit data

TR ..... data terminal ready

Tx ..... transmit

UA..... unavailable

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

VRC..... vertical redundancy check

WAN..... wide area network

Appendix H Glossary

American National Standards Institute (ANSI)

Devices and proposes recommendations for international communications standards.

asynchronous

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

backward explicit congestion notification (BECN)

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

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).

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.

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 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.

CIR

committed information rate. Less than or equal to the access rate, the CIR is used by the service provider for rate enforcement when the network is congested. When rates exceed the CIR, frames may be discarded.

clocking

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

CPE

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

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

See channel service unit.

CTS

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

DBU

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

data service unit

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

dB

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

data communications equipment (DCE)

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

DDS

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

data link connection identifier (DLCI)

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

discard eligibility (DE)

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

DSU

See data service unit.

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.

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.

encapsulation

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

file server

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

forward explicit congestion notification (FECN)

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

frame check sequence (FCS)

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 cyclic redundancy check (CRC).

frame-relay-capable interface device

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

frame relay frame

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

frame relay network

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

gateway

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

high level data link control (HDLC)

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 synchronous data link control (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-to-end 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.

local area network (LAN)

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

MIB

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

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.

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.

permanent virtual circuit (PVC)

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

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.

remote configuration

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

router

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

sealing current

A designation for a powering situation that consists of a wet loop without span power.

service

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

SNA

systems network architecture. The IBM protocol group which governs mainframe 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 EIA-232 interface that indicates if the communications is connected and ready to start handshaking control signals so communications can begin.

statistical multiplexing

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

switched network

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

synchronous

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

synchronous data link control (SDLC)

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

TELNET

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

VT-100

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

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