Express 5210

Frame Relay Service Unit

User Manual

1200208L1	Base Unit
1202187L1	Dual FXO Card
1202188L1	Dual FXS Card
1202189L1	Dual E&M Card
1204001L1	4-wire SW56 DBU Card
1204002L1	V.34 DBU Card
1204004L1	ISDN DBU Card
1204006L1	External DCE Card
1200193L1	V.35 Adapter Cable (male)
1200194L1	V.35 Adapter Cable (female)

61200208L1-1A
October 1999

This product includes software developed by the University of California, Berkeley, and its contributors.

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About This Manual

This manual is arranged so you can quickly and easily find the information you need. The following is an overview of the contents of this manual:

- Chapter 1, *Introduction*, familiarizes you with frame relay networks and Express 5210 highlights. The chapter also gives a brief explanation of options that may be purchased for use with the Express 5210.
- Chapter 2, *Installation*, describes the Express 5210 connectors (pin assignments are given in the appendix *Pinouts* on page A-1) and provides an installation diagram.
- Chapter 3, *Menu Navigation*, explains how to operate your Express 5210 using either the front panel or a VT 100 terminal interface.
- Chapter 4, *Using the Utilities Disks*, explains how to use the utility files provided with the unit for easy VT 100 and TELNET access.
- Chapter 5, *Applications*, provides examples of some common Express 5210 applications. This chapter includes network diagrams as well as configuration tables for each example.
- Chapter 6, *Configuration Overview*, explains how to access the Express 5210 Configuration menu.
- Chapters 7 through 11 provide brief explanations for selections made in the Configuration menus. These chapters are based on the first level menu branches of the Configuration menu: DTE Port, Voice Card Options, Network Port, Dial Backup, and System configuration.
- Chapter 12, *IP Setup*, explains how to set up static routes and describes the routing information provided by the Express 5210.
- Chapter 13, *Statistics*, describes how to access statistics information from the Express 5210.
- Chapter 14, *Testing*, explains how to access the Express 5210 diagnostic features, including voice and loopback tests.
- Chapter 15, *Activating DBU Functions*, provides information on the dialing options accessed through the Main menu.
- Appendix A provides pinouts for the Express 5210 connectors.
- Appendix B contains product specifications.
- Appendix C is a list of acronyms and abbreviations used in this document.
- Appendix D is a glossary of related terms.

Notes provide additional useful information.

Cautions signify information that could prevent service interruption.

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

Important Safety Instructions
Save These 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 bath tub, 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.

ADTRAN Year 2000 (Y2K) Readiness Disclosure

ADTRAN has established a Year 2000 program to ensure that our products will correctly function in the new millennium. ADTRAN warrants that all products meet Year 2000 specifications regardless of model or revision. Information about ADTRAN's Year 2000 compliance program is available at the following:

Product Matrix: www.adtran.com / y2kfax.html
E-mail: year2000@adtran.com
Faxback Document Line: (256) 963-8200
Y2K plans and product certifications are listed in the Product Matrix (see above)
Y2K Project Line: (256) 963-2200

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

1. This equipment complies with Part 68 of FCC rules. On the bottom of the equipment housing is a label showing the FCC registration number and ringer equivalence number (REN) for this equipment. If requested, provide this information to the telephone company.
2. 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.
3. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of this equipment. Advance notification and the opportunity to maintain uninterrupted service are given.
4. If experiencing difficulty with this equipment, please contact ADTRAN for repair and warranty information. The telephone company may require this equipment to be disconnected from the network until the problem is corrected or it is certain the equipment is not malfunctioning.
5. This unit contains no user-serviceable parts.
6. An FCC compliant telephone cord with a modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using an FCC compatible modular jack, which is Part 68 compliant.
7. The following information may be required when applying to the local telephone company for a dial-up line for the V.34 modem:

Service Type	Digital Facility Interface Code	Service Order Code	Network Jacks
56 kbps Digital Interface	04DU5-56	6.0F	RJ-48S
64 kbps Digital Interface	04DU5-64	6.0F	RJ-48S

8. In the event of equipment malfunction, all repairs should be performed by ADTRAN. It is the responsibility of users requiring service to report the need for service to their distributor or ADTRAN. See the inside back cover of this manual for information on contacting ADTRAN for service.

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.

WARNING

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

Canadian Emissions Requirements

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

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

Canadian Equipment Limitations

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

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

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

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

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

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

Warranty and Customer Service

ADTRAN will replace or repair this product within five years from the date of shipment if it does not meet its published specifications or fails while in service. For detailed warranty, repair, and return information refer to the ADTRAN Equipment Warranty and Repair and Return Policy Procedure.

Return Material Authorization (RMA) is required prior to returning equipment to ADTRAN.

For service, RMA requests, or further information, contact one of the numbers listed at the end of this manual.

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Chapter 1 Introduction

UNDERSTANDING FRAME RELAY

Frame relay is a wide area network (WAN) service designed to minimize physical connections. This is accomplished by using virtual connections within the frame relay cloud and accessing these virtual circuits with normally one physical connection at each location to the frame relay service. Virtual circuits are addressed using header information at the beginning of each frame. These frames are formatted by the user's CPE equipment such as the ADTRAN Express 5210.

ANSI standards describe how each frame must be constructed to provide interoperability between CPE equipment and frame relay switching equipment. Each frame must contain a header, at least one byte of information data, two bytes of CRC16, and a trailing flag 0x7E.

This header information contains a virtual circuit address known as a DLCI (data link connection identifier). The header information also contains bits used for network congestion control.

Frame relay virtual circuits may be defined as permanent (PVC) or switched (SVC). PVCs have the same DLCI for a given path each time a user protocol session is established. The network service provider assigns these DLCIs at subscription time. SVCs, on the other hand, have DLCIs dynamically assigned each time a user protocol session is established. The CPE equipment must request a call and the DLCI is assigned by the network switching equipment.

This DLCI is valid until the call is disconnected and may be assigned a different value each time a call is requested.

PRODUCT OVERVIEW

The ADTRAN Express 5210 is a standalone frame relay access device (FRAD) that provides a cost-effective means of transporting voice and multi-protocol data over frame relay or DDS networks. The Express 5210 provides an easy-to-use interface for customers migrating existing services or developing new applications for operation over frame relay networks.

The Express 5210 provides high-quality voice and fax capabilities to remote locations without expensive toll charges. In frame relay networks, the Express 5210 allows voice and data to share the same PVC, eliminating unnecessary PVC charges associated with other vendors' voice and data frame relay products. Two voice ports are provided when configured with a voice option card. Options include: Dual FXS, Dual FXO, and Dual E&M.

The Express 5210 provides a DTE interface for connecting a non-frame relay device to the frame relay network. This port can be configured for either EIA-232 or V.35 signal specifications. Synchronous protocol speeds up to 512 kbps and asynchronous protocol speeds up to 57.6 kbps are supported. See the appendix *Pinouts* on page A-1 for the pin assignments.

The Express 5210 handles each frame of the user data in a three-step manner. The first step is terminating the user protocol. The layer at which this termination occurs varies, depending on the user protocol selection for a given port. The next step is examining the user protocol destination address and routing to the destination port and virtual circuit. The last step involves encapsulating the information field of each frame and re-encapsulating based on the destination port configuration. A similar process is used for frame relay frames received on the network port.

The major features of the Express 5210 are as follows:

- Dual voice port support; options include Dual FXS, Dual FXO, and Dual E&M

- DTE data port supports SDLC, frame relay, transparent BOP, PPP sync, PPP async, and SLIP
- IP routing supported
- IP routes based on RIP protocol (versions 1 and 2)
- Static route table
- Up to 7-day statistics storage
- Frame relay diagnostics including delay measurement and packet delivery ratios
- 512 kbps frame relay access rates supported
- 60 virtual circuits supported
- Integral 56/64 DDS DSU/CSU
- SNMP/TELNET management
- RFC 1490 encapsulation for IP and LLC2
- SDLC local port spoofing
- Automatic or manual dial backup for DDS and frame relay operation
- Dial backup available with DBU cards; options include 4-wire Switched 56, V.34, and ISDN
- Time of day and weekend dial backup lockout options
- Frame relay signaling using ANSI, ITU, or LMI formats
- Easy-to-use VT 100 interface for configuration
- Built-in ethernet port
- Standard 5 year warranty

DDS Operation

DDS is a nationwide service that allows interconnection and transportation 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 Inter-LATA to an interexchange carrier. The integrated 56/64 DDS DSU supports the 56/64 kbps DDS service rate.

SNMP

The Express 5210's embedded SNMP feature allows the unit to be accessed and controlled by a network manager through one of the following:

- the network interface
- a DTE port running frame relay, SLIP, or async PPP protocol
- the 10BaseT LAN port

The Express 5210 supports the MIB-II standard, RFC 1213, and the ADTRAN Enterprise Specific MIB.

MIB files are available from ADTRAN in the support section of the ADTRAN Web page at www.adtran.com.

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.

Telnet

TELNET provides a password-protected, remote login facility to the Express 5210. TELNET allows a user on a network manager to

control the Express 5210 through the terminal menus. See the section *TELNET Utility* on page 4-1 for more information on setting up a TELNET session.

Voice Compression

The Express 5210 voice option cards employ voice compression technology to provide toll-quality voice using significantly less bandwidth than traditional voice channels. In addition to supporting voice calls, the cards support group 3 facsimile up to 14.4 kbps. The Express 5210 dynamically allocates bandwidth to voice and data applications. This results in all bandwidth being available for data applications in the absence of voice or fax.

For information on configuring these options, see the chapter *Voice Configuration* on page 8-1. The three available voice options are described in the following sections.

FXS Module

The FXS module provides two 2-wire compressed voice interfaces and serves as the source of line current and ringing voltage. The FXS serves as the station side of a foreign exchange FXS/FXO application. The FXS may also be paired with another FXS to provide private line automatic ringdown (PLAR) function across the WAN.

FXO Module

The FXO module provides two 2-wire compressed voice interfaces and provides a load for line current. The module includes a ring detector and a line current detector. The FXO serves as the office side of a foreign exchange FXS/FXO application.

E&M Module

The E&M module provides two 2- or 4-wire compressed voice interfaces for use in E&M applications.

Dial Backup Operation

The Express 5210 supports dial backup of point-to-point DDS circuits or frame relay circuits. For DDS backup, the Express 5210 enters dial backup based on physical line faults. During dial backup, the Express 5210 monitors the main line integrity and drops the dial backup call when the main line is restored.

For frame relay dial backup, the Express 5210 monitors the physical line condition as well as the signaling state of the frame relay circuit. Once the configured DBU criteria have been met, the Express 5210 initiates a DBU call. The Express 5210 receiving the call qualifies the incoming call and re-routes the PVCs affected by the outage while continuing to service other PVCs on the network interface.

During dial backup, the Express 5210 constantly monitors the physical state of the network. It also attempts to re-establish signaling on the main line. Once both the physical integrity and the signaling state are restored, the unit drops the dial backup call and reverts to the main line.

The 4-wire SW56 DBU card is 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 ISDN 1B+D card supports a U-interface to the Basic Rate ISDN and is compatible with National ISDN and AT&T DMS.

The Express 5210's unique DBU cards are field-installable by the customer. See the section *DBU and Voice Interface Card Slots* on page 2-4 for information on installing DBU cards. Also see the chapter *Dial Backup Configuration* on page 10-1 for information on configuring DBU options.

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

DBU Card Option Descriptions

4-Wire Switched 56 DBU Card

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

V.34 DBU Card

This module backs up the leased line application at data rates up to 33.6 kbps over an ordinary telephone network.

ISDN DBU Card

1B+D Basic Rate ISDN service provides backup over a switched 56/64 kbps circuit.

DCE Card

This module connects an external DCE device to the Express 5210. The card can act either as a dial backup interface or as an alternate network interface (supporting access rates up to 512 kbps).

Chapter 2 Installation

UNPACK, INSPECT, POWER UP

Receiving Inspection

Carefully inspect the Express 5210 for any damage that may have occurred in shipment. If damage is suspected, file a claim immediately with the carrier and contact ADTRAN Technical Support (ADTRAN phone numbers are given at the end of this manual). Keep the original shipping container to use for future shipment or verification of damage during shipment.

ADTRAN Shipments Include

ADTRAN shipments of the Express 5210 include the following:

- Express 5210 unit
- User manual
- ADTRAN Utilities disks (described on page 4-1)
- An 8-position modular to 8-position modular cable
- A 10BaseT ethernet cable
- VT 100 terminal adapter cable (consists of a DB-25 modular adapter and an 8-position to 8-position modular cable)

The ADTRAN Express 5210 MIB is available in the support section of the ADTRAN Web page at www.adtran.com.

ADTRAN shipments of DBU cards include the following:

- DBU card
- An 8-position modular to 8-position modular cable for the 4-wire SW56 and ISDN DBU cards, *or*
- An 8-position modular to 4-position modular cable for the V.34 DBU card.

ADTRAN shipments of voice cards include the following:

- Dual voice card
- Two 8-position modular to 8-position modular cables (for the E&M and FXO cards), *or*
- Two 4-position modular to 4-position modular cables (for the FXS card)

Customer Provides

The customer provides an interface cable for each port used. Each cable should be either an EIA-232 with a standard 25-pin male D-type connector or a V.35 cable. V.35 requires an ADTRAN adapter cable (part numbers: male 1200193L1; female 1200194L1).

Power Up

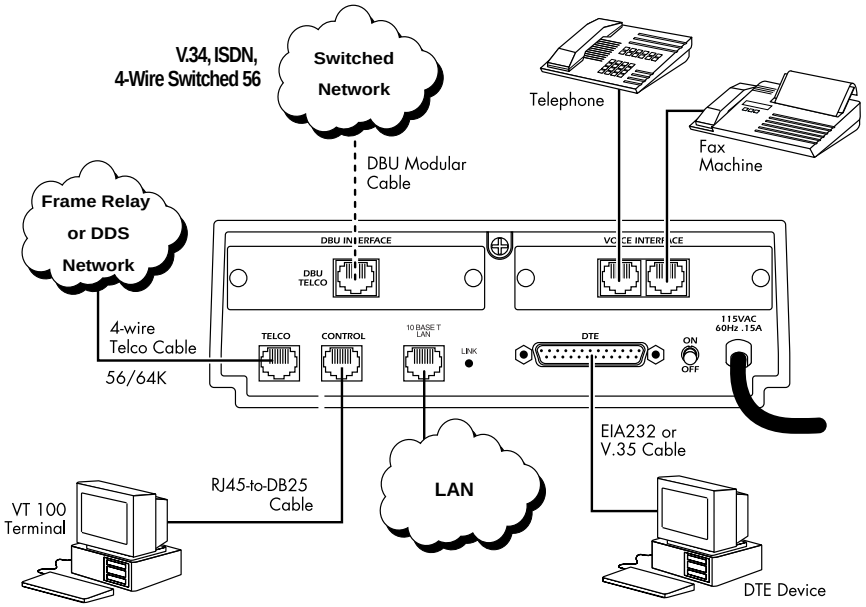
Each Express 5210 unit is provided with a captive eight-foot power cord, terminated by a three-prong plug which connects to a grounded 115 VAC power receptacle.

Power to the Express 5210 must be provided from a grounded 115 VAC, 60 Hz receptacle.

REAR PANEL

The Express 5210 is equipped with a DB-25 connector labeled **DTE**. Connections to the dedicated circuit and VT 100 interface are provided through the 8-pin telco jacks labeled **TELCO** and

CONTROL, respectively. A **10BaseT LAN** port is also provided. Pin assignments for these connectors are given in the appendix *Pinouts* on page A-1. The Express 5210 rear panel is shown in Figure 2-1.



Item	Function
DBU Interface	DBU or DCE card slot
Voice Interface	FXS, FXO, E&M card slot
Telco port	Connects to the dedicated circuit
Control port	Connects to the VT 100 interface
10BaseT LAN port	Interfaces with LAN
Link LED	Illuminates when unit is connected to ethernet hub
DTE port	Connects to a DTE device
On/Off Switch	Turns power on and off
115 VAC connection	Captive power cord

Figure 2-1. Express 5210 Rear View

DBU and Voice Interface Card Slots

The Express 5210 rear panel has two card slots for the installation of dial backup, voice, and DCE interface cards. To insert cards, perform the following procedure:

1. Remove power from the Express 5210 (the cards are *not* hot-swappable).
2. Slide the card into the corresponding rear slot until the card panel is flush with the Express 5210 chassis.
3. Push card locks in (until they click) to secure the card and ensure proper installation.

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

Telco Connector

The **TELCO** connector is an eight-position modular jack which provides connection to a dedicated 56/64 kbps network. See Table A-1 in the *Pinouts* appendix for the **TELCO** connector's pin assignments.

Control Port

The eight-position modular jack labeled **CONTROL** provides connection to a VT 100 EIA-232 compatible interface. This enables the Express 5210 to be configured through a terminal instead of the front panel. Use the VT 100 terminal cable (provided) for this connection. See Table A-2 in the *Pinouts* appendix for the connector pin assignments. A description of the operation of this port is covered in the section *VT 100 Terminal Connection and Operation* on page 3-2.

10BaseT LAN Connector

The LAN port is an 8-pin modular connector that provides a 10BaseT ethernet LAN interface. This interface is used for SNMP and TELNET management and can also route non-management data to any of the IP addresses known to the Express 5210. When illuminated, the **Link** LED (located on the rear panel) indicates proper connection to a 10BaseT hub. The pin assignments for this connector are listed in Table A-3 of the appendix *Pinouts*.

DTE Connectors

Connect a DTE device to the **DTE** connector using either an EIA-232 DTE cable or an ADTRAN V.35 DTE adapter cable. The maximum cable lengths recommended are 50 feet for the EIA-232 and 100 feet for the V.35. The pin assignments are listed in Table A-4 of the appendix *Pinouts*.

The V.35 adapter cable is recommended for use with data rates above 19.2 kbps. A low capacitance EIA-232 cable works up to 56 kbps. The DTE port is configured through the front panel or the VT 100 control port and can operate in asynchronous or synchronous mode. V.35 pin assignments are given in Table A-5 of the appendix *Pinouts*.

Chapter 3 Menu Navigation

The Express 5210 can be configured using the front panel, terminal interface, or a TELNET session. IP routing functions, statistical information, testing options, and dialing functions are also accessible from all interfaces; however, the terminal and TELNET menu interfaces offer a more detailed menu structure.

This chapter explains the terminal and front panel methods of operation. TELNET operation is similar to the terminal operation. The terminal interface description follows, and the front panel interface description begins on page 3-9. An overview of the menu structure (which corresponds with the remaining chapters of this manual) is presented on page 3-12. Information on setting up VT 100 and TELNET sessions is presented in the chapter *Using the Utilities Disks* on page 4-1.

TERMINAL INTERFACE

Terminal menus provide both local and remote access to the Express 5210 through a VT 100 terminal or TELNET session. The following sections explain how to establish a connection with a VT 100 terminal and how to navigate the terminal menus once a VT 100 or TELNET connection is established.

VT 100 Terminal Connection and Operation

To control the Express 5210 using a VT 100 terminal, perform the following procedure:

1. Set the Express 5210 baud rate to match the terminal through the front panel (default rate is 9600 bps). Select **1 CONFIG**, then **CONTROL PORT**.
2. 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 Express 5210. This connection is used for both local and remote configuration.
3. Open the connection and press the terminal keyboard's **Enter** key repeatedly until the first menu appears.
4. Pressing any key selects **LOCAL LOGIN**, which is used to configure the Express 5210 unit connected to the terminal. Pressing ^R (Ctrl R) selects **REMOTE LOGIN**, which is used to configure a remotely located Express 5210 unit. For remote applications, enter the **DLCI** (data link connection identifier) of the remote unit at the prompt. Then press **Enter**.
5. Enter the password. The factory default password is **adtran** (all lower-case). The main menu will appear, as shown in Figure 3-1.

NOTE

In the lower left-hand corner of the terminal screen, **L**, **R**, *or* **T** *is displayed, indicating the type of interface the current screen represents (local, remote, or TELNET).*

NOTE

When using Microsoft Hyperterminal, set the **FONT** *to* **TERMINAL**.

Terminal Menu Navigation

The Express 5210 uses a multilevel menu structure that contains both menu items and data fields. All menu items and data fields display in the terminal menu window, through which you have complete control of the Express 5210. The callouts in Figure 3-1 illustrate the terminal menu layout. The sections following the figure describe each callout.

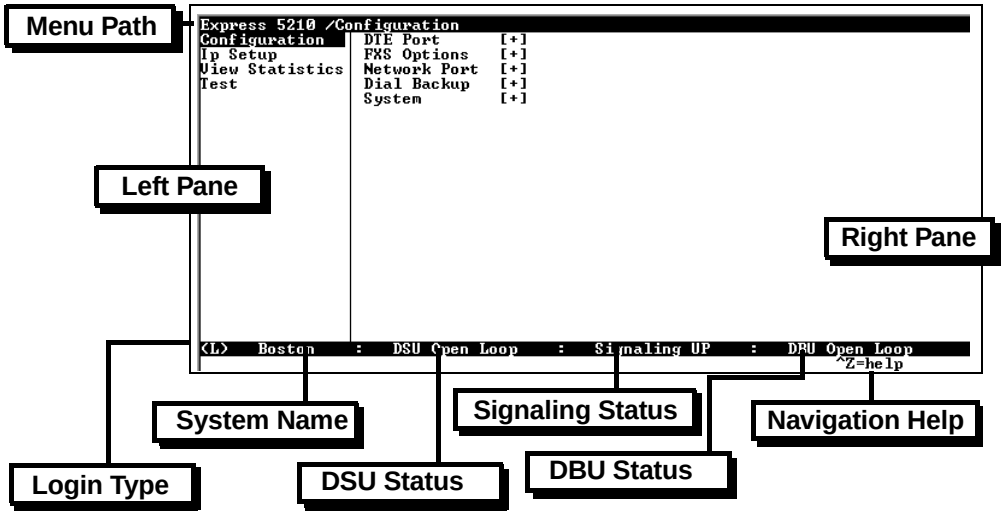


Figure 3-1. Top-level Terminal Menu Window

Menu Path

The first line of the terminal menu window (the menu path) shows the session's current position in the menu structure. For example, Figure 3-1 shows the top-level menu with the cursor on the **CONFIGURATION** submenu; therefore, the menu path reads **EXPRESS 5210/CONFIGURATION**.

Left and Right Window Panes

When you first start a terminal menu session, the terminal menu window is divided into left and right panes. The left pane shows the list of available submenus, while the right pane shows the contents of the currently selected submenu.

Window Pane Navigation

Use the following chart to assist you in moving between and within the two window panes.

To move...	Press one of these keys...
From left pane to right pane	**Tab** **Enter** **Right arrow**
From right pane to left pane	**Tab** **Escape** **Left arrow**
Within each pane	**Up arrow** **Down arrow** **Left arrow** **Right arrow**

Right Window Pane Notation

The right window pane shows the contents of the currently selected menu. These contents can include both submenu items and data fields. The following chart explains the notation used to identify these items.

This notation...	Means that...
[data]	More items are available when selected.
<data>	An action is to be taken, such as activating a test.
Menu item is highlighted when scrolled to	You can enter data in this field.
Menu item is underlined when scrolled to	The field contains read-only information.

Additional Terminal Menu Window Features

Login Type Displays **L** when menu reflects the local unit, **R** for a remote unit, and **T** during a telnet session.

System Name Displays the name entered in the **SYSTEM NAME** field (see page 11-3).

DSU Status Displays the current state of the incoming network circuit.

Signaling Status Displays the current LMI state of the network interface.

DBU Status Displays the current state of the DBU service (available when a DBU card is installed).

Navigation Help Lists characters used for navigating the terminal menu (**Ctrl-Z**). See also *Moving through the Menus* on page 3-6.

Navigating Using the Keyboard Keys

You can use various keystrokes to move through the terminal menu, to manage a terminal menu session, and to configure the system. Press **Ctrl-Z** to activate a pop-up screen listing the navigation keystrokes.

Moving through the Menus

To do this...	Press this key...
Return to the home screen.	**H**
Jump between two menu items. Press **J** while the cursor is located on a menu item, and you jump back to the main screen. Go to another menu item, press **J**, and you jump back to the screen that was displayed the first time you pressed **J.** Press **J** anytime you want to jump between these items.	**J**
Highlight items.	**Arrows**
Select a highlighted menu item or descend one menu level.	**Enter**
Cancel an edit.	**Escape**
Close pop-up help screen.	**Escape**
Move between the left and right panes.	**Tab** **Arrows**
Move to the top of a screen.	**A**
Move to the bottom of a screen.	**Z**
Ascend one menu level.	**Backspace**

Session Management Keystrokes

To do this...	Press this...
Log out of a session.	**Ctrl-L**
Invalidate the password entry and return to the login screen.	**Ctrl-S**
Refresh the screen. During normal operation, only the portion of the screen that has changed is refreshed. This option should only be necessary if the display picks up incorrect characters.	**Ctrl-R**

Configuration Keystrokes

To do this...	Press this key...
Restore factory default settings. When in the **IP SETUP** menu, this setting restores the factory defaults based on the location of the cursor.	**F**
Copy selected items to the clipboard. The amount of information you can copy depends on the cursor location when you press **C**: • If the cursor is over an editable field, only that item is copied. • If the cursor is over the index number of a list, then all of the items in the row of the list are copied.	**C**
Paste the item stored in the clipboard, if the information is compatible. You must confirm all pastes—except those to a single editable field.	**P**
Increment the value of certain types of fields by one when you paste information into those fields.	**>**

To do this...	Press this key...
Decrement the value of certain types of fields by one when you paste information into those fields.	**<**
Insert a new list item. For example, add a new item to the **ADDRESS TABLE** by pressing **I** while the cursor is over the index number.	**I**
Delete a list item. For example, delete an item from the **ADDRESS TABLE** by pressing **D** while the index number is active.	**D**

FRONT PANEL INTERFACE

The Express 5210 front panel (shown in Figure 3-3 on page 3-15) uses a multilevel menu structure containing both configurable menu items and read-only data fields. Information is displayed in the LCD window. Use the following chart to assist you in using the front panel interface.

To do this...	Press this...
Activate a menu item (see the following note)	**Arrow Keys**
Select an active (flashing) menu item	**Enter**
Stop the current activity and return to the previous menu	**Cancel**
Select menu items or enter numeric information	**Number Keys**
Edit the next entry in a routing table	**Shift-Next**
Edit the previous entry of a routing table	**Shift-Prev**
Add an entry to a routing table	**Shift-Add**
Delete the displayed routing table entry	**Shift-Delete**

*Activate menu items by scrolling to them using the arrow keys or by pressing the corresponding number or letter. For menu items designated by an alpha character rather than a number, press and release **SHIFT** and then press the letter. The flashing cursor indicates the activated parameter. Press **ENTER** to select the item.*

LED Descriptions

The Express 5210 front panel has seven LED indicators: **TD**, **RD**, **ETH**, **TDN**, **RDN**, **ALM**, and **TST**. These LEDs are identified as follows:

LED	This LED is active when...
TD	the **DTE** port is transmitting data.
RD	the **DTE** port is receiving data.
ETH	the **10BaseT LAN** port is transmitting or receiving data.
TDN	the network port is transmitting data.
RDN	the network port is receiving data.
ALM	an alarm condition exists. Alarm conditions are described in the section following this table.
TST	the unit is in network test mode initiated from the service provider or from the remote end of a point-to-point DDS circuit.

Possible Alarm Conditions

DDS Alarm Conditions

- Open loop on network
- No frame synchronization
- OOS/OOF

Frame Relay Alarm Condition

- Network frame relay signaling state down

Front Panel Operation Example

The following steps and Figure 3-2 illustrate how to select Express 5210 options:

1. Activate **CONFIGURATION** (**CONFIG**) by using the arrow keys or pressing **1**. The cursor will flash on the number next to the activated selection. Press **Enter**.
2. Use the arrow keys to view submenu items.
3. Choose an item on the submenu such as **DTE PORT**.
4. Activate **DTE PORT** by using the arrow keys or pressing **1**. Press **Enter**.
5. Activate **PROTOCOL** options by using the arrow keys or pressing **1**. Press **Enter**.
6. Press the arrow keys until the desired protocol is displayed. Press **Enter**.

			DISABLE
			FRAME RELAY
	DTE PORT	**PROTOCOL**	SDLC
CONFIG	FXS/FXO/E&M OPTIONS	PHYS LYR OPTS	TRANS BOP
	NETWORK PORT	PROTOCOL OPTS	TRANS ASYNC
	DIAL BACKUP	ADDR TABLE	PPP SYNC
	CONTROL PORT		PPP ASYNC
	SYSTEM		SLIP

Figure 3-2. Example of Front Panel Navigation

EXPRESS 5210 MENU STRUCTURE

The menu structure for both the terminal and front panel interfaces are basically the same. The opening menu is the access point to all other operations and each **MAIN** menu item leads to functions and submenus which identify and access specific parameters. The following table describes the menu structure and references the corresponding chapters.

Main Menu Item	Description	For More Information
Configuration	Sets network operating parameters for the DTE, voice, network, and dial backup interfaces. Also provisions system options.	Overview: page 6-1 DTE Port: page 7-1 Voice Cards: page 8-1 Network Port: page 9-1 Dial Backup: page 10-1 System: page 11-1
IP Setup	Sets IP routing tables and displays read-only routing information.	See page 12-1.
View Statistics	Displays status information for the DTE port, network port, ethernet port, DBU cards, protocol, system, and the voice cards.	See page 13-1.
Test	Activates voice tests and PVC loop-back testing functions.	See page 14-1.
Dial	Provides access to dialing functions (only available when DBU card is installed).	See page 15-1.

Voice testing is only available when a voice card is installed.

The **DIAL BACKUP** *and* **DIAL** *selections are available only when a DBU card is installed.*

When **DTE PORT** *is selected, the* **PROTOCOL** *enabled determines the selections for* **PHYSICAL LAYER OPTIONS**, **PROTOCOL OPTIONS**, *and* **ADDRESS TABLE**. *See the chapter DTE Port Configuration on page 7-1 for more information.*

Configuration changes are not implemented until they are applied. To apply the changes, return to the main menu by pressing the ***Escape*** *key (terminal interface) or the* ***Cancel*** *key ((front panel interface). The screen prompts you to either* **APPLY CHANGES** *or* **ABORT CHANGES**. *Choose* **APPLY CHANGES**.

Chapter 4 Using the Utilities Disks

OVERVIEW

ADTRAN delivers PC software utilities with the Express 5210. These utilities are located on the three diskettes that came with your shipment. They also include MIB files (located in the MIB directory).

Review the readme file (Readme.txt) for the latest information about the utilities.

The utilities make setting up TELNET sessions and interfacing with the terminal menus easier. The utilities all run on Microsoft Windows 3.1 or higher. The following sections describe the TELNET and VT 100 utilities.

The disks also contain Syslog and TFTP Server utilities. These utilities are not used with this product.

TELNET UTILITY

The TELNET utility delivered with the Express 5210 provides enhancements to standard TELNET programs that make it easier to work with Express 5210 options.

The TELNET menus include **SESSION**, **EDIT**, **OPTIONS**, **CAPTURE**, and **HELP** (see the menu tree in Figure 4-1 on page 4-2).

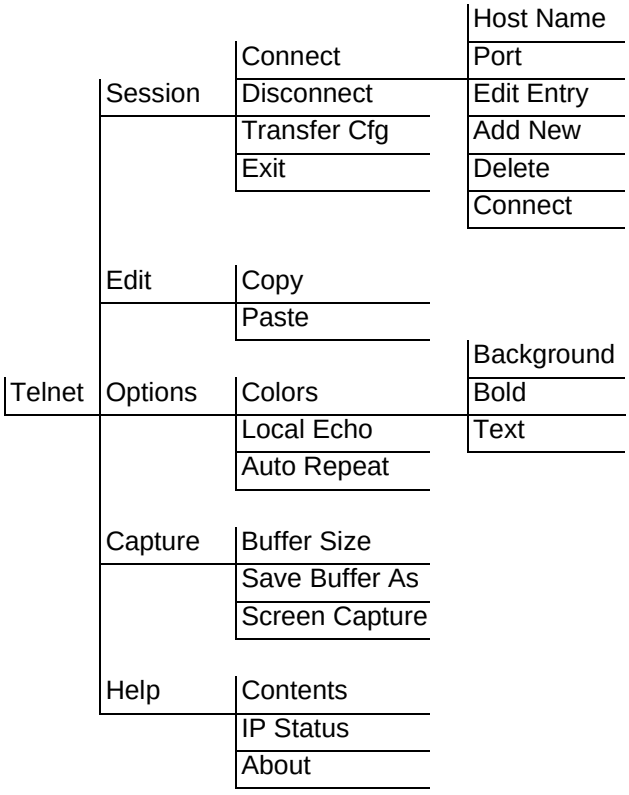


Figure 4-1. TELNET Menu Tree

Session Menu

Click on **SESSION** to open the TELNET session.

Connect

Opens dialog box for setting **HOST NAME** and **PORT** parameters for a TELNET session. Also lets you **EDIT ENTRY**, **ADD NEW** entry, and **DELETE** stored entries. When the parameters are set, click **CONNECT** to make the connection. Click **CANCEL** to end the session.

Host Name
Accepts and stores host names. You may enter a name, an IP address, or a domain name directly into this field. Click on the drop-down arrow to display a complete list of previously stored host names.

Port
Provides several port options. You may enter port numbers directly into this field to connect to non-standard ports, or you may select the drop-down combo-box to display the following options:

TELNET	Establishes a TELNET session
ECHO	Provides a loopback for troubleshooting
DISCARD	Bit bucket; discards data
DAYTIME	Returns the time
CHARGEN	Displays as a unique character stream; used for self-tests

Edit Entry
Changes either the unit name or the IP address of each host. Press either **Tab, Return,** or a **period (.**) after each number in the IP address to move to the next field. If you press **Return** or **(.)** while the cursor is located in each IP field, that field entry is deleted.

Add New
Prompts you for the same information as the **EDIT ENTRY** dialog box for a new host. When enabled, the **USE DNS** (domain name server) feature allows users to request **DOMAIN LOOK UP** via a DNS server on the network, rather than specifying an IP address. The name then appears in the **HOST NAME** field.

Delete
Removes a host name from the list; simply select the host name you want to remove and, at the prompt, click **DELETE**.

Connect
Establishes the TELNET session.

Disconnect

Terminates the TELNET session.

To re-establish the session, select **CONNECT** from the **SESSION** menu or press **ENTER** three times. This action restores the previous connection.

Transfer Cfg

This feature is used primarily for sending configuration files to the unit.

Exit

Ends the TELNET session and closes the TELNET screen.

Edit Menu

Provides **COPY** and **PASTE** commands.

Options Menu

Provides viewing alternatives for the terminal screen.

Colors

This option changes the color of the background window (**BACKGROUND**), bold highlights (**BOLD**), and text (**TEXT**).

Local Echo

Echoes each character that you enter.

AutoRepeat

Repeats characters you select from the keyboard if you hold down the key.

Capture Menu

Provides options for capturing screen images.

Buffer Size

Disables terminal window scroll bars when set to zero. (This is the normal setting for the Express 5210.) This number represents the number of lines to capture in the memory buffer.

Save Buffer As

Saves screen capture to a file.

Screen Capture

Copies the text on the current TELNET screen to the clipboard. You can open any word processor and paste the clipboard contents into the program. This option is helpful when debugging.

Help Menu

Provides on-line help for using the ADTRAN Utilities.

Contents

Opens the on-line help.

IP Status

Displays the local port address and the status of the connection.

About

Displays version and owner information.

VT 100 UTILITY

Use VT 100 emulation to configure an Express 5210 connected to a PC. The VT 100 display is almost identical to the TELNET display.

If you need help setting up the Express 5210 for a VT 100 session, refer to *VT 100 Terminal Connection and Operation* on page 3-2.

VT 100 menus include **SESSION**, **EDIT**, **PORT**, **OPTIONS**, **CAPTURE**, and **HELP** (see the menu tree in Figure 4-2).

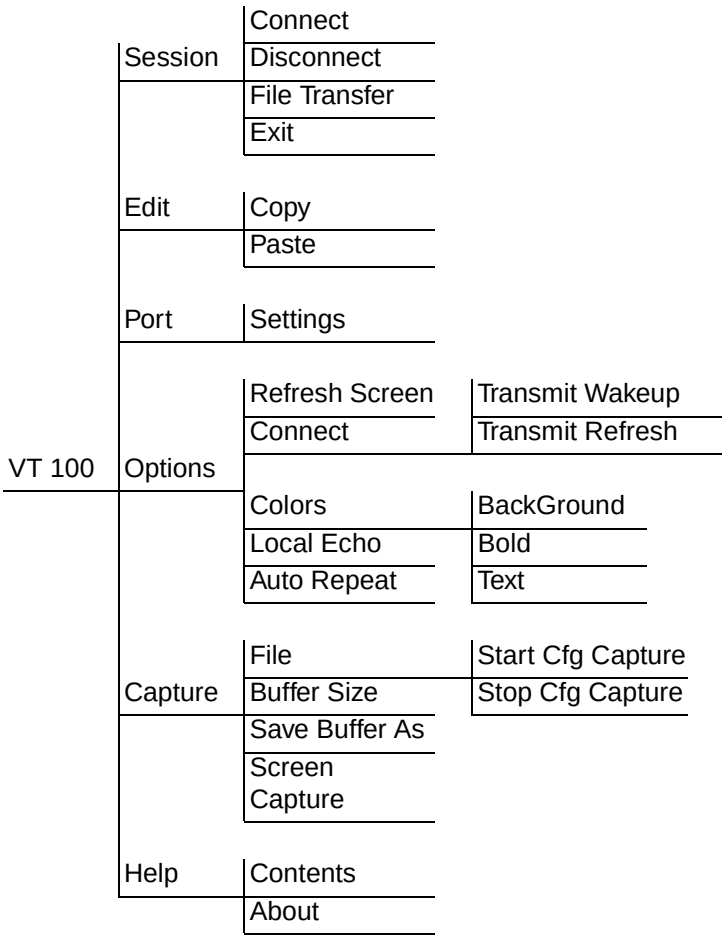


Figure 4-2. VT 100 Utilities Menu Tree

Session Menu

Opens VT 100 terminal emulation session.

Connect

Opens the specified serial port for a VT 100 session.

Disconnect

Closes the specified serial port at the end of a VT 100 session.

File Transfer

This portion of the menu does not apply to this product.

Edit Menu

Identical to the TELNET **EDIT MENU** (see *Edit Menu* on page 4-4).

Port Menu

Changes serial COM port **SETTINGS**. Provides data rate settings from 300-57600 bps.

Options Menu

Provides terminal screen commands.

Refresh Screen

Redraws the screen.

Connect

Provides the options **TRANSMIT WAKEUP** and **TRANSMIT REFRESH**.

Transmit Wakeup

Provides a control sequence that puts the Express 5210 **Control** port on-line in terminal mode.

Transmit Refresh

Provides a control sequence to automatically refresh the screen when connecting. This is the default setting for the Express 5210.

Colors

Identical to TELNET **COLORS MENU** (see *Colors* on page 4-4).

Local Echo

Echoes each character that you enter.

AutoRepeat

Repeats characters you select from the keyboard if you hold down the key.

Capture Menu

Identical to the TELNET **CAPTURE MENU** (see *Capture Menu* on page 4-4).

Help Menu

Provides on-line help and information about the version number.

Contents

Opens on-line help.

About

Displays version and owner information.

Chapter 5 Applications

This chapter provides examples of some common Express 5210 data and voice applications. The data examples include SNA/SDLC with local spoofing, transparent, and LAN applications. The voice applications (which begin on page 5-9) include switched, daisy-chaining, PLAR circuits, and direct FXS/FXO. The configuration selections given in these examples may need modification based on your network configuration.

DATA APPLICATIONS

SNA/SDLC with Local Spoofing

When used in an SNA/SDLC network, the Express 5210 provides local spoofing by emulating the primary or secondary SDLC roles (see Figure 5-1). The Express 5210 performs conversion from SDLC to frame relay and also terminates SDLC links, providing primary and secondary emulation between Express 5210s. Local spoofing improves performance by reducing traffic across the frame relay network and allows definite response times on the SDLC links.

To perform spoofing, the Express 5210 automatically sets itself up to provide primary or secondary emulation based on the receipt of SNRM (set normal response mode) from an SDLC device. The Express 5210 looks for SNRM on all ports and assumes a secondary role once SNRM is received. The Express 5210 then brings up the LLC2 link across the frame relay network to another FRAD which assumes a primary role. This allows the Express 5210 to operate with PU 2.1 devices.

Different roles can be assumed for each SDLC session. Disconnection starts the role determination procedure again.

In all cases, the Express 5210 is transparent to the XID (exchange identification) negotiation between any two network devices.

The Express 5210 uses LLC protocol (mode 2) to transport SDLC information frames. This protocol ensures a reliable link across frame relay, providing protection from frame loss and excessive delays. The encapsulation method uses the RFC 1490 format. See Table 5-1 for an example of how to configure the Express 5210 for this application.

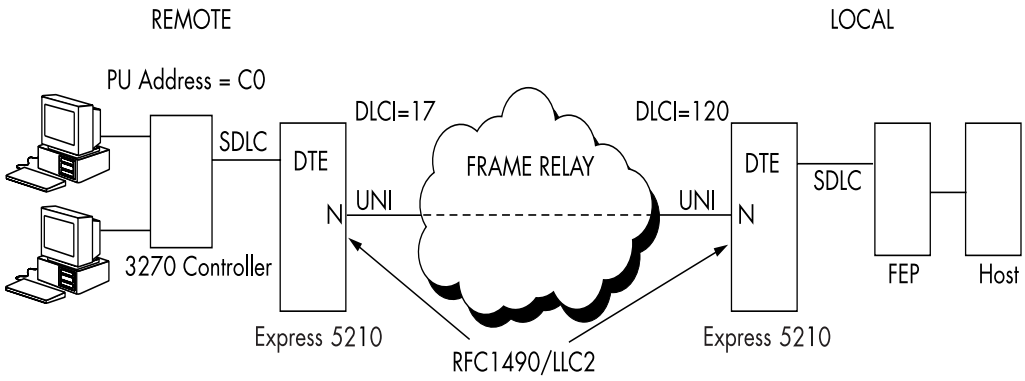


Figure 5-1. SNA/SDLC with Local Spoofing

Table 5-1. SNA/SDLC Application Configuration Settings

	HOST 5210	REMOTE 5210
DTE Port		
Protocol	SDLC	SDLC
Physical Layer Options	INTERFACE TYPE=EIA-232 BIT RATE=19.2K TD CLOCK SOURCE=INTERNAL TRANSMIT IDLE CODE=FLAGS	INTERFACE TYPE=EIA-232 BIT RATE=19.2K TD CLOCK SOURCE=INTERNAL TRANSMIT IDLE CODE=FLAGS
Protocol Options	POLL/RESPONSE TIMEOUT=3 MINIMUM POLL TIMER=0 SLOW POLL RATIO=1 DISCONNECT THRESHOLD=10 TRANSMIT DELAY=0 CTS OPTION=FOLLOW RTS DATA FORMAT=NRZI	POLL/RESPONSE TIMEOUT=3 MINIMUM POLL TIMER=0 SLOW POLL RATIO=1 DISCONNECT THRESHOLD=10 TRANSMIT DELAY=0 CTS OPTION=FOLLOW RTS DATA FORMAT=NRZI
Address Table	ENTRY #1 PU ADDRESS=C0 GROUP ADDRESS=0 LLC2 SSAP=04 LLC2 DSAP=04 OUTGOING DLCI=120	ENTRY #1 PU ADDRESS=C0 GROUP ADDRESS=0 LLC2 SSAP=04 LLC2 DSAP=04 OUTGOING DLCI=17
Network Port		
Physical Layer Options	LOOP RATE=64K CLOCK SOURCE=FROM NTWK	LOOP RATE=64K CLOCK SOURCE=FROM NTWK
Frame Relay Options	SIGNAL TYPE=ANSI T1.617-D T391=10 N391=6 N392=3 N393=4 REMOTE FECN = DO NOT NOTIFY	SIGNAL TYPE=ANSI T1.617-D T391=10 N391=6 N392=3 N393=4 REMOTE FECN= DO NOT NOTIFY

Transparent Application

In cases when the user protocol is not supported by the Express 5210, the transparent mode may be used. Transparent bit-oriented protocol (BOP) or transparent asynchronous protocol may be selected. This can be used for point-to-point connections only because the Express 5210 is transparent to the protocol address formats.

In the **TRANSPARENT BOP** protocol, the Express 5210 accepts an HDLC-like protocol and encapsulates the information field of the HDLC frames, transporting them across the frame relay network to the specified virtual circuit and remote Express 5210 port number. The incoming frames must be spaced with at least one flag byte (0x7E) and contain two bytes of CRC16 at the end of each frame.

Asynchronous protocols are supported by using the **TRANSPARENT ASYNC** mode. The Express 5210 buffers async characters and encapsulates the data portion of each character for transport across frame relay using a programmable DLCI and remote Express 5210 port number.

See Figure 5-2 and Table 5-2 for an example of a transparent BOP configuration. See Figure 5-3 and Table 5-3 for an example of a transparent asynchronous application.

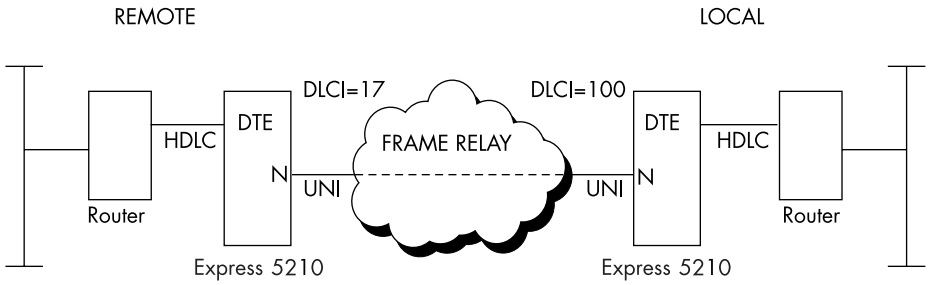


Figure 5-2. Transparent BOP Application

Table 5-2. Transparent BOP Application Settings

	HOST 5210	REMOTE 5210
DTE Port		
Protocol	TRANSPARENT BOP	TRANSPARENT BOP
Physical Layer Options	INTERFACE TYPE=V.35 BIT RATE=64K TD CLOCK SOURCE=INTERNAL TRANSMIT IDLE CODE=FLAGS FLOW CONTROL=ON	INTERFACE TYPE=V.35 BIT RATE=64K TD CLOCK SOURCE=INTERNAL TRANSMIT IDLE CODE=FLAGS FLOW CONTROL=ON
Protocol Options	DATA FORMAT=NRZI	DATA FORMAT=NRZI
Address Table	FAR END PORT=DTE PORT 1 OUTGOING DLCI=100	FAR END PORT=DTE PORT 1 OUTGOING DLCI=17
Network Port		
Physical Layer Options	LOOP RATE=64K CLOCK SOURCE=FROM NTWK	LOOP RATE=64K CLOCK SOURCE=FROM NTWK
Frame Relay Options	SIGNAL TYPE=ANSI T1.617-D T391=10 N391=6 N392=3 N393=4 REMOTE FECN=DO NOT NOTIFY	SIGNAL TYPE=ANSI T1.617-D T391=10 N391=6 N392=3 N393=4 REMOTE FECN=DO NOT NOTIFY

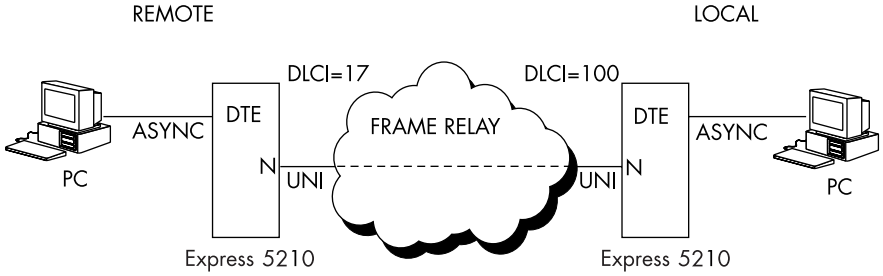


Figure 5-3. Transparent Async Application

Table 5-3. Transparent Async Application Settings

	HOST 5210	REMOTE 5210
DTE Port		
Protocol	TRANS ASYNC	TRANS ASYNC
Physical Layer Options	INTERFACE TYPE=EIA-232 BIT RATE=38.4K DATA BITS=8 PARITY=NONE STOP BITS=1 FLOW CONTROL=ON	INTERFACE TYPE=EIA-232 BIT RATE=38.4K DATA BITS=8 PARITY=NONE STOP BITS=1 FLOW CONTROL=ON
Protocol Options	FRAME SIZE=100 MAX IDLE COUNT=2	FRAME SIZE=100 MAX IDLE COUNT=2
Address Table	FAR END PORT=DTE 1 OUTGOING DLCI=100	FAR END PORT=DTE 1 OUTGOING DLCI=17
Network Port		
Physical Layer Options	LOOP RATE=64K CLOCK SOURCE=FROM NTWK	LOOP RATE=64K CLOCK SOURCE=FROM NTWK
Frame Relay Options	SIGNAL TYPE=ANSI T1.617-D T391=10 N391=6 N392=3 N393=4 REMOTE FECN=DO NOT NOTIFY	SIGNAL TYPE=ANSI T1.617-D T391=10 N391=6 N392=3 N393=4 REMOTE FECN=DO NOT NOTIFY

LAN Application

The Express 5210's **10BaseT** ethernet port allows IP routing between the ethernet interface and other IP interfaces visible to the unit. TELNET management and SNMP management are also available via the ethernet interface.

WAN interfaces may be numbered or unnumbered. Figure 5-4 depicts a numbered WAN interface. For purposes of this example, assume a subnet mask of 255.255.255.0. Routes to the remote LANs are established using static routes or RIP. Routes to the remote WAN interfaces are established using static routes, inverse ARP, or RIP. Once routes are established, IP traffic can flow between any two IP addresses shown in Figure 5-4. See Table 5-4 for an example configuration. The options listed in the table are found in the **IP SETUP** menu under **INTERFACES**.

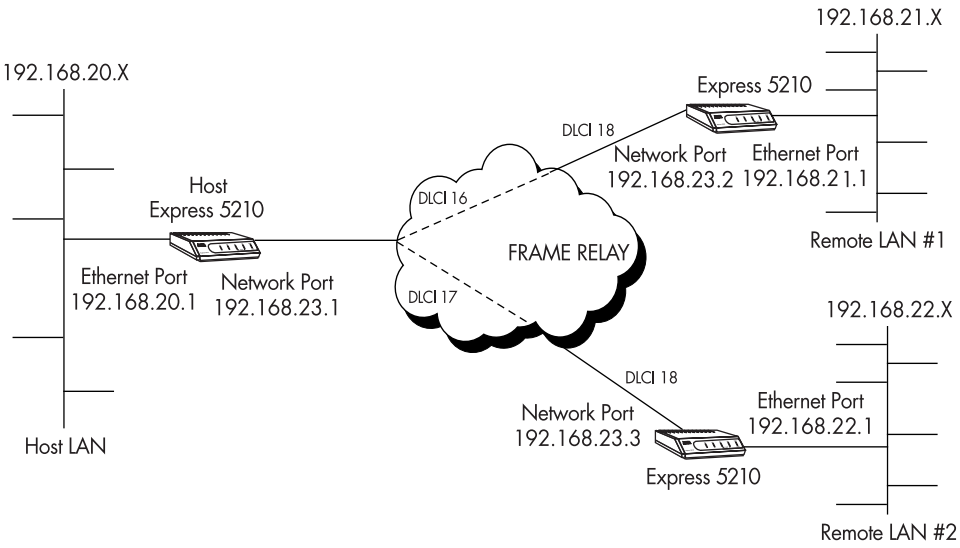


Figure 5-4. LAN Application

Table 5-4. LAN Application Settings

HOST 5210			
	ENTRY 1	**ENTRY 2**	**ENTRY 3**
Network Name	NET: 16	NET: 17	EN0:IP
Address	00	00	192.168.20.1
Subnet Mask	00	00	255.255.255.0
RIP	MODE=TX AND RX METHOD=NONE	MODE=TX AND RX METHOD=NONE	MODE=TX AND RX METHOD=NONE
Proxy ARP	DISABLED	DISABLED	DISABLED
REMOTE 5210 #1			
	ENTRY 1	**ENTRY 2**	**N/A**
Network Name	NET: 18	EN0: IP	
Address	00	192.168.21.1	
Subnet Mask	00	255.255.255.0	
RIP	MODE=TX AND RX METHOD=NONE	MODE=TX AND RX METHOD=NONE	
Proxy ARP	DISABLED	DISABLED	
REMOTE 5210 #2			
	ENTRY 1	**ENTRY 2**	**N/A**
Network Name	NET: 18	EN0: IP	
Address	00	192.168.22.1	
Subnet Mask	00	255.255.255.0	
RIP	MODE=TX AND RX METHOD=NONE	MODE=TX AND RX METHOD=NONE	
Proxy ARP	DISABLED	DISABLED	

VOICE APPLICATIONS

Voice over frame relay can be accomplished using the Express 5210 with an optional dual voice card installed (Dual FXO, FXS, or E&M card). The following sections describe voice application examples using the Express 5210. Examples include switched mode (page 5-9), daisy-chaining (page 5-11), PLAR mode (page 5-12), and direct FXS / FXO (page 5-13).

Switched Mode Application

Switched mode is used to multiplex several remote extensions (up to 40) to two host ports (see Figure 5-5). This enables many remote users to have access to a limited number of access lines on a call-by-call basis. The host unit typically connects two extensions to a PBX via an FXO module. The remote units connect to telephone sets via FXS modules.

The host unit is programmed with the extensions and DLCI information for all of the remote units. This information is communicated to the remote units over the network.

External Call Origination

When the telephone set on a remote Express 5210 is taken off-hook, the remote Express 5210 generates dial tone and waits for an extension to be entered by the user. Once the extension is entered, the remote Express 5210 transmits this information to the host Express 5210, where it is compared to extension information in the extension / DLCI table. If the extension is not located, the host assumes the number is external and attempts to seize an available port and dial the extension on the PBX. If no port is available, a trunk busy (fast busy) is returned to the remote port. After the extension is dialed, the data link is established and the call remains up until the remote Express 5210 terminates the call.

External Call Reception

When an incoming call is received from the PBX, the remote Express 5210 auto-answers the call and generates a dial tone. At this point, the calling party can dial the extension of the party they

are trying to reach. The host looks up the extension in the extension / DLCI table and routes the call appropriately. If the extension does not exist, the Express 5210 generates a trunk busy signal back into the PBX. Otherwise, the host routes the call to the appropriate port. When the remote party answers the call, the data link is established and the call remains up until the remote Express 5210 hangs up or until a loss of line current is detected on the FXO port.

Internal Calls

When the telephone set on a remote Express 5210 is taken off-hook, the remote Express 5210 generates a dial tone and waits for the extension to be entered. Once the extension is entered, the remote Express 5210 transmits this information to the host Express 5210, where it is compared to extension information in the extension / DLCI table. If the extension is found in the extension / DLCI table, the call is routed to the appropriate extension via the host unit. When the called unit goes off-hook, the data link is established and remains up until one of the two extensions terminates the call.

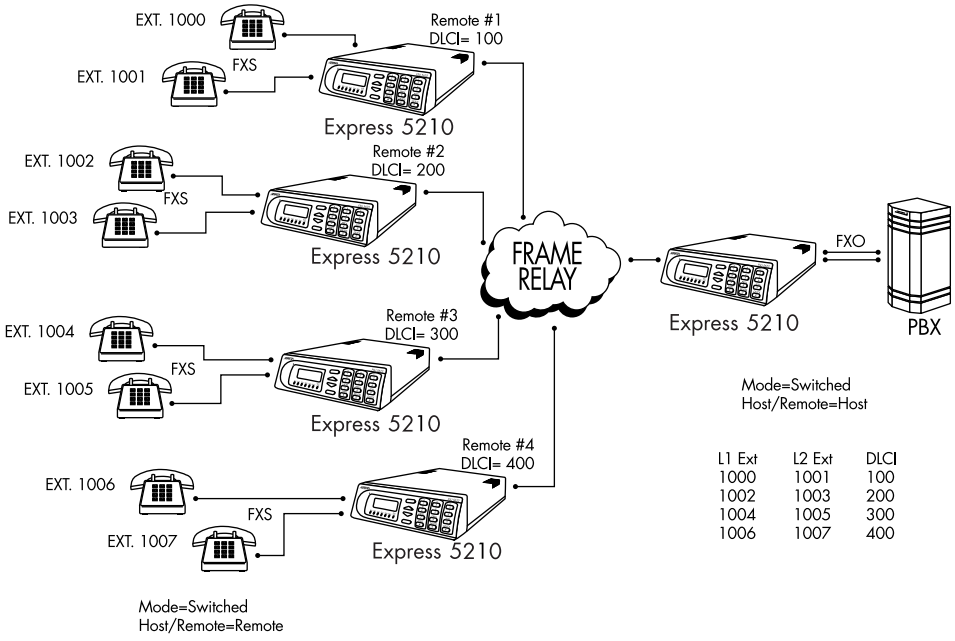


Figure 5-5. Switched Mode Application

Daisy-Chaining Over Frame Relay

In this configuration, multiple units are daisy-chained at the host site to accommodate switched OPX (off premise extension) lines. See Figure 5-6. The Express 5210 can be daisy-chained on the host end to accommodate more PBX extensions.

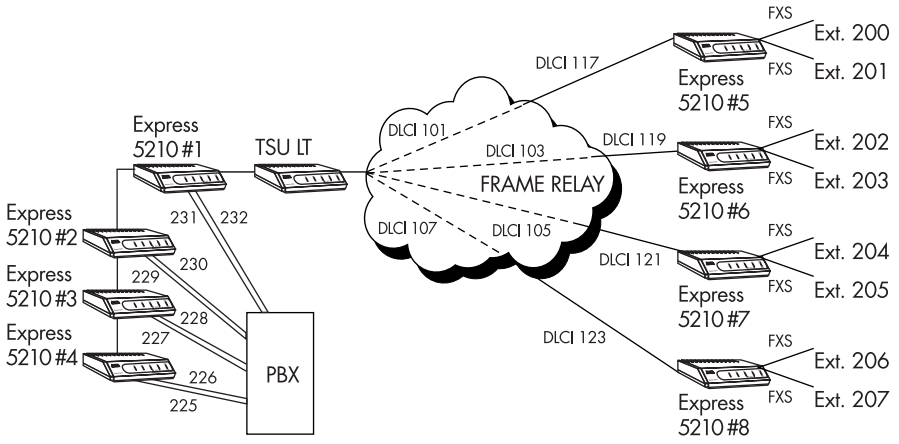


Figure 5-6. Daisy-Chaining Application

PLAR Mode Application

PLAR (private line automatic ringdown) mode connects up to two remote telephone sets to one or two local telephone sets without a PBX. PLAR mode runs over a point-to-point DDS network or over a frame relay network. This mode requires the use of FXS modules on both ends for connection to the telephone sets. In PLAR mode, taking a phone off-hook rings the opposite end of the circuit. See Figure 5-7.

For PLAR mode, the DLCI for each voice port must be programmed. In the case of a frame relay circuit, this is the local DLCI that the voice data is to be carried on. For a point-to-point DDS circuit, the DLCI value must be non-zero and it must be the same on both ends of the circuit.

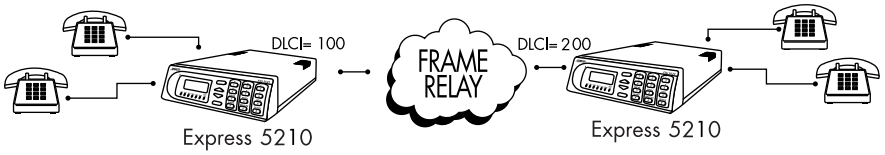


Figure 5-7. PLAR Mode Application

Direct Mode Application

Direct mode is used to set up a typical FXS / FXO extension arrangement. In this mode, the local unit is connected to a PBX via an FXO module. The remote unit uses an FXS module to connect the telephone sets. In this arrangement, the local PBX extensions are extended across the frame relay or point-to-point DDS circuit. In direct mode, the Express 5210 is transparent to the telephone circuit. All signalling information is generated / detected by the attached PBX / telephone.

For direct mode, the DLCI for each voice port must be programmed. In the case of a frame relay circuit, this is the local DLCI that the voice data is to be carried on. For a point-to-point DDS circuit, the DLCI value must be non-zero and it must be the same on both ends of the circuit. See Figure 5-8.

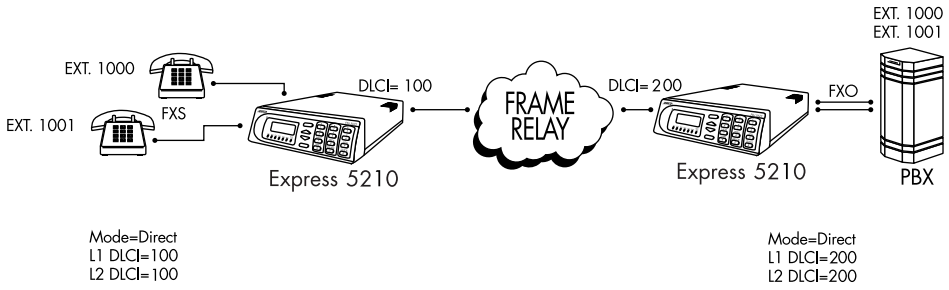


Figure 5-8. Direct Mode Application

Chapter 6 Configuration Overview

LOCAL AND REMOTE CONFIGURATION

The Express 5210 can be configured and managed locally and remotely. The unit supports multiple management sessions, allowing users to access configuration options simultaneously without interrupting each other's activity.

Configuration Methods

The following configuration methods are supported:

- Configure a local Express 5210 using the front panel or a VT 100 interface.
- Configure a remote Express 5210 using a VT 100 **REMOTE LOGIN** session established through a local unit. See the section *Terminal Interface* on page 3-1 for information on selecting local and remote configuration.
- Establish a TELNET session which allows you to control an Express 5210 through the terminal menus (see the section *TELNET Utility* on page 4-1 for more information).
- Access and control an Express 5210 using an SNMP network manager (see the section *SNMP* on page 1-4 for more information).

Configuration Menu

The **CONFIGURATION** menu (Figure 6-1) consists of submenus relating to specific interfaces or functions of the Express 5210 requiring setup:

DTE PORT
FXS/FXO/E&M OPTIONS (available when a voice card is installed)
NETWORK PORT
DIAL BACKUP (available when a DBU card is installed)
CONTROL PORT (front panel only)
SYSTEM

Configure the **NETWORK PORT** *before the* **DTE PORT**. *Selections made will affect the choices available for the* **DTE PORT**.

When configuring the **DTE PORT**, *select the* **PROTOCOL** *first. This selection determines which parameters will be available for the* **PHYSICAL LAYER OPTIONS**, **PROTOCOL OPTIONS**, *and* **ADDRESS TABLE**.

For detailed information on the individual branches of the **CONFIGURATION** menu, see the following chapters:

DTE Port Configuration on page 7-1
Voice Configuration on page 8-1
Network Port Configuration on page 9-1
Dial Backup Configuration on page 10-1
System Configuration on page 11-1

A **CONFIGURATION** menu tree is given in Figure 6-2 on page 6-5.

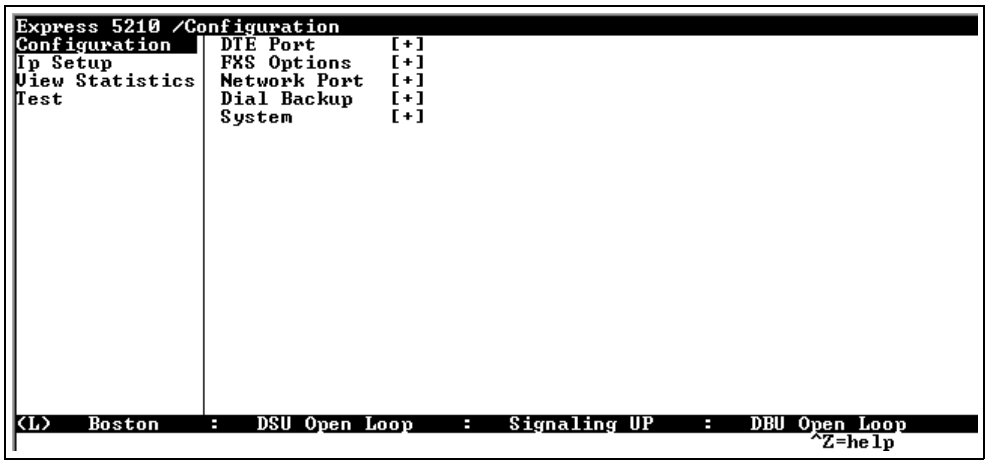


Figure 6-1. Terminal Configuration Menu (Voice and DBU cards installed)

Chapter 7 DTE Port Configuration

Configure the **PROTOCOL**, **PHYSICAL LAYER OPTIONS**, **PROTOCOL OPTIONS**, and **ADDRESS TABLE** for the **DTE** port located on the rear of the Express 5210 by selecting **DTE PORT** from the **CONFIGURATION** menu. Figure 7-1 illustrates the terminal configuration menu for the **DTE PORT**.

Configure the **NETWORK** *port before the* **DTE** *port. Selections made will affect the choices available for the* **DTE** *port.*

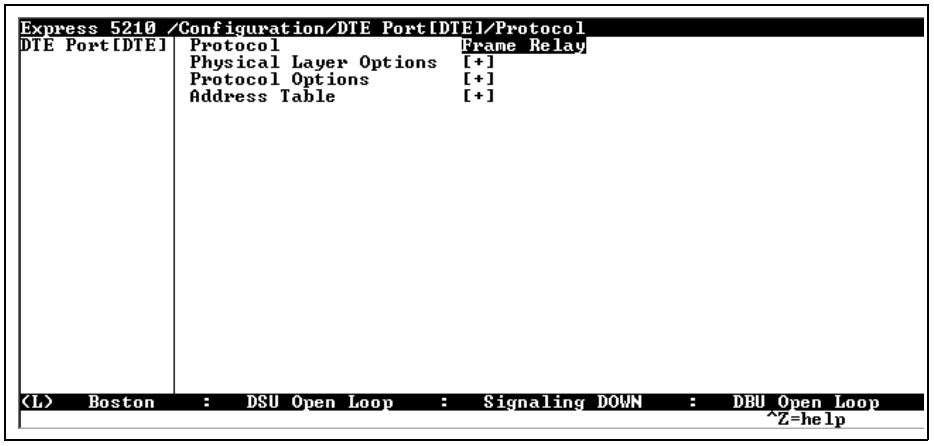


Figure 7-1. DTE Port Configuration Menu

*When configuring the **DTE** port, select the* **PROTOCOL** *first. This selection determines which parameters will be available in the other three categories (***PHYSICAL LAYER OPTIONS***,* **PROTOCOL OPTIONS***, and* **ADDRESS TABLE***).*

In this chapter the terminal selections are listed first, followed by the front panel selections (if the names differ).

See Figure 7-2 for the front panel menu tree leading to the **PROTOCOL** selection. Definitions for each choice follow, categorized by the selected protocol.

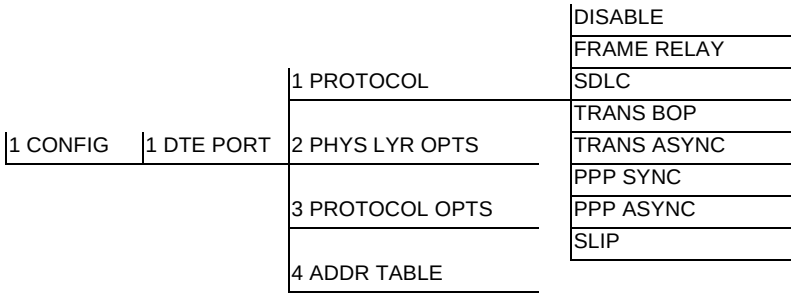


Figure 7-2. Front Panel Protocol Menu Tree

Port Disabled Protocol (DISABLE)

Follow the menu tree shown in Figure 7-3 to disable the **DTE PORT PROTOCOL**. If the **DTE** port is not in use, select **PORT DISABLED**. **PHYSICAL LAYER**, **PROTOCOL**, and **ADDRESS TABLE** options are not available when the port is disabled.

CONFIG	DTE PORT	PROTOCOL	PORT DISABLED

Figure 7-3. Port Disabled Menu Tree

Frame Relay Protocol

The **FRAME RELAY** protocol is a synchronous protocol used to concentrate two different devices into a common frame relay link to the network. While configured for **FRAME RELAY** protocol, the Express 5210 accepts frame relay frames from a router or a FRAD and routes to/from the network port based on the DLCI address. The address can be modified or preserved from the DTE and network side based on the frame relay address table. FECN, BECN, DE, and C/R states are not changed as frames are transferred between the **DTE** and the **Telco** ports. The menu tree in Figure 7-4 shows the choices available when the **FRAME RELAY** protocol is selected.

Physical Layer Options (PHYS LYR OPTS)

Interface Type (INTERFACE)

Select the connector type for the DTE interface. The choices are **EIA-232** and **V.35**. See Table A-4 in the appendix *Pinouts* for the connector pin assignments.

Bit Rate

Select the operating speed of the DTE interface.

*The bit rate selections vary depending on the speed selections made for the **Network** port. Also, for rates higher than 56/64 kbps, the External DCE card is required.*

TD Clock Source (TD CLOCK SRC)

Set the clock source to **INTERNAL** or **EXTERNAL**.

Transmit Idle Code (TX IDLE CODE)

Enable the Express 5210 to transmit **FLAGS** or all **ONES**. When operating in **FRAME RELAY** protocol, configure this option to transmit **FLAGS**.

Hardware Flow Control

This option determines how the Express 5210 responds to congestion during DBU operation. The following chart explains the choices:

Off	No flow control is used and the Express 5210 drops frames during severe congestion.
On	The Express 5210 varies the DTE TC clock as necessary to relieve congestion.

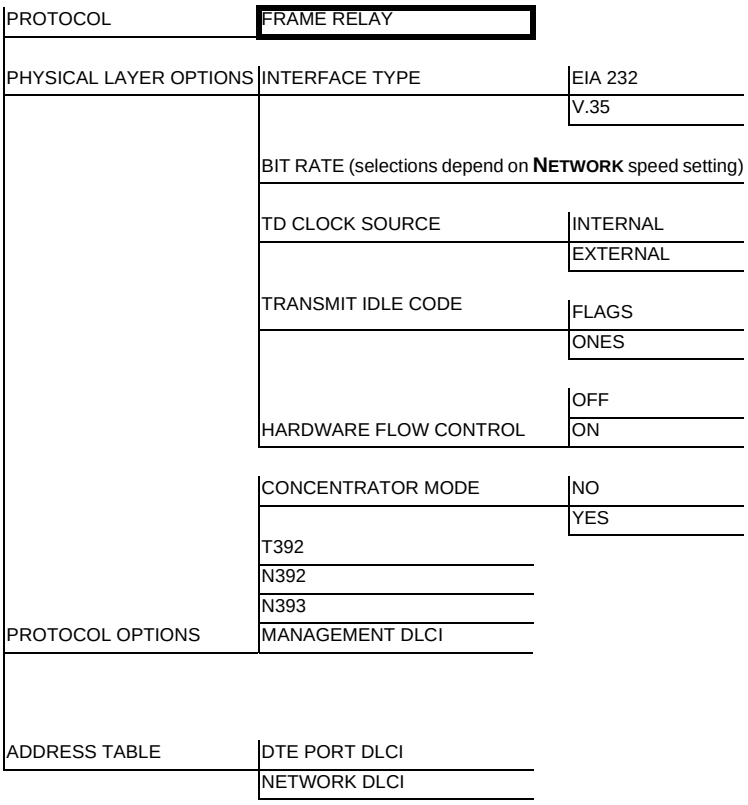


Figure 7-4. Frame Relay Protocol Menu Tree

Protocol Options (PROTOCOL OPTS)

Concentrator Mode (CON MODE)

When set to **OFF**, the Express 5210 inspects data for proprietary traffic such as voice, remote configuration, and PVC loopback data. This allows frame relay and internally generated traffic (such as voice traffic) to travel the same DLCI.

T392

Set the timeout between polling intervals. This parameter needs to be a few seconds longer than the T391 setting of the attached frame relay device.

N392 and N393

These parameters define the error threshold for the UNI formed by the Express 5210 **DTE** port and the attached frame relay device. If the error threshold is met, the **SIGNAL STATE** is changed to **DOWN**, which indicates a service-affecting condition. This condition is cleared once N393 consecutive error-free events are received. N392 defines the number of errors required in a given event window, while N393 defines the number of polling events in each window.

For example:

If N392=3 and N393=4, then if three errors occur within any four events the interface is determined **INACTIVE**.

The status of the connection can be viewed in the **STATISTICS** menu under **DTE PORT SIGNALING STATE**. The status will return to **ACTIVE** once the threshold is no longer exceeded.

Management DLCI (MGMT DLCI)

Enter the management data link connection identifier. The **MANAGEMENT DLCI** is a special DLCI used between the attached DTE device and the Express 5210 to carry SNMP and TELNET packets to/from the Express 5210 on the **DTE** port. See the following section *Guidelines for Configuring IP Addr, Subnet Mask, and Mgmt DLCI* for more information.

Guidelines for Configuring IP Addr, Subnet Mask, and Mgmt DLCI

If the attached router or FRAD is used to route SNMP/TELNET frames to the Express 5210, set the **MANAGEMENT DLCI** to a unique value that identifies the virtual circuit between the router/FRAD and the Express 5210. The router/FRAD must also be configured to route the Express 5210 **IP ADDRESS** to this DLCI. The **IP ADDRESS** and **SUBNET MASK** for the **10BaseT LAN** port or the **MANAGEMENT DLCI** interface must also be set (see the section *Interfaces* on page 12-7).

Setting the **IP ADDRESS** to 0.0.0.0 and setting the **MANAGEMENT DLCI** to a value not used by the attached frame relay device disables this feature.

Address Table (ADDR TABLE)

DTE Port DLCI (DTE DLCI)
Enter the **DTE PORT DLCI** into the protocol **ADDRESS TABLE**, mapping it to the corresponding **NETWORK DLCI**. If address translation is not required, set to the value of the corresponding **NETWORK DLCI**.

Network DLCI (NET DLCI)
Enter the **NETWORK DLCI** into the protocol **ADDRESS TABLE**, mapping it to the corresponding **DTE DLCI**. Obtain DLCI addresses from the service provider.

*There should be one entry for every virtual circuit on the frame relay **DTE** port.*

*When building or editing an **ADDRESS TABLE**, use the **Next**, **Prev**, **Add**, and **Delete** keys on the front panel (described in the chart on page 3-9), or the **Insert** and **Delete** functions of the terminal interface (described in the chart on page 3-7).*

SDLC Protocol

SDLC is a synchronous, bit-oriented, full-duplex, Layer 2 protocol used to connect SDLC devices to a frame relay network. At Layer 2, SNA networks use SDLC between FEPs (front-end processors) and cluster controllers. This protocol selection provides Logical Link Control Type 2 (LLC2). LLC2 defines the data link frame header and supports the multiplexing of one or more data links to/from separate service access points (SAPs). Type 2 provides acknowledged, connection-oriented service. See Figure 7-5.

The **PU** (physical unit) **ADDRESS**, **LLC2 SSAP**, **LLC2 DSAP**, and **OUTGOING DLCI** are used to set up an end-to-end SDLC session for each PU in the network. The **PU ADDRESS** should match the address of each controller address attached to the port. The **OUTGOING DLCI** determines the path across the frame relay network and is given by the service provider. The SSAP/DSAP pairs are user-defined but should match between two Express 5210s for each SDLC session.

All **PU ADDRESSES** for a port must be unique, but it is not necessary that they match the **PU ADDRESS** at the remote end. The SSAP / DSAP / DLCI is used to make the connection across the frame relay network.

Physical Layer Options (PHYS LYR OPTS)

Interface Type (INTERFACE)

Select the connector type for the **DTE** interface. The choices are **EIA-232** and **V.35**.

Bit Rate

Select the operating speed of the **DTE** interface.

*The bit rate selections vary depending on the speed selections made for the **Network** port. Also, for rates higher than 56/64 kbps, the External DCE card is required.*

TD Clock Source (TD CLOCK SRC)

Set the clock source to internal or external.

Transmit Idle Code (TX IDLE CODE)

Enable the Express 5210 to transmit flags or all ones. When operating the **SDLC** protocol, all **ONES** is the recommended option.

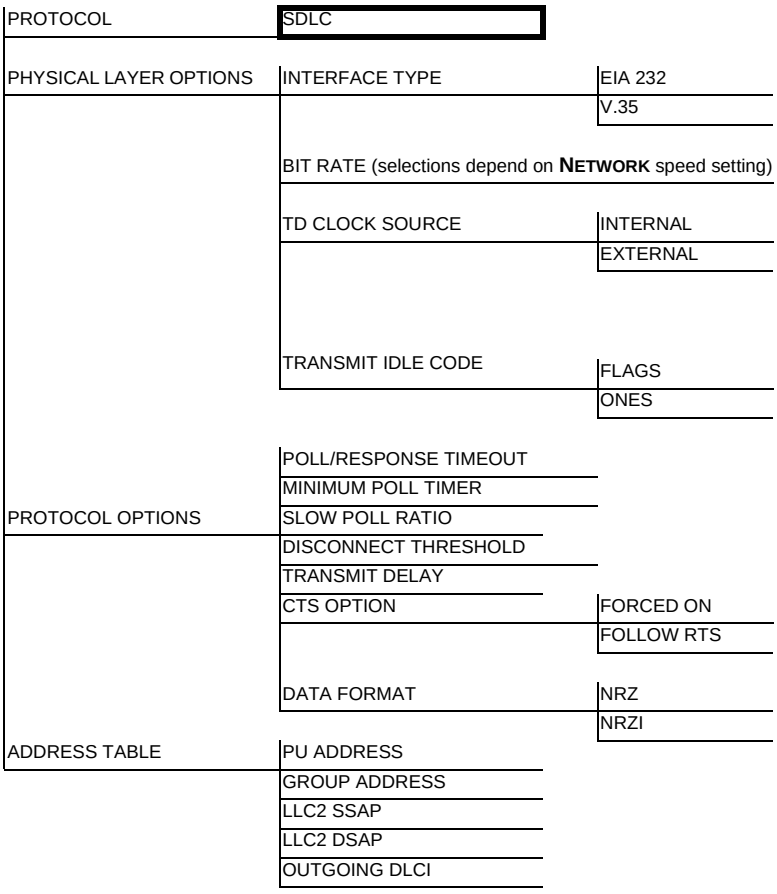


Figure 7-5. SDLC Protocol Menu Tree

Protocol Options (PROTOCOL OPTS)

Poll/Response Timeout (TIMEOUT)

Set the amount of time the Express 5210 waits for a poll response before issuing another poll.

Minimum Poll Timer (MIN POLL TIME)

This parameter defines the minimum time (in milliseconds) between consecutive polls to a given PU assigned to the **DTE** port.

Slow Poll Ratio (POLL RATIO)

Determine how often devices on the Slow Poll list are polled. This list is automatically managed based on poll timeouts. Initially, all PUs are on the Normal list. When a PU times out a fixed number of times, it is moved to the Slow Poll list. A PU remains on this list until it responds properly to a poll.

The number entered is the number of times PUs on the Normal list are polled before PUs on the Slow Poll list are polled. Enter **1** to disable this option.

Disconnect Threshold (THRESHOLD)

Set the maximum number of response timeouts allowed before a session is terminated.

Transmit Delay (TX DELAY)

Set the minimum time between transmission frames.

CTS Option

Set the Express 5210 **CTS OPTION** to **FOLLOW RTS** or to be **FORCED ON**.

Data Format (FORMAT)

Set the **DATA FORMAT** to match the attached controller or FEP line coding. The choices are non-return-to zero (**NRZ**) and non-return-to-zero inverted (**NRZI**).

When using **NRZI** format, the Express 5210 does not derive timing from the receive data input.

Address Table (ADDR TABLE)

PU Address

Enter the physical unit address of each SDLC device you wish to connect to the Express 5210.

Group Address (GROUP ADDR)

Enter the address used for group polling. With this address, the host can poll the Express 5210 for information on all units connected to the Express 5210. This address should match the host's group address. Set this entry to 0 to disable group polling for the **DTE** port.

LLC2 SSAP
Defines a point-to-point connection on the network. For an SDLC connection, the SSAP of one Express 5210 should match the DSAP on the other Express 5210. The value of this parameter must be in hex and in increments of four beginning with 04.

LLC2 DSAP
Defines a point-to-point connection on the network. For an SDLC connection, the DSAP of one Express 5210 should match the SSAP of the other Express 5210. The value of this parameter must be in hex and in increments of four beginning with 04. See the section *SNA/SDLC with Local Spoofing* on page 5-1 for a configuration example which demonstrates the SSAP and DSAP arrangement.

Outgoing DLCI (OUT DLCI)
Enter the DLCI address that identifies the virtual circuit used to make the SDLC connection.

When building or editing an **ADDRESS TABLE**, *you must use the* **Next**, **Prev**, **Add**, *and* **Delete** *keys on the front panel (described in the chart on page page 3-9), or the* **Insert** *and* **Delete** *functions of the terminal interface (described in the chart on page 3-7).*

Transparent BOP Protocol (TRANS BOP)

TRANSPARENT BOP is a synchronous mode which can accept any HDLC-like protocol as input. This setting allows the Express 5210 to connect to devices even if the Express 5210 does not understand their protocol addressing and controlling techniques. The Express 5210 becomes transparent to the data link layer protocol and provides end-to-end connectivity between two HDLC-like devices. See Figure 7-6 for the **TRANSPARENT BOP** menu tree.

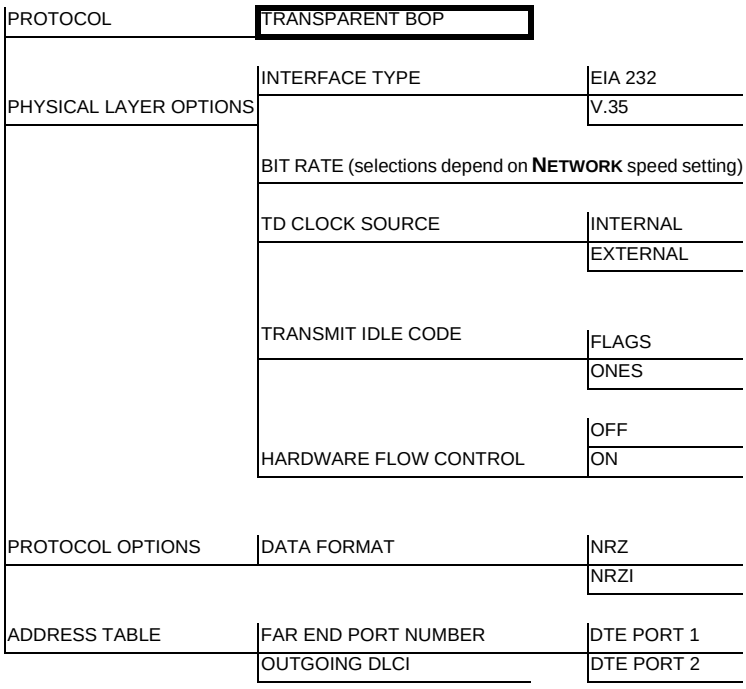


Figure 7-6. Transparent BOP Menu Tree

Physical Layer Options (PHYS LYR OPTS)

Interface Type (INTERFACE)

Select the connector type for the **DTE** interface. The choices are **EIA-232** and **V.35**.

Bit Rate

Select the operating speed of the **DTE** interface.

*The bit rate selections vary depending on the speed selections made for the **Network** port. Also, for rates higher than 56/64 kbps, the External DCE card is required.*

TD Clock Source (TD CLOCK SRC)

Set the clock source to **INTERNAL** or **EXTERNAL**.

Transmit Idle Code (TX IDLE CODE)

Enable the Express 5210 to transmit **FLAGS** or all **ONES** (**FLAGS** are recommended).

Hardware Flow Control

When set to **ON**, the Express 5210 varies the transmit clock rate to temporarily limit the transmit data rate from the DTE device to the Express 5210.

Protocol Options (PROTOCOL OPTS)

Data Format (FORMAT)

Set the **DATA FORMAT** to match the attached controller or FEP line coding. The choices are non-return-to zero (**NRZ**) and non-return-to-zero inverted (**NRZI**).

When using **NRZI** format, the Express 5210 does not derive timing from the receive data input.

Address Table (ADDR TABLE)

Far End Port Number (FAR END PORT)

Enter the port number (DTE 1 or DTE 2) connecting the remote ADTRAN frame relay product to the remote HDLC device.

Outgoing DLCI (OUT DLCI)

Enter the DLCI address that indicates the virtual circuit used to connect with the remote ADTRAN frame relay product.

Transparent Async Protocol (TRANS ASYNC)

The **TRANSPARENT ASYNC** protocol frames up async characters to transport across a frame relay network. This protocol is used when the device connected to the Express 5210 is an async device such as a terminal or PC. See Figure 7-7 for the **TRANSPARENT ASYNC** menu tree.

The Express 5210 buffers async characters from the DTE device until two idle characters or 100 characters are received. A frame relay synchronous frame is constructed containing the data content of each character. Frame relay frames received on the network containing transparent async data are transmitted to the attached

device with the character format set under the DTE port **PHYSICAL LAYER OPTIONS**.

No control lead status or break characters are transmitted across the frame relay network.

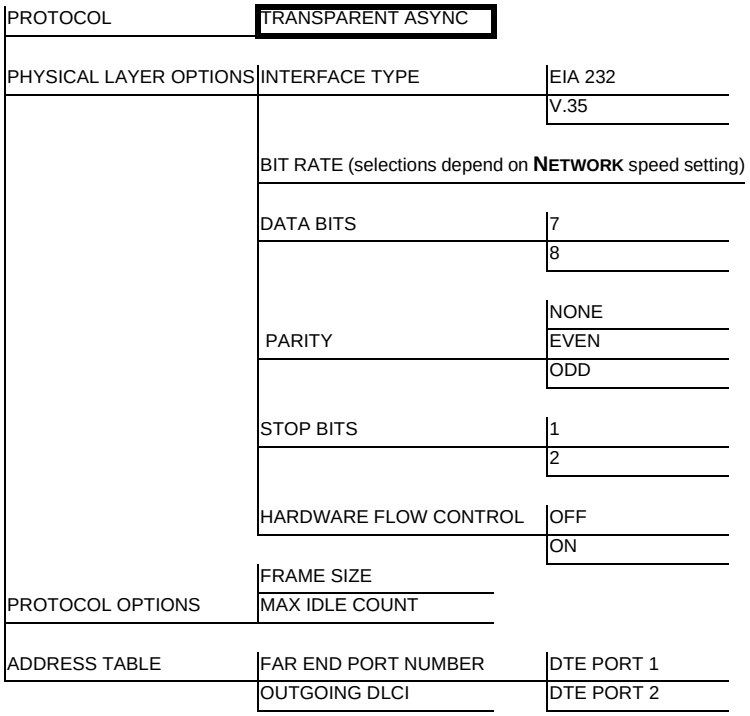


Figure 7-7. Transparent Async Protocol Menu Tree

Physical Layer Options (PHYS LYR OPTS)

Interface Type (INTERFACE)

Select the connector type for the **DTE** interface. The choices are **EIA-232** and **V.35**.

Bit Rate
Select the operating speed to match the DTE device connected to the Express 5210.

The bit rate selections vary depending on the speed selections made for the ***Network*** *port. Also, for rates higher than 56/64 kbps, the External DCE card is required.*

Data Bits
Select the byte length to match the DTE device connected to the Express 5210. The choices are **7** and **8**.

Parity
Select even, odd, or no parity information. Set to match the DTE device connected to the Express 5210.

Stop Bits
Select one or two stop bits. Set to match the DTE device connected to the Express 5210.

Hardware Flow Control
When set to **ON** the Express 5210 disables CTS, temporarily stopping the data being transmitted from the DTE device to the Express 5210.

Protocol Options (PROTOCOL OPTS)

Frame Size (FRM SIZE) and Max Idle Count (MAX IDLE)
The values assigned to these fields determine when a block of asynchronous data becomes a frame. Whichever value is reached first determines when the frame is formed. If, for example, 7 is the selected **FRAME SIZE** and 3 is the **MAX IDLE COUNT**, then a frame is formed once the Express 5210 receives either 7 characters or 3 idle characters (whichever comes first).

Address Table (ADDR TABLE)

Far End Port Number (FAR END PORT)
Enter the port number (DTE 1 or DTE 2) connecting the remote ADTRAN frame relay product to the remote async device.

Outgoing DLCI (OUT DLCI)
Enter the DLCI address that identifies the virtual circuit used to connect with the remote ADTRAN frame relay product.

PPP Synchronous Protocol (PPP SYNC)

PPP SYNCHRONOUS protocol provides a PPP device access to the frame relay network and also routes IP traffic from the network to the PPP device. See Figure 7-8 for the **PPP SYNCHRONOUS** menu tree.

Routing

Routing tables are formed through a combination of RIP and static route entries. If RIP is used, routing tables are generated dynamically. With static routing, the user is able to force relationships. Static routing requires additional configuration (see the chapter *IP Setup* on page 12-1 for more information).

A port set for **PPP SYNCHRONOUS** protocol routes and supports IP traffic only.

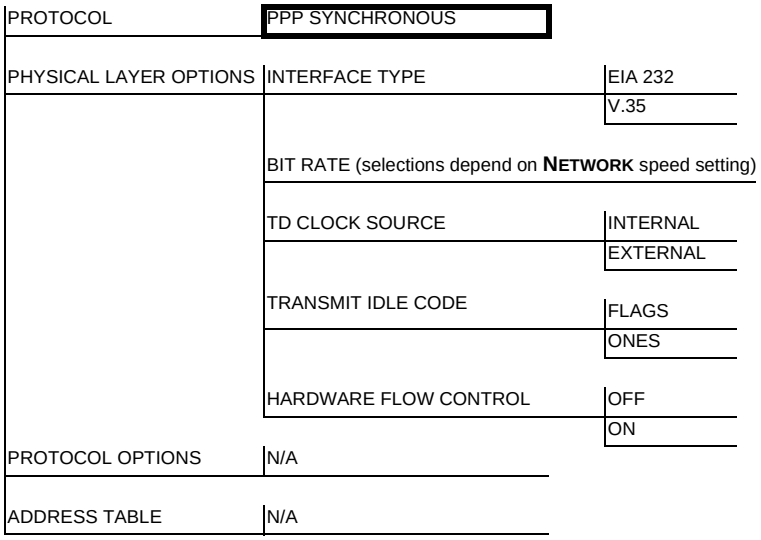


Figure 7-8. PPP Synchronous Protocol Menu Tree

Physical Layer Options (PHYS LYR OPTS)

Interface Type (INTERFACE)
Select the connector type for the **DTE** interface. The choices are **EIA-232** and **V.35**.

Bit Rate
Select the operating speed of the DTE interface.

The bit rate selections vary depending on the speed selections made for the network port. Also, for rates higher than 56/64 kbps, the External DCE card is required.

TD Clock Source (TD CLOCK SRC)
Set clock source to **INTERNAL** or **EXTERNAL**.

Transmit Idle Code (TX IDLE CODE)
Enable the Express 5210 to transmit **FLAGS** or all **ONES**.

Hardware Flow Control
When set to **ON**, the Express 5210 varies the transmit clock rate to temporarily limit the transmit data rate from the DTE device to the Express 5210.

PPP Async Protocol

The **PPP ASYNC** protocol functions the same as the **PPP SYNCHRONOUS** protocol except the port is in async format, connected to an async device. Special control characters are used to determine frame boundaries for the async channel. See Figure 7-9 for the **PPP ASYNCHRONOUS** menu tree.

Routing

Routing tables are formed through a combination of RIP and static route entries. If RIP is used, all routing tables are generated dynamically. With static routing, the user is able to force relationships. Static routing requires additional configuration (see the chapter ***IP Setup*** on page 12-1 for more information).

Physical Layer Options (PHYS LYR OPTS)

Interface Type (INTERFACE)
Select the connector type for the **DTE** interface. The choices are **V.35** and **EIA-232**.

Bit Rate
Select the operating speed of the DTE interface to match the connected device.

*The bit rate selections vary depending on the speed selections made for the **Network** port. Also, for rates higher than 56/64 kbps, the External DCE card is required.*

Data Bits
Select the byte length to match the connected asynchronous device. The choices are **7** and **8**.

Parity
Select even, odd, or no parity information. Set to match the connected asynchronous device.

Stop Bits
Select one or two stop bits. Set to match the connected asynchronous device.

Hardware Flow Control
When set to **ON** the Express 5210 disables CTS, temporarily stopping the data being transmitted from the DTE device to the Express 5210.

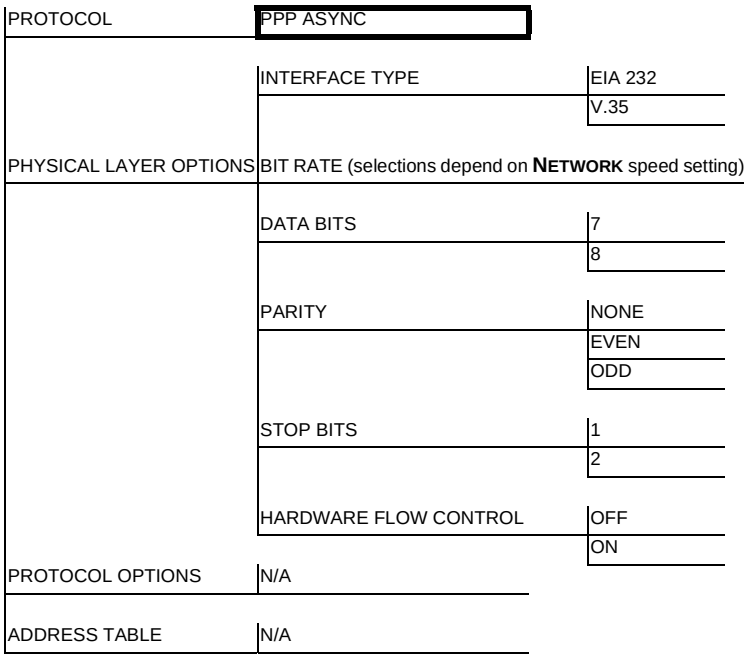


Figure 7-9. PPP Asynchronous Protocol Menu Tree

SLIP Protocol

The **SLIP** protocol is an asynchronous protocol which encapsulates and routes IP traffic to and from a SLIP device. Special control characters are used to define frame boundaries. See Figure 7-10 for the **SLIP** menu tree.

Routing

Routing tables are formed through a combination of RIP and static route entries. If RIP is used, all routing tables are generated dynamically. With static routing, the user is able to force relationships. Static routing requires additional configuration (see the chapter *IP Setup* on page 12-1 for more information).

Physical Layer Options (PHYS LYR OPTS)

Interface Type (INTERFACE)
Select the connector type for the **DTE** interface. The choices are **EIA-232** and **V.35**.

Bit Rate
Set the operating speed of the **DTE** interface to match the connected device.

*The bit rate selections vary depending on the speed selections made for the **Network** port. Also, for rates higher than 56/64 kbps, the External DCE card is required.*

Data Bits
Set the byte length to match the connected asynchronous device. The choices are **7** and **8**.

Parity
Select even, odd, or no parity information. Set to match the connected asynchronous device.

Stop Bits
Select one or two stop bits. Set to match the connected asynchronous device.

Hardware Flow Control
When set to **ON** the Express 5210 disables CTS, temporarily stopping the data being transmitted from the DTE device to the Express 5210.

PROTOCOL	SLIP	
PHYSICAL LAYER OPTIONS	INTERFACE TYPE	EIA 232
		V.35
	BIT RATE (selections depend on **NETWORK** speed setting)	
	DATA BITS	7
		8
	PARITY	NONE
		EVEN
		ODD
	STOP BITS	1
		2
	HARDWARE FLOW CONTROL	OFF
		ON
PROTOCOL OPTIONS	N/A	
ADDRESS TABLE	N/A	

Figure 7-10. SLIP Protocol Menu Tree

Chapter 8 Voice Configuration

Select **FXS**, **FXO**, or **E&M OPTIONS** from the **CONFIGURATION** menu. The option available is dependent upon the voice card installed. Figure 8-1 shows the **CONFIGURATION** menu for the FXS card.

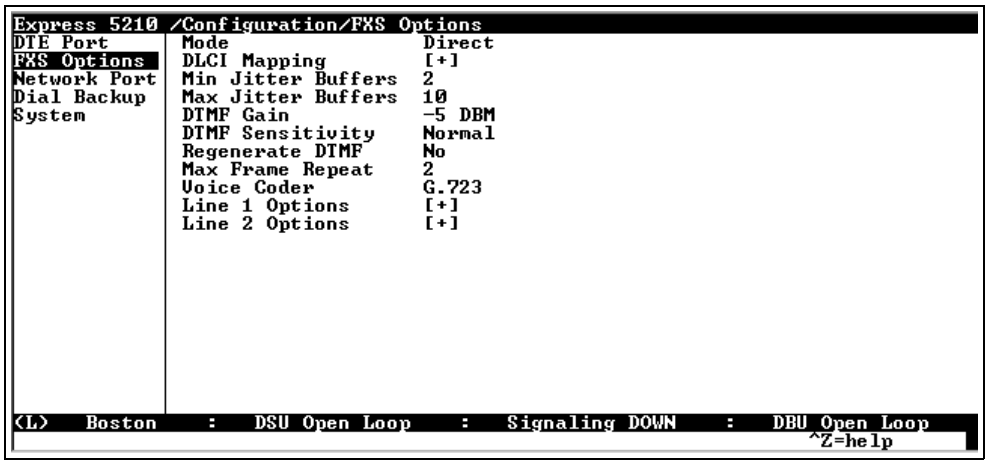


Figure 8-1. Voice Options Menu

Mode

Select either **SWITCHED** or **DIRECT** mode for the voice interface.

Switched Mode

SWITCHED mode is used to multiplex several remote extensions (up to 40) to two host ports. This enables many remote users to have access to a limited number of access lines on a call-by-call basis. The host unit typically connects two extensions to a PBX via an FXO module. The remote units connect to telephone sets via FXS modules. See the section *Switched Mode Application* on page 5-9 for an example application.

Direct Mode

DIRECT mode is used to accomplish a one-to-one mapping of ports across a frame relay network. In this mode, **L1** and **L2** on the local unit are connected to **L1** and **L2** on the remote unit. With this option, one or two extensions can be extended across the frame relay or DDS network by using an FXO module on the local unit and an FXS module on the remote unit. PLAR circuits are also supported by using FXS modules on both ends of the circuit. Related application examples are given on pages 5-12 and 5-13.

Remote/Host (Rem/Host)

Configure the unit to be either a **REMOTE** unit or a **HOST** unit. There must be only one **HOST** unit in a switched environment. Typically, the **HOST** unit connects to the PBX via FXO connections. The **HOST** unit maintains all of the extension / DLCI information. All units other than the **HOST** are set up as **REMOTE** units. No DLCI or extension configuration is required for **REMOTE** units.

This option is available only when the **MODE** *is set for* **SWITCHED**.

DLCI Mapping (DLCI MAP)

The options for **DLCI MAP** vary depending on the **MODE** and **REMOTE/HOST** selections.

Selections Available for a Unit in Direct Mode

The **DLCI MAPPING** choices for a unit in **DIRECT MODE** specify the DLCI used for voice traffic. This information must be configured in both the local and remote units. Voice data may be multiplexed with data on the same DLCI.

Line 1 DLCI (L1 DLCI)
Enter the local DLCI that line 1 voice data is to be carried on.

Line 2 DLCI (L2 DLCI)
Enter the local DLCI that line 2 voice data is to be carried on.

Selections Available for a Host Unit in Switched Mode

The **DLCI MAPPING** choices for a **HOST** unit in **SWITCHED MODE** give access to the remote extension table that is maintained by the **HOST** unit. The table consists of a local DLCI associated with the voice data on a remote Express 5210 and the extension for the two voice ports connected to that DLCI. The Express 5210 supports up to 20 DLCIs which yield a total of 40 voice ports. On the front panel, **Next**, **Previous**, **Add**, and **Delete** keys are used to edit this table. The DLCI/Extension information is communicated to the remote units over the network; therefore configuration is not required on the remote units.

Ext 1
Enter the extension for line 1 on a remote Express 5210.

Ext 2
Enter the extension for line 2 on a remote Express 5210.

DLCI
Local **DLCI** that carries **EXT 1** and **2** data.

Cascade Entry (CASCADE)
Set to **YES** when cascading units from the host unit. To cascade units, connect via the **DTE** port. Set the host unit's **CASCADE ENTRY** to **YES** and enter the DLCI number connecting the two units into the host's **DLCI** field (described previously).

Min Jitter Buffers (MIN JITTER)

The minimum number of 30 ms frames that will be buffered at the beginning of a voice call. The range is 1-4.

Max Jitter Buffers (MAX JITTER)

The maximum number of 30 ms frames that will be used to compensate for variance in network delay (jitter). The range is 2-15.

Extension Length (EXT LENGTH)

Number of digits used to assign extensions (**SWITCHED** mode only). The range is 2-4.

DTMF Gain

Set the desired output gain of regenerated DTMF tones (-5, -1, or 0 dBm). Leave this setting at default (-5 dBm) unless the circuit is missing digits when dialing.

DTMF Sensitivity (DTMF SENS)

The level of sensitivity at which the Express 5210 detects DTMF. If the unit is mis-dialing, set to **LOW**; otherwise, leave at **NORMAL**.

Regenerate DTMF (REGEN DTMF)

This option is used for troubleshooting purposes and should be left at default (**YES**).

Max Frame Repeat (MAX REPEAT)

The maximum number of times that a frame will be replayed in lieu of lost/late frames. The range is 0-3.

Interface Type

Select a two-wire or four-wire interface type (for the E&M voice card only).

Voice Coder

Select the desired **VOICE CODER**. This setting must be the same for both the host and remote units. The choices are **G.723** and **NETCODER**.

Line 1 and L2 Options (L1 and L2 OPTIONS)

Choose voice transmission settings for the two voice lines using the following selections:

Receive TLP (RX TLP)

RECEIVE TLP is the receive gain setting with a range of **-10 DBM** to **+5 DBM** (in steps of 1 dB). The voice port can be disabled by setting this field to **DISABLE**.

Max Fax Rate

The Express 5210 supports fax up to 14.4 kbps. The maximum fax rate may be set lower to reduce the amount of bandwidth used for a fax. Rates are: **OFF** (fax not supported), **4800**, **7200**, **9600**, and **14.4K** bps.

Fax Gain

Used to set the gain during a fax session. This field should be left at default unless fax problems are encountered.

Silence Suppression (SILENCE SUPP)

SILENCE SUPPRESSION reduces bandwidth during voice transmission by allocating bandwidth back to data during periods of silence in a voice call.

Chapter 9 Network Port Configuration

NETWORK PORT

Access the network options by selecting **NETWORK PORT** from the **CONFIGURATION** menu. See the menu tree in Figure 9-1. The network port is always used in frame relay protocol configurations. The network port terminates the user end of the frame relay UNI interface. The Express 5210 supports three standard PVC signaling formats: LMI (gang of four), ANSI T1.617-D (Annex D), and ITU Q.933-A (Annex A). The selected signaling format is used to poll the network end of the UNI interface and retrieve virtual circuit information. Optionally, the polling process can be disabled.

User data is encapsulated into standard frame relay formatted frames using two methods. FRF 3.1 IA procedures are used for IP and LLC2 protocols, while a proprietary method is used for transparent protocol mode. Virtual circuit sharing is allowed for both methods.

*Configure the **Network Port** before the **DTE Port**. Selections made will affect the choices available for the **DTE Port**.*

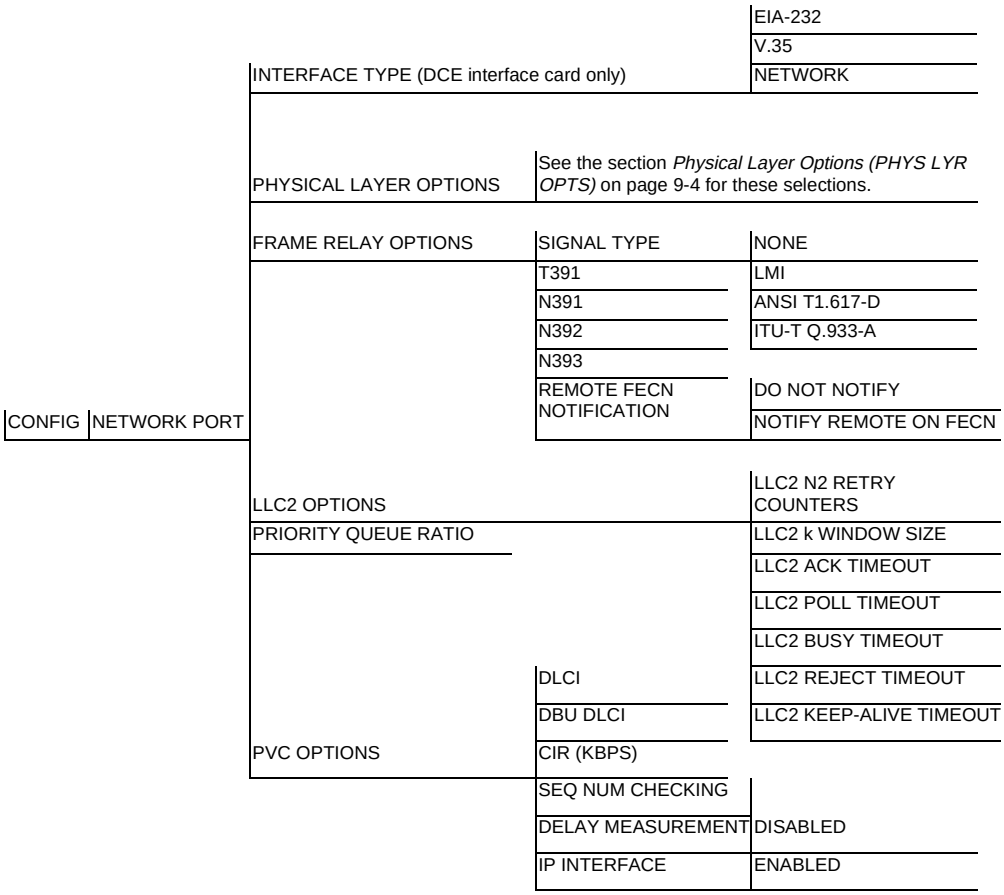


Figure 9-1. Network Port Configuration Menu Tree

When configuring from a terminal, the screen in Figure 9-2 appears when **NETWORK PORT** is selected.

In this chapter, the terminal selections are listed first followed by the front panel selections (if the names differ).

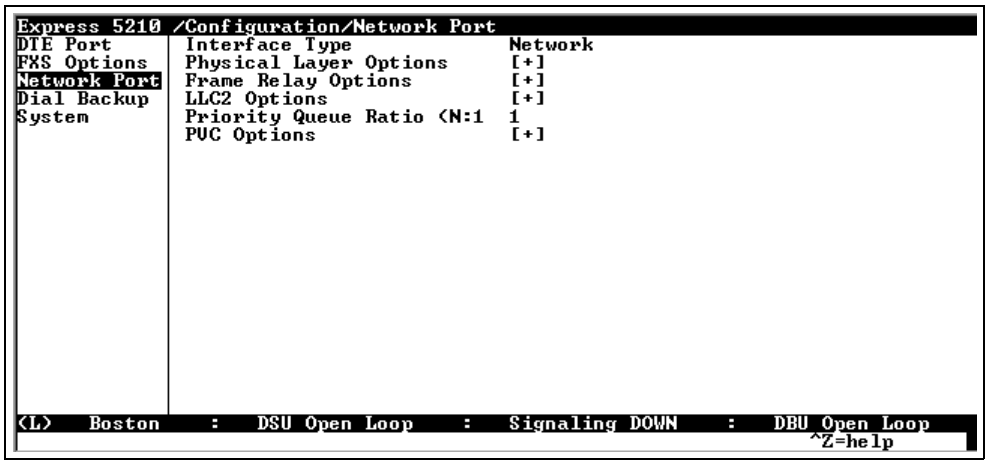


Figure 9-2. Network Port Configuration Terminal Menu

Interface Type (INTERFACE)

Select the **INTERFACE TYPE**. This option only applies to the external DCE interface card. When set to **EIA-232** or **V.35**, the DCE card can be used as an alternate network interface. When this option is set to **NETWORK**, the DCE card can be used as a dial backup interface.

Physical Layer Options (PHYS LYR OPTS)

If a DCE card is installed, these options change depending on the **INTERFACE TYPE** selected. See the following charts:

Selections available when a DCE card is *not* installed	
Loop Rate	Select a loop rate of either **56K**, **64K**, or **AUTO**.
Clock Source	Configure the Express 5210 clocking source to be derived from either the unit (**INTERNAL**) or from the network (**FROM NETWORK**). **FROM NETWORK** is the most common selection.

Selections available with a DCE card installed and an INTERFACE TYPE selection of...	
...EIA-232	
NETWORK BIT RATE	Select a network rate of **56** or **64K**.
...V.35	
NETWORK BIT RATE	Select a network rate of **56, 64, 112, 128, 168**, **192**, **224**, **256**, **280**, **320**, **384**, **448**, or **512K.**
...NETWORK	
LOOP RATE	Select a loop rate of either **56K**, **64K**, or **AUTO**.
CLOCK SOURCE	Configure the Express 5210 clocking source to be derived from either the unit (**INTERNAL**) or from the network (**FROM NETWORK**). **FROM NETWORK** is the most common selection.

Frame Relay Options (FR OPTS)

The following options appear when **FRAME RELAY OPTIONS** is selected from the **CONFIGURE NETWORK PORT** menu.

Signal Type (SIGNAL)

Set this option to match the network signaling type. The choices are **NONE**, **LMI** (gang of four), **ANSI T1.617-D** (Annex D), and **ITU-T Q.933-A** (Annex A).

For point-to-point DDS operation, the **SIGNAL TYPE** *should be set to* **NONE**.

T391

Set the time between polls to the frame relay network.

N391

Determine how often full status polls occur in relation to link integrity polls.

For example:

If N391=6, then *five* link integrity polls will be followed by a full status poll.

N392 and N393

These parameters define the error threshold for the UNI formed by the Express 5210 network port and the frame relay switch. If the error threshold is met, the signaling state status is changed to **DOWN**, which indicates a service-affecting condition. This condition is cleared once **N393** consecutive error-free events are received. **N392** defines the number of errors required in a given event window, while **N393** defines the number of polling events in each window.

For example:

If N392=3 and N393=4, then when three errors occur within any four events the interface is determined inactive.

The status of the connection can be viewed in the **STATISTICS** menu under **NETWORK PORT SIGNALING STATE**. The status will return to **ACTIVE** again once the threshold is no longer exceeded.

The network service provider should recommend the values entered into the **T391**, **N391**, **N392**, *and* **N393** *fields.*

Remote FECN Notification (REM FECN)

If set to **NOTIFY REMOTE ON FECN**, the unit notifies its corresponding remote unit if a frame with the FECN bit enabled is received. This feature is proprietary and can only be used with ADTRAN frame relay products on both ends of the virtual circuit.

LLC2 Options (LLC2 OPTS)

The following options appear when **LLC2** (Logical Link Control Type 2) **OPTIONS** is selected from the **NETWORK PORT** configuration menu.

LLC2 N2 Retry Counters (N2 RETRY)

Maximum retries for actions timed by the ACK poll, busy or reflect timers. When N2 is exceeded, the session resets.

LLC2 k Window Size (WND SIZE)

Maximum number of outstanding unacknowledged data frames that the LLC2 protocol will allow.

LLC2 Ack Timeout (ACK TO)

Timeout value used by the LLC2 protocol to establish the maximum time to wait for a positive acknowledgment from a remote device.

LLC2 Poll Timeout (POLL TO)

Maximum time to wait for a response to a command having the poll bit set.

LLC2 Busy Timeout (BUSY TO)

Length of time the LLC2 protocol will wait for a remote device to clear a busy state before querying it with an RR (receiver ready) command.

LLC2 Reject Timeout (REJECT TO)

Maximum time the LLC2 protocol will wait for a reject response after issuing a reject command.

LLC2 Keep-Alive Timeout (KA TO)

Optional tool for detecting the status of an LLC2 connection.

Priority Queue Ratio (N:1) (QUEUE RATIO)

Define the ratio that SDLC frames have over other protocols. SDLC protocols are processed each time the network port transmitter is serviced. Other protocols are processed every N times the SDLC protocol is processed. Set to 1 to enable equal priority.

PVC Options (PVC CONFIG)

The **PVC OPTIONS** table is used to re-map incoming DLCIs during dial backup applications. Normally, when an Express 5210 sends data on a particular DLCI, the frame relay switch maps that DLCI to the appropriate DLCI at the far end. During dial backup, the frame relay switch no longer exists in the data path, so the mapping must be done at the receiving end of the data path.

DLCI

Enter the **DLCI** that data is received on during non dial backup periods (local DLCI). For an example of this setup, see Figure 9-3.

DBU DLCI

Enter the DLCI that the remote Express 5210 is transmitting to (remote DLCI). This option is only available when a DBU card is installed. For an example of this setup, see Figure 9-3.

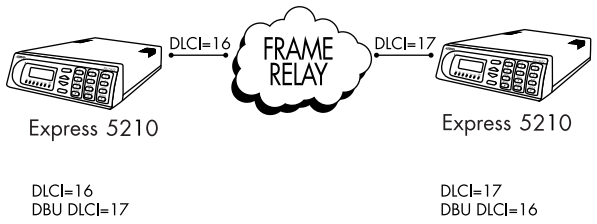


Figure 9-3. Example of DLCI Configuration

CIR <kbps>

Enter the CIR (committed information rate) in kbps for the corresponding DLCI. The CIR is used to calculate utilization percentages. The information is provided by your service provider and must be entered for each PVC.

Seq Num Checking (SEQ #)

Set to **ENABLE** only if there is an ADTRAN product (ATLAS or frame relay) on the other end of the PVC. When enabled, the Express 5210 tags each frame with a sequence number which is then used by the remote ADTRAN product to detect lost packets. Lost frame counts are given in the **STATISTICS** menu.

Delay Measurement (PVC DELAY)

Set to **ENABLE** only if there is an ADTRAN product (ATLAS or frame relay) on the other end of the PVC. When enabled, the Express 5210 periodically transmits a loopback frame to the remote ADTRAN product which is then returned to measure round trip delay of each PVC. Minimum, maximum, and average frame delay measurements are given in the **STATISTICS** menus.

IP Interface

The Express 5210 creates an IP interface for a PVC based on the presence of the DLCI in the LMI responses from the network. An IP interface is also created for a DLCI indicated during setup (such as SDLC configuration). An IP interface may be removed by setting this option to **DISABLED** for the associated DLCI.

Setting this option to **ENABLED** creates a logical IP interface for a DLCI not otherwise known, such as a nominal DLCI used in an IP routing application across a DDS link.

Chapter 10 Dial Backup Configuration

DIAL BACKUP OPTIONS

The **CONFIGURE DIAL BACKUP** menu (Figure 10-1) stores dial backup phone numbers, enables / disables the auto DBU capability, defines the DBU criteria when the DDS or frame relay circuit fails, and controls the DBU timers. See Figure 10-2 for a complete menu tree of the DBU selections.

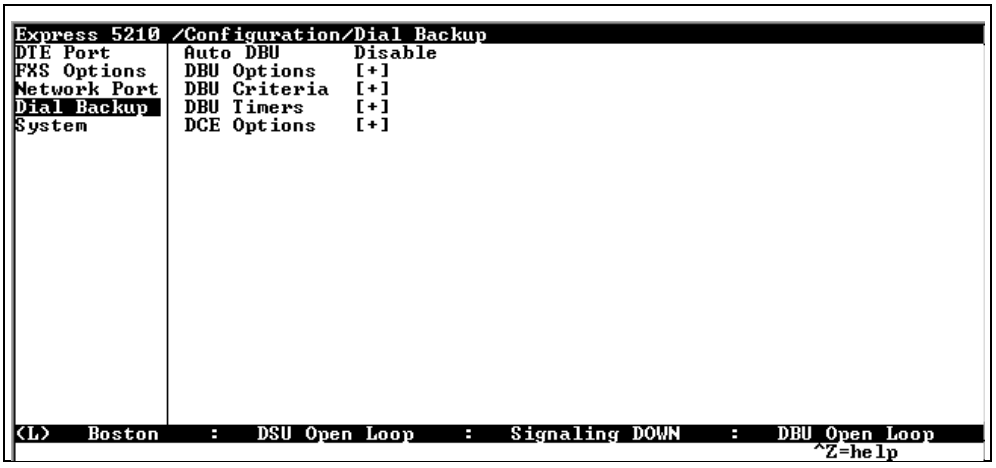


Figure 10-1. DBU Options Menu

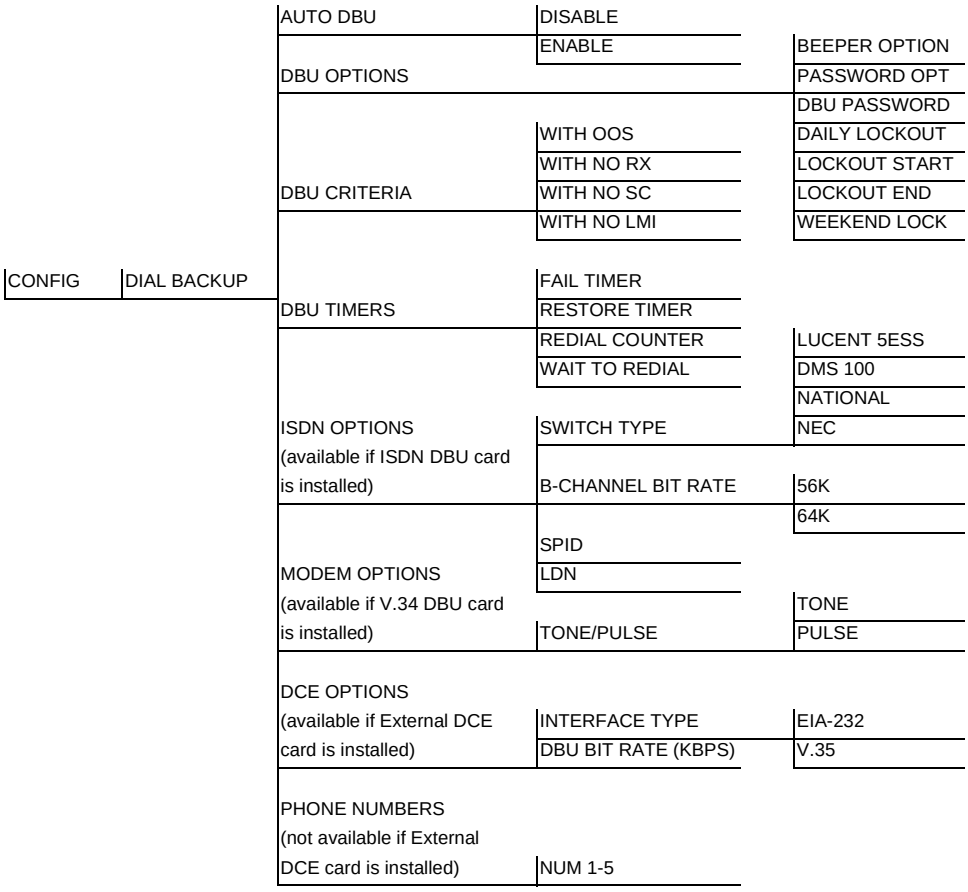


Figure 10-2. Dial Backup Menu Tree

Auto DBU

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

DBU Options

Beeper Option
If enabled, the Express 5210 issues an intermittent beep while in dial backup.

Password Opt
When enabled, the passwords entered in the **DBU PASSWORD** fields of both the near and far end Express 5210s are required to match before a dial backup connection can be made. The setting in this field must also be identical in both units (i.e., they both must be set to either **ENABLED** or **DISABLED**). This selection does not apply when the 4-Wire SW56 card or DCE card is installed.

DBU Password
Enter the authentication string used for making a dial backup connection. If **PASSWORD OPT** is **ENABLED**, the near and far end Express 5210 **DBU PASSWORDS** must be identical. If using front panel entry, see the section *Entering Letters Using the Front Panel* on page 11-4 for more information. This selection does not apply when the 4-Wire SW56 or DCE card is installed.

Daily Lockout
Enable / disable the daily lockout specified by the fields **LOCKOUT START** and **LOCKOUT END**.

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 set to **ENABLE**.

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 set to **ENABLE**.

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

DBU Criteria

With OOS

When enabled, the Express 5210 enters backup mode if an out-of-service condition is detected. The factory default setting is **ENABLE**.

With No RX

When enabled, the Express 5210 enters backup mode when a loss of signal is detected. The factory default setting is **ENABLE**.

With No SC

When enabled, the Express 5210 enters backup mode when a loss of sealing current is detected. The factory default setting is **ENABLE**.

With No LMI

When enabled, the Express 5210 enters backup mode when a loss of signaling from the frame relay switch is detected. The default setting is **ENABLE**.

DBU Timers

Fail Timer (FAIL TMR)

This option sets the amount of time the dedicated circuit failure condition must be active before the Express 5210 attempts backup. The amount of time, which is manually entered, can be up to 600 seconds. The factory default setting is 10 seconds.

Restore Timer (RESTORE TMR)

Once the circuit is down, the Express 5210 remains in backup until the circuit is active for the length of time specified for the **RESTORE TIMER**. The selection is entered in minutes (up to 60). If set to 0, the DDS or frame relay circuit must be restored manually. The factory default setting is 1 minute.

Redial Counter

This option sets the number of times the Express 5210 redials the far end when entering backup mode. The **REDIAL COUNTER**, which is manually entered, can be up to a maximum of 60 attempts. If the Express 5210 encounters a busy or reorder signal, it attempts to establish the call the specified number of times. The factory default setting is 5.

Wait to Redial (REDIAL DELAY)

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 60 seconds. The factory default setting is 15 seconds.

DBU Card Configuration Options

The following selections are dependent upon the type of DBU card installed (if any). If no card is installed or if the 4-Wire SW56 card is installed, then the selections in this section do not appear.

ISDN DBU Card

When an ISDN DBU interface card is installed, select **ISDN OPTIONS** to access the following ISDN configuration parameters:

Switch Type

Select which type of telco CO switch is providing your ISDN service. There are four switch options: **LUCENT 5ESS**, **DMS 100**, **NATIONAL**, and **NEC.**

B-Channel Bit Rate (B-CH BIT RATE)

Select the channel bit rate for the ISDN service. Select **64K** unless your service only provides **56K**.

SPID

Enter the service profile identifier (**SPID**) into this field. 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 Lucent 5ESS switch is capable of recognizing a point-to-point configuration, eliminating the need for a **SPID**. All other switch types require a **SPID**.

LDN

Enter the **LDN**. This seven-digit number is assigned by the telco when the ISDN line is installed.

V.34 DBU Card

When a V.34 DBU interface card is installed, select **MODEM OPTIONS** to access the following configuration parameter:

Tone/Pulse
Select the dialing method for the dial backup service.

DCE Card

The DCE card has two functions: it can act as a DBU interface or as an alternate network interface. When the **NETWORK INTERFACE TYPE** is set to **NET** (see page 9-3) then the DCE card functions as a DBU interface. In this case, the following configuration parameters are available:

Interface Type (INTERFACE)
Select the connector type for the DCE interface. The choices are **EIA-232** and **V.35**.

DBU Bit Rate (BIT RATE)
Set to the operating speed of the DCE interface (0-512 kbps).

When the **NETWORK INTERFACE TYPE** *is set to* **V.35** *or* **EIA-232** *(see page 9-3) then the DCE card functions as an alternative network interface. Therefore, the* **DIAL BACKUP** *options will not appear in the* **CONFIGURATION** *menu.*

Phone Numbers 1-5

The Express 5210 stores up to 5 numbers of 20 digits each (15 digits on the front panel). Edit a phone number by reentering the entire number. This process overwrites the previously stored number. This selection is not available if the External DCE interface card is installed.

Chapter 11 System Configuration

To access **SYSTEM** configuration selections, choose **CONFIGURATION** from the **MAIN** menu. Then choose **SYSTEM** from the **CONFIGURATION** menu. The terminal menu is shown in Figure 11-1, and the front panel menu tree is shown in Figure 11-2.

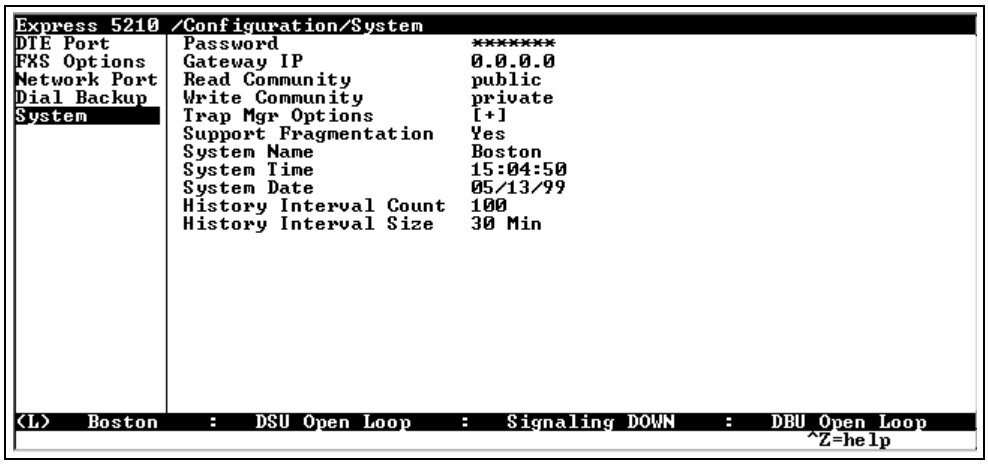


Figure 11-1. System Configuration Menu

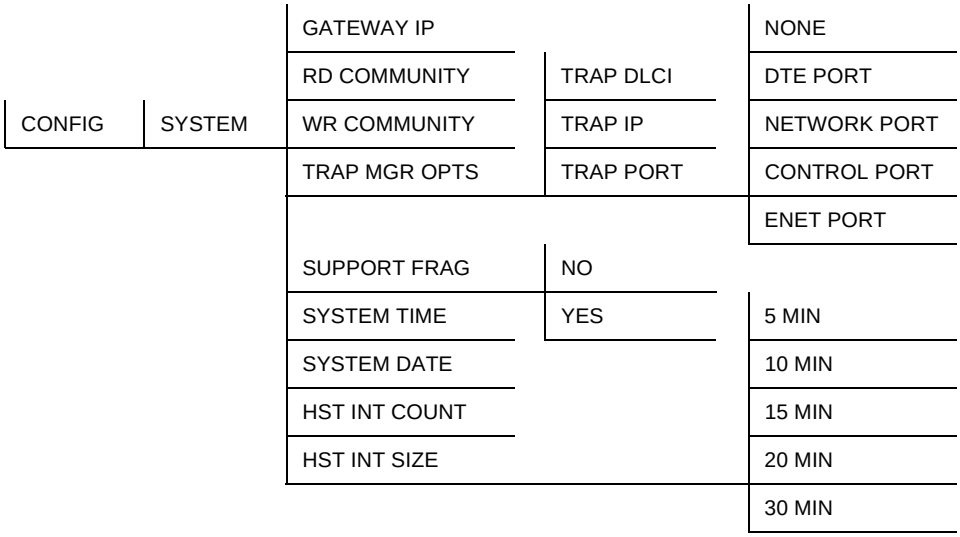


Figure 11-2. System Configuration Front Panel Menu

Password

Enter a new password of ten digits or less. The default password is **adtran**. This selection is only available in the terminal interface.

Gateway IP

Enter the **GATEWAY IP** address. If an IP packet with an unknown IP address is received, the Express 5210 sends it to the Gateway (which is a router or another FRAD).

Read Community (RD COMMUNITY)

Enter the authentication strings used for SNMP management. Match the Express 5210 to the SNMP manager for read privileges. If you are using the front panel, see the section *Entering Letters Using the Front Panel* on page 11-4 for instructions.

Write Community (WR COMMUNITY)

Enter the authentication strings used for SNMP management. Match the Express 5210 to the SNMP manager for write privileges.

If you are using the front panel, see the section *Entering Letters Using the Front Panel* on page 11-4 for instructions.

Trap Mgr Options (TRAP MGR OPTS)

The **TRAP MGR OPTIONS** table allows you to designate how traps are sent by the Express 5210 to the SNMP manager. The table supports up to five entries, consisting of the following selections:

Trap Manager DLCI (TRAP DLCI)

If the **TRAP MANAGER PORT** is set for **NETWORK PORT**, this parameter identifies the virtual circuit used for all traps generated by the Express 5210.

Trap Manager IP Address (TRAP IP)

Enter the IP address of the SNMP manager to which the Express 5210 sends traps.

Trap Manager Port (TRAP PORT)

Enter the Express 5210 port number used to transmit traps to the SNMP manager.

Support Fragmentation (SUPPORT FRAG)

When running voice applications, this should be enabled. With fragmentation enabled, large frames are fragmented to maintain voice quality in the presence of large data frames.

System Name

Enter a descriptive name for the unit. This name can help you distinguish between different installations. Enter up to 20 alpha-numeric characters in this field, including spaces and special characters (such as an underbar). The name is then displayed in the status bar of the terminal menu. This selection is only available for the terminal interface.

System Time and Date

Enter time / date information. View this information in the **SYSTEM STATUS** menu. Time is in 24-hour format (i.e., military time).

History Interval Count (HST INT COUNT)

Displays the number of history intervals available for statistics storage. History intervals are displayed in the **INTERVAL** portions of the **STATISTICS** menus. These views provide data divided into columns grouped by the interval of time selected in the **HISTORY INTERVAL SIZE** field (described next). The **HISTORY INTERVAL COUNT** field shows how many intervals can be stored at a time.

History Interval Size (HST INT SIZE)

The time entered in this field affects the **INTERVALS** view in the **STATISTICS** menus. The **INTERVALS** view provides historical data for the current day. The data is divided into columns grouped by the interval of time (5, 10, 15, 20, or 30 minutes) selected in this field. Once the maximum amount of storage time is reached (see the following note), new information overwrites existing information, beginning with the least current.

If data is not retrieved before the Total Time Stored is exceeded, it is over-written and cannot be restored. Total Time Stored = History Interval Size x History Interval Count.

ENTERING LETTERS USING THE FRONT PANEL

Configuring the **READ / WRITE COMMUNITY** names requires 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 **WRITE COMMUNITY** name illustrates this procedure:

1. Select **WR COMMUNITY** from the **SYSTEM CONFIGURATION** menu.
2. Use the up and down arrow keys to scroll to the desired character.
3. Press **Enter**.
4. Repeat steps 2 and 3 until all characters have been selected.
5. Press the **Enter** key again to complete the entry.

Chapter 12 IP Setup

IP ROUTING WITH THE EXPRESS 5210

The Express 5210 contains an IP router function to resolve paths for IP packets received. This function is used regardless of encapsulation protocol and port received from.

The heart of the routing system is a routing table which can be generated manually, automatically, or a combination of the two. Manual entry is preferred in cases where there are few routes. This minimizes traffic created by routing protocols used in the automatic method. The automatic method cuts down on manual entry for large route tables and allows for routes to be changed without service interruption.

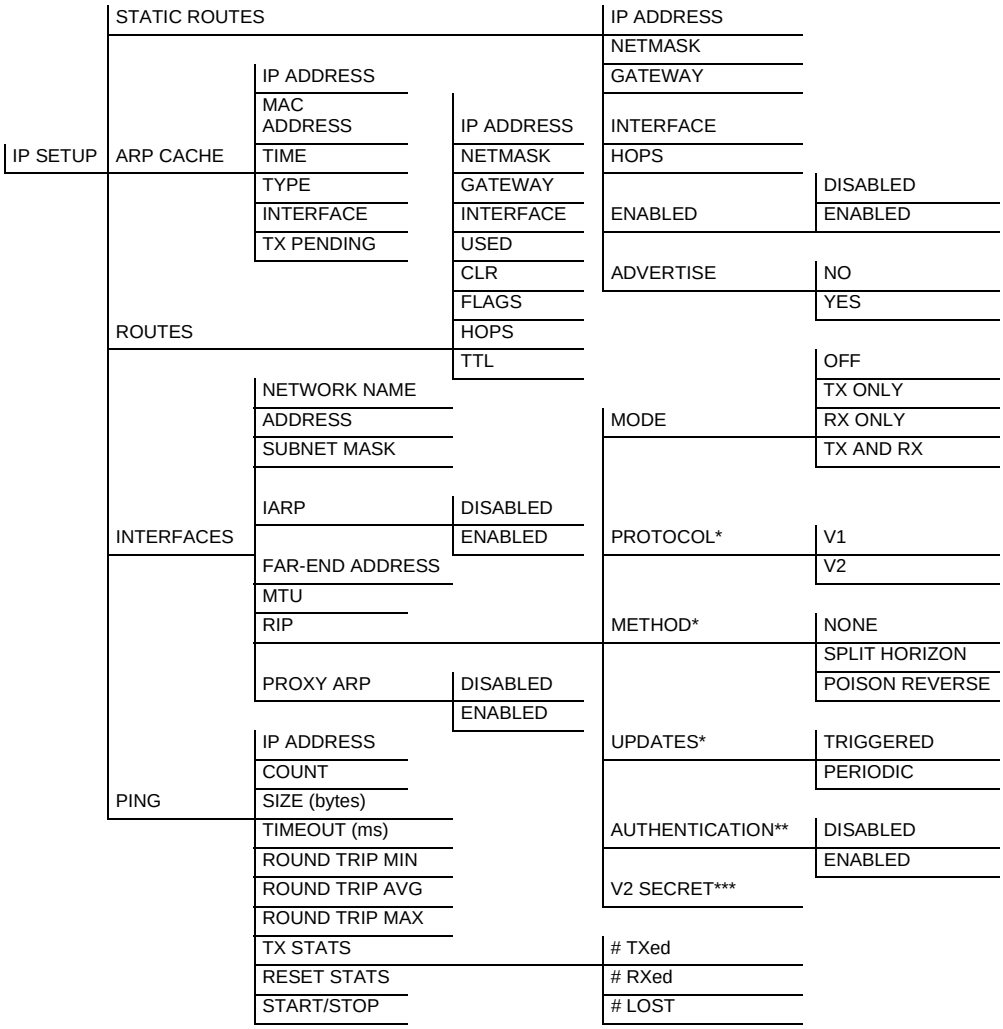
Another important element in routing is the default gateway route. This is used while routes are being formed automatically and is a convenient way to direct all IP packets in cases where only one route is needed.

Routing internet protocol (RIP) can be enabled for each port configured for IP encapsulation. The **RIP** (**IP SETUP** -> **INTERFACES** -> **RIP**) parameter enables the Express 5210 to share the internal routing table with other routers and FRADs attached to the port if set to Tx. The **RIP** parameter enables the Express 5210 to process routing table information from other routers and FRADs attached to the port. See the section *Interfaces* on page 12-7 for more information on configuring the RIP options.

In addition to RIP, the network port uses inverse ARP (RFC 1490) to associate peer router/FRAD IP addresses to PVC addresses.

The Express 5210 can also respond to requests from peer routers/FRADs seeking an association for their tables. The transmit and receive inverse ARP section can be independently enabled.

Access IP routing selections by choosing **IP SETUP** from the **MAIN** menu. Then choose **IP**. Figure 12-1 shows the front panel **IP SETUP** menu tree.



*Only available if **MODE** is set for **TX AND RX** or **TX ONLY**.

Only available if **PROTOCOL is set for **V2**.

***Only available if **AUTHENTICATION** is **ENABLED**.

Figure 12-1. IP Routing Front Panel Menu Tree

Viewing IP Information

View IP routing information either horizontally (as in Figure 12-2) or vertically (as in Figure 12-3), according to your preference. When you first enter a routing menu (such as **STATIC ROUTES**), the unit defaults to the horizontal presentation. When the fields are displayed horizontally, scroll using your left and right arrow keys to view the fields not shown on the current screen.

To set the screen to vertical presentation, use the arrow keys to highlight the left-most column of one of the rows (which is the route number). Press **Enter**. When the fields are displayed vertically, scroll using your up and down arrow keys to view the fields not shown on the current screen.

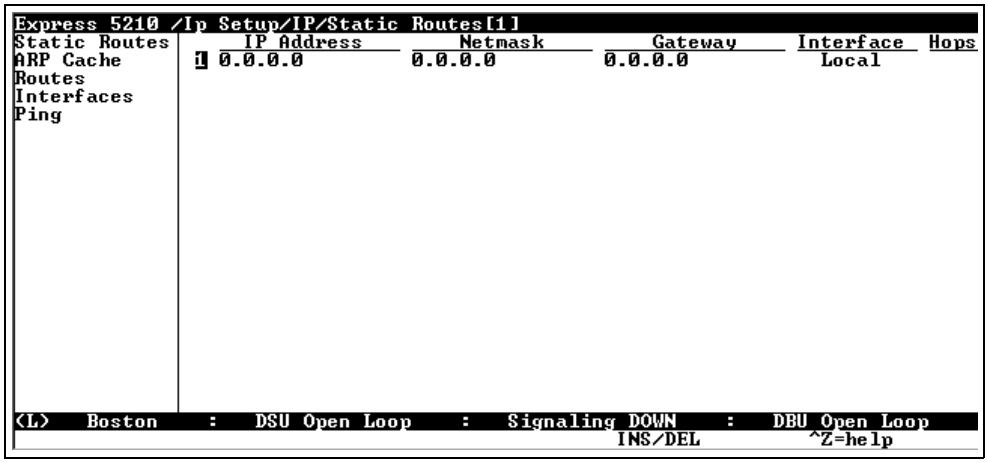


Figure 12-2. Static Routing Menu (Horizontal View)

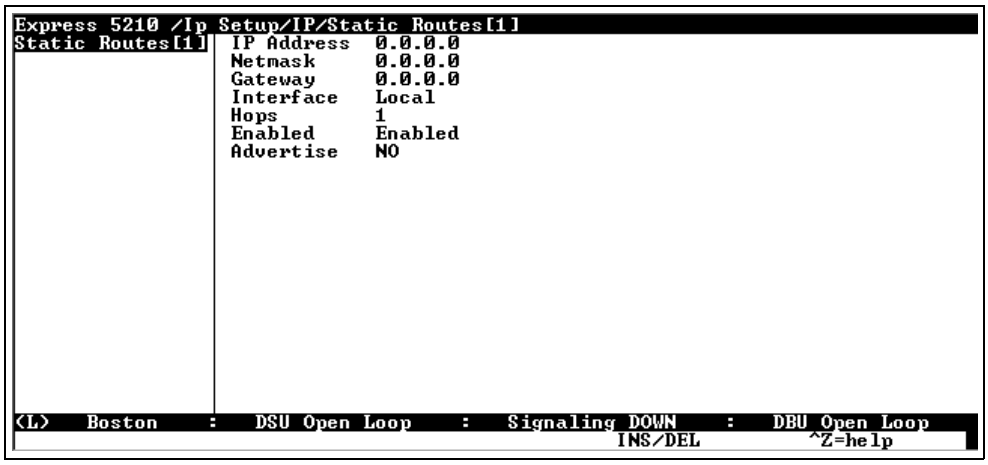


Figure 12-3. Static Routing Menu (Vertical View)

Static Routes Table

The **STATIC ROUTES** menu manages static IP routes. You can create, modify, and delete routes using this menu. The following chart describes the options found in the **STATIC ROUTES** menu:

Option	Description
IP Address	Enter the IP address of the host or network device being routed to. This entry identifies an individual host or an entire subnet. To address an entire subnet, enter a value with the host portion equal to 0.
Netmask	Enter the subnet mask of the selected route's destination host or network. This number determines for routing the number of bits used in the above-defined IP address. If a host address is desired for the IP address, this field must be set to 255.255.255.255.
Gateway	Enter the Gateway's IP address. If an IP packet with an unknown IP address is received, the unit sends it to the Gateway (which is a router or another frame relay device).
Interface	Defines the interface to which IP packets with this address will be routed. These are either ethernet or frame relay DLCIs. The interface list contains both logical and physical interfaces.

Option	Description
Hops	Enter the number of routers located between the Express 5210 and the destination (maximum number of hops = 15).
Enabled	Enable or disable the selected static route.
Advertise	Enable in order to send the static route information to other devices. The **RIP** option must be set to **TX ONLY** or **TX AND RX** in order for this to work (see page 12-8).

ARP Cache

The **ARP CACHE** menu displays the contents of the Express 5210 Address Resolution Protocol (ARP) cache. All resolved cache entries time out after 20 minutes. Unresolved entries time out in 3 minutes.

Option	Description
IP Address	Displays the IP address used for resolving the MAC address.
MAC Address	Displays the address used for resolving the ethernet address. If set to all zeros, there is no resolution for that address.
Time	Displays the minutes since the entry was last referenced.
Type	Defines this entry as dynamic or static.
Interface	Displays the interface upon which this entry was found.
Tx Pending	Displays the number of transmit packets pending a reply.

Routes

The **ROUTES** menu provides read-only information for local routes, static routes, and routes learned through RIP. Learned routes can be removed from the listing. See the following chart for descriptions of the information given in this menu.

Option	Description
IP Address	Displays the IP address of the selected route's destination host or network.
Netmask	Displays the subnet mask applied to the destination address.

Option	Description
Gateway	Displays the IP address of the host or router receiving forwarded packets.
Interface	Displays the interface to which IP packets with this address will be routed. ***LOCAL**: Sent directly to the* Express 5210 *router* ***EN0**: IP* Express 5210 *ethernet port* ***ENDPOINT NAME:** (DLCI #)*
Used	Displays the usage count of this routing table entry.
Clr	Select to clear the **USED** count.
Flags	Indicates the properties of this routing table entry, composed of the following letters: ***H** - route is a host route* ***G** - route is a gateway route* ***D** - route learned dynamically from RIP* ***I** - route learned from an ICMP redirect* ***P** - route is private and is not advertised with RIP* ***T** - route is to a triggered port (updated only when table changes)*
Hops	Displays the number of router hops required to get to the network or host. Ranges from 0 to 16. If set to 16, it is defined as infinite and cannot be routed.
TTL	Time to live. Displays the number of seconds until the address is removed from table. Value of 999 means the route is static.

Interfaces

The **INTERFACES** menu configures and monitors all interfaces connected to the Express 5210. See the following chart for descriptions of each field.

Option	Description
Network Name	Displays the name of the interface connected to the Express 5210 router. See the section *Network Name Entries* on page 12-9 for an explanation of how names in this field are acquired. Possible entries are listed below: ***EN0 IP:*** Express 5210 *ethernet port* ***ENDPOINT NAME:** (DLCI #)*

Option	Description
Address	Defines the individual interface IP address. If this field is left as 0.0.0.0, it is treated as an unnumbered interface.
Subnet Mask	Defines the subnet mask applied to the address defined for this link. If the subnet mask is unnumbered, leave as 0.0.0.0.
IARP	The Inverse ARP (**IARP**) field is only present when this is a frame relay network interface. The Express 5210 always responds to IARP requests with its IP address for the requested DLCI. ***ENABLE*****:** *The unit sends IARP packets in order to determine the IP address on the other end of the virtual circuit. If the IARP packet is responded to, a route is placed in the IP route table.* ***DISABLE*****:** *The* Express 5210 *responds to IARP requests with its IP address for the requested DLCI. If set to* ***DISABLE****, the* Express 5210 *does not generate IARP request packets.*
Far-End Address	The **FAR-END ADDRESS** field is present for PPP, SLIP, and frame relay network interfaces (with **IARP** disabled). The IP address of the device on the other end of the virtual circuit may be specified. A static route to the far end network will be added using the interface subnet mask if nonzero. If 0.0.0.0 has been specified for the subnet mask, a default subnet mask is used based on the class of the **FAR-END ADDRESS**.
MTU	Defines maximum number of bytes in a datagram transmitted over this interface.
RIP	**RIP** selections vary depending on selections made for **MODE**. See the following section, *RIP Selections on page 12-9*, for more information.
Proxy ARP	Enables the interface to respond to ARP broadcasts for networks which are present in the route table.

Network Name Entries

Logical network interfaces appear in the **NETWORK NAME** field in one of the following ways:

- Through configuration of the DTE port.

  When setting up the DTE port for **SDLC**, **TRANSPARENT BOP**, *or* **TRANSPARENT ASYNC** *protocol, the* **OUTGOING DLCI** *field identifies a logical network interface.*

- Through configuration of the network port.

  When setting up the **PVC OPTIONS** *table under* **NETWORK CONFIGURATION**, *setting* **IP INTERFACE** *to* **ENABLED** *identifies a logical network interface for that entry's DLCI.*

- Through the frame relay network.

  DLCIs are learned through full status messages received from the frame relay switch.

The only way to delete items from the **NETWORK NAME** field is through the **NETWORK CONFIGURATION** menu (**CONFIGURATION** -> **NETWORK** -> **PVC OPTIONS** -> **IP INTERFACE**). Set **IP INTERFACE** to **DISABLED** to delete the entry for the related DLCI. See the section *IP Interface* on page 9-9 for more information.

RIP Selections

Selections in this menu vary depending on selections made for **MODE**. See the following charts:

Selections available for RIP MODE option	
Mode	Select **MODE** to configure RIP for this virtual circuit. ***TX ONLY**: RIP advertisements are periodically transmitted, but received RIP packets are not processed.* ***RX ONLY**: RIP advertisements are not transmitted, but received RIP packets are processed.* ***TX AND RX**: RIP advertisements are periodically transmitted, and received RIP packets are processed.*

Additional selections available when MODE option = TX AND RX or TX ONLY	
Protocol	Sets the version of RIP being used on this interface. The options are **V1** and **V2**.
Method	Defines the method used to send RIP route advertisements. The options are listed below: ***NONE***: All routes in the router table are advertised through this interface with no modification on the routing metric. ***SPLIT HORIZON***: Only advertises routes not learned through the interface. ***POISON REVERSE***: All routes are advertised, but the routes learned through this interface are "poisoned" with an infinite route metric.
Updates	Defines when RIP advertisements are transmitted. The options are listed below: ***PERIODIC***: RIP advertisements are periodically transmitted. ***TRIGGERED***: RIP advertisements are transmitted only when new routes are learned, and learned routes do not age.
Authentication	When enabled, the unit requires all received RIP V2 packets to be authenticated against the configured **V2 SECRET**. This menu is only available if **PROTOCOL** is set to **V2**.
V2 Secret	Sets the global RIP V2 password. Routes are advertised and installed contingent on this parameter. This menu is only available if **AUTHENTICATION** is **ENABLED**.

Ping

Use the **PING** section of the **IP SETUP** menu to test the connection between the Express 5210 and another unit by sending ping requests to a specific IP address.

IP Address
Enter the IP address of the unit the Express 5210 is sending an echo request (ping) to.

If the IP address is not manually configured into the IP route table, the path will be determined dynamically through RIP and inverse ARP protocols.

Count
Enter the number of pings to be sent (1 to 99).

Size <bytes>
Enter the number of data bytes to send with each ping.

Timeout <ms>
Enter the maximum time to wait for a ping response.

Round Trip Min
This field shows the shortest round-trip delay of the received responses. Round-trip delay is counted from the time the ping is sent until the response is received.

Round Trip Avg
This field shows the average response time based on all received responses.

Round Trip Max
This field shows the longest round-trip delay of the received responses. If a response is not received before the unit times out, the delay is not calculated in.

Tx Stats
Results are shown as the ping test is being performed. The **START** command causes the Express 5210 to send ping requests to the target station. As the test progresses, the following results are shown:

TXed	This field shows the number of pings sent.
RXed	This field shows the number of responses received from the pinged device.
Lost	This field shows the number of ping requests sent that were not responded to.

Reset Stats
This selection clears the **PING** test results.

Start/Stop
This selection activates a **PING** test or stops one already in progress.

Chapter 13 Statistics

For descriptions of the terminal **STATISTICS** menus see the following section, *Viewing Statistics Information (Terminal Interface)*. For front panel menu descriptions, see the section *Viewing Statistics Information (Front Panel)* on page 13-11.

VIEWING STATISTICS INFORMATION (TERMINAL INTERFACE)

Select **VIEW STATISTICS** from the **MAIN** menu to access the **STATISTICS MENU** shown in Figure 13-1. From this menu, select to view port (DTE, Network, DBU, or Ethernet), system or voice statistics. Select **RESET STATISTICS** to clear all current information.

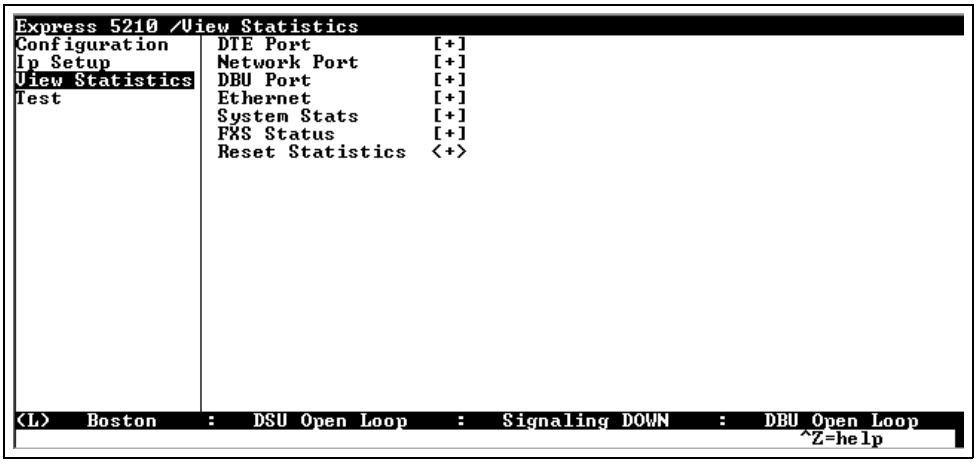


Figure 13-1. Main Statistics Screen

Menu Viewing Options

Some statistics are given in two formats: view by **INTERVALS** and view by **DAYS**. Once a viewing format is selected, the statistics can be viewed horizontally or vertically. The viewing choices are described in the following sections.

Selecting a View Format (Intervals or Days)

View by Interval

In this view, the first interval selection is a running total for the current day. All other selections are grouped into user-configured time frames with the most recent information displayed first. The first interval's header displays the current date, and the interval selections which follow display the time the intervals began. In order to categorize the intervals by date also, the midnight time stamp is replaced with the date. Note that this column still represents the timed interval (not a day's worth of information).

To configure the interval time frame, go to the **SYSTEM CONFIGURATION** menu and select **HISTORY INTERVAL SIZE.** Then enter the time you want the history interval to be set for (from 5 to 30 minutes, in five-minute intervals). The Express 5210 gathers and displays the information according to the time selected. An

example of a **STATISTICS** screen in the **INTERVALS** view format is shown in Figure 13-2.

The Express 5210 cuts the first gathering session short in order to begin falling on the selected time boundary. For example: If the unit or the statistics information was last reset at 12:03 and the History Interval Size is set for five minutes, then the first interval session will last only two minutes. Therefore, the earliest interval column (i.e., the interval listed last if no intervals have been deleted yet) normally represents a time shorter than the other columns.

View by Day

This view provides historical information for the last seven days (not including the current day). The most recent information is displayed first.

The first day's information (i.e., the last listing) does not represent a full day's worth of information (unless the unit or the statistics information was reset at exactly 12 AM).

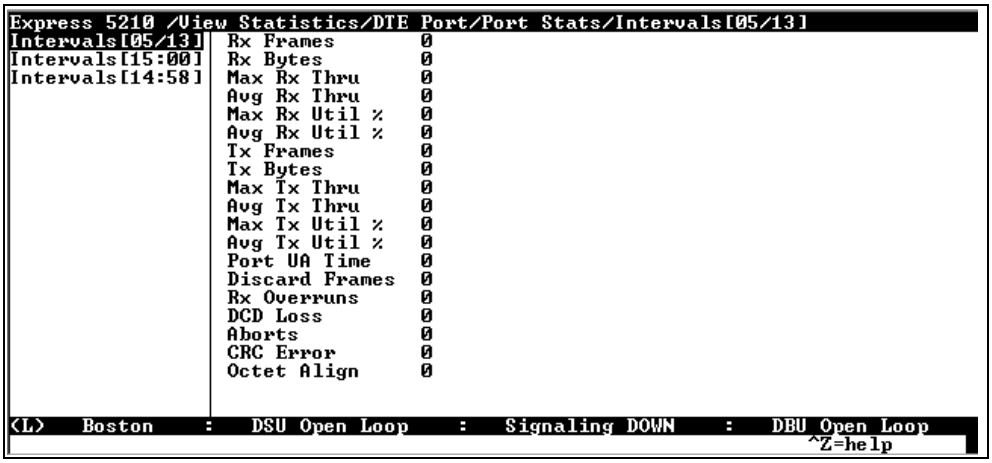


Figure 13-2. Example of Interval View

Horizontal or Vertical Display

View statistical information either horizontally or vertically, according to your preference. When you first enter the statistics menu, the unit defaults to the horizontal presentation. When the fields are displayed horizontally, scroll using your left and right arrow keys to view the fields not shown on the current screen.

To set the screen to vertical presentation (as shown in Figure 13-2), use the arrow keys to highlight the left-most column of one of the rows (this will be either the date or time, depending on the viewing type selected). Press **Enter**. When the fields are displayed horizontally, scroll using your up and down arrow keys to view the fields not shown on the current screen.

DTE Port Statistics

The following sections describe the information given for the **DTE PORT**.

Port Stats

When you select **PORT STATS** from the **DTE PORT STATISTICS** menu, the following information is given:

Statistics Field	Description
Rx Frames	Total frames received.
Rx Bytes	Total bytes received.
Max Rx Thru Avg Rx Thru	Maximum/average throughput sample in the receive direction for the given interval. This is displayed in kbps.
Max Rx Util% Avg Rx Util%	Maximum/average utilization sample in the receive direction for the given interval. Utilization is displayed as a percentage of port bandwidth.
Tx Frames	Total frames transmitted.
Tx Bytes	Total bytes transmitted.
Max Tx Thru Avg Tx Thru	Maximum/average throughput sample in the transmit direction for the given interval. This is displayed in kbps.
Max Tx Util% Avg Tx Util%	Maximum/average utilization sample in the transmit direction for the given interval. Utilization is displayed as a percentage of port bandwidth.
Port UA Time	Time in seconds the DTE port is unavailable for data delivery. This means that the DDS link is down or in test, or that the frame relay signaling state is down.
Signal Down Time	Time in seconds the signaling state is down.

Statistics Field	Description
Signal Error	Number of signal frames received with PVC signaling protocol violations.
Signal T/O	Number of T392 timeouts that have occurred.
Sig State Chg	Number of changes in the signaling protocol state.
Rx Full Status Tx Full Status	Number of full status polls received/transmitted on the DTE port.
Rx LI Only Tx LI Only	Number of link integrity (LI) only polls received/transmitted on the DTE port.
Async Status	Number of asynchronous status messages received by the Express 5210.
Discard Frame	Number of frames discarded by the Express 5210 due to bad IP frames received on the dedicated management DLCI, transmission errors, or link violations.
Rx Overruns	Number of FIFO (first in first out) messages received. The external clock for the network port is too fast.
DCD Loss	Total times the data carrier detect signal was lost.
Aborts	Number of frames received without a closing flag. This transmission error is also reflected in the **DISCARD FRAME** field.
CRC Error	Number of frames received with CRC violations. This transmission error is also reflected in the **DISCARD FRAME** field.
Octet Align	Number of frames received with a bit count that does not fall on 8-bit boundaries. This transmission error is also reflected in the **DISCARD FRAME** field.
Length Error	Number of frames received with fewer than 5 octets or greater than 4500 octets. This link violation is also reflected in the **DISCARD FRAME** field.
EA Violation	Number of frames received with an error in the extended address (EA) bit field of the frame relay header.
Encap Error	Number of frames received on a dedicated management DLCI that have RFC 1490 errors. These errors are also reflected in the **DISCARD FRAME** field.
Inactive DLCI	Number of frames received on an inactive DLCI.
Invalid DLCI	Number of frames received on a DLCI that is out of range. The valid DLCI range is 16-1007.
Unrouteable	Number of frames received on a DLCI that is not recognized by the unit.

DLCI Stats

Select **DLCI STATS** from the **DTE PORT STATISTICS** menu to access information on DLCIs related to the Express 5210 **DTE** port. The statistics given in this menu are described in the following chart:

Statistics Field	Description
Rx Frames	Total frames received.
Rx Bytes	Total bytes received.

Statistics Field	Description
Max Rx Thru Avg Rx Thru	Maximum/average throughput sample in the receive direction for the given interval. This is displayed in kbps.
Max Rx Util% Avg Rx Util%	Maximum/average utilization sample in the receive direction for the given interval. Utilization is displayed as a percentage of port bandwidth.
Tx Frames	Total frames transmitted.
Tx Bytes	Total bytes transmitted.
Max Tx Thru Avg Tx Thru	Maximum/average throughput sample in the transmit direction for the given interval. This is displayed in kbps.
Max Tx Util% Avg Tx Util%	Maximum/average utilization sample in the transmit direction for the given interval. Utilization is displayed as a percentage of port bandwidth.
Time in DBU	The amount of time (in seconds) that the DLCI has been in dial backup mode.
PVC IA Time	Time in seconds that the PVC is in the inactive state.
Rx FECN Tx FECN	Number of frames received/transmitted on this port over the specified DLCI with the FECN bit of the frame relay header enabled.
Rx BECN Tx BECN	Number of frames received/transmitted on this port over the specified DLCI with the BECN bit of the frame relay header enabled.
Rx DE Tx DE	Number of frames received/transmitted on this port over the specified DLCI with the discard eligibility (DE) bit of the frame relay header enabled.
Rx CR Tx CR	Number of frames received/transmitted on this port over the specified DLCI with the CR bit of the frame relay header enabled.
Lost Frames	Number of frames lost across the PVC. This field is applicable only if the **SEQUENCE NUMBER CHECKING** option is **ENABLED**. See the section *Seq Num Checking (SEQ #)* on page 9-8.
Rmt Lost Frames	Number of lost frames reported by the remote Express 5210. This field is applicable only if the **SEQUENCE NUMBER CHECKING** option is **ENABLED**. See the section *Seq Num Checking (SEQ #)* on page 9-8.
Rx Burst Seconds Tx Burst Seconds	Amount of time (in seconds) that throughput in the receive/transmit direction is greater than CIR.
Min Rx Frame Max Rx Frame Avg Rx Frame	Size of smallest/largest/average frame received across the DLCI.
Min Tx Frame Max Tx Frame Avg Tx Frame	Size of smallest/largest/average frame transmitted across the DLCI.
Min Frame Delay Max Frame Delay Avg Frame Delay	Minimum/maximum/average round trip delay of the DLCI. This field is applicable only if the network port's **PVC DELAY MEASUREMENT** option is **ENABLED**. See the section *Delay Measurement (PVC DELAY)* on page 9-8.
PVC State Change	Number of changes in the PVC state.

DTE Status

If a lead is active on the **DTE** port, it is listed as **ON** in the **DTE STATUS** menu.

CTS	Clear to send
RTS	Request to send
DTR	Data terminal ready
DSR	Data set ready
DCD	Data carrier detect

Network Port Statistics

The following sections describe statistical information available for the network port.

Port Stats

When you select **PORT STATS** from the **NETWORK PORT STATISTICS** menu, the following statistics are given:

Statistics Field	Description
Rx Frames	Total frames received.
Rx Bytes	Total bytes received.
Max Rx Thru Avg Rx Thru	Maximum/average throughput sample in the receive direction for the given interval. This is displayed in kbps.
Max Rx Util% Avg Rx Util%	Maximum/average utilization sample in the receive direction for the given interval. Utilization is displayed as a percentage of port bandwidth.
Tx Frames	Total frames transmitted.
Tx Bytes	Total bytes transmitted.
Max Tx Thru Avg Tx Thru	Maximum/average throughput sample in the transmit direction for the given interval. This is displayed in kbps.
Max Tx Util% Avg Tx Util%	Maximum/average utilization sample in the transmit direction for the given interval. Utilization is displayed as a percentage of port bandwidth.
Port UA Time	Time in seconds the network port is unavailable for data delivery. This can mean that the link is down or in test, or that the PVC signaling state is down.
Signal Down Time	Time in seconds the signaling state is down.
Signal Error	Number of signal frames received with PVC signaling protocol violations.

Statistics Field	Description
Signal T/O	Number of T392 timeouts that have occurred.
Sig State Chg	Number of changes in the signaling protocol state.
Rx Full Status Tx Full Status	Number of full status polls received/transmitted on the network side.
Rx LI Only Tx LI Only	Number of link integrity (LI) only polls received/transmitted on the network side.
Async Status	Number of asynchronous status messages received by the Express 5210.
Discard Frame	Number of frames discarded by the Express 5210 due to bad IP frames received on the dedicated management DLCI, transmission errors, or link violations.
Rx Overruns	Number of FIFO (first in first out) messages received. The external clock for the network port is too fast.
DCD Loss	Total times the data carrier detect signal was lost.
Aborts	Number of frames received without a closing flag. This transmission error is also reflected in the **DISCARD FRAME** field.
CRC Error	Number of frames received with CRC violations. This transmission error is also reflected in the **DISCARD FRAME** field.
Octet Align	Number of frames received with a bit count that does not fall on 8-bit boundaries. This transmission error is also reflected in the **DISCARD FRAME** field.
Length Error	Number of frames received with fewer than 5 octets or greater than 4500 octets. This link violation is also reflected in the **DISCARD FRAME** field.
EA Violation	Number of frames received with an error in the extended address (EA) bit field of the frame relay header.
Encap Error	Number of frames received on a dedicated management DLCI that have RFC 1490 errors. These errors are also reflected in the **DISCARD FRAME** field.
Inactive DLCI	Number of frames received on an inactive DLCI.
Invalid DLCI	Number of frames received on a DLCI that is out of range. The valid DLCI range is 16-1007.
DDS State Chg	Count of state changes for the network port.
DDS UA Time	Time in seconds the network port is unavailable for data delivery. This means that the link is down or in test, or that the frame relay signaling state is down.
BPV/Frame Err	Number of frames received containing a bipolar violation or a frame error.

DLCI Stats

Select **DLCI STATS** from the **NETWORK PORT STATISTICS** menu to access information on DLCIs related to the Express 5210 **Telco** port. The fields in this menu are the same as the fields in the **DLCI STATS** portion of the **DTE PORT STATISTICS** menu (described on page 13-5).

DLCI List

This menu lists all available DLCIs and classifies them as being in an **ACTIVE**, **INACTIVE**, or **UNKNOWN** state. The menu also gives the following information for each DLCI:

Statistics Field	Description
Rx Frames Tx Frames	Total frames received/transmitted.
Rx FECN Tx FECN	Number of frames received/transmitted on the network port over the specified DLCI with the FECN bit of the frame relay header enabled.
Rx BECN Tx BECN	Number of frames received/transmitted on the network port over the specified DLCI with the BECN bit of the frame relay header enabled.
Rx CR Tx CR	Number of frames received/transmitted on the network port over the specified DLCI with the CR bit of the frame relay header enabled.
Rx DE Tx DE	Number of frames received/transmitted on the network port over the specified DLCI with the discard eligibility (DE) bit of the frame relay header enabled.
Rx Bytes Tx Bytes	Total bytes received/transmitted.

DBU and Ethernet Statistics

The following chart describes the statistics available for the DBU and ethernet interfaces:

Statistics Field	Description
Rx Frames	Total frames received.
Rx Bytes	Total bytes received.
Max Rx Thru Avg Rx Thru	Maximum/average throughput sample in the receive direction for the given interval. This is displayed in kbps.
Max Rx Util% Avg Rx Util%	Maximum/average utilization sample in the receive direction for the given interval. Utilization is displayed as a percentage of port bandwidth.
Tx Frames	Total frames transmitted.
Tx Bytes	Total bytes transmitted.
Max Tx Thru Avg Tx Thru	Maximum/average throughput sample in the transmit direction for the given interval. This is displayed in kbps.
Max Tx Util% Avg Tx Util%	Maximum/average utilization sample in the transmit direction for the given interval. Utilization is displayed as a percentage of port bandwidth.
Discard Frame	Number of frames discarded by the Express 5210 due to bad IP frames received on the dedicated management DLCI, transmission errors, or link violations.

Statistics Field	Description
Rx Overruns	Number of FIFO (first in first out) messages received. The external clock for the network port is too fast.
DCD Loss	Total times the data carrier detect signal was lost.
Aborts	Number of frames received without a closing flag. This transmission error is also reflected in the **DISCARD FRAME** field.
CRC Error	Number of frames received with CRC violations. This transmission error is also reflected in the **DISCARD FRAME** field.
Octet Align	Number of frames received with a bit count that does not fall on 8-bit boundaries. This transmission error is also reflected in the **DISCARD FRAME** field.

System Statistics

The system time and date (as set in the **SYSTEM CONFIGURATION** menu), the software revision, and the ethernet address are displayed in this menu. Also, the elapsed time since the unit was turned on (or since the last restart) is given in seconds. The buffer information provided in this menu is used mainly by ADTRAN technical support in troubleshooting situations. See Figure 13-3.

Statistics Field	Description
Buffer Stats	The buffer information provided in this menu is used mainly by ADTRAN Technical Support in troubleshooting situations.
Version Checksum	Current software revision.
System Date	Displays the date set in the **SYSTEM CONFIGURATION** menu.
System Time	Displays the time set in the **SYSTEM CONFIGURATION** menu.
Elapsed Time	Displays the time elapsed since the unit was turned on or since the last restart.
Ethernet Address	Displays the unit's ethernet address.

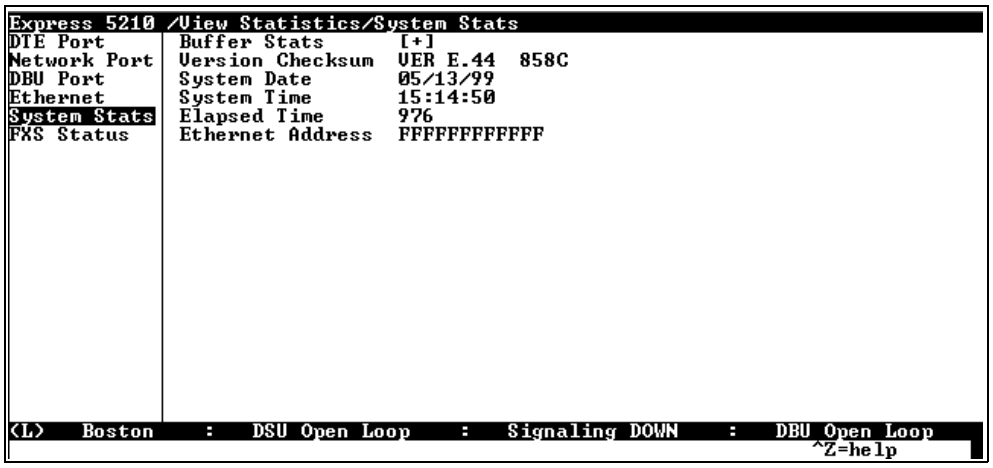


Figure 13-3. View System Statistics Menu

Voice Status

Selecting **FXO**, **FXS**, or **E&M STATUS** displays status information for lines one and two of the FXS, FXO, or E&M voice card (if installed). Possible states are **ON HOOK**, **OFF HOOK**, and **RINGING**. This menu also displays the part number of the voice card.

VIEWING STATISTICS INFORMATION (FRONT PANEL)

Select **STATS** from the main front panel menu. From this menu, choose to view **DTE**, **NETWORK PORT**, **DBU PORT**, **DLCI**, **SYSTEM**, or **FXS**/**FXO**/**E&M** statistics. Scroll through the screens using the arrow keys. The number displayed in reverse video in the upper right-hand corner of the screen indicates which port the displayed information applies to (1=DTE, N=Network, D=DBU).

Front panel **STATS** *screens display information for the current day interval. The counts clear at midnight.*

DTE Port Statistics

The following information is displayed when **DTE** is selected.

Control Signal Status Screen
An asterisk (*) indicates that the signal is active for the DTE port. See Figure 13-4.

RS	request to send
TR	data terminal ready
CS	clear to send
CD	carrier detect
SR	data set ready

Figure 13-4. Front Panel Control Signal Status Screen

Frames In
Total received frames.

Frames Out
Total transmitted frames.

Errored Frames
Total errored frames received.

Overrun Errors
Receive FIFO (first in first out) overrun. External clock for network port is too fast.

DCD Loss Errors
Total times the data carrier detect signal was lost.

CRC Errors
Frames received with CRC16 violations (not available when **TRANSPARENT ASYNC**, **PPP ASYNC**, or **SLIP** protocol is selected).

Abort Frames
Frames received with abort sequence of seven ones (not available when **TRANSPARENT ASYNC**, **PPP ASYNC**, or **SLIP** protocol is selected).

Octet Align
Synchronous frames received which are violating maximum frame size or are not octet-aligned (not available when **TRANSPARENT ASYNC**, **PPP ASYNC**, or **SLIP** protocol is selected).

Async Frame Errors
Async frames received which are violating maximum frame size or are not octet-aligned (*only* available when **TRANSPARENT ASYNC**, **PPP ASYNC**, or **SLIP** protocol is selected).

Parity Errors
Frames received with parity errors (*only* available when **TRANSPARENT ASYNC**, **PPP ASYNC**, or **SLIP** protocol is selected).

Breaks
Async break characters received (*only* available when **TRANSPARENT ASYNC**, **PPP ASYNC**, or **SLIP** protocol is selected).

Network Port Statistics

The following information is available when **NET** is selected from the **STATS** menu.

Control Signal Status Screen
An asterisk (*) indicates that the signal is active for the network port. See Figure 13-4.

RS	request to send
TR	data terminal ready

CS	clear to send
CD	carrier detect
SR	data set ready

Signal State
Current state of frame relay port (up or down). See Figure 13-5.

Signal State Change
Number of changes in the signaling protocol state.

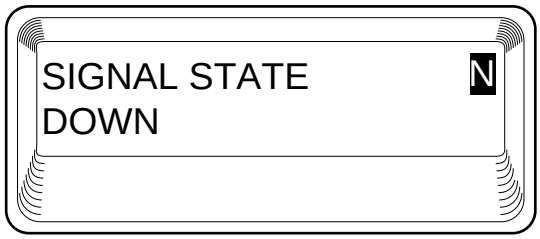


Figure 13-5. Front Panel Signal State Screen

Signal Timeouts
Total timeouts that have occurred.

Signal Errors
Total signal errors received.

Frames In
Total received frames.

Frames Out
Total transmitted frames.

Errored Frames
Total errored frames received.

Overrun Errors
Receive FIFO (first in first out) overrun. External clock for network port is too fast.

DCD Loss Errors
Total times the data carrier detect signal was lost.

CRC Errors
Frames received with CRC16 violations.

Abort Frames
Frames received with abort sequence of seven ones.

Octet Align
Synchronous frames received which are violating maximum frame size or are not octet-aligned.

DBU Status

The following information is available when **DBU** is selected from the **STATS** menu.

DBU Status
Current state of the DBU circuit.

Control Signal Status Screen
An asterisk (*) indicates that the signal is active for the DBU port. This screen only applies when the DCE card is being used for dial backup.

RS	request to send
TR	data terminal ready
CS	clear to send
CD	carrier detect
SR	data set ready

Time in DBU
The amount of time (in seconds) that the unit has been in dial backup mode.

Frames In
Total received frames.

Frames Out
Total transmitted frames.

Errored Frames
Total errored frames received.

Overrun Errors
Receive FIFO (first in first out) overrun. External clock for port is too fast.

DCD Loss Errors
Number of frames received on the dial backup circuit experiencing a loss of carrier detect.

CRC Errors
Number of frames received on the dial backup circuit with CRC violations.

Abort Frames
Total frames received on the dial backup circuit without a closing flag.

DLCI List

This menu lists all available DLCIs and classifies them as **ACTIVE**, **INACTIVE**, or **UNDEFINED**.

System Status

Select **SYSTEM** from the **STATS** menu to display the software version and checksum. This screen is shown in Figure 13-6. Press the down arrow to view the current date, current time, the elapsed

time, and the ethernet address. See Figure 13-7 and Figure 13-8. Press **Cancel** to return to the main **STATS** menu.

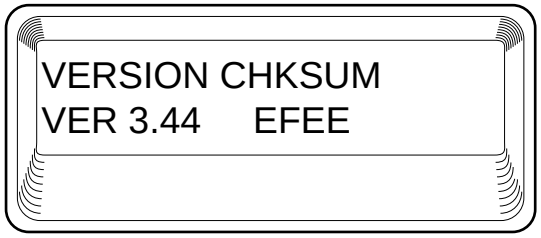


Figure 13-6. Front Panel System Status Screen

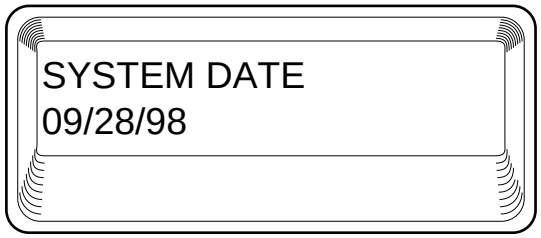


Figure 13-7. Front Panel System Date Screen

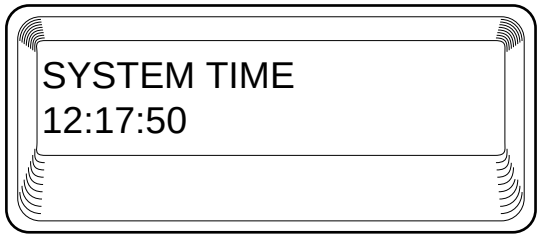


Figure 13-8. Front Panel System Time Screen

FXS/FXO/E&M Port Status

The first two voice port LCD screens display the current state of the voice ports (L1 and L2). Possible states are **ON HOOK**, **OFF HOOK**, and **RINGING**. The third screen displays the voice module's part number.

Chapter 14 Testing

This menu allows you to activate PVC loopback tests and perform voice port diagnostics. See Figure 14-1 for the terminal **TEST** menu. See Figure 14-2 for the front panel menu tree.

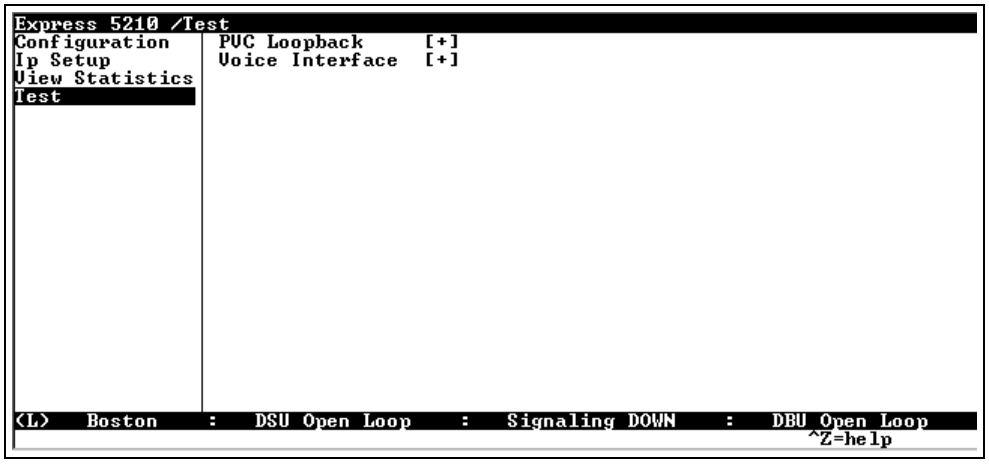


Figure 14-1. Terminal Test Menu

In this chapter the terminal selections are listed first, followed by the front panel selections (if the names differ).

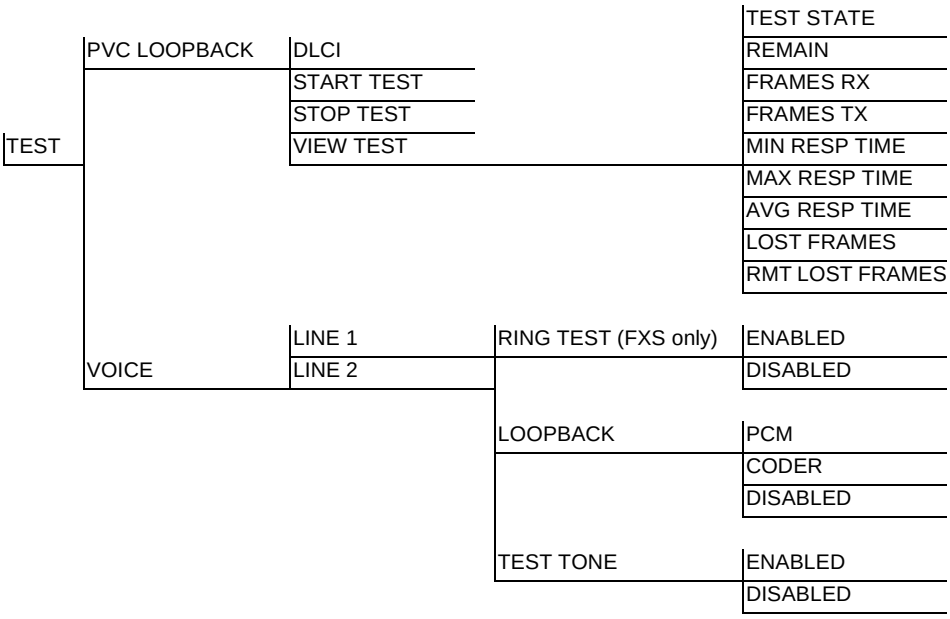


Figure 14-2. Front Panel Test Menu

PVC Loopback

A **PVC LOOPBACK** test is a non-intrusive loopback option for each PVC. During this test, the Express 5210 periodically sends test frames to the remote Express 5210 which are then returned for analysis. The bandwidth required is approximately 1 kbps for each PVC in test. The following sections describe the **PVC LOOPBACK** test options for the terminal (page 14-3) and the front panel (page 14-4).

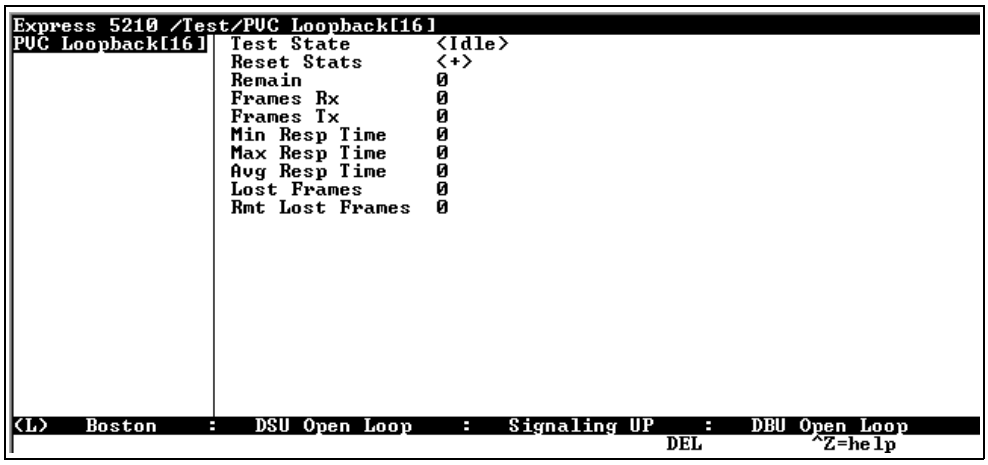


Figure 14-3. PVC Loopback Menu

Terminal PVC Loopback Selections

Select the DLCI of the PVC to be tested from the left-hand side of the **PVC LOOPBACK** terminal menu (shown in Figure 14-3). The following menu items appear on the right-hand side:

Test State
Displays current state of the test on the selected DLCI. Possible states follow:

- **Active**: The test is currently active on this DLCI.
- **Idle**: No test is active on this DLCI.

Reset Stats
This selection clears the **FRAMES RX** and **FRAMES TX** fields.

Remain
Amount of time (in minutes) that you want the unit to remain in test. Enter 0 for a continuous test.

Frames Rx
Number of frames received on the selected PVC during the current loopback test.

Frames Tx
Number of frames transmitted across the selected PVC during the current loopback test.

Min/Max/Avg Response Time
Minimum, maximum, and average round-trip time (in seconds) for the current test.

Lost Frames
Number of frames lost in the receiving direction (traveling from the remote Express 5210 to the local Express 5210).

Remote Lost Frames
Number of frames lost in the transmitting direction (traveling from the local Express 5210 to the remote Express 5210).

Front Panel PVC Loopback Selections

The following selections appear on the PVC Loopback front panel menu:

DLCI
Enter the **DLCI** of the PVC to be tested (or enter 0 to test all available PVCs).

Start Test
Starts the test.

Stop Test
Ends the test in progress prematurely or terminates a continuous test.

View Test

Descriptions of each field in the **VIEW TEST** menu follow:

Test State	Displays current state of the test on the selected DLCI. Possible states follow: ***ACTIVE***: A test is currently running. ***IDLE***: No test is running.
Remain	Enter the number of seconds that you want the unit to remain in test.
Frames Rx	Number of frames received on the selected PVC during the current loopback test.
Frames Tx	Number of frames transmitted across the selected PVC during the current loopback test.
Min Resp Time	Minimum round-trip time (in seconds) for the current test.
Max Resp Time	Maximum round-trip time (in seconds) for the current test.
Avg Resp Time	Average round-trip time (in seconds) for the current test.
Lost Frames	Number of frames lost in the receiving direction (traveling from the remote Express 5210 to the local Express 5210).
Rmt Lost Frames	Number of frames lost in the transmitting direction (traveling from the local Express 5210 to the remote Express 5210).

Voice Interface (Voice)

Selecting **VOICE INTERFACE** from the **TEST** menu allows you to test the voice connection. The tests described in this section are illustrated in Figure 14-4 on page 14-7. Voice testing is only applicable when an optional voice card is installed in the Express 5210.

Lines 1 and 2

Select **VOICE** from the **TEST** menu, and then select **LINE 1** or **2** to view the options to perform loopback tests, transmit a test tone, or initiate a ring test.

Ring Test

This command cycles the ring generator in a standard 2sec/4sec pattern. This test is applicable for the FXS voice card only. If Unit 2 (shown in Figure 14-4) is set to **RING TEST**, then Phone 2 rings. A call does not have to be up to perform this test.

Loopback

If Unit 1 (shown in Figure 14-4) is set to **LOOPBACK**, then you can hear yourself on Phone 1. A call does not have to be up to perform this test. Choose either a **PCM** or **CODER** loopback test (or choose to **DISABLE** this option). The selections are described in the following chart:

PCM	This test loops the analog channel before the compression/decompression is performed.
Coder	This test loops the analog channel after compression/decompression is performed.

Test Tone

This command transmits a 1 kHz test tone towards the digital network. If Unit 1 is set to **TEST TONE**, it is heard on Phone 2 (see Figure 14-4). A call has to be up to perform this test.

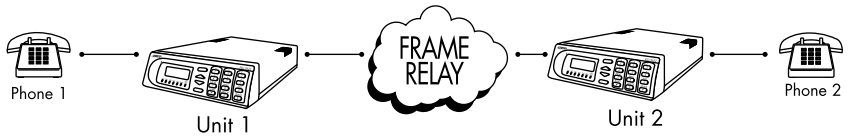


Figure 14-4. Voice Testing

Chapter 15 Activating DBU Functions

DIAL OPTIONS

The dial options available from the Main menu appear in Figure 15-1. These options are only available when a DBU card is installed.

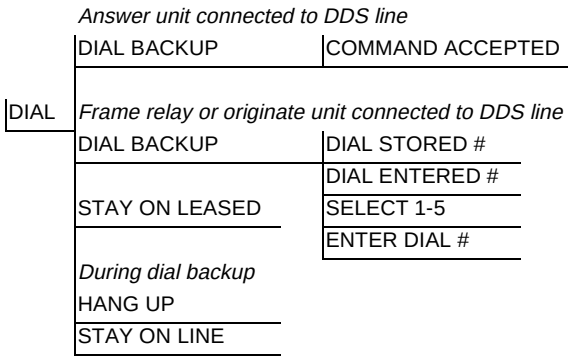


Figure 15-1. DBU Options Menu

DDS Answer

The following option is available when the answer unit is connected to the DDS line.

Dial Backup

The Express 5210 waits for an incoming call. When an incoming call is detected, the Express 5210 answers the call and enters dial backup.

Frame Relay/DDS Originate

The following options are available when the network port is running frame relay or when the originate unit is connected to the DDS line.

Dial Backup
The Express 5210 prompts to dial a stored number, enter a number to dial for dial backup, or redial the last number dialed.

Stay on Leased
The Express 5210 remains on the leased line and does not enter dial backup mode.

Dial Backup

The following options are available during dial backup.

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

Stay On Line
The Express 5210 remains in dial backup mode and returns to the **STATISTICS** menu.

Appendix A Pinouts

The following tables give the pin assignments for the connectors located on the back of the Express 5210, the DBU cards, the DCE card, and the Voice cards. For more information on the connectors, see the section *Rear Panel* on page 2-2.

Table A-1. Telco Connector Pin Assignments

Pin	Name	Description
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

Table A-2. Control Connector Pin Assignments

RJ Pin#	Function	Direction
1	GND	
2	RTS	I
3	TD	I
4	DSR	O
5	RD	O
6	CTS*	O
7	DTR	I
8	DCD	O
*Used for hardware flow control.		

Table A-3. 10BaseT Connector Pin Assignments

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

Table A-4. DTE Connector Pin Assignments

Pin	EIA	Description
1	AA	Protective Ground (PG)
2	BA	Transmit Data (SD)
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 (DTR)
21	-	Remote Loopback (RL)
22	CE	Ring Indicator (RI)
24	DA	External TX Clock (ETC)
25	-	Test Indicator (TI)

V.35 Adapter Cable

The V.35 adapter cable allows the Express 5210 to interface with DTE equipment using a **V.35** interface. This six-foot cable supports data rates of 2.4 kbps to 512 kbps.

ADTRAN part numbers:

male V.35 connector	1200193L1
female V.35 connector	1200194L1

Table A-5. V.35 Connector Pin Assignments

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 (DSR)
F	109	Received Line Signal Detector (CD)
H	-	Data Terminal Ready (DTR)
J	-	Ring Indicator (RI)
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-6. DBU Card Pin Assignments

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 1B+D ISDN		
1-3	-	Not Used
4	T	Network-Tip
5	R	Network-Ring
6 - 8	-	Not Used

Table A-7. Voice Card Connector Pin Assignments

RJ Pin #	Function
Dual FXS Card	
4	Ring
5	Tip
Dual FXO Card	
4	Ring
5	Tip
Dual E&M Card	
1	Ring
2	Tip
3	E Lead
4	Frame Gnd
5	-48 Volts
6	M Lead
7	Tip 1
8	Ring 1

Table A-8. DTE/DCE Connector Pin Assignments (DCE Card Option)

DB25 Pin#	V.35 Pin#	Function	DTE Port Direction	DCE Port Direction
1	A	FGND		
2		TD(EIA-232)	I	O
3		RD(EIA-232)	O	I
4	C	RTS	I	O
5	D	CTS	O	I
6	E	DSR	O	I
7	B	GND		
8	F	DCD	O	I
9		NEG		
10		POS		
11	AA	TC-B(V.35)	O	I
12	Y	TC-A(V.35)	O	I
13	V	RC-A(V.35)	O	I
14	T	RD-B(V.35)	O	I
15		TC(EIA-232)	O	I
16	R	RD-A(V.35)	O	I
17		RC		
18	S	TD-B(V.35)	I	O
19	P	TD-A(V.35)	I	O
20	H	DTR	I	O
21	W	ETC-B(V.35)	I	O
22	-	-	-	-
23	U	ETC-A(V.35)	I	O
24		ETC(EIA-232)	I	O
25	X	RC-B(V.35)	O	I

Appendix B Specifications Summary

SPECIFICATIONS AND FEATURES

This appendix contains the standard specifications and features incorporated in the Express 5210.

Operating Modes

Dedicated point-to-point DDS
Frame relay (CPE terminating point for frame relay UNI service)

Network Data Rates

Dedicated Mode Service Rates: 56 and 64 kbps
External DCE Card: up to 512 kbps
Switched 56: 56 kbps
V.34: 2.4 to 33.6 kbps
ISDN: B-channel rate of 56 or 64 kbps (one or two B-channels)

DTE Rates Provided

Synchronous rates: 2.4 to 512 kbps
Asynchronous rates: 2.4 to 57.6 kbps

DTE Data Interface

DB25 female
EIA-232 electrical and physical interfaces
V.35 electrical, physical with ADTRAN adapter cable

LAN Interface

10BaseT physical
Ethernet frame format

Control Port Interface

Electrical: EIA-232
Physical: RJ-48S (female DB25 adapter provided)
Data rates: async 9.6 to 38.4 kbps

Management

Internal SNMP agent
MIB II RFC 1213
Frame relay DTE MIB RFC 1315
ADTRAN enterprise MIB
VT 100 terminal (local, TELNET, or remote login from other ADTRAN device)
Front panel

Voice Support

Compression
Silence suppression
6.3 - 9.6k compressed voice
MOS-3.9

FAX Support
Group III 0.3-14.4 kbps

Dual FXS
Loop Start 2-wire voice

Line current and ring voltage supplied
R.E.N. - 3
TIA 464A DTMF decode and regeneration
G.165 echo cancellation

Dual FXO
Loop start 2-wire voice

Dual E&M
2- or 4-wire
Type I and II E&M signaling

Protocol Support

Concentrator
Frame relay

IBM Support
SNA/SDLC with local spoofing
SDLC/HDLC transparent
SDLC-LLC2 translation
Supports up to 60 SDLC PUs on each DTE port

Routed Protocols
IP

Routing Support Protocols
RIP versions 1 and 2
ARP
ICMP
IARP

Management Protocols
SNMP
TELNET (server)

IP Datalink Layer Protocols
SLIP
PPP asynchronous
PPP synchronous

Transparent
Asynchronous transparent
BOP transparent (HDLC)

Network Protocol Encapsulation
Routed protocols (IP and IBM) use FRF 3.1 format.
All other protocols use proprietary formats and require ADTRAN devices at each UNI.

Data Flow Control

Synchronous: clock slowing
Asynchronous: CTS

Diagnostics

CSU and DSU loopbacks
IP ping mode
Voice tests
PVC loopback

Line Requirements

Network Interface
Loop transmission parameters as defined in AT&T PUB 62310: Dedicated DDS

DBU Interfaces
AT&T PUB 4146B: Switched 56
RJ-48S, 4-wire, full duplex
V.34: RJ-11
ISDN: RJ-11

Receiver Sensitivity

-45 dB at all rates

Agency Approvals

FCC part 15, Class A and Part 68
Industry Canada CS03
UL and CUL

Environment

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

Physical

Dimensions: 10.4“D x 8.0“W x 2.4“H
Weight: 4.5 lbs.
Power: 115 VAC, 60 HZ, 10 W

Appendix C Acronyms/Abbreviations

ACK..... acknowledgment
ANSI ..... American National Standards Institute
AR..... access rate
ARP ..... address resolution protocol
async ..... asynchronous
BECN ..... backward explicit congestion notification
BOP ..... bit oriented protocol
CCITT..... Consultive Committee for International Telephony and Telegraphy
CD ..... carrier detect
CO ..... central office
CPE..... customer premise equipment
CRC..... cyclic redundancy check
CS ..... clear to send
CSU ..... channel service unit
CTS..... clear to send
dB..... decibel
DBU..... dial backup
DCD ..... data carrier detect
DCE..... data communications equipment
DDS..... digital data service
DE..... discard eligible
DLCI ..... data link connection identifier
DSAP ..... directory scope analysis program

DSR ..... data set ready
DSU ..... data service unit
DTE ..... data terminal equipment
DTR ..... data terminal ready
FECN ..... forward explicit congestion notification
FEP ..... front end processor
FIFO ..... first in first out
FR ..... frame relay
FRAD ..... frame relay access device
HDLC ..... high-speed data link control
IP ..... internet protocol
ISDN ..... integrated services digital network
ITU ..... International Telecommunications Union
KA ..... keep alive
LAN ..... local area network
LED ..... light emitting diode
LLC ..... logical link control
LMI ..... local management interface
LRC ..... lateral redundancy check
MIB ..... management information base
ms ..... millisecond
NRZ ..... non-return to zero
NRZI ..... non-return to zero inverted
OCU ..... office channel unit
OOS ..... out of service
PLAR ..... private line automatic ringdown
PPP ..... point to point protocol
PU ..... physical unit
PVC ..... permanent virtual circuit
RD ..... receive data
RDL ..... remote digital loopback
RFC ..... request for comments
RFECN ..... remote forward explicit congestion notification

RIP..... routing information protocol
RMA..... return material authorization
RR..... receiver ready
RS ..... recommended standard
RTS..... request to send
Rx..... receive
SAP..... service access point
SDLC..... synchronous data link control
SLIP..... serial line internet protocol
SNA..... systems network architecture
SNMP ..... simple network management protocol
SNRM..... set normal response mode
SR ..... data set ready
SVC ..... switched virtual circuit
SW56..... switched 56
sync ..... synchronous
TD..... transmit data
TR..... data terminal ready
Tx..... transmit
UNI..... user-to-network interface
VRC..... vertical redundancy check
WAN..... wide area network
XID ..... exchange identification
XMIT..... transmit

Appendix D Glossary

4-wire Switched 56

An AT&T proprietary 56/64 kbps switched digital data service offered by telco service providers and delivered to users over 4 copper wires. Compatible with the Express 5210 4-wire Switched 56 DBU option.

ANSI

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

asynchronous

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

bandwidth

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

BECN

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

bridge

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

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

CCITT

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

CD

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

clocking

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

CPE

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

CRC

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

CS

See *CTS*.

CSU

channel service unit. A device used to connect a digital phone line (T1 or Switched 56 line) coming in from the phone company to either a multiplexer,

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

CTS

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

dB

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

DCE

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

DDS

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

DE

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

DLCI

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

DSU

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

DSU loopback

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

DTE

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

encapsulation

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

end device

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

FCS

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

FECN

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

file server

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

frame-relay-capable interface device

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

frame relay frame

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

frame relay network

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

HDLC

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

hop

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

host computer

The primary or controlling computer in a multiple computer operation.

in-band

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

ingress

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

interface device

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

ISDN

Integrated Services Digital Network. A network architecture that enables end-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.

LAN

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

out-of-band

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

packet

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

packet-switching network

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

parameter

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

ping

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

point-to-point

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

PVC

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

remote configuration

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

router

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

SDLC

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

service

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

SNMP

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

SR

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

statistical multiplexing

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

switched network

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

synchronous

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

T1

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

trunk line

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

VT 100

A non-intelligent terminal or terminal emulation mode used for asynchronous communications. Used to configure the Express 5210.

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Product Support Information

Pre-Sales 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

Repair and Return

If ADTRAN Technical Support determines that a repair is needed, Technical Support will coordinate with the Customer and Product Service (CAPS) department to issue a Return Material Authorization (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
6767 Old Madison Pike
Progress Center
Building #6 Suite 690
Huntsville, Alabama 35807
RMA # _____