Express 5200
Frame Relay Service Unit

USER MANUAL

1202175L1	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

61202175L1-1A
May 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 5200 highlights. The chapter also gives a brief explanation of options that may be purchased for use with the Express 5200.
- Chapter 2, *Installation*, describes the Express 5200 connectors (pin assignments are given in Appendix A) and provides an installation diagram.
- Chapter 3, *Operation*, explains how to operate your Express 5200 using either the front panel or a VT 100 terminal interface.
- Chapter 4, *Applications*, provides examples of some common Express 5200 applications. This chapter includes network diagrams as well as configuration tables for each example.
- Chapter 5, *Configuration Overview*, explains how to access the Express 5200 Configuration menu.
- Chapter 6 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 Ports, Voice Card Options, Network Port, Dial Backup, IP Routing, and System configuration.
- Chapter 12, *Statistics*, describes how to access statistics information from the Express 5200.
- Chapter 13, *Testing*, explains how to access the Express 5200 diagnostic features, including ping and loopback tests.
- Chapter 14, *Activating DBU Functions*, provides information on the dialing options accessed through the Main menu.
- Appendix A provides pinouts for the Express 5200 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.

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.

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

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.

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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 5200.

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 5200 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 5200 provides an easy-to-use interface for customers migrating existing services or developing new applications for operation over frame relay networks.

The Express 5200 provides high-quality voice and fax capabilities to remote locations without expensive toll charges. In frame relay networks, the Express 5200 allows voice and data to share the same PVC, eliminating unnecessary PVC charges associated with other vendor's 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 5200 provides two independent DTE interfaces for connecting non-frame relay devices to the frame relay network. These ports 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 38.4 kbps are supported. See the appendix *Pinouts* on page A-1 for the pin assignments for these interfaces.

The Express 5200 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 5200 are as follows:

- Dual voice port support; options include Dual FXS, Dual FXO, and Dual E&M
- Two independent DTE data ports
- 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 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 management using ANSI, ITU, or LMI formats
- Easy-to-use VT 100 interface for configuration
- Standard 5 year warranty

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.

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 5200's embedded SNMP feature allows the unit to be accessed and controlled by a network manager through the network interface or through a DTE port running frame relay, SLIP,

or async PPP protocol. The Express 5200 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 5200. TELNET allows a user on a network manager to control the Express 5200 through the terminal menus. See the section *SNA and LAN Application with SNMP/TELNET Management* on page 4-4 for more information.

Voice Compression

The Express 5200 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 5200 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.

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 5200 supports dial backup of point-to-point DDS circuits or point-to-point frame relay circuits. For DDS backup, the Express 5200 enters dial backup based on physical line faults. During dial backup, the Express 5200 monitors the main line integrity and drops the dial backup call when the main line is restored.

For frame relay dial backup, the Express 5200 monitors the physical line condition as well as the signaling state of the frame relay circuit. A loss of signaling on either end of the circuit causes the Express 5200 to enter dial backup. During dial backup, the Express 5200 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.

For frame relay dial backup, either Express 5200 can originate a dial backup connection. The answer/originate option has no effect in frame relay mode.

Only point-to-point frame relay is supported with the Express 5200. The Express 5200 only supports one network connection at a time. Therefore, when a dial backup connection is made, the main network port is disconnected from the data path. This isolates any other nodes on a frame relay network if a dial backup connection is established with a single node.

The Express 5200'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. The four backup options are described in the following sections. Contact the local telco provider to determine which services are available in your area.

Card Options

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 a switched 56/64 kbps circuit.

DCE Card

This module connects an external DCE device to the Express 5200 for the purpose of using an external DSU/CSU to support access rates up to 512 kbps. The DCE card is inserted into the DBU card slot, but it is not used for dial backup.

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 on the inside back cover of this manual.

Chapter 2 Installation

UNPACK, INSPECT, POWER UP

Receiving Inspection

Carefully inspect the Express 5200 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 (see the back cover of this manual). Keep the original shipping container to use for future shipment or verification of damage during shipment.

ADTRAN Shipments Include

The following items are included in ADTRAN shipments of the Express 5200:

- Express 5200 unit
- User manual
- An 8-position modular to 8-position modular 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 5200 MIB is available in the support section of the ADTRAN Web page at www.adtran.com.

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

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

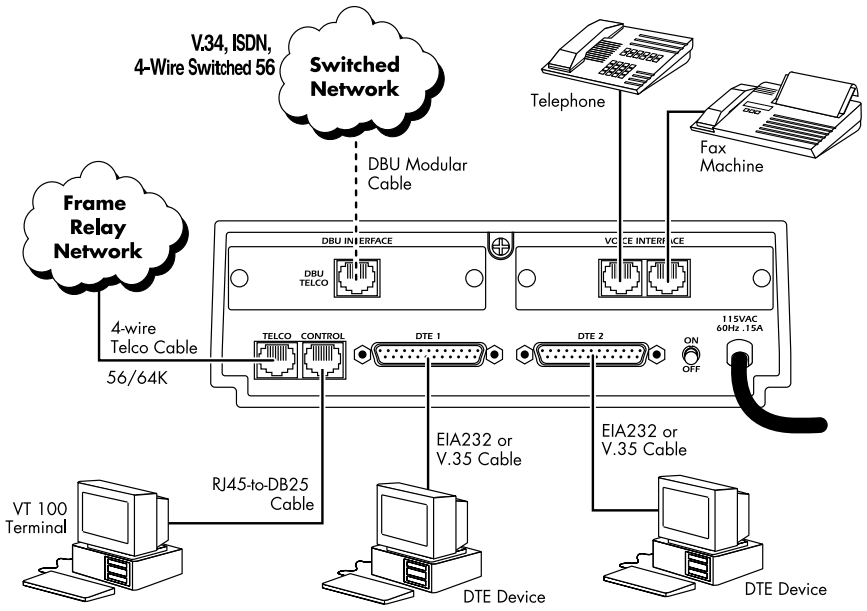
Power Up

Each Express 5200 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 5200 must be provided from a grounded 115 VAC, 60 Hz receptacle.

REAR PANEL

The Express 5200 is equipped with two DB-25 connectors labeled **DTE 1** and **DTE 2**. Connections to the dedicated circuit and VT 100 interface are provided through the 8-pin telco jacks labeled **TELCO** and **CONTROL**. Pin assignments for these connectors are given in the appendix *Pinouts* on page A-1. The Express 5200 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
DTE 1 port	Connects to a DTE device
DTE 2 port	Connects to a DTE device
On/Off Switch	Turns power on and off
115 VAC connection	Connects to captive power cord

Figure 2-1. Express 5200 Rear View

DBU and Voice Interface Card Slots

The Express 5200 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 5200.
2. Slide the card into the corresponding rear slot until the card panel is flush with the Express 5200 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 5200 to be configured through a terminal instead of the front panel. Use the VT 100 terminal cable (provided) for this connection. See *Table A-3* 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 3-4.

DTE Connectors

DTE devices are connected to the **DTE** connectors 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-2* 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 ports are configured through the front panel or the VT 100 control port. The DTE ports can operate in asynchronous or synchronous modes.

Chapter 3 Operation

FRONT PANEL

The Express 5200 faceplate is shown in *Figure 3-4* on page 3-9. Descriptions of each part of the front panel follow.

LCD Window

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

Enter

Selects active menu items. To activate a menu item, scroll to it using the arrow keys or press the number of the item. The flashing cursor indicates which parameter is activated. Press **ENTER** to select the active menu item.

Up and Down Arrows

Up and down arrows scroll through and activate the submenu items available in the current menu. The flashing cursor indicates the active parameter.

Cancel

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

When a submenu item is displayed, press **CANCEL** to exit the current display and return to the previous menu.

Numeric Keypad

The numeric keypad contains the numbers **0** through **9** and alpha characters **A** through **F**, which are used to activate menu items and enter information such as the IP address.

Next, Prev, Add, Delete

To activate these functions, press and release the **SHIFT** key, and then press the **NEXT**, **PREV**, **ADD**, or **DELETE** key. Use these keys when editing routing tables.

Shift

Enter alpha characters by pressing and releasing the **SHIFT** key before pressing the desired character. The **NEXT**, **PREV**, **ADD**, and **DELETE** keys are also activated by first pressing **SHIFT**.

To activate a menu item designated by an alpha character rather than a number, place the cursor on the menu item using the up and down arrows or press **SHIFT** and then the letter. The flashing cursor indicates the activated parameter. Press **ENTER** to select the item.

LED Descriptions

The Express 5200 has seven LED indicators: **TD1**, **RD1**, **TD2**, **RD2**, **TDN**, **RDN**, and **ALM/TST**. These LEDs are identified as follows:

TD1: Transmit Data (DTE 1)
This LED is active when the Express 5200 **DTE 1** port is transmitting data.

RD1: Receive Data (DTE 1)
This LED is active when the Express 5200 **DTE 1** port is receiving data.

TD2: Transmit Data (DTE 2)
This LED is active when the Express 5200 **DTE 2** port is transmitting data.

RD2: Receive Data (DTE 2)
This LED is active when the Express 5200 **DTE 2** port is receiving data.

TDN: Transmit Data (Network)
This LED is active when the Express 5200 **NETWORK** port is transmitting data.

RDN: Receive Data (Network)
This LED is active when the Express 5200 **NETWORK** port is receiving data.

ALM/TST: Alarm/Test
This LED is active when an alarm condition exists or when the unit is in test mode. Alarm conditions include:

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

To choose a menu item, press the corresponding number or alpha character on the keypad. Press **SHIFT** to activate menu items with alpha selections. Scrolling to the selection by using the up and down arrows also activates the menu items. The flashing cursor indicates the activated selection. Press **ENTER** to select the item. The following steps and *Figure 3-1* illustrate how to select Express 5200 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 1**.
4. Activate **DTE PORT 1** 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**.

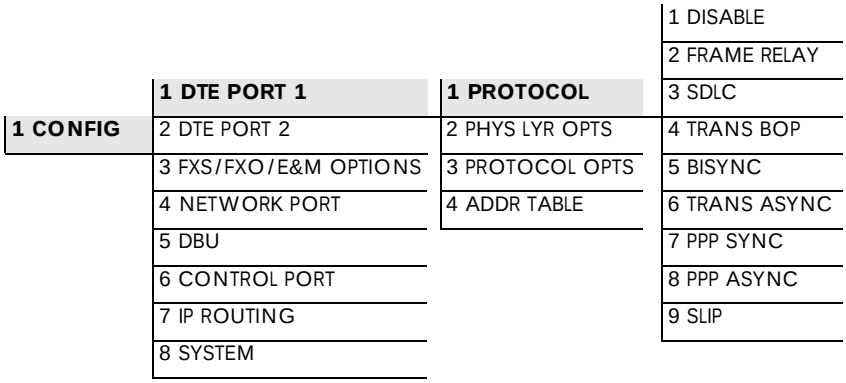


Figure 3-1. Example of Basic Menu Navigation

VT 100 Terminal Connection and Operation

To control the Express 5200 using a VT 100 terminal, perform the following procedure:

1. Set the Express 5200 baud rate to match the terminal through the front panel. 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 5200. 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 **LOGIN MENU** appears (*Figure 3-2*).

4. Select **LOCAL LOGIN** to configure the Express 5200 unit connected to the terminal. Select **REMOTE LOGIN** to configure a remotely located Express 5200 unit. For remote applications, enter the **DLCI** (data link connection identifier) number of the remote unit by pressing **1**, **Enter**, the DLCI number, and **Enter** again. Next select **BEGIN REMOTE SESSION** by pressing **2** and **Enter**.
5. Enter the password. The factory default password is **adtran**. The **MAIN** menu will appear, as shown in *Figure 3-3*.
6. Make selections by entering the number corresponding to the chosen parameter. Press **ESC** to return to the previous screen.

NOTE

In the upper right-hand corner of the VT 100 screen, **LOCAL** *or* **REMOTE** *is displayed, indicating which unit the current screen represents.*

```
                          Login Menu                    ADTRAN Express 5200
                                                                  Local

1 - Local Login
2 - Remote Login

Enter Selection -> _
```

Figure 3-2. Terminal Login Menu

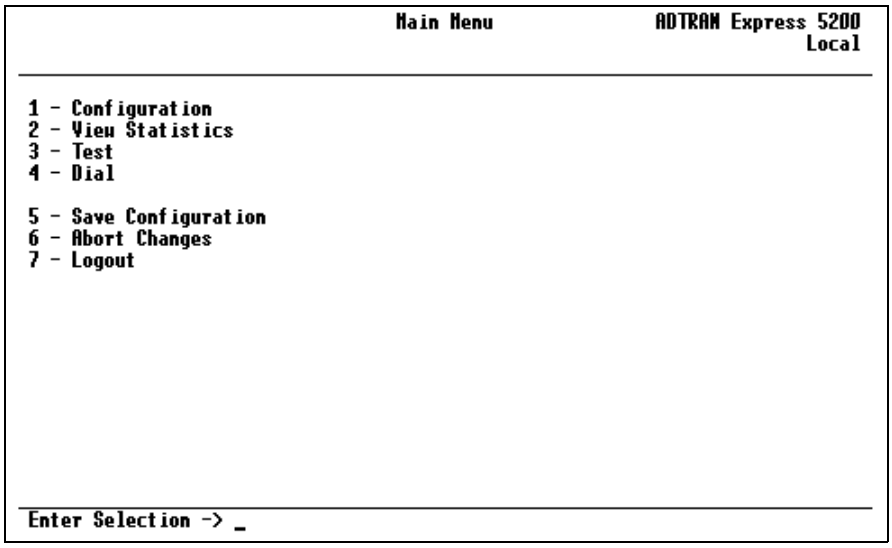


Figure 3-3. Terminal Main Menu

Express 5200 Menu Structure

The opening menu is the access point to all other operations. Each **MAIN** menu item has several functions and submenus to identify and access specific parameters.

The **LOGOUT** *selection is available on the VT 100 interface only. The* **DIAL BACKUP** *and* **DIAL** *selections are available only when a DBU card is installed.*

In this chapter, the VT 100 selections are listed first followed by the front panel selections (if the names differ).

Main Menu

Definitions for the branches of the **MAIN** menu follow:

Configuration (CONFIG)

CONFIGURATION is used to set network operating parameters for the DTE, voice, network, and dial backup interfaces. IP routing and system configuration options are also found in the **CONFIGURATION** menus. The chapter *Configuration Overview* on page 5-1 explains how to access these menus. Chapters 6 through 11 provide brief explanations for each **CONFIGURATION** selection. The chapters are based on the first level menu branches of the **CONFIGURATION** menu: *DTE Port Configuration* begins on page 6-1*; Voice Interface Configuration* begins on page 7-1*; Network Port Configuration* begins on page 8-1*; Dial Backup Configuration* begins on page 9-1*; IP Routing* begins on page 10-1*;* and *System Configuration* begins on page 11-1.

When **DTE PORT 1** *or* **2** *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 6-1 for more information.*

View Statistics (STATS)

This selection displays status information for DTE ports, the network port, the protocol, the system, and the voice cards. See the chapter *Statistics* on page 12-1 for more information.

Test

Testing options enable and disable voice and ping test functions. See the chapter *Testing* on page 13-1 for more information.

Dial (available when DBU card is installed)

This selection allows you to access DBU functions. See the chapter *Activating DBU Functions* on page 14-1 for more information.

Save Configuration (SAVE)

This parameter saves the currently selected configuration.

Configuration changes are not implemented until the **SAVE CONFIGURATION** *(***SAVE***) option is selected.*

Abort Changes (ABORT)

This parameter cancels the current selections and reverts to the last saved configuration.

Logout (VT 100 menu only)

This parameter logs out of the system.

Chapter 4 Applications

This chapter provides examples of some common Express 5200 data and voice applications. The data examples include SNA/SDLC with local spoofing, SNMP/TELNET management, bisync point-to-point, bisync multi-point, and transparent applications. The voice applications include switched, voice over frame relay, 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 5200 provides local spoofing by emulating the primary or secondary SDLC roles (see *Figure 4-1*). The Express 5200 performs conversion from SDLC to frame relay and also terminates SDLC links, providing primary and secondary emulation between Express 5200s. 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 5200 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 5200 looks for SNRM on all ports and assumes a secondary role once SNRM is received. The Express 5200 then brings up the LLC2 link across the frame relay network to another FRAD which

assumes a primary role. This allows the Express 5200 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 5200 is transparent to the XID (exchange identification) negotiation between any two network devices.

The Express 5200 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 4-1* for an example of how to configure the Express 5200 for this application.

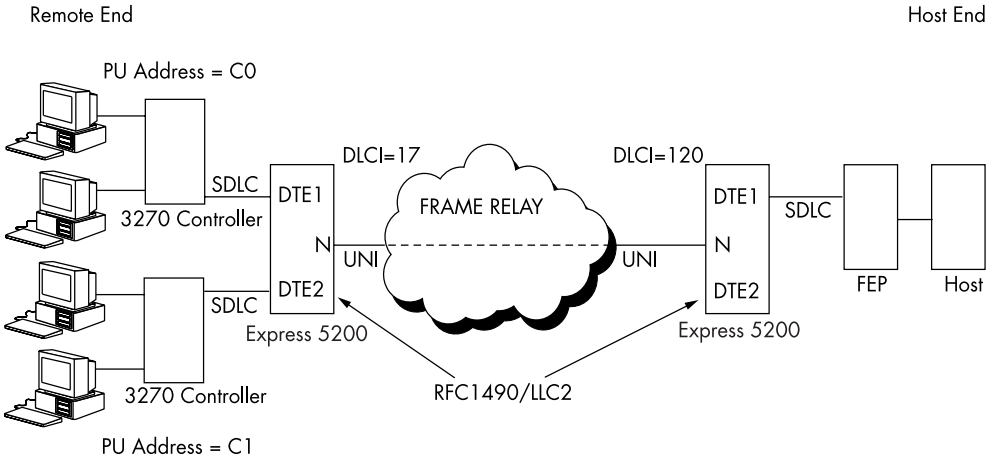


Figure 4-1. SNA/SDLC with Local Spoofing

Table 4-1. SNA/SDLC Application Configuration Settings

	HOST 5200		REMOTE 5200
DTE Port 1			
Protocol	SDLC		SDLC
Physical Layer Options	INTERFACE=EIA-232 BIT RATE=19.2K TX IDLE CODE=ONES HDW FLOW CTRL=ON		INTERFACE=EIA-232 BIT RATE=19.2K TX IDLE CODE=ONES HDW FLOW CTRL=ON
Protocol Options	TIMEOUT=3 MIN POLL TIME=0 POLL RATIO=1 THRESHOLD=10 TX DELAY=0 CTS OPTION=FOLLOW RTS		TIMEOUT=3 MIN POLL TIME=0 POLL RATIO=1 THRESHOLD=10 TX DELAY=0 CTS OPTION=FOLLOW RTS
Address Table	ENTRY #1 PU ADDRESS=C0 GROUP ADDR=0 LLC2 SSAP=04 LLC2 DSAP=04 OUT DLCI=120	ENTRY #2 PU ADDRESS=C1 GROUP ADDR=0 LLC2 SSAP=08 LLC2 DSAP=04 OUT DLCI=120	ENTRY #1 PU ADDRESS=C0 GROUP ADDRESS=0 LLC2 SSAP=04 LLC2 DSAP=04 OUT DLCI=17
DTE Port 2			
Protocol	DISABLE		SDLC
Physical Layer Options	N/A		INTERFACE=EIA-232 BIT RATE=19.2K TX IDLE CODE=ONES HDW FLOW CTRL=EN
Protocol Options			TIMEOUT=3 MIN POLL TIME=0 POLL RATIO=1 THRESHOLD=10 TX DELAY=0 CTS OPTION=FOLLOW RTS
Address Table			ENTRY #1 PU ADDRESS=C1 GROUP ADDR=0 LLC2 SSAP=04 LLC2 DSAP=08 OUT DLCI=17
Network Port			
Physical Layer Options	LOOP RATE=64K CLOCK SOURCE=FROM NETWORK		LOOP RATE=64K CLOCK SOURCE=FROM NETWORK
Frame Relay Options	SIGNAL=ANSI T391=10 N391=6 N392=3 N393=4 REM FECN=NO		SIGNAL=ANSI T391=10 N391=6 N392=3 N393=4 REM FECN=NO

SNA and LAN Application with SNMP/TELNET Management

When used in a mixed environment consisting of both SNA and LAN networks, the Express 5200 serves as a concentrator, allowing both networks access to one frame relay link. The example shown in *Figure 4-2* shows **DTE 1** configured for **SDLC** protocol (as in the previous example). **DTE 2** is configured for **FRAME RELAY** protocol, providing the LAN gateway / router with frame relay access.

The Express 5200 routes data at the DLCI level using the **DTE 2** frame relay **ADDRESS TABLE**. The Express 5200 emulates the network end of the UNI signaling protocol for the **DTE** port while emulating the CPE end for the network port. PVC status information from the frame relay network is stored and used for full status requests from the router attached to the **DTE** port.

A local DLCI is set up between the router and the Express 5200. This **MANAGEMENT DLCI** carries the SNMP and TELNET traffic destined for the Express 5200. This DLCI is included in the UNI full status responses to the router. The Express 5200 **IP ADDRESS** must be mapped to the **MANAGEMENT DLCI** in the LAN router's route table (see the following note). With this path, an SNMP manager located anywhere in the network can access the Express 5200's SNMP and TELNET information. See *Table 4-2* for an example configuration.

RIP and inverse ARP are not used for the Express 5200 DTE frame relay port.

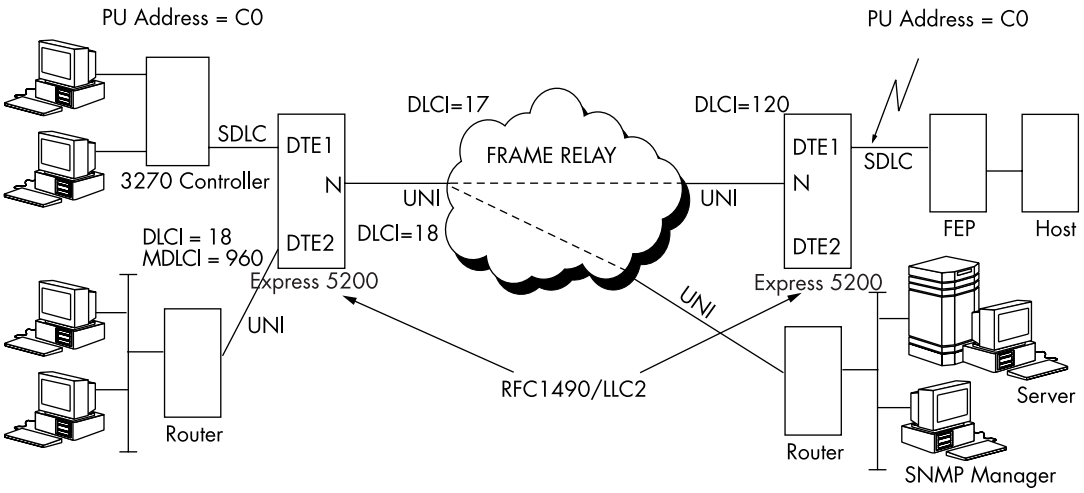


Figure 4-2. SNA and LAN Application with SNMP/ TELNET Management

Table 4-2. SNA and LAN Application Settings

	HOST 5200	REMOTE 5200
DTE Port 1		
Protocol	SDLC	SDLC
Physical Layer Options	INTERFACE=EIA 232 BIT RATE=19.2K TX IDLE CODE=ONES HDW FLOW CTRL=ON	INTERFACE=EIA 232 BIT RATE=19.2K TX IDLE CODE=ONES HDW FLOW CTRL=ON
Protocol Options	TIMEOUT=3 MIN POLL TIME=0 POLL RATIO=1 THRESHOLD=10 TX DELAY=0 CTS OPTION=FOLLOW RTS	TIMEOUT=3 MIN POLL TIME=0 POLL RATIO=1 THRESHOLD=10 TX DELAY=0 CTS OPTION=FOLLOW RTS
Address Table	ENTRY #1 PU ADDRESS=C0 GROUP ADDR=0 LLC2 SSAP=04 LLC2 DSAP=04 OUT DLCI=120	ENTRY #2 PU ADDRESS=C0 GROUP ADDR=0 LLC2 SSAP=04 LLC2 DSAP=04 OUT DLCI=17
DTE Port 2		
Protocol	DISABLED	FRAME RELAY
Physical Layer Options	N/A	INTERFACE=V.35 BIT RATE=64K TX IDLE CODE=FLAGS HDW FLOW CTRL=ON
Protocol Options	N/A	T392=15 N392=3 N393=4 IP ADDRESS=200.200.200.2 SUBNET MASK=255.255.255.0 MGMT DLCI=960
Protocol Address Table	N/A	NET DLCI=18
Network Port		
Physical Layer Options	LOOP RATE=64K CLOCK SOURCE=FROM NETWORK	LOOP RATE=64K CLOCK SOURCE=FROM NETWORK
Frame Relay Options	SIGNAL=ANSI T391=10 N391=6 N392=3 N393=4 REM FECN=NO	SIGNAL=ANSI T391=10 N391=6 N392=3 N393=4 REM FECN=NO

Bisync Application

The Express 5200 can be used to connect IBM 3780/2780 (see IBM manual number GA27-3004-2) bisync controllers and a host across a frame relay network. Point-to-point and multi-point configurations are supported at speeds up to 19.2 kbps. The LLC protocol (mode 2) is used to provide a reliable transport layer across the frame relay network. In a multi-point configuration, the Express 5200 performs local spoofing, minimizing traffic across the frame relay network. Sample network illustrations for both point-to-point and multi-point are shown in *Figure 4-3* and *Figure 4-4*.

See *Table 4-3* for an example configuration of the multi-point application.

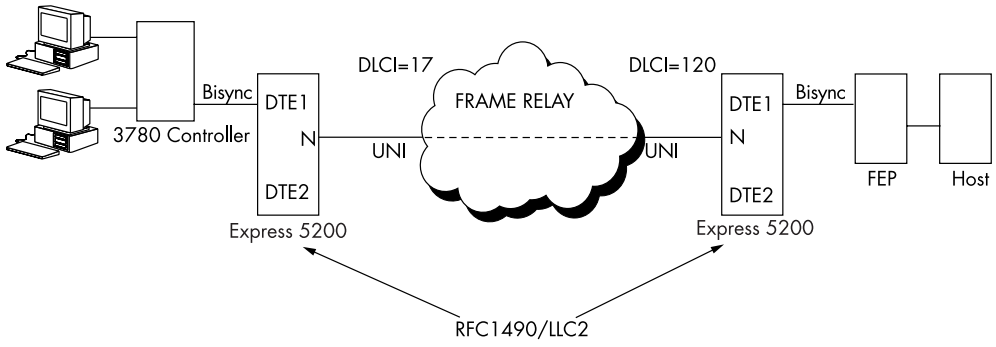


Figure 4-3. Bisync Point-to-Point

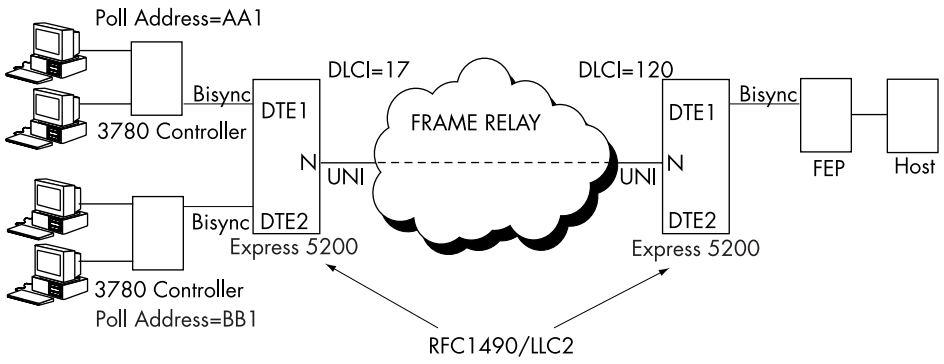


Figure 4-4. Bisync Multi-Point

Table 4-3. Multi-Point Bisync Application Settings

	HOST 5200		REMOTE 5200
DTE Port 1			
Protocol	BISYNC		BISYNC
Physical Layer Options	INTERFACE=EIA-232 BIT RATE=9600 TX IDLE CODE=FLAGS HDW FLOW CTRL=ON		INTERFACE=EIA-232 BIT RATE=9600 TX IDLE CODE=FLAGS HDW FLOW CTRL=ON
Protocol Options	LINE=MULTI TRANSLAT CODE= EBCDIC CRC16 TIMEOUT=3 THRESHOLD=10 POLL RATIO=1 CTS OPTION=FOLLOW RTS FORMAT=NRZ		LINE=MULTI TRANSLAT CODE= EBCDIC CRC16 TIMEOUT=3 THRESHOLD=10 POLL RATIO=1 CTS OPTION=FOLLOW RTS FORMAT=NRZ
Address Table	ENTRY #1 POLL ADDR=AA1 LLC2 SSAP=04 LLC2 DSAP=04 OUT DLCI=120	ENTRY #2 POLL ADDR=BB1 LLC2 SSAP=04 LLC2 DSAP=08 OUT DLCI=120	ENTRY #1 POLL ADDRESS=AA1 LLC2 SSAP=04 LLC2 DSAP=04 OUT DLCI=17
DTE Port 2			
Protocol	DISABLED		BISYNC
Physical Layer Options	N/A		INTERFACE=EIA-232 BIT RATE=9600
Protocol Options	N/A		LINE=MULTI TRANSLAT CODE= EBCDIC CRC16 TIMEOUT=3 THRESHOLD=10 POLL RATIO=1 FORMAT=NRZ
Address Table	N/A		ENTRY #1 POLL ADDRESS=BB1 LLC2 SSAP=08 LLC2 DSAP=04 OUT DLCI=17
Network Port			
Physical Layer Options	LOOP RATE=64K CLOCK SOURCE=FROM NETWORK		LOOP RATE=64K CLOCK SOURCE=FROM NETWORK
Frame Relay Options	SIGNAL=ANSI T391=10 N391=6 N392=3 N393=4 REM FECN=NO		SIGNAL=ANSI T391=10 N391=6 N392=3 N393=4 REM FECN=NO

Transparent Application

In cases when the user protocol is not supported by the Express 5200, 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 5200 is transparent to the protocol address formats.

In the **TRANSPARENT BOP** protocol, the Express 5200 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 5200 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 5200 buffers async characters and encapsulates the data portion of each character for transport across frame relay using a programmable DLCI and remote Express 5200 port number.

See *Figure 4-5* and *Table 4-4* for an example of a transparent BOP configuration. See *Figure 4-6* and *Table 4-5* for an example of a transparent asynchronous application.

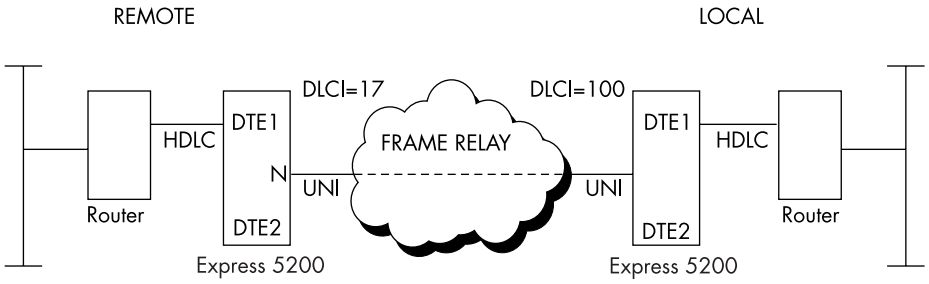


Figure 4-5. Transparent BOP Application

Table 4-4. Transparent BOP Application Settings

	LOCAL 5200	REMOTE 5200
DTE Port 1		
Protocol	TRANS BOP	TRANS BOP
Physical Layer Options	INTERFACE=V.35 BIT RATE=64K TX IDLE CODE=FLAGS HDW FLOW CTRL=ON	INTERFACE=V.35 BIT RATE=64K TX IDLE CODE=FLAGS HDW FLOW CTRL=ON
Protocol Options	N/A	N/A
Address Table	FAR END PORT=DTE 1 OUT DLCI=100	FAR END PORT=DTE 1 OUT DLCI=17
DTE Port 2		
Protocol	DISABLED	DISABLED
Network Port		
Physical Layer Options	LOOP RATE=64K CLOCK SOURCE=FROM NETWORK	LOOP RATE=64K CLOCK SOURCE=FROM NETWORK
Frame Relay Options	SIGNAL=ANSI T391=10 N391=6 N392=3 N393=4 REM FECN=NO	SIGNAL=ANSI T391=10 N391=6 N392=3 N393=4 REM FECN=NO

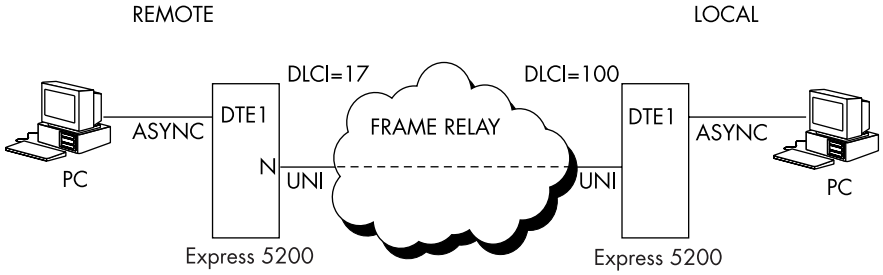


Figure 4-6. Transparent Async Application

Table 4-5. Transparent Async Application Settings

	HOST 5200	REMOTE 5200
DTE Port 1		
Protocol	TRANS ASYNC	TRANS ASYNC
Physical Layer Options	INTERFACE=EIA-232 BIT RATE=38.4K DATA BITS=8 PARITY=NONE STOP BITS=1 HDW FLOW CTRL=ON	INTERFACE=EIA-232 BIT RATE=38.4K DATA BITS=8 PARITY=NONE STOP BITS=1 HDW FLOW CTRL=ON
Protocol Options	FRM SIZE=100 MAX IDLE=2	FRM SIZE=100 MAX IDLE=2
Address Table	FAR END PORT=DTE 1 OUT DLCI=100	FAR END PORT=DTE 1 OUT DLCI=17
DTE Port 2		
Protocol	DISABLED	DISABLED
Network Port		
Physical Layer Options	LOOP RATE=64K CLOCK SOURCE=FROM NETWORK	LOOP RATE=64K CLOCK SOURCE=FROM NETWORK
Frame Relay Options	SIGNAL=ANSI T391=10 N391=6 N392=3 N393=4 REM FECN=NO	SIGNAL=ANSI T391=10 N391=6 N392=3 N393=4 REM FECN=NO

VOICE APPLICATIONS

Switched Mode Application

Switched mode is used to multiplex several remote extensions (up to 40) to two host ports (see *Figure 4-7*). 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 5200 is taken off-hook, the local Express 5200 generates dial tone and waits for an extension to be entered by the user. Once the extension is entered, the remote Express 5200 transmits this information to the host Express 5200, 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 5200 terminates the call.

External Call Reception

When an incoming call is received from the PBX, the remote Express 5200 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 5200 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 5200 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 5200 is taken off-hook, the remote Express 5200 generates a dial tone and waits for the extension to be entered. Once the extension is entered, the remote Express 5200 transmits this information to the host Express 5200, 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.

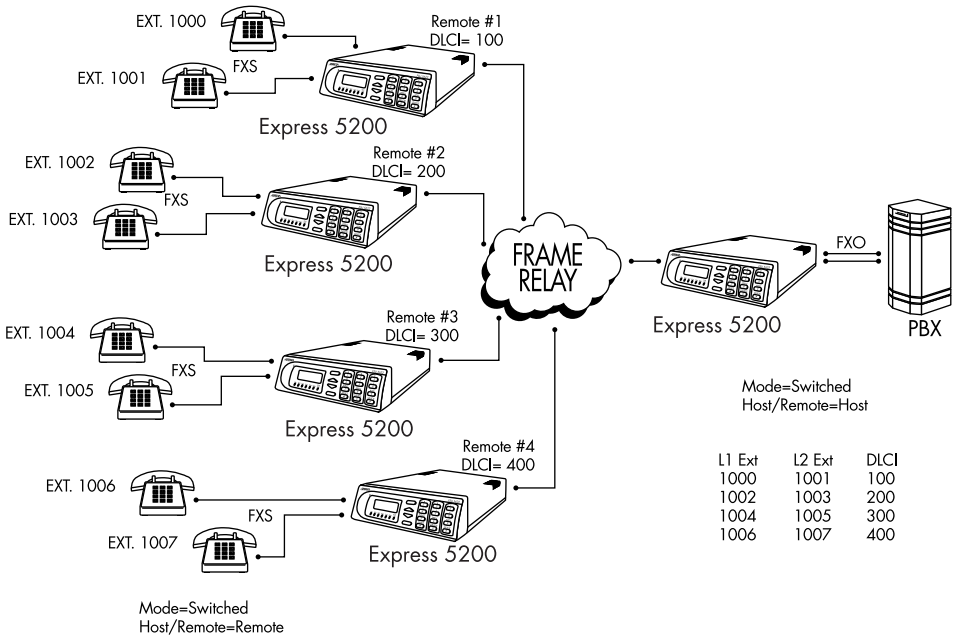


Figure 4-7. Switched Mode Application

Voice Over Frame Relay Application

Voice over frame relay can be accomplished using the Express 5200 with an optional dual voice card installed (Dual FXO, FXS, or E&M card). In this configuration, multiple units are daisy-chained at the host site to accommodate up to eight switched OPX (off premise extension) lines. Six lines are shown in *Figure 4-8*. The Express 5200 can be daisy-chained on the host end to accommodate more PBX extensions.

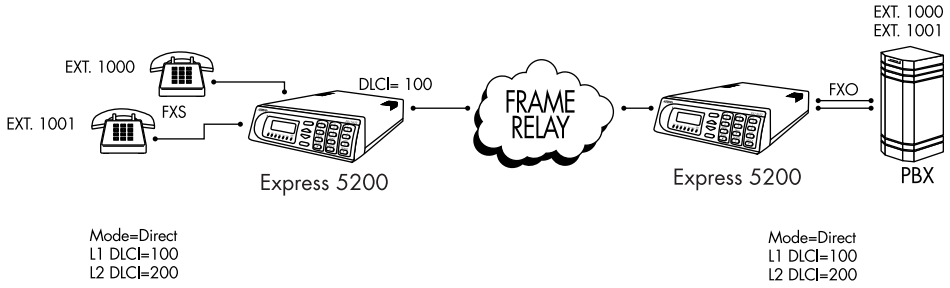


Figure 4-8. Voice Over Frame Relay Application

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 4-9*.

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 circuit, the DLCI value must be non-zero and it must be the same on both ends of the circuit.

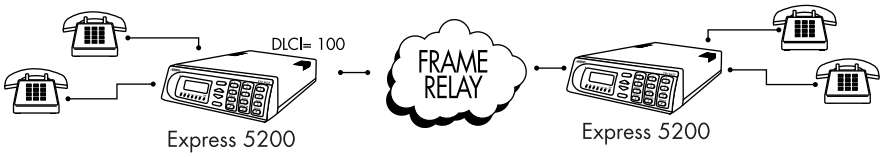


Figure 4-9. PLAR Mode Application

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 5200 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 circuit, the DLCI value must be non-zero and it must be the same on both ends of the circuit. See *Figure 4-10*.

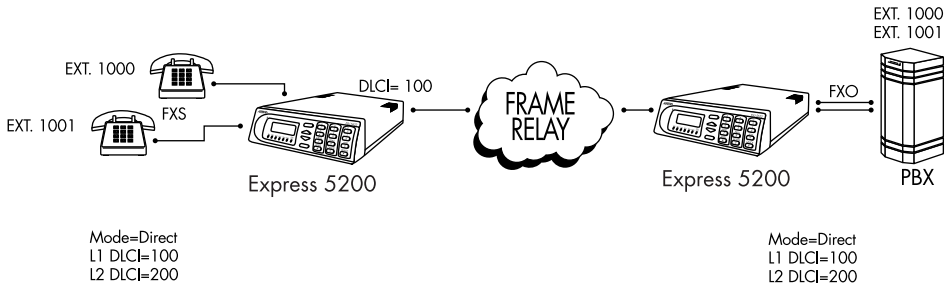


Figure 4-10. Direct Mode Application

Chapter 5 Configuration Overview

LOCAL AND REMOTE CONFIGURATION

The Express 5200 can be configured locally or, when using the VT 100 interface, communications can be established so a local Express 5200 can configure a remote Express 5200. See the section *VT 100 Terminal Connection and Operation* on page 3-4 for information on selecting local and remote configuration.

The **CONFIGURATION** menu (*Figure 5-1*) consists of submenus relating to specific interfaces or functions of the Express 5200 requiring setup:

DTE PORT 1
DTE PORT 2
FXS/FXO/E&M OPTIONS (available when voice card is installed)
NETWORK PORT
DIAL BACKUP (available when a DBU card is installed)
CONTROL PORT (front panel only)
IP ROUTING
SYSTEM

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

NOTE

When configuring **DTE PORT 1** *or* **2**, *select the* **PROTOCOL** *first. This selection determines which parameters will be available for the* **PHYSICAL LAYER OPTIONS**, **PROTOCOL OPTIONS**, *and* **ADDRESS TABLE**.

The Express 5200 contains a default set of configuration options stored in read-only memory. The unit is shipped from the factory with this profile loaded into the current (nonvolatile configuration) memory. If this profile matches requirements for the system, then no additional configuration is required to put the unit into service. If the profile does not match system requirements, it can be modified.

For detailed information on configuration see the chapters *DTE Port Configuration on page 6-1*, *Voice Interface Configuration on page 7-1*, *Network Port Configuration on page 8-1*, *Dial Backup Configuration on page 9-1*, *IP Routing on page 10-1*, and *System Configuration on page 11-1*.

```
                    Configuration Menu          ADTRAN Express 5200
                                                          Local

1 - DTE Port 1
2 - DTE Port 2
3 - Network Port
4 - Dial Backup
5 - IP Routing
6 - System

Enter Selection -> _
```

Figure 5-1. VT 100 Configuration Menu (DBU card installed)

Chapter 6 DTE Port Configuration

Configure the **PROTOCOL**, **PHYSICAL LAYER OPTIONS**, **PROTOCOL OPTIONS**, and **ADDRESS TABLE** for the two **DTE** ports located on the rear of the Express 5200 by selecting **DTE PORT 1** or **DTE PORT 2** from the **CONFIGURATION** menu. *Figure 6-1* illustrates the VT 100 configuration menu for **DTE PORT 1**.

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

```
DTE Port 1                    Configure DTE Port          ADTRAN Express 5200
                                                                  Local

1 - Protocol  SDLC
2 - Physical Layer Options
3 - Protocol Options
4 - Address Table

Selection Options ->  1)Port Disabled  2)Frame Relay  3)SDLC
 4)Transparent BOP  5)Bisync  6)Transparent Async  7)PPP Synchronous
 8)PPP Async  9)SLIP

Enter Selection ->
```

Figure 6-1. VT 100 Port Configuration Menu

*When configuring the **DTE** ports, 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 VT 100 selections are listed first, followed by the front panel selections (if the names differ).

See *Figure 6-2* for the menu tree leading to the **PROTOCOL** selection. Definitions for each choice follow, categorized by the selected protocol.

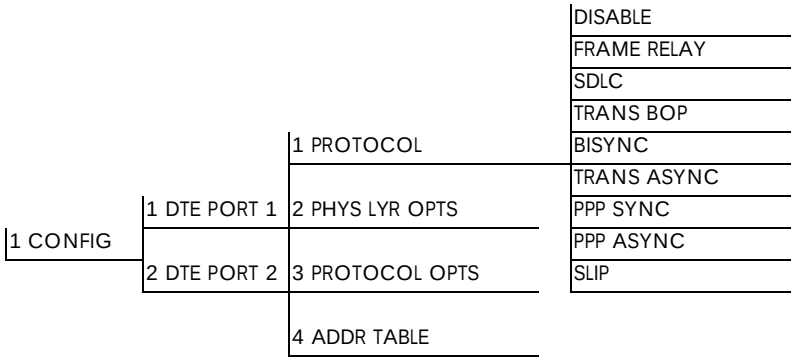


Figure 6-2. Front Panel Protocol Menu Tree

Port Disabled Protocol (DISABLE)

Follow the menu tree shown in *Figure 6-3* to disable the **DTE PORT PROTOCOL**. If only one of the **DTE** ports is in use, select **PORT DISABLED** for the unused port. **PHYSICAL LAYER**, **PROTOCOL**, and **ADDRESS TABLE** options are not available when the port is disabled.

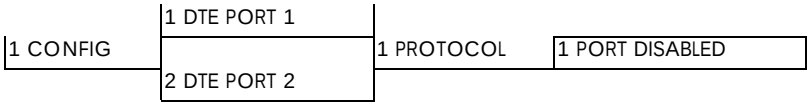


Figure 6-3. Port Disabled Menu Tree

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 5200 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 **NETWORK** ports. The menu tree in *Figure 6-4* 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-2* 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 5200 to transmit **FLAGS** or all **ONES**. When operating the **FRAME RELAY** protocol, configure this option to transmit **FLAGS**.

Hardware Flow Control (HDW FLOW CTRL)
When set to **ON**, the Express 5200 varies the transmit clock rate to temporarily limit the transmit data rate from the DTE device to the Express 5200.

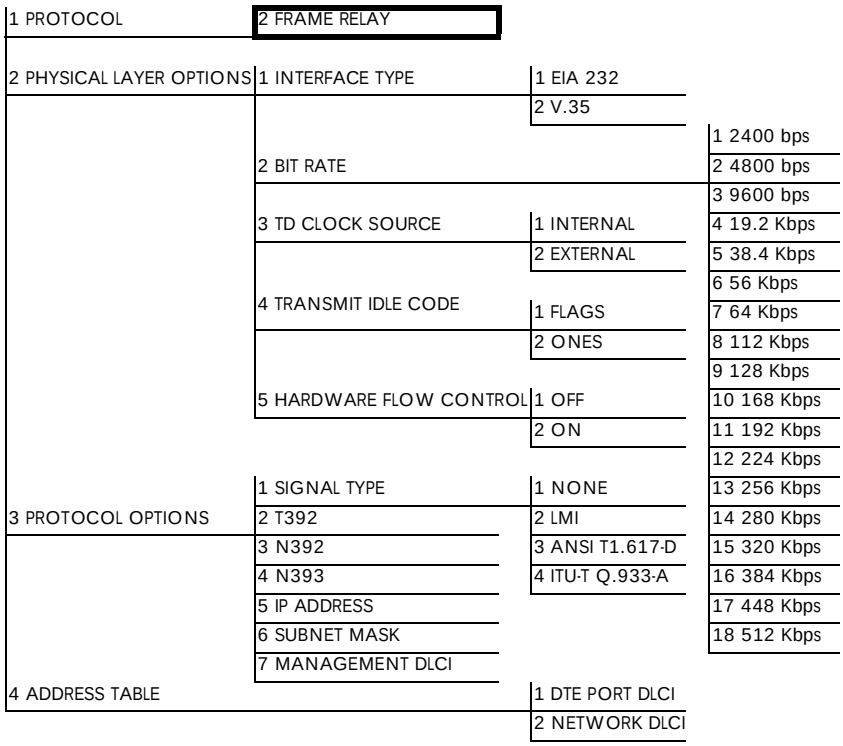


Figure 6-4. Frame Relay Protocol Menu Tree

Protocol Options (PROTOCOL OPTS)

Signal Type (SIGNAL)

Set the signaling type for the **DTE** port to match the signaling type of the connected DTE device. Choices are **NONE**, **LMI**, **ANSI T1.617-D**, and **ITU-T Q.933-A**. If **NONE** is chosen, the signaling state for the **DTE** port is always up.

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 5200 **DTE** port and the attached frame relay device. If the error threshold is met, the **SIGNAL STATE** is changed to **DOWN** (see page 12-5*)* 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** (see page 12-5*)*. The status will return to **ACTIVE** once the threshold is no longer exceeded.

Guidelines for Configuring IP Address, Subnet Mask, and Management DLCI

If the attached router or FRAD is used to route SNMP/TELNET frames to the Express 5200, set the **MANAGEMENT DLCI** to a unique value that identifies the virtual circuit between the router/FRAD and the Express 5200. The router/FRAD must also be configured to route the Express 5200 **IP ADDRESS** to this DLCI. The **IP ADDRESS** and **SUBNET MASK** for the **DTE** port must also be set.

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.

IP Address
Enter the Express 5200 **IP ADDRESS**. Each port capable of carrying IP traffic has its own unique **IP ADDRESS**. See the section *Guidelines for Configuring IP Address, Subnet Mask, and Management DLCI* on page 6-5 for more information.

Subnet Mask
Enter the subnet number assigned to the network formed by the Express 5200 and the other FRAD / routers across the frame relay network. See the section *Guidelines for Configuring IP Address, Subnet Mask, and Management DLCI* on page 6-5 for more information.

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 5200 to carry SNMP and TELNET packets to / from the Express 5200 on the **DTE** port. See the section *Guidelines for Configuring IP Address, Subnet Mask, and Management DLCI* on page 6-5 for more information.

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** element.

Network DLCI (NET DLCI)
Enter the network port DLCI into the protocol **ADDRESS TABLE**, mapping it to the corresponding **DTE PORT DLCI**. This element should contain DLCI addresses obtained from the service provider.

Next (NEXT key on front panel)
Edit the next entry in the address table.

Previous (PREV key on front panel)
Edit the previous entry in the address table.

Add (ADD key on front panel)
Add a new entry to the address table.

Delete (DELETE key on front panel)
Delete the current entry in the address table.

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

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 6-5*.

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** elements 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 5200s 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 5200 to transmit flags or all ones. When operating the **SDLC** protocol, all **ONES** is the recommended option.

Hardware Flow Control (HDW FLOW CTRL)

When configured for the **SDLC** protocol, this parameter is always enabled. The Express 5200 issues RNR (receive not ready) commands to the attached PU, temporarily disabling transmit data to the Express 5200.

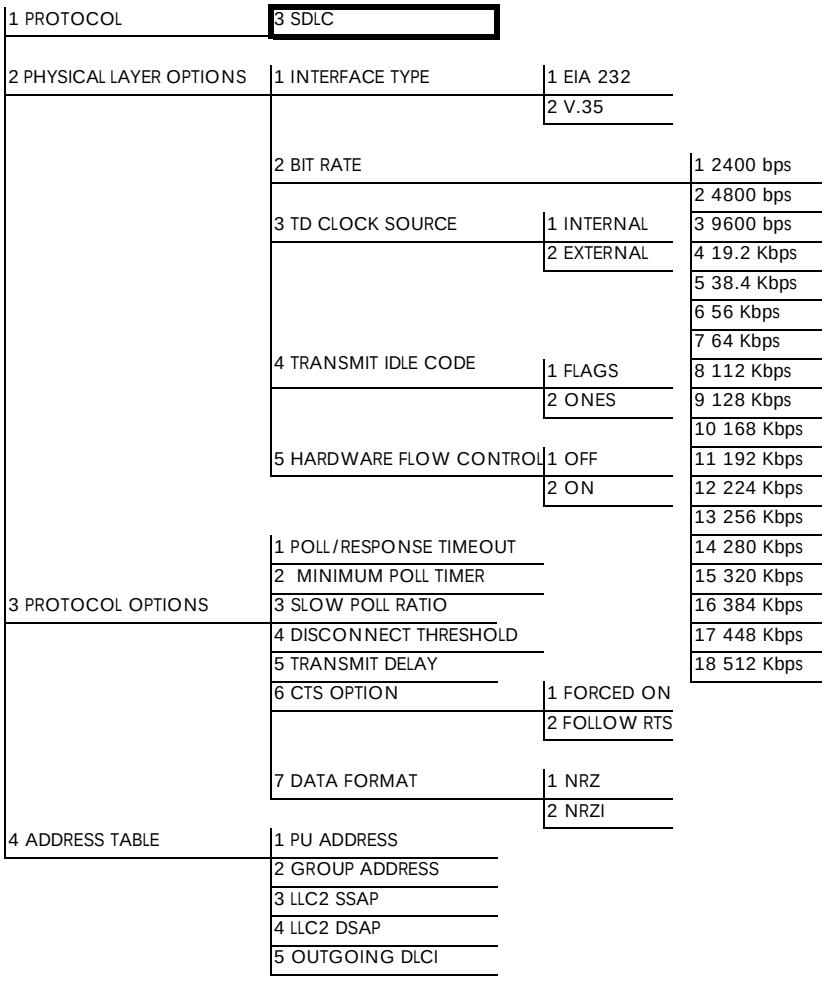


Figure 6-5. SDLC Protocol Menu Tree

Protocol Options (PROTOCOL OPTS)

Poll/Response Timeout (TIMEOUT)

Set the amount of time the Express 5200 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 5200 **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 5200 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 5200.

Group Address (GROUP ADDR)
Enter the address used for group polling. With this address, the host can poll the Express 5200 for information on all units connected to the Express 5200. 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 5200 should match the DSAP on the other Express 5200. The value of this parameter must be 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 5200 should match the SSAP on the other Express 5200. The value of this parameter must be in increments of four beginning with 04. See the section *SNA/SDLC with Local Spoofing* on page 4-1 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.

Next Entry (NEXT on front panel)
Edit the next entry in the address table.

Previous Entry (PREV on front panel)
Edit the previous entry in the address table.

Add (ADD on front panel)
Add a new entry to the address table

Delete (DELETE on front panel)
Delete the current entry in the address table.

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 5200 to connect to devices even if the Express 5200 does not understand their protocol's addressing and controlling techniques. The Express 5200 becomes transparent to the data link layer protocol

and provides end-to-end connectivity between two HDLC-like devices. See *Figure 6-6* for the **TRANSPARENT BOP** menu tree.

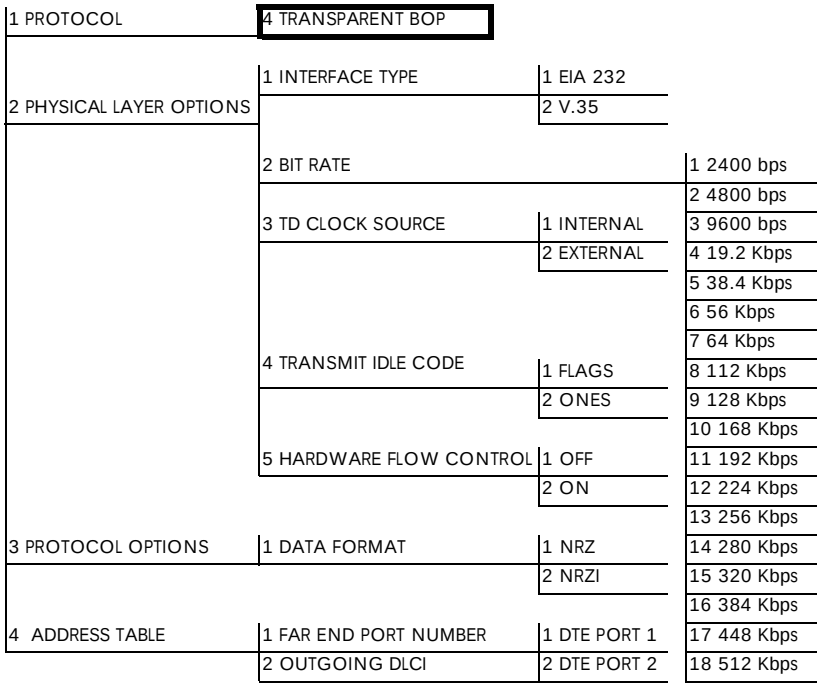


Figure 6-6. Transparent BOP Menu Tree

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 5200 to transmit **FLAGS** or all **ONES** (**FLAGS** are recommended).

Hardware Flow Control (HDW FLOW CTRL)
When set to **ON**, the Express 5200 varies the transmit clock rate to temporarily limit the transmit data rate to the Express 5200.

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 5200 does not derive timing from the receive data input.

Address Table (ADDR TABLE)

Far End Port Number (FAR END PORT)
Enter the remote Express 5200 port number that the remote HDLC device is connected to.

Outgoing DLCI (OUT DLCI)
Enter the DLCI address that indicates the virtual circuit used to connect with the remote Express 5200.

Bisync Protocol

The **BISYNC** protocol option enables the Express 5200 to connect IBM 2780/3780 bisync controllers to the host across frame relay. Both point-to-point and multi-point configurations are supported.

The Express 5200 can decode both ASCII and EBCDIC character sets and support CRC16, parity, VRC, and LRC error checking methods. See *Figure 6-7* for the **BISYNC** protocol menu tree.

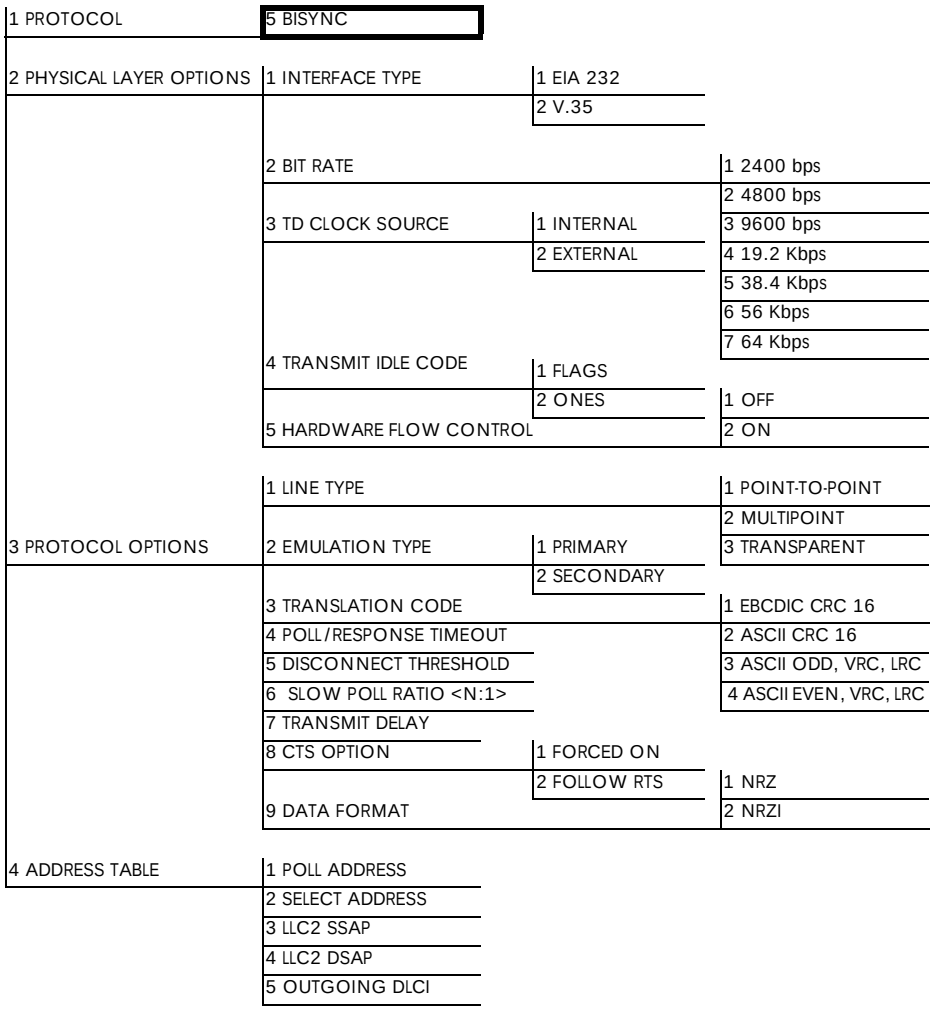


Figure 6-7. Bisync Protocol Menu Tree

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 (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 5200 to transmit **FLAGS** or all **ONES**.

Hardware Flow Control (HDW FLOW CTRL)
When configured for the **BISYNC** protocol, this parameter is always enabled. The Express 5200 uses commands within the **BISYNC** protocol to temporarily disable transmit data to the Express 5200.

Protocol Options (PROTOCOL OPTS)

Line Type (LINE)
Select a **POINT-TO-POINT**, **MULTI-POINT**, or **TRANSPARENT** line type.

Emulation Type (EMUL TYPE)
For multi-point configurations, this entry defines **PRIMARY** or **SECONDARY** emulation. Set the Express 5200 connected to the host to **SECONDARY** and the Express 5200 connected to the 2780/3780 controller to **PRIMARY**.

Translation Code (TRANSLAT CODE)
Define the character set and error checking algorithm to use. The choices are **EBCDIC CRC16**, **ASCII CRC16**, **ASCII ODD PARITY VRC/LRC**, and **ASCII EVEN PARITY VRC/LRC**.

Poll/Response Timeout (TIMEOUT)
For multi-point configurations, set the amount of time the Express 5200 waits for a poll response before issuing another poll.

Disconnect Threshold (THRESHOLD)
For multi-point configurations, set the maximum number of response timeouts allowed before a session is terminated.

Slow Poll Ratio <N:1> (POLL RATIO)

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

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

Transmit Delay (TX DELAY)

Set the minimum time between transmission frames.

CTS Option

Set the Express 5200 **CTS OPTION** to **FOLLOW RTS** or to be **FORCED ON**.

Data Format (FORMAT)

Set the **DATA FORMAT** used by your equipment. The choices are non-return-to zero (**NRZ**) and non-return-to-zero inverted (**NRZI**).

Address Table (ADDR TABLE)

Poll Address (POLL ADDR)

Enter the address string used to poll data from the unit.

Select Address (SELECT ADR)

Enter the address string used to put the bisync device into a mode where it can accept data.

LLC2 SSAP

Defines a point-to-point connection on the network. For each bisync SDLC connection, the SSAP of one Express 5200 should match the DSAP on the other Express 5200.

LLC2 DSAP

Define a point-to-point connection on the network. For each bisync SDLC connection, the DSAP of one Express 5200 should match the SSAP on the other Express 5200. See the section *SNA/SDLC with Local Spoofing* on page 4-1 for a configuration example which demonstrates the SSAP and DSAP arrangement.

Outgoing DLCI (OUT DLCI)
Enter the DLCI address used to connect with the remote device across the frame relay network.

Next (NEXT on front panel)
Edit the next entry in the address table.

Previous (PREV on front panel)
Edit the previous entry in the address table.

Add (ADD on front panel)
Add a new entry to the address table

Delete (DELETE on front panel)
Delete the current entry in the address table.

Transparent Async Protocol (TRANS ASYNC)

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 5200 is an async device such as a terminal or PC. See *Figure 6-8* for the **TRANSPARENT ASYNC** menu tree.

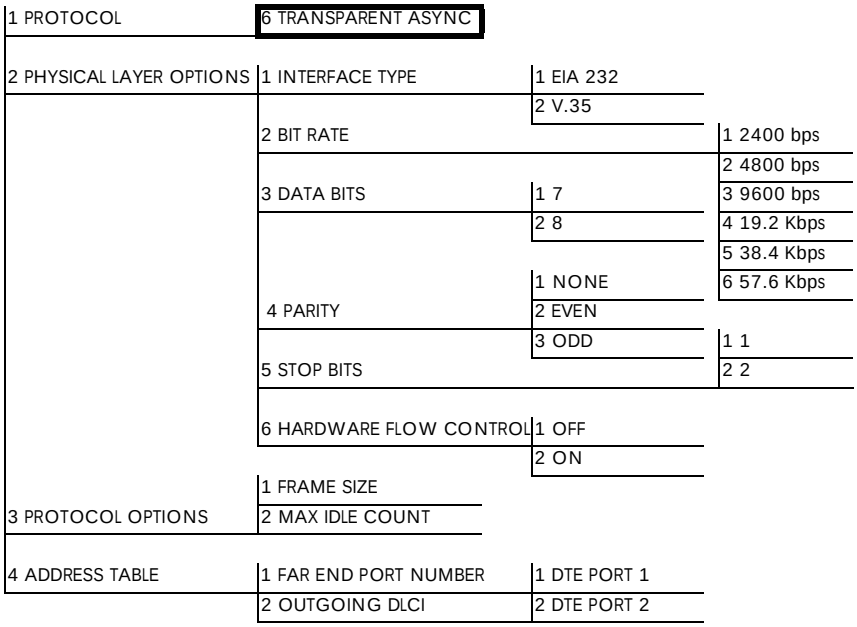


Figure 6-8. Transparent Async Protocol Menu Tree

The Express 5200 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.

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 5200.

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 5200. The choices are **7** and **8**.

Parity
Select even, odd, or no parity information. Set to match the DTE device connected to the Express 5200.

Stop Bits
Select one or two stop bits. Set to match the DTE device connected to the Express 5200.

Hardware Flow Control (HDW FLOW CTRL)
When enabled, the Express 5200 uses CTS to temporarily disable transmit data to the Express 5200.

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 5200 receives either 7 characters or 3 idle characters (whichever comes first).

Address Table (ADDR TABLE)

Far End Port Number (FAR END PORT)
Enter the remote Express 5200 port number that the remote device is connected to.

Outgoing DLCI (OUT DLCI)
Enter the DLCI address that identifies the virtual circuit used to connect with the remote Express 5200.

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. **PROTOCOL** options are not available when the **PPP SYNCHRONOUS** protocol is enabled. See *Figure 6-9* 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 route tables are configured through the **IP ROUTING** selection in the **CONFIG** menu.

Static routing requires additional configuration (see the chapter *IP Routing* on page 10-1 for more information).

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

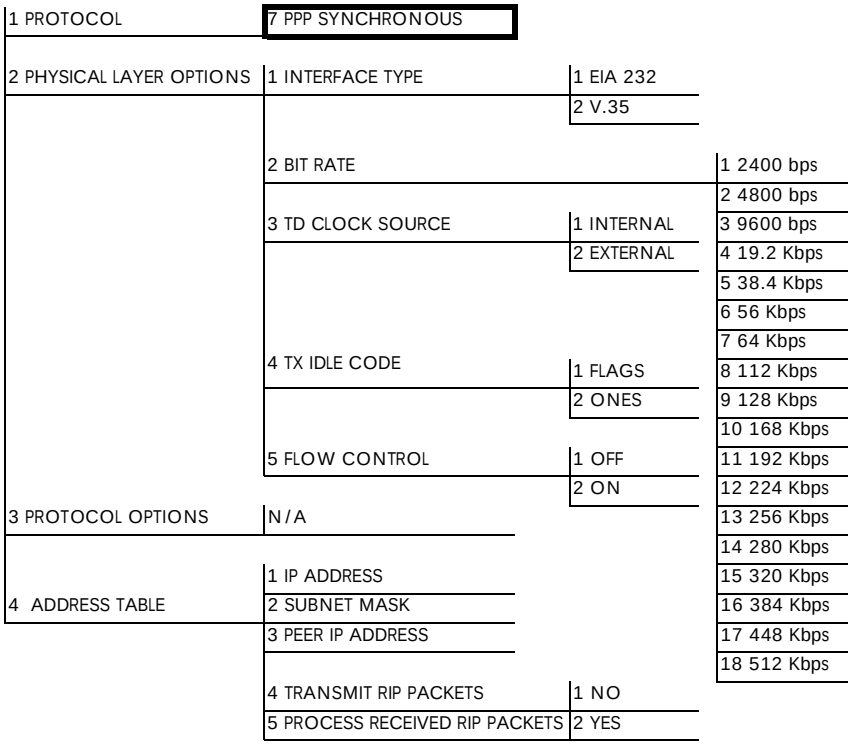


Figure 6-9. PPP Synchronous Protocol Menu Tree

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 (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 5200 to transmit **FLAGS** or all **ONES**.

Hardware Flow Control (HDW FLOW CTRL)
When enabled, the Express 5200 varies the transmit clock rate to temporarily limit the transmit data rate to the Express 5200.

Address Table (ADDR TABLE)

IP Address
Enter the internet protocol (IP) address assigned to the Express 5200 for the **DTE** port.

Subnet Mask
Enter the subnet number assigned to the network formed by the Express 5200 and the Peer PPP station.

Peer IP Address (PEER IP ADDR)
Enter the IP address of the attached PPP device.

Transmit RIP Packets (XMIT RIP)
Enable or disable the Express 5200's transmission of routing information protocol (RIP) messages. RIP broadcasts occur in 60-second intervals, advertising network addresses to the Peer PPP device. Routing tables are generated from these broadcasts.

Process Received RIP Packets (RIP PCKTS)
Enable or disable the Express 5200's reply to the request from the Peer PPP device to issue RIP messages.

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. **PROTOCOL** options are not available when the **PPP ASYNCHRONOUS** protocol is enabled. See *Figure 6-10* 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 route tables are configured through the **IP ROUTING** selection in the **CONFIGURATION** menu.

Static routing requires additional configuration (see the chapter ***IP Routing*** on page 10-1 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 (HDW FLOW CTRL)

When enabled, the Express 5200 uses CTS to temporarily disable transmit data to the Express 5200.

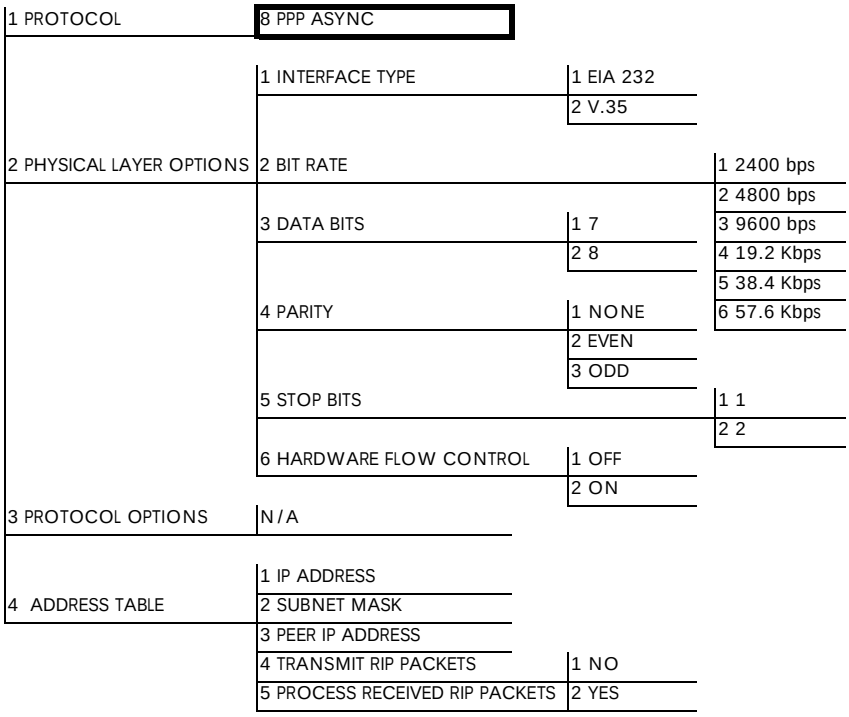


Figure 6-10. PPP Asynchronous Protocol Menu Tree

Address Table (ADDR TABLE)

IP Address
Enter the internet protocol (IP) address of the Express 5200 **DTE** port.

Subnet Mask
Enter the subnet number of the network formed by the Express 5200 and the Peer PPP station.

Peer IP Address (PEER IP ADDR)
Enter the IP address of the attached PPP device.

Transmit RIP Packets (XMIT RIP)
Enable or disable the Express 5200's transmission of routing information protocol (RIP) messages. RIP broadcasts occur in 60 second intervals, advertising network addresses to the Peer PPP device. Routing tables are generated from these broadcasts.

Process Received RIP Packets (RIP PCKTS)
Enable or disable the Express 5200's reply to the request from the Peer PPP device to issue RIP messages.

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. **PROTOCOL** options are not available when the **SLIP** protocol is enabled. See *Figure 6-11* 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 route tables are configured through the **IP ROUTING** selection in the **CONFIGURATION** menu.

Static routing requires additional configuration (see the chapter *IP Routing* on page 10-1 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 (HDW FLOW CTRL)
When enabled, the Express 5200 uses CTS to temporarily disable transmit data to the Express 5200.

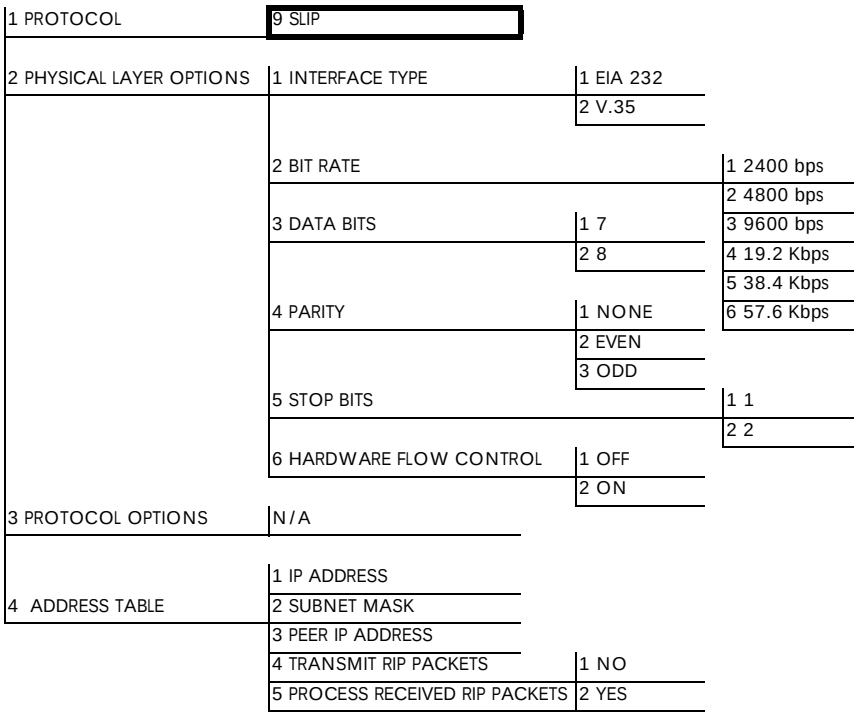


Figure 6-11. SLIP Protocol Menu Tree

Address Table (ADDR TABLE)

IP Address
Enter the internet protocol (IP) address of the Express 5200 DTE port.

Subnet Mask
Enter the subnet number of the network formed by the Express 5200 and the Peer SLIP station.

Peer IP Address (PEER IP ADDR)
Enter the IP address of the attached SLIP device.

Transmit RIP Packets (XMIT RIP)
Enable or disable the Express 5200's transmission of routing information protocol (RIP) messages. RIP broadcasts occur in 60 second intervals, advertising network addresses to the Peer SLIP device. Routing tables are generated from these broadcasts.

Process Received RIP Packets (RIP PCKTS)
Enable or disable the Express 5200's reply to the request from the Peer SLIP device to issue RIP messages.

Chapter 7 Voice Interface Configuration

Select **FXS**, **FXO**, or **E&M OPTIONS** from the **CONFIGURATION** menu. The option available is dependent upon the voice card installed. *Figure 7-1* shows the **CONFIGURATION** menu for the FXS card.

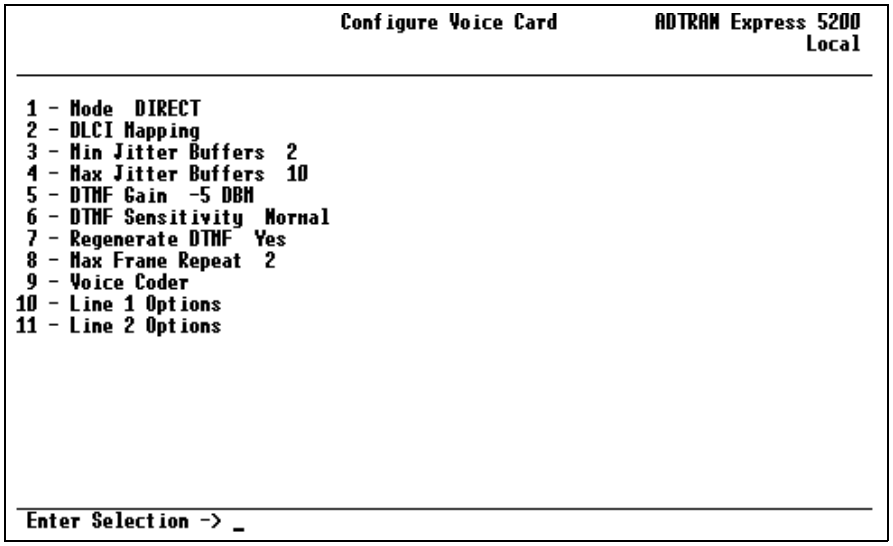


Figure 7-1. Voice Options Menu

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 4-12 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.

Remote/Host (Rem/Host)

Configure the unit to be either the **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 other 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

For **DIRECT** connections, the DLCI for voice traffic must be specified. This information must be specified in both the local and remote units. Voice data may be multiplexed with data on the same DLCI.

Line 1 DLCI (L1 DLCI)
Local DLCI that Line 1 voice data is carried on.

Line 2 DLCI (L2 DLCI)
Local DLCI that Line 2 voice data is carried on.

Selections Available for a Host Unit in Switched Mode

This selection gives 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 5200 and the extension for the two voice ports connected to that DLCI. The Express 5200 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 so configuration is not required on the remote units.

Extension 1 (EXT 1)
Enter the extension for line 1 on a remote Express 5200.

Extension 2 (EXT 2)
Enter the extension for line 2 on a remote Express 5200.

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

Cascade Entry (CASCADE)
Set to **YES** when cascading units from the host unit. To cascade units, connect via a **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 5-10.

Extension Length (EXT LENGTH)

Number of digits used to assign extensions (**SWITCHED** mode only).

DTMF Gain

The output gain of regenerated DTMF tones.

DTMF Sensitivity (DTMF SENS)

The level of sensitivity at which the Express 5200 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.

Interface Type

Two-wire or four-wire interface type selectable 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.

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 5200 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 eliminating the transmission of data while no voice activity is detected.

Chapter 8 Network Port Configuration

NETWORK PORT

Access the network options by selecting **NETWORK PORT** from the **CONFIGURATION** menu. See the menu tree in *Figure 8-1*. 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 5200 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 Ports**. Selections made will affect the choices available for the **DTE Ports**.*

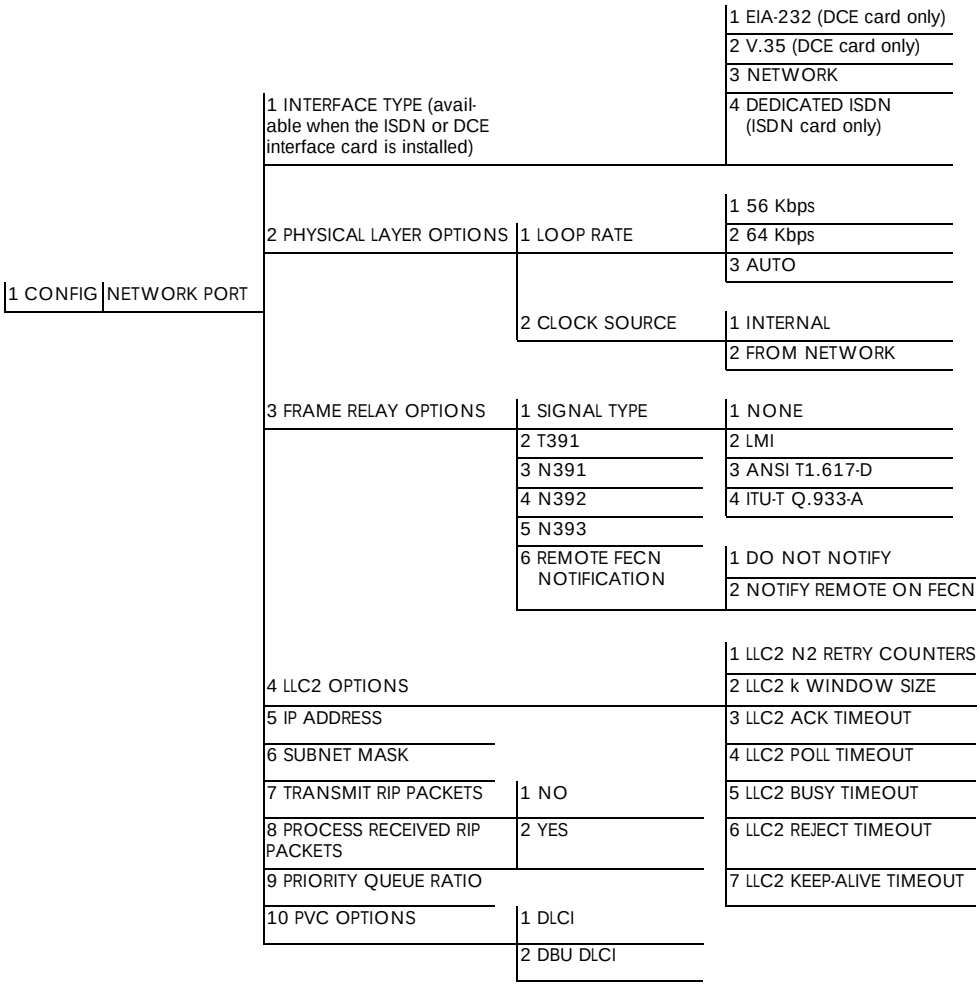


Figure 8-1. Network Port Configuration Menu Tree

When configuring from a VT 100 terminal, the screen in *Figure 8-2* will appear when **NETWORK PORT** is selected.

NOTE

In this chapter, the VT 100 selections are listed first followed by the front panel selections (if the names differ).

```
Network Port                Configure Network Port        ADTRAN Express 5200
                                                                    Local

 1 - Interface Type  Network
 2 - Physical Layer Options
 3 - Frame Relay Options
 4 - LLC2 Options

 5 - IP Address  0.0.0.0
 6 - Subnet Mask  0.0.0.0

 7 - Transmit Rip Packets  No
 8 - Process Received Rip Packets  No
 9 - Priority Queue Ratio (N:1)  1

10 - PVC Options

Enter Selection -> _
```

Figure 8-2. VT 100 Network Port Configuration Menu

Interface Type (INTERFACE)

Select the **INTERFACE TYPE**. This option only applies to the ISDN and external DCE interface cards.

Physical Layer Options (PHYS LYR OPTS)

Loop Rate

Select a loop rate of either **56K**, **64K**, or **AUTO**.

Clock Source

Configure the Express 5200 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 VT 100 screen in *Figure 8-3* appears when **FRAME RELAY OPTIONS** is selected from the **CONFIGURE NETWORK PORT** menu.

```
Network Port          Configure Frame Relay Parameters   ADTRAN Express 5200
                                                                  Local

1 - Signal Type  ANSI T1.617-D

2 - T391  10
3 - N391  6
4 - N392  3
5 - N393  4

6 - Remote FECN Notification  Do Not Notify

Enter Selection -> _
```

Figure 8-3. VT 100 Network Port Frame Relay Options 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, **SIGNAL TYPE** *should be set to* **NONE**.

T391

Set the time between polls to the frame relay network.

N391

Determine how many link integrity polls occur in between full status polls.

N392 and N393

These parameters define the error threshold for the UNI formed by the Express 5200 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 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 **NETWORK PORT SIGNALING STATE** (see page 12-5). 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 is a proprietary feature with ADTRAN Express 5200s and can only be used with an ADTRAN Express 5200 on both ends of the virtual circuit.

LLC2 Options (LLC2 OPTS)

The VT 100 screen in *Figure 8-4* appears when **LLC2** (Logical Link Control Type 2) **OPTIONS** is selected from the **CONFIGURE NETWORK PORT** menu.

LLC2 N2 Retry Counters (N2 RETRY)

Maximum retries for actions timed by the ACK poll, busy or reflect timers. When N2 is exceeded, a reset condition occurs.

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.

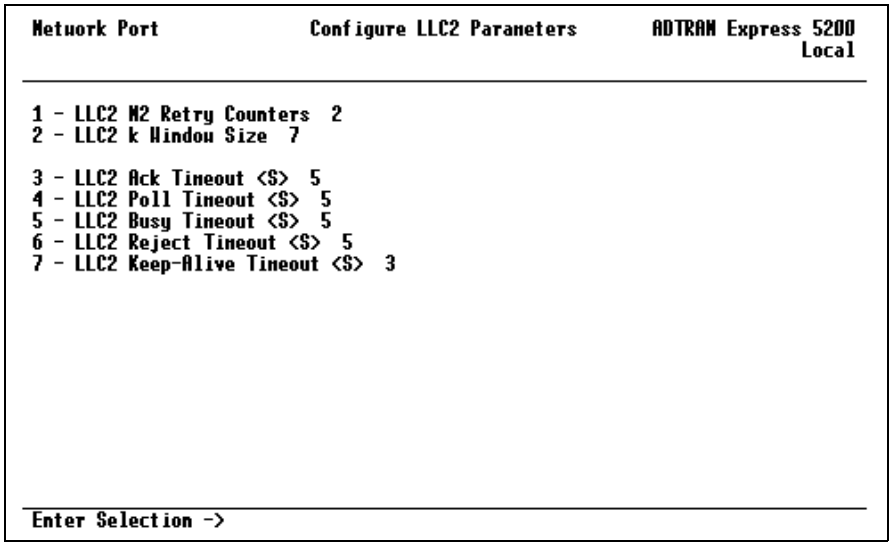


Figure 8-4. VT 100 Network Port LLC2 Options Menu

IP Address

Enter the internet protocol (IP) address of the Express 5200 **Network** port.

Subnet Mask

Enter the subnet number of the network formed by the Express 5200 and the other FRADs/routers across the frame relay network.

Transmit RIP Packets (XMIT RIP)

Enable or disable the Express 5200's transmission of routing information protocol (RIP) messages. RIP broadcasts occur in 60-second intervals, advertising network addresses to the peer routers or FRADs. Routing tables are generated from these broadcasts.

Process Received RIP Packets (RIP PCKTS)

Enable or disable the Express 5200's reply to the request from the peer routers or FRADs to issue RIP messages.

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 5200 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.

DBU DLCI

Enter the DLCI that data is received on during dial backup (i.e., the DLCI that the remote Express 5200 is transmitting to). This option is only available when an ISDN DBU or external DCE interface card is installed.

Next (NEXT key on front panel)

Edit the next entry in the **PVC OPTIONS** table.

Previous (PREV key on front panel)

Edit the previous entry in the **PVC OPTIONS** table.

Add (ADD key on front panel)

Add a new entry to the **PVC OPTIONS** table.

Delete (DELETE key on front panel)

Delete the current entry in the **PVC OPTIONS** table.

Chapter 9 Dial Backup Configuration

DIAL BACKUP OPTIONS

The **CONFIGURE DIAL BACKUP** menu (*Figure 9-1*) stores dial backup phone numbers, enables / disables the auto DBU capability, defines the DBU criteria when the DDS circuit fails, and controls the DBU timers. See *Figure 9-2* for a complete menu tree of the DBU selections.

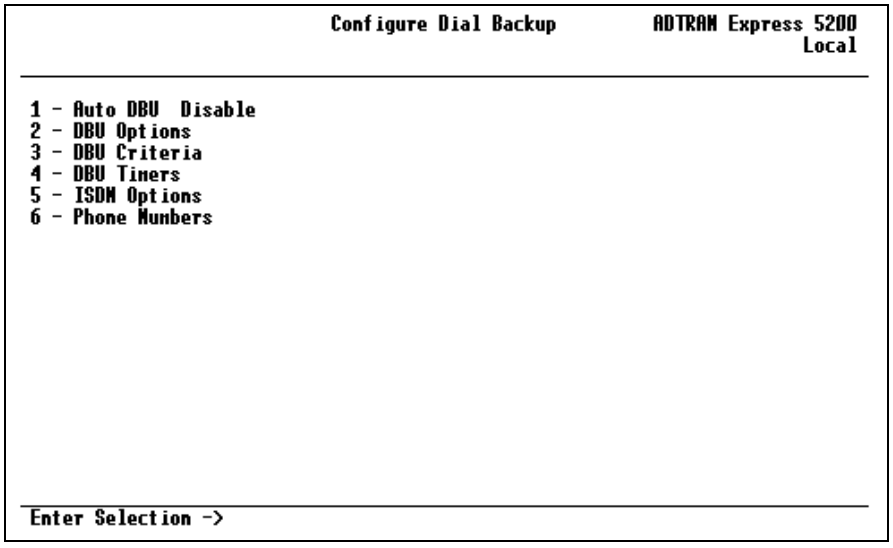


Figure 9-1. DBU Options Menu

Dial backup is only supported when the unit is operated in point-to-point mode.

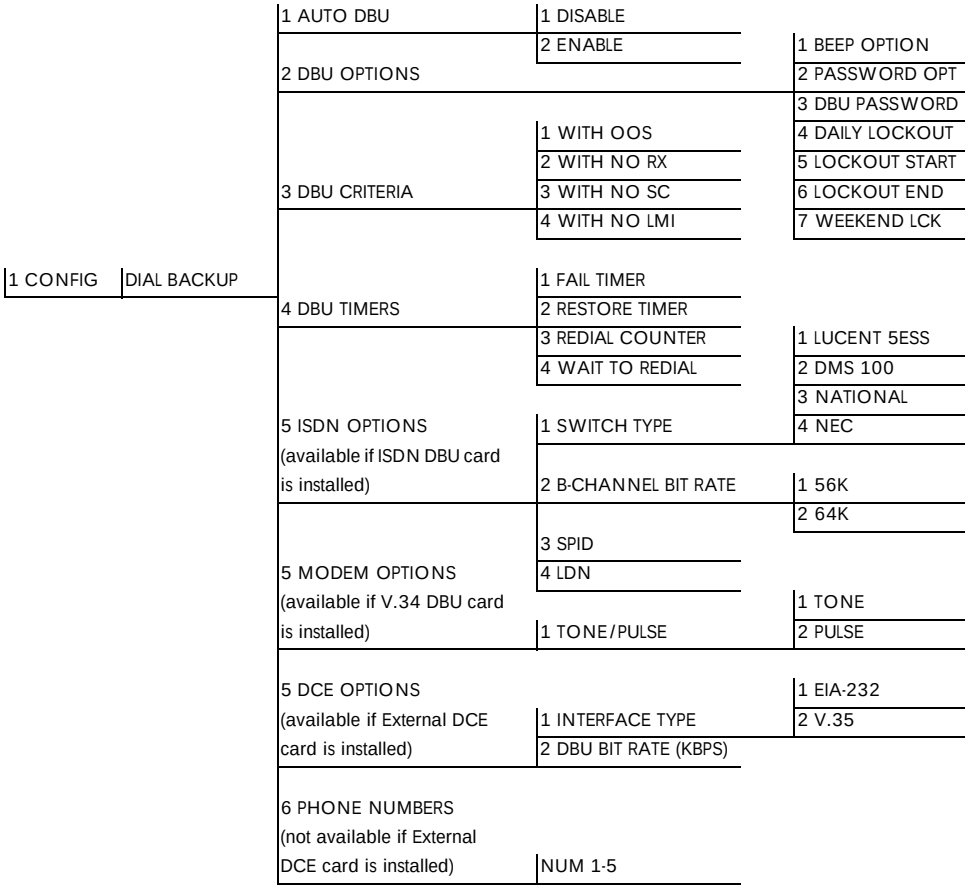


Figure 9-2. Dial Backup Menu Tree

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 5200 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 5200s 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**).

DBU Password
Enter the authentication string used for making dial backup connection. The near and far end Express 5200 **DBU PASSWORDS** must be identical. If using front panel entry, see the section *Entering Letters Using the Front Panel* on page 11-3 for more information.

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 5200 enters backup mode if an out-of-service condition is detected. The factory default setting is **ENABLE**.

With No RX
When enabled, the Express 5200 enters backup mode when a loss of signal is detected. The factory default setting is **ENABLE**.

With No SC
When enabled, the Express 5200 enters backup mode when a loss of sealing current is detected. The factory default setting is **ENABLE**.

With No LMI
When enabled, the Express 5200 enters backup mode when a loss of signaling from the frame relay switch is detected. The default setting is **ENABLE**.

DBU Timers

Fail Timer
This option sets the amount of time the dedicated circuit failure condition must be active before the Express 5200 attempts backup. The amount of time, which is manually entered, can be up to 990 seconds. The factory default setting is 30 seconds.

Restore Timer
Once the DDS circuit is down, the Express 5200 remains in backup until the DDS circuit is active for the length of time specified for the **RESTORE TIMER**. The selection is entered in minutes (up to 255). If set to 0, the DDS must be restored manually. The factory default setting is 1 minute.

Redial Counter
This option sets the number of times the Express 5200 redials the far end when entering backup mode. The **REDIAL COUNTER**, which is manually entered, can be up to a maximum of 99 attempts. If the

Express 5200 encounters a busy or reorder, it attempts to establish the call the specified number of times. The factory default setting is 5.

Wait to Redial

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

DBU Card Options

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

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 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

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

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 **DBU** interface (0-1536 kbps).

Phone Numbers 1-5

The Express 5200 stores up to 5 numbers of 36 digits each. 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 10 IP Routing

IP ROUTING WITH THE EXPRESS 5200

The Express 5200 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 **TRANSMIT RIP PACKETS** parameter enables the Express 5200 to share the internal routing table with other routers and FRADs attached to the port. The **PROCESS RECEIVED RIP PACKETS** parameter enables the Express 5200 to process routing table information from other routers and FRADs attached to the port. See *Transmit RIP Packets (XMIT RIP)* on page 6-22 and page 8-8 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 5200 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 first choosing **1 CONFIGURATION** from the **MAIN** menu. Then choose **IP ROUTING** from the **CONFIGURATION** menu. When using the VT 100 terminal interface, the screen in *Figure 10-1* will appear. *Figure 10-2* shows the front panel **IP ROUTING** menu tree.

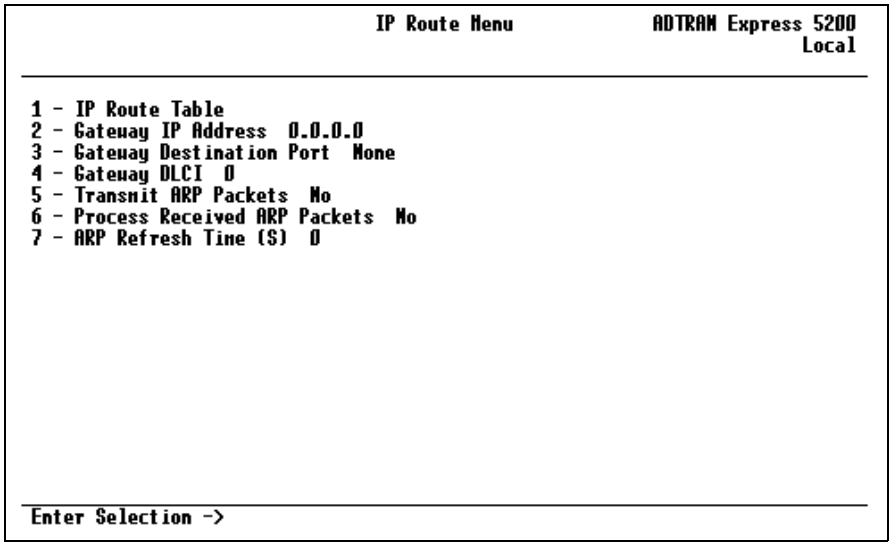


Figure 10-1. VT 100 IP Route Menu

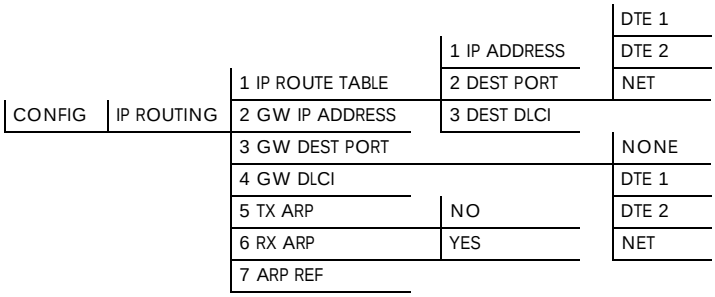


Figure 10-2. IP Routing Front Panel Menu Tree

IP Route Table

Use these menu options to build a table of addresses for routing data packets based on their IP address. When a packet with the specified IP address is received, it is sent out through the selected port on the specified DLCI. See *Figure 10-3*.

The **IP ROUTE TABLE** can be used in conjunction with RIP protocol to provide routing paths for the entire IP network. If an IP packet is received with a destination IP not located in the internal routing table (static or RIP), then the gateway route is used.

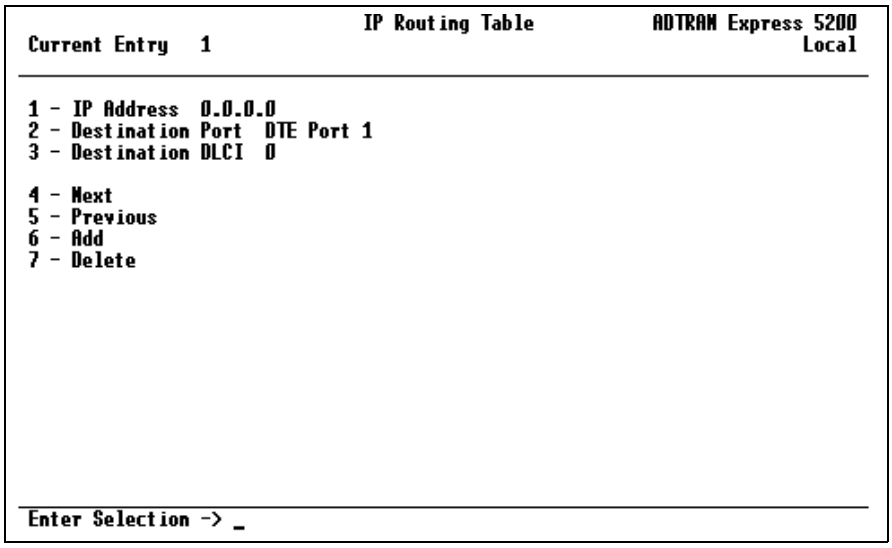


Figure 10-3. IP Routing Table Menu

Example Route Table Entry

IP ADDRESS=192.239.232.0
DESTINATION PORT=NETWORK PORT
DESTINATION DLCI=16
This example provides a route for IP address range 192.239.232.1 through 192.239.232.254 using the network port and virtual circuit 16. See the following parameter descriptions.

IP Address
Enter the **IP ADDRESS** to be routed. 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.

Destination Port (DEST PORT)
Select the port on the Express 5200 used to transmit the packets with the specified IP address.

Destination DLCI (DEST DLCI)
Enter the virtual circuit to be used when the network port is part of the destination IP path. This selection is only applicable if the corresponding **DESTINATION PORT** is set for **NETWORK PORT**.

Next (NEXT key on front panel)
Edit the next entry in the address table.

Previous (PREV key on front panel)
Edit the previous entry in the address table.

Add (ADD key on front panel)
Add a new entry to the address table.

Delete (DELETE key on front panel)
Delete the current entry in the address table.

Gateway IP Address (GW IP ADDRESS)

Enter the **GATEWAY IP ADDRESS**. If an IP packet with an unknown IP address is received, the Express 5200 sends it to the Gateway (which is a router or another FRAD).

Gateway Destination Port (GW DEST PORT)

Enter the port from which the gateway can be reached.

Gateway DLCI (GW DLCI)

If the **GATEWAY DESTINATION PORT** is set to **NETWORK**, this parameter identifies the virtual circuit used to reach the gateway.

Transmit ARP Packets (TX ARP)

This parameter enables the transmit portion of the network port inverse ARP protocol. If enabled, inverse ARP messages are sent to every DLCI assigned to the network port each ARP refresh time period and inverse ARP responses are generated.

Process Received ARP Packets (RX ARP)

This parameter enables the receive portion of the network port inverse ARP protocol. If enabled, all inverse ARP messages received are used to associate peer IP addresses with DLCI values.

ARP Refresh Time (ARP REF)

Determine how often an inverse ARP request is sent to every DLCI assigned to the network port.

ARP is used in conjunction with RIP to dynamically resolve IP routes and should be enabled if RIP is enabled on the network port (see page 8-8).

Chapter 11 System Configuration

Access **SYSTEM CONFIGURATION** selections by first choosing **1 CONFIGURATION** from the **MAIN** menu. Then choose **SYSTEM** from the **CONFIGURATION** menu. The VT 100 menu is shown in *Figure 11-1*, and the front panel menu tree is shown in *Figure 11-2*.

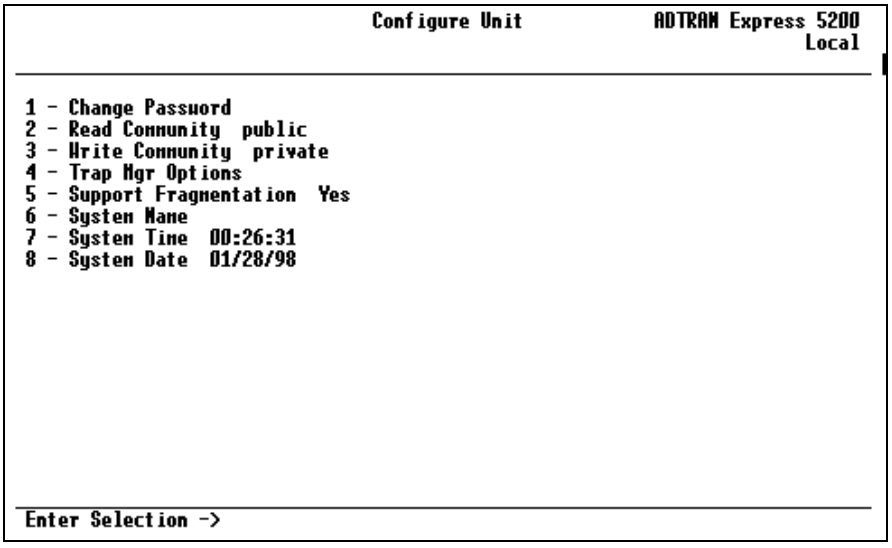


Figure 11-1. System Configuration Menu

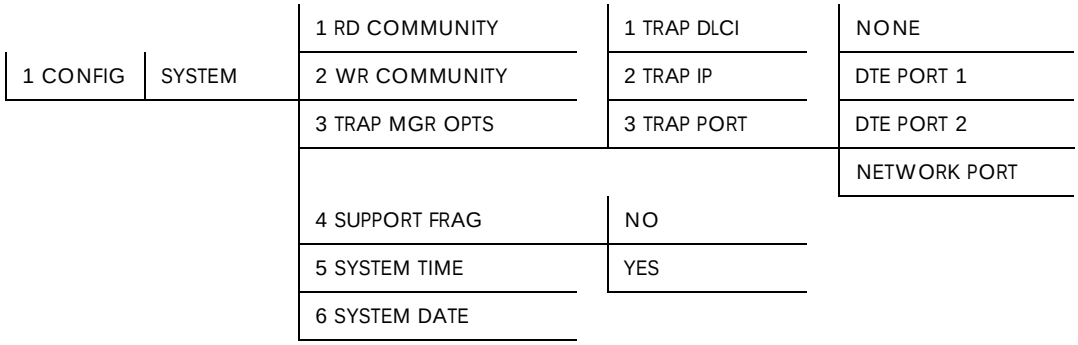


Figure 11-2. System Configuration Front Panel Menu

Change Password

Enter a new password of nine digits or less. The default password is **adtran**. This selection is only available in the VT 100 interface.

Read Community (RD COMMUNITY)

Enter the authentication strings used for SNMP management. Match the Express 5200 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 11-3 for instructions.

Write Community (WR COMMUNITY)

Enter the authentication strings used for SNMP management. Match the Express 5200 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 11-3 for instructions.

Trap Mgr Options (TRAP MGR OPTS)

Trap Manager DLCI (TRAP DLCI)

If the **TRAP MANAGER PORT** is set for **NETWORK**, this parameter identifies the virtual circuit used for all traps generated by the Express 5200.

Trap Manager IP Address (TRAP IP)

Enter the IP address of the SNMP manager to which the Express 5200 sends traps.

Trap Manager Port (TRAP PORT)

Enter the Express 5200 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 Time and Date

Enter time / date information. View this information in the **SYSTEM STATUS** menu (see page 12-10). Time is in 24-hour format (i.e., military time).

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 Statistics

For descriptions of the VT 100 **STATISTICS** menus see the following section, *Viewing Statistics Information (VT 100 Interface).* For front panel menu descriptions, see the section *Viewing Statistics Information (Front Panel Interface)* on page 12-11.

VIEWING STATISTICS INFORMATION (VT 100 INTERFACE)

Select **VIEW STATISTICS** from the **MAIN** menu to access the **STATISTICS MENU** shown in *Figure 12-1*. From this menu, select to view port (DTE or Network), protocol, system or voice statistics. Select **RESET STATISTICS** to clear all current information.

Hot Keys

Once you have entered one of the **STATISTICS** menus, hot keys are displayed across the bottom of the screen, allowing you to quickly access other menus. These keys vary depending on the menu currently displayed.

ESC

Press the **Esc** key to return to the main **STATISTICS MENU** (shown in *Figure 12-1* on page 12-2).

DLCI Status (D)

When viewing **NETWORK PORT STATISTICS** or when configured for **FRAME RELAY** protocol on a **DTE PORT** (see the section *Frame Relay*

Protocol on page 6-3), press **D** to see the **VIEW DLCI STATISTICS** menu shown in *Figure 12-6* on page 12-8.

Protocol Statistics (P) - DTE and Network Port Menus only

When in any **PORT STATISTICS** menu, press **P** to see the **VIEW PROTOCOL STATISTICS** menu shown in *Figure 12-7* on page 12-9.

Current Statistics (C)

Press **C** to resume viewing current statistics information after a freeze.

Freeze Statistics (F)

Press the **F** key to freeze the current statistics information.

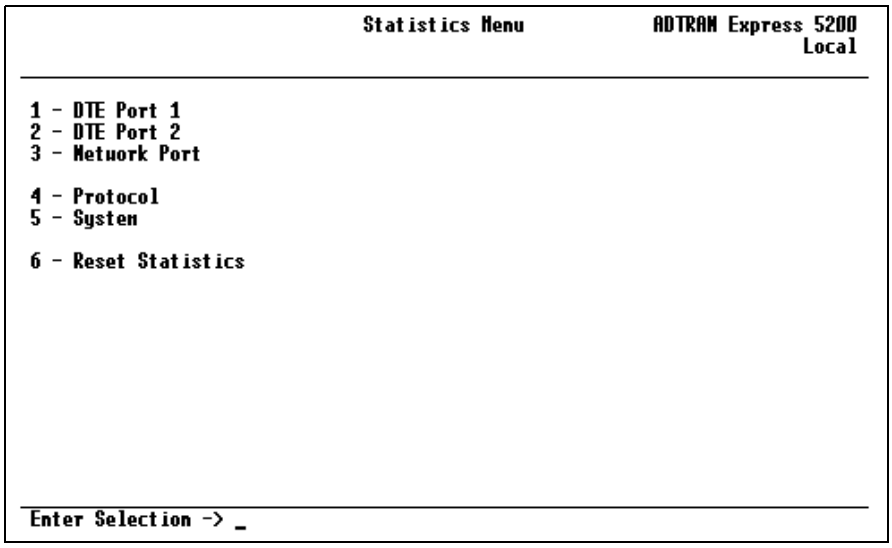


Figure 12-1. Statistics Menu

DTE and Network Ports

The following sections describe the information given on the **DTE PORT** and **NETWORK PORT VIEW STATISTICS** menus. See *Figure 12-2* through *Figure 12-5*.

Current Status

Information given is for the selected port since the last clear.

Leads On

If a lead has become active on the selected port since the last screen refresh, it is listed in the View Statistics menu. See *Figure 12-2*.

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

Total

Totals given are for the selected port since the last clear.

Rx Frames	Received frames
Tx Frames	Transmitted frames
Rx Bytes	Received bytes
Tx Bytes	Transmitted bytes

Errors

Counts given for the following errors are for the selected port since the last clear:

Rx Errored Frames	Frames dropped due to one or more errors.
CRC Errors	Frames received with CRC16 violations (not available when **TRANSPARENT ASYNC** protocol is selected).
Parity Errors	Frames received with parity errors (only available when **TRANSPARENT ASYNC** protocol is selected).

Rcv Overrun	Receive FIFO (first in first out) overrun. External clock for network port is too fast.
Port Unavailable	Frames received destined for an inactive port.
Inv Formats	Frames received with invalid encapsulation code points.
Unknown DLCI	All frames received with a DLCI address not already defined by the Express 5200.
Aborts Rcv	Frames received with abort sequence of seven ones (not available when **TRANSPARENT ASYNC** protocol is selected).
Breaks Rcv	Async break characters received (*only* available when **TRANSPARENT ASYNC** protocol is selected).
Frame Errors	Frames received which are violating maximum frame size or are not octet-aligned.
DCD Loss	Frames received with DCD falling before the end of the frame.
Buffer Unavailable	Number of packets received without any buffers available, indicating a congested situation. Verify **HARDWARE FLOW CONTROL** is enabled.
Invalid DLCI	Frames received on invalid DLCI.
Inactive DLCI	Frames received on inactive DLCI.

Signal Statistics

This status information applies when the DTE port is configured for **FRAME RELAY** protocol or when viewing **NETWORK STATISTICS** information.

Tx Signal Frame	Total signaling frames transmitted (polls or responses).

Signal Frame Error	Signal frames received with protocol violations.
Signal State	State of frame relay port (up or down)
Rx Signal Frame	Count of received signal frames (polls or responses).
Signal Timeouts	Count of how many T391 or T392 timeouts have occurred.

```
                              View Statistics              ADTRAN Express 5200
                                                                     Local
DTE Port 1    Leads On --> CTS  DSR  DCD

 Total:
    Rx Frames --->        0              Rx Bytes ---->        0
    Tx Frames --->        0              Tx Bytes ---->        0

 Errors:
    Rx Err Frms ->        0              Aborts Rcv -->        0
    CRC Errors -->        0              Frame Errs -->        0
    Rcv Overrun ->        0              DCD Loss ---->        0
    Port Unavail >        0              Buff Unavail >        0
    Inv Formats ->        0              Invalid DLCI >        0
    Unknown DLCI >        0              Inactive DLCI>        0


    Tx Signal Frm>        0              Rx Signal Frm>        0
    Sig Frm Err ->        0              Sig Timeouts >        4
    Sig State --->Down


ESC-Menu      D-DLCI Stats      P-Protocol Stats      C-Current Stats     F-Freeze
```

Figure 12-2. DTE Port View Statistics Menu-Frame Relay Protocol

```
                              View Statistics              ADTRAN Express 5200
                                                                     Local
DTE Port 2    Leads On --> CTS  DSR

 Total:
    Rx Frames --->        0              Rx Bytes ---->        0
    Tx Frames --->        0              Tx Bytes ---->        0

 Errors:
    Rx Err Frms ->        0              Breaks Rcv -->        0
    Parity Errs ->        0              Frame Errs -->        0
    Rcv Overrun ->        0              DCD Loss ---->        0
    Port Unavail >        0              Buff Unavail >        0
    Inv Formats ->        0              Invalid DLCI >        0
    Unknown DLCI >        0              Inactive DLCI>        0



ESC-Stats Menu      P-Protocol Stats      C-Current Stats      F-Freeze Stats


-
```

Figure 12-3. DTE Port View Statistics Menu (Trans Async)

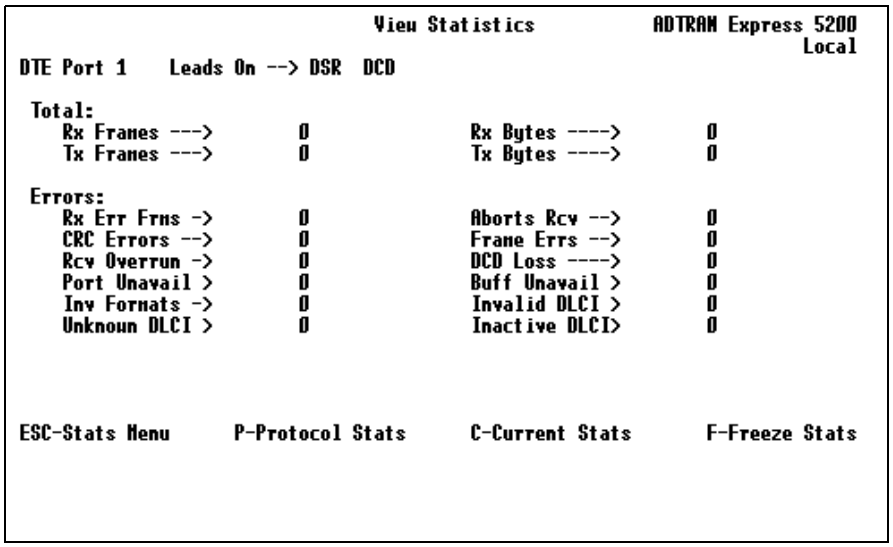


Figure 12-4. DTE Port View Statistics Menu-All Other Protocols

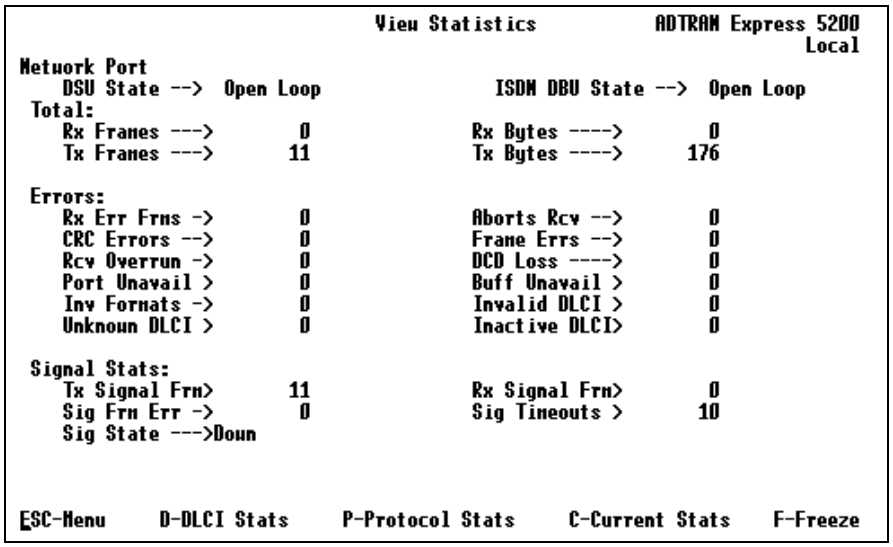


Figure 12-5. Network Port View Statistics Menu

DLCI Statistics

This menu lists every DLCI number for each frame relay port and classifies it as **A** (active), **I** (inactive), or **U** (unknown). See *Figure 12-6*. A byte and frame break out for the entire unit is also provided including an in / out count as well as a count of how many frames were received with FECN, BECN, or DE (discard eligibility) enabled.

NOTE

*DLCI information for the **DTE** port is only available when the* **FRAME RELAY** *protocol is enabled or when viewing* **NETWORK PORT STATISTICS**.

```
Current                        View DLCI Statistics          ADTRAN Express 5200
                                                                          Local
Network Port
          ------------------ Frames ------------------   -------  Bytes -------
DLCI          In        Out       FECN      BECN      DE         In         Out

   0  U          0        553          0         0       0          0        8848
  16  A          0          0          0         0       0          0           0

Unknown          0          0                                      0           0
Inactive         0          0                                      0           0
Signal           0        553                                      0        8848

ESC = Prev Menu   P = Protocol Stats    C = Current   F = Freeze  +,- = Page
```

Figure 12-6. View DLCI Statistics Menu

Protocol Statistics

This menu provides information on frames and bytes received / transmitted by the Express 5200. The information is organized by DTE protocols. Protocols other than those included in the list are placed in the **OTHER PROTOCOLS** section and are divided into

signaling frames / bytes and frame / byte totals on the network side. See *Figure 12-7*.

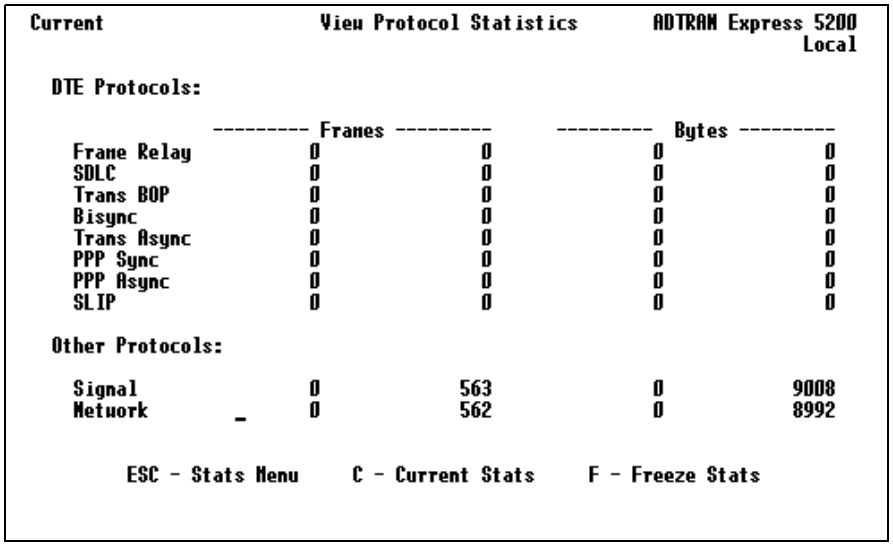


Figure 12-7. View Protocol Statistics Menu

System Statistics

The system time and date (as set in the **SYSTEM CONFIGURATION** menu) and the software revision 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 12-8*.

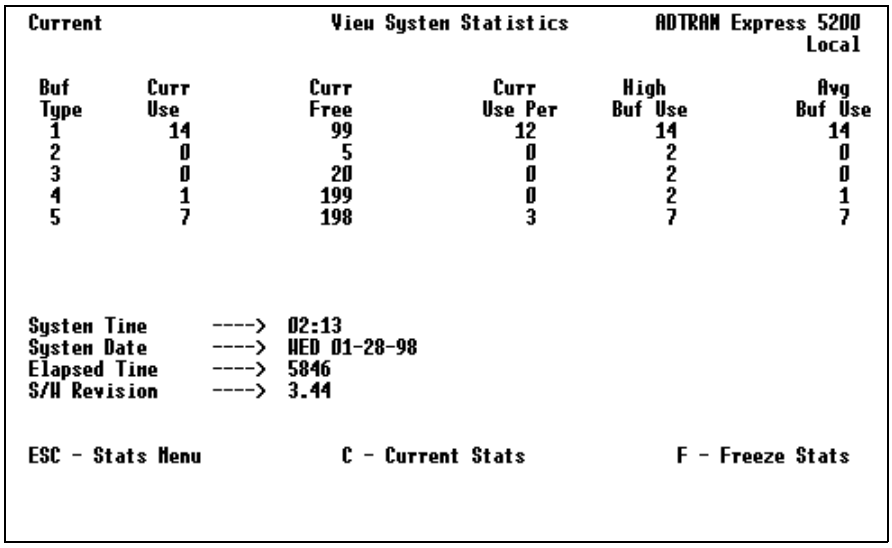


Figure 12-8. View System Statistics Menu

Voice Status

Selecting **FXO**, **FXS**, or **E&M STATS** 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**. See *Figure 12-9*.

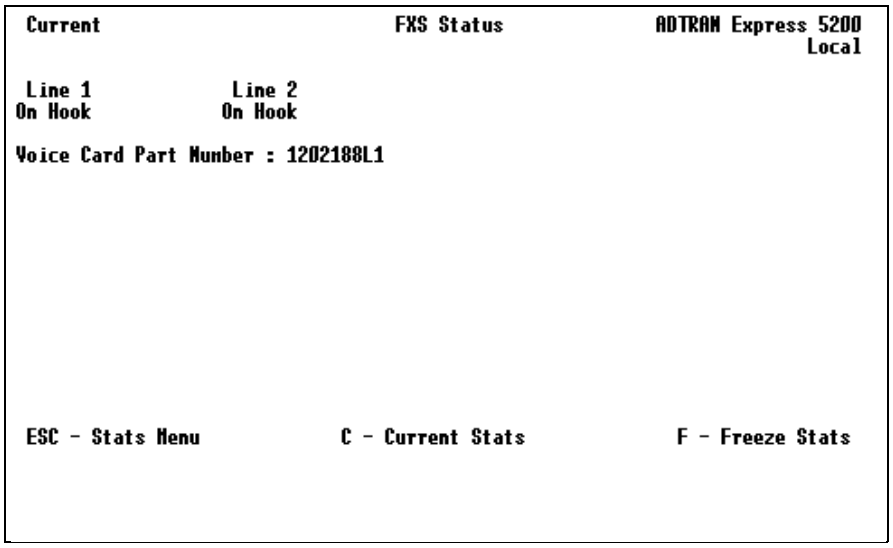


Figure 12-9. Example of Voice Status Menu (FXS Card Option)

VIEWING STATISTICS INFORMATION (FRONT PANEL INTERFACE)

Select **STATS** from the main front panel menu. From this menu, choose to view **DTE**, **NETWORK 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 1, 2=DTE 2, N=Network).

DTE Port Statistics

The following information is displayed when **DTE 1** or **DTE 2** port is selected.

Control Signal Status Screen

An asterisk (*) indicates that the signal is active for the currently selected port. See *Figure 12-10*.

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

Figure 12-10. Front Panel Control Signal Status Screen

Frames In
Total received frames since last reset.

Frames Out
Total transmitted frames since last reset.

Errored Frames
Total errored frames received since last reset.

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 since last reset.

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

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

Sync Frame Errors
Sync frames received which are violating maximum frame size or are not octet-aligned.

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

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

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

Network Port Statistics

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

DSU Loop State
Current state of the incoming DDS circuit.

DBU Status
Current state of the DBU service (only available when DBU card is installed).

Signal State
Current state of frame relay port (up or down). See *Figure 12-11*.

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

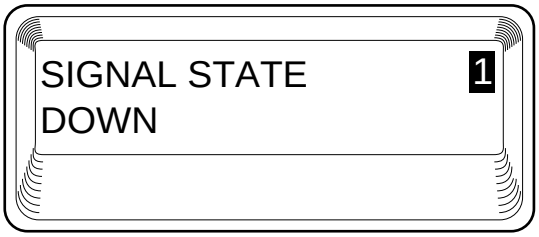


Figure 12-11. Front Panel Signal State Screen

Signal Timeouts
Total timeouts that have occurred since the last reset.

Signal Errors
Total signal errors received since last reset.

Frames In
Total received frames since last reset.

Frames Out
Total transmitted frames since last reset.

Errored Frames
Total errored frames received since last reset.

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 since last reset.

CRC Errors
Frames received with CRC16 violations.

Abort Frames
Frames received with abort sequence of seven ones.

DLCI List

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

System Status

Select **SYSTEM** from the **STATS** menu to display the software version and checksum. This screen is shown in *Figure 12-12*. Press the down arrow to view the current date and time. See *Figure 12-13* and *Figure 12-14*. Press **Cancel** to return to the main **STATS** menu.

Status Information Available for the FXS/FXO/E&M Port

The voice port **STATS** screens display the current state of the voice ports (L1 and L2). Possible states are **ON HOOK**, **OFF HOOK**, and **RINGING**.

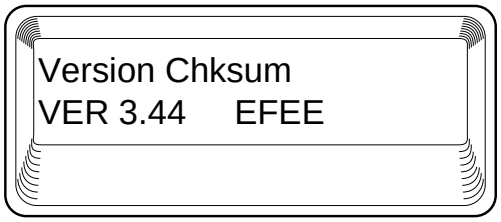


Figure 12-12. Front Panel System Status Screen

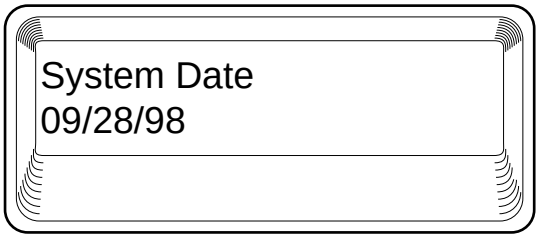


Figure 12-13. Front Panel System Date Screen

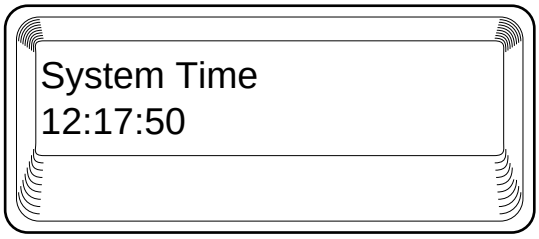


Figure 12-14. Front Panel System Time Screen

Chapter 13 Testing

This menu allows you to send ping requests and perform voice port diagnostics. See *Figure 13-1* for the VT 100 **TEST MENU**. See *Figure 13-2* for the front panel menu tree.

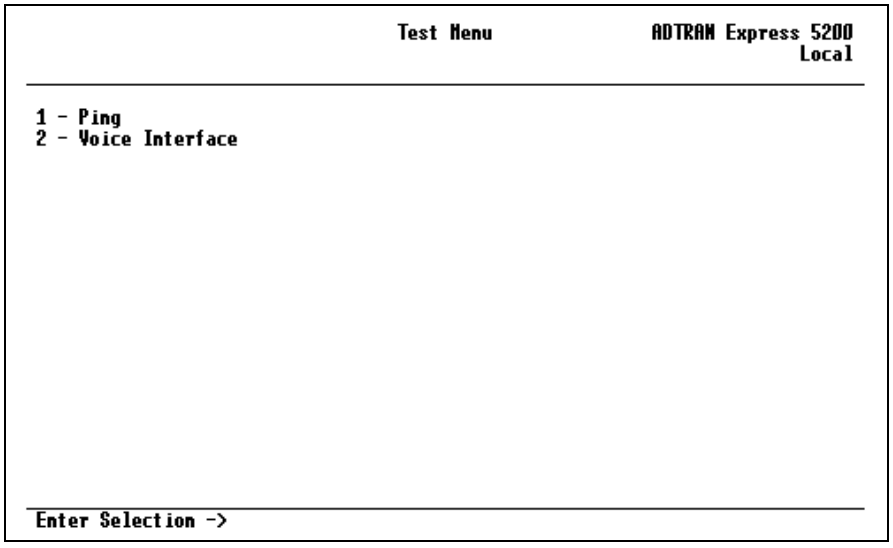


Figure 13-1. VT 100 Test Menu

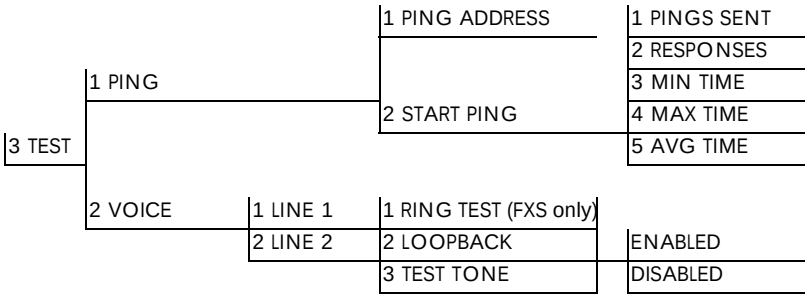


Figure 13-2. Front Panel Test Menu

Ping

Select **1 PING** to send a ping request to a specific address. See *Figure 13-3* for the VT 100 **PING MENU**.

Address to Ping (PING ADDRESS)

Enter the IP address of the unit the Express 5200 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 (for more information, see the chapter IP Routing on page 10-1).

Start Ping

Results are shown after the ping test has been performed. The **START PING** command causes the Express 5200 to send ten ping requests to the target station. At the end of the ten-ping test, the following results are shown:

Pings Transmitted (PINGS TX)
This field shows the number of pings sent (always 10).

Ping Responses (PINGS RX)
This field shows the number of responses received from the pinged device.

Min Response Time (MIN RESP TIME)
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.

Max Response Time (MAX RESP TIME)
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.

Avg Response Time (AVG RESP TIME)
This field shows the average response time based on all received responses.

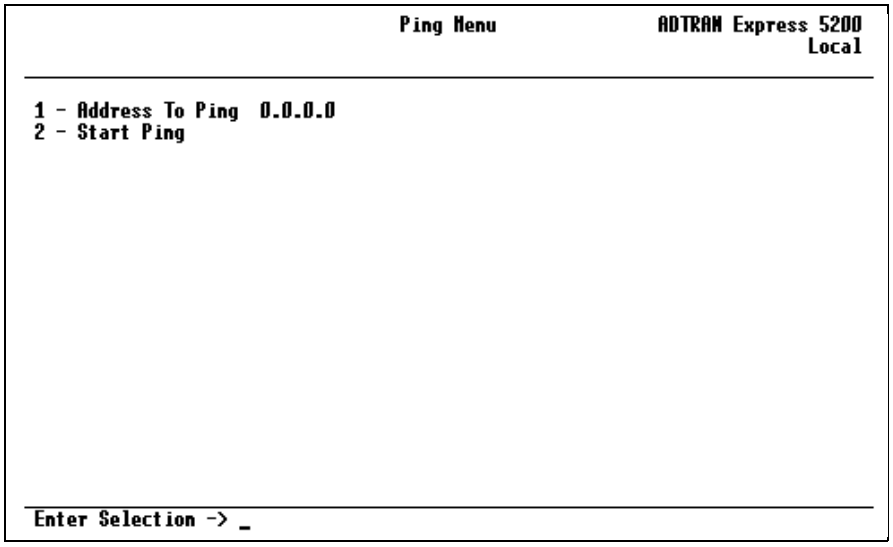


Figure 13-3. VT 100 Ping Menu

Voice

Lines 1 and 2 (FXS/FXO/E&M Cards)

Select **VOICE INTERFACE** 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. See *Figure 13-4*.

```
DTE Port 1              Voice Interface Test Menu      ADTRAN Express 5200
Current Entry   1                                              Local

1 - Ring Test  Disabled
2 - Loopback  Disabled
3 - Test Tone  Disabled

Enter Selection -> _
```

Figure 13-4. Voice Interface Test Menu

Ring Test

This command cycles the ring generator in a standard 2sec/4sec pattern. This test is applicable for the FXS voice card only.

Loopback

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.

Chapter 14 Activating DBU Functions

DIAL OPTIONS

The dial options available from the Main menu appear in *Figure 14-1*.

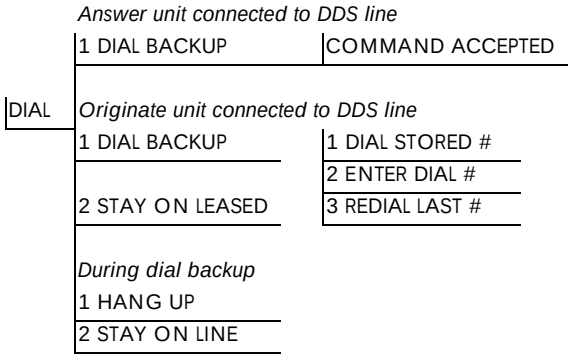


Figure 14-1. DBU Options Menu

Options Available when Answer Unit is Connected to the DDS Line

Dial Backup

The Express 5200 waits for an incoming call. When an incoming call is detected, the Express 5200 answers the call and enters dial backup.

Options Available when Originate Unit is Connected to the DDS Line

Dial Backup
The Express 5200 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 5200 remains on the leased line and does not enter dial backup mode.

Options 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 5200 remains in dial backup mode and returns to the Status menu.

Appendix A Pinouts

The following tables give the pin assignments for the connectors located on the back of the Express 5200, the DBU cards, 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. 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 (TR)
21	-	Remote Loopback (RL)
22	CE	Ring Indicator (RI)
24	DA	External TX Clock (ETC)
25	-	Test Indicator (TI)

Table A-3. 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-4. 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-5. 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-6. DTE/DCE Connector Pin Assignments (DCE Card Option)

DB25 Pin#	V.35 Pin#	Function	DTEx 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	RC-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

V.35 Adapter Cable

The V.35 adapter cable allows the Express 5200 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-7. Pin Assignment for V.35 Connector

Pin	CCITT	Description
A	101	Protective ground (PG)
B	102	Signal Ground (SG)
C	105	Request to Send (TRS)
D	106	Clear to Send (CTS)
E	107	Data Set Ready
F	109	Received Line Signal Detector (CD)
H	-	Data Terminal Ready (DTR)
J	-	Ring Indicator (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)

Appendix B Specifications Summary

SPECIFICATIONS AND FEATURES

This appendix contains the standard specifications and features incorporated in the Express 5200.

Operating Modes

Dedicated point-to-point DDS
Frame relay using DDS

Network Data Rates

Dedicated Mode Service Rates
56 and 64 kbps
External DCE Card: up to 512 kbps dial backup
Switched 56: 56 kbps
V.34: 2.4 to 33.6 kbps
ISDN: 56 or 64 kbps

DTE Rates Provided

Synchronous rates: 2.4 to 64 kbps (achieve rates up to 512 kbps with the optional external DCE card and an external DSU/CSU)
Asynchronous rates: 2.4 to 57.6 kbps

DTE Data Interfaces

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

Control Port Interface

Electrical: EIA-232
Physical: RJ-48S (female DB25 adapter provided)
Data rates: async 2.4 to 38.4 kbps

SNMP

Internal SNMP agent
MIB II RFC 1213
Frame relay DTE MIB RFC 1315
ADTRAN enterprise MIB
TELNET access

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 20 SDLC PUs on each DTE port

LAN Protocol
SLIP
IP-PPP asynchronous or synchronous

Transparent
Asynchronous transparent
BOP transparent (HDLC)

Protocol Encapsulation
IP (SLIP and PPP) and LLC2 protocols are encapsulated using RFC 1490 formats.
All other protocols use proprietary formats and require ADTRAN devices at each UNI.

Data Flow Control

Synchronous: clock slowing
Asynchronous: CTS or XON / XOFF

Diagnostics

CSU and DSU loopbacks
IP ping mode

Line Requirements

Loop transmission parameters as defined in
AT&T PUB 62310: Dedicated DDS
AT&T PUB 4146B: Switched 56 (DBU interface)
RJ-48S, 4-wire, full duplex

DBU Interfaces

Switched 56: RJ-48S
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
FRF..... frame relay forum
FSU ..... frame relay service unit
HDLC..... high-speed data link control
IP..... internet protocol
ISDN ..... integrated services digital network
ITU..... International Telecommunications Union
KA..... keep alive
LAN ..... local area network
LED..... light emitting diode
LLC ..... logical link control
LMI..... local management interface
LRC..... lateral redundancy check
MIB..... management information base
ms..... millisecond
NRZ..... non-return to zero
NRZI ..... non-return to zero inverted
OCU..... office channel unit
OOS..... out of service

PLAR..... private line automatic ringdown
PPP ..... point to point protocol
PU ..... physical unit
PVC ..... permanent virtual circuit
RD ..... receive data
RDL ..... remote digital loopback
RFC..... request for comments
RFECN ..... remote forward explicit congestion notification
RIP..... routing information protocol
RMA..... return material authorization
RR..... receiver ready
RS ..... recommended standard
RTS..... request to send
Rx..... receive
SAP..... service access point
SDLC..... synchronous data link control
SLIP..... serial line internet protocol
SNA..... systems network architecture
SNMP ..... simple network management protocol
SNRM ..... set normal response mode
SR ..... data set ready
SVC ..... switched virtual circuit
SW56 ..... switched 56
sync ..... synchronous
TD..... transmit data
TR..... data terminal ready
Tx..... transmit
UNI..... user-to-network interface
VRC..... vertical redundancy check

WAN ..... wide area network

XID ..... exchange identification

XMIT ..... transmit

Appendix D Glossary

4-wire Switched 56

An AT&T proprietary 56/64 kbps switched digital data service offered by telco service providers and delivered to users over 4 copper wires. Compatible with the Express 5200 4-wire Switched 56 DBU option.

American National Standards Institute (ANSI)

Devices and proposes recommendations for international communications standards.

asynchronous

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

backward explicit congestion notification (BECN)

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

bandwidth

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

bridge

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

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

CCITT

Consultive Committee for International Telephony and Telegraphy. A standards organization that devises and proposes recommendations for international communications. See also *American National Standards Institute (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.

channel service unit

CSU. A device used to connect a digital phone line (T1 or Switched 56 line) coming in from the phone company to either a multiplexer, channel bank, or directly to another device producing a digital signal; for example, a digital PBX, a PC, or data communications device. A CSU performs certain line-conditioning and equalization functions, and responds to loopback commands sent from the central office. A CSU regenerates digital signals. It monitors them for problems, and provides a way of testing the digital circuit.

clocking

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

CPE

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

CRC

Cyclic redundancy check. A computational means to ensure the accuracy of frames transmitted between devices in a frame relay network. The mathematical function is computed, before the frame is transmitted, at the originating device. Its numerical value is computed based on the content of the frame. This value is

compared with a recomputed value of the function at the destination device. See also frame check sequence (FCS).

CS

See CTS.

CSU

See *Channel Service Unit*.

CTS

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

data service unit

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

data communications equipment (DCE)

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

data link connection identifier (DLCI)

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

dB

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

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.

discard eligibility (DE)

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

DSU

See *Data Service Unit*.

DSU loopback

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

DTE

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

E1

Transmission rate of 2.048 Mbps on E1 communications lines. An E1 facility carries a 2.048 Mbps digital signal. See also T1.

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.

file server

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

forward explicit congestion notification (FECN)

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

frame check sequence (FCS)

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

frame-relay-capable interface device

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

frame relay frame

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

frame relay network

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

high level data link control (HDLC)

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

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.

local area network (LAN)

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.

permanent virtual circuit (PVC)

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

ping

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

point-to-point

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

RDL

Remote digital loopback.

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*.

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.

synchronous data link control (SDLC)

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

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 5200.

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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 # _____